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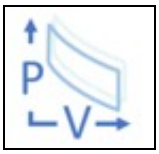
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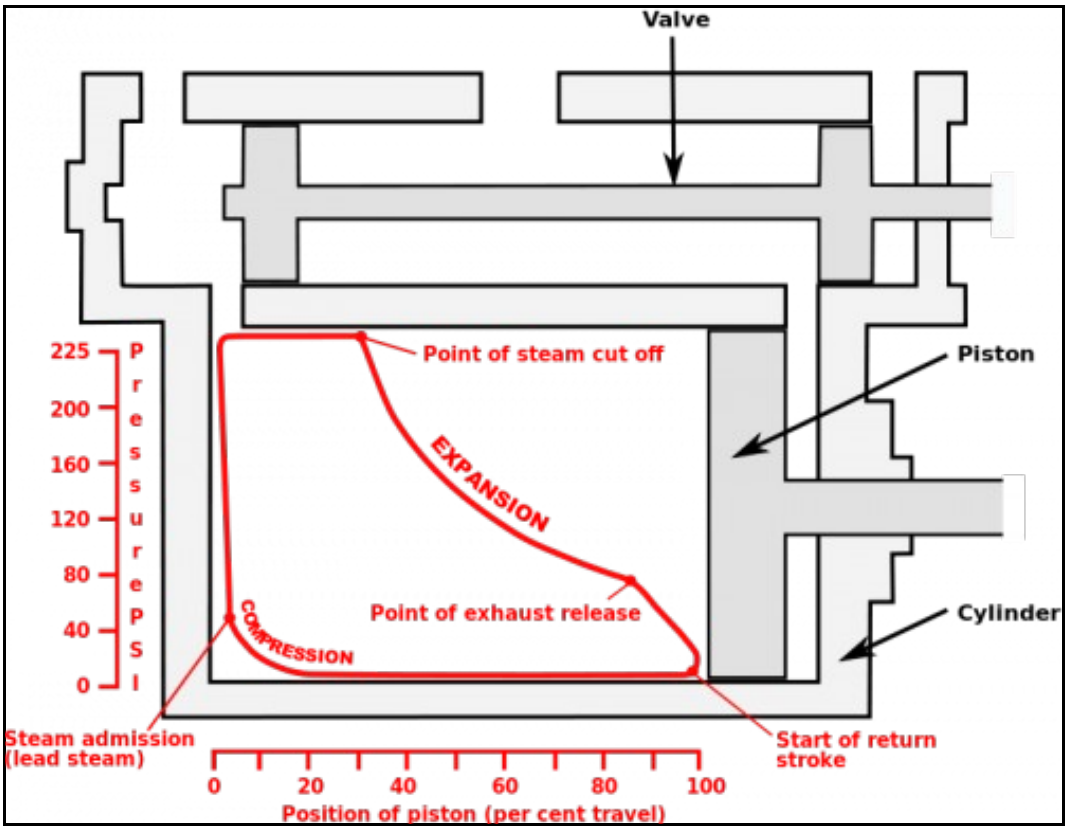
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1 Addons:PV Diagram

1.1  Add on : PV (pressure volume) diagram

A pressure?volume diagram (or PV diagram, or volume?pressure loop) is used to describe corresponding changes in volume and pressure in a system.



The diagram records the pressure of steam versus the volume of steam in a cylinder, throughout a piston's cycle of motion in a steam engine. The diagram enables calculation of the work performed and thus can provide a measure of the power produced by the engine.

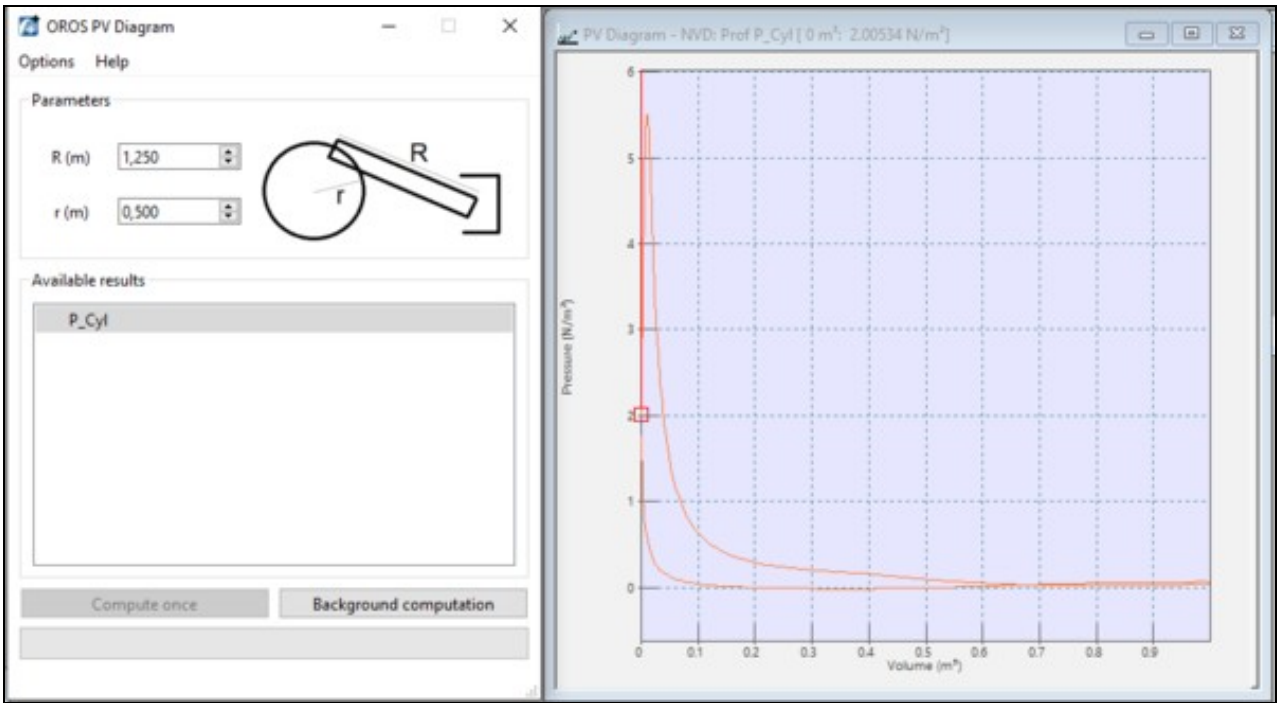
To exactly calculate the work done by the system it is necessary to calculate the integral of the pressure with respect to volume. One can often quickly calculate this using the PV diagram as it is simply the area enclosed by the cycle.

1.2 Download

Working with NVGate V15 or upper. Version from january 2022 : diagram PV

Include a model to demo with the correct settings.

1.3 How to use:



- Define one (or more) channel as a pressure.
- Add this channel into Sync. order (SOA) plug in.
- On SOA plug in , average, domain, select: "Angular"
- Open PV_Diagram.exe
- Click on refresh (right click) in available results if you do not see anything.
- Select the input.
- Compute once will display the PV diagram base once based the last triggerd block.
- "background computation, will continuously compute the diagram.

2 Advanced Swept Sine (A2S)

2.1 Introduction

Traditionally transfer functions of a system are measured using FFT based measurement with broadband excitation (as random noise or multi-sine). With only one average all frequency points of transfer function can be measured. Some limitations appear as:

- Transfer function frequency resolution is limited to FFT resolution,
- Excitation power is broadband and at each frequency line signal noise ratio can be poor with low coherence,
- No control of saturation and level on response,
- Ratio between lower and upper frequency is limited by number of FFT lines.

Swept sine technique (also called Servo Analysis, Network Analysis, or Swept Sine) automatically sweeps a sine wave over the frequency range of interest and measures the response frequency point by frequency point. Using a pure sine excitation optimizes measurement at each frequency step:

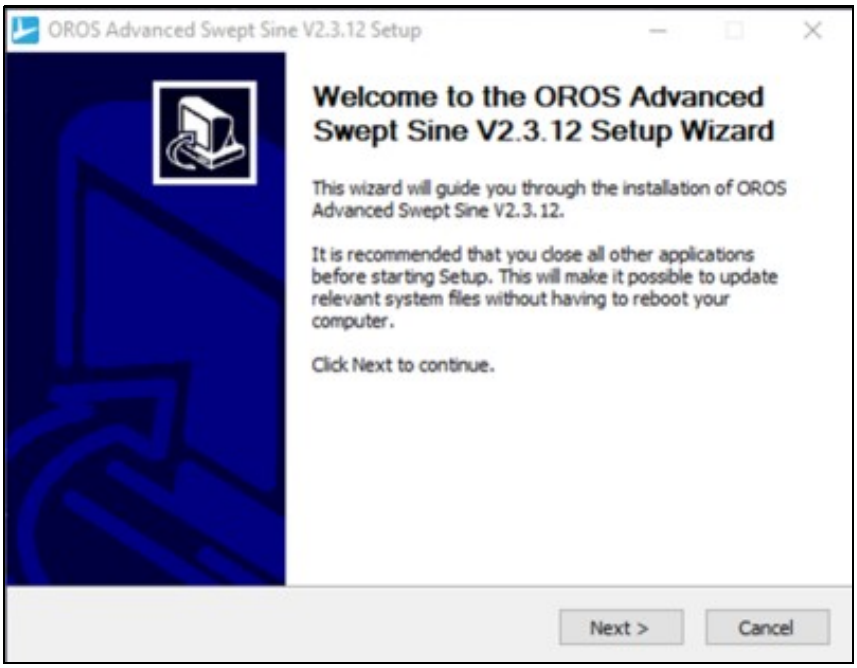
- Preventing overload,
- Measurement at any frequency,
- High frequency ratio, combined with high frequency resolution,
- Fine control of level,
- Measurement time optimized with frequency,
- Excitation level depending on frequency,
- No error between frequency lines due to non-linearity.

So using pure sine excitation, large frequency spans are possible with linear or logarithmic progression. Advanced Swept Sine automatically takes care of settings as FFT frequency range, number of FFT lines, average size...

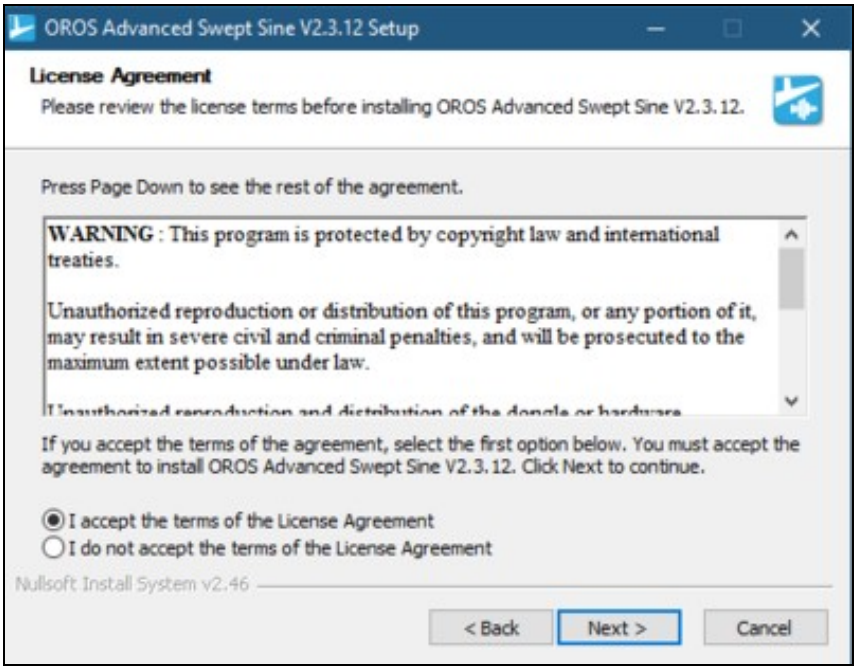
2.2 Download

Download last version V2.3.14

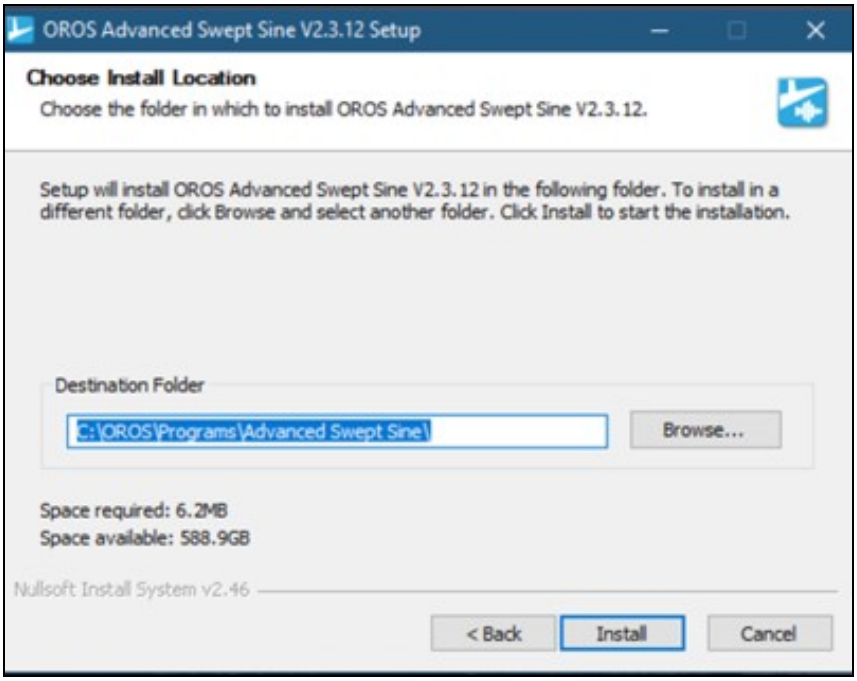
Extract the file and launch the "setup.exe" program, and the following window is displayed:



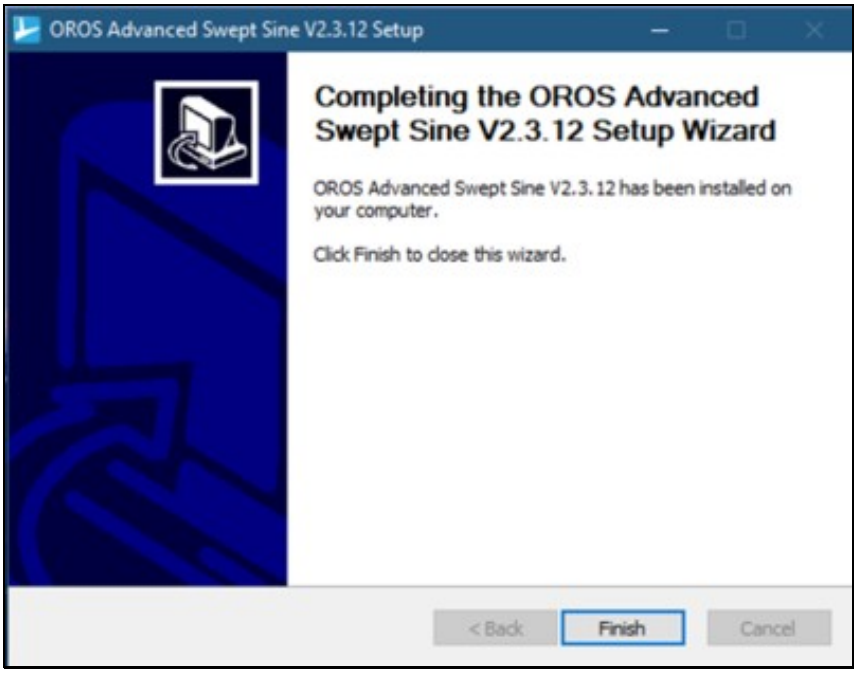
Click on "Next >", and the following window is displayed:



Read the terms of the license agreement and select "I accept the terms in the license agreement" if you agree. Click on "Next", and the following window is displayed:



Select the installation directory. By default, it is installed in: C:\OROS\Programs\Advanced Swept Sine. Click on "Install" to begin the installation, and wait until the following window is displayed:



Click on "Finish" to exit the setup wizard, and OROS Advanced Swept Sine software is successfully installed.

NOTE: Before launching the software, please connect the PC to the analyzer and launch NVGate in the connected mode.

2.3 Advanced Swept Sine Basics

2.3.1 General processing Description

In Advanced Swept Sine, for each frequency point of transfer function:

- First, sine generator sweeps smoothly to target frequency.
- Then Advanced Swept Sine waits for a user-defined fixed or frequency dependent delay in order to guarantee stabilization of system under measurement.
- And finally using selected lines from an averaged cross-FFT measurement; transfer function for this frequency point is computed and saved. FFT average time can be either fixed or frequency dependent.

Advanced Swept Sine can adjust and limit generator output level in order to get either predefined or limited level at input and output of system under measurement. Level can be frequency dependent, for example to adjust displacement on a shaker at each frequency.

2.3.2 Splitting measurement into spans

A complete measurement frequency range can be broken into up to 8 separate frequency spans; this multi-span capability is useful, for example, to define different frequency step sizes on the whole frequency range or to adjust excitation level on different frequency ranges.

A measurement can be processed with frequency increase or decrease and possibility to skip any span.

2.3.3 Measurement technique and accuracy

Swept sine technique has been introduced in 80's based on time domain for processing and time domain integration of signals, but this technique is sensitive to harmonics. Some other systems are based on a tracking filter, but with a lack of bandwidth control on large frequency spans.

OROS Advanced Swept Sine is based on FFT processing with careful designed algorithms. This FFT processing provides no sensitivity to harmonics and provides adaptive bandwidth measurement with frequency.

FFT frequency range is automatically adjusted during the measurement in order to get optimum resolution and averaging time. Averaging time can be set as a number of periods of excitation signal, so more time can be spent at low frequencies and less time at high frequencies.

In the worst case, maximum error on transfer function, due to OROS measurement technique, is lower than 0.012 dB on magnitude response and 0.02° on phase response at any measurement frequency. This is a repeatability error to add to OROS 3-Series analyzer precision (typical 0.05 dB and 0.05° see product specification).

Measurement frequency can be set between 0.01 Hz and 40 kHz. Absolute frequency resolution of generator is better than 0.00002 Hz.

2.3.4 Boosted measurement mode

BOOSTED mode lowers measurement time while preserving resolution. In many cases it is desirable to sweep over a large frequency range while detecting narrow features in the transfer function, with the consequence of a large number of frequency points and then a long measurement time.

The optional BOOSTED mode provides faster overall measurement by skipping measurement of successive frequency points with no significant frequency response changes. This boosted swept sine mode includes simultaneous monitoring of both amplitude and phase variations in order to be efficient with complex transfer function including many resonances and anti-resonances.

2.3.5 General smoothness

Advanced Swept Sine uses as generator the "Advanced sine output signal" available in NVGATE. This guarantees smooth transitions during frequency and amplitude changes.

During sweep to next frequency point, the instantaneous frequency changes at a user defined rate with no brutal phase, frequency variations. This method gives a better output signal smoothness than, for example, frequency change at signal zero crossing.

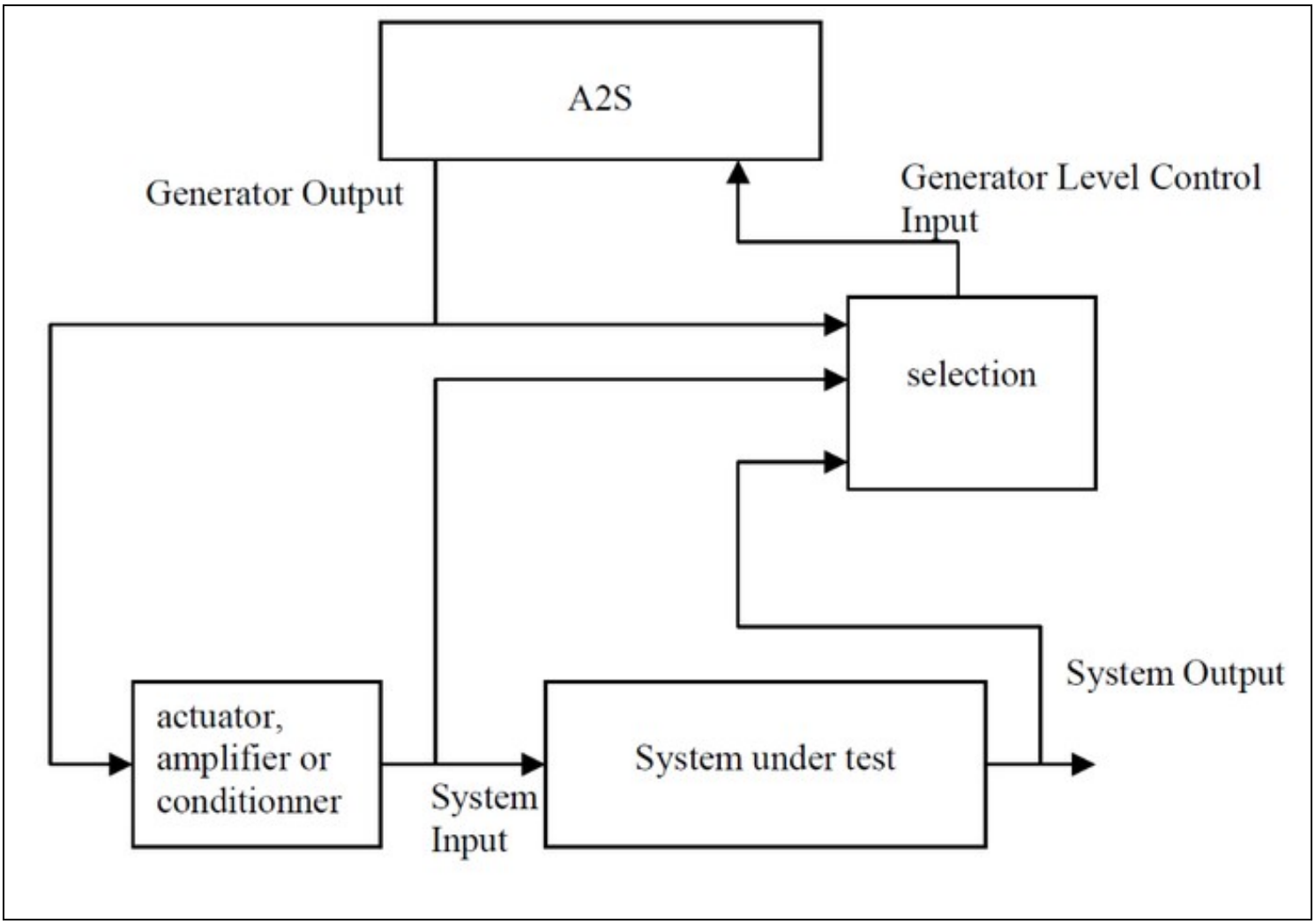
Amplitude variation is also controlled in the same way with user-defined duration for amplitude change.

Relative precision of generator frequency is better than 10^{-5} that means very closed frequency points can be processed with accuracy by Advanced Swept Sine.

2.3.6 General level control

For each frequency measurement the user defines a target level that can be frequency fixed or dependent. This target level can be used in 3 ways:

- As a generator output level,
- As a target level at system input under measurement (useful with actuator),
- Or as a target level at system output.


A2S
Generator Output
Generator Level Control Input
selection
System Output
actuator, amplifier or conditionner
System Input
System under test

In the last two ways, for each frequency point Advanced Swept Sine automatically adjusts generator output in order to get target values with a user-defined tolerance. It stops adjustment after the user-defined maximum number of tries.

The Advanced Swept Sine also includes user defined signal level limitations at system input or output. If the measured value is greater than defined limit Advanced Swept Sine automatically lowers target level value and retries frequency point measurement.

Level adjustment function associated with signal limiting function can help measurements, reducing input level at a resonance (or pole) to avoid non-linearity, or increasing level where there is anti-resonance (or zero) to get better measurement.

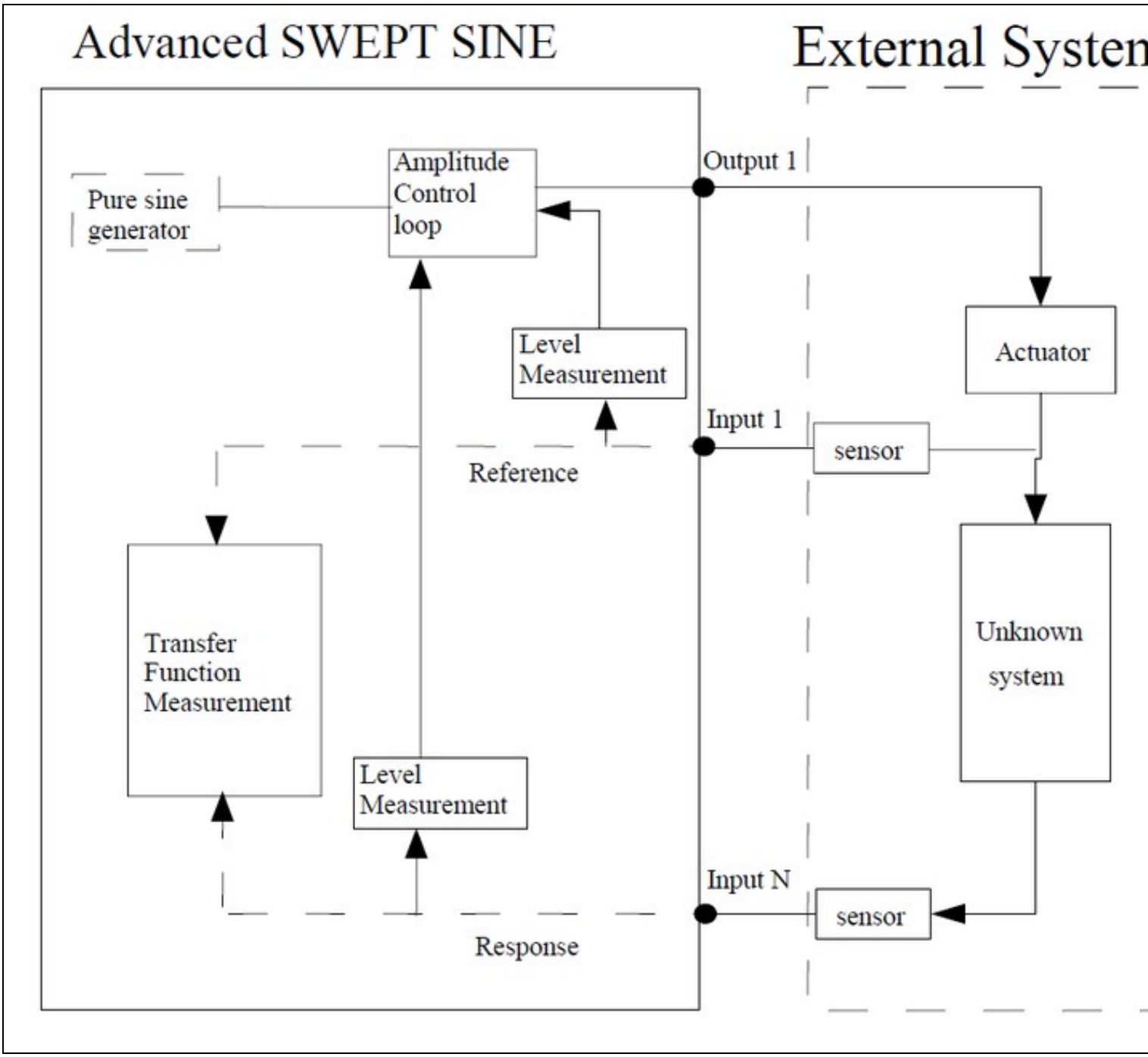
2.3.7 Multi excitations

For measurements on complex mechanical systems that need multi excitation with different amplitude or phase, the multi generator outputs of OROS 3-Series can be used.

2.4 Advanced Swept Sine implementation

The Advanced Swept Sine analyzer is a separate application controlling OROS 3-Series NVGATE software through standard NVDRIVE, the programming interface to NVGate.

2.4.1 Measurement block diagram


Advanced SWEPT SINE
External Systen
Pure sine generator
Amplitude Control loop
Output 1
Level Measurement
Actuator
Input 1
sensor
Reference
Transfer Function Measurement
Unknown system
Level Measurement
Input N
sensor
Response

On OROS 3-Series, output channel 1 is used for excitation, input channel 1 for input of system under measurement and is called excitation measurement and the user-selected input channel for corresponding output called response measurement. A selection of the number of response inputs is also available (see below).

OROS 3-Series advanced pure sine generator delivers excitation signal with smoothed amplitude and frequency variations. On excitation and response channels level measurement is obtained from FFT spectrum. These levels are used by amplitude control loop, which takes into account target level and user defined limitations.

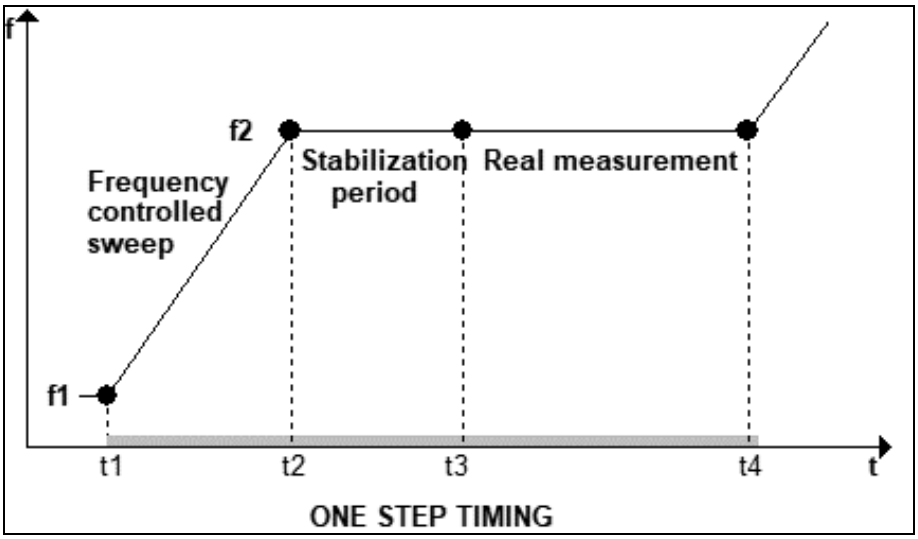
Transfer function measurement at each frequency point is obtained from corresponding lines of FFT spectrum and cross spectrum measured by OROS 3-Series, average time being adjusted for each frequency point. When necessary the swept sine controller switches FFT frequency ranges in order to get optimum time measurement and bandwidth measurement.

Final transfer function is computed step by step by swept sine control and displayed, saved or exported thought NVGATE. During processing all relevant information including rejected measurements (for example during target level adjustment) are stored in a text log file for optional processing and full trace analysis.

An example could be done with multi-span

2.4.2 Basic measurement timing

For each basic measurement step we have the following timing:



- The generator frequency (and/or the amplitude) sweeps to the new value.
- The analyzer waits for the system under measurement to stabilize. This delay is specified as a minimum time and/or a minimum number of sine periods. This delay can also be set down to zero.
- The analyzer does real measurement using averaging. The average time is specified as a minimum time (greater than 30 ms) and/or a minimum number of sine periods (greater than 10).

2.5 Starting Advanced Swept Sine

Warning: before starting Advanced Swept Sine, NVGate must be running.



Run: button for starting a measurement.

Pause/continue: button for manual pause measurement.

Stop: button for manual stop measurement.

Span: progress bar which indicates on which span is the current measurement.

Try: this shows the current try number for frequency point.

Progress: this bar is the evolution of the current measurement for the entire range frequency.

2.6 Menus options

2.6.1 File menu

2.6.1.1 Open

Open an Advanced Swept Sine project previously saved (.sws), this will load the settings of this project.

2.6.1.2 New

Open a new project with a default configuration.

2.6.1.3 Save/Save As

Using this menu to save settings of your current Advanced Swept Sine measurement and your project.

Note that to save results you may use the NVGate 'save results'.

Note: When the settings are saved in a file "file_name.sws", if the current project in NVGate is the default project the project would be automatically renamed as "SWS_file_name".

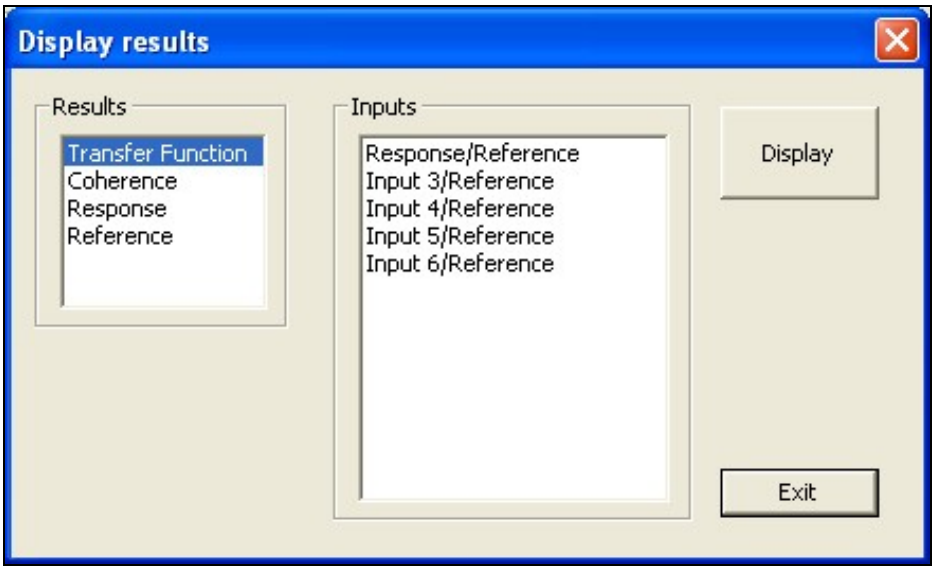
2.6.1.4 Exit

Close the Advanced Swept Sine solutions

2.6.2 Results menu

Note: in all kind of graphs displayed, if one span is in mode 'log' then X-axis is displayed in log.

Select the results you want to display in the following window:



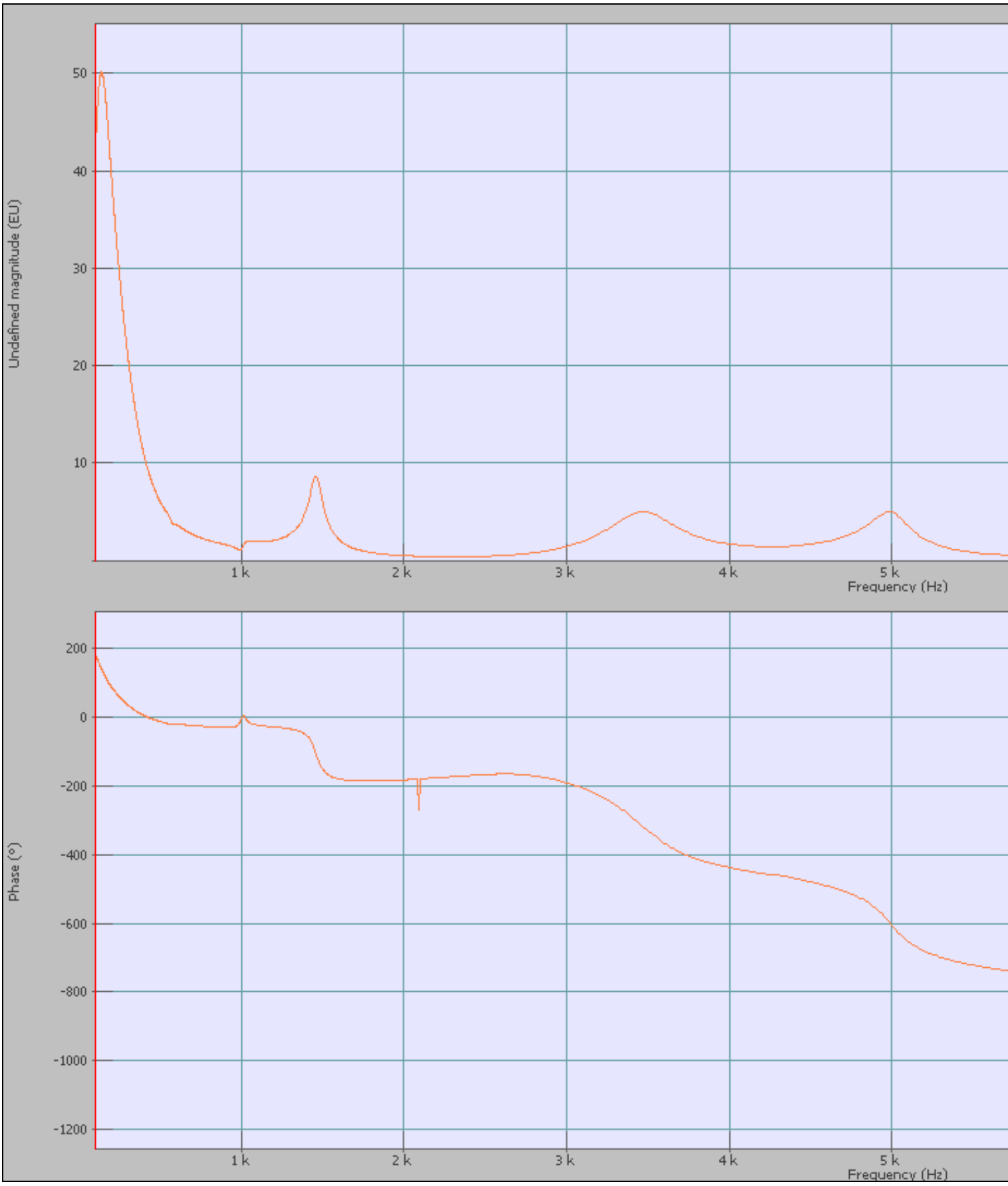
Results from the same group will be displayed in the same window.

Following graphs are just examples of the different graphs the user can display.

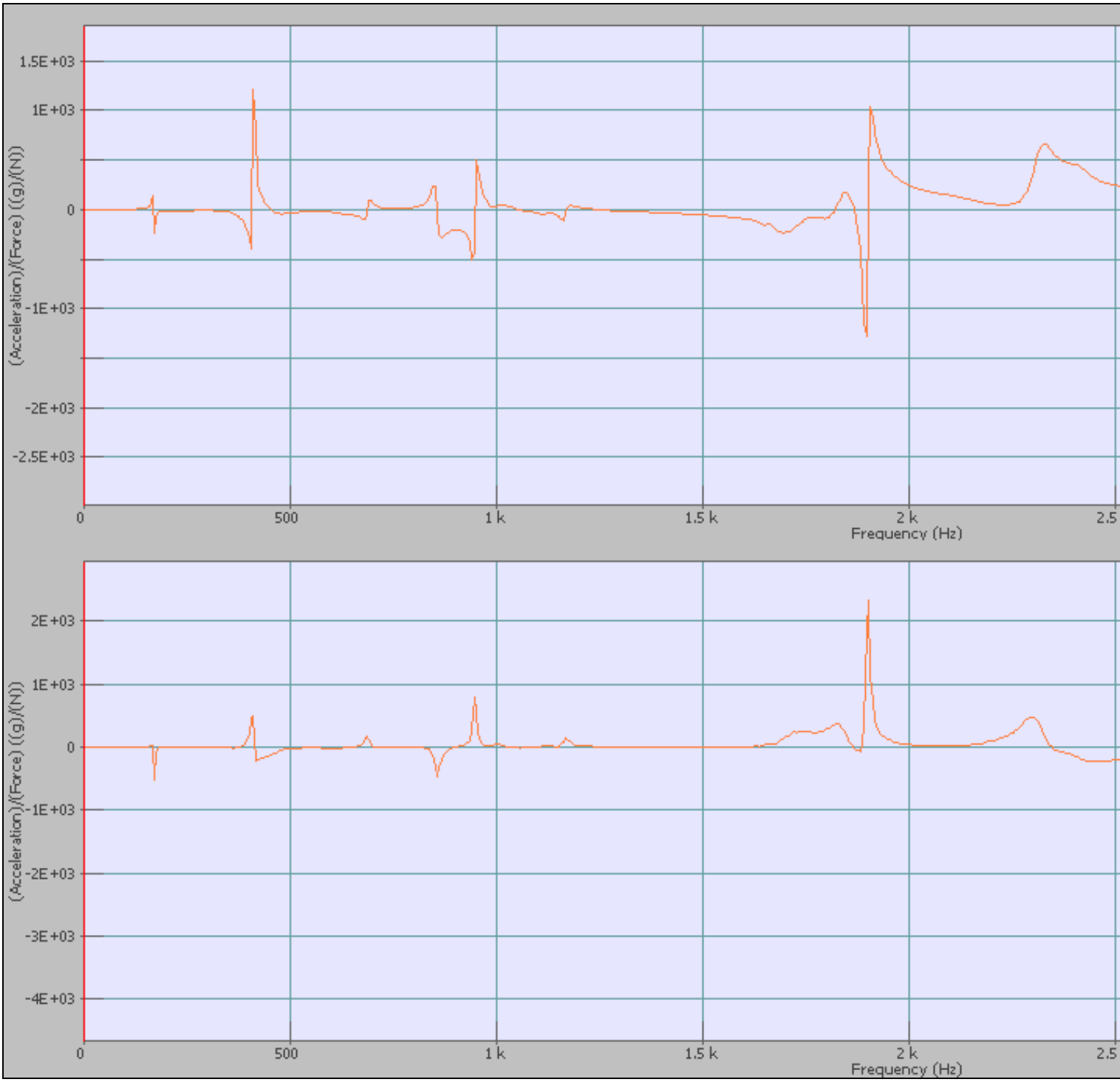
2.6.2.1 Transfer function

The transfer function could be displayed as following:

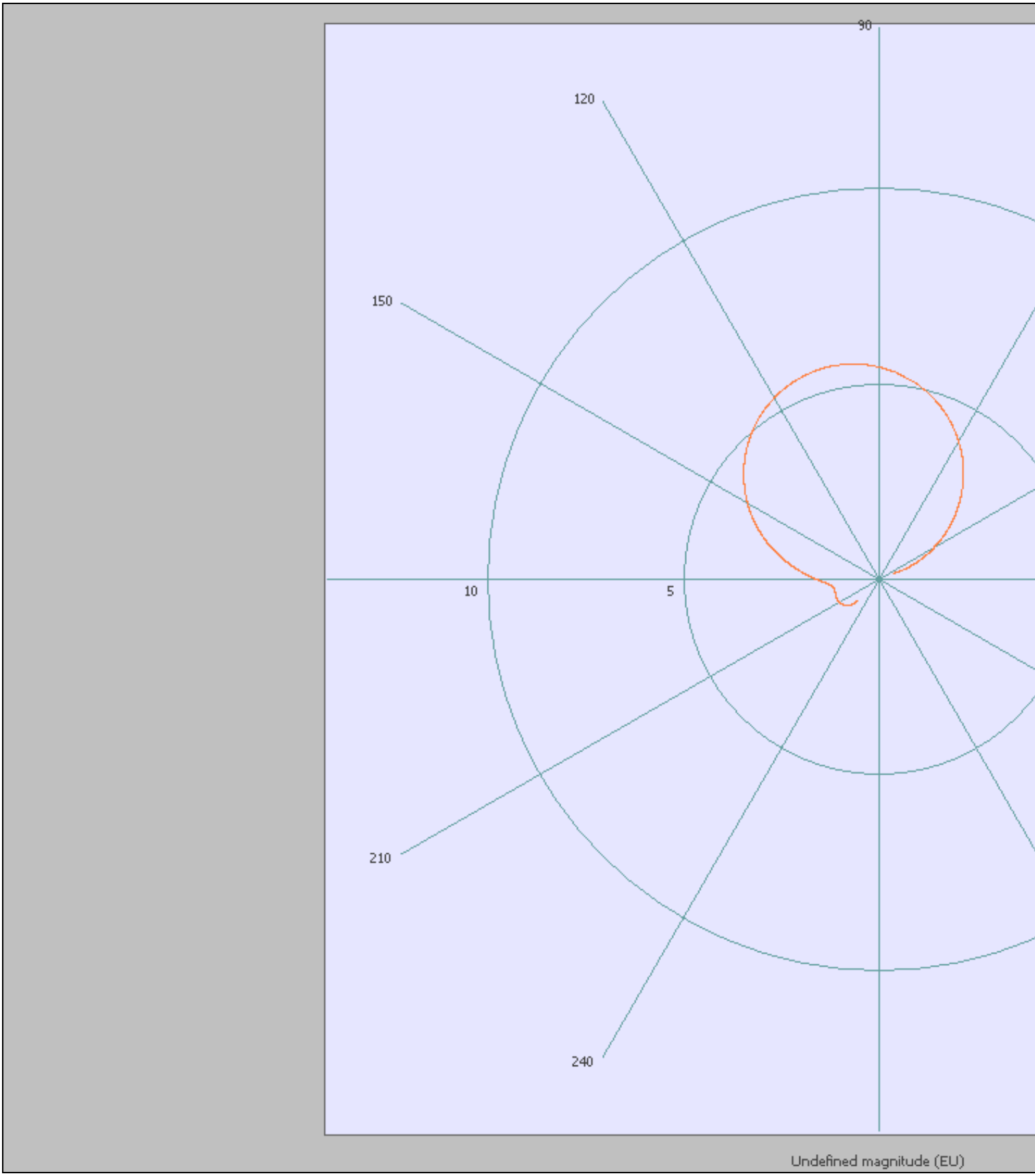
- Magnitude/Phase


Undefined magnitude (EU)
50
40
30
20
10
1 k
2 k
3 k
4 k
5 k
Frequency (Hz)
Phase (°)
200
0
-200
-400
-600
-800
-1000
-1200
1 k
2 k
3 k
4 k
5 k
Frequency (Hz)

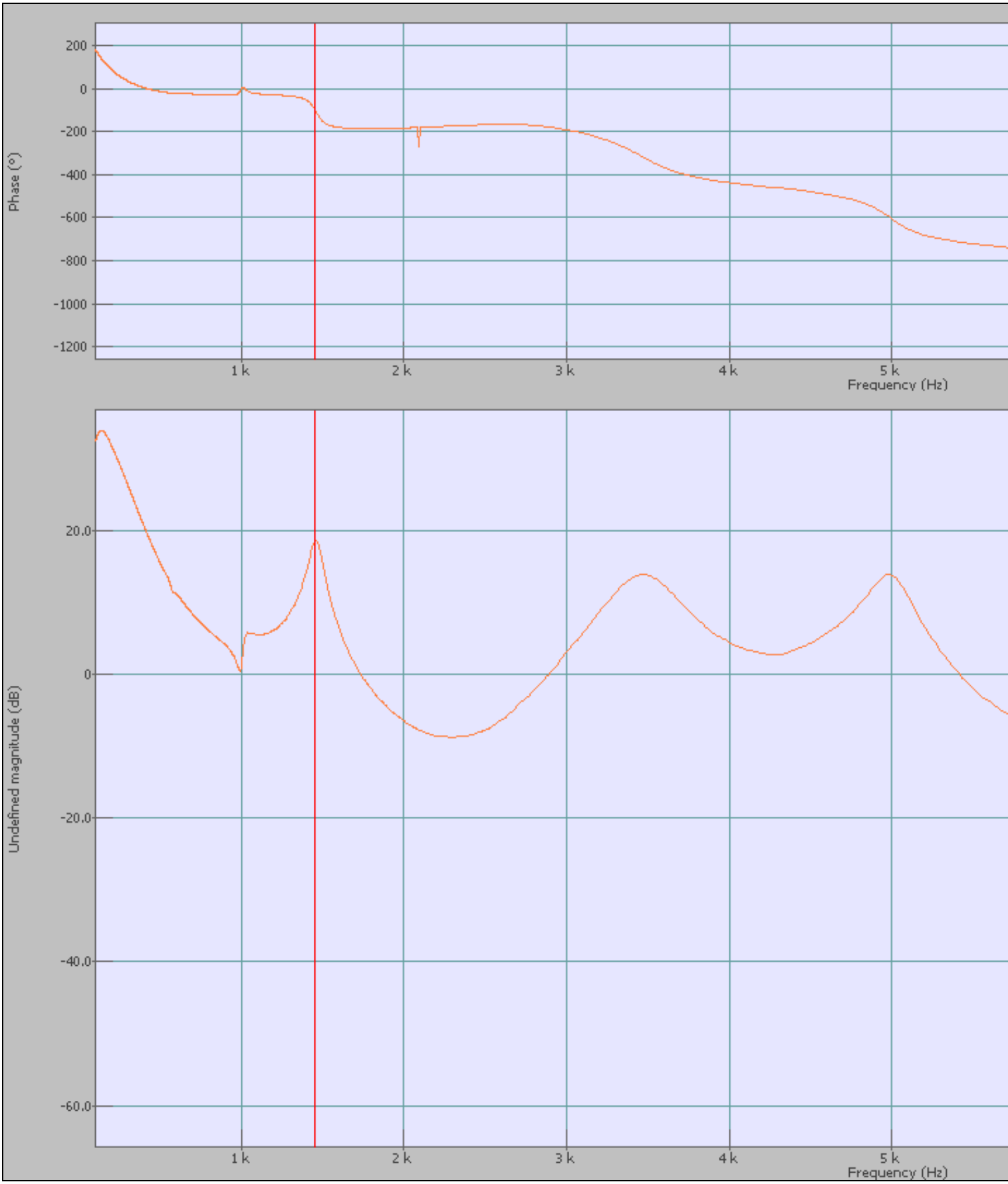
- Real/Imaginary



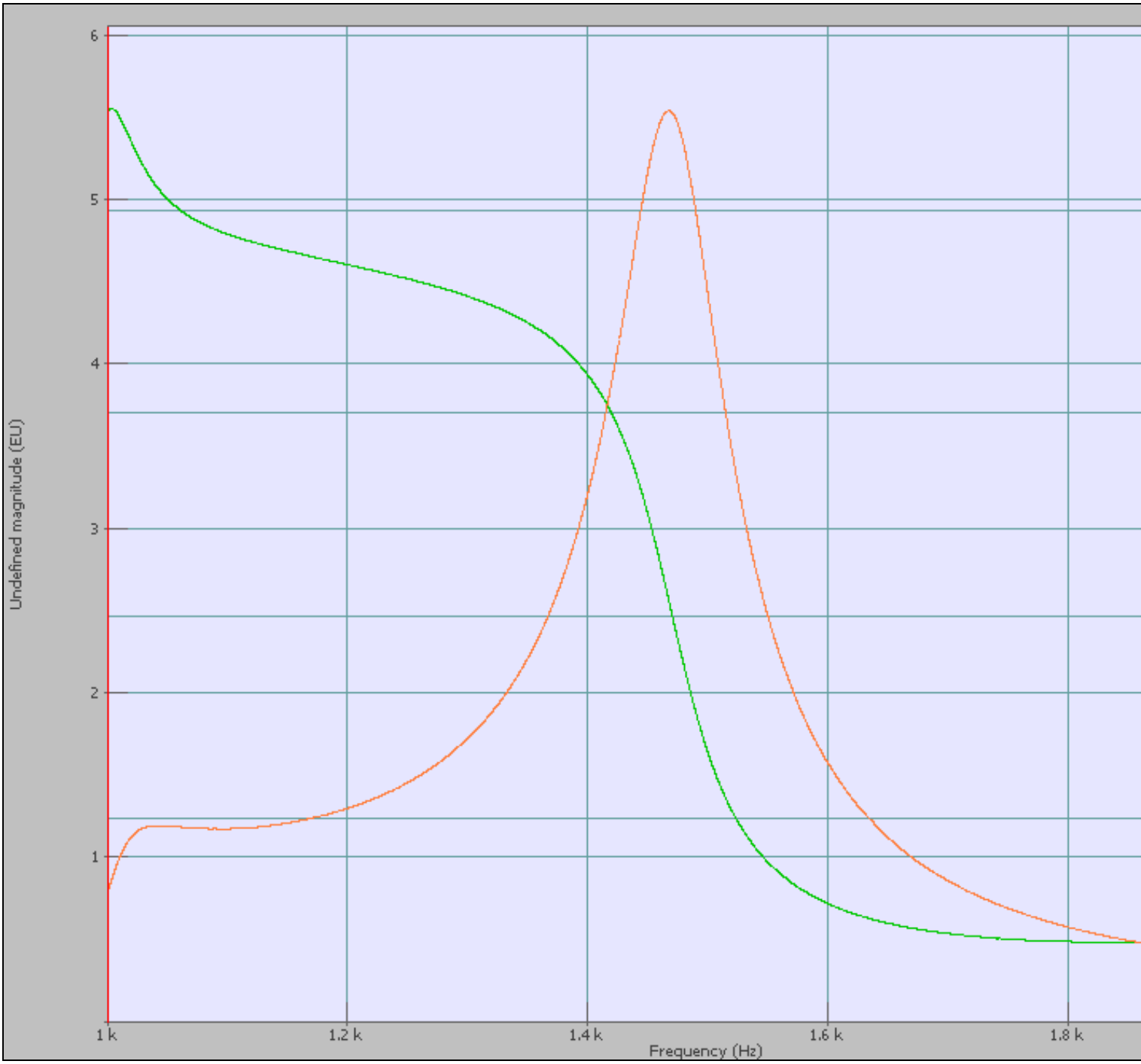
• Polar



• Phase/Magnitude



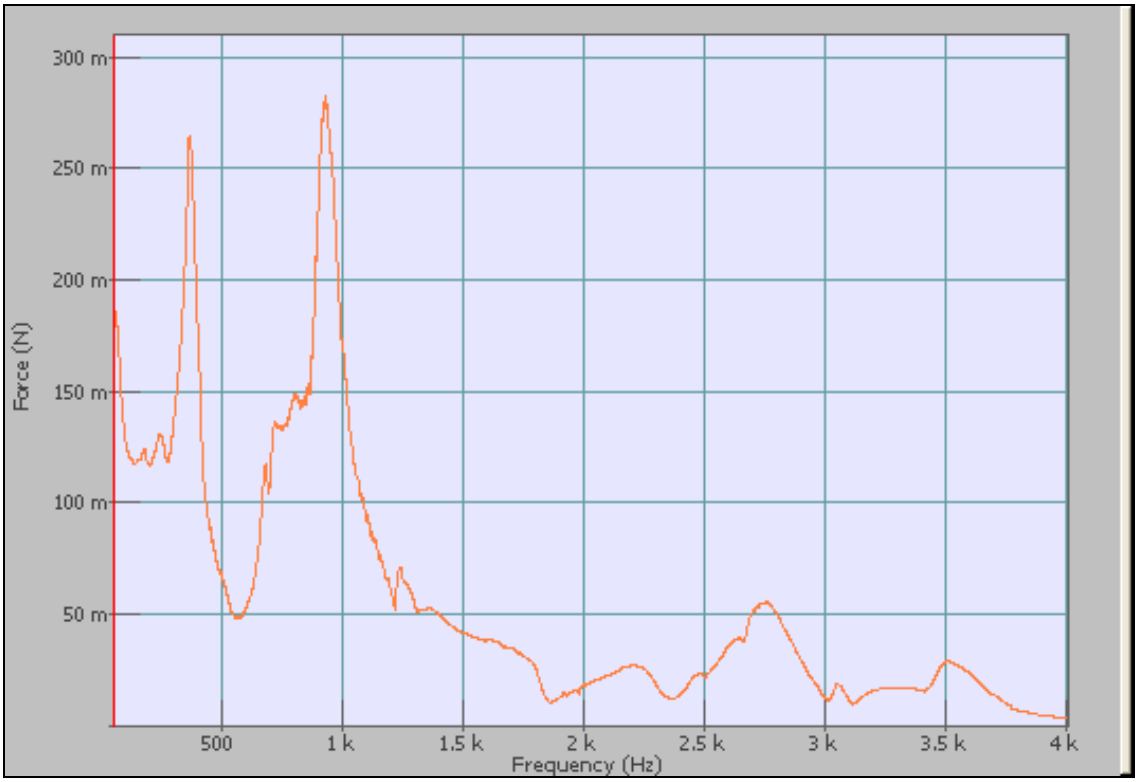
- Merged Module/Phase



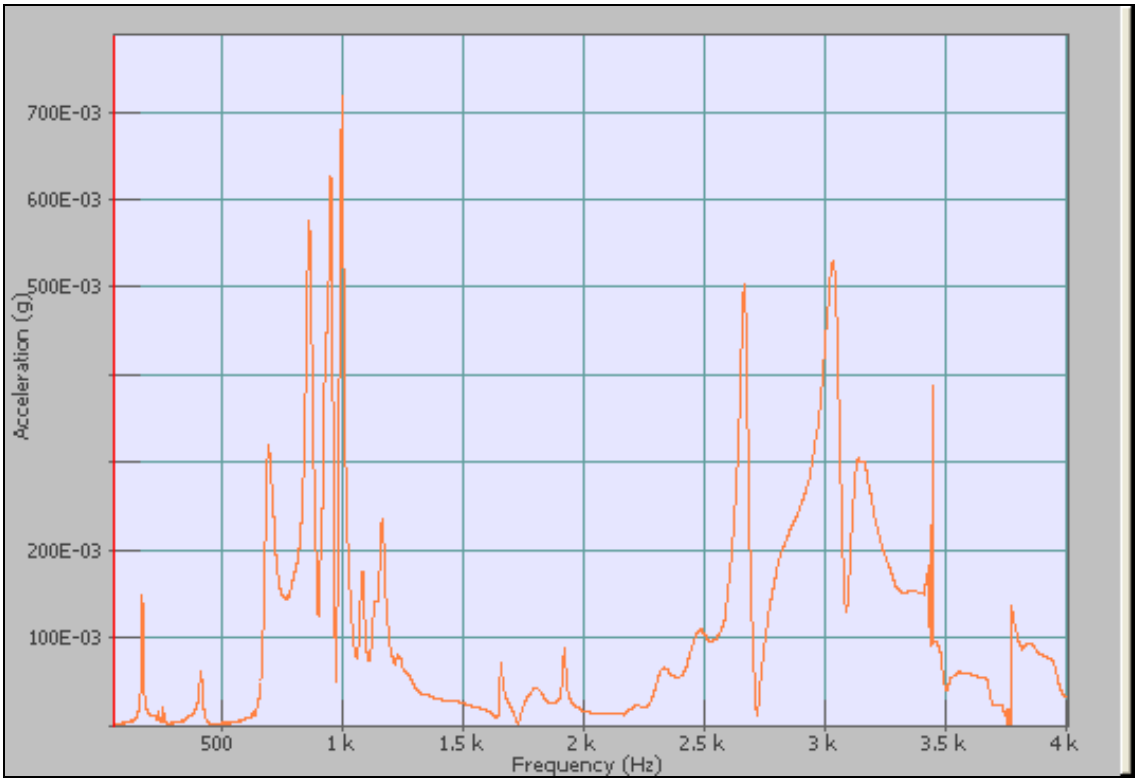
2.6.2.2 Coherence



2.6.2.3 Measurement reference level



2.6.2.4 Measurement response level



Note: for all these types of graphs, all settings for the graphs available in NVGate are also available with Advanced Swept Sine by right clicking on the graph or graph window.

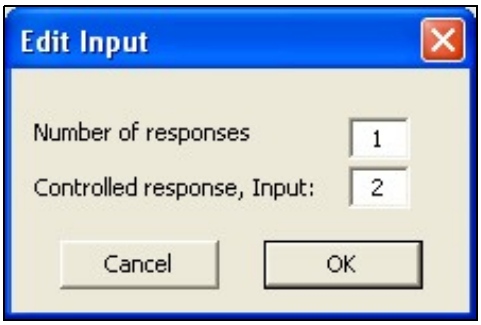
2.6.3 Edit menu

2.6.3.1 Edit Settings

This menu is to edit settings of the Advanced Swept Sine measurement (see below for more information about each setting). Settings are not available for modification during a measurement.

2.6.3.2 Edit Input

This displays the following window:



It is possible to select the number of responses (depending of the hardware connected, that means this number of responses could be between 1 and 31).

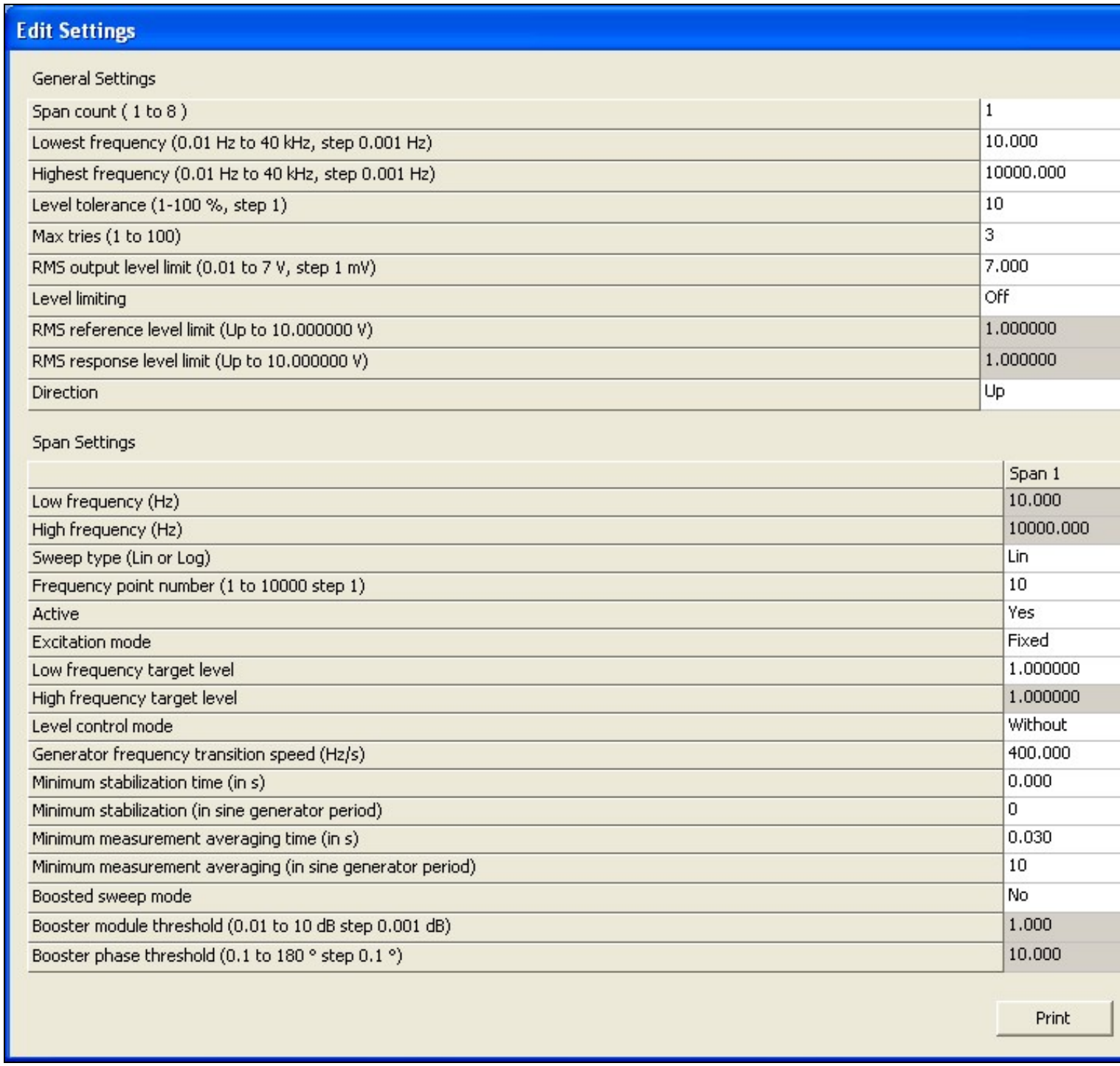
The next setting is the number of inputs the user wants to control. Note that input 1 is not available because it is automatically the reference input.

By clicking on 'OK', the inputs properties will be displayed.

2.7 Editing and saving settings

Editing settings is available through menu "Edit" >> "Edit Settings"

This command opens a new window displaying General Settings, applicable for all spans, in the upper part and Span Settings, specific for each span, in the lower part.


Edit Settings
General Settings
Span count (1 to 8) 1
Lowest frequency (0.01 Hz to 40 kHz, step 0.001 Hz) 10.000
Highest frequency (0.01 Hz to 40 kHz, step 0.001 Hz) 10000.000
Level tolerance (1-100 %, step 1) 10
Max tries (1 to 100) 3
RMS output level limit (0.01 to 7 V, step 1 mV) 7.000
Level limiting Off
RMS reference level limit (Up to 10.000000 V) 1.000000
RMS response level limit (Up to 10.000000 V) 1.000000
Direction Up
Span Settings
Span 1
Low frequency (Hz) 10.000
High frequency (Hz) 10000.000
Sweep type (Lin or Log) Lin
Frequency point number (1 to 10000 step 1) 10
Active Yes
Excitation mode Fixed
Low frequency target level 1.000000
High frequency target level 1.000000
Level control mode Without
Generator frequency transition speed (Hz/s) 400.000
Minimum stabilization time (in s) 0.000
Minimum stabilization (in sine generator period) 0
Minimum measurement averaging time (in s) 0.030
Minimum measurement averaging (in sine generator period) 10
Boosted sweep mode No
Booster module threshold (0.01 to 10 dB step 0.001 dB) 1.000
Booster phase threshold (0.1 to 180 ° step 0.1 °) 10.000
Print

2.7.1 General settings

The General Settings apply for all spans.

Span Count (from 1 to 8):

A complete measurement can be split into 1 to 8 separate frequency spans; this multi-span capability is useful, for example, to define different frequency step sizes on the whole frequency range or to adjust excitation level for different frequency ranges. The high frequency of a span always corresponds to the low frequency of the next span.

Lowest and Highest Frequency (from 10 mHz to 40 kHz, resolution 1 mHz):

These settings define the whole frequency range of the measurement. Frequency range can start as low as 0.01 Hz and go up to 40 kHz. Frequency input resolution is 0.001Hz.

Level tolerance (1 to 100%, resolution 1%):

This setting defines the allowed tolerance between the target level and the measured level, which validates one frequency measurement point.

Note: the level limiting function (if enabled) always has priority on level tolerance.

Max tries (from 1 to 100):

This setting defines for a frequency measurement point the maximum number of tries in order to reach target level or to confrom with level limits.

Tips: We recommend to set this value at least at 3 in order to process measurements with either reference or response level control or active level limiting.

RMS output level limit (from 0.01 to 7 V, resolution 1 mV):

This setting fixes the absolute limit for the output level during the measurement. The maximum value of this setting is 7.07 V RMS corresponding to ± 10V peak on generator output (this value is also the default value).

Note: this limitation is active in any case and has the higher priority on other level control functionalities. In any case generator output level will never exceed this value.

Level limiting:

Level limiting function can also optionally be activated (ON) in order to guarantee that predefined levels are not exceeded at reference and/or response channel. If any measured level at reference or response channel is higher than its corresponding limit, the generator amplitude is decreased accordingly and a new measurement is processed.

Note: this function cannot guarantee that a level greater than user-defined limit will never appear. It guarantees that a transfer function point measurement is validated only if the measured level is below this limit.

Tips: this function is very useful when user wants to avoid too large of a response level (with perhaps non linearity) due to a resonance when using constant excitation (and/or reference) level.

RMS reference level limit:

This setting defines maximum limit for reference level in order to validate a frequency point measurement. Active only if <Level limiting> is ON.

RMS response level limit:

This setting defines maximum limit for response level in order to validate a frequency point measurement. Active only if <Level limiting> is ON.

Note: In case the user want to use the level limiting only on reference (or on response), the level limit of the response (or of the reference) must be set to the maximum value.

Direction:

This setting defines if measurements are at measurement time processed from lowest to highest frequency (UP) or from the highest to lowest frequency (DOWN) In that last case, the measurement are processed in descending order of spans (from higher number to lower one).

2.7.2 Span settings

For each measurement span the following settings are defined:

Low and High frequency:

The ratio between high and low frequencies in a span must be greater than 1.0 and up to 10000. Frequency values can be lower than 0.01 Hz and up to 40 kHz with a resolution as low as 0.001 Hz.

Note: Only <High frequency> of each span (except the highest one) can be adjusted; modifying this frequency automatically adjusts <Low frequency> of next span to the same value. Low frequency of first span and high frequency of last span are set by general settings **<**Lowest and Highest Frequency>

Sweep type:

This setting specifies if the frequency steps for the span will increase in a logarithmic (ratio between 2 consecutive frequencies is constant as in a geometric progression) or linear fashion (difference between 2 consecutive frequencies is constant as in an arithmetic progression).

This setting defines the step between two measurements. The Log sweep gives more points in low frequency, and less point in high frequency, compared to Lin sweep. It is useful for giving a plot in which attenuation or gain of n dB/octave appears as a line.

Frequency point number (from 1 to 10 000):

This setting specifies the number in the span of measurement frequency points for transfer function. The real number of measurements can be higher as we can have adjustments for excitation level control and/or lower if BOOSTED mode is used.

Note: Large values produce higher frequency resolution at the cost of longer acquisition time. Boosted mode can be used to reduce measurement time.

Tips: Number of frequency points includes low and high frequency points. So, for example, to get frequency points from 200 Hz up to 800 Hz with 100 Hz linear spacing <Frequency point number> must be set to 7.

Active:

This setting lets you skip the span during measurement. If set to NO the Advanced Swept Sine smoothly stops the generator at processing end of previous span and goes to process next active span starting smoothly the generator.

Tips: this capability can be used, for example, to redo transfer function measurements on a specific frequency range of interest.

Excitation mode:

For a measurement span the target excitation level can be set to a:

- Fixed level for whole span
- Variable with frequency during the span.

In this last mode, variation law with frequency between these 2 values is the same as defined in <Sweep Type>:

- Logarithmic, the target level versus frequency curve appears a straight line on a log/log display.
- Linear, the target level versus frequency curve appears a straight line on a lin/lin display.

Target levels are set by user in physical units (also called Engineering Units, EU). Physical unit depends of the selected control mode (see below).

Low frequency target level:

This setting defines the target level value in <Fixed> excitation mode and level for low frequency in <Variable> excitation mode

High frequency target level:

This setting defines the target level value in <Variable> excitation mode for high frequency.

Level control mode:

The excitation level can be controlled in 3 different modes:

- Without: amplitude of generator is set with no additional control to target level value at each frequency step (target level is in Volt, V).
- On reference: amplitude of generator is adjusted in order to get target value at the reference input (Physical unit of reference input is used for excitation level settings).
- On response: amplitude of generator is adjusted in order to get target value at the measurement input (Physical unit of measurement input is used for excitation level settings).

Note: Adjustment is applied if measured value at selected input is out of the bounds defined by the "Amplitude tolerance" global setting. In that case output generator amplitude is modified and a new step measurement is triggered at the same frequency. This adjustment is repeated if necessary; <Max tries> general setting limits repetition.

Note: Adjustment takes also into account <level limiting> if active.

Note: On 'reference' or on 'response' mode, for the first measurement generator Advanced swept sine has no information on actuator and/or system response to compute needed generator output level from user defined target level. So a first measurement is done with generator output level set to 1/100th of RMS output level limit and using measured levels, a new generator level is computed for next try in order to reach target level.

Generator frequency transition speed:

When a measurement point is available and stored, the generator smoothly sweeps to next frequency point measurement with a transition speed defined by this setting.

Minimum stabilization time (in s) and (in sine generator period):

When generator has reached frequency and amplitude level targets, the swept sine analyzer waits a user-defined time in order to guarantee stabilization of system under measurement. This time is defined as a minimum fixed time and as minimum periods of sine generator.

Tips: Stabilization time defined in sine generator periods is efficient for spans with large variation of frequency as the whole time measurement is lower than using constant stabilization time based on lower frequency.

Minimum measurement averaging time (in s) and (in sine generator period):

These settings define the minimum averaging time for transfer function measurement after stabilization delay. A higher time gives better precision in case of noisy signals giving a low coherence.

The minimum measurement averaging time is 30 ms or 10 periods of generator, which is greater.

Boosted swept mode:

In order to speed up measurement with large number of points, Boosted mode skips over frequency measurement steps with small variations in the transfer function.

Boosted mode examines differences in amplitude and phase between the current measurement point and the previous one. If these differences are within the user-defined thresholds, the sweep will continue taking larger steps and so skipping measurement points.

If differences in amplitude and phase are greater than user defined thresholds, the number of skipped points is halved and the current frequency point is moved back and a new measurement is processed.

The transfer function of skipped frequency points is computed using interpolation between two real measurements whose differences are within defined threshold.

With this adjustable algorithm, the number of skipped points can vary between 2 and 16 giving large decreases in whole measurement time (dependent of transfer function).

Booster module and phase thresholds (from 0.01 to 10 dB with resolution of 0.001 dB for the module, and 0.1 to 180° with resolution of 0.1° for the phase):

These 2 settings are used in BOOSTED mode to define limits on amplitude and phase variations, which enable skipping points.

This Boosted mode with both module and phase threshold is a guarantee that no points would be lost and all resonance and phase change would detected.

Example on how works the boosted mode:

- The measurement start at point 1. Then point 2 is measured.
- If the difference (in term of amplitude and phase) between values of point 1 and 2 is under the user-defined threshold, the next measurement point would be point 4. In other case it will be point 3.
- Point 4 is measured, if the difference between values of point 2 and 4 is under the user-defined threshold, the next measurement point would be point 8 and point 3 is interpolated. In other case the measurement go back and point 3 is measured.
- Point 8 is measured, if the difference between values of point 4 and 8 is under the user-defined threshold, the next measurement point would be point 16 and points 5, 6 and 7 are interpolated. In other case the measurement go back and point 6 is measured and if the difference between point 4 and point 6 is under the user-defined threshold, next measurement point would be 8 (the previous step is still available), if not point 5 is calculated then measurement go to point 7.
- Point 16 is measured, the same comparison is made to know if next point is 32 or if some points between 8 and 16 need to be calculated.
- ?

Note: in any case no point would be measured twice, that means that it is really an optimization in term of time measurement without any risks of loosing points.

Details on measured or interpolated points are available in the log file. Note that the interpolated points have no FFT settings associated (the corresponding settings are set to"0" in the log file).

2.7.3 NVGate settings

Some settings on inputs can be modified using NVGATE. Advanced swept sine configures automatically NVGATE control panel with 3 tabs, the first for the reference input, the second one for the response input and the last one for general settings.

The following settings are the default setting automatically displayed in NVGate when starting Advanced Swept Sine.

- Inputs 1 and 2 are connected on Channels 1 and 2 of the FFT plug-in.
- Cross-Spectre channel 2/channel 1 authorized.
- Weighting windows: Hanning
- Advanced sine 1 on output 1 is enabled:
- Mode = Pure Tone
- Synchro = Free run
- Peak Level = 0 V
- Freq = 0 Hz
- Mute = On
- Stabilization time = 0 (time delays are managed in the FFT plug-in)
- Amplitude variation = 1s
- Phase speed = 30 ms Rad/s
- Gain = 0
- Phase offset = 0
- Output 1 transition time =10 ms

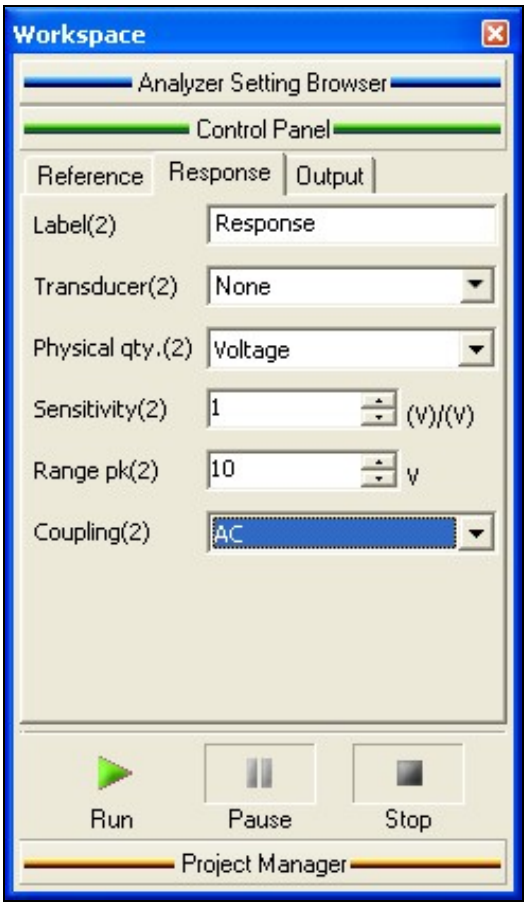
These settings ensure that there is no output signal from NVGate, in order to protect any output connected through NVGate (for example a shaker).

- Saving option: set to 'Do not save', in order not to save each point of the Advanced Swept sine measurement.

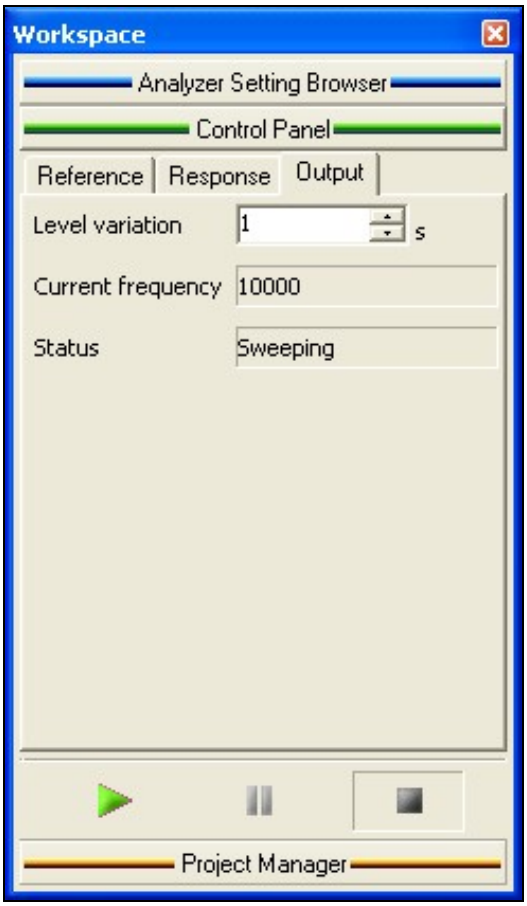
- In the FFT plug-in:
- Average type: Linear
- Trigger: Pure Tone stabilized
- Overlap = 75%
- Number of lines: 401 lines
- Zoom factor: none (i.e. zoom set on off)

In the control Panel 3 tabs have been added with several settings of NVGate.

- Reference and Response: Input 1 is called 'Reference' and Input N (N is the number of the input selected by the user) 'Response' and these two tabs displayed settings of these inputs. Between brackets is displayed the number of the input corresponding.



- General settings:
- Level variation: this setting in second represents the transition time from a level to another level.
- Current frequency: this status is the current frequency of the generator output.
- Status: this indicates if the generator is 'running up' (i.e. the generator is waiting to reach the level) or 'sweeping' (i.e. the generator is in service).



2.7.4 Saving settings

Settings of Advanced Swept sine measurement are saved through Advanced Swept sine, using **Save** or **Save as** from the **File** menu.

Settings are saved with the extension .sws.

Note: When the settings are saved in a file "file_name.sws", if the current project in NVGate is the default project the project would be automatically renamed as "SWS_file_name".

2.8 Measurement storage

2.8.1 Saving results in NVGate

As for any NVGate project you can save the results using the 'save result' menu.

2.8.2 Log file description

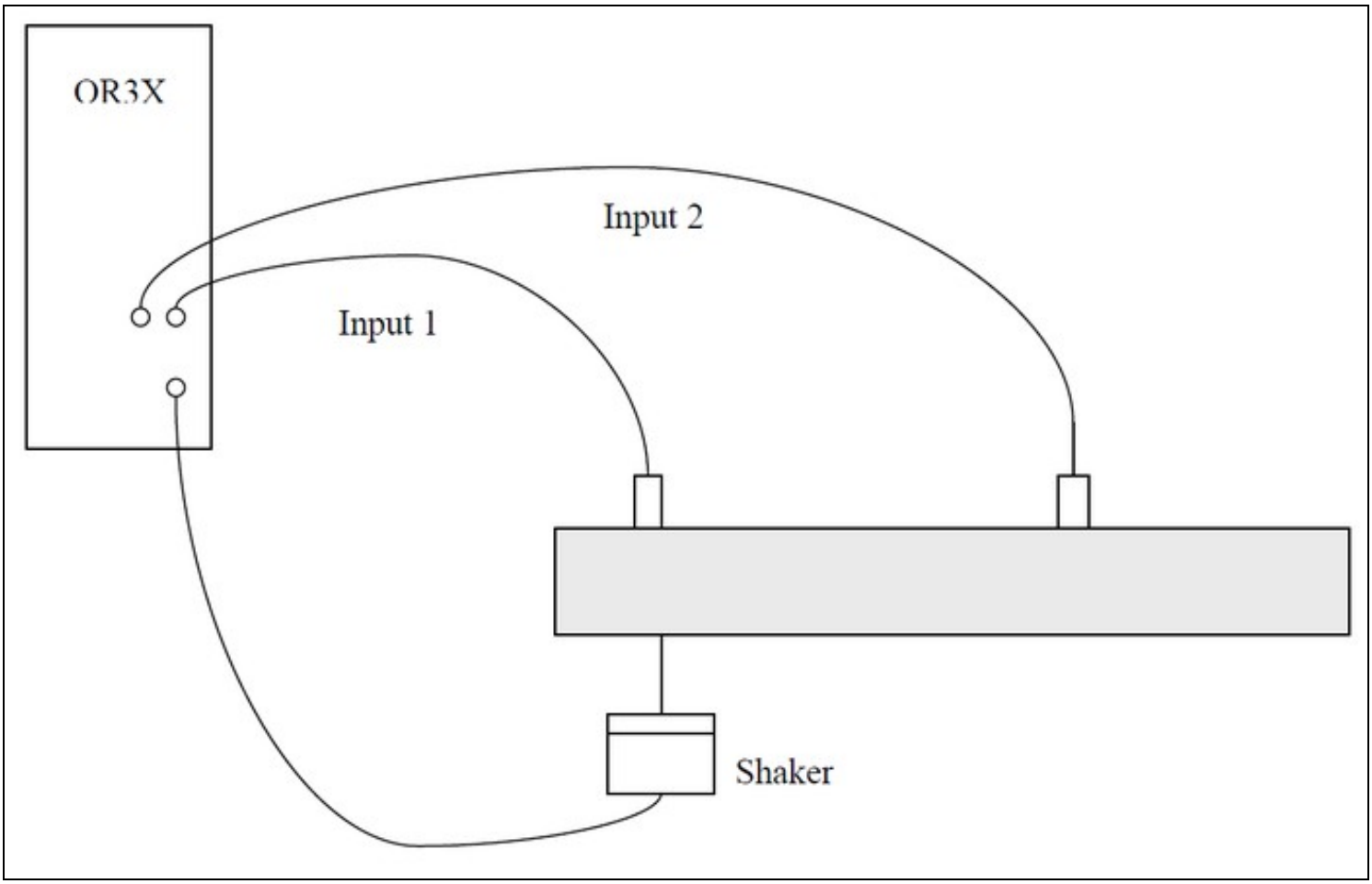
A new log file is written automatically at each new measurement, this log file has the same name than the settings file (.sws) used or 'default'. The previous log file will be renamed with the same name with the extension "_old" in order to compare two successive measurements (not more, to compare more measurements the user must rename .los files). This file includes all information on each step measurement in text format (can be imported into EXCEL). This file is located in corresponding 'OROS Advanced Swept Sine' directory, that is to say in the "LOG" file of installation, and the extension is .los.

Tip: there is a shortcut in menu 'Start' then 'All programs' called 'OROS Advanced Swept Sine' then 'Advanced Swept Sine Log Files'.

2.9 Measurement examples

2.9.1 Modal measurement

This example is based on a shaker measurement. The aim of this measurement is to define a specific mode of vibration of the structure (resonant frequencies, deflection shape?)



Input 1 is the reference (force sensor) and Input 2 is the response (accelerometer). The shaker is on an output. The Advanced Swept Sine displays Function transfer (magnitude and phase) in order to determine resonance and phase change.

A first measurement has been made without boosted mode (orange trace)

Time of measurement (extract from the log file):

- 1600 measured points - 0 interpolated points
- End Time:06/23/05 16:45:10
- Duration: 00:24:19
- Termination: Normal

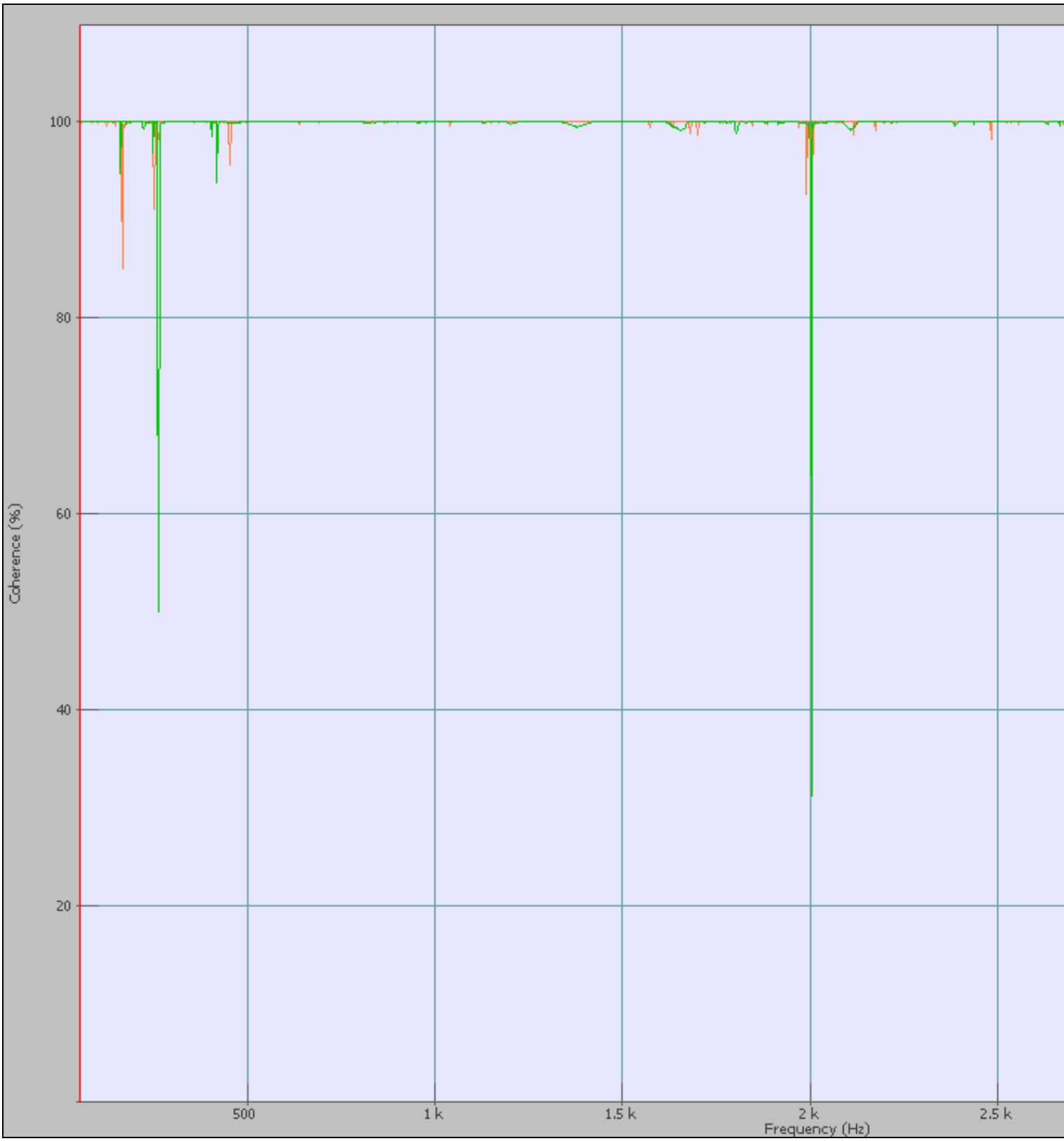
Next measurement has been done with the boosted mode active (to optimize time measurement) in exactly the same situation (green trace)

Boosted module threshold of 5 dB and boosted phase threshold of 10°.

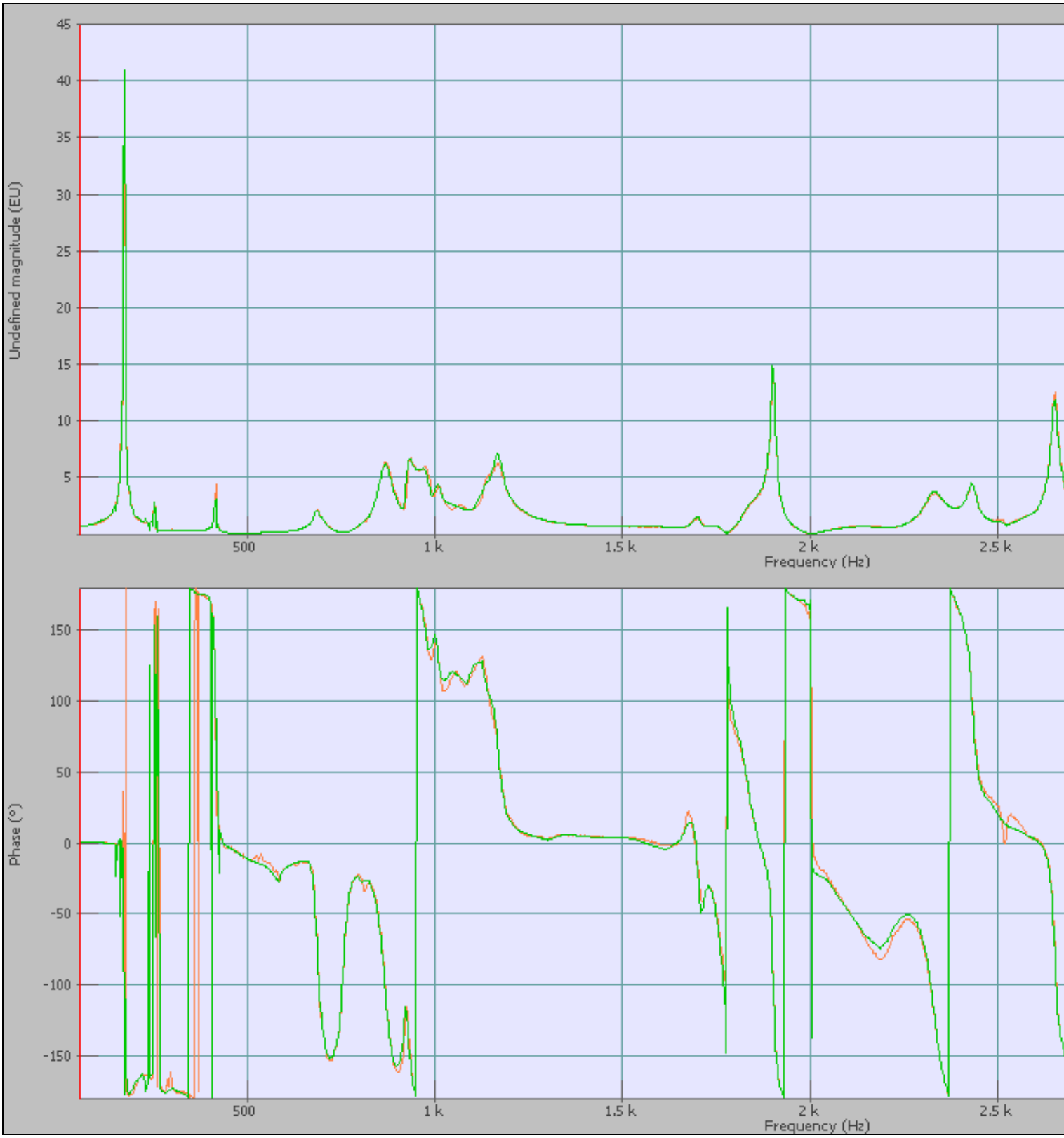
Time measurement (extract from the log file):

- 532 measured points - 1068 interpolated points
- End Time:06/23/05 16:03:49
- Duration: 00:07:53
- Termination: Normal

No visible difference in the coherence function.

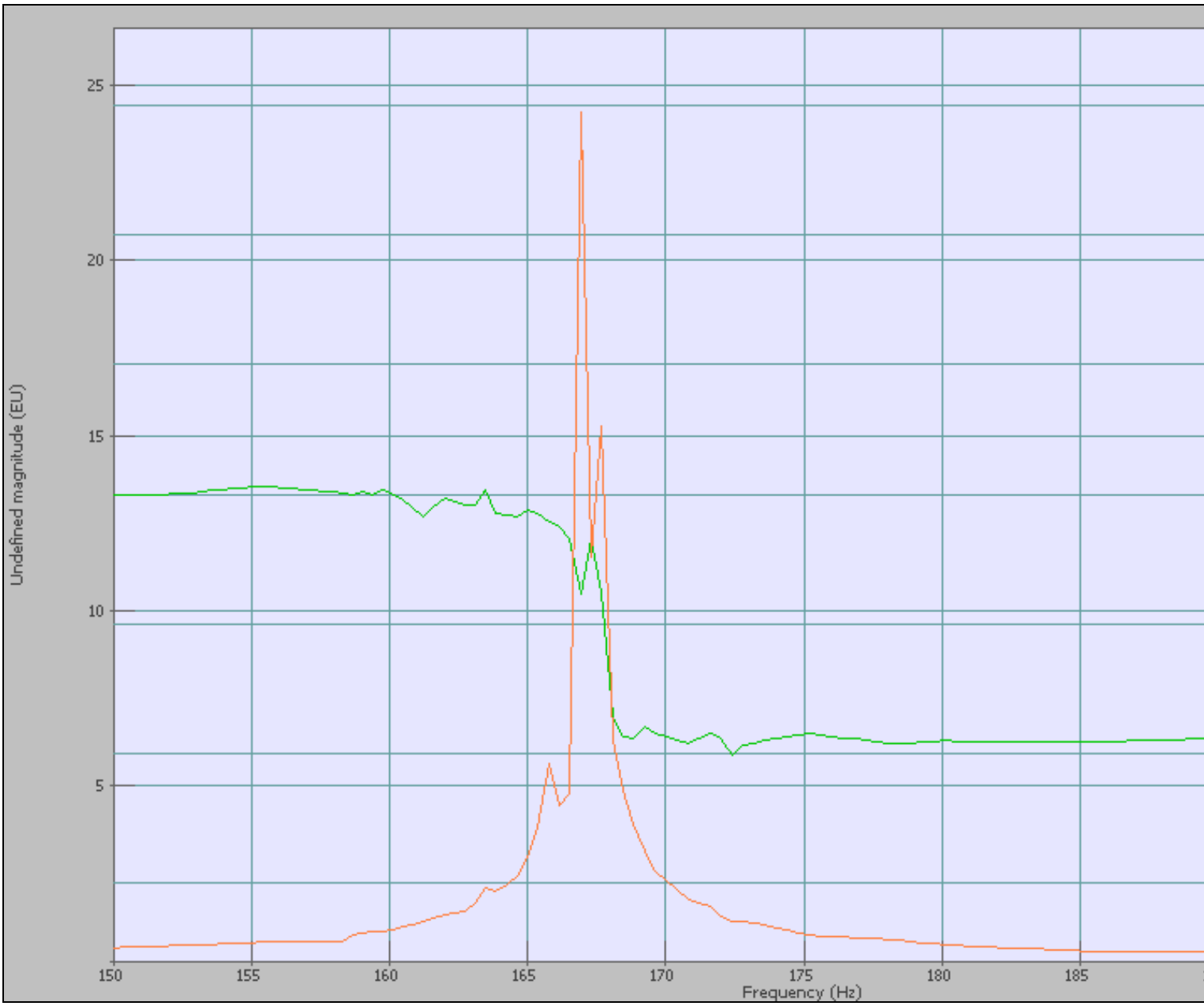

100
80
60
40
20
Coherence (%)
500
1 k
1.5 k
2 k
2.5 k
Frequency (Hz)

The transfer function is displayed on the same graph for both measurements in order to compare the accuracy.



The displayed result shows that the accuracy of the measurement is as good as without the boosted mode. The phase and module graphs are similar than for the previous measurement. No points are missing and the interpolation of some points is really closed to the measurement itself.

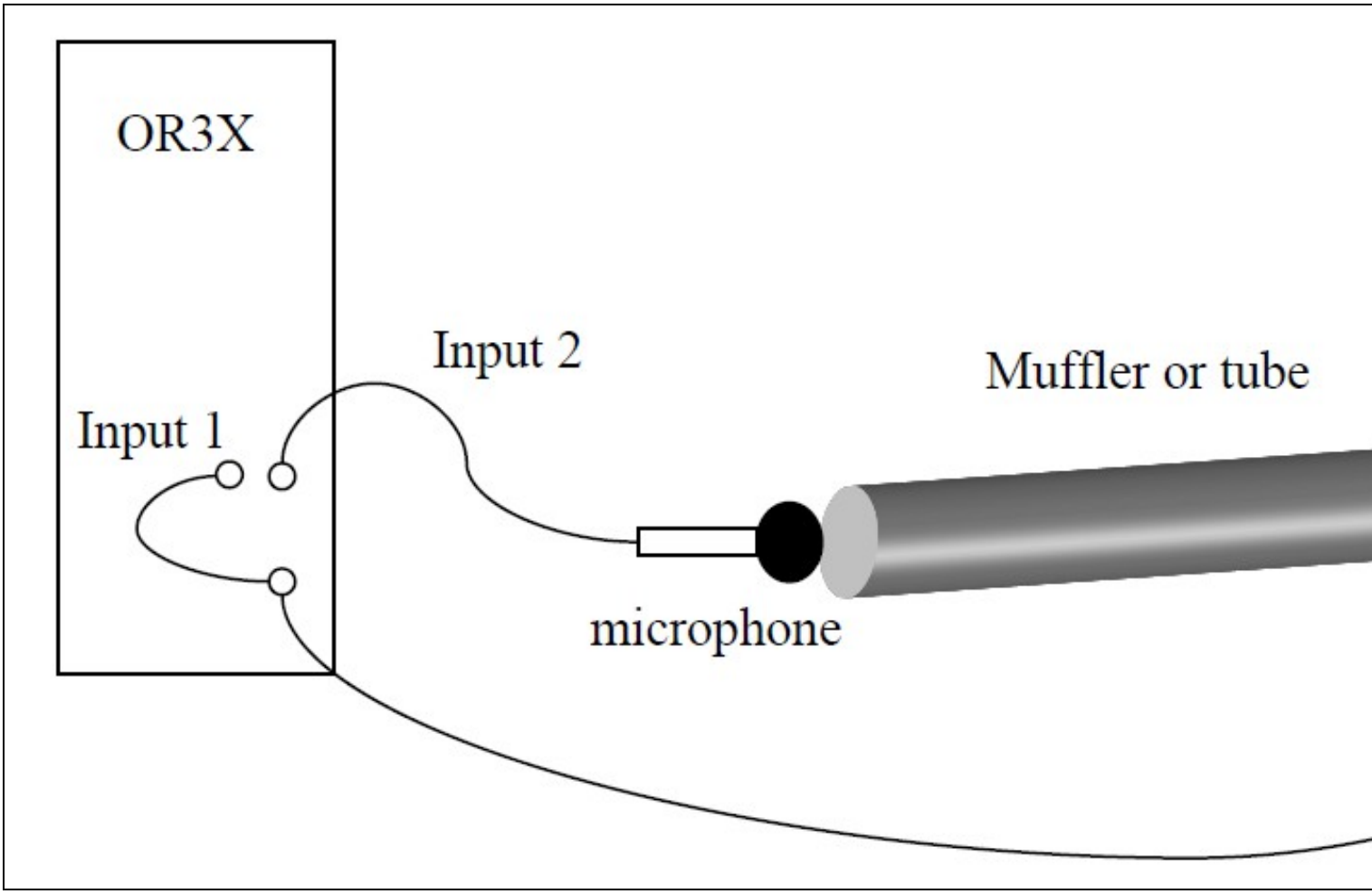
After it is possible to focus on a specific frequency bandwidth to determine a resonant frequency:



2.9.2 Acoustic measurement

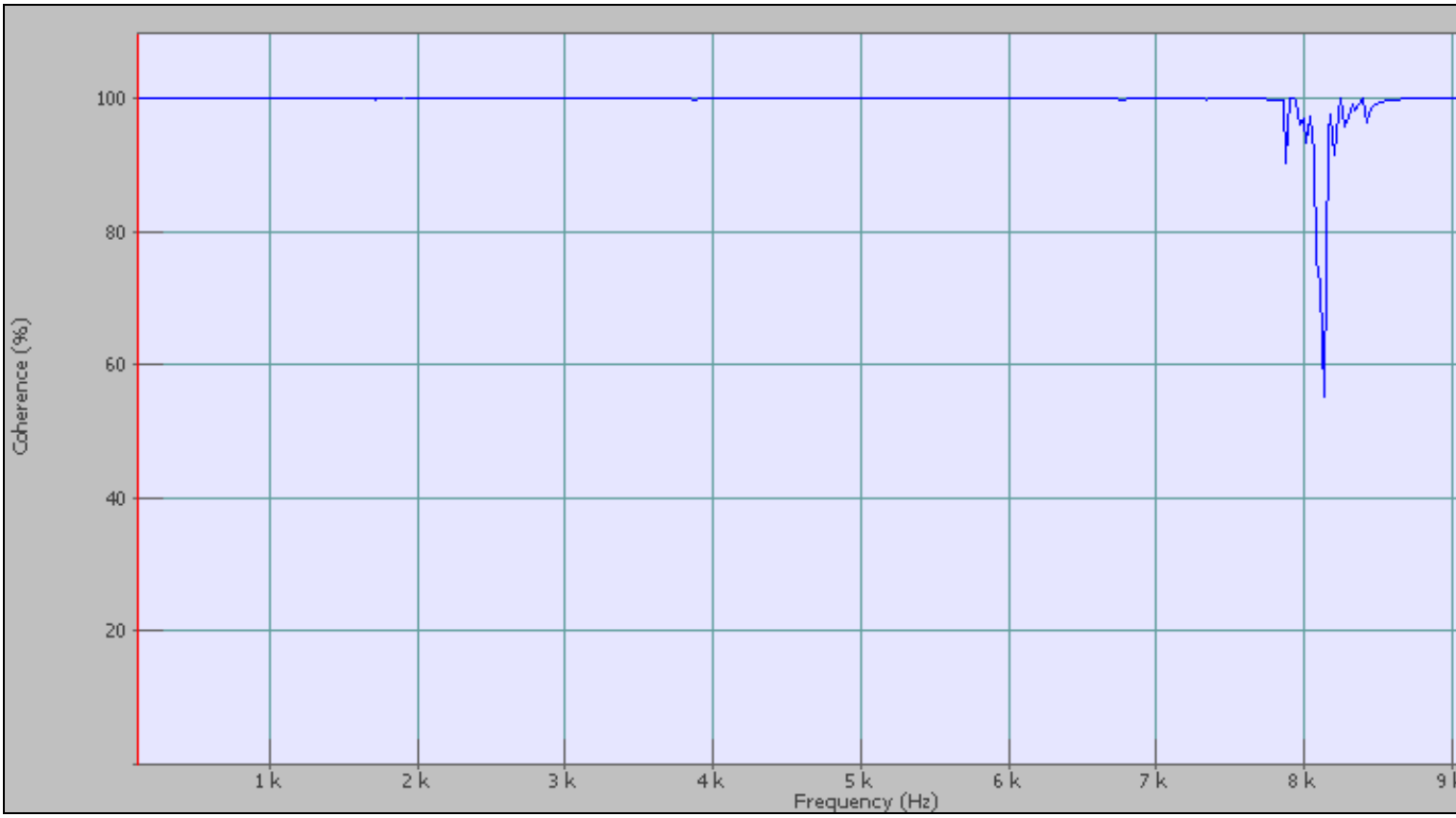
This example is based on a muffler; the aim of this measurement is to define resonance and anti-resonance in order to determine resonance and frequencies absorbed by the muffler.

Out

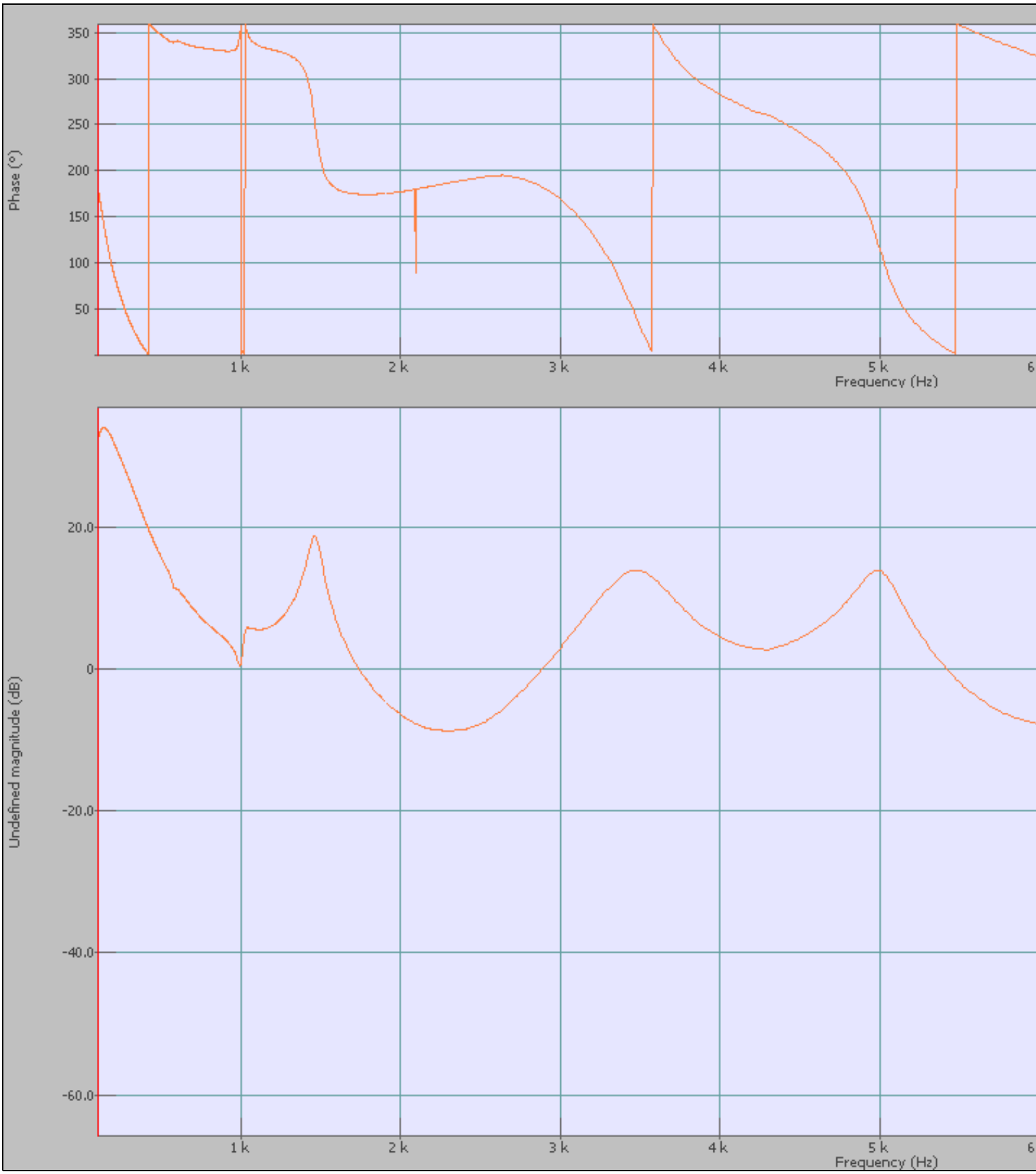


First measurement is an overview on the bandwidth 100 Hz to 10 kHz in order to determine resonances and anti-resonances.

The coherence and the transfer function have been displayed.



The coherence drop defines an anti-resonance around 8 kHz.


Phase (°)
350
300
250
200
150
100
50
1 k
2 k
3 k
4 k
5 k
Frequency (Hz)
Undefined magnitude (dB)
20.0
0
-20.0
-40.0
-60.0
1 k
2 k
3 k
4 k
5 k
Frequency (Hz)

We notice a resonance around 1.5 kHz.

In order to visualize properly these two phenomena, we use a multi-spans measurement with more points around interesting frequencies.

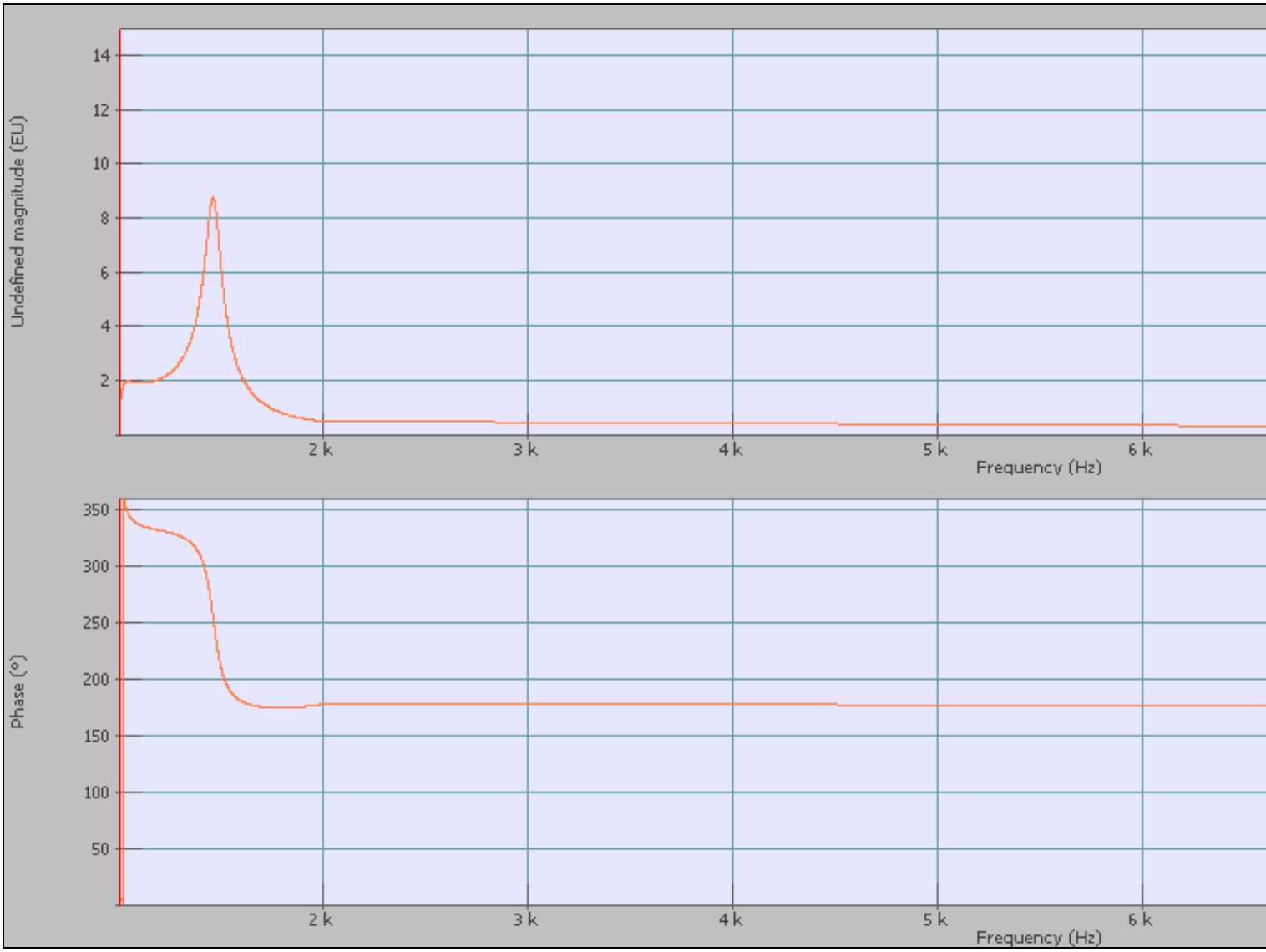
The measurement is split in 4 spans:

- 100 Hz to 1 kHz (non active)
- 1 kHz to 2 kHz (active)
- 2 kHz to 7 kHz (non active)
- 7 kHz to 10 kHz (active)

Spans where nothing interesting occurs are not activated in order to decrease time measurement.

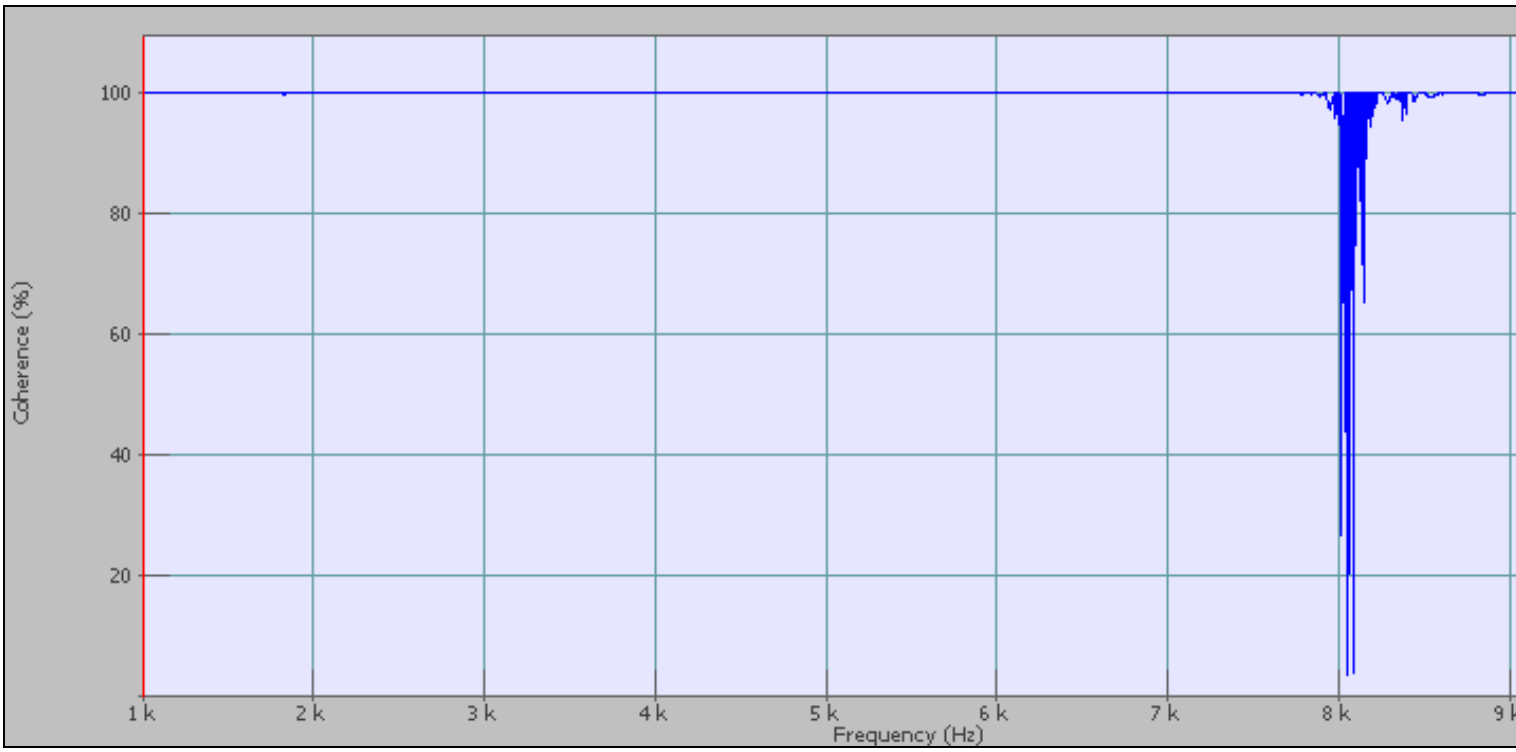
Following results correspond to these settings.

The transfer function is displayed in Magnitude/Phase:



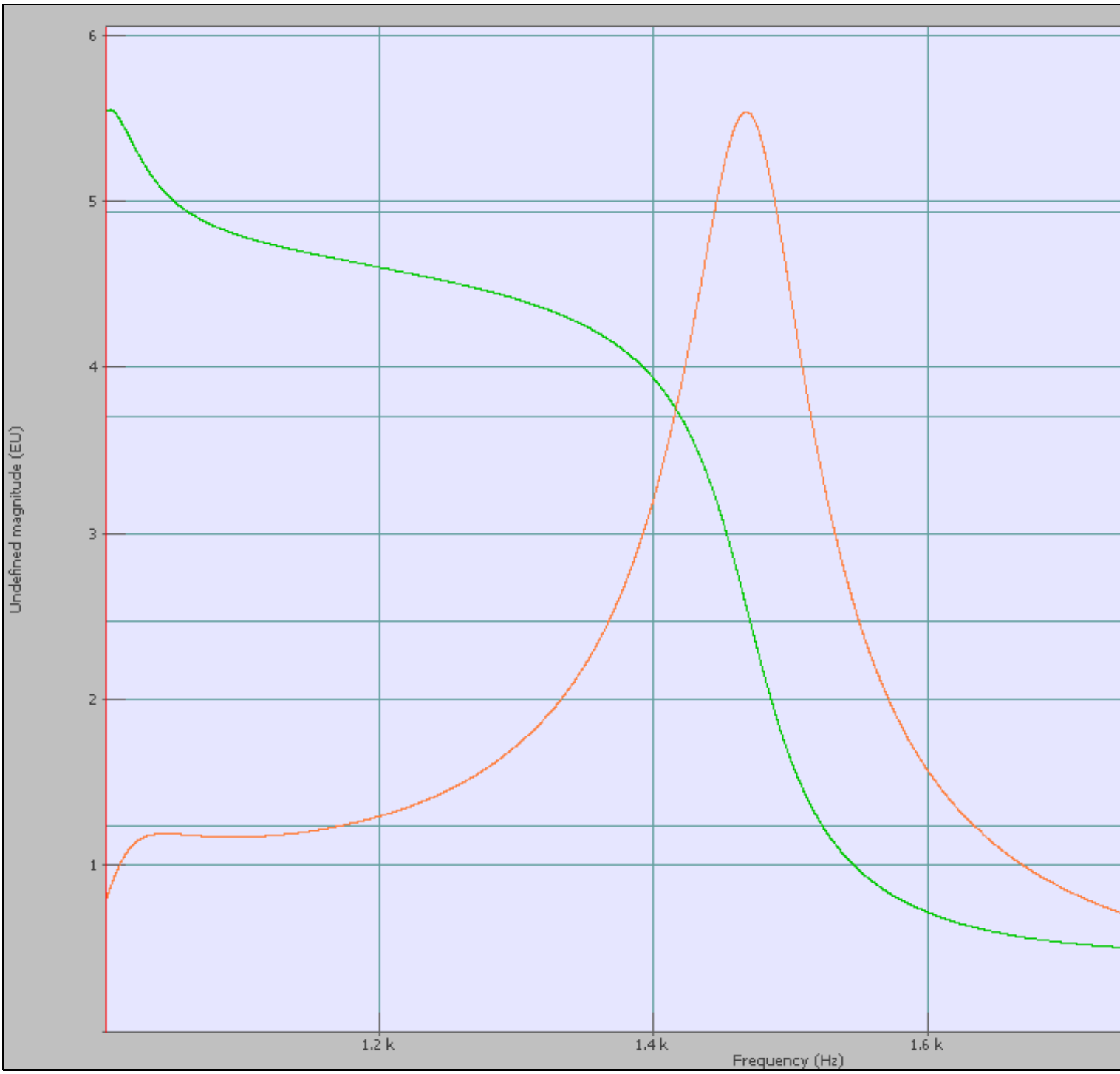
The change of phase is significant around the resonance (i.e. around 1.5 kHz) and at this frequency we can notice the magnitude of the transfer function.

For the anti-resonance it must be around 8 kHz, and this is confirmed on the coherence graph below with a significant coherence drop.



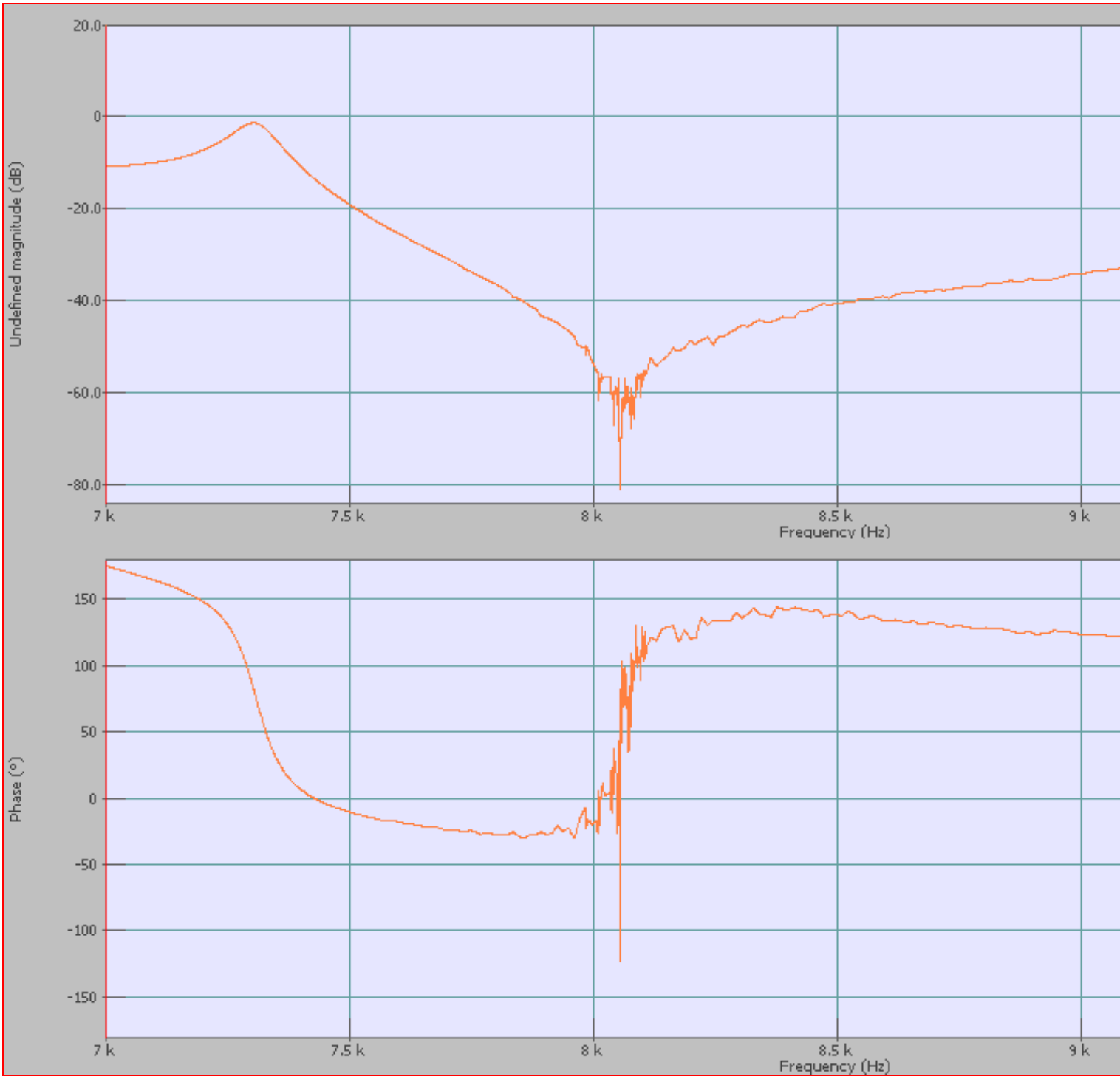
Then to see specific results on each phenomenon, two measurements have been done: one on the resonance (between 1 kHz and 2 kHz with 6 000 points) and another one on the anti-resonance (between 7 kHz and 10 kHz with 4 000 points). This could be done during the same measurement using the multi-span defined on each interesting zone. With a zoom through NVGate the following graphs could be displayed:

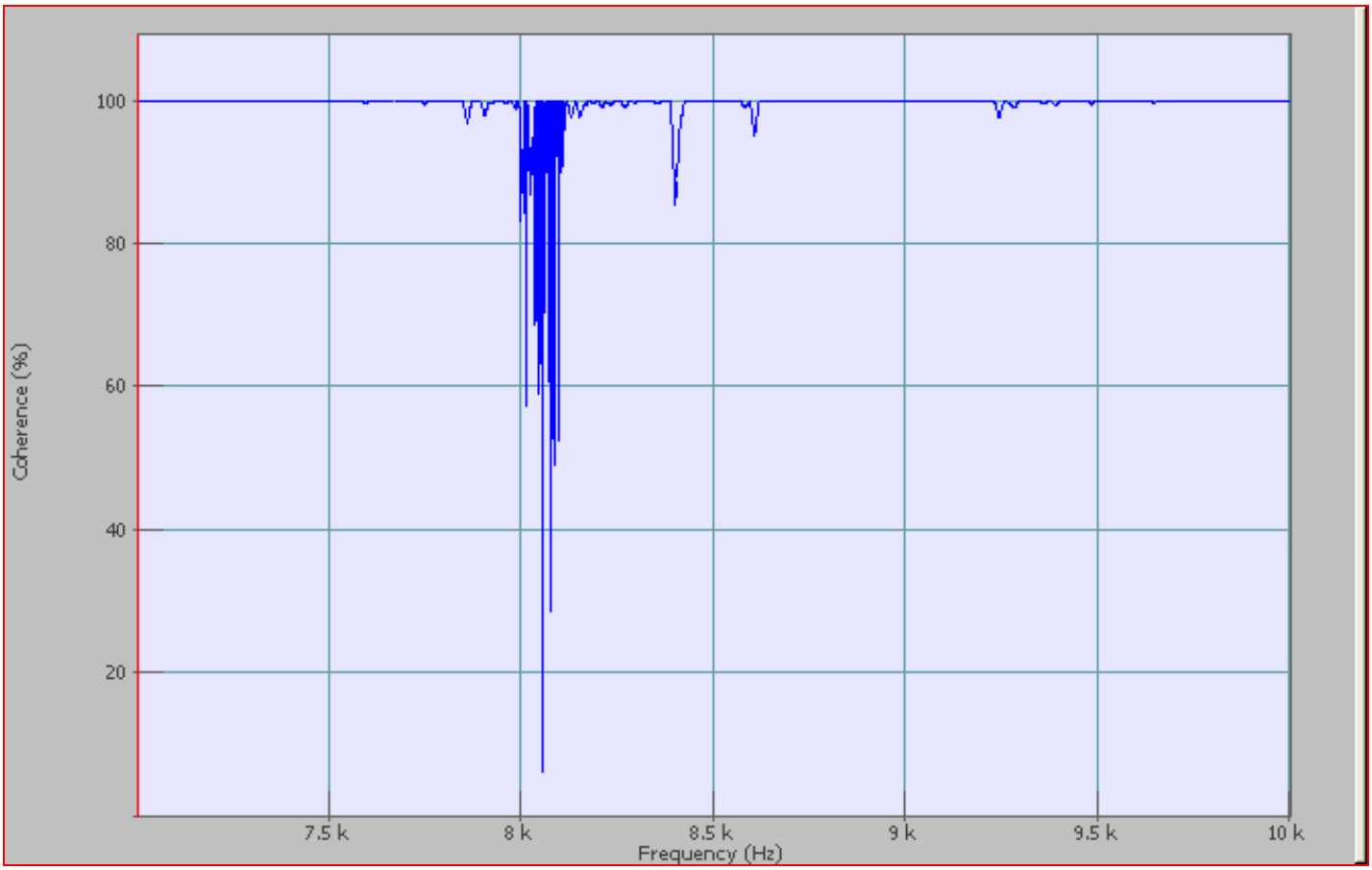
- Resonance (between 1 kHz and 2 kHz):


6
5
4
3
2
1
Undefined magnitude (EU)
1.2 k
1.4 k
1.6 k
Frequency (Hz)

We can clearly see the resonance with the change of phase on a 'Merged Magnitude/Phase' graph.

- Anti-resonance (span between 7 kHz and 10 kHz):





On this part we can see the anti-resonance on both graphs in order to determine the frequency absorbed by the muffler.

Note: These two examples are quite basic, but it is also possible to control the level on the response and/or on the reference with the level limiting of the Advanced Swept Sine solution.

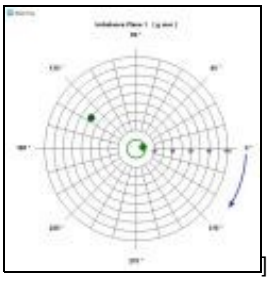
2.10 Specifications

Frequency range	0.01 Hz to 40kHz
Frequency resolution	0.00002Hz
Max number of points	80 000 points
RMS level output	10mV to 7V
Output level control	fixed, on response or on response
Sweeping type	lin or log
Sweeping mode	up, down
Sweeping speed controls	stabilization time, transition speed, averaging per point
Sweeping optimization	boosted mode
Results	spectra, FRF (magnitude & phase; real & imaginary), coherence, polar
Amplitude accuracy	0.017 dB
Phase accuracy	0.07°

3 Balancing



Balancing Software



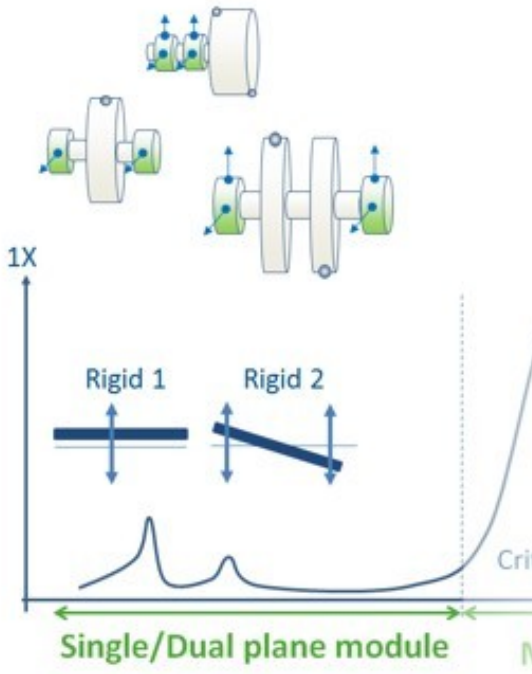
Developer	Oros.com
Type	Balancing of rotating masses, Signal processing,Industrial Rotating machines, Vibration,
First release	1995
Latest Version	2023
Download	Here
Operating system:	Windows 10 (and W7) (see PC requirements)
Language	English, German, French, Japanese, Chinese
Official website	Balancing on oros.com and here!

4 Overview

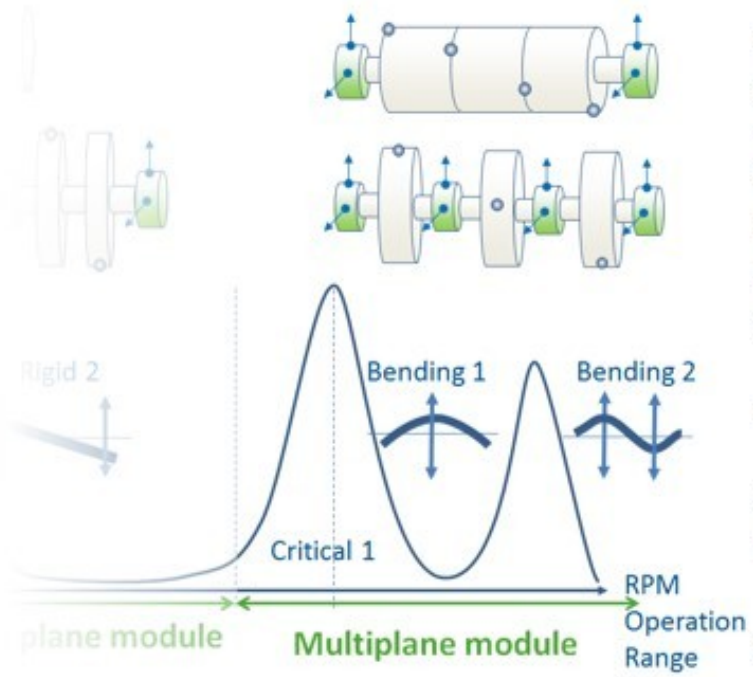
Solution for rotor balancing including single/dual plane module (rigid rotor) and multi-plane module (flexible rotor).

Single/Dual Plane Balancing (ORNVS-BAL-SDP)

- 1 or 2 balancing planes
- Rigid rotors
- 1 to 4 sensors (1 or 2 per bearing)
- Real time acquisition and 1X polar diagram (Mag/Phase).
- Steady state speed acquisition for Balancing process
- Transient speed acquisition for Analysis (Bode plot, order spectra, polar view, overall trend)
- Options for correction masses calculation: Max. allowed masses per position, disabled position, available weights
- Acceptance of residual unbalance according to ISO 1940 / Balancing quality selection
- Size and weight: optimum size with O4. Runs on the OROS instruments' platform
- Trim Balancing
- Bearing polar view and Imbalance polar view
- Report generation
- Designed for non-experts



Multiplane Balancing (ORNVS-BAL-MP)



- 1 to 20 planes
- Flexible or rigid rotors
- 1X Bode plots acquisition
- Import influence coefficient matrix
- Data Consistency check prior to computat
- Run-up, Coast-down, steady-state
- Balance at multiple speeds or ranges of speeds
- Calculate predicted vibration response vs. rpm after balancing correction
- Calculate predicted imbalance
- Save history of imbalance, mounted masses, coefficient matrix and Bode plots
- Display Bode plots (measured and synthetised), influence coefficient, Polar p

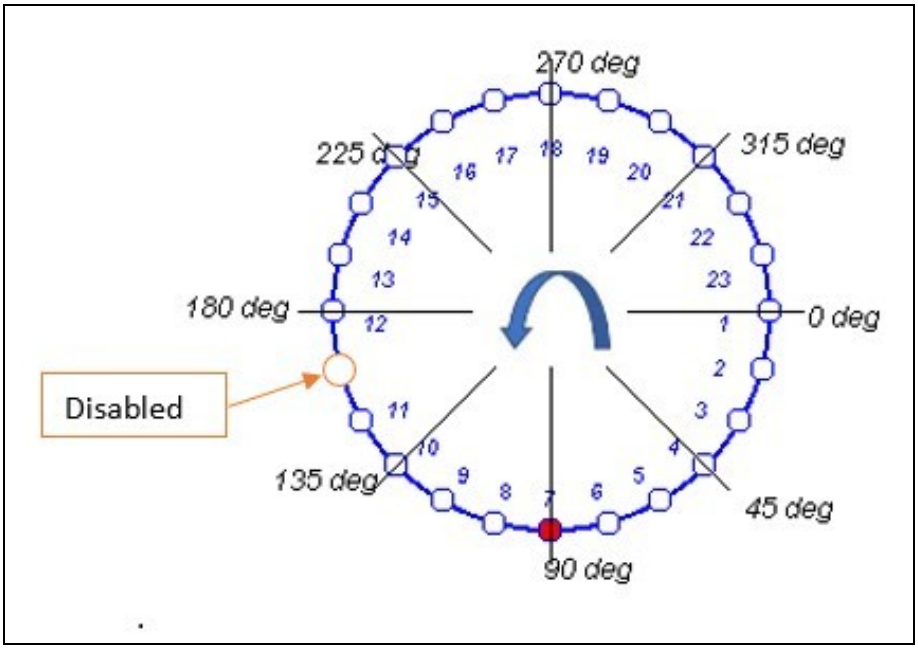
5 Balancing 2023 : What's new?

Balancing software is continuously improved to take into account the restraint of the field such as the impossibility to install a weight on the rotor, or use the own weights or comply some balancing custom rules.



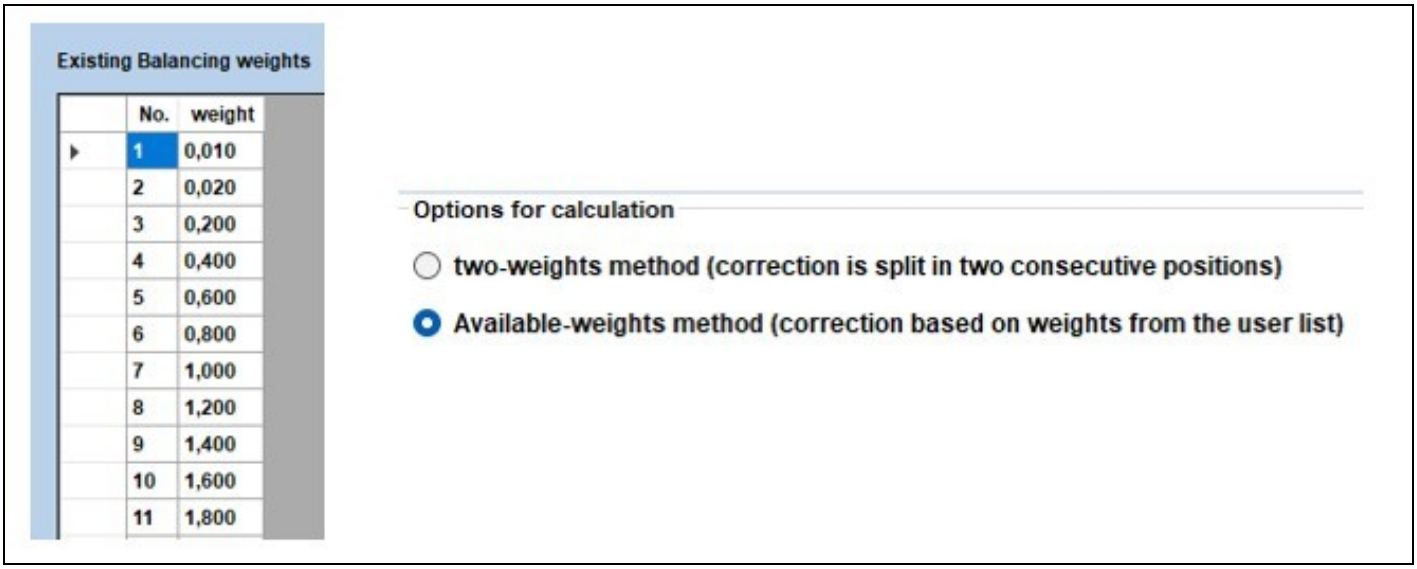
5.1 Disable some rotor positions

On the field, there are many reasons that may lead to not allow the mounting of correction masses.
Indeed, a mechanical obstruction such as a welded weight may lead impossible adding or removing mass at some rotor positions.
The computed balancing masses given by the software must take into account this fact.
As shown below, rotor positions can be disabled in the correction prognosis in the software.



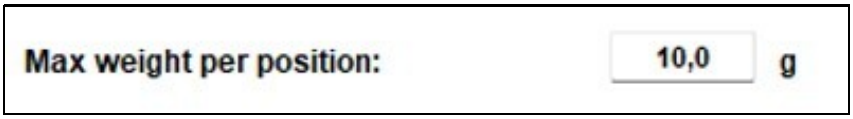
5.2 Correction weight from a database

Basically the software provide a couple of balancing masses at two consecutive positions, giving the right resulting correction vector.
On the field, it is not always possible to build the exact masses to be mounted. Balancing software can take into account the actual weights to recommend the best distribution that will apply the right correction vector.
First, User has to register any weight in a database so that the software can take them for the computation.



5.3 Set max allowed weight per position

As a rule, a mass limitation per position have sometimes to be followed to prevent the mechanical integrity of the rotor. Hence, the balancing calculation will take into account this limitation.



The new version include single/dual and multiplane balancing inside the same software !

6 Balancing 2023

6.1 Install

6.1.1 User's Manual

6.1.2 Documentation

- MultiPlane Balancing Turbocharger Application : Best practices for Flexible Balancing
- Best pratices for Flexible Balancing (White Paper)

7 Depreciated (old software)

- Depreciated: balancing single dual plane manual
- Install
- Depreciated: multiplane balancing manual old software

Video Tutorial:

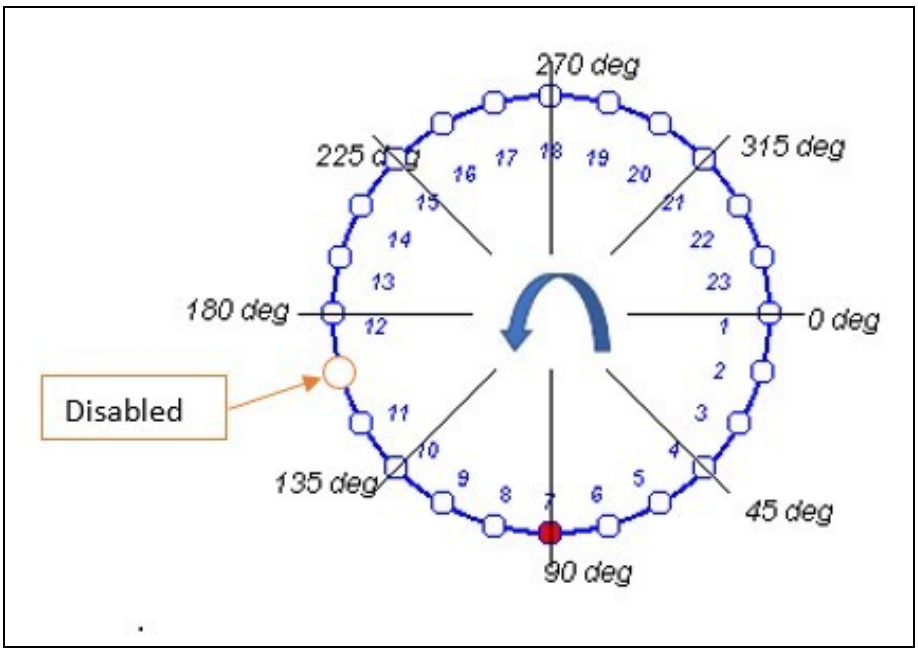
8 Balancing Manual

9 Balancing 2023 : What's new?

Balancing software is continuously improved to take into account the restraint of the field such as the impossibility to install a weight on the rotor, or use the own weights or comply some balancing custom rules.

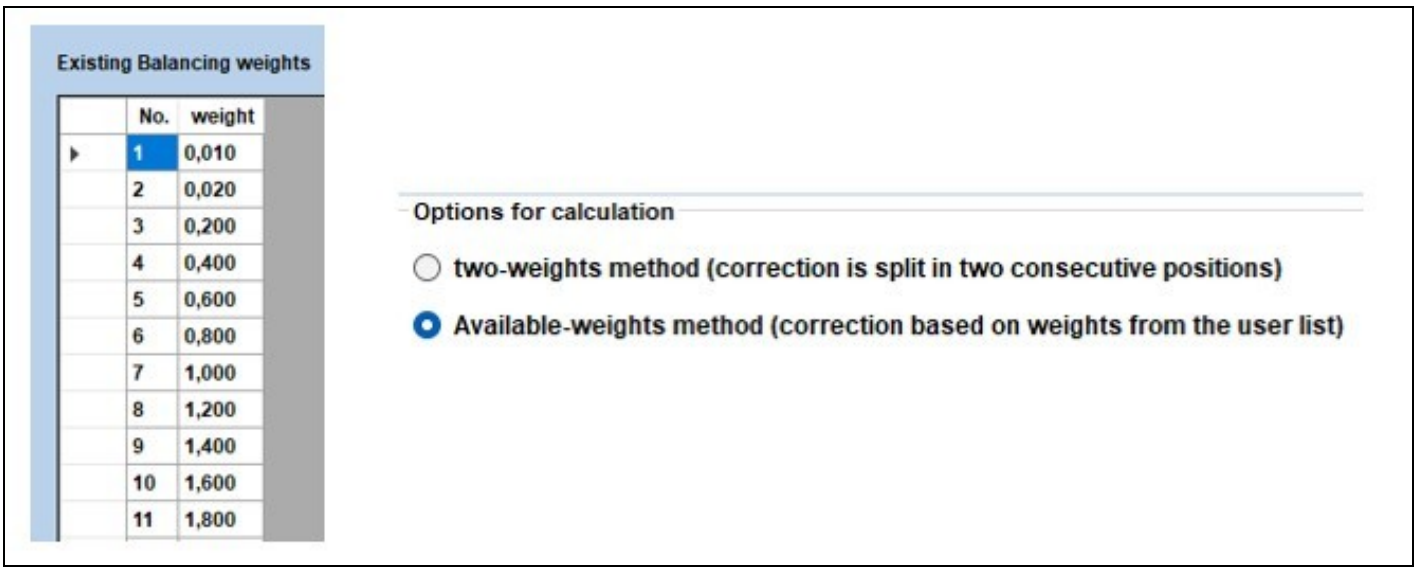
9.1 Disable some rotor positions

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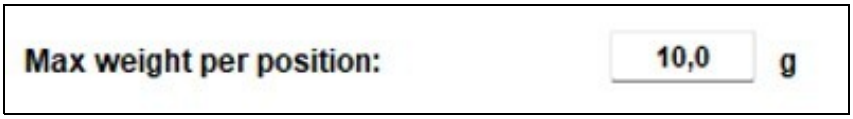
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On the field, it is not always possible to build the exact masses to be mounted. Balancing software can take into account the actual weights to recommend the best distribution that will apply the right correction vector.
First, User has to register any weight in a database so that the software can take them for the computation.



9.3 Set max allowed weight per position

As a rule, a mass limitation per position have sometimes to be followed to prevent the mechanical integrity of the rotor. Hence, the balancing calculation will take into account this limitation.



10 Installation guide



10.1 Equipment required for the installation

? Before proceeding to the Balancing installation, NVGate should be installed (Refer to NVGate User?s Manual).

? Software CD or USB stick containing OROS Balancing and the online help.

? A dongle dedicated to OROS Balancing software in case of floating license.

Software licensing

LICENSE on instrument: ORNVS-BAL-I

If you are using an instrument-locked license, the OROS hardware (OROS 3-Series analyzers) is used to allow the software operation. Your selected OROS analyzer should be connected when using the balancing solution. To update the license, use the delivered USB stick to update your hardware key. For details about this procedure, refer to your Analyzer installation guide from the OROS wiki web page.

FLOATING LICENSE: ORNVS-BAL-FD If you are using a floating license, you should plug your USB balancing dongle when using the software (online or offline). The floating license will allow you to use your balancing software on any of your analyzers. For the floating license, an updating of your hardware keys may be required. If it is the case, use the delivered USB stick to update your hardware key. For details about this procedure, refer to your Analyzer installation guide from the OROS wiki web page.

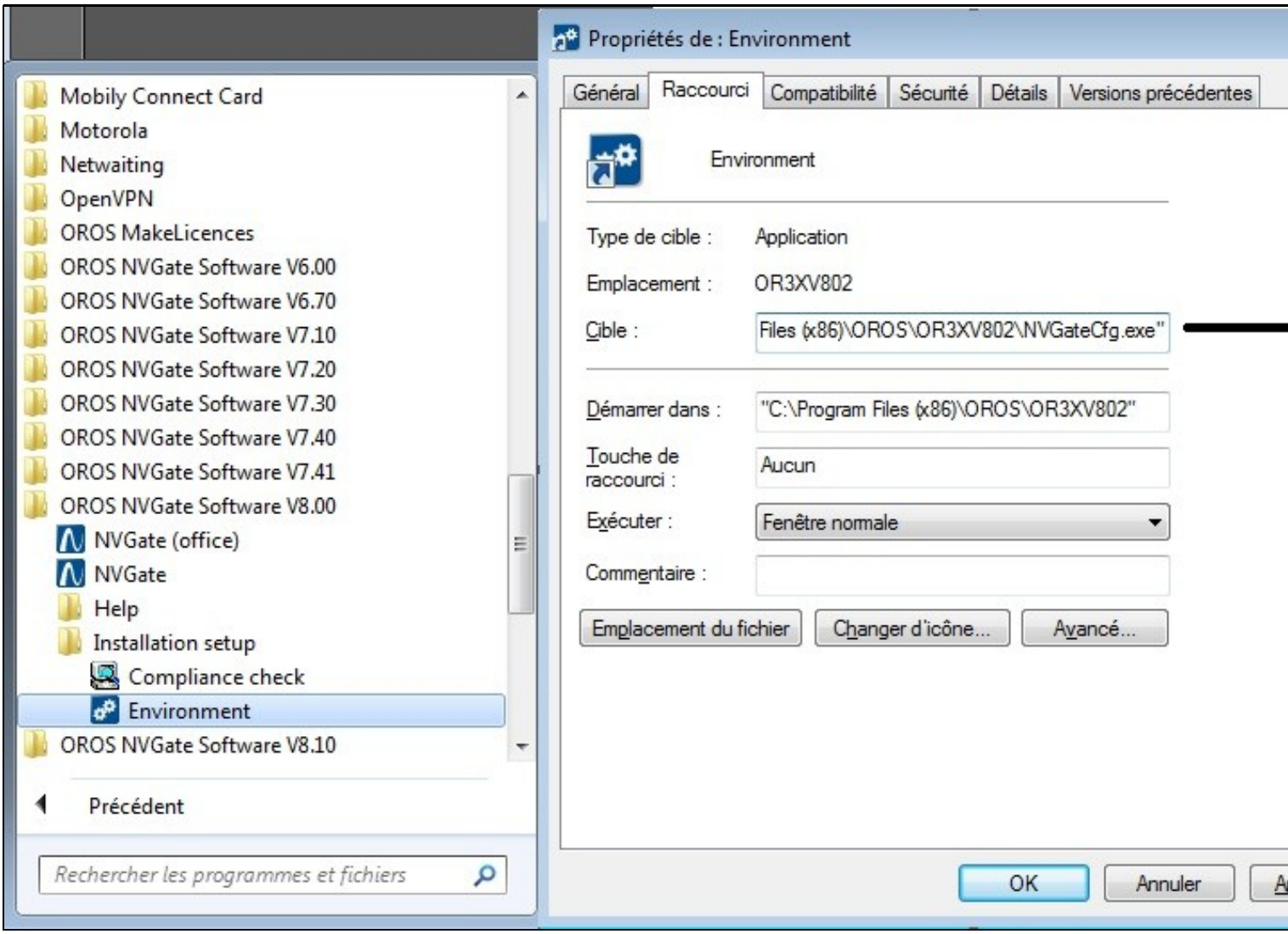
11 Bios update

12 Troubleshooting

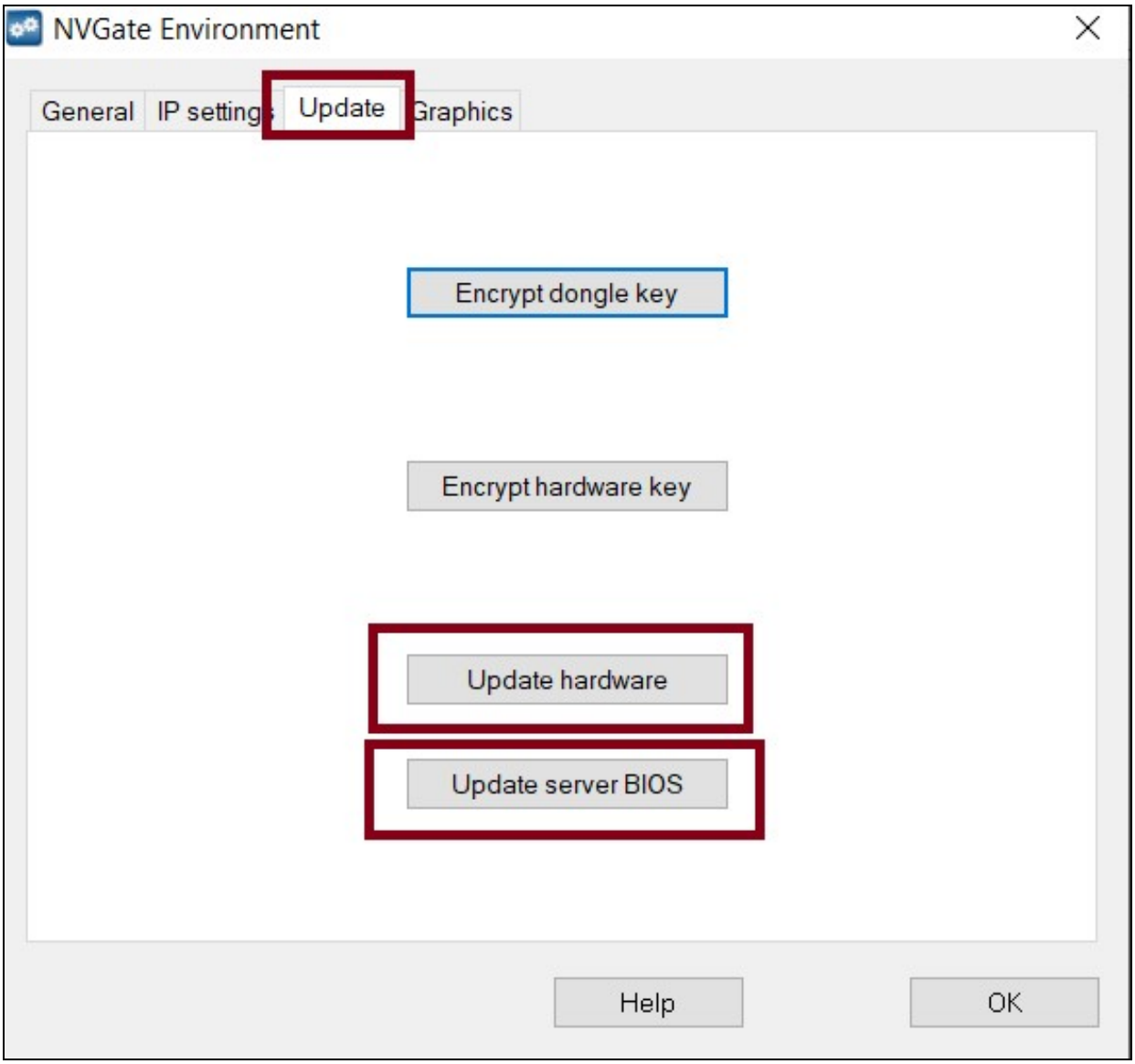
- Start the analyzer in maintenance mode (push button on/off during 10 seconds) you should see maintenance on the analyzer screen.

12.1 Bios update

- Create a shortcut of the Environment tool (NVGatecfg.exe next to NVGate.exe). Right click on it, select Properties and modify the target by adding the option -forceupdate -updateserver as described in the ?Environment_Update.jpg? attached.



- Restart NVGate Environment application and select the ?Update Server BIOS?.
- Restart Analyzer, restart the NVGate Environment and select ?Update Hardware?.

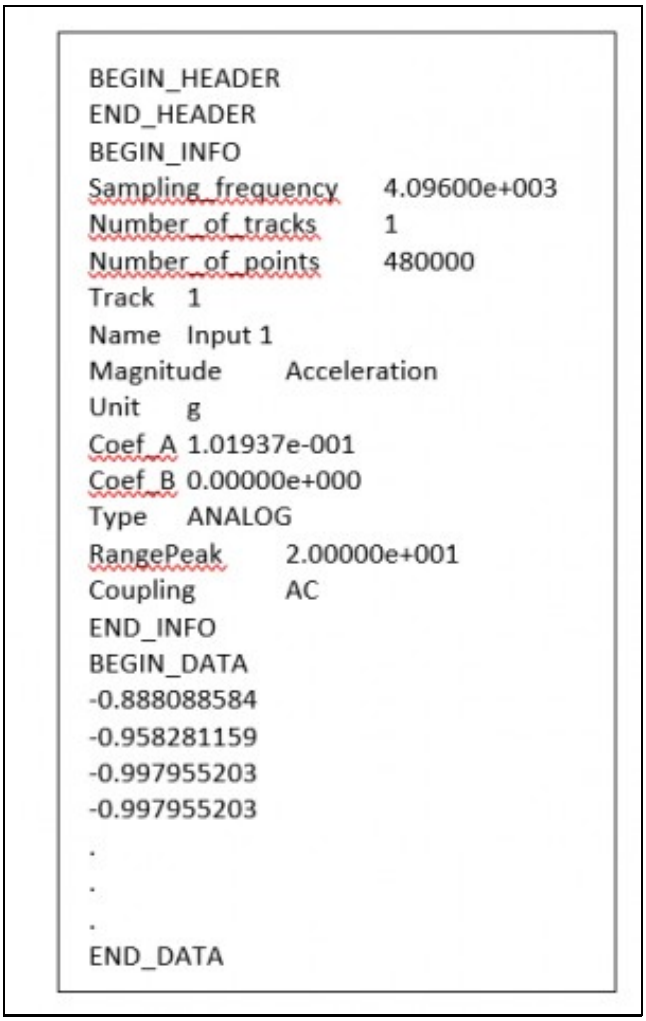


13 Description of .txt export

13.1 How to convert a signal data from Text to a compatible file for NVGate ?

NVGate allows importing signal from a text file. It?s a very convenient feature to import signal from any source. On the contrary the text file must be setup according to standards NVGate design. The easier way to do is to record a file at NVGate and export it to check its content.

Here is an example of text file for 1 channel and a brief description of its content:



Sampling_frequency 4.09600e+003 : Must be one of the sampling frequency available at NVGate

Number_of_tracks 1 : Number of Track

Number_of_points 480000 : Number of Point : must be a multiple of 256

Track 1 : Track number

Name Input 1 : Track Label

Magnitude Acceleration : Magnitude of Track

Unit g : Unit

Coef_A 1.01937e-001 : Conversion Parameter from Unit to SI Unit :

Coef_B 0.00000e+000 : Unit = Coef_A * Unit_SI + Coef_B

Type ANALOG : Analog Channel

RangePeak 2.00000e+001 : Range Peak at SI Unit

Coupling AC : Coupling

END_INFO

BEGIN_DATA

-0.888088584 Data? as many line as ?Number of Point

In addition here is an example for a multi channel signal:

```
BEGIN_HEADER
END_HEADER
BEGIN_INFO
Sampling_frequency      5.12000e+004
Number_of_tracks        3
Number_of_points        337664
Track   1       2       3
Name    Input 1 Input 2 Input 3
Magnitude       Acceleration    Accoustic_Pressure      Potential_Difference
Unit    g       Pa      V
Coef_A  1.01937e-001    1.00000e+000    1.00000e+000
Coef_B  0.00000e+000    0.00000e+000    0.00000e+000
Type    ANALOG          ANALOG          ANALOG
RangePeak       9.99001e+002    2.61406e+002    1.00000e+001
Coupling        ICP     ICP     AC
END_INFO
BEGIN_DATA
-5.62393e-003   -2.00893e-002   -1.05593e-005
-7.48160e-003   -2.27399e-002   -5.09284e-005
-9.84059e-003   -2.61856e-002   -1.21575e-004
-1.09906e-002   -2.76623e-002   -5.52535e-005
.
.
.
END_DATA
```

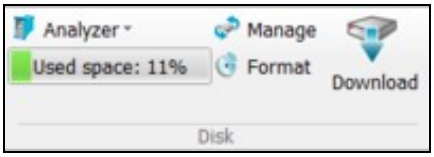
14 Disk(Hard-drive) management

14.1 Signals management

NVGate signal provides signal storage devices and used hardware for single and multi-hardware acquisitions.

2 dialog allows that the disk manager and the signal properties.

PC and Mobi-Disc management tools (available in the "data" tab).





Active Disk: Select the active disk. The active disk is the one which is mapped by the project manager. The disk where a signal file is located must be the active one in order to load it on the player (play back, post-process, exploration).

The active disk can be:

 The PC one. Available in office mode only.

 One of the Mobi-disk connected through a USB cable. Available in office mode only.

 The Analyzer disk (Mobi-Disk or fixed). Available in connected mode only.



Manage: Open the disk manager in order to manage the signal files saved on it.



Format: Format the active disk. Not available when PC disk is selected.

Warning: all saved data on the formatted disk will be definitely deleted.

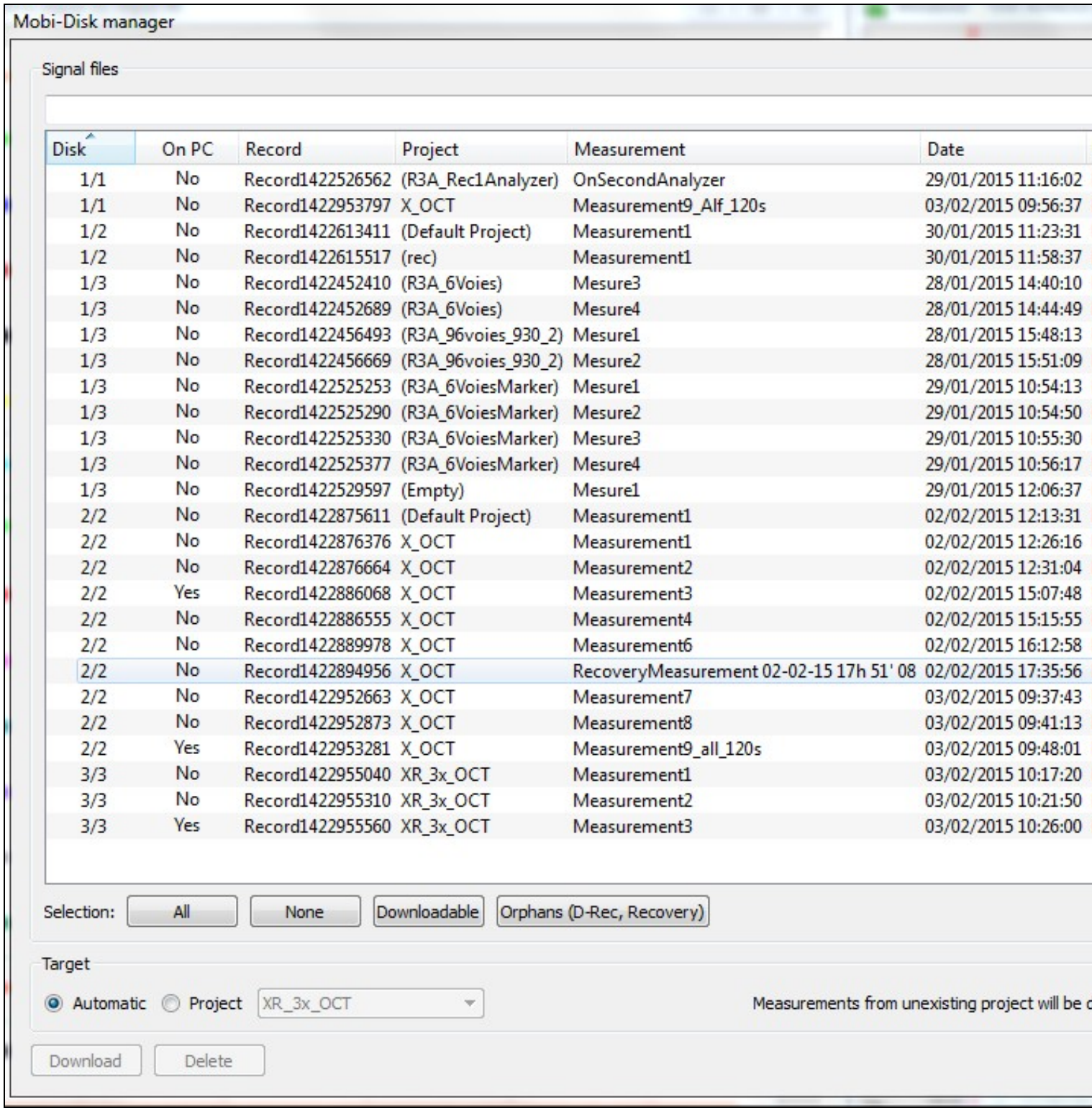


Download: Select available signal file on the active disk that match the project present on the project manager. To recover signal files from a record session made with another PC use the manage button.

14.1.1 Disks manager

Both Manage and Download buttons open it.

The dialog shows all records which have at least one file on the active disk(s): On analyzer(s) or on PC USB.


Mobi-Disk manager
Signal files
Disk
On PC
Record
Project
Measurement
Date
1/1 No Record1422526562 (R3A_Rec1Analyzer) OnSecondAnalyzer 29/01/2015 11:16:02
1/1 No Record1422953797 X_OCT Measurement9_Alf_120s 03/02/2015 09:56:37
1/2 No Record1422613411 (Default Project) Measurement1 30/01/2015 11:23:31
1/2 No Record1422615517 (rec) Measurement1 30/01/2015 11:58:37
1/3 No Record1422452410 (R3A_6Voies) Mesure3 28/01/2015 14:40:10
1/3 No Record1422452689 (R3A_6Voies) Mesure4 28/01/2015 14:44:49
1/3 No Record1422456493 (R3A_96voies_930_2) Mesure1 28/01/2015 15:48:13
1/3 No Record1422456669 (R3A_96voies_930_2) Mesure2 28/01/2015 15:51:09
1/3 No Record1422525253 (R3A_6VoiesMarker) Mesure1 29/01/2015 10:54:13
1/3 No Record1422525290 (R3A_6VoiesMarker) Mesure2 29/01/2015 10:54:50
1/3 No Record1422525330 (R3A_6VoiesMarker) Mesure3 29/01/2015 10:55:30
1/3 No Record1422525377 (R3A_6VoiesMarker) Mesure4 29/01/2015 10:56:17
1/3 No Record1422529597 (Empty) Mesure1 29/01/2015 12:06:37
2/2 No Record1422875611 (Default Project) Measurement1 02/02/2015 12:13:31
2/2 No Record1422876376 X_OCT Measurement1 02/02/2015 12:26:16
2/2 No Record1422876664 X_OCT Measurement2 02/02/2015 12:31:04
2/2 Yes Record1422886068 X_OCT Measurement3 02/02/2015 15:07:48
2/2 No Record1422886555 X_OCT Measurement4 02/02/2015 15:15:55
2/2 No Record1422889978 X_OCT Measurement6 02/02/2015 16:12:58
2/2 No Record1422894956 X_OCT RecoveryMeasurement 02-02-15 17h 51' 08 02/02/2015 17:35:56
2/2 No Record1422952663 X_OCT Measurement7 03/02/2015 09:37:43
2/2 No Record1422952873 X_OCT Measurement8 03/02/2015 09:41:13
2/2 Yes Record1422953281 X_OCT Measurement9_all_120s 03/02/2015 09:48:01
3/3 No Record1422955040 XR_3x_OCT Measurement1 03/02/2015 10:17:20
3/3 No Record1422955310 XR_3x_OCT Measurement2 03/02/2015 10:21:50
3/3 Yes Record1422955560 XR_3x_OCT Measurement3 03/02/2015 10:26:00
Selection:
All
None
Downloadable
Orphans (D-Rec, Recovery)
Target
Automatic
Project
XR_3x_OCT
Measurements from unexisting project will be
Download
Delete

The preselection buttons have been split into 3 categories:

- ***All*** / ***None***: for backup or disk cleaning.
- ***Downloadable***: Select records which have corresponding project & measurement in the *Project Manager*.
- ***Orphans***: Select records which haven't any corresponding project & measurement in the *Project Manager*.
-

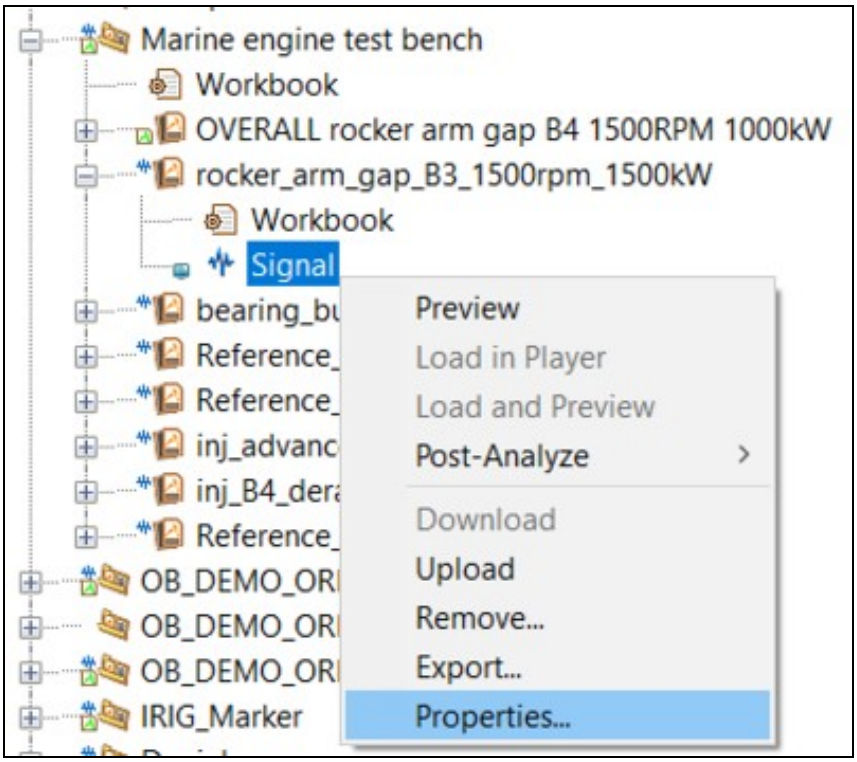
NB: Preselection buttons do not select partial records. i.e. one or more disks are not connected. Use manual selection to download an incomplete record. **Warning** this is a definitive action. It will be impossible to add missing files later.

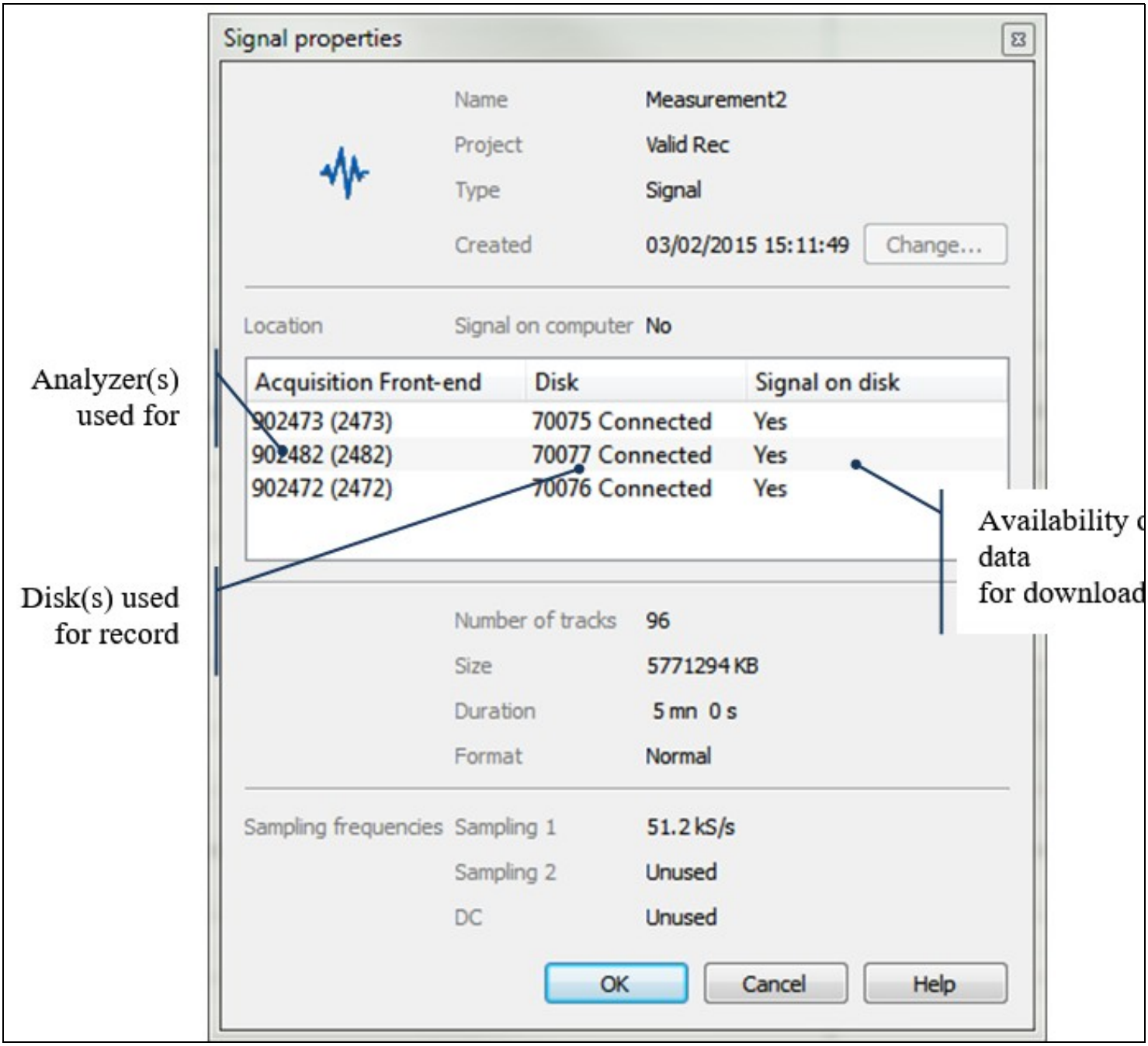
The *Target* choice allows choosing the download destination:

- ***Automatic***: add each signal file in the *Project/Measurement* used for its acquisition. Note that records without *Project/Measurement* correspondence in the *Project manager* will be added in the current project.
- ***Project:*** add the signal files in the selected project regardless of original project.

14.1.1.1 Signal properties

The properties of recorded signals includes location and traceability.




Signal properties
Name
Measurement2
Project
Valid Rec
Type
Signal
Created
03/02/2015 15:11:49
Change...
Location
Signal on computer
No
Acquisition Front-end
Disk
Signal on disk
902473 (2473)
70075 Connected
Yes
902482 (2482)
70077 Connected
Yes
902472 (2472)
70076 Connected
Yes
Number of tracks
96
Size
5771294 KB
Duration
5 mn 0 s
Format
Normal
Sampling frequencies
Sampling 1
51.2 kS/s
Sampling 2
Unused
DC
Unused
OK
Cancel
Help
Analyzer(s) used for
Disk(s) used for record
Availability
data
for download

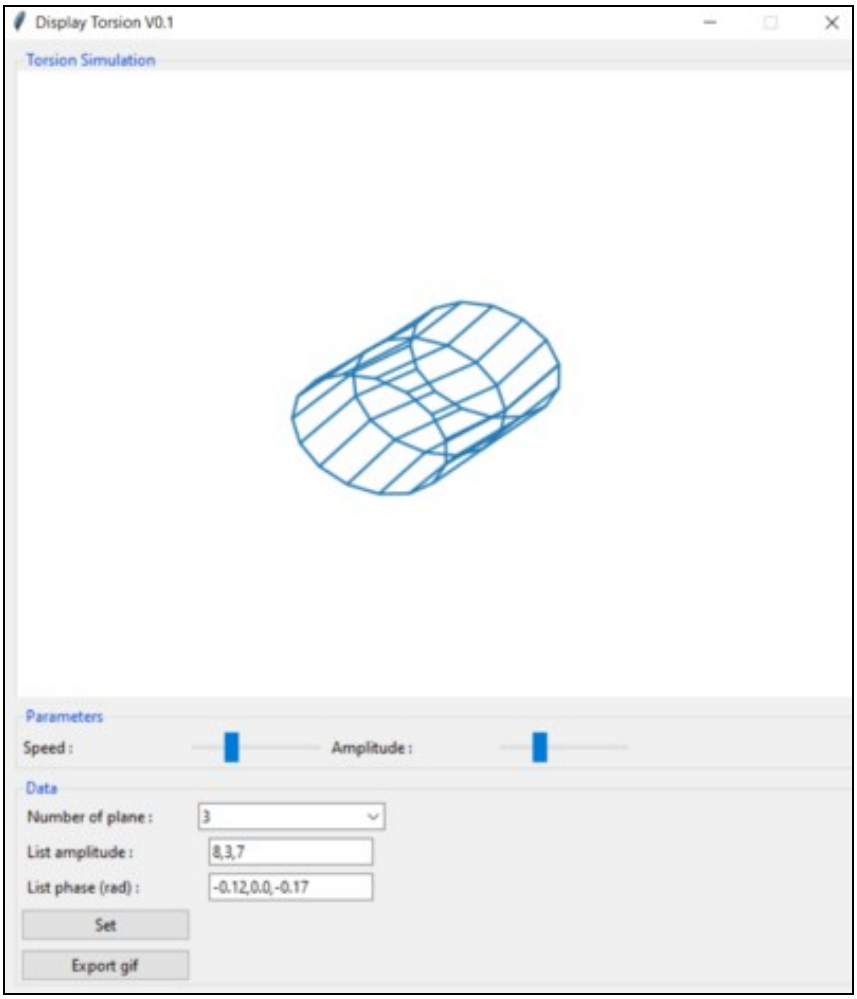
The analyzer(s) which have been used to record the signal are memorized in the column Acquisition Front-end. It is the easy to identify records that may be altered by a faulty input.

- Same thing regarding the used (Mobi-) disks.
- The information is saved with the measurement itself. They are available even if the analyzer or the disk is not connected.
- The *Signal on disk* indicates the presence of record file on the connected disks: Yes/No or a question mark when the disk is not connected.

15 Display Torsion ODS

V0.1 to download : DisplayTorsionODSV0_1

Tools to display torsion ODS by entering the parameters below.



16 MaintenanceCenter:Download Center



OROS maintenance center team. From left to right: Valentin, customer care engineer; Nathalie, production Software; Martin, maintenace technician; Laurent, customer care manager.

This page is reserved to maintenance centers.

16.1 Guides

16.1.1 Analyzers maintenances

16.1.1.1 Current analyzers

For OR36 and OR38, the process is the same as the v1 version.
Verification sequence , prod test, OR34-35-36-38-V1 manual (pdf)
Process to open OR35TW
O4 Tutorials for maintenance

16.1.1.2 Old analyzers

OR10 maintenance center note.
Important point regarding disassembly of the OR34.

16.1.2 Other guides

Process to install maintenance center
NVGate user preference for verification test
Error code and case studies

16.2 Downloads

16.2.1 O4 - Teamwork

Compatible NVGate v18 for those analyzers.
Prod and verification test / May 2026

16.2.2 OR10

Compatible NVGate v16 and 17 for this analyzer.
The second analyzer which is generating output need to be flash with NVGate V17.
Prod and verification test

16.2.3 OR36V2 - OR38V2

All is compatible NVGate V16.10.
Prod test: 10670 28-11-2016
Verification test: 20055 28-11-2016

16.2.4 OR34 - OR35V1

All is compatible NVGate V16.10.
Prod test 20083 31-05-2017
Verification test 10670 28-11-2016

16.2.5 Tools

Keysight 34465A compatibility HP34465

PDF creator 1.2.2

Prolific driver (parrallel to USB) V1417

16.3 Other

Edit wiki sidebar

17 External Tools: TachTool

This program allows a user to:

- Create a tachometer from an NVGate FFT waterfall. With this new tachometer computed, you can extract any order from FFT waterfall.
- Edit an existing tachometer.

17.1 Download

Download here (version from march 2026)
Compatibility : NVGate V17 or more
NVGate project demo data

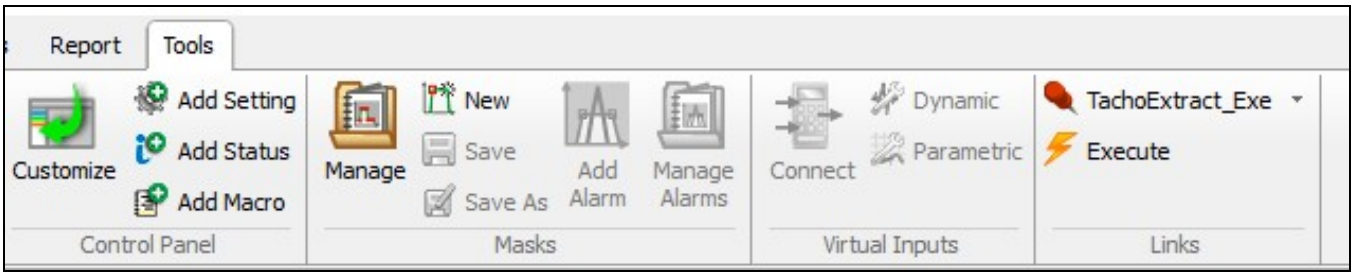
17.2 ExtractTacho

17.2.1 Package composition

- NVGate add-on tool "ExtractTach": *ExtractTach.exe*

17.2.2 Configuration

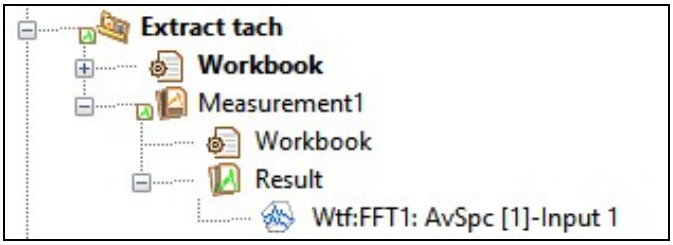
The add-on "ExtractTach.exe" is located within NVGate installation directory.



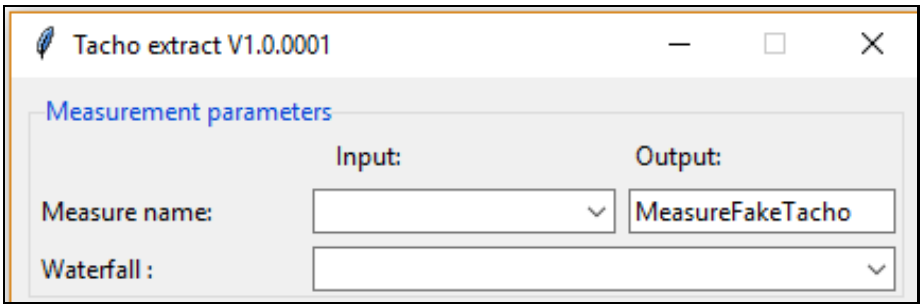
It is recommended to add a shortcut of this exe file in the "Link" directory (C:\OROS\NVGate data\Links) to have direct access from NVGate in Link Section.

Principle

From NVGate, load the project containing the measurement you want to edit. "Tach extract" will scan all the measurement in your active project.



The measurement parameters fields must be filled in:

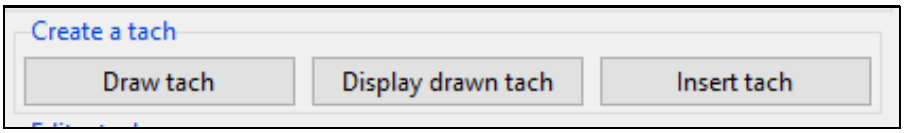


"Measure name": select the measurement where the waterfall is located

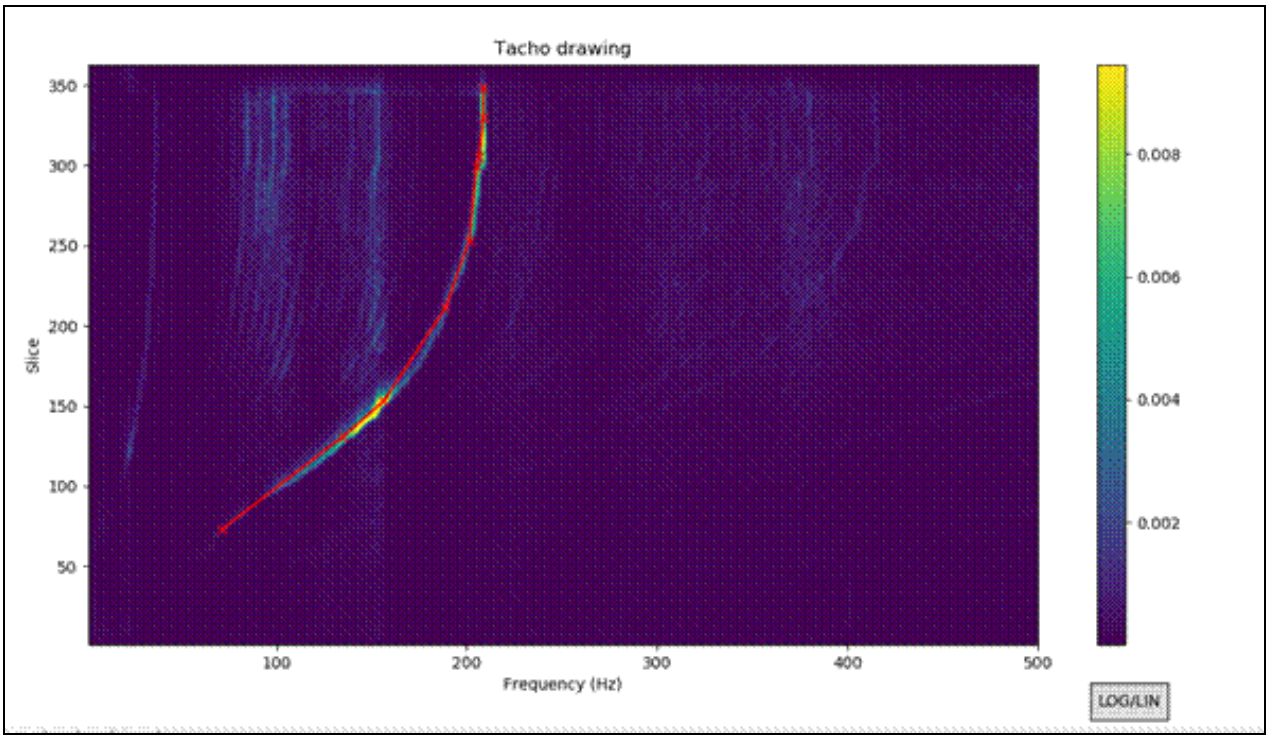
"Waterfall": Select the waterfall where you need to extract the tachometer.
"Output": A new waterfall will be created after extracting the tachometer. This will be the name of this new tachometer.

17.2.3 Create a tachometer

First of all, the tachometer must be drawn or computed, then you will be able to display it and insert it into NVGate measurement.



Select draw tach to create a tachometer from a waterfall. It will display the waterfall that you have chosen and allow you to draw a tachometer on it.



On this view, you will have to draw, with a mouse click, the order.

Click on "CTRL+Z" to remove the last point that you have drawn.
You can change the display in "Logarithm" or "Linear" to help you to draw the tachometer if needed.

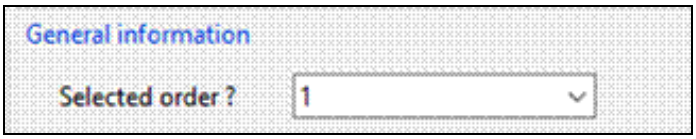
These are the display options for zooming and changing the display



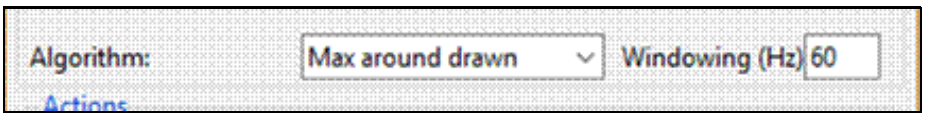
When this is done close the windows with the cross. It will automatically save what you have drawn.



Select the order number that you have drawn. We need this information for being able to recompute the tachometer.



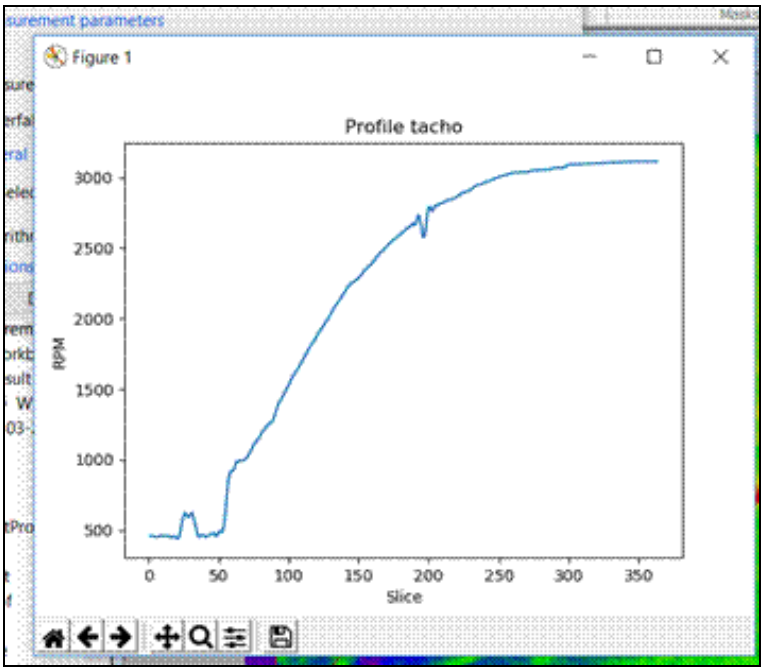
Select the algorithm:



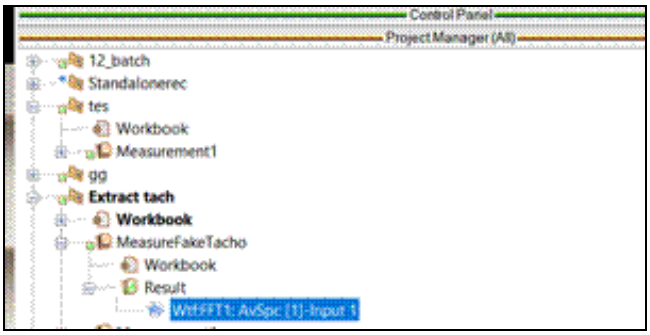
- Max around drawn (advice): will search the maximum around the drawn tachometer in a window around it.
- "Same as Drawn" will put exactly the same that you have drawn.

Display this new tachometer with "Display draw tach".

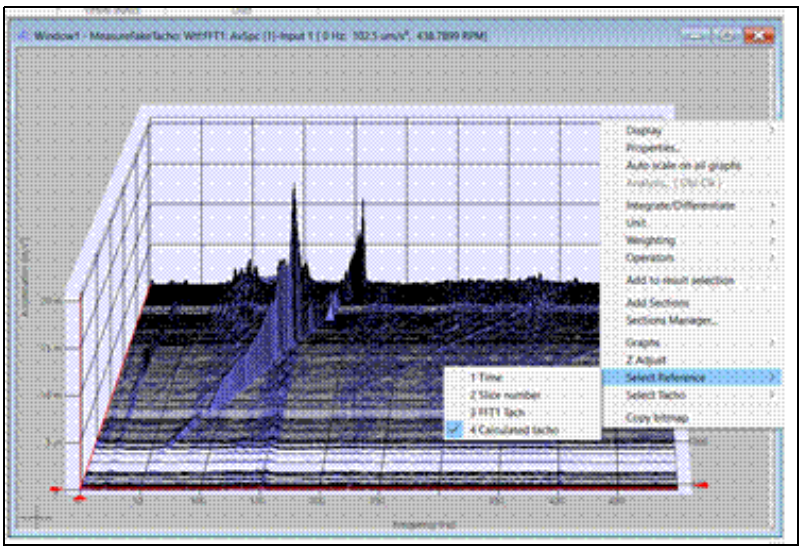
Then you show the tachometer profile that you have computed.



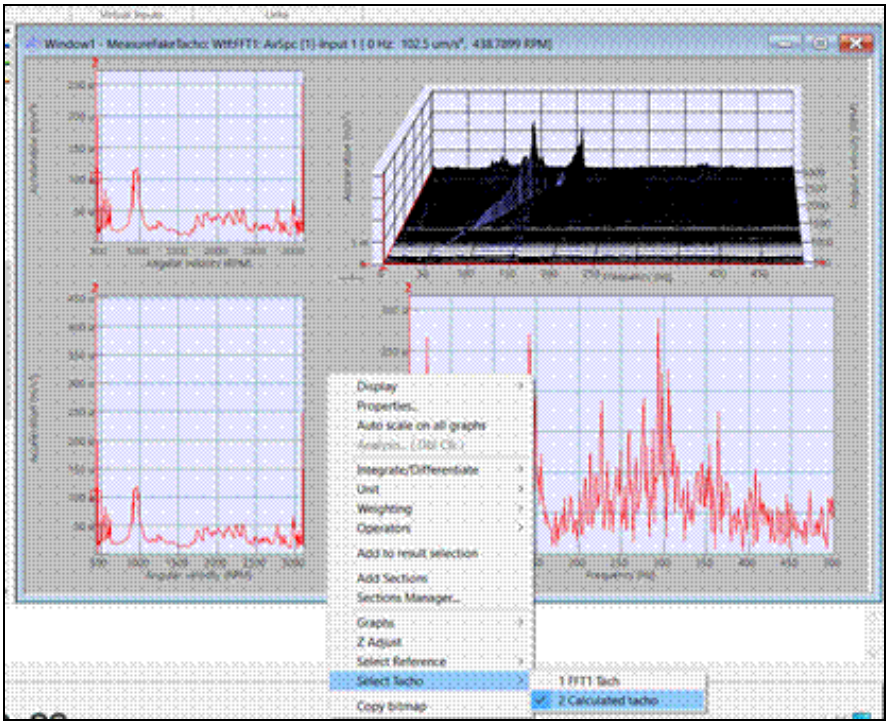
Finally, "Insert tach" will create a new measurement into NVGate with a new tachometer associated as reference.



You can change the reference and insert the calculated tacho.

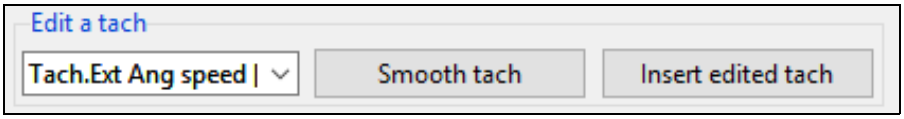


Also select the calculated tachometer on "Select tacho" panel for order extraction.



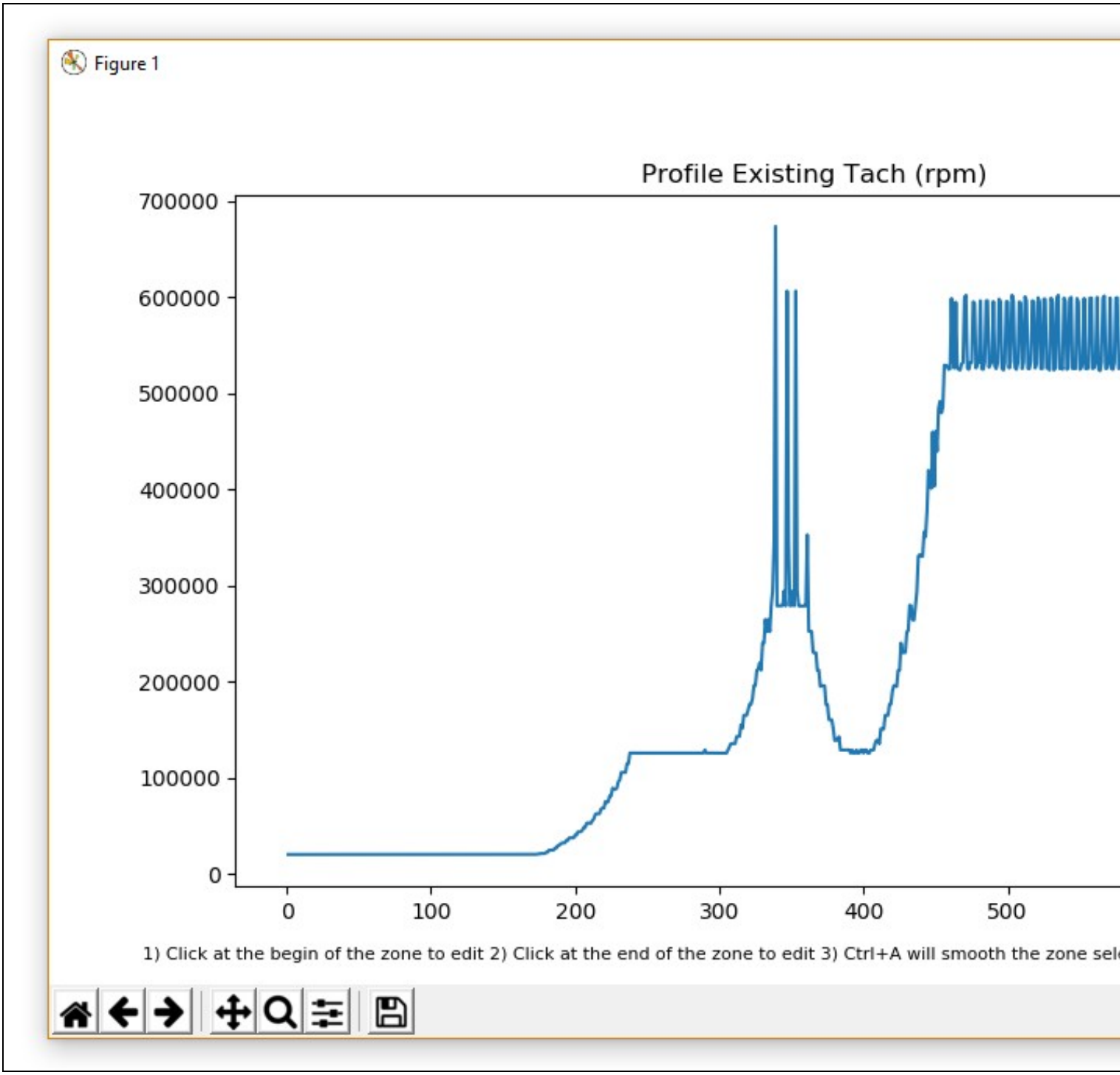
17.2.4 Edit tachometer

This function allows to edit a tachometer, and particularly to linearize it in a zone.

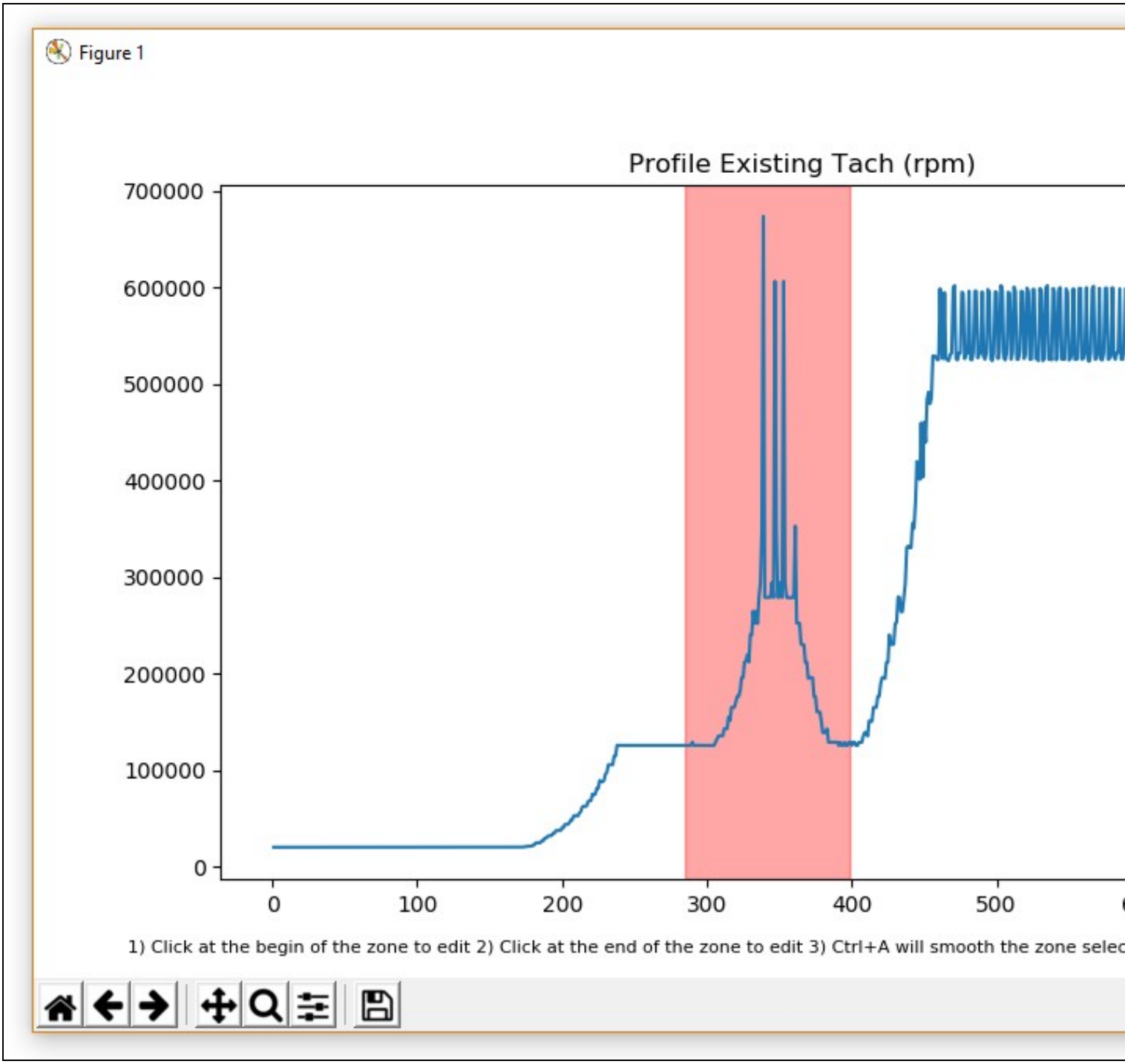


Once a result is selected into "Measurement Parameters", all existing tachometers will be added into the combo box and you can select one of them.

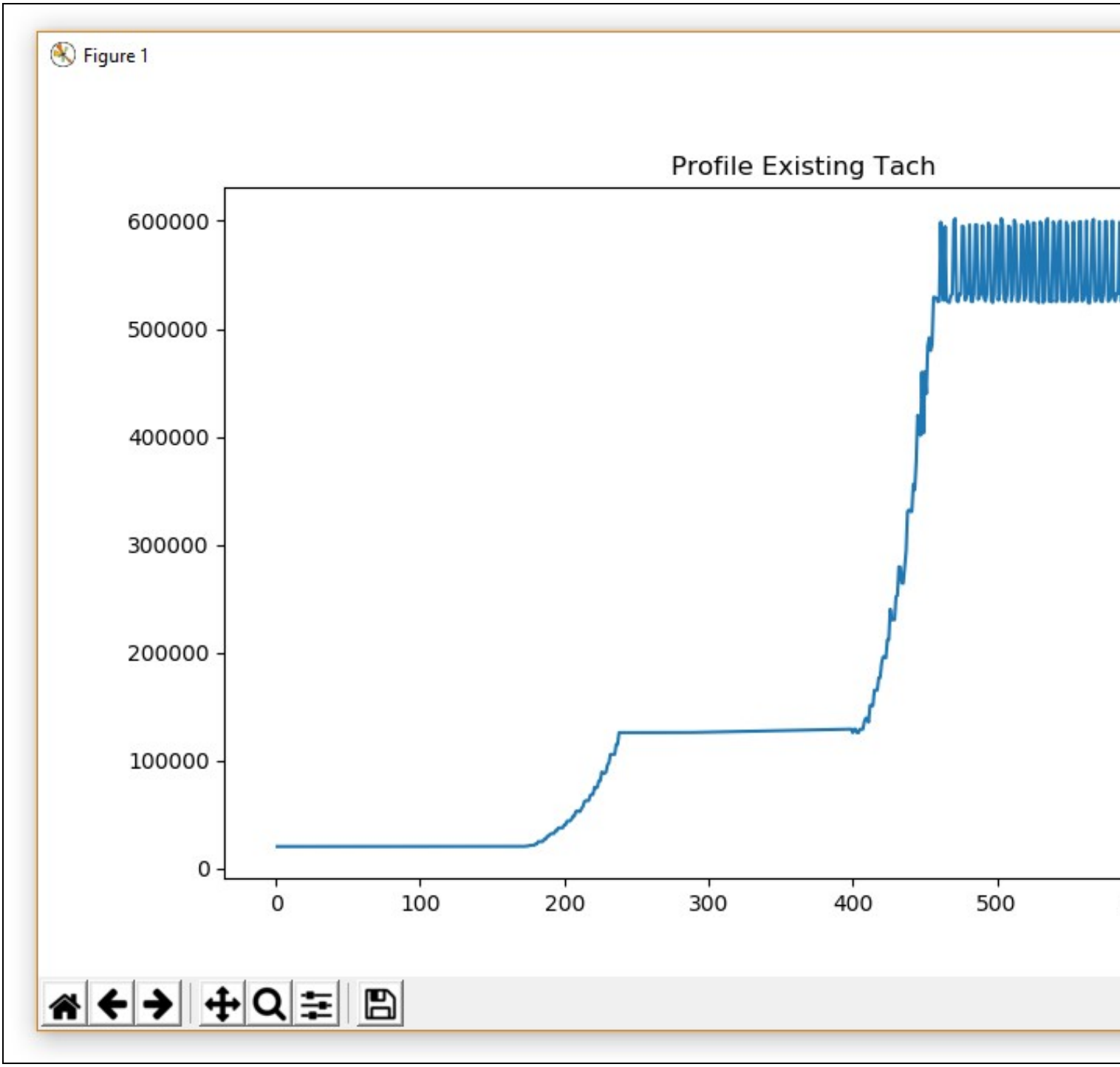
The associated tachometer profile can be display with "Smooth tach" button as below:


Figure 1
Profile Existing Tach (rpm)
700000
600000
500000
400000
300000
200000
100000
0
0
100
200
300
400
500
1) Click at the begin of the zone to edit 2) Click at the end of the zone to edit 3) Ctrl+A will smooth the zone

If it?s needed to remove a part of the profile, or linearize it because inconsistent pick, just click at the beginning of the wanted zone, and then at the end, it will display a red area:



Then, the "Ctrl+a" shortcut will linearize the area, using the start and end value of the area:



The window can now be closed and the edited tachometer inserted into NVGate via "Insert" button.

17.2.5 Notes

1) This program is delivered free of charge for NVGate V12. Support is not automatically provided on this tool.

2) For any other requests, please contact your local distributor or the OROS Customer Care department.

18 FFT Spectrum Analyzer Multipurpose

FFT analyzers
The OROS series multi-function FFT analyzer is PC-based, high-performance, high reliability and easy to operate.

We have further increased the arithmetic processing speed and increased the real-time analysis capacity to more than 16 times that of the conventional model (OR20 series). An ethernet LAN cable is used as the interface.

In addition, the number of simultaneous recording channels in the frequency range (40 kHz) has been expanded to a maximum of 1000 channels and the dynamic range has been improved to 140 dB. These improvements allow a user to measure time signals over a wide frequency range simultaneously on multiple channels.

Schedule a demo Get a quotation Contact support

- 

Analyzer Cascade mode

- 

Modal FRF measurement

- 

Acoustic Sound intensity

- 

Vibration on turbomachinery

- 

NVH automotive measurement

- 

In flight measurement

18.1 Main Features

- From 2-32 channels
- Synchronous measurements up to 1000ch is possible by combining multiple analyzers (*)
- Compact and lightweight (4ch model 1.5kg, 10ch model 3.0kg)
- Achieves high-speed communication with a PC through an ethernet LAN interface
- Equipped with an output channel as a standard
- Built-in internal battery as a standard
- Record, Fast Fourier Transform analysis, octave analysis, and tracking analysis can be performed simultaneously at high sampling frequencies

- Realtime measurements and post-analysis can be performed with the same software platform (NVGate)
- In addition to sound and vibration, strain and temperature can be measured at the same time using XPODS (**)
- CAN-bus module compatible (***)
- Recording is possible with analyzer in standalone mode or in conjunction with a PC (****)

(*) Synchronous measurements that combine multiple analyzers is possible only for TW OR35 / TW OR36 / TW OR38.

(**) The strain / temperature module(XPOD) can be installed only on TW OR35 / TW OR36 / TW OR38.

(***) CAN-bus module can be installed only on OR10/ TW OR35 / TW OR36 / TW OR38.

(****) Stand-alone measurements are possible only with SSD-equipped models OR10 / TW OR35 / TW OR36 / TW OR38.

18.2 Introducing the hardware



18.2.1 Small and lightweight

OR10-8ch model: 0.8kg

O4: 4ch model: 0.5kg

OR35 TW: 10ch model: 3.0kg

OR36 TW: 16ch model: 5.2kg

OR38 TW: 32ch model: 8.2kg

18.2.2 Ethernet LAN interface



Achieves high-speed communication with a PC through an ethernet LAN interface

18.2.3 Built-in battery

OR10/ OR35/ TW OR36 / TW OR38: Models have a built-in battery.

OR10 can be operated by battery for 4hours

OR35 can be operated by battery for 3 hours.

TW OR36 / TW OR38 can be operated by battery for 2 hours.

04 operate with battery PC.

18.2.4 External battery



We provide a compact and lightweight external battery that can be installed on all models.

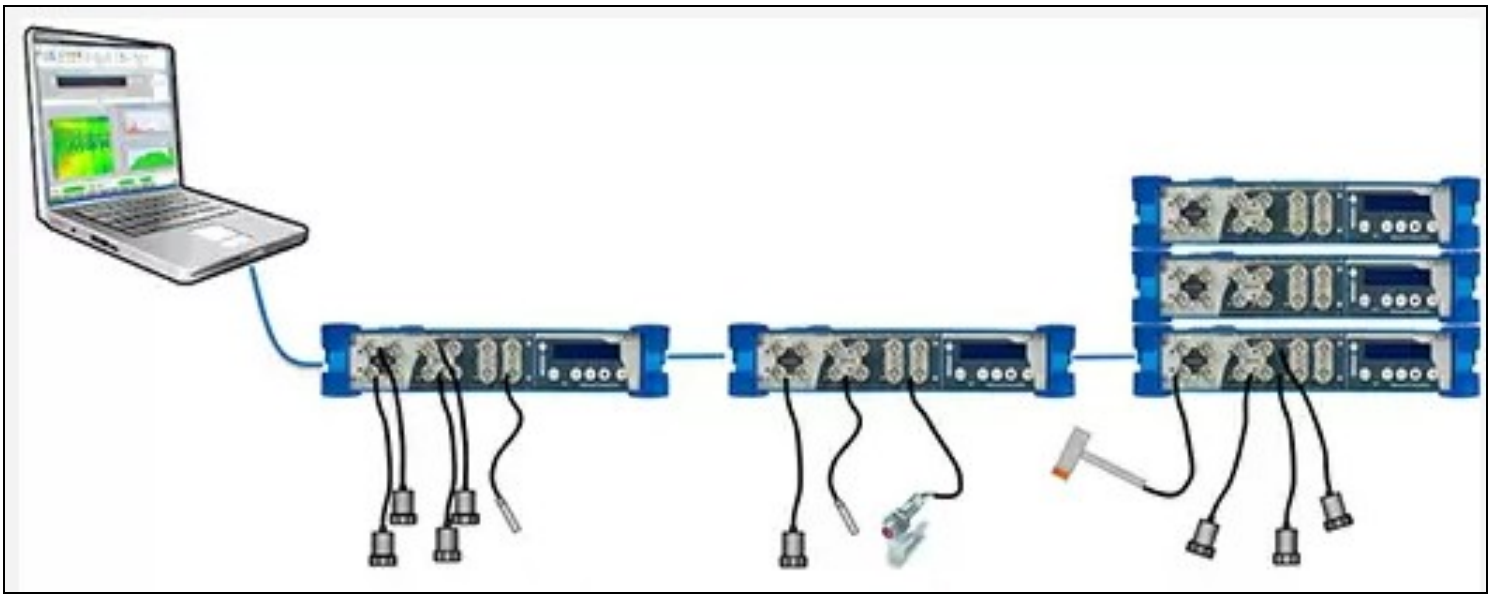
Can be used for up to 8 hours with one external battery.

Can be stored in a "PC integrated carrying case".

18.2.5 Synchronous Measurement Of Up To 1000 Channels is Possible by Combining Multiple Analyzers

(TW OR35 / TW OR36 / TW OR38 only)

High-precision synchronous measurements (0.2 ° @ 20kHz) are possible by simply connecting each analyzer using a general-purpose LAN cable. Function measurements can be taken with the hammer connected to the third unit in the chain and the accelerometers connected to each unit. Tracking analysis can be completed with the accelerometers connected to each unit while using a tachometer connected to the second unit in the chain.



18.2.6 Measure From Sound / Vibration and Strain Gauge / Temperature

(OR35 / TW OR36 / TW OR38 only)



By mounting a strain gauge conditioner and thermocouple conditioner on the Oros FFT analyzer, it is possible to measure strain and temperature data in addition to sound and vibration data.

Thermocouple amplifier: Supports types J, K, T, N, E (with temperature compensation)

18.2.7 CAN-bus Module Available



(OR10/ TW OR35 / TW OR36 / TW OR38 only)

By using the CAN-bus module, tracking analysis can be performed using information such as the engine speed flowing from the CAN-bus. By using this function, tracking analysis can be performed without using a tachometer.

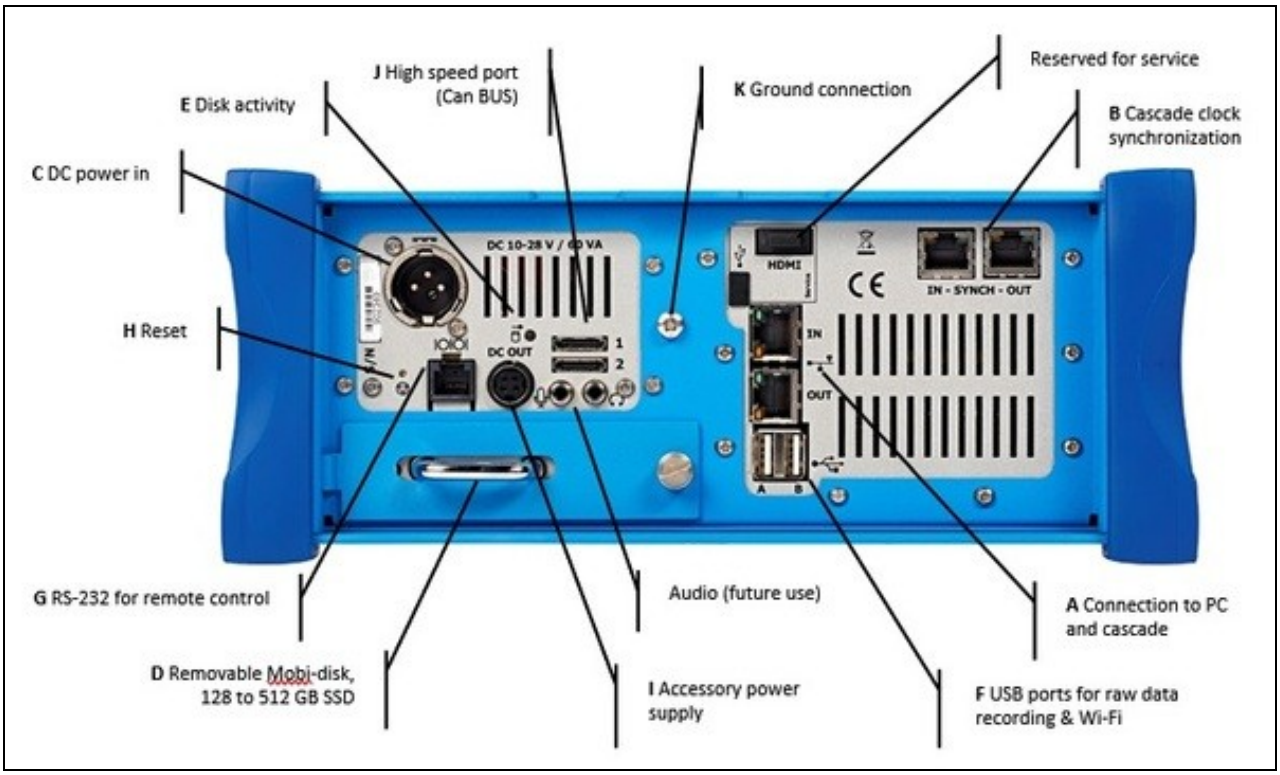
18.2.8 Recording is possible without the use of a PC by using the FFT analyzer in stand alone mode

(OR35 / TW OR36 / TW OR38 only)



The FFT analyzer is equipped with a record-only button. Simply select a predefined measurement setup and press the record button to record onto the FFT analyzer alone without the use of a PC.

In addition, the back of the Fast Fourier Transform Spectrum Analyzer Multipurpose is equipped with an audio terminal and power supply. It is possible to record audio data while also measuring the time signal. The analyzer also can supply power to required sensors, such as proximity probes, tachometers and DC sensors.



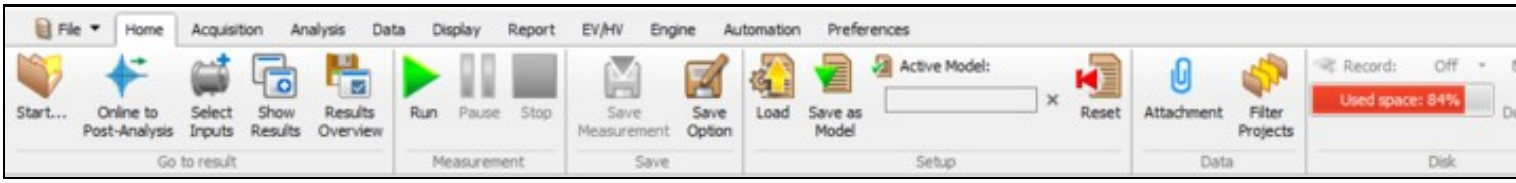
18.3 Software Introduction

- Easy-to-use interface
- Real-time measurement / post-analysis can be performed with the same software platform (NVGate)
- One-click report creation function

18.3.1 Start the Measurement Quickly and Easily

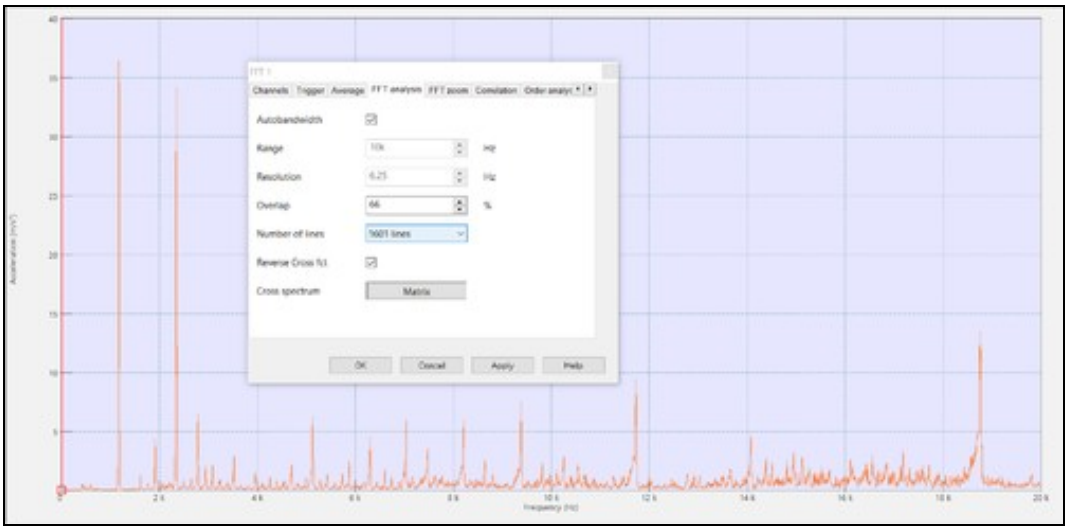
You can start measuring immediately by using the quick function provided in the OROS FFT analyzer mult function. This is completed by defining the number of input channels in the channel field and the measurement/analysis content in the show results area.

The Oros series FFT spectrum analyzer multifunction uses an interface similar to the ribbon interface used by Microsoft Office. All menus are accessible via the ribbon interface, making it easy to change measurement settings.



18.3.2 One-click Setting Function

With the Oros series multi-purpose FFT analyzer, you can display related measurement condition settings by double-clicking on the measurement screen. For example, if you double-click on the FFT analysis screen, the dialog for setting the measurement conditions for FFT analysis will be displayed on the screen as shown below.



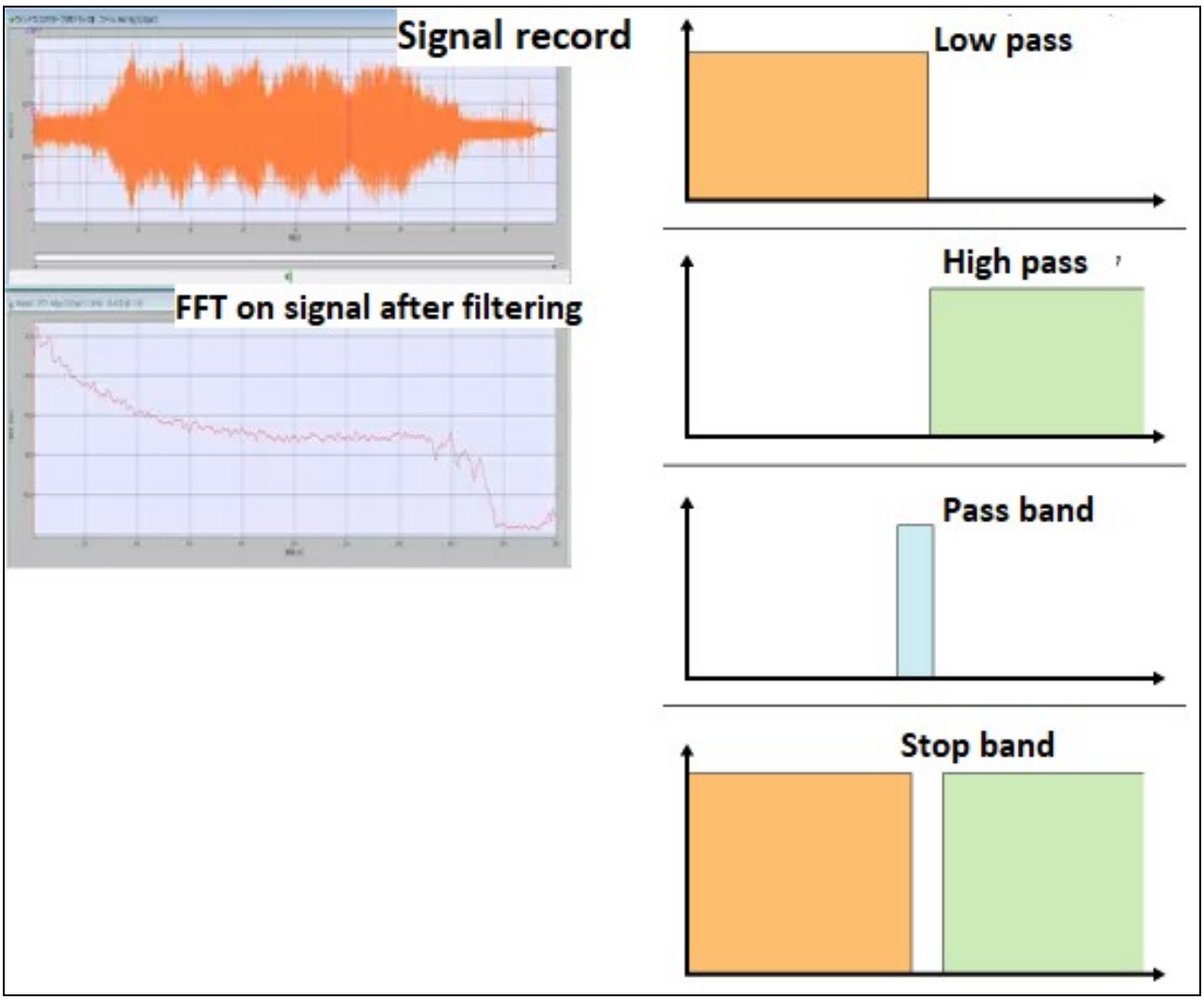
18.3.3 Control Panel

In addition, the OROS FFT spectrum analyzer is equipped with a control panel function that allows users to save frequently used measurement settings for quick access. By using this function, all settings can be changed on the control panel. For example, the following is the setting screen for a hammer test. By saving the input settings, threshold settings, and FFT analysis settings to the control panel as shown below, it is possible to make all the necessary settings quickly by only using the control panel.

Software FFT settings

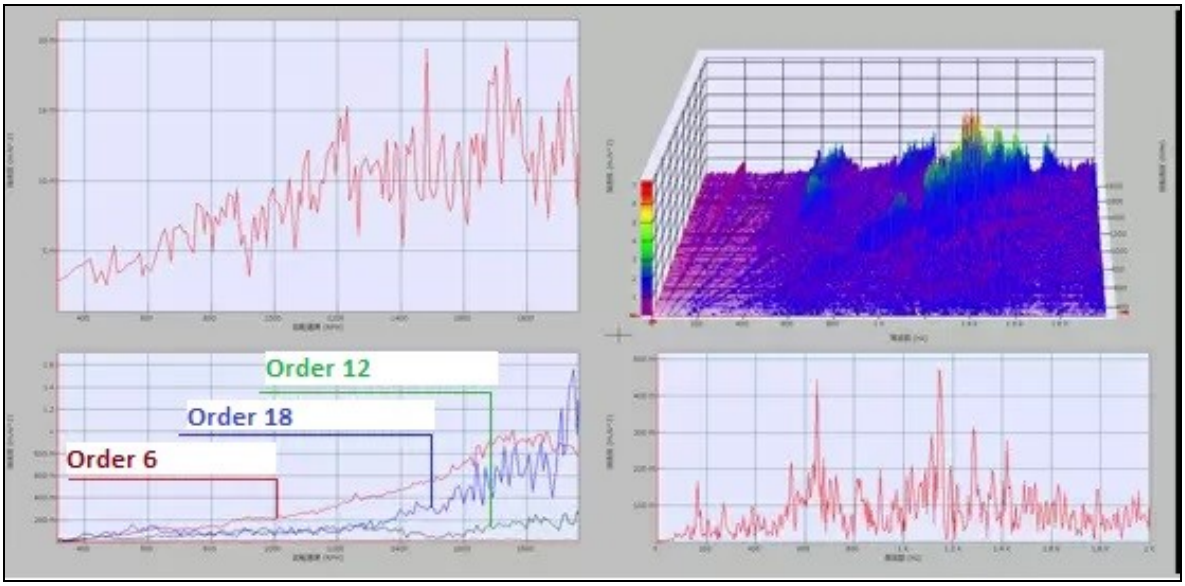
18.3.4 Various filters can be applied to recorded signals & FFT analysis results

Four types of filters: Low-pass filter, high-pass filter, band-bus filter, and band-stop filter, can be applied to the results of recorded signal and FFT analysis. By using a filter, it is possible to remove abnormal noise components from the recorded signal and perform processing such as reproducing the extracted abnormal noise components.



18.3.5 Extract arbitrary order components from the color spectrum graph in real time

Any order component can be extracted in real time from the color spectrum graph.



Easy-to-read Layout

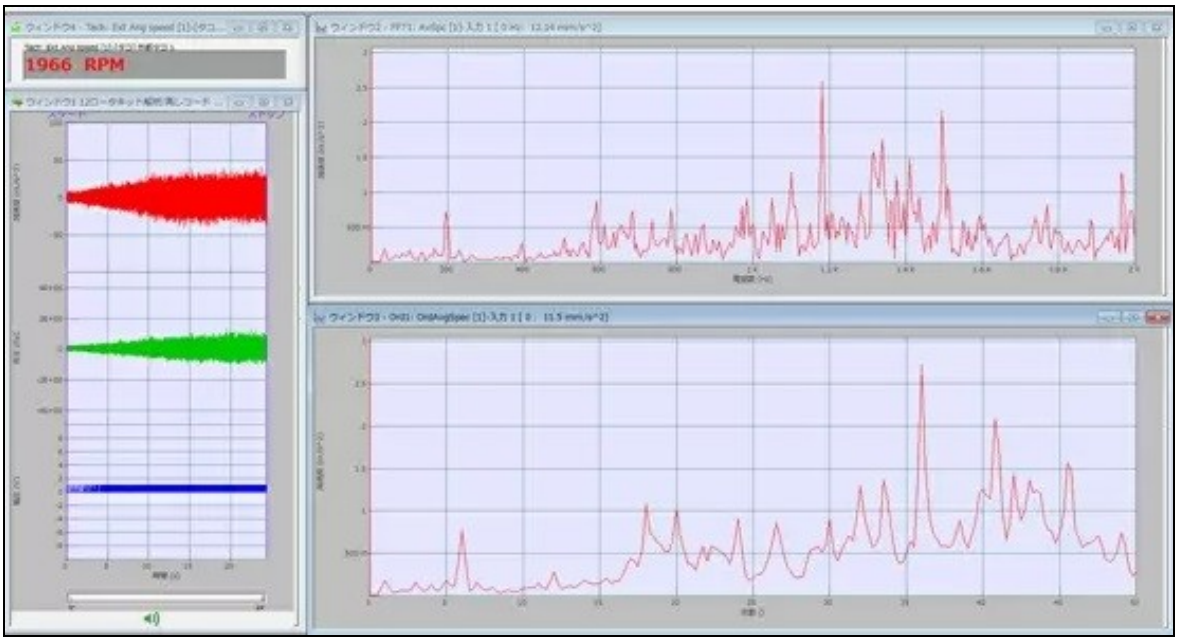
The area for arranging windows is called a layout. The OROS multi function FFT analyzer can create up to 16 layouts per project. You can easily arrange your windows by using the layout function. And your windows will open the same way each time.

It is possible to display up to 32 screens in one layout.

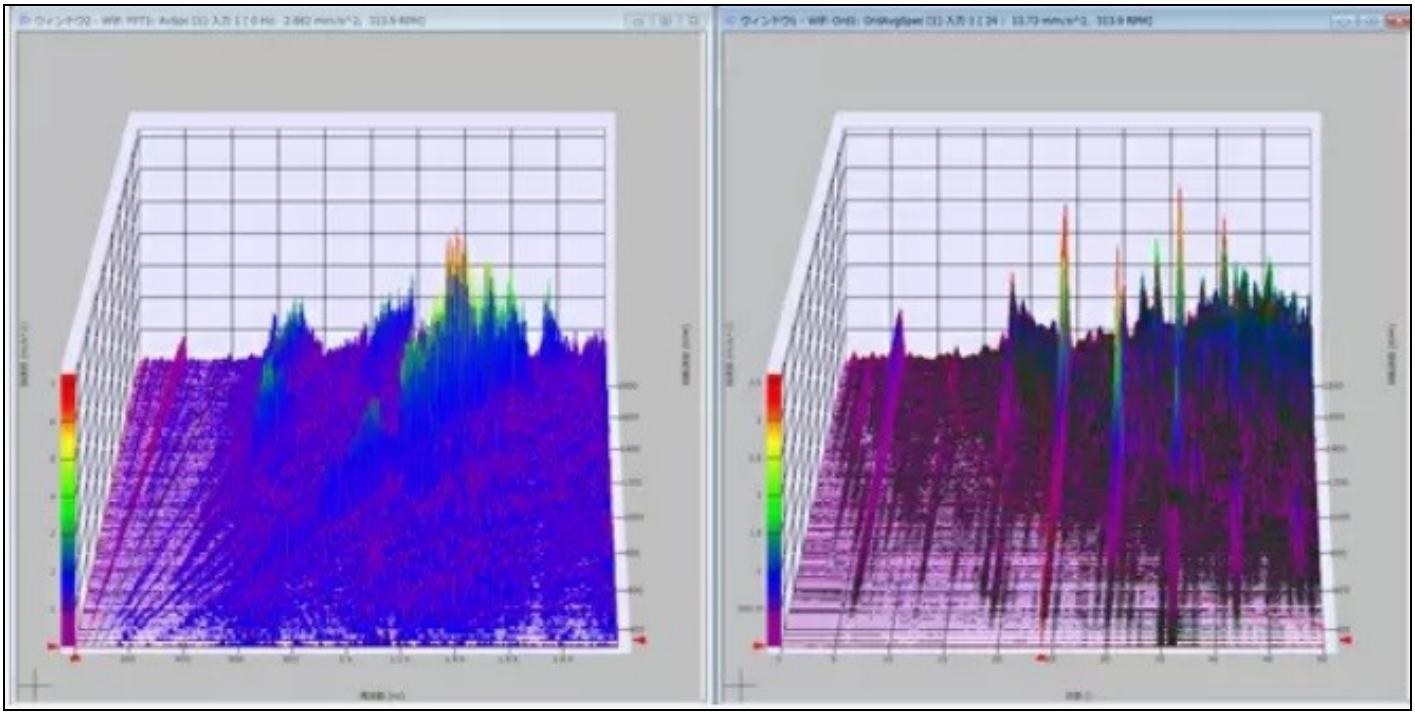
Up to 512 windows (= 16 x 32) can be displayed.

Layout utilization example:

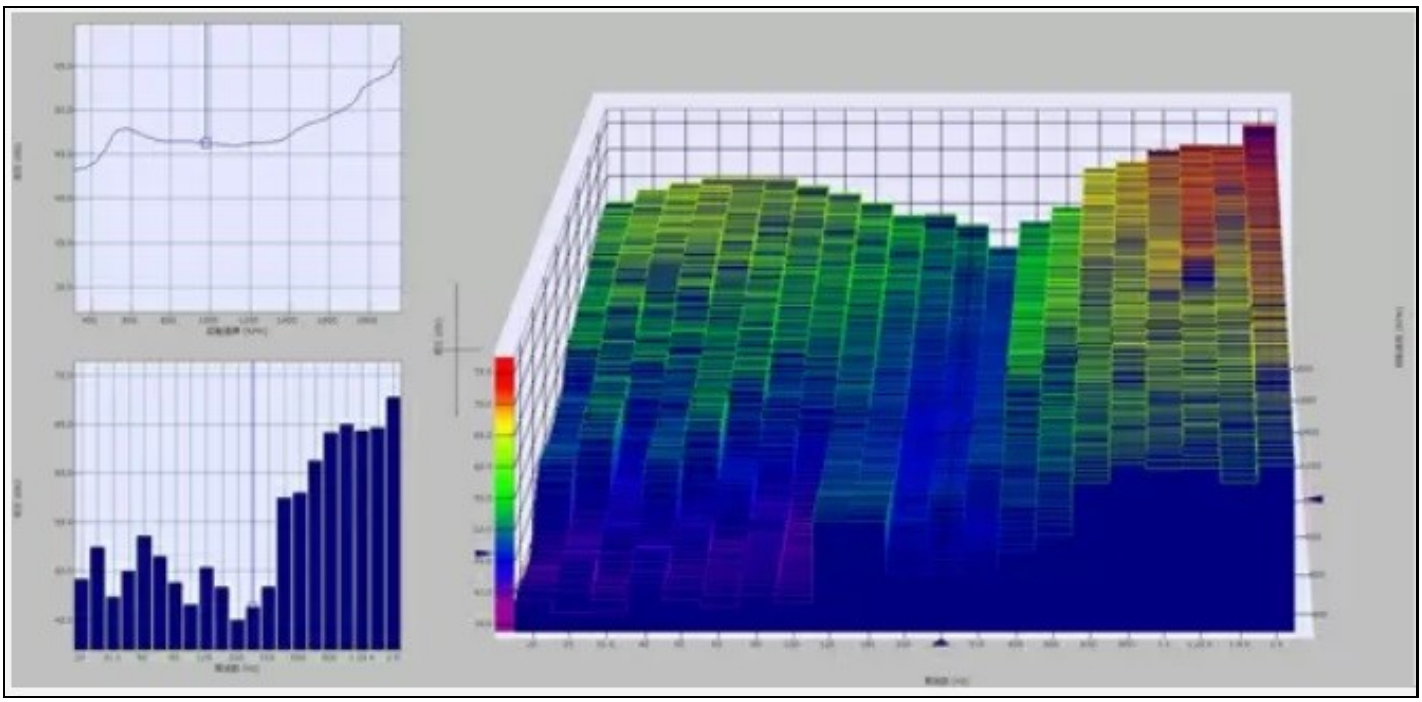
Layout 1: Record waveform, FFT analysis result, order ratio analysis result displayed



Layout 2: Display 3D frequency analysis results and 3D order ratio analysis results

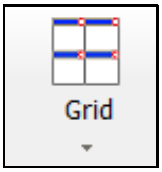


Layout 3: Display 3D **octave analyzer** analysis results

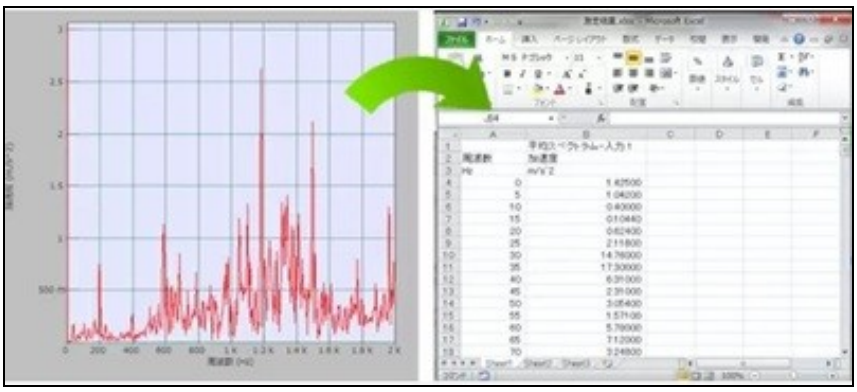


18.3.6 Easy operation <Graph layout selection button>

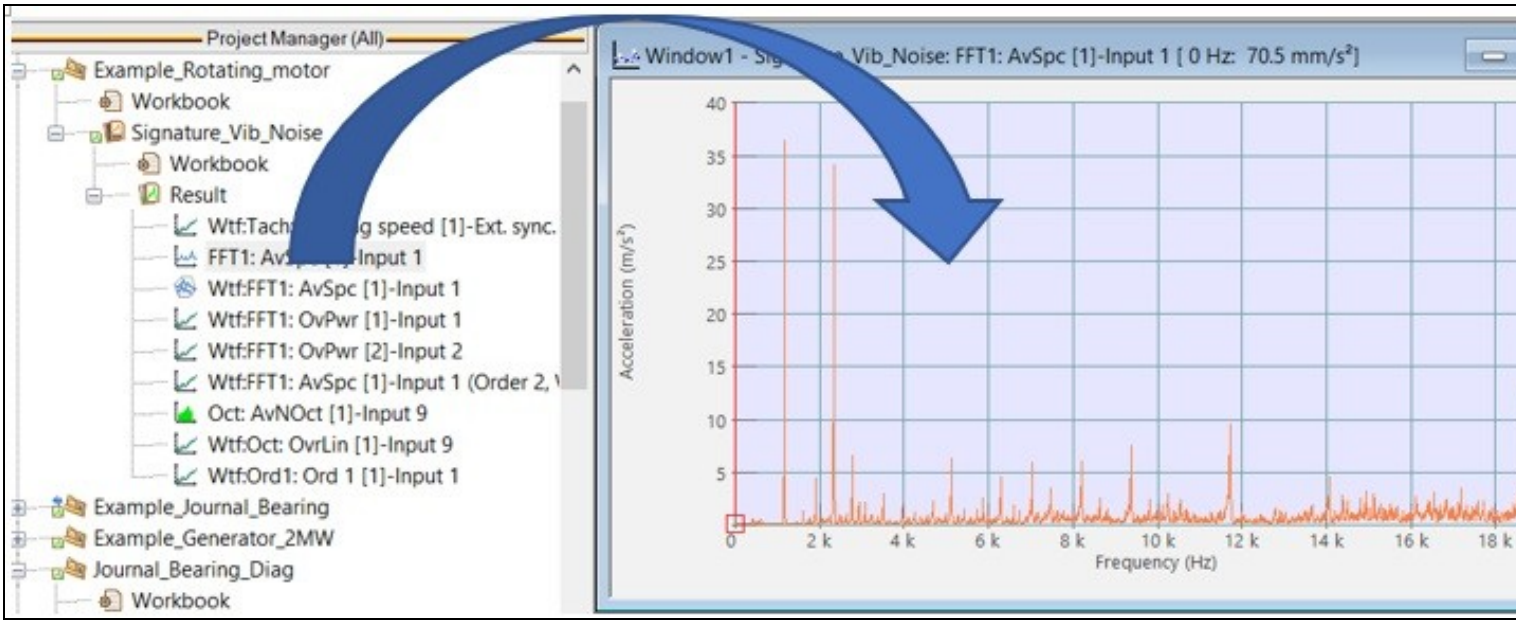
You can easily arrange windows just by selecting the grid menu.



Batch copy of measurement data with one menu. Numerical data can be transferred to Excel all at once.

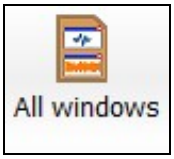


Data measured at different times can be overwritten by dragging which allows for easily comparing measurement data.



18.3.7 One-click report creation function

Simply click the report button located on the ribbon interface to create a report file containing the current measurement results.



? The content of the report is customizable. Customize it to the format that best suits your needs.



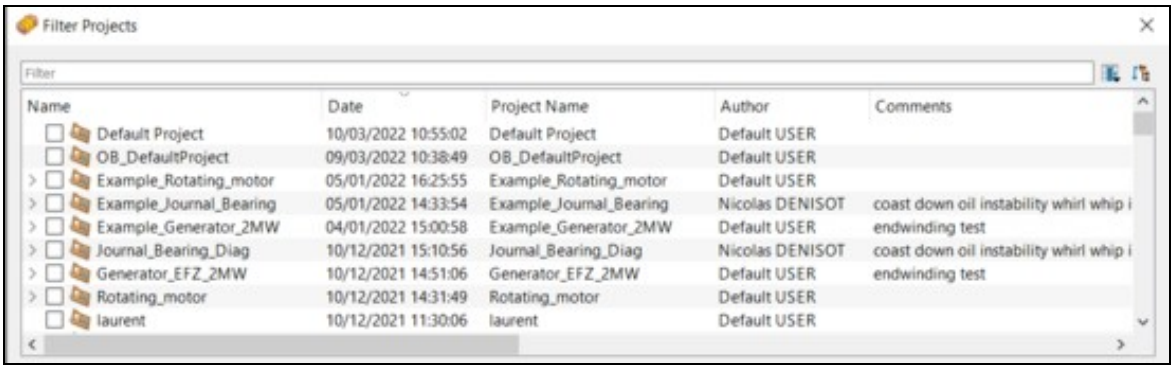
18.3.8 Measurement data search function



Various information (meta-data) can be added when saving measurement data. You then can search for measurement data and projects based on the added information.

Filter:

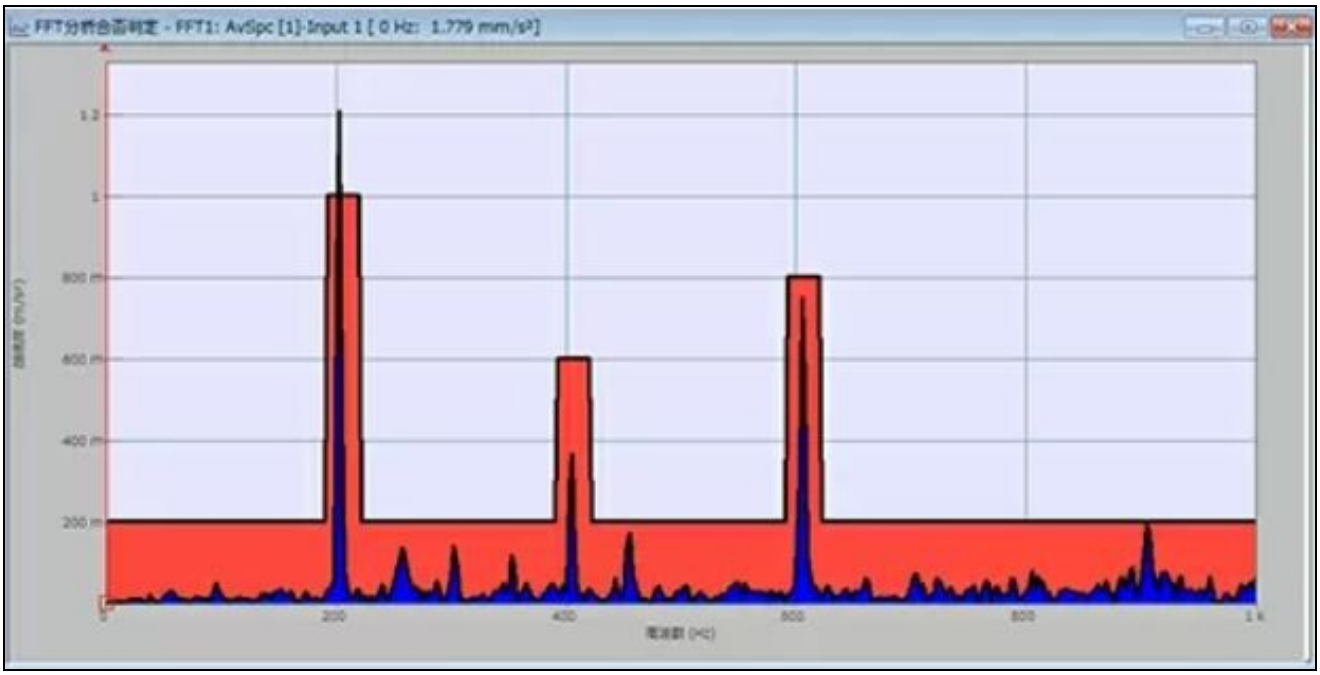
- Project name
- Measurement date and time
- Measurement conditions
- Measurement target
- Measurement site
- User



18.3.9 Fail judgment function as standard

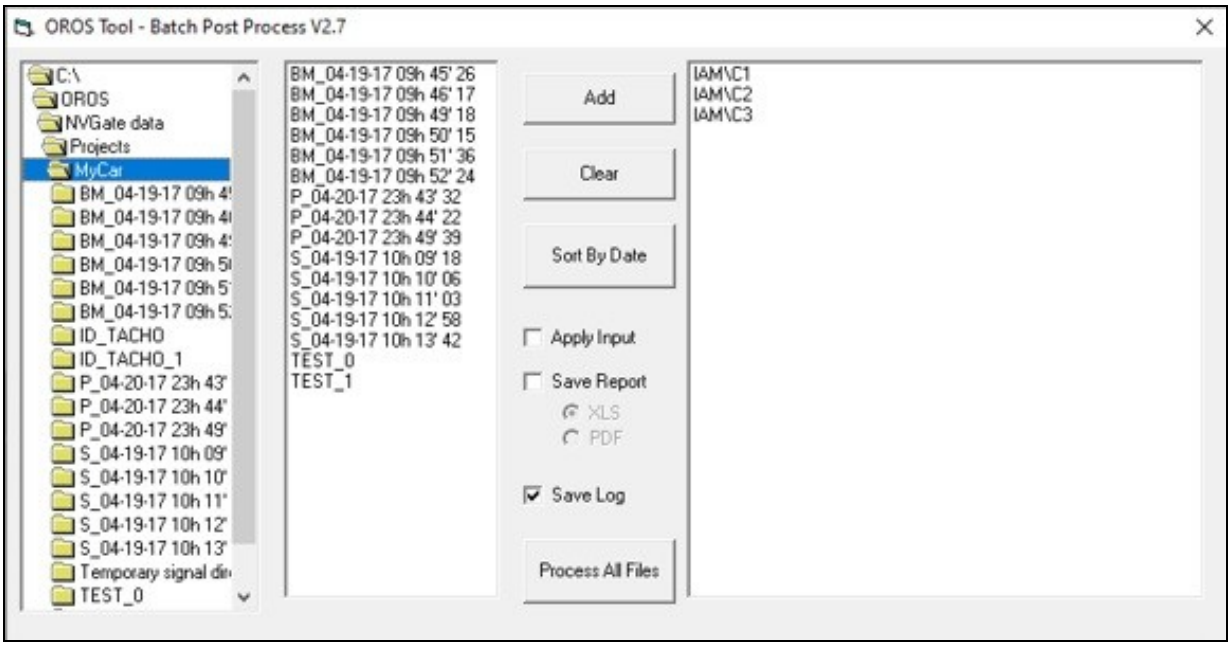
The pass / fail feature of NVGate can be performed automatically after setting the desired bounds.

In the example below, a dialog is displayed when the product fails, but it is also possible to output a contact signal instead of the dialog.



18.3.10 Automate post-analysis processing

The same processing can be continuously performed for record files measured multiple times. By using this function, it is possible to automate the generation of reports, and it is possible to generate the same number of post-analysis results and EXCEL-based reports as record files with one click. Processing that used to take more than a week can now be done in a few hours.



18.4 specification

18.4.1 Main specifications

	O4	OR35	OR36	OR38
	Dynamical Input channel			
Number of analysis channels	2, 4	6, 10 (Select Analysis or tachometer on 2 channels)	4, 8, 12, 16	8, 16, 24, 32
Terminal shape	BNC			
Input coupling and sensor support	Compatible with AC, DC / ICP (sensor with built-in amplifier) ??and TEDS			
Cutoff frequency	- 3dB at AC cutoff frequency 0.35Hz			
Input voltage range	+/- 100mV to +/- 40V (auto range function)			
Maximum voltage	60V			
Anti-Aliasing filter	400dB / OCT			
Input impedance	1M? <100pF			
A / D converter	24-bit			
Dynamic range	>140dB			
Channels-to-channels phase accuracy	± 0.02 ° (10V, 20kHz range)			
Input filter	Acoustic A, C, Z, low pass, high pass, band pass, integrator, differentiator, time axis integration function			
Sampling frequency of the signal	Select from 13 ranges between 102.4kHz and 2.048kHz.			
	Tachometer channel (Ext synch channels)			
Number of input channels	2 channels		2 channels (up to 6	

	O4	OR35	OR36	OR38
			channels as an option)	
Sampling frequency	6.4MHz (counter method)			
Voltage range	+/- 300mV 40V			
	DC input			
number of input channels	none	Analysis channel can be switched and used		
Voltage range	none	22 bits, ± 40V, offset DC 100?V or less		
Sampling frequency	none	15Hz or 12.5Hz		
	Calibration function			
Calibration method	Automatic sensitivity calculation by numerical input or reference signal (for position and standard vibration oscillatory meter)			
How to use at the time of measurement	Select by registered sensor name such as model name and machine number			
	Trigger function			
Trigger type	Edge, period, ? RPM, ? level, manual, multi (A or B, A and B, A after B)			
Trigger delay	Pre- and post-trigger functions			
Trigger signal	Select from any input channel			
	Record function			
Sampling frequency	13 ranges from 102.4kHz to 2.048kHz possible to select 2 types of range together			
A / D converter resolution	24-bit or 16-bit			
Hard drive size	PC hard drive	64 GB SSD	128 GB removable SSD hard drive (256GB or 512 GB optional)	
	FFT analysis performance			
Analysis frequency range	0.8Hz-100kHz	0.8Hz-40kHz		
FFT block size	256, 512, 1024, 2048, 4096, 8192, 1638			
Number of analysis lines	101, 201, 401, 801, 1601, 3201, 6401			
Zoom analysis	2 to 128 times (all channels at the same time)			
Overlap setting	0-99.99%			
Window function	Flat Top, Hanning, Humming, Kaiser Vessel, Rectangular, Force / Response			
Average mode	Time, frequency, fdsa / linear, exponential, peak hold			
	Analysis / display function			
Time series	Real-time waveform, record waveform, DC, Max, Min, RMS			
FFT analysis	Linear power spectrum, average spectrum, PSD, cross spectrum, transfer function (H1, H2), copying function			
Display color	Display color: Arbitrary specification of trace, cursor, background, and grid display colors			
	Options:			
	Time domain analysis (ORNV-TDA)			
Analysis items	Monitor display for arbitrary time (msec to day), effective value for arbitrary section, Min, Max, Peak, Peak / Peak, RMS, DC, crest factor, Skew, Kurtosis			
	1/n octave analysis (ORNV-OCT)			
method	Digital filter operation on time domain			
Analysis band	1/1, 1/3, 1/12, 1/24 octave (IEC1260: 1995 Class 1, ANSI S1.11-1986)			
Analysis frequency	Simultaneous analysis of all channels at 20kHz is possible (DSP option may be required)			
Average	Fast, Slow, Impulse, LEQ, constantBT, linear repeat,exponential			
	Multi-sound level meter [ORNV-OVA]			
Operation method	Time series signal digital operation			

	O4	OR35	OR36	OR38
Acoustic weighting	Linear, A, C			
Measurement	Leq, Fast, Slow, Impulse, average, Peak, Max, Min			
Average	Fast, Slow, Impulse, LEQ, constantBT, linear repeat,exponential			
	Synchronous Order tracking analysis [ORNV-ORD]			
Analysis function	Instantaneous and average spectrum,phase, order profile and overall.			
Maximum rotation speed	1,200,000 RPM			
Max analysis ordersetting	6.25, 12.5, 25, 50, 100, 200, 400			
Number of analysis lines	25-800			
Analysis bandwidth	resampling method and fixed sampling method			
display	Simultaneous display of 3D display and tracking order, simultaneous display of time signal			
	Rotational torsion analysis [ORNV-IVC]			
Operation method	Digital Frequency Voltage converter			
Number of analysis channels	2ch		2ch (up to 6ch as an option)	
	Rotation diagnosis function [ORNV-FFTDiag]			
Analysis items	Envelope analysis, cepstrum, self-cross function, MAX, MIN, peak detection from block data, simulated tach,			
	Output Channel			
Number of output channels	1ch (lemo conector, include)	2ch	2ch (up to 6ch as an option)	
Output waveform	Sinus, step sinus, sweep sinus, chirp, multi-sinus, random (pink and white), DC voltage, record signal	Sinus, step sinus, sweep sinus, chirp, multi-sinus, random (pink and white), DC voltage, record signal		
Digital / Analogic converter	24 bits	24 bits		
Output voltage	+/- 10V	+/- 10V		
Output Impedance	50 ?	50 ?		
Frequency range	~ 100kHz	~ 40kHz		
Sweep mode	Sweep and step, analyze, trigger and sync, linear and log	Sweep and step, analyze, trigger and sync, linear and log		
Synchronization with the analysis	Synchronization and free run	Synchronization and free run		
Output protection	Stabilization with time specification and forced stop button	Stabilization with time specification and forced stop button		
	Data			
Image and print	Image, printing for Windows and user template creation function for Word and Excel			
File	TXT, UFF, MATLAB, WAV (OROS and Audio) SDF, binary, ATFX (optional)			
Data entry	WAV, TXT, UFF and OR20 series AE2			
	Dimensions / weight			
Dimensions (width x height x depth mm)	35 x 110 x 185	56 × 246 × 222	102 x 260 x 311	102 x 364 x 311
Weight	0.5kg	2.8kg	5.2 kg	8.2 kg
	Power supply			
AC	AC 100V-240V			
DC	USB 3.0 type C 5V	10V-28V, 20VA	10V-28V, 60VA	10V-28V, 100VA
DC battery internal operating time (built-in)	NA : using PC battery	3h	2h	2h
Recommended operating temperature range	0 ? ? 40 ?	0 ? ? 50 ?		
cooling fan	Fan less			

	O4	OR35	OR36	OR38
		Automatic control by built-in temperature sensor, forced stop possible (however, forced ON when the temperature rises above 50 ° C)		

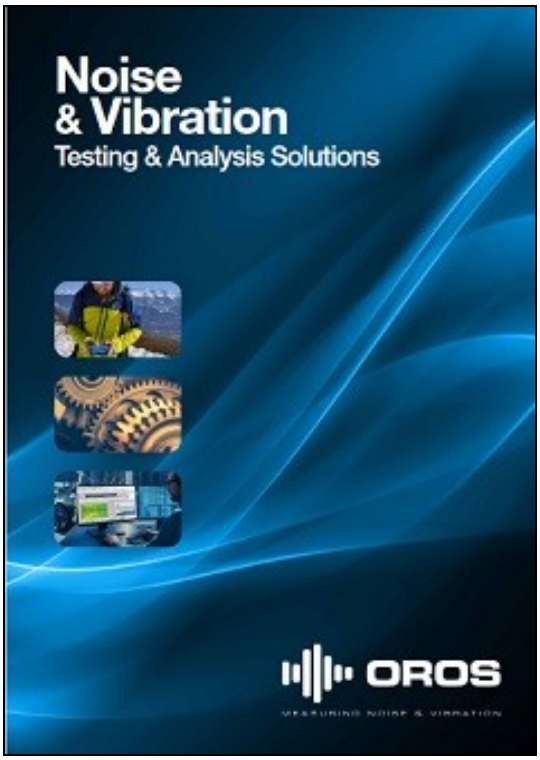
18.4.2 PC requirement

Connections	Type: **Ethernet**, Connector: **RJ45**
Operating systems	Windows 7 / **Windows 10** / **Windows 11**
Recommended	**CPU : Quad core processor** (Desktop : Intel Core i3 or Ryzen 3, Laptop : Intel Core i5 or Ryzen 5) **RAM : 6 GB** **Storage : SSD**, 1 GB free + storage for signals

18.5 Function

-  Sound Level Meter
   Waterfall analysis (three-dimensional display)
   Signal record and post analysis
   Resonance frequency by impact hammer
   Vibration on rotordynamics (orbit,...)
   Modal Analysis
   Sound Power
-  Frequency analysis, spectrum analysis
   Noise / acoustic analysis
   Time series analysis (data logger)
   Vibration of rotating machines
   Customization (ex: automatic measurement)
   Sound Quality
   Monitoring

18.5.1 Catalog download



Download

18.5.2 Applications/ Case study

Main application and commonly used functions:

FFT analyzers are used in research and development, quality control, inspection, service departments, etc.

Improvements in vehicle quietness, ride quality, comfort, maneuverability, etc.



- Frequency analysis
- 1 / N octave analysis
- Resonance frequency measurement by vibration
- Experimental mode analysis

Responding to quality problems caused by vibration and noise of vehicles and rotating equipment



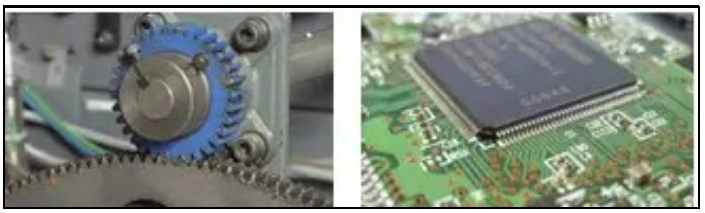
- Overall measurement
- Frequency analysis
- Turbomachinery Analysis
- Rotation order ratio / RPM tracking analysis
- Rotational torsional vibration analysis
- Resonance frequency measurement by vibration

Environmental problems caused by noise from construction machinery, office machines, home appliances, etc.



- Overall measurement
- Frequency analysis
- 1/N octave analysis

Problems with processing accuracy due to minute vibrations in microscopes, machine tools, semiconductor manufacturing equipment, etc.



- Frequency analysis
- Resonance frequency measurement by vibration
- Experimental modal analysis

A collection of application examples using the OROS FFT analyzer OROS series

Introducing solution examples that can be provided by various functions unique to OROS FFT analyzers.

- **Vibration measurement of cutting machine**



Introducing what approach can be taken using the OROS FFT Analyzer to identify mechanical resonance problems due to changes in cutting conditions.
Download on my.oros.com (need register)

- **Monitoring of wind power generation equipment and abnormality diagnosis**



Measuring vibration noise generated from rotating machines (gearboxes, generators, etc.) in wind power generation equipment is indispensable for equipment maintenance and longevity. In addition to the real-time analysis capability of rotating machinery, which is the strength of the OROS FFT analyzer, remote control / monitoring and stand-alone functions can be used to more efficiently diagnose equipment for wind power generation equipment.
Download on my.oros.com (need to register)

- **Diesel engine camshaft rotational twist measurement**

Diesel engine camshaft rotational twist
In the prototype of a small diesel engine, there is a problem that the rotational torsional vibration of the timing belt and the camshaft resonates, causing a large vibration. By measuring rotational fluctuations and rotational twists with high accuracy using the six tachometer channels mounted on the OROS FFT analyzer, it is clarified which rotational order is dominant for vibration.

Download on my.oros.com (need register)

- **Much more Application note on my.oros.com**



Allen Gears: gear box rotating vibration

- In flight helicopter vibration measurement.PNG

Conrad: On helicopter vibration measurement

- 

Mecalac: Sound power acoustic measurement

- 

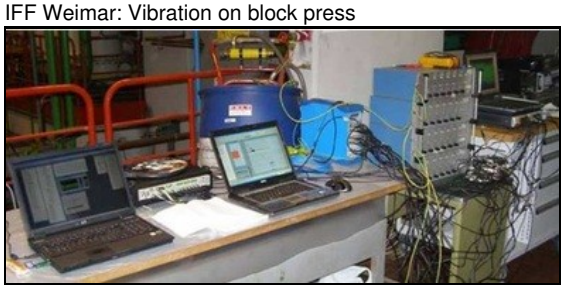
Porsche: acoustic sound quality measurement

- 

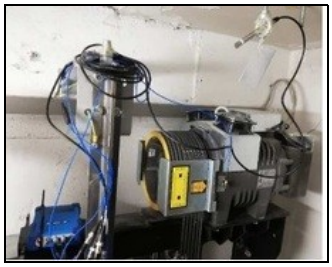
Bosch: Sound power acoustic measurement on anechoic chamber

- 

IFF Weimar: Vibration on block press

- 

Blade vibration

- 

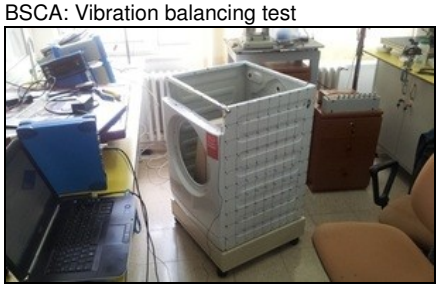
Sicor: Elevator motor vibration

- 

dBVib: On site measurement on turbomachinery

- 

BSCA: Vibration balancing test

- 

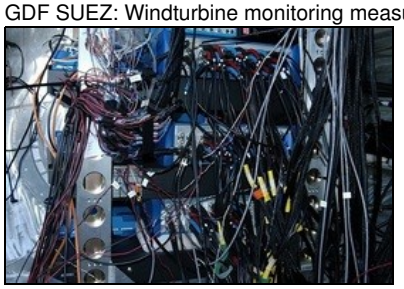
Washing machine FRF resonance frequency test

- 

Vibration measurement

- 

GDF SUEZ: Windturbine monitoring measurement

- 

3 analyzers working together

- 

Alstom: Measurement on turbine

Some references:



18.5.3 Full technical support

- **Hotline dedicated**



Responsiveness is the key to offer the best level of services. OROS relies on a powerful network of subsidiaries, offices, resellers, maintenance centers and qualified partners. They are the first steps of efficiency.

Tel: +33.4.76.90.52.40
Email: customer.care@oros.com

Your local distributor

- **User training course**

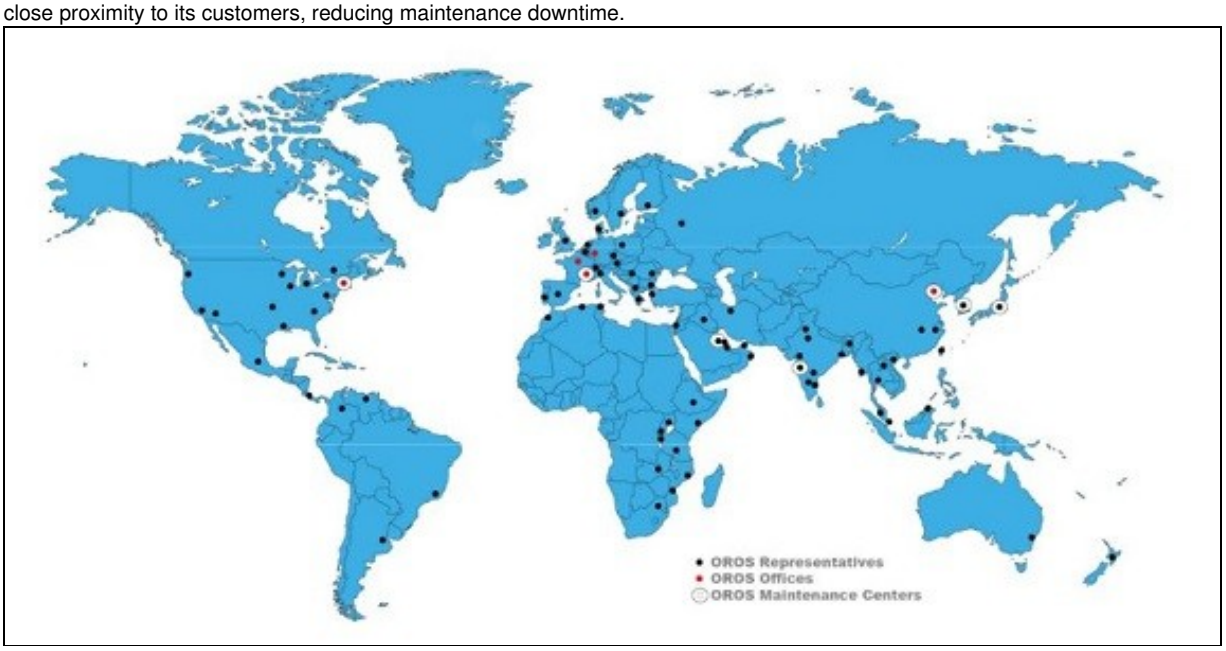
OROS proposes training specially dedicated to customers every year for free (depending on countries). This is an opportunity to take advantage of your analyzer system capabilities, to get premium information on OROS range evolution, to discuss with your peers, and for OROS, to listen to your product

enhancement desires.



- **Worldwide presence and accredited maintenance center**

With a worldwide coverage of distributor network and maintenance center (China, Europe, India, Japan, Saudi Arabia, South Korea, USA), OROS is in close proximity to its customers, reducing maintenance downtime.



Find Your local distributor



Technicians are certi?ed on a regular basis by OROS specialists, enabling them to repair, calibrate and upgrade all OROS systems.

- **Premium contract**

1, 2 or 4 years renewable contracts to extend your warranty.

- Access to the latest software version.
- Full coverage on your instrument (calibration and maintenance)
- Guaranteed turn around time (4 days) for hardware repairs and calibration

- Privileged access to extended services at a preferential rate: urgent loan within 1 day.

18.5.4 Video content

We have released videos such as product introductions and demonstrations.

Click here for the youtube video content page

Schedule a demo Get a quotation Contact support

19 Hardware battery

Let's find general information and FAQ about battery information.

Disclaimer: this page could be not up to date. Be aware than regulation about battery and transportation are quite complex and can change over time. Please follow the regulation of your country and your carrier for up to date information.

20 MSDS

20.1 OR35V1 - OR36 V1 V2 TW and OR38 V1

Nimh battery.

Manufacturer FORCEE : MSDS OR35V1 - OR36 V1 V2 TW and OR38 V1

For OROS analyzer, Forcee use niMH panasonic cells iniside their battery, so here the MSDS from panasonic (You can use this MSDS as an alternative of Forcee one: Panasonic cells inside OROS forcee battery

20.2 OR38 TW

NiMh Battery

Manufacturer GPMSDS OR38TW

The battery is made by: 15 cells of : NIMH 1.2 V / 3800 mAh - Réf: GP380LAHV

20.3 OR38V2

Nimh battery.

Manufacturer can be GP or Forsee. Ask oros with your analyzer serial number, if you need to know the manufacturer.

Manufacturer GP: MSDS GP

Manufacturer FORSEE: MSDS Forsee

20.4 OR35TW

Lithium ion battery.

MSDS Lithium ions OR35 TW battery

20.5 OR10

Lithium ions battery.

OR10 - IEC62133 conformity test

20.6 OR34

Nimh Battery.

OR34 MSDS 2020

20.7 External battery power gorilla

Technical documentation

21 Cargo transport

21.1 Nimh battery -OR34V1 - OR35V1 - OR36 and OR38 : V1,V2 , TW

No Restriction , nothing to declare.

21.2 Lithium ion battery OR35TW and OR10

It is Forbiden to transport a battery alone. The battery need to be inside the analyzer.

UPS FEDEX TNT : OK

DHL : you can can have some issue for lithium ion battety, we advice to avoid DHL for this.

Contact your carrier to inform him. Genreally speaking, on the shipping document you can thick a box and say you have lithium ion battery INSIDE the material.

Then you need to download this 2 documents below and put it on parcel. doc 1 and doc 2

22 Traveling by airplane

22.1 Lithium ion battery : OR35TW and OR10

Forbiden in ?check it in?

Ok in hand luggage.

22.2 Nimh batterie : OR34V1 - OR35V1 - OR36 and OR38 : V1,V2 , TW

OK to check it in.

OK in hand luggage.

23 Certificate

Ask us: customer.care@oros.com

24 Hardware Specification OR34

24.1 General description

The following specifications concern the OR34 analyzer. OR34 consists of a 3-Series hardware containing optional inputs and processing modules, a PC with an Ethernet interface and NVGate® software with optional plug-in analyzers.

24.1.1 Modules

The following tables detail the complete performances of OR34 hardware. Optional or standard modules may fill the described slots.

Front-end	Dynamic analog inputs	2 slots of 2 inputs (BNC)
	Dynamic analog outputs	1 output (BNC)
	Externals sync	2 trigger/tachometer inputs (BNC)
Processors	Trigger / tachometer / monitoring	1 DSP
	PC communication / recording	1 DSP
	Computation power	1 DSP
Miscellaneous	Remote control	1 with RS232 cable connection (RJ11)

24.2 Case

24.2.1 Mechanicals

Weight	**1.4 kg** (3 lb)	
Dimensions	Case (w.h.d)	**45 mm x 205 mm x 154 mm** (1.8 in x 8.1 in x 8.8 in)
	Overall (w.h.d)	**54 mm x 215 mm x 163 mm** (2.1 in x 8.4 in. x 6.4 in)

24.2.2 Power supply

Power	**< 15 VA**	
External AC Power supply	Voltage	**100 to 240 VAC**
	Frequency	**47 to 63 Hz**
DC	Range	0 V to 28 V
	Overload protection	**31 V** (over this voltage DC poles are short-circuited)
UPS (Uninterrupt-ible Power Supply)	Type	**Internal NiMh battery** (No memory effect)
	Protection against power supply loss or failure	**15 min.**

24.3 Environmental / Compliance with standards

CE\CB\FCC	Indicates compliance with EMC Directive **89/336/EEC**, **2014/30/EU** and Low Voltage Directive **73/23/EEC**,**2014/35/EU**	
Safety	**IEC 61010-1**	Safety requirements for electrical equipment for measurement, control and laboratory use.
	IEC 61010-2-30	Particular requirements for testing and measuring circuits.
	Over-voltage Cat.	**II** (Local level mains, appliance, and portable equipment)
EMC Emission	**IEC 61000-6-3**	Emission standard for residential, commercial and light-industrial environments.

	IEC 61000-6-4	Emission standard for industrial environments.
	IEC 61326-1	Electrical equipment for measurement control and laboratory use EMC requirements.
	CISPR 11	Radio disturbance characteristics of industrial and scientific equipment.: Class B limit.
	FCC Rules	Complies with the limits for a Class B digital device.
EMC Immunity	**IEC 61000-6-1**	Immunity standard for residential, commercial and light-industrial environments.
	IEC 61000-6-2	Immunity standard for industrial environments
	IEC 61326-1	Electrical equipment for measurement control and laboratory use EMC requirements.
	EN 50082-2	Generic immunity standard: Industrial environment.
EMF	**Recommendations 199/519/CE EN 62311**	Evaluation of person exposure to electromagnetic fields
Materials	**ROHS**	**2011/65/EU and 2015/863**
	WEEE	**2012/19/EU**

Temperature	Operating	**0°C to 50°C** (32°F to 122°F)
	Storage	**-20°C to 65°C** (-4°F to 149°F)
	Absolute maximum rating[ii]	**-35°C to 70°C** (-31°F to 158°F)
Humidity	Max	**93 %** RH at **40°C** non-condensing
Shock	Complies with **IEC 68-2-27**	
	Operating	**100 m/s²** (11 ms, ½ sine) and 700 **m/s²** (3 ms, ½ sine)
	Storage	**200 m/s² (**11 ms, ½ sine) and **1 000 m/s²** (3 ms, ½ sine)
	Absolute maximum rating[ii]	**1 000 m/s²** (3 ms, ½ sine)
Vibration	Complies with **IEC 68-2-6**	
	Operating	**20 m/s², 5-500 Hz, 5mm**
	Storage	**25 m/s², 5-500 Hz, 5mm**
	Absolute maximum rating[ii]	**30 m/s², 5-500 Hz, 5mm**
Bump	Complies with **IEC 68-2-29**	
	Storage	**1000 bumps** in each direction (6) at **400 m/s², 6 ms**
Enclosure	Type	**IP 40**

24.3.1 Radio frequencies sensibility

	Input measured with 50 ? terminator
Radiated RF: 80-1000 MHz, 80% AM 1 kHz, 10 V/m	< 20 µV
Conducted RF: 0.15-80 MHz, 80% AM 1 kHz, 10 V	< 100 µV
Magnetic field: 30 A/m, 50 Hz	< 2 µV

24.4 Front-end

24.4.1 Dynamic inputs

Sampling	Frequencies (Additional decimators allow analysis bandwidth down to 0.8 Hz)	**102.4 kHz, 65.536 kHz, 51.2 kHz, 37.768 kHz, 25.6 kHz, 16.384 kHz, 12.8 kHz, 8.192 kHz, 6.4 kHz, 5.12 kHz, 4.096 kHz, 3.2 kHz, 2.048 kHz**
	Converters	One **24 bit '***sigma-delta ADC'* for each input
	Frequency relative precision	0.5 10^{-4} (typical 1 10 ?5)
	Synchronization	All inputs synchronized on the same sampling clock
Anti-aliasing filter	Type	Over-sampled digital filters
	Slope	**> 400 dB/octave**
	Pass band ripple	**< 0.003 dB**
	Rejection of parasites bands	**> 110 dB (**@ frequency > 0.57 x FS)
	Effective bandwidth	**0.43 x FS** (ex: 23.2 kHz @ 51.2 kS/s)
Range (peak)	With amplifier (included)	**±17.5 mV, ±31.6 mV, ±60 mV, ±100 mV, ±175 mV, ±316 mV, ±600 mV, ±1 V, ±1.75 V, ±3.16 V, ±6 V**
	Direct	**±10 V**
Absolute accuracy	Resolution	**24 bits** (144 dB)
	All input ranges at 1 kHz	±**0.05 dB** (typical ±0.015 dB)
	Temperature variability	**< 0.1 dB** / **10°C**
DC offset	For ranges from **±**1 V to **±**10 V	**< ±0.15 %** of full scale
	For ranges below **±**1 V	**< ±1 mV**
Frequency flatness and phase response	Includes channel to channel match with different gains	
	10 V range, 0 to 20 kHz	**±0.02 dB** / **±0.02 °**
	10 V range, 20 to 40 kHz	**±0.05 dB** / **±0.05 °**
	175 mV to 6 V ranges, 0 to 20 kHz	**±0.02 dB** / **±0.1 °**
	175 mV to 6 V ranges, 20 to 40 kHz	**±0.10 dB** / **±0.5 °**
	17.5 mV to 100mV ranges, 0 to 10 kHz	**±0.05 dB** / **±0.3 °**
	17.5 mV to 100mV ranges, 10 to 20 kHz	**±0.1 dB** / **±1 °**
	17.5 mV to 100mV ranges, 20 to 40 kHz	**±0.4 dB** / **±3 °**
Cross-talk	Between N (N is odd) and N+1 inputs:	
	@ 1 kHz: **< -112 dB,** @ 20 kHz: **< -86 dB,** @ 40 kHz: **< -80 dB**	
	Between any inputs excluding: N (N is odd) and N+1 inputs:	
	@ 1 kHz: **< -122 dB,** @ 20 kHz: **< -96 dB,** @ 40 kHz: **< -90 dB**	
Signal to noise ratio	With 50 ? terminators:	

	10 V range, 40 kHz bandwidth: **> 100 dB**, spurious lines **< -115 dB** of full scale	
	10 V range, 20 kHz bandwidth: **> 104 dB**, spurious lines **< -125 dB** of full scale	
Input noise	With 50 ? terminators	
	Thermal input noise	**20 nV/VHz**
	17.5 mV range	20 kHz BW **< 3 µV rms**, 40 kHz BW: **< 4.2 µV rms**
	100 mV range	20 kHz BW **< 3 µV rms**, 40 kHz BW: **< 4.2 µV rms**
	1 V range	20 kHz BW **< 5.4 µV rms**, 40 kHz BW: **< 8.5 µV rms**
	10V range	20 kHz BW **< 44 µVrms**, 40 kHz BW: **< 70 µV rms**
Impedance		**1 M? ±1%, < 100 pF**
Coupling	**AC**	
	DC	
	ICP	**4 mA** power supply with AC coupling
	ICP + TEDS	ICP with reverse current for TEDS reading
	AC and DC float	Independent ground references for each input within the current input range
	GND	Shortcuts input poles to the ground
Protection	On any inputs[ii]	**±60 V** peak without damage
TEDS	Standards	IEEE 1451.4 2001 revision 1
	Templates	Accelerometer/Force meter (**25**) Microphones (**27**, **28** and **29**)
Dynamic	Spectral domain	**> 120 dB**

24.4.2 Dynamic outputs

Sampling	Converters	One **24 bits DAC** for each output
	Synchronization	Same sampling clock as the dynamic inputs
Range	Direct	±**10 V peak**
	With attenuator (included)	±**1 V peak**
	Clipping	**User selectable** in the output range
	Digital gain	**From 10^{-5}** to **10^{3}**
Absolute accuracy	Resolution	**24 bits** (144 dB)
	All output ranges at 1 kHz	±**0.05 dB**
	Temperature drift	**< 0.1 dB** / **10°C**
Frequency response	Variation relative to 0 dB at 1 kHz	
	All ranges, at 10 kHz	±**0.05 dB**

	All ranges, at 20 kHz	±**0.15 dB**
	All ranges, at 40 kHz	±**0.8 dB**
Noise floor level	10 V range, 20 kHz bandwidth	**110 dB** of full scale, spurious lines **-125 dB** of full scale
	10 V range, 40 kHz bandwidth	**105 dB** of full scale, spurious lines **-125 dB** of full scale
	1 V range, 20 kHz bandwidth	**99 dB** of full scale, spurious lines **-110 dB** of full scale
	1 V range, 40 kHz bandwidth	**94 dB** of full scale, spurious lines **-110 dB** of full scale
Impedance	Impedance	**50** ?
Current	Max	**±10 mA**
Protection	Sum of injected + generated voltages	±**15 V peak,** On any output[ii] Permanent short circuit supported
Total harmonic distortion	THD @ 1 kHz	**< 0.002%** or **-94 dB** at 20 kHz BW
	THD @ 5 kHz	**< 0.005%** or **-86 dB** at 20 kHz BW
Cross-talk	Output 0 dBV to 50 ? terminated input	Lower than measurable noise

24.4.3 External sync

Sampling	Frequencies	**64 times over-sampling** of the current input sampling (up to **6.4 MHz**)
	Converters	High speed voltage comparator and time counter
Range (peak)	Direct	±**300 mV**, ±**1 V**, ±**3 V**, ±**10 V**
threshold	Amplitude precision	±**1 %** of **range**
Setting	Hystersis	**1%** (of input range) to input range
	Hold off	**0 s** to **500 s**
	Slope	**Rise** or **fall**
	Hardwired pre-divider	From **1** to **255**
Time resolution		**> 160 ns** (0.06° at 1kHz and 1.2 ° at 20kHz)
Pulse rate	Max	**375k pulse/s**
Coupling	**AC**	Cut-off frequency 0.35 Hz ±10% (analog filter)
	DC	
Impedance		**1 M**?, < 100 pF
Protection	on any external sync[ii]	±**60 V peak** without damage

24.5 Digital computation

The following table details the optional DSP modules that can be added to OR34 hardware to fit analysis mode calculation needs.

24.5.1 SPUs

SPU (Signal Processing Units): the following table gives the characteristics of each analysis mode and the associated SPU consumption. For multi-analysis purpose, add the corresponding SPUs of each mode used simultaneously and increase the sum by 10%. "Real-time" means that the

analysis speed is faster than the input rate and does not miss any sample.

FFT	Real-time FFT analysis with;
	401 lines (for 801, 1601,3201, 6401 lines multiply requested SPU respectively by 1.25,1.5, 2, 3)
	20 kHz bandwidth (Requested SPU are proportional to bandwidth)
	0% overlap
	1 channel processing = **1 SPU**
1/n Octave	Real-time filter based 1/n octave analysis with:
	1/3rd octave resolution (for 1/12th and 1/24th octave multiply SPU respectively by 2 and 4)
	20 kHz bandwidth (Requested SPU are proportional to bandwidth)
	1 channel processing = **3 SPU**
Order analysis	Real-time order spectrum analysis (re-sampled time signal) with:
	Max order / order resolution = **800**
	Max RPM x Max order = **1 200 000** (requested SPU is proportional to max RPM)
	1 channel processing = **3 SPU**
Recorder	Gap free recording with:
	51.2 kHz sampling rate
	1 channel processing = **1 SPU**

24.5.2 Computation DSPs modules

Type	Sample size	**32 bit floating**
	Computation words	**32/40 bits**
	Memory	**4 MSamples**
Power	Computation capability	**12 SPU** / **DSP module**

24.5.3 Computation DSP module / OR34 unit

Minimum	**1** Computation DSP module	SPU
Maximum	**2** Computation DSP modules	SPU

24.6 Notes

The above specifications describe all the guaranteed capacities and performances of the instrument and are applicable to an OR34-4 hardware, powered for more than 15 minutes, at a stabilized room temperature of 23°C ±5°C and calibrated since less than one year.

The adapted control software NVGate® is described separately.

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[i] Prepared for future use: the related specifications or options are in development.

[ii] Exceeding absolute maximum ratings damages the system and voids guarantee.

25 Hardware Specification OR3X TW

25.1 General description

The following specifications concern $OR35_2$, $OR36_3$ & $OR38_3$ Teamwork instruments. These systems consist of OR3x hardware containing optional inputs and processing modules, a PC with an Ethernet interface, and NVGate® software with optional plug-in analyzers.

25.1.1 Modules

The following tables detail the complete capacity of $OR35_2$, $OR36_3$, & $OR38_3$ hardware system. Optional or standard modules may fill the described slots.

25.1.1.1 OR35

Front-end slots	Dynamic and/or parametric analog inputs	2 slots of 4 universal inputs (BNC)
	Dynamic analog outputs	1 slot of 2 outputs (BNC)
	Externals sync	1 slot of 2 trigger/tachometer inputs (BNC)
	Dynamic Inputs (+2)	1 slot of 2 dynamic inputs shared with Externals sync BNCs
Auxiliary slots	1 slot for: TEDS	
Processor slots	PC, Disk, Bus interfaces	1 slot
	Clock synchronization	1 slot
	Trigger / tachometer / monitoring	1 slot of 1 ForceDSP
	Real-time Processing power	2 slots of 1 ForceDSP
Miscellaneous	Internal hard drive	64 GB internal SSD
	High speed serial ports	1 port for CAN Bus probe
	Remote control (power control, NVTerm)	1 RS232 cable connection (RJ11)

25.1.1.2 OR36

Front-end slots	Dynamic and/or parametric analog inputs	4 slots of 4 universal inputs (BNC)
	Dynamic analog outputs	1 slot of 2 outputs (BNC)
	Externals sync	1 slot of 2 trigger/tachometer inputs (BNC)
	Auxiliary	2 slots of 2 inputs/outputs for optional outputs, Ext. sync or DC (parametric) inputs (BNC)
Auxiliary slots	1 slot for: TEDS	
Processor slots	PC, Disk, Bus interfaces	1 slot
	Clock synchronization	1 slot
	Trigger / tachometer / monitoring	1 slot of 1 ForceDSP
	Real-time Processing power	4 slots of 1 ForceDSP
Miscellaneous	Internal hard drive	128 to 256 GB removable SSD with USB 3.0 port

	High speed serial ports	2 ports for CAN Bus probe
	Remote control (power control, NVTerm)	1 RS232 cable connection (RJ11)

25.1.1.3 OR38

Front-end slots	Dynamic and/or parametric analog inputs	4 slots of 8 universal inputs (BNC)
	Dynamic analog outputs	1 slot of 2 outputs (BNC)
	Externals sync	1 slot of 2 trigger/tachometer inputs (BNC)
	Auxiliary	2 slots of 2 inputs/outputs for optional outputs or Ext. sync or DC (parametric) inputs (BNC)
Auxiliary slots	1 slot for: TEDS	
Processor slots	PC, Disk, Bus interfaces	1 slot
	Clock synchronization	1 slot
	Trigger / tachometer / monitoring	1 slot of 1 ForceDSP
	Real-time Processing power	8 slots of 1 ForceDSP
Miscellaneous	Internal Hard drive	128 to 256 GB removable SSD with USB 3.0 port
	High speed serial ports	2 ports for CAN Bus probe
	Remote control (power control, NVTerm)	1 RS232 cable connection (RJ11)

25.1.2 Basic hardware configuration

Hardware unit contains at least the following modules. All the other modules are optional.

25.1.2.1 OR35

Font end	4 universal analog inputs, 2 analog outputs, 2 trigger/tachometer inputs + 2 analog dynamic inputs
Processors	1 interface board (Ethernet, CAN, Disk, USB)
	1 Clock synchronization module
	1 master ForceDSP module for Trigger / tachometer / monitoring.
	1 ForceDSP computation module
Disk	64 GB internal SSD

25.1.2.2 OR36

Font end	4 universal analog inputs, 2 analog outputs, 2 trigger/tachometer inputs
Processors	1 interface board (Ethernet, CAN, Disk, USB)
	1 Clock synchronization module
	1 master ForceDSP module for Trigger / tachometer / monitoring.

	1 ForceDSP computation module
Disk	128 GB removable SSD with USB 3.0 port

25.1.2.3 OR38

Front-end	8 universal analog inputs, 2 analog outputs, 2 trigger/tachometer inputs
Processors	1 interface board (Ethernet, CAN ,Disk, USB)
	1 Clock synchronization module
	1 master ForceDSP module for Trigger / tachometer / monitoring.
	1 ForceDSP computation module
Disk	128 GB removable SSD with USB 3.0 port

25.2 Connections

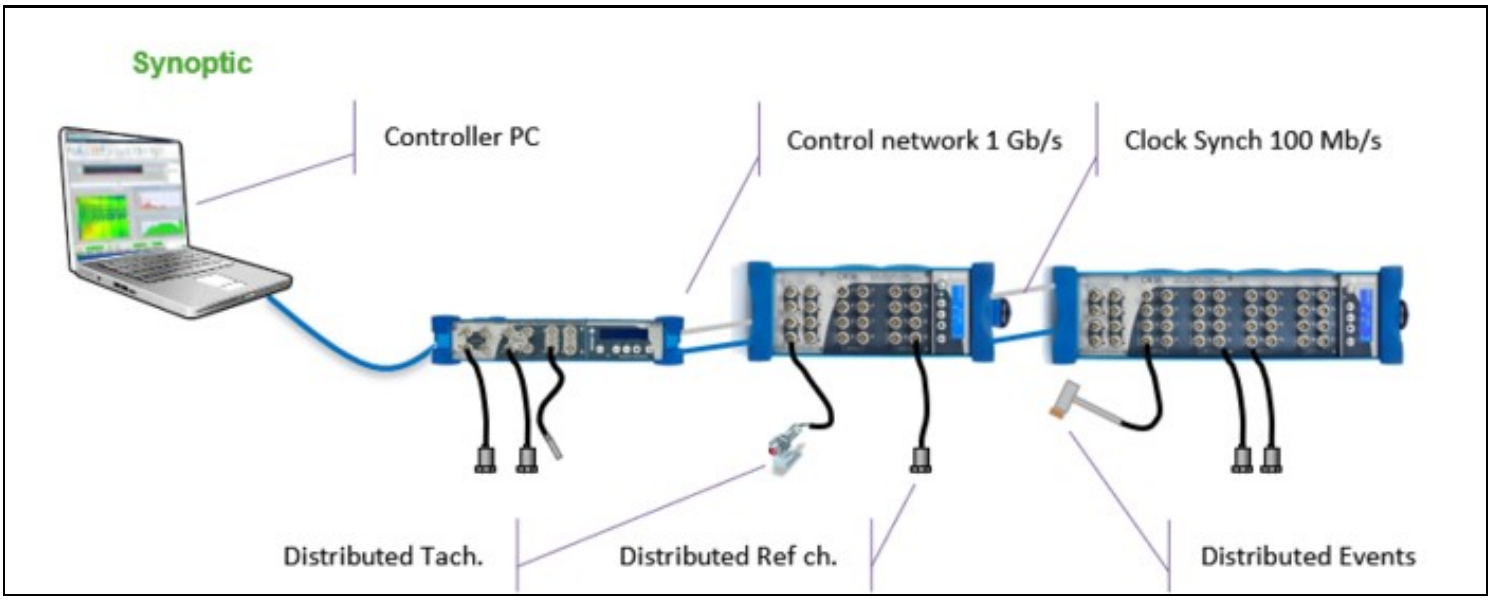
25.2.1 Network

$OR35_2$, $OR36_3$ & $OR38_3$ can operate over multiple network configurations.

Connection to PC	**Ethernet 1 Gb/s** / > 100 m / Cat 5E
Security	Support **SSH tunneling connections**
IP management	TCP/IP / The instrument can be **DHCP server** (non-authoritative)
Supported Networks	**WAN** (Internet) / **LAN** (Company) / **Wi-Fi** (wireless)

25.2.2 Cascade

$OR35_2$, $OR36_3$ & $OR38_3$ can be cascaded flexibly.



Specifications

Configuration	**Switchless daisy-chain** / **30+** cascaded analyzers / **Mixed** analyzer's type
Connections	NVGate: Ethernet **1Gb/s** / Clock sync & Reference distribution : Ethernet **100 Mb/s**
Cables	**> 100 m** per connection / Variable lengths / Cat 5E
Master/Slave	Undifferentiated analyzers' type
Accuracy	**Phase : > ±0.2°** @ 20 kHz / **> 8 ns** @ 51.2 kS/s / **Amplitude: > ±0.02 dB**
Synch. protocol	**IEEE 1588.2** Precision Time Protocol / **SyncE** (synchronous Ethernet) - No phase shift
IP management	**Automatic IP** check and resolution at NVGate start / **DHCP server** (non-authoritative)

25.3 Case

25.3.1 Mechanicals

OR35

Weight	**3 kg** (6.6 lb)	
Dimensions	Case (w.h.d)	**303 mm x 52 mm x 236 mm** (11 15/16" in x 2 1/16" in x 9 9/32" in)
	Overall (w.h.d)	**310 mm x 58 mm x 245 mm** (12 7/32" in x 2 9/32" in x 9 21/32" in)

OR36

Weight	**5.6 kg to 6.1 kg** (12.3 lb to 13.4 lb)	
Dimensions	Case (w.h.d)	**102 mm x 260 mm x 311 mm** (4 1/32" in x 1 1/4" in x 12 25/32" in)
	Overall (w.h.d)	**114 mm x 280 mm x 325 mm** (4 1/2" in x 11 1/32" in x 12 25/32" in)

OR38

Weight	**7.9 kg to 8.8 kg** (17.4 lb to 19.4 lb)	
Dimensions	Case (w.h.d)	**102 mm x 380 mm x 311 mm** (4 1/32" in x 15" in x 12 25/32" in)
	Overall (w.h.d)	**114 mm x 400 mm x 325 mm** (4 1/2" in x 15 3/4" in x 12 25/32" in)

25.3.2 Power supply

OR35

Power	**< 30 VA**	
External AC Power supply	Voltage	**100 to 240 VAC** / 1.7 A max
	Frequency	**50/60 Hz**
DCin	Range	**10 V to 28 V**
	Overload protection	Absolute maximum **< 40 V** / > 31 V poles are disconnected
Battery	Type	Built-in **89 Wh Li-ion** 8 modules
	Autonomy	**3 h**

	safety	Certified under **UN38.3** and **IEC 62133** regulations
	Charge time	**3 h** (typical)
	Charge conditions	DC power supply > 12 V

OR36

Power	**< 60 VA**	
External AC Power supply	Voltage	**100 to 240 VAC** / 1.7 A max
	Frequency	**50/60 Hz**
DCin	Range	**DC power voltage > 17 V will discard the battery to 28 V**
	Overload protection	**31 V** (over this voltage DC poles are short-circuited)
Battery	Type	**NiMh** 11 modules (no memory effect)
	Autonomy	**2 h**
	Charge time	**2 h 30 min** (typical)
	Charge conditions	DC power supply > 18 V

OR38

Power	**< 100 VA**	
External AC Power supply	Voltage	**100 to 240 VAC** / 2.0 A max
	Frequency	**50/60 Hz**
DCin	Range	**DC power voltage > 22 V will discard the battery to 28 V**
	Overload protection	**31 V** (over this voltage DC poles are short-circuited)
Battery	Type	**NiMh** 17 modules (no memory effect)
	Autonomy	**2 h**
	Charge time	**3 h** (typical)
	Charge conditions	DC power supply > 24 V

25.4 Environmental / Compliance with standards

CE\CB\FCC	Indicates compliance with EMC Directive **89/336/EEC**, **2014/30/EU** and Low Voltage Directive **73/23/EEC**,**2014/35/EU**	
Safety	**IEC 61010-1**	Safety requirements for electrical equipment for measurement, control and laboratory use.
	IEC 61010-2-30	Particular requirements for testing and measuring circuits.
	Over-voltage Cat.	**II** (Local level mains, appliance, and portable equipment)
EMC Emission	**IEC 61000-6-3**	Emission standard for residential, commercial and light-industrial environments.
	IEC 61000-6-4	Emission standard for industrial environments.
	IEC 61326-1	Electrical equipment for measurement control and laboratory use EMC requirements.
	CISPR 11	Radio disturbance characteristics of industrial and scientific equipment.: Class B limit.
	FCC Rules	Complies with the limits for a Class B digital device.

EMC Immunity	**IEC 61000-6-1**	Immunity standard for residential, commercial and light-industrial environments.
	IEC 61000-6-2	Immunity standard for industrial environments
	IEC 61326-1	Electrical equipment for measurement control and laboratory use EMC requirements.
	EN 50082-2	Generic immunity standard: Industrial environment.
EMF	**Recommendations 199/519/CE EN 62311**	Evaluation of person exposure to electromagnetic fields
Materials	**ROHS**	**2011/65/EU and 2015/863**
	WEEE	**2012/19/EU**

Temperature	OR35, OR36 Operating	**-20°C Requires a warmup (power on + run NVGAte) which last 1 min per 1 Celsius degree below zero. to 50°C** (-4°F to 122°F)
	OR38 Operating	**-20°C**[4] **to 45°C** (-4°F to 113°F)
	Storage	**-20°C to 65°C** (-4°F to 149°F)
	Absolute maximum rating[ii]	**-35°C to 70°C** (-31°F to 158°F)
Humidity	Max **80 % RH** at 40°C non condensing	
Shocks	Complies with **IEC 68-2-27**	
	Operating	**100 m/s²** (11 ms, ½ sine) and **700 m/s²** (3 ms, ½ sine)
	Storage	**200 m/s² (**11 ms, ½ sine) and **1 000 m/s²** (3 ms, ½ sine)
	Absolute maximum rating[ii]	**1 000 m/s²** (3 ms, ½ sine)
Vibrations	Complies with **IEC 68-2-6**	
	Operating	**10 m/s², 5-500 Hz, 5mm**
	Storage	**25 m/s², 5-500 Hz, 5mm**
	Absolute maximum rating[ii]	**30 m/s², 5-500 Hz, 5mm**
Enclosure	OR35	**IP 40**
	OR36, OR38	**IP 42**

25.4.1 Radio frequencies sensibility

	Input measured with 50 ? terminator
Radiated RF: 80-1000 MHz, 80% AM 1 kHz, 10 V/m	< 20 µV
Conducted RF: 0.15-80 MHz, 80% AM 1 kHz, 10 V	< 100 µV
Magnetic field: 30 A/m, 50 Hz	< 2 µV

25.4.2 OR36 & OR38 Removable Disk

Performances	Type	**1.8" - SSD - 128 GB** or **256 GB - MLC NAND** Flash Memory
	Shock	**15 000 m/s²** - 0.5 ms ½ sine

	Vibrations	**50 m/s²** - 10 to 2 kHz
	Throughput	**32 inputs + 6 aux.** @20 kHz BW ? **10h 40min** gap free
	MTBF	*'2 x 106* **'hours**
Case	Case (w.h.d)	**83 mm x 20 mm x 97 mm** (3.24 in x 0.78 in x 3.79 in)
	weight	**0.200 kg** (0.55 lb)
Connection	Into the analyzer	**SATA** - **1.5 Gb/s** sustained read/write
	To the PC	**USB 3.0** - **200 Mb/s** sustained read
Power supply	On PC	**USB** powered
	On analyzer	**Internal** power supply

25.5 Front-end

Each front end slot of the OR35 (4 BNC + 2 BNC), OR36 (4 BNC) and the OR38 (8 BNC) can be occupied by one of the following inputs type:

- Universal inputs
- Dynamic inputs
- Parametric inputs

25.5.1 Universal inputs

The universal inputs gather both dynamics and parametric input in the same board and connector. The universal inputs are necessary to support the XPod signal conditioners. The type of use of the universal inputs is selectable by software (NVGate) during the analyzer operations.

The universal inputs fulfill all the performances, precision and operability of each specific input type.

25.5.2 Dynamic inputs

Sampling	Sampling frequencies (Additional decimators allow analysis bandwidth down to 0.8 Hz)	**102.4 kHz, 65.536 kHz, 51.2 kHz, 37.768 kHz, 25.6 kHz,** **16.384 kHz, 12.8 kHz, 8.192 kHz, 6.4 kHz, 5.12 kHz, 4.096 kHz, 3.2 kHz, 2.048 kHz**
	Converters	One **24 bit '***sigma-delta ADC'* for each input
	Frequency relative precision	**0.5 10^{-4}** (typical 1 10 $^{?5}$)
	Synchronization	All inputs synchronized on the same sampling clock
Anti-aliasing filter	Type	Over-sampled digital filters
	Slope	**> 400 dB/octave**
	Pass band ripple	**< ± 0.005 dB**
	Rejection of parasites bands	**> 100 dB (**@ frequency > 0.57 x FS)
	Effective bandwidth	**0.45 x FS** (ex: 23.4 kHz @ 51.2 kS/s)
Range (peak)	With amplifier (included)	**±100 mV, ±300 mV, ±1 V**
	Direct	**±10 V**
	With attenuator (included)	**±40 V**

Absolute accuracy	Resolution	**24 bits** (144 dB)
	All input ranges at 1 kHz	**±0.05 dB** (typical ±0.015 dB)
	Temperature variability	**< 0.002 dB** / **10 °C**
DC offset	±100 mV, ±300 mV and ±1V ranges	**<** ± **100 µV**
	±10 V range	**<** ± **1 mV**
	±40 V range	**<** ± **2 mV**
Frequency flatness and phase response *(Includes channel to channel match with different ranges*)	*Inside one front-end*	
	±10 V range, DC to 20 kHz	**< ±0.02 dB** / **< ±0.02 °**
	±10 V range, 20 kHz to 40 kHz	**< ±0.05 dB** / **< ±0.05 °**
	±0.1 V, ±0.3 V , ±1 V ranges, DC - 20 kHz	**< ±0.02 dB** / **< ±0.1 °**
	±0.1 V, ±0.3 V, ±1 V ranges, 20 kHz - 40 kHz	**< ±0.1 dB** / **< ±0.5 °**
	±40 V range, DC - 20 kHz	**< ±0.1 dB** / **< ±0.4°**
	±40 V range, 20 kHz - 40 kHz	**< ±0.1 dB** / **< ±0.8 °**
	Mixed front-ends	
	±10 V range, DC to 20 kHz	**< ±0.02 dB** / **< ±0.2 °**
Cross-talk	*Between N (N is odd) and N+1 inputs:*	
	@ 1 kHz: **< -120 dB,** @ 20 kHz: **< -96 dB,** @ 40 kHz: **< -90 dB**	
	Between any inputs excluding: N (N is odd) and N+1 inputs:	
	@ 1 kHz: **< -140 dB,** @ 20 kHz: **< -114 dB,** @ 40 kHz: **< -108 dB**	
Signal to noise ratio	*With 50 ? terminators:*	
	±10 V range, 40 kHz bandwidth: **> 100 dB**, spurious lines **< -115 dB** of full scale	
	±10 V range, 20 kHz bandwidth: **> 104 dB**, spurious lines **< -125 dB** of full scale	
Input noise	*With 50 ? terminators:*	
	Thermal input noise	**20nV**/ **H z {\displaystyle {\sqrt {Hz}}}**
	±100 mV and ±300 mV ranges	20 kHz BW **< 3.5 µV** rms, 40 kHz BW: **< 5 µV** rms
	±1 V range	20 kHz BW **< 5.4 µV** rms, 40 kHz BW: **< 8.5 µV** rms
	±10 V range	20 kHz BW **< 44 µV** rms, 40 kHz BW: **< 70 µV** rms

Impedance		**1 M? ±1 %, < 100 pF**
Protection	Overvoltage	**±60 V peak without damage - On any input**[ii]

Dynamic	Spectral domain	**140 dB 25601 lines** / **30 sec. averaging**
Coupling	AC	**-3dB Cut-off frequency 0.35 Hz ±10% (first order analog filter)** See curve
	DC	
	ICP	**2 mA** or **4 mA** power supply with AC coupling (±10%)
	ICP + TEDS	ICP + reverse current on TEDS reading operations
	GND	Shortcut to ground - **Automatic current limitation** to 50 mA
Floating	Coupling	**AC** or **DC** / All ranges / overall voltage **< ±40 V**
	Common mode voltage (all ranges)	Max: **±12 V**
TEDS	**Standards**	**IEEE 1451.4 2001 revision 1**
	Supported templates	Accelerometer/Force meter (**25**) Microphones (**27**, **28** and **29**)

25.5.3 Parametric (DC) inputs

The following parametric inputs can be added to the standard $OR36_3$ or $OR38_3$ hardware configuration as follows:

- On the **auxiliary slots** by set of 2 inputs (max 4) *DC inputs on auxiliary slots features 16 bit dedicated converters*
- On the **OR36** as replacement of 4 dynamics inputs (max 12)
- On the **OR38** as replacement of 8 dynamics inputs (max 24)

The following specifications apply to the universal inputs.

Sampling	Bandwidth / Sampling	**-3 dB @ 3.5 Hz** Independent from dynamic sampling clock
	Converters	One **24 bit sigma-delta ADC** for each input
Range (peak)	Direct	**±10 V**
	With attenuator (included)	**±40 V**
Frequencies rejection	Notch filters frequencies	**50 Hz** & **60 Hz** @ **±1%**
	Rejection	**> 120 dB**
Amplitude	Effective resolution	**22 bits** (out of noise)
	Linearity	Typ. **0.0003 %** of input range peak
	Gain drift	**20 ppm** of input range peak/°**C** typ.
Offset	Offset	±10 V range: < ±**1 mV** / ±40 V range: < ±**2 mV**
	Offset drift	±10 V range: **< 40 µV**/°**C** / ±40 V range: **< 160 µV**/°**C**
Impedance		**1 M?**, **5 nF** typ.
Protection	On any input[ii]	**±60 V** peak
Input Noise	*With 50 ? terminators, excepted* ±40 V range*:*	
	Input noise	**< 4 µV** rms in 0.1 to 2 Hz BW ? Typ **2 µV rms**
	Max. Deviation	**< 6 µV** peak

Dynamic outputs

Sampling	Converters	One **24 bit DAC** for each output
	Synchronization	Same sampling clock as the dynamic inputs
Range	Direct	**±10 V peak**
	With attenuator (included)	**±1 V peak**
	Clipping	**User selectable** in the output range
	Digital gain	From $\mathbf{10^{-5}}$ to $\mathbf{10^{3}}$
Absolute accuracy	Resolution	**24 bits** (144 dB)
	All output ranges at 1 kHz	**±0.05 dB**
	Temperature variability	**< 0.1 dB** / **10 °C**
Frequency response	*Variation relative to 0 dB @ 1kHz*	
	All ranges, at 10 kHz	< **±0.05 dB**
	All ranges, at 20 kHz	< **±0.15 dB**
	All ranges, at 40 kHz	< **±0.8 dB**

Dynamic outputs (continued)

Noise floor level	10 V range, 20 kHz bandwidth	
	10 V range, 40 kHz bandwidth	
	1 V range, 20 kHz bandwidth	
	1 V range, 40 kHz bandwidth	
Impedance	User selectable	**50** ?, **600** ? or **Grounded**
Current	Max	**±10 mA**
Protection	Sum of injected + generated voltages	**±15 V peak,** On any output[ii] Permanent short circuit supported
Total harmonic distortion	THD @ 1 kHz	**< 0.002%** or **-94dB** at 20 kHz BW
	THD @ 5 kHz	**< 0.005%** or **-86dB** at 20 kHz BW
Cross-talk	Output 0 dBV to 50 ? terminated input	**Lower than measurable noise**

External sync

Sampling	Frequencies	**64 times over-sampling** of the current input sampling (up to **6.4 MHz**)
	Converters	High speed voltage comparator and time counter
Ranges (peak)		**±300 mV**, **±1 V**, **±3 V**, **±10 V**, **±40 V**
Resolution	Amplitude accuracy	**±1%** of **range**
Setting	Hysteresis	**1%** (of input range) to input range

	Hold off	**0 s** to **500 s**
	Slope	**Rise** or **fall**
	Hardwired pre-divider	**1** to **255**
Accuracy	**Time resolution**	**> 160 ns** (0.06° at 1 kHz and 1.2° at 20 kHz)
Pulse rate	Max	**375 kpulse/s**
Coupling	**AC**	**-3dB Cut-off frequency 0.35 Hz ±10% (first order analog filter)**
	DC	
Impedance		**1 M**?, < 100 pF
Protection	on any external sync[ii]	±**60 V peak** without damage

25.5.4 Expander modules (XPod)

With the universal inputs the $OR35_2$, $OR36_3$ and $OR38_3$ can receive signal conditioning modules called XPod. Different Xpod types are available.

Wheatstone bridge XPod

Connectors	Type	**Sub-D9 ? Female**
Bridges	Mounting	**Full**, **Half** and **quarter**
	½ bridge completion resistors	2 * **10 k?** - 0.1% - 10 ppm
	¼ bridge completion resistors	120 **?** or 350 **?** - 0.1% - 25 ppm
	Excitation voltages	**0 to 10 V**
	Excitation currents	0 to 4 V: **< 30 mA -** 4 V to 10 V: < **12 mA**
	Sensing	**Negative** and **positive** probes
Amplifiers	Type	Differential - DC capable
	Gains	**10** or **100**
	Error	**< 0.01 dB**
Inputs	Ranges	±**100 mV -** ±**1 V**
	Common mode voltage	**±7** V without limiting differential input
	Impedance	**1 M?**
	Noise floor levels (100 Hz to 20 kHz)	Gain 100: **2 µVrms** - Gain 10: **4 µVrms**
DC offset	Temperature drift	**1 µV/°C**
	Compensation resolution	**3 %** of present offset
Protection	Overvoltage	Device on: max **±30 V** - device off: max **±15 V**

Temperature XPod

The temperature XPod operates on the universal or parametric inputs. The XPod support thermocouple and RTDS conditioning, cold point compensation and linearization. Amplified signal are injected in the analyzer on the ±10 V range.

Connectors	Type	Mini Thermocouple/RTD type

	Pins	**3 polarized pin** - spring-loaded - compatible with 2 point plugs
	Material	Glass filled thermoplastic - White body
Thermocouples	**Type J**	-**210 °C to +1 100 °C** - Yellow LED
	Type K	**-200 °C to +1 300 °C** - Green LED
	Type T	**-200 °C to +390 °C** - Brown LED
	Type N<ref>) Add 0.1°C to absolute temperature error</ref>	**-200 °C to +1 200 °C** - Pink LED
	Type E	**-200 °C to +800 °C -** Purple LED
	Cold compensation	Integrated - 2 sensors - user on/off
	Absolute temperature error	> -150 °C : ±**0.9°C** / < -150 °C : ±(**0.4°C** + **0.1%** of MT<ref>) MT is Measured Temperature</ref>)
RTDS	PT 100	-**190 °C to +880 °C*** ? Blue LED
	PT 1000	**-190 °C to +880 °C*** - Grey LED
	Absolute temperature error	±(**0.4°C** + **0.3%** of MT[9])
	Wires	3 wires connections
	Current	PT100: **500 µA to 4 mA** - PT1000: **500 µA** to **1 mA**

*Calibrated up to +800 °C

25.5.5 CAN BUS probe

The CAN bus probe is connected to the $OR35_2$, $OR36_3$ and $OR38_3$ via the high speed serial ports. It offers a passive CAN bus listener with the following specifications.

Type	Standards	**CAN 2.0A** & **CAN 2.0B** / Compliant with **J1939 protocol**
	Speed	**125 kb/s** to **500 kb/s**
Probe	Probe	**High Z** / **Analyzer** or **bus** powered
	Connectors	CAN : **Sub-D 15** / Analyzer: **High speed serial port** (1,5 m)
Capacity	Channels	**100 channels @ 10 Hz** refresh rate / **Synchronous** with analyzer inputs

25.6 Digital computation

25.6.1 Force DSPs modules

ForceDSP on OR3XTW

Type	Sample size	**32 bit floating**
	Computation words	**32/40 bit**
	Internal memory	**16 MSample**
Power	**Computation capability**	**see here**
Input sharing	Inputs per DSP	**8 max**

Number of DSPs/unit

Minimum	**1** Computation DSP module
OR35 Max.	**2** Computation DSP modules
OR36 Max.	**4** Computation DSP modules
OR38 Max.	**8** Computation DSP modules

25.6.2 Special DSPs modules

The following DSPs are always integrated in OR35, OR36 & OR38 hardware.

Master DSP module	Monitor computations	**FFT 401 lines** (max 4 Channels)
	Time domain detectors	**DC, Max, Min, RMS, Kurtosis** (on the monitor Channels)
	Special	Auxiliary inputs, Events, Tachs, Torsion, Generators

25.6.3 Normal DSP (OR34)

This specification are about normal DSP. For force DSP on OR3TW. This information can not be accurate. The following table details the calculation needs (SPUs) for each analysis plug-in of NVGate software.

Narrow band analysis (FFT)	Real-time FFT analysis with;
	401 lines (for 801, 1601,3201, 6401 lines, multiply requested SPU respectively by 1.25, 1.5, 2, 3)
	20 kHz bandwidth (Requested SPU are proportional to bandwidth)
	0% overlap
	1 channel processing requires **1 SPU**
Synchronous order analysis	Real-time order spectrum analysis (re-sampled time signal) with:
	Any duration of visualization, any averaging
	20 kHz bandwidth (Requested SPU are proportional to bandwidth)
	1 channel processing requires **3 SPUs**
Time Domain analysis	Real-time time domain monitor and statistical analysis with:
	Simultaneous time view and statistical extraction. Any duration of visualization, any averaging
	20 kHz bandwidth (Requested SPU are proportional to bandwidth)
	1 channel processing requires **3 SPU**
1/n Octave	Real-time filter based 1/n octave analysis with:

	1/3rd octave (for 1/12th and 1/24th octave multiply requested SPU respectively by 2 and 4)
	20 kHz bandwidth (Requested SPU are proportional to bandwidth)
	1 channel processing requires **3 SPUs**
Recorder	Gap free recording with:
	51.2 kHz sampling rate gap free recording
	1 channel processing requires: **0.66 SPU**

25.6.4 Signal Processing Units

SPU (Signal Processing Units): the previous table gives the characteristics of each analysis mode and the associated SPU consumption. For multi-analysis purpose, add the corresponding SPUs of each mode used simultaneously and increase the sum by 10%. "Real-time" means that the analysis speed is faster than the input rate and does not miss any sample.

25.7 Notes

The previous specifications describe all the guaranteed capacities and performances of the instrument and are applicable to an $OR35_2$-10, $OR36_3$-16 or $OR38_3$-32 hardware powered for more than 15 minutes at a stabilized room temperature of 23°C ±5°C and calibrated since less than one year.

The adapted control software NVGate is described separately.

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[i] Prepared for future use: the related specifications or options are in development.

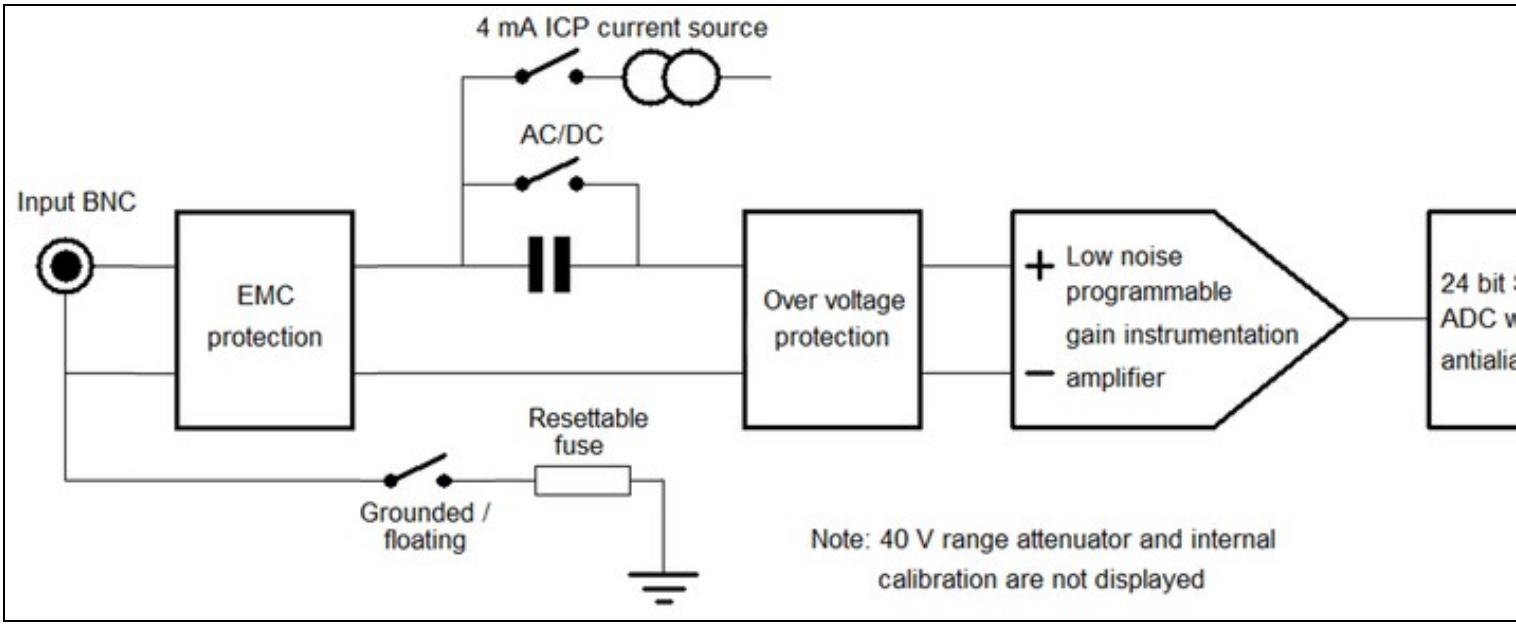
[ii] Exceeding absolute maximum ratings damages the system and voids guarantee.

Specifications not binding; OROS reserves its right to change these specifications without notice.

---

26 Input structure

Each analog input has the following structure in order to reduce external noise influence:



The EMC filter provides general protection against high frequency (> 100 kHz) parasitic signals.

Each input can be grounded or kept floating in order to be able to reject ground loop noise due to sensors cabling. A resettable fuse is used and can support, if grounded, up to 30V in case of ground potential difference (to avoid) between sensors and analyzer. Each input structure is mainly designed as symmetric in order to provide high common mode voltage rejection.

Analog ground is connected to the analyzer frame. Inside the analyzer the cabling is separated between analog parts and digital parts in order to keep high signal/noise ratio.

Ethernet connection is designed and tested to be floating from the frame (Ethernet cable connection is done using an isolation transformer). So ground loops can be avoided between analyzer and PC (be careful using shielded Ethernet cable, STP, as generally shield is connected to each connector frame).

27 MaintenanceCenter:Install

OROS MAINTENANCE CENTER

INSTALLATION AND DEPLOYEMENT GUIDE

27.1 Object

This document explains how to install OROS Maintenance Center Tools.

Please check the "Maintenance Center Packing List" to make sure you have all required equipment.

27.2 Prerequisite

In order to install the Tools provided by OROS, make sure you have the followed elements.

*Element with a * are provided by OROS.*

27.2.1 Environment

You should create a dedicated spot to OROS including:

- Table of about 2×3 m
- ESD Table-Cover, including a bracket
- Grounded electrical equipment
- Streamer « OROS Maintenance Center »*

The operating conditions must be as follow:

- temperature = 23°C ± 5°C
- humidity rate < 80%, non-condensing

27.2.2 Tools

The following tools* are required to repair OR3X analyzers:

- Philips screwdriver (Facom PZ1 1 × 100)
- Flat screwdriver (Facom 3.5 × 0.6)
- Torx screwdriver T10
- Torx screwdriver T20
- Wrench Ø5
- Wrench Ø5.5
- Lumberg ZMS 20

27.2.3 Computer

You must have a computer with the following requirement:

- Same as NVGate requirement (see NVGate documentation)
- Set the power management properties such as the "Turn Off hard disk or "System Standby" to "Never"
- 4 USB ports at least
- 1 Serial port (optional)
- 1 Parallel port (only if you plan to use the "old-fashioned" Switch Box)

	=	223.255.253.49	=	255.255.255.0
		Network Mask		

- 1 ethernet network port to connect the OR3x with:
  IP adress

- Connection to internet (Ethernet or Wireless)

27.2.4 Hardware

You must have the following hardware items at your disposal:

- OROS Switch Box USB*
- OROS Switch Box Parallel port (optional)
- HP34401 multimeter
- DB9-DB9 serial cable*
- Serial-to-USB adapter*
- NVGate Superdongle*
- OR3X Hardware, V1 type (OR34 or OR35 or OR36 or OR38)
- OR3X Hardware, V2 type (OR36_V2 or OR38_V2)

27.2.4.1 Multimeter configuration

Computer Connection

The multimeter serial port can be connected:

- Directly to the Serial Port of the computer, if there is one
- To a USB port of the computer, with the Serial-to-USB adapter provided by OROS

In the second case, use the "PL2303_Prolific_DriverInstaller_v1417" package.

Serial-to-USB References:

Provider:	MOUSER ELECTRONICS
Description:	RN-USB-SERIAL : USB 1.1 to RS232
Manufacturer:	ROVING NETWORK
Manufacturer Reference:	RN-USB-SERIAL
Order Reference:	765-RN-USB-SERIAL

Multimeter Communication Settings

Set the multimeter input/output parameters as follows (see the HP34401A Multimeter User Guide):

- Remote Interface = RS232
- Speed = 1200 Bauds
- Parity = Even

Multimeter Verification

The HP34401A multimeter must be sent to your local manufacturer for verification every year.

A copy of the corresponding report must be sent to OROS.

27.2.5 Software

You must have the following software items installed on your PC:

- Microsof Office Word

- PDF Creator **V1.2.2***
- NVGate V7.10 (or above)*
- Mailbox (optional)
- TeamViewer

The following sections explain how to configure these software.

27.2.5.1 Microsoft Office Word configuration

Language and version

It is recommended using an English version.

French version has been tested successfully in our premises but we do not guaranty that it will work with another language version.

Any version from Word97 and above can be used.

Specific Options

It is advisable to set the following options for your Word editor:

- No grammar/orthographic tool checking
- Do not automatically save every x minutes

Theses parameters are not obligatory, but if not done, they can slow down the OROS Automatic Verification Tools.

Macros

The OROS Automatic Verification Tools manipulate Macro VBA utilities.

Make sure the Macro Security option is set to its lower value.

27.2.5.2 PDF Creator configuration

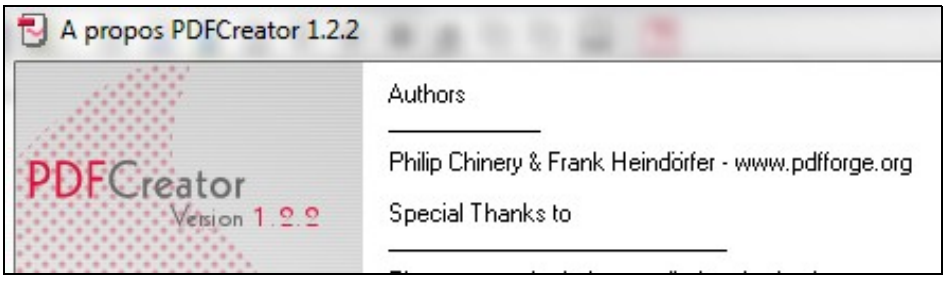
Version

The PDF Creator version **MUST BE** V1.2.2 version.

It your current version is another one (older or newer), you must uninstall it and install the V1.2.2 provided by OROS. And remind to **NEVER** update it, even if a Windows message ask you to do so.

You can check the Version from the menu item [? ?-> about]:

File:Maintenance center install 01.png



Default Printer

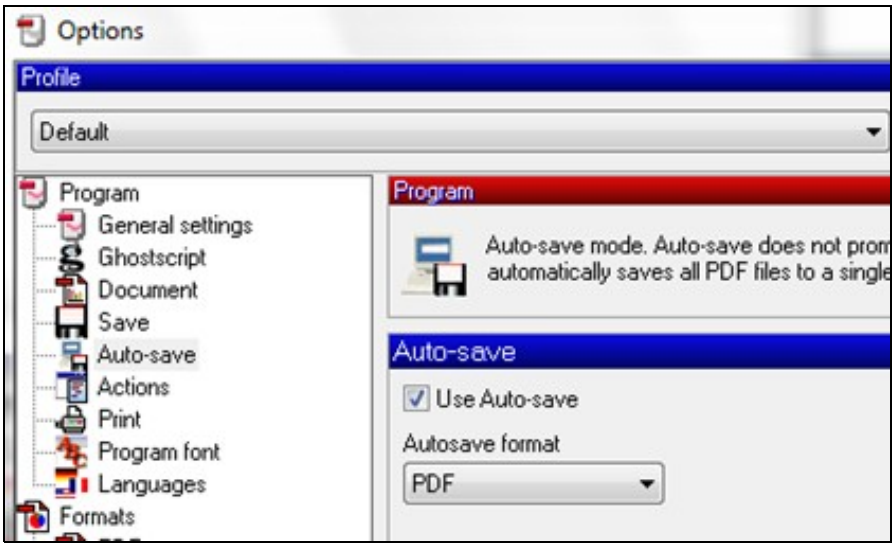
Set this PDF Creator as the default printer in your computer printer settings.

Autosave

Open the menu [Printer ?> options] and select the [Autosave] tab.

Tick the [Use Auto-save] checkbox as shown below.

This will be automatically set-up to save graphics when using OROS Automatic Verification Tools.



Leave the other settings to their default values.

27.2.5.3 NVGate configuration

You are advised to manually copy the "Alpha0.cfg" and "NVGate.usr" files provided by the OROS Support Team.

As these files are different for each NVGate version, this action should be done for every NVGate version you are planning to use with the OROS Automatic Verification Tools.

The Alpha0.cfg file allows every hardware configurations (including all auxiliary board types) and limits the software plug-in to the Recorder and the FFT ones.

You should use the USB SuperDongle key.

27.2.5.4 Mailbox configuration (optional oR use usb keys or Network)

Please, check with your Information System team to install and set-up a Mailbox.

This will be used to communicate with the OROS Support team (to exchange result files for example).

27.2.5.5 Teamviewer configuration

On the install CD of the maintenance center you will find on setup/Teamviewer/TeamViewerQS_en.exe
Just copy this .exe on your PC. Launch the .exe when you want to start a TeamViewer session with OROS customer care.

27.3 OROS tools softwares installation

Once you have check and configured all the environment settings, you can process the OROS Maintenance Software Tools installation.

This chapter described how to install these elements:

- Switch Box USB: driver and autotest
- Switch Box parallel: autotest (i.e the "old-fashioned" Switch Box)
- OR3X V1 Maintenance Tool
- OR3X V1 Automatic Verification
- OR3X V2 Maintenance Tool
- OR3X V2 Automatic Verification

27.3.1 Switch Box USB

This is the new Switch Box provided by OROS, made upon an OR3x blue frame.

Unlike the "old-fashioned" Switch Box, you can plug all 32 inputs and optional auxiliary BNC from the OR3X to repair/verify in one go.

27.3.1.1 Connection

- Plug in the power supply cable to the mains (this is the same DC power as OR35 one)
  Make sure the mains are connected to ground.
-

File:Maintenance center install 02.png

Plug the USB cable to the Switch Box rear panel and to a computer USB slot



27.3.1.2 Program setup

- For windows 10 disable "signed driver enforcement" by following this process:

https://ph.answers.acer.com/app/answers/detail/a_id/38288/~/windows-10%3A-disable-signed-driver-enforcement

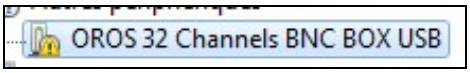
- Click on "SwitchBoxV2_Verification_Setup.exe".

The default installation directory is: "C:\OROS\SwitchBoxV2_Verification"

- Power on the Switch Box by pressing the "Power" button during 3 seconds

All BNC LEDS are lighted blue then stay lighted green and Windows displays a message "New Hardware Detected".

- Open the Devices Manager and select the "OROS 32 Channels BNC BOX USB" item:



- Right-click to install the driver from the "\OR38test_V2\Drivers\SwitchBoxV2\" directory

Once this driver is installed successfully, all BNC LEDS are lighted off.

If you are using the adaptor RS232 to USB to connect the multimeter to the PC by USB you need to install the driver. For this install :

Setups\PL2303_Prolific_DriverInstaller_v1417\PL2303_Prolific_DriverInstaller_v1417.exe

27.3.1.3 Test

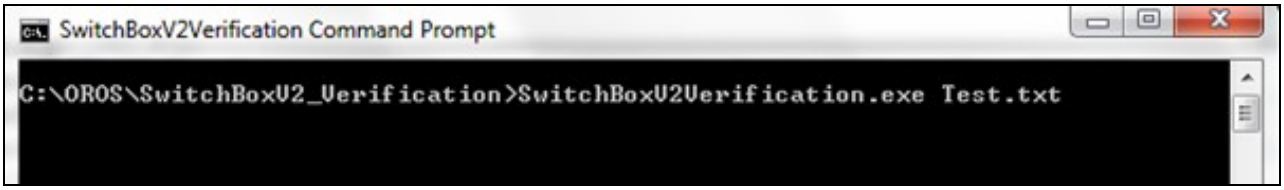
- File:Maintenance center install 03.png

Connect a BNC cable between Mult. A and Multimeter



- Run "Programs ? OROS ? SwitchBoxV2_Verification ? SwitchBoxV2Verification command prompt"
- Type in "SwitchBoxV2Verification.exe Test.txt"

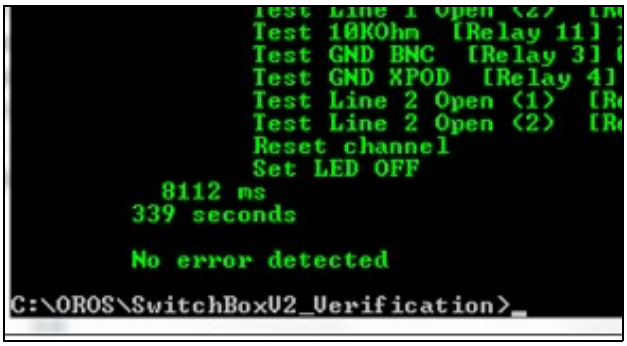
(Warning : don't put The X-pod terminal on the switchbox)



While this Autotest is running :

- Test result is displayed in green in the prompt windows (or red if error)
- The BNC LED currently processed is lighted white, then green when finished (or red if error)

At the end of the Autotest (about 10 minutes), the following window should display "No Error detected":



The text result file is located in the "C:\OROS\SwitchBoxV2_Verification" directory.

This operation must be done at least every 3 months and the result file sent to OROS

27.3.2 Switch Box parallel

This is the "old-fashioned" white OROS switch box, which is normally replaced by the USB one.

This paragraph is for compatibility purpose only.

27.3.2.1 Connection

- Plug in the power supply cable to the mains
  Make sure the mains are connected to ground.
- Plug the parallel cable to the Switch Box rear panel and to the computer parallel port

27.3.2.2 Program setup

- Click on "SwitchBox_Verification_Setup.exe".

The default installation directory is: "C:\OROS\SwitchBox_Verification_V1"

27.3.2.3 Test

- Remove all BNC cables
- Connect a BNC cable between HP33401 on switch box and multimeter
- Run "Programs ? OROS ? SwitchBox_Verification ? ? SwitchBox_Verification command prompt"
- Type in "SwitchBox_Verification.exe Test.txt"



While this Autotest is running , test result is displayed in green in the prompt windows (or red if error).

At the end of the Autotest (about 30 minutes), the window should display "No Error detected"

The text result file is located in the "C:\OROS\SwitchBox_Verification_V1" directory.

This operation must be done at least every 3 months and the result file sent to OROS

27.3.3 NVGate

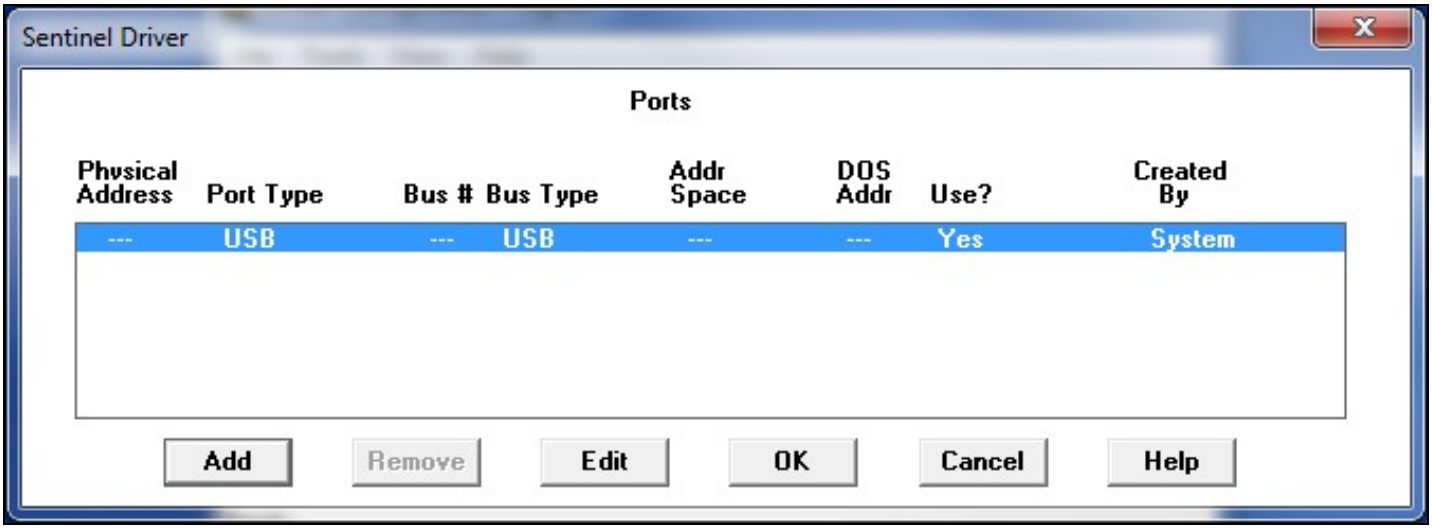
NVGate version should be V7.10 or higher.

27.3.3.1 Program setup

You can install several NVGate versions on your computer.

- Insert the SuperDongle key on a USB port
- Install NVGate from your CD as usual with the following differences:
- The default directory is "C:\Program Files\OROS\OR3X\", it is preferable to select another directory with the version number, for example:
  C:\OROS\NVGATE_V710\ for NVGate V7.10
  C:\OROS\NVGATE_V800\ for NVGate V8.00
  and so on ?
- It also good to have a specific database for each version of NVGate. This can be set on NVGatecfg.exe.
- When the "Setup Key" window is displayed to ask the key directory, click on "Cancel"
- You are advised to manually copy the "Alpha0.cfg" and "NVGate.usr" files provided by the OROS Support Team. As these files are different for each NVGate version, this action should be done for every NVGate version you have installed. The Alpha0.cfg file allows every hardware configurations (including all auxiliary board types) and limits the software plug-in to the Recorder and the FFT ones.
- You need also to copy the project and macro on the database of NVGate. By default the project and macro are here: OR38test_V2\OR3X V2 Auto Verification\. By default the project and macro have to be here C:\OROS\NVGate data on the folder Macro and project.

- It is recommended to disable all ports (especially ECP one) from Sentinel Driver, except the USB one:



This tool is generally located in (depending of your Windows Operating System):

- "C:\Program Files (x86)\Common Files\SafeNet Sentinel\Sentinel System Driver"
- "C:\Program Files\Common Files\SafeNet Sentinel\Sentinel System Driver"

27.3.3.2 Test

Start NVGate in the Office mode (will start with the SuperDongle Key).

You should be able to see all analog input/output connection types:

This will enable you to plug any customer OR3x analyzer, whatever its configuration is.

Then you can test, repair and verify any OR3x analyzer.

27.3.4 OR3X V1 Maintenance Tool

27.3.4.1 Program setup

- Click on "Setup_OR38test_V1.exe".

The default installation directory is: "C:\OROS\OR3X_ProdTest_V1"

27.3.4.2 Configuration

- Edit the following element in the "custom.ini" file:

Part for the report document

[Document]

PathSaveReportMC=C:\OR3x_MAINTENANCE_TOOL\RESULTS\

PathSaveReport=C:\OR3x_TESTS_RESULTS\

Manually create corresponding directory and/or change the path, for example:

[Document]

PathSaveReportMC=C:\OROS\OR3X_ProdTest_V1\Results\

PathSaveReport=C:\OROS\OR3X_ProdTest_V1\Results\

- Create a shortcut for "Or38test" program on the desktop:



27.3.4.3 Test

Click on this icon, you are asked to enter a password:

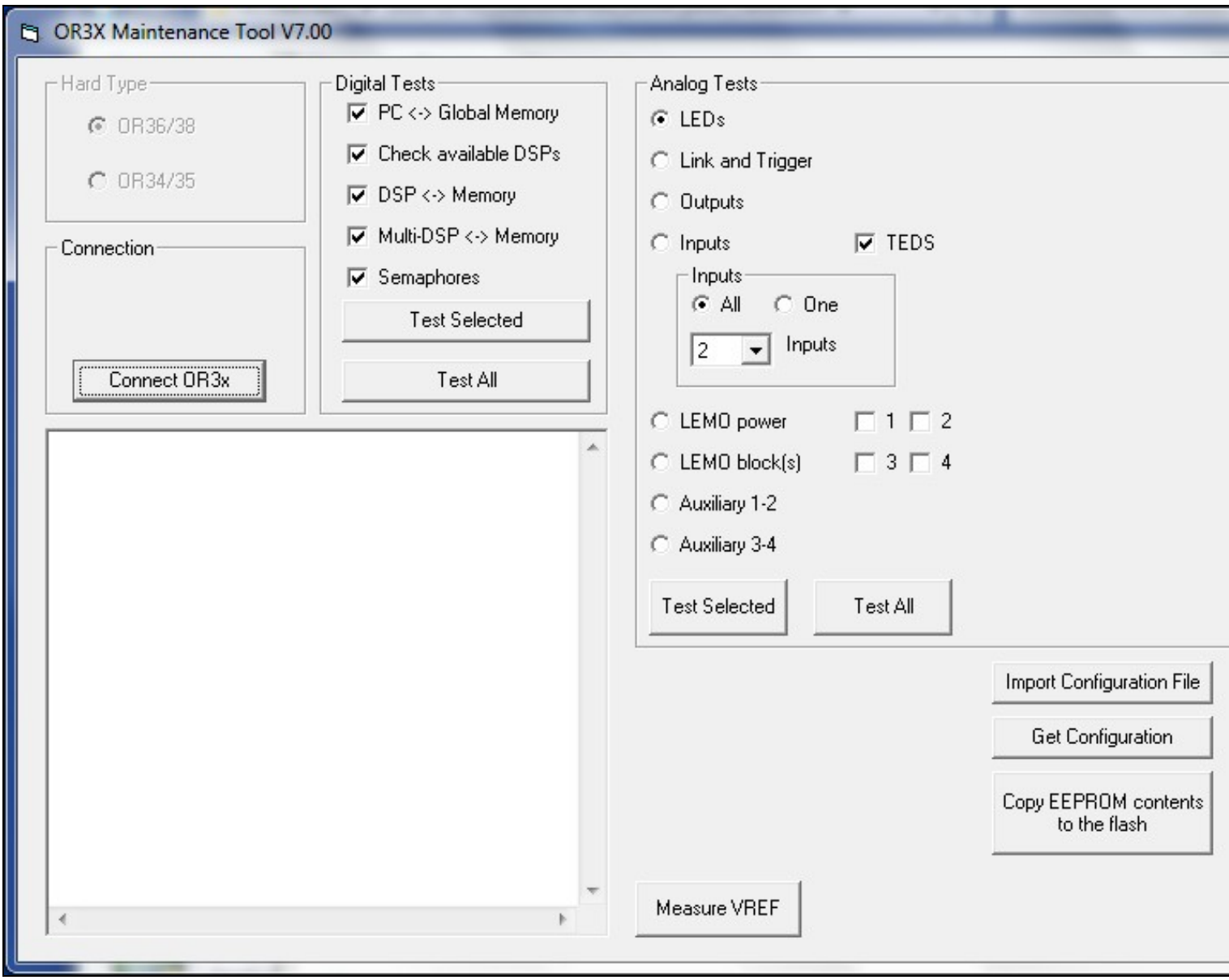


Leave it with the current password and click on OK to continue.

(This will be used for advanced operations that can be carried on only by the OROS Support Team over a TeamViewer session).

The **OR3x Maintenance Tool** starts:

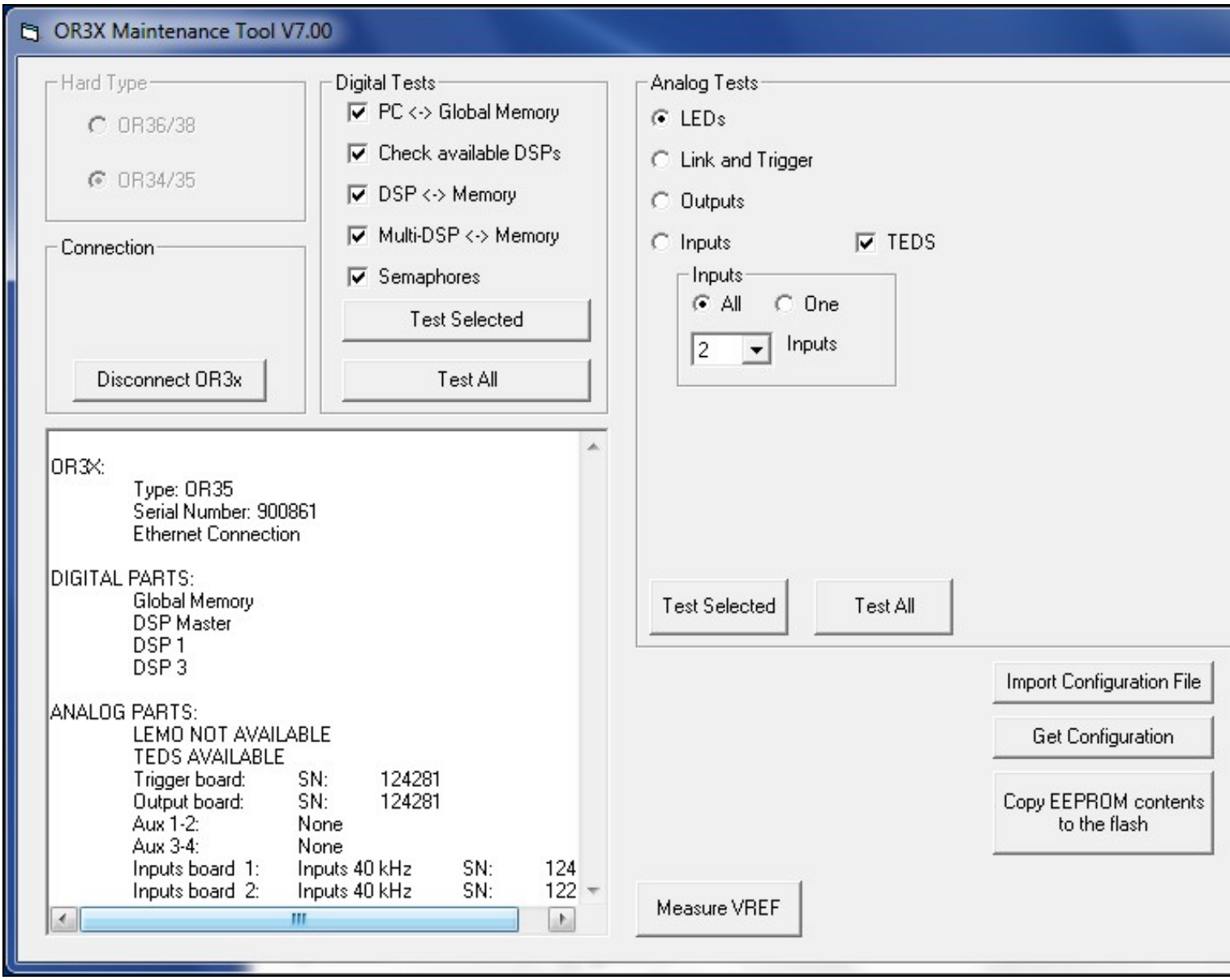
File:Maintenance center install 05.png



Connect an OR3x V1 analyzer (OR34, OR35, OR36 or OR38) to the Ethernet port.

Click on [Connect OR3x], then [Get Configuration], the log window displays the current OR3X configuration :

File:Maintenance center install 06.png



Check that a text file is created in the "C:\OROS\OR3X_ProdTest_V1\Results" directory.

("900861.txt" in this example)

Click on [Disconnect OR3X] and [EXIT] the program.

27.3.5 OR3X V1 Automatic Verification

27.3.5.1 Program setup

- Click on "Setup_OR3XAutomaticVerification_V1".

The default installation directory is: "C:\OROS\OR3X_Automatic_Verification_V1"

27.3.5.2 Configuration

Projects and Macros for NVGate:

A specific set of projects and macros are required by NVGate to run the Automatic Verification.

Manually copy the contents of these directories to the NVGate data ones:

"C:\OROS\OR3X_Automatic_Verification_V1\Projects"	?	"C:\OROS\NVGate data\Projects"
"C:\OROS\OR3X_Automatic_Verification_V1\Macros"	?	"C:\OROS\NVGate data\Macros"

Ini files

- Edit the following elements in the "**constants.ini**" file:

NVGate versions:

```
[OR38]
'Indicate the number of OR38 software:
NSoft=1
'List the different OR38 software:
Soft1=NVGATE V7.10
```

For example, if you have installed 2 NVGate versions (let's say V7.10 and V8.00), modify these lines:

```
[OR38]
'Indicate the number of OR38 software:
NSoft=2
'List the different OR38 software:
```

Soft1=NVGATE V7.10

Soft2=NVGATE V8.00

And do the same for the [OR36], [OR35] and [OR34] sections.

- Edit the following element in the "**custom.ini**" file:

NVGate Paths:

[OR38]

Path1=C:\Program Files\OROS\OR3X\ ? C:\OROS\NVGATE_V800\

Analyzer1=NVGATE

For example, if you have installed 2 NVGate versions (let's say V7.10 and V8.00), modify these lines:

[OR38]

Path1= C:\OROS\NVGATE_V710\

Analyzer1=NVGATE

Path2= C:\OROS\NVGATE_V800\

Analyzer2=NVGATE

And do the same for the [OR36], [OR35] and [OR34] sections.

Operator Names:

[Operators]

'Indicate the number of operators

Number=1

'List the name of operators

Name1=OPERATOR Name

Indicate the number of operators who can access the program and list their names, for example:

[Operators]

'Indicate the number of operators

Number=3

'List the name of operators

Name1=John

Name2=Kate

Name3=Peter

Report Document:

[Document]

?

'Set the folder where to save the report document.

'If no path is entered, then the report documents are save

'in the current folder.

'If there is a path (i.e. the calibration can takes place on

'several PC, thus the iterative numbers are shared),

'then the report documents are save in the selected folder.

PathSaveReport= C:\OROS\OR3X_Automatic_Verification_V1\reports\

PathSaveReportList= C:\OROS\OR3X_Automatic_Verification_V1\reports\list.doc

If you have installed the current software in the default directory, you shouldn't have to modify this item unless you want to save the verification reports to another directory.

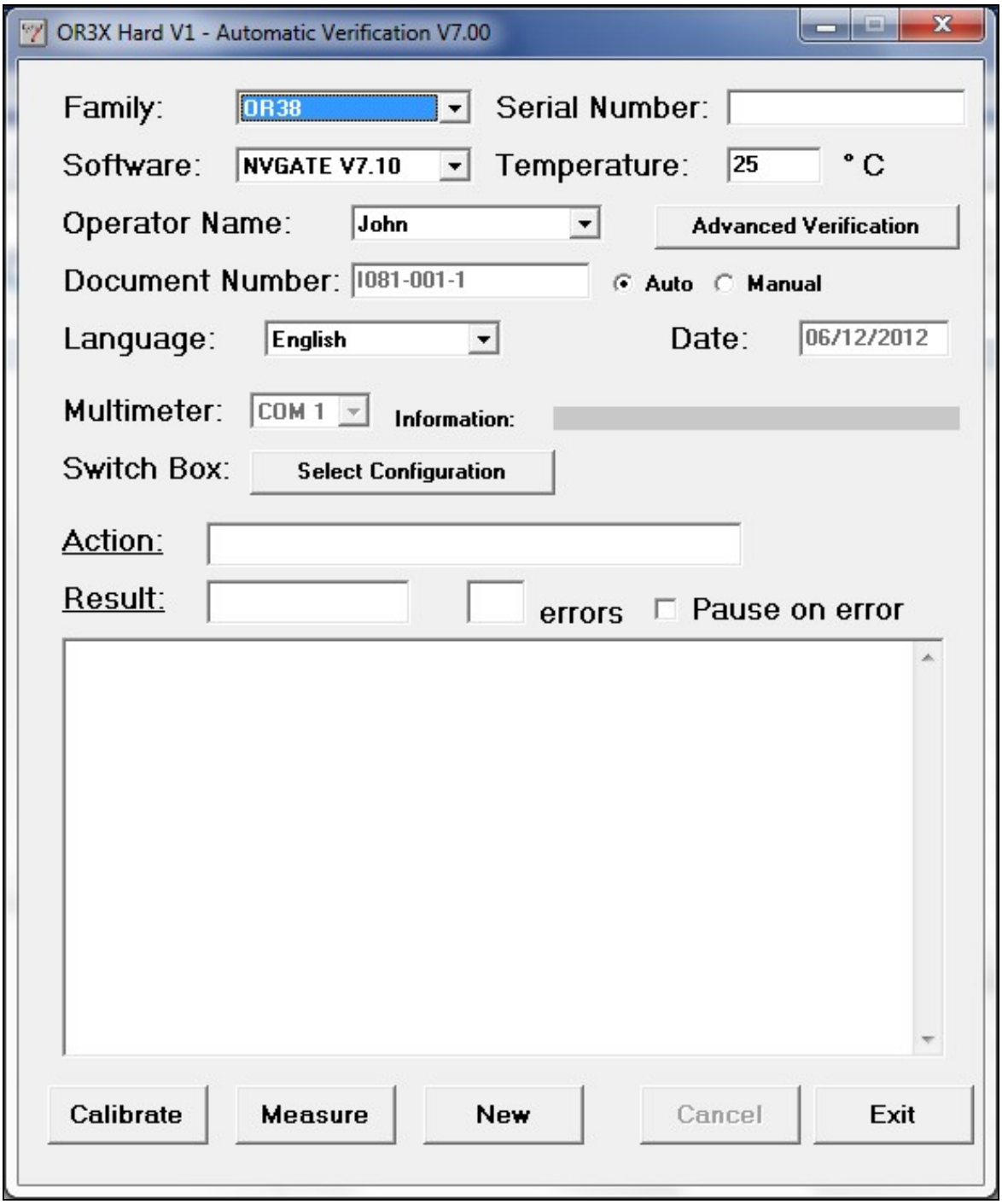
In this case, do not forget to manually create the corresponding directory.

- Create a shortcut for "OR3X V1 Auto Verification.exe" program on the desktop:



27.3.5.3 Test

Click on this icon to display the interface:



If you want to thoroughly test this program, please see its User Manual.

27.3.6 OR3X V2 Maintenance Tool and Automatic Verification

27.3.6.1 Program setup

- Click on "Setup_OR38test_V2.exe".

The default installation directory is: "C:\OROS\OR3X_ProdTest_V2"

Both softwares (Maintenance Tool and Automatic Verification) are installed by this setup.

Alternatively, the Automatic Calibration can be installed on its own with "Setup_OR3XVerification_V2.exe" in the default "C:\OROS\OR3X_Automatic_Verification_V2" directory.

27.3.6.2 Configuration for Maintenance Tool

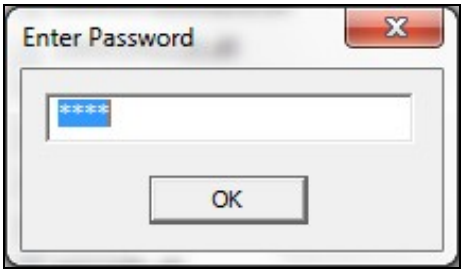
- Copy the "OR3X V2 Production Test" shortcut to the desktop:



- Results are saved in "C:\OROS\OR3X_ProdTest_V2\OR3X V2 TEST RESULTS"

27.3.6.3 Test Maintenance Tool

Click on this icon, you are asked to enter a password:



Leave it with the current password and click on OK to continue.

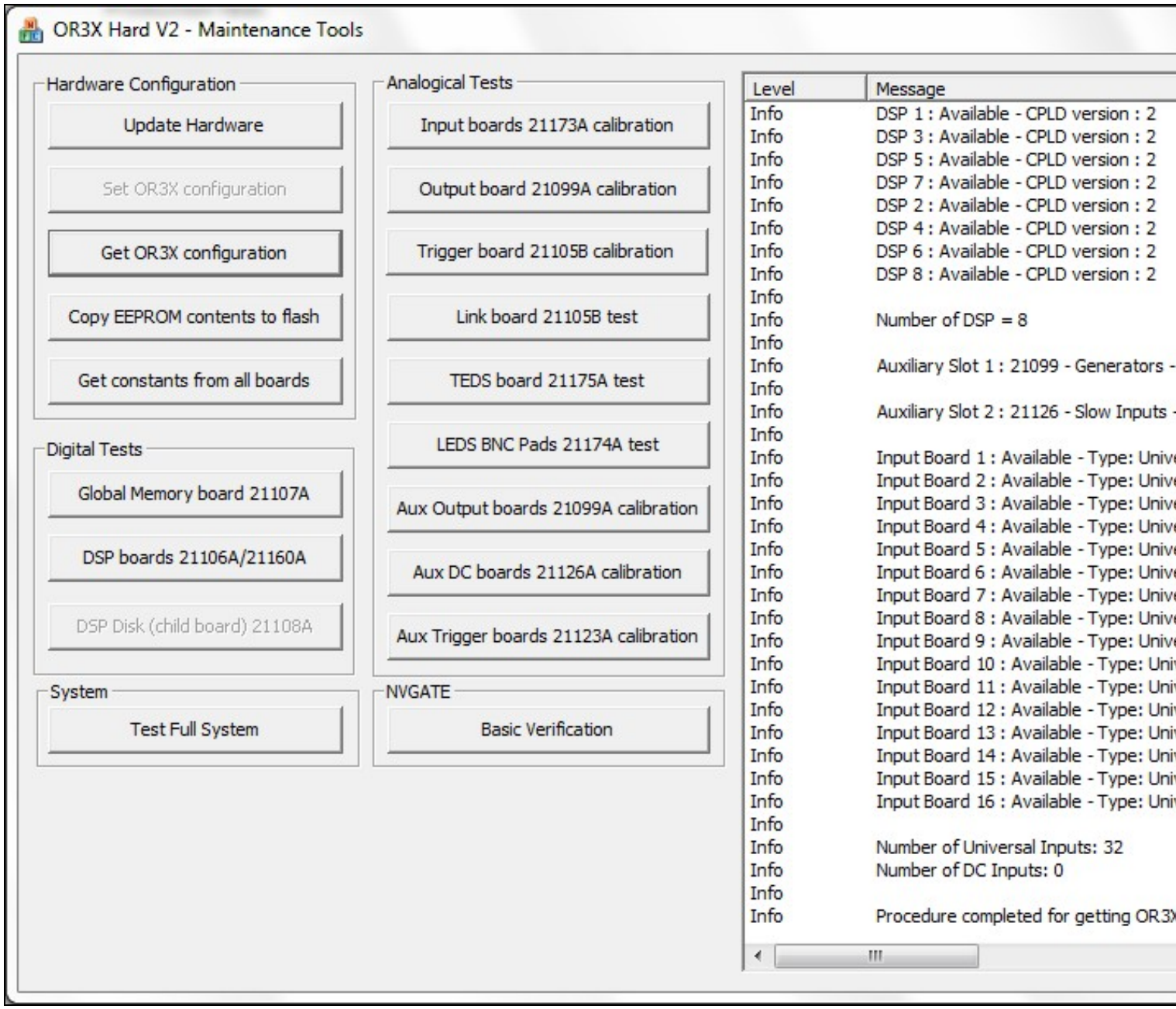
(This will be used for advanced operations that can be carried on only by the OROS Support Team over a TeamViewer session).

The **OR3x Hard V2 Maintenance Tool** starts.

Connect an OR3x V2 analyzer (OR36 V2 or OR38 V2) to the Ethernet port.

Click on [Get OR3X configuration], the log window displays the current OR3X configuration :

File:Maintenance center install 07.png


OR3X Hard V2 - Maintenance Tools
Hardware Configuration
Update Hardware
Set OR3X configuration
Get OR3X configuration
Copy EEPROM contents to flash
Get constants from all boards
Digital Tests
Global Memory board 21107A
DSP boards 21106A/21160A
DSP Disk (child board) 21108A
System
Test Full System
Analogical Tests
Input boards 21173A calibration
Output board 21099A calibration
Trigger board 21105B calibration
Link board 21105B test
TEDS board 21175A test
LEDS BNC Pads 21174A test
Aux Output boards 21099A calibration
Aux DC boards 21126A calibration
Aux Trigger boards 21123A calibration
NVGATE
Basic Verification
Level
Message
Info DSP 1 : Available - CPLD version : 2
Info DSP 3 : Available - CPLD version : 2
Info DSP 5 : Available - CPLD version : 2
Info DSP 7 : Available - CPLD version : 2
Info DSP 2 : Available - CPLD version : 2
Info DSP 4 : Available - CPLD version : 2
Info DSP 6 : Available - CPLD version : 2
Info DSP 8 : Available - CPLD version : 2
Info
Info Number of DSP = 8
Info
Info Auxiliary Slot 1 : 21099 - Generators -
Info
Info Auxiliary Slot 2 : 21126 - Slow Inputs -
Info
Info Input Board 1 : Available - Type: Unive
Info Input Board 2 : Available - Type: Unive
Info Input Board 3 : Available - Type: Unive
Info Input Board 4 : Available - Type: Unive
Info Input Board 5 : Available - Type: Unive
Info Input Board 6 : Available - Type: Unive
Info Input Board 7 : Available - Type: Unive
Info Input Board 8 : Available - Type: Unive
Info Input Board 9 : Available - Type: Unive
Info Input Board 10 : Available - Type: Uni
Info Input Board 11 : Available - Type: Uni
Info Input Board 12 : Available - Type: Uni
Info Input Board 13 : Available - Type: Uni
Info Input Board 14 : Available - Type: Uni
Info Input Board 15 : Available - Type: Uni
Info Input Board 16 : Available - Type: Uni
Info
Info Number of Universal Inputs: 32
Info Number of DC Inputs: 0
Info
Info Procedure completed for getting OR3X

If everything is OK, this dialog box is displayed:



Check that a log file is created in the "C:\OROS\OR3X_ProdTest_V2\OR3X V2 TEST RESULTS" directory.

("GetOR3XConfiguration_901522.log" in this example)

27.3.6.4 Configuration for Automatic Verification

Projects and Macros for NVGate:

A specific set of projects and macros are required by NVGate to run the Automatic Verification.

Manually copy the contents of these directories to the NVGate data ones:

"C:\Data\Outils_de_prod_10334\OR3X_ProdTest_V2\OR3X V2 Auto Verification\Projects"

? "C:\OROS\NVGate data\Projects"

"C:\Data\Outils_de_prod_10334\OR3X_ProdTest_V2\OR3X V2 Auto Verification\Macros"

? "C:\OROS\NVGate data\Macros"

If already done when installing "OR3X V1 Automatic Verification", it is not necessary to copy projects and macros.

If not, copy them.

All projects and Macros are the same for OR3X V1 and OR3X V2 hardwares.

Ini files

- Edit the following elements in the "**constants.ini**" file:

NVGate versions:

```
[OR38V2]
'Indicate the number of OR38V2 software:
NSoft=1
'List the different OR38V2 software:
Soft1=NVGATE V7.10
```

For example, if you have installed 2 NVGate versions (let's say V7.10 and V8.00), modify these lines:

```
[OR38V2]

'Indicate the number of OR38V2 software:

NSoft=2

'List the different OR38V2 software:

Soft1=NVGATE V7.10

Soft2=NVGATE V8.00
```

And do the same for the [OR36V2] section.

- Edit the following element in the "**custom.ini**" file:

NVGate Paths:

```
[OR38V2]

Path1=C:\Program Files\OROS\OR3X\ ? C:\OROS\NVGATE_V800\

Analyzer1=NVGATE
```

For example, if you have installed 2 NVGate versions (let's say V7.10 and V8.00), modify these lines:

```
[OR38V2]

Path1= C:\OROS\NVGATE_V710\

Analyzer1=NVGATE

Path2= C:\OROS\NVGATE_V800\

Analyzer2=NVGATE
```

And do the same for the [OR36V2] section.

Operator Names:

```
[Operators]
```

'Indicate the number of operators

Number=1

'List the name of operators

Name1=OPERATOR Name

Indicate the number of operators who can access the program and list their names, for example:

[Operators]

'Indicate the number of operators

Number=3

'List the name of operators

Name1=John

Name2=Kate

Name3=Peter

Report Document:

[Document]

?

'Set the folder where to save the report document.

'If no path is entered, then the report documents are save

'in the current folder.

'If there is a path (i.e. the calibration can takes place on

'several PC, thus the iterative numbers are shared),

'then the report documents are save in the selected folder.

PathSaveReport= C:\OROS\OR3X_Automatic_Verification_V2\reports\

PathSaveReportList= C:\OROS\OR3X_Automatic_Verification_V2\reports\list.doc

Note that by default, the result directory is:

"C:\OROS\OR3X_ProdTest_V2\OR3X V2 Auto Verification\Reports"

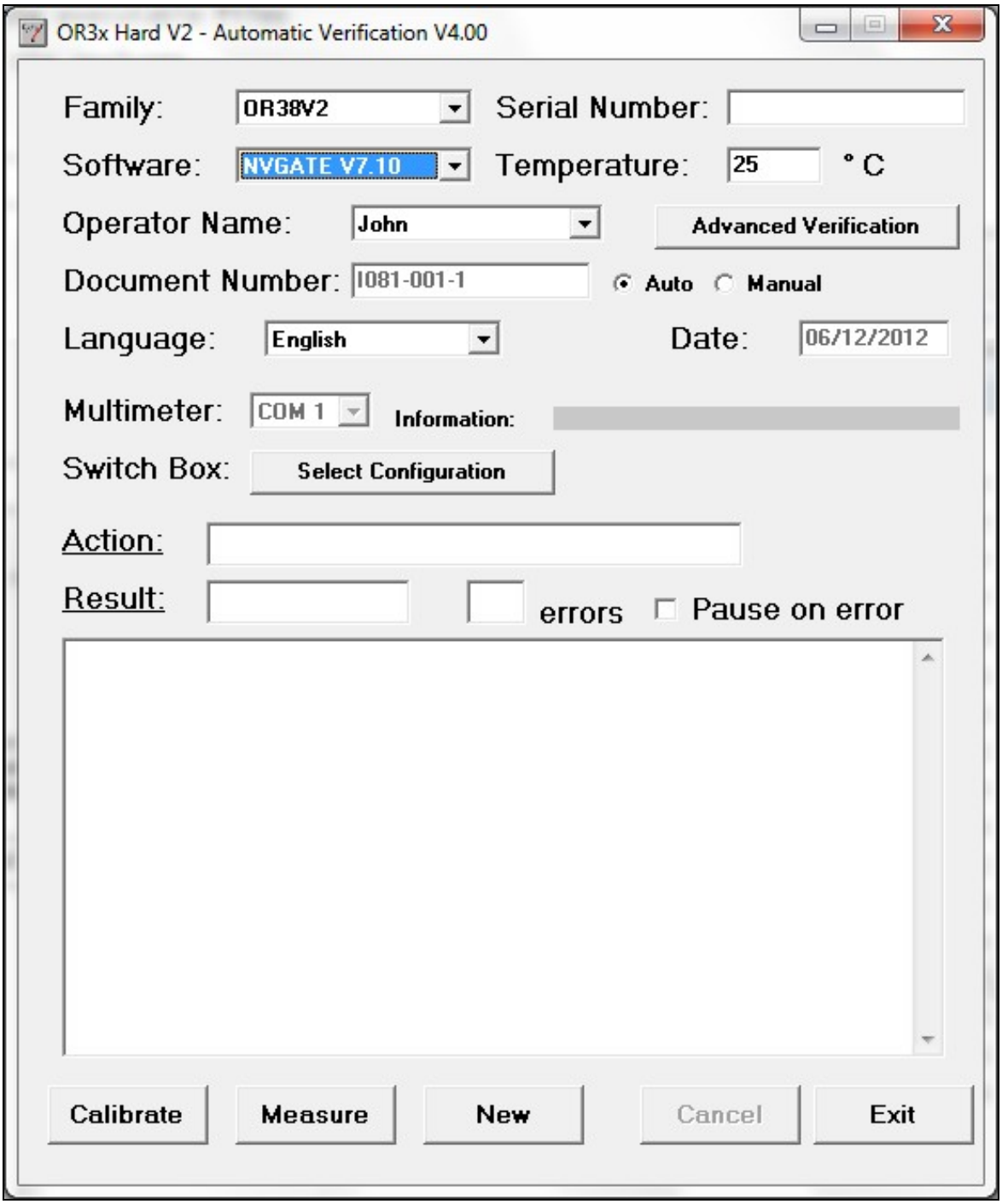
So, modify these fields in consequence and/or manually create corresponding directory.

- Create a shortcut for "OR3X V2 Auto Verification.exe" program on the desktop:



27.3.6.5 Test

Click on this icon to display the interface:


OR3x Hard V2 - Automatic Verification V4.00
Family:
OR38V2
Serial Number:
Software:
NVGATE V7.10
Temperature:
25
° C
Operator Name:
John
Advanced Verification
Document Number:
I081-001-1
Auto
Manual
Language:
English
Date:
06/12/2012
Multimeter:
COM 1
Information:
Switch Box:
Select Configuration
Action:
Result:
errors
Pause on error
Calibrate
Measure
New
Cancel
Exit

If you want to thoroughly test this program, please see its User Manual.

27.4 Annexes

27.4.1 Compatibility chart

It is advisable to always be up to date with OROS tools, as some limitations can appear with former ones.

The following chart gives an overview of compatibility limitation in regards to the tools versioning.

OR3X Hardware, V1 type

(OR34 or OR35 or OR36 or OR38)

Tool	NVGate version compatibility	Switch Box Parallel (16 Channels)	Switch Box USB (32 Channels)
OR3x Maintenance Tool V5.51	? V6.00	YES	NO
OR3x Maintenance Tool V6.0	? V6.70	YES	YES
OR3x Maintenance Tool V7.0	? V7.10	YES	YES
OR3x Automatic Verification V5.42	? V6.00	YES	NO
OR3x Automatic Verification V6.0	? V6.70	YES	YES
OR3x Automatic Verification V7.0	? V7.10	YES	YES

OR3X Hardware, V2 type

(OR36 V2 or OR38 V2)

Tool	NVGate version compatibility	Switch Box Parallel (16 Channels)	Switch Box USB (32 Channels)
OR3x Maintenance Tool V4.0	? V7.10	YES	YES
OR3x Automatic Verification V4.0	? V7.10	YES	YES

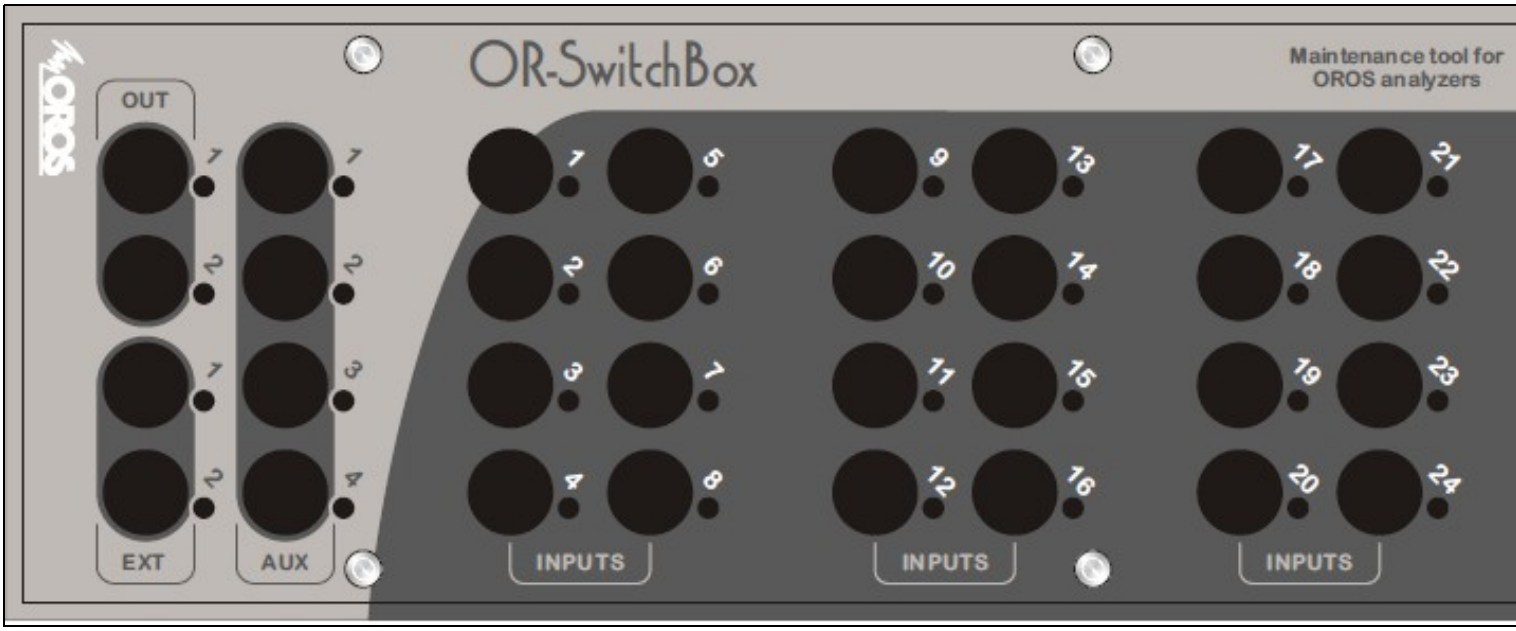
Current versions (December 2012)

Current Tool version for	OR3x V1 type	OR3x V2 type
OR3x Maintenance Tool	V7.0	V7.0
OR3x Automatic Verification	V4.0	V4.0
NVGate	V8.0	V8.0

27.4.2 Switch Box (USB) connections

This blue switch box can handle all connection at the same time.

If you are testing a 32 channels analyzer and/or auxiliaries options, you will have to connect all cables at once.



27.5 OROS Support Team

To contact the OROS Support Team:

Email : customer.care@oros.com

Phone = 00 33 4 76 90 52 40 |

They will provide you help to make effective use of these tools.

If required, they can take advantage of a TeamViewer session to access advanced operation or update tools.

28 Introduction



This .pdf Manual is an offline version of the NVGate official wiki documentation.

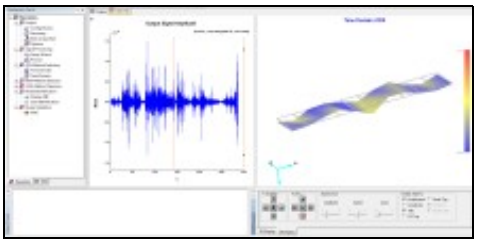
If you are connected to the internet, we advise you to use the online version. The online version can be found here: https://wiki.oros.com/wiki/index.php/NVGate

If you do not have Internet access, this .pdf contains all of the NVGate wiki articles. Articles are listed alphabetically.

For beginners, we advise you to start with: "NVGate Software overview".

29 Modal

Modal Software



Developer	Oros SA
Type	Modal Analysis, Structural dynamics, Data Acquisition, Modal testing, Vibration, Frequency response
First release	2003
Latest Version	V5.9 (2024)
Download	Download Here
Operating system:	Windows 10 & 11 (PC Requirements)
Language	English, Chinese
Official website	oros.com

29.1 Overview

OROS Modal is a high-performance software dedicated to structural dynamics. It allows engineers to identify the dynamic characteristics of structures through Modal Analysis (EMA/OMA) and Operating Deflection Shapes (ODS).

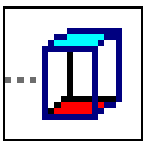
Complete Workflow
From geometry definition to final parameter identification in a seamless environment.

Ease of Use
Intuitive interface designed by and for experimentalists to minimize setup time.

High Accuracy
State-of-the-art algorithms for precise damping and frequency estimation.

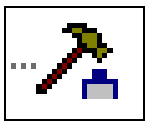
Native Integration
Fully compatible with OROS analyzers for real-time and post-analysis sync.

29.2 Software Modules



Geometry

Define your structure with nodes, lines, and surfaces.



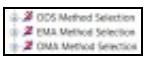
Acquisition

Setup channels, impact hammer, or shaker tests.



Processing

Frequency Response Functions (FRF) and Coherence.



Identification

Extract Modal Parameters: EMA, OMA, and ODS.



Validation

MAC and COMAC for model validation and comparison.



Import / Export

Universal file formats (UFF), Excel, and reporting.

29.3 Resources

29.3.1 Learning & Support

- **First Steps Guide** - Getting started with OROS Modal.
- **Tutorials** - Hands-on exercises and case studies.
- **ODS Tutorial** - Learning Operating Deflection Shapes.
- **Keyboard Shortcuts** - Improve your productivity.
- **Theoretical FAQ** - Deep dive into modal theory.

29.3.2 Technical Notes

- Algorithm Comparison: Comparison of identification methods inside Modal.
- MIF Information: Mode Indicator Function details.

29.4 Installation

Access the latest version and installation guides: **Download & Install Modal**

29.5 Video Tutorials

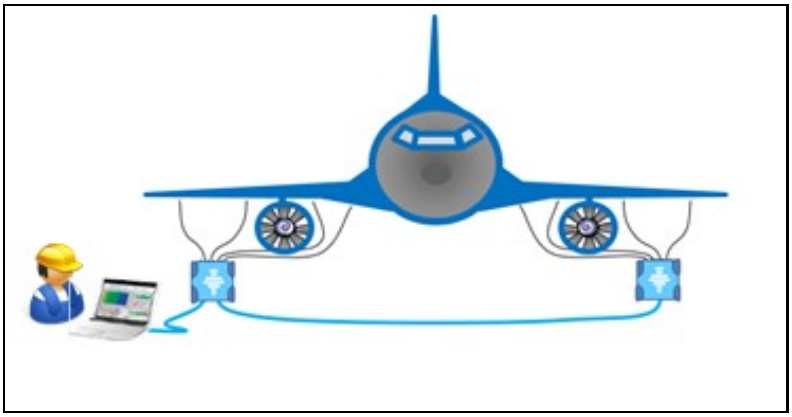
30 Modal Data Acquisition

30.1 Data acquisition

Data acquisition is a critical step for modal analysis: without correct data, no exploitable results. Thanks to the direct acquisition implemented in Modal, enjoy the Teamwork analyzers power and accuracy with a dedicated interface for structural acquisition. The interface works with the different excitation modes: impact hammer, shaker, operating excitation.



To excite a large structure, up to 6 shakers per analyzers can receive signals from generators outputs. In order to fit the wide range of potential cases, the complete series of excitation signals from random, chirp, swept sine, stepped sine to normal modes can be generated.



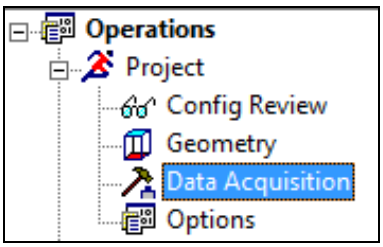
For high channel count applications, Teamwork technology cascades several analyzers together to acquire simultaneously hundreds of channels. Teamwork instruments guarantee an efficient instrumentation thanks to the different possible configuration.



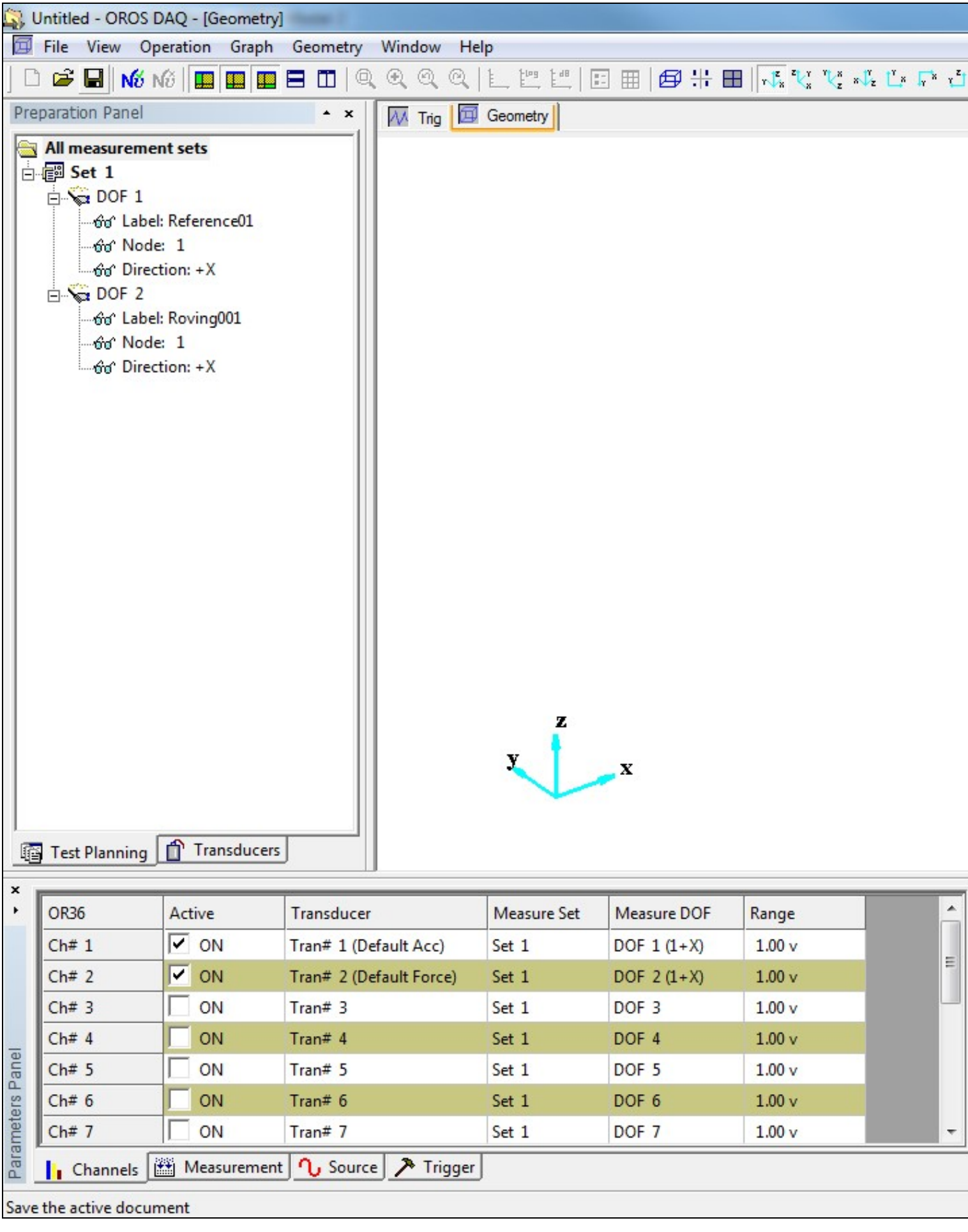
For example, this flexibility allows to highly reduce the cable length by distributing the instruments along the structure under test.

The direct data acquisition (DAQ) module is available in Modal, which enables you to complete a modal test easily and quickly.

Launch the DAQ by clicking the "Data Acquisition" item, shown as the following.



Then the geometry modeled in Modal will be transferred to DAQ automatically.

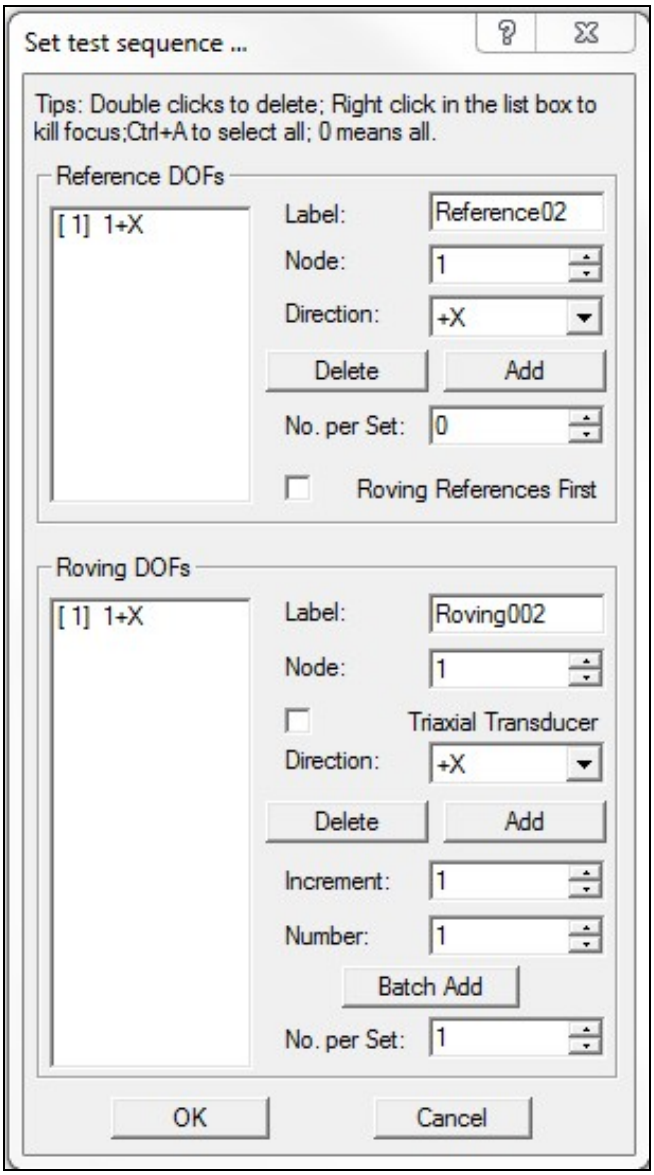

Untitled - OROS DAQ - [Geometry]
File View Operation Graph Geometry Window Help
Preparation Panel
All measurement sets
Set 1
DOF 1
Label: Reference01
Node: 1
Direction: +X
DOF 2
Label: Roving001
Node: 1
Direction: +X
Test Planning
Transducers
Trig
Geometry
z
y
x
OR36 | Active | Transducer | Measure Set | Measure DOF | Range
Ch# 1 | ON | Tran# 1 (Default Acc) | Set 1 | DOF 1 (1+X) | 1.00 v
Ch# 2 | ON | Tran# 2 (Default Force) | Set 1 | DOF 2 (1+X) | 1.00 v
Ch# 3 | ON | Tran# 3 | Set 1 | DOF 3 | 1.00 v
Ch# 4 | ON | Tran# 4 | Set 1 | DOF 4 | 1.00 v
Ch# 5 | ON | Tran# 5 | Set 1 | DOF 5 | 1.00 v
Ch# 6 | ON | Tran# 6 | Set 1 | DOF 6 | 1.00 v
Ch# 7 | ON | Tran# 7 | Set 1 | DOF 7 | 1.00 v
Parameters Panel
Channels
Measurement
Source
Trigger
Save the active document

To perform a complete modal acquisition, follow the different steps described here.

30.1.1 Test planning

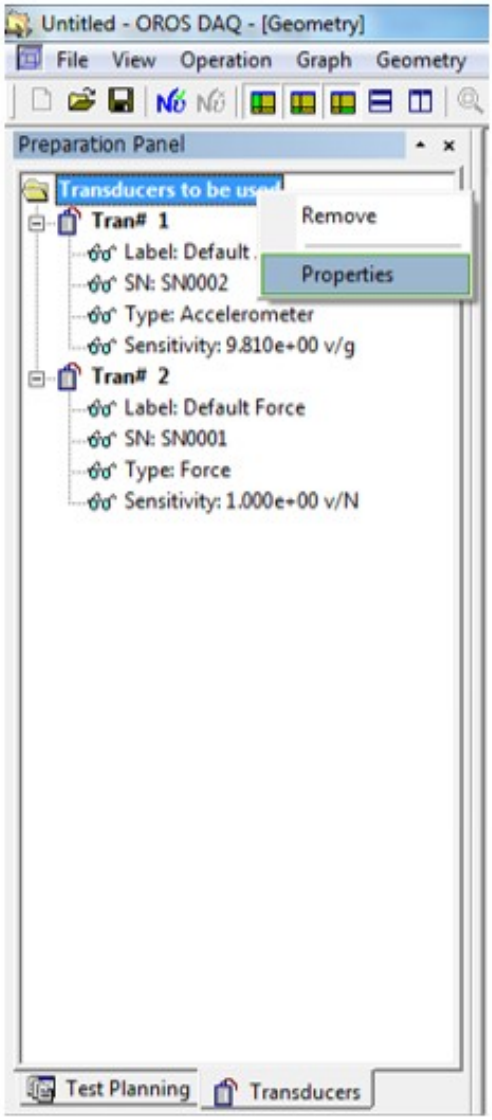
In the preparation panel, set the test planning.

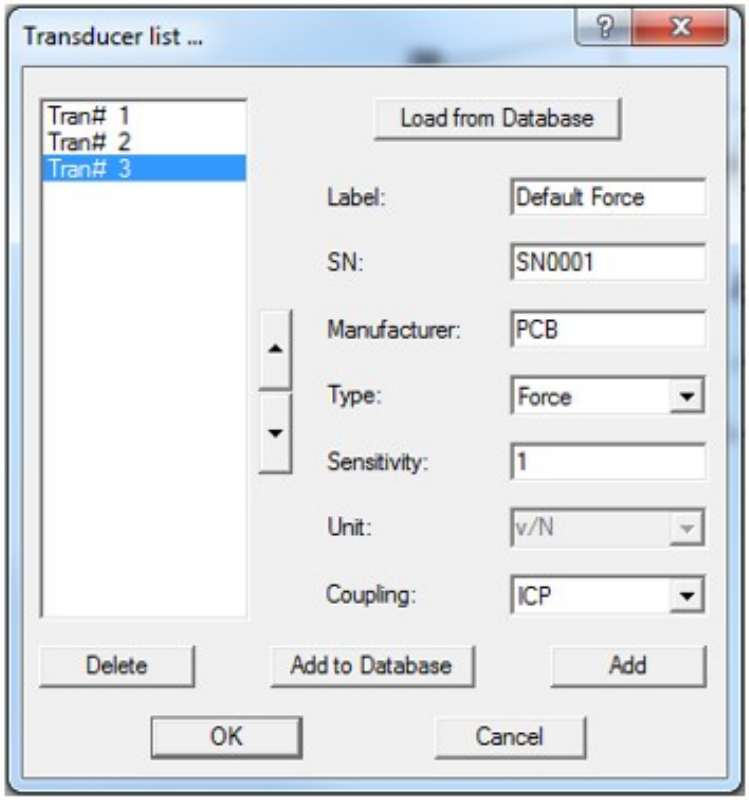




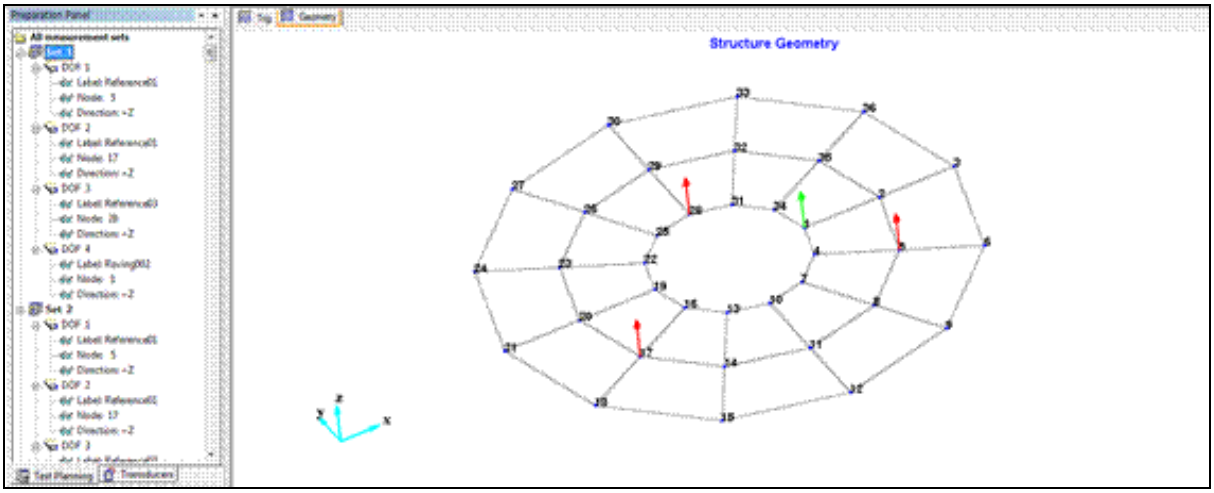
30.1.2 Transducers definition

Set the transducer list in the ?Transducers? page of Preparation Pane. Note to select the correct transducer type and fill the correct sensitivity.





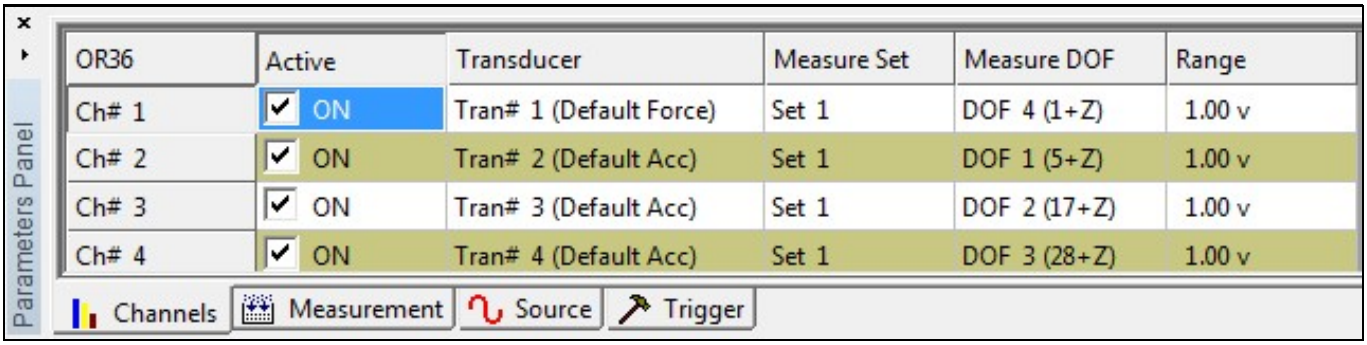
Check the different mesurements directly on the geometry



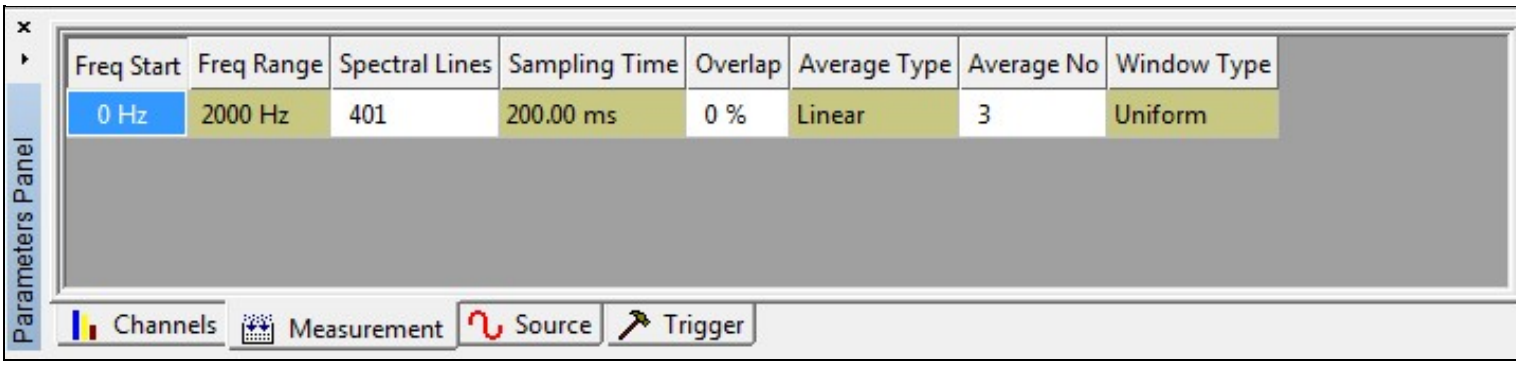
The references are displayed in red and the roving DOFs in green.

30.1.3 Measurement parameters setup

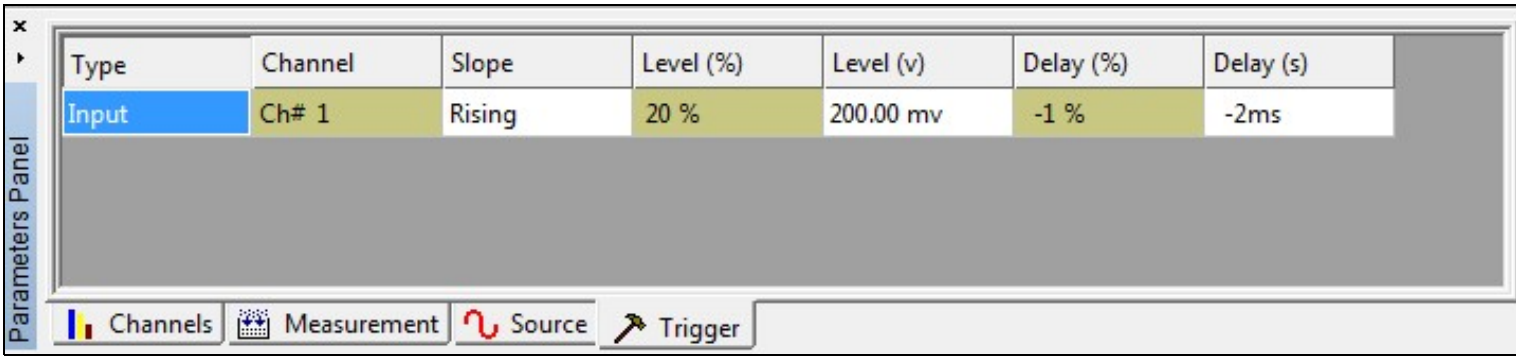
- Parameters Panel->Channel: set range for each active channel; match them to the corresponding measurement DOFs and transducers.



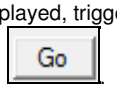
- Parameters Panel->Measurement: set the frequency range, spectral lines, average number, and window type.

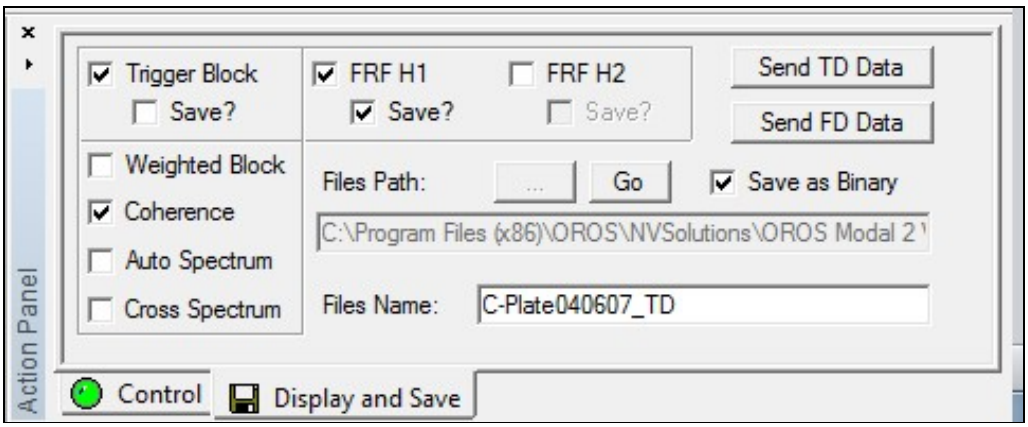


- Parameters Panel->Trigger



30.1.4 Display ans save options

Action Panel->Display and Save: set the data blocks you want to display and export. As the following graph, trigger block, FRF H1, and coherence will be displayed, trigger block and FRF H1 will be exported in the Binary UFF format. You can go to this data storage directory to check files by pressing button 

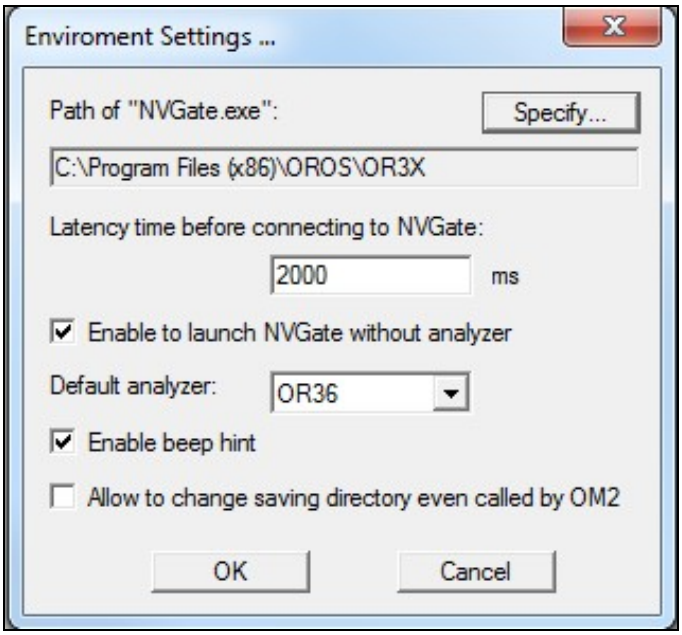


30.1.5 Analyzer connection

Click the button on the toolbar showed as the following to lunch NVGate and connect to it. During this process, you may be asked to operate the wizard of NVGate. You should confirm that the NVGate has been launched successfully before pressing the ?OK? button.



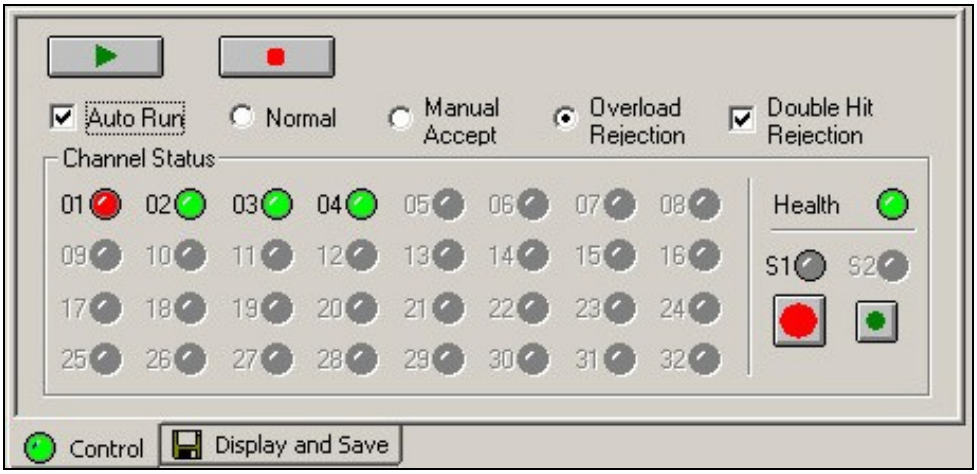
If necessary, you may need to set the environment parameters of DAQ by the menu of ?Operation?->?Environment setting?. Please refer to the online help of DAQ for more details



Note that for acquisition with several synchronized analyzers, NVGate V10 minimum is required.

30.1.6 Acquisition control

Control Panel->Control: press  to begin the measurement,  to pause, and  to stop. If the ?Auto Run? option is checked, the measurement sets will be executed automatically one by one, you don?t need to press the button  after one measurement set is finished. ?Normal?, ?Manual Accept? and ?Overload Rejection? are different modes to accept the triggered data. You can also set ?Double Hit Rejection? to reject the continuous hits when performing a hammer impact test to get better measurement quality.



Health: if overload or double hit happens, then Health LED becomes red.

When the acquisition is completed, press the button of 

or 

to transfer the data to the Modal main interface and start the modal identification.

31 Modal First steps

Modal test and analysis is used to determine the engineering structures? modal parameters, such as modal frequencies, damping ratios, and mode shapes. The measured excitation and response (or only response) data are utilized in modal analysis, and then dynamic signal analysis and modal parameters identification are processed. The modal test and analysis has been developed for more than three decades, and much progresses have been made. It has been widely applied to the engineering filed, such as the dynamic design, manufacture and maintenance, vibration and noise reduction, vibration control, condition monitoring, fault detection, model updating and model validation.

31.1 Operating Deflection Shape

Operating Deflection Shape (ODS) is the simplest way to see how a machine or structure moves during its operation, at a specific frequency or moment in time. There are two types of ODS: time domain ODS (TD ODS) and frequency domain ODS (FD ODS).

TD ODS is based on the multi-channel time history data acquired spatially from a machine or structure. It shows the vibration motion of the machine or structure in a period of time clearly, just like a recorder. You can view a structure?s overall motion, and the motion of one part relative to another. Locations of excessive vibration are easily identified.

FD ODS is based on the frequency response functions (FRFs) or power spectral density functions (PSDs), which can be estimated from multi-channel time history data acquired spatially from a machine or structure. It shows how a structure behaves at a single frequency, helping you to find whether or not a resonance is being excited. In the OROS Modal, you even be allowed to inside the different behaves of repeated frequencies.

31.1.1 Experimental Modal Analysis

In the Experimental Modal Analysis (EMA), the structures are excited by artificial forces, then both the inputs (excitation) and outputs (response) are measured to get the frequency response functions (FRFs) or impulse response functions (IRFs) by digital signal processing. Modal parameters can be identified from FRFs or IRFs by identification algorithms in frequency domain or time domain. EMA tests are usually carried out in the lab, with the advantage of high SNR (Signal to Noise Ratio) and easy to change test status.

EMA identification methods can be classified into time domain (TD) methods and frequency domain (FD) methods according to different identification domain. Also they can be classified into SISO (single input single output), SIMO (single input multiple output), and MIMO (multiple input multiple output) according to different number of input and output.

The FRFs are generally utilized for the EMA in frequency domain, which are estimated from the excitation and response signals. Then the modal parameters are identified by constructing the parametric or nonparametric models of the FRFs and and curve fitting them. While the IRFs are generally utilized for the EMA in time domain, which can be obtained the inverse FFT of FRFs.

Time domain methods are suitable for the global analysis in a broad frequency band, which have good numeric stability. However, there are some limitations too: (1) very difficult to confirm the order of math model, (2) always time consuming, (3) many calculation modes got with the structural modes, and difficult to delete them, (4) many setting and judgment needed, complicated-to-use, (5) not able to taking account of the influence of out-band modes. Contrarily, frequency domain methods are always reliable, rapid, easy-to-use, with the capacity to consider the out-band modes and analysis uneven spaced FRFs, so they are applied widely.

31.1.2 Operational Modal Analysis

Operational Modal Analysis is used for large civil engineering structures, operating machinery or other structures, making use of their output response only. These structures are always loaded by natural loads that cannot easily be controlled and measured, for instance waves loads (offshore structures), wind loads (Buildings) or traffic loads (bridges).

Compared with EMA, OMA has its outstanding advantages. In OMA the structure studied is excited by natural loads instead of some expensive excitation equipments as used in EMA. In fact it is very difficult to excite large structures by artificial means. So OMA is more economic and fast, and endowed by nature with characteristics of multiple-input / multiple-output (MIMO). It could be used to distinguish closely coupled modes. Moreover, all the measured responses come under operational state of structures, and their real dynamic characteristics in operation could be revealed, so OMA is very suitable for health monitoring and damage detection of large-scale structures.

Because there are limited channels and accelerometers in a data acquisition system, you may need to decide how to distribute the many measurement points in several groups, the so-called setups. For each setup you should keep 1 or more accelerators at the same location, which are called reference points. The reference points should be located far away the nodal points of the mode shapes. It is recommended to set 2 or 3 reference points.

31.1.3 Modal software features

- Running on the current mainstream Operating systems: Windows 2000/XP/2003 Server/Vista
- Coding with VC++ language and object oriented programming technique, easy to be maintained and expanded
- Four powerful functions: geometry modeling, project management, dynamic signal processing, and modal analysis
- Convenient data importing interface, not only for time domain signal, but also frequency domain signal
- Direct data acquisition from OR3x series analyzers, performing a modal test easily and rapidly
- Various data format: Modal standard file format, Universal File Format (UFF) and OROS format (res, oxf, or oxl)
- Integrated functions for geometry modeling
    - Import geometry from UFF or IGES files
    - Export geometry to UFF files
    - Create regular 3D geometry objects
    - Create and edit geometry interactively
    - Undo and redo operations for geometry edit
    - Customized geometry library
- Combined with all kinds of data acquisition systems or dynamic signal analyzers to make up advanced modal analysis systems
- Powerful, effective and easy-to-use signal processing based on wizard setting
    - Detrend, decimation and digital filter
    - Customized FFT parameters: FFT length, average times, and overlap percent
    - All kinds of window function: boxcar, hanning, hamming, flattop, exponential, force and so on
    - Power Spectrum Density (PSD) estimation: Auto PSD, Cross PSD, PSD matrix, using Welch?s averaged periodogram technique
    - Single input / multiple output (SIMO) FRF estimation: H1, H2 and Hc methods
    - Multiple input / multiple output (MIMO) FRF estimation with multiple coherence function
    - The signal processing is reversible
- Dealing with not only traditional Experimental Modal Analysis (EMA), but also Operational Modal Analysis (OMA)
- EMA techniques based on both input (excitation force) and output response
    - Select-band SIMO modal analysis technique: SIMO rational fraction orthogonal polynomial (RFOP), to obtain several modes from a selected frequency band by one identification
    - Narrow-band MIMO modal analysis technique, MIMO complex mode indicator function (CMIF), to identify modes one by one
    - Select-band MIMO modal analysis technique: frequency domain poly-reference (FDPR) and MIMO rational fraction orthogonal polynomial (RFPM), to obtain several modes from a selected frequency band by one identification
    - Broad-band MIMO modal analysis technique: EMA broad band frequency domain (EBFD) , to obtain many modes from a broad frequency band by one identification, or even obtain all the modes from the full frequency band by one identification
    - MIMO analysis methods: with capacity to identify heavy close or even repeated modes, ideal methods for experimental modal analysis of large and complicated structures
    - Single reference (SR) and Multiple References (MR) hammer impact modal analysis techniques
- OMA techniques base on output data only
    - Valuable for the large civil engineering structures, operating machinery or other structures which are not easily excited artificially; cheap and fast, without requirement for excitation equipment; able to get the dynamic characters of structures in real operating conditions
    - Narrow-band operational modal analysis technique: frequency spatial domain decomposition (FSDD), to obtain modes one by one from the full output spectrum matrix
    - Narrow-band operational modal analysis technique: complex mode indicator function (CMIF), sharing the same algorithm with EMA Narrow-band, to obtain modes one by one from the half output spectrum matrix
    - Broad-band operational modal analysis technique: OMA broad band frequency domain (OBFD), to obtain many modes from a broad frequency band of the half output spectrum matrix by one identification, or even obtain all the modes from the full frequency band by one identification
- Adopting mode indicator function (MIF) to indicate the existence of structural modes
- Unlimited number of identified modes
- Flexible interface arrangement and various mouse and hotkey operation, thereby greatly improving work efficiency
- Perfect and friendly function for arranging interface, operating and exporting data
    - Multiple language interface: English and Chinese are available, and it?s convenient to develop other language interface
    - Special 2D and 3D graphic control panes, supplemented with other control modes such as mouse, hotkey, and menu operations
    - Flexible 2D curves display and control: showing or hiding gridlines, legends and other components, providing complete measurement information (measurement node, direction, whether driving point or not, and so) of each plot
    - Multiple curve expressions: magnitude (linear, log, and dB coordinate), phase, unwrapped phase, real part, imaginary part, and Nyquist
    - Flexible 3D graphics display and control: showing or hiding node ID, input / output tags, axis and other components, freely translating, zooming and rotating the object

- Top, bottom, left, right, front and back view of 3D objects, rendering in the style of frame lines or surface
- Animation control based on OpenGL: play, stop, previous/next frame, amplitude and speed control functions
- Exporting the modal results to text or graph
- Directly saving all the curves or graphics to BMP or JPG files
- Exporting the mode animation to AVI media files, convenient to generate multimedia presentation

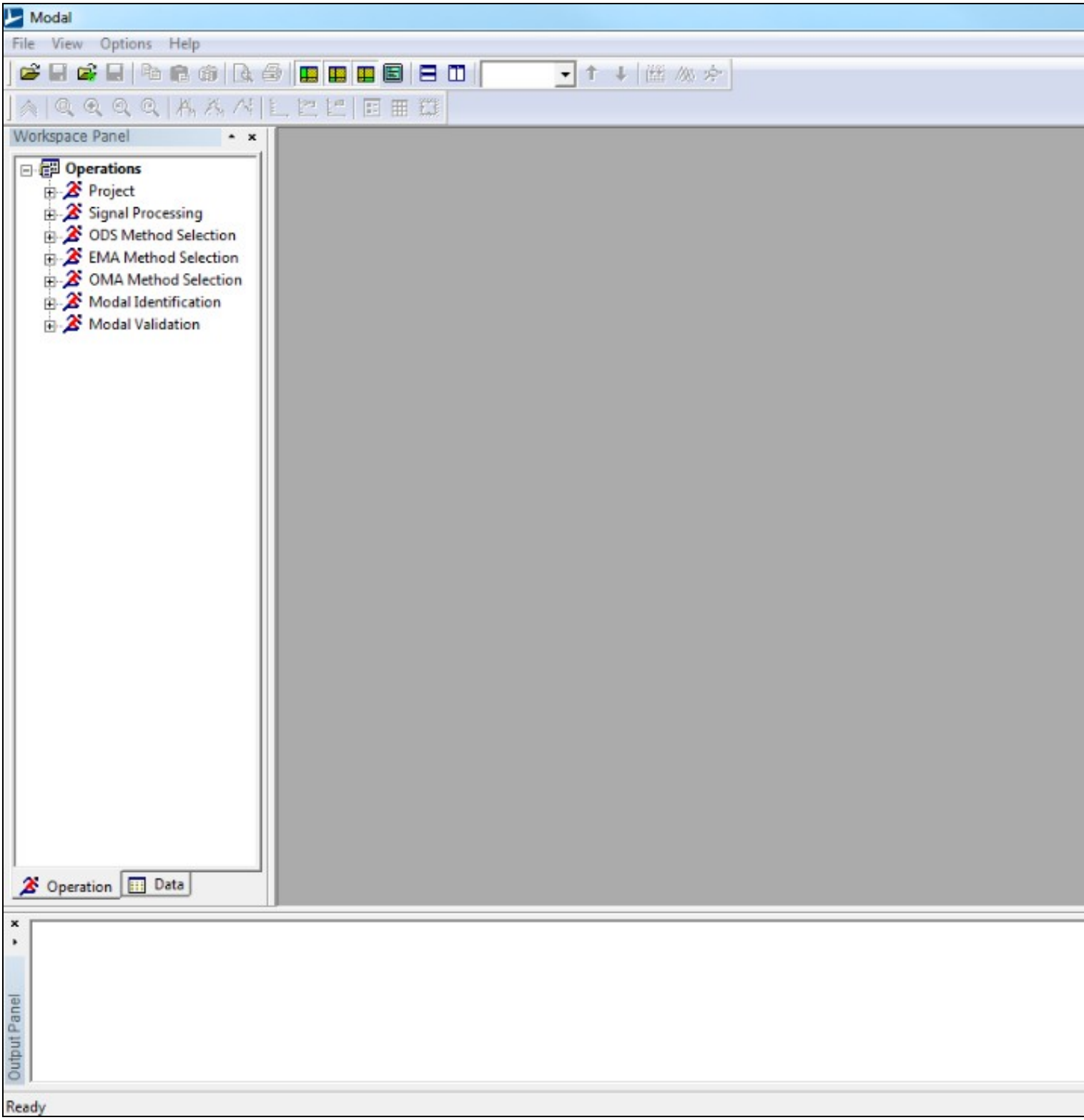
31.2 First steps

31.2.1 Modal software first description

When Modal is launched, the following window appears for a few seconds.



Then the following window is displayed.


Modal
File View Options Help
Workspace Panel
Operations
Project
Signal Processing
ODS Method Selection
EMA Method Selection
OMA Method Selection
Modal Identification
Modal Validation
Operation
Data
Output Panel
Ready

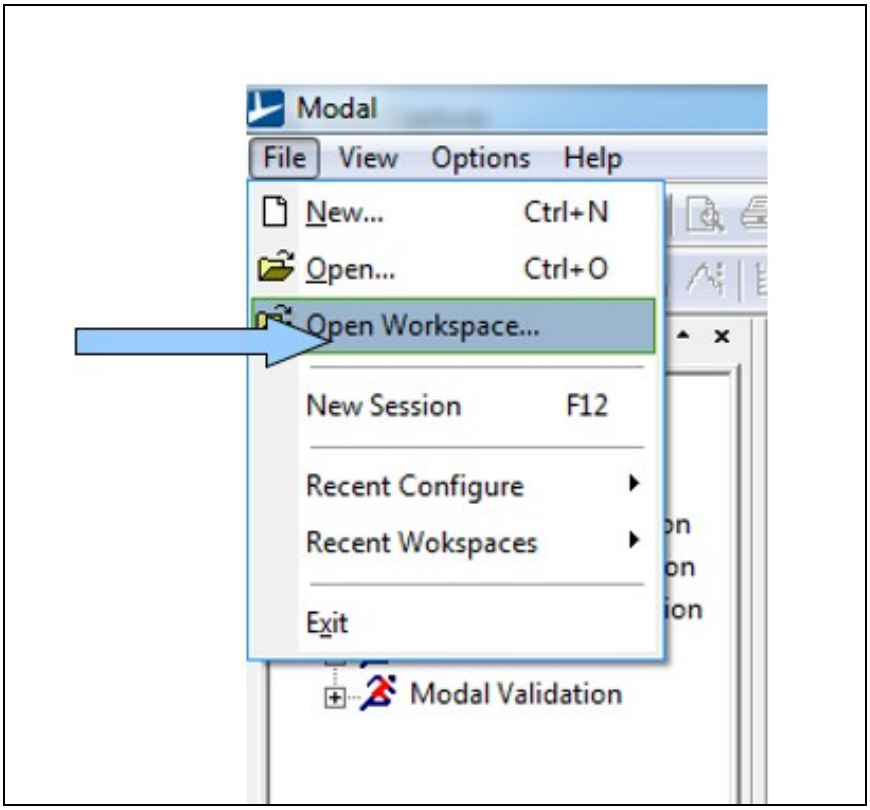
Click on ?file? in the menu toolbar and then click on ?open workspace?.

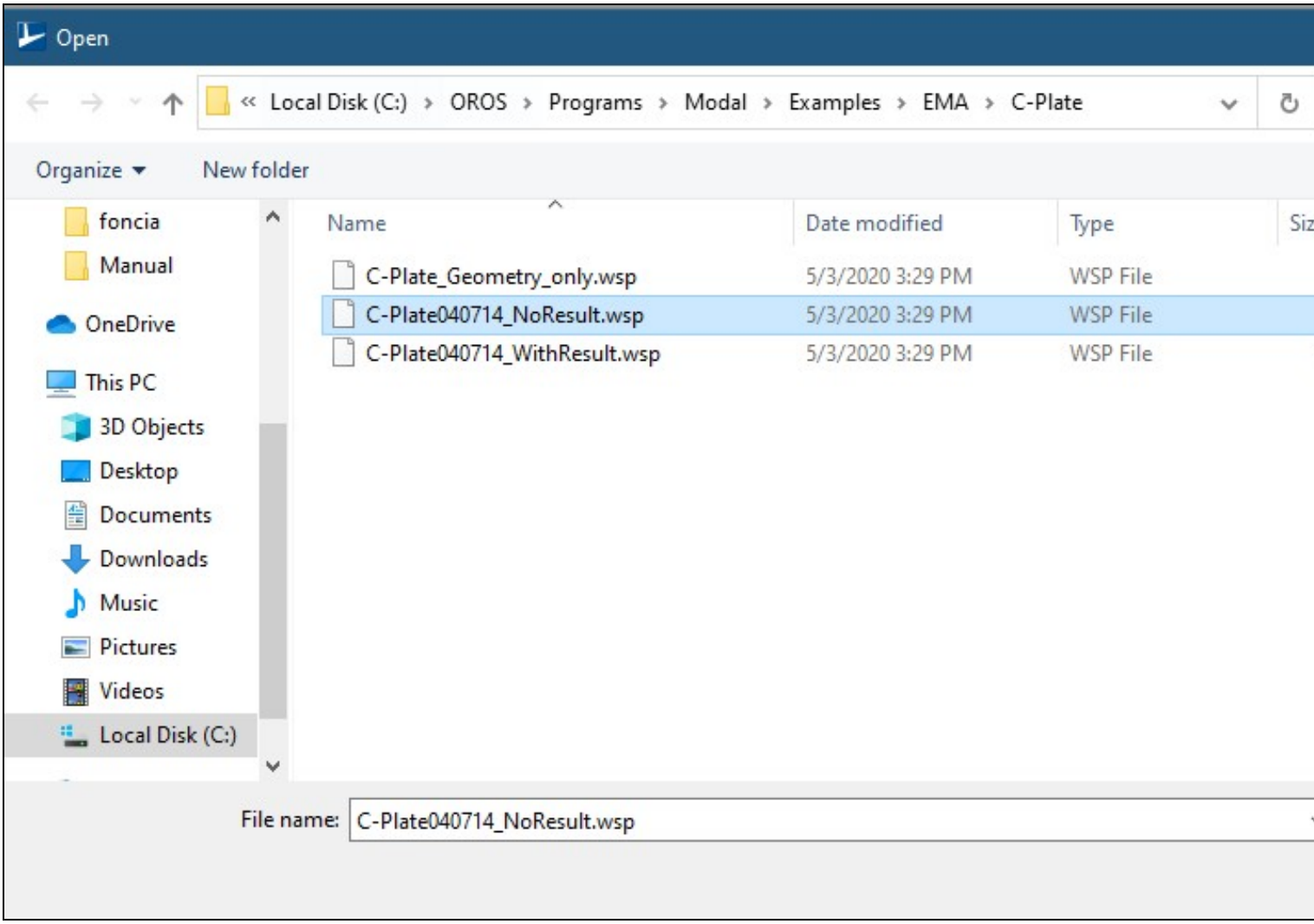
For the first time, you can open one of the existing projects installed in the directory ?C:\OROS\Programs\Modal\Examples?.

There are:

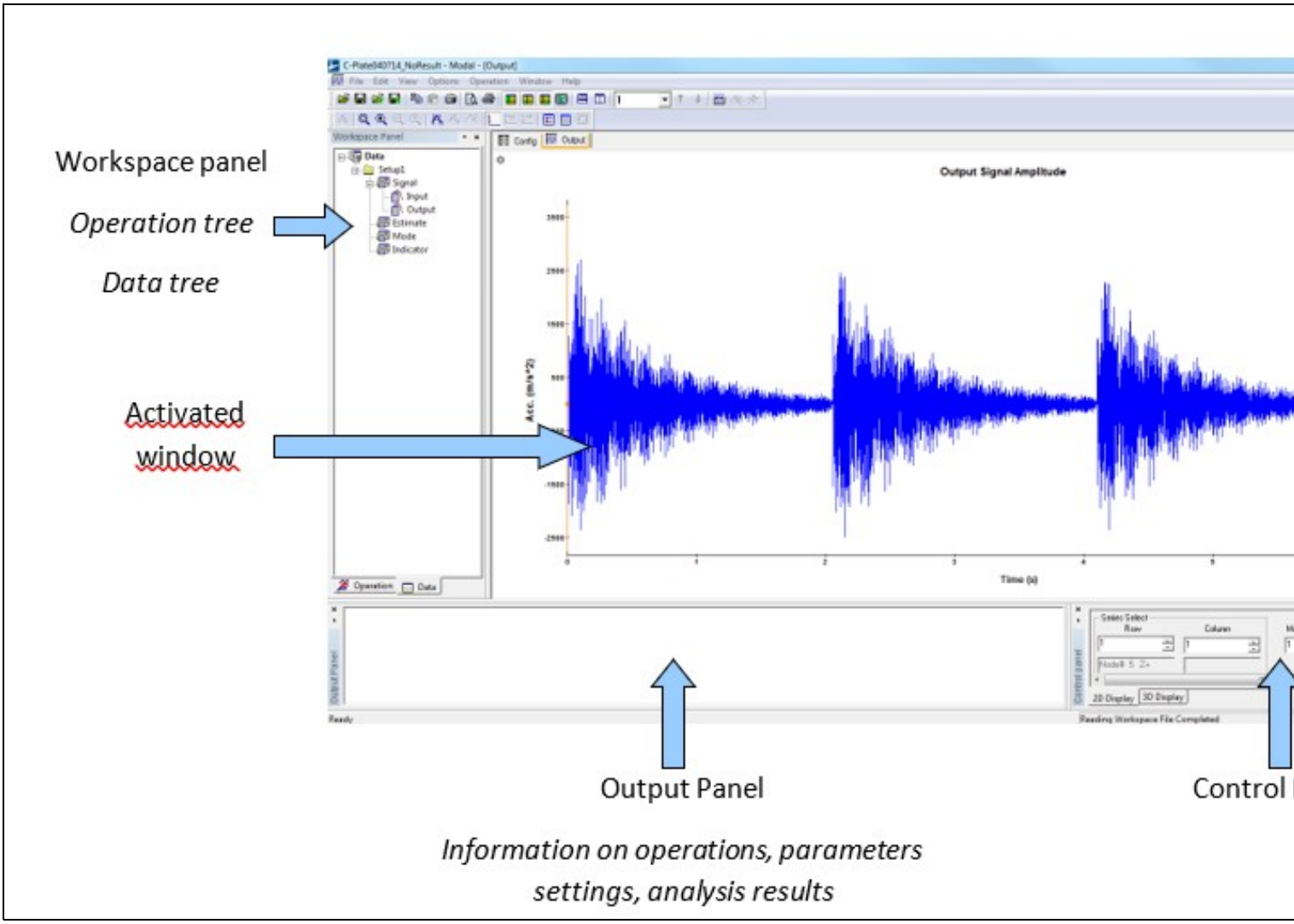
- 4 projects for Experimental Modal Analysis

- 2 projects for Operational Modal Analysis




Open
« Local Disk (C:) › OROS › Programs › Modal › Examples › EMA › C-Plate
Organize
New folder
foncia
Manual
OneDrive
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
Name
Date modified
Type
C-Plate_Geometry_only.wsp
5/3/2020 3:29 PM
WSP File
C-Plate040714_NoResult.wsp
5/3/2020 3:29 PM
WSP File
C-Plate040714_WithResult.wsp
5/3/2020 3:29 PM
WSP File
File name:
C-Plate040714_NoResult.wsp

The main interface of the software is displayed as below, which includes four panels.



Workspace panel contains:

1. 1. an operation tree organized as a wizard to follow the different steps of a modal analysis
   2. a data tree where you can find all the data and results imported or calculated in the opened project.

Activated window can display:

1. 1. 2D windows: time domain data, FRFs estimation, curve-fitting?
   2. 3D windows: geometry, mode shapes.

Output Panel displays the last calculated results.

Control Panel contains different commands and functions respectively useful for 2D and 3D windows.

31.2.2 To know more

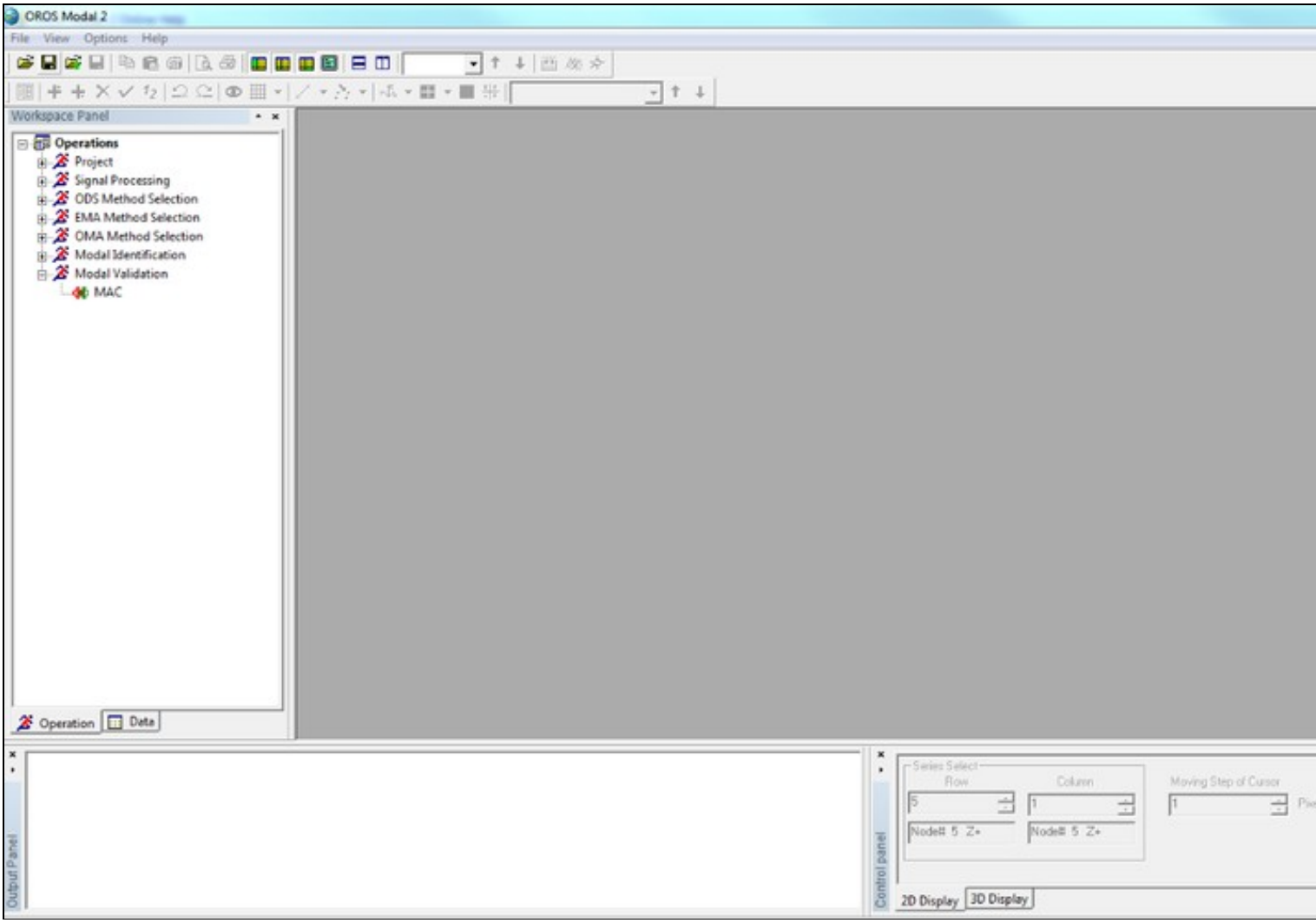
To discover the different functions of this software, please refer to the ?Getting Started Manual? by clicking on "Help -> Getting Started...". You can follow the various steps described in the document to obtain results very quickly.

The online help embedded within the software can help you and also be consulted for all kinds of questions.

31.3 Environment

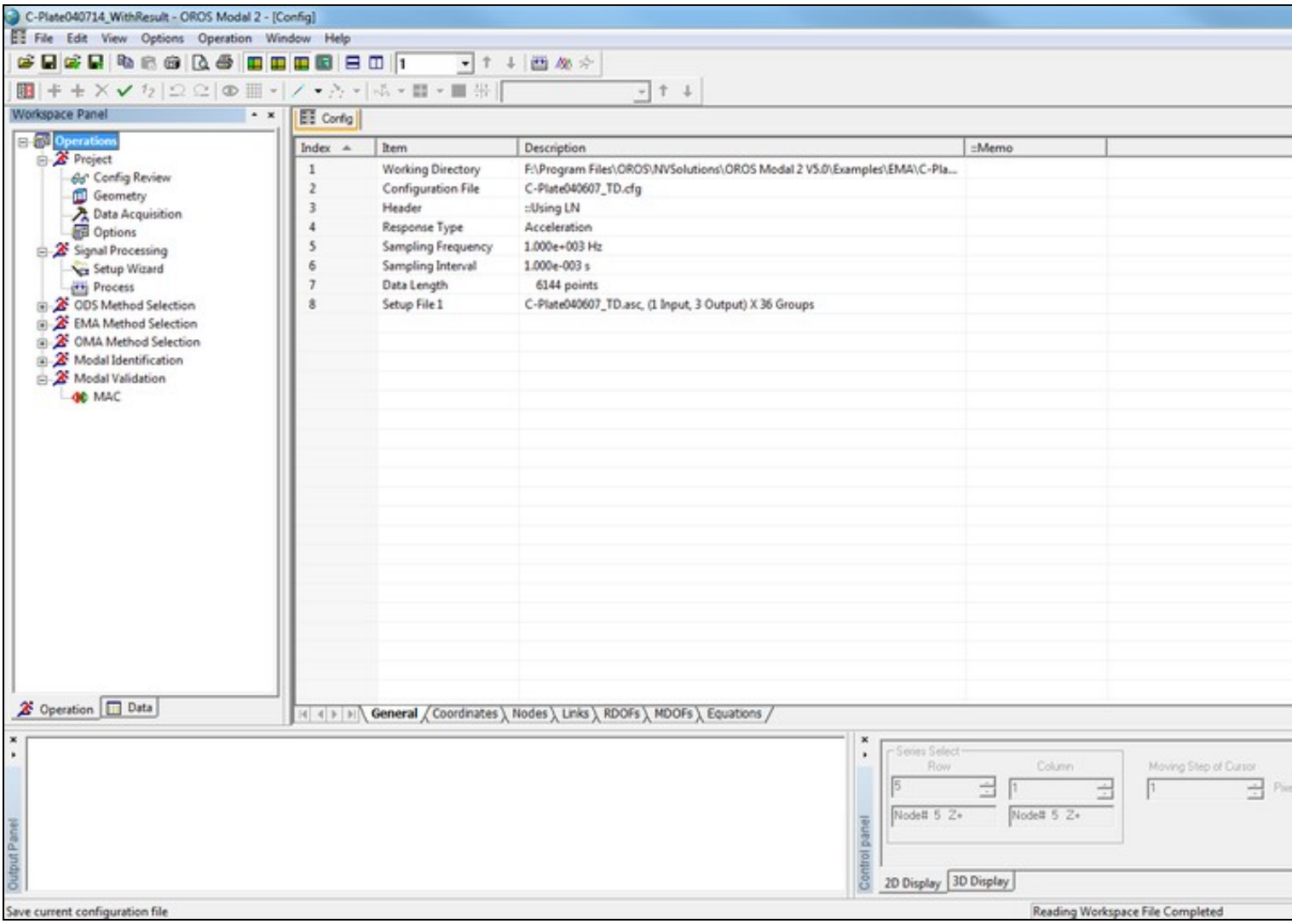
31.3.1 General interface

When Modal is running, the following interface will be displayed.

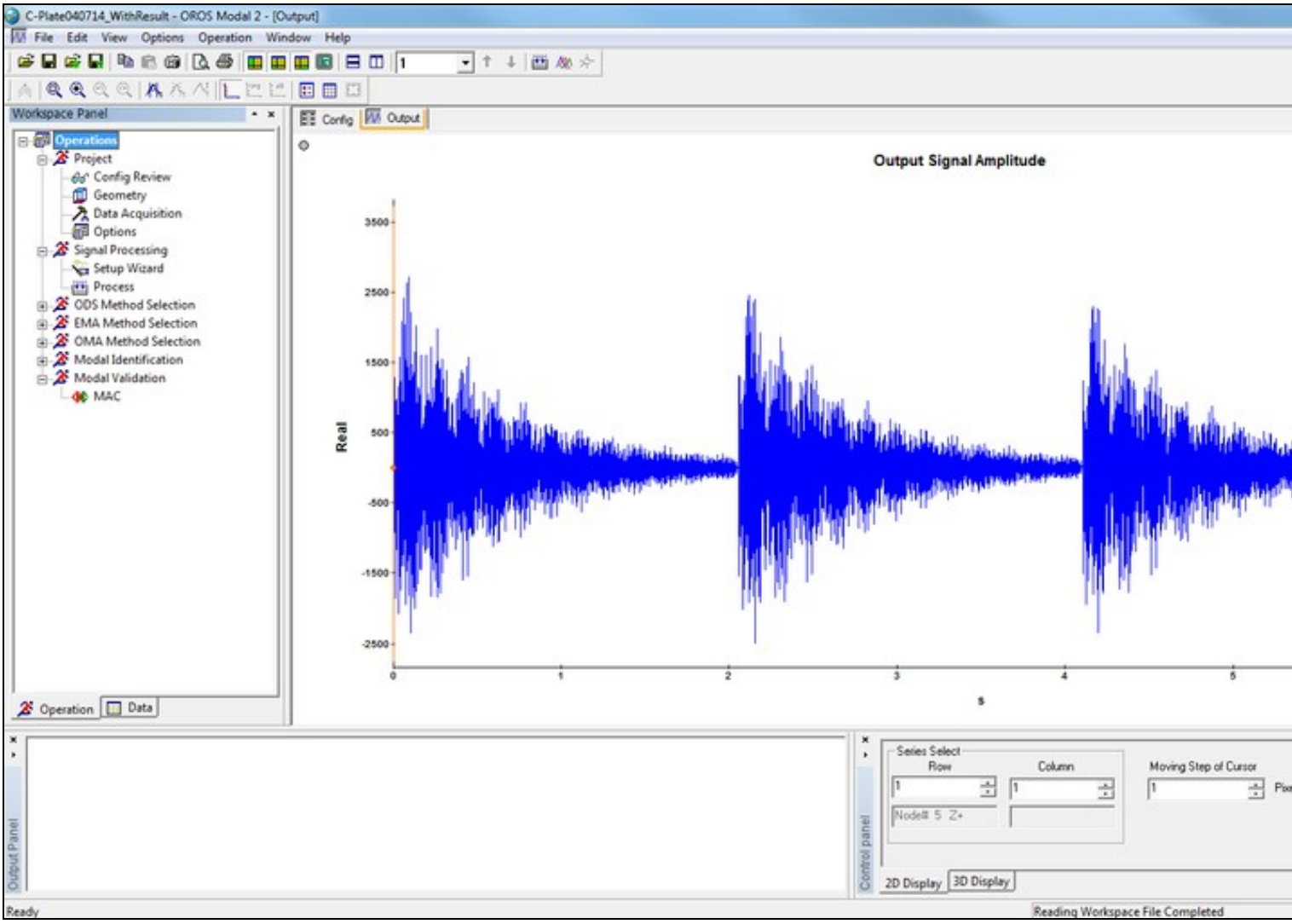

OROS Modal 2
File View Options Help
Workspace Panel
Operations
Project
Signal Processing
ODS Method Selection
EMA Method Selection
OMA Method Selection
Modal Identification
Modal Validation
MAC
Operation
Data
Output Panel
Control panel
Series Select
Row
Column
Moving Step of Cursor
5
1
1
Node# 5 Z+
Node# 5 Z+
2D Display
3D Display

The menus, toolbars, workspace panel, output panel and control panel are listed from top to bottom. The center empty area of the interface is reserved for the main window. The workspace panel, output panel and control panel are generally called shortcut panels. The state bar locates in the bottom of window. The menus? tips, processing bar and its tips are all showed on the state bar.

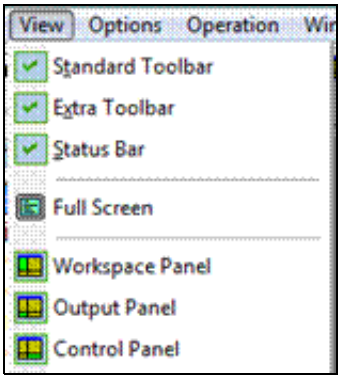
When you create a new configuration file or open a workspace file without measurement data, the ?Config? window will first be shown.



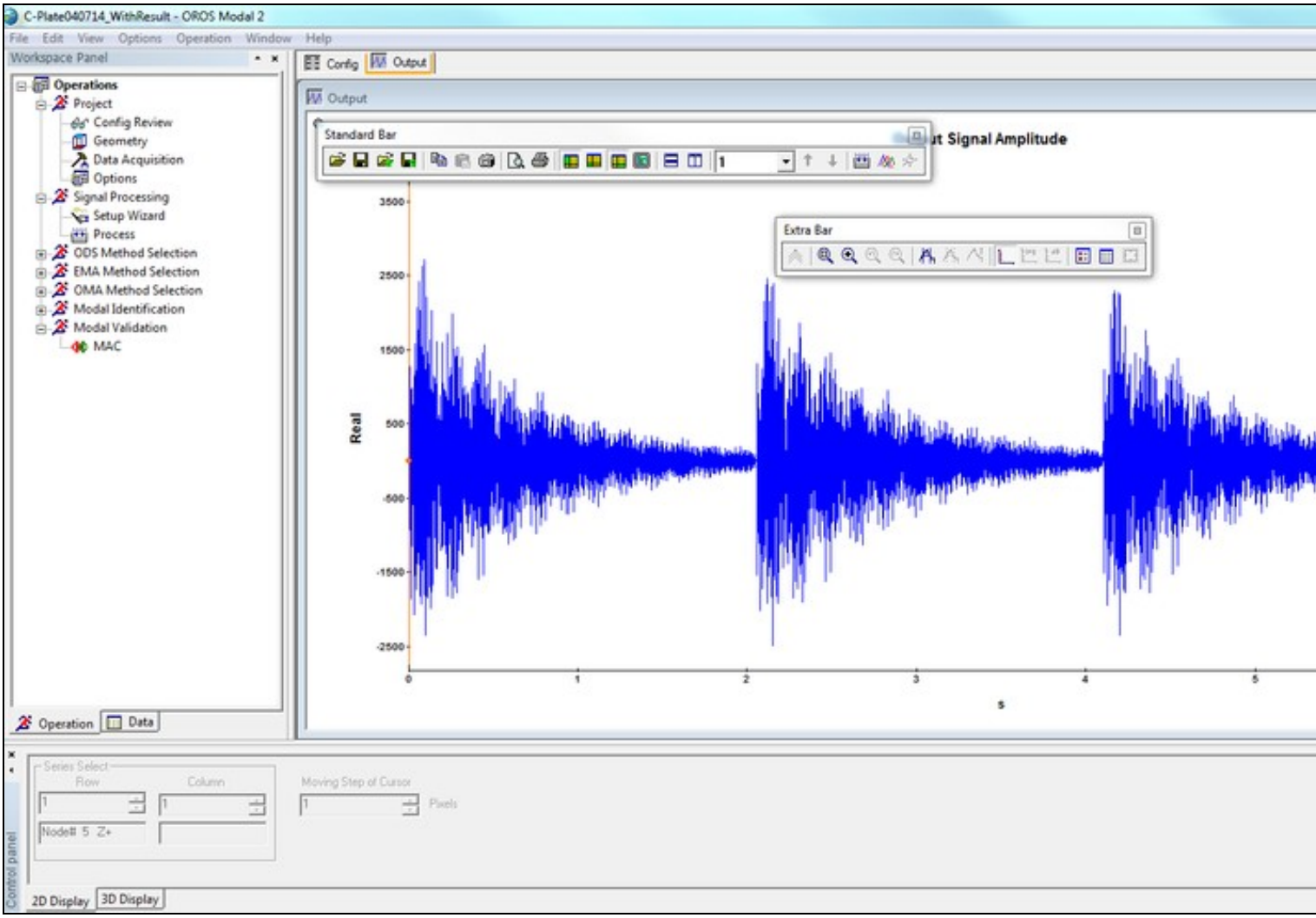
When users open a configuration file or workspace file with measurement data, the ?Output? curve window will first be shown. There are two cursors on the left and right of the window respectively. The red point denotes the closest point to the cursor. The X and Y axes values of the two red points are shown dynamically on the top right corner of the window.



Each part of the interface can be shown or hidden through menu or toolbar operation. Users can also change the size or positions of each part by dragging the mouse.



Besides, all parts of the interface can be arranged to floating style for the purpose of getting more display space.



The software can also remember the adjusted interface style automatically in order to fit users? habits.

32 Modal Geometry

32.1 Geometry modelling

32.1.1 Principle

To begin with the geometry modeling, we should know about three important concepts, i.e. coordinates, nodes and links. A geometry is made up of these three elements.

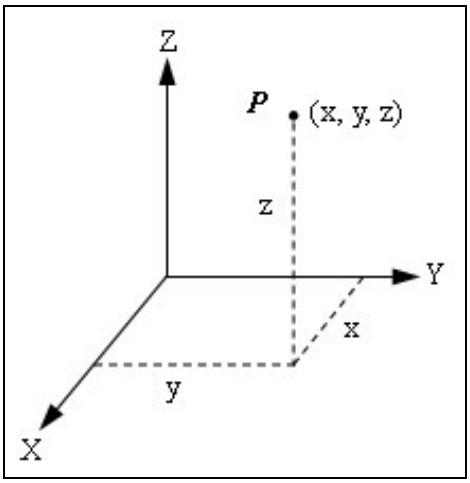
32.1.1.1 Coordinates

32.1.1.1.1 Global and local coordinates

There are two kinds of coordinate systems in Modal, i.e. the global coordinate system and local coordinate system. The global coordinate system which defines the global origin point and global X, Y, and Z axis, is a kind of Cartesian coordinate. The No. of global coordinate system is 0 in Modal. The local coordinate systems are all defined referring to the global coordinate. Three kinds of local coordinate systems are available now, i.e. the Cartesian coordinate, the cylindrical coordinate and the spherical coordinate. You can have only one global coordinate, but many local coordinates. All the coordinates in Modal are defined according to the right-hand rule.

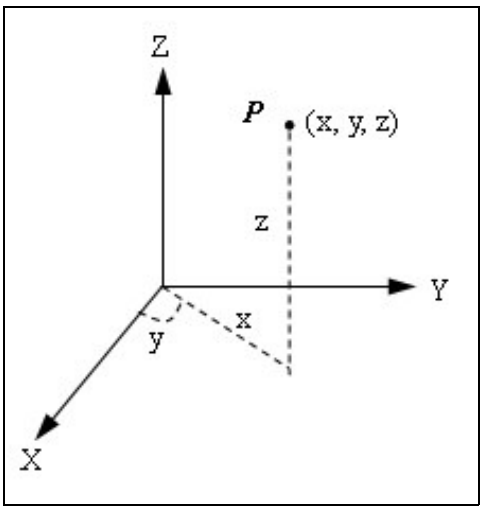
32.1.1.1.2 Cartesian coordinate

To define a point in the Cartesian coordinate system, you need three translations x, y, and z as the following:



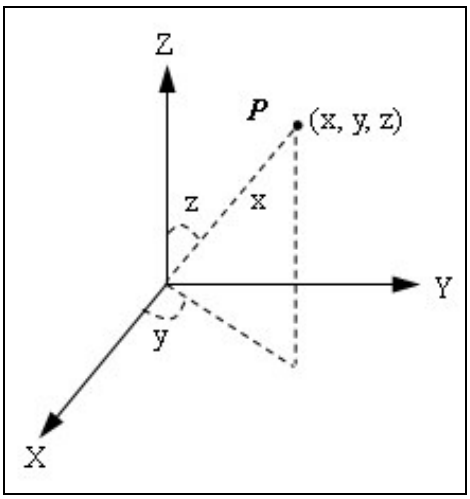
32.1.1.1.3 Cylindrical coordinate

To define a point in the Cylindrical coordinate system, you need radius x, rotation y, and translation z, as the following:



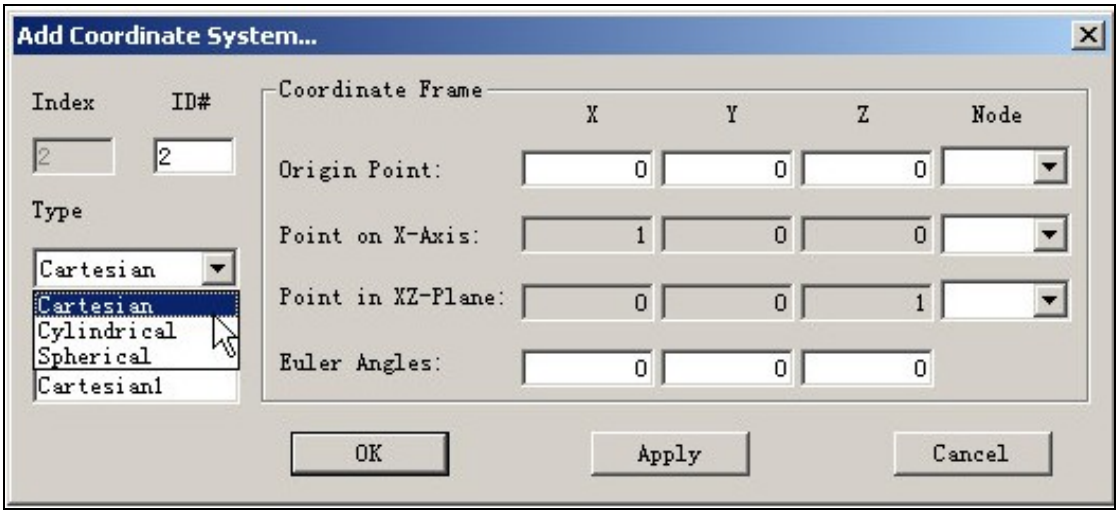
32.1.1.1.4 Spherical coordinate

To define a point in the Spherical coordinate system, you need radius x, rotation y, and rotation z, as the following:

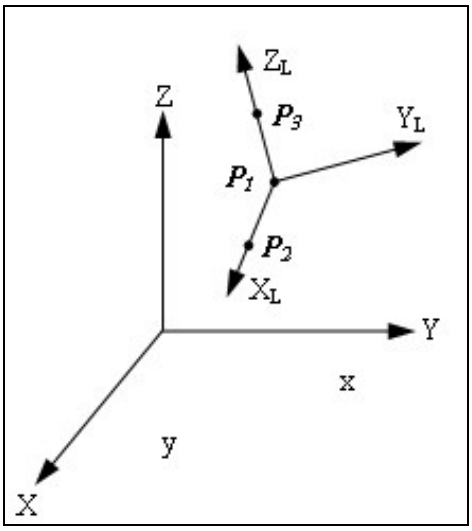


It?s easy to transform between these three coordinate systems.

32.1.1.1.5 Define a coordinate



To define a local coordinate system, you should assign an ID No., select the coordinate type, and specify the position and direction of local coordinate frame. A local coordinate $O_LX_LY_LZ_L$ is always defined referring to the global coordinate *OXYZ*. In Modal, three points are employed to specify the coordinate frame, i.e. the original point P_1, a point P_2 on the X_L aix, and another point P_3 on the X_LZ_L plane. For convenience, the point P_3 is usually selected on the local Z_L axis.



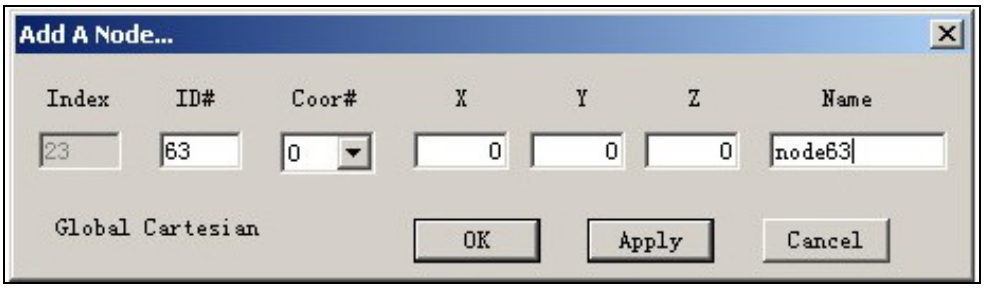
As shown in the above picture: the local X_L axis can be determined by P_1 and P_2; the plane X_L-Z_L can be determined by P_1, P_2, and P_3, thus the Z_L axis can also be obtained; the Y_L axis can then be determined according to the right-hand rule.

You can also define a local coordinate system by the origin point and three Euler angles.

32.1.1.2 Nodes

32.1.1.2.1 Define a node

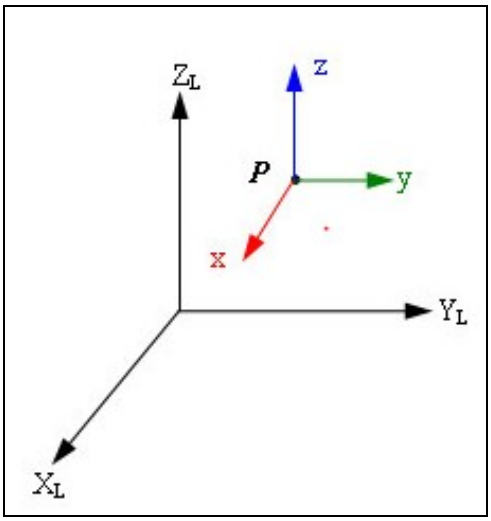
A node must belong to a coordinate, either the global coordinate system or a local coordinate system. Besides the coordinate ID, you still need to specify its No. and x, y, z values.



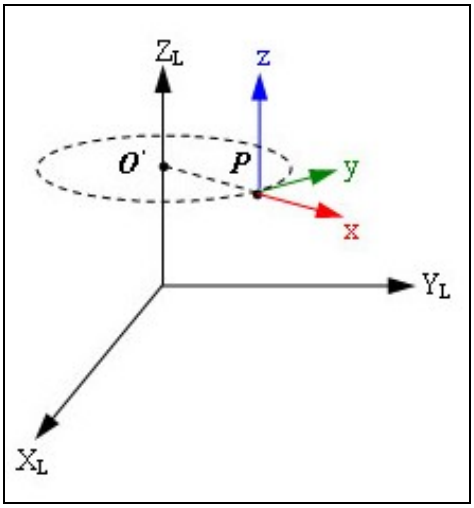
32.1.1.2.2 Directions of a node

In Modal, it?s very important that the directions of a node are defined in the local coordinate system.

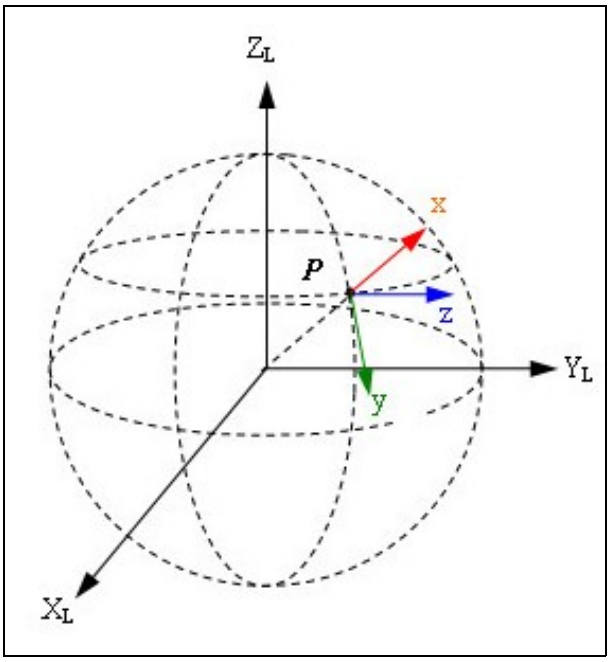
In a local Cartesian coordinate, all the points have the same directions with local axis. These three directions accord with right-hand rule.



In a local cylindrical coordinate: the x direction vector start from the cross point *O*? to node point *P*; the z direction is the same as local Z_L axis; and the y direction is tangential to the circle. These three directions accord with right-hand rule.



In a local spherical coordinate: the x direction vector start from the origin point to node point *P*; the y direction is tangential to the longitude circle; and the z direction is tangential to the latitude circle. These three directions accord with right-hand rule.



32.1.1.3 Links

Two types of link are supported in Modal: lines and polygons.

A line is defined by two nodes. For instance, "3 5" defines a trace line between node 3 and node 5.

A polygon is defined by a sequence of nodes. You are allowed to define a polygon with arbitrary number of nodes, which should be arranged according to the clockwise or anticlockwise direction. For instance, "1 2 3 4 5 6" defines a hexagon.

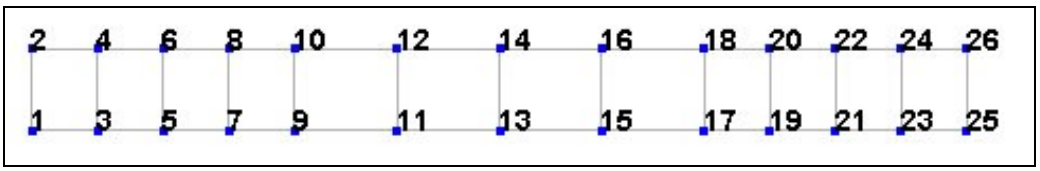
32.1.2 Geometry in Modal software

To build a geometry model in the Modal software, you have three methods at least:

- Use the integrated function for geometry modeling in Modal
- Import geometry from UFF files;
- Create geometry information in the Excel, and then copy and paste them to the "Config" view.

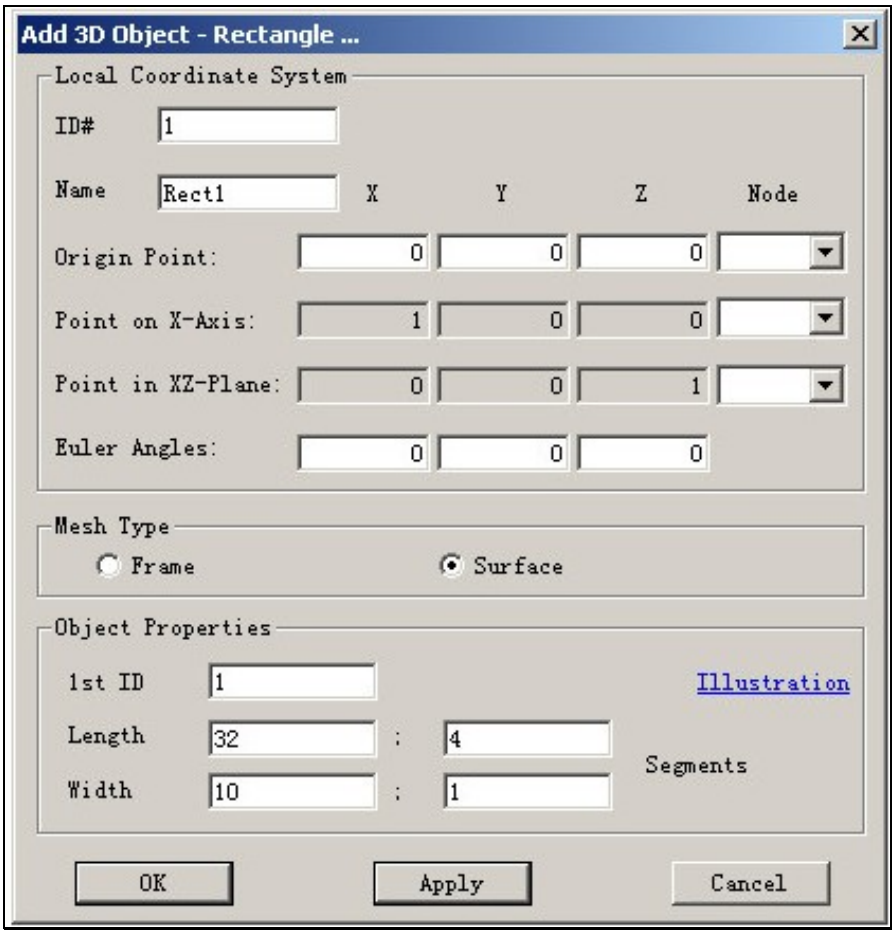
32.1.2.1 geometry modeling illustration

In this section, the process of creating an uneven spaced plate is introduced.

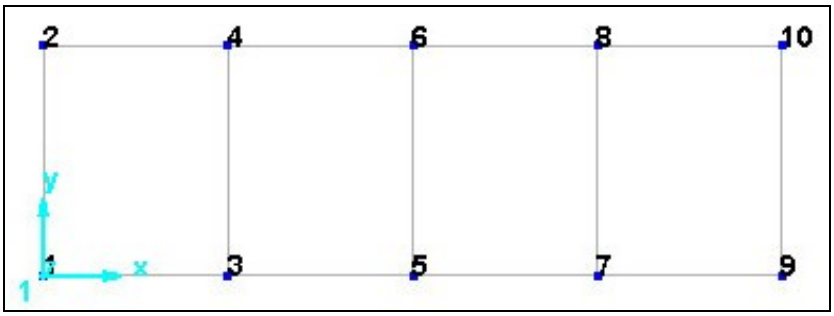


The plate is 10 in width, and 114 in length, which is divided into 12 segments. The first 4 segments (A) and last four segments (C) are evenly distributed with an interval of 8, and the middle 4 segments (B) are evenly distributed with an interval of 12.5. To ensure the nodes numbered continuously, the following steps should be processed:

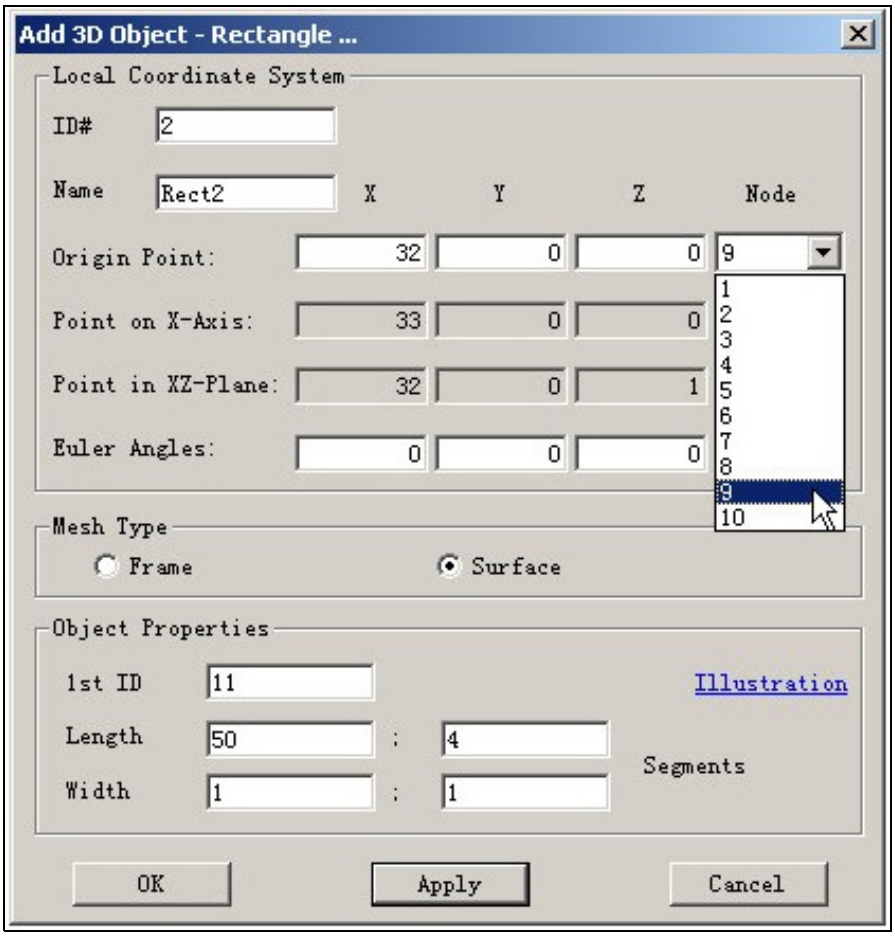
- Segment A. The parameters should be set as below:



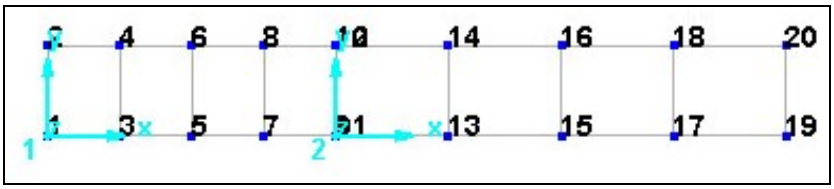
The structure showed as below is got?



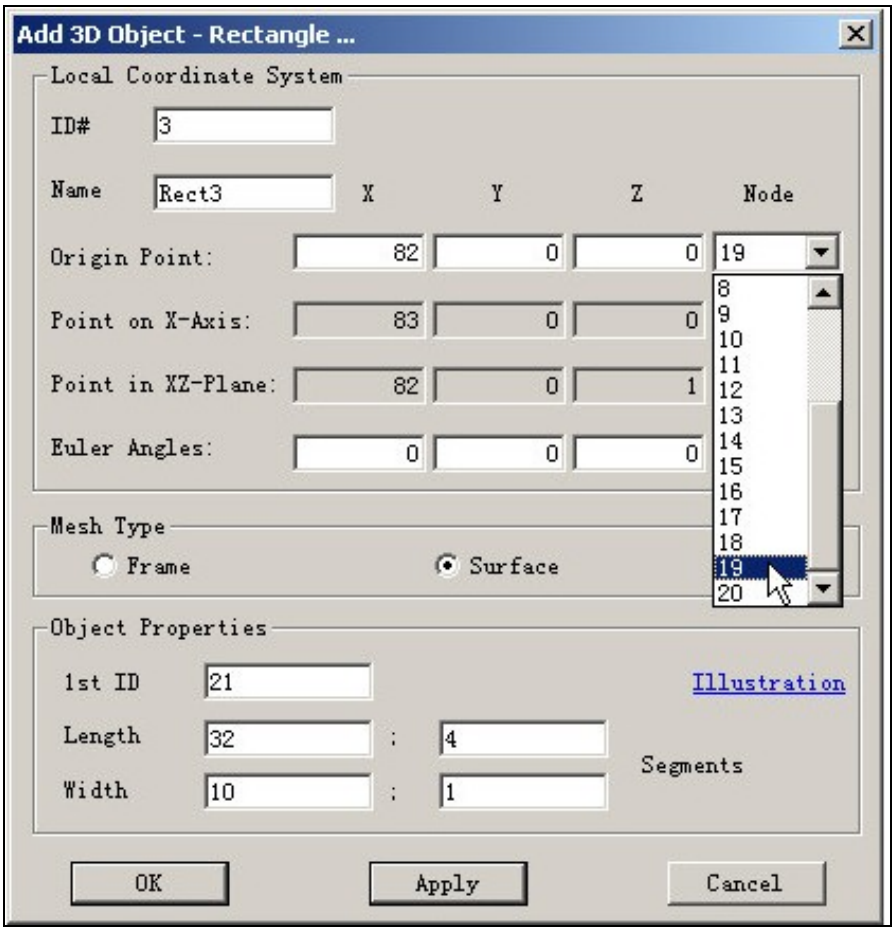
- Segment B. The origin point of segment B should be node 9. The value of Point on X-Axis and Point in XZ-Plane will be changed automatically.

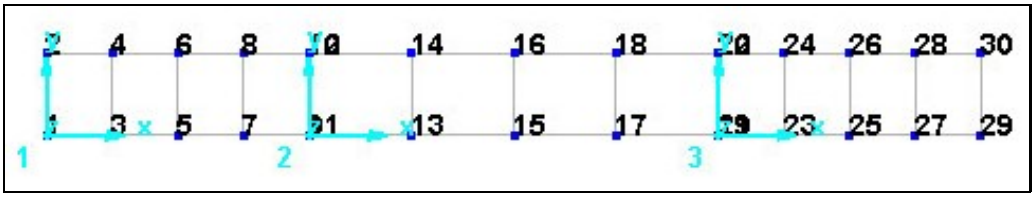


The structure showed as below is got?

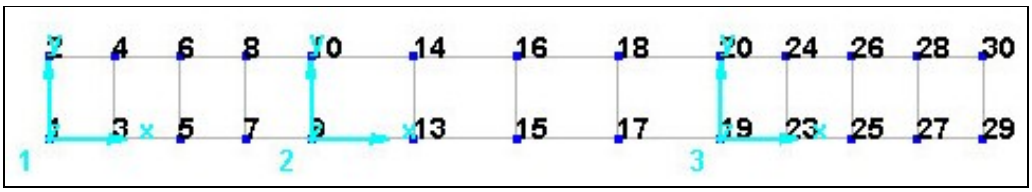


- Segment C. The origin point of segment C should be node 19. The value of Point on X-Axis and Point in XZ-Plane will be changed automatically.

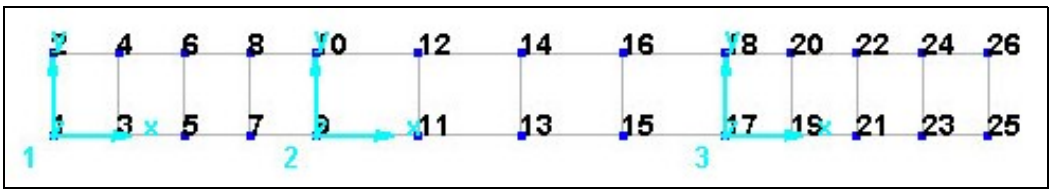




- Note that there are some repeated nodes, for example, node 9 and node 11, node 10 and node 12. Remove all the repeated nodes by pressing the button of "validity check"  .



- Note that the IDs of nodes are not continuous now. Renumber all the nodes in-order by pressing the button  . The task of modeling has been accomplished by now.



32.1.2.2 Basic geometry library

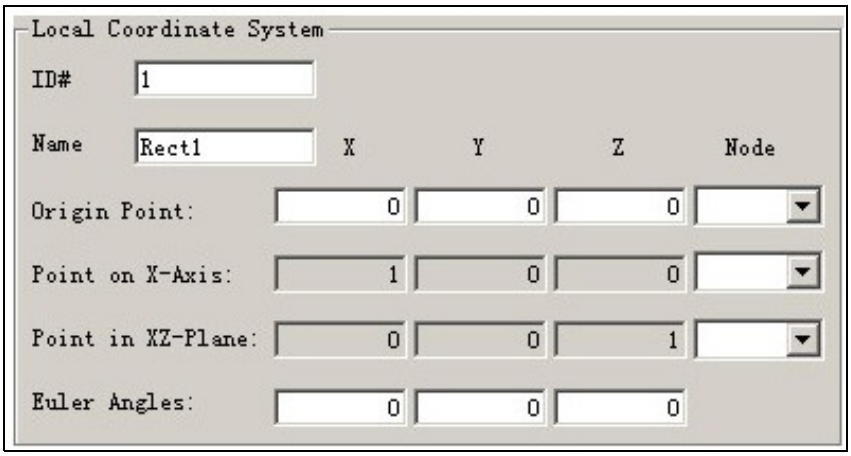
Geometry modeling is realized in the "Config" view or 3D "Geometry" view by operating the relevant toolbar and right click menu. The location, shape, mesh and numbering of a 3D object can be totally specified by setting its local coordinate system, mesh type, first ID and properties. Several internal 3D objects are included in Modal, such as Line Segments, Line, Rectangle, Trapezia, Sector, Elliptic Sector, Cube, Elliptic Cylinder, Cone, and Sphere.

When bundling several 3D objects together, there may exist some repeated nodes, which will lead to some problems. It?s recommended to delete these repeated nodes. You can finish this task conveniently in Modal.

32.1.2.2.1 Local coordinate systems

Each new 3D object will be created with a new local coordinate, whose type depends on the different kinds of object. You should define the origin point and coordinate frame in the below interface.

The local coordinate is determined by three geometry point in Modal.

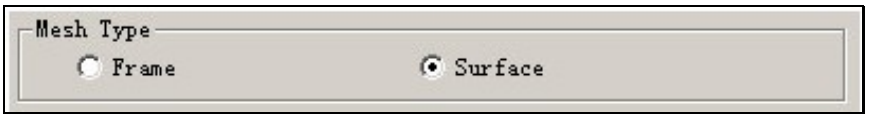


The ID# will be specified automatically. Of course you can change it if necessary. You can type the three points manually, or select an existed node from the "Node" list. If a node is selected, its global coordinate value will be filled into the blanks automatically.

Note: On the icons for adding 3D objects in the toolbar, the light blue point indicates the origin of local coordinate system. For example, the icon  indicates that the origin of a rectangle object lies in its bottom left corner.

Moreover, there is hyperlink text of "Illustration" on the dialog of setting properties. Illustration graph of 3D object to be added will show when moving cursor on it.

32.1.2.2.2 Mesh type



This option allows you to set the mesh type to frame or surface. If the surface type is selected, the meshed can be rendered. For a line object, only the frame type is optional.

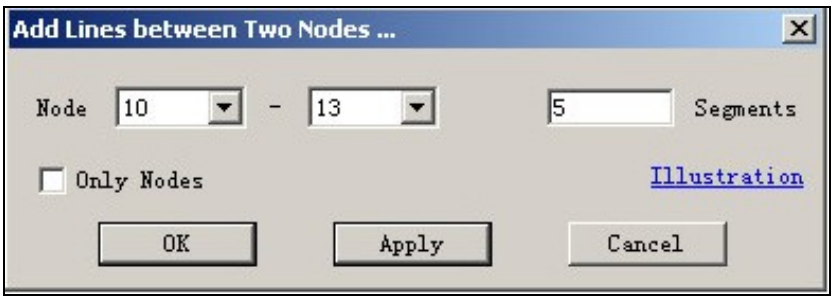
32.1.2.2.3 st ID

This option allows you to set the first node ID of a new 3D object. Modal automatically assigns the 1st ID for the new object. It?s recommended to set this parameter equal or large than the default value for a primary user.

Of course, in some occasions, setting the 1st ID flexibly will greatly reduce the workload for an advanced user.

32.1.2.2.4 Properties

- **Line Segments**

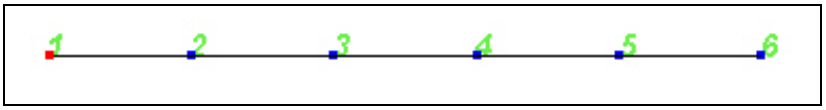


Add line segments between two specified nodes. If "Only Nodes" is checked, then the links will not be added.

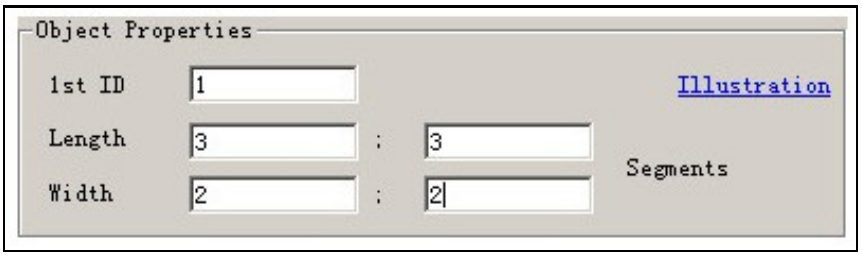
- **Line**



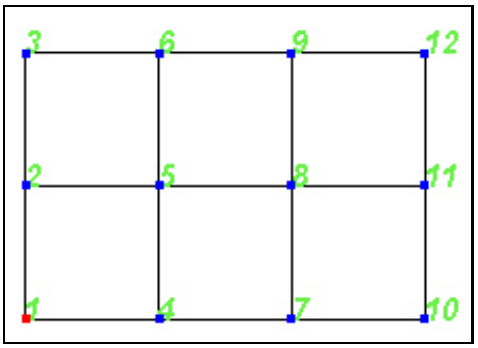
Only the length and number of segments are required for a line object. The line is along the X axis of local coordinate, and its local origin locates in the left fringe. The node IDs are increasing from its left to right. The new coordinate is of Cartesian type.



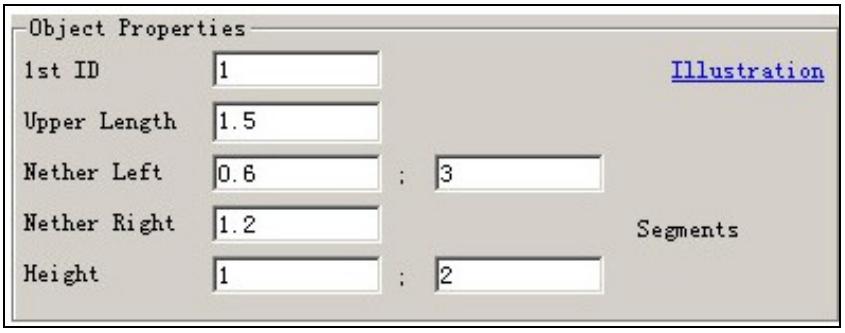
- **Rectangle**



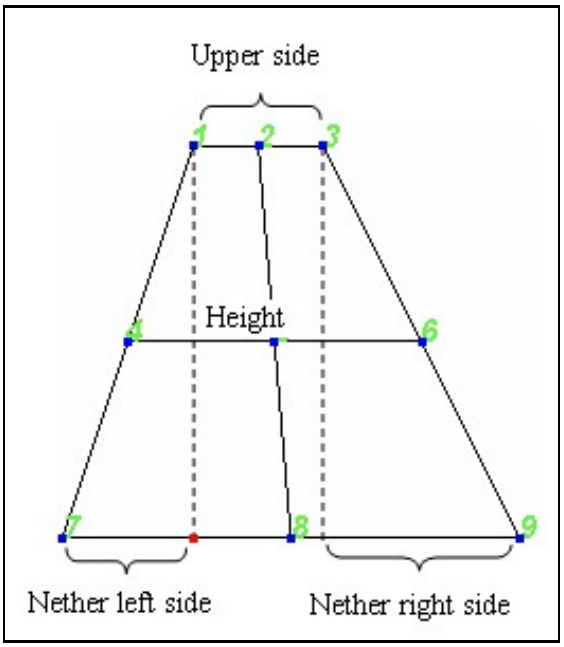
Length, width and their number of segments should be specified for a rectangle object. The local origin of a rectangle object locates in its bottom left corner. The node IDs are increasing from its left to right. The nodes are numbered from the origin, in the turn of from left to right and from bottom to top. The new coordinate is of Cartesian type.



- **Trapezia**

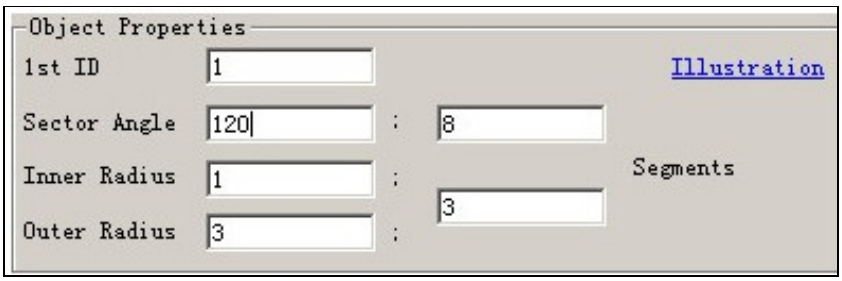


Upper side length, nether left side length, nether right side length, height and their number of segments should be specified for a trapezia object. The local origin of a trapezia object is the intersection point of left height line and nether side, which is shown as the red point in the figure below. The nodes are numbered in the turn of from bottom to top and from left to right. The new coordinate is of Cartesian type.

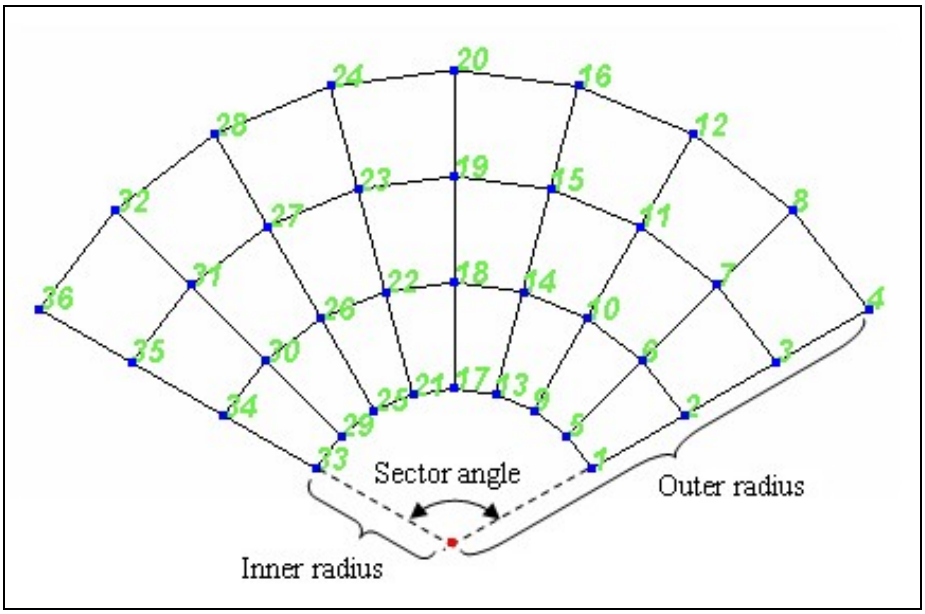


If the length of nether left side or nether right side is equal to zero, it?s a right-angle trapezia. If both of them are equal to zero, it?s a rectangle. If the length of upper side is equal to zero, it?s a triangle.

- **Sector**

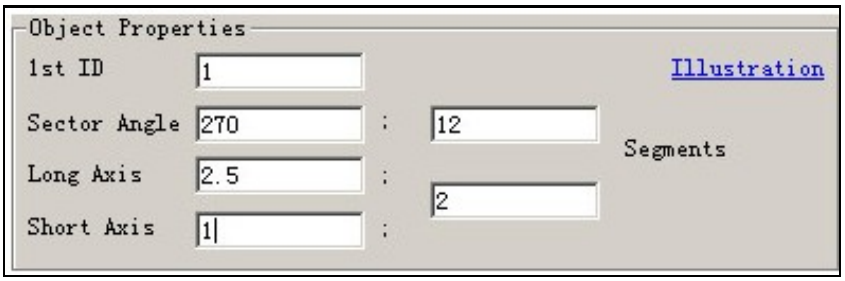


The shape of a sector object is specified by the sector angle, inner radius and outer radius. To mesh the sector you should set the number of segments of sector angle and radius. The local origin of a sector object is right the circle center. The sector object is distributed symmetrically to the Y axis of local coordinate system. The nodes IDs are increasing from inner to outer in the anticlockwise direction. The new coordinate is of Cylindrical type.

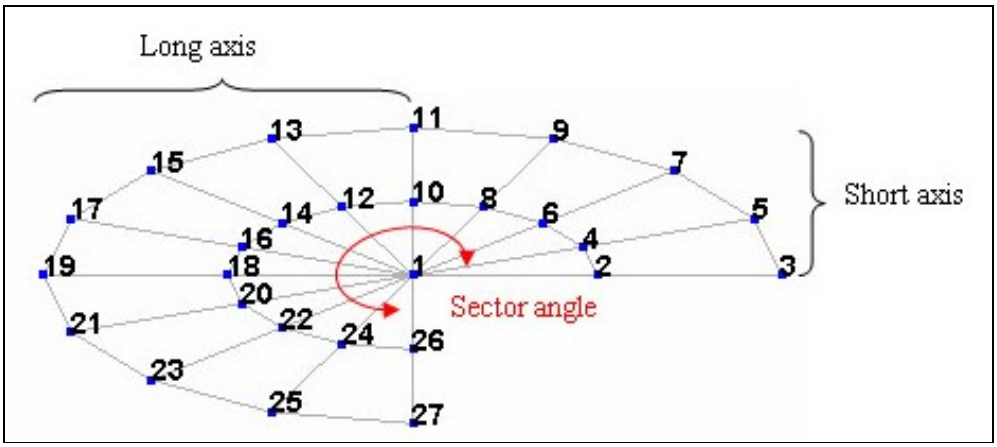


If the sector angle is equal to 360 degrees, it?s a hollow cirque. If the inner radius is equal to zero, it?s a solid sector. If the sector angle is equal to 360 degrees, and the inner radius is equal to zero, it?s a solid circle.

- **Elliptic Sector**

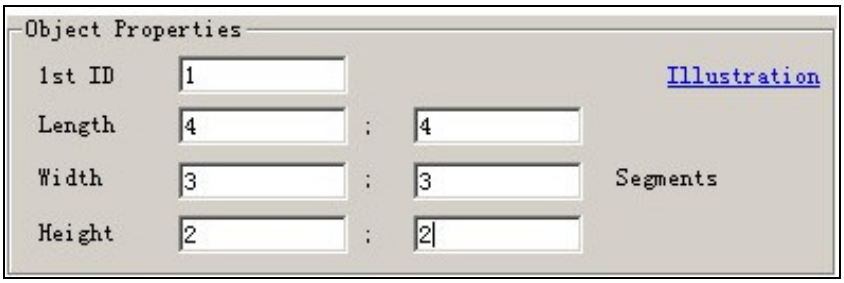


The shape of an elliptic sector object is specified by the sector angle, long radius and short radius. To mesh the elliptic sector you should set the number of segments of sector angle and radius. The local origin of a elliptic sector object is right the ellipse center. The nodes IDs are increasing from inner to outer in the anticlockwise direction. The new coordinate is of Cartesian type.

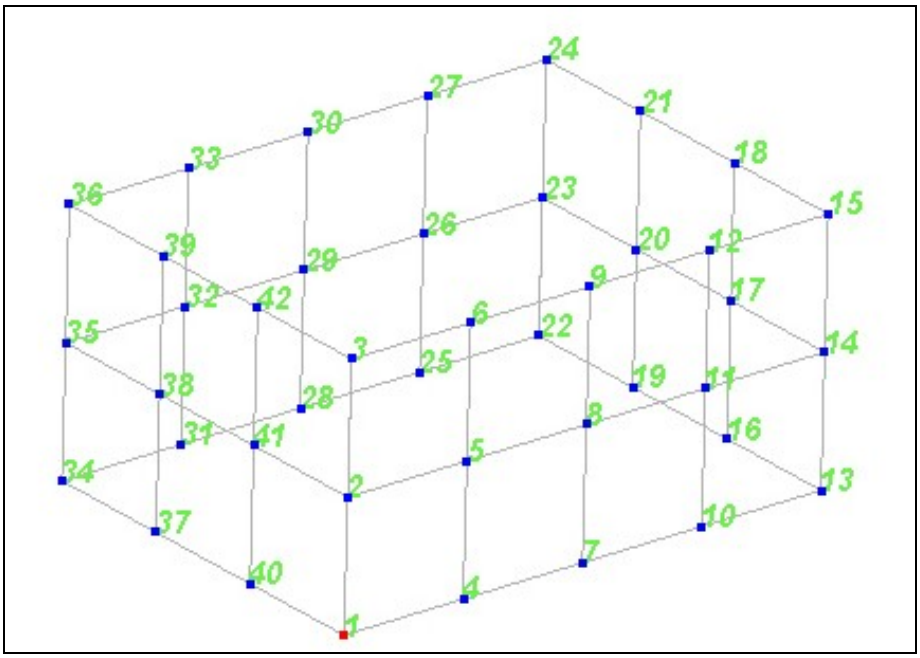


If the sector angle is equal to 360 degrees, it?s an ellipse. If the long radius is equal to the short radius, it?s a circle sector, which is the same as the sector object introduced above. If the sector angle is equal to 360 degrees, and the long radius is equal to the short radius, it?s a solid circle too.

- **Cube**

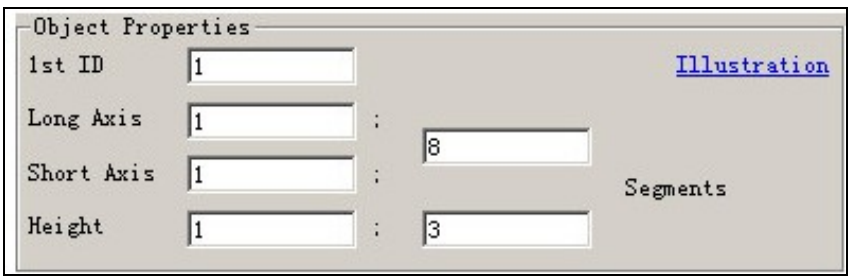


Length, width, height and their number of segments should be specified for a cube object. The local origin of a cube object locates in the nether left corner of the front side, which is shown as the red point in the figure below. The nodes are numbered from the origin, and the IDs are increasing from nether to upper in the anticlockwise direction. The new coordinate is of Cartesian type.

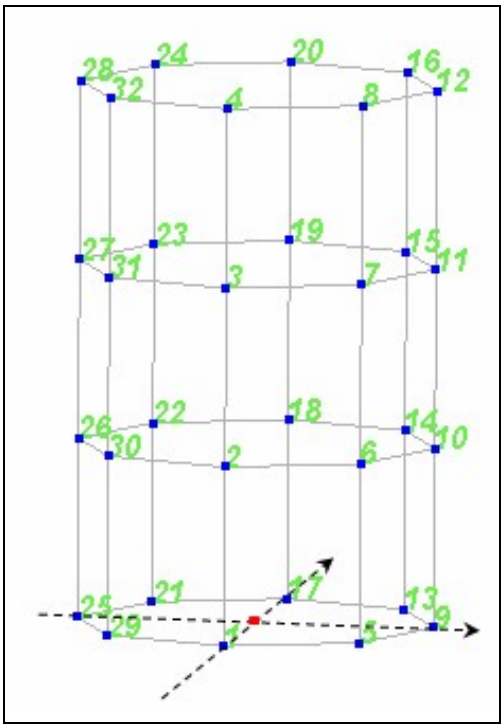


There is neither top side nor bottom side in this cuboid object. If necessary, you can bundle this object with two rectangle objects, and then remove the repeated nodes to get a cube with all six sides. If the length, width and height are all equal, it?s a cube.

- **Elliptic Cylinder**



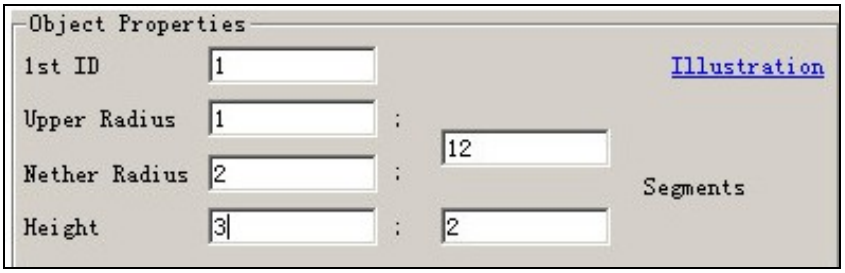
Long axis and short axis and height should be specified for an elliptic cylinder object. To mesh this object you should set the number of segments of circumference and height. The local origin of an elliptic cylinder object is right the ellipse center of bottom side. The nodes are numbered from the Y axis of local coordinate, and the IDs are increasing from bottom to top in the anticlockwise direction. If the cross section is an circle, the new coordinate is of Spherical type. If the cross section is an ellipse, the new coordinate is of Cartesian type.



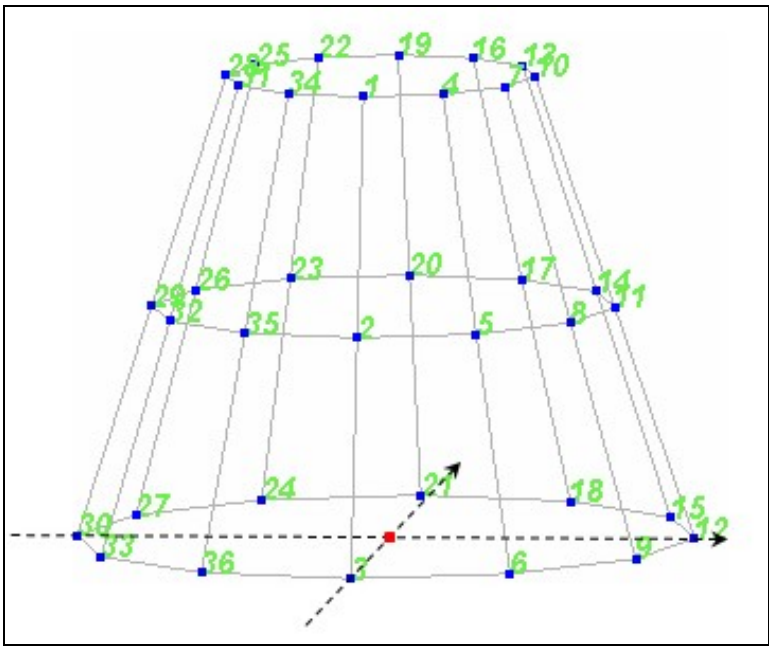
There is neither top side nor bottom side in this elliptic cylinder object. If necessary, you can bundle this object with two sector or elliptic sector objects, and then remove the repeated nodes to get a elliptic cylinder with top and bottom sides.

If the long axis is equal to the short axis, it?s a common cylinder.

- **Cone**



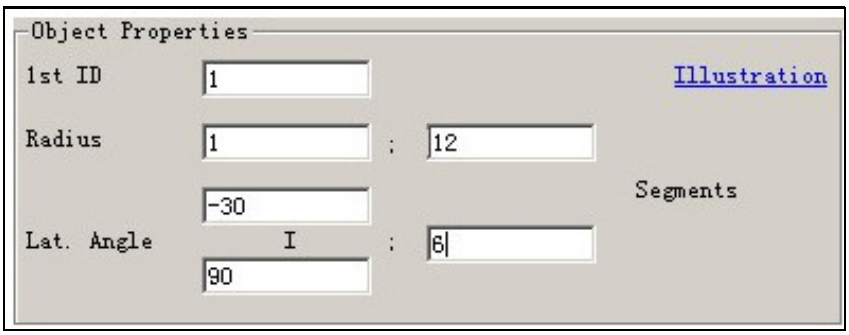
Upper radius, nether radius and height should be specified for frustum of a cone object. To mesh this object you should set the number of segments of circumference and height. The local origin of a cone object is right the circle center of bottom side. The nodes are numbered from the Y axis of local coordinate, and the IDs are increasing from bottom to top in the anticlockwise direction. The new coordinate is of Cylinder type.



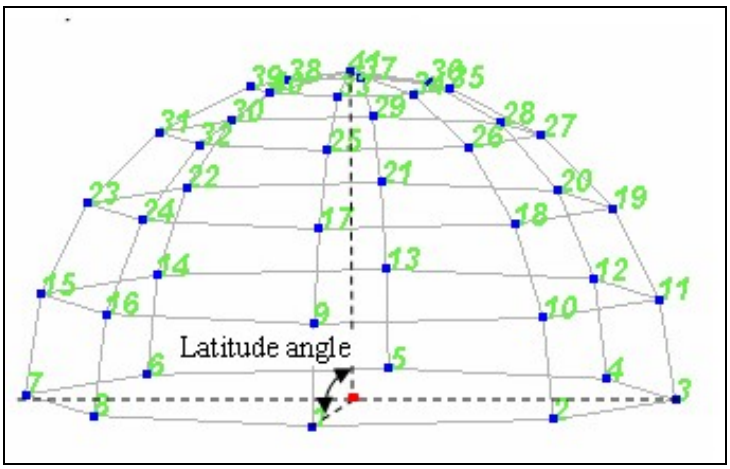
There is neither top side nor bottom side in this cone object. If necessary, you can bundle this object with two sector or elliptic sector objects, and then remove the repeated nodes to get a cone with top and bottom sides.

If the upper radius or nether radius axis is equal to zero, it?s a complete cone (not a frustum).

- **Sphere**



Radius and range of latitude angle should be specified for frustum of a sphere object. The range of a latitude angle is [-90,90] degree. Latitude angle of zero means the equator. Latitude angle of -90 degree means the south pole. Latitude of 90 means the north pole. To mesh this object you should set the number of segments of circumference and latitude angle. The nodes are numbered from the negative Y axis of south latitude plane in the local coordinate, and the IDs are increasing from south to north in the anticlockwise direction. The new coordinate is of Spherical type.



If the latitude angle is greater than -90 degree and less than 90 degree, it?s the frustum of a sphere. There is neither top side nor bottom side in this cone object. If necessary, you can bundle this object with two sector or elliptic sector objects, and then remove the repeated nodes to get a complete frustum of sphere. If the latitude angle ranges from -90 degree to 90 degree, it?s a complete sphere. If the latitude angle ranges from zero to 90 degree, it?s a hemisphere.

32.1.2.3 Interactive geometry modelling

Modal also provides you with functions of interactive geometry modeling. You can add nodes, lines, polygons and 3D objects just by mouse clicking, and realize operations of translation, zoom, rotation, deletion, and so on. The functions are accessible by the Graphics Extra Toolbar.

The graphics extra toolbar is available only when geometry, mode shape or ODS animation are showed in the current main window. It is used to control the 3 dimension graphics and animations. This toolbar is the same as configuration extra toolbar, only different buttons are enabled, and its floating style is as below:

The functions of each button as follows:

 : Show the interface for geometry modeling

 : Delete the selected items

 : Check all items, and remove the repeated nodes

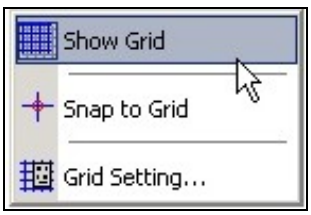
 : Renumber all the nodes in-order

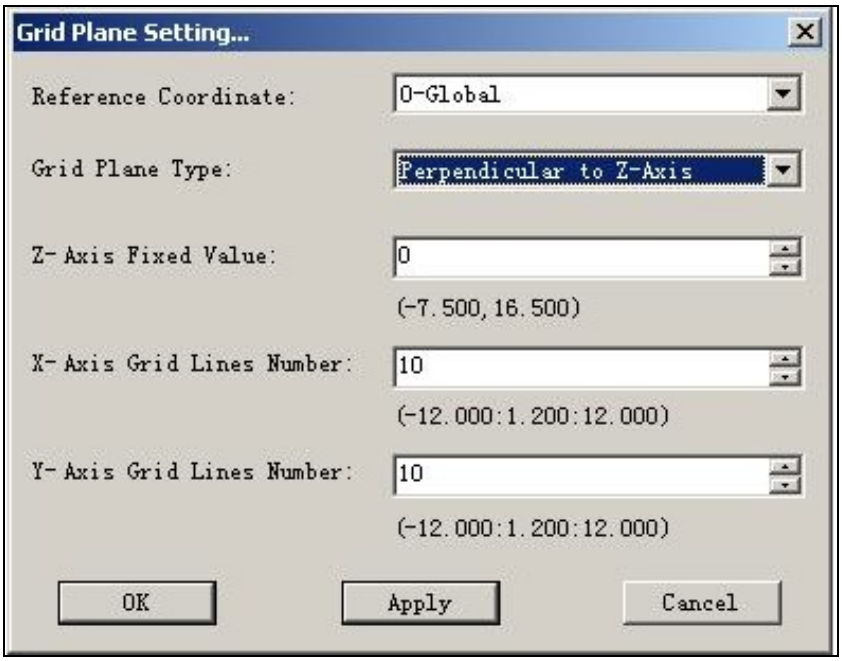
 : Undo the last action

 : Redo the previous undone action

 : Reset the layout to show the objects in window

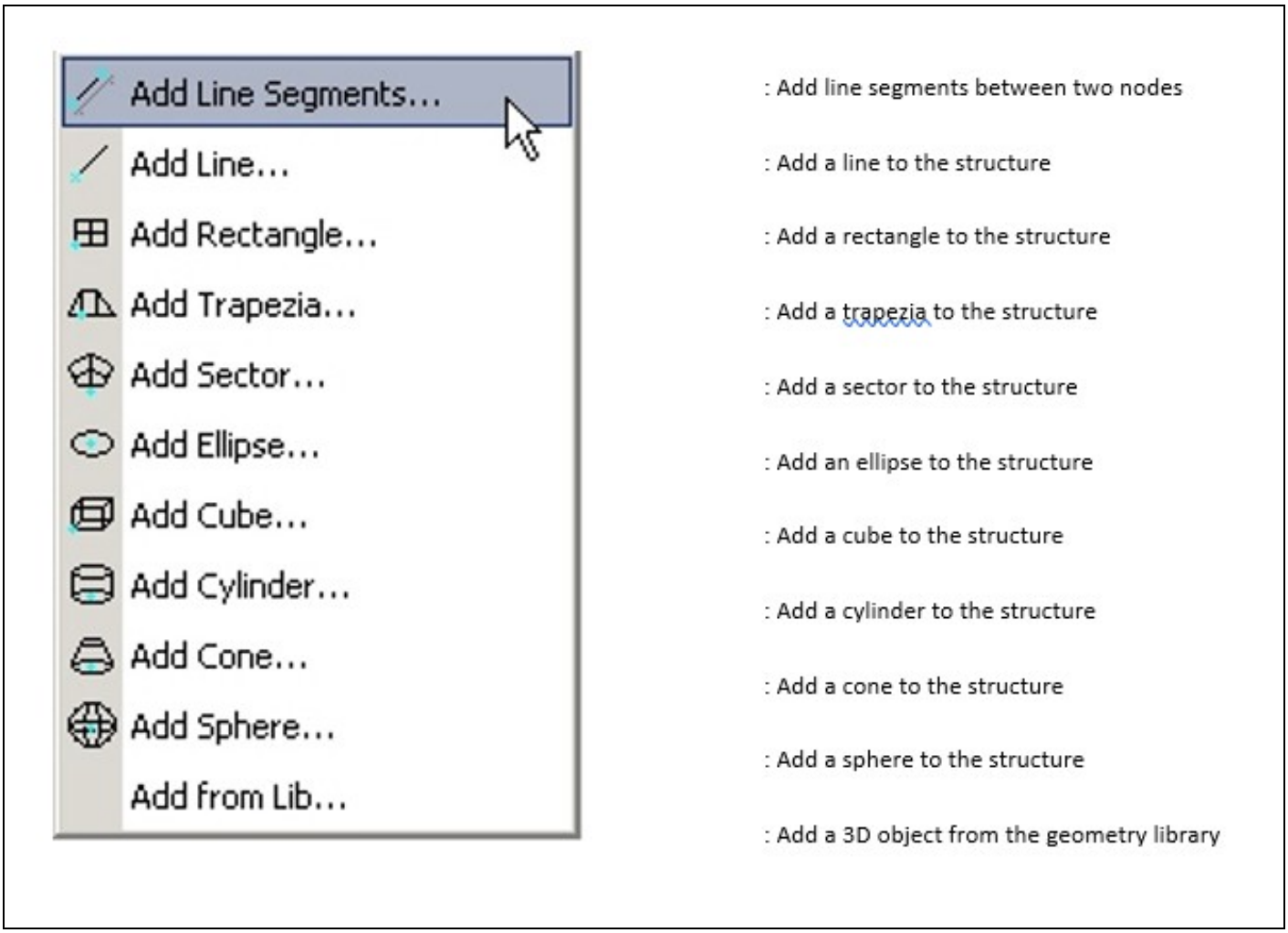
 : Show the grid plane or not. There is a dropdown menu below this button:

	: Show the grid plane or not
	: Snap to grid point
	: Call the dialog to set the parameters of grid plane

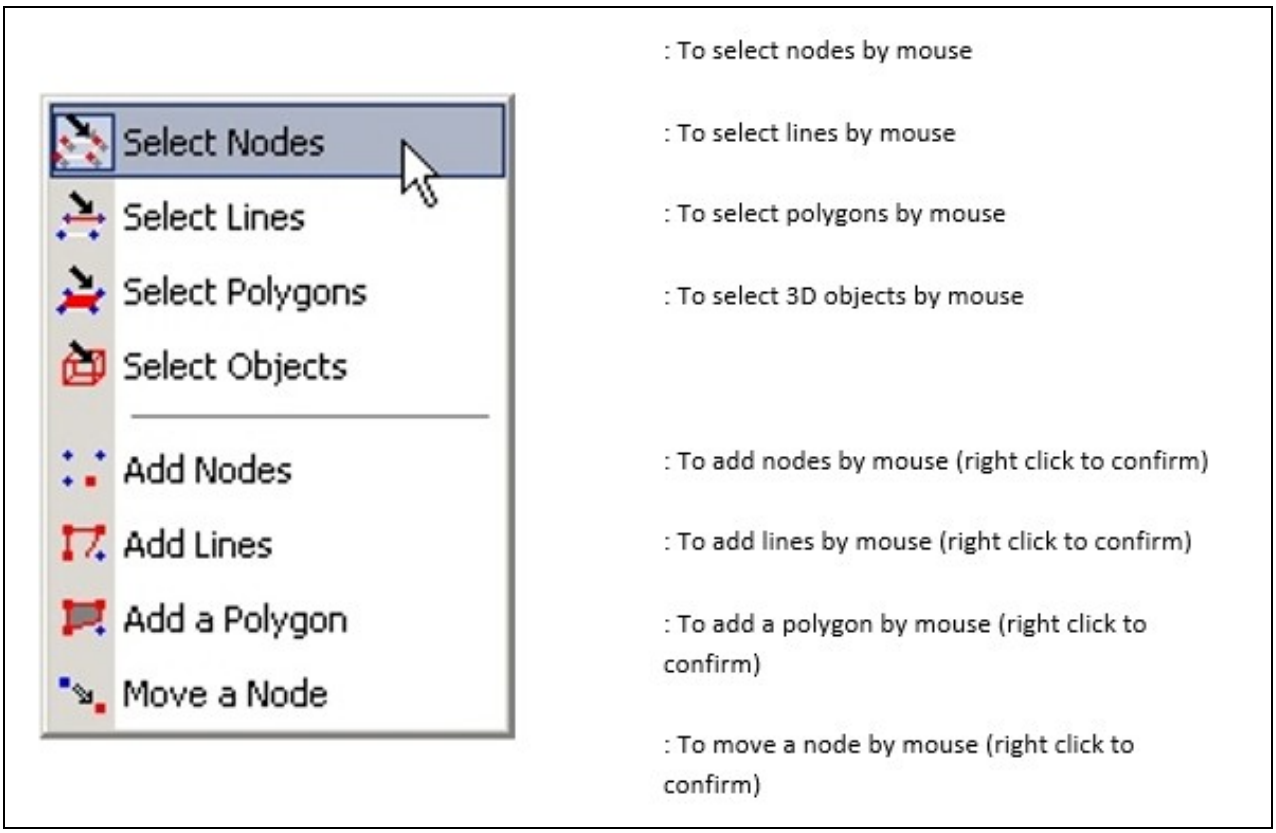


Referring to the global coordinate or some local coordinate, the position of the grid plane can be set by changing the parameters in the dialog. With the grid plane, you?ll be convenient to edit the geometry, such as adding a node or moving a node. Note that the coordinate values displayed are all relative to the reference coordinate, and in the format of Cartesian, even if the reference coordinate is of cylinder or sphere type.

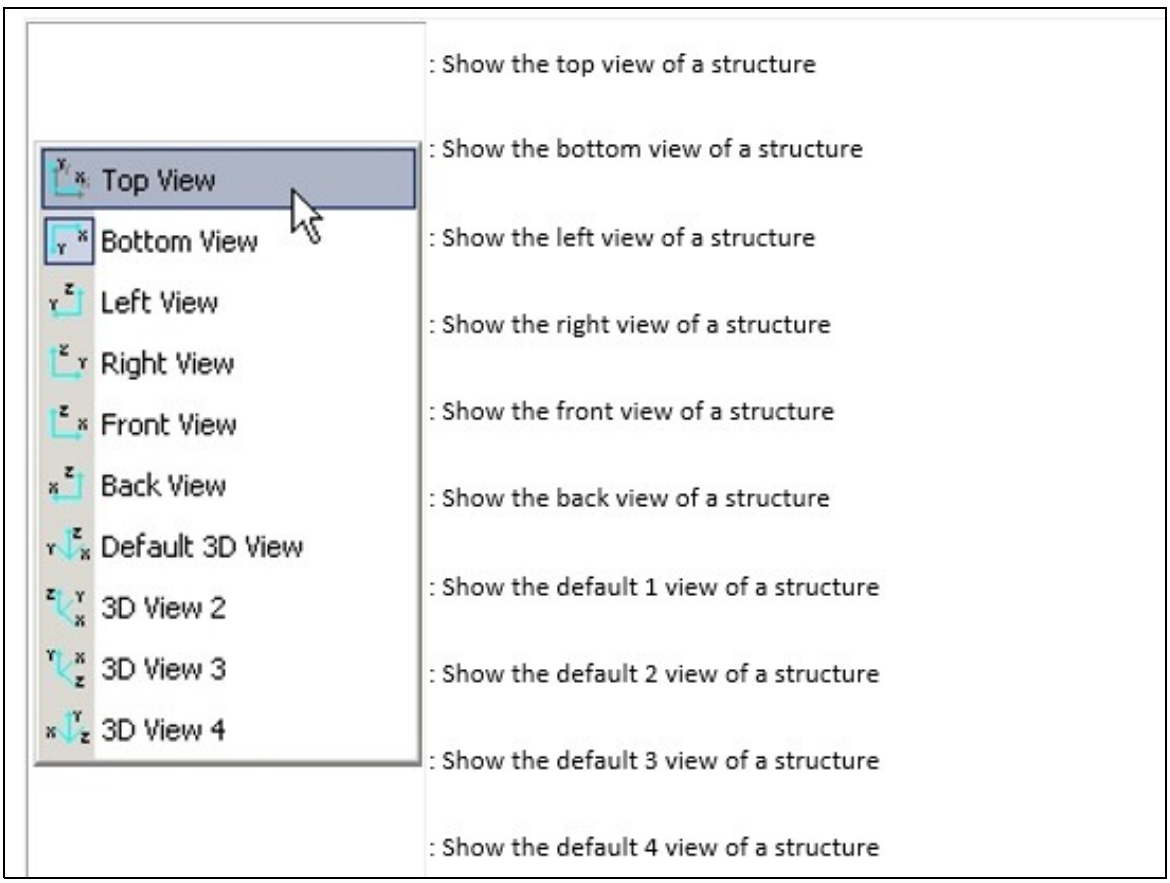
 : Add line segments between two nodes. There is a dropdown menu below this button:



: To select nodes by mouse. There is a dropdown menu below this button:



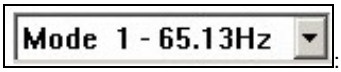
 : Show the default 3D view. There is a dropdown menu below this button:



 : Display the transparent surface of un-deformed structure. There is a dropdown menu below this button:

 : Render animation surface (for polygon elements) of not

 : Show the single view or quad view in the window



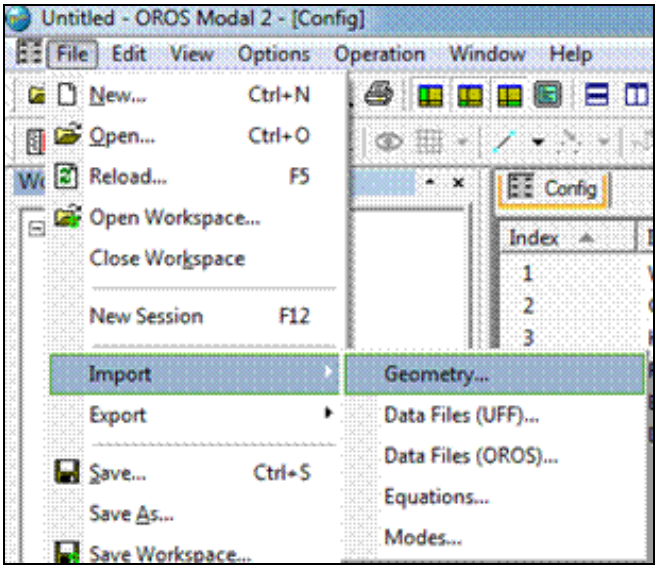
: Select mode No. from the list (for mode shape animation)

 : Turn to next mode (for mode shape animation)

 : Turn to previous mode (for mode shape animation)

32.1.2.4 Import geometry

You can import geometry information from UFF 15/82/2412 files and IGES files.



You can create geometry information in the Excel, and then copy and paste them to the "Config" view.

Config

Index	::No. #	::Coord X	::Coord Y	::Coord Z	::Coord No.	::Memo
1	1	83.333	0.000	0.000	0	
2	2	166.670	0.000	0.000	0	
3	3	250.000	0.000	0.000	0	
4	4	72.169	-41.667	0.000	0	
5	5	144.340	-83.333	0.000	0	
6	6	216.510	-125.000	0.000	0	
7	7	41.667	-72.169	0.000	0	
8	8	83.333	-144.340	0.000	0	
9	9	125.000	-216.510	0.000	0	
10	10	0.000	-83.333	0.000	0	
11	11	0.000	-166.670	0.000	0	
12	12	0.000	-250.000	0.000	0	
13	13	-41.667	-72.169	0.000	0	
14	14	-83.333	-144.340	0.000	0	
15	15	-125.000	-216.510	0.000	0	
16	16	-72.169	-41.667	0.000	0	
17	17	-144.340	-83.333	0.000	0	
18	18	-216.510	-125.000	0.000	0	
19	19	-83.333	0.000	0.000	0	
20	20	-166.670	0.000	0.000	0	
21	21	-250.000	0.000	0.000	0	
22	22	-72.169	41.667	0.000	0	
23	23	-144.340	83.333	0.000	0	
24	24	-216.510	125.000	0.000	0	
25	25	-41.667	72.169	0.000	0	
26	26	-83.333	144.340	0.000	0	
27	27	-125.000	216.510	0.000	0	
28	28	0.000	83.333	0.000	0	

General | Coordinates | **Nodes** | Links | RDOFs | MDOFs | Equations

33 Modal Import Export

33.1 Import / Export

Data and all kinds of results can be exported or printed, which provides you great convenience to write a report or give a presentation. These functions include: Importing data, exporting data, m exporting table,export graphics, exporting animations, print preview and print].

33.1.1 Import

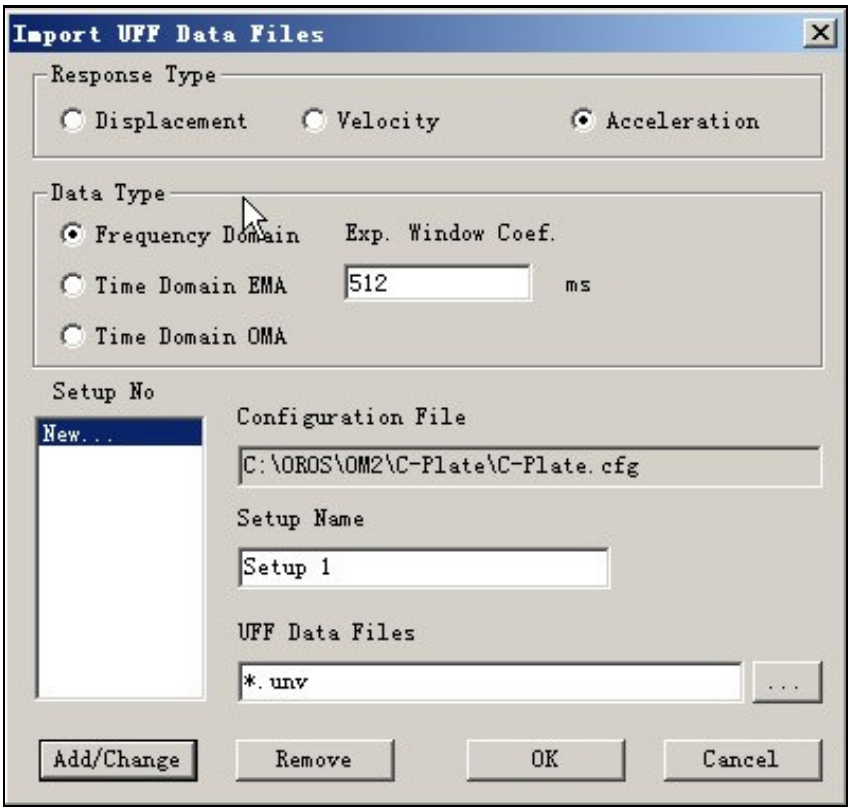
33.1.1.1 Geometry

You can import geometry information from UFF 15/82/2412 files and IGES files

33.1.1.2 Data Files

33.1.1.2.1 UFF

You can import measurement data in frequency domain (including Frequency Response Functions and Coherence Functions) or time domain (time histories) from the UFF 58/58b files.



1. Response Type

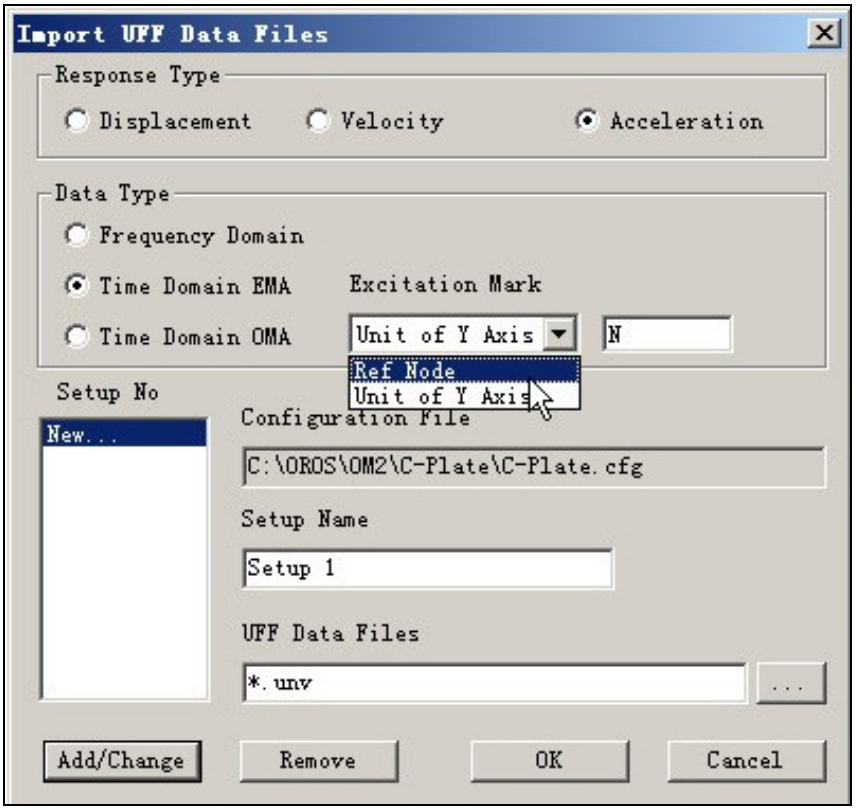
The type of response to be imported. Generally we use accelerometers, so we specify the type as "Acceleration" here.

1. Data Type

The type of data to be imported. There are three types here: 1) frequency response functions (and coherence functions) for EMA analysis, 2) time histories for EMA analysis, and 3) time histories for OMA analysis.

If FRFs which have been applied with exponential windows are to be imported, you need fill the content of "Exp. Window Coef." to modify the increasing damping caused by the exponential window.

If time histories are to be imported, you need specify the marker to distinguish excitation signal from response signal. Here you have two options: reference DOF (REFDOF) or the unit of Y Axis. When the marker is REFDOF, the measurement information of excitation signal should be defined in the field the reference node and direction. While the marker is the unit of Y Axis, software take the signal block with the unit you specified as excitation signal.



1. Setup Name and UFF Data Files

Then you can specify or modify the "Setup Name" and "UFF data files" for each setup. The wildcards (?*? or ???) is allowed to refer to multiple UFF files. If many files are included, you are recommended to use wildcards manually. The common definition of wildcards is employed: "*" to represent any multiple characters, and ??? to represent a single character. For example, the "*.unv" represents all the files whose extension names are "unv" in the same directory of this configuration file.

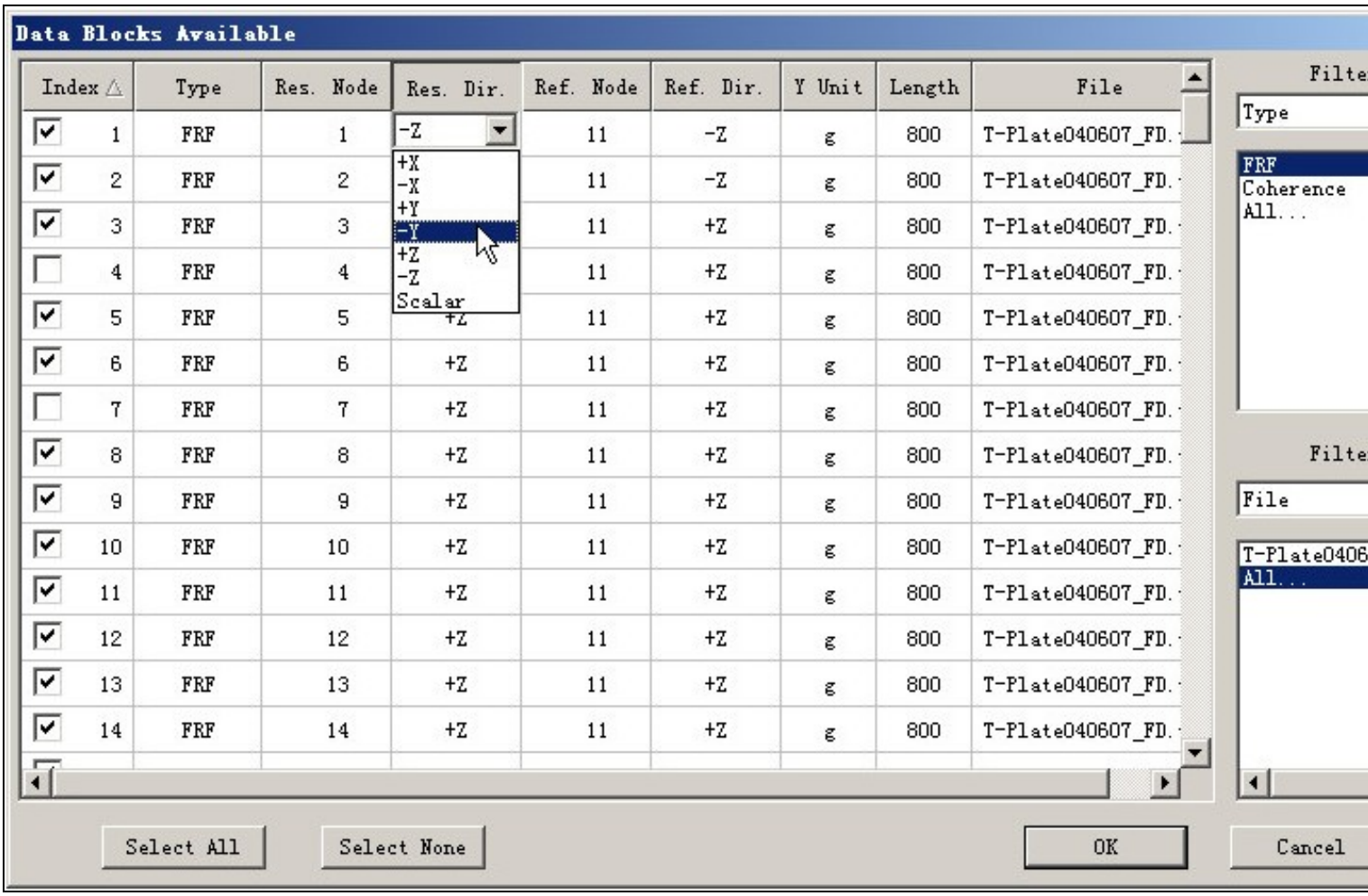
Note (very important): if you want to import time domain UFF data files for EMA, you?d better use the wildcard. You must put the measurement data of one test (for example, in the IMRT, one test means the measurement of one point) into one UFF file. If you have 20 nodes to measure in an IMRT, then you should have 20 UFF files, such as node01.uff, node02.uff, ... node20.uff. Here you can use "node*.uff" to import all the 20 files.

1. Buttons

Press the "Add/Change" button to confirm this operation, then these data files information will be stored for the specified setup. For an EMA test, you are only allowed to have one setup, no matter whether it is time domain or frequency domain. For an OMA test, you are allowed to add more setups.

Press the "OK" button to write these information to the current configuration file, and the new configuration file will be automatically reloaded to import the data specified.

The following interface will appear after the importing:

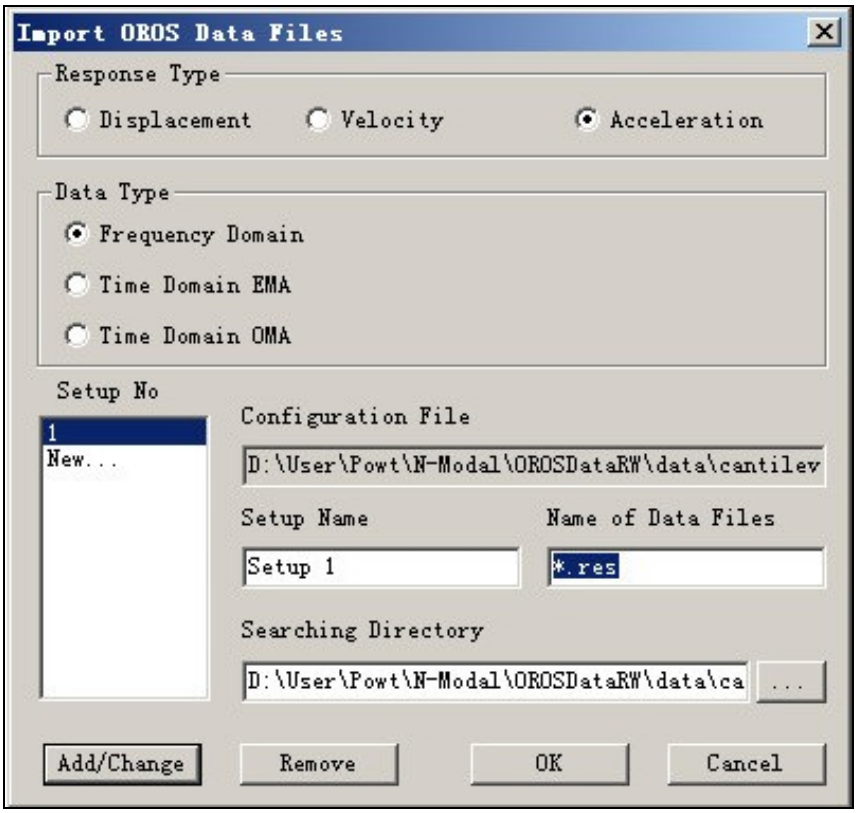


You can check or change the information of imported data here, such as the response nodes and directions. You can also unselect the data you don?t like. Click the header of each column, the current list will be sorted. In the right of this dialog, two filters are set for convenience.

33.1.1.2.2 OROS Format

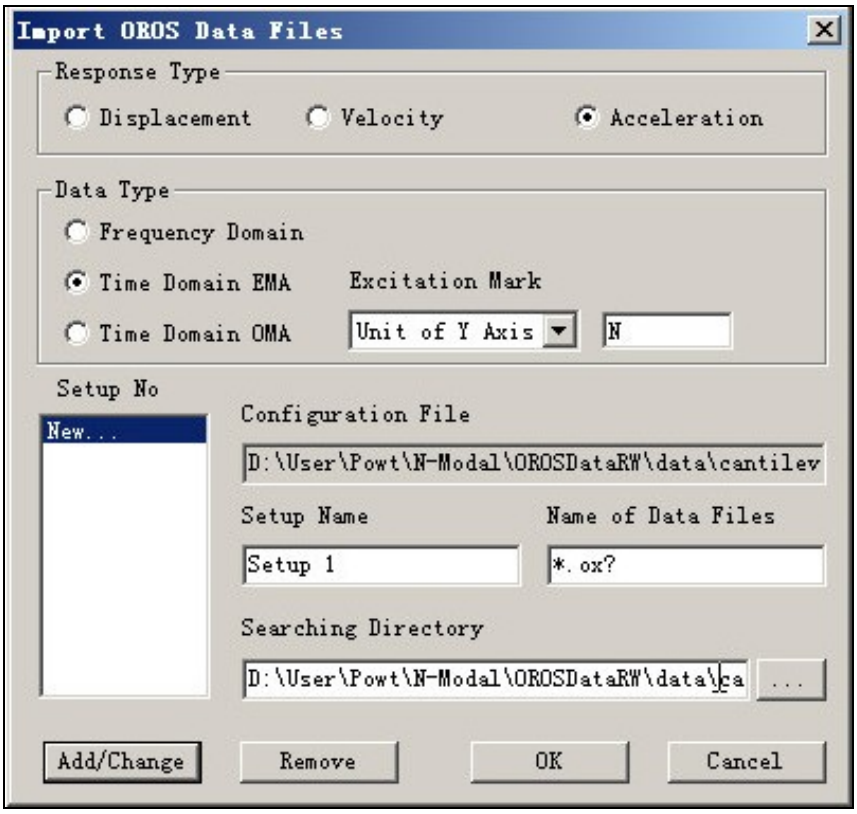
You can import measurement data in frequency domain ("*.res", including Frequency Response Functions and Coherence Functions) or time domain ("*.oxf" or "*.oxl", time histories) from the OROS format data files.

The interface for importing OROS format data files is very similar with the one for importing UFF data.

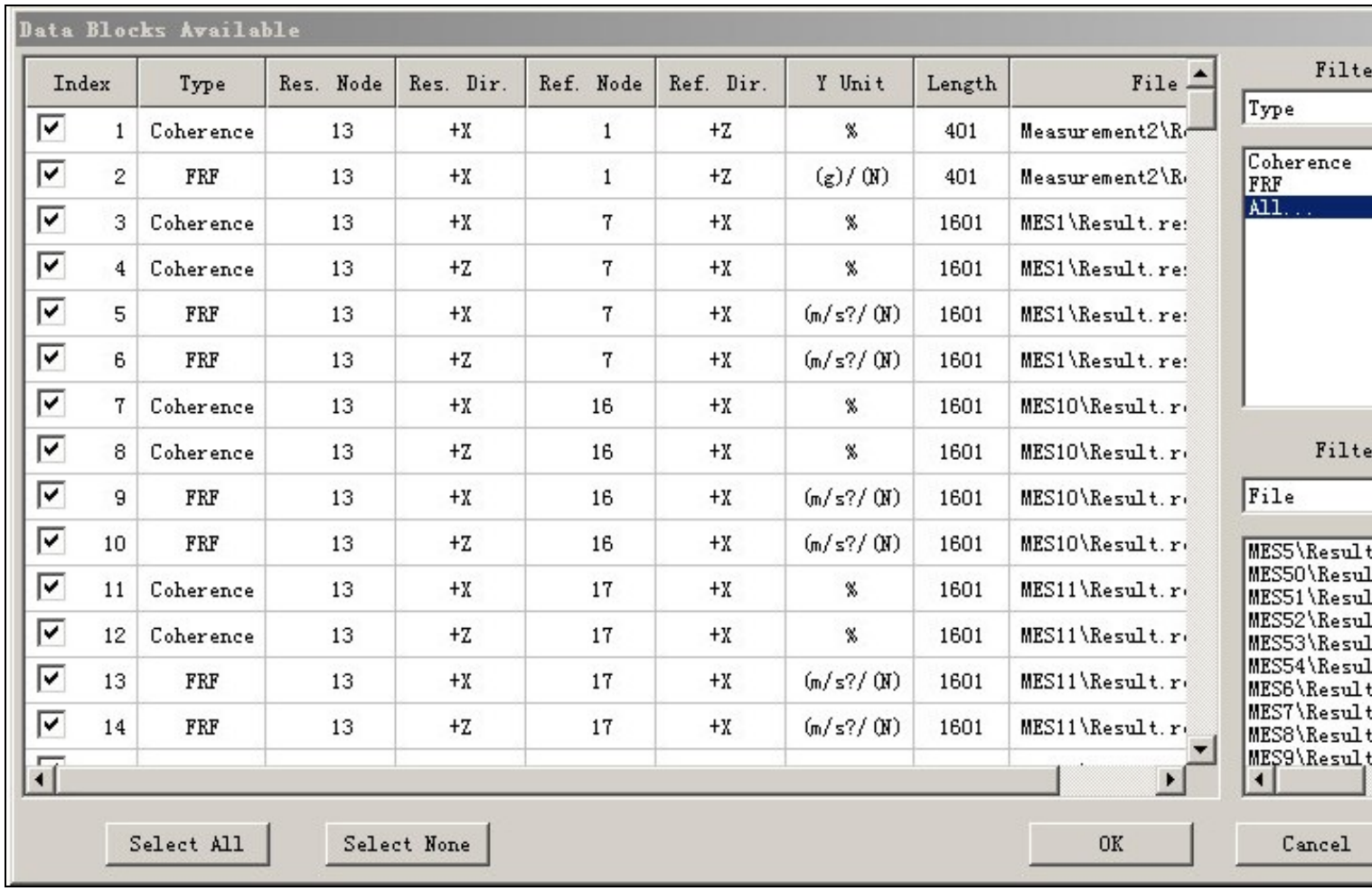


To import the FRFs and COHs from the OROS ".res" files, you don?t need to specify the the "Exp. Window Coef." . Because this information is included in the ".res" file, and will be read by OM2 automatically.

The data files of one modal test may be stored in many different directories, so in this interface you should specify the "Searching Directory", but not the name of files. OM2 will search data files in the specified directory and all its subdirectories.



The same interface which allows you to check and change the information of imported data will appear after the configuration file is reloaded.


Data Blocks Available
Index
Type
Res. Node
Res. Dir.
Ref. Node
Ref. Dir.
Y Unit
Length
File
1 Coherence 13 +X 1 +Z % 401 Measurement2\R
2 FRF 13 +X 1 +Z (g)/(N) 401 Measurement2\R
3 Coherence 13 +X 7 +X % 1601 MES1\Result.re
4 Coherence 13 +Z 7 +X % 1601 MES1\Result.re
5 FRF 13 +X 7 +X (m/s?/(N) 1601 MES1\Result.re
6 FRF 13 +Z 7 +X (m/s?/(N) 1601 MES1\Result.re
7 Coherence 13 +X 16 +X % 1601 MES10\Result.r
8 Coherence 13 +Z 16 +X % 1601 MES10\Result.r
9 FRF 13 +X 16 +X (m/s?/(N) 1601 MES10\Result.r
10 FRF 13 +Z 16 +X (m/s?/(N) 1601 MES10\Result.r
11 Coherence 13 +X 17 +X % 1601 MES11\Result.r
12 Coherence 13 +Z 17 +X % 1601 MES11\Result.r
13 FRF 13 +X 17 +X (m/s?/(N) 1601 MES11\Result.r
14 FRF 13 +Z 17 +X (m/s?/(N) 1601 MES11\Result.r
Filte
Type
Coherence
FRF
All...
Filte
File
MES5\Result
MES50\Resul
MES51\Resul
MES52\Resul
MES53\Resul
MES54\Resul
MES6\Result
MES7\Result
MES8\Result
MES9\Result
Select All
Select None
OK
Cancel

33.1.1.3 Equations

You can import the constrain equations from a ASCII format configuration file. The imported equations will be appended to the current equations list in the project. Please note that the sequence of equations is very important, which might lead to different animation effect.

33.1.1.4 Modes

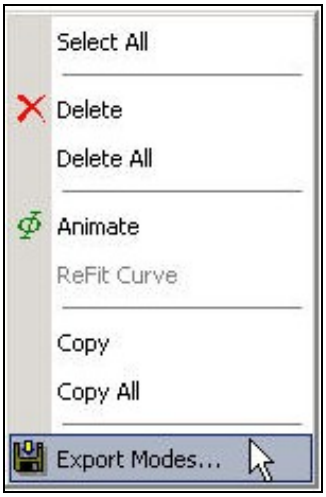
You can import identified modes (including frequencies, damps, mode shapes, modal A and modal B) from UFF 55 files. An item called "Imported" will appear in the branch of "Data\Setup?\Mode" in the "Data" page of "Workspace" Panel.

33.1.2 Export

Data and all kinds of results can be exported or printed, which provides you great convenience to write a report or give a presentation.

33.1.2.1 Data

You can export the modes by corresponding toolbar of the mode list view  or the right click menu.



All the mode can be exported to a UFF 55 file (".unv") or ASCII file (".asc").

Data such as input signals, output signal, frequency response functions, power spectrums, and coherences can be exported to UFF files or ASCII files in the "Data" tab page of Workspace shortcut panel.

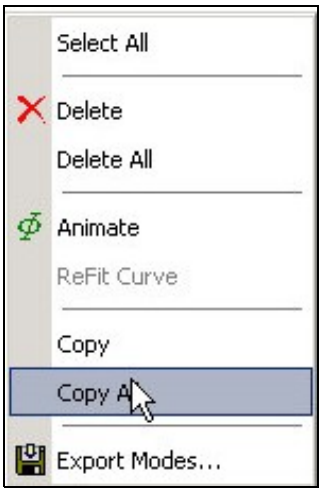
All the data in the data table view can be exported to an ASCII file.

33.1.2.2 Table

The identified mode list can be export to Microsoft WORD as an table by the following steps:

1. Copy the Mode List to Clipboard

?Copy? button  in the standard toolbar or ?Copy All? item in the right click menu of the mode list view can be used to copy all the modes to system?s clipboard. If only part of the modes are needed, please select the items you wanted by ?Shift? or ?Ctrl? keys (just like the operations in the Windows? Explorer), then click on the ?Copy? item in the right click menu.



1. Paste to WORD and Create the Table

Run WORD and create a new document, and paste the contents in the clipboard into it. Select the pasted lines, and use the Insert Table Command, the a new table containing the modes are created. To prettify this table, you can adjust it furthermore.

If you want to use these tables in Microsoft PowerPoint, you can create the table in WORD first, and then copy it to the PowerPoint.

33.1.2.3 Graphics

Everything in the main window, including the 2D curves, 3D graphics, data tables and so on, can be captured and saved as BMP or JPG graphic files by the ?Save Snapshot? button  in the standard toolbar.

You can also copy a snap into Windows? clipboard by the ?Copy? button  in the standard toolbar, and then paste it to the document.

33.1.2.4 Animations

The animations of mode shapes or ODS in Modal can be saved as AVI media files according to the following steps:

- Make sure that the mode shape or ODS wanted is shown in activated.
- Press the "Record" button  in the "3D Display" shortcut panel (or using the right click menu), and enter the wanted file name. The default name can be changed from the dialog of "Set Properties...".
- Saving progress will be displayed in the status bar. You can play this AVI file with some media player, or insert it to the WORD/PowerPoint documents.
- The AVI file is encoded with the CODEC you set in the dialog of " Set Properties...". Some CODECs might fail to work correctly. If this happens, please select another one in the dialog of "Set Properties..."..
- Different CODEC leads to different play quality and different file size, you can select the best after trying all.

33.1.2.5 Print

Everything displayed in the main window, including the 2D curves, 3D graphics, configuration information, data tables and so on, can be previewed by  button or printed by  button in the standard toolbar. Of course, you can realize these operations by menu too.

34 Modal Install

35 Installation guide

Thank you for purchasing Modal software.

Modal is a dedicated tool for processing a comprehensive modal analysis.

Start with the construction of the geometry and the acquisition of data in an optimized window. After these first steps, continue naturally by displaying quickly the Operating Deflection Shapes. Finally, with the provided powerful algorithms, modal parameters: natural frequencies, damping ratios, and mode shapes can be easily obtained from either modal data or operating data.

This "**INSTALLATION GUIDE**" will help you to install the **Modal** software.

For getting detailed information on the software, you can go and visit the Online Help embedded within the software. To start to use your new modal software, you can follow the instructions in the ?Getting Started? document installed simultaneously to the software.

35.1 Download

Download Last Version of Modal on myoros.com (need to create an account).

35.2 First checking

35.2.1 Required Configuration

35.2.1.1 Recommended PC configuration

Here

35.2.1.2 Equipment required for the installation

USB drive containing the Modal software installation setup "ModalSetup.msi"

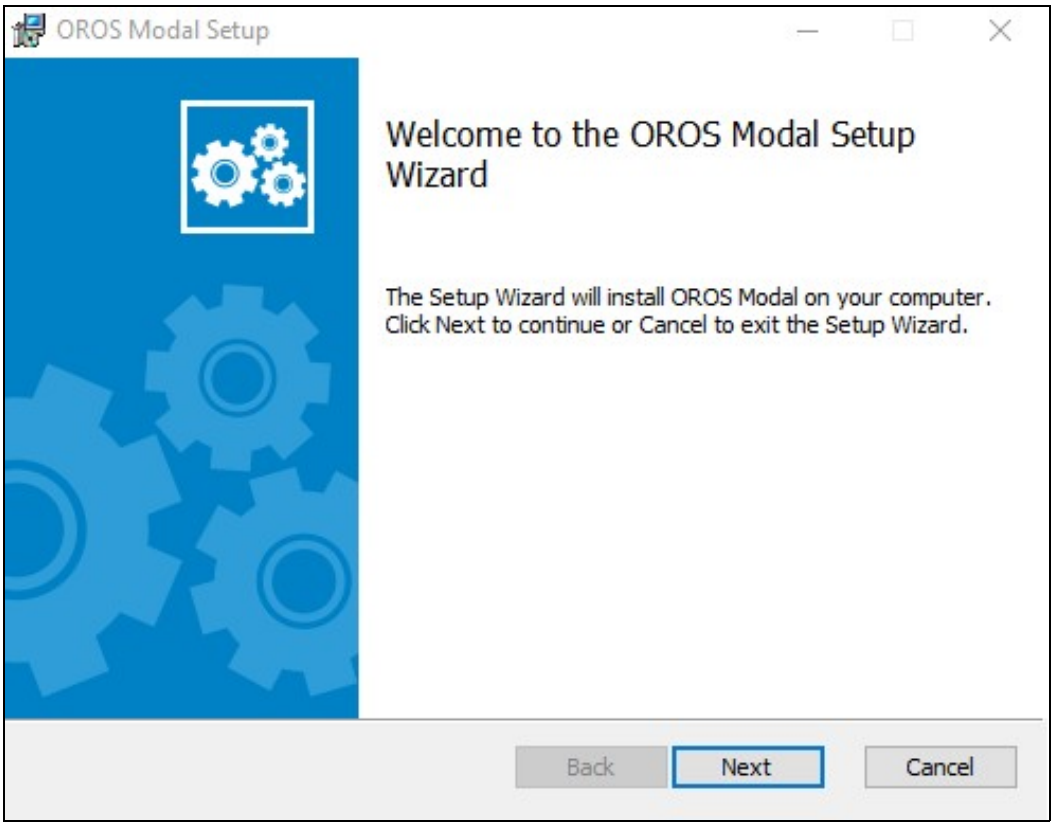
35.3 Installation

35.3.1 NVGate software installation

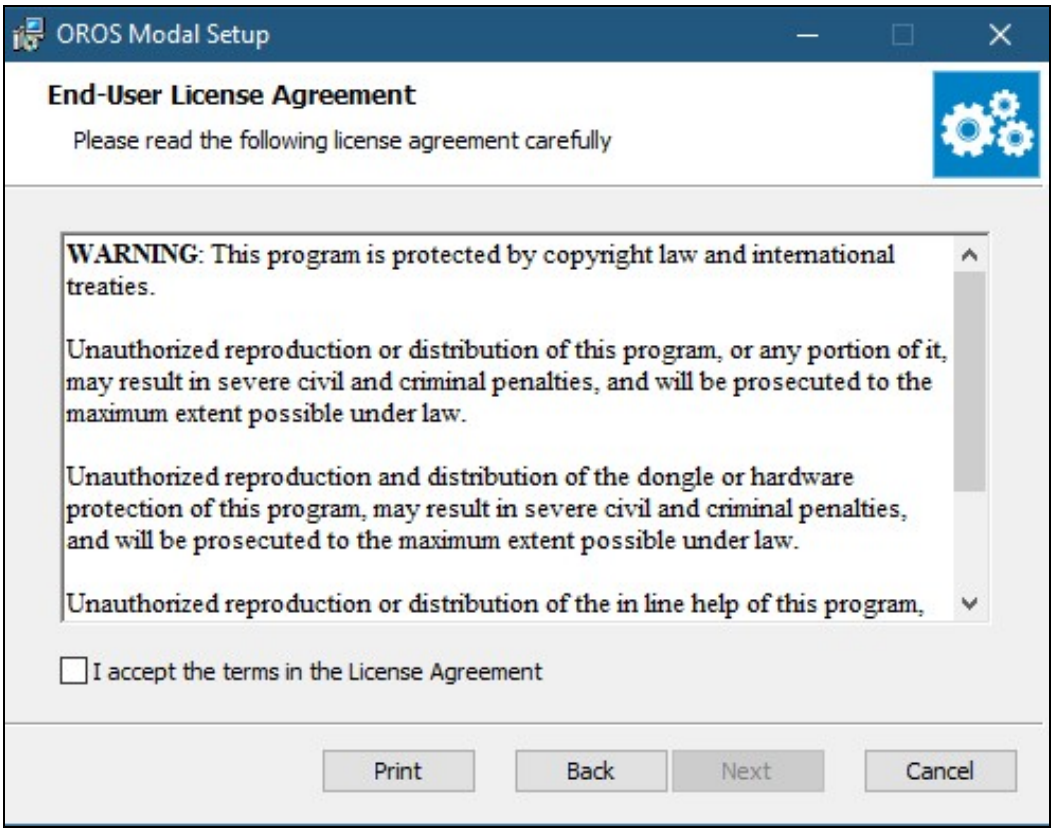
If you need to update modal keys, first you need to install NVGate.

35.3.2 Modal Software Installation

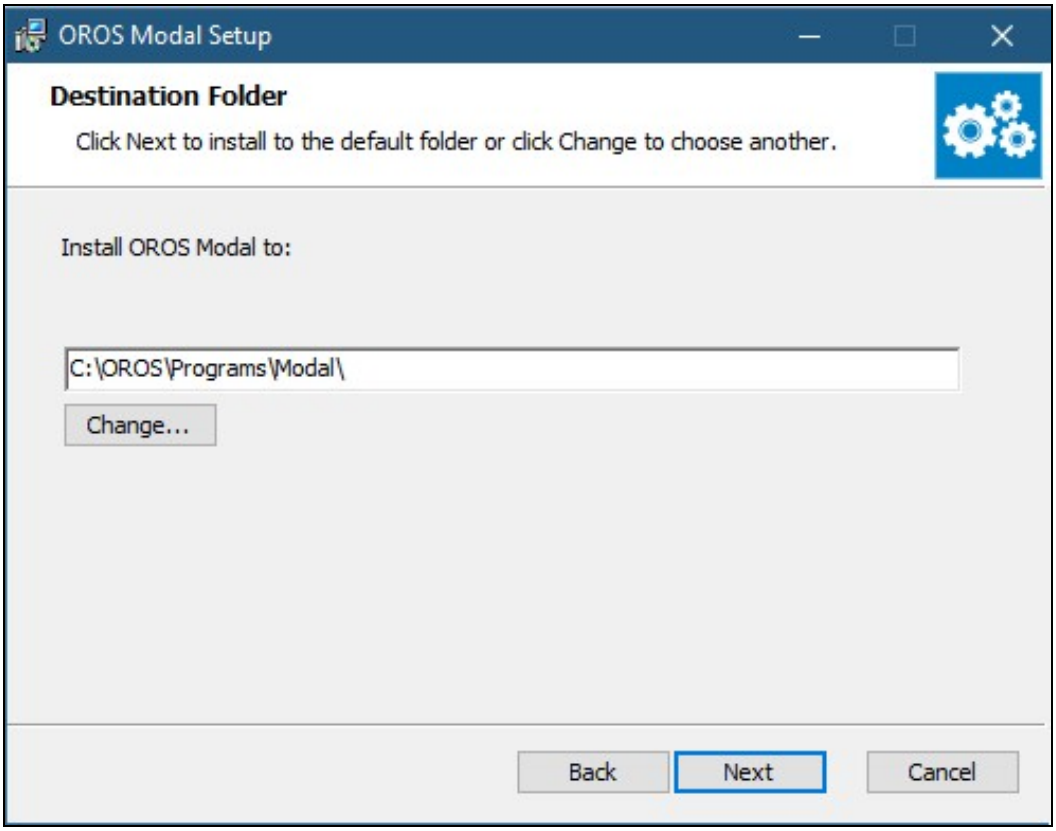
Run " ModalSetup.msi" program, and the following window is displayed:



Click on "Next", and the following window is displayed:

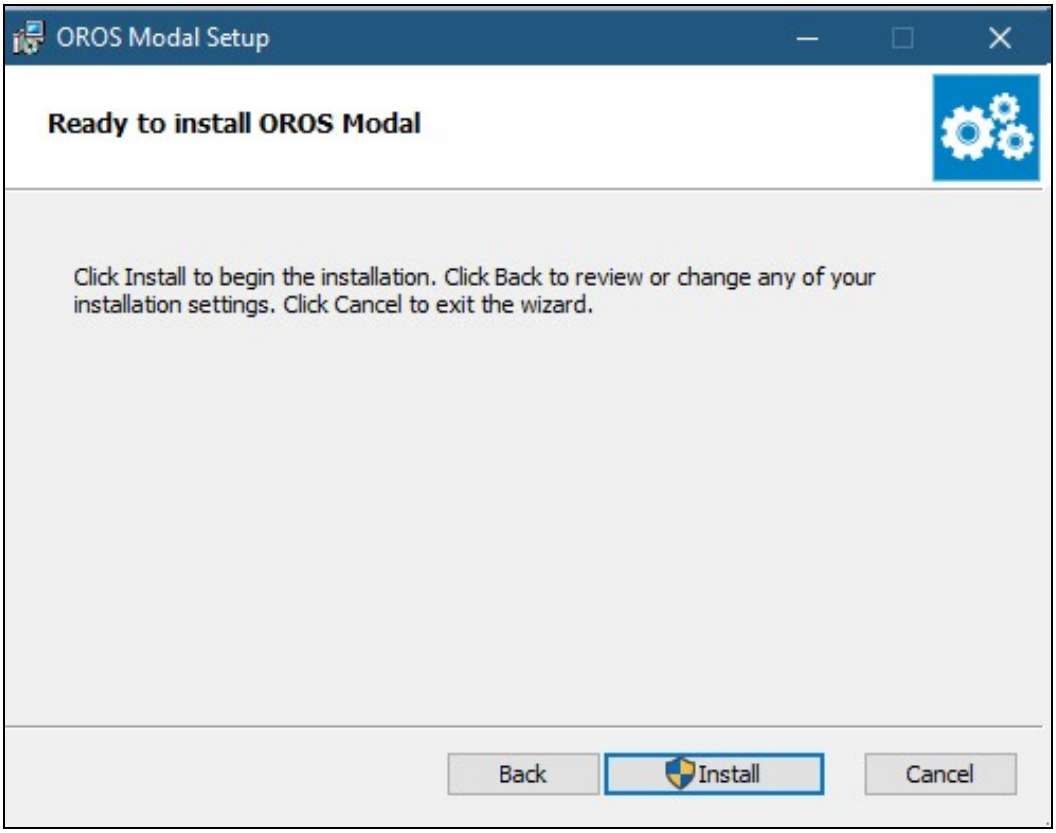


Read the terms in the license agreement and check ?I accept the terms in the License Agreement? if you agree. Click on ?Next?, the following window is displayed:

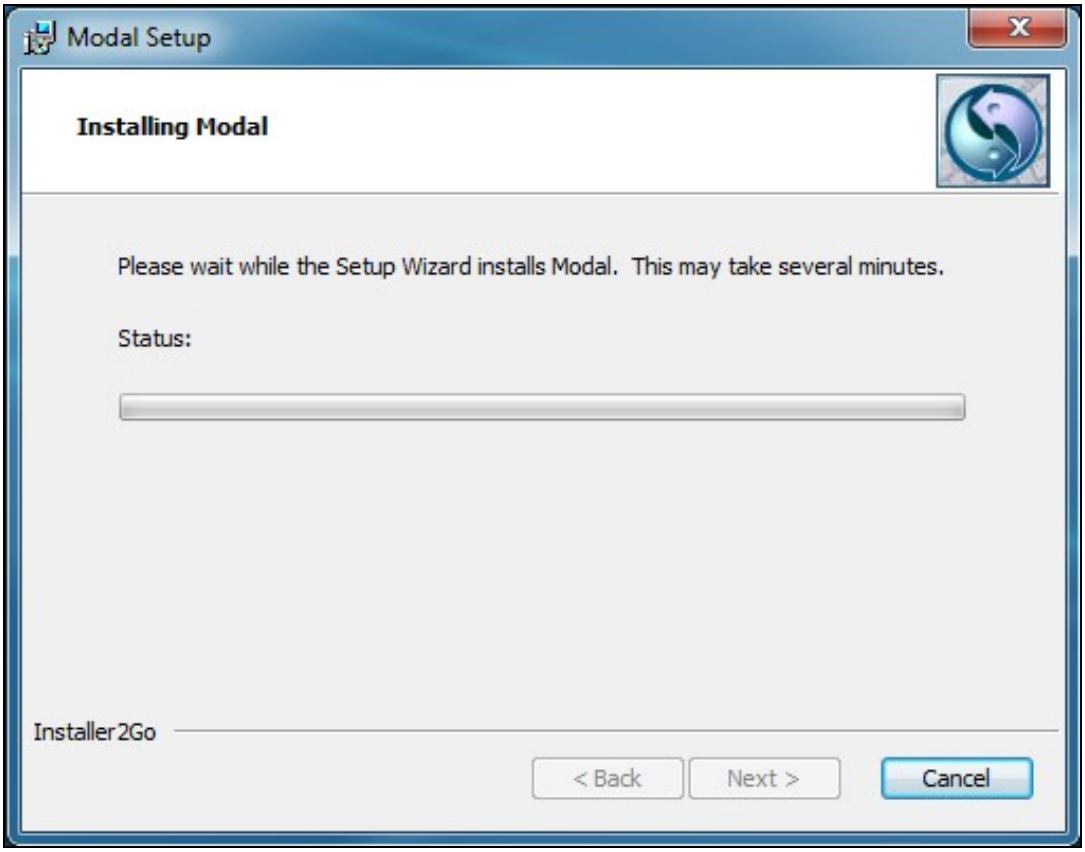


Select the installation directory. By default, Modal is installed in C:\OROS\Programs\Modal\.

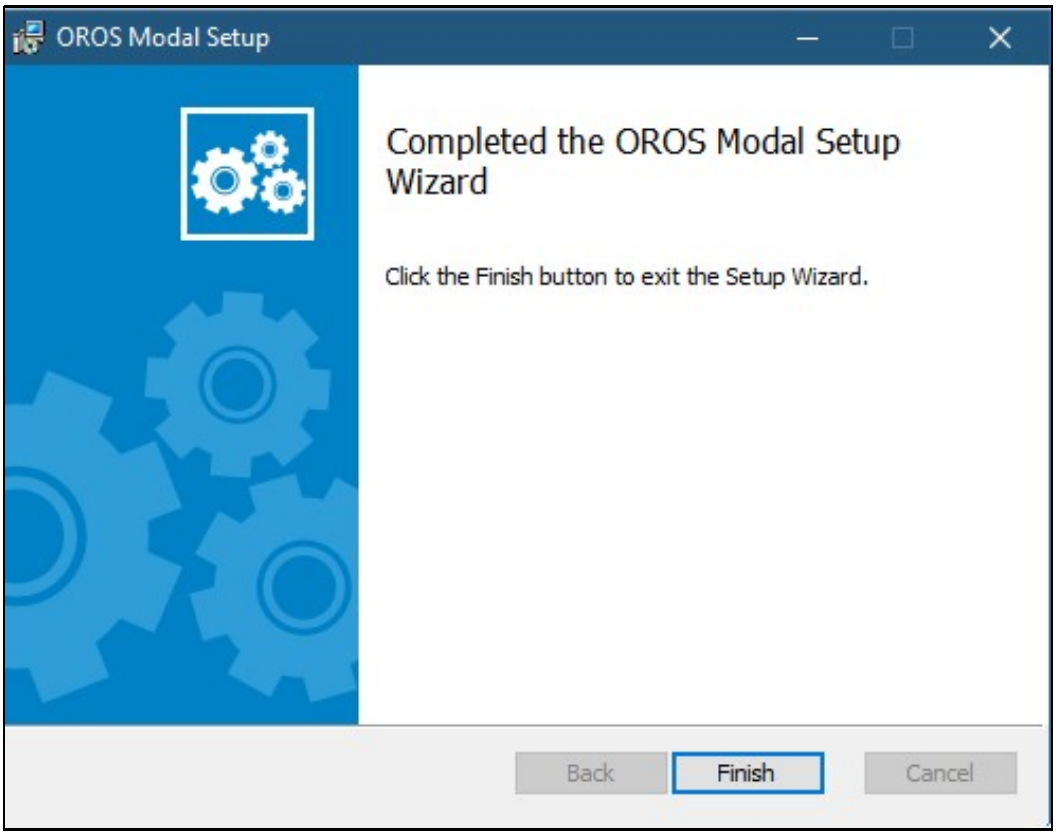
Click on "Next", the following window is displayed:



Click on "Install", the software installation starts, and the following window is displayed:



Let the setup wizard proceed to the full installation. Do not abort the installation process. When it is done, the following window is automatically displayed:



Click on ?Finish? to exit the Setup Wizard, and the Modal software is successfully installed.

NOTE: To launch the software correctly, please don?t forget to plug the dongle if your license is dongle locked, or connect the PC to the analyzer if your license is instrument locked.

35.3.3 update the.cfg

On the first software launch, Modal will ask for a ".cfg" file (the key file).

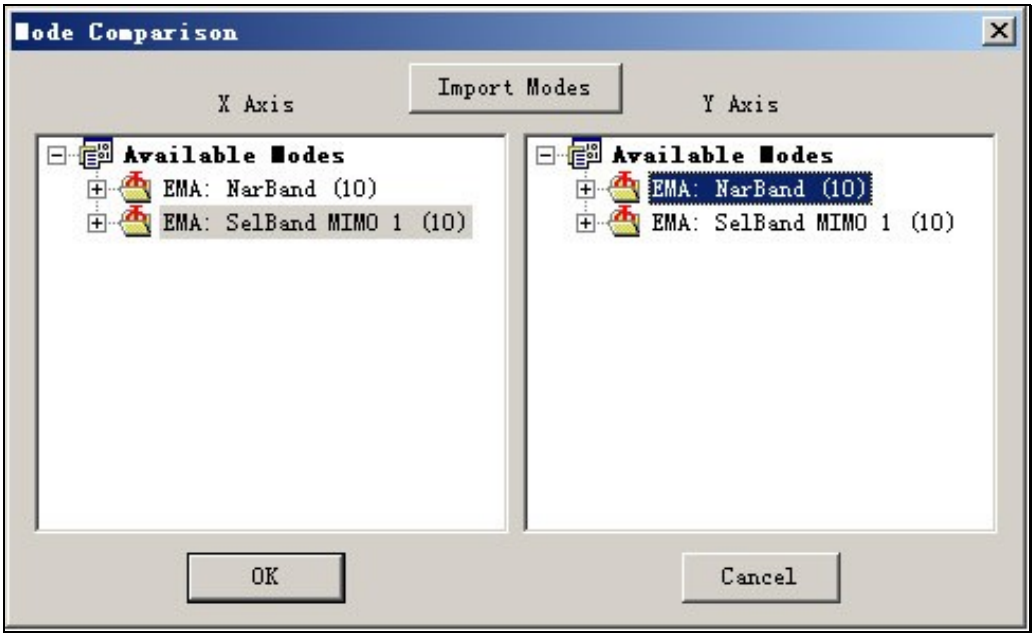
This file should be on the install folder of NVGate by default here : C:\OROS\Programs\NVGate\o_xxxx.cfg (with XXXX the dongle serial number). If you do not find this file ask customer.care@oros.com with your serial number.

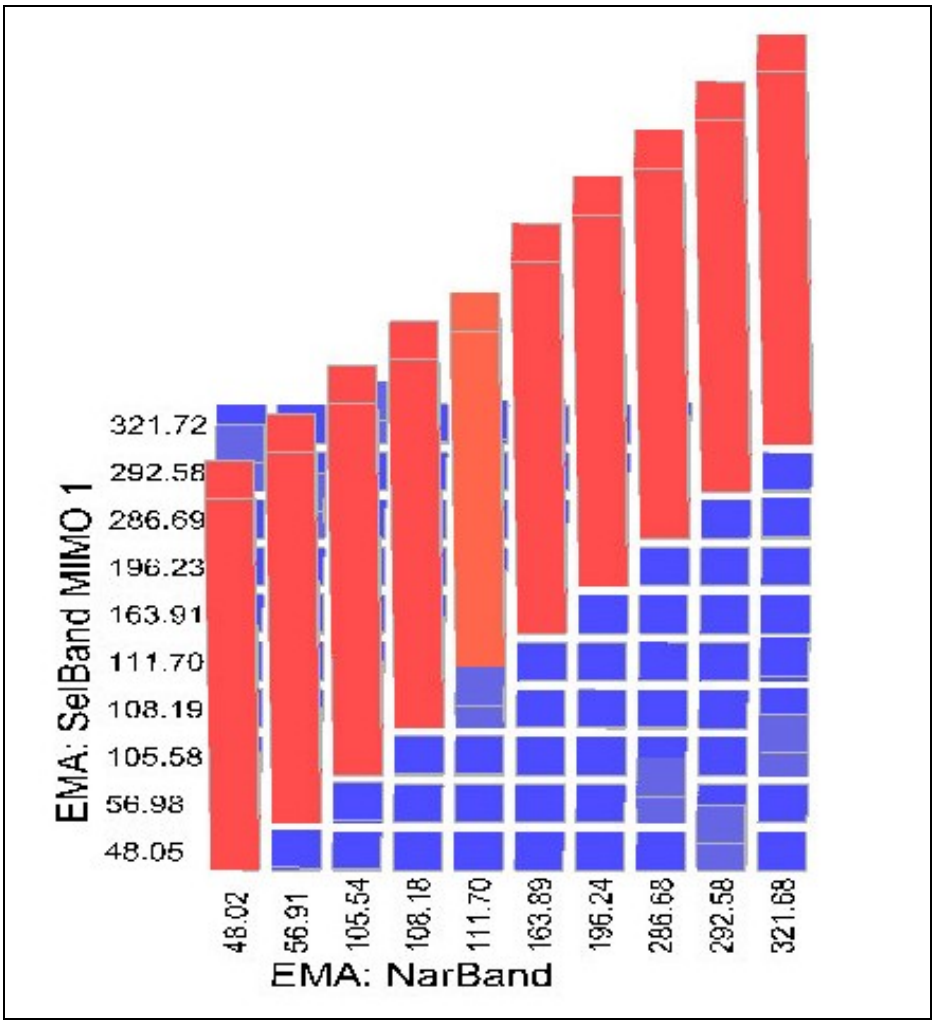
36 Modal MAC and COMAC

36.1 Modal validation, MAC & COMAC

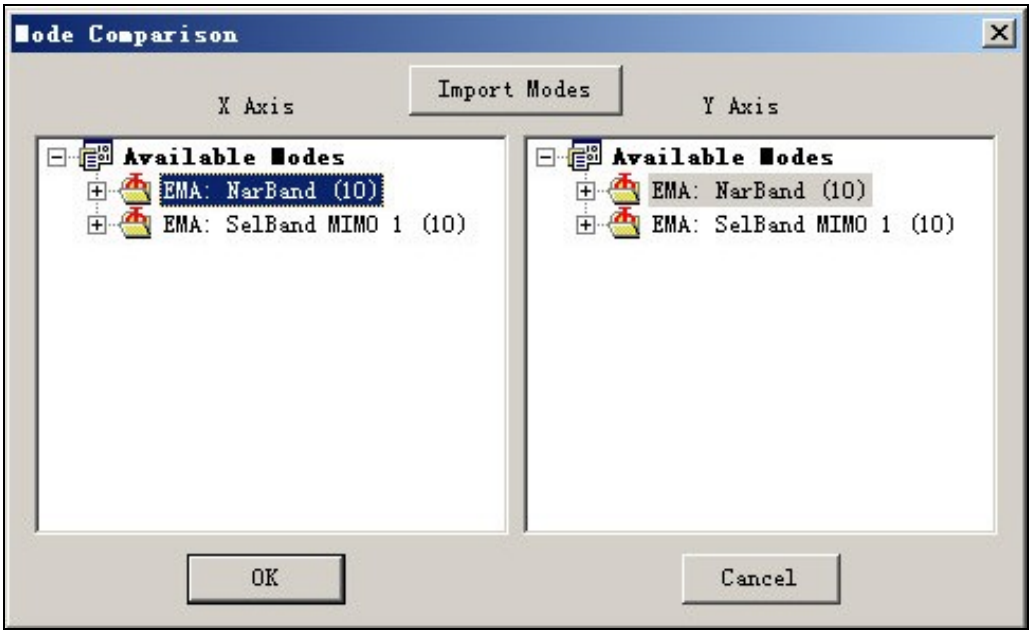
Modal Assurance Criterion (MAC) values can be used to compare two arbitrary complex vectors. The MAC value between two vectors who have linear relationship is near to one. The MAC value between two linearly independent vectors will be near zero. MAC calculation has two applications in the modal analysis.

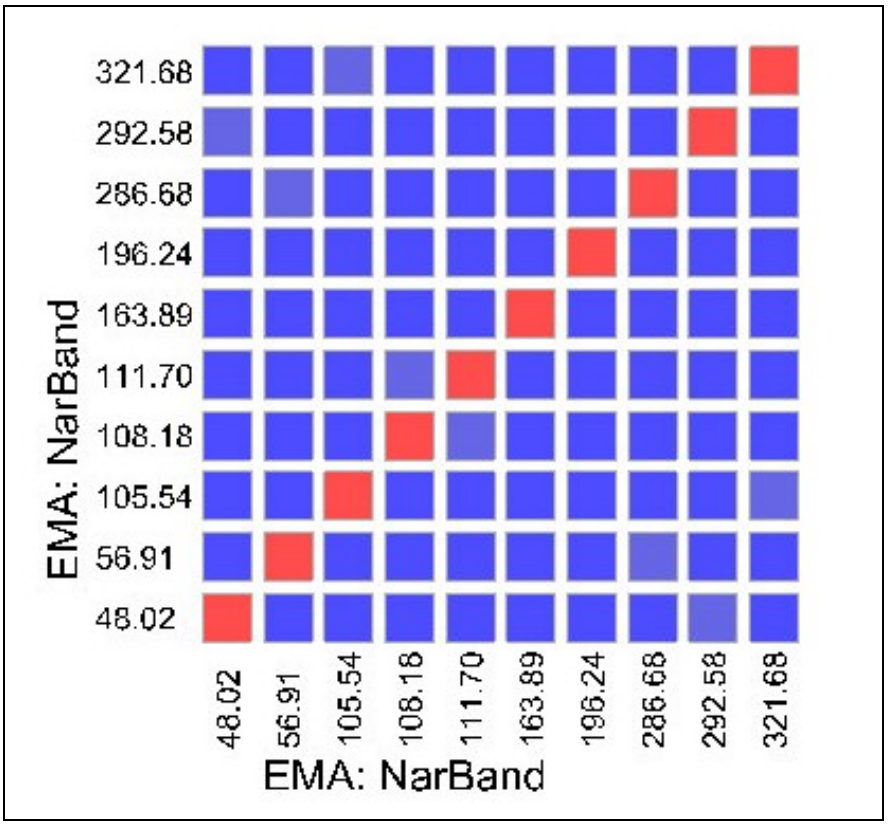
First, it can be used to compare two mode shapes obtained from two different modal parameter estimation processes on the same test data. Two similar mode shapes have a high MAC value, and two same mode shapes have a MAC value of 1.




EMA: SelBand MIMO 1
321.72
292.58
286.69
196.23
163.91
111.70
108.19
105.58
56.98
48.05
48.02
56.91
105.54
108.18
111.70
163.89
196.24
286.68
292.58
321.68
EMA: NarBand

Second, it can be used to check the orthogonality of mode shapes when weighted by the mass matrix. Even when no exact mass matrix is available, the orthogonality of mode shapes is approximately satisfied. We can use it to validate the modal result.

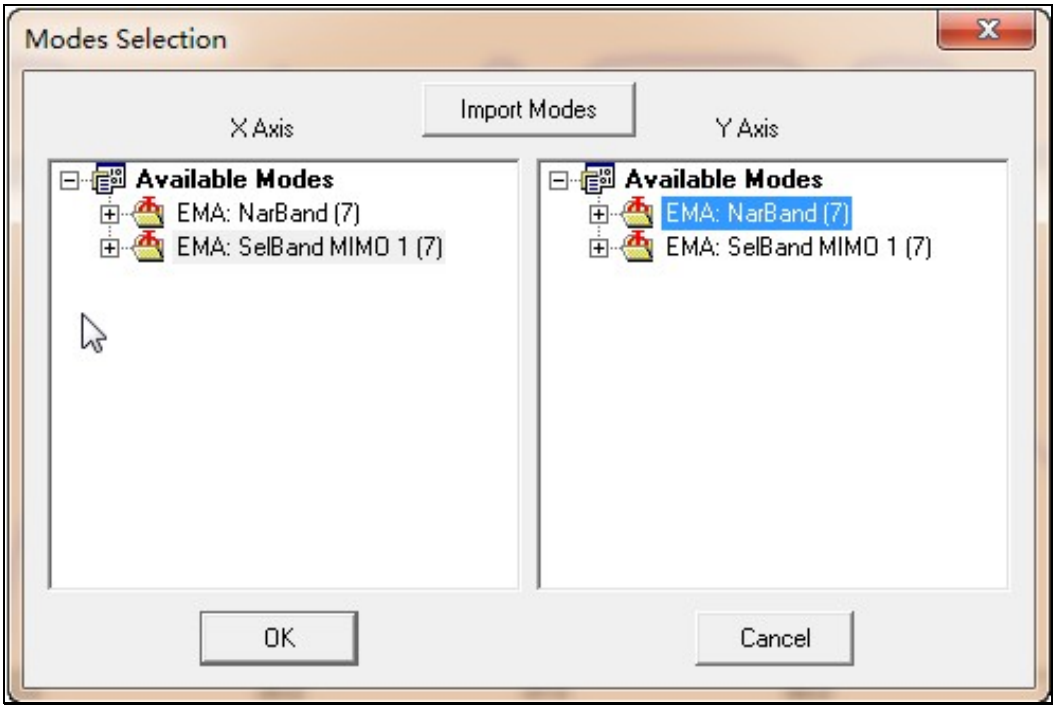




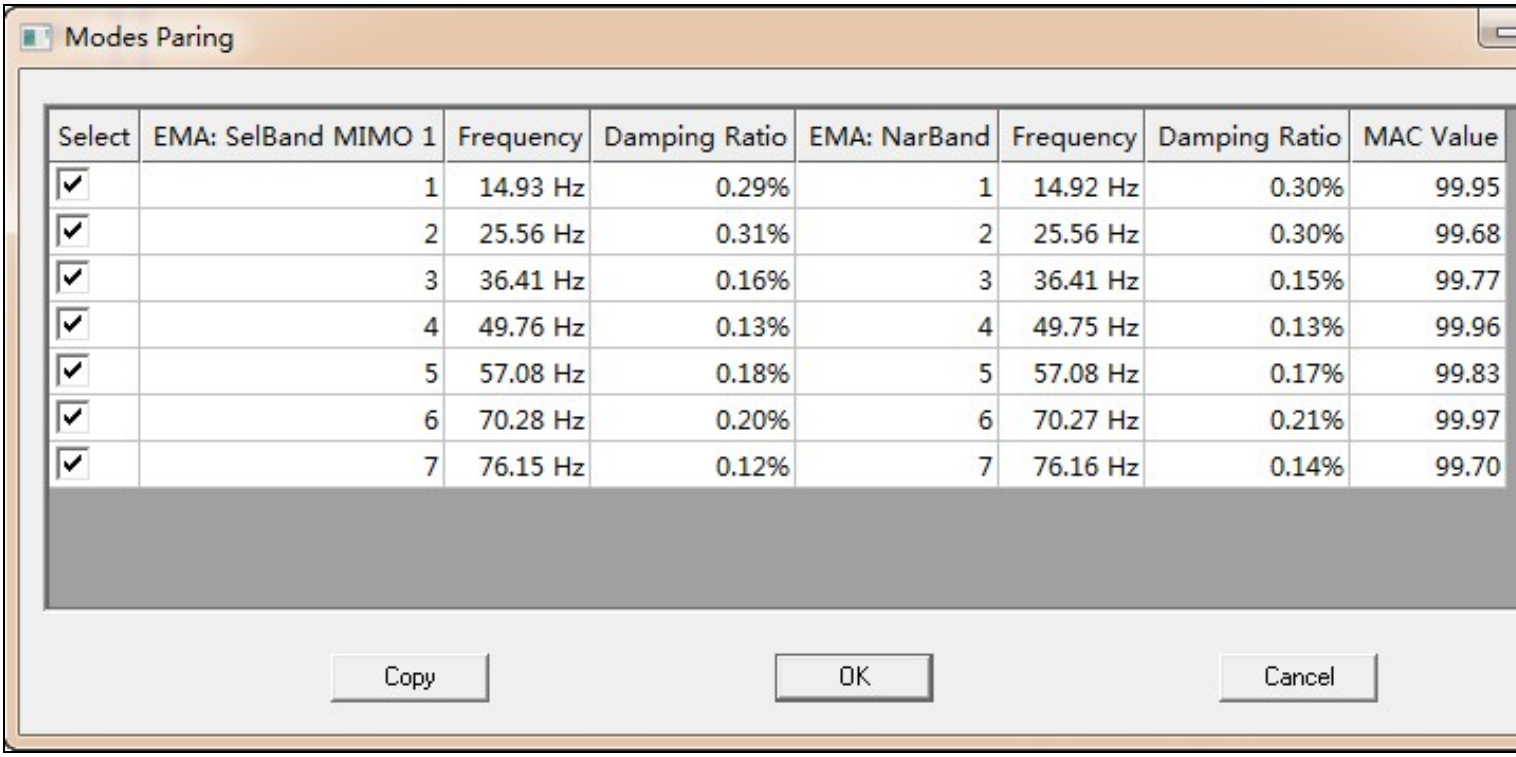
The MAC value table can also be showed by the right click popup menu.

Coordinate Modal Assurance Criterion (COMAC) is an extension of Modal Assurance Criterion (MAC). COMAC attempts to identify which measurement degrees of freedom contribute negatively to a low value of MAC. COMAC is calculated over a set of mode pairs, analytical versus analytical, experimental versus experimental or experimental versus analytical. In Modal, COMAC between modes from different identification algorithms or imported modes can be calculated.

To calculate COMAC, the first step is to set the two sets of modes you want to be compared.

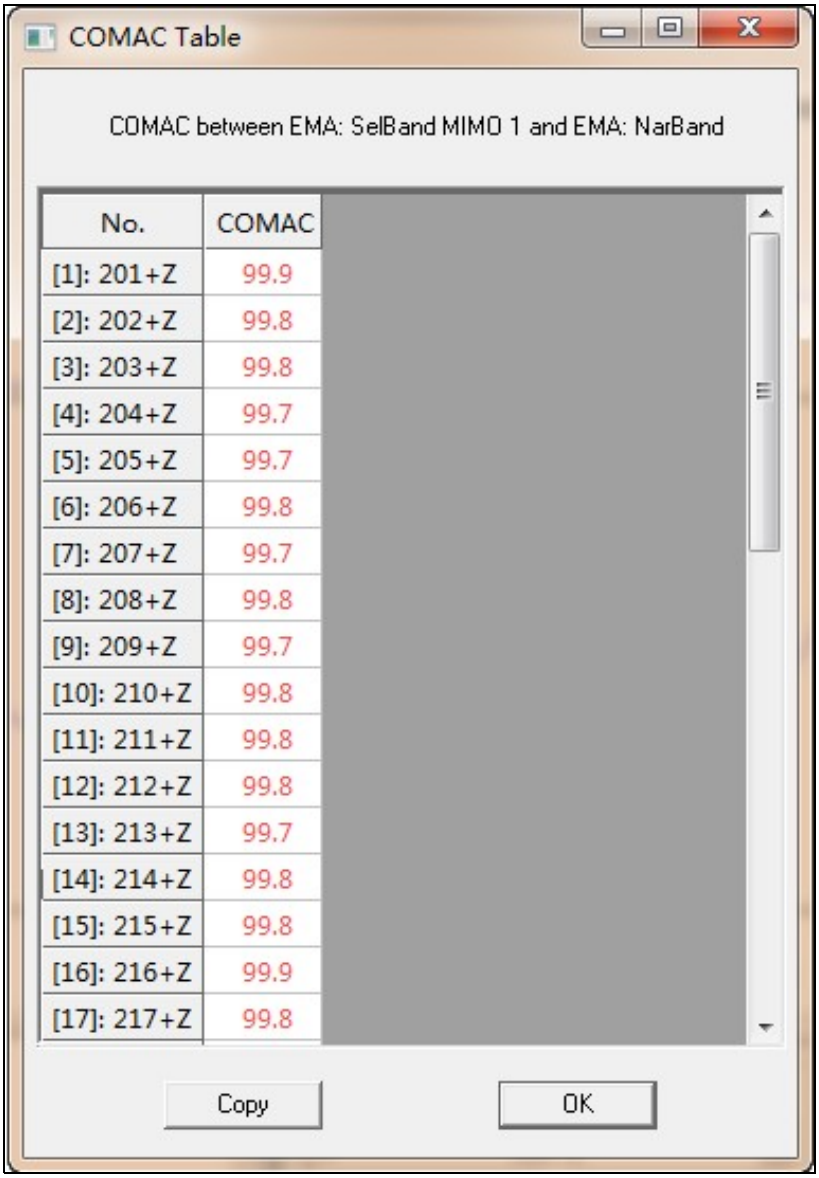


In the second step, the mode pairs should be determined. The process of modes paring will be done by Modal automatically, according to the MAC values between each modes in the two sets. You are also allowed to select part of the mode pairs.



Select	EMA: SelBand MIMO 1	Frequency	Damping Ratio	EMA: NarBand	Frequency	Damping Ratio	MAC Value
☑	1	14.93 Hz	0.29%	1	14.92 Hz	0.30%	99.95
☑	2	25.56 Hz	0.31%	2	25.56 Hz	0.30%	99.68
☑	3	36.41 Hz	0.16%	3	36.41 Hz	0.15%	99.77
☑	4	49.76 Hz	0.13%	4	49.75 Hz	0.13%	99.96
☑	5	57.08 Hz	0.18%	5	57.08 Hz	0.17%	99.83
☑	6	70.28 Hz	0.20%	6	70.27 Hz	0.21%	99.97
☑	7	76.15 Hz	0.12%	7	76.16 Hz	0.14%	99.70

Then the COMAC values table will be displayed.



37 Modal ODS and Modal(EMA-OMA) identification

37.1 ODS & Modal Analysis

Modal can deal with Operating Deflection Shape (ODS) Analysis and two types of modal analysis: Experimental Modal Analysis (EMA, both input and output data are available) and Operational Modal Analysis (OMA, only output data are available).

You can find out how a machine or structure moves during its operation via ODS, which shows the overall dynamic characters of the structure or machine.

You can get the modal parameters of structures via EMA or OMA, by performing the following four steps: (1)Signal processing to get frequency response functions (for EMA) or output power spectrum matrices (for OMA); (2) Selecting an appropriate identification algorithm;?3?Doing modal identification; (4) Operating the identification results, such as viewing mode shapes, copying, and removing, and so on.

Almost all the algorithms begin with the Modal Indicator Function (MIF).

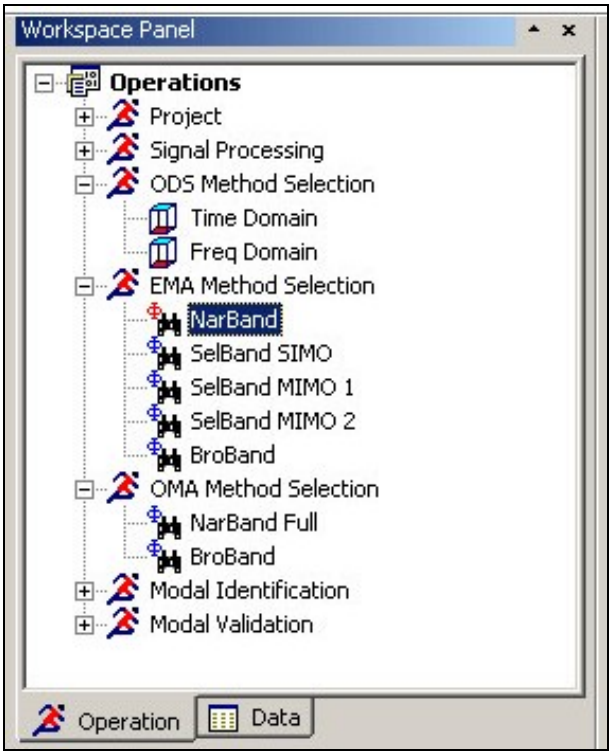
The following modules are available in Modal: TD ODS, FD ODS, EMA Narband (CMIF), EMA SelBand-SIMO (RFOP), EMA SelBand-MIMO 1 (FDPR), EMA SelBand MIMO 2 (RFPM), EMA BroBand (BBFD), OMA NarBand Full (FSDD), OMA NarBand Half (CMIF), and OMA BroBand (OBFD). A NarBand method means an algorithm performed in a narrow frequency band, who has the biggest advantage of simple and easy to use. You can identify the modes only by picking the peaks of MIF one by one. A SelBand method means an algorithm performed in one or several selected frequency bands. A BroBand method means an algorithm performed in a broad frequency band or even the full frequency band sometimes.

An effective tool Modal Assurance Criterion (MAC) is also provided to validate the result of modal identification.

37.1.1 Modal Analaysis process illustration

37.1.1.1 Selecting an Algorithm

Before modal identification, you should select an appropriate algorithm according to the analysis type (EMA or OMA) and number of input (SIMO or MIMO). You can select the specified algorithm by mouse click on the corresponding item in the "Workspace" shortcut pane. A message will appear if you success in doing this.



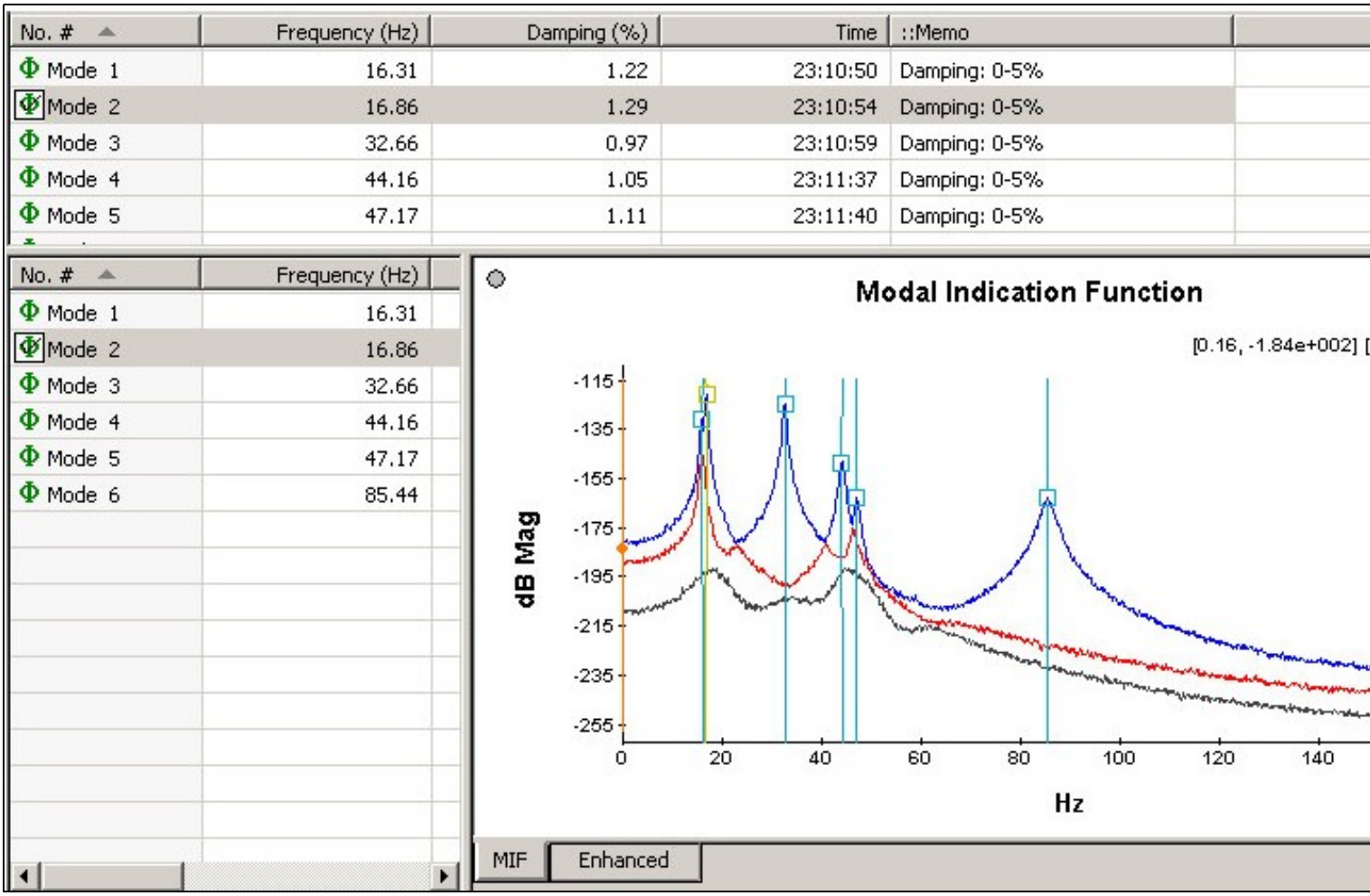
Another appropriate algorithm can be selected for necessary. And you can compare the results from different algorithms. If some selected algorithm is not fit for the current case, you will be prompted to select another one.

37.1.1.2 Doing Modal Identification

It?s recommended to employ the modal indicator function (MIF) for the modal identification in the frequency domain. The identification process varies according to different type of algorithms.

1. Narrow-Band Identification Algorithm

(1) Open the MIF curves interface by pressing the  button in the toolbar, and the following interface will appear:



The interface consists of two mode list views and a tab window view (?MIF? tab and ?Enhanced? tab). The two mode list view is synchronous. You can adjust the separator lines to resize these views.

(2) Press the button in the toolbar to begin the NarBand modal identification.

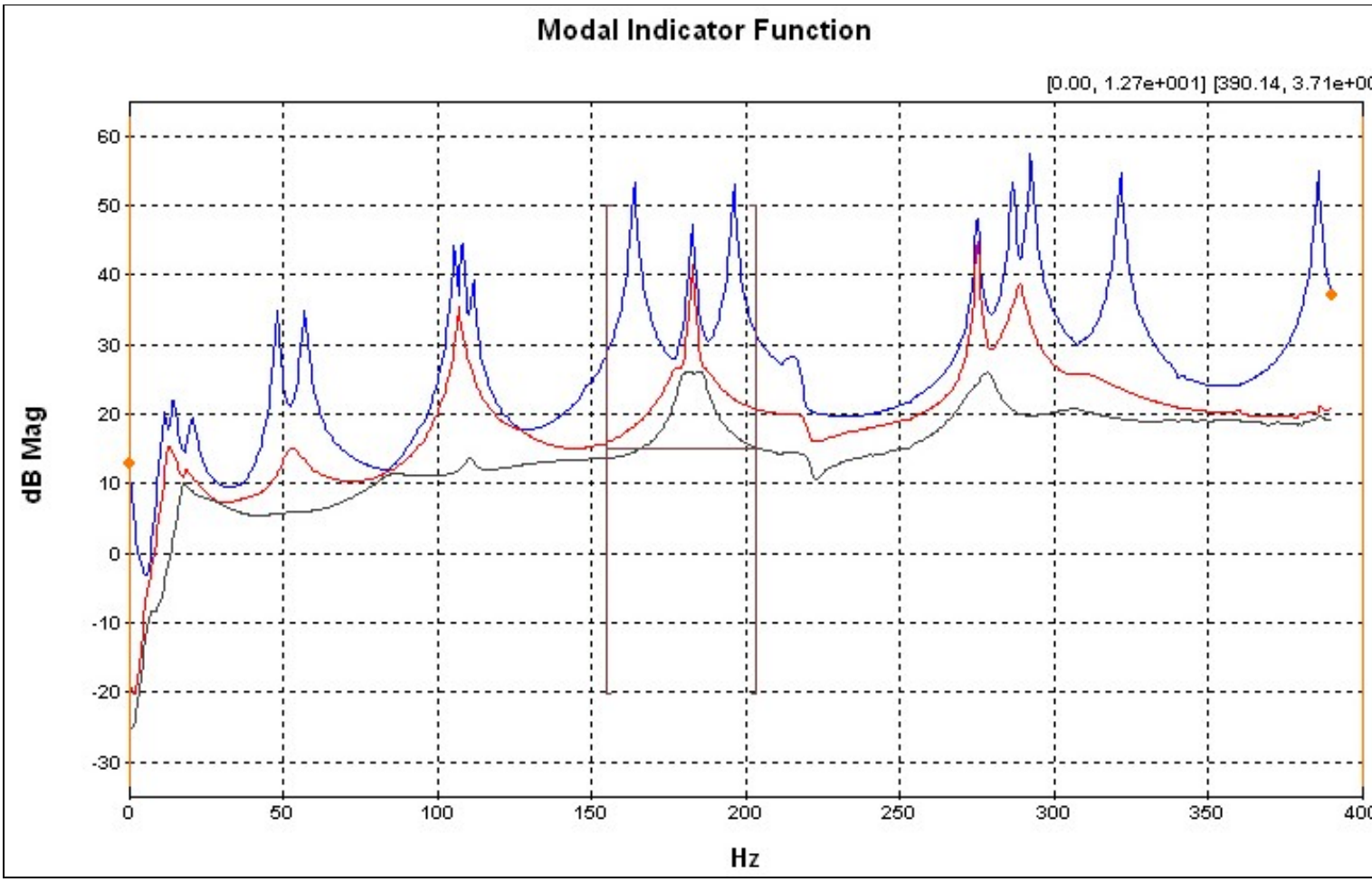
(3) Check the identified results and curve fitting of enhanced curves. All the identified modes will be shown in the two mode list views and output shortcut pane. You can check the relevant enhanced curves and its curve fitting in each setup for each mode. If ideal curve fitting hasn?t been got, you can adjust the fitting band manually, and identify this mode again in the current setup by double clicks.

1. Select-Band Identification Algorithm

(1) Open the MIF curves interface by pressing the button in the toolbar.

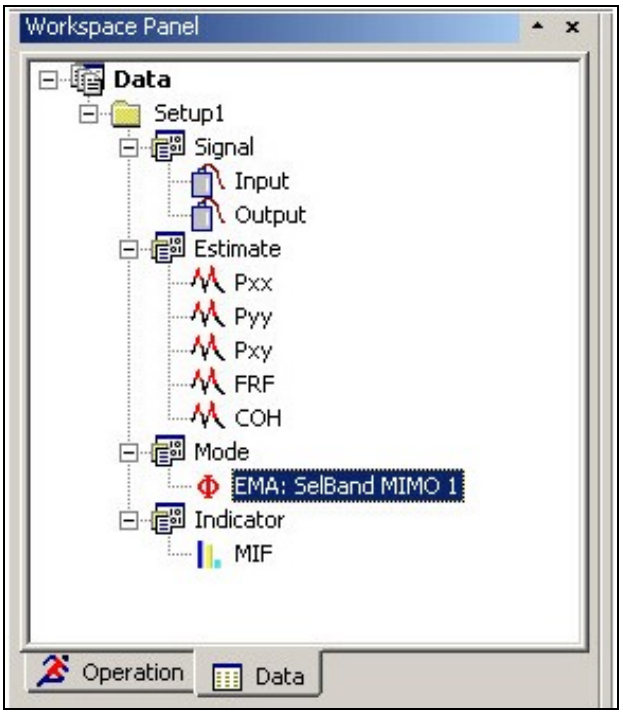
(2) Select the identification frequency band. Move the cursors by mouse or keyboard to the frequency point you want, then double click the mouse or press Enter key to select this band. As a result, a tag like "[-]" appears to indicate this selected band. The data in this band will be used for modal identification. Multiple selected bands for the identification are allowed in Modal, and all the data in these bands will be used to identify modal parameters. To delete the latest selected band, you can use the button in the toolbar, or by the mouse?s middle click. To delete all the selected bands, you can use the button in the toolbar, or by the mouse?s middle double clicks.

(3) Specify the modal order in the selected bands. MIF plot can be used to indicate the modes existence efficiently. A peak in this plot means a mode. For example, in the selected band of the following figure, four modes are detected, including two heavily closed modes.



(4) Press the  button in the toolbar to begin modal identification with selected algorithm.

(5) Check the results. The synthesized FRF/HPSD curves will appear in the main window after identification, and the result will be shown in the output shortcut pane. At the same time, an item corresponding to the selected identification algorithm will appear under the directory of ?Data\Setup1\Mode? in the workspace shortcut pane.



Double click on this item will show the identified mode list.

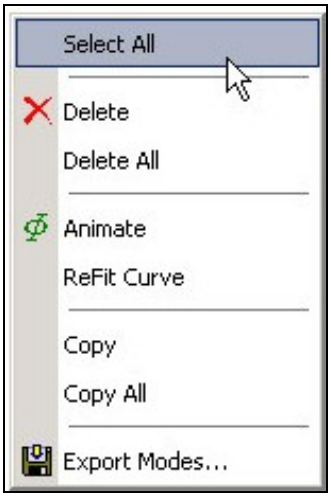
No. #	Frequency (Hz)	Damping (%)	Modal A	Time	::Memo
Mode 1	65.13	0.94	1.31e+01 + 1.98e+02i	10:26:13	Damping: 0-5%
Mode 2	89.16	0.20	-1.42e+02 + 1.40e+02i	10:26:13	Damping: 0-5%
Mode 3	135.32	0.51	-1.16e+01 + 3.39e+02i	10:26:24	Damping: 0-5%
Mode 4	183.02	0.31	-2.76e+01 + 5.52e+02i	10:26:32	Damping: 0-5%
Mode 5	221.20	0.20	-1.90e+01 + 6.01e+02i	10:26:43	Damping: 0-5%
Mode 6	252.88	0.03	-7.95e+01 + 5.21e+02i	10:26:53	Damping: 0-5%
Mode 7	327.98	0.20	-6.92e+01 + 1.05e+03i	10:27:01	Damping: 0-5%
Mode 8	457.48	0.26	-2.24e+01 + 1.04e+03i	10:27:08	Damping: 0-5%
Mode 9	523.08	0.29	-1.42e+01 + 1.29e+03i	10:27:17	Damping: 0-5%
Mode 10	539.82	0.11	-2.20e+02 + 1.30e+03i	10:27:17	Damping: 0-5%
Mode 11	673.38	0.47	-2.32e+02 + 1.68e+03i	10:27:28	Damping: 0-5%
Mode 12	684.54	0.59	-7.66e+01 + 1.70e+03i	10:27:28	Damping: 0-5%
Mode 13	742.68	0.17	-2.01e+02 + 1.92e+03i	10:27:37	Damping: 0-5%

3. Broad-Band Identification Algorithm

The process of Broad-Band algorithms is almost the same with Select-Band algorithms, only that broader or even full frequency band can be set for the Broad-Band identification.

37.1.1.3 Operating the Results

Detailed information on identified modal frequencies, damping ratios, identification time, if structural mode are displayed in the mode list view. You can sort the modes ascending or descending according to the specified keyword by clicking on this column header. Also you can do many other operations by the toolbar or right click popup menu, such as deleting modes, copying modes, viewing the mode shapes, exporting the modes, and so on.



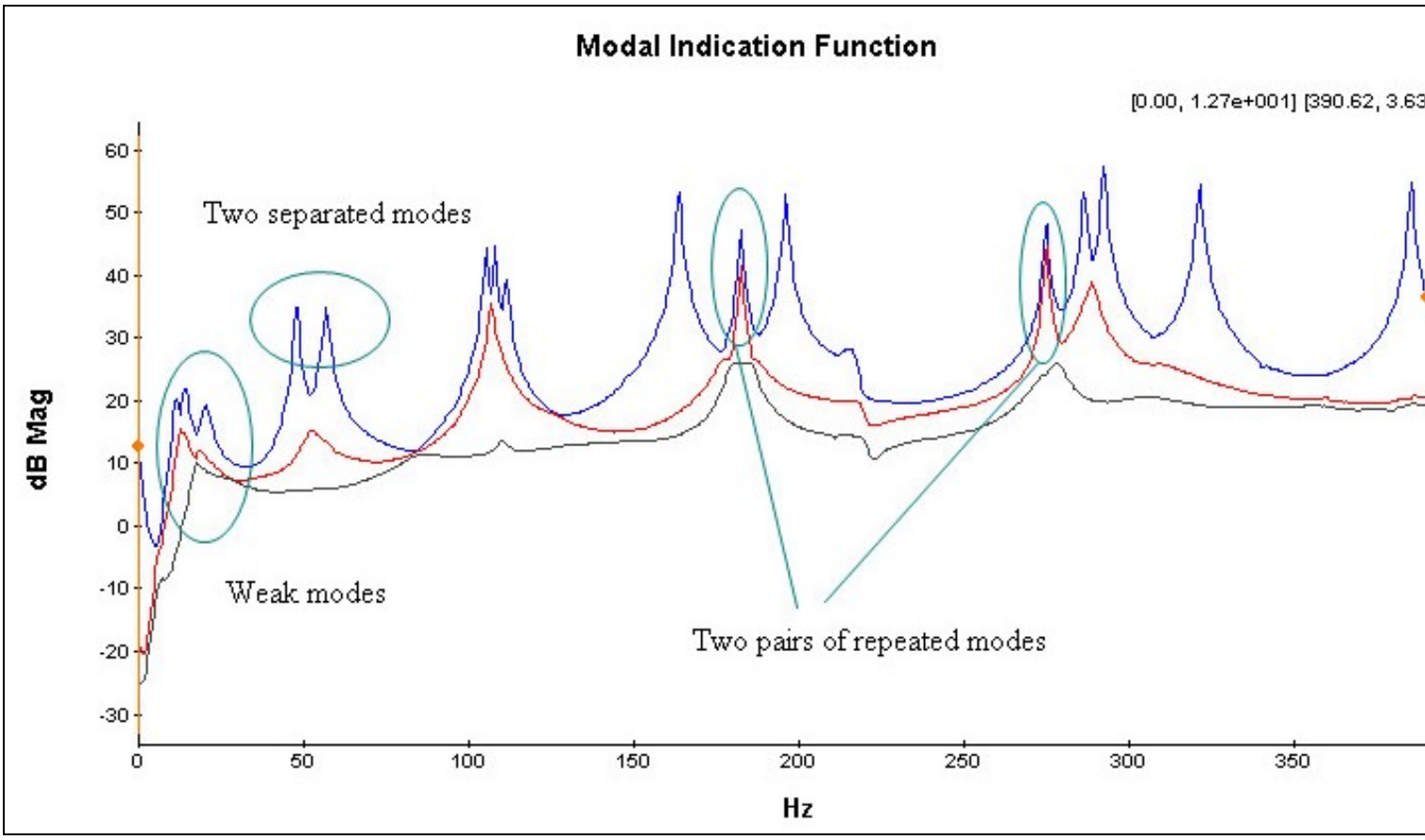
You can also double click on the icon of ??? in the front of each row to view the mode shape animations. The mode shape animations are an import criterion of modal identification.

37.1.2 Modal Indicator Function (MIF)

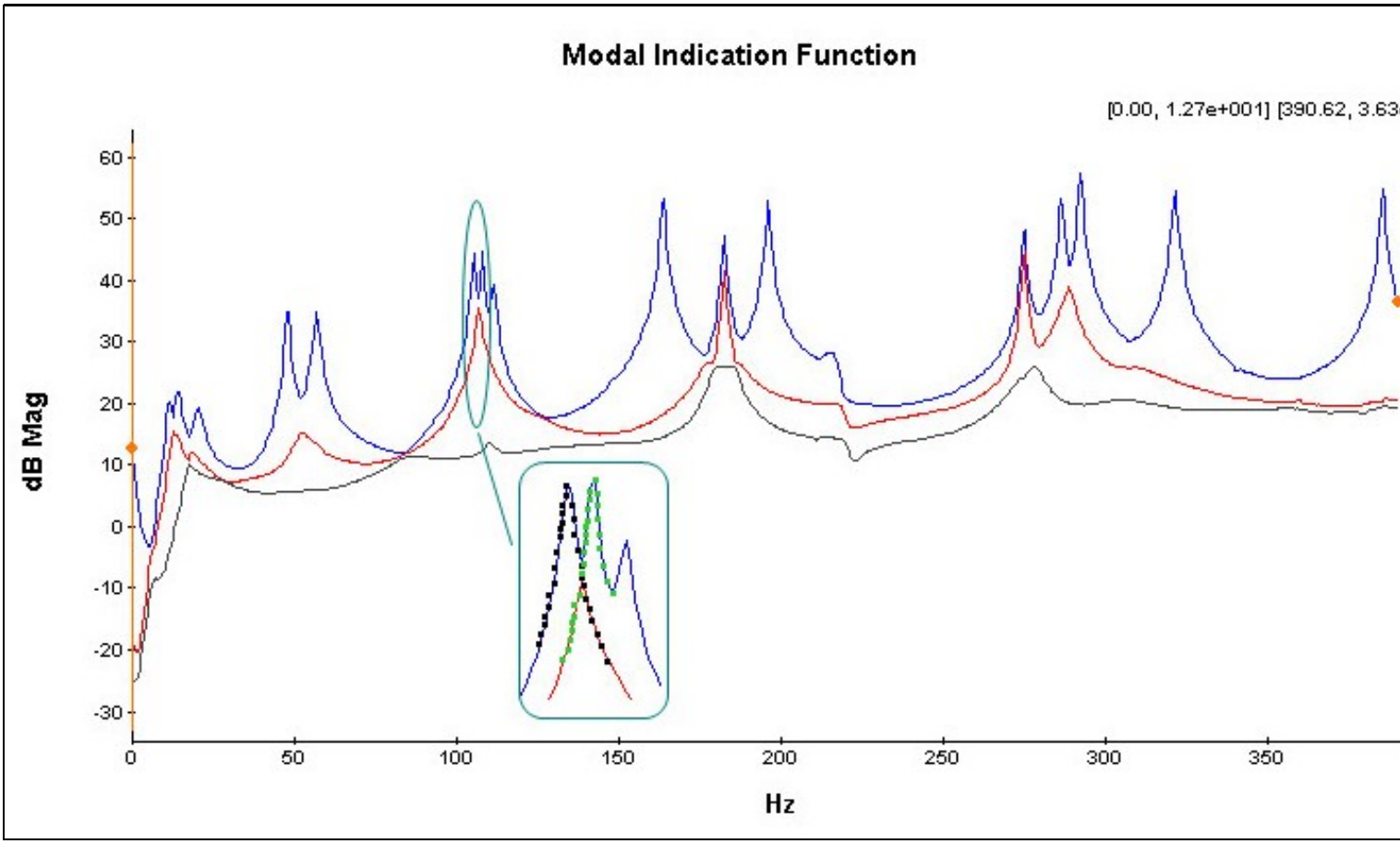
A very important step of modal identification is to determine how many modes are contained in a selected frequency band. MIF plot is a very good tool to achieve this, indicating the modes efficiently.

MIF can be employed in not only EMA, but also OMA. The number of MIFs equals the number of excitations or references. The MIFs consist of the singular values of frequency response function matrix (FRF), output power spectral density matrix (OPSD), or half power spectral density matrix (HPSD).

By the powerful singular value decomposition, the real signal space is separated from the noise space. Therefore, the MIFs exhibit the modes effectively. A peak in the MIFs plot usually indicate the existence of a structural mode, and two peaks at a same frequency point means the existence of two repeated modes. Moreover, the magnitude of the MIFs always implies the strength of a mode.



Sometimes we should note the cross modes, for example

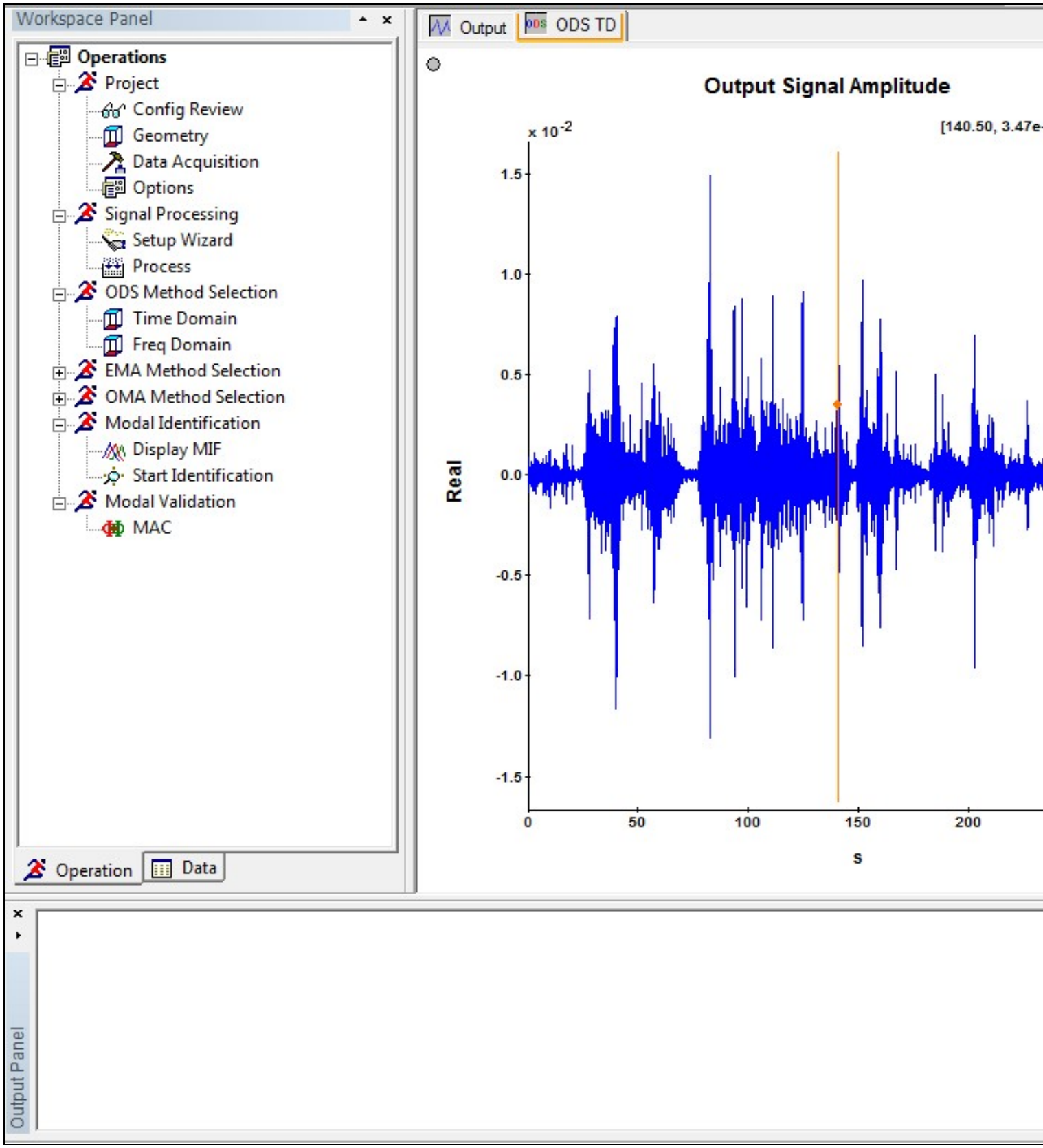


As showed in the above figure, the peak in the second MIF curve doesn?t indicate a mode. It?s formed by the cross of two modes.

37.1.3 Operating Deflection Shape

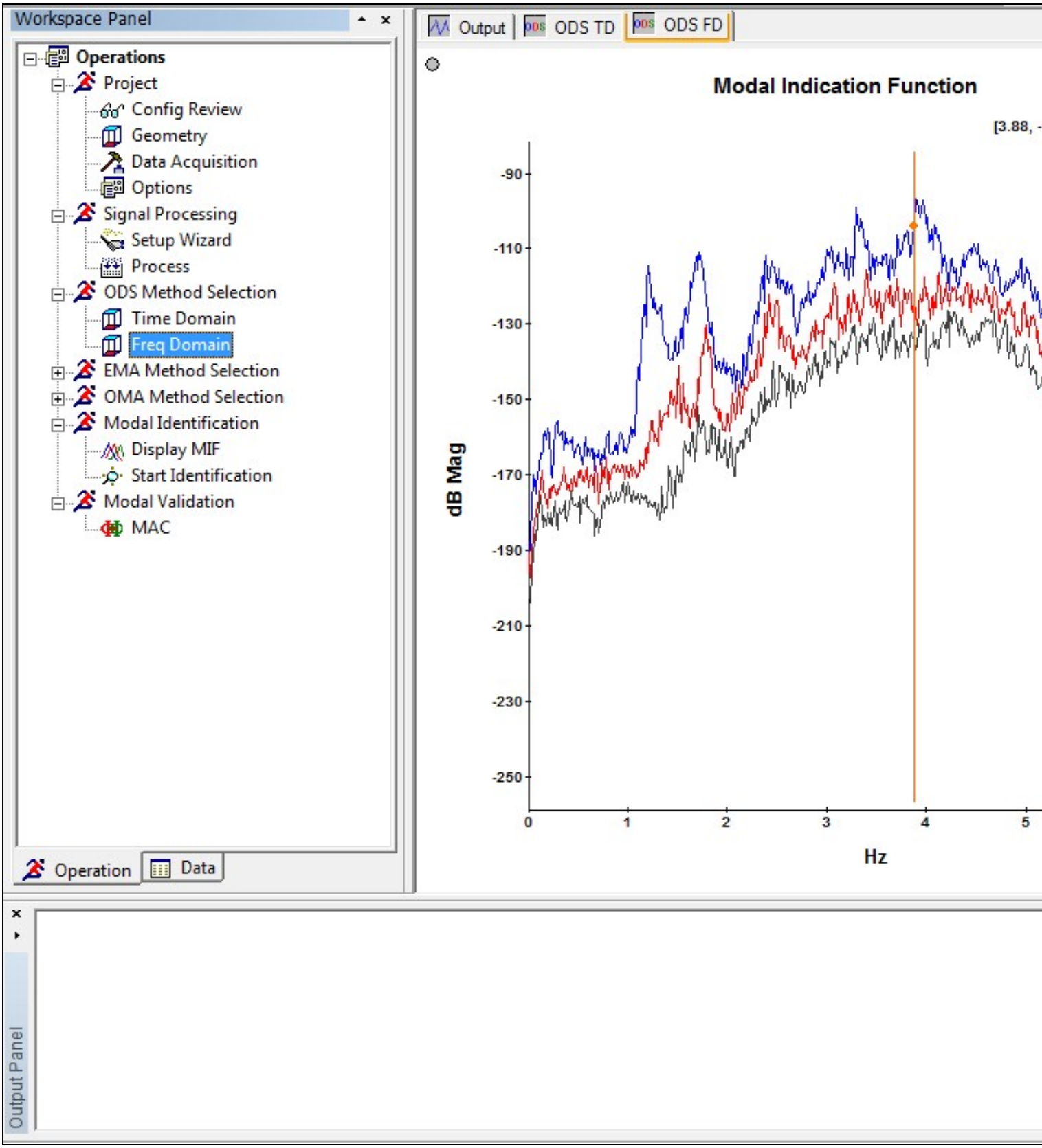
37.1.3.1 Time domain ODS

With Modal, you can animate time domain ODS directly from multi-channel data that was acquired spatially from a machine or structure. This is done by sweeping a cursor through a set of time histories. You can stop the animation, back it up, and play it forward to observe in slow motion vibration phenomena that may have taken place very quickly.


Workspace Panel
Operations
Project
Config Review
Geometry
Data Acquisition
Options
Signal Processing
Setup Wizard
Process
ODS Method Selection
Time Domain
Freq Domain
EMA Method Selection
OMA Method Selection
Modal Identification
Display MIF
Start Identification
Modal Validation
MAC
Operation
Data
Output
ODS TD
Output Signal Amplitude
x 10-2
[140.50, 3.47e-
Real
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
0
50
100
150
200
s
Output Panel

37.1.3.2 Frequency Domain ODS

With Modal, you can animate frequency domain ODS directly from data that was acquired spatially from a machine or structure. This is done by sweeping a cursor through a set of frequency domain measurements, or dwelling at a specific frequency. A FD ODS allows you to see how a structure behaves at a single frequency.



37.1.4 Modal Analysis

37.1.4.1 Modal identification methods

Modal analysis can be conducted via artificial excitation, e.g. shaker or instrument hammer excitation, and input force and output responses are measured. That is normally called an Experimental Modal Analysis (EMA). Modal analysis can be also accomplished during operational conditions of a mechanical structure via responses measurements due to ambient or natural excitation, or other excitation but without input force measurements. This is called as Operational Modal Analysis (OMA).
Modal identification algorithms can generally be divided into 2 categories: Time domain (TD) techniques and frequency domain (FD) techniques. TD modal identification has the advantage of estimation of all the modes in the frequency band of interests at once. However, all the TD modal identification algorithms have common unfavorable feature, difficulty to distinguish physical (structural) modes from computational (noise) modes. For application to real-world structure, to locate structural modes reliably is the most important task of a modal analysis. This is why only FD techniques are implemented in OM2.

EMA	OMA
EMA approach can be divided into three levels based on Single Input Single Output (SISO), Single Input Multiple Outputs (SIMO), Multiple Input Multiple Outputs (MIMO). Modal is born in MIMO. However, SIMO algorithm is also implemented for preliminary application. MIMO EMA has important advantages: not only consistent results can be obtained, but close spaced and even repeated modes can be identified. A modal Indication function (MIF) is calculated via Singular-Value-Decomposition (SVD) of the frequency Response Functions.	OMA is a powerful tool to extract dynamic characteristics of real world structure from output-only measurements during operational conditions. The output response can be generated by ambient or natural excitation as well as artificial broadband excitation (but without input force measurements). A modal Indication function (MIF) is calculated via Singular-Value-Decomposition of Power Spectrum Density (PSD) matrix or Half Power Spectrum Density (HPSD) matrix.
	OMA Narband Full
	Narrow-band operational modal identification algorithm in frequency domain. 1. Distinguishes structural modes from noise modes much easier compare to TD OMA. 2. Based on modal decomposition of Power Spectrum Density (PSD) matrix. 3. Identifies one mode at a time. 4. Can easily deal with closely spaced or even repeated modes of real word mechanical structures. 5. Easy-to-use. 6. An assumption that singular vector, i.e. mode shapes vector, are orthogonal is made. However, even with this approximation, the modal parameters identified still have enough accuracy to meet engineering need.
EMA Narband	**OMA Narband Half**
Narrow-band MIMO modal identification algorithm. 1. Identifies one mode at a time. 2. Can easily deal with closely spaced or even repeated modes of real word mechanical structures. 3. Easy to use. 4. As typical spatial domain decomposition technique enough output measurements are required. 5. An assumption that singular vector, i.e. mode shapes vector, are orthogonal is made. However, even with this approximation, the modal parameters identified still have enough accuracy to meet engineering need.	Narrow-band MIMO modal identification algorithm. 1. Based on modal decomposition of Half Power Spectrum Density (HPSD) matrix. 2. Identifies one mode at a time. 3. Can easily deal with closely spaced or even repeated modes of real word mechanical structures. 4. Easy to use. 5. As typical spatial domain decomposition technique enough output measurements are required. 6. An assumption that singular vector, i.e. mode shapes vector, are orthogonal is made. However, even with this approximation, the

	modal parameters identified still have enough accuracy to meet engineering need.
EMA Selband SIMO	
Selected-band SIMO modal identification technique, suitable for the modal test with only one excitation or one reference, e.g., a single shaker or single reference for impact tests. 1. Identifies a few modes at a time at user-selected frequency bandwidth. 2. Based on Rational Fraction Polynomial formulation of frequency response function (FRF). To improve numerical performance, orthogonal polynomial is adopted instead of power polynomial in traditional FRF representation. 3. Can be applied in modal testing with a few response measurements.	
EMA Selband MIMO1	
Selected-band MIMO modal identification technique. 1. Identifies a few modes at a time at user-selected frequency bandwidth. 2. Can easily deal with closely spaced or even repeated modes of real-world complex mechanical structures. 3. A rank chart is displayed to be sure of the number of modes within the frequency band. 4. All modal parameters within the frequency band will be automatically identified. 5. FRF curve-fitting, i.e. comparison between synthesized FRFs based on identified modal parameters and measured FRFs is applied for validation. 6. Use Singular-Value Decomposition (SVD) of FRF data for distinguish structural modes from noise modes, and Principle Component Analysis (PCA) for data condensation. 7. Easy to use. 8. Normally the number of measurements should be larger than the number of modes.	
EMA Selband MIMO2	
Selected-band MIMO modal identification technique. 1. Identifies a few modes at a time at user-selected frequency bandwidth. 2. Can easily deal with closely spaced or even repeated modes of real-world mechanical structures. 3. Based on Rational Fraction Polynomial formulation of frequency response function (FRF). To improve numerical performance, orthogonal polynomial is adopted instead of power polynomial in traditional FRF representation. 4. It would be better to limit the number of references DOFs of the FRF matrix, e.g. less than three. 5. Can be applied in modal testing with a few response measurements.	

EMA Broadband	OMA Broadband
Broad-band MIMO modal identification technique. 1. Identifies all modes in a broad frequency band or even in the full frequency band. 2. Can easily deal with closely spaced or even repeated modes of real-world mechanical structures. 3. Can deal with heavily damped modes. 4. Can produce clear frequency stabilization chart. 5. Selects the structural poles automatically. 6. It is recommended to identify the rigid body modes along. 7. Can be applied in modal testing with a few response measurements.	Broad-band operational modal identification technique. 1. Based on the Half PSD estimated from output responses. 2. Identifies all modes in a broad frequency band or even in the full frequency band. 3. Can easily deal with closely spaced or even repeated modes of real-world mechanical structures. 4. Can deal with heavily damped modes. 5. Can produce clear frequency stabilization chart. 6. Selects the structural poles automatically. 7. It is recommended to identify the rigid body modes along.

37.1.4.2 Narband (CMIF)

Complex Mode Indicator Function (CMIF), is an narrow band modal identification algorithm in the frequency domain. CMIF an easy-to-use method. You should use it as the following steps:

37.1.4.2.1 Selecting a Peak

Press the button  in the toolbar, and click the MIF plot to activate it. A red cross marker ??? will appear, who is able to find the local peak automatically. The index and coordinate value of the marker are shown in the top left corner of MIF graph. In the figure below, (99,1):[47.85,3.48e+001] means that the cross cursor is now at the 99th point of the first MIF curve, and the coordinate is (47.85, 34.8).

?

37.1.4.2.2 Auto Identification

After selecting the peak, you should double click to finish this identification. The identified results will be shown in the MIF plot, mode list and output shortcut pane. Each identified mode will be marker with a shape symbol. Its middle pane indicates the position of peak, and the line points to the identified frequency. The mode selected in the mode list will be marked yellow in the MIF plot while the others are blue.

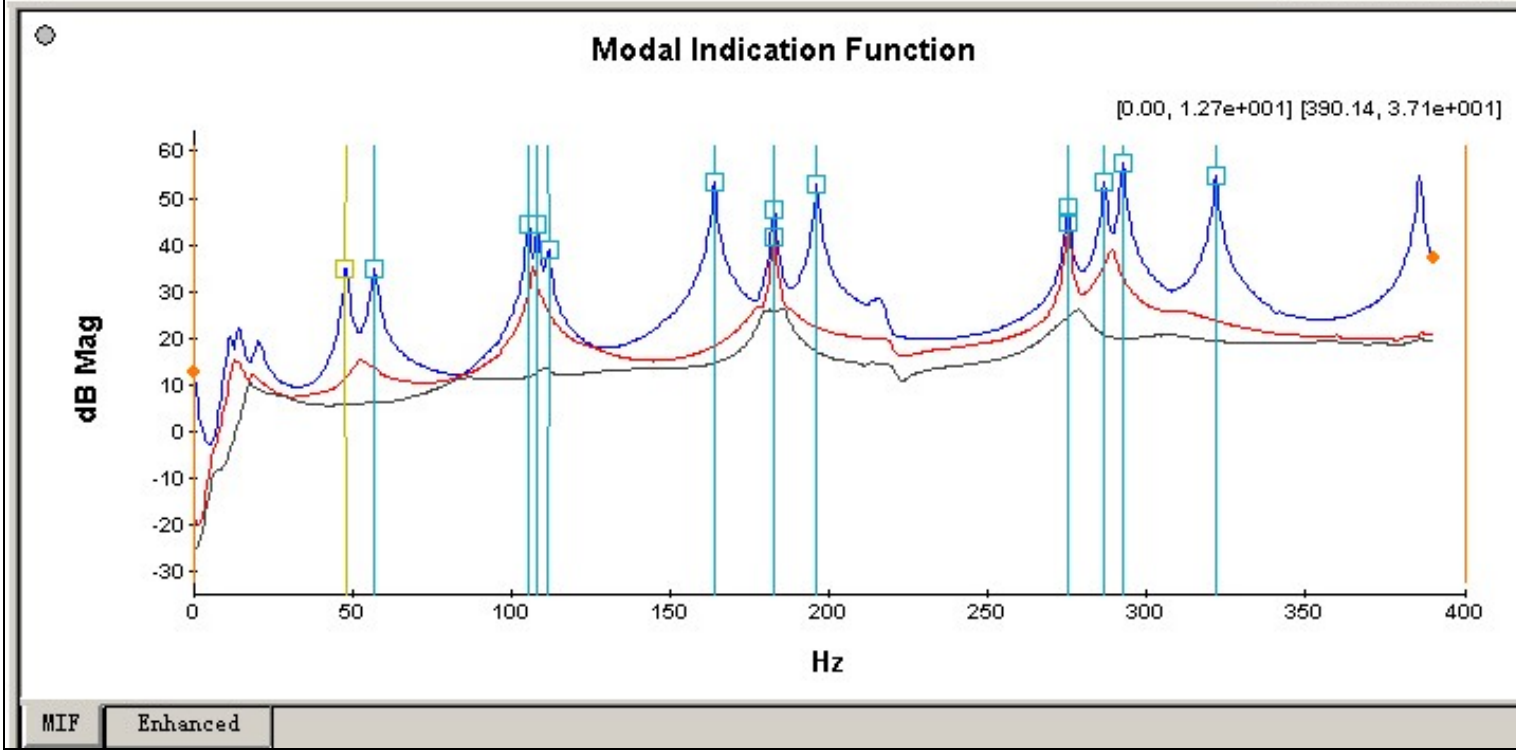
37.1.4.2.3 Checking curve fitting and Refitting

You can check the quality of curve fitting by selecting some mode in the mode list and then turning to the ?Enhanced? tab page. Seen from below, the blue one is the enhanced FRF curve, and the red one is its fitting curve. Sometimes the identification result is not good because of the automatically selected band is not the best. Thus you can move the two cursors to select a better band, then **double click** to identify this mode again.

37.1.4.3 Selband SIMO (RFOP)

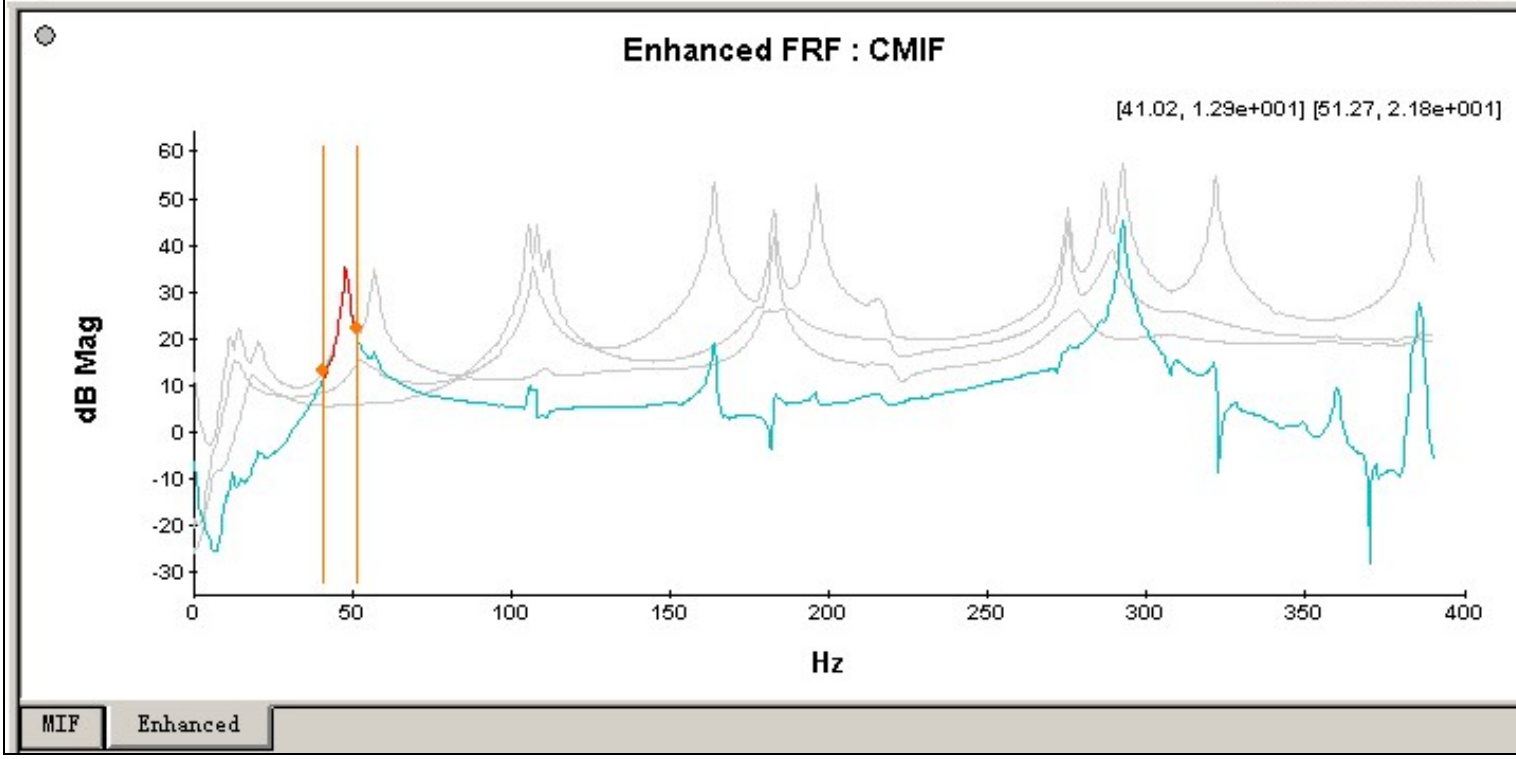
Output | CMIF Alg

No. #	Frequency (Hz)	Damping (%)	Modal A	Time	::Memo
Mode 1	48.02	0.52	-2.99e+00 + 6.90e+01i	09:25:19	Likely Mo
Mode 2	56.91	0.76	-3.81e+00 + 9.98e+01i	10:13:53	Likely Mo
Mode 3	105.54	0.25	-6.35e+01 + 1.37e+02i	10:13:55	Likely Mo
Mode 4	108.18	0.15	5.54e+00 + 1.55e+02i	10:13:58	Likely Mo
Mode 5	111.70	0.32	-8.53e+01 + 1.66e+02i	10:14:02	Likely Mo

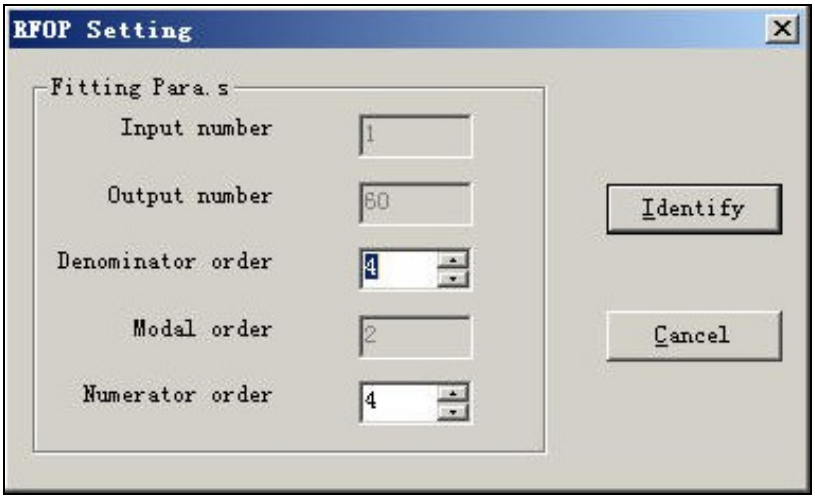


Output | CMIF Alg

No. #	Frequency (Hz)	Damping (%)	Modal A	Time	::Memo
Mode 1	48.02	0.52	-2.99e+00 + 6.90e+01i	09:25:19	Likely Mo
Mode 2	56.91	0.76	-3.81e+00 + 9.98e+01i	10:13:53	Likely Mo
Mode 3	105.54	0.25	-6.35e+01 + 1.37e+02i	10:13:55	Likely Mo
Mode 4	108.18	0.15	5.54e+00 + 1.55e+02i	10:13:58	Likely Mo
Mode 5	111.70	0.32	-8.53e+01 + 1.66e+02i	10:14:02	Likely Mo



Rational Fraction Orthogonal Polynomials (RFOP), is an SIMO modal identification algorithm in the frequency domain. It is suitable for cases with only one excitation or one reference. RFOP can fit the FRFs or HPSDs in a fairy broad frequency band.



Each parameter is defined as the following?

37.1.4.3.1 Input Number

Number of excitations or references. It is automatically displayed by the software, and can only be 1 in the RFOP algorithm.

37.1.4.3.2 Output Number

Number of excitations or non-references. It is automatically displayed by the software.

37.1.4.3.3 Denominator Order

Rational fraction math model is used in the RFOP algorithm, and the order of denominator is twice of the modal order in the selected frequency band. Generally you can confirm the modal order by the MIF plot. In some cases, the modal order should be increased properly to hold the noisy modes, and the noise modes can be deleted by the criterion on damping ratios and mode shapes.

37.1.4.3.4 Modal Order

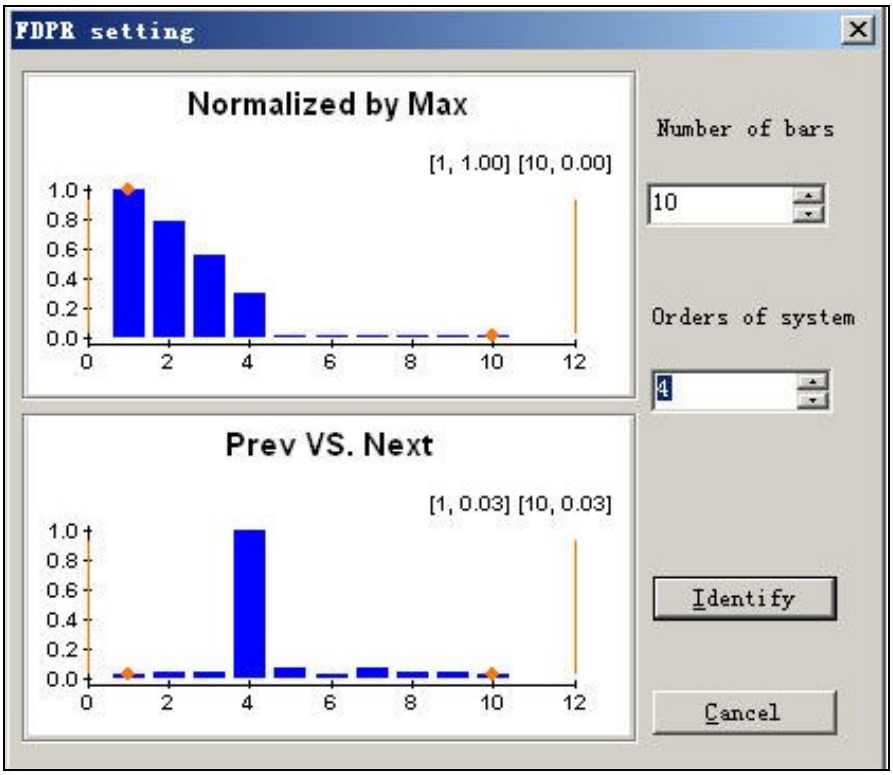
This parameter varies with the denominator order you set. You should ensure that this value equal or larger than the real modal order in the selected frequency band.

37.1.4.3.5 Numerator Order

This parameter varies with the denominator order you set, and keeping equal to it. You are allowed to set this value individually to be larger than the denominator order, for the sake of compensating for the out-band modes.

37.1.4.4 Selband MIMO1

Frequency Domain Poly-reference (FDPR), is a MIMO modal identification algorithm in the frequency domain. It is suitable for cases with multiple excitations or multiple references. FDPR usually fits the FRFs or HPSDs in a narrow frequency band. The outstanding advantage of FDPR is its highly easy-to-use.



Besides the MIF plot, two another bar graphs are provided for you to confirm the modal order in the selected frequency band according to the bars? height. The upper graph shows the relative height of each mode, and it indicates the first four modes are greater than others. The lower graph shows the ratio of previous mode vs. next mode. You will find the fourth one is extremely high. It means that there are 4 structural modes, and the rest are ?noisy modes". So, here you should specify the system order to 4.

Each parameter is defined as the following?

37.1.4.4.1 Number of Bars

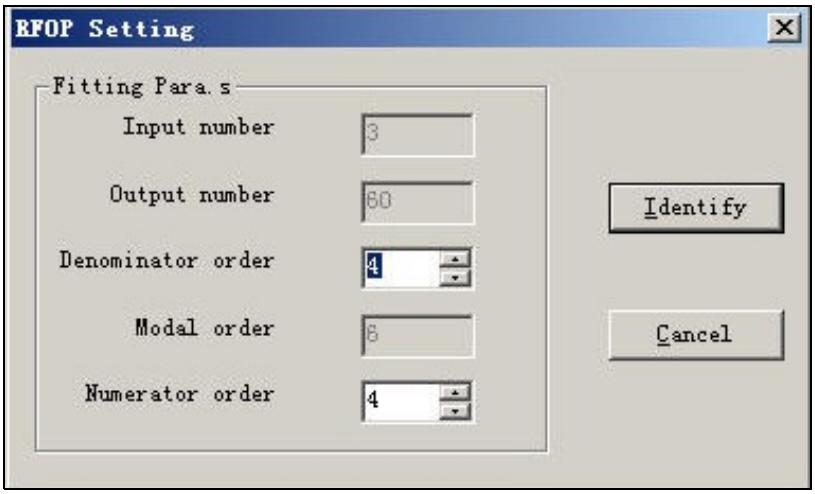
Number of bars shown in the graph, default as 10. The minimum value of this parameter is 2, and the maximum value is the output number of FRFs. You can change this value to view the bas more clearly.

37.1.4.4.2 Order of System

Modal order in the selected frequency band. Generally a fairy good value will be automatically set according to the practice. You are also allowed to change this value to get better result.

37.1.4.5 EMA Selband MIMO2

Rational Fraction Orthogonal Polynomials for MIMO (RFPM), is a MIMO modal identification algorithm in the frequency domain. It is suitable for cases with multiple excitations or multiple references. RFPM can fit the FRFs or HPSDs in a fairy broad frequency band.



Each parameter is defined as the following?

37.1.4.5.1 Input Number

Number of excitations or references. It is automatically displayed by the software.

37.1.4.5.2 Output Number

Number of excitations or non-references. It is automatically displayed by the software.

37.1.4.5.3 Denominator Order

Matrix form fractional fraction math model is used in the RFPM algorithm, and the order of denominator is related with the modal order in the selected frequency band. Generally you can confirm the modal order by the MIF plot. The product of denominator order and input number should be larger than twice of the modal order. When the product of denominator order and input number is larger than the twice of the modal order, noisy modes will be identified, which can be deleted by the criterion on damping ratios and mode shapes.

37.1.4.5.4 Modal Order

This parameter varies with the denominator order you set. You should ensure that this value equal or larger than the real modal order in the selected frequency band.

37.1.4.5.5 Numerator Order

This parameter varies with the denominator order you set, and keeping equal to it. You are allowed to set this value individually to be larger than the denominator order, for the sake of compensating for the out-band modes.

37.1.4.6 EMA Broadband (BBFD)

The BroBand modal identification module is based on the algorithm of Polyreference Least Squares Complex Frequency (p-LSCF), developed in 2003. p-LSCF is a frequency MIMO modal identification algorithm which has superior performance compared to most time domain MIMO techniques, such as Polyreference Least Squares Complex Exponential (PRCE or LSCE), Extended Ibrahim Time Domain (EITD), and Eigensystem Realization Algorithm(ERA). BroBand EMA makes use of measured Frequency Response Function (FRF) as source data.

?

37.1.4.6.1 Features/Advantages of EMA Broband

EMA BroBand does not suffer from numerical problems, i.e. ill-conditioning problem in computing poles of the system in broadband as most frequency domain modal identification algorithm, e.g. Rational Fraction Orthogonal Polynomial (RFOP) and Frequency Domain Polyreference (FDPR), encountered. Compared to SelBand techniques, BroBand can then be applied to identify all the modes in a wide, including full, frequency band of interest at one time.

Compared to most time domain modal identification techniques, such as well know Polyreference (or Least Squares) Complex Exponential (PRCE, or

LSCE) technique, :BroBand yields extremely clear stability diagram, making it much easier to select structural modes, or the physical poles, from which modal frequencies and damping ratios can be readily obtained.

The BroBand modular in OM2 has the feature of automatic modal sorting capability, i.e. BroBand can automatically distinguish structural modes from "noise" modes, or real modes from spurious modes.

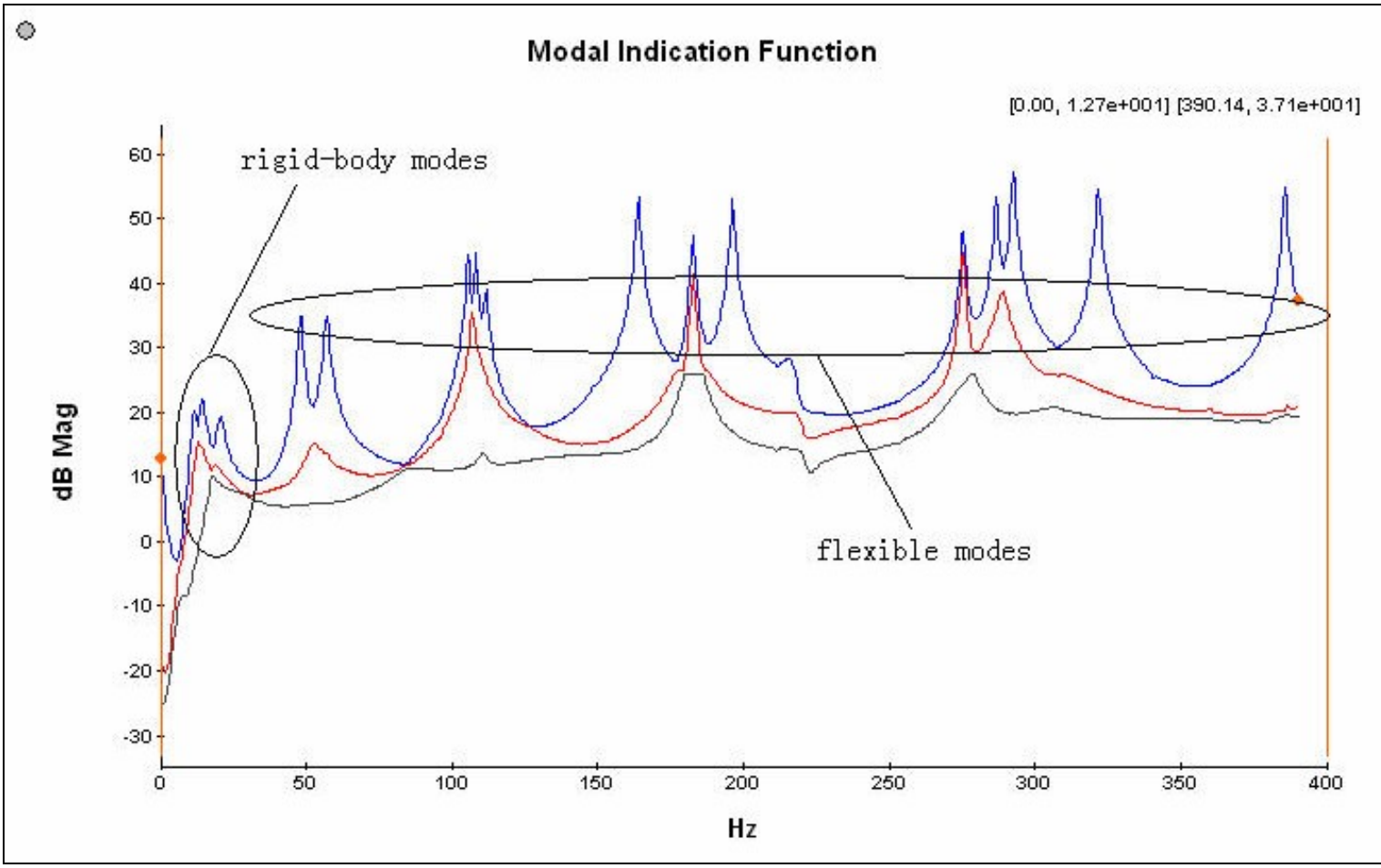
37.1.4.6.2 Main Procedures for EMA BroBand

Major procedures for modal identification with EMA Broband are as follows:

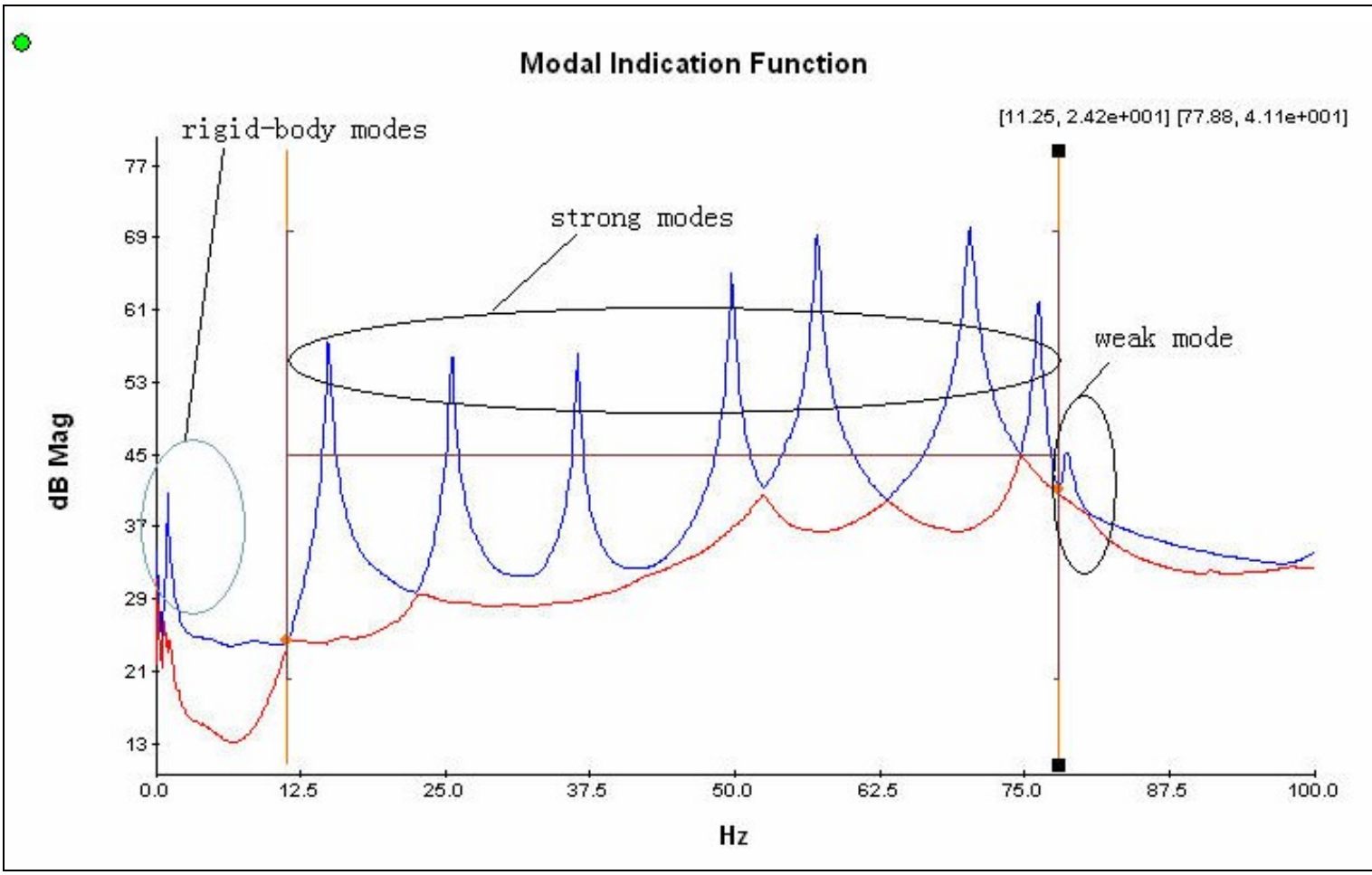
1. Select a frequency band

The EMA Broband can be used to identify all modes in a broad frequency band, including full band. However, frequency band selection may be advantageous and is suggested in the cases as:

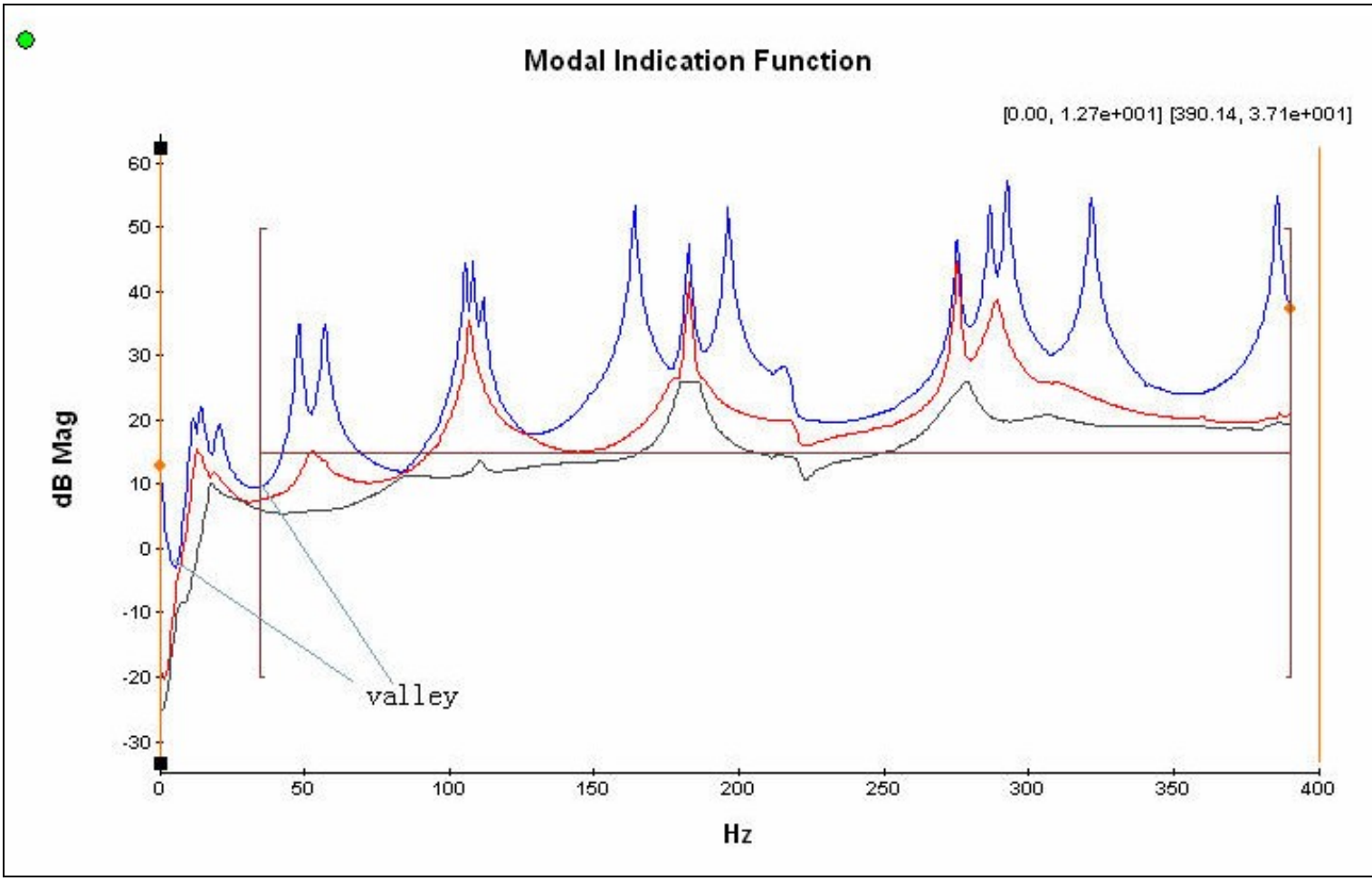
- In the "soft" suspension of test article to simulate free-free boundary condition, so called "rigid-body modes" are sometime weakly excited in low frequency range. In this case, frequency band selection excluding this low frequency range is suggested for identification of flexible structural modes. The "rigid-body modes" can also be obtained with selection of corresponding low frequency band.



- A structure under testing sometimes shows "strong mode" or "global modes" in specific frequency band, and "weak modes", or "local modes" in other frequency band. These "strong/global modes" and "weak/local modes" can be easily observed from Modal Indication Function (MIF) plot based on height of the MIF peaks. In this case, it is suggested to divide the full band into few sub-band which cover "strong/global modes" and "weak/local modes", respectively.



- It is suggested to start the frequency band from a valley of the MIF plots, and end the band at a valley too. According to our experience, such a frequency band can yield better result.



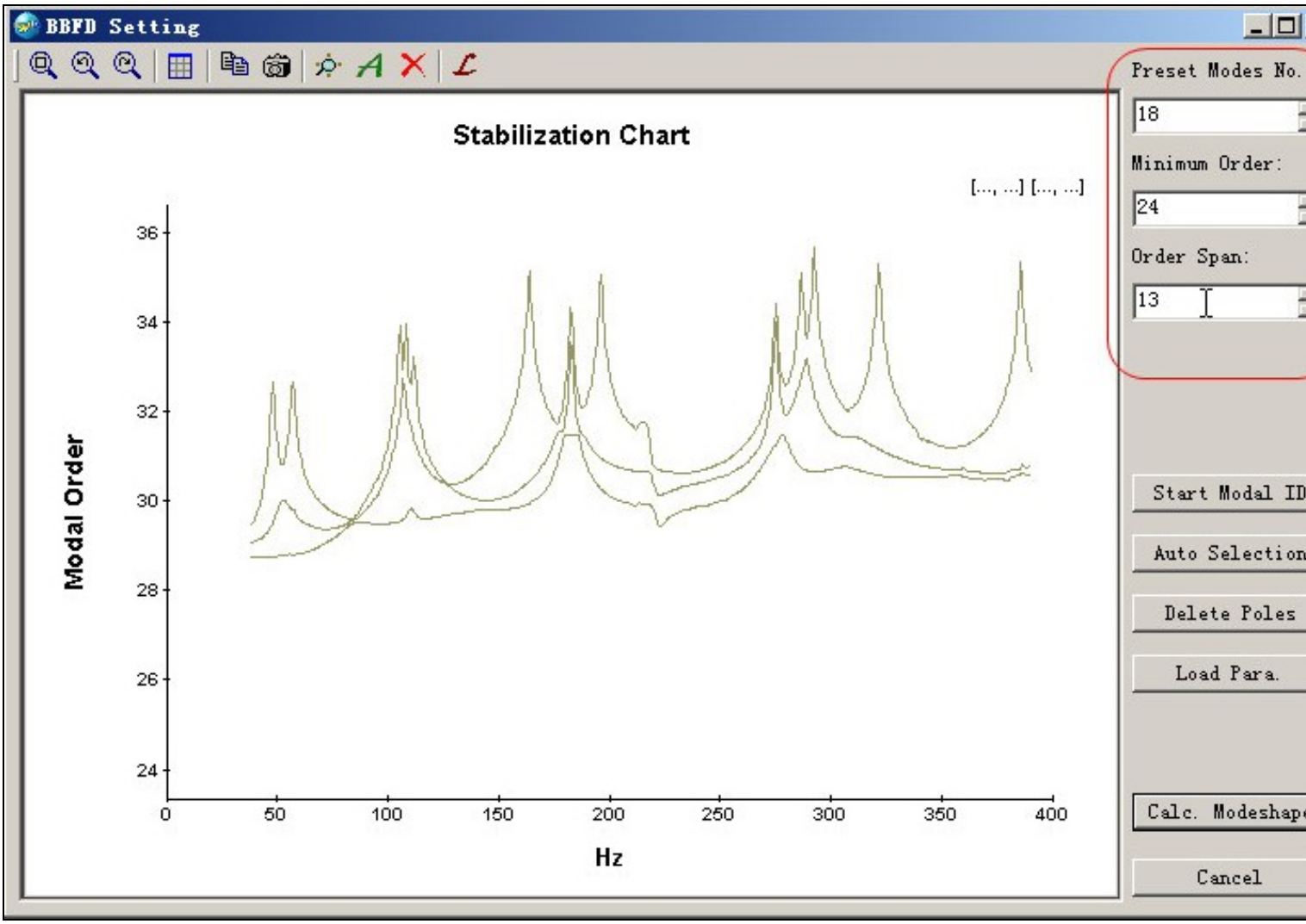
1. Start Identification

Press the button of "Start Identification"  in the toolbar to start modal identification.

1. Modal Order determination

Preliminary determination of the number of modes in the selected frequency band according to the MIF plot, and fill it in the edit box of "Preset Modes No." Then the BroBand software will calculate a default "minimum order" according to this number. The relationship between "Preset Modes No." and "Minimum Order" is: minimum order = (preset modes No)*Ni/2, where Ni means the number of input.

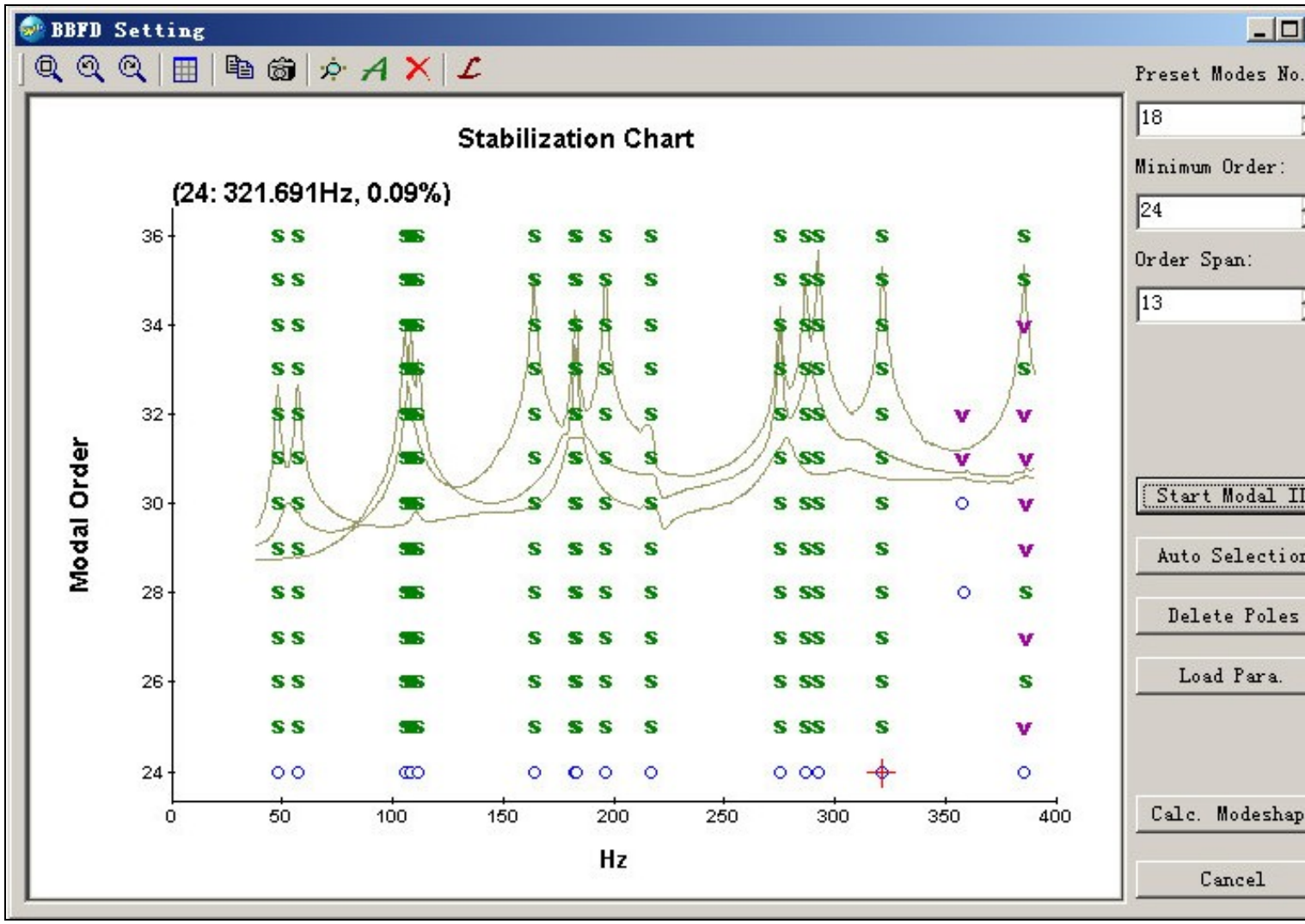
Change the number of "Order Span" if necessary. The BroBand software will estimate the poles with a range of system order from "Minimum Order" to "Maximum Order", where Maximum order= Minimum order + Order Span-1. The default order span is 12.



"Start Modal ID"

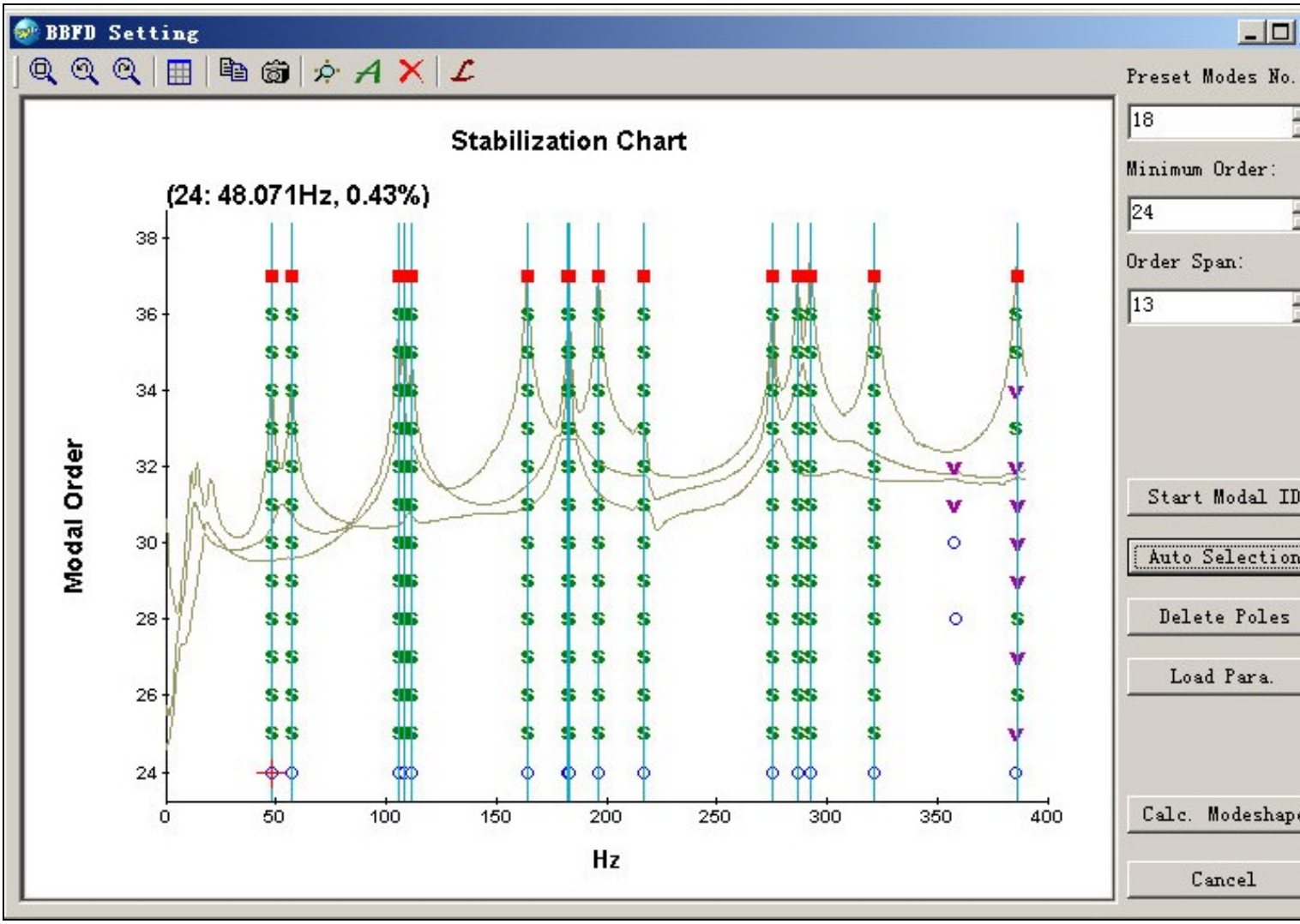
Press the button of "Start Modal ID" or  to obtain frequency stability diagram. This operation might take a little longer time to finish a complex structure with large number of modes and measurement coordinates. In the stability diagram, a shape symbol represents one pole. A pole in this diagram may represent a physical (i.e. structural) mode or a spurious (or noise) mode. It is normally not difficult to distinguish physical/structural) mode from spurious/noise mode by the distribution of poles. Generally speaking, a physical/structural mode can be identified in each proper number of orders, while for a spurious/noise pole it usually is not the case. There are five kinds of symbols to indicate the poles:

Symbol	Description
o	The pole is not stable. (The poles obtained from the first order are always considered as unstable.)
f	The frequency of the pole does not change within the tolerance of 1%.
v	The frequency of the pole does not change within the tolerance of 1%, and the pole vector does not change within the tolerance of 10%.
d	The frequency of the pole does not change within the tolerance of 1%, and the damping of the pole does not change within the tolerance of 10%.
s	Both frequency, damping and vector are stable within the tolerances: the frequency of the pole does not change within the tolerance of 1%; the pole vector does not change within the tolerance of 10%; and the damping of the pole does not change within the tolerance of 10%.

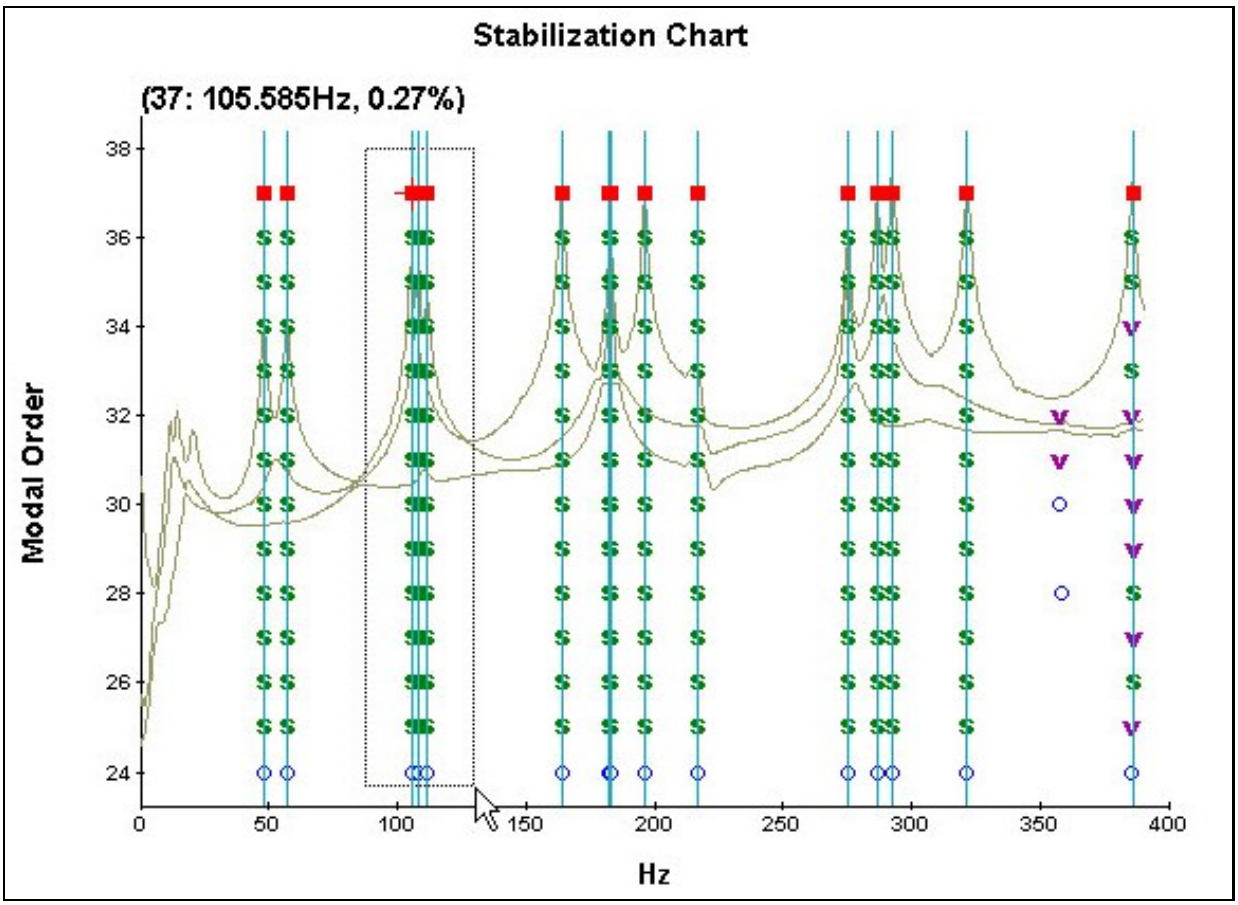


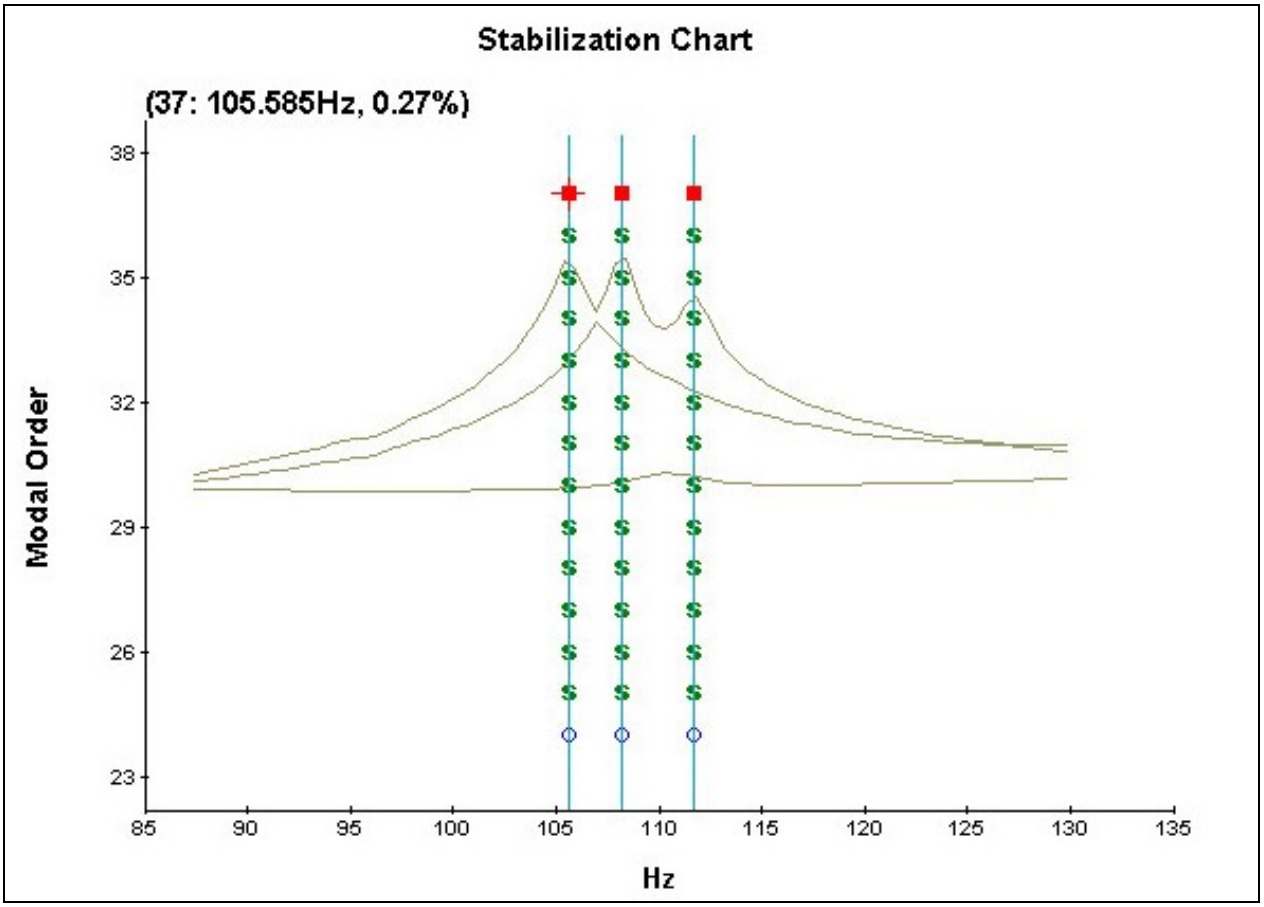
1. "Auto Selection" of structural modes

Press the button of "Auto Selection" or  , the OM2 selects the physical/structural modes automatically. While move the mouse cursor on a pole, the modal frequency and damping ratio corresponding to this pole will be shown. You can move the mouse on different poles to check the stability via small change of the modal frequency and/or damping ratio.



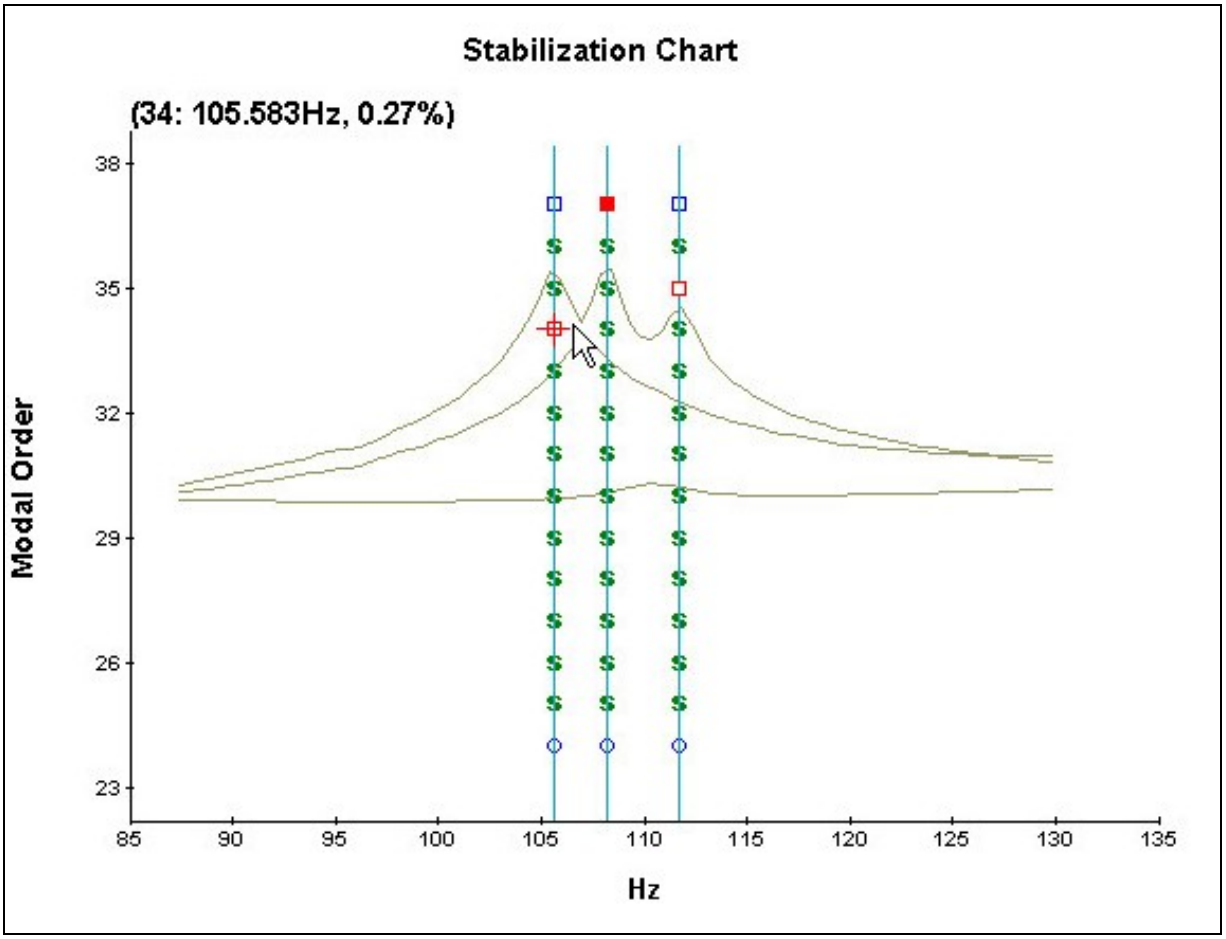
You can zoom in to check part of the stabilization diagram by click and drag a rectangle with the mouse.





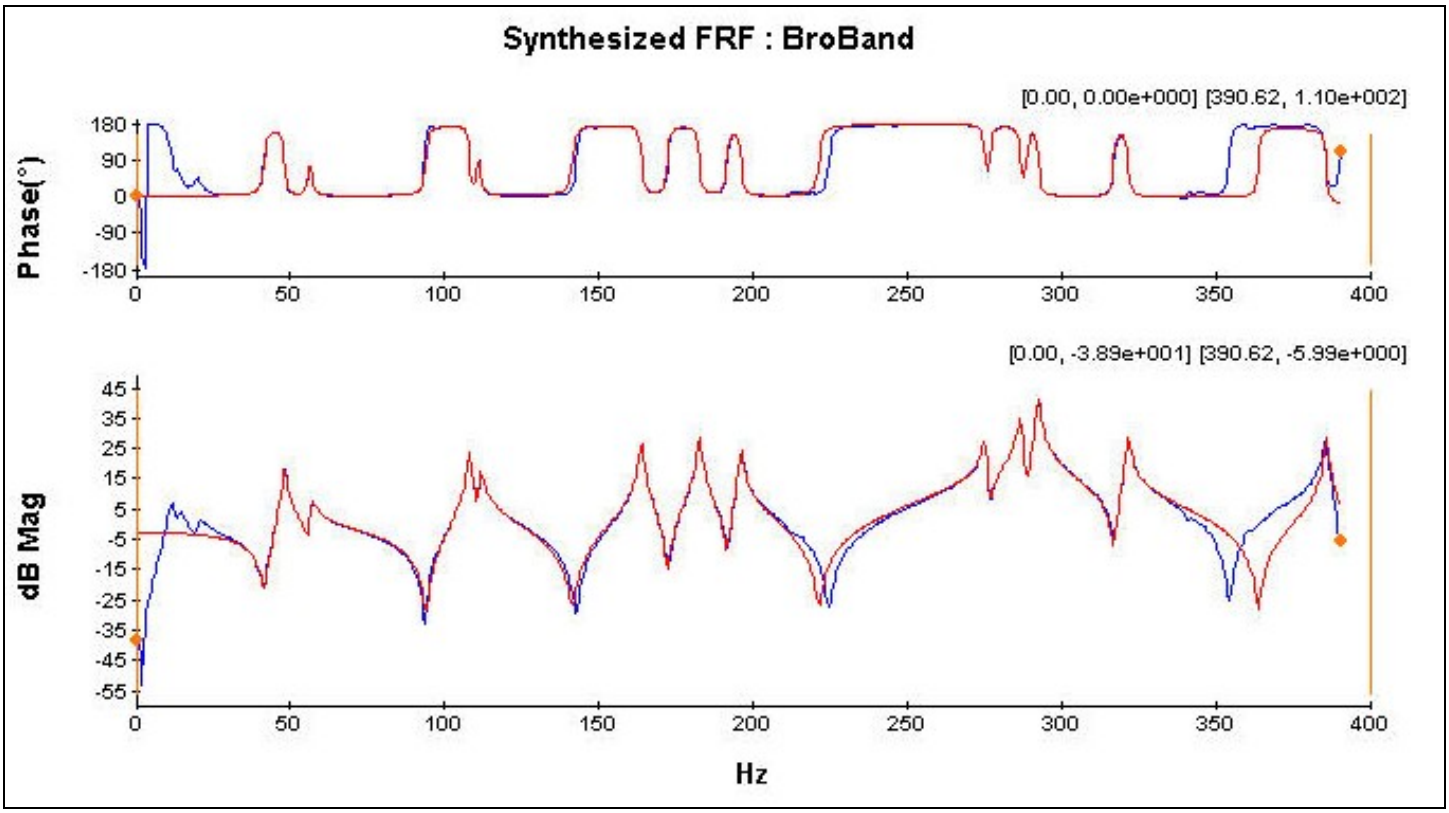
1. Manually selection of physical/structural poles

A pole can also be manually selected by clicking it or deselected it by same operation. A selected pole will be marked with a shape symbol  .



1. Mode shape calculation

Press the button of "Calc. Modeshape" to confirm the pole section and BroBand software start to estimate the mode shapes and to calculate the synthesized FRFs.



1. Inspection of identified modal parameters

Open the view of mode list. Yyou can check the identified result here: modal frequencies, damping ratios, modal A, modal B, and mode shape animations.

No. #	Frequency (Hz)	Damping (%)	Modal A	Time	::Memo
Φ Mode 1	48.04	0.47	-2.91e+00 + 7.19e+01i	09:09:36	Likely Mode
Φ Mode 2	56.94	0.86	4.49e-01 + 8.90e+01i	09:09:36	Likely Mode
Φ Mode 3	105.59	0.27	-4.16e+01 + 1.44e+02i	09:09:36	Likely Mode
Φ Mode 4	108.18	0.11	3.02e-02 + 1.64e+02i	09:09:36	Likely Mode
Φ Mode 5	111.66	0.30	-5.56e+00 + 1.58e+02i	09:09:36	Likely Mode
Φ Mode 6	163.92	0.14	-3.45e+00 + 1.78e+02i	09:09:36	Likely Mode
Φ Mode 7	182.60	0.12	-2.20e-01 + 2.49e+02i	09:09:36	Likely Mode
Φ Mode 8	182.91	0.12	-7.94e+01 + 2.71e+02i	09:09:36	Likely Mode
Φ Mode 9	196.23	0.12	-1.03e+01 + 2.23e+02i	09:09:36	Likely Mode
Φ Mode 10	217.07	1.13	-9.85e+02 - 4.15e+02i	09:09:36	Likely Mode
Φ Mode 11	275.18	0.09	7.47e+00 + 3.14e+02i	09:09:36	Likely Mode
Φ Mode 12	275.22	0.06	2.71e+01 - 3.60e+02i	09:09:36	Likely Mode
Φ Mode 13	286.70	0.10	-3.03e+01 + 4.08e+02i	09:09:36	Likely Mode
Φ Mode 14	292.58	0.07	-2.47e+01 + 3.89e+02i	09:09:36	Likely Mode
Φ Mode 15	321.69	0.09	-3.08e+01 + 6.00e+02i	09:09:36	Likely Mode
Φ Mode 16	385.97	0.02	-7.86e+01 + 2.86e+02i	09:09:36	Likely Mode

1. Continue modal identification in another frequency band

If more than one frequency band is selected, returning to the MIF plot window, and repeat the above operations. The result obtained from previous modal identification can also be loaded by pressing the button of "Load Para.".

37.1.4.6.3 On the Toolbar of "BBFD Setting" Diagram



	Display the full band of current curve
	Back to previous display range
	Go to next display range
	Show or hide the graph grid
	Copy contents in current main window to the clipboard
	Save current snapshot to BMP or JPG
	Start modal identification to gain poles
	Select the structural poles automatically
	Delete all the selected poles
	Load the parameters (poles, selected poles, frequency band) of previous modal identification

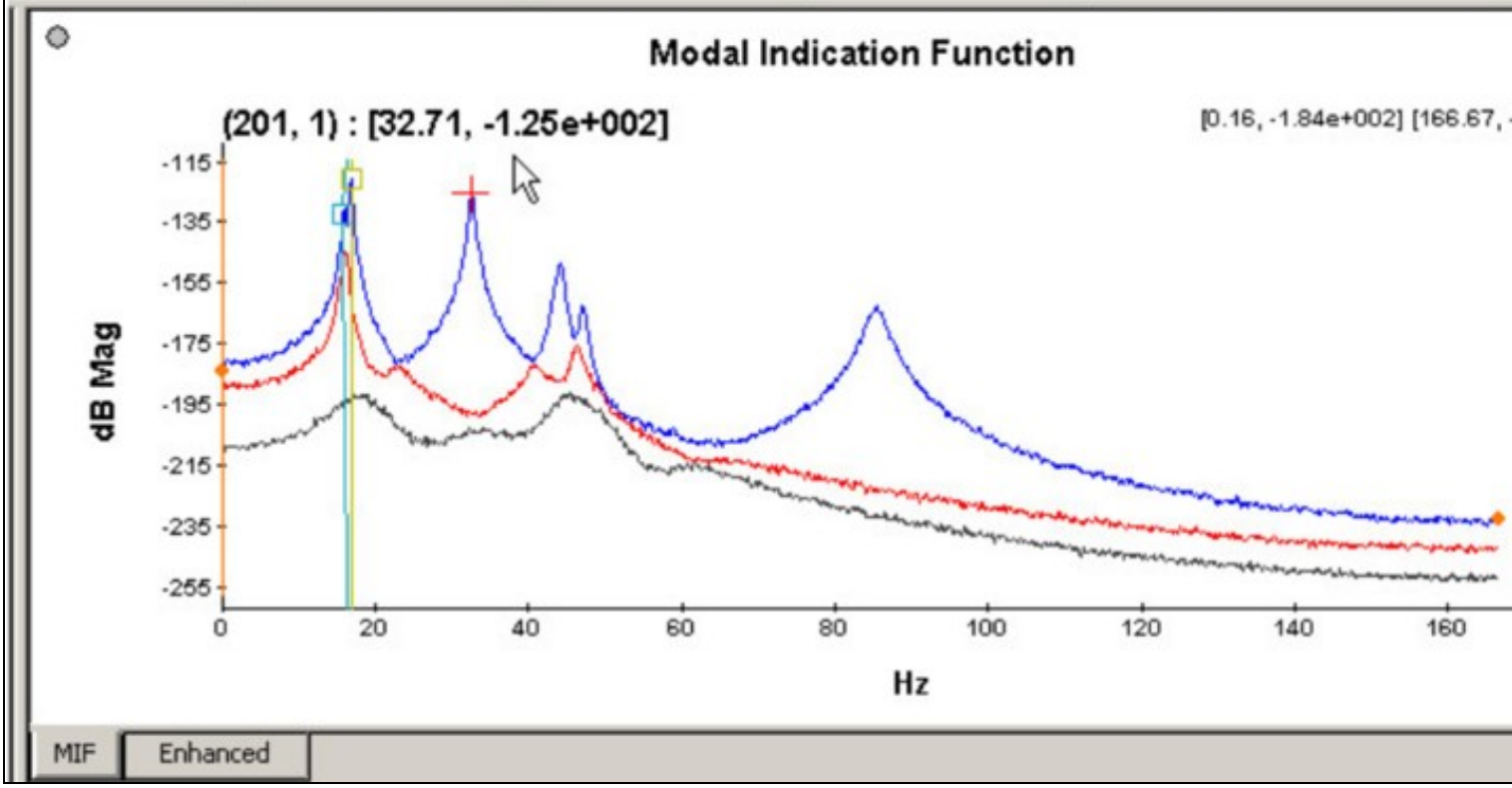
37.1.4.7 OMA NarBand Full (FSDD)

Frequency Spatial Domain Decomposition (FSDD), is an OMA modal identification algorithm in the frequency domain. FSDD an easy-to-use method. You should use it as the following steps.

37.1.4.7.1 Selecting a Peak

Press the  button in the toolbar, and click the MIF plot to activate it. A red cross marker will appear, who is able to find the local peak automatically. The index and coordinate value of the marker are shown in the top left corner of MIF graph. In the figure below, (201,1):[32.71,-1.25e+002] means that the cross cursor is now at the 201st point of the first MIF curve, and the coordinate is (32.71Hz, -125dB).

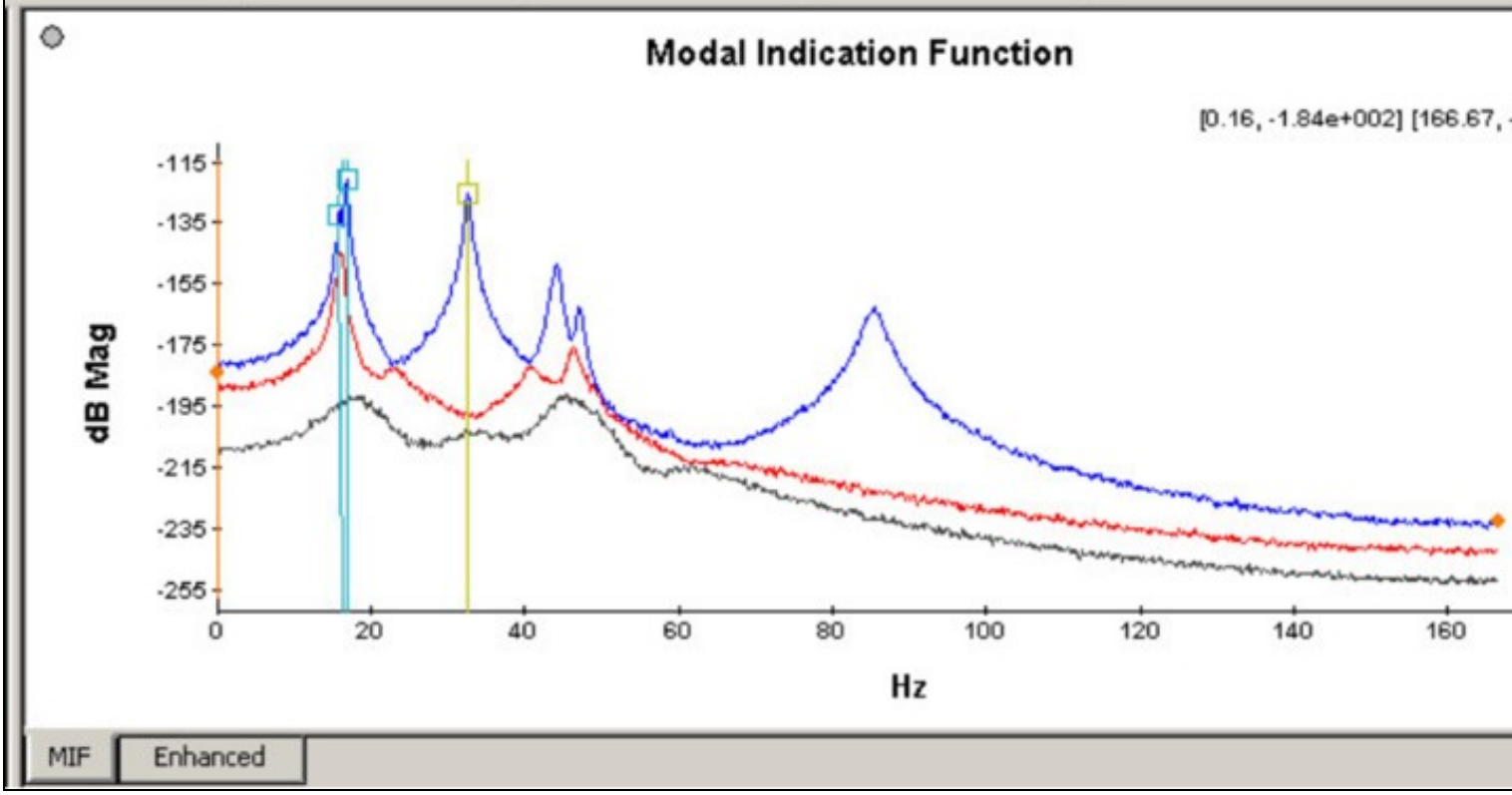
No. #	Frequency (Hz)	Damping (%)	Time	::Memo
Mode 1	16.23	1.19	21:07:14	Damping: 0-5%
Mode 2	16.86	1.30	21:07:38	Damping: 0-5%



37.1.4.7.2 Auto Identification

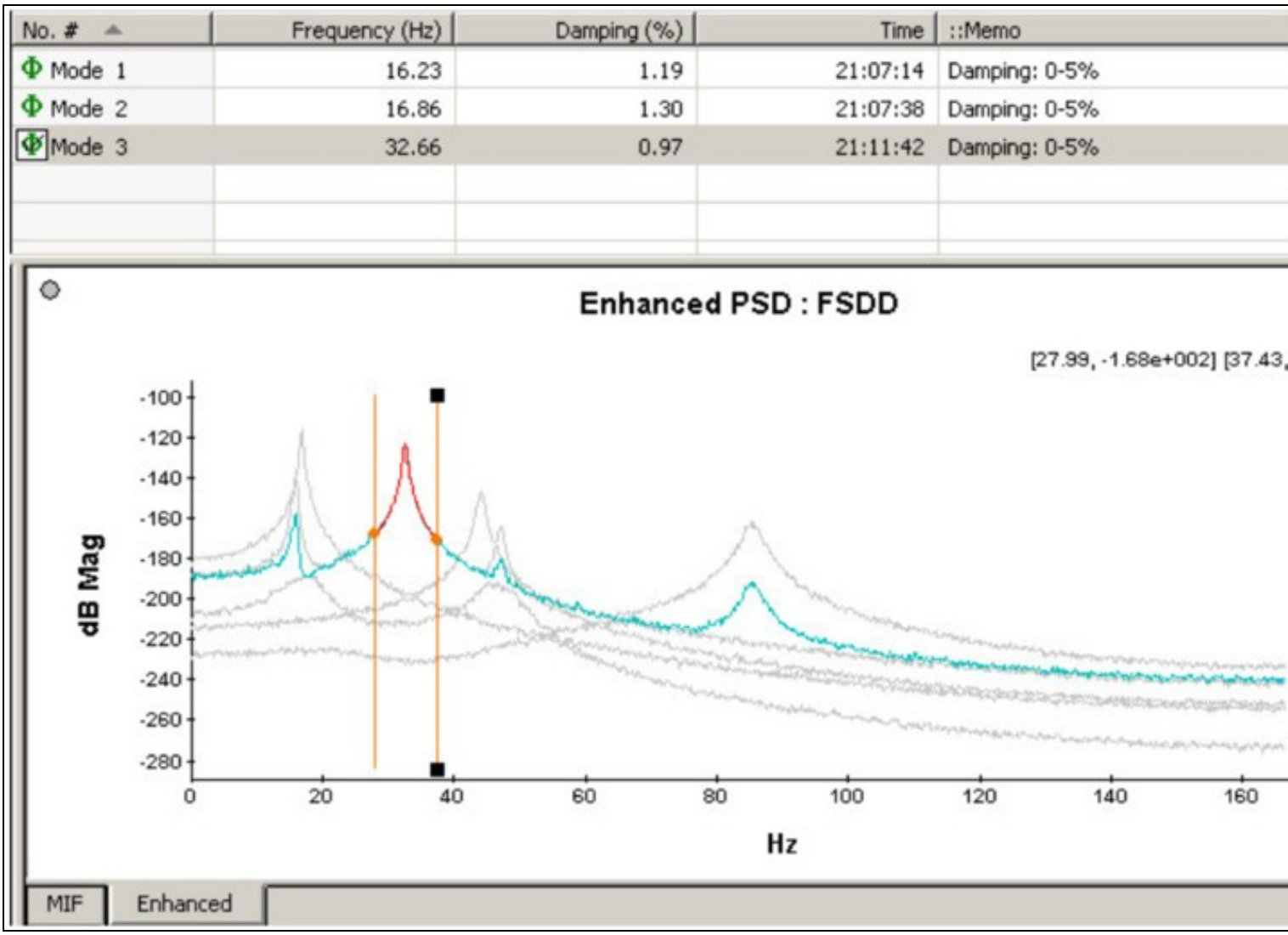
After selecting the peak, you should **double click** to finish this identification. The identified results will be shown in the MIF plot, mode list and output shortcut pane. Each identified mode will be marker with a  shape symbol. Its middle pane indicates the position of peak, and the line points to the identified frequency. The mode selected in the mode list will be marked yellow in the MIF plot while the others are blue.

No. #	Frequency (Hz)	Damping (%)	Time	::Memo
Mode 1	16.23	1.19	21:07:14	Damping: 0-5%
Mode 2	16.86	1.30	21:07:38	Damping: 0-5%
Mode 3	32.66	0.97	21:11:42	Damping: 0-5%



37.1.4.7.3 Checking curve fitting and refitting

You can check the quality of curve fitting by selecting some mode in the mode list and then turning to the 'Enhanced' tab page. Seen from below, the blue is the enhanced PSD curve, and the red is its fitting curve. Sometimes the identification result is not good because of the automatically selected band is not the best. Thus you can move the two cursors to select a better band, then double click to identify this mode again. It should be noted that you should check the fitting curve for each setup, and refit for each setup if necessary. You can switch between each setup by the 'Setup No.' list box in the standard toolbar.



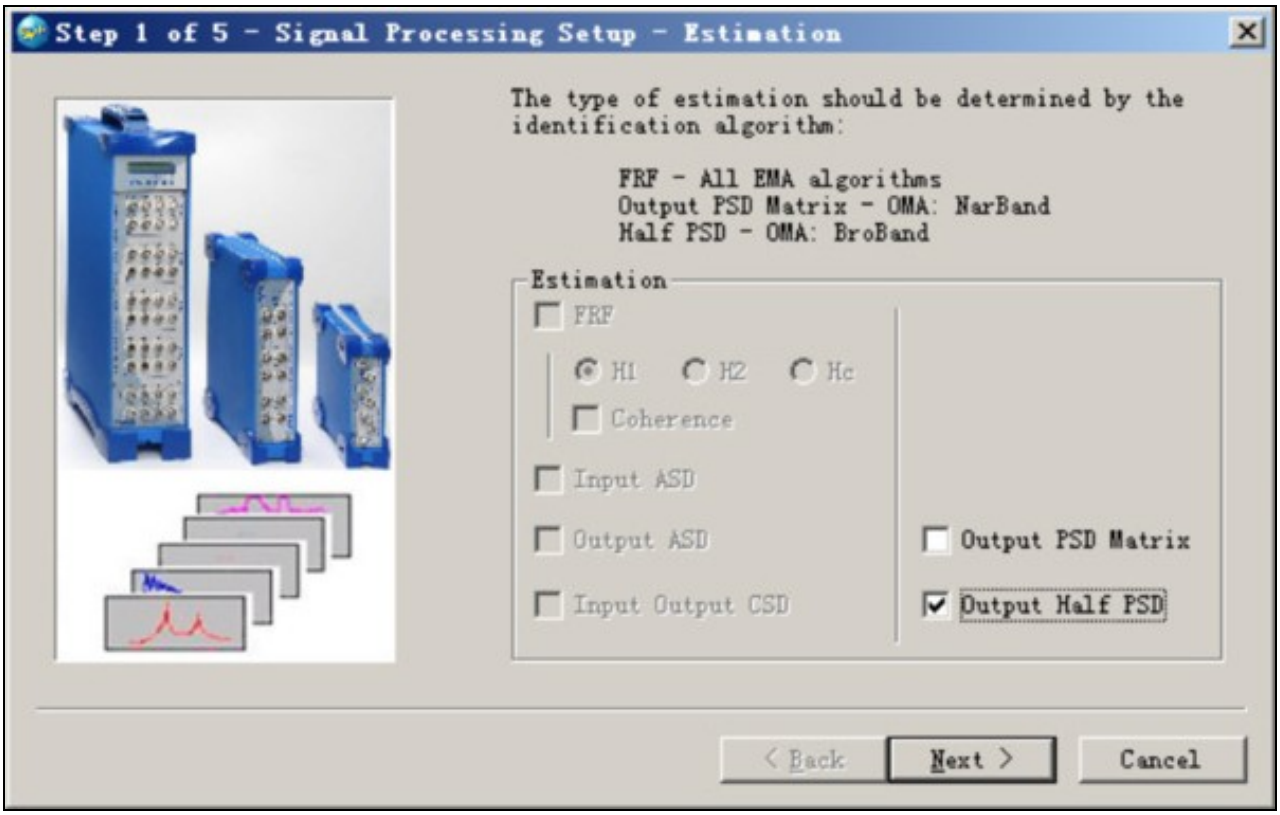
37.1.4.8 OMA BroBand (OBFD)

The BroBand Modal Identification Modula is bases on the algorithm of Polyreference Least Squares Complex Frequency (p-LSCF), developed in 2003. p-LSCF is a frequency MIMO modal identification algorithm which has superior performance compared to most time domain MIMO techniques, such as Polyreference Least Squares Complex Exponential (PRCE or LSCE), Extended Ibrahim Time Domain (EITD), and Eigensystem Realization Algorithm(ERA). EMA BroBand makes use of measured Frequency Response Function (FRF) as source data. OMA BroBand, which shares the same modal identification algorithm, on the other hand uses measured Half Power Spectrum Density (HPSD) as source data. As a result, a signal processing procedure to estimate the HPSD is required before the modal identification.

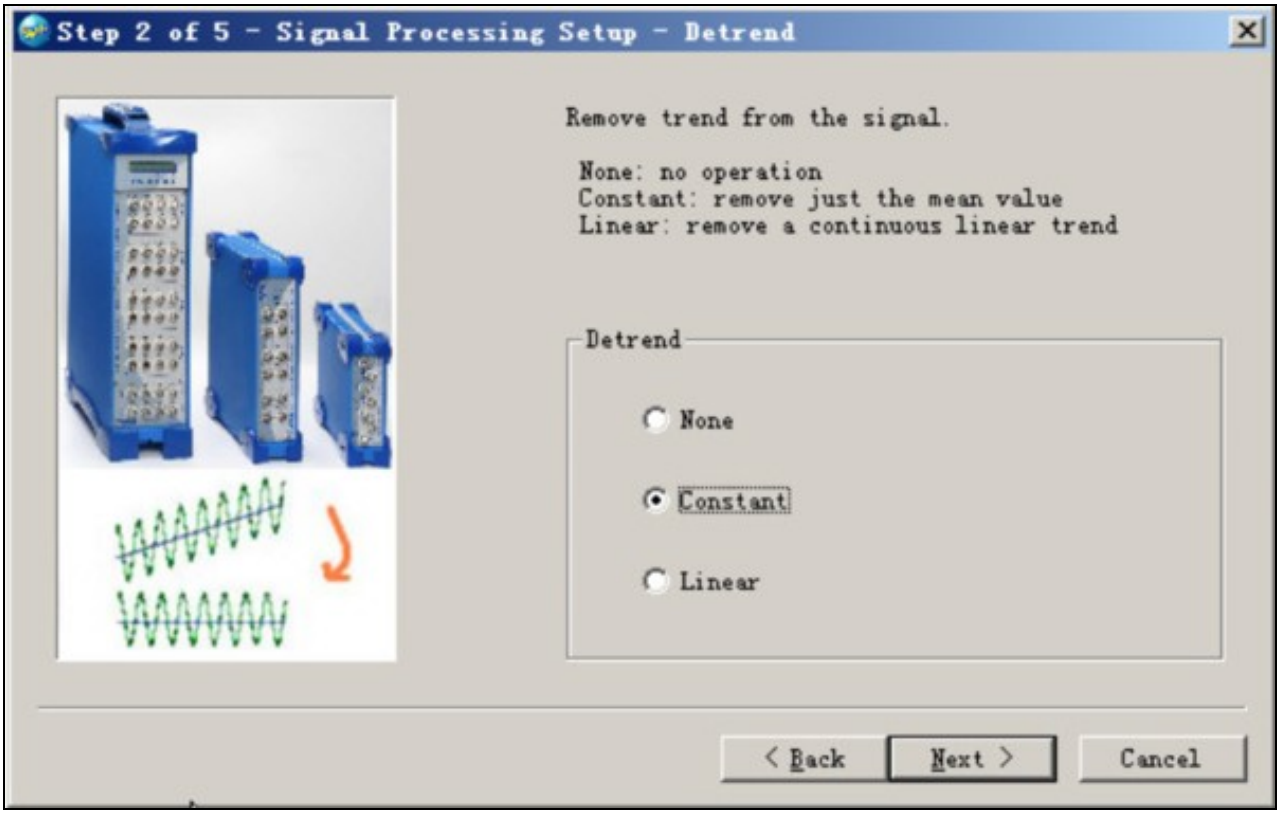
37.1.4.8.1 Estimate the HPSD

You should begin the HPSD estimation by using the "Signal Processing Wizard". The main procedures are as the following.

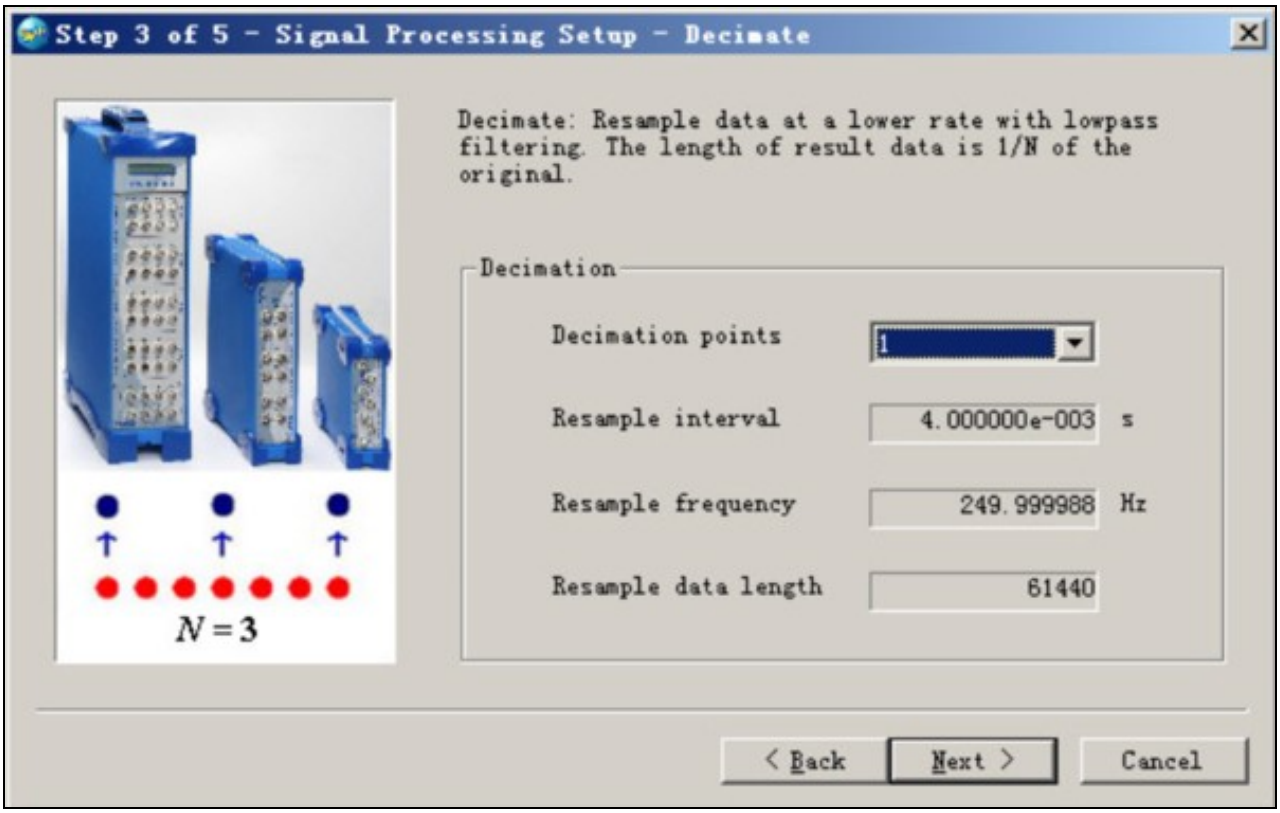
1) Select to estimate the Output Half PSD:



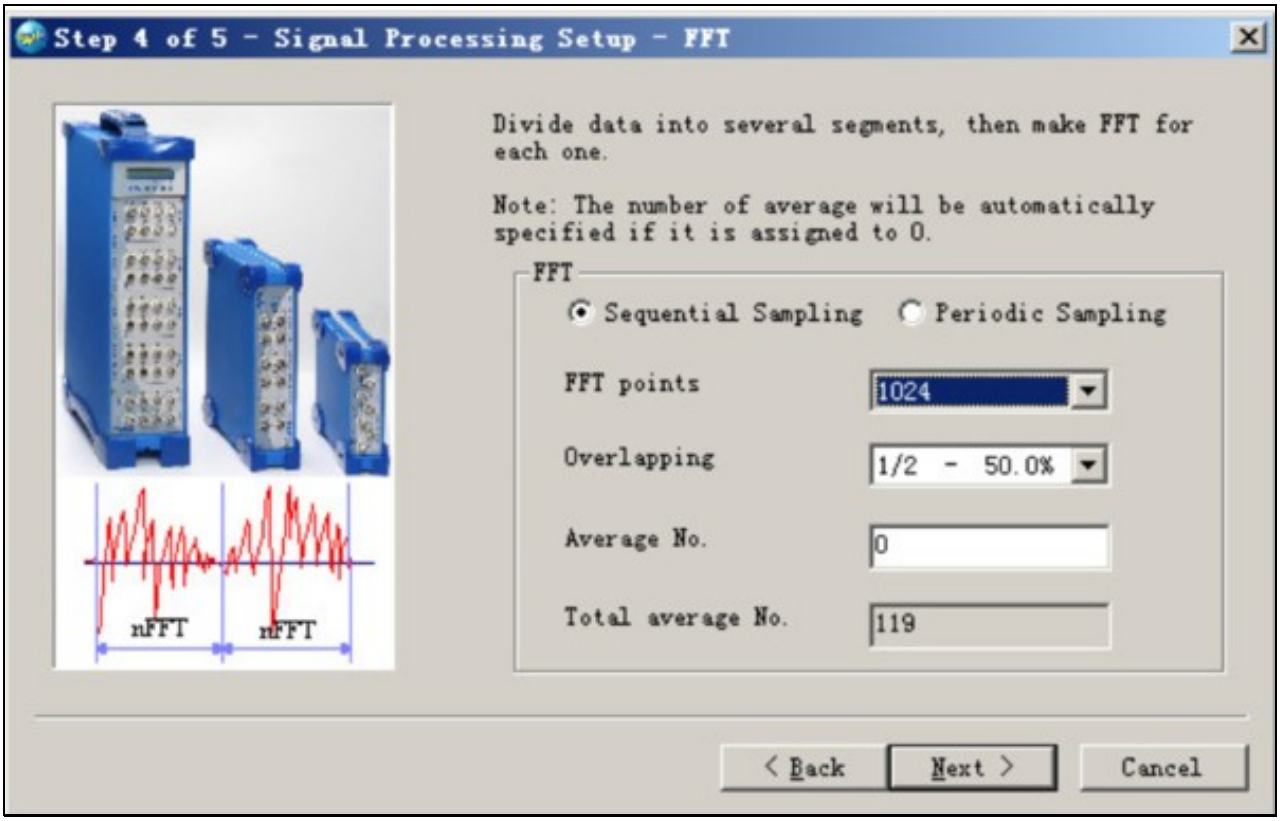
2) Remove the trend of signal:



3) Perform decimation if necessary:

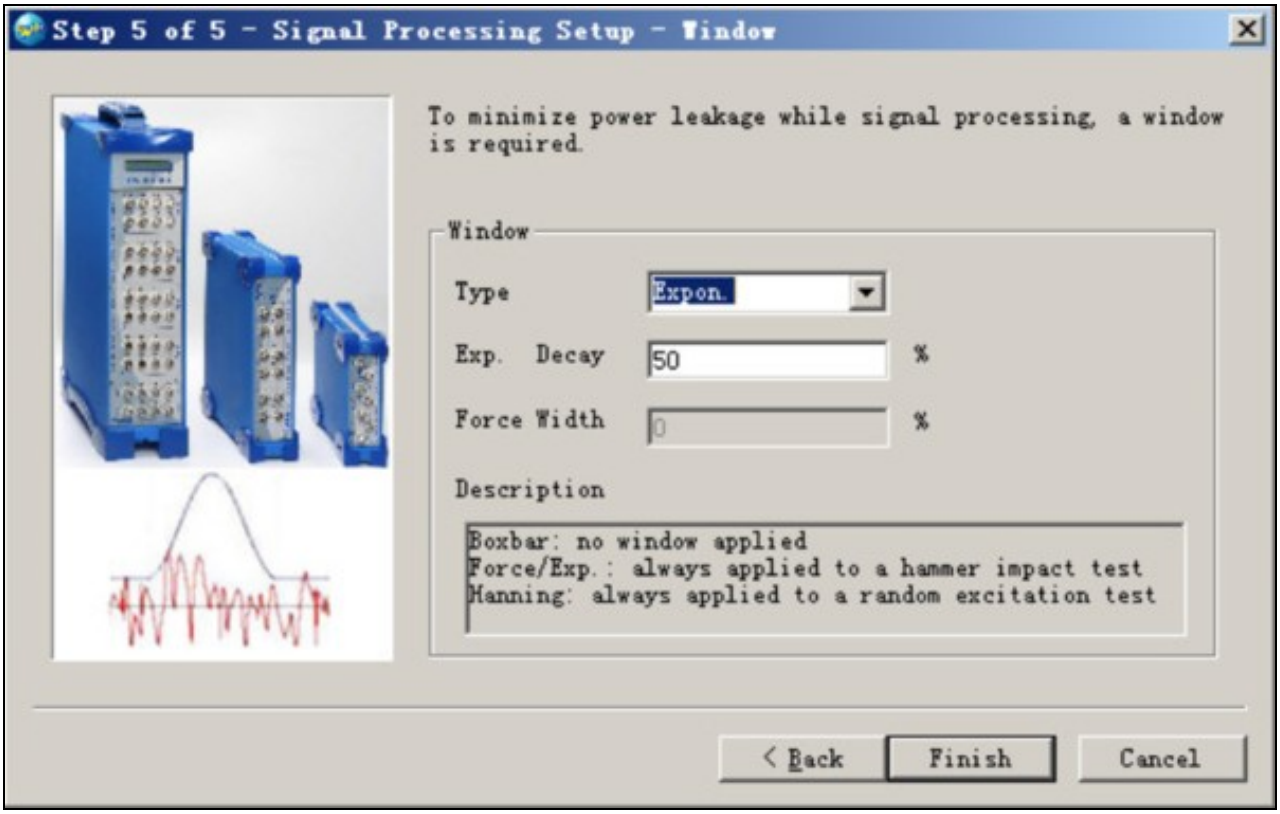


4?Set the FFT parameters:



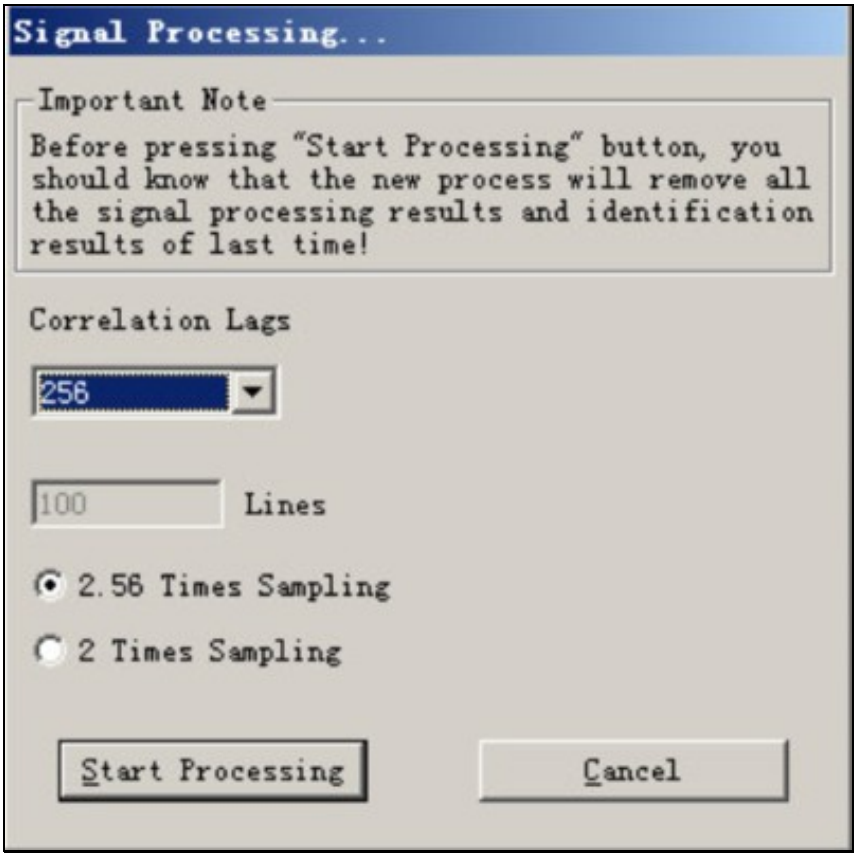
5) Apply the exponential window function:

Here the exponential window is asked to reduce the leakage in the processing of H-PSD estimation. Usually the coefficient of exponential window can be set as 50%, which means the exponential function reduces to 1/e when the time is 50% sampling period.

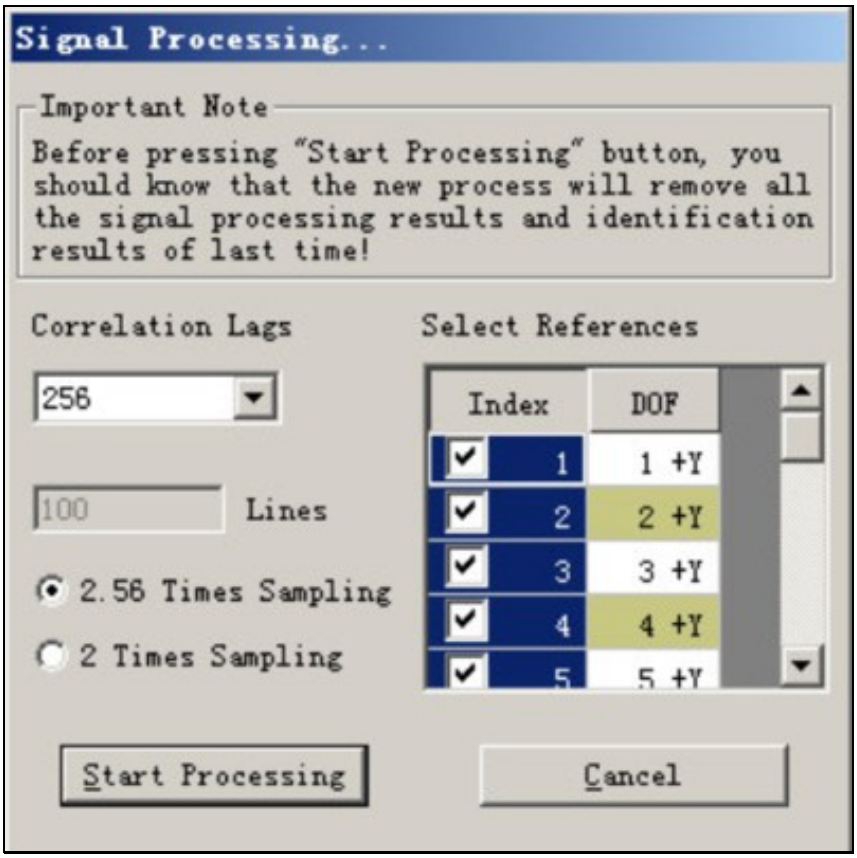


6) Begin signal processing, and set the number of correlation lags:

Usually the lags should be set to 256.



For the multiple-setup case, the references are set automatically. But for the one-setup case, you may asked to select the references manually. All the measurements are selected as references by default. Sometimes this default setting may cause too large calculation workload, and you need select some proper references according to all kinds of factors, such as the structure of test model, the positions of measurement points



In the above dialog, you can select or unselect all by clicking the column header of "Index".

37.1.4.8.2 Begin Modal Identification

The modal identification procedure is the same as EMA BroBand.

38 Modal practical

38.1 Download

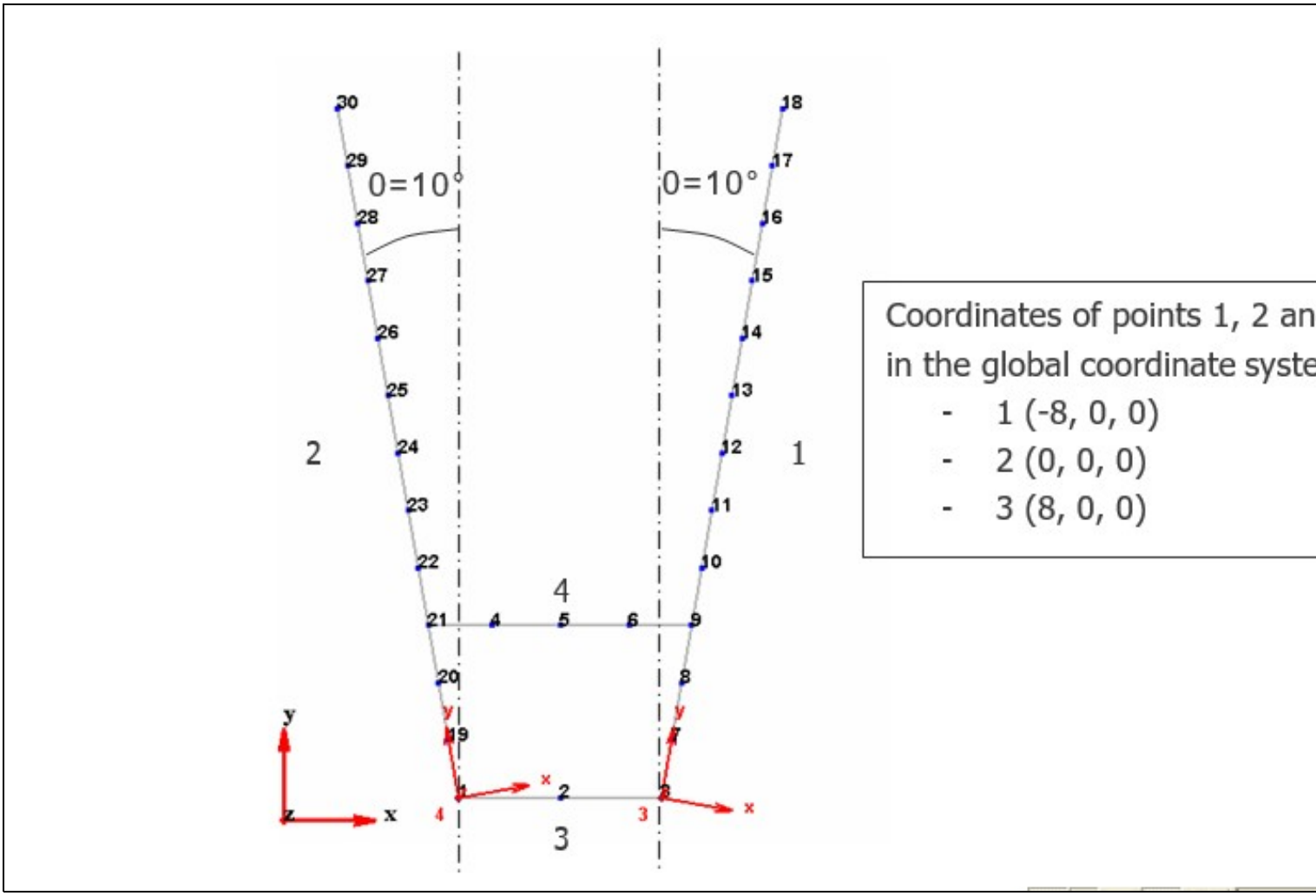
Download the data of the project here.

38.2 Create a new project

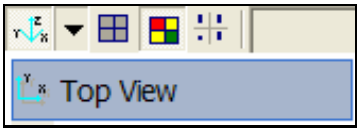
- Open the software
- Click on `File/New' and give a name to your project `Cantilever'.

38.2.1 GEOMETRY BUILDING

The goal of this part is to model the cantilever by the geometry below. The different steps of the procedure are described here.

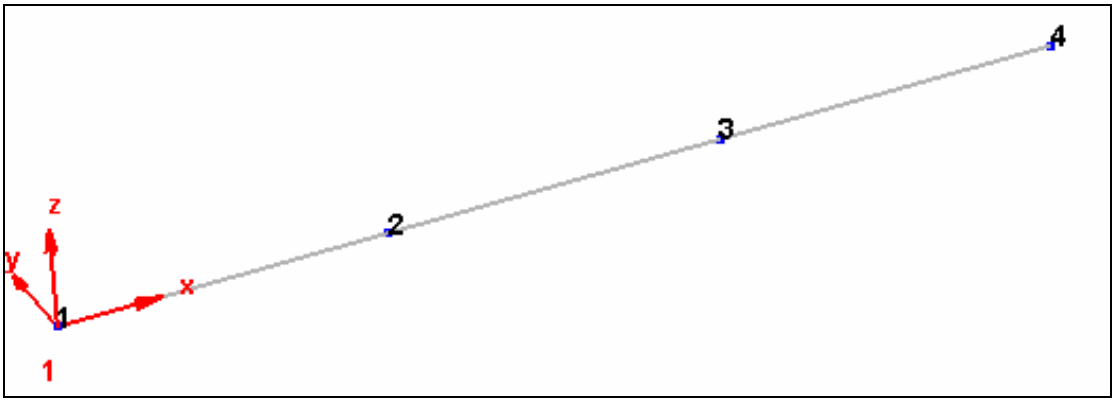


- Position in the XY plan by clicking on `Top view? in the toolbar.



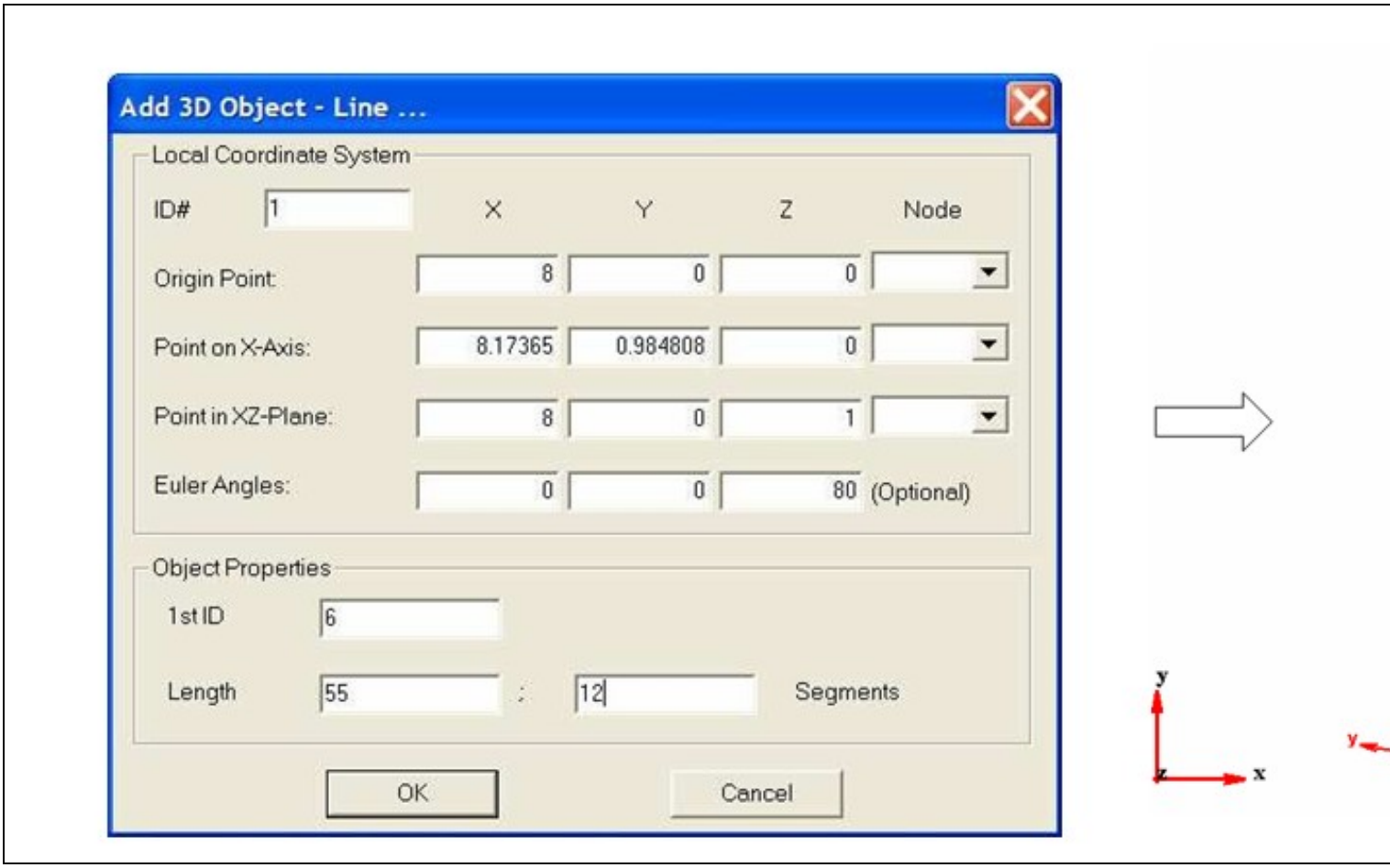
- Line 1

Click on `add line?  in the geometry toolbar. A line is defined as follow:



For each line, the software associates a Cartesian coordinates system. The line is defined by the origin of this system, the direction of X axis, the length and the number of segments.

To create the line 1, enter the following parameters:



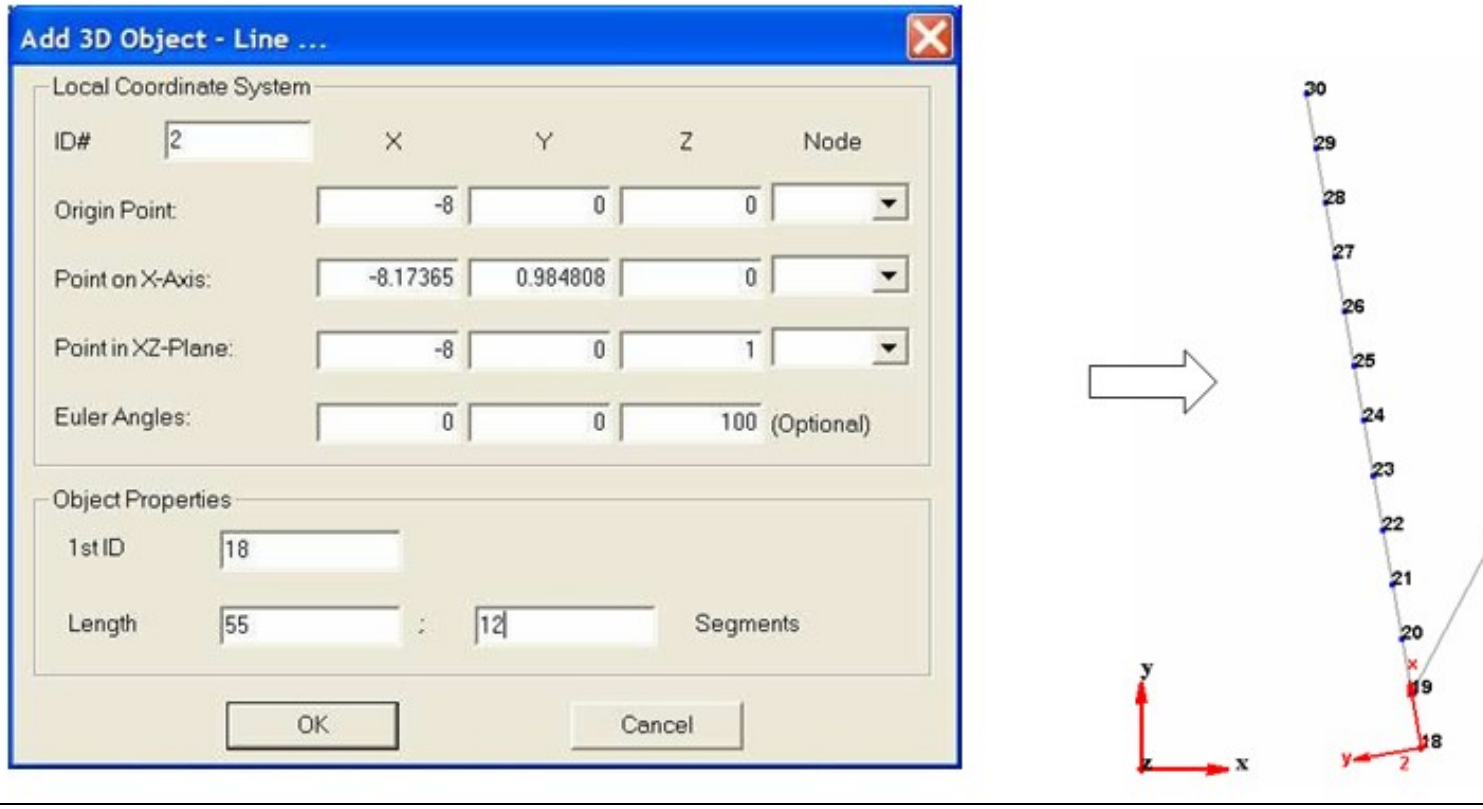
Note: for the local coordinate system parameters, enter parameters about origin point and Euler angles only.

Rename the point 6 in point 3 by opening `Config review? and make the modification in the `nodes? window.

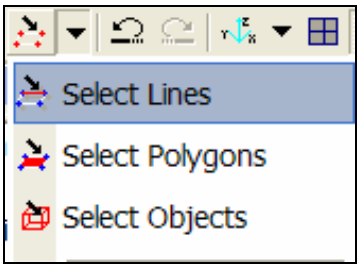
Note: When the `config review? is activated, click on `modeling interface? button  to display both `geometry? and `config review? windows.

- Line 2

Click on `add line?  and enter the following parameters

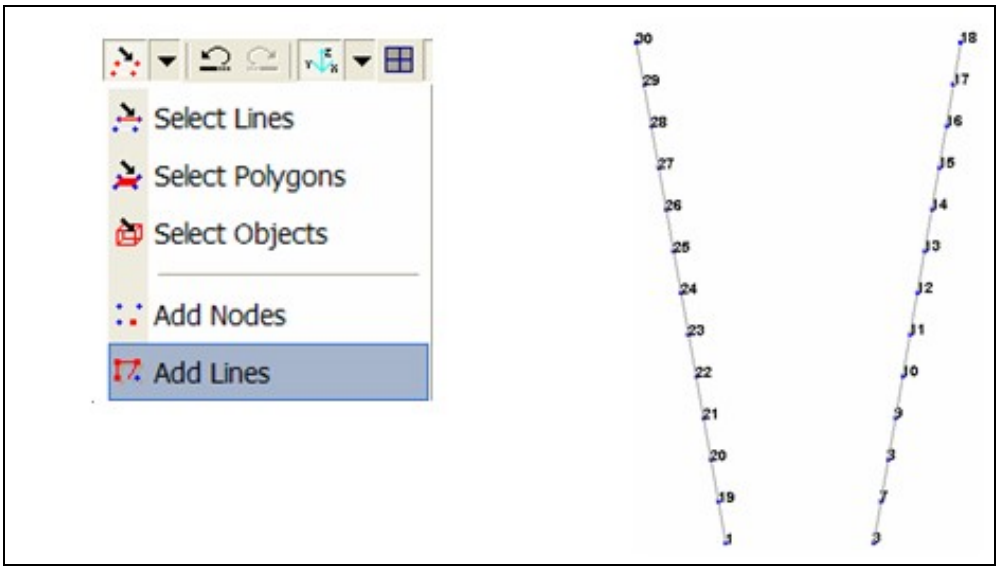


Remove the line between point 18 and 19 by clicking on `select lines? in the toolbar Select the line 18-19 and delete it.



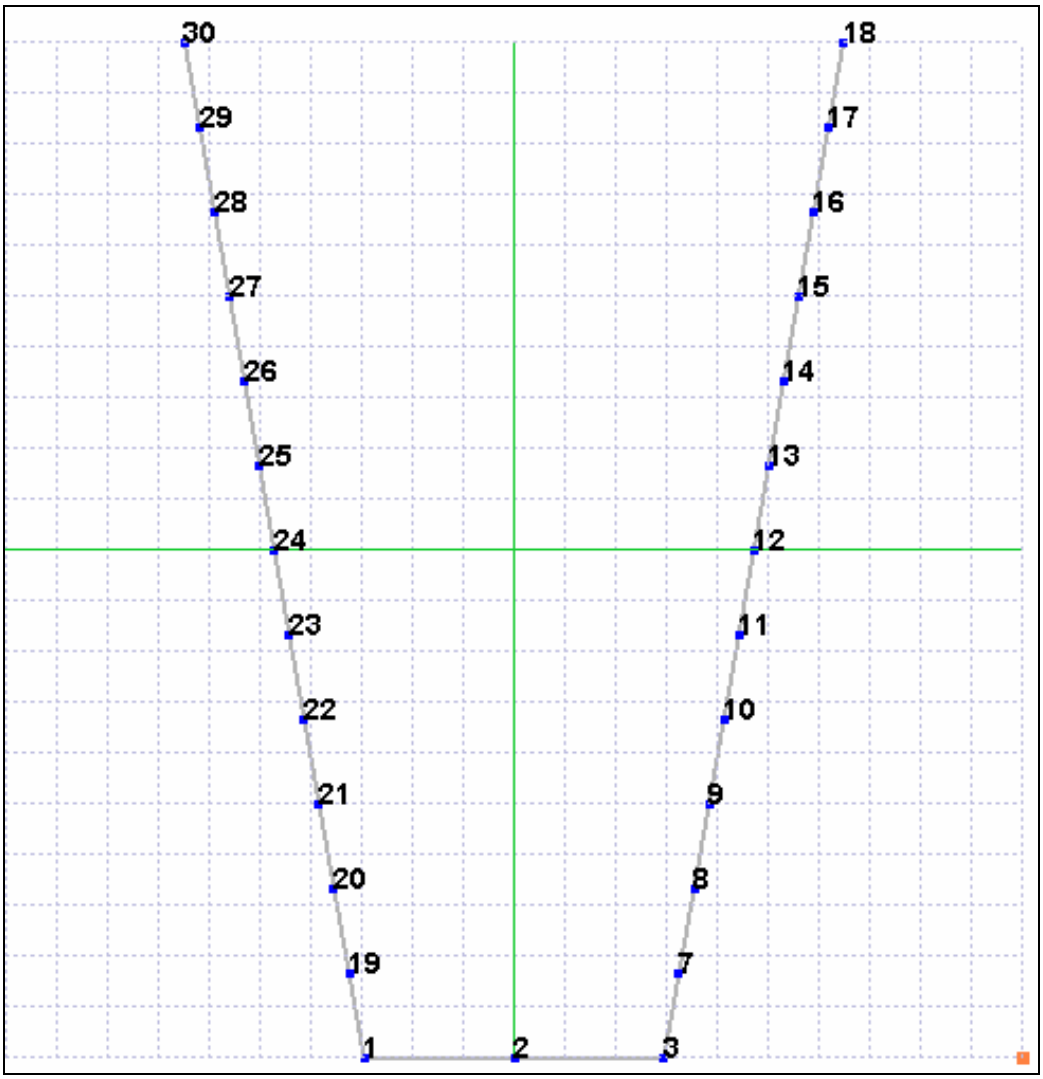
Rename the point 18 in point 1.

Create the lines 1-19 and 3-7 by clicking on`add lines? in the toolbar and link the points directly on the geometry. (left click on the 2 points and right click to end the operation)



- Line 3

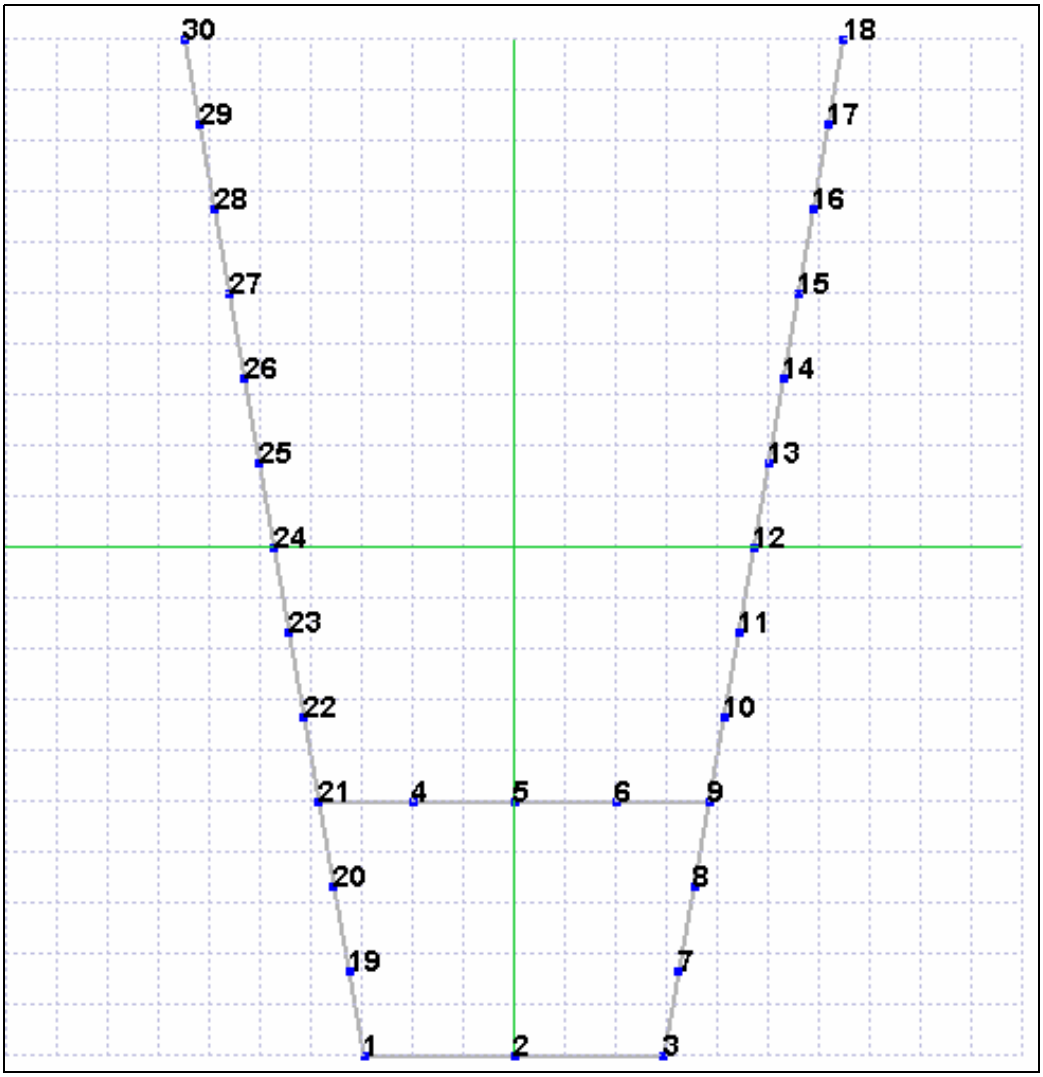
Click on `add lines?  and link point 1 and 3



To create point 2, click on `add nodes?  , a grid is displayed to help you to position new points. Right click to fix a new point and rename it in point 2.

- Line 4

Create the points 4, 5 and 6 with the grid and add lines to link them.



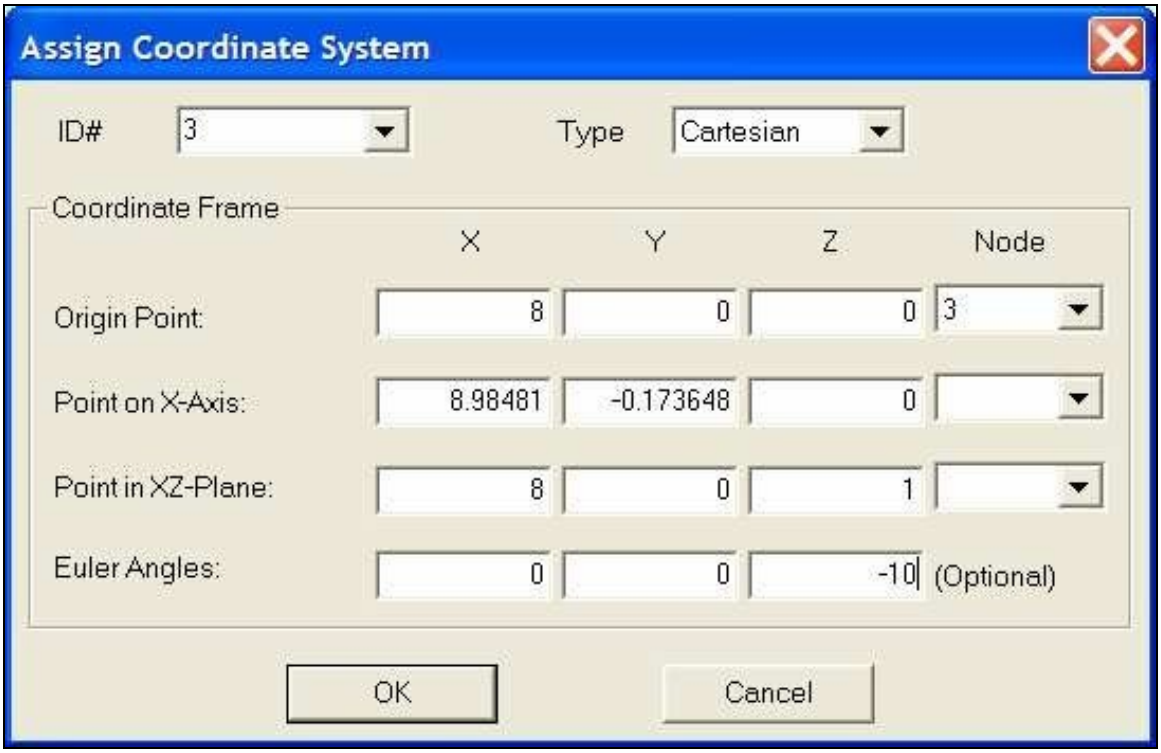
- Experimental coordinates systems

Regarding the axis definition for the acquisition, 2 local coordinates systems should be added respectively on the nodes of line 1 and 2.

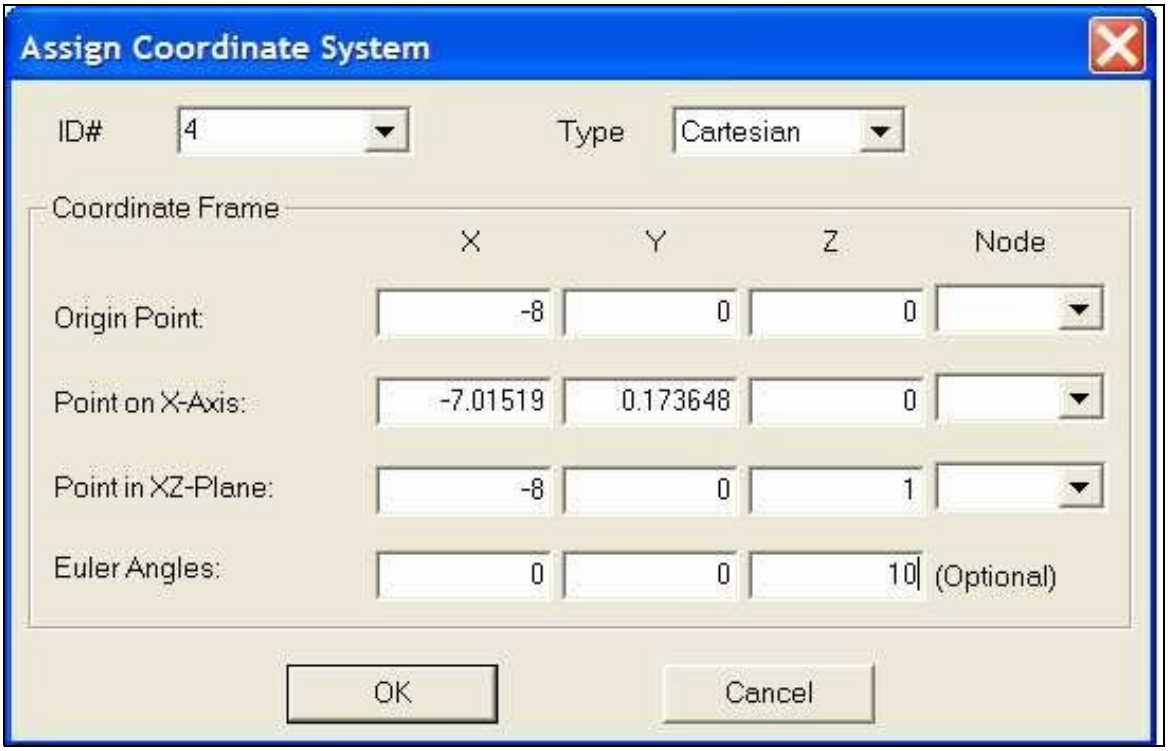
In the `config review? select the nodes of lines 1. Right click and select `Assign Coord.?



To reproduce the experimental conditions, enter the following parameters

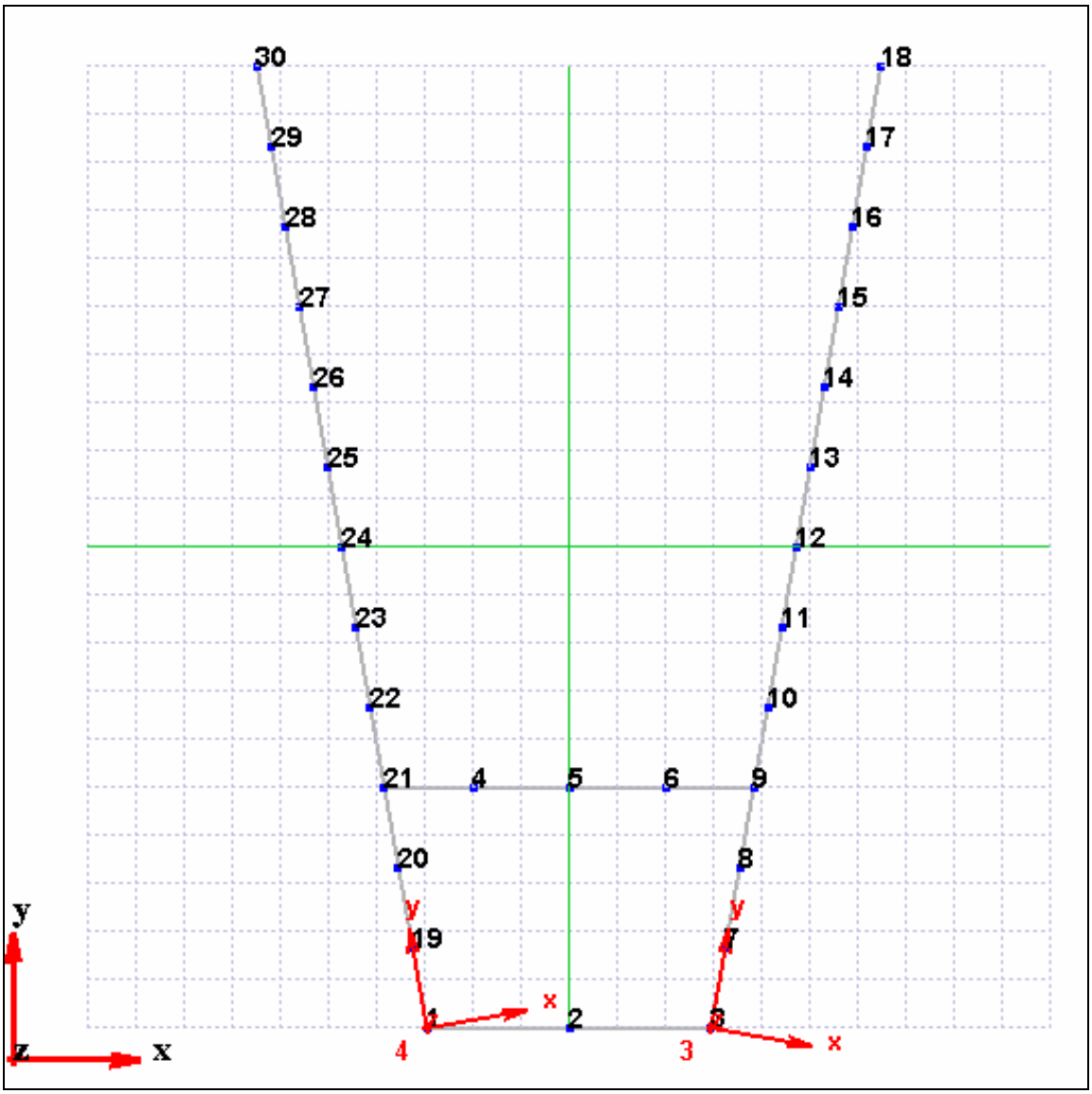


In the `Config review? select the nodes of line 2. Right click and select `Assign Coord.? Enter the following parameters



Delete the coordinates systems 1 and 2 in `config review? /coordinates

- Results

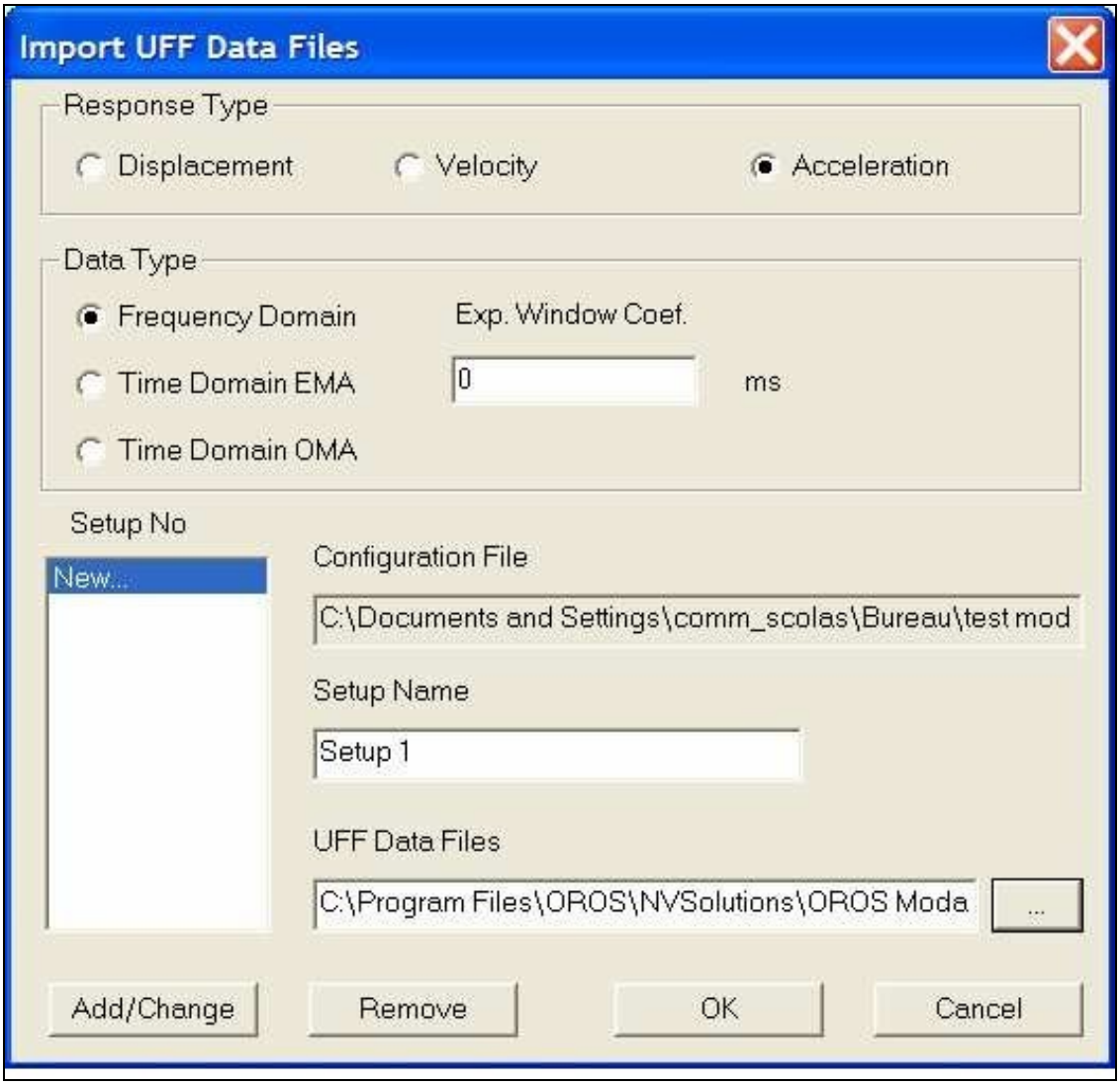

30
29
28
27
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24
23
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21
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19
18
17
16
15
14
13
12
11
10
9
8
7
4
5
6
1
2
3
y
x
z
y
x
y
x
4
3

38.3 DATA IMPORT AND READING

38.3.1 Data import

For this demo, use the data file `CANTILEVER HAMMER DATA.uff? containing the Frequency Response Functions acquired with one impact hammer and 2 accelerometers.

In the File menu, click on Import/Data files (UFF). The following window is displayed.



Select `acceleration? for response type,

`Frequency domain? for data type.

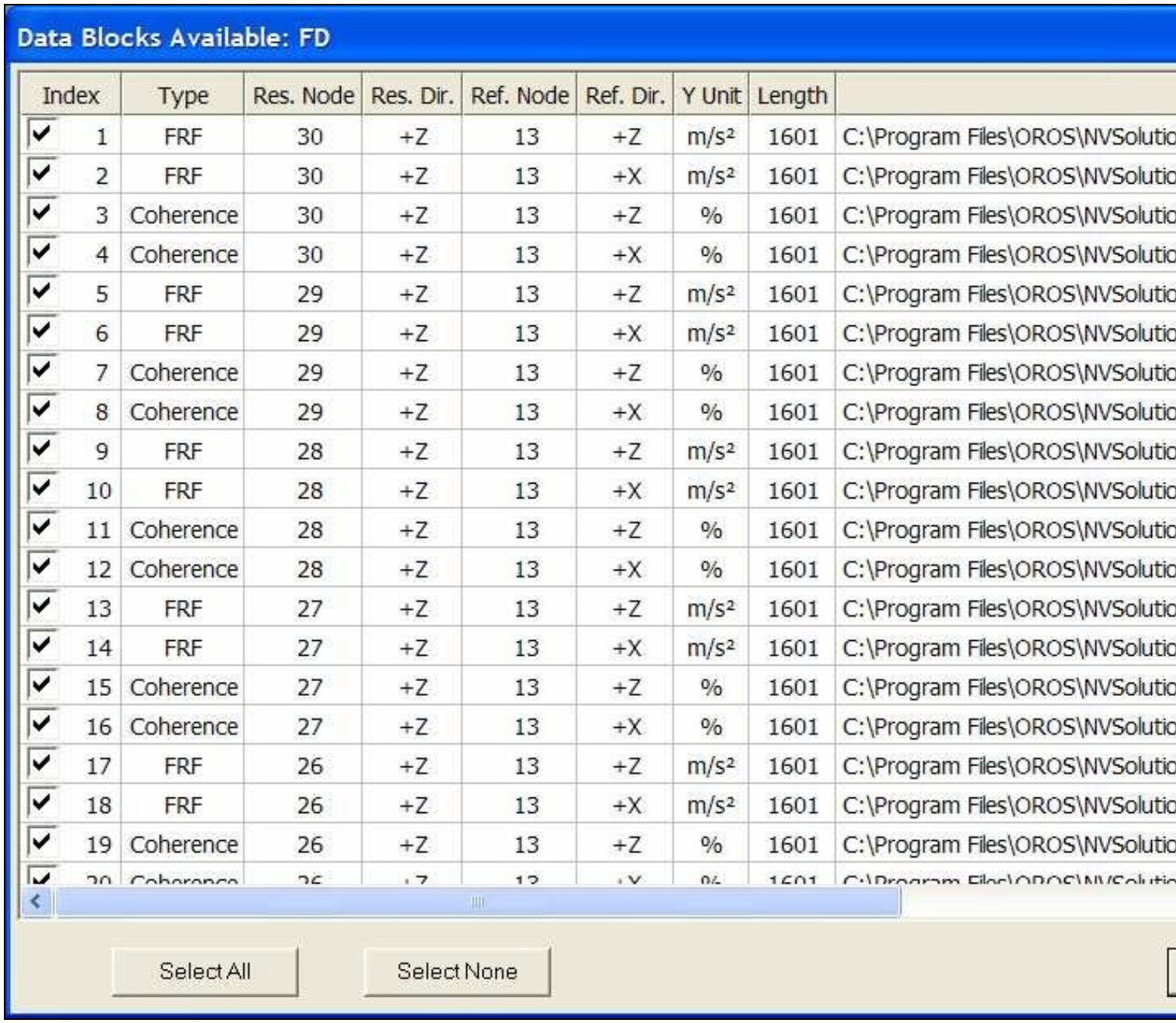
Click on the button



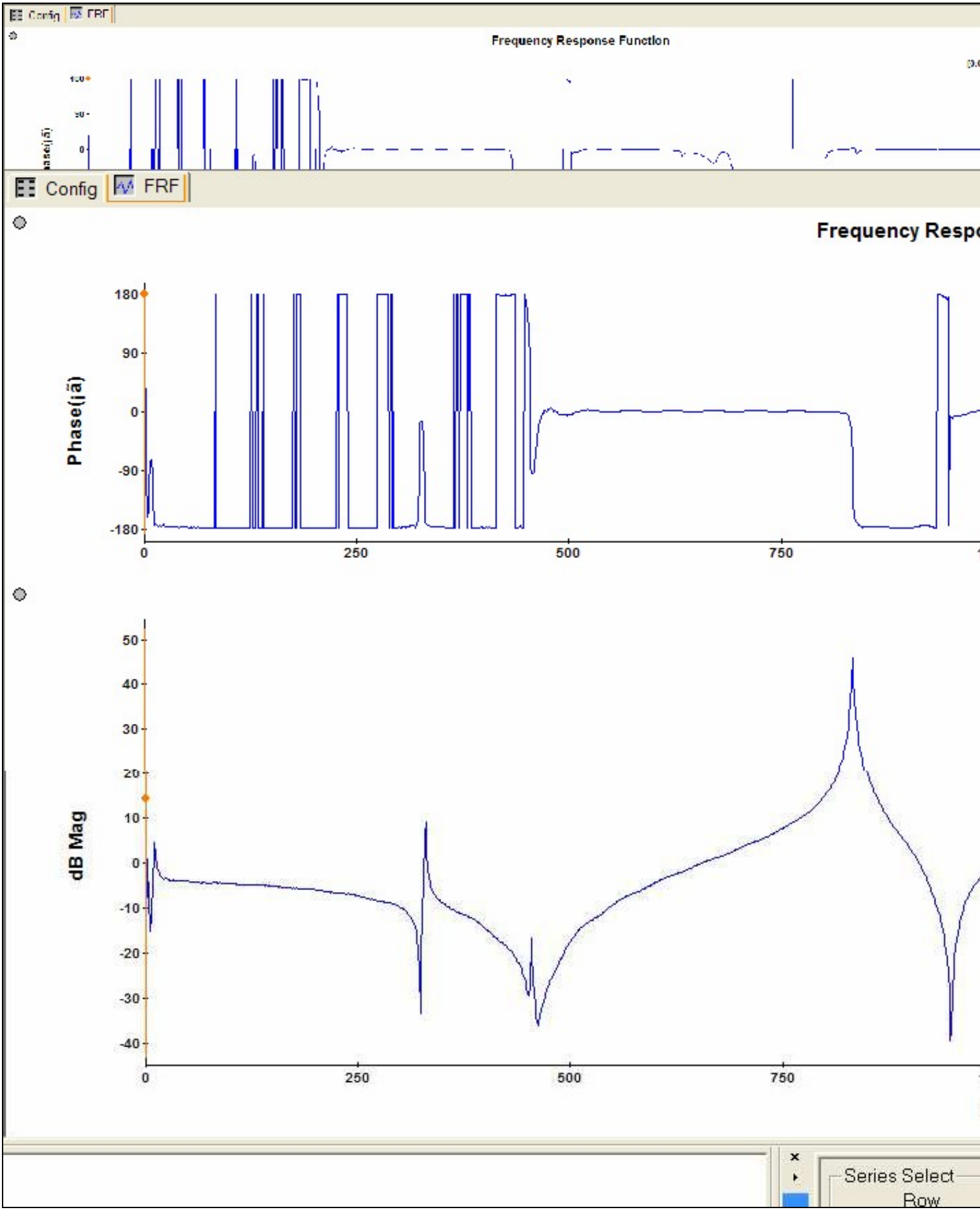
, select the file `CANTILEVER HAMMER DATA.uff? and click on OK.

The following window shows all the results contained in the imported file with their characteristics. Information of nodes and directions can be modified if an error occurs.

Any filters are available to import a part of the data only.


Data Blocks Available: FD
Index
Type
Res. Node
Res. Dir.
Ref. Node
Ref. Dir.
Y Unit
Length
1 FRF 30 +Z 13 +Z m/s² 1601 C:\Program Files\OROS\NVSolutio
2 FRF 30 +Z 13 +X m/s² 1601 C:\Program Files\OROS\NVSolutio
3 Coherence 30 +Z 13 +Z % 1601 C:\Program Files\OROS\NVSolutio
4 Coherence 30 +Z 13 +X % 1601 C:\Program Files\OROS\NVSolutio
5 FRF 29 +Z 13 +Z m/s² 1601 C:\Program Files\OROS\NVSolutio
6 FRF 29 +Z 13 +X m/s² 1601 C:\Program Files\OROS\NVSolutio
7 Coherence 29 +Z 13 +Z % 1601 C:\Program Files\OROS\NVSolutio
8 Coherence 29 +Z 13 +X % 1601 C:\Program Files\OROS\NVSolutio
9 FRF 28 +Z 13 +Z m/s² 1601 C:\Program Files\OROS\NVSolutio
10 FRF 28 +Z 13 +X m/s² 1601 C:\Program Files\OROS\NVSolutio
11 Coherence 28 +Z 13 +Z % 1601 C:\Program Files\OROS\NVSolutio
12 Coherence 28 +Z 13 +X % 1601 C:\Program Files\OROS\NVSolutio
13 FRF 27 +Z 13 +Z m/s² 1601 C:\Program Files\OROS\NVSolutio
14 FRF 27 +Z 13 +X m/s² 1601 C:\Program Files\OROS\NVSolutio
15 Coherence 27 +Z 13 +Z % 1601 C:\Program Files\OROS\NVSolutio
16 Coherence 27 +Z 13 +X % 1601 C:\Program Files\OROS\NVSolutio
17 FRF 26 +Z 13 +Z m/s² 1601 C:\Program Files\OROS\NVSolutio
18 FRF 26 +Z 13 +X m/s² 1601 C:\Program Files\OROS\NVSolutio
19 Coherence 26 +Z 13 +Z % 1601 C:\Program Files\OROS\NVSolutio
Select All
Select None

Here all the data will be used, so click on OK. The FRFs are directly displayed in the software.


Config
FRF
Frequency Response Function
Config
FRF
Frequency Respo
Phase(iã)
180
90
0
-90
-180
0
250
500
750
dB Mag
50
40
30
20
10
0
-10
-20
-30
-40
0
250
500
750
Series Select
Row

All the FRFs can be visualized.

38.3.2 DATA READING

By using the Control Panel (Series select), all the FRFs can be displayed. For each result, there is information about the DOFs (node, direction).

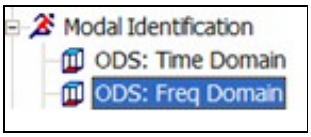
Several types of displayed are available by right clicking on the graph: magnitude/phase, real/imaginary, Nyquist.

By right clicking on the graph and selecting `Showed Series??, you can display several FRFs on the same graph for comparison.

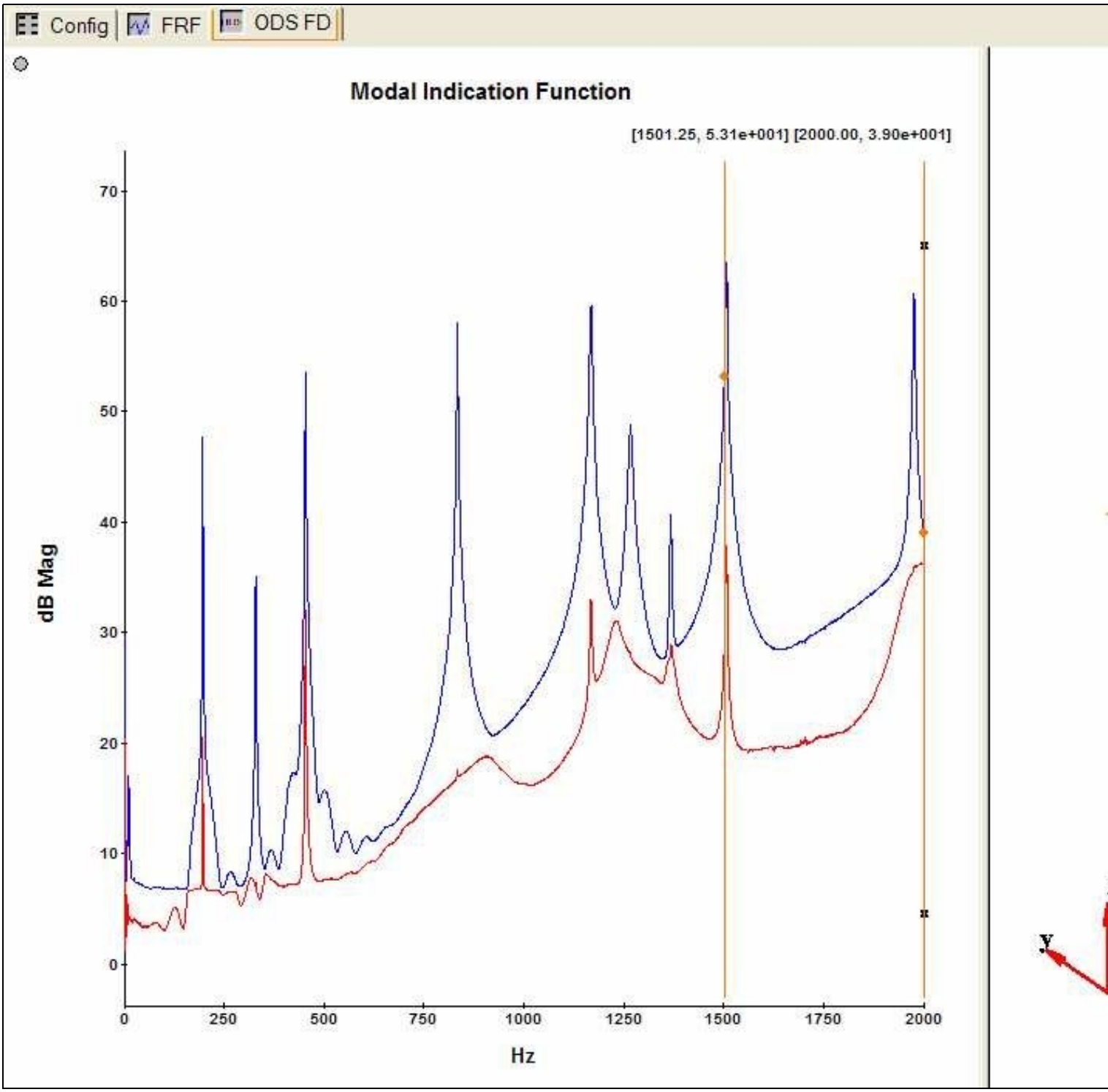
38.4 MODAL IDENTIFICATION

38.4.1 OPERATING DEFLECTION SHAPE

In the operation tree, double click on `ODS: Freq Domain The following interface is displayed.



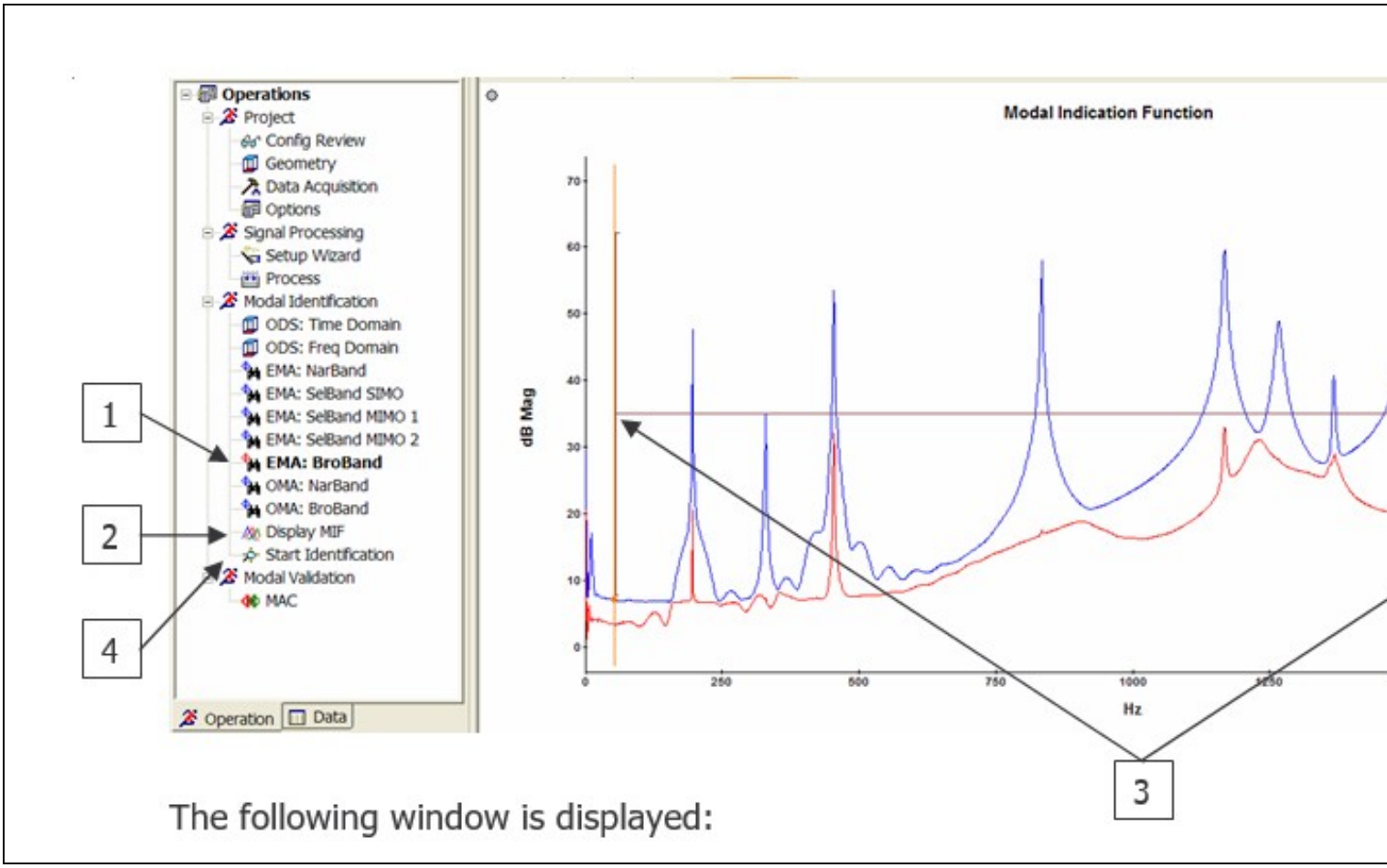
On the left, the Modal Indication Function (MIF) shows the modes in the frequency band. Position the cursor on the peaks and visualize the corresponding mode shapes on the right.


Config
FRF
ODS FD
Modal Indication Function
[1501.25, 5.31e+001] [2000.00, 3.90e+001]
dB Mag
70
60
50
40
30
20
10
0
0
250
500
750
1000
1250
1500
1750
2000
Hz
Y

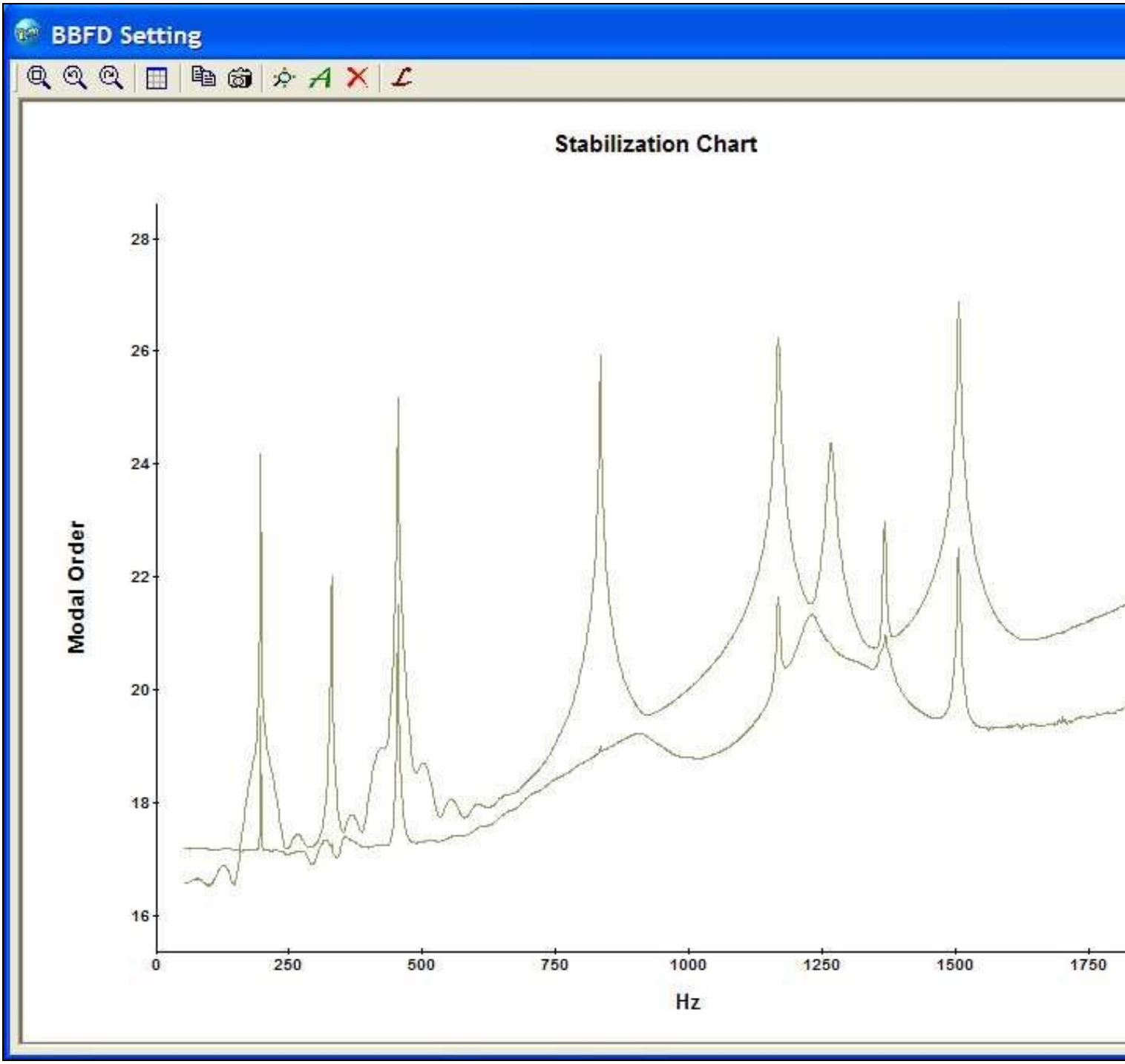
38.5 MODAL ANALYSIS USING EMA BROBAND

In the operation tree:

- select EMA Broband (A red icon appears near the method),
- the MIF is displayed,
- Select a large frequency band by positioning the cursors and double click to fix them (a black line between the 2 cursors appears),
- click on start identification



The follwoing windows is displayed:

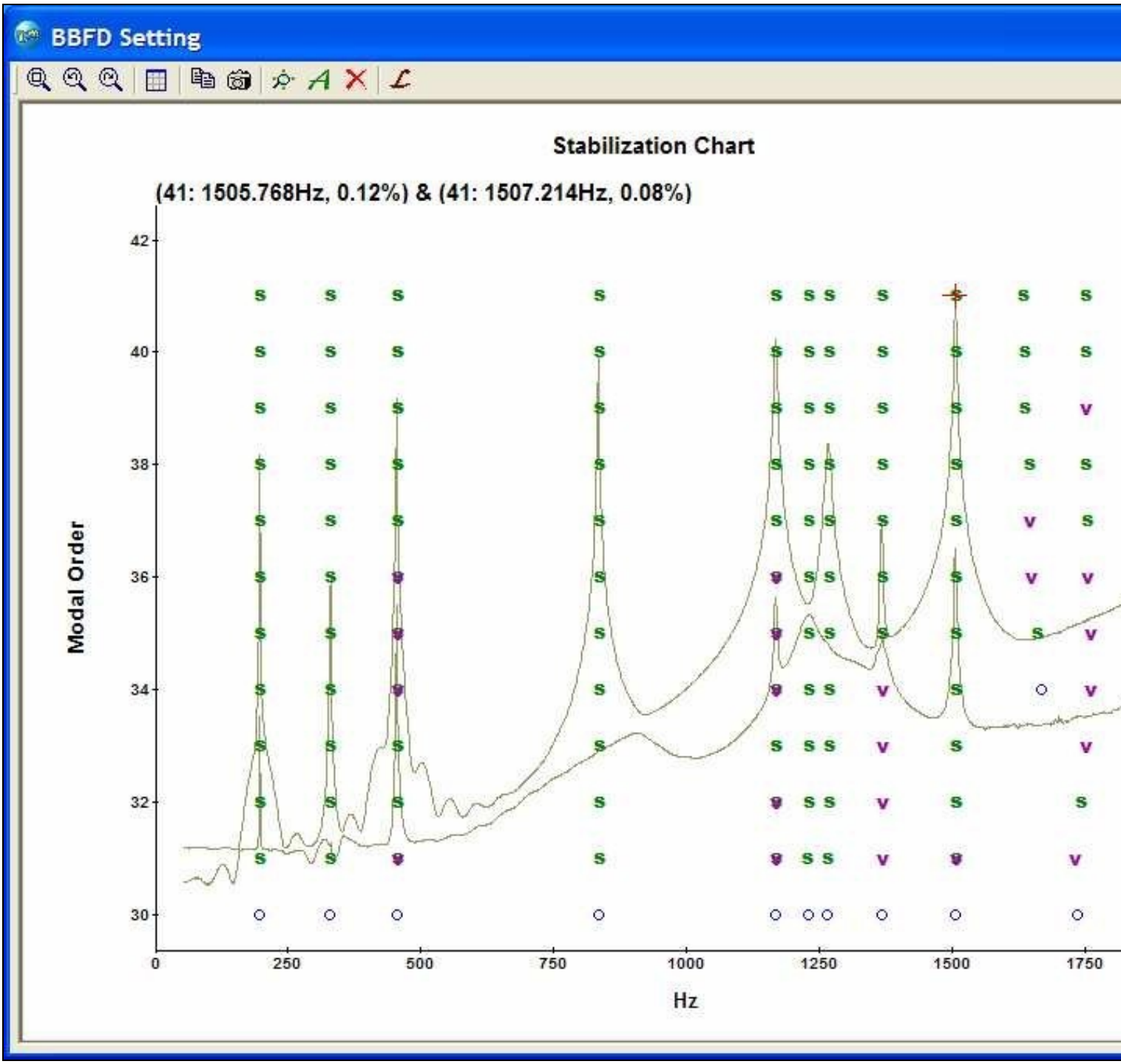


- Preliminary determination of the number of modes in the selected frequency band according to the MIF plot, and fill it in the edit box of "Preset Modes No." Then the BroBand software will calculate a default "minimum order" according to this number. The relationship between "Preset Modes No." and "Minimum Order" is: minimum order = (preset modes No)*Ni/2, where Ni means the number of input. Change the number of "Order Span" if necessary. The BroBand software will estimate the poles with a range of system order from "Minimum Order" to "Maximum Order", where Maximum order= Minimum order + Order Span-1. The default order span is 12.

- Modal identification

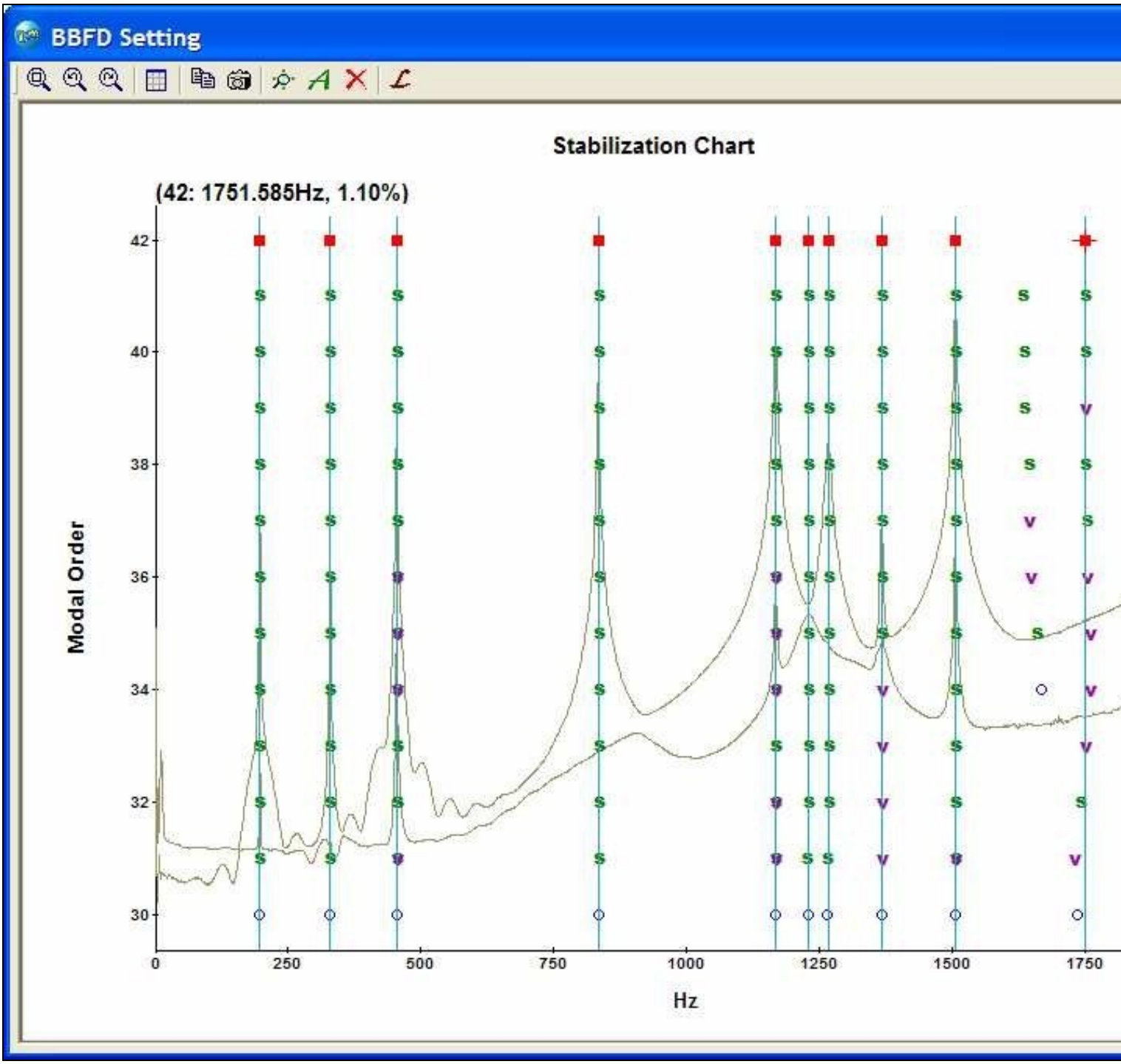
Press the button of "Start Modal ID" to obtain frequency stability diagram. This operation might take a little longer time to finish a complex structure with large number of modes and measurement coordinates. In the stability diagram, a shape symbol represents one pole. A pole in this diagram may represent a physical (i.e. structural) mode or a spurious (or noise) mode. It is normally not difficult to distinguish physical/structural) mode from spurious/noise mode by the distribution of poles. Generally speaking, a physical/structural mode can be identified in each proper number of order, while for a spurious/noise pole it usually is not the case. There are five kinds of symbols to indicate the poles:

Symbol	Description
o	The pole is not stable. (The poles obtained from the first order are always considered as unstable.)
f	The frequency of the pole does not change within the tolerance of 1%.
v	The frequency of the pole does not change within the tolerance of 1%, and the pole vector does not change within the tolerance of 10%
d	The frequency of the pole does not change within the tolerance of 1%, and the damping of the pole does not change within the tolerance of 10%.
s	Both frequency, damping and vector are stable within the tolerances: the frequency of the pole does not change within the tolerance of 1%; the pole vector does not change within the tolerance of 10%; and the damping of the pole does not change within the tolerance of 10%.


BBFD Setting
Stabilization Chart
(41: 1505.768Hz, 0.12%) & (41: 1507.214Hz, 0.08%)
Modal Order
42
40
38
36
34
32
30
0
250
500
750
1000
1250
1500
1750
Hz

- Auto selection of structural modes

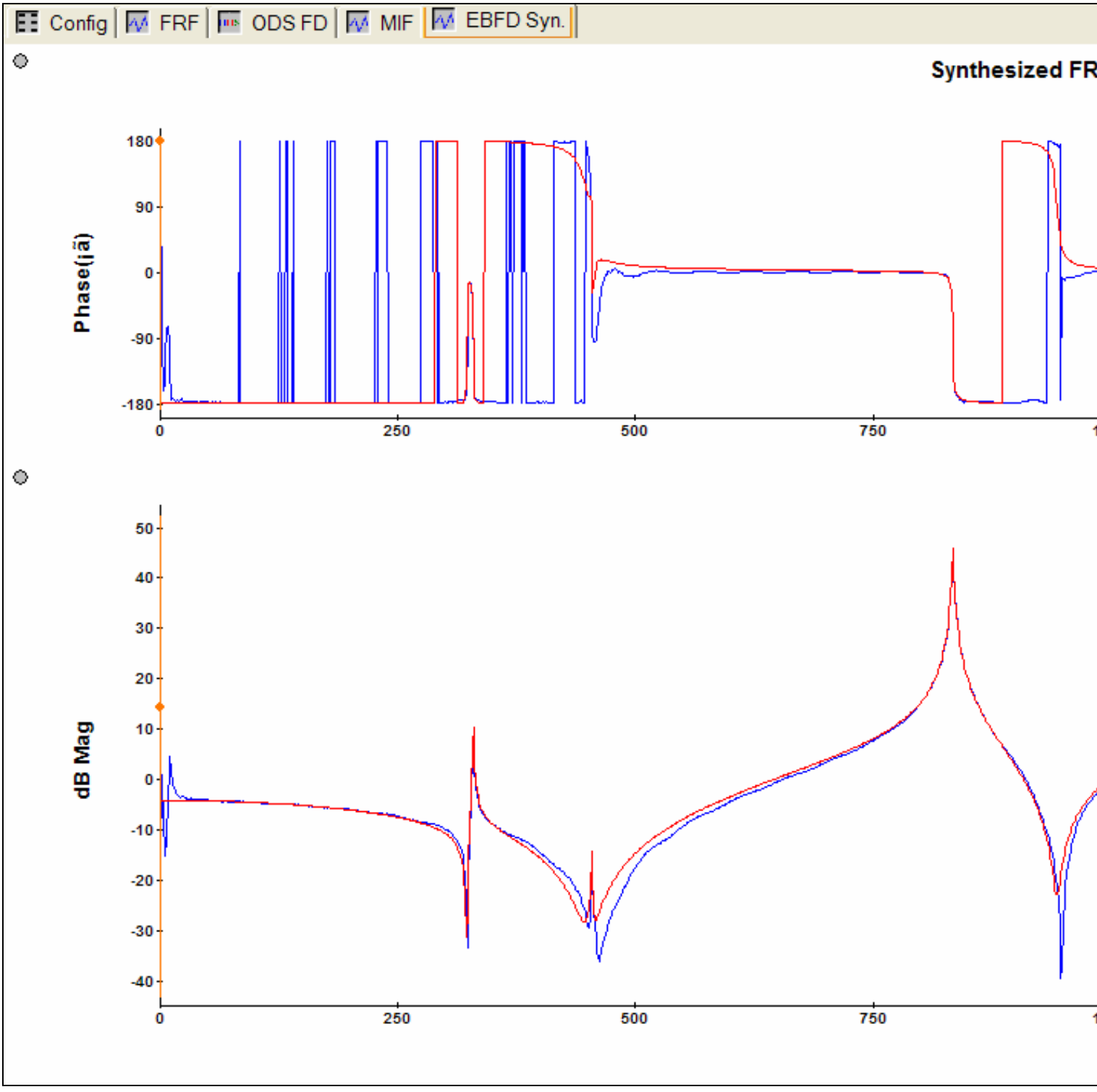
Press the button of "Auto Selection" or  , the OM2 selects the physical/structural modes automatically. While move the mouse cursor on a pole, the modal frequency and damping ratio corresponding to this pole will be shown. You can move the mouse on different poles to check the stability via small change of the modal frequency and/or damping ratio.



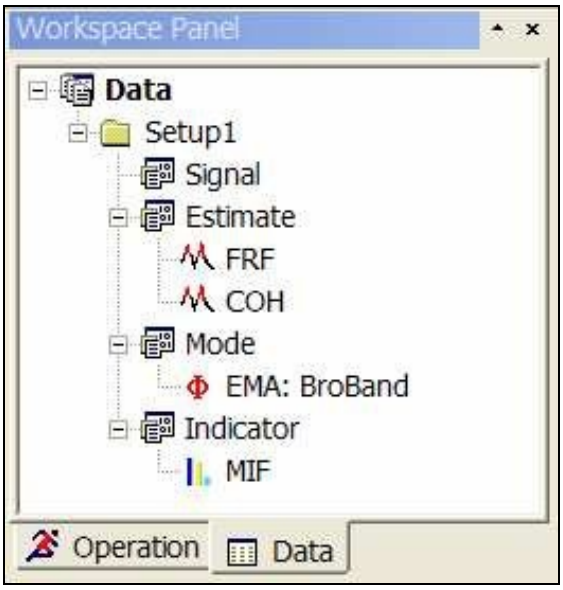
Note: Manual selection of structural modes: a pole can also be manually selected by clicking it or deselected it by same operation. A selected pole will be marked with a shape symbol .

- Mode shapes calculation

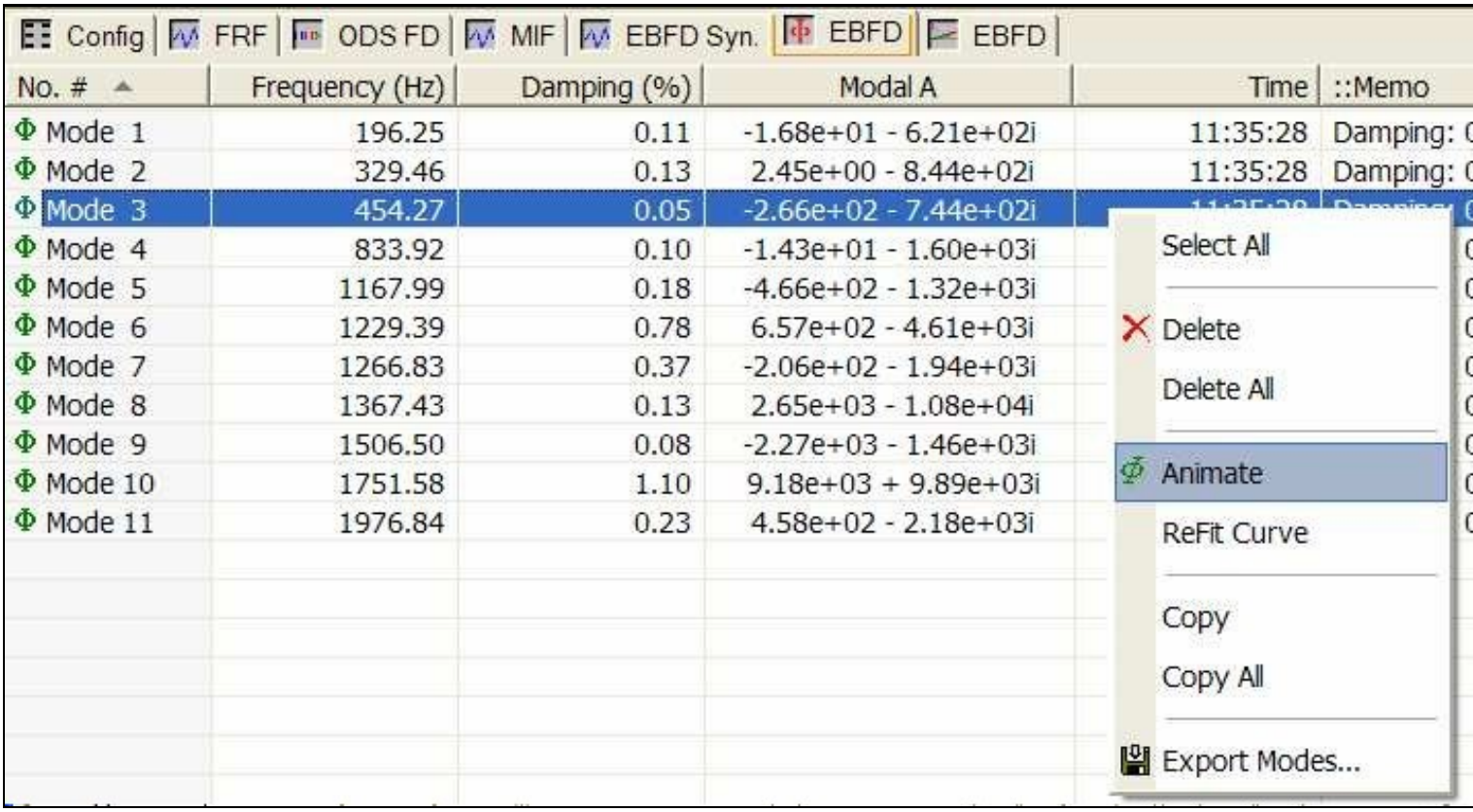
Press the button of "Calc. Modeshape" to confirm the pole section and BroBand software start to estimate the mode shapes and to calculate the synthesized FRFs.



- Results visualization



To visualize the list of the modes, double click on `EMA: BroBand The list of results will be displayed. By right clicking on a mode and selecting `animate?, the corresponding mode shape will be showed.



38.6 MODAL VALIDATION

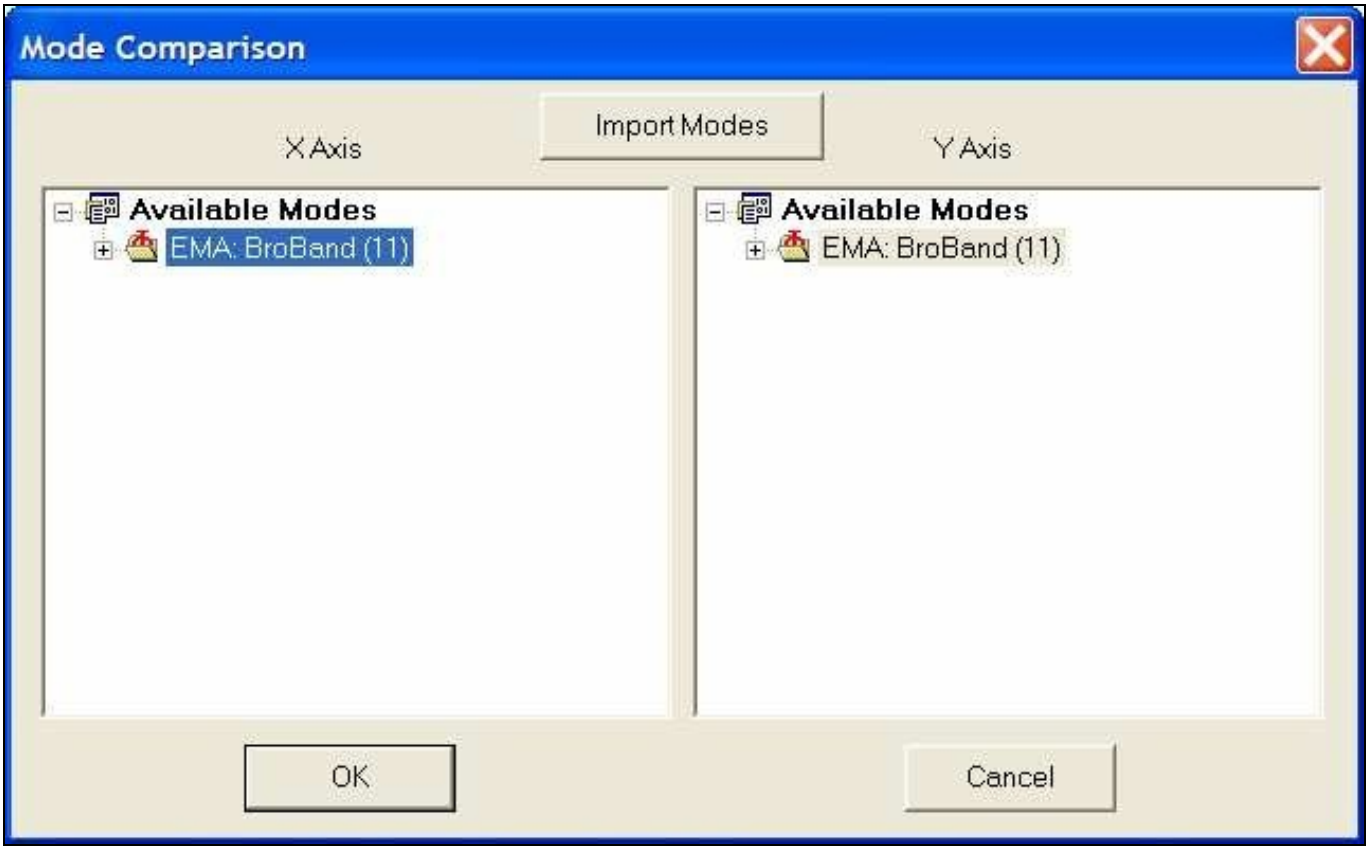
The first way to check the results is to look at the coherence between the experimental FRFs and the synthesized ones in the selected frequency band.

To go further, results from 2 different methods can be compared using the Modal Assurance Criterion (MAC).

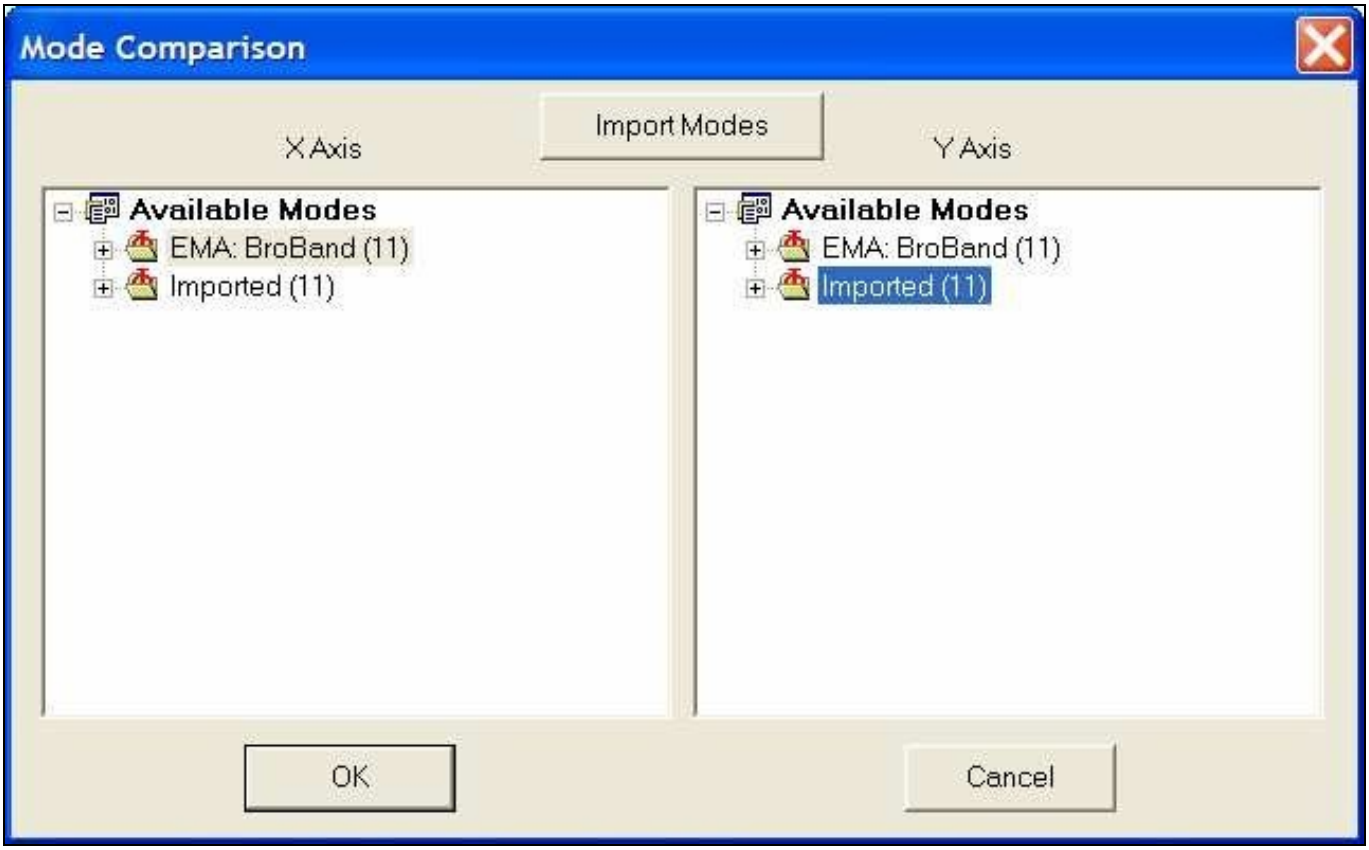
Here, we have results from Broadband method. The repertory `Cantilever modal demo? contains a file `MIMO1 results? with the modal parameters obtained from MIMO1 method.

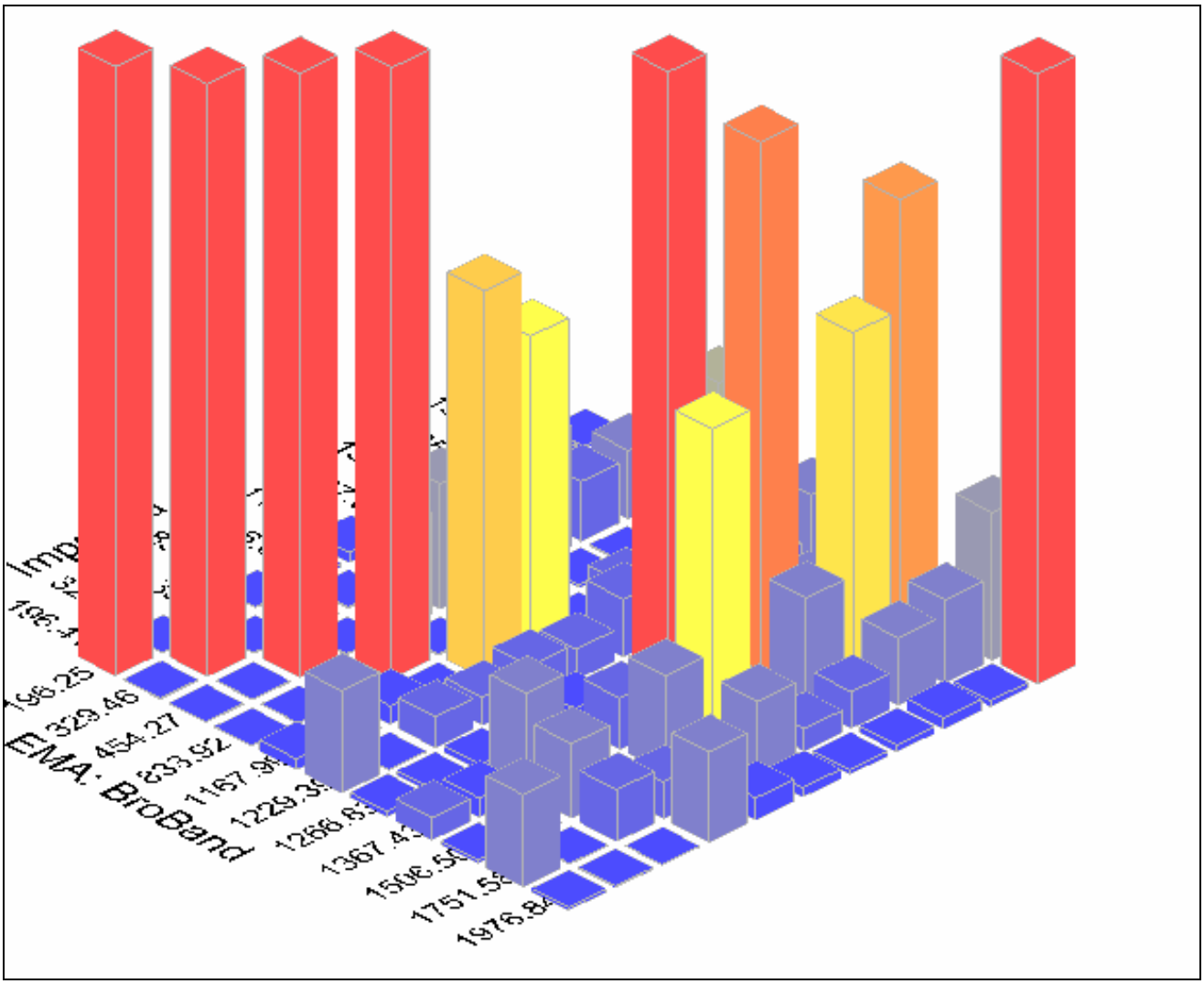
In the operation tree, double click on MAC: 

The following window is displayed



Click on Import Modes and select the file `MIMO1 results? and OK




EMA. BioBand
196.25
329.46
454.27
633.92
1167.9
1229.3
1266.8
1367.4
1506.5
1751.5
1976.84

38.7 SAVE/EXPORT

The project can be saved in a workspace containing data, geometry, results? It?s also possible to save independently each part of a project.

- ♦ The data (FRFs) are saved in uff 58
- ♦ Create a file uff 15 containing the geometry by clicking on File/export/geometry,
- ♦ Export the modal results by right clicking on the modes list and select `Export Modes??
- ♦ Create a file .avi with a mose shape by displaying a mode shape and click on  in the control panel.

39 Modal Shortcuts

Many shortcuts are provided to help you operate Modal more conveniently. Your efficiency can be greatly improved by these shortcut operations employing the mouse and keyboard.

39.1 Shortcut Operations in the Explorer

Double click on a ?.cfg? file	**Run Modal, and open this configuration file**
Double click on a ?.wsp? file	Run Modal, and load this workspace file
Drag a ?.cfg? file to the software?s mainframe	Open this configuration file
Drag a ?.wsp? file to the software?s mainframe	Load this workspace file

?

39.1.1 Shortcut Operations in the General Interface

Ctrl+N	**Create a new configuration file**
Ctrl+O	Open a configuration file
Ctrl+P	Print contents in the current window
Ctrl+C	Copy contents in the current window to the clipboard
Ctrl+V	Insert clipboard contents
Ctrl+Z	Undo the last action
Ctrl+Y	Redo the previous undone action
Ctrl+D	Locate to the setup list box in the standard toolbar, and switch between each setup
F1	Show the online help manual
F5	Reload the current configuration file
F12	Begin a new session of OROSModal2
Double click on a window tab	Close the relevant window
Middle click on a window tab	Close the relevant window

?

39.1.2 Shortcut Operations in the 2D Curve Window

Double click	**Select the band between current cursors**
Enter	Select the band between current cursors
Middle click	Delete the latest selected band
Backspace or Delete	Delete the latest selected band
Double middle click	Delete all the selected bands
Esc	Delete all the selected bands
Tab	Find the limits between current cursors

?	Move the two cursors to the left simultaneously
?	Move the two cursors to the right simultaneously
?	Move the two cursors outwards simultaneously
?	Move the two cursors inwards simultaneously
Page Up	Increase the cursors? moving step
Page Down	Decrease the cursors? moving step
Home or End	Make the two cursors return to default positions
F2 ? Mouse moving	Move the two cursors with the mouse simultaneously
F3 ? Mouse click	Zoom in the range between the two cursors
F4 ? Mouse click	Display the full band of current curve

?

39.1.3 Shortcut Operations in the 3D Graphics Window

Ctrl+M	**Locate to the mode list box in the toolbar, and switch between each mode**
Click and moving	Rotate the model
F2 ? mouse moving	Translate the model or selected 3D objects
F3 ? mouse moving up or down	Zoom in or out the model or selected 3D objects
F4 ? mouse moving	Rotate the model or selected 3D objects
Mouse wheel scroll	Zoom in or out the model or selected 3D objects
Delete	Delete selected items (nodes, lines, polygons, 3D objects)
?	Translate to the left
?	Translate to the right
?	Translate to the top
?	Translate to the bottom

?

39.1.4 Shortcut Operations in the Dialog of ?Showed Series?

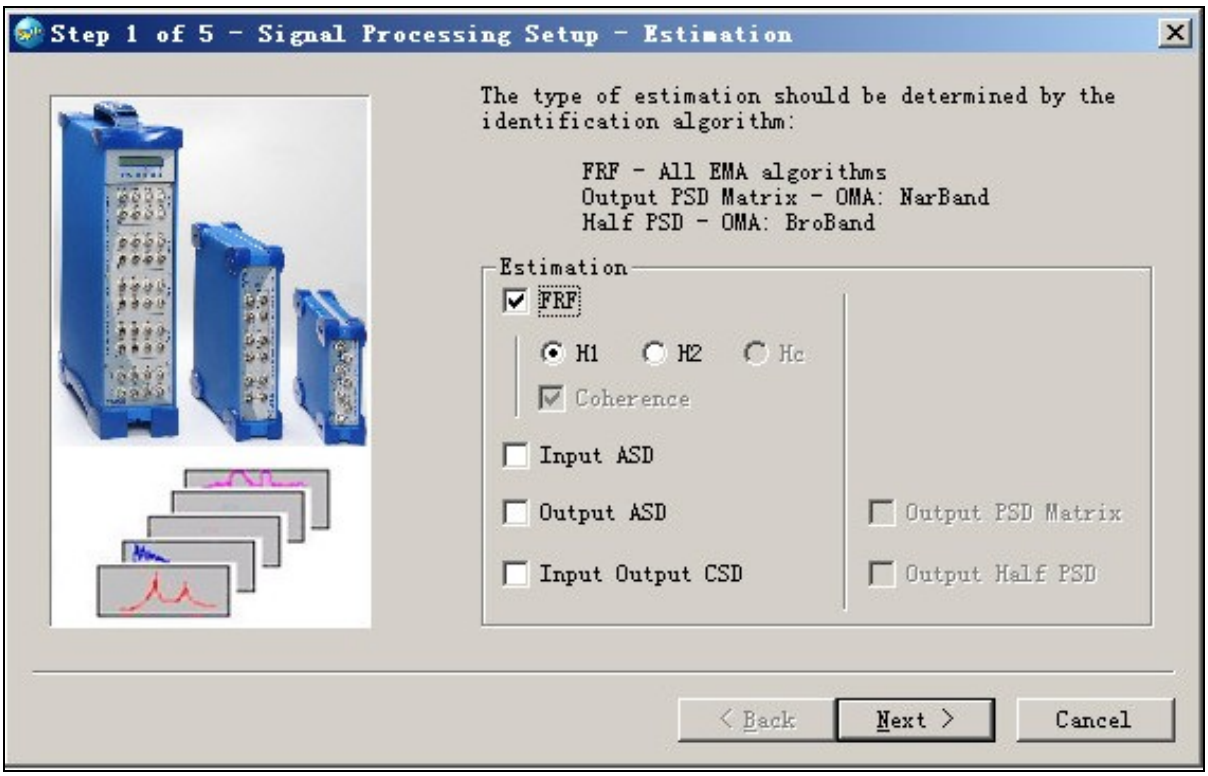
Double click on the ?Available No.?	**Add the selected items to ?Selected No.?**
Double click on the ?Selected No.?	Delete the selected items from ?Selected No.?
Right click anywhere	Delete all the items in ?Selected No.?
Middle click anywhere	Delete all the items in ?Selected No.?

40 Modal Signal Processing

40.1 Signal processing

Signal processing wizard is designed to set the parameters for signal processing. Many signal estimations can be realized, such as power spectrum estimation, multiple input multiple output frequency response function estimation, and coherence function estimation, and so on. Five steps should be performed in this wizard: Estimation, Detrending, Decimation, Fast Fourier Transform (FFT)], and Windowing.

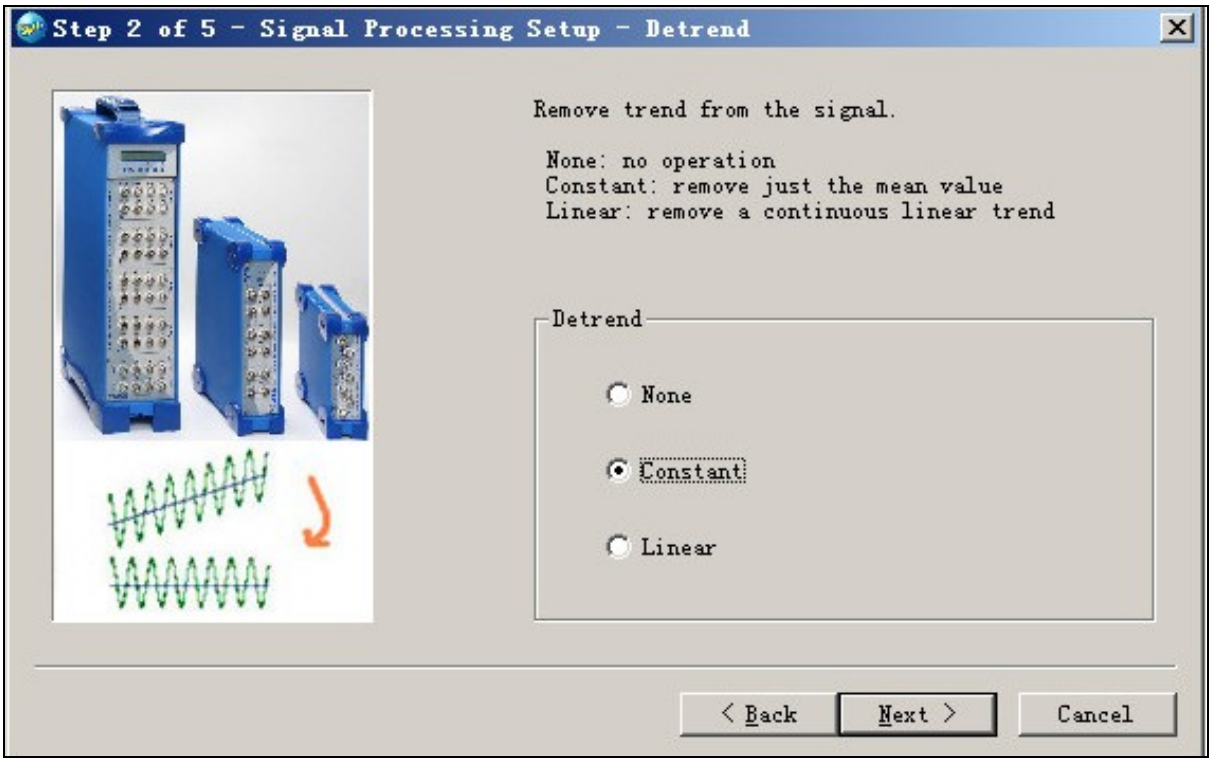
40.1.1 Estimation



Various signal estimation process can be set in this page. You must estimate the ?FRF? if you want to perform modal parameters identification in the case of EMA. H1,H2 and Hc are three different methods for FRF estimation. Reference signal is needed for Hc method. You must estimate the ?Output PSD Matrix?(for OMA NarBand Full) or ?Output half PSD?(for OMA BroBand, OMA NarBand Half, and so on) if you want to perform modal parameters identification in the case of OMA.

The next step of signal processing wizard is Detrending.

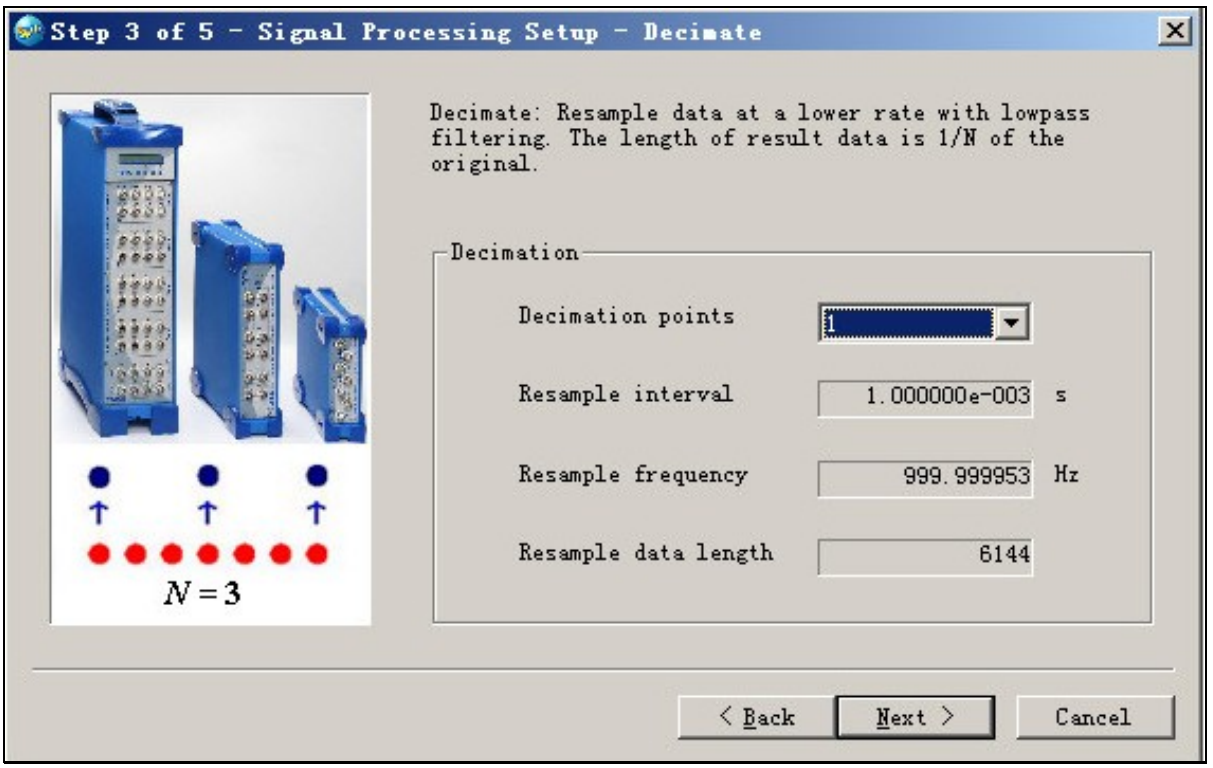
40.1.2 Detrending



The purpose of detrending is to condition the time domain signals, remove their constant or linear trend.

The previous step of signal processing wizard is Estimation, and the next step is Decimation.

40.1.3 Decimation



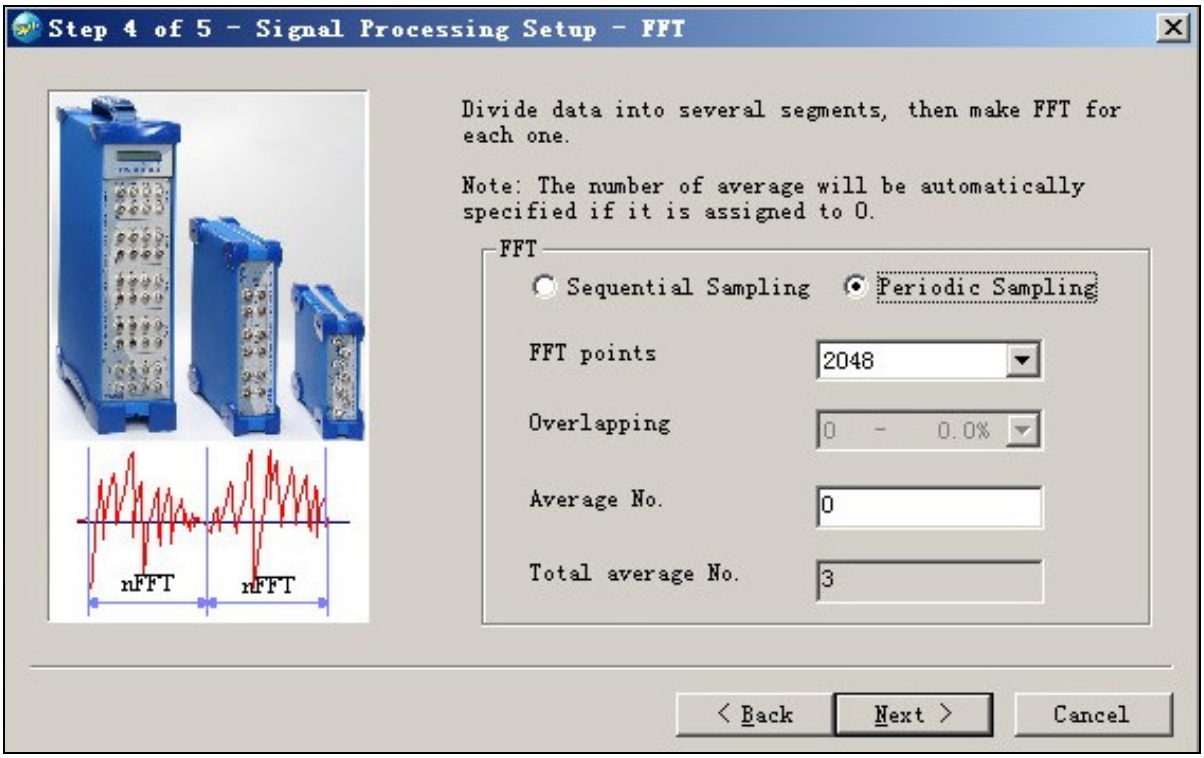
The purpose of decimation is to reduce the range of analysis frequency. For example, you are interest in the frequency range of 0~10 Hz, and the sampling frequency is 256 Hz, then you should set the decimation points to 10.

The basic principle of decimation is reserve part of points and removing the others: if the decimation points is N, the length of data will be 1/N of original data. To prevent the estimation from frequency aliasing, a low-pass filter is necessary in this process.

There are not any anti-aliasing filters in some low-cost data acquisition. It will greatly improve the quality of estimation for you to sample data with high frequency and then decimate them in Modal, partly compensating for the loss of anti-aliasing filters.

The previous step of signal processing wizard is Detrending, and the next step is setup of FFT].

40.1.4 Setup of FTT



In this page, parameters for fast Fourier transform (FFT) will be set to transfer the time domain signals to frequency domain.

?Sequential Sampling? means that the data was sampled sequentially, without any pause. A typical instance is to sample data sequentially under random excitation. "Periodic Sampling? means that the data in the file was sampled periodically. A typical instance is to sample multiple frames of data in a hammer impact test, for the sake of performing average in the spectrum estimation. The practical significance of "Periodic Sampling" is the overlap percent is set to zero in FFT.

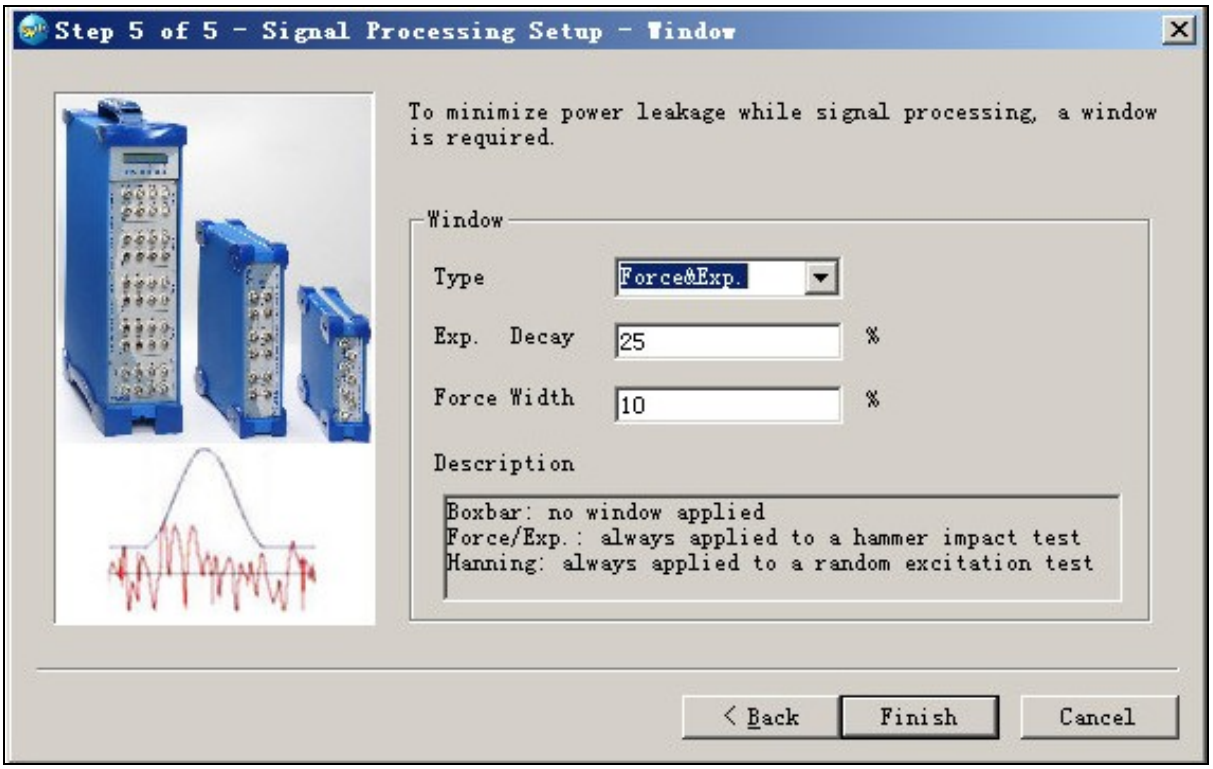
?FFT Points? specifies the length of each segment in the transform. The optional list will be confirmed by the software according to the length of imported data automatically. You can select one from this list. When the data points has less than ?FFT points?, zeros will be padded, and truncated if it has more.

?Overlapping? specifies the percent of overlap between each segment. The purpose of overlap is to increase the times of average. For an example of 2048 data length and 1024 FFT points, if the overlap percent is set to 0, the original data can be divided into two segments for FFT (the first segment is from 1 to 1024, and the second part is from 1025 to 2048); When the overlap percent is set to 50%, the number of overlap points is 512, and the original data can be divided into three segments (the first segment is from 1 to 1024, and the second segment is from 513 to 1536, and the third segment is from 1025 to 2048).

?Average No.? specifies the number of average during the FFT calculation. Its default value is 0, which means the maximum possible average numbers. When the number specified by the user is larger than the maximum average number, it will be modified to the maximum average number automatically

The previous step of signal processing wizard is decimation, and the next step is windowing.

40.1.5 Windowing



You can specify the windowing functions for the FFT in this page. The truncation and non-periodicity of signal will cause energy leakage and lead to alias error in the frequency domain. The main purpose of windowing is adding time weight functions to the signal to filter the non-periodicity part and reduce leakage. Six kind of window function such as Boxcar, Exponential, Force & Exponential, Hanning, Hamming, Flattop is provided and can be employed for different cases.

40.1.5.1 Boxcar

Boxcar window, called as Transient window also, has the shape of rectangle. It adds the same weight to all parts of the time history, i.e. no weight is added.

The Boxcar function has a value of 1 over its length and it only truncation the signal simply. It can be applied to the signal such as periodic (period random) and transient (Chirp, Burst Chirp) signal generally.

40.1.5.2 Exponential

The shape of the exponential window is that of a decaying exponential. By assigning the time const, the exponential window damps the signal, ensuring that the signal fully decays by the end of the sample block.

Exponential function can be applied commonly to the measurement of light damping system.

The following equation defines the exponential window:

$W(t)=e^{-?t}$

Where ? is a constant. In Modal, Td is defined as the exponential decay time over which exponential window function decays from 1 to 1/e, in this case , ?=1/ Td. When applying exponential function to a signal, damping of the system will be increased and should be modified. The damping ratios and frequencies can be automatically modified in Modal if the exponential window is applied by the signal processing wizard. When the input data is FRFs which were estimated by applying exponential window, you should remember to specify the decay time (with unit of ms) in the configuration file.

Note: The value you should fill in this interface is not ?, but the percentage of ? constitutes to the sampling period.

40.1.5.3 Force & Exponential

In a force window, the front part of the signal is preserved and the others are set to 0. The time length of the preserved signal is named force width. When Force & Exponential window is selected, exponential window is applied to both channels while force window is only applied to the reference channel.

Force window is very useful for the hammer impact test and it can wipe off the fluctuation of the force signal and greatly improve SNR (Signal Noise Ratio).

Note: You should fill the percentage of these values constitute to the sampling period as well.

40.1.5.4 Hanning

Hanning window is also named random window and has a shape similar to that of half a cycle of a cosine wave. It decays the start and end part of the signal and enforce the signal to become periodic.

It is a general-purpose window and its typically applied to the test excited by random noise.

40.1.5.5 Hamming

Hamming window is similar to Hanning window and it can further decrease the side lobe.

40.1.5.6 Flattop

Namely cosine window, the flattop has the flatness power shape and the higher amplitude accuracy while poor frequency resolution.

The flattop window is most useful in accurately measuring the amplitude of specified frequency components such as filter characters.

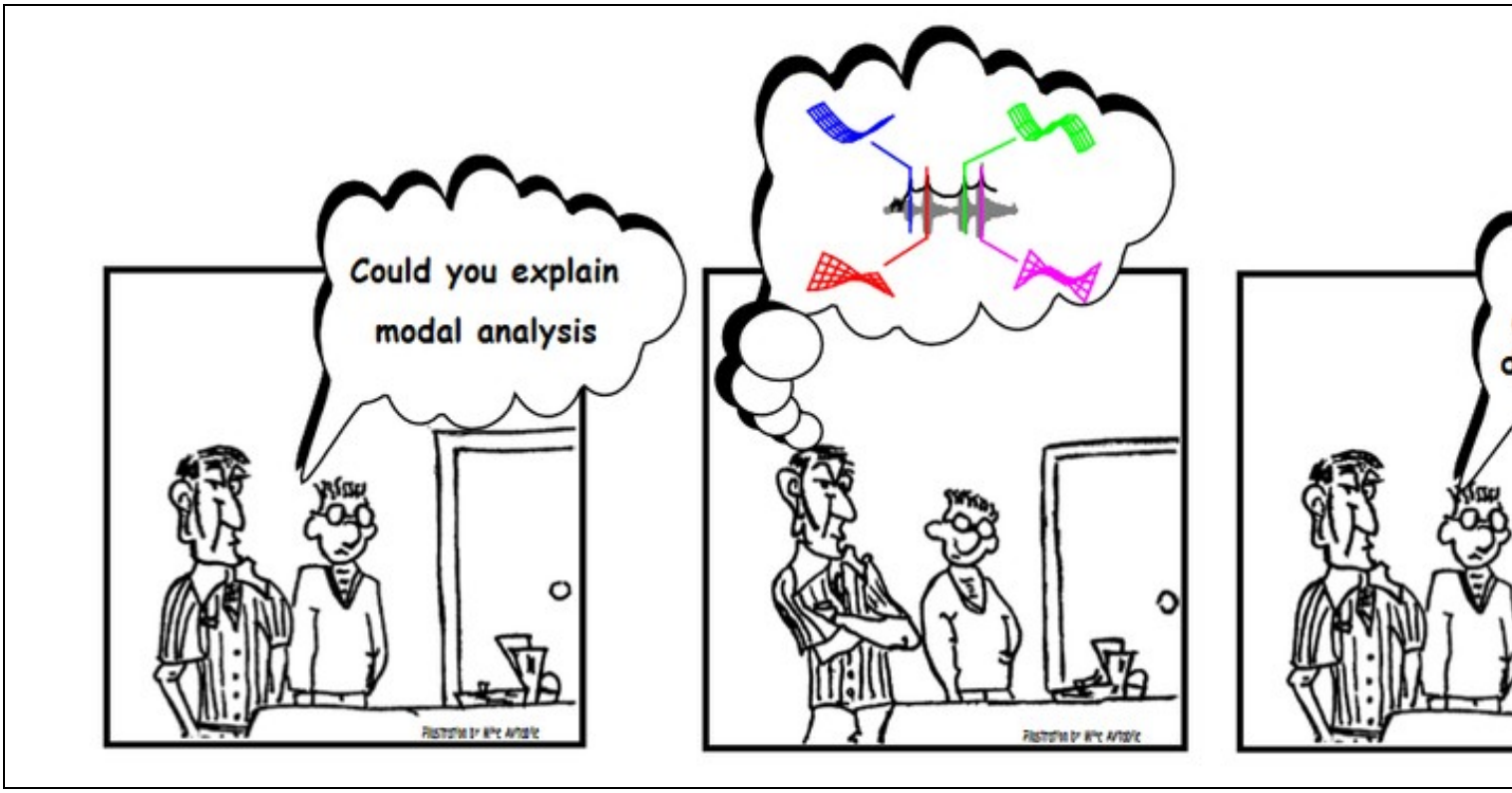
This is the last step of the signal processing wizard, and the previous step is setup of FFT. Press the ?Finish? button to confirm all the parameters set in the wizard, and you can begin to signal processing now.

The sampling times can be set to 2.56 or 2. Usually in an EMA analysis it is set to 2.56, and in an OMA analysis it is set to 2. If the sampling times is 2.56, then the number of the spectral line will be 1/2.56 of the FFT length, and the analysis frequency range will be 1/2.56 of the sampling frequency. If the sampling times is 2, then the number of the spectral line will be half of the FFT length, and the analysis frequency range will be half of the sampling frequency.

After signal processing, the result data will be displayed under the directory of ?Data\Setup?\Estimate" in the ?Data? page of workspace short pane, such as FRF (frequency response function), COH (coherence function), Pxx (input auto power spectral density function), Pyy (output auto power spectral density function), Pxy (input and output cross power spectral density function), OPSD (output power spectral density matrix) and HPSD (half power spectral density function). Double click these items, and relevant curves or lists will be displayed in the main window.

If you want to do signal processing with other parameters, please run the wizard and process again. Before the new signal processing, all the result got from last signal processing will be refreshed or deleted automatically.

41 Modal Theorical FAQ



The following articles have originally been published in SEM Experimental Techniques. It is write by Dr Peter Avitabile head of The Structural Dynamics and Acoustic Systems Laboratory (SDASL) at the University of Massachusetts

41.1 Modal Generality

What is modal analysis?.
Common mistakes.

41.2 Acquisition

41.2.1 Generality

Basic steps to acquire data
Can the test setup have an effect on the measured modal data ? Do the setup boundary conditions and accelerometers have an effect?
How many points are enough when running a modal test
is it better to collect averaged FRF data for a modal test? Or collect time data and process it afterwards?
We talked about the number of points needed for a modal test before.

41.2.2 Sensor and reference

I ran one test with an x-excitation and can see some modes and another test with a y-excitation and see some different modes could I use an oblique angle instead ?
Do I need to have an accelerometer mounted in the X, Y and Z directions to do a modal test?
Is there a difference between a roving hammer and roving accelerometer test?
Someone told me that you must have multiple references to identify pseudo repeated.
Is there any benefit to using multiple references?I thought only one reference was need.
Should I always use a hard tip for impact testing . . .so the input spectrum is flat over all frequencies
double impact question

41.3 Shacker

Is there any difference between a modal test with a shaker excitation or impact excitation?
Is there any real advantage to MIMO testing? Why not just use SISO and then move the shaker?
Which shaker excitation is best? Is there any difference?

41.4 results interpretation.

I showed some mode shapes to someone. They asked me if the structural design was ok. What should I tell them ?

41.5 Modal theorical

41.5.1 Windowing

When impact testing, can the use of the exponential window cause any problems?
Which window is most appropriate for the various types of modal tests performed?
I heard someone say Pete doesn't do windows. Whets the scoop.

41.5.2 Curvfitting

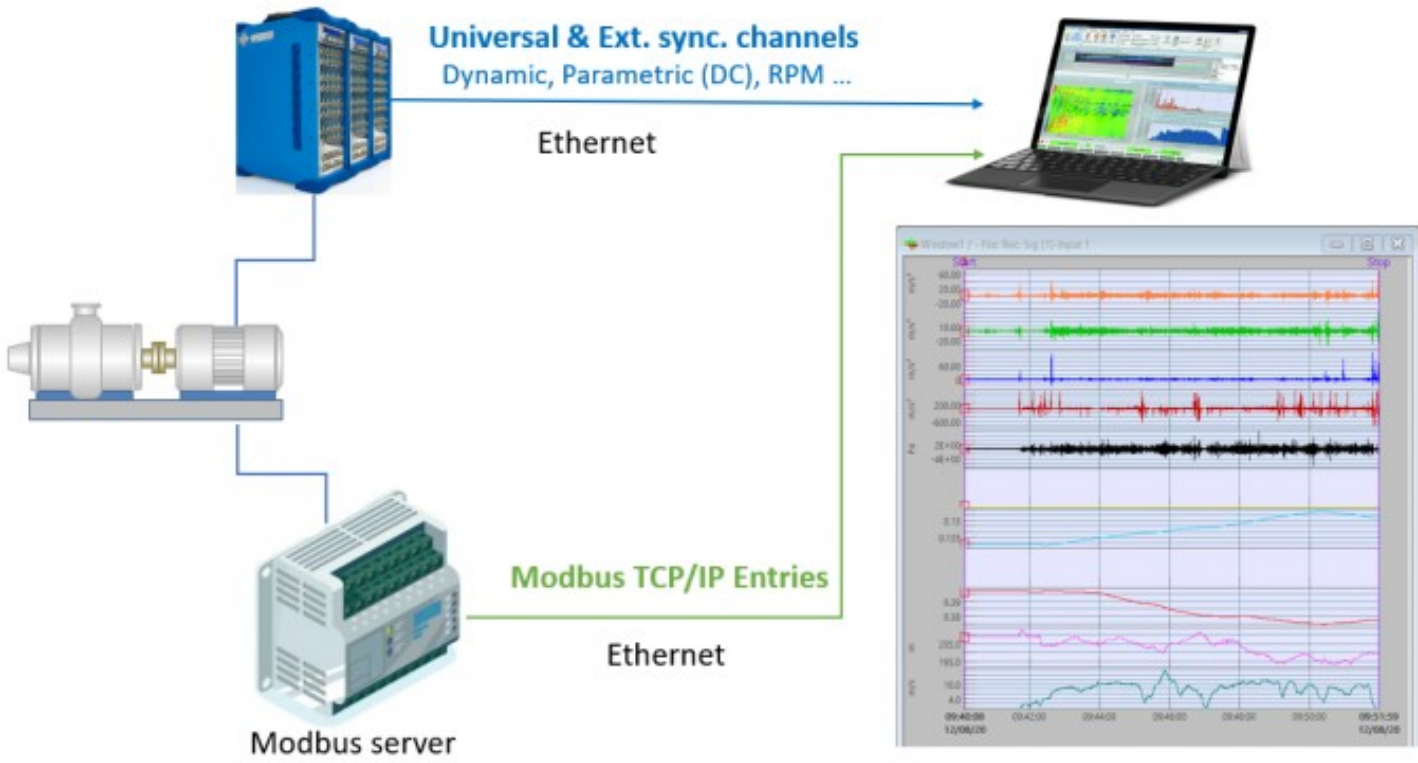
Curvefitting is so confusing to me!
What's the difference between local and global curvefitting ?
I still don't understand curvefitting ...

41.5.3 others questions

What's the difference between a complex mode and a real normal mode?
Could you explain the difference between time domain, frequency domain and modal space?
I ran a modal test on a portion of a structure of concern and many modes look the same!
Someone told me SDM will never work
Are you sure you can get mode shapes from one row or column of the H matrix?
I hear about SVD all the time Could you explain it simply to me?
I'am still overwhelmed by all this modal stuff Laplace, Fourier, FRFs, and all that!
Does it make any sense to use the actual operating loads as the excitation force for a modal test if the force is a random signal ?
Why is calibration and mode shape scaling important? And does it make a difference?
Mode shape scaling requires a drive point measurement.Is there any way to scale shapes without this ?
What's the difference between operating deflection shapes and mode shapes? sometimes they look the same to me!
Why is mass loading and data consistencyimportant for modal parameter estimation?
Should I use all collected measurements when estimating modal parameters ?
Why do some measurements have anti-resonances and others not ?

42 IP to NVGate

This add-on allows NVGate to read inputs with Modbus TCP/IP protocol. It converts bus values to Simulated DC input and can be used as physical inputs in NVGate, which are synchronized with dynamic / parametric / Ext. sync. channels acquired from OR3X or O4 analyzer. It supports all the Modbus register types. This add-on can also update or create properties that are metadata stored in the NVGate measurements. The metadata can be computed from one bus value (min, max, average, first, last) or can be read from a file.



42.1 Download

Download here

42.2 Requirements

- NVGate version 15 (2022) or greater.
- Modbus to NVGate add-on.
- Your own TCP/IP Modbus server or the demo server provided with Modbus to NVGate.

42.3 Procedure

Please follow the following steps:

1. Copy the Modbus folder on your PC.

2. Launch NVGate.

3. Launch the Modbus server (you can first use the test server launching test_server.exe from the Modbus folder).

4. Launch ModbusToNVGate.exe.

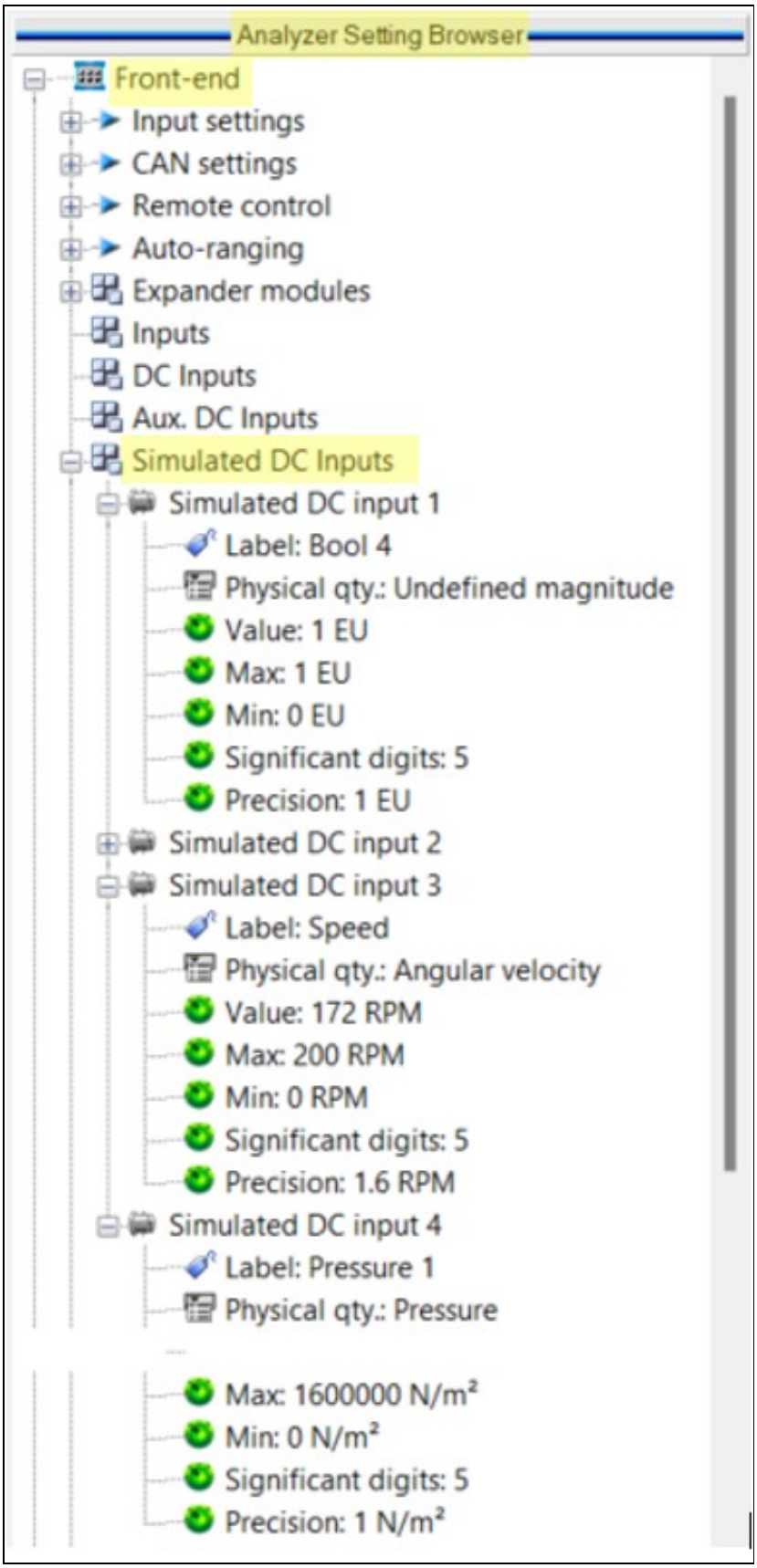
5. Select the inputs file (sample_standard_f1.xlsx in the Modbus folder).

6. Select the properties file (sample_properties.json in the Modbus folder).

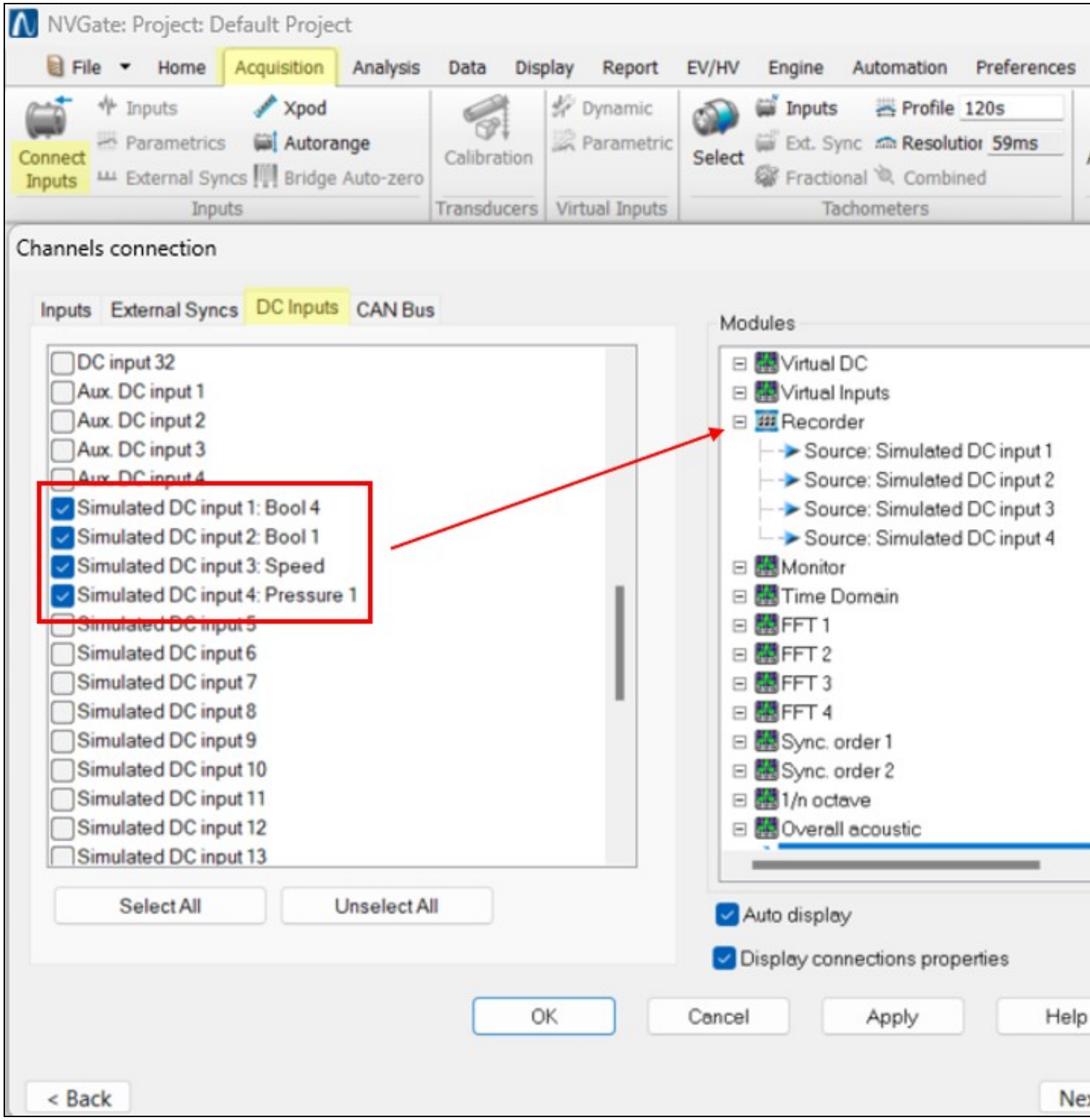
7. Click on start.



8. In NVGate, in the analyzer Setting Browser / Front end / Simulated DC Inputs, you?ll see that Simulated DC Values are collected.


Analyzer Setting Browser
Front-end
Input settings
CAN settings
Remote control
Auto-ranging
Expander modules
Inputs
DC Inputs
Aux. DC Inputs
Simulated DC Inputs
Simulated DC input 1
Label: Bool 4
Physical qty.: Undefined magnitude
Value: 1 EU
Max: 1 EU
Min: 0 EU
Significant digits: 5
Precision: 1 EU
Simulated DC input 2
Simulated DC input 3
Label: Speed
Physical qty.: Angular velocity
Value: 172 RPM
Max: 200 RPM
Min: 0 RPM
Significant digits: 5
Precision: 1.6 RPM
Simulated DC input 4
Label: Pressure 1
Physical qty.: Pressure
Max: 1600000 N/m²
Min: 0 N/m²
Significant digits: 5
Precision: 1 N/m²

From Acquisition / Connect Inputs, you can drag and drop the DC simulated channels (in the DC inputs tab) in a module (Recorder for example):



42.3.1 Recording

The add-on detects Recording starts and stops in NVGate. When properties are defined in the Input file, they are updated when the recording stops.

42.3.2 Input file

This file contains the list of data to be read from the server:

- General
  - Label: Name of the input displayed in NVGate.
  - User unit: the unit as described in the Units.xlsx
  - Min value and Max value: The minimum and maximum value (expressed in user unit). The min value must correspond to Bus data min, and the max value must correspond to Bus data max, i.e., if a temperature in [-20, 100] can be encoded on the bus with values in [-200, 1000]. So, range min = -20 and max = 100.

- Modbus input
  - Address: the register address.
  - Type: type of MODBUS request (among Discrete Input, Internal Bits, Holding Register, Input Register).
  - Bit: for Discrete Input or Internal Bits, the position of the bit in the register
  - Bus min, Bus max: Bus data: see range (in this example, the values must be min = -200 and max = 1000).
- NVGate Simulated DC number: Must be in [1, 32].
- Measurement properties (the parameters are metadata written in the measurement when the recording stops. They are accessible from Measurement Properties in NVGate.)
  - Name: the name displayed in NVGate.
  - Method: how the value is computed (first, last, min, max, average). If the method is ?file?, the value is read from the Properties file.
  - # digits after dot: value rounding.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	General (f1)				Modbus input					NVGate	Measurement properties		
2	Label	User unit	Min value	Max value	Address	Type	Bit	Bus min	Bus max	Simulated input number	Name	Method	# digits after dot
3	Bool 4	-	0	1	41004	Discrete Input	4	0	1	1	last bool 1	last	0
4	Bool 1	-	0	1	41004	Discrete Input	1	0	1	2	max bool 1	max	0
5	Speed	rpm	0	200	41008	Holding Register		0	128	3	Max speed	average	1
6	Pressure 1	Bar	0	16	41016	Input register		0	1600	4			
7	Bool 5	-	0	1	41024	Internal Bits	2	0	1		last bool 5	last	0

42.3.3 Properties file

A JSON file giving the value of some properties. The method of the property must be ?file?.

42.3.4 Unit file

The conversion coefficient between the units from MODBUS and the NVGate default unit (in International System of Units, SI).

42.3.5 ModbusToNVGate.ini

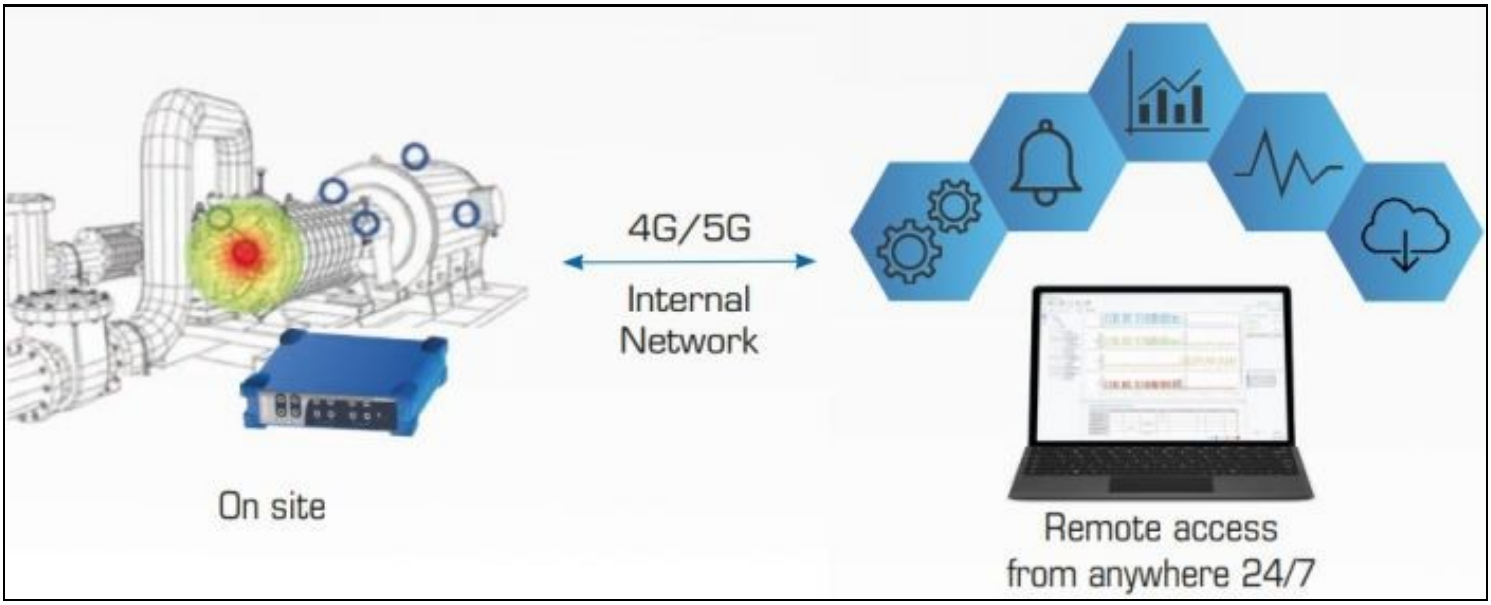
The ModbusToNVGate.ini file contains:

- Server IP and port.
- NVGate server IP and port (when NVGate is executed on a different PC from the Modbus to NVGate add-on)
- Modbus RTU mode (advanced usage): enable RTU mode with 1.

43 Monitoring Solution

43.1 Introduction

The OROS Monitoring solution can continuously supervise the noise and vibration levels of your critical assets, notifying alerts autonomously when predetermined levels are exceeded and catching real time high added value data on the spot.



This solution is dedicated for mid to long term monitoring application, and the main features are:

- Operate standalone: power cut and restart management
- From basic to advanced event triggering conditions
- Pre-trigger time domain signal recording remotely downloadable for further analysis
- Advanced and flexible actions on events
- Automatic alert notifications for rapid countermeasures
- Database and remote access to event log, trend, and measurement data for initial diagnostics at any time
- Flexible storage capabilities, suitable for site with or without a network connection

43.2 Installation

43.2.1 Download

Download last version of Monitoring Solution.

43.2.2 Equipment required for the installation

USB drive containing Monitoring software installation setups ?SetupM-Logger.exe? and "SetupM-View.exe".

NVGate software must have been installed first (from V16.00.002).

43.2.3 Installation of NVGate software

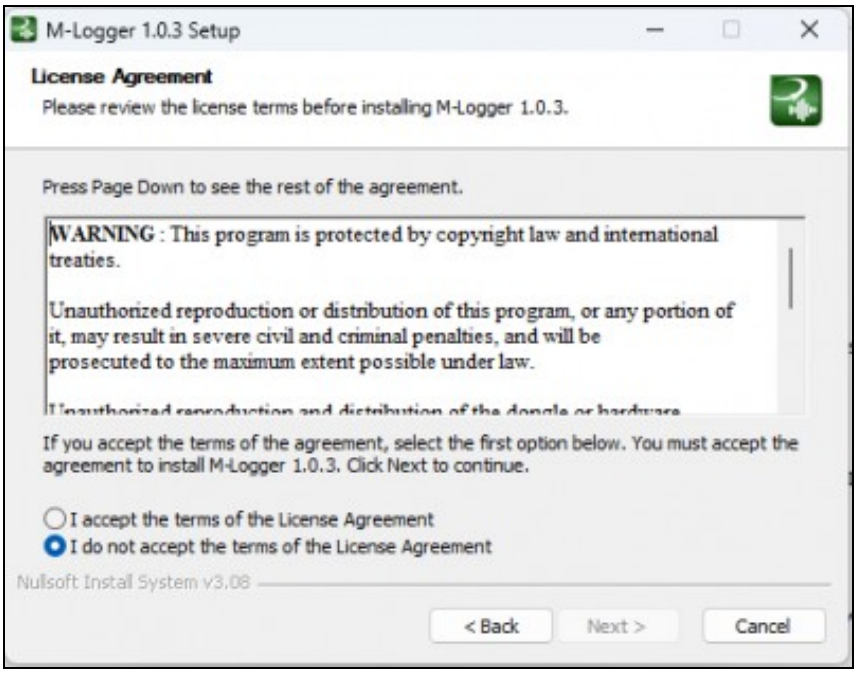
First you need to install NVGate.

43.2.4 Installation of Monitoring software

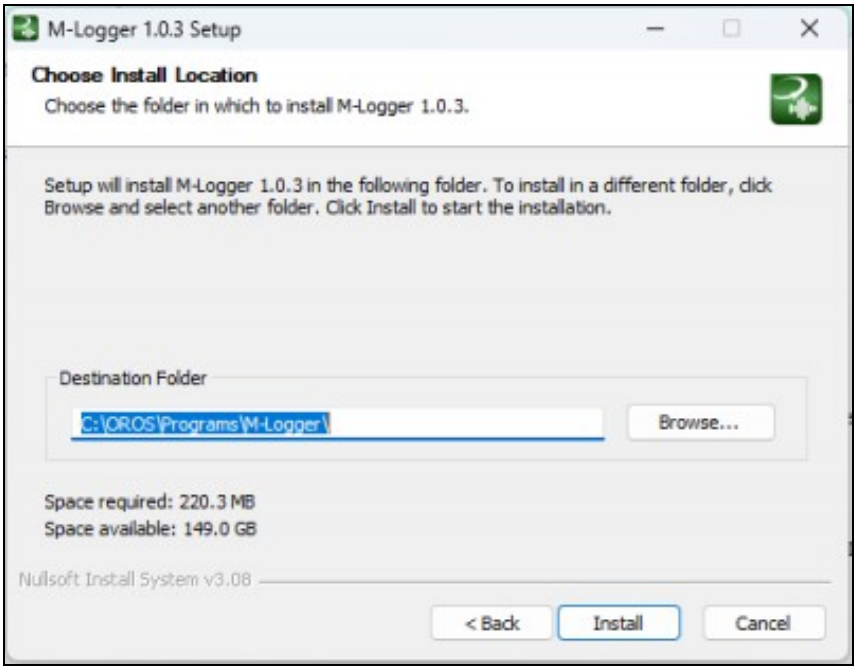
In the PC that is connected to OROS analyzer, run ?SetupM-Logger.exe? program, and the following window is displayed:



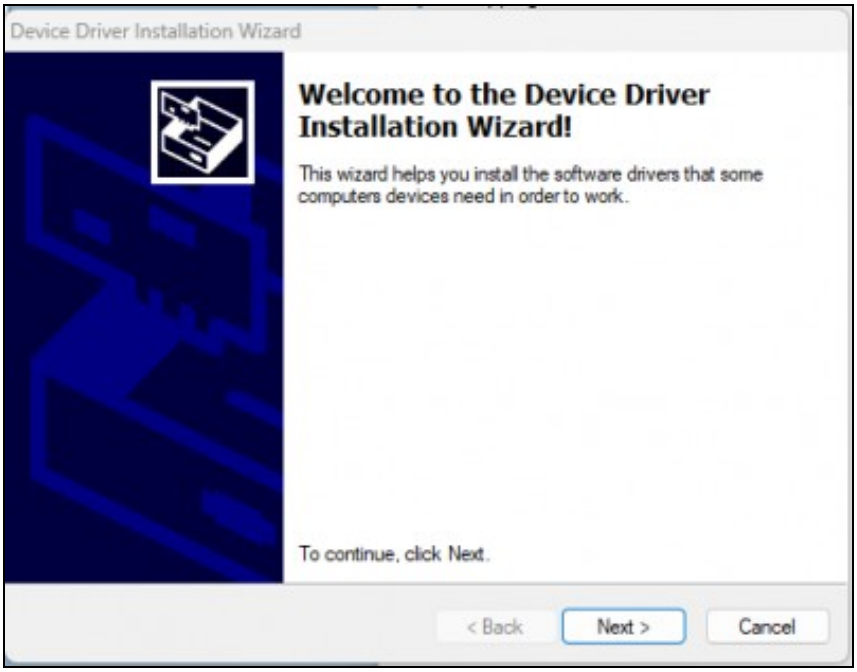
Click on ?Next?, and the following window is displayed:



Read the terms in the license agreement and check ?I accept the terms in the License Agreement? if you agree. Click on ?Next?, the following window is displayed:



Select the installation directory. It is highly recommended to keep the default location: C:\OROS\Programs\M-Logger. Click on ?Install? to start the installation, and wait until the following window is displayed:



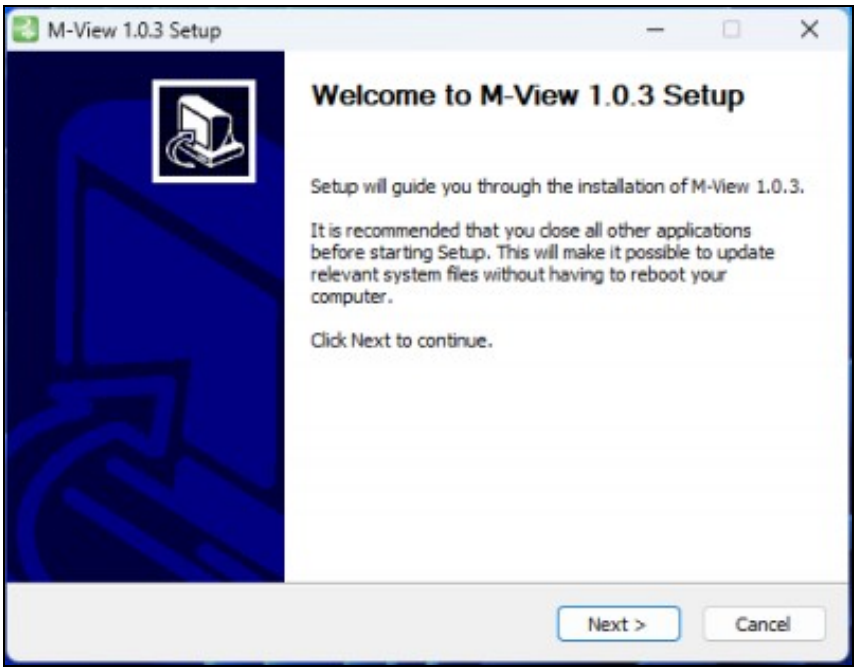
Click on ?Next?, the following window is displayed:



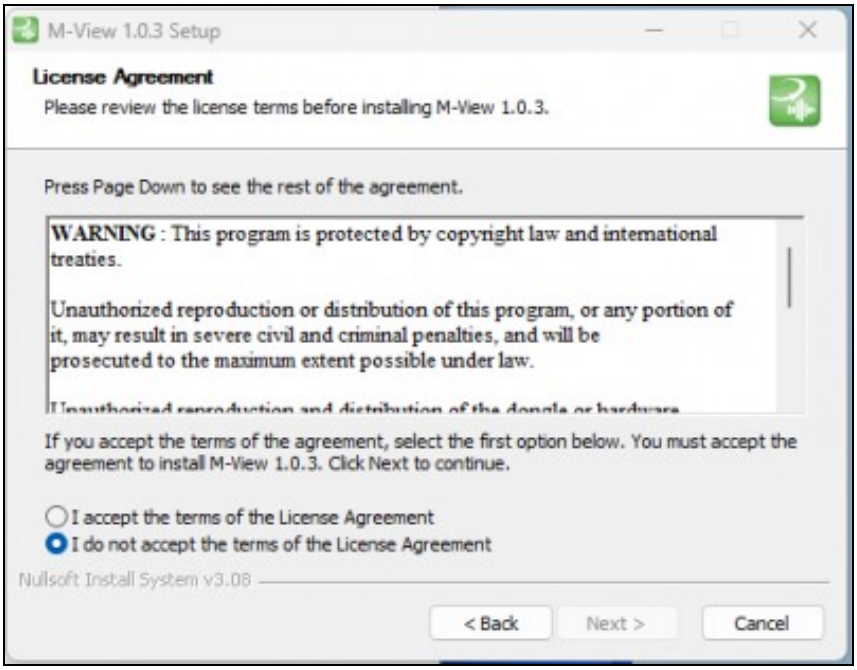
Click on ?Finish? to exit the setup wizard, and OROS M-Logger software is successfully installed.

The drivers for the Autonomy kit are installed during the default installation.

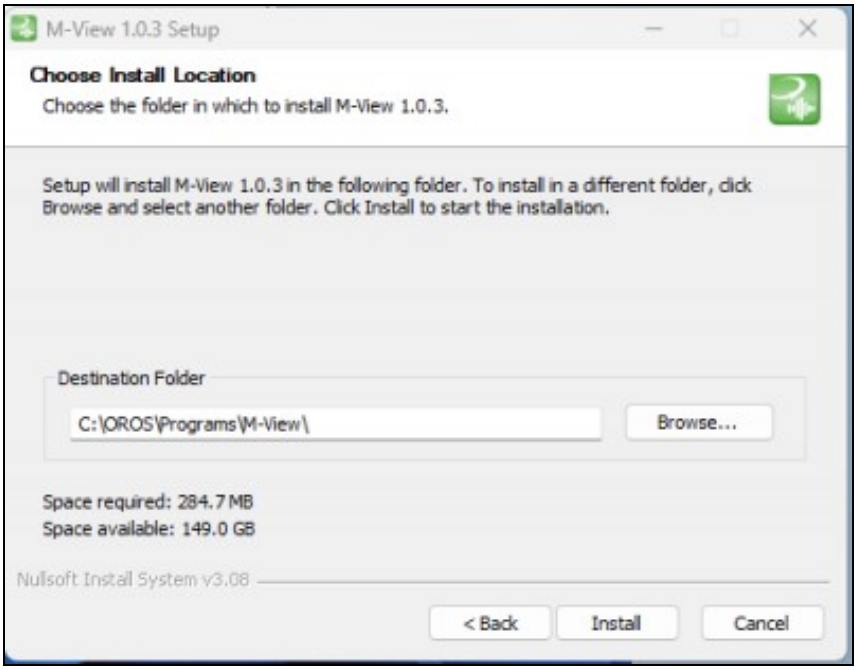
Next, run ?SetupM-View.exe? program in the PC which is used for checking collected data (usually is not the same PC which runs M-Logger), and the following window is displayed:



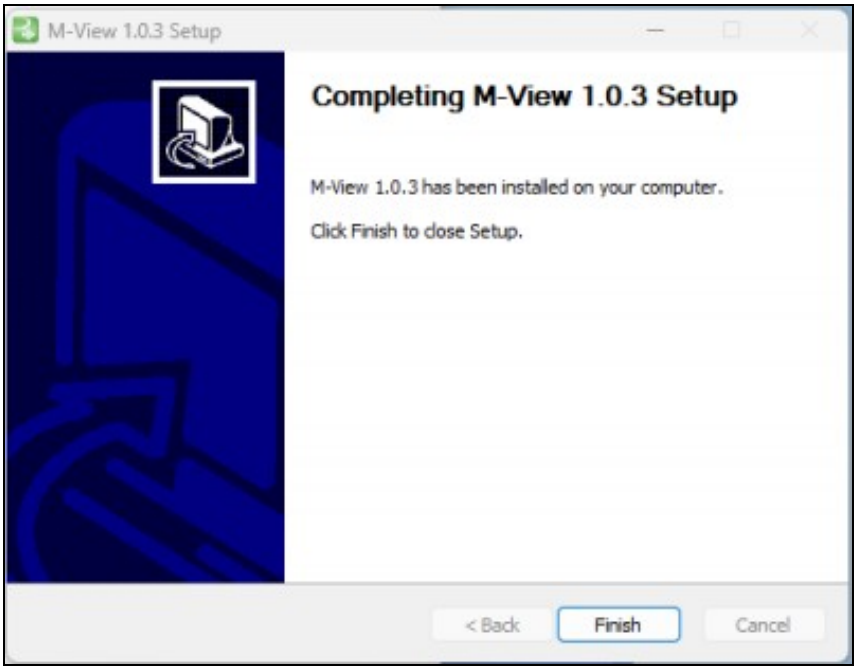
Click on ?Next?, and the following window is displayed:



Read the terms in the license agreement and check ?I accept the terms in the License Agreement? if you agree. Click on ?Next?, the following window is displayed:



Select the installation directory. It is highly recommended to keep the default location: C:\OROS\Programs\M-View. Click on ?Install? to start the installation, and wait until the following window is displayed:



Click on ?Finish? to exit the setup wizard, and OROS M-View software is successfully installed.

43.2.5 Autonomy kit installation (optional)

The autonomy kit must be plugged to the analyzer's RJ11 port and to the PC USB port, and drivers should be installed. Drivers are installed automatically during the installation of M-Logger, and can also be installed manually in case troubleshooting is necessary.

This autonomy kit is dedicated to OROS analyzers. Do not use it with any other device.

Only use original components provided.

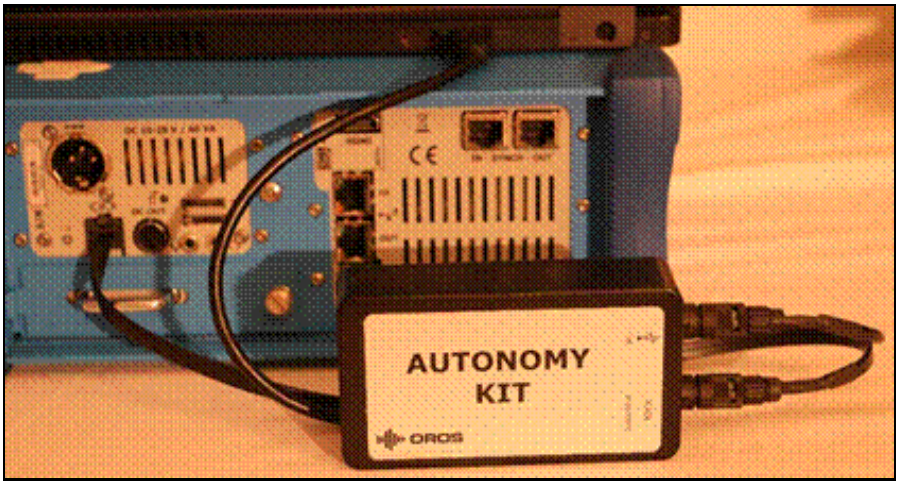


Figure 1 ? Autonomy kit installation with OR36

 This **Autonomy Kit** contains electronic equipment. It should not be mixed with general household waste. For proper treatment, return this product to OROS or to any local company authorized to recycle waste electrical and electronic equipment.

 This **Autonomy Kit** complies with following European Standards:

- 2014/35/EU low voltage directive
- 2011/65/EU and 2015/863 ROHS directive
- 2012/19/EU WEEE directive

43.2.6 Database installation and management

43.2.6.1 Database installation

MongoDB is a document-oriented NoSQL database used for high volume data storage and used by OROS Monitoring. OROS Monitoring solution is compatible with MongoDB 6.0.x only. MongoDB can be installed on different platform, and following instructions explain how to install it on Windows or Linux system.

43.2.6.1.1 Installation on Windows system

a. Pre-requisites MongoDB support these Windows versions :

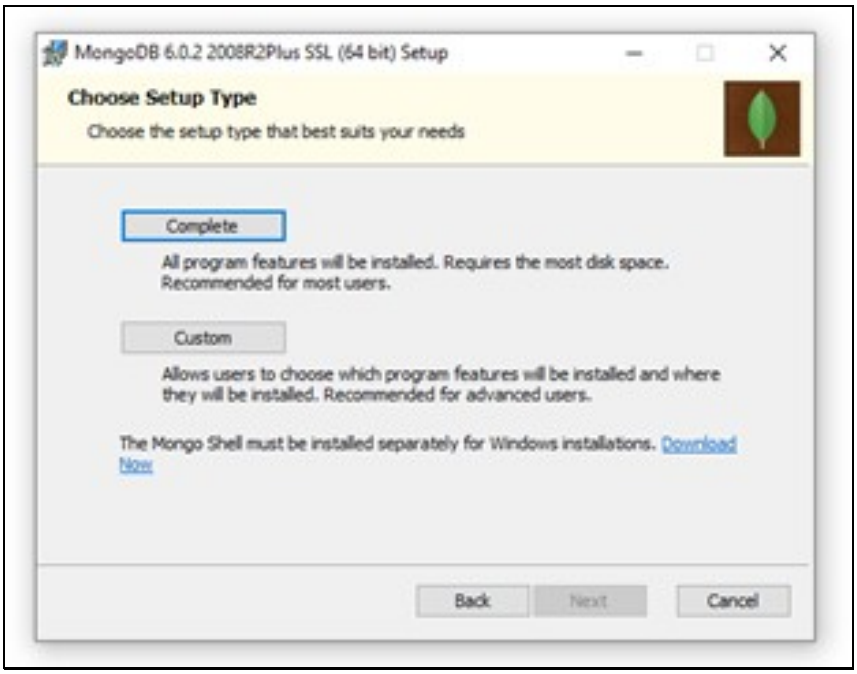
- Windows 10 et 11 64 bits
- Windows Server 2016, 2019, 2021 64bits

Download installation files:

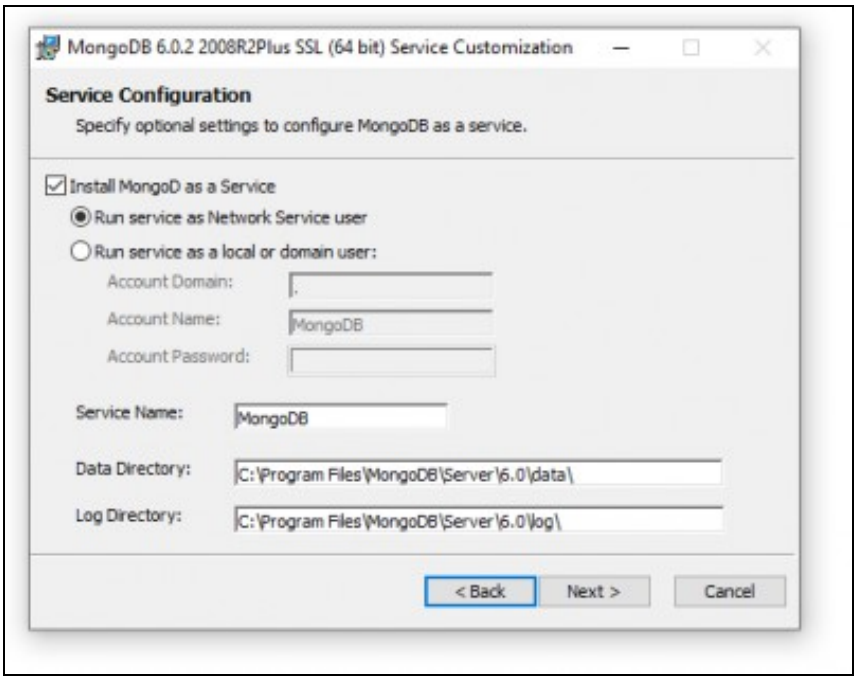
- MongoDB: https://fastdl.mongodb.org/windows/mongodb-windows-x86_64-6.0.5-signed.msi
- Mongosh: https://github.com/mongodb-js/mongosh/releases/download/v1.8.0/mongosh-1.8.0-x64.msi

b. MongoDB installation

Execute mongodb-windows-x86_64-6.0.5-signed.msi and click on ?Complete?:



Let default parameters filled:



Install

c. Configure MongoDB Open with a text editor mongod.cfg file located in mongodb folder, default : "C:\Program Files\MongoDB\Server\6.0\bin\mongod.cfg".

We need to enable zstd compression, find wiredTiger block and edit it as followed :

```
storage:
  dbPath: C:\Program Files\MongoDB\Server\6.0\data
  journal:
    enabled: true
  engine: wiredTiger
  wiredTiger:
    collectionConfig:
      blockCompressor: zstd
```

Configure the net part as needed, example with port 27017 and allowing any external IP address :

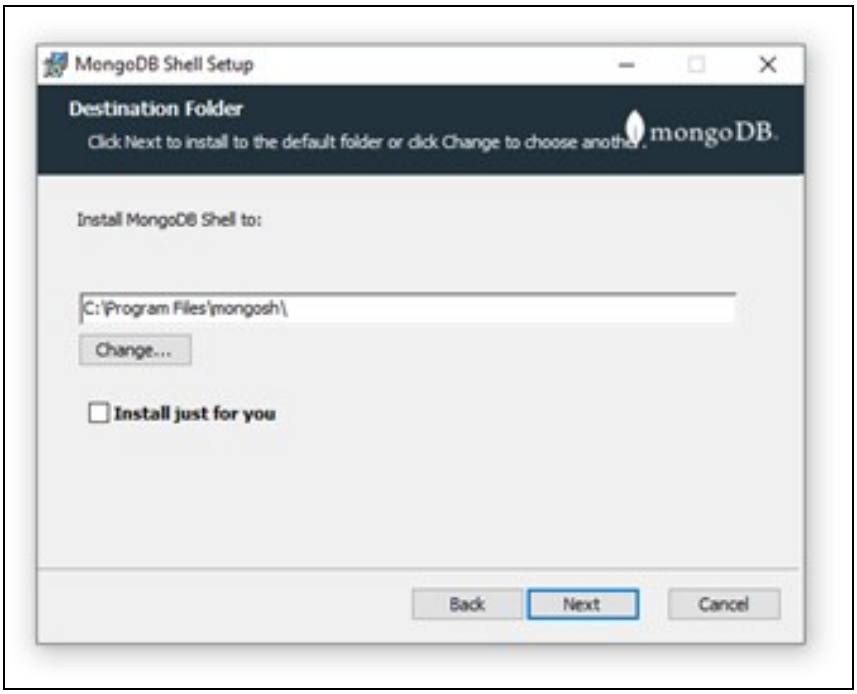
```
# network interfaces
net:
  port: 27017
  bindIpAll: true
  #  bindIp: 127.0.0.1"
```

If you want to secure the connection to MongoDB, only allow know IP address.

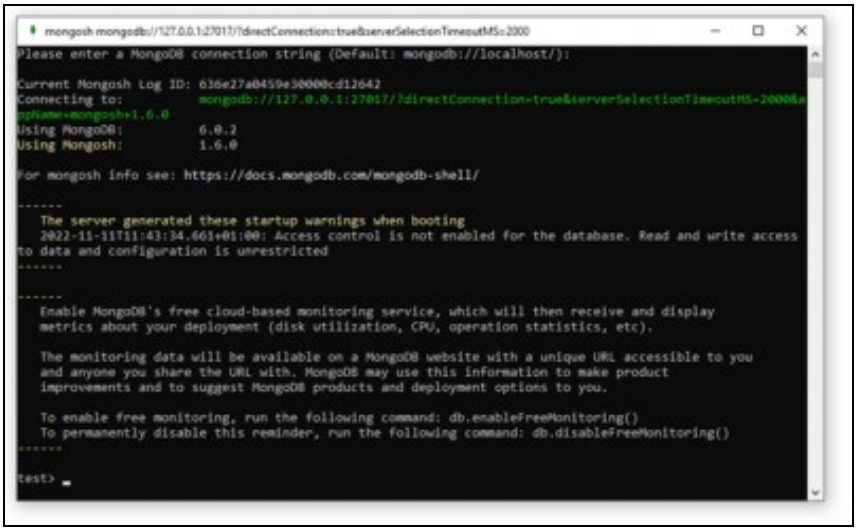
Documentation is available on official website: https://www.mongodb.com/docs/manual/reference/configuration-options/

d. MongoDB Shell installation

Run mongosh-1.8.0-x64.msi, uncheck ?Install just for you? and continue installation.



Run mongosh.exe from "C:\Program Files\mongosh". A command window will popup asking MongoDB information, do not write anything and press Enter, connection should be done:



e. Create an admin user

In the shell windows type: *use admin*

Then the following command will create an administrator user for MongoDB, which is mandatory. You will be able to create standard ReadOnly or Write access user using Monitoring dedicated M-DBTools.

In this example the admin user created is named ?oros? and his password is ?oros?, please use a strong password for the admin user:

db.createUser({ user: "oros" , pwd: "oros", roles: ["userAdminAnyDatabase", "dbAdminAnyDatabase", "readWriteAnyDatabase"]})



Restart the computer, and now MongoDB is configured and ready to be used.

43.2.6.1.2 Installation on Linux system

Installation on Debian

https://www.mongodb.com/docs/v6.0/tutorial/install-mongodb-on-debian/

https://www.mongodb.com/docs/mongodb-shell/install/

a. Pre-requisites

Packages: gnupg2, wget, sudo, net-tools, curl

b. MongoDB installation

- Add MongoDB server key

wget -qO - https://www.mongodb.org/static/pgp/server-6.0.asc | sudo apt-key add ?

- Add MongoDB repository

Debian 11

echo "deb http://repo.mongodb.org/apt/debian bullseye/mongodb-org/6.0 main" | sudo tee /etc/apt/sources.list.d/mongodb-org-6.0.list

Debian 10

echo "deb http://repo.mongodb.org/apt/debian buster/mongodb-org/6.0 main" | sudo tee /etc/apt/sources.list.d/mongodb-org-6.0.list

Debian 9

echo "deb http://repo.mongodb.org/apt/debian stretch/mongodb-org/6.0 main" | sudo tee /etc/apt/sources.list.d/mongodb-org-6.0.list.

- Install MongoDB

sudo apt-get update

sudo apt-get install -y mongodb-org

sudo apt-get install -y mongodb-mongosh

c. Configure MongoDB Open with a text editor mongod.cfg file : /etc/mongod.conf

We need to enable zstd compression, find wiredTiger block and edit it as followed :

```
storage:
 dbPath: C:\Program Files\MongoDB\Server\6.0\data
  journal:
    enabled: true
  engine: wiredTiger
  wiredTiger:
    collectionConfig:
      blockCompressor: zstd
```

Configure the net part as needed, example with port 27017 and allowing any external IP address :

```
  # network interfaces
  net:
    port: 27017
    bindIpAll: true
    #  bindIp: 127.0.0.1"
```

Documentation is available on official website: https://www.mongodb.com/docs/manual/reference/configuration-options/

d. Enable MongoDB as a service

systemctl enable mongod.service

e. Create an admin user

mongo

use admin

db.createUser({ user: "oros" , pwd: "oros", roles: ["userAdminAnyDatabase", "dbAdminAnyDatabase", "readWriteAnyDatabase"]})

f. Start MongoDB

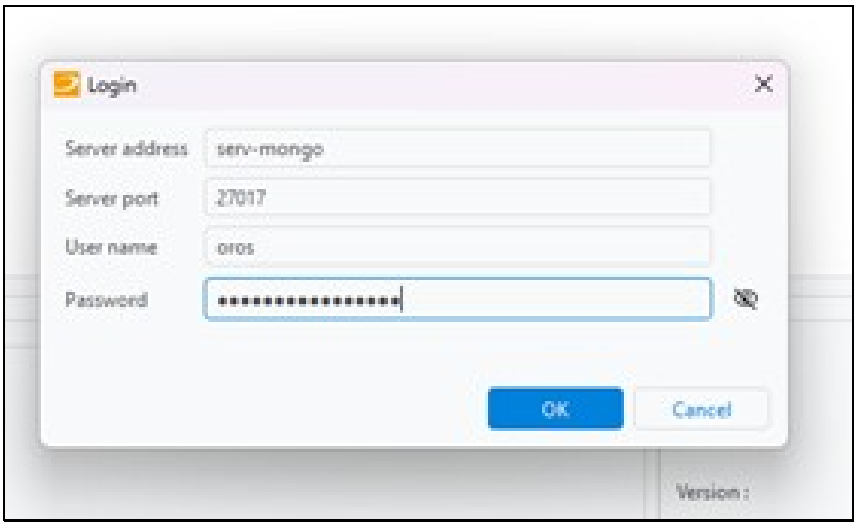
sudo systemctl start mongod

43.2.6.2 Database management

MongoDB is the database engine, and at least one database needs to be created to be used by OROS Monitoring solution.

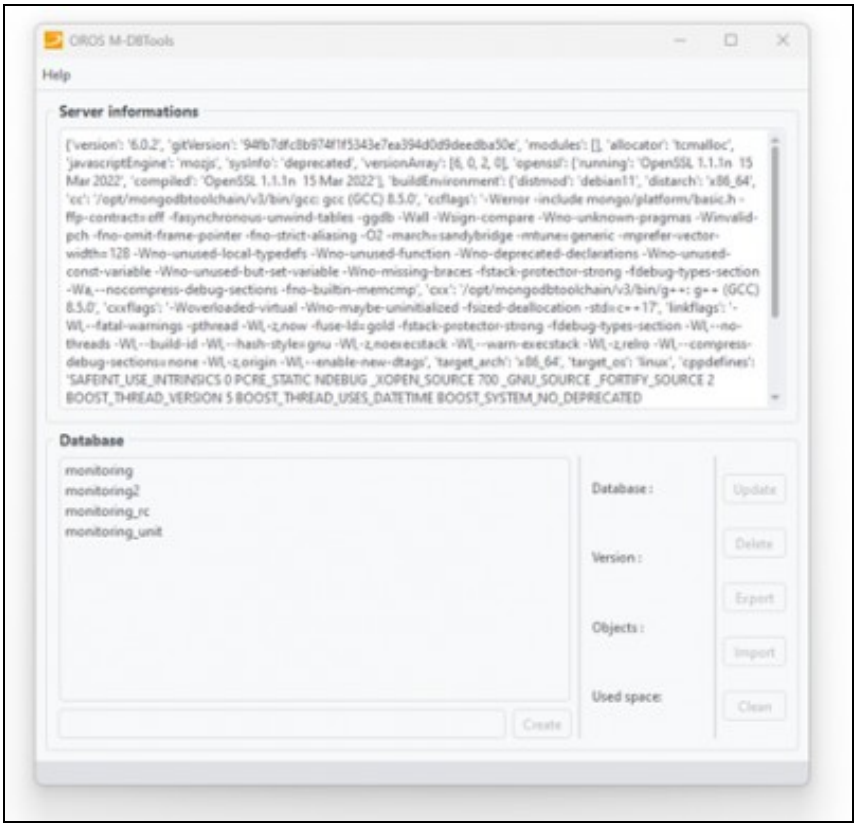
Run M-DBTools.exe, which is installed in M-Logger or M-View folder (by default C:\OROS\Programs\M-Logger or C:\OROS\Programs\M-View), and login:

- Server address: Your server address, localhost if database is installed on running PC
- Server port: 27017 (by default, other if you changed it in your MongoDB configuration file)
- User name: Defined in ?Create an admin user? chapter
- Password: Defined in ?Create an admin user? chapter



Please note that only administrators are allowed to run this tool, otherwise it will not connect to MongoDB.

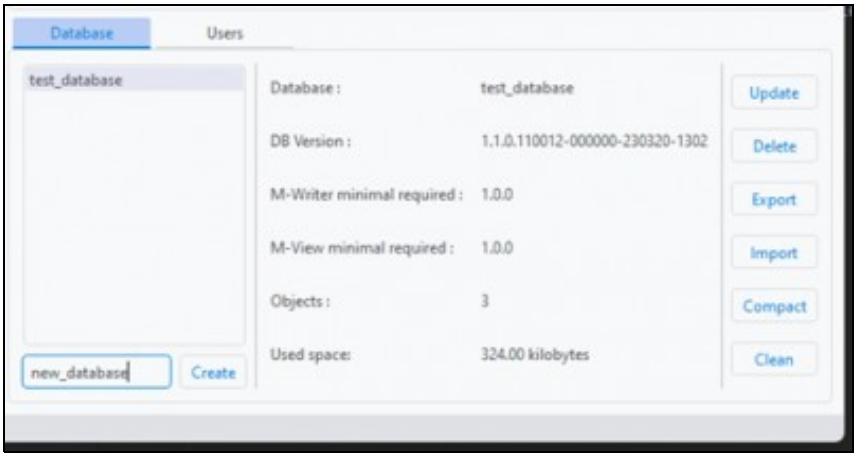
Server information and databases list will be displayed once connected.



43.2.6.2.1 Manage databases

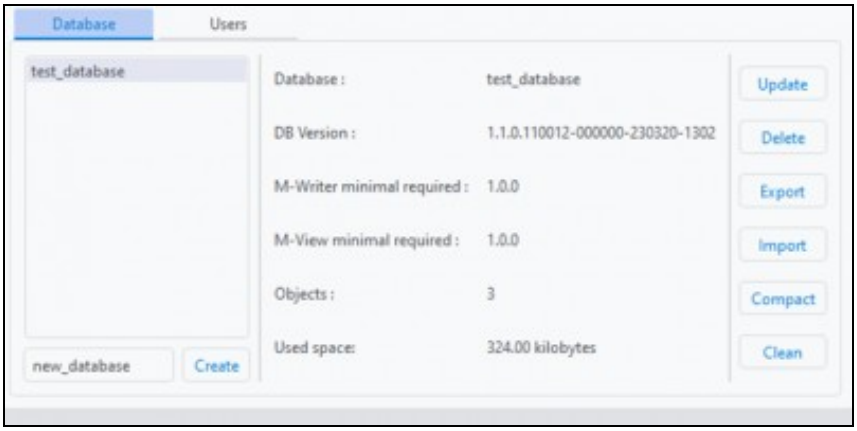
a. Create a database

Fill a name in the dedicated field then press create, after few seconds/minutes the database will appear into the list.



b. Database information

Clicking on your database will show some information like the version, number of object, space used ...



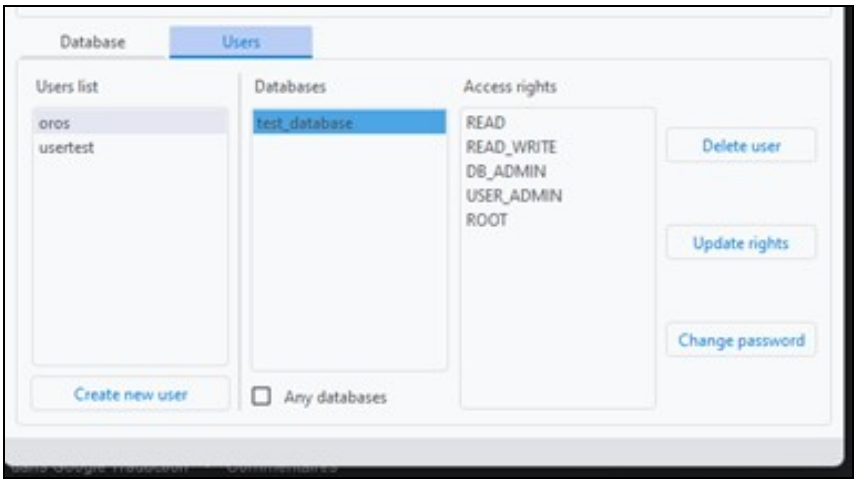
c. Update database

Due to an upgrade of M-Logger / M-View, it might be necessary to update your database, and thus M-DBTools is needed.

Select the desired database and press update. Depending on the number of objects this may take some time, you will be notified once it's done.

43.2.6.2.2 Manage users

Users are manageable in the "Users" panel:



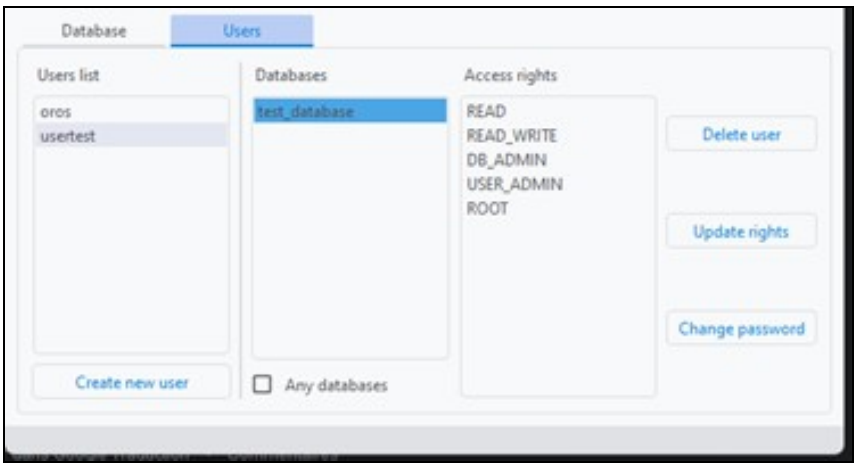
a. Create user

Click on "Create new user" button, a dialog will popup asking for an username and a password, then click on create, the user will appears in the user list.

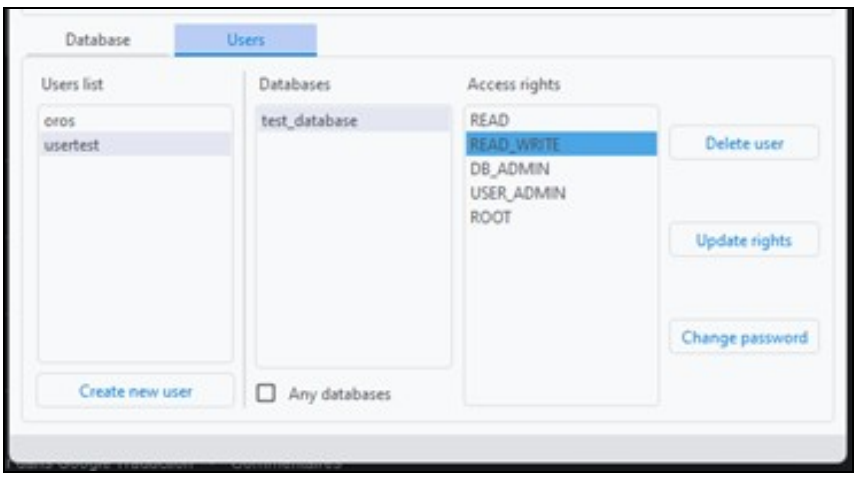
b. Grant access to user

- Grant access to a dedicated database

Clicking on a user and a database will show the access rights for this user:



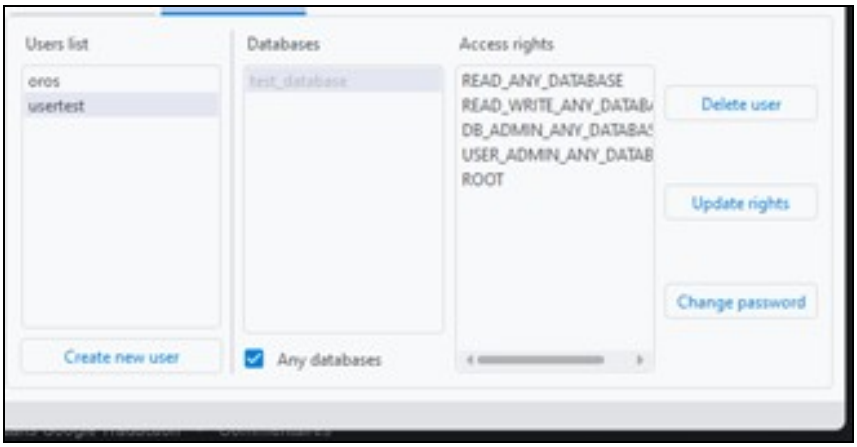
Access can be granted by clicking on the desired rights, below "READ_WRITE" is selected, allowing the user to write to the database, which is mandatory for a M-Logger user.



Then click on "Update rights" to apply the new rights.

- Grant access to all databases

Checking "Any databases" will display different access rights, which will be applied to all database + MongoDB instance. Also, if you need to create another MongoDB administrator then it?s an "Any Databases" rights, and select "ROOT" + "DB_ADMIN" + "USER_ADMIN" rights.



Then click on ?Update rights? to apply the new rights.

43.2.7 PC and Windows configuration

In order to guarantee a full autonomy, the computer must be configured to reboot in case of any power failure. The following PC parameters are advised:

PC automatic restart due to power failure:

To account for any potential power failure at the analyzers location the following settings should be programmed on the PC to automatically switch on the PC once the power is restored.

Access the PC's BIOS:

- Restart PC, press F12 (on most PC's) to access the PC's Bios.
- Check the Bios parameters.
- On power management check the option "power on AC".

Specific settings should be chosen in the computer

- PC

Contact you IT manager to properly configure the computer : disable sleep mode, no password to automatically restart windows, no low-energy or powering-off option ?). In addition, installation of Teamviewer is recommended in order to monitor from a remote access.

In order to open your windows session automatically :
https://learn.microsoft.com/en-us/troubleshoot/windows-server/user-profiles-and-logon/turn-on-automatic-logon

If you plan to monitor your application for more than a couple of hours, it is advised to power both the computer and the OROS analyzer by mains (not on battery).

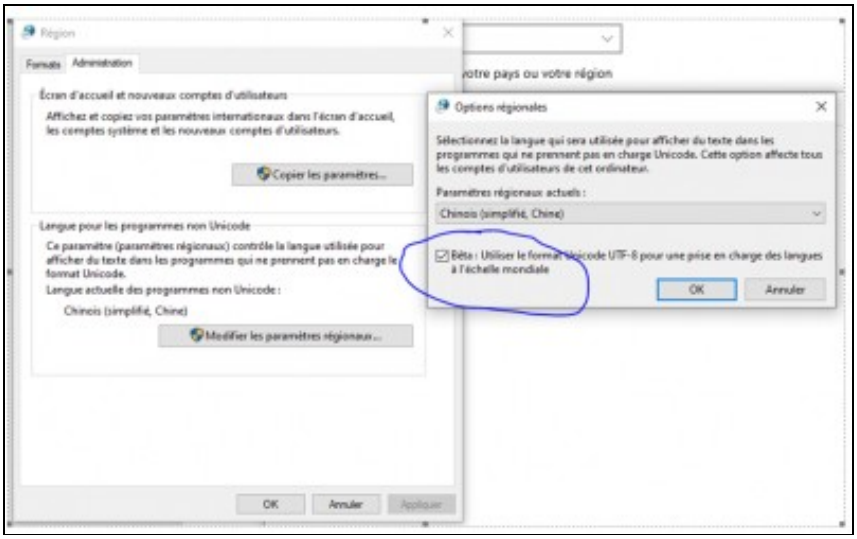
Consider installing a remote access software.

It could be useful to control the computer when an alert is trigged for example.

43.3 FAQ

I use microsoft windows on chinese/japanese language. However, monitoring crash when I click on "refresh button". How to solve this ?

On windows regional settings, tab admin, let the unicode program on your language, however click on "beta : use the unicode UTF-8...". This solve the issue.



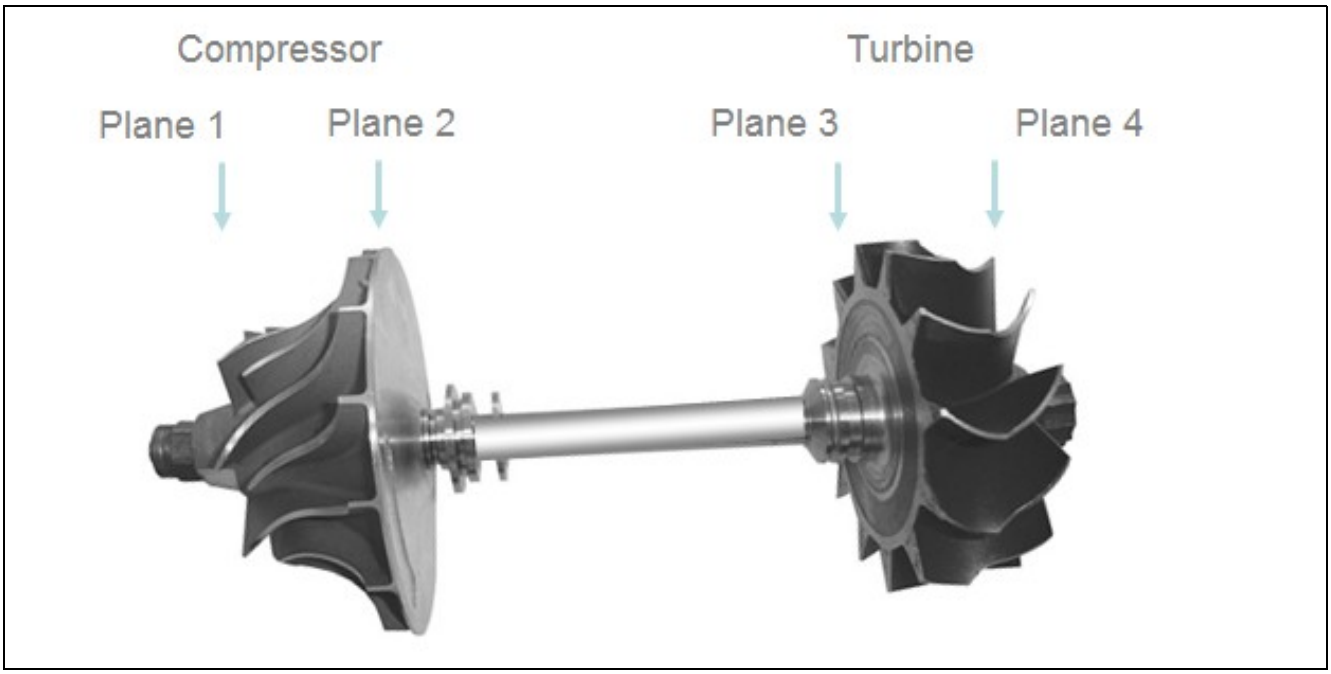
44 MultiPlane Balancing Turbocharger Aplication

45 Best practices for Flexible Balancing: Application to turbocharger balancing

45.1 Turbocharger Balancing

Turbocharger rotors are small items but because of their high rotational speed, they may experience several critical speeds and should be considered as flexible. For that reason it is not possible to balance the rotor at only one speed: several speeds should be considered: so a run-up or a run-down.

The number of possible balancing planes are typically up to 4: 2 on the compressor side and 2 on the turbine side. Depending on the case, it may not be possible to add or remove weight depending on the material characteristics (drilling, scrapping, grinding) on each of the planes. Then, a selection of the planes has to be considered: typically the plate of compressor side may be a good selection. The blades stay in principle untouched.



Possible balancing planes on turbochargers:

The balancing procedure should be considered similarly to a modal analysis. The idea is to determine the relationship between the response (vibration measured at the bearing) and the exciting force (the imbalance). So adding a known weight is like impacting a structure with an impact hammer and measuring the injected force. Once the relationship is known (the influence coefficient matrix), it is easy to locate the original force (imbalance) and propose and correction weight.

The idea is to excite the 1X component with an imbalance force. The excited response should be as much as possible due to the imbalance. Any other reason (typically, a structural resonance of the bearing) will introduce errors, will decrease the precision, and will make the balancing correction less efficient.

45.2 What should be taken care of when going through flexible balancing?

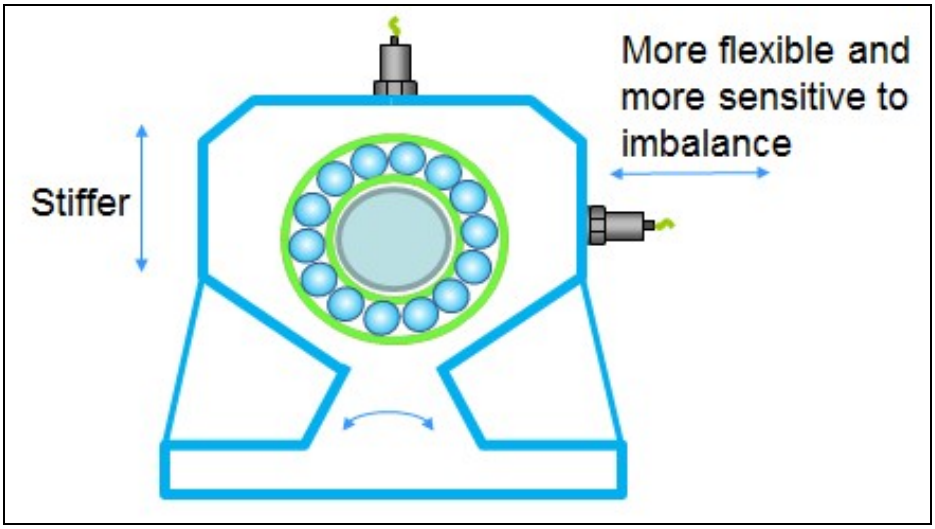
The different choices that the user has to do chronologically are:

- **Sensor positioning:** Sensors should give results that are highly impacted by the imbalance (original or trial weight related). Typically accelerometers are used: they should preferably be positioned in a direction where the bearing is less stiff (often the horizontal direction).
- **Setting of the input range:** After the initial balancing, it may appear that the 1X component becomes smaller. It may be necessary to adapt the input range (doing an auto range for example).
- **Trial weights positioning:** The trial weights position is important as well as it should bring new information compared to the original run or other trials.
- **RPM run up/down rate:** It is important to have the same rotor acceleration between the initial runs and the trial runs. The structure may not behave in the same way depending on how quickly speed increases or decreases.
- **Data:** Data of the different runs should be synchronized from one to another. For calculating the influence coefficients matrix, the data of the different runs (Initial, Test 1, Test 2 etc. ?) should be comparable at the exact same RPM value.

- **RPM selection:** it is **probably the most sensitive point to take into account** when achieving balancing. The data should be selected with care because the wrong data or too much data would get the user to biased results.
- **Trim Balancing or not:** To be able to carry trim balancing (further balancing after rotor weight correction implementation), one has to be sure that the system stays linear: meaning that the same matrix of influence coefficient can be used. If, it is not the case, one has to use this measurement as a new initial run.

Hopefully there are useful criteria that help the user to do the good choices! Let's go a bit more in details!

45.2.1 Sensor positioning



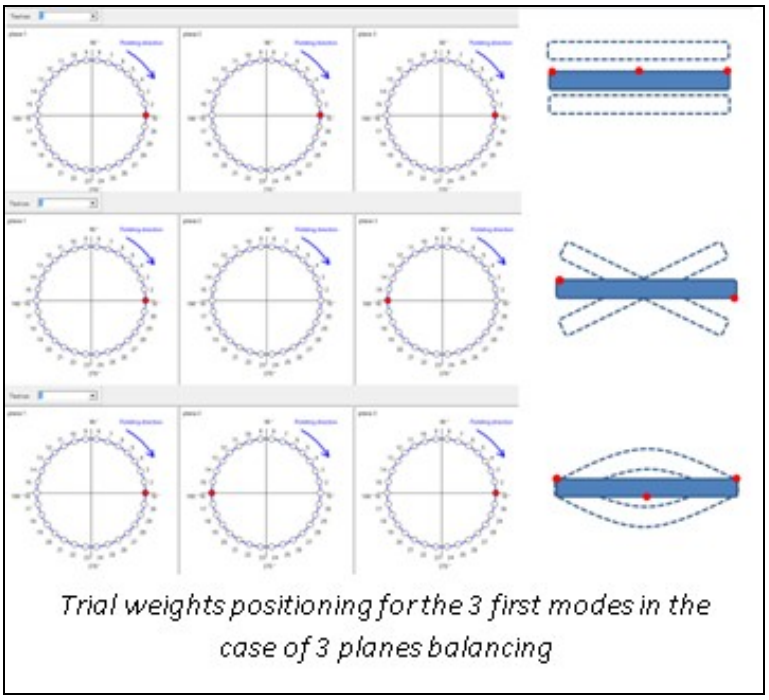
Accelerometers are often placed in the horizontal direction as they are more sensitive to imbalance.

Other types of sensors such as force sensors or proximity probes can be used.

During balancing, the purpose is to concentrate on the rotor independently from the surrounding supporting or driving structure. It is very comparable to modal analysis when a structure is hung with rubber band. In this way, one wants to measure the response of only the test item independently from the rest.

45.2.2 Trial weights positioning

Trial weights should be positioned in order to excite the modes that should be balanced. In the example below, the 3 first modes are excited by the weights. Run 1 excites the first rigid mode, Run 2 the second one and Run 3 excites the first bending mode.

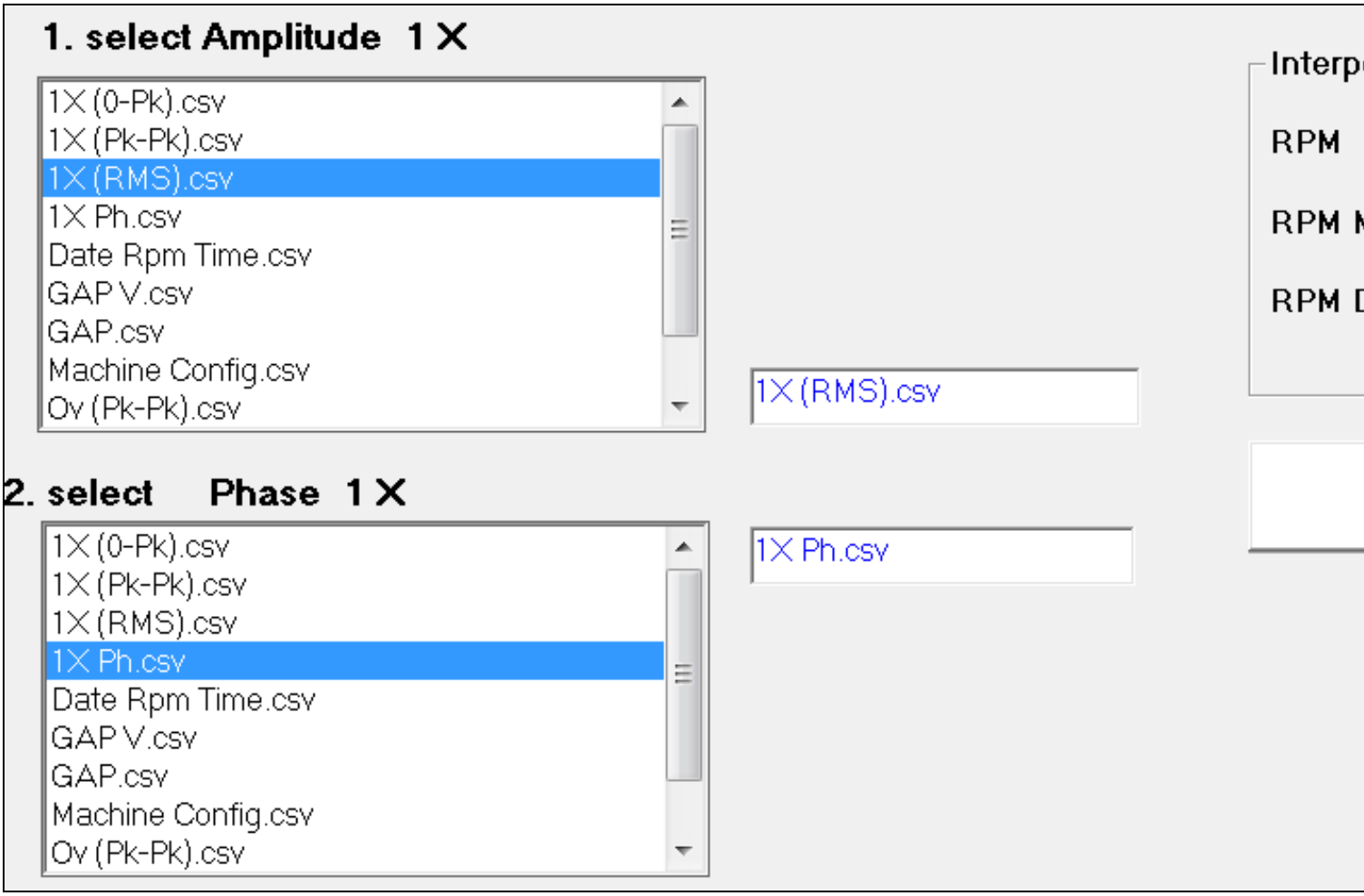


Trial weights positioning for the 3 first modes in the case of 3 planes balancing

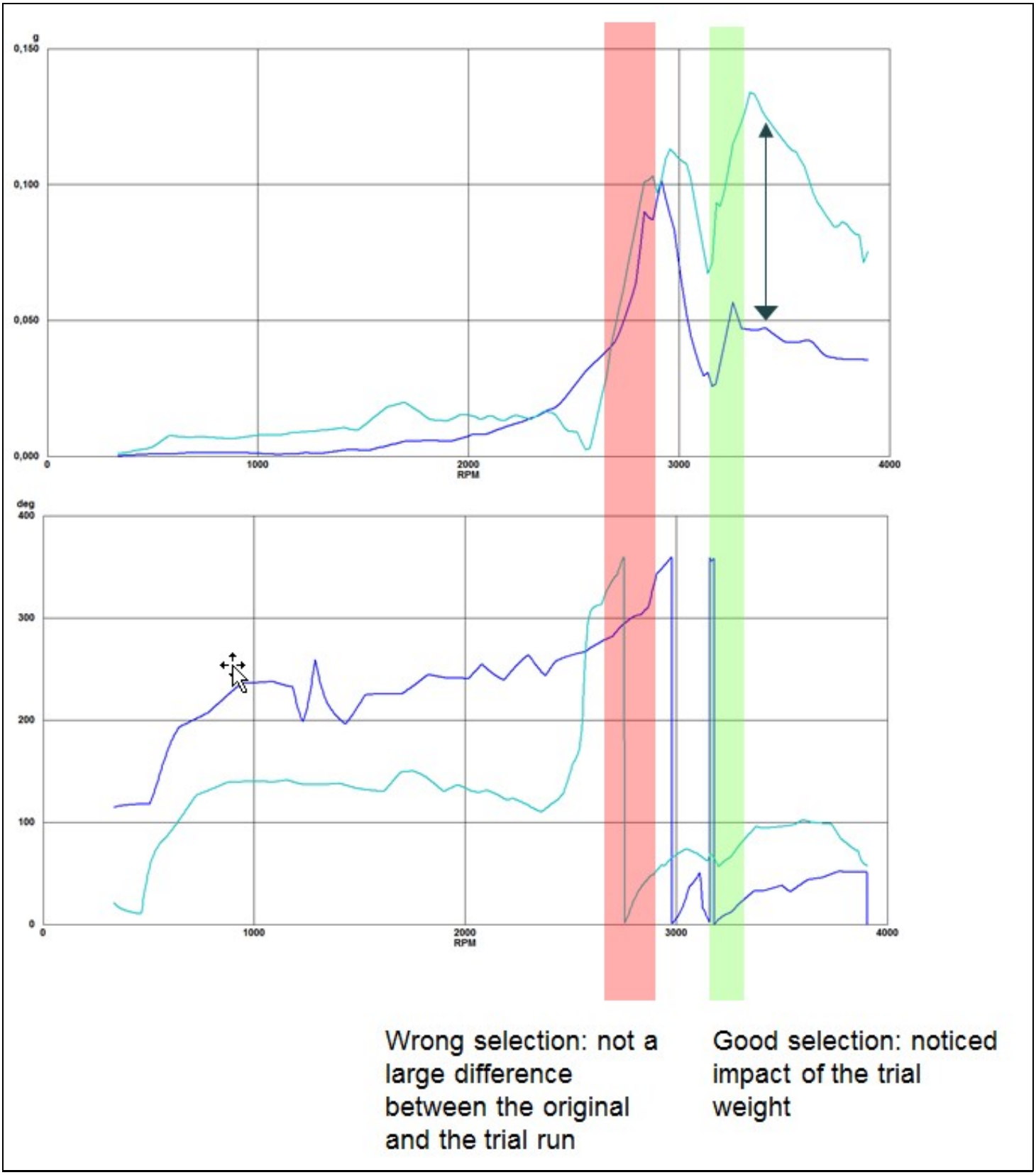
A bad situation is for example if the trial weight is positioned exactly at the original imbalance position. In that case, it doesn't bring new information.

45.2.3 Data synchronization

The data of the different runs (Initial, Test 1, Test 2 etc ?) should be comparable at each RPM value: one should compare for example the value of the initial run at 335 RPM, with the value for test 1 at the exact same RPM value (and not 334 RPM or 336 RPM): the larger differences, the larger errors will get. For that reason, it is very useful to interpolate the data that have been acquired.


1. select Amplitude 1 X
1X (0-Pk).csv
1X (Pk-Pk).csv
1X (RMS).csv
1X Ph.csv
Date Rpm Time.csv
GAP V.csv
GAP.csv
Machine Config.csv
Ov (Pk-Pk).csv
1X (RMS).csv
Interp
RPM
RPM M
RPM D
2. select Phase 1 X
1X (0-Pk).csv
1X (Pk-Pk).csv
1X (RMS).csv
1X Ph.csv
Date Rpm Time.csv
GAP V.csv
GAP.csv
Machine Config.csv
Ov (Pk-Pk).csv
1X Ph.csv

45.2.4 RPM selection: Tips, Tools and criteria



When choosing the right RPMs. One should consider that each set of RPM, 1X Initial, 1X Run1, 1X Run2 is used to calculate a response matrix (called influence matrix). Having more force/response relationship information (staying in a linear domain) at different speeds helps to do a better curve fitting and calculate a more accurate matrix of influence. If for different speeds, the structure responds in the same way (same amplitude, stable phase), it doesn't bring enough new information to solve the problem and calculate the matrix of influence in the most accurate way.

In addition, the response should be representative of the influence of the imbalance: a structural mode of the bearing for example will bring erroneous information.

45.2.4.1 One should avoid

- Structural resonances of the support (impact testing of the support/bearing may be useful prior to the balancing test).
- Stationary phase (not much information).
- Resonance itself as the phase variations may be unstable (noisy phase).

45.2.4.2 One should choose

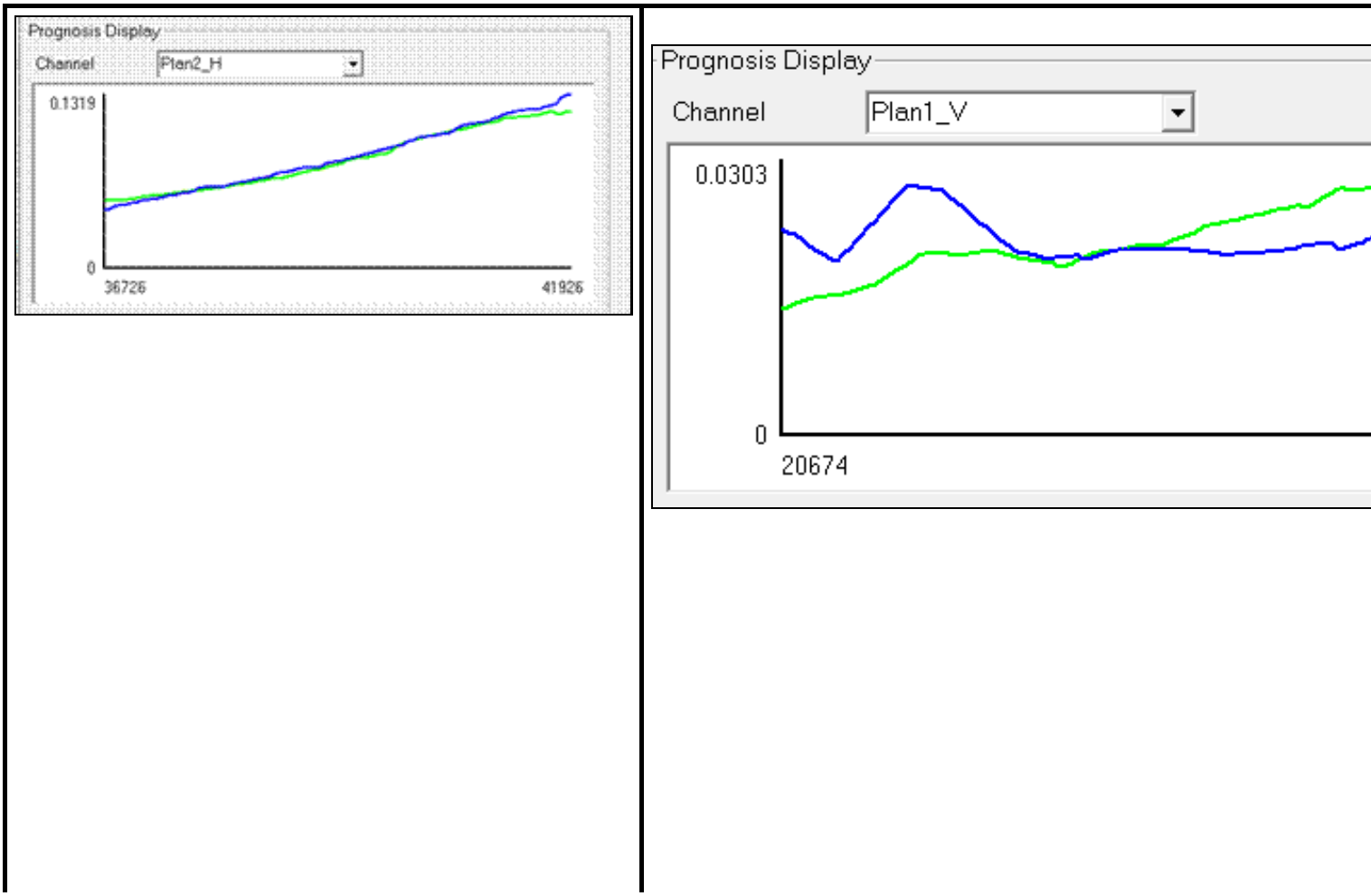
- RPM range where the phase changes are large but stable (just before or after the resonance)
- RPM range where we see clearly an impact of the trial mass over the original situation (like the green area on the example).

45.3 How to validate choices: The prognostic tool!

The prognostic tool is also a good way to check that the right choices have been made.

In every case the prognostic is calculated from the influence coefficient matrix. If the selections are the good ones, the prognostic should be close to the original when putting a correcting mass of 0 (as default). It is not supposed to be exactly 0 but should be close to it. If it is not the case it may say that something else than imbalance is taking place: like a structural resonance for example.

The example below shows the example of a proper speed selection and a bad one.

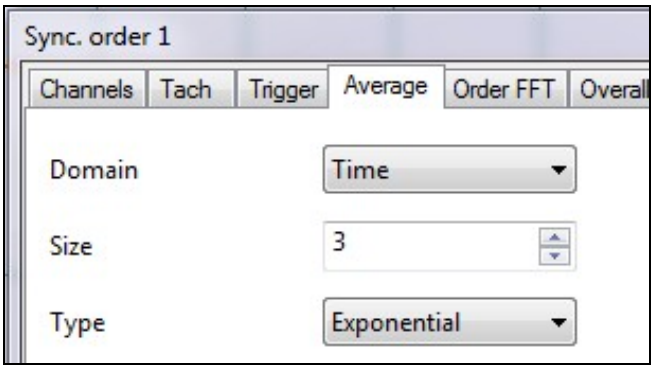


Right Speed selection	Wrong speed selection

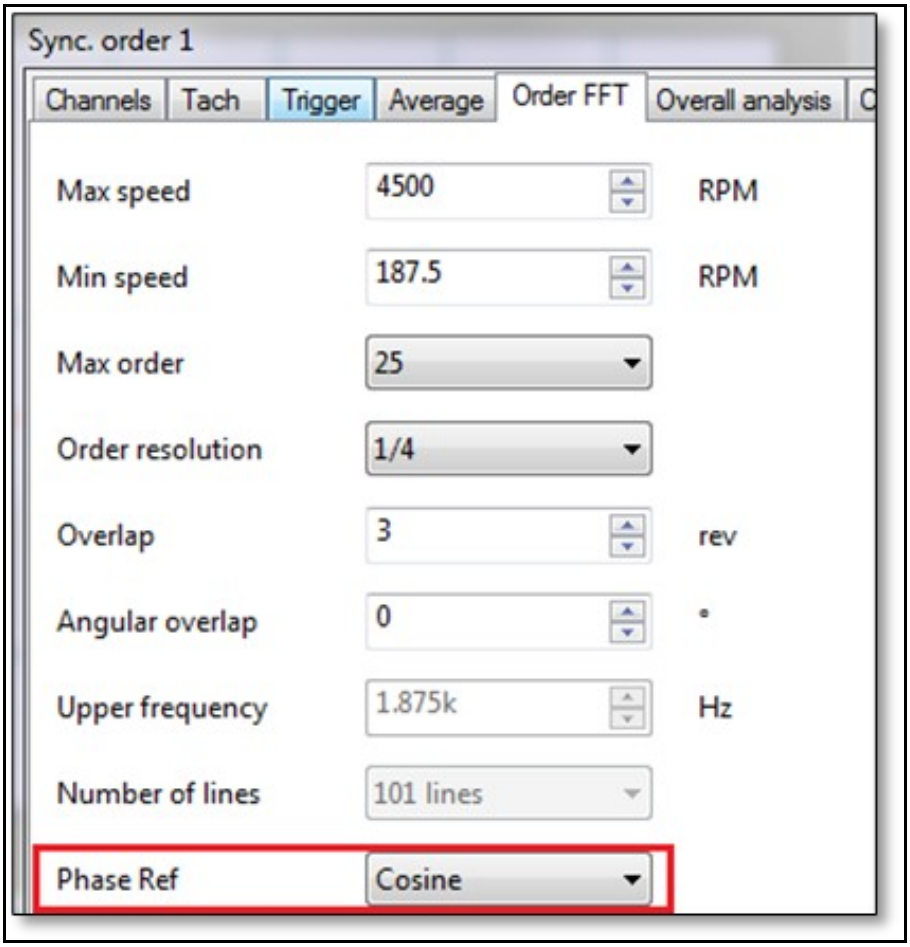
46 MultiPlane export 1X NVGate

46.1 How to set up NVGate for Multi-Plane Balancing

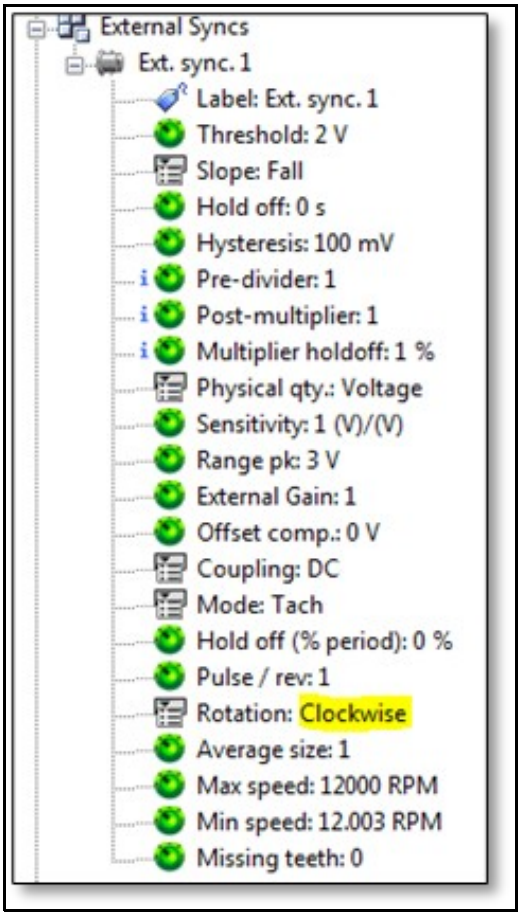
- SOA settings: Select **Average = Time**, better for rotor balancing:



- **SOA settings : PhaseRef=Cosine,**



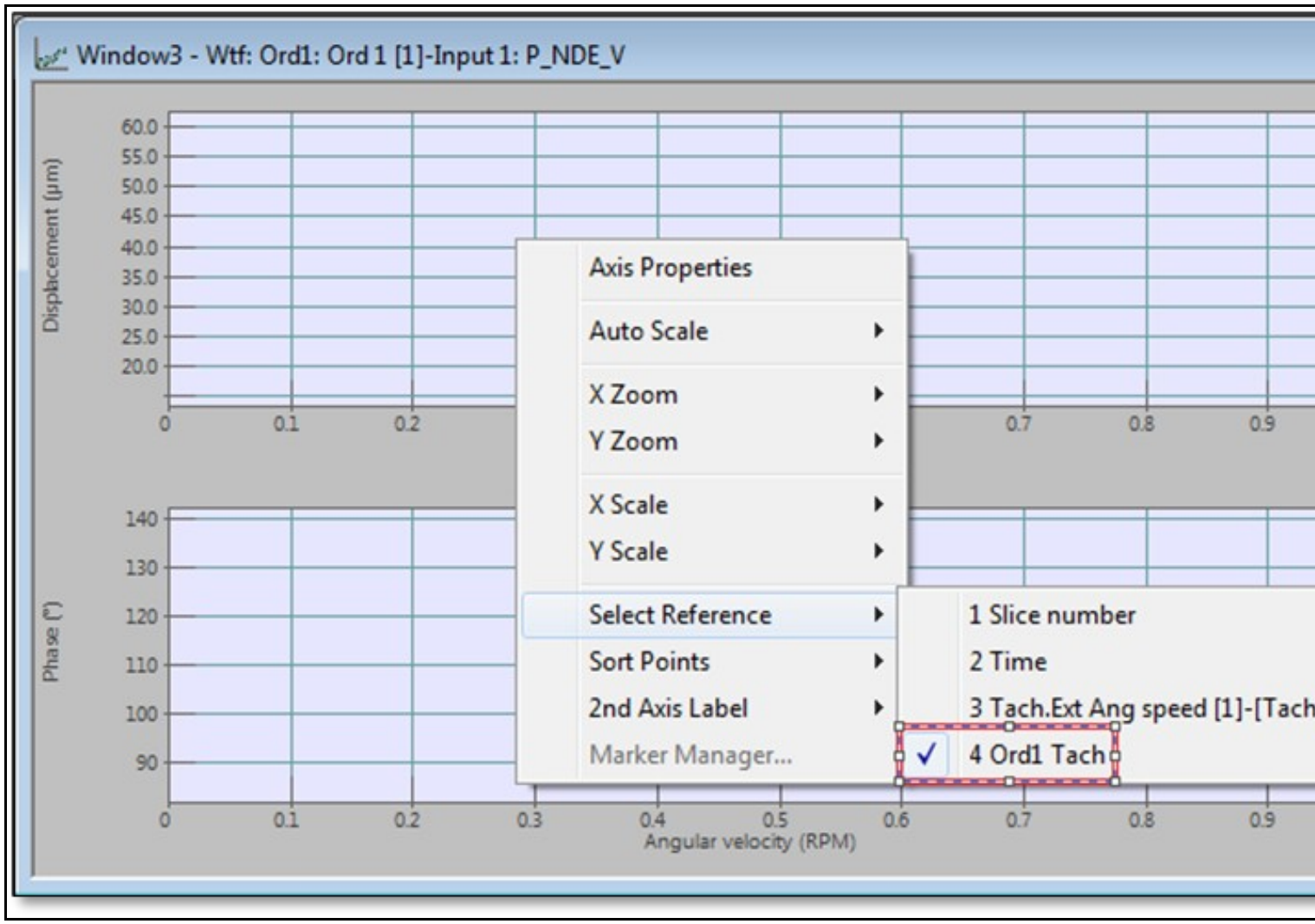
- **Set the Ext Synch inputs Rotation as ClockWise**



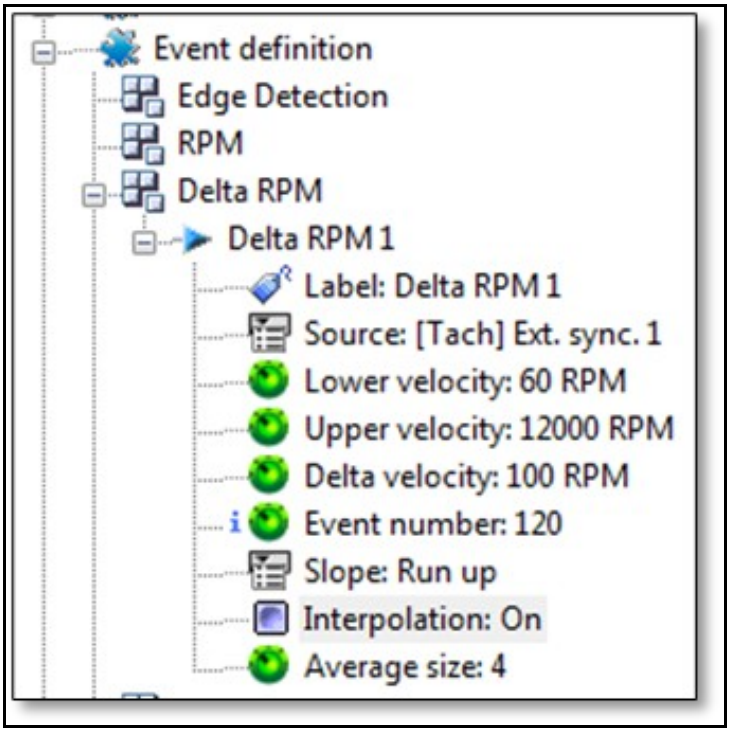
- Bode Plot 1X : Magnitude vs Speed :

Select the "Ord1 Tach" for the bode plot. This speed is evaluated in the middle of the trigger block whereas the "Tach Ext Ang speed" is the speed at the beginning of the trigger block.

-

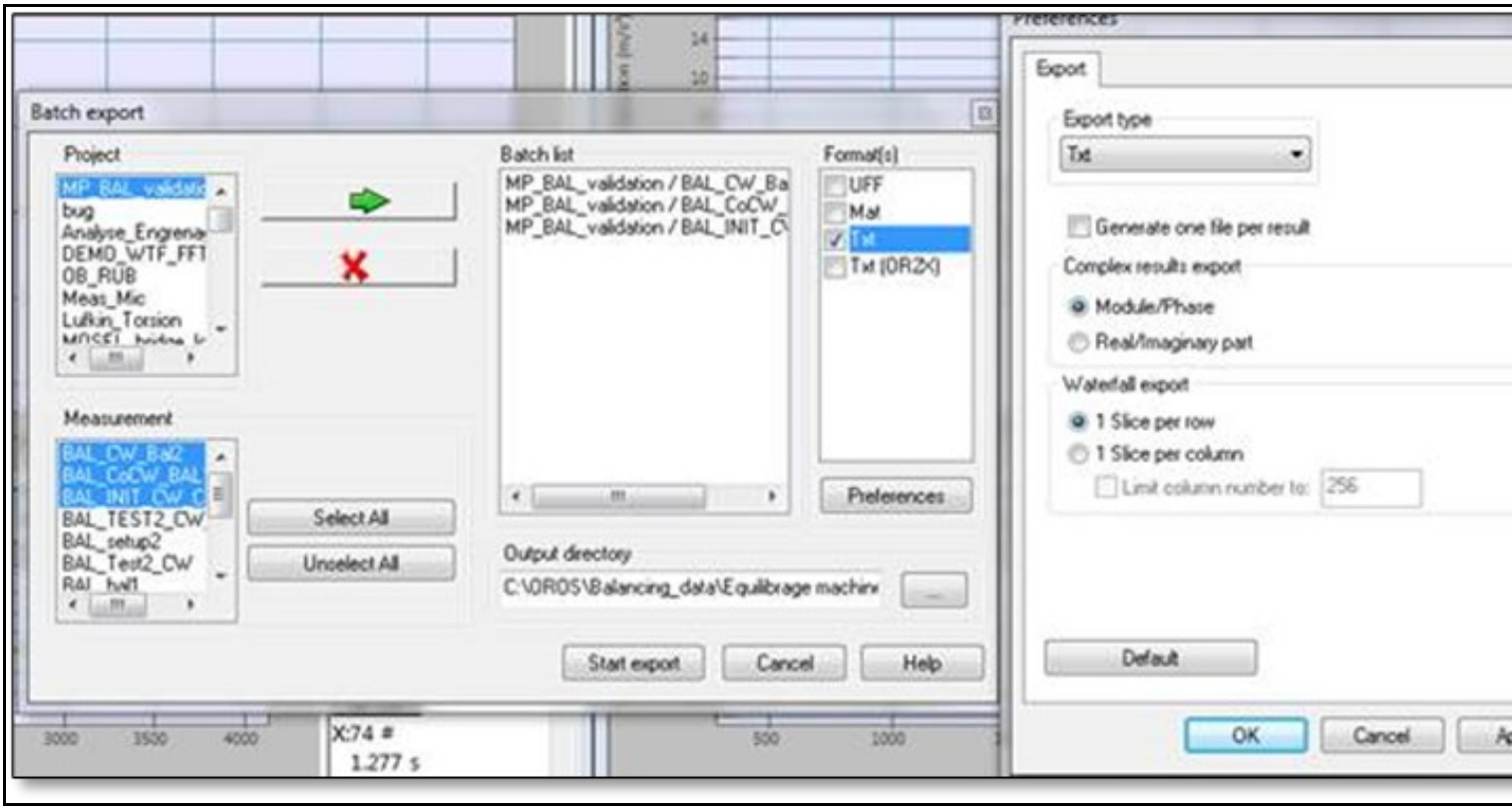

Window3 - Wtf: Ord1: Ord 1 [1]-Input 1: P_NDE_V
Displacement (µm)
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
0
0.1
0.2
0.7
0.8
0.9
Axis Properties
Auto Scale
X Zoom
Y Zoom
X Scale
Y Scale
Select Reference
Sort Points
2nd Axis Label
Marker Manager...
1 Slice number
2 Time
3 Tach.Ext Ang speed [1]-[Tach
4 Ord1 Tach
Phase (°)
140
130
120
110
100
90
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Angular velocity (RPM)

- Interpolation : **prefer to use interpolated delta RPM event for Waterfall trigger.** Indeed, the MP balancing process needs several transient speed runs. In order to get synchronized runs, we advise to use the interpolated delta RPM for the Waterfall trigger.

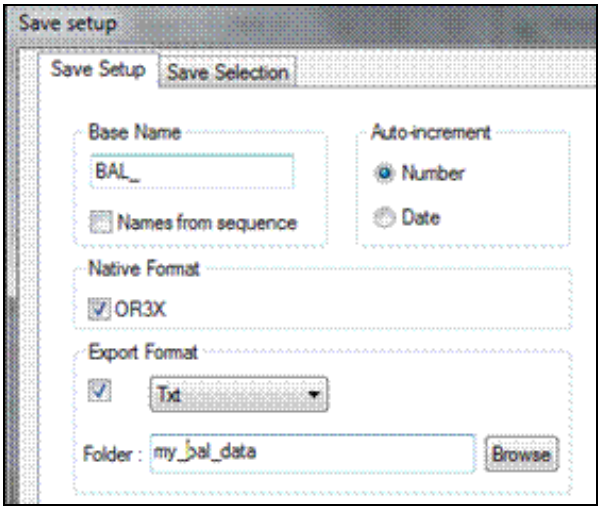


- Export toward TXT files:

Export results through File Tab => Results Files (check the format export in the picture on the right)



It is also possible to trigger exporting after each measurement (through Save setup):



-

47 Notices and General safety instructions

This is the notice and general safety instruction for using OROS OR3X analyzer

47.1 Notices

The information contained in this document is subject to change without notice.

47.1.1 Responsibilities

OROS is not liable for any errors contained in this document.

OROS makes no warranties of any kind with regards to this document, whether express or implied. OROS disclaims the implied warranties of merchantability and fitness for a particular purpose.

OROS shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory, in connection with the furnishing of this document or the use of the information in this document.

47.1.2 Warranty Information

A copy of the warranty terms applicable to your OROS product and replacement parts can be obtained from your local distributor. A copy of the extended warranty (service contracts) terms applicable to your OROS product can be obtained from your local distributor.

47.1.3 Calibration/Verification

OROS instruments needs to be calibrated regularly. OROS recommend to verify and calibrate your instrument yearly.

Note: The calibration does not guarantee the measurements accuracy for the coming year. It guarantees that your previous measurements do not show erroneous results.

47.1.4 Support

Support (hotline, trainings, coaching, renting, customization, update) are managed locally by country with the support of OROS customer care team. For any support please contact your local distributor first.

47.1.5 Service/repairs

OROS offers local service and repairs through its maintenance centers available within a worldwide coverage (China, Europe, India, Japan, South Korea, USA). Local technicians are certi?ed on a regular basis by OROS specialists, enabling them to repair, calibrate and upgrade all OROS systems **reducing the maintenance downtime**.

Find your local distributor details.

47.2 General Safety Instructions



Read the manual before use. It provides **important safety information.**

Your safety is our primary concern. Please carefully read the following information to be safe with your OROS instrument.

47.2.1 Safety symbols in the manual

47.2.1.1 Warning

 Calls attention to a procedure, practice, or condition that could cause body injury or death.

47.2.1.2 Caution

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

47.2.2 Warnings

The following general safety precautions must be observed during all operations with OROS instruments.

Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. OROS assumes no liability for the customer?s failure to comply with these requirements.

47.2.2.1 Notice

Some accessories shown in this document are available as option and will not be shipped as standard parts.

47.2.2.2 Environmental Considerations

The following guidelines must be observed to avoid environmental pollution while using and recycling the OROS products.

47.2.2.2.1 Product End-of-Life Handling

Observe the following guidelines when recycling an OROS instrument:

System and Components Recycling: Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life.

Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.

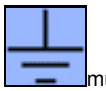
This symbol indicates that this system complies with the European Union?s requirements according to Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) According to article 7 of directive 2012/19/EU, costs for collection, treatment, recovery and environmentally sound disposal of waste electrical and electronic equipment (WEEE) shall be provided by the users. French users, please consult our local policy @ www.oros.fr.

47.2.2.2.2 Restriction of Hazardous Substances

OROS products comply with the 2011/65/EU et 2015/863 RoHs directives. Our products are lead free. Pollution degree 2.

47.2.3 General safety and hazard warnings for OROS Instruments

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified. Only qualified personnel should perform service procedures.  To avoid fire and personal injury: **Use proper power cord**. Use only the power cord specified in this product and certified for the country of use.

Connect OROS Teamwork instruments to the ground. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding connector  must be connected to earth ground.

To avoid electric hazards during **battery operation, connect OROS Teamwork instrument to the ground**  .

Respect all terminal ratings. To avoid fire or shock hazard, observe all ratings and marking on the product. **Do not apply voltages over +/-60 V** to any terminals and covers of the instruments.

 All inputs +/-40 V - CAT I

Do not operate without covers. Do not operate this product with covers or panels removed.

Avoid exposed circuitry. Do not touch exposed connections and components when AC outlet is connected.

Do not operate with suspected failures. If you suspect there is any damage to this product, get it inspected by qualified service personnel.

Only use original and approved devices, components and accessories. Apply them in accordance with their intended use.

Maintenance of the instruments and accessories is operated in **OROS certified maintenance center only**.

Adverse environmental conditions : Take **specific protections** when operating the instrument exposed to the following conditions

- **Do not operate** in **wet/damp conditions** for **outdoor operations.**

 indoor, dry location use only.

- **Do not operate** in **explosive atmosphere** (Dust, flammable gases/vapors, fumes or dissolver).
- Keep product surfaces **clean** and **dry**. Disconnect and power off the instrument before cleaning external surfaces with a damp cloth. Power on and reconnect when surfaces are dry.
- **Provide proper ventilation**. See the "Fan" chapter.
- **Do not operate** the instrument **out of the temperature, shock and vibration absolute maximum ratings** (see compliance with standards).
- **Do not operate** in environments where pollutants may be present.

47.2.4 Electrical and radio frequencies

47.2.4.1 Electrical and radio environments

OROS instruments are designed to operate in office, laboratory, on-board and industrial environments regarding electrical and radio disturbances.

47.2.4.1.1 Radio frequencies sensibility

	Input measured with 50 ? terminator
Radiated RF: 80-1000 MHz, 80% AM 1 kHz, 10 V/m	< 20 µV
Conducted RF: 0.15-80 MHz, 80% AM 1 kHz, 10 V	< 100 µV
Magnetic field: 30 A/m, 50 Hz	< 2 µV

47.2.4.2 Compliance with standards

CE\CB\FCC	Indicates compliance with EMC Directive **89/336/EEC**, **2014/30/EU** and Low Voltage Directive **73/23/EEC**,**2014/35/EU**	
Safety	**IEC 61010-1**	Safety requirements for electrical equipment for measurement, control and laboratory use.
	IEC 61010-2-30	Particular requirements for testing and measuring circuits.
	Over-voltage Cat.	**II** (Local level mains, appliance, and portable equipment)
EMC Emission	**IEC 61000-6-3**	Emission standard for residential, commercial and light-industrial environments.
	IEC 61000-6-4	Emission standard for industrial environments.
	IEC 61326-1	Electrical equipment for measurement control and laboratory use EMC requirements.
	CISPR 11	Radio disturbance characteristics of industrial and scientific equipment.: Class B limit.
	FCC Rules	Complies with the limits for a Class B digital device.
EMC Immunity	**IEC 61000-6-1**	Immunity standard for residential, commercial and light-industrial environments.

	IEC 61000-6-2	Immunity standard for industrial environments
	IEC 61326-1	Electrical equipment for measurement control and laboratory use EMC requirements.
	EN 50082-2	Generic immunity standard: Industrial environment.
EMF	**Recommendations 199/519/CE EN 62311**	Evaluation of person exposure to electromagnetic fields
Materials	**ROHS**	**2011/65/EU and 2015/863**
	WEEE	**2012/19/EU**

47.2.4.3 Environmental limits

Never expose the instrument and its accessories **over the environmental limits** described hereafter.

Humidity	Max **80 % RH** at 40°C non-condensing	
Altitude	Operating, non tested above	? 2000 m (6562 feet)
Temperature	OR34, OR35, OR36 Operating	**-20°C to 50°C** (32°F to 122°F)
	OR38 Operating	**-20°C**[4] **to 45°C** (32°F to 113°F)
	Storage	**-20°C to 65°C** (-4°F to 149°F)
	Absolute maximum rating[i]	**-35°C to 70°C** (-31°F to 158°F)
Shocks/Bumps	Complies with **IEC 68-2-27 (all) and MIL-STD-810F (OR35TW)**	
	Operating (OR36 & OR38)	**10 g** (11 ms, ½ sine) and **70 g** (3 ms, ½ sine)
	Storage (OR36 and OR38)	**40 g (**11 ms, ½ sine)
	Operating (OR35)	**40 g** (6 ms, ½ sine) and **60 g** (3 ms, ½ sine) MIL-STD-810F method 514.5
	Storage (OR35)	**60 g (**11 ms, ½ sine) MIL-STD-810F method 516.5
	Absolute maximum rating[i]	**100 g** (3 ms, ½ sine)
Vibrations	Complies with **IEC 60068-2-6**	
	Operating (OR36 & OR38)	**2 g, 5-500 Hz, 5mm**
	Operating (OR35)	**2.5g, 5-500 Hz, 5mm**
	Absolute maximum rating[i]	**30 m/s², 5-500 Hz, 5mm**
Enclosure	OR35	**IP 40**
	OR34, OR36, OR38	**IP 42**

48 NVGate 2021: Release note

Other languages available: *Fr, De*

OROS strives to be closer to its users, carefully listening to needs and requests. For that reason, OROS regularly releases new versions. Customers under contract automatically benefit from each release.



The NVGate® 2021 major version became available in January 2021. This release of the OROS 3-Series analyzer?s software platform brings additional functionalities and significant performance improvements. Below is a summary of the main enhancements of your NVGate experience:



On line OROS Wiki, how can I help you?
Help is now available online with a powerful search engine. An offline version is available as well for when you are in the field.



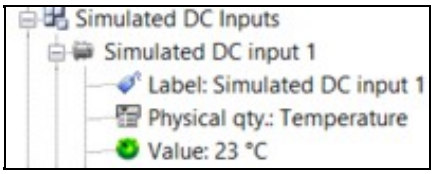
Relax the limits of filtering!
Cut off frequencies of filters, Butterworth and **new Chebyshev type I and II**, can now be chosen very flexibly.



Tracking my bearing frequencies on RPMs variations
Kinematik markers are now tracking the frequency lines as the speed fluctuates.



Enrich your measurements in real time with **GPS** information.



Using the **DC simulated** function, one can now associate NVGate results with information from external software in real time using NVDrive.



Draw those orbits!
Orbits can now be displayed directly in NVGate with FFt-Diag option.



Dynamical inputs can now calibrate DC sensors with y = ax + b formula.



How much does this body shake?
A new add-on is available to apply human vibrations filters and calculate associated quantities.

This release note describes the content of version, with operating details.
To download and install NVGate 2021, check this page.

Compatibility: NVGate 2021 is compatible with all OROS instruments that have not been discontinued. Depending on the hardware options and version, some instrument features may or may not be available.

49 Here is OROS Wiki on the line, how can I help you?

All the documentation and help have been completely renewed. We have put an online wiki-based documentation with videos, manuals, application notes, and download links.

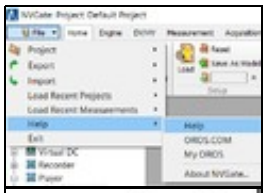
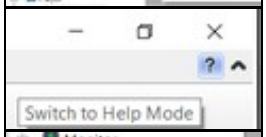
This page is in free access and can be consulted here: https://wiki.oros.com/wiki/index.php/Home

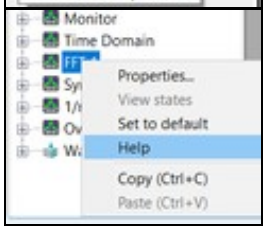
49.1 Online Help: wiki

We advise being connected to internet to enjoy the new documentation page.

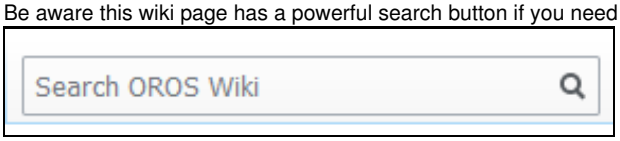
If you are connected to Internet, the following buttons will bring you to the NVGate wiki page.

https://wiki.oros.com/wiki/index.php/NVGate

- 
- 

- 

Be aware this wiki page has a powerful search button if you need to search any setting.



If you are using NVGate in a different language than english, the wikipage will be opened with /XX at the end (XX correspond to the unicode language.

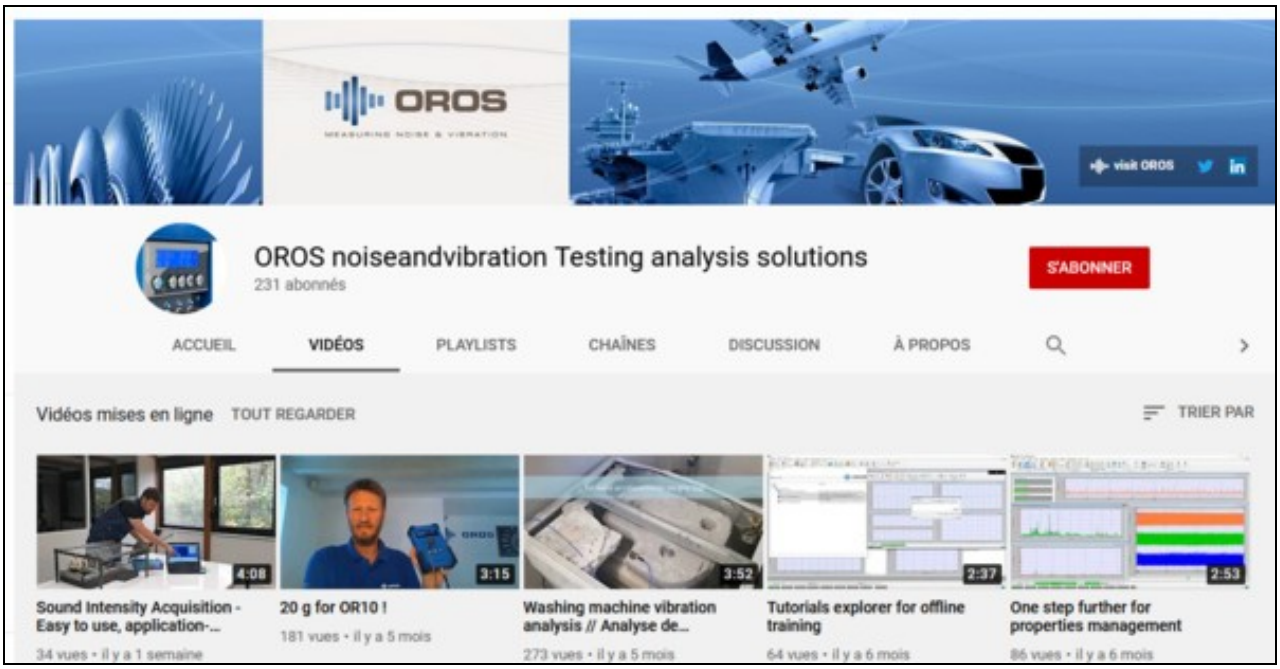
For example, if you are using NVGate in Japanese, help will bring you to the page: https://wiki.oros.com/wiki/index.php/NVGate/ja (==> ja is the international Japanese code)

49.2 Off line Help: PDF manual

If you are not connected to the internet which may often happen in the field, the NVGate.pdf manual will be opened. This file is located in the "Manuals" folder in the installation directory of NVGate.

49.3 Tutorials Videos

The OROS Youtube channel is available here featuring a full panel of videos on how to use OROS products:



OROS Youtube channels page

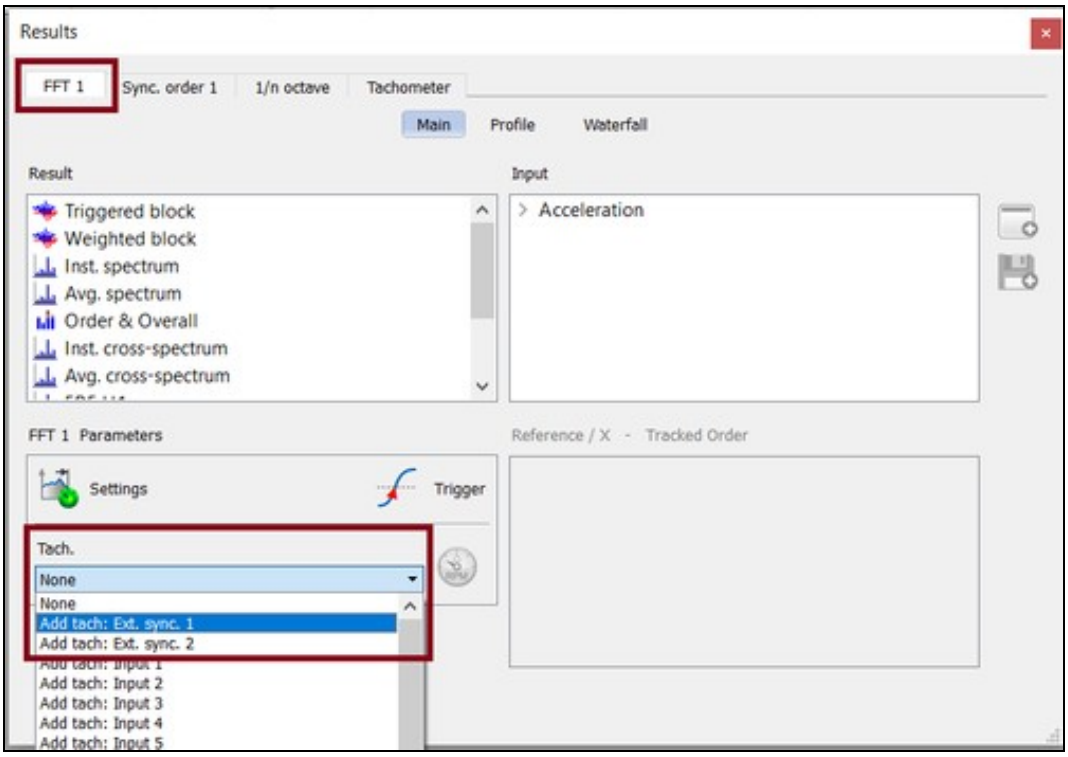
We have included tutorial videos in this wiki to help you to use the OROS software.

50 Tracking bearing frequencies on RPMs variations

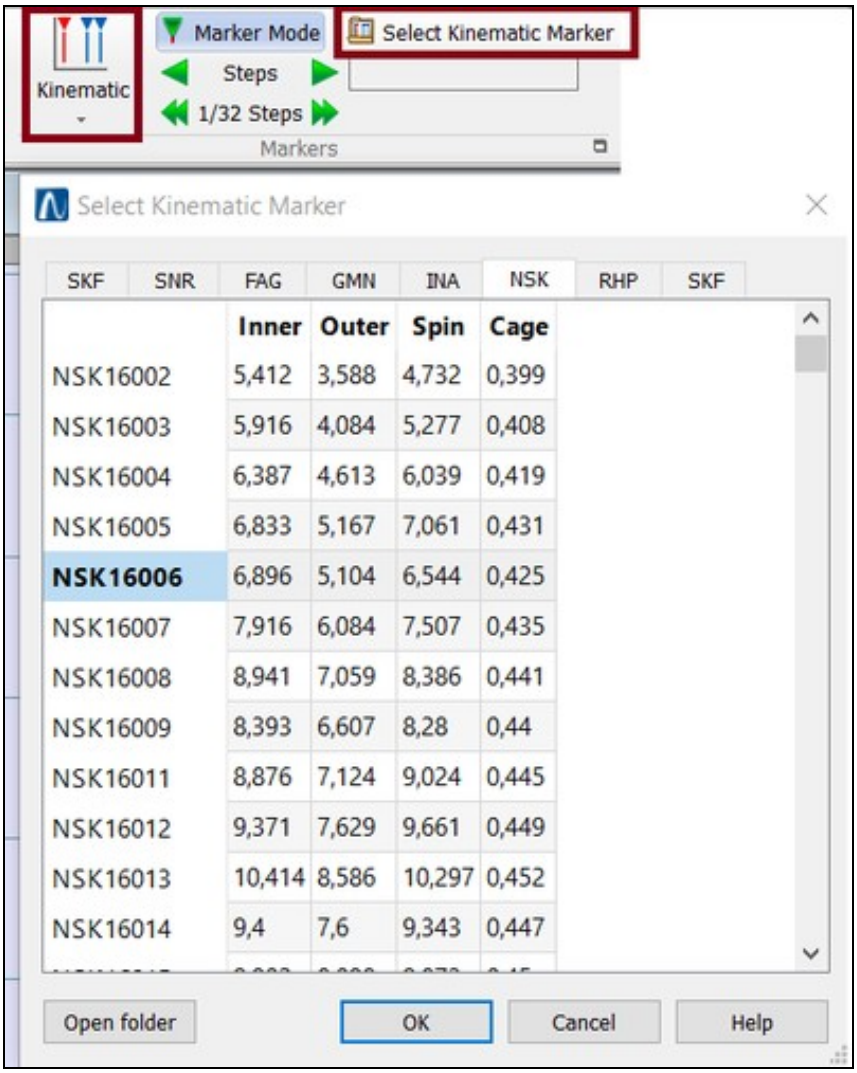
50.1 Kinematik markers follow FFT tachometer

The Kinematik marker can now be associated to the speed of the tachometer. So during a Run up the kinematik marker will automatically move inside FFT spectrum with the speed.

How to use it: Select a Tachometer on the FFT tab from GoToResult page.

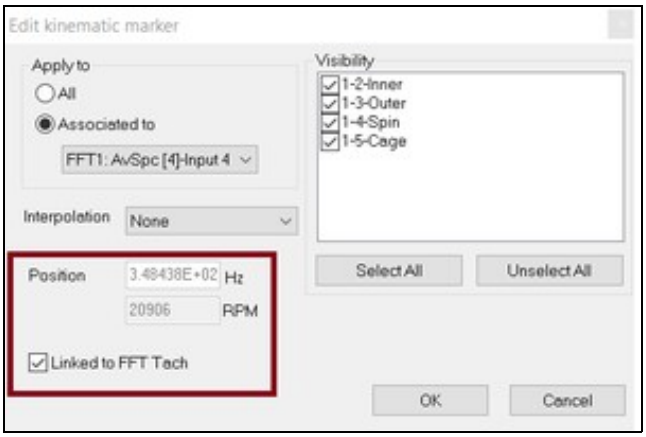


Then display a FFT spectrum. Select a kinematik marker and put it on the window.


Kinematic
Marker Mode
Select Kinematic Marker
Steps
1/32 Steps
Markers
Select Kinematic Marker
SKF
SNR
FAG
GMN
INA
NSK
RHP
SKF
Inner
Outer
Spin
Cage
NSK16002 5,412 3,588 4,732 0,399
NSK16003 5,916 4,084 5,277 0,408
NSK16004 6,387 4,613 6,039 0,419
NSK16005 6,833 5,167 7,061 0,431
NSK16006 6,896 5,104 6,544 0,425
NSK16007 7,916 6,084 7,507 0,435
NSK16008 8,941 7,059 8,386 0,441
NSK16009 8,393 6,607 8,28 0,44
NSK16011 8,876 7,124 9,024 0,445
NSK16012 9,371 7,629 9,661 0,449
NSK16013 10,414 8,586 10,297 0,452
NSK16014 9,4 7,6 9,343 0,447
Open folder
OK
Cancel
Help

Now this marker will be linked to the FFT speed.

Then on properties, you can link (or not) this marker to the speed.



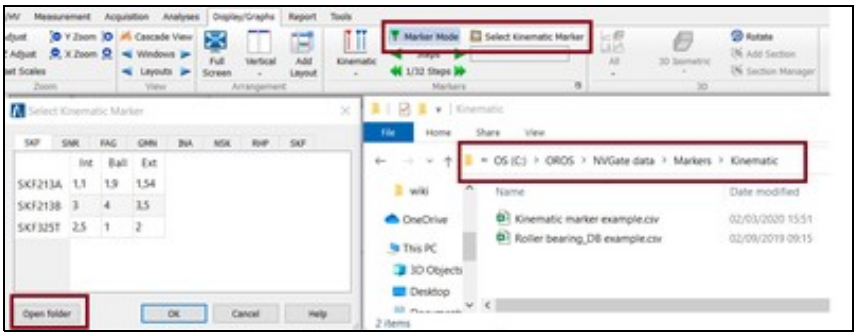
50.2 Automatic installation of the database

Now the excel kinematic database including bearings from NSK, SKF, FAG, SNRn, GMN, INA, RHP is installed automatically.

You can find it in the installation folder: "NVGate Data\Markers\Kinematic\"

50.3 Direct access to database

When clicking on the "open folder" button, you will directly access the folder where the Excel kinematic database is stored so you can edit the database easily if you need to add the kinematic configuration of a rotating machine.

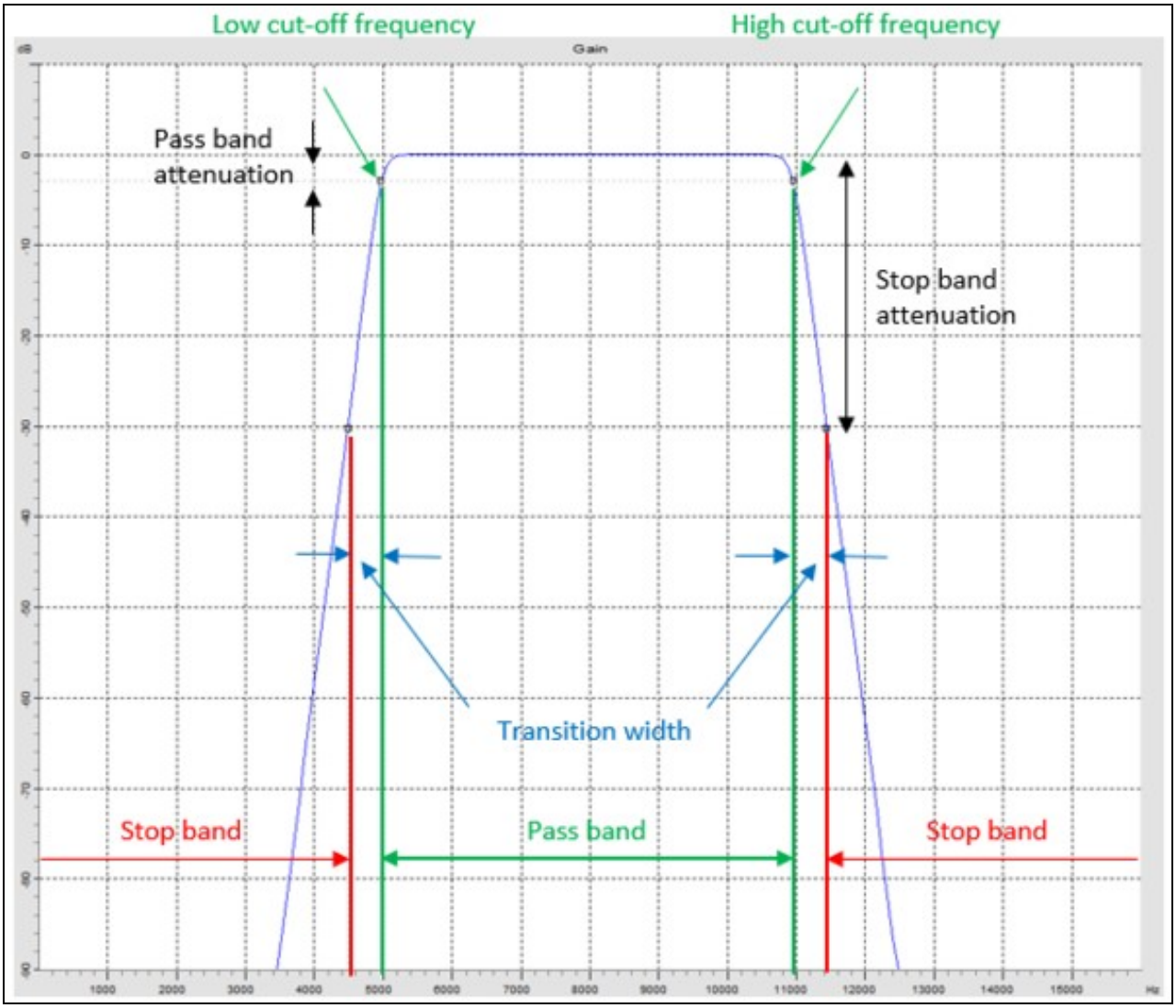


51 Relax the limits of filtering!

All details on the filters can be read here

51.1 Relaxed constraints on the cut-off frequency

To guarantee the stability of the filter, there are certain constraints on the value of the cut-off frequency. Compared with previous version of NVGate, such constraints are relaxed significantly now.



For the high pass and low pass filters, the maximum value of the cut-off frequency is the input frequency range **FR**. The minimum value is **FR** / 50000 in the Office mode, and **FR** / 40000 in the Connected mode. In the previous NVGate version, the minimum value was **FR** / 40 for the low pass filter, and **FR** / 400 for the high pass filter.

For the band pass and band stop filters, the low cut-off frequency f_{low} and the high cut-off frequency f_{high} need to meet the following conditions in the Office mode:

- f_{low} ? 0.0001 * **FR**
- f_{high} ? **FR**
- 0.0004 * **FR** ? f_{high} - f_{low} ? 0.9998 * **FR**

And in the Connected mode, the conditions are as below:

- f_{low} ? 0.0005 * **FR**
- f_{high} ? **FR**
- 0.000675 * **FR** ? f_{high} - f_{low} ? 0.99 * **FR**

In the previous NVGate version, the conditions on the cut-off frequencies were:

- f_{low} ? 0.055 * **FR**
- f_{high} ? **FR**
- 0.0075 * **FR** ? f_{high} - f_{low} ? 0.99 * **FR**

51.2 Improved precision

Now, the filters are calculated in 64-bit floating point format in the Office mode, and in 40-bit floating point format in the Connected mode. In the previous NVGate version, the 32-bit floating point format was used in both modes.

51.2.1 New prototype filters

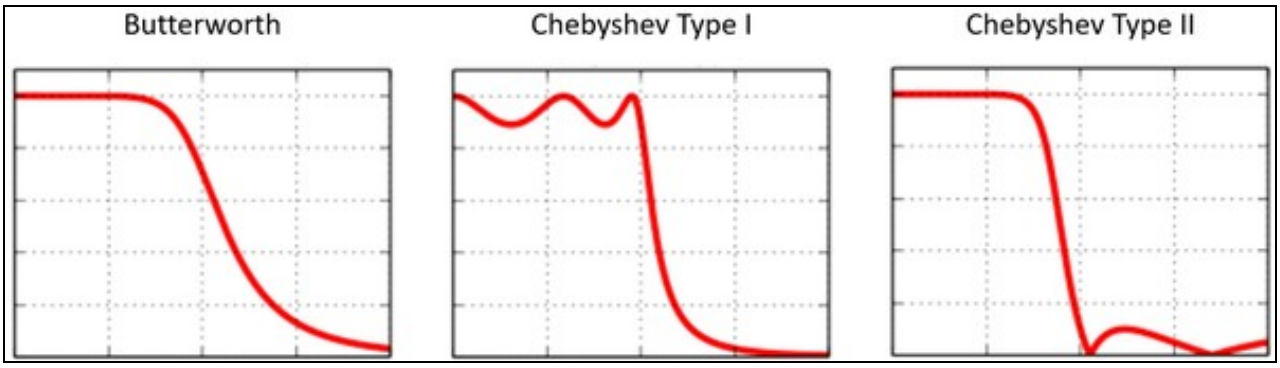
In addition to the Butterworth filter, now you can build the IIR filters with the Chebyshev type I (band-pass ripple) filter or Chebyshev type II (stop-band ripple) filter.

The Butterworth filter has flat response in both the pass band and stop band, but its transition band is wide.

The Chebyshev type I (band-pass ripple filter) has the steepest roll-off among the three filters, and its response in the stop band is flat. However, it has ripples in the pass band.

The Chebyshev type II (stop-band ripple) filter has flat response in the pass band, but it has ripples in the stop band. Its transition band is narrower than the Butterworth filter, but wider than the Chebyshev type I.

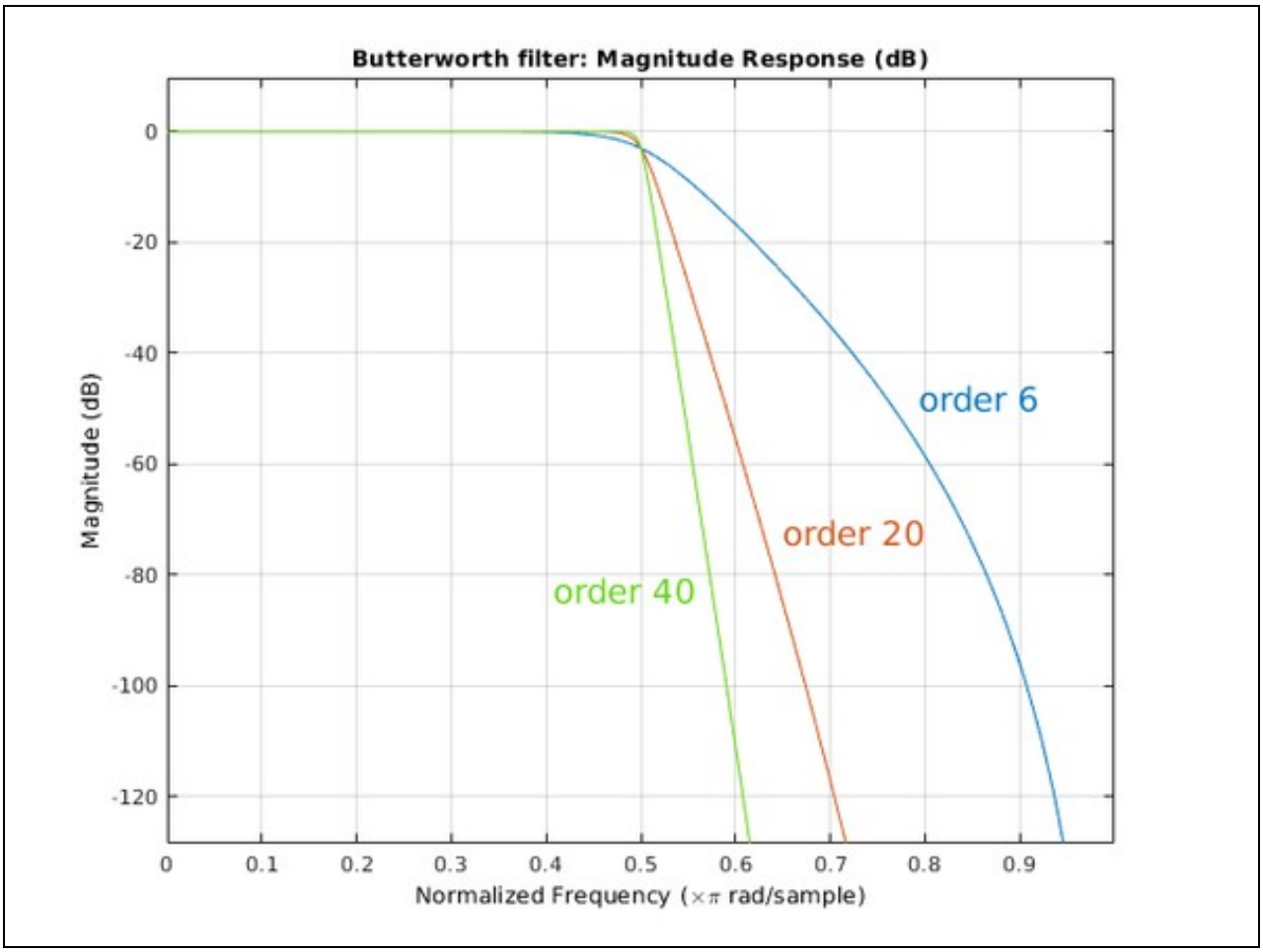
Below is an example showing these three filters with the same filter order.



Thanks to its maximal flat frequency response in the pass band, the Butterworth filter is commonly used in applications where signal distortion should be minimized, such as audio noise reduction. It is also widely used for anti-aliasing. The Chebyshev filters are optimized to provide steep roll-off, and they are usually used in applications where the maximum rejection of the nearby frequencies is required.

51.2.2 Increased filter order

The order of the filter affects the steepness of its roll-off. The higher the order is, the sharper the transition between the pass band and the stop band is. An example demonstrating the impact of the filter order is shown below:

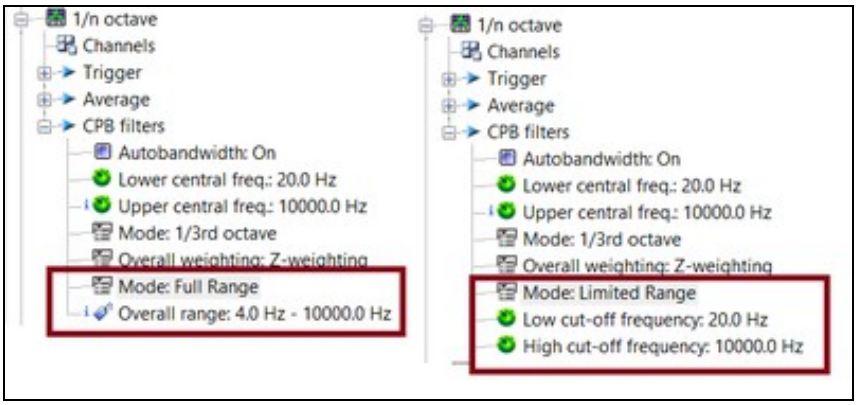


For the high pass and low pass filters, the filter order can be selected from 1 to 40 in the Office mode, and from 1 to 10 in the Connected mode now. In the previous NVGate version, the maximum filter order was 6.

For the band pass and band stop filters, the filter order is 2*N, and N can be selected from 1 to 30 in the Office mode, and between 1 to 10 in the Connected mode now. In the previous NVGate version, the maximum value of N was 5.

51.2.3 Octave overall no limitation

1/n Octave Overall levels frequency range plug-ins are now editable. You can define the min and max. This overall is computed in the time domain (weighting filter and detector). Processing weighting in the time domain provides accurate measurement for non-stationary signals (impulsive).



Full range mode computes the overall on the whole frequency range excluding the DC component. (The minimum range is defined by "CPB filters Lower central frequency"/5). **Limited range** lets the user define the range by changing the low cut off frequency and high cut off frequency.

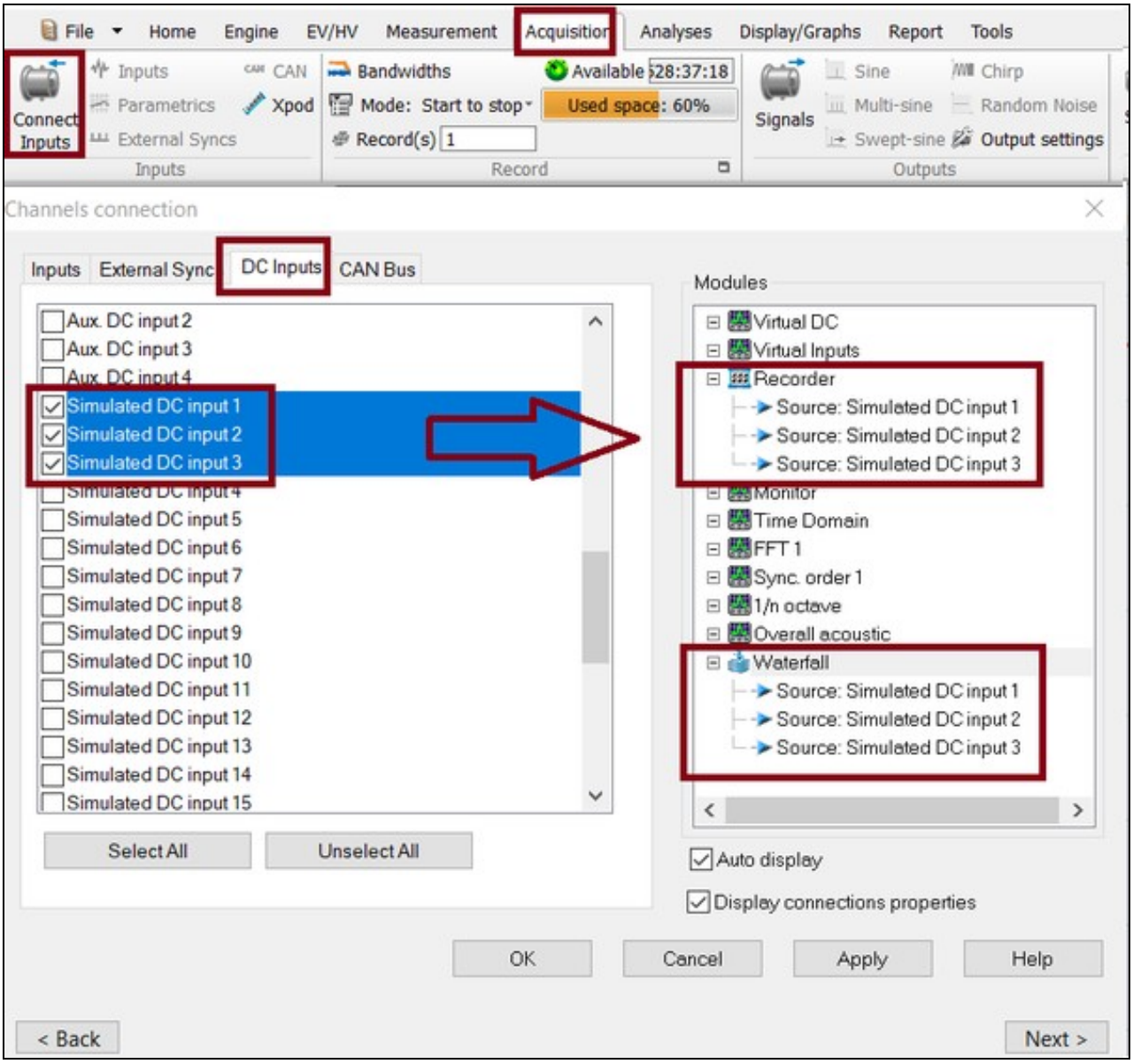
52 Enrich your measurements in real time: from GPS to environmental metadata

The DC simulated inputs allow you to inject up to 32 external DC channels in NVGate from external source (example : GPS, weather station, external can bus...). The frequency sampling is up to 15 samples / second. Thanks to the python developer toolkit, a developer can easily develop an interface to inject the values into NVGate. The GPS and weather station below have been developed using the DC simulated.

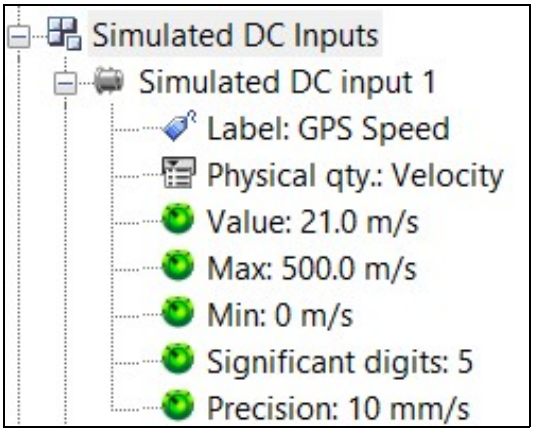
This option is included with the reference ORNV-VI-DC (which also includes the Virtual input).

How to use it:

On the Acquisition Tab, select connect input, select the DC inputs and select the DC simulated channels.



These channels can be activated and connected to the recorder and/or waterfall like any other DC channels.



The settings **Value** (which can be controlled by an external software) will change the value of the inputs.

The other DC simulated settings details are explained on the front end settings page.

52.1 GPS

Thanks to the "DC simulated channels" we have created an Add-on to record GPS data.

The GPS have the following features

- Record the X-Y GPS coordinates.
- Record and display the speed profile.
- Use the speed profile as a waterfall reference.
- Create a .gpx and display it on an internet website if you have an Internet connection).

You can visit the dedicated page to download it and advanced configuration. : https://wiki.oros.com/wiki/index.php/NVGate_DC_Simulated_Manager

We have 2 ways to acquire the GPS position, android phone or GPS Compliant with NMEA 0183 standard.

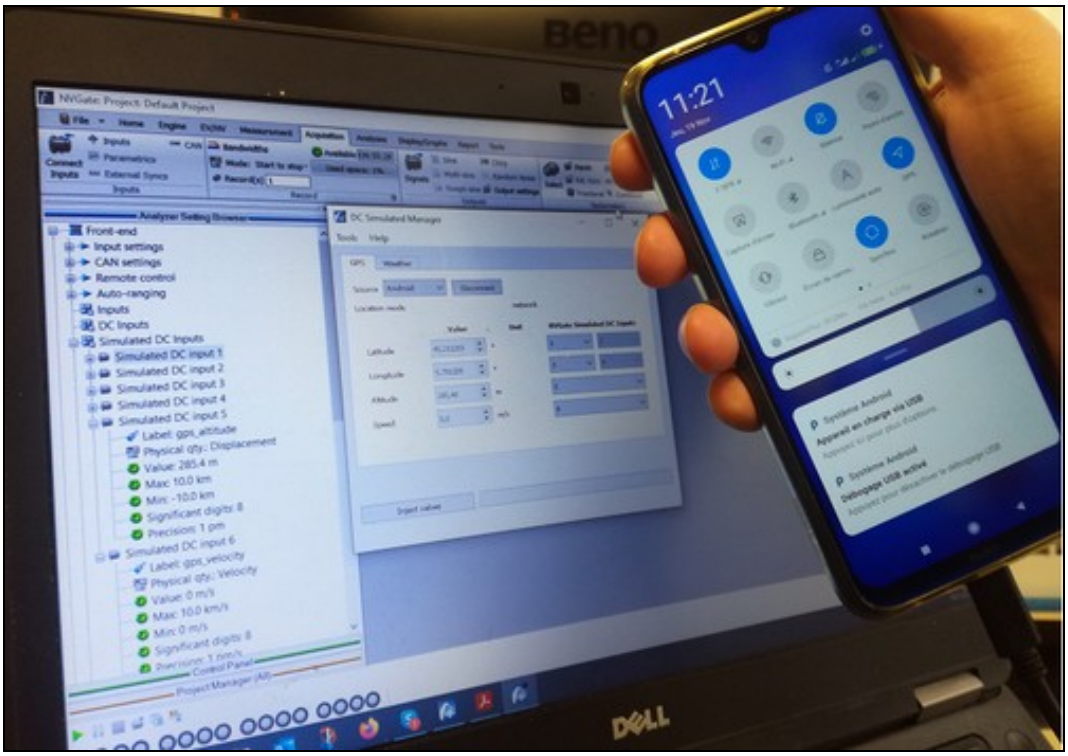
52.1.1 Serial GPGGA GPS

We are compatible with GPS USB Serial Interface Compliant with NMEA 0183 standard GPGGA

We recommend the GPS USB Navilock NL-602U but other GPS units will work as well.



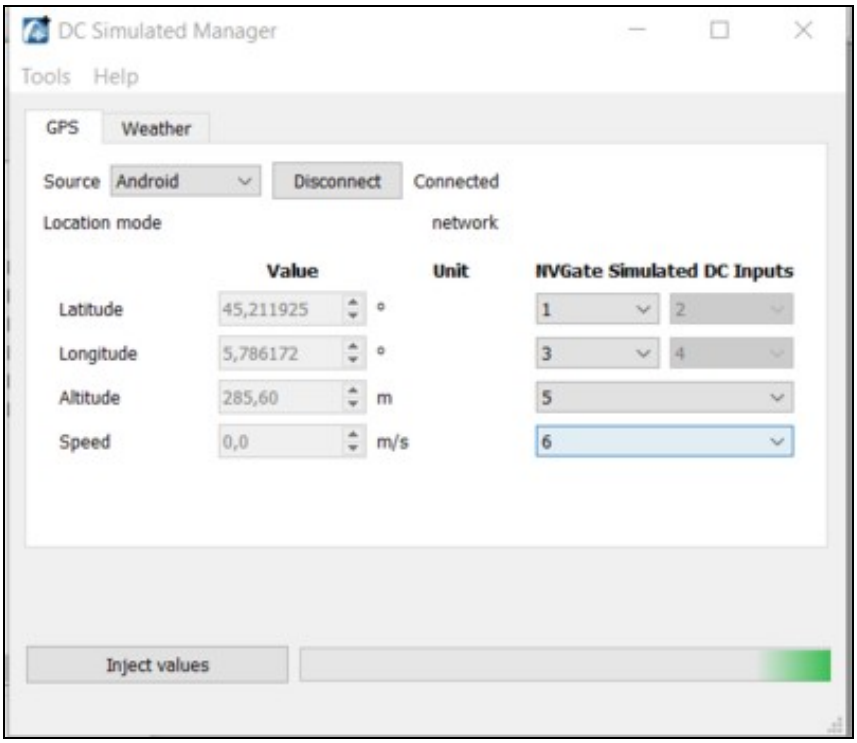
52.1.2 Android GPS



GPS data can also be retrieved using Android ADB (Android Debug Bridge). If you plug your android phone, we can inject the GPS position into NVGate.

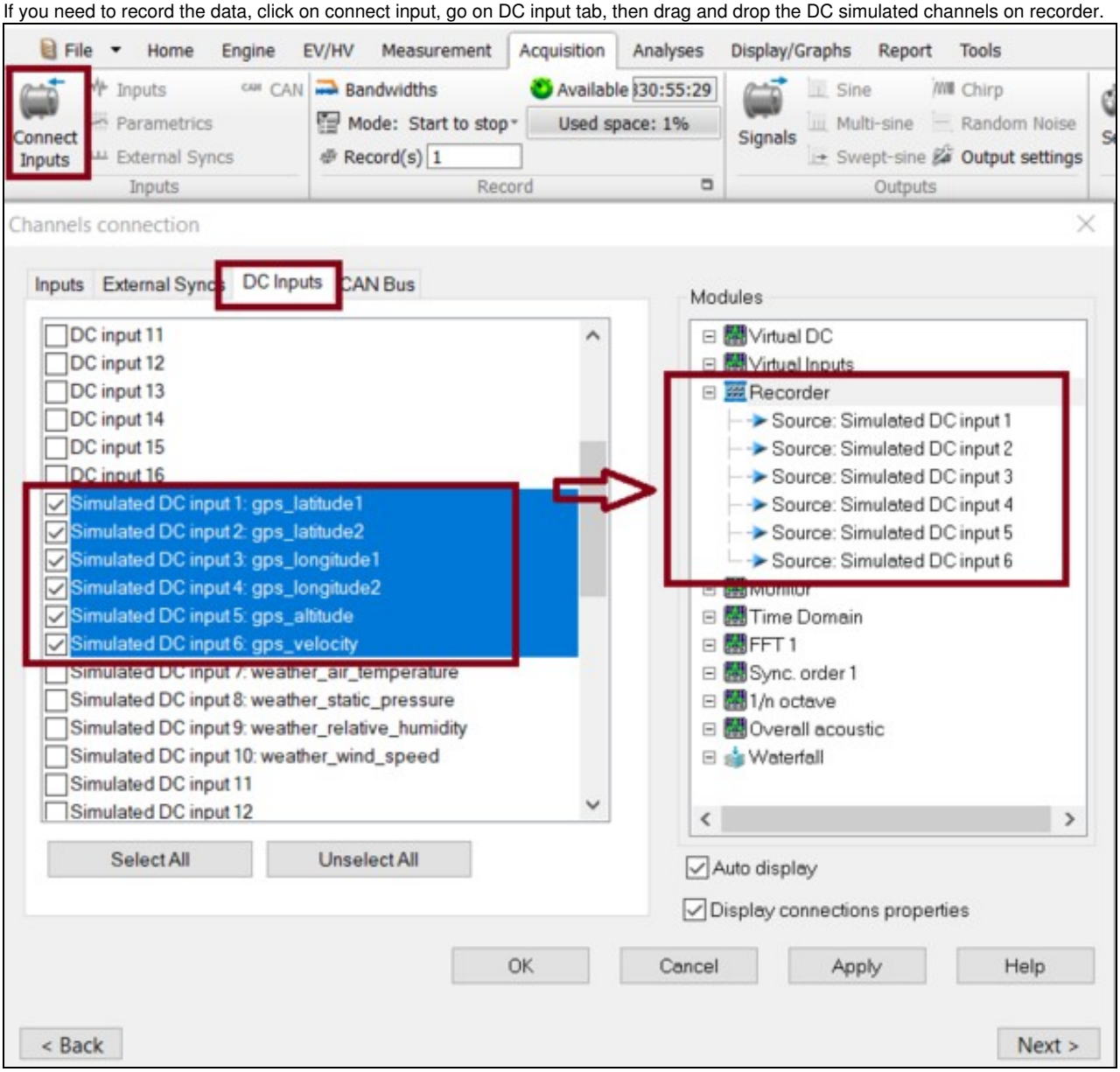
52.1.3 How to use it

Once the gps is plugged and configured, click on inject data, this will put the value on the DC simulated inputs.



Then you can use these channels on NVGate.

If you need to record the data, click on connect input, go on DC input tab, then drag and drop the DC simulated channels on recorder.

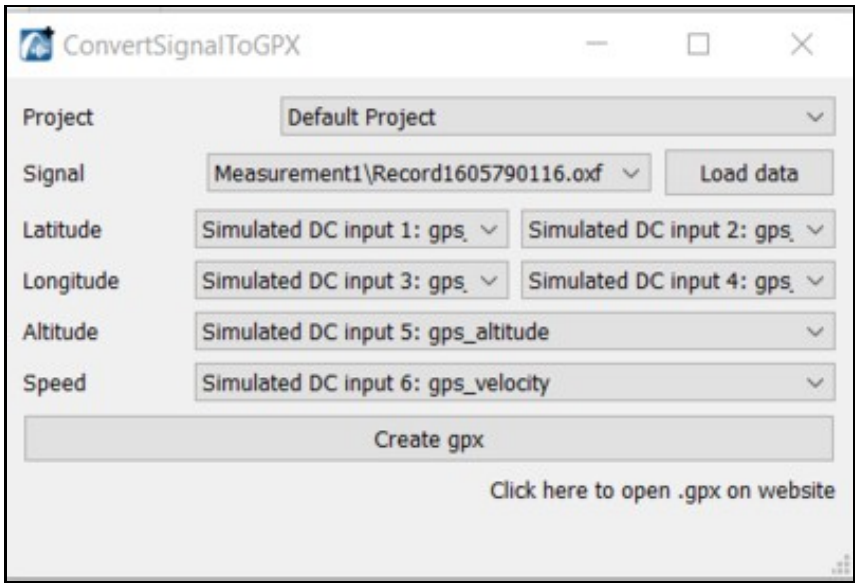


If you have recorded the data you will be able to create a .gpx file

52.1.4 Creating and visualize .gpx file

We can create a .gpx from an .oxf (OROS) signal file. a .gpx is gps file to follow the geographic information of the signal on a map.

You need to click on "Convert signal to gpx". 

This will open the windows below. 

Select the signal file that you need to convert and click on load data. You can modify the channels if needed. Click on create .gpx. The .gpx will be put in the "attachement" folder of the NVGate project.

If you want to visualize the .gpx we advise using the website : https://www.gpsvisualizer.com/ Clicking on "Click here to visualize the .gpx on a website" opens a website allowing you to plot the gpx on a map.

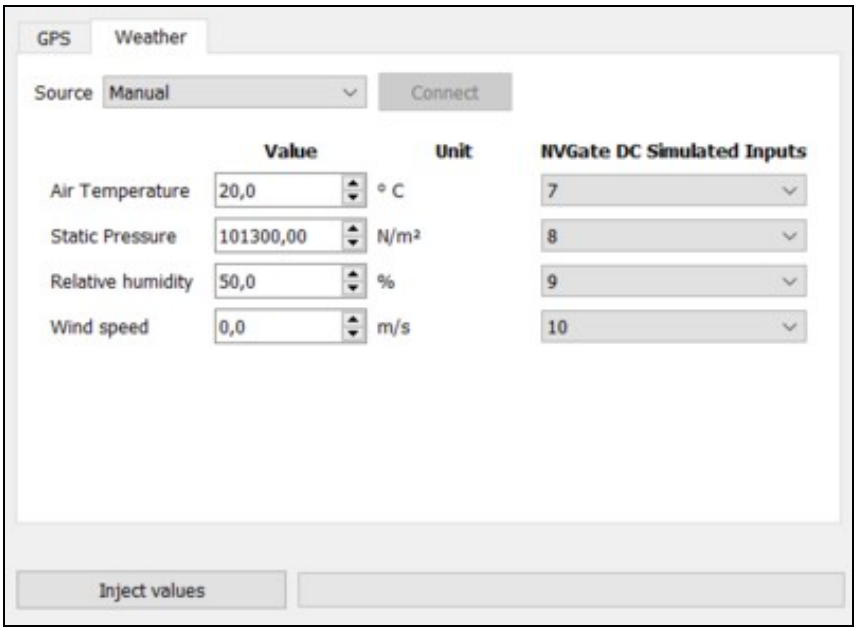
52.2 Weather station

Precipitation, wind speed/direction, pressure, temperature, and pressure can prejudice sound pressure levels or need to be recorded when you are doing sound measurement.

Thanks to the DC simulated channels, we can now enter manually the value or we can connect a weather station to NVGate.

52.2.1 Manual

The user can enter manually the weather value.



52.2.2 Davis instruments weather station



3 elements are required to make it work

- 6322OV Wireless Vantage Pro2 Integrated Sensor Suite

- 6316 Wireless Envoy

- 6510USB WeatherLink Data Logger.

This weather station provides accurate, reliable weather monitoring with real-time data updates every 2.5 seconds. Sensor suite includes outside temperature and humidity sensors in a passive radiation shield, wind speed and direction, and rainfall.

Note : The weather Station needs to pass by OROS SA for configuration.

52.2.3 Other weather stations

Please contact OROS to check the possibility to import the data (paid service).

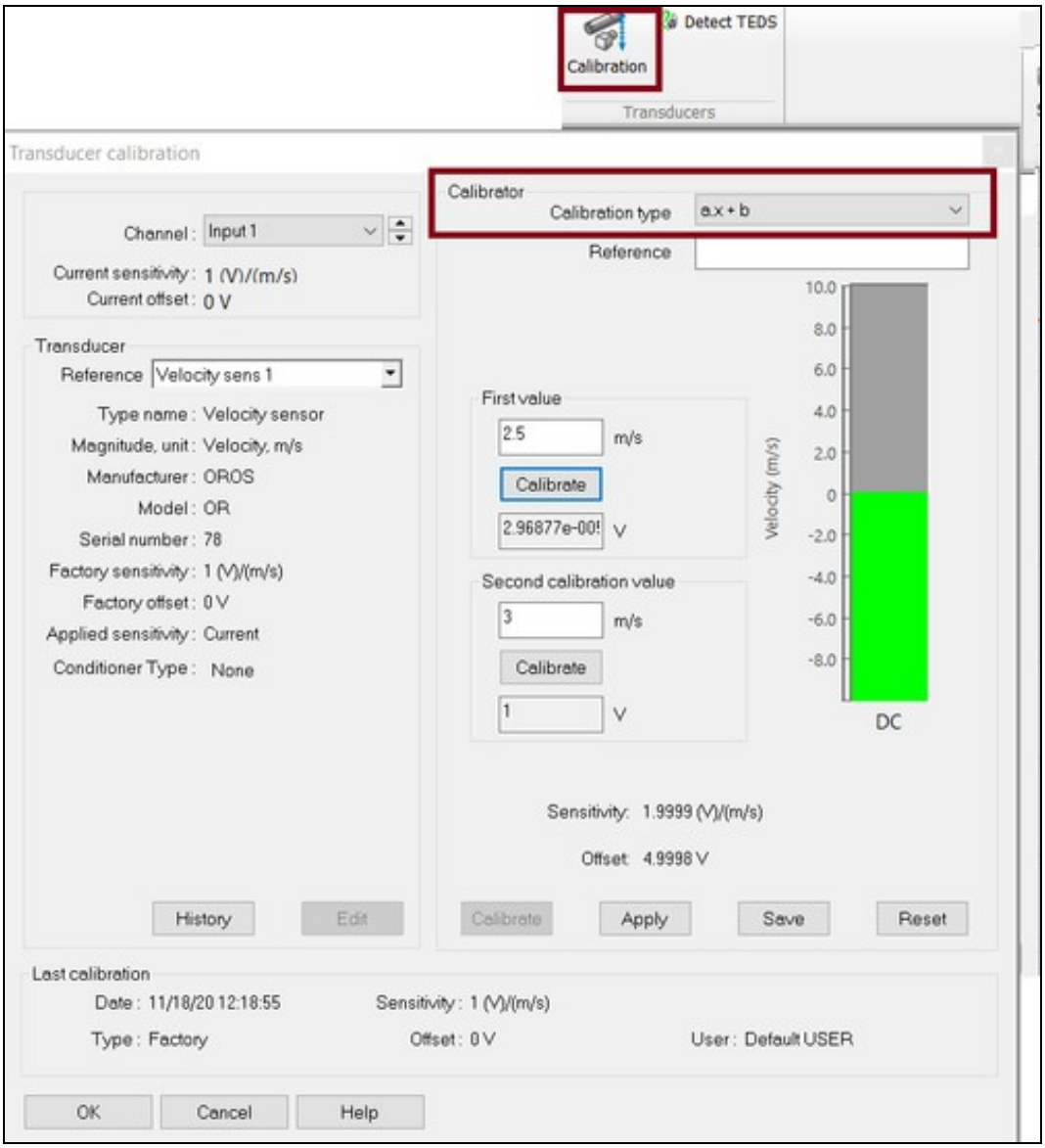
53 DC Dynamical sensor y = ax+b calibration

It is now possible to calibrate a dynamical sensor in "DC" or "DC floating" coupling using 2 values, then the software will automatically compute sensitivity and offset to obtain the "y = ax + b" formula.

This function is practical for 4-20 mA sensors or ?quasi-static? sensors acquired on dynamic channels. Wire sensor displacement sensor calibrated with a rule, pressure sensor with a calibrated compressor, proximity probe calibrated with a micrometer.

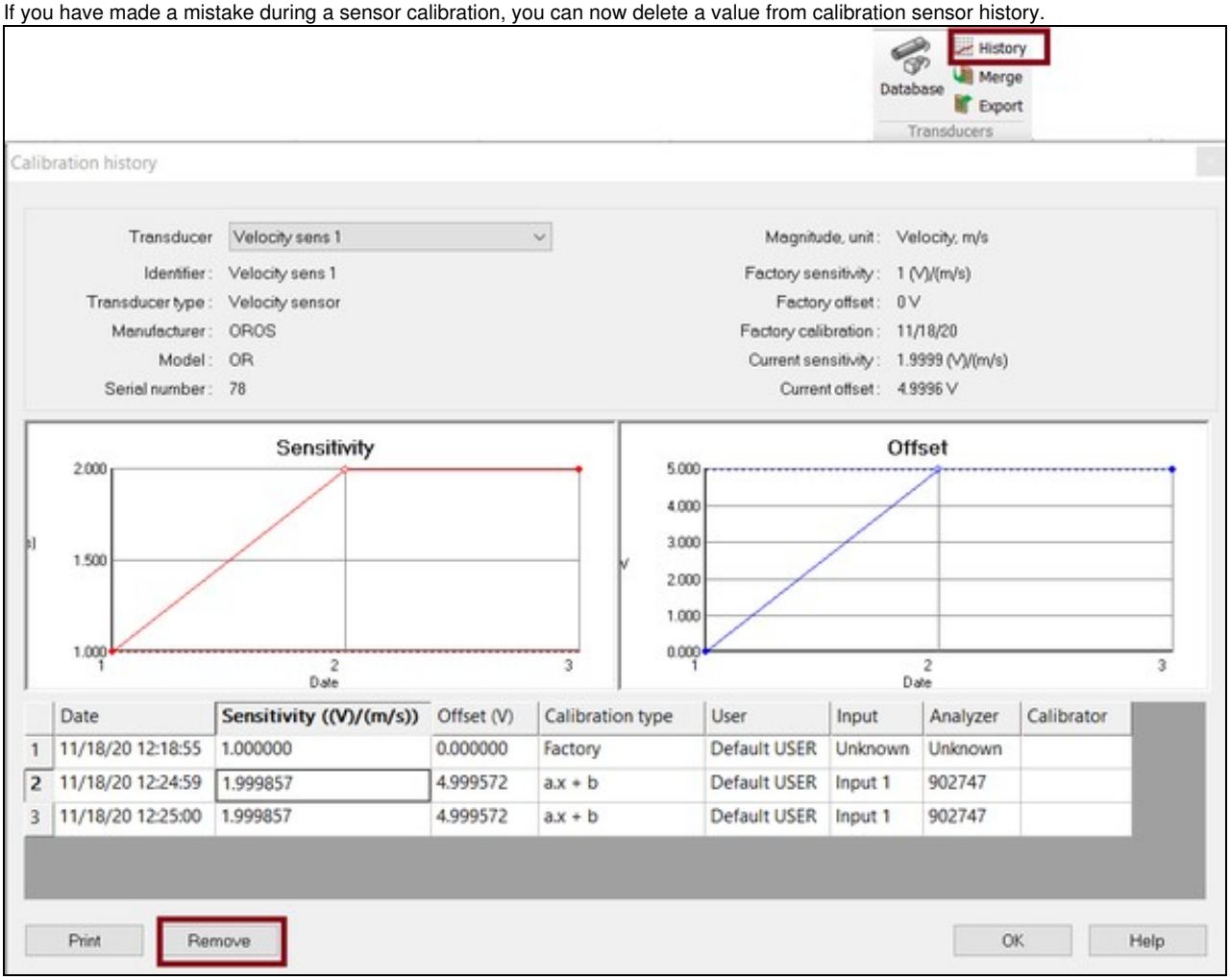
For using it, first create a DC sensor on the sensor database. Then apply this sensor to a channel.

Now on the calibration part, you can calibrate it using 2 values. Then the software will automatically apply the sensitivity and offset.



53.1 Remove a sensor from history

If you have made a mistake during a sensor calibration, you can now delete a value from calibration sensor history.



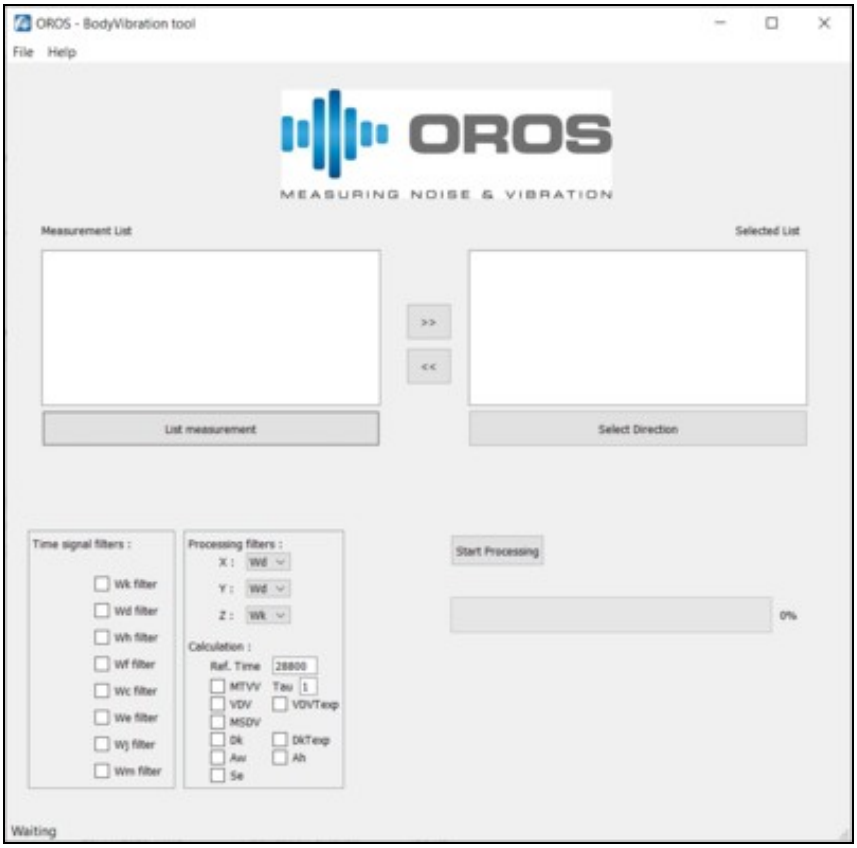
You need to go on history, select the sensor, select the value that you need to delete, then click on remove.

54 How much does this body shake?

The OROS Body Vibration tool allows you to evaluate the effect of vibration on the human body according to standards ISO 2631 and ISO 5349. These standards define measurement practice and vibration signal analysis to evaluate the effect on health and comfort of environmental and equipment vibrations on the Human body.

The ISO 2631 describes the effect on health and comfort of vibration on the whole-body in transportation system, and the ISO 5349 the effect on health of vibration on hands and arms when manipulating machine-tools or vibrating objects.

This is a post analysis toolkit, operating after the recording of the signal. It will calculate time-weighted signal of acceleration and specific indicators both defined in the standards.



Standards compatible: international standards about whole/body vibration including: ISO 5349, ISO 8041, ISO 2631-1 and ISO 2631-5.

Whole/body Vibration Indicators include : VDV, MSDV, MTVV, Weighted raw, al(ISO 2631-5), D(ISO 2631-5) are available. RMS, Peak, Crest, peak-Peak, are also available in NVGate plug in.

Body vibration indicators

M T V V {\displaystyle MTVV}	Maximum Transient Vibration Value, represent the maximal RMS value of the signal
V D V {\displaystyle VDV}	Vibration Dose Value, taking into account the temporal shocks in the signal
M S D V {\displaystyle MSDV}	Motion Sickness Dose Value, representing the comfort in transportation measurement
D k {\displaystyle D_{k}}	The Acceleration Dose, representing the effect of the vibration on the spine
A w {\displaystyle A_{w}}	Daily maximal exposure value (Calculated from Post processing in NVGate)
P e a k {\displaystyle Peak}	Amplitude Peak of the vibration; maximal amplitude of the signal from the 0 (Calculated from Post processing in NVGate)
C r e s t f a c t o r {\displaystyle Crestfactor}	Ratio between the Peak level and the RMS of the weighted signal(Calculated from Post processing in NVGate)

Signal filtering including:

Time-weighting filters

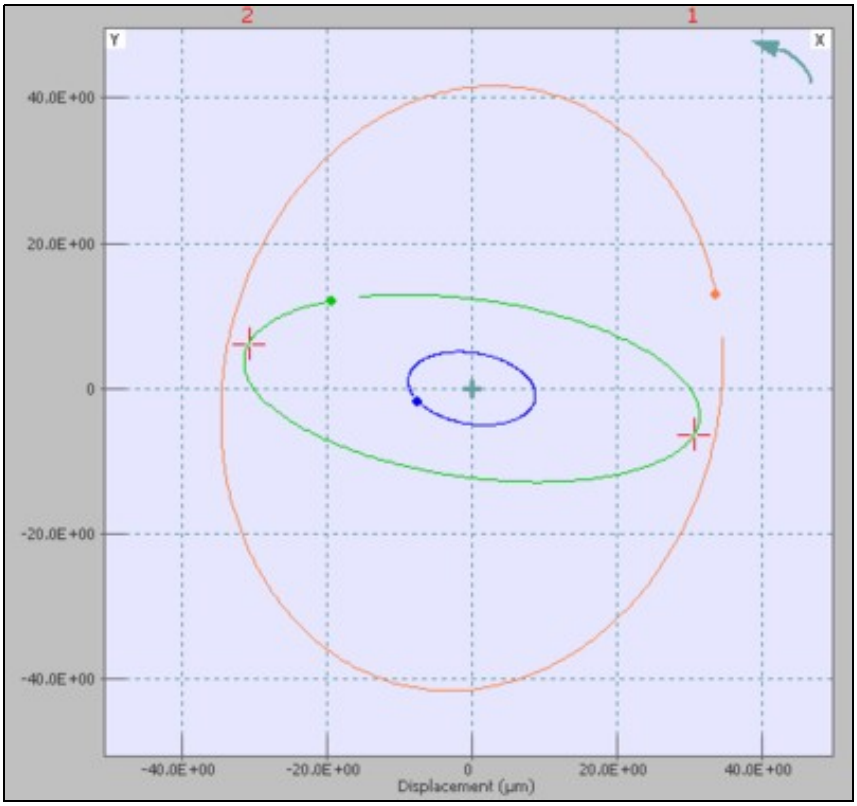
W k {\displaystyle W_{k}}	Time weighting for the Z axis for whole-body measurement (ISO 2631-1)
W d {\displaystyle W_{d}}	Time weighting for the X and Y axis for whole-body measurement (ISO 2631-1)
W h {\displaystyle W_{h}}	Time weighting for the hand-arms measurement in any direction (ISO 5349-1)
W f {\displaystyle W_{f}}	Time weighting for motion sickness measurement in the vertical direction (ISO 2631-1)
W c {\displaystyle W_{c}}	Time weighting for the X axis for whole-body measurement (ISO 2631-1)
W e {\displaystyle W_{e}}	Time weighting for all rotational directions for whole-body measurement (ISO 2631-1)
W j {\displaystyle W_{j}}	Time weighting for the Z axis for head comfort measurement (ISO 2631-1)

How to use it: https://wiki.oros.com/wiki/index.php/Human_Vibration

This Add-on is free of charge for NVGate 2021 users and TDA (?)

55 Orbit display included in FFT diag or ORD diag

For customer with option FFT-Diag or ORD-Diag, they will now have the Orbit display available in NVGate.



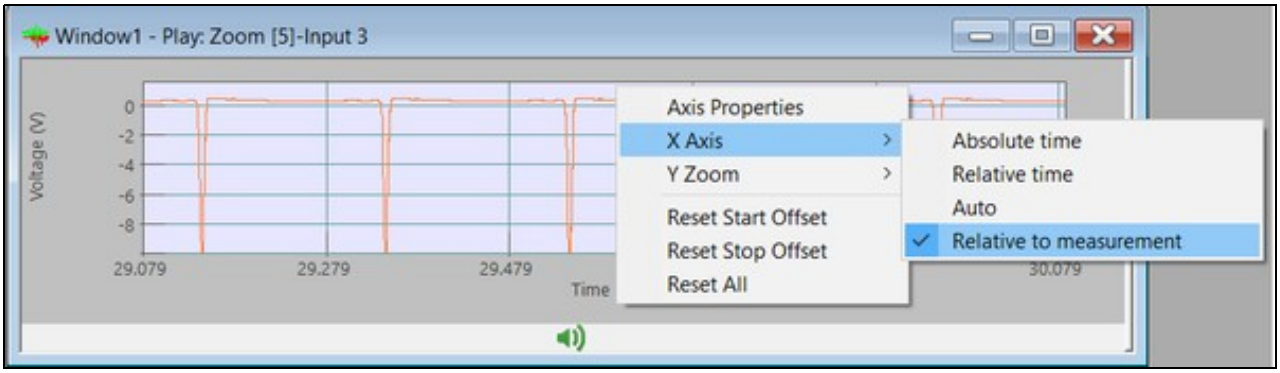
The orbit is available using the add/remove windows.

For more details, please check the orbit dipslay page.

56 Miscellaneous

56.1 Displaying Time in Zoomed signal relative to measurement

It is now possible to display the time "relative to measurement" in zoom signal.



- Absolute time: displays the time from windows format.
- Relative time: displays the duration of the record. The beginning of the record is set to 0.
- Auto: selects absolute or relative time depending on the duration of the record. For records smaller than 2s, the relative time is displayed, for others, the absolute time is chosen.
- relative to measurement: displays the duration of the record. The beginning of the record is set to the "player start offset"

56.2 NVdrive : SetViewmeterLevels

Using NVdrive, you can now control and set the alarm level, high level and low level.


Properties
Viewmeter
Trace legend
Display mode
Digital
0dB
Y Axis
Linear
32.7 dB
Display alarm level
5.657E+00
V
22.9 dB
Display high level
2.828E+00
V
12.4 dB
Display low level
-0.2 dB
-5.657E+00
V
Zone à masquer
Always on top
Default
Apply to
Active window
All windows
Save as user preferences
OK
Cancel
Apply
Help

Check the NVDrive toolkit for more info.

57 Bug fixing

- 13728: [Fractional Tachometer] Using a fractional tachometer lead to DSP error -
- 13729: [Drec] : Impossible to record more than 38 ch in Drec
- 13672: Delta RPM with source DC tach (from monitor) - do not trig the waterfall
- 10572: Low pass response for ICP and AC coupling poorly specified
- 13811: NVDrive GetResultEx error while running without displaying result
- 13774: Orbit display improvement
- 13790: Change the number of displayed orbits
- 13794: A problem of DRPM stop at 5000 RPM instead of 6000.
- 13953: [General] A-weighting can be applied several times (report 13912)
- 13938: Input type: Xpod bridge, one channel 5 doesn't work if 1 activated
- 13767: Create a new unit : do not go on a "empty" windows, keep the previous configuration.
- 13979: WIFI connection
- 14011: import a template from NVgate to OR10 , the japanese label became wrong
- 14009: OR10 Stand Alone : the japanese label data become wrong
- 13912: A-weighting can be applied several times
- 13984: Units - The number of digits doesn't change in a specific configuration

58 NVGate 2022: Release note

OROS strives to be closer to its users, carefully listening to needs and requests. For that reason, OROS regularly releases new versions. Customers under contract automatically benefit from each release.



The NVGate® 2022 major version became available in January 2022. This release of the OROS 3-Series analyzer?s software platform brings additional functionalities and significant performance improvements. Below is a summary of the main enhancements of your NVGate experience:

>> 3 main features to bring your **TEAMWORK efficiency** at its maximum

Share & Explore your data Simply & FREEly !

Start **NVGate in READER mode** from anywhere and work all the way to the report. Your teams and partners can explore your data simply and without any software license: simply FREEly! >>

Save more clicks and push teams efficiency to the limits

Experience the enhanced field ergonomics and intuivity thanks to the optimized **new Ribbon Tabs** and application-oriented default settings. NVGate 2022 bring settings and displays at your fingertips in less clicks.>>

Keeping the pace with evolutions: announcing Windows 11 compatibility.

The new **Windows 11** is now released and NVGate 2022 is adapting to offer a full **compatibility** with this new modern environment.

>> 4 main features to keep proposing the **highest performance in ROTATING** analysis

Triple shaft order analysis !

Whether your test is carried on a gear box,

Measure all your shafts with 1 tach sensor: virtual tach gear ratio upgraded to a 100 !

Measuring vibrations on multi-shaft

Display the Pressure Volume diagram (PV) of your Reciprocating machines.

The PV diagram allows to draw

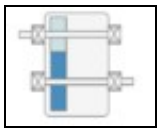
Team up your systems when using ORBIGate for your rotordynamics testing.

ORBIGate keeps progressing as



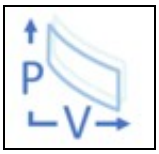
Triple shaft order analysis !

an integrally geared compressor or any other multi-shaft rotating machinery, NVGate offers now the possibility to carry **3 simultaneous order tracking analysis** at a time both in online and office mode.



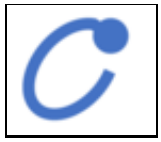
Measure all your shafts with 1 tach sensor: virtual tach gear ratio upgraded to a 100 !

machines such as gear boxes may require positioning several tachometer sensors. NVGate 2022 features an extension of the ratio for the **Fractional tach feature up to a 100**.



Display the Pressure Volume diagram (PV) of your Reciprocating machines.

the Pressure vs the Volume directly when using the NVGate software interface. The **PV diagram** is a new add-on available.



Team up your systems when using ORBIGate for your rotordynamics testing.

well bringing new features. In particular the dedicated rotor dynamics solution can now be used on daisy chained systems as NVGate.

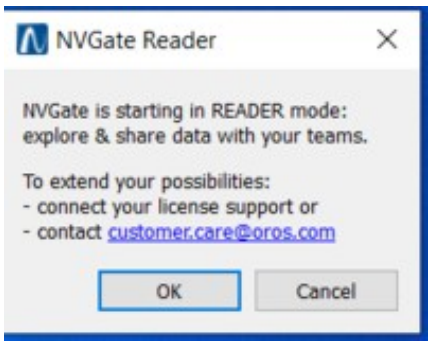
This release note describes the content of version, with operating details.
To download and install NVGate 2022, check this page.

Compatibility: NVGate 2021 is compatible with all OROS instruments (OR34 V1 - OR35 V1 - OR36 V2 and TW - OR38 V2 and TW- OR10) that have not been discontinued. Depending on the hardware options and version, some instrument features may or may not be available.

58.1 NVGate READER : Share & Explore your data Simply & FREEly !

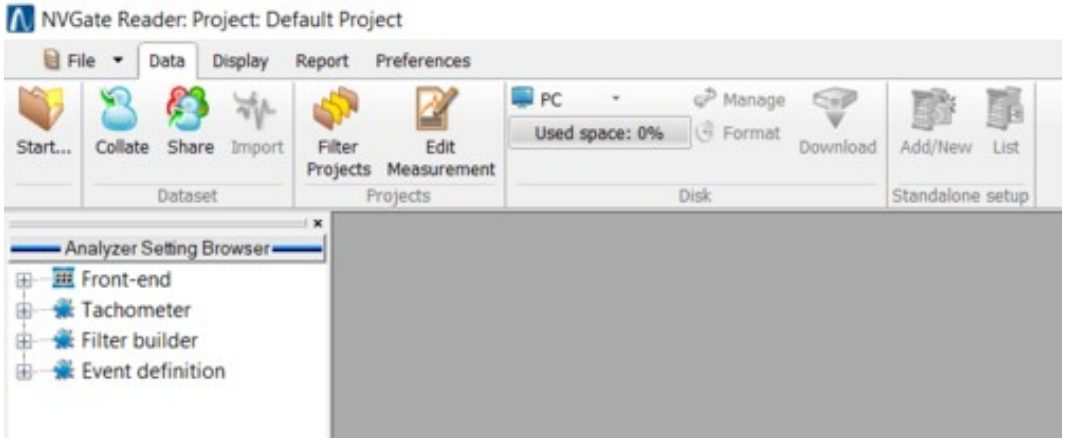
Start NVGate in READER mode from anywhere and work all the way to the report. Your teams and partners can explore your data simply and without any software license: simply FREEly! This is the very first step you can have to discover OROS and NVGate possibilities : whether you are experienced in Noise and Vibration or not.

Whenever NVGate 2022 is started without any licensing support detected it will start in READER mode.The following dialog window will be displayed:

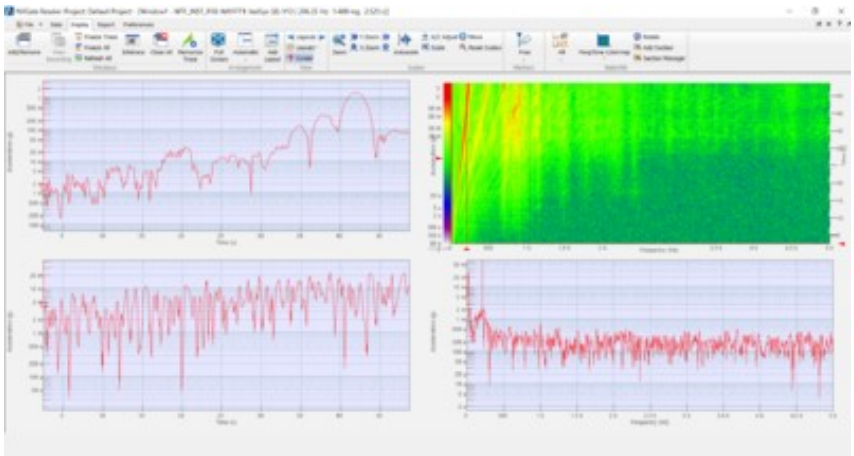


The READER mode will let the user:

- - Manage the data : Collate & share data, filter and sort out data based on properties: so using the power of Dataset Management



- - Display the data whatever the display type
- - Use the display and analysis tools : zooming, scaling, cursor and markers reading results values



- - Publish automated or manual reports

How to proceed?
Solely data created or shared from a NVGate 2022 version are compatible with the NVGate 2022 READER:
- For teams using a licensed version of NVGate, data generated with NVG2022 will be stored in the project manager and **straightforward readable** whenever starting in READER mode
- For READER users without any licensed version of NVGate, the data **SHARED from your team member or partner** can be imported using the "COLLATE" function.
- Embedded examples installed with the version are **available for self training** and can be displayed using the "EDIT MEASUREMENT" feature.

- For users who want to SHARE their data with READER users: they can do it using the "SHARE" function

- In all cases, shared DATA is initially created on a NVGate licensed version either in real time when connected to an OROS instrument or from a post-analysis based on a recorded signal

58.2 Enhanced ERGONOMICS : Save more clicks and push teams efficiency to the limits

Experience the enhanced field ergonomics and intuivity thanks to the optimized **new Ribbon Tabs** and application-oriented default settings. NVGate 2022 bring settings and displays at your fingertips in less clicks.

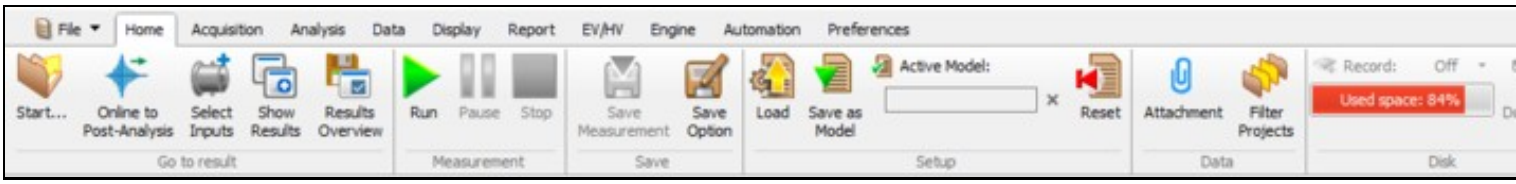
The interface gathers the analyzers functionalities in simple, clear and easy to identify tabs organized according to the main operations (Home,

Acquisition, Analysis, Data, Display, Report, Automation, Preferences).

58.2.1 Tab: new icone disposition

Key features have been emphasized by interface, guiding the users to the best way using their OROS 3-Series analyzer. The software entries are organized in a logical operation way. There are 8 different tabs corresponding to the main operations type:

58.2.1.1 Home



The goal of the Home tab is to make a user friendly tab for doing a measurement. You can load a project, create a setup (using the "go to results" group), start an acquisition, see your data, the disk space and change the user. In fact for a lot of every day application you can stay on this tab, no need to check the other one.

we have also highlighted the Attachement function  on this tab.

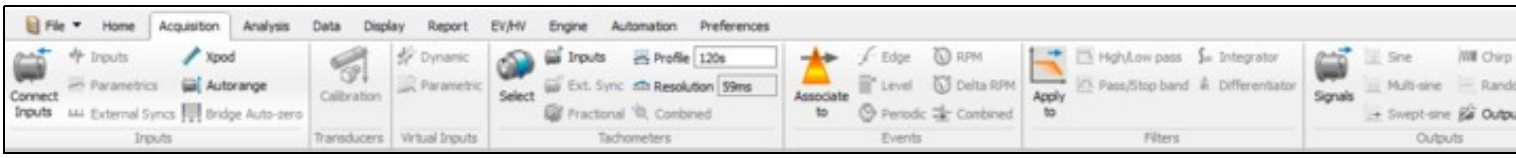
Attachment: Enables to quickly identify if files (reports, pictures, videos....) are attached to the current project. Click on this button to create and/or open the attachment folder. *Note: if the "Default project" is active, the Attachment button is greyed.*

 The *Attachment* folder of the current project is empty or does not exist.

 File(s) are located in the *Attachment* folder of the current project.

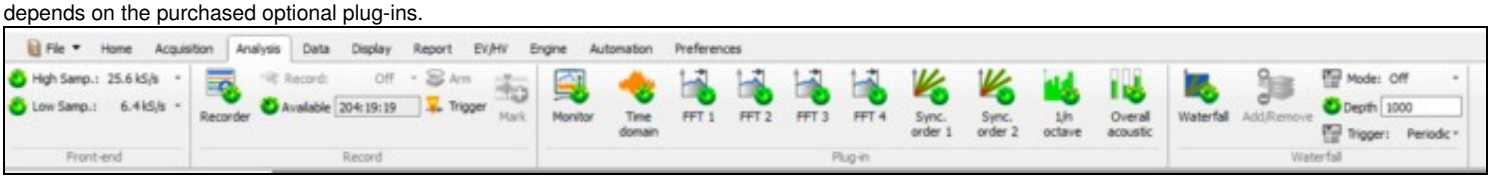
58.2.1.2 Acquisition

This tab provides all the necessary entries to setup the front-end and the use of any channels in details. It separates the acquisition channels setup from the outputs, triggering, tachometer, and filters ones.



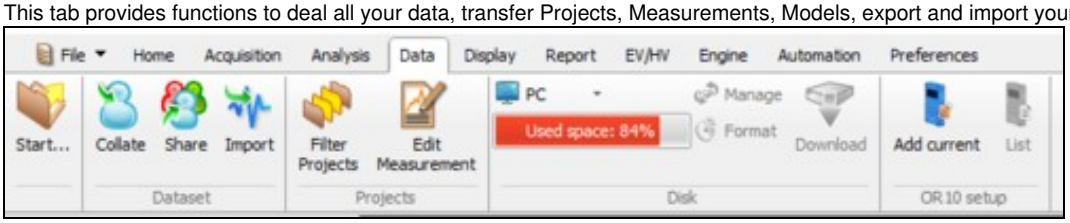
58.2.1.3 Analysis

In this tab, the software gathers the front-end, recorder and analyses controls. Each icon corresponds to a plug-in analyzer. The content of this tab depends on the purchased optional plug-ins.



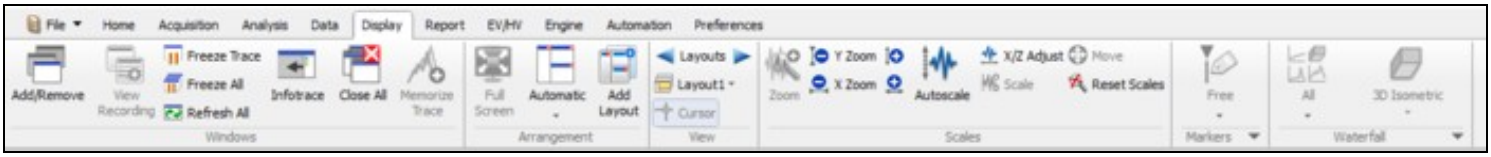
58.2.1.4 Data

This tab provides functions to deal all your data, transfer Projects, Measurements, Models, export and import your data, filter the Project Manager.



58.2.1.5 Display

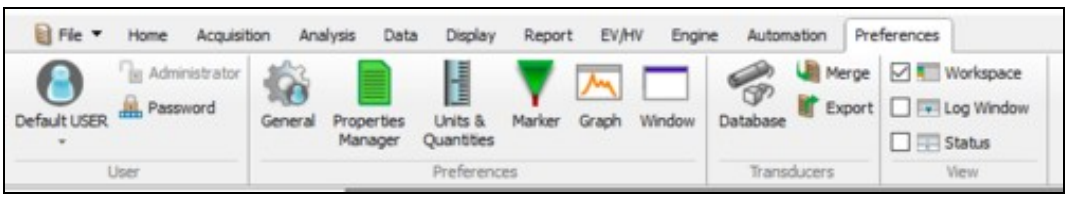
This tab covers the results display control. It allows creating, fulfilling, arranging and viewing the windows and layouts. It controls the scale, units, weighting and data operations of any graphs, manages the waterfalls and extraction graphs and the markers.



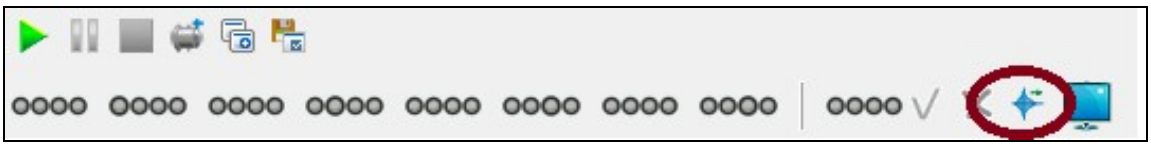
The display tab has been entirely thought and improved with NVGate 2022. Some functions have been highlighted : freeze, zoom, add layout. The mouse mode has been also improved (cursor, marker, zoom, move, rotate). One mode can now be selected in one click. Also now the default mouse mode will always be the cursor mode, so if you unselect a mode it will go back directly to the cursor mode.

58.2.1.6 Preferences

This tab provides direct access to the user?s definition, user's preferences and sensor database.



58.2.1.7 Post analysis button on status bar



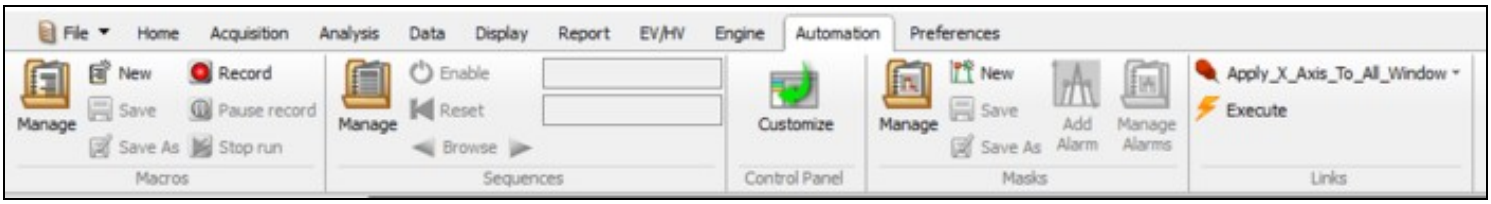
On the status bar you have now a direct access to the "online to post analysis" mode.

 | **Online to Post-analysis**: This button is used to switch from Online mode to Post-analysis mode. This will open the *Select Signal* window which lists all the recorded signals available. The selected signal will be then playback and can be re-injected into any plug-in analyzer (Monitor, FFT, 1/n Octave...). It is also possible to play back a recorded signal through the Output during Online analysis.

See player page for more details.

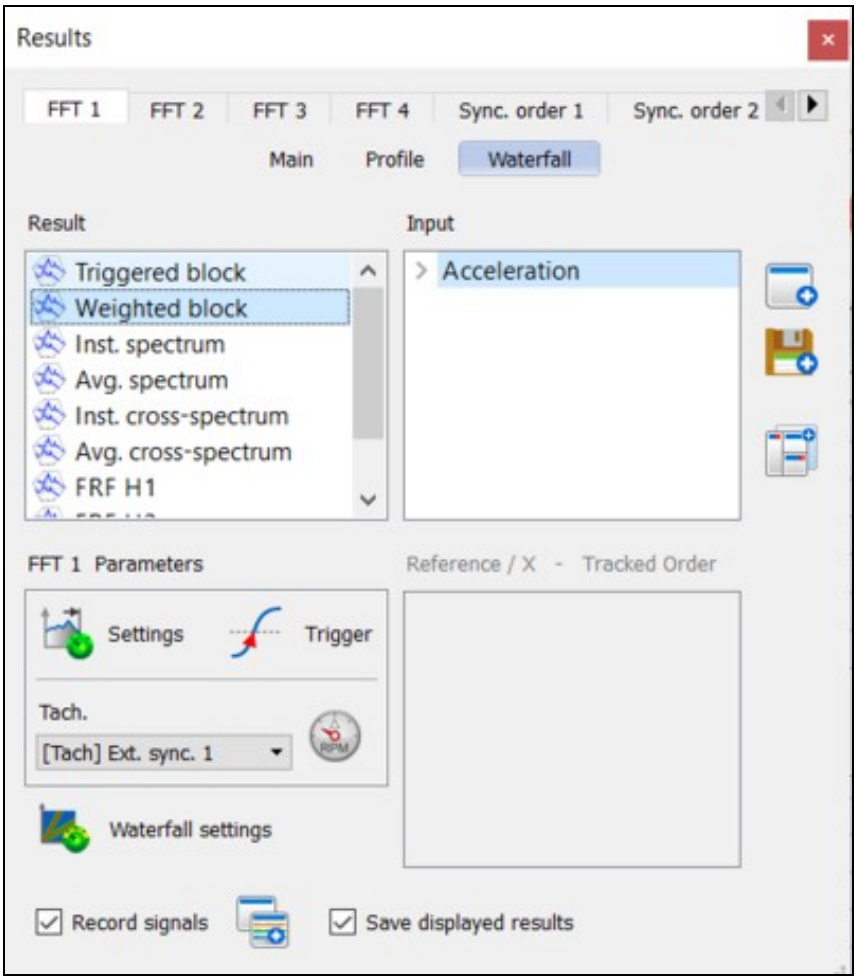
58.2.1.8 Automation

The Automation tab contains powerful and helpful tools to automate repetitive tasks made with the analyzers.



58.2.2 Go to results: one click icons

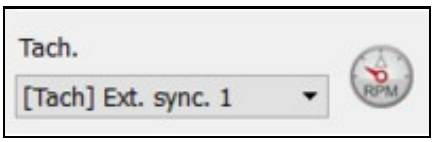
New "one click" function have been added on the go to results for more user friendliness.



-  view recording: will open the signal monitoring window on top of the current layout. In the case of this window is already open in another layout, it swaps to this layout.
-  Add Layout: Creates a new layout. A dialog box used to name the new layout is displayed by clicking on the button. A new tab is created and selected, corresponding to the new layout.
- 

Opens the waterfall triggering dialog. This dialog allows selecting the trigger of by the waterfall plug-in (only available on profile and waterfall tab).

58.2.3 RPM buttons create automatic events



The RPM button has now beeing entierly redesigned. Apply this button will automatically put the waterfall trigger on delta RPM or periodic. This will make the setup of NVGate much more easier for a rotating or run up aplication. (only available on profile or waterfall tab)

In details this button will :

- Create a Delta RPM event, source = the one activated in the "Tach.". Delta velocity : 10 RPM.
- Create a Periodic event (0.5 sec)
- Create a Combined event 1. mode: "Delta RPM OR Periodic 1"
- Set waterfall Trigger to Combined event
- Create of an RPM event (source = the one activated in the tach field)

58.2.4 New default settings

The default settings in NVGate have been updated to the ones below. With these default settings, you can do rotating analysis measurement directly. Be aware that if you load an exiting project, the settings will not be affected. You can also easily change these settings.

FFT Overlap: 66%

FFT lines: 3200

FFT Overall low freq : 2 Hz

SOA resolution: 1/8

SOA overlap: 5

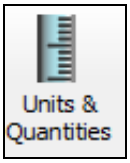
SOA OVL lower order: 0.2

Event Delta RPM: Delta velocity 10 rpm

Waterfall Depth: 1000

Tachometer/RPM Profiles/Duration: 120 sec

58.3 New units available

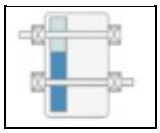


New units have been added:

Angular velocity: Hertz

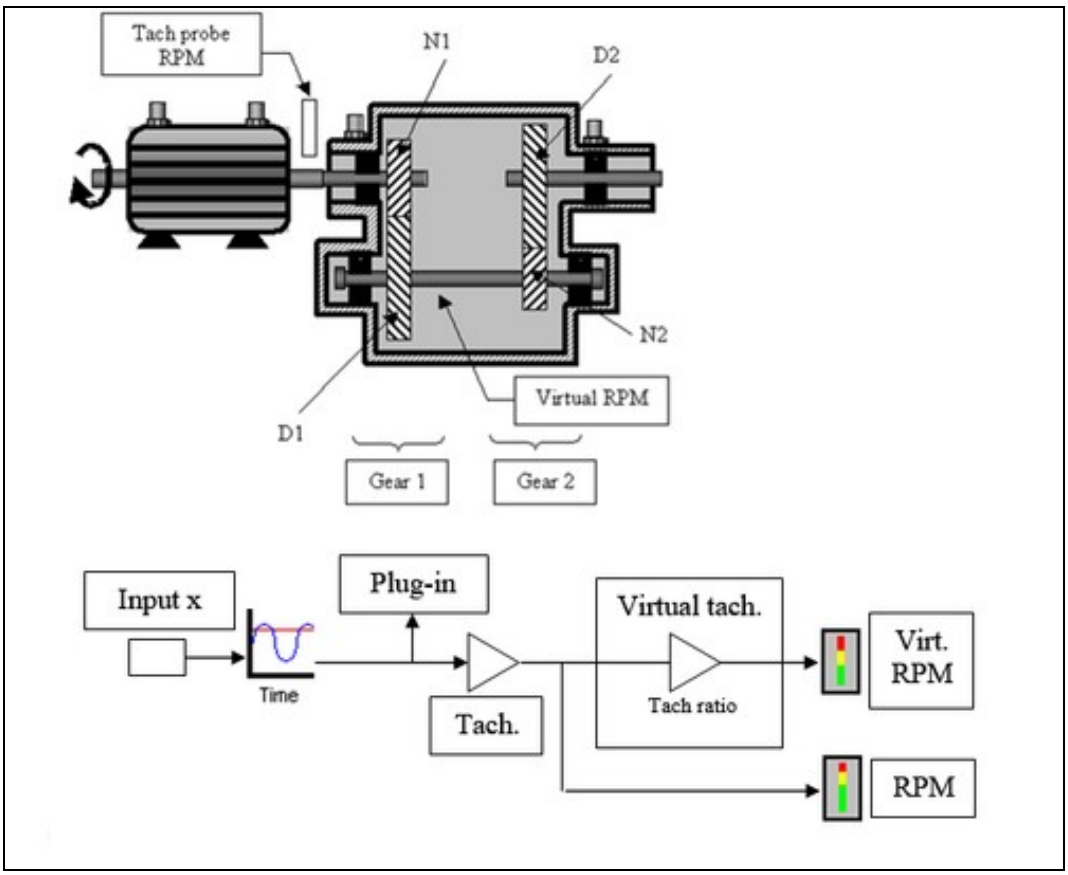
Pressure: Pascal and Bar

Torsionnal velocity: RPM

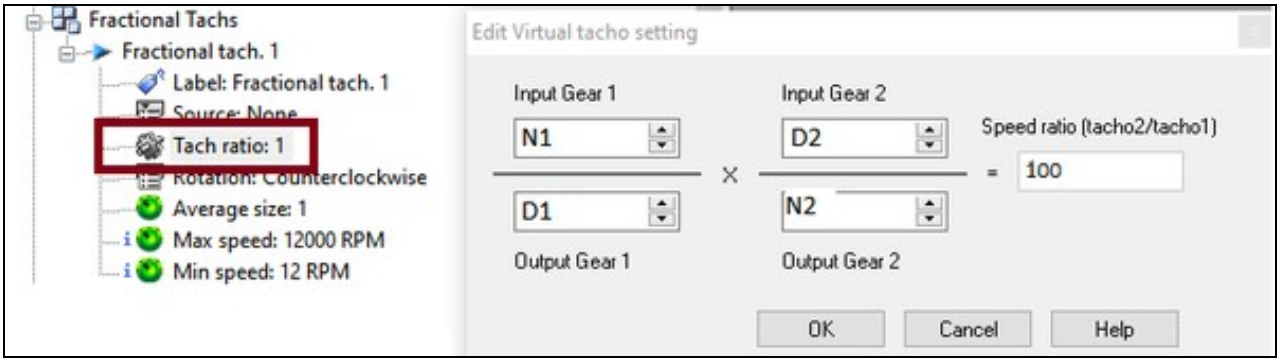
58.4  Measure all your shafts with 1 tach sensor: virtual tach gear ratio to 100

 : Fractional tachometer: computes RPM speed for a non accessible shaft by using gear ratio setting: adapted for gear boxes and transmissions. The ratio can now be set up to 100! (it used to be 2).

-> Used to define up to 4 fractional tachs using data from the tach or the Ext Tach.



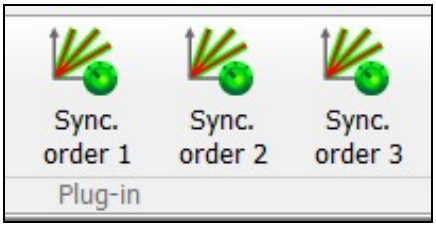
- **Tach ratio**: this is the ratio between the output angular speed and the input angular speed. This setting is defined by the product of 2 fractions: N1/D1 * N2/D2 where N1, D1, N2 and D2 are integer values. Tach.1 / Tach.2 ratio maximum value can be set up to 100.



58.5 Triple shaft order analysis : 3 parallel real time SOA analysis

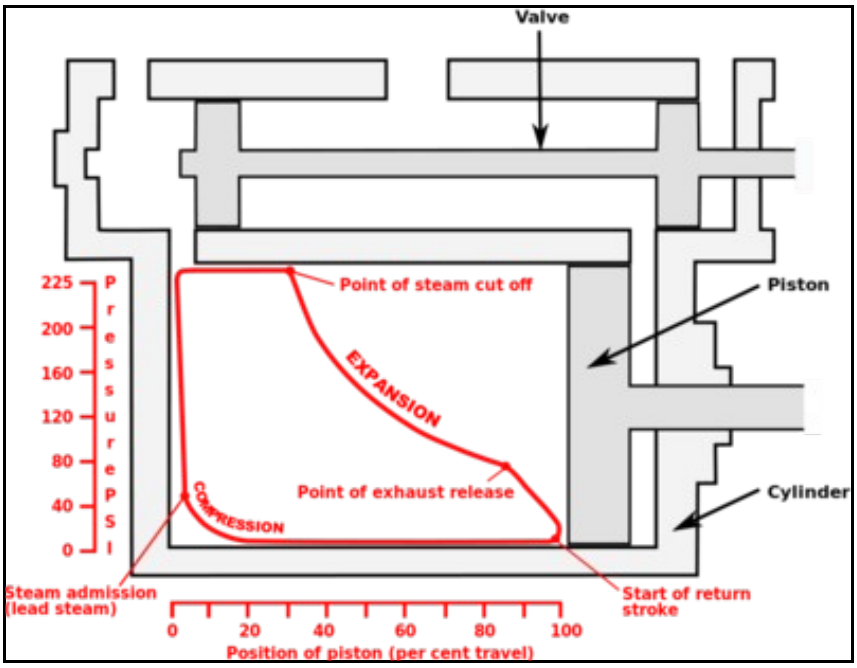
Whether your test is carried on a gear box, an integrally geared compressor or any other multi-shaft rotating machinery, NVGate offers now the possibility to carry **3 simultaneous order tracking analysis** at a time both in online and office mode.

OROS, leader on rotating vibration analysis, is the only one in the world to let you achieve such a performance.



58.6 Display the Pressure Volume diagram (PV) of your Reciprocating machines

A pressure?volume diagram (or PV diagram, or volume?pressure loop) is used to describe corresponding changes in volume and pressure in a system.

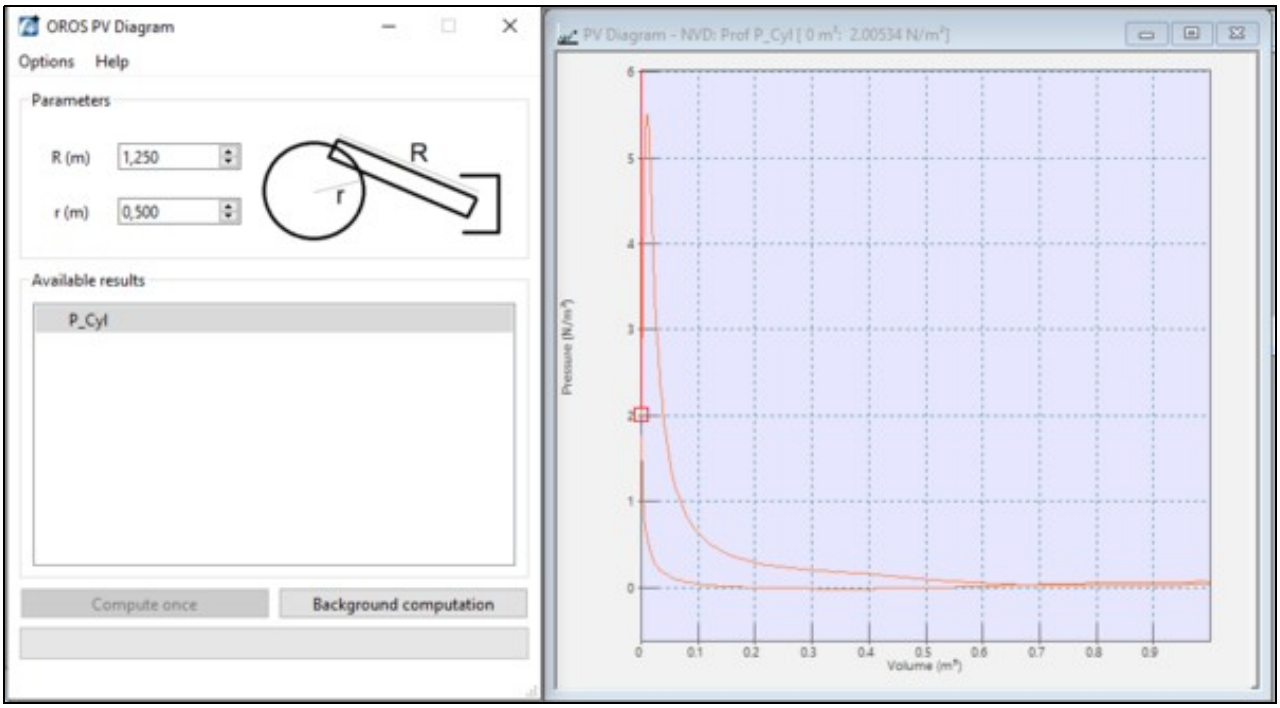


The diagram records the pressure of steam versus the volume of steam in a cylinder, throughout a piston's cycle of motion in a steam engine. The diagram enables calculation of the work performed and thus can provide a measure of the power produced by the engine.

To exactly calculate the work done by the system it is necessary to calculate the integral of the pressure with respect to volume. One can often quickly calculate this using the PV diagram as it is simply the area enclosed by the cycle.

Download: Check the PV diagram page

How to use :



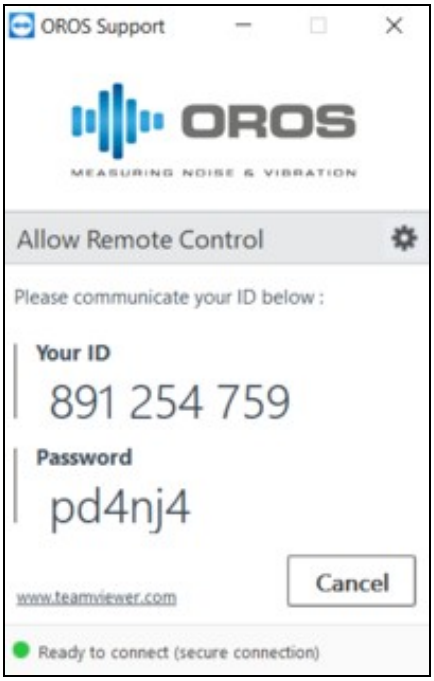
- Define one (or more) channel as a pressure.
- Add this channel into Sync. order (SOA) plug in.
- On SOA plug in , average, domain, select: "Angular"
- Open PV_Diagram.exe
- Click on refresh (right click) in available results if you do not see anything.
- Select the input.
- Compute once will display the PV diagram base once based the last triggerd block.
- "background computation, will continuously compute the diagram.

58.7 Windows 11 compatibility

This version is compatible and fully tested with the last version of Microsoft Windows 10 and new Microsoft version Windows 11.

58.8 Teamviewer V15 quick support

If you have any question for using your OROS analyzer, Teamviewer is a power full tool to take control of your PC and check together your question. NVGate 2022 include a the new version V15 of teamviwer .



This version is available on your computer foler here: C:\OROS\NVGate data\Links\TeamViewerQS.exe . You can also donwload using this specific link : https://get.teamviewer.com/orosTV

58.9 NVDrive

NVGate software can be fully remote-controlled using an external software package. The commands required for controlling each analyzer function are listed in the NVDrive®library.

58.9.1 Toolkit refresh

NVDrive toolkit has been refreshed with new examples, new print screen, new tree structure, .dll have been updated for beeing more clear and highlight the python language. Also we have now only one reference on the price list "ORNV-TOOLKIT" which includes the full toolkit (NVdrive, Matdrive, .oxf, python.).

58.9.2 New commands: Read Write NVGate user properties (Project / Measurement)

NVDrive allows you to take control of the analyzer with command lines. New NVDrive commands have been added on the NVDrive toolkit to read, write and delete the user properties of projects and measurements.


3.4.11 - “GetProjectUserPropertiesList” command. 175
3.4.12 - “GetMeasurementUserPropertiesList” command. 176
3.4.13 - “AddProjectUserProperty” command. 177
3.4.14 - “AddMeasurementUserProperty” command. 178
3.4.15 - “ModifyProjectUserProperty” command. 179
3.4.16 - “ModifyMeasurementUserProperty” command. 180
3.4.17 - “DeleteProjectUserProperty” command. 181
3.4.18 - “DeleteMeasurementUserProperty” command. 182

58.10 New car cigaret lighter plug

For OR36 and OR38 analyzer, OROS has designed a new cigaret lighter for beeing able to deliver 24.5V. You can plug it on 10V-35V cigaret lighter and it will deliver 24.5V on output to power supply OR36 and OR38 analyzer and charge the battery.

It can be ordered with the reference : OR36-8TW-DCCL



(Cigaret lighter power supply for OR35, OR34 and OR10 remain available.)

58.11 Team up your systems when using ORBIGate for your rotordynamics testing

ORBIgate keeps progressing as well bringing new features. In particular the dedicated rotor dynamics solution can **now be used on daisy chained systems** as NVGate. (Tested with 88 channels. Tell us if you need more)
In addition, measuring vibrations on multi-shaft machines such as gear boxes may require positioning several tachometer sensors:
On top of that ORBIGate features as well an extension of the ratio for the **Fractional tach feature up to a 100**.

58.12 New Sound Power V3.20

OROS SOUND POWER Solution has been designed to let you achieve that type of test in the most efficient and accurate way.

This new version includes the following improvements:

- New command to start directly the software on your pre-configured setup
- Option to modify the limit of overall octave filter
- Excel templates fully updated to the last standard
- Full compatibility with NVGate 2022.

Read the dedicated Sound Power 3.20 release note for more info.

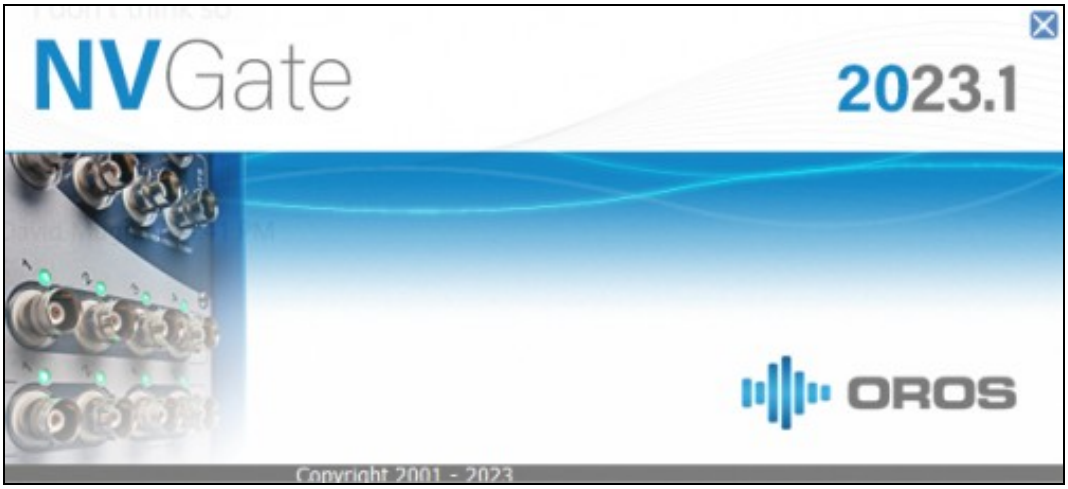
58.13 Bug fixing

- 14133: Record with DC inputs doesn't work for some frequency samplings.
- 14112: Double filter with HP @10HZ in TDA in post analyse: nothing is displayed.
- 14102: Christmas tree with OR35TW is reproduce in a specific configuration.
- 14166: Delete the last value from calibration history.
- 14187: History transducer database can not be display on a japanese windows 10 PC.
- 14190: Random Burst on Block Event.
- 14130: "result selection windows": Lissajous graph is not display .

- 14184: Wrong display of TDA table after copy graph .
- 14210: OCT not possible to set a time constant below 20 ms.
- 14219: Autorange is "Saving the working results".
- 14286: Octave limited range of CPB filter is working strangely.
- 14194: Octave LimitedRange And Reduce SamplingFreq crash NVGate
- 14399: Impossible to compute EVHV Spatiogramme.
- 14290: several Lissajous graphics - cursors are not linked together.
- 14437: Error on NVDrive "NVGS_GetTrackNumberOfSample" Function with SBL > 2GB

59 NVGate 2023: Install Process

NVGate 2023 is now available.



59.1 What's new ?

Read the release note NVGate 2023.

59.2 What do you need ?

59.2.1 Keys

A reader mode is available without license.

The normal version is available for OROS customers under warranty or maintenance contract.
You need to ask your local OROS distributor or customer.care@oros.com for the .zip keys.

59.2.1.1 Download NVGate version

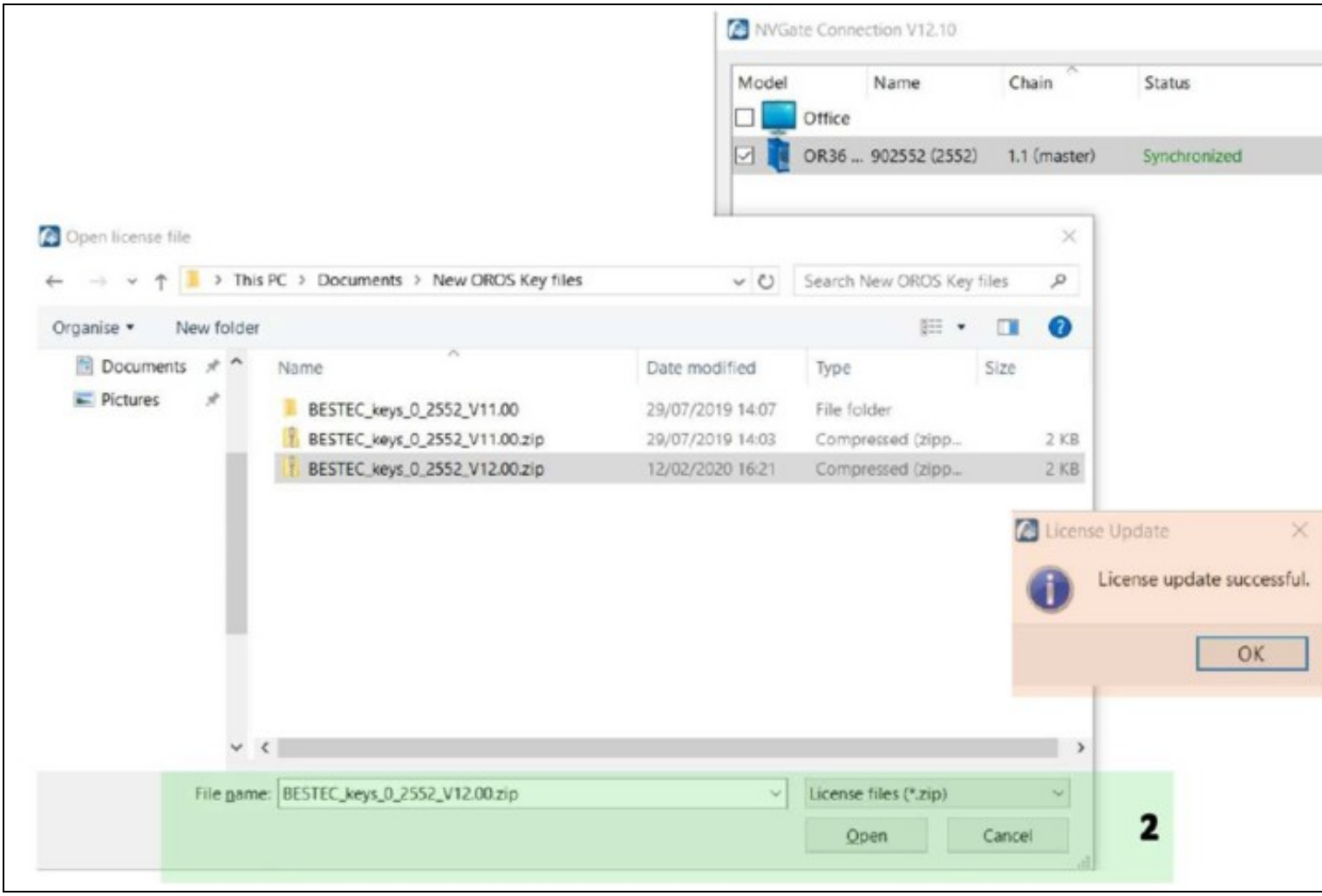
Download NVGate 2023.

59.3 Install Process

- Extract NVGate version
- Launch the setup.exe and follow the instructions.(No need to input the key during the install)
- When the window "NVGate environment" appears, press ok.
- Start NVGate, the window below is displayed.

59.3.1 update the keys

- 1) Select the item (analyzer or dongle) for which you want to update the license keys.
- 2) Select the **.ZIP** archive containing your new license key files.
- 3) The license key files will be automatically copied in the NVGate installation folder and the keys of your analyzer and USB dongle will be encrypted.


NVGate Connection V12.10
Model
Name
Chain
Status
Office
OR36 ... 902552 (2552)
1.1 (master)
Synchronized
Open license file
This PC > Documents > New OROS Key files
Search New OROS Key files
Organise
New folder
Documents
Pictures
Name
Date modified
Type
Size
BESTEC_keys_0_2552_V11.00
29/07/2019 14:07
File folder
BESTEC_keys_0_2552_V11.00.zip
29/07/2019 14:03
Compressed (zipp...
2 KB
BESTEC_keys_0_2552_V12.00.zip
12/02/2020 16:21
Compressed (zipp...
2 KB
License Update
License update successful.
OK
File name:
BESTEC_keys_0_2552_V12.00.zip
License files (*.zip)
Open
Cancel
2

- **update firmware**



Firmware: click on update firmware, it will automatically update the firmware.

That's all. NVGate is updated.

59.4 Troubleshooting

59.4.1 Encrypt keys

If any issue during the encrypt keys, follow this process :

1) Extract the .zip keys file

2) Rename the .txt by a .bat

3) Copy the keys (.bat and .cfg) on the install directory of NVGate (next to NVGate.exe)

4) Plug dongle and analyzer

5) launch the .bat associated to the hardware/dongle serial number.

The dongle/hardware is updated.

59.5 Old versions

59.5.1 NVGate2022 V15

https://wiki.oros.com/wiki/index.php/NVGate_2022:_Install_Process

59.5.2 NVGate2021 V14

https://wiki.oros.com/wiki/index.php/NVGate_2021:_Install_Process

60 NVGate 2023: Release note

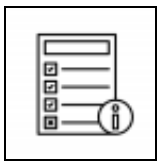
OROS strives to be closer to its users, carefully listening to needs and requests. For that reason, OROS regularly releases new versions. Customers under contract automatically benefit from each release.



The NVGate® 2023 (V16), which is compatible with our latest hardware O4 and new solution Monitoring, became available in February 2023.

The NVGate® 2023.1 (V16.10) major version became available in November 2023. This release of the OROS 3-Series analyzer?s software platform brings additional functionalities and significant performance improvements. Below is a summary of the main enhancements of your NVGate experience:

>> 3 main features to **avoid dramatic mistakes** and bring **efficiency** to maximum



Expert by your side all the time !

As a newbie, have you ever wished to have an expert to check your settings, fix mistakes and explain why? As a pro, have you ever wished to be notified when you made the rookie mistake? With **NVGate Advisor**, your wish comes true!



Modbus TCP/IP client add-on compatibility

Compatible with our new **Modbus TCP/IP** client add-on, which reads entries from Modbus server and injects the data to NVGate in real-time.



Tachometer sensor setup can?t be simpler

The most common rotating speed sensors are defined in the database, simply select yours from the list and the **tacho setting** is ready. Your sensor is not in the list? Easy, just add it to the database and setup becomes hassle-free.

This release note describes the content of the version, with operating details.
To download and install NVGate 2023.1, check this page.

Compatibility*: NVGate 2023 is compatible with the following OROS instruments: O4 - OR34 - OR10 - OR35 TW - OR36 TW - OR38 TW. Depending on the hardware options and version, some instrument features may or may not be available.

60.1 NVGate ADVISOR: Expert by your side all the time !

Have you ever hesitated in selecting analysis parameters ?

Have you ever spent hours trying to figure out why results are not as expected ?

Have you ever ended up with useless measurement data due to slight negligence in settings ?

As a beginner, have you ever wished to have an expert to check your settings, fix mistakes and explain why ?

As an expert, have you ever wished to be notified when you made the rookie mistake?

With **NVGate ADVISOR**, the metrology watchdog developed with OROS know-how accumulated over 40 years, you will always be accompanied by a noise and vibration expert.

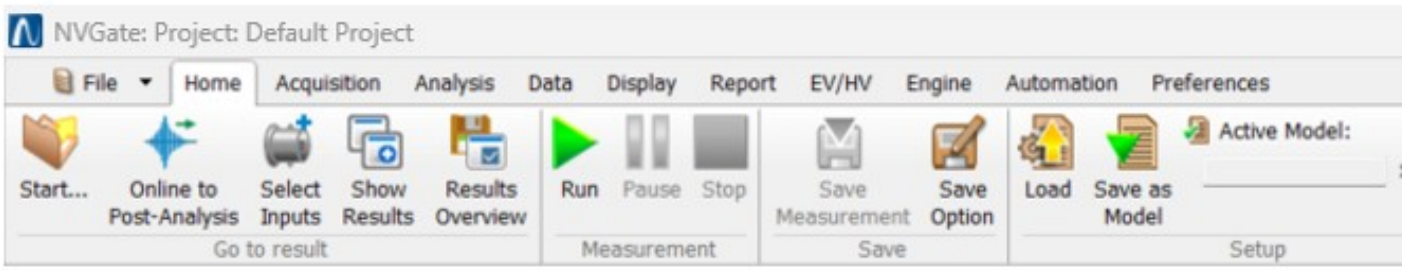
You are doing **impact testing**? Check out this step-by-step guide!

You are doing **rotating machine analysis**? Check out this video!

NVGate ADVISOR brings to the user:

60.1.1 Notification

When one or more issues are detected, the user will be notified immediately by the ?Advisor? icon in the ?Home? tab and ?Analysis? tab,

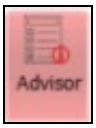


or by the icon at the lower right corner of NVGate.

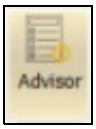


The number shown in the icon is the number of new (unread) Advices generated after the last time the user checked the Advisor window.

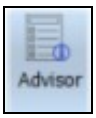
There are three levels of notification, which are color coded:



Error (red): It is certain that a mistake occurs, and the measurement will not be done correctly.



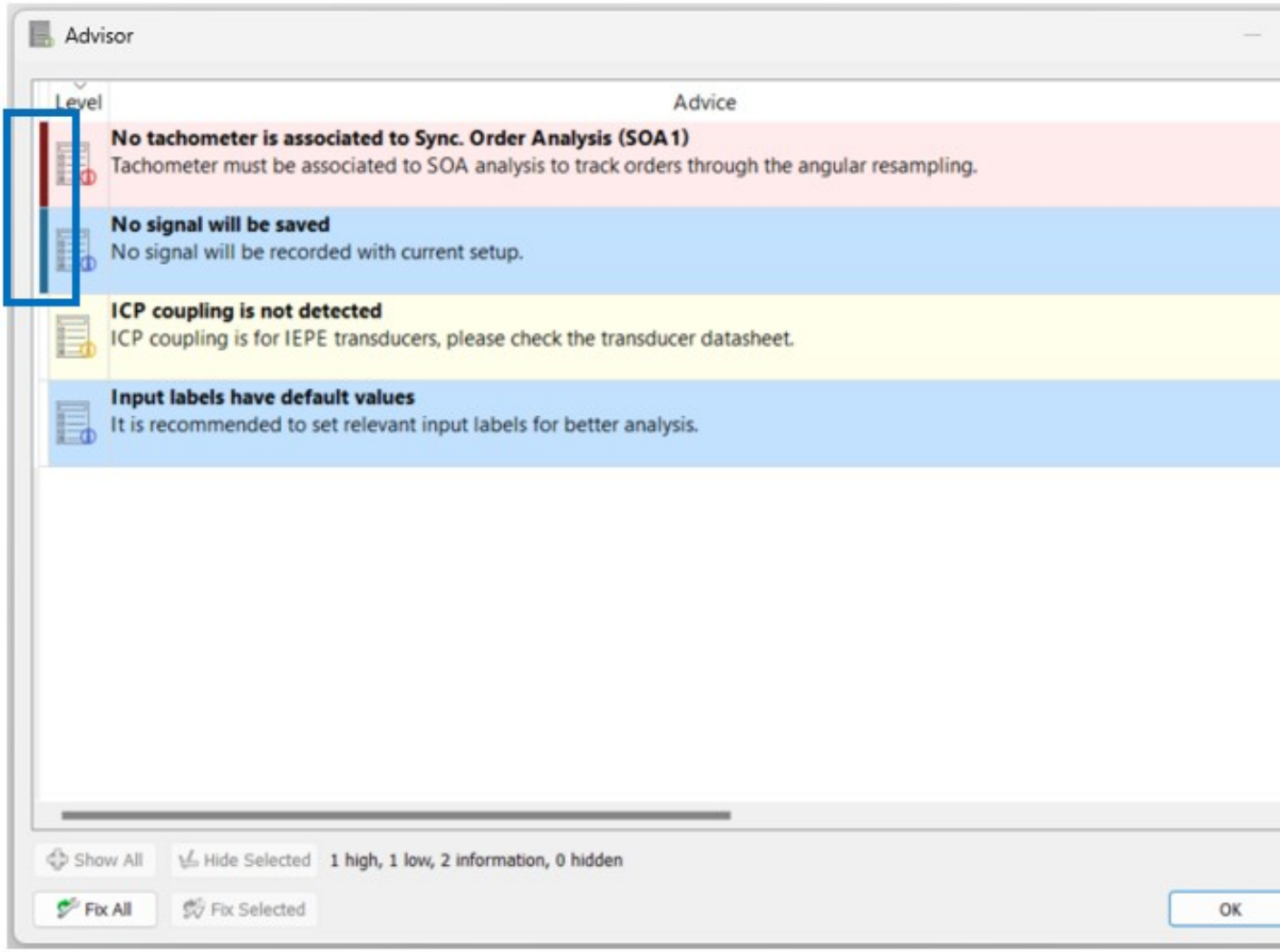
Warning (yellow): It is well likely that a mistake occurs based on our know-how.



Suggestion (blue): It might not be a mistake, but probably a negligence.

60.1.2 Explanation and suggestion

Click on the Advisor icon, and the Advisor window will be opened. The bar in the beginning means that this Advice is new and unread. In each Advice, the explanation of the detected issue is given, and corresponding solution or suggestion is proposed to assist the user to set up properly and obtain correct measurements. Based on the information, the user can decide to fix the issue or ignore it.



60.1.3 Actions


Auto-fix: When this icon is activated, the solution proposed in the Advice can be applied automatically. With auto-fix, it becomes easy to set up

NVGate properly in minimal time. NVGate configuration remains available for your own settings.

 **Manual-fix**: Clicking this icon will open the configuration window containing the parameter which is suggested to be modified. User can solve the issue manually by following the suggestion given in the Advice.

 **Ignore**: User can hide the Advice which is not concerned.

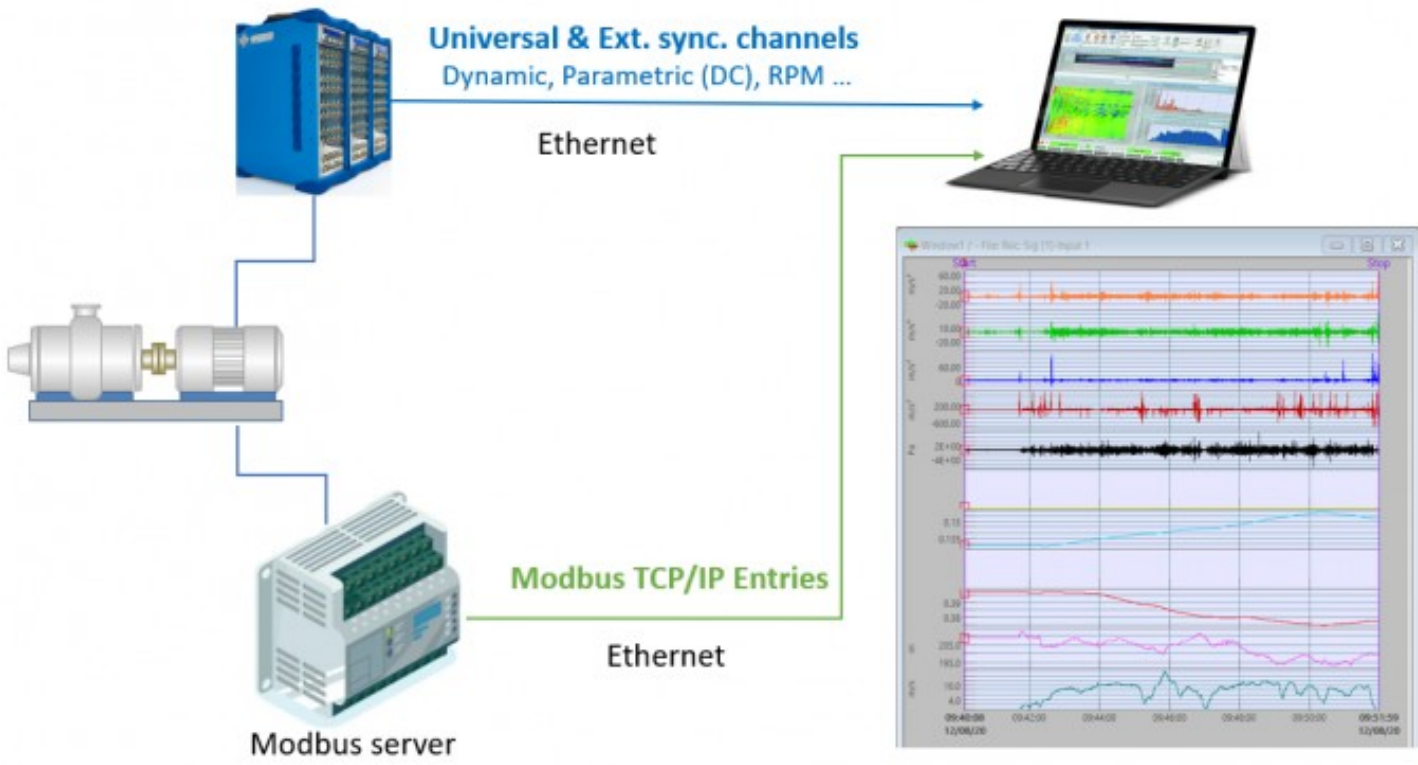
 **Fix-all**: For all the Advices in the list that can be fixed automatically, the solutions will be applied.

 **Show-all**: All the ignored Advices will be shown again.

Advisor works in both online and post analysis modes, helping user to properly set up NVGate efficiently. The majority of current Advices are for the application of impact testing and rotating machine analysis, and more Advices covering a wider range of applications will be available in the future NVGate versions.

60.2 Modbus TCP/IP client add-on compatibility

The new **Modbus TCP/IP** client add-on is available now. It reads entries from Modbus server and injects the data to NVGate in **real-time**.



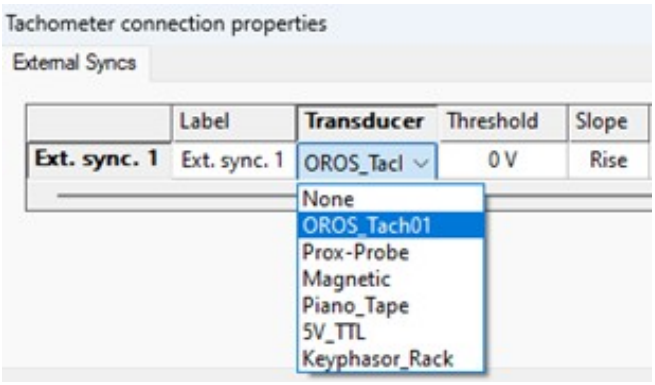
The add-on reads from Modbus server the entries which are synchronized with **dynamic** / **parametric** / **Ext. sync.** channels acquired from OR3X or O4 analyzer, and reinjects the entries to NVGate in real-time using simulated DC channels. These values are then managed as DC data in NVGate. The entries can be saved as **properties** of projects / measurements automatically. They can also be used to **trigger** measurements (recorder, SOA, waterfall ?).

Requirements: the PC running the Modbus TCP/IP client add-on should host at least 2 Ethernet connectors. One is dedicated for OR3X analyzer, and the other is for establishing connection to the Modbus server. The Modbus server is identified with an IP address and a port number.

60.3  Tachometer setup becomes hassle-free

When pulses from tachometers are acquired by Ext. Sync. inputs, user needs to know the delivered outputs in order to correctly set up parameters, for example, threshold, coupling, range peak and so on. In addition, properly setting up max speed, which is linked to the shaft speed, is crucial for a successful analysis such as order tracking. However, sometimes it could be difficult for the users to understand all these settings.

The most common **rotating speed sensors** are now available in the transducer database. User simply selects the sensor from the transducer list, and the tachometer settings are ready.



The transducers in the list can be **customized**, and **new transducers** can be added by editing the file ?Tachometers.tdb?, which can be found in the installation directory of NVGate.

60.4 New default settings

The default settings for waterfall depth have been updated in order to facilitate your measurements and analysis.

- When only 2D results (Profiles) are collected in waterfall, by default the waterfall depth is 100,000.
- When 3D results are collected in waterfall, by default the waterfall depth is 1000.

Be aware that if you load an exiting project, the settings will not be affected. You can also easily change these settings.

60.5 New release of solutions

Same as NVGate, our dedicated solutions keep progressing as well, bringing new features and improvements.

60.5.1 New Balancing 2023

The new version includes the following new features:

- Rotor positions can be disabled in the correction prognosis.
- Correction based on user-defined weights is now available.
- Allowed maximum weight can be set for each position now.
- Full compatibility with NVGate 2023.

60.5.2 New ORBIGate V7.2

The new version includes the following new features:

- To comply with the standard **ISO 20816**, the indicator **S [pk-pk]** for the maximum shaft vibration is now available.
- Tachometer setup becomes hassle-free: User can simply select the sensor from the transducer list, and the tachometer settings are ready.
- Signals are saved by default now, avoiding empty-hand situation due to negligence.
- Full compatibility with NVGate 2023.

Please read the dedicated release notes for more info.

60.6 Bug fixing

In NVG2023.1:

- 14729: CANBus J1939 compatibility
- 15258: CANBus: Add CAN 2.0B
- 15376: Tortional velocity measured from tacho at slow speed becomes 0
- 15372: Phase difference between online results and post-analysis results
- 15367 :Integrator filter at very low frequency phase can be difference in PA and acquisition mode due to HP filter
- 15329: Integrator filter on accelerometer in teamwork mode, value in post-analysis is not velocity
- 15314: In Japanese OS, ?Next? button is not correctly loaded in display window
- 15301: In cascade mode, the calibration process takes too long
- 15299: No explicit error message when trying to load a post-analysis workbook in cascade mode
- 15297: Rename measurement in teamwork mode, need to press refresh to see the change
- 15293: Display reference profile waterfall is limited to 20 channels
- 15220: The orbits (lissajou) in post-analysis are (sometimes) different from Online measurements
- 15167: Signal corrupts with double sampling frequency in V16
- 15147: Time marker mix-ups with several signals in the same project
- 15124: Increase the number of spare units
- 15047: Converting OR10 signal to ORXF format doesn?t work with CAN channels
- 14913: 2 "Channel connection properties" windows at once
- 14025: Press cancel when asked to save the measurement, the sequence jumps ahead

In NVG2023 (V16):

- 15137: Problem when save waterfall slice with holes in reference values
- 15091: Add setting ?record on analyzer or on PC? in the ribbon menu
- 15127: Dongle value shows ?0? in NVGate connection window
- 15107: Several NVDrive commands are not UTF-8 compatible
- 15077: NVDrive command GetActiveTrace always returns -1
- 15074: Unit changes when saving FFT profile order
- 15073: In Japanese OS, the bottom buttons in Environment are hidden
- 15072: Problems with section manager of 1/N octave
- 14955: Signal corrupts with double sampling frequency
- 14826: NVDrive command GSRL_GetInputName does not return the correct value
- 14770: PA on a part of the signal: OCT results are not consistent at high frequencies
- 14761: Default transducer: wrong applied sensitivity in PA
- 14757: Wrong SOA tach when draw a bode diagram
- 14748: Select inputs - the filter function for transducers improved
- 14704: Edit measurement does not work when load a measurement in "reader mode"
- 14520: Sound volume problem

60.6.1 Compatibility

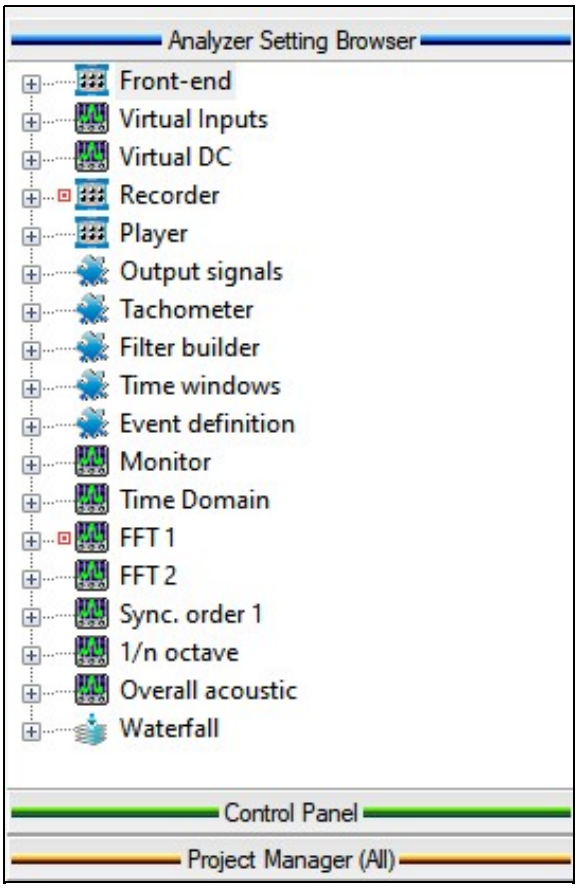
NVGate 2023 is compatible with the following OROS instruments: O4 - OR34 - OR10 - OR35 TW - OR36 TW - OR38 TW. Depending on the hardware options and version, some instrument features may or may not be available.

Note 1 : OR35 V1, OR36 V2, and OR38V2 (end of maintenance in 02/2021) have not been tested with this version. It could work, but will not be supported by OROS in case of issues.

Note 2 : OR34 is now being replaced by O4. NVGate 2023 will be the last version supported and available for OR34.

61 NVGate Analyzer Setting Browser (ASB)

61.1 ASB (Analyzer Setting Browser)



The analyzer settings (front-end and analysis) are gathered in a tree called the Analyzer Setting Browser (ASB). The ASB window is shown/hidden from the *Home* tab / *View* group with the *Workspace* check box.

The ASB is designed to offer access to all analyzer settings. The standard access to the analyzer setup offers a simplified and more intuitive general Vision interface (see Chapter 6). The Modules: The main entries of the ASB consist of modules corresponding to the main analyzer functions.

- The **sources** that acquire, store and play-back signals.
- The **resources** that provide events, filters, weighting windows, and tachometers to the plug-in analyzers.
- The **plug-in** analyzers that process independent analysis modes.
- The **Waterfall** that synchronizes the results computed by the plug-ins.

The ASB has a maximum depth of 3 levels: module, sub-module, and settings. In the case of multiple similar sub-modules (inputs for example), the sub-modules are arranged in collections.

For each module, this document provides an array that summarizes the available results with detailed information. The sub-modules: The modules contain the function and their setting functions.

- Sub-module = a function
- Inputs = incoming signals measured from the front-end
- Outputs = signals generated from the hardware
- Collection = A set of identical sub-modules (e.g; inputs, channels, events, ect..)

The Settings:

The settings are the function?s parameters. There are multiple type of settings identified by specific icons:

-  A scalar (integer or real) boundaries are displayed in the tooltip
-  A list: the setting is one of the list items. Note: the list content may vary with the current configuration.
-  A text e.g; the label of channel
-  A signal. Usually a file containing signal(s)
-  A check box. (e.g; mute/un-mute generator)
-  An action. Temporary information. (e.g; a user event trigger)
-  Special: multi-parameter setting (e.g; The tach ratio)
-  Special: graphical multi-parameter setting (e.g; force/response weighting windows)

Note: A setting may be informative, i.e, it is not possible to modify it. In such case an I is displayed close to the icon: 

Note: Settings may be hidden or visible depending on the current configuration.

Considerations for post-processing : If the time signal is recorded on the PC or on the Mobi-Disk², it is highly recommended to be in office mode (hardware not connected) in order to avoid low performances and malfunctions.

61.2 Controls

This section explains how to access the different controls contained in the ASB (settings, custom display...) and what they mean.

61.2.1 Access

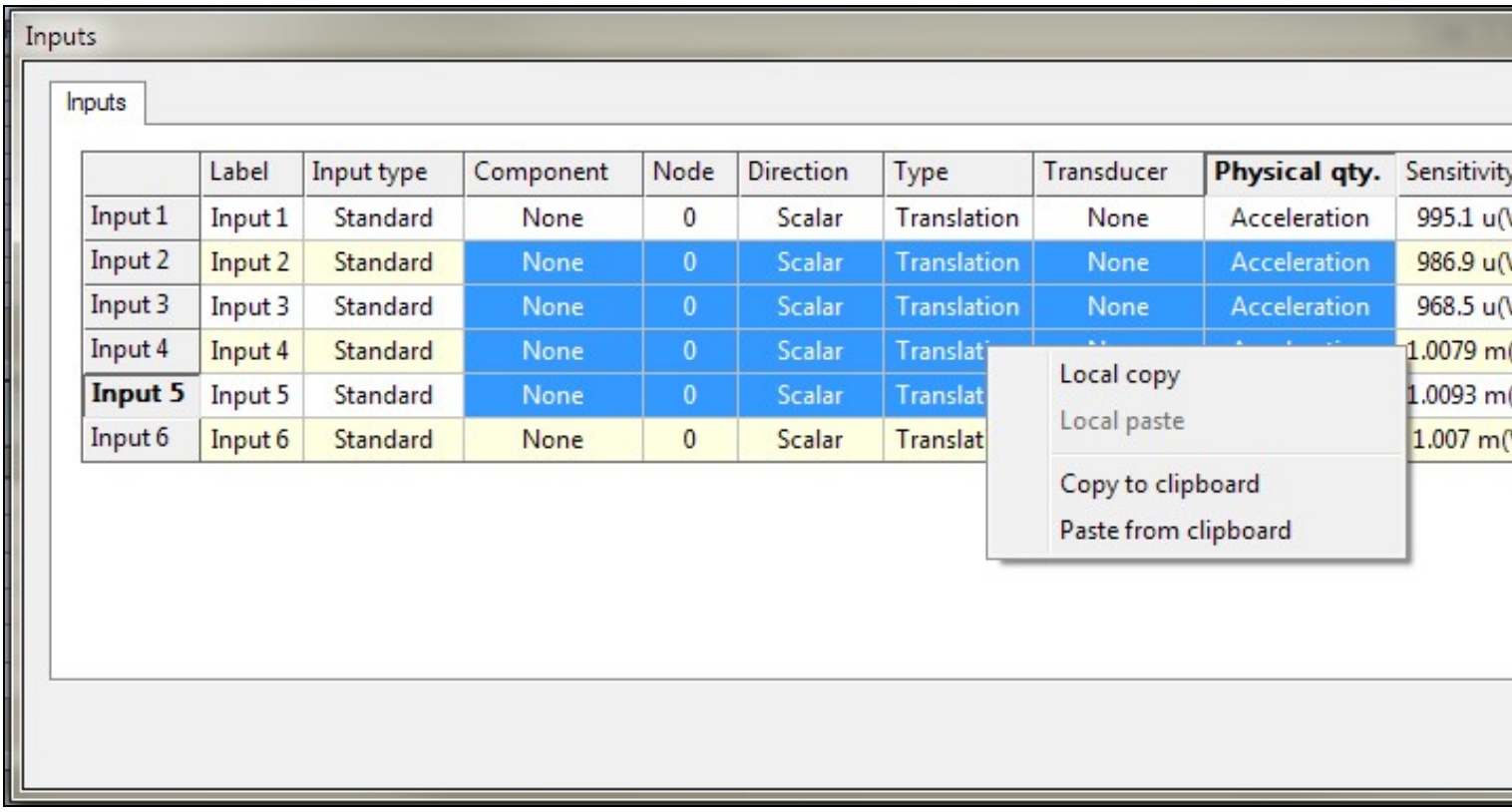
There are 4 way to access a setting:

61.2.1.1 From the module

The first access level is available by right clicking on a module (Front-end, Recorder, Tachometer, FFT...) and **Properties** where all the settings contained in this module can be adjusted.

61.2.1.2 From the collection

The second access level is available by right clicking on a collection (Inputs, Outputs, Channels, Tracks...) and **Properties** where all the settings contained in this collection can be adjusted.

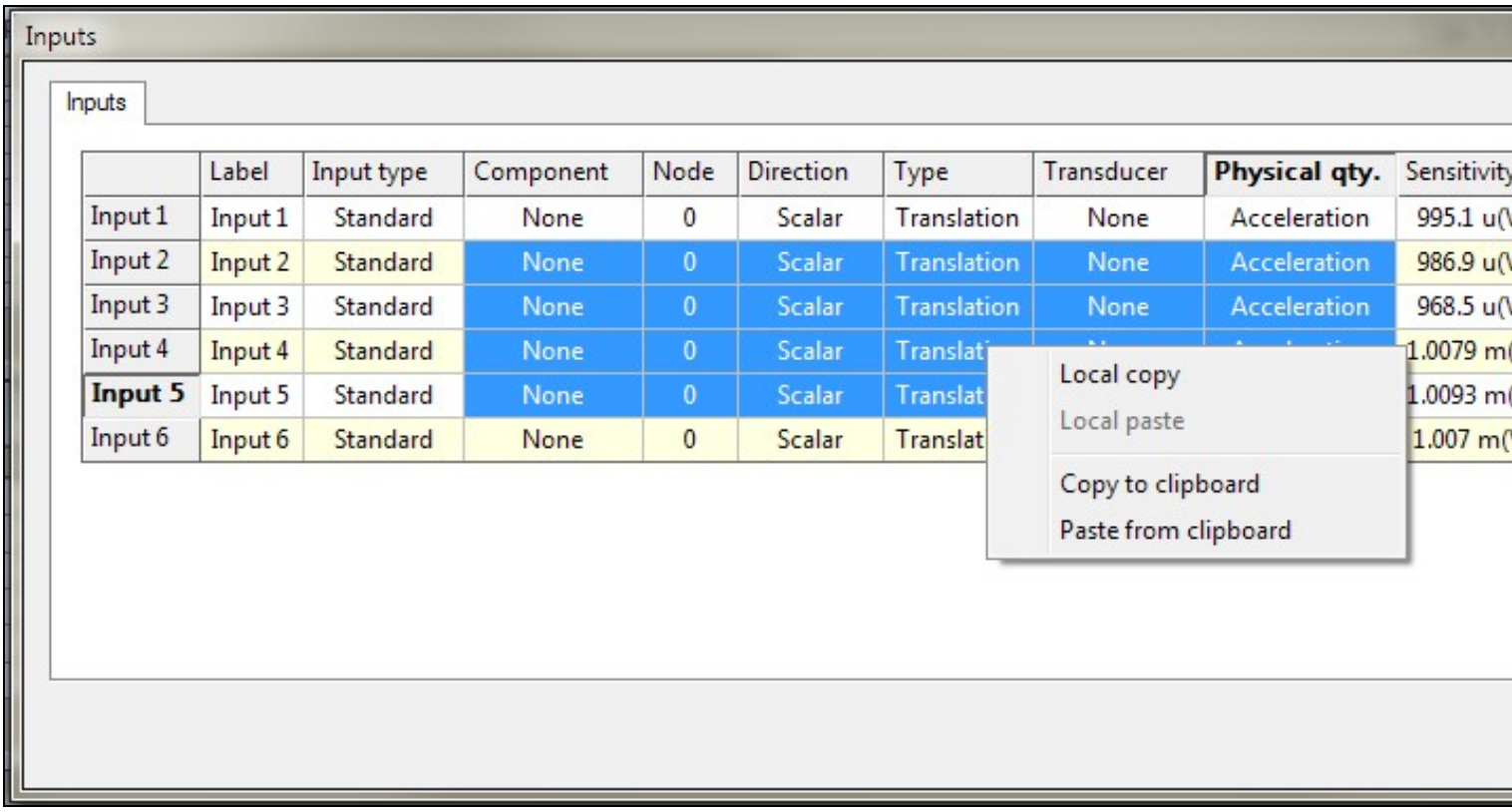


It is also possible to copy and paste some items from a cell, a line, a column or a group of cell to another if they have compatible titles (Label, Transducer, Sensitivity?).

61.2.1.2.1 Copy/paste Front-end tables

Taking advantages from the Excel capabilities for tables? creation and updating, NVGate V8.30 offers now to update the front-end/player tracks from Excel table.

This feature uses the Windows® clipboard.



Two entries are made available from the contextual menu of the front-end or player tracks properties:

Copy to Clipboard and *Paste from Clipboard.* These commands come in addition to the local copy & paste which allows duplicating cells locally. Note that it is also available from any NVGate table.

Using the new *Copy to clipboard* capability allows pasting your inputs/track configuration to Excel, modifying it and then return it back in to NVGate. This also works with any spreadsheet software accepting csv content.

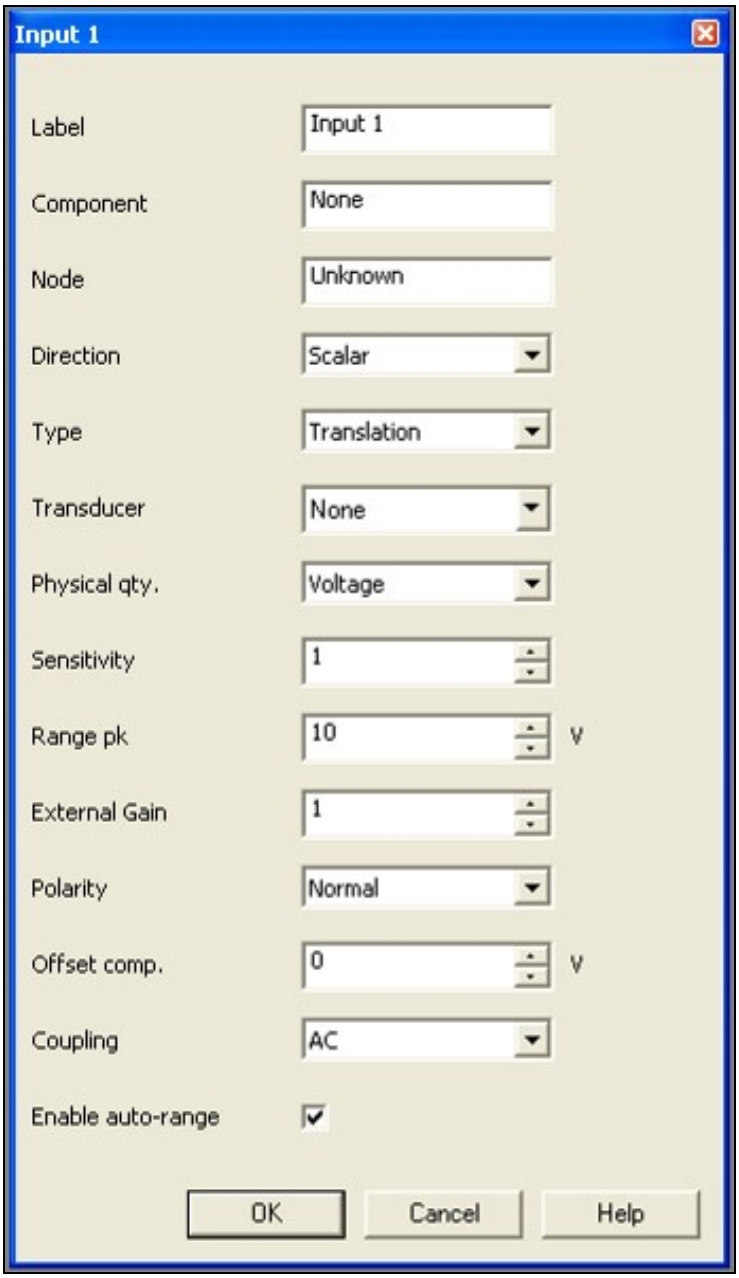
Generally, it works as a *WYSIWYG* (What You See Is What You Get); Data are exported in the same format/unit as displayed in NVGate table. Import (Paste into NVGate) behaves like you are typing the values.

Nevertheless, some precautions apply transferring data from Excel to NVGate:

- Headers (line and column) are added when pasting in Excel. This cell should not be copied prior to paste in NVGate.
- For the purpose of correct reading, units? columns are automatically added. These columns are ignored when pasting into NVGate. These columns may be absent from the Excel table.
- The figure (sensitivity, offset, etc...) units are read according to the current NVGate user preference one - not the units in the Excel table.
- Paste in NVGate starts from the upper-right cell of the area to update in the NVGate table. The cell should not be in editing mode.
- If pasted value is not acceptable for NVGate, the corresponding cell will:
- Adjust it to the closest upper value if it is possible (ex: max range)
- Ignore and keep the current one if not acceptable (ex: unknown coupling)

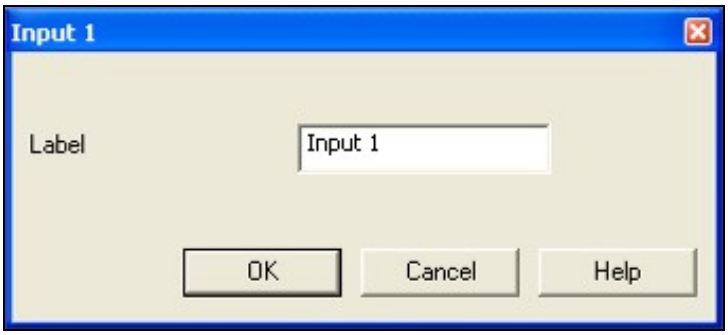
61.2.1.3 From the sub-module

The third access level is available by right clicking on a sub-module (Input x, Output x, Track x, Channel x...) and **Properties,** where all the settings contained in this sub-module can be adjusted.


Input 1
Label
Input 1
Component
None
Node
Unknown
Direction
Scalar
Type
Translation
Transducer
None
Physical qty.
Voltage
Sensitivity
1
Range pk
10
V
External Gain
1
Polarity
Normal
Offset comp.
0
V
Coupling
AC
Enable auto-range
OK
Cancel
Help

61.2.1.4 From the setting

The fourth access level is available by right clicking on the setting itself (Label, Duration, Transducer, Coupling...) and **Properties,** where the new value for this setting can be entered.



61.2.2 Contextual menu

Contextual menus appear when right clicking on an area or an item.

61.2.2.1 On an item

Different controls are available according to the item you right click on.

- **Properties:** displays the properties of the item.
- **Add/Remove:** Available for collections (Channels, Event...), it enables or disables some items of the collection.
- **Set to default**: Reset a setting, a sub-module or a module to the default values. All connections are removed.
- **Copy (Ctrl+C)**: Copy a setting, a sub-module, or a module. This copy is internal and does not use the Clipboard.
- **Paste (Ctrl+V)**: Available when a copy action has been previously performed. Only the settings common to both the copy and the paste item are affected.
- '*IDN* **info:** Available only when the Shift key is pressed. It displays an identification number used by NVDrive.[?]
- **View state**: Available only on plug-ins, it hides or shows the status of this plug-in in the Status window.
- **Add to control panel**: Enable the corresponding setting to be modified from the Control Panel.
- **dB**: Enable the corresponding setting to be displayed in dB. Only available for some scalar settings.

61.2.2.1.1 On ASB background

- **Auto width**: This function adjusts the width of the ASB.

61.3 Plug-in analyzer status

An icon is displayed in the ASB when a plug-in is connected. For each plug-in the icon displays the analysis status (running, stopped, recording...).

- **Running** : the plug-in analyzer is processing the data acquisition.
- **Paused** : the plug-in analyzer is paused. The plug-in analyzer is not processing any data. The user must click on the "continue" button to continue the analysis. For the recorder plug-in the "Continue" action starts a new record because in the paused state no data is recorded.
- **Stopped** : the plug-in analyzer is stopped.
- **Recording** : the plug-in recorder is processing the data acquisition.
- **Block Triggering** : the plug-in analyzer is waiting for the Trigger event to occur in order to process the data.
- **Waiting** : in the manual rejection mode, the plug-in analyzer is waiting for the user to accept or to reject the current analyzed signal block.
- **Failure** : the plug-in analyzer has failed (the analyzer is no longer able to compute the data acquisition; a warning message will appear)

61.4 Copy/Paste settings between plug-ins

By right clicking on any settings of the ASB you can Copy values of settings, and then Paste it anywhere else. There is an automatic type matching, which allows pasting only value of the same settings (using the IDN number).

This Copy/Paste is available at each level of the ASB. This allows for multi-analysis on the same condition.

For example, you can see the same signal in the time domain and in the spectral domain, with exactly the same settings (for instance resolution). In the following example, the FFT1 have been set in the ?Spectral domain?, with a specific range and a resolution. For the FFT2, right click on FFT2 and paste the setting from FFT1, then you have just to change the domain from spectral to time in that case. You can compare the signal in, exactly, the same conditions.

61.5 ASB User preference

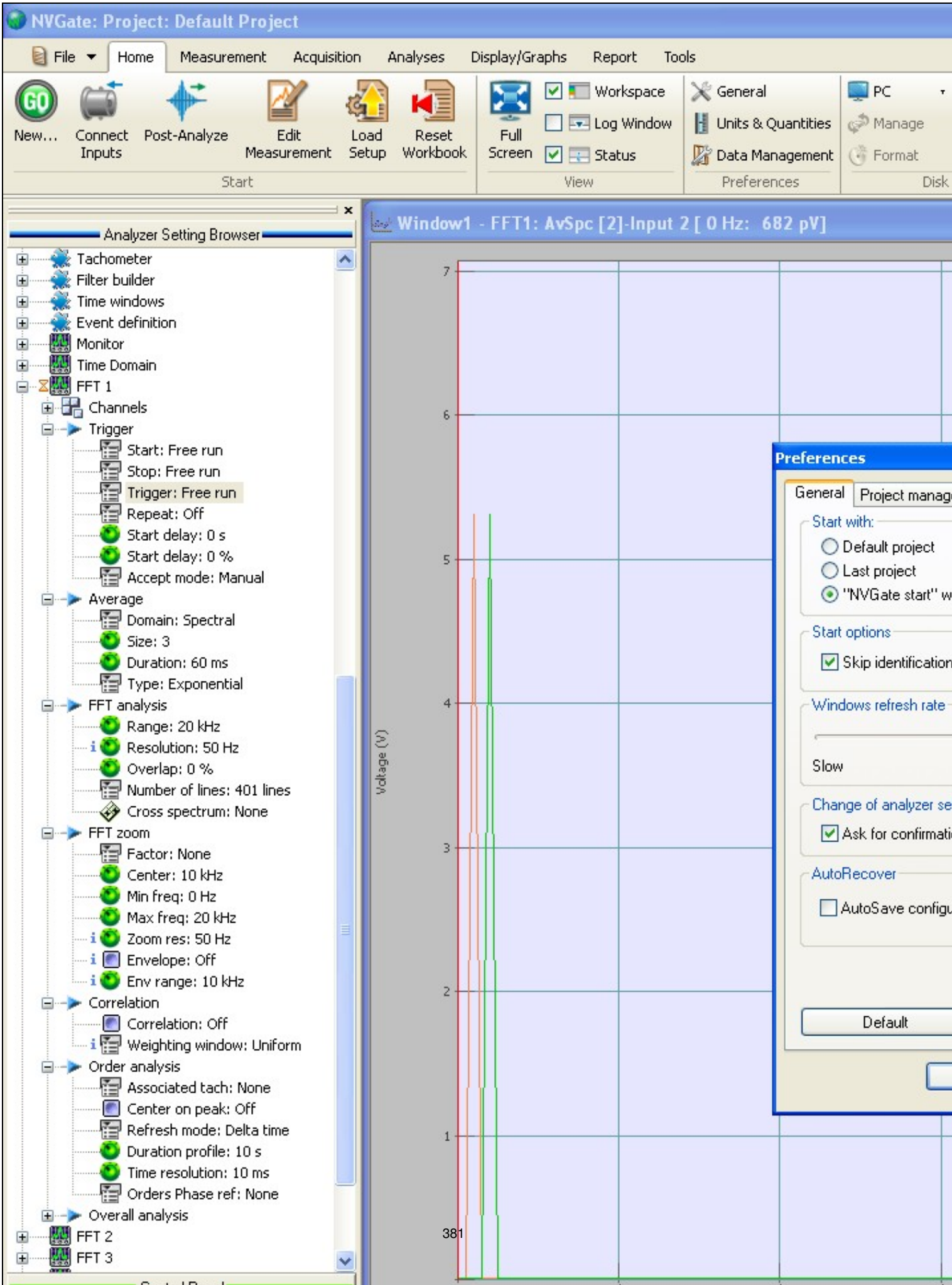
NVGate provides specialized modes that enable dedicated functionalities related to the application. You can enable them by selecting specialized mode functionalities such as:

- Availability of results
- Settings
- User preferences

Unselecting specialized mode will mask these functionalities. There are 2 specialized modes:

- **Structural mode**: this mode is dedicated to the acquisition of modal data through hammer acquisition or signals provided by up to 6 shakers. The following topics are available when structural mode is active:

- Visibility of FRF (H1, H2) and Coherence results in FFT plug-ins.
- Visibility of time windows (force and response) in the ASB, and control panel.
- Availability of the inputs node settings in the inputs properties (ASB, Control Panel and Ribbon)
-


NVGate: Project: Default Project
File
Home
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
New...
Connect Inputs
Post-Analyze
Edit Measurement
Load Setup
Reset Workbook
Start
Full Screen
Workspace
Log Window
Status
View
General
Units & Quantities
Data Management
Preferences
PC
Manage
Format
Disk
Analyzer Setting Browser
Tachometer
Filter builder
Time windows
Event definition
Monitor
Time Domain
FFT 1
Channels
Trigger
Start: Free run
Stop: Free run
Trigger: Free run
Repeat: Off
Start delay: 0 s
Start delay: 0 %
Accept mode: Manual
Average
Domain: Spectral
Size: 3
Duration: 60 ms
Type: Exponential
FFT analysis
Range: 20 kHz
Resolution: 50 Hz
Overlap: 0 %
Number of lines: 401 lines
Cross spectrum: None
FFT zoom
Factor: None
Center: 10 kHz
Min freq: 0 Hz
Max freq: 20 kHz
Zoom res: 50 Hz
Envelope: Off
Env range: 10 kHz
Correlation
Correlation: Off
Weighting window: Uniform
Order analysis
Associated tach: None
Center on peak: Off
Refresh mode: Delta time
Duration profile: 10 s
Time resolution: 10 ms
Orders Phase ref: None
Overall analysis
FFT 2
FFT 3
Window1 - FFT1: AvSpc [2]-Input 2 [0 Hz: 682 pV]
Voltage (V)
7
6
5
4
3
2
1
381
Preferences
General
Project manag
Start with:
Default project
Last project
"NVGate start" w
Start options
Skip identification
Windows refresh rate
Slow
Change of analyzer se
Ask for confirmati
AutoRecover
AutoSave configu
Default

Availability of accept/reject in the bottom right:

- **Rotating mode**: this mode is dedicated to rotating and reciprocating machines. The following topics are available when rotating mode is active:

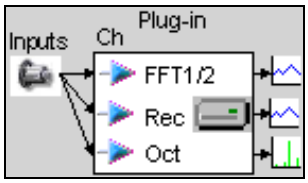
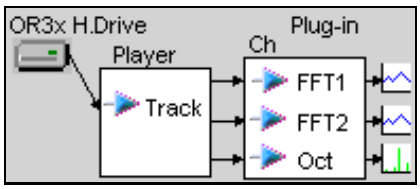
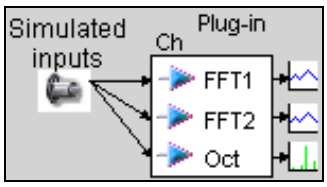
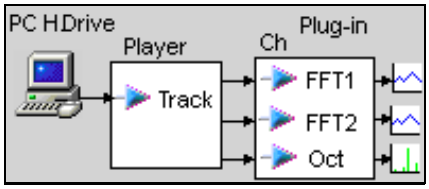
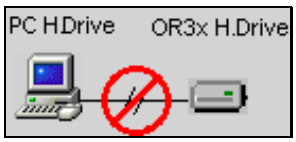
- FFT order extraction, constant band tracking or synchronous order.
- Tachometer settings.
- Plug-in analysis ?Sync Order? will be unlocked.

Note: These specialized modes can be selected (by default) in the user?s preferences.

62 NVGate Architecture

62.1 Modes

Here are the different Operating and Analysis modes you can use with OR3X/NVGate.

	Analysis Modes	
Operating modes	On-line	Post analysis
Connected		
Office		
D-Rec (Optional)		Not possible

Note: You can see the current operating mode and some other information in the Status bar on the bottom of the NVGate Window:

62.1.1 On-line

This mode is available with the Office or the Connected operating mode.

The Connected operating mode is used to record the signal provided by the inputs and perform real-time analysis (FFT, 1:n Oct?.).

The Office operating mode means no instrument is connected. It is the most frequently used to set up and prepare projects and measurements.

62.1.1.1 Post analysis

This mode is available with the Office or the Connected operating mode. It allows computing the saved signals (compute FFT analysis on a recorded signal for example). To use it from the **Channels** menu, select **Post-analysis**. You should have at least one recorded signal file on your OR3X or PC Hard Drive before using the Post-analysis mode.

The OR3X or the PC Hard Drive (according to your selection) sends the recorded signal through the Player module in order to display the signal on the screen.

The inputs are not accessible anymore; they are replaced by Tracks (find all the information about the recorded channels in the Player module).

Note: In the post analysis mode, the Front-end is not available anymore.

Tip: It is possible to re-record a recorded signal file residing on either the OR3X or PC Hard Drive using the Player module.

62.1.1.2 Connected

This mode corresponds to the use of NVGate connected to instruments through the Ethernet link. This configuration uses the hardware resources (DSP?s and local hard disk) for On-line analysis as well as Post-analysis.

The available options in connected mode are set up in the instrument license key. The USB dongle license key is not requested to operate this mode.

62.1.1.3 Office

Office mode uses exclusively the PC resources (CPU, hard disk) for post-analysis and result exploitation, with no connection to instrument.

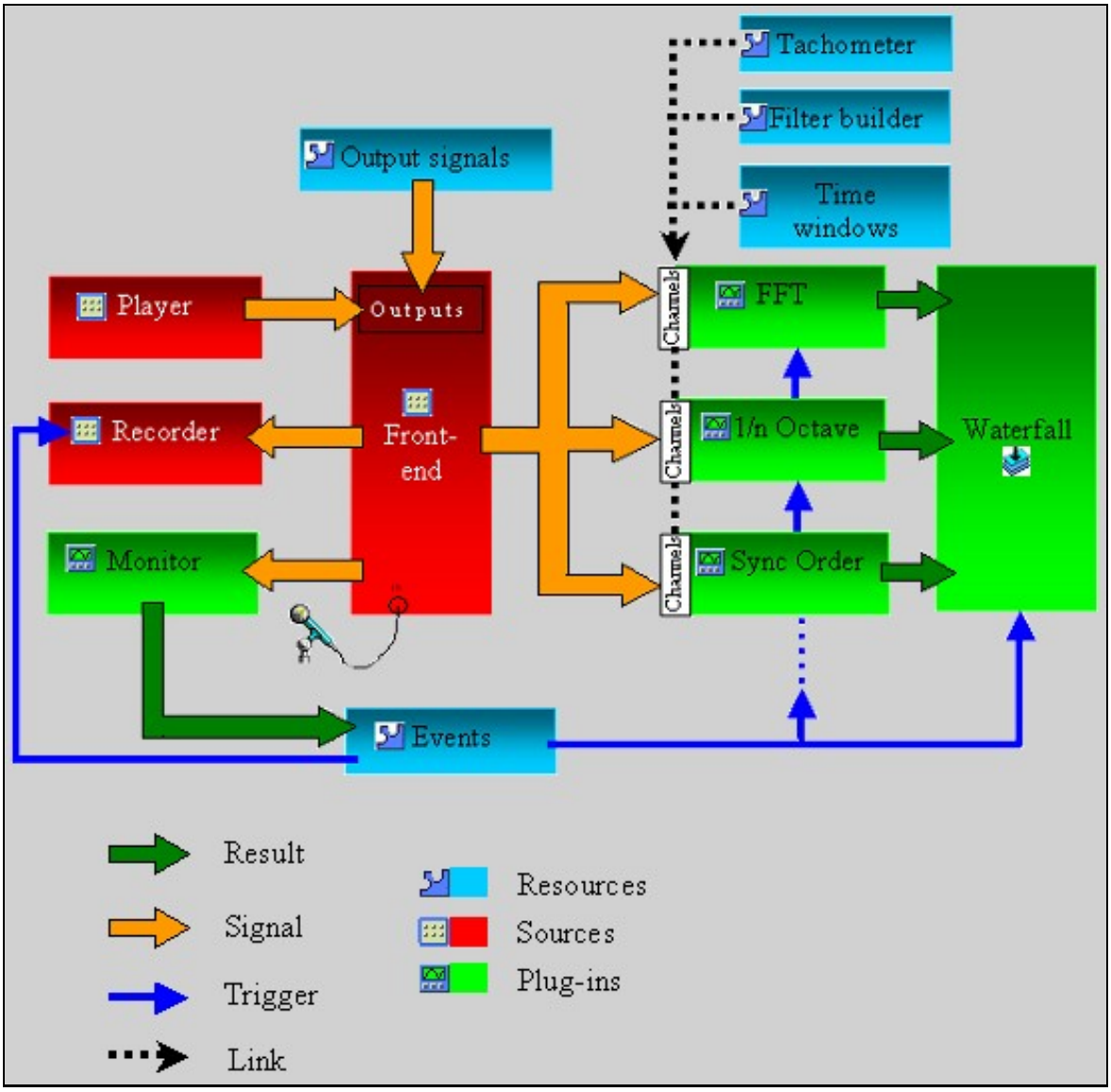
The available options in Office mode are set up in the USB dongle. The USB dongle license key is requested to operate this mode.

Both modes (Connected and Office) can be run simultaneously on different PCs allowing independent use of each license key (for example: On-Line acquisition and Office post-analysis).

62.1.1.4 On-Line acquisition

The following synopsis presents the basic structure of the NVGate multi-analyzer architecture for real-time acquisition and analysis. In this mode, OR3X processes parallel analysis with all plug-in analyzers running at the same time (FFT, 1/n Octave, SOA, Recorder?).

The Front-end inputs may be connected to any plug-in analyzer through the channels. There are up to 32 (8 for OR34/OR35 analyzer) channels on each plug-in analyzer. Any input plug-in analyzer channel combination is allowed.



The plug-in analyzers share general resources such as Filters, Events, Time windows and Tachometers. These resources can be associated with any channel or plug-in analyzer with a centralized set of parameters: for example, by applying filter 1 to channel 1 to 8 of each plug-in analyzer and filter 2 to channels 9 to 16 you can modify filtering characteristics directly from the resource settings.

The Filter builder provides general purpose filters for low pass, high pass, pass band, stop band, integration and differentiation functions that apply to the time domain signals.

For example: distributing Input I to channel 1 to 3, will provide simultaneous analysis of acceleration, velocity and displacement of an accelerometer by applying Integrator filter to channel 2 and double Integrator filter to channel 3.

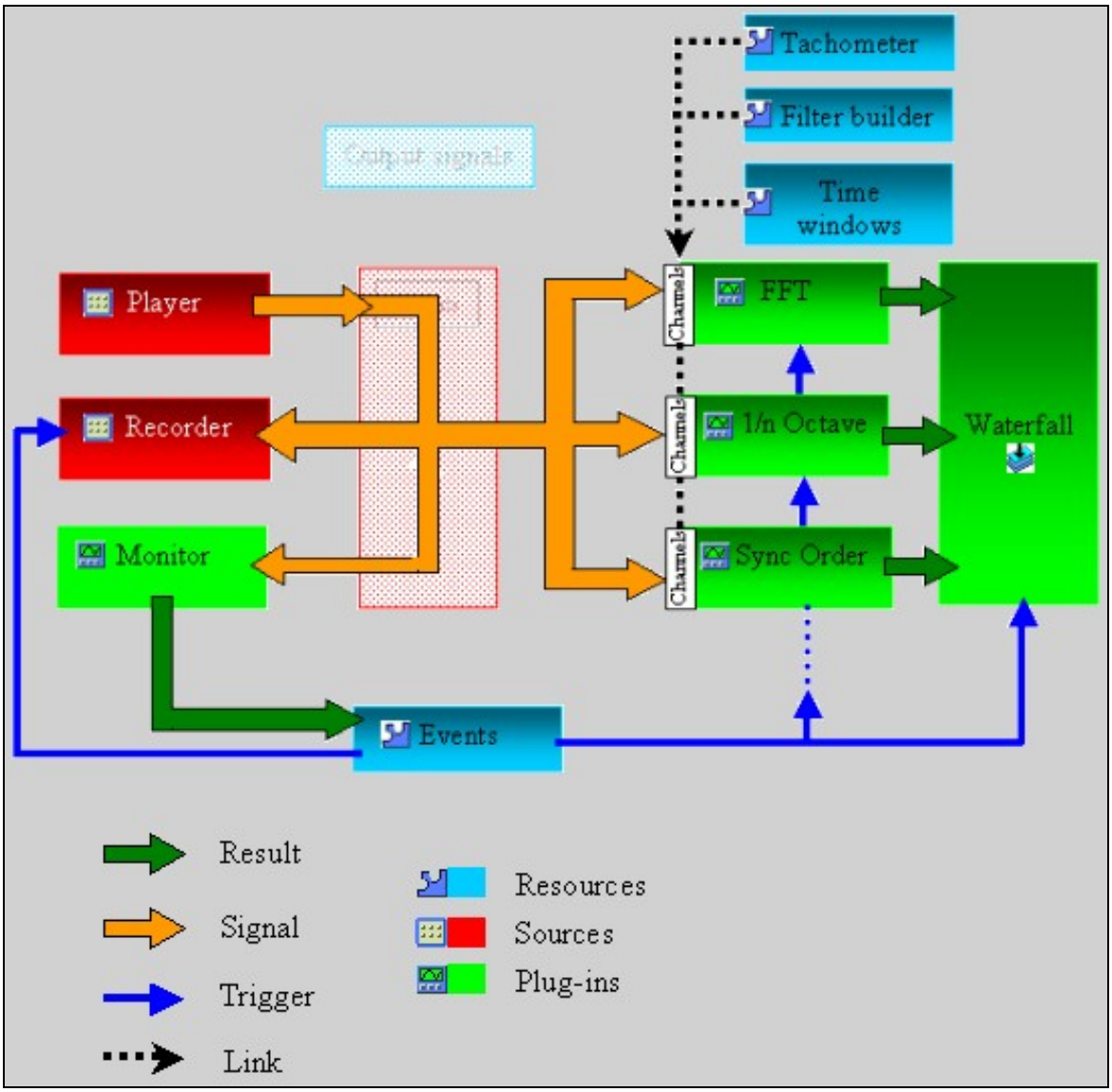
The Time windows resources allow the modification of force and response weighting windows. For example: associating the force window with channel 1 and the Response window to the rest of channels allows the modification of response characteristics from a single set of parameters in the resource.

The Event Definition resource is used to create an event that can start, stop and trigger plug-in analyzers acquisition. These events can be based on different criteria (DC level, RPM, time?) as well as on results computed by the Monitor (Kurtosis, RMS, DC?). For example: an event based on an input RMS level can be used to start and/or stop the FFT averaging and the Recorder simultaneously by connecting the event to the plug-in analyzer trigger sub-module.

The Waterfall module collects and synchronizes the results computed and provided by the different plug-in analyzers. These results are displayed in segments and can be sorted in relation to selectable references (Time, RPM, DC?). For example: while computing orders, it is possible to track these values by adding them and the Tachometer (the reference) to the Waterfall. You will then be able to display order profiles and switch the reference between time and RPM. It is then possible to add any new result (value or spectrum) or any reference (DC input, 2nd tachometer) to the Waterfall.

62.1.1.5 Post analysis

In the Post analysis mode, the Front-end and Output signals are no longer available. The only source able to provide recorded time signals is the player.


Tachometer
Filter builder
Time windows
Player
Recorder
Monitor
FFT
1/n Octave
Sync Order
Waterfall
Events
Result
Signal
Trigger
Link
Resources
Sources
Plug-ins

Post analysis features exactly the same functions as the On-Line mode replacing the inputs by the Player tracks. The Player tracks are then connectable to the plug-in analyzer channels and can be used by the resources. Post analysis processing can be performed on the DSP (Connected mode, only for OR36/OR38) as well as on the PC CPU (Office mode). In addition to the Post analysis, it is possible to split the recorded signal files (channels and duration) by re-recording selected channels and time segments in a new signal file.

Post analysis processing time depends directly on the computation load. It may be faster or slower than the real-time analysis. Using the Post analysis accommodates larger requests in terms of computation power. This cannot be achieved in real-time analysis.

If the time signal is located on the PC or on the Mobi-disk, it is highly recommended to be in office mode (no instrument connected) in order to avoid low performances and malfunctions.

63 NVGate BatchPostProcess tool

Have hundreds of records to post process at once? It has never been easier using the NVGate add-on tool ?BatchPostProcess?.

The batch post-processing tool allows users to automate their post analysis campaigns. Users will be able to calculate a set of results for an entire measurement campaign. In the example below, we carried out 8 run-ups and 8 run-downs for each, then calculated FFTs, RMS values and overall profiles.

63.1 Download

new version V3.0 from march 2026: release note :

- build in python
- new interface
- Tested for NVGate V17 and more
- no need to put it next to NVgate.exe

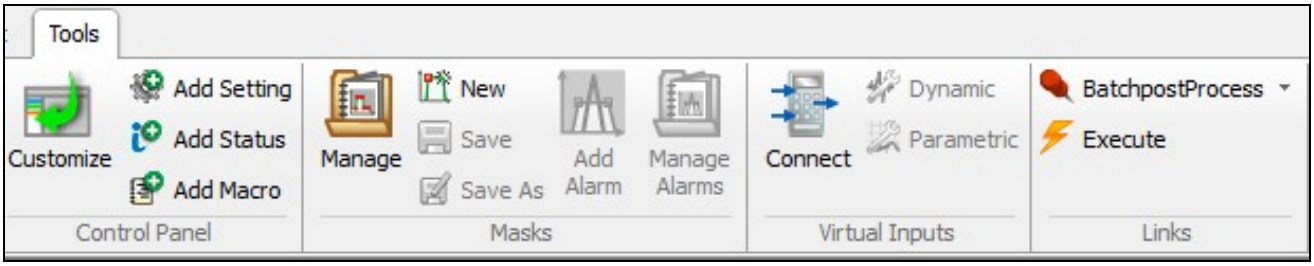
63.2 Package composition

NVGate add-on tool ?BatchPostProcess?: oros_BatchPostProcess.exe

folder: "_internal" this folder need to be next the .exe

63.3 Configuration

Optional : It is recommended to add a shortcut of this exe file in the ?Link? directory (C:\OROS\NVGate data\Links) to have direct access from NVGate in Link Section.

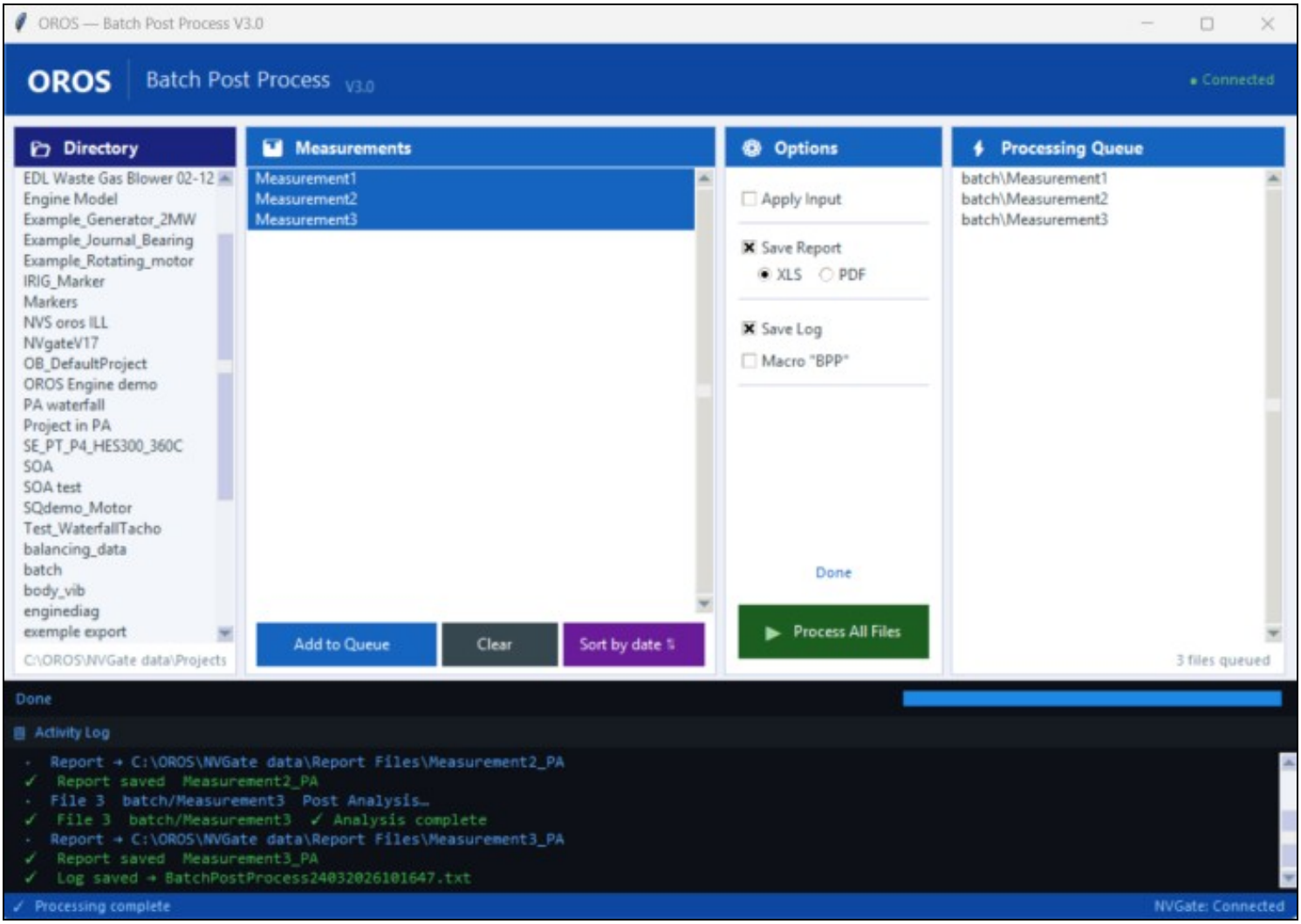


63.4 Principle

- From NVGate, setup your post analysis based on the first record file. Once your configuration is done, run the ?BatchPostProcess?.
- Select from the top left list box the project where the signal files is located to be post processed (can be from any project). Select the signal from middle list box, then ?Add? to the list of signal files to be post processed. It is possible to select signal files from several projects.
- Press ?Process All Files? to start the post process according to the current setup in NVGate. All files from top right list box will be post processed.

Results from post analysis are stored in current project, the name of the measurement is based on each signal file name with additional extension ?_PA?

- All signal files to be processed should be similar (number of channels) to the initial record file. If this condition is not valid, the record file may not be post processed.


OROS — Batch Post Process V3.0
OROS
Batch Post Process V3.0
• Connected
Directory
EDL Waste Gas Blower 02-12
Engine Model
Example_Generator_2MW
Example_Journal_Bearing
Example_Rotating_motor
IRIG_Marker
Markers
NVS oros ILL
NVgateV17
OB_DefaultProject
OROS Engine demo
PA waterfall
Project in PA
SE_PT_P4_HES300_360C
SOA
SOA test
SQdemo_Motor
Test_WaterfallTacho
balancing_data
batch
body_vib
enginediag
exemple export
C:\OROS\NVGate data\Projects
Measurements
Measurement1
Measurement2
Measurement3
Add to Queue
Clear
Sort by date ↑
Options
Apply Input
Save Report
XLS
PDF
Save Log
Macro "BPP"
Done
Process All Files
Processing Queue
batch\Measurement1
batch\Measurement2
batch\Measurement3
3 files queued
Done
Activity Log
· Report → C:\OROS\NVGate data\Report Files\Measurement2_PA
✓ Report saved Measurement2_PA
· File 3 batch/Measurement3 Post Analysis…
✓ File 3 batch/Measurement3 ✓ Analysis complete
· Report → C:\OROS\NVGate data\Report Files\Measurement3_PA
✓ Report saved Measurement3_PA
✓ Log saved → BatchPostProcess24032026101647.txt
✓ Processing complete
NVGate: Connected

63.5 Option

- Option: ?Apply Input? allows to keep the current input table for ?label / Component / Node / Direction?. It?s useful to modify this data for several signal files, either in re-recording or for post analysis.
- Options ?Save Report? allows to generate report from each Post Analysis to Excel. It requires that current post analysis configuration in NVGate is configured with reporting to Excel.
- Option ?Refresh On Stop? should not be activated in NVGate in order to have a report file for each measurement. Report file could be saved in either Excel or PDF format. If the target file for reporting already exists, it is replaced by this new one.

- Option ?Save Log? allows to save a log file from application within NVGate directory.
- Right click on the application background (grey part) offers 3 options:
    - Enable/Disable function ?Set on top?. By default application remains on top of displayed windows.
    - Enlarge ?Selection Measurement? display zone in order to display entire name for measurement list.
    - Minimize to minimize the application windows.

63.6 Troubelshooting

The batch post process is waiting for "FTT STOP" before loading a new signal. If you are doing only recording, the bypass will be to add one channel into the "FFT plug in" for having the "STOP".

63.7 Old version

V2.8

"Apply input" ==> if you change the label, sensitivity (...) of a tack, this will also apply to all the other signal.

"Macro BPP" ==> Macro "Batch Post Process". At the end of the batch post process , a "BPP" macro will be run. So rename the macro than you want to use with the name "BPP"

63.8 Notes

1) This program is delivered free of charge for NVGate V12.00 and later. Support is not automatically provided on this tool.

2) For any other requests please contact your local distributor or the OROS Customer Care department.

64 NVGate Can BUS

64.1 CAN Bus

Car Area Network (CAN) bus is great source of data easily collected into vehicles, jet engines and power generation machineries. This Network provides real-time parameters that can be used to correlate measurements and/or evaluate their influence. As an example, the correlation of noise and vibration with the engine load is a typical application of CAN parameter acquisition. For this application, the engine load is collected from the ECU through the CANBus.

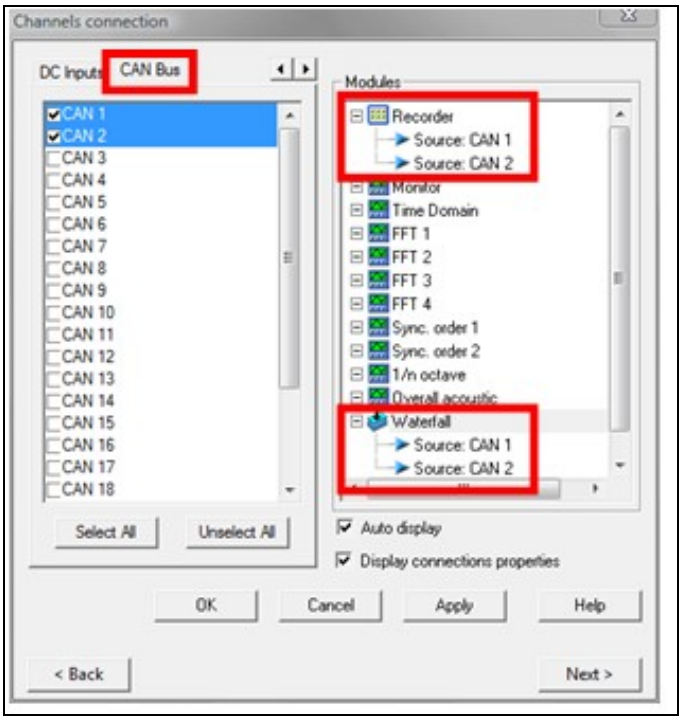
64.1.1 Hardware

The hardware consists of an interface box which is adapted to the CAN-Bus impedance and a High speed serial cable (1 and 3 meters) connected to the new analyzer?s high speed serial port. When connected to a CAN-bus the parameter encoding has to be setup in the software allowing their collection by the hardware.



64.1.2 Connection

Then each CAN parameter is declared in the CAN input list. One CAN inputs corresponds to one parameter from the CAN bus. The CAN inputs are enabled like the DC inputs.



The CAN inputs operate like DC inputs. They can:

- Be recorded with the recorder plug-in
- Monitored by view meter or front end profiles
- Saved into profiles (waterfall)
- Used as waterfall's parameters
- Trigger level and delta level events

Up to 24 CAN parameters are available. Note that as the maximum recorded channels is 38, it is not possible to records all standards inputs (32 inputs + 4 aux. + 2 triggers) plus all CAN inputs (24 CAN parameters).

We are able to **import CanBus .dbc file** to automatically import the settings. Read this page.

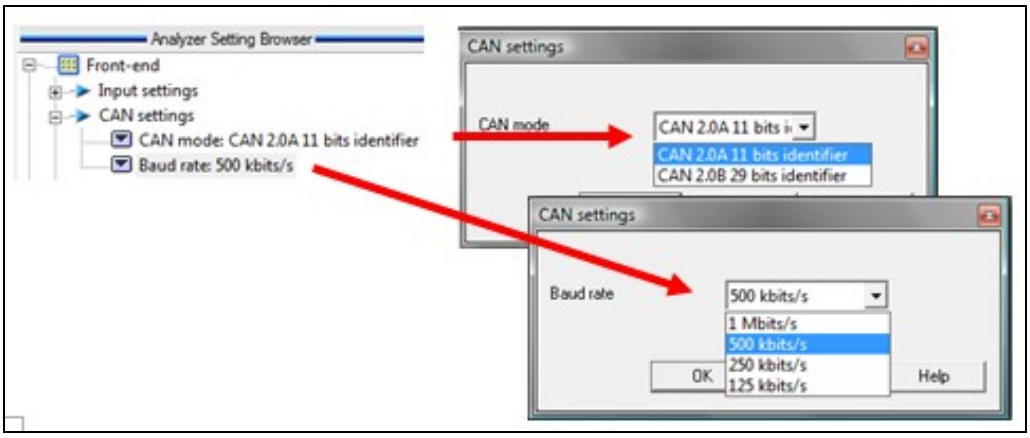
CAN parameters configurations are saved in a model, workbook or project and are easily recalled for further utilization.

64.1.3 Can-Bus general Settings

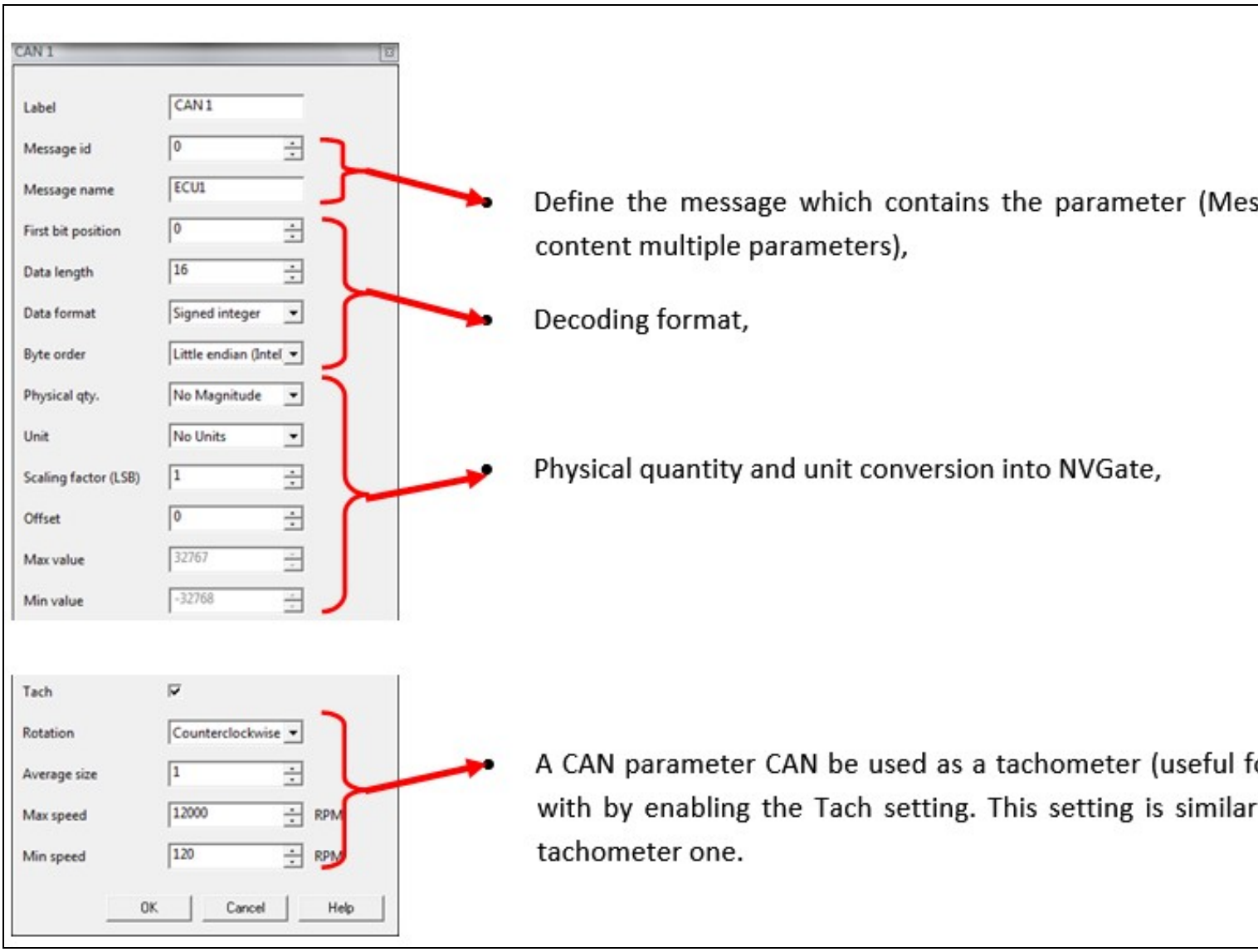
When connected to a CAN-bus the parameter encoding has to be setup in the software allowing their collection by the hardware.

- **CAN Mode:** The Mode one defines the protocol to be used. Most of CAN bus uses 11 bits protocol.
- **Baud Rate:** The Baud rate one defines the speed of the bus. 500 Mb/s is the most common baud rate for automotive application.

64.1.4 Can-Bus input settings



These sub-module contains all the settings related to the parametrics CAN inputs such as data type, parameters and sensitivity read from CAN interface. The CAN interface handle up to 24 different parameters. These format settings define where and how the parameter is encoded in one CAN message:



- **Label**: defines the name of this CAN input (by default CAN input n, with 1 <= n <= 24). The label of each CAN input is used in the result name and in all connection tools.
- **Message ID**: defines the ID of the message which contains the parameter
- **Message NAME**: defines the ID of the message which contains the parameter
- **First bit position**: defines the 1st position of the bit that contains the parameter
- **Data length:** defines the length of the data which contains the parameter
- **Data Format:** defines the format of the parameter if this is a "**Signed Integer**" or "**Unsigned Integer**"
- **Byte order:** defines the order of the byte to decode the parameter. This is either "Little endian (Intel)" or "Big endian (Motorola)"
- **Physical qty**.: defines the physical quantity of the read value of parameter used to convert to NVGate data.
- **Unit**.: the Unit of the read value of parameter used to convert to NVGate data
- **Scaling factor (LSB):** define the scale factor conversion of the parameter to convert to NVGate data
- **Offset:** defines the offset compensation

Example:

Reading active gear:
Physical quantity: No Magnitude, Unit = No Unit,
Scaling factor (LSB) = 1, Offset = 0
Read Data = 2
NVGate value is: Read Data * Scaling factor (LSB) + Offset
NVGate value is: 2

Reading Acceleration in "g"
Physical quantity acceleration, Unit = Gravity (same as NVGate user Preferences)
Scaling factor (LSB) = 0.01, Offset = 0
Read Data = 1254
NVGate value is: Read Data * Scaling factor (LSB) + Offset
NVGate value is: 12.54g

- **Max Value:** defines the maximum value allowed for the parameter. This read only setting is automatically computed according to other setting parameters.
- **Min Value:** defines the minimum value allowed for the parameter. This read only setting is automatically computed according to other setting parameters.
- **Tach**: On / Off. Used to activate a digital tach whose source is this external sync.
- **Rotation**: Depending on the way you look at a measured shaft or on the convention you are using, the shaft may be considered as rotating clock wise or counter clock wise. This has noticeable impact on the phase of spectra and orders.

See Tachometers § for more details.

Hidden/fixed: Hidden if Tach is Off.

- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.

Hidden/fixed: Hidden if Tach is Off.

- **Max speed**: defines the highest measured angular speed. All revolutions with a speed higher than Max speed are rejected. By default Max speed is expressed in RPM.

The Max speed setting is also used:

- to specify the limit of Y axis of the RPM profile result
- to compute the limit of the maximum order of the SOA plug-in analyzer.

Hidden/fixed: Hidden if Tach is Off.

- **Min speed**: defines the lowest measured angular speed. All revolutions with a speed lower than Min speed are forced to 0 RPM. By default Min speed is expressed in RPM. The user can enter any value between Max speed / 1000 and Max speed. The max Min speed and min Min speed are defined according to the Max speed and Speed ratio.

Hidden/fixed: Hidden if Tach is Off.

64.1.5 import .dbc file

*We are able to **import CanBus .dbc file** to automatically import the settings. Read this page.*

65 NVGate CBT principle and settings

Constant Band Tracking (CBT) feature consists of Order analysis calculations based on energy summation from FFT data. Summation bands (in Hz) defined by a user will be fixed over time, through run up or down condition of the measurement. The provided tach signal is connected to FFT and energy summation around multiple (integer or not) of rotating frequency will be calculated in real-time.

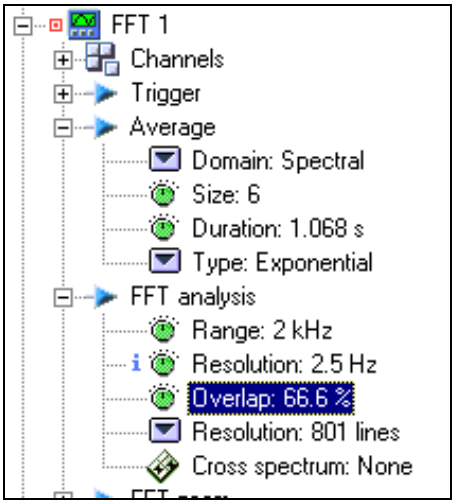
For FFT Spectrums giving discrete frequency lines, energy summation will be based on the summation of spectral lines values. The minimum number of lines to be taken into account is related to windowing function used for time block filtering. Up to 8 different orders may be extracted per channels. Order selection may be different from one channel to another.

65.1 Setting Constant Band Tracking Parameters

65.1.1 a/ Order Amplitude Extraction

Order amplitude extraction from FFT spectra is highly dependent on FFT speed itself. High resolution in FFT setting (very small delta f) will result in long trigger blocks and consequently slow FFT refreshes. Fast run or run down conditions (quickly changing vibration signature) may therefore be incompatible with slow FFT calculations. One way to avoid this problem may be to reduce Spectrum resolution to an acceptable value and add an Overlap (see picture 1) in FFT calculation.

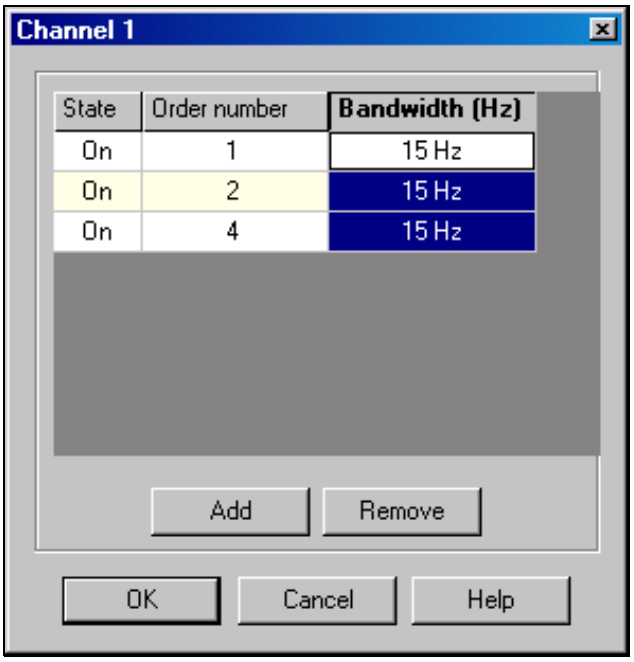
The number of averages is also a parameter to look after as too many averages may smooth run up/down vibration signature. Contrarily too few averages may result in a noisy looking order amplitude curve.



Picture 1: Overlap setting

65.1.1.1 b/ Frequency bandwidth definition

Frequency band on which order amplitude may be extracted is to be defined by user for each channel (see picture 2). Too wide of a frequency band definition may lead to measurement errors, as harmonics from rotation speed may be very close at low speed. For instance at 1000 RPM, Order 1 will be at 16.6Hz, Order 2 at 33.2Hz, defining a frequency band for energy summation of 50Hz for instance for order 1 will result in integrating Order 1 and Order 2 in this case. More generally speaking the amplitude value of Order 1 calculated with Constant Band Tracking technique may often be overestimated during low speed analysis process.



Picture 2: frequency bandwidth definition

Minimum frequency bandwidth available

Minimum band available is directly related to weighting window type used in FFT calculation.

Due to window shape, energy of a pure tone sine wave for instance may be split on 3 or more spectral lines. Consequently, a minimum frequency band will be proposed in the setting window.

Example of Hanning window:

From the curve shown in Picture 3, you can see that applying Hanning weighting window on a pure tone sine wave will result in energy spread between the 2 side spectral lines (-1 and +1 on Picture 3) of sine frequency. Energy on the next spectral lines (-2 and +2 on Picture 3) will be reduced to 0 amplitude.

Picture 3: Hanning weighting window

In this case, if Δf is the spectral resolution of FFT, f_0 the frequency of a vibration phenomenon, minimum energy calculation for Constant Band tracking should be done at spectral lines:

$$[(f_0-\Delta f) + f_0 + (f_0+\Delta f)]$$

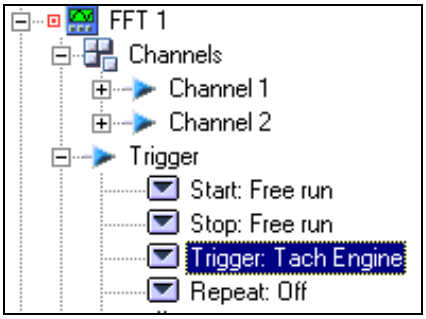
that is to say a frequency bandwidth of

$$\text{CBT min band} = (f_0+\Delta f)-(f_0-\Delta f)$$
$$= 2*\Delta f$$

NOTE: when f_0 is not matching exactly one spectral line (f_0 is not a multiple of Δf) leakage phenomenon may happen. In this case energy of vibration will be spread on next closest spectral lines (on the left and right). Energy picked up at spectral lines $(f_0+\Delta f)$ or $(f_0-\Delta f)$ corresponds itself to the energy component measured on a frequency band of $[f_0+\Delta f-\varepsilon;\ f_0+\Delta f+\varepsilon]$ or $[f_0-\Delta f-\varepsilon;\ f_0-\Delta f+\varepsilon]$, where ε correspond to leakage bandwidth. In OROS OR2x, ε was considered to be equivalent to $\Delta f/2$.

65.1.1.1.1 c/ Phase calculation in Constant Band Tracking

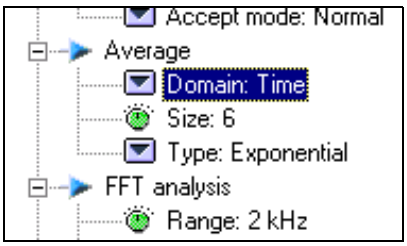
In order to extract precise phase information from Constant Band Tracking, measurement have to be synchronized with rotational speed. Acquisitions of FFT blocks (trigger block) will need to be synchronized with Tach pulses in order to guaranty exact start condition in time (see Picture 4).



Picture 4: Trigger setup for CBT phase

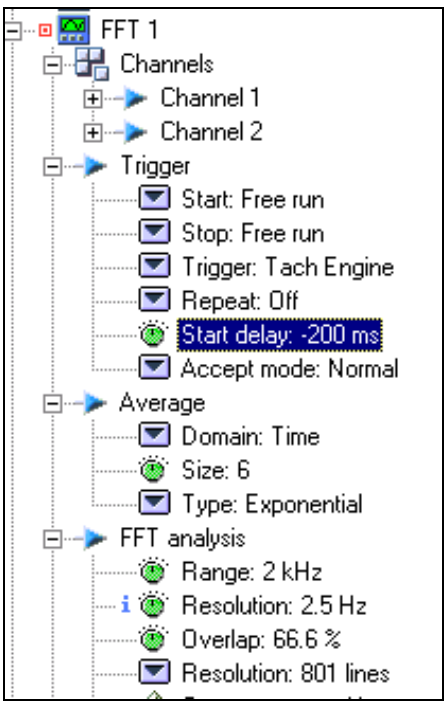
Increase of phase precision with averaging domain.

Provided the FFT trigger condition is set to Tach pulses, averaging domain be can be set to Time. This will activate Time Shift Resampling (see User Note: S015-081-1 Time shift resampling) in time domain and therefore increasing phase accuracy of trigger block by a factor of 16.(see Picture 5)



Picture 5: Time domain averaging setting

Similarly, to guaranty that core information of Trigger Blocks (and therefore phase information) are not filtered out by weighting window, it is recommended to center time Trigger Blocks by shifting them half a block. This is made possible through the 'Start Delay' feature by adjusting it to a negative value of half the size of a trigger block (equivalent to 1/[2*"delta"f], where "delat"f is the spectral resolution). (see picture 6)



Picture 6: Trigger delay setting in CBT

65.1.2 Difference beetween CBT and SOA

Read this page.

66 NVGate Connection Wizard

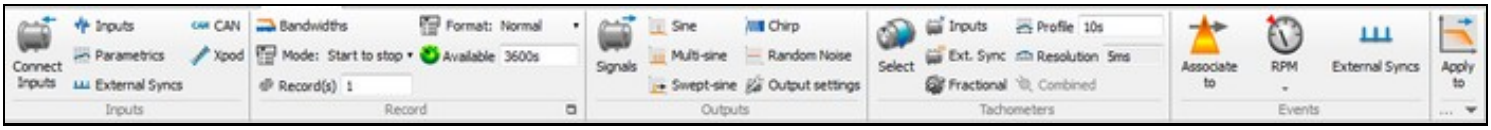
66.1 Connection wizards

Connection wizards are available to connect the different inputs (or files track) to the analysis parts such as plug-in analysis, monitor, recorder, events and waterfall.

The analyzer allows processing simultaneously any inputs in any analysis modes (true multi-analysis).

Connection wizard are available from:

- The ***Home*** tab /***Start*** group -> *Connect Inputs* or *Post-Analyze*
- The Acquisition tab:



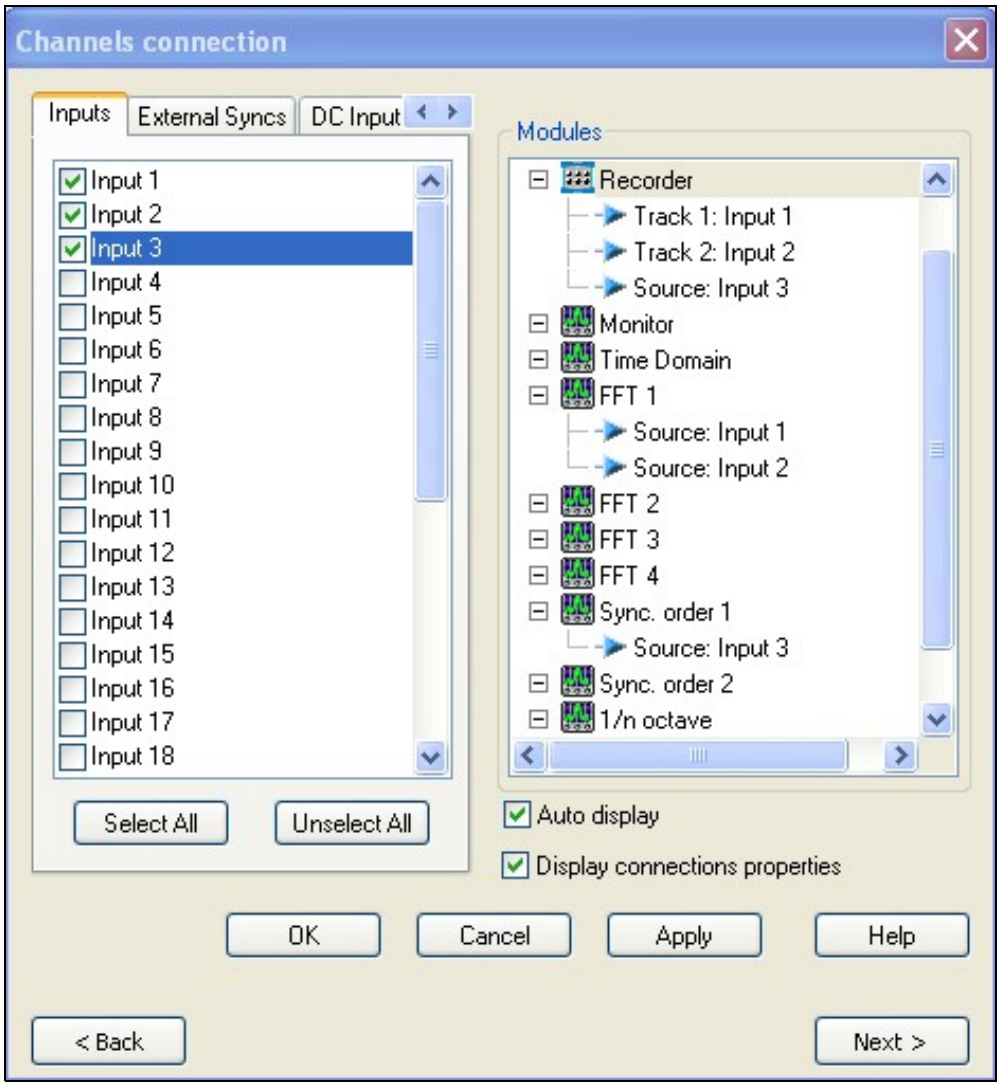
The contextual menu of the "collections" of entries from the ASB



66.1.1 Inputs

66.1.1.1 Dynamic Inputs

To select inputs, simply drag & drop the selected inputs to the requested analysis mode (plug-in analyzer), you will immediately see the inputs sharing out.

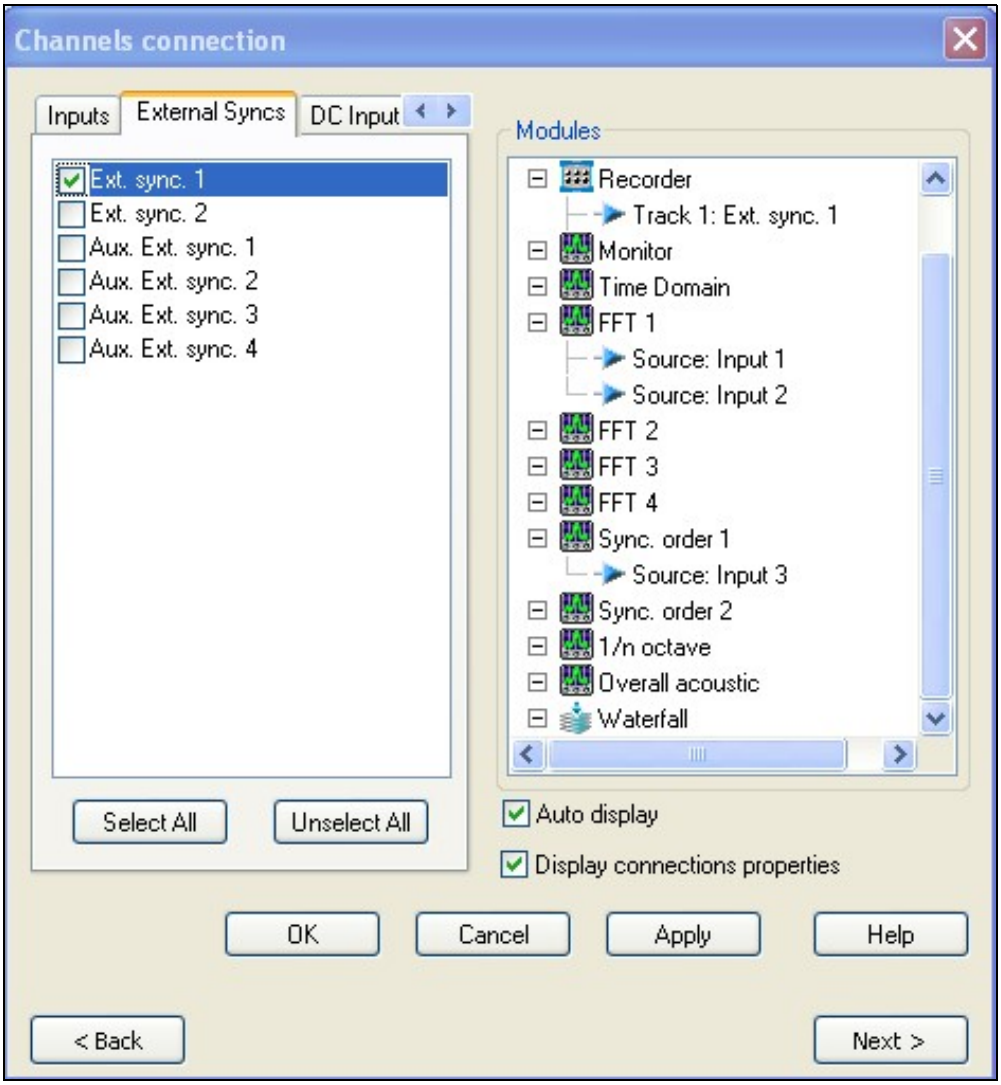

Channels connection
Inputs
External Syncs
DC Input
Input 1
Input 2
Input 3
Input 4
Input 5
Input 6
Input 7
Input 8
Input 9
Input 10
Input 11
Input 12
Input 13
Input 14
Input 15
Input 16
Input 17
Input 18
Select All
Unselect All
Modules
Recorder
Track 1: Input 1
Track 2: Input 2
Source: Input 3
Monitor
Time Domain
FFT 1
Source: Input 1
Source: Input 2
FFT 2
FFT 3
FFT 4
Sync. order 1
Source: Input 3
Sync. order 2
1/n octave
Auto display
Display connections properties
OK
Cancel
Apply
Help
< Back
Next >

Active input: Lists the available inputs. Check inputs to activate them. Multiple inputs may be selected.

- **Plug-in analyzer:** Lists the available plug-ins and the inputs connected to them. Several inputs can be selected and dragged & dropped on selected analyzers. If an input is dropped on an analyzer, it will be automatically checked.

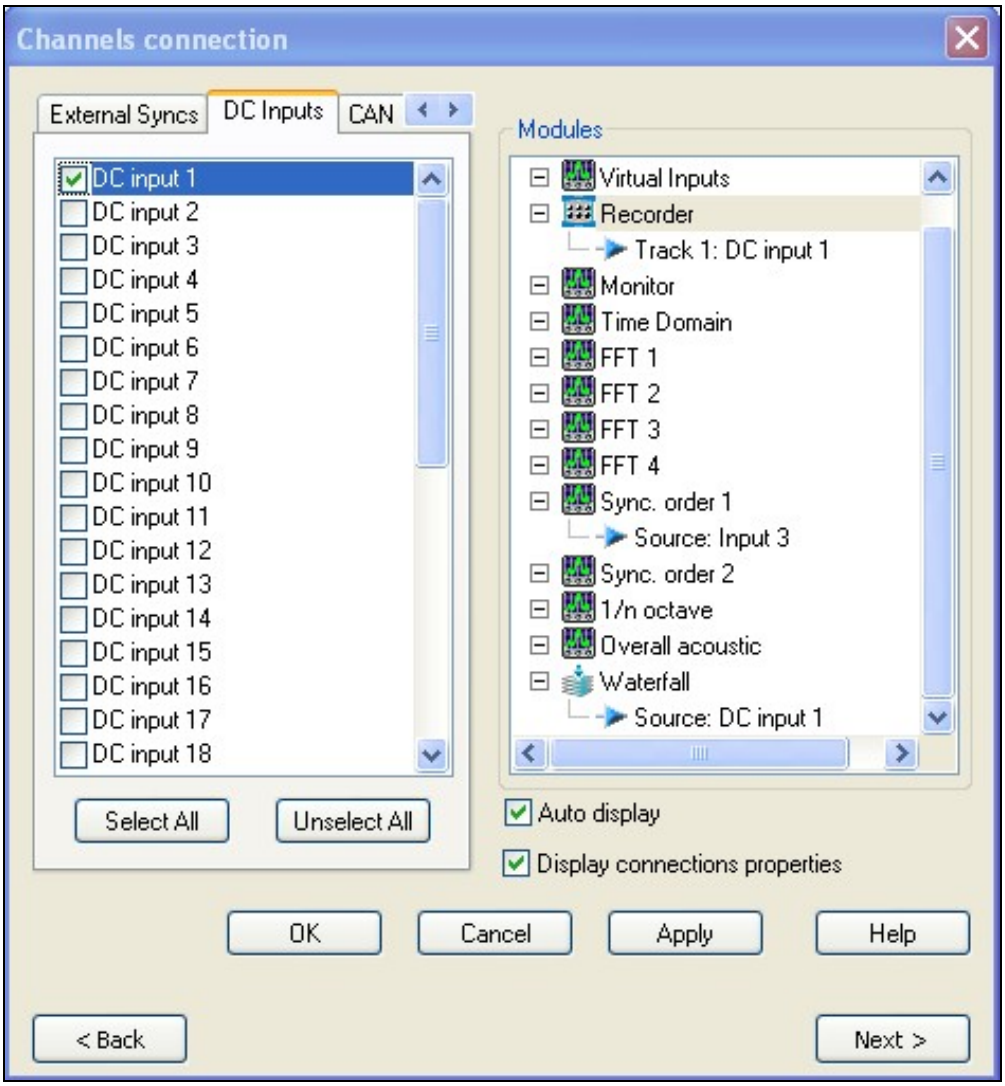
66.1.1.1.1 External Syncs

In the same way, the selected External Syncs could be connected to the recorder.



66.1.1.1.1.1 DC Inputs

Using drag & drop, connect the selected Inputs to the Recorder and/or to the waterfall.



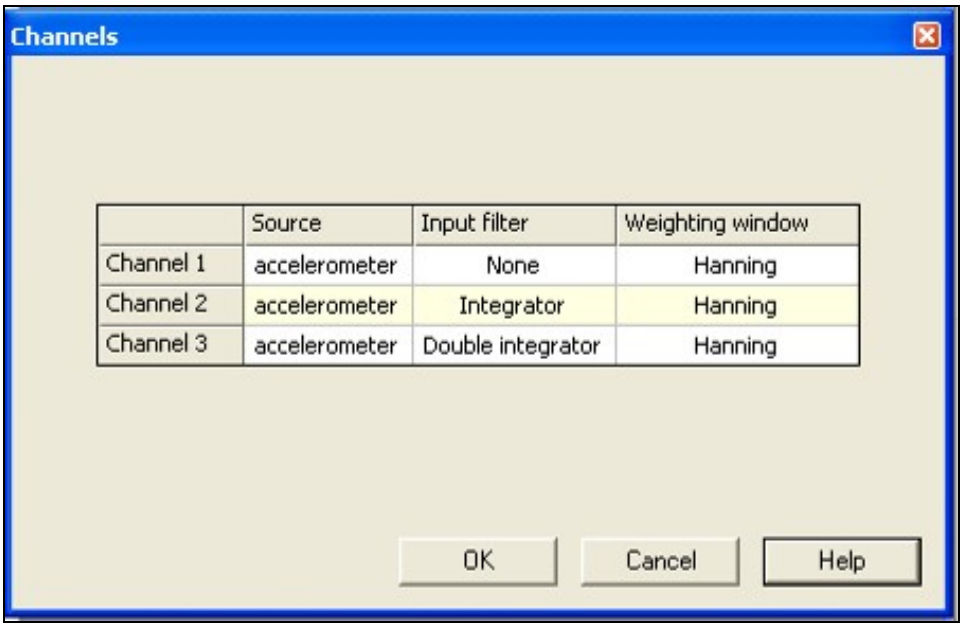
At any time you can add or remove the channel you selected in a plug-in analyzer by right clicking on it and by selecting remove. You have also the opportunity to **select** or **unselect all** channels.

The **auto display** box displays automatically the window with graph corresponding to your selection. To know more about auto display, see also chapter 7 ?User Preferences?.

Selecting ?Display connections properties?, displays the window with Channels connections properties.

For each plug-in, up to 8 or 32 channels (depending on purchased configuration) are available for input connection. This allows multiple preprocessing of each input.

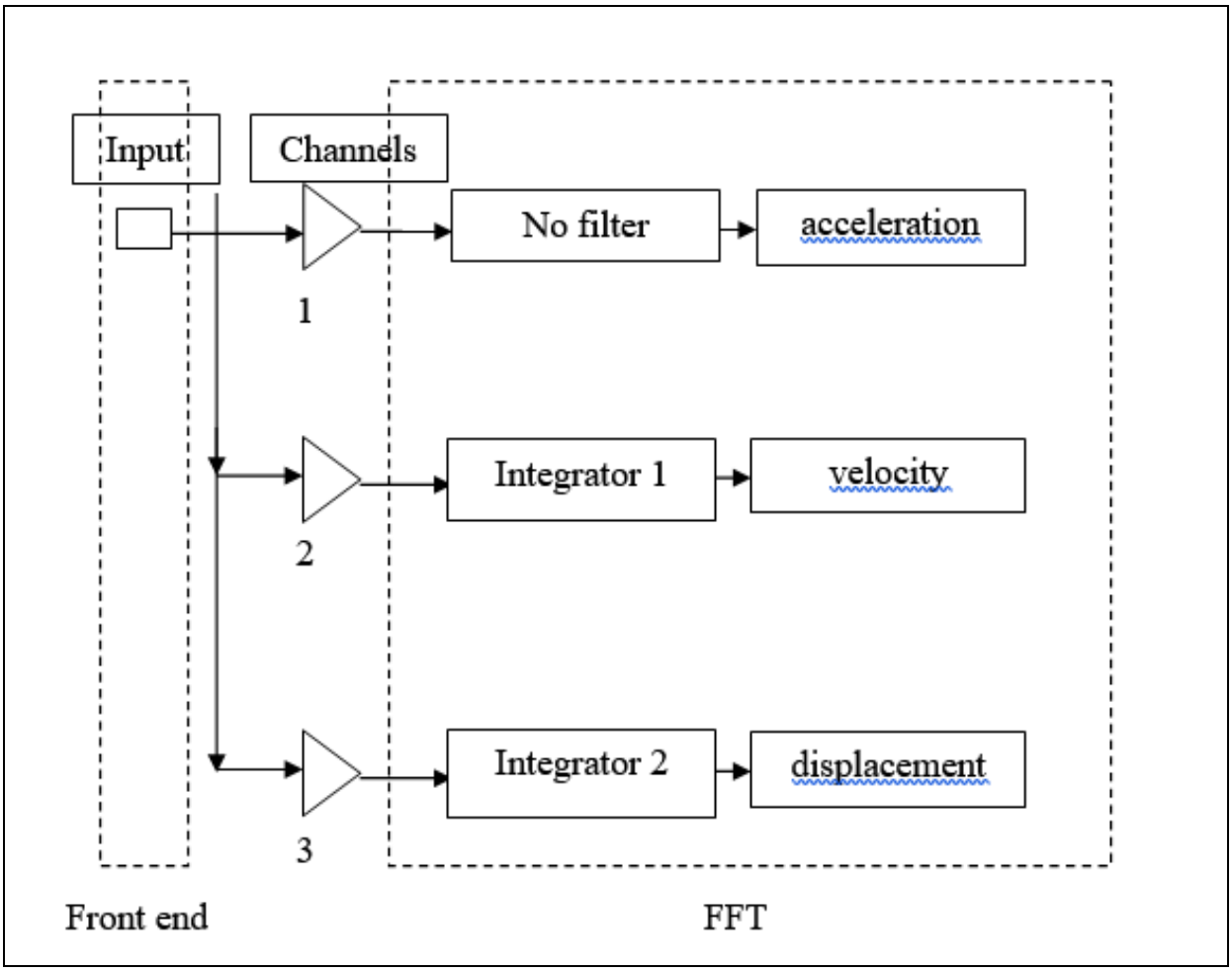
Example:



Distributing Input 1 (accelerometer) to channel 1 to 3 will provide simultaneous analysis of the 3 different physical quantities available from acceleration (velocity and displacement).

This can be achieved by applying Integrator filter (Integrator1) to channel 2 and double Integrator (Integrator2) to channel 3, then you have simultaneously the analysis of acceleration, velocity and displacement of the accelerometer.

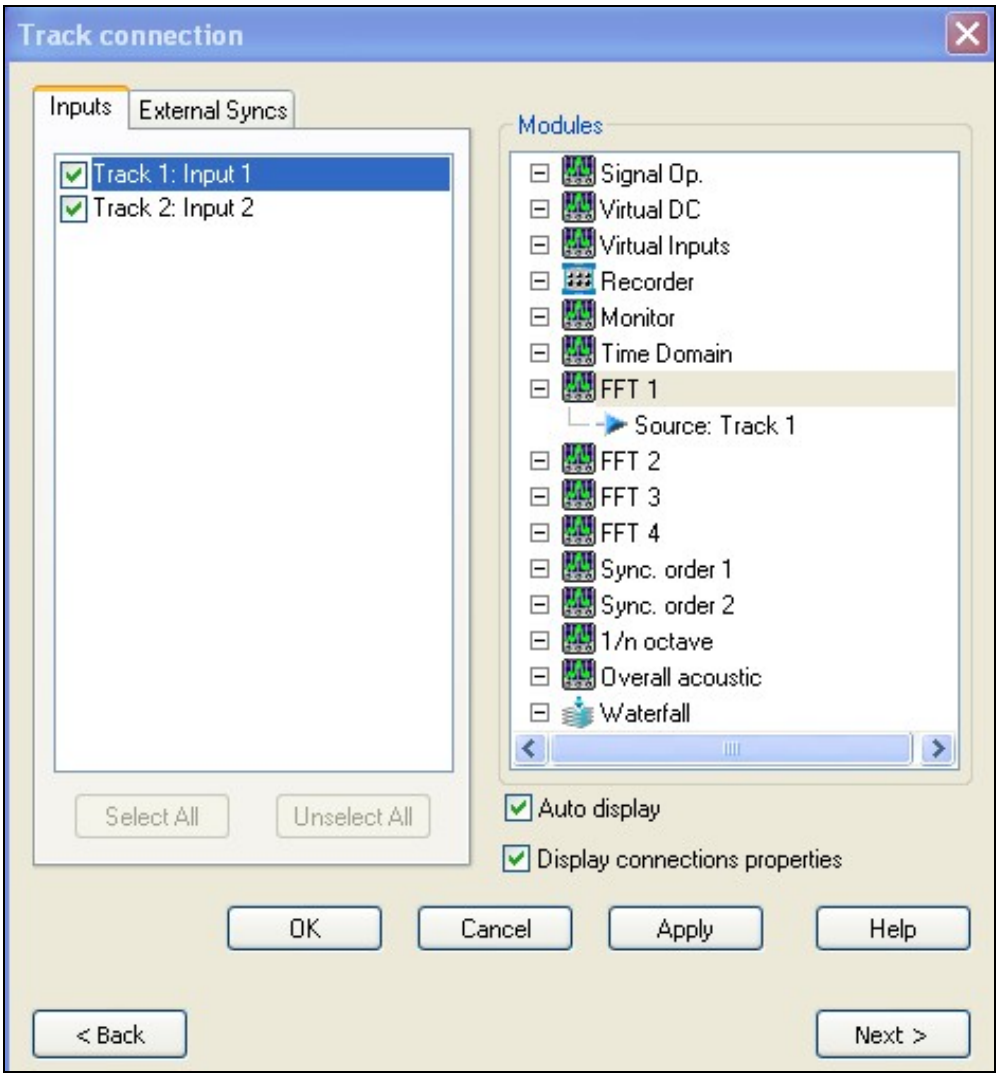
During Order Analysis, you can track up to 8 orders by channel, but you can put up to 8 channels by input. That means for 2 inputs you can track 16 orders and so on.


Input
Channels
No filter
acceleration
1
Integrator 1
velocity
2
Integrator 2
displacement
3
Front end
FFT

Using Order spectra, you can have a complete signal on Channel 1 and an A-weighted signal on Channel 2.

66.1.1.1.2 Tracks

For the post-analysis, the same settings are available, the difference is that the inputs are no longer available, now you have track to connect to the different plug-in analyzer. Channels are available for each track like for input that means that the multi-analysis works in the same way with the post-analysis



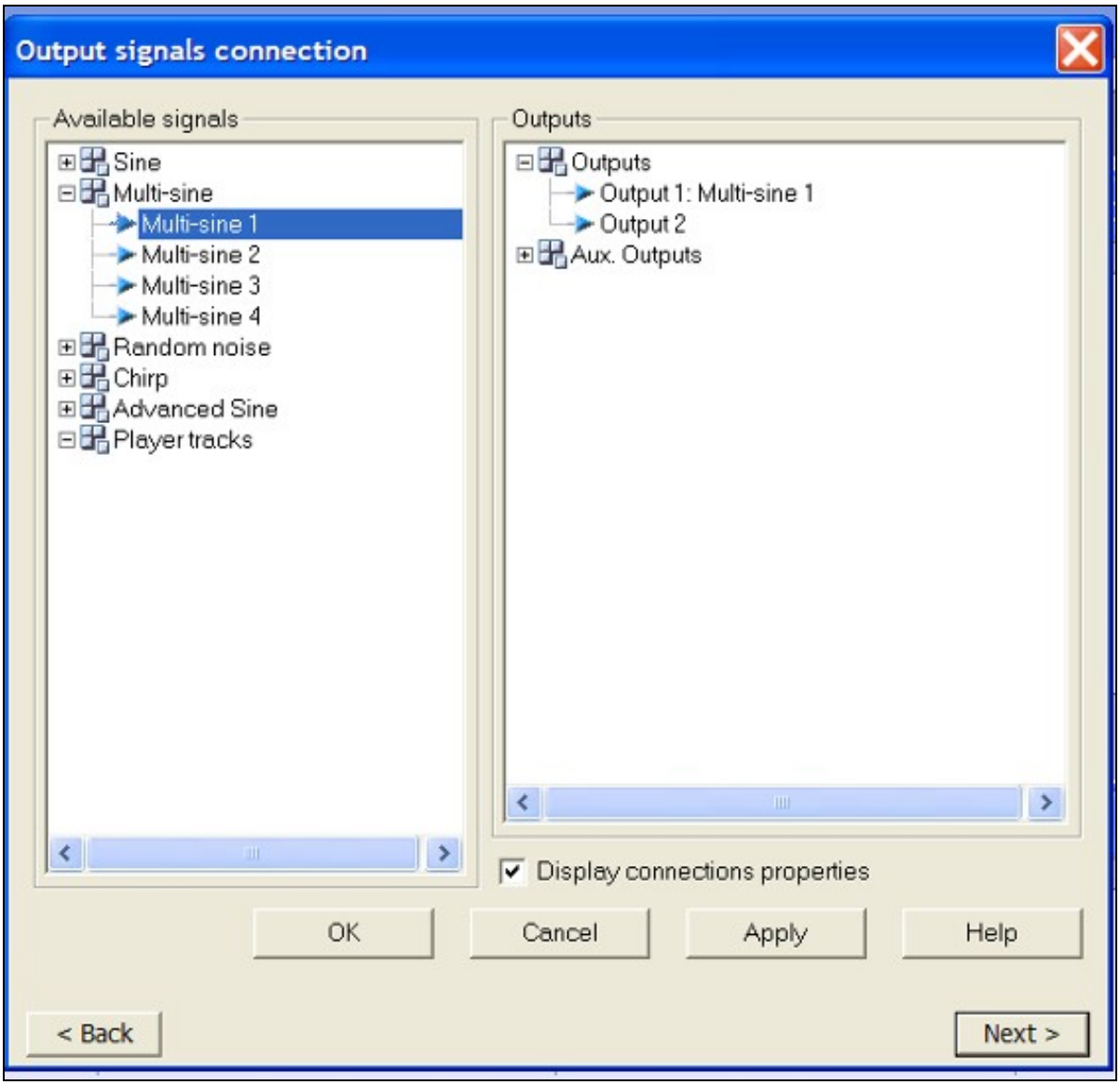
Used to activate or remove one or several tracks and connect or disconnect them to or from one or several analyzers. Player tracks connection dialog is only available in Post analysis mode.

- **Track connected:** Lists the available tracks. Check tracks to activate them. Multiple tracks may be selected.
- **Plug-in analyzer:** Lists the available plug-ins and the tracks connected to them. Several tracks can be selected and dragged & dropped on selected analyzers. If a track is dropped on an analyzer, it will be automatically checked.

Right click to remove selected connections.

66.1.1.1.3 Outputs

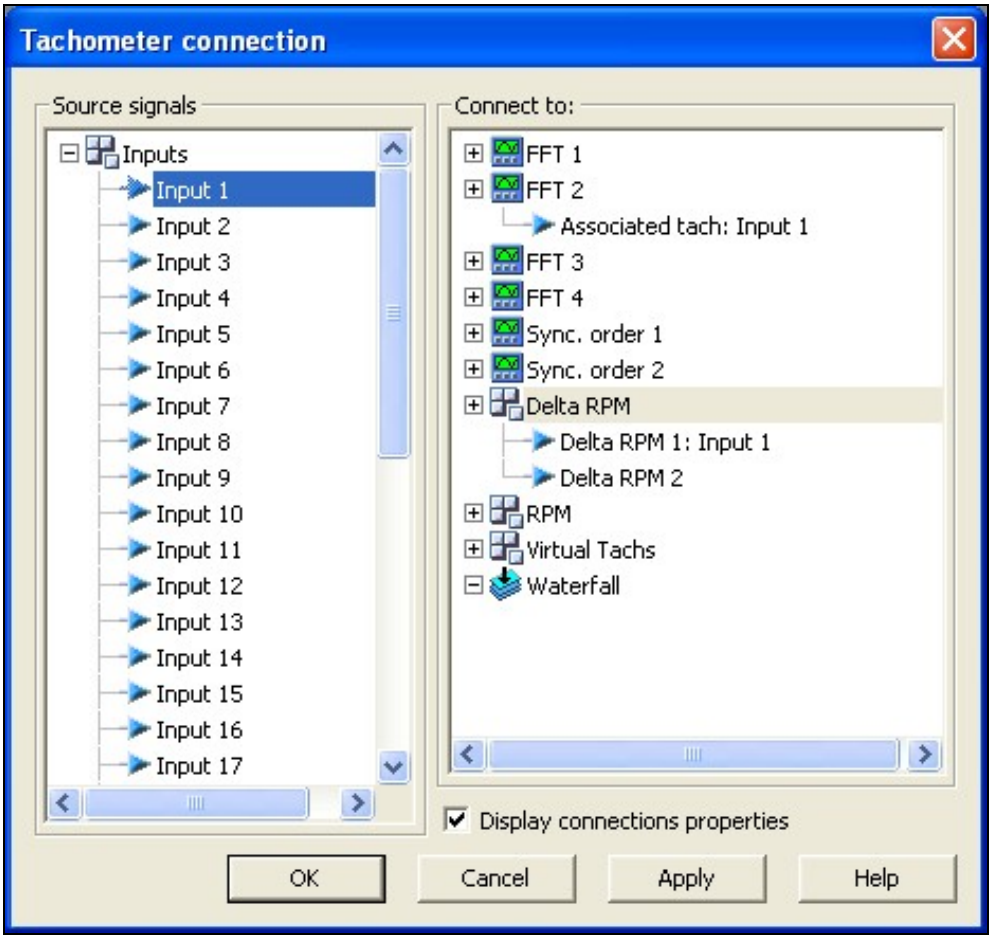
To connect output signals on *outputs* or *Aux. outputs* simply drag and drop available signals on outputs.



Properties of all connected signals and outputs will be displayed and available to modify in the following window.

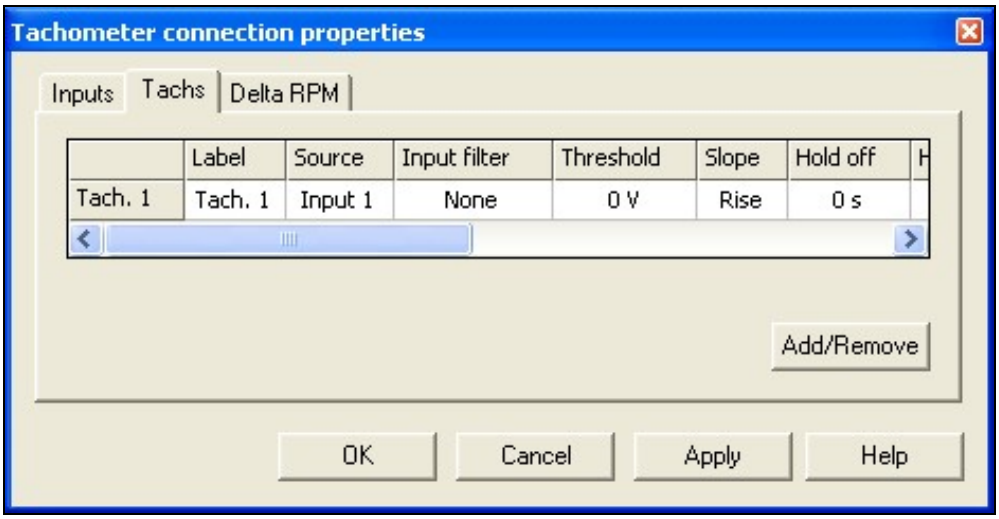
66.1.1.1.4 Tachometer

Connect a source corresponding to a tachometer signal to a plug-in FFT or SOA or to an event.



By ?drag and drop? the user can connect any source signals to any plug-in. By default if a source signal selected as a tachometer is dragged and dropped directly to the specified connection, the tachometer?s source will be connected to the first available setting.

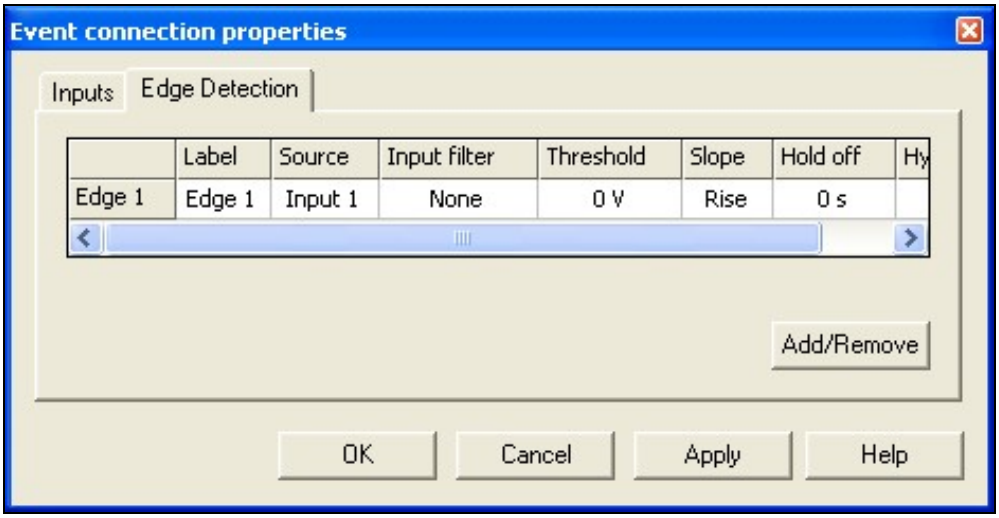
Properties of all connected inputs, tachometers and delta RPM will be displayed and available to modify in the following window.



66.1.1.1.5 Event connection

By this menu it is possible to define an event for the start, stop and/or trigger.

By drag and drop you can define the specific event to the selected plug-in, then all properties linked with the event and the input will be displayed.



- **Edge detection**: By default the edge detection is connected to the trigger* of the plug-in
- **RPM**: By default the RPM is connected to the start event of the specified plug-in.
- **Delta RPM**: By default the RPM is connected to the trigger* event of the specified plug-in.
- **Level**: By default the RPM is connected to the start event of the specified plug-in.
- **Delta Level**: By default the RPM is connected to the trigger* event of the specified plug-in.
- **Internal**: By default the RPM is connected to the trigger* event of the specified plug-in.
- **Result availability**: By default the RPM is connected to the trigger* event of the specified plug-in.
- **Combined Events**: By default the RPM is connected to the trigger* event of the specified plug-in.

Note: if the trigger event is not available on the selected plug-in the default connection will be done on the start event.

In the case the default value is already defined, the selected event will be connected to first available event.

For the Combined Events, the user must add a combination in the ASB in order to be able to connect combined event to selected plug-in.

For RPM or Delta RPM event, a tachometer must be defined (?Connection? Tachometers).Connect available events to plug-ins to use them as triggers.

67 NVGate Control Panel

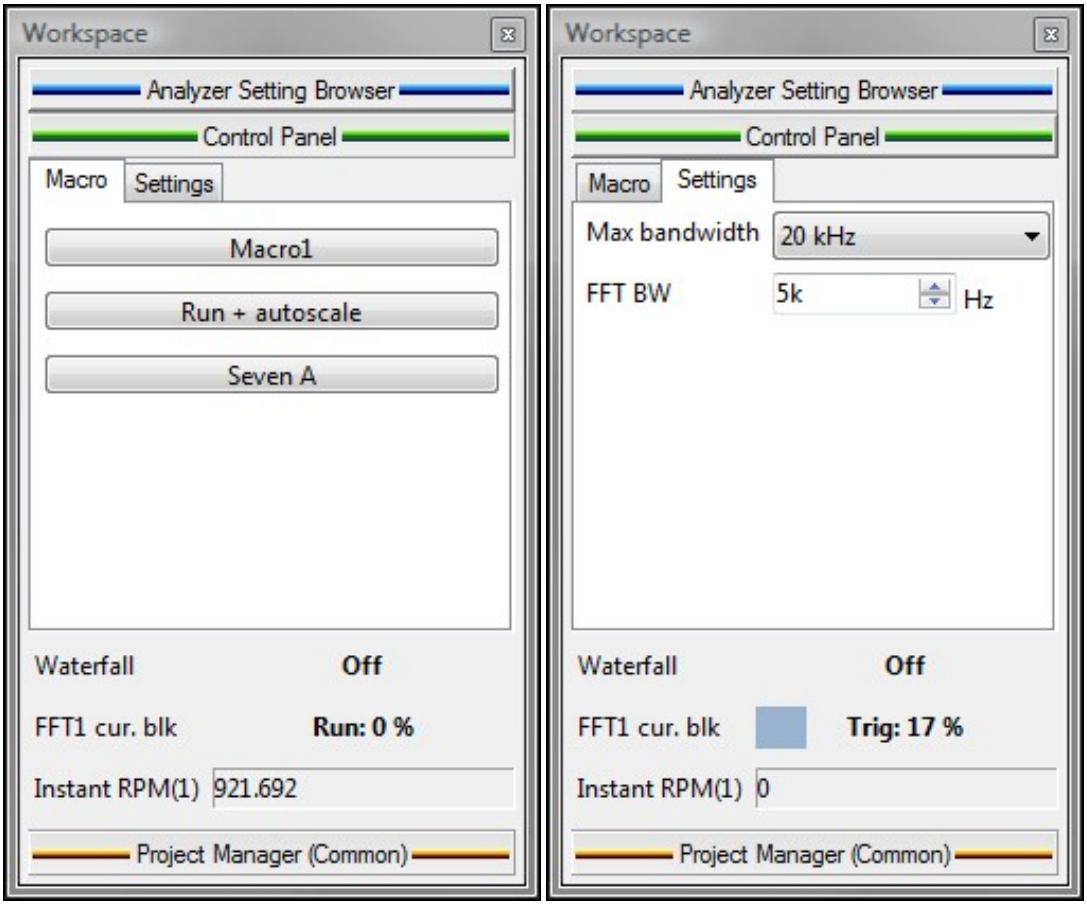
67.1 Control Panel description

The configurable Workspace area provides quick access to settings and/or ASB status. It looks similar to the "Favorites" in Internet Explorer. The settings can be arranged into customizable tabs.



To configure the control panel, right click on the control panel and select Customize Control Panel or use the menu Automation \ Customize Control Panel.

67.1.1 Tabs

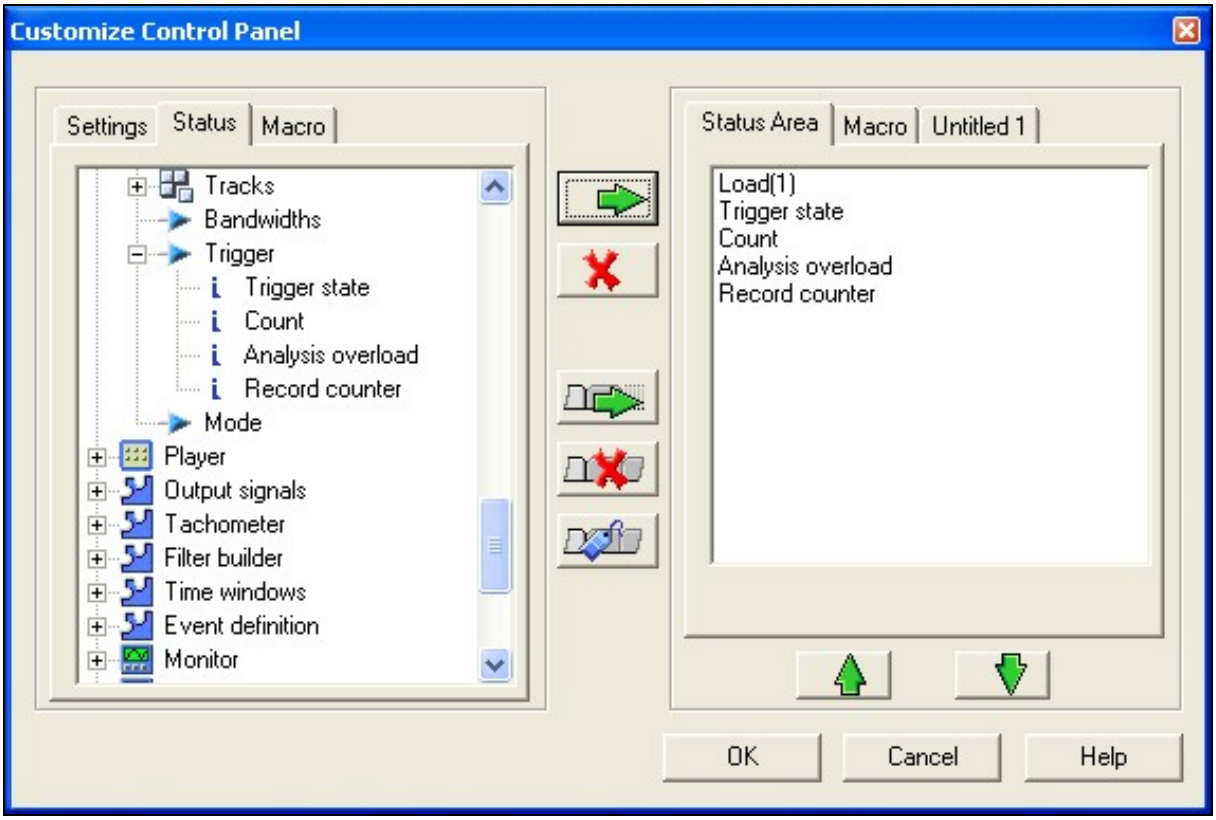


- **Setting:** It is possible to create as many setting tabs as wanted. These tabs can contain settings or statuses (max 20).
- **Status:** The status area is just above the buttons and is visible whenever a setting tab is selected. It may contain only statuses. Each time a plug-in is connected, the corresponding status bar is automatically added to the control panel.
- **Macro:** This tab is dedicated to the "Macro" button.

67.1.1.1 Customize Control panel



The left part of the window contains the items that can be added to the control panel. The right part contains the tabs used to receive and organize these items.



- **Settings tab:** Displays all available settings in tree format similar to the Analyzer Setting Browser. Settings can be added only to the Settings tab.
- **Status tab:** Displays all available settings in tree format similar to the Analyzer Setting Browser. Status can be added to the Status area or to the Settings tab.
- **Macro tab:** Displays the list of available macros. Macros can only be added to the Macro tab.



Add to Control panel: add the item selected (status, setting or macro) from the previous tabs to the control panel.



Remove: Removes the selected item from the control panel.



Create a new tab: Creates a new tab used to contain settings or status.



Remove a tab: Removes the selected setting tab.



Rename a tab: Changes the name of the selected tab.



Push up/down the setting/status: Used to change the order of the items in the current tab

- **Status Area:** Display all statuses that have been selected. The tab can only be used for statuses.
- **Macro Tab:** Display all macros that have been selected. The tab can only be used for macros.
- **Settings Tab:** Display all settings and statuses that have been selected.

Note 1: It is possible to change the name of the settings and status by right-clicking on the item and select Rename in the popup menu.
Note 2: It is possible to use drag and drop to add items.

68 NVGate D-Rec

'D-rec' option turns your analyzer into a true stand-alone recorder. You will be able to record raw signal data without PC.

68.1 D-Rec, Recording without PC overview

Hardware compatible : OR35TW-OR36TW-OR38TW(OR10 : Read Stand Alone page)
Licence : Optionnal, contact your local distributor.

With The *D-rec* option your analyzer is turned into a true stand-alone recorder able to face any field situation. With D-rec, the instrument is available from power-on to power-off without any PC or other fragile/complex consumer interfaces like PDA, smart phones and mini PC. Setting up the front end and the recorder is operated through the new bright display with its large buttons. This interface is adapted to many situations such as outdoor, sun light, wearing gloves, etc...

Using D-rec takes place in 3 different operations:

- Operating the recorder with the LCD panel,
- Preparing predefined setups through NVGate,
- Signal recovery with NVGate,

68.1.1 Part 1: recorder operating

The D-rec control is made through the analyzer LCD panel. The described menus are available on analyzers sold or upgraded with the corresponding option.

After powering on the instrument the LCD panel proposes to enter the D-rec operations. There are 2 possible modes: record directly or setup the recorder.



1. To **record directly**, simply press the run button with the green arrow. The analyzer loads the default setup and starts recording.



2. The setup name is displayed during the load. When recording the system displays the available disk space and recording time. The *Run*, *Pause* and *Stop* buttons control the recorder operations.

3. To **setup the recorder**, press the *Pause* button down to the D-rec arrow. The LCD will display a set of menus. The navigation is controlled by the *Run*, *Pause*, *Stop* and *Down arrow* buttons. Buttons actions are displayed on the LCD above the corresponding gray lines.



The recorder supports multiple records and sessions (Power On/Off). In case of unexpected stop (Power failure or Mobi-Disk removal during a record) the interrupted records are automatically recovered at the next power on.

68.1.1.1 D-rec menus Operations

The front end and recorder setup allows to:

- Load a predefined D-rec setup (also called configuration)
- Change the recorder setup: Sampling frequency, Mode and Duration.
- Enable or disable channels: Dynamic inputs (IN), parametric inputs (DC) and external synch. (Ext). Note that each input can be activated as a dynamic or a parametric channel.
- Modify the input settings: Coupling, range and Xpod conditioner.
- Modify the DC inputs range.
- Modify the Ext. synch inputs: Coupling and range.
- Exit the D-rec mode to start with NVGate or shutdown the analyzer.

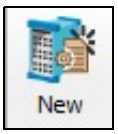
For D, E, and F, the inputs modification can be applied to a group of inputs. In the first menu set the inputs you want to change to Y (or set All to Y to modify all inputs simultaneously). Then set the coupling or range for example. It will apply to all the selected channels.

68.1.2 Part 2: Preparing D-rec configurations with NVGate

The analyzer memorize up to 12 different setups that can be loaded on site, without a PC. A D-rec configuration concerns the front-end and recorder setup only. The configuration can be created in 2 ways: Setup the front-end and the recorder or let D-rec do it automatically from an existing analysis workbook.

68.1.2.1 Setup the front-end and the recorder

Run NVGate with your analyzer connected. A new item is available in the tab*home* menu: *D-rec?*



From this menu entry NVGate will propose a set of dialog boxes that guide the user through the necessary settings to build a D-rec setup. The displayed dialogs are the following:

1. Channels connection

2. Event connections

3. Recorder properties

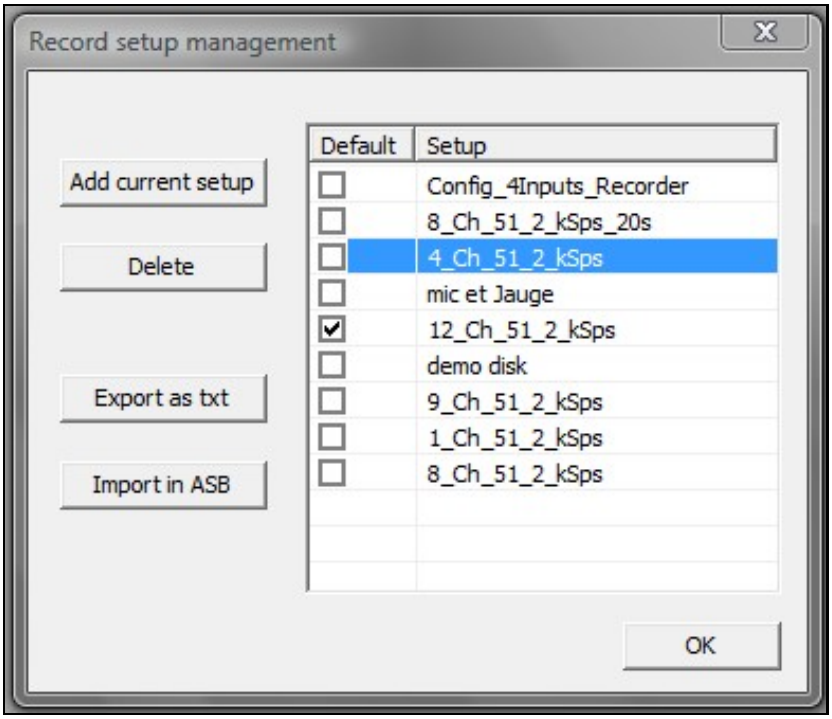
4. Records setup management

Item #1 and #3 are exactly the same as the standard ASB dialogs for the channels connection and the recorder setup.

Item #2 is also the same but only a subset of the events is handled by D-rec: Recorder trigger on Edge on Ext. synch, Level and delta level on DC inputs and periodic event only.

Item #4 allows managing the setups saved in the analyzer. The D-rec setups can be written, removed, imported and exported from this dialog box.





To write an NVGate configuration in the hardware, press the "Add current setup" button. The current front-end and recorder settings will be saved in the analyzer. Note that all active channels (IN, DC, EXT and CAN) will automatically be connected to the recorder tracks. To delete a D-rec setup, select it in the list and press "Delete".

One of the D-rec setups saved in the analyzer can be set as the default setup when starting the D-rec. Check it in the "Default" column.

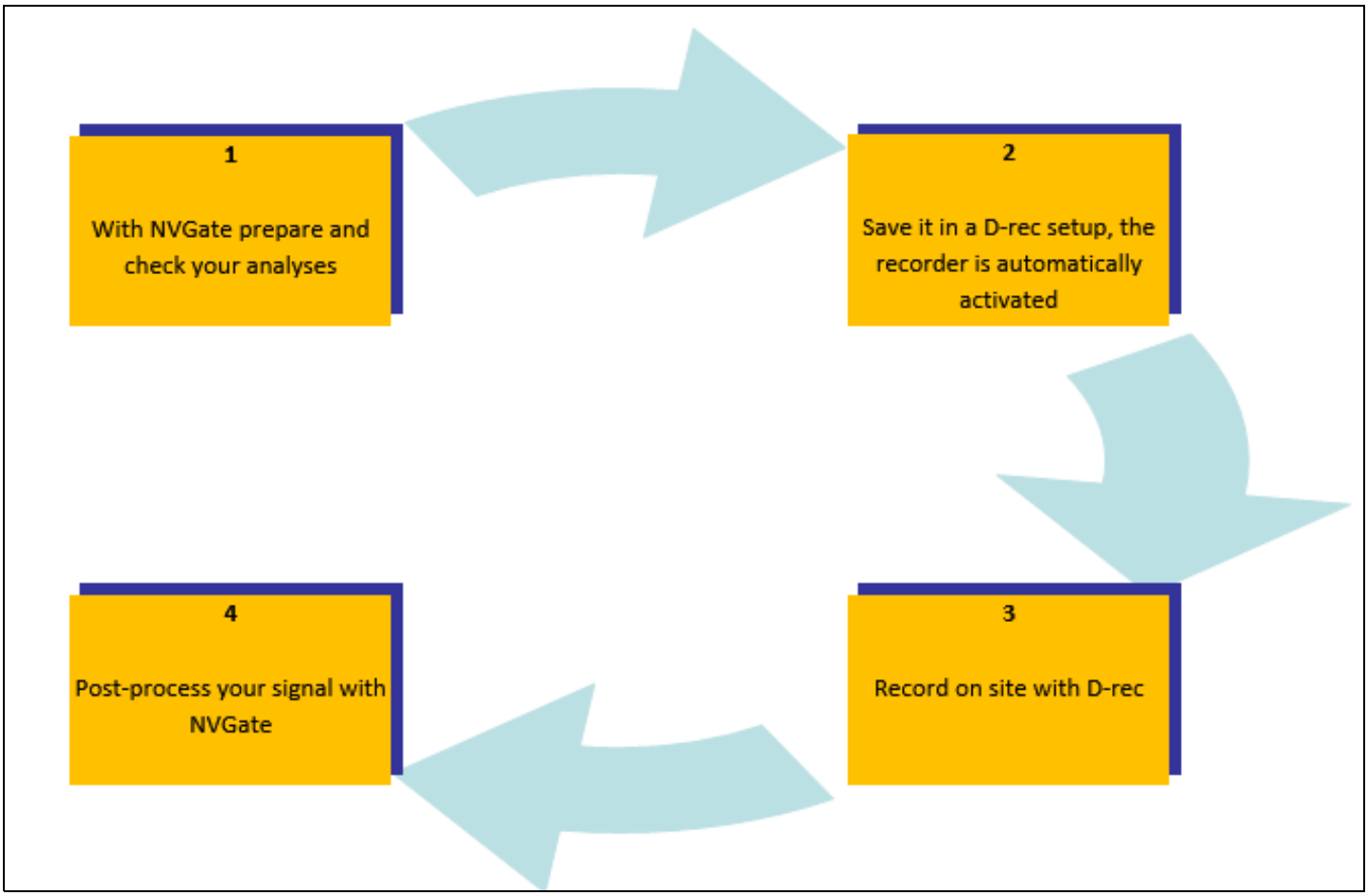
Each setup can be exported in text file to be used as a trace of the D-rec settings when using it on-site. Of course it is possible to control the front-end and recorder settings with the LCD menus, but a paper sheet or file overview is more comfortable to install the transducers and cables. To create a description file, use the "Export as txt" button.

It is possible to recover, control or modify an existing D-rec setup which is already saved in the analyzer. The "Import in ASB" function will setup the current NVGate ASB with the configuration saved in the analyzer.

68.1.2.2 Automatic recorder setup

D-rec has been designed to record without a PC. Such operations require a setup validation and are followed by a signal post-processing. With D-rec you can focus on the goal of your data acquisition rather that minding about channels, coupling and bandwidths.

With your analyzer connected you can prepare your analysis with NVGate focusing on which result you expect: spectra, order extraction, triggering threshold and others. Moreover you can validate that this front-end and analysis setup will provide the results you want.



When your analysis setup is ready, you can add it to the D-rec setup list (see below) with the "Setup\D-rec setup(s)?" menu entry. NVGate will activate the recorder with all the active inputs. You can go and make your measurements in confidence.

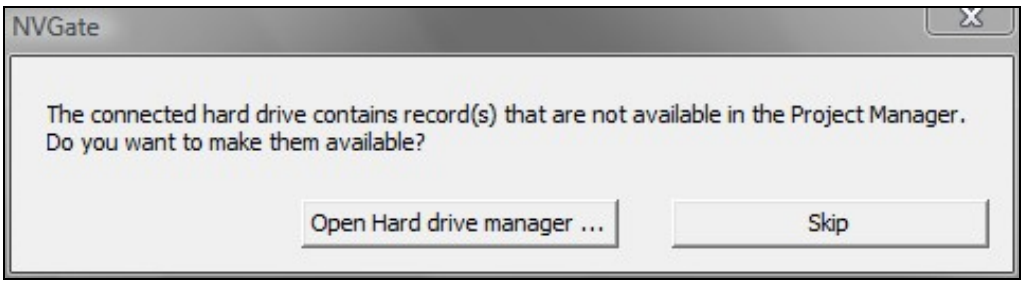
68.1.3 Part 3: recovering the signal with NVGate

The recorded signals are recovered with the NVGate project manager. To be accessible, the measurements must be associated to one project. Like the on-line records, the signal data can stay on the Mobi-Disk or be downloaded into the host PC hard-drive.

After a D-rec session(s), the signal recovery is operated through NVGate with the Mobi-Disk connected. The Mobi-Disk connection can be:

- Running NVGate in the connected mode with the Mobi-Disk inside the hardware,
- Running NVGate in the office mode with the Mobi-Disk connected to a USB port of the host PC.

When NVGate starts and is connected to a Mobi-disk that contains signals recorded with D-rec, the following message appears.



You can skip it and process later. In this case the menu entry "Hard-drive\manage" will show the same dialog box as the "Open Hard drive manager" button.

The Hard drive manager lists all the files (records) present in the active disk (in the hardware or USB connected). The records made in stand-alone are automatically named with the date/time based on the analyzer real-time clock.

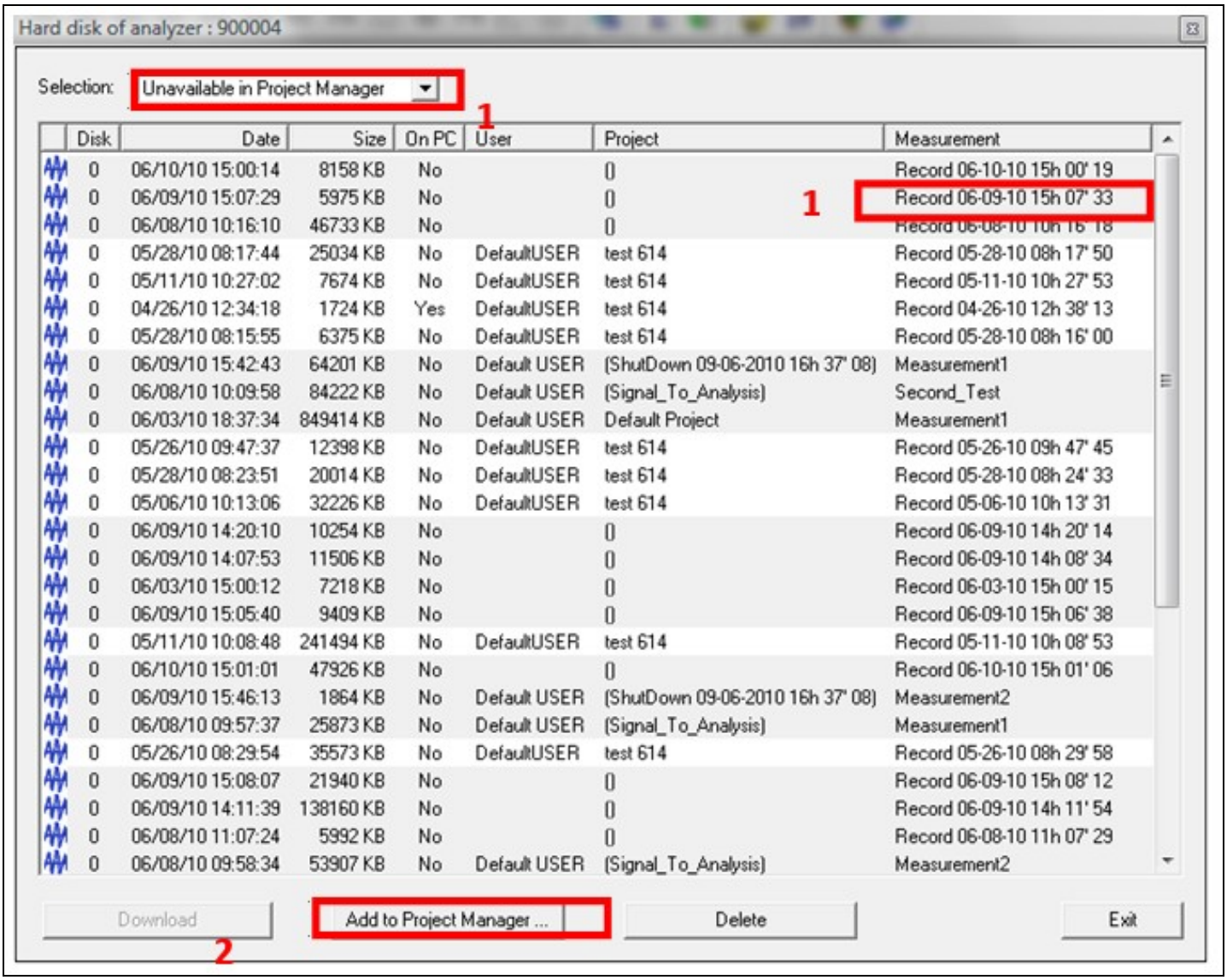
To recover these files in the project manager:

1. Select the measurements to process. Automatic selection is available from the top combo-box (select *unavailable in project manager*) or manual selection with the mouse and CTRL or SHIFT buttons.

2. Press the bottom "Add to Project Manager" button to add these records into one of your projects.

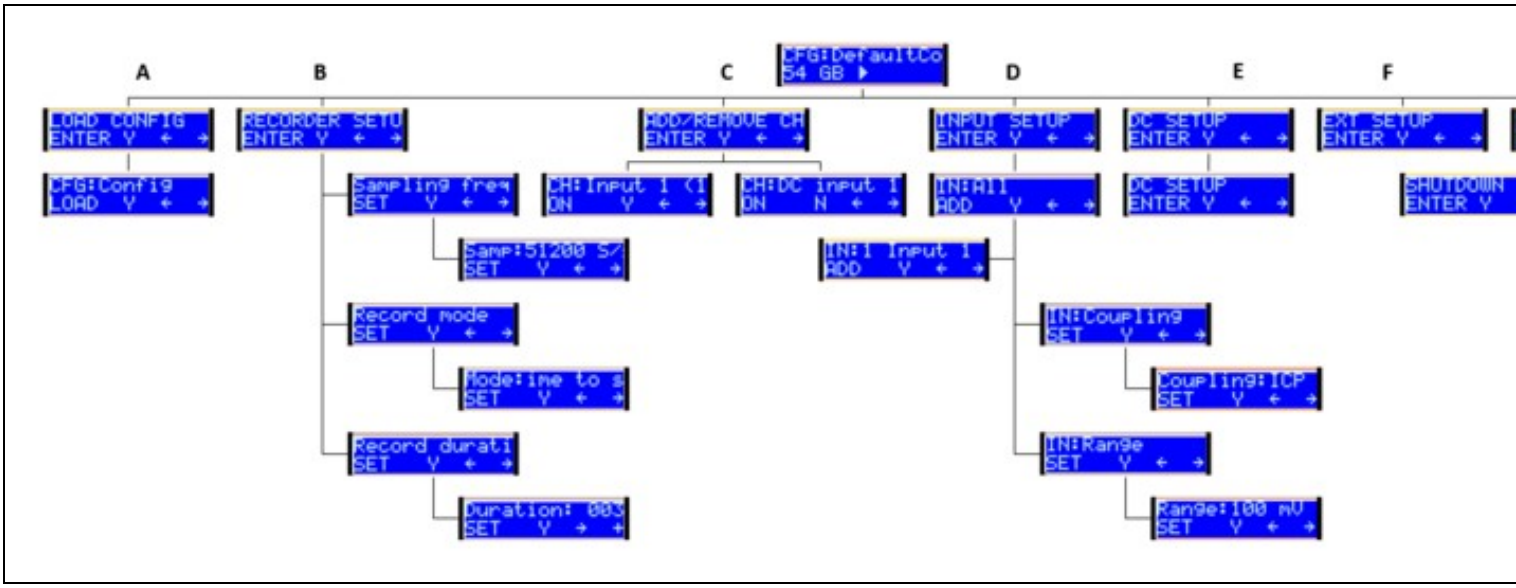
The signal files are now ready for visualization, post-processing and export. The data are still on the Mobi-Disk. Use the download function to copy it on the PC hard-drive.

- To be previewed the files must be loaded into the player with the *Load and preview* function. The signal previewing computation may take a few seconds, it occurs one time only.
- When exportation is needed, the files must be downloaded to the PC hard drive first.



Disk	Date	Size	On PC	User	Project	Measurement
0	06/10/10 15:00:14	8158 KB	No		()	Record 06-10-10 15h 00' 19
0	06/09/10 15:07:29	5975 KB	No		()	Record 06-09-10 15h 07' 33
0	06/08/10 10:16:10	46733 KB	No		()	Record 06-08-10 10h 16' 18
0	05/28/10 08:17:44	25034 KB	No	DefaultUSER	test 614	Record 05-28-10 08h 17' 50
0	05/11/10 10:27:02	7674 KB	No	DefaultUSER	test 614	Record 05-11-10 10h 27' 53
0	04/26/10 12:34:18	1724 KB	Yes	DefaultUSER	test 614	Record 04-26-10 12h 38' 13
0	05/28/10 08:15:55	6375 KB	No	DefaultUSER	test 614	Record 05-28-10 08h 16' 00
0	06/09/10 15:42:43	64201 KB	No	Default USER	(ShutDown 09-06-2010 16h 37' 08)	Measurement1
0	06/08/10 10:09:58	84222 KB	No	Default USER	(Signal_To_Analysis)	Second_Test
0	06/03/10 18:37:34	849414 KB	No	Default USER	Default Project	Measurement1
0	05/26/10 09:47:37	12398 KB	No	DefaultUSER	test 614	Record 05-26-10 09h 47' 45
0	05/28/10 08:23:51	20014 KB	No	DefaultUSER	test 614	Record 05-28-10 08h 24' 33
0	05/06/10 10:13:06	32226 KB	No	DefaultUSER	test 614	Record 05-06-10 10h 13' 31
0	06/09/10 14:20:10	10254 KB	No		()	Record 06-09-10 14h 20' 14
0	06/09/10 14:07:53	11506 KB	No		()	Record 06-09-10 14h 08' 34
0	06/03/10 15:00:12	7218 KB	No		()	Record 06-03-10 15h 00' 15
0	06/09/10 15:05:40	9409 KB	No		()	Record 06-09-10 15h 06' 38
0	05/11/10 10:08:48	241494 KB	No	DefaultUSER	test 614	Record 05-11-10 10h 08' 53
0	06/10/10 15:01:01	47926 KB	No		()	Record 06-10-10 15h 01' 06
0	06/09/10 15:46:13	1864 KB	No	Default USER	(ShutDown 09-06-2010 16h 37' 08)	Measurement2
0	06/08/10 09:57:37	25873 KB	No	Default USER	(Signal_To_Analysis)	Measurement1
0	05/26/10 08:29:54	35573 KB	No	DefaultUSER	test 614	Record 05-26-10 08h 29' 58
0	06/09/10 15:08:07	21940 KB	No		()	Record 06-09-10 15h 08' 12
0	06/09/10 14:11:39	138160 KB	No		()	Record 06-09-10 14h 11' 54
0	06/08/10 11:07:24	5992 KB	No		()	Record 06-08-10 11h 07' 29
0	06/08/10 09:58:34	53907 KB	No	Default USER	(Signal_To_Analysis)	Measurement2

68.1.4 D-rec menus Organization chart



Note: Some sub-menus are not described in this diagram.

68.1.5 Video exemple

Washing machine vibration analysis *(using D-rec @30Seconds*).

69 NVGate dataset management

69.1 Dataset management

Data management is fully integrated into NVGate. This essential feature of your analyzer provides search & select functions based on the meta-data content of the project manager items.

69.1.1 Benefits

The objective of OROS Dataset management is to provide self-described data and avoid the constraints of databases organization. The data can be exchanged in any directory in the PC environment (LAN, Disk, USB, etc...).

With OROS Dataset management it is simple to:

- **Share** a project, a model or a measurement called *File 1*, **without any explanation,**
- **Access** projects, models and measurements from **any network or local directory**,
- **Work together** with your colleagues on a **common project**,
- **Filter your data** environment (project manager, open dialogs) simplifying the data access,
- **Archive and retrieve** your complete dataset **without reminding** the files names.
- ?

69.1.1.1 Data organization

The dataset management proposes a general-purpose data organization based on 3 levels of data:

- The ***context***, which holds the *campaign* or *site* or *customer* information. Located in the projects, it does not hold additional data than properties. The context is usually defined by the *manager* (test, service and engineering).
- The ***setup***, which holds the acquisition and analyses description type. Located in the models, it contains the complete analyzer setup plus properties. The setup is usually defined by the *experts* (from your company, a services company, your local support or OROS customer care)
- The ***measurement***, which holds the measured/analyzed data and specific measurement details. Located in the measurement, it contains data, setup (workbook) and properties. The measurements are usually generated by the *operators* (the one who make the measurements)

69.1.1.2 Self-description

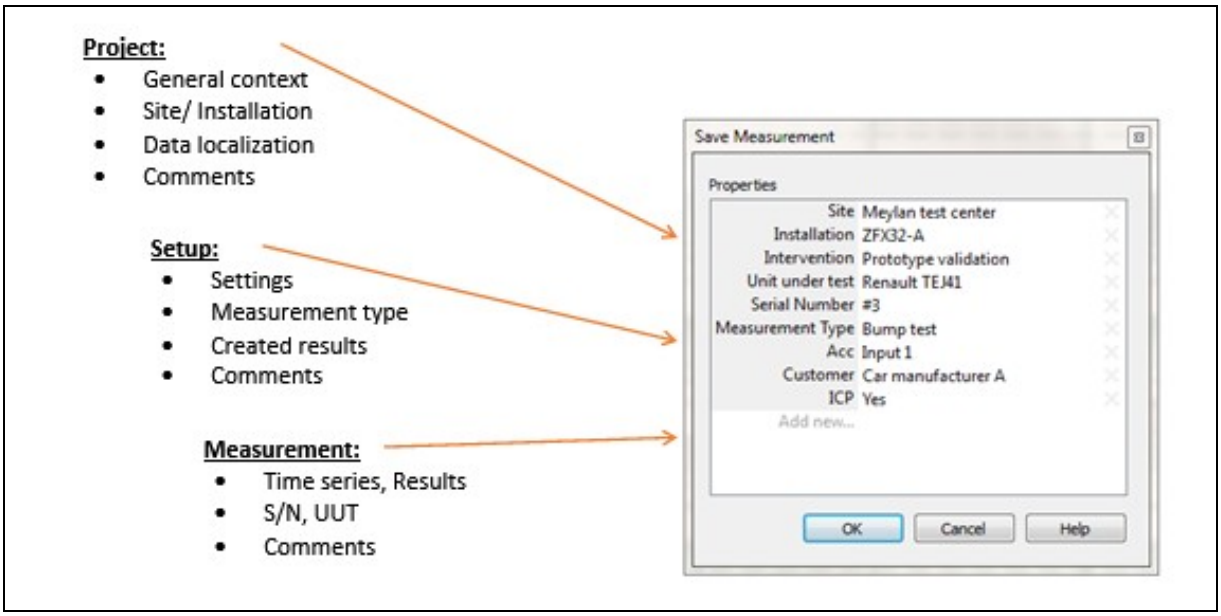
Each item holds properties that describe what is not available from the workbook, data and additional files. Properties are fulfilled by users or automatically according to the current context.

The data are located in the NVGate data directories where any type of additional files (pictures, audio, schemes, instructions, etc?) can be associated to detail their description.

69.1.1.3 Heritage

The Data organization is used to propagate the properties to the final result; the measurement. The measurement inherits properties from the opened project and the last loaded *Model*. This allows getting the context and setup correctly described in the measurement.

The heritage benefit is double; first it reduces the information to be fulfilled and secondly it allows sharing the measurement without project or model.



Properties inheritance

69.1.1.4 Filtering

The properties are helpful arranging the projects and measurements in coherent sets. NVGate proposes Excel like filtering features to hide unused Item in the project manager.

69.1.1.5 Data mining

The self-description brought by the properties allows easily mining Projects, Models and Measurements in local or shared data storage. Based on properties filters and in-depth scanning, the OROS dataset management features efficient data browsing.

69.1.1.6 Data sharing

Share/Collate functions bring simple ways to exchange Projects, Measurements and Models with your colleagues, customers and managers. Copy/Paste conflicts are silently managed; Projects merge automatically the Measurements and Measurements carry the source Model. Additional non-OROS files are also transported with the NVGate ones.

Data security is guaranteed with copy/move/delete log files and windows like conflicts management.

69.1.1.7 Data archiving

The Share/Collate allows efficiently archiving and retrieving data on your PC, on an external drive or through the network.

69.1.1.8 Properties

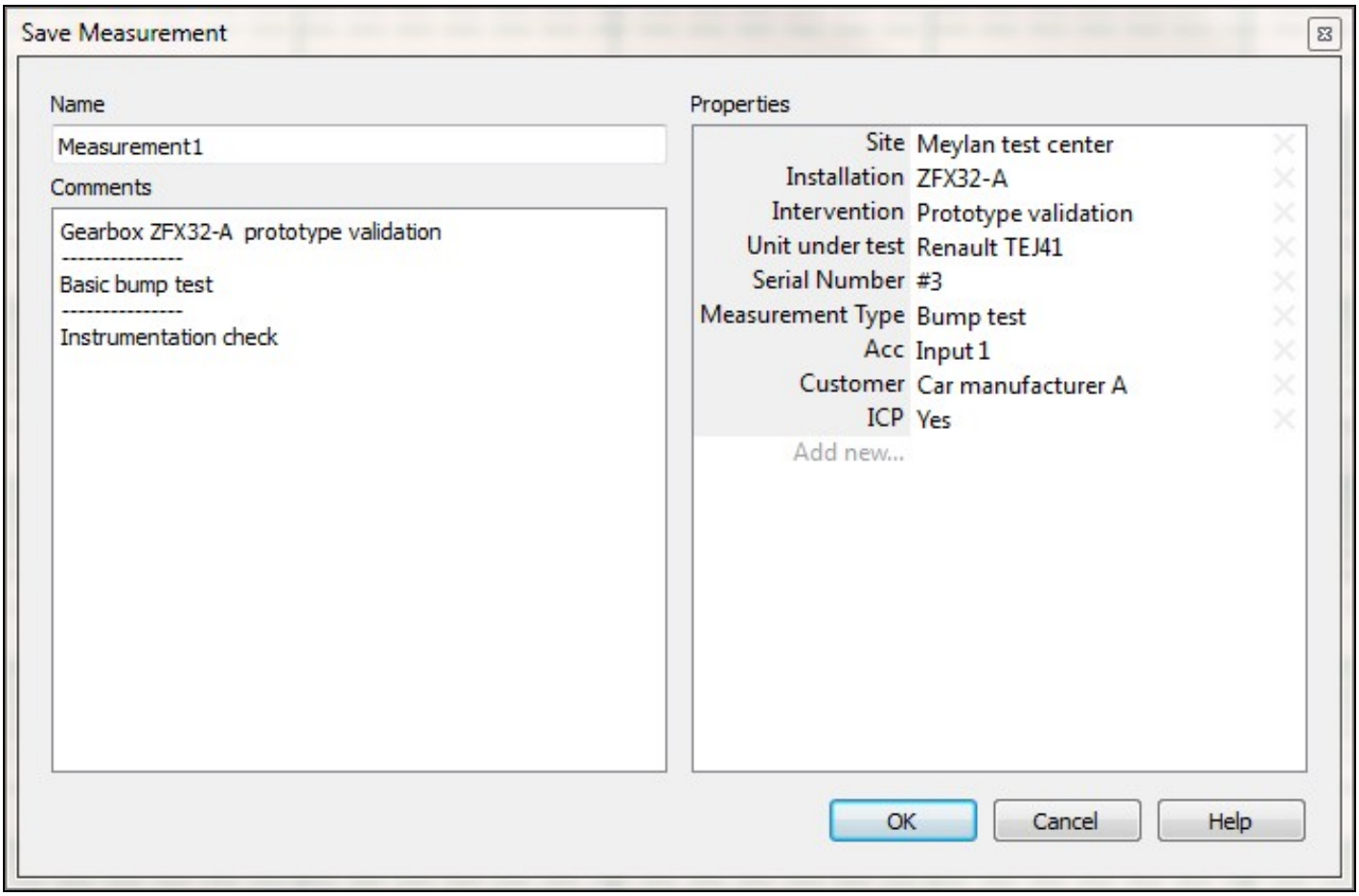
The properties are used as meta-data to enrich projects, models and measurements. They are informed while saving the items or by editing the properties from the project manager.

The properties belong to 3 different categories:

- The **OROS** properties are automatically informed such as *Dates*, *Author*, *Project* and *Saved results type*
- The **OROS user** properties are predefined to be informed by the user: Comments, Site, Installation, Intervention, Measurement type, UUT, Serial number
- The **Users** properties are created and filled by the operator while saving or by editing the properties. Ex: *Customer name*, *Transducer type*

Suggested properties usages

While saving data (Project, Model or Measurement) the save dialog box proposes the following layout (same for Project, Model and Measurement):

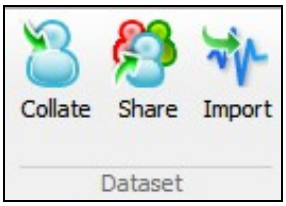


On the left side the Item?s name and the comments. Current Project and Model comments will inherit to the Measurements.

On the right side the OROS user and User properties. Current Project and Mode properties will inherit to the Measurements.

69.1.2 Share and collate dataset

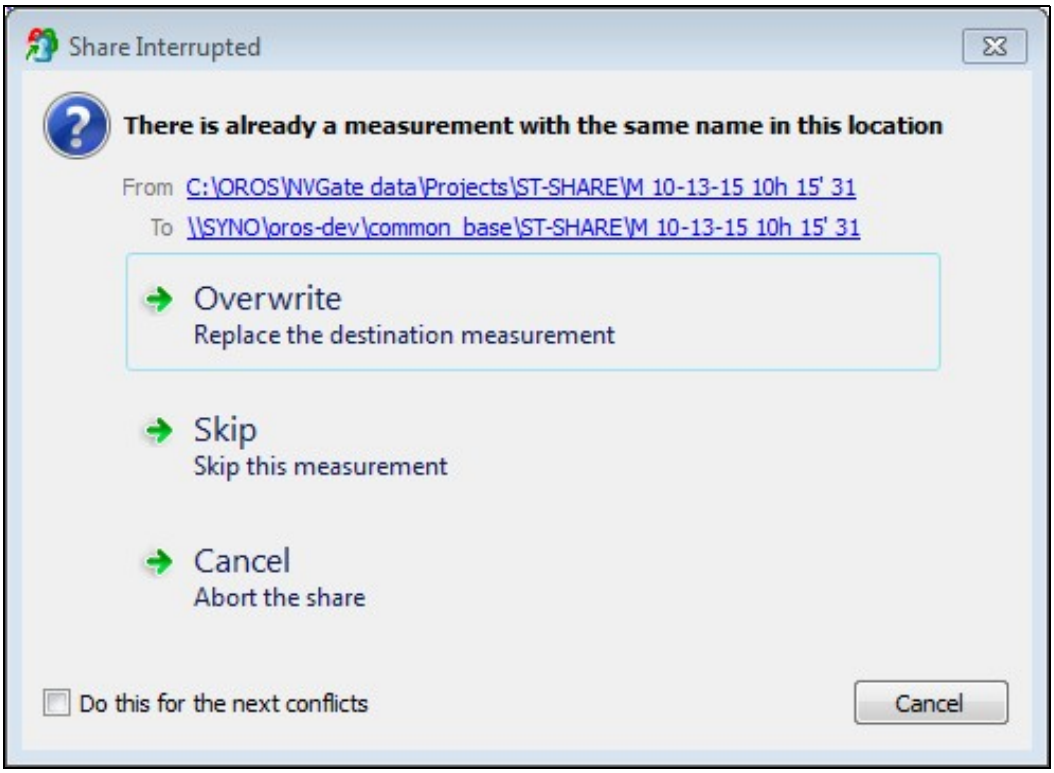
This function transfers Projects, Measurements, Models and associated attachments from the NVGate Data to a common directory and reciprocally.



These transfers operate in both direction; Share data from the NVGate PC to a common base ; Collate the data from a common base to the PC. The target/source directory can be in the PC, on the LAN or on an external device.

Most of transfer conflicts and errors are automatically managed especially the merge of *Projects*, *Measurements* and *Attachments*. Most of them are solved automatically.

In case of ambiguous conflicts, operator is asked to provide the action in a Windows style .

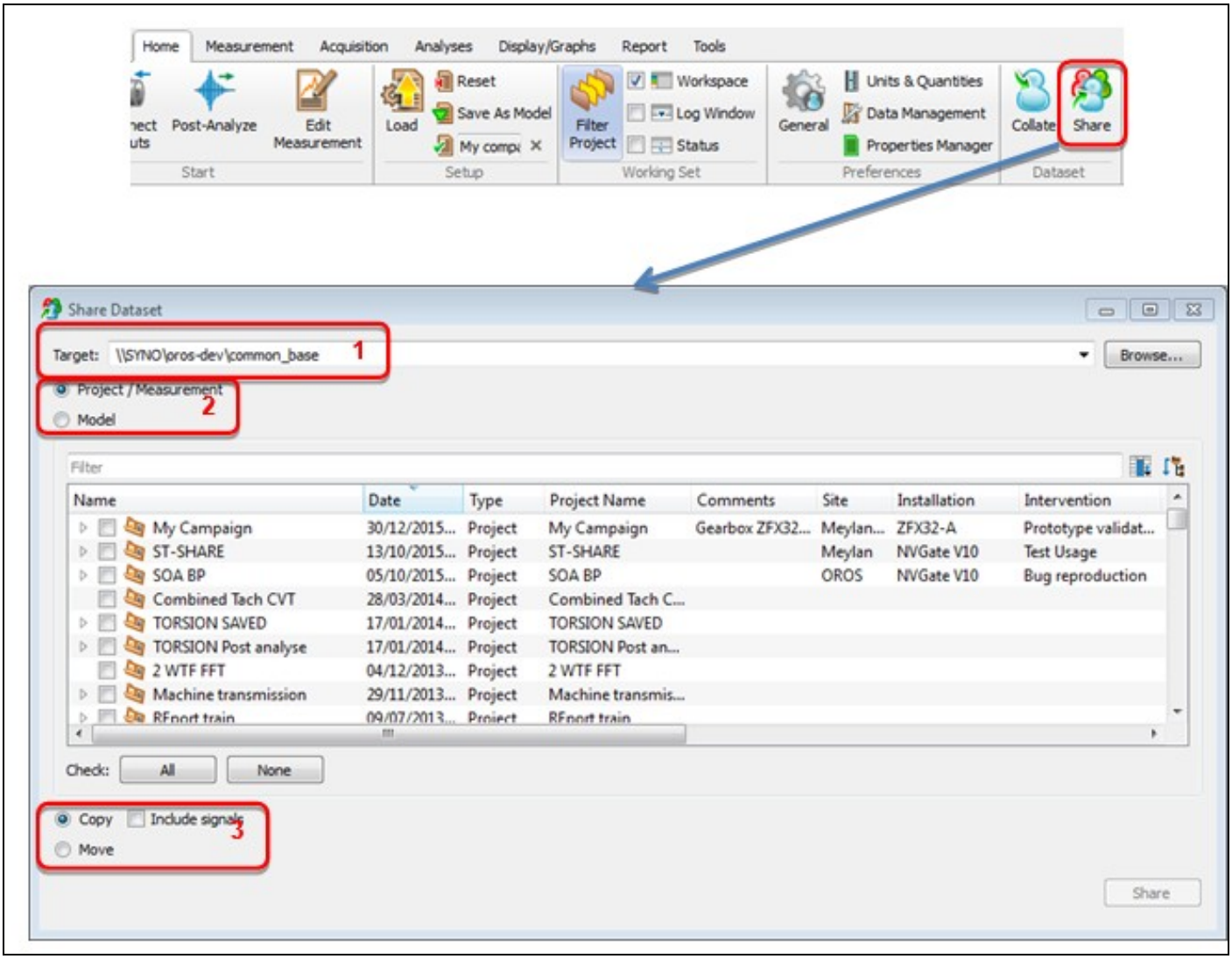


When possible, source and target directory are accessible through the hyperlinks.

Data Traceability Each transfer (share and Collate) generates a report in 2 ways:

69.1.2.1 Share Dataset

The Datasets are shareable from the ribbon *Home/Dataset:*


Home
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
Post-Analyze
Edit Measurement
Start
Load
Reset
Save As Model
Setup
Filter Project
Workspace
Log Window
Status
Working Set
General
Units & Quantities
Data Management
Properties Manager
Preferences
Collate
Share
Dataset
Share Dataset
Target: \\SYNO\pros-dev\common_base
1
Browse...
Project / Measurement
Model
2
Filter
Name
Date
Type
Project Name
Comments
Site
Installation
Intervention
My Campaign 30/12/2015... Project My Campaign Gearbox ZFX32... Meylan... ZFX32-A Prototype validat...
ST-SHARE 13/10/2015... Project ST-SHARE Meylan NVGate V10 Test Usage
SOA BP 05/10/2015... Project SOA BP OROS NVGate V10 Bug reproduction
Combined Tach CVT 28/03/2014... Project Combined Tach C...
TORSION SAVED 17/01/2014... Project TORSION SAVED
TORSION Post analyse 17/01/2014... Project TORSION Post an...
2 WTF FFT 04/12/2013... Project 2 WTF FFT
Machine transmission 29/11/2013... Project Machine transmis...
Check:
All
None
Copy
Include signals
Move
3
Share

The Share Dataset dialog behaves as multi-selection featuring the following extra settings:

1. The path of the target directory. Shared Items will be deposited at the root of this directory for the Project/Measurement hierarchy. Models will be deposited in a subfolder named "Folder".
Used targets are memorized and made available with the down arrow at the right.

2. Selection of what will be shared.

- Project/Measurements will transfer selected *Projects* and *Measurements*. The *Models* associated with selected *Measurements* will also been carried on.
  Used to share measurement data with their setups.
- Models: Only the selected *Models* will be transferred.
  Used to spread Models to the measurement teams.

3. Define how to transfer:

- Copy keeps the data on the NVGate data locally while transferring a copy of selected ones
- Move, first copies the dataset and then delete the copied from the NVGate data.
- Include signals carries on the time series files when selected. Leave the time series files on the local NVGate data when unselected.
  Note: In order to avoid data loss, the *Include signals is* forced to "select" when *Move* is chosen.

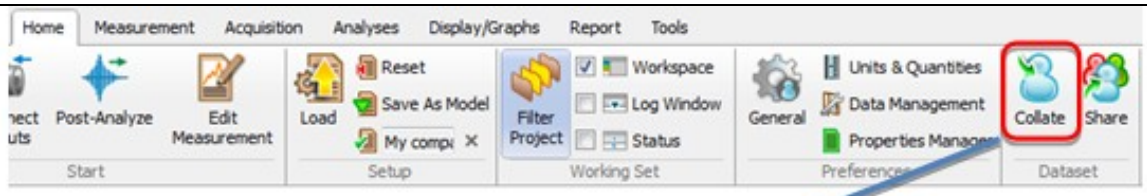
Note: that *Share* can also be used for dataset backup on the NVGate PC, an external disk or on the network.

69.1.2.2 Collate Datasets

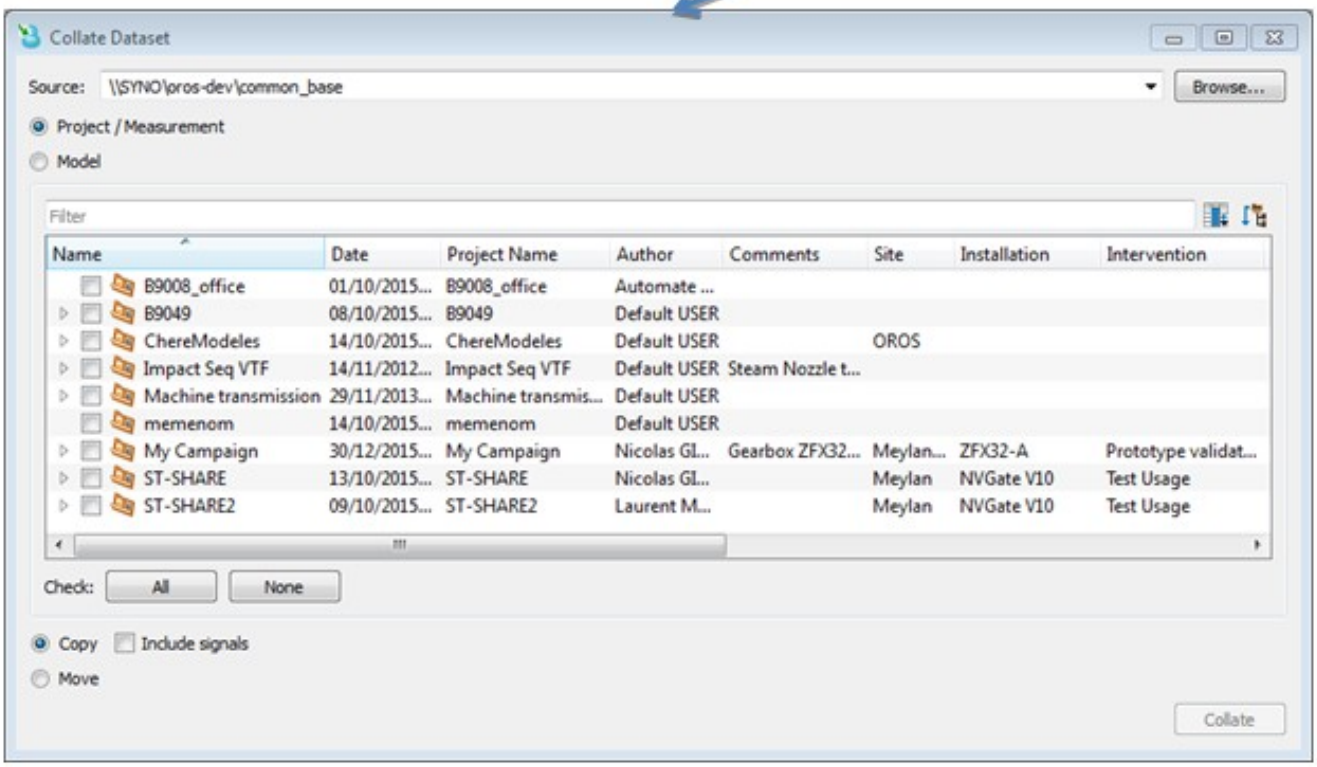
Collate [k??le?t] verb. To gather together information from different sources in order to study it carefully

Sharing data means recovering those data in local NVGate instances. The *Collate* function allows selecting and gathering dataset from common directories to the local NVGate data.

Collate dataset is available from the ribbon *Home/Dataset:*



The collate dialog behaves as the share one.



Main difference is that the searched path is not limited at the *Source* level. The *Collate* function will take in account in depth hierarchy of the source directory among all its subdirectories.

This allows having a directory structure on the data set common base and being able to search in with the properties only for ones that do not know the directory organization.

69.1.2.3 Import

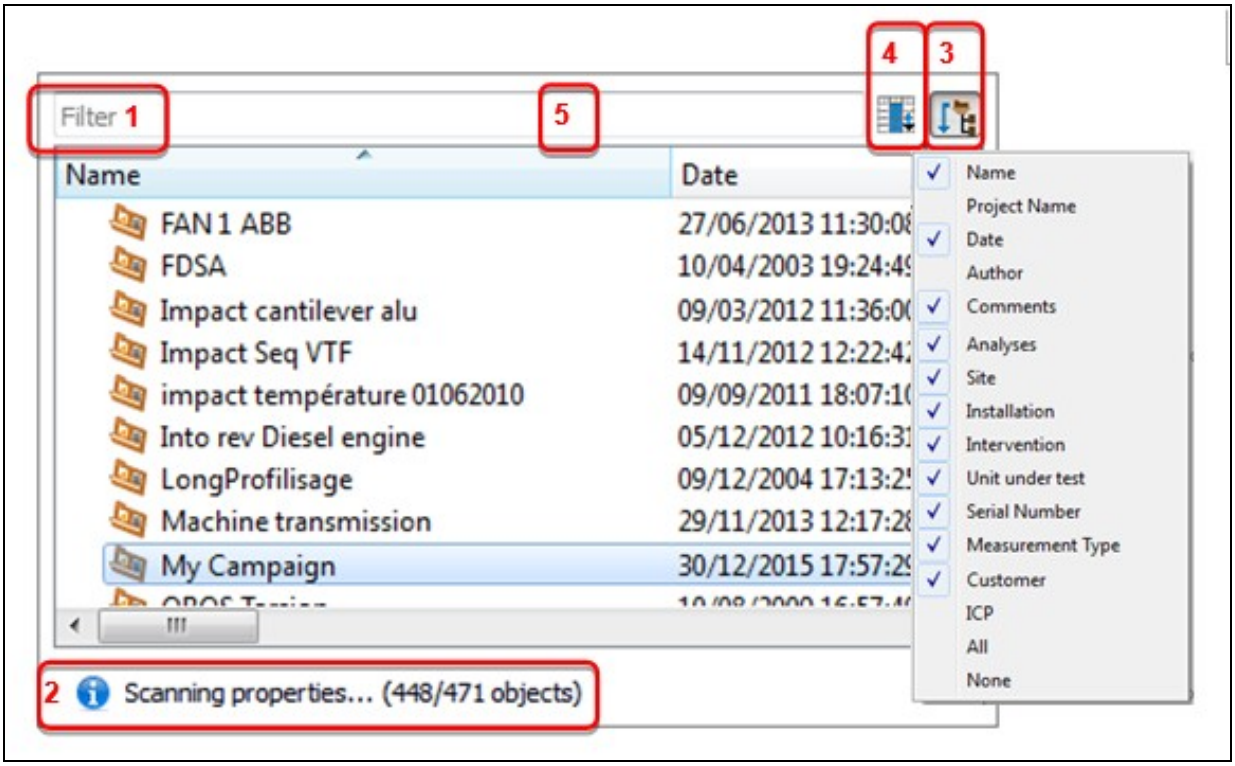
See Export/import.

69.1.3 Browsers Dataset windows

NVGate features dialog boxes to browse the data from the project manager (local data) or external sources. Two type of browsers are proposed; Item selection and set selection.

These 2 dialogs share common functions:

1.



The filter will show only the items matching with the entered keyword. The keyword match are searched in the name, the properties values and the comments.

2. The dialog starts operating immediately. Nevertheless with large data set, the dialog may take a few second to scan all the properties of each Item. In such case the scan progress is displayed here. The filtering remains incomplete until the scan finished.

3. Flat/Tree: This button allows switching between a tree view (like in the project manager or Windows explorer) and flat view where all Items are listed regardless the hierarchy.

4. The searched properties. Show the properties used for filter search (see §1) Unselected properties will be ignored during the search.

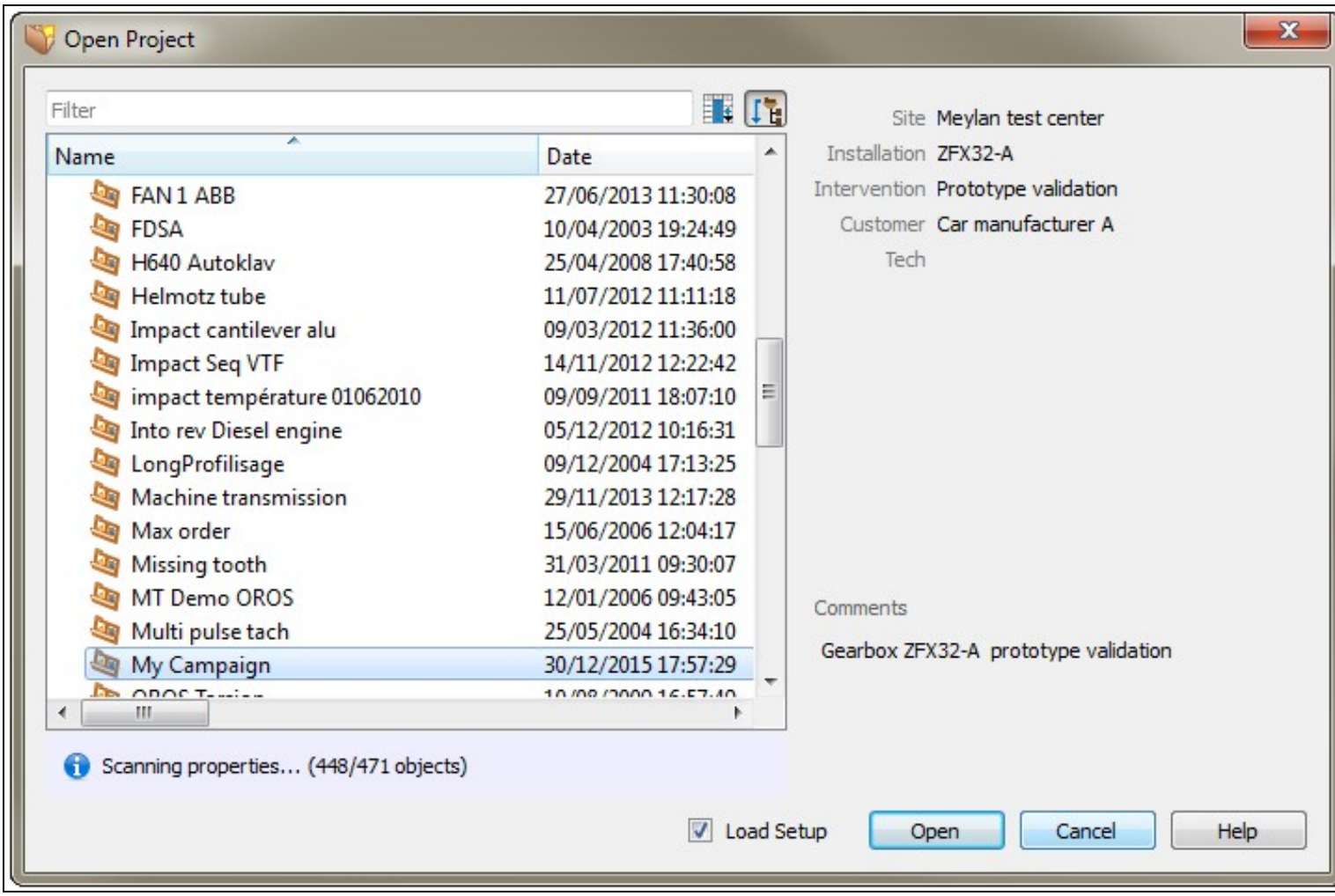
5. Show/Hide properties. Right click on the properties line to select which ones are visible in the columns.

69.1.3.1 Item selection browser

This browser is used to open, load or edit unique *Items* from the local NVGate data. It is used for the following operations:

- Open Project
- Load Signal for post-analysis
- Load Setup
- Edit Measurement

The right side summarizes the *OROS user* and *User properties* of the current Item. This helps navigating in the list of Items in order to find the searched one.

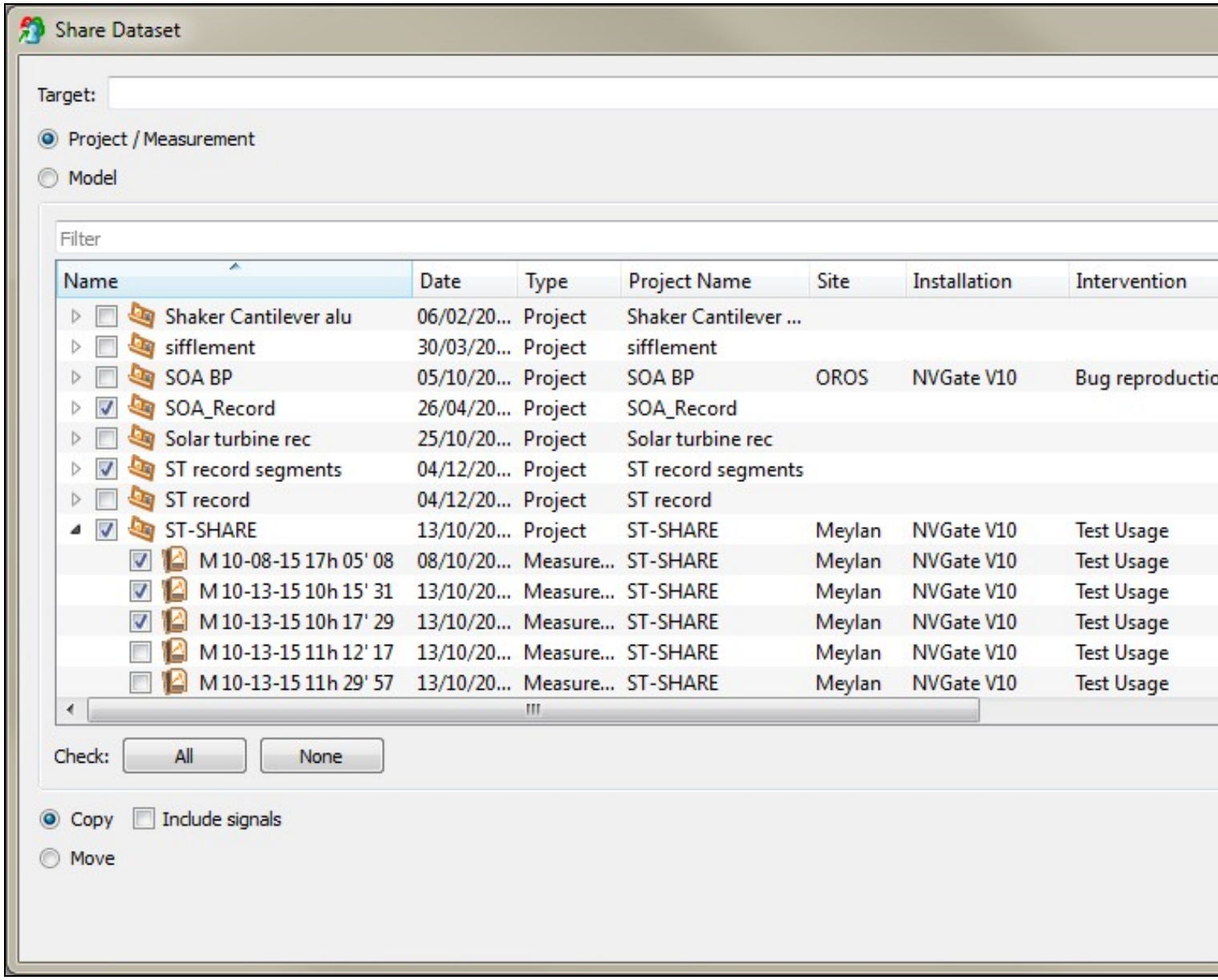


Drag & drop the right border to resize the dialog. The complete properties table appears to filter by properties as in the *Set selection dialog*.

69.1.3.2 Set selection browser

This browser is used to select a set of *Item*s to apply batch, filter or transfer this set. It is used for the following operations:

- Share Projects/Measurements and Models
- Collate Projects/Measurements and Models
- Filter local NVGate data
- Batch report selection



The Set selection browser features check boxes on the left sides for *Item*s selection. The properties table allows efficient filtering, offering fast selection of a coherent set of data.

70 NVGate DC Simulated Manager

This Add on is a tool which uses the DC simulated inputs in NVGate. It provide a GPS and can deal with weather station data.

70.1 Download

Latest version (07.12.2020) can be donwloaded here : DC simulated manager v1.0

Configuration needed :
- NVGate 2021 or upper
- DC simulated channels (ORNV-VIDC option)

71 GPS

We have 2 ways to acquire the GPS position, android phone or GPS Compliant with NMEA 0183 standard.

71.1 Serial GPGGA GPS

We support the GPS USB Navilock NL-602U. You can order at OROS under the reference: ORAC-GPS-NA01.

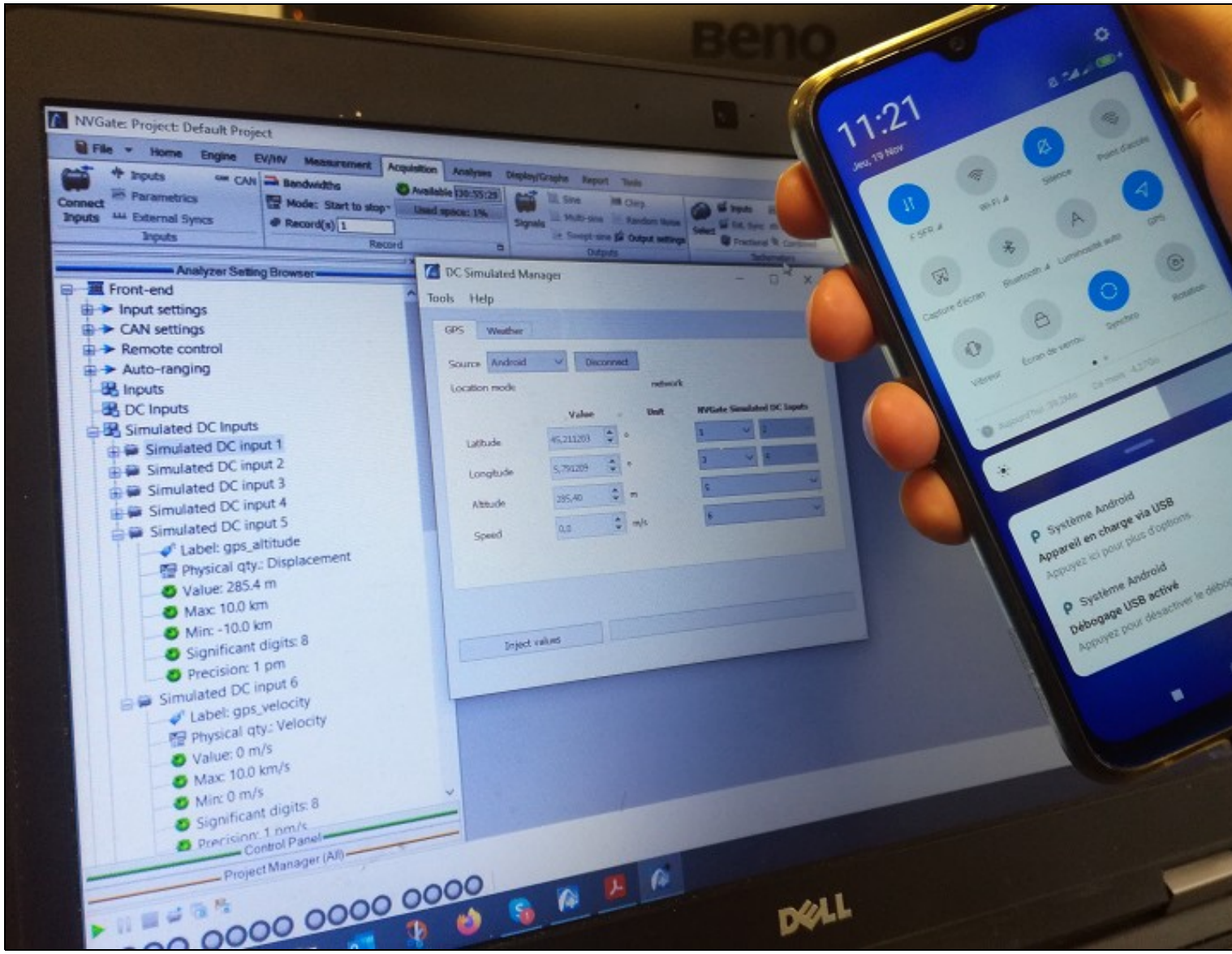
We should be compliant with any other GPS USB Serial Interface Compliant with NMEA 0183 standard GPGGA. (however in case of issue we do not have other model in stock so we will not be able to support it)



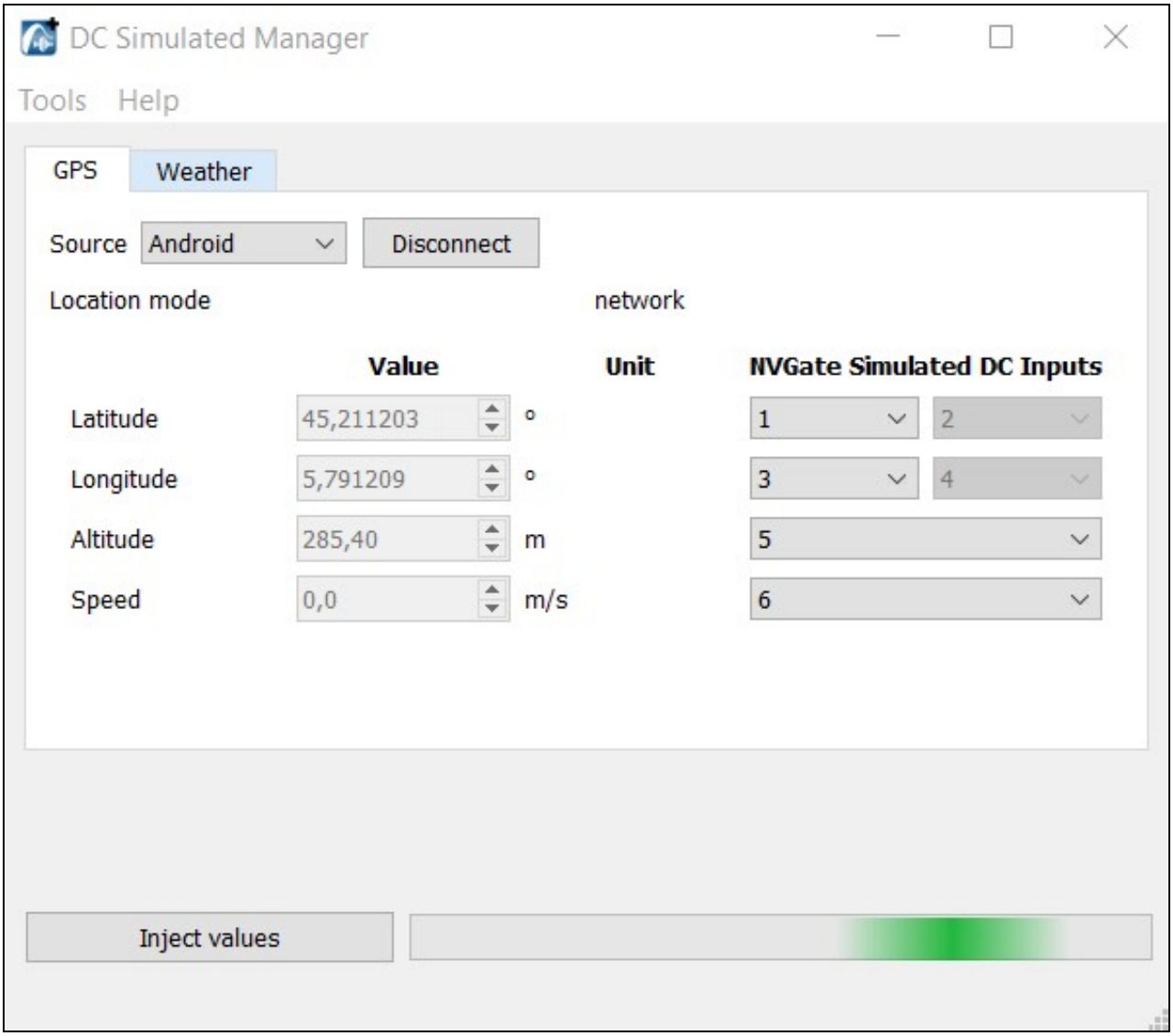
71.2 Android GPS

Recommended: Android 9 or more.
Tested and approved: Xiaomi 8, One+, Android 7: Samsung
Incompatibility: Huawei phone.

It should work with nearly all the android phone. No support will be given in case of incompatibility with your phone. (or you send us the phone for doing the test... :))



Principle : GPS data is retrieved using Android ADB (Android Debug Bridge). When you plug your android phone, we inject the GPS position inside NVGate.



Procedure:

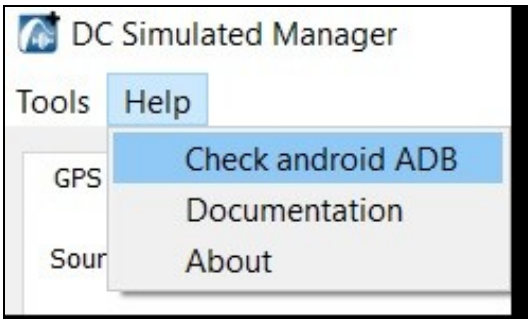
- Activate android developers option. (To enable developer options, on android settings/"about phone" tap the Build Number option 7 times).

- Enable USB debugging (on developers options menu). Process is here

- Plug your android phone into your PC.

- Allow the incoming USB debugging connection and check "Always allow from this computer".

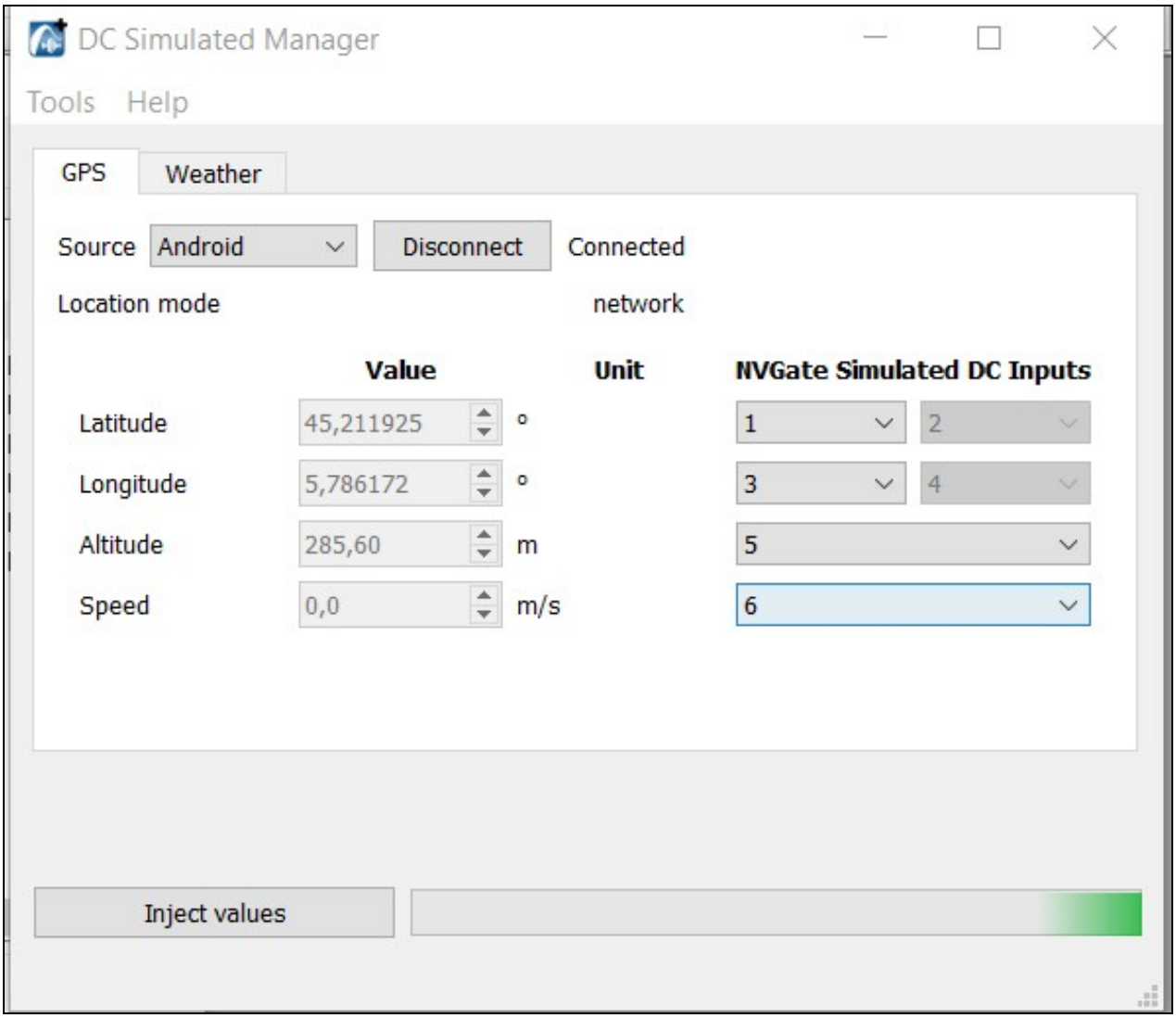
Test the connection using the ADB connection button:



Also be sure that GPS is enabled on your phone, then you need to have an application which is running and using the GPS on the background of the phone (example: we advice to launch Google Maps or GPS Data)

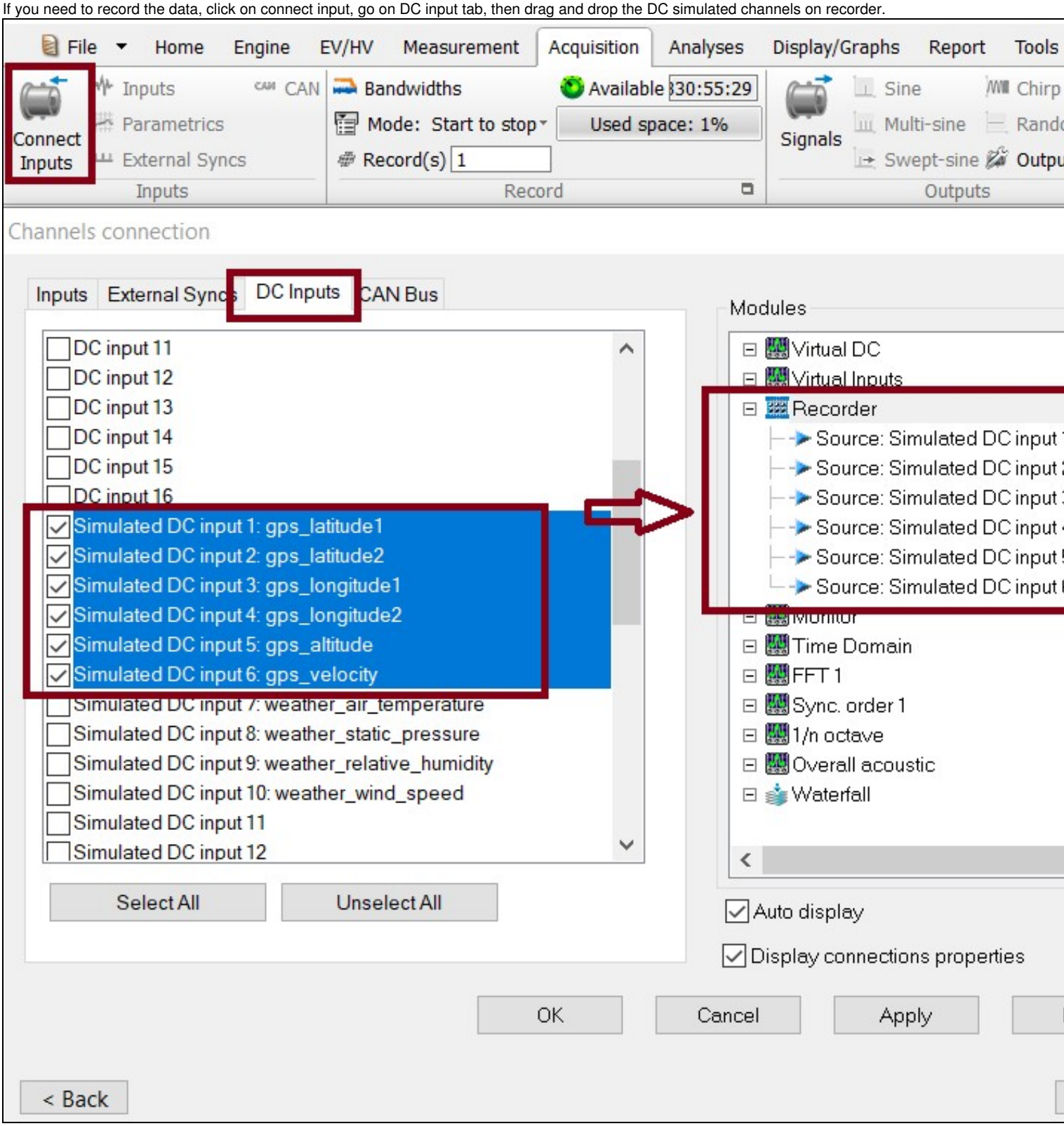
71.3 How to use

Once the gps is plugged and configured, click on inject data, this will put the value in the DC simulated inputs.


DC Simulated Manager
Tools
Help
GPS
Weather
Source
Android
Disconnect
Connected
Location mode
network
Value
Unit
NVGate Simulated DC Inputs
Latitude
45,211925
°
1
2
Longitude
5,786172
°
3
4
Altitude
285,60
m
5
Speed
0,0
m/s
6
Inject values

Then you can use these channels in NVGate.

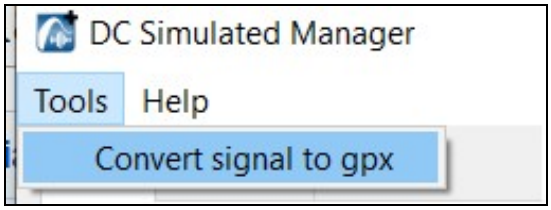
If you need to record the data, click on connect input, go on DC input tab, then drag and drop the DC simulated channels on recorder.

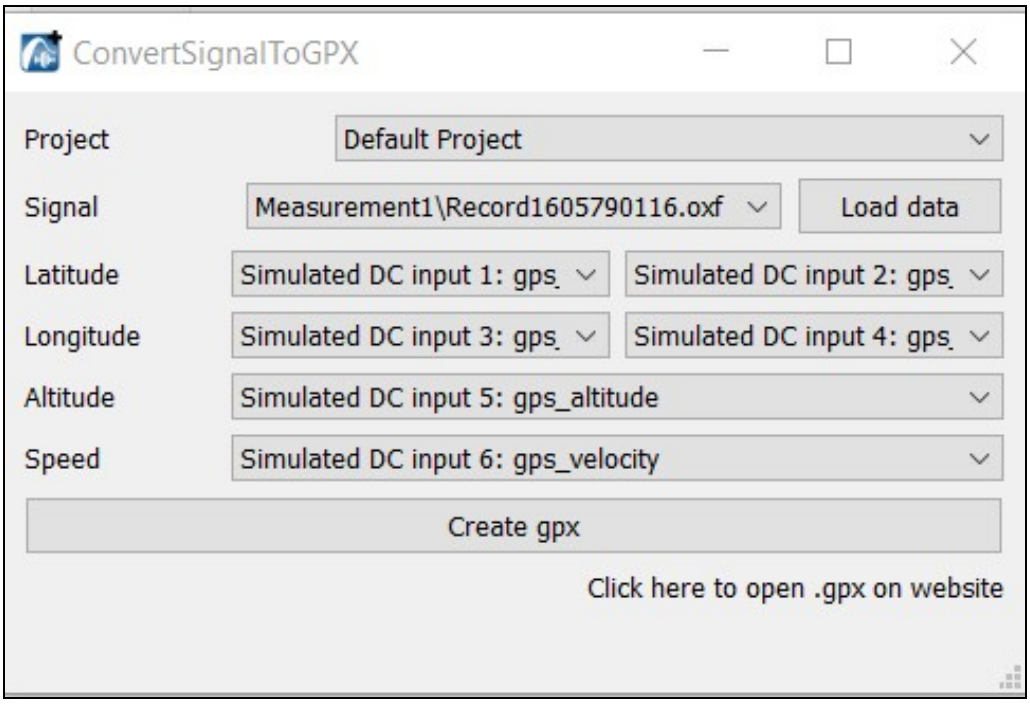


If you have record the data you will be able to create a .gpx file.

71.4 Creating and visualize .gpx file

We can create a .gpx from an .oxf (OROS) signal file.

You need to click on Convertsignaltogpx. 

This will open the window below. 

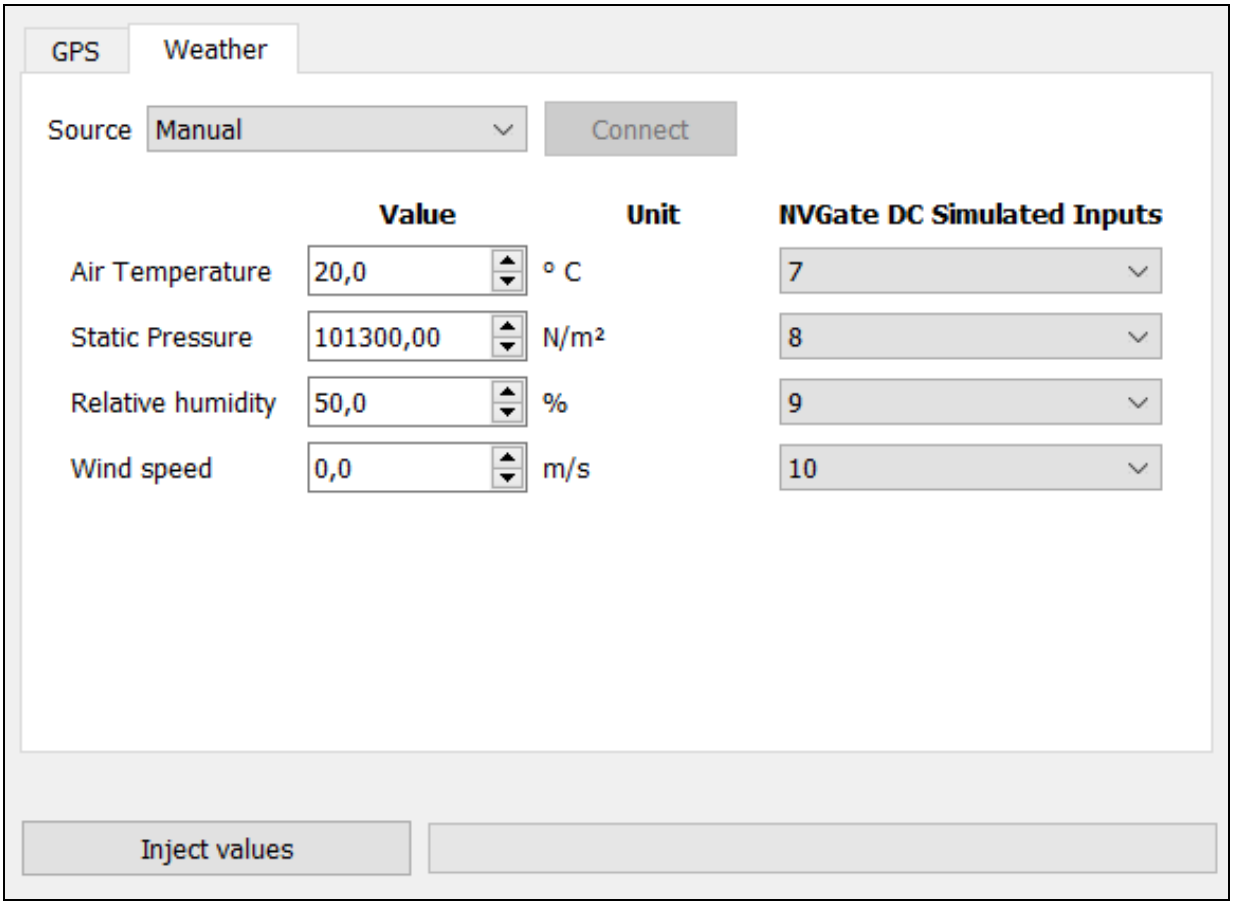
Select the signal file that you need to convert and click on load data. You can modify the channels if needed. Click on create .gpx. The .gpx will be put in the "attachment" folder of the NVGate project.

If you want to visualize the .gpx we advise using the website : https://www.gpsvisualizer.com/ Clicking on "Click here to visualize the .gpx on a website" opens an website allowing you to plot the gpx on a map.

72 Weather station

72.1 Manual

The user can enter manually the weather value.



72.2 Davis instruments weather station



You need the 3 elements to make it work.

- 6322OV Wireless Vantage Pro2 Integrated Sensor Suite

- 6316 Wireless Envoy

- 6510USB WeatherLink Data Logger.

This weather station provides accurate, reliable weather monitoring with real-time data updates every 2.5 seconds. Sensor suite includes outside temperature and humidity sensors in a passive radiation shield; wind speed and direction; and rainfall.

Note : **The weather Station need to pass by OROS SA for configuration.**

72.3 Other weather station

Please contact OROS to check the possibility of importing the data. (paid service)

73 NVGate Diesel Engine Vibration Solution: EngineDiag

Reciprocating machines generate specific vibration signatures. Dedicated tools associating the machine mechanical characteristics and high performance analysis capabilities are necessary to understand the dynamic behavior of these machines. With EngineDiag, OROS takes on the challenge to offer tool integration in one product in order to enhance test efficiency.

73.1 Installation

73.1.1 Equipment required for the installation

USB drive containing Angle-Frequency installation setup ?SetupAngleFrequency.exe?.

NVGate software must have been installed first.

73.1.2 Installation of NVGate software

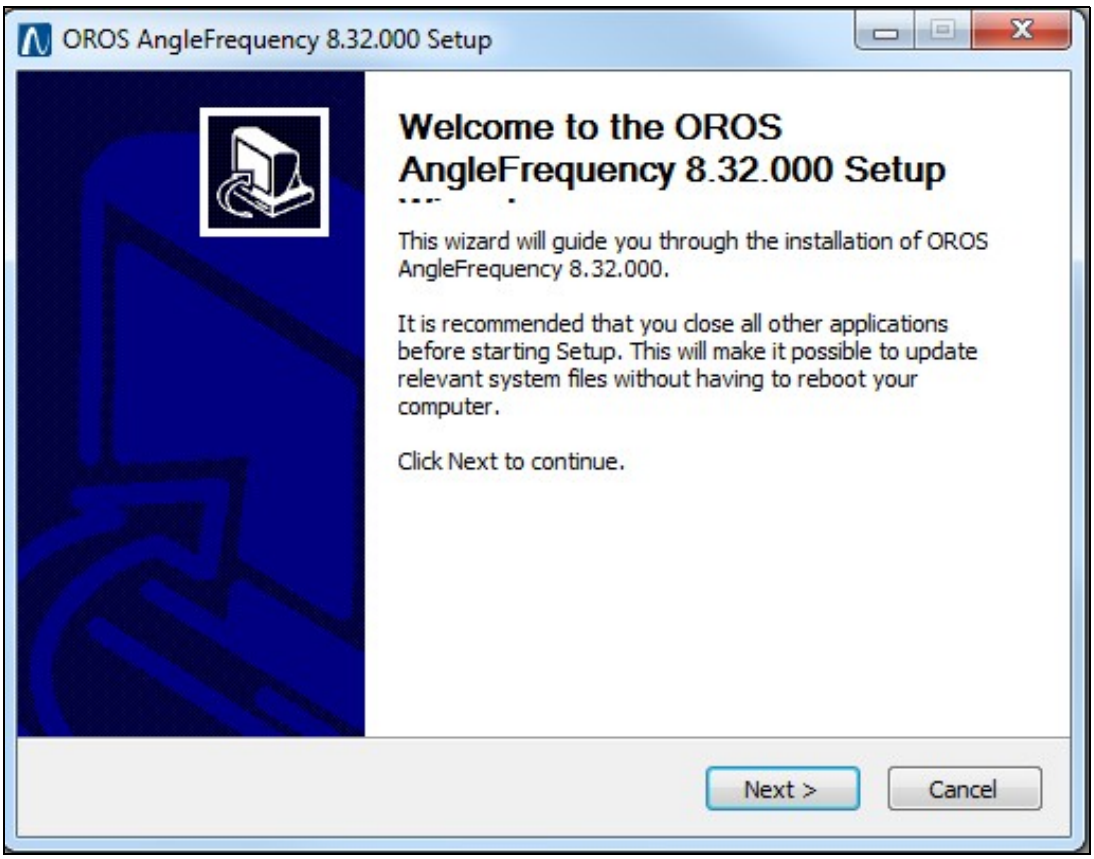
First you need to install NVGate.

73.1.3 Installation of Angle-Frequency option

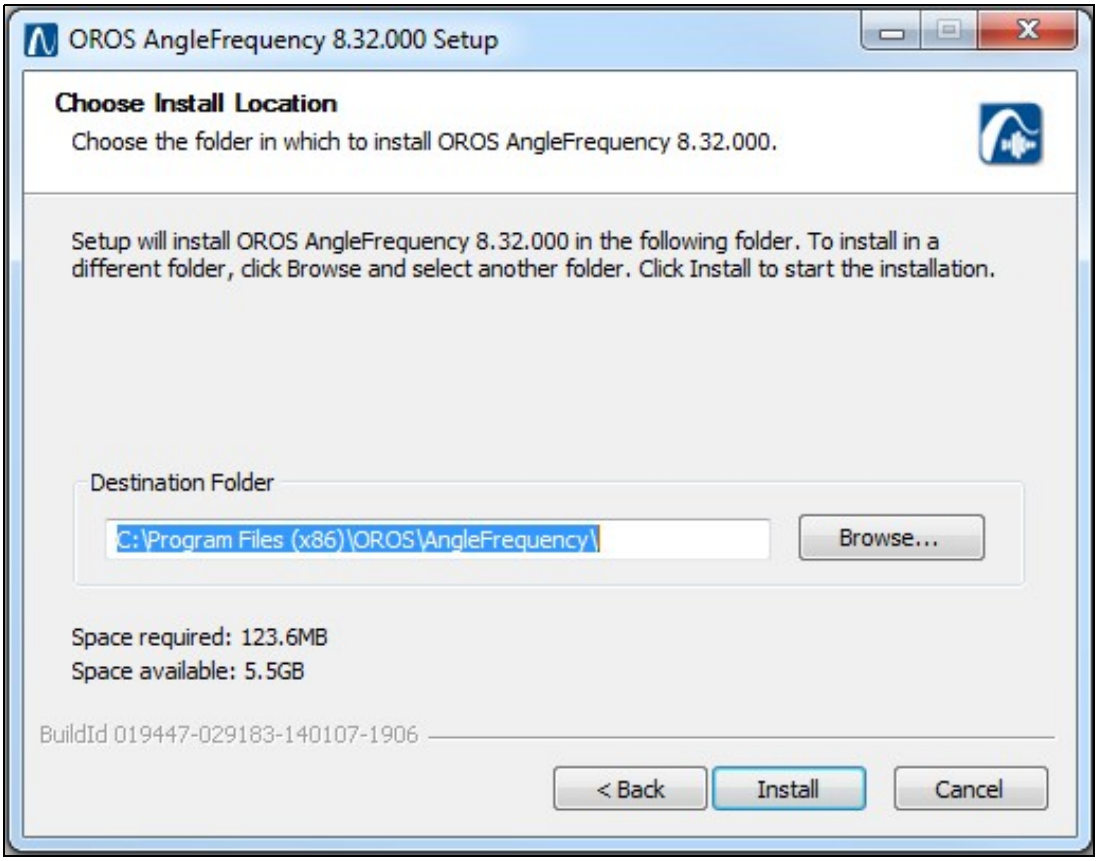
EngineDiag is a module integrated in NVGate. For the Angle-Frequency option, it's necessary to install a complementary application: 'SetupAngleFrequency.exe'.

Double click on 

and the following window is dispalyed:

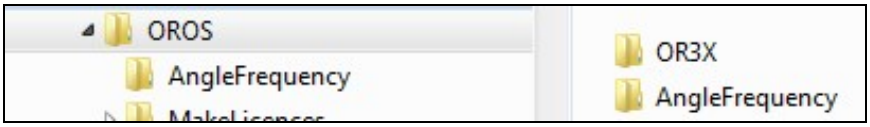


Click on "Next", and the following window is displayed:

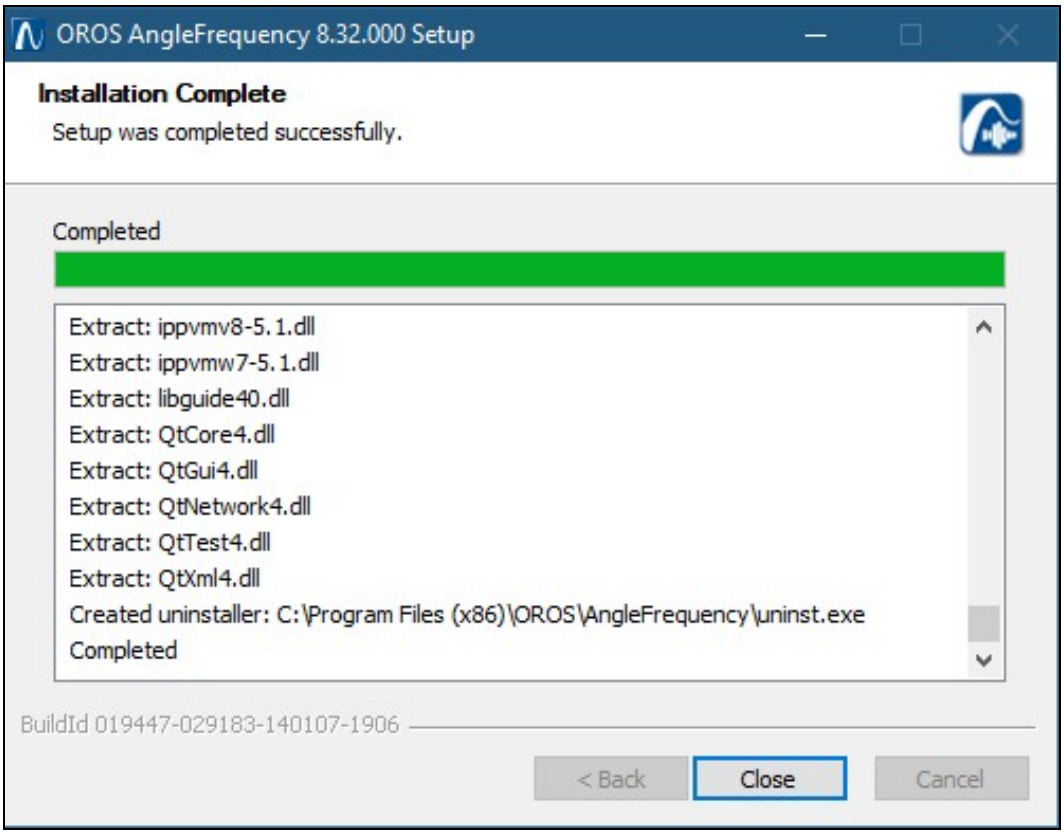


Select the destination folder and click "Install".

Note: if you change the default destination folder, be careful to install the Angle-Frequency module in the same directory as NVGate like the example below:



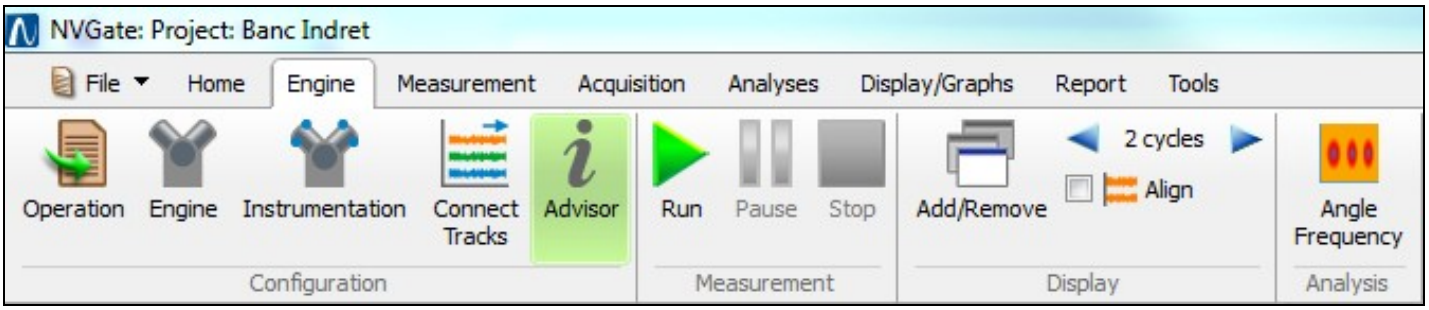
Click on ?Install? to start the installation, and wait until the following window is displayed:



Click on ?Close? to exit the setup wizard, and OROS EngineDiag is successfully installed.

73.2 Environment Configuration

With the EngineDiag module, a new ribbon is available in NVGate. EngineDiag allows you to access to NVGate through an interface, which is dedicated to the engines, and more generally to the reciprocating machines.



73.2.1 Properties

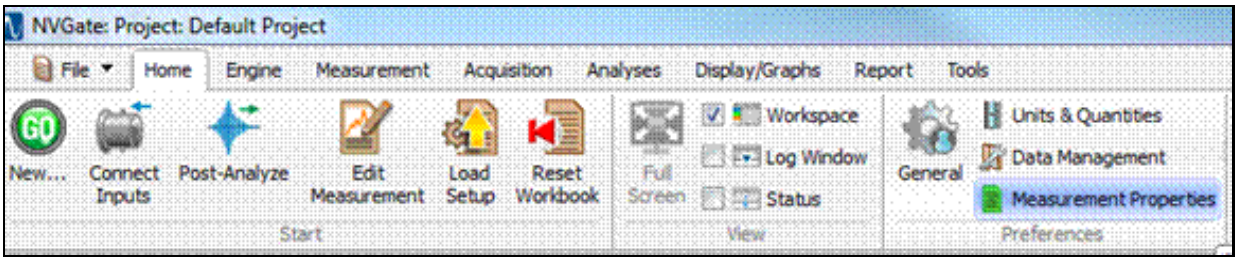
To simplify data saving, history creation and data search, it is possible and recommended to associate metadata to each measurement.

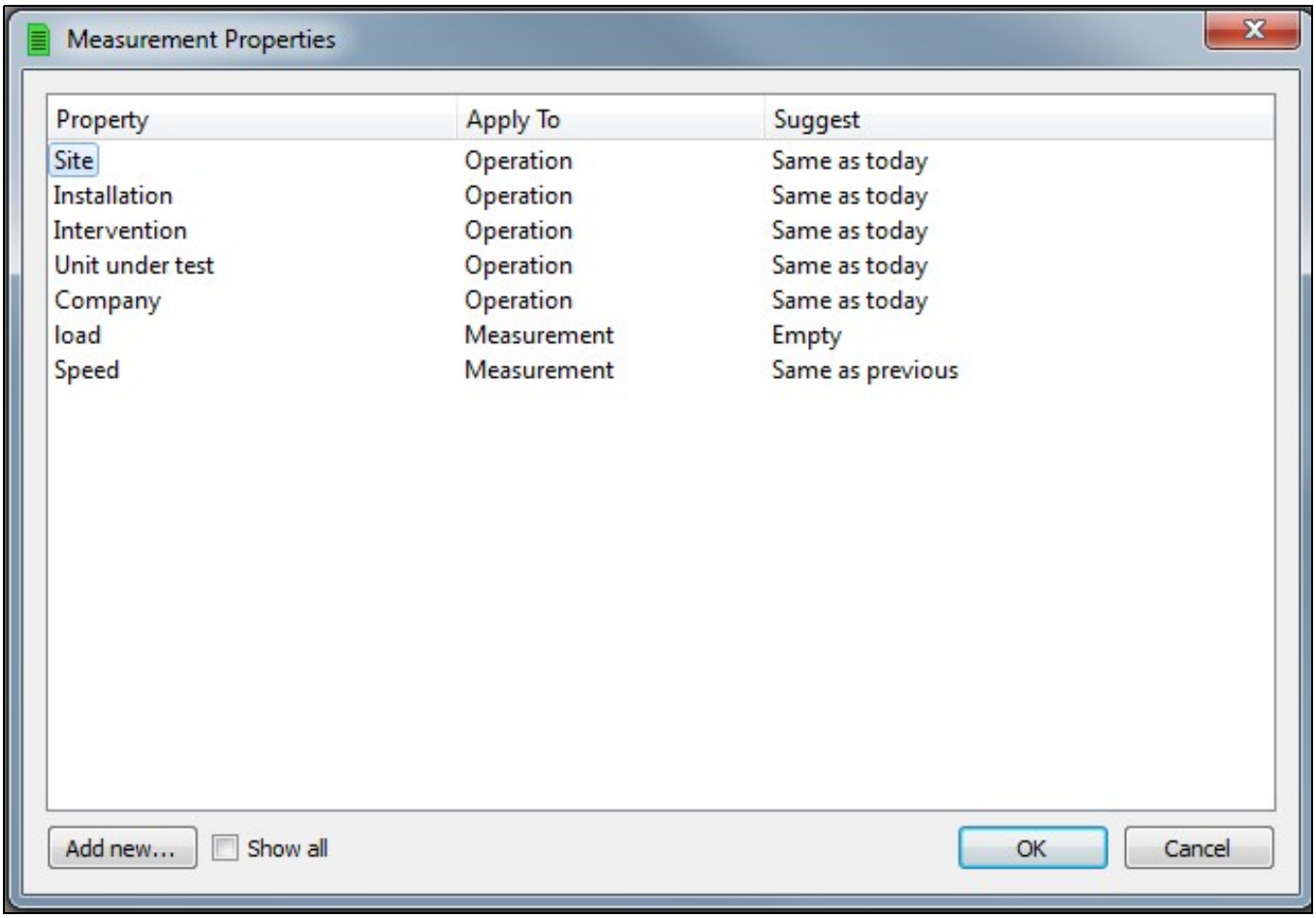
One can determine two types of metadata:

- Properties related to a measurement campaign
- Properties related to each measurement

Properties are defined by default in NVGate but the list of properties can be modified according to the user's need.

The list of properties is available in the Home ribbon by clicking on Measurement properties.

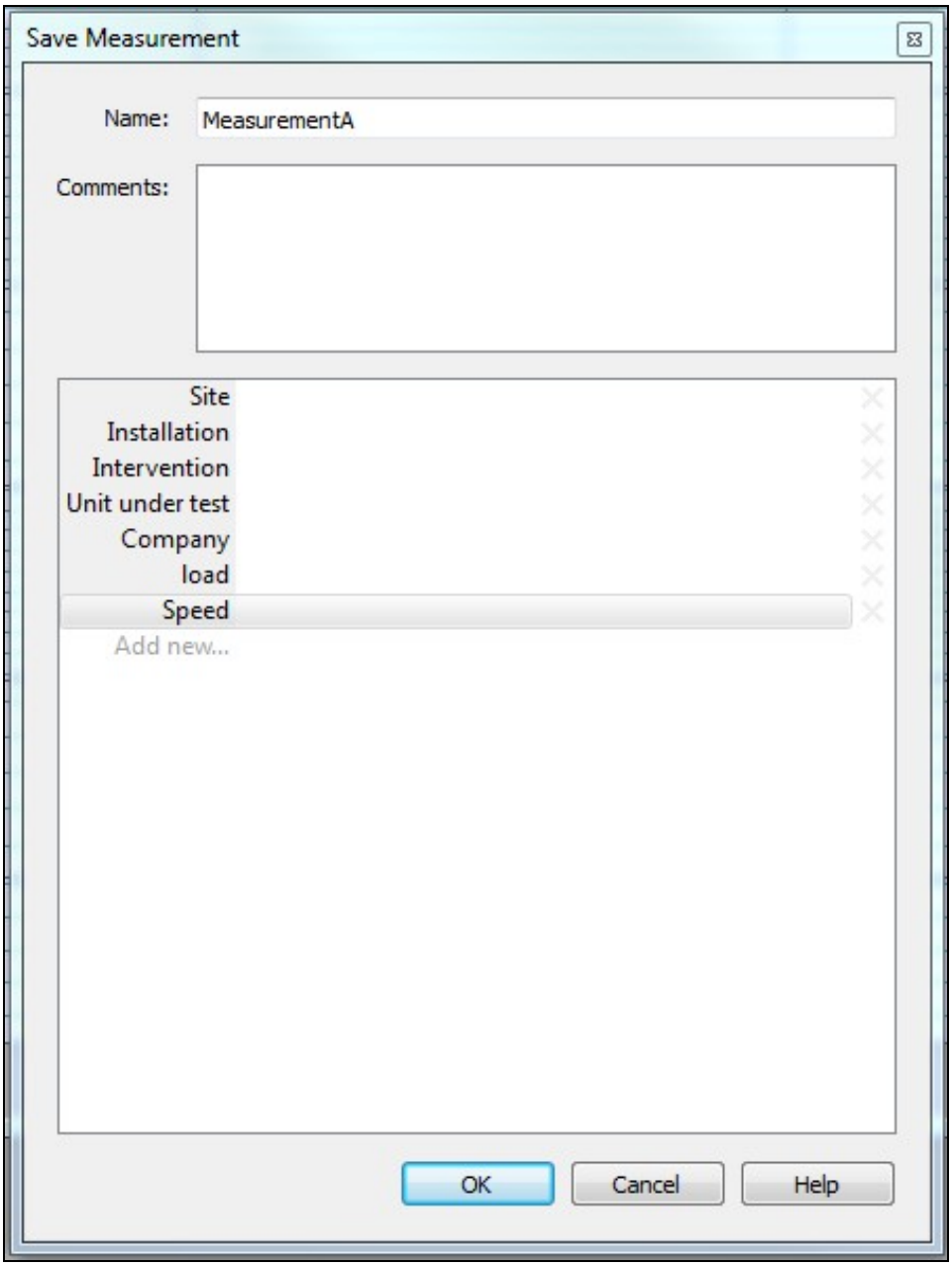

NVGate: Project: Default Project
File
Home
Engine
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
New...
Connect Inputs
Post-Analyze
Edit Measurement
Load Setup
Reset Workbook
Start
Full Screen
Workspace
Log Window
Status
View
General
Units & Quantities
Data Management
Measurement Properties
Preferences


Measurement Properties
Property
Apply To
Suggest
Site
Operation
Same as today
Installation
Operation
Same as today
Intervention
Operation
Same as today
Unit under test
Operation
Same as today
Company
Operation
Same as today
load
Measurement
Empty
Speed
Measurement
Same as previous
Add new...
Show all
OK
Cancel

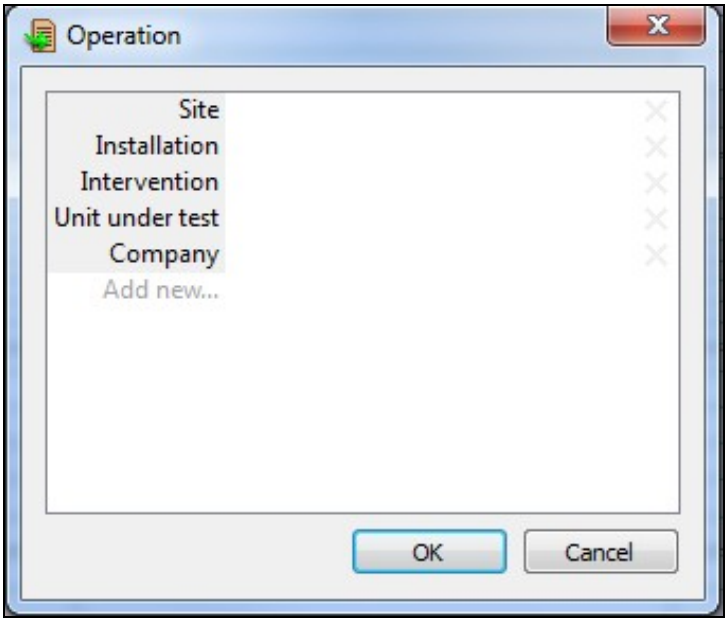
This window shows all the properties used.

For each property a user can define two fields (Apply To & Suggest):

- **Apply to**: Indicates where the property will appear.
- Apply to measurement: The property will appear in the save measurement only.



- Apply to Operation: the property will appear in the operation window and in the save measurement window. The user can pre-fill in some of values in the window Operation available in the Engine ribbon.

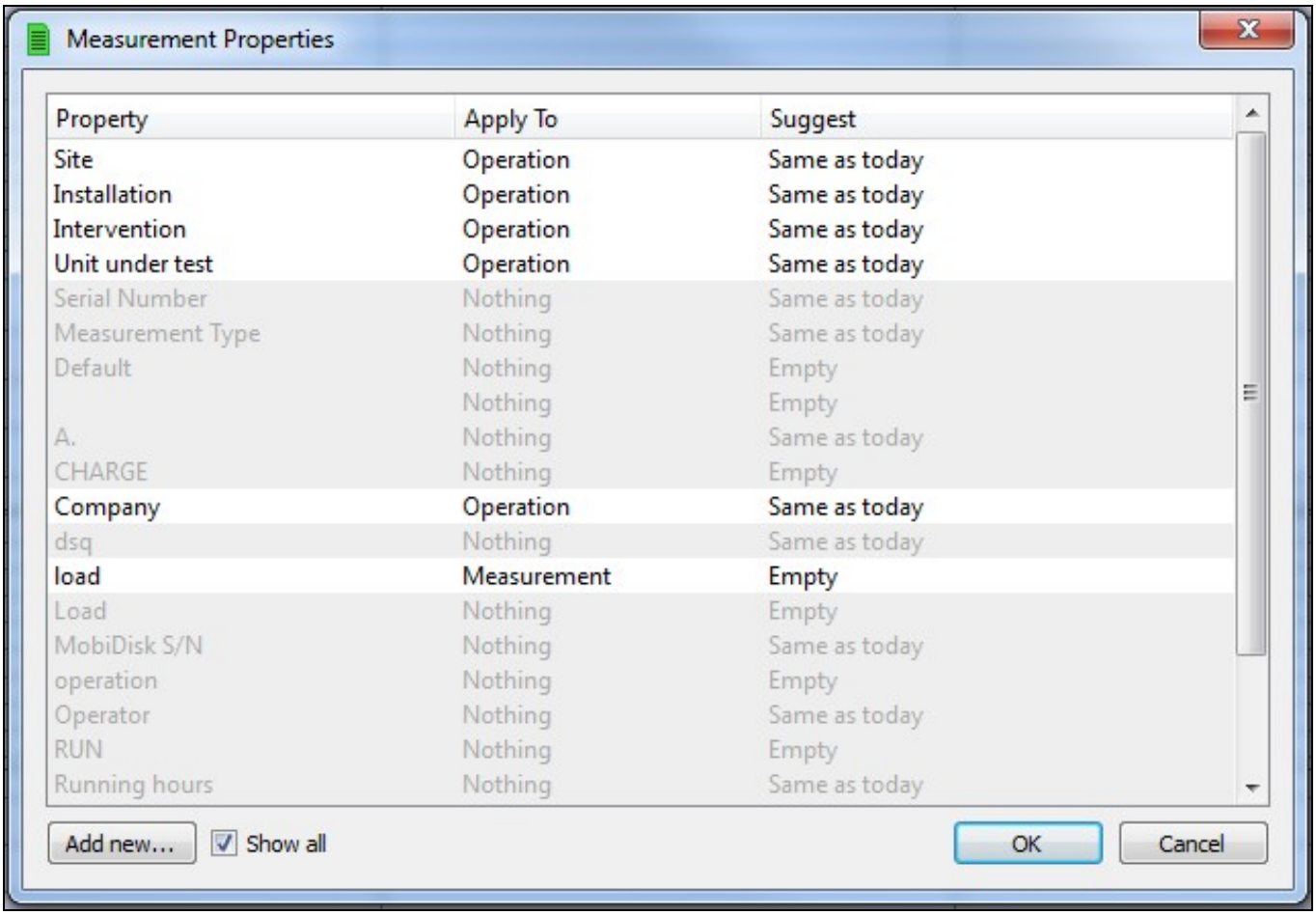


- Apply to nothing: the property will not appear.

- **Suggest**

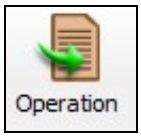
```
* Empty: The property is empty by default
* Same as previous: By default the property keep the last value entered by the user.
* Same as today: The property keeps the same value during one day. The day after the value is reset to empty.
```

By selecting show all in this window, all the properties, even those that are not used anymore, are displayed.



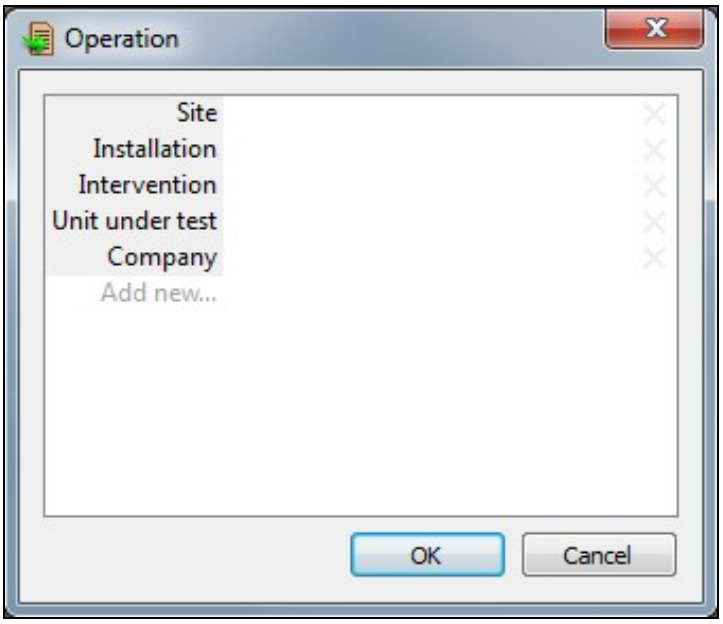
73.2.1.1 Operation

These properties related to a measurement campaign are generally related to several measurements done on the same day and on the same installation. Instead of writing this information for each measurement, it's possible to define the environment once before stating the measurement.

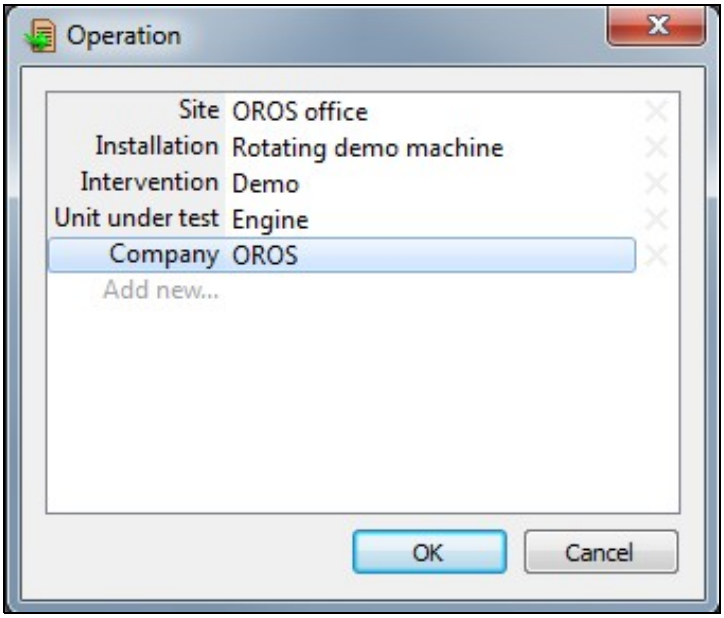
This information can be defined in the operation window available by clicking on the button 

.

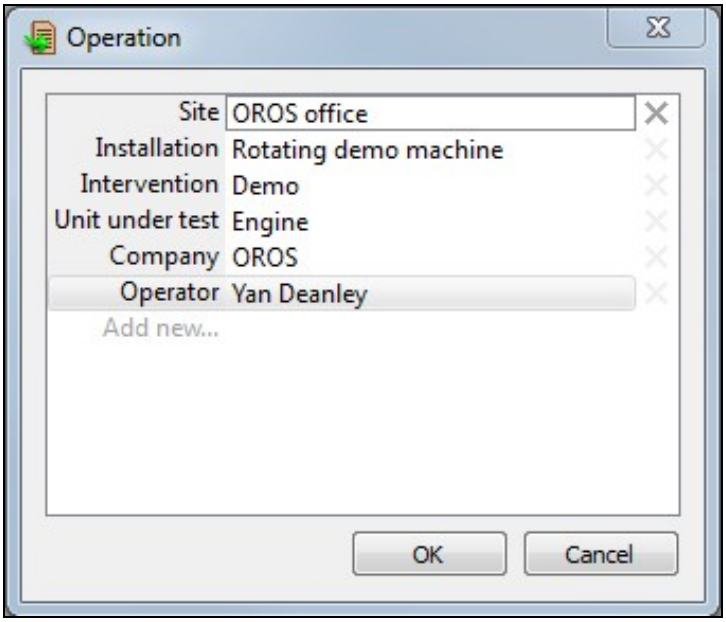
Below are the properties by default:



The properties can be defined by what is directly shown in the following example:



At this stage, new properties can be added if needed by clicking on "Add new" in this window



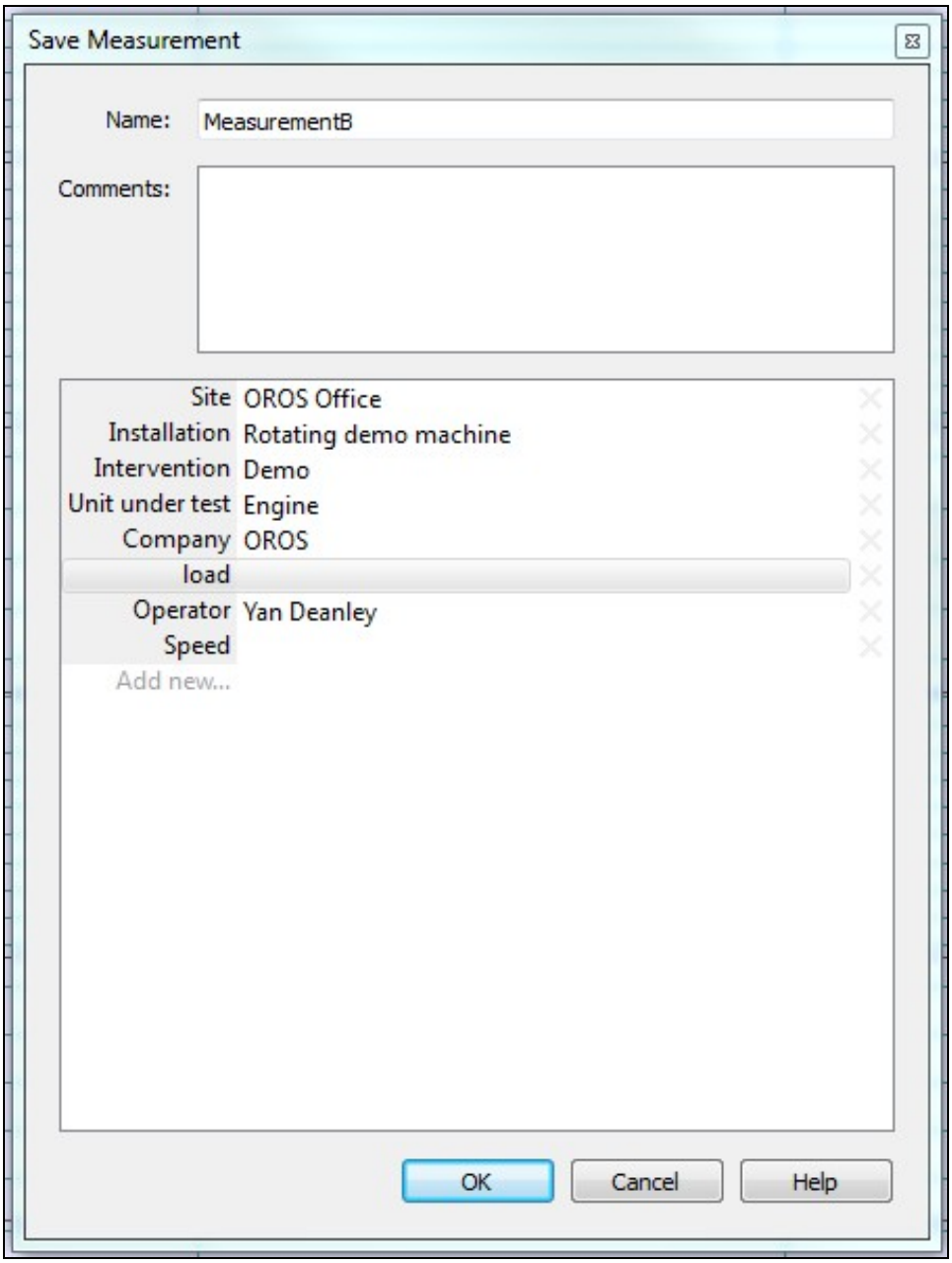
Select "OK".

All these properties will be added to each measurement that is done on this day.

73.2.1.2 Measurement

In the "Save Measurement" window, all the activated properties are displayed.

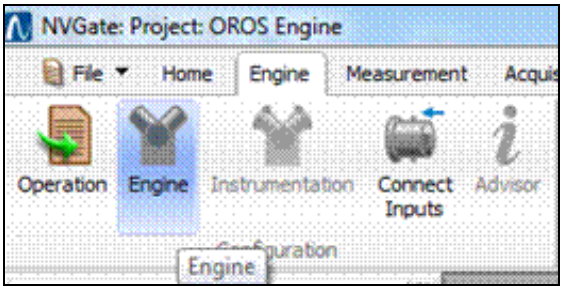
The properties are pre-filled in the operation window and appear with the value defined by the user in the operation window.


Save Measurement
Name:
MeasurementB
Comments:
Site
OROS Office
Installation
Rotating demo machine
Intervention
Demo
Unit under test
Engine
Company
OROS
load
Operator
Yan Deanley
Speed
Add new...
OK
Cancel
Help

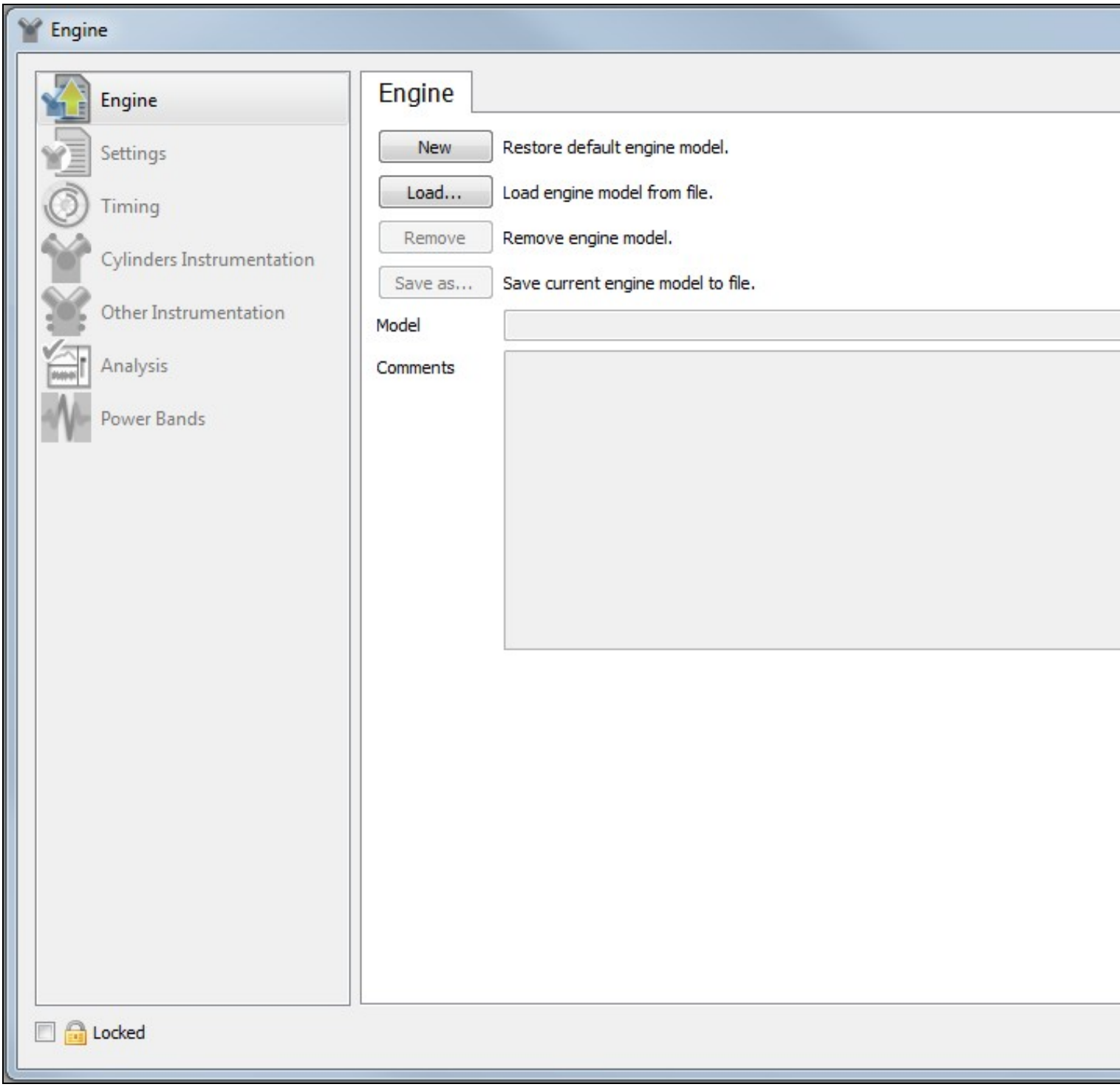
73.3 Engine Configuration

One of the objectives of the EngineDiag module is to integrate, in NVGate, the physical data related to the engine under test in order to have all this information during the analysis.

The design and the kinematic information can be described by clicking on the button Engine.



The following window is displayed.


Engine
Engine
Settings
Timing
Cylinders Instrumentation
Other Instrumentation
Analysis
Power Bands
Engine
New
Restore default engine model.
Load...
Load engine model from file.
Remove
Remove engine model.
Save as...
Save current engine model to file.
Model
Comments
Locked

From this window a complete Engine model can be described.

An Engine model contains the:

- Engine designation
- Engine settings
- Timing information
- Instrumentation
- Type of analysis applied to this engine

This information can be saved in an independent file .engine, in the NVGate projects and in the measurements.

73.3.1 Engine

From this first panel, several actions are available:

- New: create a new Engine model

By clicking on "new", a default engine model is loaded and the "settings" panel is automatically displayed.

Here, some modifications can be done.

- Load: Load an existing engine model

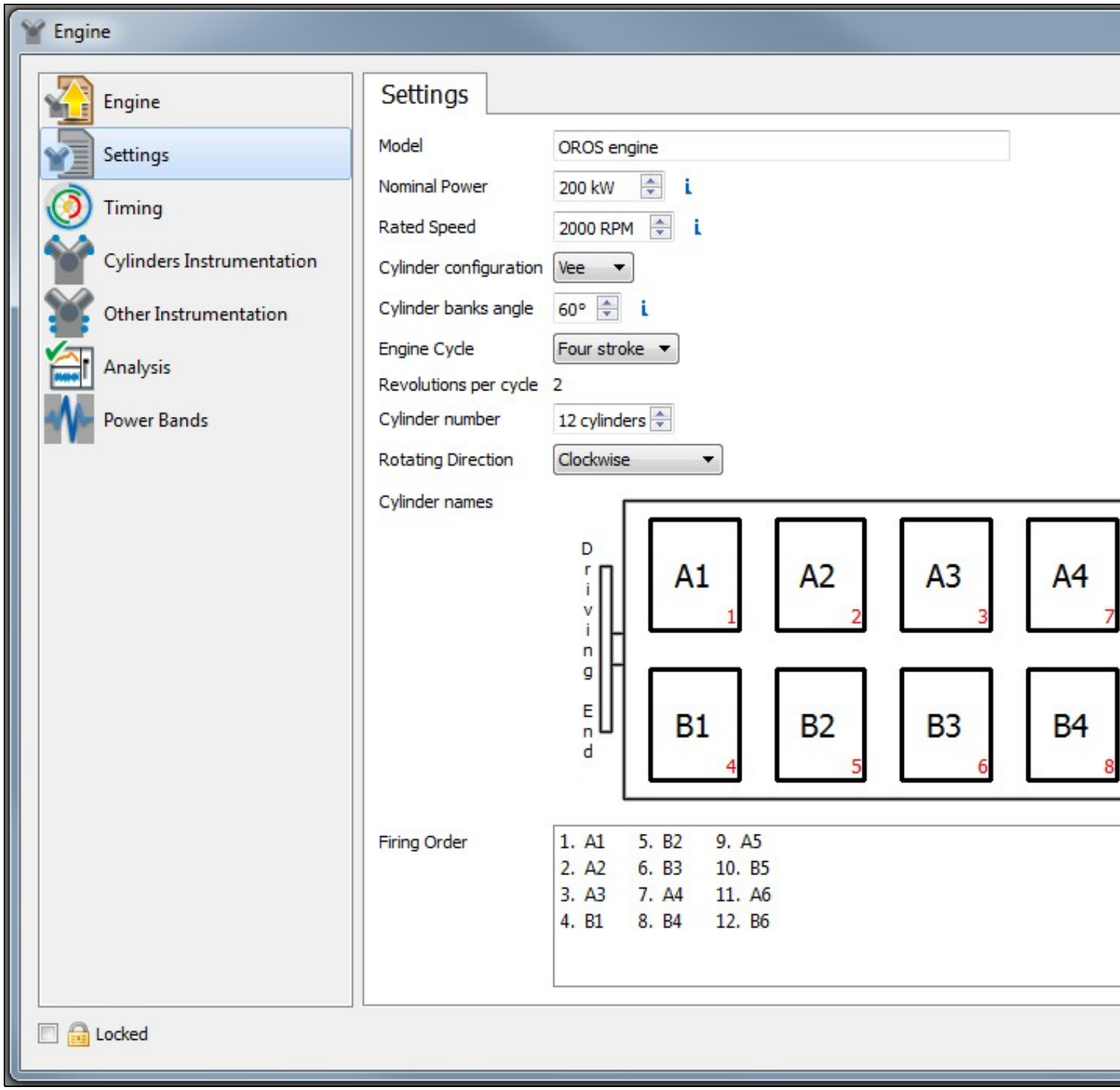
By clicking on "Load", an existing engine model can be loaded by selecting a file .engine.

- Remove: Remove the current engine model.
- Save as: Save the current engine model to a file.

This panel gives also the model name defined in the settings panel and all the comments written by the user. The field "comments" is saved in the engine model.

73.3.2 Settings

The settings panel allows you to describe the engine characteristics.


Engine
Engine
Settings
Timing
Cylinders Instrumentation
Other Instrumentation
Analysis
Power Bands
Settings
Model
OROS engine
Nominal Power
200 kW
Rated Speed
2000 RPM
Cylinder configuration
Vee
Cylinder banks angle
60°
Engine Cycle
Four stroke
Revolutions per cycle
2
Cylinder number
12 cylinders
Rotating Direction
Clockwise
Cylinder names
Driving End
A1
1
A2
2
A3
3
A4
7
B1
4
B2
5
B3
6
B4
8
Firing Order
1. A1
2. A2
3. A3
4. B1
5. B2
6. B3
7. A4
8. B4
9. A5
10. B5
11. A6
12. B6
Locked

The 3 fields: Nominal power, rated speed and cylinder bank angle are here for more information. The results are not influenced by these values.

The other settings will influence the results.

- Cylinder configuration: Free or In Line.
- Engine cycle: 2 strokes or 4 strokes.
- Cylinders number: Indicate the cylinders number.
- Rotating Direction: Clockwise or counterclockwise

With this information, a schematic picture is automatic.ally drawn. The cylinder's names can be modified by clicking directly on them.

On this picture, the small numbers in red represent the firing order. This order can be modified in the panel below the picture.

73.3.3 Timing

The timing information corresponds to the machine kinematics. The cycle of each reciprocating machine is divided in to several phases. These phases are separated by kinematic events. The figure below shows the typical cycle of a 4-stroke diesel engine with the different phases:

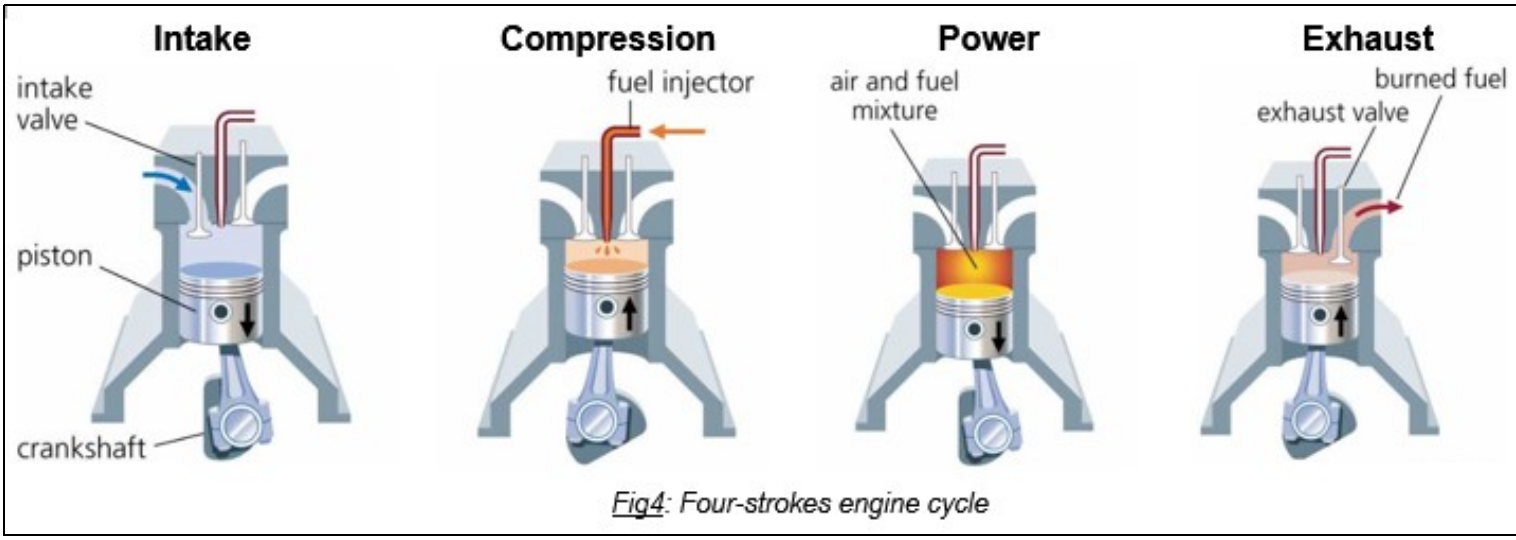
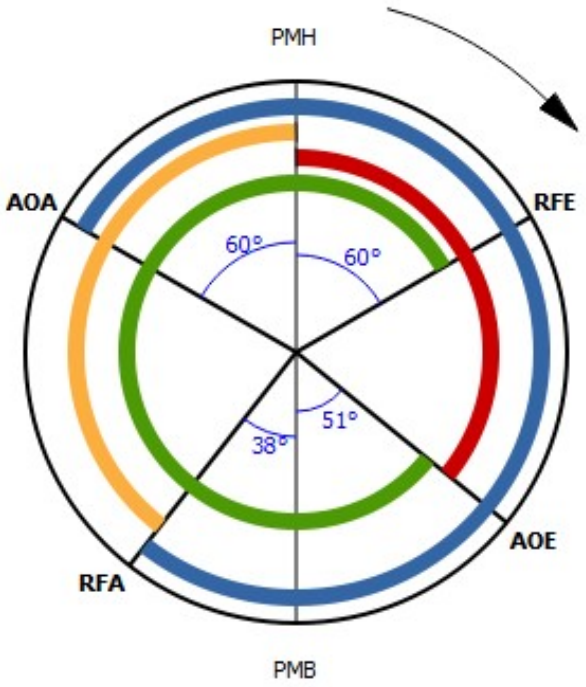


Fig4: Four-strokes engine cycle

The duration of each phase is defined by the valves opening and closing. The position of these events is given in angle relative to the Top Dead Center (TDC) where the piston is at top of the cylinder or Bottom Dead Center (BDC) where the piston is at the bottom of the cylinder. This information is generally contained in the timing diagram provided by the engine manufacturer. EngineDiag supports the ability to enter the timing diagram information to be used in the analysis.

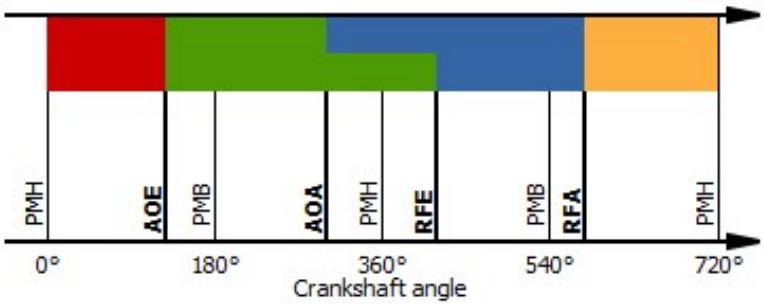
The timing panel allows you to describe the timing information generally provided by the engine manufacturer.

Timing



Event	Position from DC	Angle (°)	Revolution
PMH	-	-	-
PMB	-	-	-
AOA	Before PMH	60	1
RFA	After PMB	38	2
AOE	Before PMB	51	1
RFE	After PMH	60	2

Phase	Start	Stop	Color
INTAKE	AOA	RFA	
COMPRESSION	RFA	PMH	
POWER	PMH	AOE	
EXHAUST	AOE	RFE	



Tachometer Reference

PMH A1

- The events table

The events table allows you to define the kinematic events (Intake opening, exhaust opening,?) and position them in relation to the events Top Dead Center (TDC) and Bottom Dead Center (BDC).

An event is defined by two things:

- An angle from the TDC or BDC.
- Its position in the engine cycle.

This information is important for four-stroke engines. It's necessary to know if the event appears in the first or in the second crankshaft revolution. Every modification done in the events table is automatically reported on the two graphs displayed here. At the top, a typical timing diagram and at the bottom the linear engine cycle representation.

A new event can be added by clicking on the  below the events table. .

- The phases table

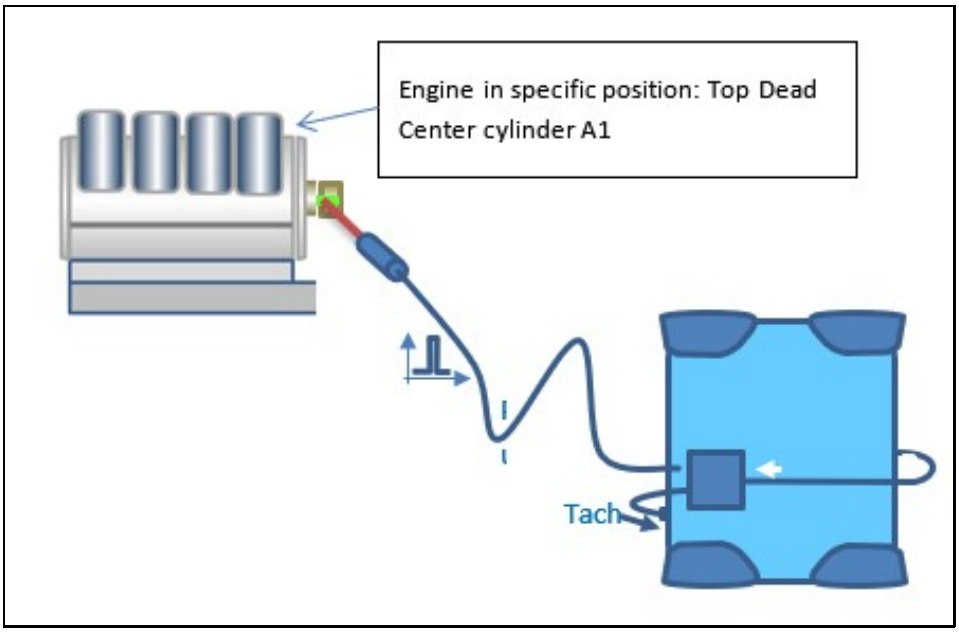
From the events described in the events table, the different phases of the engine cycle can be defined. Each phase is defined by its start and stop event as well as a color. The settings can be modified by double clicking on the concerned setting.

A new phase can be added by clicking on the  below the phases table. The selected phase can be removed by clicking on the  .

- Tachometer reference

The tachometer reference is the event synchronized to the tachometer that will be used for the synchronous analysis.

In the example below, the tachometer reference is TDC A1 because the pulse is synchronized with this event.



73.3.4 Instrumentation

The objective here is to describe the instrumentation installed on the engine under test to keep it in memory.

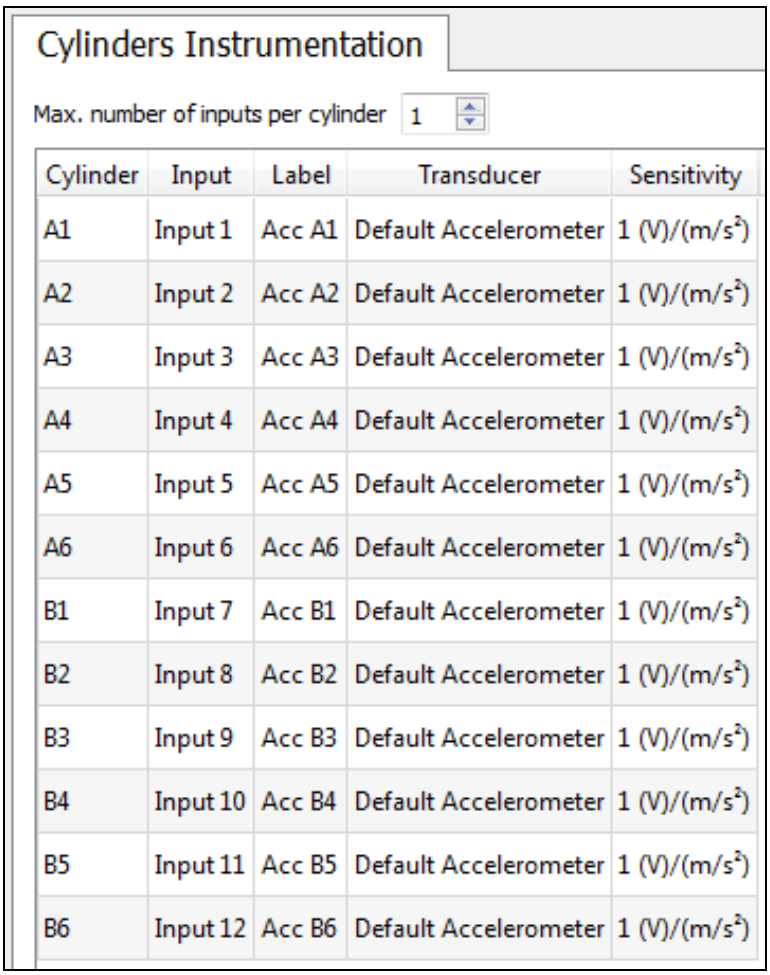
73.3.4.1 Cylinders instrumentation

This panel displays the instrumentation installed on the cylinders.

For each cylinder, one can define:

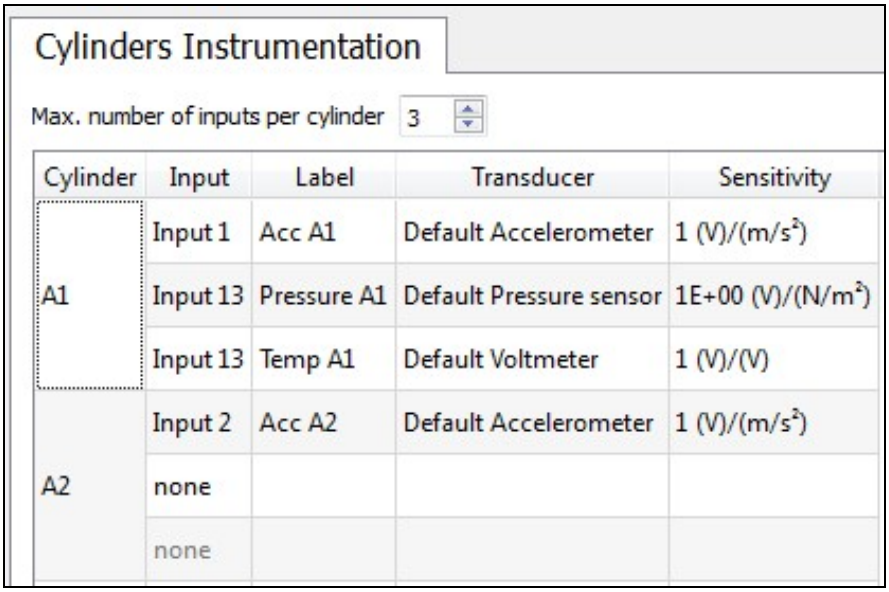
- Analyzer input.
- Label.
- Type of transducer by using the transducer database.

The sensitivity of the selected transducer is automatically displayed.



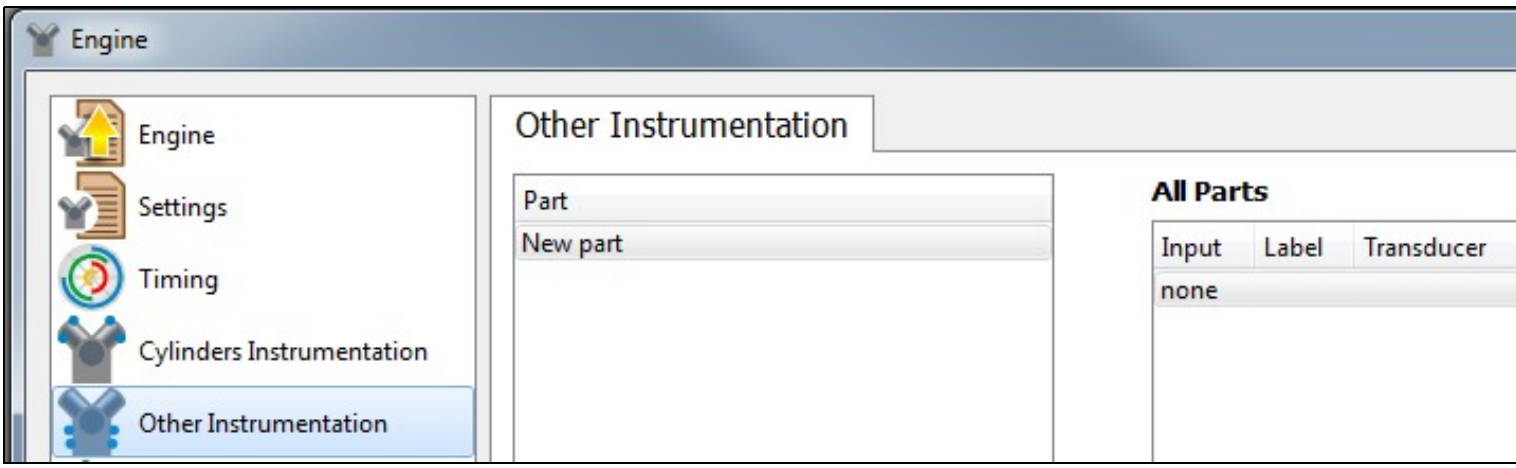
Cylinder	Input	Label	Transducer	Sensitivity
A1	Input 1	Acc A1	Default Accelerometer	1 (V)/(m/s²)
A2	Input 2	Acc A2	Default Accelerometer	1 (V)/(m/s²)
A3	Input 3	Acc A3	Default Accelerometer	1 (V)/(m/s²)
A4	Input 4	Acc A4	Default Accelerometer	1 (V)/(m/s²)
A5	Input 5	Acc A5	Default Accelerometer	1 (V)/(m/s²)
A6	Input 6	Acc A6	Default Accelerometer	1 (V)/(m/s²)
B1	Input 7	Acc B1	Default Accelerometer	1 (V)/(m/s²)
B2	Input 8	Acc B2	Default Accelerometer	1 (V)/(m/s²)
B3	Input 9	Acc B3	Default Accelerometer	1 (V)/(m/s²)
B4	Input 10	Acc B4	Default Accelerometer	1 (V)/(m/s²)
B5	Input 11	Acc B5	Default Accelerometer	1 (V)/(m/s²)
B6	Input 12	Acc B6	Default Accelerometer	1 (V)/(m/s²)

Several transducers can be installed on the same cylinder. You can define the maximum number of inputs per cylinder. See the example below with 3 inputs:



73.3.4.2 Other instrumentation

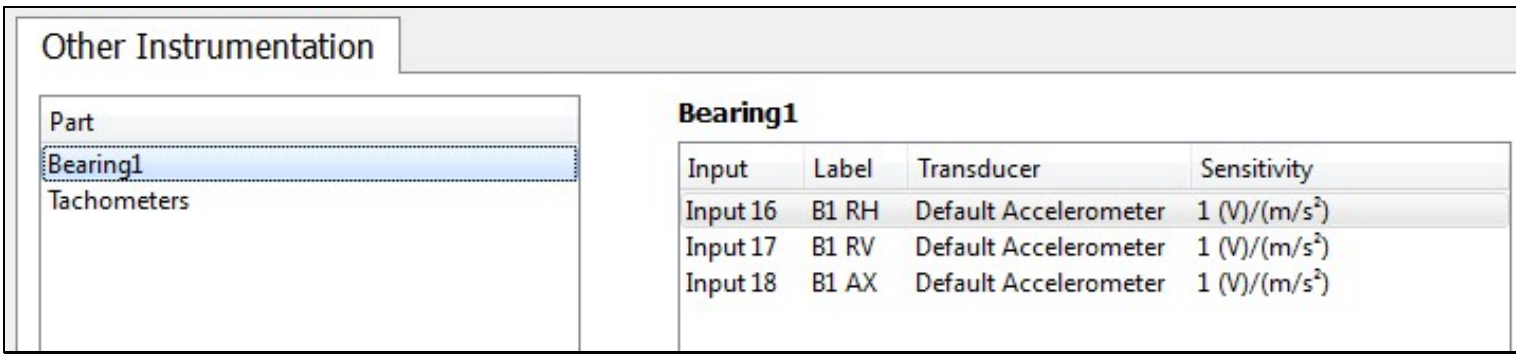
In addition to the cylinder instrumentation, others transducers can be installed on the machine.



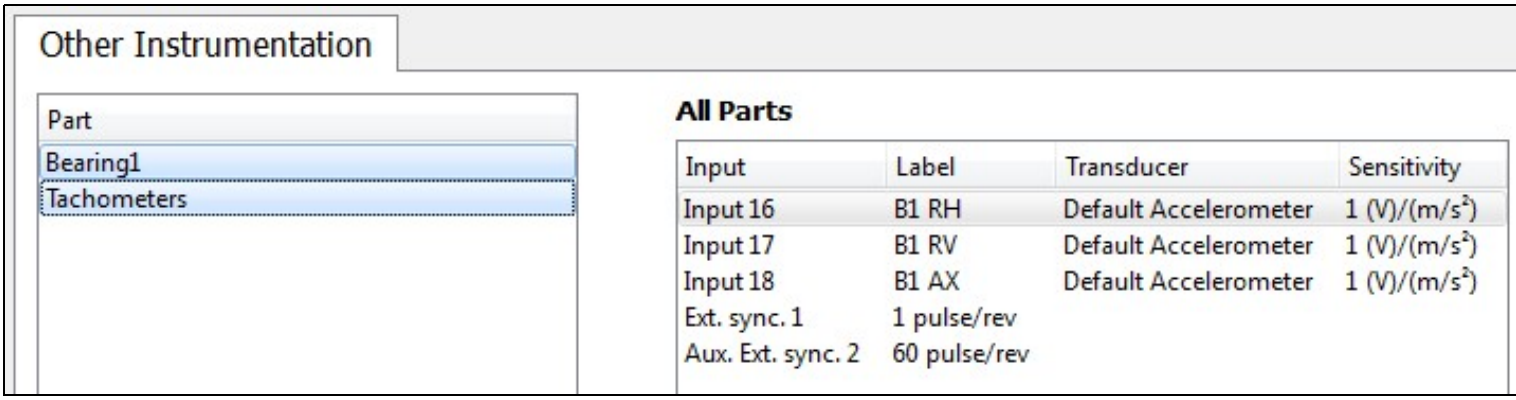
Several groups of transducers can be defined, which are often associated to a machine part: bearing, absorber...

Double click on "New part" to define the part name and click on the  to add a new part.

Several transducers can be associated to each part. By selecting a part, the associated transducers are automatically displayed.

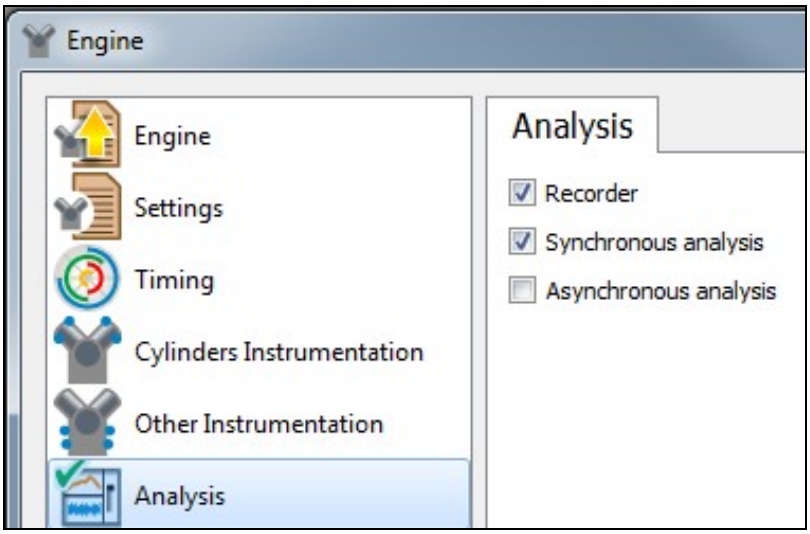


By selecting all the parts simultaneously, all the transducers installed on the engine are displayed.



73.3.4.3 Analysis

The Analysis panel allows you to select the type of analysis that will be done. This information will be used to help the user to configure NVGate.



- The recorder use the NVGate recorder
- The synchronous analysis uses the Synchronous order plug-in
- The asynchronous analysis uses the FFT plug-in

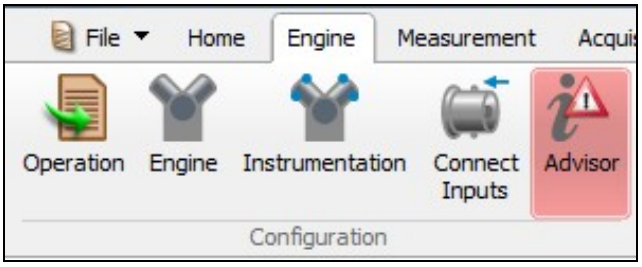
When the engine model is defined, do not forget to save it in the Engine panel with the "Save as" button.

73.4 NVGate configuration

73.4.1 The Advisor

From the parameters defined in the engine model, the Advisor will help the user to configure NVGate correctly.

The advisor is a helpful tool, it's not compulsory to use it for the configuration.

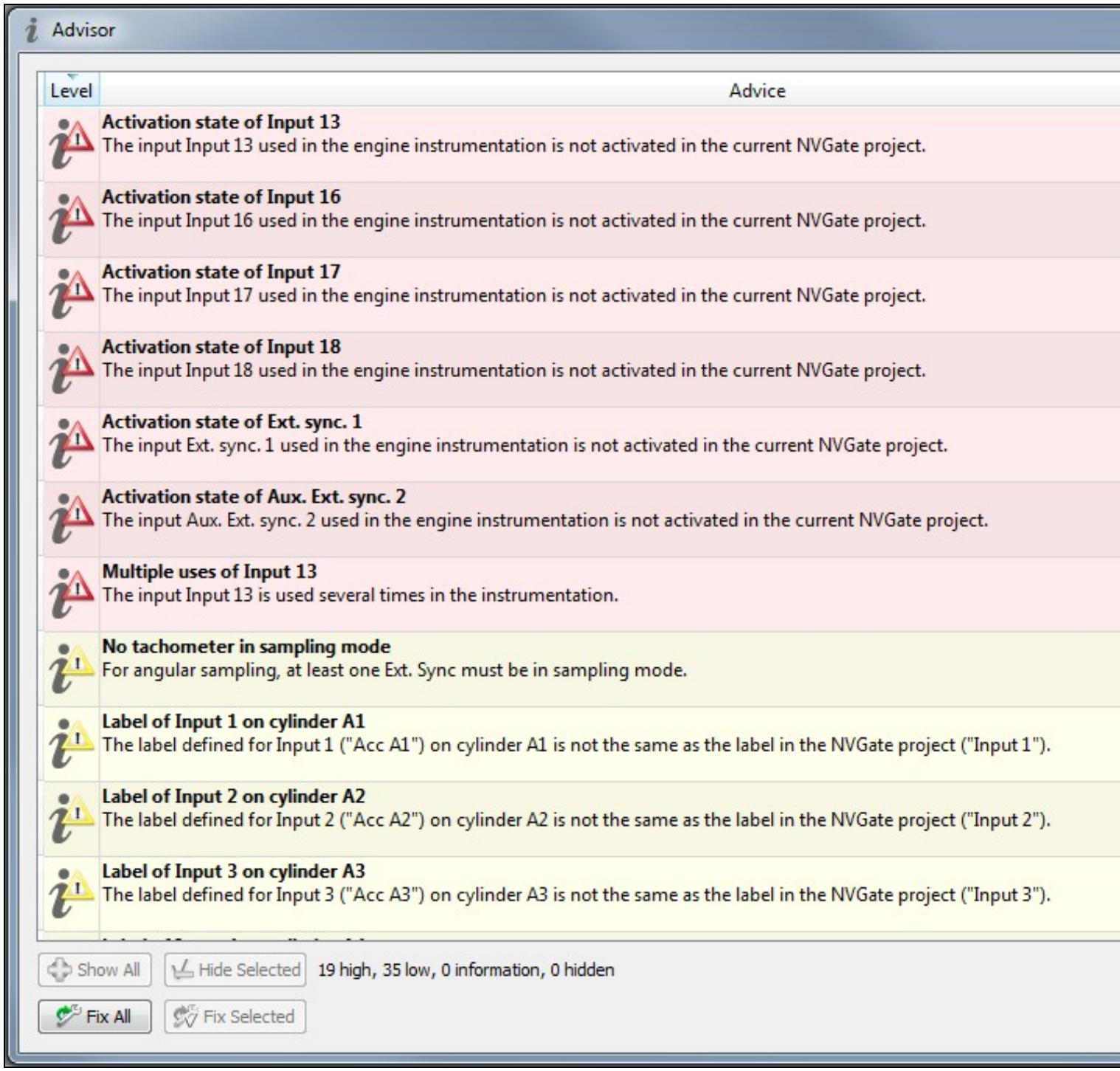


The advisor gives a status about the software configuration depending on the Engine model.

Using different colors, the advisor indicates the current status of the NVGate configuration

	The measurement will not be done correctly. The configuration should be adjusted.
	Regarding the type of analysis selected, some settings are missing in order to obtain all the results.
	Regarding the type of analysis selected, the NVGate configuration is correct. The user can choose which results he wants to display and start the acquisition.

By clicking on the Advisor button, all the errors will be displayed with title, explanation and criticality, as shown below.

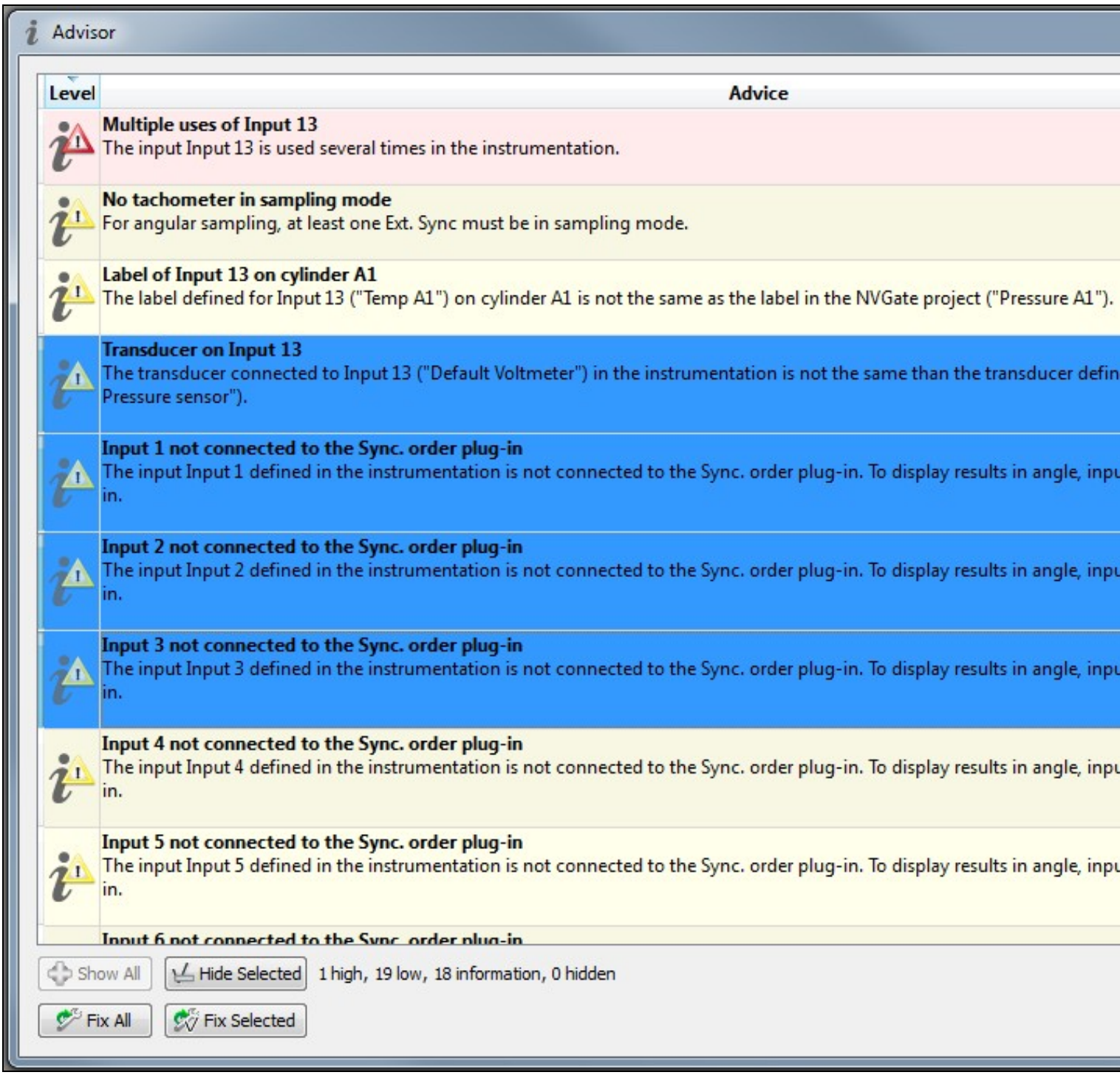

Advisor
Level
Advice
Activation state of Input 13
The input Input 13 used in the engine instrumentation is not activated in the current NVGate project.
Activation state of Input 16
The input Input 16 used in the engine instrumentation is not activated in the current NVGate project.
Activation state of Input 17
The input Input 17 used in the engine instrumentation is not activated in the current NVGate project.
Activation state of Input 18
The input Input 18 used in the engine instrumentation is not activated in the current NVGate project.
Activation state of Ext. sync. 1
The input Ext. sync. 1 used in the engine instrumentation is not activated in the current NVGate project.
Activation state of Aux. Ext. sync. 2
The input Aux. Ext. sync. 2 used in the engine instrumentation is not activated in the current NVGate project.
Multiple uses of Input 13
The input Input 13 is used several times in the instrumentation.
No tachometer in sampling mode
For angular sampling, at least one Ext. Sync must be in sampling mode.
Label of Input 1 on cylinder A1
The label defined for Input 1 ("Acc A1") on cylinder A1 is not the same as the label in the NVGate project ("Input 1").
Label of Input 2 on cylinder A2
The label defined for Input 2 ("Acc A2") on cylinder A2 is not the same as the label in the NVGate project ("Input 2").
Label of Input 3 on cylinder A3
The label defined for Input 3 ("Acc A3") on cylinder A3 is not the same as the label in the NVGate project ("Input 3").
Show All
Hide Selected
19 high, 35 low, 0 information, 0 hidden
Fix All
Fix Selected

For each error, the advisor indicates if it can be solved automatically  or manually  .

- Click on  and it will automatically set up NVGate to solve the error.
- Click on  and it will open the window where the user has to do an action to solve the error.

To save time, the 

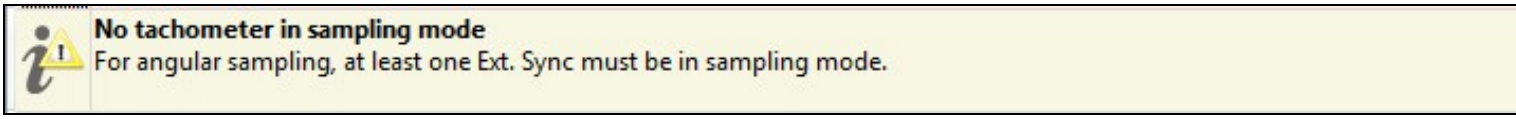
button allows you to fix all the displayed errors that can be solved automatically.



The "Fix Selected" button, 

, solves the selected errors in the list.

The advisor gives only advice. The user can read the information and decide to ignore some of the errors. Each error can be hidden by clicking on the button shown below.



The "Hide Selected" function, 

, allows you to hide several errors at the same time by selecting them.

All the hidden functions are not deleted. At any time the user can display all of them by clicking on the button 

.

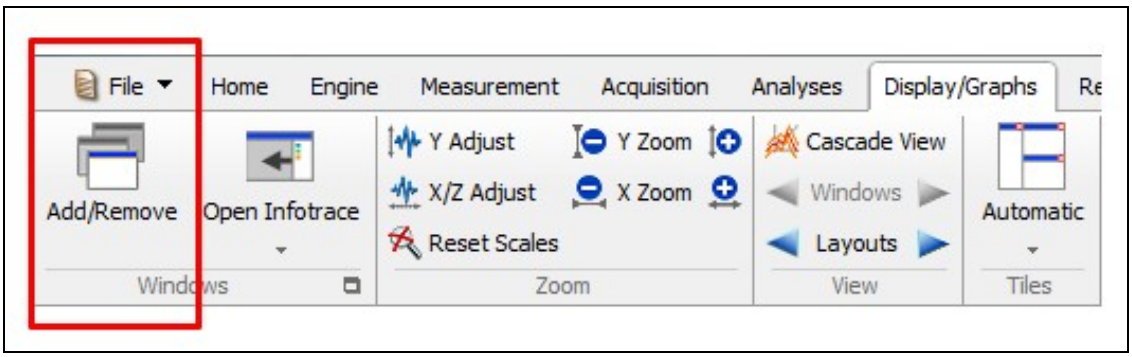
The advisor displays the important rules to make a correct measurement but the NVGate configuration is not restricted to the advice shown here.

All the capabilities of NVGate are available. The user can complete this first configuration to perfectly adapt it to its application.

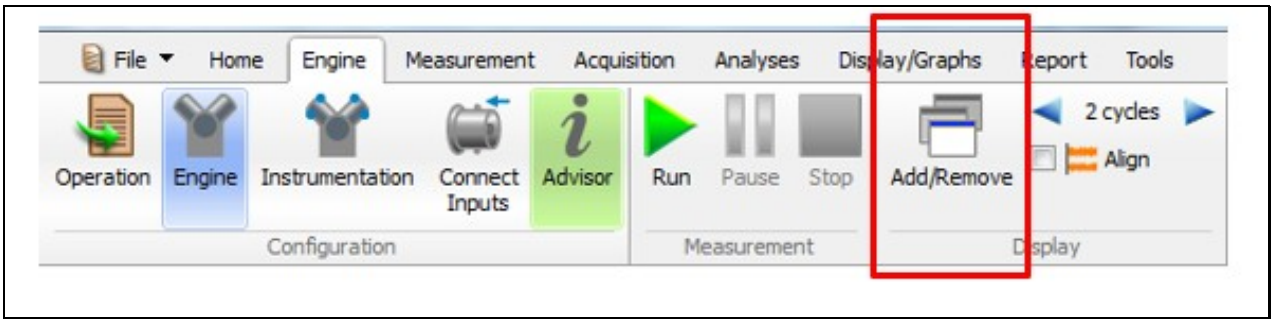
73.5 The Dedicated Results

With the Engine Module, several dedicated results are available.

These results can be displayed through the "Add/Remove window" available in the ribbon "Display/Graphs".



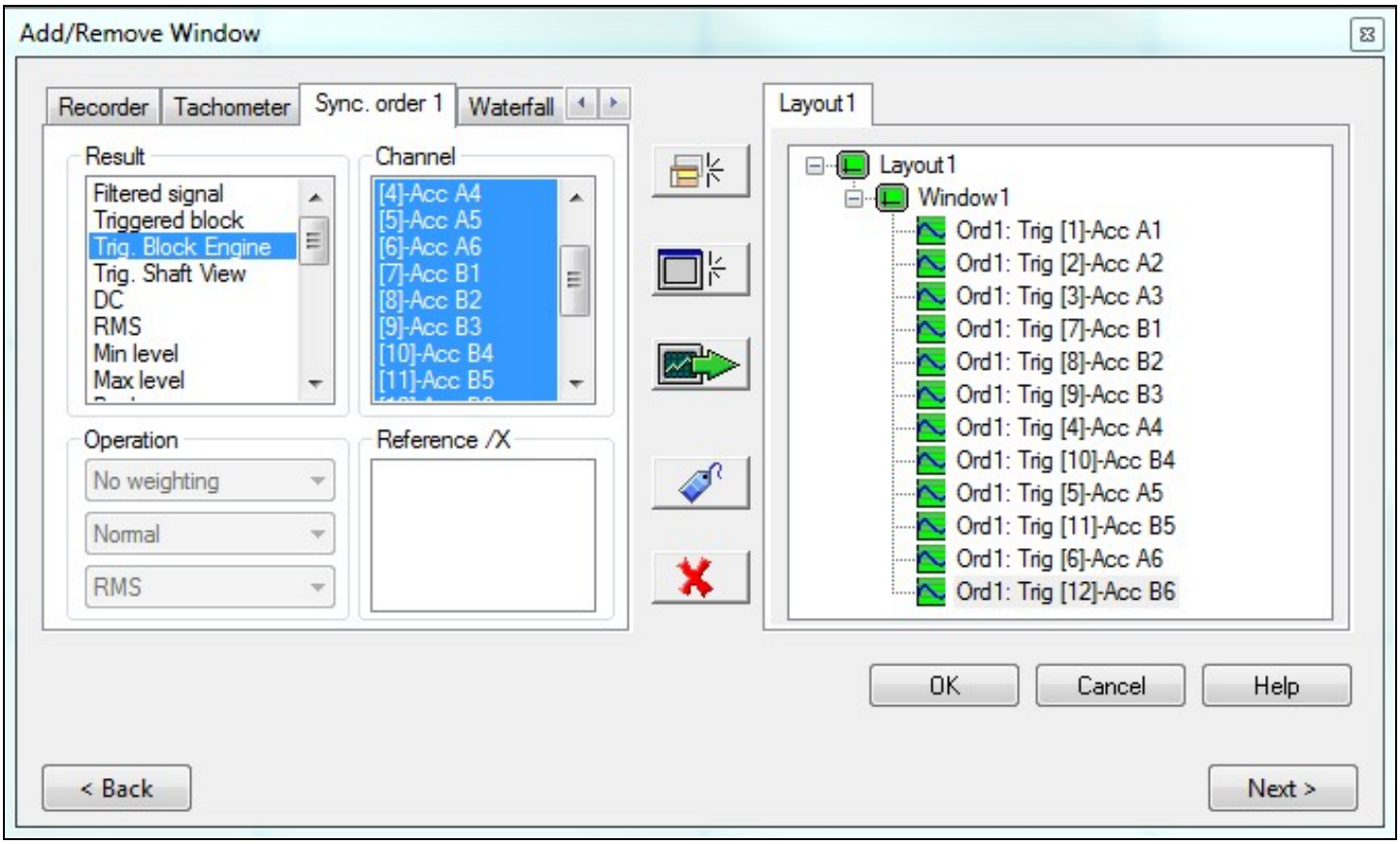
And also in the ribbon "Engine".



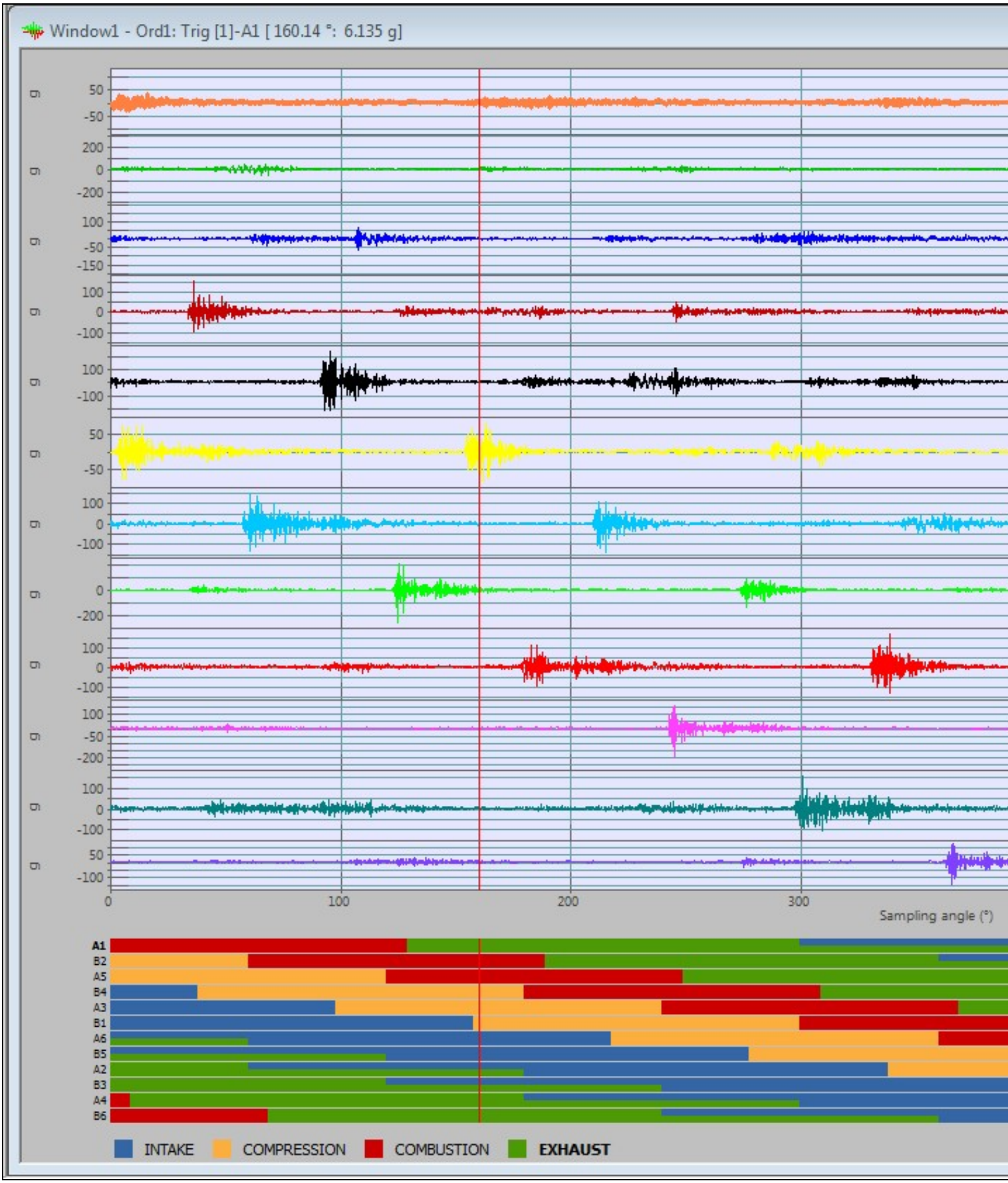
73.5.1 Time signal - The Triggered Block Engine

The triggered block engine is a new result of the Sync. order plug-in associating the engine information to the standard synchronous triggered blocks.

Select the results as below:

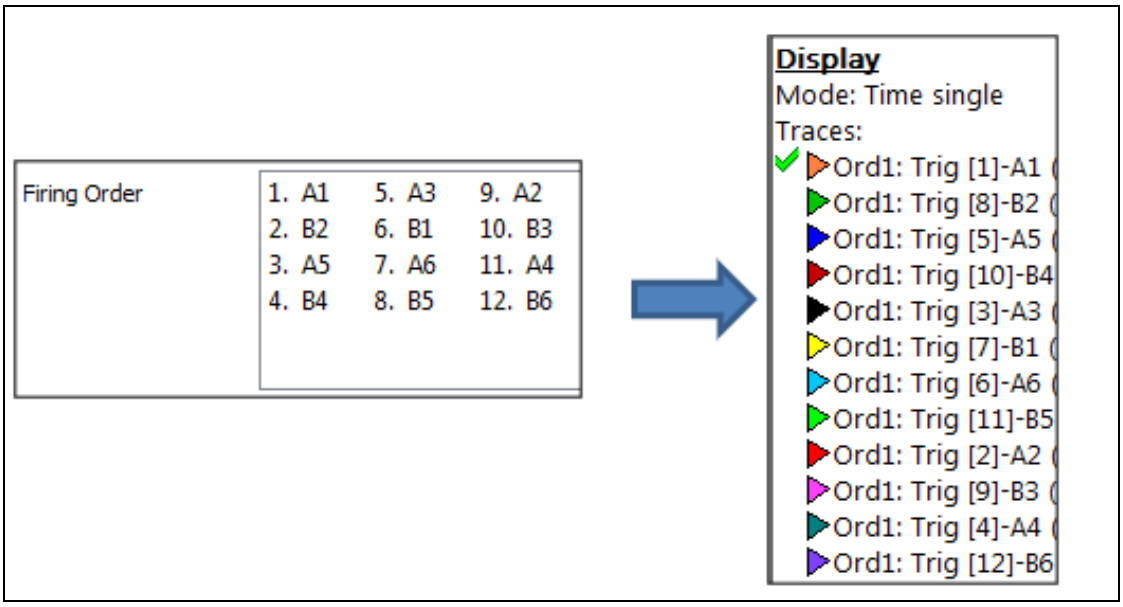


The following window will be displayed:


Window1 - Ord1: Trig [1]-A1 [160.14 °: 6.135 g]
g
50
-50
200
0
-200
100
-50
-150
100
0
-100
100
-100
50
-50
100
0
-100
0
-200
100
0
-100
100
-50
-200
100
0
-100
50
-100
0
100
200
300
Sampling angle (°)
A1
B2
A5
B4
A3
B1
A6
B5
A2
B3
A4
B6
INTAKE
COMPRESSION
COMBUSTION
EXHAUST

Specific features:

- The results are displayed automatically in the firing order defined in the window Engine/Settings

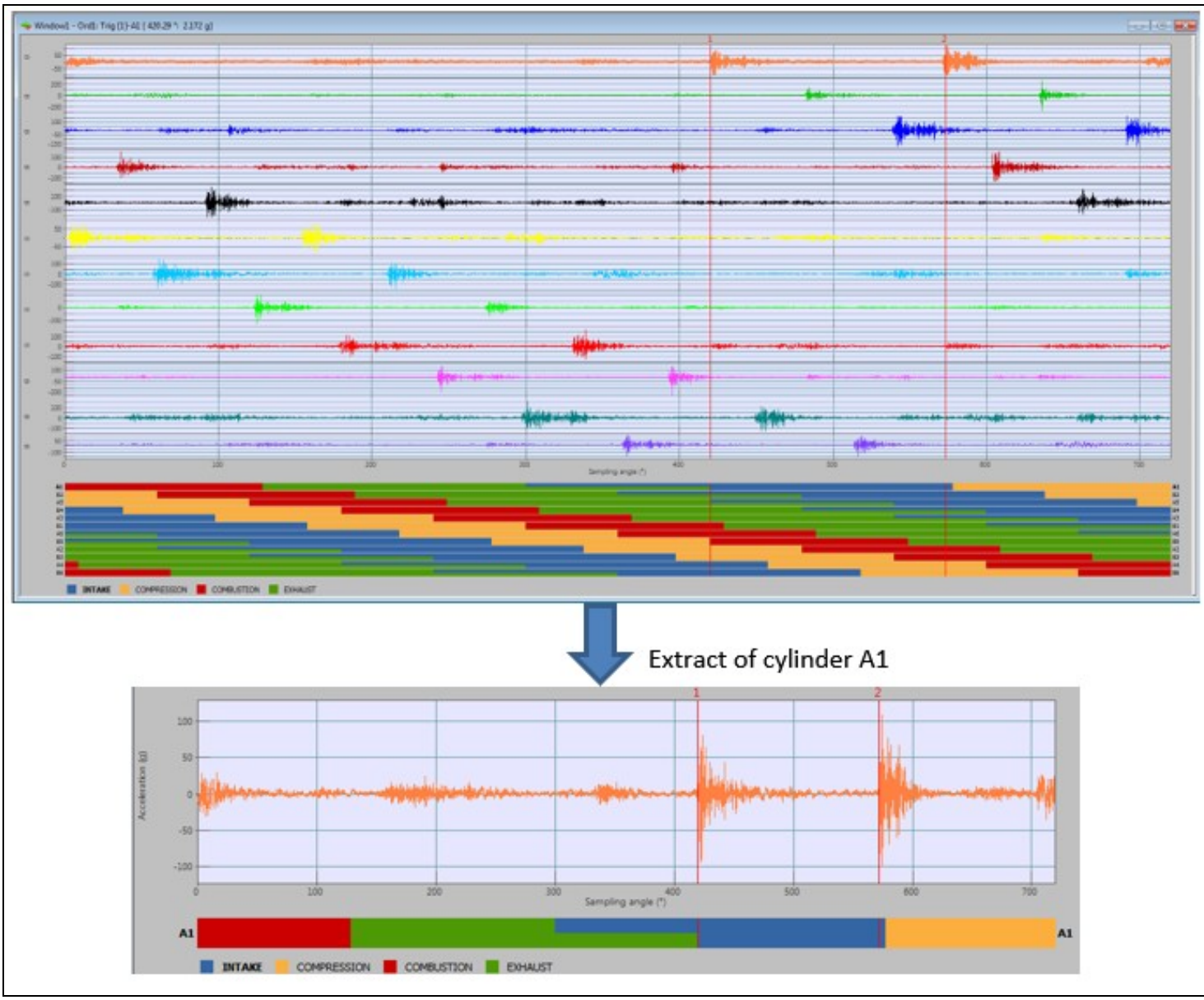


The cycle overview (defined in Engine/Timing) of each displayed cylinders are shown at the bottom of the window. The cycle overview of each cylinders is determined by:

- The tachometer reference.
- The firing order.
- The timing diagram.

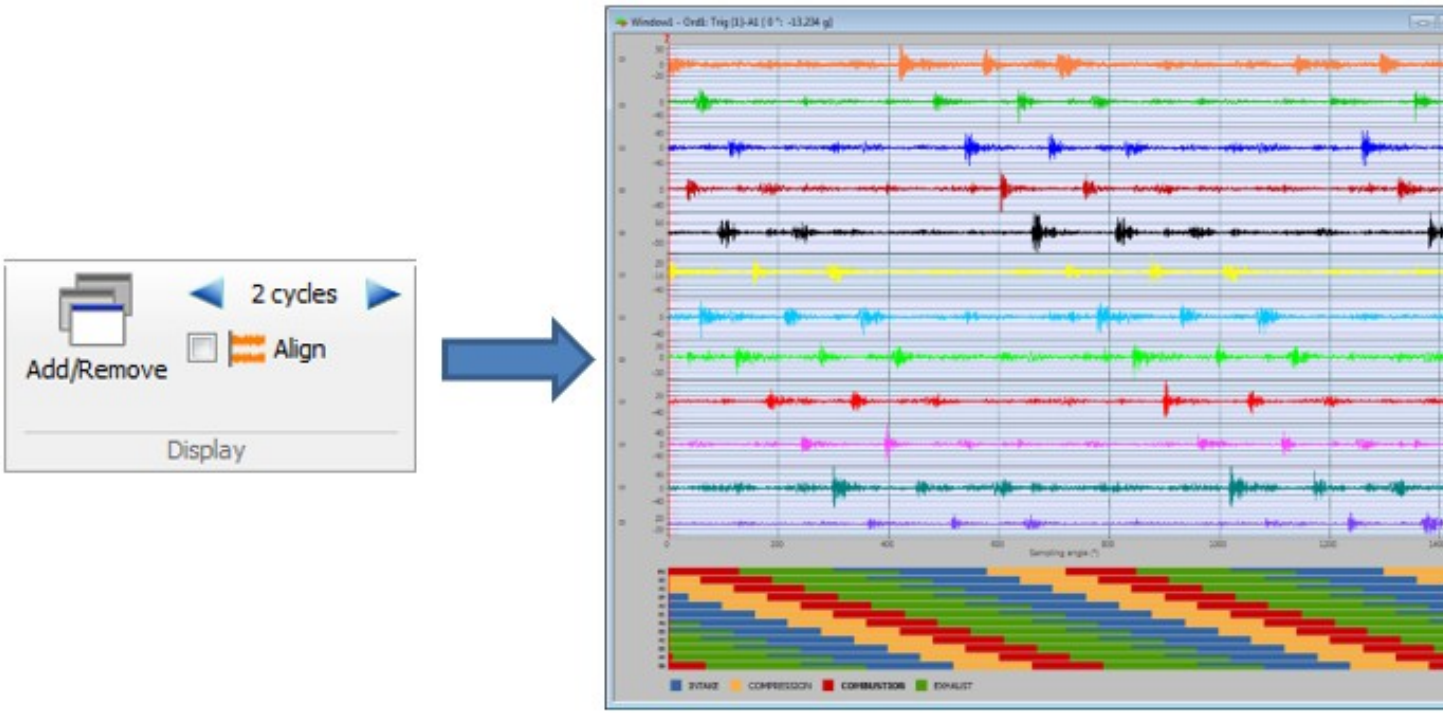
2 cursors displayed on the signals and the cycle overview allow you to identify the kinematic events on the signals.

-


INTAKE
COMPRESSION
COMBUSTION
EXHAUST
Extract of cylinder A1
Acceleration (g)
Sampling angle (°)
A1
A1
INTAKE
COMPRESSION
COMBUSTION
EXHAUST

On the example above the cursors are positioned at the beginning of the 2 main events of the signal. Looking at the cycle overview, one can note that:

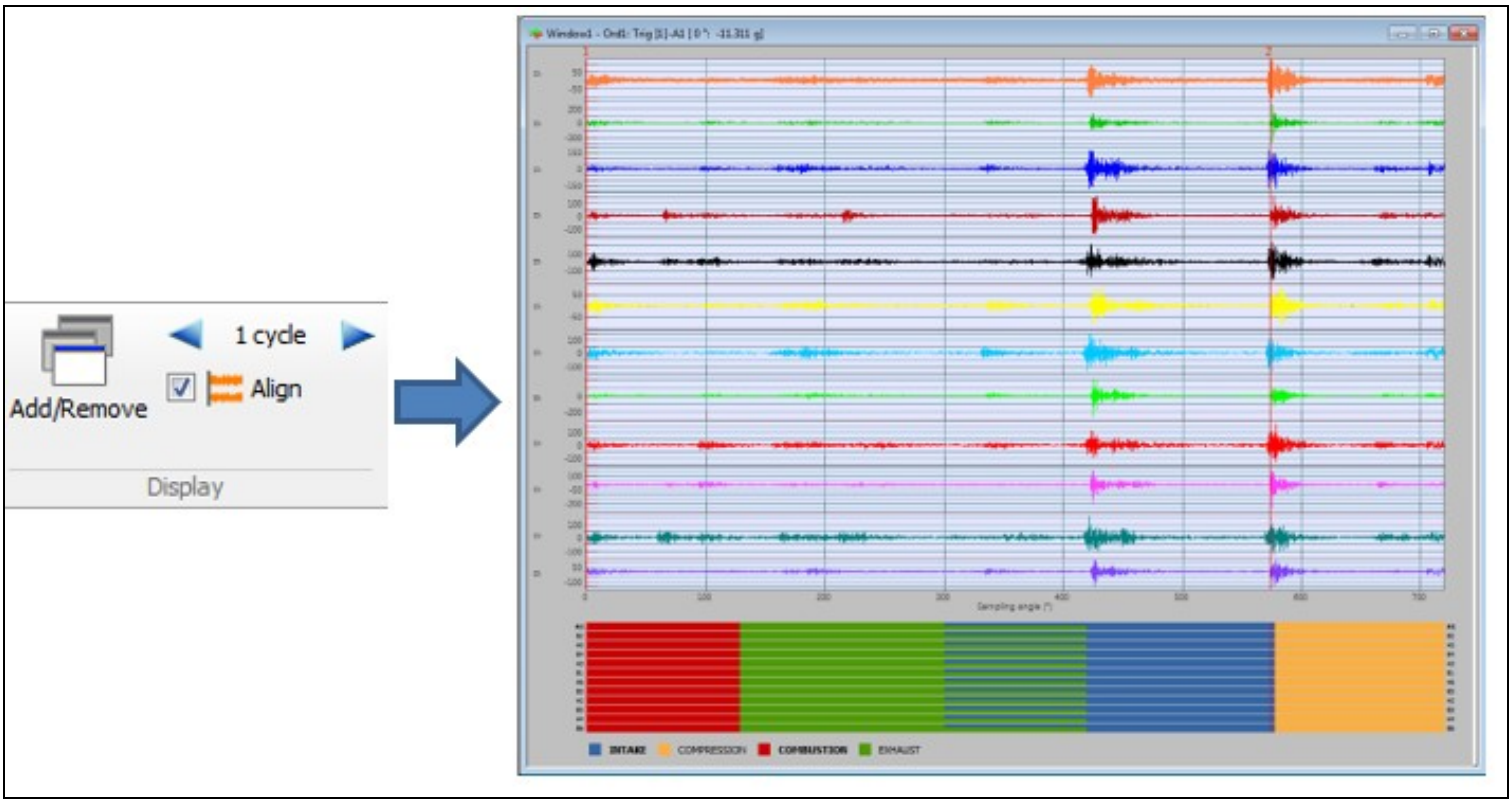
- The first cursor corresponds to the end of the exhaust phase, i.e. the exhaust valve closing.
- The second cursor corresponds to the end of the intake phase, i.e. the intake valve closing.
- By default, only one cycle is displayed in this window, 360° (crankshaft angle) for a 2-strokes engine or 720 ° (crankshaft angle) for a 4-strokes engine. More cycles can be displayed. The number can be defined in the Engine Ribbon.



The max number of cycles that can be displayed depends on the order resolution defined in the Synch order plug-in.

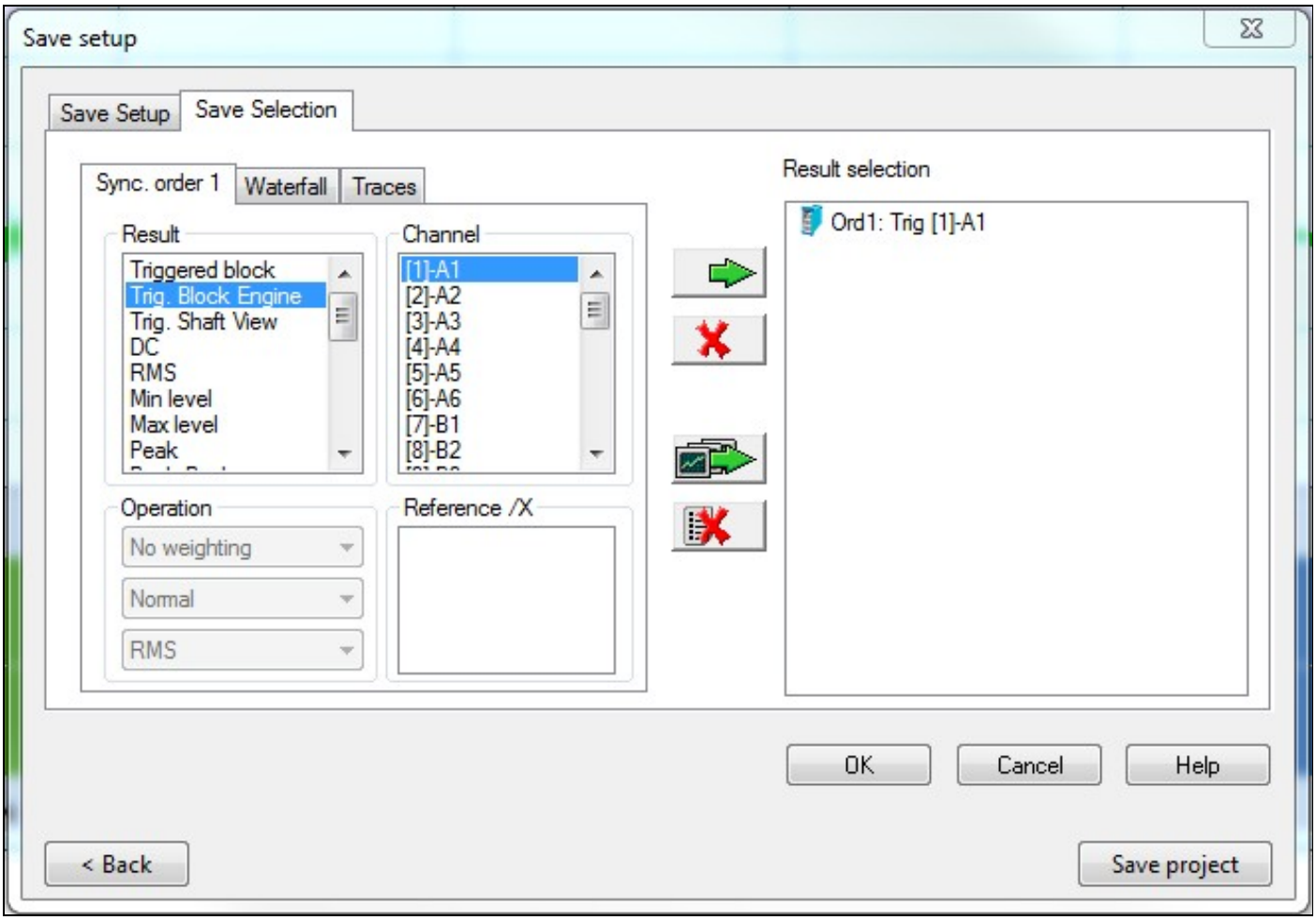
Order resolution	Max number of cycles for 2-strokes engine	Max number of cycles for 4-strokes engine
1	1	0
½	2	1
¼	4	2
1/8	8	4
1/16	16	8
1/32	32	16

The signals can be aligned on the same event by selecting the 'align' function in the Engine Ribbon.

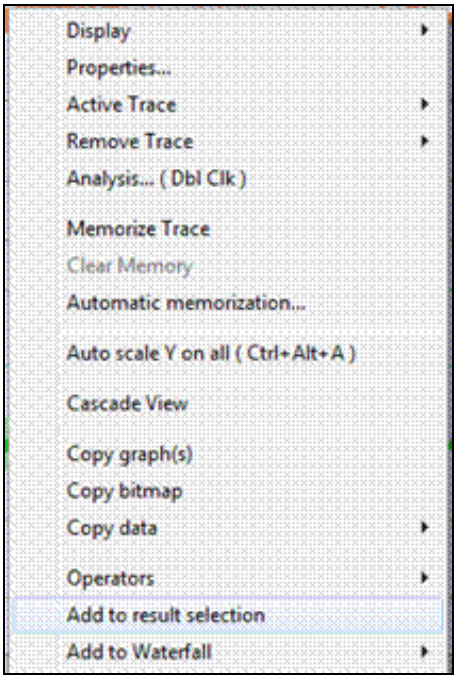


73.5.2 Comparison

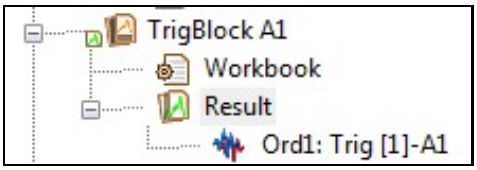
This Trigger Block Engine result can be saved as any NVGate result. Add the results in the "Save Selection" tab, which is available in the "Save Setup" window, which is accessible in the Measurement Ribbon.


Save setup
Save Setup
Save Selection
Sync. order 1
Waterfall
Traces
Result
Triggered block
Trig. Block Engine
Trig. Shaft View
DC
RMS
Min level
Max level
Peak
Channel
[1]-A1
[2]-A2
[3]-A3
[4]-A4
[5]-A5
[6]-A6
[7]-B1
[8]-B2
Operation
No weighting
Normal
RMS
Reference /X
Result selection
Ord1: Trig [1]-A1
OK
Cancel
Help
< Back
Save project

Otherwise, right click in the window and click on "Add to result selection", like below.

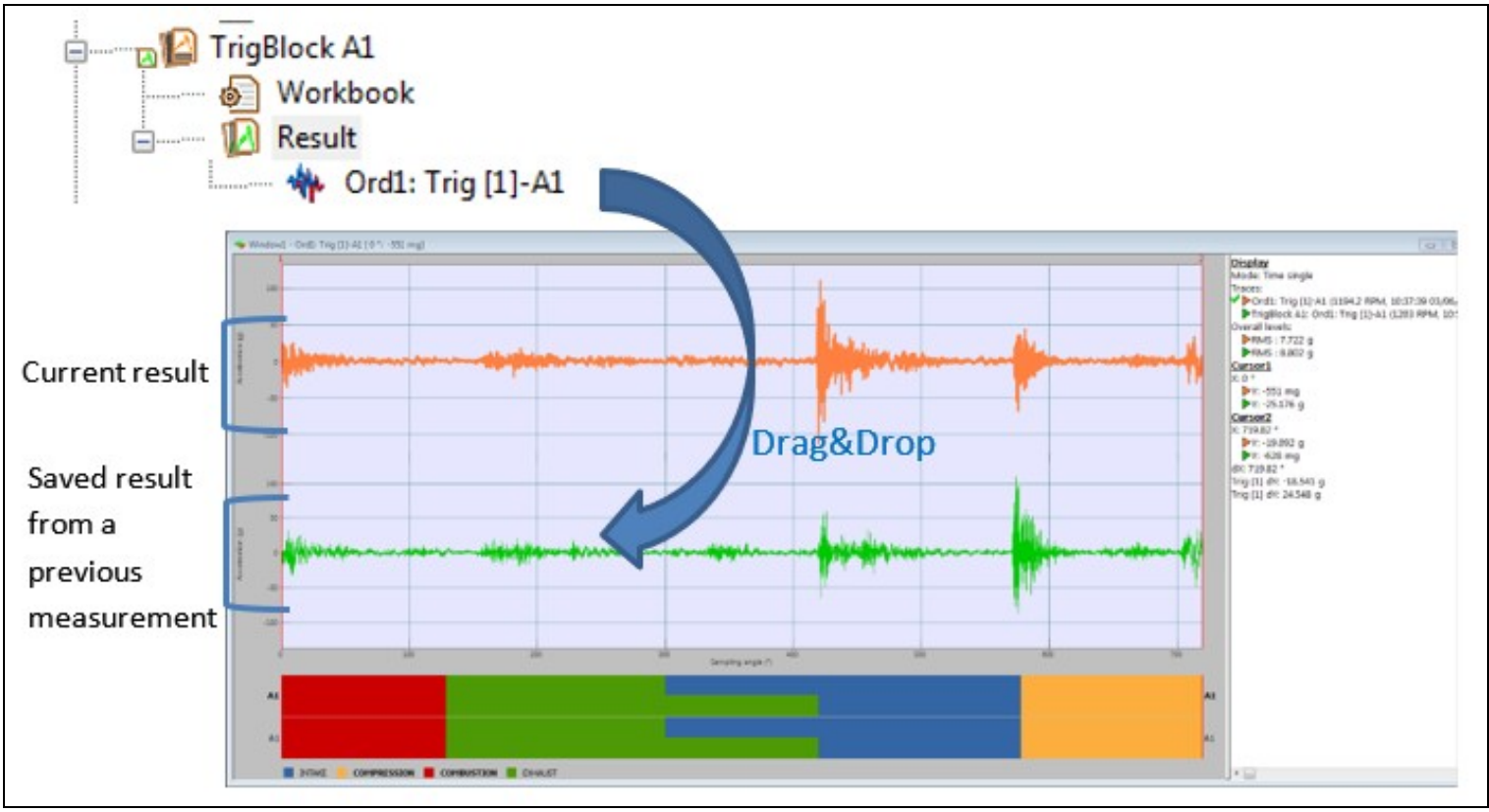


The new saved results will appear in the Project Manager.



The saved results can be compared between them or with a current result in the same window.

To add result in a window, drag&drop the result from the project manager to the window.



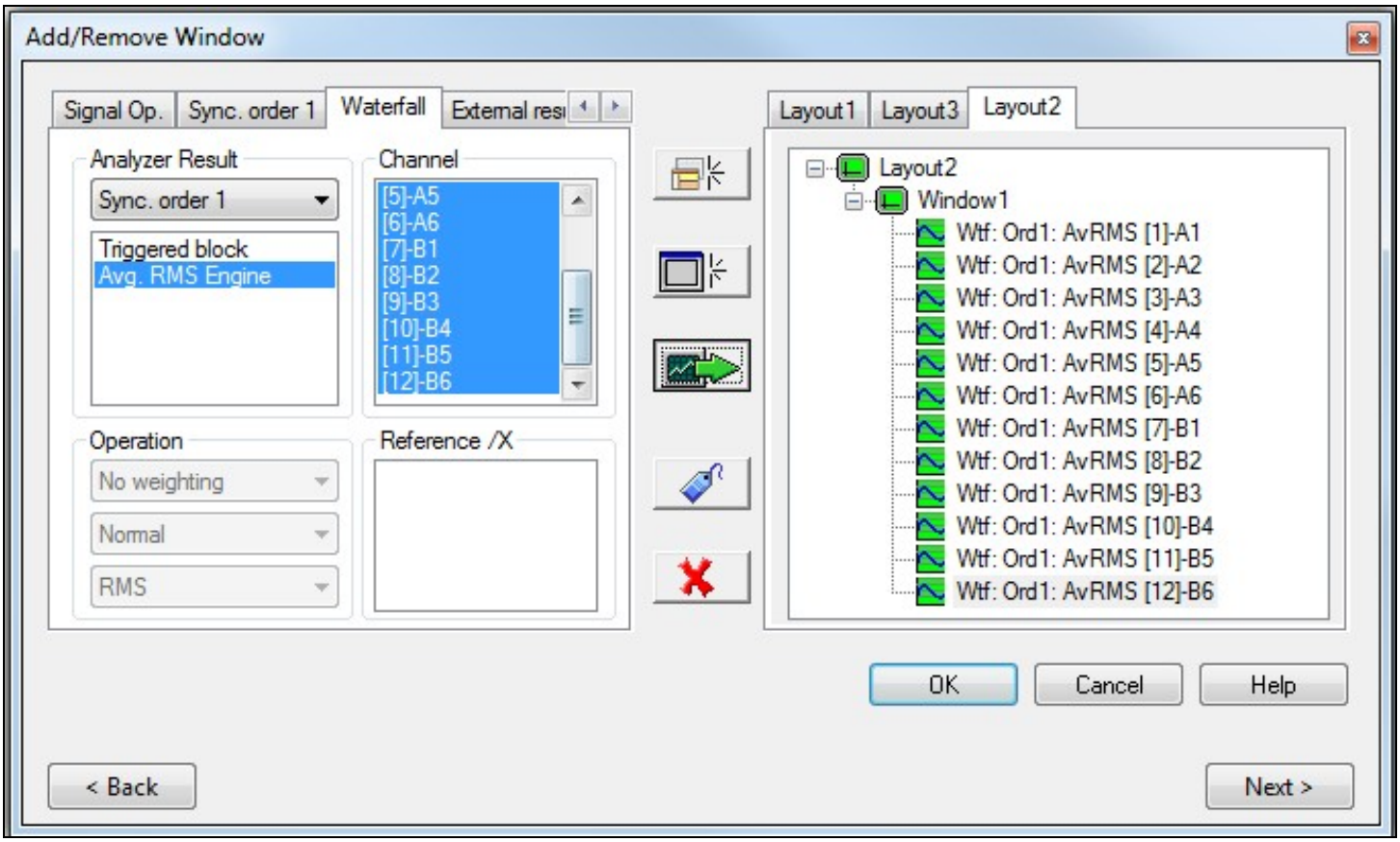
The cycle overview of each of the measurements is also displayed.

73.5.3 The Averaged RMS Engine

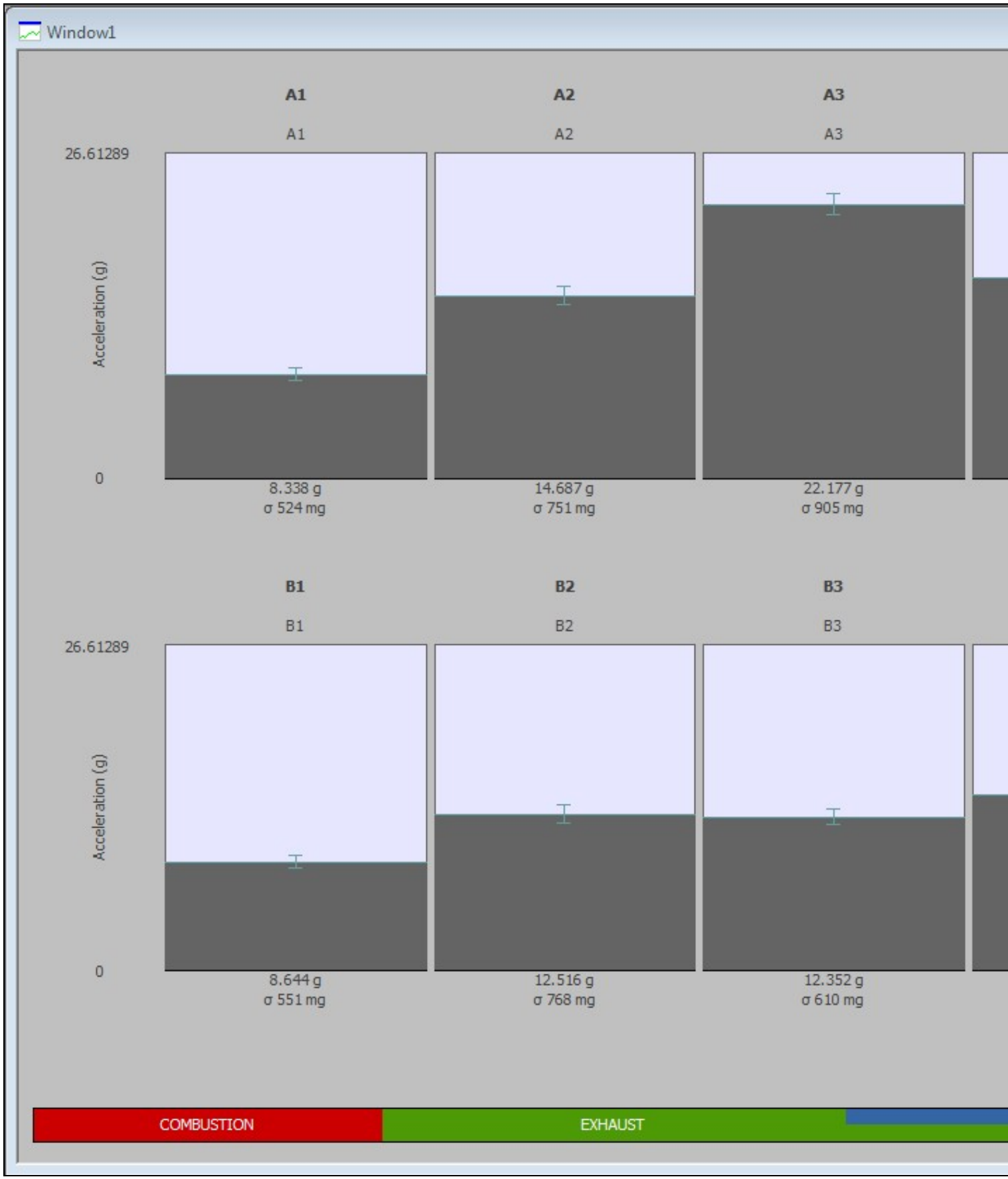
The Averaged RMS Engine is a result available in Waterfall, allowing you to display the RMS level of the cylinders calculated on the engine cycle and averaged on the measurement.

This new result is based on the RMS level calculated in the Sync. Order plug-in.

Select the results as shown below:



The following window will be displayed:


Window1
A1
A2
A3
A1
A2
A3
26.61289
Acceleration (g)
0
8.338 g
σ 524 mg
14.687 g
σ 751 mg
22.177 g
σ 905 mg
B1
B2
B3
B1
B2
B3
26.61289
Acceleration (g)
0
8.644 g
σ 551 mg
12.516 g
σ 768 mg
12.352 g
σ 610 mg
COMBUSTION
EXHAUST

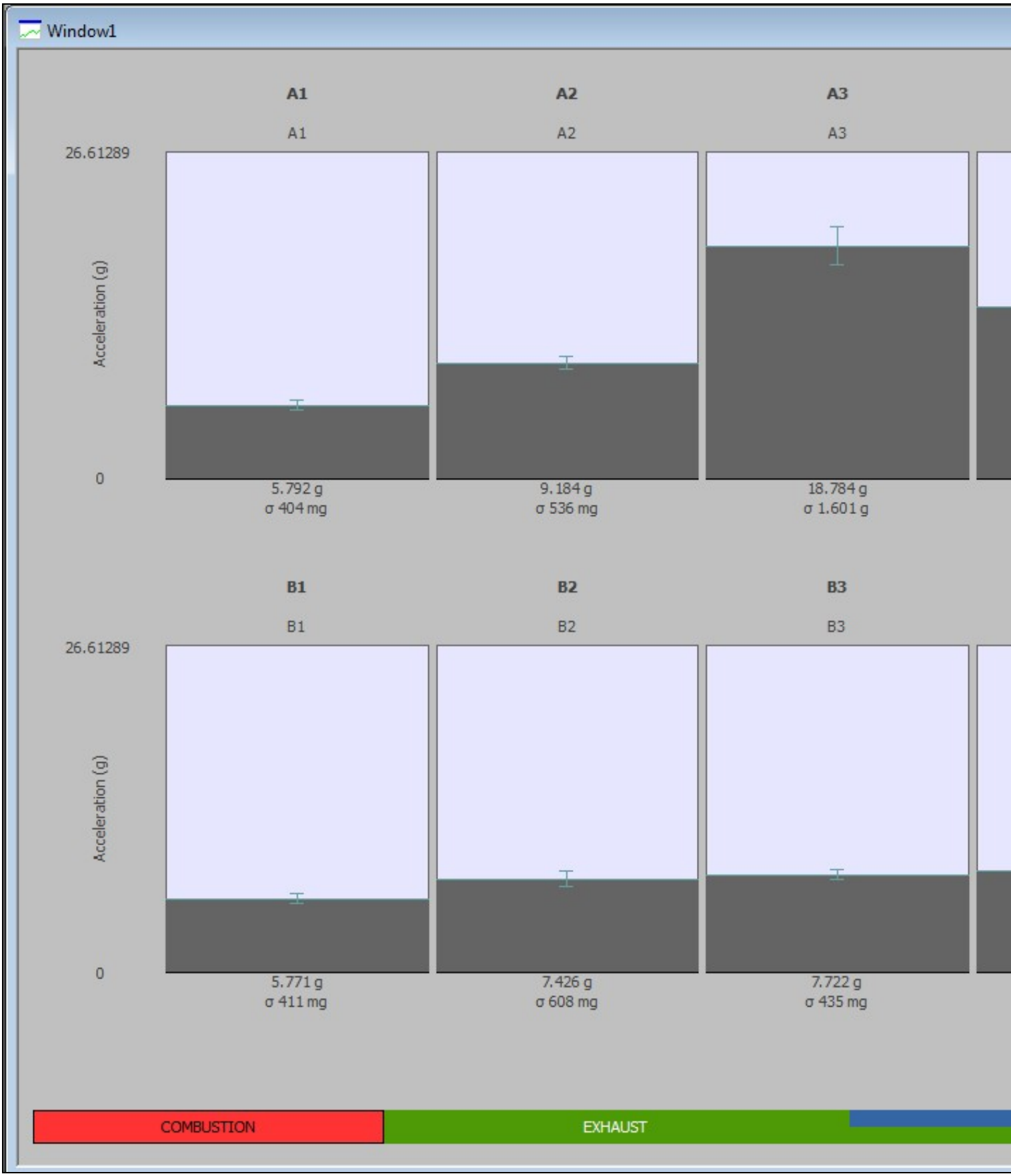
This window shows the averaged RMS value on the engine cycle for each cylinder. The viewmeter indicates the value and the symbol  represents the standard deviation.

These values are all displayed in a summary table in the infotrace.

After a first visualization of the global RMS level calculated on the complete cycle, it's possible to display the RMS level of each phase of the cycle; typically the combustion, the exhaust, the intake and the compression.

To display these results, click on one phase of the cycle overview displayed at the bottom of the window.

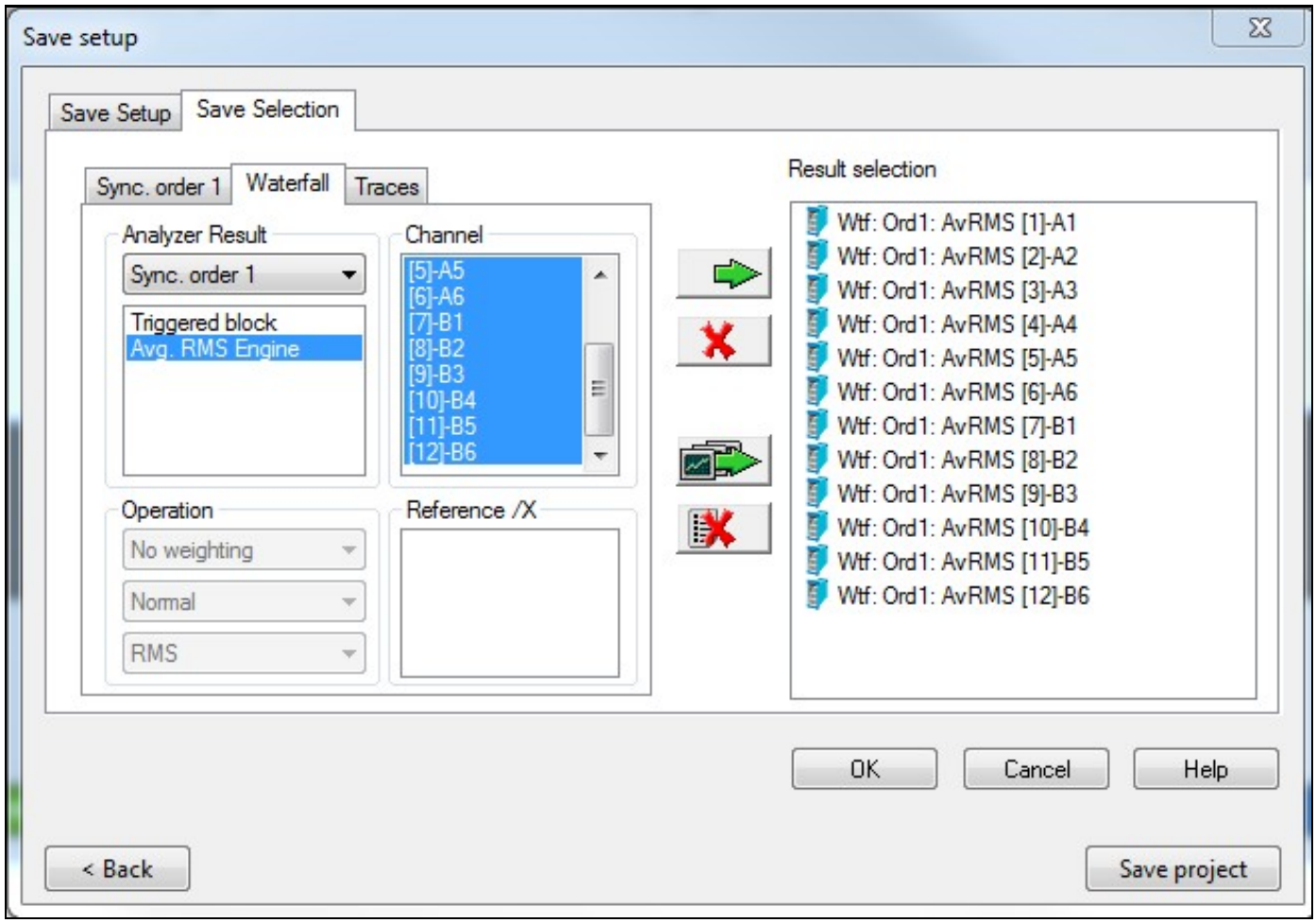
Below the RMS level is calculated during the combustion.


Window1
A1
A2
A3
A1
A2
A3
26.61289
Acceleration (g)
0
5.792 g
σ 404 mg
9.184 g
σ 536 mg
18.784 g
σ 1.601 g
B1
B2
B3
B1
B2
B3
26.61289
Acceleration (g)
0
5.771 g
σ 411 mg
7.426 g
σ 608 mg
7.722 g
σ 435 mg
COMBUSTION
EXHAUST

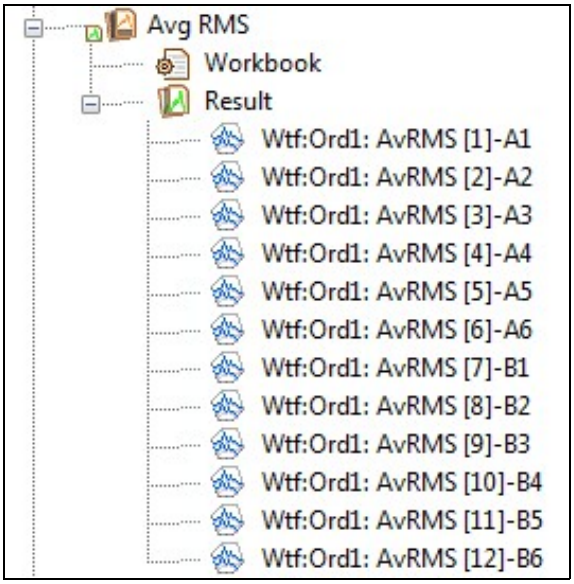
To come back to the global RMS level calculated on the cycle, double click on the cycle overview.

73.5.4 Comparison

This Avg. RMS Engine result can be saved like the other NVGate results. Add the results in the "Save Selection" tab available in the "Save setup" window, which is accessible in the Measurement Ribbon.

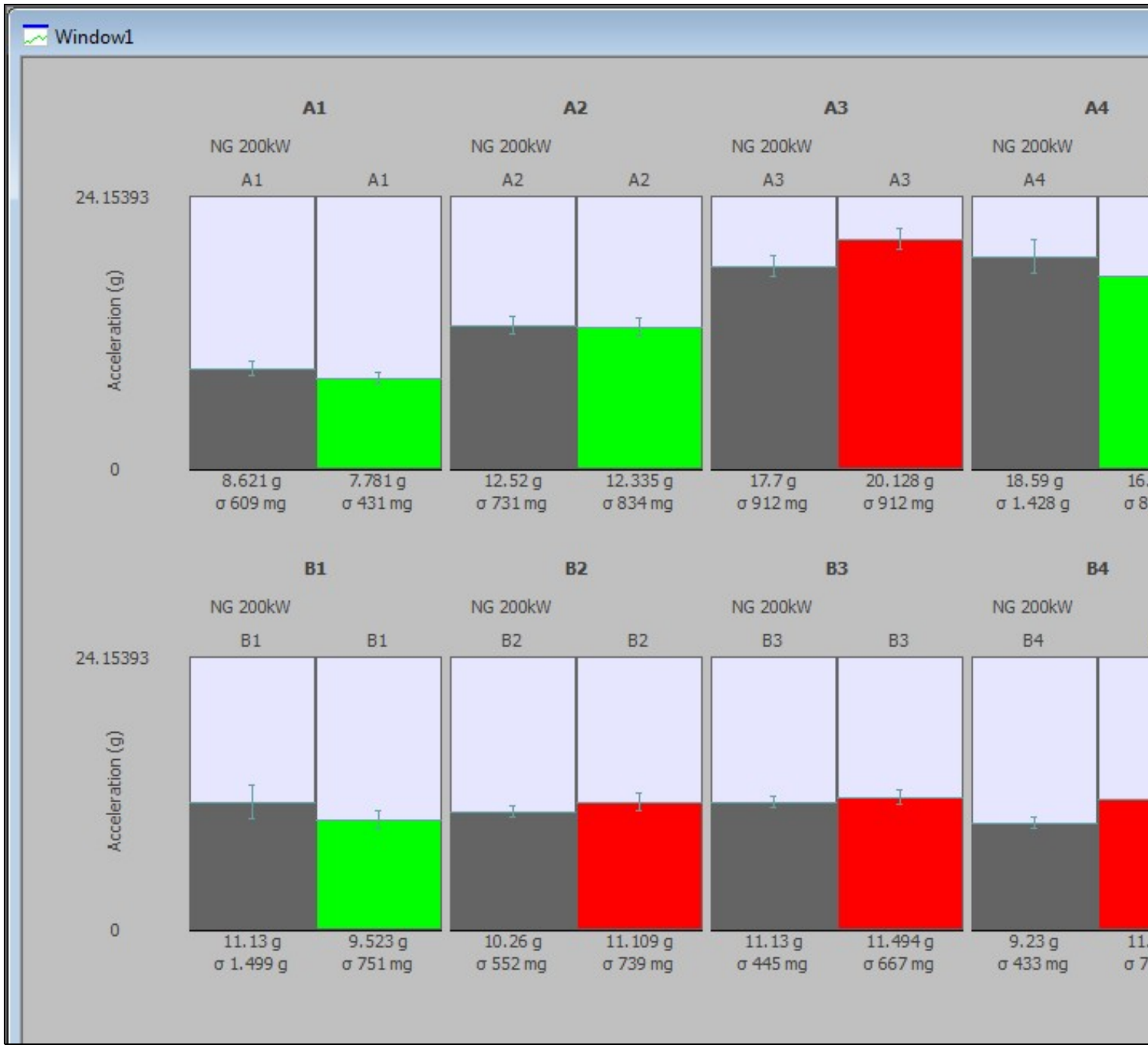


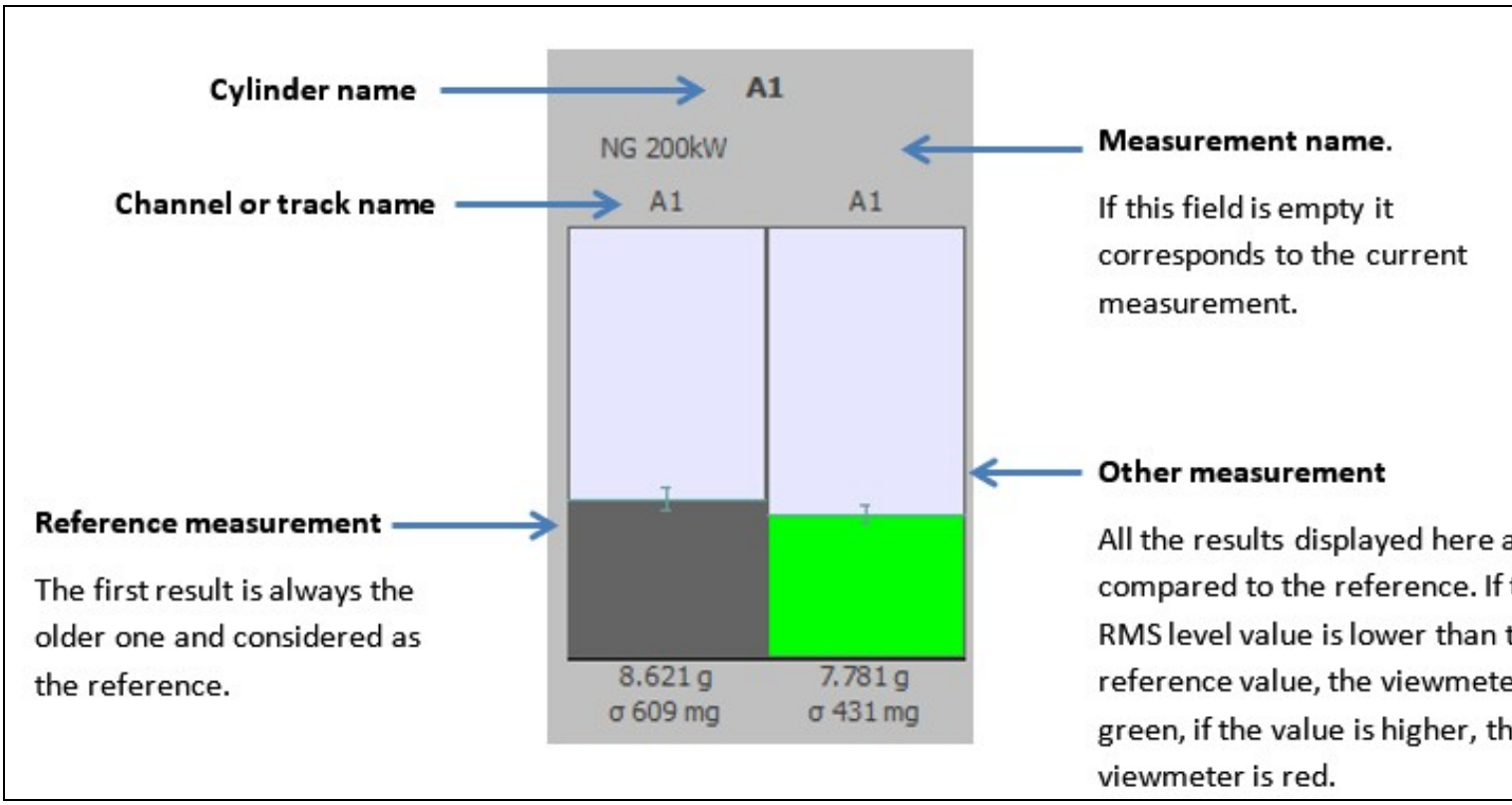
The new saved result will appear in the Project Manager.



To compare results, drag & drop the results from the Project Manager to the window.

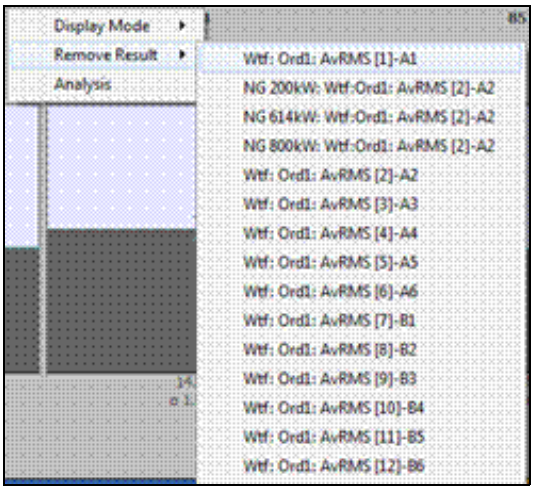
The software will automatically arrange the results by cylinder and date. The results are grouped by cylinders and the first result displayed is the oldest one.


Window1
A1
A2
A3
A4
NG 200kW
NG 200kW
NG 200kW
NG 200kW
A1
A1
A2
A2
A3
A3
A4
24.15393
Acceleration (g)
0
8.621 g
σ 609 mg
7.781 g
σ 431 mg
12.52 g
σ 731 mg
12.335 g
σ 834 mg
17.7 g
σ 912 mg
20.128 g
σ 912 mg
18.59 g
σ 1.428 g
B1
B2
B3
B4
NG 200kW
NG 200kW
NG 200kW
NG 200kW
B1
B1
B2
B2
B3
B3
B4
24.15393
Acceleration (g)
0
11.13 g
σ 1.499 g
9.523 g
σ 751 mg
10.26 g
σ 552 mg
11.109 g
σ 739 mg
11.13 g
σ 445 mg
11.494 g
σ 667 mg
9.23 g
σ 433 mg



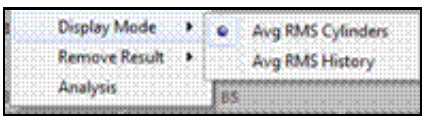
There is no limitation regarding the number of results that can be displayed at the same time.

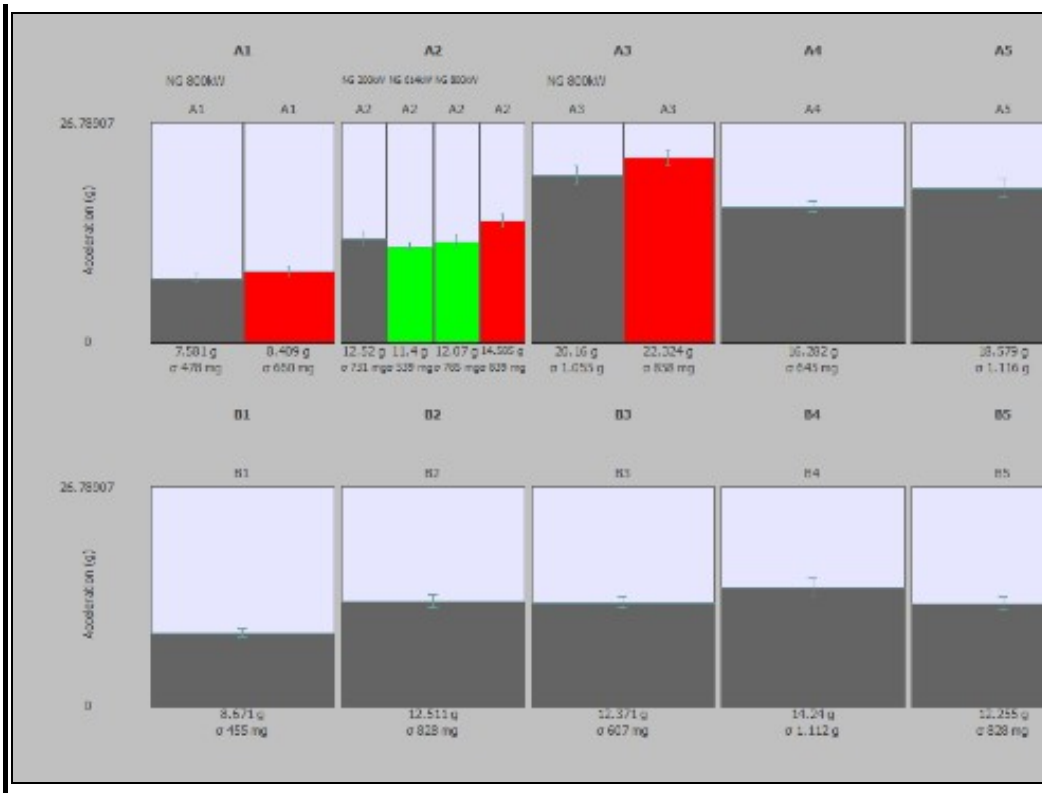
To remove results, right click on the window, select 'Remove Result' and the results you want to remove.

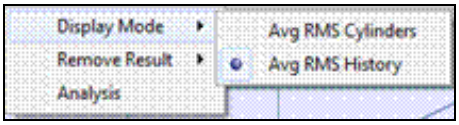


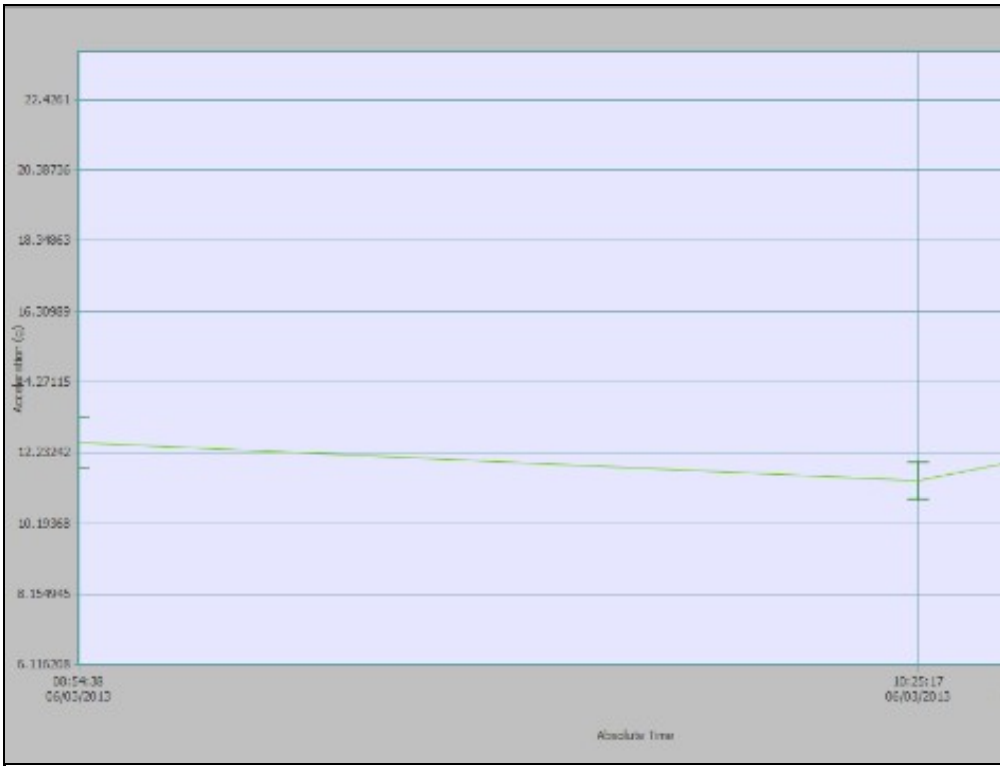
This display allows you to compare a few measurements. To make a trend analysis on several measurements, it's possible to change the display mode.

The 2 modes are available by right clicking on the window and selecting "Display Mode".




A1
A2
A3
A4
A5
B1
B2
B3
B4
B5
Acceleration (g)


Display Mode
Remove Result
Analysis
Avg RMS Cylinders
Avg RMS History


Absolute Time

The History mode shows the values with the standard deviation in absolute time. It allows you to follow the parameters during a long period.

In this representation, a color is associated to each cylinder. The same color is used on the graph and in the results table in the infotrace.

73.6 Angle-Frequency Analysis and Display

Angle-Frequency analysis is interesting when working on a reciprocating machine. It allows you to identify specific events.

The method implemented in the software is based on the Wigner-Ville algorithm.

This method is particularly adapted for short transient signal where the STFT is not sufficient. Another advantage is the good resolution, both in angle and frequency, that one can obtain.

The principle is to represent the energy density on a colorspectrogram using the Wigner-Ville distribution (W (?, f)). The relevance of the results of such analysis depends on settings including angle and frequency resolution.

From this representation, additional results are extracted to make the analysis easier. They correspond to the integration of the energy densities on the engine cycle and on a selected frequency range. They are defined as follows:

- Energy spectrum $S(f) = \grave{o} S(q,f)dq$

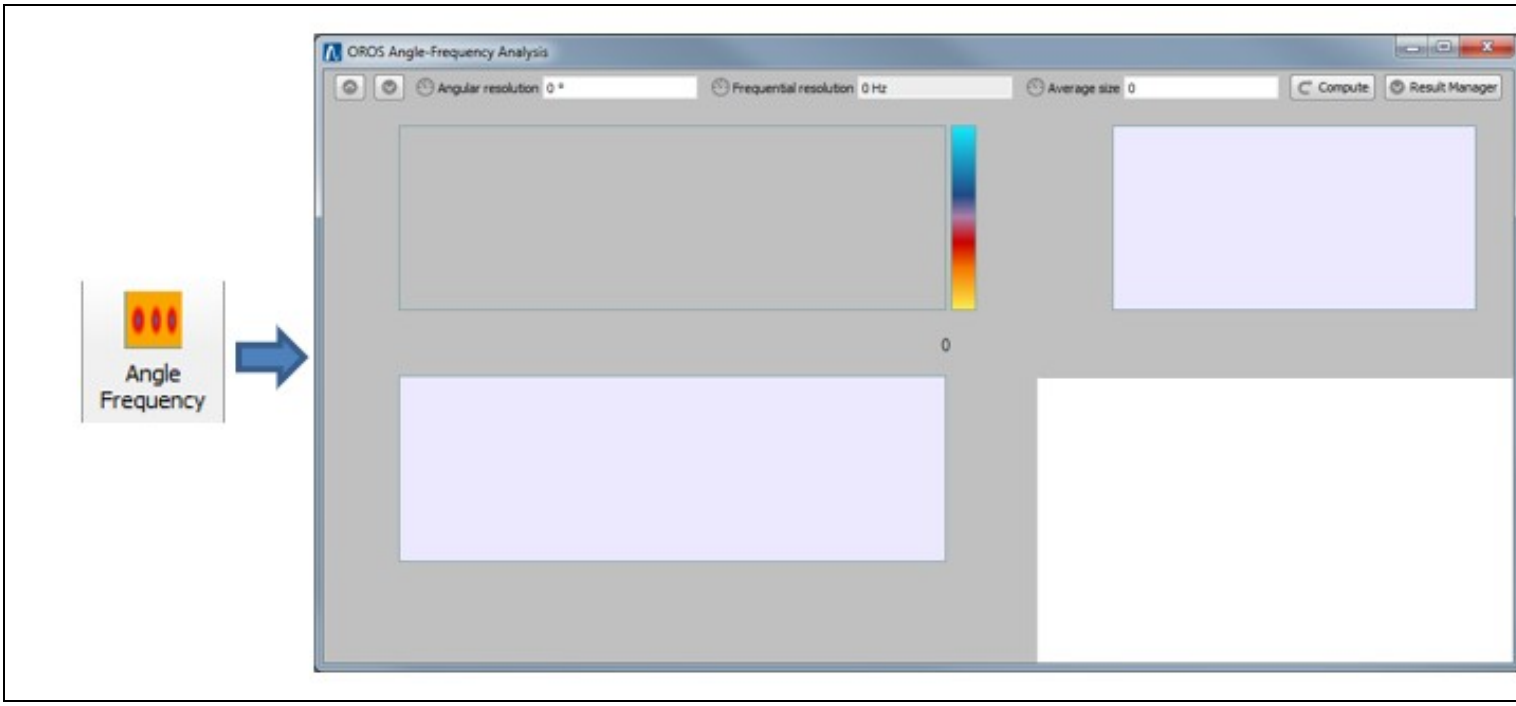
- Instantaneous power $P(q) = \grave{o} S(q,f)df$

This analysis is available in post-analyze only.

73.6.1 A Dedicated Window

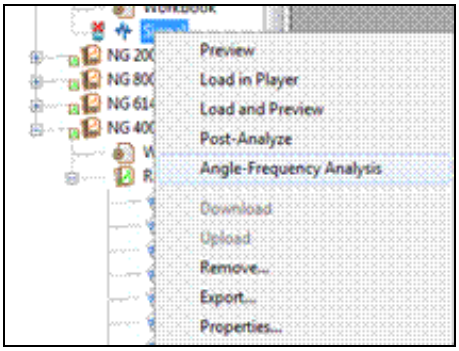
Before starting, note that this analysis is available in post-analyze only.

If a signal is loaded in the player, click on the button "Angle-Frequency" in the Engine Ribbon to open the following dedicated window:



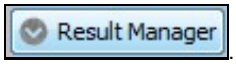
It's also possible to use the "Angle-Frequency Analysis" on another signal not loaded in the player.

In this case, right click on the concerned signal in the project manager and select "Angle-Frequency Analysis".

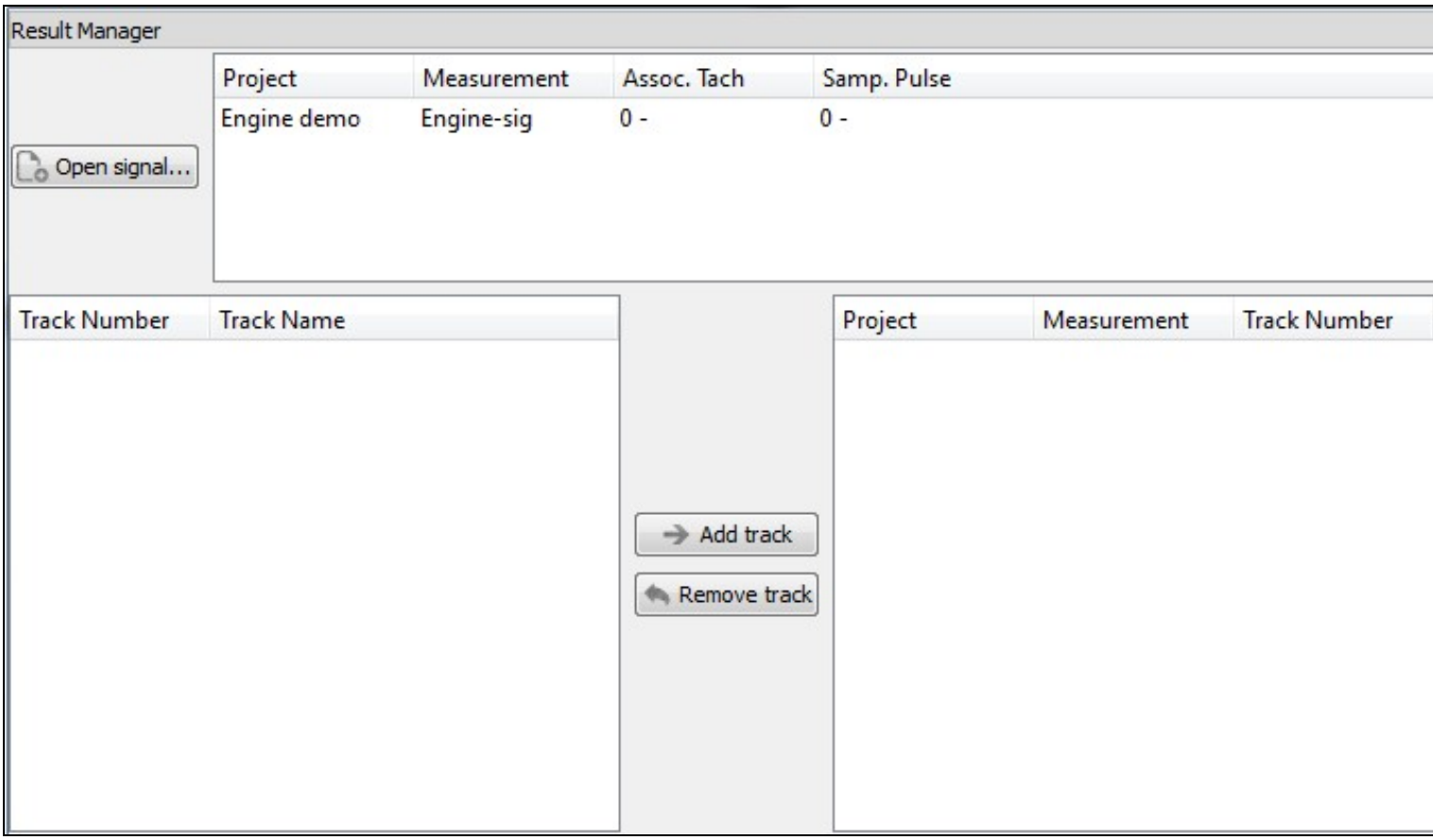


73.6.2 Result Manager

The Result Manager shows the signal(s) and the tracks that will be analyzed in angle-frequency.

Click on the button 

. The following part of the window will appear.



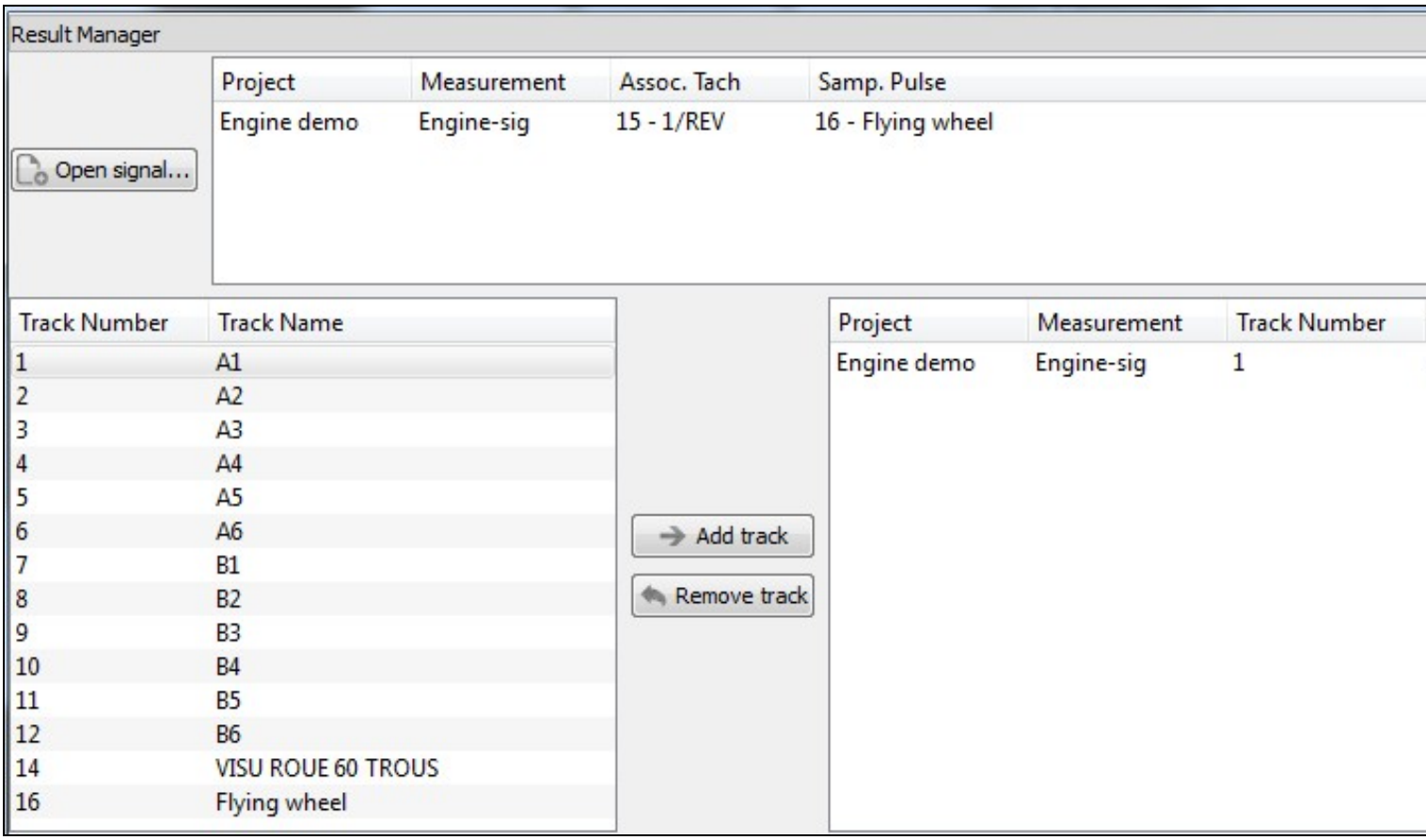
Signal One can see the selected signal name and the corresponding project.

It's possible to open several different signals in a same window by clicking on "open signal".

Tachometers The second step is to define the tachometers that will be used for the analysis:

- Assoc. Tach: Here you can define the tachometer that will be used for the synchronous analysis.
- Samp. Pulse: Indicate the tachometer that will be used for the angular sampling. This signal must contain several pulses per revolution and will lead to a better accuracy in angle. Nevertheless, it's not necessary to define a sampling pulse. The angular sampling can be done with the Assoc. Tach. In this case, set this parameter to none.

Tracks Select the tracks that will be analyzed and displayed and click on 'Add track'. If several signals are loaded in the window, the displayed tracks list will depend on the selected signal. Select each signal one by one and choose the tracks for each of them.

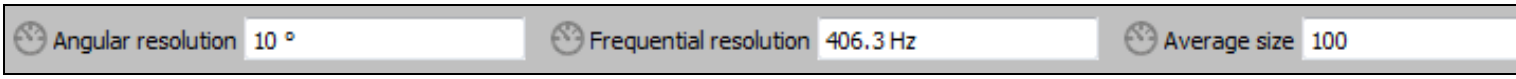


After this first step, it's possible to click again on 

to reduce this window section.

73.6.3 Settings

Three parameters have to be set up: the angular resolution, the frequential resolution and the average size. They can be modified in the window bar:

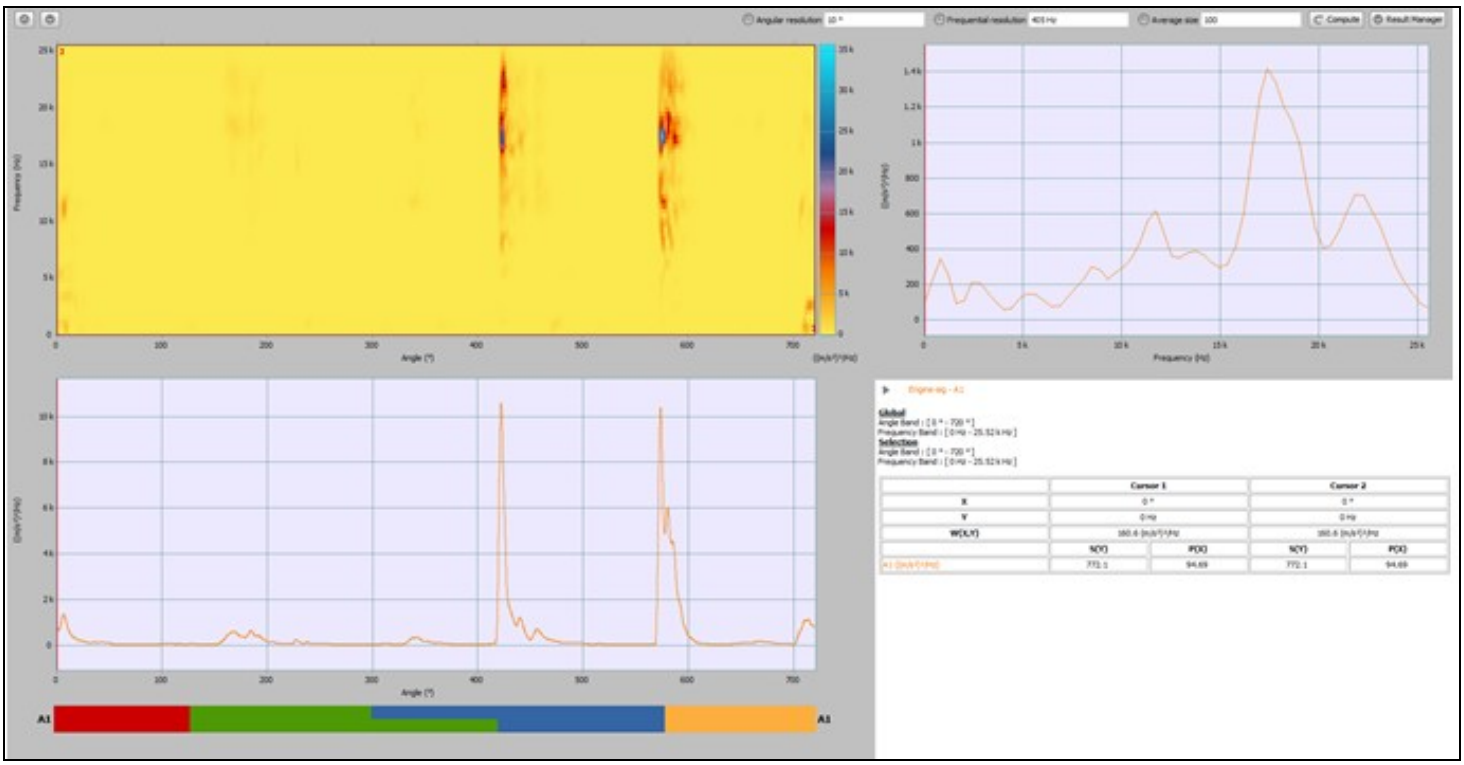


Angular resolution: this parameter determines the angle that separates two values in the angle axis. The maximum resolution can be determined in function of the machine. For example, working on a 4-strokes 12 cylinders diesel engine, the angular resolution must be lower than 720/12= 60° to be able to differentiate all the events on the different cylinders.

Frequential resolution: This parameter determines the frequency that separates two values in the frequency axis. **Average size:** This parameter is the average number used to calculate the Wigner-Ville spectrum. For this result, the average is made on the engine cycle (720° for a 4-strokes engine and 360° for a 2-strokes engine). In most cases, set the average number to 100 leads to good results.

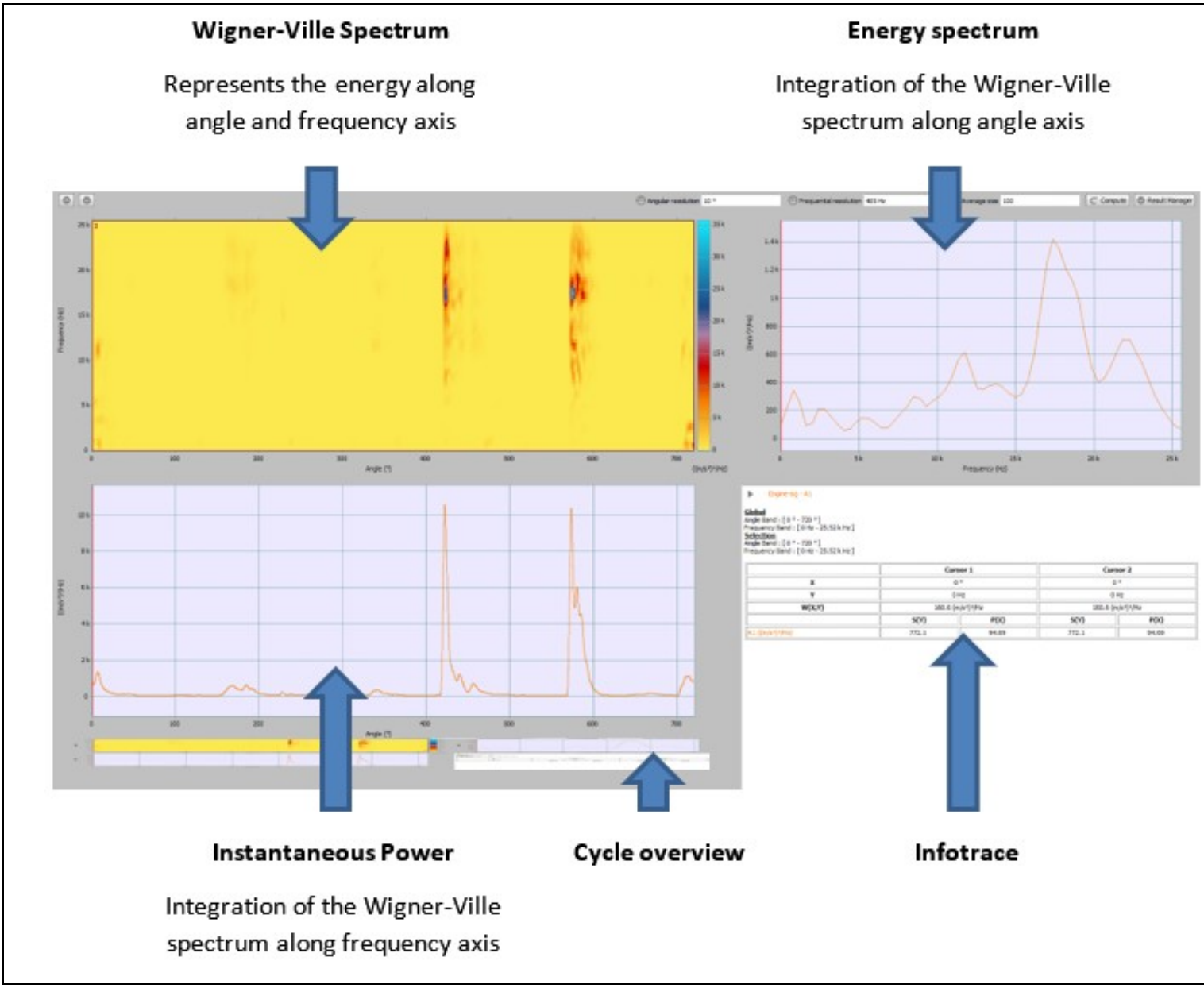
When these parameters are set up, click on 

to launch the computation and display the result.



73.6.4 Results

The window is shared in several parts to present all the useful information.

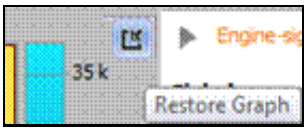


73.6.4.1 Display Tools

Each graph can be maximized by clicking on the following button in the top right corner of each graph. Move the mouse over this area to let the button appear.



In the same way, click on the following button to come back to the default view.



Cursors By default, the energy spectrum and the instantaneous power are calculated from the complete colorspectrogram.

With the mouse, it's possible to select a part of the colorspectrogram and calculate the energy spectrum and instantaneous power from this selection.

The previous selection can be moved and modified. The results are automatically adjusted depending on the selection.

Double click on the colorspectrogram to come back to the selection by default (the complete colorspectrogram).

2 vertical and 2 horizontal cursors are available on the colorspectrogram. The horizontal cursors are linked to the 2 cursors on the energy spectrum. The vertical cursors are linked to the 2 cursors on the instantaneous power and to the 2 cursors on the cycle overview.

All the cursors values are noted in the infotrace.

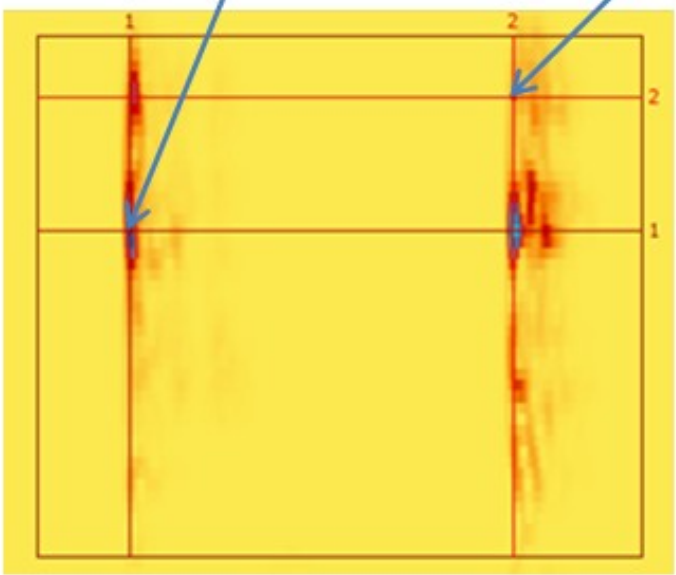
Global
Angle Band : [0 ° - 720 °]
Frequency Band : [0 Hz - 25.52 k Hz]

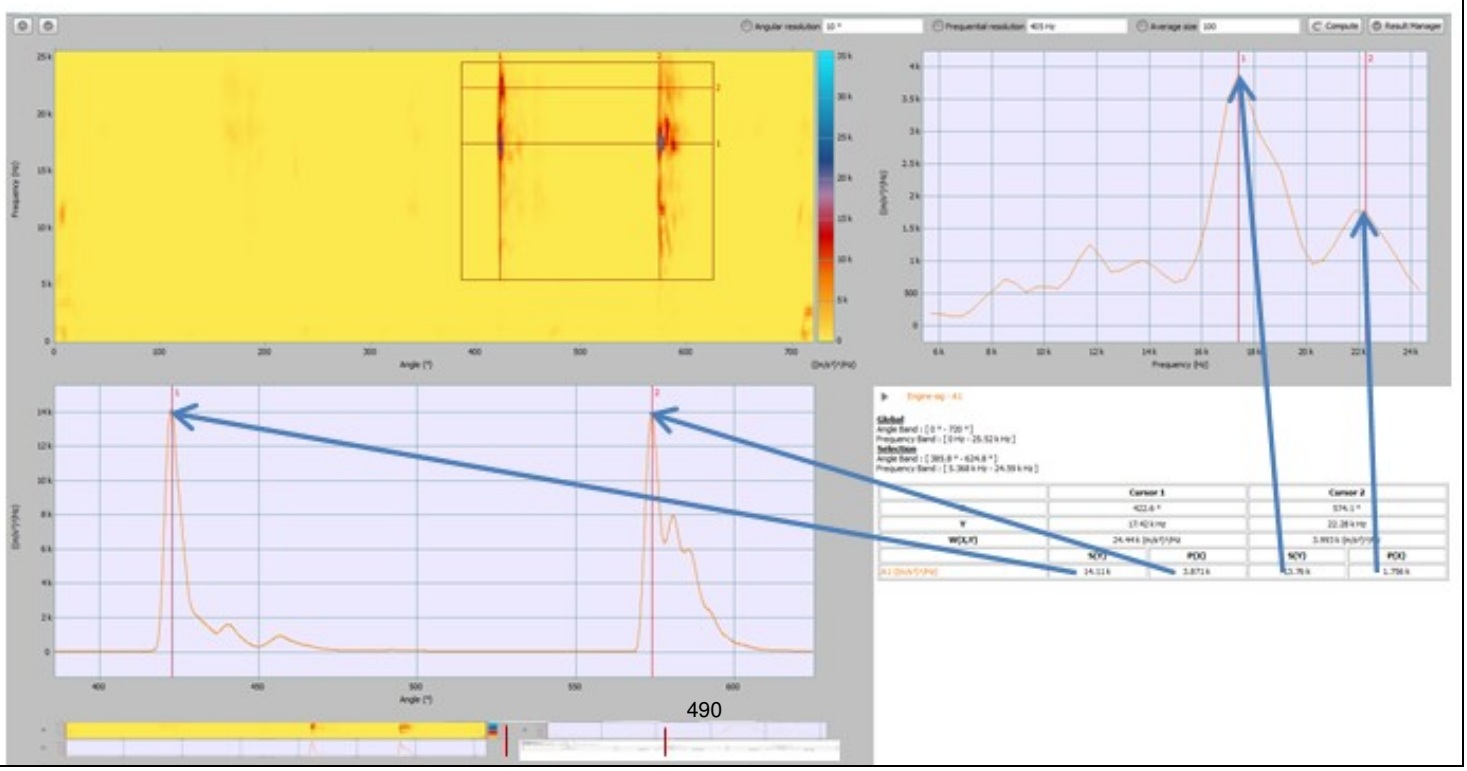
Angle and frequency band of the Wigner-Ville spectrum (colorspectrogram)

Selection
Angle Band : [385.8 ° - 624.8 °]
Frequency Band : [5.368 k Hz - 24.59 k Hz]

Angle and frequency band of selected area displayed on the colorspectrogram

	Cursor 1		Cursor 2	
X	422.6 °		574.1 °	
Y	17.42 k Hz		22.28 k Hz	
W(X,Y)	24.44 k (m/s²)²/Hz		3.993 k (m/s²)²/Hz	
	S(Y)	P(X)	S(Y)	P(X)
A1 ((m/s²)²/Hz)	14.11 k	3.871 k	13.76 k	1.756 k

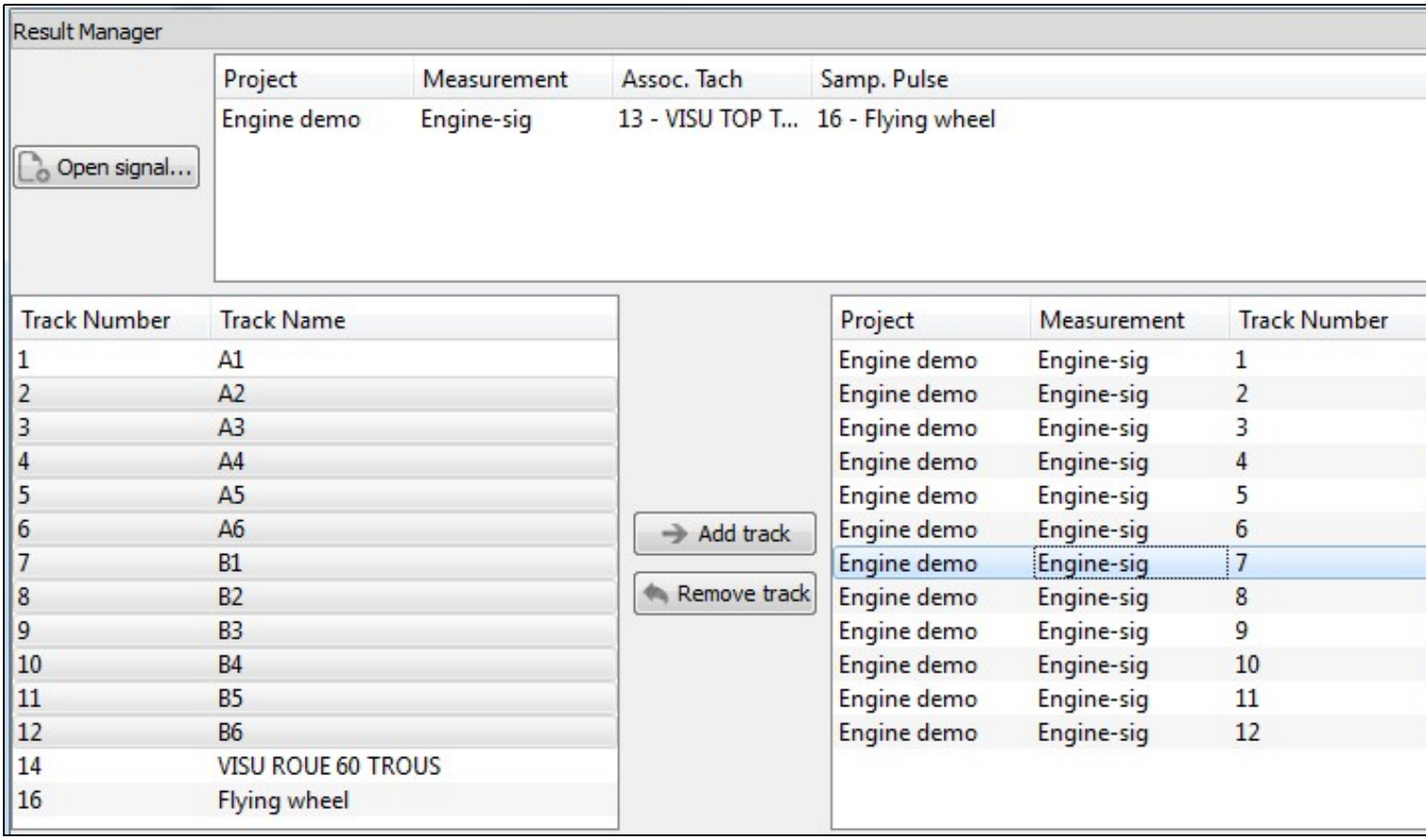




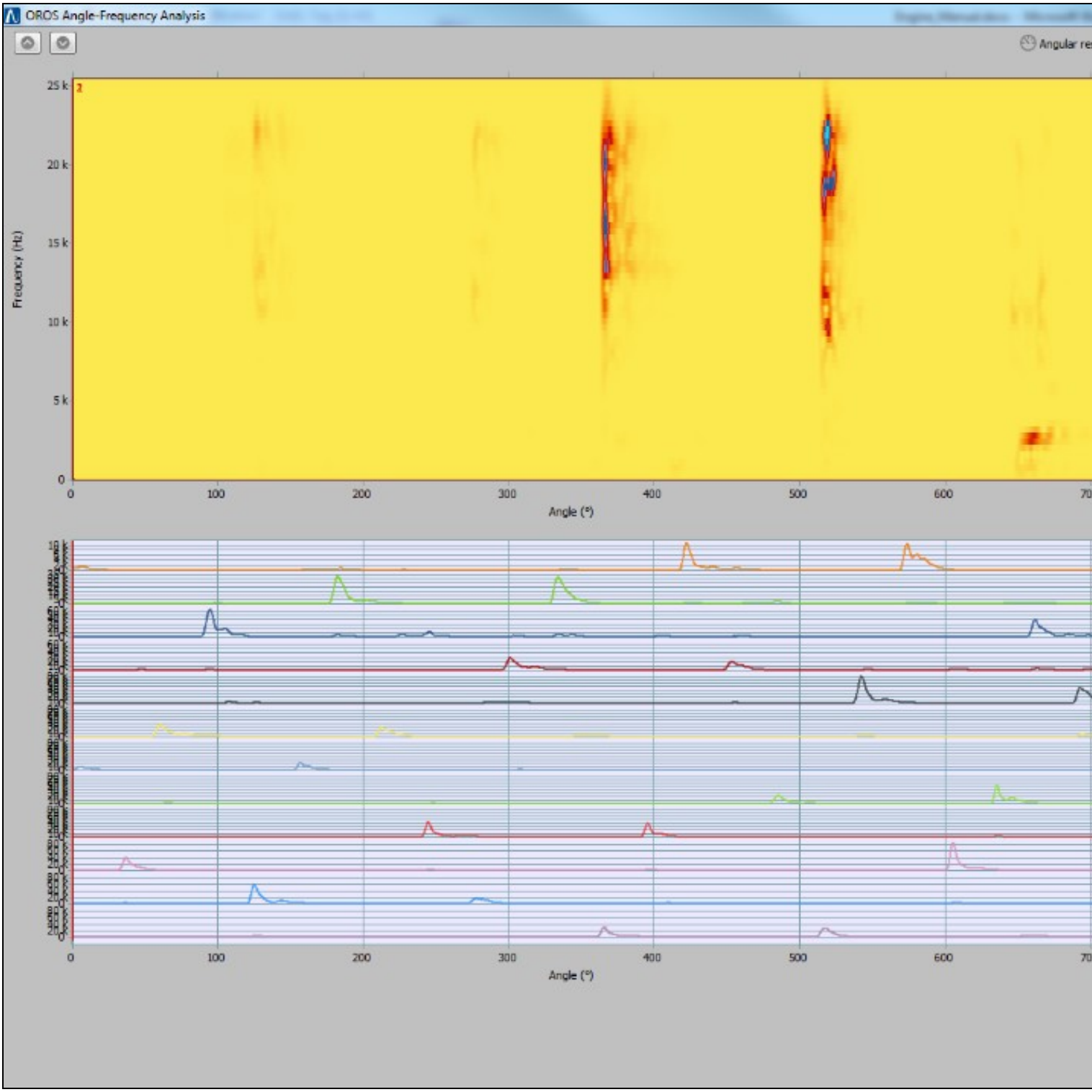
73.6.5 Comparison

73.6.5.1 Tracks from the same signal

Open the result manager with 



All the tracks available in the opened signal are shown. Select the tracks, click on add track and click on the button "Compute" to add these results in the window.

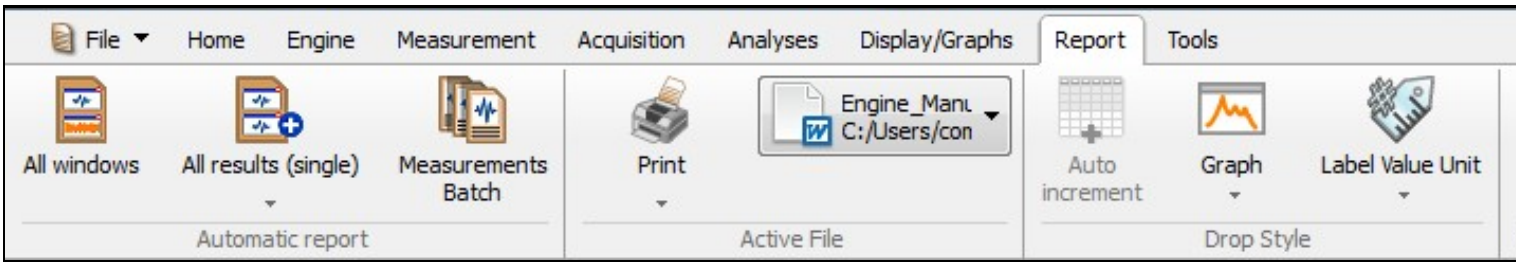


Here, one colorspectrogram is displayed.  indicates the displayed tracks.

The buttons  at the left top corner allow you to navigate among the results and visualize the various calculated colorspectrograms.

73.6.5.2 Report

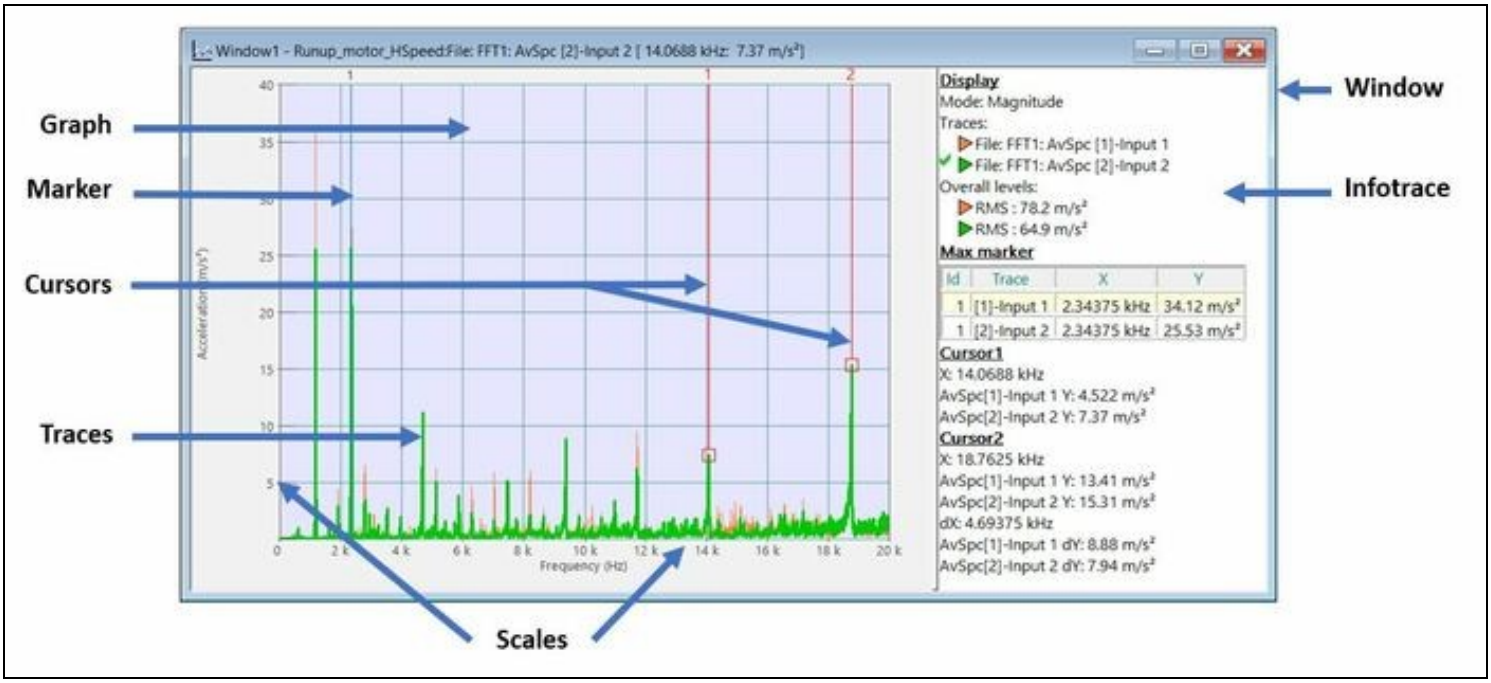
To add the angle-frequency results in a report, go to the Report ribbon, select the active Word file and drag & drop the Angle-Frequency icon to the document.



74 NVGate Display

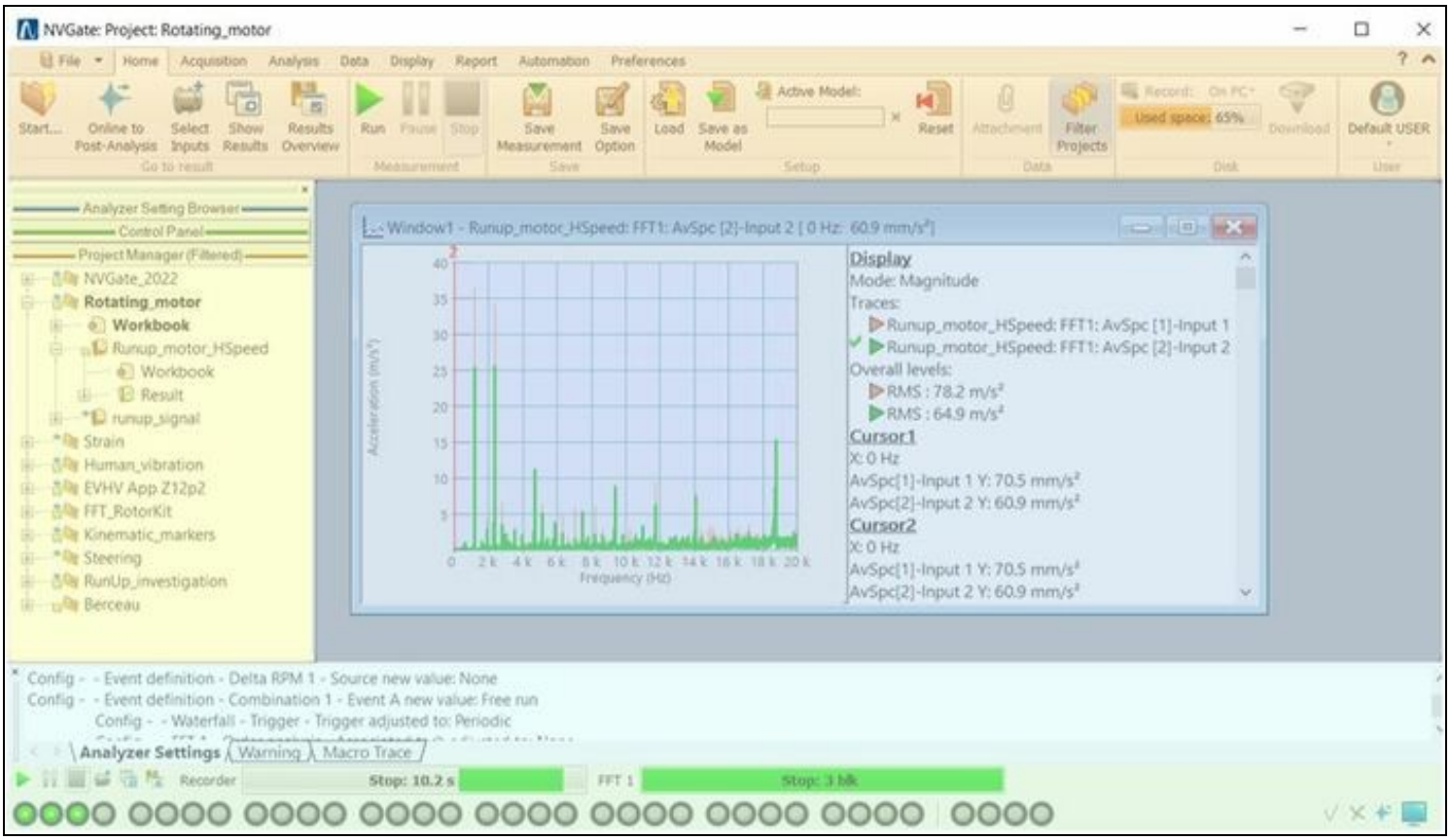
This section explains all the functions and information you can find in the graphs, windows and infotrace. It contains also the information relative to the scales, graphic modes, display modes and the contextual menus.

Different windows which contain one or more graphs or traces can be created using the *Results* dialog or the *Add/remove window* dialog. You can also add or remove some information in the Infotrace using the Infotrace properties. Manage all the display settings using the right click in almost any area. For each result type there are different available options using the right click.



The windows allow to display signal traces. They can contain several traces in the same graph (multi-trace display) or several graphs (multi-graph display). The windows can display 1D graphs (viewmeter, RPM monitoring), 2D graphs (profiles, signal recording) or 3D graphs such as Waterfall display.

74.1 Interface overview



NVGate ribbon: tabs

Workspace

Windows, Graphs and Infotrace

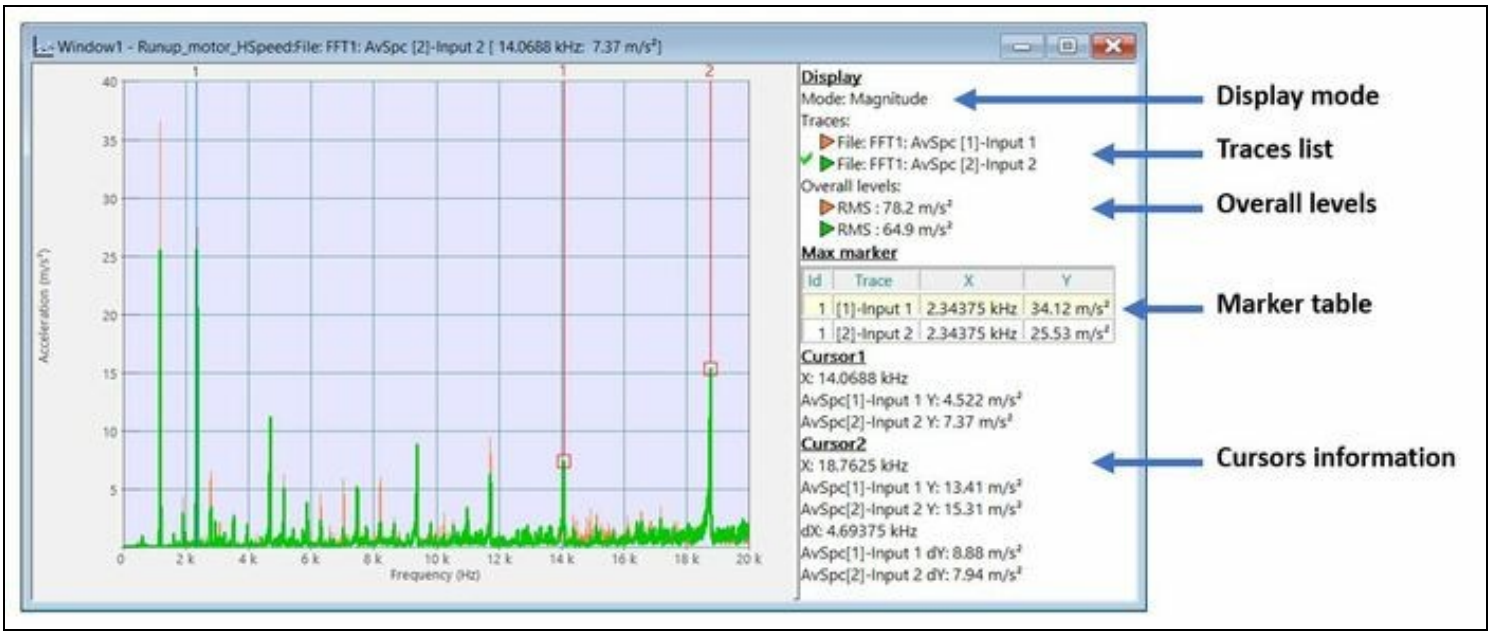
Log window

Status bar

74.1.1 Infotrace

The infotrace displays information about the graph:

- **Graph mode:** magnitude, real...
- **List of traces with their states:** available or not / displayed in all areas or not / not displayed. You can move into the infotrace to select a specified trace and to follow cursor?s value of this trace. Memorized traces are also displayed in the list (Memx)
- **Overall levels:** Displays the RMS level in 2D windows containing spectra or time signals.
- **Cursor information:** x, y, order, dx, dy if available
- **Marker arrays:** Using keyboard arrows, you can select the active trace in the infotrace.

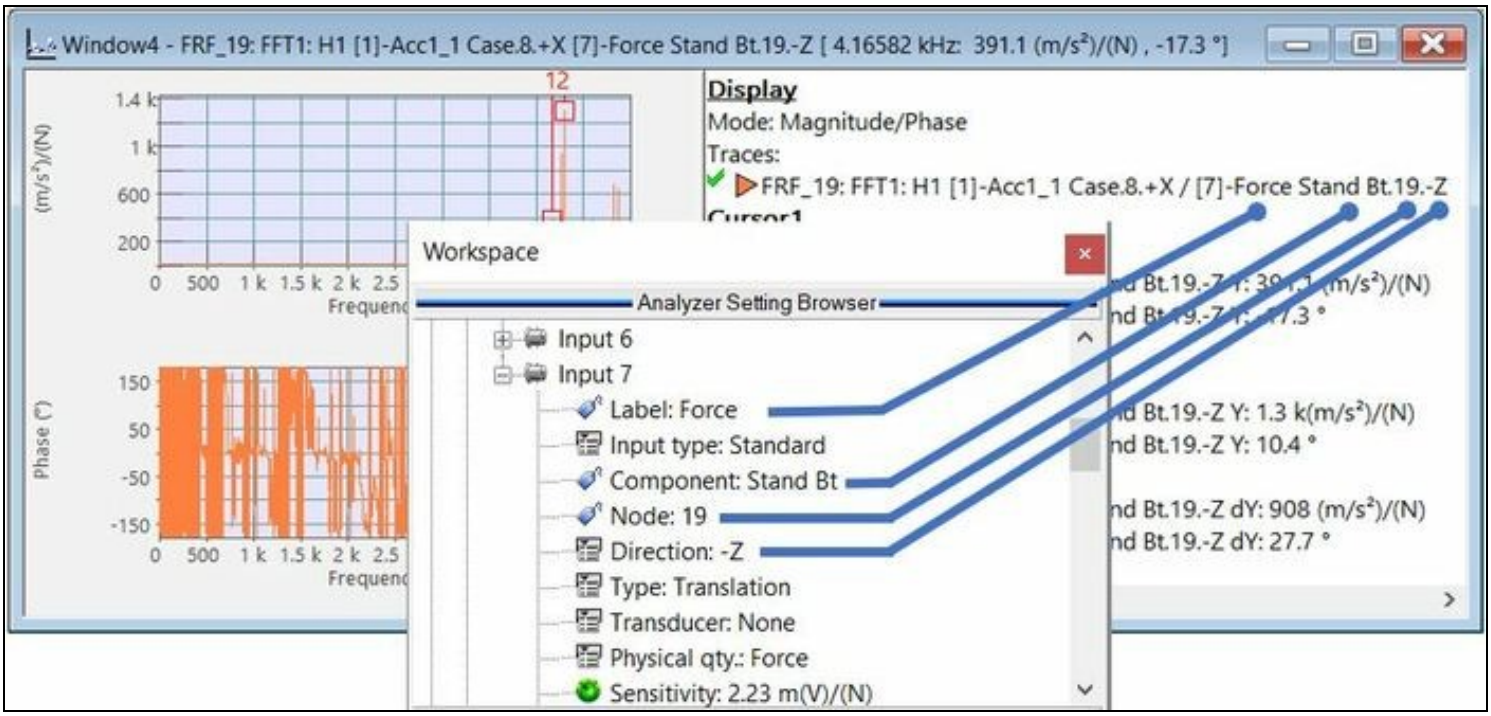


74.1.1.1 Traces names

The traces names indicate accurately what signal is displayed. A trace label consists of:

Item	Indicates	Example
File	Trace origin when it does not come from current analysis	Measurement A
Source	Trace origin when it does not come directly from a plug-in	Wtf, Mem02, Oper
Plug-in	The plug-in which calculated the trace	FFT 1, OCT
Results type	The type of result in the plug-in	AcgSpct, Coh, Trigger block
Channel	The channel in the plug-in	[3]
Label	The input Label	Acc. top
Section	The section in the Waterfall	Z= 2500 RPM, X=375 RPM
Unit/Weighting	Applied alteration	Pk-Pk, PSD, (A)
Time Date	Of the result	15:50:14 03/10/15

In order to simplify the trace identifications in applications that manage many measurement points (structural dynamics, Roving impact hammer) the content of the front-end identification settings are inserted in the trace labels.



The trace labels display the *Component*, *Node* and *Direction* when the corresponding setting is different from its default value:

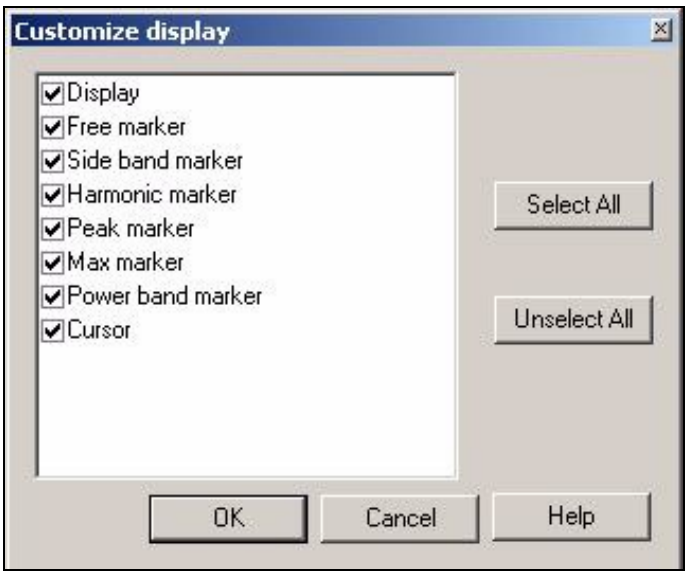
- *Component* = None
- *Node* = 0
- *Direction* = Scalar

This applies individually, setting by setting and is independent for each channel.

74.1.1.2 Contextual menu

The infotrace contextual menu is accessible by right clicking on the infotrace.

Customize: From the Infotrace, right click and select Customize.



This dialog box is used to select the information to be displayed in the infotrace (cursor coordinates, marker values?).

All checked items are displayed, unchecked items are not displayed.

- **Select All:** Selects all items
- **Unselect All:** Unselects all items
- **Ok:** Applies the changes and closes the dialog box.
- **Cancel:** ignores the changes and closes the dialog box.

Auto width: Sets the Infotrace area width to the width of the largest element currently displayed.

Copy marker table: Copies the marker table content to the clipboard in Excel format, in order to paste it in Excel. Each column/line of the table becomes a column/line in the Excel sheet.

See the "Copy marker" topic p 101 for more details about the marker table copy.

Close: Hides the Infotrace area.

74.1.2 Graph

A graph displays computed traces. It can be multi-trace or multi-graph.

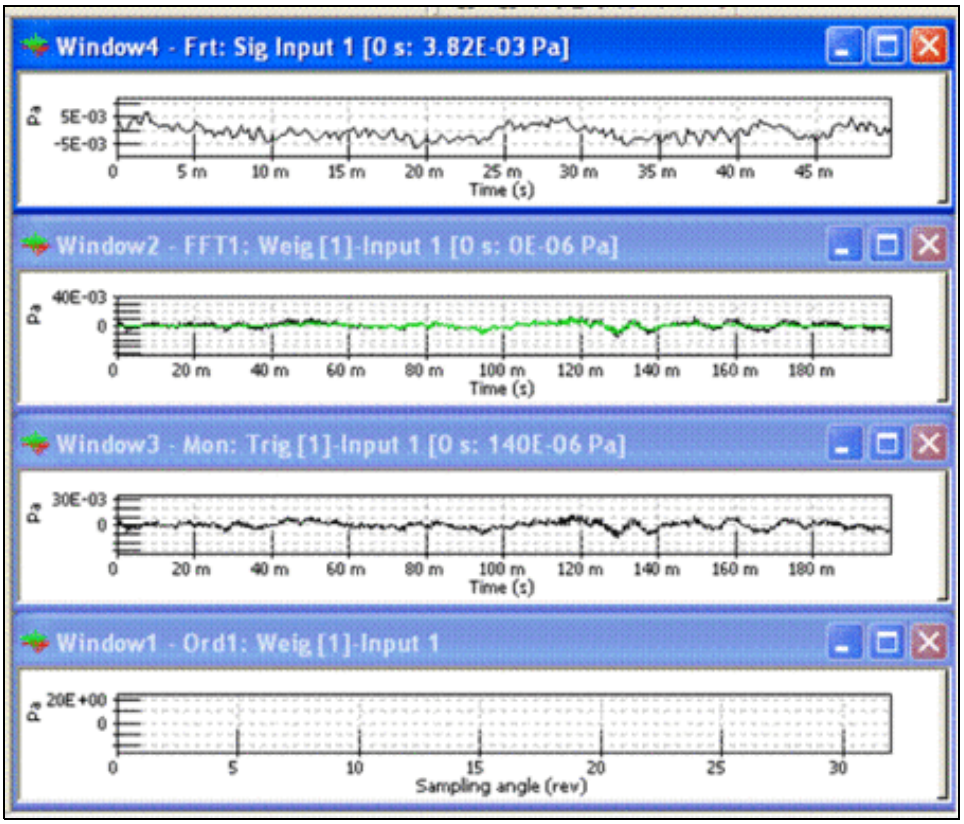
74.1.2.1 Graph type

74.1.2.1.1 Time

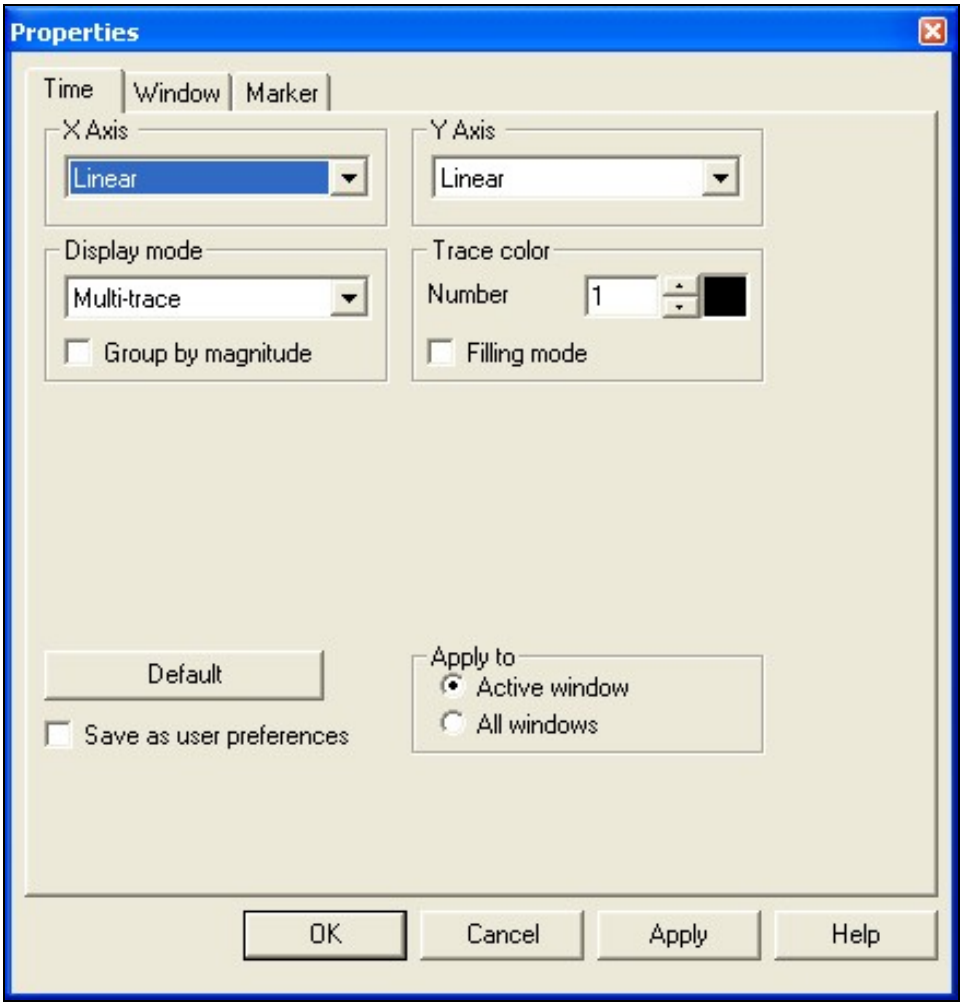
Time graphs display time real signals.

Source signals (plug-in/process)
The following results may be displayed as time graphs:

- Front-end: Signal.
- Monitor: Triggered block.
- FFT x: Triggered block, weighted block.
- SOA x: Triggered block, weighted block.


Window4 - Frt: Sig Input 1 [0 s: 3.82E-03 Pa]
Pa
5E-03
-5E-03
0
5 m
10 m
15 m
20 m
25 m
30 m
35 m
40 m
45 m
Time (s)
Window2 - FFT1: Weig [1]-Input 1 [0 s: 0E-06 Pa]
Pa
40E-03
0
0
20 m
40 m
60 m
80 m
100 m
120 m
140 m
160 m
180 m
Time (s)
Window3 - Mon: Trig [1]-Input 1 [0 s: 140E-06 Pa]
Pa
30E-03
0
0
20 m
40 m
60 m
80 m
100 m
120 m
140 m
160 m
180 m
Time (s)
Window1 - Ord1: Weig [1]-Input 1
Pa
20E+00
0
0
5
10
15
20
25
30
Sampling angle (rev)

Properties


Properties
Time
Window
Marker
X Axis
Linear
Y Axis
Linear
Display mode
Multi-trace
Group by magnitude
Trace color
Number
1
Filling mode
Default
Save as user preferences
Apply to
Active window
All windows
OK
Cancel
Apply
Help

- **X-Axis:**

  -**Linear:** uses linear scale for X-axis units.

- **Y-Axis:**

  -**Linear:** uses linear scale for Y-axis units.
  -**Logarithmic:** uses logarithmic scale for Y-axis units.

- **Display mode**

  -**Multi-graph:** overlays all traces using one graph per trace on the same window.
  -**Multi-trace:** overlays all traces in one graph.
  -**Multi-trace 3D:** overlays all traces in one 3D graph.
  -**Magnitude gathering:** if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.

- **Trace color**

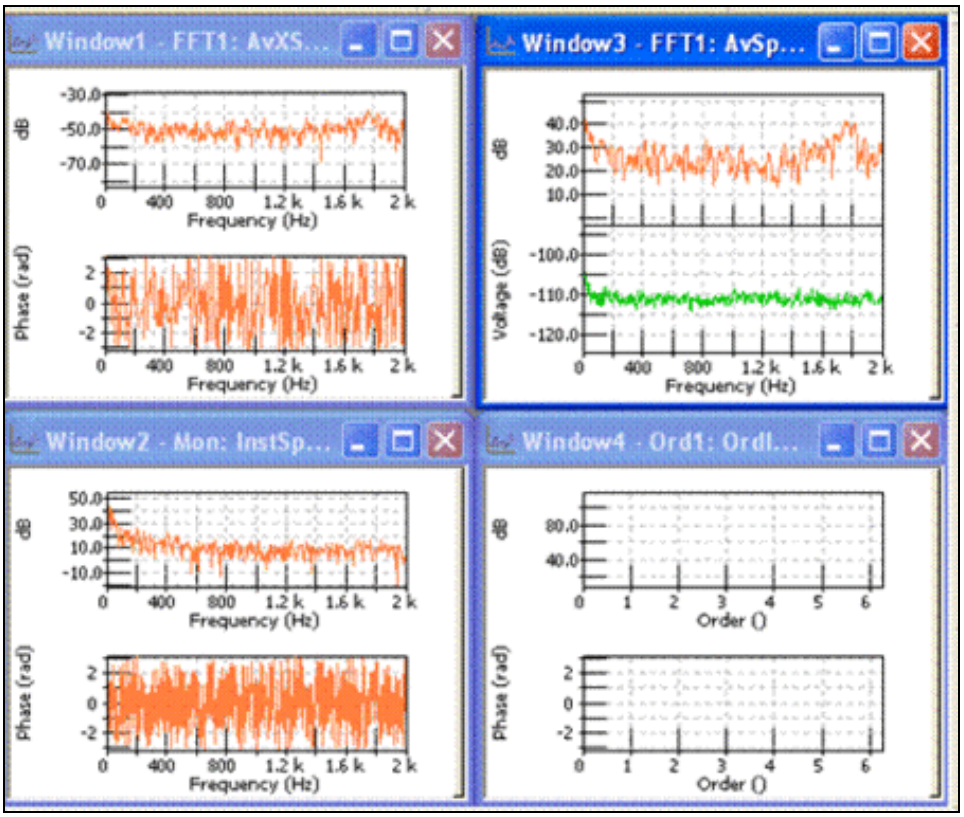
  -**Number:** selects the trace number for color modification.
  -**Color box:** click on this box to modify the color of the selected trace.
  -**Filling mode:** if selected, all the curves of the windows are filled from:
  The bottom of the area if Y scale is a dB one or Logarithmic one,
  The 0 value if the Y scale is linear.

74.1.2.1.2 Spectral

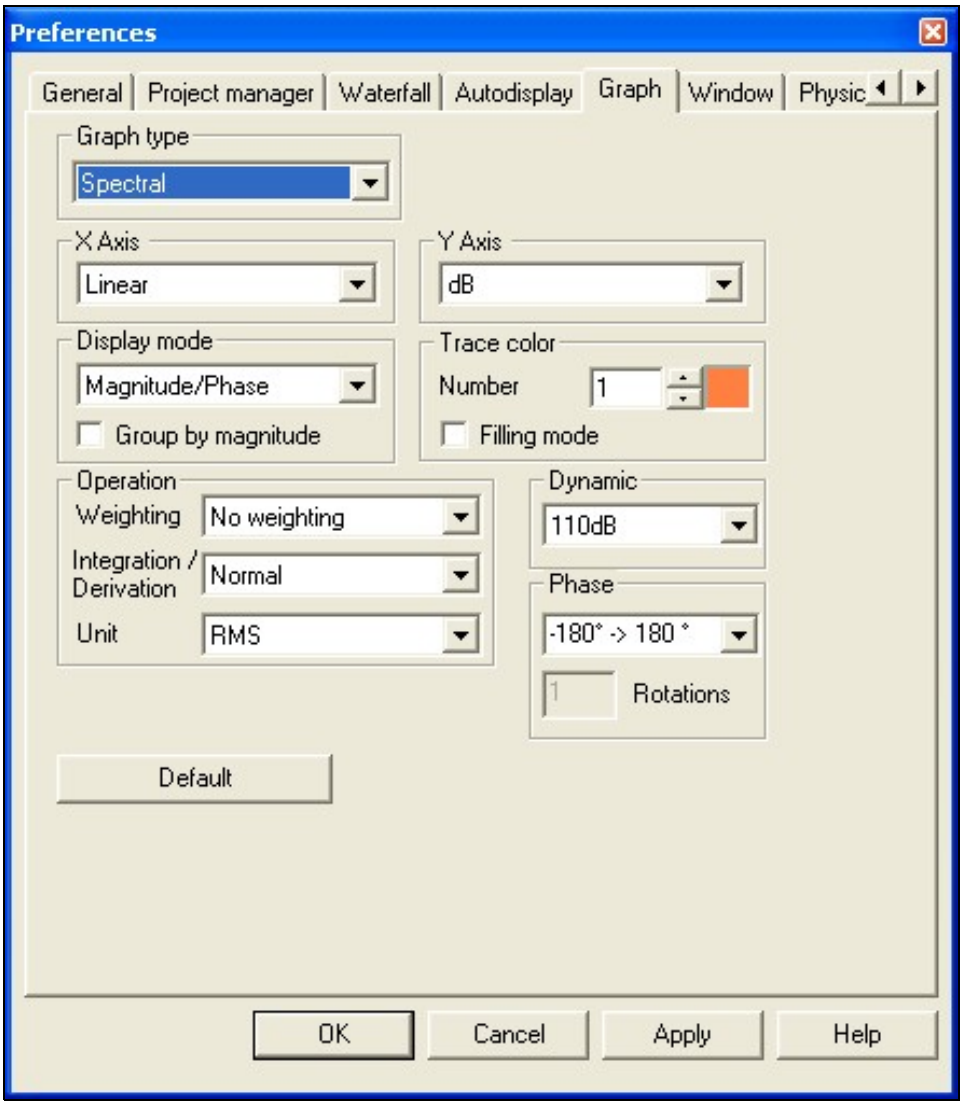
Spectral graphs display narrow band (complex) spectra.

Source Signals
The following results may be displayed as spectral graphs:

- Monitor: Inst. spectrum, Avg spectrum.
- FFT x: Inst. spectrum, Avg spectrum, Inst cross-spectrum, Avg cross-spectrum, FRF H1, FRF H2, spectrum.
- Sync. order x: Ord. inst. spectrum, Ord. avg. spectrum, Ord. spectrum.


Window1 - FFT1: AvXS...
dB
-30.0
-50.0
-70.0
0
400
800
1.2 k
1.6 k
2 k
Frequency (Hz)
Phase (rad)
2
0
-2
Window3 - FFT1: AvSp...
40.0
30.0
20.0
10.0
Voltage (dB)
-100.0
-110.0
-120.0
Window2 - Mon: InstSp...
50.0
30.0
10.0
-10.0
Window4 - Ord1: Ordl...
80.0
40.0
Order ()
1
2
3
4
5
6

Properties


Preferences
General
Project manager
Waterfall
Autodisplay
Graph
Window
Physic
Graph type
Spectral
X Axis
Linear
Y Axis
dB
Display mode
Magnitude/Phase
Group by magnitude
Trace color
Number
1
Filling mode
Operation
Weighting
No weighting
Integration / Derivation
Normal
Unit
RMS
Dynamic
110dB
Phase
-180° -> 180 °
1
Rotations
Default
OK
Cancel
Apply
Help

• **X Axis:**

-**Linear:** uses linear scale for X-axis units.
-**Logarithmic:** uses logarithmic scale for X-axis units.

• **Y Axis:**

-**Linear: uses linear scale for Y-axis units.**
-**Logarithmic: uses logarithmic scale for Y-axis units.**

• **dB:** uses reference dB scale for Y-axis units.
• **Display mode**

-**Magnitude:** overlays all magnitude traces on a single graph.
-**Phase:** overlays all phase traces on a single graph.
-**Real part:** overlays all real parts traces on a single graph.
-**Imaginary part:** overlays all imaginary part traces on a single graph.
-**Magnitude/phase:** overlays all magnitude traces on the upper graph and all the phase traces on the lower graph.
-**Real/imaginary:** overlays all magnitude traces on the upper graph and all the phase traces on the lower graph.
-**Polar:** overlays all complex traces on a polar graph: ? = magnitude, ? = phase.
-**Real part 3D:** displays all real part traces as a 3D graph arranged along the Z-axis.
-**Imaginary part 3D:** displays all imaginary part traces as a 3D graph arranged along the Z-axis.
-**Magnitude 3D:** displays all magnitude traces as a 3D graph arranged along the Z-axis.
-**Phase 3D:** displays all phase traces as a 3D graph arranged along the Z-axis.
-**Real part multi-graph:** displays all real part traces using one graph per trace in the same window.
-**Imaginary part multi-graph:** displays all imaginary part traces using one graph per trace in the same window.
-**Magnitude multi-graph:** displays all magnitude traces using one graph per trace in the same window.
-**Phase multi-graph:** displays all phase traces using one graph per trace in the same window.
-**Phase/Magnitude:** overlays all phase traces on the upper graph using 1/3 of window space and all the magnitude traces on the lower graph using 2/3 of the window.
-**Merged Magnitude/Phase:** displays all magnitude and phase part traces as a unique graph.
-**Magnitude gathering:** if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.

• **Trace color:**

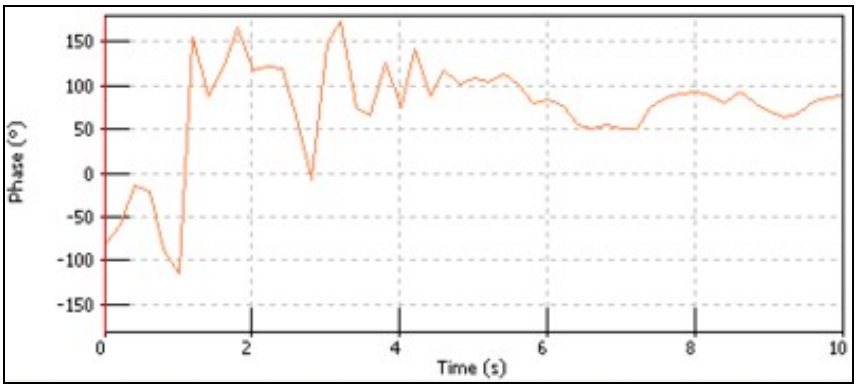
-**Number:** selects the trace number for color modification.
-**Color box:** click on this box to modify the color of the selected trace.
-**Filling mode:** if selected, all the curves of the windows are filled from:
the bottom of the area if Y scale is a dB one or Logarithmic one,
the 0 value of the Y scale is linear.

• **Dynamics:**

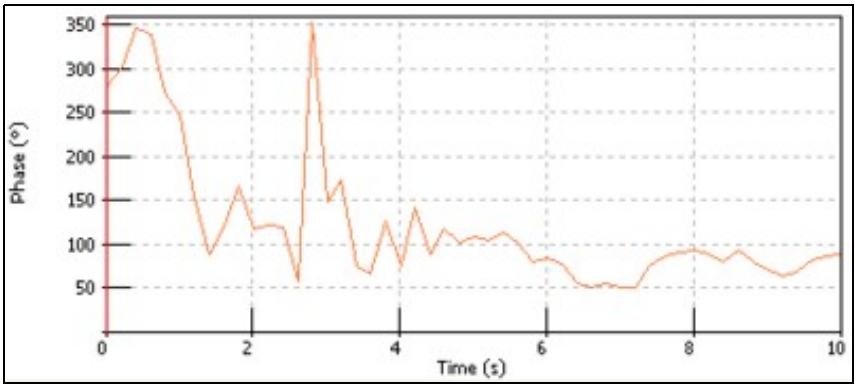
-**90 dB:** resizes the Y-axis to 90 dB dynamics starting from +20 dBV.
-**110 dB:** resizes the Y-axis to 110 dB dynamics starting from +20 dBV.
-**130 dB:** resizes the Y-axis to 130 dB dynamics starting from +20 dBV.
-**150 dB:** resizes the Y-axis to 150 dB dynamics starting from +20 dBV.

• **Phase:**

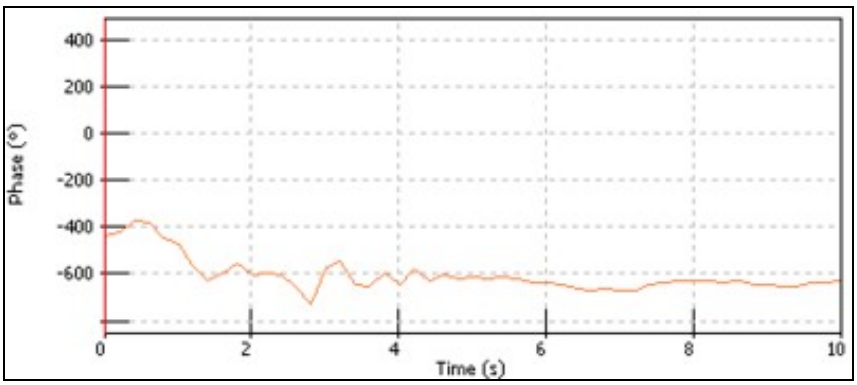
- **-180° -> 180°:** sets the phase graph Y-axis between ?180° to +180°.



-**0 -> 360°:** sets the phase graph Y-axis between 0 to +360°.



- **Rotations:** sets the number of rotations to be displayed on the Y-axis.



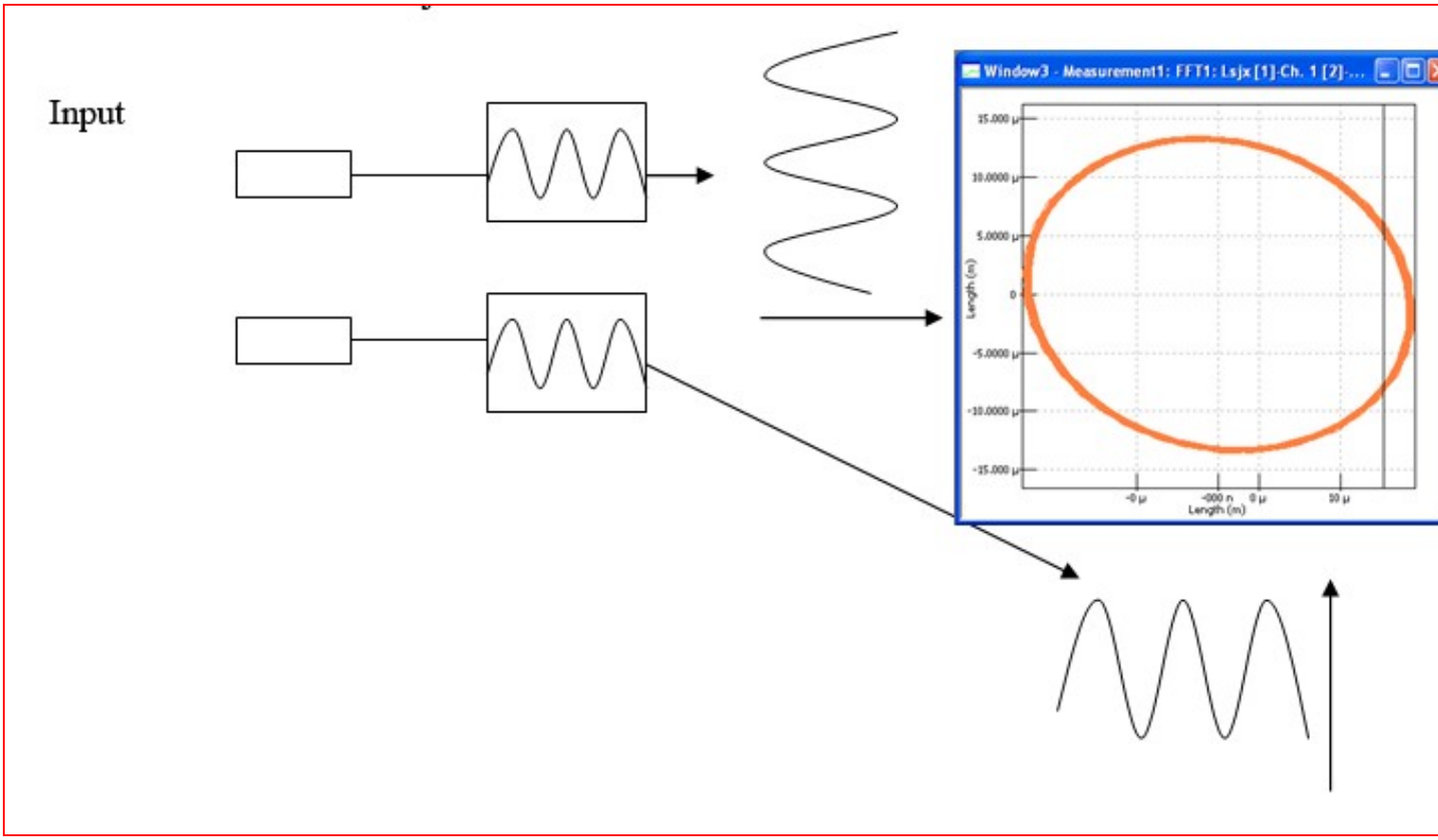
74.1.2.1.3 Lissajous

Parametric graph of one triggered block with another one for reference.

Source Signals

The following results may be displayed into Lissajous graphs:

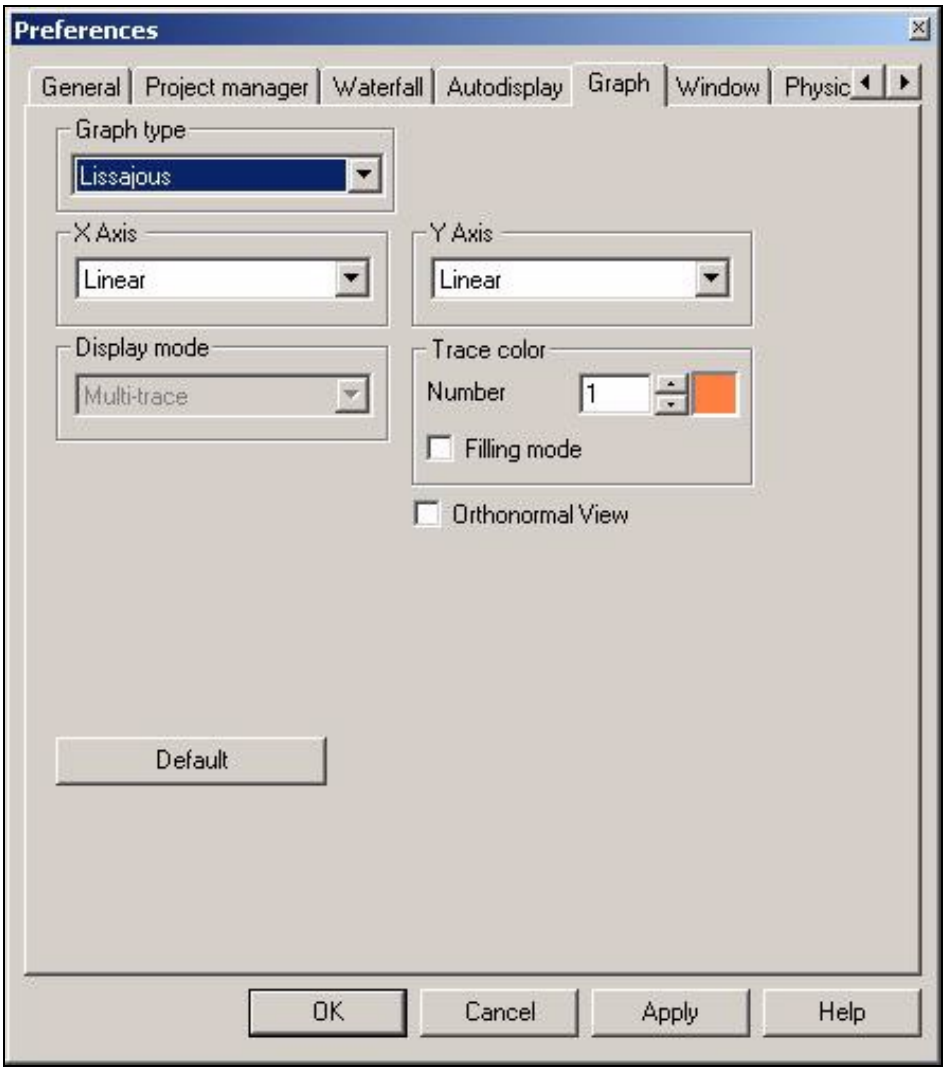
- **FFT x: Lissajous**.



The perimeter of the Lissajous corresponds of the FFT length?s block.

You can use filters on this kind of graph, as integration or a double integration.

Properties


Preferences
General
Project manager
Waterfall
Autodisplay
Graph
Window
Physic
Graph type
Lissajous
X Axis
Linear
Y Axis
Linear
Display mode
Multi-trace
Trace color
Number
1
Filling mode
Orthonormal View
Default
OK
Cancel
Apply
Help

- **X Axis:**

  -**Linear:** uses linear scale for X-axis units.

- **Y Axis:**

  -**Linear:** uses linear scale for Y-axis units.

- **Display mode:**

  -**Multi-trace:** overlays all traces on a single graph.

- **Trace color:**

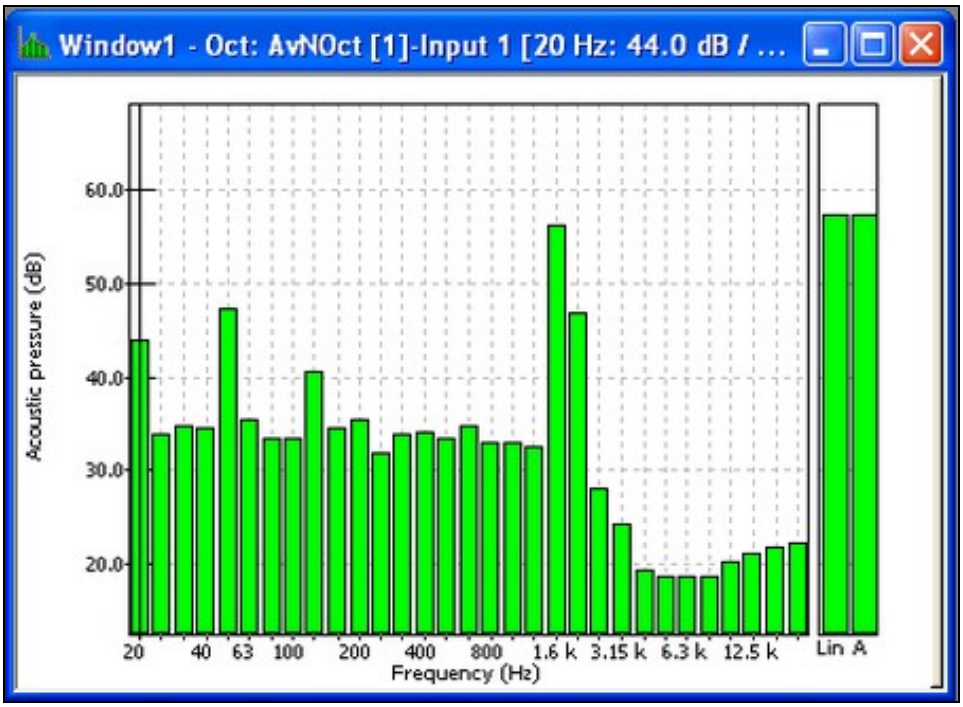
  -**Number:** selects the trace number for color modification.
  -**Color box:** click on this box to modify the color of the selected trace.
  -**Orthonormal view:** if checked, the graph is displayed in an orthonormal area.

74.1.2.1.4 Nth octave

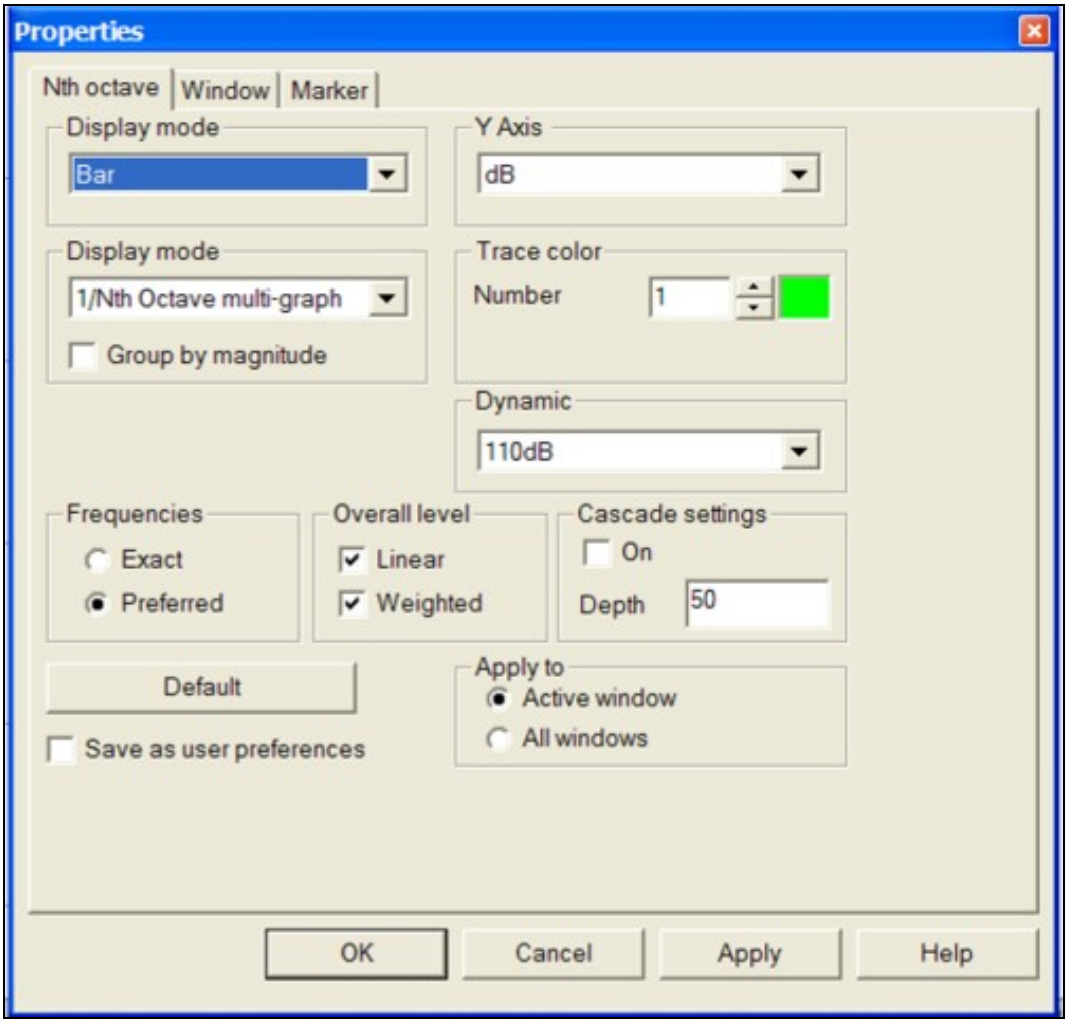
Displays nth octave band graph.

Source Signals
The following results may be displayed as nth octave graphs:

- Nth-Octave: 1/n octave, Avg 1/n octave.



Properties


Properties
Nth octave
Window
Marker
Display mode
Bar
Y Axis
dB
Display mode
1/Nth Octave multi-graph
Group by magnitude
Trace color
Number
1
Dynamic
110dB
Frequencies
Exact
Preferred
Overall level
Linear
Weighted
Cascade settings
On
Depth
50
Default
Apply to
Active window
All windows
Save as user preferences
OK
Cancel
Apply
Help

- **Y Axis:**

  -**Linear:** uses linear scale for Y-axis units.
  -**Logarithmic:** uses logarithmic scale for Y-axis units.
  -**dB:** uses reference dB scale for Y axis units.

- **Display mode**

  -**Bar:** bar representation
  -**Step:** step representation
  -**Rectangle:** overlaid rectangle
  -**Filled:** overlaid filled rectangles.

- **Display mode**

  -**Multi-trace:** overlays all traces on a single graph.
  -**Multi-graph:** one graph for each trace.
  -**Magnitude gathering:** if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.

- **Trace color**

  -**Number:** selects the trace number for color modification.
  -**Color box:** click on this box to modify the color of the selected trace.

- **Overall level**

  -**Linear:** if checked, the linear global level is displayed.
  -**Weighted:** if checked and available, the weighted level is displayed.

- **Frequencies:**

  -**Exact:** displays exact band center frequency.
  -**Preferred:** displays preferred frequencies, i.e rounded values for the central frequencies. Preferred frequencies are only available for octave and 1/3rd octave windows: in the octave. If this mode is selected in 12th and 24th octave windows, exact frequencies are displayed.

- **Dynamics:**

  -**90 dB:** resizes the Y-axis to 90 dB dynamics starting from +20 dBV.
  -**110 dB:** resizes the Y-axis to 110 dB dynamics starting from +20 dBV.
  -**130 dB:** resizes the Y-axis to 130 dB dynamics starting from +20 dBV.
  -**150 dB:** resizes the Y-axis to 150 dB dynamics starting from +20 dBV.

74.1.2.1.5 Viewmeter

Displays scalar value graphs.

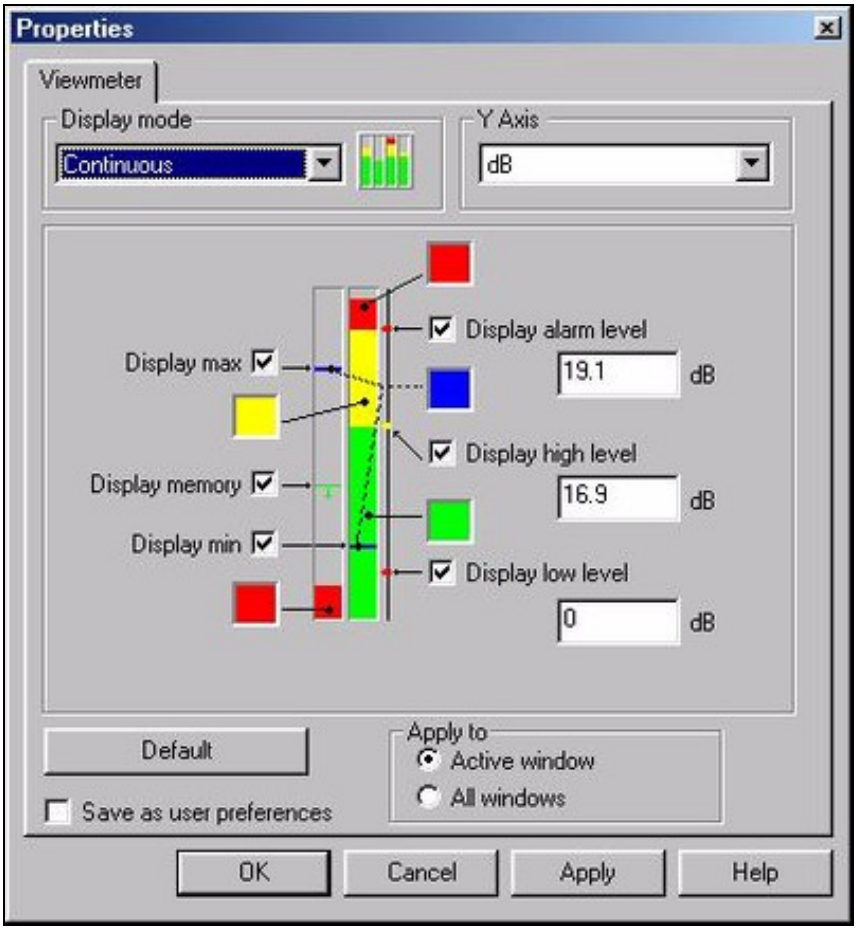
Source Signals
The following results may be displayed as nth viewmeter graphs:

- Front-end: DC.
- Monitor: DC, Max, Min, Kurtosis.
- Recorder: RMS
- FFT X: Order & Overall
- SOA X: Order & Overall
- 1/n Octave: Overall values
- Tachometer: Angular speed


Window1...
Acoustic pressure (dB)
80.0
70.0
60.0
50.0
40.0
RMS [1]
Window2 - Mon: RMS [1]-Input 1 [79....
Acoustic pressure (dB)
100.0
80.0
60.0
40.0
20.0
Mon: Max [1]-Input 1
Mon: RMS [1]-Input 1
Window3 - Oct: OvrWgt(A) [1]-Input ...
Acoustic pressure (dBA)
80.0
70.0
60.0
50.0
40.0
Oct: OvrLin [1]-Input 1
OvrWgt [1]
Window4...
Tach: Ang speed Tach. 1
1500
RPM
Window5 - FFT1: Ord ...
dB
120.0
80.0
40.0
FFT1: Ord 1 [1]-Input 1
Window6 - Ord1: Ord ...
dB
160.0
120.0
80.0
Ord1: Ord 1 [1]-Input 1

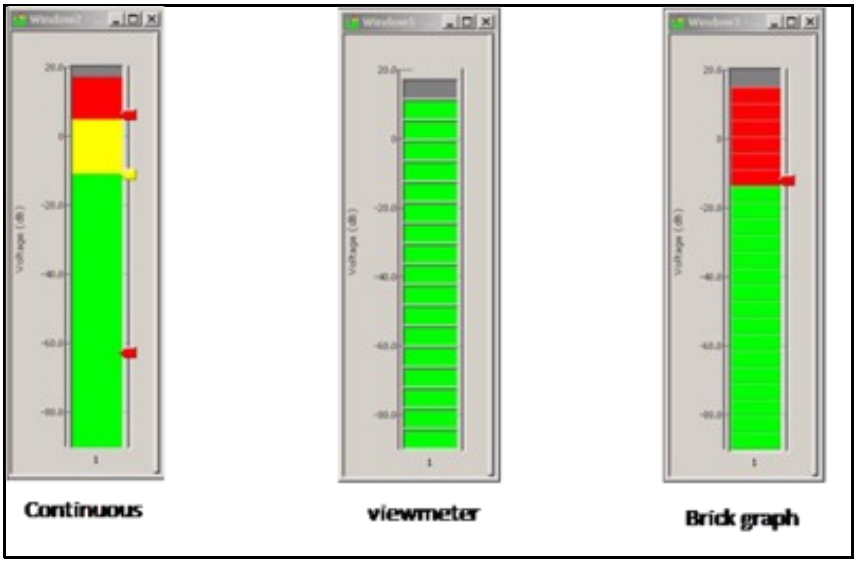
Properties

This page defines the way in which the scalar results are displayed.



- **Display mode:** There are two types of display:

  -**Bar graph:**



  -**Digital display**

- **Y Axis:**

  -**Linear:** uses linear scale for Y-axis units.
  -**Logarithmic:** uses logarithmic scale for Y-axis units.
  -**dB:** uses reference dB scale for Y-axis units.

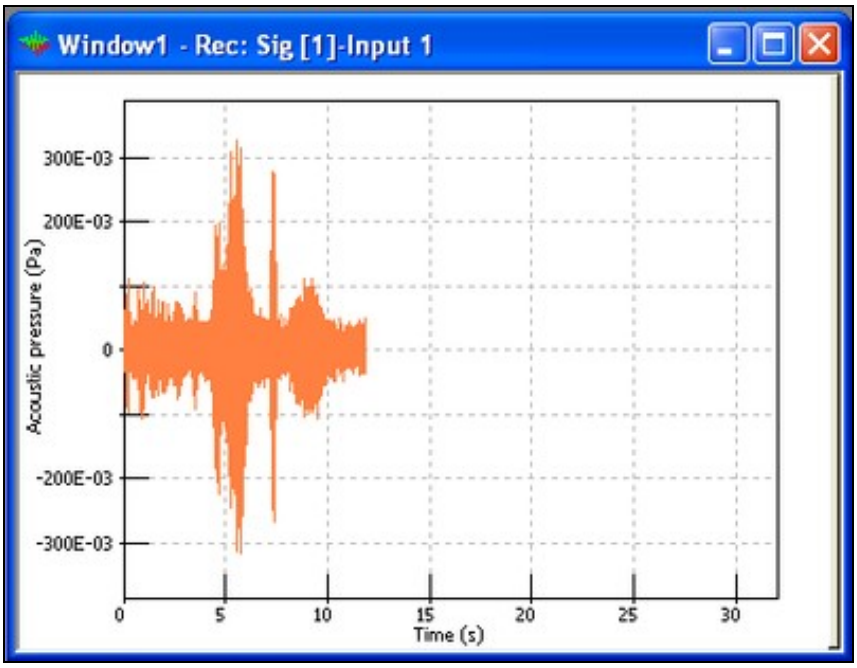
- **Display max, Display min:** Displays the min and the max scalar value as a cursor. The color of the cursor can be freely selected. This property only applies to bar graphs.
- **Display low level:** Changes the color of the display when the value is below this level. The color can be freely selected.
- **Display high level:** Changes the color of the display when the value is higher than this level. The color can be freely selected.
- **Display alarm level:** Changes the color of the display when the value is higher than this level. The color can be freely selected.
- **Brick height:** Defines the height of the bricks for the viewmeter and brick display modes.
- **Save as user preference:** When this box is checked, the value is given as a percentage of the full scale, and may be applied to any graph.

74.1.2.1.6 Monitoring

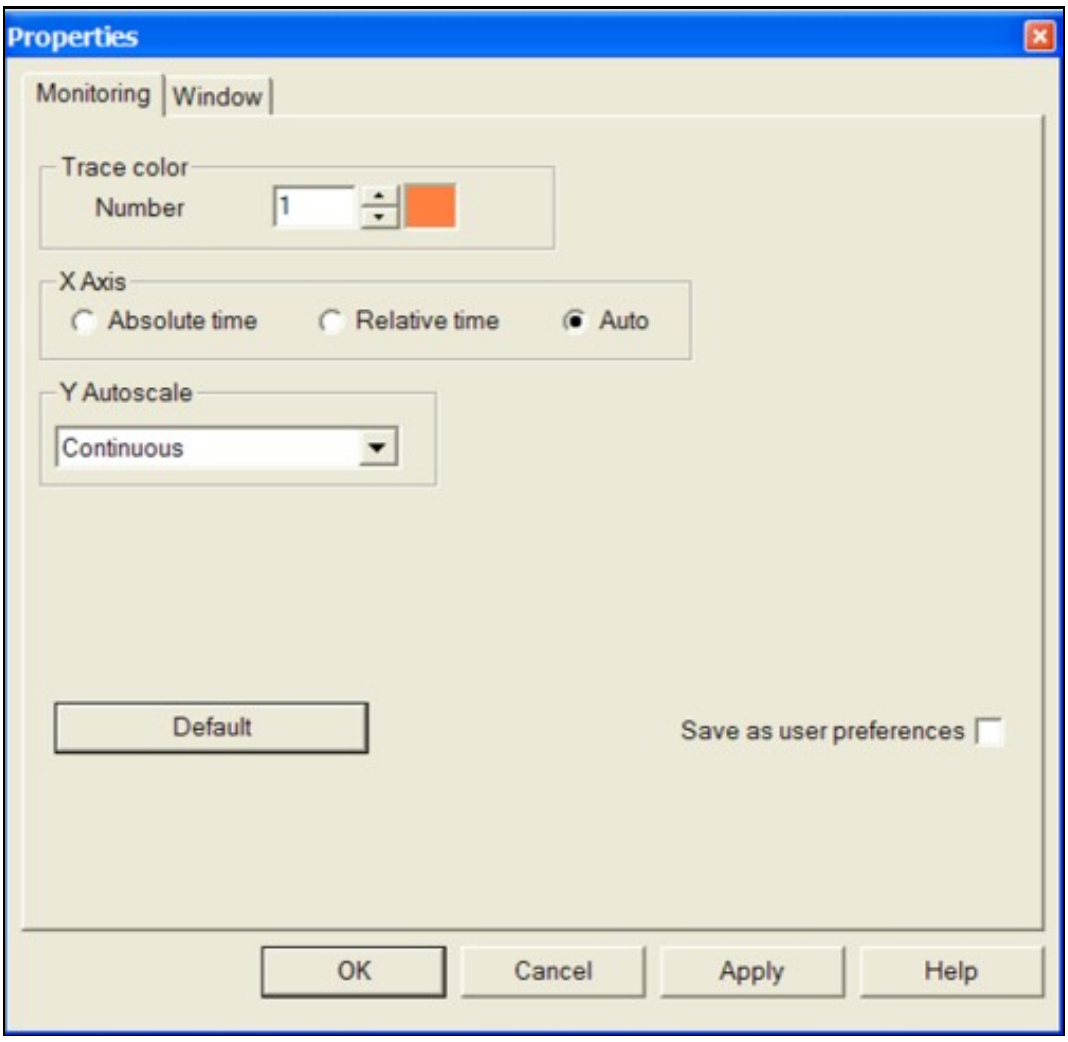
Displays compressed signal graph during recording.

Source Signals
The following results may be displayed as nth monitoring graphs:

- Recorder: monitoring signal


Window1 - Rec: Sig [1]-Input 1
300E-03
200E-03
0
-200E-03
-300E-03
Acoustic pressure (Pa)
0
5
10
15
20
25
30
Time (s)

Properties


Properties
Monitoring
Window
Trace color
Number
1
X Axis
Absolute time
Relative time
Auto
Y Autoscale
Continuous
Default
Save as user preferences
OK
Cancel
Apply
Help

- **Trace color**

  -**Number:** selects the trace number for color modification.
  -**Color box:** click on this box to modify the color of the selected trace.

- **X Axis**

  -**Absolute time:** displays the time from windows format.
  -**Relative time:** displays the duration of the record. The beginning of the record is set to 0.
  -**Auto:** selects absolute or relative time depending on the duration of the record. For records smaller than 2s, the relative time is displayed, for others, the absolute time is chosen.

- **Y Autoscale:**

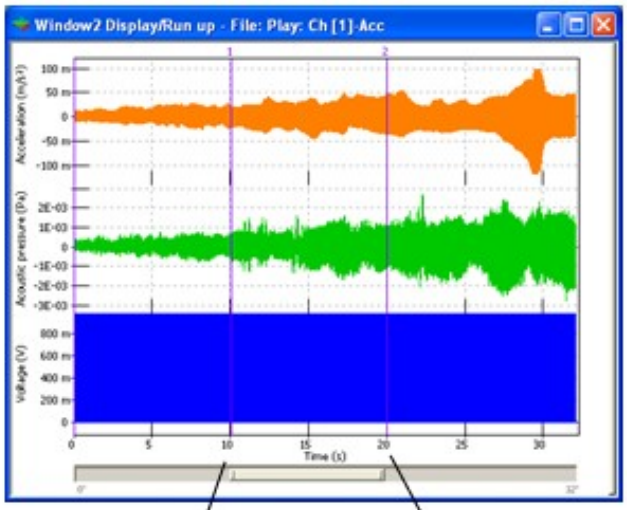
  -**Continuous:** the Y scale is automatically adjusted to the current min and max y values of the window traces with a margin to facilitate visibility.
  -**Disabled:** Y autoscale is not activated.

74.1.2.1.7 Compressed signal

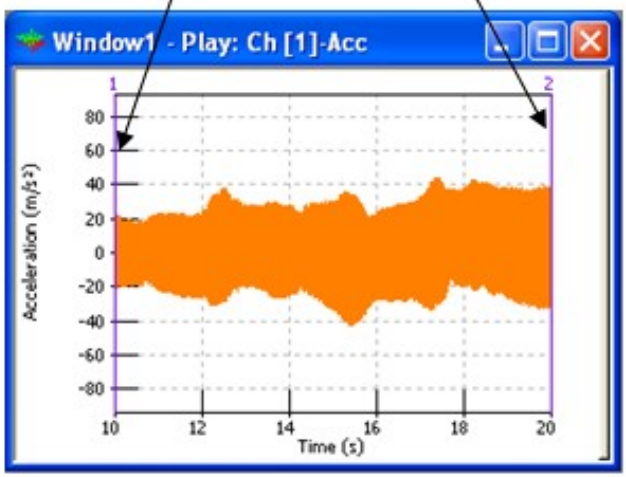
Displays compressed recorded signal graphs.

Source Signals
The following results may be displayed as nth compressed signal graphs:

- Zoomed signal

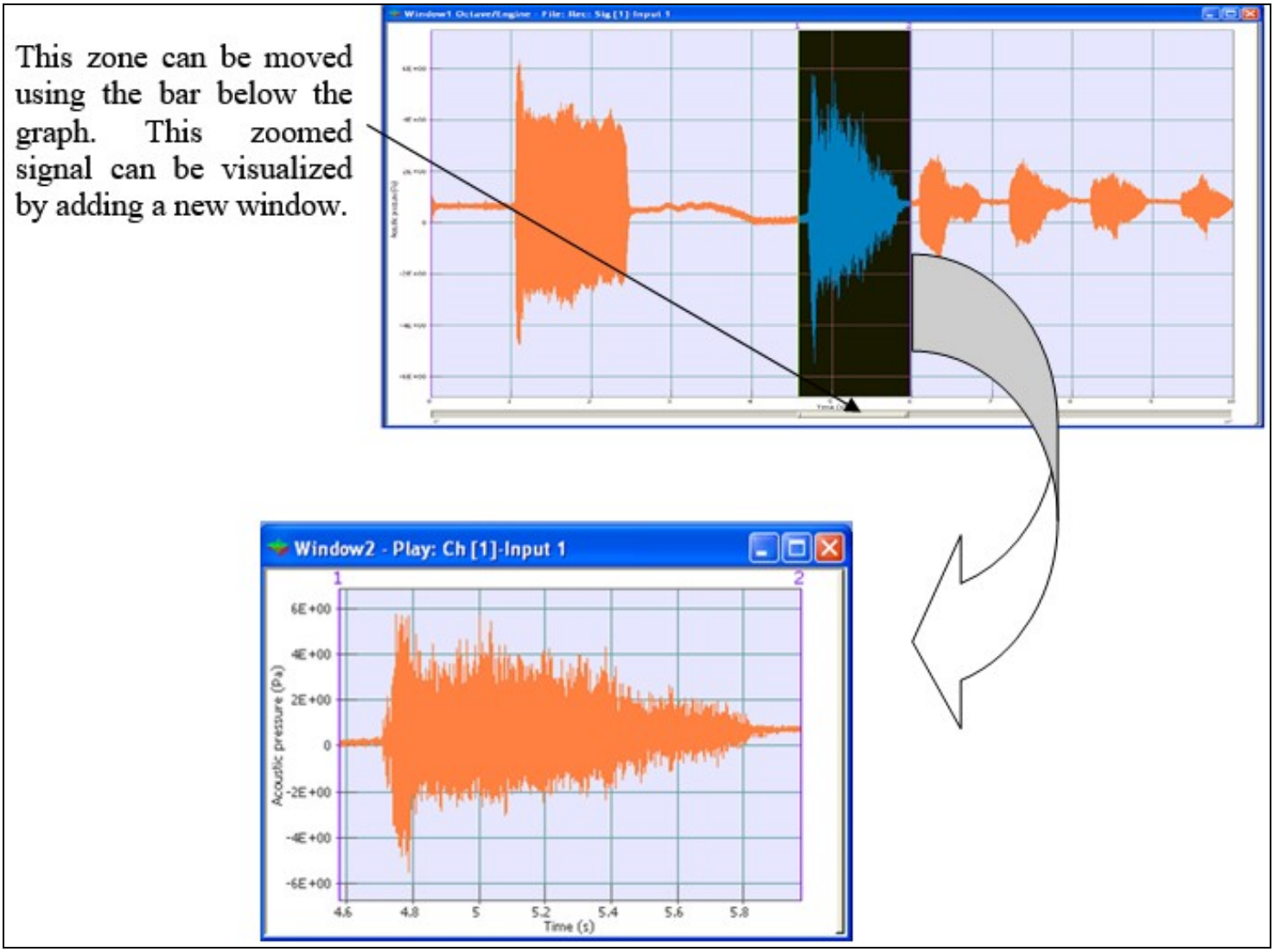


Signal file



Zoomed signal

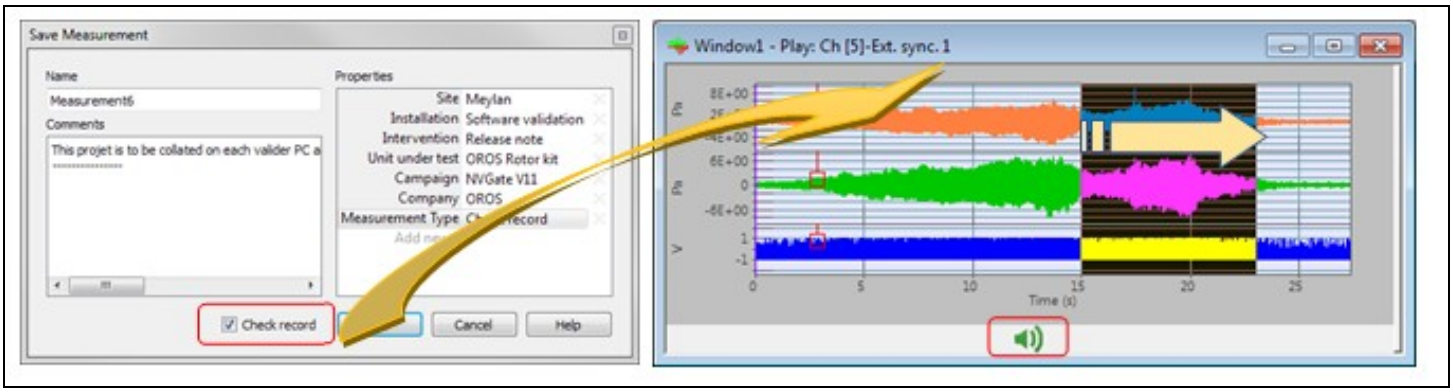
This kind of zoom can be done by ?drag & drop? the selected zone you want to analyze.



After displaying the zoomed signal, on the recorded signal you can modify your zoom at any time. All changes would be displayed automatically in the zoomed signal as soon as you modified your zoomed zone.

Check record

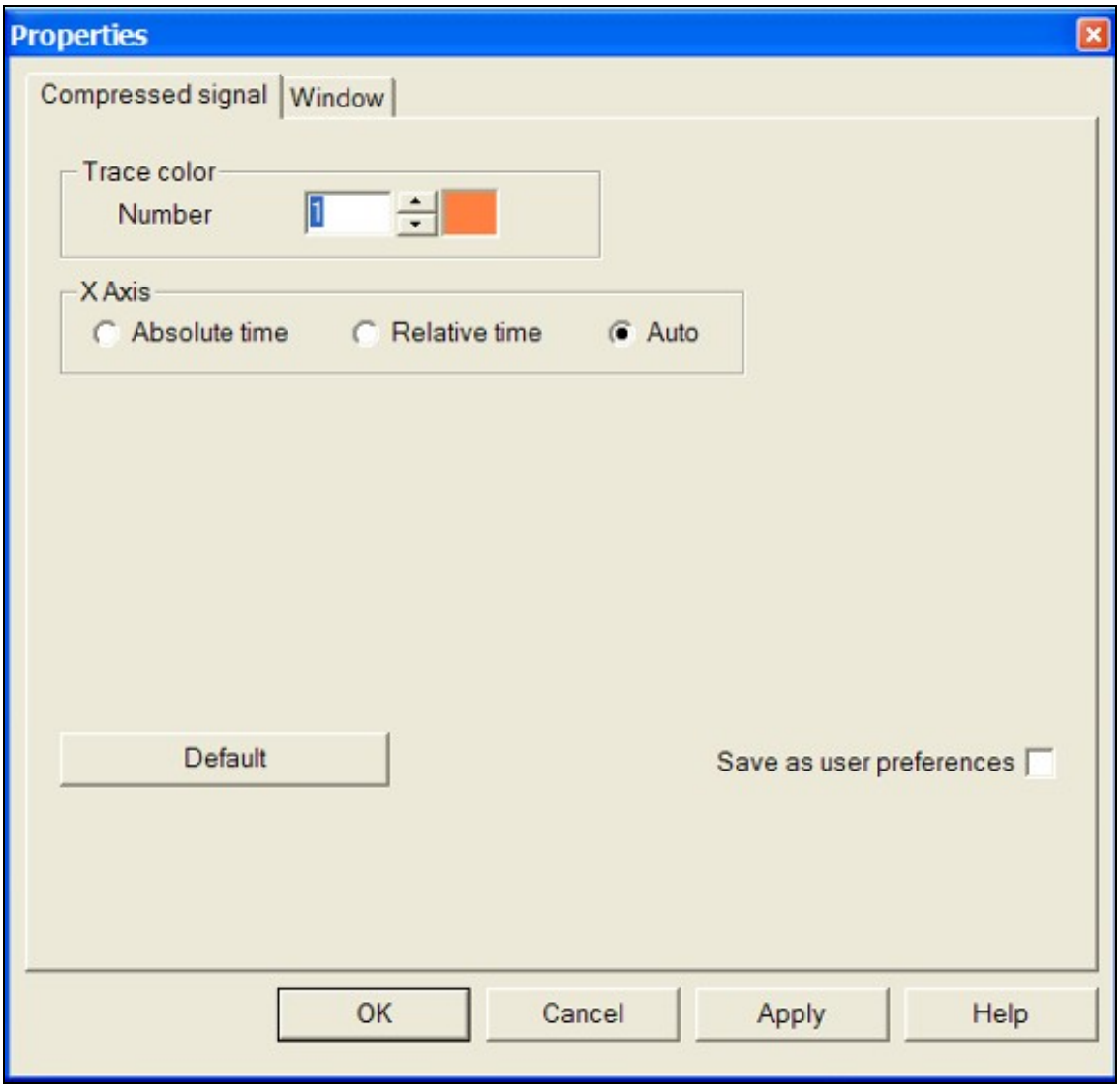
Check record function is for **verifying the signal data in details just after its acquisition**. When NVGate records a signal, the save window proposes to display the zoom signal view of the saved measurement. The signal is displayed after closing the window with OK.



It is then possible to:

- **Zoom into the signal** by drag & dropping on the graph
- **Listen to the tracks** through the PC loudspeaker by clicking on the loudspeaker icon. Select the listened track with the up/down arrows.

Properties


Properties
Compressed signal
Window
Trace color
Number
1
X Axis
Absolute time
Relative time
Auto
Default
Save as user preferences
OK
Cancel
Apply
Help

- **Trace color**

  - **Number**: selects the trace number for color modification.
  - **Color box**: click on this box to modify the color of the selected trace.

- **X Axis**

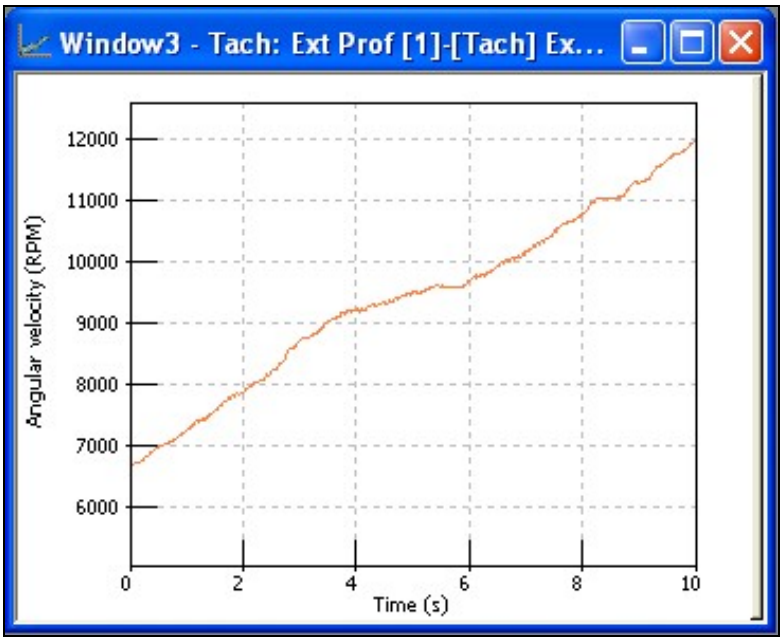
  - **Absolute time**: displays the time from windows format.
  - **Relative time**: displays the duration of the record. The beginning of the record is set to 0.
  - **Auto**: selects absolute or relative time depending on the duration of the record. For records smaller than 2s, the relative time is displayed, for others, the absolute time is chosen.

74.1.2.1.8 Profile

Displays scalar profile.

Source Signals
The following results may be displayed as nth compressed signal graphs:

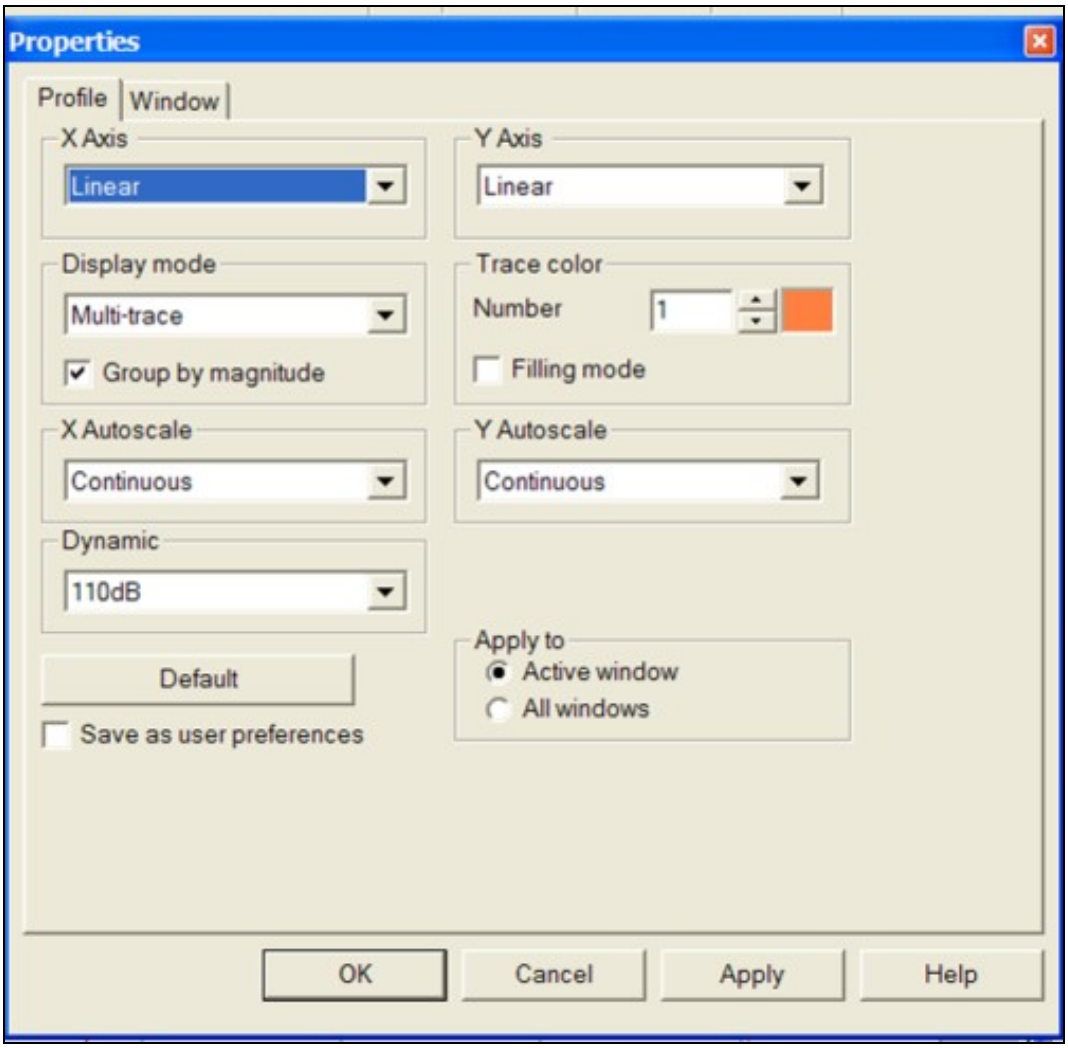
- Monitor: DC, Max, Min, Kurtosis
-



Front-end: DC

- Tachometer: RPM

Properties



- **X Axis:**

  -**Linear:** uses linear scale for X-axis units.

- **Y Axis**

  -**Linear:** uses linear scale for Y-axis units.

- **Display mode**

  -**Magnitude:** overlays all magnitude traces on a single graph.
  -**Phase:** overlays all phase traces on a single graph.
  -**Magnitude gathering:** if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.

- **Trace color**

  -**Number:** selects the trace number for color modification.
  -**Color box:** click on this box to modify the color of the selected trace.
  -**Filling mode:** if selected, all the curves of the windows are filled from:
  the bottom of the area if Y scale is dB or Logarithmic,
  the 0 value if the Y scale is linear.

- **X Autoscale:**

  -**Continuous:** the X scale is automatically adjusted to the current min and max x values of the window traces.
  -**Disabled:** X autoscale is not activated.

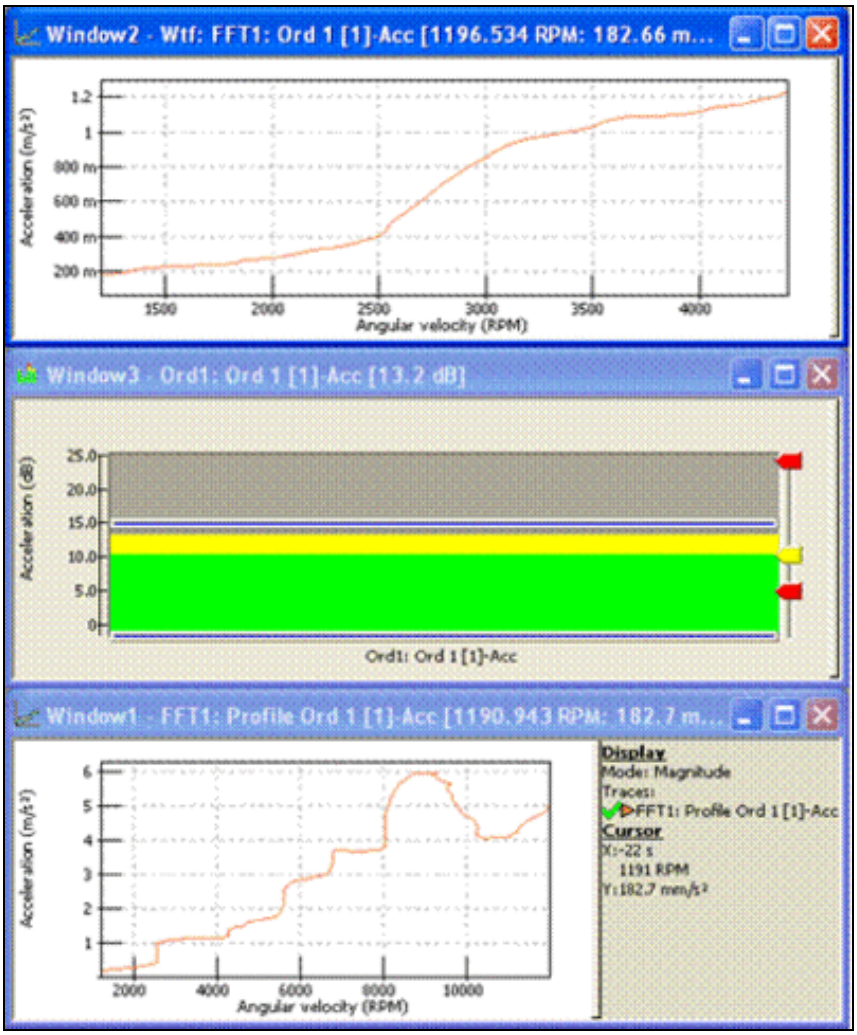
- **Y Autoscale**

  -**Continuous:** the Y scale is automatically adjusted to the current min and max y values of the window traces with a margin to facilitate visibility.
  -**Disabled:** Y autoscale is not activated.

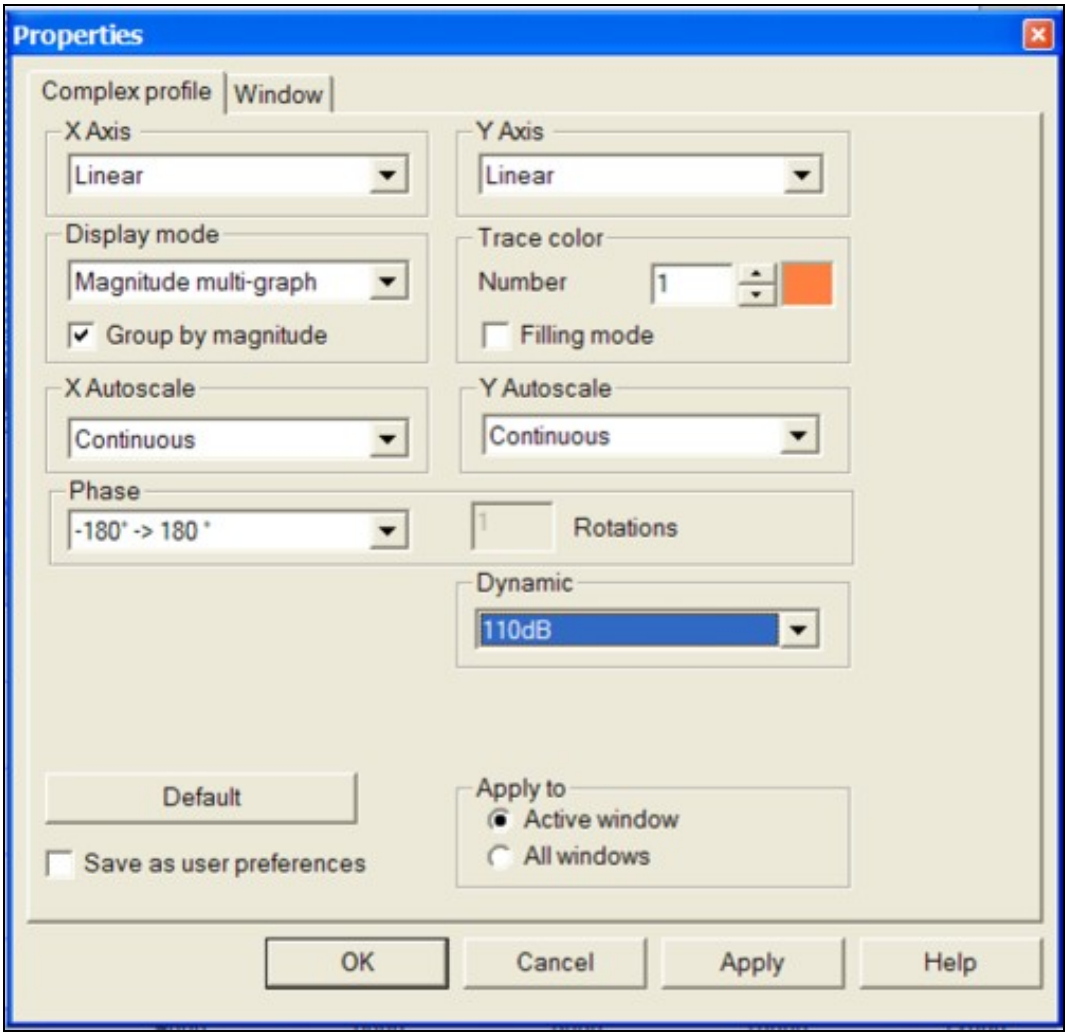
74.1.2.1.9 Complex profile

Source Signals
The following results may be displayed as complex profile graphs:

- FFT X: Order profile
- Waterfall: Order profile
- SOA X: Order profile


Window2 - Wtf: FFT1: Ord 1 [1]-Acc [1196.534 RPM: 182.66 m...
Acceleration (m/s²)
1.2
1
800 m
600 m
400 m
200 m
1500
2000
2500
3000
3500
4000
Angular velocity (RPM)
Window3 - Ord1: Ord 1 [1]-Acc [13.2 dB]
Acceleration (dB)
25.0
20.0
15.0
10.0
5.0
0
Ord1: Ord 1 [1]-Acc
Window1 - FFT1: Profile Ord 1 [1]-Acc [1190.943 RPM: 182.7 m...
Acceleration (m/s²)
6
5
4
3
2
1
2000
4000
6000
8000
10000
Angular velocity (RPM)
Display
Mode: Magnitude
Traces:
FFT1: Profile Ord 1 [1]-Acc
Cursor
X:-22 s
1191 RPM
Y:182.7 mm/s²

Properties


Properties
Complex profile
Window
X Axis
Linear
Y Axis
Linear
Display mode
Magnitude multi-graph
Group by magnitude
Trace color
Number
1
Filling mode
X Autoscale
Continuous
Y Autoscale
Continuous
Phase
-180° -> 180°
1
Rotations
Dynamic
110dB
Default
Apply to
Active window
All windows
Save as user preferences
OK
Cancel
Apply
Help

• **X Axis:**

-**Linear:** uses linear scale for X-axis units.

• **Y Axis:**

-**Linear:** uses linear scale for Y-axis units.
-**Logarithmic:** uses logarithmic scale for Y-axis units.
-**dB:** uses reference dB scale for Y axis units.

• **Display mode:**

-**Magnitude:** overlays all magnitude traces on a single graph.
-**Phase:** overlays all phase traces on a single graph.
-**Real part:** overlays all real part traces on a single graph.
-**Imaginary part:** overlays all imaginary part traces on a single graph.
-**Magnitude/phase:** overlays all magnitude traces on the upper graph and all phase traces on the lower graph.
-**Real/imaginary:** overlays all magnitude traces on the upper graph and all phase traces on the lower graph.
-**Polar:** displays in polar coordinates, the phase and the amplitude on a single graph.
-**Real part multi-graph:** displays all real part traces using one graph per trace in the same window.
-**Imaginary part multi-graph:** displays all imaginary part traces using one graph per trace in the same window.
-**Magnitude multi-graph:** displays all magnitude traces using one graph per trace in the same window.
-**Phase multi-graph:** displays all phase traces using one graph per trace in the same window.
-**Phase/Magnitude:** overlays all phase traces on the upper graph using 1/3 of window space and all the magnitude traces on the lower graph using 2/3 of the window.
-**Merged Magnitude/Phase:** displays all magnitude and phase parts traces on a single graph.
-**Magnitude gathering:** if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.

• **Trace color:**

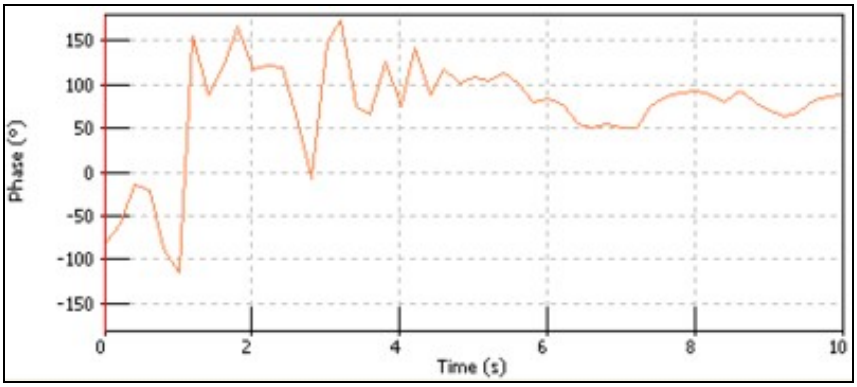
-**Number:** selects the trace number for color modification.
-**Color box:** click on this box to modify the color of the selected trace.
-**Filling mode:** if selected, all the curves of the windows are filled from:
The 0 value if the Y scale is linear.

• **Dynamics:**

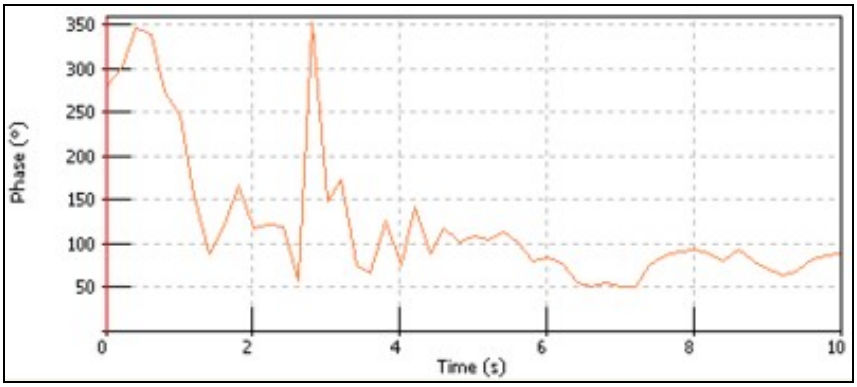
-**90 dB:** resizes the Y-axis to 90 dB dynamics starting from +20 dBV.
-**110 dB:** resizes the Y-axis to 110 dB dynamics starting from +20 dBV.
-**130 dB:** resizes the Y-axis to 130 dB dynamics starting from +20 dBV.
-**150 dB:** resizes the Y-axis to 150 dB dynamics starting from +20 dBV.

• **Phase:**

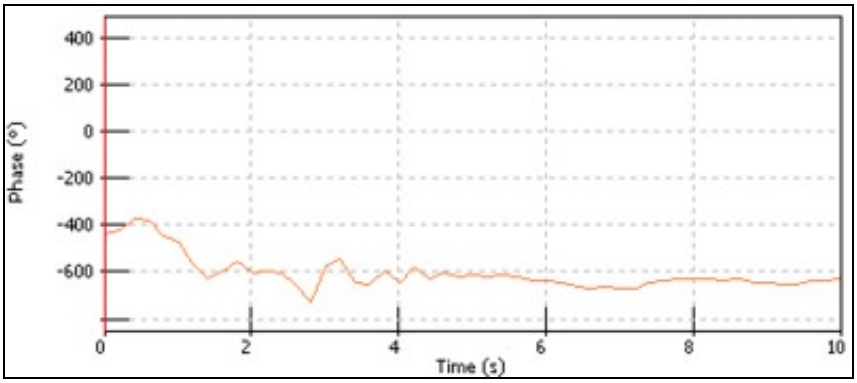
-**-180° -> 180°:** sets the phase graph Y-axis between ?180° to +180°.



-**0 -> 360°: sets the phase graph Y-axis between 0 to +360°.**



-**Rotations:** sets the number of rotations to be displayed on the Y-axis. Example for 5 rotations:



- **X Autoscale:**

-**Continuous:** the X scale is automatically adjusted to the current min and max x values of the window traces.
-**Disabled:** X autoscale is not activated.

- **Y Autoscale:**

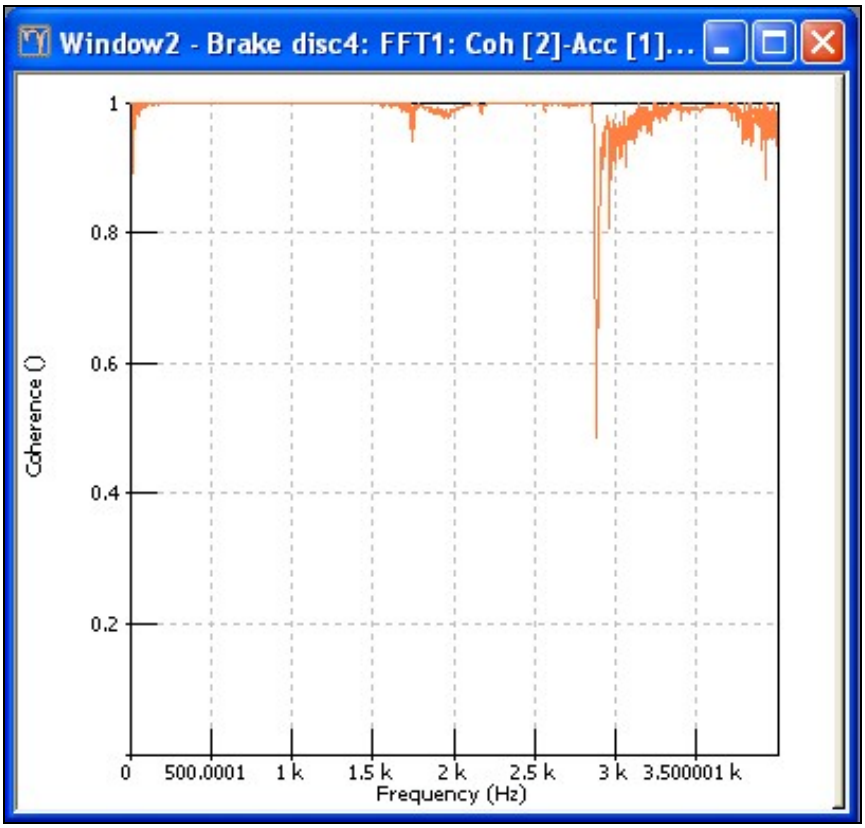
-**Continuous:** the Y scale is automatically adjusted to the current min and max y values of the window traces with a margin to facilitate visibility.
-**Disabled:** Y autoscale is not activated.

74.1.2.1.10 Coherence

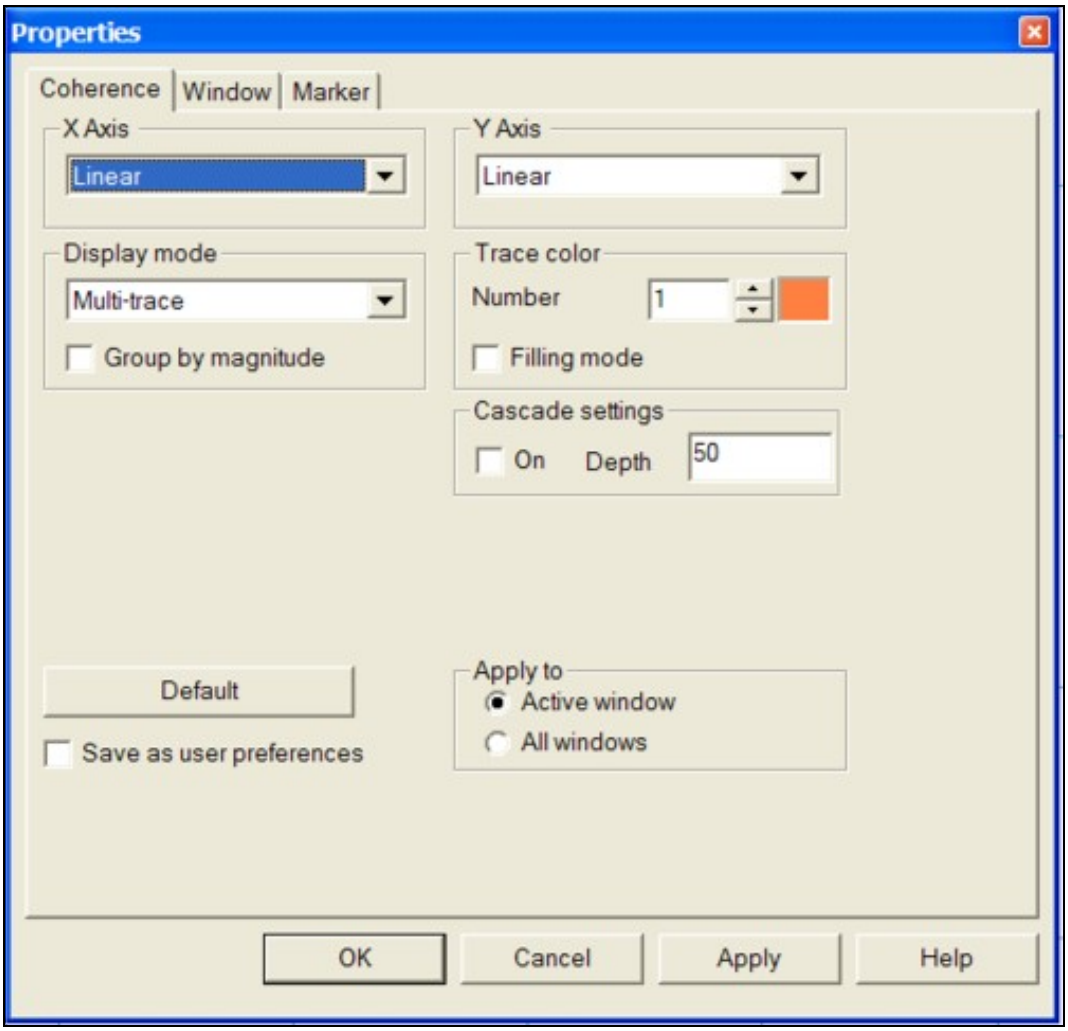
Displays coherence graphs.

Source Signals:
The following results may be displayed as coherence graphs:

- FFT X: Coherence


Window2 - Brake disc4: FFT1: Coh [2]-Acc [1]...
Coherence ()
1
0.8
0.6
0.4
0.2
0
500.0001
1 k
1.5 k
2 k
2.5 k
3 k
3.500001 k
Frequency (Hz)

Properties


Properties
Coherence
Window
Marker
X Axis
Linear
Y Axis
Linear
Display mode
Multi-trace
Group by magnitude
Trace color
Number
1
Filling mode
Cascade settings
On
Depth
50
Default
Save as user preferences
Apply to
Active window
All windows
OK
Cancel
Apply
Help

- **X Axis:**
- Linear: uses linear scale for X-axis units.
- **Y Axis:**

-**Linear:** uses linear scale for Y-axis units.

- **Display mode:**

-**Multi-graph:** overlays all traces on a single graph.
-**Multi-trace:** displays all traces using one graph per trace in the same window.
-**Time multi-trace 3D:** overlays all traces on a single 3D graph.
-**Magnitude gathering:** if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.

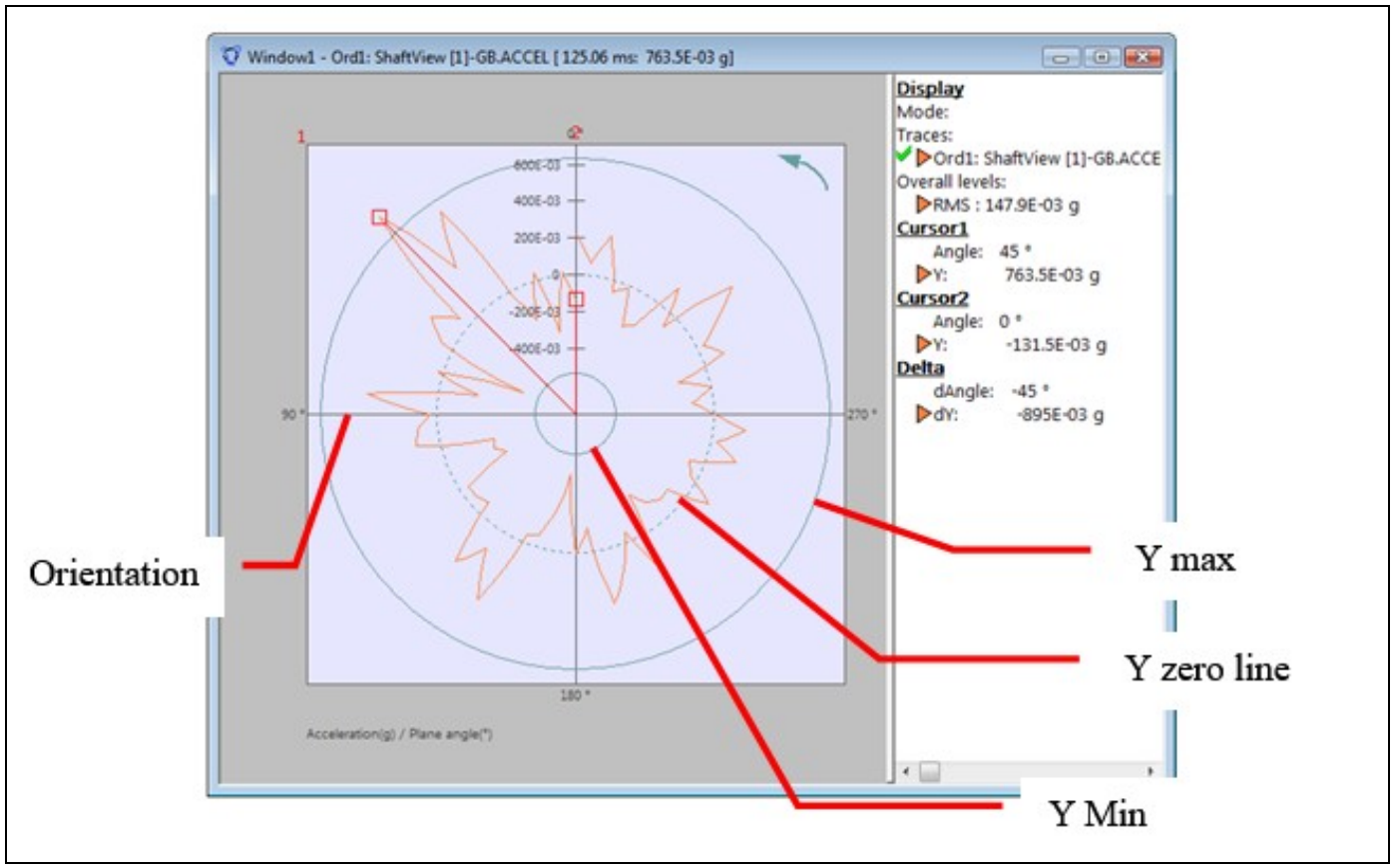
- **Trace color:**

-**Number:** selects the trace number for color modification.
-**Color box:** click on this box to modify the color of the selected trace.
-**Filling mode:** if selected, all the curves of the windows are filled from:
the bottom of the area if Y scale is dB or Logarithmic,
the 0 value if the Y scale is linear.

74.1.2.1.11 Shaft View

The shaft view or "marguerite" shows the trigger block of FFTs and SOA around one revolution. This graph includes angular cursors (with delta-angle) useful for reading the location of peaks.

Note that in order to provide a stable trace, the corresponding plug-in must be triggered by a keyphasor. This keyphasor (any edge event) being the phase reference of each revolution. In the case of synchronous order analysis, the plug-in is automatically triggered on the tach. pulses.



The shaft view shows the first entire revolution contained in the trigger block. If less than one revolution is contained in the trigger block, nothing is displayed. A tachometer must be connect to the FFT or SOA plug-in in order to show traces in the shaft view.

The rotation indicator (and the angle labels arrangement 0 to 360°) is defined by the user?s preferences or directly from the window?s properties.

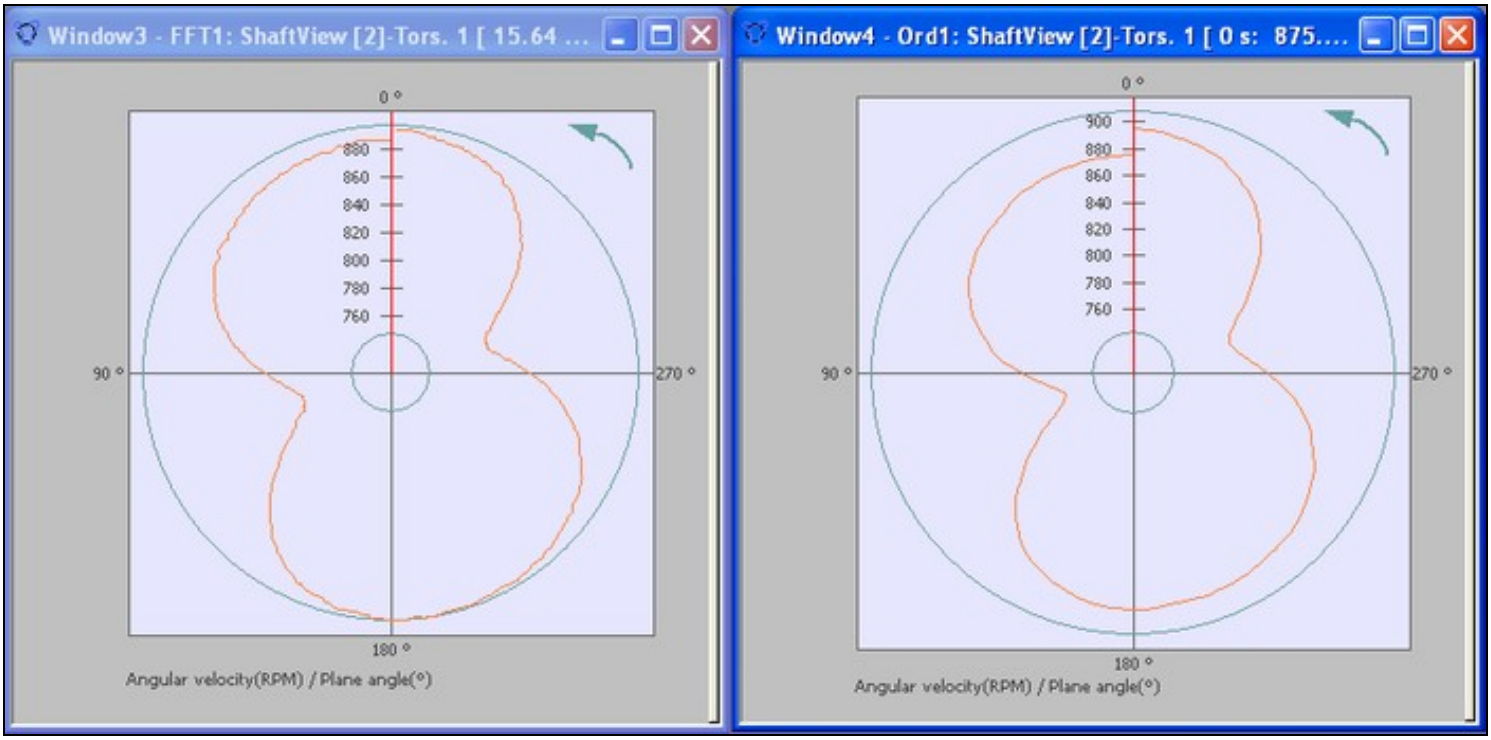
The keyphasor location is also user definable: It may take place every 45° along the complete revolution.

All graphs in a window have the same rotation and keyphasor location.

Source Signals

The following results may be displayed as Triggered Shaft View graphs on condition that a tachometer is associated to the plug-in:

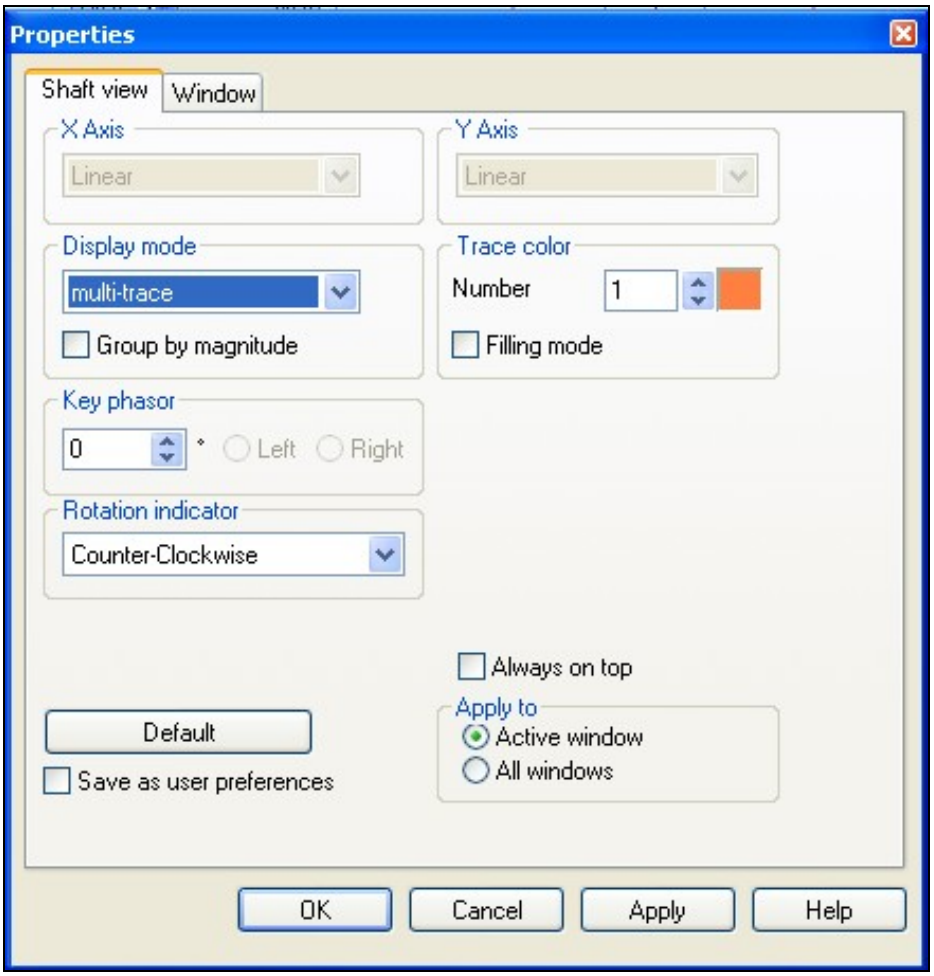
- FFT x: Triggered Shaft View
- SOA x: Triggered Shaft View



The following results may be displayed as Average Shaft View graphs on condition that a tachometer is associated to the plug-in and that time average is chosen:

- FFT x: Average Shaft View
- SOA x: Average Shaft View

Properties



- **X Axis:**

  -**Linear:** uses linear scale for X-axis units.

- **Y Axis:**

  -**Linear:** uses linear scale for Y-axis units.

- **Display mode:**

  -**Multi-graph:** overlays all traces on a single graph.
  -**Multi-trace:** displays all traces using one graph per trace in the same window.

- **Trace color:**

  -**Number:** selects the trace number for color modification.
  -**Color box:** click on this box to modify the color of the selected trace.
  -**Filling mode:** if selected, all the curves of the windows are filled from:
  the 0 value if the Y scale is linear.

- **Key phasor:** Allows to specify the position of the key phasor by entering the shift angle in ° and the direction left or right.
- **Rotation indicator:**

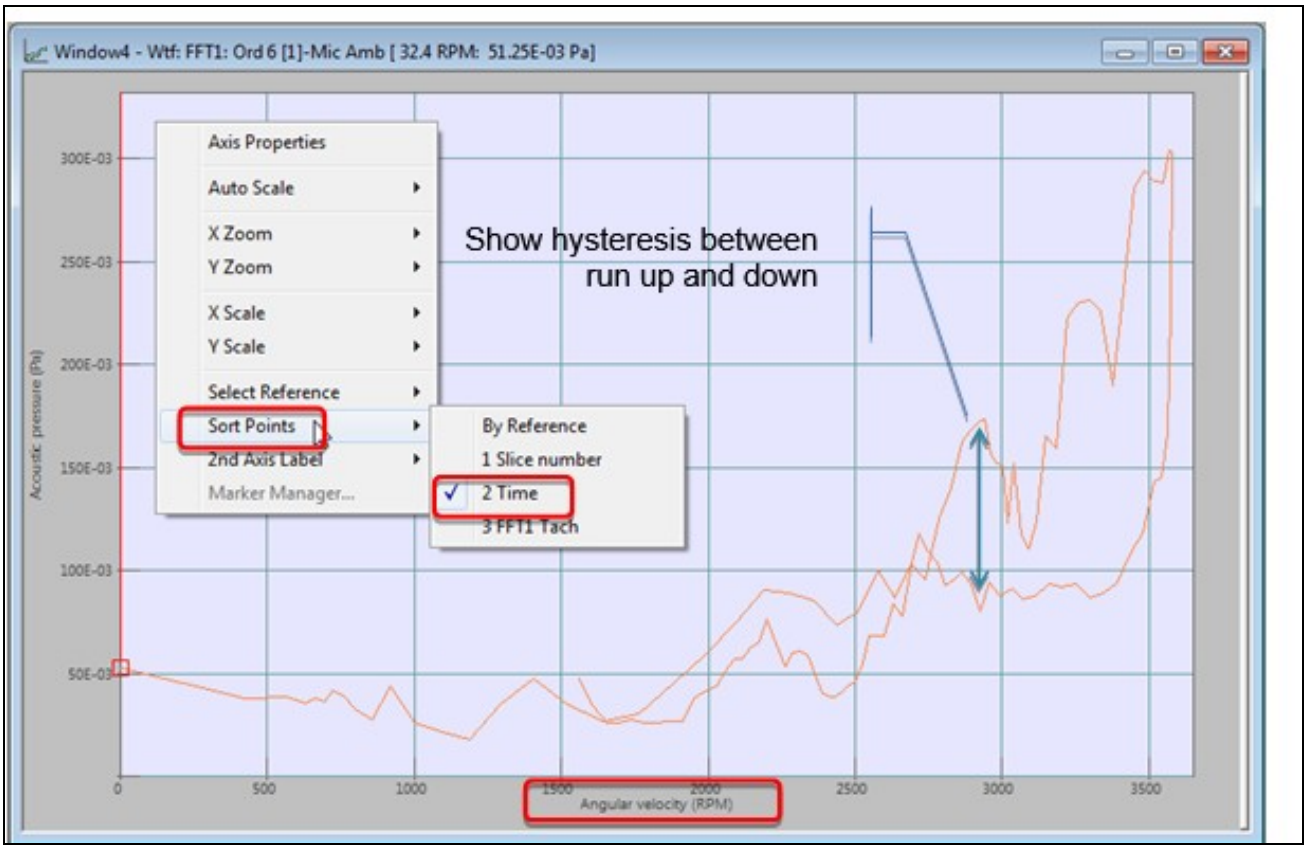
  -**Counter-Clockwise:** defines a counter-clockwise rotation.
  -**Clockwise:** defines a clockwise rotation.

74.1.2.1.12 Waterfall graphs (2D view, 3D view, color spectrum)

74.1.2.1.13 Slices sorting selection in 2D/3D

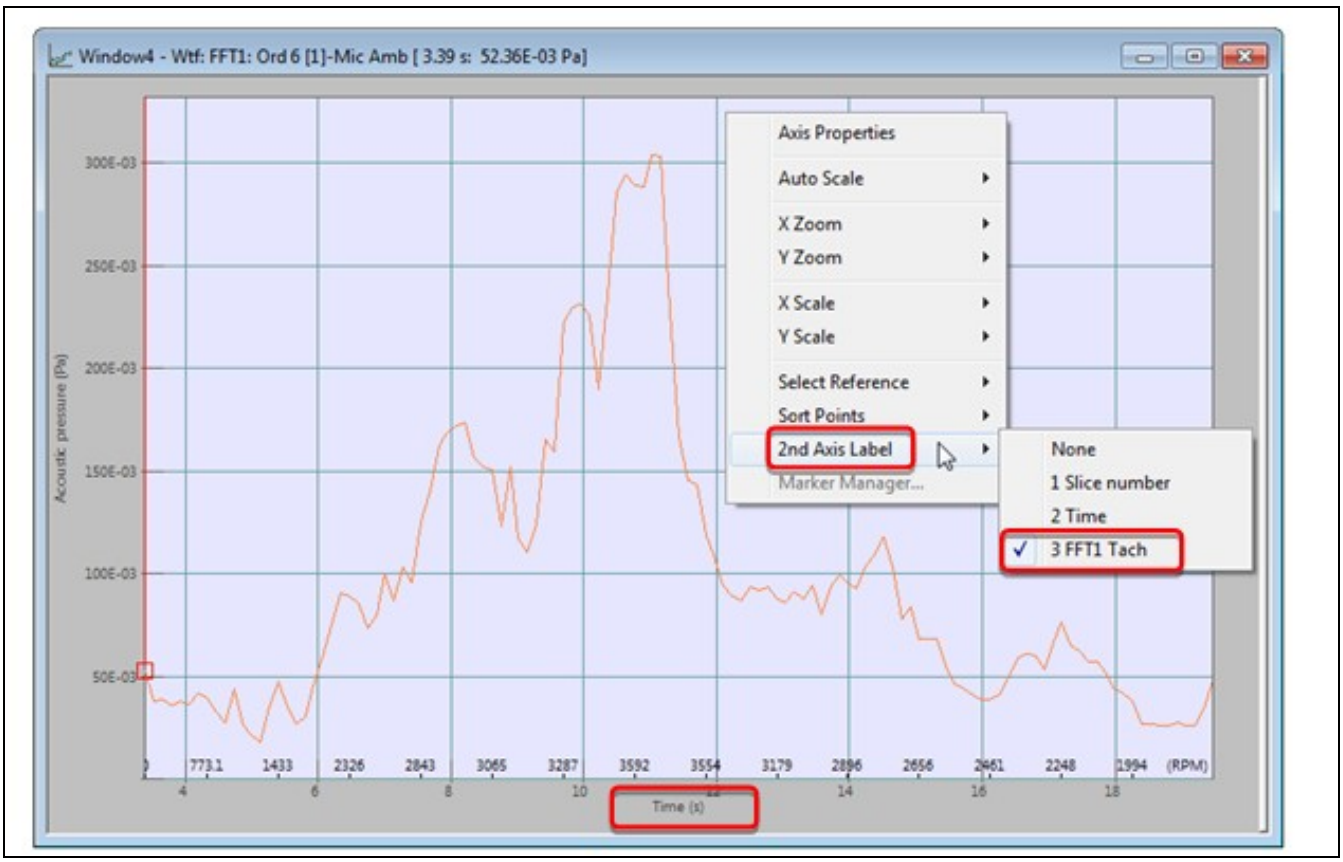
NVGate is able to display unwrapped run-up/down profiles The "Sort points" selection allows displaying the data along one X scale but sort it along another reference.

The following example shows data displayed with tachometer speed on the X axis speed but sorted along to the time:



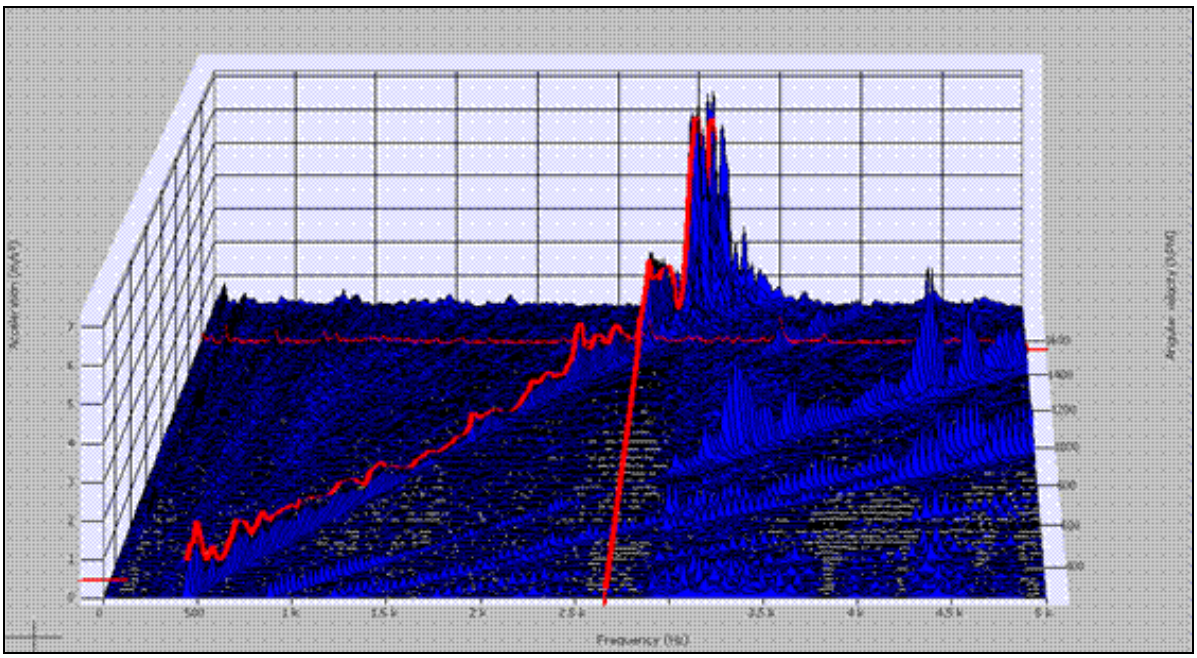
This is useful for mixed run up/down to see hysteresis.

74.1.2.1.14 Second X axis in profiles



For applications with mixed run-Up/Down (RPM, Torque, Temperature, etc...), it is useful to see the results evolution according to their occurrence (time, slice) but keeping the up/down information. This feature allows viewing the data unwrapped.

Waterfall display features different type of view of the stacked results. All views are related to the same 3D space:



The Z-axis is the selected reference (RPM, time or number of slices in order of the acquisition) its range is the waterfall depth. You can change the reference for z-axis at any time. This is available for 2D and 3D view.

The Y-axis is the selected magnitude; this can be changed at any time.

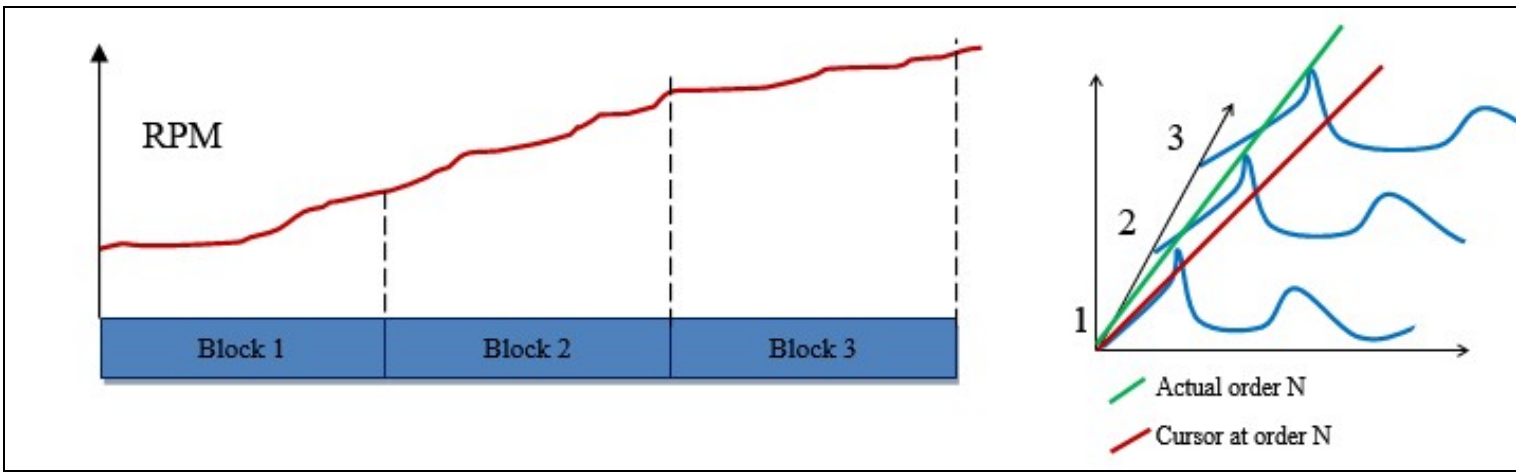
The X-axis is the frequency.

74.1.2.1.14.1 Tachometer centered on FFT/SOA blocks

This allows centering tachometer speed at the center of the FFT/SOA trigger block(s). It is useful with long trigger blocks (High resolution analyses) to perfectly match the actual data with the order cursor or section.

With classical tach:

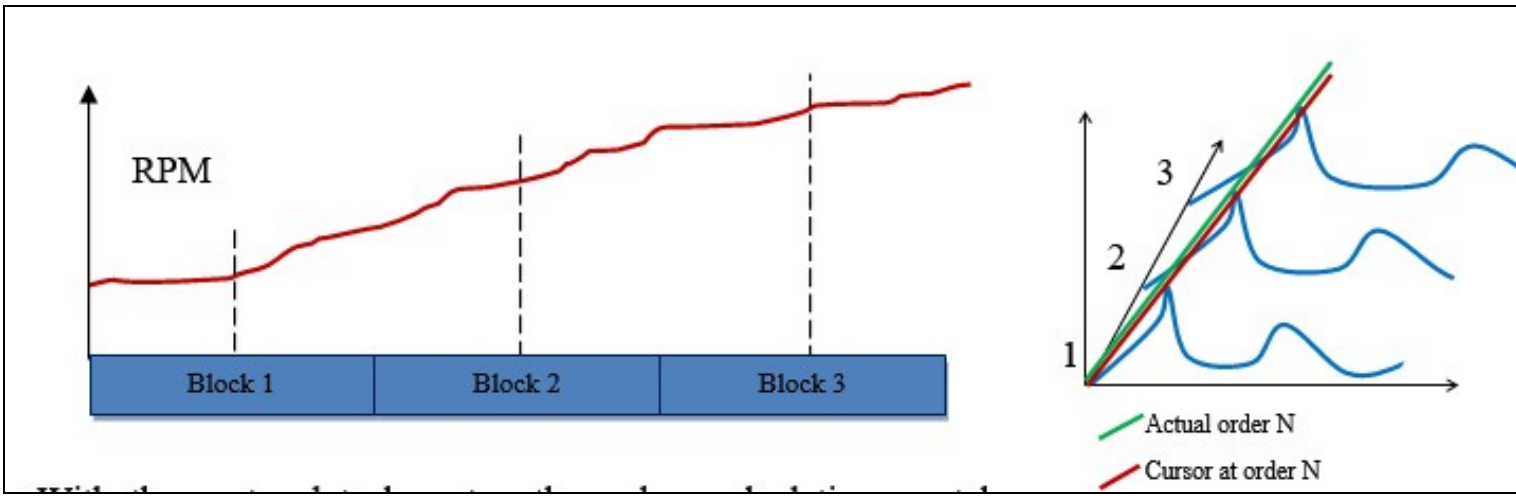
The RPM is collected at the end of the analysis block.



This situation leads to an offset in the waterfall calculation of the orders (cursors, sections). For a run up, as the angular speed is over evaluated, the order calculation is lower than the actual ones.

With centered tach:

The RPM is calculated as the average speed during the block duration to be synchronized with the analyzed data.



With the centered tachometer, the orders calculations match more accurately the actual orders in waterfall.

The computation of the angular speed takes in account the averaging, triggering and overlap used in the plug-in.

The centered speed is calculated as:

$$CT = \frac{RPM\ (End\ _of\ _analysis\ ) - RPM\ (Begin\ _of\ _analysis\ )}{2}$$

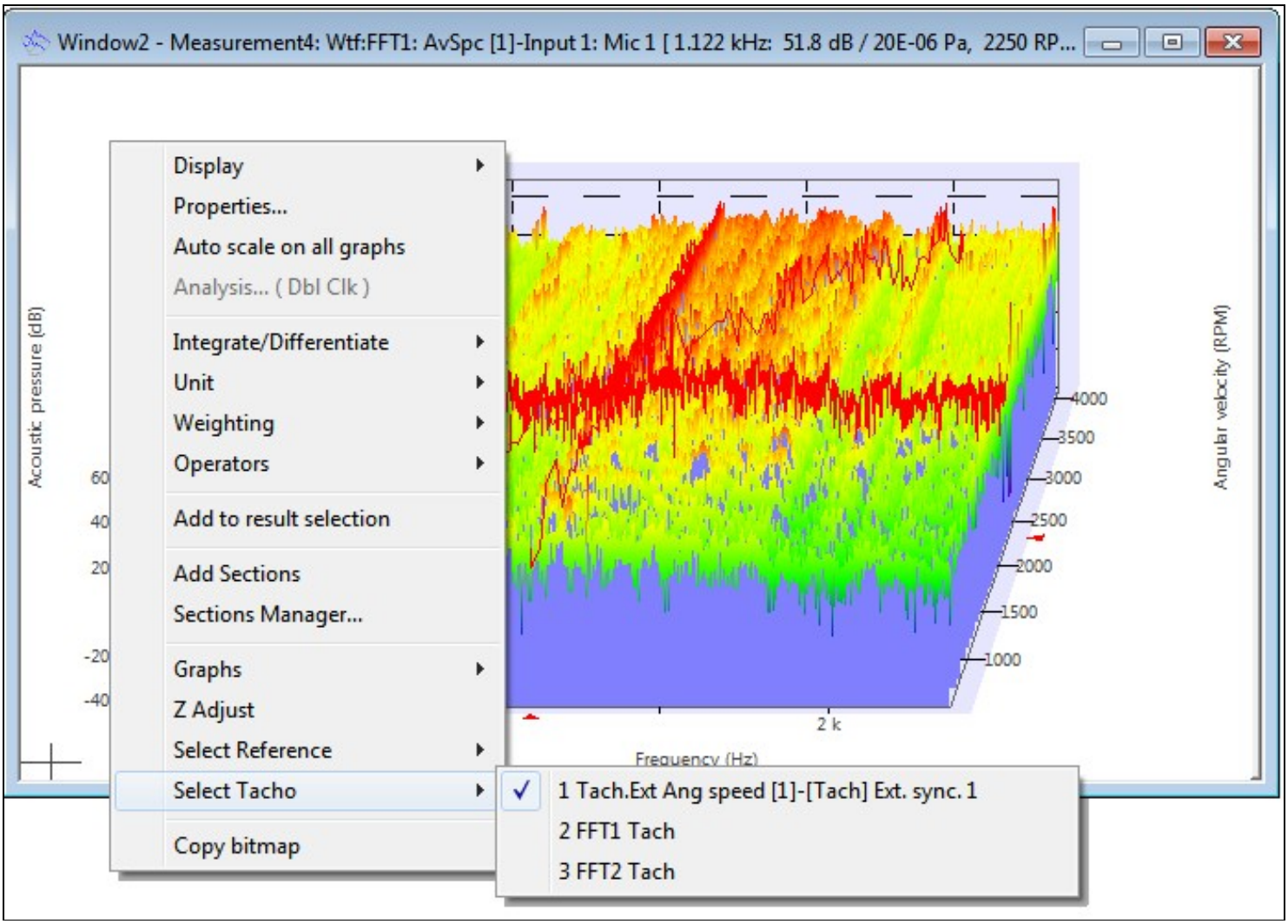
The RPM centering and averaging is done in the analysis plug-in prior to be connected to the waterfall. To use the centered tach simply add the said tachometer to the corresponding plug-in (FFTn or SOAn). These additional tachometers are available in the waterfall as soon as one of the result of the plug-in is added to the waterfall.

1. Add Tach to the Plug-in,

2. Add plug-in results (Spectra, orders, etc..) to the waterfall,

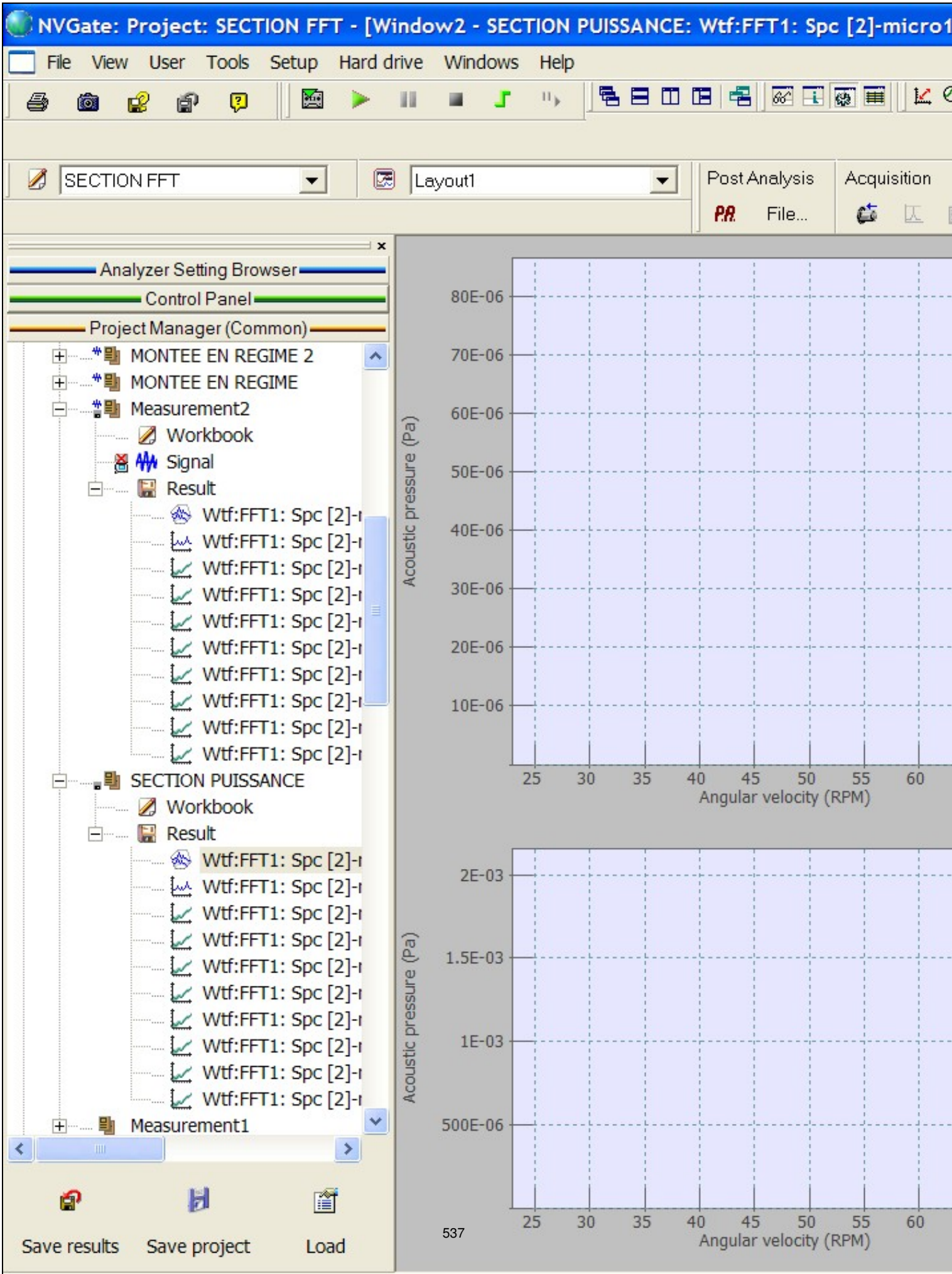
3. Display the waterfall

4. Select the Plug-in Tach, as a tachometer and reference

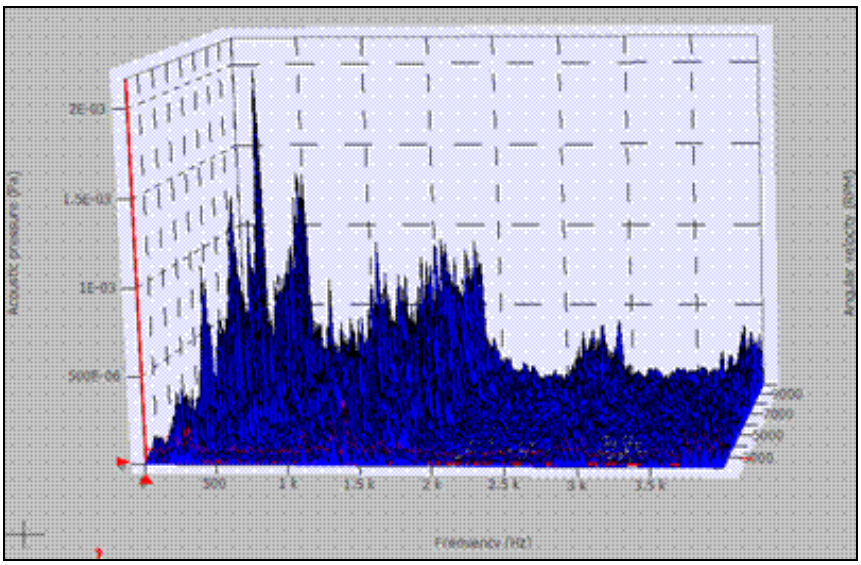

Window2 - Measurement4: Wtf:FFT1: AvSpc [1]-Input 1: Mic 1 [1.122 kHz: 51.8 dB / 20E-06 Pa, 2250 RP...
Display
Properties...
Auto scale on all graphs
Analysis... (Dbl Clk)
Integrate/Differentiate
Unit
Weighting
Operators
Add to result selection
Add Sections
Sections Manager...
Graphs
Z Adjust
Select Reference
Select Tacho
Copy bitmap
1 Tach.Ext Ang speed [1]-[Tach] Ext. sync. 1
2 FFT1 Tach
3 FFT2 Tach
Acoustic pressure (dB)
Angular velocity (RPM)
Frequency (Hz)
2 k

```
display modes :
```

5. 3D isometric

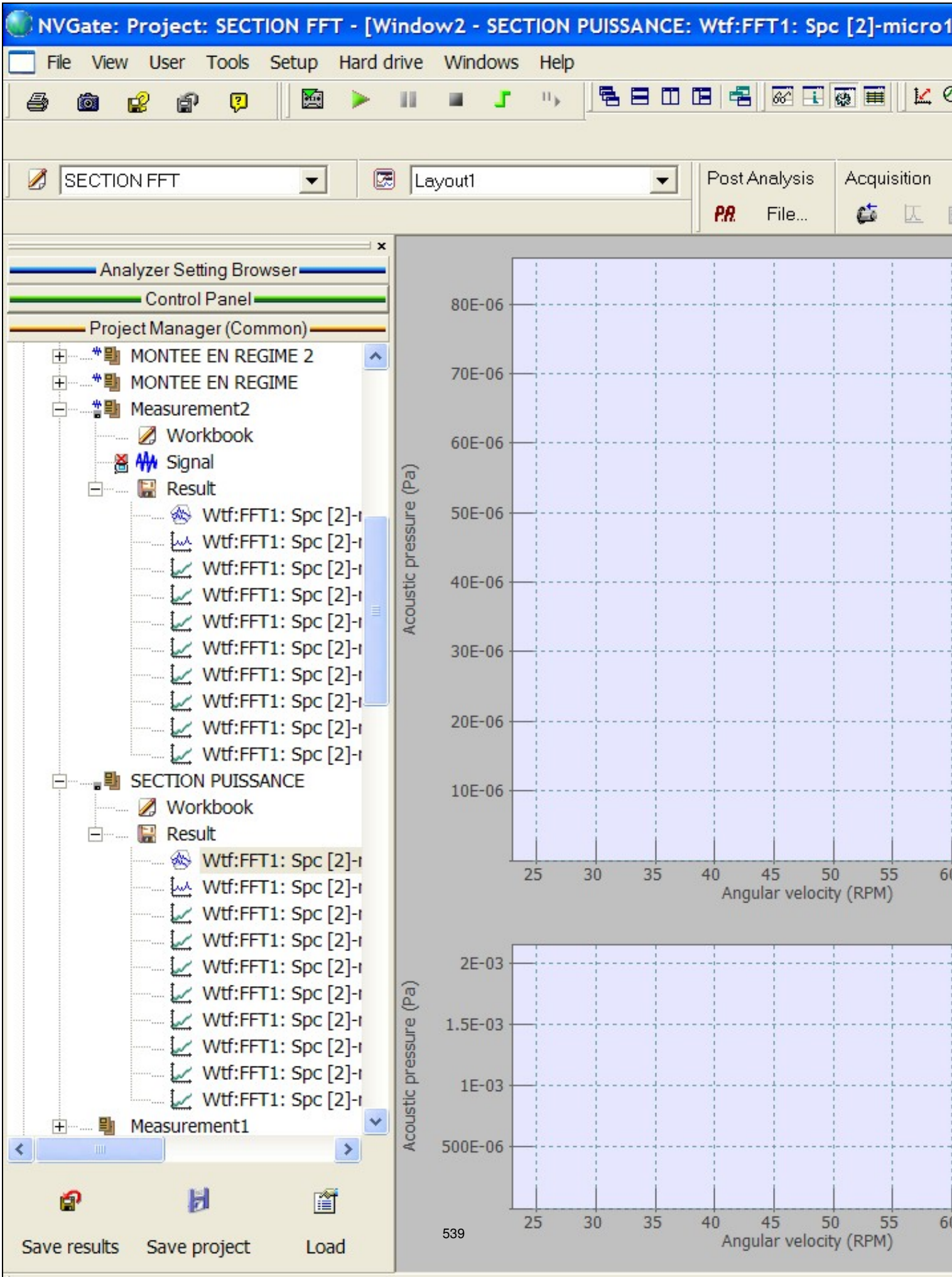

NVGate: Project: SECTION FFT - [Window2 - SECTION PUISSANCE: Wtf:FFT1: Spc [2]-micro1
File View User Tools Setup Hard drive Windows Help
SECTION FFT
Layout1
Post Analysis
File...
Acquisition
Analyzer Setting Browser
Control Panel
Project Manager (Common)
MONTEE EN REGIME 2
MONTEE EN REGIME
Measurement2
Workbook
Signal
Result
SECTION PUISSANCE
Workbook
Result
Measurement1
Save results
Save project
Load
Acoustic pressure (Pa)
80E-06
70E-06
60E-06
50E-06
40E-06
30E-06
20E-06
10E-06
25 30 35 40 45 50 55 60
Angular velocity (RPM)
2E-03
1.5E-03
1E-03
500E-06

6. 3D perspective:



7. Freq/Time Colormap:

8. Time/Freq Colormap:


NVGate: Project: SECTION FFT - [Window2 - SECTION PUISSANCE: Wtf:FFT1: Spc [2]-micro1
File View User Tools Setup Hard drive Windows Help
SECTION FFT
Layout1
Post Analysis
File...
Acquisition
Analyzer Setting Browser
Control Panel
Project Manager (Common)
MONTEE EN REGIME 2
MONTEE EN REGIME
Measurement2
Workbook
Signal
Result
SECTION PUISSANCE
Workbook
Result
Measurement1
Save results
Save project
Load
Acoustic pressure (Pa)
80E-06
70E-06
60E-06
50E-06
40E-06
30E-06
20E-06
10E-06
25 30 35 40 45 50 55
Angular velocity (RPM)
2E-03
1.5E-03
1E-03
500E-06

74.1.2.1.15 Orbit

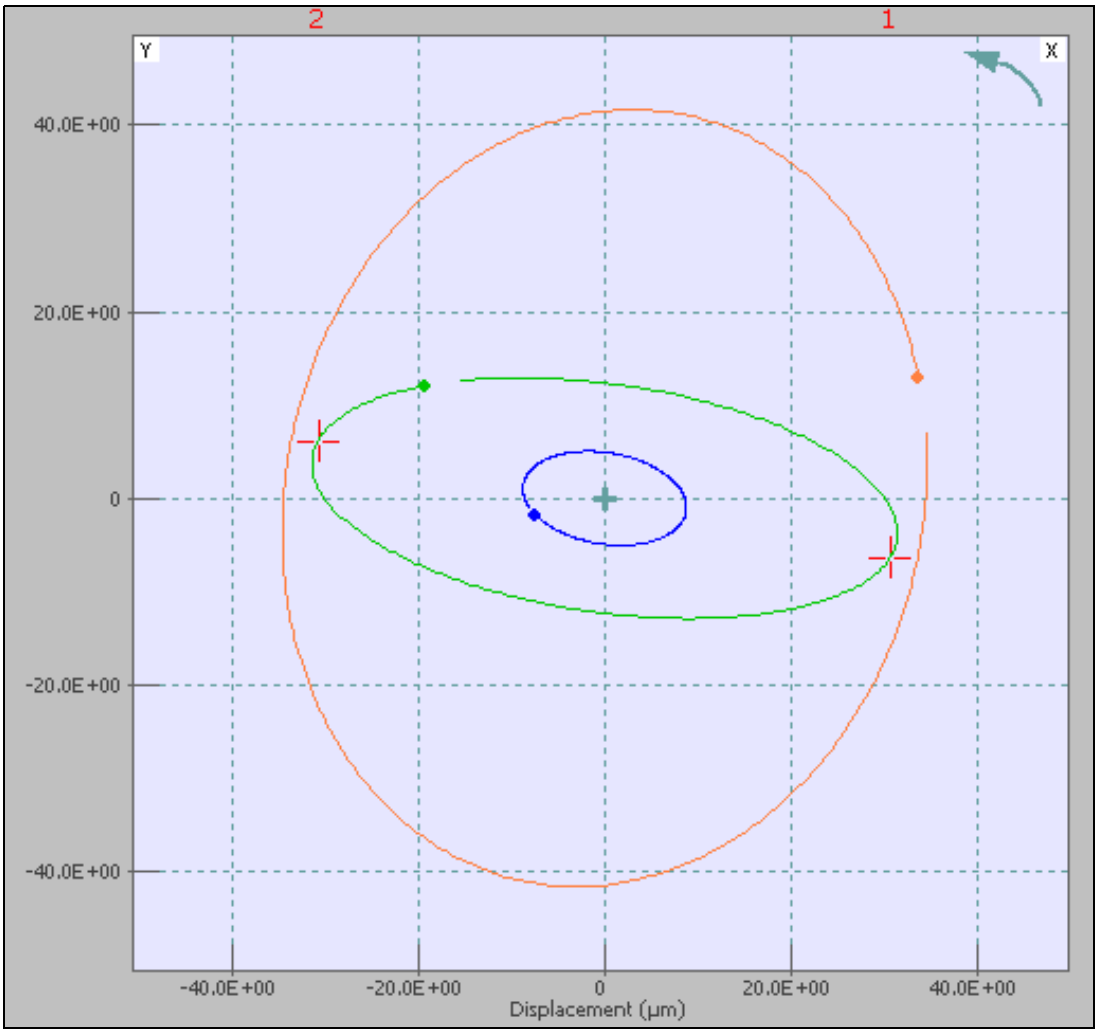
Displays the AC dynamic motion of the center of a rotating shaft. It generates a two-dimensional image.

Source Signals

The following results may be displayed as Orbit graphs on condition that a tachometer is associated to the plug-ins:

- FFT x: Raw Orbit, Synthetized Orbit (for customer with FFT-diag option)
- SOA x: Raw Orbit, Synthetized Orbit (For customer with ORD-Diag option)

Note :



The Raw Orbit graph displays an entire number of complete rotations contained in one block. At least one rotation is required.

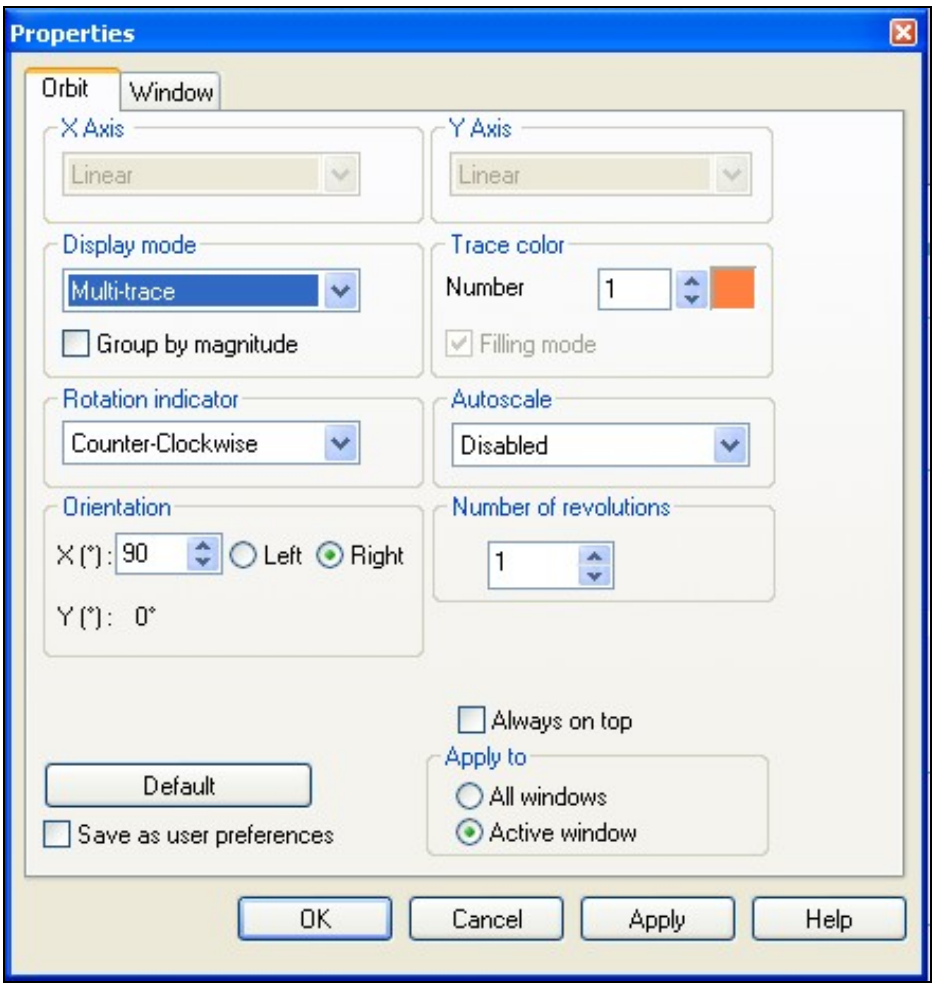
The FFT should better be triggered by the Ext. Sync. channel.

If the FFT is bad configured, it is possible that no results are shown.
The FFT synthtetized Orbit is only available for customer with FFt-CBT option. The FFT synthetized Orbit is filtered using CBT technics. this method provide a non accurate phase value on synthetiseed orbit. For acurate synthetize Orbit phase, you need to use the SOA Synthetized Orbit.

The ORD Synthesized Orbit graph is calculated with the orders of two channels selected. For a couple "ChannelA, ChannelB" up to 8 Synthesized Orbits can be selected. Each orbit corresponds to an order which appears in the tracked order setting.

The display of the Synthesized Orbit is done on 360 points (1 point per degree).

Properties



- **X Axis:**

  -**Linear:** uses linear scale for X-axis units.

- **Y Axis:**

  -**Linear:** uses linear scale for Y-axis units.

- **Display mode:**

  -**Multi-graph:** overlays all traces on a single graph.
  -**Multi-trace:** displays all traces using one graph per trace in the same window.

- **Trace color:**

  -**Number:** selects the trace number for color modification.
  -**Color box:** click on this box to modify the color of the selected trace.
  -**Filling mode:** if selected, all the curves of the windows are filled from:
  the bottom of the area if Y scale is dB or Logarithmic,
  the 0 value if the Y scale is linear.

- **Rotation indicator:**

  -**Counter-Clockwise:** defines a counter-clockwise rotation
  -**Clockwise:** defines a clockwise rotation.

- **Autoscale:**

  -**Continuous:** applies a continuous autoscale during the measurement.
  -**Disabled:** disable the autoscale.

- **Orientation:** Allows to shift X-axis and Y-axis from a defined angle to the left or to the right; X and Y are nevertheless always orthogonal.
- **Number of revolutions:** Number of revolution displayed in the graph.

74.1.2.1.16 Gap

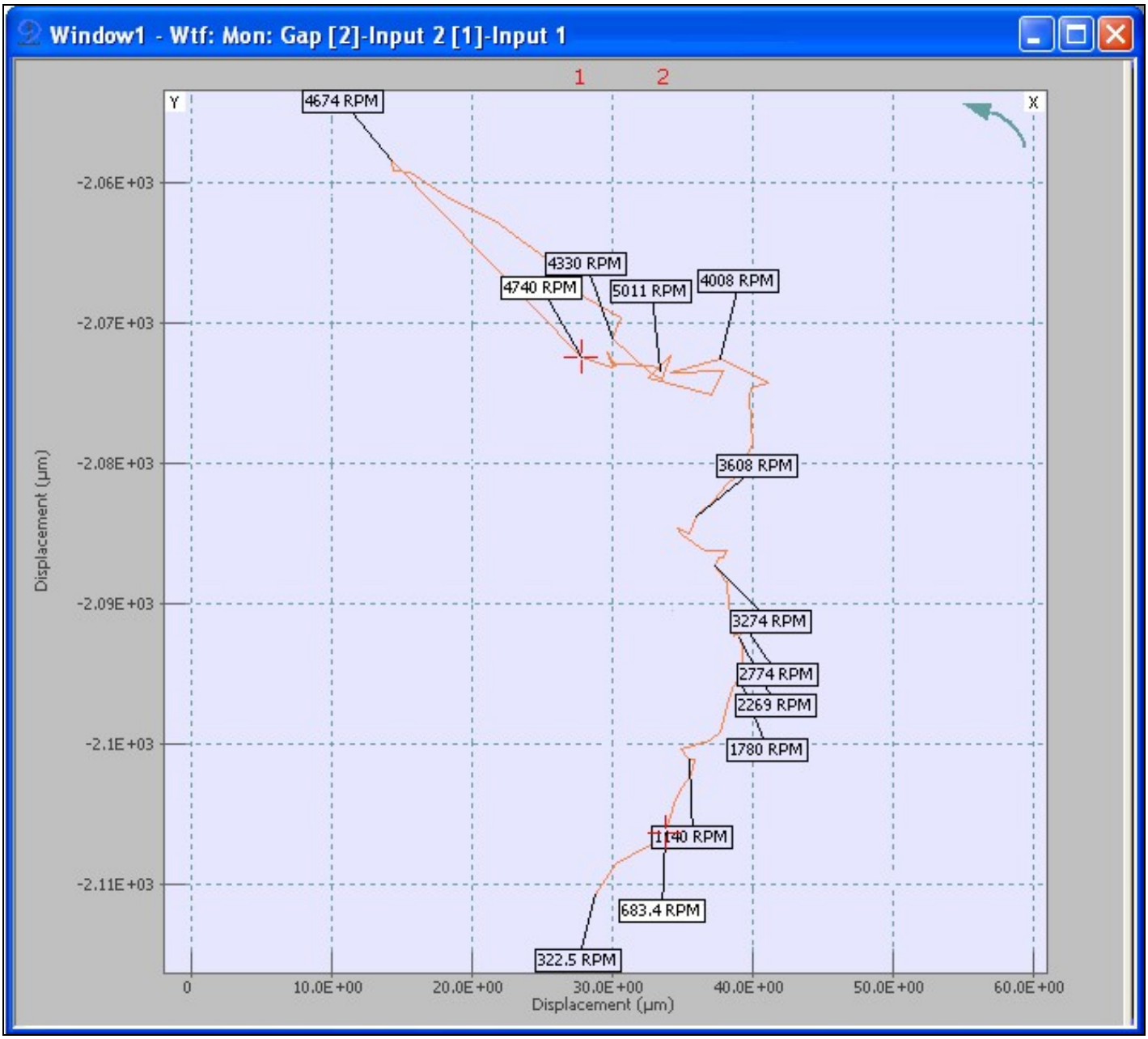
Displays the shaft center DC position changes.

Source Signals

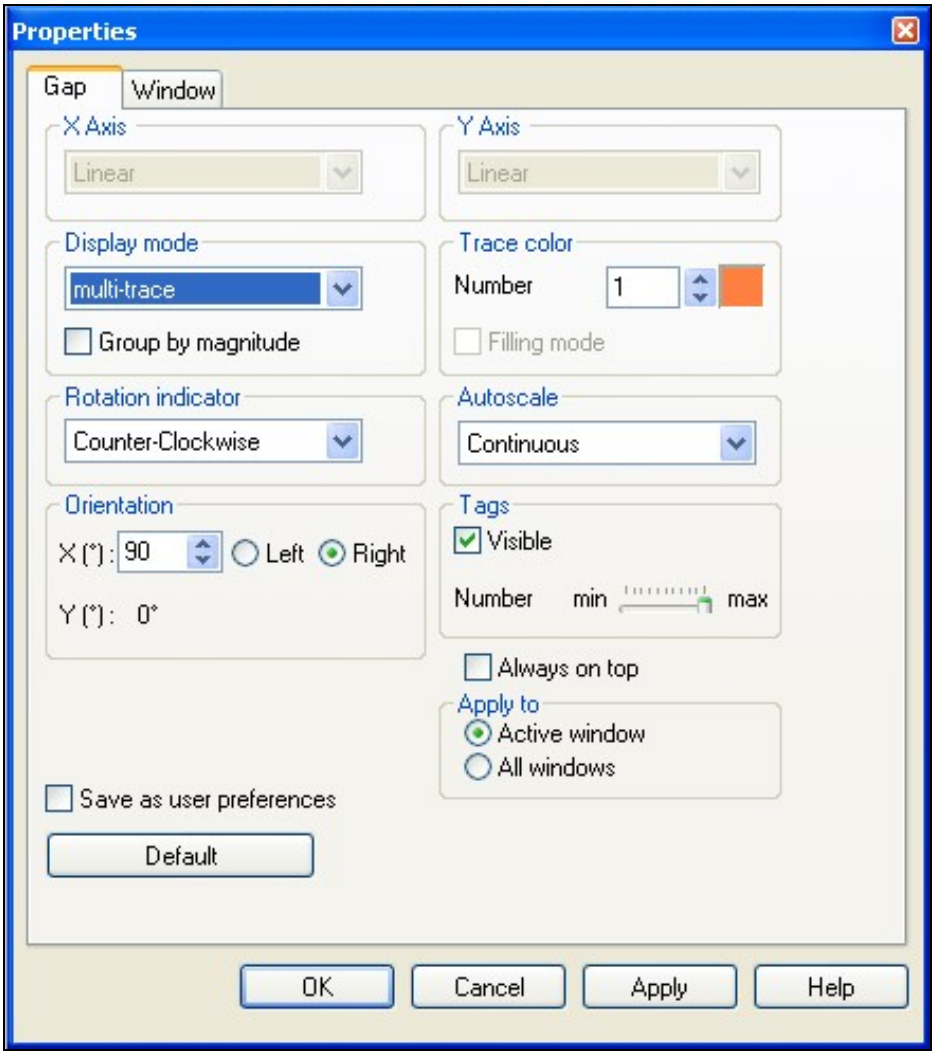
The following results may be displayed as Gap graphs:

- Waterfall: Gap

The Gap is available in the Waterfall for the Monitor and Time domain analyzer plug-ins and only for the DC values.


Window1 - Wtf: Mon: Gap [2]-Input 2 [1]-Input 1
1
2
Y
X
4674 RPM
4330 RPM
4740 RPM
5011 RPM
4008 RPM
3608 RPM
3274 RPM
2774 RPM
2269 RPM
1780 RPM
1140 RPM
683.4 RPM
322.5 RPM
-2.06E+03
-2.07E+03
-2.08E+03
-2.09E+03
-2.1E+03
-2.11E+03
Displacement (µm)
0
10.0E+00
20.0E+00
30.0E+00
40.0E+00
50.0E+00
60.0E+00
Displacement (µm)

Properties


Properties
Gap
Window
X Axis
Linear
Y Axis
Linear
Display mode
multi-trace
Group by magnitude
Trace color
Number
1
Filling mode
Rotation indicator
Counter-Clockwise
Autoscale
Continuous
Orientation
X (°): 90
Left
Right
Y (°): 0°
Tags
Visible
Number
min
max
Always on top
Apply to
Active window
All windows
Save as user preferences
Default
OK
Cancel
Apply
Help

- **X Axis:**

  -**Linear:** uses linear scale for X-axis units.

- **Y Axis:**

  -**Linear:** uses linear scale for Y-axis units.

- **Display mode:**

  -**Multi-graph:** overlays all traces on a single graph.
  -**Multi-trace:** displays all traces using one graph per trace in the same window.

- **Trace color:**

  -**Number:** selects the trace number for color modification.
  -**Color box:** click on this box to modify the color of the selected trace.
  -**Filling mode:** if selected, all the curves of the windows are filled from:
  the bottom of the area if Y scale is dB or Logarithmic,
  the 0 value if the Y scale is linear.

- **Rotation indicator:**

  -**Counter-Clockwise:** defines a counter-clockwise rotation.
  -**Clockwise:** defines a clockwise rotation.

- **Autoscale:**

  -**Continuous:** applies a continuous autoscale during the measurement.
  -**Disabled:** disable the autoscale.

- **Orientation:** Allows to shift X-axis and Y-axis from a defined angle to the left or to the right; X and Y are nevertheless always orthogonal.
- **Tags:**

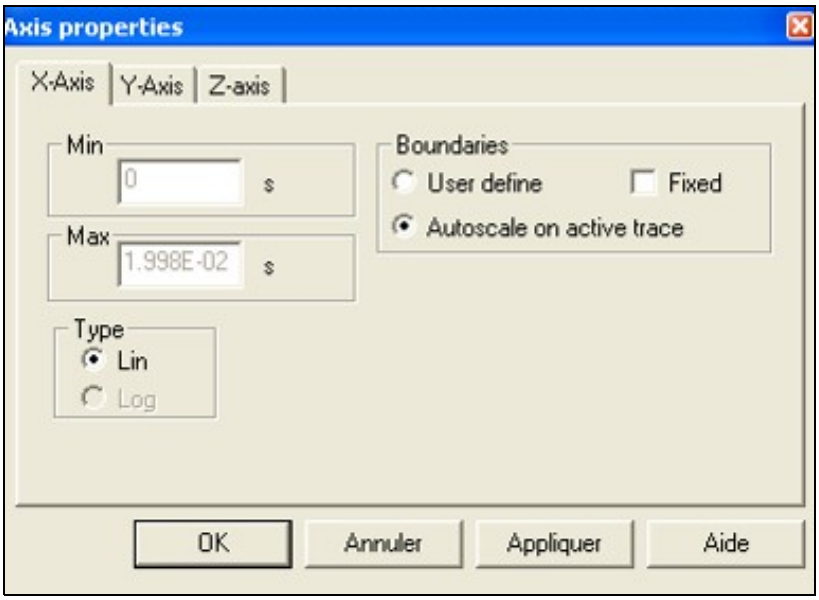
  -**Visible:** Tags are visible on the graph.
  -**Number:** defines the tags density on the plot (min or max).

74.1.2.2 Contextual menu

The Graph contextual menu is accessible by right clicking on the graph.

74.1.2.2.1 Axis properties

The axis values and behavior can be set in the *Axis properties* dialog box.



- **Min:** Enabled only when the *User Define* type is selected. It sets the minimum value assigned to the scale.
- **Max:** Enabled only when the *User define* type is selected. It sets the maximum value assigned to the scale.
- **Boundaries:**

  - **User Define**: Used to select the min and max scale values.
  - **Autoscale on active trace**: The minimum and maximum scale values are automatically adjusted to the values of the active trace.
  - **Autoscale on all traces**: The minimum and maximum scale values are automatically adjusted so that every trace is fully visible.

- **Type**: Changes the type of scale (Linear, logarithmic or dB). Only the available types are enabled.
- **Enable/disable zoom**: when checked, it is impossible to make any change to the scale.

74.1.2.2.2 Zoom

X zoom

All of these functions are available if there is no active X automatic autoscale.

- **Zoom in:** Zoom in on the horizontal scale by placing the cursor position in the center. If the center is at the minimum value, you may not zoom. You may zoom if the X scale width is greater than the active signal precision in X.
- **Zoom out:** Zoom out from the horizontal scale by placing the cursor position in the center. If the center is at the minimum value, you may not zoom. You may zoom if Z min and max values are included in the min and max value gap defined by the active signal of the window.
- **Full width:** Restores the X min and max values defined by the active signal of the window.
- **Auto-scale:** Set min and max values of the X scale to the X min and max values of the active signal for the "On active" item and to the X min and max values of all signals of the window for "On all" item. A margin is added to these values to facilitate visibility. The X width is always more than X active signal precision.

Y zoom

- **Zoom in:** Used to zoom in on the vertical scale. You may zoom in if the scale width is greater than the active signal precision in Y.
- **Zoom out:** Used to zoom out from the vertical scale. You may zoom in if min and max values are included in Y min and max value gap defined by the active signal of the window.
- **Full width:** Restores the Y min and max values defined by the active signal of the window.
- **Auto-scale:** Sets min and max values of the Y scale to the Y min and max values of the active signal for the "On active" item and to the min and max values of all signals of the window for "On all" item. A margin is added to these values to facilitate visibility. The Y width is always more than Y active signal precision.

Z zoom

All of these functions are available if there is no active X automatic autoscale.

- **Zoom in:** Used to zoom in on the Z scale. You may zoom if the scale width is greater than the active signal precision in Z.
- **Zoom out:** Used to zoom out from the Z scale. You may zoom if min and max values are included in Z min and max value gap defined by the

active signal of the window.

- **Full width:** Restores the Z min and max values defined by the active signal of the window.
- **Auto-scale**: Sets min and max values of the Z scale to the Z min and max values of the active signal. A margin is added to these values to facilitate visibility. The Y width is always greater than Y active signal precision.

74.1.2.2.3 Scale

X scale: Changes X scale type of the area to the selected type. Available types (according to the kind of the area) are:

- Linear
- Logarithmic

Y scale: Changes Y scale type of the area to the selected type. Available types (according to the kinds of the area and the window) are:

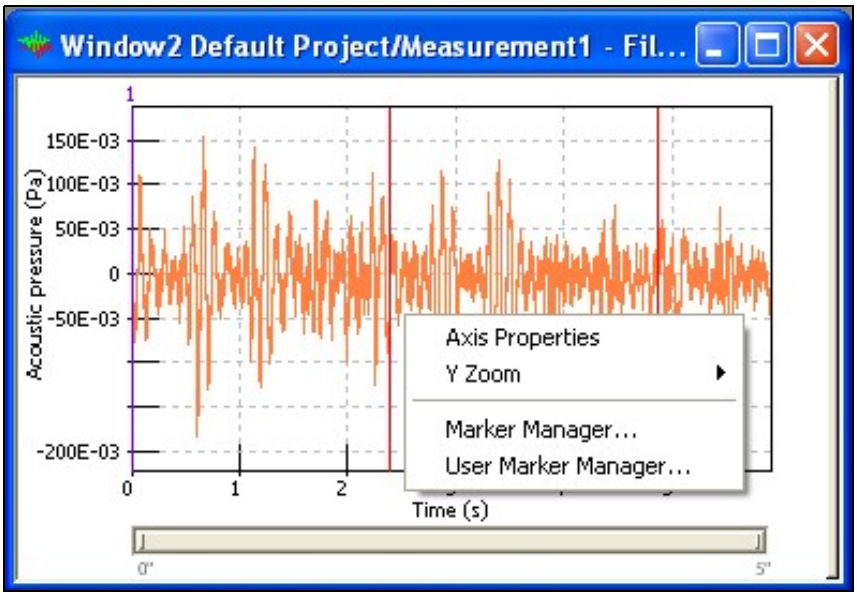
- Linear
- Logarithmic
- DB

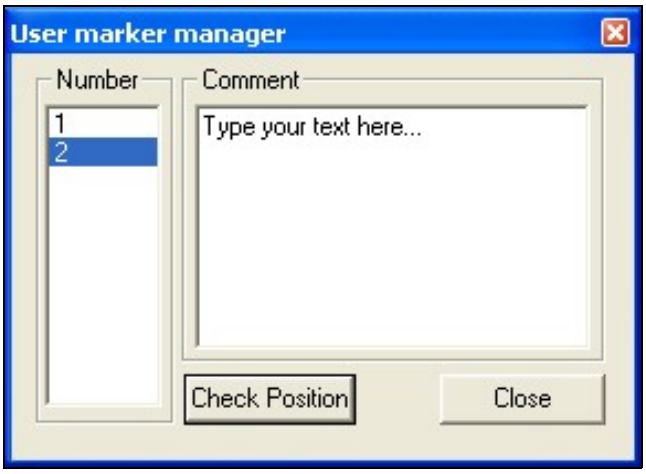
Z scale: Changes Z scale type of the area to the selected type. Available types (according to the kinds of the area and the window) are:

- Linear
- Logarithmic
- dB

74.1.2.2.4 Marker manager

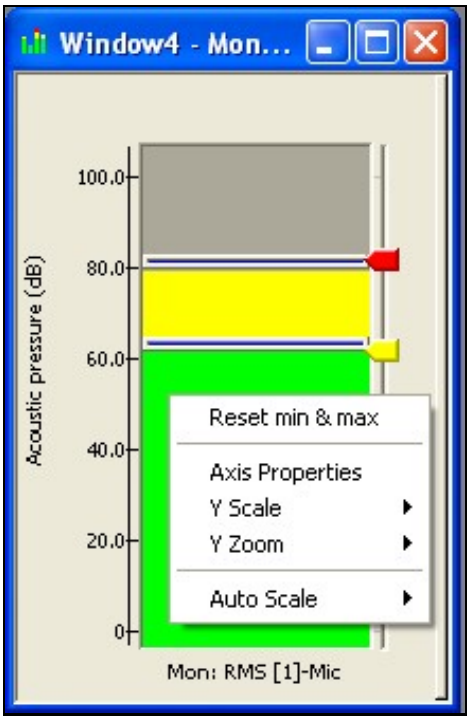
This dialog is only available for the Monitoring and Compressed windows. It contains the list of all record markers of the record signal opened. In the monitoring window, each record marker comment can be modified. In the compressed window, comments cannot be modified.





74.1.2.2.5 Reset Min & Max

Restores min and max values for the selected scale



74.1.3 Window

74.1.3.1 Contextual menu

The window contextual menu is accessible by right clicking on the part around the graph.

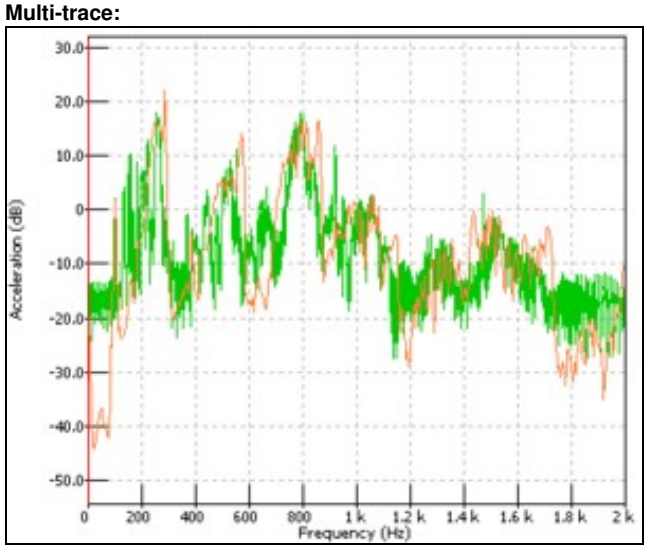
74.1.3.1.1 Display

In each window, several display modes are available, depending on the graph type.

Graph type	Display mode
Time signal	Multi-trace Multi-graph Time multi-trace 3D
Spectral	Magnitude Phase Real part Imaginary part Magnitude/Phase Real/Imaginary Polar Real part 3D Imaginary part 3D Magnitude 3D Phase 3D Real part multi-graph Imaginary part multi-graph Magnitude multi-graph Phase multi-graph Merged magnitude/phase
Nth Octave	Multi-trace Multi-graph
Viewmeter/Monitoring	Continuous Viewmeter Brick Digital Digital magnitude & phase
Waterfall	Magnitude Phase Real part Imaginary part
Monitoring/Compressed signal	Multi-graph (Only one mode available)
Profile	Multi-trace Multi-graph
Complex profile	Magnitude Phase Real part Imaginary part Magnitude/Phase Real/Imaginary Real part multi-graph Imaginary part multi-graph

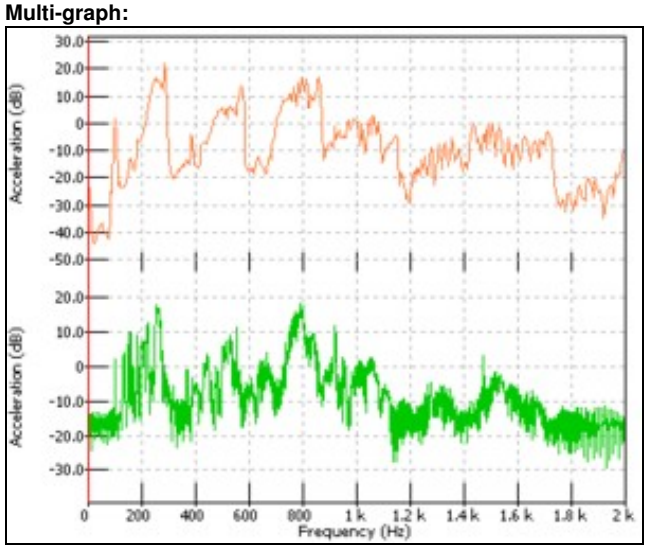
	Magnitude multi-graph Phase multi-graph Merged magnitude/phase
Lissajoux	Multi-trace (Only one mode available)
Constant Band Tracking	Magnitude Phase Real part Imaginary part Magnitude/Phase Real/Imaginary Real part multi-graph Imaginary part multi-graph Magnitude multi-graph Phase multi-graph Merged magnitude/phase

Multi-trace:



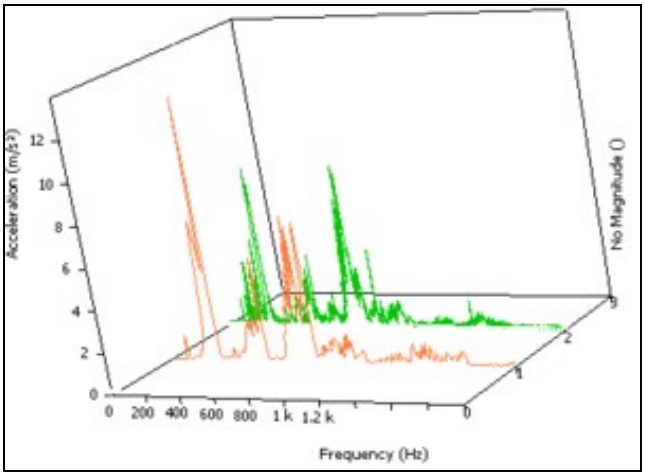
This mode displays all window traces of the same type in one graph. In several window types, two multi-trace graphs are displayed in the same window: for example, one for the Real part and one for the imaginary part. In this mode, a **magnitude gathering mode** can be activated in the set preferences window: this mode displays signals by creating one area for each Y magnitude included in the window. If two or more signals have the same Y magnitude, they will be displayed in the same area.

Multi-graph:



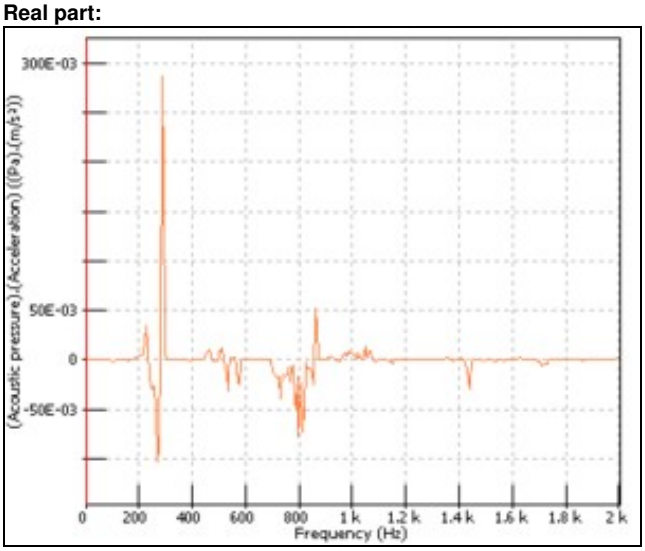
This mode displays one graph per trace in the window.

Multi-trace 3D:



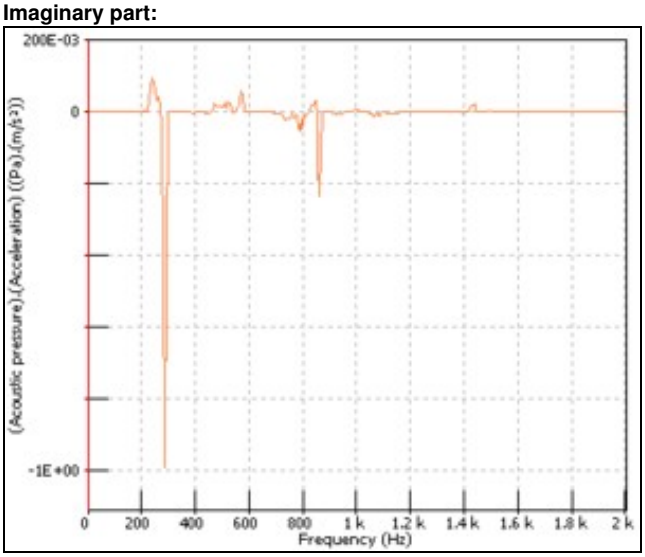
This mode displays all traces in the same 3D graph.

Real part:



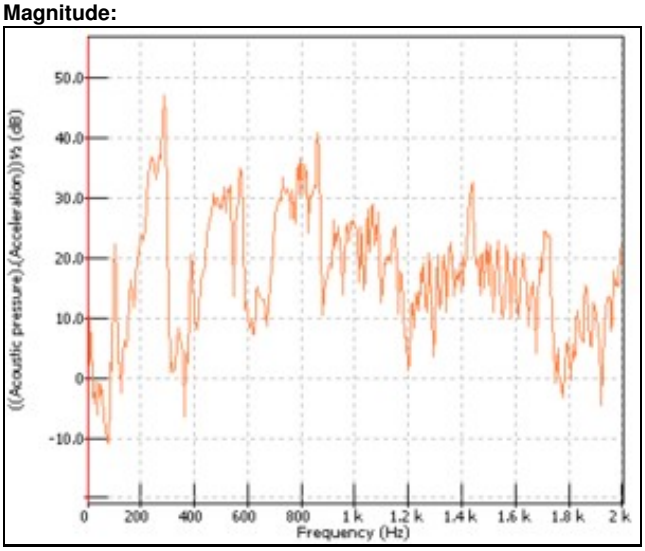
This mode displays the real part of the signal. It can be displayed in multi-trace, multi graph, or multi-trace 3D, depending on the graph type.

Imaginary part:



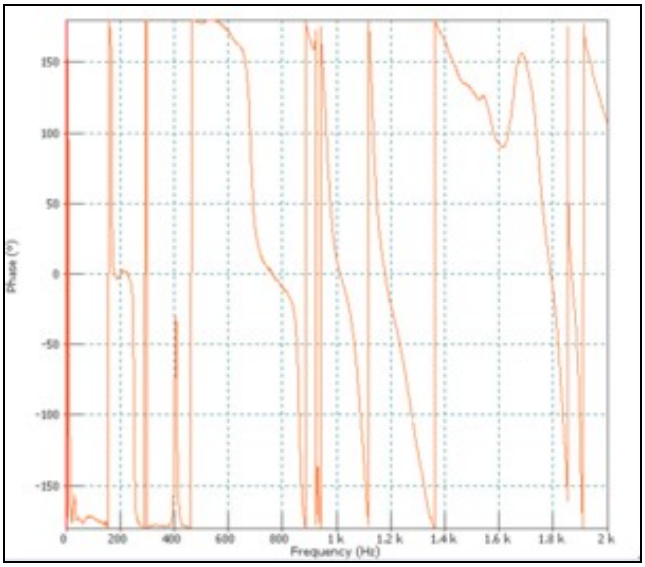
This mode displays the imaginary part of the signal. It can be displayed in multi-trace, multi graph, or multi-trace 3D, depending on the graph type.

Magnitude:



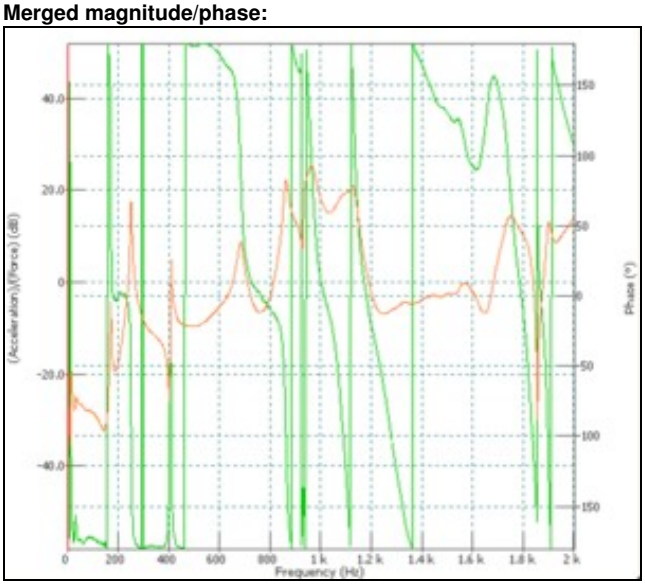
This mode displays the magnitude of the signal. It can be displayed in multi-trace, multi graph, or multi-trace 3D, depending on the graph type.

Phase:



This mode displays the phase of the signal. It can be displayed in multi-trace, multi graph, or multi-trace 3D, depending on the graph type.

Merged magnitude/phase:



This mode displays the magnitude and the phase of the signal in the same area. This is a multi-trace mode. The module scale is on the left of the graph and the phase scale is on the right.

74.1.3.1.2 Properties

See "Graph type" topic p 37.

- Always on top: the window will be on top
- Default: reset the all the settings to the default settings
- Apply to: applies the settings either to All windows or just for the Active window
- Save as user preferences: save the properties settings

74.1.3.1.3 Active trace

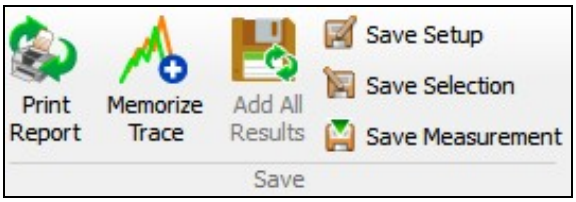
Select the active trace of the window. When the signal changes, the Y scale is updated to the Y magnitude of the signal. Only signals with the same Y magnitude as the active signal are displayed. The others are displayed as unavailable in the info-trace.

The color of the cursor corresponds with the trace?s color; you can select in the infotrace the active trace and its linked cursor using arrays of the keyboard.

74.1.3.1.4 Remove trace

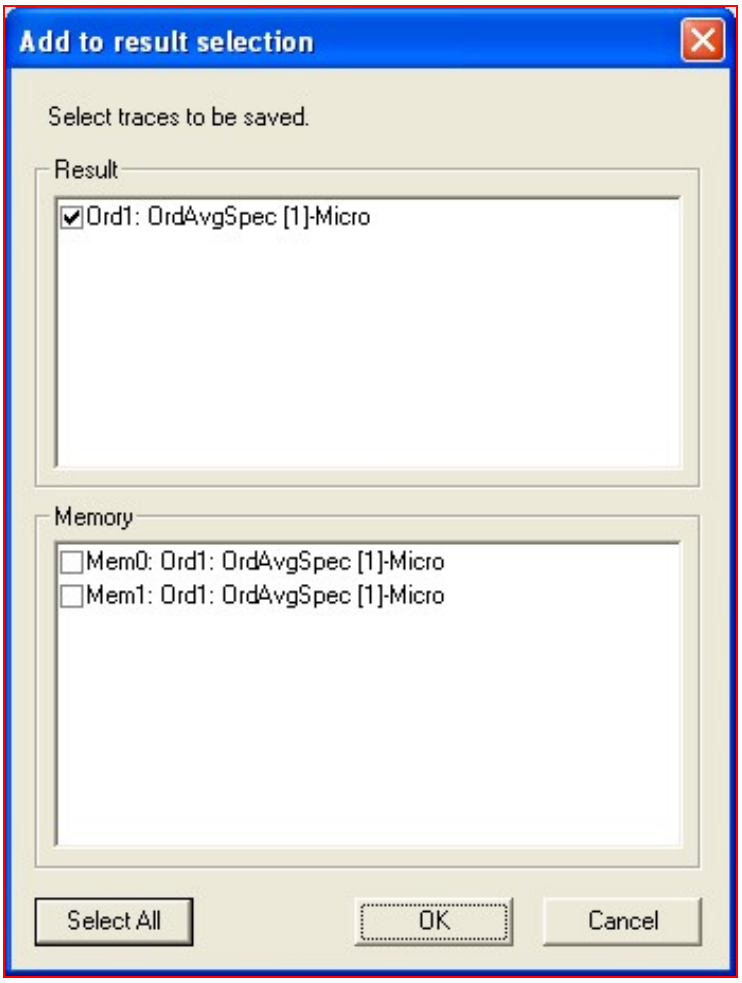
Removes selected trace from the window. If this trace is the active one, the active signal is changed. A trace can be removed using ?Ctrl suppr?.

74.1.3.1.5 Memorize trace



Memorizes the active trace of the active window at any time (independently from Run and Stop event).

The memorized trace is named *Memx: active trace name.* There?s an incrementation of the memorized traces id (x). You can save the memorized traces by adding it to the result selection.

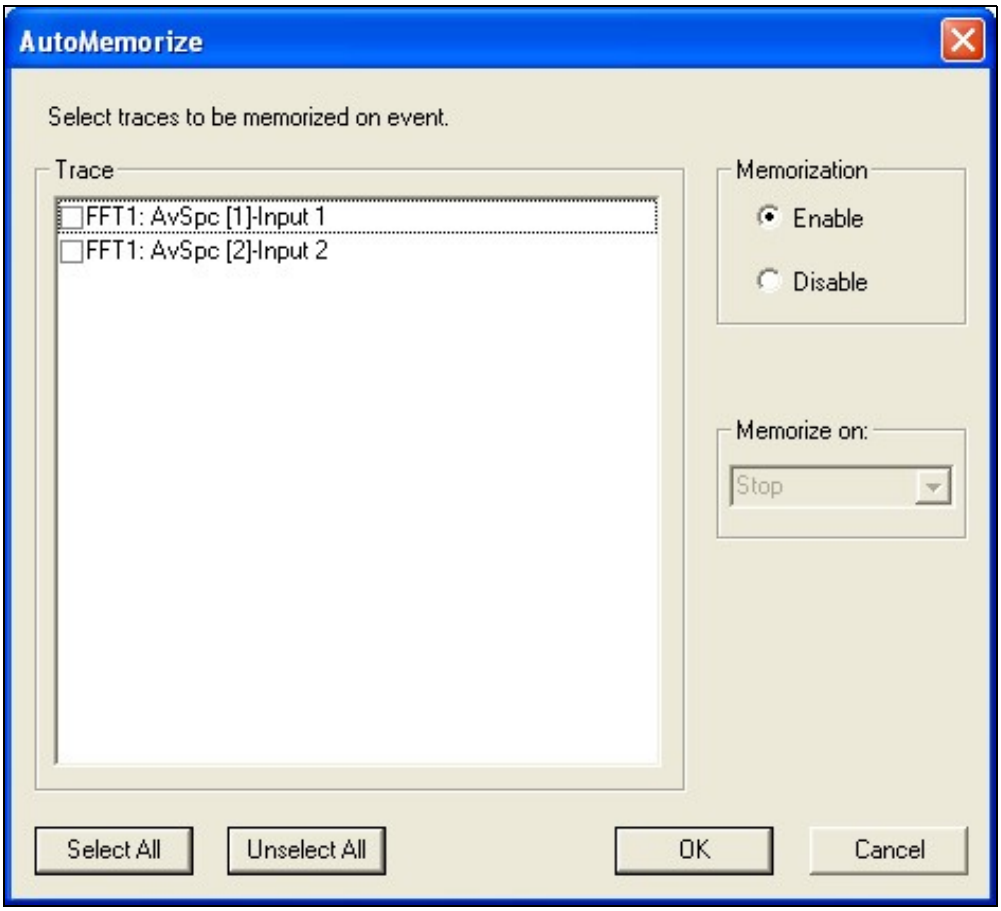

Add to result selection
Select traces to be saved.
Result
Ord1: OrdAvgSpec [1]-Micro
Memory
Mem0: Ord1: OrdAvgSpec [1]-Micro
Mem1: Ord1: OrdAvgSpec [1]-Micro
Select All
OK
Cancel

Note: you can memorize an active trace by using the insert button of the keyboard.

74.1.3.1.6 Clear memory

Clear all memorized traces. You can remove specific memorized traces with the ?Remove trace? command.

74.1.3.1.7 AutoMemorize



?AutoMemorize? traces consists in memorizing traces on the stop event. Select the graph to be memorized.

By using an operator on an active trace and his associated memorized traces is available by right-clicking on the graphs and selecting ?operators?. This operator will be automatically updated if a memorized trace is added or deleted (see also operators).

During a multi-run, the average on automatic memorized trace is done automatically for each run, and the average trace is automatically updated.

74.1.3.1.8 Auto scale Y on all

Sets min and max values of the Y scale to the Y min and max values of all signals displayed in the graph. A margin is added to these values to facilitate visibility. The Y width is always more than Y active signal precision.

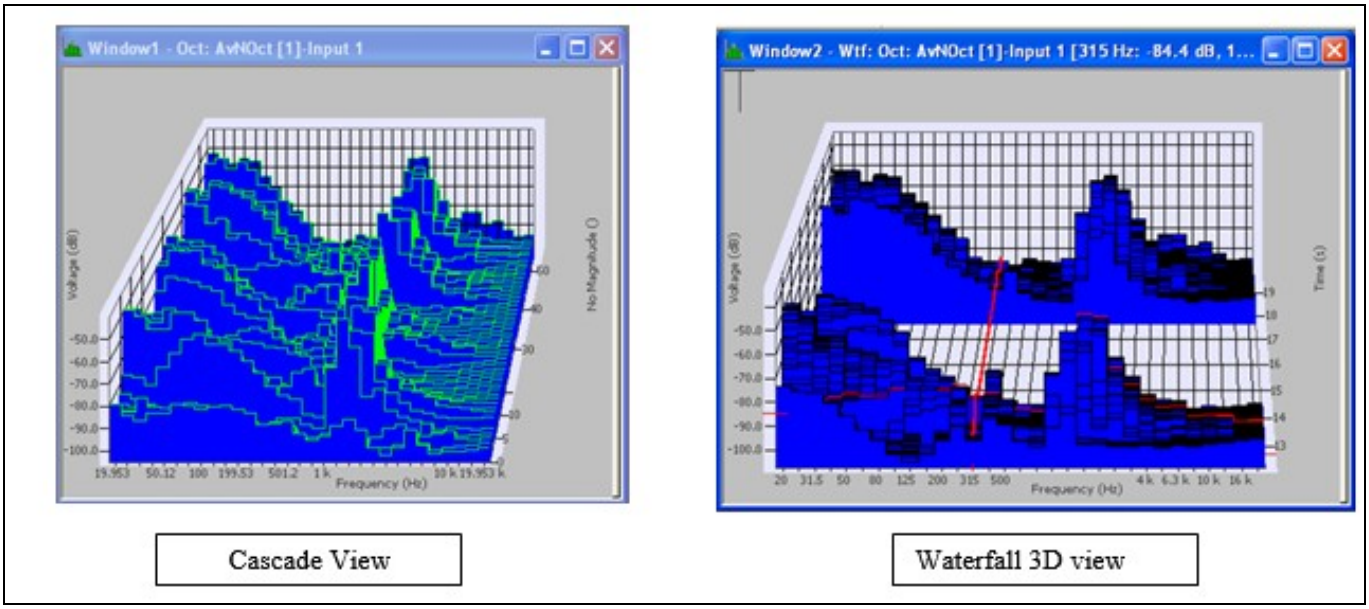
74.1.3.1.9 Cascade view

Present the current active trace in a cascade view of the last 50 (default value) recovered results.

This is dedicated for monitoring used, this is not a waterfall (acquisition mode in real-time). The Z-axis represents the number of slices independently from any reference such as time or RPM evolution.

This function is available only for 2D spectra and trigger blocks.

Warning: if you are in manual trigger, or if there is an absence in the time, you won?t be able to notice it with the cascade view. In the following example, a pause has been made during the measurement; on the waterfall 3Dview (with time for reference) it is possible to see this pause. In the cascade view the pause won?t be noticed (number of block for reference).



74.1.3.1.10 Weighting

These commands are available only for results with an X-Axis that represents frequencies. The operations are performed in the spectral domain

- **None:** No weighting is applied.
- **A Weighting:** Selects the "A" weighting
- **More:** Used to select specialized weighting

See more details about Weightings in NVGate Filters.

74.1.3.1.11 Add to Result selection

This command adds all the results displayed in the window to the list of results that must be saved in a measurement. If the result is already on the list, it is not added. Some results displayed cannot be saved (Instant trigger of the front end, profile of a DC input).

74.1.3.1.12 Copy graph(s)

This command copies the active graph in the format ?wmf?, this command is not available for 3D Waterfall.

74.1.3.1.13 Copy bitmap

This command copies graph in the format ?.bmp?

74.1.3.1.14 Copy data

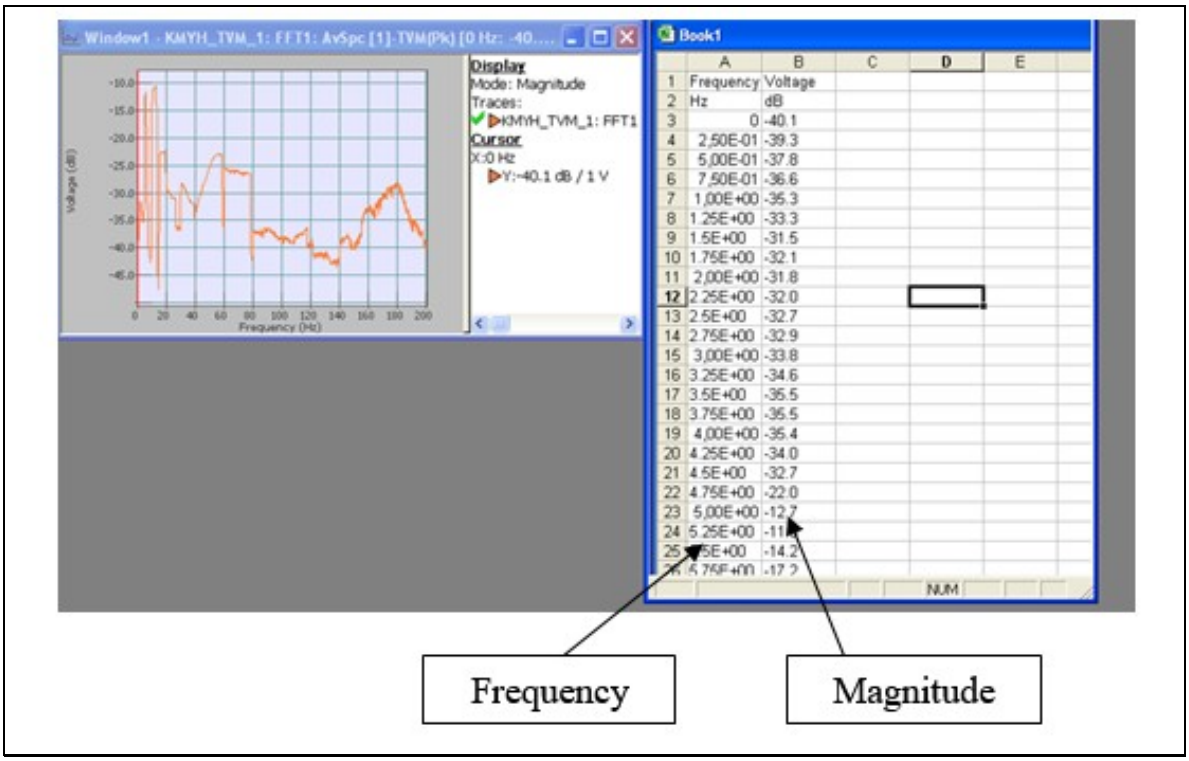
This command copies data in order to export them in Excel. This will export all point?s values from the active graph. NVGate export values with a point as separator and in engineer mode. This command is available for all spectra and profiles (even waterfall profiles).

If the graph is displayed with complex values, then the ?copy data? command allows to export phase and module values.

Example:

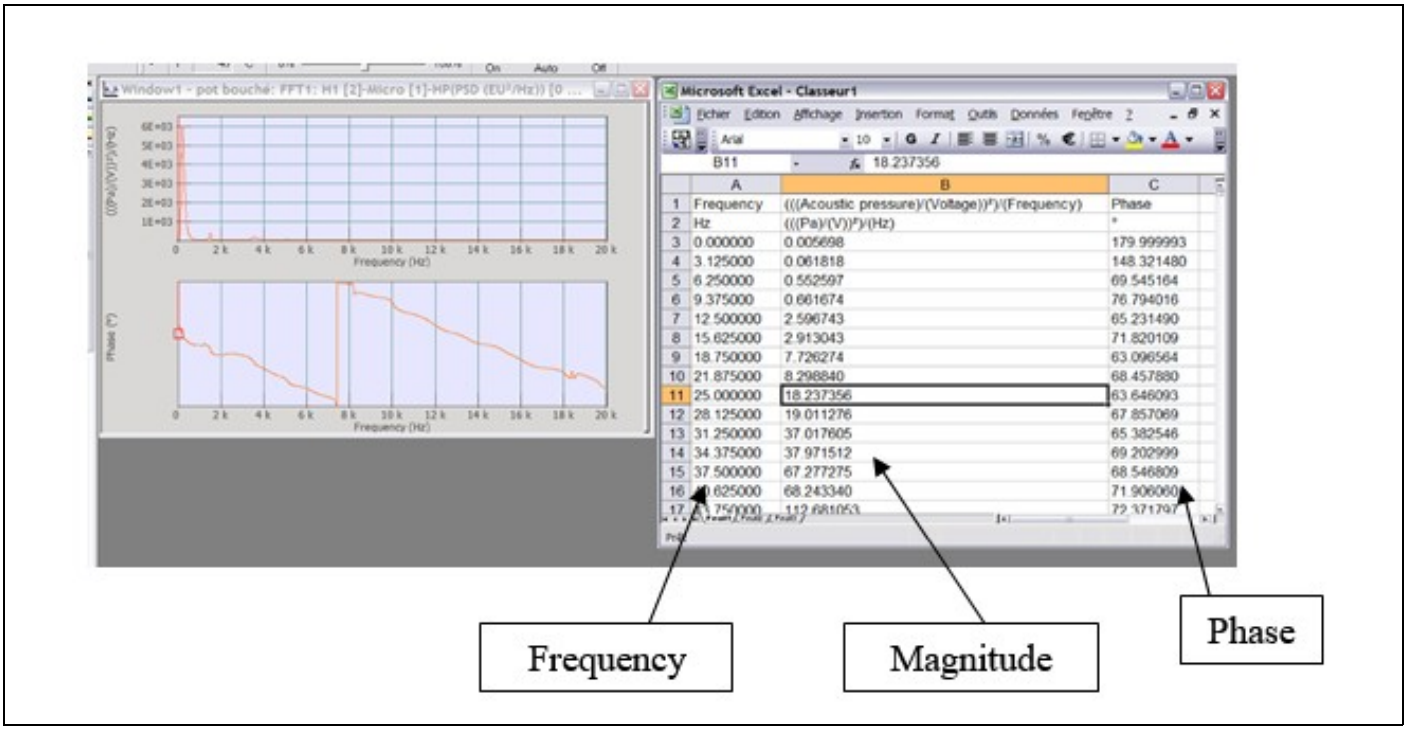
- Natural values:

Values displayed are values from the Active trace:



- Complex values:

For complex values the ?Copy data? will displayed phase and module values.



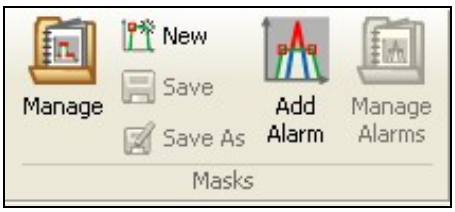
74.1.3.1.15 Copy to Mask

Adds the result to the project template results. This result is then available for editing and use as a template.

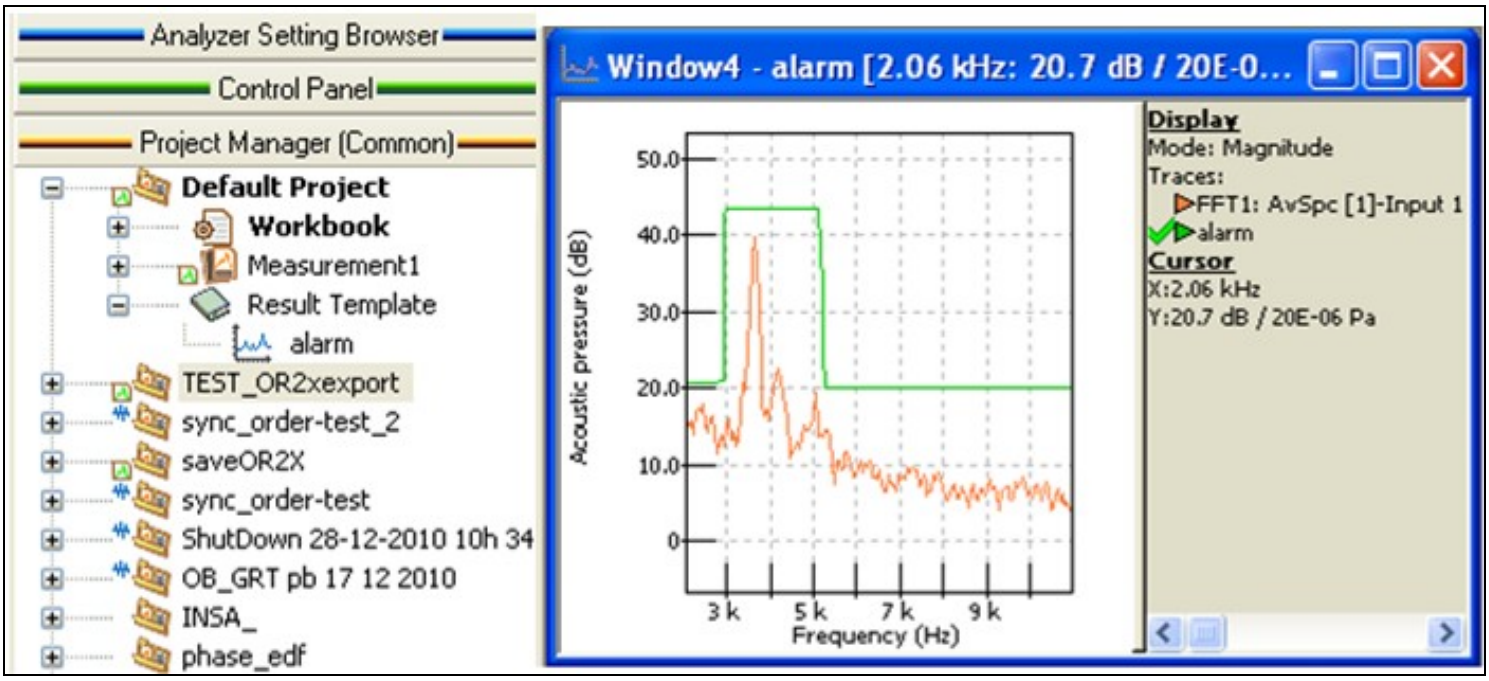
74.1.3.1.16 Add Alarm

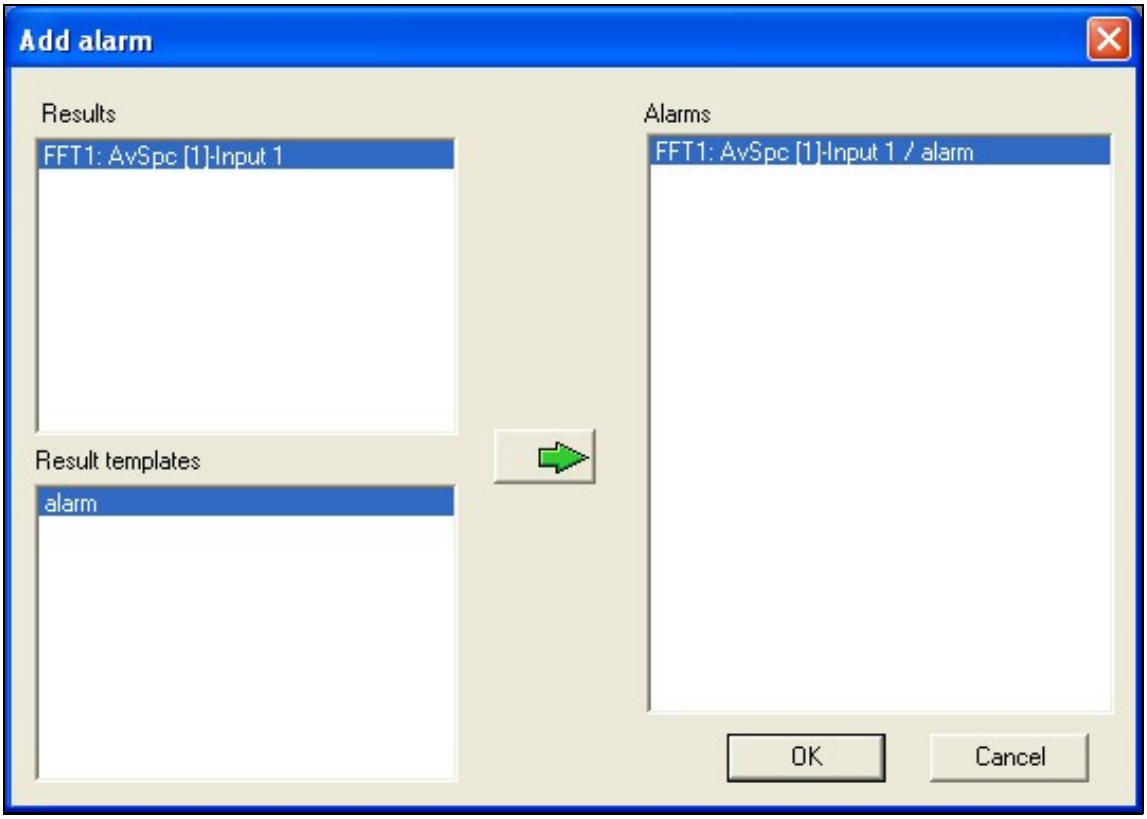
Dialog box to create an alarm. An alarm compares a dynamic signal with a template result. The result of the comparison can be used in the macro to perform certain tests.

To make this option available, a result template must be added to the window (using drag & drop for example).



Go to the "Chapter 5: Tools" to see more details about the Result template.


Analyzer Setting Browser
Control Panel
Project Manager (Common)
Default Project
Workbook
Measurement1
Result Template
alarm
TEST_OR2xexport
sync_order-test_2
saveOR2X
sync_order-test
ShutDown 28-12-2010 10h 34
OB_GRT pb 17 12 2010
INSA_
phase_edf
Window4 - alarm [2.06 kHz: 20.7 dB / 20E-0...
Acoustic pressure (dB)
50.0
40.0
30.0
20.0
10.0
0
3 k
5 k
7 k
9 k
Frequency (Hz)
Display
Mode: Magnitude
Traces:
FFT1: AvSpc [1]-Input 1
alarm
Cursor
X:2.06 kHz
Y:20.7 dB / 20E-06 Pa


Add alarm
Results
FFT1: AvSpc [1]-Input 1
Result templates
alarm
Alarms
FFT1: AvSpc [1]-Input 1 / alarm
OK
Cancel

To create an alarm, select a result from the top list, a template from the bottom list and click the Add button. The list on the right displays a list of the existing alarms.

74.1.4 Pointer type

The pointer type depends on the mode that is activated in the Display Tab.



Zoom: Displayed when the magnifying tool is selected: Used to select a rectangle in a graphic area, or to zoom in with a by left click and drag.



Cursor: Displayed when cursor mode is selected: Used to move the cursor by left clicking and dragging.



Move: Displayed when ?move mode? is selected. Used to change x and y scale boundaries by left clicking and dragging.

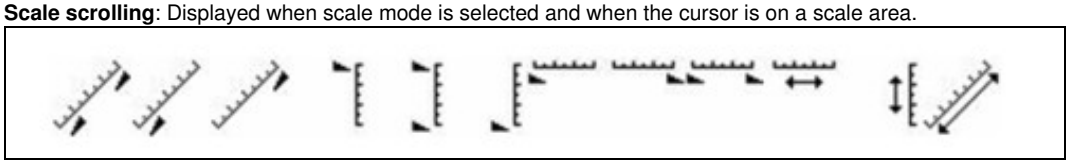


Rotation: Displayed when the rotation tool is selected: Used to rotate a 3D graph.



Marker: Displayed when the marker mode is activated. Used to modify the marker position and properties.

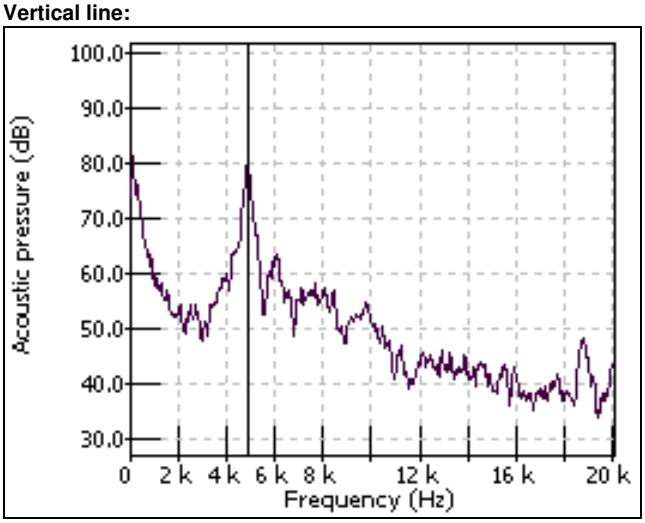
Scale scrolling: Displayed when scale mode is selected and when the cursor is on a scale area.



74.1.5 Cursors

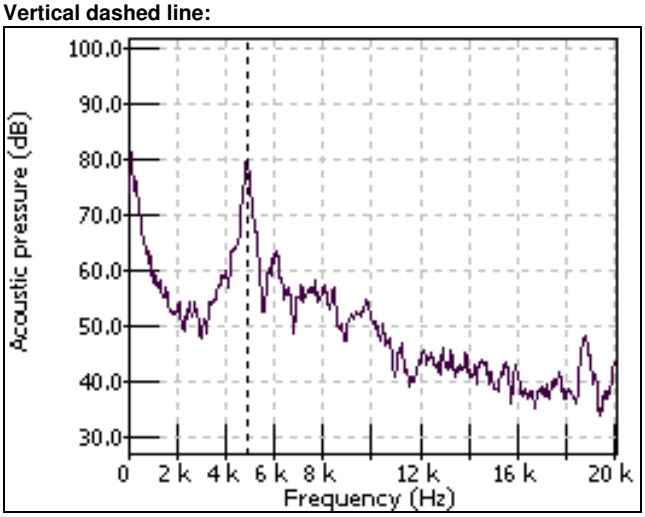
74.1.5.1 Style

Vertical line:



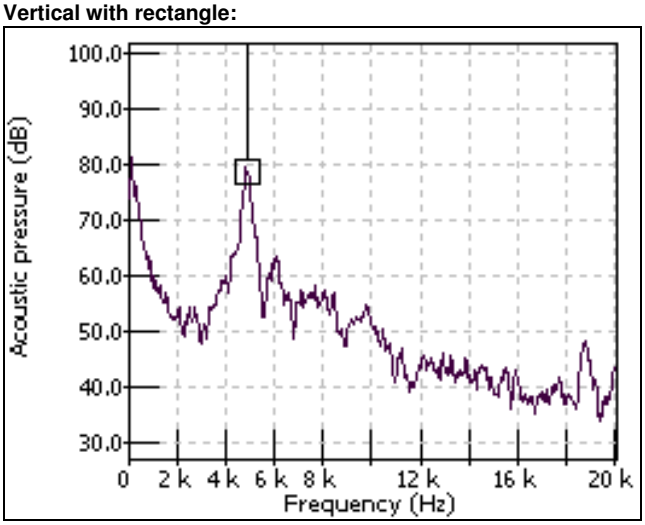
Displays a single line.

Vertical dashed line:



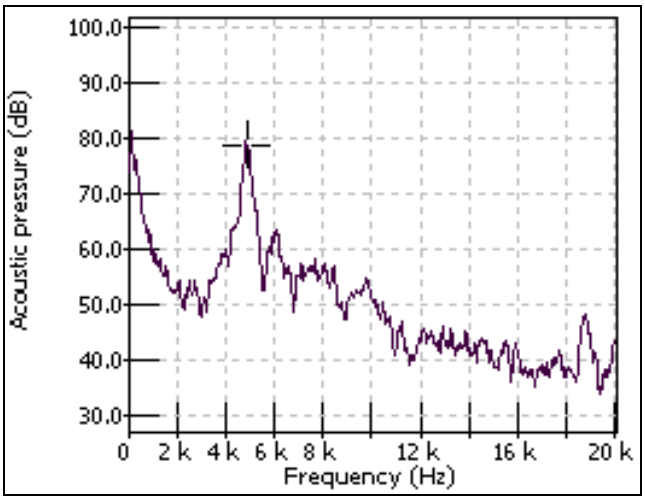
Displays a single dashed line.

Vertical with rectangle:



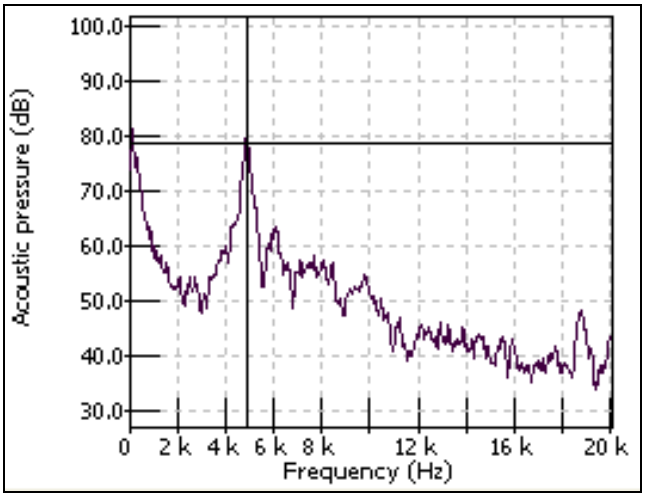
A rectangle is displayed around the selected point.

Cross hair:



No line is displayed but there is a target around the selected point.

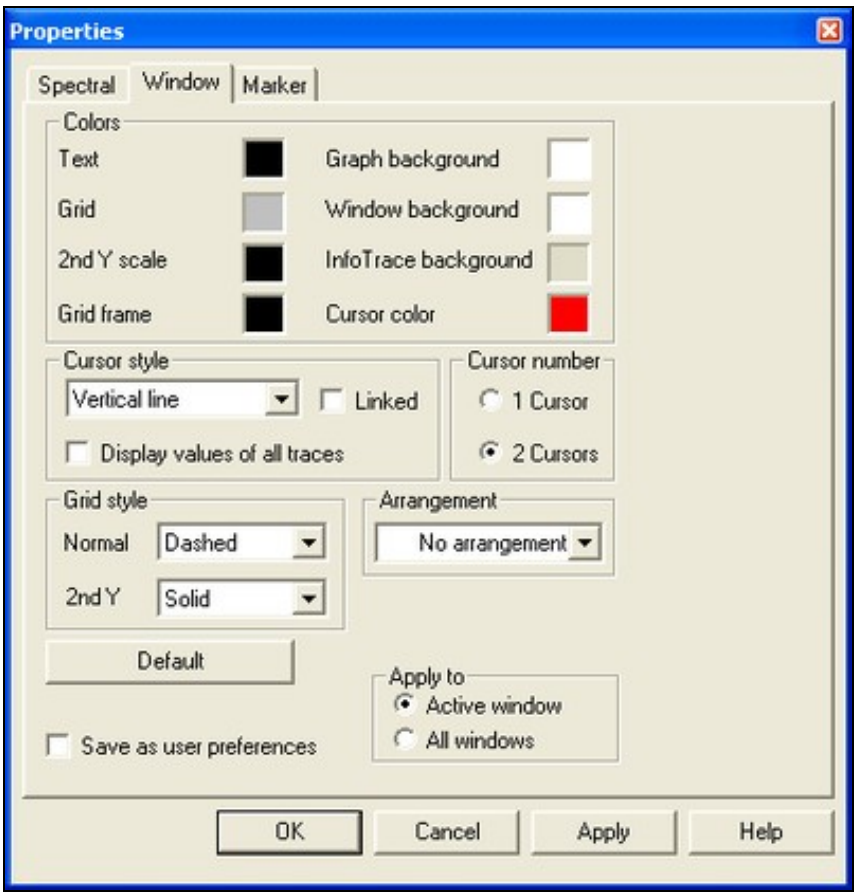
Vertical + horizontal:

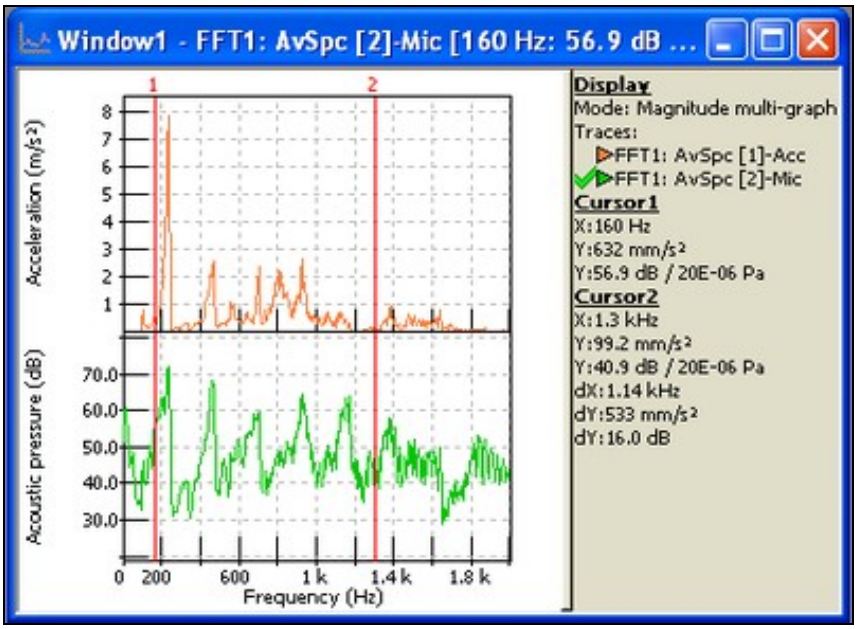


Displays 2 lines, an horizontal and a vertical that cross the selected point.

74.1.5.2 Dual

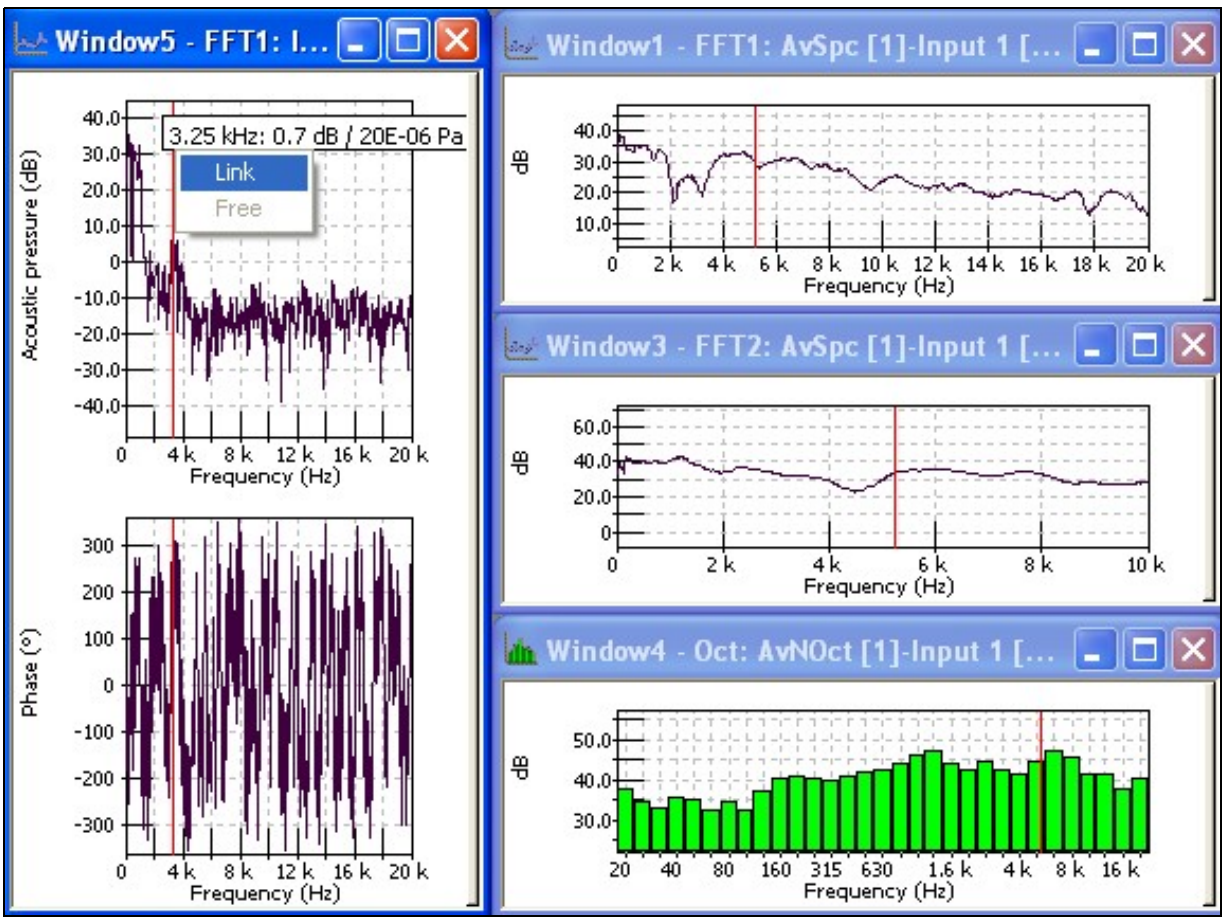
Select 2 cursors from the window properties. That allows to compute delta values on X-axis and Y-axis.



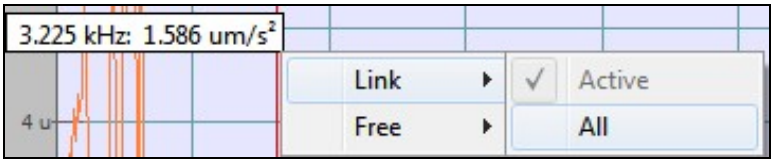


74.1.5.3 Cursor Link

Link the cursors of different graphs that share the same unit on the X-Axis. Once linked, all the cursors move at the same time and the same position.



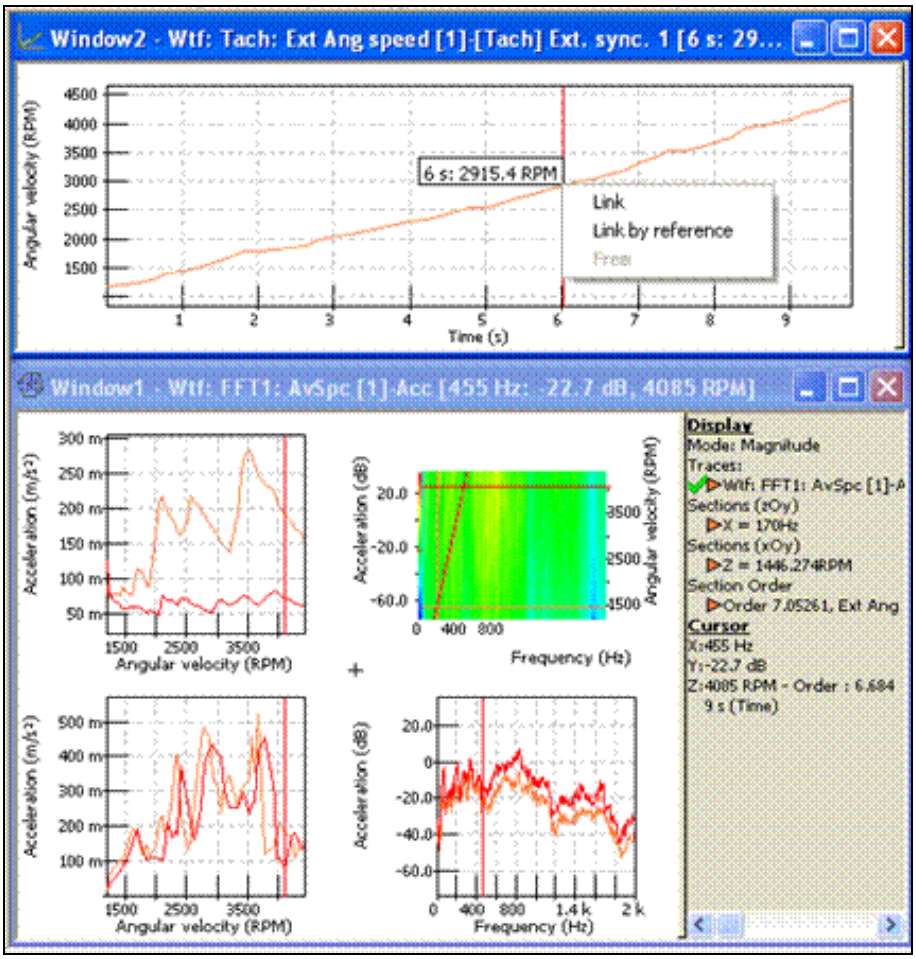
74.1.5.4 Link all cursors in one click



Cursors can be linked one by one to follow the same X-coordinate. It is now possible to link/unlink from the cursor contextual menu.

This applies to the link by reference and covers all the cursors of the current layout.

74.1.5.5 Waterfall link



- **Link:** Link the cursor of different graphs that share the same unit on the X-Axis. Once linked, all the cursor moved at the same time and the same position.

- **Link by reference:** Link the cursor of several Waterfalls referring to their internal index. Enables linking cursors that are displayed in graphs that do not share the same unit.

- **Free:** Release a cursor that has been previously linked.

75 NVGate DSP computation SPU

?? NVGate ? DSP Computation SPU
Reference tables for Signal Processing Unit (SPU) consumption per channel and per analysis type.

? **Key principle:** The higher the sampling frequency, the more data to process ? and the fewer SPUs are available per DSP board. SPU budget must be shared across all active channels and analysis types.

76 Force DSP

On force DSP (and normal DSP), the number of SPU change according to the max sampling frequency.

The more you have data to analyse (high sampling frequency), the less you have power computation (SPU). We have:

Sampling Frequency (kHz)	Number of SPU / DSP (Normal or Force)
102.4	6
65.536	9
51.2	12
32.768	18
25.6	24
16.384	36
12.8	48
6.4	96
3.2	192
1.6	384

76.1 FFT

According to the architecture of force DSP, the SPU computation per channels is not linear. So we have the following table for real time SPU computation :

Number of FFT lines	Normal DSP: SPU / channel	Force DSP: SPU / channel
401	1	0.33
801	1.25	0.18 (yes[1])
1601	1.5	0.75
3201	2	0.8
6401	3	2
12801	4	2
25601	6	3.5

Envelope: 401 lines : 2 SPU per channel on force DSP

Zoom: 401 Lines : 0.66 SPU per channel on force DSP.

1) Computing is not linear and FFT 801 lines is the most optimised for DSP

76.1.1 Recorder

Recorder Sampling frequency (Hz)	Normal DSP: SPU / channel	Force DSP: SPU / channel
51200 or upper	1	0.66
32768	0.66	0.44
25600	0.5	0.33
16384	0.33	0.22
12800	0.25	0.167
Else	0.125	0.083

76.1.2 Octave

Octave	Normal DSP: SPU / channel	Force DSP: SPU / channel
1/3	3	1
1/12	6	2

Octave	Normal DSP: SPU / channel	Force DSP: SPU / channel
1/24	12	4

76.1.3 OVA

Normal DSP: SPU / channel	Force DSP: SPU / channel
1	0.25

76.1.4 TDA

Normal DSP: SPU / channel	Force DSP: SPU / channel
3	1.5

76.1.5 SOA

SPU computation for SOA is more complex because it depends of maximum speed, resolution and frequency. Also force DSP computation is not linear.

Force DSP will improve the SPU computation by reducing between 2.5 and 5 to compare with normal DSP.

(@20kHz - 401 lines, we need a maximum of 3 SPUs with normal DSP)

77 Normal DSP

SPU computation for normal DSP : OR34 V1 - OR35V1 - OR36V1 OR36V2 (normal DSP) - OR38V1 - OR38V2 (Normal DSP).

Because of the computation linearity, we simplify by saying: 1DSP = 12 SPU (no matter the sampling frequency). This allow a simplification for SPU computation. So we can deduce:

77.1 FFT

Computation SPUs:

Bandwidth	Fdec	Resolution	Envelope	Zoom	SPU/Channel for Real-time	SPU/Channel for non Real-time
20k	1	401	No	No	1	0,5
10k	1	401	No	No	0,5	0,25
Nk	1	401	No	No	=N/20	=N/40
10k	2	401	No	No	1	1
5k	4	401	No	No	0,8	0,6
2k	10	401	No	No	0,6	0,6
1k	20	401	No	No	0,5	0,6
Lower than 1k	Higher than 20	401	No	No	0,5	0,5
20k	1	401 and below	No	No	1	0,5
20k	1	801	No	No	1,25	0,5
20k	1	1601	No	No	1,5	0,5
20k	1	3201	No	No	2	0,5
20k	1	6401	No	No	3	0,5
20k	1	401	No	No	1	0,5
20k	1	401	No	Yes	2	1,5
20k	1	401	No	No	1	0,5
20k	1	401	Yes	Yes	3	3

Where

$$Fdec = \frac{SamplingFrequency/2.56}{FFTBandwidth}$$

Sampling Frequency: set in *Front-End/Inputs settings/Input sampling*

FFT Bandwidth: set in *FFTx/FFT analysis/range*

77.2 SOA

Computation SPUs:

Bandwidth (Hz)	Decimation factor	Resolution	SPU/Channel
20 k	1	401	3
10 k	1	401	1,5
N k	1	401	=(N*3)/20
10 k	2	401	2
5 k	4	401	1,3
2,5 k	8	401	1,1
1,25 k	16	401	0,9
625	32	401	0,8
313	64	401	0,7
156	128	401	0,6
78	256	401	0,6
20 k	1	401 and below	3
20 k	1	801	3,25

Where

$$Fdec = \frac{SampleFrequencyBandwidth/2.56}{SOAFreqBandwidth}$$

Sampling Frequency: set in *Front-End/Inputs settings/Input sampling*

FFT Bandwidth: set in *FFTx/FFT analysis/range*

==

77.3 Octave:

Bandwidth	Fdec	Reso	SPU/Channel for Real-time

25.6k	1	1/3rd	4
20k	1	1/3rd	3
12.8k	1	1/3rd	2
10k	1	1/3rd	1,5
20k	1	1/3rd	3,0
10k	2	1/3rd	2,0
5k	4	1/3rd	1,25
20k	1	1/1	1,5
20k	1	1/3rd	3
20k	1	1/12th	6
20k	1	1/24th	12

Where

$$Fdec = \frac{SampleFrequencyBandwidth/2.56}{OCTFreqBandwidth}$$

Sampling Frequency: set in *Front-End/Inputs settings/Input sampling*

1/N Oct Bandwidth: set in *OCT/FFT analysis/range*

77.4 OVA

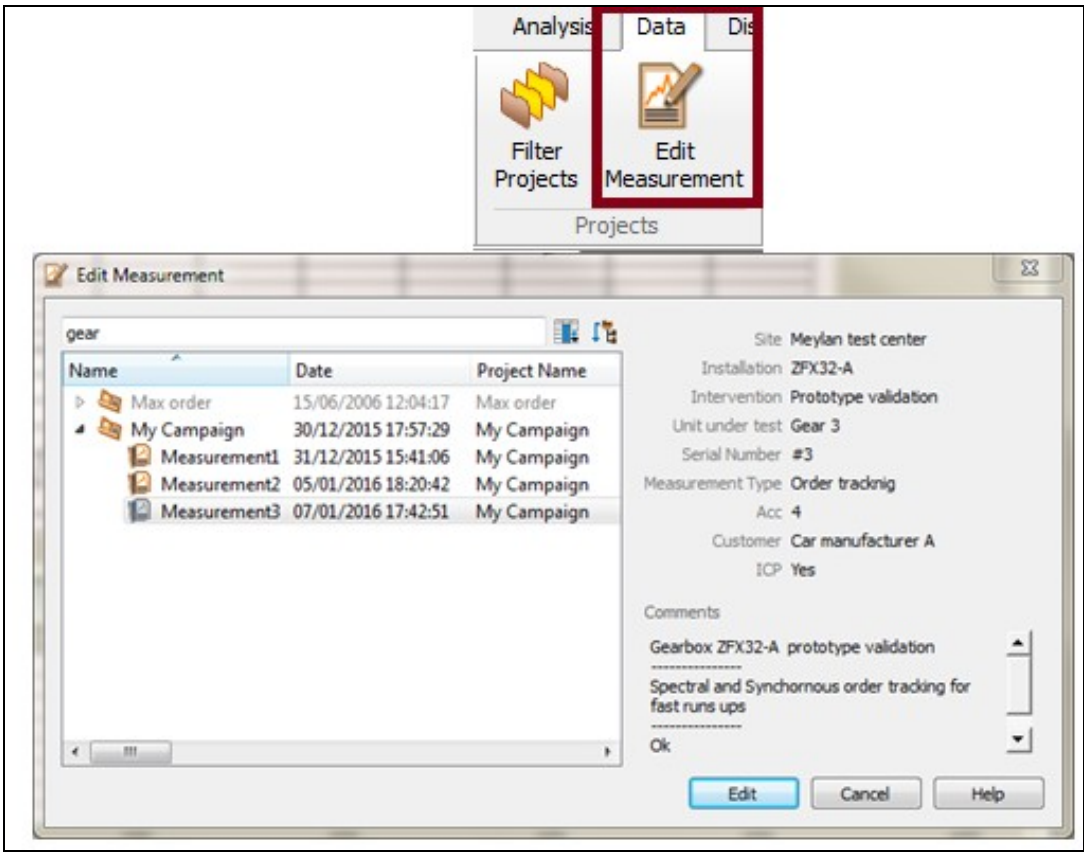
Bandwidth	SPU/Channel for Real-time
25,6k	1,25
20k	1
12,8k	0,75
10k	0,5

The overall acoustic levels analysis requires 1 SPU per channel at 20 kHz bandwidth. The number of required SPUs is directly proportional to the analysis bandwidth (i.e. the sampling frequency divided by 2.56).

78 NVGate Edit Measurement

The Edit measurement allows reviewing the measurements for comparison, modification or report. An edited measurement comes as a foreground layer on the top of the current analysis one.

Measurement edition is available from the ribbon *Data/Edit Measurement* and "report/Edit Measurement



When a *Measurement* is edited it is possible to update it and/or to make a report.

Please see the "Edit DOF" video :

79 NVGate Encrypt keys

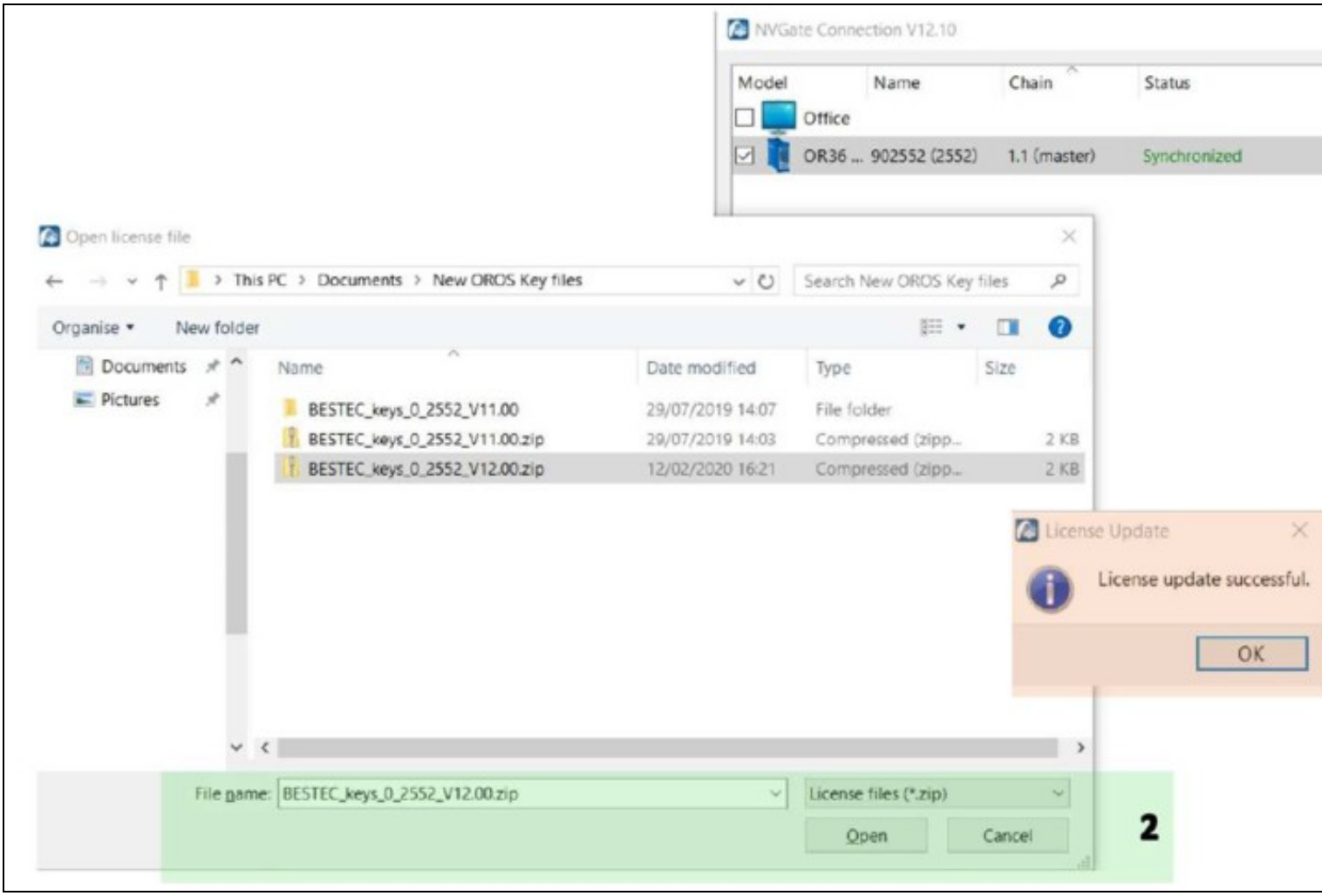
79.1 Keys

You need to have a .zip keys. You can find it :

- On install file deliver with your analyzer folder "keys"
- On your webmail, provide by Oros or your local distributor.

For any helpask your local OROS distributor for the .zip keys.

- Start NVGate, the window below is displayed.
  - ♦ **update the keys**
    - ◊ 1) Select the item (analyzer or dongle) for which you want to update the license keys.
    - ◊ 2) Select the **.ZIP** archive containing your new license key files.
    - ◊ 3) The license key files will be automatically copied in the NVGate installation folder and the keys of your analyzer and USB dongle will be encrypted.



That's all. NVGate is updated.

79.2 Troubleshooting

79.2.1 Encrypt keys

If any issue during the encrypt keys, follow this process :

1) Extract the .zip keys file

2) Rename the .txt by a .bat

3) Copy the keys (.bat and .cfg) on the install directory of NVGate (next to NVGate.exe)

4) Plug dongle and analyzer

5) launch the .bat associated to the hardware/dongle serial number. (a dos prompt is launch and will update the keys)

The dongle/hardware is updated.

If the dos prompt does not find analyzer, please do the follwoing:

1) Open NVGateCFG.exe (next to NVGate.exe)

2) Tab update

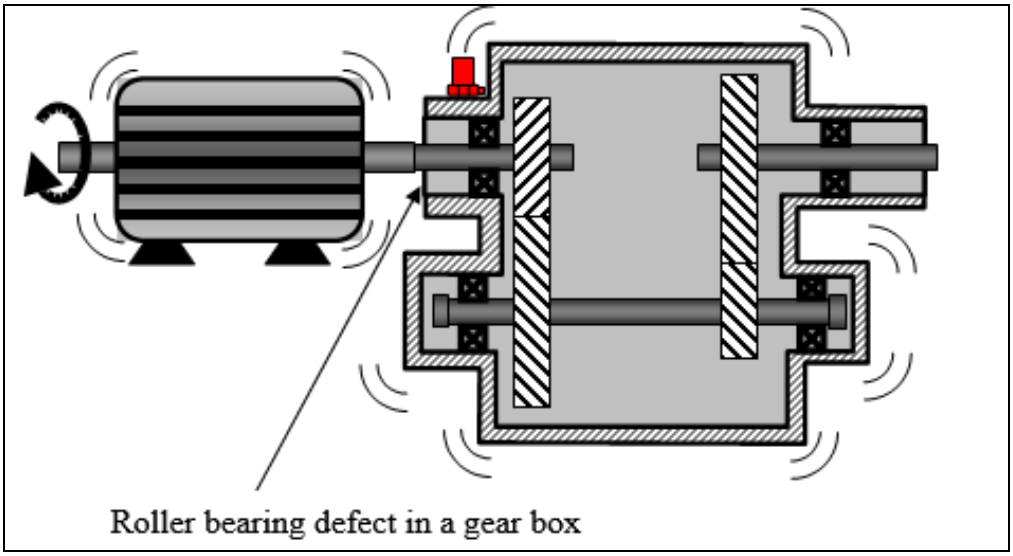
3) Launch "encrypt hardware key" / "encrypt dongle keys"

80 NVGate Envelope analysis

Using the envelope analysis for roller bearing defect detection.

80.1 Objective:

Abnormal vibrations were detected on a speed reducing gear box. We proceeded to diagnose the machine. A default in the roller bearing is suspected. An accelerometer is positioned close to the bearing and connected to the OR3X analyzer.



80.1.1 Necessary equipment:

OROS analyzer with NVgate Software In this example, we are analyzing the time signal file recorded with the analyzer. Office mode of NVGate is used.

80.1.2 Description:

The first step consists of the traditional FFT spectrum analysis of the signal in the complete frequency bandwidth (0-20 kHz).

The zoom analysis is used in the second step. The third step describes the envelope analysis.

Finally, we will also proceed to the analysis of the demodulated signal in the fourth step.

80.1.3 Step 1: Traditional Spectrum Analysis

In a first step, we determine the spectrum obtained from the accelerometer signal. The signal is considered on a frequency band 0-20 kHz.

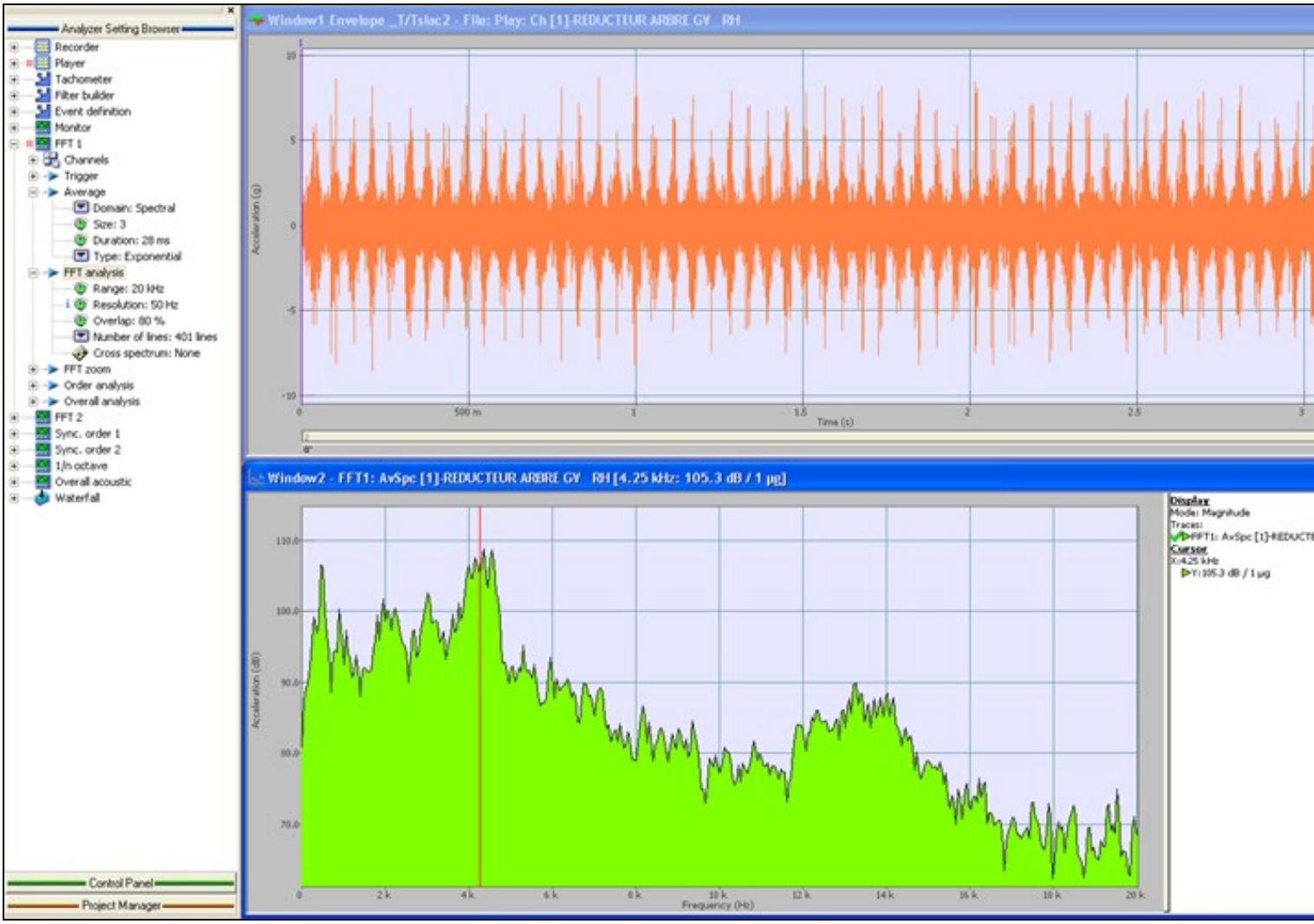

Analyzer Setting Browser
Recorder
Player
Tachometer
Filter builder
Event definition
Monitor
FFT 1
Channels
Trigger
Average
Domain: Spectral
Size: 3
Duration: 28 ms
Type: Exponential
FFT analysis
Range: 20 kHz
Resolution: 50 Hz
Overlap: 80 %
Number of lines: 401 lines
Cross spectrum: None
FFT zoom
Order analysis
Overall analysis
FFT 2
Sync. order 1
Sync. order 2
1/n octave
Overall acoustic
Waterfall
Control Panel
Project Manager
Window1 Envelope _T/Tslac2 - File: Play: Ch [1]-REDUCTEUR ARBRE GV RH
Acceleration (g)
Time (s)
Window2 - FFT1: AvSpc [1]-REDUCTEUR ARBRE GV RH [4.25 kHz: 105.3 dB / 1 µg]
Acceleration (dB)
Frequency (Hz)
Display
Mode: Magnitude
Traces:
Cursor
X: 4.25 kHz
Y: 105.3 dB / 1 µg

Figure 1: Spectrum Analysis
With the cursor we can detect two resonance domains. The first resonance is detected around 4.3 kHz and the second one around 13.3 kHz.

80.1.4 Step 2: Zoom Analysis

The traditional approach is to use a zoom analysis around 4.3 and 13.3 kHz in our case. In the NVGate software, define the settings of the FFT Zoom by:

- Setting a zoom factor of 16.
- Defining the center frequency of the zoom at 4.3 kHz in a first time. We can also use the drag and drop action to place the center frequency in the averaged spectrum window.

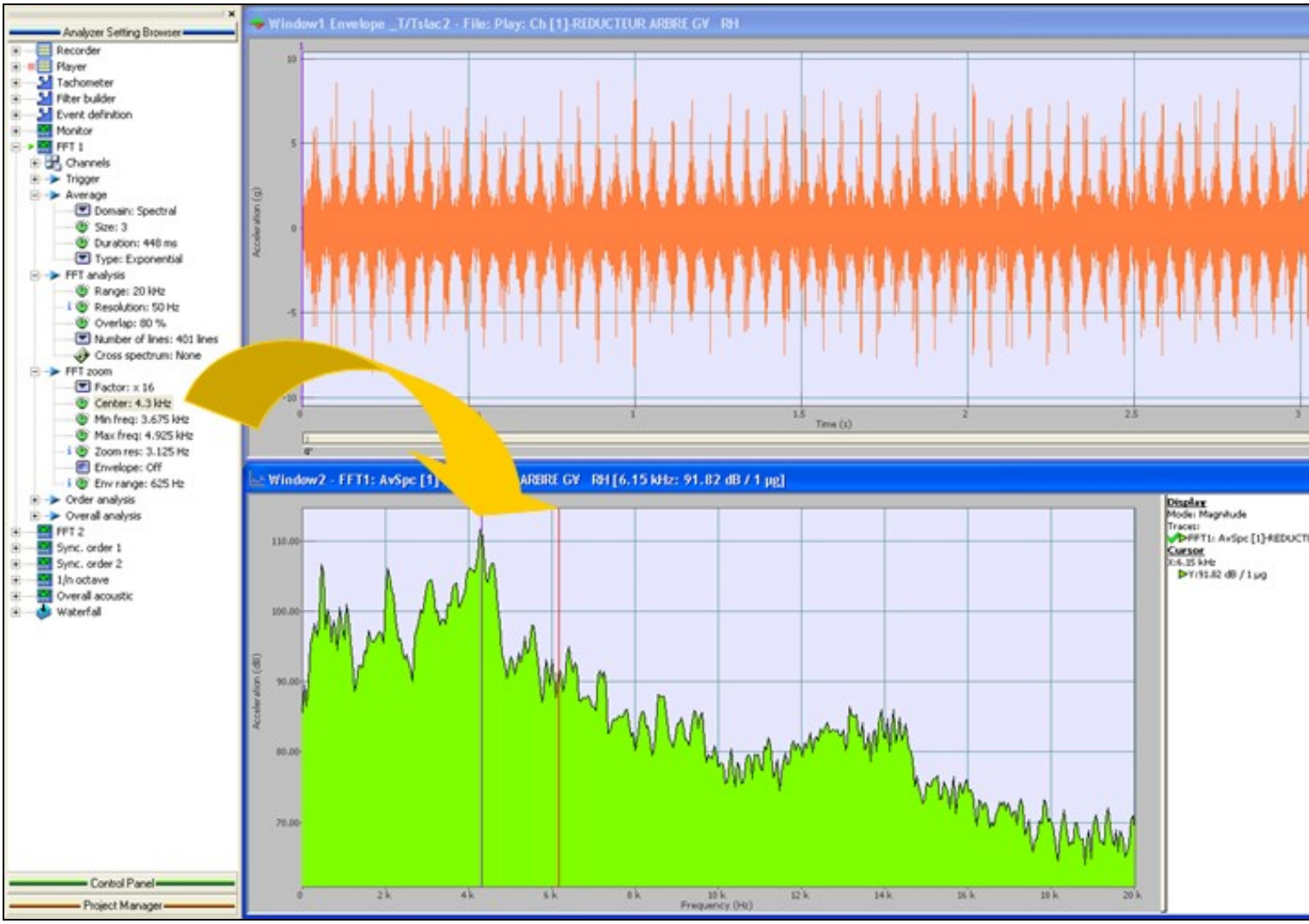


Figure 2 - Zoom Analysis Settings

Now the Zoomed averaged spectrum window can be displayed (Figure 3).

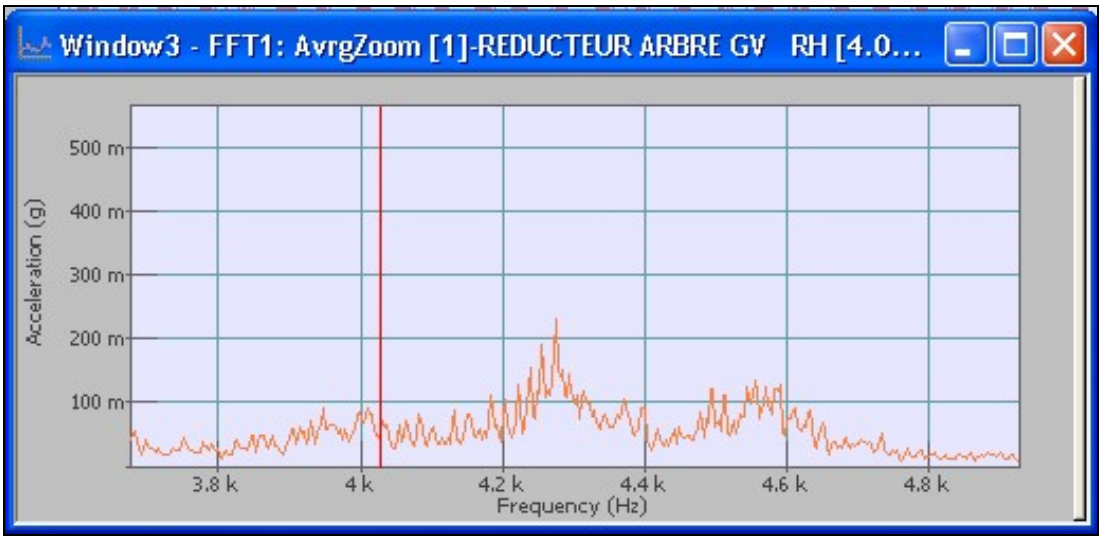


Figure 3- Zoom Analysis

The zoomed spectrum helps us to have a better resolution around the carrier frequency at which the signal is demodulated. For doing this kind of analysis we can use the side band markers. A typical signal spectrum can be seen as it usually has a central frequency line with lower amplitude side lines, as shown on the figure below:

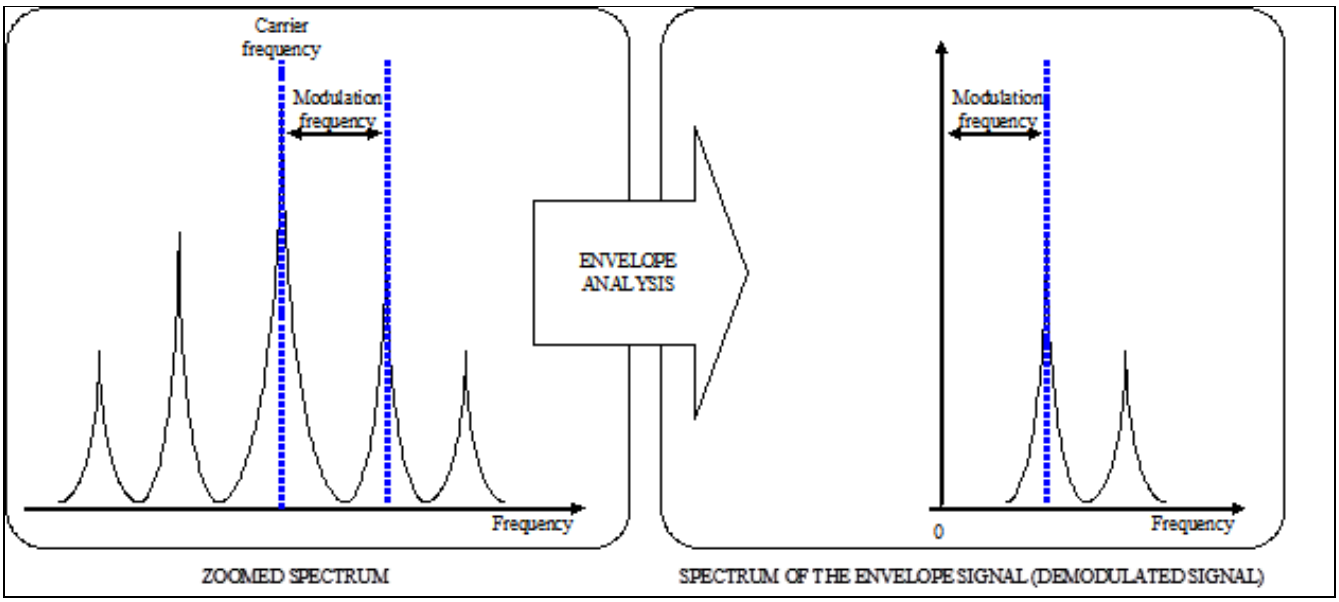


Figure 4- Envelope Analysis

If we see such a spectrum shape then it means we can start the envelope analysis.

In the NVGate software, we use the side band markers in the Zoomed averaged spectrum window to identify the modulation frequency (Figure 5).

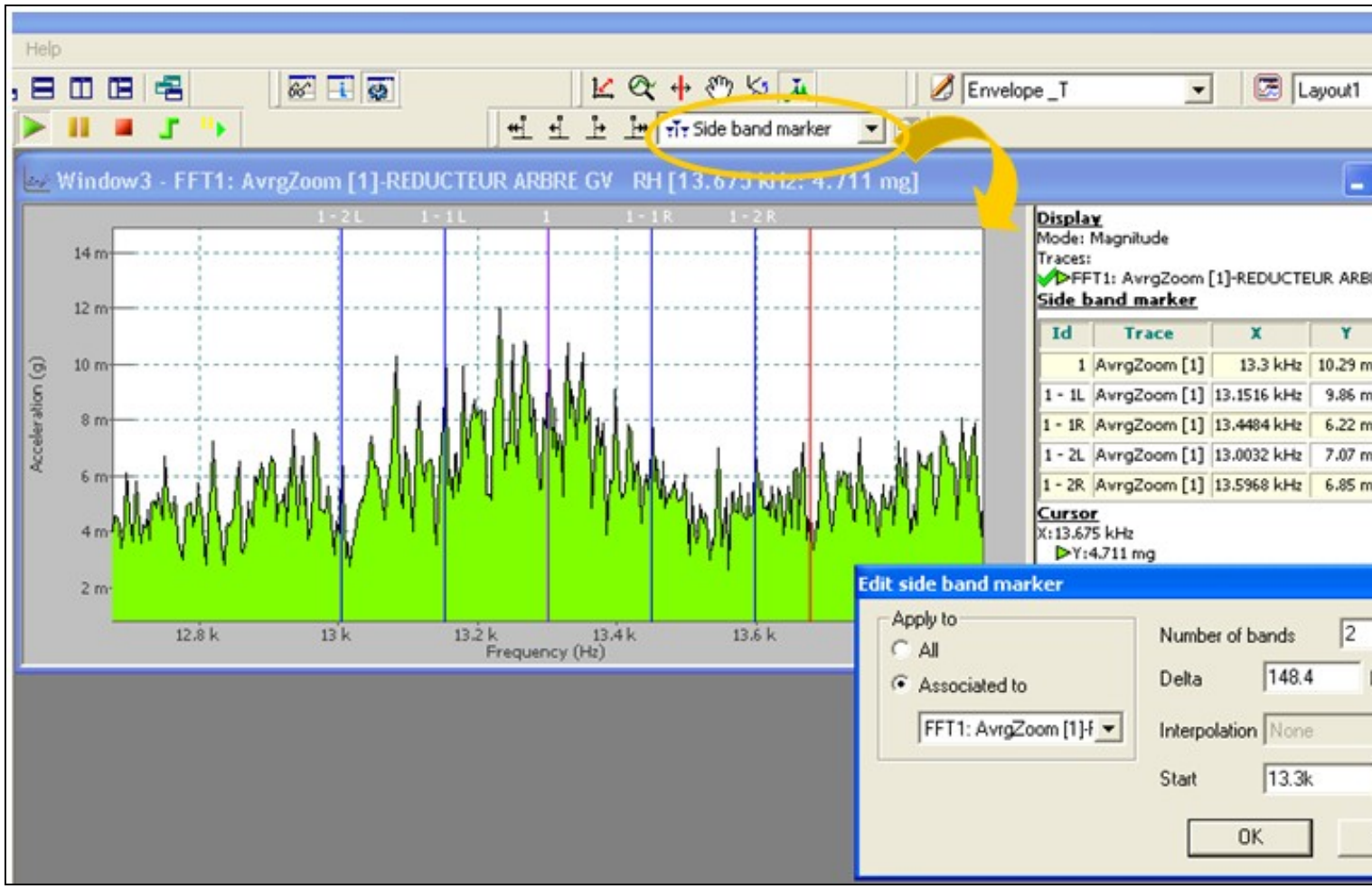


figure 5: Side band markers in the Zoomed averaged spectrum window around 13.3 kHz

We suspect a modulation frequency of 148.4 Hz which exactly corresponds to the value of the inner bearing race defect frequency provided by the manufacturer of the ball bearing.

From the shape of this spectrum we can also see there is a modulation phenomenon. This is why we are going to proceed to the envelop analysis to check the demodulated signal and its spectrum.

80.1.5 Step 3: Envelope Analysis

The envelope mode is activated by choosing a zoom factor (already done in our example) and checking the box "Envelope" (Figure 6).

The Envelop trigger and the Envelope spectrum windows can now be displayed (number 4 of the Figure 6).

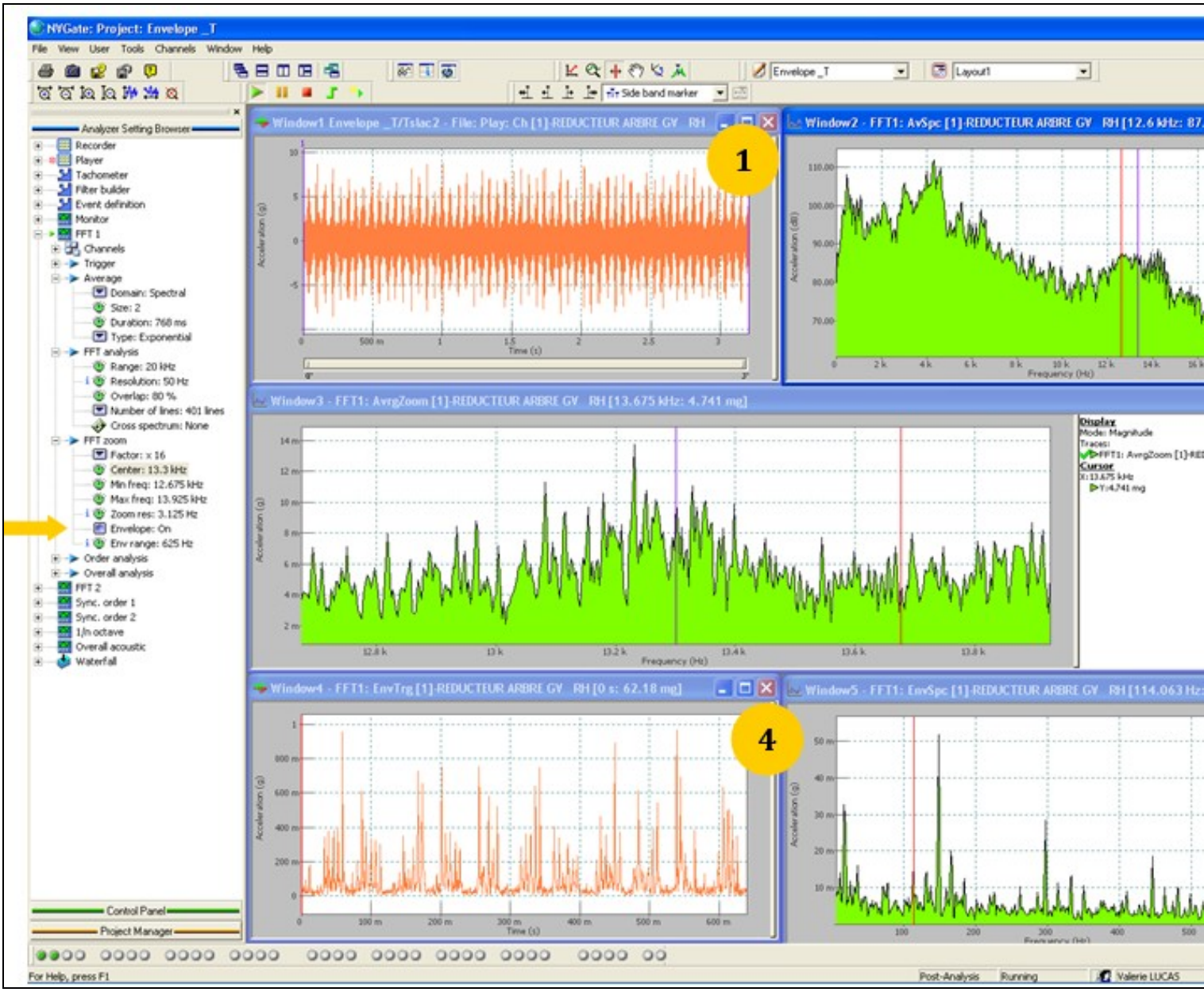


Figure 6- Envelope and Zoom Analysis at 13.3 kHz

Five shocks per revolution are identified in the Envelope trigger window obtained after the signal demodulation (number 4 of the Figure 6).

We are using the Harmonic markers in the Envelope spectrum window to detect the modulation frequency that is significant to the defect in the gear box. In our case, we confirm that the frequency at 148.4 Hz is the modulation frequency (Figure 7).

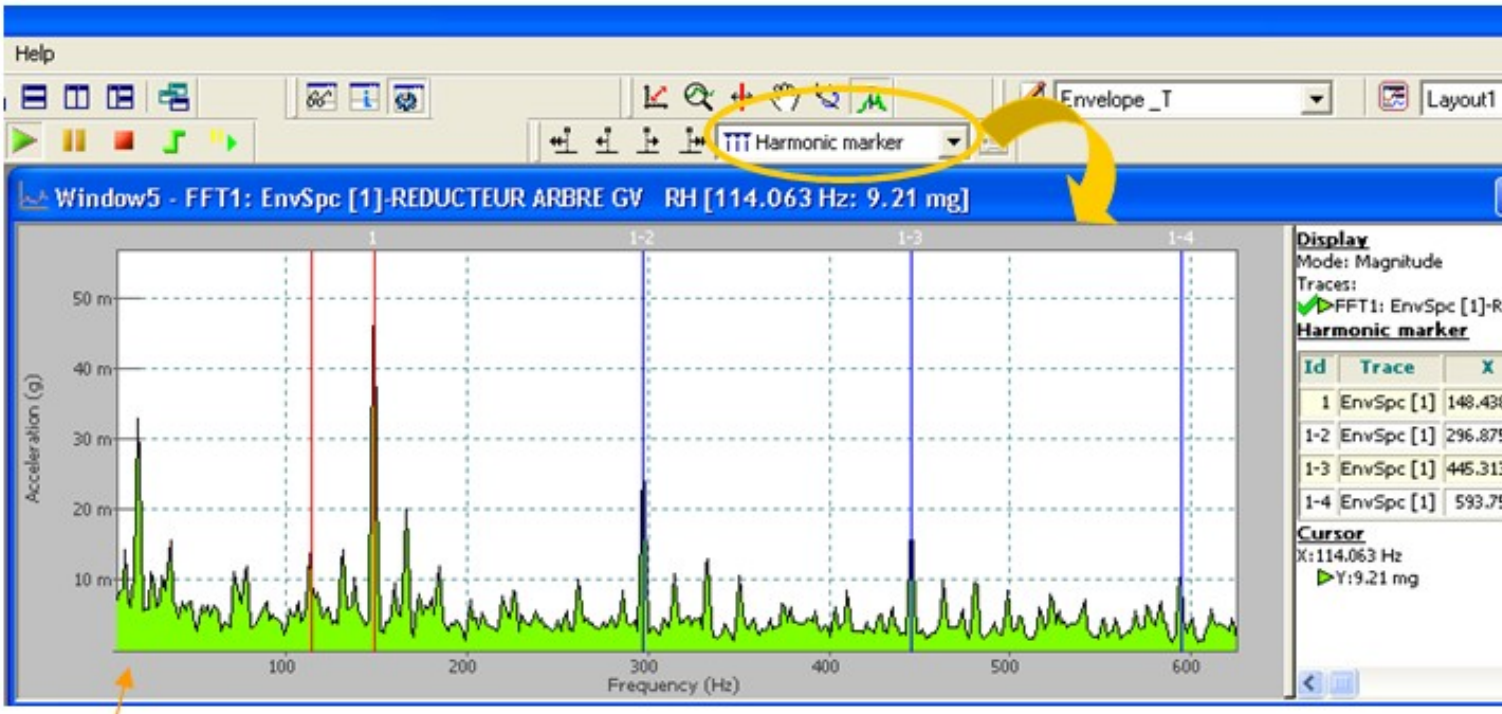


Figure 7 – Fundamental frequency at 148.4 Hz and its harmonics

Additionally we can also notice an emerging frequency line at 17.7 Hz which correspond fundamental rotation frequency of the gear box. The conclusions are the same as for an e analysis done a with center frequency at 4.3 kHz.

80.1.6 Step 4: Analysis of the demodulated signal

From the envelope signal window we can also detect the two characteristic frequencies previously found (Figure 8):

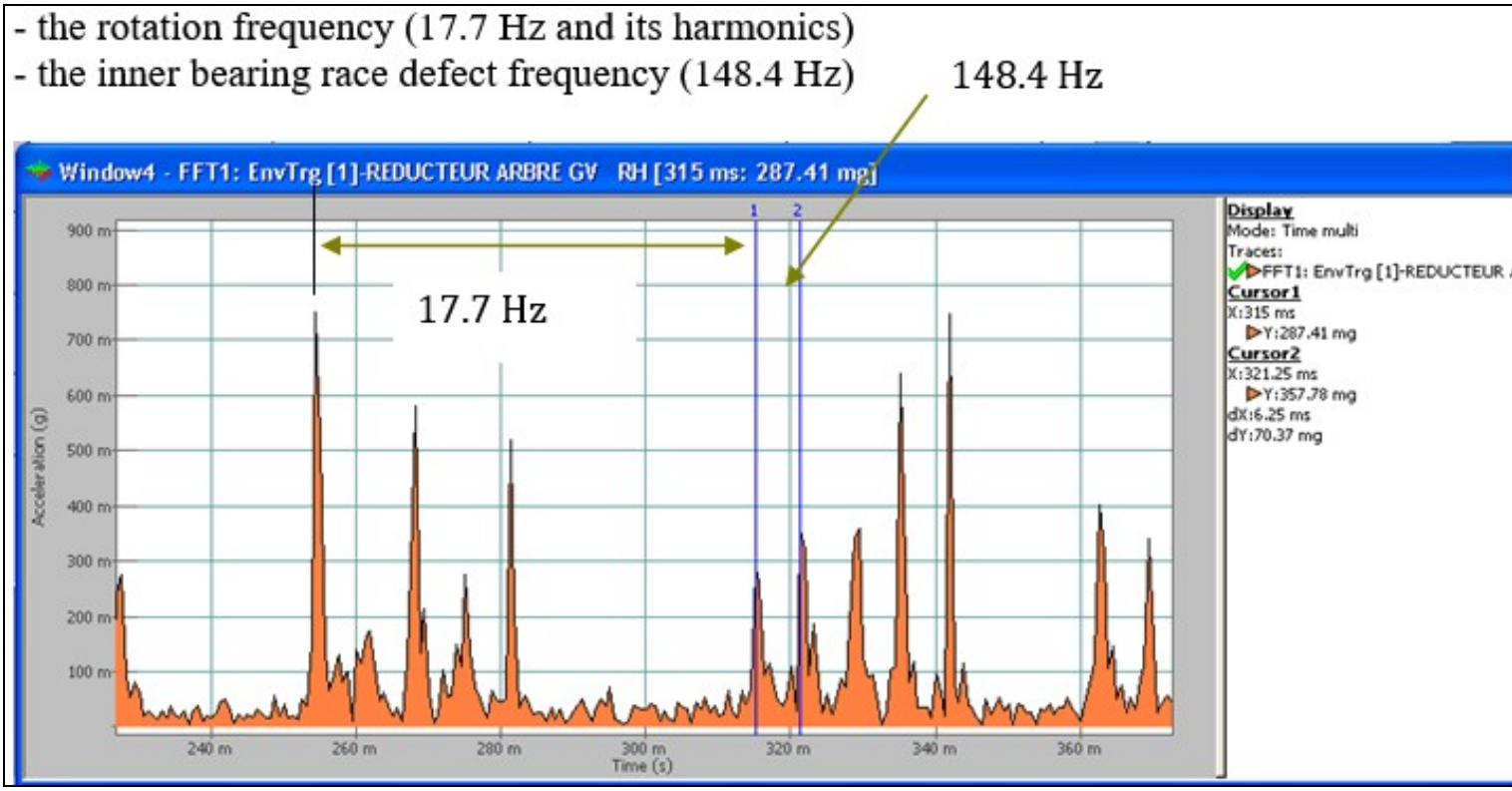
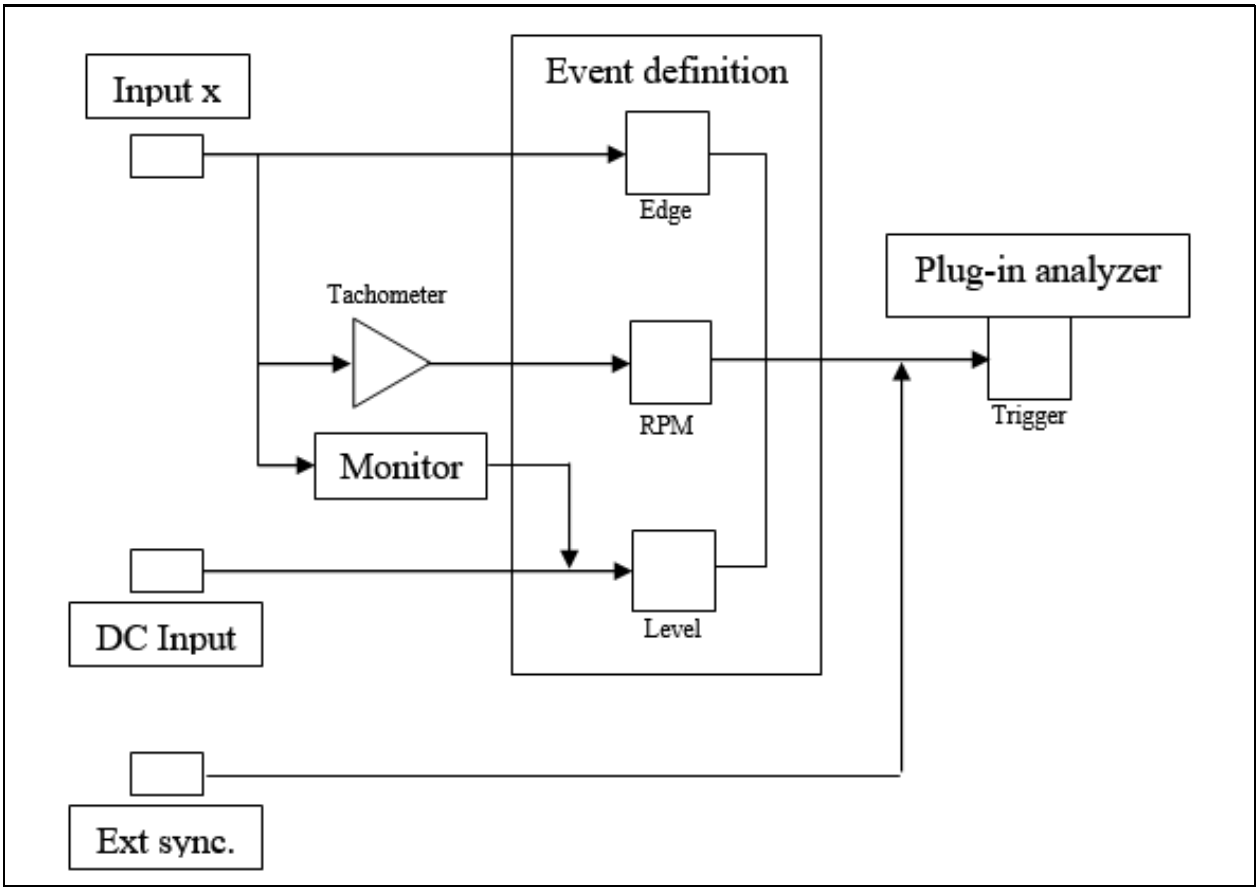


Figure 8 ? Zoom display on the envelope trigger window

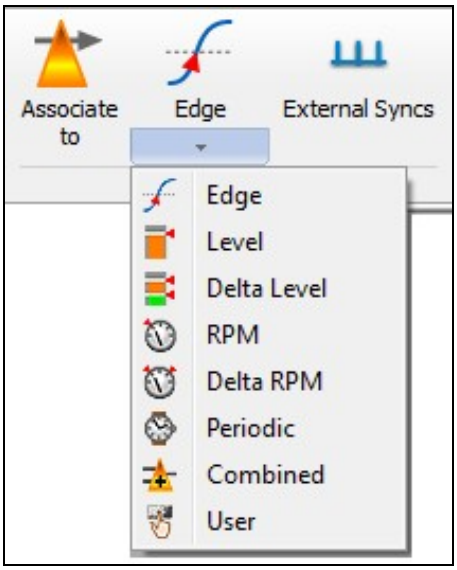
81 NVGate Event definition

81.1 Event definition

This module is used to define multiple events that can start, stop, and trigger the plug-ins or the source modules such as Recorder and Player.

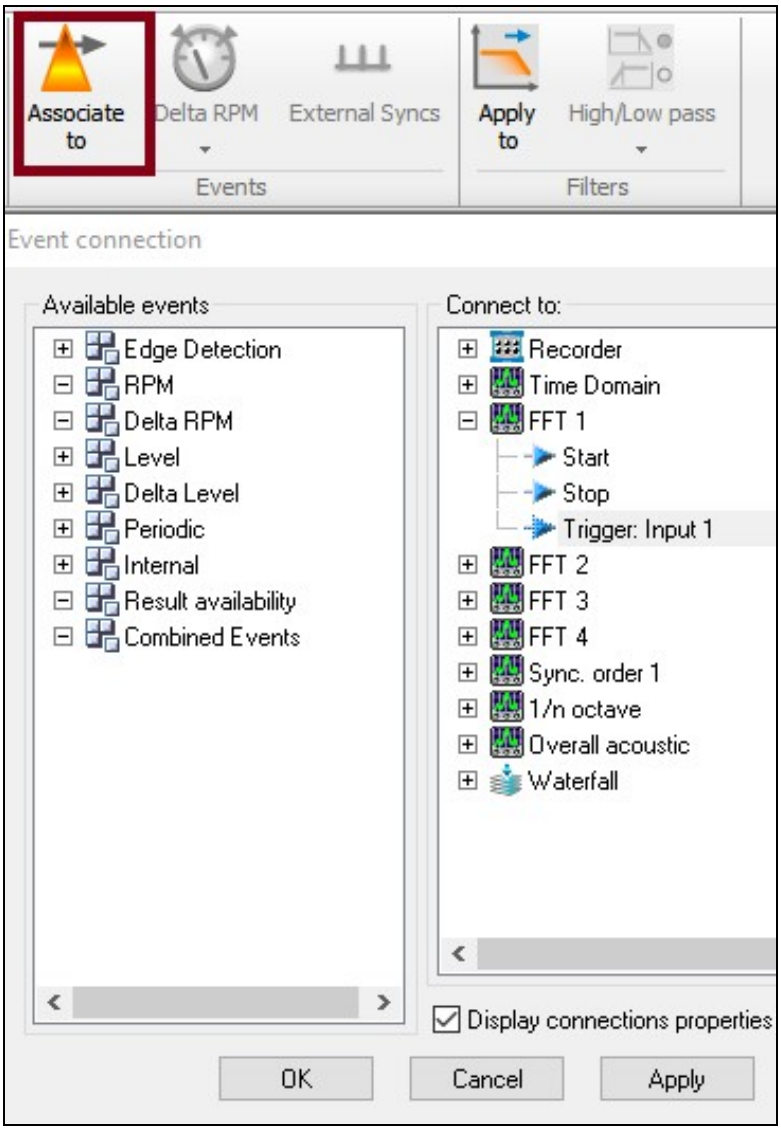


81.2 Connect



On the acquisition tab, this area manages events and corresponding triggers. This group allows selecting the event type (source, setup) and associates it with the plug-in analyzers triggers

This button opens the corresponding Event properties. The opened dialog shows both the source signal setup and the detection settings (may be split in different tabs). On this dialog box you can easily "drag and drop" events to "start", "Stop" or "trigger" any NVGate plug in.


Associate to
Delta RPM
External Syncs
Apply to
High/Low pass
Events
Filters
Event connection
Available events
Edge Detection
RPM
Delta RPM
Level
Delta Level
Periodic
Internal
Result availability
Combined Events
Connect to:
Recorder
Time Domain
FFT 1
Start
Stop
Trigger: Input 1
FFT 2
FFT 3
FFT 4
Sync. order 1
1/n octave
Overall acoustic
Waterfall
Display connections properties
OK
Cancel
Apply

The available event types are below:

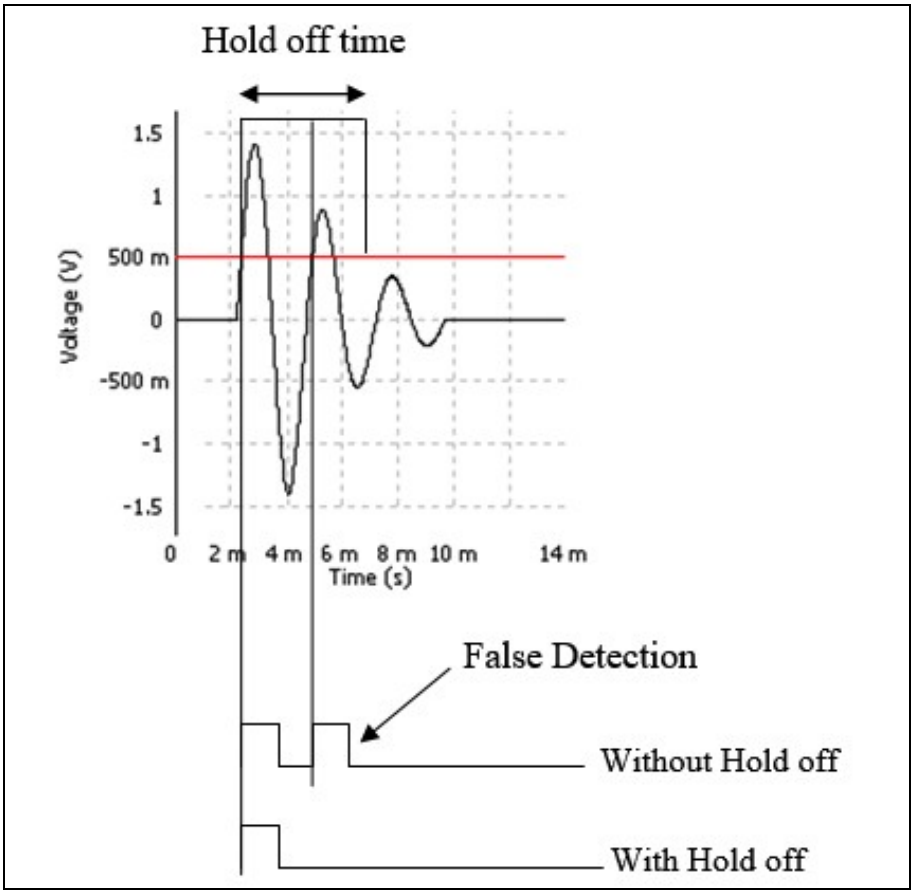
81.3 Edge detection


Edge: Detect when the signal from an input or a recorded track crosses a threshold. This module is used with the analog inputs (tach pulse or hammer impact). This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.

- **Label**: the name of the event (by default Edge n, with 1 <= n <= 2).
- **SourceInput 5 to input 8 are not able to be set as source using an OR35 analyzer.**: selects the signal input source. The user can choose any Front-end fast analog input (in connected mode on-line) or from the Player (in post-analysis mode).
- **Input '***filter***'**: adds a digital filter before the edge detection process. The user can choose any filter from the list of the defined filters.
- **Threshold**: sets the signal threshold for edge detection. The threshold is expressed in the same unit as for the input signal. The value can be adjusted between +/- the full input signal scale (depending on the input range).
- **Slope**: selects the slope of the input signal on which a transition is detected.

Slope	Description
Rise	The events are detected on rising edge of the input signal
Fall	The events are detected on falling edge of the input signal

- **Hold off**: defines the minimum time (expressed in seconds) between the detection of two edges. If a transition is detected before this time has expired since the last valid event then the new edge is rejected. The user can enter any value between 0 and 36000s.

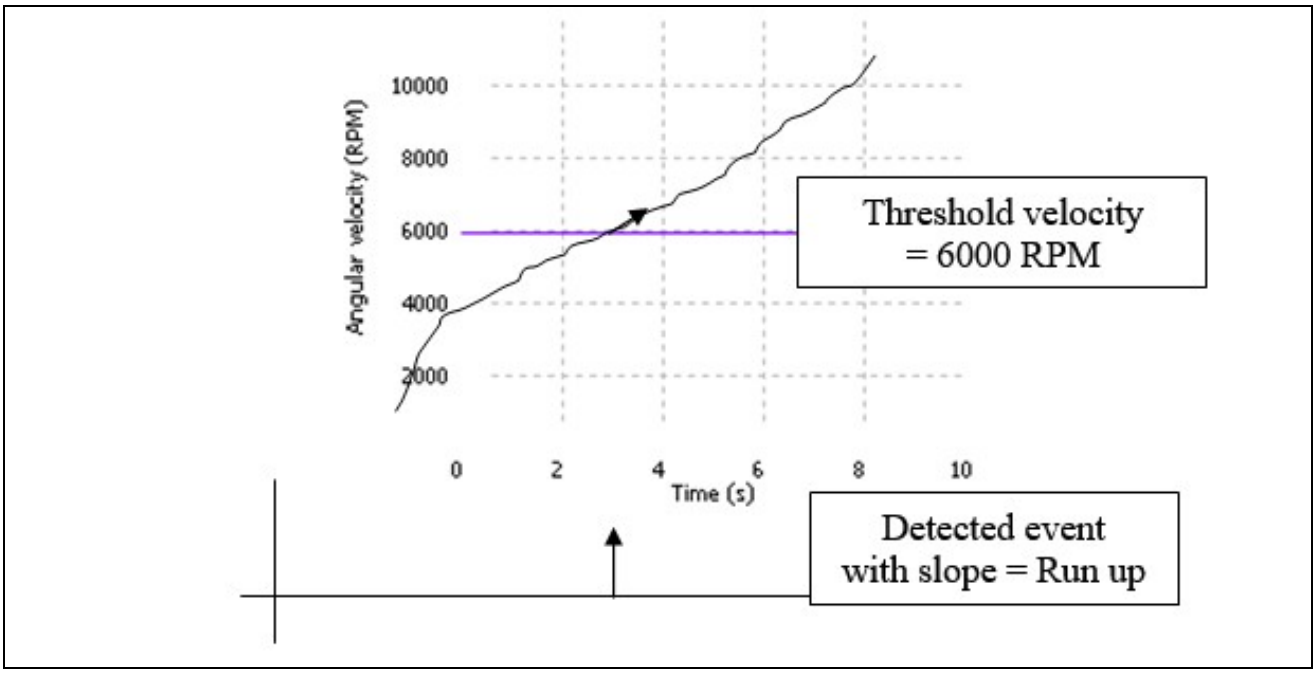


- **Hystersis**: defines the hystersis around the threshold. The value can be adjusted between 0 and the full scale of the input signal (depending on the input range). If Slope is set to RISE, the input signal must go below Threshold - Hystersis before a new event can be detected. If Slope is set to FALL, the input signal must go above Threshold + Hystersis before a new event can be detected. This setting is used to reject false edge detection following, for example, an input signal transition.

81.4 RPM

 RPM: Detect when a tachometer is below or above a specified angular speed. This module is associated with the Tachometer module. You need to first activate it on Tachometer plug in. This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.

- **Label**: the name of the event (by default RPM n, with 1 <= n <= 2).
- **Source**: selects the tach source. The user can choose any active tach as the source of the RPM event.
- **Threshold velocity**: defines the threshold velocity for detecting an event. The user can enter any value between the Min Speed and the Max Speed setting values defined in the tach source.



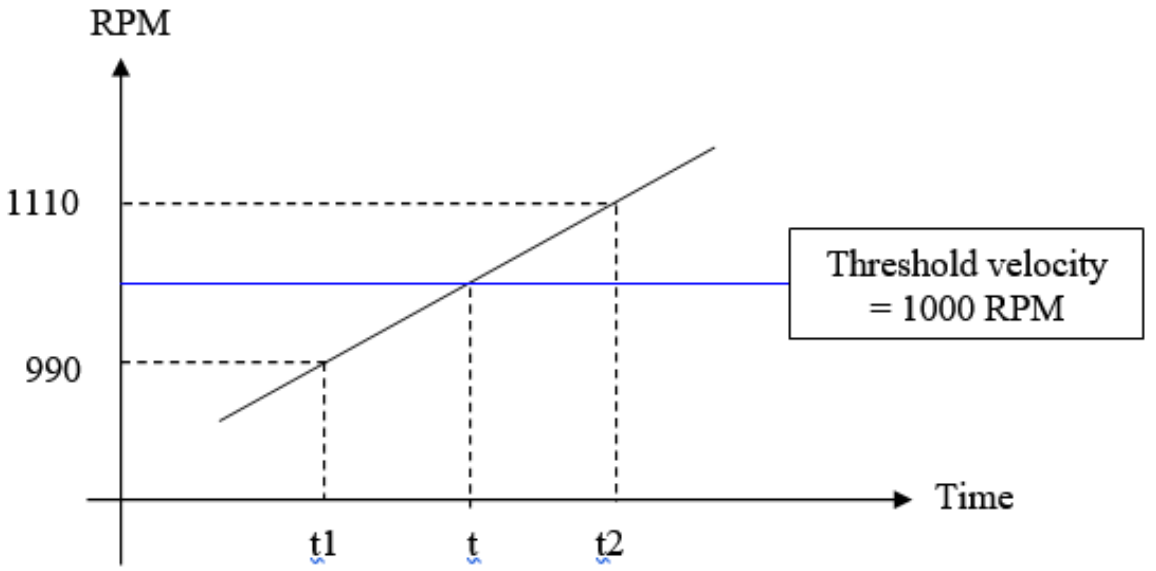
- **Slope**: selects the slope of the tach velocity evolution on which a transition is detected.

Slope	Description
Run up	Events are detected on speed acceleration
Run down	Events are detected on speed deceleration

- **Hystersis**: defines the hystersis around the threshold. The value can be adjusted between 0 and the Max Speed setting of the tach source. If Slope is set to RISE, the velocity must go below Threshold - Hystersis before a new event can be detected. If Slope is set to FALL, the velocity must go above Threshold + Hystersis before a new event can be detected. This setting is used to reject false edges detection following, for example, tach velocity transition.
- **Interpolation**: used for the interpolation of the event date. For example, if Threshold velocity is 1000 RPM and if the tach delivers a revolution at 990 RPM beginning on date t1 and a revolution at 1010 RPM beginning on date t2:
- if the Interpolation is disabled, the event is detected on date t2
- if the Interpolation is enabled, the event is detected on date

t1 + (t2 - t1) * (1000 - 990) / (1010 - 990)

$$\frac{1010-990}{1000-990}=\frac{t2-t1}{t-t1} \qquad t=t1+(t2-t1)\frac{(1000-990)}{(1010-990)}$$

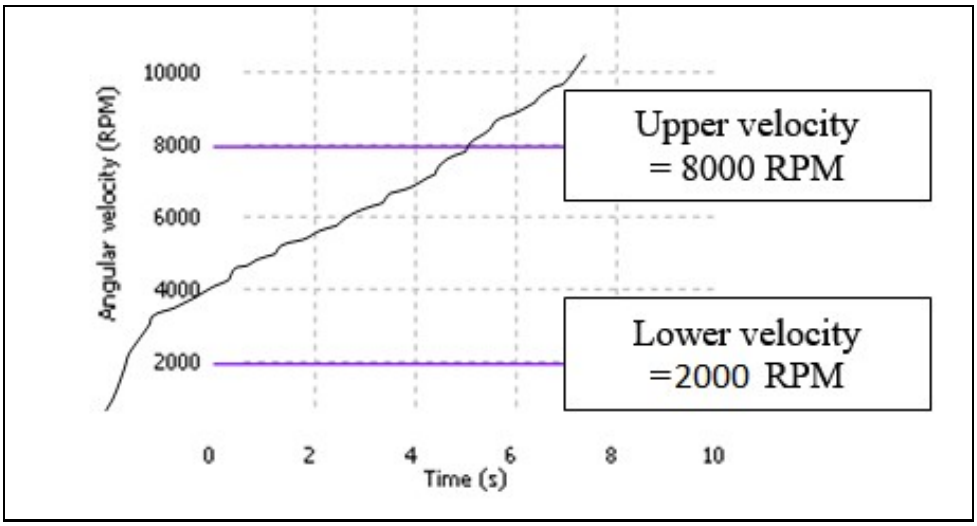


- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.

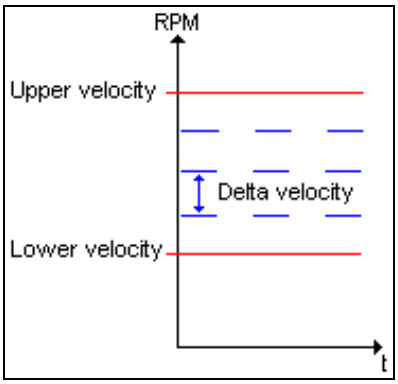
81.5 Delta RPM


Delta-RPM: Same as RPM but generates an event at each step. This module is associated with the Tachometer module. You need first to activate it on Tachometer plug in. It is used to trigger a plug-in by step. This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.

- **Label**: the name of the event (by default Delta RPM n, with 1 <= n <= 2).
- **Source**: selects the tach source. The user can choose any active tach as source of the Delta RPM event.
- **Lower velocity**: the level above which the velocity variation condition is tested for launching the delta RPM event.
- **Upper velocity**: the level below which the velocity variation condition is tested for launching the delta RPM event.



- **Delta velocity**: the variation in velocity that launches the event.



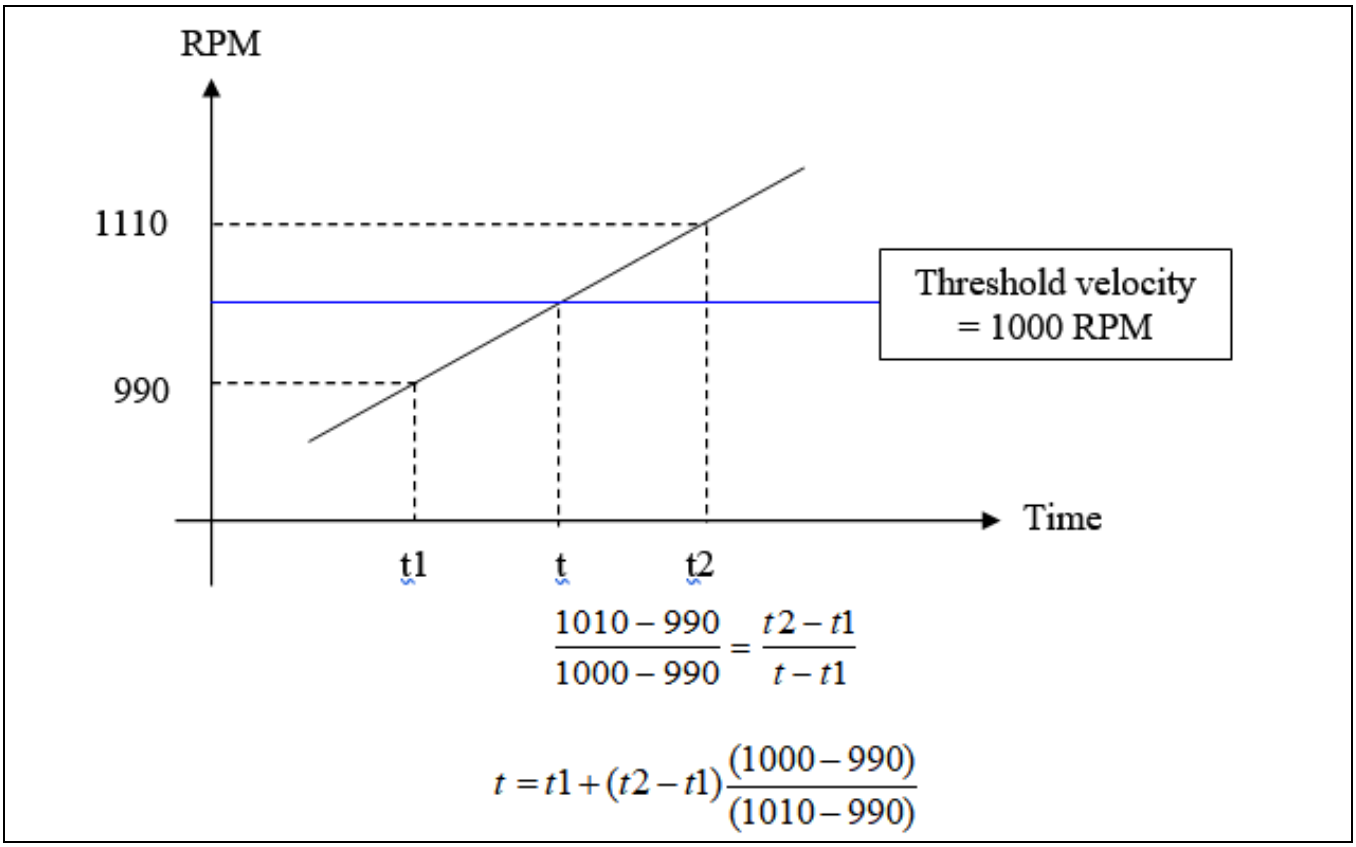
- **Number of events**: the number of events between Upper velocity and Lower velocity (considering Delta velocity).

$$Number\ of\ events = \frac{Uppervelocity - Lowervelocity}{Deltavelocity} + 1$$

- **Slope**: selects the slope of the tach velocity evolution on which a transition is detected.

Slope	Description
Run up	Events are detected on speed acceleration
Run down	Events are detected on speed deceleration
First	The first event detected (during rise or fall) determines the slope of this event.
Any	Events are detected on speed acceleration and deceleration.

- **Interpolation**: Used for the interpolation of the event date. For example, if Threshold velocity is 1000 RPM and if the tach delivers a revolution at 990 RPM beginning at the date t1 and a revolution at 1010 RPM beginning on date t2:
- If the Interpolation is disabled, the event is detected on date t2
- If the interpolation is enabled, the event is detected on date t1 + (t2 - t1) * (1000 - 990) / (1010 - 990)



- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.

81.6 Level


Level: Detect when a signal is below or above a level This module is used with DC inputs (optional) and/or associated with the TDA or Monitor module. This event can be applied to any plug-in analyzer including Waterfall and Recorder.

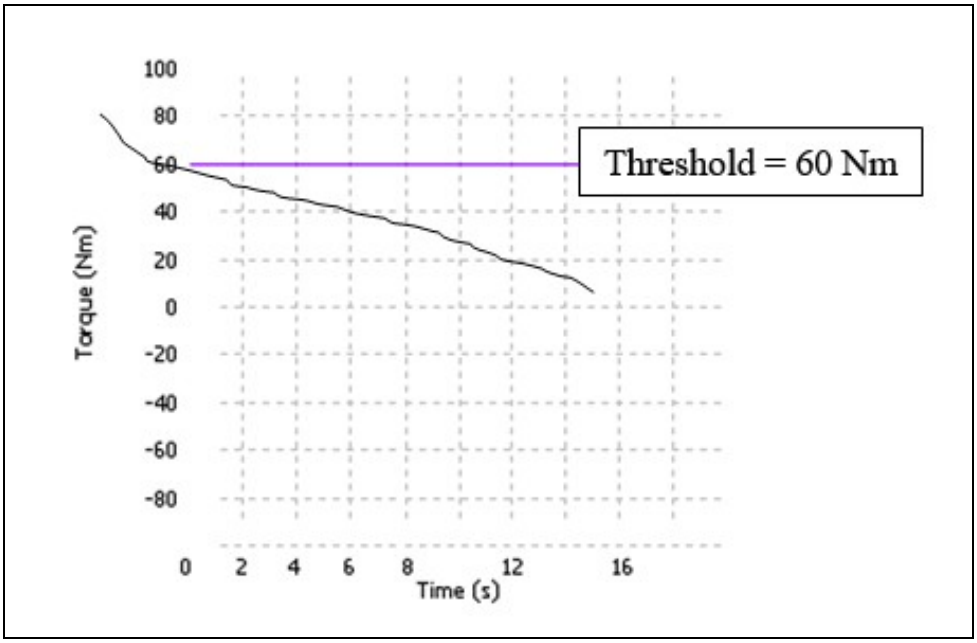
- **Label**: the name of the event (by default Level n, with 1 <= n <= 4).
- **Source**: selects a DC input or a Monitor channel as source of the level event.
- **Type**: the type of measurement for level detection.

Type	Description
DC	measurement of the input DC level
Min	measurement of the minimum signed input level
Max	measurement of the maximum signed input level
RMS	measurement of the input RMS level
Skew	measurement of the input skew level
Kurtosis	measurement of the input kurtosis level

Hidden/fixed: The type is fixed to DC if the source is a DC input.

- **Threshold**: The threshold of the level event. The limitation is +/- Range peak of the source for DC, Min and Max types. The limitation is +/- 20 for skew. The value goes from 1 to 250 for kurtosis and from 0 to Range peak of the source for RMS. This setting can be displayed in dB if the

measurement type chosen is RMS.



- **Status**:

Status	Description
Above	The event is detected if the measured value is above the threshold.
Under	The event is detected if the measured value is below the threshold.

81.7 Delta level

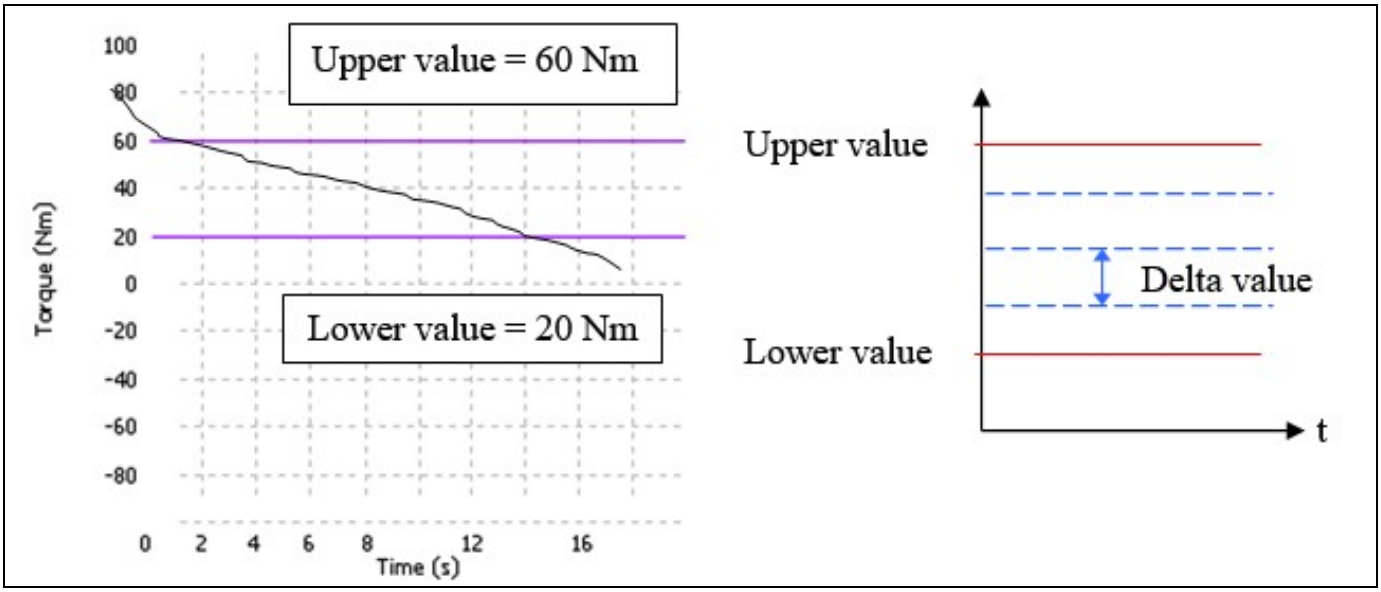

This module is used with DC inputs (optional) and/or associated with the Monitor module. It is used to trigger a plug-in by step. This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.

- **Label**: the name of the event (by default Delta n, with 1 <= n <= 4).
- **Source**: selects a DC input or a Monitor channel as source of the level event.
- **Type**: the type of measurement for delta level detection.

Type	Description
DC	measurement of the input DC level
Min	measurement of the minimum signed input level
Max	measurement of the maximum signed input level
RMS	measurement of the input RMS level
Skew	measurement of the input skew level
Kurtosis	measurement of the input kurtosis level

Hidden/fixed: The type is fixed to DC if the source is a DC input.

- **Lower value**: the lower level of the delta level event. Its minimum value is - Range peak of the source for DC, Min and Max types. It is 0 for RMS, - 20 for skew and 1 for kurtosis. This setting can be displayed in if the measurement type chosen is RMS.



- **Upper value**: the upper level of the delta level event. Its maximum value is Range Peak of the source for DC, Min, Max and RMS types. It is 20 for skew, and 250 for kurtosis. This setting can be displayed in dB if the measurement type chosen is RMS.
- **Delta value**: This setting can be displayed in dB if the measurement type chosen is RMS.
- **Slope**: selects the slope of the level evolution on which a transition is detected.

Slope	Description
Rise	The events are detected on an increasing level
Fall	The events are detected on a decreasing level
First	The first event detected (during rise or fall) determines the slope of this event.
Any	The events are detected on a increasing or decreasing level

81.8 Periodic

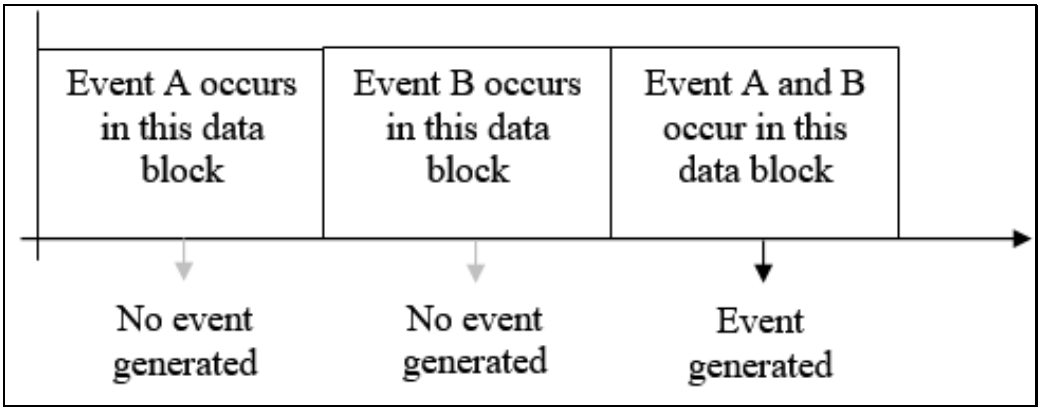

Periodic: Used to trigger a plug-in by periodic step. This event can be applied to any plug-in analyzer including Waterfall and Recorder.

- **Label**: the name of the event (by default Periodic n, with 1 <= n <= 2).
- **Period**: defines the event generation period. An event is generated every Period second (the first one is generated 1 period after the run). The user can enter a value between 2 ms and 1000000 s.

81.9 Combined events


Combined: Generates an event which is the result of a combination of 2 events. Possible combinations are: OR, AND and AFTER.

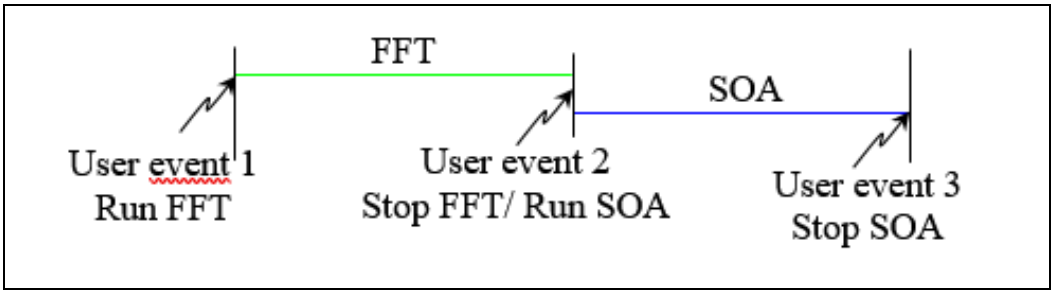
- **Label**: the name of the event (Default: *Combination n*, with 1 <= n <= 2).
- **Event A**: defines the first operand of the combined event. The user can choose any defined event as operand except for a combined event.
- **User**: defines the user used to detect a new event from the two operands, Event A and Event B.

User	Description
A or B	An event is generated when event A or B occurs
A and B	An event is generated when both event A and B occur at the same time (in the same data block = 256 pts) Example: 
A after B	An event is generated when event A occurs after event B.

- **Event B**: defines the second operand of the combined event. The user can choose any defined event as operand except for a combined event.

81.10 User events


User: Generates an event when the operator presses the corresponding event button in the software/remote controller interface. Four user events are available. These events are compatible with the macros. They are particularly useful to run several plug-ins at different time in the same analysis. It can also be put in the control panel or controlled by NVDrive.



- **Label**: Allows to rename the event.
- **Trigger**: The user event?s triggering.

81.11 External Synch


External synch: Properties of the Ext synch trigger inputs.

81.12 Monitoring Solution

If you would like more advanced trigger and actions, please have a look on the the monitoring solution.

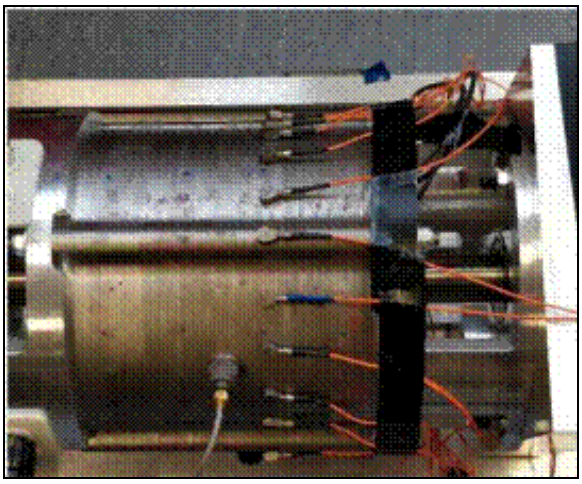
82 NVGate EVHV

82.1 Introduction and Overview

82.1.1 Objectives

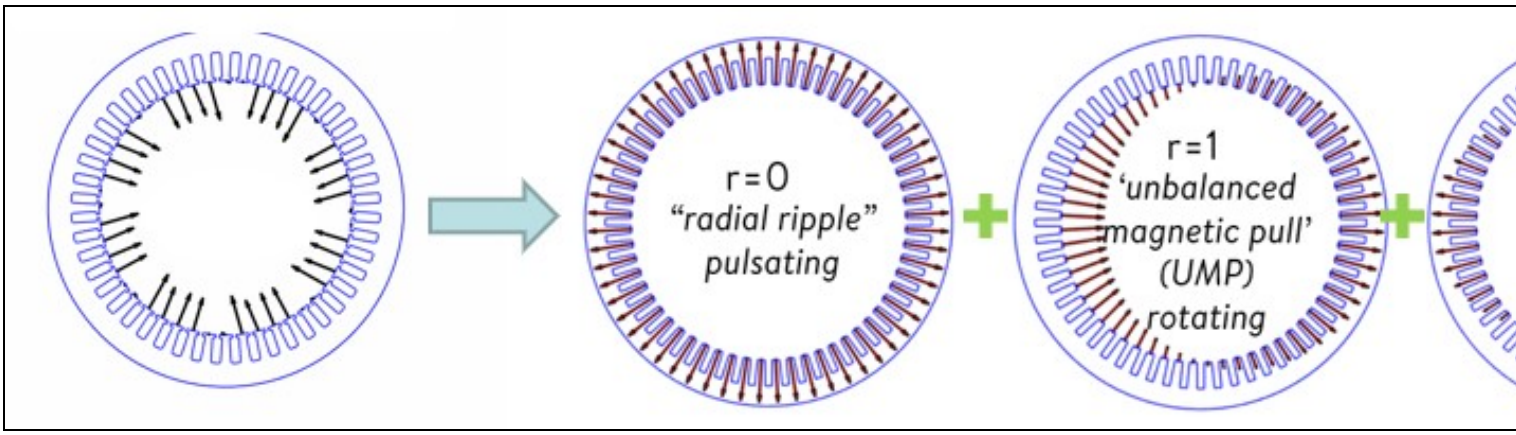
The objective of the EVHV module is to characterize the electromagnetic forces which are responsible for the noise emission of an electric motor. In particular, it will be achieved through 2 main steps:

- eFrequencies determination and displays: They represent the characteristic frequencies that one may expect to find in the spectra. They are based on the specificities of the motor and depend on the RPM. For this reason, they are defined as harmonics.
- Spatiograms analysis and displays: Spatiograms are calculated based on measurements of accelerometers data distributed around the surface of the motor stator as shown in the picture below.



Sensors positioned for Spatiograms analysis

Each spatiogram is representative of a spatial distribution of the Electromagnetic forces. The sum of the participation of each spatiogram leads to the global vibration response. Determining the spatiogram responsible for the vibration harmonic that should be decreased is one of the major objectives of the EVHV module.



Separation of the response in a sum of participating wavenumbers

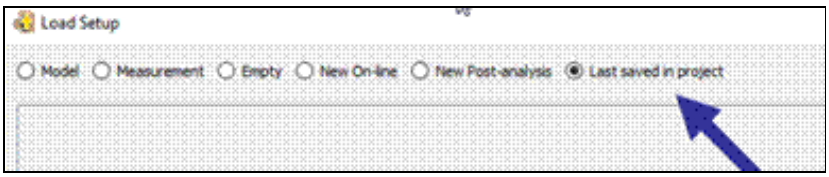
82.1.2 "Getting Started" Tutorial

The following tutorial is based on a provided project called "EVHV App Z12p2" (get it here). To follow the steps below, one should first place this project in the NVGate projects directory. When starting NVGate the following window will display. One should open a project and select "EVHV App Z12p2". This chapter is meant to provide a first global approach in order to go through the main steps.

82.1.3 Open the Project and Load Setup

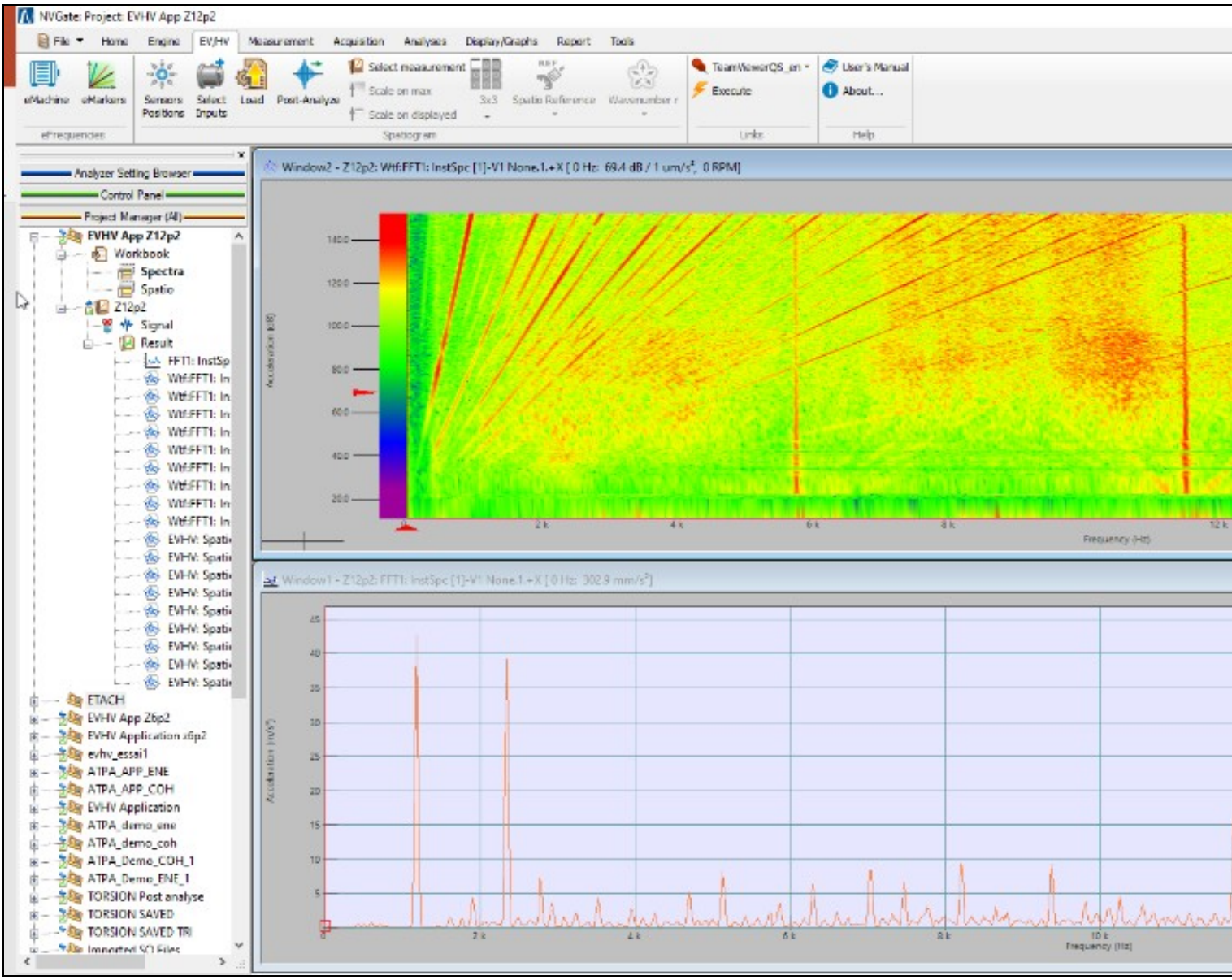


Open project



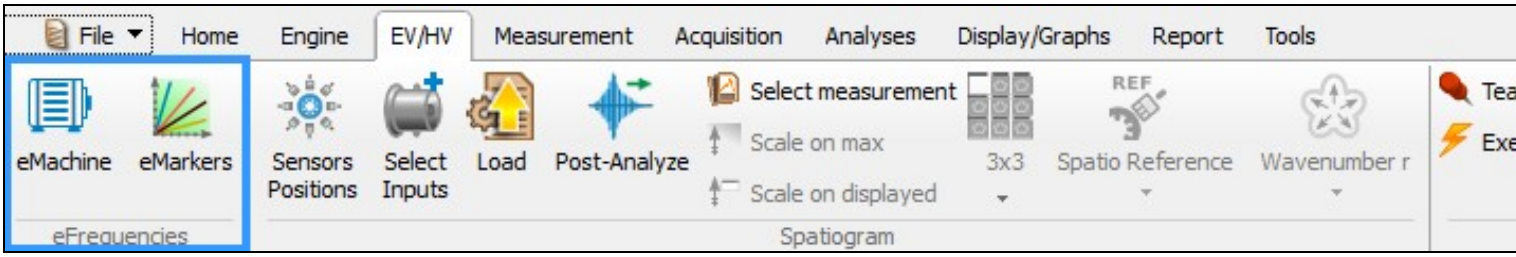
Load Setup, last saved in project

The setup contains 2 layouts: Spectra and Spatio


NVGate: Project: EVHV App Z12p2
File
Home
Engine
EV/HV
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
eMachine
eMarkers
Sensors Positions
Select Inputs
Load
Post-Analyze
Select measurement
Scale on max
Scale on displayed
3x3
Spatio Reference
Wavenumber r
TeamViewerQS_en
Execute
User's Manual
About...
eFrequencies
Spatiogram
Links
Help
Analyzer Setting Browser
Control Panel
Project Manager (All)
EVHV App Z12p2
Workbook
Spectra
Spatio
Z12p2
Signal
Result
FFT1: InstSp
Wtf:FFT1: In
EVHV: Spatio
ETACH
EVHV App Z6p2
EVHV Application z6p2
evhv_essai1
ATPA_APP_ENE
ATPA_APP_COH
EVHV Application
ATPA_demo_ene
ATPA_demo_coh
ATPA_Demo_COH_1
ATPA_Demo_ENE_1
TORSION Post analyse
TORSION SAVED
TORSION SAVED TRI
Window2 - Z12p2: Wtf:FFT1: InstSpc [1]-V1 None,1,+X [0 Hz 69.4 dB / 1 um/s², 0 RPM]
Acceleration (dB)
Frequency (Hz)
Window1 - Z12p2: FFT1: InstSpc [1]-V1 None,1,+X [0 Hz 302.9 mm/s²]
Acceleration (m/s²)
Frequency (Hz)

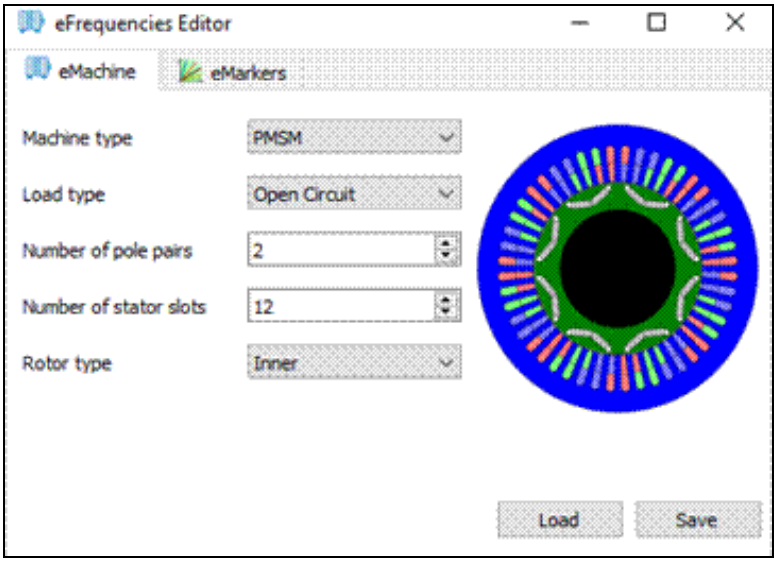
Display layout 1 called Spectra

82.1.4 Checking the eFrequencies



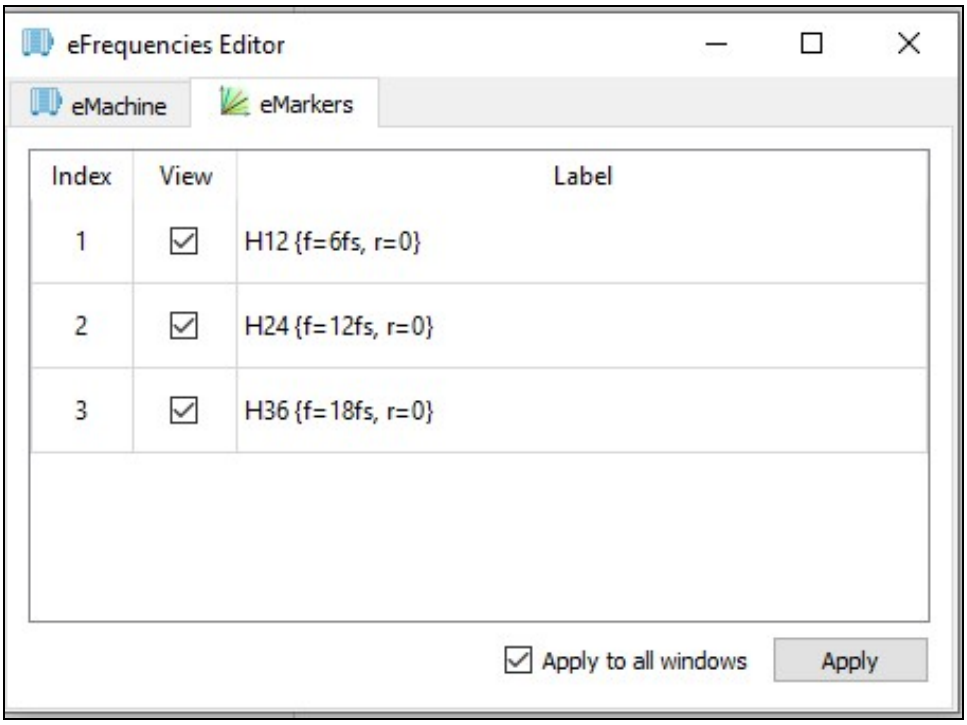
EV/HV ribbon

eMachine should be clicked to access to the following dialog. At this stage, one can select the main characteristics of the eMotor.



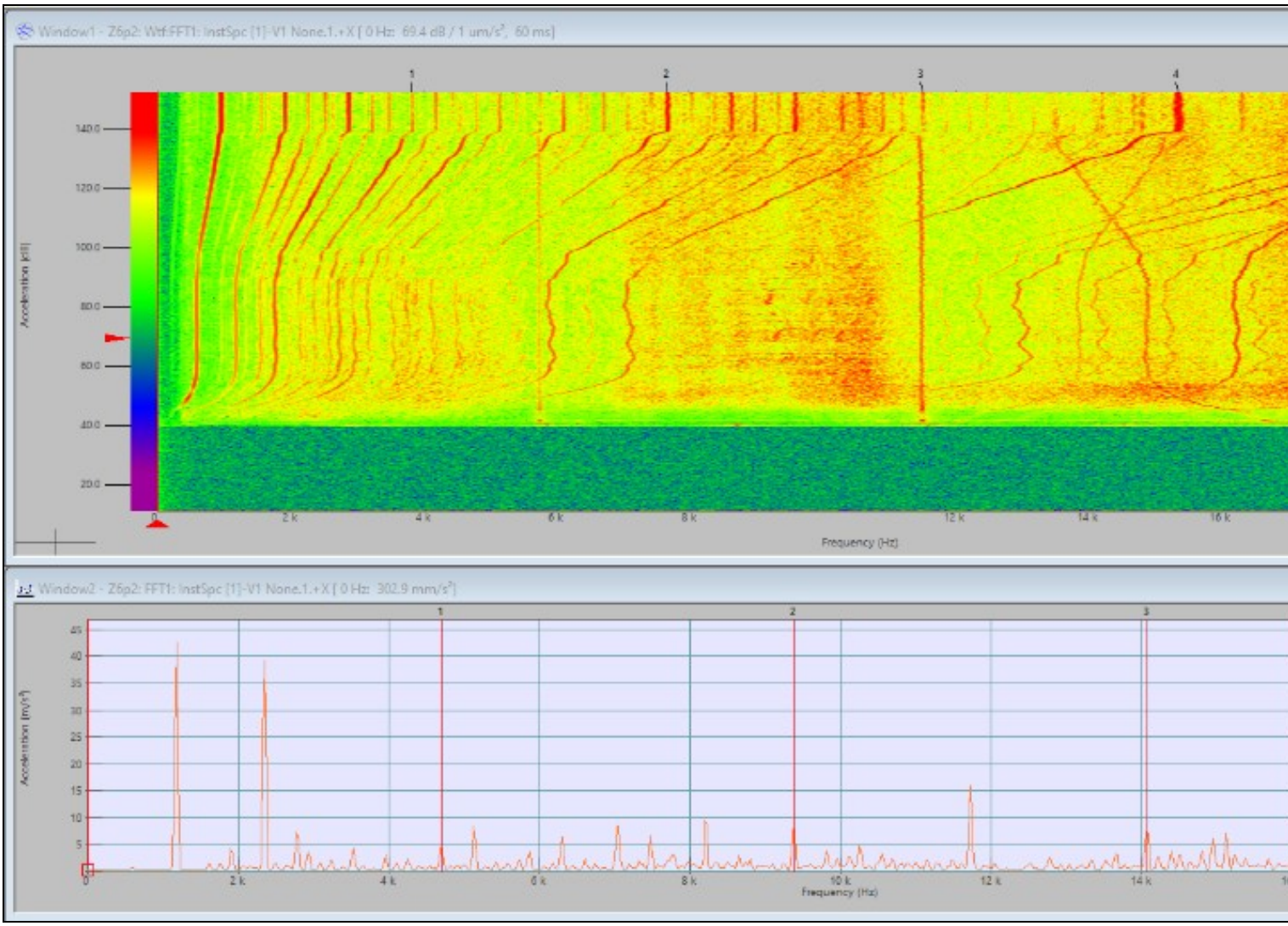
Machine definition

When the machine is configured, one can press Save. The user goes automatically to the following dialog which is the "eMarkers" one.



eMarkers table

When pressing "Apply" the eMarkers will be displayed on the graphs of the current layout.


Window1 - Z6p2: Wtf-FFT1: InstSpc [1]-V1 None.1.+X [0 Hz 69.4 dB / 1 um/s², 60 ms]
Acceleration [dB]
Frequency (Hz)
Window2 - Z6p2: FFT1: InstSpc [1]-V1 None.1.+X [0 Hz 302.9 mm/s²]
Acceleration (m/s²)
Frequency (Hz)

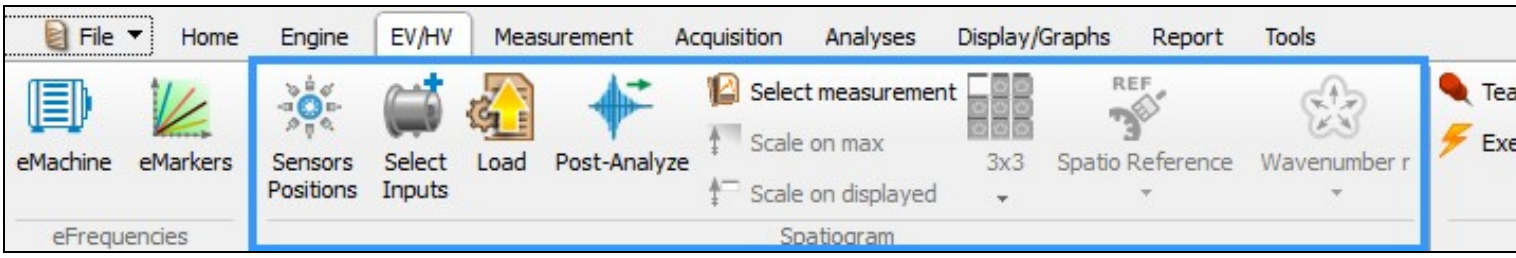
Spectra with the eMarkers

The eMarkers dialog should be closed by clicking on the cross on the top right hand-side.

Change the Layout to reach layout2 (called Spatio): Changing the layout can be achieved by clicking on 

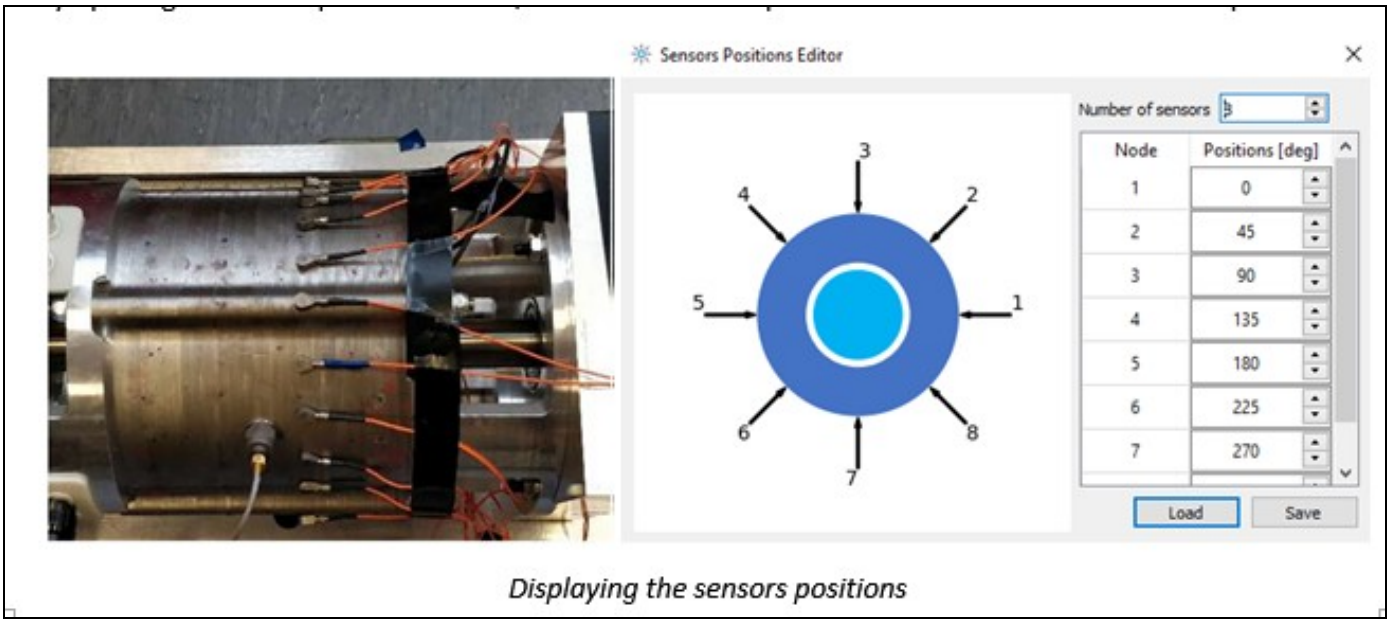
which is located in the "Measurement" tab. A keyboard shortcut also exists: [CTRL+SPACE].

82.1.5 Displaying Spatiograms



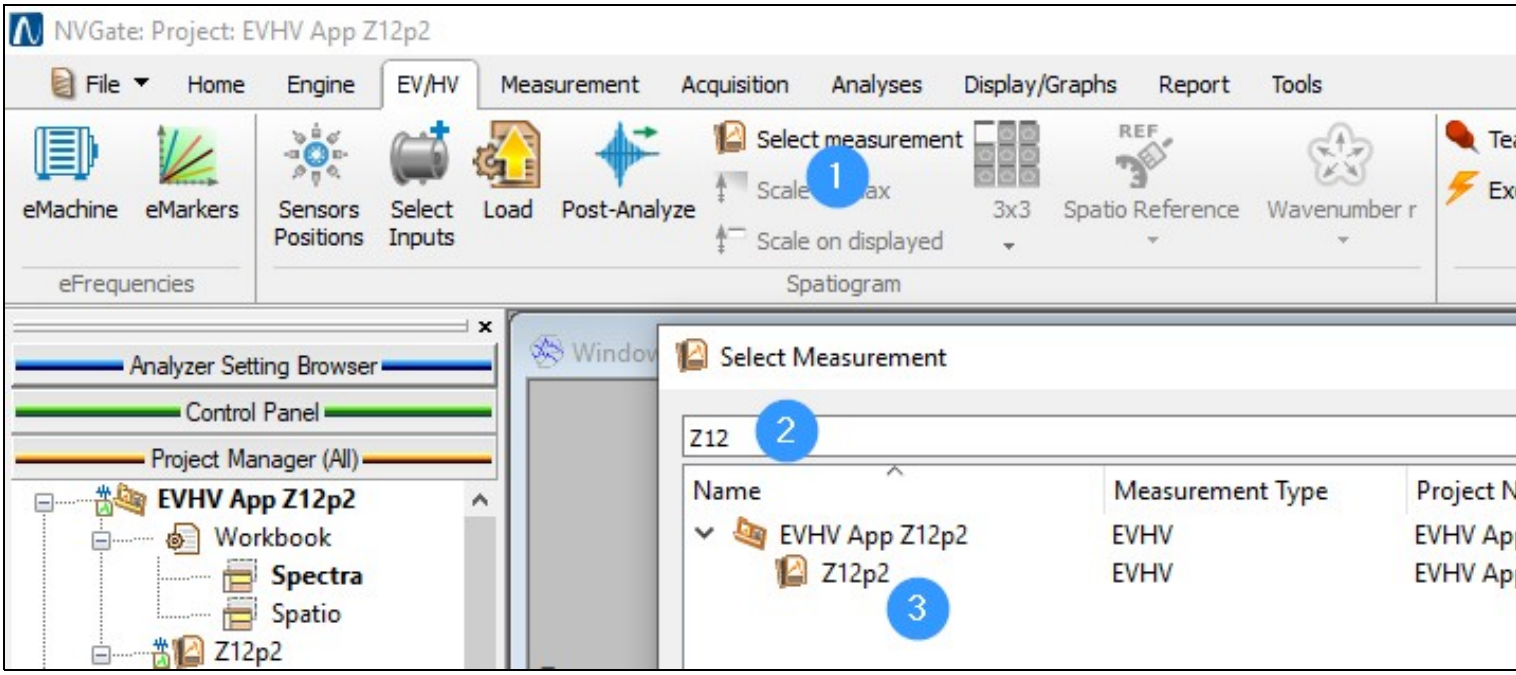
Icons linked to the display of the spatiograms

By opening the  Sensor Positions editor, one can check the positions that were saved in the setup.



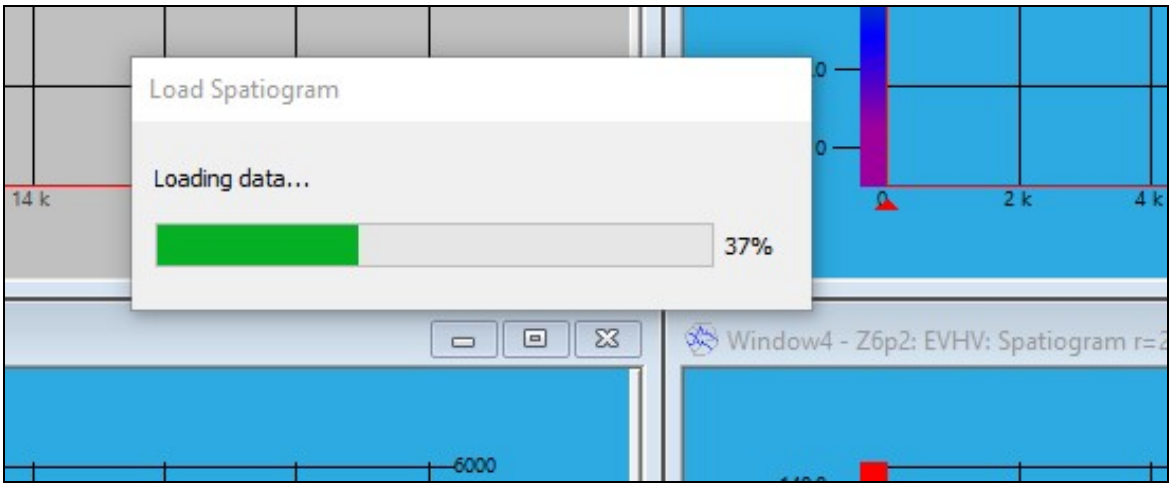
Displaying the sensors positions

The next step is to select a measurement. In the provided project and its contained measurement, spatiograms are already calculated. One should press the icon "select measurement" as shown below. In the dialog that follows, one should type in the filtering area. For example: "Z12". This will allow you to easily find the appropriate measurement.



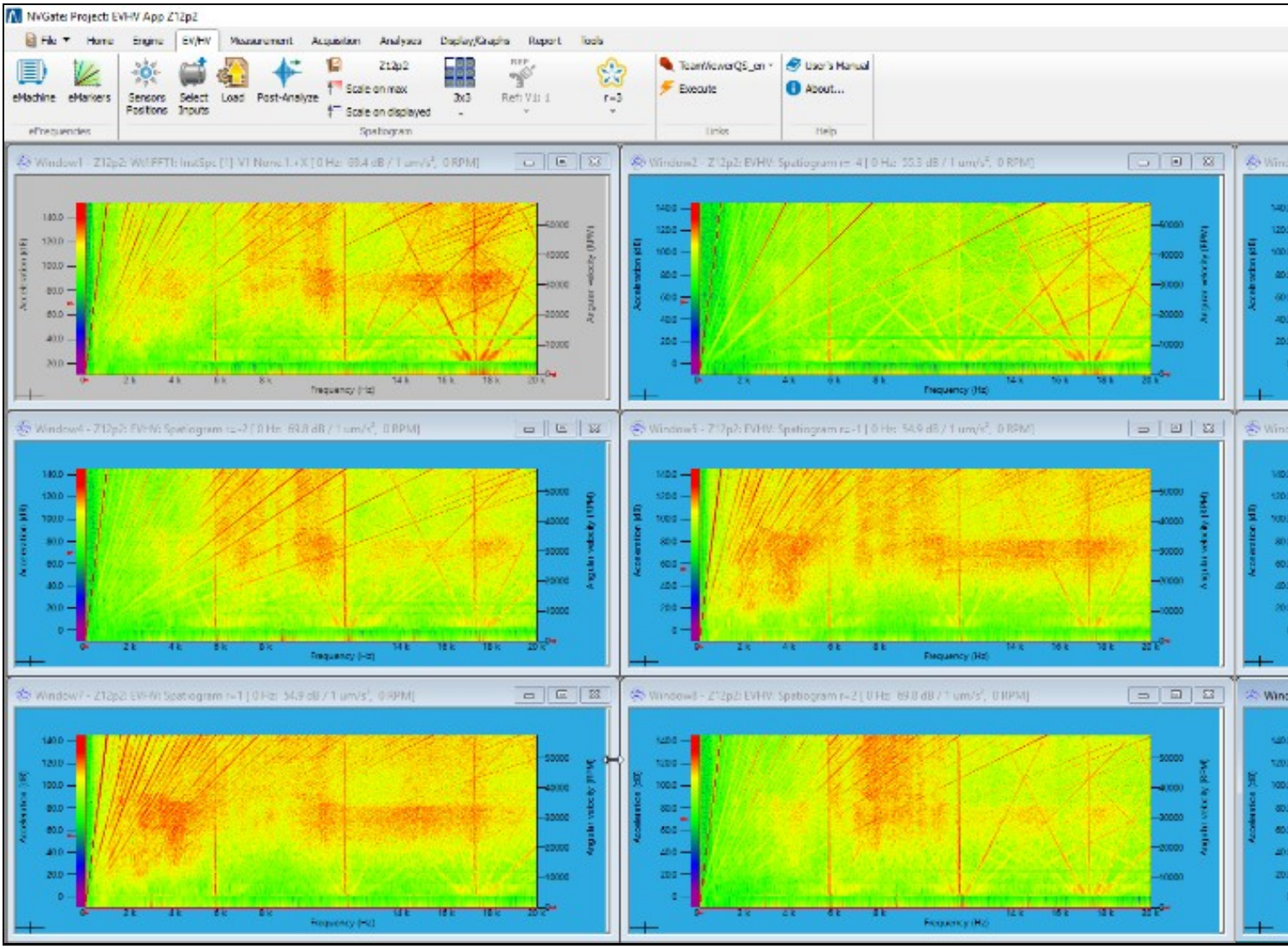
Selecting a measurement

If a spatiogram has not already been calculated, at this point, spatiograms for all wavenumbers will be loaded and displayed as you can see in our below example. Please note that there will be one spatiogram per wavenumber.



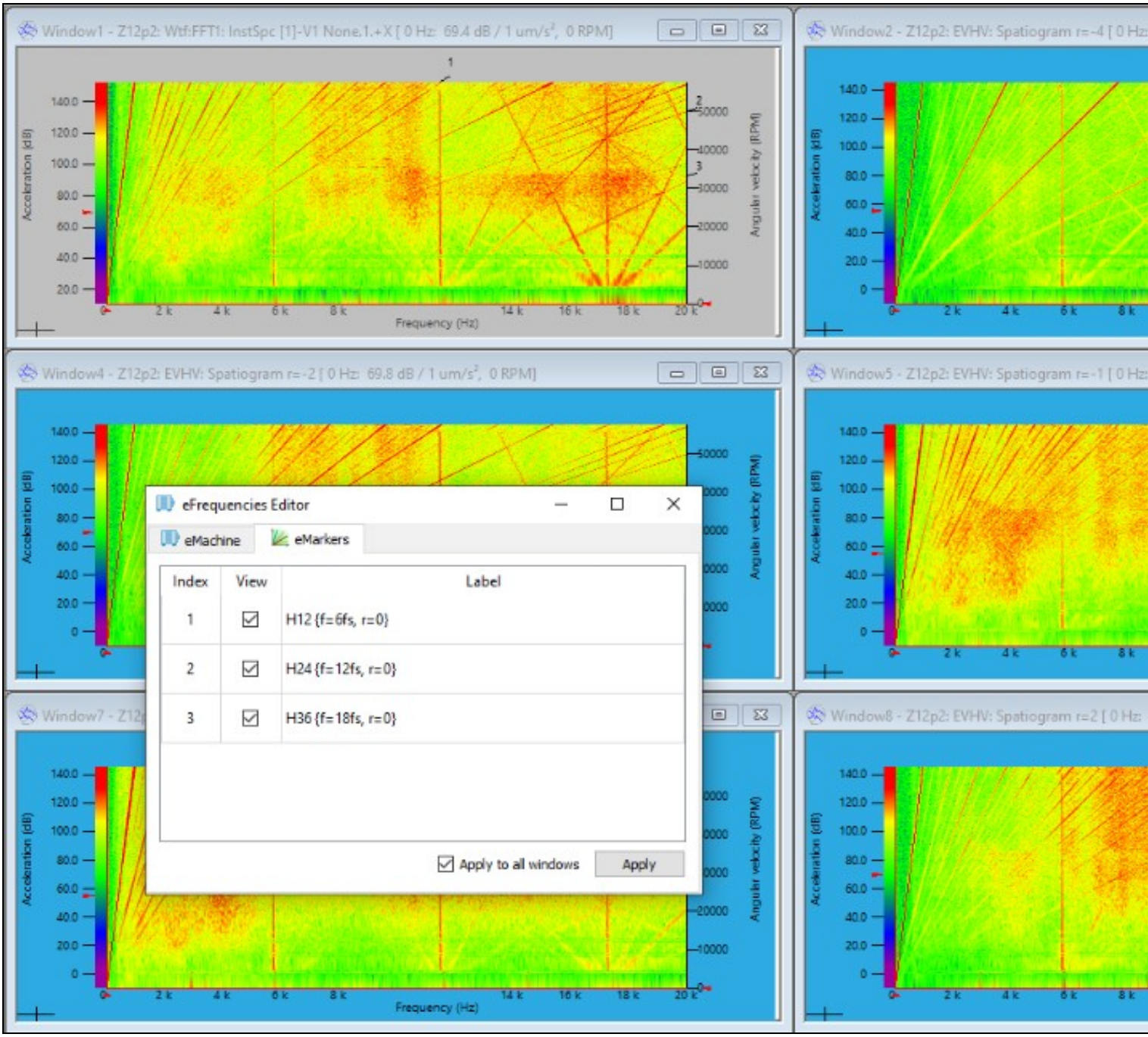
Loading the Spatiograms

Following that action, the spatiograms are automatically scaled and displayed as follows.



Spatiograms displays

- The spatiograms are displayed here using the 3*3 configuration.
- The left top window is a reference spectrogram, the others are spatiograms
- The spatiograms are automatically scaled by using the default "scale on max display option". It takes the Max of all results and set it as the maximum value of the scale.
- We want now to find the participating wavenumbers to the specific harmonic of interest. As an example, we want to know what the participating wavenumbers to H12 are (Index 3). We see that the wavenumber 0 is clearly the highest contributor to H12.
- Applying the eMarkers, confirms that emarker3 is placed on the spatiogram.



Applying eMarkers to the Spatiograms

When using the displays:

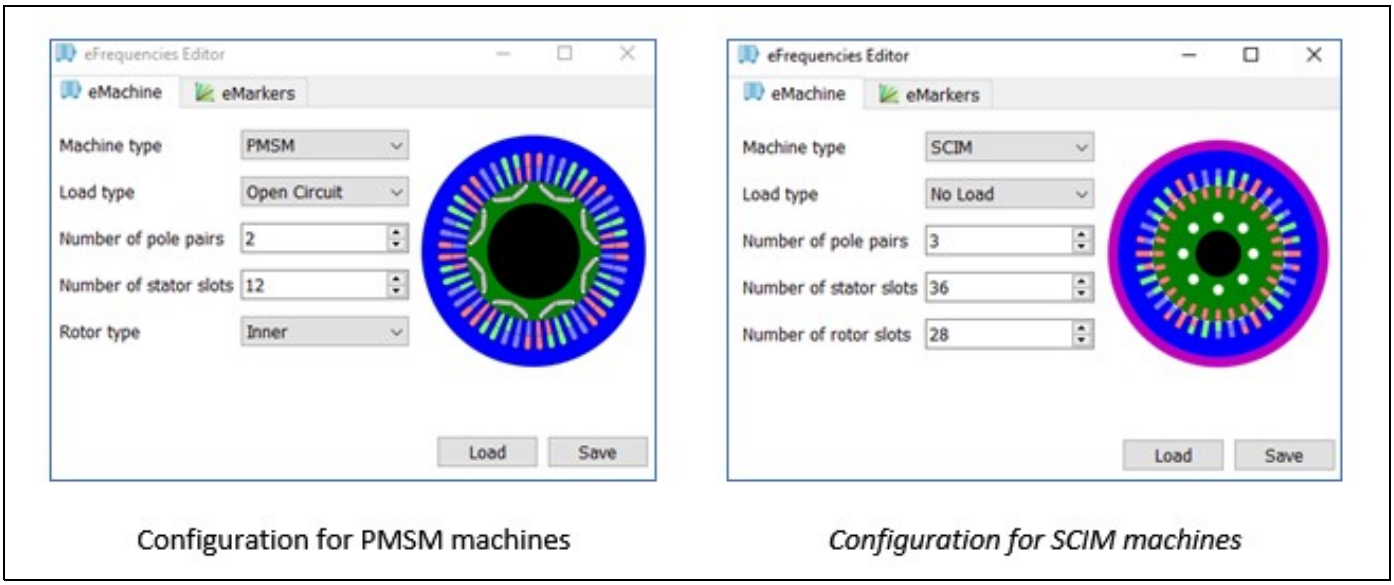
- The windows configuration can be changed using 
- The scaling can be updated using the Scale on Max  or the scale on displayed 
- The reference spectrogram (after selecting it) can be changed by using 
- The wavenumber for each spatiogram can be changed by using 

82.2 eFrequencies: from eMachine Setup to eMarkers Display

There are 2 main steps in the determination of the eFrequencies: the machine description achieved through the eMachine tab  and the eMarkers tab  where the eFrequencies are calculated.

82.2.1 eMachine

By clicking on  , one displays the following dialog. Two main types of machines are configurable: PMSM machines and SCIM machines.



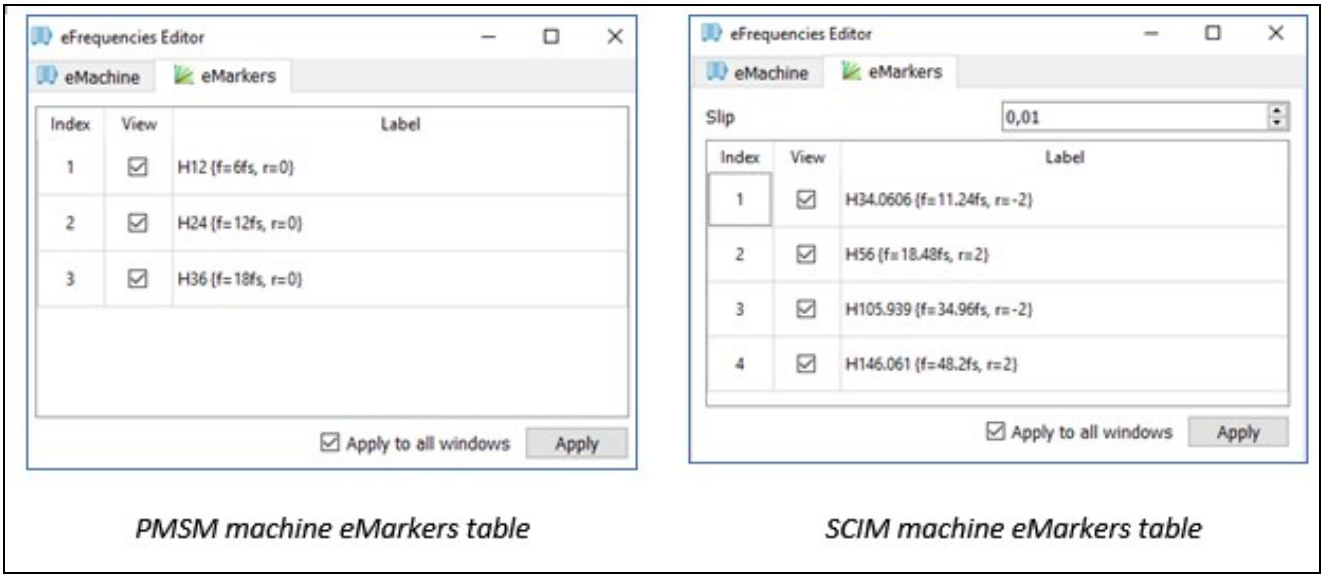
One can keep this configuration in the workbook of the project by pressing SAVE. After pressing SAVE, the eMarkers tab opens automatically.

One can load an eMachine by pressing LOAD. When opening a project with its associated workbook, the eMachine saved in the workbook of that project will be automatically loaded.

The configuration parameters depend on the type of machine and they can be seen in the above example.

82.2.2 eMarkers

The eMarkers associated to the eMachine can be displayed by clicking on the following icon  From the table one can apply the eMarkers to the relevant graphs (spectra, spectrograms, spatiograms).



One can choose to whether or not to have them displayed by activating/inactivating the VIEW checkbox.

When displaying eMarkers for a SCIM machine, one should setup the SLIP as well (between 0 and 1).

The tool tip of each eMarker will provide more detail about the eMarker. To see it, the eFrequencies editor needs to be active and one needs to hold the mouse for one second over the harmonic.

One should read the table using the following notations:

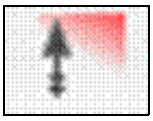
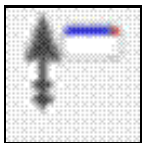
- H: Harmonics of the rotating speed
- f: frequency
- fs: electric stator frequency
- r: wavenumbers

82.3 Spatiograms: from Acquisition to Display

Spatiograms allow us to evaluate the contribution of each wavenumber to the vibration response. This is done by comparing all the spatiograms to one reference spectrogram. Spatiograms are calculated offline based on instant spectra waterfalls using the motor RPMs or time as the z axis reference. If the spatiograms are not contained in the project, they are automatically calculated when selecting the measurement.

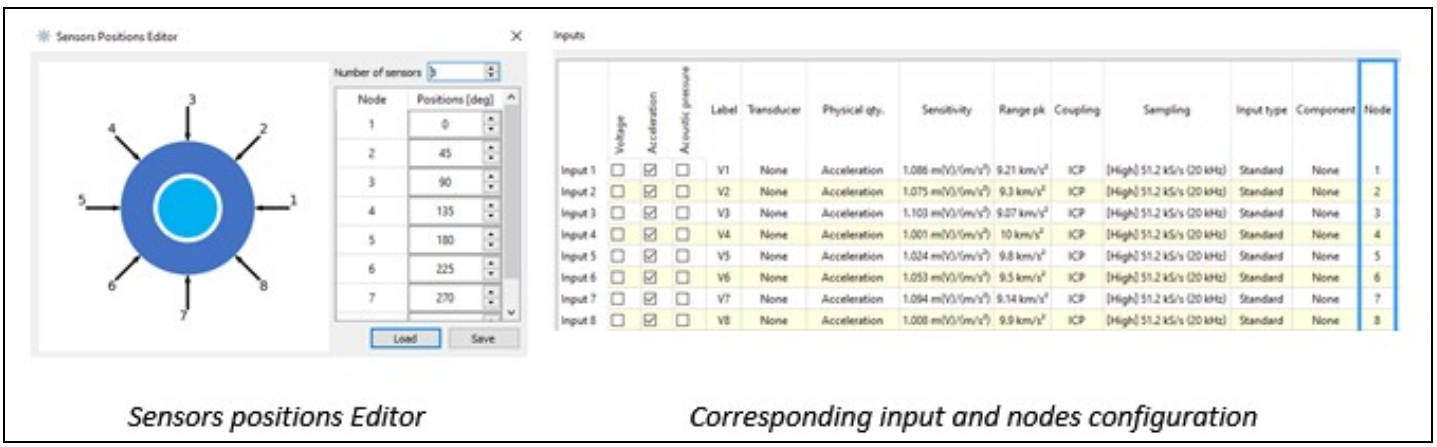
In the spatiograms ribbon area the following actions can be achieved:

	Sensors positions	Allows to specify the positions of the accelerometers used to measure and calculate the spatiograms.

	Select inputs	Allows access to the inputs configuration. This is used to setup the instrument to acquire the data required to calculate the spatiograms.
	Load	Allows you to load a measurement setup. One can, for example, reload a measurement setup which was used for a previous measurement.
	Post analyze	Allows you to post analyze a signal that was recorded.
	Select measurement	Allows you to select the measurement containing the results. If the measurement already contains the spatiograms, they will be displayed. Otherwise they will be recalculated.
	Scale on Max	Allows you to rescale all spatiograms with the same Max scale. This max scale is the Max value contained in all spatiograms. This icon is available when a spatiogram is active. It is greyed when a reference spectrogram is active.
	Scale on Displayed	Allows you to rescale all spatiograms with the same Max scale. This max scale is the Max value contained in all the displayed spatiograms. This icon is available when a spatiogram is active. It is greyed when a reference spectrogram is active.
	Windows configuration	Allows you to choose the windows configurations. It also allows you to refresh the display.
	Reference spectrogram selection	Allows you to select the reference spectrogram to be displayed. The associated node is also shown as "Ref: [input label]: node number". This icon is only active when the spectrogram window is active.
	Spatiogram selection	Allows you to select the spatiogram to be displayed by selecting its associated wavenumber. This icon is only active when the spectrogram window is active.

82.3.1 Sensors Positions

To allow the spatiograms to display the sensors, positions need to be defined. This is achieved through the "Sensors Positions Editor"  as displayed below.



Sensors positions Editor *Corresponding input and nodes configuration*

The node defined in this window needs to be the same ones as the ones used in the input's configuration.

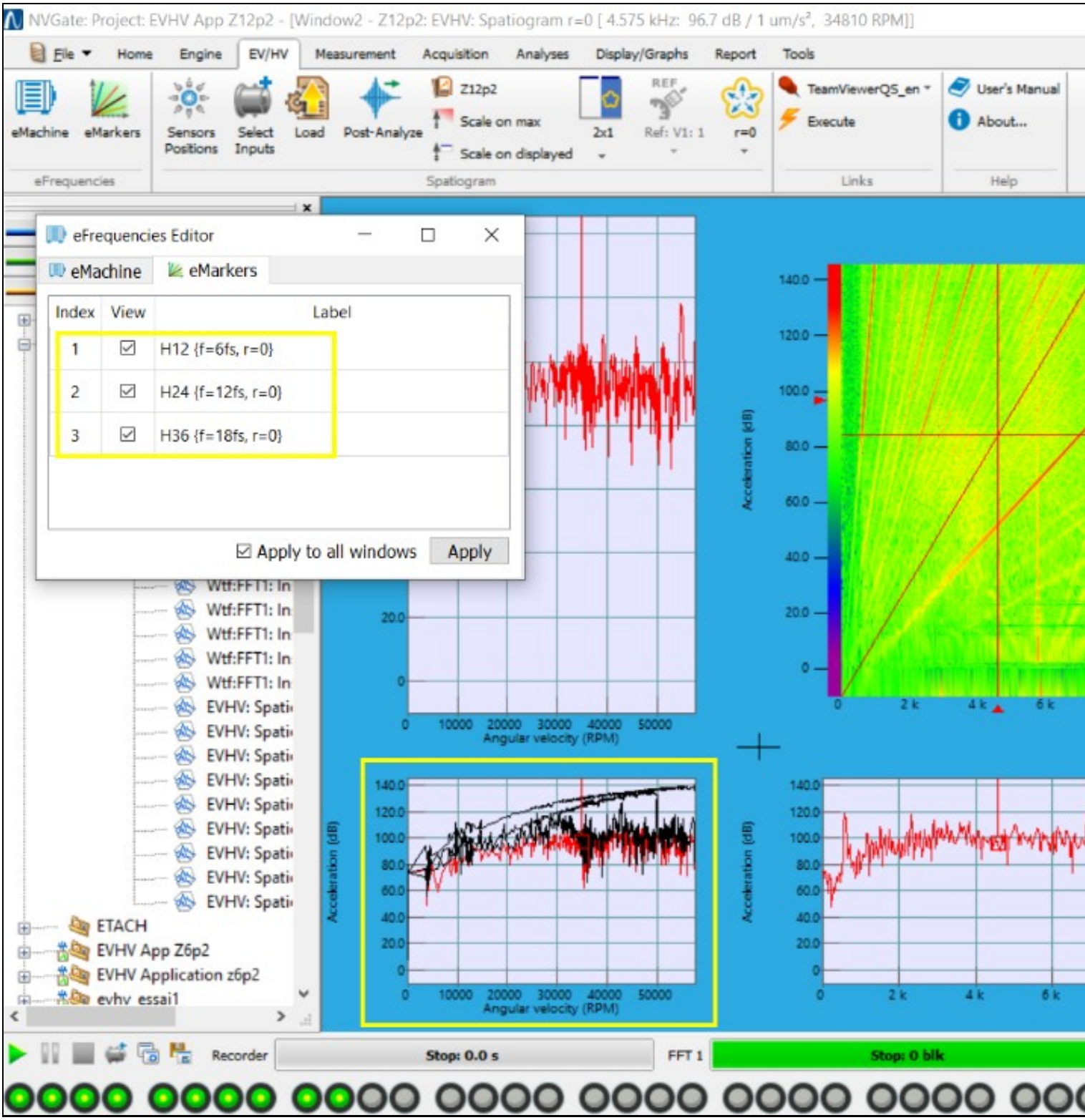
The sensors position setup can be saved in the project workbook using the SAVE button. It can be reloaded using the LOAD button. When loading the project, its associated setup is loaded as well.

82.3.2 Displaying Spatiograms

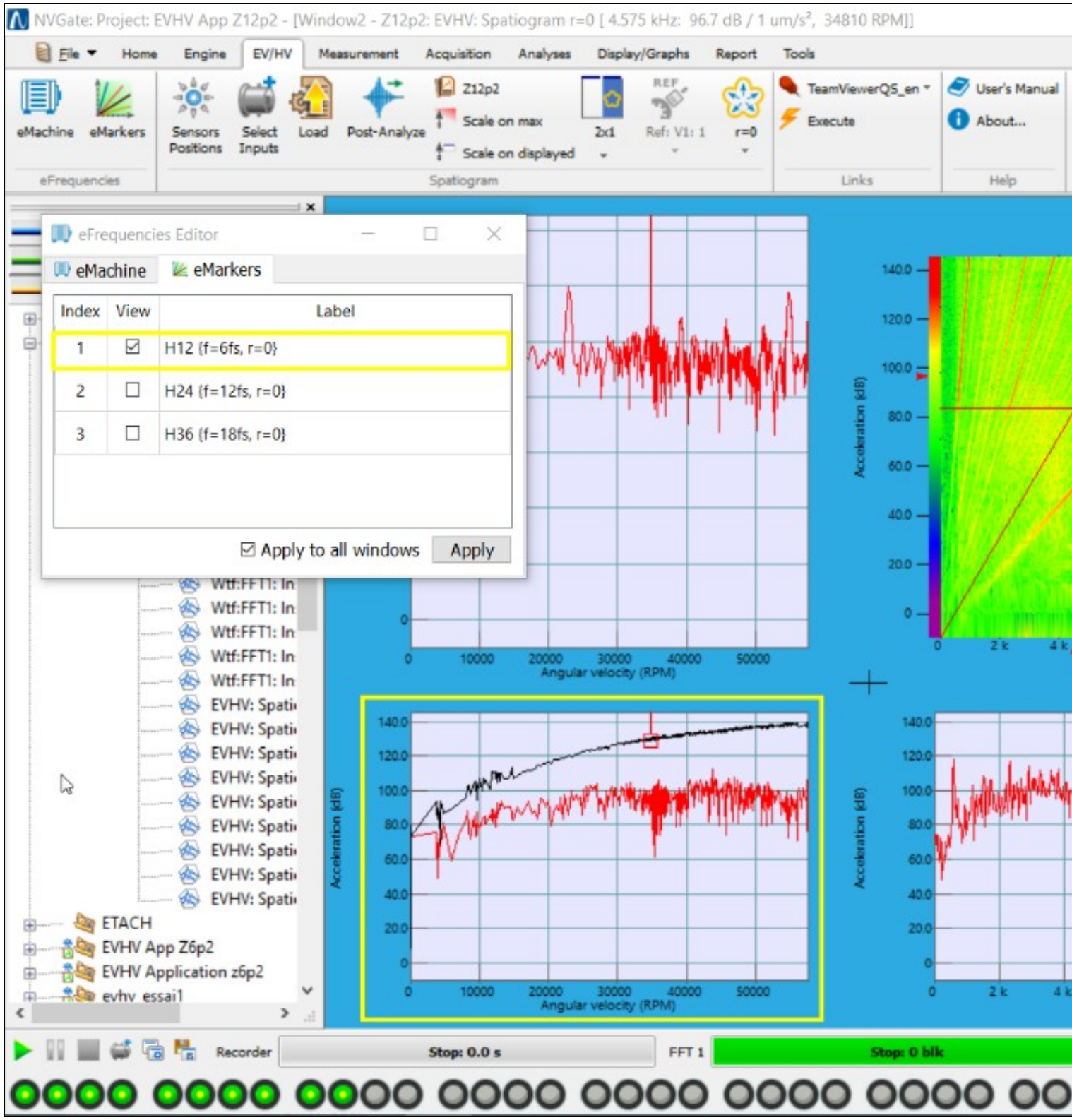
Spatiograms are displayed by first selecting the measurement using  and selecting the desired wavenumbers using  . Spatiograms are all displayed with a blue background to distinguish them specifically from the Spectrograms.

There is a shortcut that allows you to easily change wavenumbers. One should select the spatiogram that is to be modified and use [CTRL]+ [up and down arrows].

In order to fully use the content of the Spatiograms, one should apply the markers on the spatiograms and open the section using the left bottom cross. If the spatiogram contains eMarkers, the bottom left section will show the profiles of the eMarkers.


NVGate: Project: EVHV App Z12p2 - [Window2 - Z12p2: EVHV: Spatiogram r=0 [4.575 kHz: 96.7 dB / 1 um/s², 34810 RPM]]
File
Home
Engine
EV/HV
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
eMachine
eMarkers
Sensors Positions
Select Inputs
Load
Post-Analyze
Z12p2
Scale on max
Scale on displayed
2x1
Ref: V1: 1
r=0
TeamViewerQS_en
Execute
User's Manual
About...
eFrequencies
Spatiogram
Links
Help
eFrequencies Editor
eMachine
eMarkers
Index
View
Label
1
H12 {f=6fs, r=0}
2
H24 {f=12fs, r=0}
3
H36 {f=18fs, r=0}
Apply to all windows
Apply
Wtf:FFT1: In
EVHV: Spati
ETACH
EVHV App Z6p2
EVHV Application z6p2
evhv_essai1
Acceleration (dB)
Angular velocity (RPM)
Recorder
Stop: 0.0 s
FFT 1
Stop: 0 blk

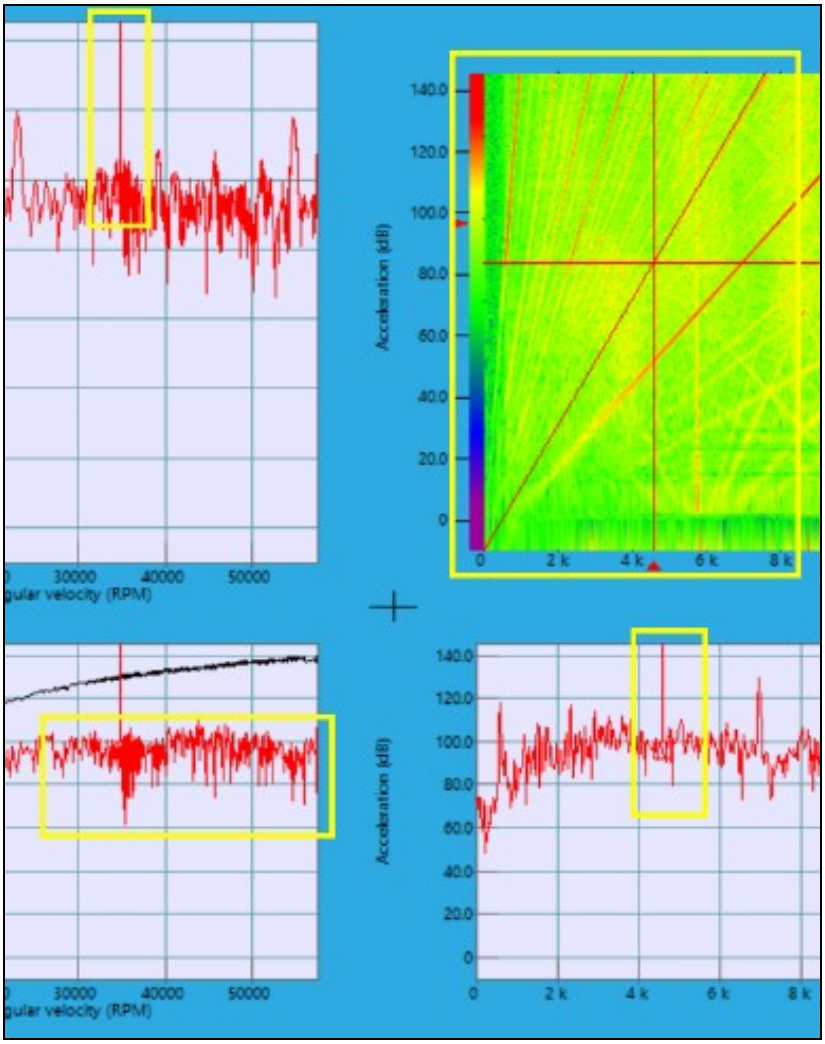
Showing all eMarkers contained in Spatiogram 0



Selecting all active eMarkers contained in Spatiogram 0

The order section cursor is also active and can be used to compare the eMarkers section to other order sections.

One can grab the cursor in each of the sections to position it at the right frequency or right RPM (or time).
The spatiograms will follow the preferences setup for the colormaps (dB by default). It can also be displayed as a 3D graph if desired [Lin by default]. As described earlier, and as the EVHV module is integrated in NVGate, it will benefit of all NVGate standard functions. For more details the NVGate user's manual should be consulted.



Order profile cursor

82.4 Links

The links group allows you to add any additional dedicated module which would be optionally written as a macro or an external program. It should be placed in the LINKS directory of NVGate. If this is done, it will appear in the list.

- Selection of an external application or macro to be started
- Execute the application

82.5 Help

The help section allows you to access 2 main features:

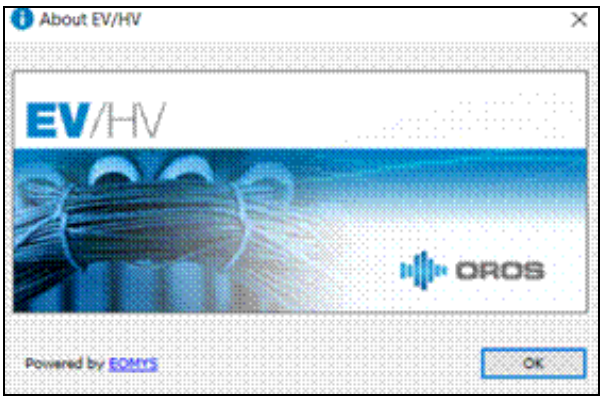


This icon allows you to start the EVHV module user's manual



This icon allows you to display the "About ?" information

The EVHV module has been developed thanks to a cooperation between OROS and EOMYS who is specialist in Electromagnetic Noise and Vibration. Credits to EOMYS are given in this About dialog.



The About section

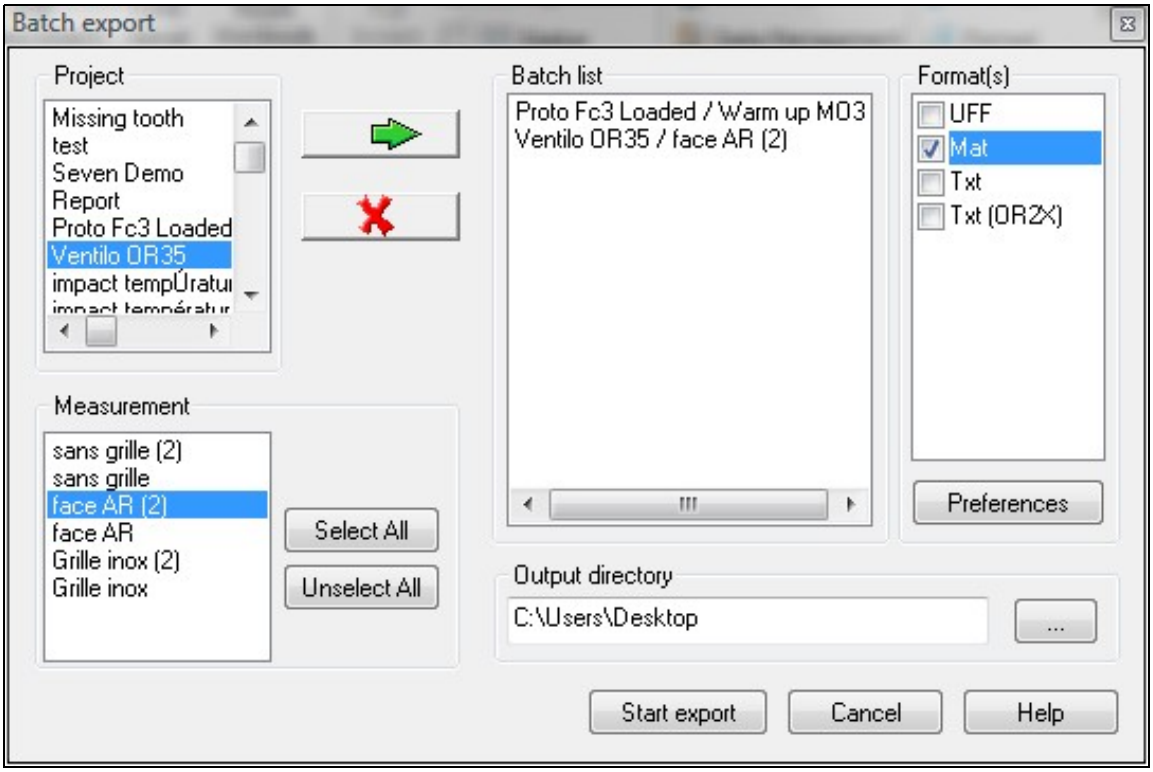
83 import

83.1 Export



83.1.1 Result files

Export results from the project manager to a user specified directory in various data format.



Project: Lists the projects that contain measurements. Only one project can be selected.

Measurement: Lists the measurements in the project selected. Select one or several measurements and click on the add button.

Batch list: Contains all the measurements that will be converted. Use the add/remove button to modify list content.

Format: This is the output format. The formats available are:

Result	Signal
Mat: to be used with Matlab	Mat: to be used with Matlab (max 4.7 Go file)
Txt: usable by any text or spreadsheet editor - more info about .txt	SDF: Standard data format
UFF: Universal File Format	UFF: Universal File Format
	Wav audio: Wav file, re-sampled to standard audio frequency (44.1, 48, 96 kHz) / 16 bit . To be used by any audio player
	Wav: Standard wav format 16 bit, usable with OR2X technology
	Txt: Text usable by any text or spreadsheet editor

See User preferences- § Export" topic for more details

Output directory: The location on the disk where the files will be exported. During the export, a directory will be created for each project, and will contain the exported files corresponding to all selected measurements.

83.1.1.1 Signals files

Export Signal from the project manager records to a user specified directory in various data format.

See details from previous § Export result files

83.1.1.2 Import



83.1.1.2.1 Import project

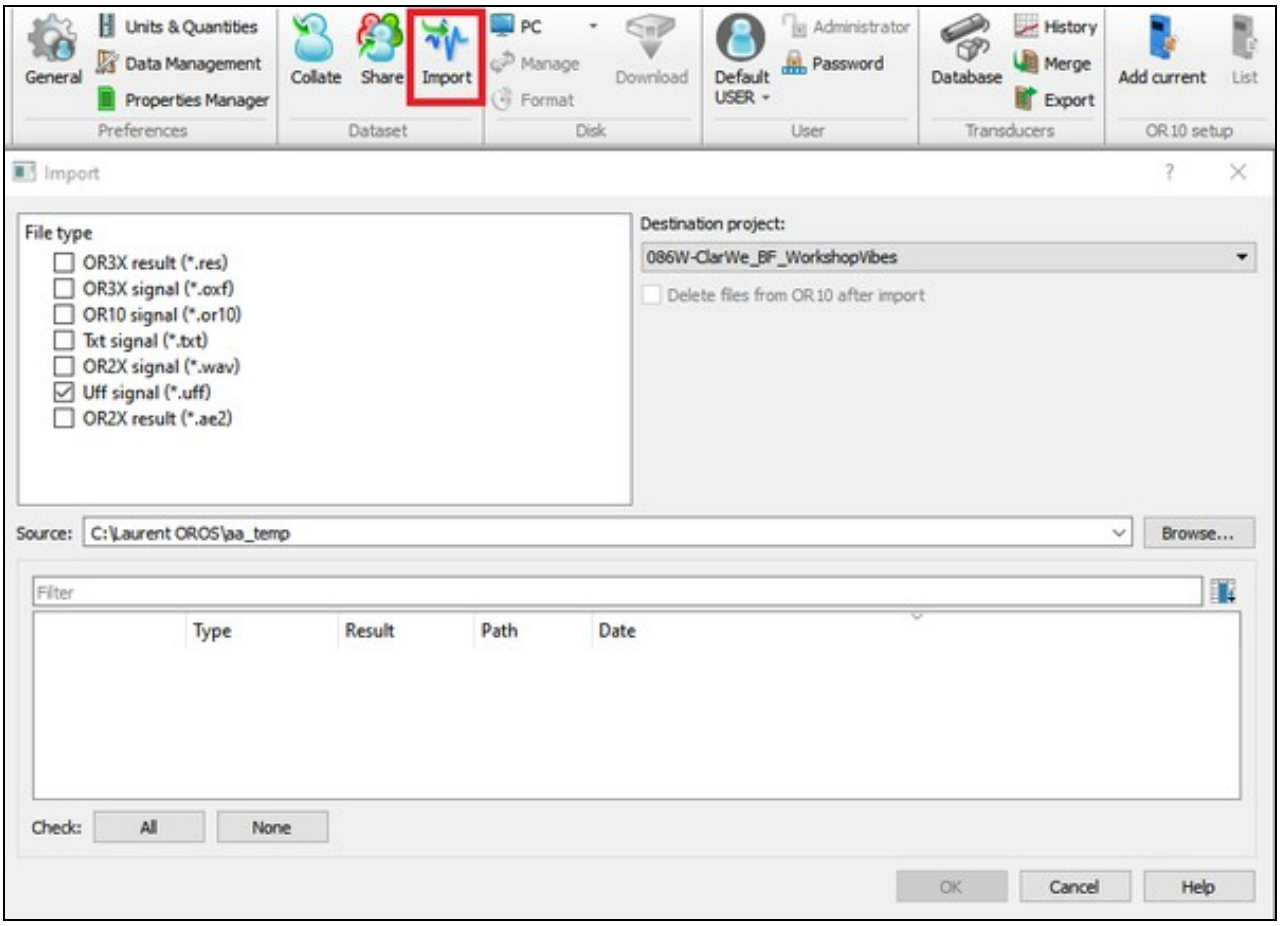
This command is used to import project that are not in the project database. It makes a copy of the project and makes it available to the current user, or whoever created the project. If a project already exists in the project base, a ~ (tilde) will automatically be added.

Directory: Select the directory in which you would like to look for the project. The "found project" list will display all projects that are immediately in the directory selected. If the "scan" button is pressed, all the projects that are contained in the specified directory will be displayed.

Found projects: Displays the list of projects found. Select one or several projects to import.

83.1.1.2.2 Import Files

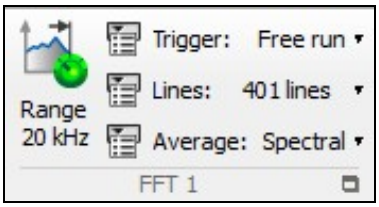
This command is used to import results or signals. It makes a copy of the file and makes it available to the current user, or whoever created the file. The file will be included in a measurement If a measurement already exists in the project, a ~ (tilde) will automatically be appended.

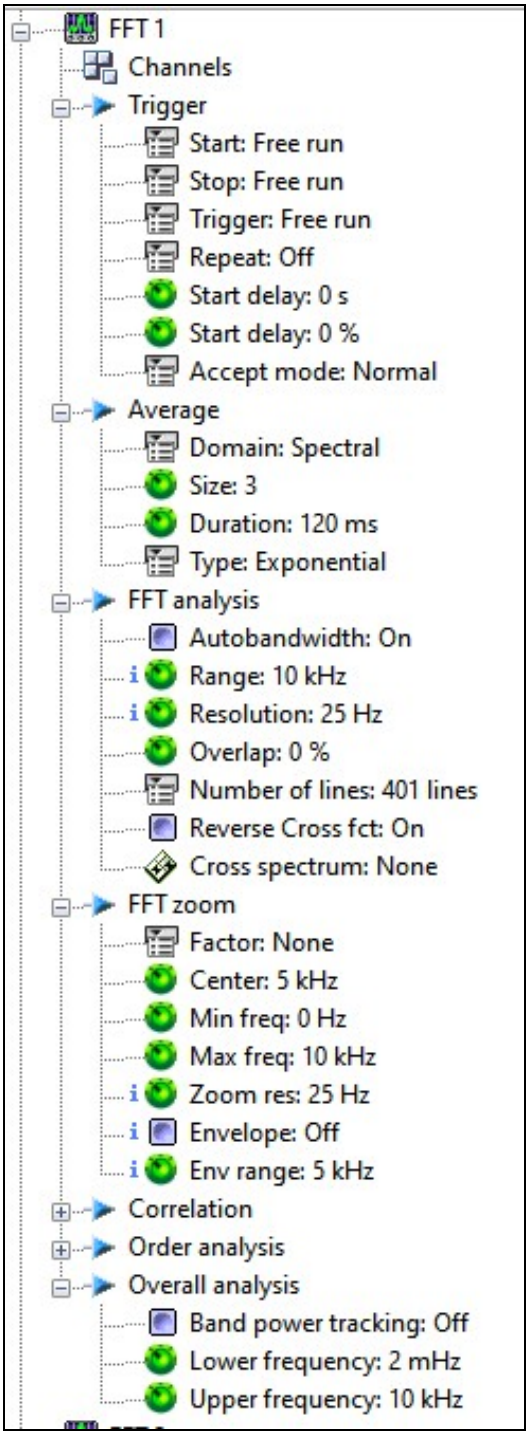


- Destination project: Determines which project will receive the new measurement
- File type: One or several types can be selected. File type may be OR2X or OR3X.
    - **Note :** Time signal .UFF files needs to have sampling frequency compatible with NVGate Front end. WAV signal files does not have this limitation.

- Source: Selects the directory in which you would like to look for the files. The "found files" list will display all the files that are immediately in the directory selected. all the files that are contained in the specified directory will be displayed.
- Filter : filter the list
- Check : you can choose to select all or none.

84 NVGate FFT





A spectrum analyzer is an instrument used to characterize signals in the frequency domain.

Frequency-domain displays show a parameter (usually amplitude) versus frequency. A spectrum analyzer takes an analog input signal (a time domain signal) and converts it to the frequency domain. The resulting spectrum measurement shows the energy of each frequency component at each point along the frequency spectrum.

FFT spectrum analyzer uses digital signal processing to sample the input signal and convert it to the frequency domain. This conversion is done using the Fast Fourier Transform (FFT), the math algorithm used for transforming data from the time domain to the frequency domain.

FFT spectrum analyzer is a powerful instrument, since their processing power can extract both magnitude and phase, and can also switch easily between the time and frequency domains. It makes them ideal measuring instrument for acoustic, vibration analysis, measures for audio, electronic, telephone equipments, measures for electricity networks, seismic analysis, control of manufacture and monitoring.

The NVGate FFT plug-in is used to compute the input signal FFT (you can also compute time signals in post analysis mode with the Player module). Up to 4 FFT plug-in can be present in the software configuration, each of them running independent analyses on the same or different channels.

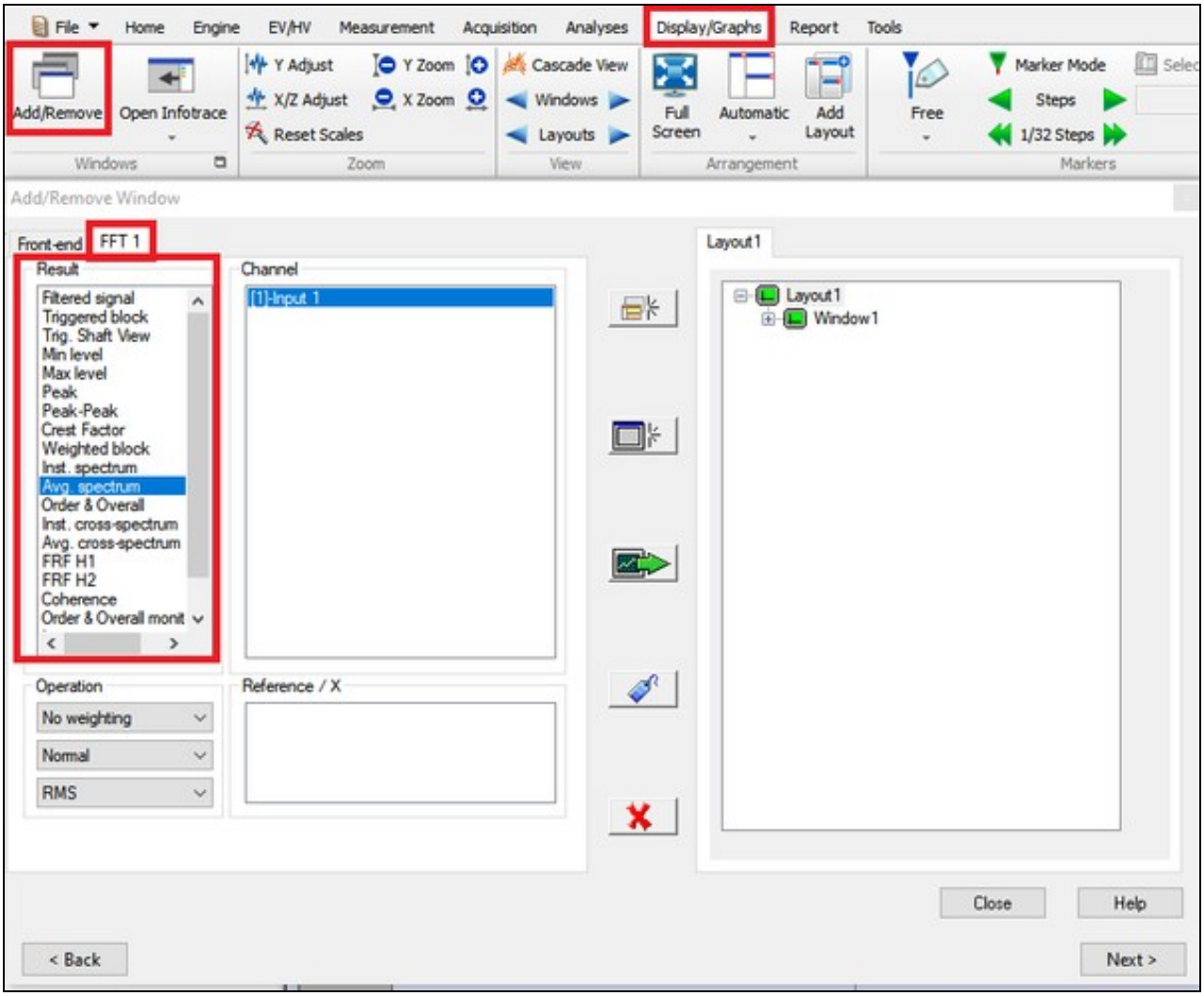
84.1 Video tutorial

We advise using GoToResult for performing FFT.

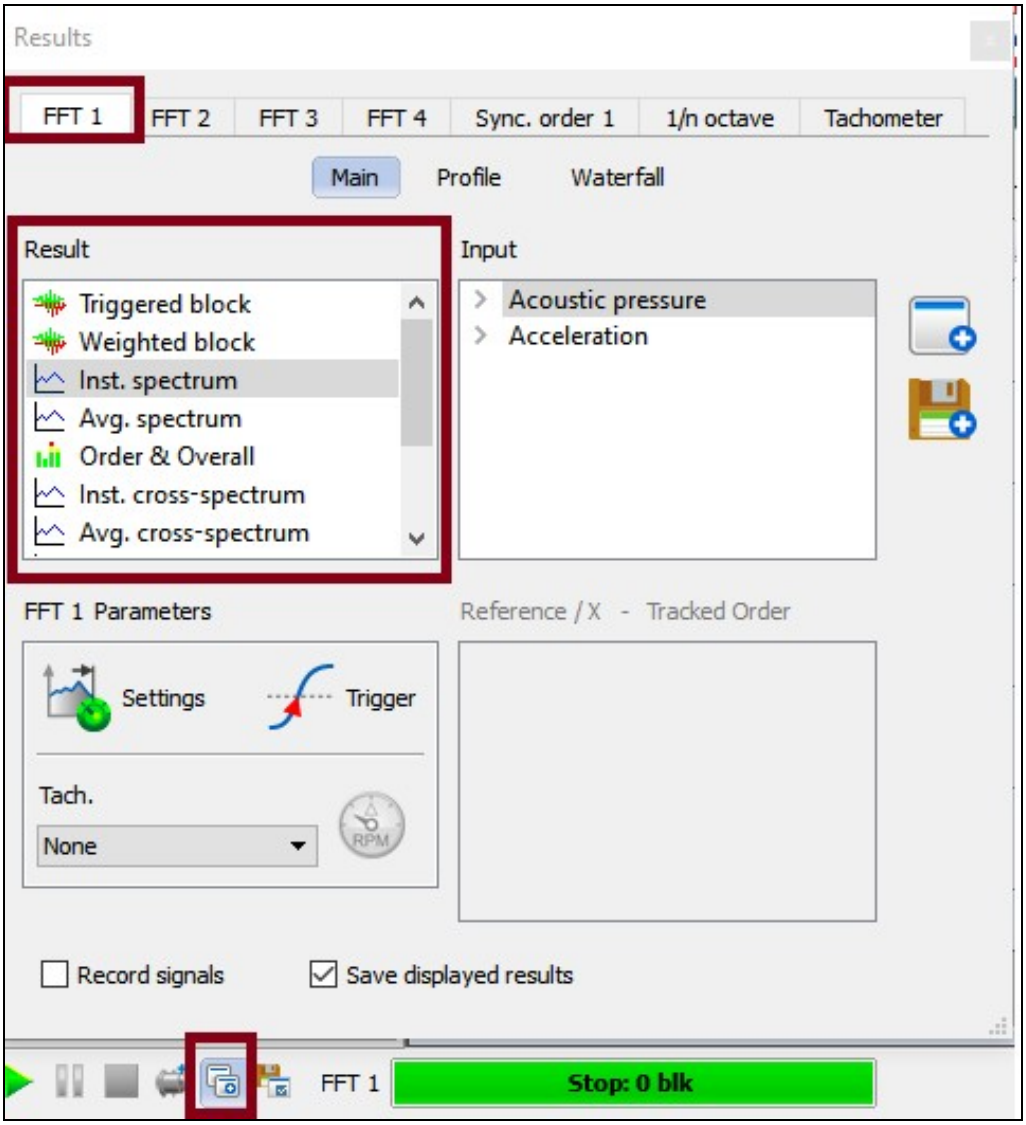
84.2 Display available results

Diplay windows can be done in 2 ways.

- With Add/remove windows


File
Home
Engine
EV/HV
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
Add/Remove
Open Infotrace
Windows
Y Adjust
X/Z Adjust
Reset Scales
Y Zoom
X Zoom
Zoom
Cascade View
Windows
Layouts
View
Full Screen
Automatic
Add Layout
Arrangement
Free
Marker Mode
Steps
1/32 Steps
Markers
Add/Remove Window
Front-end
FFT 1
Result
Filtered signal
Triggered block
Trig. Shaft View
Min level
Max level
Peak
Peak-Peak
Crest Factor
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
FRF H1
FRF H2
Coherence
Order & Overall monit
Channel
[1]-Input 1
Operation
No weighting
Normal
RMS
Reference / X
Layout1
Layout1
Window1
Close
Help
< Back
Next >

- Using GoToResult windows



Note: Zoom windows, Scalar value, cepstrum, enveloppe, orbit are not available using GoToResultWindows, use add/remove windows

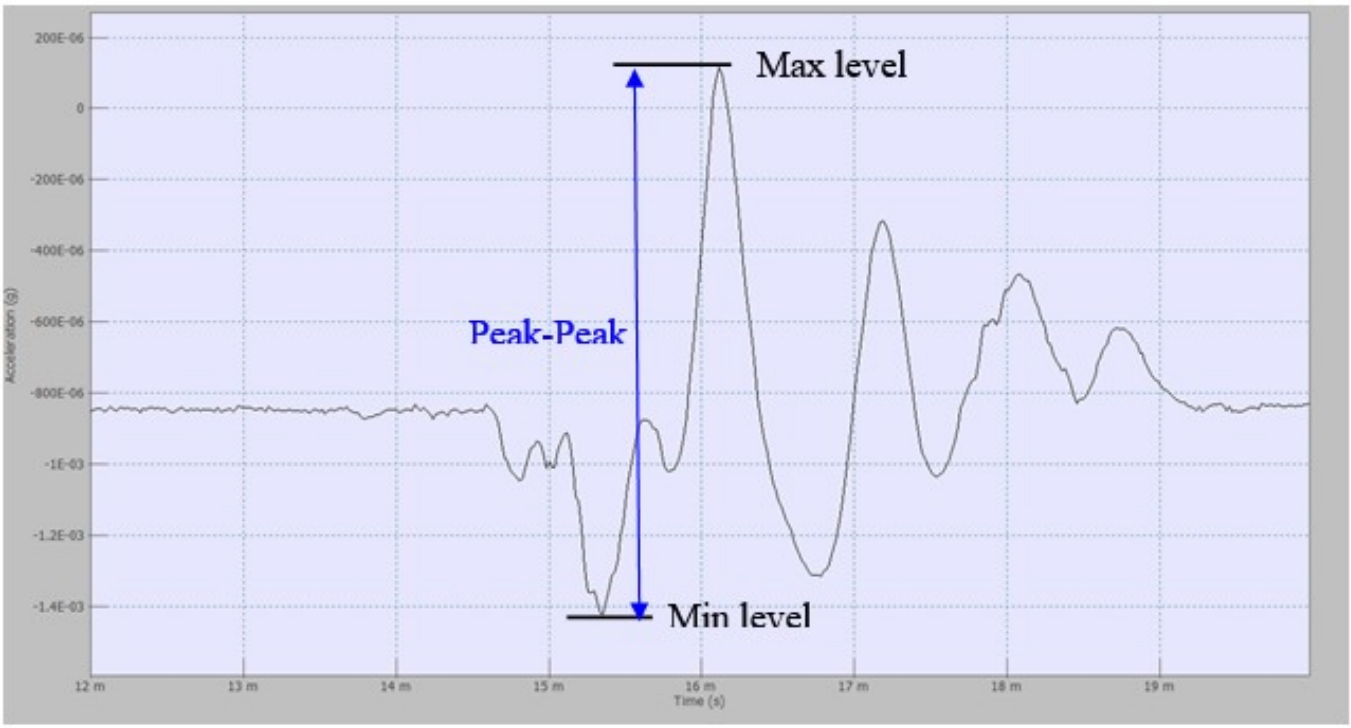
The results available are as follows : With Resolution being the value of the *FFT x/FFT analysis/Resolution* setting

Type	**Size**	**Dimension**	**Domain**	**Save**	**Option**
Filtered signal	256 pt	2D	time	Display only	FFT
Triggered block	(Resolution-1)*2,56	2D	time	Yes	FFT
Trigger Shaftview	(Resolution-1)*2,56	2D	Angle	Yes	FFT-Diag
DC	1pt	1D		Yes	FFT-Diag
RMS	1pt	1D		Yes	FFT-Diag
Min level	1pt	1D		Yes	FFT-Diag
Max level	1pt	1D		Yes	FFT-Diag
Peak	1pt	1D		Yes	FFT-Diag
Peak-Peak	1pt	1D		Yes	FFT-Diag
Crest Factor	1pt	2D		Yes	FFT-Diag
Avg. block	(Resolution-1)*2,56	2D	time	Yes	FFT
Avg. Trigger Shaftview	(Resolution-1)*2,56	2D	angle	Yes	FFT
Weighted block	(Resolution-1)*2,56	2D	time	Yes	FFT
Spectrum	Resolution	2D	spectral	Yes	FFT
Inst. spectrum	Resolution	2D	spectral	Yes	FFT
Avg. spectrum	Resolution	2D	spectral	Yes	FFT
Order & Overall	1 pt	1D		Yes	FFT / CBT
Inst. cross-spectrum	Resolution	2D	spectral	Yes	XFT
Avg. cross-spectrum	Resolution	2D	spectral	Yes	XFT
FRF H1	Resolution	2D	spectral	Yes	XFT
FRF H2	Resolution	2D	spectral	Yes	XFT
Coherence	Resolution	2D	spectral	Yes	XFT
Order profile	2048 pt max	2D	time	Display only	CBT
Zoomed spectrum	Resolution	2D	spectral	Yes	FFT-Diag
Zoomed avg. spectrum	Resolution	2D	spectral	Yes	FFT-Diag
Lissajou	(Resolution-1)*2,56	2D	Time Vs. time	Yes	FFT
Zoomed cross spectrum	Resolution	2D	spectral	Yes	FFT-Diag
Zoomed avg. cross spectrum	Resolution	2D	spectral	Yes	FFT-Diag
Zoomed FRF H1	Resolution	2D	spectral	Yes	FFT-Diag
Zoomed FRF H2	Resolution	2D	spectral	Yes	FFT-Diag

Zoomed Coherence	Resolution	2D	spectral	Yes	FFT-Diag
Zoomed Cepstrum	Resolution	2D		Yes	FFT-Diag
AutoCorrelation	(Resolution-1)*2,56	2D	time	Yes	FFT-Diag
CrossCorrelation	(Resolution-1)*2,56	2D	time	Yes	FFT-Diag
Inst.AutoCorr	(Resolution-1)*2,56	2D	time	Yes	FFT-Diag
Avg.AutoCorr	(Resolution-1)*2,56	2D	time	Yes	FFT-Diag
Inst.CrossCorr	(Resolution-1)*2,56	2D	time	Yes	FFT-Diag
Avg.CrossCorr	(Resolution-1)*2,56	2D	time	Yes	FFT-Diag
Cepstrum*	1/((Resolution-1)*2,56)	2D	Quefrency	Yes	FFT-Diag
InstCepstrum*	1/((Resolution-1)*2,56)	2D	Quefrency	Yes	FFT-Diag
AvgCepstrum*	1/((Resolution-1)*2,56)	2D	Quefrency	Yes	FFT-Diag
ZoomedCepstrum*	1/((Resolution-1)*2,56)	2D	Quefrency	Yes	FFT-Diag
Raw Orbit	(Resolution-1)*2,56	2D	Time Vs. time	Yes	N/A
Synthetized Orbit	(Resolution-1)*2,56	2D	Time Vs. time	Yes	N/A

- **Filtered signal**: This result is available if a filter is selected in the FFT x/Channel x/Input filter setting. It displays the input time signal after filtering.
- **Triggered block**: This displays the signal after being triggered by the event selected with the *FFT x/Trigger/Trigger* setting.

Results below are calculated from the triggered block results. The refresh & computation rate depend on the PC to analyzer connection availability (non real-time results)



- **Min level**: displays the maximal value of the signal.
- **Max level**: displays the minimal value of the signal.
- **Peak**: displays the absolute value of Min level and Max level.
- **Peak-Peak**: displays the difference between Min level and max level. Peak-Peak level ? 0.

- **Crest factor**: displays the ratio Peak level/RMS level. Characteristics of the Crest Factor:
- Crest Factor ? 1
- DC level = 1
- Crest Factor of sinus = $\sqrt{2}$
- Max level = $\sqrt{N}$ with N = number of samples in the triggered block = 2.56*lines number-1
- **Avg. block**: This result is available if the *FFT x/Average/Domain* setting value is Time. It the time signal block average.
- **Weighted block**: This result displays the signal after being weighted by the weighting window selected using the *FFT x/Channel x/Weighting window* setting.
- **Spectrum**: This result is available if the *FFT x/Average/Domain* setting value is Time. It displays the result of the FFT processing after time averaging.
- **Inst. spectrum**: This result is available if the *FFT x/Average/Domain* setting value is Spectral. It displays the FFT processing results.
- **Avg. spectrum**: This result is available if the *FFT x/Average/Domain* setting value is Spectral. It displays the instant spectrum average result.
- **Order & Overall**: It displays the result of the computation of the orders chosen with the *FFT x/Channel x/Tracked order* setting and the Overall level if the *FFT x/Overall Analysis/Band power tracking* is set to On.
- **Inst. cross-spectrum**: This result is not available if there is no cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix. It displays the cross spectrum between the 2 channels selected.
- **Avg. cross-spectrum**: This result is not available if there is no cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix. It displays the instant cross spectrum average results.
- **FRF H1**: This result is not available if there is no cell checked in the matrix of the *FFT x/FFT analysis/Cross spectrum* matrix. It displays the Frequency Response Function H1, see Appendix for details.
- **FRF H2**: This result is not available if there is no cell checked in *FFT x/FFT analysis/Cross spectrum* setting. It displays the Frequency Response Function H2, see Appendix for details.
- **Coherence**: This result is not available if there is no cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix. It displays the H1/H2 ratio.
- **Order profile**: It displays changes in the Order & Overall result.

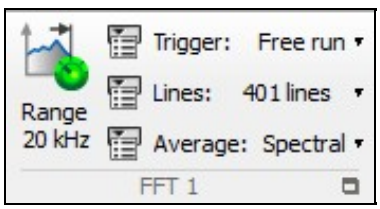
- **AutoCorrelation**: This result is available if correlation is selected in *the FFT x/Correlation* and *FFT x/Average/Domain* setting value is Time.
- **CrossCorrelation**: This result is available if correlation is selected in *the FFT x/Correlation* and *FFT x/Average/Domain* setting value is Time. This result is not available if there is no cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix
- **Inst. AutoCorr**: This result is available if correlation is selected in *the FFT x/Correlation* and *FFT x/Average/Domain* setting value is Spectral or Frequency synchronous.
- **Avg. AutoCorr**: This result is available if correlation is selected in *the FFT x/Correlation* and *FFT x/Average/Domain* setting value is Spectral or Frequency synchronous.
- **Inst. CrossCorr**: This result is available if correlation is selected in *the FFT x/Correlation* and *FFT x/Average/Domain* setting value is Spectral or Frequency synchronous. This result is not available if there is no cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix
- **Avg. CrossCorr**: This result is available if correlation is selected in *the FFT x/Correlation* and *FFT x/Average/Domain* setting value is Spectral or Frequency synchronous. This result is not available if there is no cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix
- **Zoomed spectrum**: This result is available when the value of the *FFT x/FFT zoom/Factor* setting is different from None. It displays the FFT zoomed signal processing result. The minimum and maximum of the X axis are the values of the *FFT x/FFT zoom/Min freq* setting and *FFT x/FFT zoom/Max freq* settings respectively.
- **Zoomed avg. spectrum**: This result is available when the *FFT x/FFT zoom/Factor value* setting is different from None. It displays the zoom spectrum average result. The minimum and maximum of the X axis are the values of the *FFT x/FFT zoom/Min freq* setting and *FFT x/FFT zoom/Max freq* setting respectively.
- **Lissajous**: This result simultaneously displays the value of the channel chosen on the Y axis and the value of the reference channel on the X axis at the same time.
- **Cepstrum**: This result is always available. X scale is in quefrency (time equivalent) and Y scale is always in dB. *Cepstrum analysis can be used as a tool for the detection of periodicity in a spectrum, for examples families of harmonics with uniform spacing. A high quefrency represents rapid fluctuations in the spectrum (small frequency spacings) and a low quefrency represents slow changes with quefrency (large frequency spacings). Note that the quefrency does not give information regarding absolute frequency, only about frequency spacings.*

- **Zoomed cross-spectrum**: This result is available when the *FFT x/FFT zoom/Factor value* setting is different from None and if there is at least one cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix. It displays the zoomed cross spectrum between the two channels selected. The minimum and maximum of the X axis are the values of the *FFT x/FFT zoom/Min freq* setting and *FFT x/FFT zoom/Max freq* setting, respectively.
- **Zoomed avg. cross-spectrum**: This result is available when the *FFT x/FFT zoom/Factor value* setting is different from None and if there is at least one cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix. It displays the zoomed cross spectrum average result. The minimum and maximum of the X axis are the values of the *FFT x/FFT zoom/Min freq* setting and *FFT x/FFT zoom/Max freq* setting, respectively.
- **Zoomed FRF H1**: This result is available when the *FFT x/FFT zoom/Factor value* setting is different from None and if there is at least one cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix. It displays the zoomed Frequency Response Function H1, see Appendix for details. The minimum and maximum of the X axis are the values of the *FFT x/FFT zoom/Min freq* setting and *FFT x/FFT zoom/Max freq* setting, respectively.
- **Zoomed FRF H2**: This result is available when the *FFT x/FFT zoom/Factor value* setting is different from None and if there is at least one cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix. It displays the zoomed Frequency Response Function H2, see Appendix for details. The minimum and maximum of the X axis are the values of the *FFT x/FFT zoom/Min freq* setting and *FFT x/FFT zoom/Max freq* setting, respectively.
- **Zoomed Coherence**: This result is available when the *FFT x/FFT zoom/Factor value* setting is different from None and if there is at least one cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix. It displays the zoomed H1/H2 ratio results. The minimum and maximum of the X axis are the values of the *FFT x/FFT zoom/Min freq* setting and *FFT x/FFT zoom/Max freq* setting, respectively.
- **Zoomed Cepstrum**: This result is available when the *FFT x/FFT zoom/Factor value* setting is different from None. It displays the zoomed cepstrum.

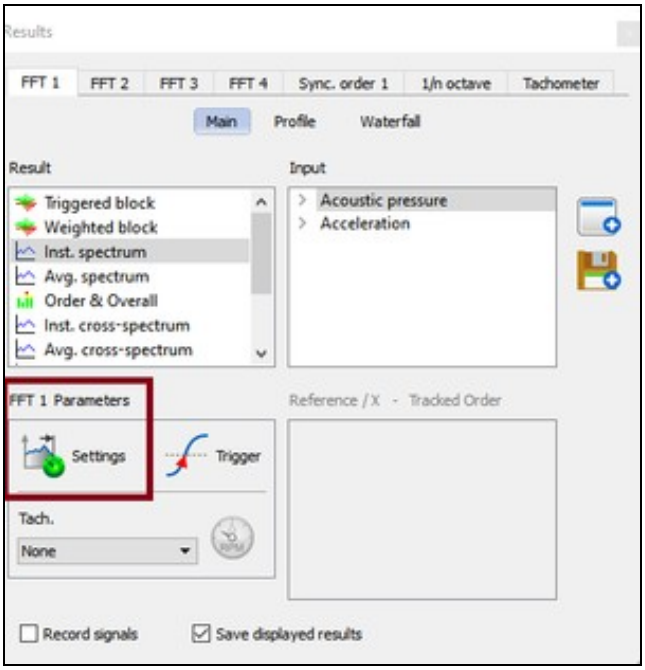
84.3 Settings

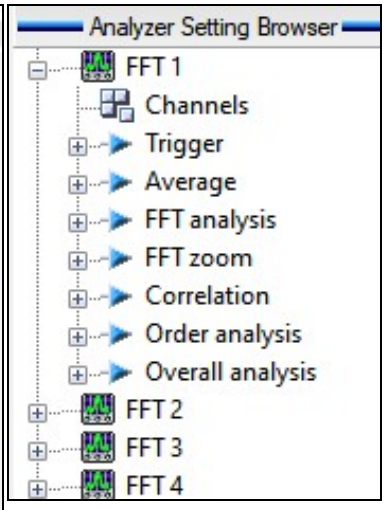
There are several ways to access the settings : We advise the first one.

GoToResults **ASB(Analyzer Setting Browser)** **Ribbon**

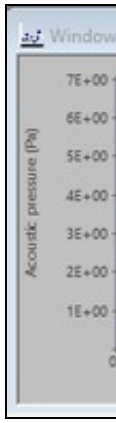


GoToResults | **ASB(Analyzer Setting Browser)** | **Ribbon**





NVGate ribbon - tab:analysis
Note: Clicking on the bottom right icon ( ) open the FFTx plug-in properties dialog allowing a full access to all the settings.



84.3.1 Channel

Contains the settings related to the source input.

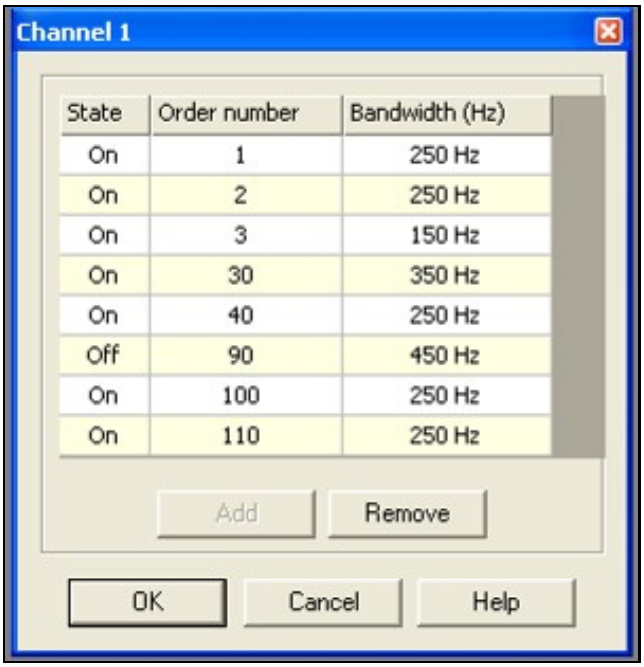
- **Source**: input source to be analyzed. It may come from the input Front-end or from the Player in the post analysis mode (see the post analysis chapter). In the post analysis mode, the tracks with a signal bandwidth lower than the range of the FFT cannot be plugged.
- **Input filter**: filter to be used for filtering the source before analysis. The Filters that are not compatible with the FFT range cannot be selected (see the Filter builder chapter). The A and C weighting on time domain are available in the NVGate® filter list.

These acoustics filters can be applied as all other NVGate® filters pass/stop band, high/low pass, and integrators.

Note: These weighting on time domain are no longer available for pass band higher than 25.6kHz and lower than 10kHz.

For filter characteristics, see the Appendix.

- **Tracked order**: orders to be tracked with the FFT Constant Band Tracking mode. Up to 8 different orders may be selected for each channel, and there are three settings for each order:
-



State: ON if you want the order to be computed

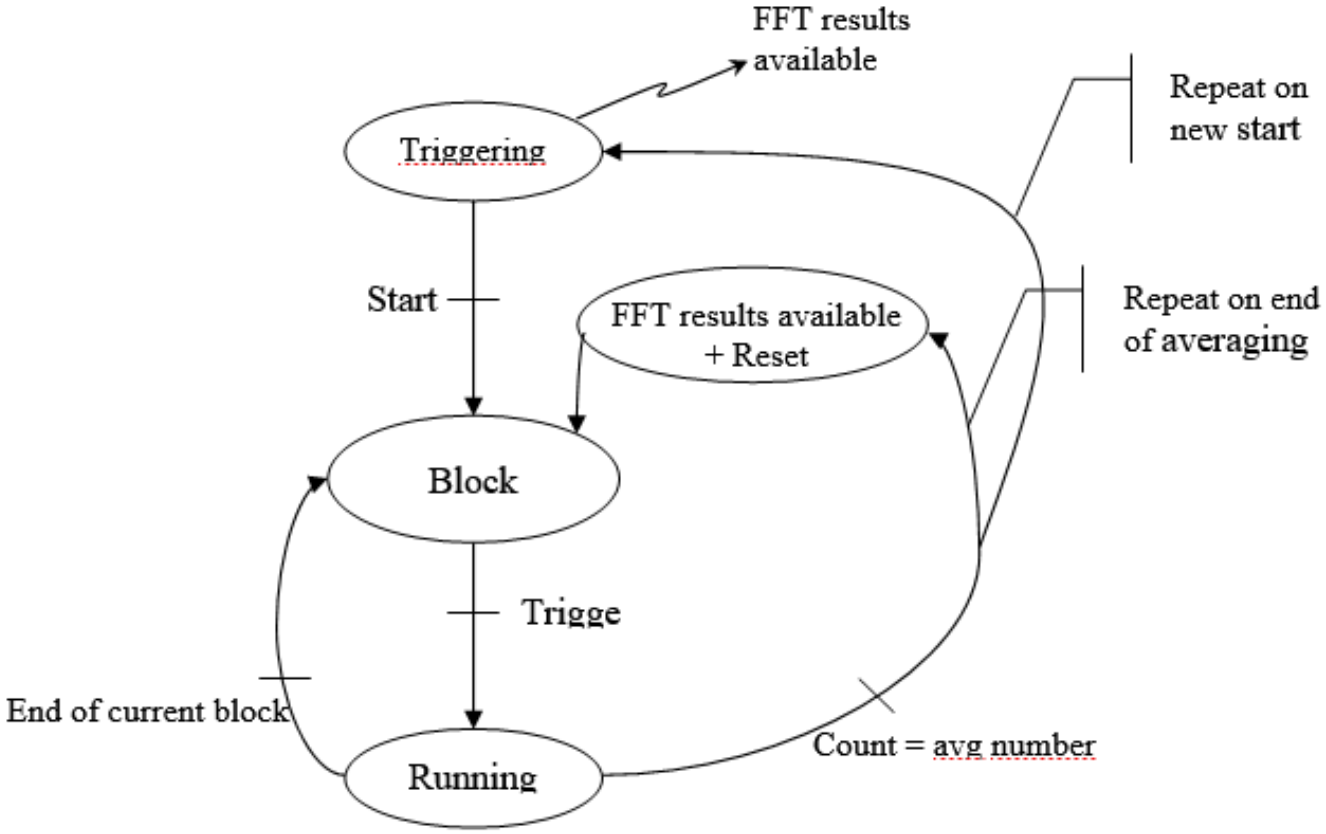
- **Order number**: Select the number of the order you want to track, from 0.001 up to 800.
- **Bandwidth**: Select the bandwidth used to compute the energy of the order from *3*FrequencyRange/(NumberOfLine-1)* up to *FrequencyRange* with *FrequencyRange* being the value of the setting Range from the FFT analysis sub-module, and *NumberOfLines* being the value of the Resolution setting from the FFT analysis sub-module.
- **Weighting window**: window used to weighting the signal before the processing. There are six set windows: Uniform, Hanning, Hamming, Kaiser Bessel, Flat top, and three customized windows: Force, Response and Dual exp (see the Time Windows chapter). For the window characteristics, see the Appendix.

84.3.2 Trigger

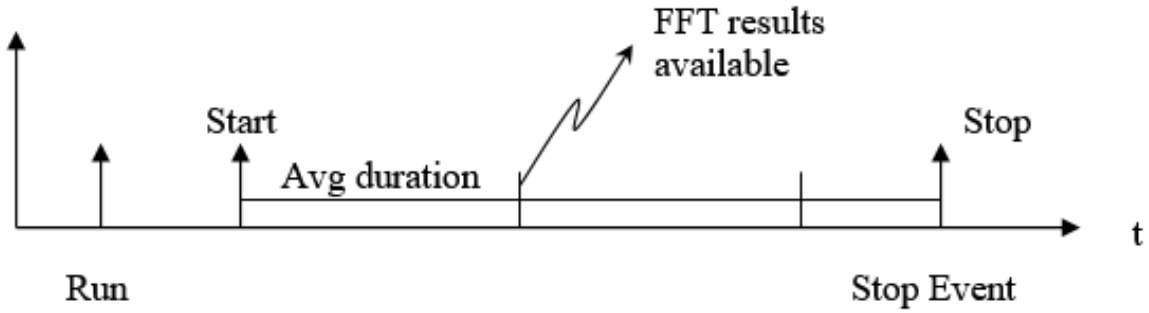
Contains the settings related to trigger events and how to start, and stop signal computation.

- **Start**: defines the event to start the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Start" condition.
- **Stop**: defines the event to stop the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Stop" condition.
- **Trigger**: defines an event to compute the FFT on one block of time signal. After the computation, the plug-in waits for a new event to compute another block.
- **Repeat**: this setting is used to select a condition for the plug-in to be restarted. If an event is selected as a Start event, the option "New start" is available, and when this mode is selected each Start event restarts the plug-in. The "End of averaging" mode is available when the value of the *FFT x/Average/Type* setting is different than "Exponential" mode. This restarts the plug-in when the averaging is finished. For linear average when it is set to "End of averaging", the "Avg duration" gives the periodicity of the average restart. By default the Repeat mode is set to "Off".

The following scheme describes the repeat mode for the FFT analysis:

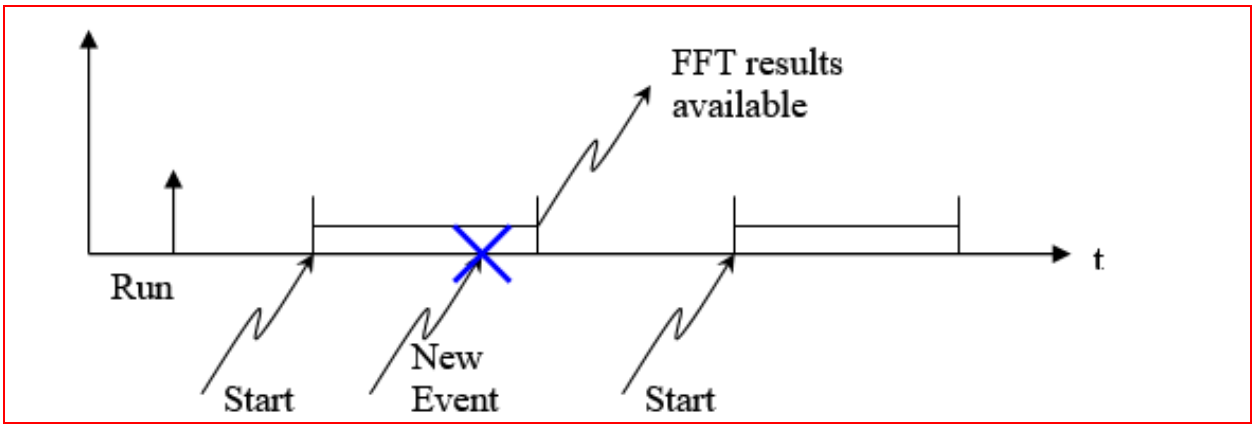


- Mode Repeat on 'end of averaging':



The ?Run? corresponds to the start of the analyzer. The start is the beginning of average duration. At the end of the first average, the second average will start and so on till the end of the integration time (even if the last short time integration duration is not over). Each averaging has the same size, except the last that can be smaller.

- Mode Repeat on ?New start?:



The ?Run? triggers the analyzer, but the average begins at the start event (set in the event definition). This averaging stops at the end of average duration or at the stop event. Then the next averaging is waiting for the new start event to occur.

In case a new event occurs during a previous averaging, this start event won?t be effective because the previous average duration is not over, you can only set other event after the end of the previous one.

- **Start delay**: time delay applied to the time the start event occurs, or block percentage delay.
  The delay in percentage is calculated as:
  Start delay in % = [(Start delay in s) / (Block duration)] * 100
  This value of start delay can be negative and also greater than 100 %.

  Note: some settings (bandwidth, number of lines) are directly linked with the start delay, then by modifying any of these settings the last Start delay modified (time or %) would be fixed, and the other one will be automatically sets regarding modified settings.
- **Accept mode**: used to select the method for rejecting signal blocks.

Mode	Description
Normal	All the blocks are accepted
Manual	After the computation of each block, the plug-in is in the Waiting mode and waits for the user to push the accept or reject button
Overload rejection	Blocks with an overload are automatically rejected

- **Trigger Frequency:** Adjust the synchronous frequency (for Frequency Domain Synchronous Analysis).

Hidden/fixed: The Trigger frequency is enabled when FFTx/Average/Domain is set to Frequency Synchronous.

84.3.3 Average

See also : User note about FFT averaging.

Contains the settings related to the type of averaging of the signals to be computed.

- **Domain**: You can choose between Spectral, Time or Frequency Synchronous.

Domain	Description

Spectral	Calculates the average after FFT processing,
Time	Calculates the average before FFT processing.
Frequency Synchronous	Frequency domain Synchronous averaging (FDSA) uses one frequency band as the phase reference, and each FFT block is recomputed so that the phase of the frequency chosen with the *FFT x/FFT analysis/Trigger Frequency* setting is 0. Enables the Trigger frequency setting to be adjusted from *FFTx/Trigger/Trigger frequency*.

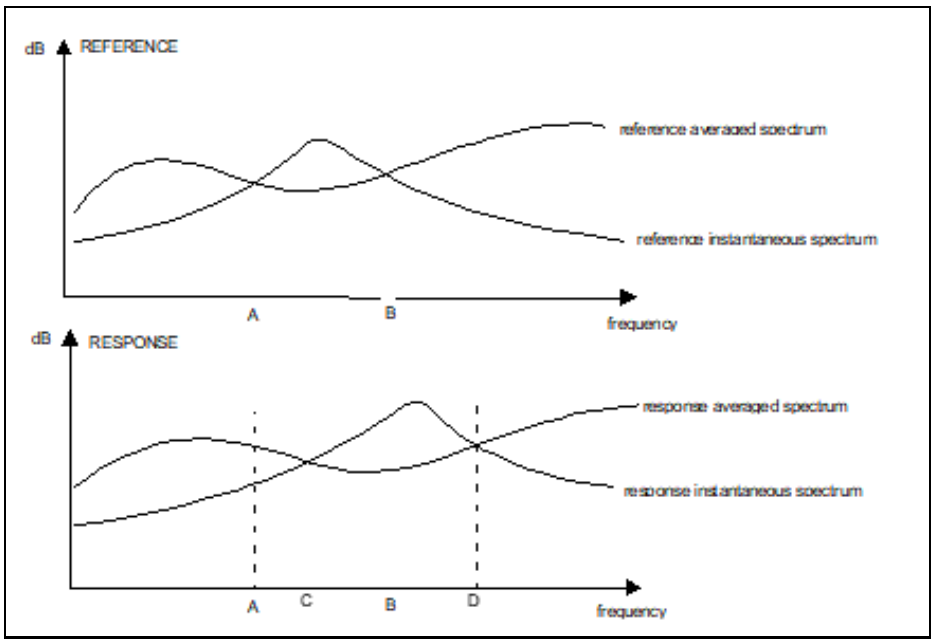
- **Size**: The number of signal blocks used to compute the average, from 1 up to 1000000000.
- **Duration**: The duration of the signal used to compute the average. This depends on four other settings: Size from the same sub-module, and Range Overlap and Resolution from the FFT Analysis sub-module. BlockDuration = (NumberOfLines-1)/FrequencyRange

Duration = BlockDuration * (Size - (Size-1)*Overlap)

With BlockDuration being the duration of one block of signal, NumberOfLines being the value of the setting Resolution from the FFT analysis sub-module, FrequencyRange being the value of the setting Range from the FFT analysis sub-module, Size being the value of the setting Size from the same sub-module and Overlap being the value of the setting Overlap from the FFT analysis sub-module.

The average duration disappears when the trigger of the FFT is changed from "Free Run" to a different trigger (Manual, Ext.Sync., Delta RPM,?) as the elapsed time between two triggering is not predictable anymore."

- **Type**: The method of averaging the signal. There are four different averaging modes: Linear, Exponential, Peak hold, and Referenced Peak hold.

Type	**Description**
Linear	Linear averaging of results is carried out on the value of the Size setting from the same sub-module. The FFT plug-in automatically stops when the given number of averages is reached.
Exponential	In this mode of computation, each new average is obtained by adding its previous value and the new FFT result divided by the value of the Size setting, and then subtracting its previous value divided by the value of the Size setting.
Peak hold	This method processes the peaks found in their spectrum power density for each channel, and for a number of FFT analysis given by the value of the Size setting. The FFT plug-in automatically stops when a given number of averages is reached. For each frequency line, each time the value of the instantaneous spectrum is greater than the value of the averaged spectrum, the averaged spectrum value becomes equal to the instantaneous spectrum value. Otherwise, the average spectrum value is not modified. Note: in this case averaged spectrum doesn?t mean average value but hold value.
Referenced Peak hold	

	This method processes the peaks found in their spectrum power density for each channel, and for a number of FFT analyses determined by the size setting. The FFT plug-in automatically stops when a given number of averages is reached. When this mode is selected, a new setting called Reference channel appears in the same sub-module; if None is selected, the average processing is the same as the Peak hold mode. If a channel is selected, then there are two different behaviors depending on the channel: For the reference channel: For each frequency line, each time the value of the instantaneous spectrum is greater than the value of the average spectrum, the average spectrum value is equal to the instantaneous spectrum value. Otherwise, the average reference spectrum value is not modified. For the other channels: For each frequency line, for each modification of the average reference spectrum, the average channel spectrum is equal to the instantaneous channel spectrum values, even if it is less than the average spectrum value. The modification of the reference and the other channels is synchronized. In this example, the modified spectrum lines are between **A** and **B** for both reference channel and response channel. The spectrum lines between **B** and **D** in the response channel are not updated. The modification of the reference and response channels is synchronized Each time the peak value of the reference channel has been modified, the **averaged cross spectrum** is equal to the instantaneous reference spectrum by the response spectrum product. In this example, the modified spectrum lines are between **A** and **B**. The functions as transfer function (where the reference channel is taken into account) will be modified between **A** and **B**.

Hidden/fixed: Peak hold and Referenced Peak hold are only available if the Domain setting from the same sub-module is set to Spectral.

- **Reference channel**: channel to be used as a reference in the Referenced Peak hold averaging mode. This setting is only available when this averaging mode is selected. You can choose between the channels that are plugged into the FFT plug-in, if ?None? is selected the average processing is the same as the Peak hold mode.

84.3.4 FFT analysis

Contains the settings related to the type of analysis of the signals to be computed.

- **Range**: the FFT plug-in frequency range. The analyzer sampling frequency divided by 2.56 limits this range, and the minimum is obtained by dividing this limit by 50000. For example, if the analyzer sampling frequency is 51,2kS/s, then the max range is 20 kHz and the min is 400mHz. In post analysis mode, the Max Bandwidth setting from the Player plug-in provides the analyzer sampling frequency by multiplying the value by 2.56 (ex: if max bandwidth = 20 kHz then the analyzer sampling frequency is 51.2kS/s), otherwise, the analyzer sampling frequency is provided by the input sampling setting from the Front end plug-in input setting sub-module.
- **Resolution:** This is a fixed setting, for information only. It displays the frequency span between two points of a spectral result. The FFT resolution is obtained by dividing the FFT frequency range by the resolution minus 1. For example if the FFT Range is 20 kHz and the resolution is 401 lines, then the frequency span is: 20000 / (401 - 1) = 20000 / 400 = 50Hz.
- **Overlap**: Defines the amount of overlap of input signals between two successive FFT computations, from 0% to 99.99%.

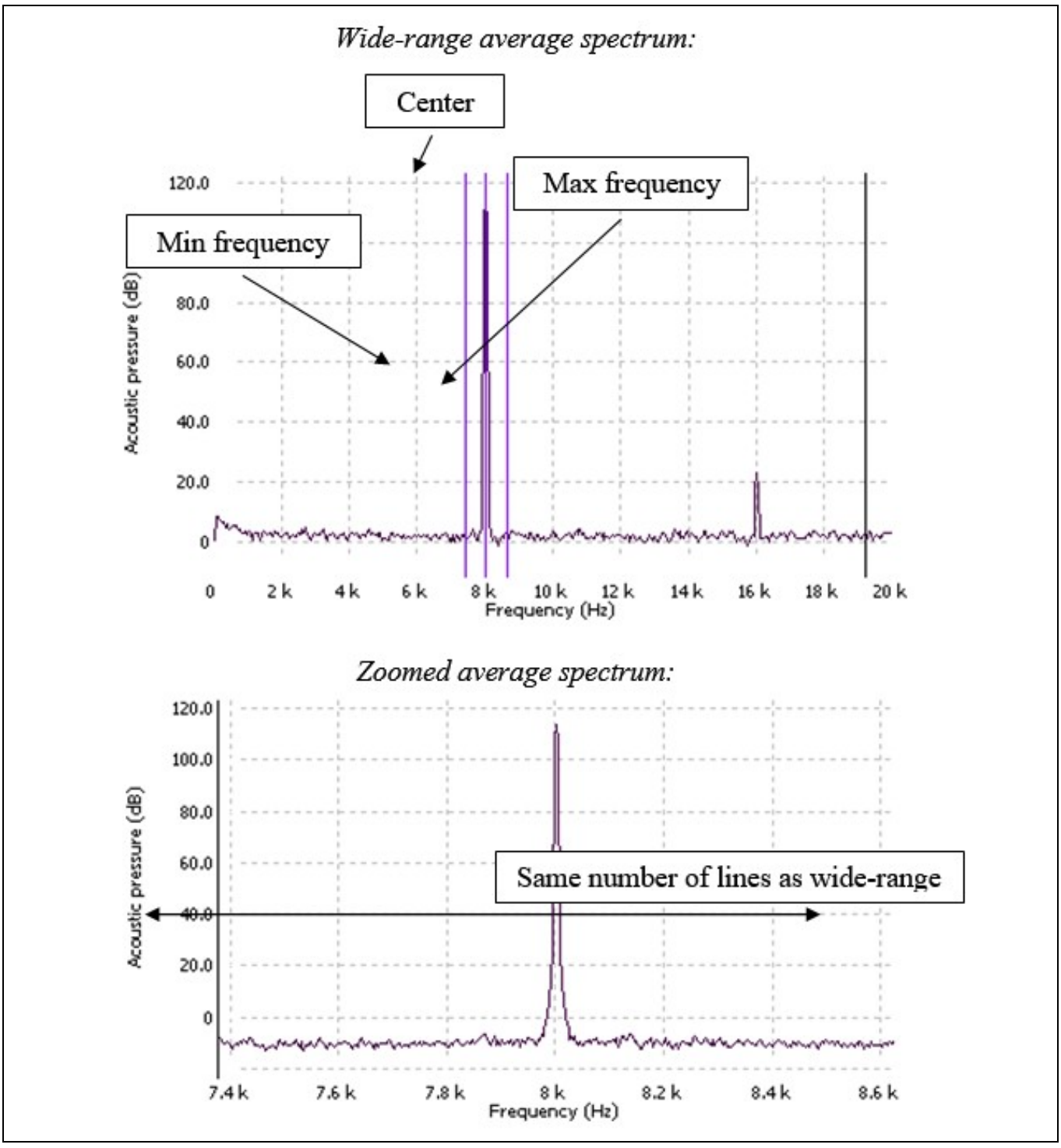
Note: When the overlap exceeds 99%, NVGate does not inform if you lost real-time. At this moment, NVGate is performing as fast as it can by taking the last trigger block than can be computed by the processor.

- **Number of lines**: The FFT number of analyzed lines. There are seven possibilities: 101, 201, 401, 801, 1601, 3201 or 6401 lines.
- **Trigger Frequency:** This setting is only available when the *FFT x/Average/Domain* setting is "Synchronous". The value can be chosen from the FFT Frequency range; this frequency is the phase reference: each FFT block is recomputed so that the phase of the frequency chosen is 0.
- **Reverse cross function:** this setting allows calculating the cross function of the greyed part of the Cross spectrum setting. Default value is True except on cascaded mode (multiple hardware) as the number of reference spectrum to be carried between the analyzers may lead to a dramatic loss of performances.
- **Cross spectrum**: Matrix used for the selection of the computed cross spectra, Only the upper half of the matrix can be used, because when a box is checked, two cross spectra are computed with each of both channels being the reference. Selecting the cross spectra is necessary to have access to some results: instant cross spectrum, average cross spectrum, FRF H1, FRF H2 and coherence.

- **Autobandwidth**: manages the analysis and recording bandwidths automatically. The *Inputs selection* window **allows the use of 2 different sampling rates for the dynamic inputs**. It gathers inputs with the same physical quantity into groups, maintaining the same sampling into each group. When inputs are associated with **the analysis plug-in, it adjusts its analysis bandwidth to match the inputs ones**. Mixing input bandwidths in one analysis plug-in lead to set its bandwidth to the lowest one. *Autobandwidth* is set by default in the FFT plug-ins. it adjusts the setting : FFT Analysis\Range .When it is enabled in the plug-in, these settings "switch to informative status"

84.3.5 FFT zoom

Unlike the display zoom function; the analysis zoom function allows you to zoom into a selected bandwidth increasing the analysis resolution.



- **Factor**: Switch the FFT zoom on or off depending on its value. If the value is "None" there is no zoom result available. There are seven possible factors: x2, x4, x8, x16, x32, x64, x128. The value stands for the dividing factor to be used to obtain the frequency span of the zoom results. For example, if the FFT resolution is 401 lines and the Frequency range is 20kHz then the frequency span is 50Hz. If the zoom is activated with a x4 factor, the frequency span of the zoom results is 50 / 4 = 12,5Hz. The zoom results are Zoomed Spectrum, Zoomed Average Spectrum, and Zoomed cross spectrum, Zoomed Avrg cross spectrum, Zoomed FRF H1, Zoomed FRF H2, Zoomed Triggered Block and Zoomed Coherence if there is at least one cell checked in the *FFT x/FFT analysis/Cross spectrum* matrix. These results are available when the Factor is different from the None value.
- **Center**: The center frequency of the zoom. The value can be set directly, or automatically by changing the Min Frequency or the Max frequency settings.
- **Min freq**: The minimum frequency of the zoom. The value can be set directly, or automatically by changing the Center or Factor settings to match them.
- **Max freq**: The maximum frequency of the zoom. The value can be set directly, or automatically by changing the Center or the Factor settings to match them.

Note: These zoom settings are working as following:

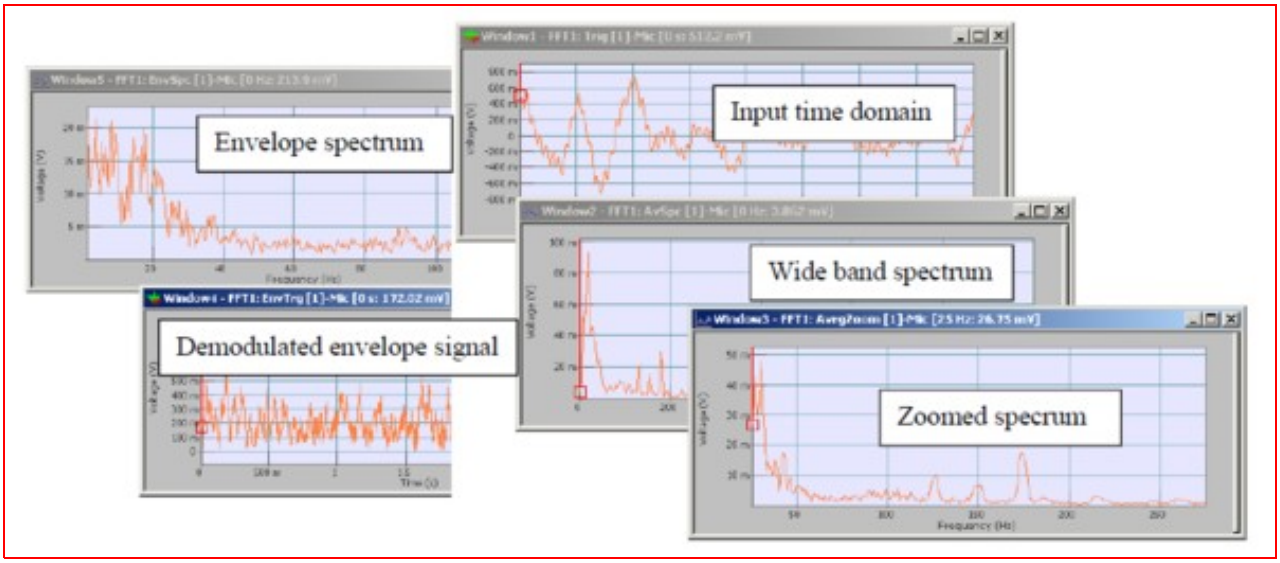
- Set **Factor** and **Center** (min and max values are update automatically with the center frequency) if the zoom would be done around a central frequency well defined. By modifying Factor, max and min frequencies will be automatically set to define zoom limits.
- Set **max** and **min** frequencies (center and factor are update automatically) if the limits in frequency would be fixed on specific values.

84.3.5.1 Envelope

Read the user note for more info about envelope analysis.

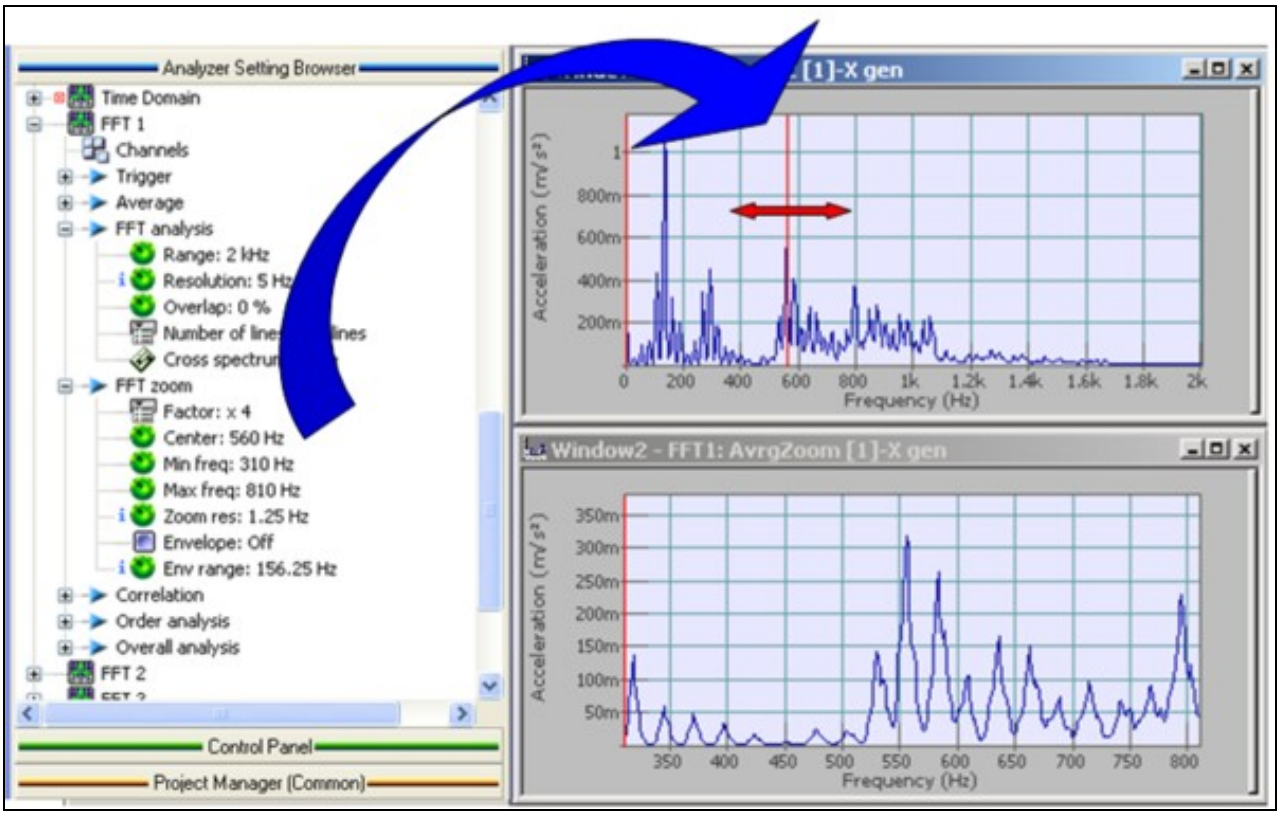
FFT plug-in integrates as a standard an amplitude demodulation analysis that provides envelope results. Even demodulated time domain signal and envelope spectra can be handled for real time display, result saving and report generation. Envelope demodulation is linked to the FFT zoom activation. When FFT zoom is different from none, the envelope demodulation can be activated through a simple click.

Then the envelope limits (range, modulating, frequency) are set by the zoom settings. It is then possible to get simultaneously the entire spectral and time information with the following displays:



Hidden/fixed: The envelope is available only if the zoom is active.

Note: All frequency setting, such as FFT zoom boundaries, start and stop sweep sine, filter limits, etc? can be directly controlled from a display. This is easily achieved by drag and drops the corresponding setting inside a compatible (with X-axis as frequency) graph.

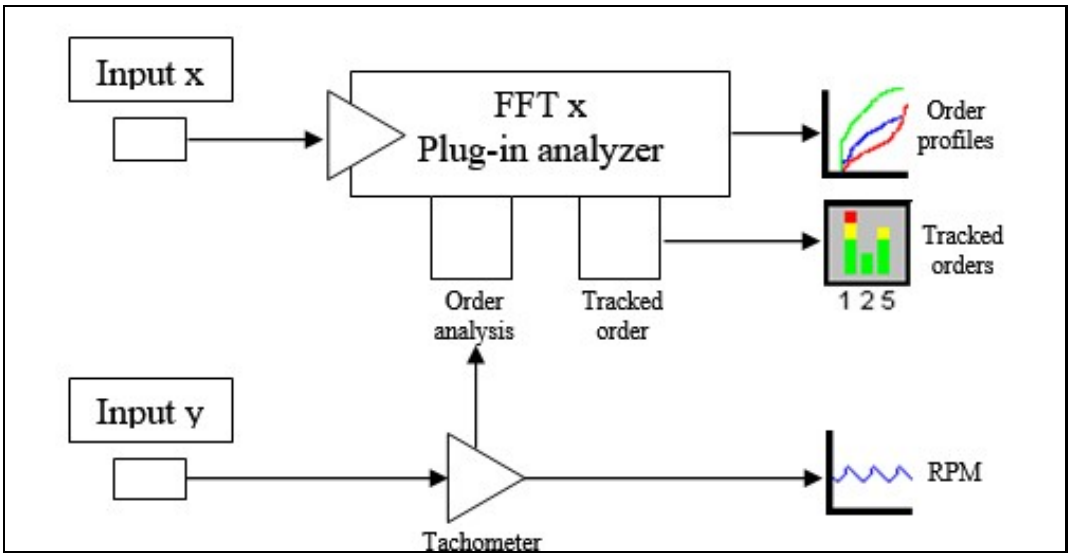


As an example (see fig below) you can easily focus on spectra area using the zoom center setting as a cursor in the wideband FFT spectra. Then it is efficient to move the center of the FFT zoom from one peak to the order as a cursor. In cab also be useful to control pass-band filter limits, directly from the corresponding spectra. Try it when you use the monitor filter scalar values.

84.3.6 CBT: Order analysis

Read the dedicated CBT page for more info.

Contains the settings related to constant band tracking operations.



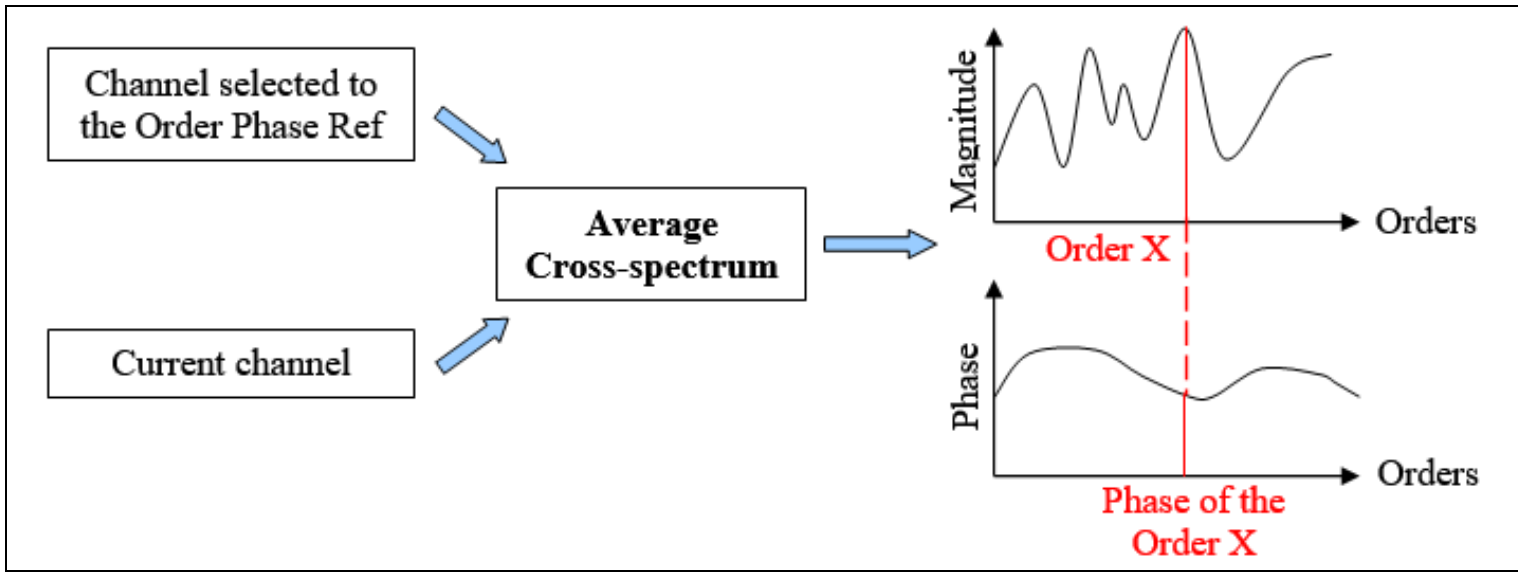
- **Associated tach**: The selected Tach enables the FFT plug-in to perform Constant Band Tracking.

Warning: Do not select an associated tach if you do not use one, the FFT will not start.

- **Center on peak**: This setting is used to center the spectral lines used to compute the total power around a peak (if it exists) close to the order frequency.
- **Refresh mode**: When displaying some order profile results, this setting is used to choose between two methods of adding a new measurement point to the curve.
-

Mode	Description
Delta time	A new point is added periodically. The Time Resolution settings set the refreshing period.
Delta RPM	A new point is added each time the Tach speed has increased the Speed Resolution setting value.

- **Duration profile**: The size of the profile window time axis.
- **Time resolution**: used to set the refreshing period for the order profile results. This setting is visible if the Refresh Mode setting value is Delta time.
- **Max speed**: The Max speed that the Tach selected with the Associated Tach setting can handle. This value is for information only; it cannot be set directly. This setting is visible if the Refresh Mode setting value is Delta RPM.
- **Min speed**: The Min speed that the Tach selected with the Associated Tach setting can handle. This value is for information only; it cannot be set directly. This setting is visible if the Refresh Mode setting value is Delta RPM.
- **Speed resolution**: used to set the refreshing conditions for the order profile results. A new point is added each time the Tach speed has increased of the setting value. This setting is visible if the Refresh Mode setting value is Delta RPM.
- **Orders Phase ref**: This function allows to use the cross-spectrum phase value for the phase of the order (relative phase). The cross-spectrum phase is the relative phase between the input signal of the current channel and the reference input signal associated to this channel. Whatever the average mode, the average cross-spectrum is always used to calculate the orders phase.



- Not activated: The phase of the order is the spectrum phase of the frequency corresponding to the order value (absolute phase). If the average mode is spectral, the inst-spectrum is used and if the average mode is time, the average spectrum is used.

- **Activated**: choose the channel used to calculate the orders phase.

If a channel is selected, the cross-spectrum matrix is not available anymore.

Note: This set up don?t change the spectrum phases and consequently don?t change the orders phases extracted from a waterfall of spectra.

84.3.7 Correlation

Calculation of the Auto Correlation and the Cross Correlation.

The cross-correlation function $\Re xy(\tau)$ gives a measure of the extent to which two signals correlate with each other as a function of the time displacement τ between them.

$$\Re xy(\tau) = y(\tau) \otimes x(-\tau)$$

Where: τ is the time displacement,

$\otimes$ is the convolution symbol

The auto-correlation is a special case where $x(\tau) = y(\tau)$.

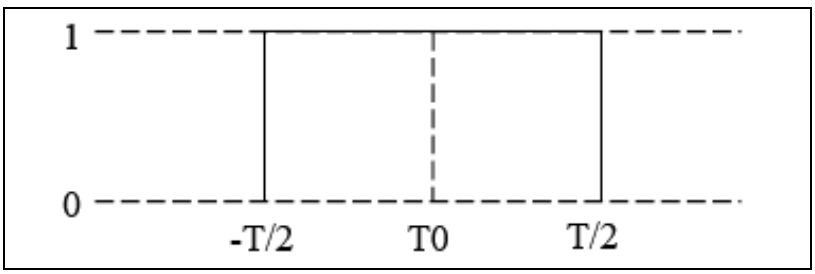
- **Correlation:** Allows to activate or not the calculation of the correlation.

All results of the correlation are in the time domain with ?T/2 et T/2 where T equal to the duration of the block trigger of the FFT.

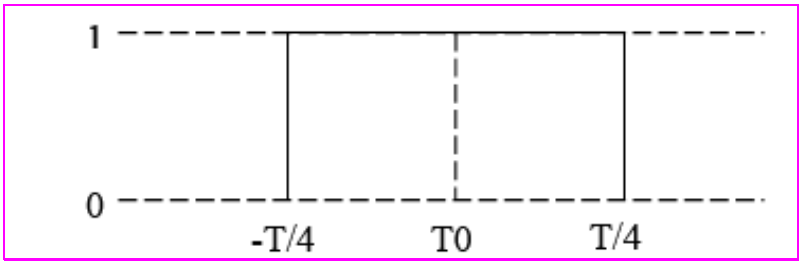
- **Weighting window:** Choose between following values of this setting:

Three types of correlation window are available:

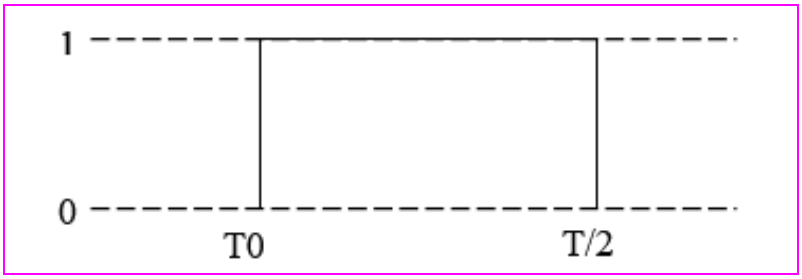
Uniform [-T/2, T/2] (where T is the trigger block length): All the window coefficients are equal to 1. For best results with the Uniform weight window, you should use signal sources that are self-windowing, such as transients, burst, and periodic waveforms (signal period must be a multiple of the weight window length). In order to have the trigger point (T0) at the center of the time trigger block, the trigger Delay must be set to ?T/2**.**



Centered Zero Padding [-T/4, T/4] (where T is the trigger block length): Only the central part of the window (representing the half-length) is not null. This weight window must be used with random noise. In order to have the trigger point (T0) at the center of the time trigger block, **the trigger Delay must be set to ?T/4** (where T is the trigger block length)



Left Zero Padding [0, T/2] (where T is the trigger block length): Only the first half of the window is not null. This weight window must be used with random noise. In order to have the trigger point (T0) at the beginning of the time trigger block, **the trigger Delay must be set to 0.**



If the correlation is activated then all results of the FFT will be affected by the weighting windows of the correlation. When the setting Correlation is deactivated the weighting windows by default (Hanning) is applied on all inputs of the FFT plug-in.

Notes: Results from the correlation are normalized.

Considerations to obtain good results when making correlation measurement.

- Use input **AC** coupling. Both auto correlation and cross correlation are disturbed by DC offset in the input signal.
- Use appropriate trigger mode and trigger delay. The trigger mode should be different from free run. The trigger Delay must be set to ?T/2 (where T is the time signal block length) with the Uniform and Centered Zero Padding correlation weighted window (and 0 for the Left Zero Padding window). But in some cases, especially with the Centered Zero Padding and Left Zero Padding window (as these function types attenuate parts of the trigger signal block), the trigger Delay must be adjusted to position the input signal with respect to time.

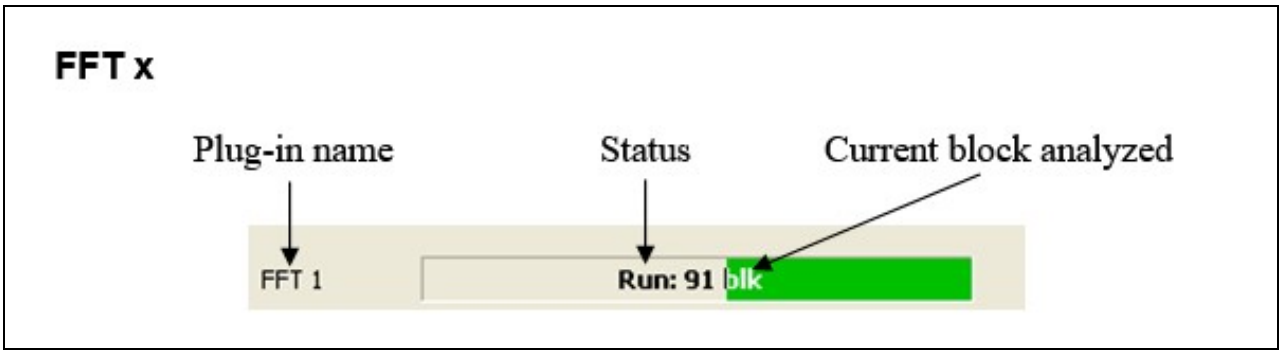
84.3.8 Overall analysis

Calculation of the FFT bands sum.

- **Band power tracking**: Switches computation of the overall level result on or off.
- **Lower frequency**: Specifies the lower frequency of the overall computation frequency range.
- **Upper frequency**: Specifies the upper frequency of the overall computation frequency range.

84.4 FFT status

All status are available for the control panel. Statuses are refreshed all the time at roughly 10 Hz.



The current plug-in status is synthesized in a special progress-bar. This progress bar is automatically displayed in the ?control panel? when the plug-in is active (i.e. as soon as at least 1 input is connected to the FFT plug-in). This status is called ?FFTx? (x from 1 to 4) and it is available in the status ASB tree (see customize control panel).

This status displays the averaging count (i.e. current analyzed block number), the plug-in state and the real-time status.

- **State**: block number analyzed
- **Run:** The FFT plug-in is computing spectra and averaging it.
- **Stop:** The FFT plug-in is stopped.
- **Trig:** The FFT plug-in is waiting for next block; i.e. next trigger event (block triggering) or first start event (triggering)
- **Pause:** The FFT plug-in averaging is paused
- **Waiting:** The FFT plug-in averaging is waiting for the acquisition to be accepted or rejected (in structural mode).

Notes: in exponential averaging mode the average counts stops increasing as soon as the set value is reached.

The way the status bar is displayed, depends on the type of averaging selected:

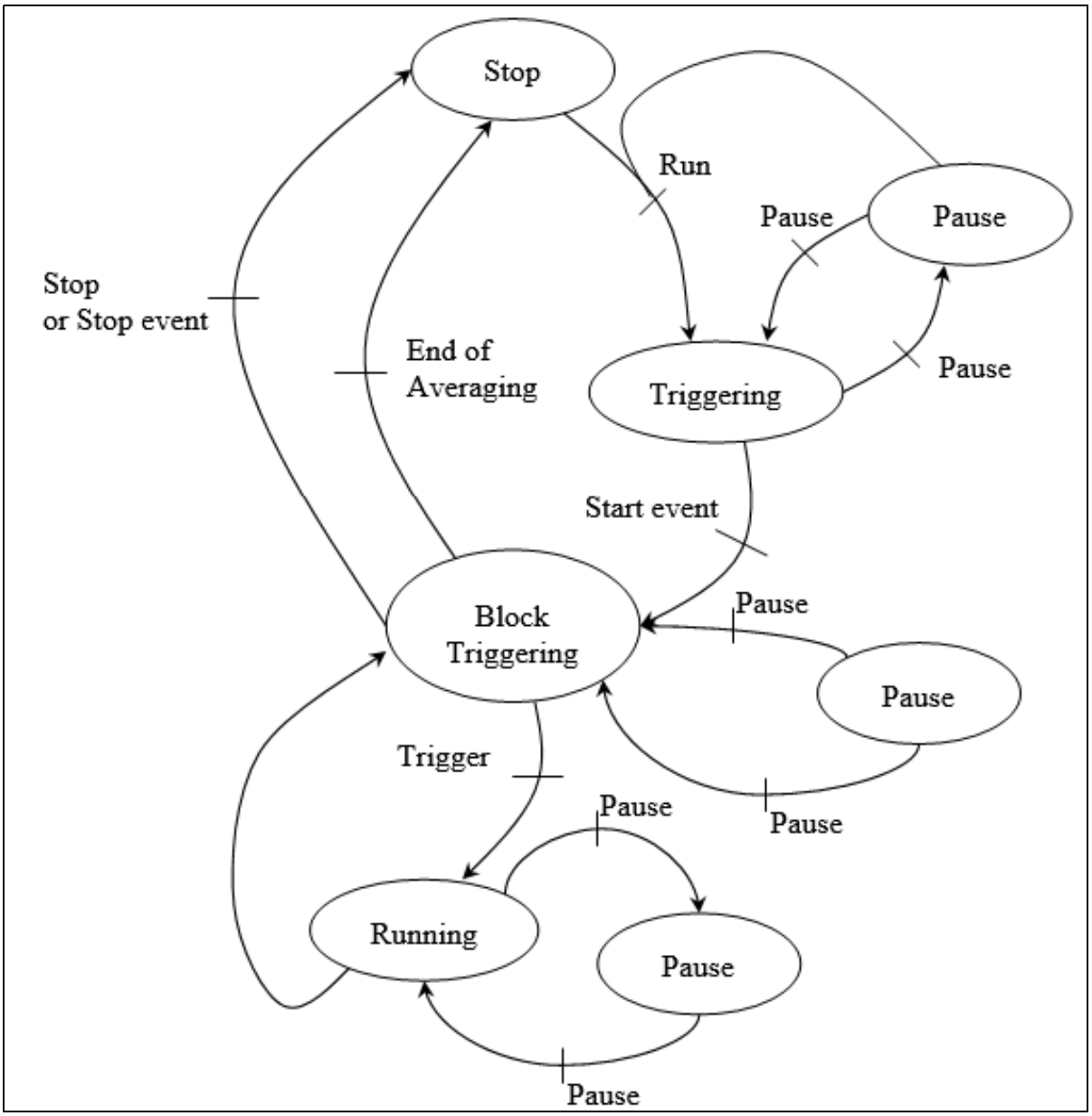
- **?Linear?**, **?Peak hold?** or **?Ref peak hold?:** the progress bar is filled from left to right.
- **?Exponential?**: the progress bar is filled from right to left with a flashing until the end of the acquisition.

The color of the background bar and of the text depends on real-time status:

- *Green background and white or black text*: acquisition in real-time.
- *Red background and white or black text*: the current acquisition is not real-time (current block is not analyzed).
- *Green background and red text*: the current acquisition is real-time, but since start not all the blocks were analyzed.
- Triggering: displays the state of the triggering in percentage before acquiring.
- Acquiring: displays the progression of the time block acquisition in percentage. Until the acquiring period is not finished, the corresponding results are not available; they will be displayed at the end of the acquisition.
- Paused: the acquisition is paused
- Stop: the acquisition is stopped

Trigger State

The following scheme describes the basic statuses evolution of the FFT measurement:


Stop
Run
Pause
Pause
Stop
or Stop event
End of
Averaging
Triggering
Pause
Start event
Block
Triggering
Pause
Pause
Trigger
Pause
Pause
Running
Pause
Pause

By default the trigger state is on ?Stop? and waiting for a ?Run? (start or trigger). Then the state become ?Triggering? and is waiting for a start event, the states become ?Block Triggering? and is now waiting for a trigger event for being in the ?Running state. If there is less than one second elapsed since the end of current block analysis, FFT status stay at "running" state.

The status is ?Stop? after a stop event or at the end of averaging.

In structural mode, a state ?Waiting? is available and is waiting for the ?Accept/Reject? event to continue.

84.4.1 Count

This status displays the averaging count processed. This status is expressed in analyzed block.

84.4.1.1 Real-time

This status displays if the averaging is in real-time or not (i.e. the current block is analyzed or not). If the corresponding signal were not available at this time, the acquisition is not real-time. That means that the treatment is longer than the acquisition. There are three values for this state:

- **?OK?**: The acquisition is real-time (all block have been processed and averaged)
- **?No?**: Acquisition was not real-time (some previous blocks are missing in the average).
- **?-?**: The acquisition is currently not real-time (current block is not analyzed an averaged).

84.4.1.2 Block overload

This status corresponds to the instantaneous overload indication within 1 FFT trigger block, for instance amplitude overload occurred in the current analyzed block. It is useful in structural mode if for one hammer impact one channel is overloaded. Note that overloaded block may be automatically rejected (see accept mode).

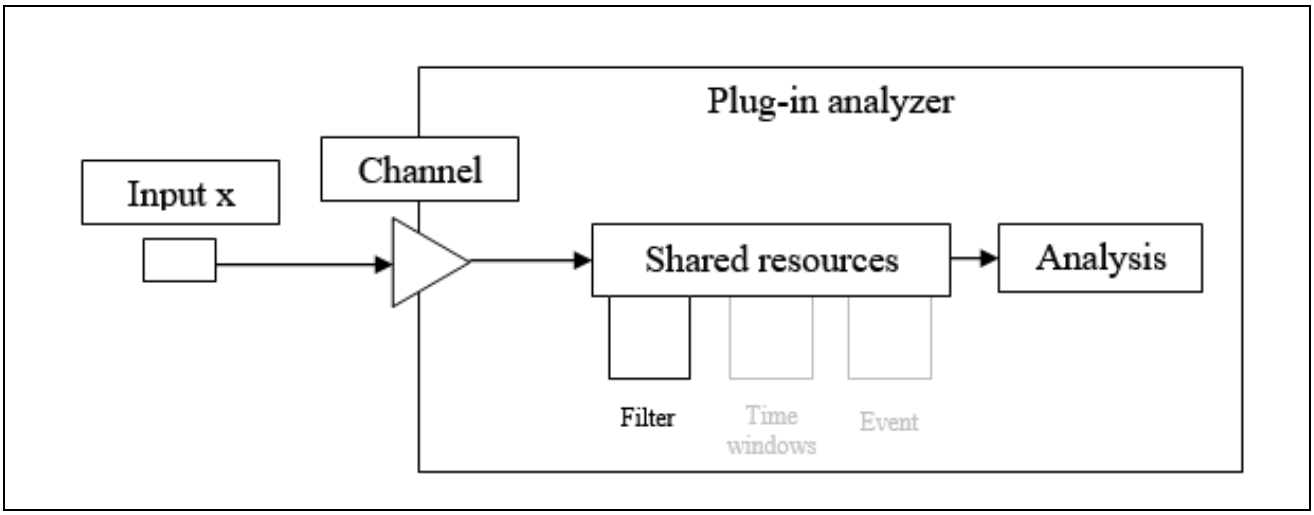
84.4.1.3 Analysis overload

This status corresponds to overload indication over the measurement period. It means that during the whole measurement period there was (or not) an overload. It memorizes block overloaded.

85 NVGate Filter Builder

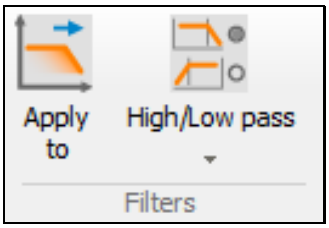
85.1 Filters

Define several IIR filters and select the modules to which the filters are applied. The filters operate on the time domain series, and they can be applied to various signal processing stages (Inputs, Plug-in channels, Outputs, Player tracks).

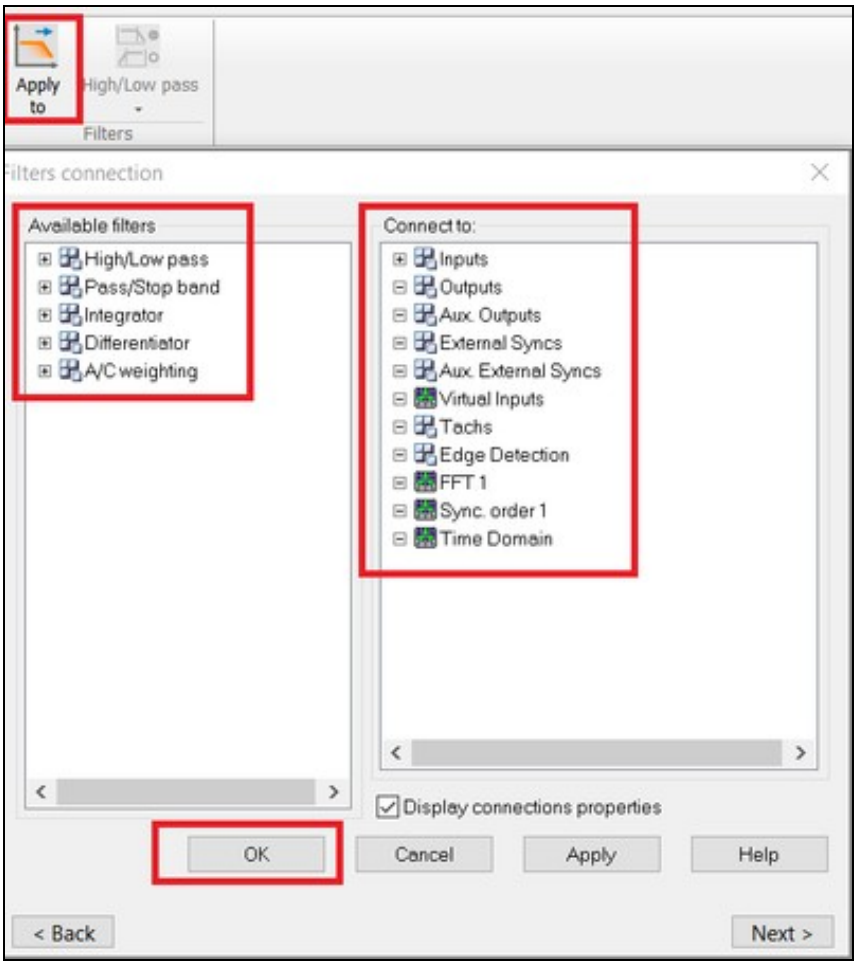


85.1.1 Connect a filter

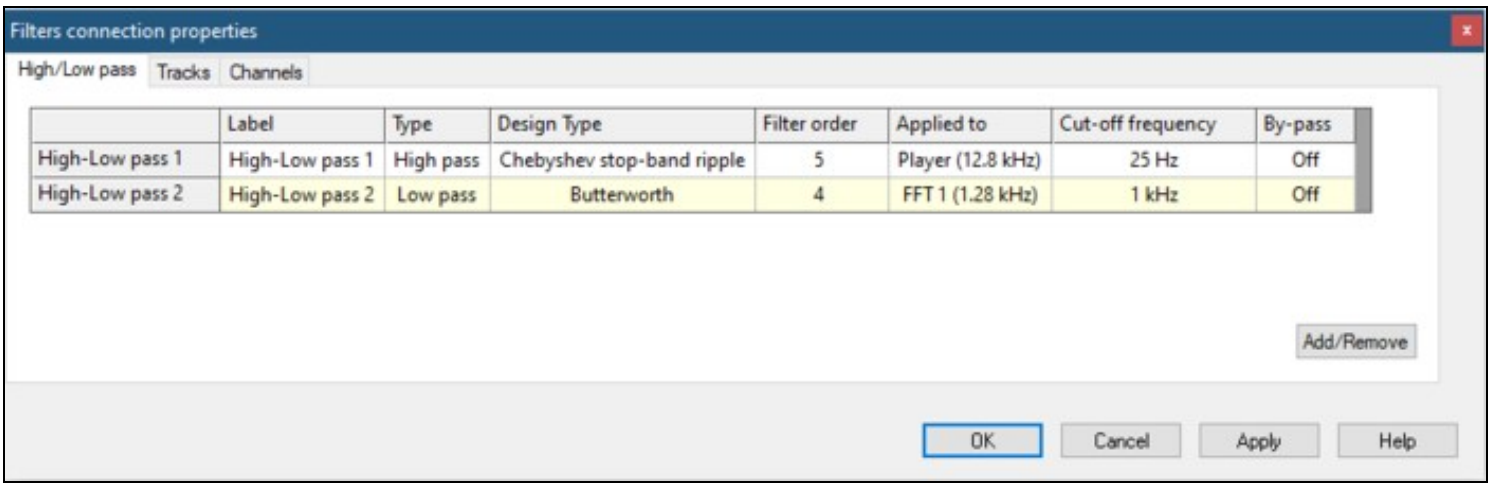
In the acquisition tab, The left button (*Apply to*) allows users to choose where to apply the filters. The right button (*Filter builder*) allows users to setup the properties of the filters.



 *Apply to: This button opens the following dialog. To choose where to apply the filters, drag the selected filter on the left and drop it on the selected module on the right.*



Then the filters connection properties will be displayed, and the properties of the selected filters and channels can be modified in this window.

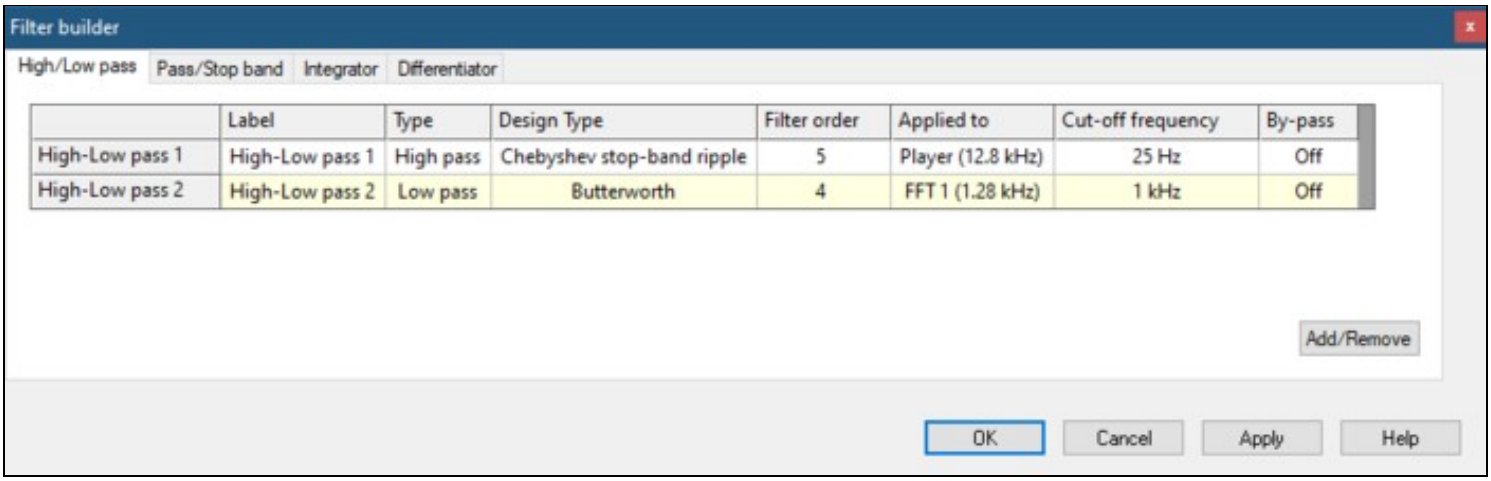


Note: Due to the bandwidth compatibility, once a filter is applied to a module (ex: a plug-in channel), it can only be used to the same plug-in channels. The front-end is considered as a plug-in.

85.1.1.1 Filter builder

85.1.1.1.1 High-Low pass

 : Used to design a high-pass filter or a low-pass filter (Butterworth, Chebyshev Type I, and Chebyshev Type II).



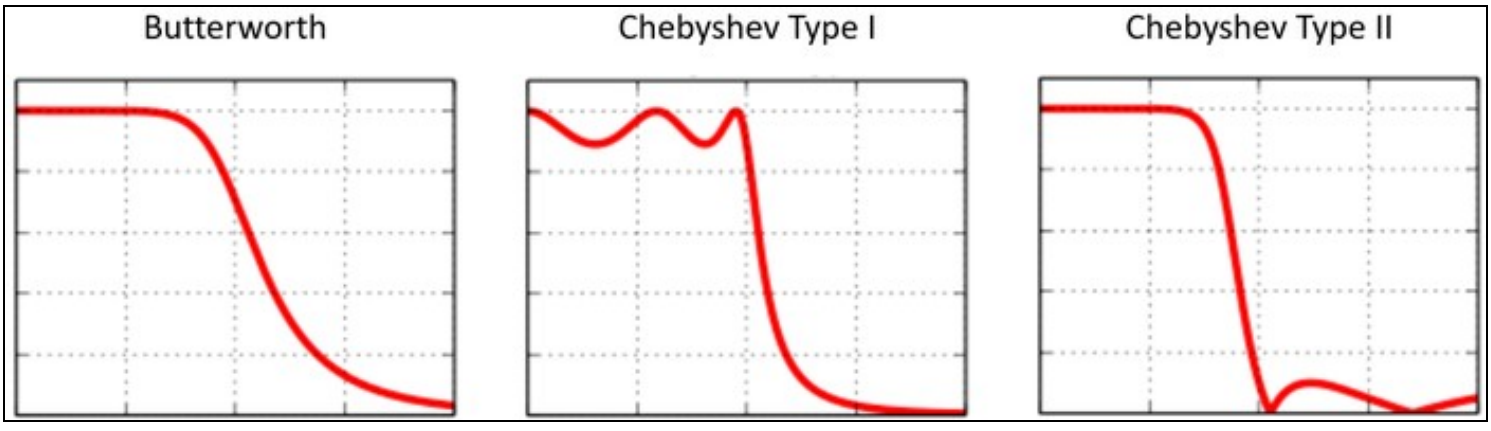
- **Label**: The name of the filter (by default High-Low pass n, with 1 ? n ? 4).
- **Type**: The type of the filter - Low pass or High pass.
- **Design Type**: The analog prototype filter - Butterworth, Chebyshev band-pass ripple (Type I), or Chebyshev stop-band ripple (Type II).

  The Butterworth filter has flat response in both the pass band and stop band, but its transition band is wide.

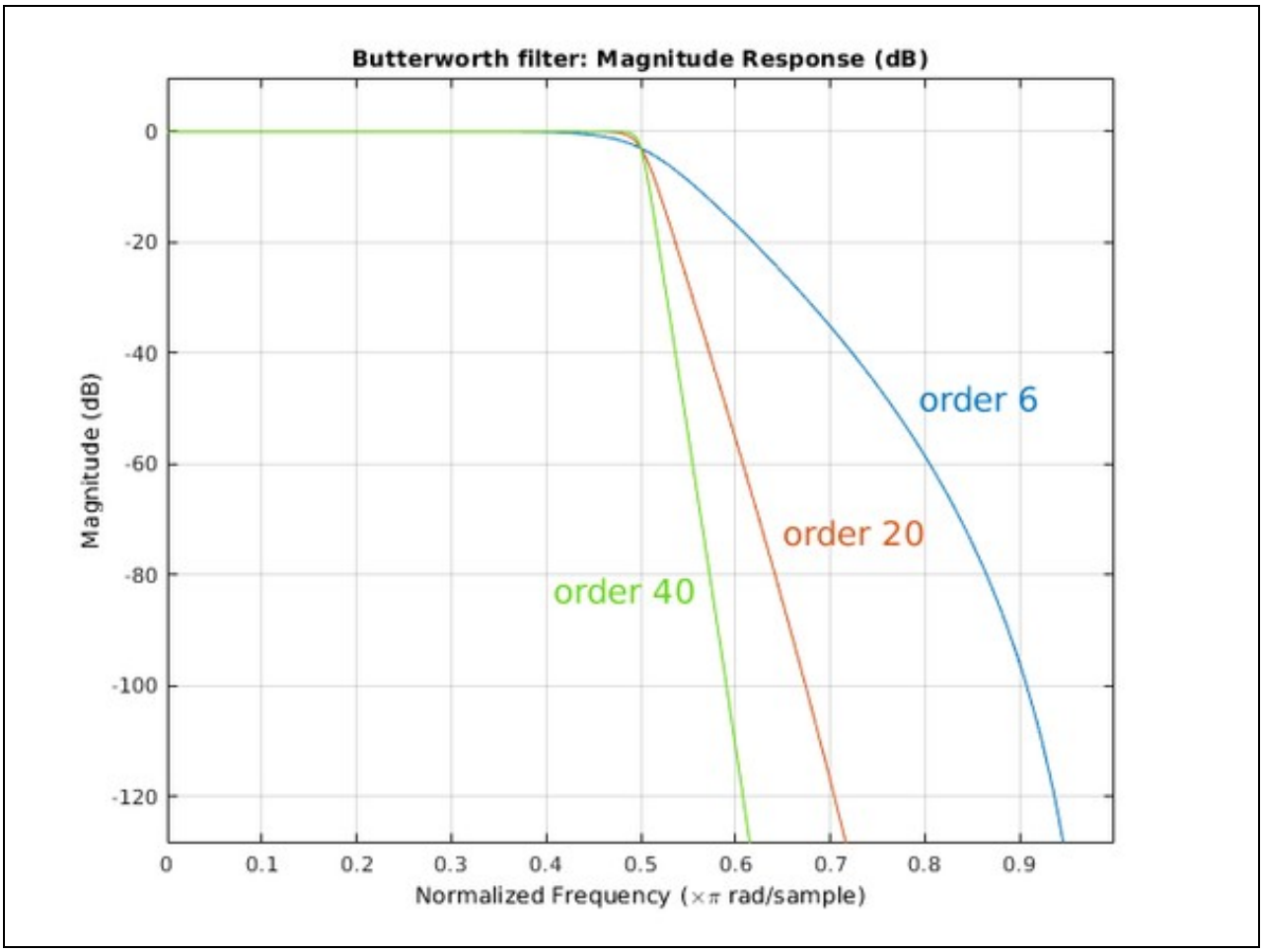
  The Chebyshev type I (band-pass ripple filter) has the steepest roll-off among the three filters, and its response in the stop band is flat. However, it has ripples in the pass band.

  The Chebyshev type II (stop-band ripple) filter has flat response in the pass band, but it has ripples in the stop band. Its transition band is narrower than the Butterworth filter, but wider than the Chebyshev type I.

  Below is an example showing these three filters with the same filter order.



- **Filter order**: The filter order can be selected from 1 to 40 in Office mode, and from 1 to 10 in Connected mode. The higher the order is, the steeper the cut-off slope is.



- **Applied to**: Shows which plug-in the filter is applied to. The construction of the filter requires applying it to a signal with the same bandwidth. The determination of the associated plug-in/bandwidth is automatic. Deactivate the filter to reset.

  The other modules (front-end, monitor, resources) operate at the front end input sampling frequency (in connected mode on-line) or at the max player bandwidth (in post analysis mode).

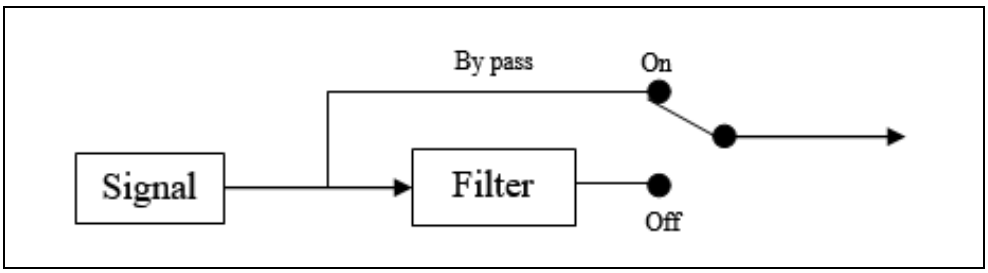
Apply to	Description
Front-end (20 kHz)	To be used on any resources and monitor
FFTx (10 kHz)	To be used on the FFT x analyzer only

  Note that even if plug-ins run in the same bandwidth, it?s not possible to share filters between different plug-ins.

- **Cut-off frequency**: The cut-off frequency of the filter. The maximum value is the input frequency range **FR**. The minimum value is **FR** / 50000 in the Office mode, and **FR** / 40000 in the Connected mode.

  Warning: For measurements including the signal phase (i.e: balancing or Bode plot), the cut-off frequency must be chosen far from (at least 10 times) the frequency of interest. If not, the phase of the low pass filter will affect the phase of the result.

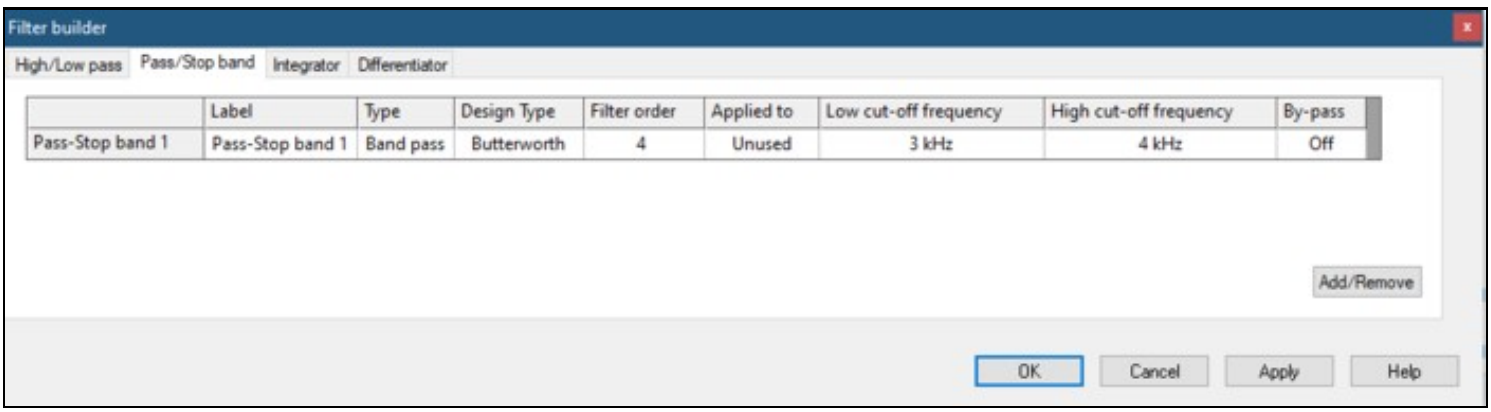
- **By-pass**: On / Off. The filter is not applied if By-pass is On.



By-passing a filter does not request stabilization time.

85.1.1.1.2 Pass-Stop band

 : Used to design a band-pass filter or a band-stop filter.



- **Label**: The name of the filter (by default Pass-Stop band n, with 1 ? n ? 4).
- **Type**: The type of the filter - Band pass or Band stop.
- **Design type**: The analog prototype filter - Butterworth, Chebyshev band-pass ripple (Type I), or Chebyshev stop-band ripple (Type II).
- **Filter order**: The filter order is 2*N, and N can be selected between 1 to 30 in the Office mode, and between 1 to 10 in the Connected mode. The higher the order is, the steeper the cut-off slope is.
- **Applied to**: Shows which plug-in the filter is applied to. The construction of the filter requires applying it to a signal with the same bandwidth. The determination of the associated plug-in/bandwidth is automatic. Deactivate the filter to reset.

  The other modules (front-end, monitor, resources) operate at the front end input sampling frequency (in connected mode on-line) or at the max player bandwidth (in post analysis mode).

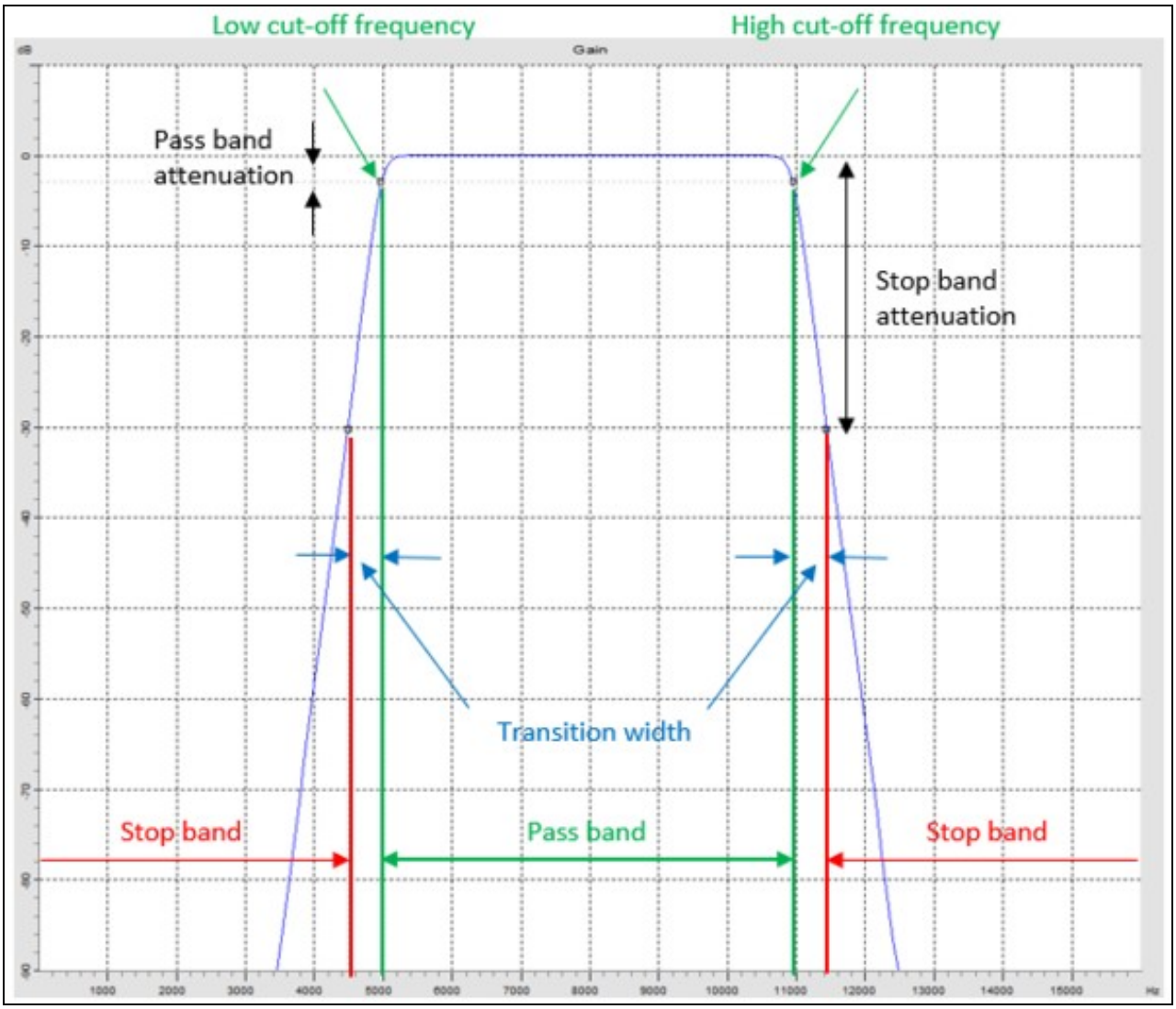
Apply to	Description
Front-end (20 kHz)	To be used on any resources and monitor
FFTx (10 kHz)	To be used on the FFT x analyzer only

  Note that even if plug-ins run in the same bandwidth, it?s not possible to share filters between different plug-ins.

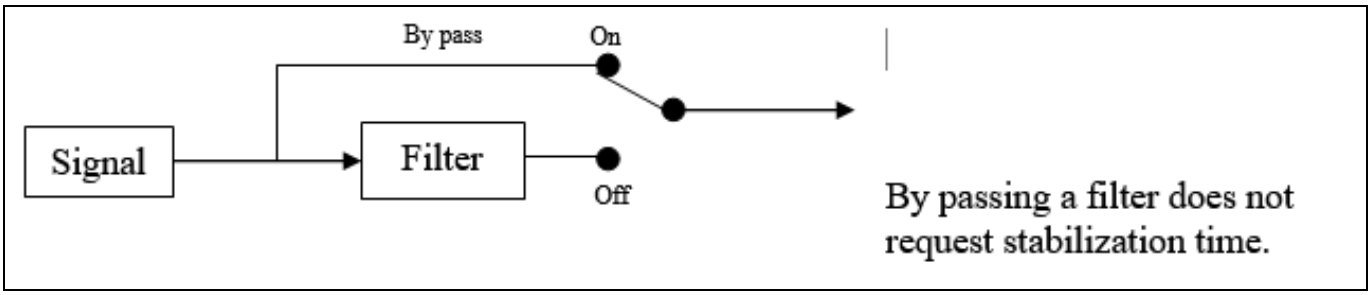
- **Low cut-off frequency** and **High cut-off frequency**: The low cut-off frequency of the filter f_{low} and the high cut-off frequency of the filter f_{high}, as shown in the following figure.
  Their values need to meet the following conditions in the connected and office mode:

Connected	Office
f_{low} ? 0.0005 * **FR**	f_{low} ? 0.0001 * **FR**
f_{high} ? **FR**	f_{high} ? **FR**
0.000675 * **FR** ? f_{high} - f_{low} ? 0.99 * **FR**	0.0004 **FR** ? f_{high} - f_{low} ? 0.9998 * **FR**

  Here **FR** is the input frequency range, the pass band attenuation is 3 dB (0.1 dB if the design type is Chebyshev pass-band ripple filter), and the transition width is **FR** / 400.


Low cut-off frequency
High cut-off frequency
Gain
dB
Pass band attenuation
Stop band attenuation
Transition width
Stop band
Pass band
Stop band
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
Hz

- **By-pass**: On / Off. The filter is not applied if By-pass is On.



85.1.1.1.3 Integrator



: Used to design a time integrator filter associated with a high pass filter (to limit gain near DC components).

- **Label**: the name of the filter (by default Integrator n, with 1 <= n <=).
- **Type**: the type (High Pass + single integ. / High Pass + double integ.) of the filter.
- **Applied to**: Indicates on which plug-in the filter can be used. Indeed the construction of the filter requires applying it on signal with the same bandwidth. The determination of the associated plug-in/bandwidth is automatic. Deactivate the filter to reset it.

The other modules (front-end, monitor, resources) operate at the front end input sampling (in connected mode on-line) or to the max player bandwidth (in post analysis mode).

Apply to	Description
Front-end (20 kHz)	To be used on any resources and monitor
FFTx (10 kHz)	To be used on the FFT x analyzer only

- ♦ **Note :** Even if plug-ins run in the same bandwidth, it not possible to share filters between different plug-in.

- **HP cut-off frequency**: the cut-off frequency of the High pass filter contained in this integrator filter. Its maximum value is FR / 2000, and its minimum value is FR / 10000, where FR is the input frequency range.

Warning for measurements including signal phase (i.e: balancing or Bode plot) the cut-off frequency must be chosen far (10 times) from the frequency of interest. If not the phase of the low pas filter will affect the phase of the result.

'*Integration* **time**: the time constant of the integrator filter is equal to 1s. This is fixed value, not a setting.

The frequency response of a first order integrator filter is equal to:

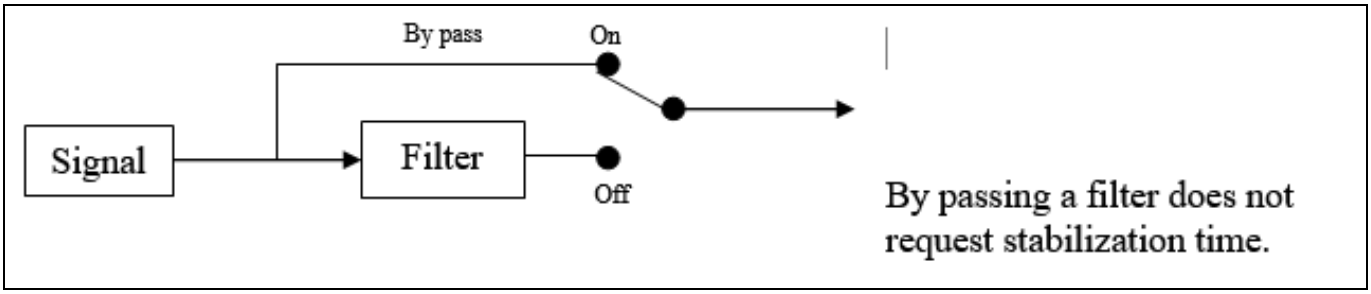
$$S(f) = \frac{1}{j\frac{w}{w0}}$$

$\omega 0 = \frac{2\Pi}{T}$ where: T is the integration time = 1s.

The attenuation of a sine signal with a frequency of f Hz is equal to:

$$20\log(\frac{1}{Tf})$$

- **By-pass**: On / Off. The filter is not applied if By-pass is On.



- **Note :** In post analyse, you will have a stabilisation time of 2 seconds before having any results or signal :
  - The integrator filter has an integration time of 1s.
  - This integrator filter also include a high pass filter. This filter needs also a stabilization time of 1s.

Therefore, the total stabilisation time of the filter is 2 seconds. Meanning the 2 first seconds of the signal will not be analysed.

85.1.1.1.4 Differentiator



Used to setup a time differentiator filter associated with an exponential average to avoid that small fluctuations of the input signal become important distortions in the output signal.

- **Label**: the name of the filter (by default Differentiator n, with 1 <= n <= 3).
- **Applied to**: Indicates on which plug-in the filter can be used. Indeed the construction of the filter requires applying it on signal with the same bandwidth. The determination of the associated plug-in/bandwidth is automatic. Deactivate the filter to reset it.

The other modules (front-end, monitor, resources) operate at the front end input sampling (in connected mode on-line) or to the max player bandwidth (in post analysis mode).

Apply to	Description
Front-end (20 kHz)	To be used on any resources and monitor
FFTx (10 kHz)	To be used on the FFT x analyzer only

Note even if plug-ins run in the same bandwidth, it no possible to share filters between different plug-in.

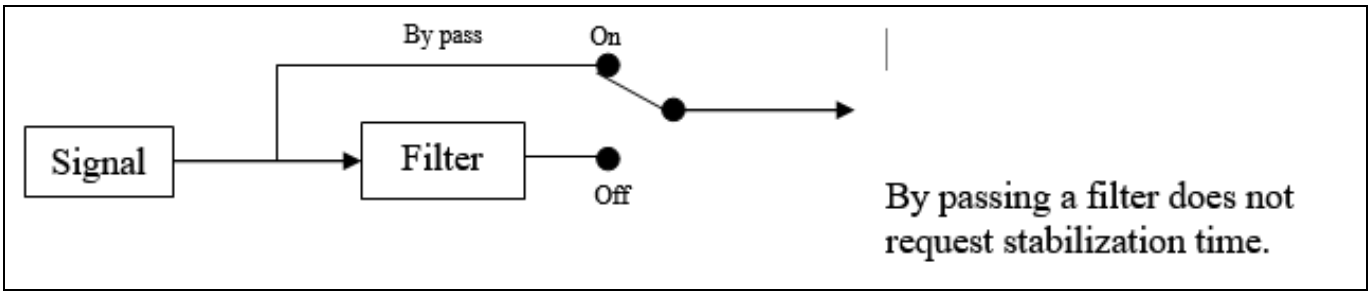
- **Avg. duration**:Filter average duration. By default, the average duration is equal to 0s. This value can be modified by the user. This setting is used to specify the exponential average duration of the differentiator filter

$X_{mean}(n)$ = ?X(n) + (1 ? ?)$X_{mean}(n-1)$ with $X_{mean}(n)$ the averaged input signal at instant n, X(n) the input signal at instant n and ? the averaging factor.

The following formula is applied to the averaged signal:

$Y(n) = (X_{mean}(n) - X_{mean}(n-1)) / f_s$. with, Y(n) the differentiated signal at instant n, $X_{mean}(n)$ the averaged input signal at instant n and f_s the sampling frequency.

- **By-pass: On** / **Off.** The filter is not applied if By-pass is On.



86 NVGate filter formula appendix

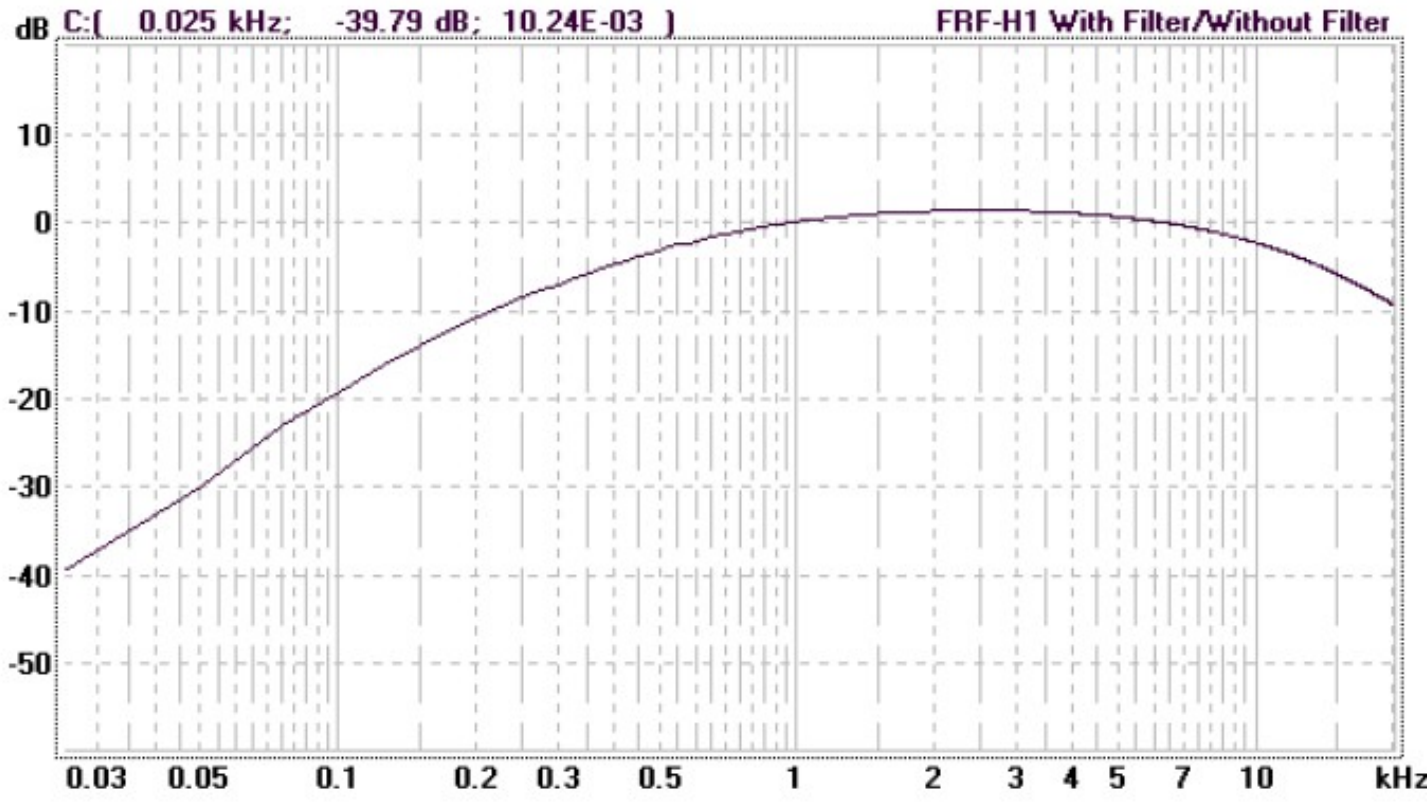
87 Digital Filters

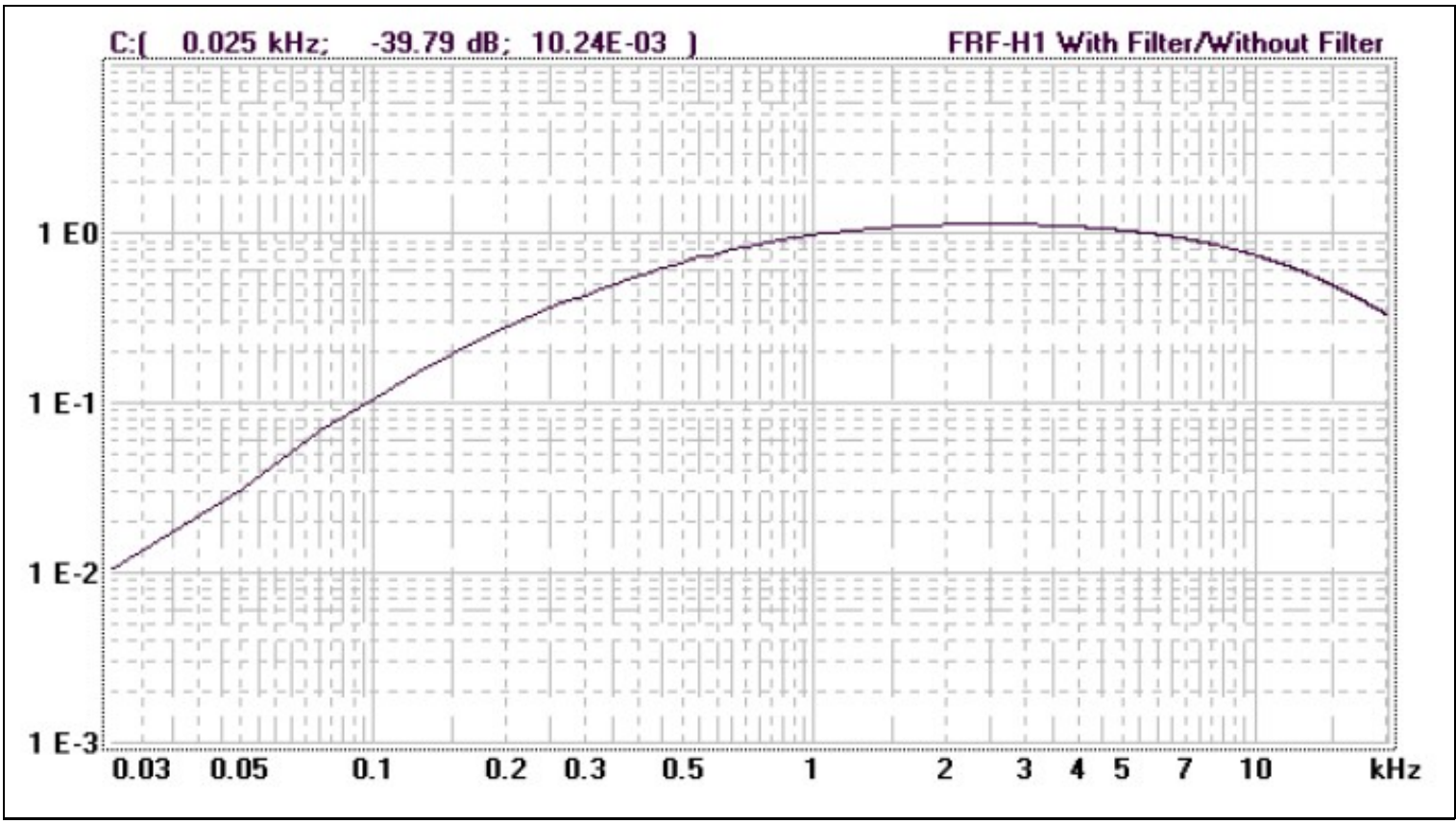
These filters use the Infinite Impulse Response. You will find below descriptions of NVGate digital filters

87.1 "A" Weighting Filter

$$A(f) = \frac{12200^2 . f^4}{k_A \left(f^2 + 20{,}6^2\right)\left(f^2 + 12200^2\right)\left(f^2 + 107{,}7^2\right)^{1/2}\left(f^2 + 737{,}9^2\right)^{1/2}}$$

$k_A = 0.79435$

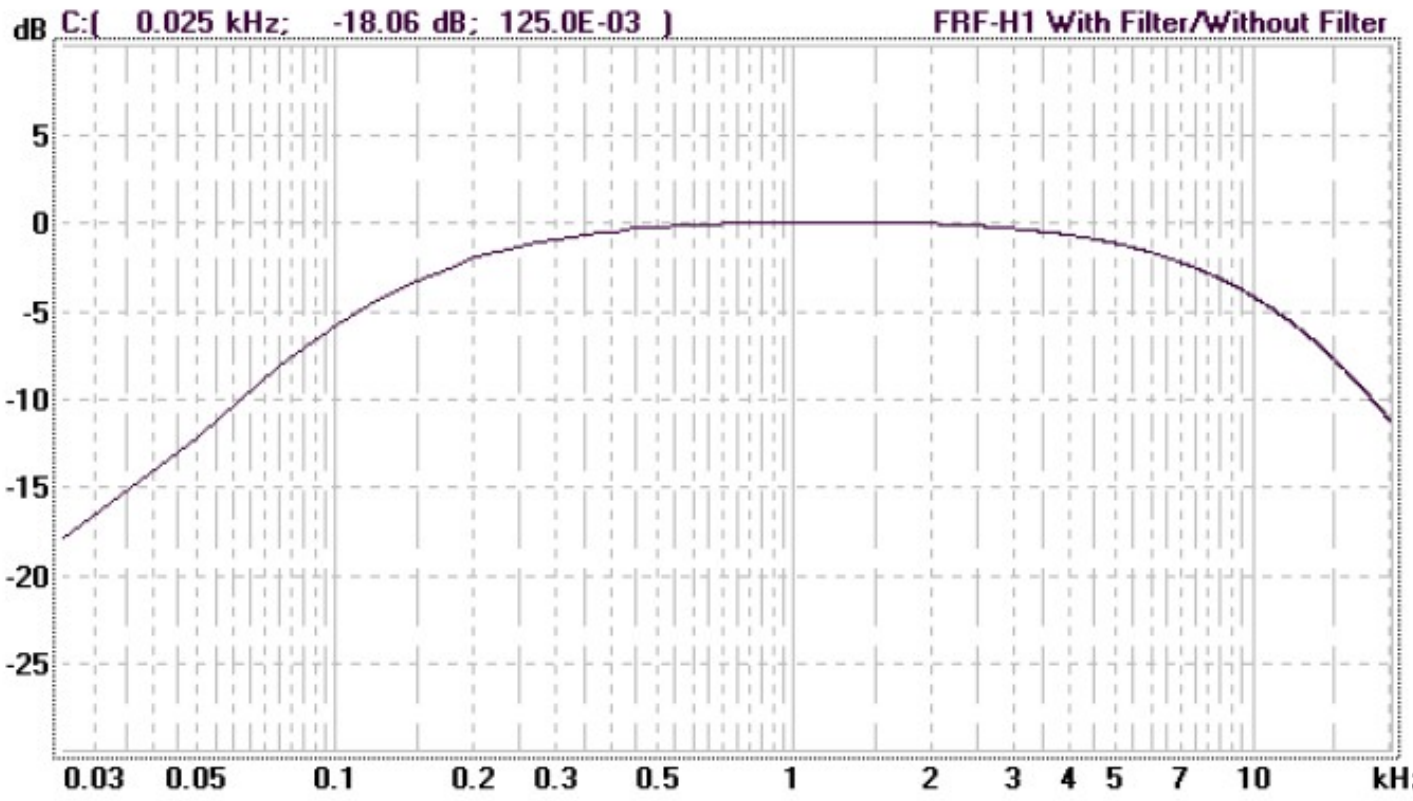


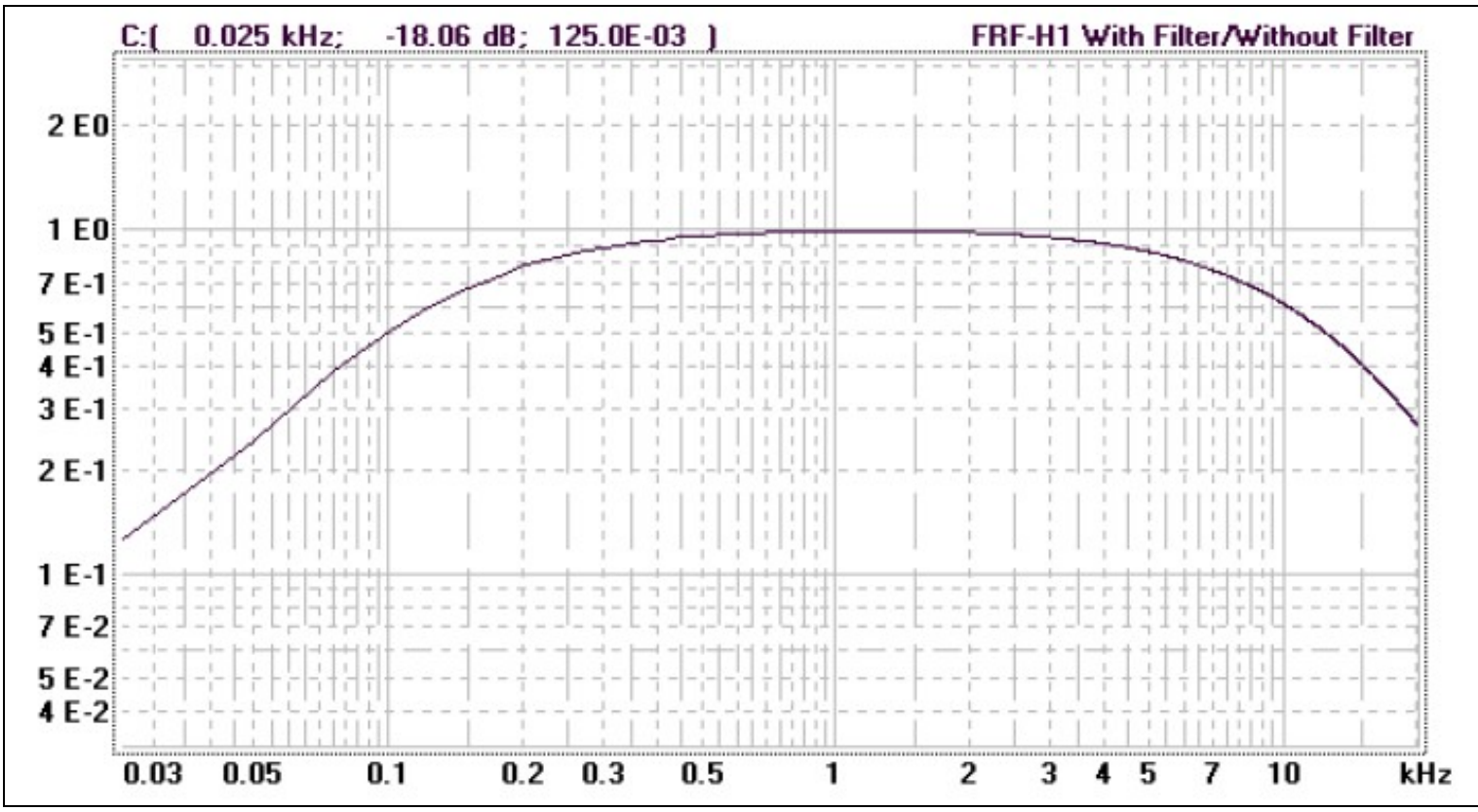


87.1.1 "B" Weighting Filter

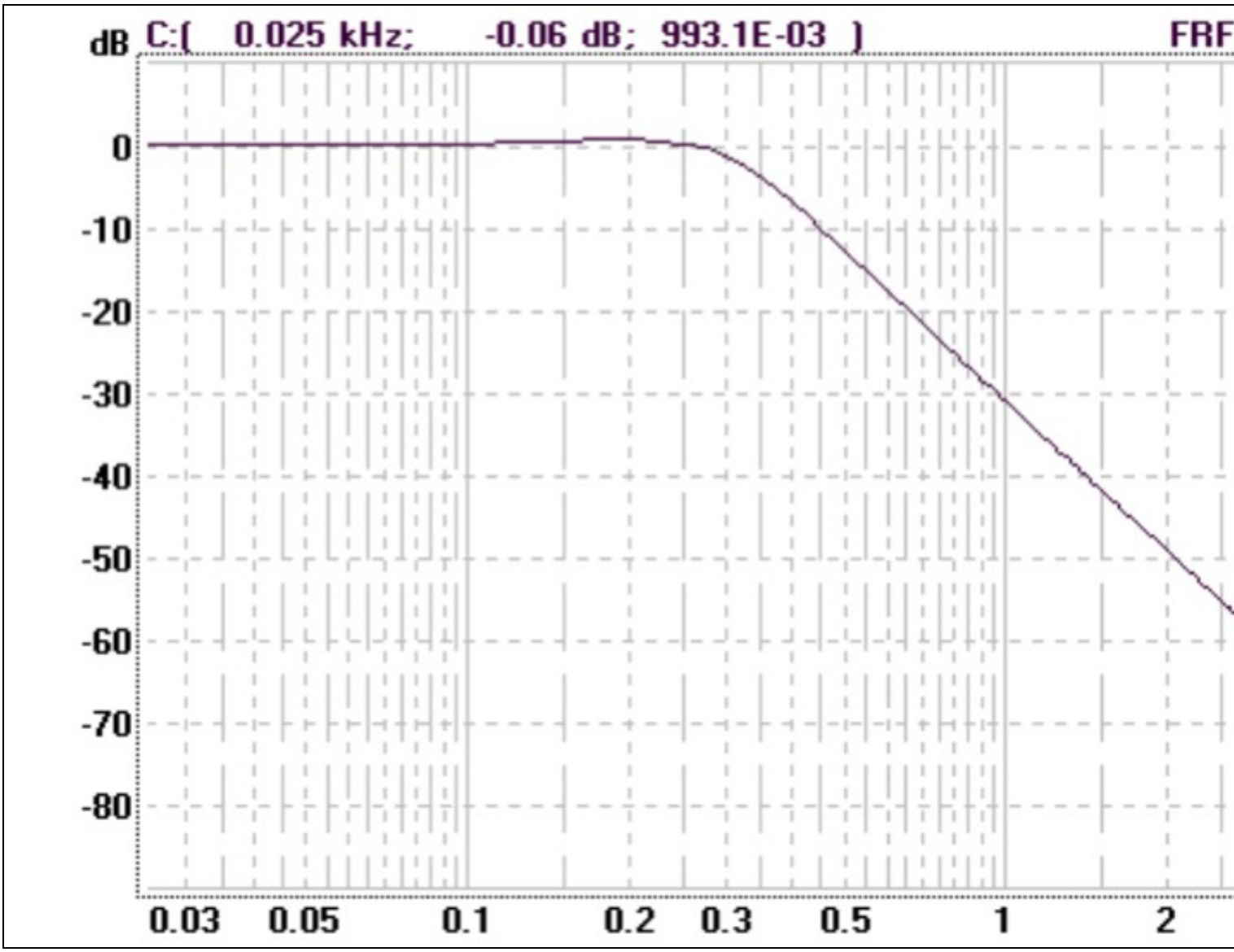
$$B(f) = \frac{12200^2 . f^3}{k_B \left(f^2 + 20{,}6^2\right)\left(f^2 + 12200^2\right)\left(f^2 + 158.5^2\right)^{1/2}}$$

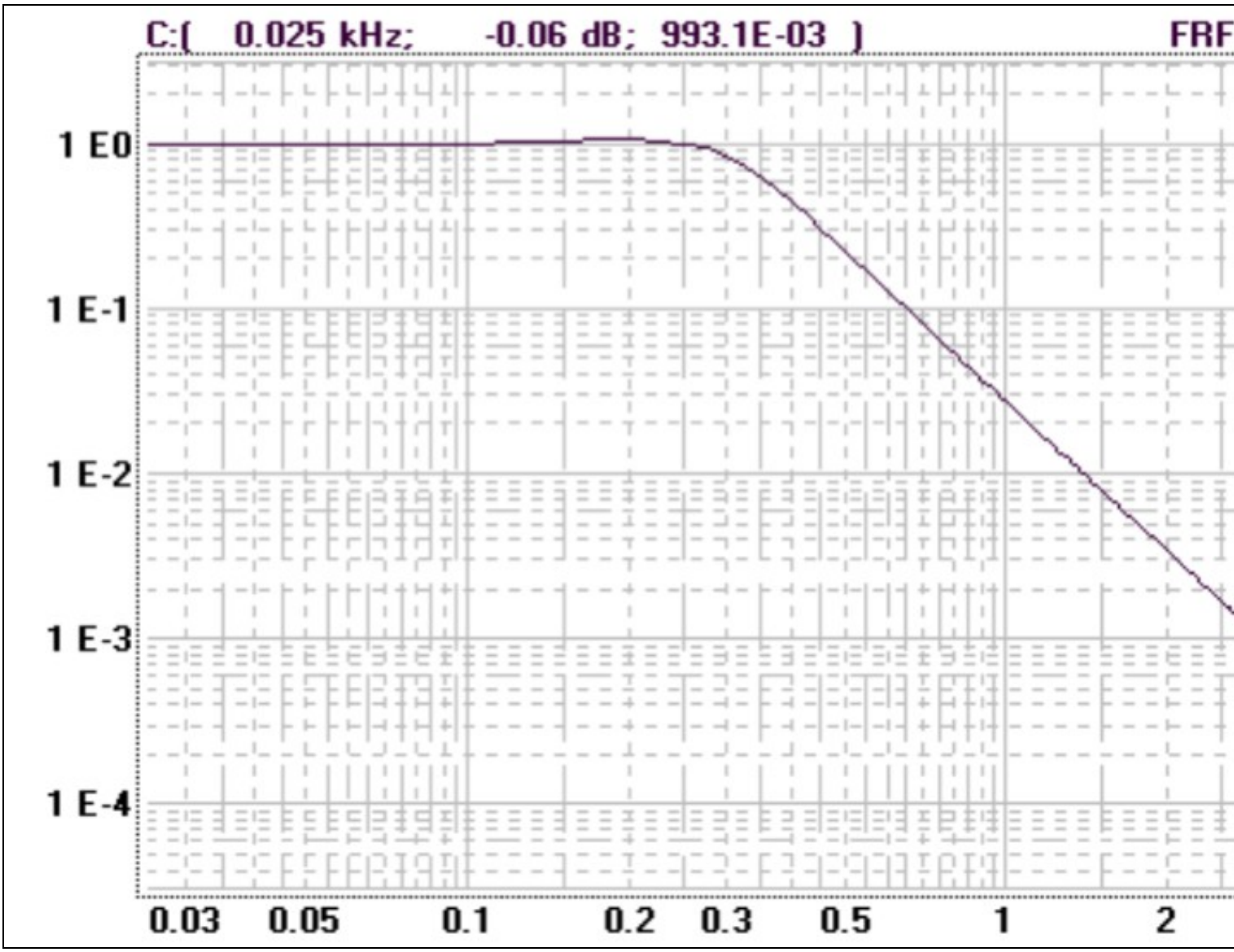
$k_B = 0.98066$



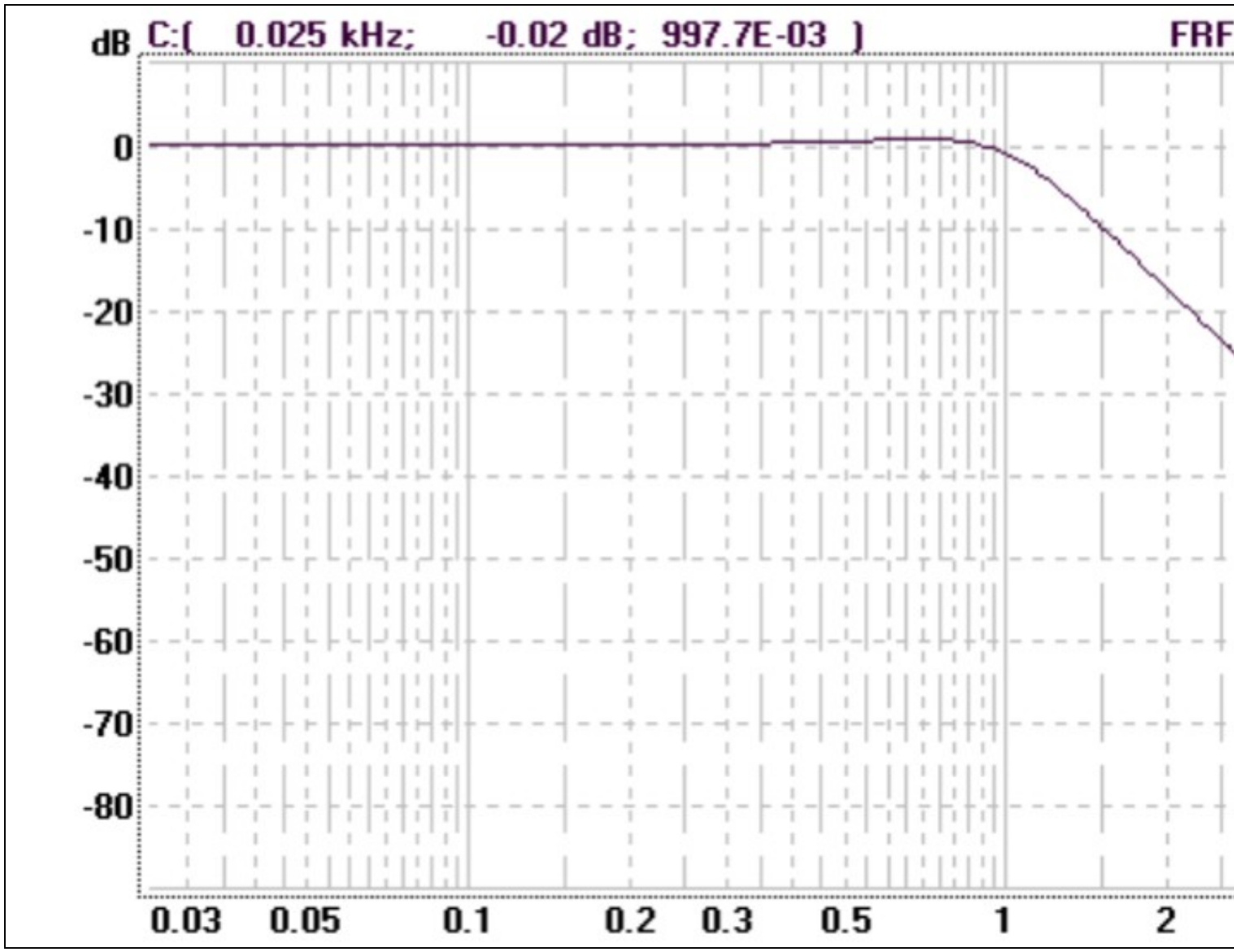


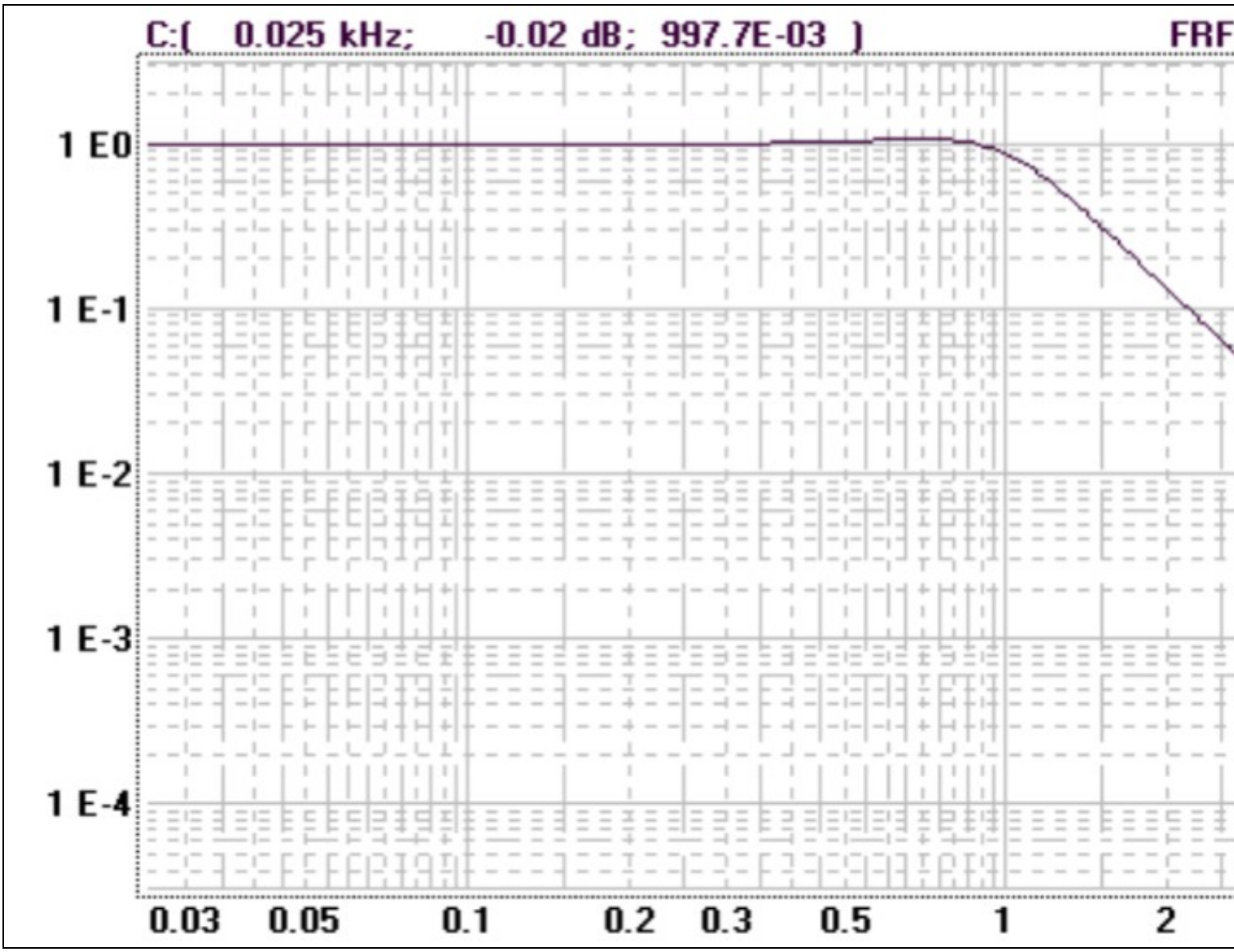
87.1.2 300 Hz Filter


dB
C:(0.025 kHz; -0.06 dB; 993.1E-03)
FRF
0
-10
-20
-30
-40
-50
-60
-70
-80
0.03
0.05
0.1
0.2
0.3
0.5
1
2


C:(0.025 kHz; -0.06 dB; 993.1E-03)
FRF
1 E0
1 E-1
1 E-2
1 E-3
1 E-4
0.03
0.05
0.1
0.2
0.3
0.5
1
2

87.1.3 1 kHz Filter

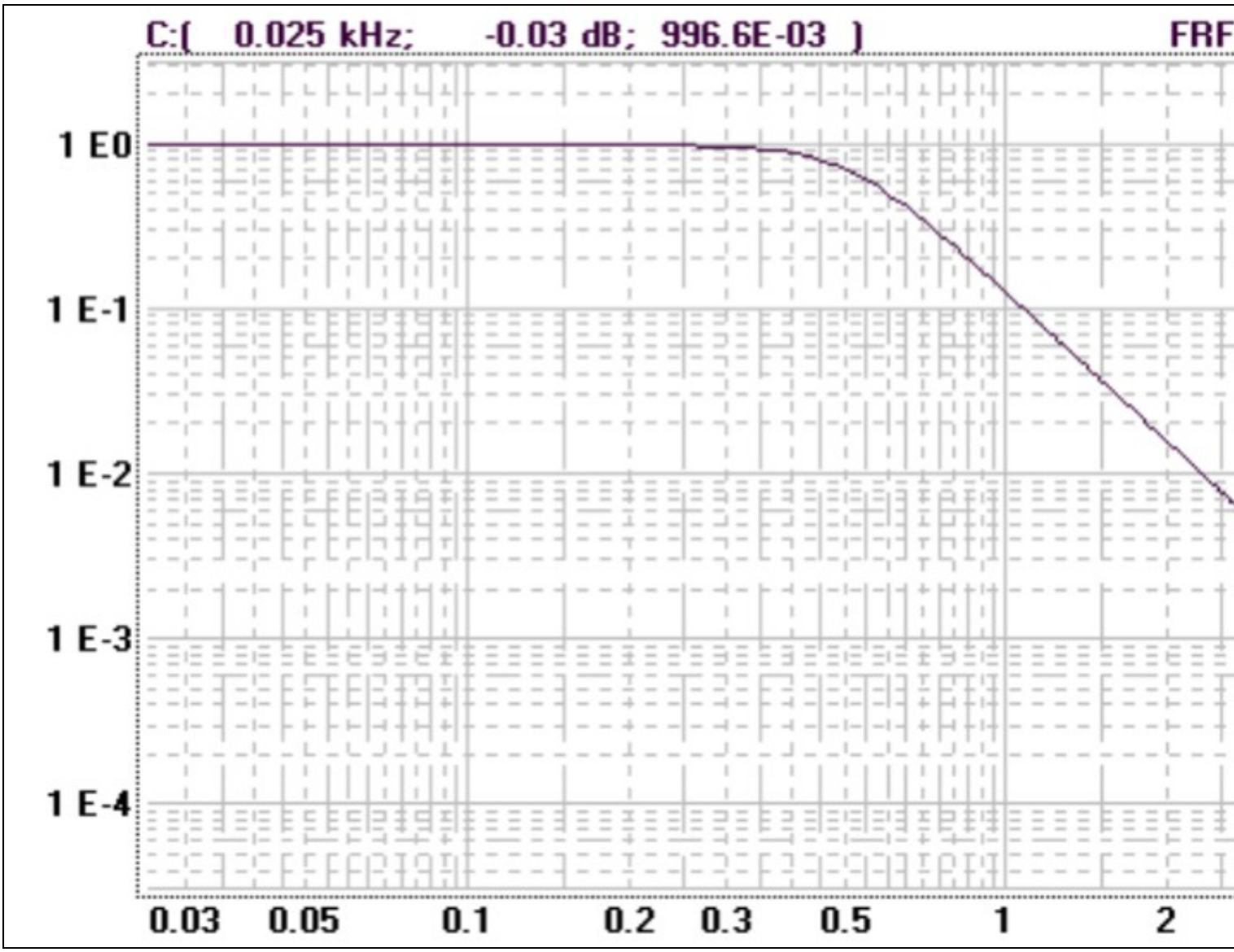



C:(0.025 kHz; -0.02 dB; 997.7E-03)
FRF
1 E0
1 E-1
1 E-2
1 E-3
1 E-4
0.03
0.05
0.1
0.2
0.3
0.5
1
2

87.1.4 User Low Pass Filter

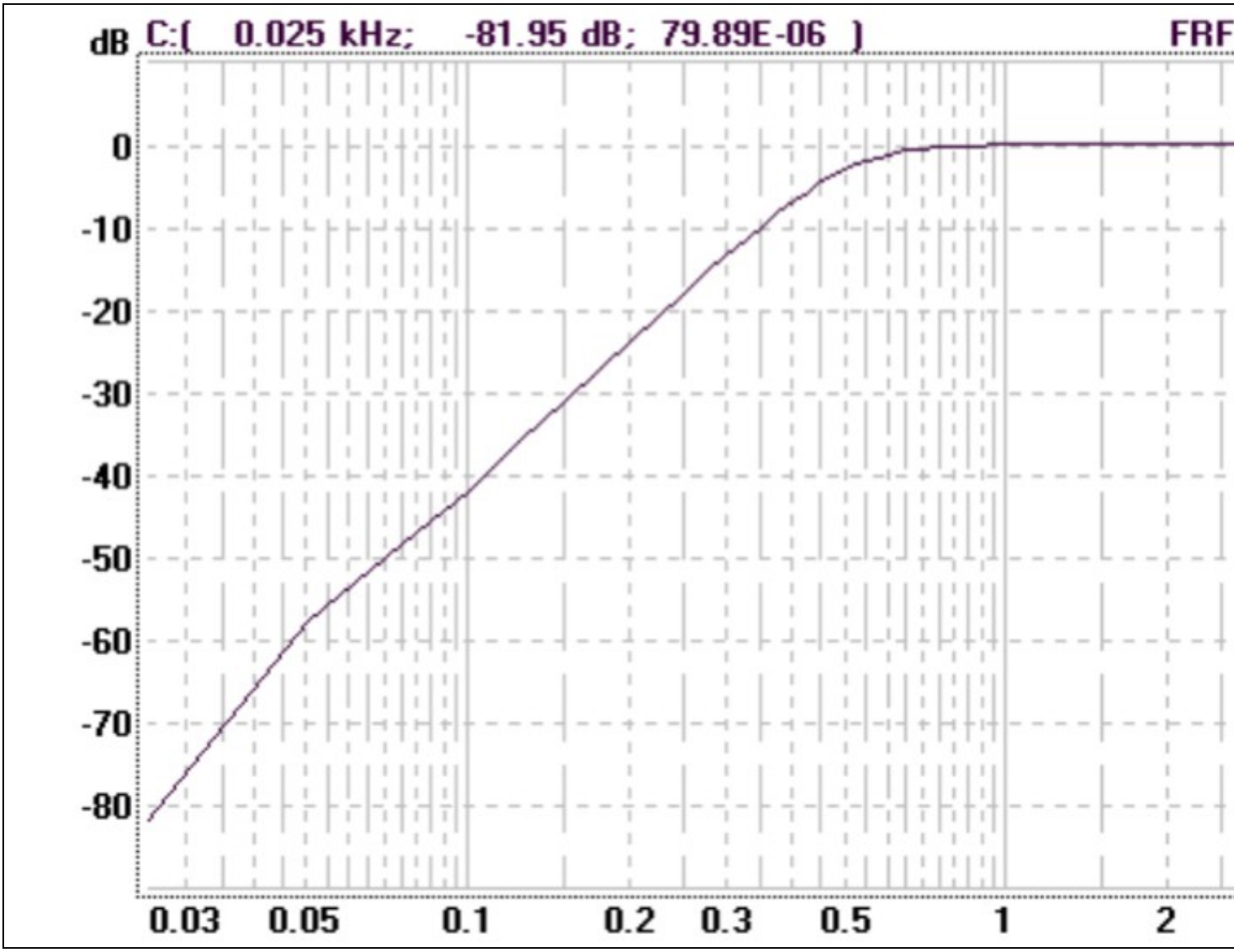
Example with a 500 Hz cut-off frequency:

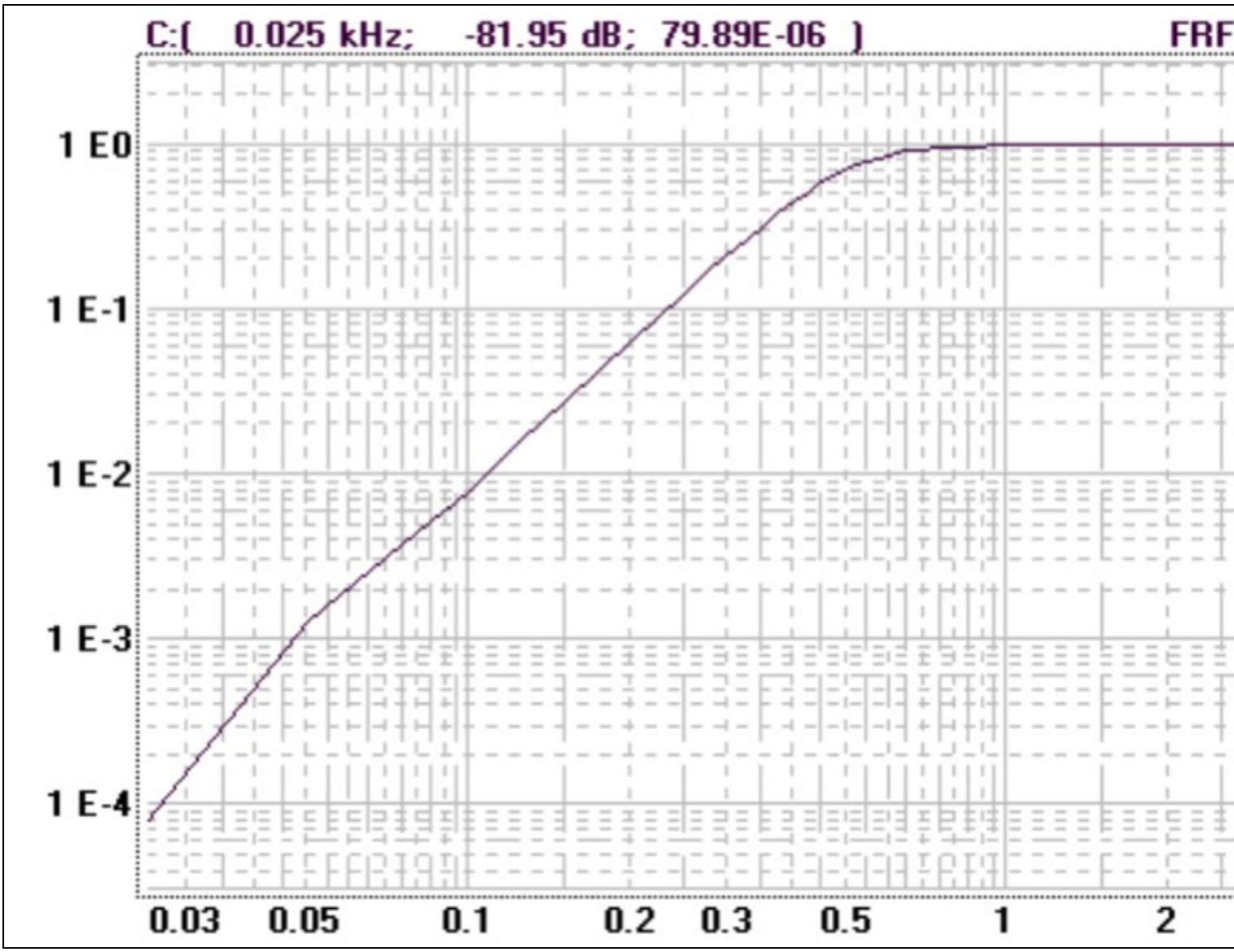



C:(0.025 kHz; -0.03 dB; 996.6E-03)
FRF
1 E0
1 E-1
1 E-2
1 E-3
1 E-4
0.03
0.05
0.1
0.2
0.3
0.5
1
2

87.1.5 User High Pass Filter

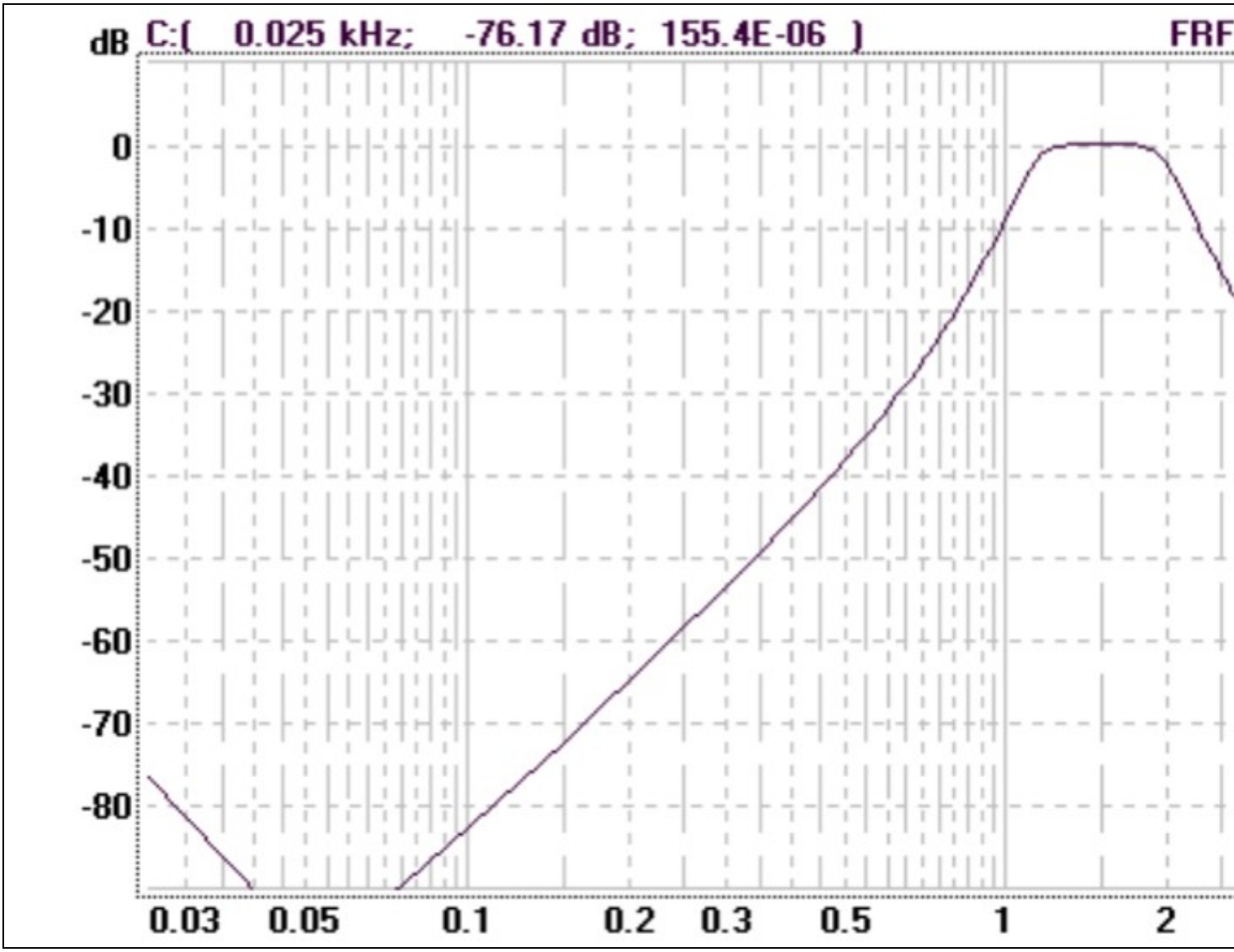
Example with a 500 Hz cut-off frequency:

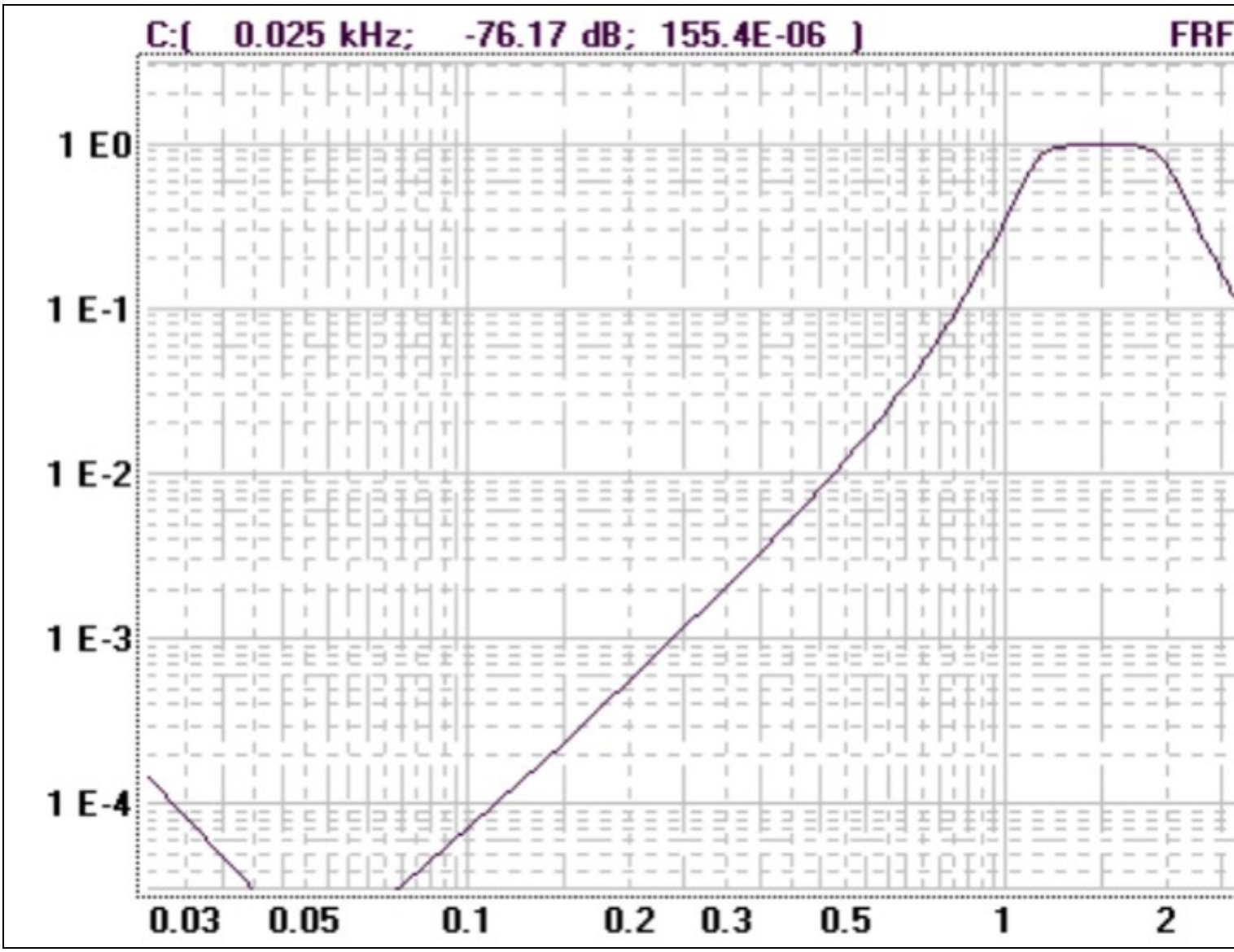



C:(0.025 kHz; -81.95 dB; 79.89E-06)
FRF
1 E0
1 E-1
1 E-2
1 E-3
1 E-4
0.03
0.05
0.1
0.2
0.3
0.5
1
2

87.1.6 User Band Pass Filter

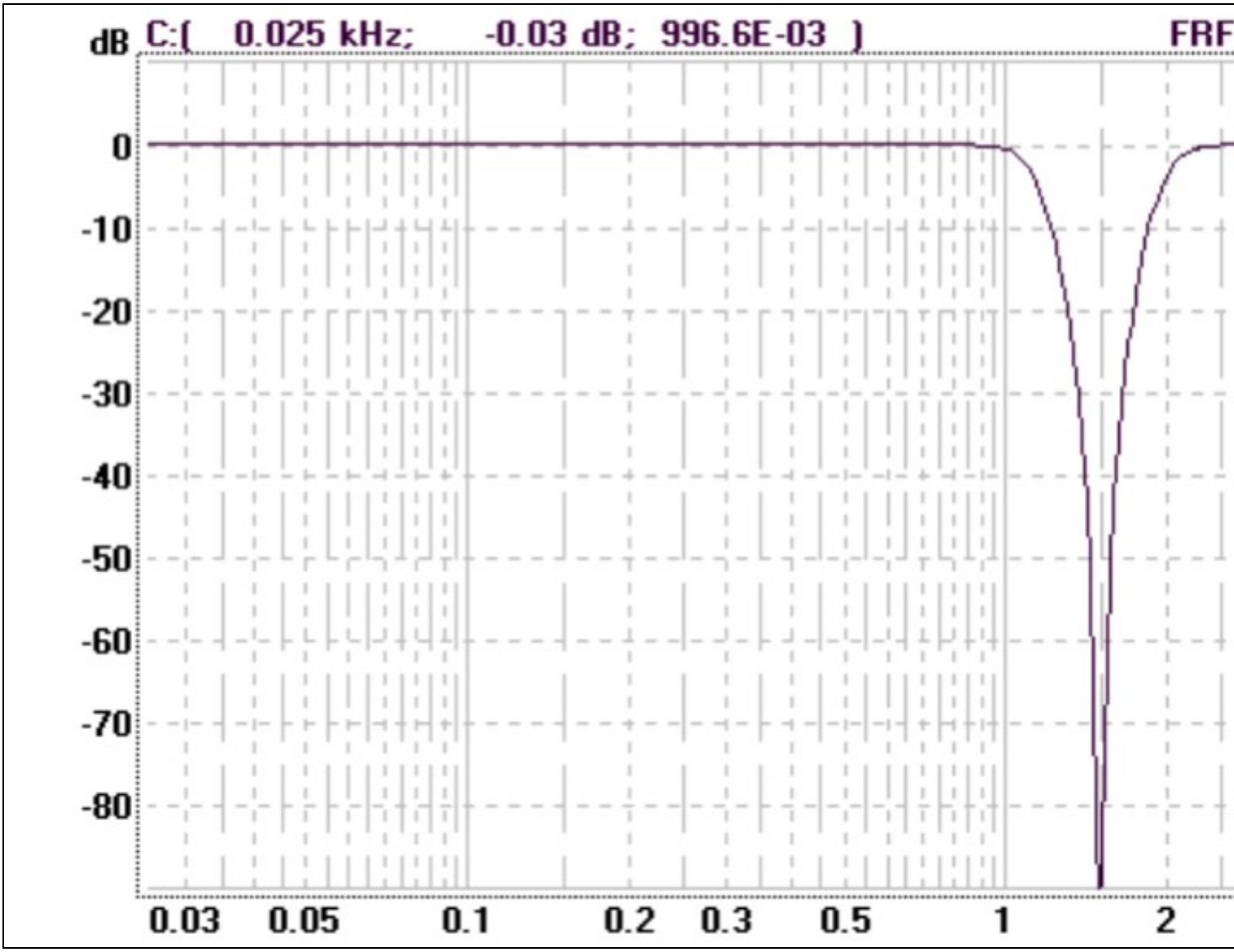
Example with a 1100 Hz low cut-off and 2000 Hz high cut-off frequencies:

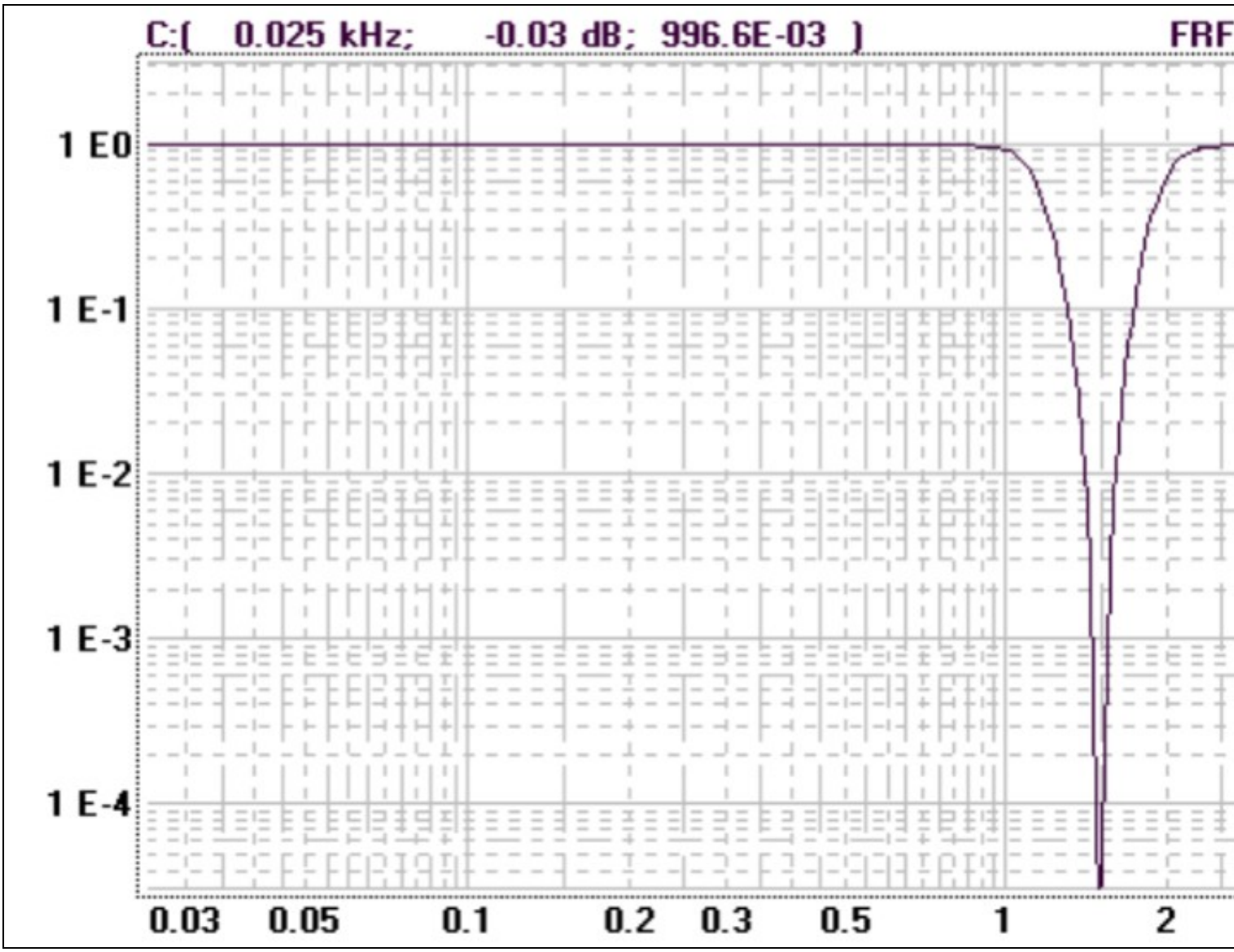



C:(0.025 kHz; -76.17 dB; 155.4E-06)
FRF
1 E0
1 E-1
1 E-2
1 E-3
1 E-4
0.03
0.05
0.1
0.2
0.3
0.5
1
2

87.1.7 User Band Stop Filter

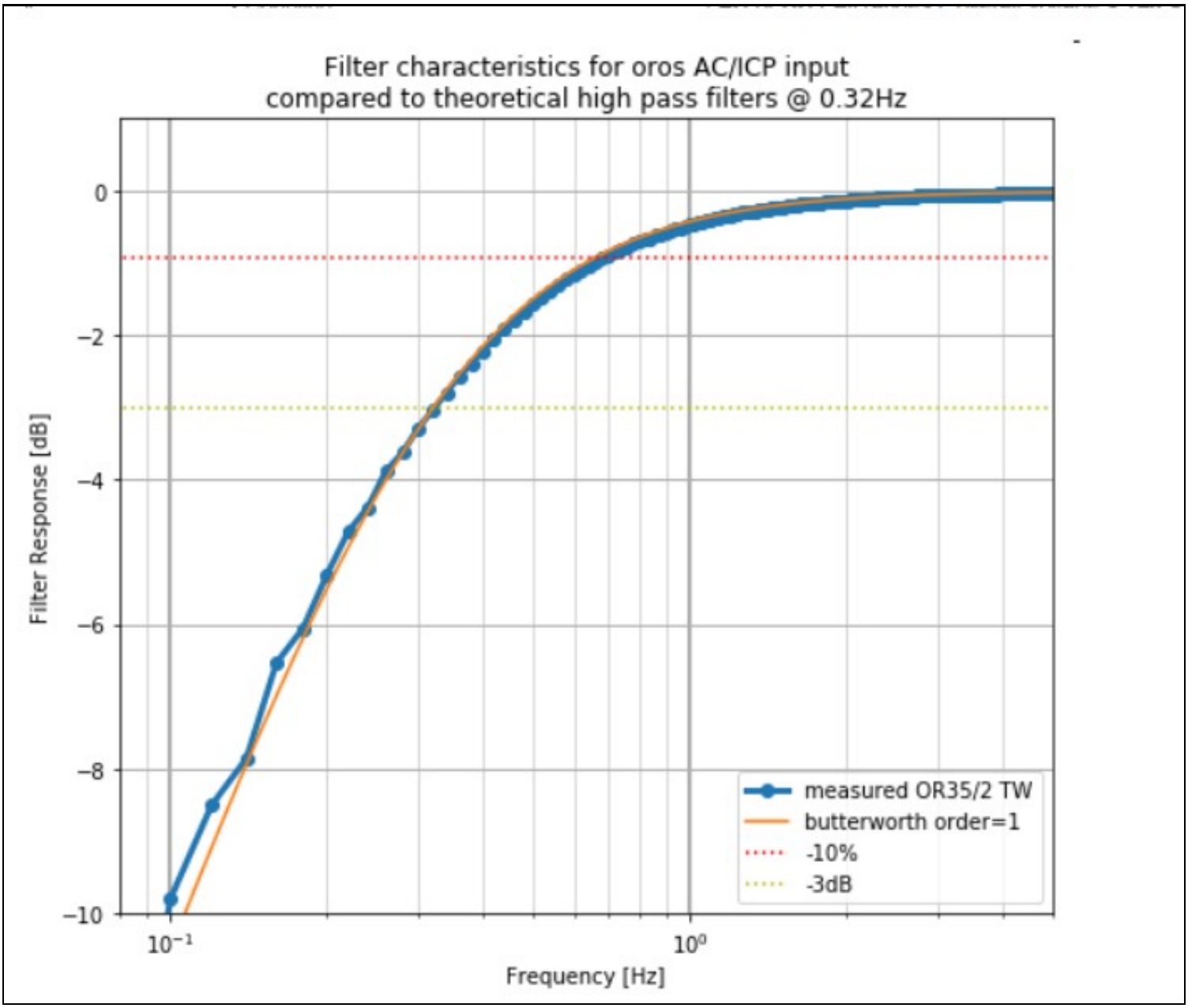
Example with a 1100 Hz low cut-off and 2000 Hz high cut-off frequencies:




C:(0.025 kHz; -0.03 dB; 996.6E-03)
FRF
1 E0
1 E-1
1 E-2
1 E-3
1 E-4
0.03
0.05
0.1
0.2
0.3
0.5
1
2

88 AC dynamical input filter

Spécification of dynamical input AC filter: -3dB Cut-off frequency 0.35 Hz ±10% (first order analog filter)



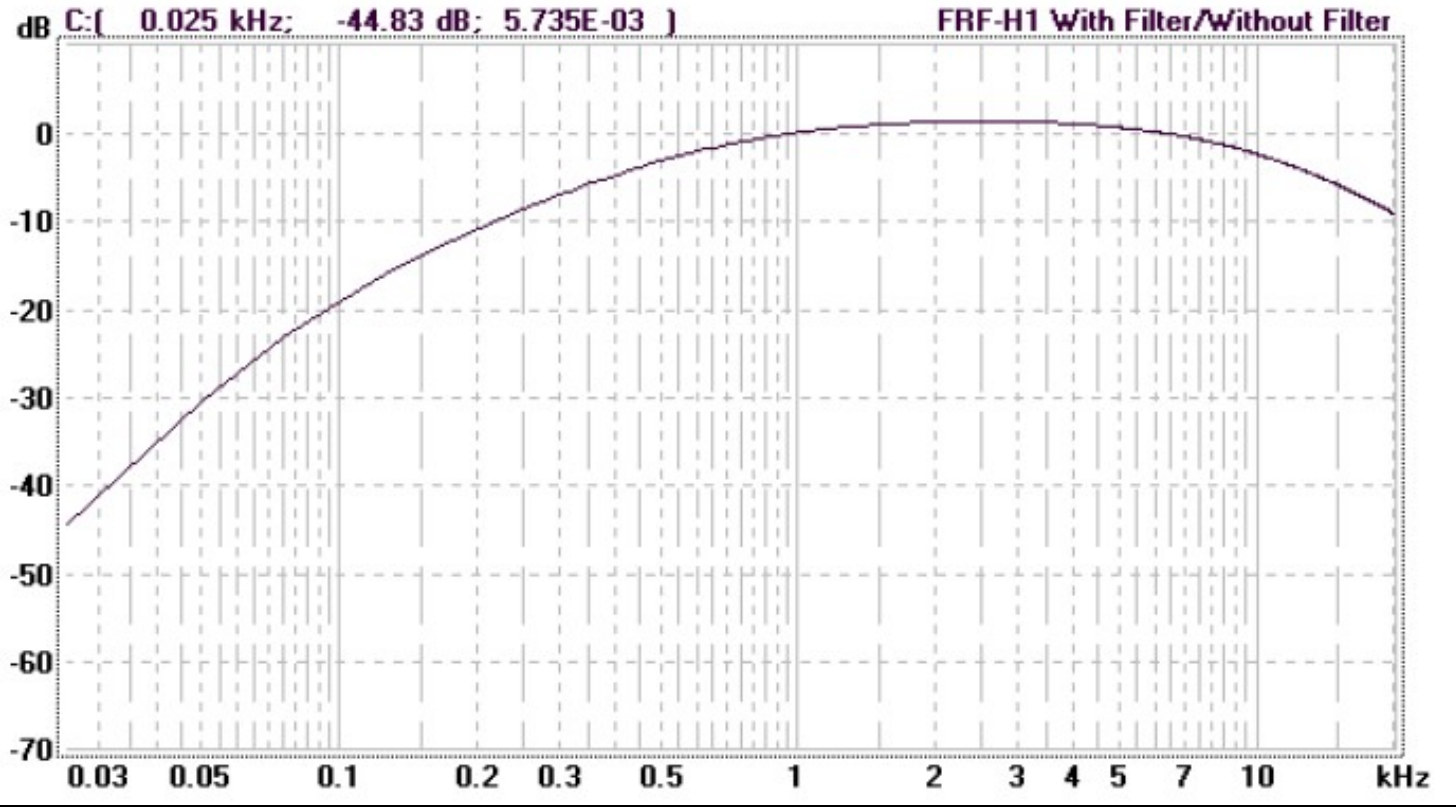
89 Spectral Weighting Filters

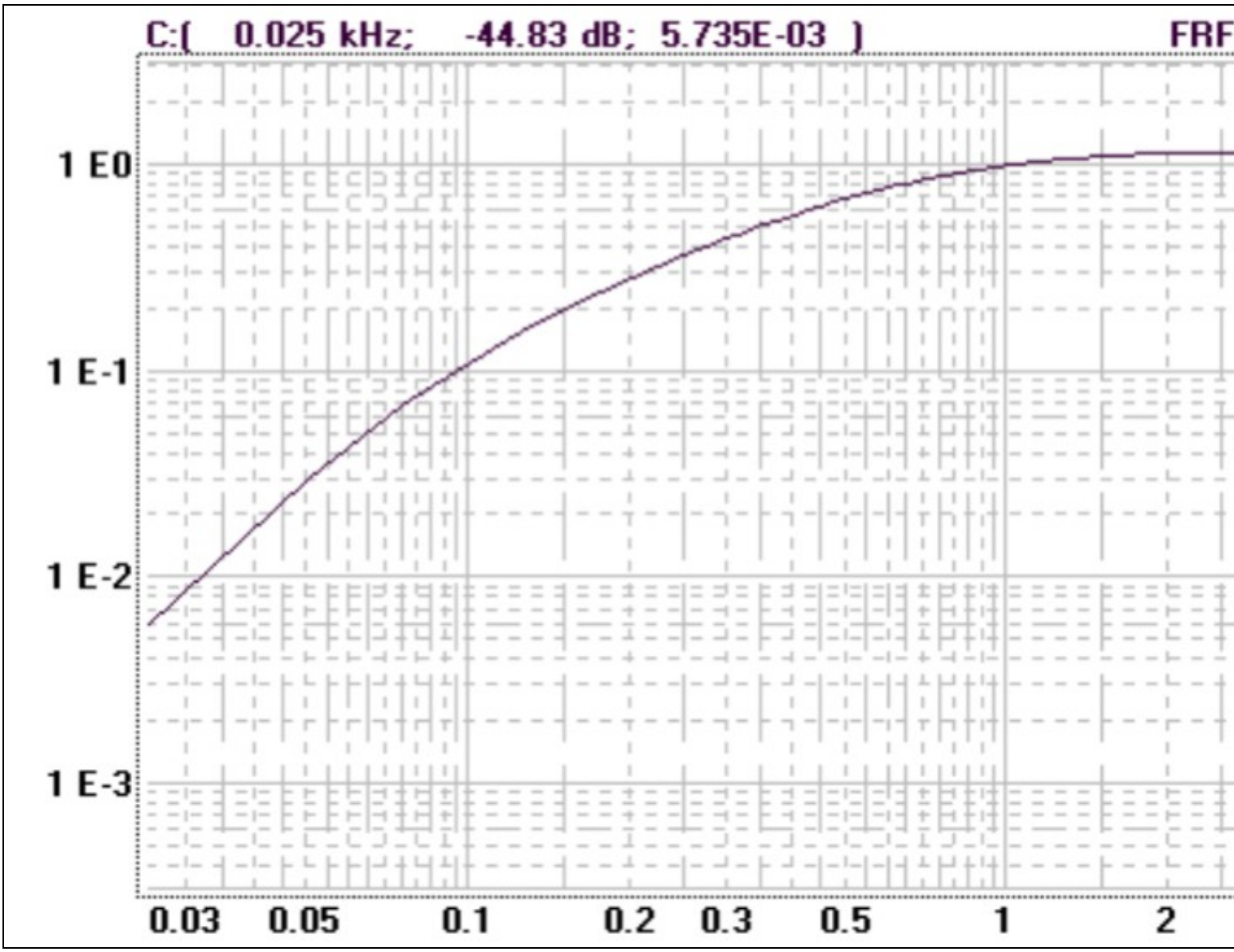
89.1 "A" and "D" Related Filters

89.1.1 "A" Spectral Weighting Filter

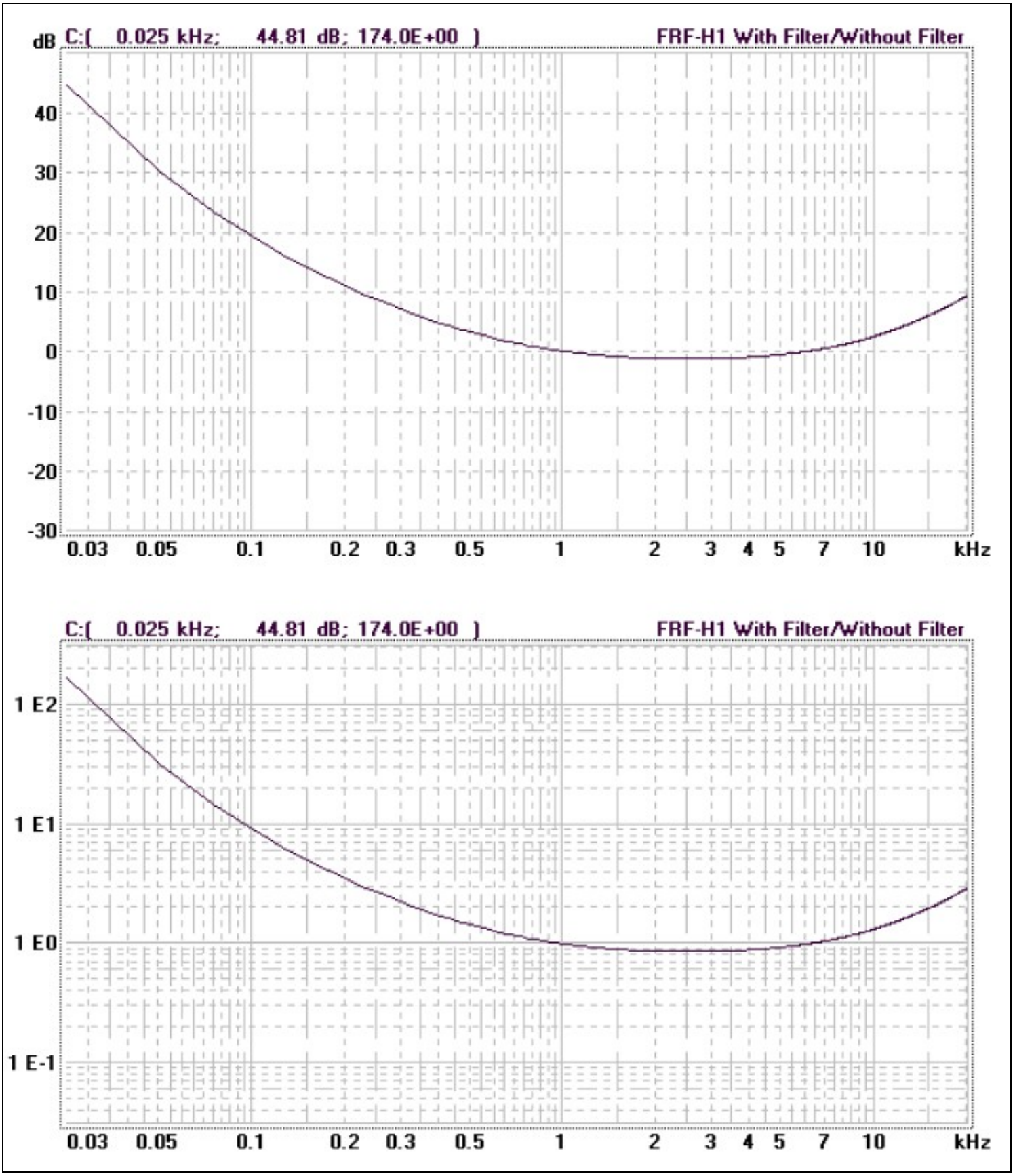
$$A(f) = \frac{12200^2 . f^4}{k_A \left(f^2 + 20{,}6^2\right)\left(f^2 + 12200^2\right)\left(f^2 + 107{,}7^2\right)^{1/2}\left(f^2 + 737{,}9^2\right)^{1/2}}$$

$k_A = 0.794346395$




C:(0.025 kHz; -44.83 dB; 5.735E-03)
FRF
1 E0
1 E-1
1 E-2
1 E-3
0.03
0.05
0.1
0.2
0.3
0.5
1
2

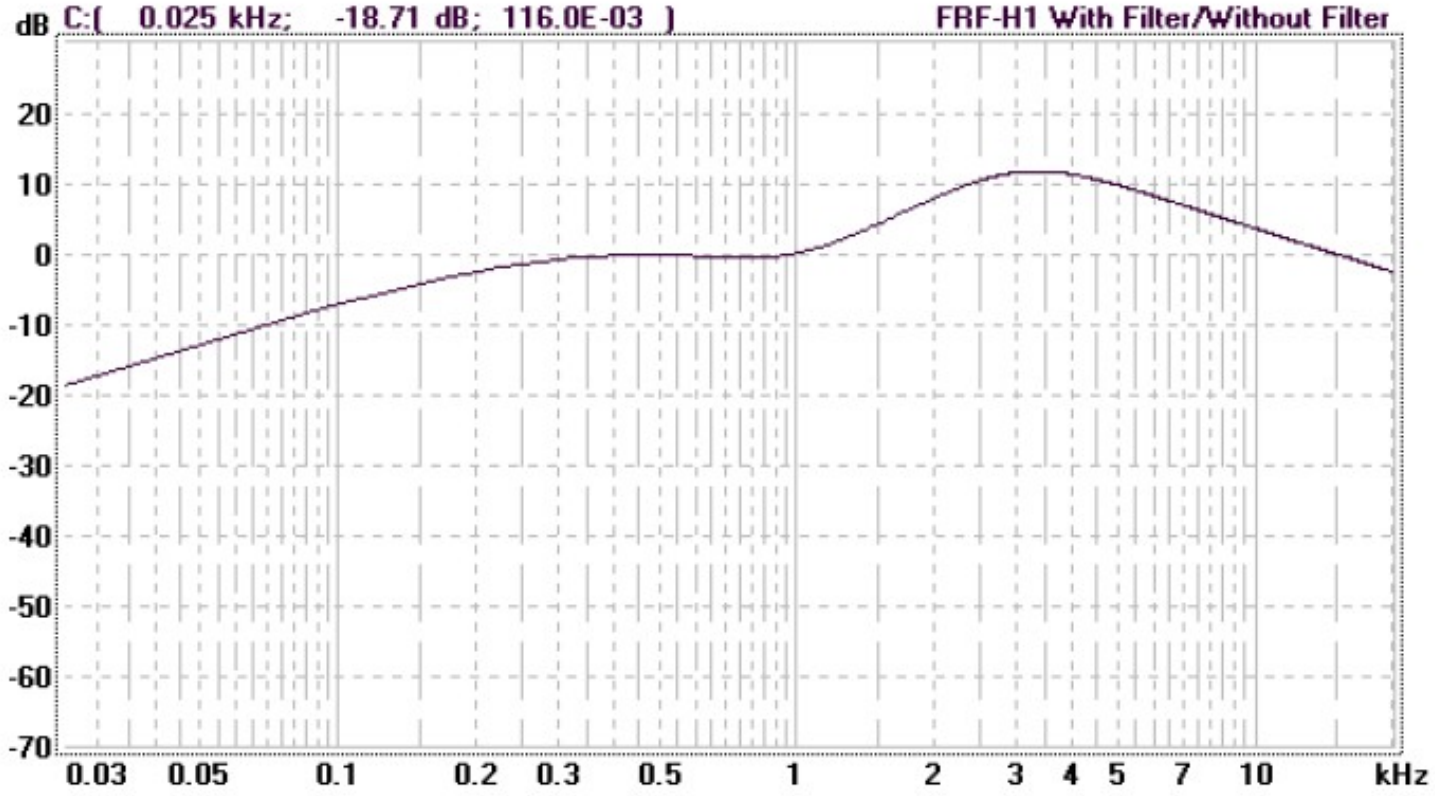
89.1.1.1 "1/A" Spectral Weighting Filter

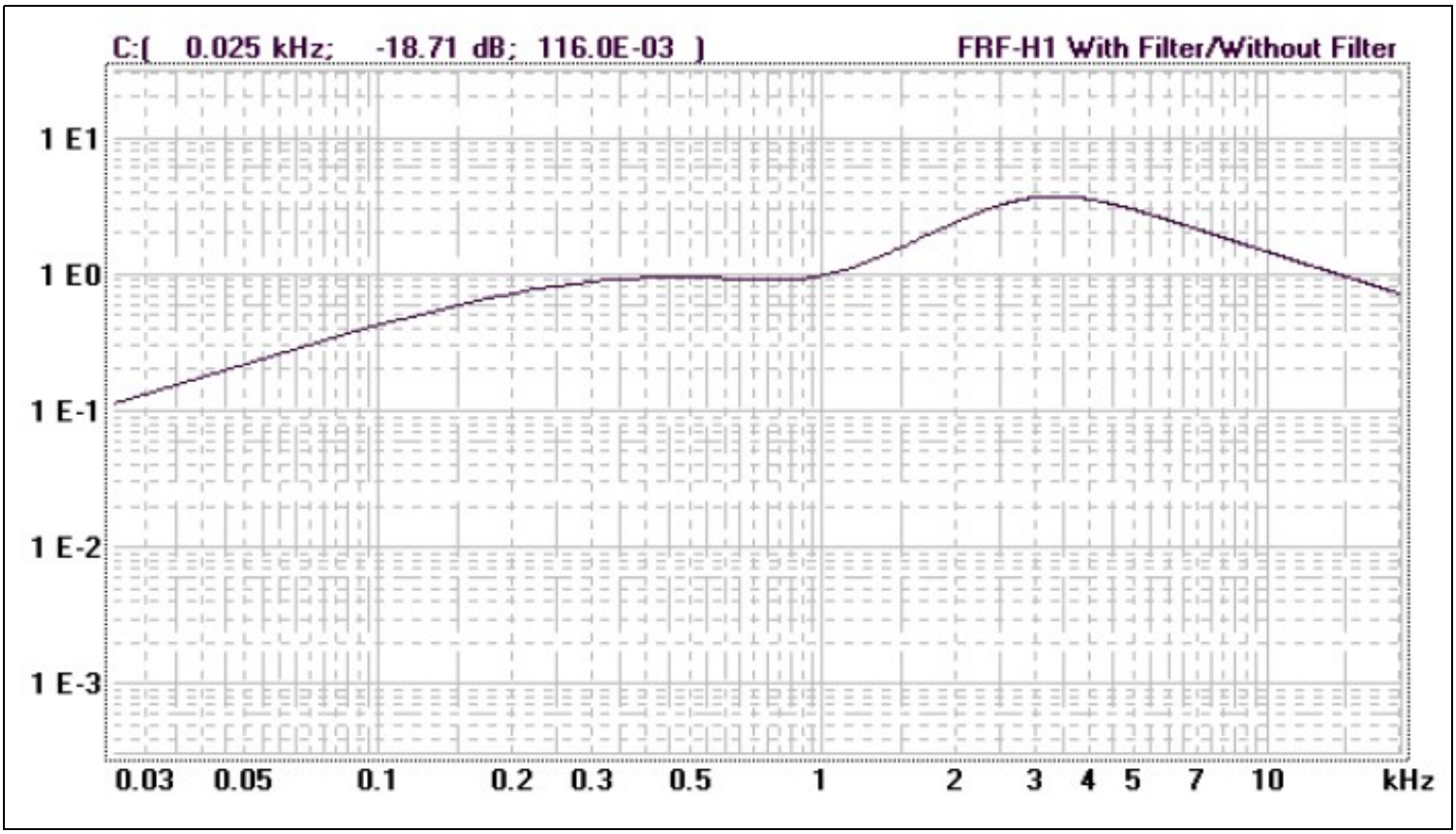


89.1.1.2 "D" Spectral Weighting Filter

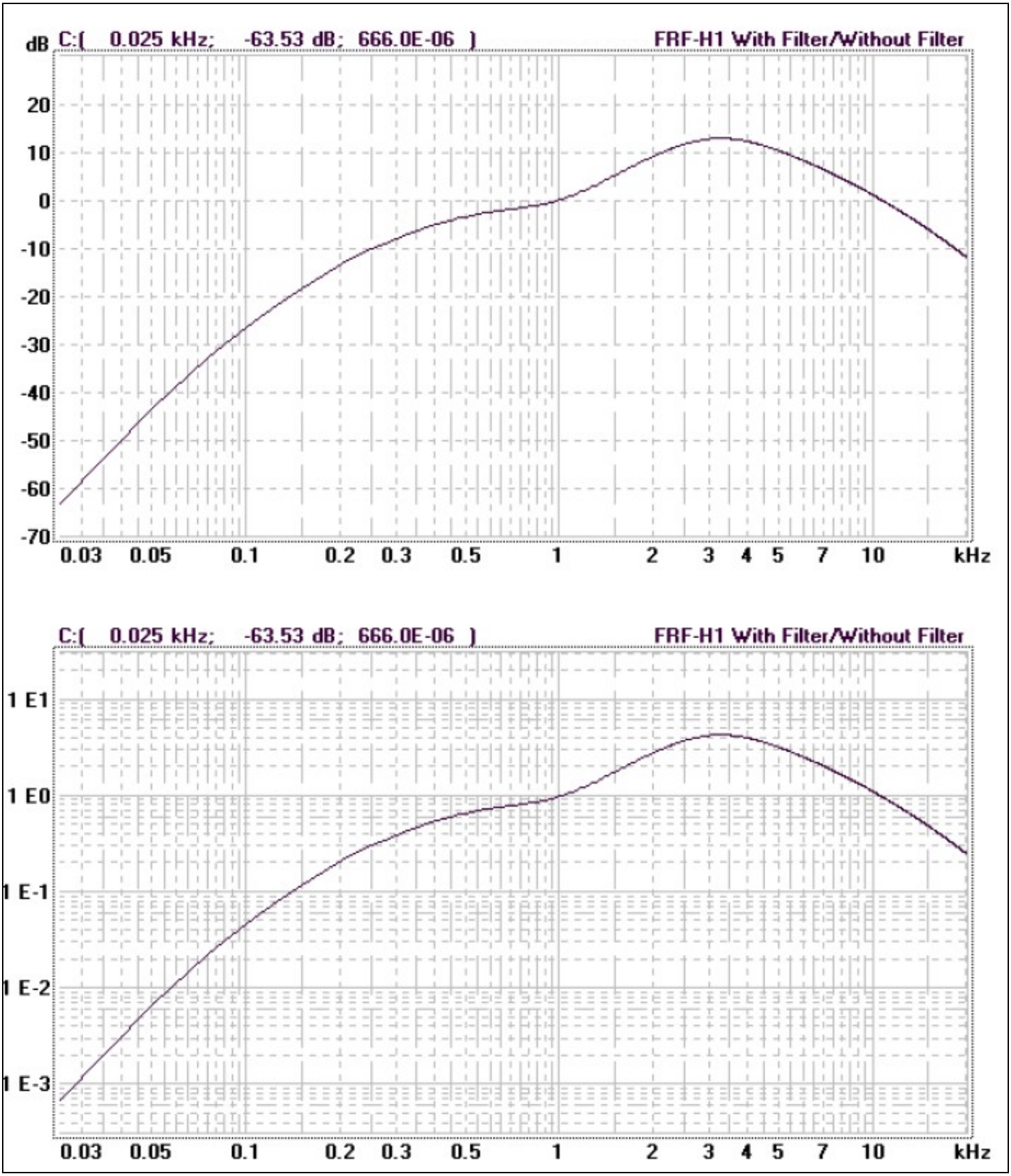
$$D(f) = \frac{f\left(f^4 - 9{,}9505.10^5 f^2 + 1{,}07725.10^{12}\right)^{1/2}}{k_D\left(f^2 + 282{,}7^2\right)^{1/2}\left(f^2 + 1160^2\right)^{1/2}\left(f^4 - 7{,}95.10^6 f^2 + 9{,}677.10^{13}\right)^{1/2}}$$

$k_D = 6.9.10^{-5}$



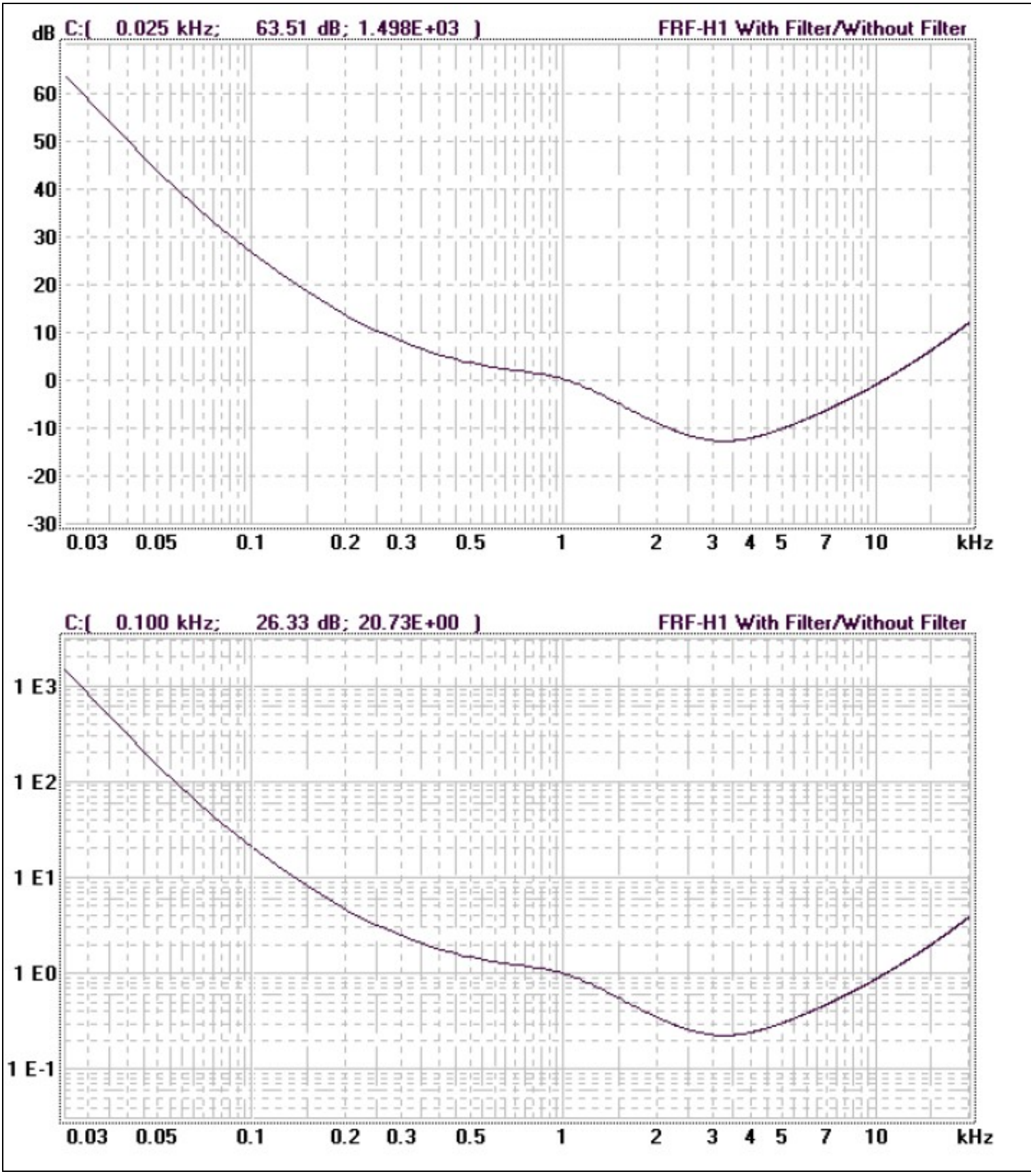


89.1.1.3 "A*D" Spectral Weighting Filter

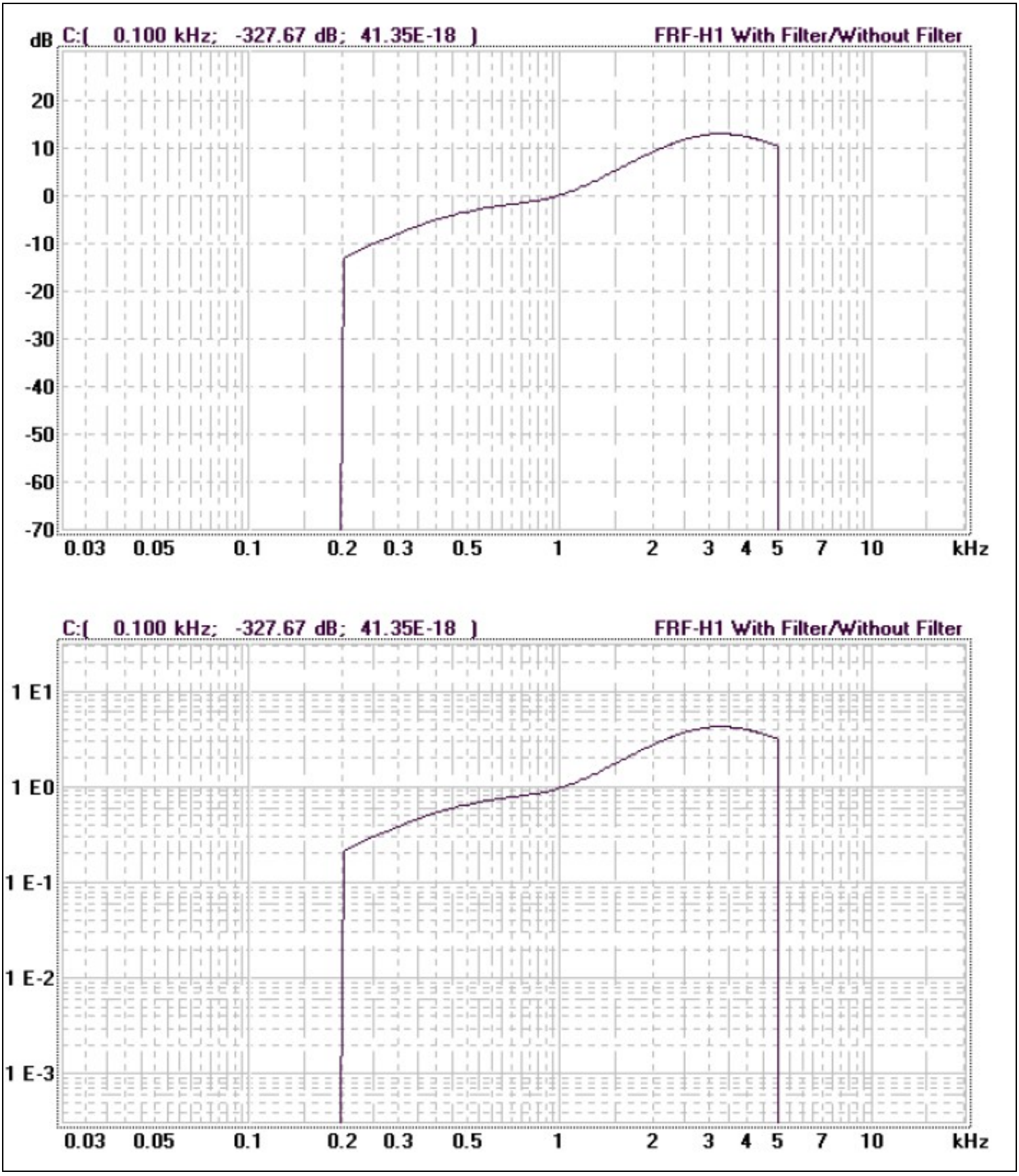

dB
C:(0.025 kHz; -63.53 dB; 666.0E-06)
FRF-H1 With Filter/Without Filter
20
10
0
-10
-20
-30
-40
-50
-60
-70
0.03
0.05
0.1
0.2
0.3
0.5
1
2
3
4
5
7
10
kHz

C:(0.025 kHz; -63.53 dB; 666.0E-06)
FRF-H1 With Filter/Without Filter
1 E1
1 E0
1 E-1
1 E-2
1 E-3
0.03
0.05
0.1
0.2
0.3
0.5
1
2
3
4
5
7
10
kHz

89.1.1.4 "1/(A*D)" Spectral Weighting Filter



89.1.1.5 "A*D*200-5000 Hz" Spectral Weighting Filter



89.2 ISO2631 Filters

The Wc, Wd and Wk spectral weighting filters comply with the ISO 2631-1 (2nd

edition 1997-05-01) and the UIC513R standards.

The Wc, Wd and Wk spectral weighting filters are based on the limit bandwidth Wa

spectral weighting filter:

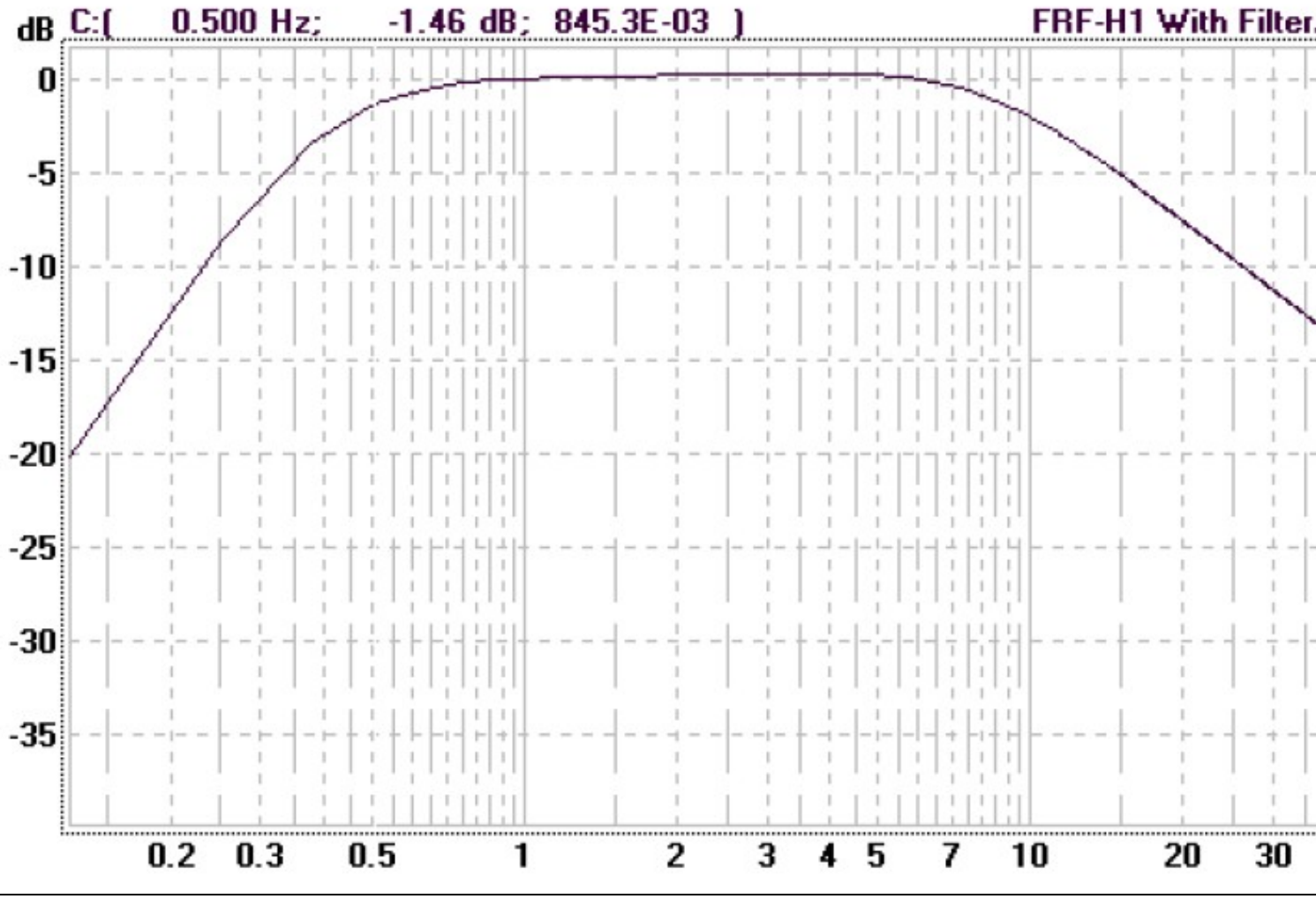
$$Wa(f) = \frac{f_2^2 \cdot f^2}{\left(f^4 + \left(\frac{f_1^2}{Q_1^2} - 2f_1^2\right)f^2 + f_1^4\right)^{1/2}\left(f^4 + \left(\frac{f_2^2}{Q_1^2} - 2f_2^2\right)f^2 + f_2^4\right)^{1/2}}$$

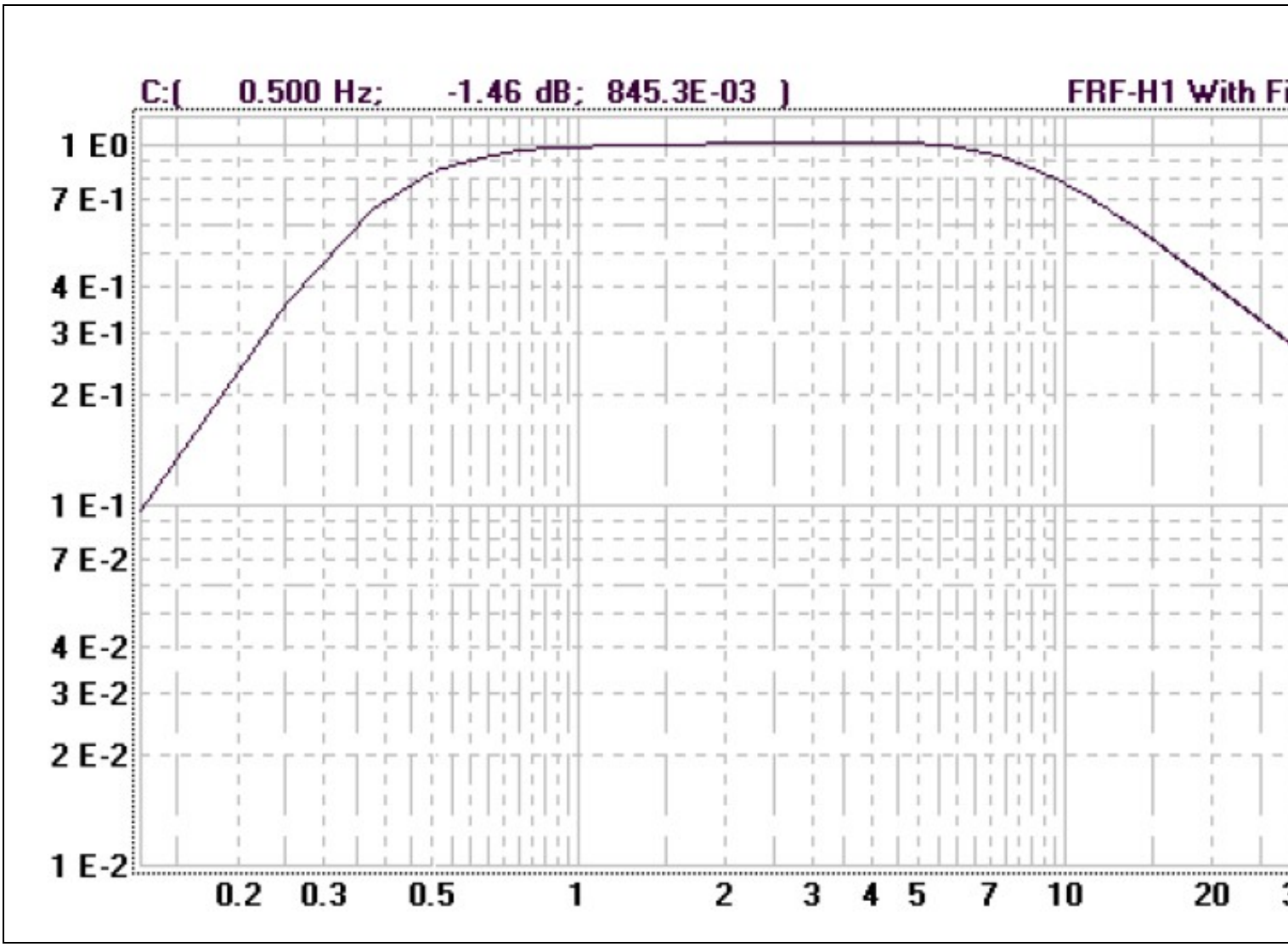
$f_1 = 0.4$ Hz $\quad f_2 = 100$ Hz $\quad Q_1 = 0.71$

89.2.1 "Wc (ISO2631)" Spectral Weighting Filter

$$Wc(f) = \frac{Kf_4^2}{f_3} \frac{\left(f^2 + f_3^2\right)^{1/2}}{\left(f^4 + \left(\frac{f_4^2}{Q_2^2} - 2f_4^2\right)f^2 + f_4^4\right)^{1/2}} . Wa(f)$$

$f_3 = 8$ Hz $\quad$ $f_4 = 8$ Hz $\quad$ $Q_2 = 0.63$ $\quad$ $K = 1$

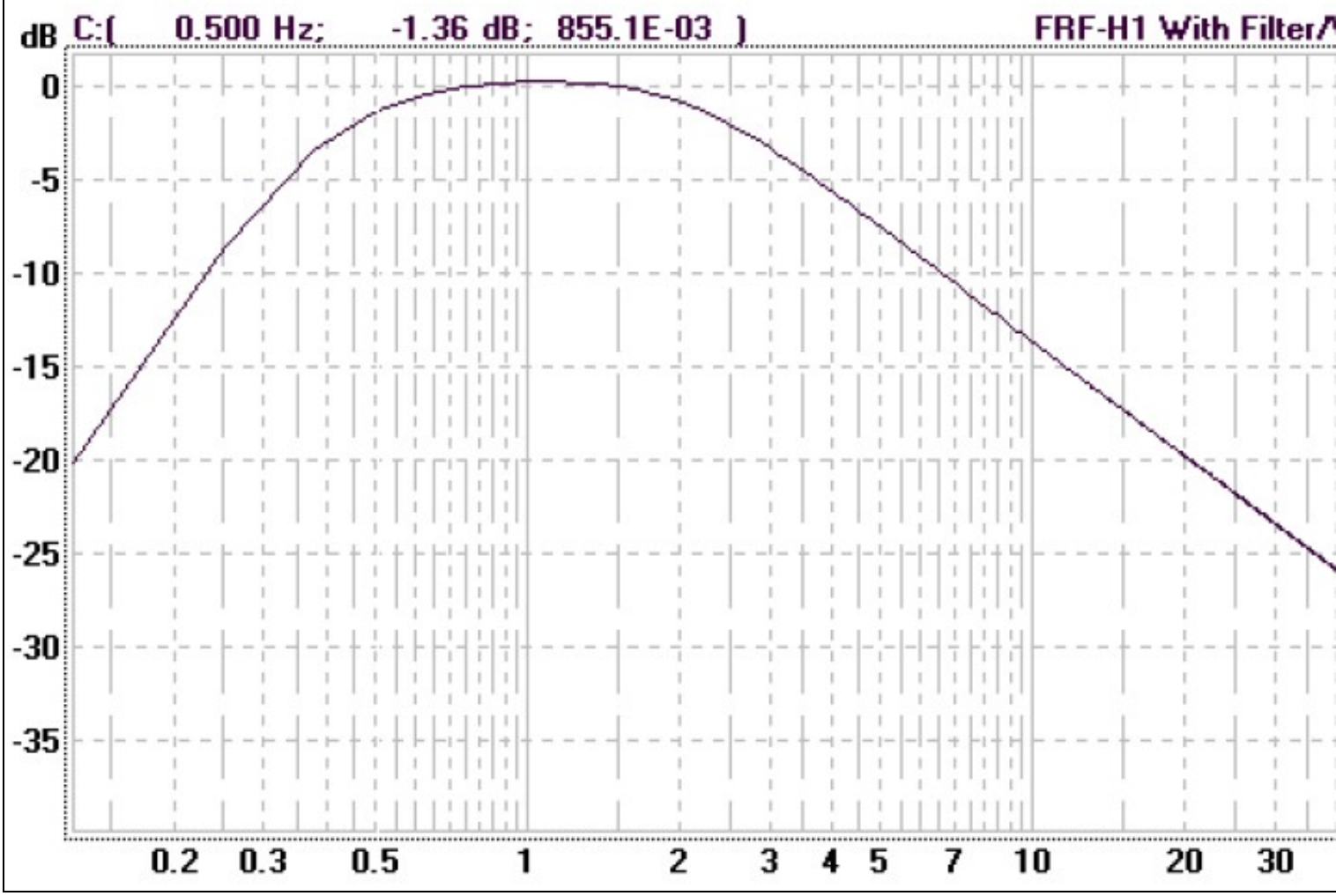


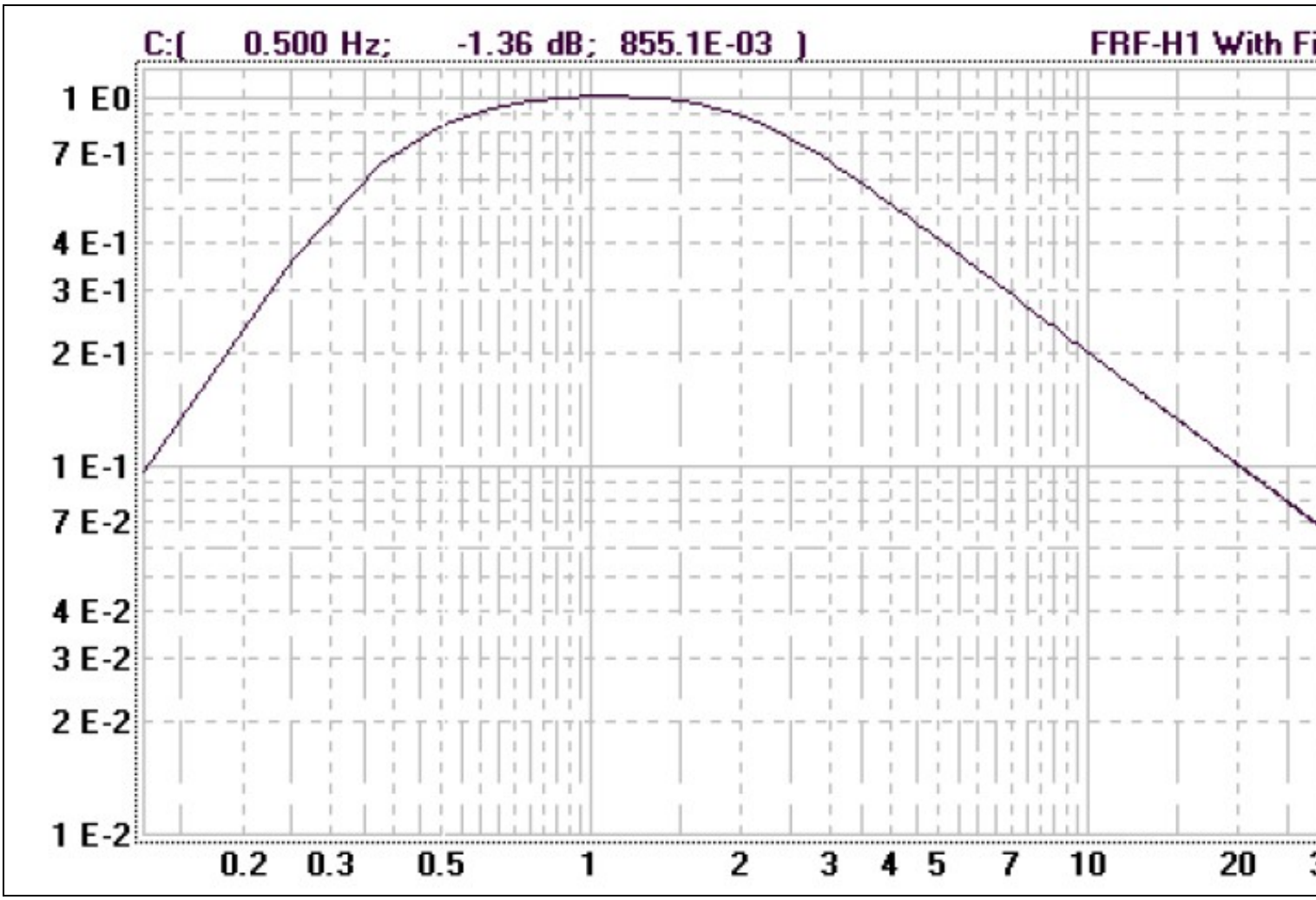

C:(0.500 Hz; -1.46 dB; 845.3E-03)
FRF-H1 With Fi
1 E0
7 E-1
4 E-1
3 E-1
2 E-1
1 E-1
7 E-2
4 E-2
3 E-2
2 E-2
1 E-2
0.2
0.3
0.5
1
2
3
4
5
7
10
20

89.2.2 "Wd (ISO2631)" Spectral Weighting Filter

$$Wd(f) = \frac{Kf_4^2}{f_3} \frac{\left(f^2 + f_3^2\right)^{1/2}}{\left(f^4 + \left(\frac{f_4^2}{Q_2^2} - 2f_4^2\right)f^2 + f_4^4\right)^{1/2}} .Wa(f)$$

$f_3 = 2$ Hz $\quad$ $f_4 = 2$ Hz $\quad$ $Q_2 = 0.63$ $\quad$ $K = 1$



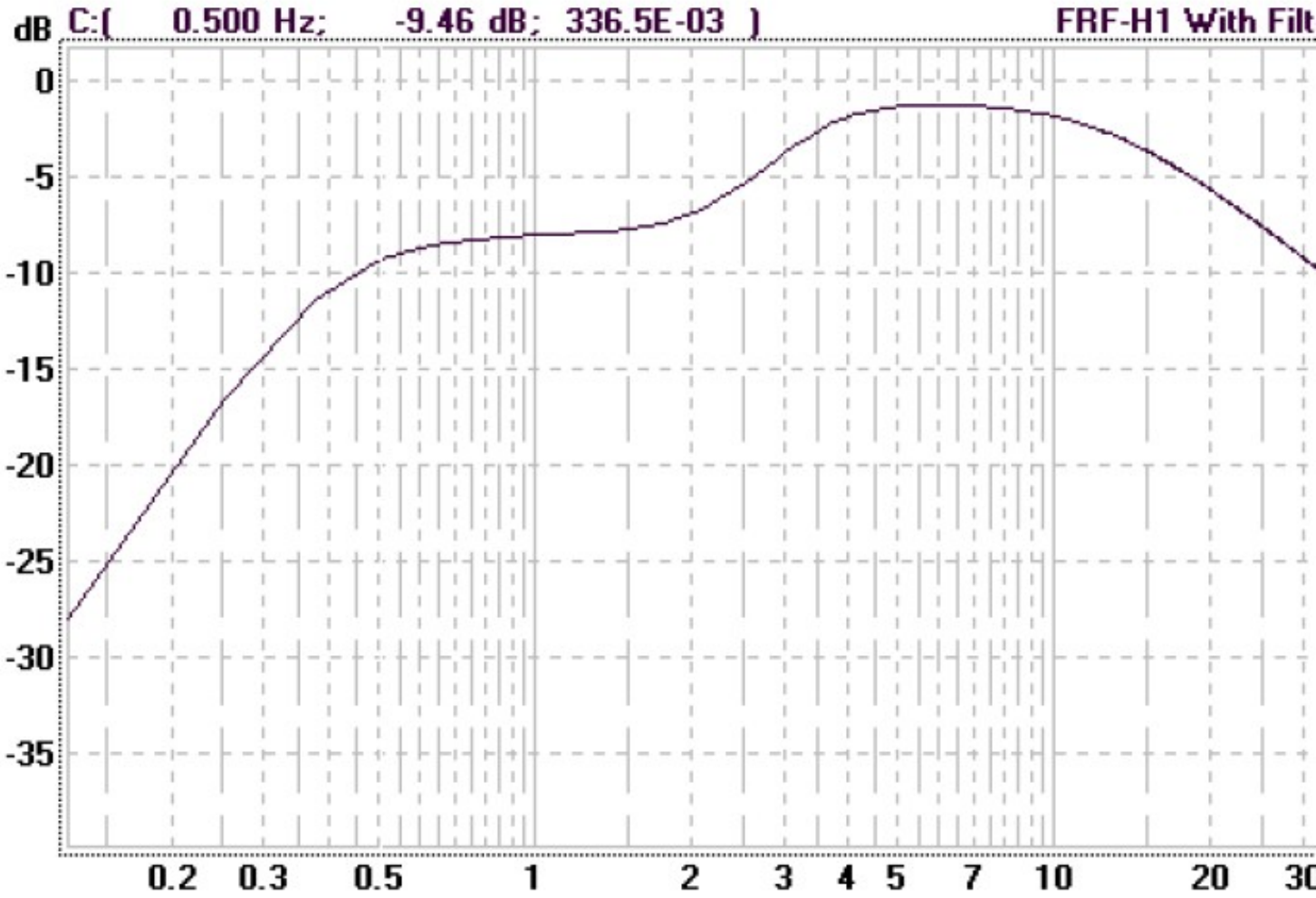

C:(0.500 Hz; -1.36 dB; 855.1E-03)
FRF-H1 With Fi
1 E0
7 E-1
4 E-1
3 E-1
2 E-1
1 E-1
7 E-2
4 E-2
3 E-2
2 E-2
1 E-2
0.2
0.3
0.5
1
2
3
4
5
7
10
20

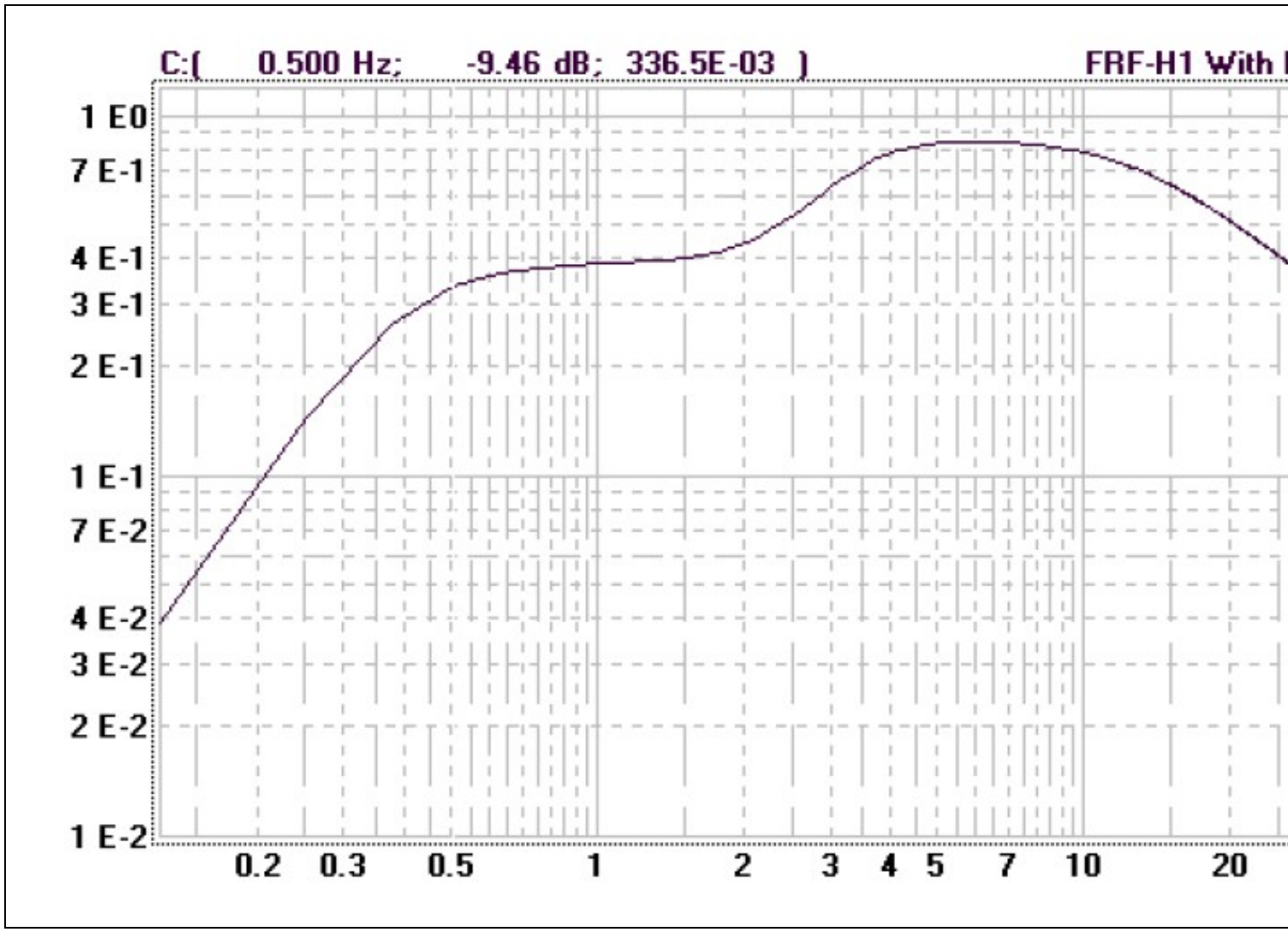
89.2.3 "Wk (ISO2631)" Spectral Weighting Filter

$$Wk(f) = \frac{Kf_4^2 f_6^2}{f_3 f_5^2} \frac{\left(f^2 + f_3^2\right)^{1/2}\left(f^4 + \left(\frac{f_5^2}{Q_3^2} - 2f_5^2\right)f^2 + f_5^4\right)^{1/2}}{\left(f^4 + \left(\frac{f_4^2}{Q_2^2} - 2f_4^2\right)f^2 + f_4^4\right)^{1/2}\left(f^4 + \left(\frac{f_6^2}{Q_4^2} - 2f_6^2\right)f^2\right.}$$

$f_3 = 12.5$ Hz $\quad f_4 = 12.5$ Hz $\quad f_5 = 2.37$ Hz $\quad f_6 = 3.35$ Hz

$Q_2 = 0.63 \quad Q_3 = 0.91 \quad Q_4 = 0.91 \quad K = 0.4$




C:(0.500 Hz; -9.46 dB; 336.5E-03)
FRF-H1 With
1 E0
7 E-1
4 E-1
3 E-1
2 E-1
1 E-1
7 E-2
4 E-2
3 E-2
2 E-2
1 E-2
0.2
0.3
0.5
1
2
3
4
5
7
10
20

89.3 BSI6841 and BSI6842 Filters

The Wb, Wc, Wd, We, Wf and Wg spectral weighting filters comply with the

BSI6841 standard.

The Wh spectral weighting filter complies with the BSI6842 standard.

The Wb, Wc, Wd, We, Wf, Wg and Wh spectral weighting filters are based on the

limit bandwidth Hb spectral weighting filter:

$$Hb(f) = \frac{f_2^2 \cdot f^2}{\left(f^4 + \left(\frac{f_1^2}{Q_1^2} - 2f_1^2\right)f^2 + f_1^4\right)^{1/2}\left(f^4 + \left(\frac{f_2^2}{Q_1^2} - 2f_2^2\right)f^2 + f_2^4\right)^{1/2}}$$

	f1 (Hz)	f2 (Hz)	Q1
Wb	0.4	100	0.71
Wc	0.4	100	0.71
Wd	0.4	100	0.71
We	0.4	100	0.71
Wf	0.08	0.63	0.71
Wg	0.8	100	0.71
Wh	6.3	1250	0.71

Wc, Wd, We, Wg and Wh are given by:

$$W(f) = \frac{Kf_4^2}{f_3} \frac{\left(f^2 + f_3^2\right)^{1/2}}{\left(f^4 + \left(\frac{f_4^2}{Q_2^2} - 2f_4^2\right)f^2 + f_4^4\right)^{1/2}} . Hb(f)$$

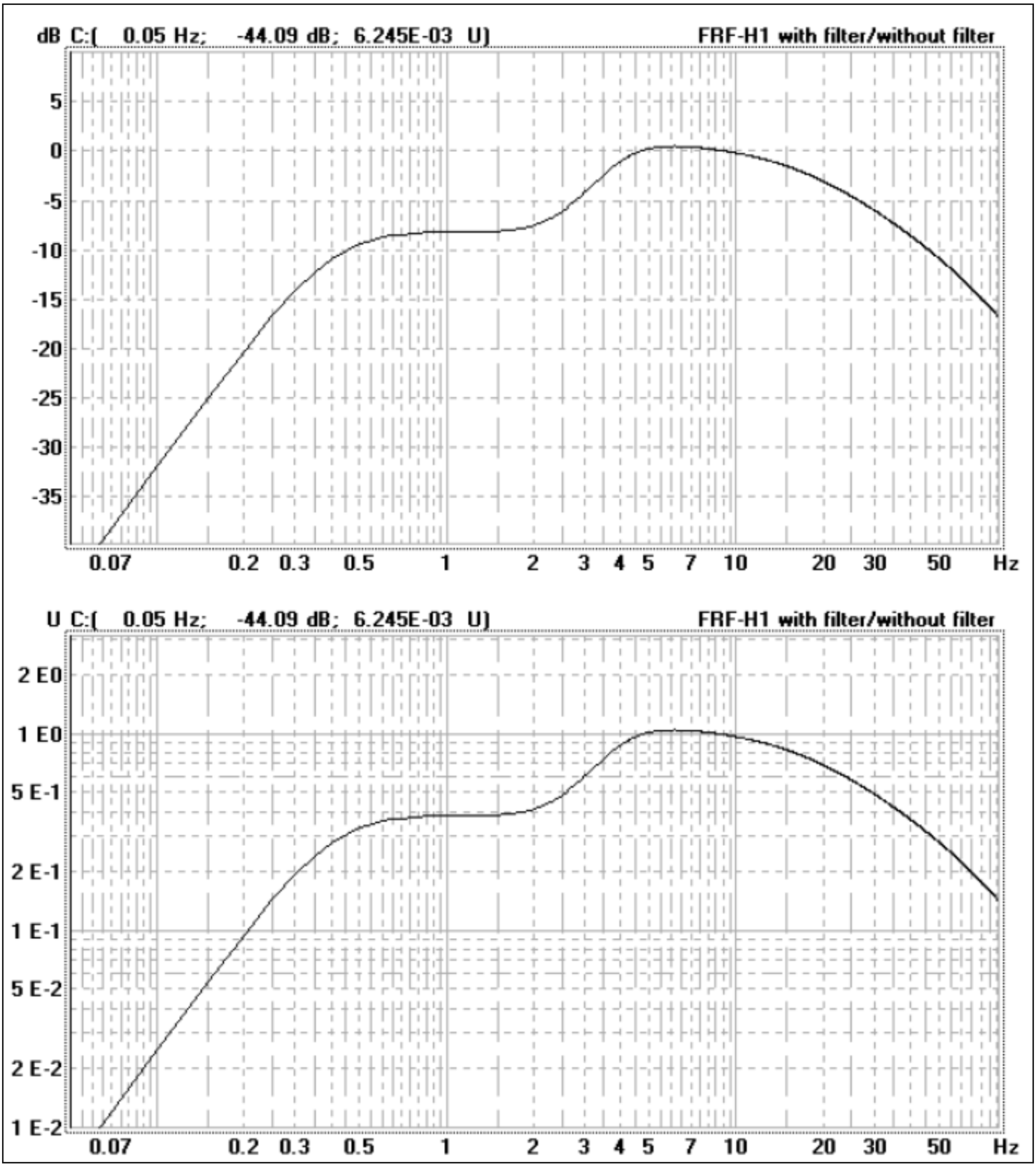
Wb and Wf are given by:

$$W(f) = \frac{Kf_4^2 f_6^2}{f_3 f_5^2} \frac{\left(f^2 + f_3^2\right)^{1/2}\left(f^4 + \left(\frac{f_5^2}{Q_3^2} - 2f_5^2\right)f^2 + f_5^4\right)^{1/2}}{\left(f^4 + \left(\frac{f_4^2}{Q_2^2} - 2f_4^2\right)f^2 + f_4^4\right)^{1/2}\left(f^4 + \left(\frac{f_6^2}{Q_4^2} - 2f_6^2\right)f^2 + f_6^4\right)^{1/2}} . Hb(f)$$

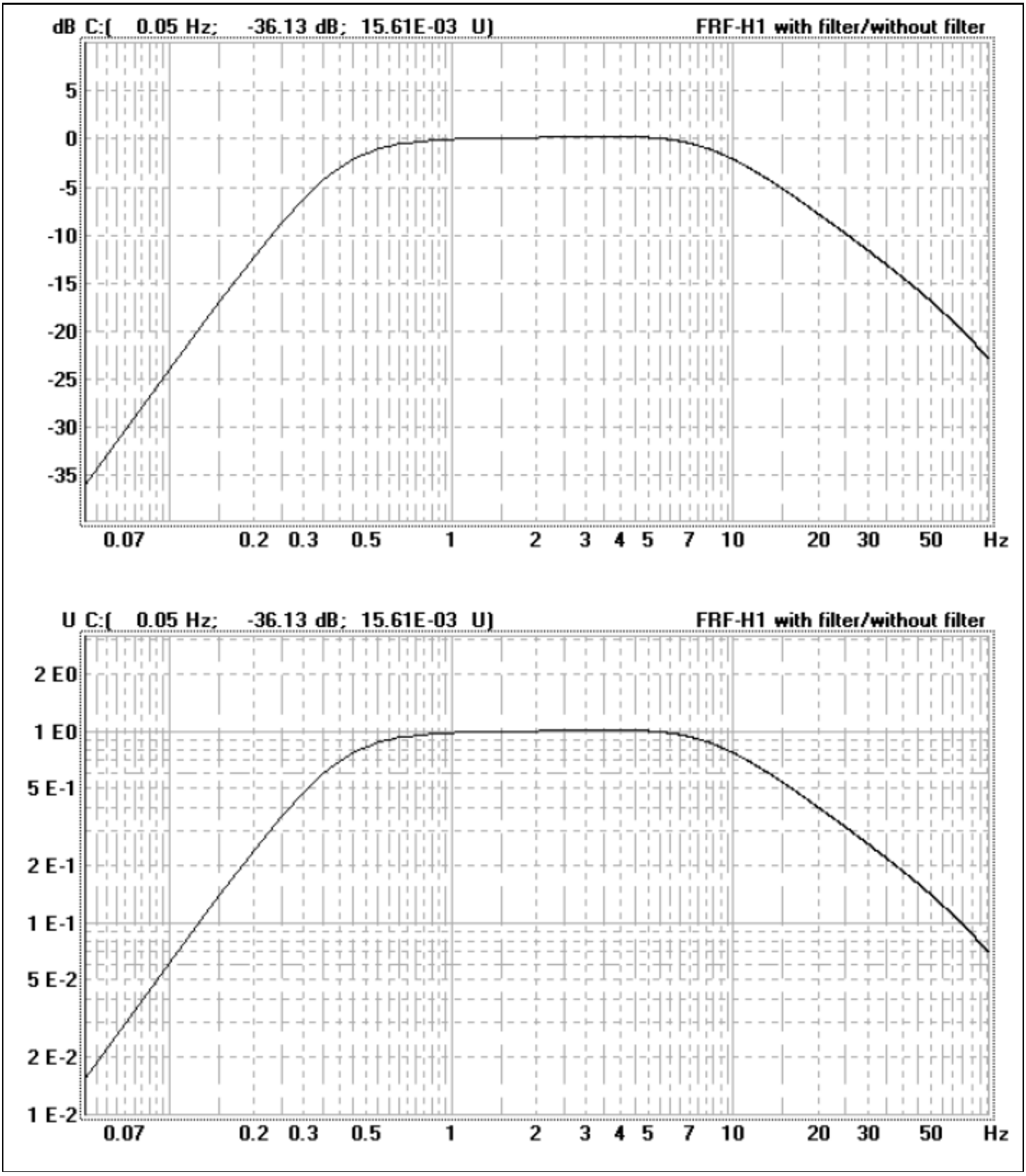
With the following coefficients:

	f3 (Hz)	f4 (Hz)	f5 (Hz)	f6 (Hz)	Q2	Q3	Q4	K
Wb	16	16	2.5	4	0.55	0.90	0.95	0.4
Wc	8	8	-	-	0.63	-	-	1.0
Wd	2	2	-	-	0.63	-	-	1.0
We	1.0	1.0	-	-	0.63	-	-	1.0
Wf	∞	0.250	0.0625	0.10	0.86	0.8	0.8	0.4
Wg	1.5	5.3	-	-	0.68	-	-	0.42
Wh	16	16	-	-	0.64	-	-	1

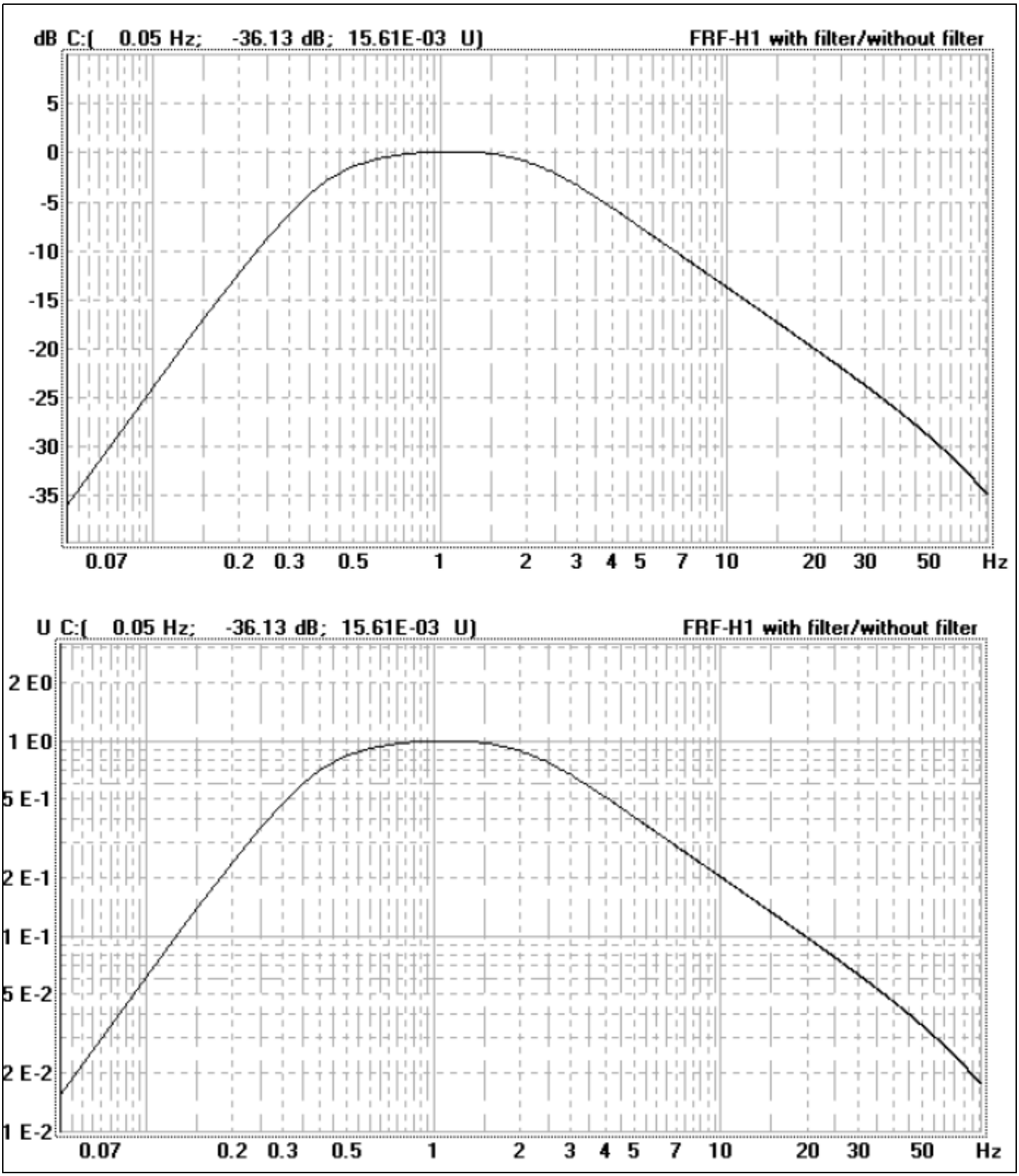
89.3.1 Wb (BSI6841) Spectral Weighting Filter


dB C:(0.05 Hz; -44.09 dB; 6.245E-03 U)
FRF-H1 with filter/without filter
5
0
-5
-10
-15
-20
-25
-30
-35
0.07
0.2
0.3
0.5
1
2
3
4
5
7
10
20
30
50
Hz
U C:(0.05 Hz; -44.09 dB; 6.245E-03 U)
FRF-H1 with filter/without filter
2 E0
1 E0
5 E-1
2 E-1
1 E-1
5 E-2
2 E-2
1 E-2
0.07
0.2
0.3
0.5
1
2
3
4
5
7
10
20
30
50
Hz

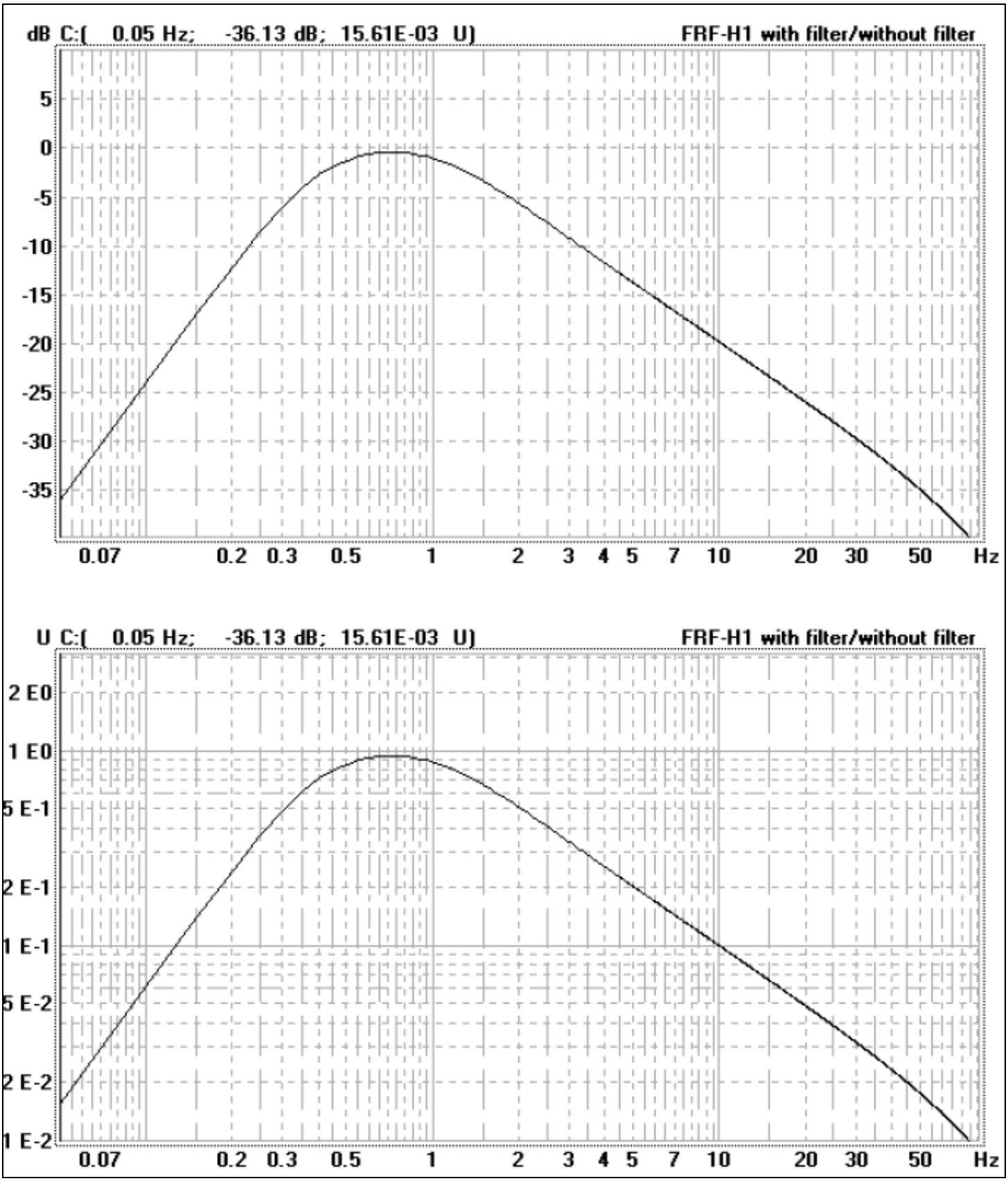
89.3.2 Wc (BSI6841) Spectral Weighting Filter



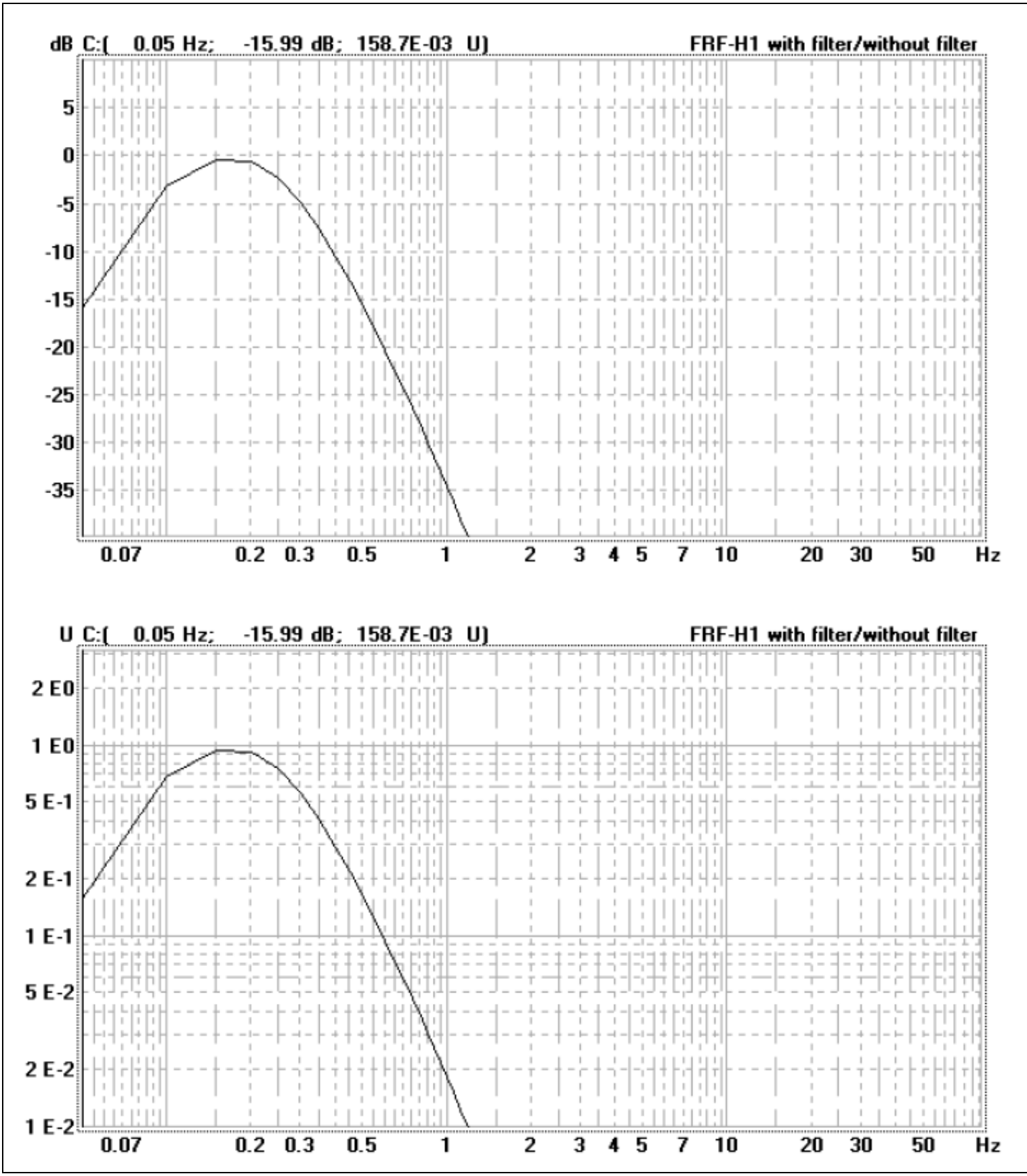
89.3.3 Wd (BSI6841) Spectral Weighting Filter



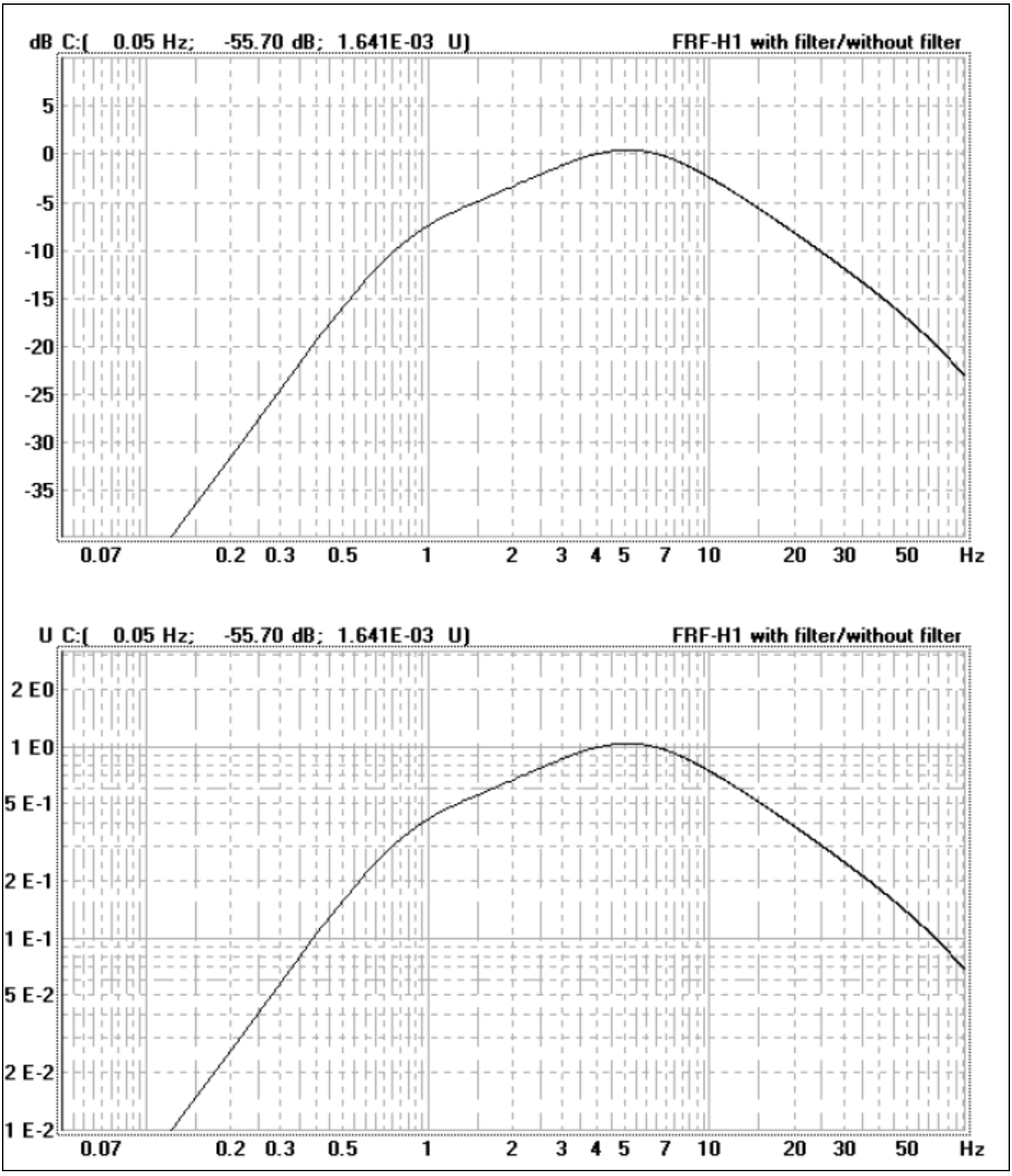
89.3.4 We (BSI6841) Spectral Weighting Filter



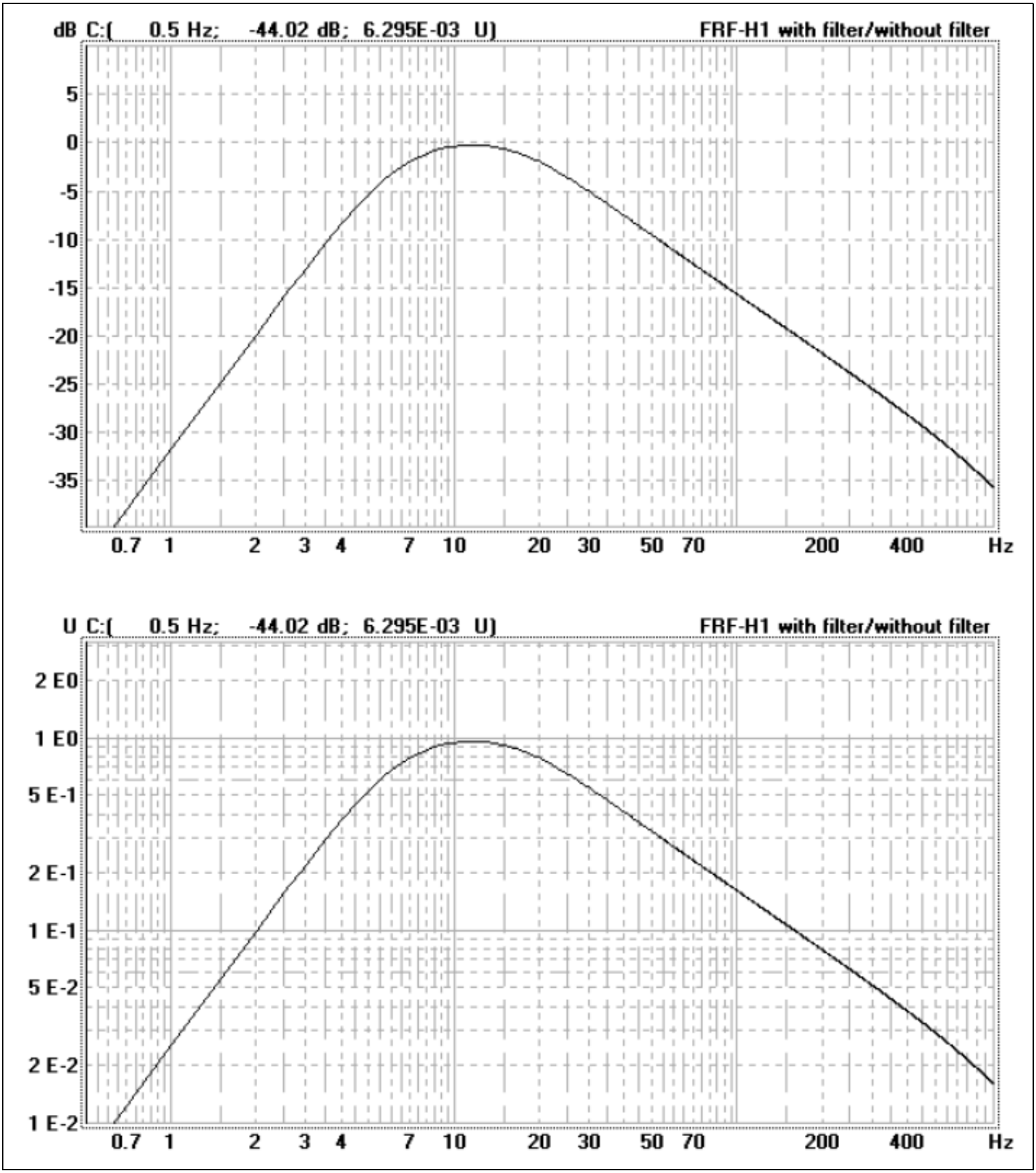
89.3.5 Wf (BSI6841) Spectral Weighting Filter



89.3.6 Wg (BSI6841) Spectral Weighting Filter



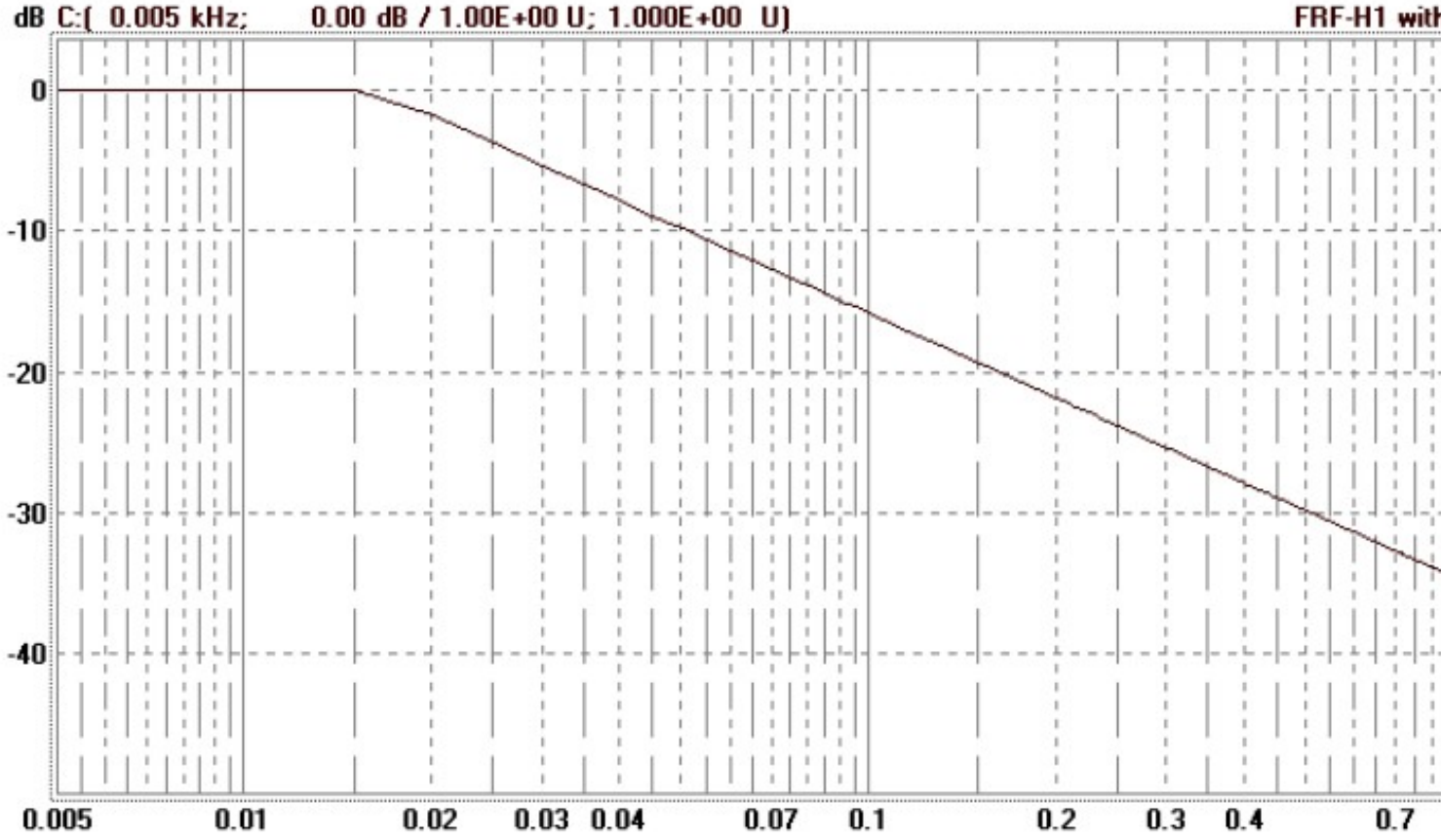
89.3.7 Wh (BSI6842) Spectral Weighting Filter

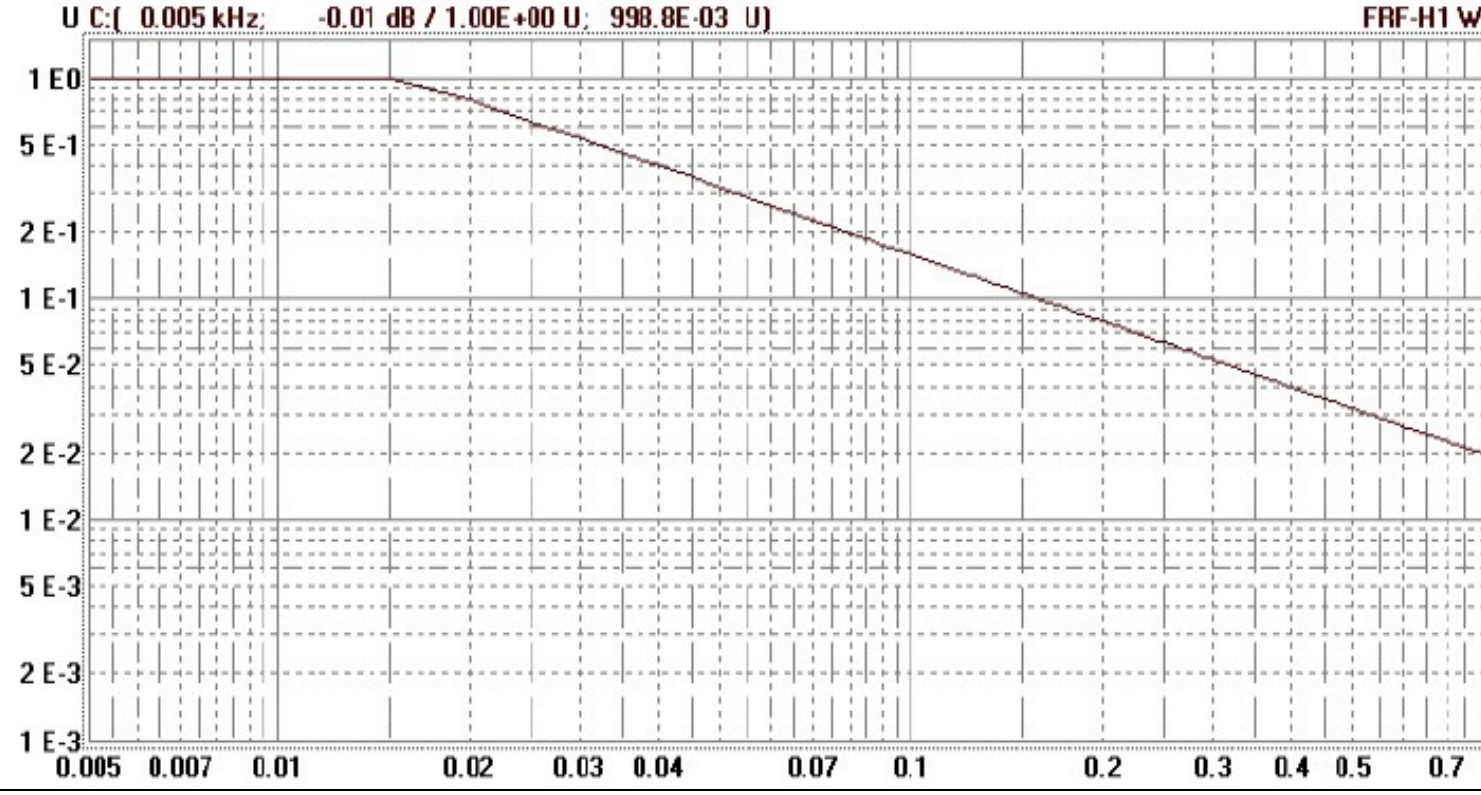


89.3.8 ISO5349 Filter

W(f)= K.f

if (f < or = 16) then K = 1.0 or else K = 16/f

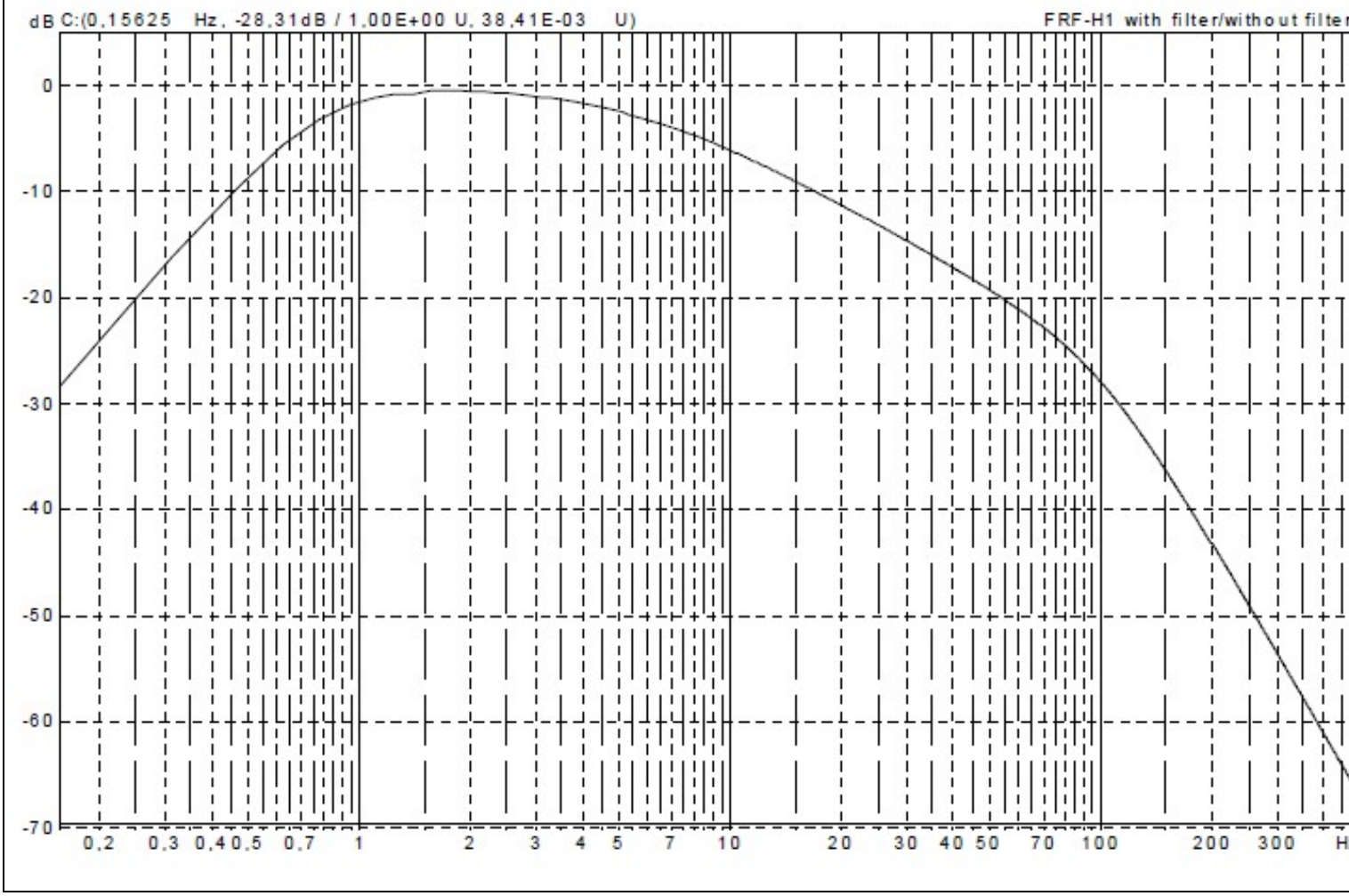

dB C:(0.005 kHz; 0.00 dB / 1.00E+00 U; 1.000E+00 U)
FRF-H1 with
0
-10
-20
-30
-40
0.005
0.01
0.02
0.03
0.04
0.07
0.1
0.2
0.3
0.4
0.7


U C:(0.005 kHz; -0.01 dB / 1.00E+00 U; 998.8E-03 U)
FRF-H1 W
1 E0
5 E-1
2 E-1
1 E-1
5 E-2
2 E-2
1 E-2
5 E-3
2 E-3
1 E-3
0.005
0.007
0.01
0.02
0.03
0.04
0.07
0.1
0.2
0.3
0.4
0.5
0.7

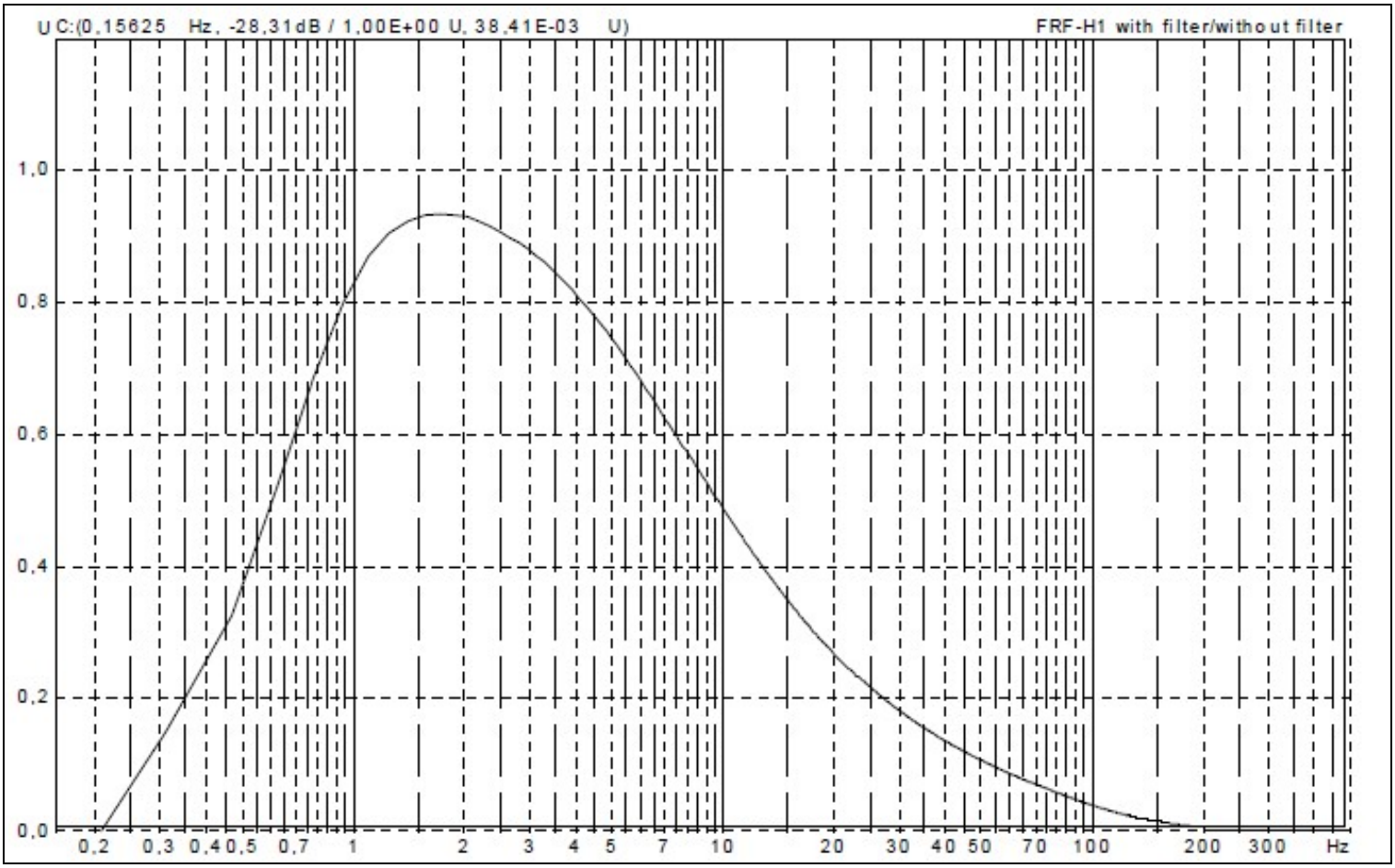
89.3.9 W.B.Combined (ISO6954) Spectral Weighting Filter

89.3.9.1 W.B.Combined based on acceleration as input quantity

$$W.B.Combined_Acc(f) = \frac{1}{\sqrt{1+\left(\frac{f}{100}\right)^4}} * \frac{1}{\sqrt{1+\left(\frac{f}{5.6}\right)^2}} * \frac{1}{\sqrt{1+\left(\frac{10^{-0.1}}{f}\right)^4}}$$



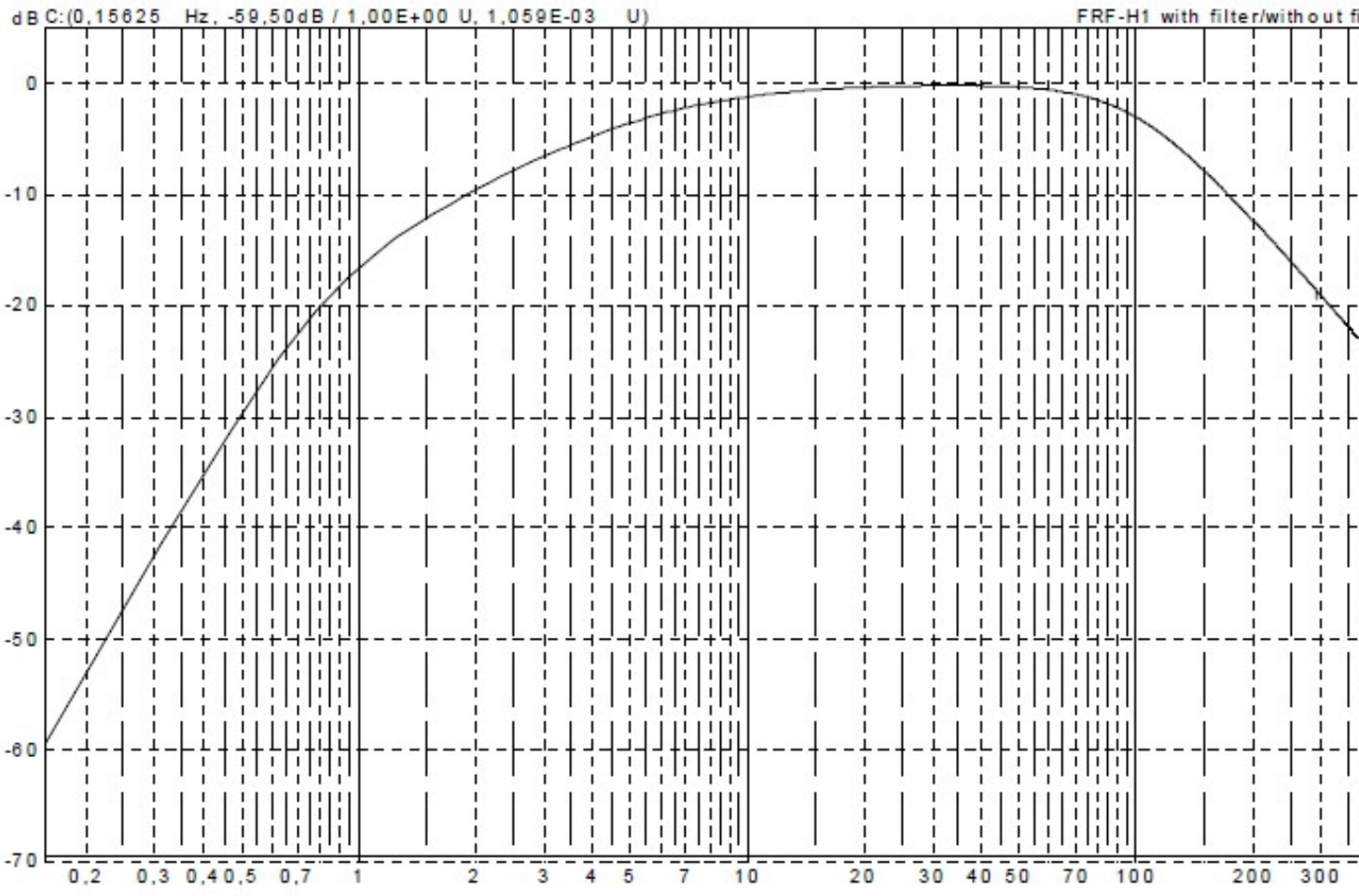
2.

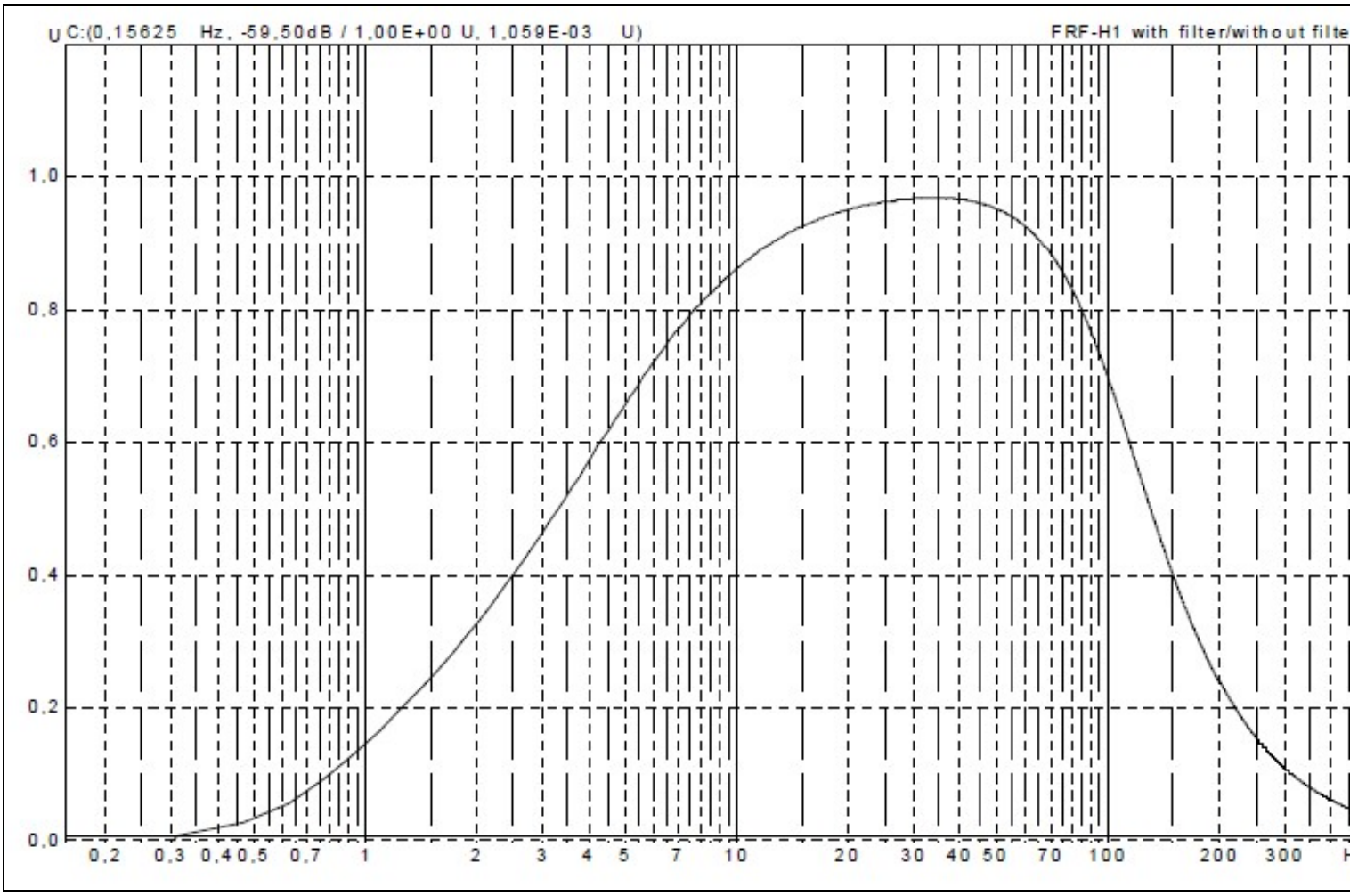

U C:(0,15625 Hz, -28,31dB / 1,00E+00 U, 38,41E-03 U)
FRF-H1 with filter/without filter
1,0
0,8
0,6
0,4
0,2
0,0
0,2 0,3 0,4 0,5 0,7 1 2 3 4 5 7 10 20 30 40 50 70 100 200 300 Hz

89.3.9.2 W.B.Combined based on velocity as input quantity

$$W.B.Combined_Vel(f) = W.B.Combined_Acc(f) * f * \frac{Q_1}{Q_2}$$

$Q_1 = 0.147$ $Q_2 = 0.833$




U C:(0,15625 Hz, -59,50dB / 1,00E+00 U, 1,059E-03 U)
FRF-H1 with filter/without filte
1,0
0,8
0,6
0,4
0,2
0,0
0,2 0,3 0,4 0,5 0,7 1 2 3 4 5 7 10 20 30 40 50 70 100 200 300

90 NVGate Formula Computation

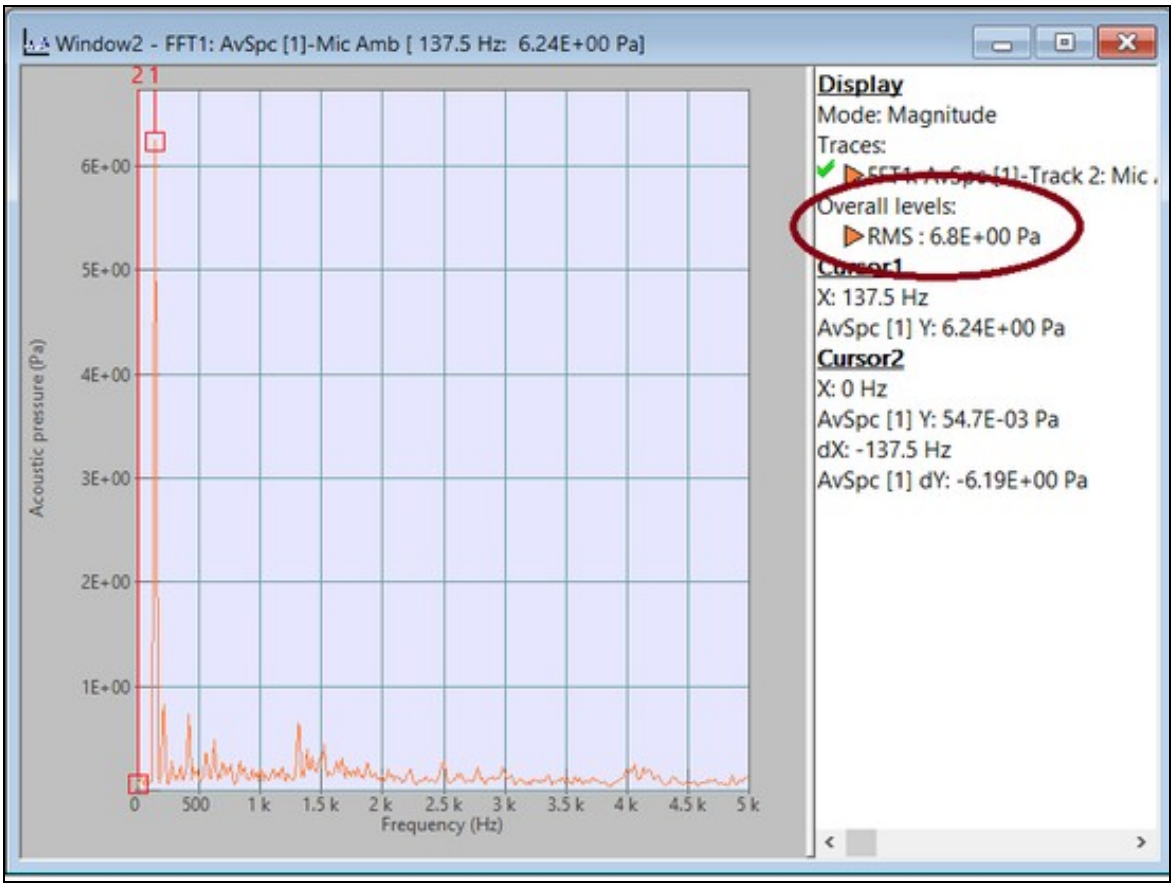
Description of NVGate Computation: This document describes the different computations that are done inside the analyzer.

90.1 Computation of overall Level

Frequently asked question : Why the overall RMS level of my Spectrum mismatches with the sum of spectrum lines ?

ENBW is the key... :)

On NVGate you can find the RMS overall level on several windows. For exemple, on FFT spectrum it can be found here:



If you want to recompute this value using the FFT spectrum line you need to do the following computation:

First you have to sum the amplitude of the frequency line between the freq min and the freq max A(f). (be careful if you have RMS value you have to put each amplitude to square before sum it. $(A(f)^2)$. Then you have to devide that by the ENBW of the ponderation windows (for information it?s 1.5 for haning windows.) then do the square root of this sum.

That is to say:

$Ap(f) = A(f)^2/ENBW$

Then you sum S (f1, f2) = sum from f1 to f2 of Ap(f).

Then you have to put the square root of this sum to have the overall power : P(f1,f2)) = SQRT (S (f1, f2))

How to find ENBW coefficent ?

You will find it on weighting windows page. To sum up:

ENBW rectangular windows = 1

ENBW hanning windows = 1.5

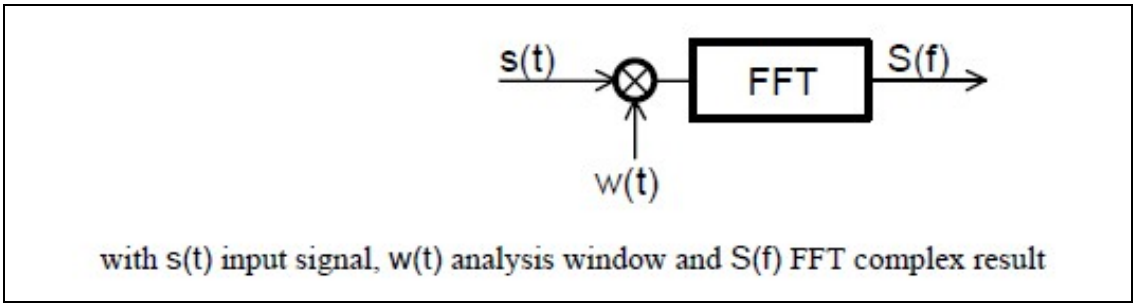
ENBW hamming windows = 1.36

ENBW kaiser bessel windows = 1.8

ENBW Flat Top windows = 3.77

90.1.1 Computation of FFT

For each record of signal with duration of T , the corresponding Fourier Transform is computed as:



with s(t) input signal, w(t) analysis window and S(f) FFT complex result

90.1.2 Analysis Windows

Weighting windows are defined in the OROS analyzer as follows:

$$w(t) = a_0 - a_1.\cos 2\pi t / T + a_2.\cos 4\pi t / T - a_3.\cos 6\pi t / T + a_4.\cos 8\pi t / T$$

for $0 \le t < T$

with a0 = 1 in order to get unity gain.

For a such window we can define the Noise Bandwidth Factor of the Window, NBFW, as

$$NBFW = a_0^2 + 0.5 (a_1^2 + a_2^2 + a_3^2 + a_4^2)$$

The Effective Noise Bandwidth of the Window, ENBW, is equal to

$$ENBW = [a_0^2 + 0.5 (a_1^2 + a_2^2 + a_3^2 + a_4^2)] / T$$

or

$$ENBW = NBFW / T$$

90.1.3 Computation of Spectra in Spectral Averaging

Instantaneous auto spectrum $I_{xx}(f)$ is computed as follows

$$I_{xx}(f) = S_x(f) . S_x^*(f)$$ [

where * indicates the complex conjugate of the function

and instantaneous complex cross spectrum $I_{xy}(f)$ as

$$I_{xy}(f) = S_x(f) . S_y^*(f)$$ [

Averaged auto spectrum $G_{xx}(f)$ for N^{th} average is computed as follows

$$G_{xx}(f) = [(N-1).G_{xx}(f) + I_{xx}(f)] / N$$ [

and averaged cross spectrum $G_{xy}(f)$ as

$$G_{xy}(f) = [(N-1).G_{xy}(f) + I_{xy}(f)] / N$$ [

The coherence, $\gamma_{xy}(f)$, that gives a measure of the degree of linear relation between the 2 signals is computed as follows:

$$\gamma_{xy}(f) = [|G_{xy}(f)|^2 / (G_{xx}(f) . G_{yy}(f))]^{½}$$ [

with

$$0 \le \gamma_{xy}(f) \le 1$$

90.1.4 Computation of Spectra in Time Averaging

Instantaneous auto spectrum and instantaneous cross spectrum are computed as follows for spectral averaging.

Linear averaged FFT result $A_x(f)$ for N^{th} average is computed as follows

$$A_x(f) = [\ (N-1).A_x(f) + S_x(f)\ ] / N \quad [$$

which is equivalent to the FFT of signal blocks, s(t), averaging.

Averaged auto spectrum $G_{xx}(f)$ is computed as follows

$$G_{xx}(f) = A_x(f) \ . \ A_x^*(f) \quad [$$

and averaged cross spectrum $G_{xy}(f)$ as

$$G_{xy}(f) = A_x(f) \ . \ A_y^*(f) \quad [$$

The coherence, $\gamma_{xy}(f)$, is computed as for spectral averaging from $G_{xy}(f)$, $G_{xx}(f)$ and $G_{yy}(f)$.

90.1.5 Linear, Exponential, Peakhold and Referenced Peakhold Averaging

If user has selected M averages, the successive averages are computed as follows:

? In linear mode, the equations [7], [8] in spectral mode or [10] in time mode are used to compute successive averages from the 1st one to the Mth and then the analyzer stops. In these equations N varies respectively from 1 to M.

? In exponential mode, the M first averages are computed as in linear mode and then the analyzer continues averaging with N equal to M.

- In peakhold averaging, auto spectra are computed in spectral and time mode as follows:

$G_{xx}(f) = \max(G_{xx}(f) , I_{xx}(f))$ for each f [13

The cross spectra are not averaged in peak mode.

- In referenced peakhold averaging:
  - auto spectra for the referenced channel is computed in spectral and time mode as follows:

$G_{xx}(f) = \max(G_{xx}(f) , I_{xx}(f))$ for each f [14

$\text{Max}(f) = I_{xx}(f) > G_{xx}(f)$ for each f [15

  - auto spectra for the response channels are computed in spectral and time mode as follows:

If Max(f) then $G_{xx}(f) = I_{xx}(f)$ for each f [16

  - cross spectra are computed in spectral and time mode as follows:

If Max(f) then $G_{xy}(f) = I_{xy}(f)$ for each f [17

90.1.6 Time Integration or Derivation of Spectra

Auto and cross spectra can be modified in order to get the same effect as a single or double integration or derivation in time domain.

Each line of spectra, G_{xx} or G_{xy}, is respectively divided or multiplied by $(2\pi tf)^2$ for single integration derivation and by $(2\pi tf)^4$ for double integration or derivation.

This is equivalent to use time domain integrators or derivators with a time constant τ .

90.1.7 Scaling of Auto and Cross Spectra

Basically auto spectra and cross spectra are internally scaled in EU^2 relative to a pure sine signal (EU stands for Engineering Unit, which is the physical unit of the analyzed signal).

For example, if user injects an 1 EU rms pure sine at a frequency exactly equal to one of the FFT lines, the corresponding line for I_{xx}, I_{xy}, G_{xx} and G_{xy} is equal to 1 EU^2.

90.1.8 Display of Auto and Cross Spectra

Auto spectrum and cross-spectrum module can be displayed relatively to Amplitude or Power Spectrum Density.

When Amplitude is selected the spectrum line values are displayed relatively to a pure sine signal. For example, if user injects a 1 EU rms pure sine at a frequency exactly equal to one of the FFT lines, the displayed values are:

1.000 EU rms in RMS mode,

1.414 EU peak in PEAK mode,

2.828 EU pp in PEAK to PEAK mode

The selection of one of these modes is available in the Input setup dialog box for each channel.

If the user selects display of Power Spectrum Density, PSD, he is mainly concerned with power density distribut
which is expressed in EU / Hz^{½}.

The analyzer computes the PSD as follows:

$$PSD_{xx}(f) = [\ G_{xx}(f) / ENBW\ ]^{½} \quad [1$$

$$PSD_{xy}(f) = [\ |G_{xy}(f)|\ / ENBW\ ]^{½} \quad [1$$

90.1.9 Computation of frequency band power

Computation of a frequency band power, FBP, takes NBFW into account as follows:

$$FBP_{xx} = [\ \sum G_{xx}(i) / NBFW\ ]^{½}$$

$$FBP_{xy} = [\ \sum |G_{xy}(i)|\ / NBFW\ ]^{½}$$

in order to give the power or cross power for the frequency band.

90.1.10 Computation of auto-correlation and cross-correlation

The cross-correlation function $\Re xy(\tau)$ gives a measure of the extent to which two signals correlate with each o
as a function of the time displacement τ between them.

$$\Re xy(\tau) = y(\tau) \otimes x(-\tau) \quad [2$$

where:

τ is the time displacement

$\otimes$ is the convolution symbol

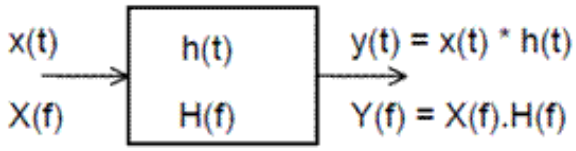
The auto-correlation is a special case where $x(\tau) = y(\tau)$.

90.1.11 Frequency Response Measurement

From two auto spectra and the associated cross spectrum, the analyzer can compute the frequency response of a linear system. Two cases are considered for result interpretation, without or with extra measurement noises.

90.1.11.1 Without measurement noise

Consider an ideal linear system



the frequency response function is equal to

$$H(f) = Y(f) / X(f) \quad [23]$$

and we can easily demonstrate the two following relations:

$$H(f) = G_{xy}(f) / G_{xx}(f) \quad [24]$$

$$H(f) = G_{yy}(f) / G_{yx}(f) \quad [25]$$

The analyzer computes 2 frequency responses, H1 and H2 as follows

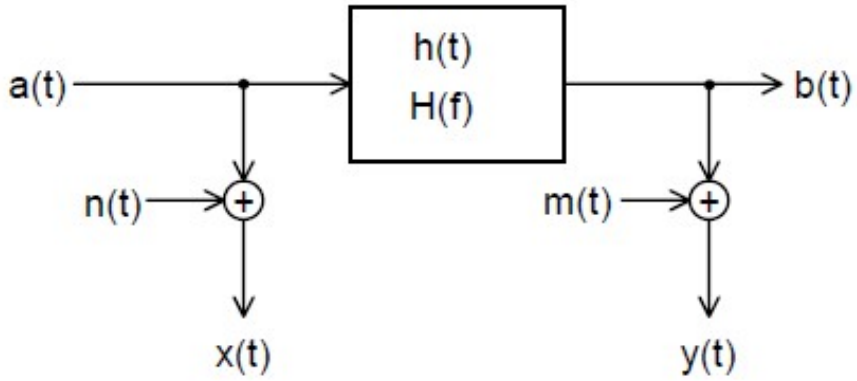
$$H1(f) = G_{xy}(f) / G_{xx}(f) \quad [26]$$

$$H2(f) = G_{yy}(f) / G_{yx}(f) \quad [27]$$

These 2 frequency responses are identical without measurement noise.

90.1.11.2 With measurement noise:

In practice, measurements are done with an extra noise n(t), at measured input signal x(t), and another extra noi
m(t), at measured output signal y(t):



Supposing that the input signal a(t), the additional input noise n(t), and the additional output noise m(t) are
correlated we get:

$$G_{xy}(f) = G_{ab}(f) \quad [2$$

$$G_{xx}(f) = G_{aa}(f) + G_{nn}(f) \quad [2$$

$$G_{yy}(f) = G_{bb}(f) + G_{mm}(f) \quad [3$$

so

$$H1(f) = G_{xy}(f) / (G_{aa}(f) + G_{nn}(f)) \quad [3$$

which is an underestimate of H(f)

$$H2(f) = (G_{bb}(f) + G_{mm}(f)) / G_{yx}(f) \quad [3$$

which is an overestimate of H(f)

We can note that for these 2 estimations of the Frequency Response Function, the phase of estimated H(f) is equal
the phase of $G_{xy}(f)$ independently of the noises level and it is the same for H1 and H2.

90.1.11.3 Real and Imaginary parts:

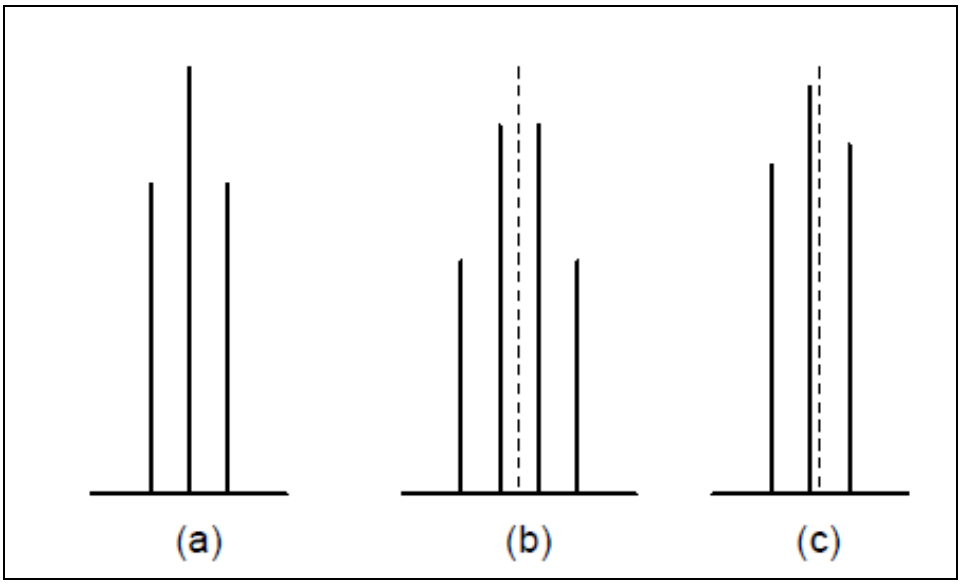
$$\text{Real part}(f) = \text{Module}[H(f)] \times \text{COS}(\text{cross-phase}(f)) \quad [33]$$

$$\text{Imaginary part}(f) = \text{Module}[H(f)] \times \text{SIN}(\text{cross-phase}(f)) \quad [34]$$

90.1.12 Interpolation of Peaks in Spectra

When analyzing a sinusoid using FFT, this one appears as a peak in the spectrum.

As the spectrum is only measured at discrete frequencies, so we generally get an error in both amplitude and frequency of the associated highest line in the spectrum, for example:

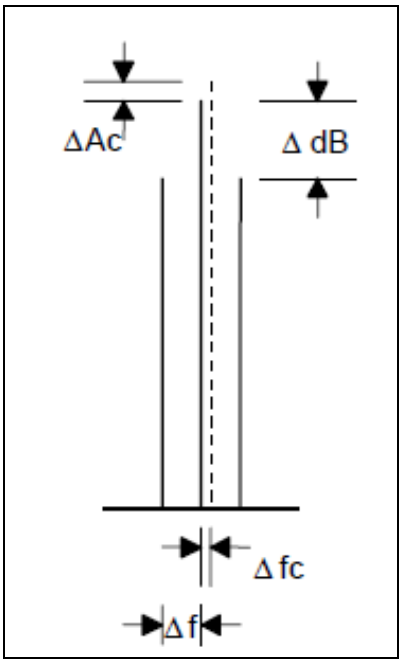


(a) sinusoid frequency equal to a spectrum line

(b) sinusoid frequency at the middle of two spectrum lines

(c) sinusoid frequency near a spectrum line

These errors are compensated by an interpolation technique using the window filter characteristics of the weighting function:



Knowing the characteristics of the analysis window, the difference ?dB, between the two highest spectrum lines gives the correction ?Ac (amplitude) and ?fc (frequency) to be applied in order to get the exact values of sinusoid amplitude and frequency.

In the OROS analyzer, the frequency correction is computed, at user request, with a resolution equal to 1/32th of the analysis resolution ?f.

90.1.13 Cepstrum

The Module Cepstrum display is available in the FFT analysis with option "diag".

$$C(\tau) = \left| FFT^{-1}\left(\log(F_{xx}(f)\right)\right|$$

Where F_{xx} is the power spectrum of the time signal $f_x(t)$
τ is the "quefrency" (this variable has the dimension of time)

Where F_{xx} is the power spectrum of the time signal $f_x(t)$

? is the "quefrency" (this variable has the dimension of time)

Cepstrum analysis can be used as a tool for the detection of periodicity in a spectrum, for example families of harmonics with uniform spacing.

A high "quefrency" represents rapid fluctuations in the spectrum (small frequency spacings) and a low "quefrency" represents slow changes with quefrency (large frequency spacings). Note that the quefrency does not give information on the absolute frequency but only about frequency spacings.

90.1.14 Envelope spectrum

The envelope signal is computed from the zoomed signal by taking the module of the complex signal multiplied by 2.

This corresponds to an Hilbert transform (signal multiplied by itself but out of phase by 90°).

Indeed to compute the zoom spectrum, it is necessary to compute 2 signals:

R (t) = input (t) * cos (2 * PI * fc * t)

I (t) = input (t) * sin (2 * PI * fc * t)

With fc = Zoom center frequency ; input (t) = input signal.

Then The signals R (t) and I (t) are decimated (zoom factor: 2, 4, 8?).

The envelope signal is equal to :

Env (t) = 2 * sqrt (RZD (t) * RZD (t) + IZD (t) * IZD (t))

With : RZD (t) = real part of the zoomed signal after decimation

IZD (t) = imaginary part of the zoomed signa after decimation

90.1.15 Measurement scalar Level

DC Level:

$$m1 := \frac{1}{N} \cdot \left(\sum_{i=1}^{N} x_i \right)$$

RMS Level:

$$m2 := \left[\frac{1}{N} \cdot \sum_{i=1}^{N} \left(x_i - m1 \right)^2 \right]^{\frac{1}{2}}$$

Skew Level

$$m3 := \left[\frac{1}{N} \cdot \sum_{i=1}^{N} \left(\frac{x_i - m1}{m2} \right)^3 \right]$$

Kurtosis Level

$$m4 := \left[\frac{1}{N} \cdot \sum_{i=1}^{N} \left(\frac{x_i - m1}{m2} \right)^4 \right]$$

With:

N = signal block size

x_i = input samples

91 NVGate Glossary

91.1 Glossary

Analog input

An analog input is the physical way into the OR38 multi-analyzer for a signal. An input can be activated or not and can be connected or not to a plug-in analyzer channel. The same input can be connected to one or several channels of an analyzer or even to several plug-in analyzers. The corresponding LED is on when the input is activated.

ASB (Analyzer Setting Browser)

ASB, The Analyzer Setting Browser, is one of the 3 graphic tools forming the workspace. It allows you to set up the analyzer and control the Instrument directly. The main categories of the ASB are inputs, resources, and plug-in analyzers. 3 types of icon represent these 3 categories. The setups made in the ASB are saved in the current project.

Channel

A channel is the way in to a plug-in analyzer. It can be activated or not and can be connected to an analog input or not. In order to be able to display a result obtained from an analyzer channel, the channel should be activated and connected to input.

Collection

A collection is a group of sub-modules of the same type (inputs, filters pass/stop band, etc.)

Control Panel

The control panel is part of the workspace. It allows you to control the measurement process. It is user-customizable and saved in the current project. The control panel is customized by right clicking in its area.

Cursor

The cursor allows you to obtain the coordinates of any point of a trace.

Download

Only available if the Instrument OR38 is connected to the PC. You can download the data stored in the OR38 to the PC hard drive.

Event definition

An event is defined as a trigger condition. Any event defined in the event definition is a resource of NVGate® and can be selected from any of the plug-in analyzers.

Export

Allows to convert a signal file into a specific format to a located directory.

Filter builder

The filter builder allows you to design the filters you need for your analysis. Any filter built in the filter builder is a resource of NVGate® and can be selected from any of the plug-in analyzers.

Front-end

Front-end is the section where you can set-up your analog inputs, outputs and external synchronizing inputs.

Graph

A graph is the trace display area. A graph can consist of one or several traces (multitrace 2D or 3D). A window can consist of one or several graphs (multigraph window). A contextual menu appears when clicking in the graph background: it contains zooming tools and trace and marker managers. Another contextual menu is available by clicking in the window background.

Import

Allows you adding project(s) from a located directory into your Project Manager.

Infotrace

The infotrace is the information zone of a graph. It contains the legend and the marker tables. It can be displayed by pulling the bar on the right side of the window.

Layout

Display set-up, window arrangement, displayed results.

Log Window

The log window reports any action you have performed.

Marker

A marker is a tool for automatically obtaining coordinate values for displayed traces. Markers can be of several types: free, harmonic, peak, max, side band, and power band.

Marker table

The marker table is displayed in the infotrace.

Measurement

A measurement is a subpart of a project. It allows you to organize your setups and results.

Module

A module is a box that contains an analyzer mode. There are 3 types of module. Hardware control: I/O settings, recording, battery... Library: general analyzer resources management (filtering, trigger...) Analysis: 1 per analysis mode provided (Frequency analysis, Oct analysis...).

Monitor

The monitor is a particular type of plug-in analyzer. The monitor allows basic FFT setups and lets you observe the signal at any stage during the analysis process without stopping the measurement.

Operators

Allows you to make comparisons and averages between several traces.

Output signals

The output signals resource is the section where you can define the signals to be generated. Once defined the output signals can be selected from the analog outputs to be generated.

Player

The player is the tool for playing back recorded signals.

Plug-in analyzer

A plug-in analyzer is an analyzer plugged into NVGate®. The number and properties of the plug-in analyzer depend on your configuration.

Project manager

The project manager is part of the workspace. It allows you to organize and store all your data and setups. A project consists of several measurements.

Recorder

The recorder allows you to record time domain signals.

Results

Results are any type of data that can be saved for displayed.

Signal

A signal is a piece of raw data in the time domain.

Sub-module

A sub-module is a basic analyzer function and data processing operator.

Trace

A trace is the representation of a signal or a result. A multitrace graph is a graph containing several traces: it can be 2D or 3D.

Upload

Available only if the Teamwork instrument is connected to the PC. This is used to send a recorded signal file from the PC to the instrument. You can select to keep the signal onto the PC or to remove it after the upload.

Waterfall

A waterfall is a 3D display representing on one axis the frequency domain, on the vertical axis the amplitude and in the third dimension the change in the result during time, block numbers, or RPM.

Window

A window can contain one or several graphs (multigraph window).

Workbook

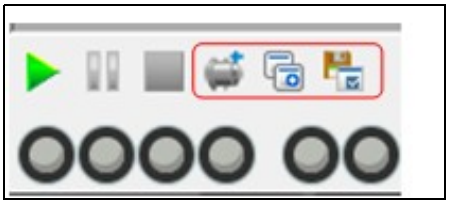
A workbook contains an analyzer status (ASB settings, setup, Control Panel, layout...).

Workspace

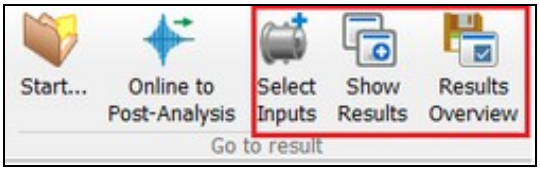
The workspace is the area grouping the ASB (Analyzer Setting Browser), the Control Panel, and the Project Manager. It is used for setting up, running and organization data within NVGate®.

92 NVGate GoToResult

Available from both the bottom bar :



and *Home\GoTOResult*:



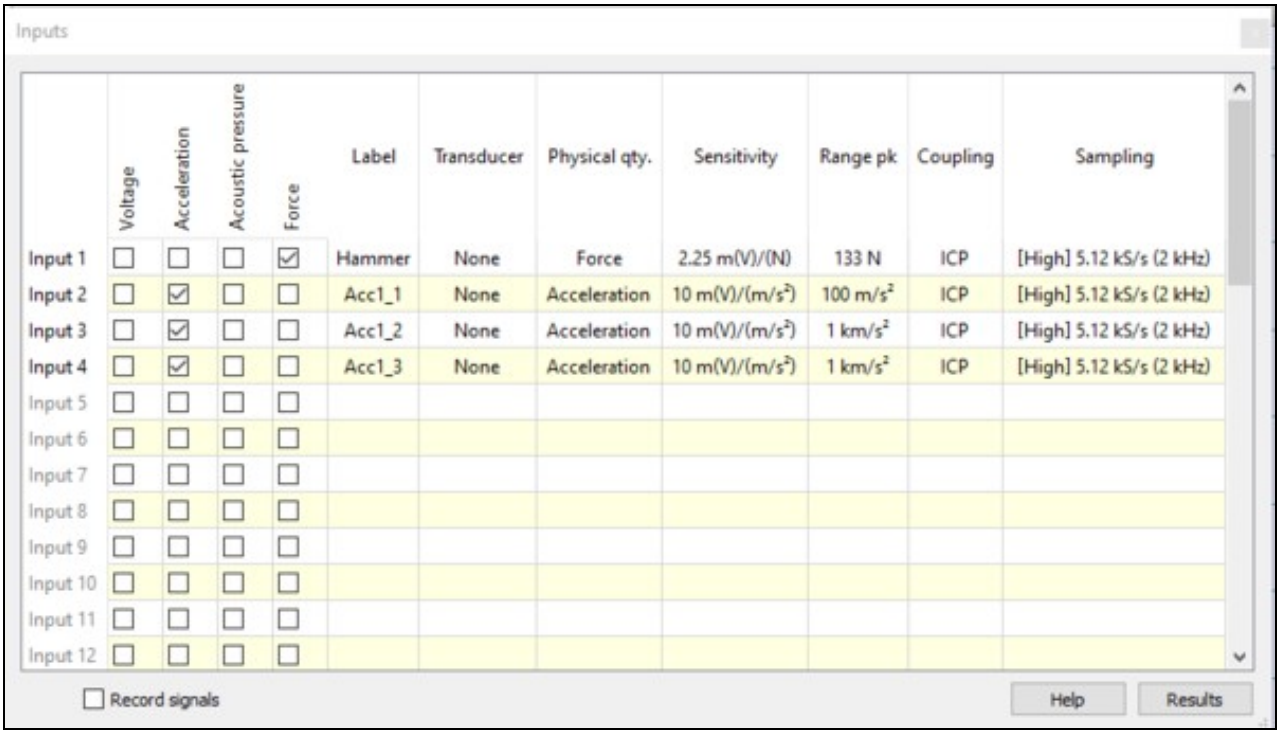
This window allows selecting the inputs to be used and setups their acquisition.

The 2 first buttons control the visibility of the corresponding windows *Inputs selection* and *Show results*. Click once to show the window, click again to hide it. The 3rd button only opens the *Results overview*.

These 3 buttons show the windows described below.

92.1 Step 1: Inputs selection





92.1.1 Usage

The *Inputs selection* window **allows access to the other items of the NVGate interface** (ex: *check ICP, Autorange*, change sampling frequencies, graphs?) while it remains open.

The actions in this window apply immediately to the analysis, there is no possible cancel. In the same way actions in other parts of NVGate are immediately reflected in this window.

This window manages dynamic inputs only. For using parametric, CAN or ext. synch inputs, one should use the acquisition tab of the ribbon.

92.1.1.1 Operations

The Inputs selection window allows activating and setting-up the dynamic inputs in a fast and smart way. Inputs are activated and set to a physical quantity when the corresponding check box is clicked.

92.1.1.1.1 Selection

This table allows selecting one or multiple cells in an Excel like mode, using **mouse drag, keyboard arrows** and **SHIFT**/**CTRL** keys. After editing, the focus is automatically set to the next cell for continuous operation with the keyboard:

Exit key	Return	Tab	Left arrow	Right arrow	Up arrow	Down arrow
Next cell	Down	Right	Left	Right	Up	Down

92.1.1.1.1.1 Edition

Editing a cell or a group of cells is direct, **no need to double click**, **simply enter the values** or initials for combo boxes. Hit the <Space> key to open the combo with the current selection. This allows using the keyboard only while setting cells in a column or a line.

92.1.1.1.1.2 Add physical quantities

The 3 basic physical quantities (Voltage, Acceleration and Acoustic pressure) used in noise and vibration are proposed as default. **Changing one input physical quantity will add a new column** with this physical quantity.

In addition to the basics and active physical quantity, the columns also show the physical quantities of deactivated inputs. **This is useful to add default physical quantities to your models**.

92.1.1.1.1.3 Transducers

The list of possible transducers is **adjusted to the input physical quantity**. Ex: if an input is set to acoustic pressure, only a microphones? list is proposed.

92.1.1.1.1.4 Sampling & groups

The sampling setting is new. It **defines the recording sampling and the analysis bandwidth for each group of inputs**. The groups correspond to the inputs physical quantities. See the *Autobandwidth* chapter for more details

There are 2 samplings, *High* and *Low*. Each sampling can be adjusted from the table with *Right click -> Change -> Select new sampling*.

Changing the sampling of one input will apply to all input in the same group. For applying different samplings to inputs with same physical quantity, use the ASB.

Sampling settings are also available from the ribbon Measurement\Front-end\High Samp. and Low Samp. and from the Front-end Module in the Analysis Setting Browser.

92.1.1.1.1.5 Record signals

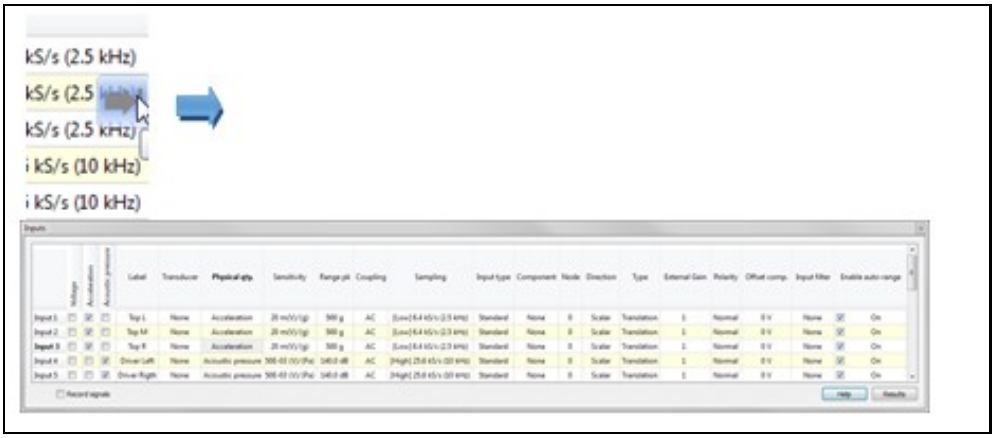
Check this box to **ensure the recording of all active inputs**. This includes the DC inputs (parametric), the Ext Sync. and the CAN ones.

Unchecking this box just set the recorder to off. The inputs remain set in the recorder. This is helpful to **temporarily pause the inputs recording**; especially on setup fine tuning.

A button "view recording" is available on step 2 to **monitor temporarily or continuously the signal:**.

92.1.1.1.1.6 Access to all

By default, the window shows only the basic settings. In order to get the full columns, **flyover the right side of the table and click on the grayed arrow**.



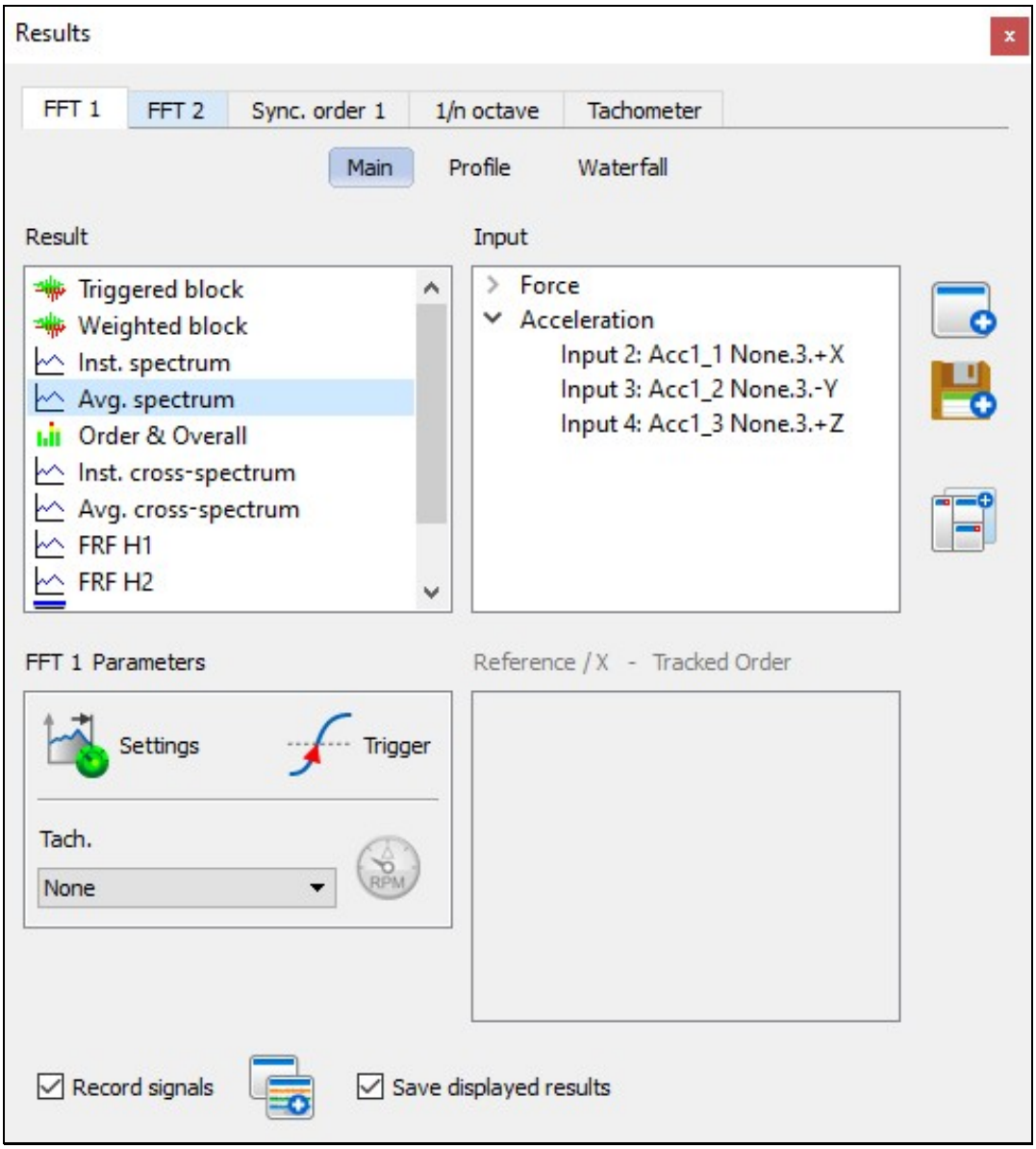
Same with the left arrow to return to the basic view.

92.1.1.1.1.7 Post-analysis

Inputs selection window works on both on-line and post-analysis modes.

92.1.1.1.2 Step 2 Show results




Results
FFT 1
FFT 2
Sync. order 1
1/n octave
Tachometer
Main
Profile
Waterfall
Result
Triggered block
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
FRF H1
FRF H2
Input
Force
Acceleration
Input 2: Acc1_1 None.3.+X
Input 3: Acc1_2 None.3.-Y
Input 4: Acc1_3 None.3.+Z
FFT 1 Parameters
Settings
Trigger
Tach.
None
RPM
Reference / X - Tracked Order
Record signals
Save displayed results

92.1.1.1.2.1 Call

Directly following the *Inputs Selection* window, this window allows **displaying and saving results from activated inputs**.

Hide the window by clicking on its control button closing the window (up-right red cross) or by clicking on its corresponding button in the NVGate bottom bar.

92.1.1.1.2.2 Usage

The *Show results* window **allows access to the other items of the NVGate interface** (*Add/Change layout, Setup tachometer*?) while it remains open.

The actions in this window apply immediately to the analysis, there is no cancel possible from this window. In the same way, actions in other parts of NVGate are immediately reflected in this window.

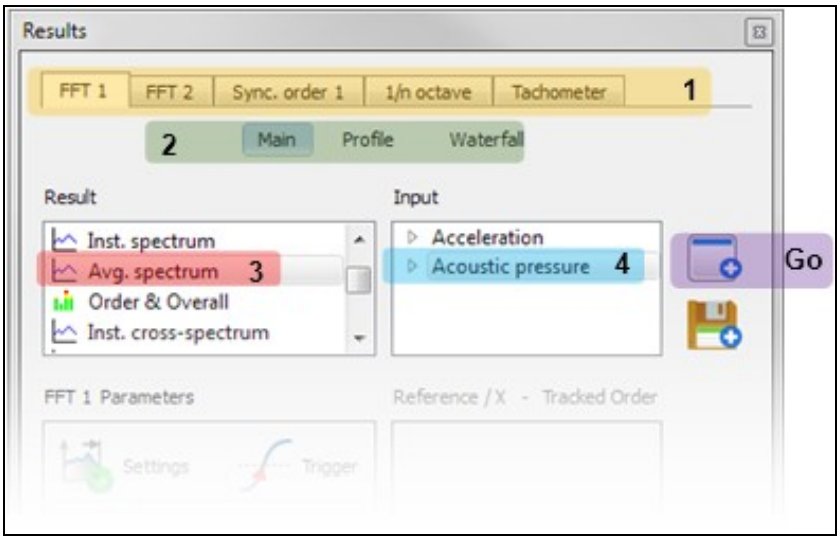
This window manages to connect and display result from FFTx, SOAx, OCT plug-ins only. (For results from TDA and OVA, one should use the  Connect Inputs button followed by the  Add/remove windows .

92.1.1.1.2.3 Show results

The Show *results* window allows displaying and saving results without connecting inputs or tracks to the plug-in analyzers in advance.

Results to be displayed are selected as follows:

1. Select the plug-in which calculates the results,



2. select the results? familly between:

- *Main* is for results imediatelly provided by the analysis like the trigger blocks, RPM, spectra, FRFs, ?
- *Profile* is for scalar profiles like order tracking, acoustic level, RPM profiles, ?
- *Waterfall* is for 3D results.

3. Select the result type,

4. select the Inputs/Tracks to be displayed. This list **gathers the sources in groups according to their physical quantities**. One can develop the group for partial selection.

Go. Use the *Show* button to display your selection. This button operates in 2 ways:

- Add a new window in the current layout with the selected results by clicking the button

- Drag & Drop the button to an existing window of the current layout to add the selected results in this window.

92.1.1.1.2.4 Add Layout


Add Layout: Creates a new layout. A dialog box used to name the new layout is displayed by clicking on the button. A new tab is created and selected, corresponding to the new layout.

Tips : [Ctrl+shift+space]: to change the different layouts.

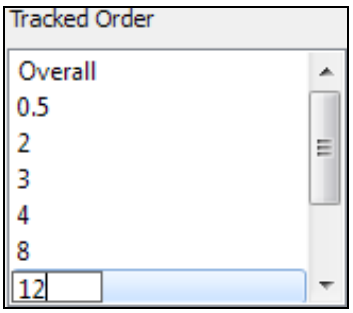
92.1.1.1.2.5 View Recording


view recording: will open the signal monitoring window on top of the current layout. In the case of this window is already open in another layout, it swaps to this layout.

92.1.1.1.2.6 References

Cross functions (FRFs, ORFs, Coherence, etc..) are selected through the bottom right area. The references are displayed as the inputs/tracks using the physical quantity group. There is no need to predefine the cross function from the Plug-in settings.

92.1.1.1.2.7 Orders and overall



For order tracking, the Show results window features a fast and simple order selection mode. While selecting order-based result, one can enter the chosen orders in the bottom right area of the window.

Values are entered directly using the keyboard; The Enter and up/down keys will navigate to next or previous lines in the list.

If the plug-in channels show different orders to track for one line, "Mixed" will be displayed.

92.1.1.1.2.8 Save results

Results to be saved (i.e. added to the save selection list) are selected as for showing it.

There are 3 ways to save the results:

- Manually by using the save button. This will add the selected results to the save selection.
-



Automatically and continuously, by checking the Save displayed results check box at the bottom of the window. This will continuously add the displayed results to the save selection. Results remain in the save selection list, even if they are removed from the layout.

-

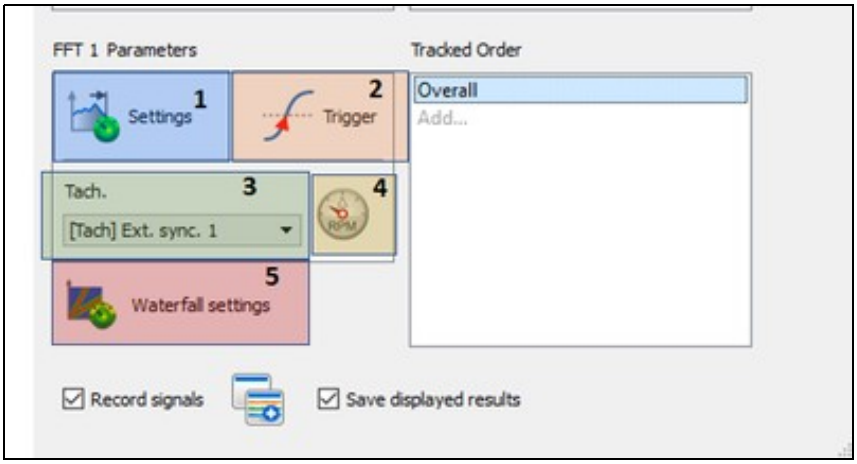


Automatically once by using Measurement\Save\Add All Results button from the ribbon. This button acts like the save all display result but only at once.

- This button is grayed when all displayed results are already in the save selection
- When the Save displayed results is active, this button shows

92.1.1.1.2.9 Parameters

The bottom half of the window allows adjusting the selected plug-in parameters and triggering.



1. This button opens the active plug-in properties. NB: it is also possible to access it from the ribbon while the window is open. Helpful with the directly available main settings.

2. Click here to open the *Events connection* window, where one can **associate event with plug-ins? Start, stop or trigger**.

3. Activate the plug-in tach with this combo box. The tachometer properties will be proposed just after selecting the tach. The corresponding input (dynamic, or ext. synch) is automatically activated.
NB: The selected tachometer is associated with the plug-in. For profile and waterfall results, the corresponding tachometer is showed as: XXX tach (ex. FFT1 tach, or SOA2 tach)

4. Click on the engine tachometer icon will automatically change the waterfall trigger on mode : **"delta RPM or periodic"**. This will make the setup of NVGate much more easier for a rotating or run up application.

This button also create the following events:

- Create a Delta RPM event, source = the one activated in the "Tach.". Delta velocity : 10 RPM.
- Create a Periodic event (0.5 sec)
- Create a Combined event 1. mode: "Delta RPM OR Periodic 1"
- Set waterfall Trigger to Combined event
- Create of an RPM event (source = the one activated in the tach field)

(This button is only available on profile or waterfall tab)

5. Open the waterfall triggering dialog. This dialog allows selecting the trigger of by the waterfall plug-in (only available on profile and waterfall tab).

92.1.1.1.3 Step 3 Results overview

92.1.1.1.3.1 Call

Available from the bottom bar. This window **shows a synthetic table of the displayed and saved results**. Close the window by clicking on its control button closing the window (up-right red cross).

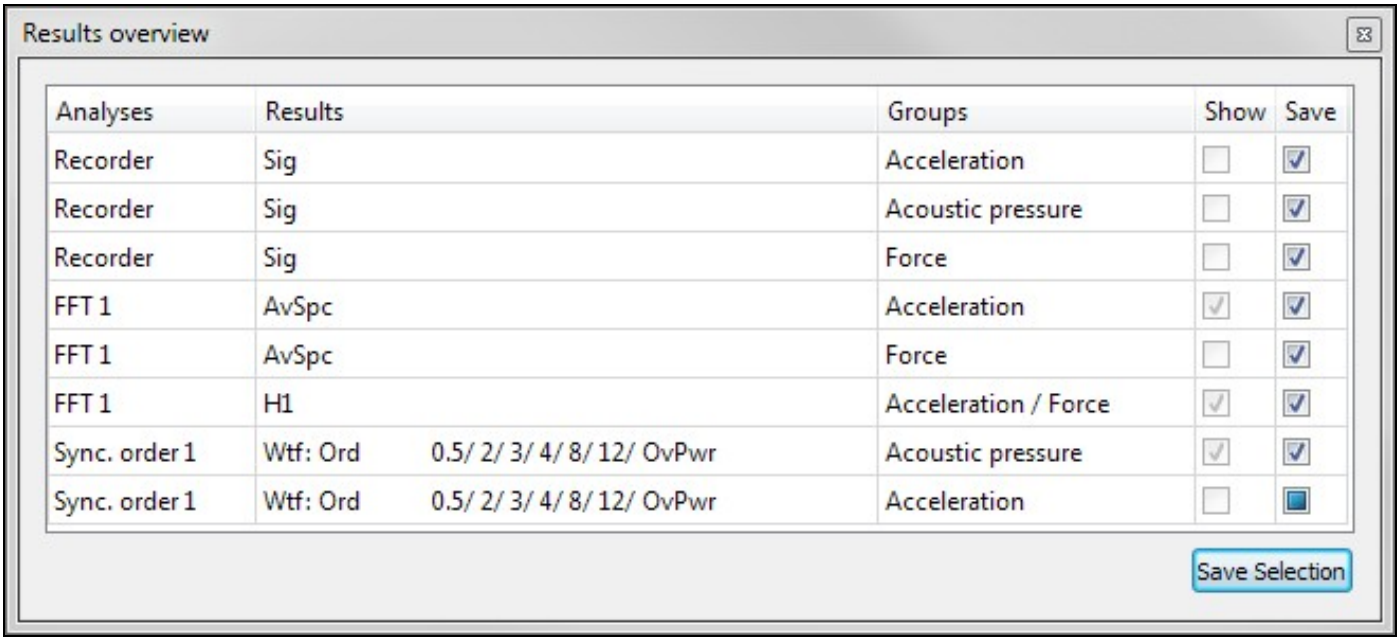
92.1.1.1.3.2 Usage

The table summarizes all the displayed and saved result (i.e. present in the Save Selection list), by:

- Plug-ins
- Type of results

- Groups (i.e. Physical quantity)

The 2 columns at the right, indicate what is done with each set of results. *Show* for the displayed results and *Save* for the to-be-saved results.



The check boxes have 3 possible status:

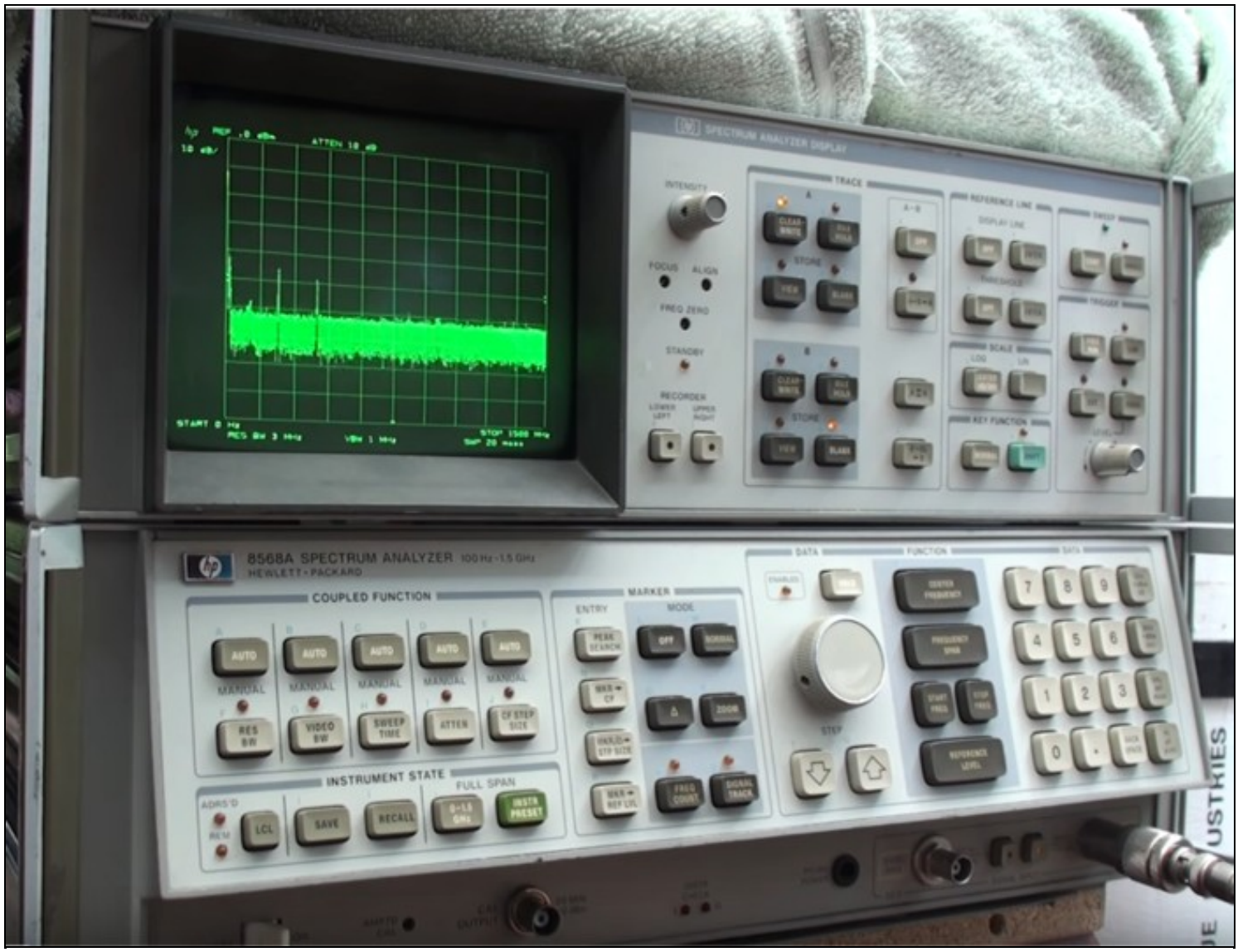
-  Checked, means all the inputs with these type and physical quantity, calculated by the plug-in are saved and/or displayed.
-  Unchecked, means none of the inputs with these type and physical quantity, calculated by the plug-in are saved and/or displayed.
-  Partial, means only a part of the inputs with these type and physical quantity, calculated by the plug-in are saved and/or displayed. One can check and uncheck the *Save* column boxes. Partial status boxes change to checked or unchecked only.

It is possible to check the results one by one with the *Save Selection* window by clicking on the corresponding button at the bottom-right of the window

93 NVGate HP Spectrum Analyzer

93.1 How to turn your OROS Analyzer into a HP Spectrum Analyzer ?

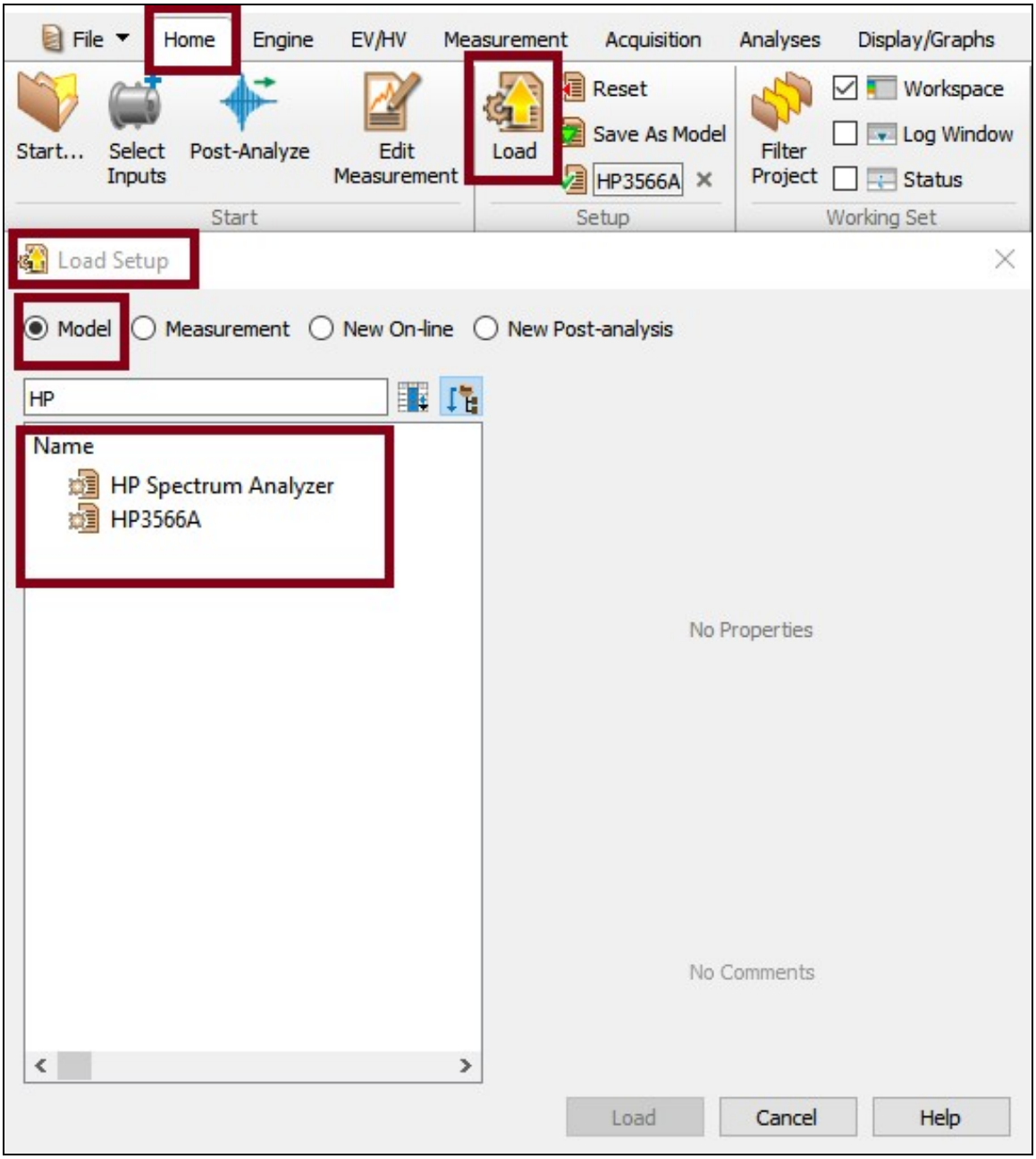
OROS OR34 Analyzers with NVGate software can perform the same function (and much more...) than legendary HP spectrum analyzer.
(hewlett packard was the first manufcaturer of spectrum analyzer, you can have a look on the link, that's really interesting !)



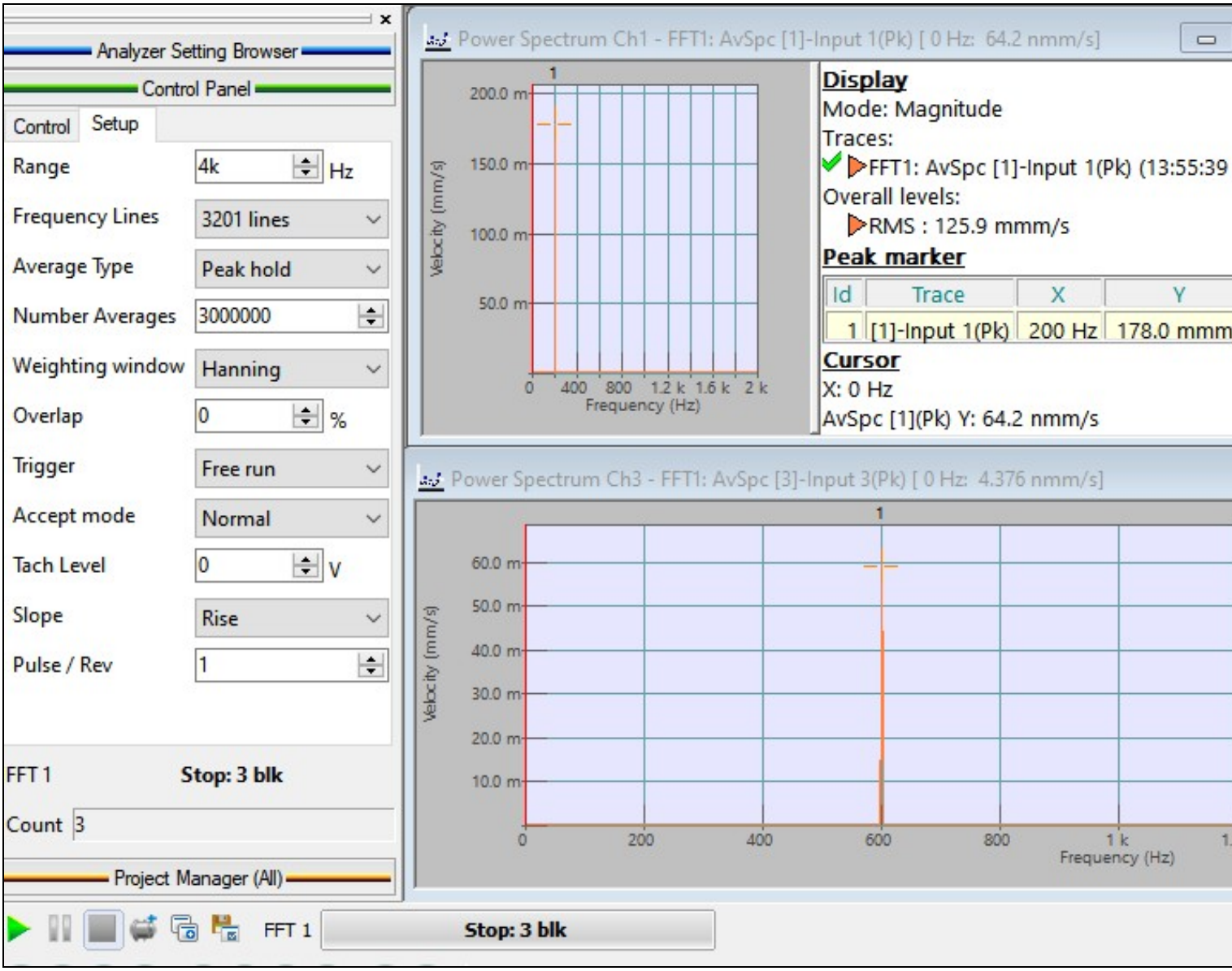
With the model below, we have a quick access to the same settings and function of a HP spectrum analyzer.

93.1.1 To use it

- Download the 2 models here :
- You will find inside 2 .zip models with :
    - General HP spectrum analyzer
    - HP 356670A
- extract the file
- Copy the folder on C:\OROS\NVGate data\Workbook Library\User\
- Launch NVGate and open the model :

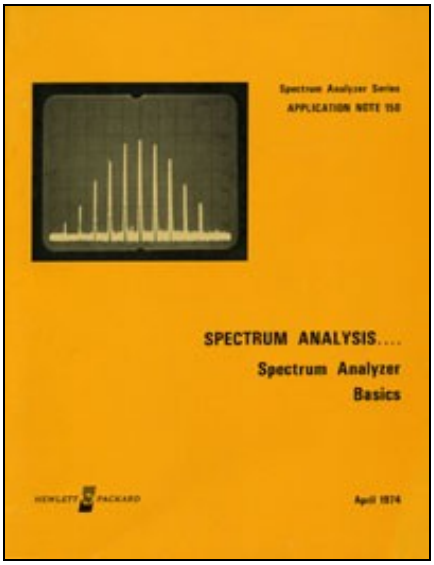


- Now you have the same settings and display than you can find on HP spectrum analyzer.



93.1.2 Documentation

You can check the HP documentation from 1974 .pdf is here



What Is a Spectrum Analyzer?

To display the frequency domain requires a device that can discriminate between frequencies while measuring the power level at each. The spectrum analyzer was designed for this purpose. A spectrum analyzer is an instrument which graphically displays voltage or power as a function of frequency on a CRT (cathode ray tube). It can be used to analyze signals in the frequency domain.

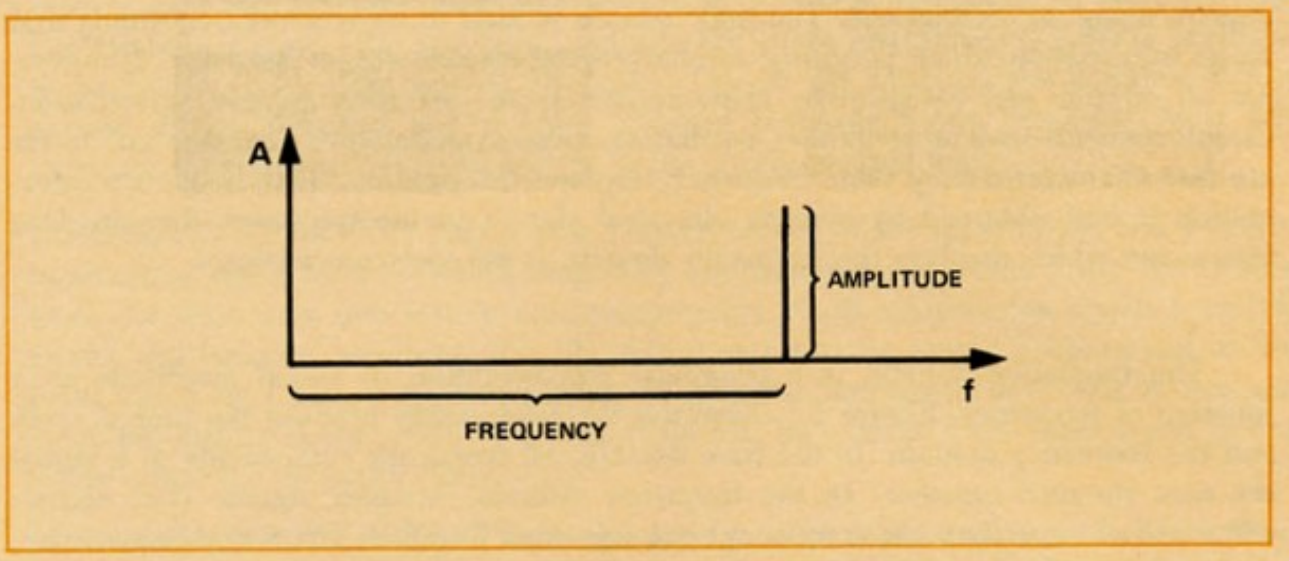


Figure 1.2 Frequency domain display of a CW signal.

Spectrum Analyzer Applications

The frequency domain contains information not found in the time domain and therefore, the spectrum analyzer has certain advantages not available with an oscilloscope. Following is an outline of spectrum analyzer applications. These are described

NVGate FFT can also be suitable... :)

Source : Hewelt Packard Spectrum Analysis Original Application Notes.

94 NVGate Installation and Connection

94.1 Get STARTED

94.1.1 NVGate installation and update

94.1.1.1 Preparation

For the installation in the "Office Mode" (without OROS Teamwork instrument):

- USB dongle
- USB key containing:
    - NVGate Installation Setup
    - License keys

For the installation in the "Connected Mode" (with OROS Teamwork instrument connected):

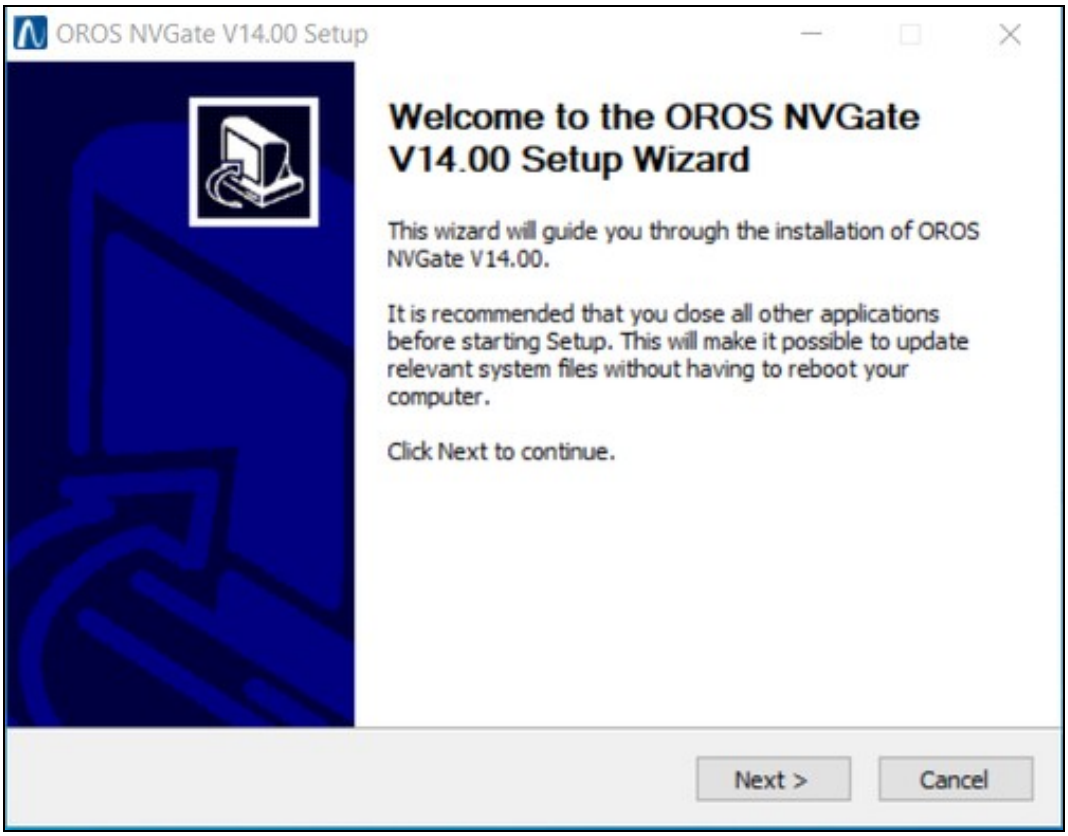
- The OROS-3 Series Instrument (OR34, OR35, OR36 or OR38)
- DC power supply
- 1 Ethernet connection cable
- USB key containing
    - NVGate Installation Setup
    - License keys

Note: before installing NVGate® check that the configuration of your PC is compatible with the minimum requirement (see the NVGate technical specifications in the appendixes)

Caution: Windows user need to have right for reading/writing on NVGate install directory (by default : C:\OROS\Programs\NVGate) and on NVGate Project Database (by default : C:\OROS\NVGate data).

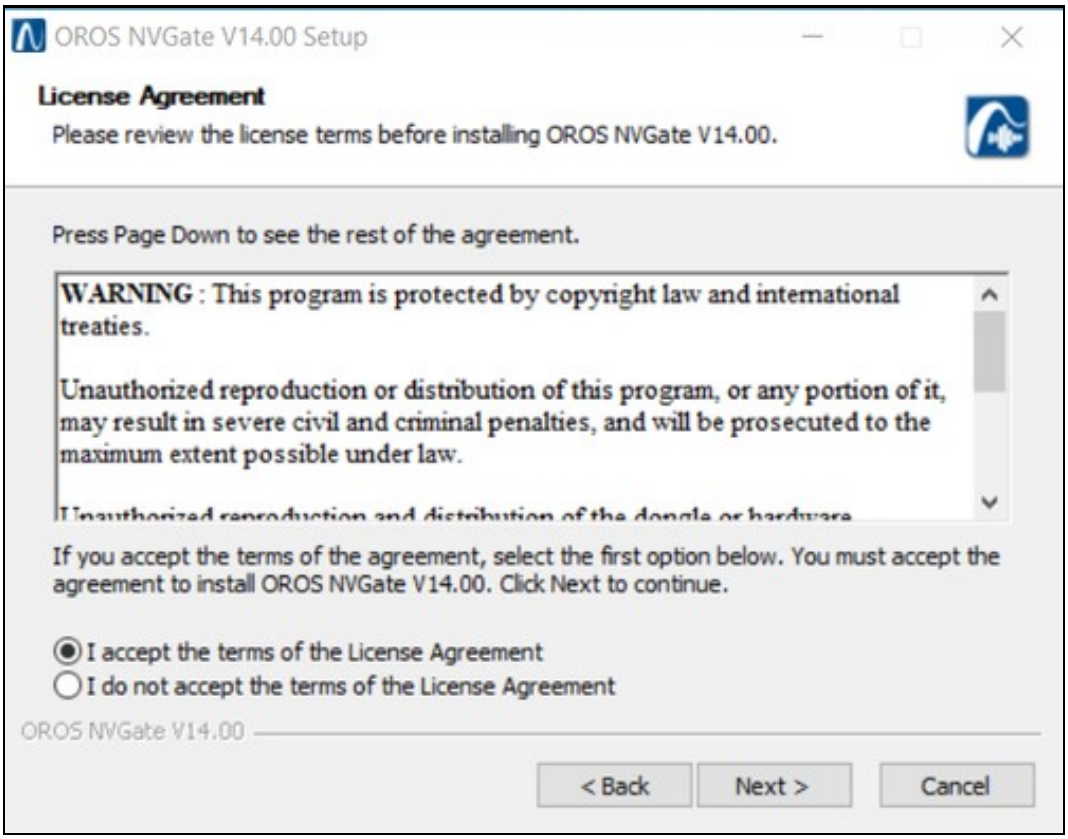
94.1.1.2 First Installation

Plug the USB Key to your PC and run the "setup.exe" application from the NVGate directory. Then the following window is displayed:



Click on next

Read the terms in the license agreement and select "I accept the terms in the license agreement" if you agree.



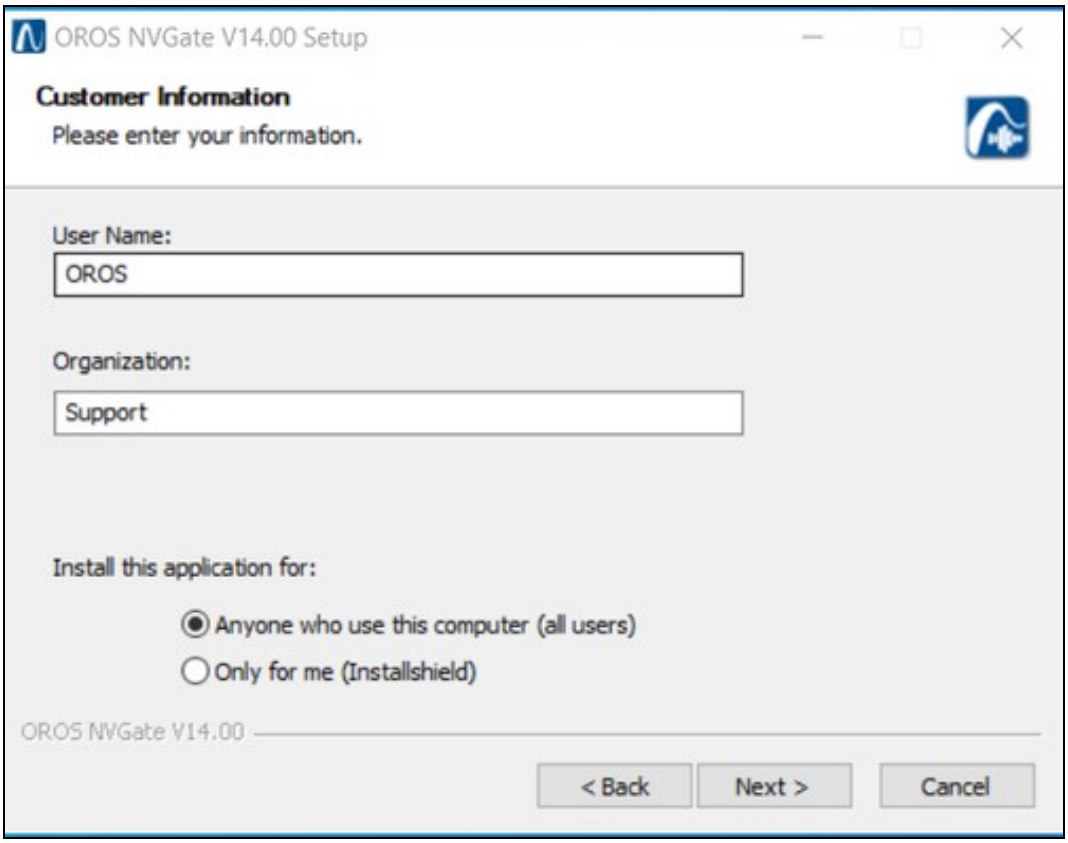
Click on "Next >", the following window is displayed:

Enter the user name, the organization.

click on "Next >", the following window is displayed:

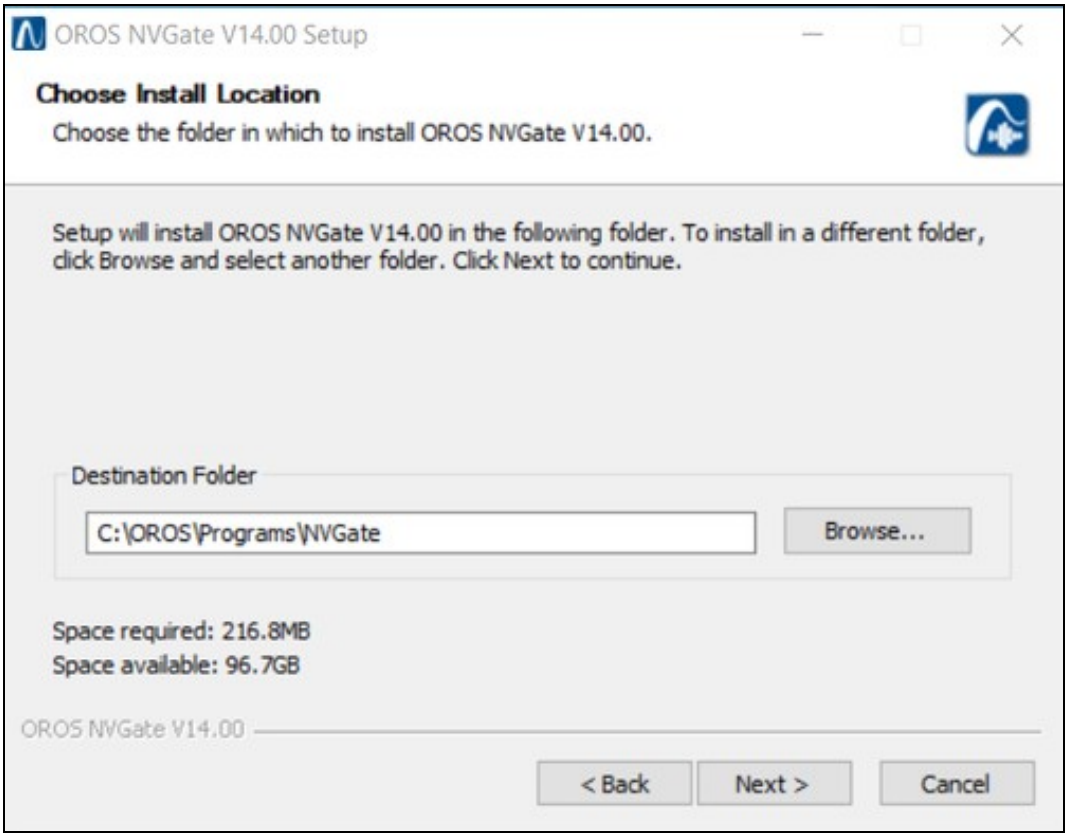
Select the location of the OR3X folder. By default, NVGate is installed on *C:\OROS\Programs\NVGate*

Caution: It is not recommended to install NVGate or any data directory in the C:\program files directory. This may lead to malfunctions and data loss.



Click on "Next >". The following window is displayed:

Remove any OROS license dongle from the PC and Click on "Install". NVGate software installation is processed:



During the installation, other tools needed by NVGate are automatically installed and setup like Sentinel Protection software:

Caution: Let the installation wizard proceed to the full installation. Do not abort the installation process.

At the end of installation, the keys location is requested:

Indicate the path where key files are located (by default, they are in the "Keys" directory on the CD).

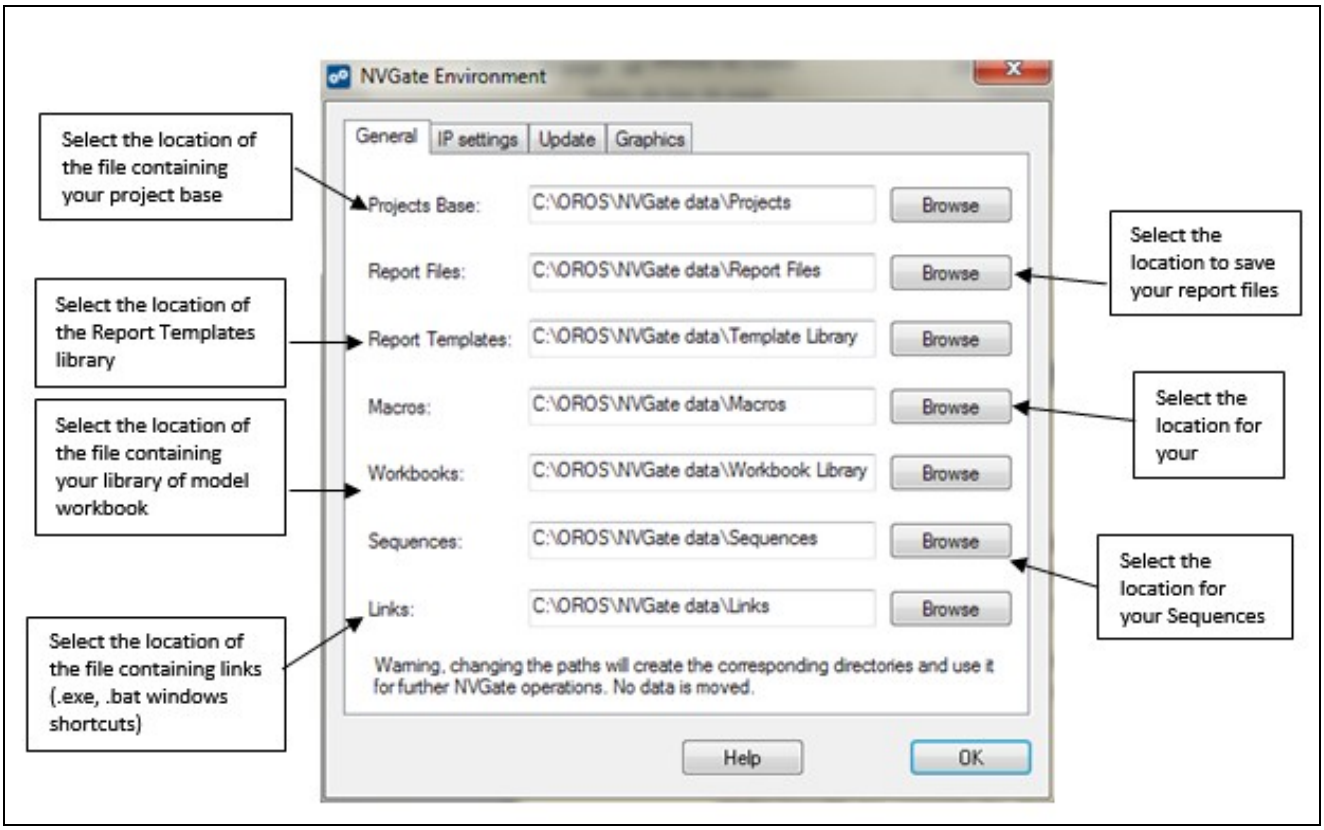
Key files are: "h_xxxx.bat", "h_xxxx.cfg", "o_yyyy.bat" and "o_yyyy.cfg" (xxxx is the serial number of your OROS Teamwork instrument; yyyy is the serial number of your dongle). These keys are in the Keys directory of your NVGate installation CD. Keep it safely.

If you have several instrument and/or dongles, you will have several "h_xxxx.bat", "h_xxxx.cfg", "o_yyyy.bat" and "o_yyyy.cfg" files in the "Keys" directory

All the key files are copied to the NVGate installation directory.

94.1.1.3 Directories setup

This window NVGate environment (NVGatecfg.exe next to NVGate.exe) is displayed. You can choose where your data will be located. The setup and measurement will be saved in the Project base directory. It is strongly recommended to keep the default directories.

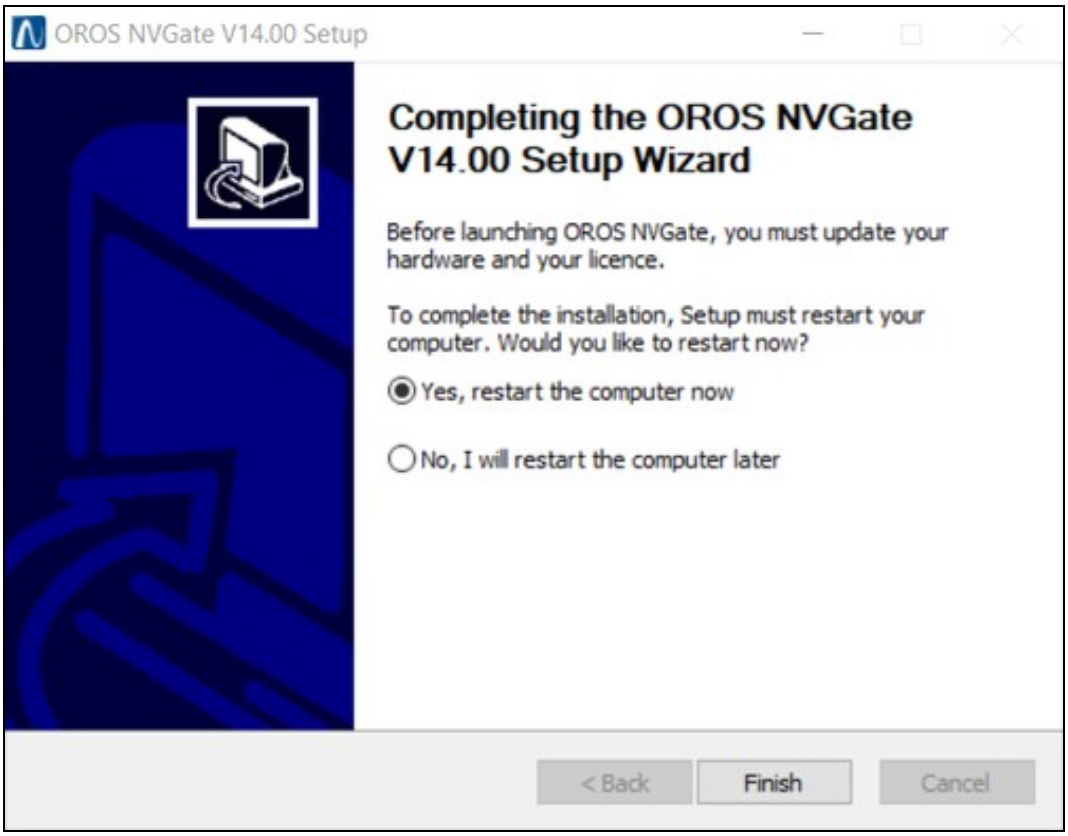


Note: This NVGate environment window is also available from NVGate installation folder (as recommended: C:\OROS\Programs\NVGate). Execute the NVGateCfg.exe and NVGate environment will be displayed.

Then click on ?OK, the following window is displayed:



Click on "Yes to all". The NVGate software is installed:



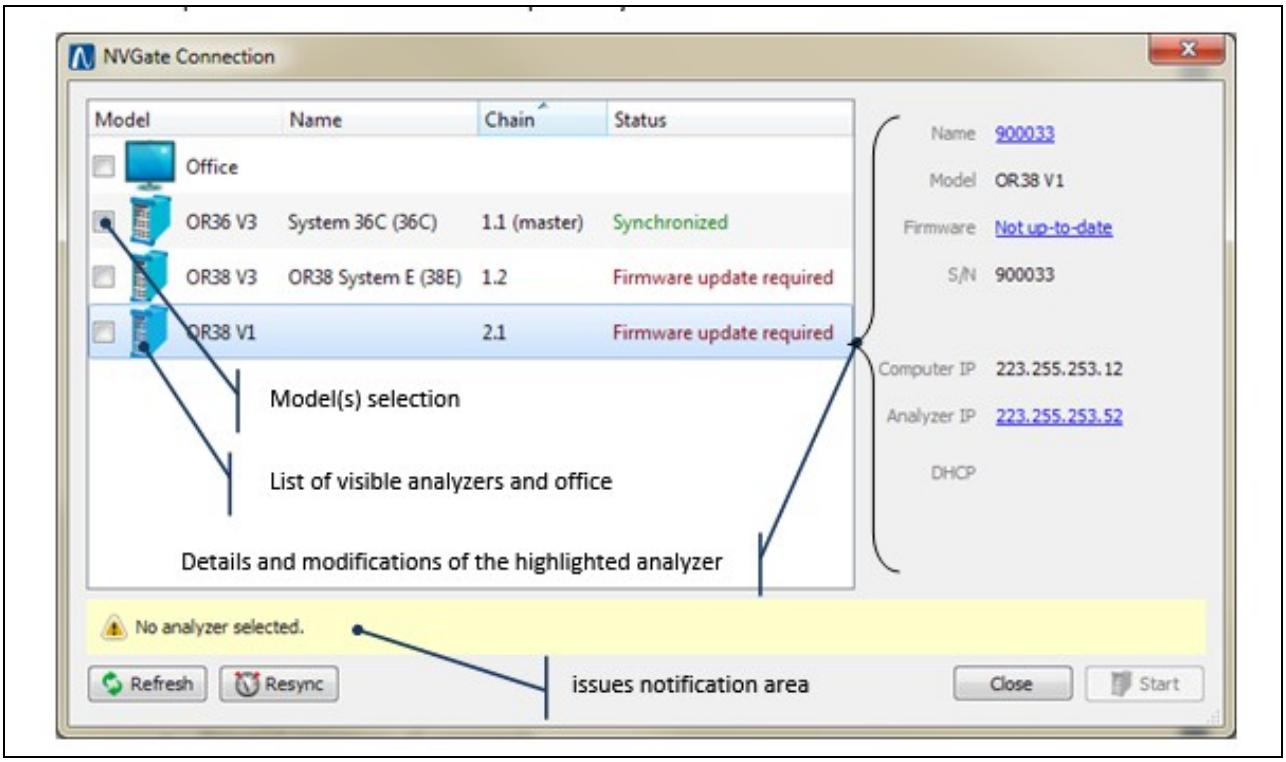
It is necessary to restart the computer to complete the installation of Sentinel driver. Click on "Finish".

94.1.2 Connecting the analyzer to your PC

NVGate features a dialog box dedicated to the connection and update of the analyzer(s). This dialog allows choosing between office, connected and cascaded modes.

94.1.2.1 Connection dialog

This dialog gathers in a unique list the office mode and the list of visible analyzers for connected mode. It is possible to select one or multiple analyzers, Teamwork instruments only, or the office mode



The dialog contains multiple area and commands.

- ***Model*** list area shows the available analyzers and the office mode.
- ***Details* & modifications** area shows the information related to the highlighted analyzer and allows updating it through the hyperlinks. Analyzer may be highlighted by clicking on the corresponding row out of the selection check box.
- ***Connection Issue notification***. This area appears at the bottom of the Model list when an issue blocks the start of NVGate (*Start* button is disabled)
- ***Refresh*** button rescans the network and updates model column.
- ***Resync*** button re-launches the clock synchronization between multiple Teamwork analyzers for cascade purposes.
- ***Start*** button launches NVGate with the selected model; Office, Connected, Multiple analyzers

94.1.2.2 Visibility of analyzers

Visible analyzers are the OROS 3-Series (V2 and V3 called *Teamwork*) connected on the same network as the PC. The connection between the PC and the visible analyzer(s) must be on the same logical network (i.e.: A company LAN with LAN switches or cascade of *Teamwork* analyzers).

- Analyzers already running an NVGate session are not visible in this dialog.
- Analyzers with the same IP address are visible in this dialog. IP must be changed to different ones to allow starting NVGate on multiple analyzers.

Name, Chain, and ***Status*** columns are periodically updated.

NB: Internet Routers are supported by *Teamwor*k analyzers only by specifying the analyzer IP address in the command line of NVGate.

94.1.2.3 Ethernet connection rules

On the back panel of the analyzer:

2 Ethernet 1 Gb/S connectors for connection to PC and cascade of analyzers.

- Connect the PC to IN
- In cascade mode connect the PC to first analyzer (master) to IN. Next units are daisy chained (OUT -> IN, OUT- > IN, etc?) in cascaded mode.
- Cable required Category 5 unshielded twisted-pair. Use the blue cables.

2 clock synchronization connectors 100 Mb/s Ethernet

- Do not use while using a sole analyzer
- Daisy chain from Master unit to the next one in cascaded mode (OUT -> IN, OUT- > IN, etc?)

94.1.2.4 Connection to the analyzer

To connect to your analyzer, select the corresponding check box in the ***Model*** column. To start NVGate with the ***Office*** mode (Running on the PC with a dongle or the analyzer as a dongle) select the ***Office*** model.

The ***Office*** model is automatically selected if there is no visible analyzer.

In the presence of visible analyzers, NVGate will select the first connected one in the list according to the following priority:

- Firmware compatibility
- IP compatibility
- Discovery date

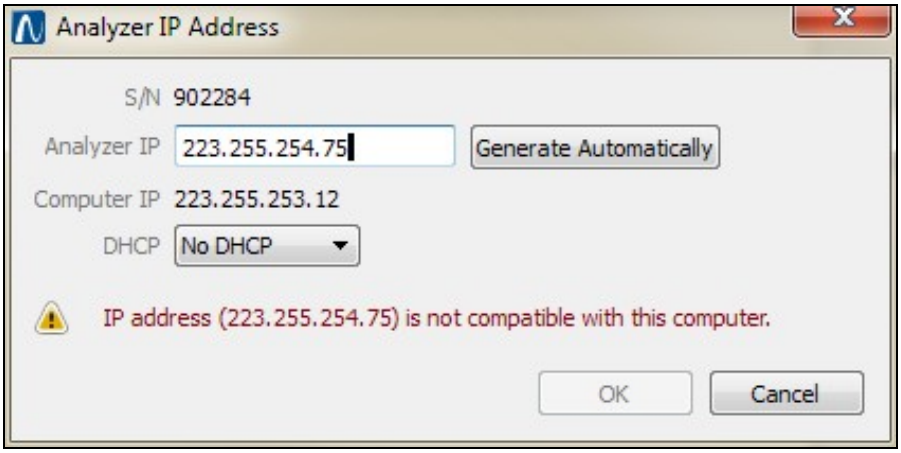
The ***Start*** button will remain disabled until the following criteria are fulfilled:

- At least one model is selected
- If it is one or plural connected one:
- The corresponding models? firmware are up to date.
- The IP address of the selected models are compatible with the PC one

NB: it is not possible to mix ***Office*** and ***Connected*** models

94.1.2.5 Ethernet IP management

Both PC IP and and highlighted analyzer are visible in the detail area. You can change the analyzer IP settings by clicking on the ***analyzer IP*** link.

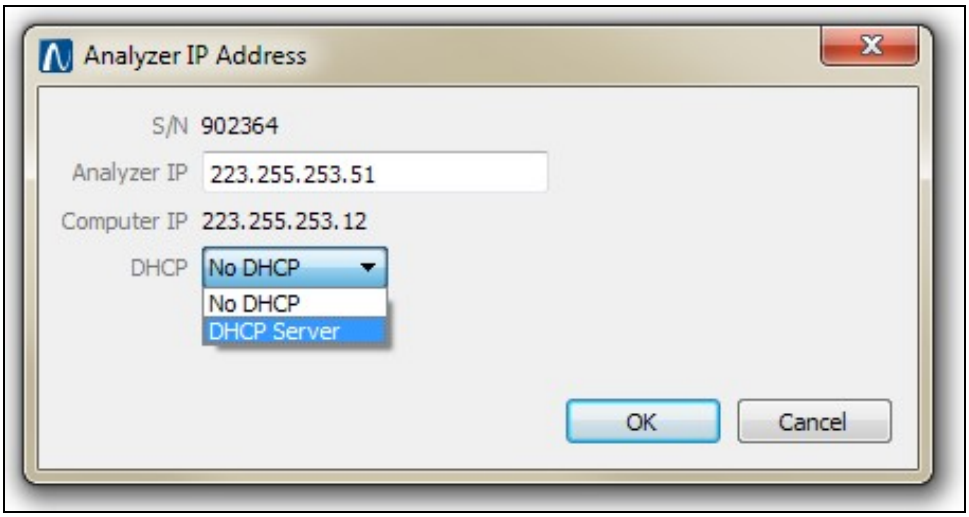


You can update the analyzer IP manually but the most substantial and easy way to solve IP address conflicts is to use the ***Generate Automatically*** button. This method will take in account all IP addresses in the logical network to avoid any conflict; even the ones not visible from this dialog.

94.1.2.6 DHCP server from the analyzer

This feature allows the analyzer to provide the PC?s IP address. This is available from *Teamwork* analyzers only.

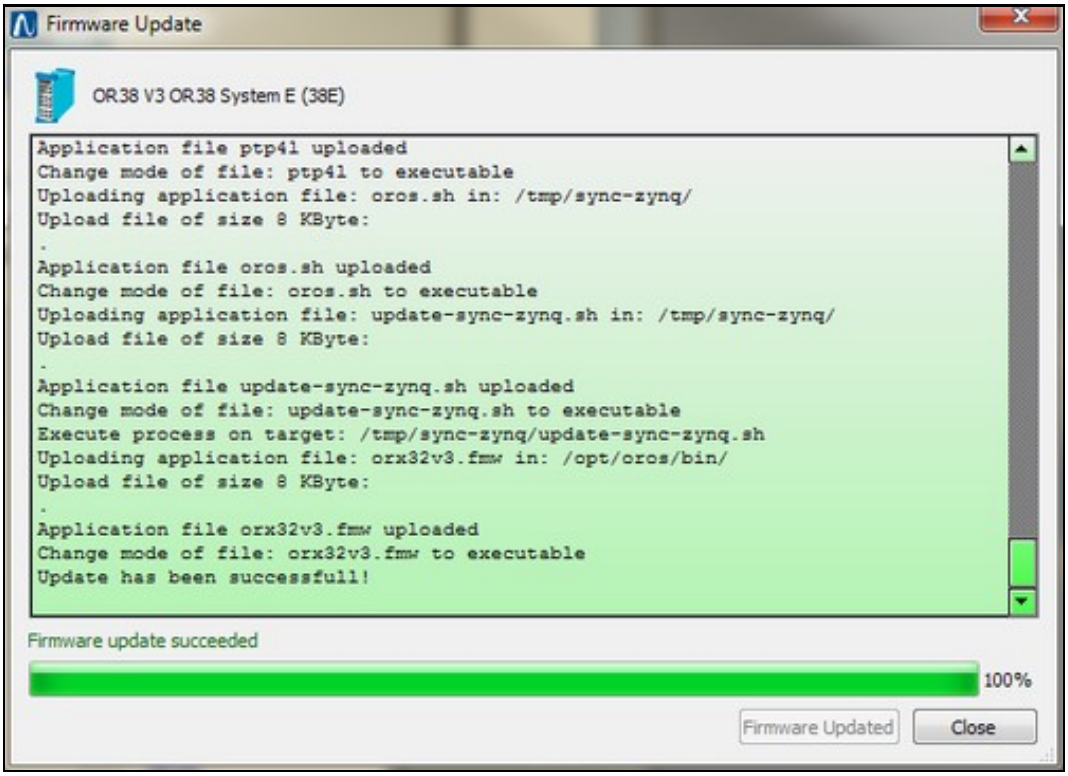
When a *Teamwork* analyzer is set as a DHCP server, it will update your PC IP address when this one is set as ***Get automatically IP address.*** This configuration allows immediate connection of PC configured for company network.



The DHCP server of the analyzer is ***Non-authoritative***, this means that when the analyzer is connected to a local network it will not act when an ***Authoritative*** one exists.

94.1.2.7 Firmware update

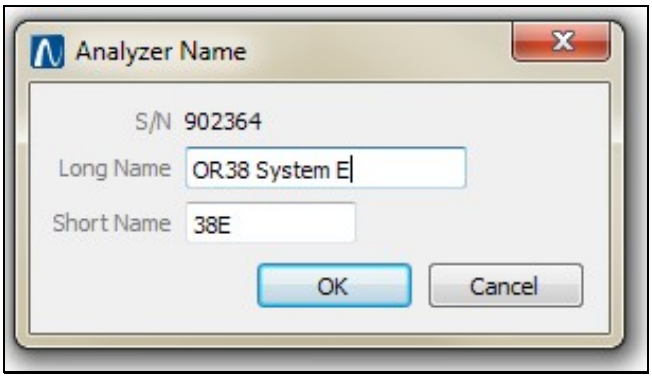
The firmware can be updated on demand. The ***Connection*** dialog detects the not-up-to-date firmware. Simply click in the ***firmware*** link: *Not up-to-date* to enter the firmware update process.



A monitoring window is opened during the update. At the end if the update is successful, the window background goes to green. In case of unsuccessful, it goes to red.

94.1.2.8 Change analyzer name

While using multiple analyzers together, it is useful to set easily the identification of each chassis. Click on the ***Name*** Link to update the highlighted analyzer identifiers.

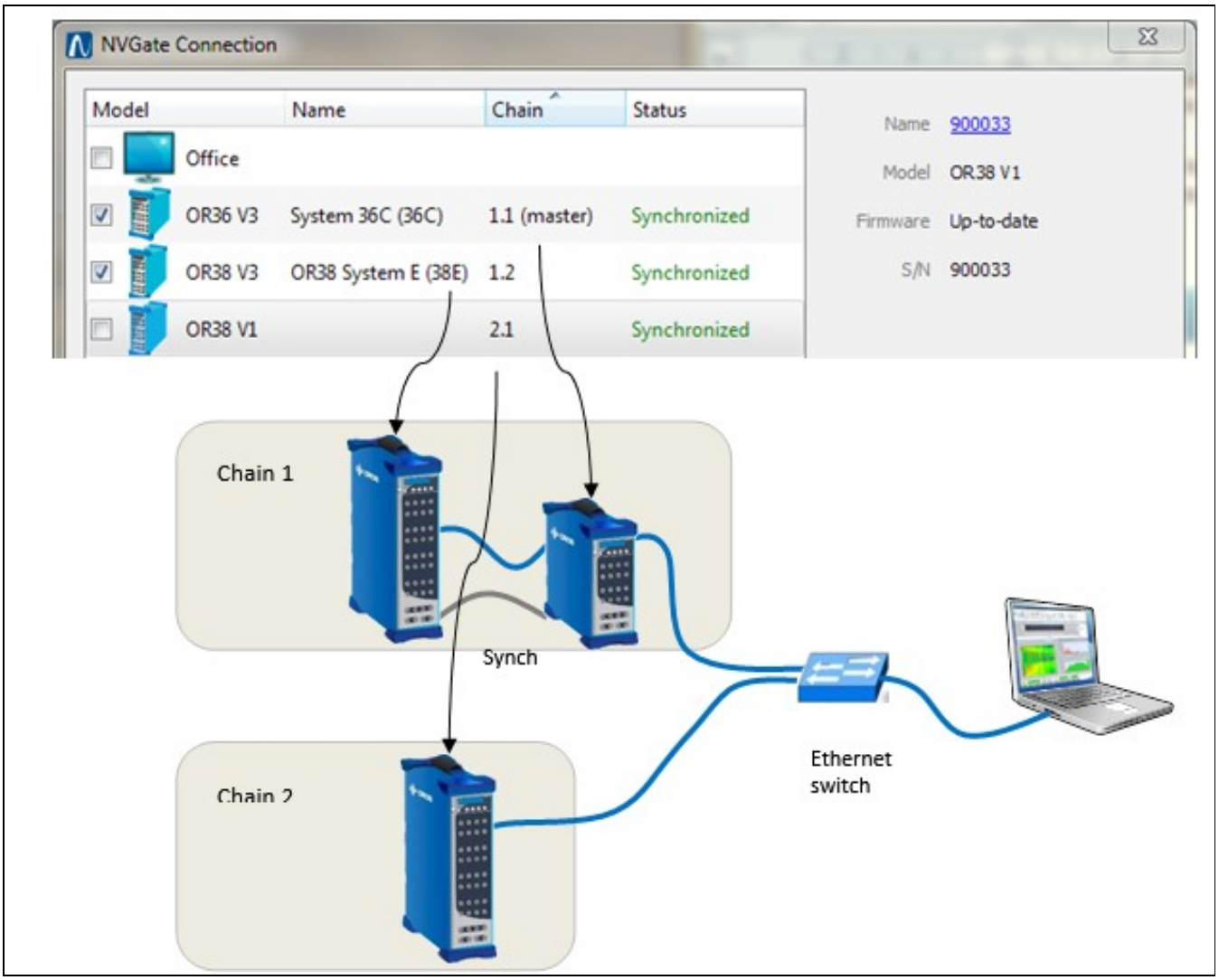


- Long name is used to identify the system in the software installation and properties dialogs
- Short names are used in NVGate settings and trace/result management.

94.1.2.9 Connect to multiple analyzers at a time (Teamwork only)

NVGate allows running multiple *Teamwork instruments* from a unique NVGate instance at a time. This allows cascaded or distributed configuration of OR36/OR38 *Teamwork*.

The same program (NVGate.exe) and connection dialog is used. After launching NVGate you get the visible analyzer list in the connection dialog.


NVGate Connection
Model
Name
Chain
Status
Office
OR36 V3
System 36C (36C)
1.1 (master)
Synchronized
OR38 V3
OR38 System E (38E)
1.2
Synchronized
OR38 V1
2.1
Synchronized
Name 900033
Model OR38 V1
Firmware Up-to-date
S/N 900033
Chain 1
Synch
Chain 2
Ethernet
switch

The ***Chain*** column shows the possible analyzers combination.

- The first digit is for the chain Id.
- The second one is for the analyzer position in the said chain.
- A chain is defined by a group of consecutive daisy-chained analyzers with a clock synchronization line in between.

A unique analyzer is considered as a chain.

The ***Status*** column shows the synchronization status.

- ***Synchronized*** means the analyzers sampling clocks are in phase (< ±0.2° @ 20 kHz).
- It is possible to start NVGate before the synchronization process is finished; NVGate interface will wait for the achievement.
- Single chain analyzers are automatically synchronized.

If the synchronization cannot achieve (ex. cabling change) you can restart the process with the ***ReSync*** button.

TIP: If you cannot see all analyzers on the NVGate connection window, try this: power up each analyzer one by one from the master to the last slave.

For Hardware connections, take a look at part 3.5 here.

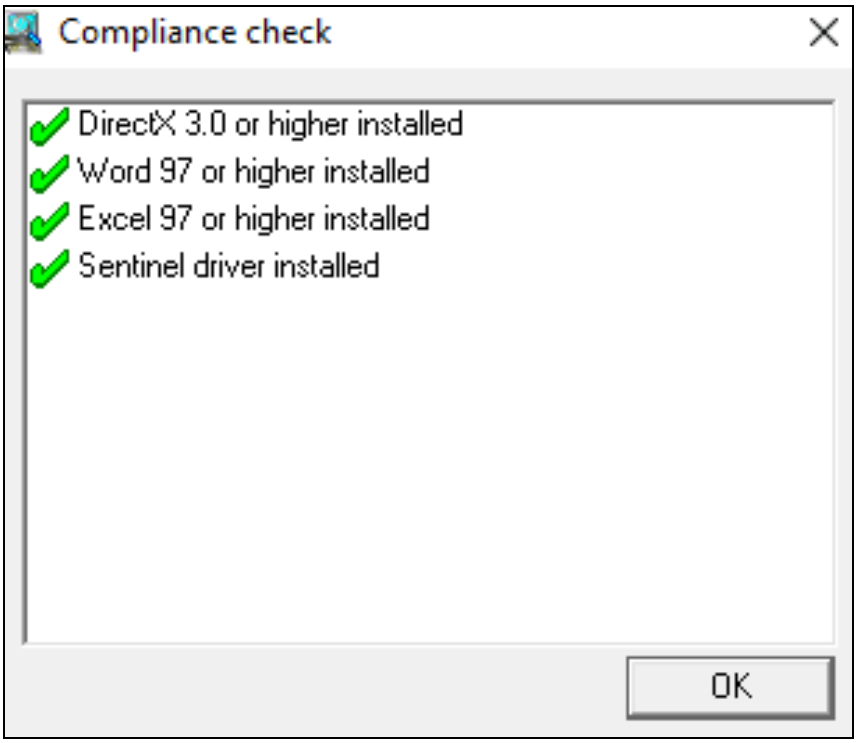
94.2 F.A.Q

94.2.1 NVGate is not able to detect my dongle but my dongle is plugged into the PC, why?

Sentinel Driver allows NVGate to communicate with the dongle. It must be installed if you are using a dongle or another USB device. If NVGate does not detect the dongle, it might be caused by incorrectly install sentinel drive.

First verify that the Sentinel driver is properly installed. To check open the NVGate software folder and launch "CheckConfig.exe":

- green check mark indicates that sentinel driver has been successfully installed
- red cross mark indicates that sentinel drive has not been installed



To install the Sentinel driver, go in NVGate installation folder, select ?SentinelDriver_7.6.9? folder and then select ?Sentinel Protection Installer 7.6.9.exe?. Proceed with the installation.

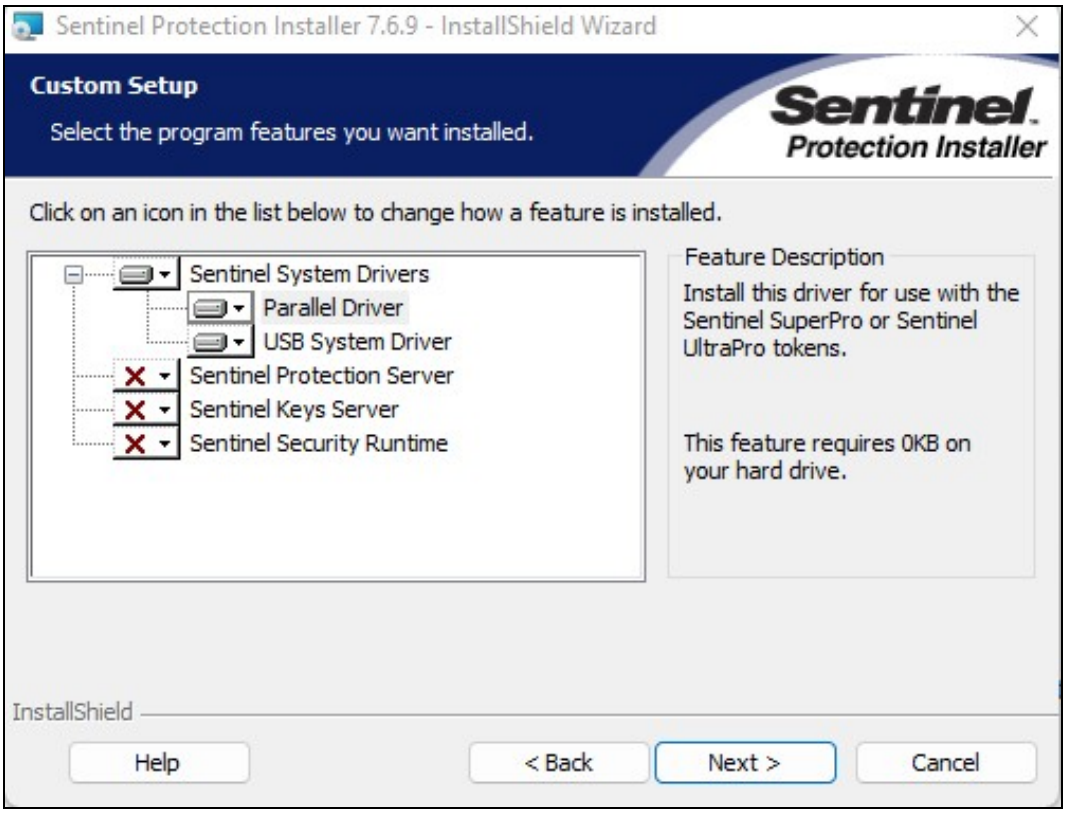
When this window is displayed, choose Next:



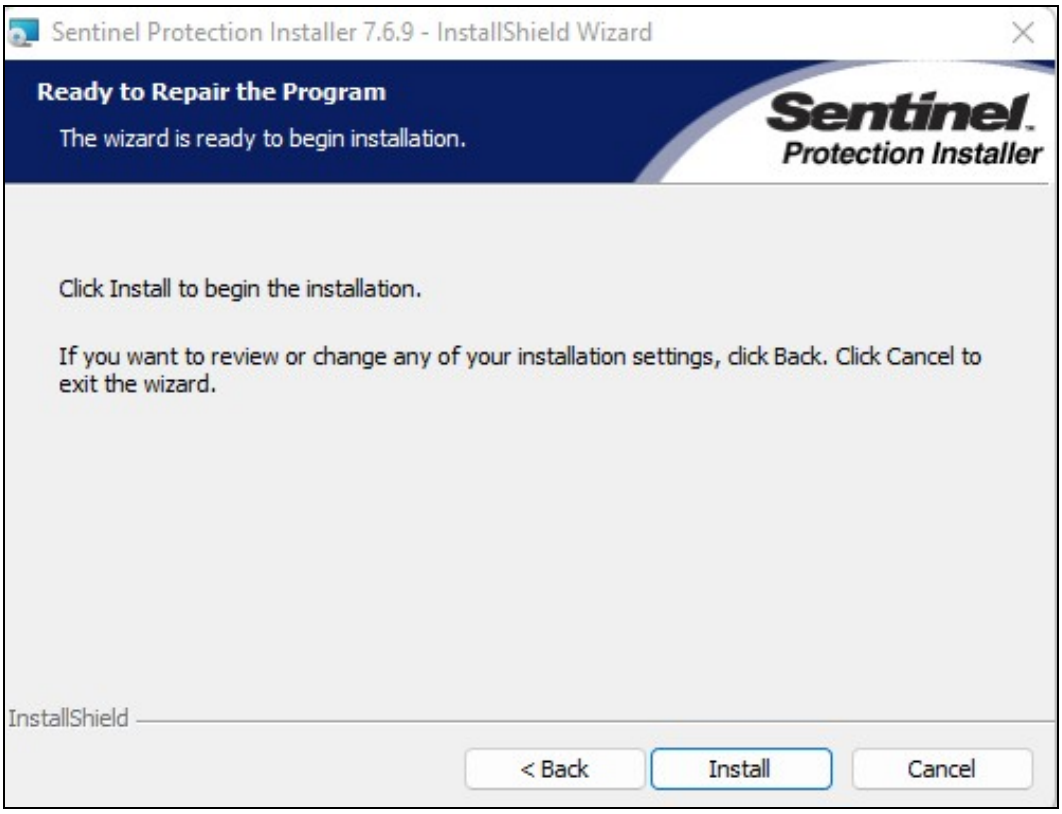
Perform a 'Modify' installation to customise your option. Select 'Remove' if the installation is incorrect (see below for further details). Now click Next.



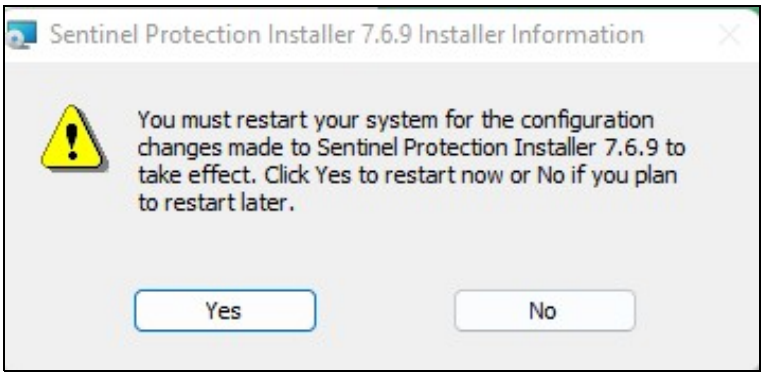
In the custom setup, choose to delete the last three options.



Perform installation by clicking on Next.



This last message should appear at the end :



In case it still has not been correctly installed :

- uninstall sentinel driver with add/remove program
- reboot the PC
- install sentinel driver 7.6.9
- reboot the PC

95 NVGate Integrate - Differentiate - Unit

95.1 Integrate/Differentiate

These commands are available only for results with an X-Axis that represents frequency lines. The operations are performed in the spectral domain.

- **Normal:** No operation is performed on the data
- **dt:** The result is integrated, so that acceleration becomes velocity. The following formula used is:

$$\text{val_dt} = \frac{val}{j\omega}$$

- **dt²:** The result is integrated twice, so that acceleration becomes displacement. The following formula used is:

$$\text{val_dt2} = \frac{val}{(j\omega)^2}$$

- **dx/dt:** The result is derived, so that velocity becomes acceleration. The following formula used is:

$$\text{val_dx/dt} = \text{val} \times (j\omega)$$

- **dx/dt²:** The result is derived twice, so that displacement becomes acceleration. The following formula used is:

$$\text{val_dx/dt2} = \text{val} \times (j\omega)^2$$

95.1.1 Unit

These commands are available only for results with an X-Axis that represents frequencies. The operations are performed in the spectral domain.

- **RMS:** Provides the RMS (EU) value. This is the default unit.
- **Peak:** It is based on a sine signal, and therefore equal to 1.414 times the RMS value.
- **Peak-Peak:** It is based on a sine signal, and therefore equal to 2.828 times RMS value.
- **EU²:** Means Square value.
- **PSD (EU²/Hz):** Calculates the Power Spectral Density of the result. The formula used is:

$$\text{val_PSD} = \frac{val^2}{ENBW \times Frequency_resolution}$$

Where ENBW is the Equivalent Noise Band Width that takes into account the weighting windows (1 for Rectangular, 1.5 for Hanning, 1.36 for Hamming, 3.77 for Flat top) and *val* the RMS value.

- **ESD (EU²/Hz²):** Calculates the Energy Spectral Density of the result. The formula used is:

$$\text{val_ESD} = \frac{val^2}{ENBW \times Frequency_resolution^2}$$

Where ENBW is the Equivalent Noise Band Width that takes into account the weighting windows (1 for Rectangular, 1.5 for Hanning, 1.36 for Hamming, 3.77 for Flat top) and *val* the RMS value.

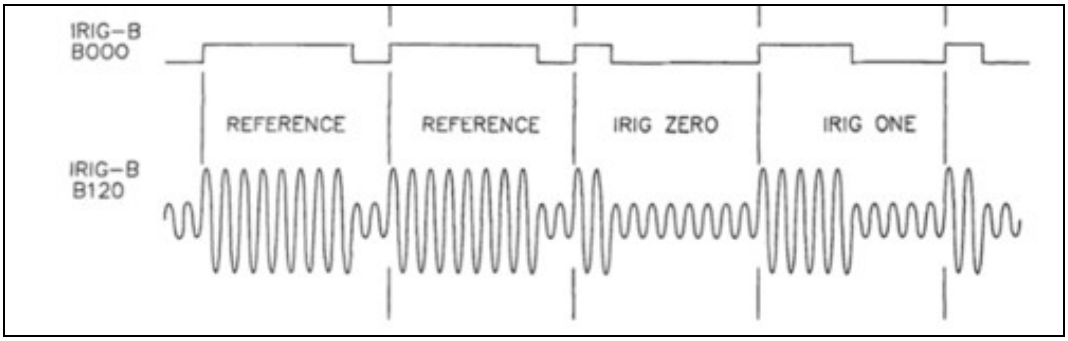
- **RMS PSD (EU/Hz$^{1/2}$):** Calculates the RMS Power Spectral Density of the result. The formula used is:

$$\text{val_RMSPSD} = \frac{val}{(ENBW \times Frequency_resolution)^{1/2}}$$

Where ENBW is the Equivalent Noise Band Width that takes into account the weighting windows (1 for Rectangular, 1.5 for Hanning, 1.36 for Hamming, 3.77 for Flat top) and *val* the RMS value.

96 NVGate IRIG Marker

In NVGate, a feature decoding time stamps from IRIG-B signal is available with the IRIGMark application. It is an external software which drives the label of a free marker with the current date computed from an IRIG channel. This tool is available free of charge to all customers.



96.1 Package composition

- NVGate add-on tools ?Mark IRIG?

- NVGate project with IRIG signal to test the ?add-on?

- Application note.

96.2 Configuration

Download: IRIG Marker package (version from 19/03/2026) compatibility : NVGate V17 or upper

Install the setup.exe on the folder C:\OROS\NVGate data\Links.

Then it can quickly and easily execute from the tab: ?tools? of NVGate (see picture below).

If you want to test the application and you do not have IRIG signal:

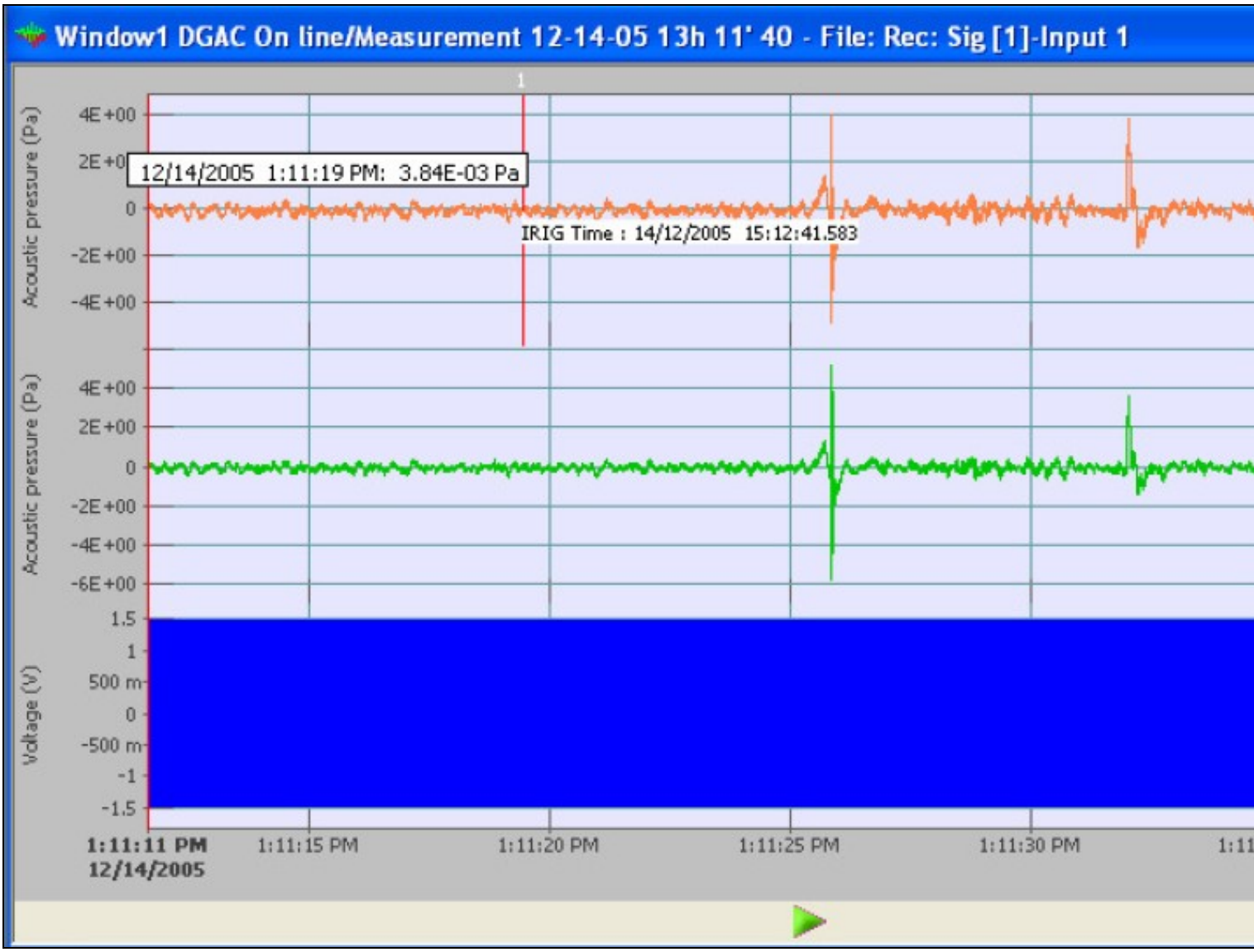
- Put the NVGate project on the NVGate database (by default : C:\OROS\NVGate data\Projects)

- Launch NVGate and load the signal in the player

- Execute MarkIRIG.exe

96.3 Principle

To apply markers with IRIG time, the only requirement is to display the time signal and make the window active. Then, as long as the trace displayed is part of a signal which contains an IRIG signal track (displayed or not), the marker is added onto the active trace by a simple click on the toolbar .exe button. As a matter of fact, the time displayed on the IRIG marker, as well as in the marker table, is actually the IRIG time decoded from the IRIG signal and not the time of the computer during the measurement.


Window1 DGAC On line/Measurement 12-14-05 13h 11' 40 - File: Rec: Sig [1]-Input 1
Acoustic pressure (Pa)
4E+00
2E+00
0
-2E+00
-4E+00
12/14/2005 1:11:19 PM: 3.84E-03 Pa
IRIG Time : 14/12/2005 15:12:41.583
Acoustic pressure (Pa)
4E+00
2E+00
0
-2E+00
-4E+00
-6E+00
Voltage (V)
1.5
1
500 m
0
-500 m
-1
-1.5
1:11:11 PM
12/14/2005
1:11:15 PM
1:11:20 PM
1:11:25 PM
1:11:30 PM

This kind of IRIG marker can of course be applied to any time signal on any window at the same time. One can basically have as many IRIG markers as traces displayed, no matter how many windows are used.

96.4 Tips

- To move the marker IRIG, you need to activate the NVGate ?marker mode? (Tab : Display/Graph: Marker mode)

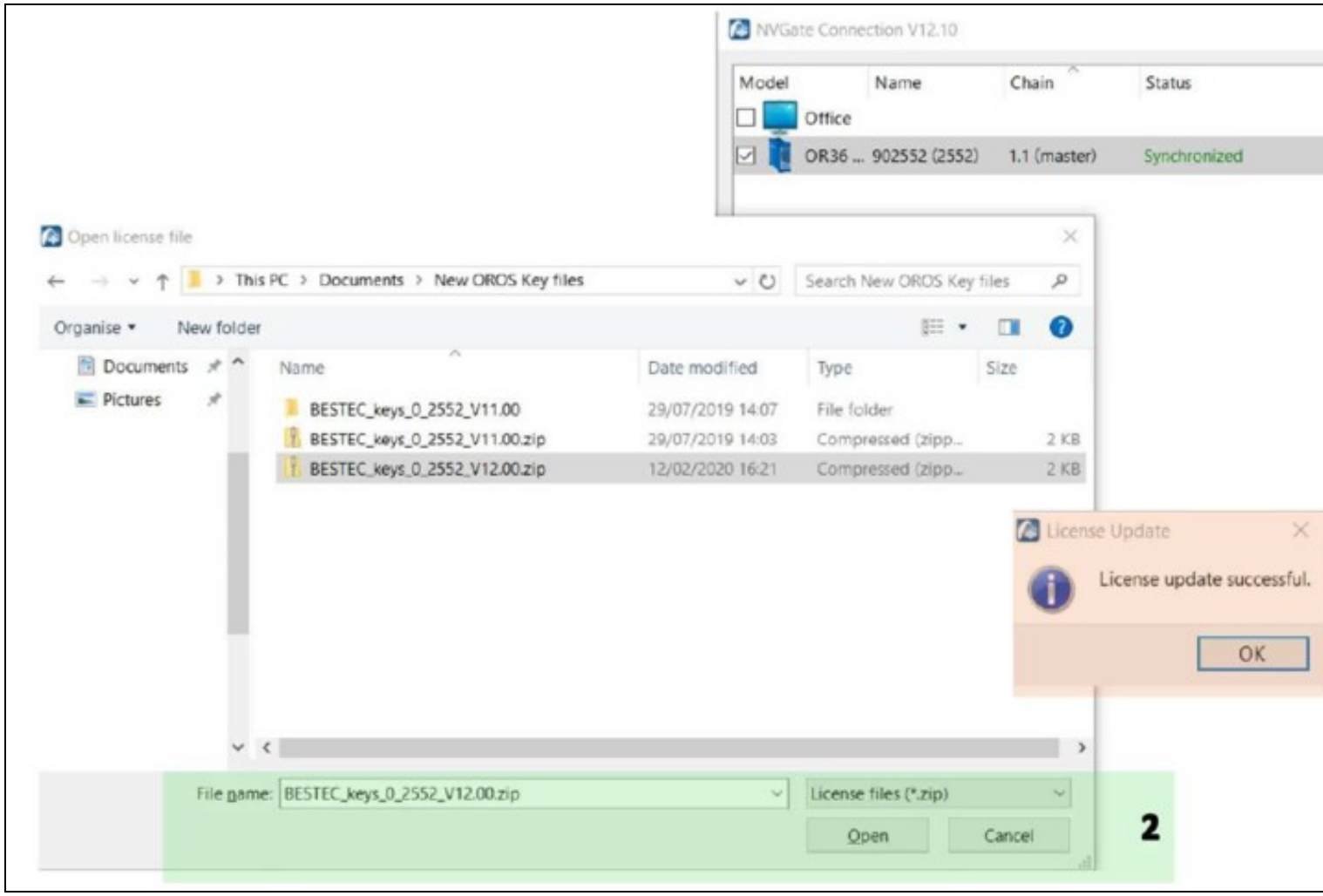
- Because it is a marker, this value can be shown to NVGate info trace, then it can be put easily in a Word or Excel report...

- Because you know one value of IRIG time, you can begin the post analyses on this value then if you export it in excel or Matlab or UFF you can synchronize all the other data with this value.

97 NVGate Licence Keys Troubleshooting

97.1 Standard process

- 1) Select the item (analyzer or dongle) for which you want to update the license keys.
- 2) Select the **.ZIP** archive containing your new license key files.
- 3) The license key files will be automatically copied in the NVGate installation folder and the keys of your analyzer and USB dongle will be encrypted.



if any issue

97.2 Troubleshooting: Encrypt using NVGate environment

If any issue during the encrypt keys, follow this process :

1) Extract the .zip keys file

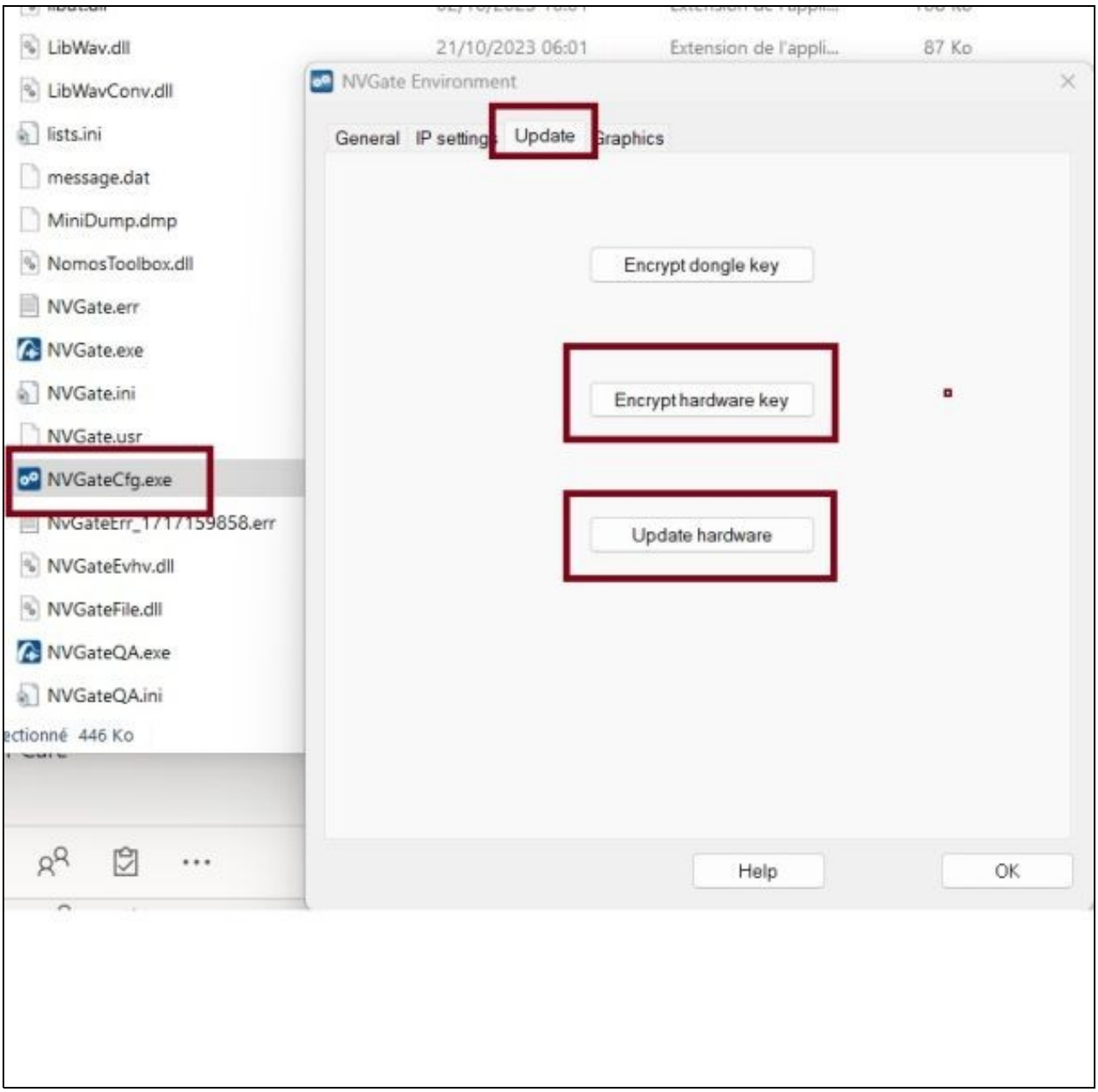
2) Rename the .txt by a .bat

3) Copy the keys (.bat and .cfg) on the install directory of NVGate (next to NVGate.exe)

4) Plug dongle and analyzer

5) go on NVgatecfg.exe (NVGate environment next to NVGate.exe)

5) Tab Update, click on encrypt hardware keys and encrypt dongle keys.



The dongle/hardware is updated.

97.3 Issue remain Troubelshooting

97.3.1 USB Dongle

Driver for USB dongle is sentinel driver. Check than dongle driver is correctly installed : C:\OROS\Programs\NVGate\checkconfig.exe

Does sentinel driver is installed ?

- If yes, we can think USB dongle is defected, please contact your local distributor.
- If no :

On install folder of NVGate check the folder : SentinelDriver_7.6.9 or download it here .

Do a custom install and install exactly like the picture below. (parallel driver need to be install)



When install is finish please reboot the PC.

Now, check if sentinel driver is installed. If yes, try to encrypt the keys.

97.3.2 Hardware dongle

If still issue when you encrypt hardware keys, verify you have access and you can read the hardware ID.

Launch: dongleupdate.exe (next to NVGate.exe)

Target : Hard

Get key.



Then verify than the dongle ID is the same than the serial number on the licence file.

If there is no results, put a fixed IP adress on the hardware by default 223.255.253.50 and put a fixed IPV4 adress on the PC (exemple of compataible adress: 223.255.253.49).

Then do a get key again

97.4 Contact us

If any issue please contact you local distributor (or customer.care@oros.com) with a print screen.

98 NVGate Macro

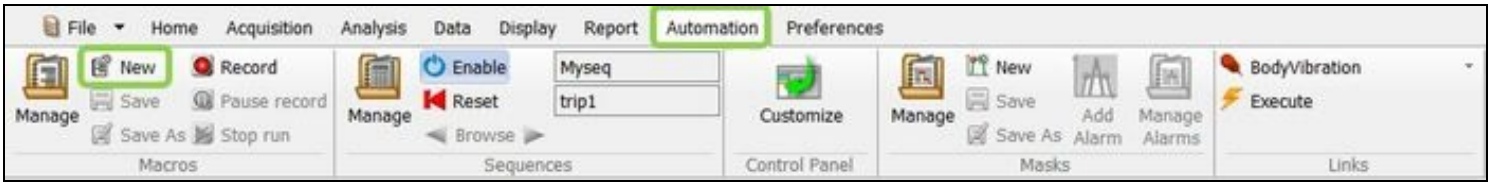
98.1 Tutorial

A macro is a powerful automation tool of NVGate allowing to create your own programs from a simple graphic interface, and doesn't require any software development skills.

In this section, we will create a macro that will automatically restart the recording as soon as the measurement is stopped. To do so, add the channels into the recorder.

98.1.1 Creating a new Macro

Go in the "Automation" tab of the NVGate ribbon, and select "New" in the Macro group:

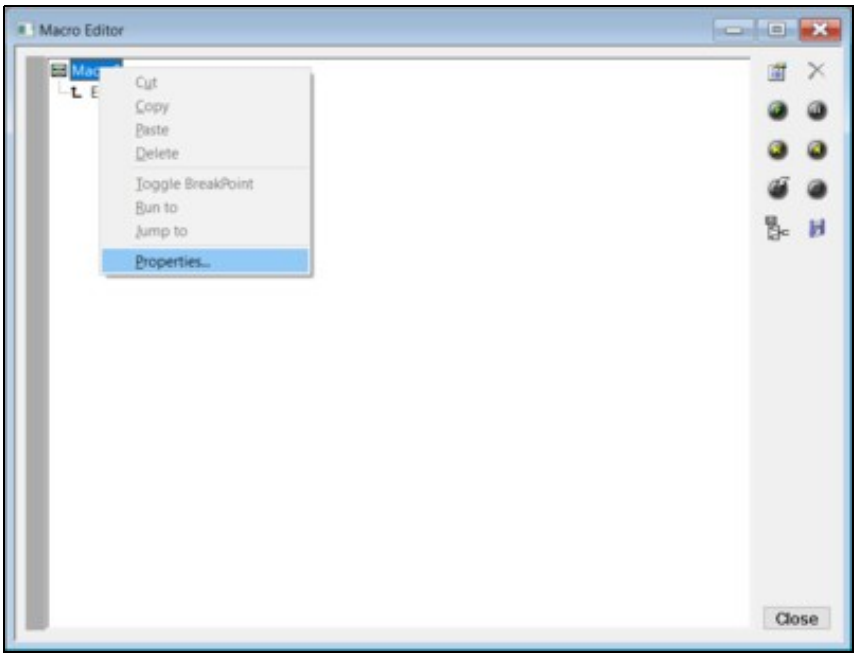


98.1.1.1 Add a parameter

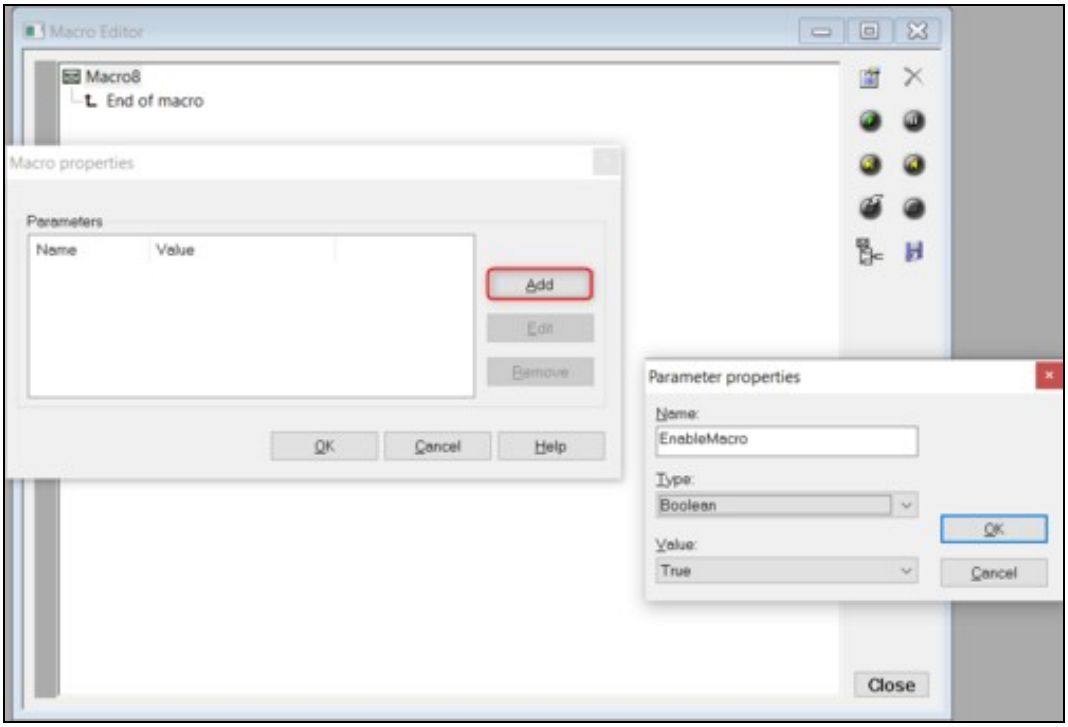
This will open the Macro editor :

Our macro needs to restart the recording as soon as it had been stopped. The macro needs to loop as long as necessary, and the user must be able to stop the loop when needed. To do so, we will create a boolean parameter to control the loop. The loop will then iterate as long as this parameter is "True", and the user can change it to "False" to stop the loop and the Macro.

To create this parameter, right click on the name of the macro and select "Properties":

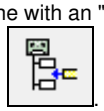


Then click on "Add", and define the Boolean parameter "EnableMacro" as follows:



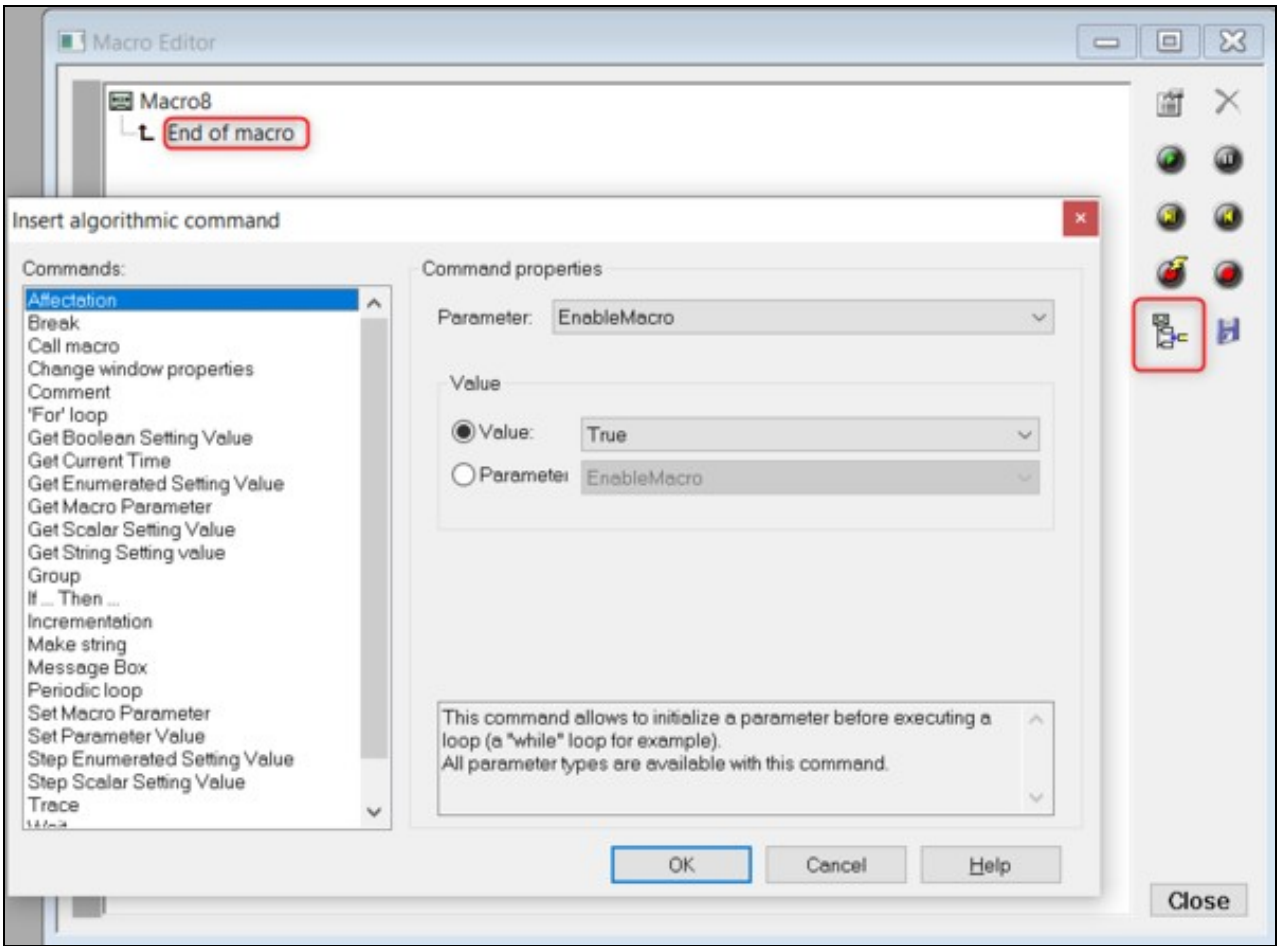
98.1.1.2 Affectation

In order to control the Macro, we will must be able to change the value of "EnableMacro" from "True" to "False".

This can be done with an "affectation" on the Macro editor. An affectation being an Algorithmic command, it must be add from the "add an Algorithmic command" icon  .

To create an affectation, select "End of Macro" and click on the  icon. You need to select "End of Macro" because the affectation will come just before this line.

Select "Affectation" in the list and set it up as follows :

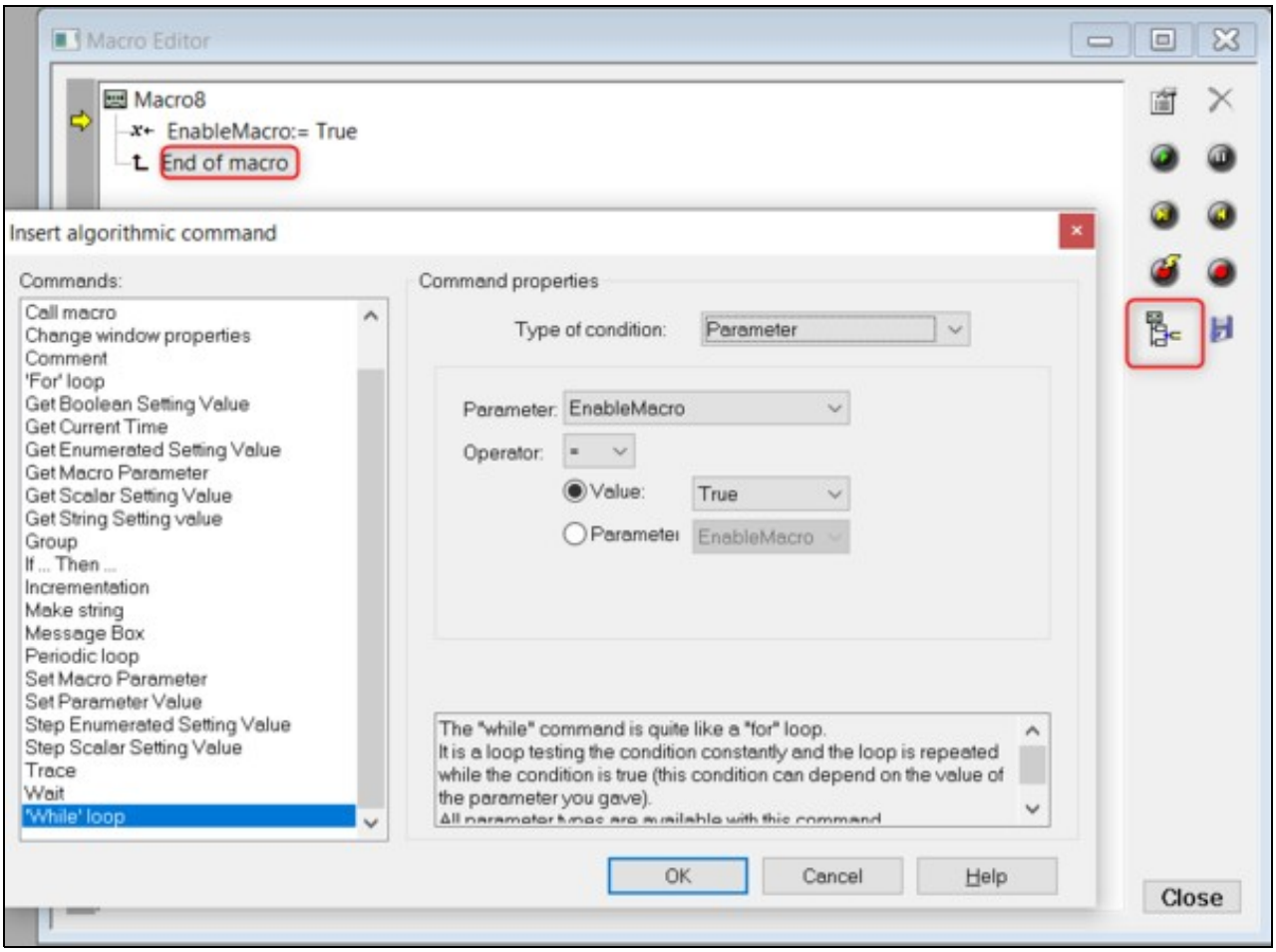


You can now change the value of "EnableMacro" by double-clicking on the Affectation command.

98.1.1.3 While Loop

In order to loop as long as needed, we will use a "while" loop that iterates as long as "EnableMacro" is set on "True".

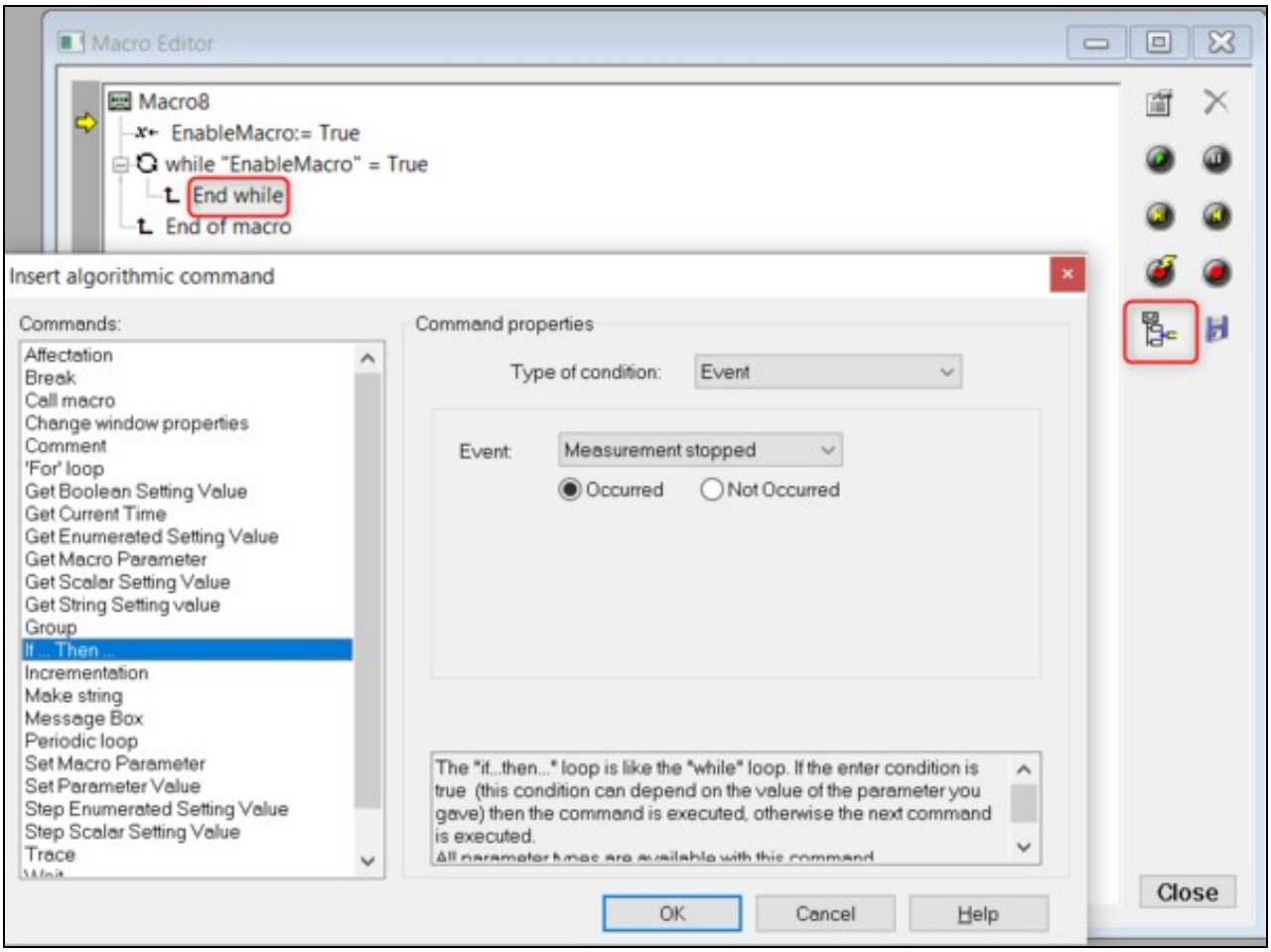
The while loop is an Algorithmic command, and will be added the same way as the Affectation command. Click on "End of Macro", click on the  icon and select "while loop". Then set the loop as follows :



98.1.1.4 If instruction

Inside the while loop, we need to test if the measurement has been stopped. An IF instruction can be used to perform such logical test. The IF instruction allow you to chose between two different actions to take regarding the current state of an event, or the value of parameter. Here, we will test if the event "Measurement is stopped" occurred.

To add the IF instruction inside the loop, select the "End while", open the Algorithmic list and select "If... Then...". Setup the If test as follows :



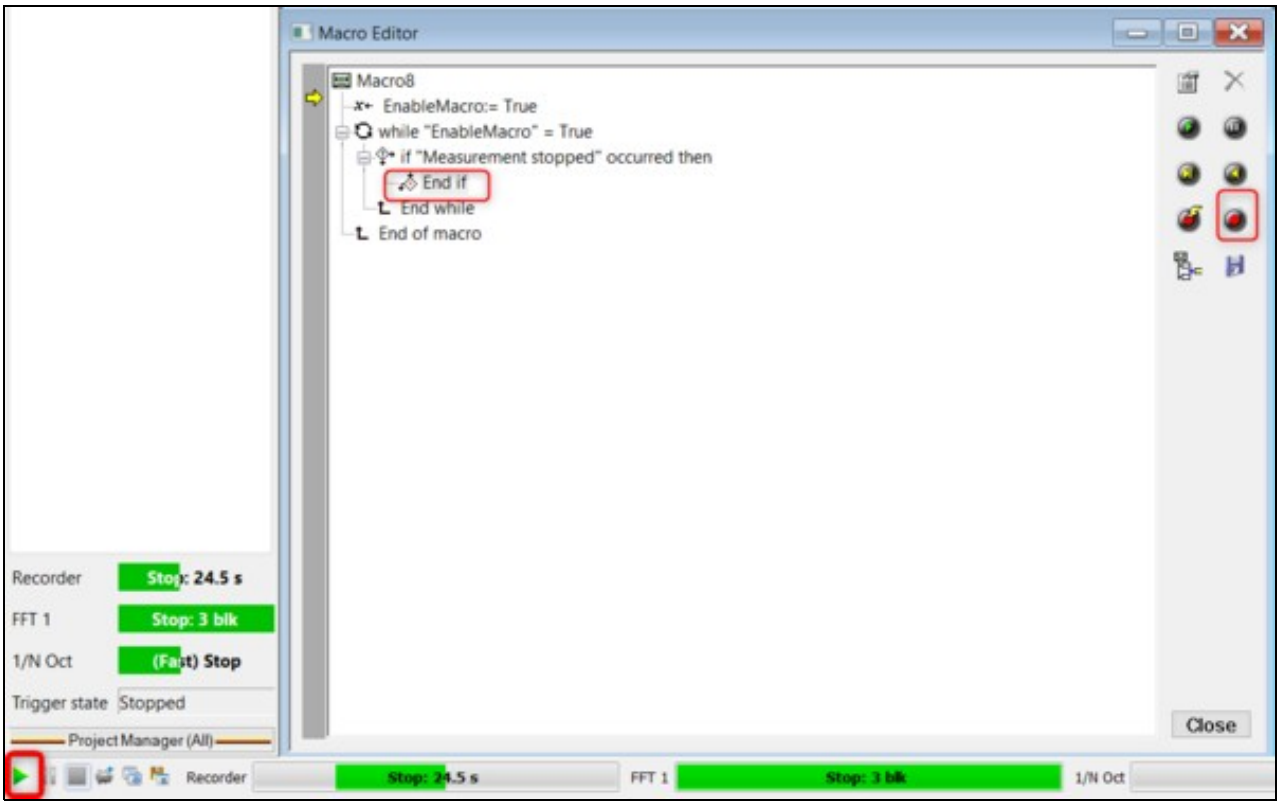
98.1.1.5 Add the Run Command

Now that the If test is setup, we only need to add the "Run" instruction inside the If test to have the macro re-starting the measurement as soon as it has been stopped. However, the "Run" command is not an Algorithmic, but an NVGate command.

To add an NVGate command into the Macro, we will need to use "record off line"  or "record on line"  options. These icons will allow you to add one or serveral NVGate command in the macro by simply clicking on them. Once you added all the NVGate commands you want, you need to re-click on the "record on line" or "record off line" icon to stop the recording and validate the sequence.

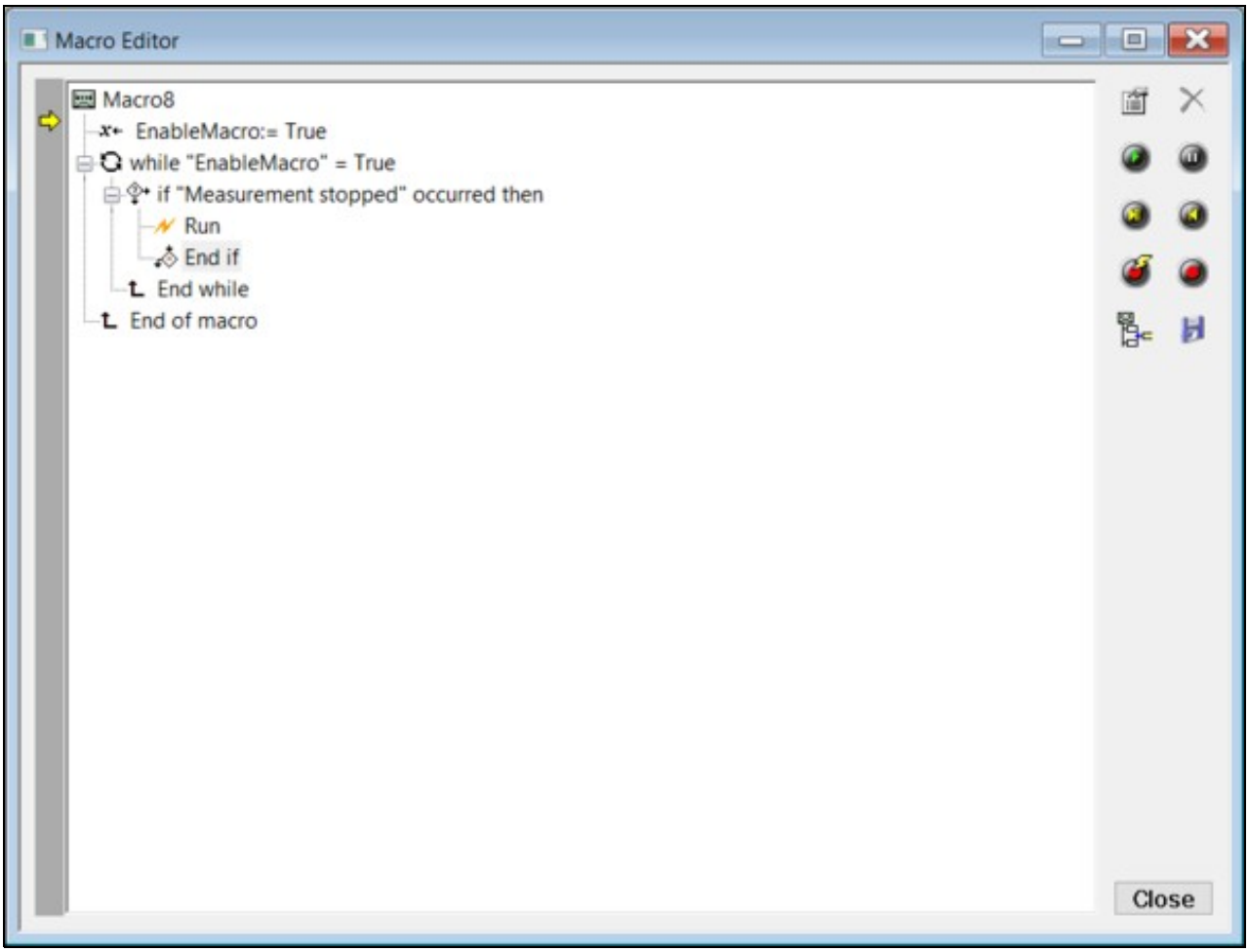
The "record on line"  command will add the NVGate command in the macro and execute it at the same time. By example, clicking on  and  will add the "Run" command in the macro and start the acquisition in NVGate. Clicking on  and then  will add the "Run" command in the macro, but will not start the acquisition in NVGate.

To add the NVgate "Run" command into our macro, we don't need to actually start the acquisition in NVGate. To add it, select the "End if" line in the macro (because we want to add the "Run" command before this line), click on  . Then click on  and re-click on  to stop the recording of the command :



98.1.1.6 The complete Macro

The macro is now complete :



You may save it with the floppy-disk icon  .

To try it, you can Run the acquisition by clicking on "Run"  in NVGate and then start the macro by clicking on the play icon  of the macro editor. If you stop the recording, a new one will be automatically restarted by the macro. For on optimised use, set the NVgate save option on "Without name confirmation".

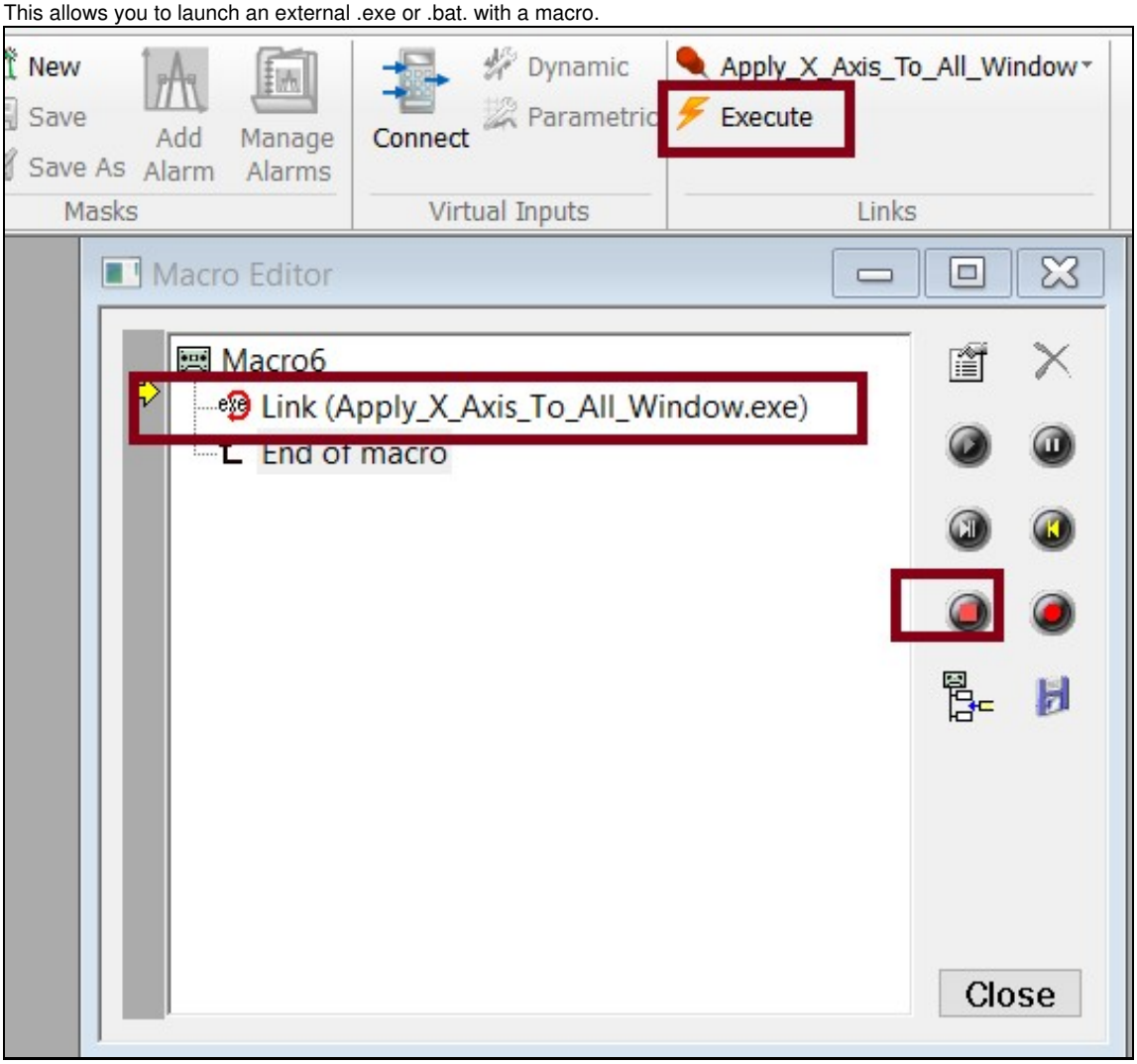
You can stop the macro anytime by using the "pause" option of the macro editor  and set the "EnableMacro" parameter on "False".

98.1.1.7 Launch the Macro

Use the control panel to launch the macro in NVGate.

98.1.1.8 Execute a .exe in a macro

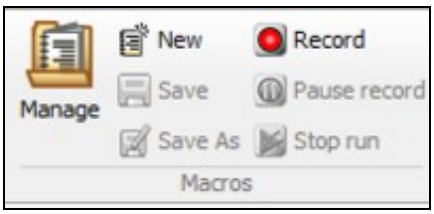
This allows you to launch an external .exe or .bat. with a macro.



Process:
- Put your .exe in C:\OROS\NVGate data\Links
- click on "record on line buton". 
- Select the .exe using the NVGate Link
- stop the "record on line".

98.1.2 Macros group

The macros group is used to create/manage macros that perform automatically recurrent operations.




Manage: Open the macros manager.


New: Create a new macro and load it in the macro editor. This menu is disabled if another macro is being edited.


Save: Save the macro currently edited. Only available if a macro is being edited.


Save as: Save the macro currently edited with a new name. Only available if a macro is being edited.


Record: Start recording the user action on the software. Each recorded action is appended to the Macro and will be a visible line in the macro editor.

Prior to start the macro recording user must enter the macro name and the recording mode:

- Macro name: Name of the macro.
- Recording mode:

Mode	Description
On-line	Commands corresponding to user actions are recorded in the macro.
Off-line	User actions have no effect. Commands corresponding to user actions are recorded in the macro.

Note: Click on the record button to stop recording the macro. The macro is saved with the name specified in the "Record" dialog.

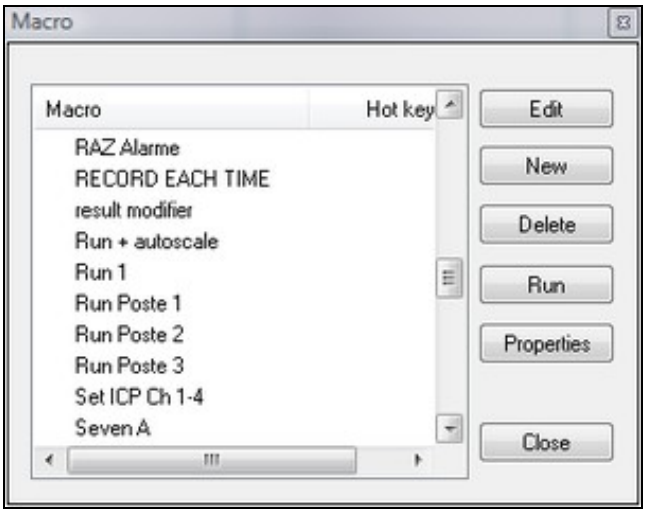

Pause record: Pause the ongoing macro record. User actions are not yet recorded. Available if macro is being recorded.

Useful to prepare the system for an action to be recorded without filling the editor with unwanted lines.


Stop run: Stop the execution of the running macro. Available if macro is running.

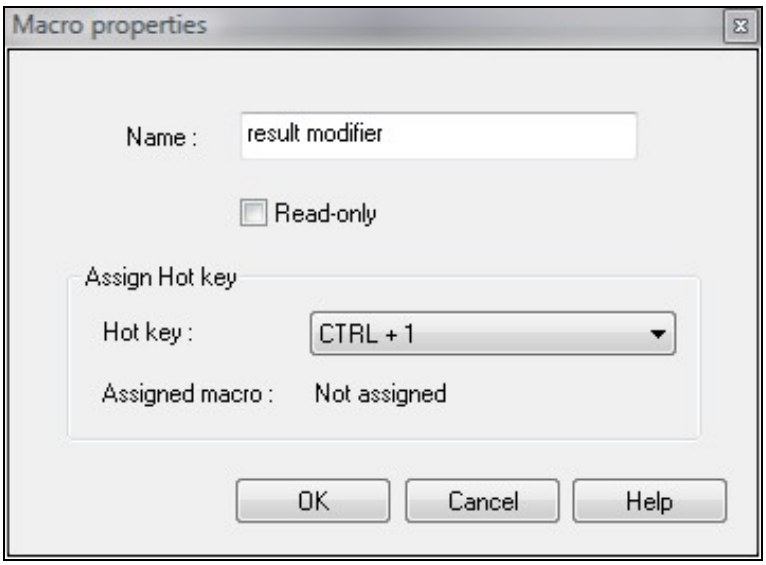
98.1.2.1 Macros Manager

Display the macros list and the associated hot-keys. A hot-key is a shortcut to run the macro.



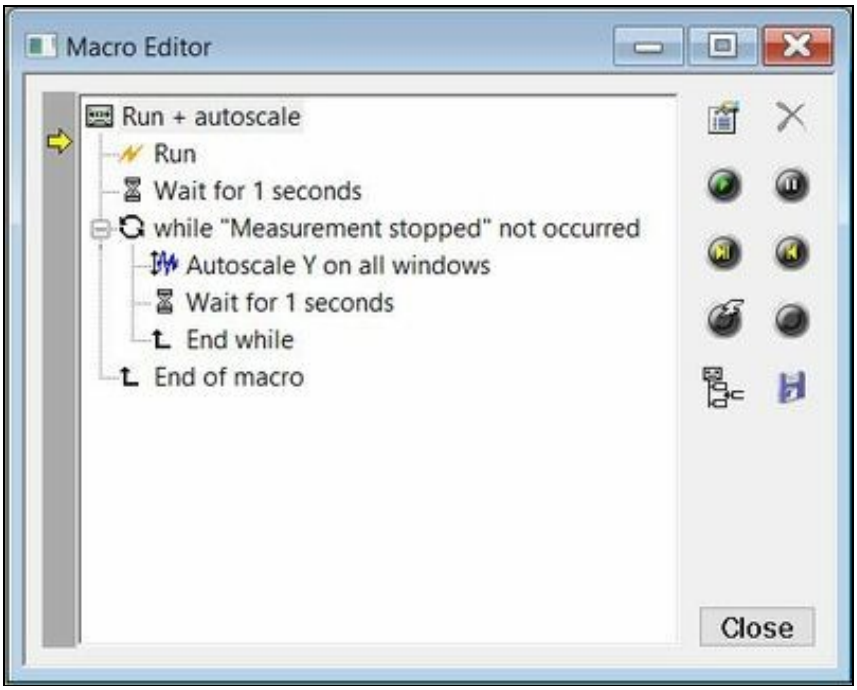
Note: the three first hot keys are automatically assigned in the "Macro" menu from the OR38/OR36 Front Panel, labeled as "0", "1" and "2".

- **Edit:** Edit the macro selected. Available if no macro is being edited, recorded, or executed.
- **New:** Create a new macro. The new macro is opened in the editor. Available if no macro is being edited, recorded, or executed.
- **Delete:** Delete the macro selected.
- **Run:** Run the macro selected. Available if no macro is being executed.
- **Properties:** Edit macro properties (name, read-only flag, and assigned hot-key). Available if no macro is being edited, recorded, or executed.



- **Name:** Change the name of the macro.
- **Read-only:** If the macro is read-only, the macro can be loaded to the macro editor but can?t be modified.
- **Hot key:** Define a hot-key to run the macro.
- **Assigned macro:** Macro associated with the hot-key selected in "Hot-key" combo-box. If hot-key selected is already assigned, a message is generated when the window is closed, requesting confirmation of the new assignment.

98.1.3 Macro Editor



Properties: Open a dialog box intended to edit macro properties.

Delete : Delete the selected command in the macro tree. If the macro selected contains a set of commands (for example a loop command), a dialog box appears in order to confirm command removal. If removal is confirmed, the command and all commands it contains are deleted.

This command is enabled if the macro is not running and it is not read-only.

Run: Run the macro from the current command (indicated by execution pointer) to the next breakpoint. If no breakpoint follows, the execution goes to the end of the macro. Enabled if the macro is not running.

Pause: Stop macro execution. The command running is completed, and then execution stops.

This command is enabled when the macro is running only.

Step next: Run current command (indicated by execution pointer). This command is enabled when the macro is not running.

Reset: If the macro is running, stop the execution, and then set the execution pointer to the first command of the macro.

Record on-line: Record commands in the macro. The record on-line mode applies the user actions. The commands corresponding to actions are recorded and inserted in the macro before the selected command. This command is enabled if the macro is not running and it is not read-only.

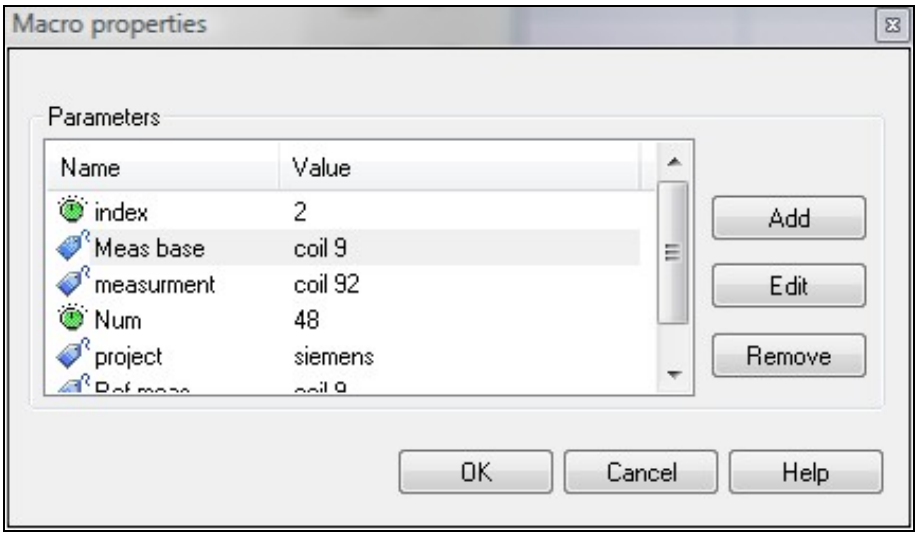
Record off-line: Record commands in the macro. The record off line mode applies the user actions only when the macro will start. The commands corresponding to actions are recorded and inserted in the macro before the selected command. This command is enabled if the macro is not running and it is not read-only.

Insert an algorithmic command: Insert an algorithmic command before the selected command. This command is enabled if the macro is not running and it is not read-only.

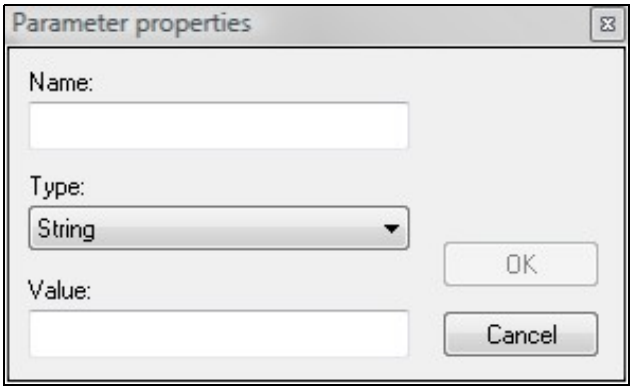
Save: Save the macro.

98.1.3.1 Macro properties

Macro properties consist of a set of parameters of different types, which can be used to define macro command properties. This command is enabled if the macro item is selected in the macro tree.



- **Add:** Defines a new parameter.



- **Name**: name of the parameter
- **Type**: type of the parameter. The different types available are

Type	Description
Boolean	Parameter that can take only 2 values: True or False. This type of parameter is necessary for the MessageBox command to store the answer of the user. The parameter can then be tested in a "If...Then" command.
File name	Not used
Float	Parameter that can contain a decimal value (1.2, 1.12e6, -0.025, 5,-12387...). It is useful to store constant value that will be used in the macro for test condition (If...then, While) or for other command (Wait, SetParamerValue).
Integer	Parameter that contains an integer value (5, -1024, 6401). Behavior similar to the float parameter, it can be also used in loop commands (For loop, periodic loop)
String	Parameter that contains a string of character. This type of parameter is useful to store constant string and to create string used by NVGate (Measurement name, Report template) or by commands (MessageBox, Trace). Several commands are dedicated to this string parameters (MakeString, GetCurrentTime...)

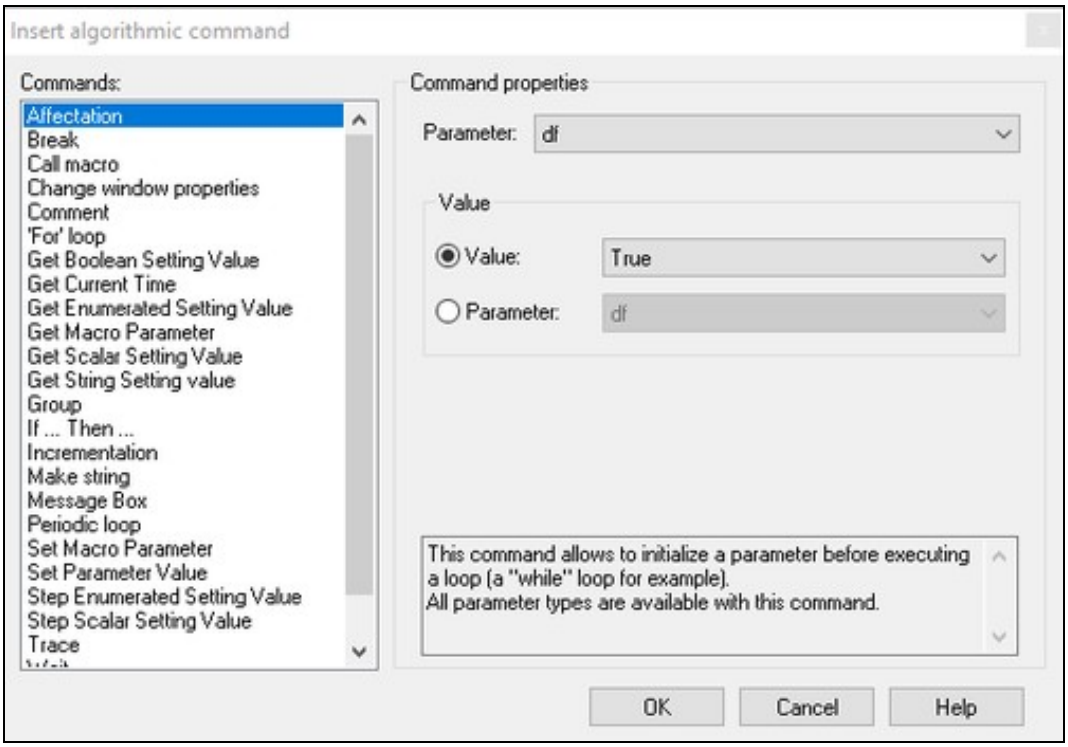
- **Value**: default value of parameter
- **Edit:** Open the "Parameter properties" dialog box, which is used to edit the parameter selected in parameters list. It is possible to change the

name, the type, or the default value of the parameter. If the parameter is used by one or more macro commands, the type can?t be edited (the "Type" combo-box is disabled).

- **Remove:** Removes the selected parameter. If the parameter is used by one or more macro commands, the parameter is not removed and an error message is generated.

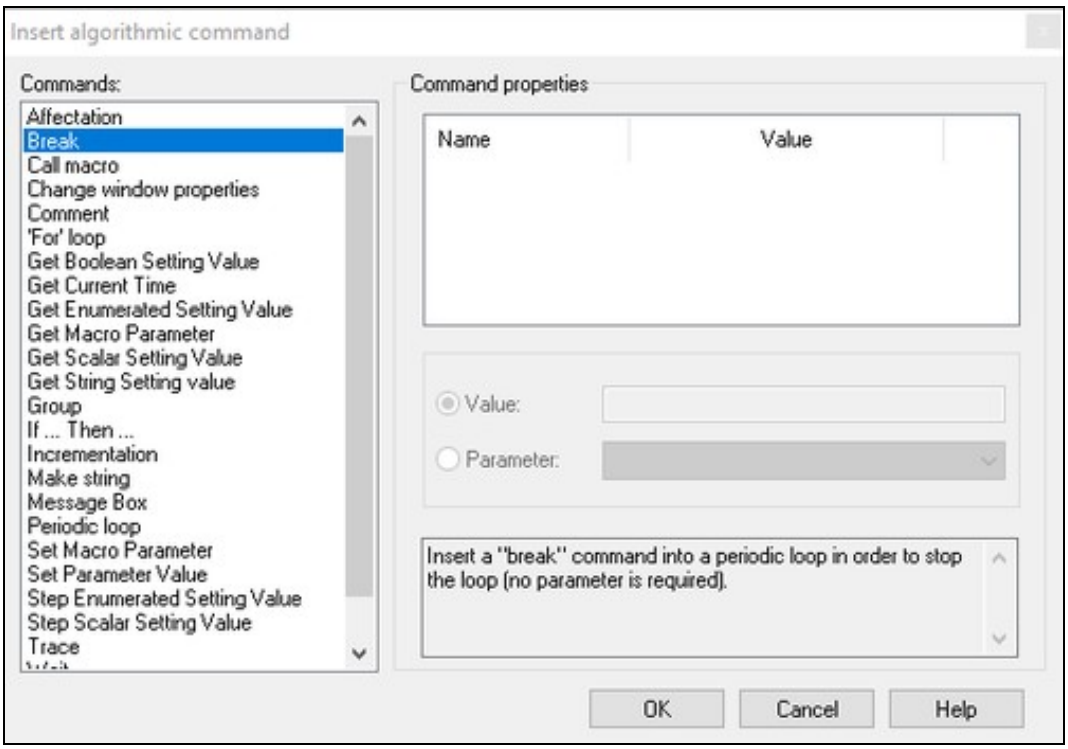
98.1.3.2 Algorithmic commands

98.1.3.2.1 Affectation



Sets a value to a parameter. The new value can be defined by a parameter.

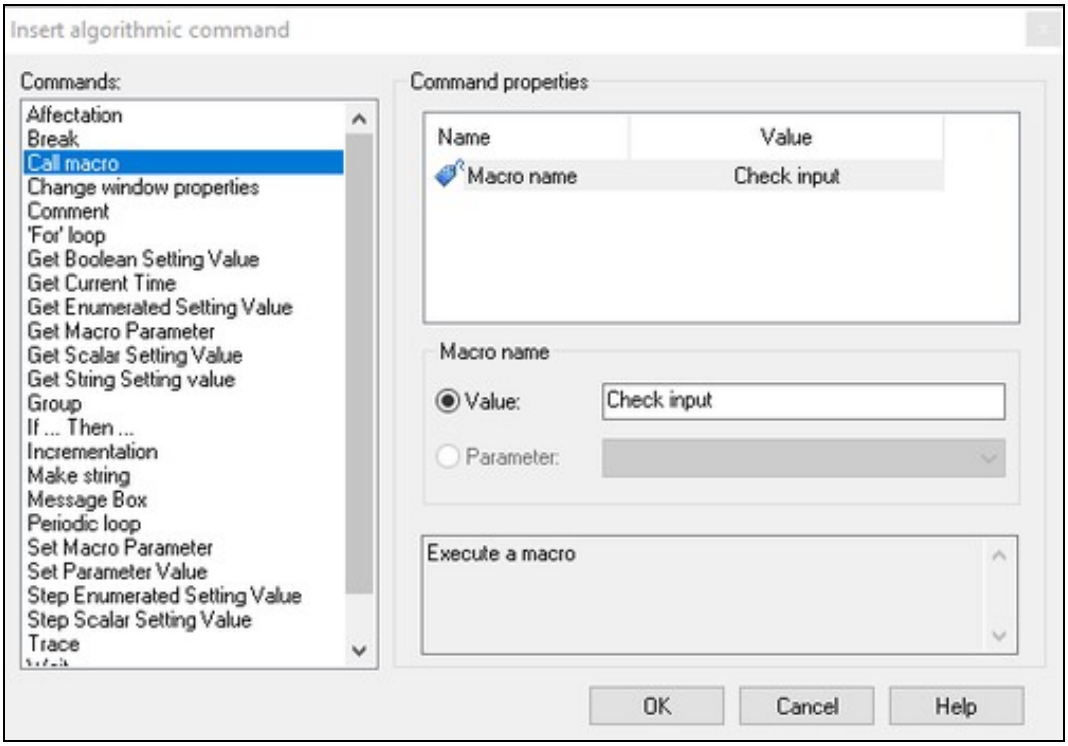
98.1.3.2.2 Break



Used to exit a loop. It can be used inside a "for" loop to stop before the end of the iteration, inside a "while" loop to exit the loop without fulfilling the condition. It is the only way to exit a "Periodic loop".

98.1.3.2.3 Call Macro

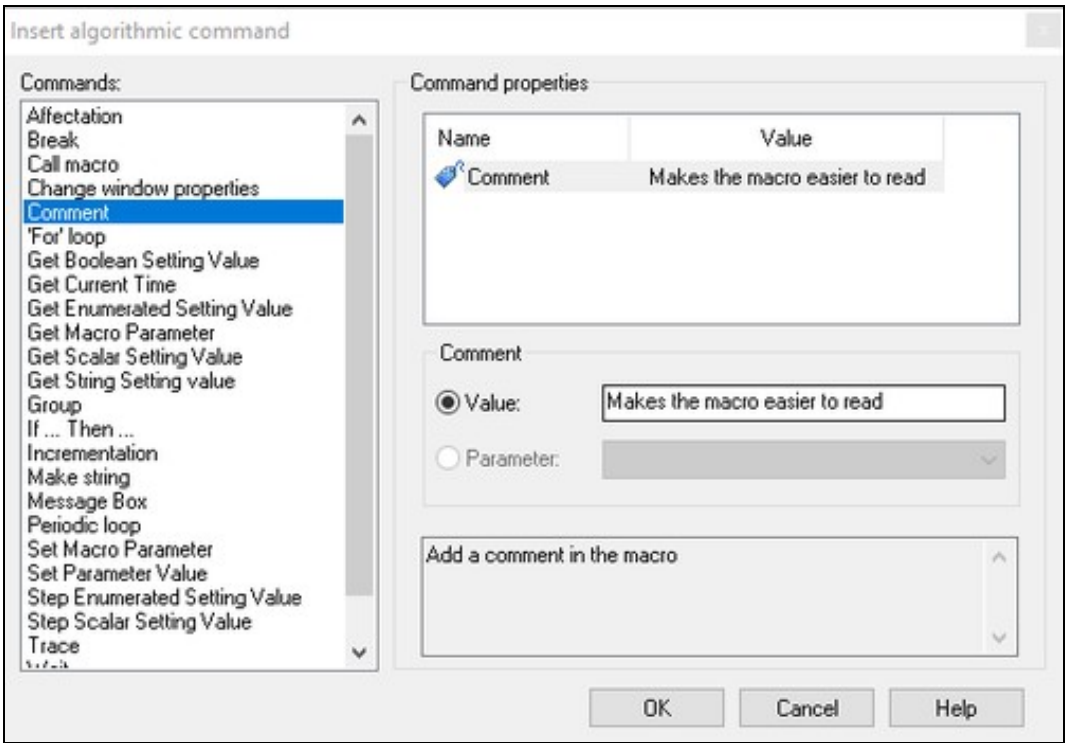
Calls another macro.



The only parameter is the name of the macro that is called. The body of the command is divided into three steps in order to exchange parameters between the calling macro and the called macro.

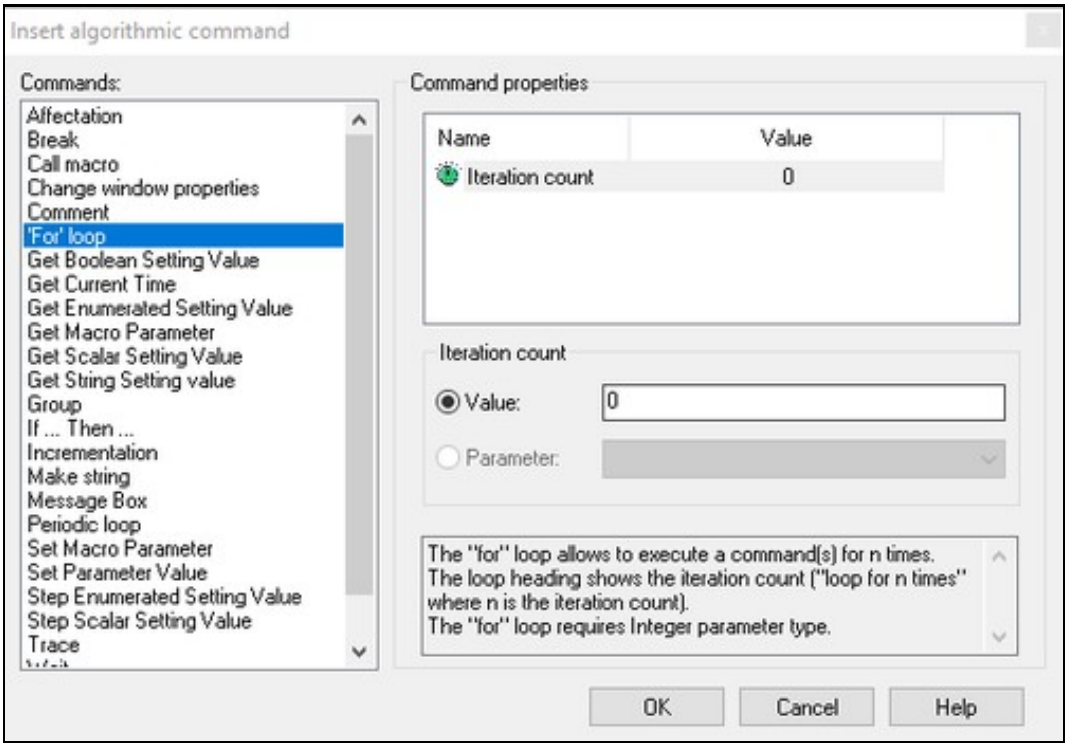
98.1.3.2.4 Comment

The purpose of this command is to facilitate understanding of the macro. It is used to add a comment line to the body of the macro.



The only parameter is the comment.

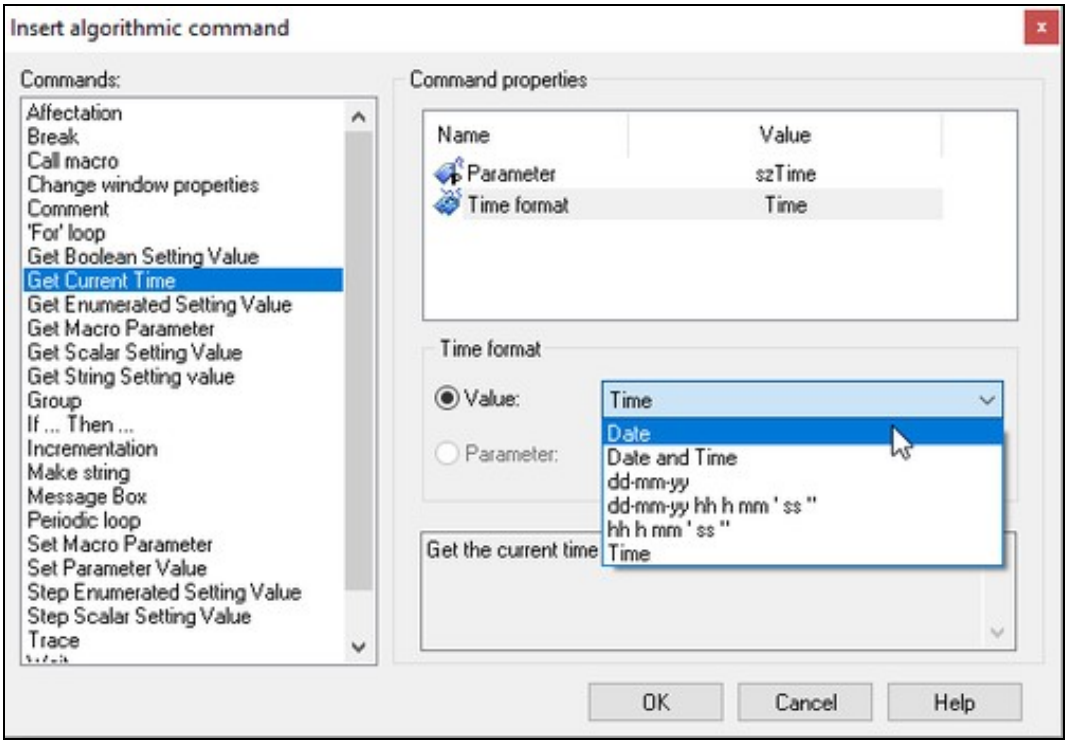
98.1.3.2.5 "For" loop



Runs a set of commands several times. The number of iterations can be defined by an integer value or by an integer parameter.

98.1.3.2.6 Get Current Time

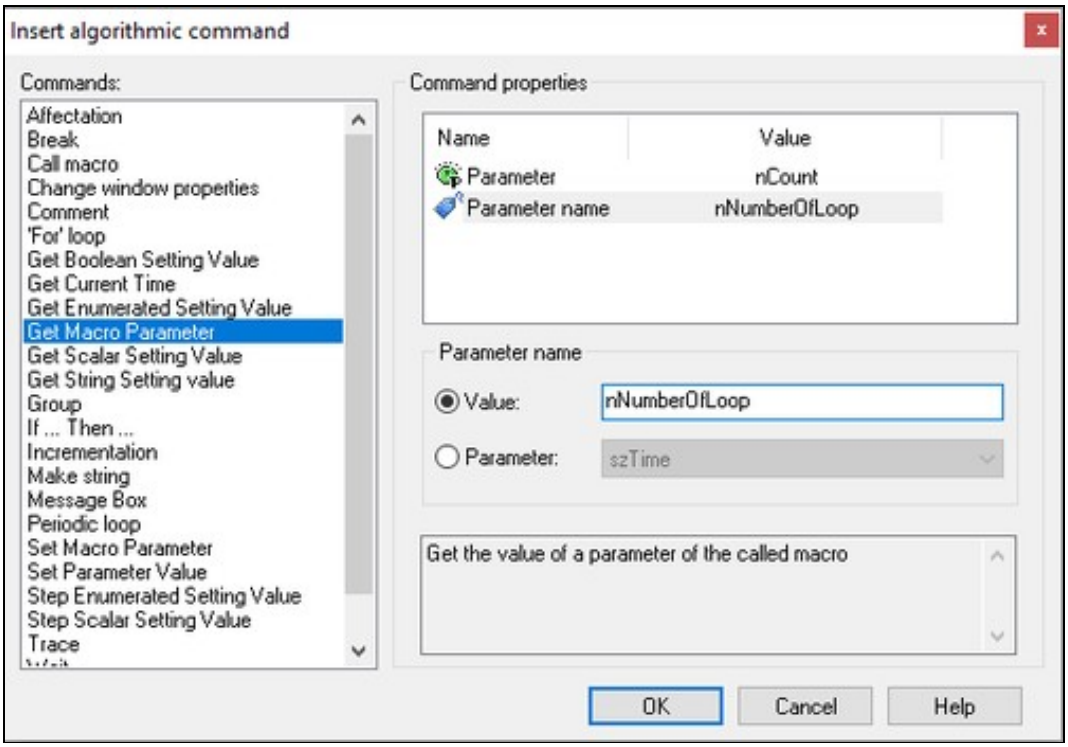
This command retrieves the time and stores it in a string parameter. This string may be use to send a trace, to create a measurement name...



The "Time format" specifies the way in which the time should be written. "Date", "Time" and "Date and Time" use the regional settings of the host computer while the three other formats are fixed formats.

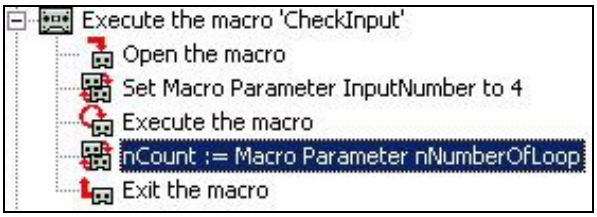
98.1.3.2.7 Get Macro Parameter

Gets the value of a parameter of a called macro. This command must be inserted between the "Exit macro" and the "Execute macro" commands, inside the body of the "Call Macro" command.



"Macro parameter" is the parameter of the calling macro that will receive the value of the parameter of the called macro.

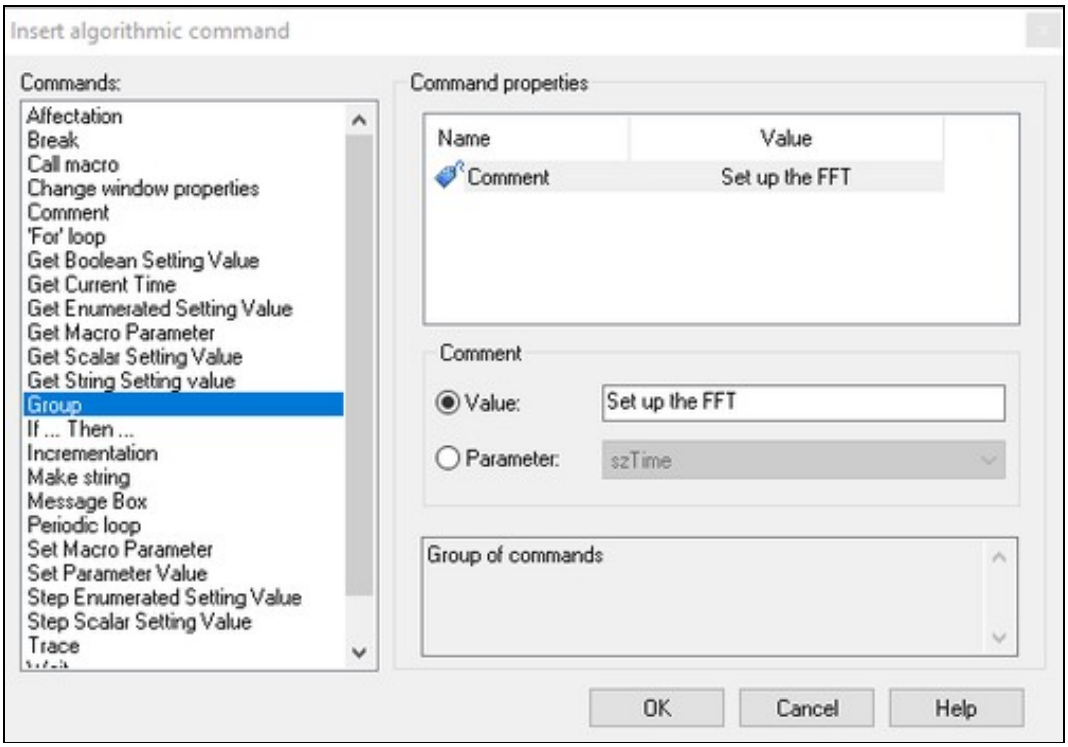
"Parameter name" is the name of the parameter in the called macro.

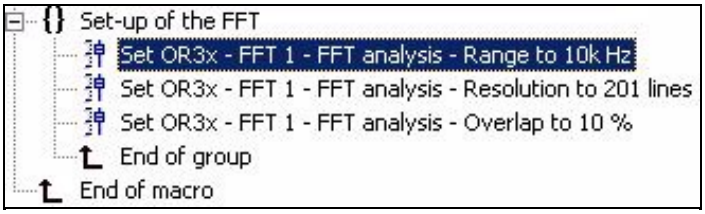


In this example, the command gets the value of the parameter nNumberOfLoop of the macro CheckInput and sets this value to the parameter nCount of the calling macro.

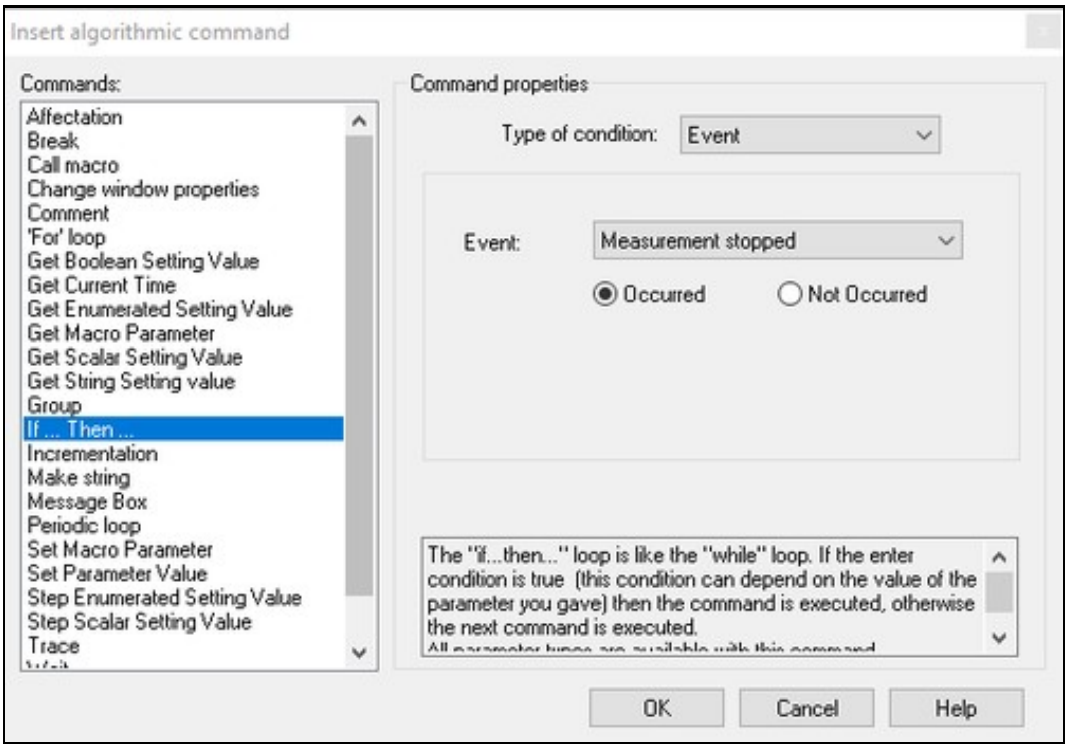
98.1.3.2.8 Group

The purpose of this command is to facilitate understanding of the macro. It creates a branch that contains a set of instructions. It has no effect during execution, but it helps to organize the macro and facilitates copying and pasting, since all commands are copied at once.





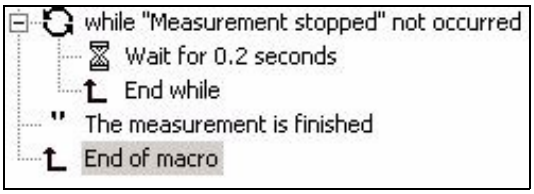
98.1.3.2.9 If?Then?



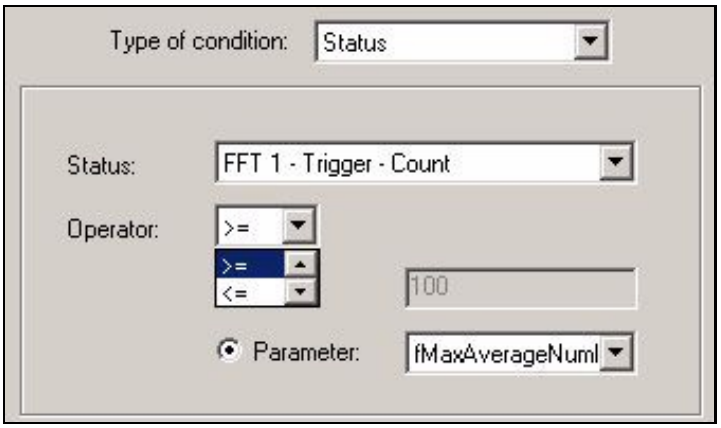
Runs a set of commands according to a condition. The condition can depend on an event, status value or parameter. The event condition can be "event x occurred" or "event x not occurred".

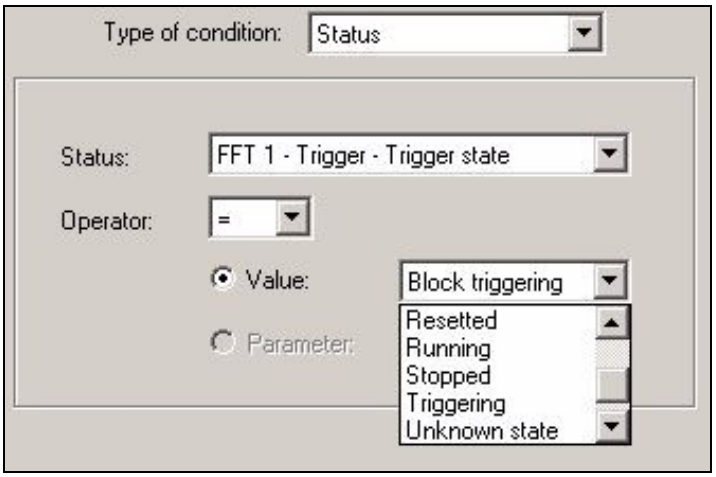
There are five types of conditions:

- **Event:** The event can be "**Measurement stopped**", meaning that the analyzer went from "Running" to "Stopped" or "**Measurement started**", meaning the analyzer went from "Stopped" to "Running". This condition is used to wait for the end of a measurement, for instance.

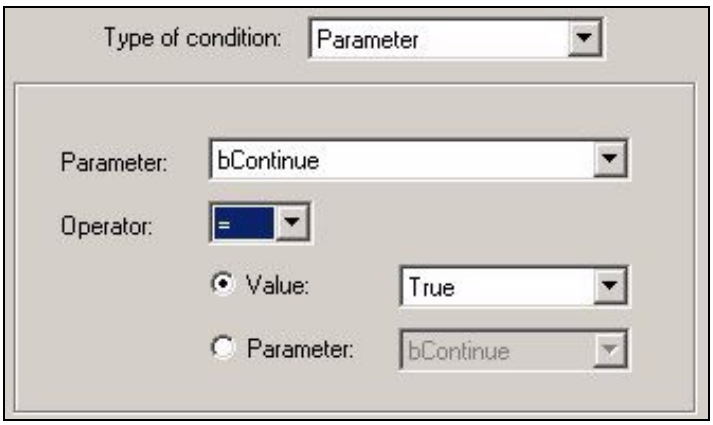


- **Status:** All analyzer statuses can be used for this condition. Depending on the type of status, it is possible to compare its value to a list of possible values or perform a logical test (?=?, ?!=?,?<=?,?>=?) with a constant or a parameter.

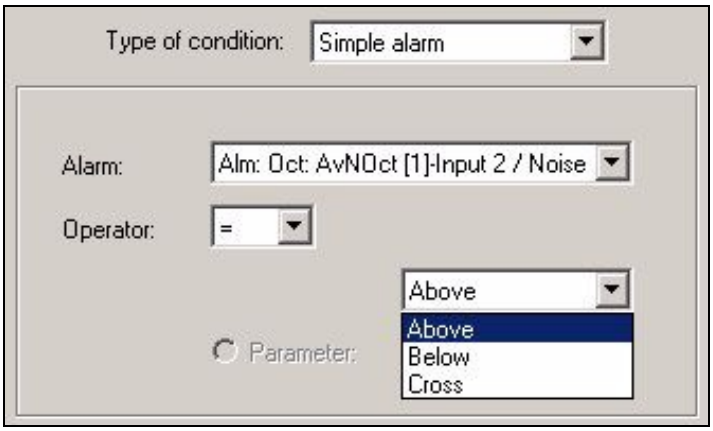




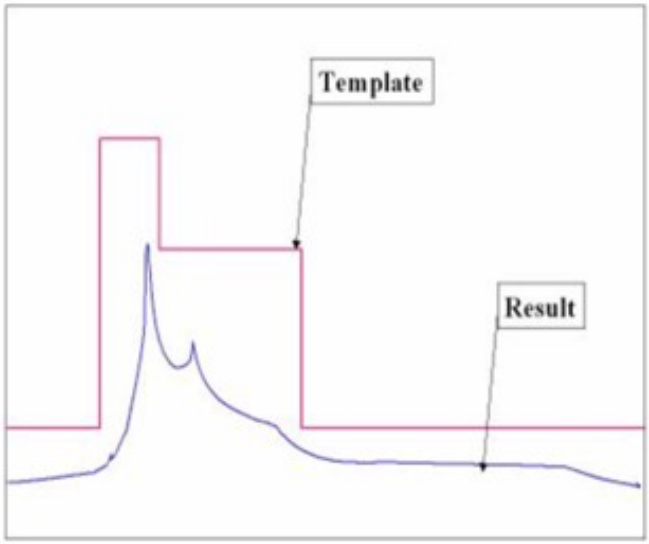
- **Parameter:** The macro parameter of can be compared to a constant or to another parameter.



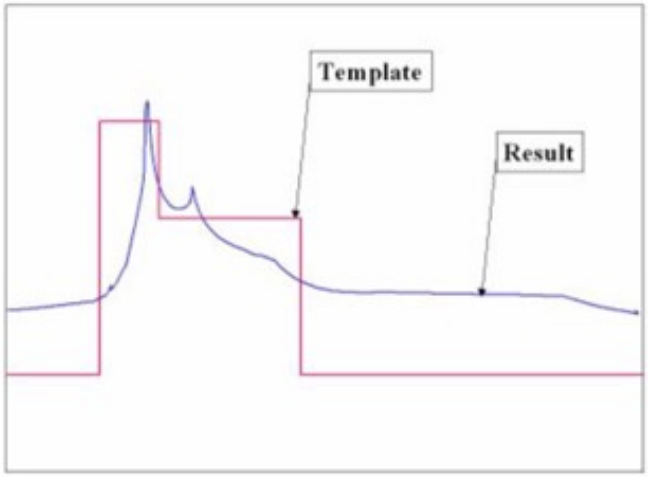
- **Simple alarm:** This condition is available only when at least one alarm on a simple template result has been declared.



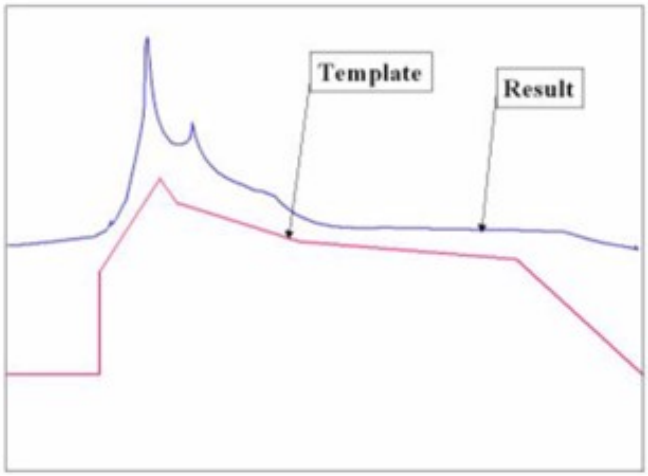
- **Alarm results**



Operator	Test	Condition value
=	Above	False
!=	Above	True
=	Cross	False
!=	Cross	True
=	Below	True
!=	Below	False

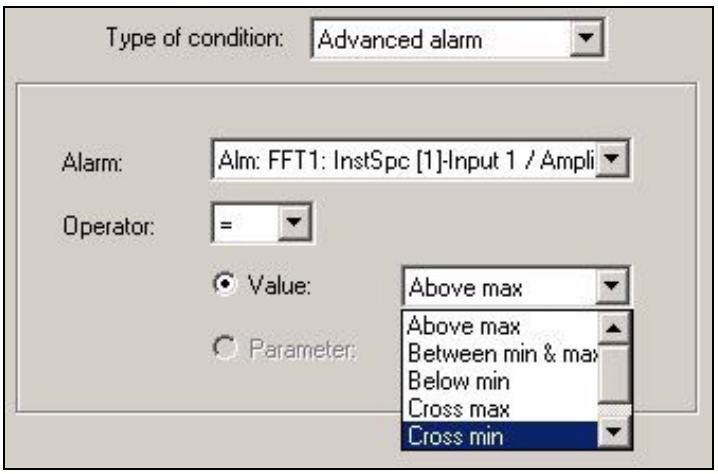


Operator	Test	Condition value
=	Above	False
!=	Above	True
=	Cross	True
!=	Cross	False
=	Below	False
!=	Below	True

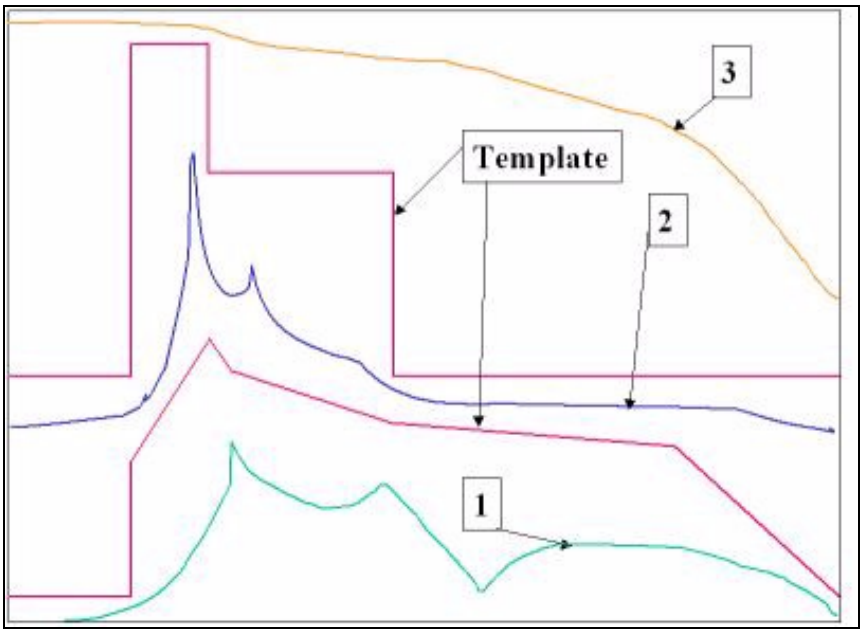


Operator	Test	Condition value
=	Above	True
!=	Above	False
=	Cross	False
!=	Cross	True
=	Below	False
!=	Below	True

- **Advanced alarm:** This condition is available only when at least one alarm on a double template result has been declared.

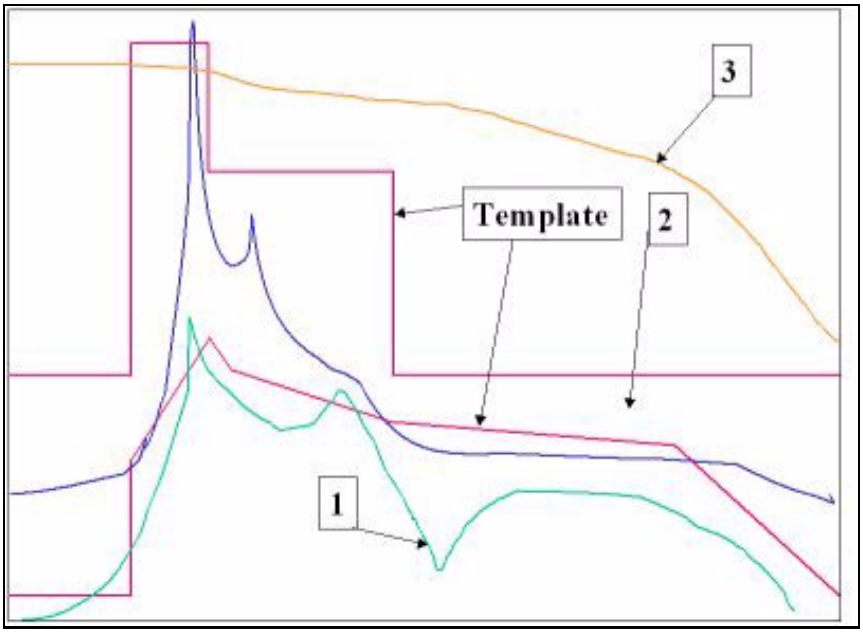


- **Advanced Alarm results**



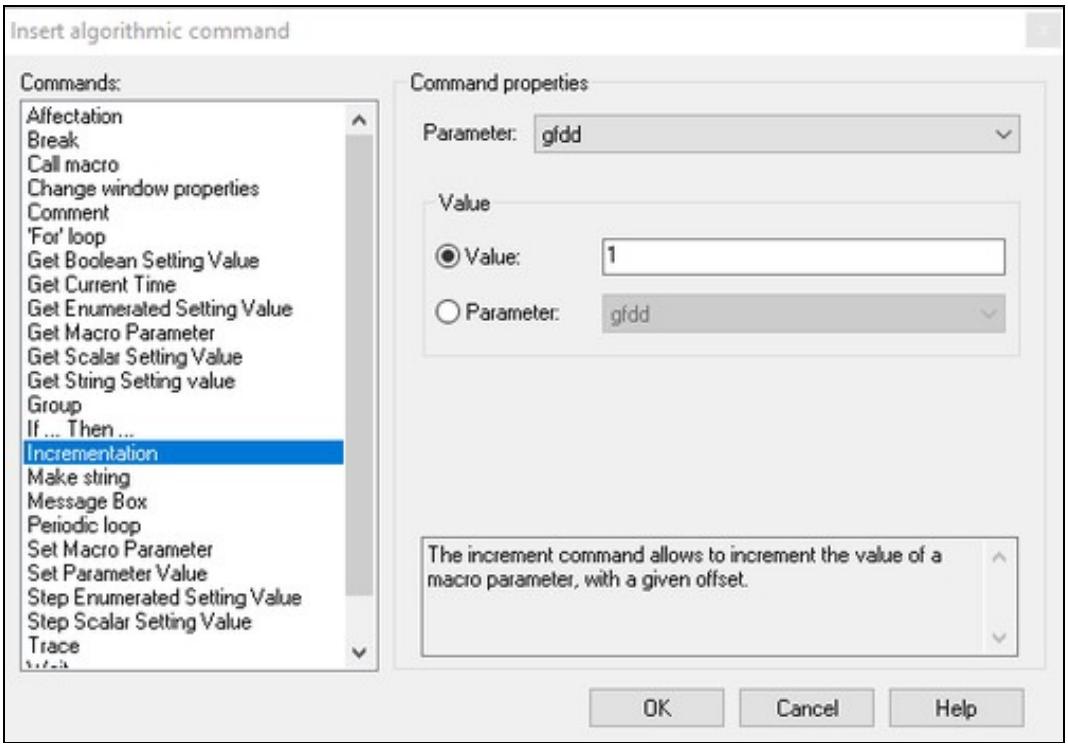
Operator	Test	Condition value for 1	Condition value for 2	Condition value for 3
=	Above max	False	False	False
!=	Above max	True	True	True
=	Cross max	False	False	True
!=	Cross max	True	True	False
=	Between min & max	False	False	False
!=	Between min & max	True	True	True
=	Cross min	True	False	False
!=	Cross min	False	True	True
=	Below min	False	False	False

!=	Below min	True	True	True
=	Cross min & max	False	True	False
!=	Cross min & max	True	False	True



Operator	Test	Condition value for 1	Condition value for 2	Condition value for 3
=	Above max	False	False	True
!=	Above max	True	True	False
=	Cross max	False	False	False
!=	Cross max	True	True	True
=	Between min & max	False	True	False
!=	Between min & max	True	False	True
=	Cross min	False	False	False
!=	Cross min	True	True	True
=	Below min	True	False	False
!=	Below min	False	True	True
=	Cross min & max	False	False	False
!=	Cross min & max	True	True	True

98.1.3.2.10 Incrementation



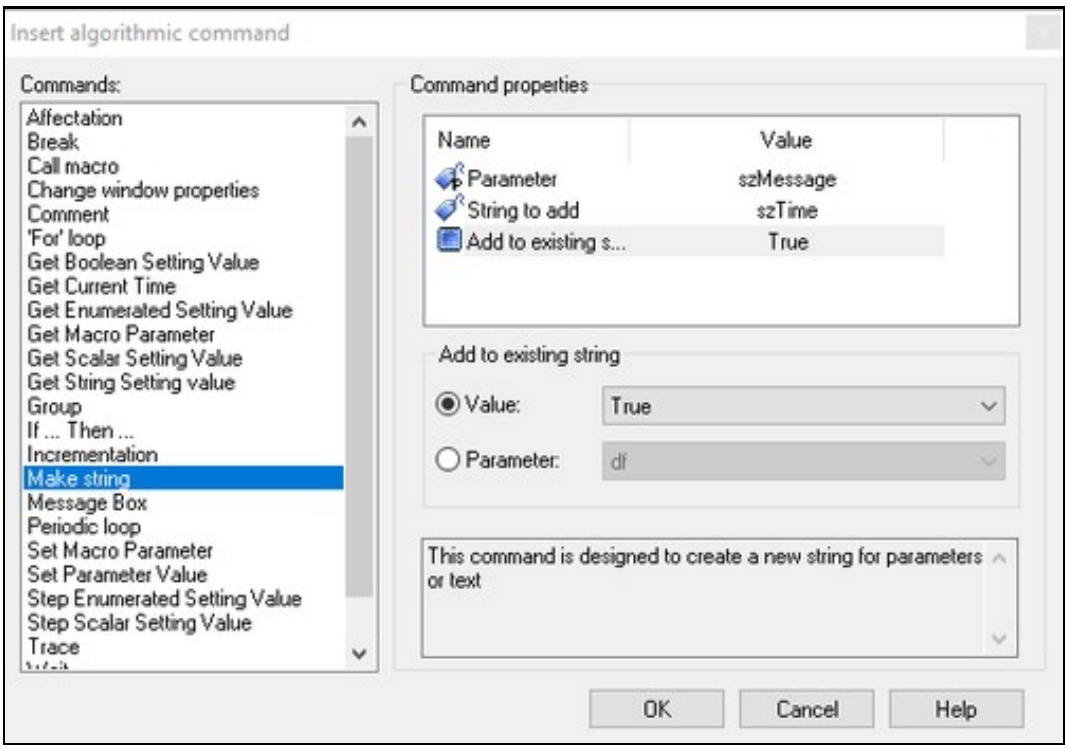
The increment command is used to increment the value of a macro parameter with a given offset.

The "Value" group-box allows defining the offset. The offset can be defined by a value or by a parameter of the same type as the parameter incremented.

Available if one or more integer or float parameter is defined.

98.1.3.2.11 Make String

Command used to create a string.

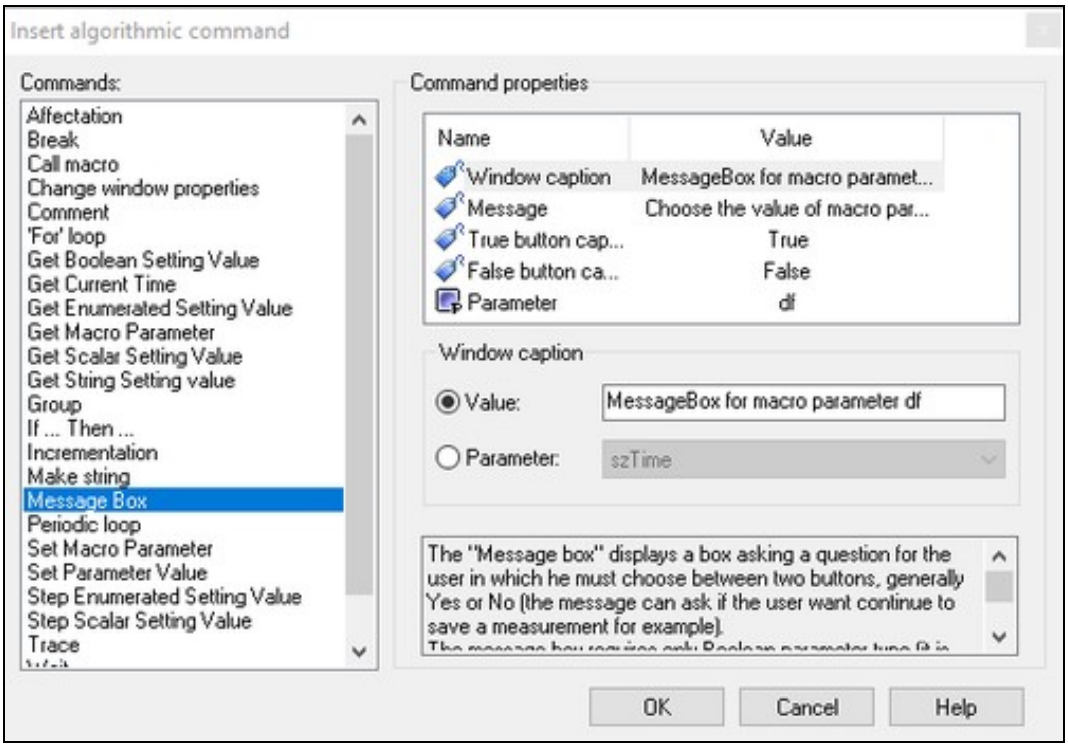


"Macro parameter" is the string that is modified. It can only be a String parameter.

"String to add" is the string that is added to the first parameter. It can be a constant or a parameter

"Add to existing string" is a Boolean parameter that indicates if the second parameter replaces or is added to first one. If the value is false, the command behaves like the Affectation command

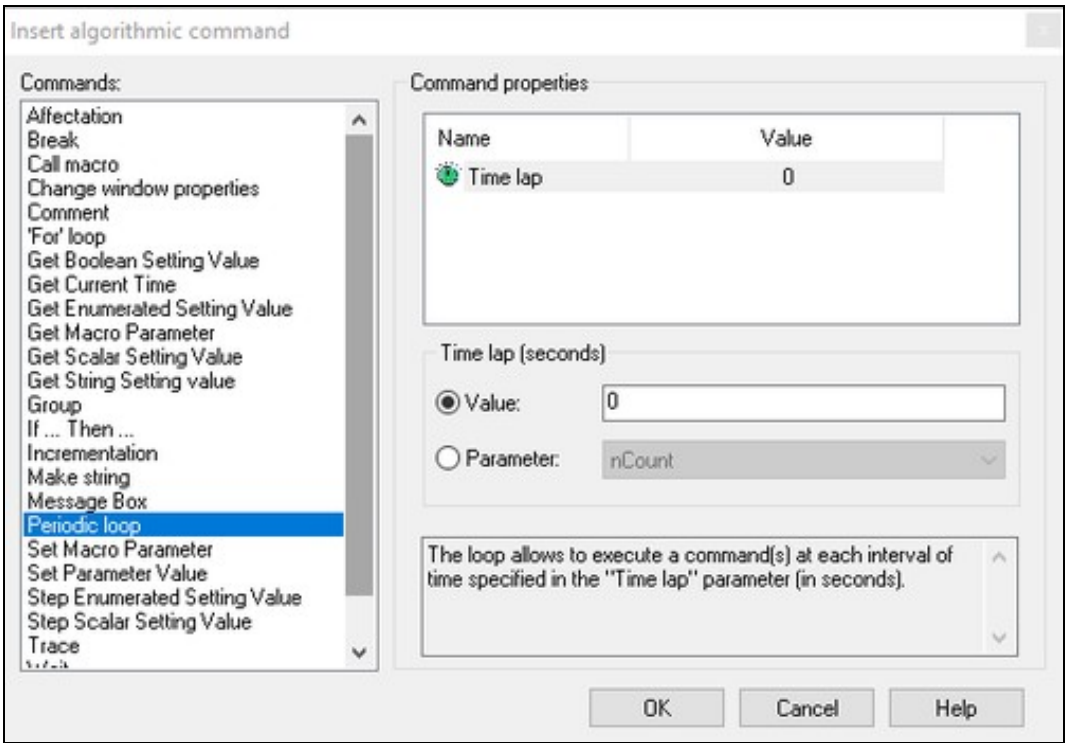
98.1.3.2.12 Message box



Displays a dialog box, which is used to change the value of a Boolean parameter. The box is made up of a message and two buttons ("true" and "false"). It is possible to define the box caption, the message content and the button captions. A click on the "true" button sets the Boolean parameter to "true". A click on the "false" button sets the value to "false".

When the command is executed, the box is displayed. A click on one of the buttons closes the message box and sets the Boolean parameter value.

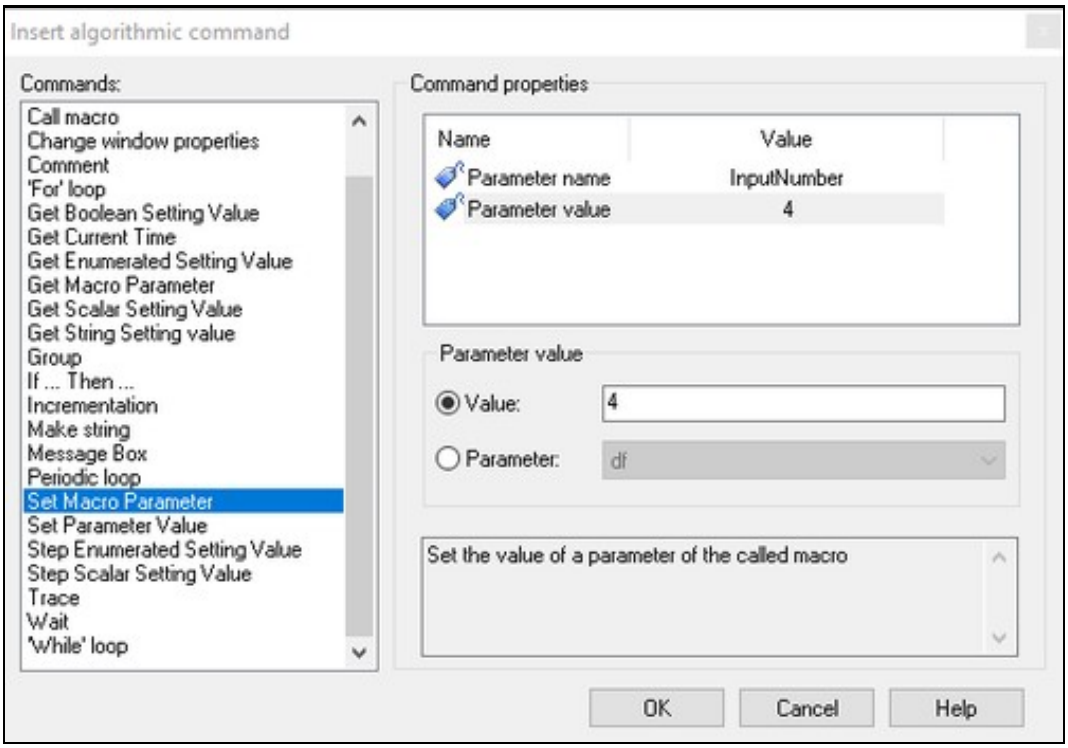
98.1.3.2.13 Periodic loop



Runs a set of commands at each interval of time specified in the "Time lap" parameter. The time lap is specified in seconds, the "Break" command must be used to exit the loop.

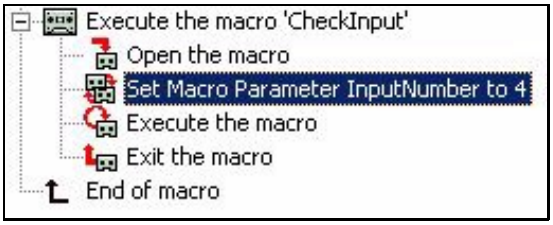
98.1.3.2.14 Set Macro parameter

Sets the parameter value of a called macro. This command must be inserted between the "Open macro" and the "Execute macro" commands, inside the body of the "Call Macro" command.

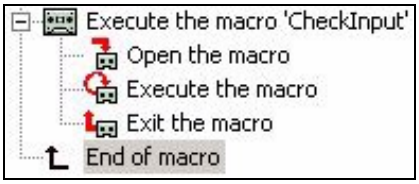


"Parameter name" is the name of the parameter in the called macro.

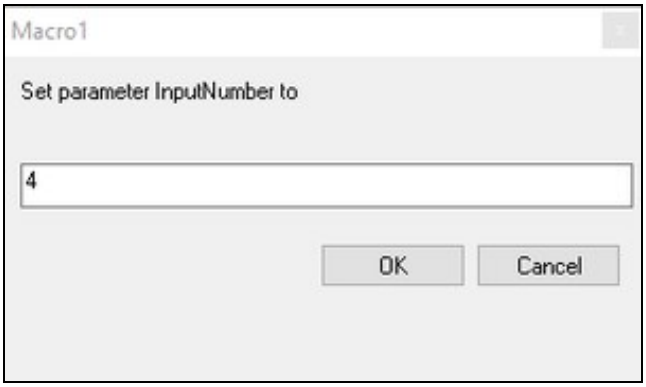
"Parameter value" is the value the parameter must take.



In this example, the command sets the value of the parameter InputNumber of the macro CheckInput to 4.

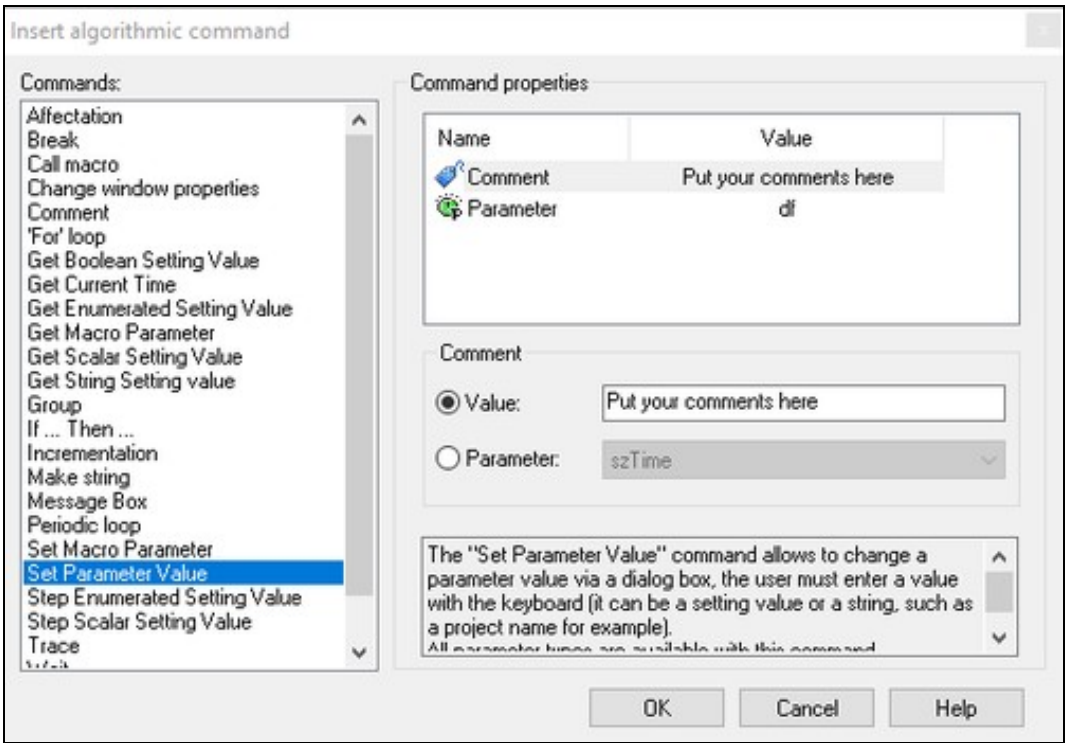


When the macro is running, a dialog box is displayed, which is used to change the value of a parameter.



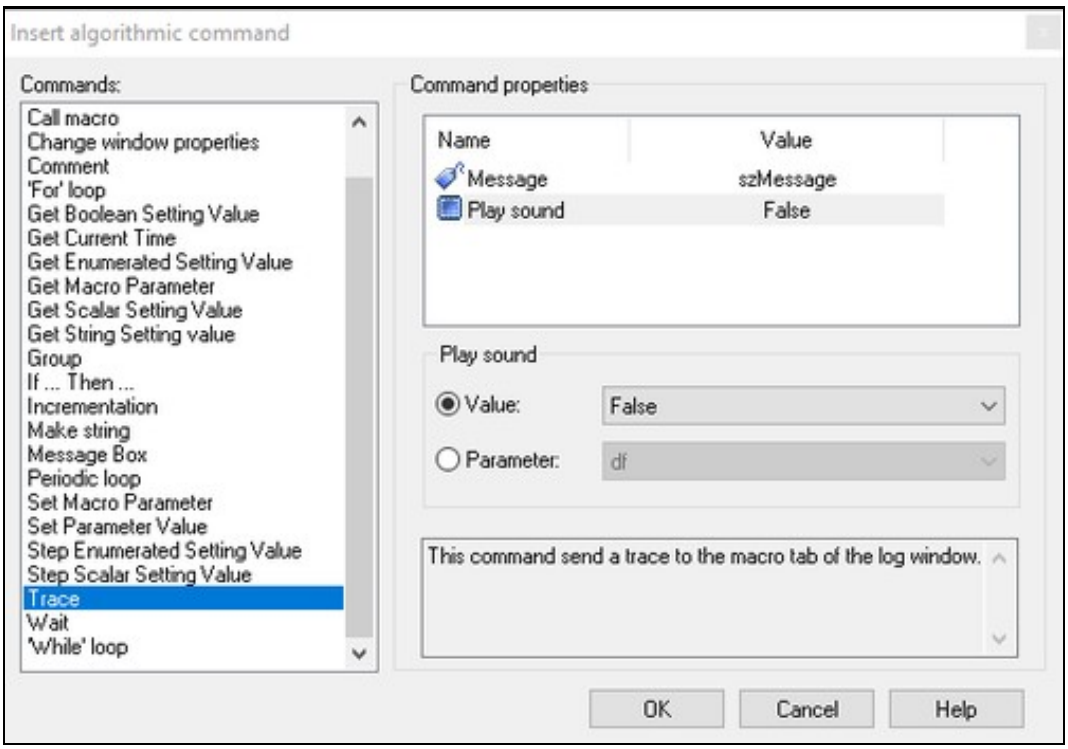
The message generated in the top of the dialog box can be defined in the "command properties". A control is used to edit the parameter value. A click on the OK button changes the parameter value, and closes the dialog box. A click on the Cancel button closes the dialog box without changing parameter value.

98.1.3.2.15 Set Parameter Value



98.1.3.2.16 Trace

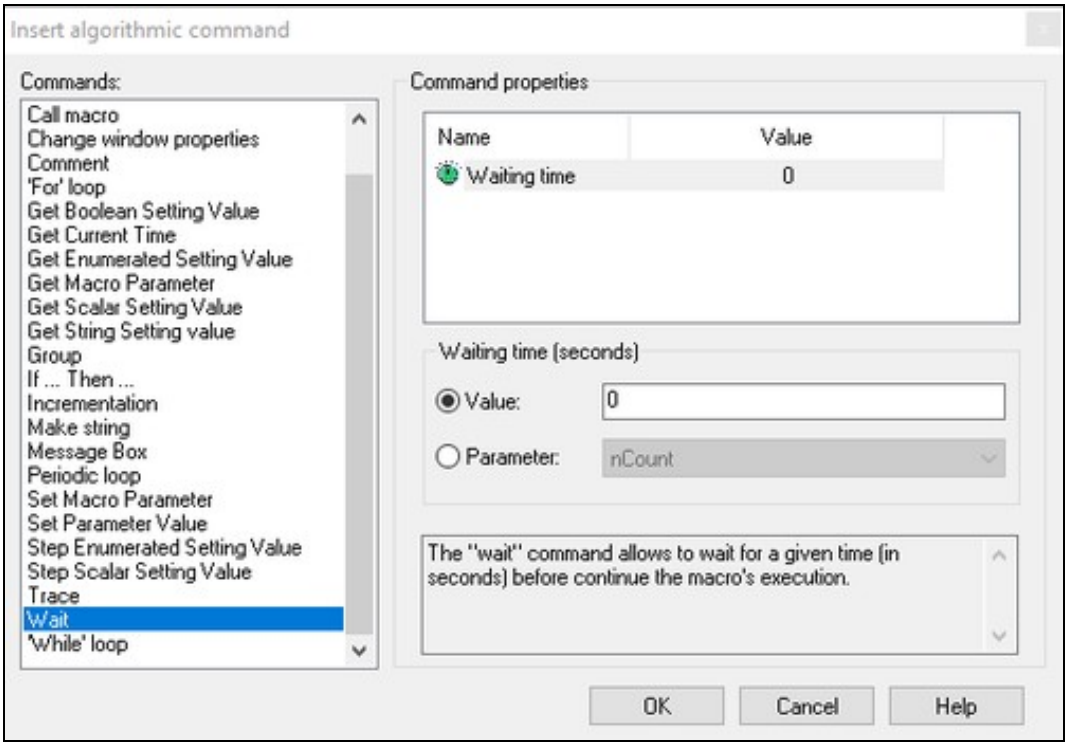
Command used to send a message in the log window.



"Message" is the text that is displayed in the log window.

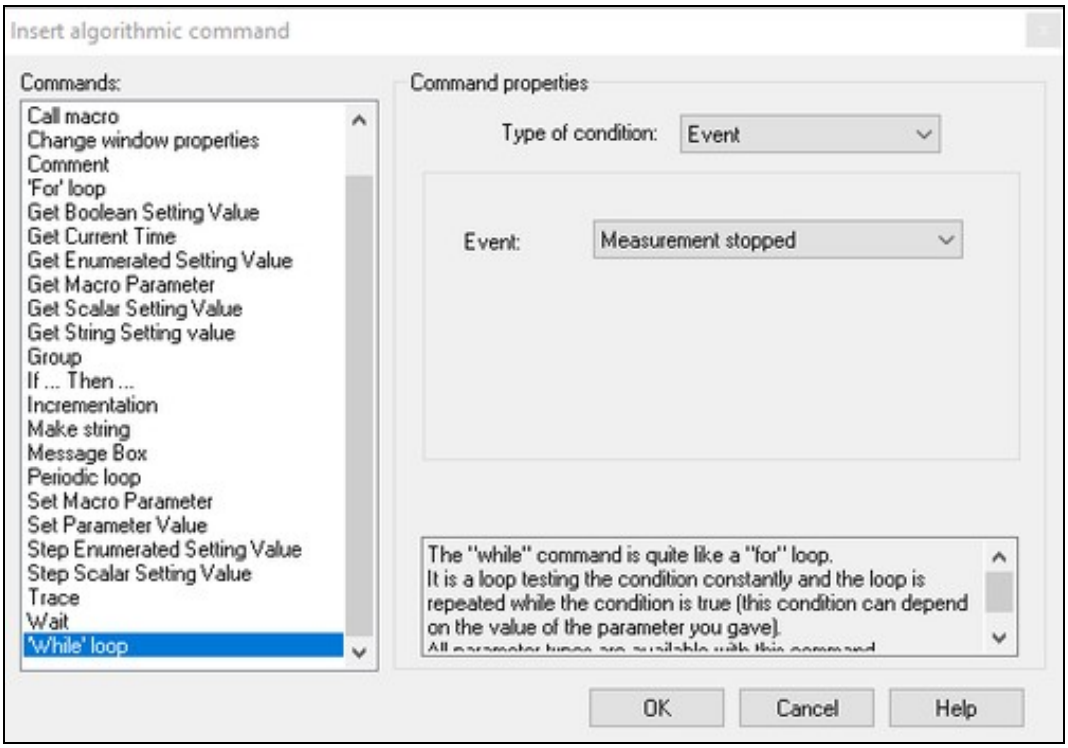
"Play sound" is used to play a sound when the message is sent. The host computer must have speakers connected.

98.1.3.2.17 Wait



Waits for a given time. The wait time is specified in seconds.

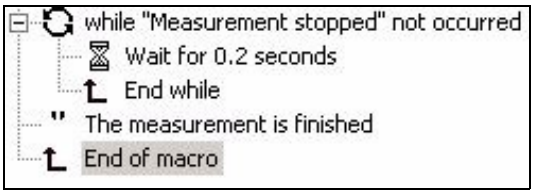
98.1.3.2.18 "While" loop



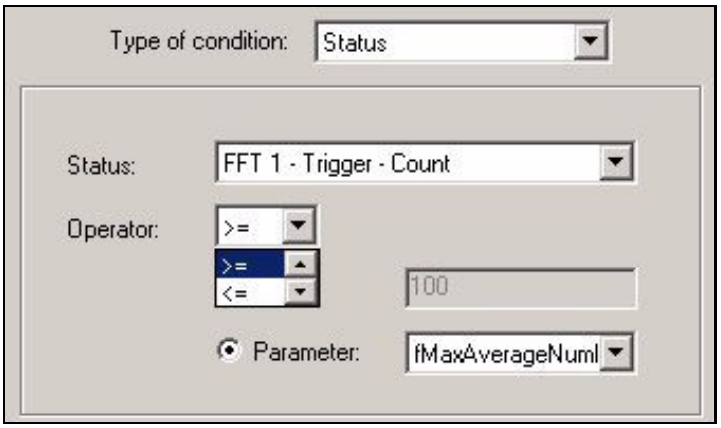
Runs a set of commands several times until the condition is false. The condition can depend on an event, status value or parameter. The event condition can be "event x occurred" or "event x not occurred".

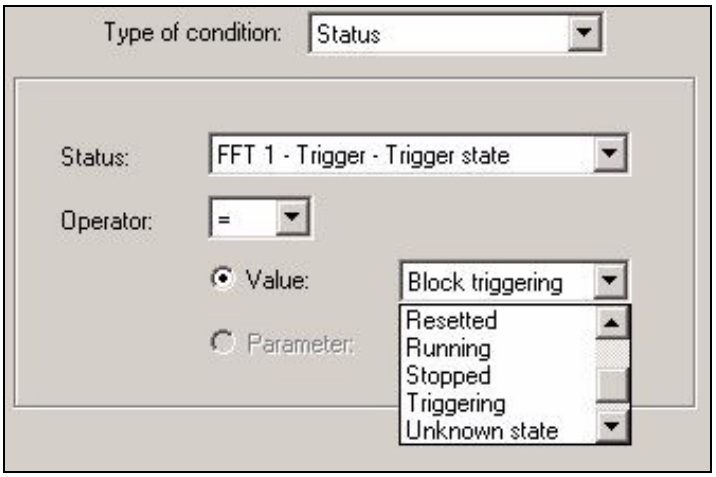
There are five types of conditions:

- **Event:** The event can be "**Measurement stopped**", meaning that the analyzer went from "Running" to "Stopped" or "**Measurement started**", meaning the analyzer went from "Stopped" to "Running". This condition is used to wait for the end of a measurement, for instance.

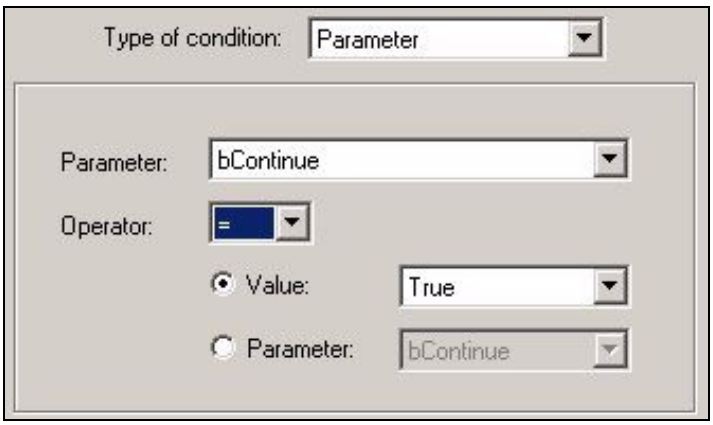


- **Status:** All analyzer statuses can be used for this condition. Depending on the type of status, it is possible to compare its value to a list of possible values or perform a logical test (?=?, ?!=?,?<=?,?>=?) with a constant or a parameter.

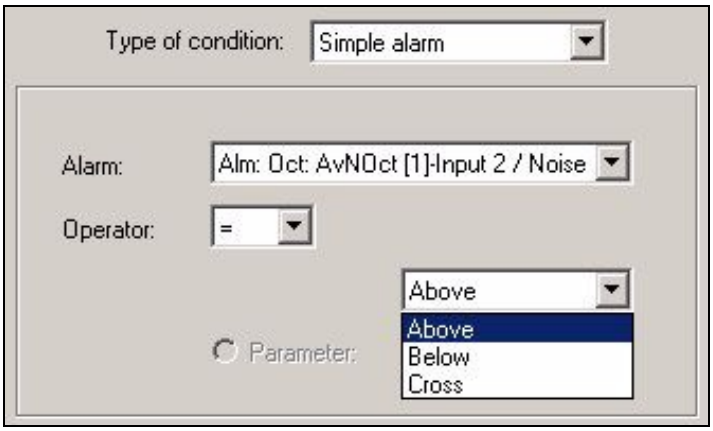


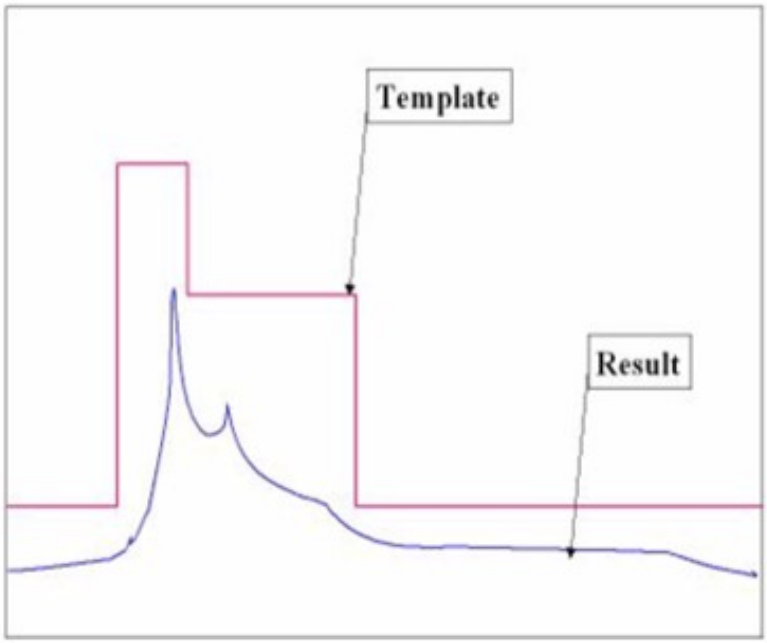


- **Parameter:** The macro parameter of can be compared to a constant or to another parameter.

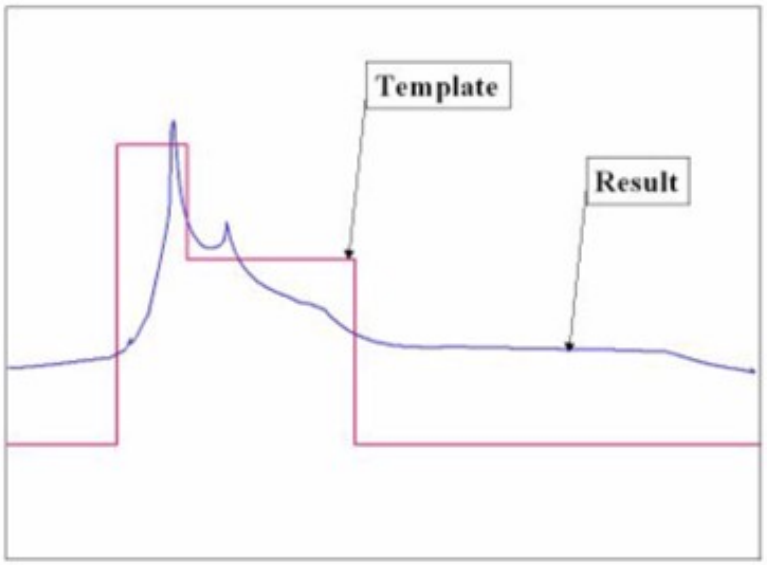


- **Simple alarm:** This condition is available only when at least one alarm on a simple template result has been declared.

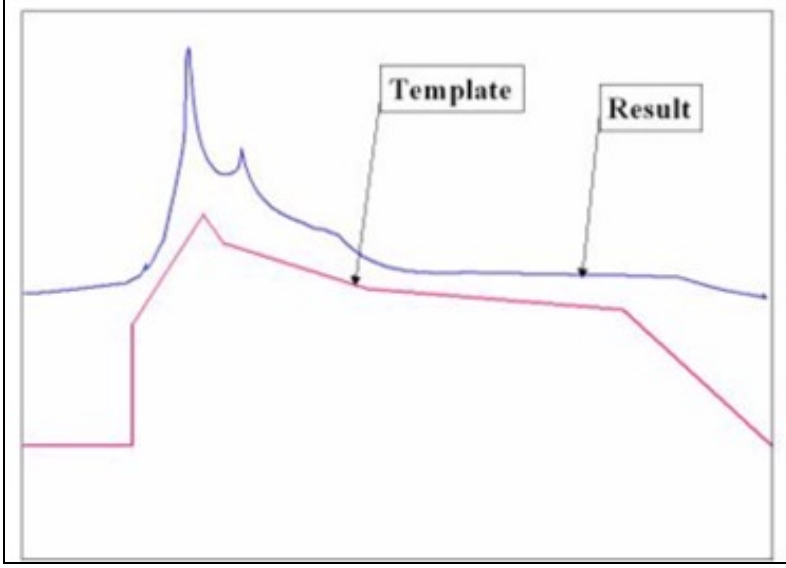




Operator	Test	Condition value
=	Above	False
!=	Above	True
=	Cross	False
!=	Cross	True
=	Below	True
!=	Below	False

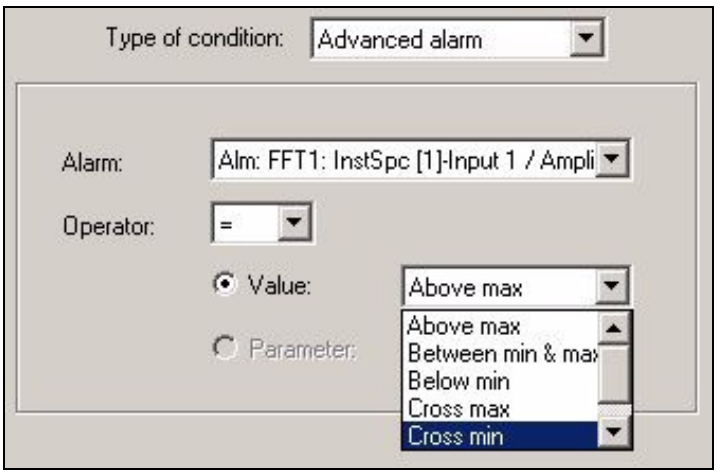


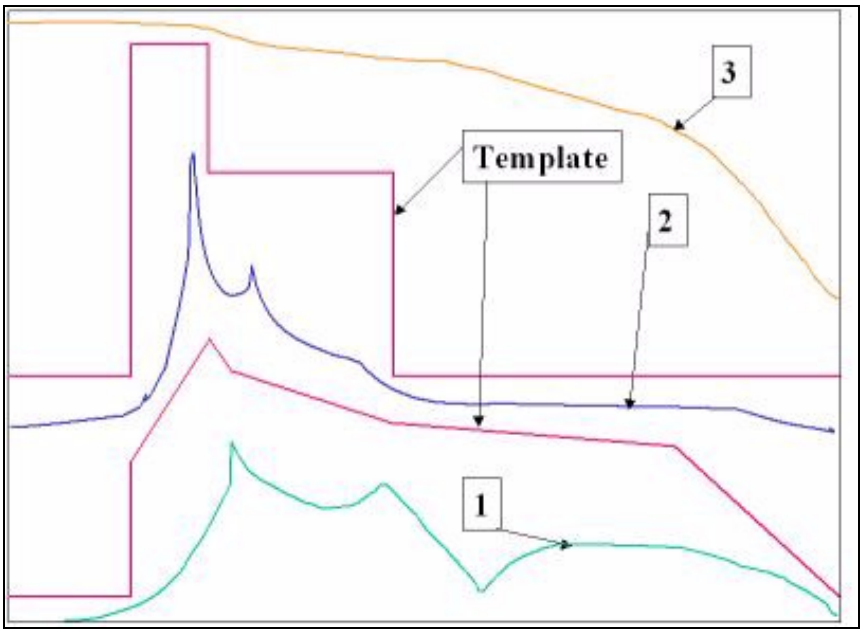
Operator	Test	Condition value
=	Above	False
!=	Above	True
=	Cross	True
!=	Cross	False
=	Below	False
!=	Below	True



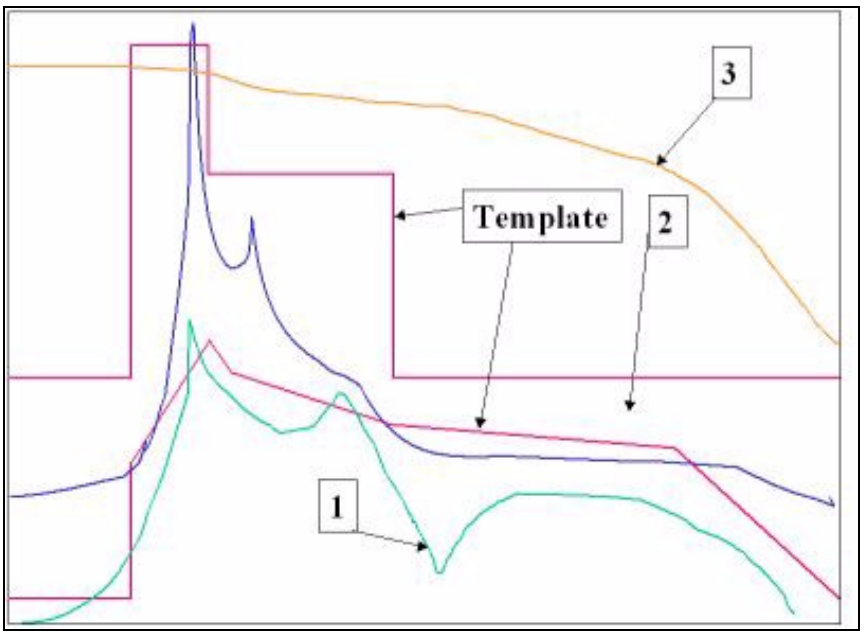
Operator	Test	Condition value
=	Above	True
!=	Above	False
=	Cross	False
!=	Cross	True
=	Below	False
!=	Below	True

- **Advanced alarm:** This condition is available only when at least one alarm on a double template result has been declared.





Operator	Test	Condition value for 1	Condition value for 2	Condition value for 3
=	Above max	False	False	False
!=	Above max	True	True	True
=	Cross max	False	False	True
!=	Cross max	True	True	False
=	Between min & max	False	False	False
!=	Between min & max	True	True	True
=	Cross min	True	False	False
!=	Cross min	False	True	True
=	Below min	False	False	False
!=	Below min	True	True	True
=	Cross min & max	False	True	False
!=	Cross min & max	True	False	True



Operator	Test	Condition value for 1	Condition value for 2	Condition value for 3
=	Above max	False	False	True
!=	Above max	True	True	False
=	Cross max	False	False	False
!=	Cross max	True	True	True
=	Between min & max	False	True	False
!=	Between min & max	True	False	True
=	Cross min	False	False	False
!=	Cross min	True	True	True
=	Below min	True	False	False
!=	Below min	False	True	True
=	Cross min & max	False	False	False
!=	Cross min & max	True	True	True

98.1.3.3 Editor contextual menu

98.1.3.3.1 Setting properties

- **Cut:** Removes the command selected and copies it to the clipboard.
- **Copy:** Copies the command selected in the clipboard.
- **Paste:** Inserts the command stored in the clipboard into the macro. The command will be inserted before the command selected.

If the item selected in the macro tree is an "end of loop" item, the command will be inserted at the end of the loop body.

If the item selected in the macro tree is the "end of macro" item, the command will be inserted at the end of the macro.

- **Delete:** Deletes the command selected. Available if the item selected in the macro tree is a command item (not "end of loop" or "end of macro item).
- **Toggle break point**

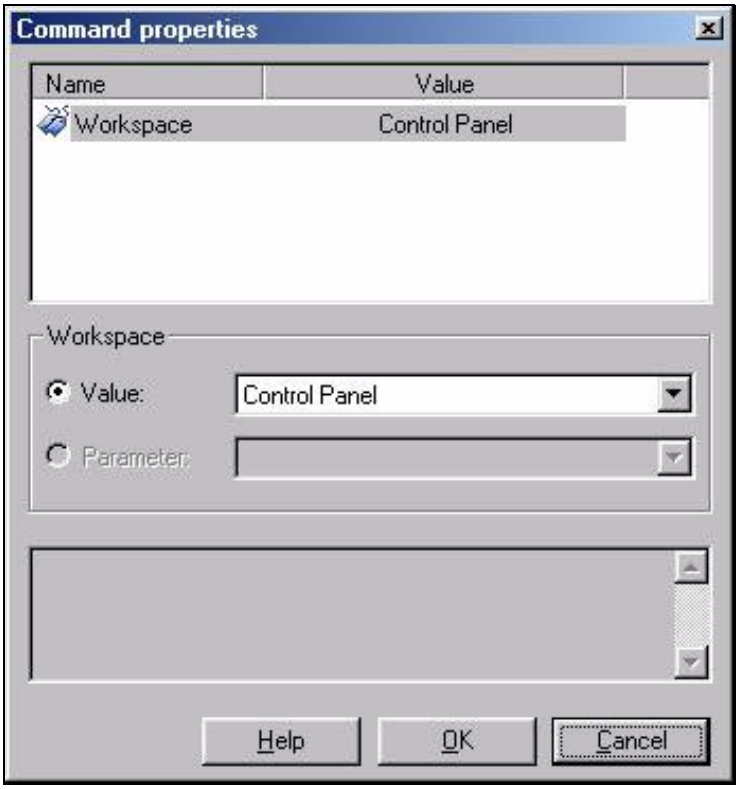


If a breakpoint is put on the command selected, this command removes it. Otherwise, it sets a breakpoint for this command. Only available if the item selected is a command item.

Breakpoint has been set. This command is not executed.

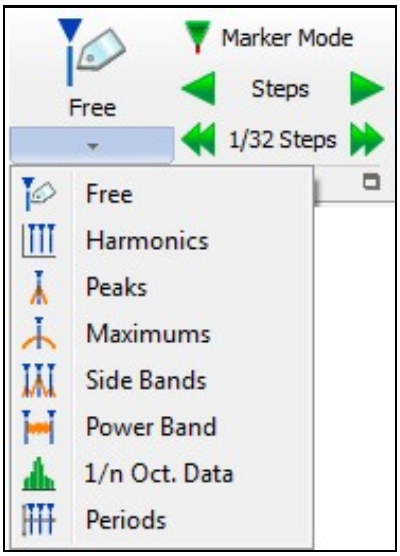
During macro execution (see Run button), the execution stops on the first command where a toggle break point is placed.

- **Run to:** Runs the macro from the current command (indicated by execution pointer) to the selected command, ignoring breakpoints. The selected command is not executed. If the current command is after the selected command, execution goes to the end of the macro, ignoring breakpoints.
- **Jump to:** Sets execution pointer to the selected command.
- **Properties**



Edits command properties.

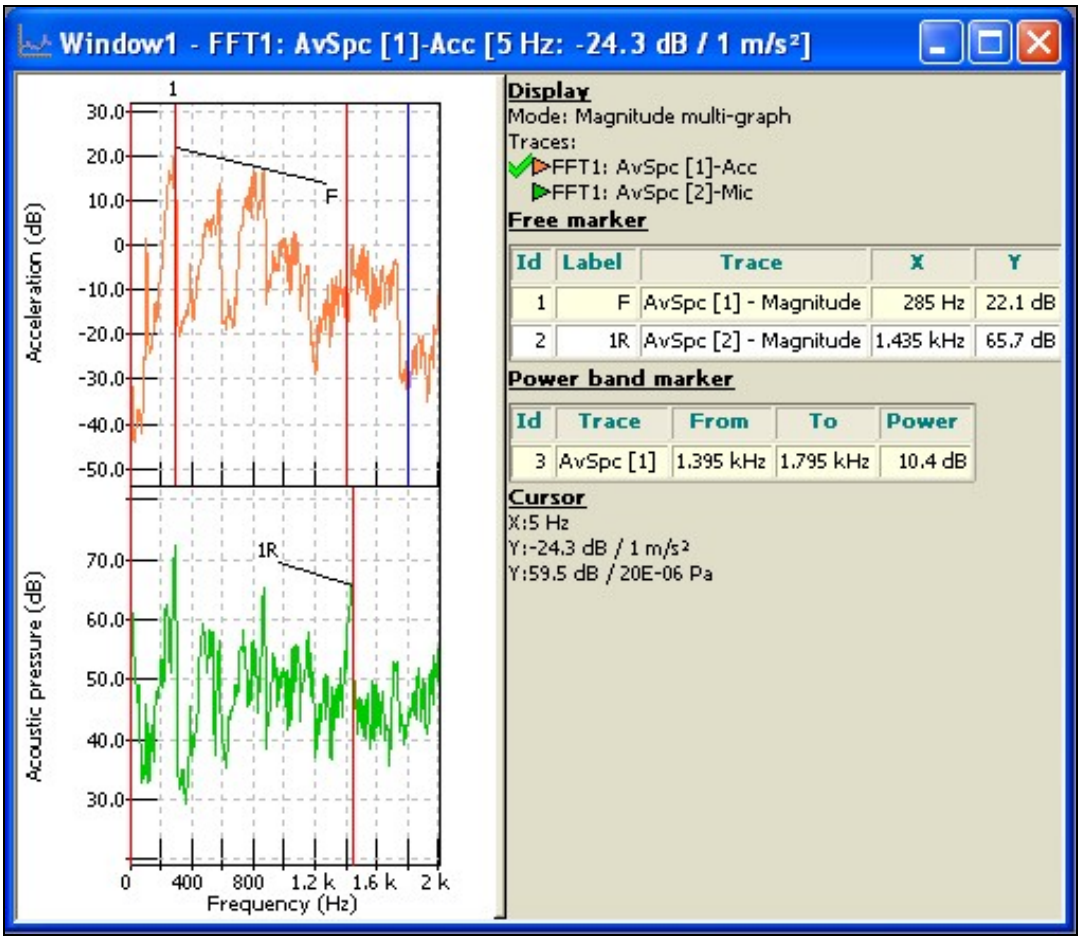
99 NVGate Marker



NVGate features a complete set of real-time markers that help identifying typical signature and points of exception in both time and spectral graphs.

99.1 Marker description

The marker group allows selecting and positioning the chosen marker. The markers allow quantifying measurement behaviors such as the band power between 2 frequencies, track signal harmonics or tracking the max amplitude of a signal?



There is also a copy function using the right click from the Infotrace that allows to paste the whole marker table to Word® or Excel®.

J16 =

	A	B	C	D	E	F	G	H
1	Free marker							
2	Id	Label	Trace	X	Unit	Y	Unit	
3	1	F	AvSpc [1] - Magnitude	285	Hz	22.1	dB	
4								
5	2	1R	AvSpc [2] - Magnitude	1.435	kHz	65.7	dB	
6								
7	Power band marker							
8	Id	Trace	From	Unit	To	Unit	Power	Unit
9	3	AvSpc [1]	1.395	kHz	1.795	kHz	10.4	dB
10								

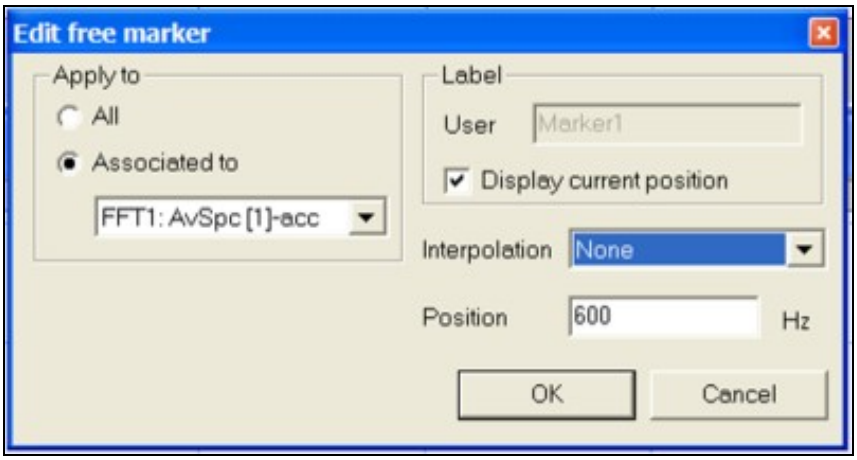
99.1.1 Free marker

- 

Switch the cursor to deposit a free marker in the click location. The free marker can be positioned everywhere to add a legend in a spectra, profile, 1/n octave and waterfall section.

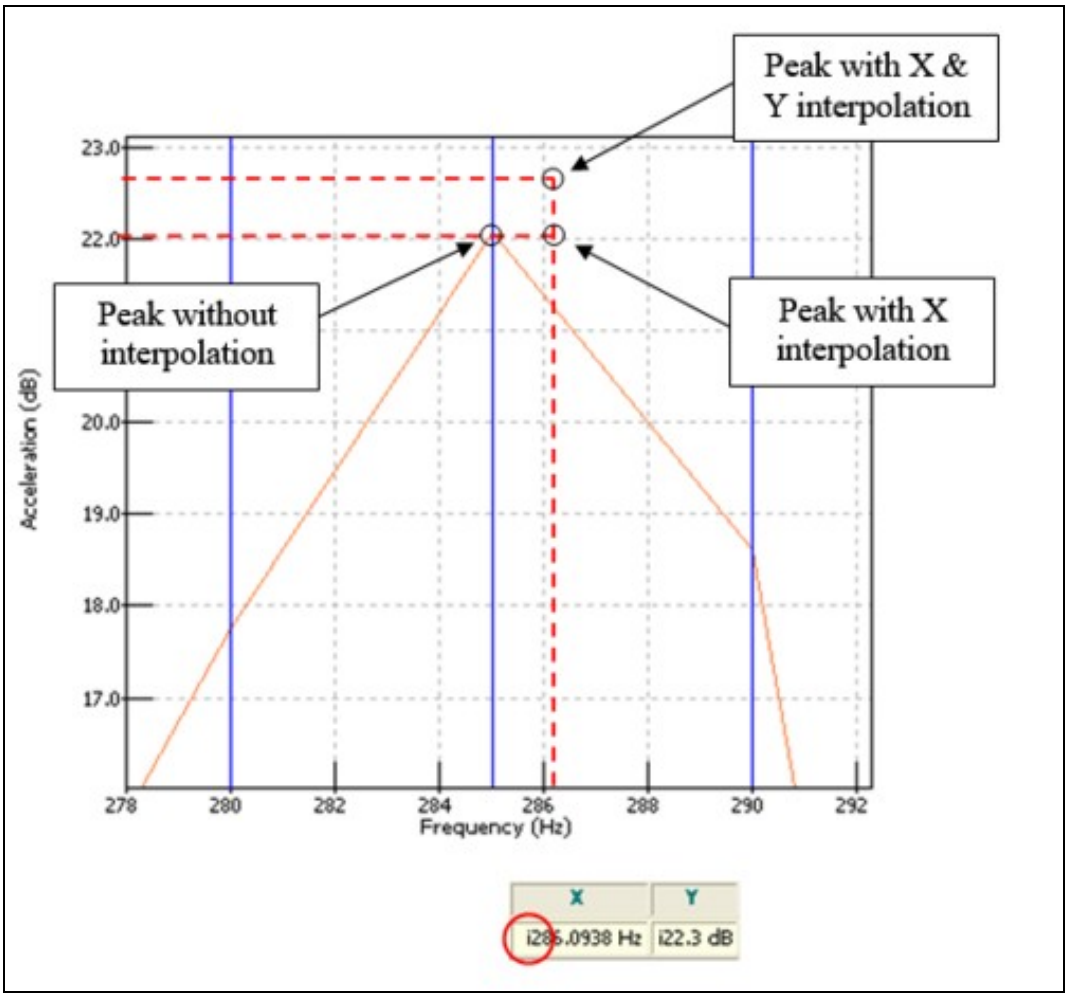
When available, a free marker can be placed and moved within a graph to track specific values. A label can be associated with each free marker.

Right clicking on a free maker displays menu including "Properties", which opens edit free maker dialog box.



- Label: The label associated with the marker. The user can enter directly a name or pick ?display current position? to display automatically the coordinates of the selected point.
- Position: The X position of the current marker. The position value can be fixed by entering the new value in this box.

- Interpolation: This setting selects the interpolation of values displayed in the marker table.
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.



When the interpolation function is active, the interpolated value is preceded by a "i".

Note: the interpolated values of free markers will be available only if the free marker is placed on a peak. The peak detection criteria are the same as the peak marker adjusted in the User preferences.

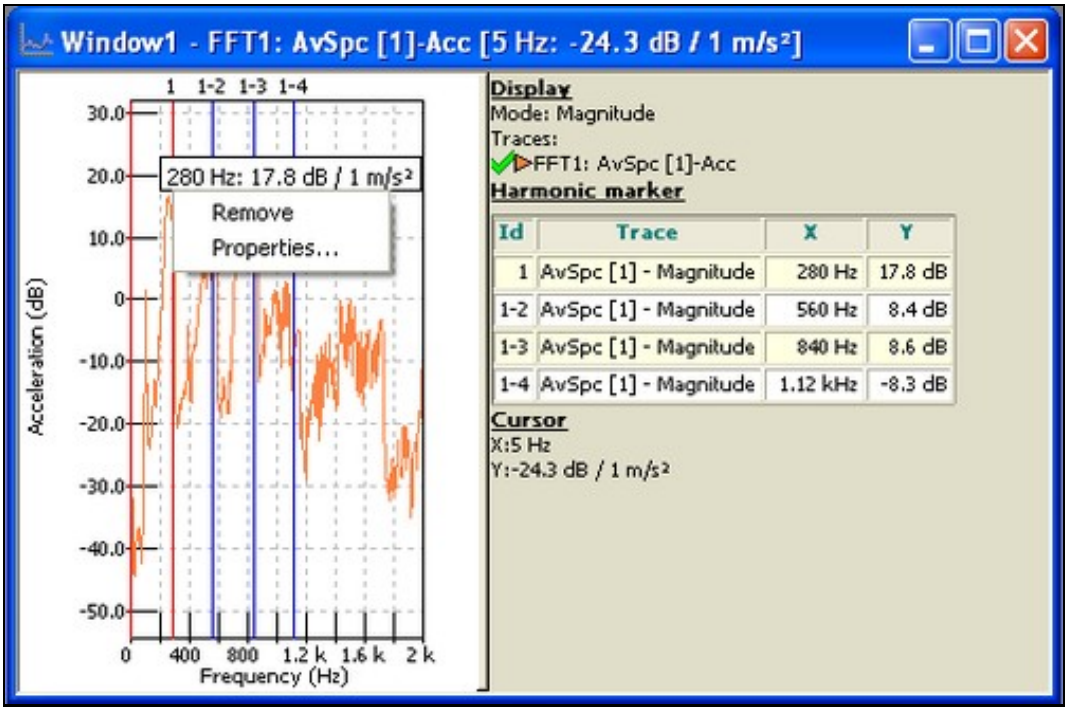
- Apply to
- All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
- Associated to: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.

99.1.1.1 Harmonic marker

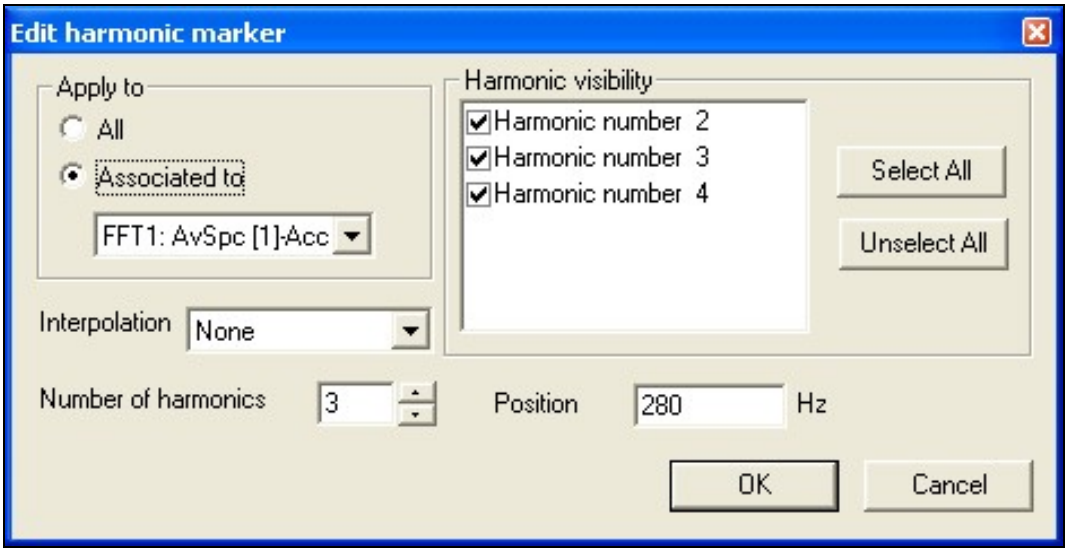
- 

Switch the cursor to deposit a set of harmonics in the click location. The harmonic marker can be positioned everywhere in a spectra and waterfall X/Y sections.

Computes and displays harmonic values for the selected trace(s).

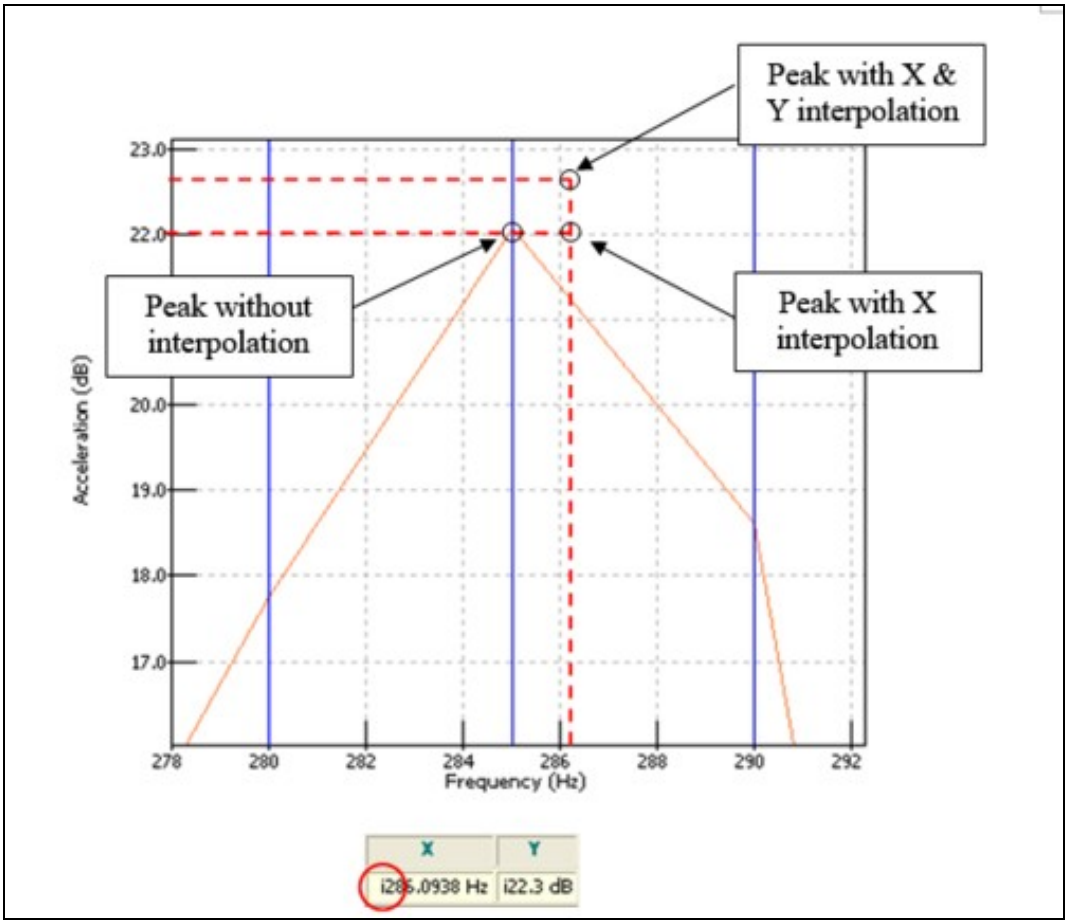


Harmonic marker properties



- Harmonic visibility: Harmonics checklist. Only checked harmonics will be displayed.

- Interpolation
- None: no interpolation applied.
- X: x interpolation is active.
- X&Y: x and y interpolations are active.



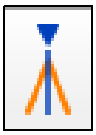
When the interpolation function is active, the interpolated value is preceded by a "i".

Note: the interpolated values of harmonic markers will be available only if the harmonic marker is placed on a peak.

- Apply to
  - ♦ All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
  - ♦ Associated to: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.

99.1.1.2 Peak marker

•

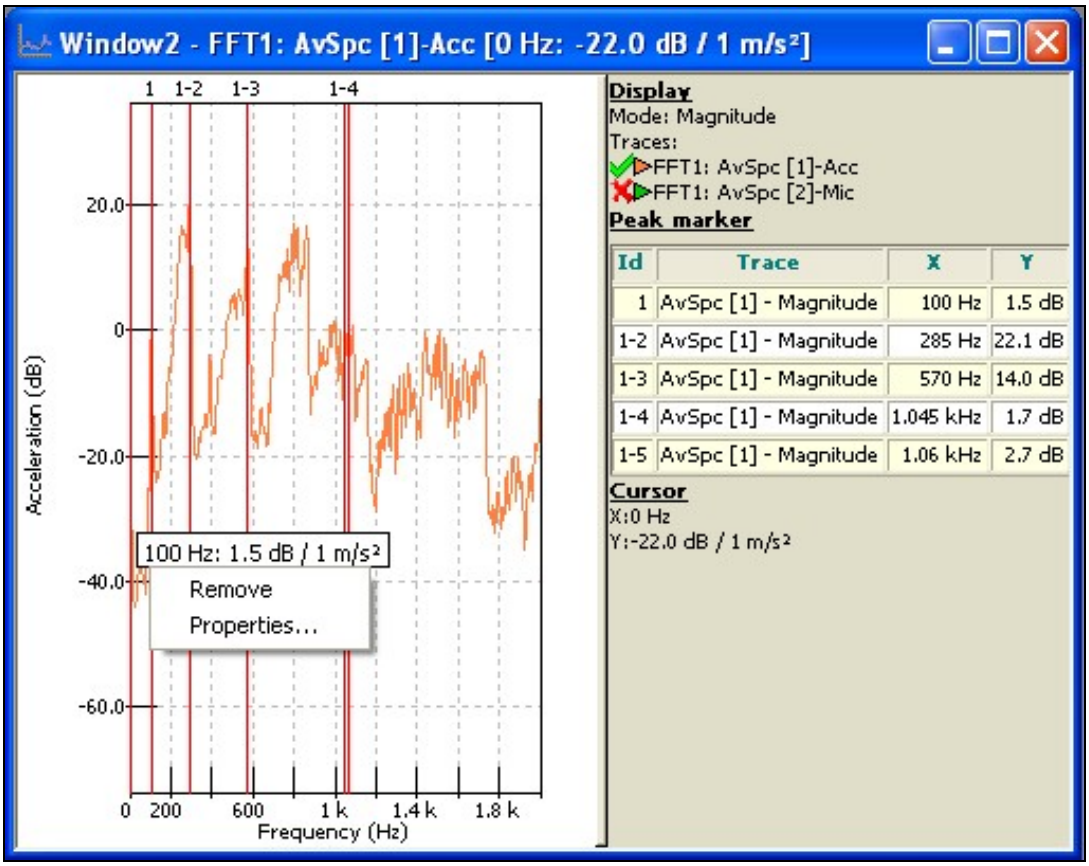


Switch the cursor to add a set of peak detection markers in the clicked graph. The peak marker detects automatically the peaks in the spectra and waterfall X/Y sections.

Computes and displays peak values for the selected trace(s).

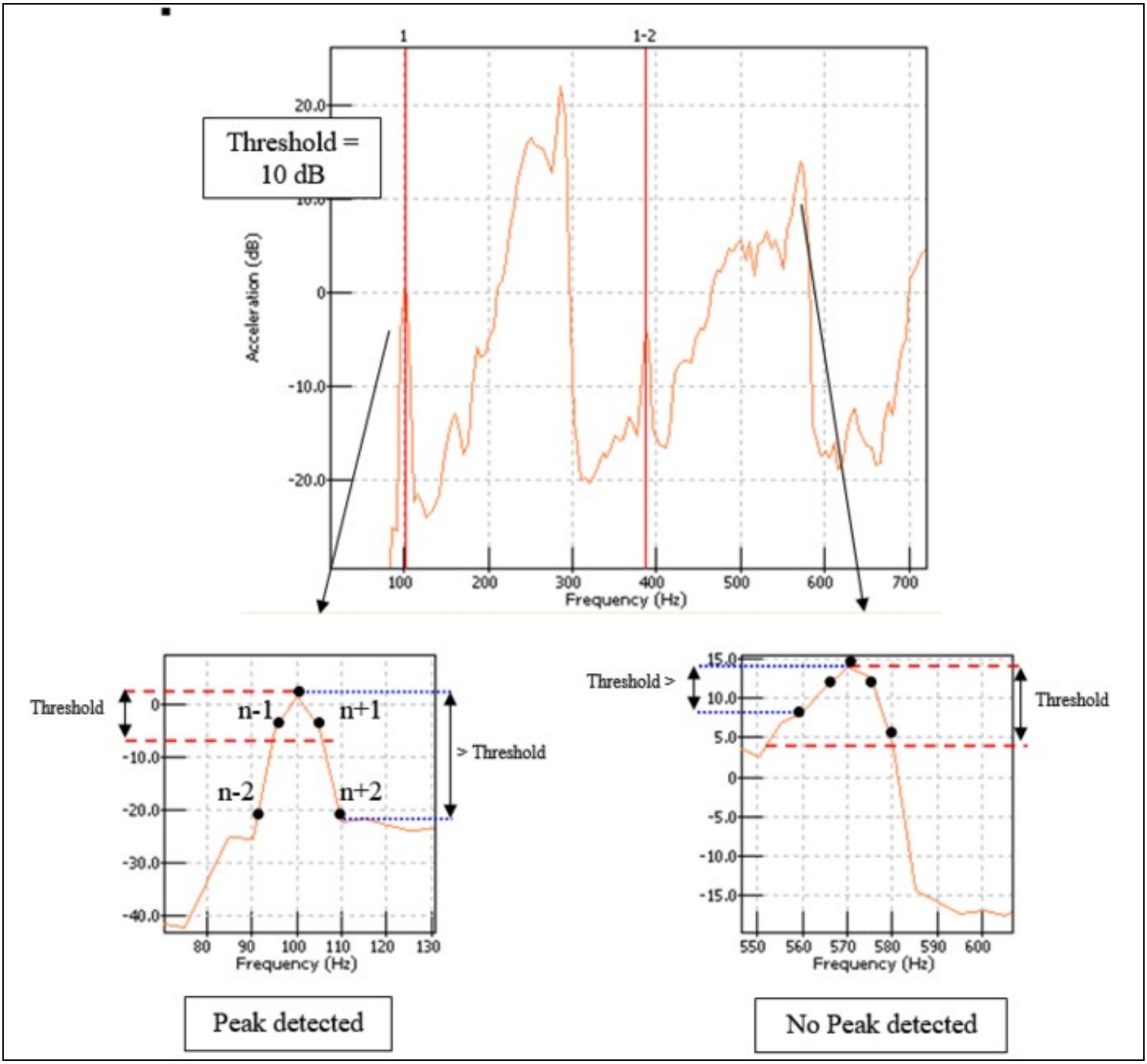
A spectrum line is detected as a peak if two following conditions are matched:

- The 2 adjacent spectrum line levels (N-1, N+1) are lower than the central spectrum line one?s
- The 2 following adjacent spectrum line levels (N-2, N+2) are lower than the central spectrum level minus the peak threshold

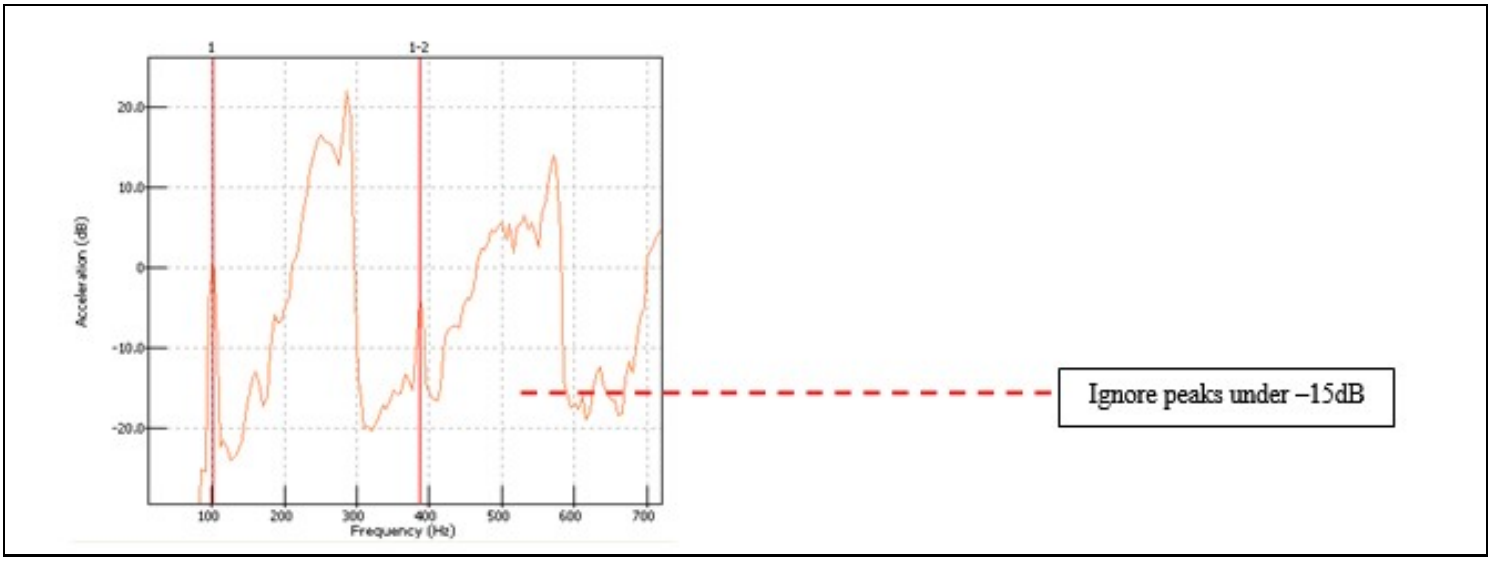


Peak marker properties

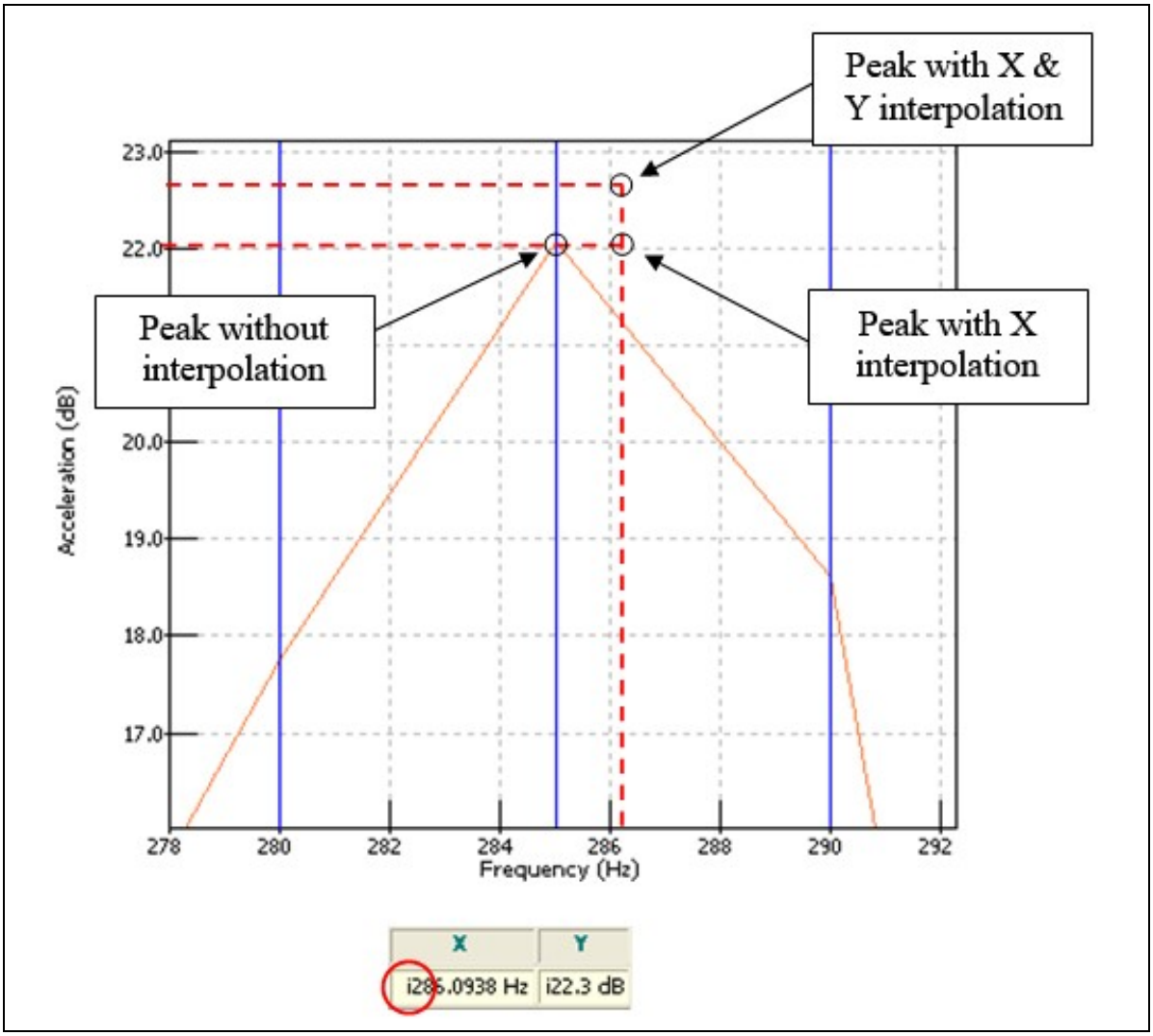
- Threshold: In the example below, the "Threshold" is 10 dB.



- Ignore under: Does not display the detected peak if the peak is under this value. In the example below, the "ignore under" value is ?15 dB.



- Number of peak: Number of peaks to be displayed. That will first display the greatest peaks.
- Interpolation
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.



When the interpolation function is active, the interpolated value is preceded by an "i".

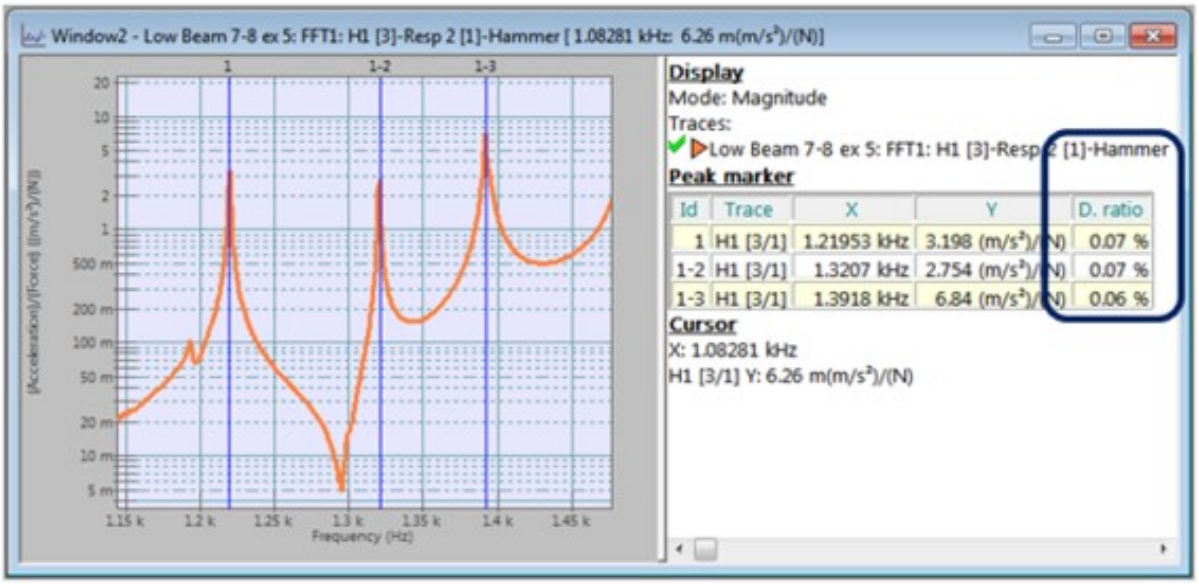
- Apply to
- All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
- Associated with: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.
- Damping ratio damping ratio is calculated for each detected peak. The calculation is based on the Half-power-band-width method, where DR is the damping ratio:

$$\Delta\omega = bandwitdh@(peak_amplitude \quad \frac{1}{\sqrt{2}}) \qquad DR = \frac{\Delta\omega}{2\omega_R}$$

$$\omega_R = peakfrequency$$

The calculation of the damping factor is activated through the marker properties or preferences.

When it is activated an additional column is added in the corresponding marker table. The marker table can be saved in an MS Office document or simply copied and pasted.



Warning, using nonhomogeneous weighting windows (i.e.: equivalent noise bandwidths are not the same) on FRF channels leads to incorrect peak interpolation and damping results.

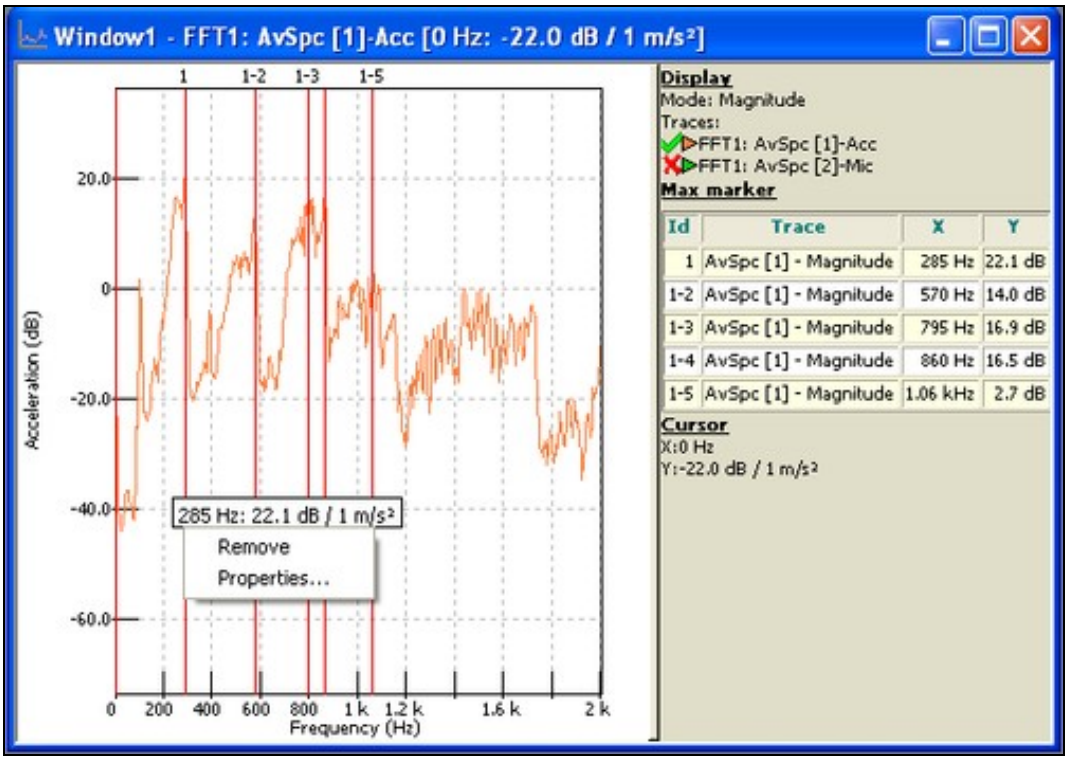
99.1.1.3 Max marker

- 

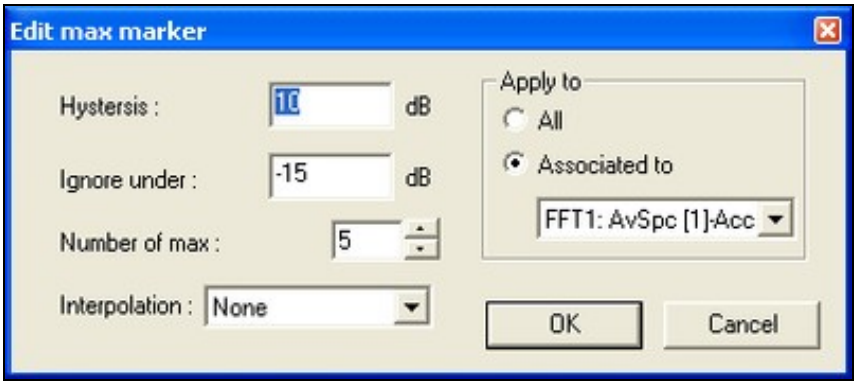
Switch the cursor to add a set of maximum detection markers in the clicked graph. The max marker detects automatically the maximum in the spectra and waterfall X/Y sections.

Computes and displays max values for the selected trace(s).

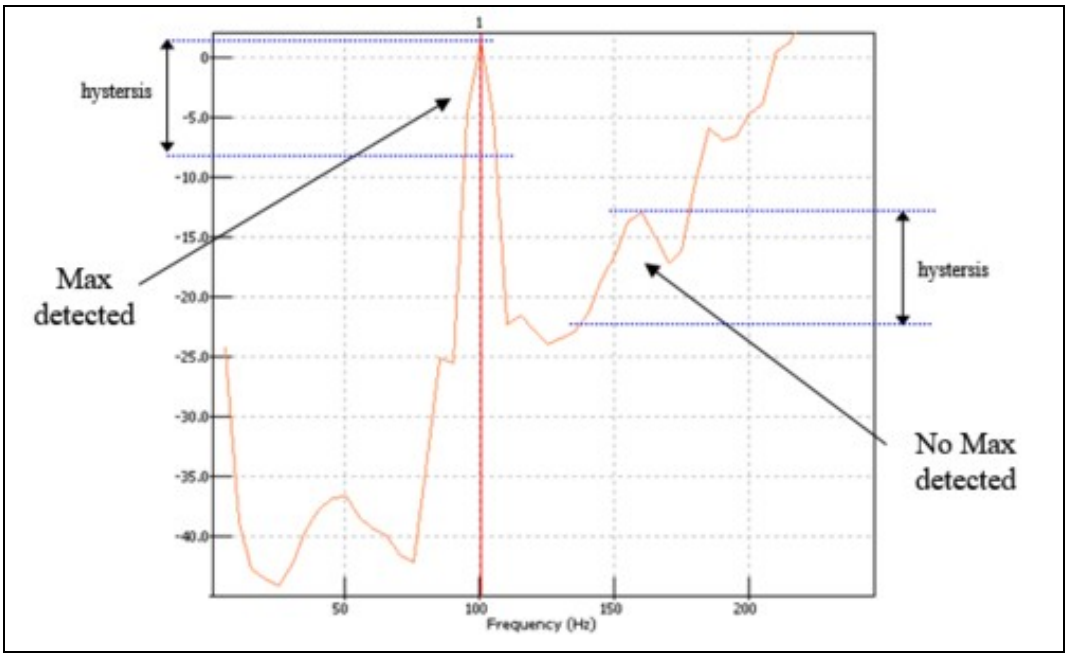
A maximum is defined as a local maximum such that the variation in size of spectral density of ray, in relation to other local maximum surrounding it, is greater than a set threshold



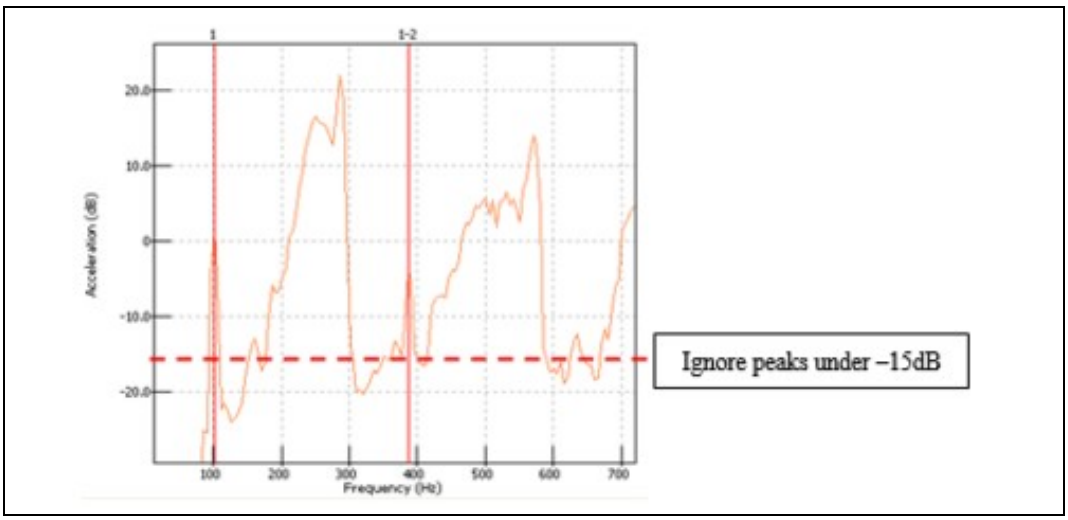
Max marker properties



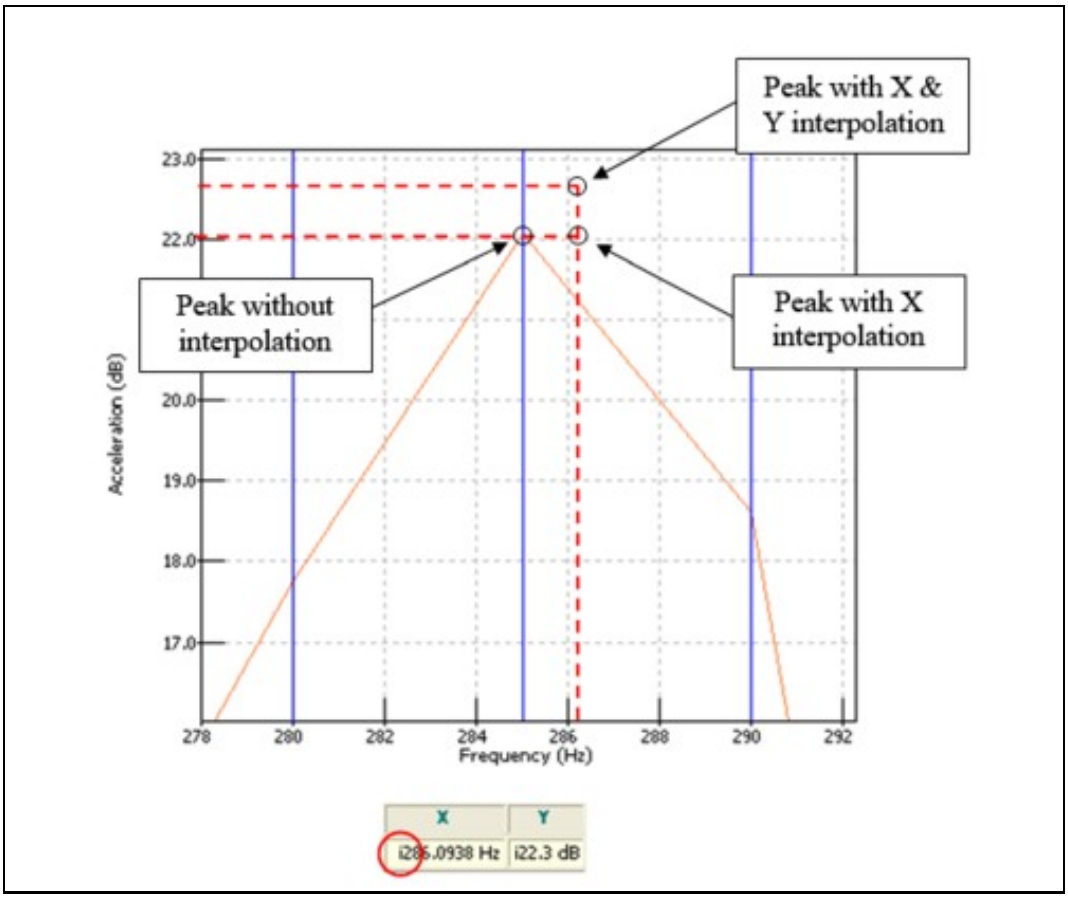
- Hystersis



- Ignore under: Does not display the detected peak if the peak is under this value. In the example below, the "ignore under" value is ?15 dB.



- Number of max: Number of max to be displayed. That will first display the greatest max.
- Interpolation
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.



When the interpolation function is active, the interpolated value is preceded by a "i".

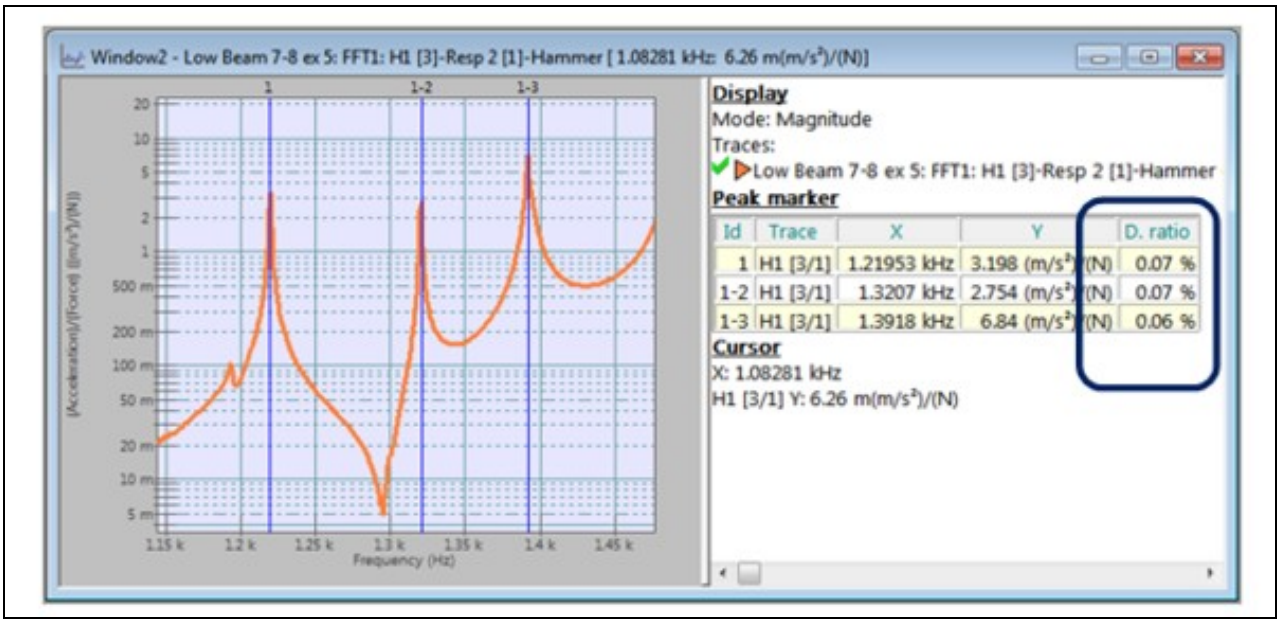
- Apply to
- All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
- Associated to: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.
- Damping ratio damping ratio is calculated for each detected Maximum. The calculation is based on the Half-power-band-width method, where DR is the damping ratio:

$$\Delta\omega = bandwitdh@(peak_amplitude \quad \frac{1}{\sqrt{2}}) \qquad DR = \frac{\Delta\omega}{2\omega_R}$$

$$\omega_R = peakfrequency$$

The calculation of the damping factor is activated through the marker properties or preferences.

When it is activated an additional column is added in the corresponding marker table. The marker table can be saved in an MS Office document or simply copied and pasted.



Warning, using nonhomogeneous weighting windows (i.e.: equivalent noise bandwidths are not the same) on FRF channels leads to incorrect peak interpolation and damping results.

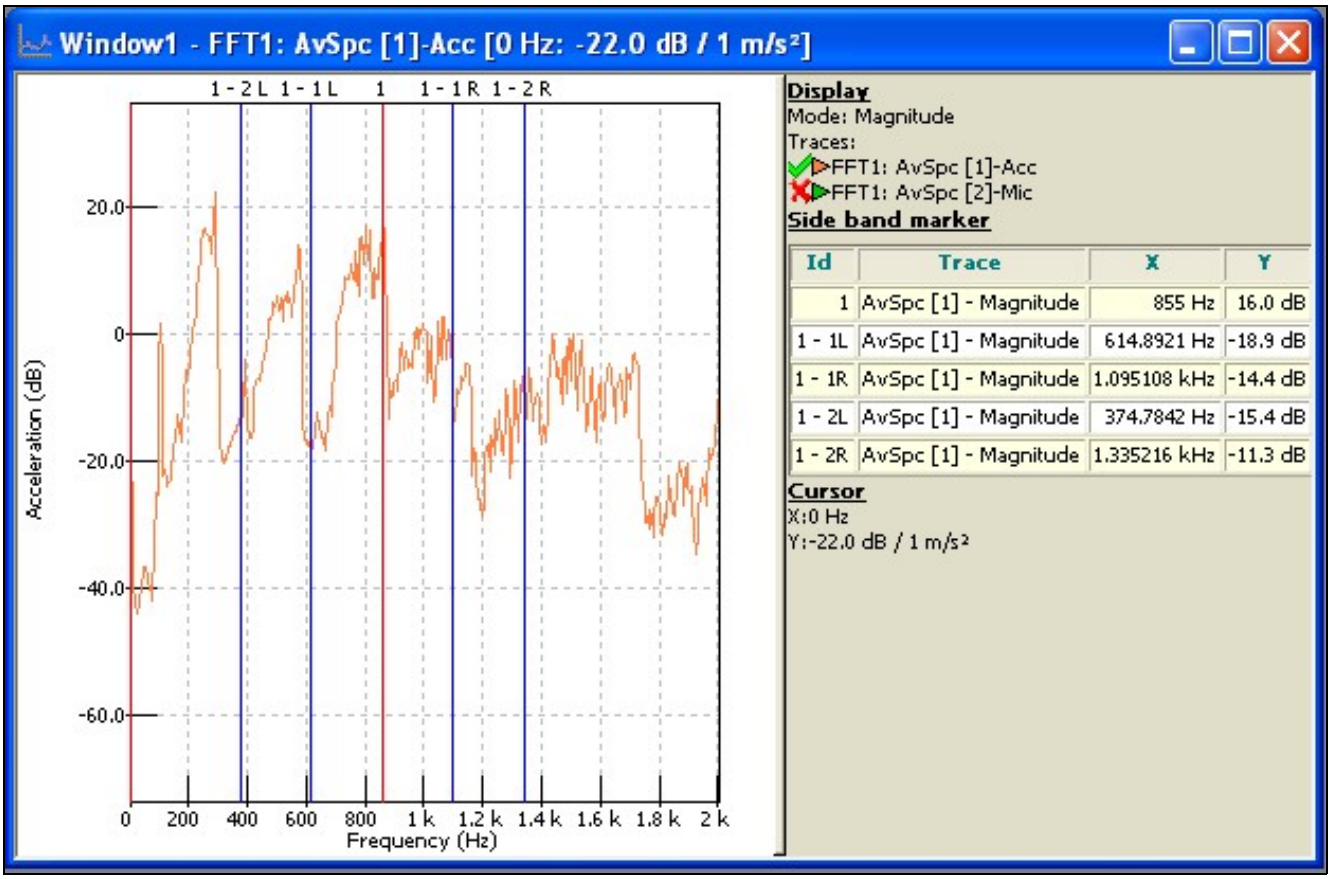
99.1.1.4 Side band marker

- 

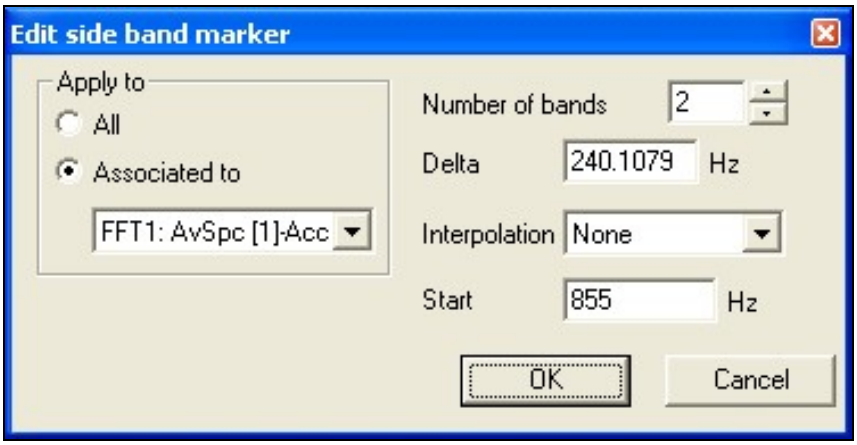
Switch the cursor to add a side band marker at the clicked location. The Sideband marker can be positioned everywhere in a spectra and waterfall X/Y sections

Display values for a central frequency and side frequencies (left and right) defined by a delta value.

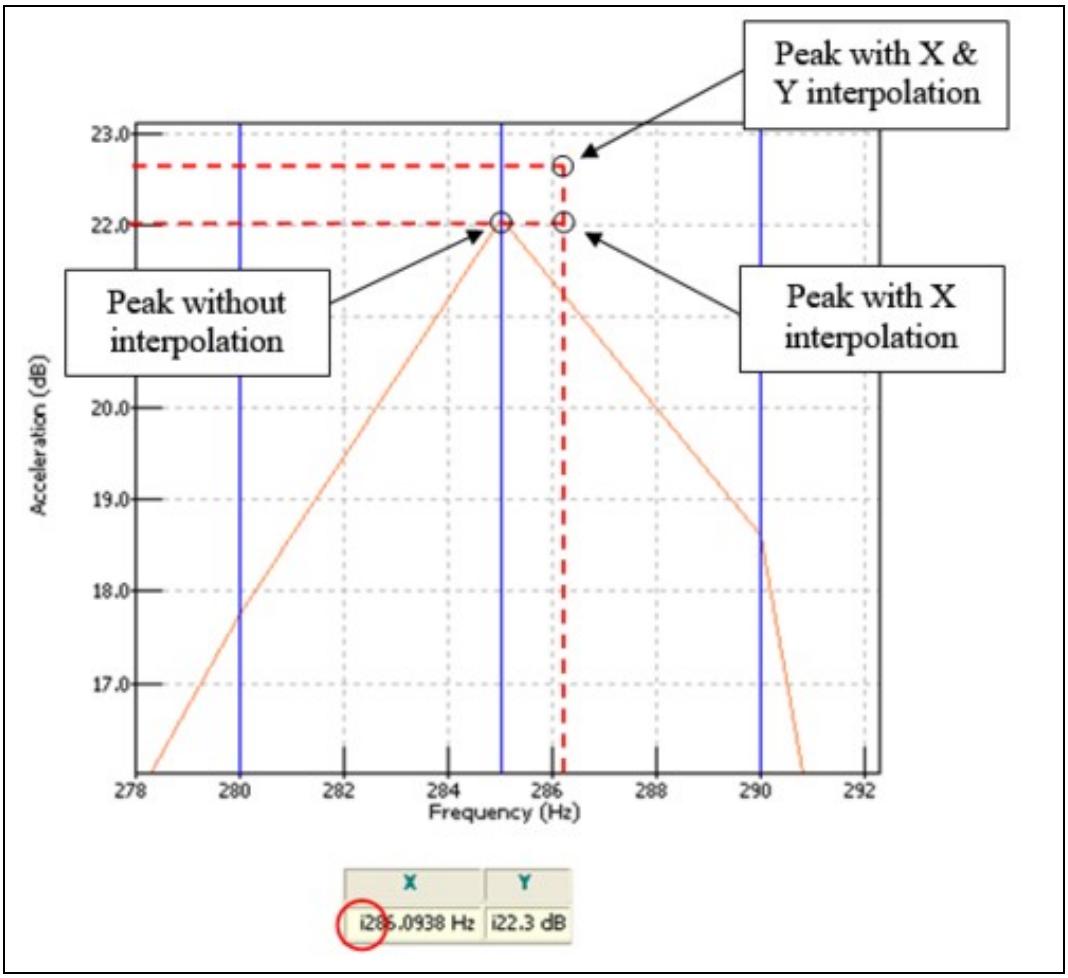
The management of side band markers selects the assumed porter and the first side band of modulation. The position of the cursor during the selection of the porter or the first side band is previously interpolated on the frequency axis, taking into account the frequency response of the weighting window used if the Interpolation setting allows this



Side band marker properties



- Start: Central value.
- Delta: Range between 2 side frequencies.
- Number of bands: Defines the number of bands (on the left and on the right).
- Interpolation
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.


Peak with X & Y interpolation
Peak without interpolation
Peak with X interpolation
Acceleration (dB)
23.0
22.0
20.0
19.0
18.0
17.0
278
280
282
284
286
288
290
292
Frequency (Hz)
X
Y
i286.0938 Hz
i22.3 dB

When the interpolation function is active, the interpolated value is preceded by a "i".

Note: the interpolated values of free markers will be available only if the side band marker is placed on a peak.

- Apply to
  - ♦ All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
  - ♦ Associated with: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.

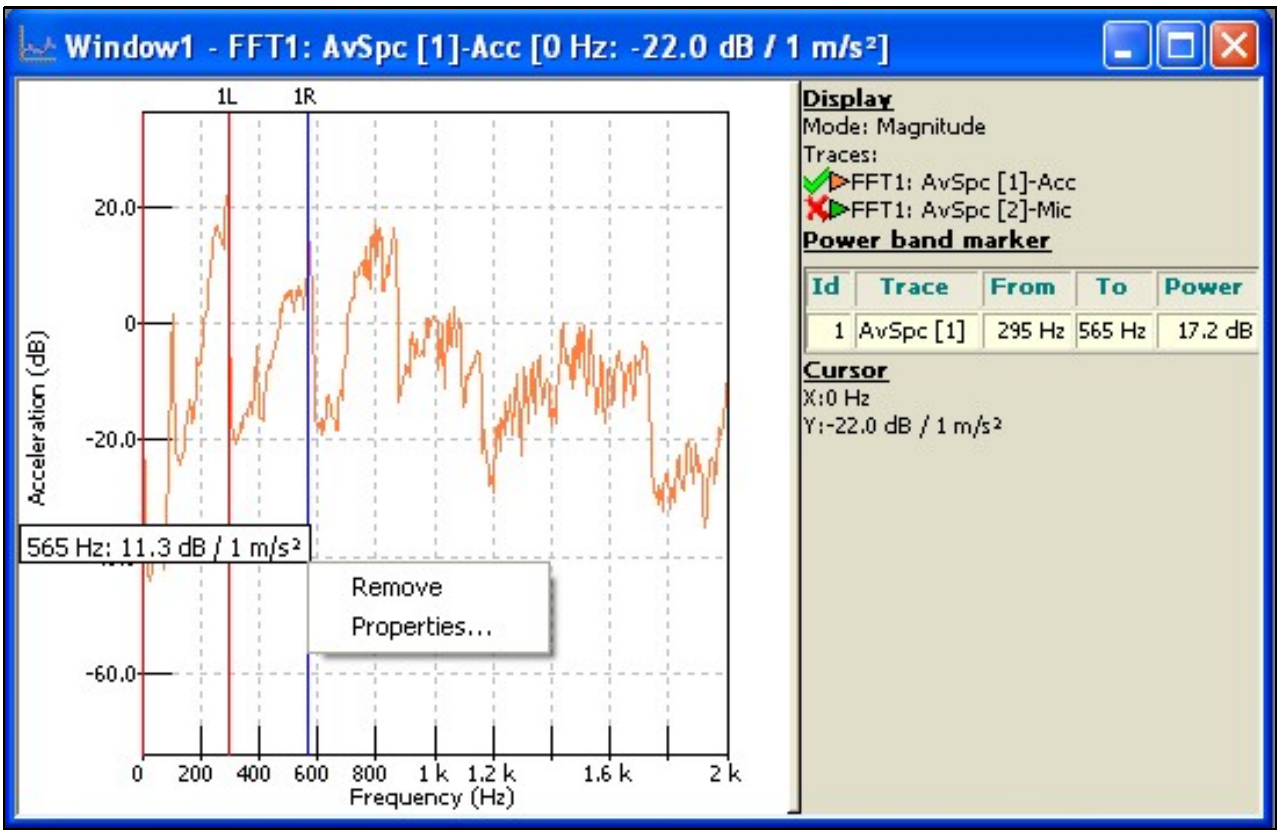
99.1.1.5 Power band marker

-

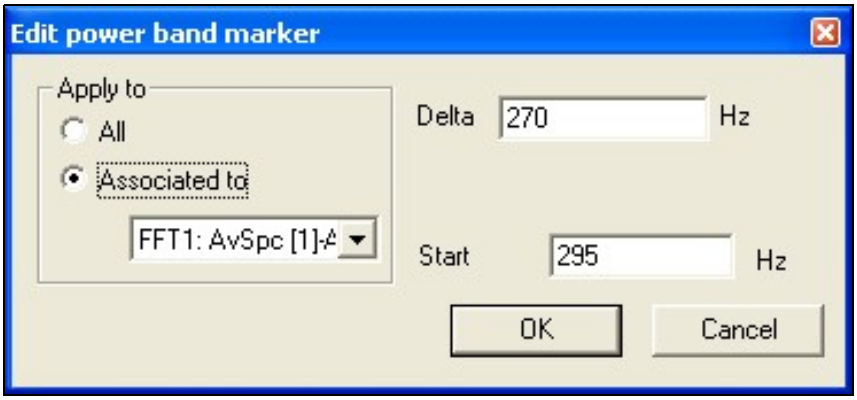


Switch the cursor to add a power band marker at the clicked location. The power-band marker can be positioned everywhere in a spectra and waterfall X/Y sections. It extracts the RMS power in the selected band taking in account the equivalent bandwidth of the weighting window.

Computes and displays power in signal range defined by start position and delta.



Power band marker properties



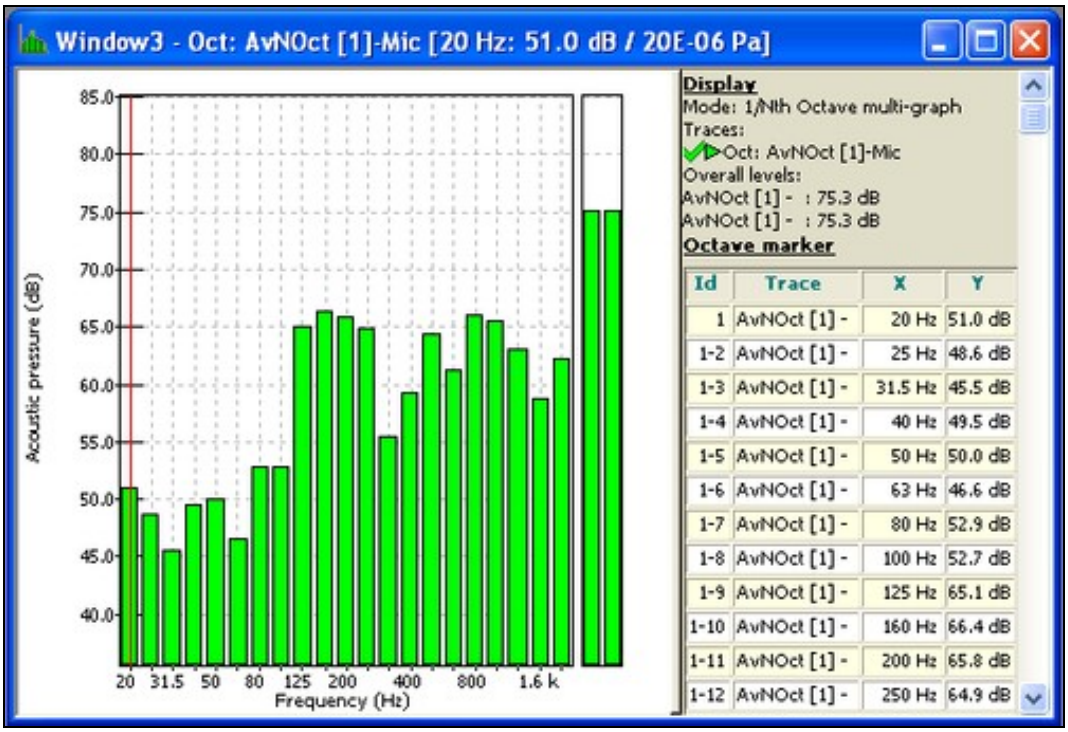
- Start: Start value for the power band computation.
- Delta: Bandwidth used for the computation.
- Apply to
    - All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
    - Associated with: the marker is associated to only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.

99.1.1.6 1/n Octave data marker

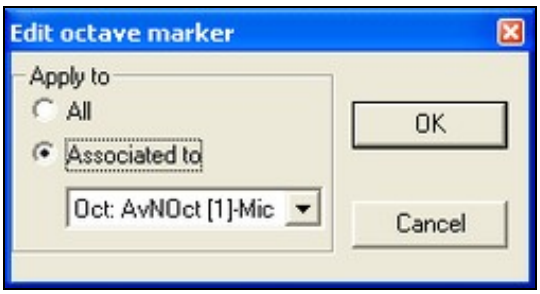


Switch the cursor to add a 1/n octave data marker at the clicked graphs. The 1/n octave data marker can be positioned in CPB spectra and waterfall X/Y sections of the same type. It extracts the list of the band levels in db or linear units into the infotrace.

Display all band values.



Octave marker properties



- Apply to
  - ♦ All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
  - ♦ Associated with: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.

99.1.1.7 Kinematic markers

-

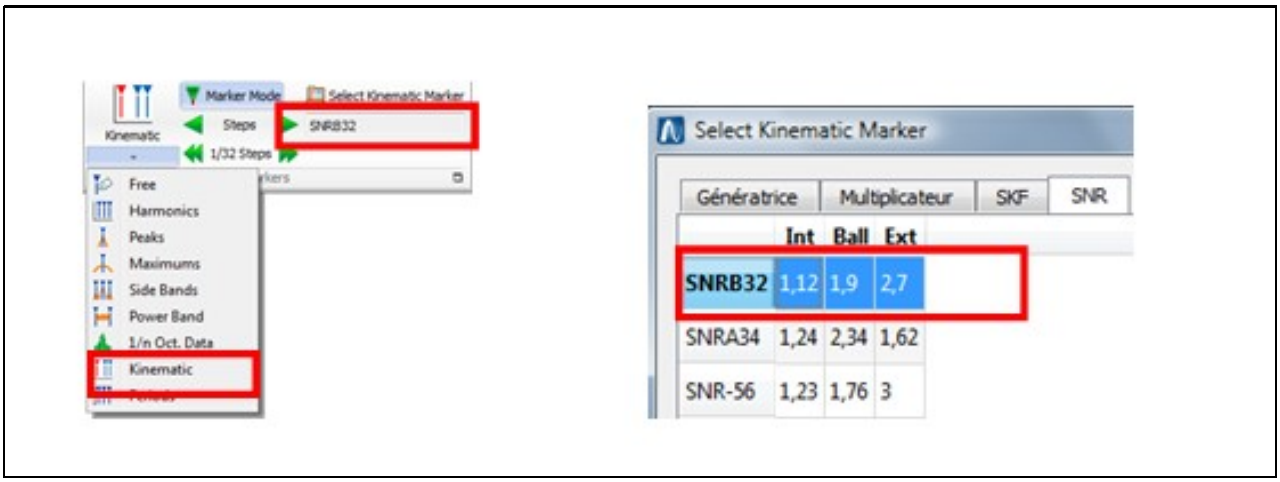


Switch the cursor to deposit a set of harmonics in the click location. The harmonic marker can be positioned everywhere in a spectra and waterfall X/Y sections.

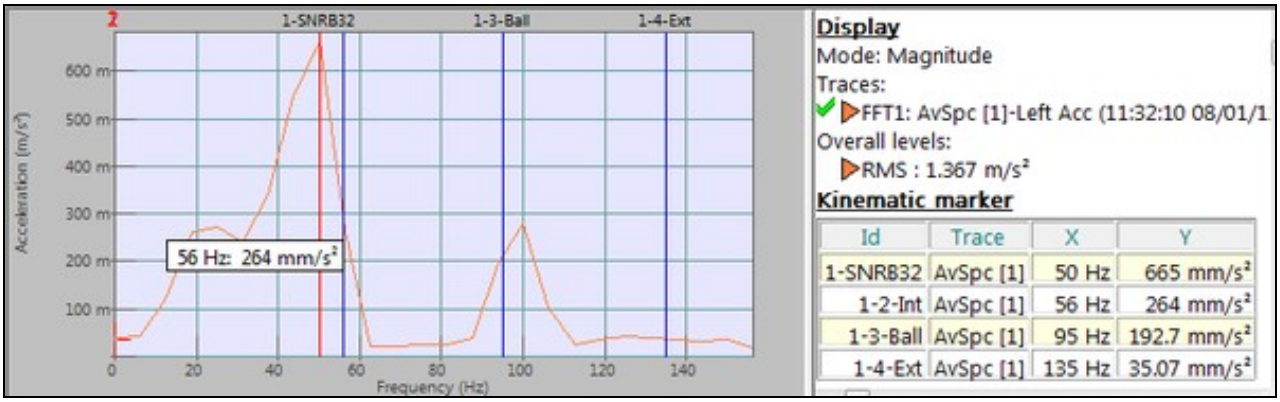
The Kinematic marker helps identifying the frequencies (or orders) which match the various rotating speed in machineries. These frequencies are linked with a fundamental one (usually the main shaft rotating frequency) by fixed ratio. These ratios depend on the machinery kinematics.

Kinematic marker fits ideally the diagnostics on bearing, gear train and belt/chain systems by helping the identification of the defects? source.

To add a kinematic marker to a window, select Kinematic from the *Display/graph/Markers* left button.

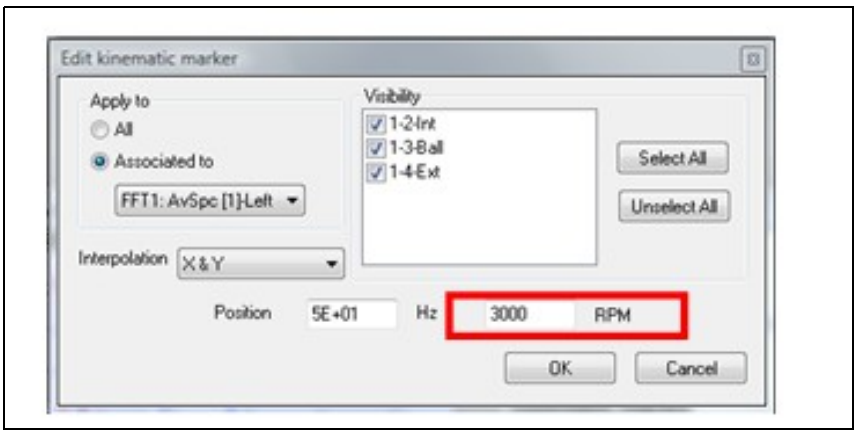


Then it becomes possible to select one marker from the list. Click *Select Kinematic Marker* button to open the selection dialog. Select one line from the table of the current tab and close the dialog box. The corresponding marker will be applied double clinking on a spectral graph.



This type of marker may be manipulated from any of the sub-marker lines.

Kinematic marker properties In the kinematic marker properties (Right click on it or through marker manager) the fundamental frequency may be adjusted in Frequency unit or RPM.



'*Kinematic marker Description* The Kinematic descriptions for these markers are taken from *.csv* (or Excel?) files.



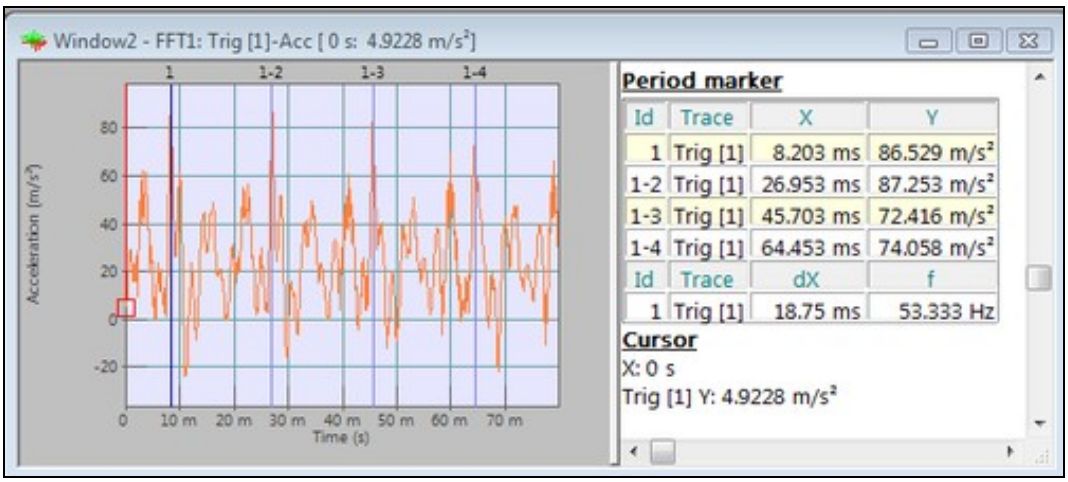
The files may be modified to adjust the kinematics ratio. The files content are read every time the select kinematic marker is opened. No need to exit the NVGate software for update.

Each file can contain unlimited markers and group of markers. NVGate handle simultaneously multiple kinematic descriptor files. The descriptor files have to be in the following directory (default):*C:\OROS\NVGate data\Markers\Kinematic.*

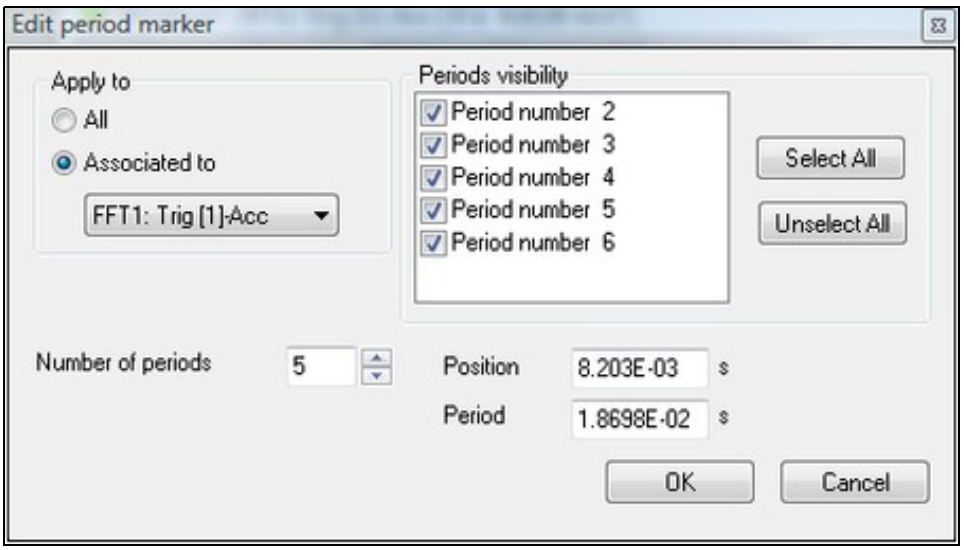
The kinematic marker operations are similar to the harmonics one.

99.1.1.8 Periodic marker

- 
Switch the cursor to add a periodic marks at the clicked location. The period marker can be positioned trigger blocks. Operates like an harmonic marker but in the time domain. Computes and displays periodic values for the selected trace(s).The periodic allows identifying the periodicity and frequency of repeated phenomena identified into time series graphs



Periodic marker properties



- Period visibility: checklist. Only checked periods will be displayed.

- Apply to
    - All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
    - Associated to: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.

99.1.1.9 Record Marker

-  Record marker (CTRL+M) Using this shortcut while the analyzer is recording, add record marker to the signal. If there is a recording window, the maker is displayed. During the recording, a comment can be added to the record marker, via the properties dialog box.

The record marker is available from the *Analysis\Record* group. *See Analysis tab.*

99.1.2 Copy marker table

Available in Infotrace area. Used to copy marker data to the clipboard. The data is formatted to be pasted easily in Word® or Excel®.

Example of result with this command:

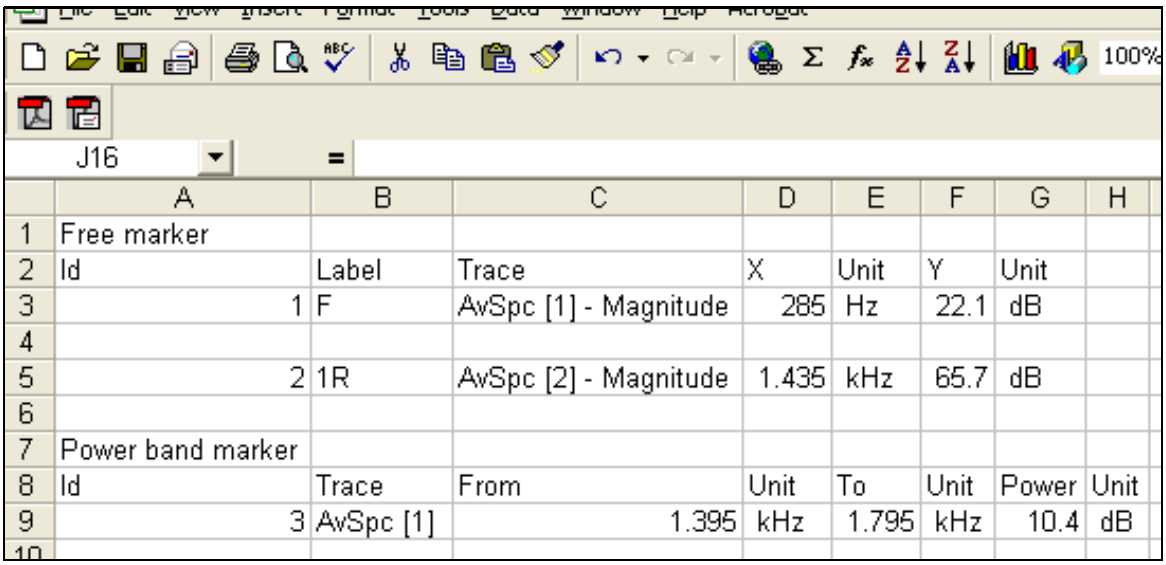
For Word®:

Free marker

Id Label Trace X Unit Y Unit

1 Marker Sig [1] 0.00141 s 5.453 V

For Excel®:



J16 =

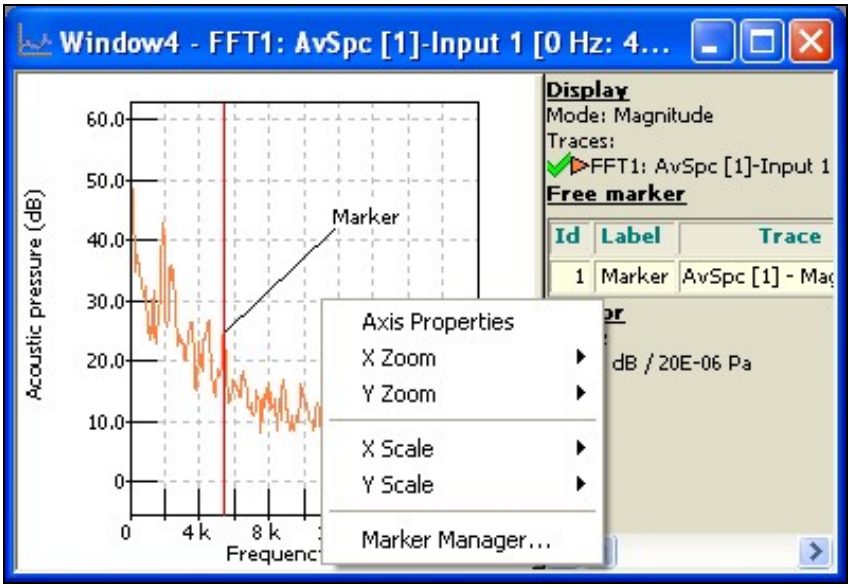
	A	B	C	D	E	F	G	H
1	Free marker							
2	Id	Label	Trace	X	Unit	Y	Unit	
3	1	F	AvSpc [1] - Magnitude	285	Hz	22.1	dB	
4								
5	2	1R	AvSpc [2] - Magnitude	1.435	kHz	65.7	dB	
6								
7	Power band marker							
8	Id	Trace	From	Unit	To	Unit	Power	Unit
9	3	AvSpc [1]	1.395	kHz	1.795	kHz	10.4	dB

99.1.3 Marker table in reports

The marker table can be droped in the report template. See NVGate Report for details.

99.1.4 Marker manager

Gives the list of all the markers in the window, except record markers. In this dialog box, any window marker can be removed or modified.





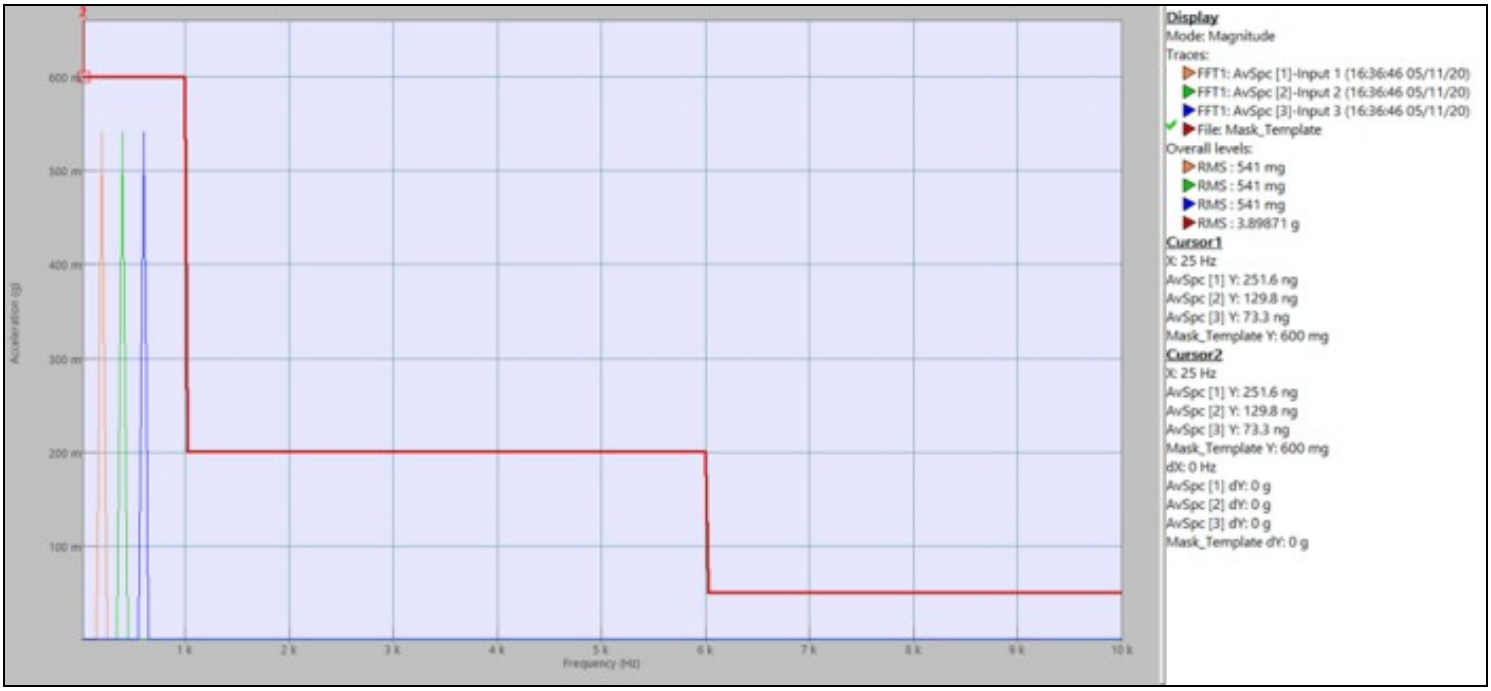
- **Select All:** Checks all the items of the list
- **Unselect All:** Uncheck all the items of the list.
- **Remove:** Removes all checked markers from the window
- **Properties:** Displays the properties dialog of the active marker of the list.

100 NVGate Mask And Alarm

The Masks (also called *Mask*) are used to compare a measured result with a template.

100.1 Tutorial

Here is an example of a template plotted over the FFT spectrum for three inputs.



This tutorial will show you how to use a mask and an alarm to start the recording of 3 inputs when the FFT spectrum of the first input crosses the mask. To do that, we will need a to use a mask, an alarm and a macro. The setup must contain three input channels connected to the recorder and the FFT plugins. The average spectrum must be displayed. The starting event of the recorder must be set on "Manual Trigger".

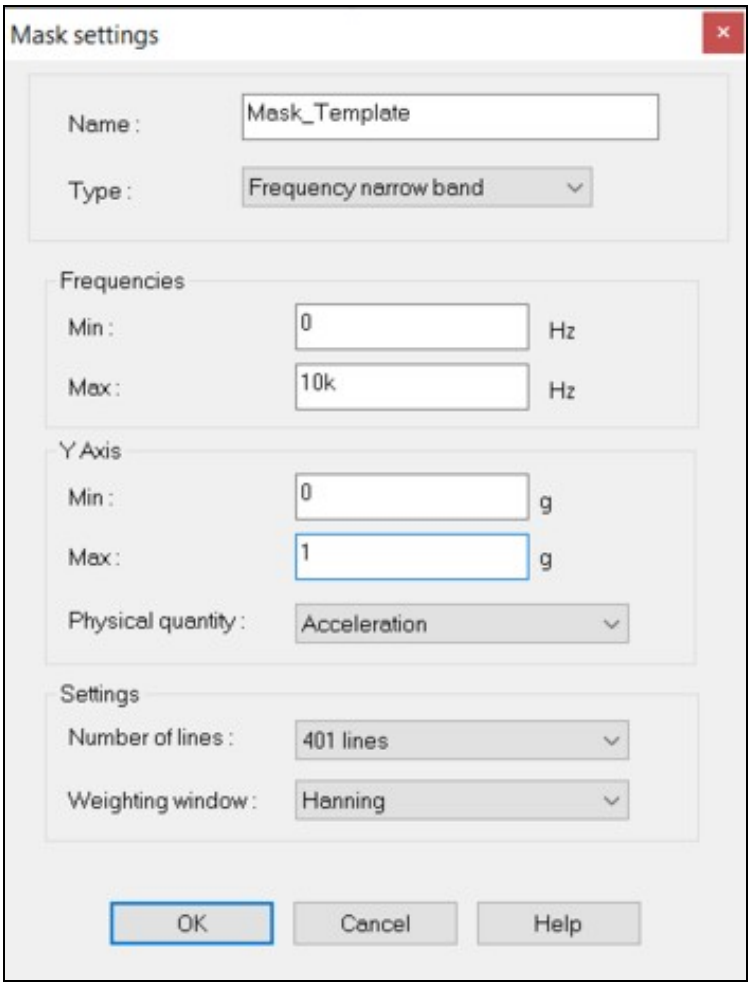
100.1.1 Setup a mask

The Mask group can be found in the "Automation" tab of the NVGate Ribbon.

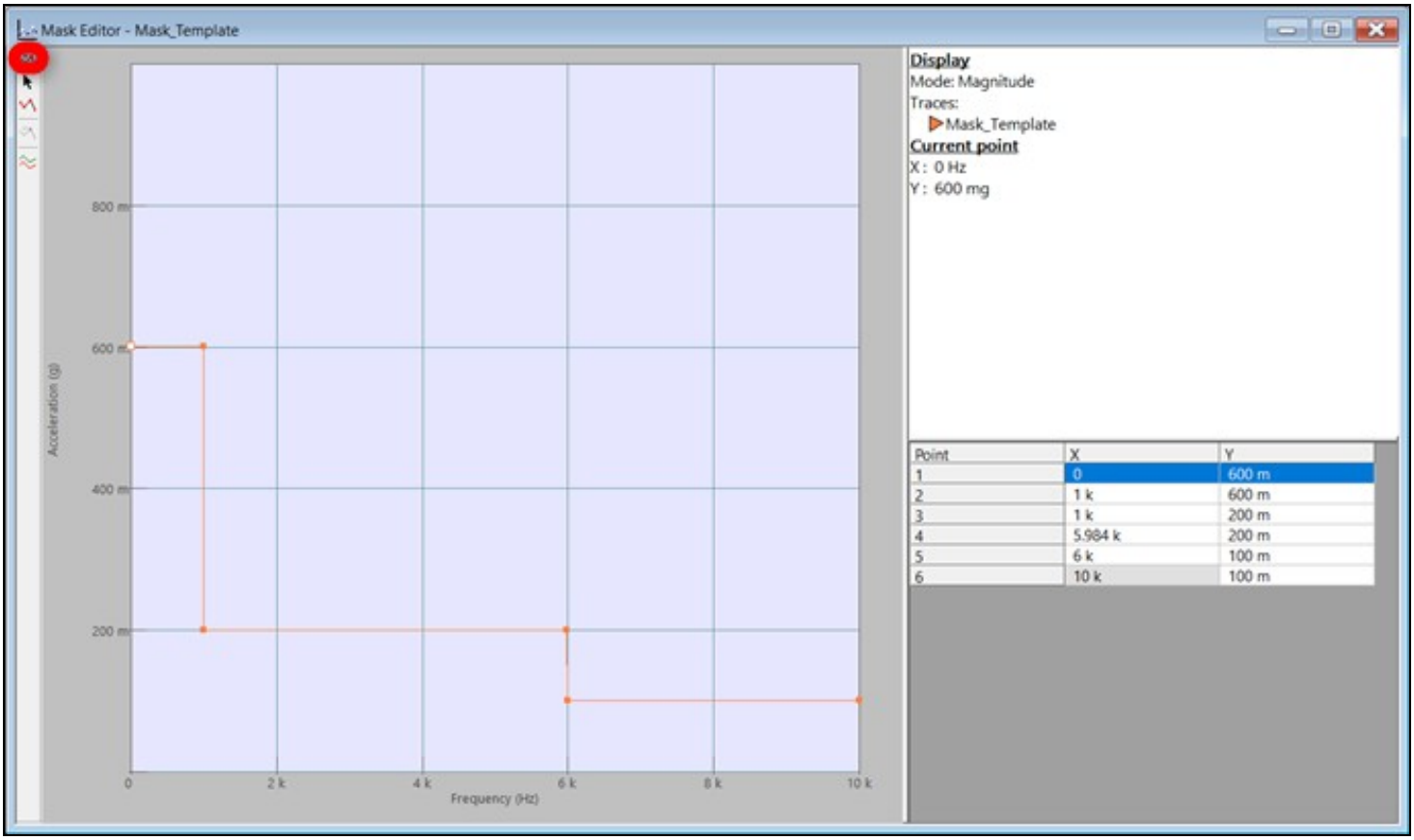
To create a new mask, select "New" :



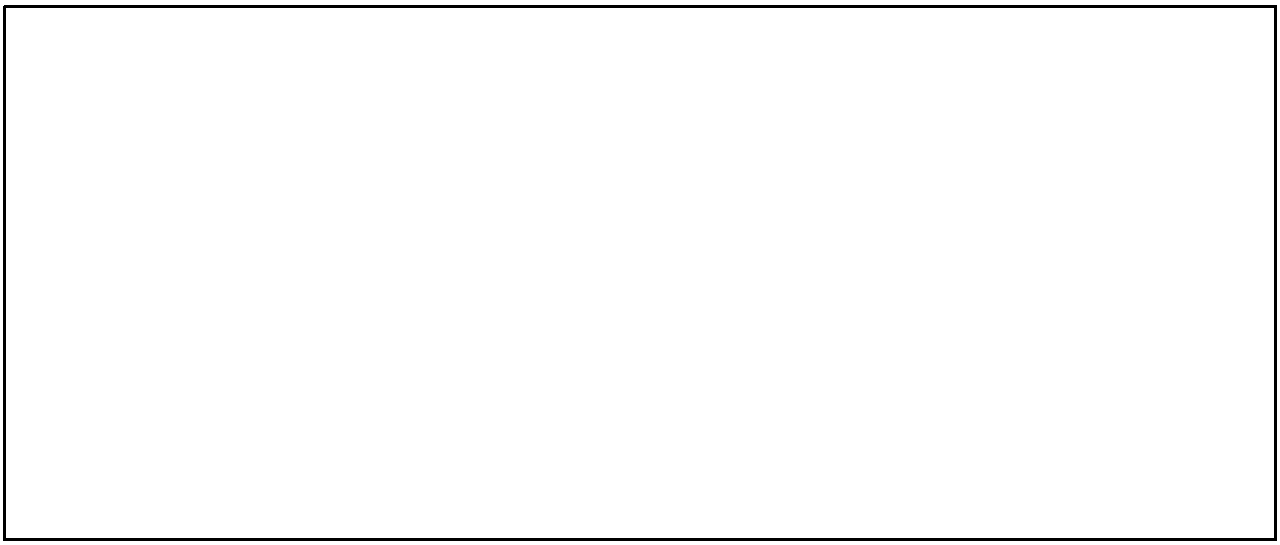
And set the parameters of your mask :


Mask settings
Name :
Mask_Template
Type :
Frequency narrow band
Frequencies
Min :
0
Hz
Max :
10k
Hz
Y Axis
Min :
0
g
Max :
1
g
Physical quantity :
Acceleration
Settings
Number of lines :
401 lines
Weighting window :
Hanning
OK
Cancel
Help

You can then draw the template by adding points with the mouse and adapt the coordinates in the info-trace :

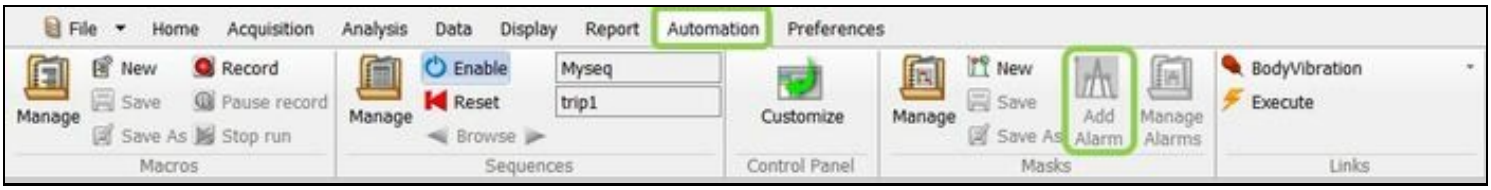


Once you close the window, the mask is then created under the project in the project manager and can be dropped into the result graph, here the FFT spectrum :

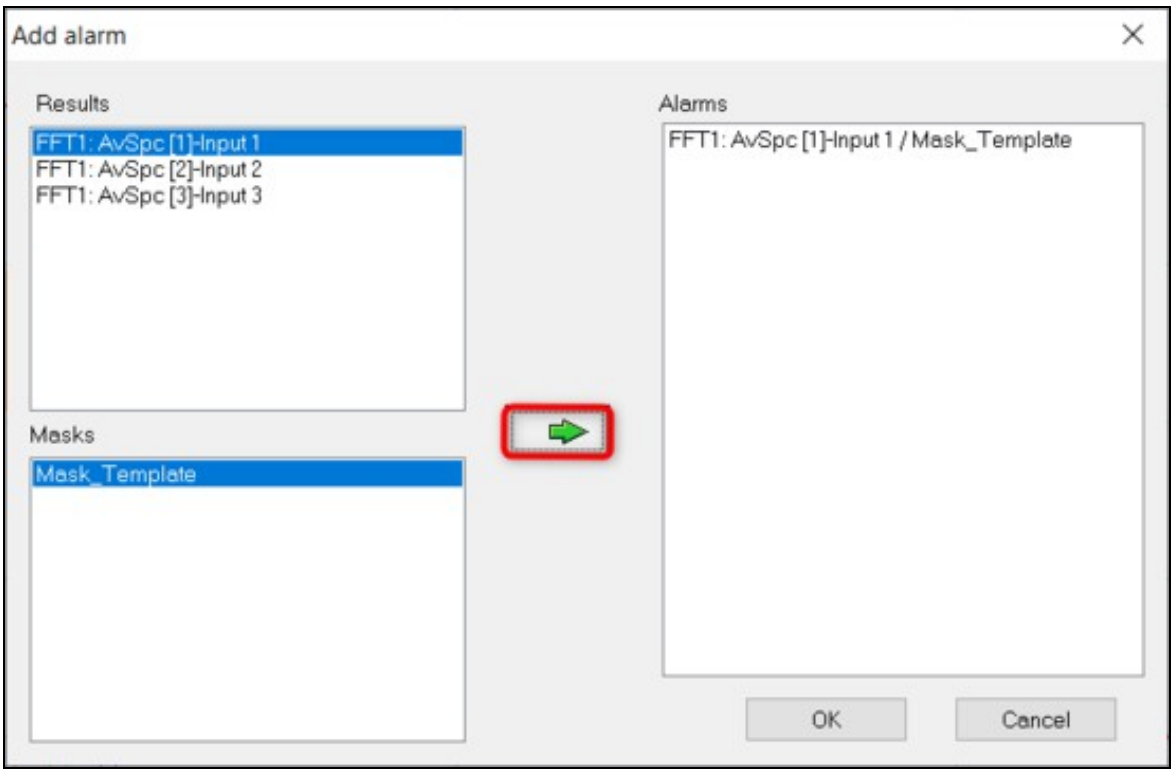


100.1.1.1 Add an Alarm

Once you added the mask on the graph, you can create an alarm. The alarm will then allow you to use as an event in a Macro.
To create the alarm, select "Add Alarm" from the NVGate ribbon :

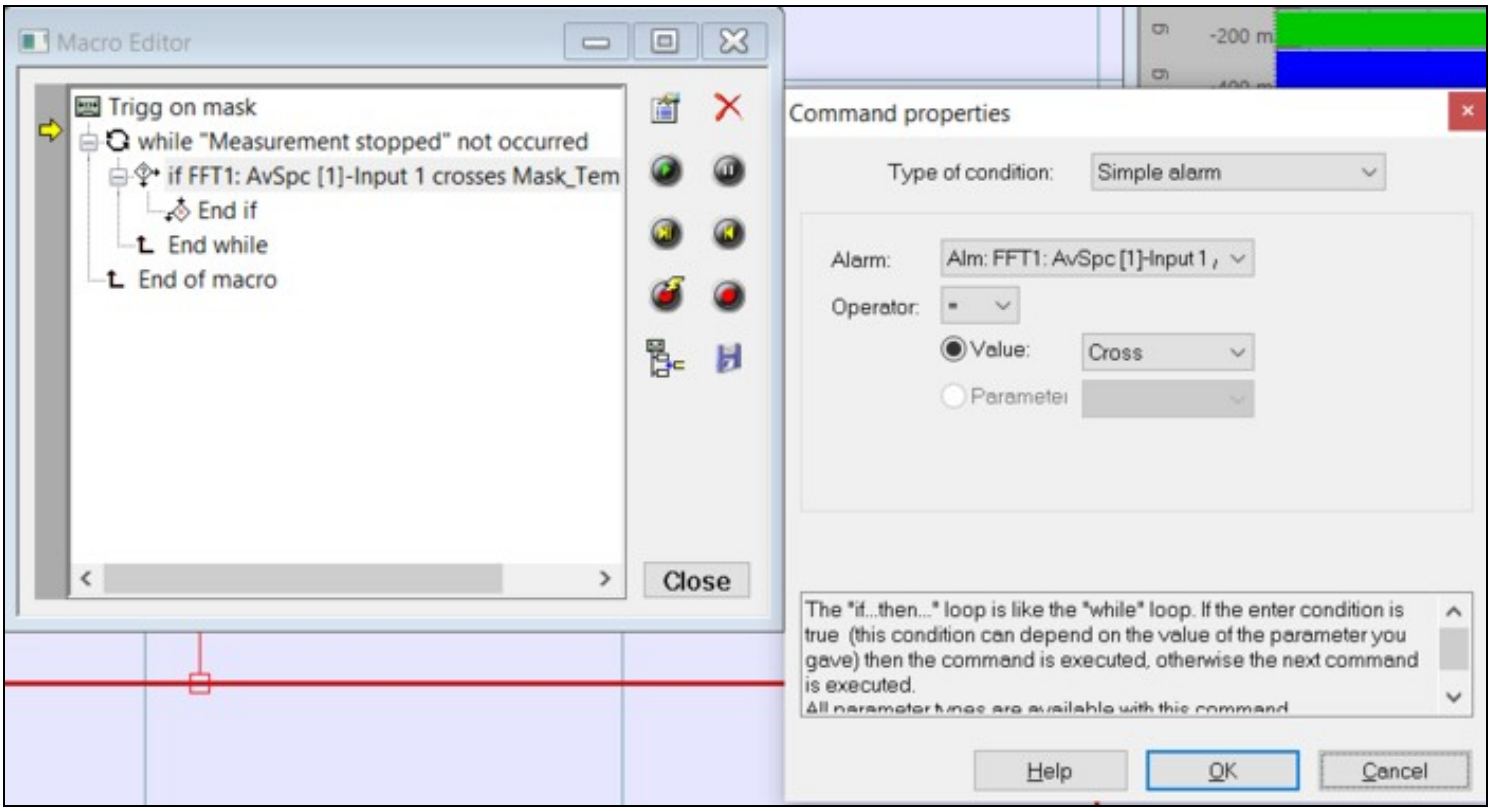


Then, in the next window, create the alarm between the mask and the selected curves :

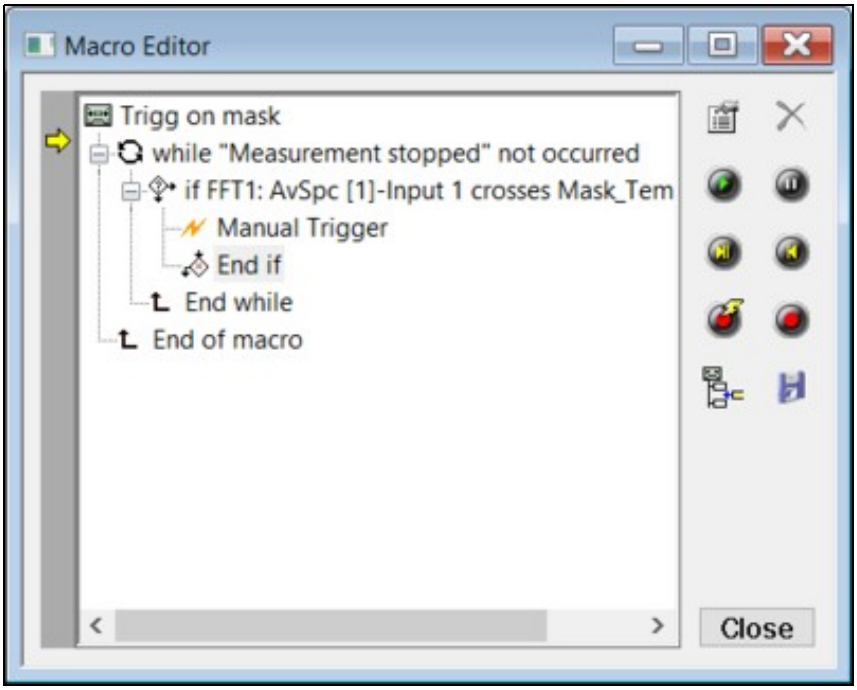


100.1.1.2 Setup the Macro

We will use the If command of the Macro to start the recording on the crossing of the Mask. After creating a the Macro containing a while loop "Until measurement stopped", add the "If" command inside the loop and set it up as follow :



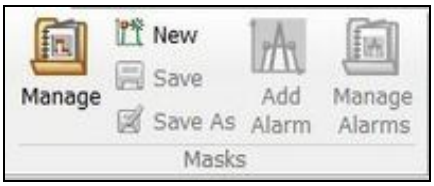
Then, add the "Manual trigger" (by using the record option of the the Macro) into the If command.



100.1.1.3 Conclusion

You can now run the measurement and start the the Macro: the recording of the signal will began only if the spectrum of the first input crosses the mask template.

100.1.2 Masks Group





Manage: Opens the Mask manager and displays the list of masks classified by project



Save: Saves the mask loaded in the editor in the current project.



Save As: Saves the mask with a new name in the current project.



New: Creates a new mask. The "Masks settings" dialog box is displayed, in order to define masks characteristics.

Disabled if a template is already edited.

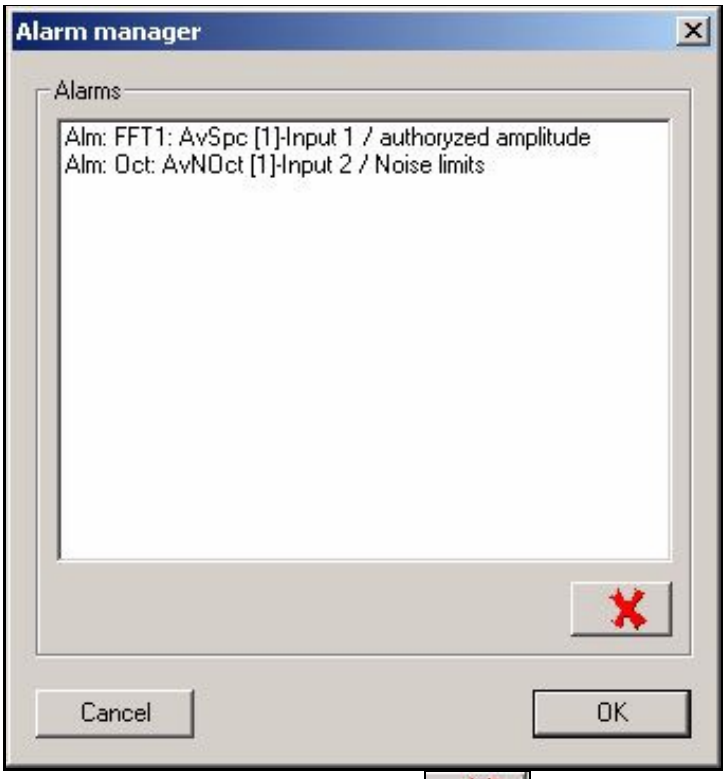
Template types

Displays the type of the new mask. The different types are

- 1/n octave (available if 1/n octave plug-in analyzer is available)
- Profile
- Frequency narrow band (available if one or more FFT plug-in analyzer is available)
- Order narrow band (available if one or more synchronous order analysis plug-in analyzer is available)



Manage alarms: Open a dialog box displaying the list of available alarms.

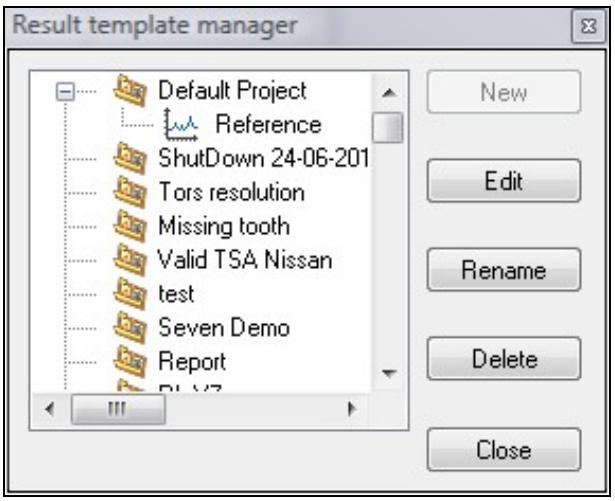


Select an alarm and click the remove button  to remove the alarm.



Add Alarm: Create a new comparison alarm in the active a graphic window. Disabled if the window does not contain a template result and a result coming from a plug-in.

100.1.3 Mask Manager



- **New:** Creates a new mask in the project selected in the list. The "Masks settings" dialog box is displayed, in order to define masks characteristics.

Disabled if a template is already being edited.

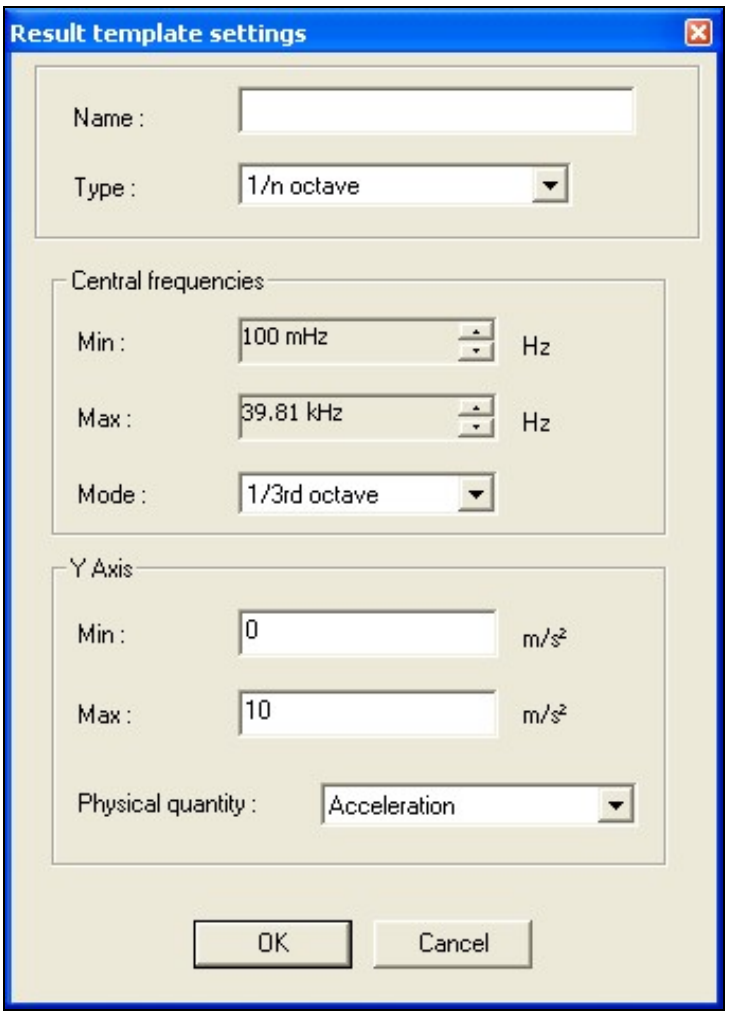
- **Edit:** Edits the mask selected in the list.

See "Frequency narrow band mask settings" topic p 56.

- **Rename:** Renames the mask selected in the list.
- **Delete:** Deletes the template selected in the list.

100.1.4 Mask settings

100.1.4.1 1/n octave mask settings



100.1.4.1.1 Central frequencies

- Min: Minimum value on X-axis.
- Max: Maximum value on X-axis.
- Mode: Defines the number of frequency bands. Available with 1/n octave template result only.

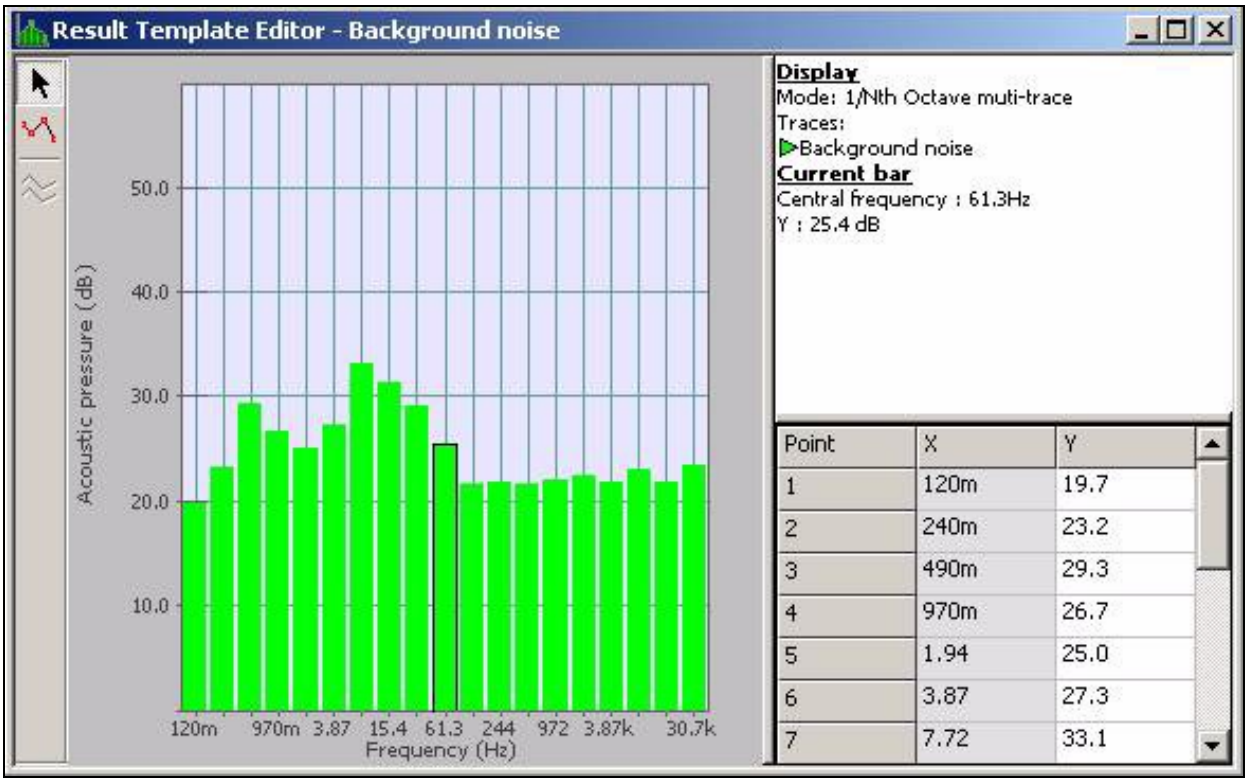
The possible values are

- Octave
- 1/3rd octave
- 1/12th octave
- 1/24th octave

100.1.4.1.2 Y axis

- Min: Minimum value on Y-axis.
- Max: Maximum value on Y-axis.
- Physical quantity: Physical quantity represented on Y-axis.

100.1.4.2 1/n octave mask editor



- Select a bar  : Switches to "Select" mode. Bar is selected by clicking on it. The selected bar can be resized by dragging and dropping.
- Select all bars  : Selects all bars of mask. All bars can be resized by resizing one of them. The same offset is applied to all bars.

100.1.4.2.1 Graph contextual menu

- Y scale: Switches between linear and dB scale on the Y-axis.

100.1.4.2.1.1 Edit grid

- Select point: A click on a grid line selects the corresponding point in the graph area.
- Edit point: You may double-click on a cell to edit the X-coordinate or Y-coordinate of a point.

The Y-coordinate value is bound by the Y minimum and maximum values.

The X-coordinate value is bound by the previous and next point?s X-coordinate.

Clicking on another cell or pressing enter key validates a value.

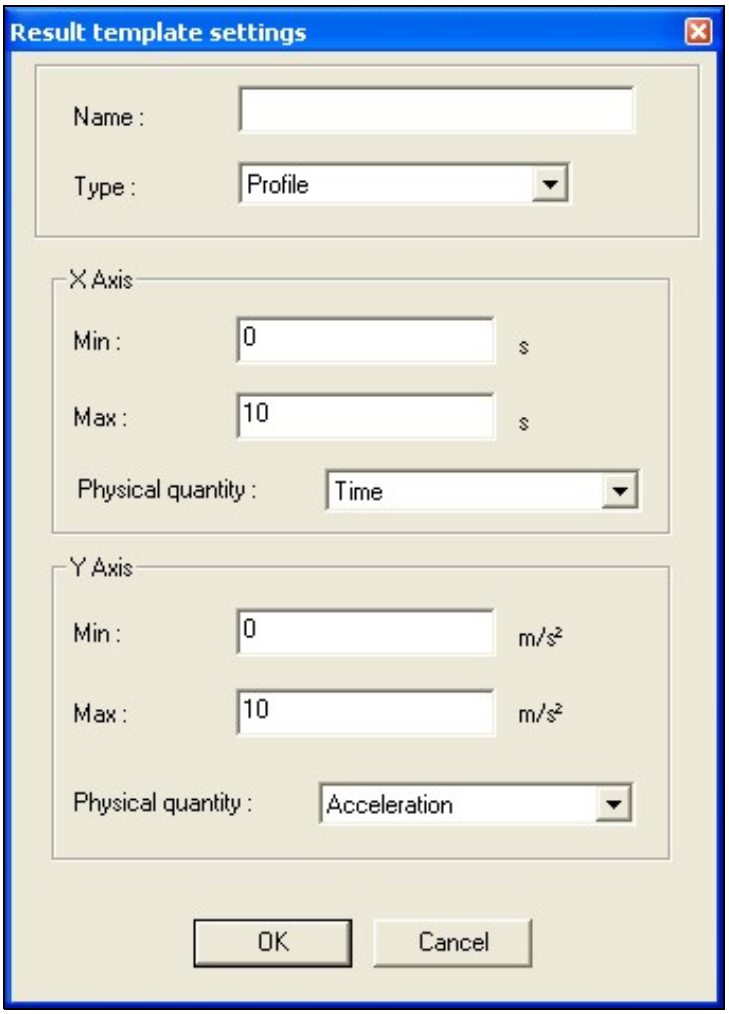
- Paste special: The edit grid or a part of the edit grid may be filled by editing the grid content in Excel®, and then copying and pasting from the clipboard.

Only selected cells are updated, if the grid content is valid.

The X-coordinates of the first and last point cannot be edited. The corresponding cells are disabled.

The values used in the Excel® sheet must be specified in the current units.

100.1.4.2.2 Profile mask settings


Result template settings
Name :
Type :
Profile
X Axis
Min :
0
s
Max :
10
s
Physical quantity :
Time
Y Axis
Min :
0
m/s²
Max :
10
m/s²
Physical quantity :
Acceleration
OK
Cancel

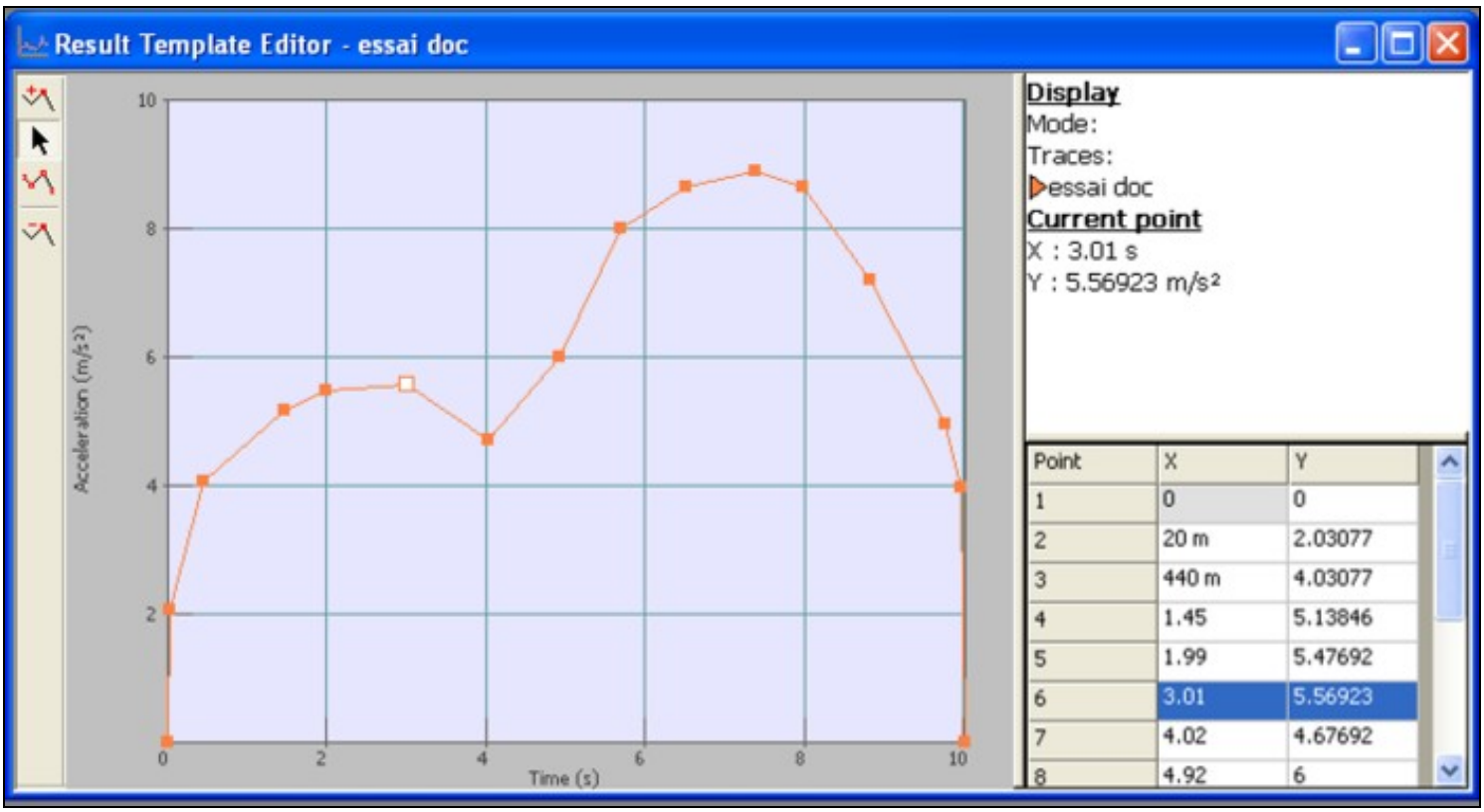
100.1.4.2.2.1 X axis

- Min: Minimum value on X-axis.
- Max: Maximum value on X-axis.
- Physical quantity: Physical quantity of the reference (represented on X axis).

100.1.4.2.2.2 Y axis

- Min: Minimum value on Y-axis.
- Max: Maximum value on Y-axis.
- Physical quantity: Physical quantity represented on Y-axis.

100.1.4.2.3 Profile mask editor



- Add a point  : Switches to "Add point" mode. In this mode, a new point is created by clicking in one of the two graph areas. A point with the same X-coordinate is added to the curve of the other graphic area. The Y-coordinate of this point is calculated by linear interpolation between previous and next point.
- Select a point  : Switches to "Select" mode. A point is selected by clicking on it. The selected point can be moved by dragging and dropping. The drop area is bound by the X-coordinates of the next and previous points, and the Y-axis minimum and maximum values.

When a point is selected in one of the two curves, the point with same X-coordinate is selected in the other curve. When a point is moved, the point with the same X-coordinate in the other curve is moved also, in order to keep the same X-coordinate.

The two end points can be translated on the Y-axis only. Their X-coordinates are the X-axis minimum and maximum values, respectively.

- Select all points  : Selects all points on both curves. A curve can be translated on the Y-axis by moving one of its points.
- Remove selected point  : Removes the selected point from both curves. The previous point becomes the new selected point. Not available if all points or one of the end points are selected.

100.1.4.2.3.1 Graph contextual menu

- Add point: Used to add a point by right-clicking on the desired position. A point with the same X-coordinate is added in the other curve. The Y-coordinate of this point is calculated by linear interpolation between previous and next point.
- Remove point: Used to remove the designated point by right-clicking on it. The point with same X-coordinate is removed from the other curve.

Only available when the user has right-clicked a given point (except end points).

- Move point: Used to move the designated point by right-clicking on it. A left click in the graph area determines the new position of the point. The point with the same X-coordinate in the other curve is moved also, in order to keep the same X-coordinate
- Y scale: Switches between linear and dB scale on the Y-axis.

100.1.4.2.3.2 Edit grid

- Select point: By clicking on a grid line, you may select the corresponding point in the graph area.
- Edit point: Double-click on a cell to edit the X-coordinate module or phase. A cell can be also edited by selecting it and pressing the enter key.

The module value is bound by the module minimum and maximum values. The phase belongs to the range [-Pi,Pi]. The X-coordinate value is bound by the X-coordinate of the previous and next points.

A value is validated by clicking on another cell or pressing the enter key.

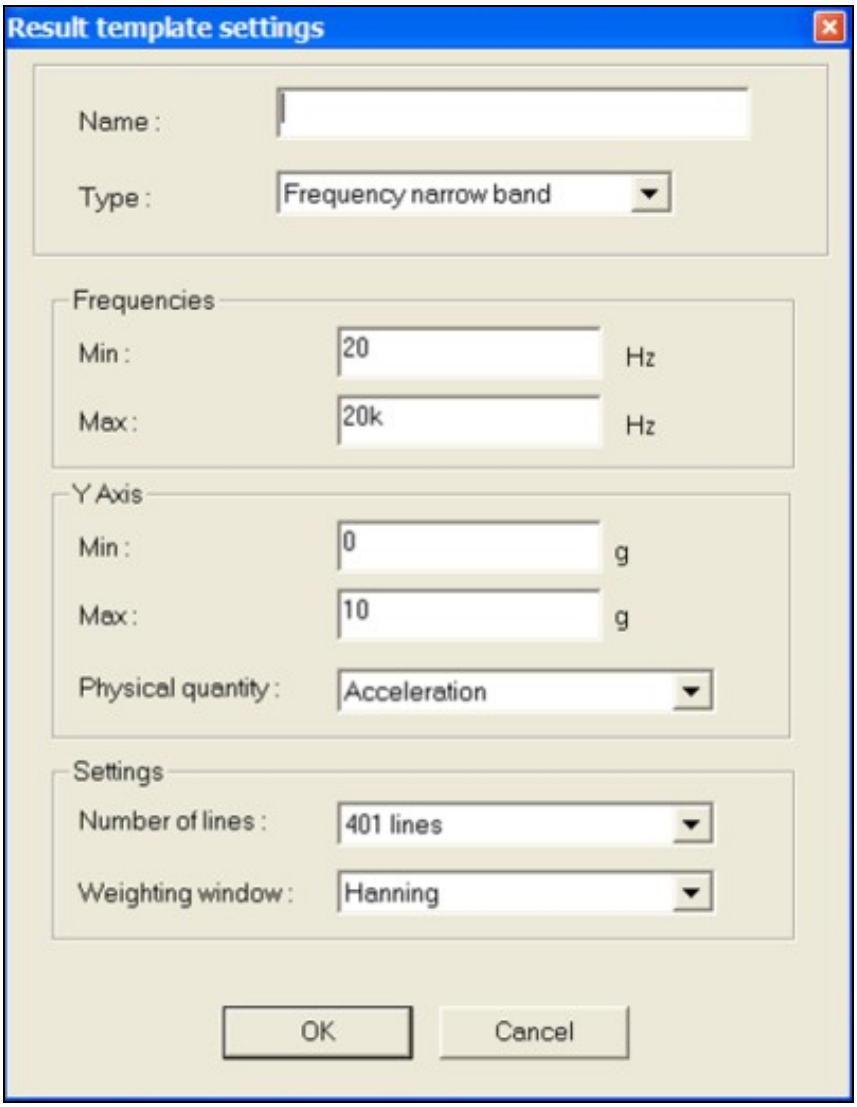
- Paste special: The edit grid or a part of the edit grid may be filled by editing the grid content in Excel®, and then copying and pasting from the clipboard.

Only selected cells are updated, if the grid content is valid.

The X-coordinates of the first and last point cannot be edited. The corresponding cells are disabled.

The values used in the Excel® sheet must be specified in the current units.

100.1.4.2.4 Frequency narrow band mask settings


Result template settings
Name :
Type :
Frequency narrow band
Frequencies
Min :
20
Hz
Max :
20k
Hz
Y Axis
Min :
0
g
Max :
10
g
Physical quantity :
Acceleration
Settings
Number of lines :
401 lines
Weighting window :
Hanning
OK
Cancel

100.1.4.2.4.1 Frequencies

- Min: Minimum value on X-axis.
- Max: Maximum value on X-axis.

100.1.4.2.4.2 Y axis

- Min: Minimum value on Y-axis.
- Max: Maximum value on Y-axis.
- Physical quantity: Physical quantity represented on Y-axis.

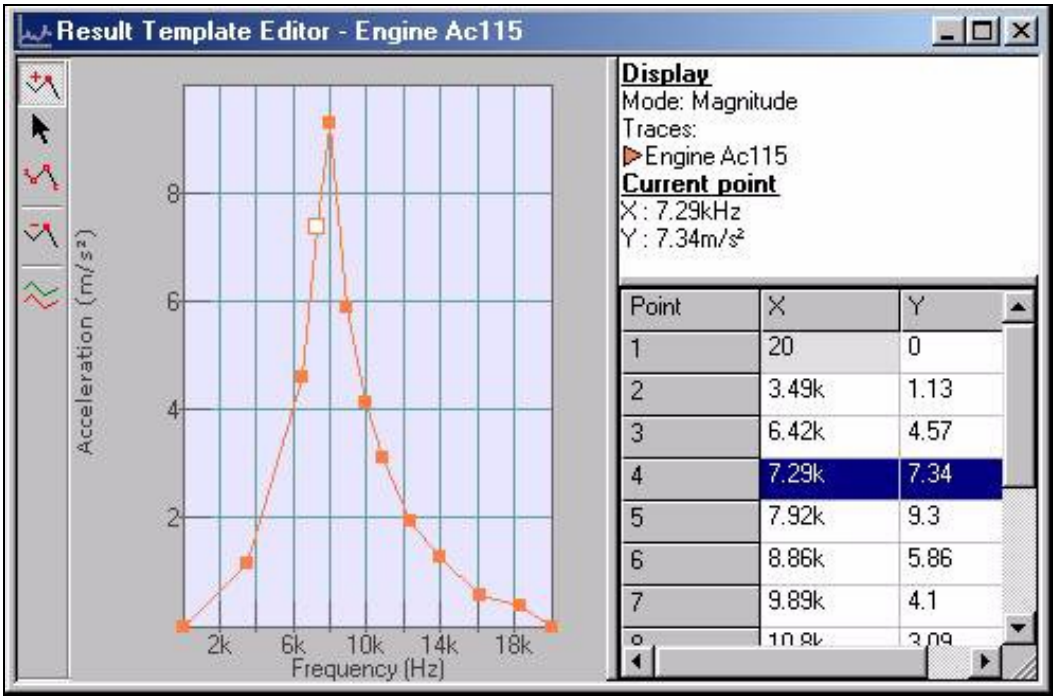
100.1.4.2.4.3 Settings

- Number of lines: Defines the number of lines.

This setting is particularly usefull to exploit Power Spectrum Density or Energy Spectrum Density

- Weighting window: defines the used weighting window. This setting is used to use mask in PSD units

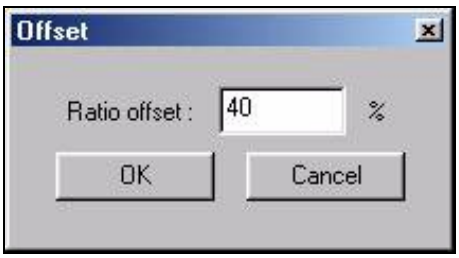
100.1.4.2.5 Frequency narrow band mask editor



- Add a point  : Switches to "Add point" mode. In this mode, a new point is created by clicking in the graph area.
- Select a point  : Switches to "Select" mode. The point is selected by clicking on it. It can be moved by dragging and dropping it. The drop area is limited by the next and previous point X-coordinates, and Y minimum and maximum values. The two end points can be translated on the Y-axis only. Their X-coordinates are the X minimum and maximum values, respectively.
- Select all points  : Selects all points of mask. The entire curve can be translated according to the Y-axis by moving one of its points.
- Remove selected point  : Removes the selected point. The previous point becomes the new selected point.

Not available if all points or one of the end points are selected.

- Generate min-max mask  : Displays a dialog box used to generate a min-max mask from the mask edited, applying an offset ratio. The min-max mask is made up of two curves: from each point on the mask edited, two points with same X-coordinate are generated, applying the offset ratio negatively and positively on theY-coordinate.



A click on the OK button changes the mask edited to a min-max mask, which is displayed in the editor (see Min-Max mask editor).

100.1.4.2.5.1 Graph contextual menu

- Add point: Used to add a point by right-clicking on the desired position.
- Remove point: Used to remove the designated point by right clicking on it.

Only available when the user has right-clicked a given point (except end points).

- Move point: Used to move the designated point by right-clicking on it. A left-click in the graph area determines the new position of the point.
- Y scale: Switches between linear and dB scale on the Y-axis.

100.1.4.2.5.2 Edit grid

- Select point: Clicking on a grid line selects the corresponding point in the graph area.
- Edit point: A double-click on a cell is used to edit the X-coordinate or Y-coordinate of a point. A cell can be also edited by selecting it and pressing the enter key.

The Y-coordinate value is limited by the Y minimum and maximum values.

The X-coordinate value is limited by the X-coordinate of the previous and next point.

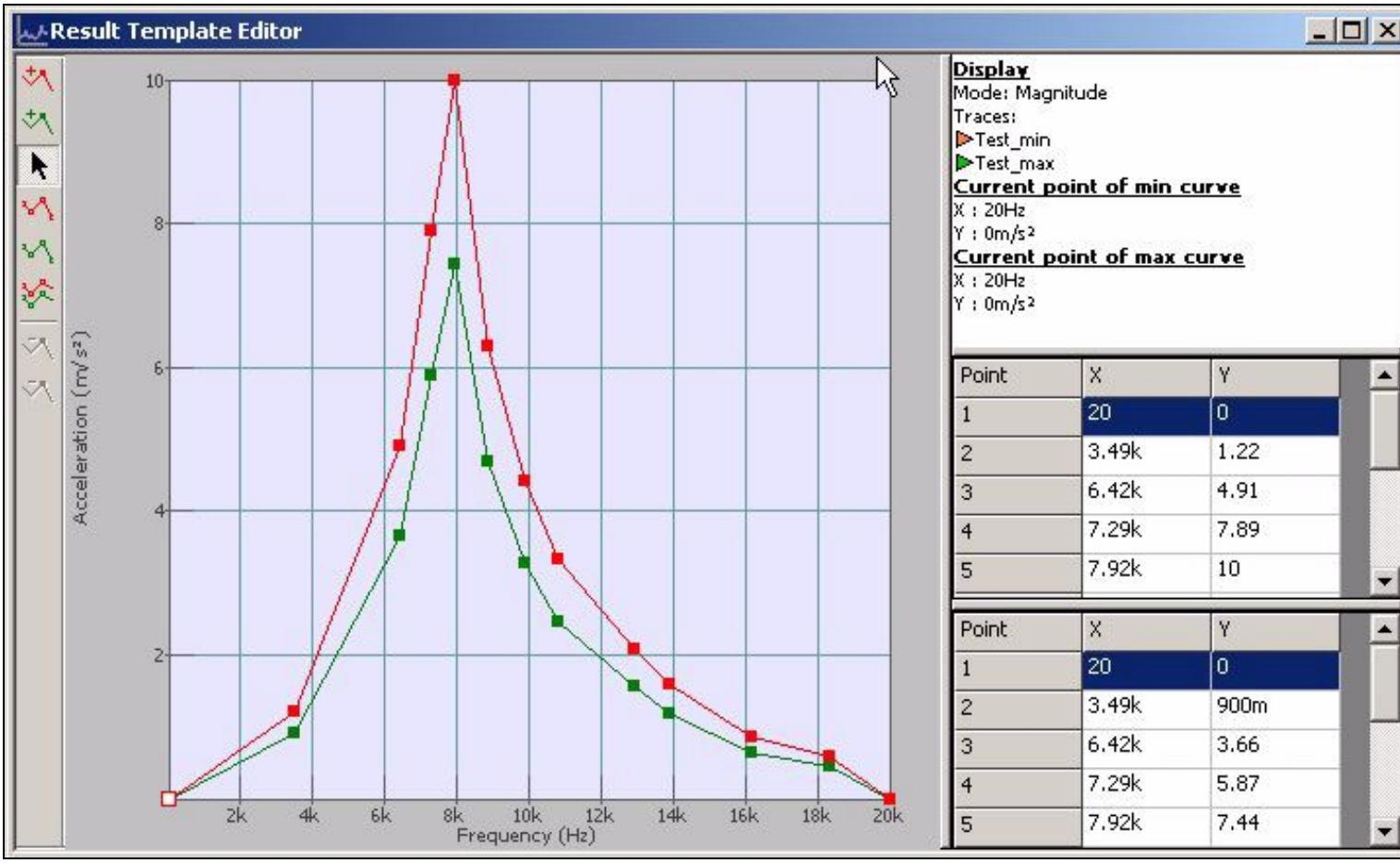
A value is validated by clicking on another cell or pressing the enter key.

- Paste special: The edit grid or a part of the edit grid may be filled by editing the grid content in Excel®, and then copying and pasting from the clipboard.

Only selected cells are updated, if the grid content is valid.

The X-coordinates of the first and last point cannot be edited. The corresponding cells are disabled.

The values used in the Excel® sheet must be specified in the current units.



- Add a point to top curve  : Switches to "Add point" mode. In this mode, a point is added to the top curve by clicking in the graph area.
- Add a point to bottom curve  : Switches to "Add point" mode. In this mode, a point is added to the bottom curve by clicking in the graph area.
- Select a point  : Switches to "Select" mode. A point is selected by clicking on it. The selected point can be moved by dragging and dropping. The drop area is bound by the X-coordinates of the next and previous points, and the Y axis minimum and maximum values. The two end points can be translated on Y axis only. Their X-coordinates are the X-axis minimum and maximum values, respectively.
- Select all points of top curve  : Selects all points of the top curve. The entire curve can be translated on the Y axis by moving one of its points.
- Select all points of bottom curve  : Selects all points of the bottom curve. The entire curve can be translated on the Y-axis by moving one of its points.
- Select all points of both curves  : Selects all points of both curves. Both curves can be translated on the Y-axis by moving one of their points.
- Remove selected point of top curve  Removes the selected point of top curve. The previous point becomes the new selected point.

Not available if all points or one of the end points are selected.

- Remove selected point of bottom curve  : Removes the selected point of bottom curve. The previous point becomes the new selected point.

Not available if all points or one of the end points are selected.

100.1.4.2.5.4 Edit grid

The editor contains two edit grids, one for each curve. The top and bottom grid are intended to edit the top and bottom curves, respectively.

- Select point: By clicking on a grid lines, you may select the corresponding point in the associated curve. A cell can be also edited by selecting it and pressing the enter key.
- Edit point: You may double-click on a cell to edit the X-coordinate or Y-coordinate of a point.

The Y-coordinate value is bound by the Y minimum and maximum values.

The X-coordinate value is bound by the previous and next point?s X-coordinate.

A value is validated by clicking on another cell or pressing enter key.

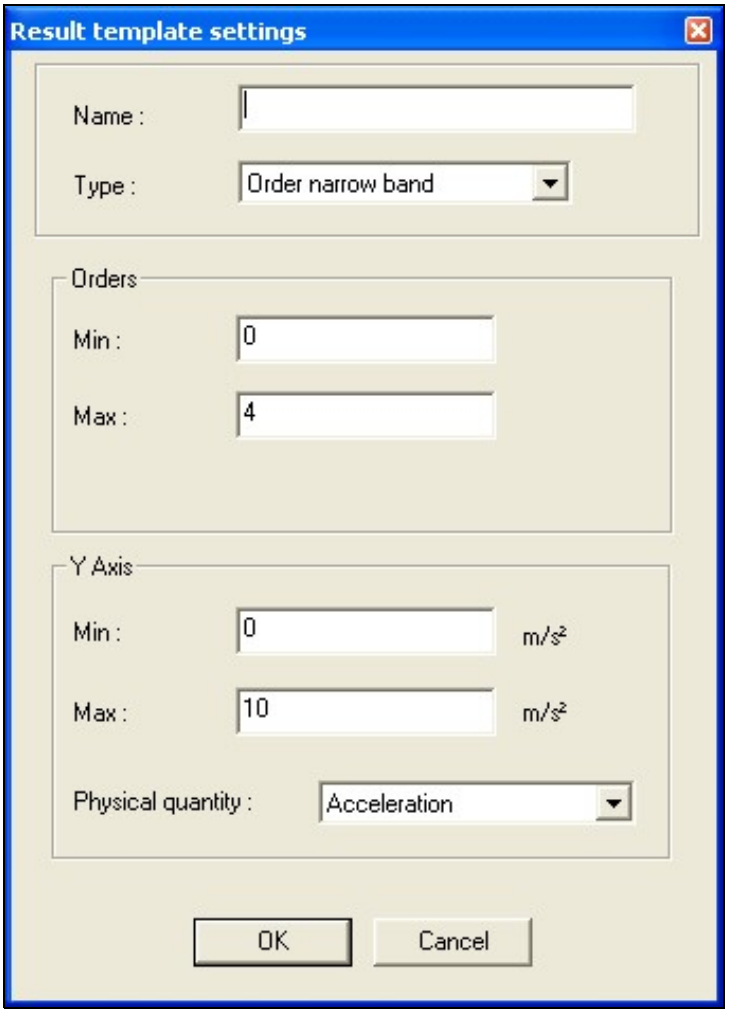
- Paste special: The edit grid or a part of the edit grid may be filled by editing the grid content in Excel®, and then copying and pasting from the clipboard.

Only selected cells are updated, if the grid content is valid.

The X-coordinates of the first and last point cannot be edited. The corresponding cells are disabled.

The values used in the Excel® sheet must be specified in the current units.

100.1.4.2.6 Order narrow band mask settings



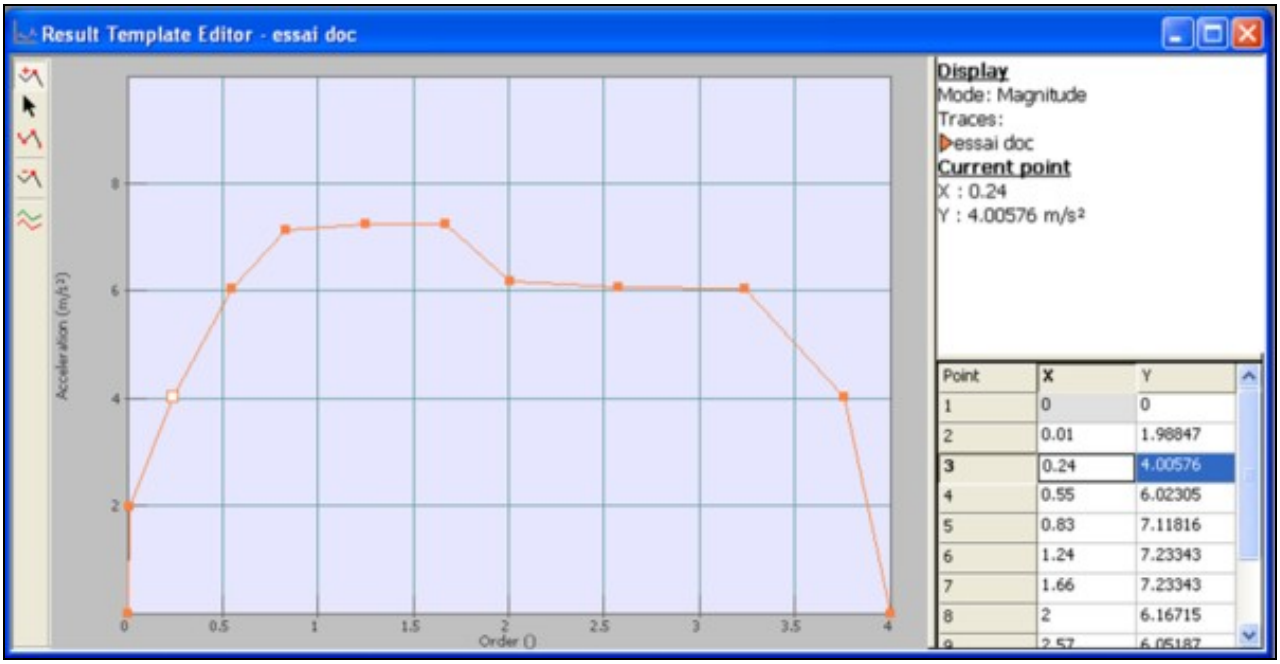
100.1.4.2.6.1 Orders

- Min: Minimum value on X-axis.
- Max: Maximum value on X-axis.

100.1.4.2.6.2 Y axis

- Min: Minimum value on Y-axis.
- Max: Maximum value on Y-axis.
- Physical quantity: Physical quantity represented on Y-axis.

100.1.4.2.7 Order narrow band mask editor



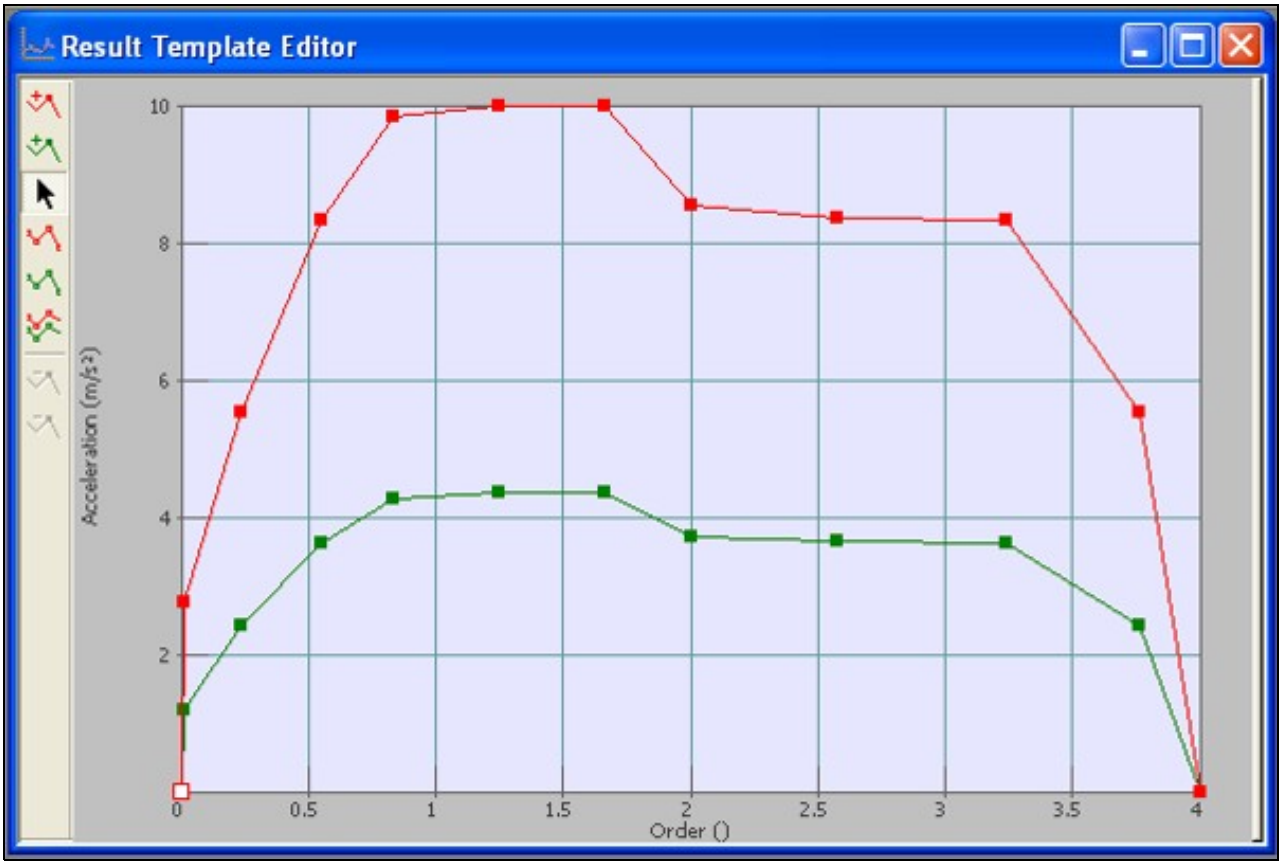
- Add a point  : Switches to "Add point" mode. In this mode, a new point is created by clicking in the graph area.
- Select a point  : Switches to "Select" mode. The point is selected by clicking on it. It can be moved by dragging and dropping it. The drop area is limited by the next and previous point X-coordinates, and Y minimum and maximum values. The two end points can be translated on the Y-axis only. Their X-coordinates are the X minimum and maximum values, respectively.
- Select all points  : Selects all points of mask. The entire curve can be translated according to the Y-axis by moving one of its points.
- Remove selected point  : Removes the selected point. The previous point becomes the new selected point.

Not available if all points or one of the end points are selected.

- Generate min-max mask  : Displays a dialog box used to generate a min-max mask from the mask edited, applying an offset ratio. The min-max mask is made up of two curves: from each point on the mask edited, two points with same X-coordinate are generated, applying the offset ratio negatively and positively on theY-coordinate.



A click on the OK button changes the mask edited to a min-max mask, which is displayed in the editor (see Min-Max mask editor).



100.1.4.2.7.1 Graph contextual menu

- Add point: Used to add a point by right-clicking on the desired position.
- Remove point: Used to remove the designated point by right clicking on it.

Only available when the user has right-clicked a given point (except end points).

- Move point: Used to move the designated point by right-clicking on it. A left-click in the graph area determines the new position of the point.
- Y scale: Switches between linear and dB scale on the Y-axis.

100.1.4.2.7.2 Edit grid

- Select point: Clicking on a grid line selects the corresponding point in the graph area.
- Edit point: A double-click on a cell is used to edit the X-coordinate or Y-coordinate of a point. A cell can be also edited by selecting it and pressing the enter key.

The Y-coordinate value is limited by the Y minimum and maximum values.

The X-coordinate value is limited by the X-coordinate of the previous and next point.

A value is validated by clicking on another cell or pressing the enter key.

- Paste special: The edit grid or a part of the edit grid may be filled by editing the grid content in Excel®, and then copying and pasting from the clipboard.

Only selected cells are updated, if the grid content is valid.

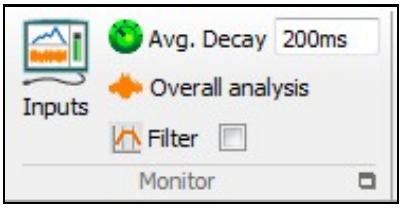
The X-coordinates of the first and last point cannot be edited. The corresponding cells are disabled.

The values used in the Excel® sheet must be specified in the current units. Create a new comparison alarm in the active a graphic window. Disabled if

the window does not contain a template result and a result coming from a plug-in.

101 NVGate Monitor Plug In

The Monitor plug-in offers simple and powerful ways to monitor the measured signals. This 4 channels plug-in runs independently from the general analyzer status (running/Paused/stopped) with the capability of swapping connected channels at any time.



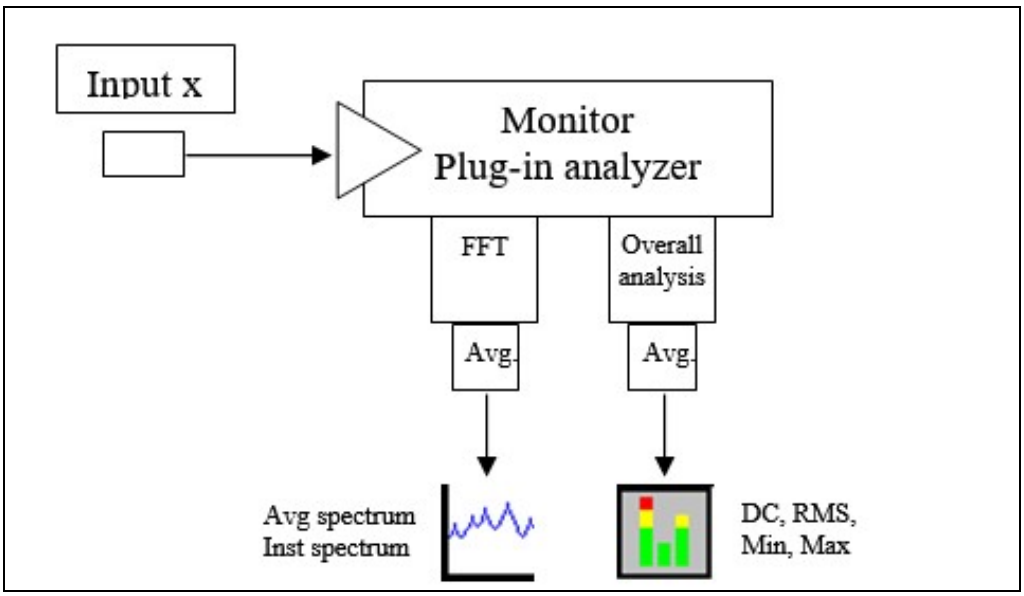
The second capability of the monitor is to extract statistical components of the signal in a specific bandwidth. Extracted levels can be used for triggering and waterfall references.

The monitor runs its analyses on a specific processor (DSP) allowing a totally independent computation for the regular analyses.

Note: Clicking on the bottom right icon ( ) opens the monitor plug-in properties dialog allowing a full access to all the settings.

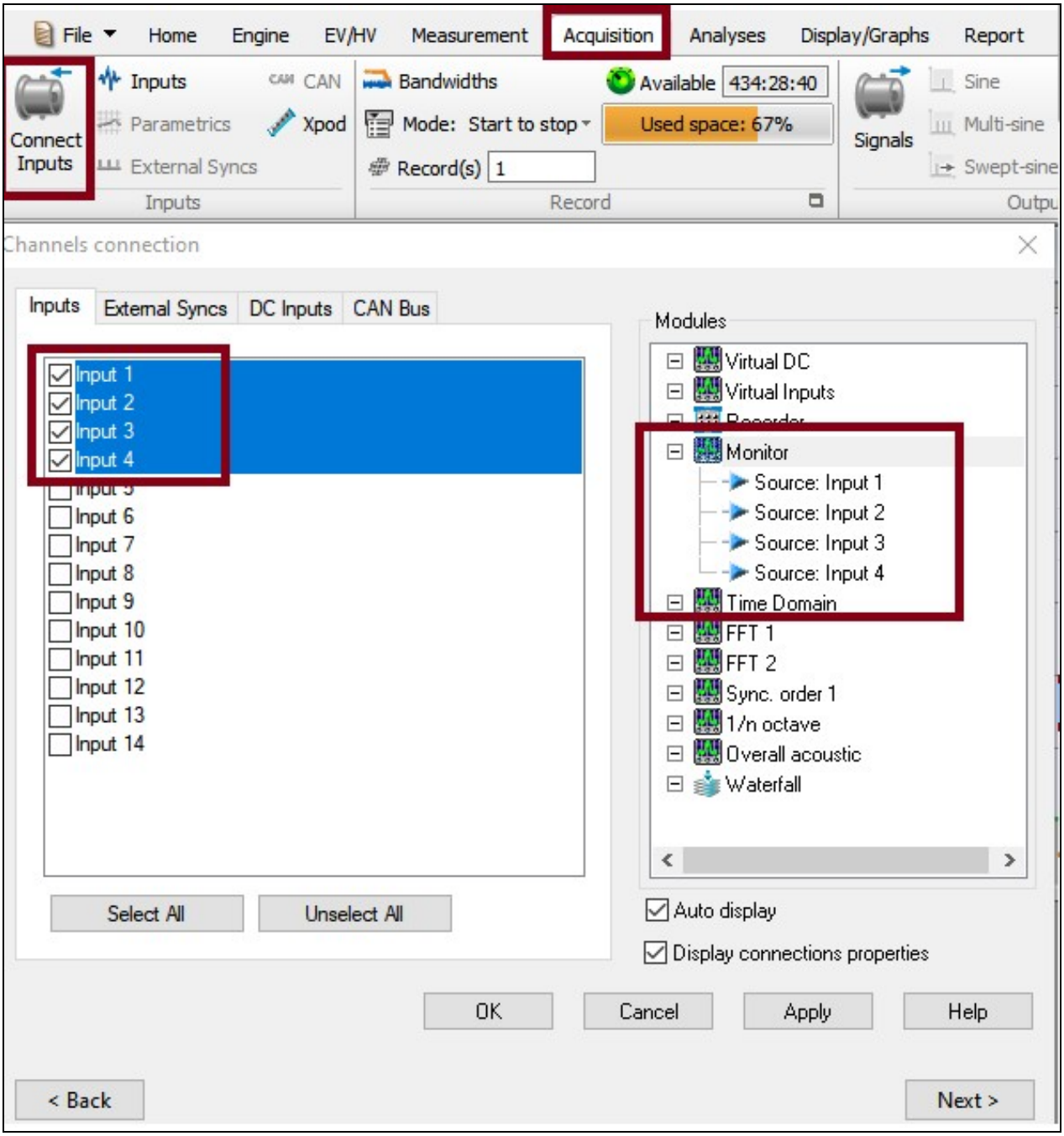
101.1 Monitor

The Monitor input can be connected and hot swapped independently of any plug-in analysis. It is used to monitor one or several signals.

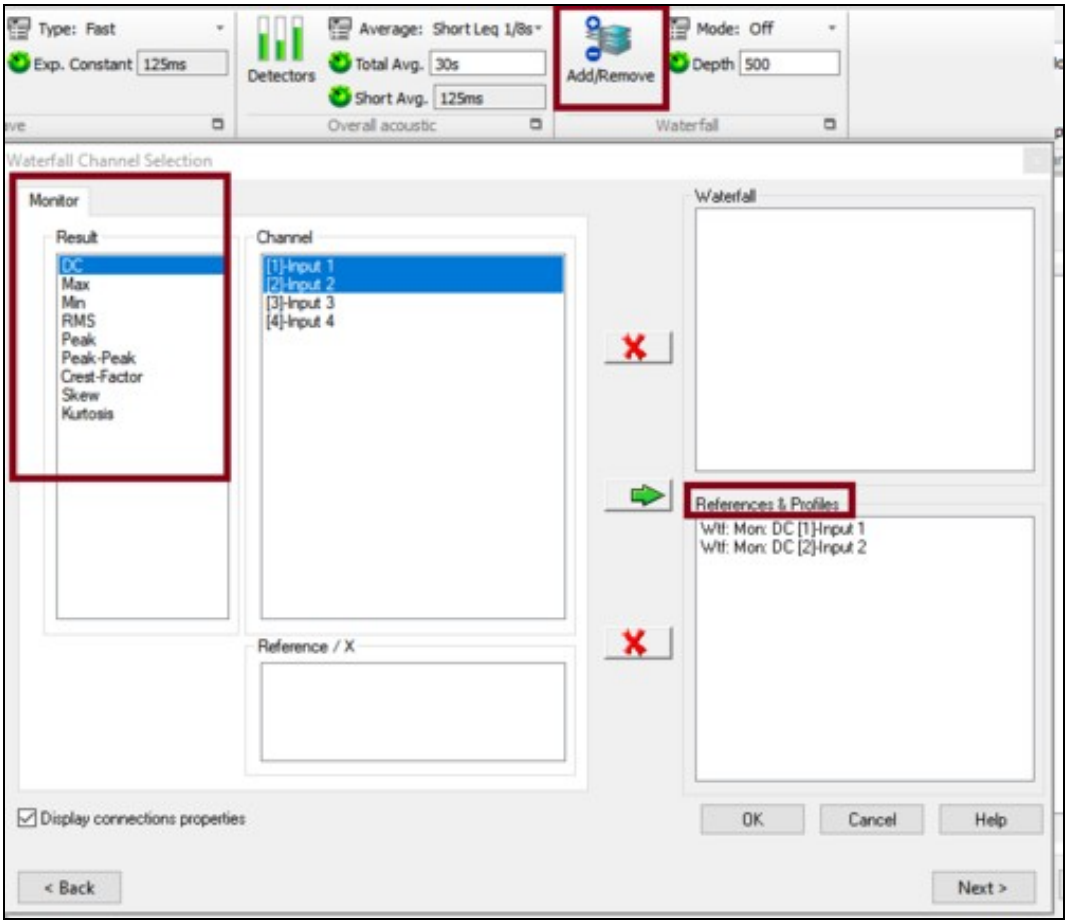


101.2 Connect tutorial

- Click on tab: Acquisition, connect Input, then drag and drop the channels on monitor.

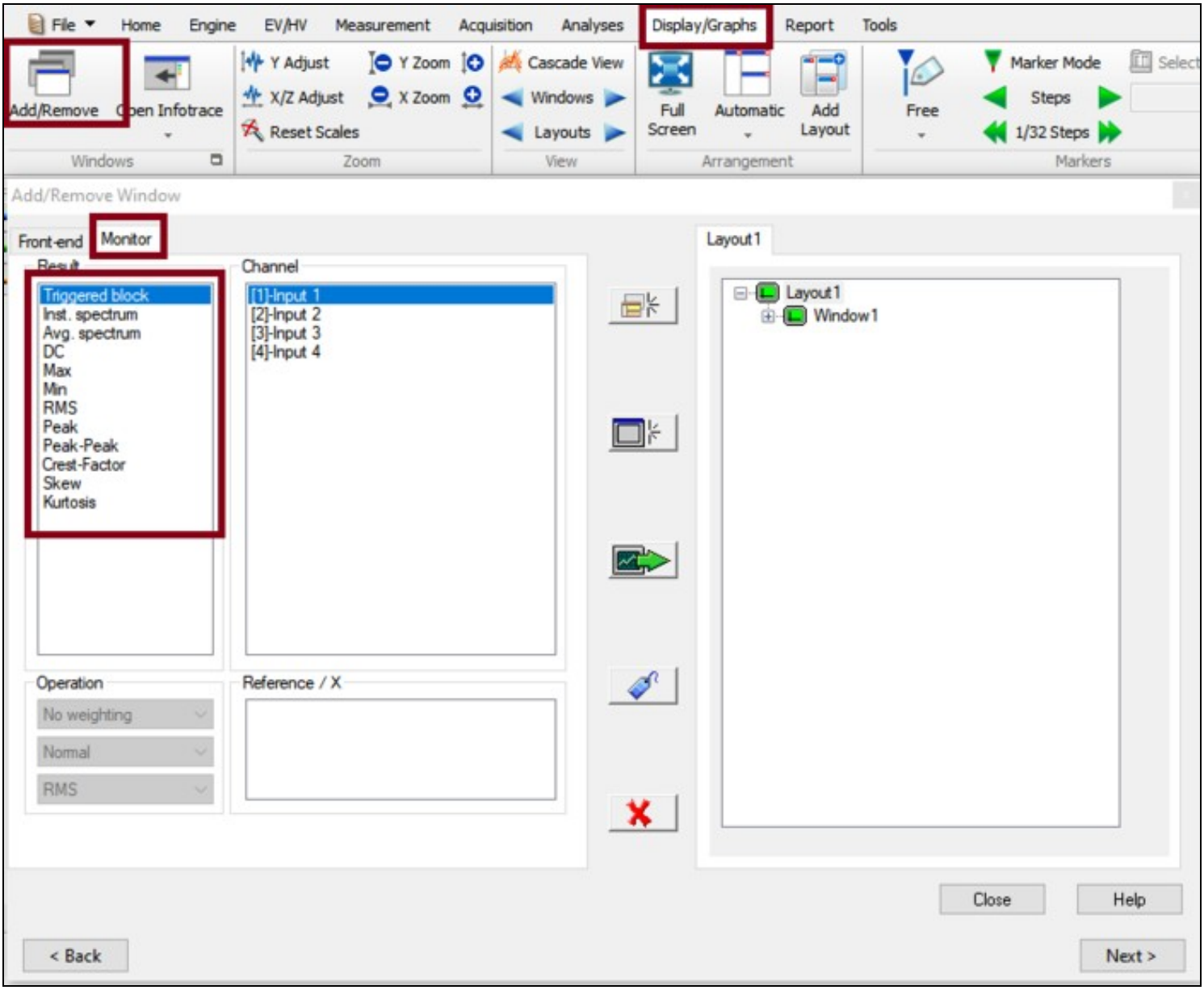


- note that you can have a scalar profile by putting the scalar into the waterfall.



101.3 Display and Available results

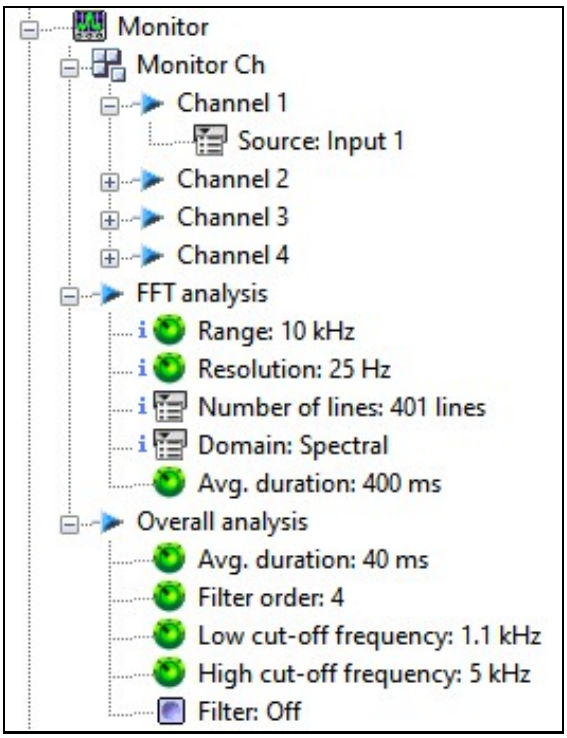
You can display the results using add/remove windows.


File
Home
Engine
EV/HV
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
Add/Remove
Open Infotrace
Windows
Y Adjust
Y Zoom
X/Z Adjust
X Zoom
Reset Scales
Zoom
Cascade View
Windows
Layouts
View
Full Screen
Automatic
Add Layout
Arrangement
Free
Marker Mode
Steps
1/32 Steps
Markers
Add/Remove Window
Front-end
Monitor
Result
Triggered block
Inst. spectrum
Avg. spectrum
DC
Max
Min
RMS
Peak
Peak-Peak
Crest-Factor
Skew
Kurtosis
Channel
[1]-Input 1
[2]-Input 2
[3]-Input 3
[4]-Input 4
Operation
No weighting
Normal
RMS
Reference / X
Layout1
Layout1
Window1
Close
Help
< Back
Next >

- **Triggered block**: This displays the time domain signal.
- **Inst. spectrum**: This displays the FFT processing results.
- **Avg. spectrum**: This displays the average spectrum.
- **DC, Max, Min, RMS, Kurtosis** on a specified band

101.4 Settings

101.4.1 Channel



-  **Inputs:** Opens the channels sources selection. Allows choosing which input or track is monitored. Up to 4 ch at a time. The channel sources can be swapped at any time sis, record, play-back) of the instrument.

Contains the source of the signal to be monitored.

- **Using input 5 to input 8 as source with an OR35 analyzer will cause Non-real-time analysis. This way may lose some trigger event samples.**: input source to be analyzed. It may come from the Front-end input or from the Player in post analysis mode (see the post analysis chapter). In post analysis mode, tracks with a signal bandwidth lower than the range of the Monitor cannot be plugged.

101.4.2 FFT analysis

Contains the settings related to the FFT analysis of the signals to be monitored.

- **Range**: the frequency range of the Monitor plug in.

Hidden/fixed: The monitor range is fixed by the input frequency range (in connected mode on-line) and by the max bandwidth of the player (in post analysis mode).

- **Resolution:** the resolution of the FFT. This is a fixed setting, for information only. It displays the resolution between two points of a spectral result. The FFT resolution is obtained by dividing the frequency range of the FFT by the resolution minus 1. For example if the FFT Range is 20kHz and the resolution is 401 lines, then the frequency span is: 20000 / (401 - 1) = 20000 / 400 = 50Hz.

- **Number of lines**: The FFT number of analyzed lines.

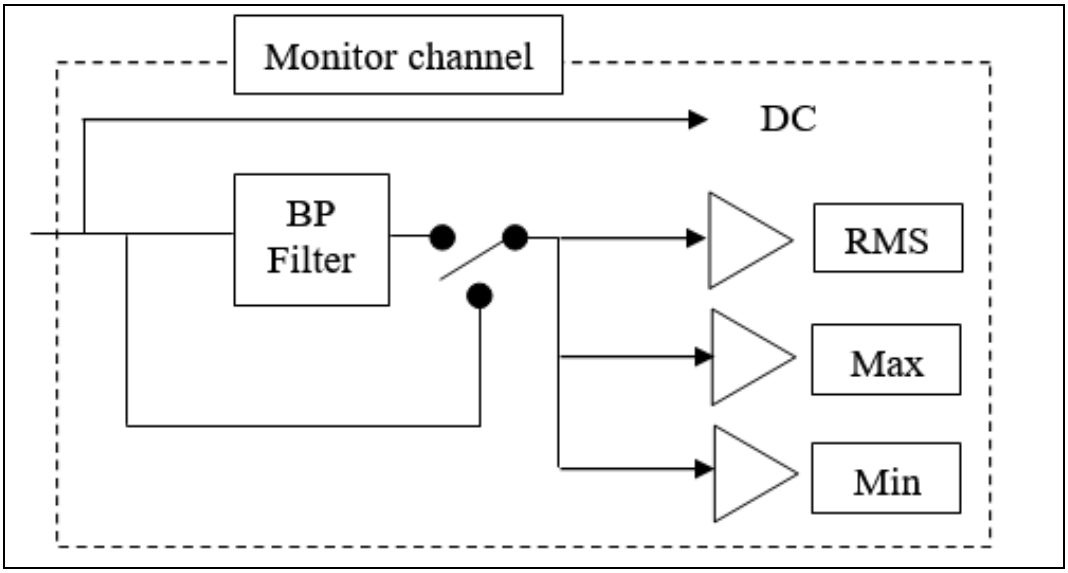
Hidden/fixed: fixed to 401 lines

- **Domain**: The averaging domain: spectral domain averaging computes the average after FFT processing.

Hidden/fixed: fixed to spectral

-  **Average duration:** Setup the exponential spectrum average decay of the FFT part.

101.4.3 Overall analysis



-  **Overall analysis:** Opens the statistical extraction setting. This dialog set up the filter characteristics and the averaging of the extracted values (DC, RMS, Min/Max, Kurtosis)

- **Avg duration**: Each scalar is computed for each block of signal (length of the block is 256/ (*Front-end / Input Sampling*), and then average during the value of the setting.

- **Filter order**: the order of the filter: 2, 4, 6, 8 or 10.
- **Low cut-off frequency**: the low cut-off frequency of the filter. Its minimum value is 0.055 * FR, where FR is the input frequency range. However, the following conditions must also be fulfilled:

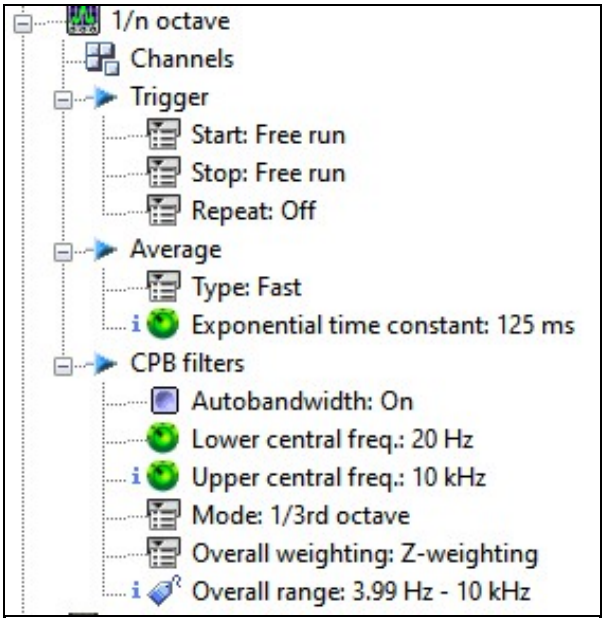
0.0075 * FR <= B <= 0.5 FR,

Where B is the bandwidth between Low and high cut-off frequency
and FR is the input frequency range.

- **High cut-off frequency**: the high cut-off frequency of the filter. Its maximum value is the input frequency range. However, the following conditions must also be fulfilled: see Low cut-off frequency.
-  **Filter:** Allows applying the filter (Tick on) or bypassing it (No Tick). The Bypass is immediate without delay.

102 NVGate Octave Analyzer





NVGate Octave analyzer is especially designed for vibration and acoustic signal analysis needing 1/nth octave analysis. This plug-in provides 1/1, 1/3rd, 1/12th and 1/24th digital filters that complies with the latest acoustic standards, such as IEC 61260-1:2014 standard. It provides real time analysis and post analysis results.

Moreover, the user can select time domain weightings (A or C) and time domain digital integrators and can apply on spectral results A or C weighting.

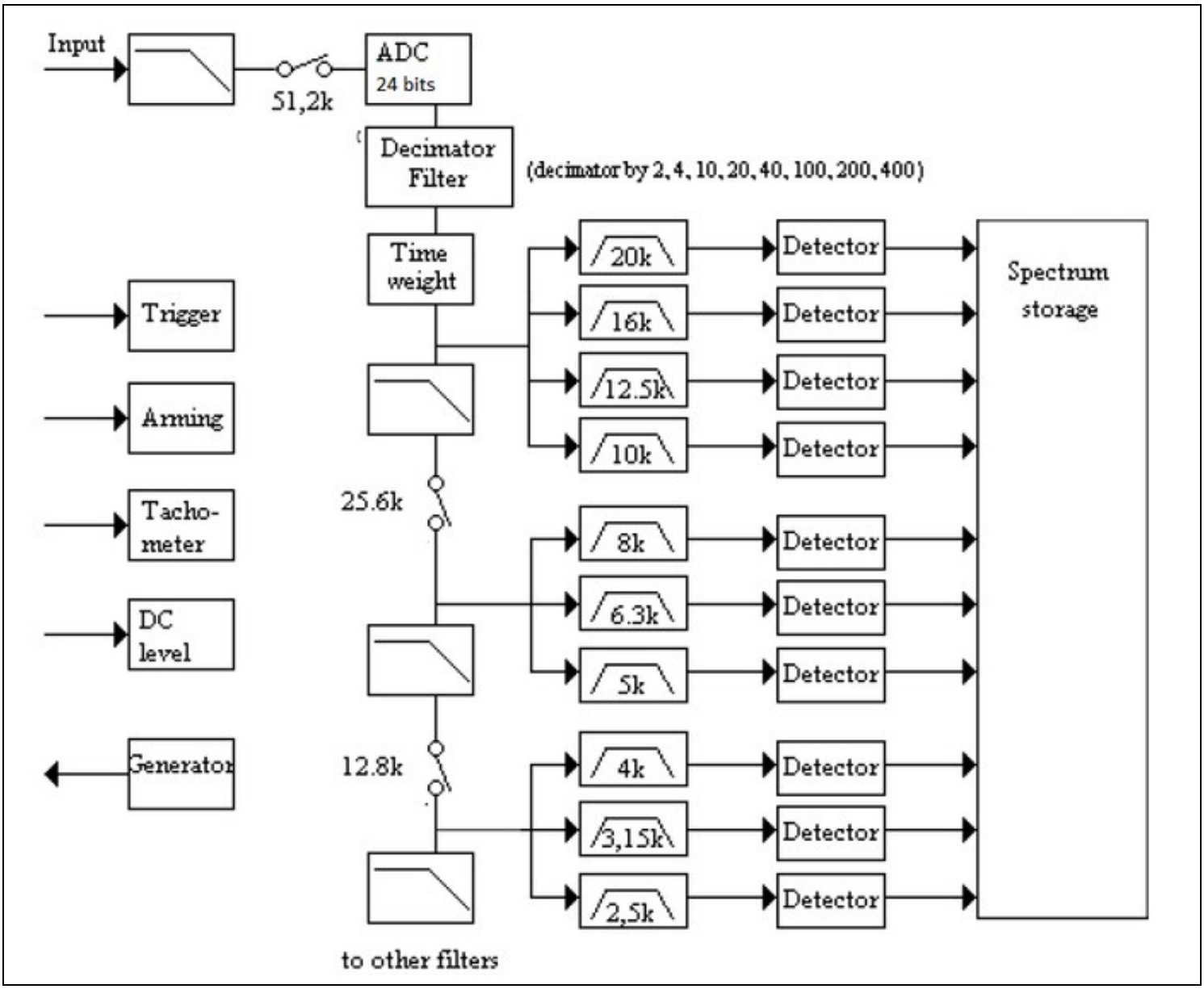
A lot of averaging modes are available and to comply with acoustic standards, detectors also provide Fast, Slow, Impulse and LEQ averaging.

Octave Tracking is available with time, RPM, or any ?V triggering.

102.1 Structure and Operation overview

102.1.1 Structure

The figure below shows the block diagram of the analyzer (for one channel) with octave set from 20 kHZ to 2,5kHz.


Input
51,2k
ADC
24 bits
Decimator
Filter
(decimator by 2, 4, 10, 20, 40, 100, 200, 400)
Time
weight
Trigger
Arming
Tacho-
meter
DC
level
Generator
25.6k
12.8k
20k
16k
12.5k
10k
8k
6.3k
5k
4k
3,15k
2,5k
Detector
Detector
Detector
Detector
Detector
Detector
Detector
Detector
Detector
Spectrum
storage
to other filters

After amplification and antialias filtering, analog input signals are sampled at 51.2 kHz and converted by an analog to digital converter.

The sample frequency depends on the value of the High Filter Setting
Next, the input signals can be time weighted filters.

- A, B and C weight filters : These filters available in acoustic frequency range (i.e. from 20 Hz to 20 kHz) satisfy requirements from last standards IEC 651 type 0 and IEC 804 type 0.
- Any other NVGate filter need to be apply on Input Front end (real time) or Input Player (post analyisis).

After time domain filtering, the signals go to the digital 1/n^{th} octave filter bank.

This filter bank is based on the 6th order digital band pass. A downsampling for low central frequency filters reduces computation load. The downsampling filters have a rejection greater than 90 dB at half of each new sampling rate and a ripple less than 0.007 dB in the useful bandwidth.

The filter range uses base 10 so that we get exact frequencies at 0.1 Hz, 1.0 Hz, 10 Hz, 100 Hz, 1 kHz and 10 kHz.

102.1.2 Computation central frequency

The following calculations are used to compute the central frequencies:

- $fc = 1000 * 10^{3n/10}$ for 1/1 octave
- $fc = 1000 * 10^{n/10}$ for 1/3rd octave
- $fc = 1000 * 10^{(n+0.5)/40}$ for 1/12th octave
- $fc = 1000 * 10^{(n+0.5)/80}$ for 1/24th octave

Number of filter and frequency range for each filter bank:

1/1 octave filter bank:

- can have up to 11 filters (with 1 to 1000 frequency ratio),
- covers range from 125 mHz to 16 kHz.

1/3rd octave filter bank:

- can have up to 31 filters (with 1 to 1000 frequency ratio),
- covers range from 100 mHz to 20 kHz.

For 1/12th octave:

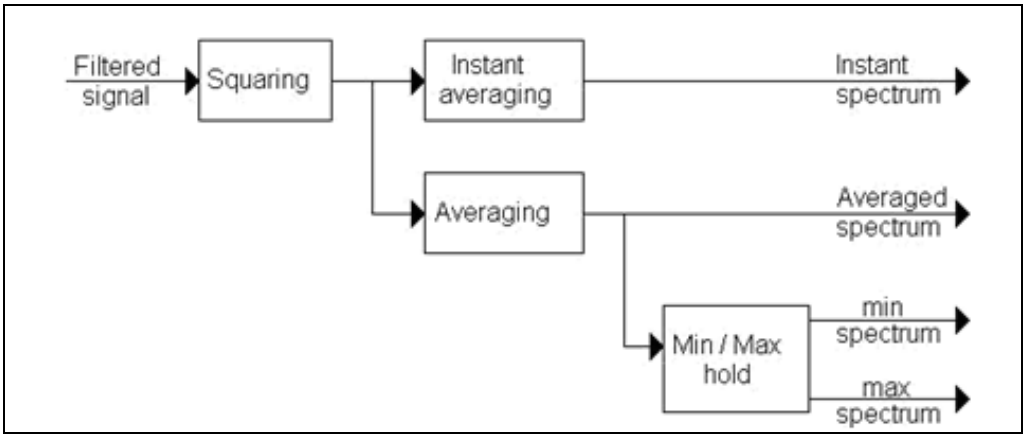
- the filter bank gets 4 filters for each useful bandwidth of 1/3rd filters, i.e. 124 filters,
- covers range from 92 mHz to 21.8 kHz.

For 1/24th octave:

- the filter bank gets 8 filters for each useful bandwidth of 1/3rd filter, i.e. 248 filters,
- covers range from 90 mHz to 22.1 kHz.

102.1.3 Detector

The next step is the detector process for each 1/nth filter:



The filtered signal is input to a squaring module in order to get true RMS detector.

This module computes 1/N * ?$x^2_{n.}$

The instant averaging is always running and is based on the exponential averaging with a time constant equal to 1/fc where fc is the center frequency of corresponding filter. So each detector has its own time constant and the output fluctuation in the worst case is limited to +/- 0.4 dB with a sine input signal.

The averaging process provides a lot of modes (linear, exponential and dedicated to acoustical measurements) which are described in averaging part.

A hold box allows to get Maximum and Minimum spectra during one measure.

102.1.4 Stabilisation delay

A stabilization delay is implemented in order to ignore and suppress the transient response of passband filters. It is automatically taken into account after any change of input setup. It is equal to 5 periods of the lower frequency filter for 1/3rd octave and octave filters. This delay is four times greater for 1/12th octave filters (i.e. 20 periods of the lower frequency filter) and eight times greater for 1/24th octave filters (i.e. 40 periods of the lower frequency filter).For example, if lower frequency filter is centered at 1 Hz, then the stabilization delay is equal to 5 seconds for octave and 1/3rd octave, 20 seconds for 1/12th octave and 40 seconds for 1/24th octave. During this delay the detectors are inactive.

The filter bank continuously runs and instant averaging is always available (excluding time period for filter stabilization).

In linear modes, trigger events are used to start and/or stop energy computation in detectors and store associated results in the spectrum waterfall memory.

In exponential modes, detectors are always running and trigger events are only used to store associated results in the spectrum waterfall memory.

102.2 Software use and settings

102.2.1 Connect track and display

We advice using GoToResult result Wizard for connecting track and displaying Octave results.

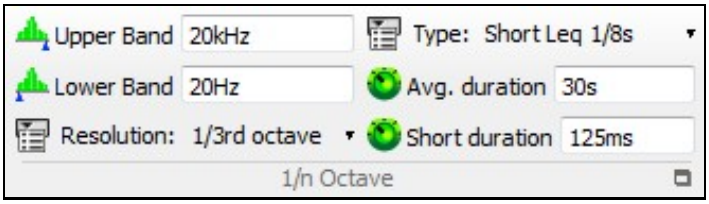
102.2.2 Display Available results:

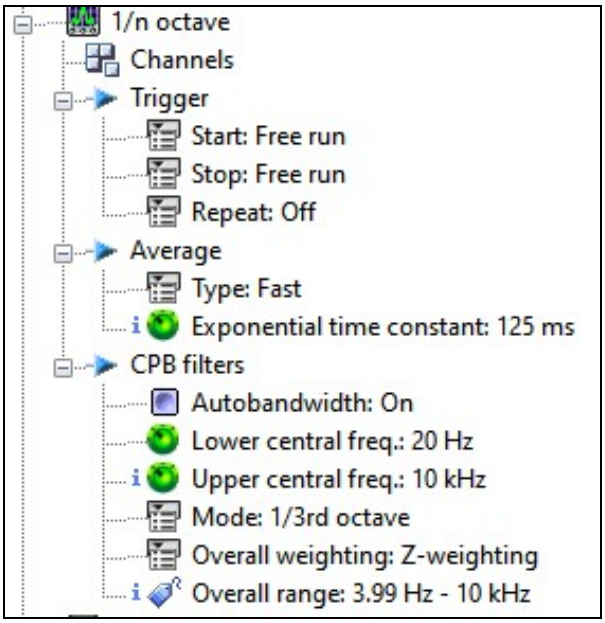
Type	Size	Dimension	Domain	Save
1/n octave	FilterNumber	2D	spectral	Yes

Avg. 1/n octave	FilterNumber	2D	spectral	Yes
Min Avg. octave	FilterNumber	2D	spectral	Yes
Max Avg. octave	FilterNumber	2D	spectral	Yes
Overall level	1 pt	1D	level	Yes
Overall Weighted	1 pt	1D	level	Yes

- 1/n octave: This result is always available. It displays the output of the RMS detectors that analyzes the output of each filter from the filter bank.
- Avg. 1/n octave: This result is available when the 1/n Octave plug-in is in "Running" state. It displays the result of the averaging of the 1/n octave result.
- Min Avg. octave: This result is available when the 1/n Octave plug-in is in "Running" state. It displays the minimum value of each band of the Avg 1/n octave result. Restarting the plug-in will reset this result.
- Max Avg. octave: This result is available when the 1/n Octave plug-in is in "Running" state. It displays the maximum value of each band of the Avg 1/n octave result. Restarting the plug-in will reset this result.
- Overall level: This result is available when the 1/n Octave plug-in is in "Running" state. It displays the overall level of the signal between the lower and upper frequency. It is computed before the filter bank, thus it is not the addition of the values of the 1/n octave result.
- Overall Weighted: This result is available when the 1/n Octave plug-in is in "Running" state. It displays the overall level of the weighted signal between the lower and upper frequency. The weighted filter is chosen by the *1/n octave/CPB filters/Global Level Weighting* setting. It is computed before the filter bank, thus it is not the addition of the values of the 1/n octave result.

102.2.3 1/n Octave Settings





102.2.3.1 Channel

Contains the settings related to the source input.

- **Source**: input source to be analyzed. It may come from the Front-end input or from the Player in post analysis mode (see the post analysis chapter). In post analysis mode, tracks with a signal bandwidth lower than the Upper central frequency cannot be plugged.

102.2.3.2 Trigger

Contains the settings related to triggering events and how to start and stop signal computation.

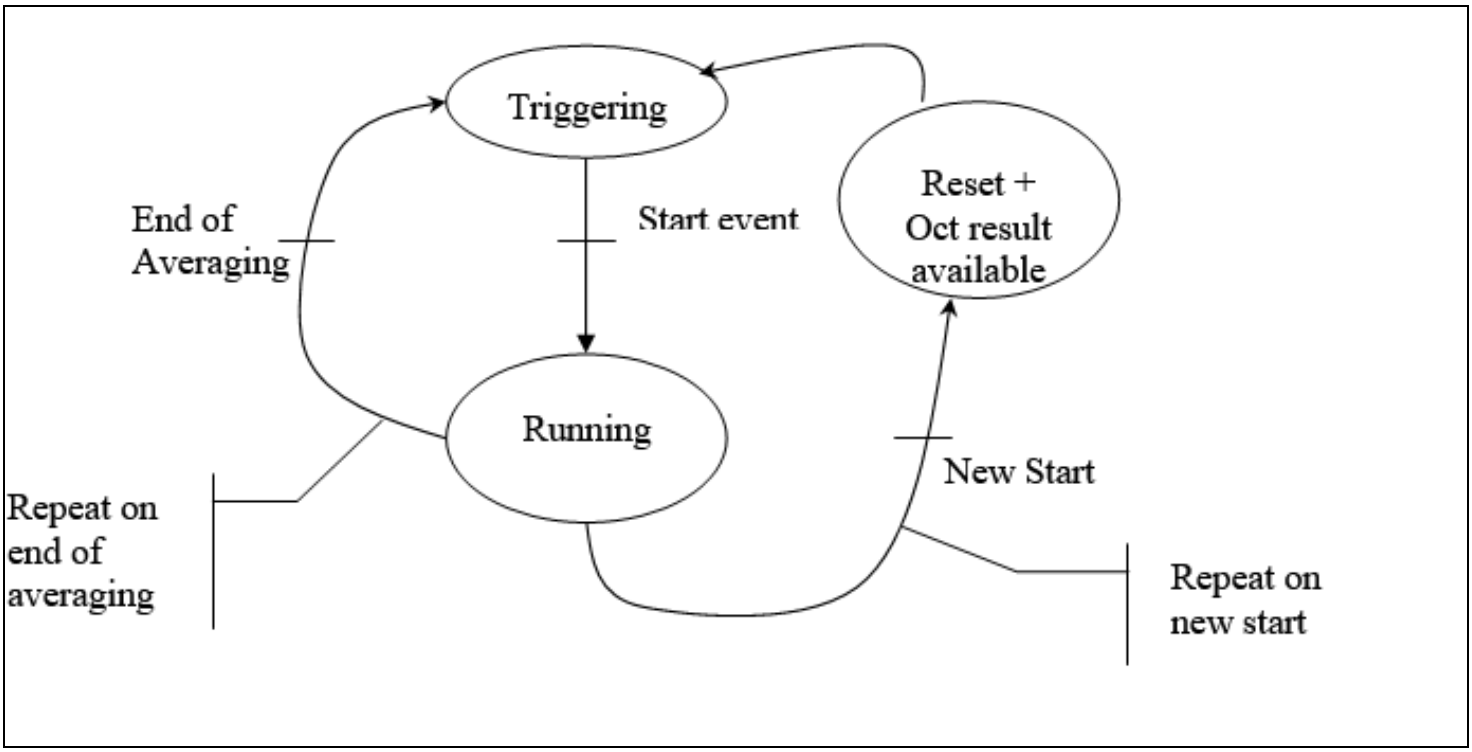
- **Start**: defines the event to start the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Start" condition.
- **Stop**: defines the event to stop the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Stop" condition.
- **Repeat**: This setting allows selecting a condition for the plug-in to be restarted. If an event is selected as a Start event, the option New start is available, and when this mode is selected each Start event restarts the plug-in. The mode End of averaging is available when the value of the *1/n Octave x/Average/Type* setting is different from the Exponential mode, it restarts the plug-in when the averaging is finished. It is set to "Off" except for linear average when it is set to "End of averaging". In this case, the "Avg duration" gives the periodicity of the average restart.
-

Repeat	**Description**
Off	no repeat. The measurement is stopped at the end of averaging.
New start	The measurement restarts when the start event occurs. It is enabled if Start is different from Free run.
End of averaging	The measurement restarts at the end of averaging.

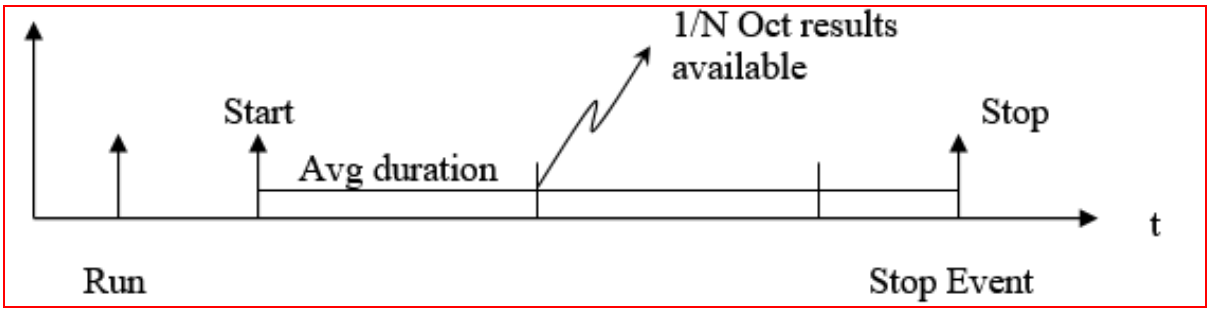
Hidden/fixed: the average type sets the authorized repeat modes.

Type	**Repeat mode**
Linear	Off / New start / End of Averaging
Repeat	Set to End of averaging
Short LEQ (1/8s or 1s)	Set to End of averaging
Other types	Set to Off

The following scheme is a description of the two different repeat modes:

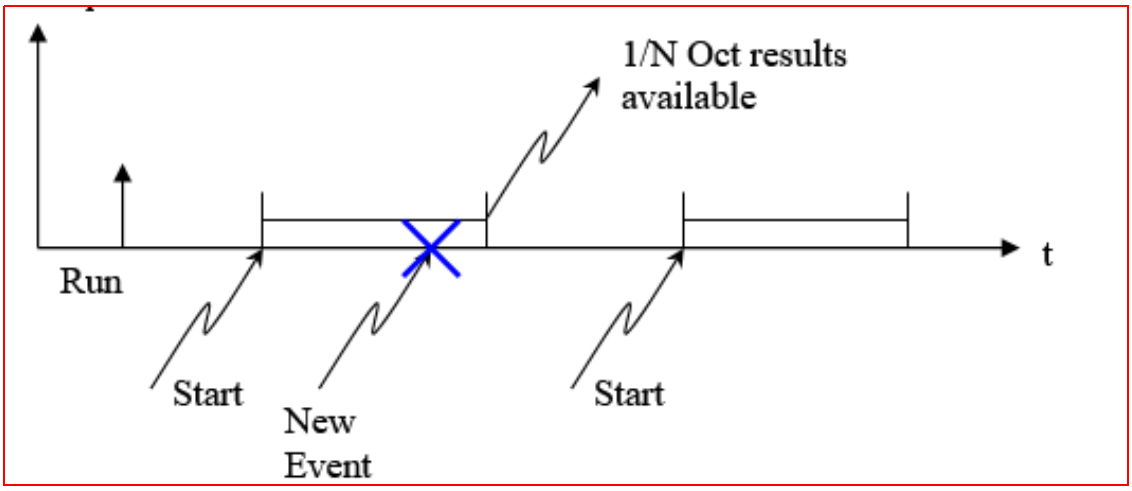


- Mode Repeat on ?end of averaging?:



The ?Run? corresponds to the start of the analyzer. The start is the beginning of average duration. At the end of the first average, the second average will start and so on until the end of the integration time (even if the last short time integration duration is not over). Each averaging has the same size, except the last that can be smaller.

- Mode Repeat on ?New start?:



The ?Run? trigger the analyzer, but the average begins at the start event (set in the event definition). This averaging stops at the end of average duration or at the stop event. Then the next averaging is waiting for the new start event to occur.

In case a new event occurs during a previous averaging, this start event won?t be effective because the previous average duration is not over, you can only set other event after the end of the previous one.

102.2.3.3 Average

Contains the settings related to the type of averaging of the signals to be computed.

- **Type**  : the average type.

Type	Description
Linear	Arithmetic average of the instantaneous 1/n octave during the "Avg duration"
Repeat	Performs linear averaging over "Short duration"  time and finally computes a linear average of all "Short duration" results over "Avg. duration" time *Refresh* is performed every "Short duration" with the display if the corresponding linearly averaged spectrum over "Short duration" time. The final averaged spectrum corresponds to the linear averaged spectrum over "Avg. duration" (equivalent to the linear average of each "Short duration" result). The *event "Oct result available"* (to be used for instance as a trigger in the waterfall) corresponds to the Avg. 1/n oct spectrum after each "Short duration" calculation.
Exponential	Works with the same time constant on every detector. It is equivalent to a RC filter following the squaring module. Performs continuous exponential averaging of instantaneous 1/n octave spectrum over "Exponential time constant" value. *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs))*256 with fs the input sampling frequency) The *event "Oct result available"* corresponds to the periodicity (1/(fs))*256 with fs the input sampling frequency).
Constant BT 0.2 dB	Performs exponential averaging with averaging time in each 1/n octave band inversely proportional to the frequency so that the product B*T is constant. For "Constant BT 0.2 dB": B*T = 500 with B the center frequency of 1/n octave band and T the corresponding integration time. This averaging setting gives a standard error "epsilon"<0.2dB *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency) The *event "Oct result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling frequency).
Constant BT 0.5 dB	Performs exponential averaging with averaging time in each 1/n octave band inversely proportional to the frequency so that the product B*T is constant. For "Constant BT 0.5 dB": B*T = 100 with B the center frequency of 1/n octave band and T the corresponding integration time. This averaging setting gives a standard error "epsilon"<0.5dB *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency) The *event "Oct result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling

	frequency).
Constant BT 1 dB	Performs exponential averaging with averaging time in each 1/n octave band inversely proportional to the frequency so that the product B*T is constant. For "Constant BT 1 dB": B*T = 25 with B the center frequency of 1/n octave band and T the corresponding integration time. This averaging setting gives a standard error epsilon <1dB *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency) The *event "Oct result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling frequency).
Constant BT 2 dB	Performs exponential averaging with averaging time in each 1/n octave band inversely proportional to the frequency so that the product B*T is constant. For "Constant BT 2 dB": B*T = 5 With B the center frequency of 1/n octave band and T the corresponding integration time. This averaging setting gives a standard error epsilon<2dB *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency) The *event "Oct result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling frequency).
Short LEQ 1/8s	Corresponds to a linear averaging with a fixed "Short duration" of 1/8s (equivalent to Repeat averaging mode with non selectable "Short duration" parameter). *New result* available every 125 ms for display and for the Waterfall. The *event "Oct result available"* corresponds to the Avg. 1/n oct spectrum after each "Short duration" calculation (every 125ms). This average mode is not available for frequency ranges below 5kHz.
Short LEQ 1s	Corresponds to a linear averaging with a fixed "Short duration" of 1s (equivalent to Repeat averaging mode with non selectable "Short duration" parameter). *New result* available every second for display and for the Waterfall. Note: The tenth second measure corresponds to the average of the entire measurement (not the average for the tenth second). Moreover if you stop the measurement before the end, the last measurement would not be displayed. The *event "Oct result available"* corresponds to the Avg. 1/n oct spectrum after each "Short duration" calculation (every 1s). This average mode is not available for frequency ranges below 5kHz.
Fast	Corresponds to an exponential averaging with a fixed "Exponential time constant" of 0.125s. *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency) The *event "Oct result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling frequency). This average mode is not available for frequency ranges below 5kHz.
Slow	Corresponds to an exponential averaging with a fixed "Exponential time constant" of 1s. *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency). The *event "Oct result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling

	frequency). This average mode is not available for frequency ranges below 5kHz.
Impulse	Corresponds to an exponential integration with a raise Exponential time constant of 35 ms and a fall Exponential time constant of 1500ms. *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency). The *event "Oct result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling frequency). This average mode is not available for frequency ranges below 5kHz.

***Hidden/fixed**:* the last five types are enabled only if the Upper central frequency is upper than 6.3 kHz.

- **Avg. duration**  : defines the long term average duration time in second. See the table below for more information. If you change the short duration, the average duration will be automatically adjust to the closest value multiple of short duration.
- **Short duration**  : defines the short term average duration time in second. See the table below for more information.
- **Exponential time constant**: defines the average duration time in second for the exponential averaging mode. See the table below for more information.

Hidden/fixed:

Type	Avg. duration	Short duration	Exponential time constant
Linear	Visible	not used	not used
Repeat	visible	visible	not used
Exponential	not used	not used	visible
Cst BT	not used	not used	not used
Short LEQ1/8s	visible	set (1/8s)	not used
Short LEQ 1s	visible	set (1s)	not used
Fast	not used	not used	set (1/8s)
Slow	not used	not used	set (1s)
Impulse	not used	not used	set (0.035s)

102.2.4 CPB filters

- **Autobandwidth**: manages the analysis and recording bandwidths automatically. The Inputs selection window allows the use of 2 different sampling rates for the dynamic inputs. It gathers inputs with the same physical quantity into groups, maintaining the same sampling into each group. When inputs are associated with the analysis plug-in, it adjusts its analysis bandwidth to match the inputs ones. Mixing input bandwidths in one analysis plug-in lead to set its bandwidth to the lowest one. Autobandwidth is set by default . When it is enabled in the plug-in, these settings "switch to informative status"

- **Lower central freq**  : the central frequency of the lower band of the frequency range. The bands considered are octave bands (for the octave mode) and 1/3 octave bands (for the other modes).

The user enters a value, which is adjusted to the closest central frequency. The bandwidth between the Lower and Upper central frequencies must be lower than or equal to eleven filters (considering octave bands) and 31 filters (considering 1/3 octave bands). So, if this bandwidth increases, then the Upper central frequency is automatically reduced.

- **Upper central freq** : the central frequency of the upper band of the frequency range. The bands considered are octave bands (for the octave mode) and 1/3 octave bands (for the other modes).

The user enters a value, which is adjusted to the closest central frequency. The bandwidth between Lower and Upper central frequency must be lower than or equal to eleven filters (considering octave bands) and 31 filters (considering 1/3 octave bands). So, if this bandwidth increases, then the Lower central frequency is automatically increased.

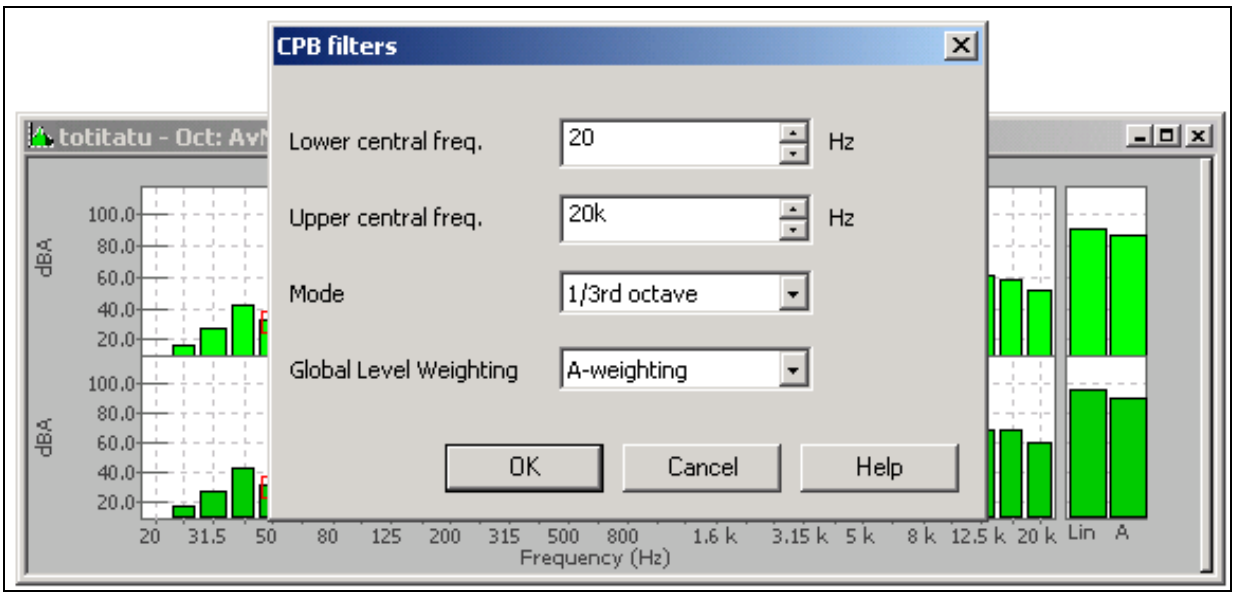
Note: For having the last band compatible with the Class #1 standard, the front end sampling frequency need to cover the full band. Exemple: for having Class #1 compatible for 1/3 octave 20kHz the sampling frequency need to be 65,536kS/s. If you let the sampling frequency at 51.2kS/s (20kHz bandwith) you will be Class #2 standards.

- **Mode** :

Mode	Description
Octave	Octave digital filter
1/3 octave	1/3 octave digital filter
1/12 octave	1/12 octave digital filter
1/24 octave	1/24 octave digital filter

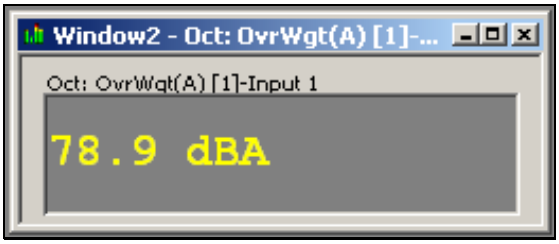
- **Global Level weighting:**

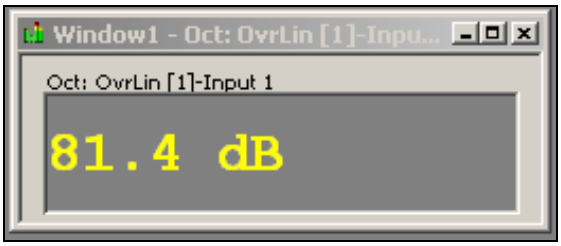
Weighted overall levels of the1/n Octave Plug-in are now computed in the time domain (weighting filter and detector). Processing weighting in the time domain provides accurate measurement for non-stationary signals (impulsive).



The type of time domain weighting (A or C) is selected in the ASB setting *1/n Oct / CPB filters / Global level weighting.*

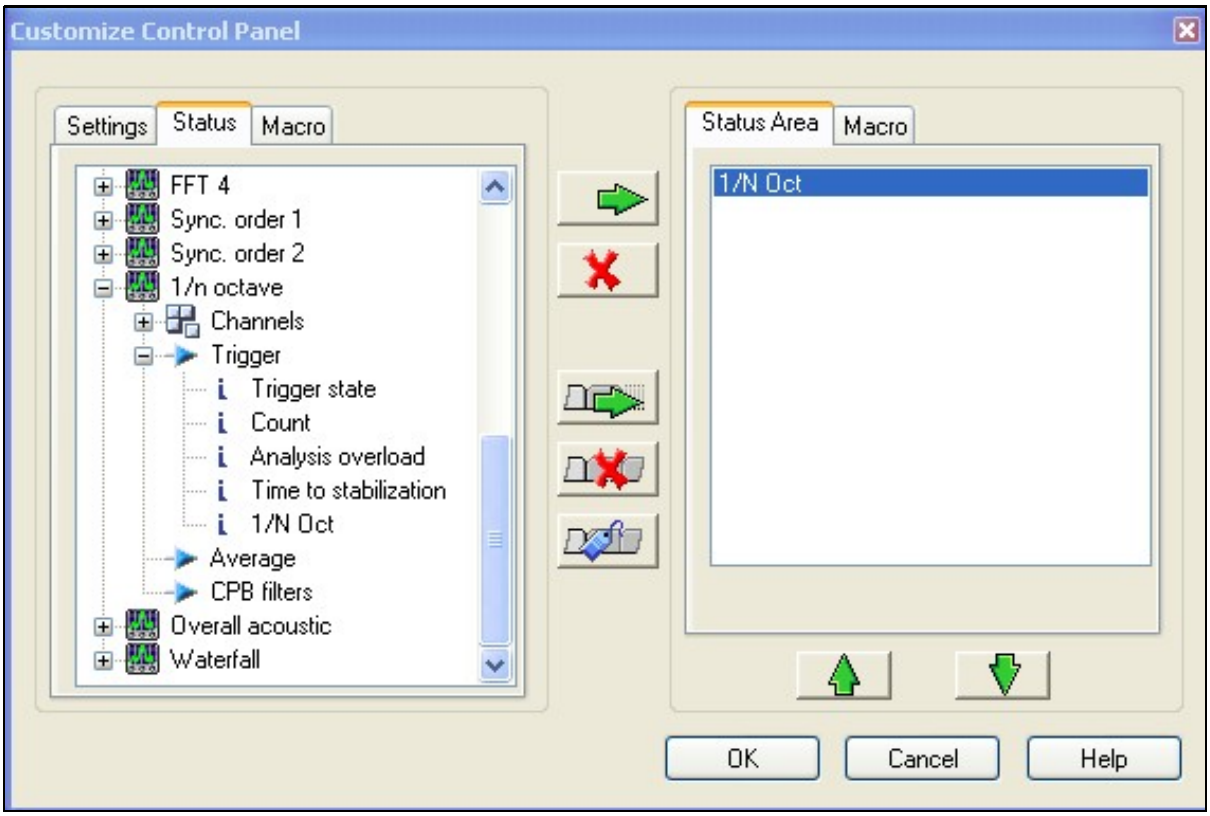
These overall values can be displayed in view meter.



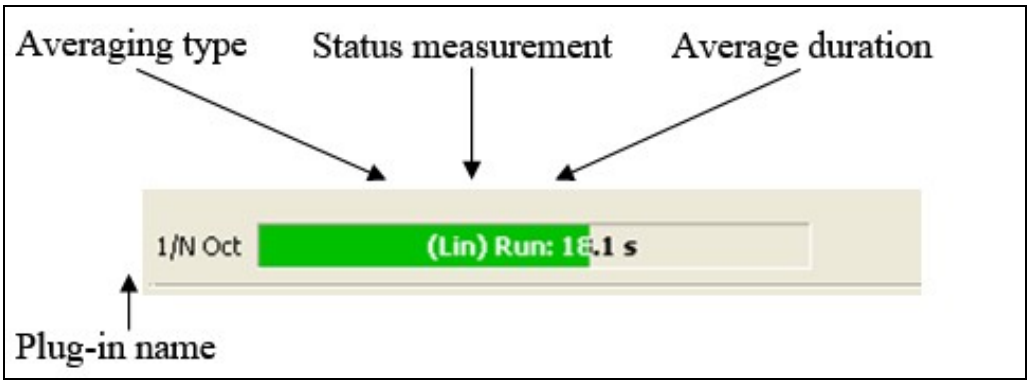


102.3 1/n Octave status

All statuses are available to add to the control panel



102.3.1 1/N oct



The current plug-in status is synthesized in a special progress-bar. This progress bar is automatically displayed in the ?control panel? when the plug-in is active (i.e. as soon as at least 1 input is connected to the Sync Order plug-in). This status is called ?1/N Oct? and it is available in the status ASB tree (see customize control panel).

This status displays the type of averaging between brackets (i.e. Lin, Rep, Leq, CBT, Fast, Slow, Ipls or Exp), the plug-in state (Run, Paused, Stop) and the real-time status.

The way the status bar is displayed depends on the mode selected:

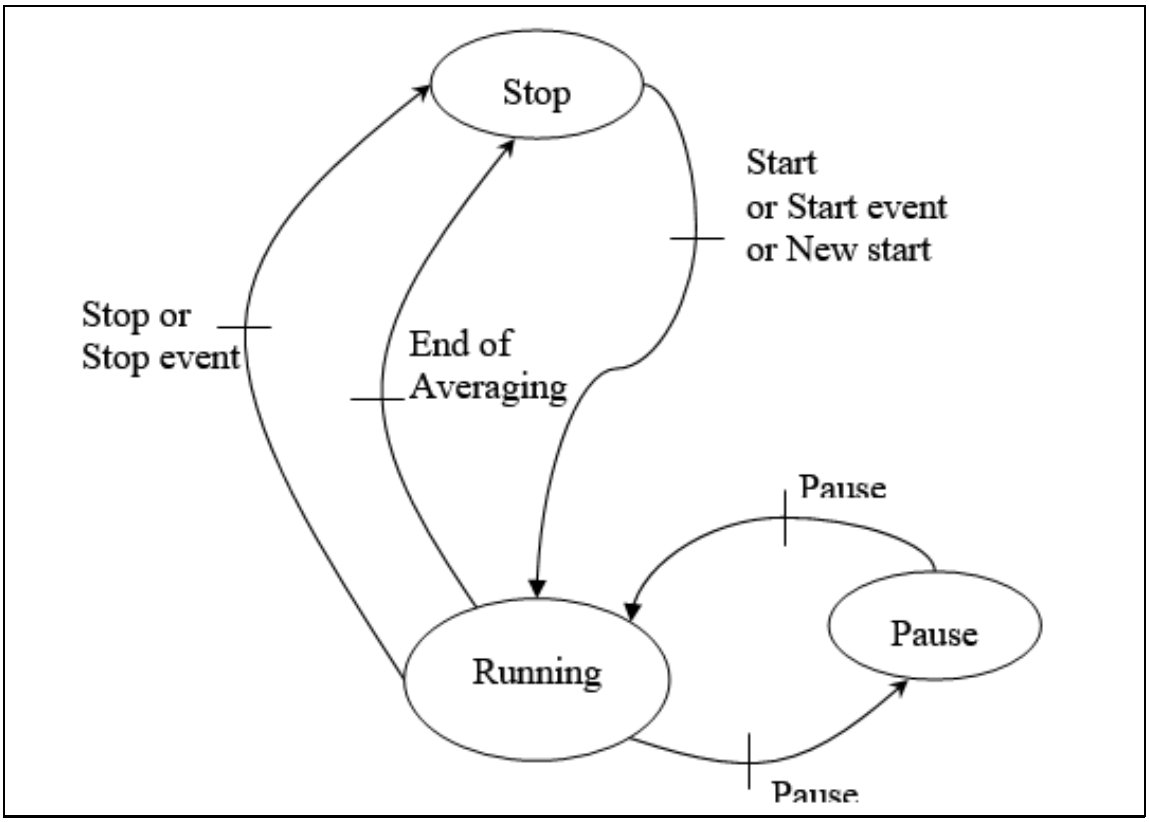
- **Linear, Repeat, Short Leq:** display the Average Duration. The status bar is displayed from left to right. The text displayed indicates the state of the acquisition (Run, Paused or Stop) with the time.
- **Cst BT, Fast, Slow, Impulse:** the status bar is a ?snake? type; the text displayed indicates the state of the acquisition (Run, Paused or Stop).
- **Exponential:** the status bar is displayed from right to left with flashing until the end of the acquisition. The text displayed indicates the exponential averaging time.

The color of the background bar and of the text depends on real-time status:

- *Green background and white or black text*: acquisition in real-time.
- *Red background and white or black text*: the current acquisition is not real-time (current block is not analyzed).
- *Green background and red text*: the current acquisition is real-time, but since start not all the blocks were analyzed.

102.3.2 Trigger state

The following scheme describes the different states of the measurement:



102.3.3 Count

This status displays:

- The average time in linear, short Leq and repeat modes.
- The exponential time constant in exponential, Fast, Slow, Impulse modes.
- The integration time T in constant band tracking modes.

Note that in linear mode, if repeat were on end of averaging, the count would restart at the end of averaging until stop event. If repeat were on new start, the count is set to zero at the end of averaging waiting for a new trigger.

In Short Leq mode, the count is stopped at the end of time duration (the repeat mode is made on short duration).

102.3.4 Analysis overload

This status displays if during the acquisition, there was an amplitude overload (or not) of the analyzed inputs.

102.3.5 Time to stabilization

Until this time to stabilization is over, results are not available. All filters have a stabilization time and at any change of settings, filters need this time before the results are available. The lower the frequency is the longer this stabilization is.

The filters stabilization time is given by:

*Time (s) = x * 5 / lower central frequency*

Where x depends on the mode:

Mode	**x**
Octave	1

1/3 octave	1
1/12 octave	4
1/24 octave	8

If there were no change between two runs, no stabilization would be necessary. But if a new plug-in is connected, the system is reinitialized and then there is a time to stabilization.

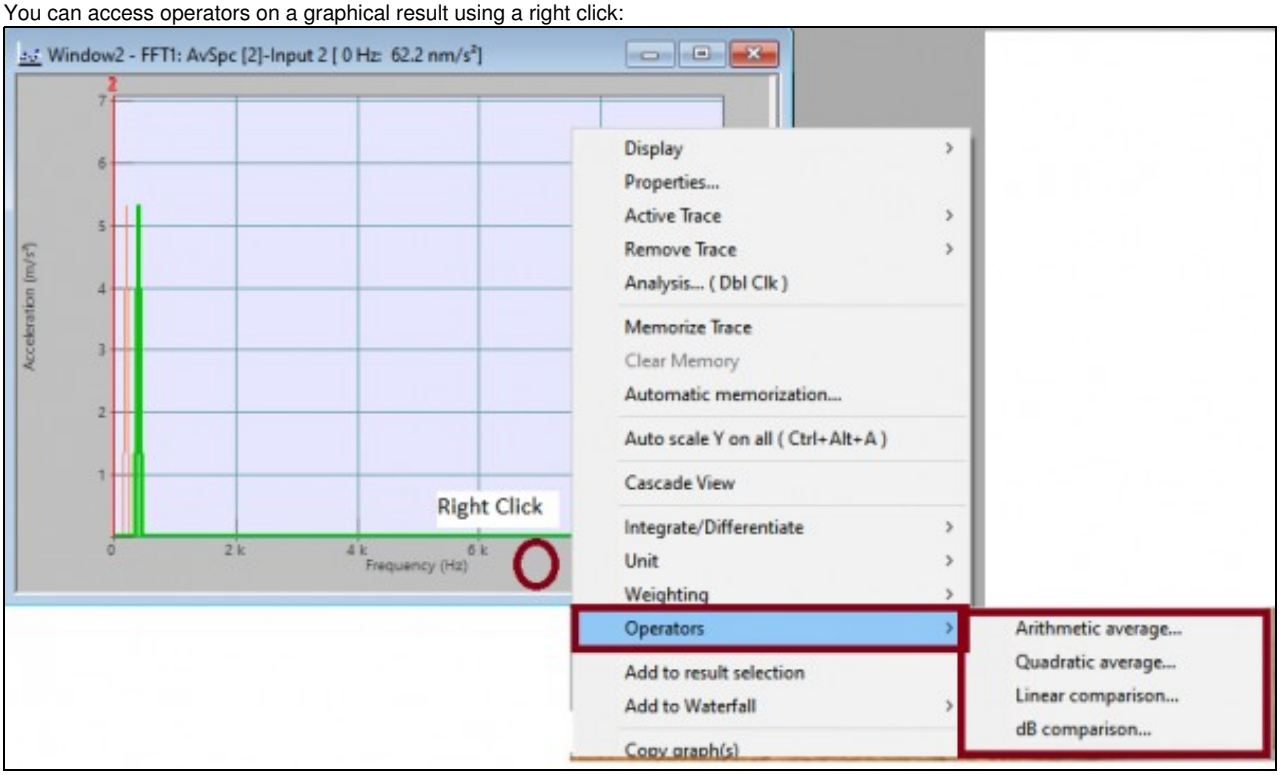
103 NVGate Operator

For time signal operator, check: virtual input plug in.

103.1 Operators

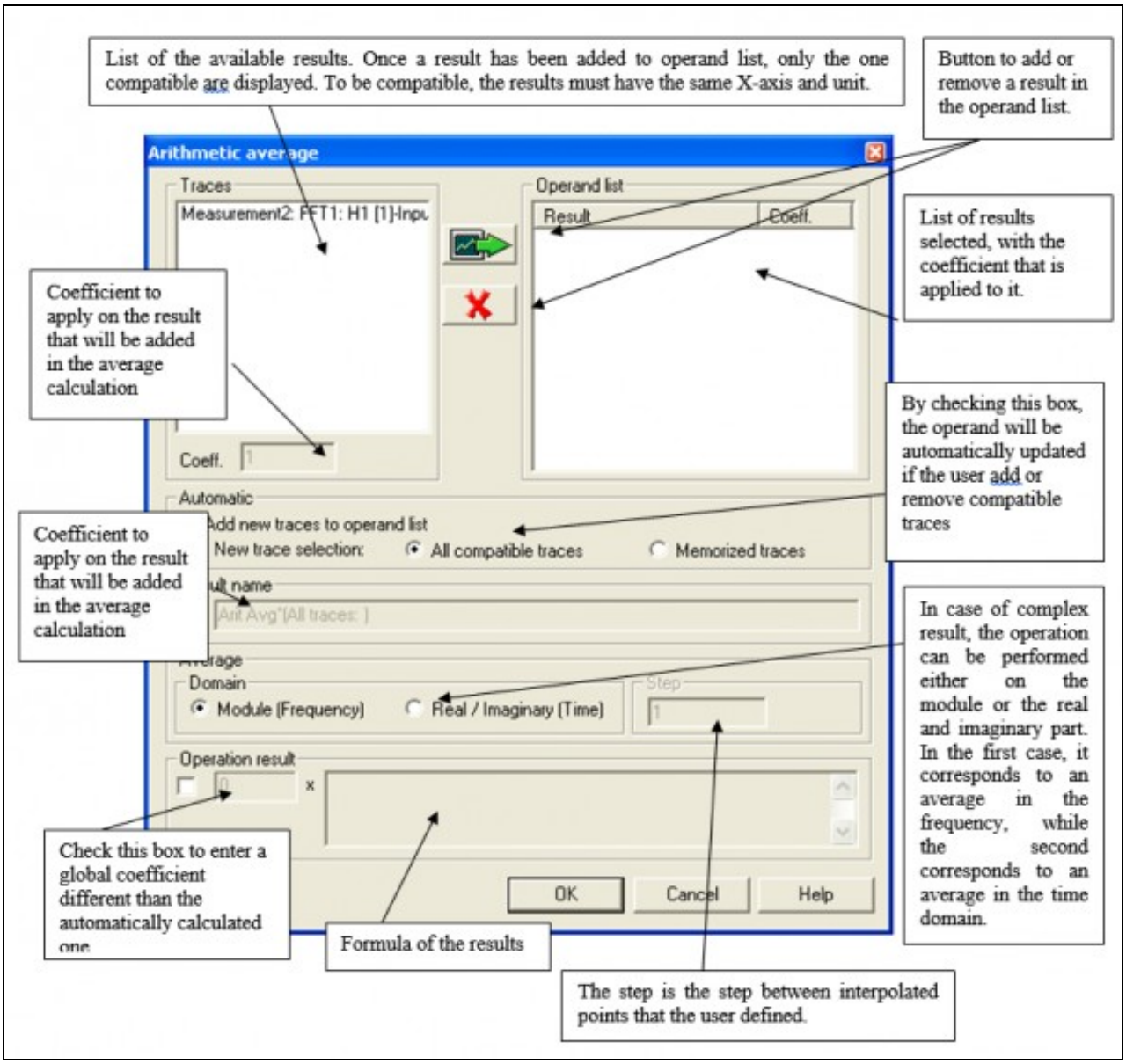
Operators are used to perform calculations using various results. All kind of operators (Arithmetic average, Quadratic average, Linear comparison or dB comparison) are available for any type of results.

You can access operators on a graphical result using a right click:



103.1.1 Arithmetic average

This dialog box is designed to create a new result which is the arithmetic average of several results. This average can be calculated only for results that are in the same window. They must also have the same x-Axis definition.


List of the available results. Once a result has been added to operand list, only the one compatible are displayed. To be compatible, the results must have the same X-axis and unit.
Button to add or remove a result in the operand list.
Arithmetic average
Traces
Measurement2: FFT1: H1 [1]-Inpu
Operand list
Result
Coeff.
List of results selected, with the coefficient that is applied to it.
Coefficient to apply on the result that will be added in the average calculation
Coeff.
1
Automatic
Add new traces to operand list
New trace selection:
All compatible traces
Memorized traces
By checking this box, the operand will be automatically updated if the user add or remove compatible traces
Coefficient to apply on the result that will be added in the average calculation
ult name
Arit Avg"[All traces:]
Average
Domain
Module (Frequency)
Real / Imaginary (Time)
Step
1
In case of complex result, the operation can be performed either on the module or the real and imaginary part. In the first case, it corresponds to an average in the frequency, while the second corresponds to an average in the time domain.
Operation result
0
x
Check this box to enter a global coefficient different than the automatically calculated one
OK
Cancel
Help
Formula of the results
The step is the step between interpolated points that the user defined.

The formula of the calculated result is:
Average_Result = Q * (C1 Result_1 + C2 Result_2 + ... + Cn Result_n)

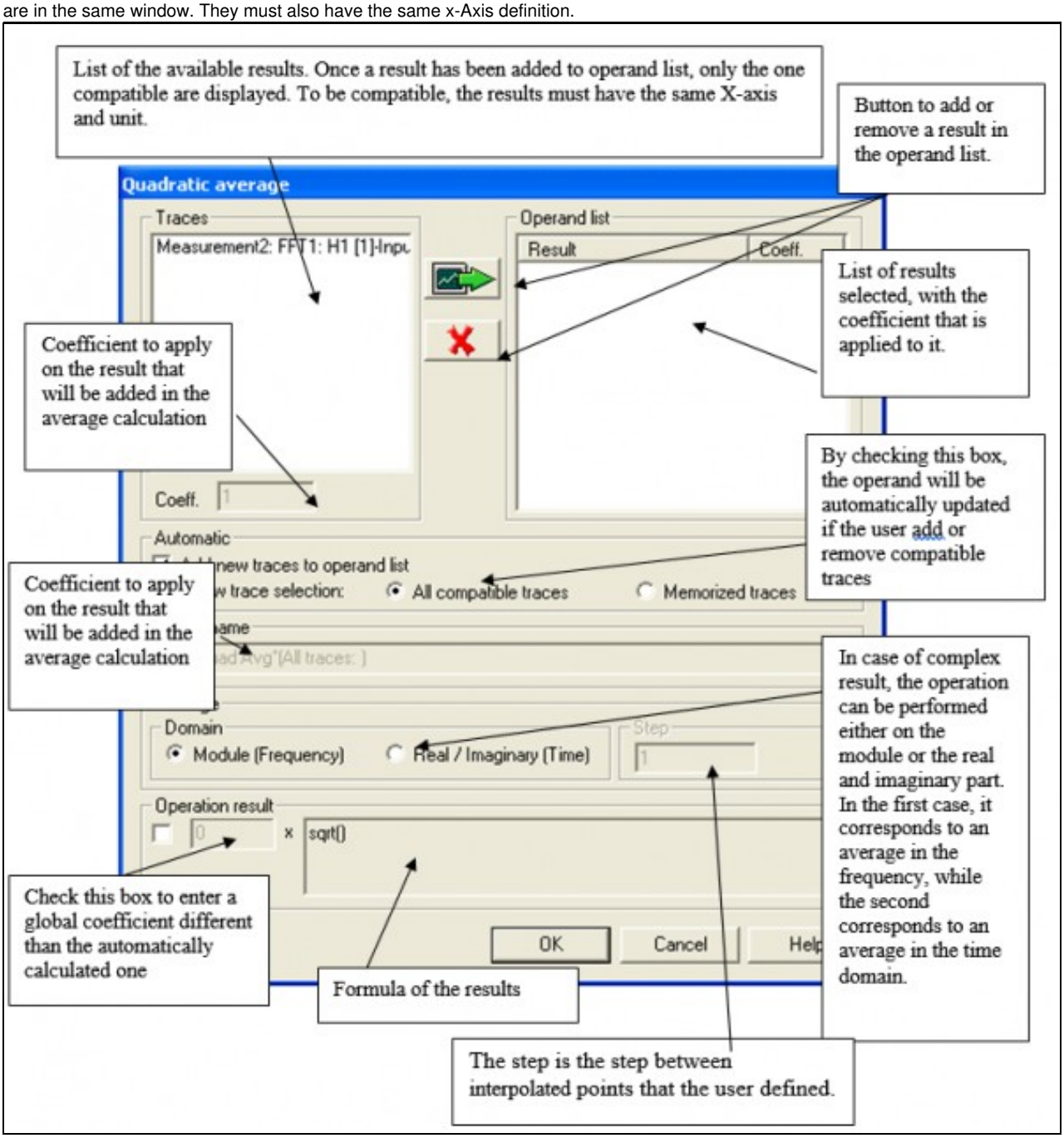
The default values of C1, C2...Cn are 1 and the default value of Q is (C1+C2+...+Cn)/n, but all these coefficients can be modified.

To set the C_i coefficient, fill in the "Coef" value and then add one or several results with the following button 

To set the Q coefficient, add up all results, check the box below "Operation result", and enter the value.

103.1.2 Quadratic average

This dialog box is designed to create a new result, which is the quadratic average of several results. This average can be calculated only for results that are in the same window. They must also have the same x-Axis definition.



The formula of the calculated result is:

'***Comp_Result = Q *[(C1 Result_1² + C2 Result_2² + ... + Cn Result_n²)]½)***

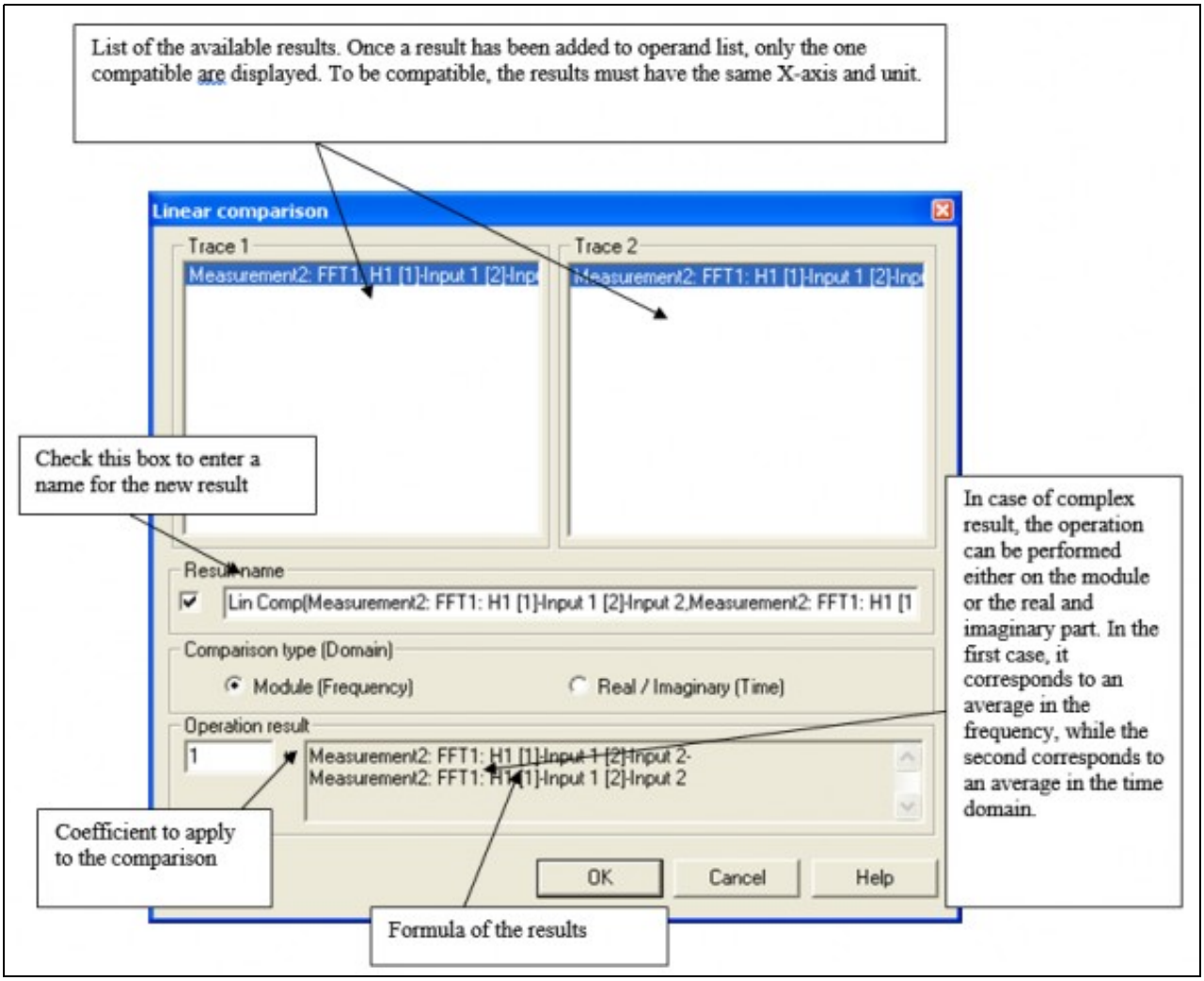
The default values of C1, C2...Cn are 1 and the default value of Q is 1, but all these coefficients can be modified.

To set the C_i coefficient, fill in the "Coef" value and then add one or several results with the following button 

To set the Q coefficient, add up all your result, check the box below "Operation result", and enter the value.

103.1.3 Linear comparison

This dialog box is designed to create a new result, which is the comparison of 2 results. This operation can be calculated only for results that are in the same window. They must also have the same x-Axis definition.



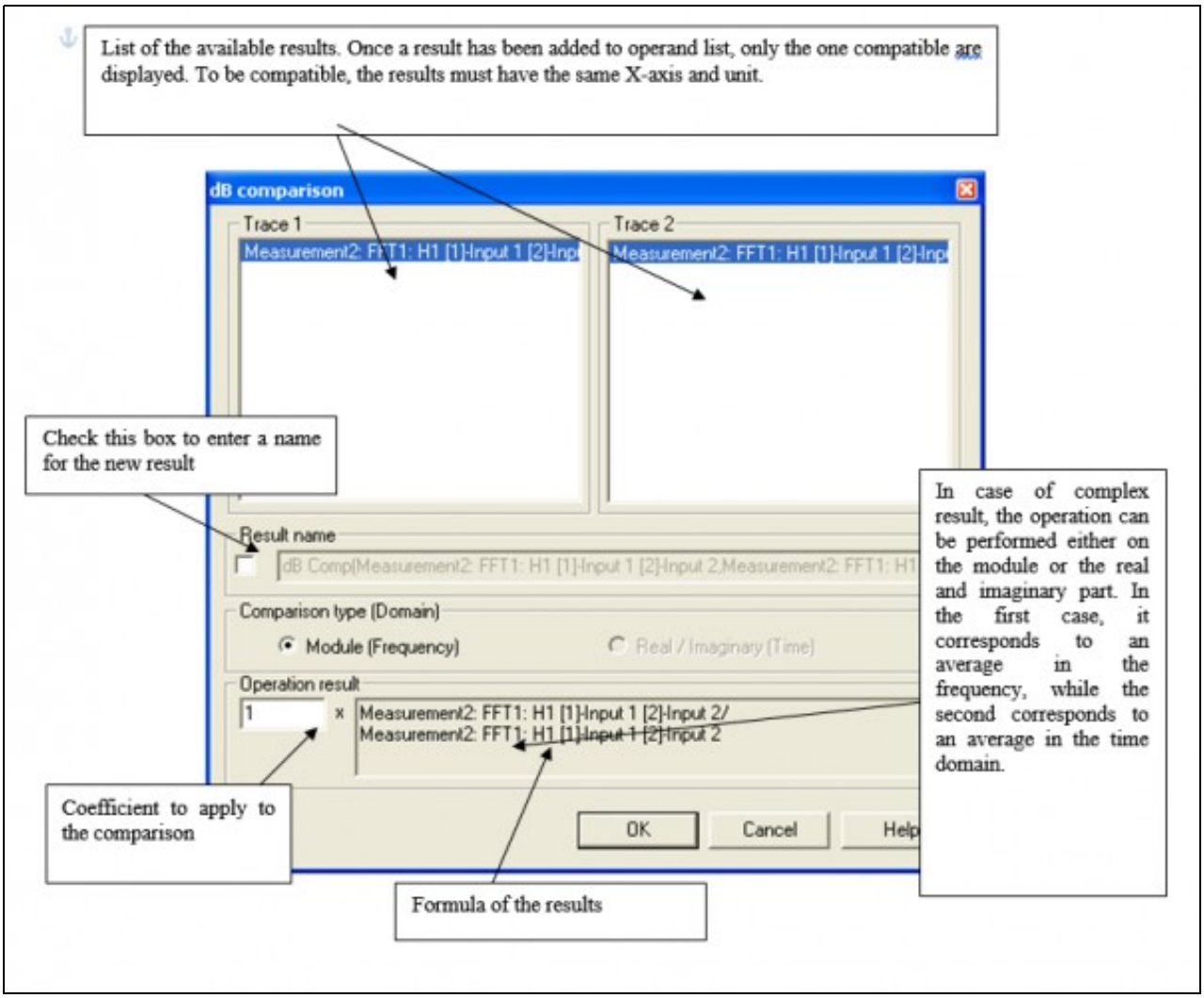
The formula of the calculated result is:

Comp_Result = Q *(Result_1 - Result_2)

The default value of Q is 1, but all of these coefficients can be modified.

103.1.4 dB comparison

This dialog box is designed to create a new result, which is the comparison of two results. The comparison is made so that the result shows the difference between the two results in dB. It corresponds to the calculation of the ratio between the two results. This operation can be performed only on results that are in the same window. They must also have the same x-Axis definition.



The formula of the calculated result is:

Comp_Result = Q *(Result_1/Result_2)

The default value of Q is 1, but all of these coefficients can be modified.

104 NVGate OR10 Stand alone

104.1 OR10: Standalone operations

104.1.1 Video introduction

104.1.2 Template preparation

Standalone operations with OR10 are conducted with the OR10's keyboard and touch screen. It features simple and fast setup and data acquisition with reduced interface. In order to benefit from the various OROS instruments possibilities, it is recommended to use predefined *templates. Templates* applies multiple front-end and recorder setups to OR10 in standalone operations.

Templates are generated by *NVGate* the OROS Software platform

It is also possible to generate Templates by editing files manually. It is not recommended to use this manner as the format may change without notice.

Templates are transferred in the OR10 memory in 2 possible ways:

- NVGate connected to any OROS instrument license can be used to prepare templates. License input number may limit templates inputs number. Mode on the OR10 Optional instrument locked NVGate license required.
- Ethernet cable
- Wi-Fi
- By file transfer from PC to µSD card

104.1.2.1 NVGate Template generation

This feature is available from NVGate version 11.30.

1. Launch NVGate on the PC with your license:

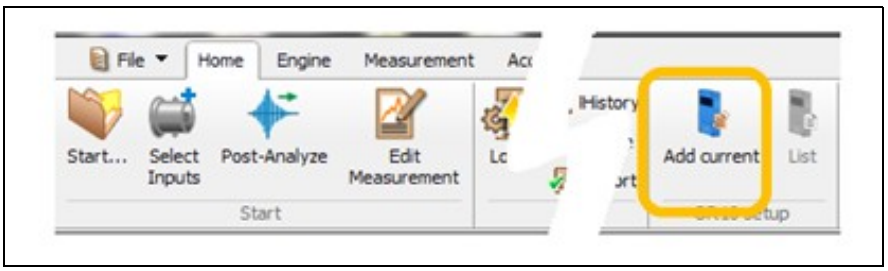
- Dongle locked: Plug the delivered OROS dongle in one of the USB ports of the PC running NVGate.
- Instrument locked: Connect the OR10 to the PC (Ethernet or Wi-Fi) to the PC.

2. Setup the front-end:

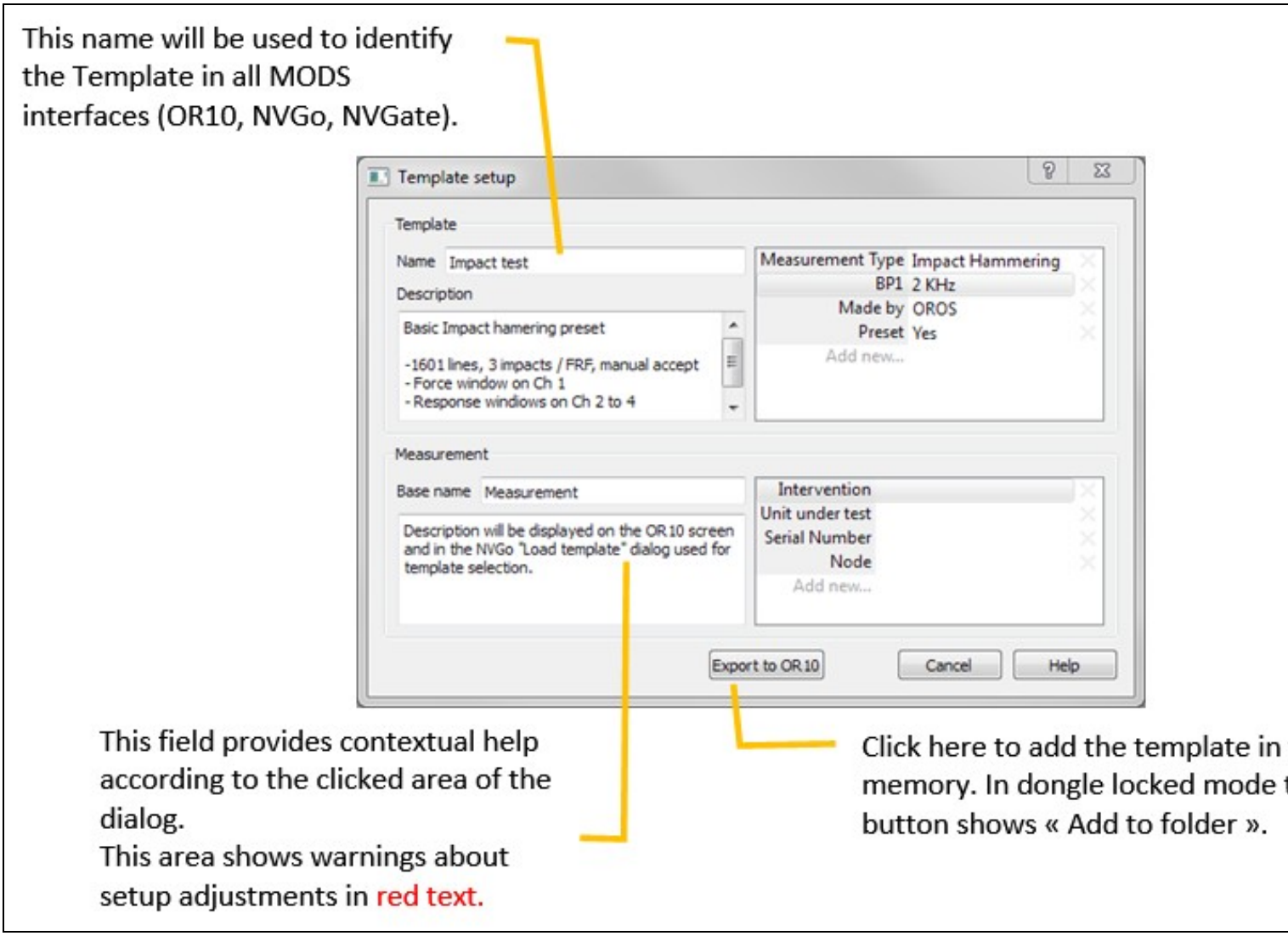
- Inputs & Ext. sync activation, couplings, sensitivities, ranges, labels, thresholds
- Sampling frequency. Note: the highest SF will be applied to all inputs
- CAN bus channels (up to 16) & parameters
- Recorder setup, duration and type (*Start to stop* and *Start to time* only)

3. Add the setup to the OR10 or to file:

- Click on *Home/OR10 Setup/Add current.*



- The Template setup dialog is displayed



OROS NVGate software uses *DataSet Management* (DSM) native technology. DSM features flexible properties that inform the used and produced data. (see *M002-115-7 Users' manual* for details).

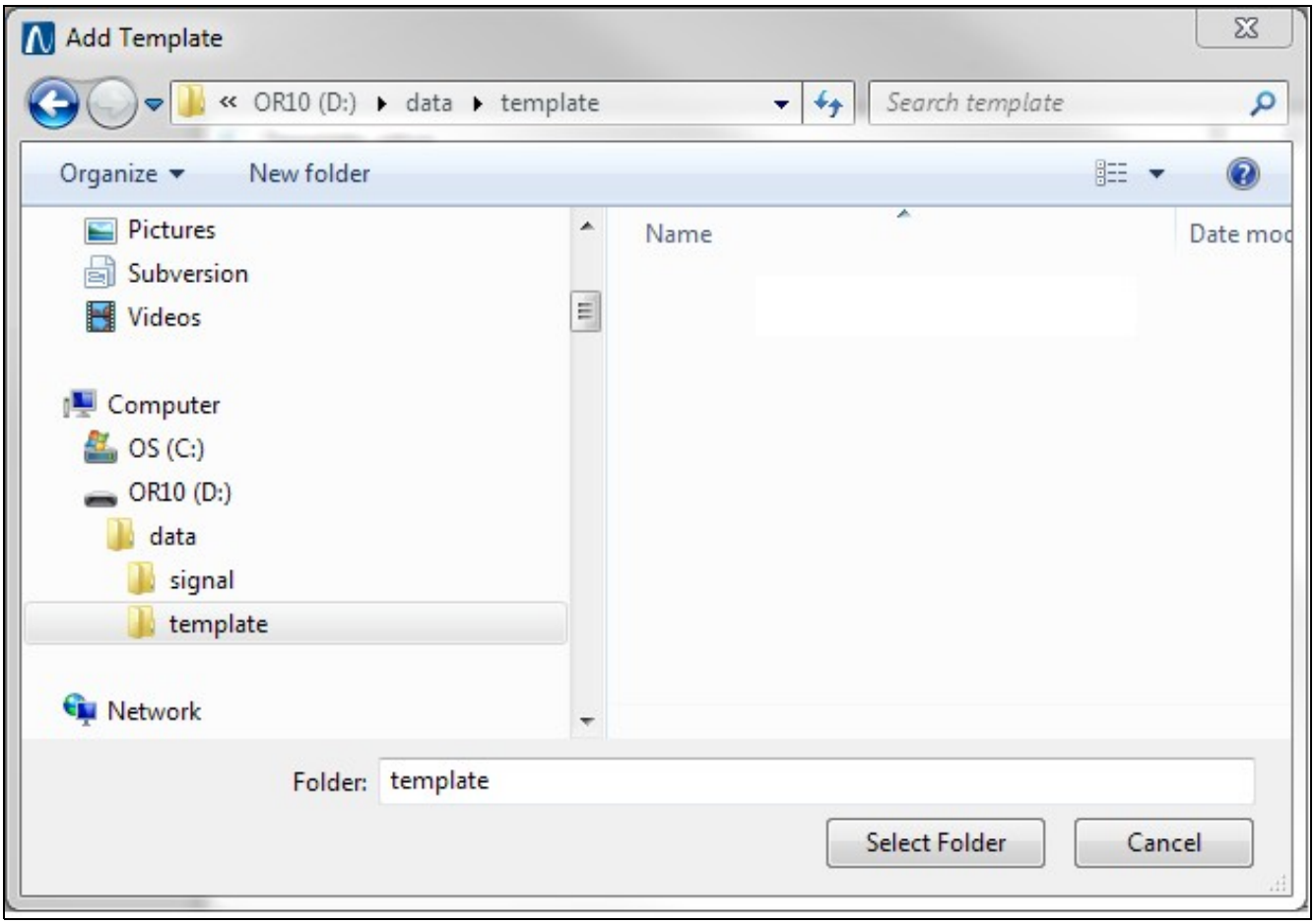
MODS *Templates* benefit from this technology. The *Template Setup* dialog allow adding/editing comments and properties to the *Templates* and *Measurements* as follow:

- *Description* will be shown with the *Template* name into Standalone and NVGo interfaces,
- *Template* properties will be shown with the *Template* name & description into NVGo interface. The properties will be added to all *Measurements* made with this *Template*,
- *Measurement* properties will be shown for edition while saving measurement into NVGo interface,
- When importing measurement files in NVGate, the properties the destination *Project* will be added to all imported *Measurements*.

104.1.2.2 Adding Template by files

When *Templates* are generated without OR10 connected to the PC (Dongle locked or Instrument locked on another OROS instrument) the transfer is made by file copy.

Click on the "Add to folder" button on bottom of the *Template Setup* dialog. Browse to the OR10 µSD card.



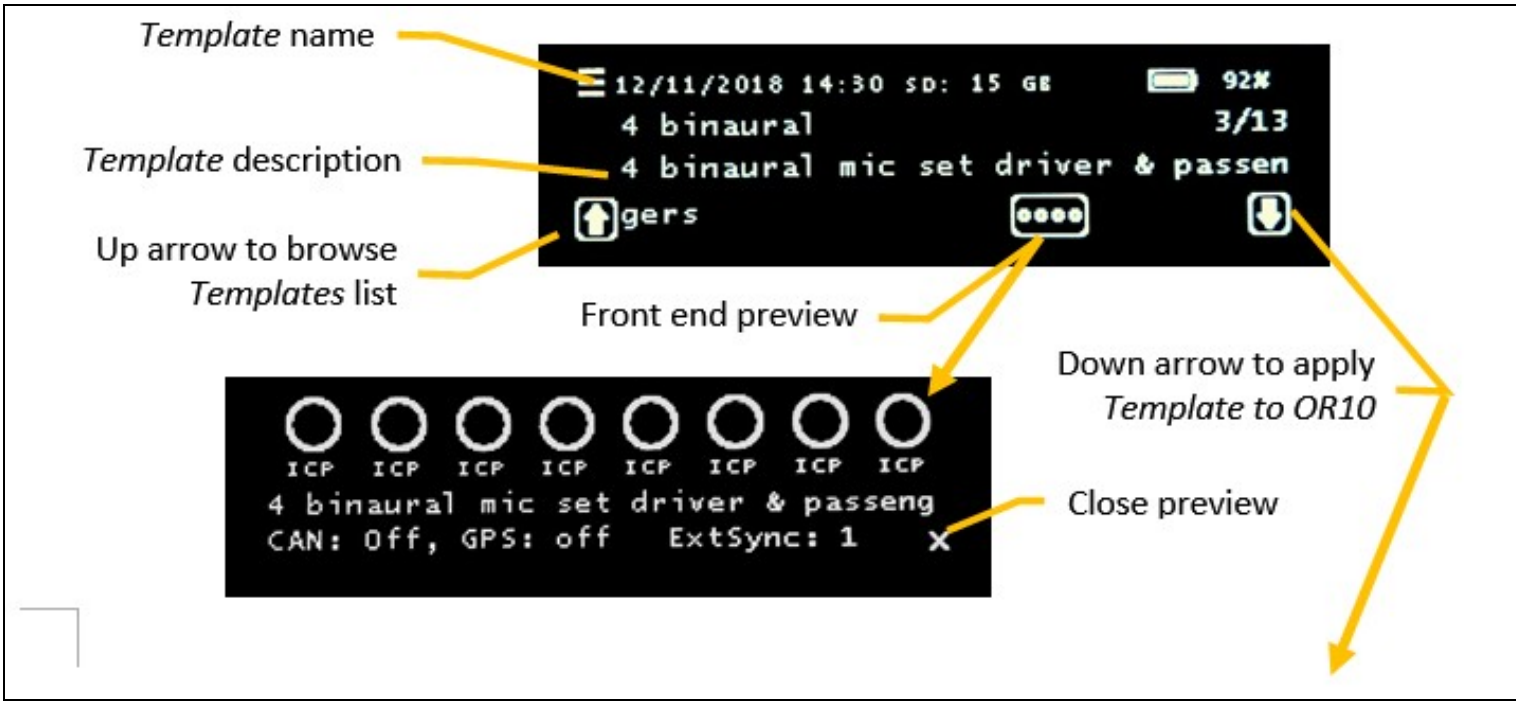
Open *Data\template* and click on *Select Folder*. Your new template is now available from OR10.

104.1.3 Standalone acquisition

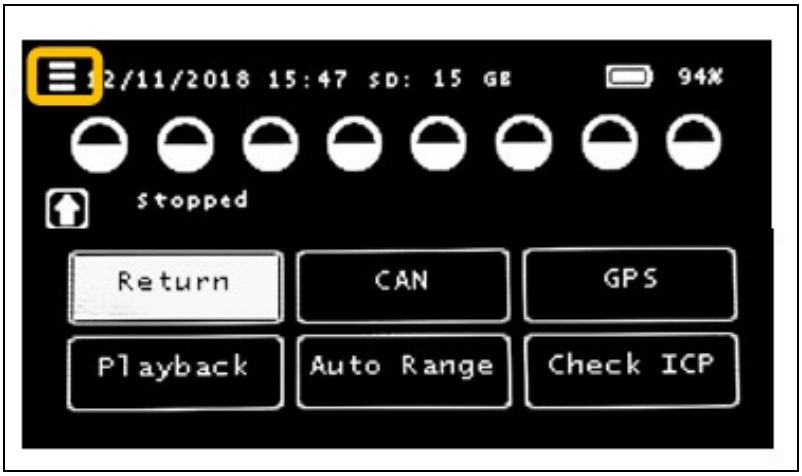
In standalone mode the OR10 instrument operates autonomously being setup through the keyboard and touch screen. Standalone mode requires an instrument locked license to operate.

The sequence of operations is as follow

1. From the main screen, browse and select the appropriate *Template*:

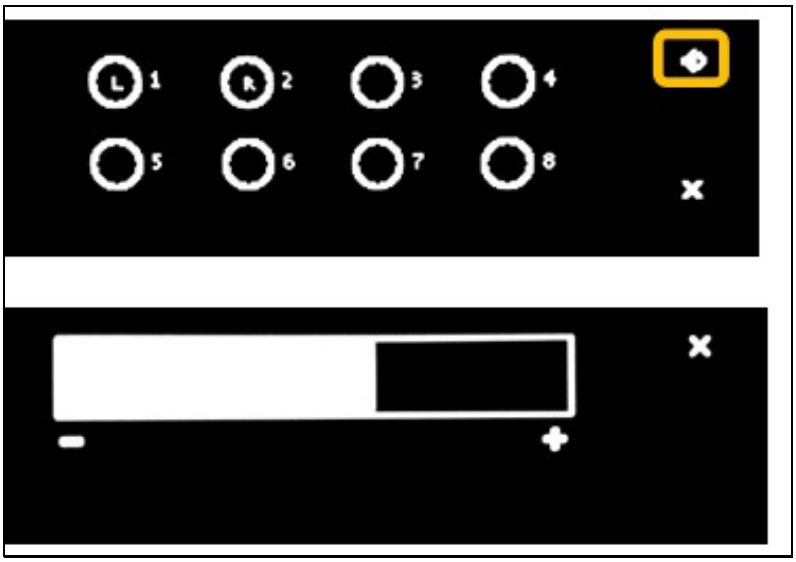


2. Press down arrow to apply chosen Template to OR10 front-end. The input load is shown.
Note: Keyboard arrows may be used instead of touch screen ones.



3. Press the top left menu to adjust and check front-end with:

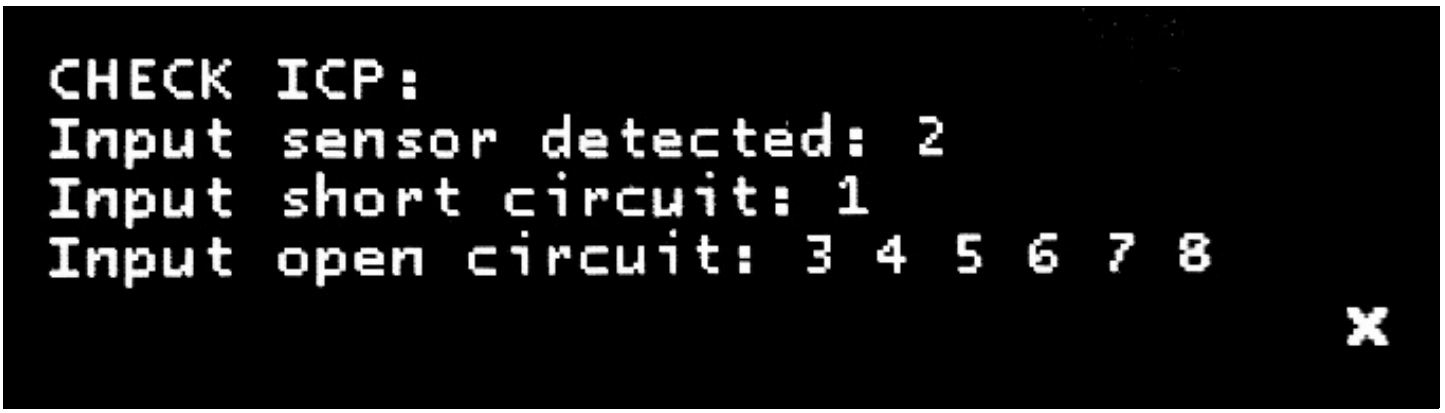
- Playback**:** play the inputs signal to the headphone connectors in stereo. Inputs are routed/un-routed to left or right channel by pressing the inputs position on the screen.
  To move to another input, first un-route the input already routed to L or R channel. Playback volume can be adjusted by pressing the top right loudspeaker icon.



- Auto Range: Adjust individually and synchronously each input range according to the max absolute level on 1 sec period.



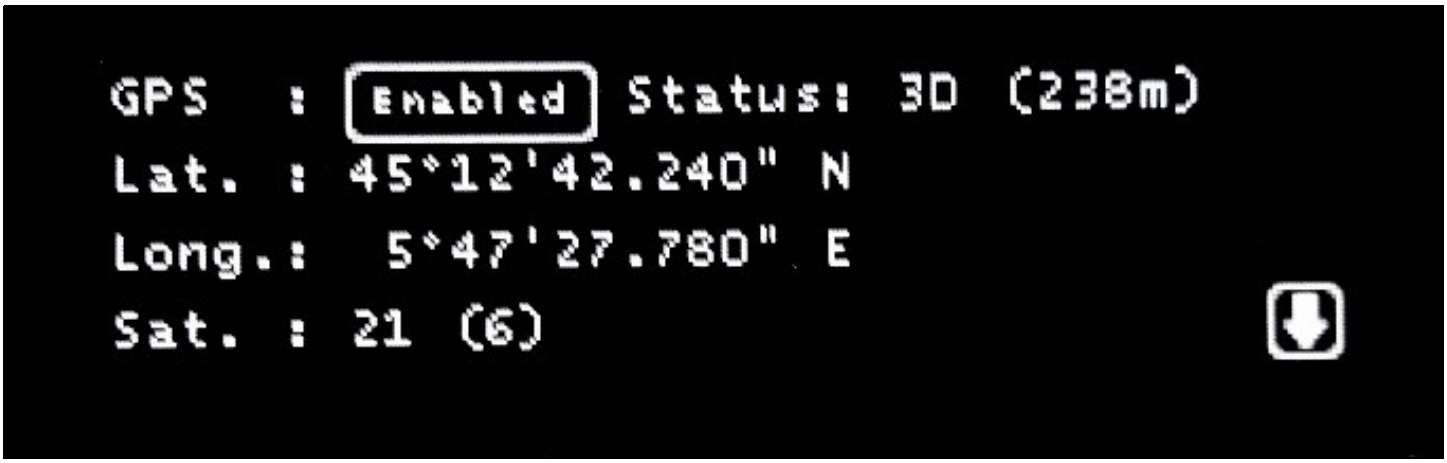
- Check ICP: Check the presence of an ICP transducer on each input. This takes few seconds to stabilize the ICP voltage.



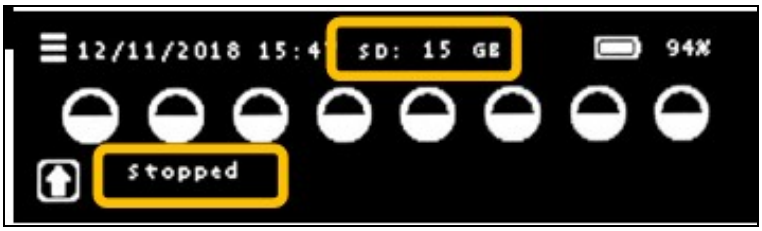
- **C**AN: Show the number of CAN messages configured and acquired.



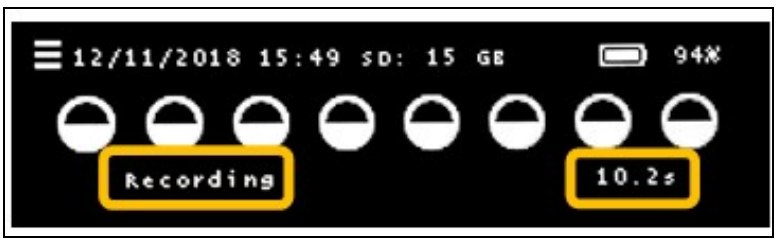
- GPS: Enable/Disable the GPS. Provides status, position and number of satellites. Note: The GPS antenna provides best results while being set horizontally.



4. **Check available memory**?



5. **Start acquisition:** Press REC button on the keyboard. Status switches to Recording<ref>during the recording, Auto Range and Check ICP functions are disabled.</ref> and duration is displayed. All active inputs and CAN channels are recorded.



6. **Stop the acquisition**: The acquisition stops

- At the end of the defined duration in *Start to Time* mode,
- When REC button is pressed.



7. **Save the record:** Records are saved with the predefined base name of the used *Template*. A combination of a 3-digit number and a letter is added to manage the multiple acquisitions:

- Letter is incremented while using the same *Template* for multiple acquisitions
- Number is incremented and letter reset when *Template* is changed.
- Number and letter are adjusted to follow the highest file name combination on the OR10 memory.

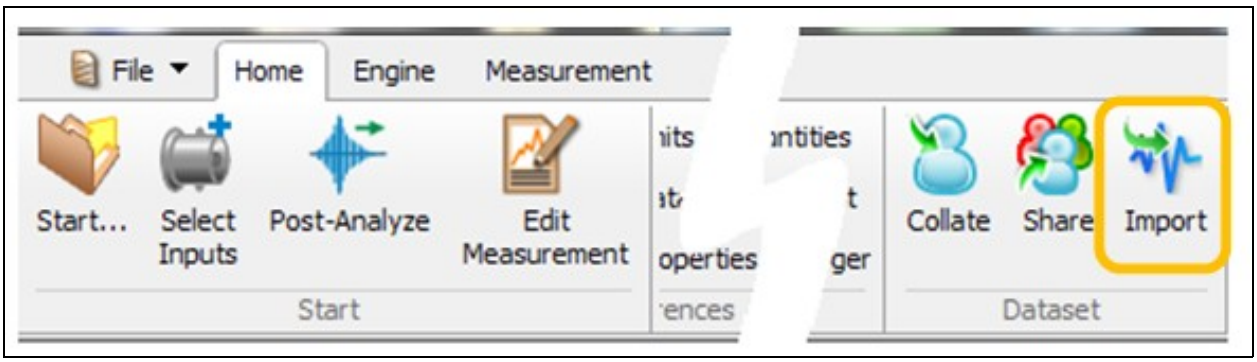
All the properties with contents are saved with the recorded data. Saved properties will be associated to the *Measurement* when records are imported in NVGate.
8. **Make a new acquisition** or **restart from point 1**. Press up arrow to return to main screen.



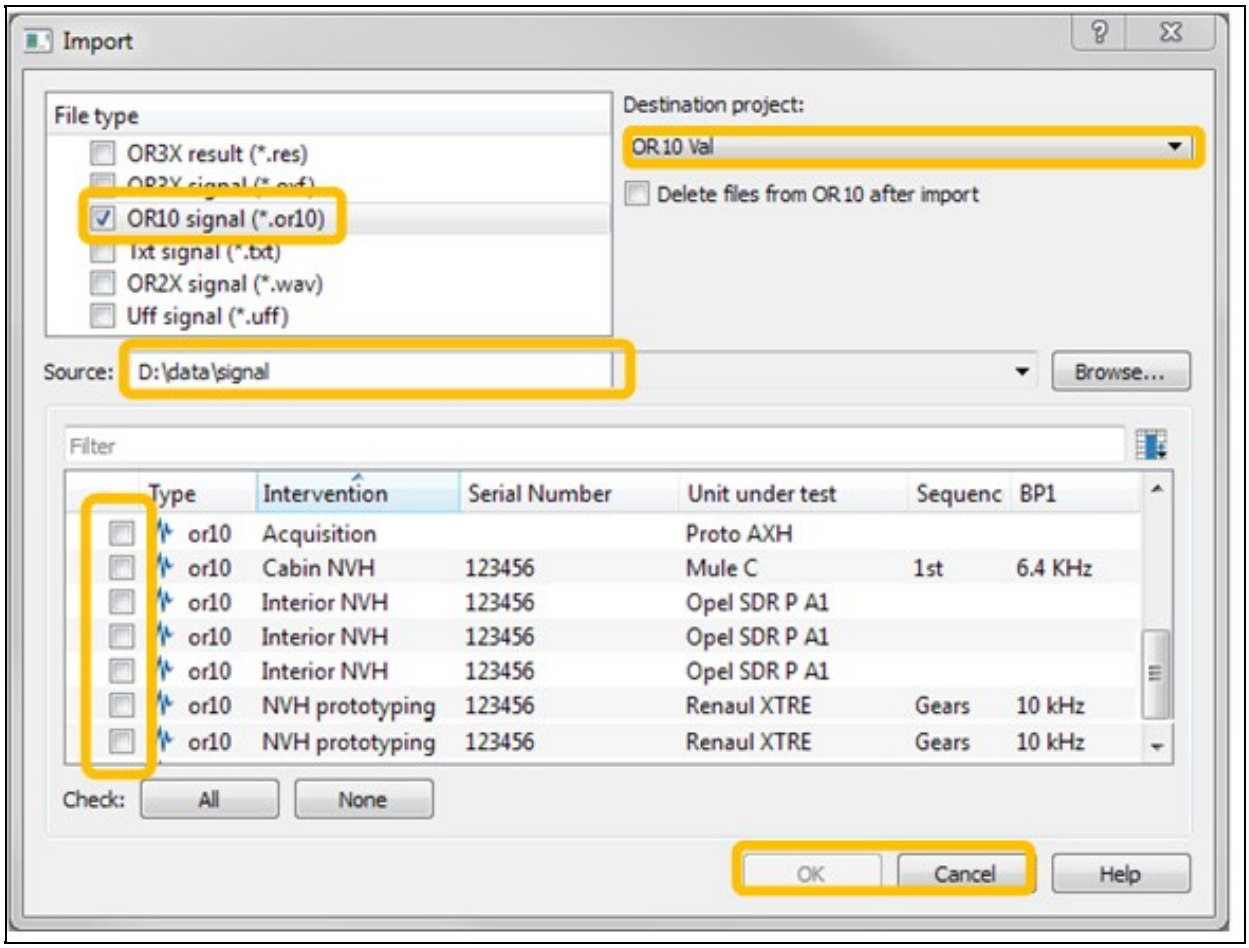
104.1.4 Recovering recorded files from OR10

Recorded data are saved in OROS proprietary format. Those files must be imported in the OROS NVGate software platform prior to post-analysis or export to other formats.

Connect the PC OR10 memory to the PC (see § *Accessing OR10 data*) and start NVGate on the PC. From NVGate ribbon click on Home/Dataset/Import.



The import file dialog is opened.



- Select file type: OR10 signal (.or10),
- Select destination *Project*. Note the imported record files will be will be added to this *Project* as *Measurements*. The *Project* properties will be added to the *Measurements,*
- Select source path, OR10 or folder (see § *Accessing OR10 data*),
- Sort and Select the set of files to import,
- Click on Ok, your files are now available in the NVGate data. These files are compatible with all modules of the OROS software suite.

104.1.4.1 GPS files

When the GPS is activated and see satellites, the successive (3D, 10 Hz) positions during the record are saved with the signal. GPS data are imported with the signal as .gpx files. These files are stored in the "Attachment" directory in the imported measures. From NVGate interface, open the project manager (*Home/Workflow*, then *Project manager*). Right click on the imported Measure and select *Attachement*.

104.1.5 Post-process OR10 data

From this point, recorded data may be:

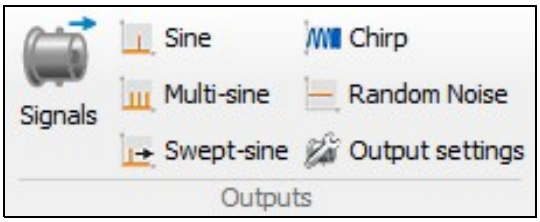
- Post-analyzed with NVGate plug-ins or other modules of the OROS software suite,
- Exported (.txt, .uff, .wav) to others software according to the NVGate export licenses (.sdf, .atfx),

Directly processed by 3rd party software compatible with NVGate formats (OROS SQ, MODAL.)

105 NVGate Output Signals

This module generates multiple signals such as fixed sinus, random noises, and swept sinus. You can have up to 6 outputs channels with OROS analyzers.

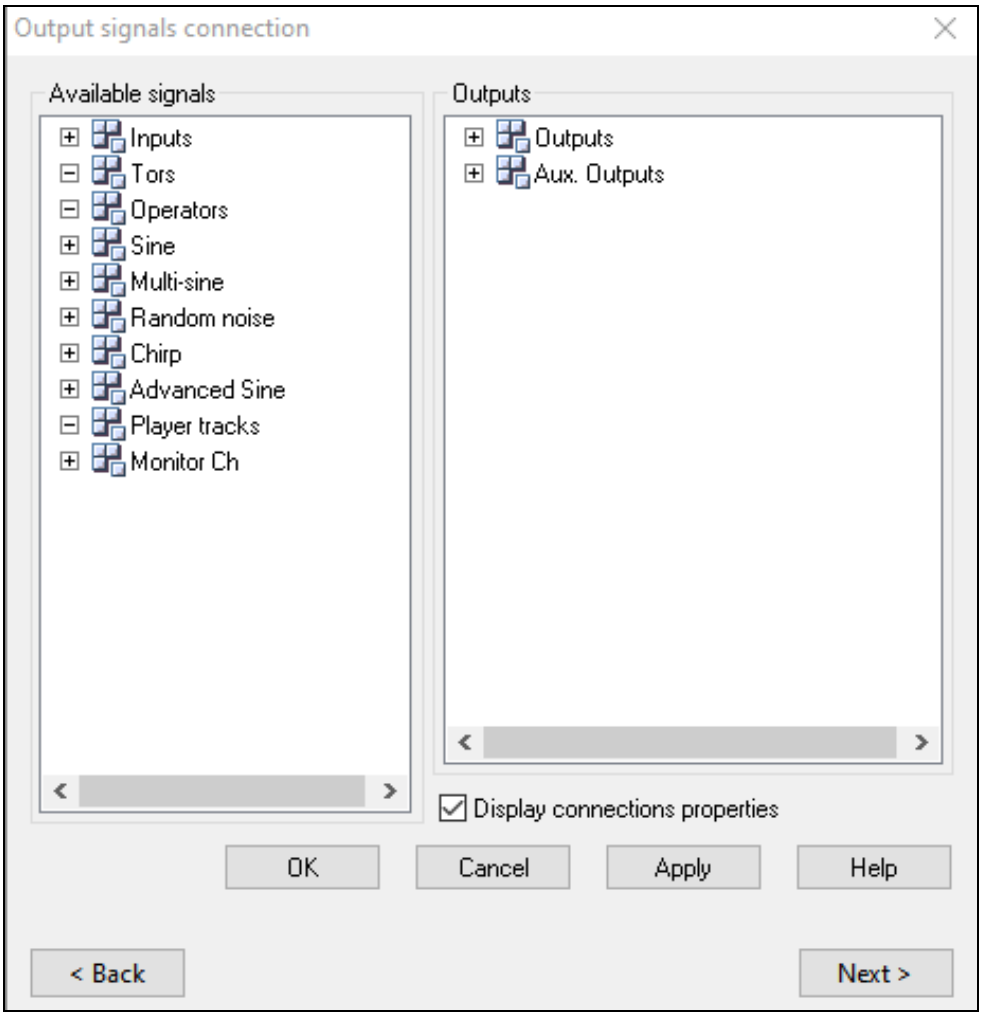
105.1 Connect



On the tab acquisition, Output can generate a signal on the front-end outputs (generators)

The left button (*signals*) allows selecting the signal type from the list and connecting it to the available outputs (1 to 6) .The other buttons open the signal settings and manage the generators activity.

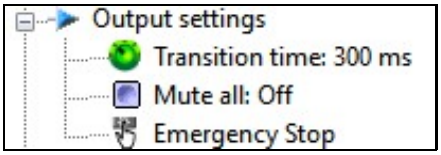
-  *Signals:* Shows the list of available signals and let the users connect it to the outputs. You can easily connect signal with a "drag and drop" on the windows below.



105.2 Settings

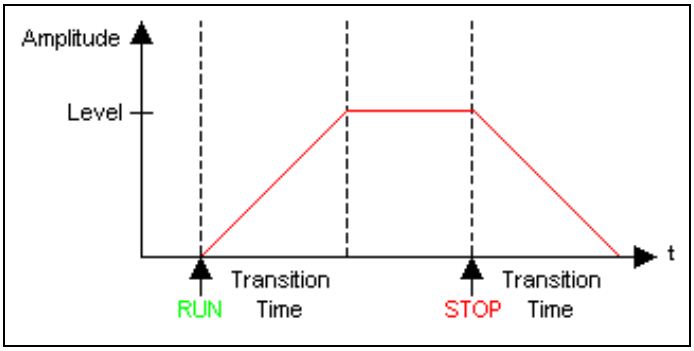
105.2.1 Output general settings

 Outputs settings: Manages the generated signal settling, (Mute, transition time). It is also available on ASB front end.



Used to control general output behavior. i.e. the signal generated on Out 1 &2 and Aux. Out 1 to 4.

- **Transition time**: The value of this setting is the time it takes for the output to go from 0 to activated level and the time it takes for the output to go from the activated level to 0 when deactivated. This transition time is applied only if the *Output x/transition control* value is "On"

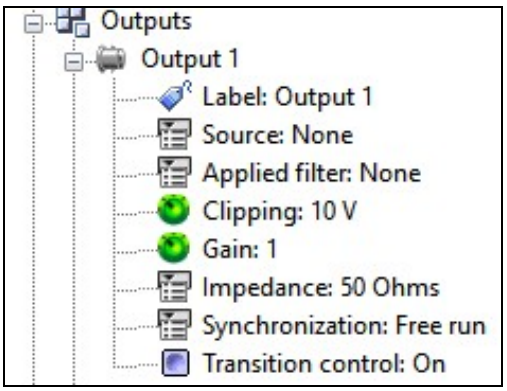


- **Mute '***all***'**: On / Off: When "On", all the outputs are set to zero. The value of this setting is automatically set is "On" when the *Emergency Stop* setting from the same sub-module is pushed.

'*Emergency* '**Stop**: Automatically mutes all the outputs when pushed. Use the *Mute all* setting from the same sub-module to make the outputs work again.

105.2.2 Output channel settings

Available on ASB/ front end/Output.



- **Label**: the name of this Output (by default Output n, with 1 <= n <= 2). The label of each output is used in the result name and in all connection tools.
- **Source**: the input signal of the output (NONE by default). The input signal can be any dynamic input of the Front-end (in the On-line mode) or any signal generated by the output signals resource (in the On-line mode) or any track of the Player (recorded from inputs).
- **Applied '***filter*': the filter applied to this output. The list of filters applicable to the outputs is defined in the Filter module, by choosing Apply to = All.
- **Clipping**: the amplitude limitation of the output signal (from 1 mV to 10 V).
- **Gain**: This setting can be displayed in dB. It is the gain applied to the output signal.
- **Impedance**:

Impedance	Description
GND	The output is connected to the ground.
50 Ohms	The output impedance is equal to 50 Ohms.
600 Ohms<ref>Only available for OR38 & OR36. For phone lines connections use.</ref>	The output impedance is equal to 600 Ohms.

- **Synchronization**:

Synchronization	Description
Free run	The output delivers a signal as soon as there is a source connected.
Linked to run	The output is activated only after the first run action.

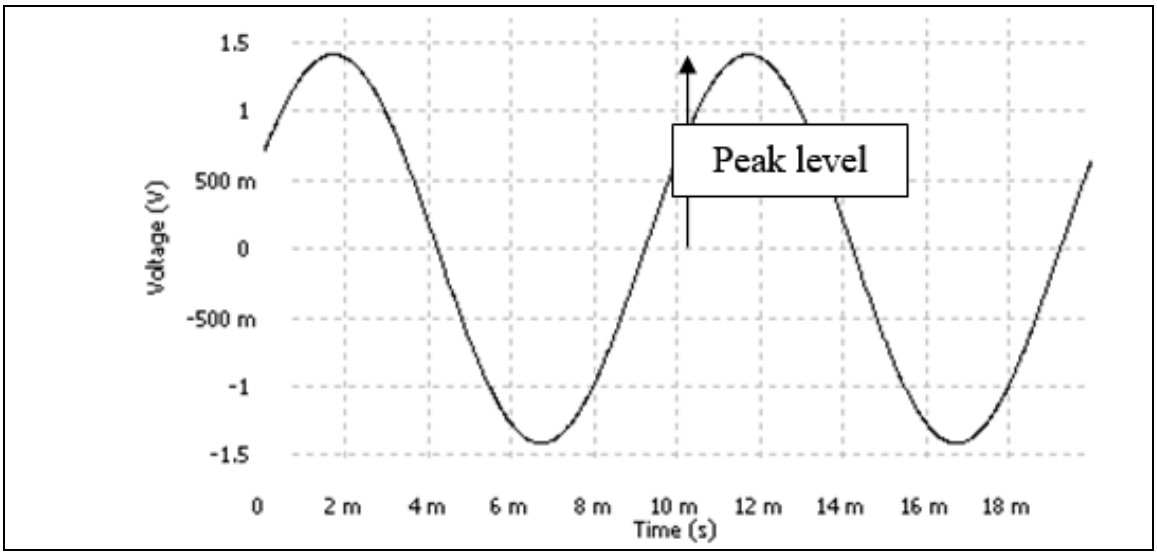
- **Transition control**: On / Off. If the value of this setting is "On" the *Output settings/transition time* is applied when this output is activated or disabled.

105.3 Signal available

105.3.1 Sine

-  *Sine:* Opens the pure sine properties dialog for adjustment.

Used to generate and configure up to 6 fixed sinus. A sinusoidal signal is generated with the frequency specified in the sine **Frequency** field. The frequency corresponds to one of the analysis bands. This type of signal is used for measuring the amount of distortion in a system for example. The amplitude of the signal can be changed using the **Level** settings.

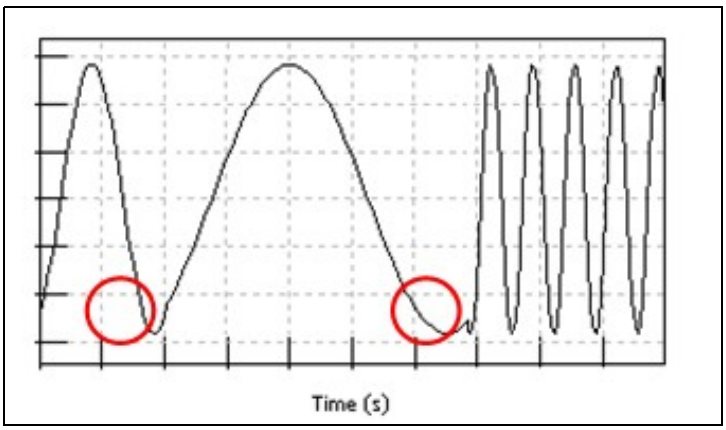


- **Frequency**: sine frequency.

Tips: put 0Hz for DC Volatge generation.

- **Peak level**: the peak level
- **RMS level**: sine RMS level. This setting can be displayed in dB.

Note: Amplitude and frequency modifications are applied immediately without any transition.



105.3.2 Multi-sine

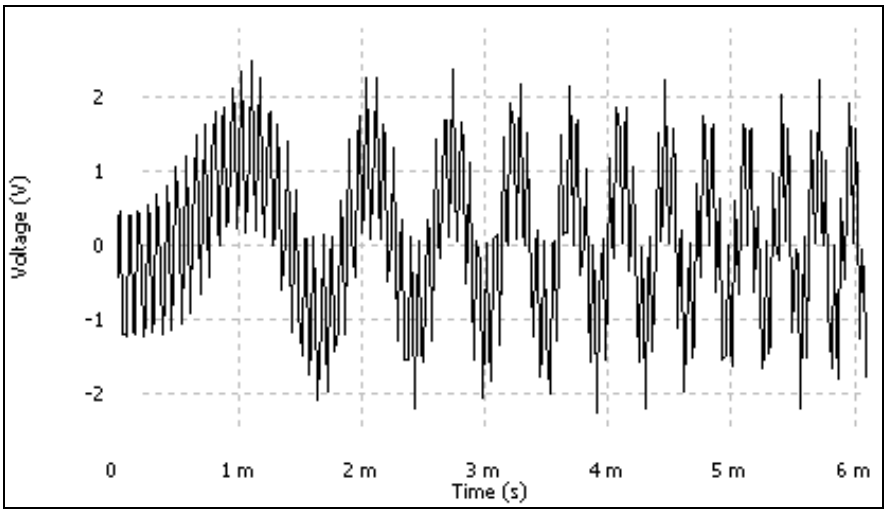
 : Multi-sine: Opens the *Multi-sine* properties dialog for adjustment.

Multisine is computed by adding sine signals whose frequencies are power of two sub-modules of sampling frequency. This means that multisine output block includes all discrete sine waves of FFT spectrum of corresponding block size and resolution. Multisine has the advantage of showing no leakage effect in FFT as all sine waves are exact periods of the trigger block for FFT computation. The most appropriate FFT weighting window to be used is ?uniform? window. Multisine generators work on a sample block basis, it means signal blocks are repeated identically over time.

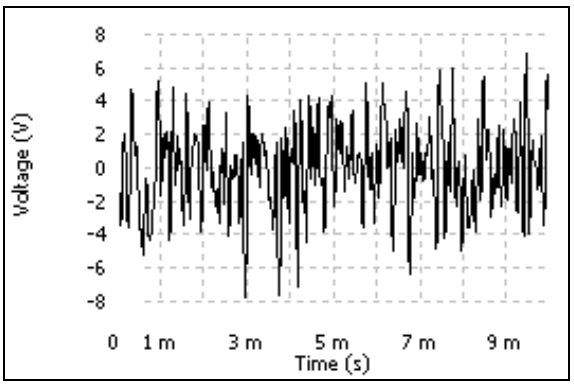
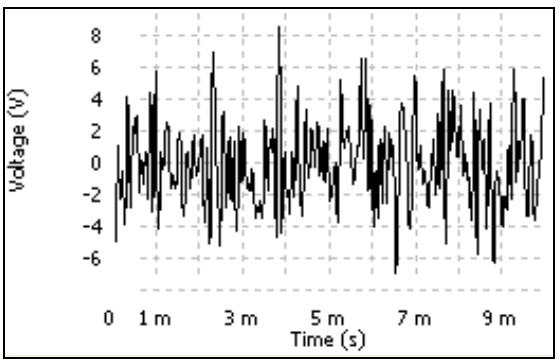
Used to generate and configure up to 2 multi-sines. The multi-sine is computed by adding sine signals whose frequencies are power of two sub-modules of sampling frequency. So with the FFT analyzer, each sine signal can be exactly at an analysis frequency line and there is no leakage due to analysis window. Due to its specific structure, using a rectangular analysis window for FFT analysis on a multi-sine excitation is recommended.

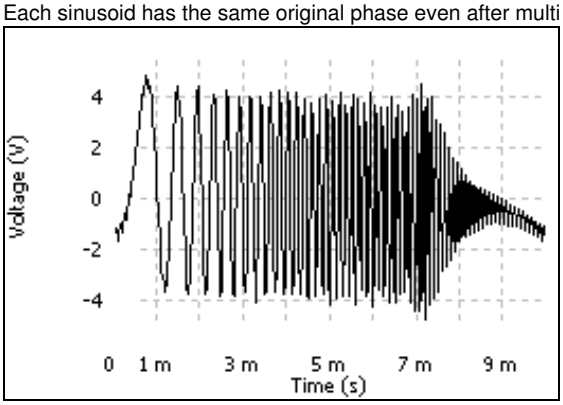
The phase between sine signals can be controlled in order to get a low crest factor or randomized, but with a higher crest factor.

Multi-sine is periodic with a period equal to the opposite of its frequency resolution.



- **Lower frequency**: the lower frequency of the multi-sine frequency range. Its minimum value is the resolution.
- **Upper frequency**: the upper frequency of the multi-sine frequency range. Its maximum value is SF / 2.56, where SF is the sampling frequency.
- **RMS level**: multi-sine RMS level. This setting can be displayed in dB.
- **Resolution**: the resolution of the multi-sine. Its minimum value is SF / 16384, where SF is the sampling frequency. Its maximum value is SF / 256.
- **Phase**: Computational mode of the original sinusoid phases.

Phase	Description
Random	The original phase of each sinusoid is selected randomly after each multi sine deactivation/activation. First activation:  After reactivation: 

	Phase relationship between sine waves is selected at selection of setting and will not change unless ?random? setting is changed back and forward. After ?random? is selected phase relationship is defined (randomly for the first block) and repeated identically for each signal block of N lines. Phase relationship for all multisine generators will be different as random setting activation is made at different moment in time and applied for different generator objects. Two blocks of multisine random phase of the same generator are 100% correlated. Two mulitsine random phase generators are not correlated.
Fixed	Each sinusoid has the same original phase even after multi sine deactivation/activation.  Multisine phase relation if fixed and will be the same each time setting ?fixed? is selected. Phase relationship is the same for all multisine generators meaning that signal blocks will be the identical between any multisine generators of the same setting. Multisine fixed phase generators are 100% correlated.

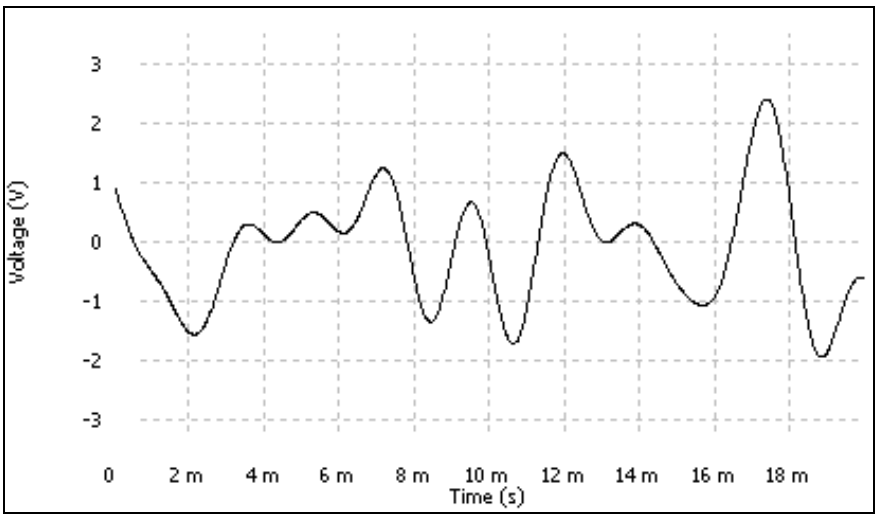
Burst setting in Multisine generators will shorten the time during which the output signal is active despite the signal block being of the same length. All bandwidth frequencies are present in each burst but may not be complete cycles as block period is truncated. Two bursts being identical (respectively fixed or random phase) they are 100% correlated. Two random bursts from two separate generators will not be correlated signals.

105.3.3 Random noise

 Random Noise: Opens the *Random noise* properties dialog for adjustment. Adapted for non linear responses measurement.

Used to generate and configure up to 2 white or pink random noise types.

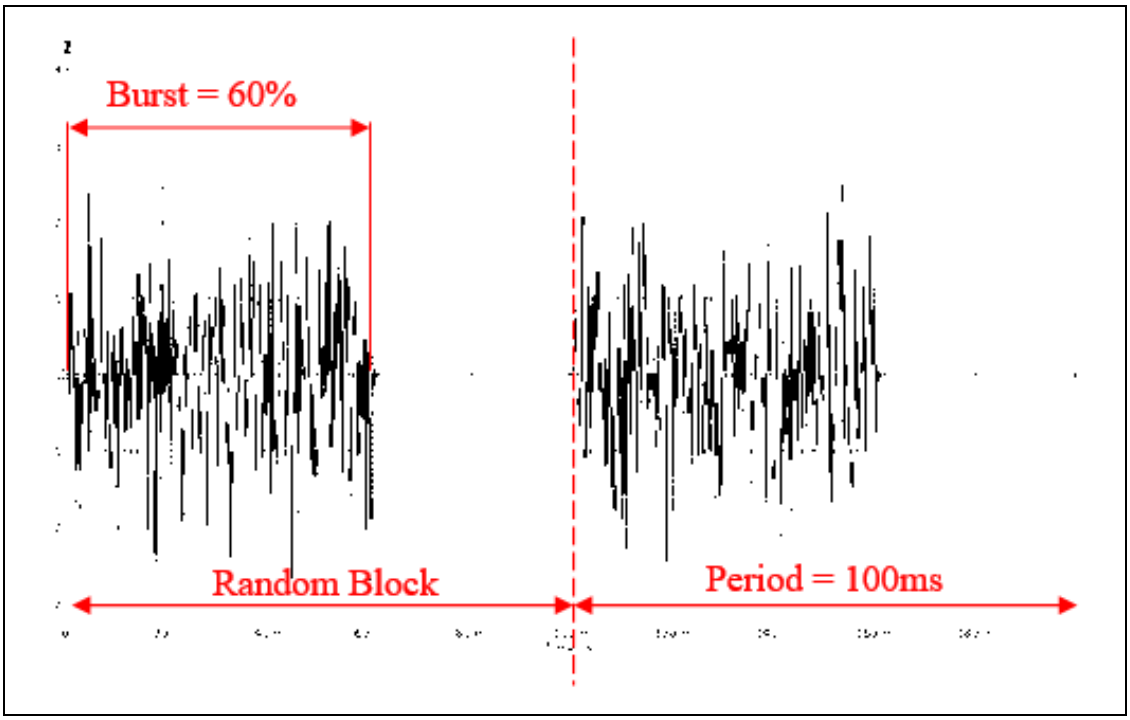
Signal block is recalculated each time. All frequencies of generator bandwidth are taken into account with a resolution of Fs/16384 (Fs being front end sampling frequency), this resolution is independent from FFT resolution. Consequently signal content of each FFT trigger block is not the same meaning that signals between two trigger blocks are not correlated. Similarly random noise signal between two separate generators are also not correlated.



Random noise is generated using algorithms that guarantee no short or long-term periodicity.

- **Lower frequency**: the lower frequency of the Random noise frequency range. Its minimum value is equal to SF / (2.56 * 6400), where SF is the sampling frequency and 6400 + 1 is the resolution.
- **Upper frequency**: the upper frequency of the Random noise frequency range. Its maximum value is SF / 2.56, where SF is the sampling frequency.
- **RMS level**: the Random noise RMS level. This setting can be displayed in dB.
- **Period**: The period selected for the Random noise. It used to define a Random Block. Its maximum value is 100s.
- **Burst**: This setting lets the user specify the percentage of non-null signal in a random block.

Exemple with: burst: 60% - period: 100ms :



- **Type**:

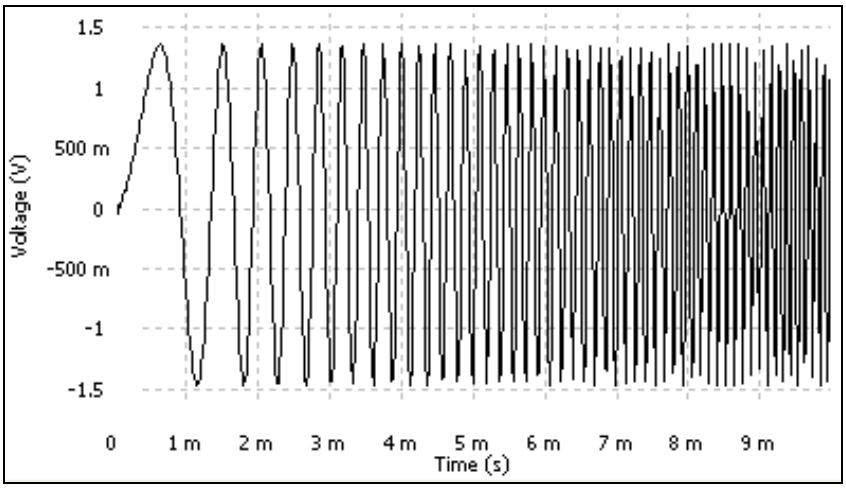
Type	Description
White	White noise has the same distribution of power for all frequencies, so there is the same amount of power between 0 and 500 Hz, 500 and 1,000 Hz or 20,000 and 20,500 Hz.
Pink	Pink noise has the same distribution of power for each octave, so the power between 0.5 Hz and 1 Hz is the same as between 5,000 Hz and 10,000 Hz. Since power is proportional to amplitude squared, the energy per Hz will decline at higher frequencies at the rate of -10dB/decade.

105.3.4 Chirp

Chirp means continuous short term variable frequency (1 analysis block), 1 amplitude. Adapted for damping measurement and FFT analysis.

 Chirp: Opens the *Chirp* properties dialog for adjustment.

Used to generate and configure up to 6 chirps. A sine signal, of which the frequency varies from **Lower Frequency** to **Upper Frequency**, is generated in the delay corresponding to the size of a generator block.



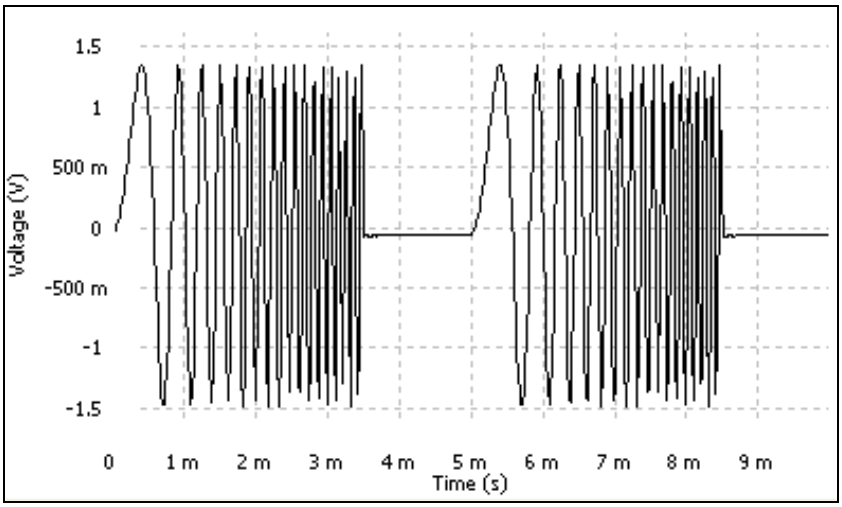
- **Lower frequency**: the lower frequency of the Random noise frequency range. Its minimum value is equal to SF / (2.56 * 6400), where SF is the sampling frequency and 6400 + 1 is the resolution.
- **Upper frequency**: the upper frequency of the chirp frequency range. Its maximum value is SF / 2.56, where SF is the sampling frequency.
- **RMS level**: the chirp RMS level. This setting can be displayed in dB.
- **Size**: This setting specifies the number of samples required for the generator to go from the lower frequency to the upper one.

Block size	FFT lines number
256	101
512	201
1024	401
2048	801
4096	1601
8192	3201
16384	6401

- **Burst**: This setting lets the user specify the percentage of non-null signal greater than the size of a generator block. For instance, for a burst value of 25% and a block size of 1024, the generator delivers blocks of 256 samples of chirp separated by blocks of 768 null samples.

Size = 256

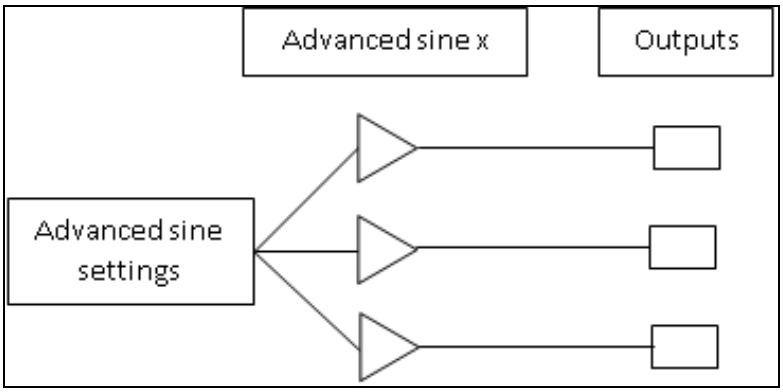
Burst = 70



105.3.5 Advanced sine

 Swept-sine: Opens the *Swept-sine* properties dialog for adjustment.

Used to generate and configure up to 6 advanced sines, allowing the user to generate a swept sine, a pure tone, or to sweep step-by-step.



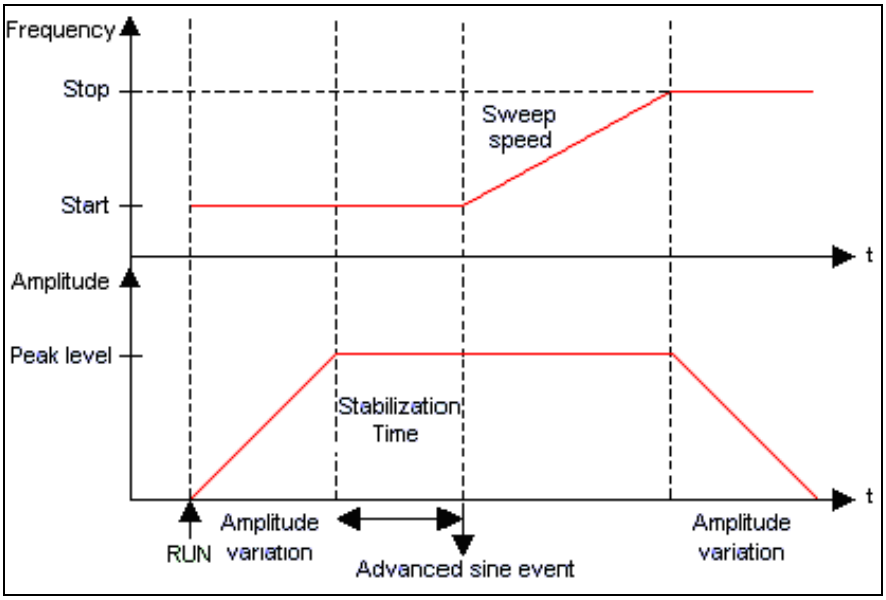
- **Gain**: Each advanced sine has a gain setting with a 0dB reference that is the value of the *Advanced sine settings/ Peak level setting*
- **Phase offset**: All the advanced sine have the same phase reference. This setting is used to set a phase offset between them.

105.3.5.1 Advanced sine settings

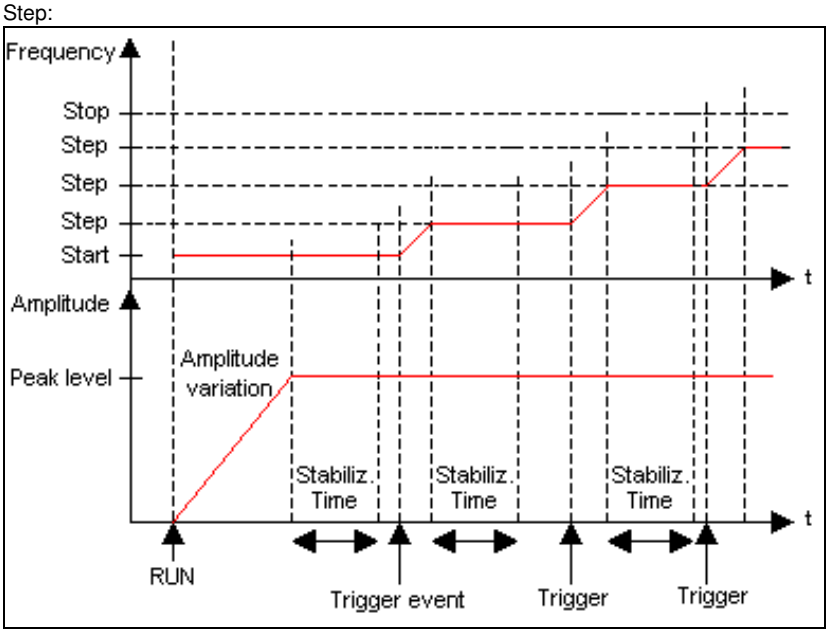
This sub-module contains the settings related to the main advanced sine generator, including the advanced sine mode setting, stabilization time, amplitude variation...

- **Mode**:

Mode	Description
Sweep:	The advanced sine performs a continuous sweep of the frequencies between Start Frequency and Stop Frequency



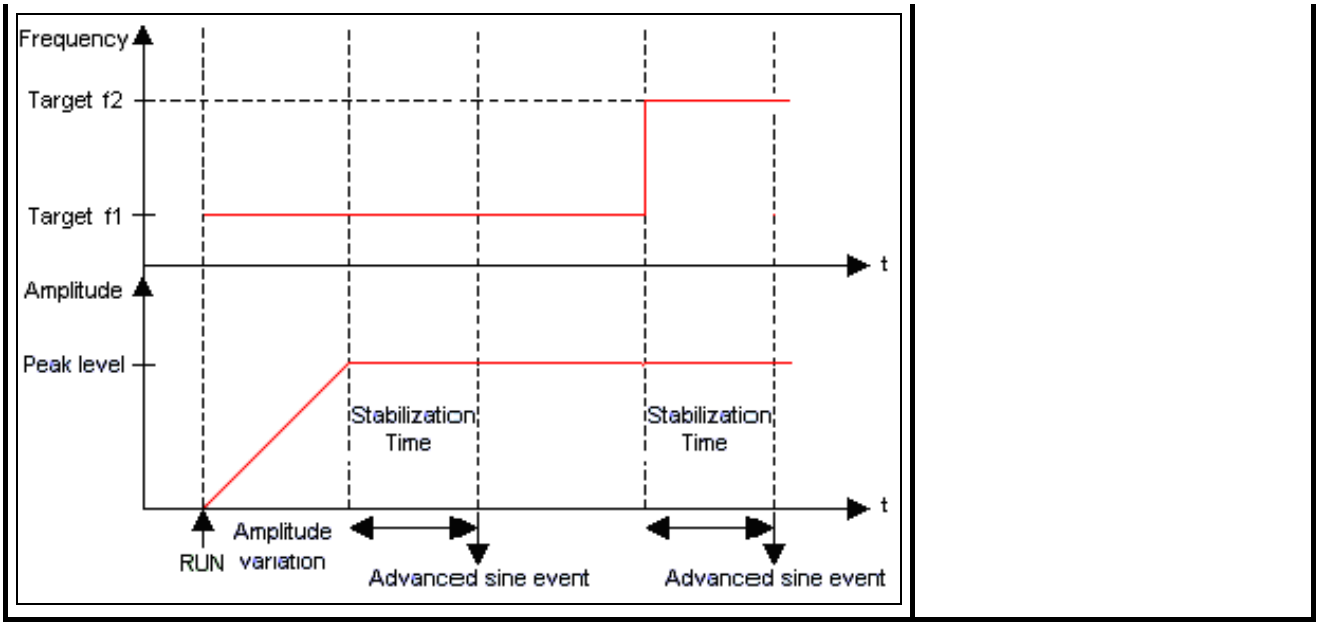
Step:



The advanced sine performs a sweep of the frequencies between Start Frequency and Stop Frequency, it stops at each step, waits during stabilization time, and waits for the new step event before going on.

Pure tone:

The advanced sine generates a pure sine with the frequency of the *Advanced sine settings/ Target Frequency* value



- **Synchronization**: "linked to run" or "Free run". The Advanced sine generator will not be stopped by a stop event, if the setting is on ?Free run?. The default value is ?Linked to run?.

If you change the amplitude or the frequency of the generated signal, there will be a stabilization time, and you will have to generate an event when the signal is stabilized.

In these 3 modes, each time the generator stops on a frequency;

1. At the beginning (amplitude increase until the first frequency),

2. At a new step (at the end of stabilization time), or in ?pure tone? or ?swept sine? pause mode when it reaches the target frequency; the generator sends a stabilized event, after being stabilized (amplitude and frequency).

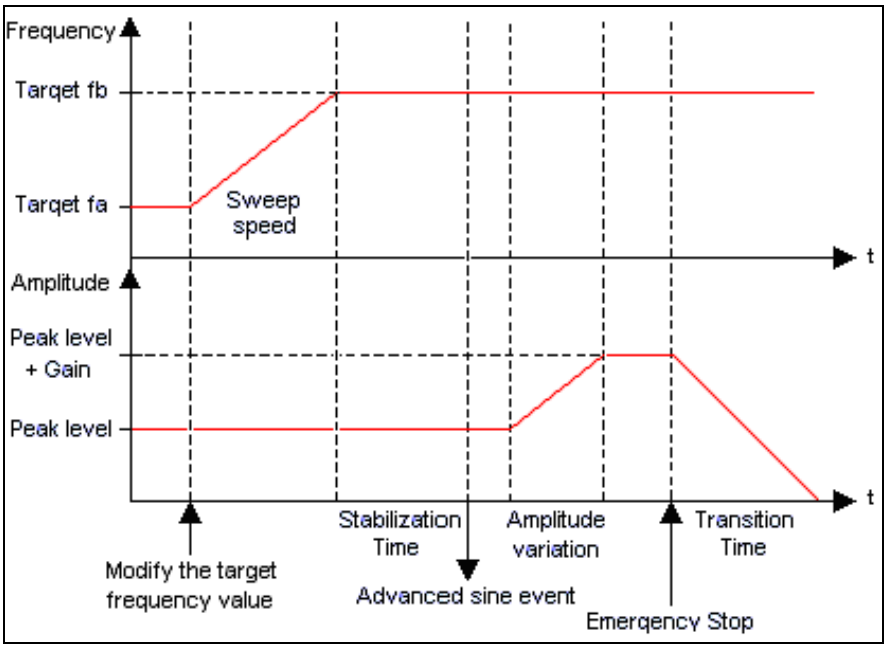
3. In ?Free run?, if the generator is already stabilized at the run event, then a stabilized event is generated at this moment.

If the output is on ?Advanced sine? source, the setting of ?Synchronization? of the advanced sine will recopied to the ?synchronization? of the output (which one become fixed).

Hidden/fixed:

Mode	**Sweep**	**Step**	**Pure tone**
Synchronization	Fixed to ?Linked to run?	Visible	Visible

- **Pause**: On / Off. When Pause is active, the frequency sweeping is halted when there is only one frequency generated. This frequency is now called "Target frequency". You can modify this frequency value to another target so the frequency will sweep to the new target.



Hidden/fixed:

Mode	Sweep	Step	Pure tone
Pause	visible	hidden	hidden

- **Peak level**: the advanced sine peak level (between 0 and 10 V).
- **Start frequency**: The start frequency of the sweep.

Hidden/fixed:

Mode	Sweep	Step	Pure tone
Start frequency	visible	visible	hidden

- **Stop frequency**: The stop frequency of the sweep.

Hidden/fixed:

Mode	Sweep	Step	Pure tone
Stop frequency	visible	visible	hidden

- **Target frequency**: The value of this setting is the frequency currently generated when the value of the *Pause* setting is "On" or if the *Mode* is set to "Pure Tone"

Hidden/fixed:

Mode	Sweep	Step	Pure tone
Target frequency	visible if Pause = On	visible if Pause = On	visible

- **Sweep variation**: Two different types of sweep are available: a linear sweeping or a logarithmic sweep:

Sweep variation	Description
Lin	The Sweep speed is constant.
Log	The Sweep speed increases exponentially when the frequency increase is linear.

Hidden/fixed:

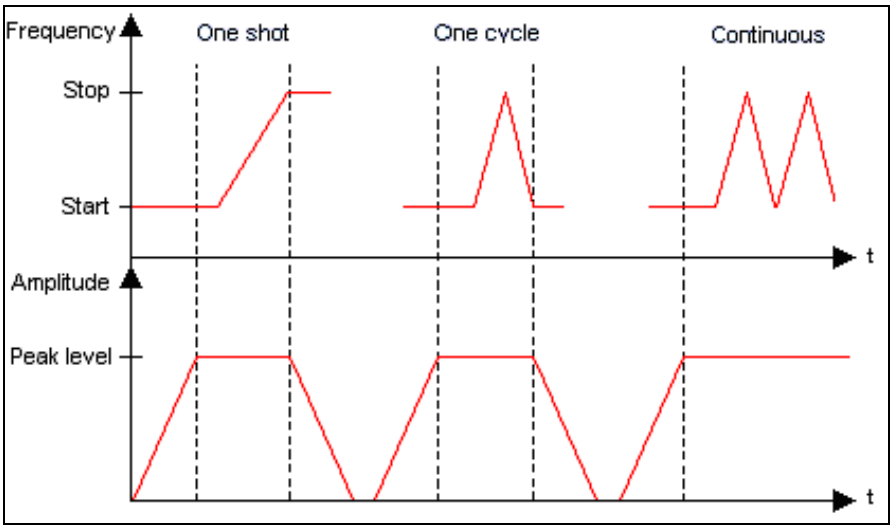
Mode	Sweep	Step	Pure tone
Sweep variation	visible	fixed to Lin	hidden

- **Sweep speed**: It is expressed in Hz/s in a linear sweep variation, and in dec/s in a logarithmic sweep variation. The unit of the logarithmic sweep speed can be changed to oct/min in the user preferences/physical quantity (select "Sweep speed (logarithmic)" in the physical quantity list).

Hidden/fixed:

Mode	Sweep	Step	Pure tone
Sweep speed	visible	hidden	hidden

- **Sweep type**:



Sweep type	Description
One shot	The advanced sine sweeps the frequencies from Start Frequency to Stop Frequency and stops.
One cycle	The advanced sine sweeps the frequencies from Start Frequency to Stop Frequency, then back to Start Frequency and stops.
Continuous	The advanced sine sweeps the frequencies between Start Frequency to Stop Frequency without stopping.

Hidden/fixed:

Mode	Sweep	Step	Pure tone
Sweep type	visible	visible	hidden

- **Stabilization time**: Sweep mode: Selects wait time for the advanced sine at the start frequency and at the right level before starting the sweep. Step mode: Selects wait time for the advanced sine at each step before waiting for the new step event.
- **Amplitude '***variation'*: Maximum length of time for the advanced sine to reach a new level.
- **Phase speed**: Speed of phase variation when setting a new value for *Advanced sine x/ Phase offset setting*
- **Step**: Frequency gap between two steps

Hidden/fixed:

Mode	Sweep	Step	Pure tone
Sweep type	visible	visible	hidden

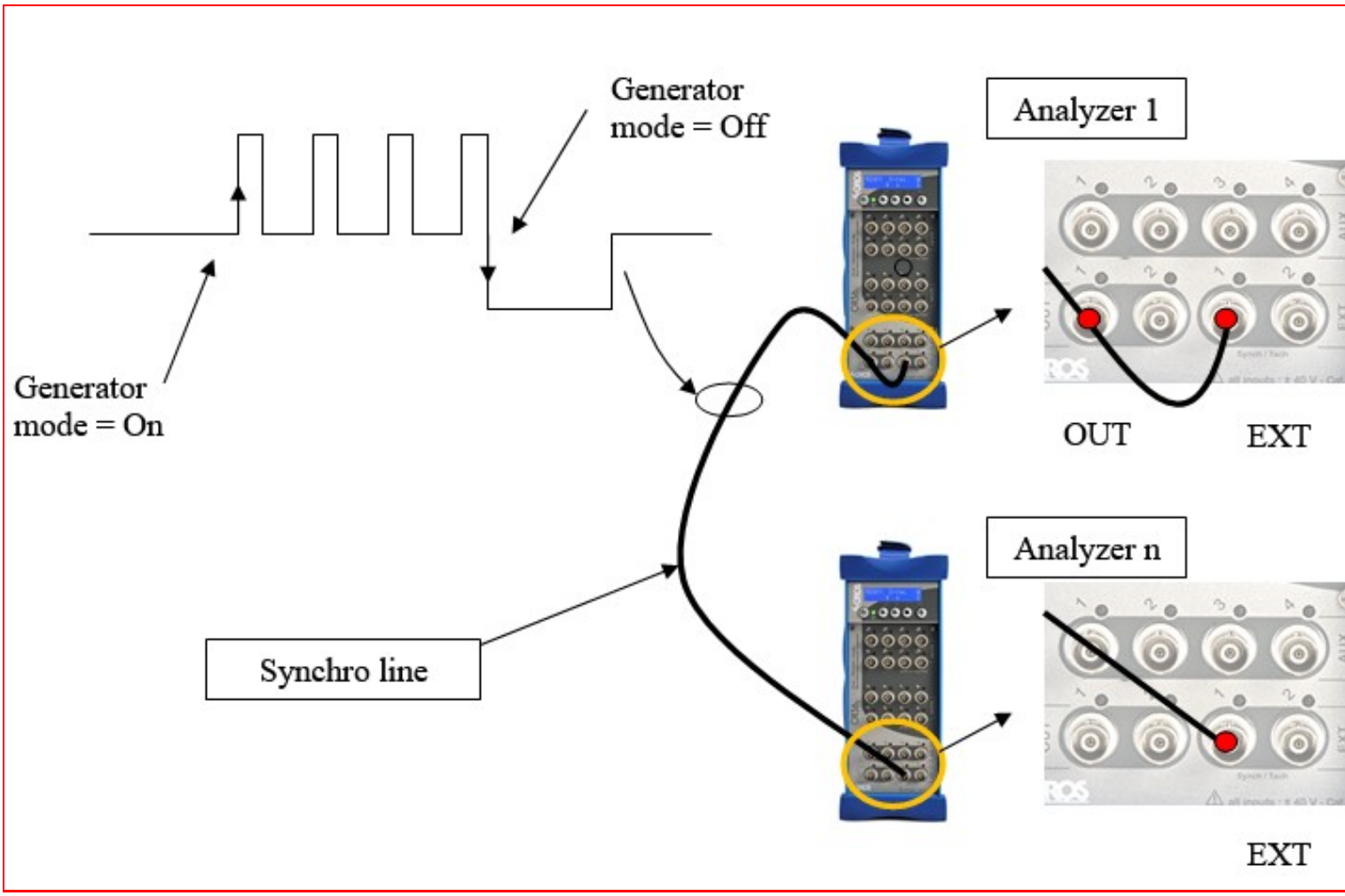
- **New step**: The event that triggers the sweep of the advanced sine to the next step

Hidden/fixed:

Mode	Sweep	Step	Pure tone
Sweep type	hidden	visible	hidden

105.3.6 Synchro

This special output signal is used to synchronize raw data recorded on multiple OR3X units (even OR2X). This synch signal must be connected on ext. synch trigger input of each recording unit (see below)


Generator
mode = Off
Generator
mode = On
Analyzer 1
OUT
EXT
Analyzer n
Synchro line
EXT

- **Active**: On/Off Set the synch signal available in sources list, no signal is generated on outputs at this stage
- **Generator Mode**: Controls synch signal behavior.
- **On**: start the synch clock generation (0 / +2 V square @ 50 Hz)
- **Off**: stop the synch clock generation followed by a -2V step during 1 sec.

Track assembly procedure.

1. Activate the synch signal

2. Select *Front-end / Output 1 / source = Synchro*

3. Set *Front-end / ext synch / coupling = DC* on each recording unit

4. Set *Front-end / ext synch / threshold = 1 V* on each recording unit

5. Set *Recorder/trigger/start = ext synch* on each recording unit

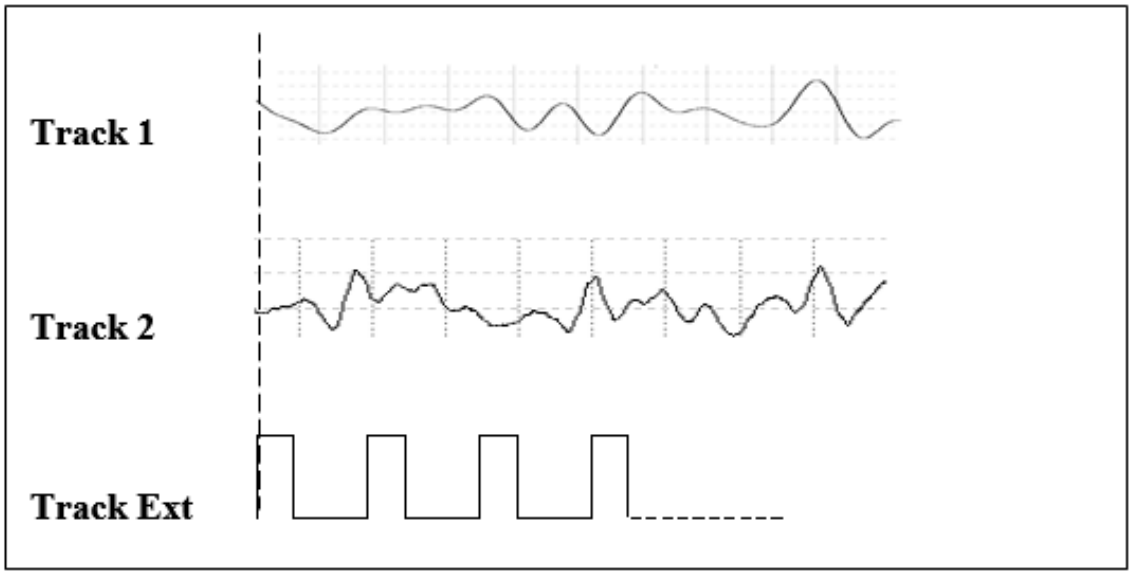
6. Add ext. sync track to the recorder on each unit

7. Set same recording duration on each unit

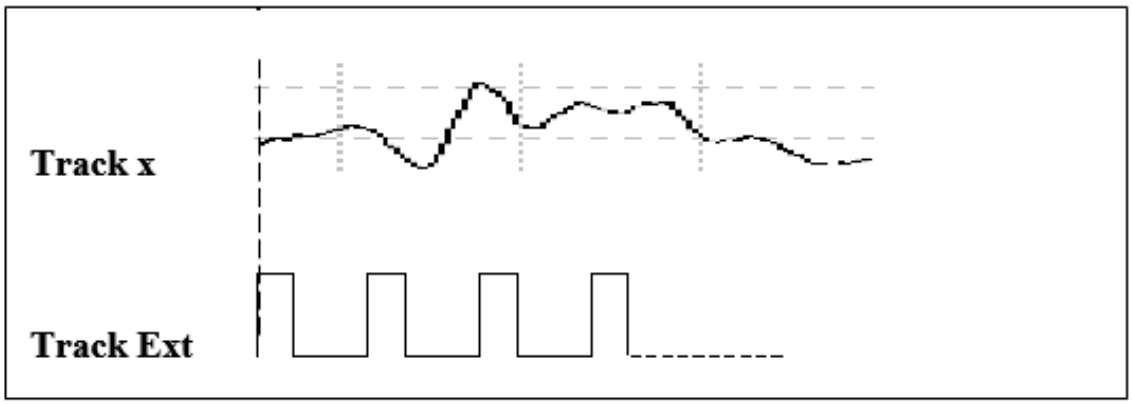
8. Run each unit

9. Set *generator mode = on* to start record

Record on Analyzer 1

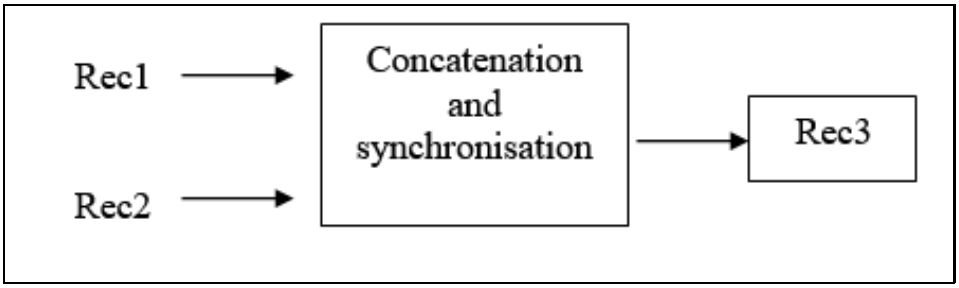


Record on Analyzer 2

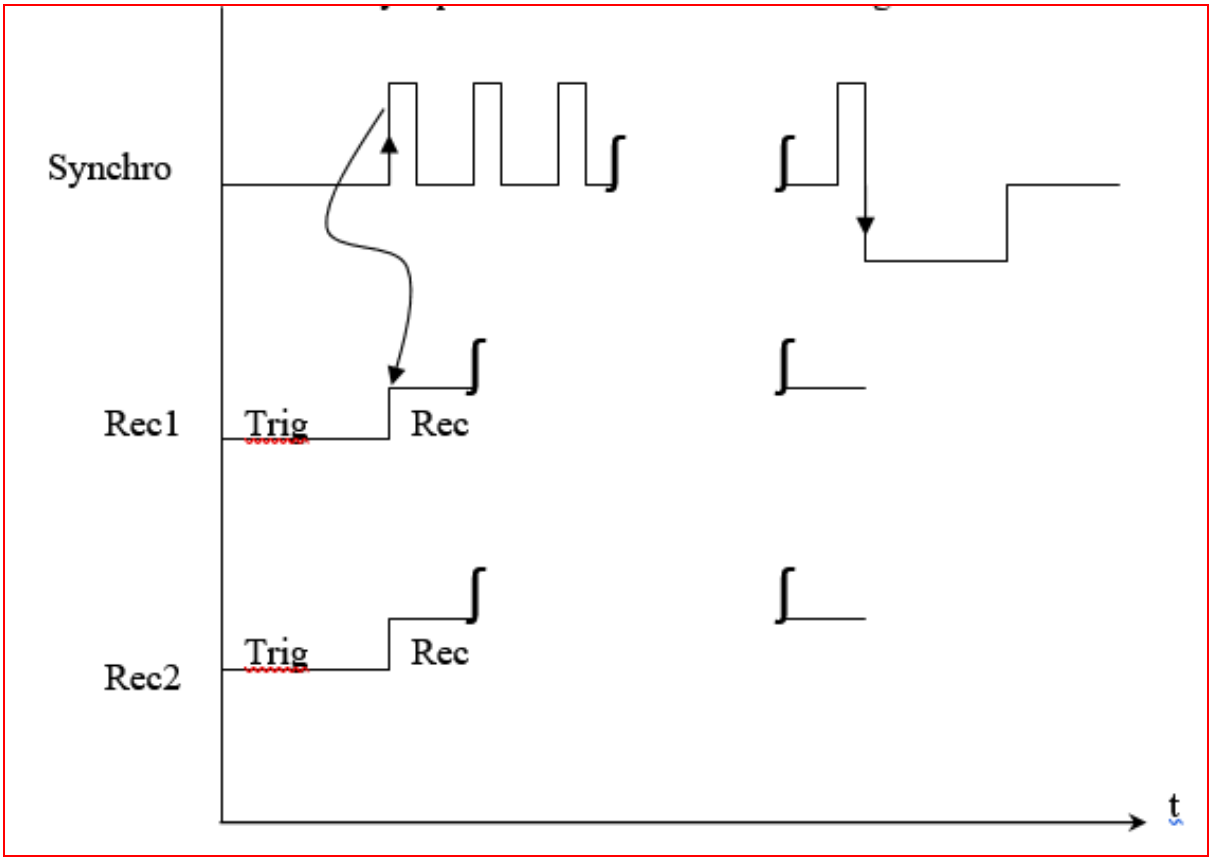


10. Download all recorded files on one PC

11. Launch ?Track Assembler?



The concatenation synopsis is shown on the following scheme:



More information on the Track Assembler in ?Operation on multiples Hardware?.

105.4 Listening track

There are 3 ways to listen track:

105.4.1 Input: listen during measurement

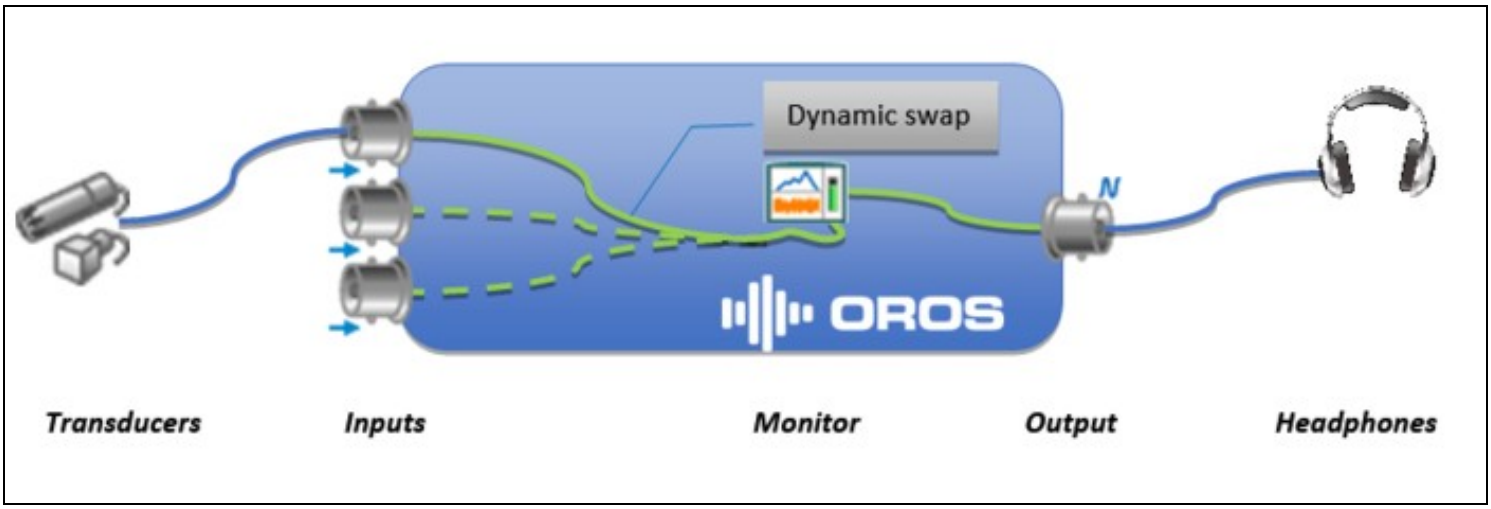
Back to the roots of vibration analysis: Everybody knows that our ears and brain is the best instrument to feel and interpret vibration signals. This is also why we take so much care in removing these NVH signals from our machines, vehicles and appliances. The audio playback of vibration (or any other) signal allows the user to "listen in" on what your OROS analyzer is "hearing".

Connect input feature allows a user to play input channels on an output. This allows the user to listen during measurement with an headphone on the output.

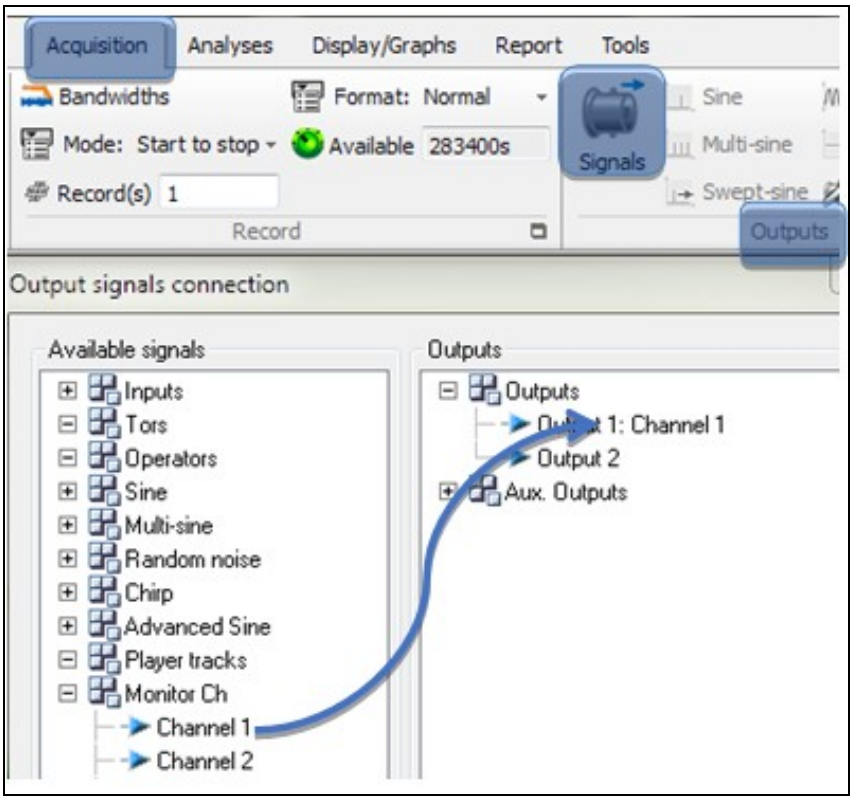
105.4.1.1 Monitor channels : Hot Swap

NVgate uses the monitor hot swap capability to allow changing the replicated signal during acquisition/recording.

The NVGate synopsis is as follows:



To activate it, simply connect one of the monitor *Channels* to the desired output from the *Acquisition/Outputs/Signal* dialog.

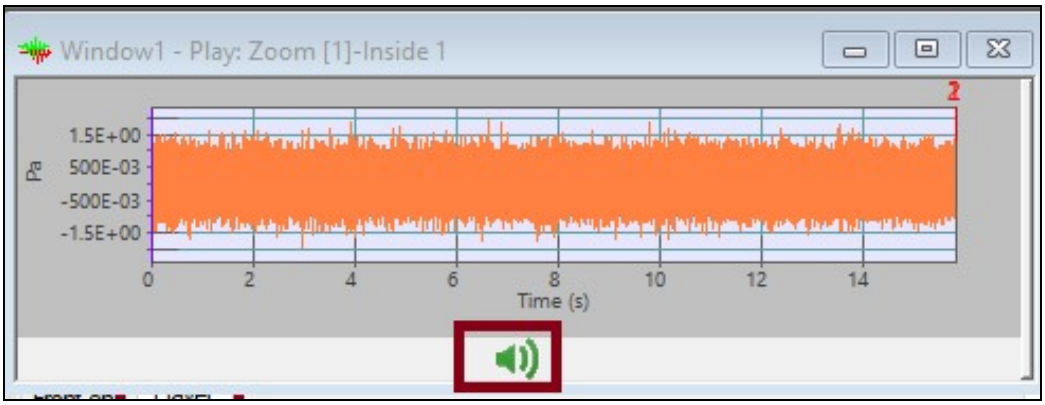


Then you can add any front-end input to the monitor channel. The selected input signal will replicate (play) on the output. You can swap from one input to another at any time including during the run and signal recording.

NB: Remember to switch the output impedance to 600 ? for better listening quality.

105.4.1.2 Play-Back on PC speaker

If you need to listen a signal already recorded, do not use an output channel. We advice to use the playback on PC speaker defined here: From any of the previous configurations, the recorded signal can be listened to on PC speakers.



Click on  in the active window. The button stops the play back at any time. A mobile cursor (blue) localizes the played back signal part in the signal window.

105.5 Create and play ANY signal

You can play a signal already recorded with an OROS analyzer, or any signal imported into NVgate. You can put the signal in the player (even in connected mode) allowing the signal to be played on an ouptut channel.

105.5.1 Example : playing a triangle signal on analyzer output

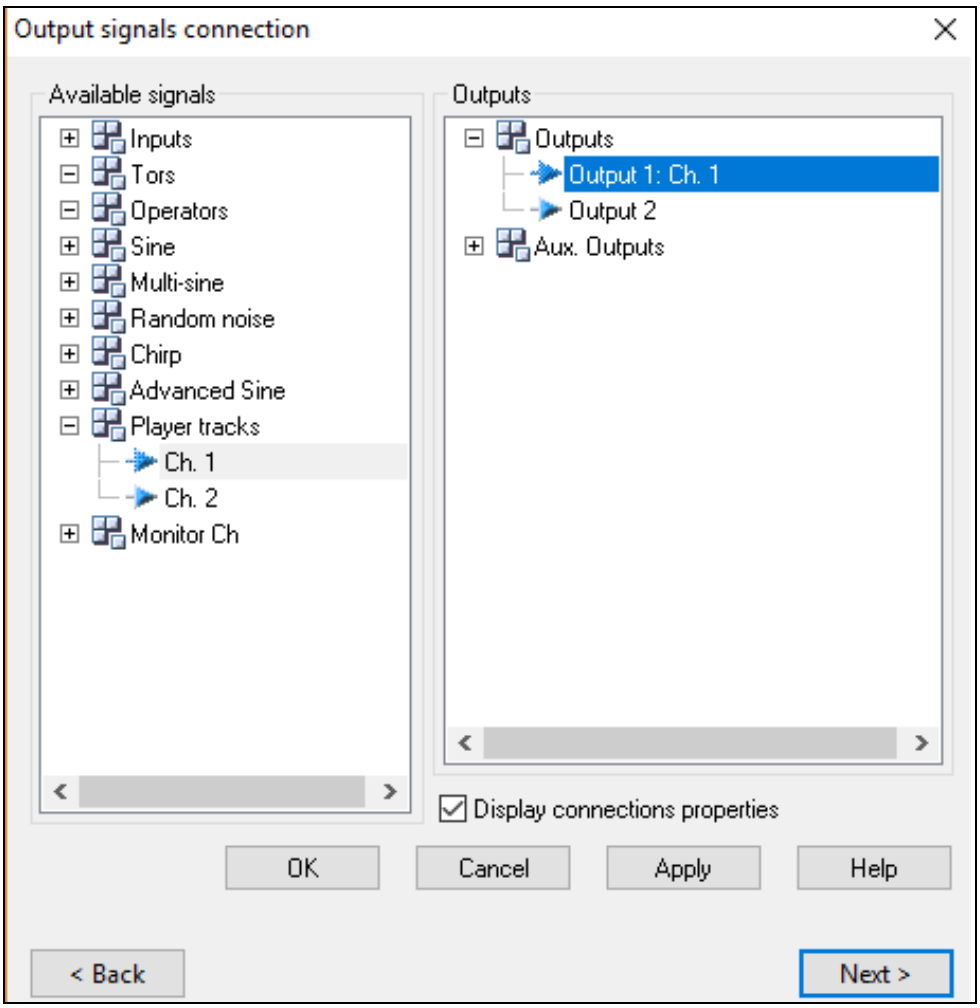
? Generate a triangular signal with an application (Matlab,?) or an online site (example: http://onlinetonegenerator.com/);

? Save this signal in .wav;

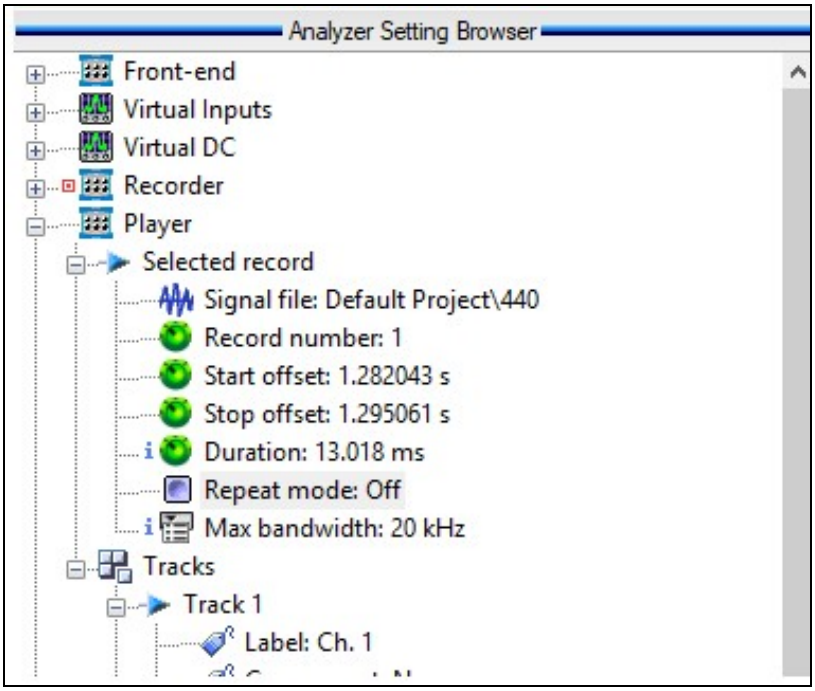
? In NVGate, import this signal (File / Import / Files / OR2X Signal (* .wav, .mat, .UFF...);

? Load this signal in the player (right click then "load in player");

? In the options proposed in output, select the channel coming from the player:

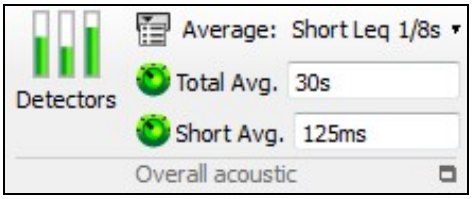


?If you want to play this signal repeatedly, you must change the "Repeat mode" parameter in "Analyzer Setting Browser":



106 NVGate Overall Acoustic - Sound Level meter

This plug in is a powerful multi channel Sound level meter. It complies with the latest standards such as IEC 61672. It runs 3 RMS detectors + 1 peak per channel.



106.1 Overview

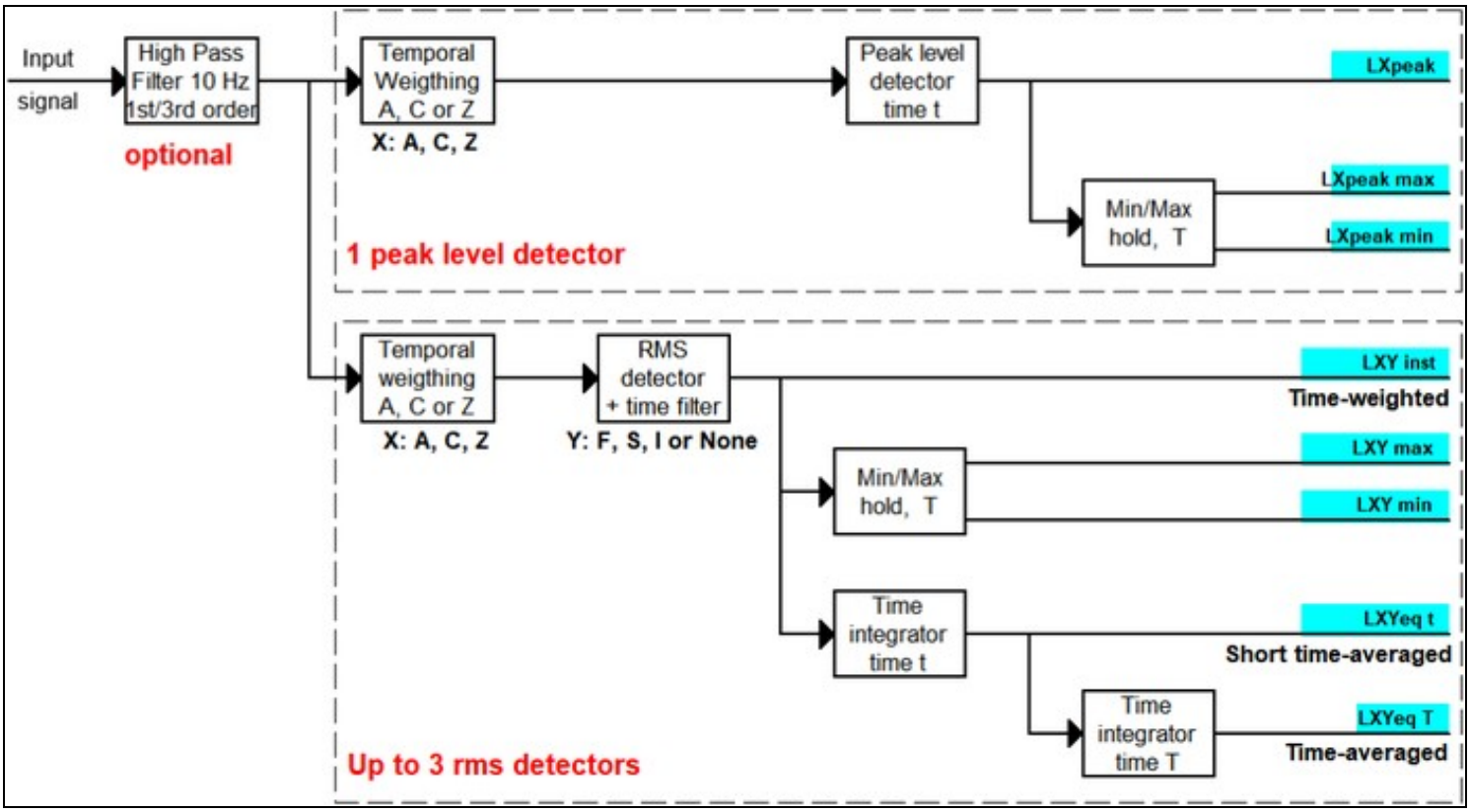
ORNV-OVA operates as the other plugs-in.

Frequency response complies with IEC 60 651 and IEC 60 804 standards for class 0 and with IEC 61 672-1:2013 standard for class 1. The real frequency range is low bounded by the high pass filter (see below).

The high frequency is limited by 1.2 times the input frequency range. For example with input frequency range equal to 20 kHz a signal at 24 kHz can be detected.

The OVA plug-in doesn't manage any analysis bandwidth. It analyses the signals at the high sampling of the front end or the Max bandwidth of the Player in post-analysis.

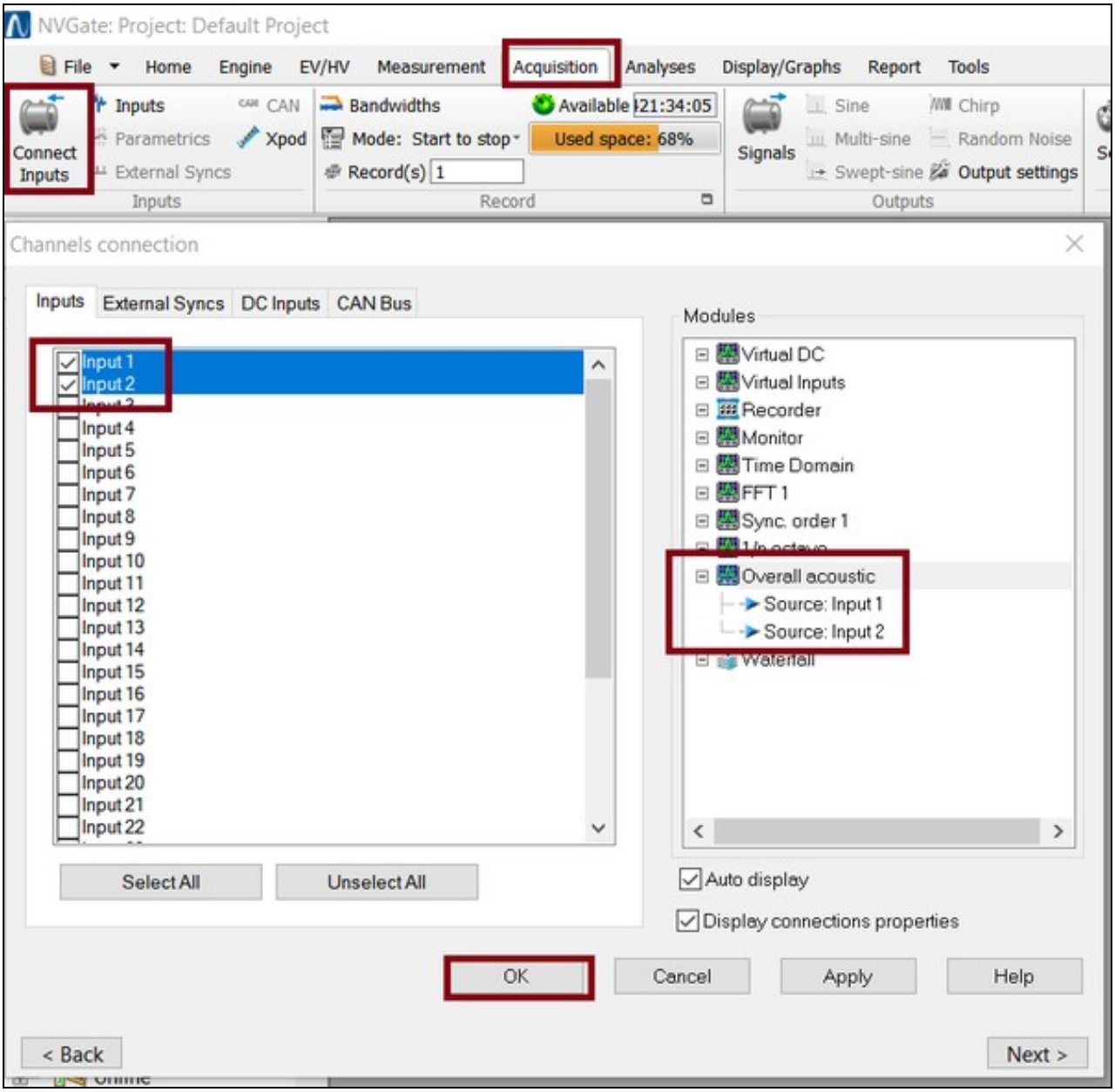
The following scheme describes the way signals are processed in the instrument.



Note: Available results are labeled in blue.

106.1.1 Connect

To connect the channels, use the connect input on acquisition tab.



106.1.2 Available results:

Type	Size	Dimension	Domain	Save
L*X*peak	1 pt	Scalar	Level	Yes
L*X*peak max	1 pt	Scalar	Level	Yes
L*X*peak min	1 pt	Scalar	Level	Yes
L*XY* inst	1 pt	Scalar	Level	Yes
L*XY* max	1 pt	Scalar	Level	Yes
L*XY* min	1 pt	Scalar	Level	Yes
L*XY* eq *t*	1 pt	Scalar	Level	Yes
L*XY* eq *T*	1 pt	Scalar	Level	Yes

X = Applied weighting (A or C), in case of Z selection (no weighting) X is not displayed.

Y = Applied time filter (None, Fast, Slow or Impulse), If none is selected (no time filtering) Y is not displayed

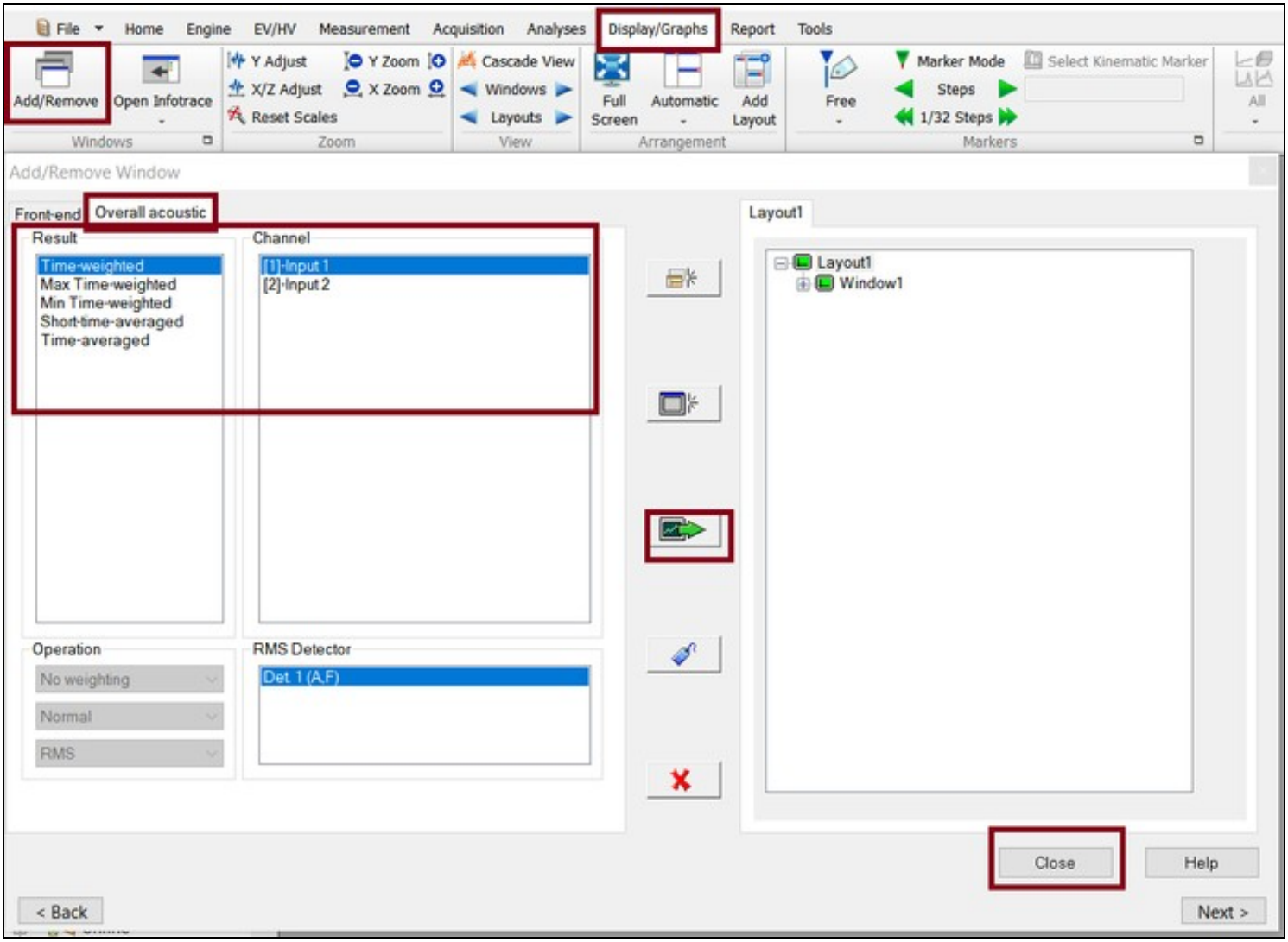
t = Short time integration duration. This duration is repeated until T.

T = Integration duration. T = ? t

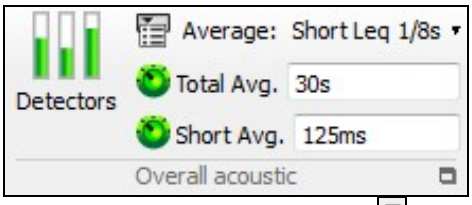
Response of A and C filters are fully conformant with above mentioned standards for all available frequency ranges, but in order to be have a sound level meter fully conformant with these standards a frequency range of 20 kHz or greater must be used.

106.1.2.1 Display

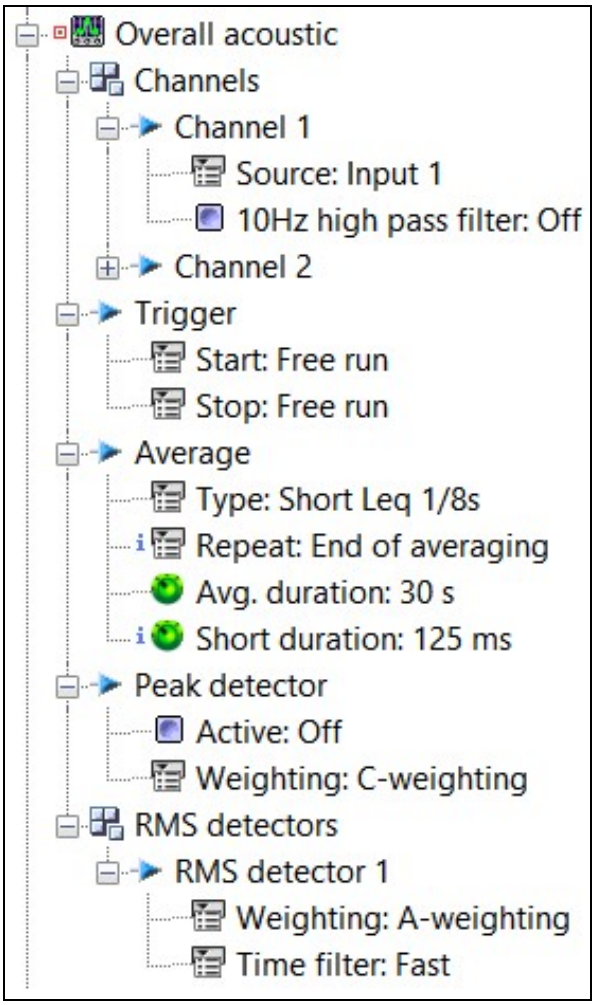
To display the results, use the Add/remove windows on *display/graph tab*


File
Home
Engine
EV/HV
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
Add/Remove
Open Infotrace
Windows
Y Adjust
X/Z Adjust
Reset Scales
Y Zoom
X Zoom
Zoom
Cascade View
Windows
Layouts
View
Full Screen
Automatic
Add Layout
Arrangement
Free
Marker Mode
Steps
1/32 Steps
Select Kinematic Marker
Markers
All
Add/Remove Window
Front-end
Overall acoustic
Result
Time-weighted
Max Time-weighted
Min Time-weighted
Short-time-averaged
Time-averaged
Channel
[1]-Input 1
[2]-Input 2
Operation
No weighting
Normal
RMS
RMS Detector
Det. 1 (A,F)
Layout1
Layout1
Window1
Close
Help
< Back
Next >

106.1.3 Settings



Note: Clicking on the bottom right icon ( ) opens the 1/n OCT plug-in properties dialog allowing a full access to all the settings.



106.1.3.1 Channels

- Source: input source to be analyzed. It may come from the Front-end input or from the Player in post-analysis mode (see the post-analysis chapter). In post-analysis mode, tracks with different signal bandwidth cannot be plugged simultaneously.

- 10Hz high pass filter: High pass filtered activation. When this setting is "on" a 10 Hz 3rd order high pass filter is applied on the current input in order to remove very low frequency components from input signals. Attenuation, is conformant with IEC 61 672-1standard: 3 dB at 10 Hz, 60 dB at 1 Hz and lower than 0.5 dB at 20 Hz. When this setting is "off" inputs are filtered by default with a first order 5 Hz filter that rejects residual DC component. The attenuation is 3 dB at 5 Hz and 14 dB at 1 Hz. The 10 Hz high pass filtering can be set independently on each channel.

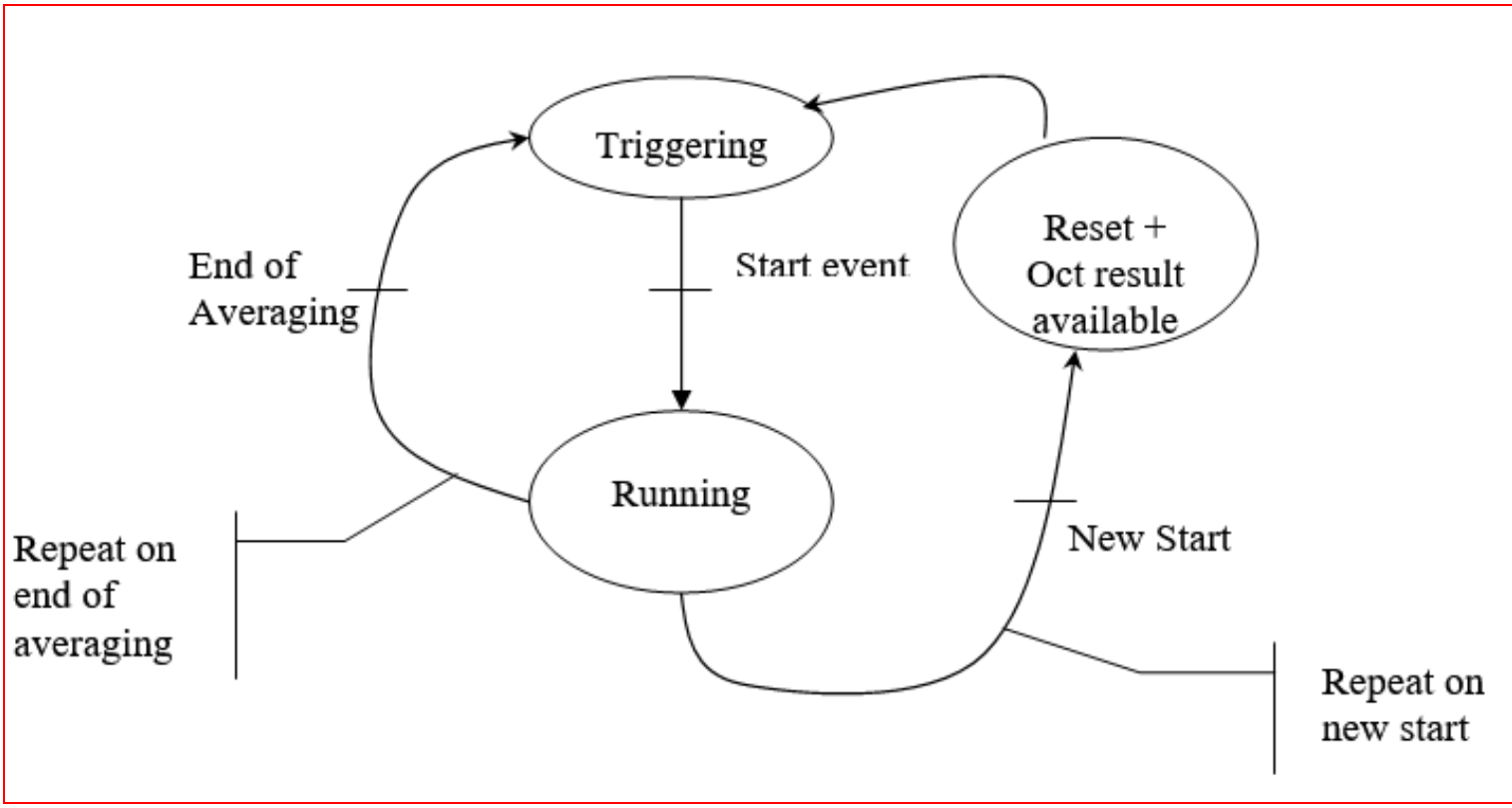
106.1.3.1.1 Trigger

Contains the settings related to plug-in start and stop signal computation.

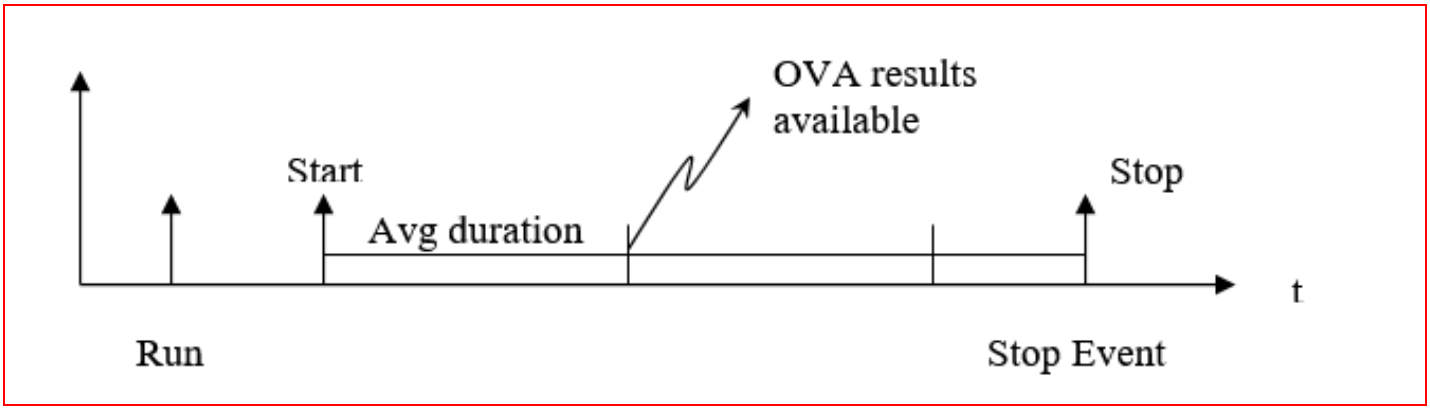
- Start: selects the event to start the averaging or short averaging. Any event can be chosen among the list of defined events. By default only the Free run and Manual events are available. Additional events can be defined in the "Event Definition" shared resource.
- Stop: selects the event to stop the averaging. Any event can be chosen among the list of defined events. By default only the Free run and Manual events are available. Additional events can be defined in the "Event Definition" shared resource.

When repeat mode is active (short Leq n averaging, or linear + repeat) averaging are repeated between start and end of averaging. New short averaging occurs at end of averaging or new event on start.

The following scheme is a description of the two different repeat modes:

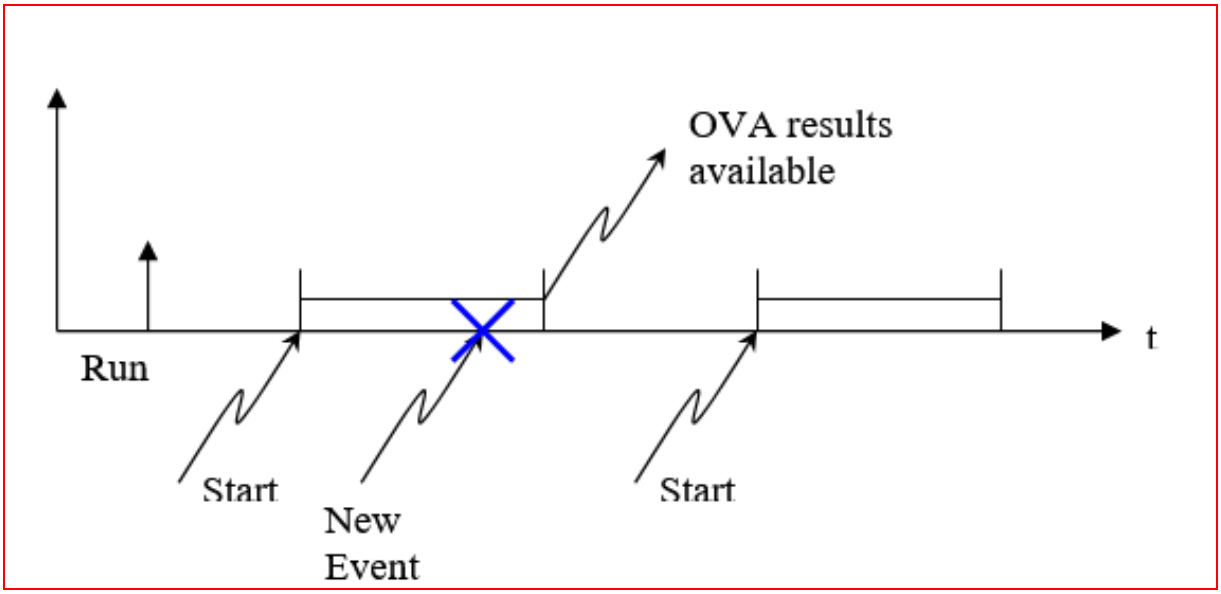


- Mode Repeat on ?end of averaging?:



The ?Run? corresponds to the start of the analyzer. The start is the beginning of average duration. At the end of the first average, the second average will start and so on till the end of the integration time (even if the last short time integration duration is not over). Each averaging has the same size, except the last that can be smaller.

- Mode Repeat on ?New start?:



The ?Run? triggers the analyzer, but the average begins at the start event (set in the event definition). This averaging stops at the end of average duration or at the stop event. Then the next averaging is waiting for the new start event to occur.

In case a new event occurs during a previous averaging, this start event won?t be effective because the previous average duration is not over, you can only set other event after the end of the previous one.

106.1.3.1.2 Average

- Type: Lets you choose the averaging mode within the following list:

Type	Description
Linear	Arithmetic average of the instantaneous detector outputs during the "Avg duration"
Short Leq 1/8s	Corresponds to a repeated linear averaging with a fixed "Short duration" of 1/8s. Long duration averaging is simultaneously computed. All computations end after Avrg. duration elapsed. *New result* available every 1/8s for display and for the Waterfall.

	The *event "OVA Leq result available"* (to be used for instance as a trigger in the waterfall) corresponds to detector outputs availability each 1/8s.
Short Leq 1s	Corresponds to a repeated linear averaging with a fixed "Short duration" of 1s. Long duration averaging is simultaneously computed. All computations end after Avrg. duration elapsed. *New result* available every second for display and for the Waterfall. The *event "OVA Leq result available"* (to be used for instance as a trigger in the waterfall) corresponds to detector outputs availability every second.
Short Leq (t)	Corresponds to a repeated linear averaging with a user selectable "Short duration". Long duration averaging is simultaneously computed. All computations end after Avrg. duration elapsed. *New result* available every short duration (t) for display and for the Waterfall. The *event "OVA Leq result available"* (to be used for instance as a trigger in the waterfall) corresponds to detector outputs availability every short duration.

All these modes feature long duration set up.

- Repeat: Performs linear averaging over "Short duration" time and finally computes a linear average of all "Short duration" results over "Avg. duration" time

Refresh is performed every "Short duration".

The *event "OVA Leq result available"* (to be used for instance as a trigger in the waterfall) corresponds to detector outputs availability after each "Short duration" calculation.

This setting is available for modification only when linear averaging is active, on all over cases it feature only information.

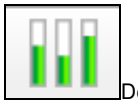
- Average duration: sets the integration duration. T = ? t, this settings is available for every type. If you change the short duration, the average duration will be automatically adjust to the closest value multiple of the short duration.

- Short duration: sets short time integration duration. This duration is repeated until the average duration. This setting is not available for linear type, and only modifiable in Short Leq (t) (automatically set in other types).

The table below shows the state of these settings function of the average type:

Type	**Repeat**	**Avg. duration**	**Short duration**
Linear	Visible	Visible	Not used
Short Leq (t)	Fixed (end of averaging)	Visible	Visible
Short Leq1/8s	Fixed (end of averaging)	Visible	Fixed (1/8s)
Short Leq 1s	Fixed (end of averaging)	Visible	Fixed (1s)

106.1.3.1.3 Peak detector

-  Detector: opens the detectors properties. 1 peak and up to 3 RMS detector can be activated. They process all plug-in channels

simultaneously.

Activated or not with A, C or Z (flat) time weighting.

A	Selects the ?A? weighting on the time signal. This weighting type is not available for frequency ranges below 10 kHz and above 25.6 kHz.
C	Selects the ?C? weighting on the time signal. This weighting type is not available for frequency ranges below 10kHz and above 25.6 kHz.
Z	No weighting applied. This is the default setting for frequency range lower than 10kHz and above 25.6 kHz.

106.1.3.1.4 RMS detectors

For each channel 1 to 3 RMS detectors can be activated

	Weighting	Time filter
RMS detector 1	A-weighting	Fast
RMS detector 2	C-weighting	Slow
RMS detector 3	Z-weighting	Impulse

These detectors are fully conformant and validated as defined in IEC 61 672-1 and IEC 61 672-2 standards.

For each detector a min/max hold function is provided.

For each detector the following setting can be set:

- Weighting

A	Selects the ?A? weighting on the time signal. This average mode is not available for frequency ranges below 10kHz
C	Selects the ?C? weighting on the time signal. This average mode is not available for frequency ranges below 10kHz.
Z	No weighting applied. This is the default setting for frequency range lower than 10kHz

- Time filter

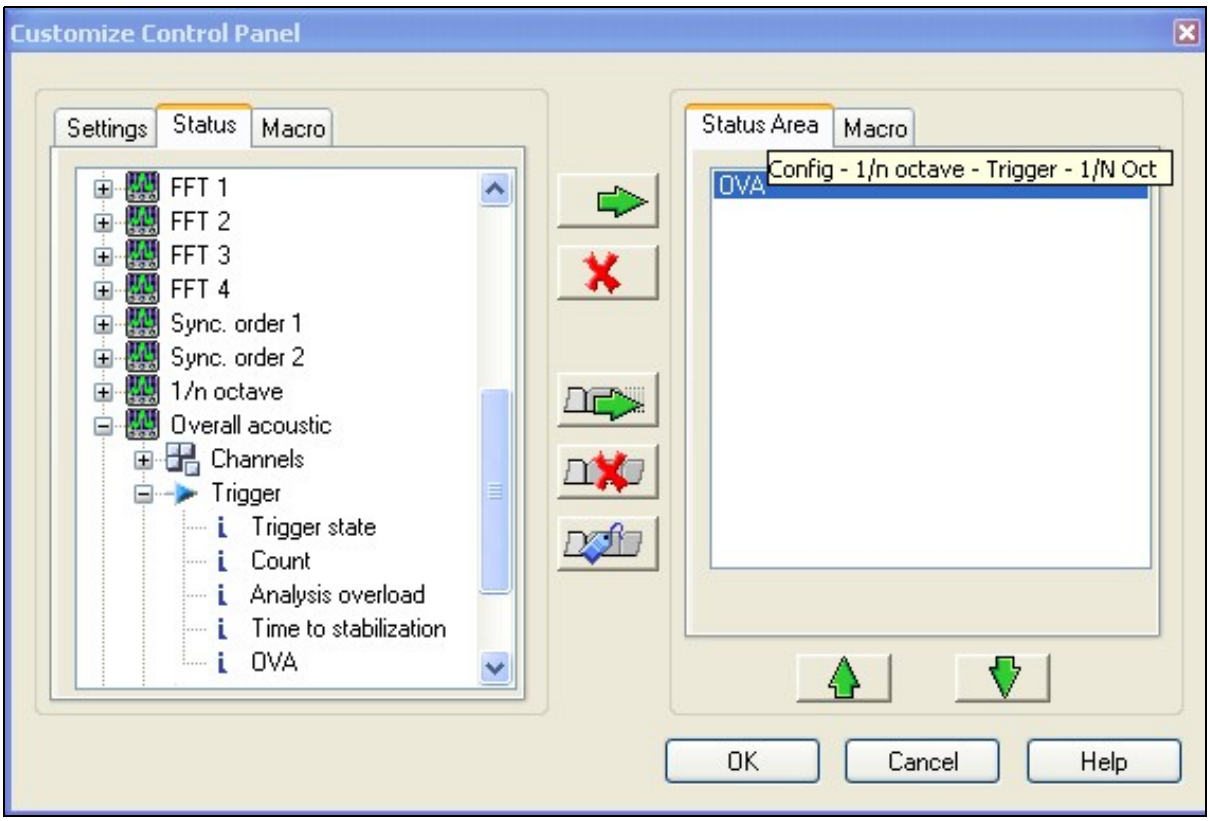
Fast	Corresponds to an exponential averaging with a fixed "Exponential time constant" of 0.125s. *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency) The *event " OVA Leq result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling frequency).
Slow	Corresponds to an exponential averaging with a fixed "Exponential time constant" of 1s. *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency). The *event " OVA Leq result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling frequency).

Impulse	Corresponds to an exponential integration with a raise Exponential time constant of 35 ms and a fall Exponential time constant of 1500ms. *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency). The *event " OVA Leq result available"* corresponds to the periodicity ((1/(fs*2,56))*256 with fs the input sampling frequency).
None	No time filter applied

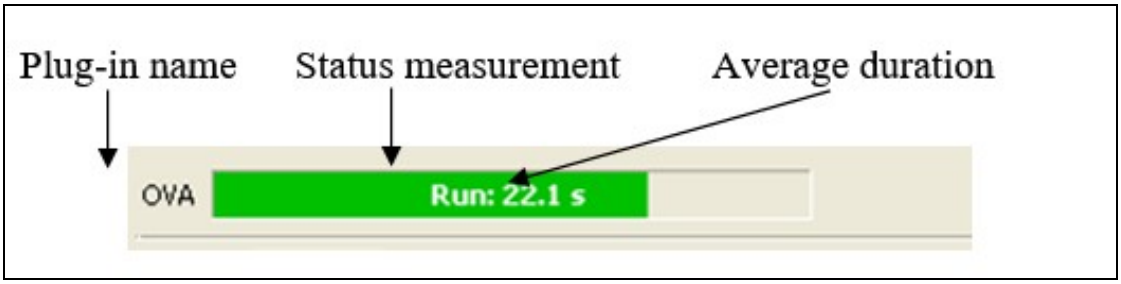
Note: Time filters are available for all frequency ranges

106.1.4 OVA status

All statuses are available to add to the control panel



106.1.4.1 OVA



The current plug-in status is synthesized in a special progress-bar. This progress bar is automatically displayed in the ?control panel? when the plug-in is active (i.e. as soon as at least 1 input is connected to the Overall Acoustic plug-in). This status is called ?OVA? and it is available in the status ASB tree (see customize control panel).

This status displays the type of averaging between brackets (i.e. Lin, Rep, Leq, CBT, Fast, Slow, Ipls or Exp), the plug-in state (Run, Paused, Stop) and the real-time status.

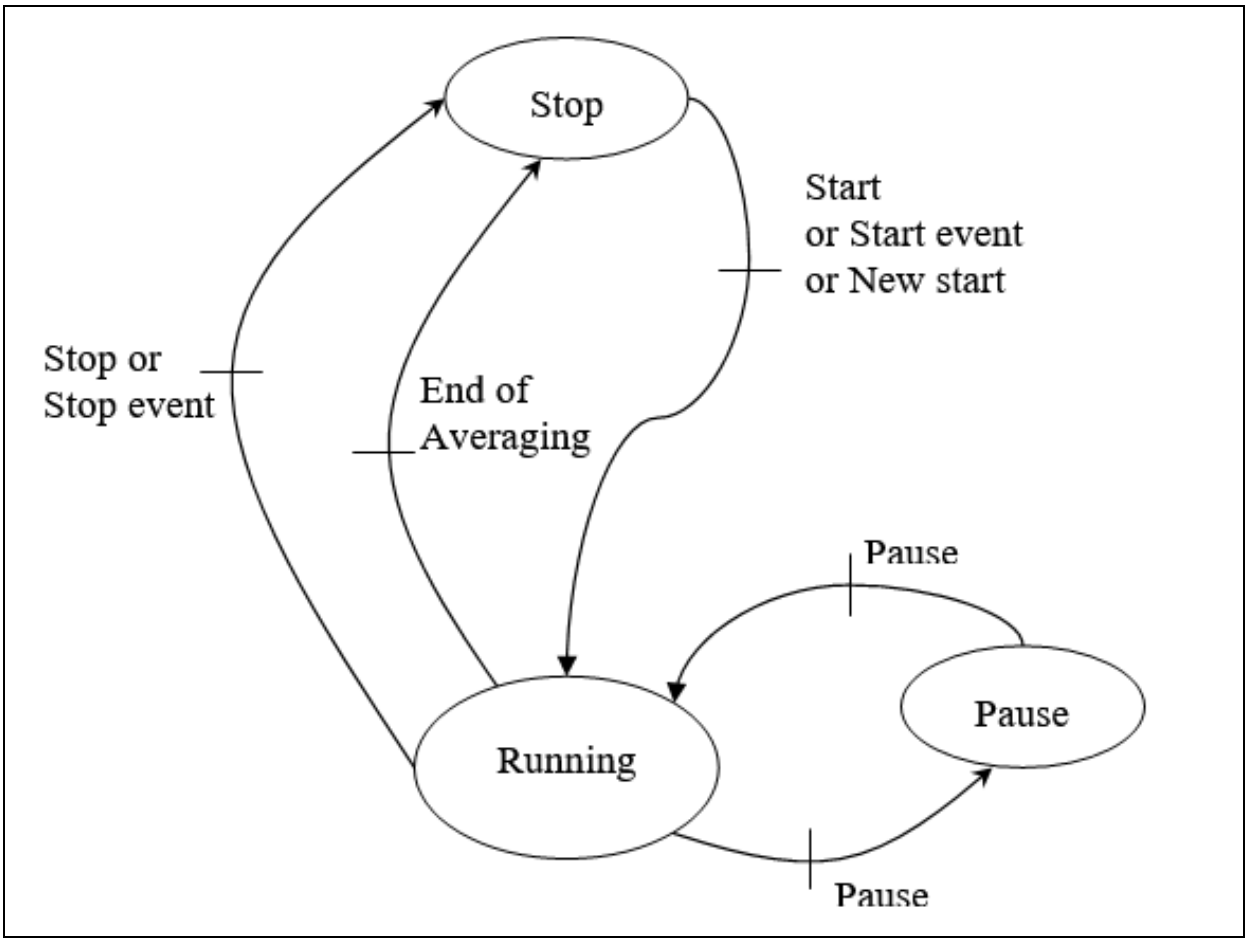
The status bar is displayed from left to right (whatever the type average is: Short Leq 1s, Short Leq 1/8s, Short Leq (t) or Linear), and the text displays the average duration with the measurement state (Run, Paused, Stop).

The color of the background bar and of the text depends on real-time status:

- *Green background and white or black text*: acquisition in real-time.
- *Red background and white or black text*: the current acquisition is not real-time (current block is not analyzed).
- *Green background and red text*: the current acquisition is real-time, but since start not all the blocks were analyzed.

106.1.4.1.1 Trigger state

The following scheme describes the different states of the measurement:



106.1.4.1.1.1 Count

This status displays time until the end of averaging time in any type of mode (in mode repeat for linear, the count restarts at the end of averaging, in others modes the count is stopped at the end of averaging).

Note that in linear mode, if repeat were on end of averaging, the count would restart at the end of averaging until stop event. If repeat were on new start, the count is set to zero at the end of averaging waiting for a new trigger.

In Short Leq mode, the count is stopped at the end of the time duration (the repeat mode is made on short duration).

106.1.4.1.1.2 Analysis overload

This status displays if during the acquisition, there were an overloaded period (or not).

106.1.4.1.1.3 Time to stabilization

Until this time to stabilization is over, results are not available. All filters have a stabilization time and at any change of settings, filters need this time before the results are available. The lower the frequency is the longer this stabilization is.

If there were no change between two runs, no stabilization would be necessary. But if a new plug-in is connected, the system is reinitialized and then there is a time to stabilization.

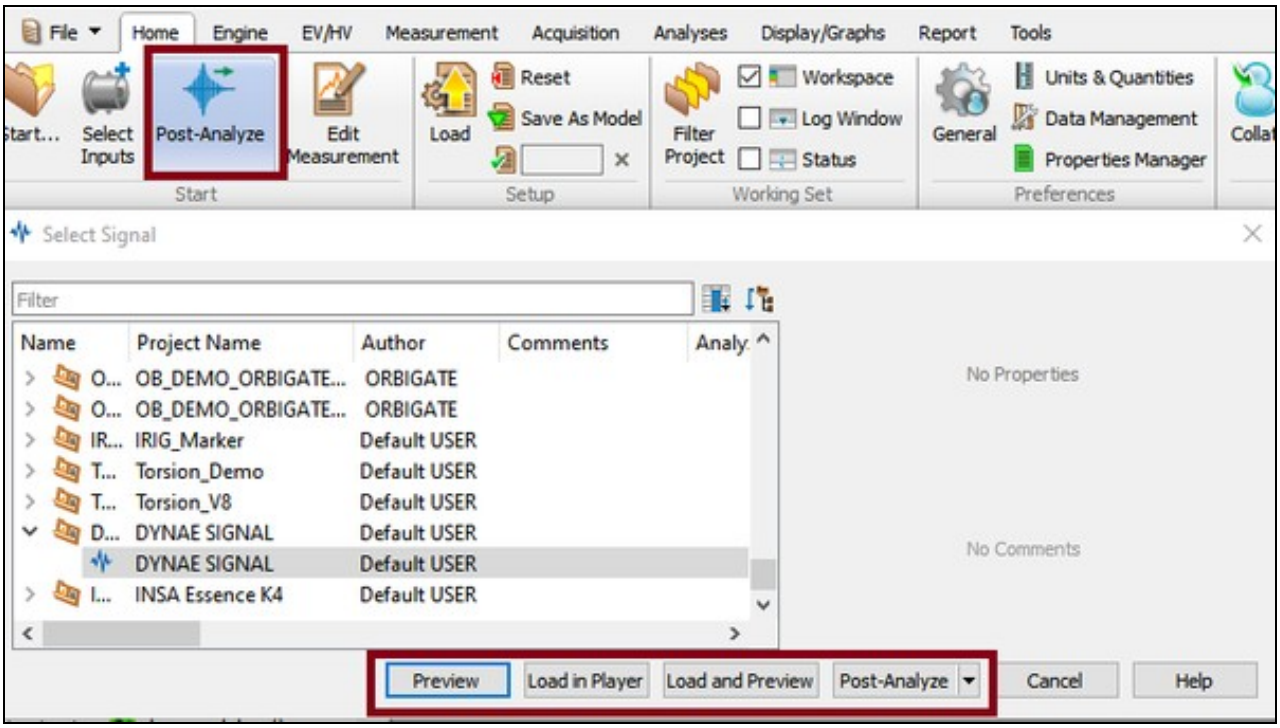
107 NVGate Player

The Player module is used to playback temporal signals in NVGate. The signal can be a previously recorded signal or an imported signal. Once loaded in the player, the signal can be displayed, listened through the computer audio port and post-analysed. In this way, you can re-inject the recorded signals into any NVGate plug-in (Monitor, FFT, 1/n Octave...). It is also possible to play back a recorded signal through the Output during On-line analysis.

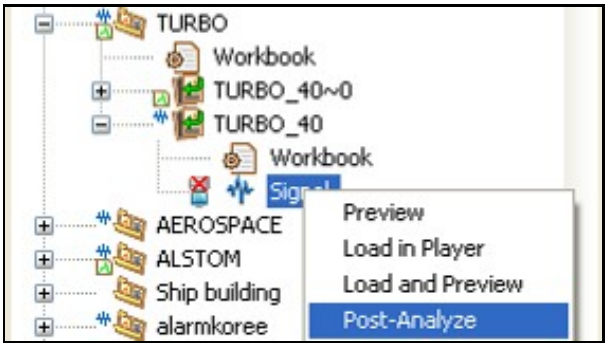
This page will present you the different usages of the player.

107.1 Load a signal for post analysis

- From the Home tab / Start group, press the *Post-Analyze* button. This will display a selection of signal files available for post-analysis:



- From the project manager, by right clicking on the signal you want to analyze. You can choose to **preview**, **load, load & preview** or **Post-Analyze** it.



1. **Preview** lets you visualize the recorded signal envelope. Contents of signal files can be visualized in a high-speed preview even if you are manipulating a huge file. This new technology allows multiple files to be previewed at the same time. Very large domain records (several Gigabytes) can be previewed in a click, even if the hardware is not connected. This means that the files can be located on the hardware OR3x disk and visualized (not post-analyzed) on the PC without request of downloading, or Hardware connection.

2. **Load in player** makes your signal available in the player without viewing it.

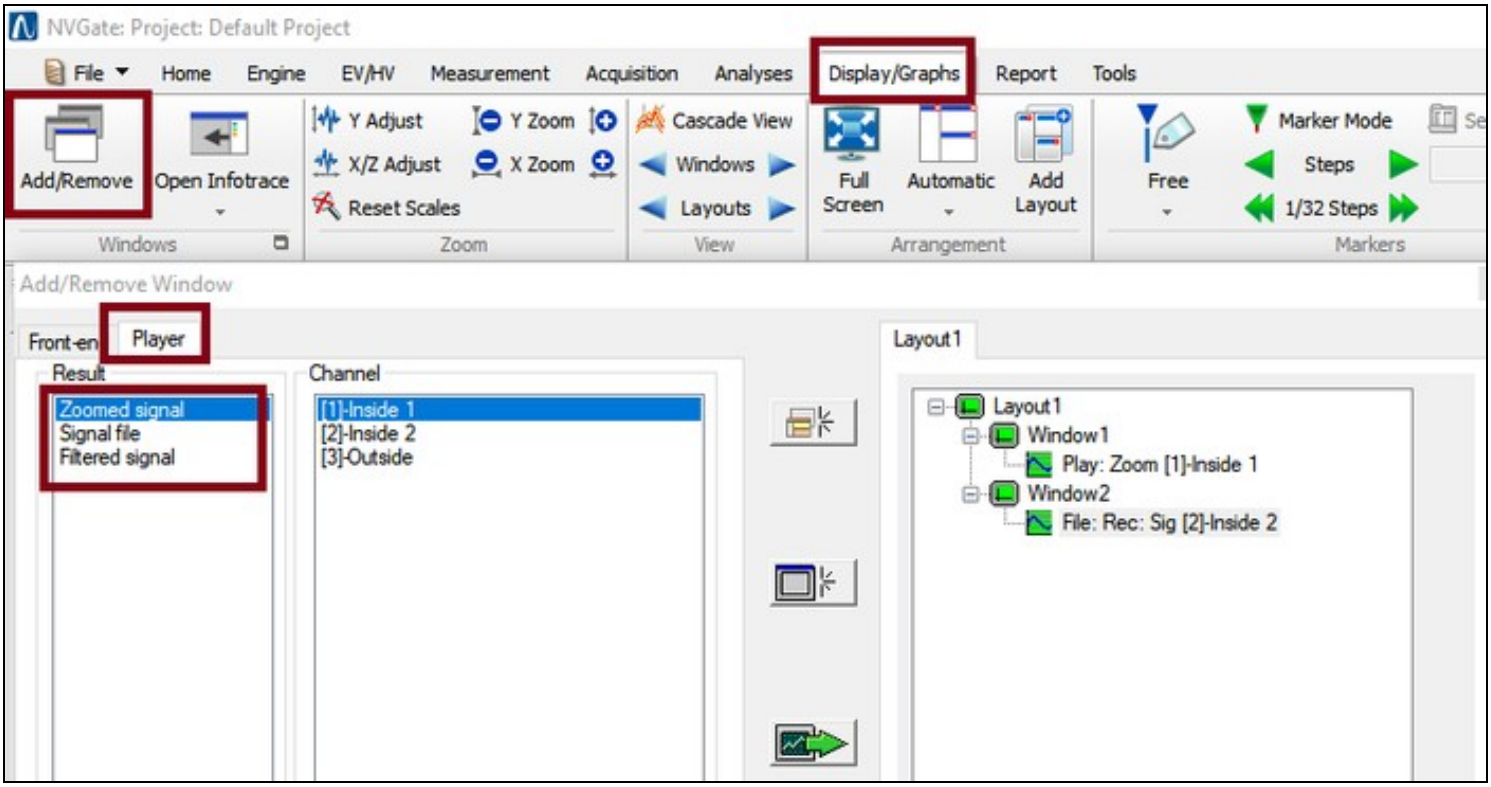
3. **Load & Preview** is a combination that lets you see the envelope of the recorded signal you loaded.

4. **Post analyze/new** is a combination that lets you see the envelope of the recorded signal you are loading, switch to post-analysis and start a new setup menu for post-analysis. (If you are already in post analyse, the current setup will not be deleted).

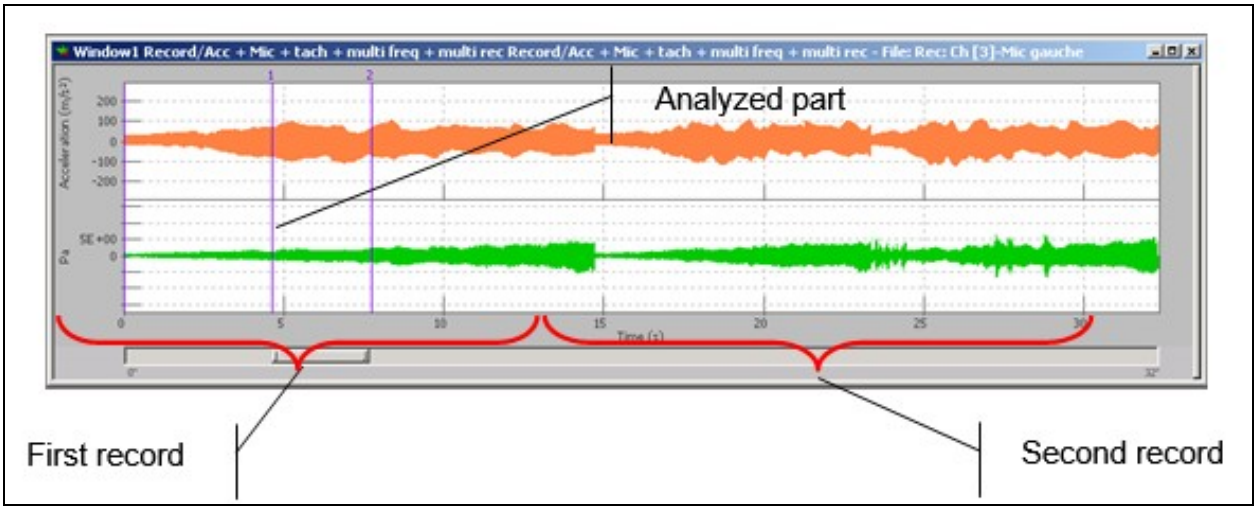
5. **Post analyze/Keep record setup** is a combination that lets you see the envelope of the recorded signal you are loading, switch to post-analysis, and keep the setup used during the record signal by replacing dynamical input of the frontend by the player tracks. *Note:* ***'if the record setup contains virtual inputs, torsional channels, CAN or DC channels, the connection of these channels to the plug-ins will be reset.***
The video below explain the post analyze "Keep record setup".

107.1.1 Display the signal

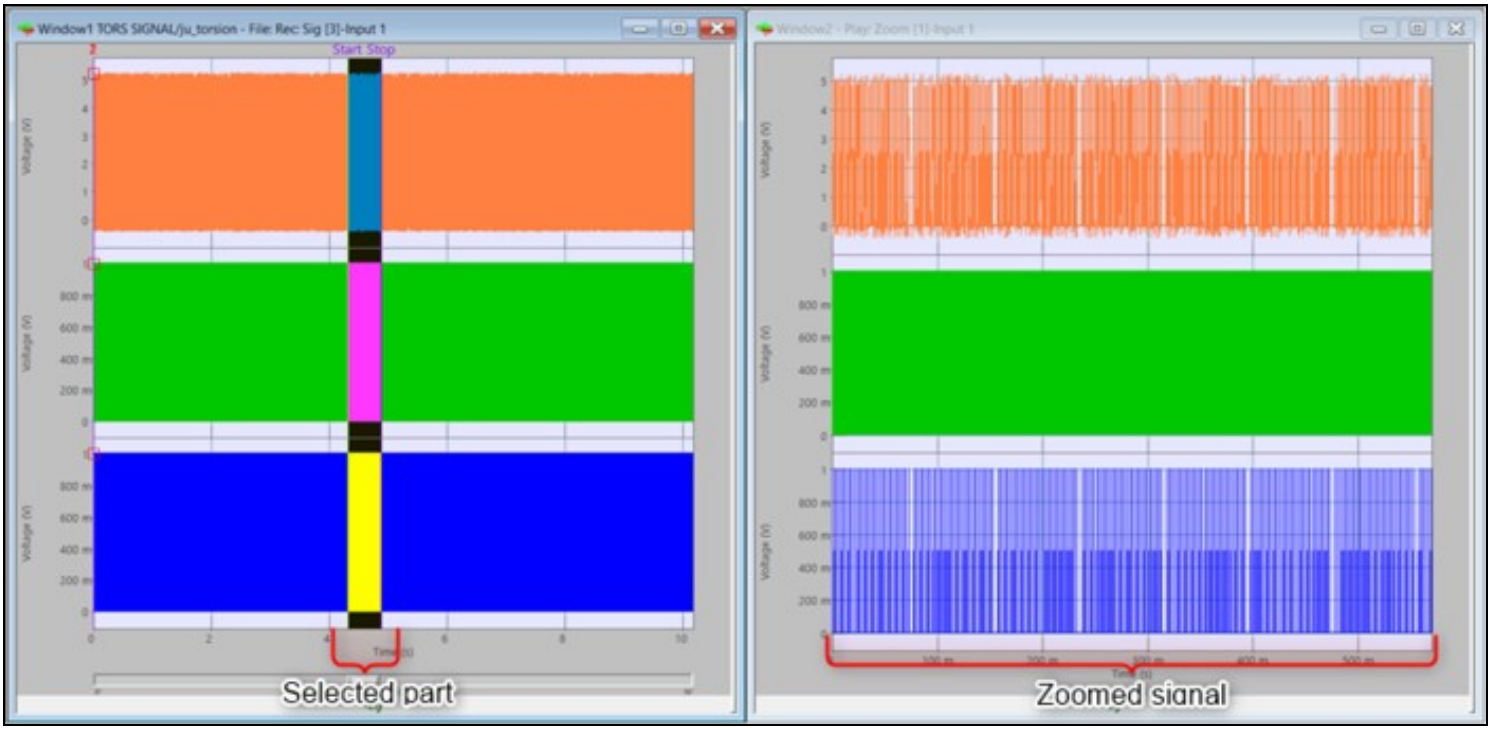
NVGate® proposes 2 different types of windows for displaying the signal.



- The signal File is for the file overview providing a compressed view of each record.



- The second type is the zoom on the analyzed part (between the start and stop offset cursors).



You can zoom on a specific part of the signal selected with the mouse. This operating mode allows an easier navigation inside the recorded domain file to locate the part of interest. If you are in post-analysis mode, only the selected part of the signal will be analyzed.

- The filter signal is only available in on_line connected mode if a filter is applied. It allow you to see the filtered signal.

Available results

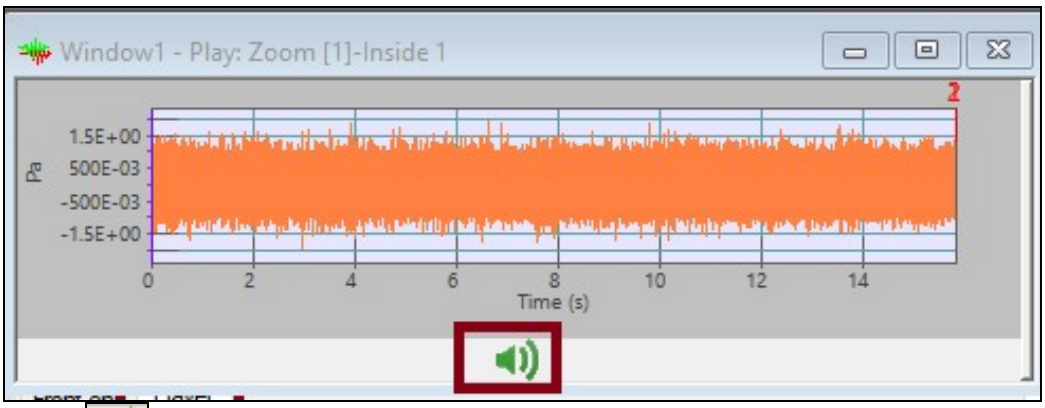
Type	Size	Dimension	Domain	Save
Signal File	2048 compressed pt max	2D	Compressed time	Display only

There are 2 modes for the player:

- **Post-analysis**, the player takes place of the front end; the signal can be analyzed by any plug-ins.
- **Play-back on output** In connected mode on-line, signals are played on the output (load files in the player and connect tracks to outputs). Note that the Input sampling must be the same as player max bandwidth x 2.56.

107.1.2 Playback on PC speaker

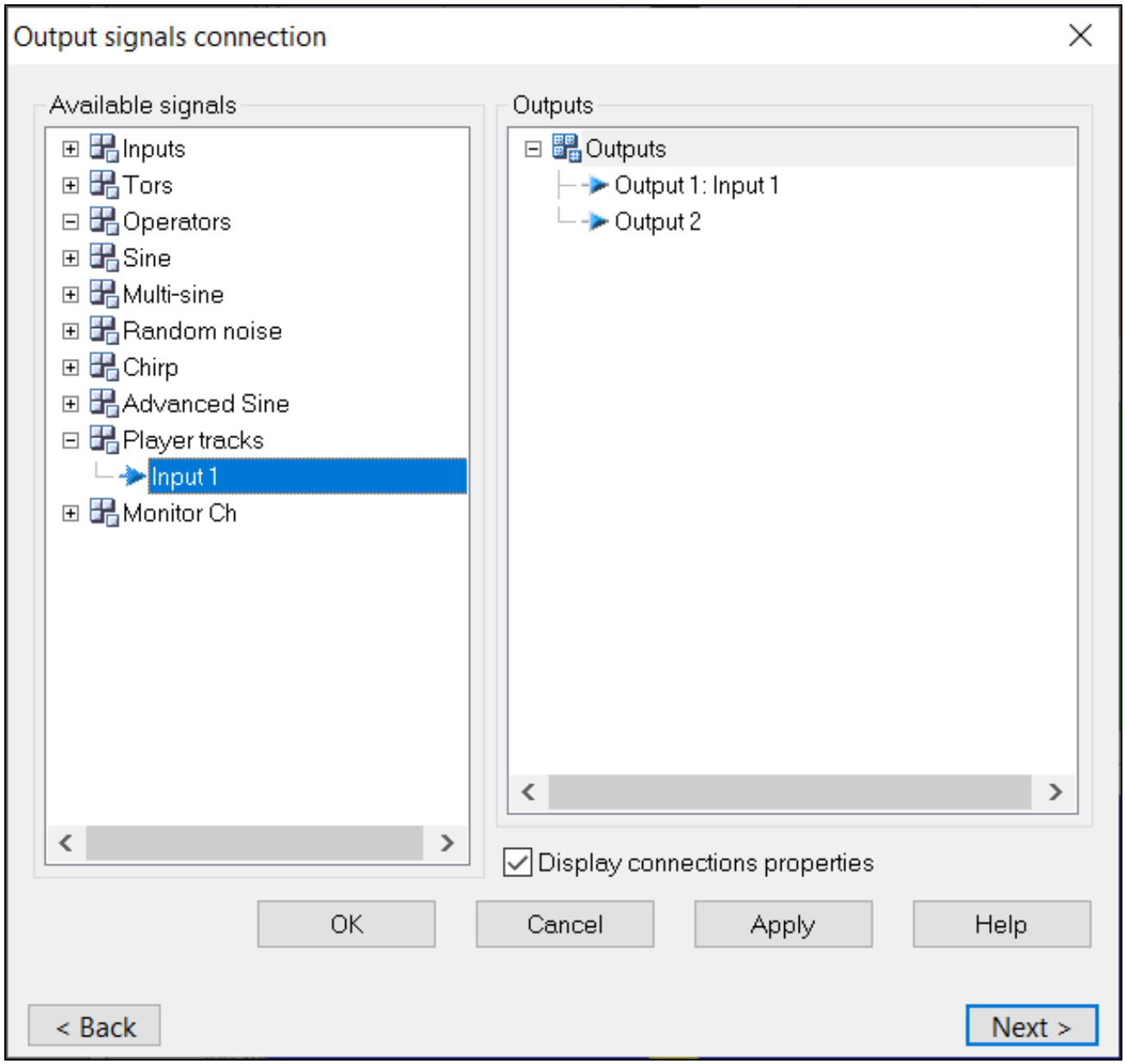
From any of the previous configurations, the recorded signal can be listened through the PC loudspeakers.



Click on  in the active window. The button stops the play-back at any time. A mobile cursor (blue) localizes the played back signal part in the signal window. Only the active trace is played.

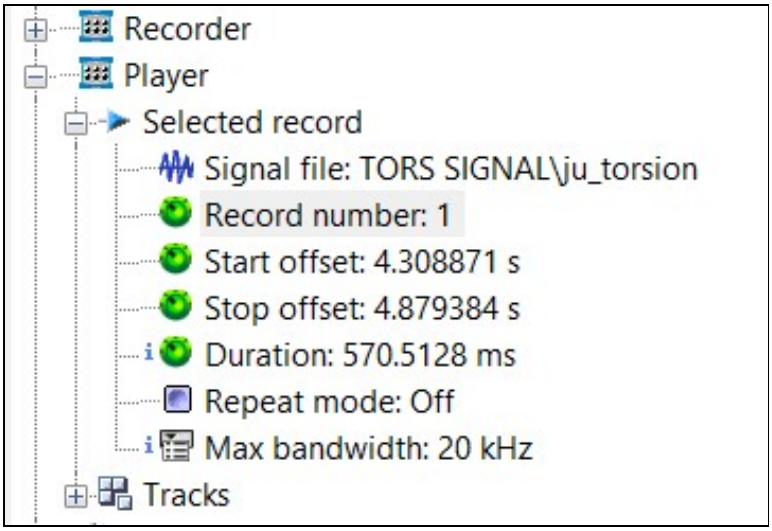
107.1.3 Connect the player tracks on the output

Once the signal is loaded, you can play the tracks on the output of the frontend :


Output signals connection
Available signals
Inputs
Tors
Operators
Sine
Multi-sine
Random noise
Chirp
Advanced Sine
Player tracks
Input 1
Monitor Ch
Outputs
Outputs
Output 1: Input 1
Output 2
Display connections properties
OK
Cancel
Apply
Help
< Back
Next >

107.1.4 Player option

The options of the player are accessible and can be modified from the ASB:



- **Signal file**: the name of the measurement containing the signal file.
- **Record number**: defines the record to be processed (if the signal file contains more than 1 record).
- **Start offset**: the beginning position of the part of signal to analyze or play (0 <= Start Offset < Stop Offset).
- **Stop offset**: the end position of the part of signal to analyze or play (Start Offset < Stop Offset <= selected record duration).
- **Duration**: the duration of the selected part of signal between the Start offset and the Stop offset.

Hidden/fixed: Fixed

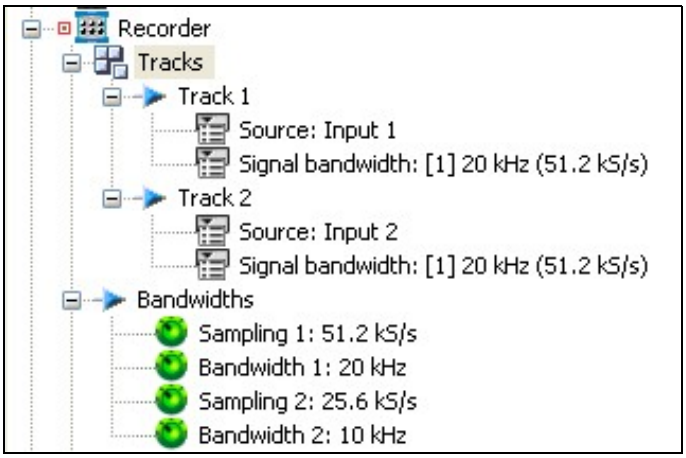
- **Repeat '***mode***'**: On/Off: used to repeat playback of the selected part of the signal indefinitely. The repeat mode is not enabled in post-analysis mode.

Hidden/fixed: Hidden in post analysis mode

- **Max bandwidth**: contains the list of available frequency bandwidths in the selected signal file. This setting defines the largest frequency bandwidth for all the plug-in analyzers in the post-analysis mode.

Example:

Input 1 and Input 2 are the inputs to be recorded. Input 1 will be recorded with signal bandwidth = 20 kHz and Input 2 with signal bandwidth = 5 kHz.



In post analysis mode, the Player max bandwidth can be selected between 5 kHz and 20 kHz. Then, each Signal bandwidth group can be used in different plug-ins.

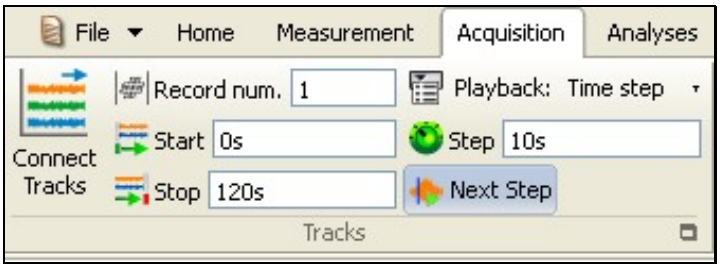
ON-LINE	POST ANALYSIS					
Recorded file	**Player**	**Plug-in analyzer**				
Signal Bandwidth 1	Signal Bandwidth 2	Selected Max Bandwidth	Plug-in analyzer x			Plug-in analyzer y
			Selected Bandwidth	Available Input	Selected Bandwidth	Available Input
20 kHz	5 kHz	5 kHz	5 kHz	#1 & #2	5 kHz	#1 & #2
20 kHz	5 kHz	20 kHz	5 kHz	#1& #2	20 kHz	Only #1

The maximum available bandwidth for a plug-in analyzer depends on the Player max bandwidth selected. Then the inputs available in a plug-in are linked to the plug-in analyzer selected bandwidth. In the example above, the plug-in analyzer y selected bandwidth is 20 kHz. As the Player selected max bandwidth is 20 kHz, the Input 2 (signal bandwidth 2 = 5 kHz) cannot be analyzed at the frequency of 20 kHz.

- **Analysis mode**: defines how the selected part of signal is analyzed in the post-analysis mode. *Hidden/fixed:* Visible in post analysis mode

Analysis mode	Description
Continuous	The selected part of the signal is played continuously.
Time step	The player switches to pause every "Time step" second.

- **Time '***step*': defines the time step in seconds in the "Time step" analysis mode. The player switches to "pause" every "time step" second. The user must then click on the "Player Continue" button to analyze the next "time step" signal duration.

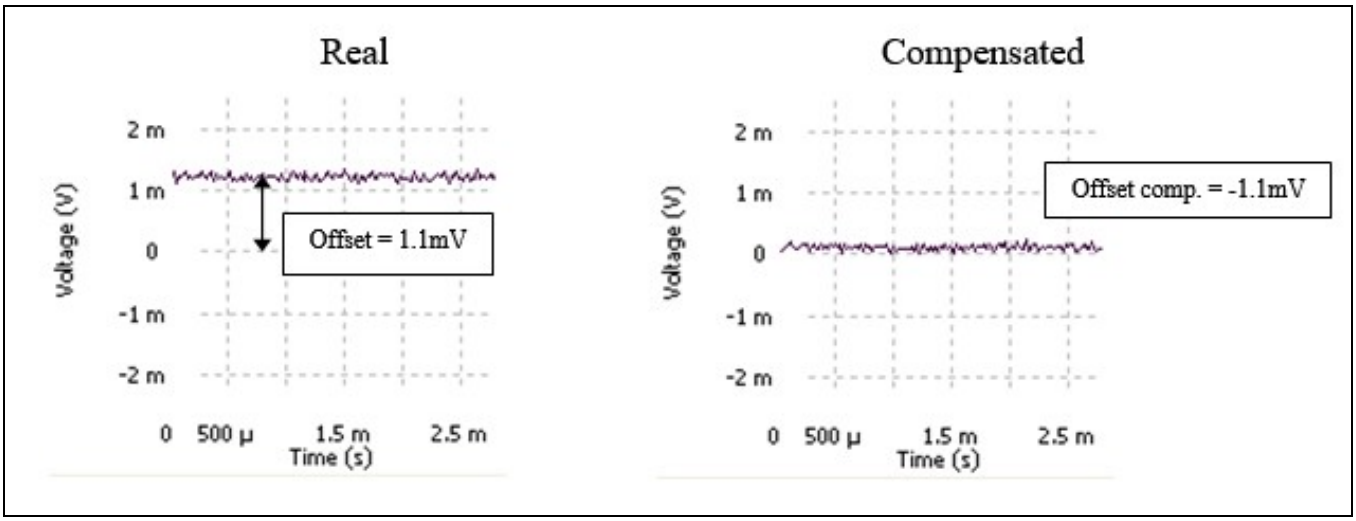


Hidden/fixed: Visible in the post analysis mode

107.1.4.1 Tracks

Displays the list of the tracks contained in the selected signal file. The following settings are automatically adjusted at each signal file new selection.

- **Label**: the name of the input signal recorded. *Fixed*
- **Transducer:** the name of the transducer used during recording.
- **Physical qty.**: the unit of the input signal selected during recording.
- **Sensitivity:** the sensitivity of the transducer.
- **Range peak:** the input range peak in the transducer SI unit. *Fixed*
- **Offset comp.**: the input offset compensation in Volts.



- **Coupling:** the input coupling. *Fixed*
- **Signal bandwidth:** the equivalent signal frequency bandwidth and the corresponding sampling frequency (for example: 20 kHz (51.2 kS/s).

Filter: Allows you to put a filter on the player track. The player tracks can be connected to a plug-in analyzer in the Post-analysis mode or to the Front-end output in *Connected* mode on line. *Fixed*

107.1.5 Post analysis Video

```
@1min 27s is example of post analysis on the signal
```

108 NVGate Post Analysis

The Post Analysis of a signal is a mode of NVGate where the physical input of the frontend are replaced by the tracks of the signal load in the player. This will allow you to re-analyse a signal previously recorded. Therefore, this mode can be used to calculate new result from a previous measurement, or re-calculate results with different setups.

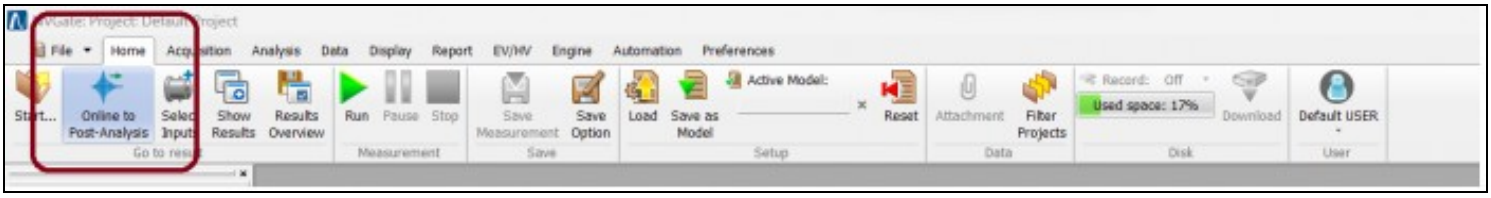
The post analysis mode can be made in connected (starting NVGate with the analyser) or office mode (starting NVGate with the dongle). However, we strongly advise to perform post analysis in Office mode, as the communication between the PC and the analyser will limit the performances. To do so, the signal must have been downloaded from the analyser to the computer.

108.1 Tutorial

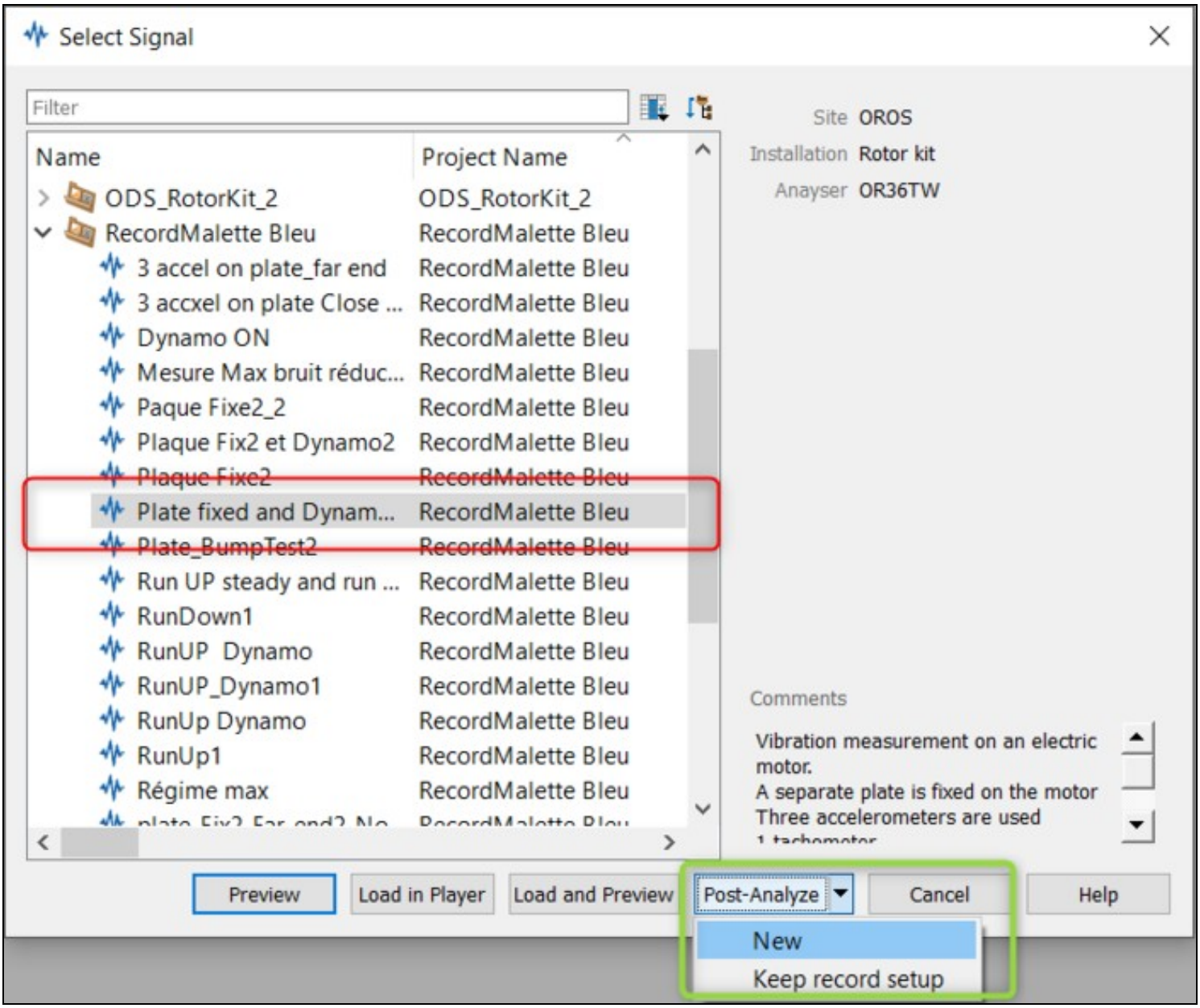
In this tutorial, we will perform the post analysis of a signal recorded during a previous measurement with an OR36TW. The post analysed record is a run-up, a run-down, and a phase at steady speed of an electric motor. The electric motor is linked to a Dynamo and a plate is attached to the its base. Four sensors are used : three accelerometers and a tachometer for the speed. I will post analyse the signal to separate each steps of the record.

108.1.1 Loading the signal

switch to post analyse more from the "home" tab

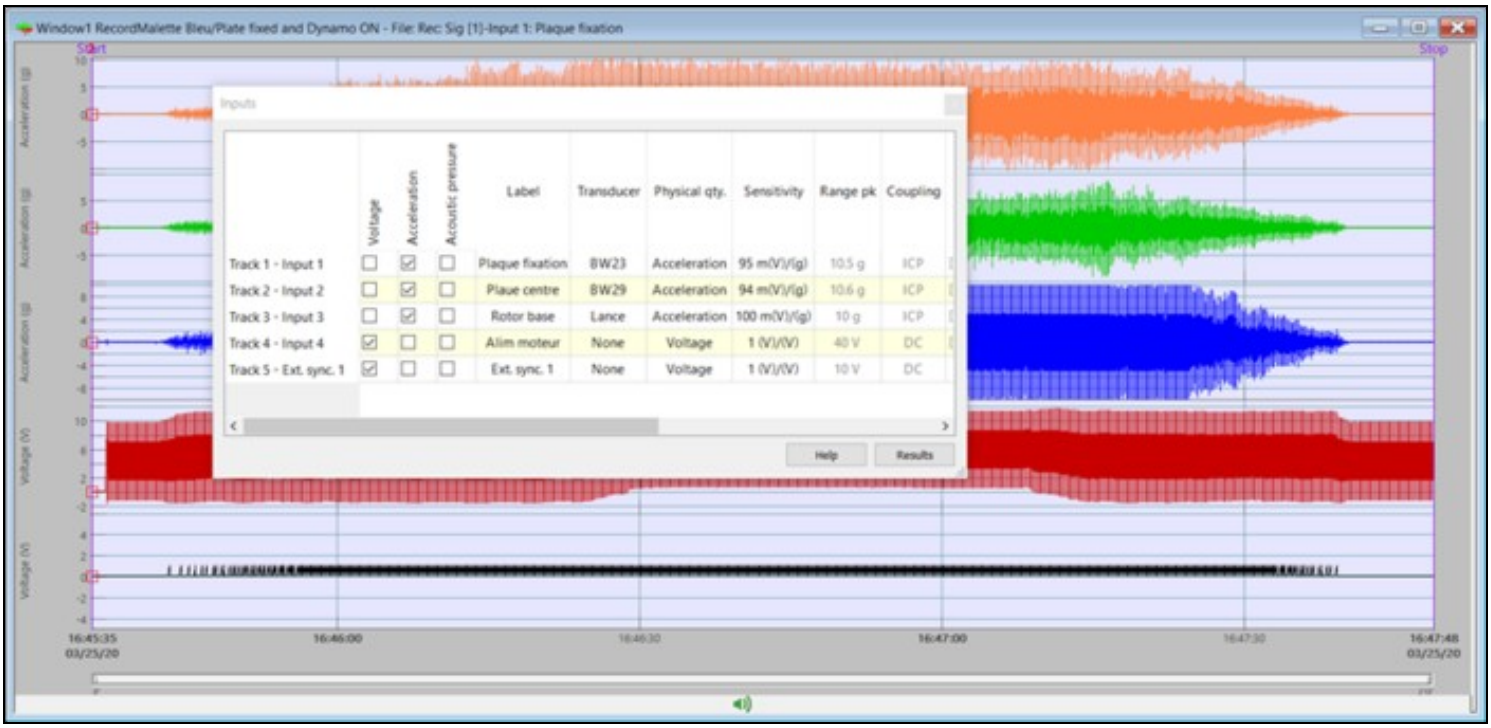


After clicking the *Select Signal* window is open. This window allow you to select the signal you want to load. Here, I select the record "Plate fixed and Dynamo" and slect *New* under the *Post Analyze* button :


Select Signal
Filter
Name
Project Name
ODS_RotorKit_2
ODS_RotorKit_2
RecordMalette Bleu
RecordMalette Bleu
3 accel on plate_far end
3 accxel on plate Close ...
Dynamo ON
Mesure Max bruit réduc...
Paque Fixe2_2
Plaque Fix2 et Dynamo2
Plaque Fixe2
Plate fixed and Dynam...
Plate_BumpTest2
Run UP steady and run ...
RunDown1
RunUP Dynamo
RunUP_Dynamo1
RunUp Dynamo
RunUp1
Régime max
Site OROS
Installation Rotor kit
Anayser OR36TW
Comments
Vibration measurement on an electric motor.
A separate plate is fixed on the motor
Three accelerometers are used
Preview
Load in Player
Load and Preview
Post-Analyze
Cancel
Help
New
Keep record setup

For more detail about the loading of the record, please see the Parameter: Loading a signal section of this page.

After clicking on post analyse, NVGate is automatically switch to post analysis mode, the signal is load in the player and the *Input* window is opened :

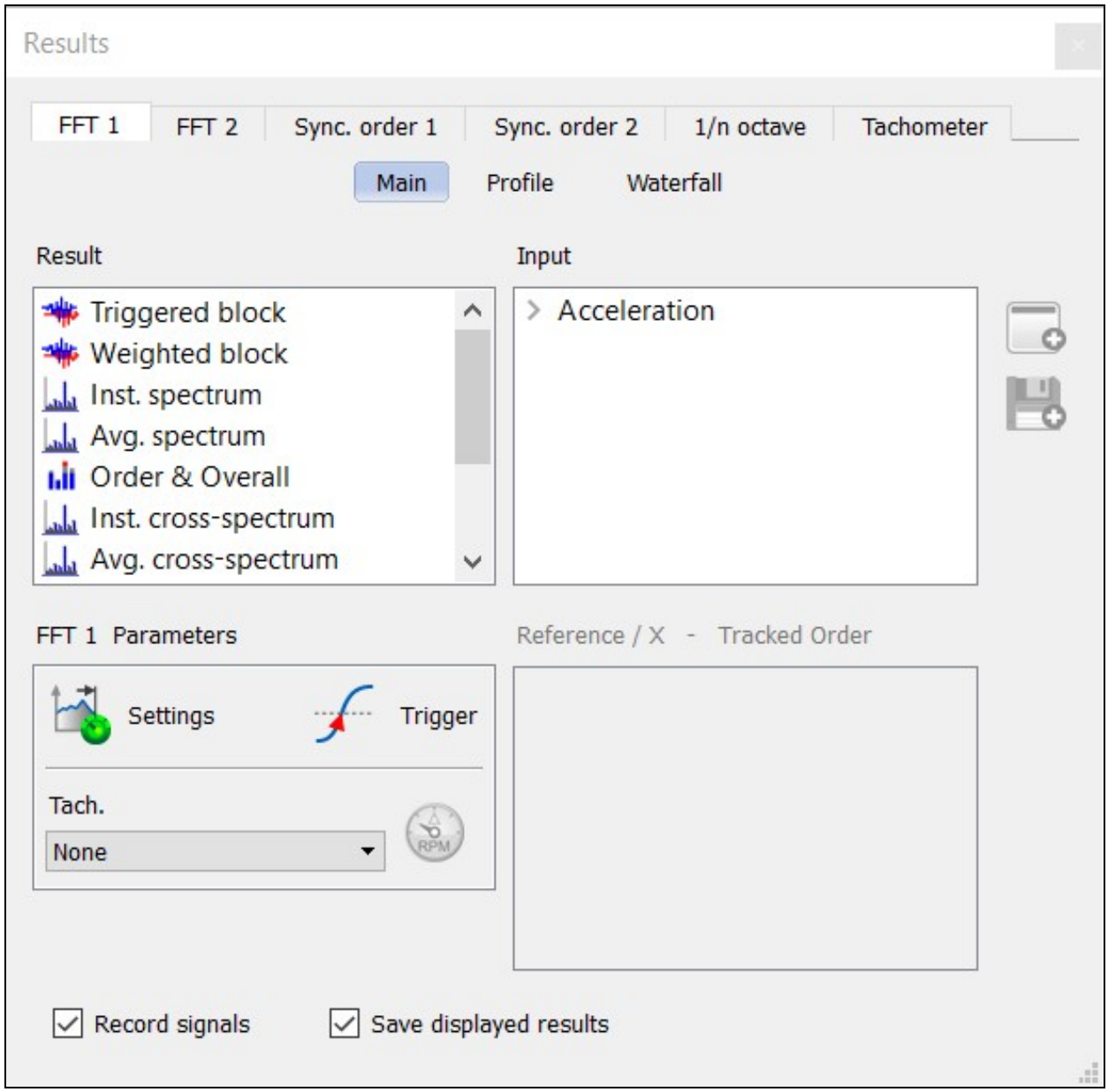


You can see that the frontend inputs are replaced by the tracks of the record.

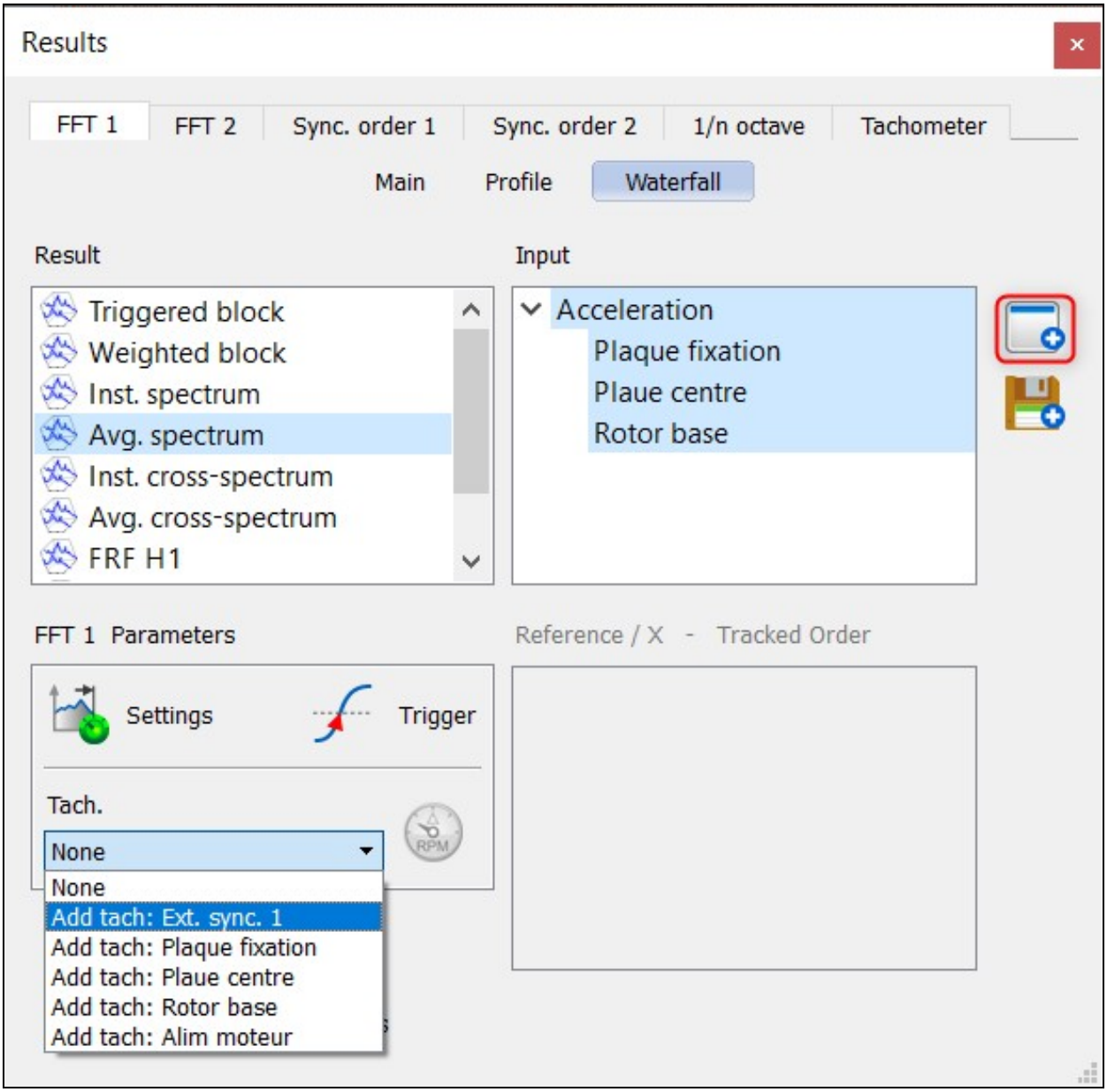
108.1.2 Connect the tracks in the plug-ins

In this section, we will see how to display the waterfall of the average spectrum, the profile of the first order with the SOA plug-in, and the speed profile of the tachometer.

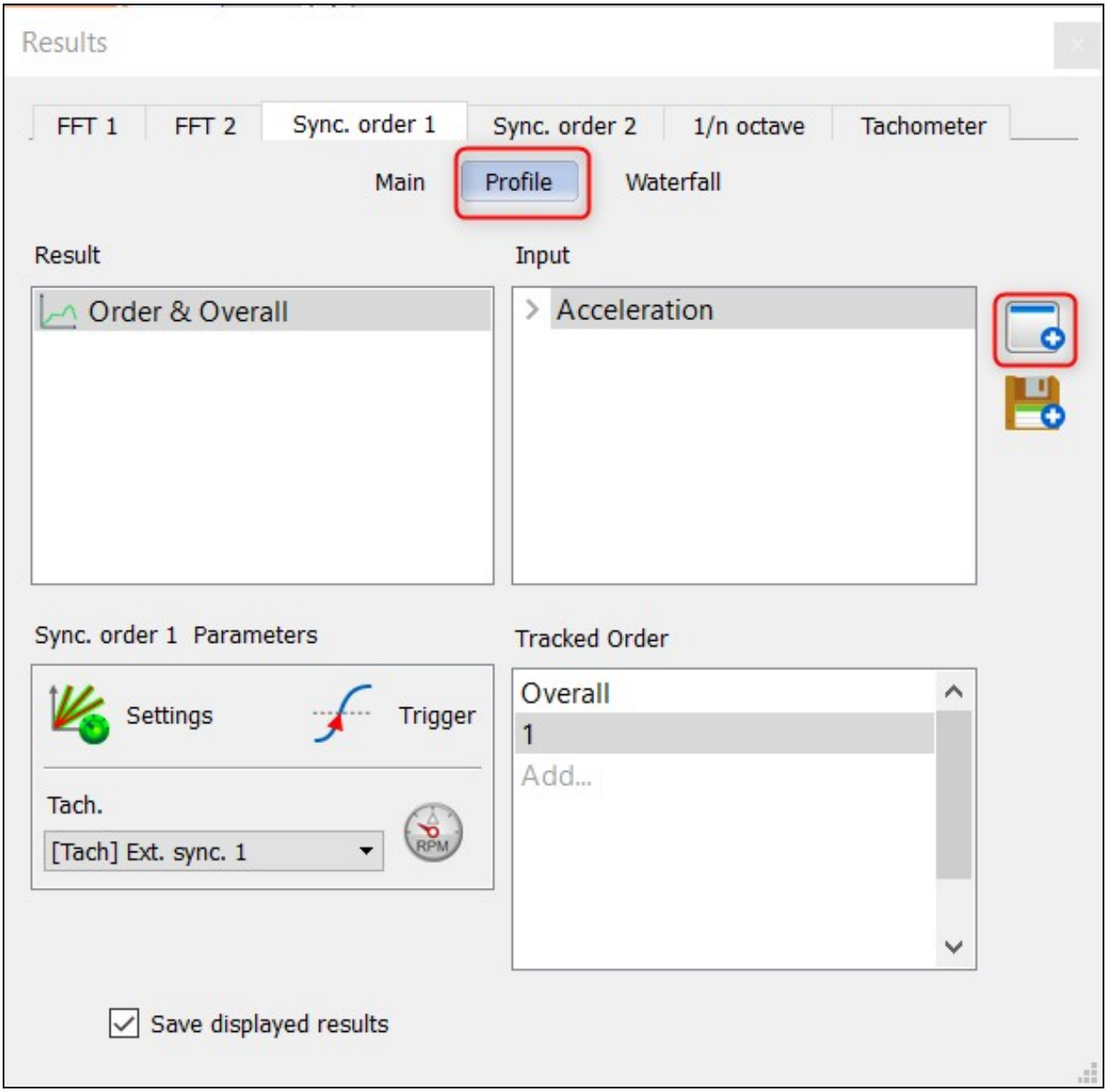
To connect the tracks in the different NVGate plug-in, click on *Result* to open the *Show result* window:


Results
FFT 1
FFT 2
Sync. order 1
Sync. order 2
1/n octave
Tachometer
Main
Profile
Waterfall
Result
Input
Triggered block
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
Acceleration
FFT 1 Parameters
Reference / X - Tracked Order
Settings
Trigger
Tach.
None
RPM
Record signals
Save displayed results

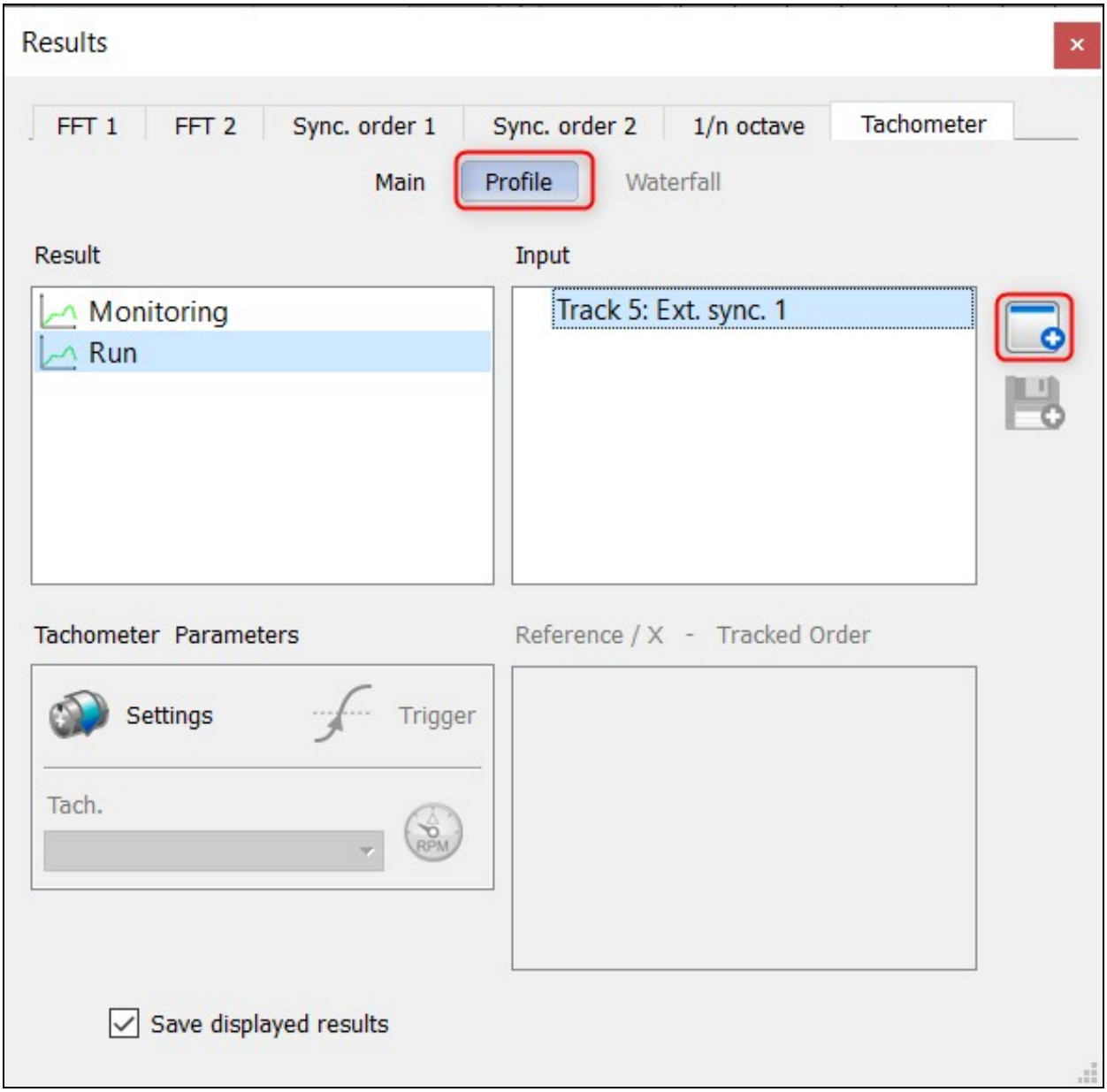
We can now connect the tracks in the FFT module to display the waterfall :



In the SOA plug-in to display the profile:

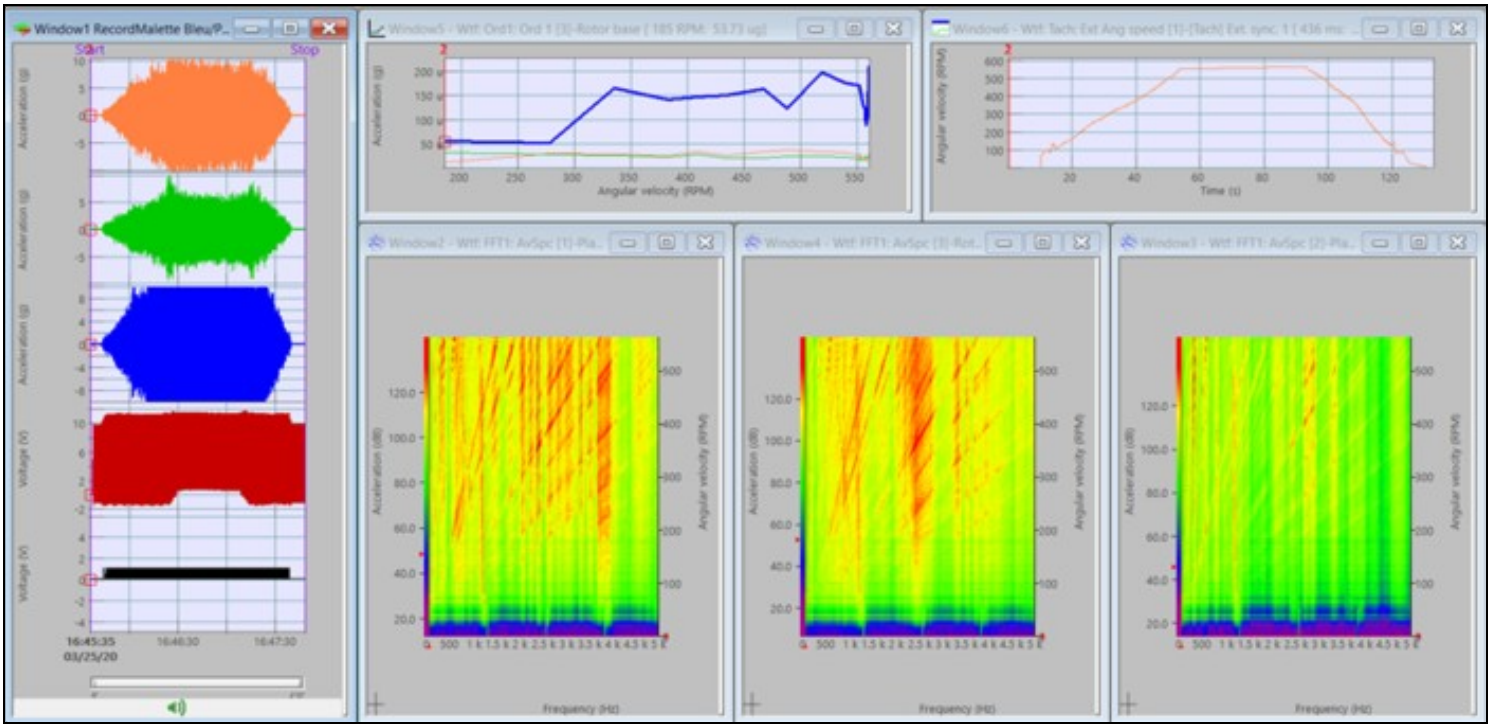


And in the tachometer section to display the tachometer profile:



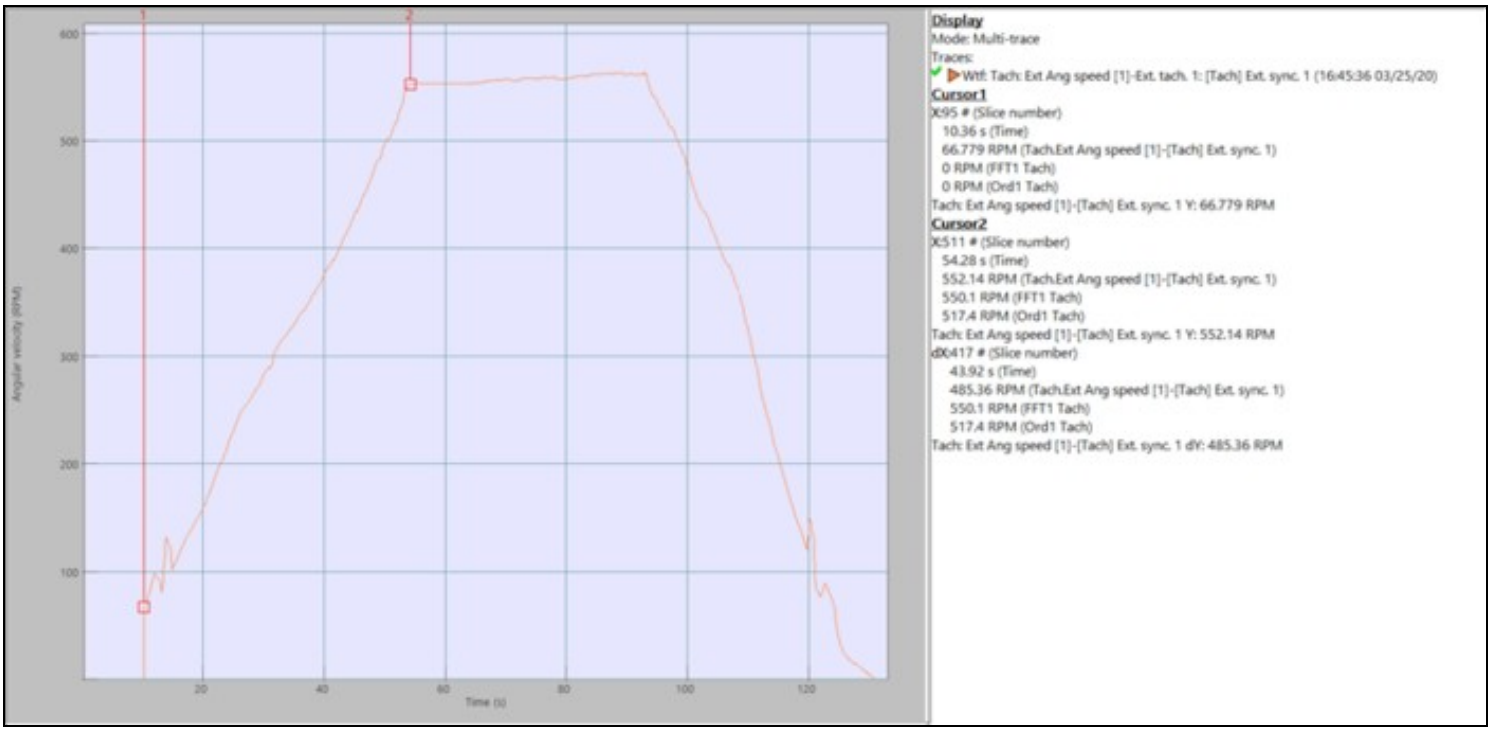
- **Note :** please refer to the NVGate software tutorial and the plug-ins pages to correctly setup each modules and displays.

After displaying all the wanted results, I can run the acquisition by the same manner as On-line mode, by clicking on  :

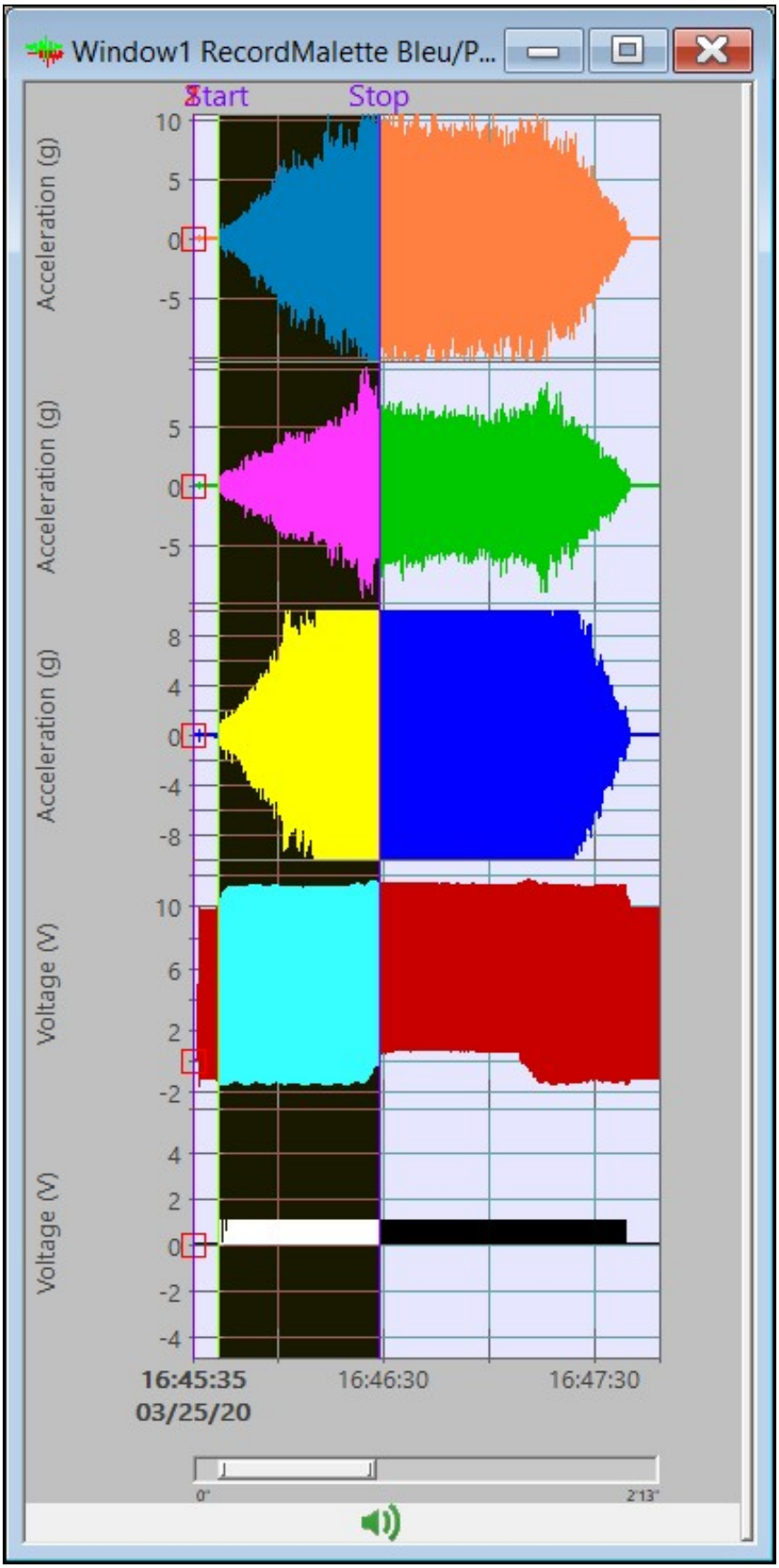


108.1.3 Selecting specific ranges

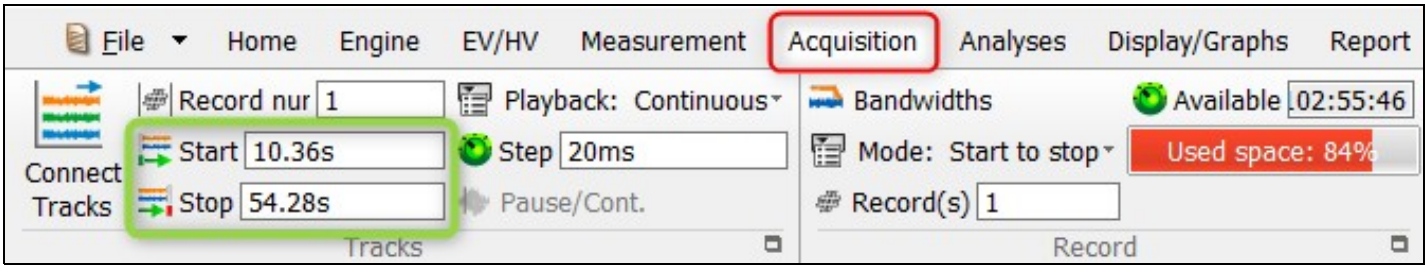
After this first acquisition, the three phases of the measurement, the run-up, steady state ans run-down, are clearly visible on the tacho profile, and I can use the cursors to find each starting and ending points :



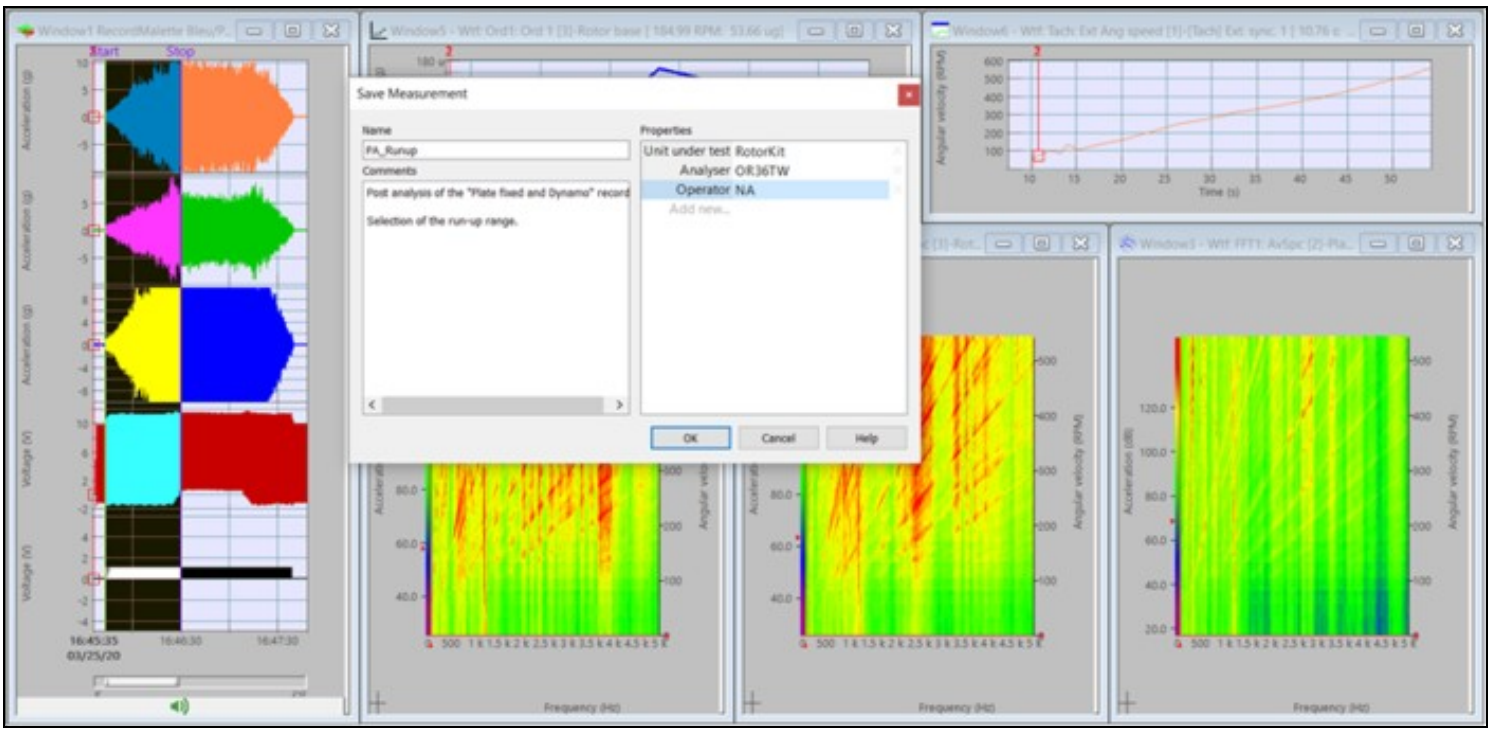
We can now select the specific ranges to separate our analysis on the three states of the record and create our new measurements. The run-up is between 10.36 and 54.28 seconds on the record. We can either select the run-up's range with the mouse in the player :


Window1 RecordMalette Bleu/P...
Start
Stop
Acceleration (g)
Acceleration (g)
Acceleration (g)
Voltage (V)
Voltage (V)
16:45:35
03/25/20
16:46:30
16:47:30
0"
2'13"

Or directly in the *tracks* section of the Acquisition tab of the NVGate ribbon:

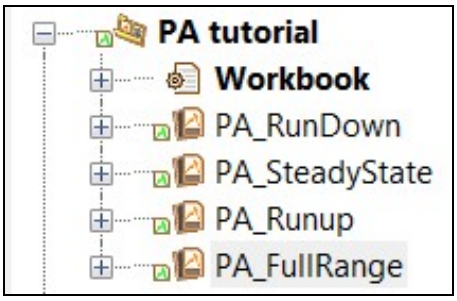


Once the range is selected, you can run the acquisition by clicking on  . Only the selected range will be analysed, and you can then save the results :



108.1.4 Conclusion

You can now select the Steady state and the Run_down ranges and make the acquisitions. After saving the results, the measurement will appear in the project manager :



- **Note :** You can adapt the setup of the result s for each rage if needed (the relevant results for the steady state may not be the same than the Run up and down states).

108.2 Parameters

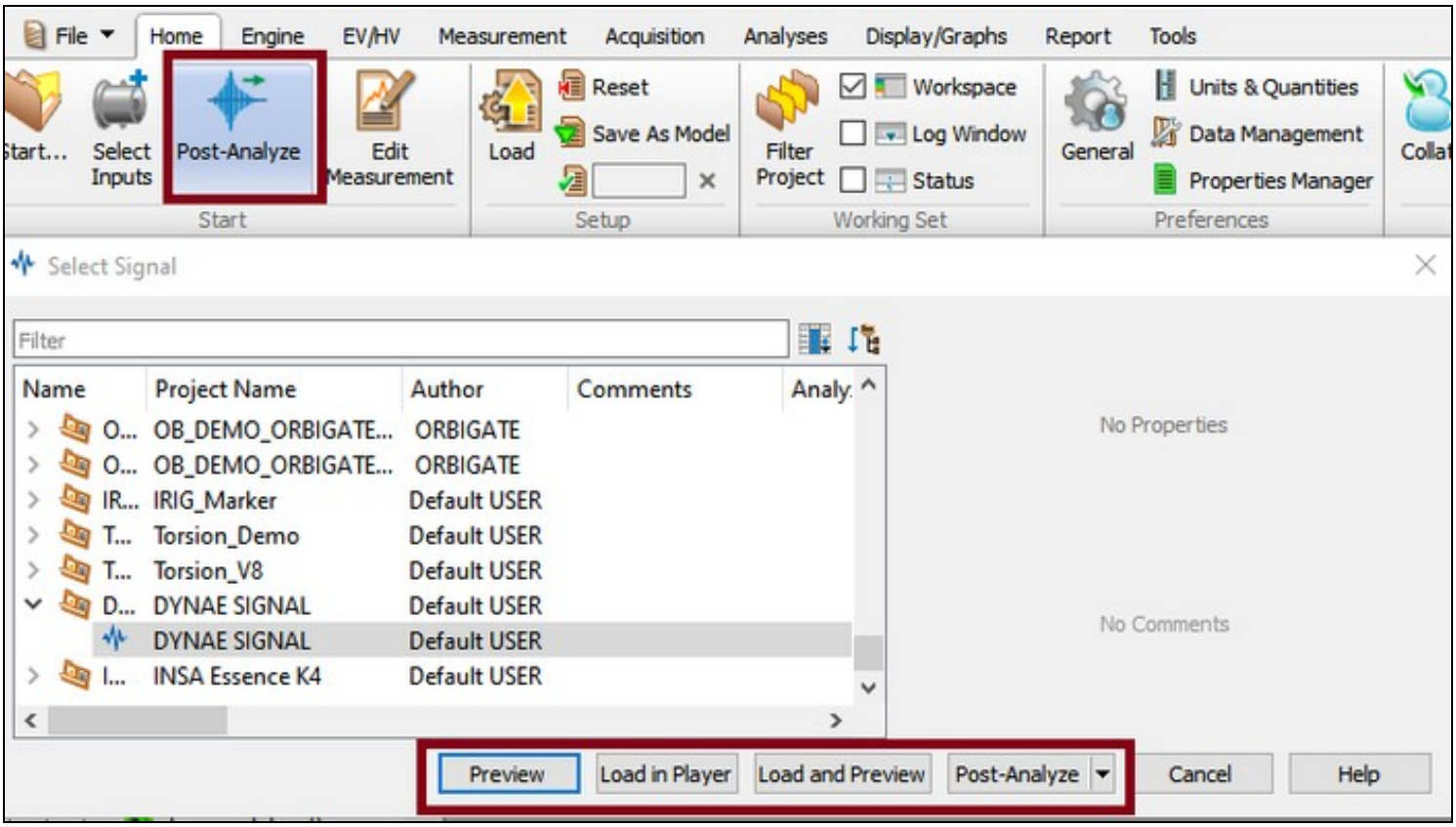
108.2.1 Loading a signal

In this section, we detail the two different method to load a signal and switch to post analysis mode.

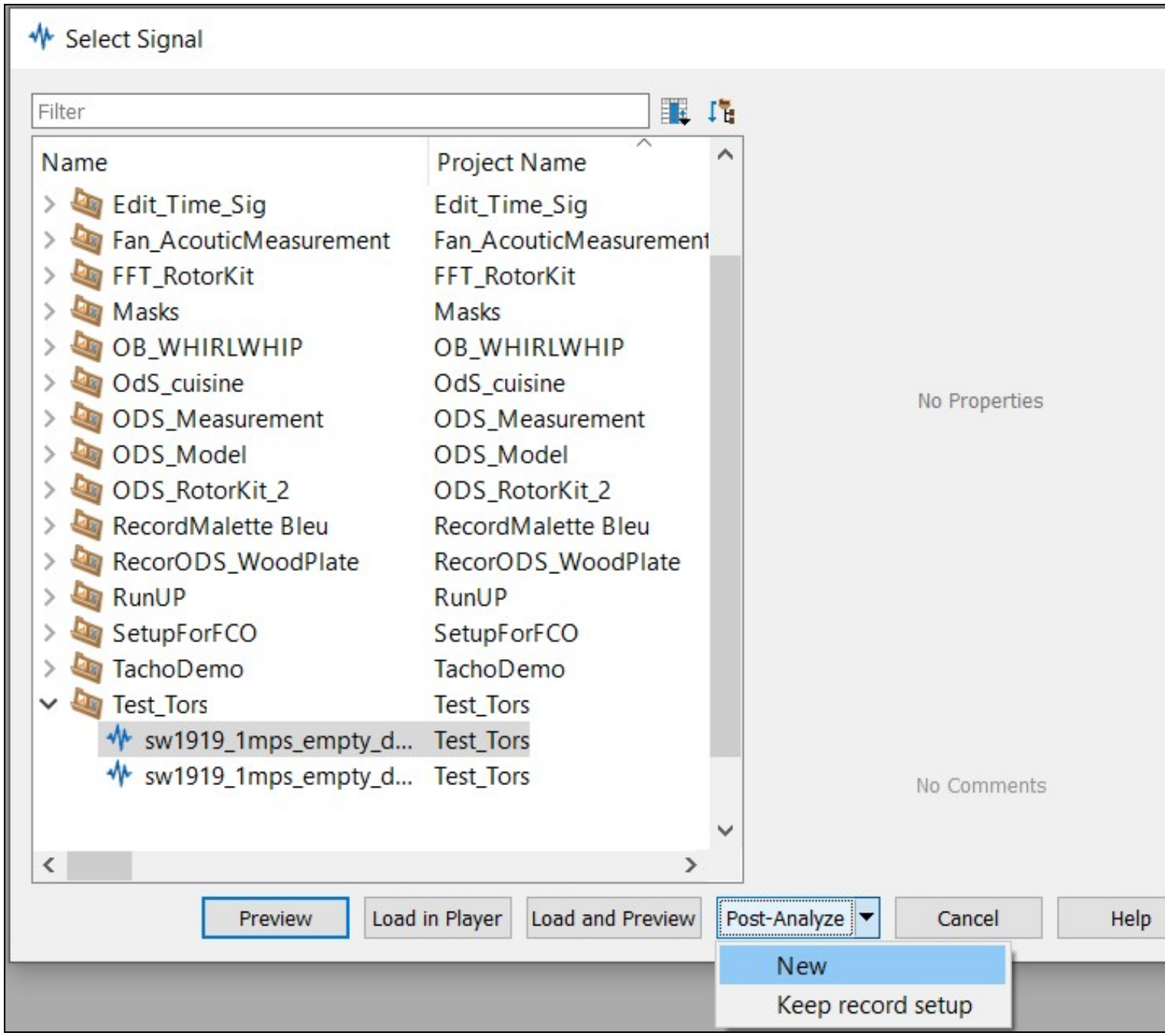
108.2.1.1 New setup option

This first option allow you to post analyse the signal with a brand new setup. It will load a signal in the player, display the preview of the signal envelope, and switch to post-analysis mode.

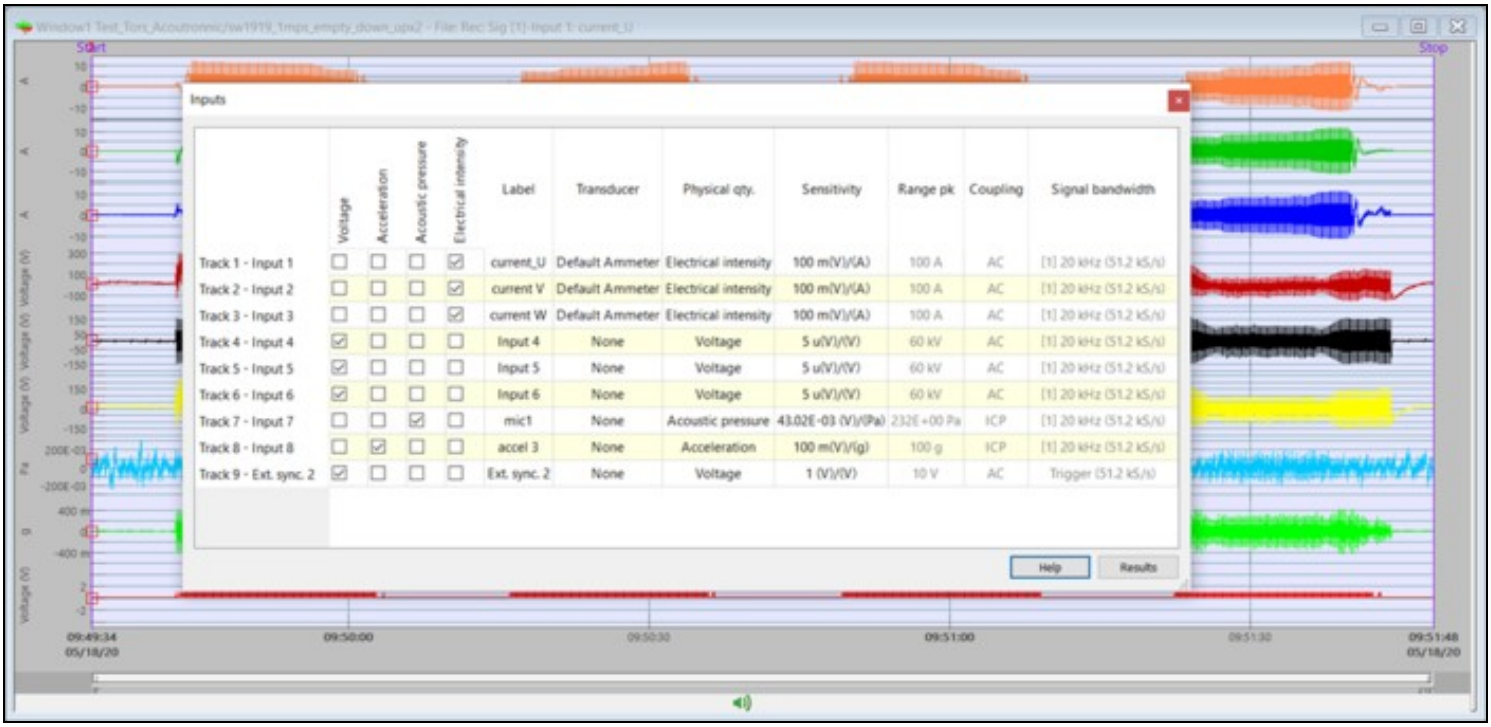
- From the Home tab / Start group, press the *Post-Analyze* button. This will display a selection of signal files available for post-analysis:



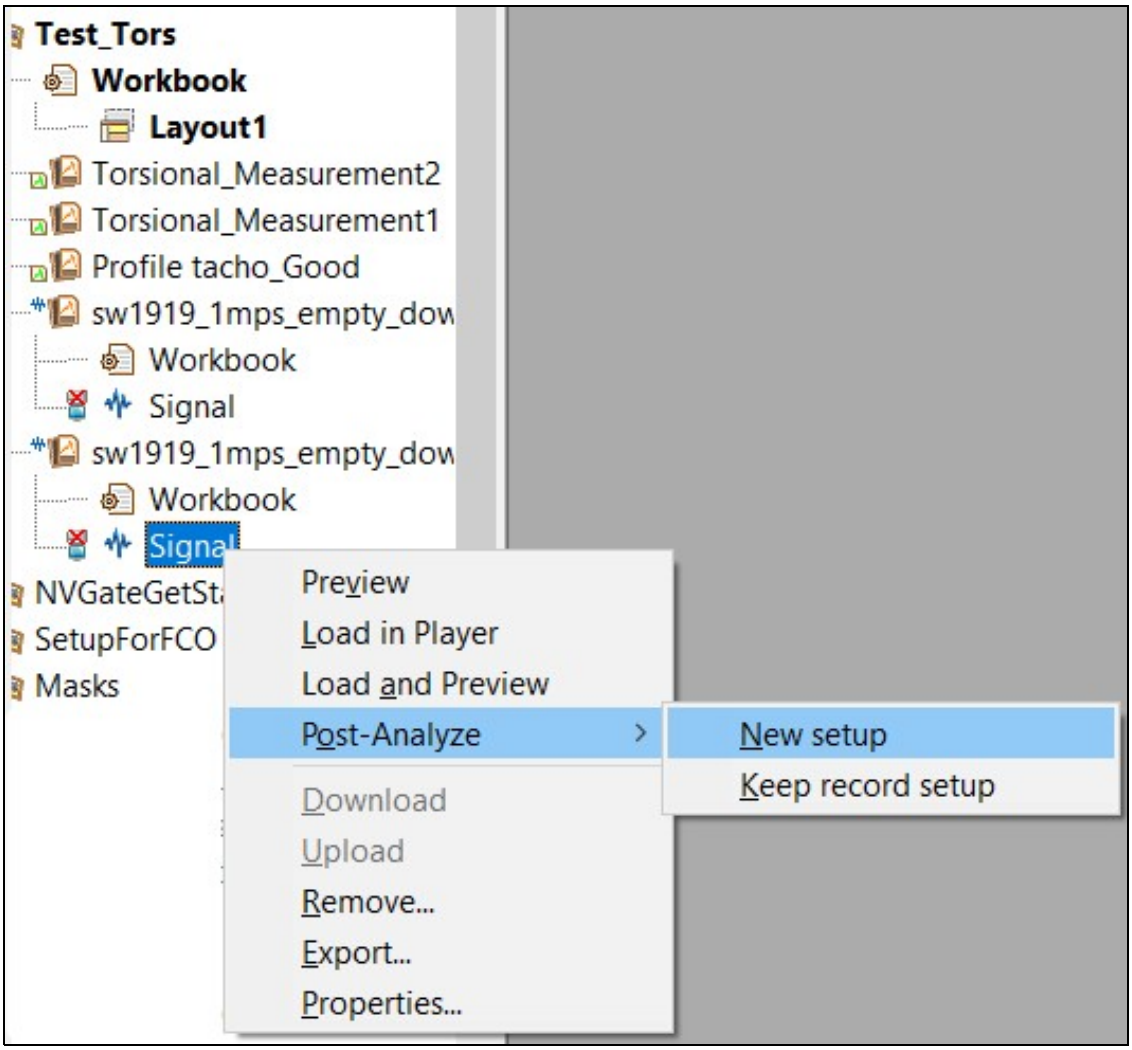
Click on the descending arrow to select **New**:


Select Signal
Filter
Name
Project Name
Edit_Time_Sig
Edit_Time_Sig
Fan_AcouticMeasurement
Fan_AcouticMeasurement
FFT_RotorKit
FFT_RotorKit
Masks
Masks
OB_WHIRLWHIP
OB_WHIRLWHIP
OdS_cuisine
OdS_cuisine
ODS_Measurement
ODS_Measurement
ODS_Model
ODS_Model
ODS_RotorKit_2
ODS_RotorKit_2
RecordMalette Bleu
RecordMalette Bleu
RecorODS_WoodPlate
RecorODS_WoodPlate
RunUP
RunUP
SetupForFCO
SetupForFCO
TachoDemo
TachoDemo
Test_Tors
Test_Tors
sw1919_1mps_empty_d...
Test_Tors
sw1919_1mps_empty_d...
Test_Tors
No Properties
No Comments
Preview
Load in Player
Load and Preview
Post-Analyze
Cancel
Help
New
Keep record setup

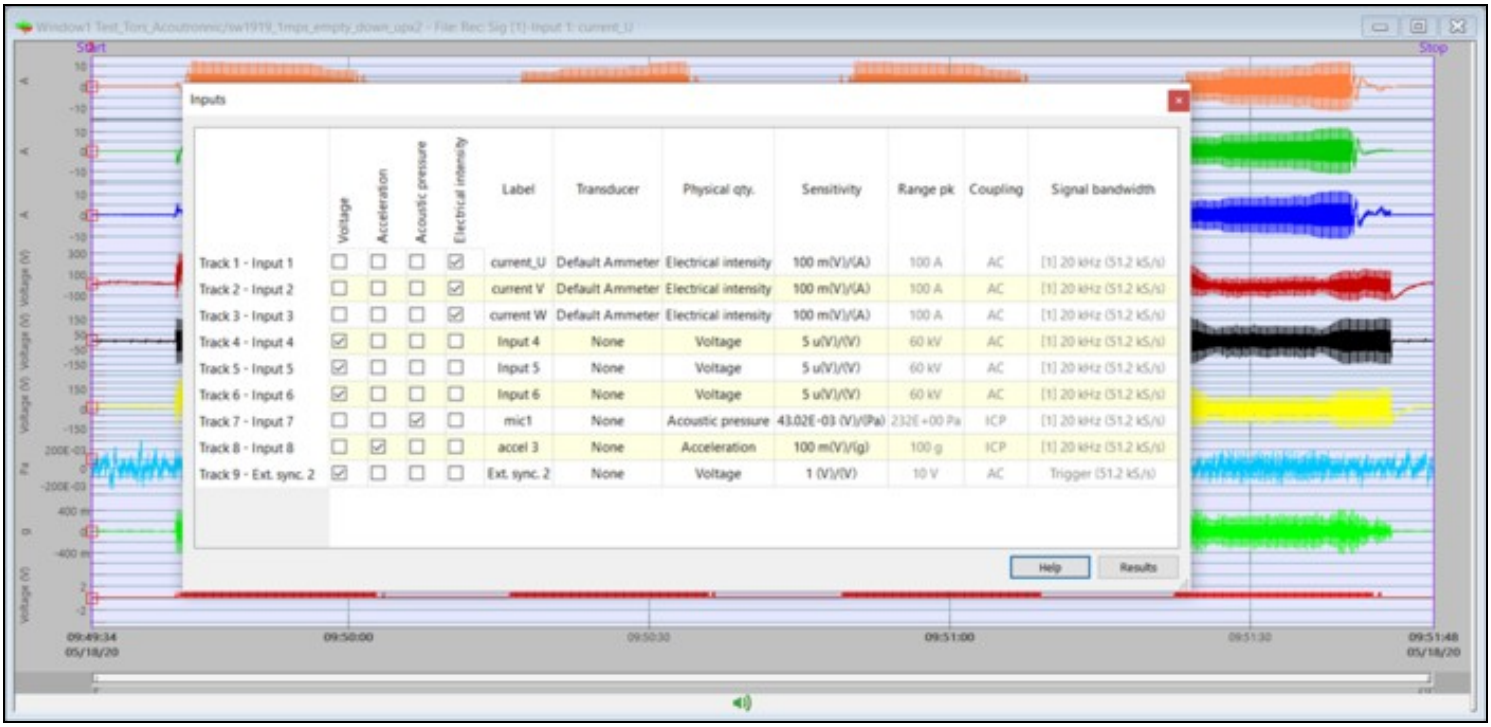
This will open the **connection properties** widow, and you can connect your tracks in the different module to perform your post analysis.



- From the project manager, by right clicking on the signal you want to analyze. Choose **Post-Analyze** , and click on **New**:


Test_Tors
Workbook
Layout1
Torsional_Measurement2
Torsional_Measurement1
Profile tacho_Good
sw1919_1mps_empty_dow
Workbook
Signal
sw1919_1mps_empty_dow
Workbook
Signal
NVGateGetSt
SetupForFCO
Masks
Preview
Load in Player
Load and Preview
Post-Analyze
Download
Upload
Remove...
Export...
Properties...
New setup
Keep record setup

As previously, this will open the **connection properties** widow, and you can connect your tracks in the different module to perform your post analysis.

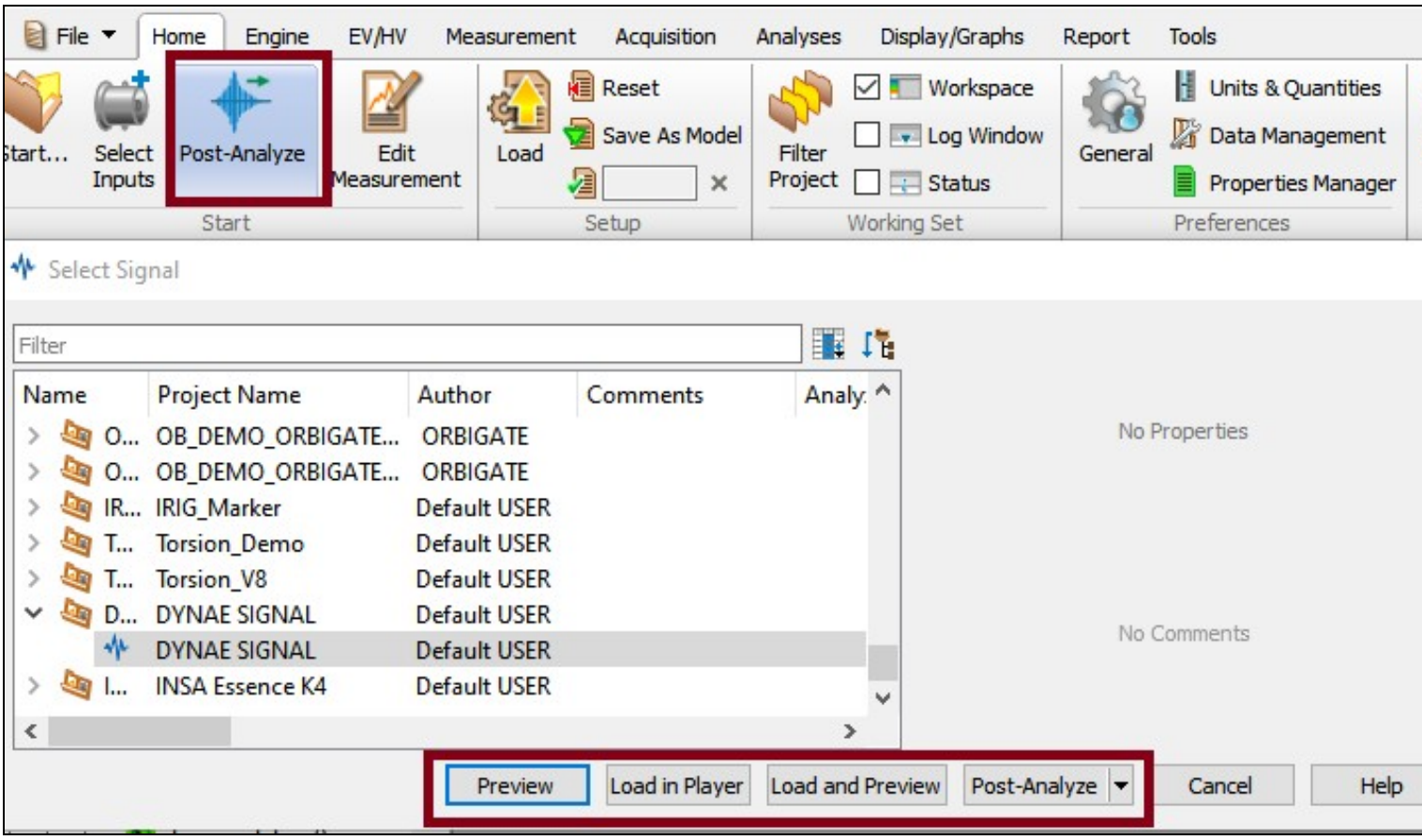


if you are already in **post analyse mode**, the current setup will not be deleted if you load a new record with this method. Therefore, you can use this method to post Analyse two record witht the same analysis setup. However, the records must have the same track number and type.

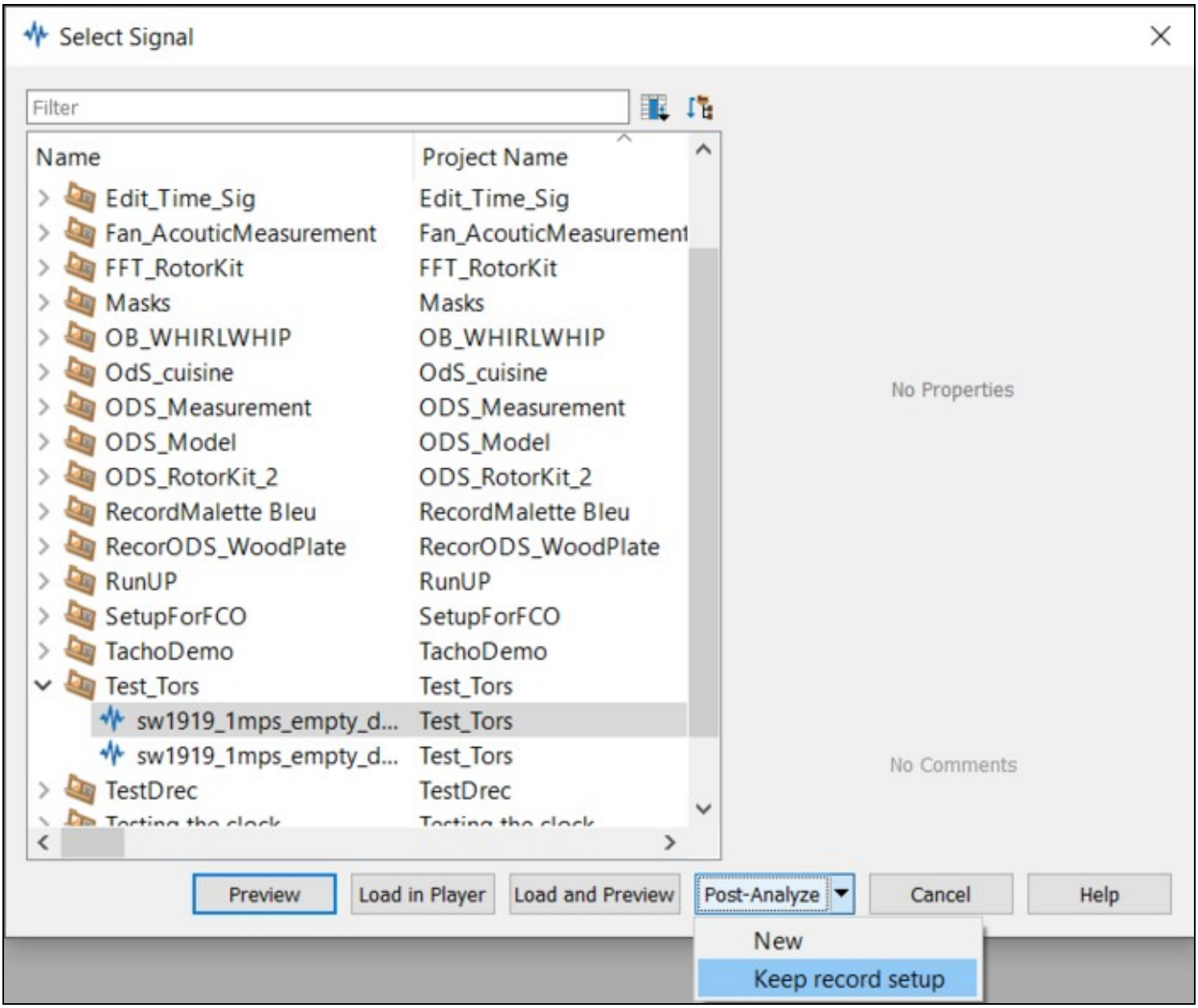
108.2.1.2 Keep recording setup option

This second method will allow you to post analyse the signal with the same setup used for the recording. As previously, this will load signal in the player and display the envelope of the recorded signal, switch to post-analysis mode, and keep the setup used during the record signal by replacing dynamical input of the frontend by the player tracks. Note: 'if the record setup contains virtual inputs, torsional channels, CAN or DC channels, the connection of these channels to the plug-ins will be reset.

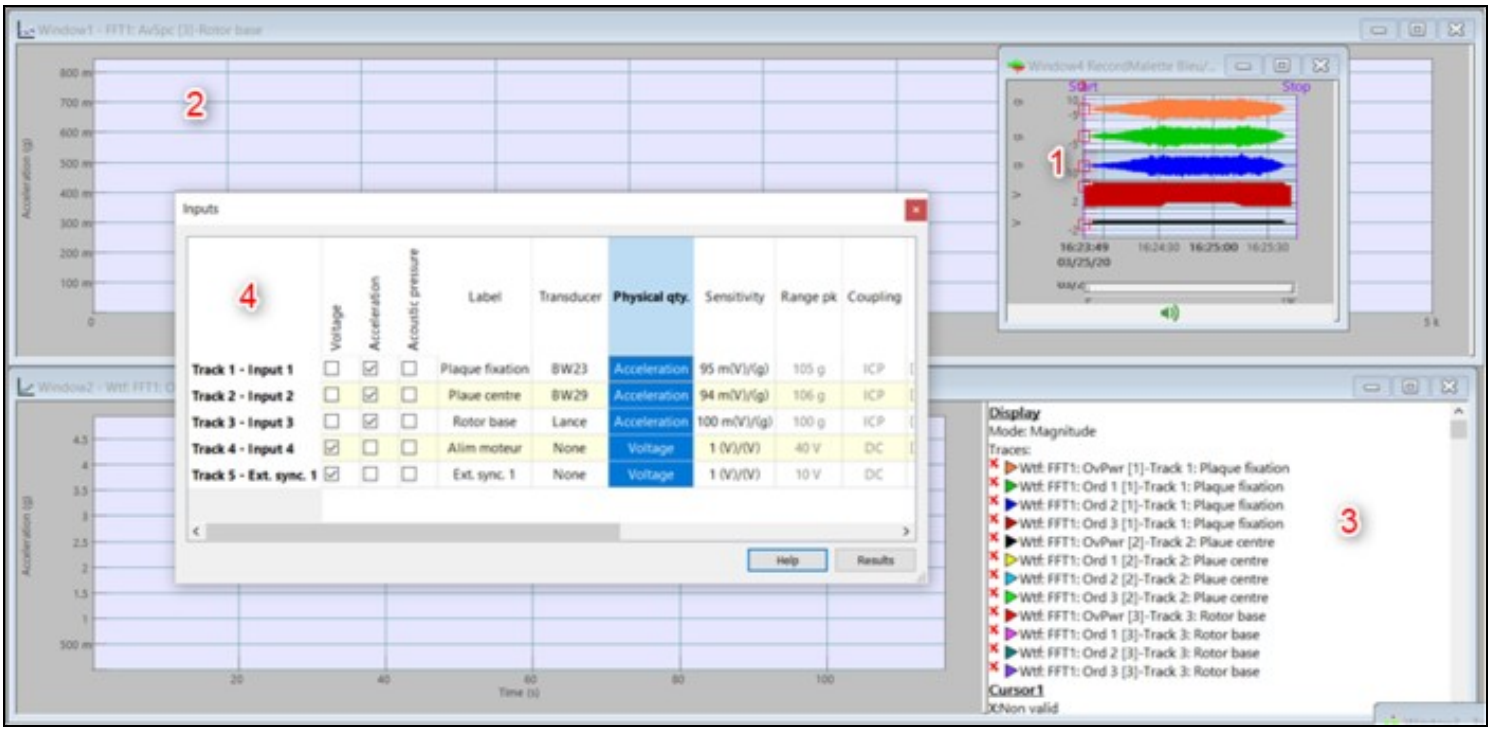
- From the Home tab / Start group, press the *Post-Analyze* button. This will display a selection of signal files available for post-analysis:



Click on the descending arrow to select **Keep record setup**:

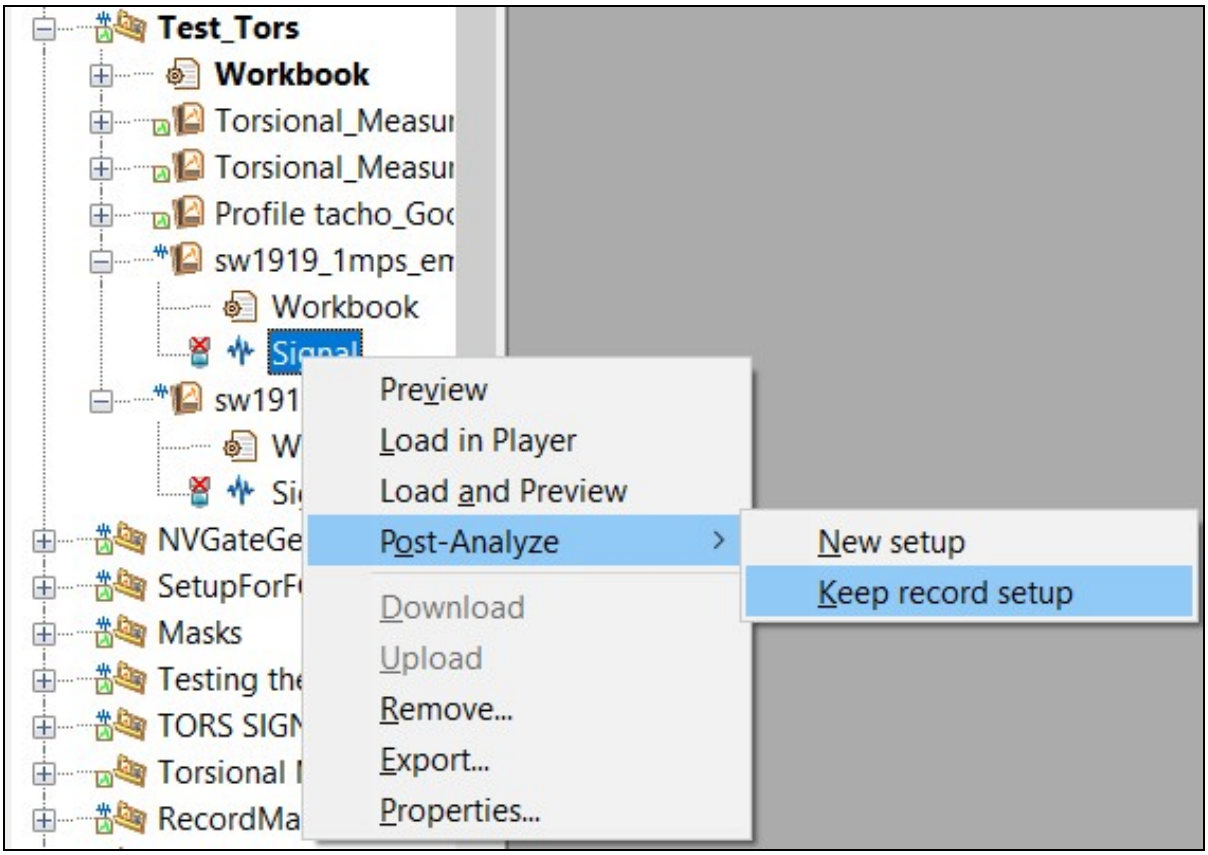

Select Signal
Filter
Name
Project Name
Edit_Time_Sig
Edit_Time_Sig
Fan_AcouticMeasurement
Fan_AcouticMeasurement
FFT_RotorKit
FFT_RotorKit
Masks
Masks
OB_WHIRLWHIP
OB_WHIRLWHIP
OdS_cuisine
OdS_cuisine
ODS_Measurement
ODS_Measurement
ODS_Model
ODS_Model
ODS_RotorKit_2
ODS_RotorKit_2
RecordMalette Bleu
RecordMalette Bleu
RecorODS_WoodPlate
RecorODS_WoodPlate
RunUP
RunUP
SetupForFCO
SetupForFCO
TachoDemo
TachoDemo
Test_Tors
Test_Tors
sw1919_1mps_empty_d...
Test_Tors
sw1919_1mps_empty_d...
Test_Tors
TestDrec
TestDrec
No Properties
No Comments
Preview
Load in Player
Load and Preview
Post-Analyze
Cancel
Help
New
Keep record setup

This will open the **Preview window** (1), and all the plug-in used in real time during the analysis. Here, the FFT window (2) and the waterfall (3). Finally the **Connection window** (4) is displayed, so you can connect your tracks in other plug-ins to perform your post analysis.

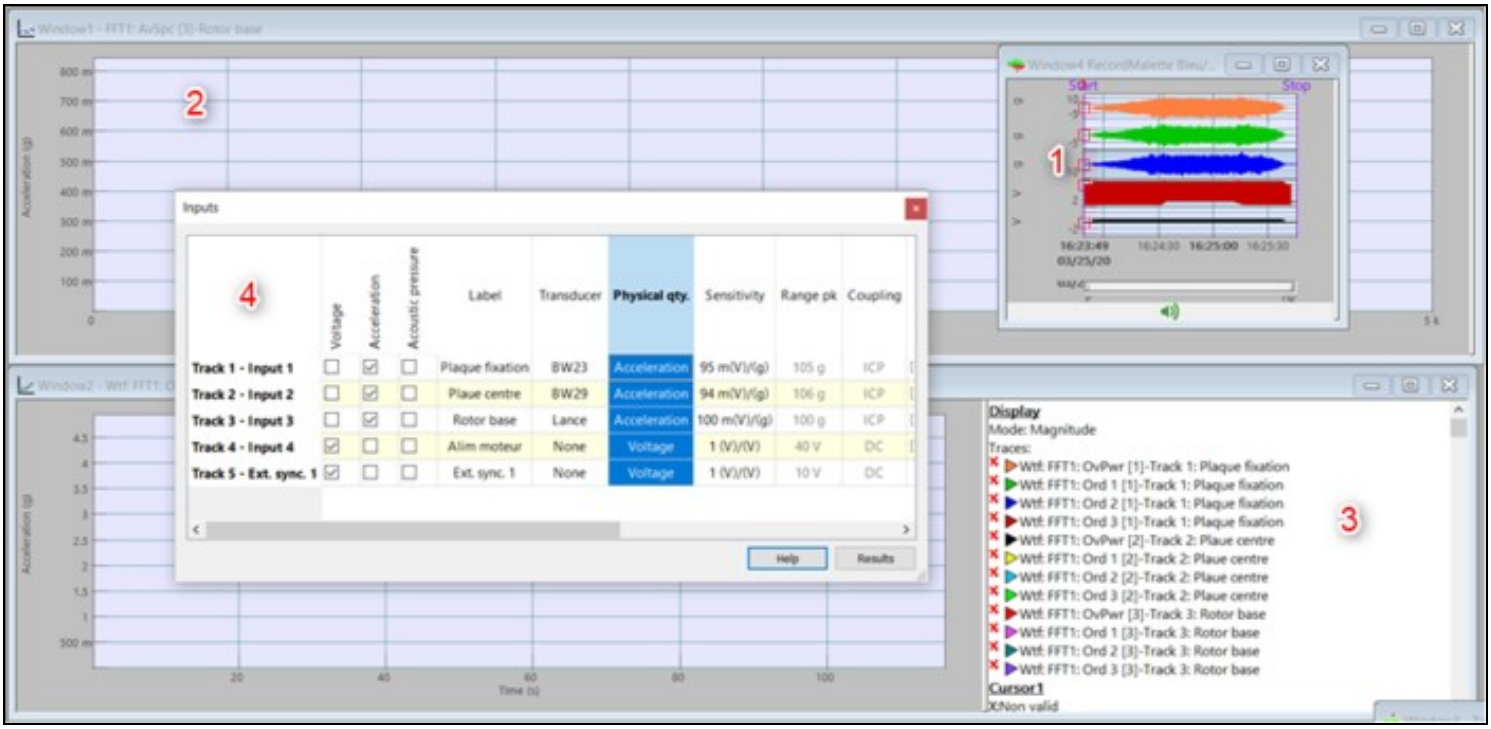


The opened plug-in are setup the same way as during the acquisition. So you can change these setup, as you would do for an online real time analysis.

- From the project manager, by right clicking on the signal you want to analyze. Choose **Post-Analyze** , and click on **Keep record setup**:



As from the ribbon, this will open the recorder and plug-in used for acquisition.



if you are already in **post analyse mode**, the current setup will **be deleted** if you load a new record with this method and be replaced by the setup used during the recording. To post analyse another record with the current setup, simply load it in the player.

Please see also the *Keep record setup* tutorial video :

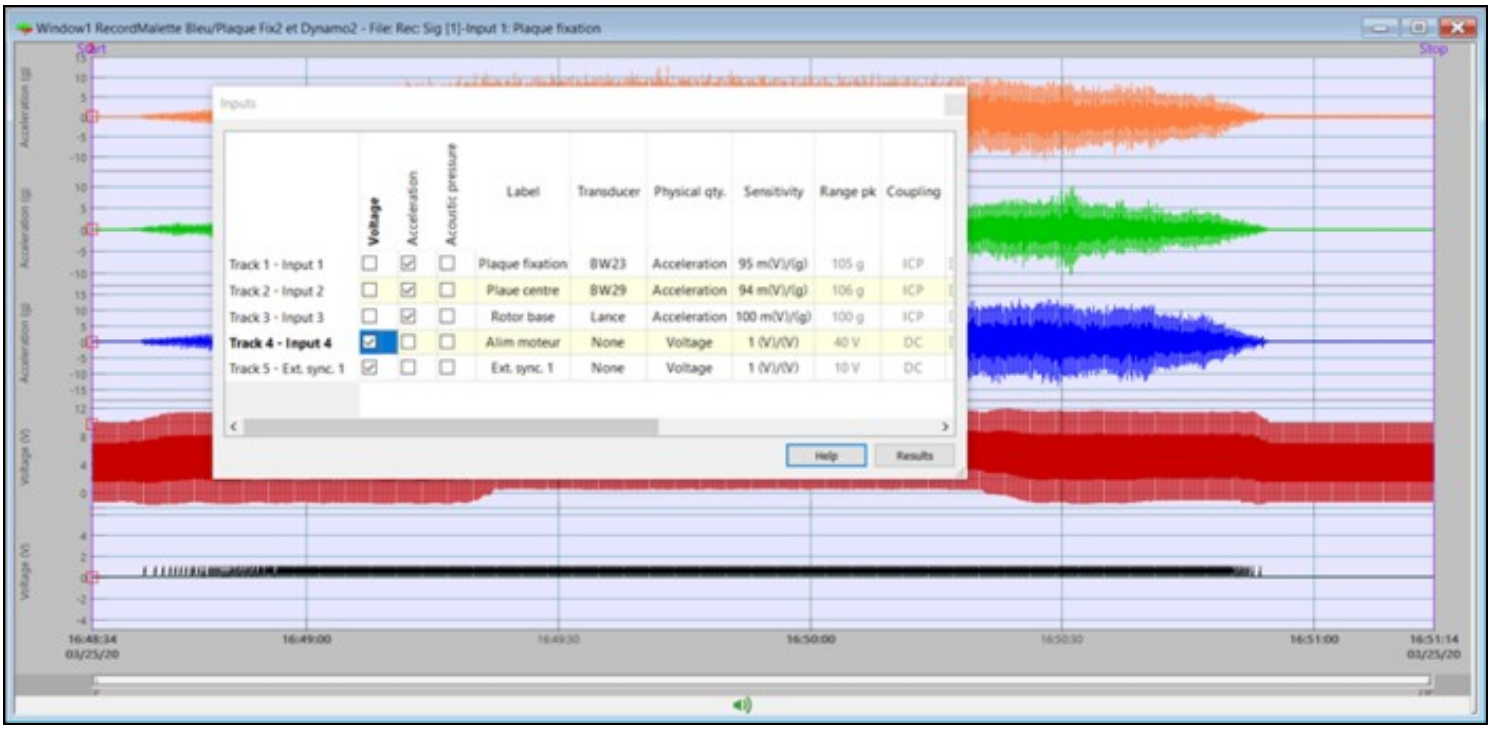
108.2.2 Connecting the tracks in NVGate

In this section, we will see how to connect the tracks in the different plug-in once the signal have been load in the player. We will use the **New** setup option, as it will work exactly the same with the **Keep record setup** option.

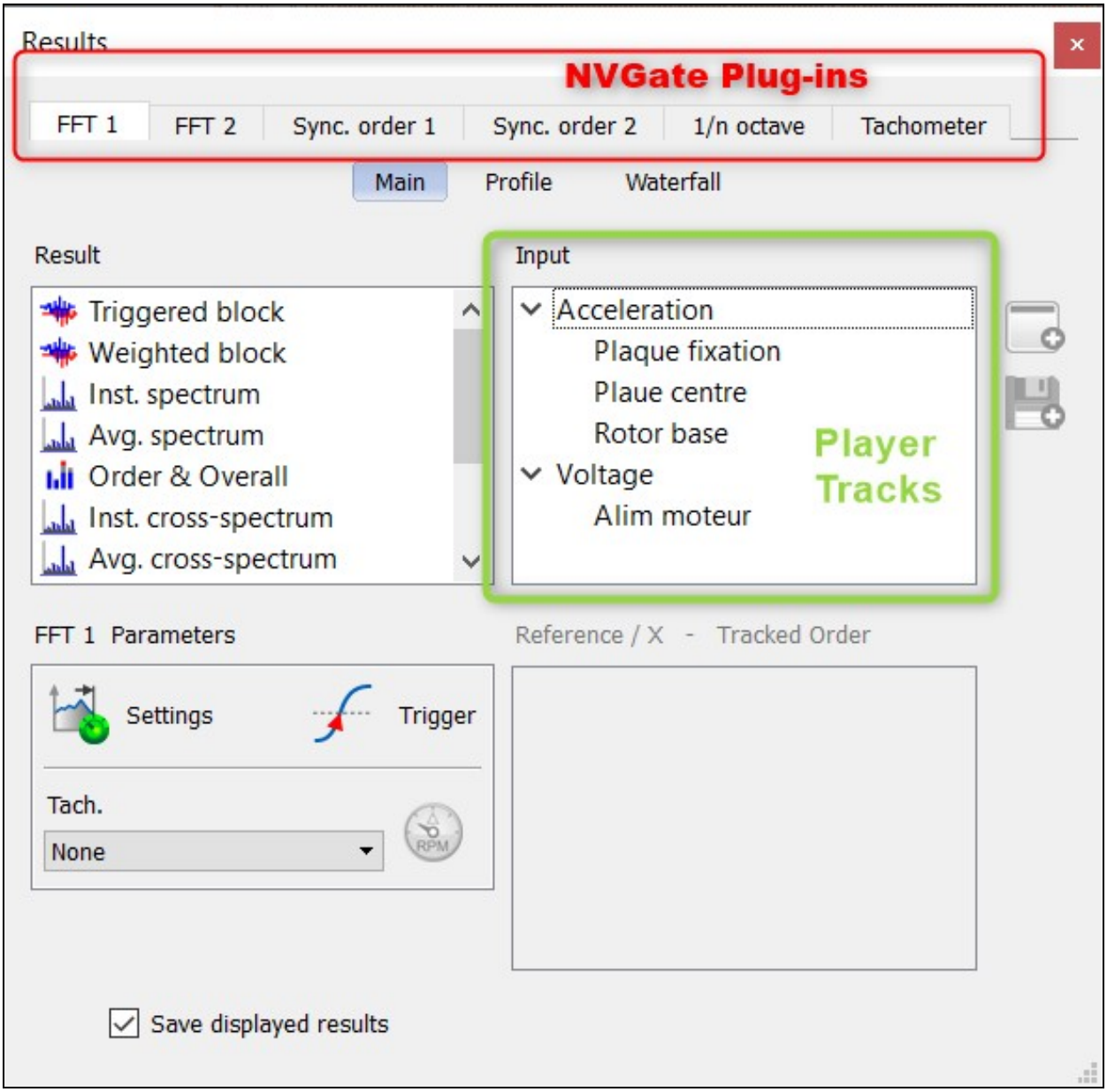
108.2.2.1 Connect tracks to the different modules

In this example, I have 3 acceleration input, a voltage input and an Ext. Sync input used for a tachometer. The recording contain a run-up, steady state a maximal speed ans a run-down of an electric motor. I will use the acceleration and tachometer channel for post analysis.

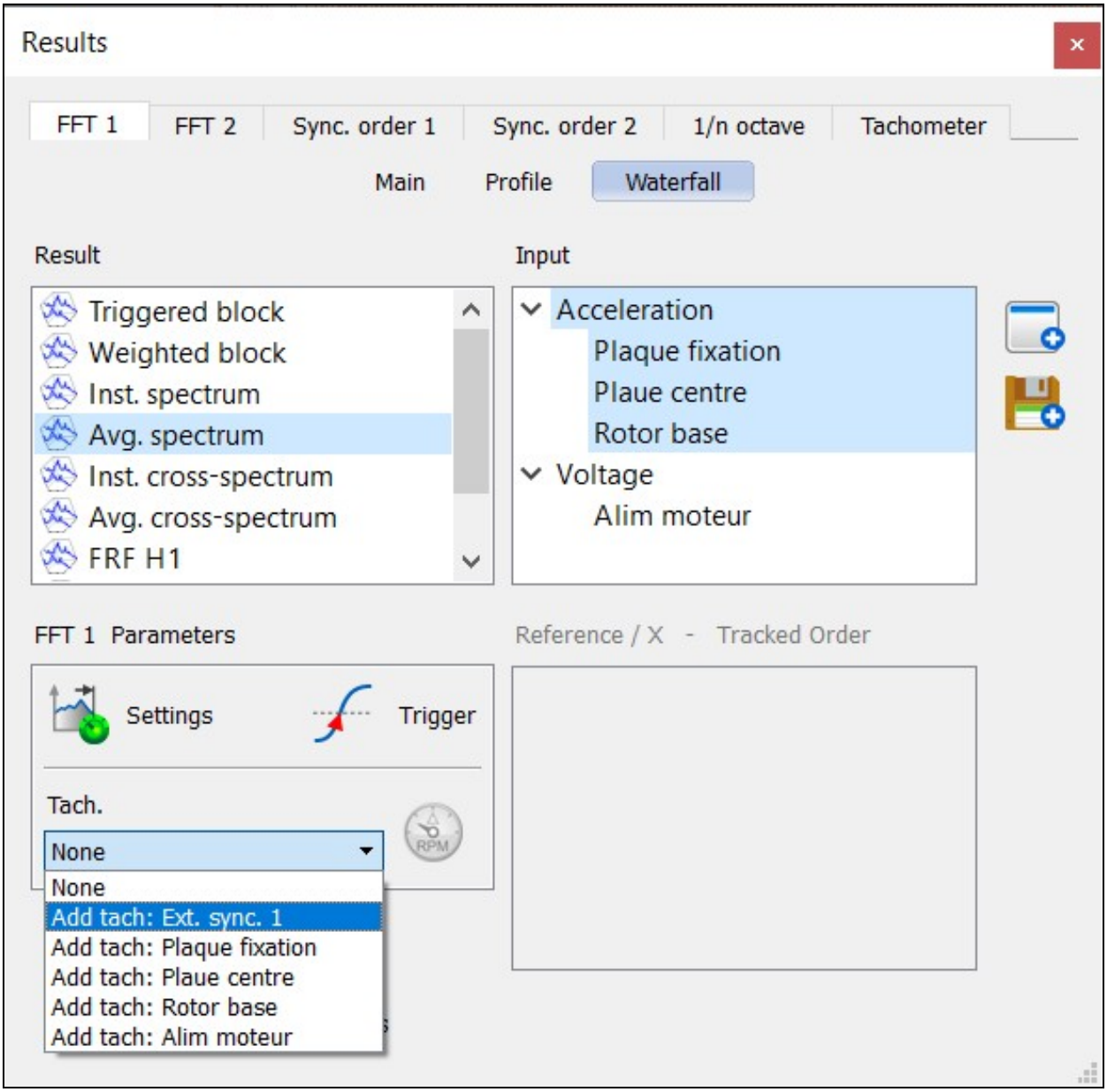
Once the record is load, the player window and the connect tracks window appears:

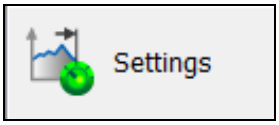


As in on-line mode, I can click on *Result* to display the *Result window* and connect the different tracks. The tracks appears in the **Input** section:

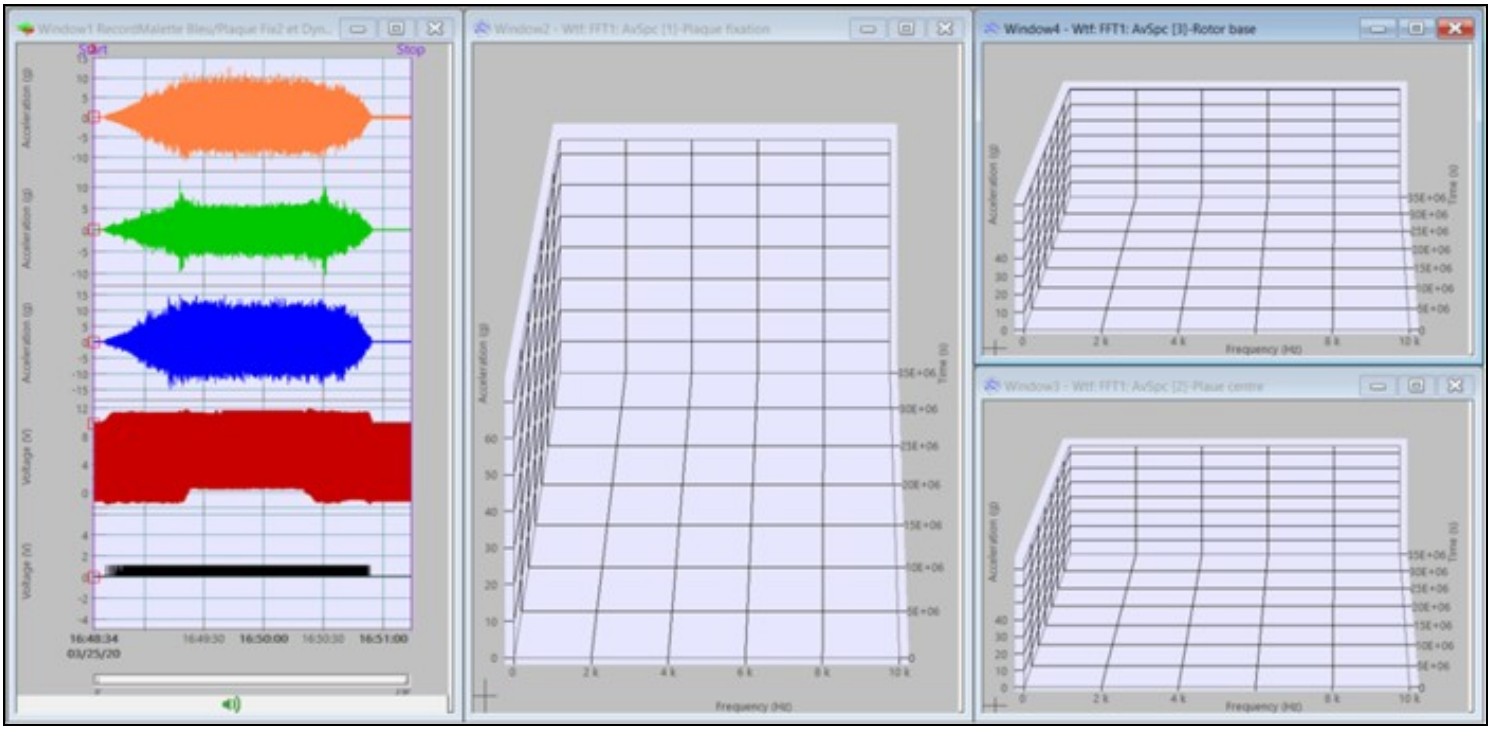


I can now create a waterfall of the Average spectrum of my accelerometers inputs, and add the tachometer Ext. Sync. channel as reference :



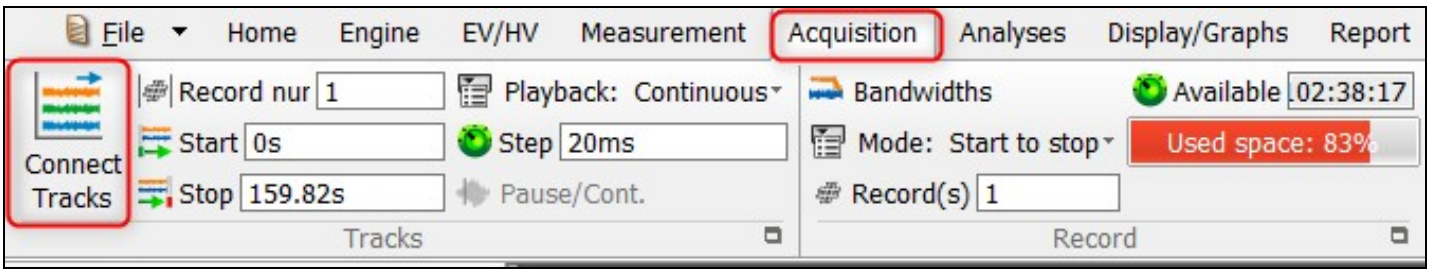
Then click on 

to adapt the setup of the FFT, and then  to display the waterfalls:

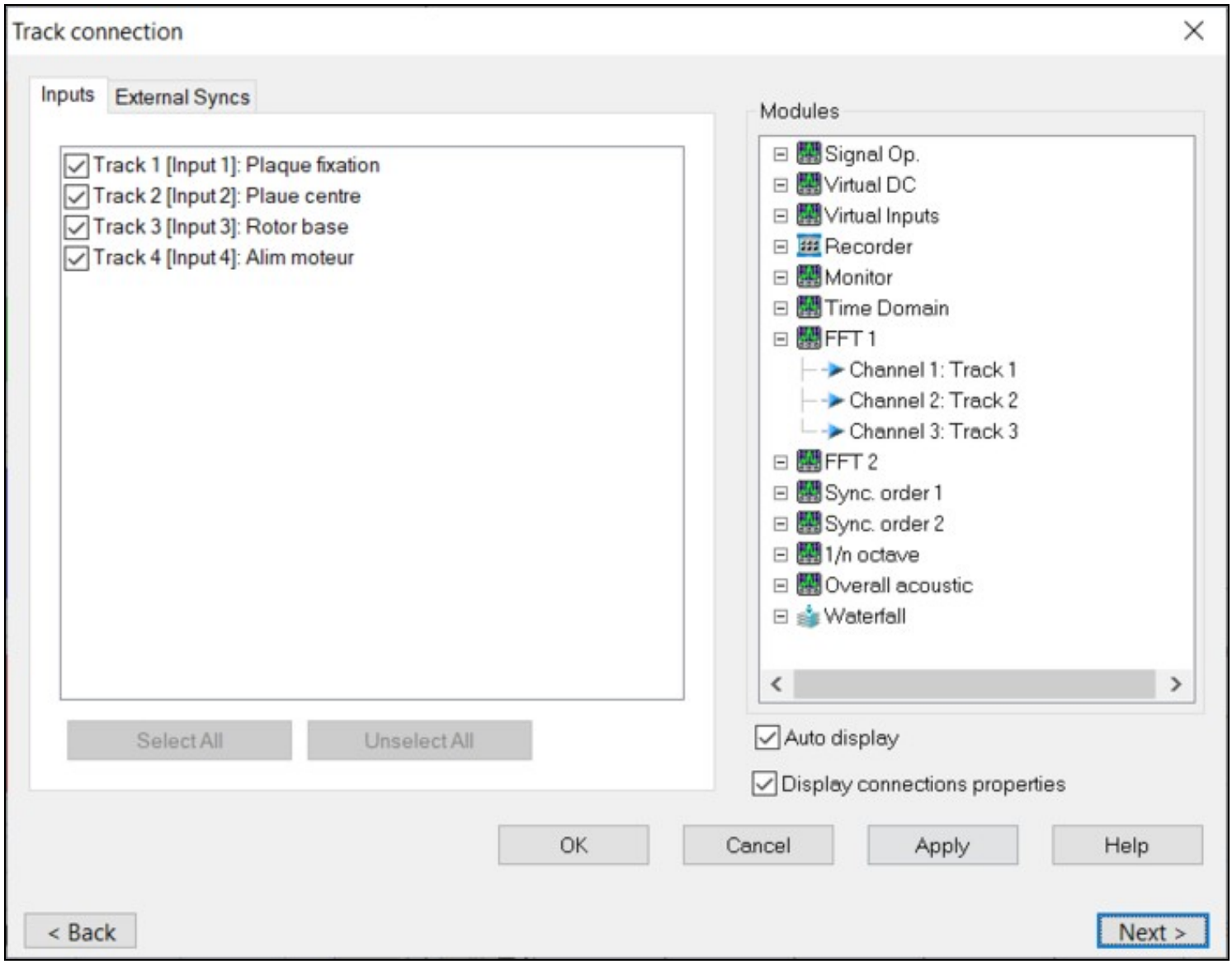


108.2.2.1.1 Connect tracks to the TDA plug-in

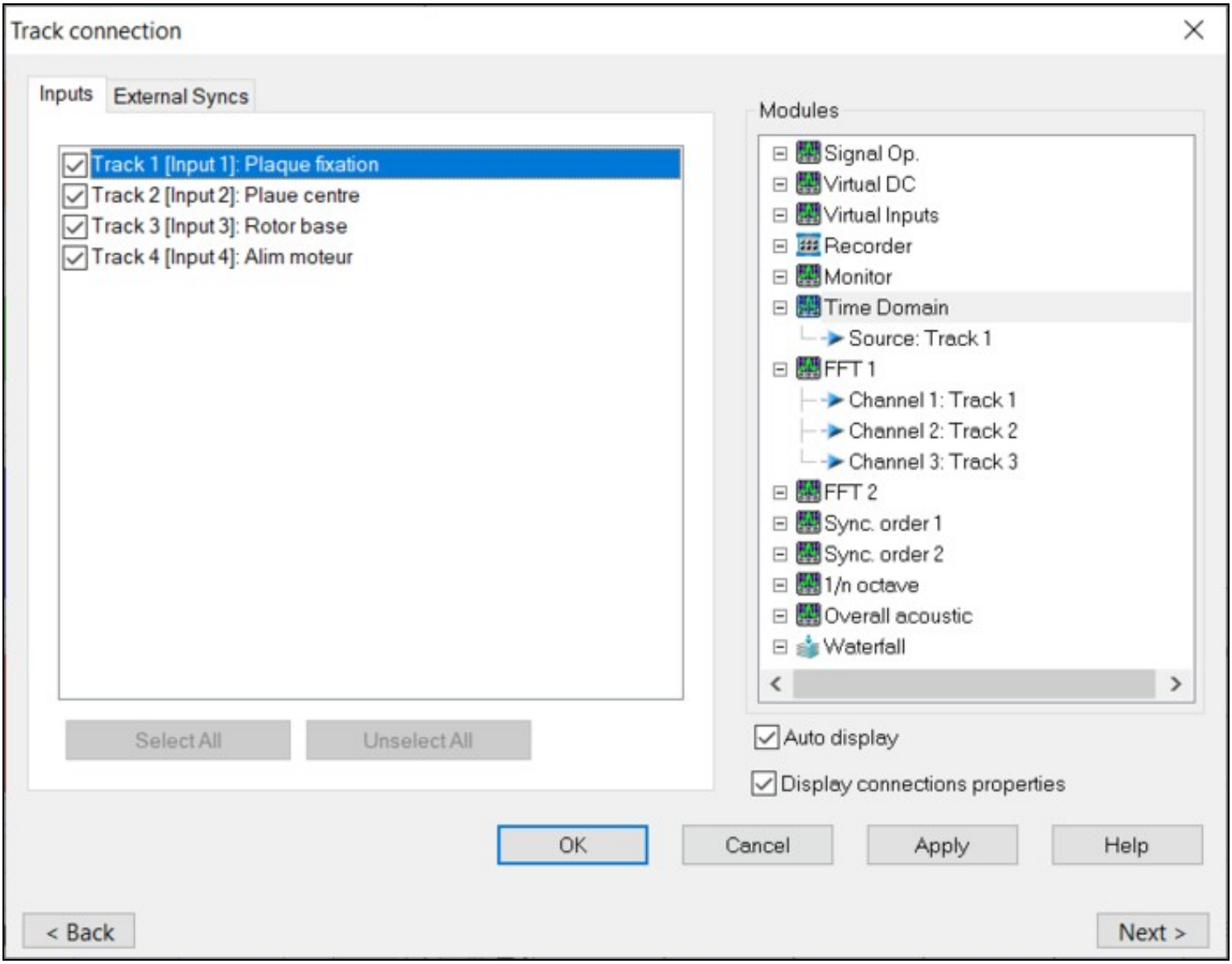
To connect tracks to the TDA plug-in, you cannot use the *Result window*. To use this module in post analysis, go into the Acquisition tab of the NVGate ribbon. Select *Connect Tracks* (which replace *Connect Inputs* of the on-line mode):



The *Track connection* window appear:


Track connection
Inputs
External Syncs
Track 1 [Input 1]: Plaque fixation
Track 2 [Input 2]: Plaue centre
Track 3 [Input 3]: Rotor base
Track 4 [Input 4]: Alim moteur
Select All
Unselect All
Modules
Signal Op.
Virtual DC
Virtual Inputs
Recorder
Monitor
Time Domain
FFT 1
Channel 1: Track 1
Channel 2: Track 2
Channel 3: Track 3
FFT 2
Sync. order 1
Sync. order 2
1/n octave
Overall acoustic
Waterfall
Auto display
Display connections properties
OK
Cancel
Apply
Help
< Back
Next >

You can then select the track you want, and **drop** them in to any plug-in. Here, we are adding the first tract to the TDA:



You can then click on *OK*, and display the TDA results from the Display/Graph tab of the ribbon.

108.2.2.2 Connect a tachometers as a torsional channels

Post Analysis if often used for torsional measurement. for details about channel connection, you can directly visit the NVGate Torsional analysis wiki page.

108.3 Batch Post Process

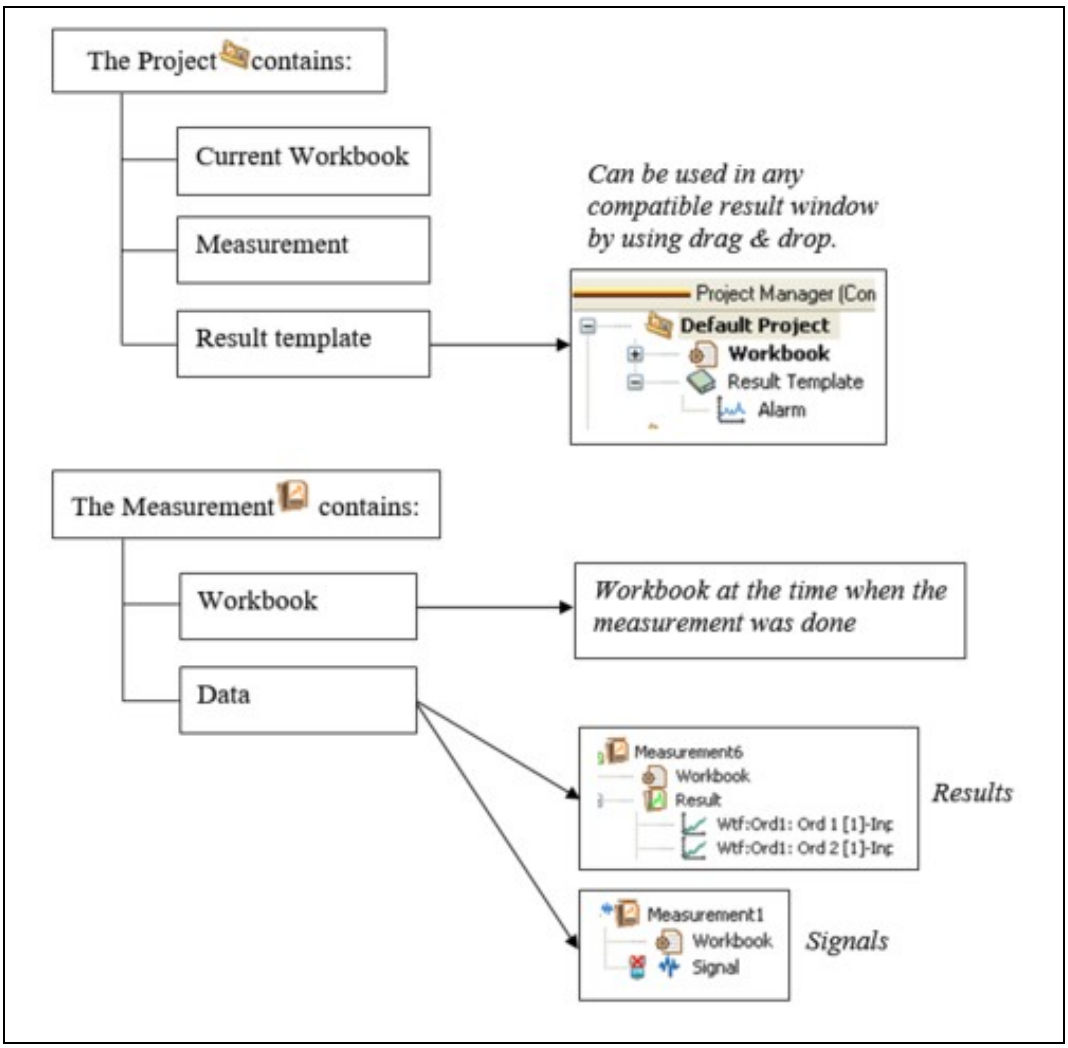
The BatchPostProcess tool is an external tool of NVGate that allow to automatically repeat the same post analysis setup over multiple recording.

For details, please visit the **BatchPostProcess** dedicated wiki page.

109 NVGate Project manager

109.1 Introduction

The Project Manager is made up of 3 main parts: The Workbook, the Project and the Measurement.



The item indicates if a project/measurement contains a signal file.

The item indicates if a project/measurement contains results.



Workbook:

The Workbook contains:

- Analyzer settings
- Layout
- Control Panel
- Save setup
- Report setup



Analyzer settings



Layouts and windows arrangement



Control Panel setup



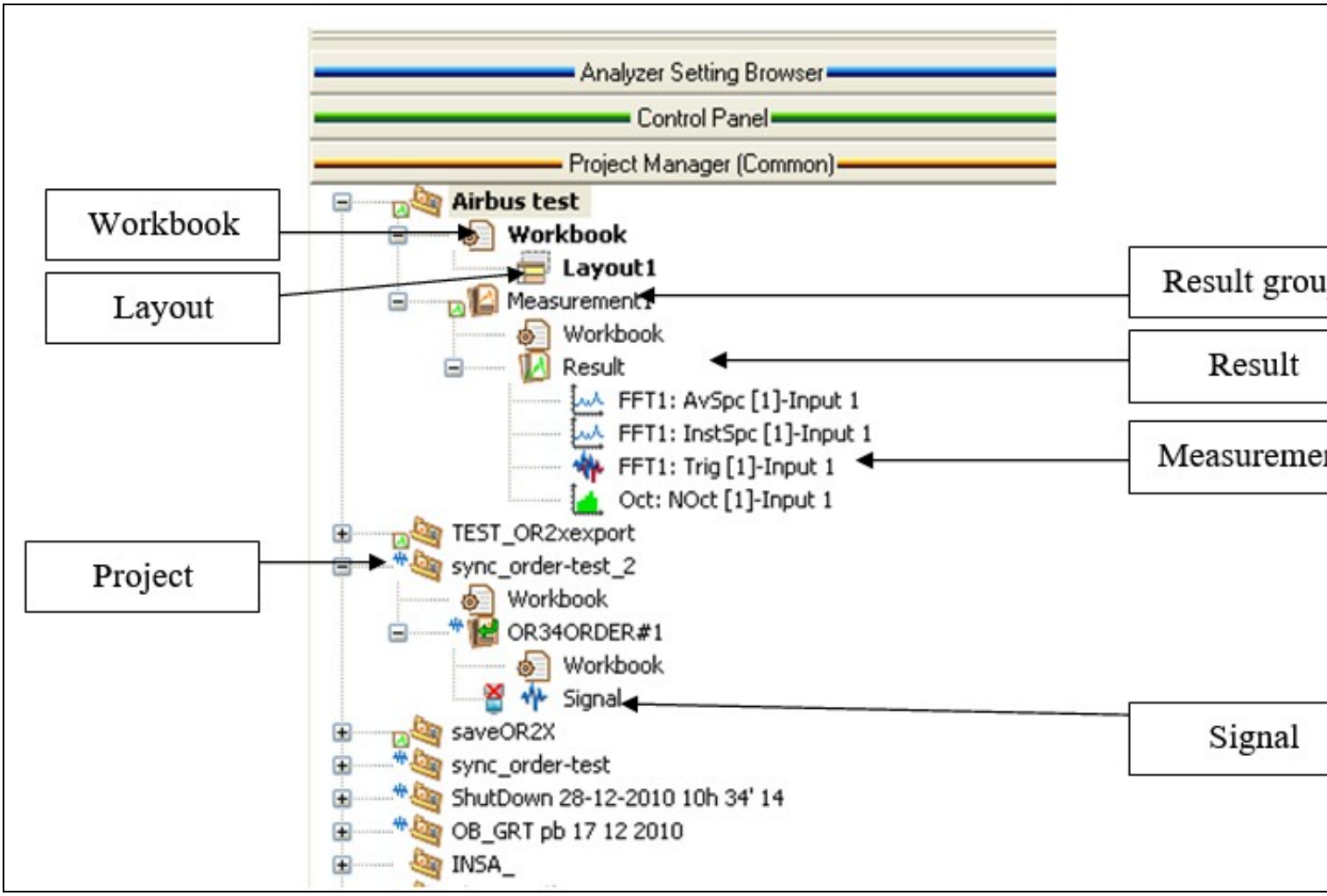
Selection of results set to be saved



The report template selection, windows selection and output directory

109.2 Project manager

The Project Manager is used to store all of your projects, results, and measurements. There are several display options that enable you to show or hide certain items. You can display some results with drag and drop.

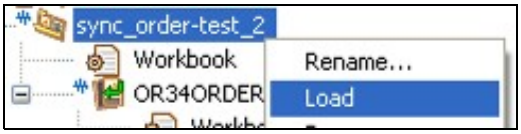


109.2.1 Project

 The project is the highest level of the organizational structure. It contains at least one workbook and can receive an unlimited number of measurements. The project has therefore two main aspects:

- Configuration of the analyzer and the interface using the workbook
- Storage of data using the measurements

There is always one active project. This is this project that receives the new measurements. The project workbook configures the analyzer. To open a project, select the open command in the pop-up menu associated with the project item.



Other option

- **Save:** This command is available only on the current project. It saves the project workbook.
- **Save as:** This command is available only on the current project. It saves the project with a different name. It is a way of copying the current project.

- **Rename:** This command is not available on the current project (Use "Save As" instead). It may be used to change the name of the project.

- **Open and Load setup** This command open the project adn load a setup. The project becomes the current project.

- **Remove:** This command removes the selected project. The data contained is lost permanently.

- **Attachments** Add extra files on a folders for each Item (Project, Measurement and Model) that can hold various files not directly managed by NVGate. Ex: Voice record, Word pad, pictures, scheme, planning, etc?

(The files deposited in this directory will be transferred with the Items during share/collate actions.)

109.2.2 Workbook

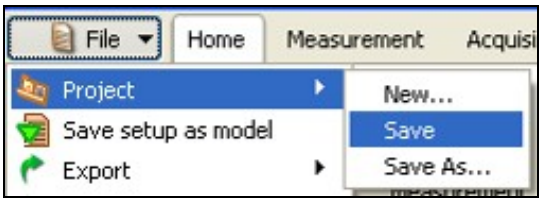
 The workbook is designed to manage the analyzer and software setup. The table below gives the details of the functions managed by the workbook.

Analyzer setup	**The value of all analyzer settings**
Layout	All windows displaying results are stored in layouts.
Control panel	The personalization of the control panel.
Save setup	All results that must saved when a new measurement is created.
Report setup	All information regarding report generation.

- **Saving**

The project workbook is saved when the project is saved. This can be done in several ways:

- Select the "Save" command in the pop-up menu associated with the project item.
- Select the "Save project" command from the file menu.

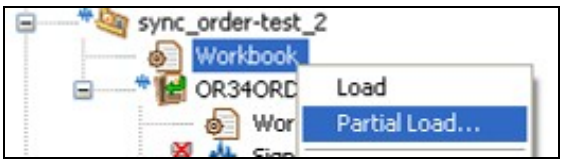


- Use the shortcut "Ctrl + D"

A workbook is created when a measurement is created. This workbook is the copy of the project workbook at the time the measurement is created. This allows you to recover the settings used for a measurement possibly reuse them.

- **Loading**

The workbook is automatically loaded when a project is loaded. It is also possible to load the content of any other workbook to the workbook of the active project. This load can be complete or partial and can be done by command in the pop-up menu associated with the workbook item.

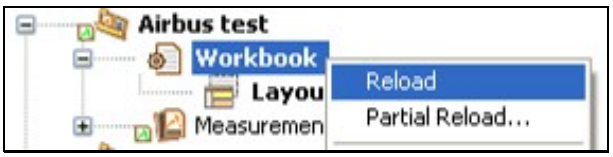


- **Partial Load** This command is similar to the "Load" command, but only parts of the workbook are loaded.



The parts of the workbook that are not selected remain unchanged.

- **Reload** or "Partial reload" command in the pop-up menu associated with the active workbook item. In this case, the last saved copy of this workbook is used.



The parts of the workbook that are not selected remain unchanged.

- **Change workbook** command in the pop-up menu associated with the project item.



This allows you to select any workbook from project database or any workbook template.

- **Save**: This command is available only for the current project workbook. This command saves the workbook.
- **Save as Model**: This command is available only for the current project workbook. This command saves the workbook in the workbook library. This makes the workbook available, however the project database will change in the future. The workbook models are available in the "Project\Change workbook" command and in the "New Project" command.
- **Add Layout**: This command is available only for the current project workbook. It creates a new layout (with the desired name).
- **Remove Layout**: This command is available only for the current project workbook. It removes the selected layout. This destroys all the windows that belong to this layout.
- **Properties**: This command gives general information about the workbook.

Active Items When the action "Load" is performed for an item, then the item is active (the name of the item is displayed in bold).

An item is active when it is bold. The 4 items that can be active are:

	**Project:** This is the current project. When the analysis mode is "measurement mode", the workbook for this project is active.
	**Measurement:** This is the current measurement. When the analysis mode is "result mode", the workbook for this measurement is active.
	**Workbook:** This is the current workbook. It can belong to the current project or the current measurement depending on this analysis mode.
	**Layout:** This is the current layout. The windows displayed belong to this layout.

109.2.3 Measurement

 This item is designed to store data. The data can be of two types:

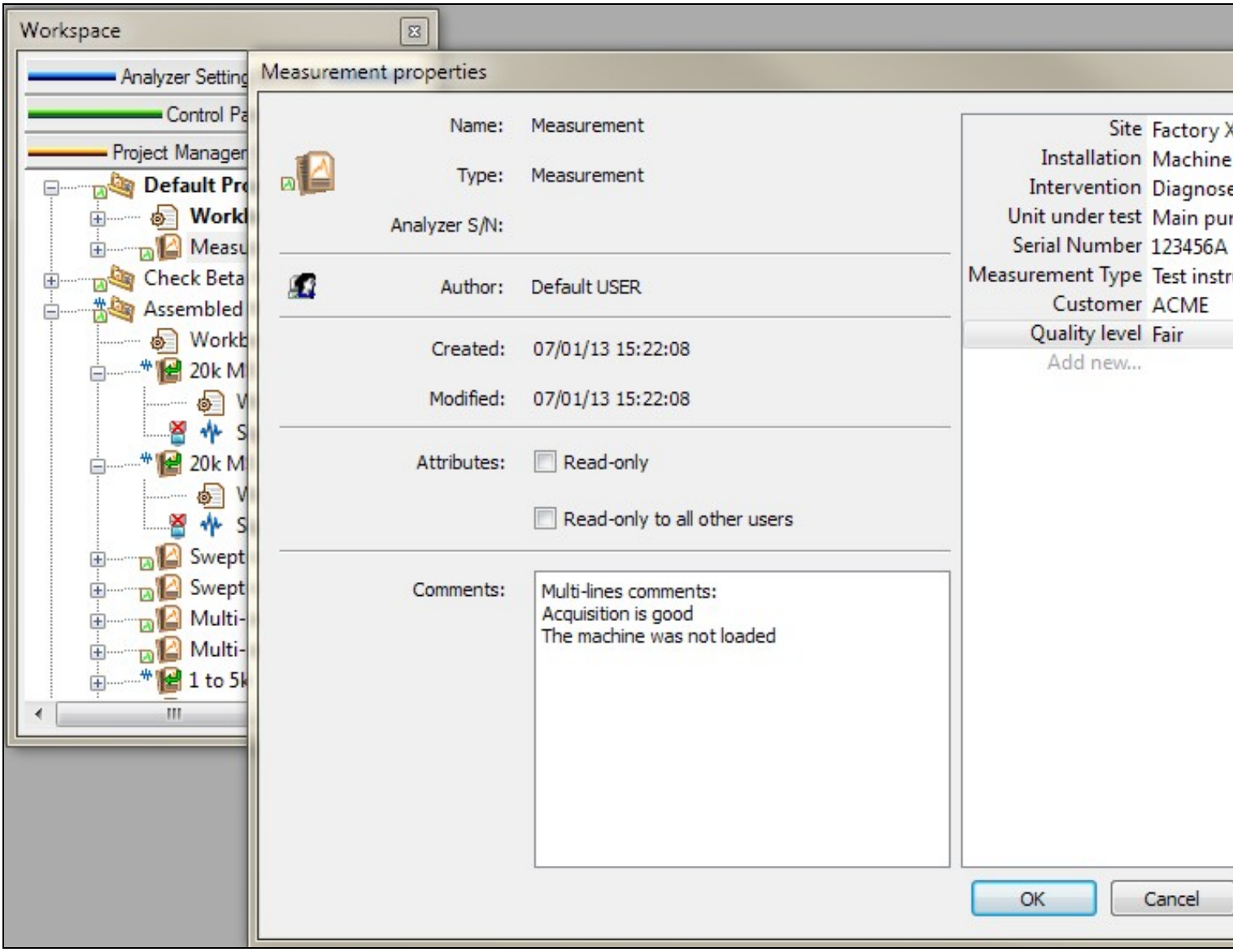
- Signals coming from the recorder
- Results coming from an analyzer (FFT, Octave, Waterfall...)

A measurement always contains one workbook, which is a copy of the workbook used to create the measurement.

- **Edit:** This command loads the measurement. The analysis mode is then set to "Result mode".

The Result editor is used for post-analysis of saved results. It allows to switch between 2 measurement workbooks in order to compare the results.

- **Rename:** This command is used to rename the selected measurement.
- **Remove:** This command removes the selected measurement. The data contained are permanently lost.
- **Properties:** This command allows viewing or modifying the measurement properties in order to be used for future data mining.


Workspace
Analyzer Setting
Control Pa
Project Manager
Default Pr
Workl
Measu
Check Beta
Assembled
Workb
20k M
20k M
Swept
Swept
Multi-
Multi-
1 to 5k
Measurement properties
Name: Measurement
Type: Measurement
Analyzer S/N:
Author: Default USER
Created: 07/01/13 15:22:08
Modified: 07/01/13 15:22:08
Attributes: Read-only
Read-only to all other users
Comments:
Multi-lines comments:
Acquisition is good
The machine was not loaded
Site Factory X
Installation Machine
Intervention Diagnose
Unit under test Main pur
Serial Number 123456A
Measurement Type Test instr
Customer ACME
Quality level Fair
Add new...
OK
Cancel

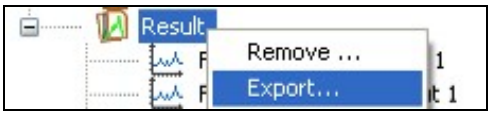
- **Collapse items:** This command collapses the entire branch of the selected measurement. Only the measurement item remains visible.
- **Expand items** This command expands the entire branch of the selected measurement. All items (workbook, results...) are expanded and made visible.
- **Attachments** Add extra files on a folders for each Item (Project, Measurement and Model) that can hold various files not directly managed by NVGate. Ex: Voice record, Word pad, pictures, scheme, planning, etc?

(The files deposited in this directory will be transferred with the Items during share/collate actions.)

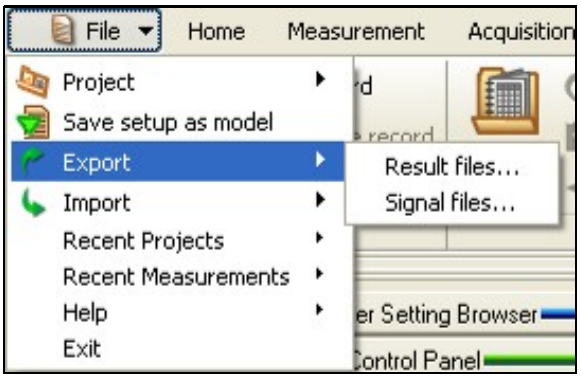
109.2.4 Result group

 This item gathers all results of a measurement. The actions that can be performed from this item are:

- **Remove:** This command removes all the measurement results. The data is permanently lost.
- **Export:** Exports the results in an external format (UFF?). This can be done from the pop-up menu associated with the item.



A command to export the results of several measurements at the same time is also available in the "File" menu.

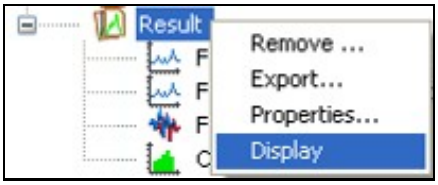


For more details about the export formats, see the "Export" topic.

- **Properties:** This command gives general information about the results.

All the plug-ins that have provided results are listed, with their corresponding number of results.

- **Display:** Displays all the measurement results. One window per type of result is created, limited by the maximum curve that the window can contain.



109.2.5 Result

This type of item can belong to a Result group item, a Ref. Result Item or a Template Result item.

The icon associated with the item indicates the results type. The table below lists the different icons that can be found.

 Temporal result (triggered block, weighted block...)

 Spectral result (Spectrum, Order Spectrum, FRF...)

 Scalar result

 Profile result (scalar profile, order profile...)

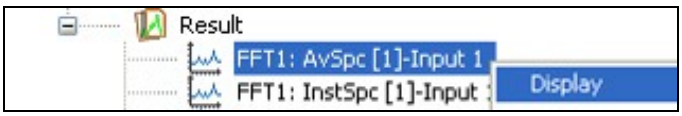
 3D result (Waterfall of spectrum, triggered block, octave spectrum...)

 Octave result

 Coherence result

The main action that can be performed from this item is to display the result.

A new window is created, containing the result. This can be done from the pop-up menu associated with the item. This can also be done by double clicking on the item.



- **Display:** Displays the selected results in a new window.
- **Remove:** This command is available only when the measurement is loaded. It is used to remove the result from the measurement.
- **Properties:** This command gives general information about the result.
- **Add to template result:** This command adds the selected result to the template results of the current project.

109.2.6 Signal

 This item represents a signal file generated by the recorder. Depending on the analysis, the item points to file located on the PC or the analyzer hard disk.

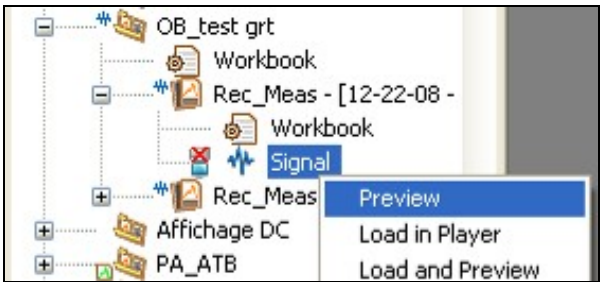
- **Signal location**

An icon to the left of the Signal icon indicates the location of the signal file. The table below explains the meaning of the 6 icons that can be found:

	The file is only on the analyzer hard disk.

	The file is only on the PC hard disk.
	The file is on both the PC and the analyzer hard disk.
	The file is on the PC and the analyzer is not connected (The file might also be on the analyzer hard disk).
	The file is not on the PC and the analyzer is not connected (The file might also be on the analyzer hard disk).
	The file is not found on the PC or on the analyzer hard disk.

- **Preview:** This command displays an overview of the signal. This command is available, even if the signal is on the analyzer hard disk and NVGate? is in office mode.



- **Load in Player:** This command loads the signal file to the player. It is then possible to display this signal, play the tracks on output, and perform post analysis.

Once loaded to the player, the signal can be displayed and post-analyzed. To load the file to the player, select the command "load in player" in the pop-up menu associated with the signal item. The signal file can also be loaded and displayed at once by double clicking on the signal item.

When the analyzer is connected, only files located on the analyzer hard disk can be loaded.

When the analyzer is not connected, only files located on the PC hard disk can be loaded.

- **Load and preview:** This command combines the two previous commands.

- **Post-Analyze:** This command loads the signal in the player and display the menu 'track connections' in order to define your post-analysis.

If the time signal is recorded on the PC or on the Mobi-disc?, it is highly recommended to be in office mode (hardware inactive) in order to avoid low performances and malfunctions.

New Setup: Start with an empty workbook

Keep record Setup: This second method will allow you to post analyse the signal with the same setup used for the recording.

- **Uploading/Downloading**

Upload\Download:

Used to transfer files to\from the analyzer hard disk from\to the PC hard disk. This can be done from the pop-up menu associated with the signal item.



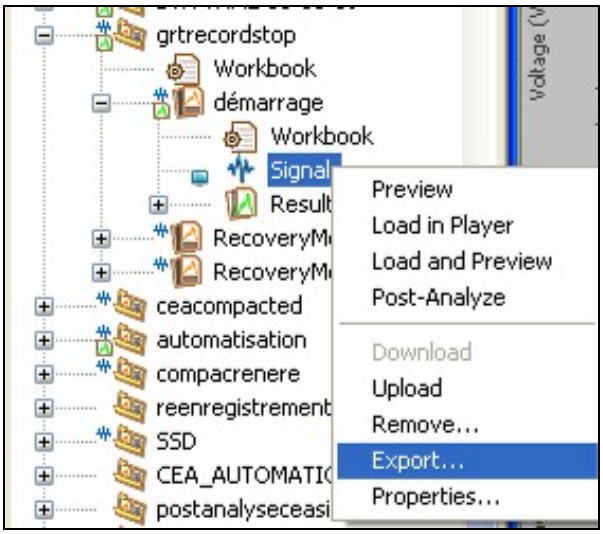
A command to transfer several files at the same time is also possible. This command is available only when hardware with a hard disk is connected

- **Export:**

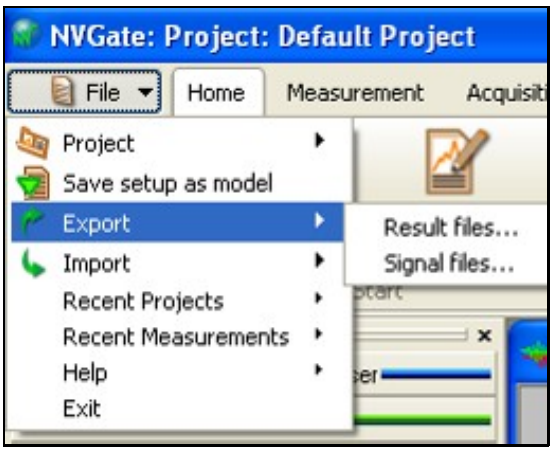
Exports the signal file in an external format (wav?).

A signal can be exported only when it is located on the PC hard disk. The export can be done from the pop-up menu associated with the signal item.

A command to export several files at the same time is also available in the "File" menu.



For more details about the export formats, see the "Export" topic.

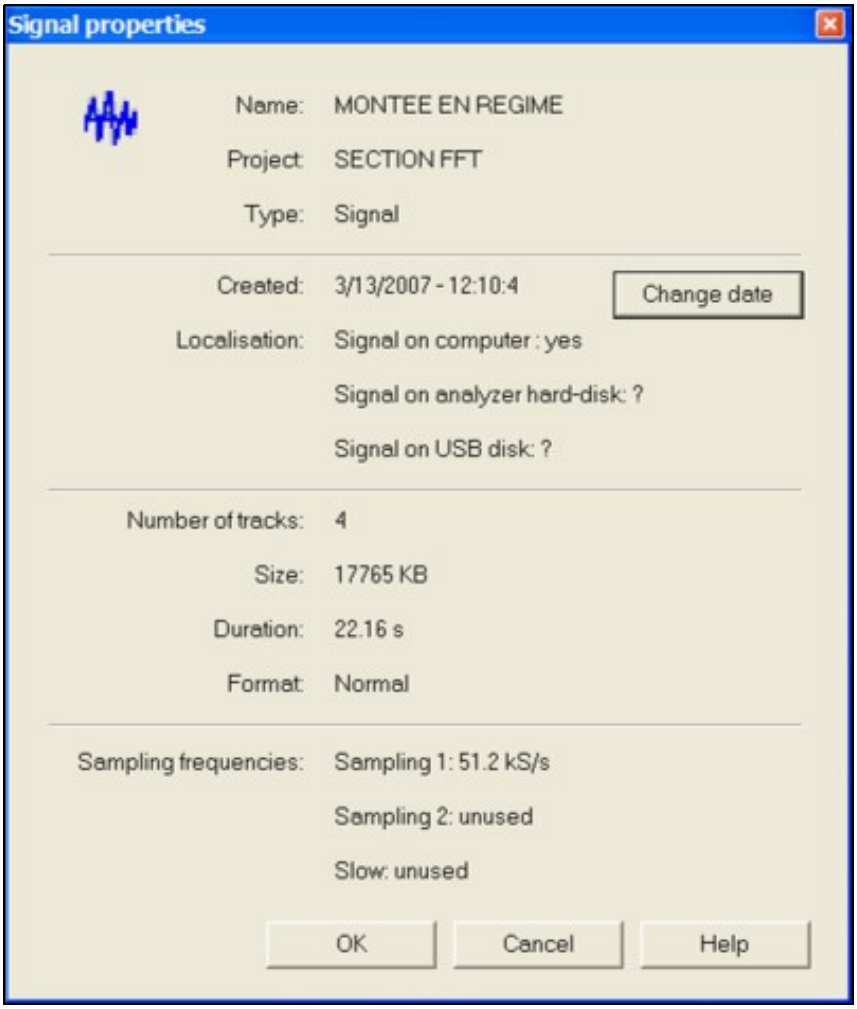


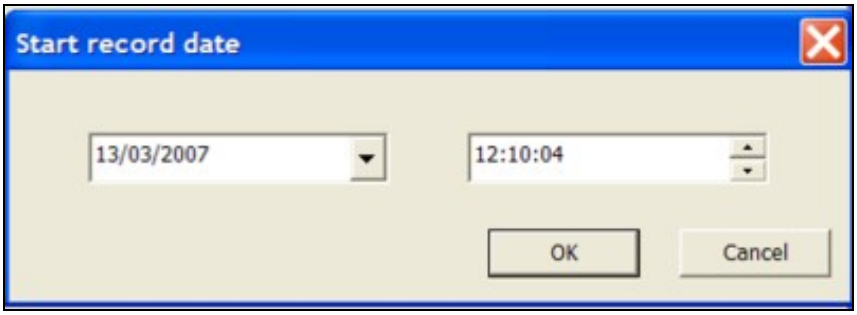
- **Remove:** This command enables to remove the selected signal from the PC if the file is on the PC hard disk and from the analyzer hard disk of the hardware if connected and if the file is on the analyzer hard disk.



If, after removal, the file is not on the PC, or on the analyzer, the signal is permanently lost.

- **Properties:** This command gives general information about the result.





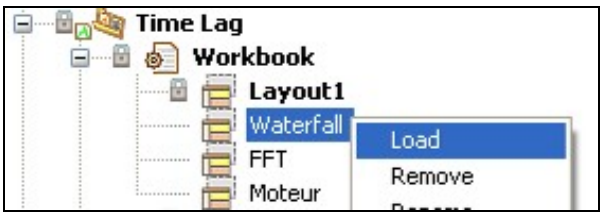
Change date: allows to change the date of the beginning of the signal. It is used to display the absolute time.

109.2.7 Layout

 The layout is the part of the workbook that contains the graphic windows. There is no limitation of number of layouts, but the workbook always has at least one layout.

The windows displayed are the active layout windows. There are several ways to select a layout:

- Double-click on the layout item in the project manager.
- Select the load command in the pop-up menu associated with the layout item in the project manager.



- Use the shortcut "Ctrl + Space bar" to switch to the previous active layout.
- Use the shortcut "Ctrl + Maj+ Space bar" to switch to the next the layout
- Use the Browse Layout buttons or the Layout selection list from the *Display* tab.

Notes: The layouts are associated with the analysis mode (Measurement or Result mode) and are available only in the correct mode. Therefore, a name used for a layout in the measurement mode will not be available in result mode.

- The selected tabulation of the control panel is related to the layout. This is designed to minimize the selection in the workspace.

- **Rename:** This command is used to rename the selected layout.

- **Properties:** This command gives general information about the layout.

109.2.8 Imported measurement

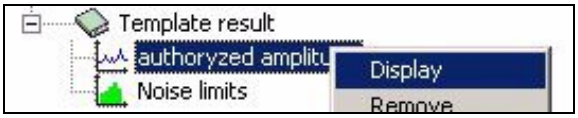
 This item comes from the import of a result or a signal file.

The behavior of this item is similar to the behavior of a usual measurement item. It differs only in that the workbook associated with the measurement is empty. There is no information about the analyzer settings, or about the layouts and other workbook elements.

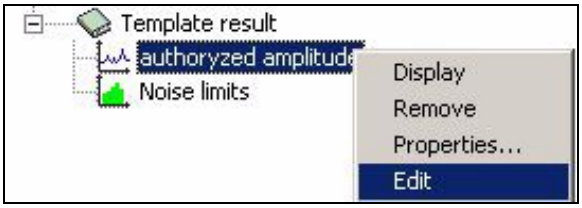
109.2.9 Result Template

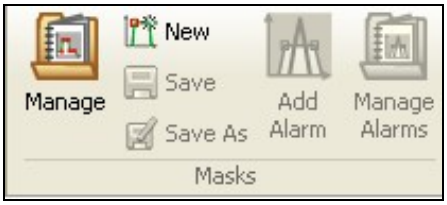
 This item appears when results template are added to the project. They can be added from the Tab "tools": Mask or from the "Add to result template" menu in a window.

- **Displaying:** To display the result template, Double-click on the item or select the "Display" command from the pop-up menu associated with the item.



- **Editing:** To edit and modify the template result, use the Tools\Result Template\Main menu or the "Edit" command of the pop-up menu associated with the item.



or


109.3 Advanced

The way a new measurement is created is defined in the Save Setup dialog box using the Save Option property.

There are some specific cases where the behavior defined by the Save Option must be overridden:

- When the recorder is stopped, a measurement is created, overriding the "**Do not save**" choice.
- When the recorder is stopped, the measurement takes a specific name, overriding the "**In default measurement**" choice.
- For multi-analysis, the results corresponding to the different plug-ins are saved in separate measurements if the plug-ins do not stop simultaneously. While NVGate? is Running (meaning that at least one plug-in is still running), the measurements are saved with "**With name confirmation**" unless the Save option choice is "Do not save".

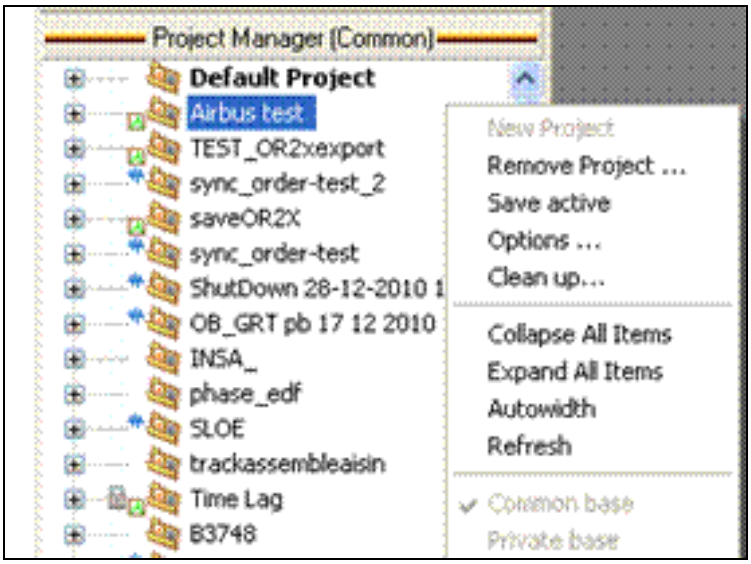
109.3.1 Recovered project

Each time NVGate? is not closed correctly and a default measurement is present in the project, the project is automatically loaded when NVGate? is launched, to ensure that no data is lost. If the project was the "Default project", then to the user is prompted to rename this project "Recovered project".

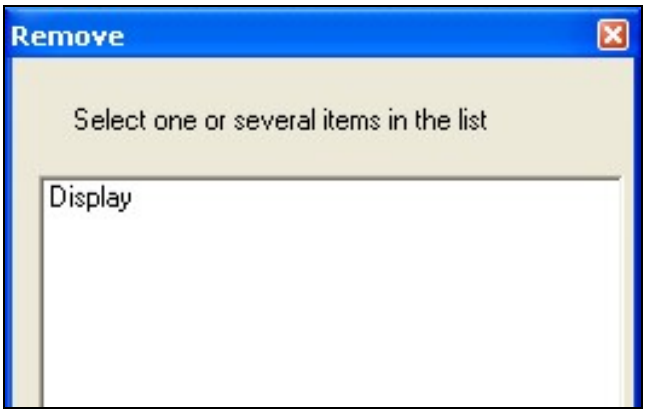
109.3.1.1 Contextual menu

The contextual menus are accessible by right clicking on the area.

General menu: Appears by right clicking anywhere on the Project Manager background.

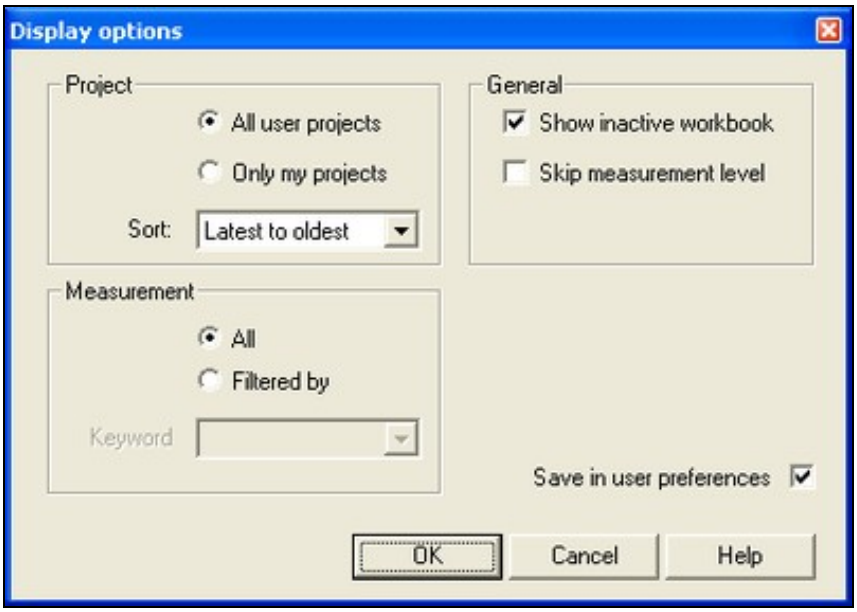


- **Remove project:** This command opens the following dialog box.



You may also remove one or several projects from the project base. The current project cannot be removed.

- **Save active:** This command saves the current project and, if there is a measurement loaded, it also saves the current measurement.
- **Options:** This command opens the following dialog box:

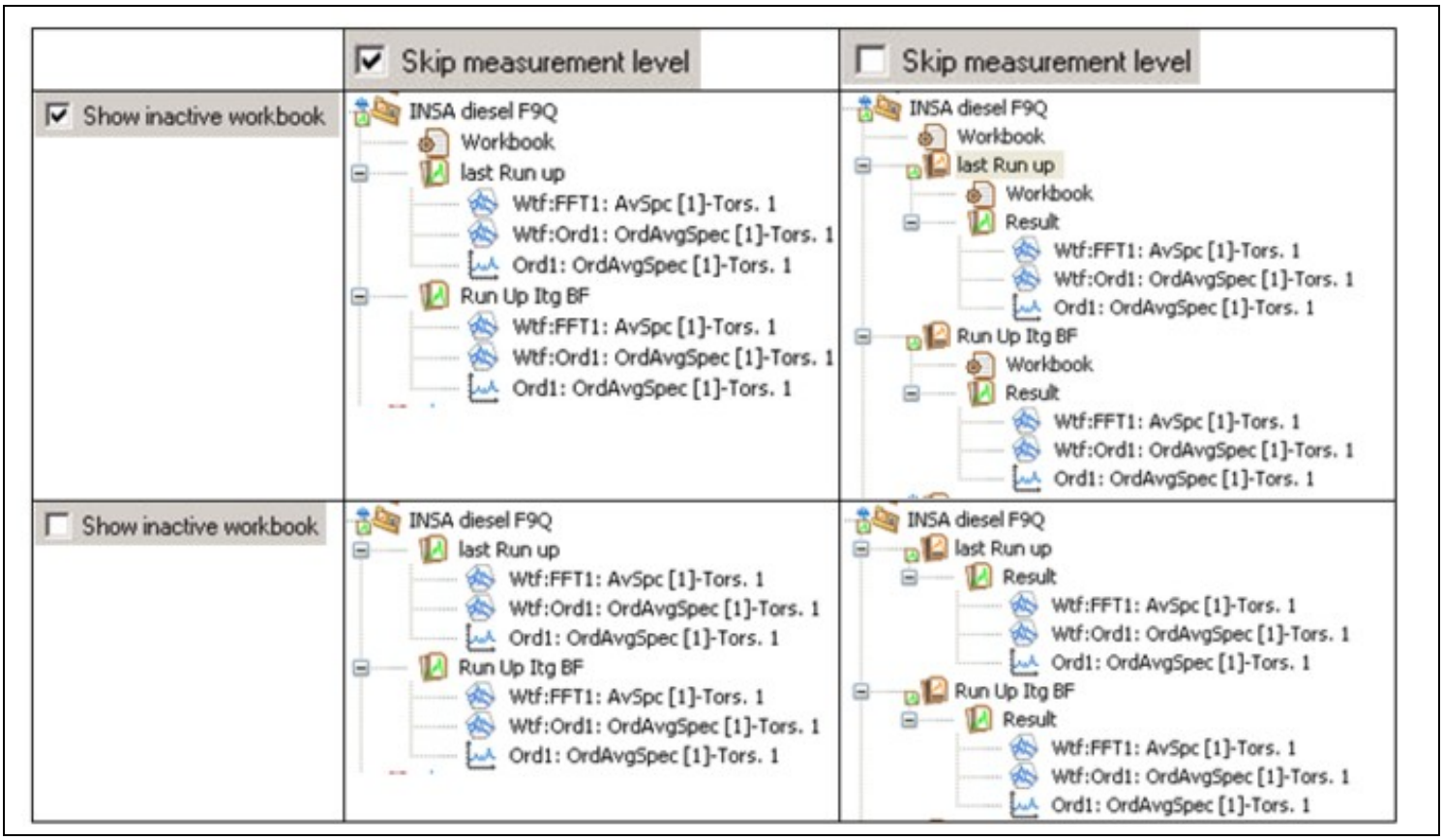


This option is used to modify the way the project manager is presented.

- **Project:** It is possible to hide projects that do not belong to the current user. This is particularly useful when there are multiple NVGate? users on the same PC.

The project can be sorted alphabetically, chronologically or inversely chronologically.

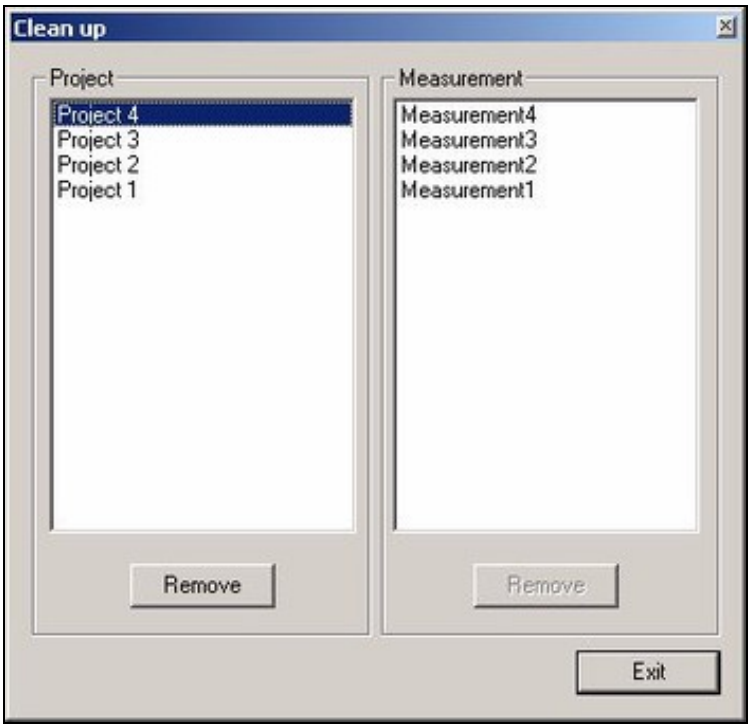
- **Measurement:** The measurement can be filtered by keyword. The keywords are assigned to the measurement when it is created, or can be changed in measurement properties. This option is very helpful when organizing measurement campaigns.
- **General:** It is possible to hide all the inactive workbooks and to delete the measurement level. The table below illustrates the differences:



- **Save in user preferences:** These settings can be stored in the user preferences and can be set in the preferences.

109.3.1.1.1 Clean up

The purpose of the following dialog box is to accelerate the cleaning of the project base. It is used to remove projects or measurements.



- **Project:** The list contains all projects except the current one. Once a project is selected, it is possible to remove the full project or to select a measurement to remove. If several projects are selected, it is then only possible to remove the selected project.
- **Measurement:** When one project is selected, the list of project measurements is displayed and available to be removed.

Collapse all items: Collapses all the branches of the project manager tree. Only the project items are visible.

Expand all items: Expands the entire branch of the project manager tree. All the items of the tree are visible. This can make the tree very large.

Auto width: Adjusts the width of the tree to the widest branch, so that every item is fully visible.

109.3.1.1.2 Group properties

- **Properties:** This command gives general information about the project.

It is possible to modify the project attribute. When "Read-only" is selected, it is not possible to modify the project. When "Read-only to all other users" is selected, the project cannot be modified by another user, but can be used freely.

"Allow access to" property must be set on "All users" to enable restricted users to use this project.

A comments area is available to add information. (Use "Ctrl + Return" to start a new line).

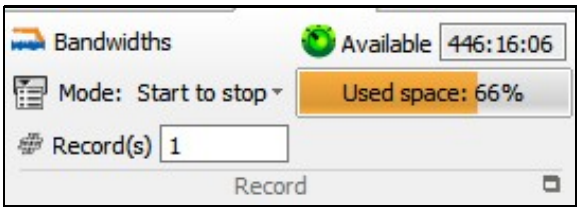
109.3.1.2 Protection

An icon can appear to the left of the project, workbook, layout and measurement icon. When there is no icon, this means that the item is not protected. The table below explains the meaning of the 3 icons that can be found:

	The item is in read-only. This protection can be removed using the properties command by unselecting the read-only protection.

	The item does not belong to the current user and is protected by its user. The current user cannot modify this item.
	The item does not belong to the current user, but is not protected. The current user can freely use this item.

110 NVGate Recorder



The Recorder module is used to configure the time signal recording sessions (Bandwidth, Trigger).

This plug-in is used to record signals from the different types of Front-end (inputs, DC inputs or external synch inputs) or Player inputs (in Post-Analysis mode). The data can be recorded on the PC hard disk in office mode or on the OR3x hard disk in connected mode. Each recorded signal is called a track in the recorder. A recorded signal file can contain up to 4 different sampling frequencies:

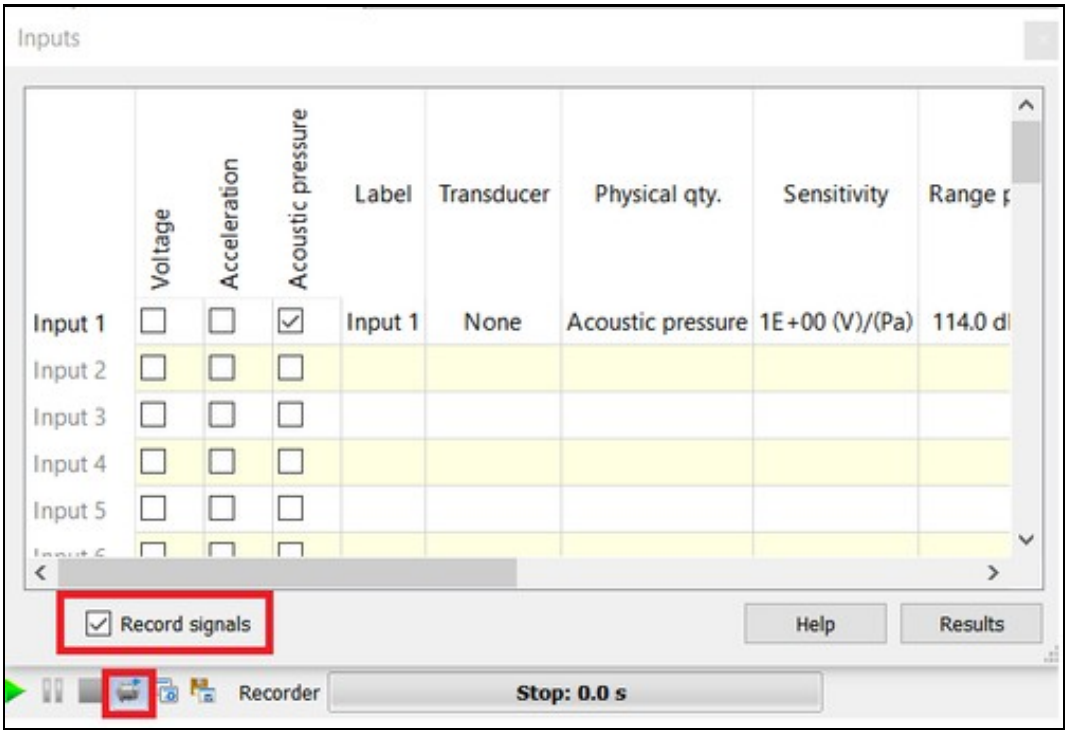
- One for parametric inputs
- One for external synch inputs
- Up to 2 for other inputs

The user can select a trigger event to start the acquisition of a record and another one to stop the record.

110.1 Tutorial

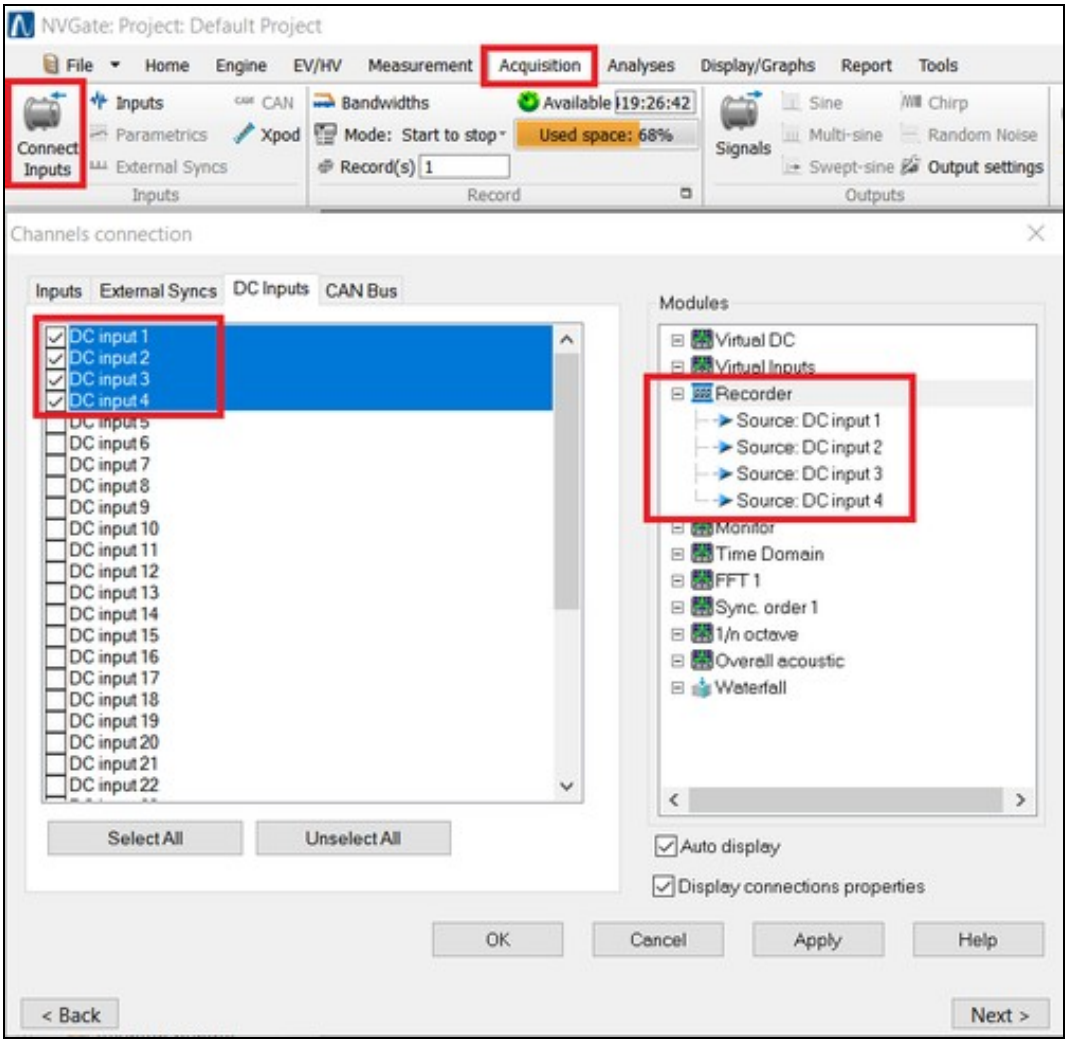
110.1.1 Using Go to result

Just click on "record signals" using Go to result windows. The track will be automatically recorded.



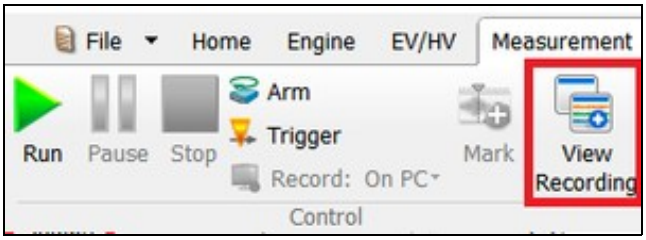
110.1.2 Using Connect Inputs

For connecting, DC channels, Can Bus, Xpods,(...) we advise users to enable the input and do a drag and drop into the recorder.



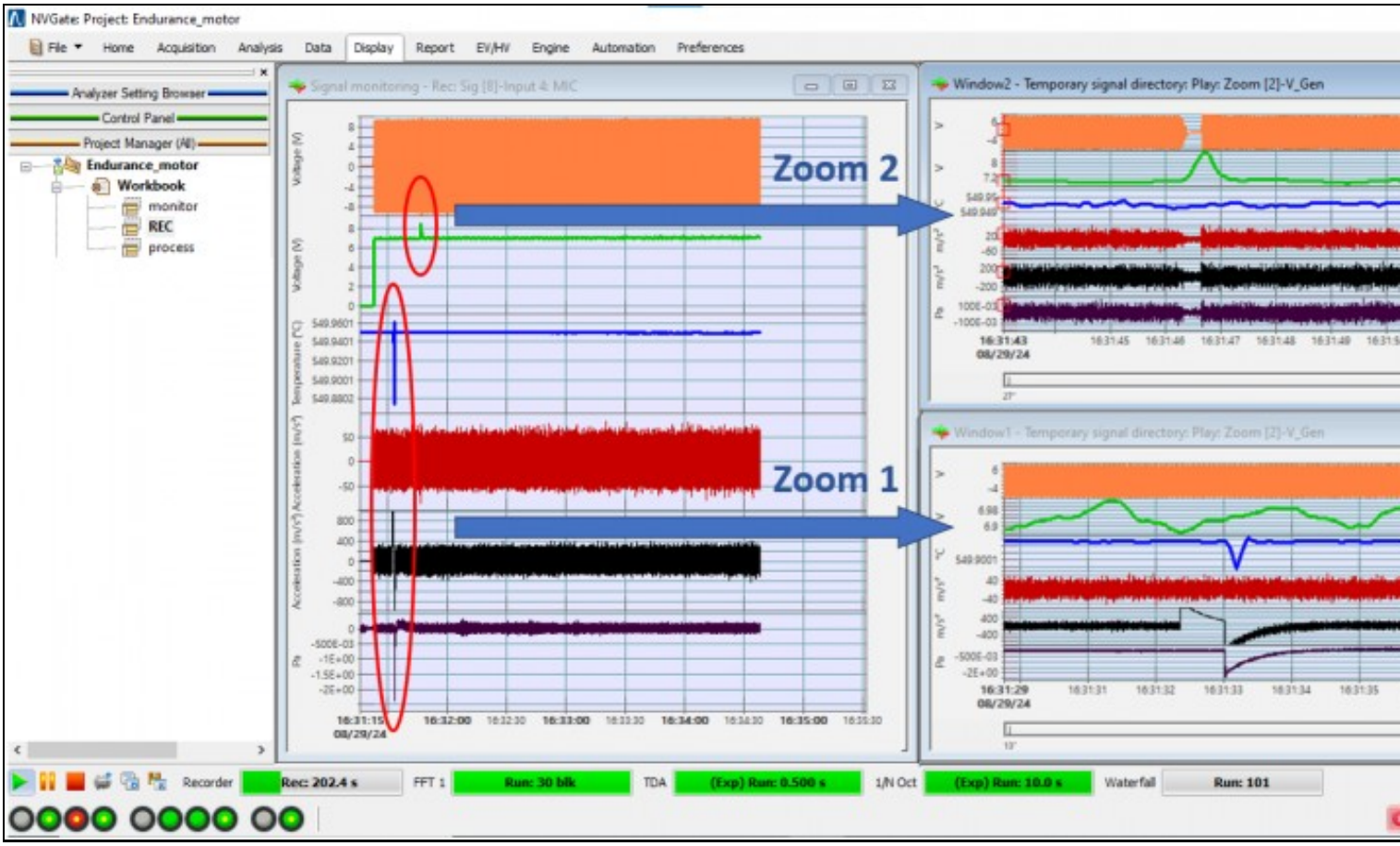
110.1.3 Display

On measurement tab, click on view recording.



110.1.3.1 Real-Time Zoom

Drag and drop the section of the signal you're interested in while recording, and the selected part will be instantly zoomed in. You can zoom in on multiple sections simultaneously in different windows, enhancing your real-time analysis and visualization capabilities.



110.2 Available results:

Type	Size	Dimension	Domain	Save
RMS	1 pt	1D		Display only
Monitoring Signal	2048 pt max	2D	Compressed time	Saved on PC hard disk
Time	20, 40 or 60 GBytes<ref>Depending on the analyzer type</ref>	2D	Time	Saved on PC or on Analyzer hard disk.

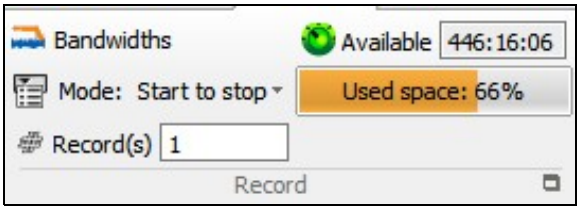
RMS: RMS level measured on a recorded input signal computed on the selected bandwidth.

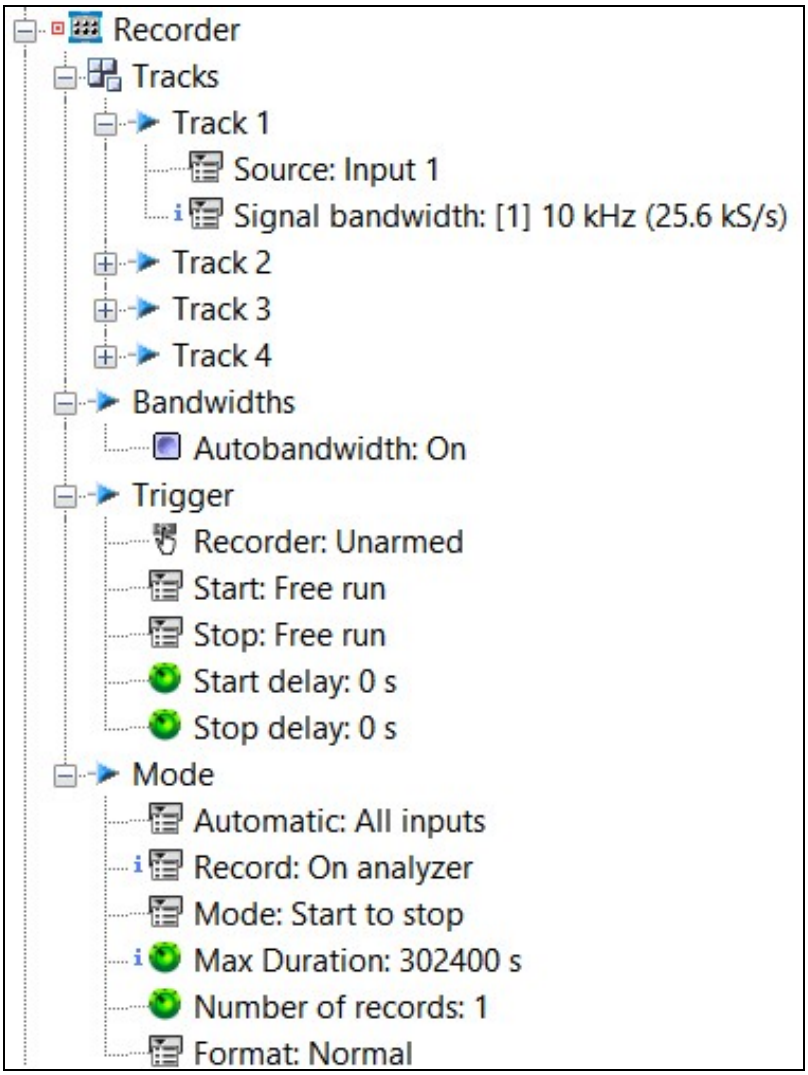
Monitoring signal: this result displays the compressed input signal after frequency decimation. The result is only updated during recording.

Time: time domain signal sampled at Sampled Frequency 1 or Sampled Frequency 2 automatically saved on hard disk during acquisition.

All the results are available using Add/remove windows.

110.3 Settings




Recorder
Tracks
Track 1
Source: Input 1
Signal bandwidth: [1] 10 kHz (25.6 kS/s)
Track 2
Track 3
Track 4
Bandwidths
Autobandwidth: On
Trigger
Recorder: Unarmed
Start: Free run
Stop: Free run
Start delay: 0 s
Stop delay: 0 s
Mode
Automatic: All inputs
Record: On analyzer
Mode: Start to stop
Max Duration: 302400 s
Number of records: 1
Format: Normal

-  Available: Display the maximum possible recording duration depending on the current recorder setup. The max duration is computed from the free space of the selected hard disk, the number of tracks (and their corresponding sampling frequency) and the number of records. Note in time to stop, the max duration may also be limited by the local available memory (PC/Analyzer) for the description blocks.
- Used Space: gives a visual overview of the disk occupation.

110.3.1 Tracks

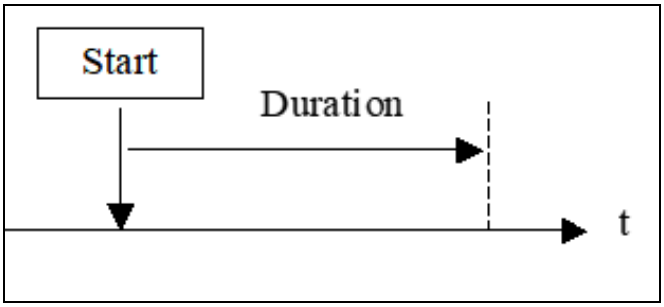
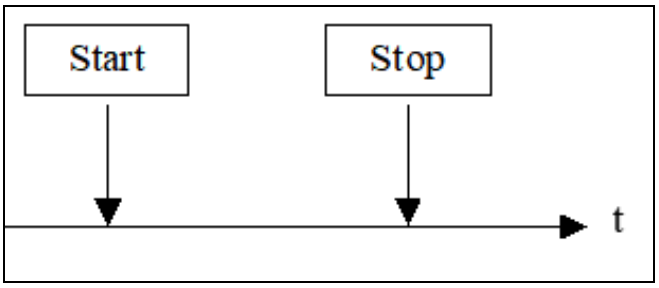
Used to configure the track x to be recorded.

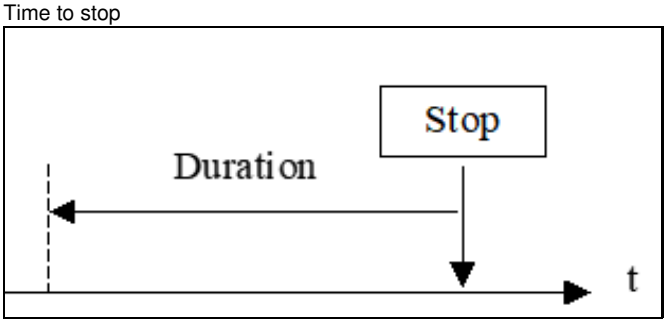
- **Source**: signal to be recorded. It may come from the input Front-end or from the Player in post analysis mode (see "Post analysis" topic chapter 6).
- **Signal bandwidth**: frequency bandwidth of the recorded track. This value is equal to the sampling frequency of the recorded signal divided by 2.56 (this factor was chosen in order to avoid any aliasing problems during frequency analysis). For the DC input this setting is forced to the input setting DC input sampling value. For the External Synchro input this setting is forced to the input setting input sampling value. For the input, the user can choose between the 2 frequencies bandwidths defined in the next settings.

110.3.1.1 Mode

This sub-module is used to define the recording set-up (record on PC hard disk or on the analyzer hard disk, the number of records...).

- **Automatic**:
  - All inputs: All inputs activate in the frond end are put into the recorder.
  - No input: Recorder is off
  - Disabled: the automatic Mode is disabled. The channels need to be put manually into the recorder (refer to the recorder/tracks or connect track).
- **Record**: enables the Record plug-in. The user can choose between Off (the recorder is disabled) and On PC (in the Office mode) or On analyzer (in the Connected mode).
- **Mode**  : defines the ways the signal is recorded.

Recorder mode	Description
Start to time 	Acquisition begins on the start event and stops when the specified duration has been recorded. A user with the Stop command can stop the acquisition at any moment. If the Number of records is greater than 1, a new record is started with a new start event. When all the specified records have been recorded the plug-in goes in the Stopped state (the Stop command also forces the plug-in the Stopped state).
Start to stop 	Acquisition begins on the start event and stops when the user sends a stop command or when a stop event occurs (depending on the selected stop event). If the Number of records is greater than 1, a new record is started with a new start event. When all the specified records have been recorded the plug-in goes in the Stopped state (the Stop command also forces the plug-in the Stopped state).

Time to stop 	Acquisition begins on the Run command. The record stops when a stop event has been detected or when the user sends a Stop command. The duration of the recorded signal is equal to the minimum between the time elapsed since the Run command and the value specified in the Duration setting (i.e. only the last Duration seconds of the recorded inputs are saved in the signal file).

- **Duration:** defines the duration of a record.
- **Max duration**: displays the largest value for the Duration setting corresponding to the space available on the selected hard disk (PC hard disk in Office mode or the OR3x hardware HD in Connected mode). The max duration is computed from the free space of the selected hard disk, the number of tracks (and their corresponding sampling frequency) and the number of records.

In the Time to stop mode the maximum duration is defined by the size of memory available on the hardware. For information only, if the record is on the analyzer hard drive, max size is 262144 blocks of 2048 samples. Max duration is then: (262144 * 2048)/(Sampling freq*Nb. Channels) :)

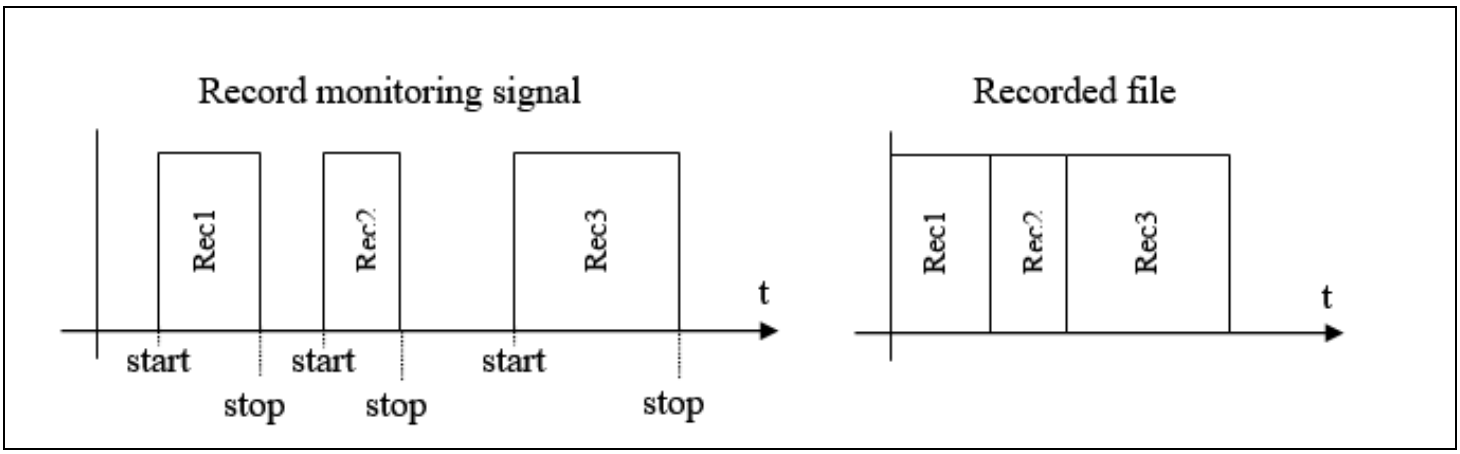
If the Record is on the PC the max size is 1048576 blocks of 2048 samples .

For "V1 hardware" the available size is either 262144 blocks of 2048 samples.

Hidden/fixed: Fixed

- **Number of records** : defines the number of records (1 to 1000). The recorded signal file can contain several records except in the Time to stop recorder mode (in this case only one record is available).

Note: The start and stop displayed on the picture below are not the start and stop of the analyzer, but the ones of the recorder i.e. the start and stop trigger.



- **Format**: defines the format of the recorded samples.

Format	Description
Normal	Samples are saved in 32 bit floating point format in SI unit
Compacted	Samples are saved in 16 bit signed integer format in logical unit (-32767<= sample value <= 32768). This format reduces the amount of hard disk space and throughput required by a factor of 2.

110.3.1.1.1 Trigger

This sub-module is used to define the start and stop conditions of the signal to be recorded.

- **Recorder:** defines the status of the recorder ("armed" or "unarmed"). The user can choose to arm the record in order to be ready for recording. When a "Run" is made with a recorder in the status "unarmed", before running the record will be set to "armed". In the status "armed", any modifications of Front End or Recorder settings put automatically the recorder in the status "unarmed". The action of "armed" corresponds to the creation of a .lxf file (which corresponds to save the record set up).
- **Start**: defines an event to start the recorder. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Start" condition.

Hidden/fixed: Hidden if the recorder mode is "Time To Stop"

- **Stop**: defines an event to stop the recorder. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Stop" condition.

Hidden/fixed: Hidden if the recorder mode is "Start To Time".

Note: If a trigger is used to stop the recorder, it doesn?t stop exactly at the event, one more block is recorded. It is useful in connected mode to stop the record on all the DSPs at the same time.

- **Start delay**: defines the delay between the start event date and the real beginning of the record. The user can enter a value between $-202752/Fe_{Max}$ s and 360000 s (where Fe_{Max} is the largest sampling frequency of the recorded signals). The pre-trigger capability (Start Delay < 0) is very useful when the user wants to record the signal just before the start event.

Hidden/fixed: Hidden if the recorder mode is "Time To Stop".

- **Stop delay**: defines the delay between the stop event date and the real stop date. The user can enter a value between 0 s and 360000 s.

Hidden/fixed: Hidden if the recorder mode is "Start To Time".

110.3.1.1.2 Bandwidths

Used to set the bandwidth and sampling frequency of the signal to be recorded.

- **Sampling**: sampling frequency. The user can define up to 2 sampling frequencies among the available decimated values of the input setting sampling frequency.
- **Bandwidth**  : this is the signal frequency bandwidth in the frequency domain. The frequency bandwidth is equal to the sampling frequency divided by 2.56.

The recorder supports up to 4 different bandwidths:

Type	Range	Mode
FS 1	2.048 S/s to FSF	User define
FS 2	2.048 S/s to FSF	User define

Ext. Synch	Front-end Sampling Freq (FSF)	Automatic
Parametric inputs	15 Hz	Fixed

Note: once running the recorder, the other plug-in analyzer settings cannot be modified without restarting the record.

110.3.1.2 Autobandwidth

110.3.1.2.1 Principle

Autobandwith manages the analysis and recording bandwidths automatically.

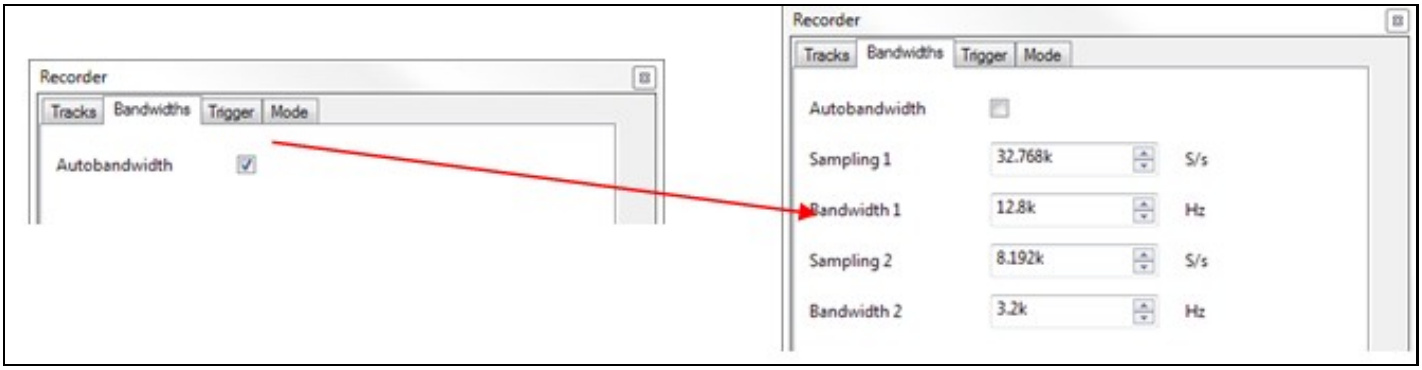
The *Inputs selection* window **allows the use of 2 different sampling rates for the dynamic inputs**. It gathers inputs with the same physical quantity into groups, maintaining the same sampling into each group.

When inputs are associated with **the analysis plug-in, it adjusts its analysis bandwidth to match the inputs ones**. Mixing input bandwidths in one analysis plug-in will set its bandwidth to the lowest one.

Autobandwidth is set by default in the concerned plug-ins.

110.3.1.2.2 Recorder

When inputs are associated with the recorder, it adjusts the recording bandwidths channel by channel.

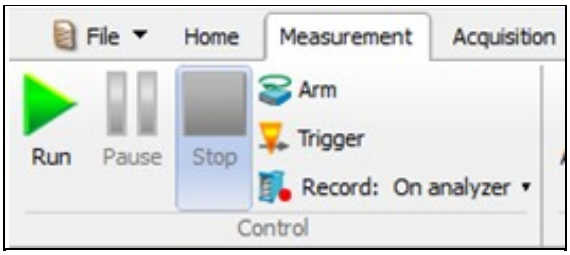


Deactivating the recorder's *Autobandwidth* allows managing the dynamic inputs sampling from the recorder. It is recommended to keep the recorder *Autobandwidth* active unless the recording signal must be a lower frequency than the analysis.

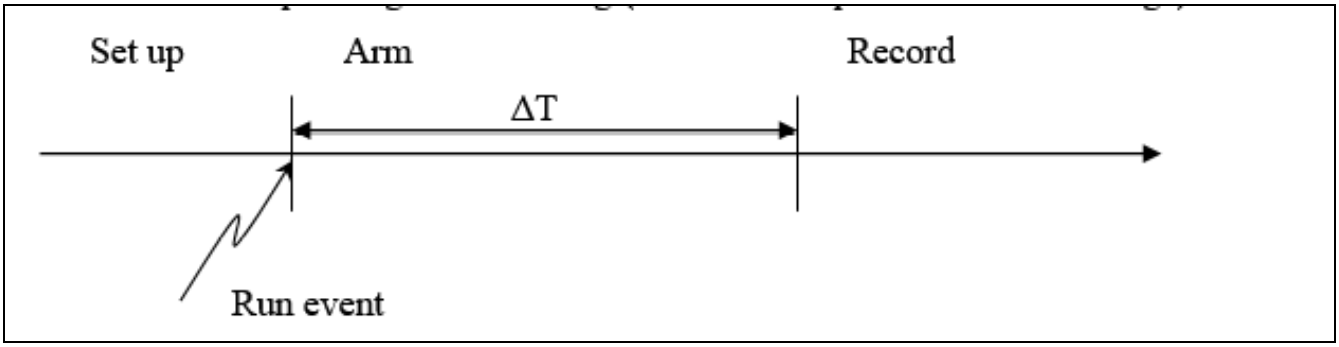
110.3.1.3 Arming

Arming of the recorder creates a backup of your record settings. Arming the recorder secures the record allowing an easy recovery of the data regardless of the cause of the end of the recording.

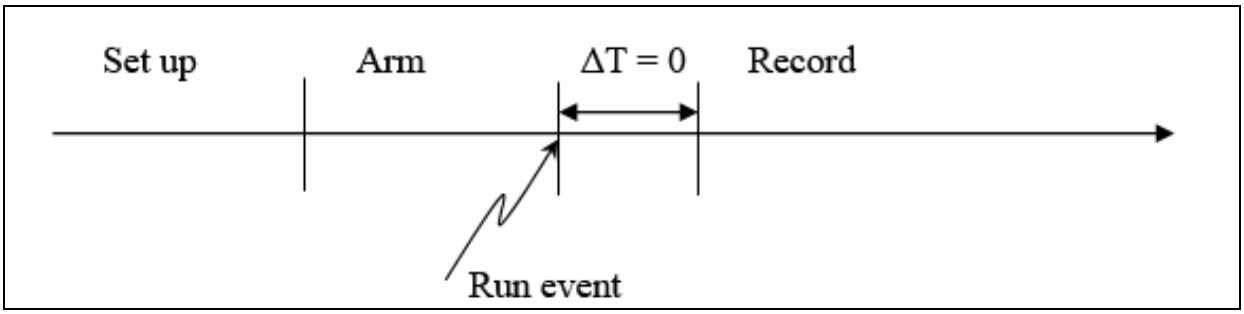
The recorder is armed automatically when pressing the RUN button. This operation may take a couple of seconds. It is possible to pre-arm the recorder allowing an immediate start of the recorder. This is available from the *Measurement* tab of the *Vision* interface:



- Unarmed record: the recorder is armed automatically by the start event. Then between the beginning of the start event and recording, there is a time ?T corresponding to the arming (i.e. the backup of the record settings).

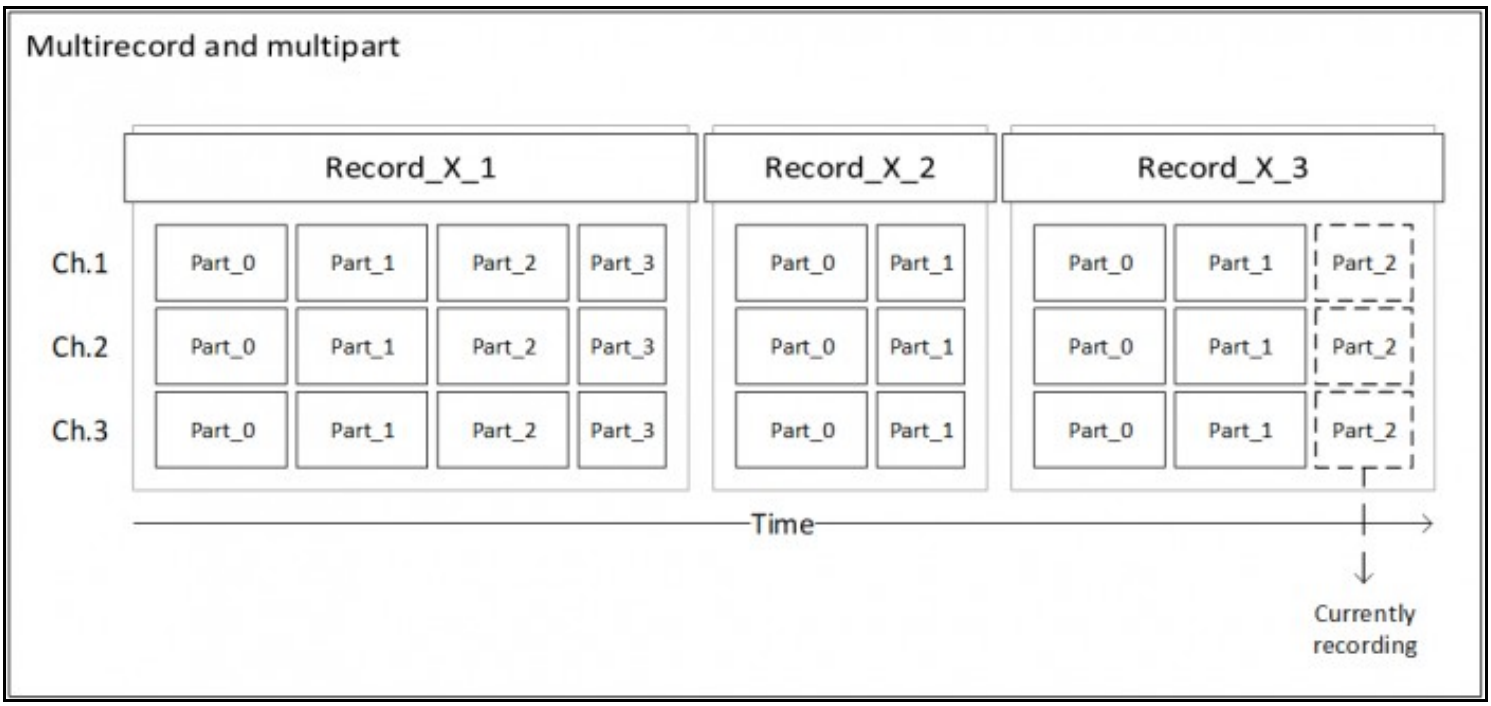


- Armed record: after the setup the recorder is armed (i.e. backup of the record settings allowing more security for you record). Then at any moment, when the recorder is armed, a ?Run event? starts the record instantaneously (?T = 0).

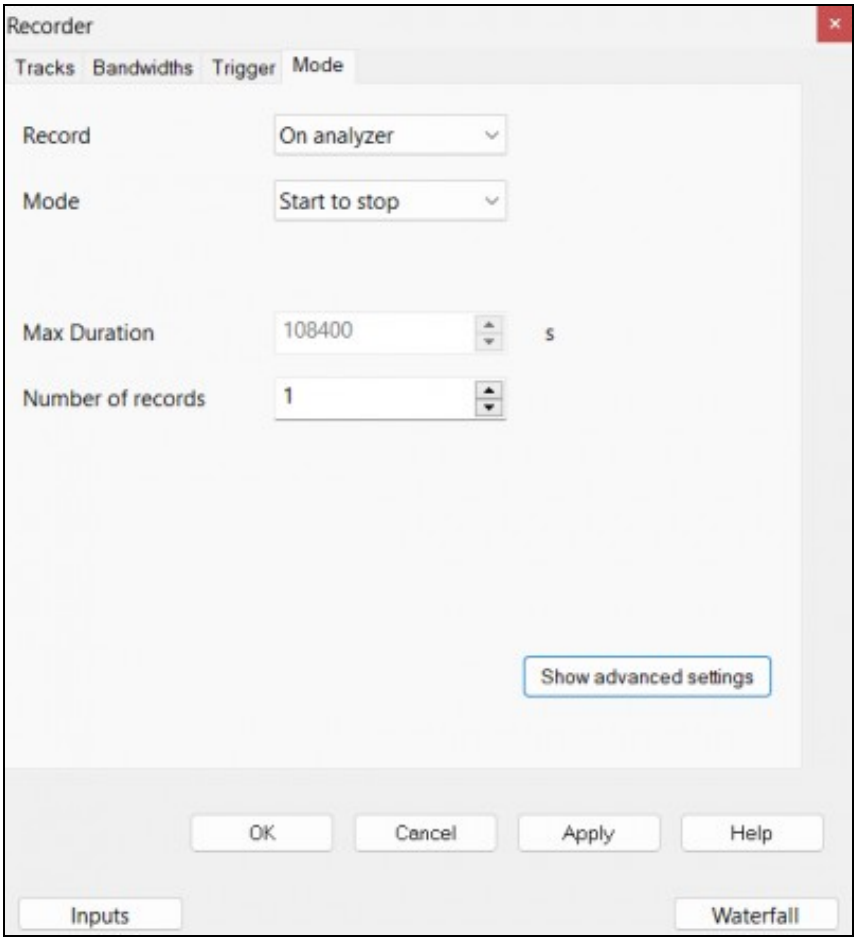


110.3.2 Part file length

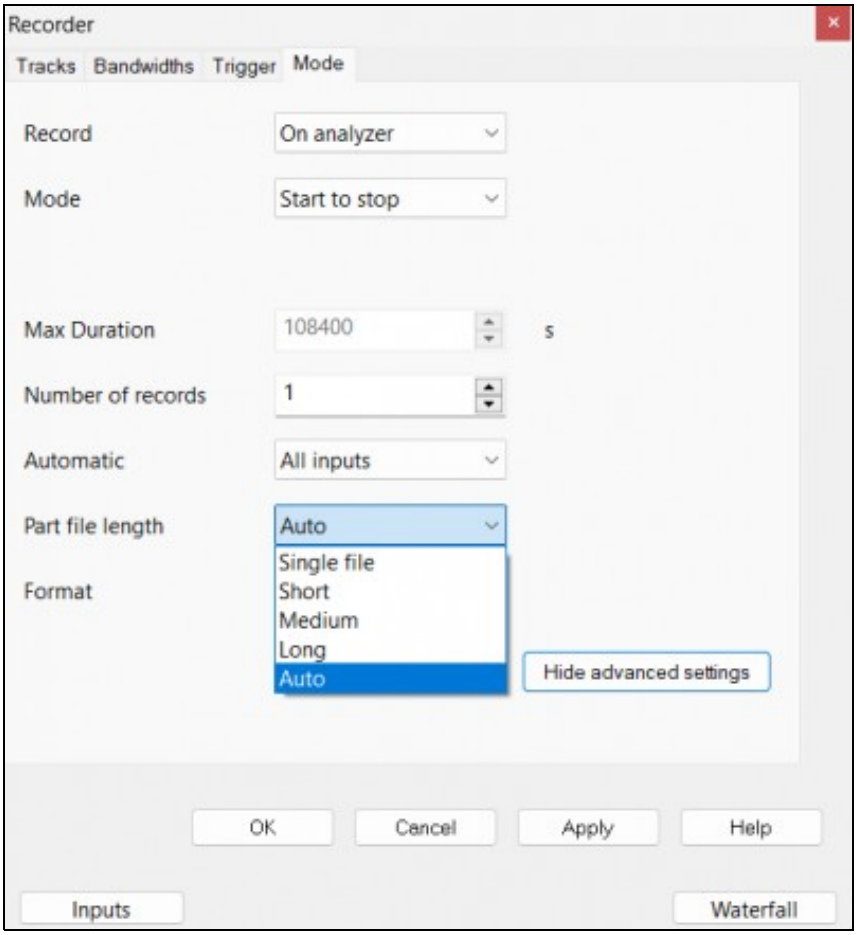
Since NVGate V17, Users have the flexibility to configure each time signal to include multiple records, with each record further divided into parts of customizable lengths.



By default, the recorder is configured with a single record and the part length set to 'Auto' as below:



The duration of a part can be configured in the advanced settings as below:



- Single file: Only 1 part per signal.
- Short: Part length is set to 64 seconds.
- Medium: Part length is set to 640 seconds.
- Long: Part length is set to 1920 seconds.
- Auto: The part length depends on the recording mode:
    - "Start to stop" mode: Part length is set to 640 seconds.
    - "Start to time" mode:
        - If duration is longer than 100 hours, then part length is set to 1920 seconds;
        - If duration is between 10 and 100 hours, then part length is set to 640 seconds;
        - If duration is between 5 and 10 hours, then part length is set to 128 seconds;
        - If duration is less than 5 hours, then part length is set to 64 seconds.
    - "Time to stop" mode: For duration of 1024 seconds or longer, the part length is set to 64 seconds. For shorter duration, the first power of 2 greater than duration/16 is selected. A minimum part length is enforced when the total record bandwidth is high. When the combined bandwidth of all recorded inputs exceeds 256 kHz, 512 kHz, or 1024 kHz, the minimum part length is set to 8, 16, or 32 seconds, respectively.

110.4 Recovering records

The recorded data benefits from specific safety tools that allow recovering the data in case of failure during the record.

There are 2 types of recovery:

- Manual recovery: if the initial project has been cancelled from your PC, or has been recorded with another PC, or if the project has been renamed. The recovering tools are available in the hard drive manager called from the *Home* tab/*Disk* group (*Manage*).

- Automatic recovery: in the case of an unexpected stop of the analyzer; i.e; during a recording, at the end of the recording or before saving the measurement.

During the next launch of NVGate, the Disc is scanned, and then all unsaved files will be recovered if the initial project is found in the local tree diagram. The recovered measurement will be renamed with the date of record.

This recovery type can handle multi records; the recover will be based on the shorter record.

If an unexpected stop occurred (power outage ?), signals will be recovered and only few seconds will be lost, depending on the configuration of your record (sampling frequency, slow inputs).

For example, at 1 ch @ 51.2 kS/s, a maximum of 2.5 s could be lost.

If the mode ?Time to stop? in the recorder is selected, unsaved files will not be recovered.

110.5 Progress Bar

Depending on the recorder mode the progress bar can be a normal, backward or ?snake? type, with text indicating the state of the recording and the time of recorded data.



111 NVGate Report

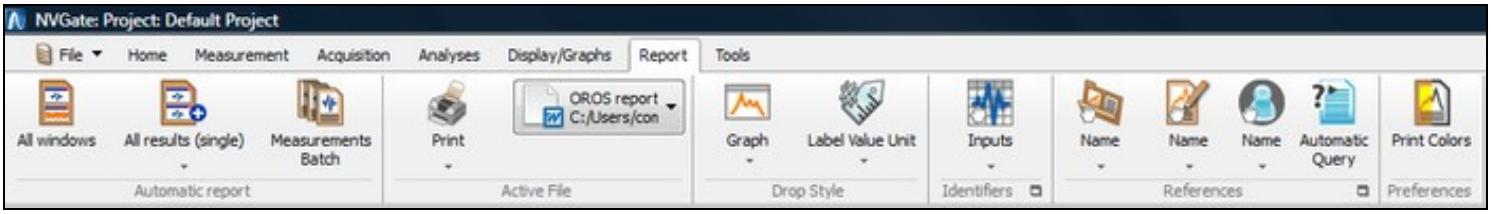
Powered by the Vision interface and still based on the use of templates, the NVGate reporting toolset focuses on intuitive transfer of analyzer?s data, leaving to MSOffice the page setup and extra content.

111.1 Overview

The reporting tools are gathered in a dedicated tab called *Reports*. The *Reports* tab features 4 groups that offer respectively; the file selection (Word or Excel), the format of dropped data, contextual information and graphics preferences.

The report tab is divided in 3 sections:

- **Automatic**: Generates report automatically
- **Operational**: Select a template and refresh /print
- **Creation**: Format, references and graphics preferences



111.2 Tutorial

111.2.1 Introduction

111.2.1.1 Objectives:

In this tutorial, we will show the basic operations to do a report.

Through the different steps of a typical procedure, the useful functions will be described. The report functions are based on the drag and drop of items.

111.2.1.1.1 Equipment

- OR3X Analyzer
- PC with NVGate
- Ethernet link
- Microsoft Word/Excel
- 1 signal

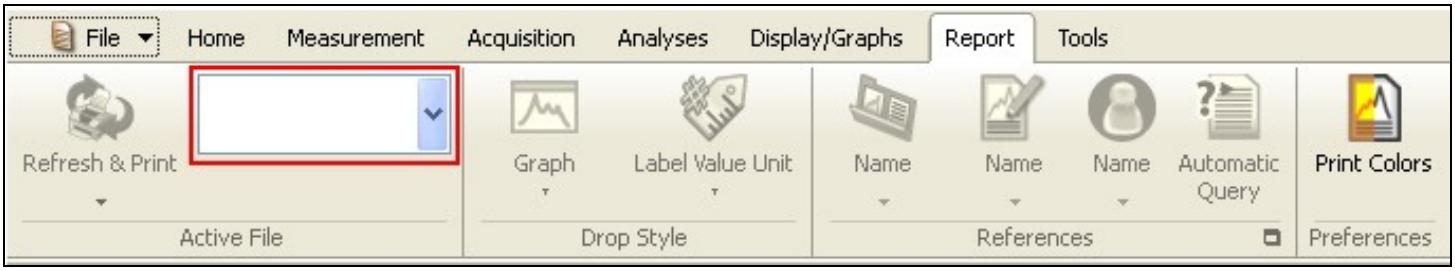
You can create a report in On-line mode or in Office mode.

111.2.1.2 Procedure

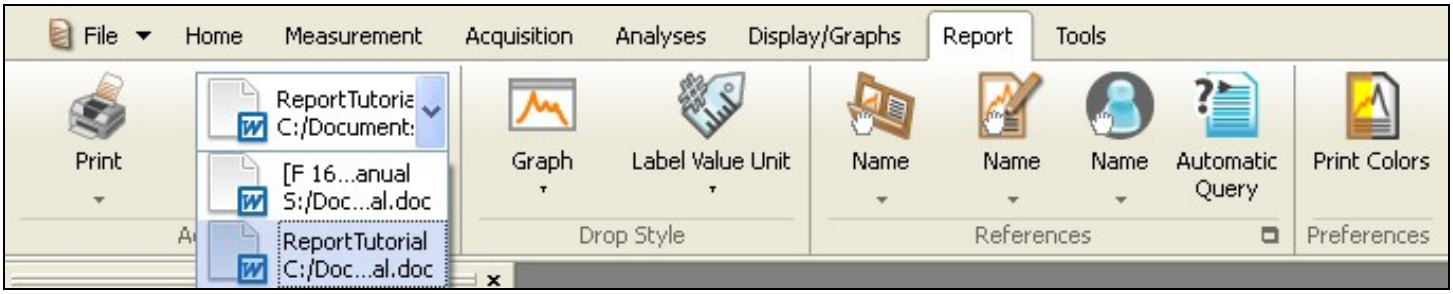
111.2.1.2.1 Active file

First you need to open a new or existing Word/Excel document.

In NVGate, go in the Report tab, in the Active File group.



Move the mouse over the combo-box. Automatically, the software will check the opened file on the computer and fill up the list. It is then possible to select the working template.



In order to work in the best conditions, position the both windows (NVGate window and Word document) side by side.

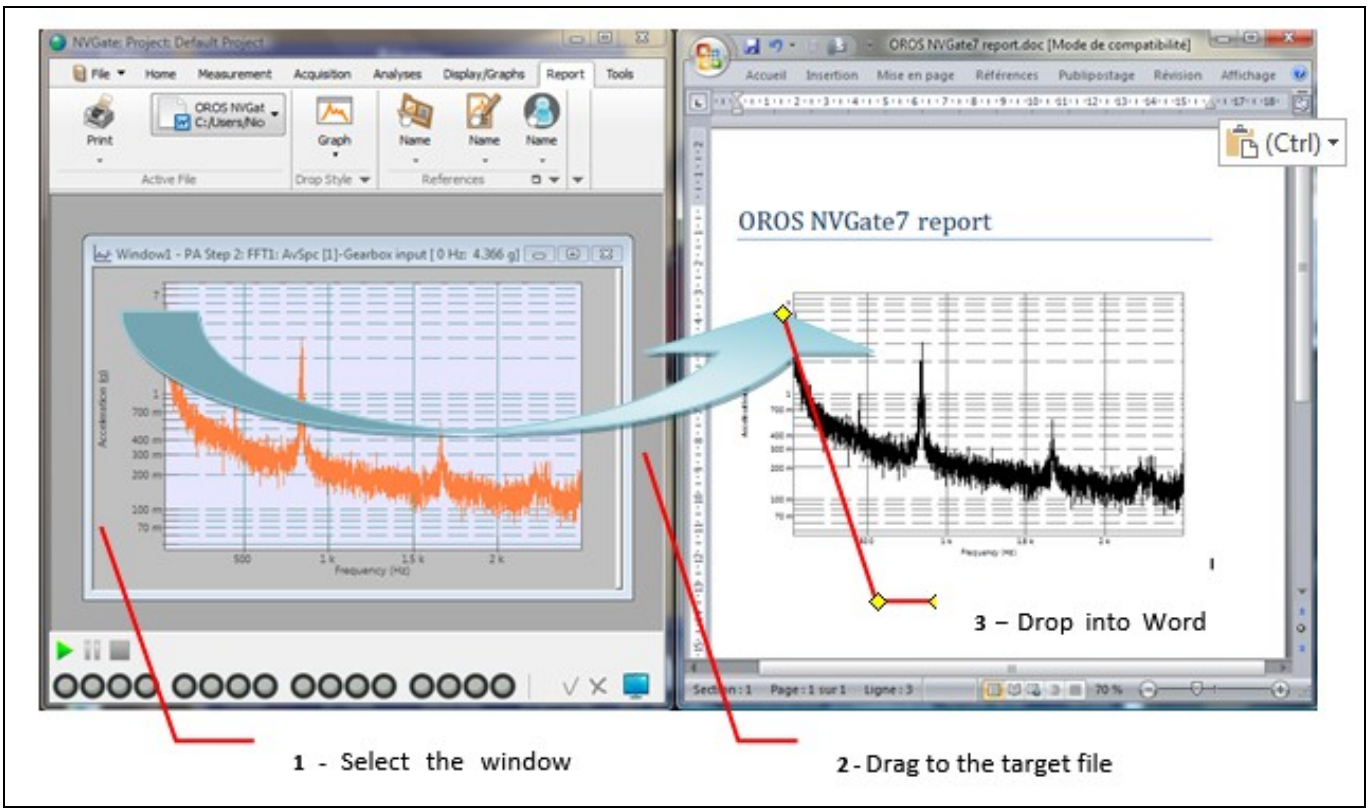
NVGate items are identified by a tag in the template. The tags are editable in Excel cells, hidden text in Word (apply the ¶ mode to see the tags).

It?s better to work in ¶ mode while doing the report to avoid any drag and drop inside a tag.

111.2.1.2.2 Deposit NVGate items

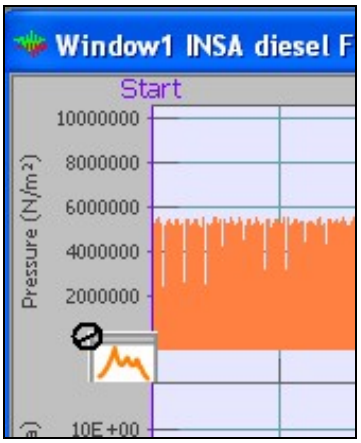
The reporting operations are based on the use of Drag & Drop; Select an item from NVGate and drop it into the template. The software will add a TAG in the target file and then update it with the corresponding NVGate data.

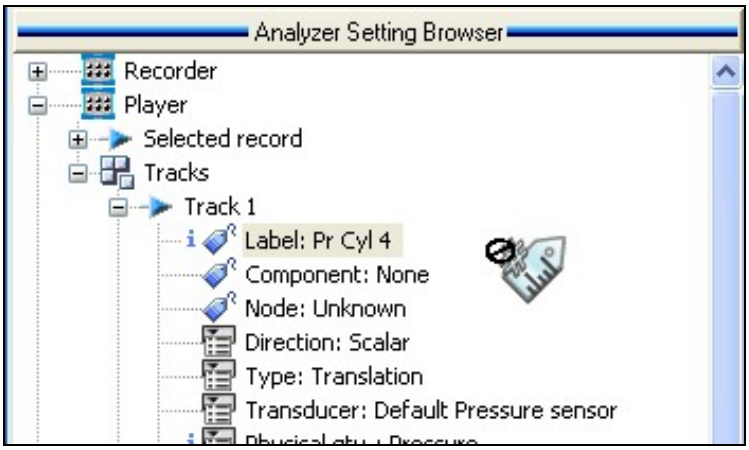
To add a graphical result(s) into a Word document, click on the corresponding window area (grey area), then drag & drop it at the chosen location in the template:



While selecting an OROS Item for reporting, an icon is displayed on the cursor to confirm:

- this item is droppable in the report,
- the used format (drop style) in the report





Obviously, any text, image, table, link can be used in the template to enrich the report with results interpretation, corporate data, and others.

We can, for example, create a table in the Word document in order to insert the sensors identification.

With tags:

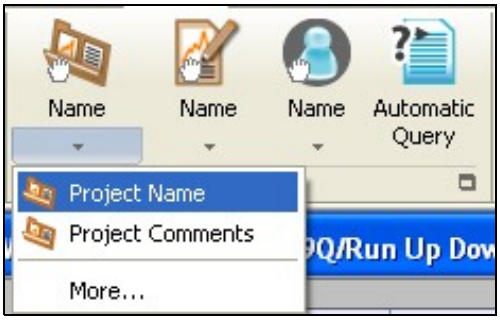
Equipment:¶

Sensor·Label¤	Transducer·type¤	Sensitivity¤	¤
[NVGate·Setting·4·431·1·Label·Value·Unit]Label·Pr·Cyl·4[/]¶¤	[NVGate·Setting·4·431·369·Label·Value·Unit]Transducer·Default·Pressure·sensor[/]¶¤	[NVGate·Setting·4·431·366·Label·Value·Unit]Sensitivity·1E+00·(V)/(N/m²)[/]¶¤	¤
[NVGate·Setting·4·432·1·Label·Value·Unit]Label·Mic·Amb[/]¶¤	[NVGate·Setting·4·432·369·Label·Value·Unit]Transducer·Default·Microphone[/]¶¤	[NVGate·Setting·4·432·366·Label·Value·Unit]Sensitivity·1E+00·(V)/(Pa)[/]¶¤	¤
[NVGate·Setting·4·433·1·Label·Value·Unit]Label·Acc·palier·3·V[/]¶¤	[NVGate·Setting·4·433·369·Label·Value·Unit]Transducer·Default·Accelerometer[/]¶¤	[NVGate·Setting·4·433·366·Label·Value·Unit]Sensitivity·1·(V)/(m/s²)[/]¶¤	¤
[NVGate·Setting·4·434·1·Label·Value·Unit]Label·Tach[/]¶¤	[NVGate·Setting·4·434·369·Label·Value·Unit]Transducer·Default·Tachometer[/]¶¤	[NVGate·Setting·4·434·366·Label·Value·Unit]Sensitivity·1·(V)/(Hz)[/]¶¤	¤

Without tags:

Equipment:

Sensor Label	Transducer type	Sensitivity
Label Pr Cyl 4	Transducer Default Pressure sensor	Sensitivity 1E+00 (V)/(N/m²)
Label Mic Amb	Transducer Default Microphone	Sensitivity 1E+00 (V)/(Pa)
Label Acc palier 3 V	Transducer Default Accelerometer	Sensitivity 1 (V)/(m/s²)
Label Tach	Transducer Default Tachometer	Sensitivity 1 (V)/(Hz)



In addition to the actual measurement setup and result data, a measurement must be identified and detailed by meta-data (project name, measurement name, date, comments and properties.). The References group provides such information to be inserted in the report.

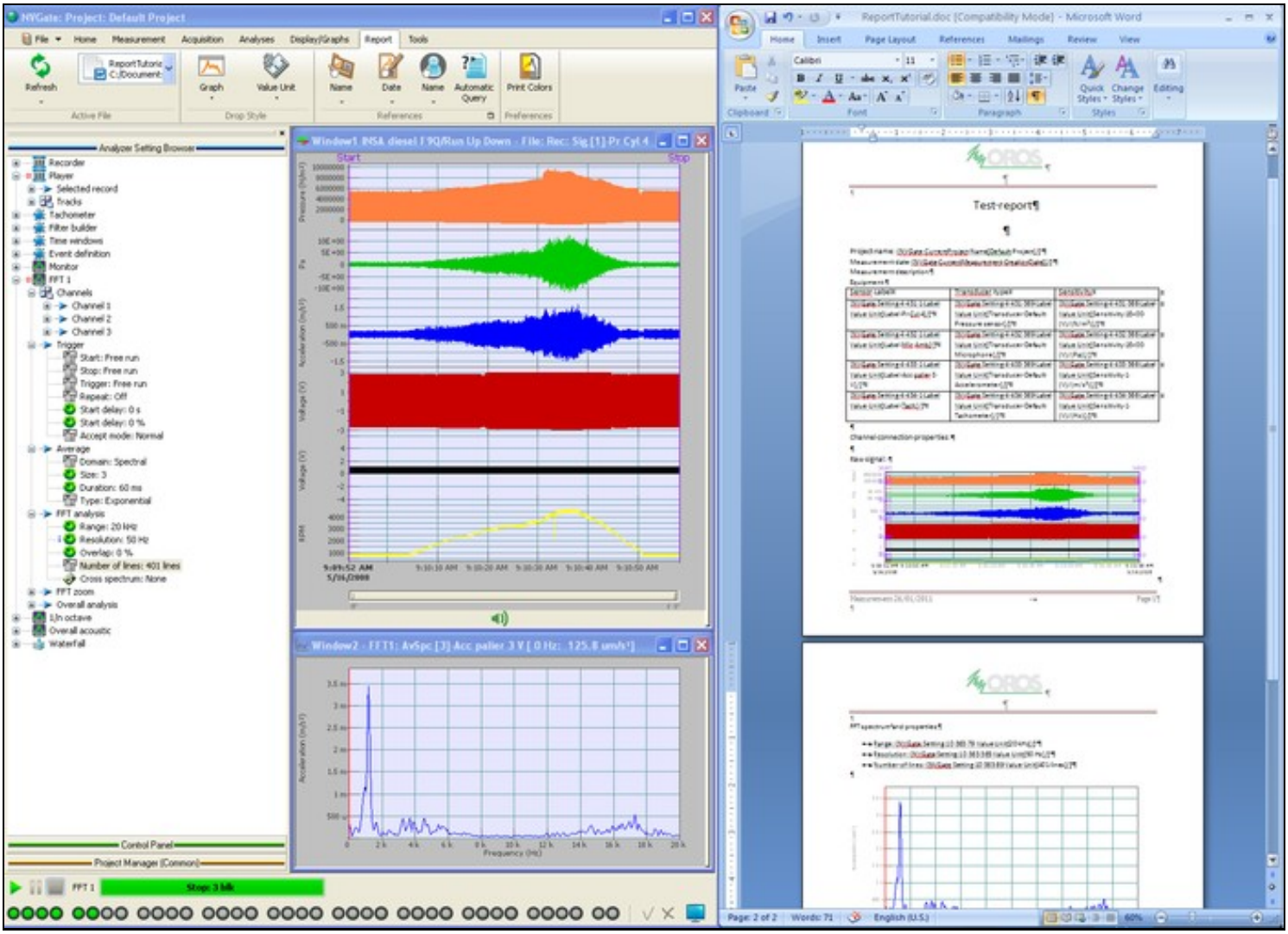
Drag and drop these items directly from the group.

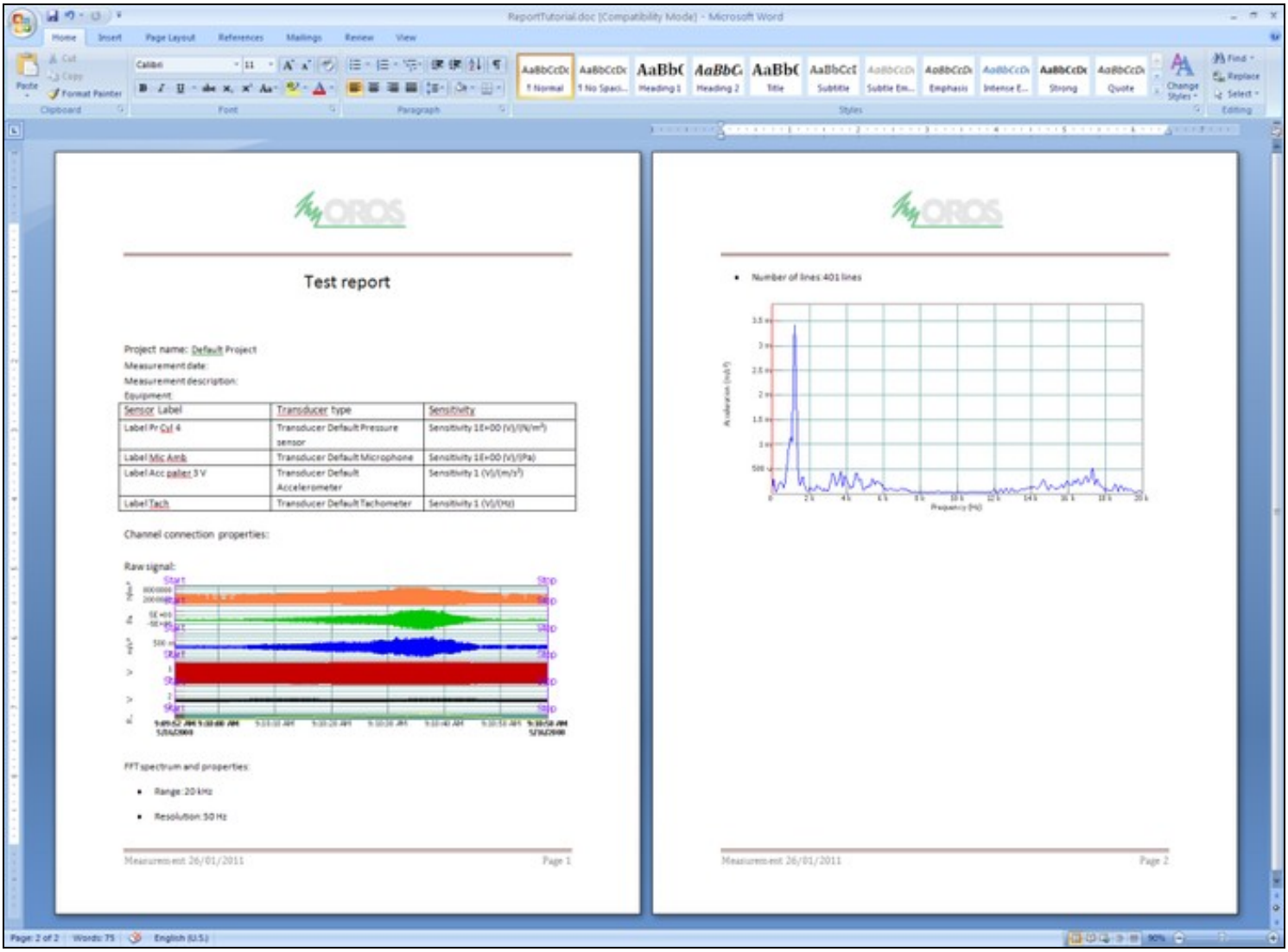
Select More to see the whole set of properties

111.2.1.2.3 Example of template:

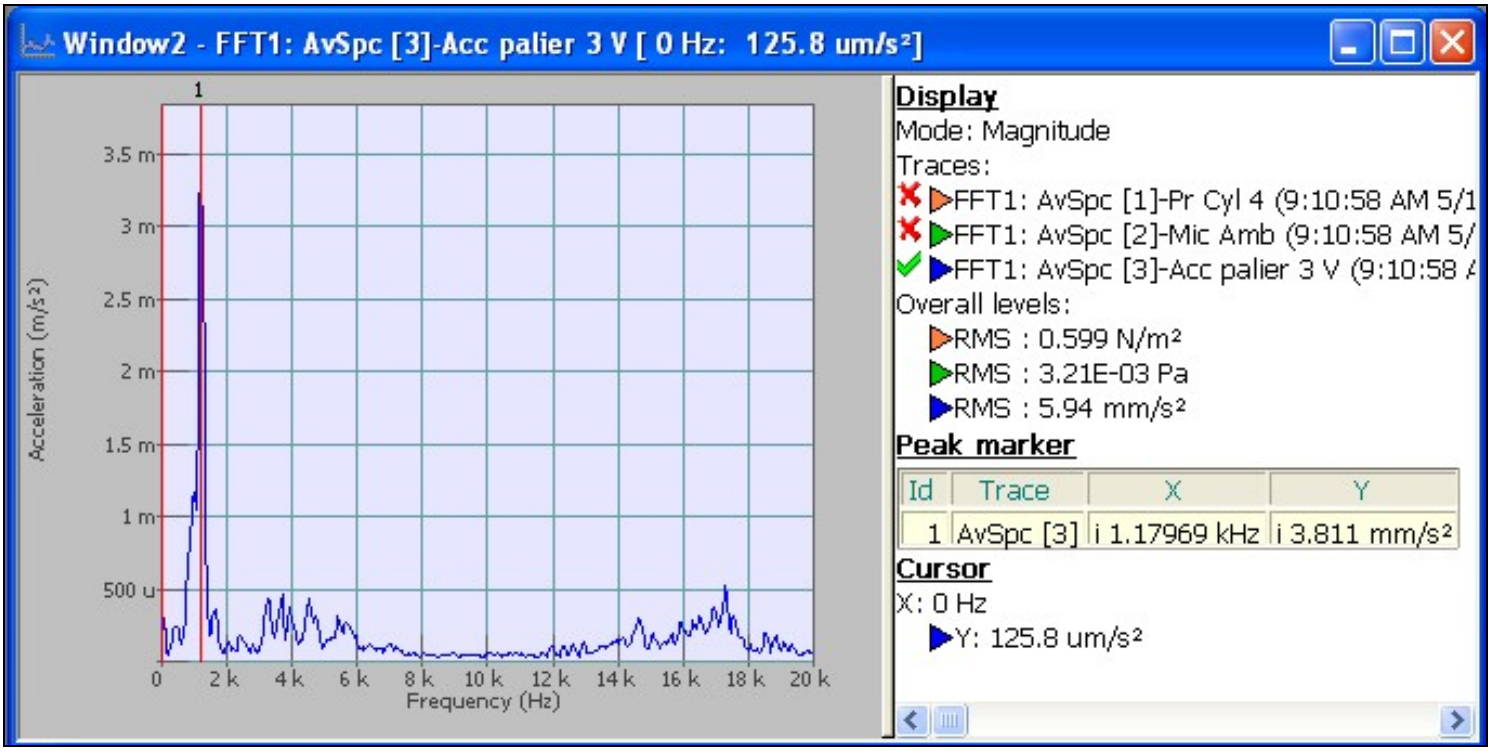
In the first lines, the Project name and date were inserted. Then a table with all sensors specifications was added.

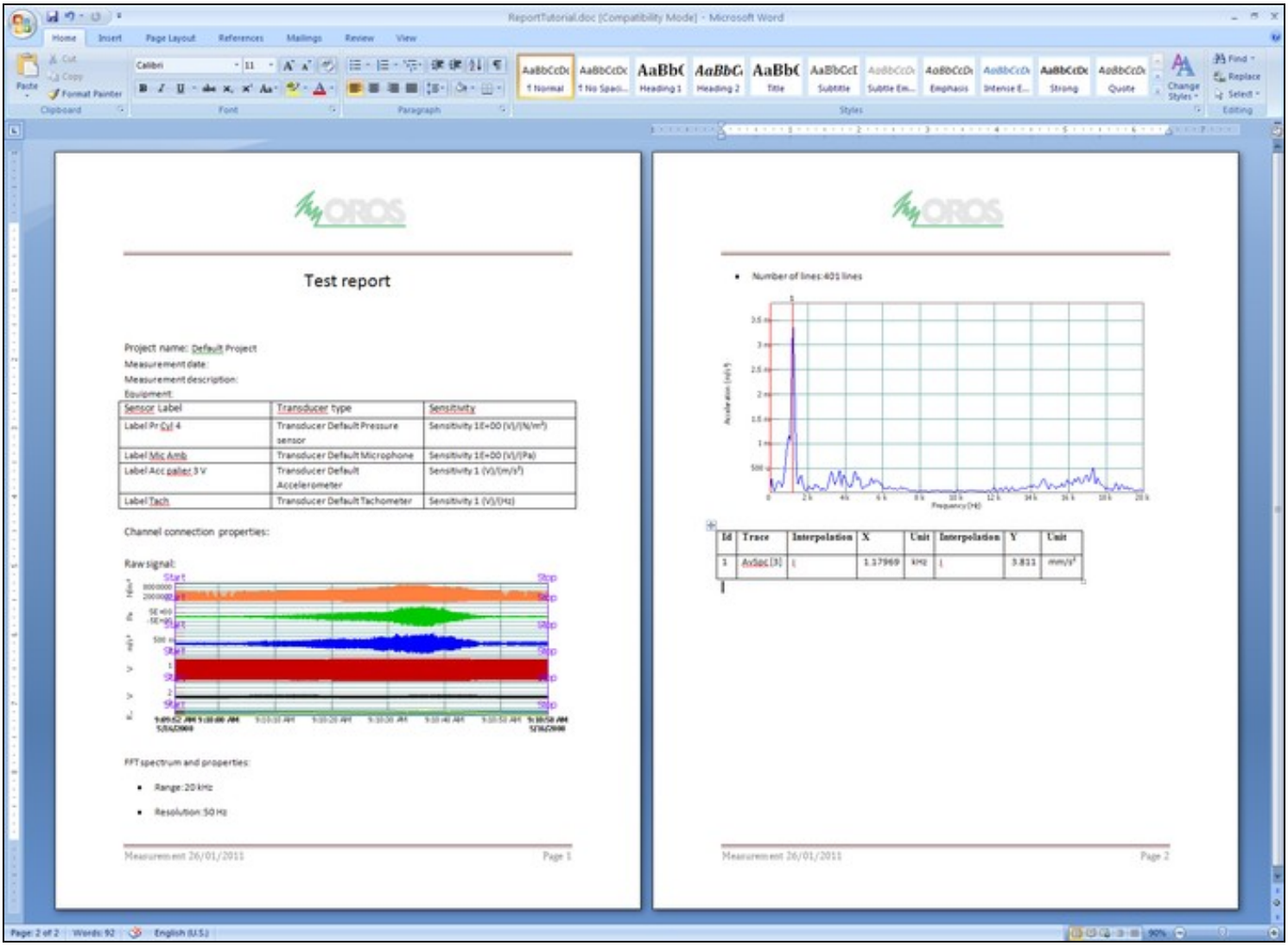
A drag and drop of the time signal was done. After post-analyzing the time signal, a FFT spectrum was displayed in NVGate and finally dragged and dropped in the template with some FFT settings (frequency range, resolution and number of lines).


NVGate: Project: Default Project
Test report
Page: 2 of 2


ReportTutorial.doc [Compatibility Mode] - Microsoft Word
Test report
Project name: Default Project
Measurement date:
Measurement description:
Equipment:
Sensor Label
Transducer type
Sensitivity
Label Pr Cyl 4
Transducer Default Pressure sensor
Sensitivity 1E+00 (V)/(N/m²)
Label Mic Amb
Transducer Default Microphone
Sensitivity 1E+00 (V)/(Pa)
Label Acc palier 3 V
Transducer Default Accelerometer
Sensitivity 1 (V)/(m/s²)
Label Tach
Transducer Default Tachometer
Sensitivity 1 (V)/(Hz)
Channel connection properties:
Raw signal:
FFT spectrum and properties:
Range: 20 kHz
Resolution: 50 Hz
Measurement 26/01/2011
Page 1
Number of lines: 401 lines
Measurement 26/01/2011
Page 2

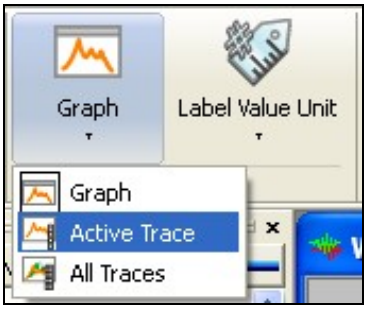
You can also put markers on graphs and display the Marker table by drag and drop from the infotrace.

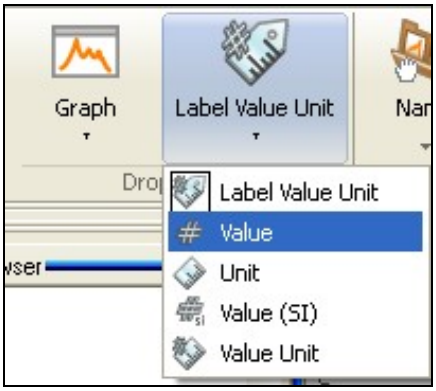



ReportTutorial.doc [Compatibility Mode] - Microsoft Word
Test report
Project name: Default Project
Measurement date:
Measurement description:
Equipment:
Sensor Label
Transducer type
Sensitivity
Label Pr Cyl 4
Transducer Default Pressure sensor
Sensitivity 1E+00 (V)/(N/m²)
Label Mic Amb
Transducer Default Microphone
Sensitivity 1E+00 (V)/(Pa)
Label Acc pallet 3 V
Transducer Default Accelerometer
Sensitivity 1 (V)/(m/s²)
Label Tach
Transducer Default Tachometer
Sensitivity 1 (V)/(Hz)
Channel connection properties:
Raw signal:
FFT spectrum and properties:
Range: 20 kHz
Resolution: 50 Hz
Measurement 26/01/2011
Page 1
Number of lines: 401 lines
Id
Trace
Interpolation
X
Unit
Interpolation
Y
Unit
3
Avtec [3]
1.17969
kHz
3.811
mm/s²
Measurement 26/01/2011
Page 2

111.2.1.2.4 Data format

In the Drop Style group, you can define the format of the data in the report file. Indeed, analysis results can be exported as data or graph as well as a setting format includes its name or units.





Note: advise not to use the **Active Trace** or **All Traces** for narrow band spectra within Word documents. It leads to a long process into Word.

111.2.1.2.5 Refresh

The refresh function is used to update the file.

You can resize the graph in the report. Even if the graph seems to be distorted, this is easily solved with the Refresh function.

111.2.1.3 Printing a report

Generating a report consists on the following operations:

1. **Select a template** (or target file)

2. **Update** its content with NVGate measurements

3. **Save** or **print** the report

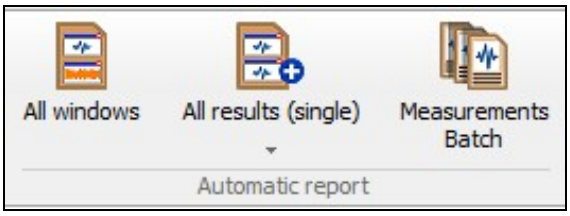
The *Automatic report* group makes the 1, 2 and 3 steps automatically.

The report templates are built up with the *Reports* tab, and then the report generation is available from the *Measurement* and *Reports* tabs.

111.3 Settings

111.3.1 Automatic report tools

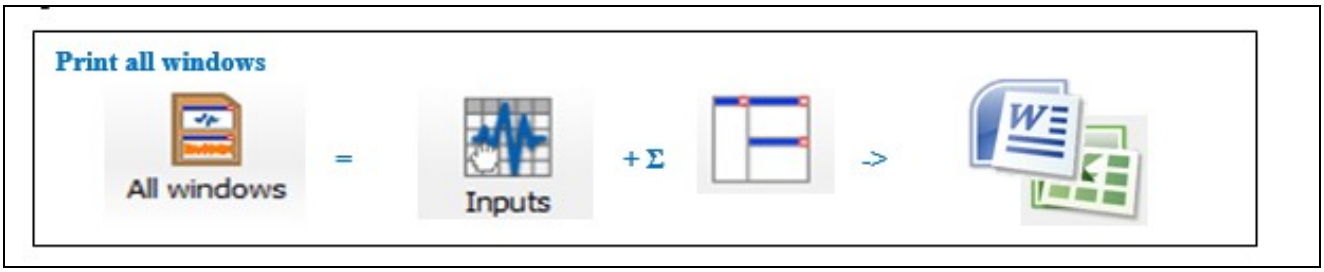
The *Automatic report* group is located the left side of the R*eport* ribbon.



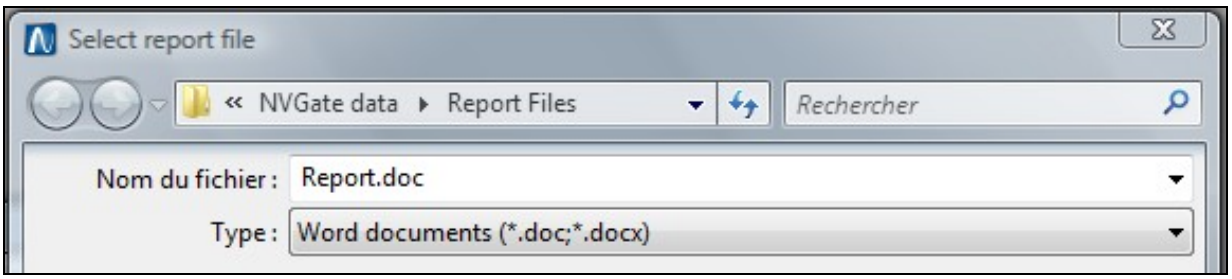
It features 3 fully automated report generations and a batch function for multiple measurements reports

111.3.1.1 Print all windows

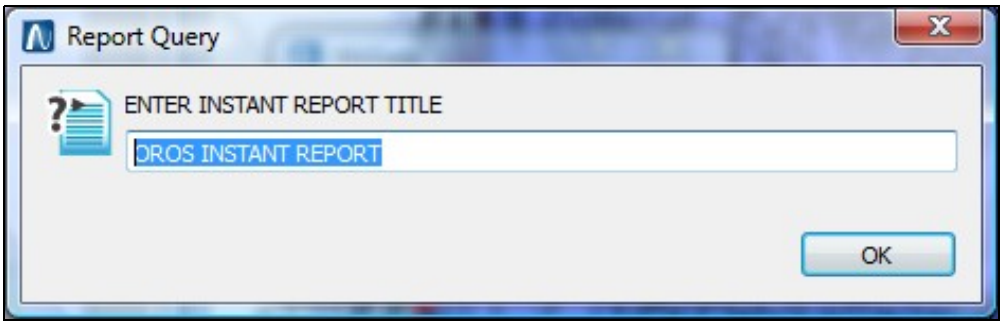
This function allows printing all the displayed graphs in a comprehensive report, without requiring setup any template. Simply press the *All windows* button to get your data plotted in a word file.



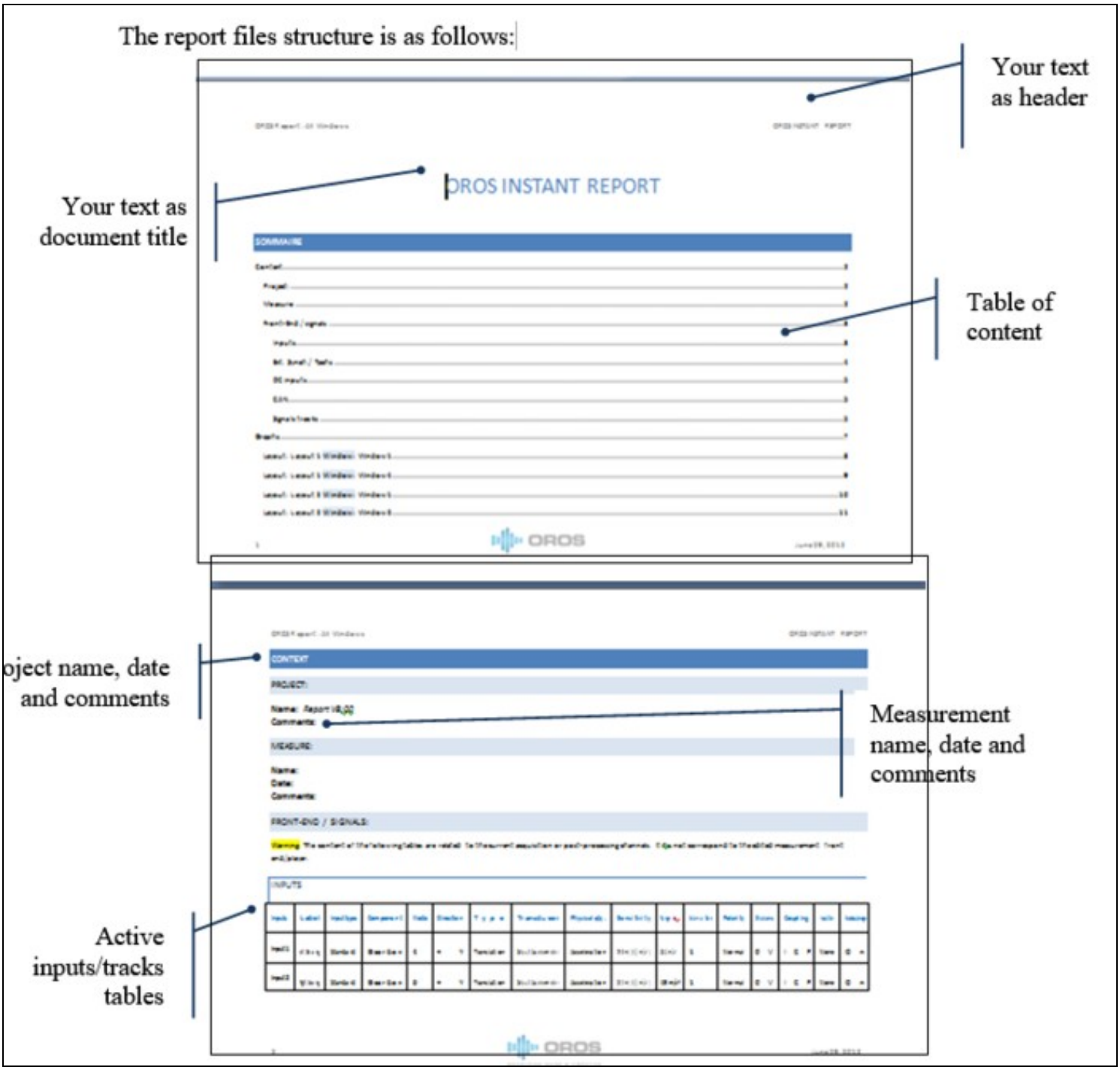
First, a location and name are requested for the report file.



Secondly, the title of the report is requested. This text is displayed as the file title and in the header



The report files structure is as follows:



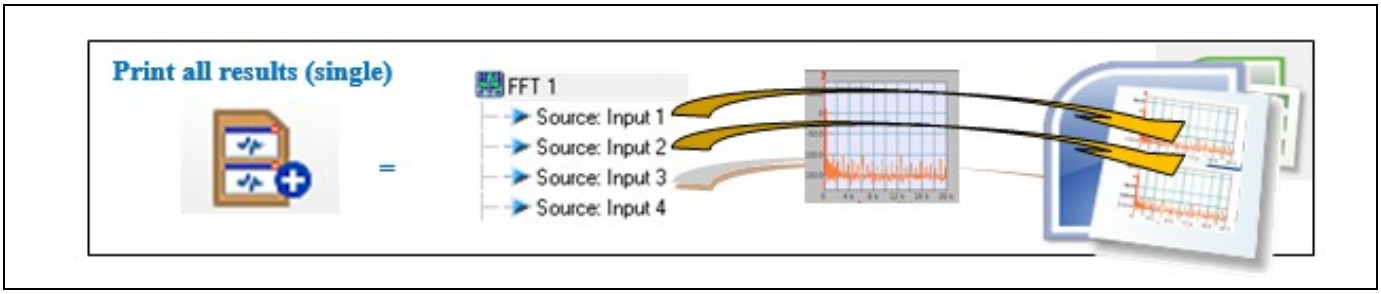
Then for each existing *Layout*,

for each opened *Window*s, the following page is appended:



Print all results (single)

This function allows printing all channel results in a comprehensive report, without requiring the setup of any template. The procedure is the same as the *All windows* report.



This function is useful for multi-analysis and multi-channel measurements report. It generates automatically a report with all the acquired and analyzed data. The user select the type of result to be printed be displaying at least one of the results in one layout of the current setup.

The function scans each layout to get the plug-in (FFTx, SOAx, OCT?) and the result type (Spectrum, RMS, trigger block?) of the first trace in each window (reference trace). Then it plots the same result type for each channel of the corresponding plug-in.

As an example working with inputs 1 to 8 connected to FFT and recorder with the following layouts:

Layout 1

Window 1: Front-end RMS input 1 to 8

Window 2: Recorded signal input 4 and 8

Layout 2

Window 1: FFT Average spectrum input 1

Window 2: FFT Trigger bloc input 1

The *All results* automatic report will print the following graphs:

Layout 1: Window 1 RMS level: Inputs 1 to 8 (8 plots)

Layout 1: Window 2 Recorded signal: inputs 1 to 8 (8 plots)

Layout 2: Window 1 FFT avg. spectra: inputs 1 to 8 (8 plots)

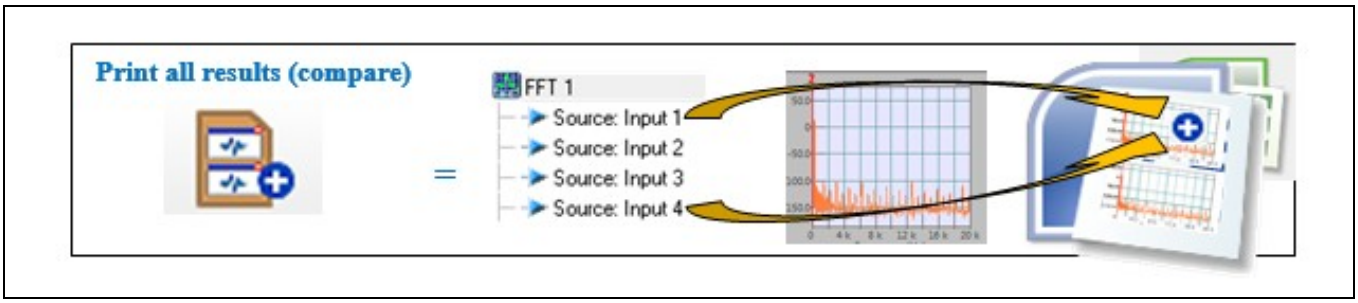
Layout 2: Window 2 FFT Trigger bloc: inputs 1 to 8 (8 plots)

The format of the reference trace is applied to each corresponding plot. In the case of cross function the reference trace will be used as the reference for each result (FRF, Coherence, etc.)

Note: the report format is the same as the *All windows* one

111.3.1.1.1 Print all results (compare)

The compare version of the print all result function allows comparing every measured results with a reference one.



In this case the reference trace will remain displayed while the other results are plotted within the same graph. This method scans the result exactly as the single version except it shows 2 traces per graph in the report.

111.3.1.1.1.1 Considerations for All windows and All results(x) automatic reports

The report generation is based on the content of the saved workbook. If your workbook has been changed without saving it (CTRL+D or Save project) the content of the report file will reflect the last saved workbook content.

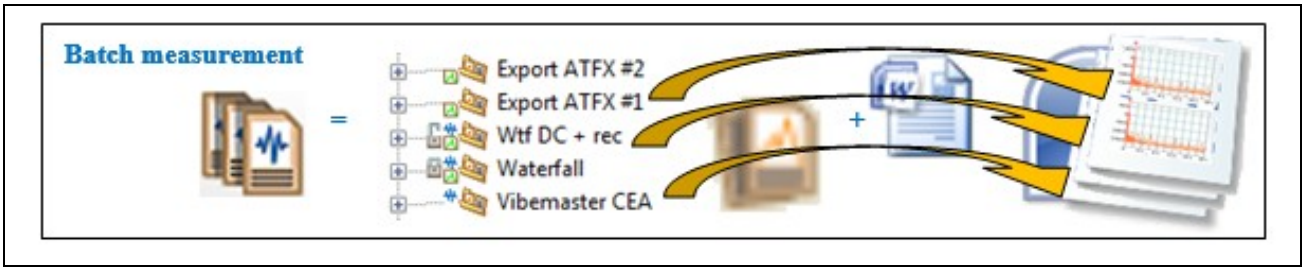
The report is based on predefined templates. You may adapt these templates in order to change contents (ex: your company logo, or add specific setting or marker).

The original templates are located in the *NVGate installation directory* \ *Template library*. Copy the corresponding folder (All windows or All results) from this directory and paste it in the *NVGate Data*\ *template library*. The pasted file will be taken in account instead of the original ones.

The report generated with these methods may be updated from the NVGate GUI: Open the report file, select it from the report\active file group in NVGate and press *Refresh* button.

111.3.1.1.2 Batch measurement

The *Batch measurement* function allows printing all the saved results of a set of similar measurements. It is adapted to the exploitation of measurement campaigns. The batch measurement report is also used to format a set of measurements with the same presentation layouts.



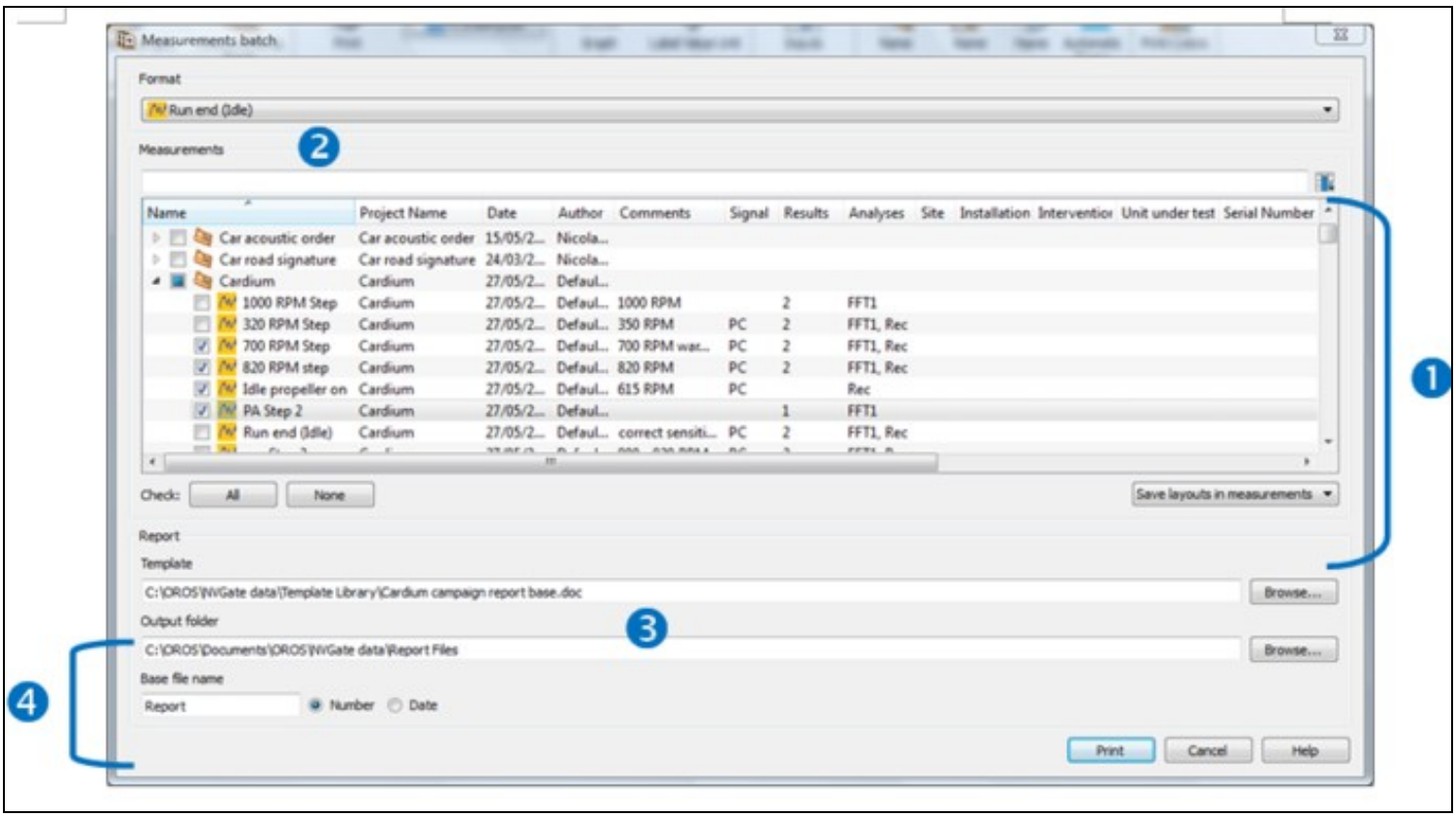
The inputs are:

- A set of saved measurements
- A reference layouts
- A Word?/Excel? template

The **first operation** consists of setting up one measurement in order to **adjust the graphs format**. Select one measurement and modify/enrich the layouts: graphs, scales, markers, windows/layout name, comments and properties. Click on *Home/Start/Edit measurement* button and save the edited measurement.

Secondly, create a Word? template which fits the edited measurement. See the [Reference manual Vol. 3 Reports, Tools & ribbons] for instructions.

Third, select the measurements to be printed. Click on the *Report/Automatic reports/Measurement batch* button. The batch report selection dialog is showed (NB: it may take a few second to display if your project manager contains lot of projects/measurements).



This Dialog is divided in 3 areas, one for each input parameters and one for the output files

1. The selection of *measurements* to be printed selection.

2. The format to be applied on the processed measurement data (*Layouts* of a measurement from the Project manager)

3. The Word? *template* to use for each generated report

4. The output options; directory and file name.

Last, print the reports. By selecting "*Save layouts in measurements*" each processed measurement will be updated with the format layouts. When these measurements are edited, the graph presentation is then homogeneous and corresponds to the report contents. By selecting "*Discard layouts from measurements*" the measurement layout are not modified.

111.3.1.1.2.1 Data selection

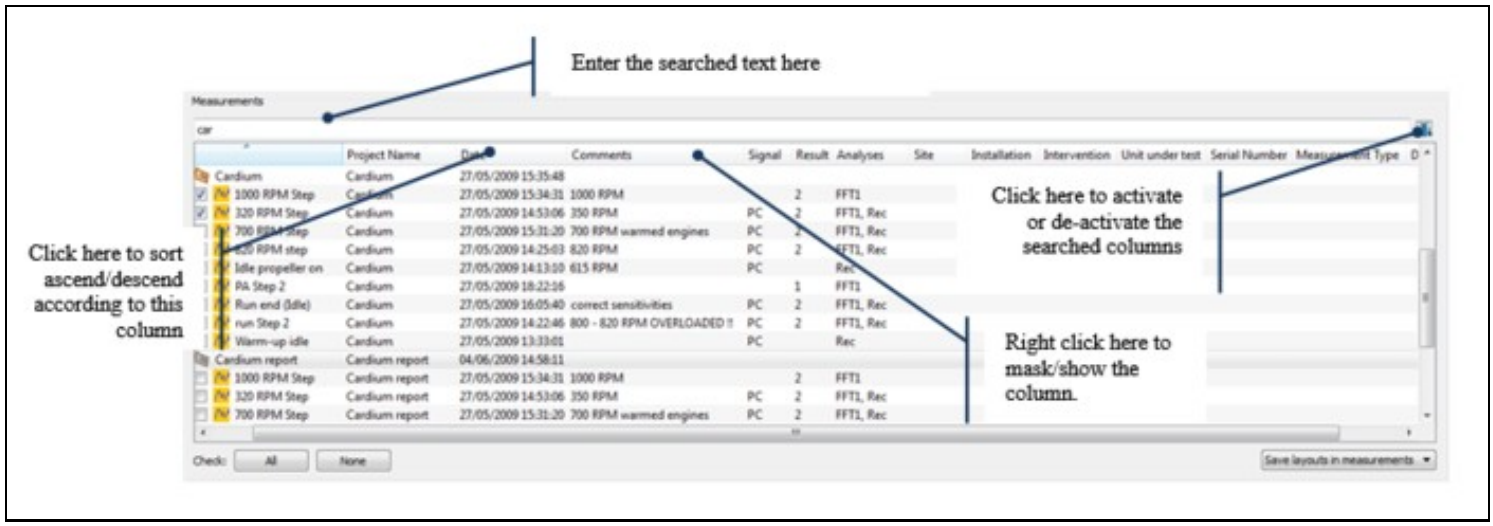
The measurements selection is helped by a search engine which filters the project manager measurements according to their properties.

The "measurement" frame reflects the project manager content. It is possible to expand or collapse the projects. The displayed measurements correspond to the following criteria:

- One of the active properties matches the search text,
- The measurement is already selected.

It is then possible to make mixed selection from various criteria. The properties are activated/deactivated (i.e. included in the search process) by selecting it with the button at the right of the search text.


It is also possible to mask/show the properties columns by right clicking on the header. The column order can be changed by drag and dropping one column to its new location.



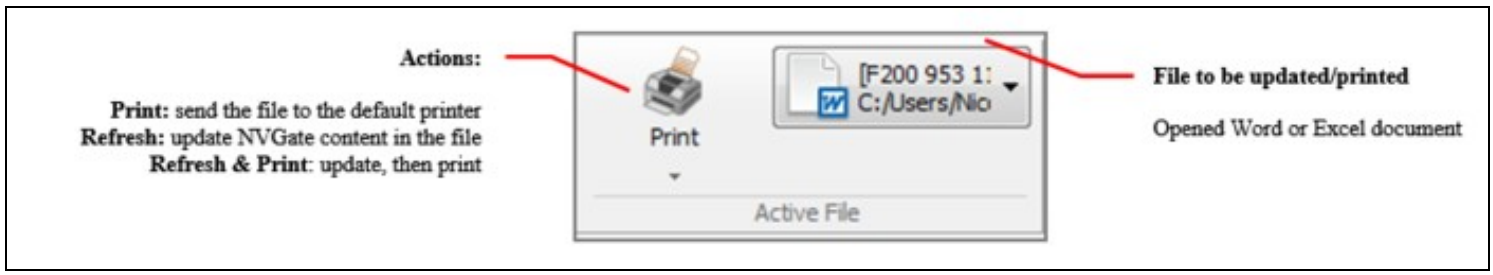
The measurements are sorted by column content (alphanumerical sort) by left clicking on the column header.

111.3.1.1.3 "Active File" group

This group is used to select which file will be used for report and to update/print it.

The file must be opened and one of the following; Word or Excel (2003, 2007 and 2010).

To select the file, move the mouse over the File selection combo-box, the software will check the opened file on the computer a fill up the list. It is then possible to select the working template.

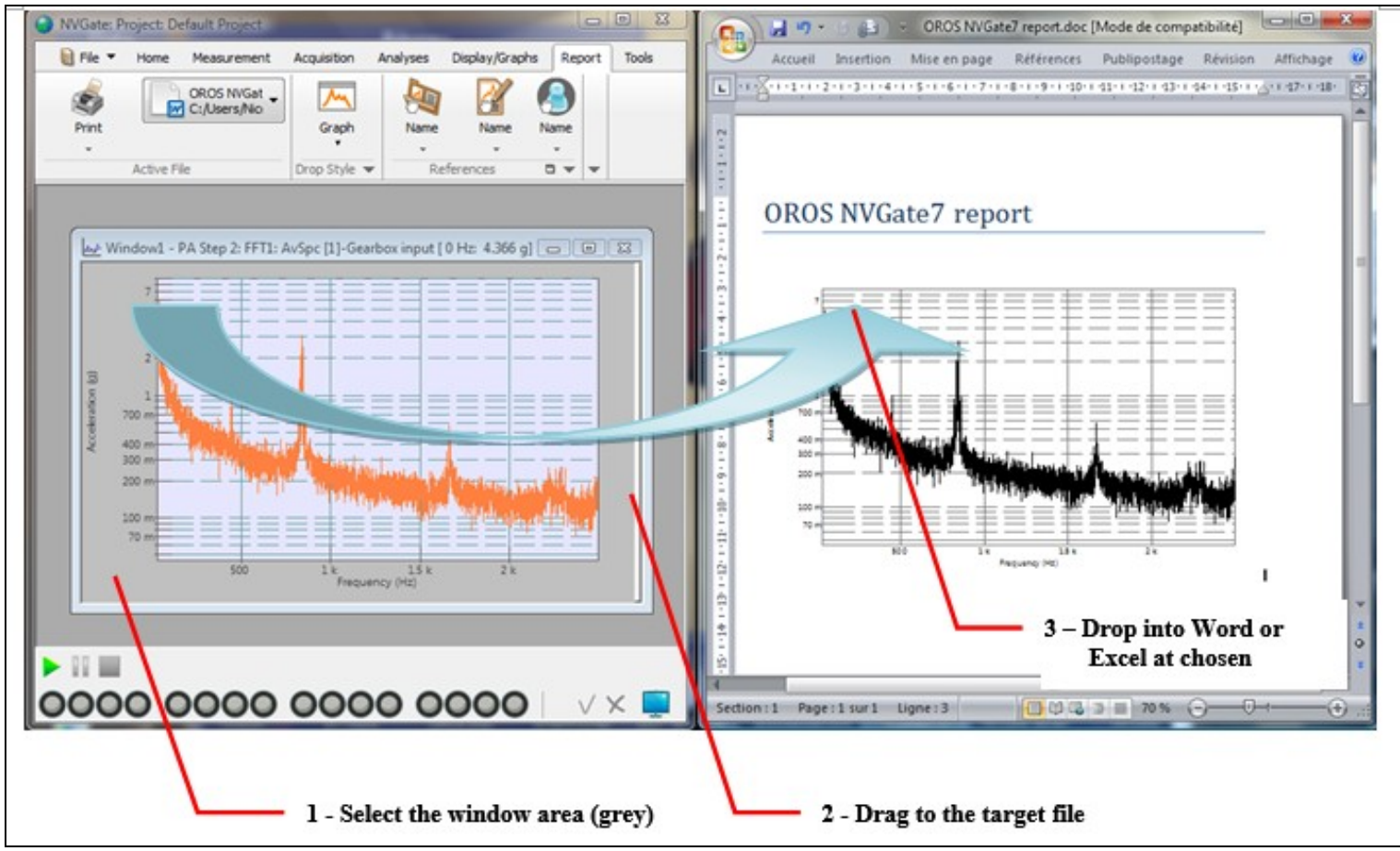


Building up a template

The *Reports* tab and others parts of the NVGate GUI are available to create a template or even to update an existing one for your reports.

The operations are based on the use of Drag & Drop; Select an item from NVGate and drop it into the template. The software will add a TAG in the target file and then update it with the corresponding NVGate data.

Example: To add a graphical result(s) into a word document, click on the corresponding window area, then drag & drop it at the chosen location in the template:



While selecting an OROS Item for reporting, an icon is displayed on the cursor to confirm:

- this item is droppable in the report,
- the used format (drop style) in the report

Any text, image, table, link can be used in the template to enrich the report with results interpretation, corporate data, and others.

NVGate items are identified by a tag in the template. The tags are editable in Excel cells, hidden text in Word (apply the mode to see the tags) or replacement text for the images (select image format and then replacement text).

Example of tags:

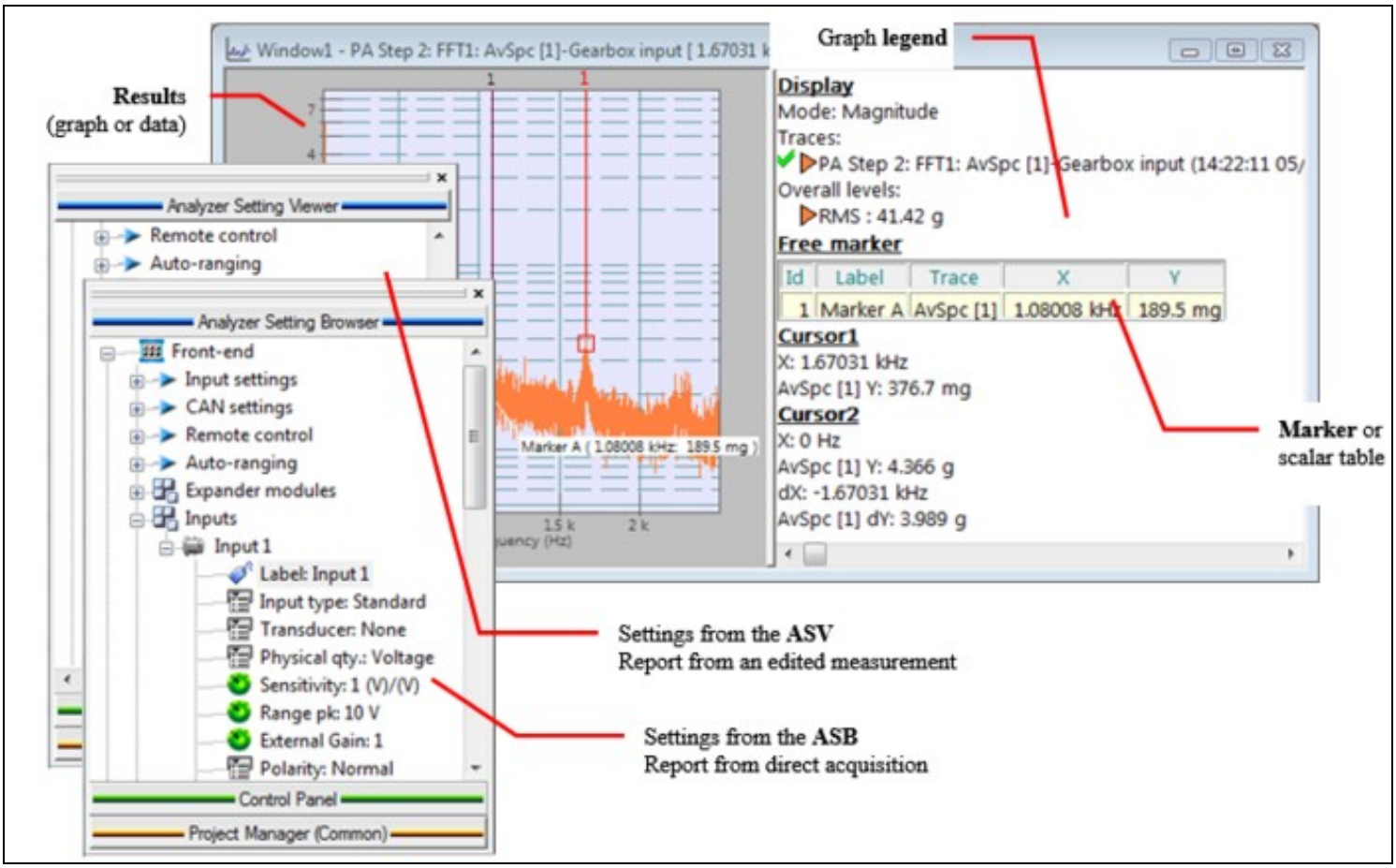
- ***[NVGate Graph Layout1 Window1]*** ***For a window***
- ***[NVGate Data ActiveTrace Layout1 Window1]Table[/]*** ***For a result dataset***
- ***[NVGate Setting 1 1 3 Label Value Unit]****Range pk 10 V*[/] ***For a setting***
- ***[NVGate CurrentMeasurement Comments]*****My comments here** [/] ***for a measurement comment.***

The tag must be kept complete i.e: the last part: **[/]** has to remain associated to the tag without carriage return between except for the multi-line reports. As soon as data are deposited in a template their format is 100% free. Size, color, font, location, insertion, etc? can be changed to ensure a coherent page setup with existing document or complies with a company charter.

Removing the tags will definitely remove the link between NVGate and the template (i.e. the item content is no more refreshed)

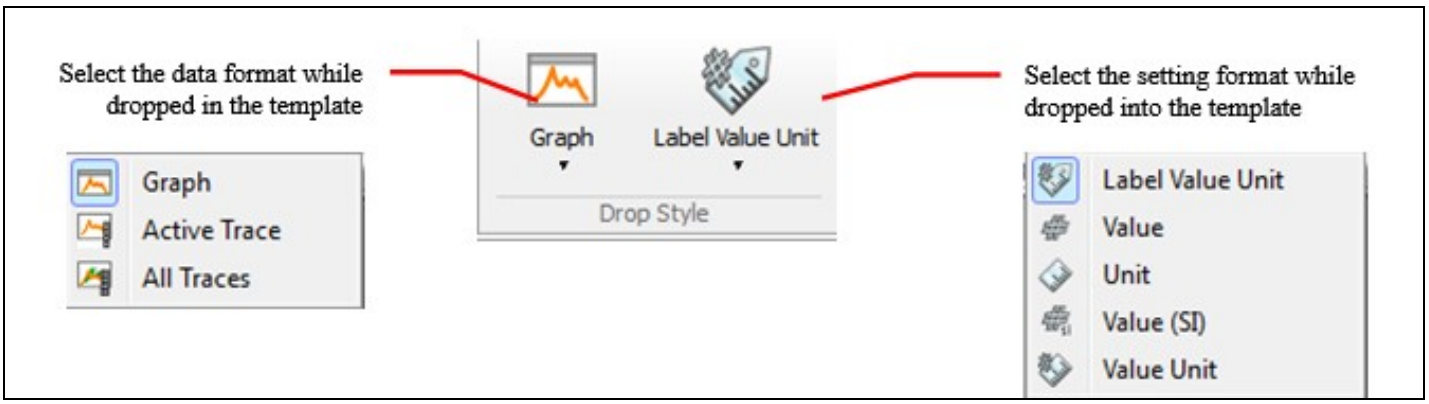
111.3.1.1.4 Available items for report

Most of the information that can be added to a template comes from the NVGate windows and analyzer setting trees (ASB and ASV). Drag & drop the selected Item to the target file in order to add the corresponding tag (and refreshable data) to the template.



111.3.1.1.5 "Drop style" group

This group allows defining the format of the data in the report file. Indeed, analysis results can be exported as data or graph as well as a setting format includes its name or units.



111.3.1.1.5.1 For results

- ***Graph*** will deposit an image of the dragged windows in the same way as the "copy/paste graph"
- ***Active Trace*** will deposit a table that contains the active trace data (X and Y) in the same way as the "copy/paste data/active trace"
- ***All Traces*** will deposit a table that contains all traces data (X and Y1, Y2, Yn?)

Note: advise not to use the ***Active Trace*** or ***All Traces*** for narrow band spectra within Word documents. It leads to a long process into Word.

111.3.1.1.5.2 For settings

- ***Label/Value/Unit*** will deposit the dragged setting in the described format. E.g: for the sensitivity of a channel;
- Label = Sensitivity (depending on the NVGate language)
- Value = 10m

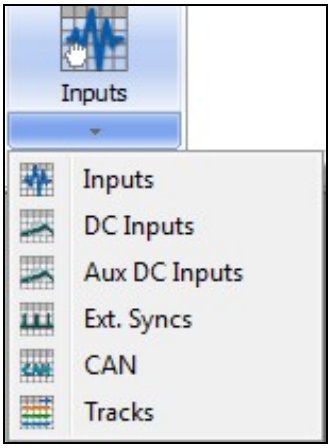
- Unit = V/g (depending on the active preferences)
- ***Value (SI)*** will deposit the dragged setting value in the SI units (m, A,V, s, etc?). This options force the value to be expressed in SI.

The settings export is useful to build tables for the front-end or analyses setting in the report. Example:

Input #	Label	Sensitivity	Transducer
1	*Body Top Acc*	*10 mV/g*	*PCB 35456*
2	*Cyl 1 pres*	*500 nN/m²*	*PRS 33*
Ext 1	*Torsion shaft1*	*1024 pulses/rev*	*OROS tach.*

Filled by NVGate reporting

111.3.1.1.5.3 For front-end

- 

The Identifiers drop down button allows choosing one of the front-end input categories and deposit the corresponding table of settings in the report. Available tables are:

- Dynamic Inputs: **Inputs**
- Parametric inputs: **DC** and **Aux DC inputs**
- Trigger/Tach.: **Ext. Synch** (including the Aux ones)
- **CAN** parameter
- **Player tracks** (include all inputs categories)

The tables are filled in the report only if content exits (i.e.: the corresponding inputs or tracks are activated). If there is no corresponding content, the table is not visible.

The result will be as follows:

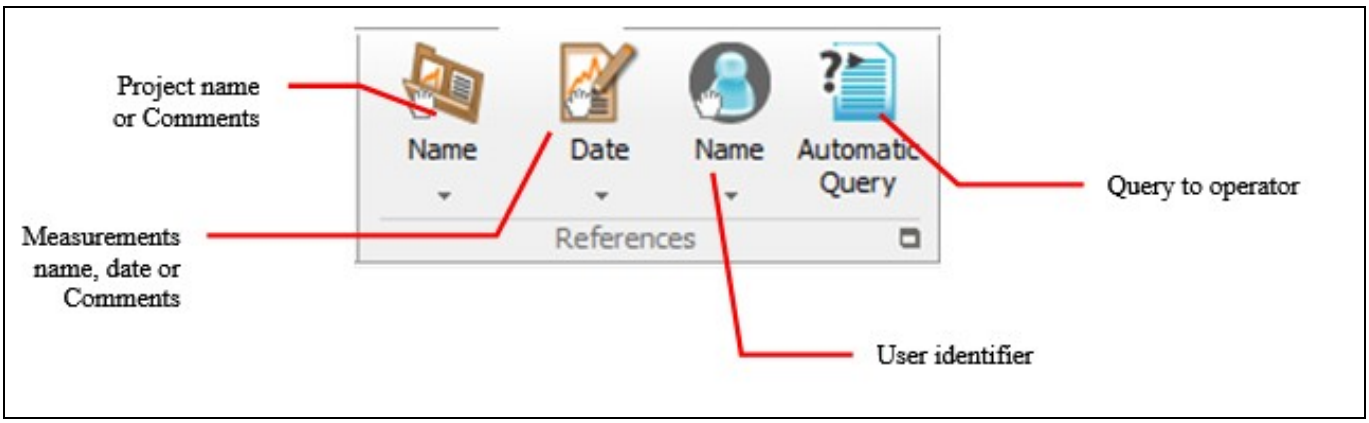
Inputs	Label	Input type	Component	Node	Direction	Type	Transducer	Physical qty.	Sensitivity	Range
Input 1	left Bearing	Standard	Gear box	4	+ Y	Translation	Default Accelerometer	Acceleration	198 m/(V)/(m/s²)	50.5 m
Input 2	Right bearing	Standard	Gear box	6	+ Y	Translation	Default Accelerometer	Acceleration	204 m/(V)/(m/s²)	49 m/

Note: you may adjust the table format into the report using the text orientation and adjustment for better results. OROS recommend using the landscape orientation for the report page which contains tables.

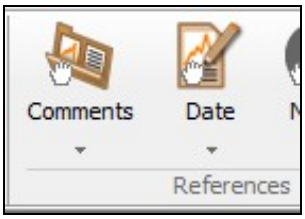
111.3.1.1.6 "References" group

In addition to the actual measurement setup and result data, a measurement must be identified and detailed by meta-data. This group provides such information to be inserted in the report.

The project and measurement identification allow locating the data in your computer or network. The date and comments remind the local context of the measurement. The user name is useful to check with the operator in case of misunderstanding.



111.3.1.1.6.1 Including properties in the reports



The report toolset of NVGate allows inserting the properties values in the reports.

The properties tags are made available from the Report/References/Project and Measurements buttons.

Select More? from the corresponding Item, the following dialog is displayed.

Simply drag & drop the selected item to the Word? or Excel? file in order to get the current project or edited measurement properties value updated in the report

By default the measurement and project contains predefined properties:

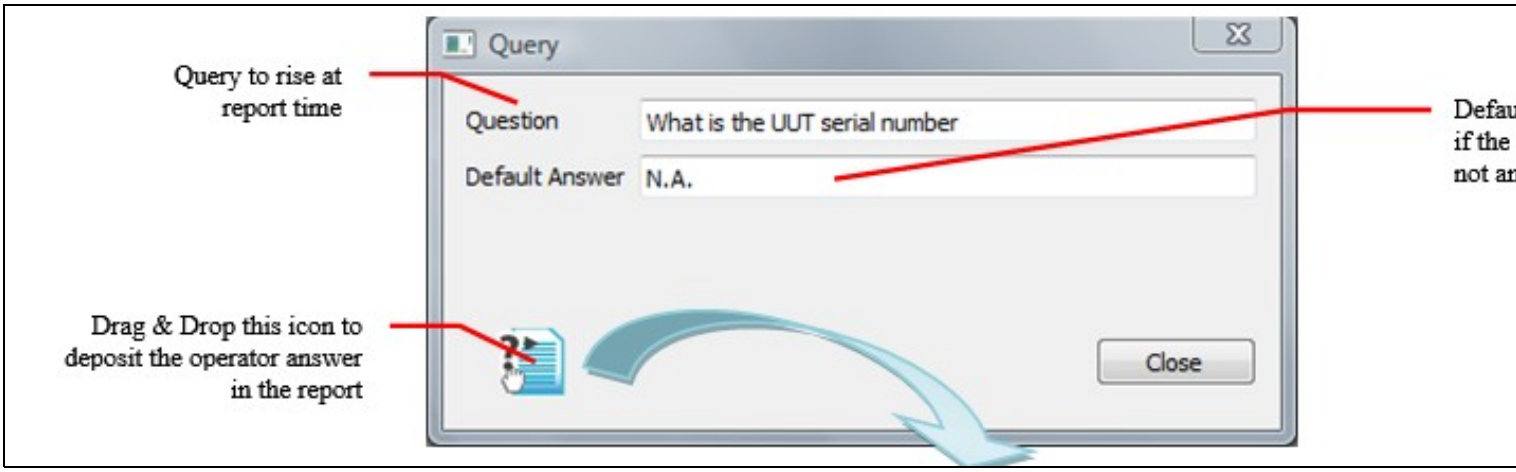
- The ***OROS*** properties are automatically filled by NVGate: Date, Author, Protection, Project name, Signal location and Number and type of saved results.
- The ***OROS user*** properties are already created by NVGate. Their values, but must be filled by the operator: Comments, Site, Installation, Intervention, UUT, Serial number, Measurement type and Default type

The **Users** properties are created and filled by the operator while saving or by editing the properties. Their availability in the reports depends on their creation on your computer.

111.3.1.1.7 Automatic query

Some information or data does not have a place to be saved in a noise and vibration analyzer (e.g: unit under test S/N or duration of warm up). For this purpose NVGate7 propose to insert systematic queries in the report process reports. When a query exists, it will be asked to the operator and its answer will be inserted in the report.

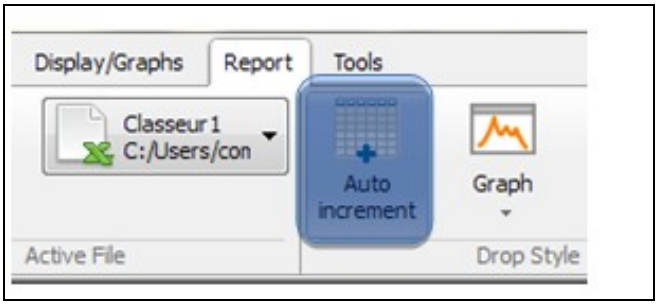
Operations: Click on the *Automatic query*, a dialog is displayed:



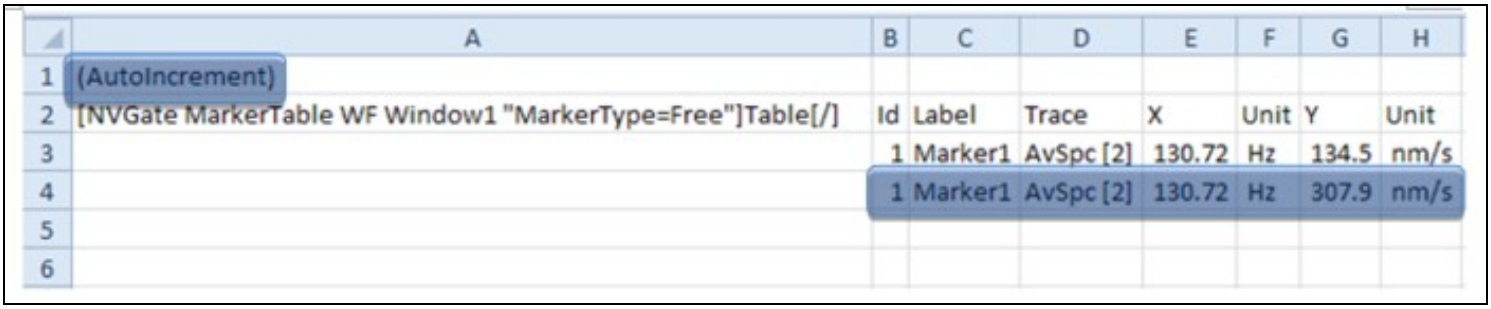
The query can be issued (dropped) in the report document as many time as required. The question will be raised only once for each different query.

111.3.1.2 Auto increment row on Reports

It is now possible to add multiple acquisitions in one report. Typically designed for test of components set or assembled parts; such as end-winding or production quality check, this new feature operates with Excel reports.



The basic idea is to increment the position of the results to the next empty row at each report refresh. For such purpose the standard report capabilities now offers an auto-increment row option. When this setting is activated the drag & drop tag in the report will include the auto-increment.



This function works with any item dropped to the Excel report (markers, data, graphs, settings, etc?).

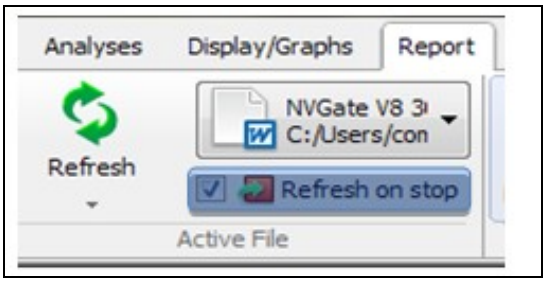
Getting the frequency, amplitude and phase of a set of components (bump test) is now fast and secured using the auto-incremented marker table coupled with a sequence for the identification data.

The following example fills the test report of an end-winding bump test. The remote control user field settings have been used for measurement identification (blade # & side). A sequence is activated to update these settings for each bump. A peak marker has been used to collect the frequency and amplitude of each bump test.

	Blade	Hide	Side	Hide	Hide	Hide	Freq	Unit	Amplitude	Unit
				(AutoIncrement)						
(AutoIncrement)		(AutoIncrement)		[NVGate Marker	Id	Trace				
[NVGate Setting 1 891 1	8	[NVGate Setting 1 891 1	A		1,000E+00	H1 [2]	2,50938	kHz	5,76	(g)/(N)

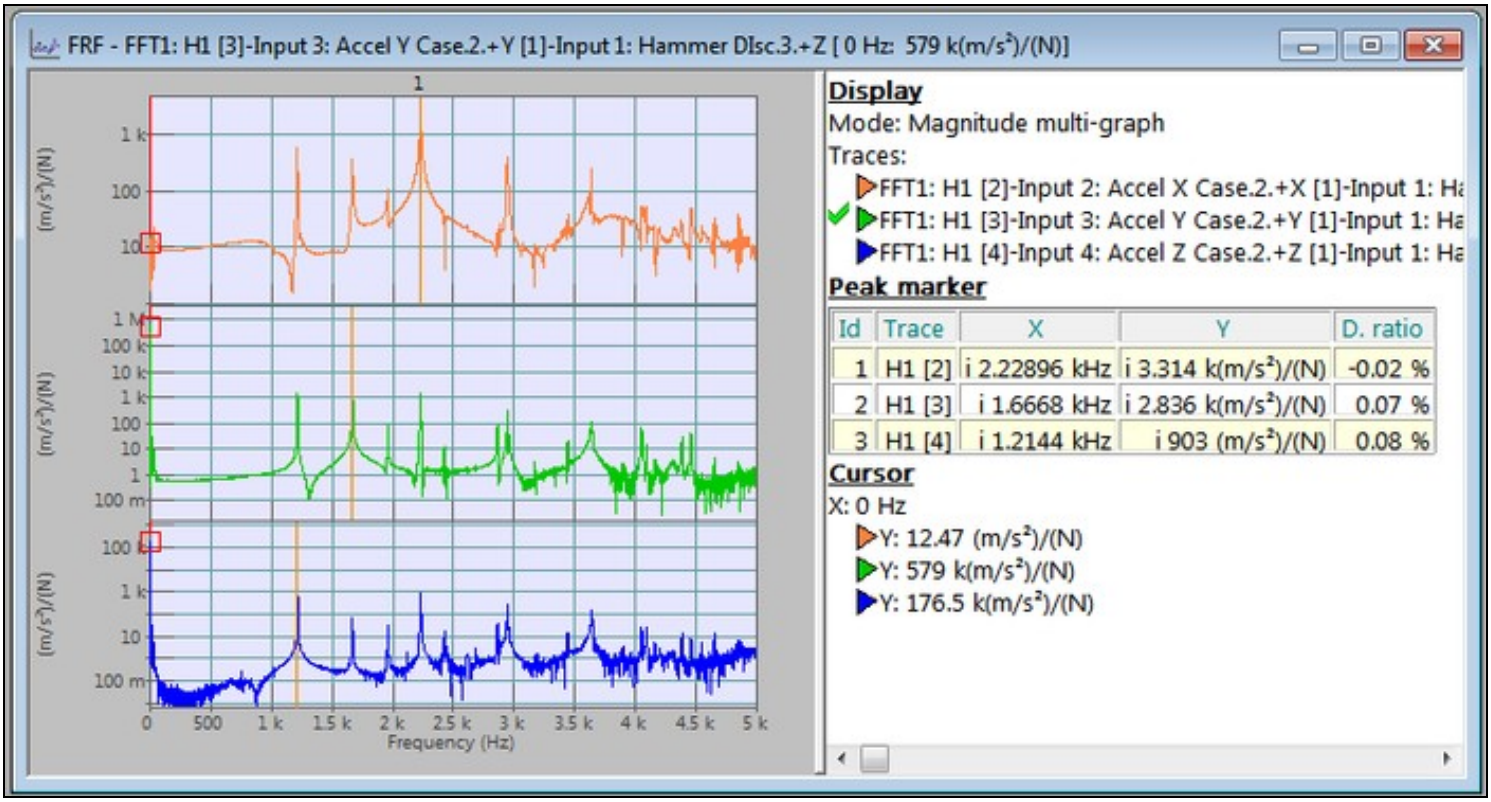
111.3.1.3 Refresh report on end of analysis

Once again OROS is enhancing your efficiency during measurement and analysis. This time we added a simple button which directly puts your result in the current opened report. By selecting this option no need to think about refreshing your report, it will remain up-to-date at any time.



111.3.1.4 Table format on Excel reports

Adding marker or inputs tables in an Excel report is a popular function of the NVGate report mode. It is now possible to define how the NVGate table will be arranged in the Excel sheet.



In the following examples we have 3 FRFs (1 hammer, 1 tri-axis accelerometer) per measurement point. We measure the highest peak amplitude, frequency and damping ratio on all FRFs at each measurement point.

The table format is governed by attributes in the NVGate Tag in the report file. After the drag & drop of the table in the report file, you can insert the following attributes<ref>To be inserted between quotes inside the tag brackets.</ref>

111.3.1.4.1 Flattened table

The first arrangement allows transposing the table in one unique line. This is useful with the auto-increment function when you are using multi-line table (ex: multiple traces) for each acquisition.

Regular report will provide this:

(AutoIncrement)									
[NVGate Mai	Id	Trace	polation	X	Unit	polation	Y	Unit	D. ratio
Test 1	1	H1 [2]	i	2.22896	kHz	i	3.314 ı/s²)/(N)		-0.02 %
	2	H1 [3]	i	1.6668	kHz	i	2.836 ı/s²)/(N)		0.07 %
	3	H1 [4]	i	1.2144	kHz	i	903 ı/s²)/(N)		0.08 %
Test 2	1	H1 [2]	i	2.23047	kHz	i	2.503 ı/s²)/(N)		-0.12 %
	2	H1 [3]	i	1.66768	kHz	i	3.507 ı/s²)/(N)		0.07 %
	3	H1 [4]	i	2.22744	kHz	i	1.262 ı/s²)/(N)		0.08 %

By adding the **"TableStyle=Flat"** to the NVGate tag:

[NVGate MarkerTable FRFs FRF "MarkerType=Peaks" "TableStyle=Flat"]Table[/]

The result is changed as follow:

(AutoIncrement)												
[NVGate Mai	Id	Trace	polation	X	Unit	polation	Y	Unit	D. ratio	Id	Trace	pola
Test 1	1	H1 [2]	i	2.23047	kHz	i	2.503 ı/s²)/(N)		-0.12 %	2	H1 [3]	i
Test 2	1	H1 [2]	i	2.22896	kHz	i	5.51 ı/s²)/(N)		-0.02 %	2	H1 [3]	i

111.3.1.4.2 Select columns

This arrangement allows selecting which columns to be printed in the report. For example if you do not need the interpolation information add the **"TableColumns= "** to the NVGate tag:

*[NVGate MarkerTable FRFs FRF "MarkerType=Peaks" "TableStyle=Flat" '"**TableColumns=1,2,4,5,7,8,9**"']Table[/]*

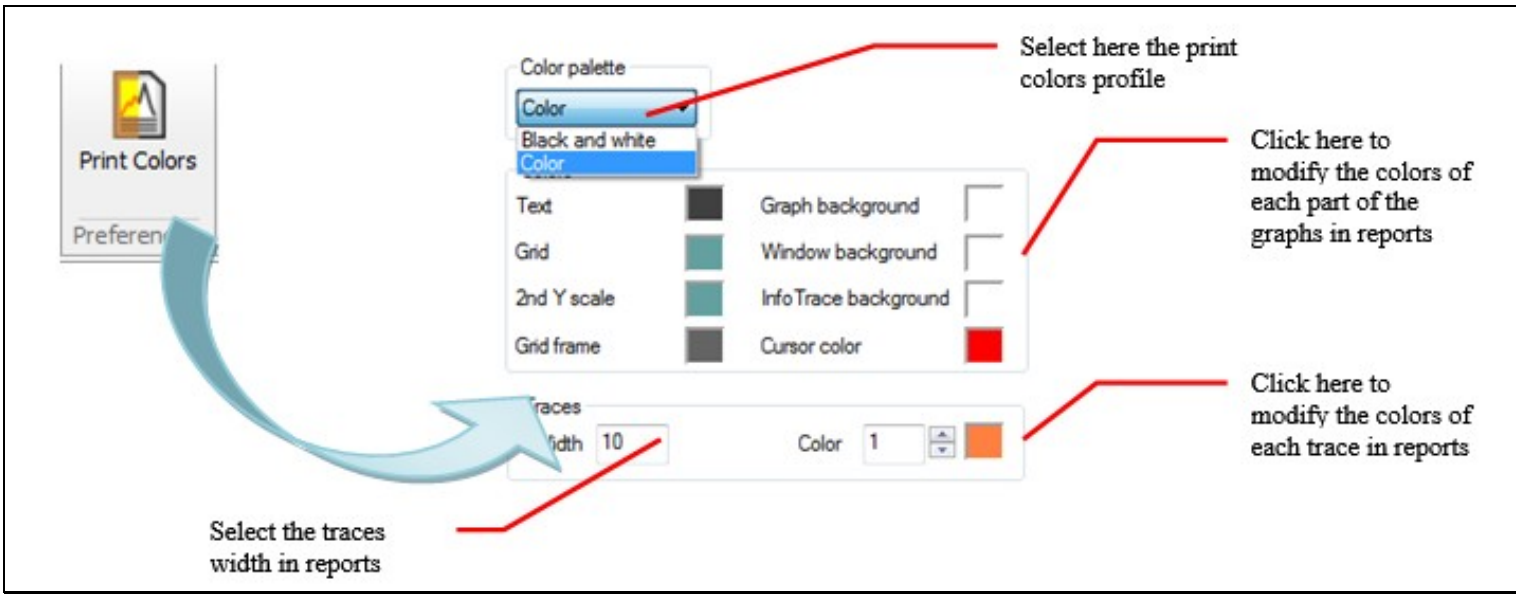
Assuming the column 3 and 6 are for the interpolation indicator, the table will look at:

(AutoIncrement)											
[NVGate Mai	Id	Trace	X	Unit	Y	Unit	D. ratio	Id	Trace	X	Unit
Test 1	1	H1 [2]	2.22739	kHz	2.973	k(m/s²)/(N)	-0.03 %	2	H1 [3]	1.66665	kHz
Test 2	1	H1 [2]	2.22891	kHz	3.873	k(m/s²)/(N)	-0.1 %	2	H1 [3]	1.6667	kHz

111.3.1.5 Reports page setup

Reports are dedicated to be viewed out of the analysis software (electronic documents, paper, e-mails), then the NVGate dedicated color may be not suitable for this destinations.

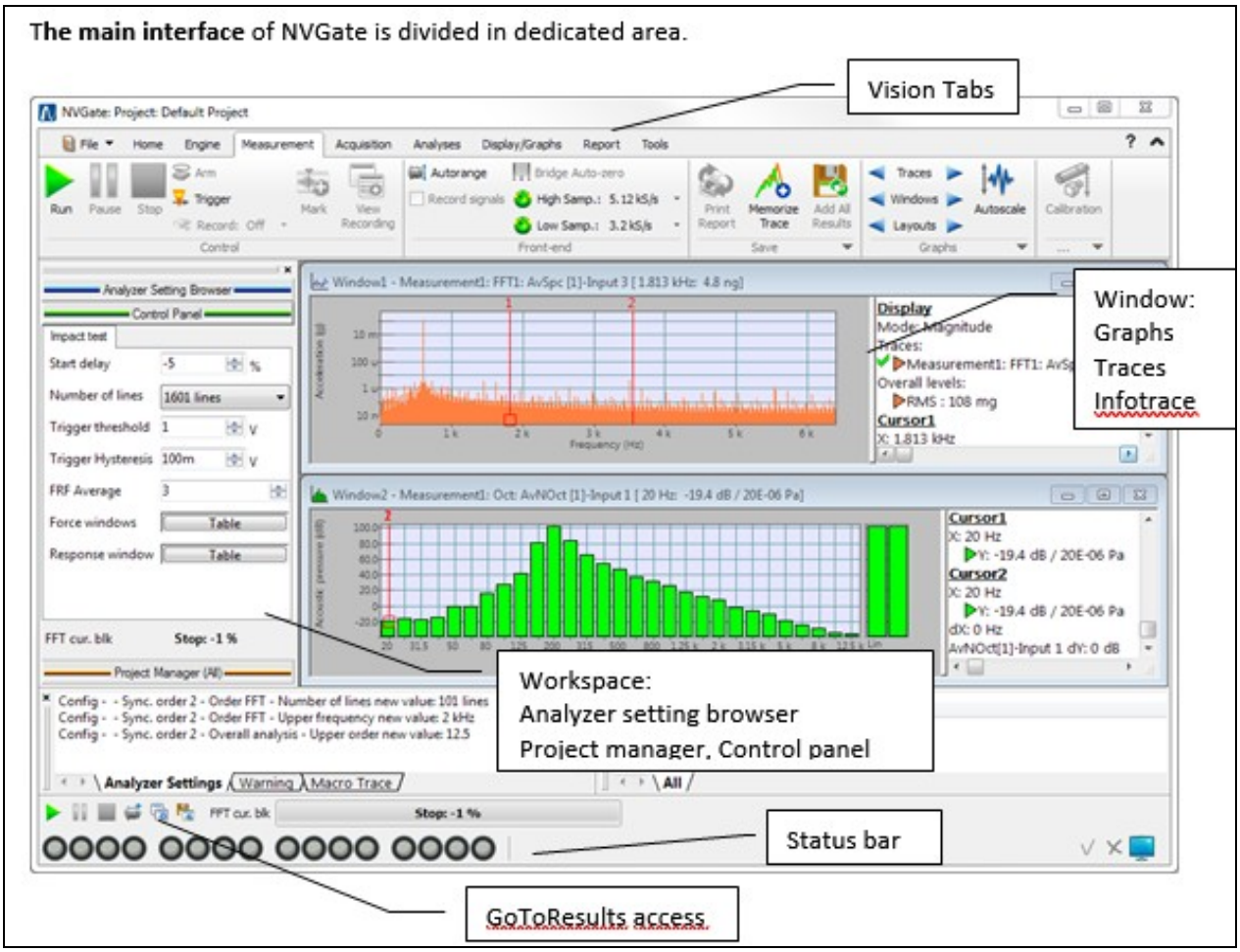
Specific colors and traces widths preferences are used for the graphs in reports. Moreover, 2 different profiles allow managing both colored and black and white reports.



The Print color profile is saved in the active user preferences set. The changes apply to the active reports at each refreshment time.

112 NVGate Ribbons overview

112.1 Interface Overview and Ribbon description



More information on the dedicated page :
Vision Tab
Windows: Graph - trace - infotrace
Analyzer setting browser
Control Pannel
Project manager
Status Bar
Go to result

112.1.1 Vision Tab

The Vision interface gathers the analyzers functionalities in simple, clear and easy to identify tabs organized according to the main operations (First steps, measuring, results edition, configuration build-up, automation, general setup etc?).

Key features have been emphasized by the Vision interface, guiding the users to the best way using their OROS 3-Series analyzer.

112.1.1.1 Operation with Vision

With Vision the software entries are organized in a logical operations way. There is 7 different tabs corresponding to 3 main operations type:

1. Measure ? Setup ? Custom

2. Measurements

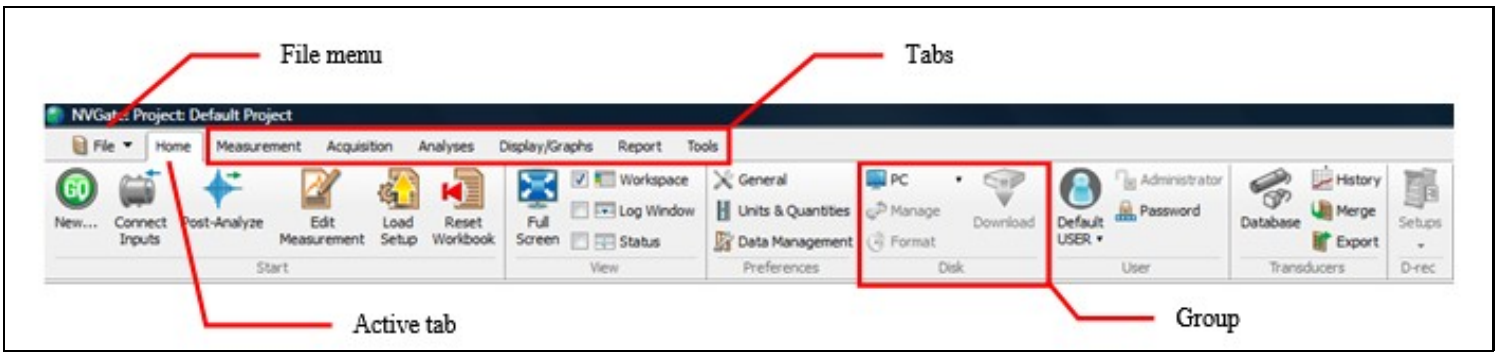
The principal goal the instrument is to measure noise and vibrations. The tabs corresponding to such operations are gathered at the top left of the interface: Home & Measurements.

3. Setup and fine tuning

This section of the Vision tab offers a clear way to build or modify a measurement or post-analysis configuration. That covers the main steps of a measurement setup. These steps are respectively managed by the Acquisition, Analyses and Display/Graphs tabs.

112.1.1.1.1 Tab & groups

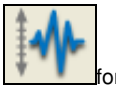
The interface layer features 7 standard tabs (optional tab are also visibles). Each tab contains a set of groups which gathers settings, info and buttons about one topic (e.g. disk, FFT or transducers).



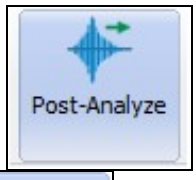
112.1.1.1.2 Actions

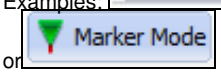
The groups contain buttons, setting and check boxes of different types:

Buttons: Left click on it leads to an action or opens a dialog box.

Examples:  for auto scale or  for inputs connection

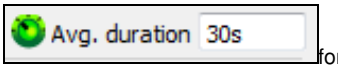
Status buttons: These buttons work like the standard ones but they can be activated or de-activated. They are used for changing a state. An activated button is slightly darkened.

Examples: 

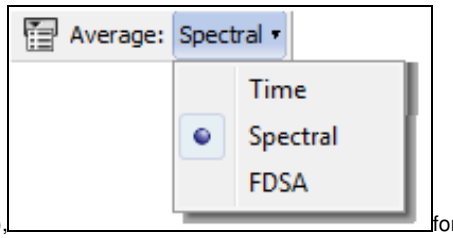
that switches between **on-line** and **post-analysis** modes,
or 

for enabling the marker manipulations.

Settings: Provide a direct access to one of the ASB setting. Allow to continuously check the setup.

Examples: 

for a numerical setting, 

for a **Boolean** (checkbox), 

for a selection in a list 

Multi-actions: These buttons work as the standard ones but it is possible to select their action from a list. When an action item is selected from the list, it becomes the default action of the button, the icon is changed.

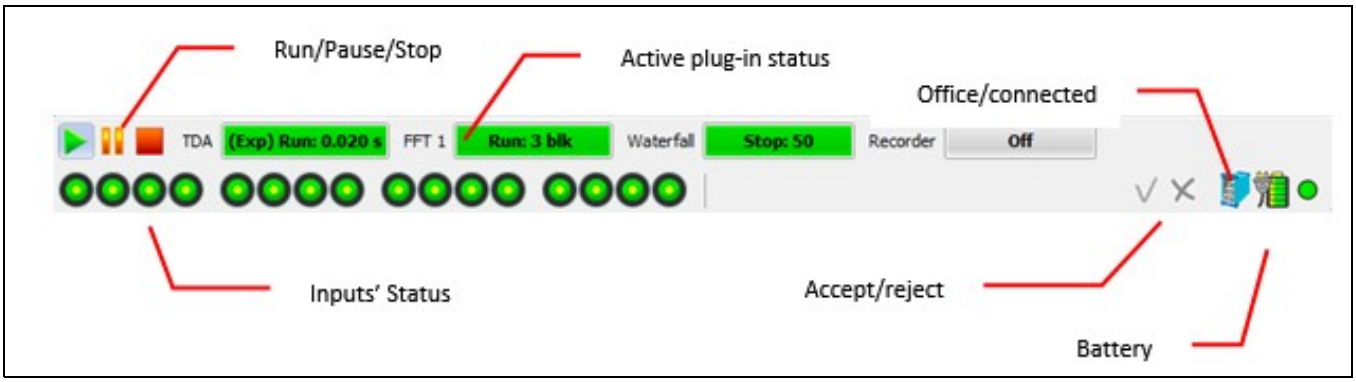
Examples are: Marker, or User selection.

Status buttons: These buttons change and show the status of the active element (windows, trace, etc..). Selecting one of the items in their list will apply this status to the active element. The status buttons change depending on the applied changes to the element (or change of element). It is useful to monitor and see immediately in what state is a 3D or the active user for example.

Note: The buttons are highlighted when the mouse pointer pass over an active button.

112.1.1.1.3 Status bar

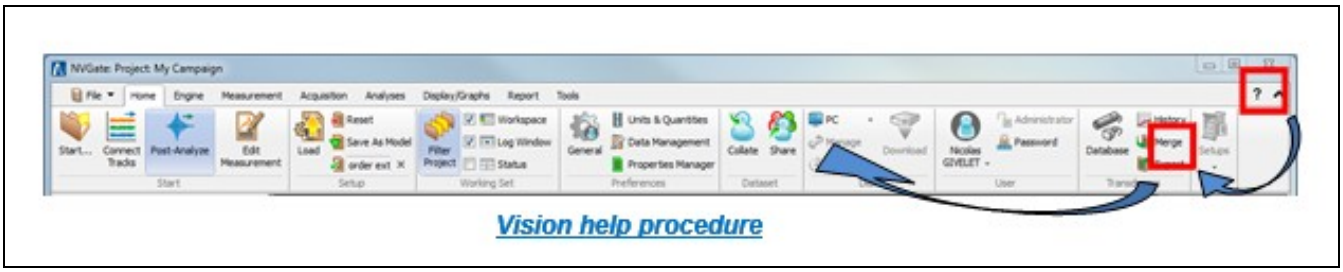
At the bottom of the screen a fixed status bar maintains a continuous monitoring of the inputs and analysis:



See status bar page for more info

112.1.1.1.4 On line help on Vision ribbons

The content of the Vision? ribbons are connected to the on-line help.



In order to get help from one of the Vision elements, activate the help mode by clicking on the upper right question mark. The cursor switches to a pointer + question mark. Then click on the desired item. The corresponding page of the reference manual will be opened.

Note that the latest pdf reader software is supported with NVGate: Acrobat reader 32 or 64 bits and Acrobat and any other pdf reader. The ability to open the manual at the corresponding pages is supported by Adobe? products only. OROS recommend using acrobat reader using the on-line help functionality.

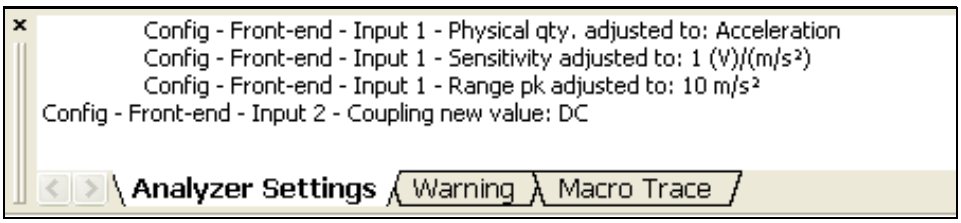
112.1.1.1.5 Minimize ribbon and full screen

In order to gain space on the NVGate screen during acquisition and analysis the NVGate ribbon can be minimized. It operates like in the MS Office suite:

Use the upper right arrow to minimize or reset the ribbon size. When the ribbon is minimized the tab header remains visible. Their content is accessible by clicking on the corresponding tab header. The full screen function has been improved. It hides the application top bar as well as the windows bottom bar.



112.1.1.1.6 Log window



In the Home tab, tick/untick the Log window



to show/hide the Log window (Analyzer settings, Warning and Macro Trace information).

112.1.2 File Menu

112.1.2.1 Project



112.1.2.1.1 New

Opens the Start & Go. This dialog proposes to load predefined setups or to build a new one. *See § Tabs/Home in this chapter for details*

112.1.2.1.2 Load

Opens the dialog box to load a project. Select a project from the current base.

112.1.2.1.3 Save:

Saves the current project. If the current project is the default project, the Save command will act as the Save As.

112.1.2.1.4 Save As:

Saves the current project with a new name

112.1.2.2 Save setup as model



Save the current setup in the *C:\OROS\NVGate data\Workbook Library\user* Directory. The models can be reloaded from the *Load setup* button in the *Home* Tab.

A Model includes the following items:

- Workbook
- ASB
- Layouts
- Control panel
- Save Setup
- Macros
- Sequences
- Signal file loaded in the player

After being saved, the model remains unchanged whatever the number of time it is used. In order to change a model it must be loaded, modified and saved as a model again with the same name.

112.1.2.3 Recent projects

Displays the list of the most recent projects used by the current user.

112.1.2.4 Recent measurements

Displays the list of the most recent measurements used by the current user.

112.1.2.5 Help

112.1.2.5.1 Users? manual

Load the users? manual. Acrobat reader must be installed on the PC.

The user manual gathers all the guides and rules to uses the analyzer from its installation to advanced automated operations. It answer to the "How do I?" question.

112.1.2.5.2 Reference manual

Load the reference manual. Acrobat reader must be installed on the PC.

The reference manual contains the detailed description of each item of the analyzer. It can be loaded with the F1 key on any Item.

112.1.2.5.3 What?s new

Load the release note of the current NVGate version. Acrobat reader must be installed on the PC.

This is helpful identifying the latest features or getting instruction of items which are not already available in the reference manual

112.1.2.5.4 Web

Shortcuts to the OROS pages on the web. The myOROS website gathers many helpful information and example dedicated to OROS products users. Register on www.myOROS.com

112.1.2.6 Exit

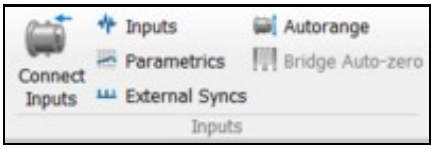
Exit NVGate.

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113 NVGate Ribbons: Acquisition

113.1 Inputs group

The inputs group allows dispatching the front-end channels to the analyzer's plug-in and setting up the front-end. This group is visible in Online mode only.



Connect Inputs: Allow dispatching the front-end inputs (all type) to the analysis plug-ins.

Inputs: Allow modifying the dynamic input properties. Available when at least one input is active.

Parametrics: Allow modifying the parametric input (DC) properties. Available when at least one DC input is active.

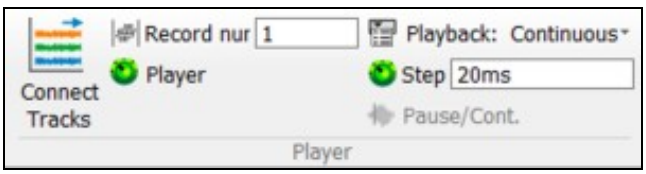
External syncs: Allow modifying the digital trigger inputs properties. Available when at least one Ext synch input is active.

Autorange (CTRL+SHIFT+A): Control and start the auto-ranging procedure. *See Chapter 1 ASB § Front-end/Auto-range for details.*

Bridge auto-zero: Balance the inputs connected through the Wheatstone bridge Xpod. *See Chapter 1 ASB - § front-end/inputs settings for details.*

113.2 Player group

This group is visible in Post-analysis mode.



Connect tracks: This button allows dispatching the signal tracks (all types) to the analysis plug-ins.

Record number: Define the record number (i.e. a section in the file defined during the acquisition) to be post-processed.

Player settings: Give a direct access to the Player settings

Playback mode: Allows choosing between a continuous and a step/step post-process.

- *Continuous:* the signal analyses are processed as fast as possible between the start and stop offset.
- *Time step:* the signal analyses are processed step by step. The step duration is defined by the *Step* setting (see hereafter). Each new step is manually (or automated by a macro) triggered through the *Step* setting (see hereafter).

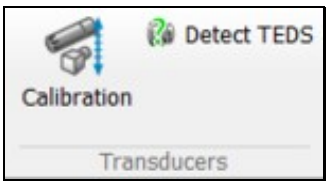
Step: Defines the time duration of the playback step for the "Time step" analysis mode. The player switches to "pause" every "time step" second.



Pause/Cont.: Enables to perform the post-analysis up to the next step.

113.3 Transducers calibration

Enables to calibrate the sensors. This group is active only in connected mode.





Calibration: Open the calibration procedure tool.

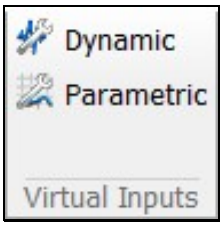


Detect TEDS: Start the sequence for detecting transducers (or missing one) equipped with an electronic datasheet inside (TEDS: Transducer Electronic Data Sheet) connected to the front end.

See transducer and sensor page for details.

113.4 Virtual Inputs group

This group gives access to the real-time computation between channels. It is grayed out if the Virtual Inputs option is not available with the user's licenses or if no input/track is connected to this plug-in.





Dynamic: Allow modifying the virtual dynamic input properties. Available when at least one input is connected to the Virtual Input plug-in (Use the *Connect Inputs* button from the Inputs group for that).

Note: the Virtual Input plug-in is optional, it may not be available on the license. In that case, this button is grayed out and the Virtual Input plug-in is not present in the Connect Inputs window.



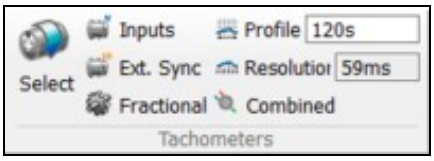
Parametric: Allow modifying the virtual parametric input properties. Available when at least one input is connected to the Virtual DC plug-in (Use the *Connect Inputs* button from the Inputs group for that).

Note: the Virtual DC plug-in is optional, it may not be available on the license. In that case, this button is grayed out and the Virtual DC plug-in is not present in the Connect Inputs window.

See Virtual Input page for details.

113.5 Tachometers group

Manage the tachometer resources. This group allows selecting the tach type (source, setup) and associates it with the plug-in analyzers and waterfall.



Select: Allow dispatching the different tachometer types to the plug-in analyzers.

Inputs: Open the properties dialog for the tachometers based on a dynamic input. Used to define up to 4 tachometers using signal from fast analog inputs (from the Front-end or from the Player).

Ext. Sync: Open the properties dialog for the tachometers based on a high speed oversampled Ext Synch input. In acquisition mode, the tach Ext synch comes from the frond-end.

In post-analysis mode, we connect player track on tachometer Ext sync resource.

Fractional: Open the properties dialog for the tachometers that derives from another one. Fractional tach. computes RPM speed for a non accessible shaft by using gear ratio setting. Used to define up to 4 fractional tachs using data from the tach or the Ext Tach.

Note: the fractional tach. cannot be settled from the Ribbon, use the ASB for it

Profile: Set up the tachometer profiles duration. These graphs are available for the Tachometer module in the Add/Remove graph dialog.(from 10s to 1200s). The profile displays continuously the tachometer speeds with a memory depth defined by the profile setting.

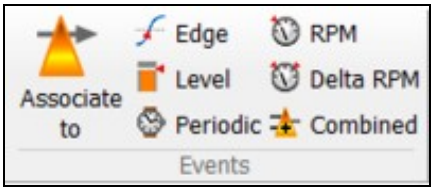
Resolution: Define the shortest time between 2 angular speed values saved in the profile.

Combined: Open the properties dialog for the tachometers computed from other ones. Adapted for CVT.

Note: the combined tach cannot be settled from the Ribbon, use the ASB for it.

113.6 Events group

This group manages the events and corresponding triggers. It allows selecting the event type (source, setup) and associates it with the plug-in analyzers triggers.



Associate to: Allow dispatching the events to the different possible Plug-ins triggers.

Edge: Detect when the signal from an input or a recorded track crosses a threshold. This module is used with the analog inputs (tach pulse or hammer impact). This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.

Level: Detect when a signal is below or above a level This module is used with DC inputs (optional) and/or associated with the TDA or Monitor module. This event can be applied to any plug-in analyzer including Waterfall and Recorder.

Periodic: Used to trigger a plug-in by periodic step. This event can be applied to any plug-in analyzer including Waterfall and Recorder.

RPM: Detect when a tachometer is below or above a specified angular speed. This module is associated with the Tachometer module. You need to first activate it on Tachometer plug in. This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.



Delta RPM: Same as RPM but generates an event at each step. This module is associated with the Tachometer module. You need first to activate it on Tachometer plug in. It is used to trigger a plug-in by step. This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.



Combined: Generate an event which is the result of a combination of 2 events. Possible combinations are: OR, AND and AFTER.

Read event definition page for details.

113.7 Filters group

Manage the filters definition and position. These filters operate on the time domain series. They can be applied in various locations onto the signal process (Inputs, Plug-in channels, Outputs, Player tracks).





Apply to: Allow dispatching the filters to the different possible location in the signal process.



High/Low pass: Used to design a high-pass filter or a low-pass filter (Butterworth, Chebyshev Type I, and Chebyshev Type II).



Pass/Stop band: Used to design a band-pass filter or a band-stop filter.



Integrator: Used to design a time integrator filter associated with a high pass filter (to limit gain near DC components).



Differentiator: Used to setup a time differentiator filter associated with an exponential average to avoid that small fluctuations of the input signal become important distortions in the output signal.

See filter page for details.

113.8 Outputs group

Manages the generated signal on the front-end outputs (generators).





Signals: Show the list of available signals and let the users connect it to the outputs.



Sine: Open the pure sine properties dialog for adjustment.



Multi-sine: Open the Multi-sine properties dialog for adjustment.



Swept-sine: Open the Swept-sine properties dialog for adjustment.



Chirp: Open the Chirp properties dialog for adjustment.



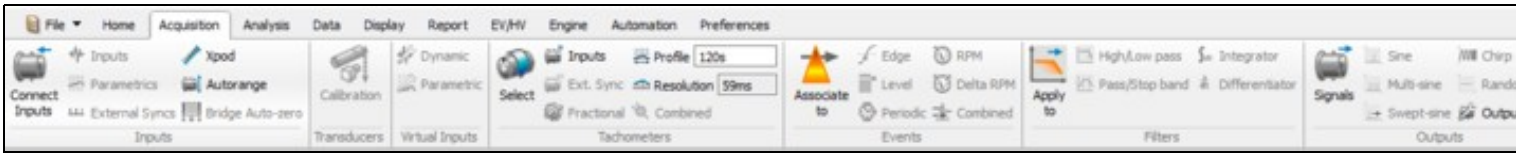
Random noise: Open the Random noise properties dialog for adjustment. Adapted for non linear responses measurement.



Output settings: Manage the generated signal setting (Mute, transition time). It is also available on ASB front end. Used to control general output behavior, i.e. the signal generated on Out 1 &2 and Aux. Out 1 to 4.

Read Output page for details.

114 NVGate Ribbons: Acquisition Tab

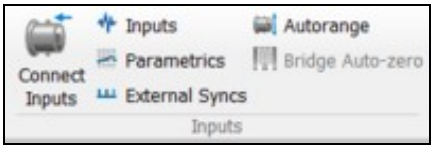


This tab provides all the necessary entries to setup the front-end and the use of any channels in details. It separates the acquisition channels setup from the outputs, triggering, tachometer, and filters ones.

While switching to post-analysis the inputs group is swapped to player track group which control the player operations, track connections and track setup.

114.1 Inputs group

The inputs group allows dispatching the front-end channels to the analyzer's plug-in and setting up the front-end. This group is visible in Online mode only.





Connect Inputs: Allow dispatching the front-end inputs (all type) to the analysis plug-ins.



Inputs: Allow modifying the dynamic input properties. Available when at least one input is active.



Parametrics: Allow modifying the parametric input (DC) properties. Available when at least one DC input is active.



External syncs: Allow modifying the digital trigger inputs properties. Available when at least one Ext synch input is active.



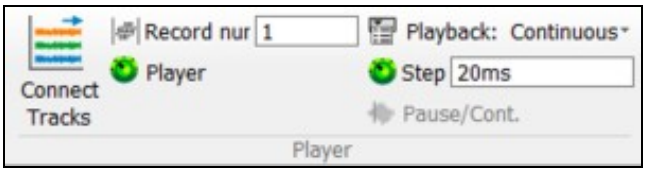
Autorange (CTRL+SHIFT+A): Control and start the auto-ranging procedure. *See Chapter 1 ASB § Front-end/Auto-range for details.*



Bridge auto-zero: Balance the inputs connected through the Wheatstone bridge Xpod. *See Chapter 1 ASB - § front-end/inputs settings for details.*

114.2 Player group

This group is visible in Post-analysis mode.





Connect tracks: This button allows dispatching the signal tracks (all types) to the analysis plug-ins.



Record number: Define the record number (i.e. a section in the file defined during the acquisition) to be post-processed.



Player settings: Give a direct access to the Player settings



Playback mode: Allows choosing between a continuous and a step/step post-process.

- *Continuous:* the signal analyses are processed as fast as possible between the start and stop offset.
- *Time step:* the signal analyses are processed step by step. The step duration is defined by the *Step* setting (see hereafter). Each new step is manually (or automated by a macro) triggered through the *Step* setting (see hereafter).



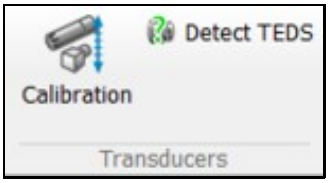
Step: Defines the time duration of the playback step for the "Time step" analysis mode. The player switches to "pause" every "time step" second.



Pause/Cont.: Enables to perform the post-analysis up to the next step.

114.3 Transducers calibration

Enables to calibrate the sensors. This group is active only in connected mode.





Calibration: Open the calibration procedure tool.

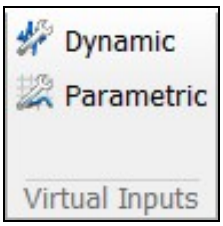


Detect TEDS: Start the sequence for detecting transducers (or missing one) equipped with an electronic datasheet inside (TEDS: Transducer Electronic Data Sheet) connected to the front end.

See transducer and sensor page for details.

114.4 Virtual Inputs group

This group gives access to the real-time computation between channels. It is grayed out if the Virtual Inputs option is not available with the user's licenses or if no input/track is connected to this plug-in.





Dynamic: Allow modifying the virtual dynamic input properties. Available when at least one input is connected to the Virtual Input plug-in (Use the *Connect Inputs* button from the Inputs group for that).

Note: the Virtual Input plug-in is optional, it may not be available on the license. In that case, this button is grayed out and the Virtual Input plug-in is not present in the Connect Inputs window.



Parametric: Allow modifying the virtual parametric input properties. Available when at least one input is connected to the Virtual DC plug-in (Use the *Connect Inputs* button from the Inputs group for that).

Note: the Virtual DC plug-in is optional, it may not be available on the license. In that case, this button is grayed out and the Virtual DC plug-in is not present in the Connect Inputs window.

See Virtual Input page for details.

114.5 Tachometers group

Manage the tachometer resources. This group allows selecting the tach type (source, setup) and associates it with the plug-in analyzers and waterfall.





Select: Allow dispatching the different tachometer types to the plug-in analyzers.



Inputs: Open the properties dialog for the tachometers based on a dynamic input. Used to define up to 4 tachometers using signal from fast analog inputs (from the Front-end or from the Player).



Ext. Sync: Open the properties dialog for the tachometers based on a high speed oversampled Ext Synch input. In acquisition mode, the tach Ext synch comes from the frond-end.

In post-analysis mode, we connect player track on tachometer Ext sync resource.



Fractional: Open the properties dialog for the tachometers that derives from another one. Fractional tach. computes RPM speed for a non accessible shaft by using gear ratio setting. Used to define up to 4 fractional tachs using data from the tach or the Ext Tach.

Note: the fractional tach. cannot be settled from the Ribbon, use the ASB for it



Profile: Set up the tachometer profiles duration. These graphs are available for the Tachometer module in the Add/Remove graph dialog.(from 10s to 1200s). The profile displays continuously the tachometer speeds with a memory depth defined by the profile setting.



Resolution: Define the shortest time between 2 angular speed values saved in the profile.

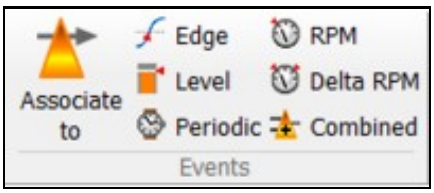


Combined: Open the properties dialog for the tachometers computed from other ones. Adapted for CVT.

Note: the combined tach cannot be settled from the Ribbon, use the ASB for it.

114.6 Events group

This group manages the events and corresponding triggers. It allows selecting the event type (source, setup) and associates it with the plug-in analyzers triggers.





Associate to: Allow dispatching the events to the different possible Plug-ins triggers.

Edge: Detect when the signal from an input or a recorded track crosses a threshold. This module is used with the analog inputs (tach pulse or hammer impact). This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.

Level: Detect when a signal is below or above a level This module is used with DC inputs (optional) and/or associated with the TDA or Monitor module. This event can be applied to any plug-in analyzer including Waterfall and Recorder.

Periodic: Used to trigger a plug-in by periodic step. This event can be applied to any plug-in analyzer including Waterfall and Recorder.

RPM: Detect when a tachometer is below or above a specified angular speed. This module is associated with the Tachometer module. You need to first activate it on Tachometer plug in. This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.

Delta RPM: Same as RPM but generates an event at each step. This module is associated with the Tachometer module. You need first to activate it on Tachometer plug in. It is used to trigger a plug-in by step. This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.

Combined: Generate an event which is the result of a combination of 2 events. Possible combinations are: OR, AND and AFTER.

Read event definition page for details.

114.7 Filters group

Manage the filters definition and position. These filters operate on the time domain series. They can be applied in various locations onto the signal process (Inputs, Plug-in channels, Outputs, Player tracks).



Apply to: Allow dispatching the filters to the different possible location in the signal process.

High/Low pass: Used to design a high-pass filter or a low-pass filter (Butterworth, Chebyshev Type I, and Chebyshev Type II).

Pass/Stop band: Used to design a band-pass filter or a band-stop filter.

Integrator: Used to design a time integrator filter associated with a high pass filter (to limit gain near DC components).

Differentiator: Used to setup a time differentiator filter associated with an exponential average to avoid that small fluctuations of the input signal become important distortions in the output signal.

See filter page for details.

114.8 Outputs group

Manages the generated signal on the front-end outputs (generators).



 **Signals**: Show the list of available signals and let the users connect it to the outputs.

 **Sine**: Open the pure sine properties dialog for adjustment.

 **Multi-sine**: Open the Multi-sine properties dialog for adjustment.

 **Swept-sine**: Open the Swept-sine properties dialog for adjustment.

 **Chirp**: Open the Chirp properties dialog for adjustment.

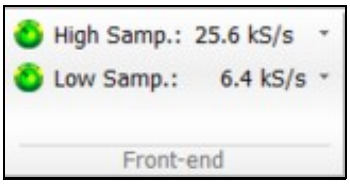
 **Random noise**: Open the Random noise properties dialog for adjustment. Adapted for non linear responses measurement.

 **Output settings**: Manage the generated signal setting (Mute, transition time). It is also available on ASB front end. Used to control general output behavior, i.e. the signal generated on Out 1 &2 and Aux. Out 1 to 4.

Read Output page for details.

115 NVGate Ribbons: Analysis

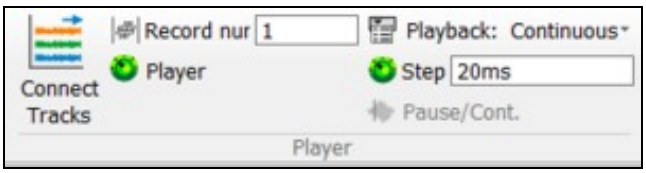
115.1 Front-end group



Control/command the Front-end sampling high frequency and low frequency. *Note: The plug-in analyzer and the recorder can reduce their respective bandwidths independently. This setting fixes the acquisition time accuracy and fixes the max signal bandwidth.*

See Front-end/inputs settings for details.

115.2 Player group





Connect tracks: This button allows dispatching the signal tracks (all types) to the analysis plug-ins.



Record number: Define the record number (i.e. a section in the file defined during the acquisition) to be post-processed.



Player settings: Give a direct access to the Player settings



Playback mode: Allows choosing between a continuous and a step/step post-process.

- *Continuous:* the signal analyses are processed as fast as possible between the start and stop offset.
- *Time step:* the signal analyses are processed step by step. The step duration is defined by the *Step* setting (see hereafter). Each new step is manually (or automated by a macro) triggered through the *Step* setting (see hereafter).

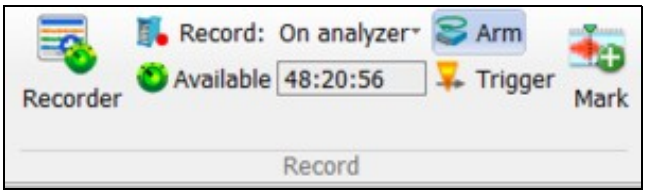


Step: Defines the time duration of the playback step for the "Time step" analysis mode. The player switches to "pause" every "time step" second.



Pause/Cont.: Enables to perform the post-analysis up to the next step.

115.3 Record group





Recorder settings: Give a direct access to the Recorder settings.



Record status: Controls the recorder location and activity.

- 
  If the setting is set to Off, the icon is grayed.
- If the setting is set to PC, the signals are recorded on the PC HDD.
- If the setting is set to Analyzer, the signals are recorded on the analyzer's disk.



Available: Display the maximum possible recording duration depending on the current recorder setup. The max duration is computed from the free space of the selected hard disk, the number of tracks (and their corresponding sampling frequency) and the number of records.

Note: in time to stop mode, the max duration may also be limited by the local available memory (PC/Analyzer) for the description blocks.



Arm (CTRL+SHIFT+R): Arm the recorder. Prepare the recorder to start immediately on the run. Arming process can lap a few seconds. If the recorder is not armed, it will take a few second to achieve the arming prior to effectively start recording the data.

Note 1: modifying a setting of the analyzer will disable the arming. It is then necessary to re-arm it.
Note 2: the recorder can be armed from the ASB: (Recorder /Trigger/ Recorder).



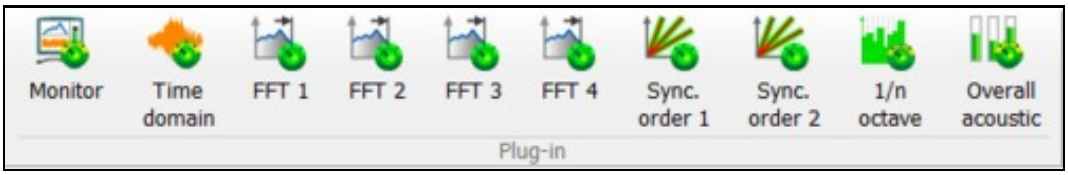
Manual trigger (CTRL+T): Generate a manual trigger event. This event is available for the event list and can be associated to the plug-in triggers (start/stop or trigger). See acquisition tab description.

Warning: While the manual trigger is not associated to a plug-in, it has no effect.



Record mark: Allow adding a mark with comments while recording. These marks are available when the signal file is edited.

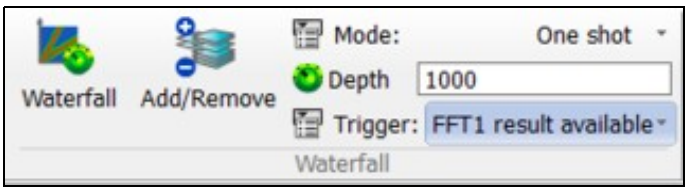
115.4 Plug-in group



These buttons give a direct access to the plug-in settings. *Note: only the plug-ins available with the user licenses are displayed.*

Monitor settings
TDA settings
FFT settings
SOA settings
OCT settings
OVA settings

115.5 Waterfall group





Waterfall settings: Give a direct access to the Waterfall settings.



Add/Remove: Opens the Waterfall *add/remove result* dialog, which allows selecting the list of result to be collected by the waterfall plug-in.



Mode: Select the data collection synchronization:

- One shot: the waterfall is fulfilled in one shot from its start trigger to the stop one.
- Continuous: the plug-in is fulfilled as a rolling buffer (FiFo) memorizing the last data only.

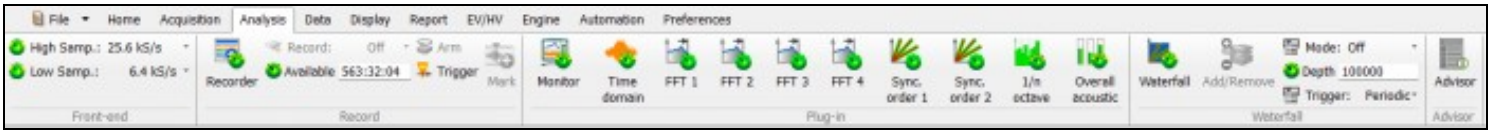


Depth: Defines the maximum number of slices to be collected. In the *continuous* mode it defines the depth of the rolling buffer.



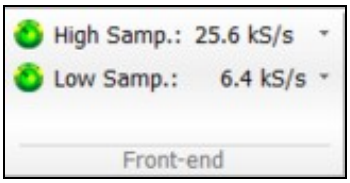
Trigger selection: select the event which trigs acquisitions. A new data collection is performed each time a trigger event occurs.

116 NVGate Ribbons: Analysis Tab



In this tab, the software gathers the analyses controls. The content of this tab depends on the purchased optional plug-in.

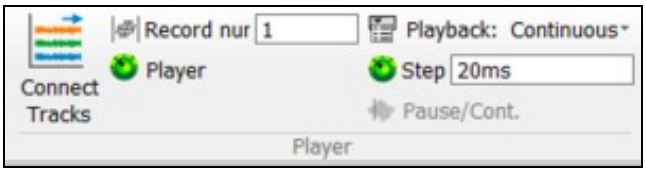
116.1 Front-end group



Control/command the Front-end sampling high frequency and low frequency. *Note: The plug-in analyzer and the recorder can reduce their respective bandwidths independently. This setting fixes the acquisition time accuracy and fixes the max signal bandwidth.*

See Front-end/inputs settings for details.

116.2 Player group





Connect tracks: This button allows dispatching the signal tracks (all types) to the analysis plug-ins.



Record number: Define the record number (i.e. a section in the file defined during the acquisition) to be post-processed.



Player settings: Give a direct access to the Player settings



Playback mode: Allows choosing between a continuous and a step/step post-process.

- *Continuous:* the signal analyses are processed as fast as possible between the start and stop offset.
- *Time step:* the signal analyses are processed step by step. The step duration is defined by the *Step* setting (see hereafter). Each new step is manually (or automated by a macro) triggered through the *Step* setting (see hereafter).

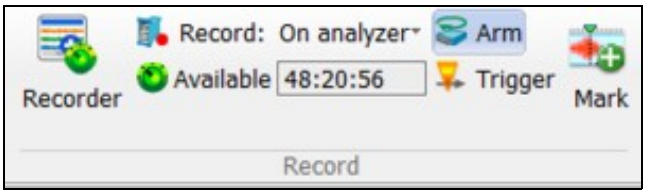


Step: Defines the time duration of the playback step for the "Time step" analysis mode. The player switches to "pause" every "time step" second.



Pause/Cont.: Enables to perform the post-analysis up to the next step.

116.3 Record group



Recorder settings: Give a direct access to the Recorder settings.

Record status: Controls the recorder location and activity.

- If the setting is set to Off, the icon is grayed.
- If the setting is set to PC, the signals are recorded on the PC HDD.
- If the setting is set to Analyzer, the signals are recorded on the analyzer's disk.

Available: Display the maximum possible recording duration depending on the current recorder setup. The max duration is computed from the free space of the selected hard disk, the number of tracks (and their corresponding sampling frequency) and the number of records.

Note: in time to stop mode, the max duration may also be limited by the local available memory (PC/Analyzer) for the description blocks.

Arm (CTRL+SHIFT+R): Arm the recorder. Prepare the recorder to start immediately on the run. Arming process can lap a few seconds. If the recorder is not armed, it will take a few second to achieve the arming prior to effectively start recording the data.

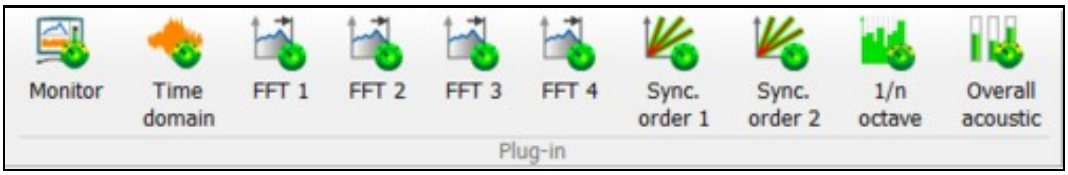
Note 1: modifying a setting of the analyzer will disable the arming. It is then necessary to re-arm it.
Note 2: the recorder can be armed from the ASB: (Recorder /Trigger/ Recorder).

Manual trigger (CTRL+T): Generate a manual trigger event. This event is available for the event list and can be associated to the plug-in triggers (start/stop or trigger). See acquisition tab description.

Warning: While the manual trigger is not associated to a plug-in, it has no effect.

Record mark: Allow adding a mark with comments while recording. These marks are available when the signal file is edited.

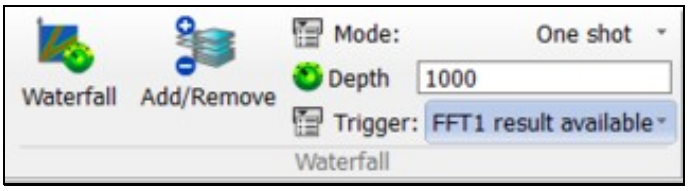
116.4 Plug-in group



These buttons give a direct access to the plug-in settings. *Note: only the plug-ins available with the user licenses are displayed.*

Monitor settings
TDA settings
FFT settings
SOA settings
OCT settings
OVA settings

116.5 Waterfall group



Waterfall settings: Give a direct access to the Waterfall settings.

Add/Remove: Opens the Waterfall *add/remove result* dialog, which allows selecting the list of result to be collected by the waterfall plug-in.

Mode: Select the data collection synchronization:

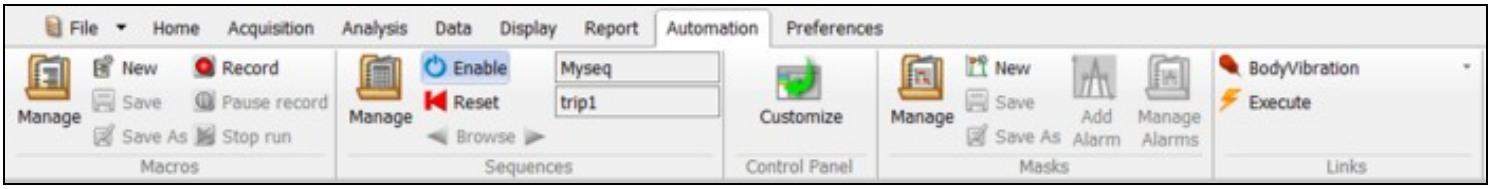
- One shot: the waterfall is fulfilled in one shot from its start trigger to the stop one.
- Continuous: the plug-in is fulfilled as a rolling buffer (FiFo) memorizing the last data only.

Depth: Defines the maximum number of slices to be collected. In the *continuous* mode it defines the depth of the rolling buffer.

Trigger selection: select the event which trigs acquisitions. A new data collection is performed each time a trigger event occurs.

117 NVGate Ribbons: Automation

The "Automation" tab contains powerful and helpful tools to automate repetitive tasks made with the analyzers.



117.1 Macros group

See Macro Page

117.2 Sequences group

See Sequence Page

117.3 Control Panel

See Control Panel Page

117.4 Masks group

See Mask/alarm Page

117.5 Links group

This part of the "Automation" tab provides a link to external software. Once a target is selected, each mouse click on the *Execute* button launches the target software. As a reminder, the target software can be any executable file from windows (.bat, .exe, shortcuts, etc...). Simply add one target in the C:/OROS/NVGate/ Data/Links directory and you will be able to use directly for the NVGate interface.





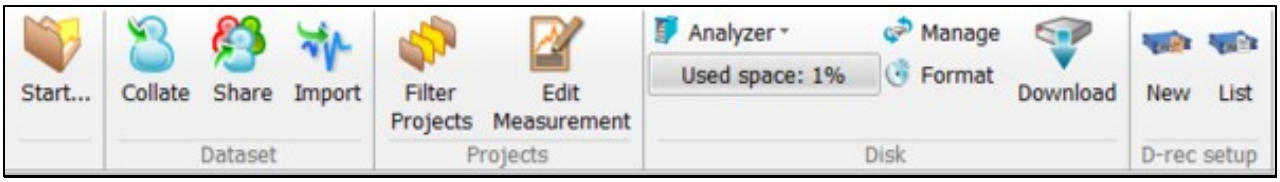
Select application: displays the application selected within the list of applications available. All applications must be located in the directory Links.



Execute: Runs the selected application.

Also note that a link can be executed with a Macro.

118 NVGate Ribbons: Data



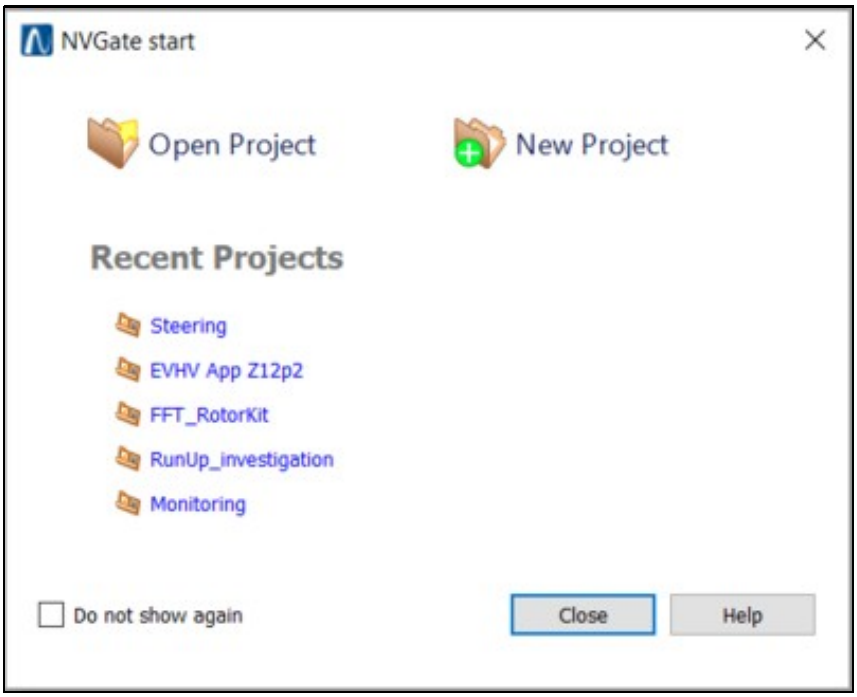
This tab provides functions to deal all your data, transfer Projects, Measurements, Models, export and import your data, filter the Project Manager.

118.1 Start



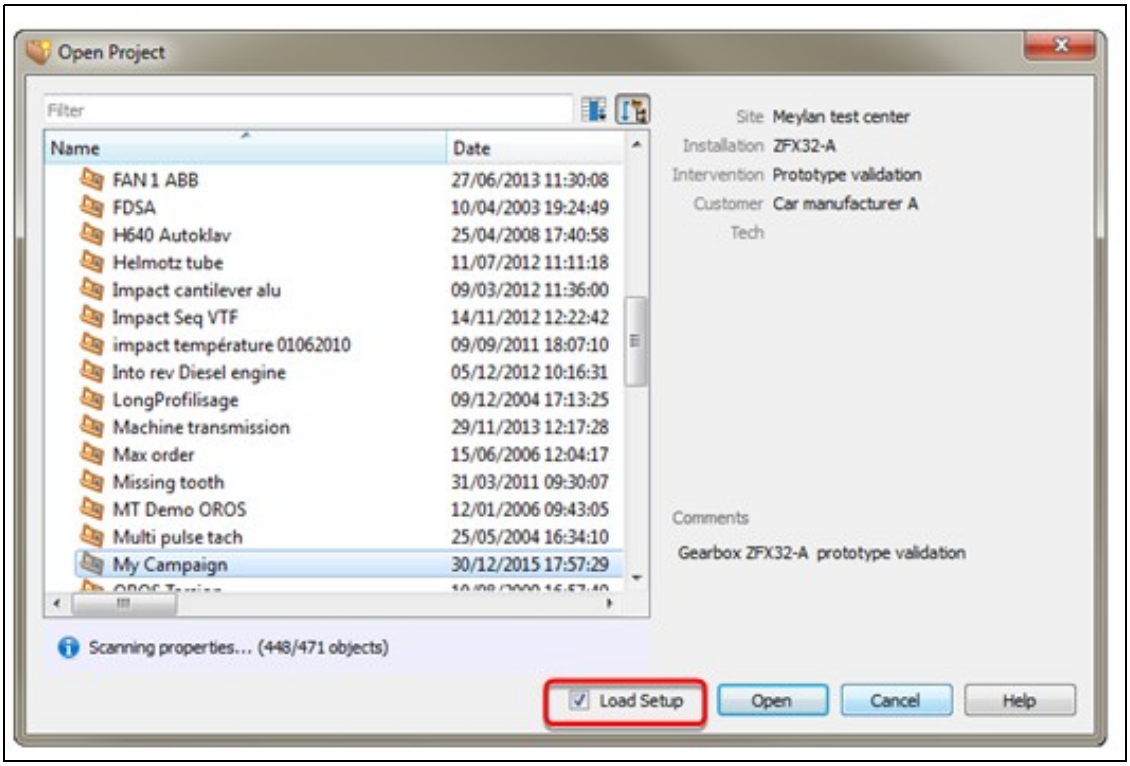
Start?: Opens the *NVGate start* dialog which is dedicated to make the first steps in the software. The *NVGate start* dialog is also displayed at each NVGate Start, except if the user checks the option *Do not show again" in the dialog.*

While launching NVGate or click on this button, operator is invited to select or create a project. This step allows reloading or defining the context.



118.1.1 Open Project

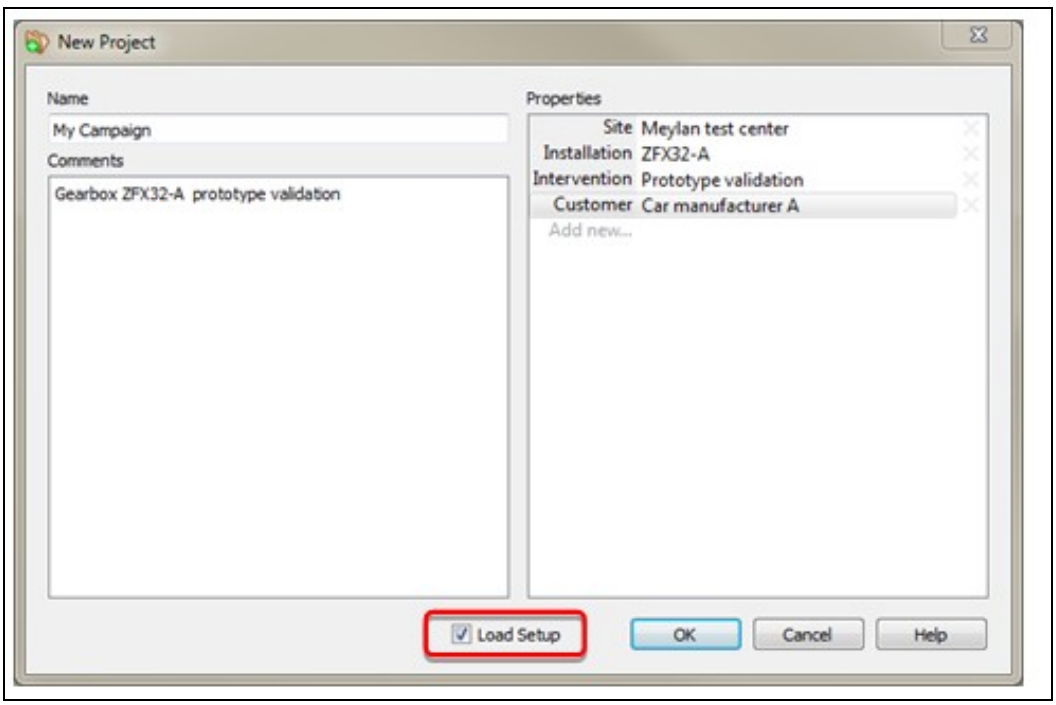
Selecting *Open project* opens the *Open Project* dialog which behaves as the single Item selection.



Select your project and click *Open* button.

118.1.2 New Project

Selecting *New project* opens the following dialog:



Fulfill the necessary properties and comment to describe the context of this project and click on *OK* button. This bring you to the setup selection.

118.2 Dataset





Collate: Enable to copy or move Projects / Measurements / Models from a specified source to the current Projects database.



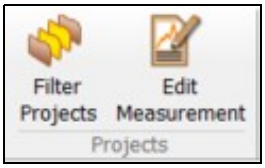
Share: Enable to copy or move Projects / Measurements / Models from the current Projects database to a specified target.

See Share and collect dataset for details.



Import: Import Signals and/or results files. See Export/import for details.

118.3 Projects





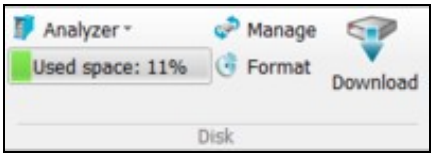
Filter projects: Open the *Filter projects* dialog, which allows selecting the projects to be visible in the Project Manager.



Edit measurement: Allow reviewing the measurements for comparison, modification or report. An edited measurement comes as a foreground layer on the top of the current analysis one. See edit measurement for details.

118.4 Disk

PC and Mobi-Disc management tools





Active Disk: Select the active disk. The active disk is the one which is mapped by the project manager. The disk where a signal file is located must be the active one in order to load it on the player (play back, post-process, exploration).

The active disk can be:


The PC one. Available in office mode only.

 One of the Mobi-disk connected through a USB cable. Available in office mode only.

 The Analyzer disk (Mobi-Disk or fixed). Available in connected mode only.

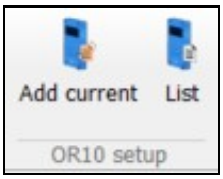
 **Manage**: Open the disk manager in order to manage the signal files saved on it.

 **Format**: Format the active disk. Not available when PC disk is selected.

Warning: all saved data on the formatted disk will be definitely deleted.

 **Download**: Select available signal file on the active disk that match the project present on the project manager. To recover signal files from a record session made with another PC use the manage button.

118.5 OR10 setup

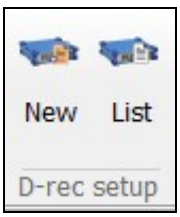


 **Add current**: Add the current setup to the OR10 or generate a file to be copied on the OR10 µSD card.

 **List**: Open the *OR10 templates management* dialog, which lists all the setups available on the OR10.

118.6 D-rec

This group manages D-rec (Direct recording) setups. D-rec allows recording signals with the analyzer without any PC or connection.



 **New**: Propose a set of dialog boxes that guide the user through the necessary settings to build a D-rec setup.

 **List**: Open the *Record setup management* dialog which allows managing the setups saved in the analyzer. The D-rec setups can be written, removed, imported and exported from this dialog.

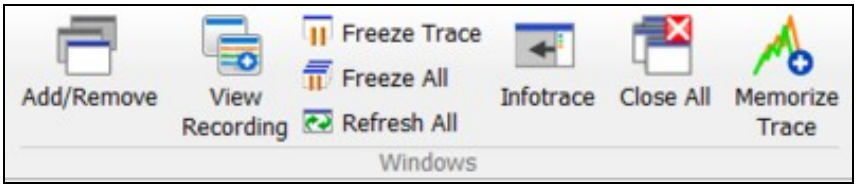
Read D-rec dedicated page for details.

119 NVGate Ribbons: Display

The "Display" tab covers the results display control. It allows creating, fulfilling, arranging and viewing the windows and layouts. It controls the scale of any graphs, manages the waterfalls and extraction graphs and the markers.



119.1 Windows group



This part of the "Display" tab manages the windows creation, their refreshment and the *infotrace* view/hide.

See windows-graph page

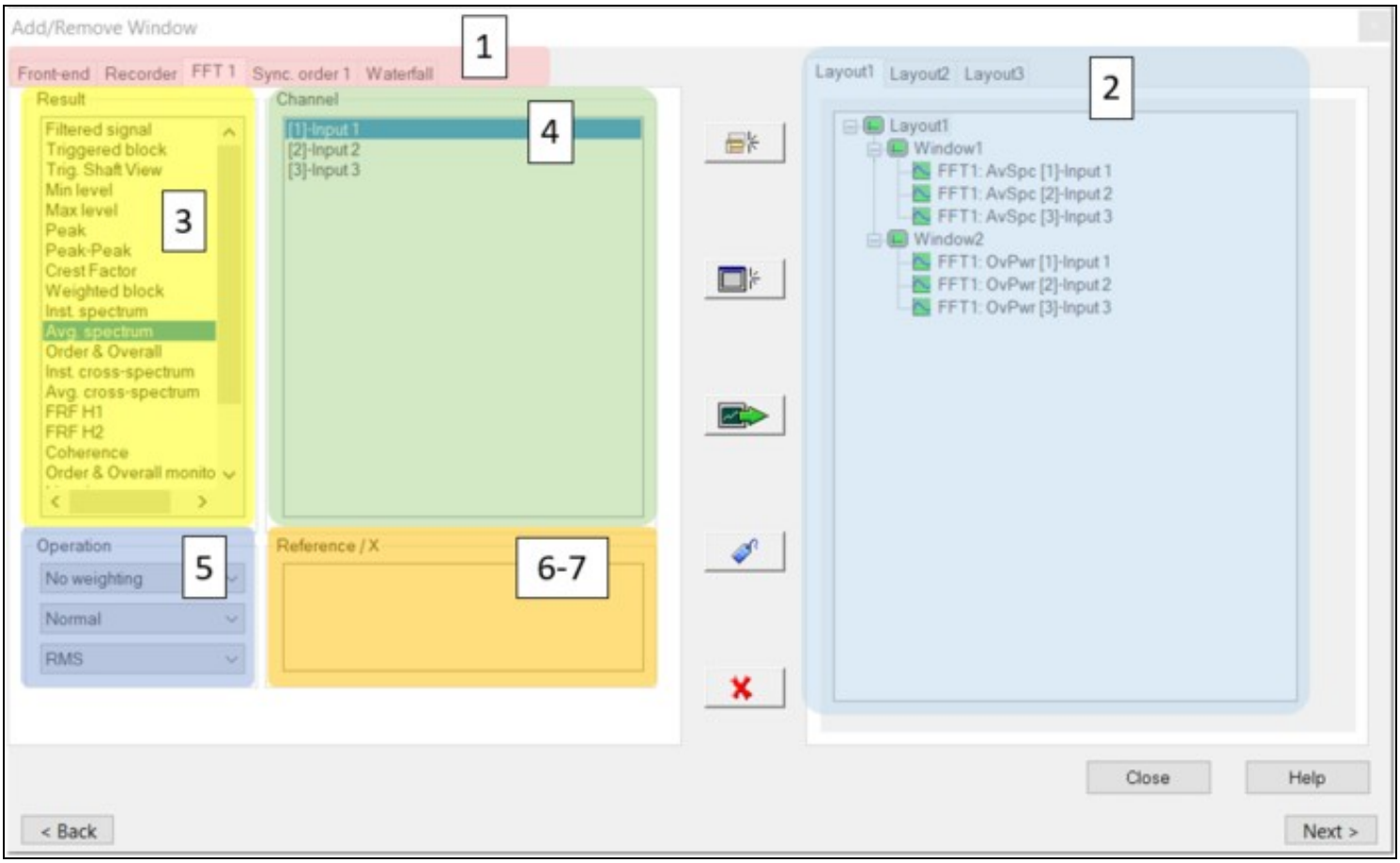
119.1.1 Add/remove window



Add/remove: Opens the *Add/Remove window* dialog, which allows to display the measurement results of the active plug-in analyzers. This dialog allows creating and arranging the traces, graphs, windows and layouts.

The maximum number of traces, windows and layouts available are:

- 32 Traces per window
- 32 Windows per Layout
- 16 Layouts per project.



1: A tab is displayed for each plug-in analyzer connected.

2: A tab is displayed for each layout. Each tab is made up of a tree showing the windows and results displayed in each window.

3: **Result selection**: List of results provided by the plug-in analyzer selected. Multiple plug-ins may be selected if all results selected are compatible (which means that they can be displayed in the same result window).

4: **Channel selection**: List of plug-in analyzer channels connected, available for the result selected.

5: **Operation**: in the top combo-box, list of weighting which can be applied to results selected. In the middle combo-box, list of derivation/integration operations which can be applied. In the bottom combo-box, list of display units.

6: **Reference** / **X**: List of plug-in analyzer channels connected. This can be the reference. Available for results that require a reference only (cross-spectrum, for example).

7: **Tracked order**: List of tracked orders on channel selected. Available if result selected is an order result.


Creates a new layout. A dialog box used to name the new layout is displayed by clicking on the button. A new tab is created and selected, corresponding to the new layout.

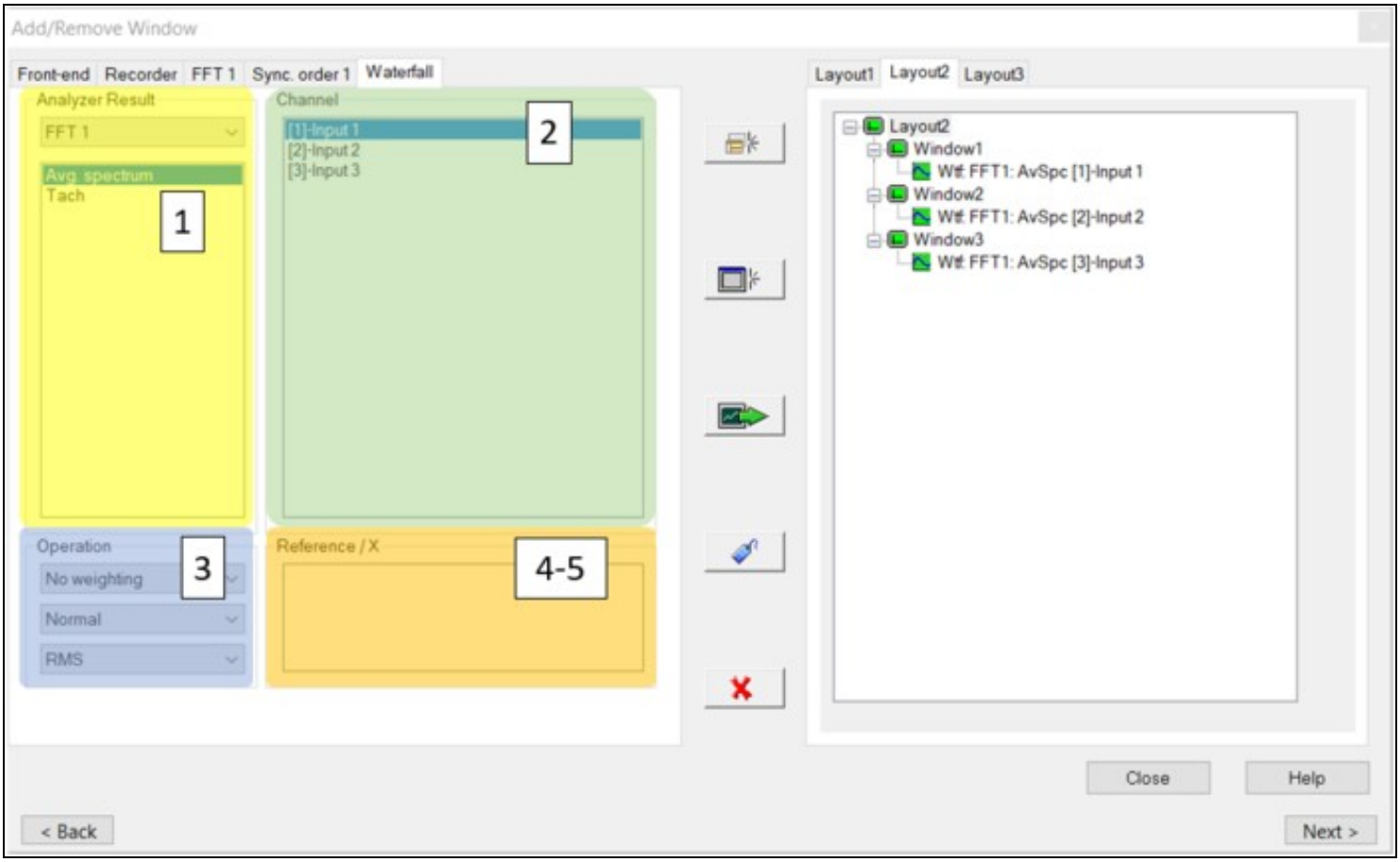

Creates a new window, in the layout of the selected tab. A dialog box used to name the new window is displayed by clicking on the button.


Adds the results selected in the window of the layout tab. If the layout does not contain any windows, a new window is created. A dialog box that shows the name of the new window is displayed. If a result is selected in the layout tab, a click on this button has no effect.


Renames the window selected in the layout tab. If no window is selected, a click on this button has no effect and an error message is displayed in a message box.


Deletes the selected window or trace selected in layout tab.

Waterfall tab



1: **Analyzer result**: The list of plug-in analyzers connected that provide Waterfall source results is displayed in the combo-box. The list of results provided by the plug-in analyzer selected, which can be a waterfall source is displayed in the list-box below.

2: **Channel selection**: List of plug-in analyzer channel connected, available for the result selected.

3: **Operation**: in the top combo-box, list of weighting which can be applied to the results selected is displayed. In the middle combo-box, a list of derivation/integration operations that can be applied is displayed. In the bottom combo-box, a list of display units is displayed.

4: **Reference** / **X**: List of plug-in analyzer channels connected. This can be a reference. Available for results that require a reference only (cross-spectrum, for example).

5: **Tracked order**: A list of tracked orders on the channel selected. Available if the result selected is an order result.

119.1.2 Other functions



View recording: Open the signal monitoring window on top of the current layout. In the case of this window is already opened in another layout, it swaps to this layout.



Freeze trace (F10): Freeze/unfreeze (toggle) the traces of the active window.



Freeze all traces: Freeze/unfreeze (toggle) all the displayed traces in the active Layout



Refresh all: Force the refreshment of displayed data. Applies to all windows and all traces. Used in case of de synchronization between the hardware and the software.



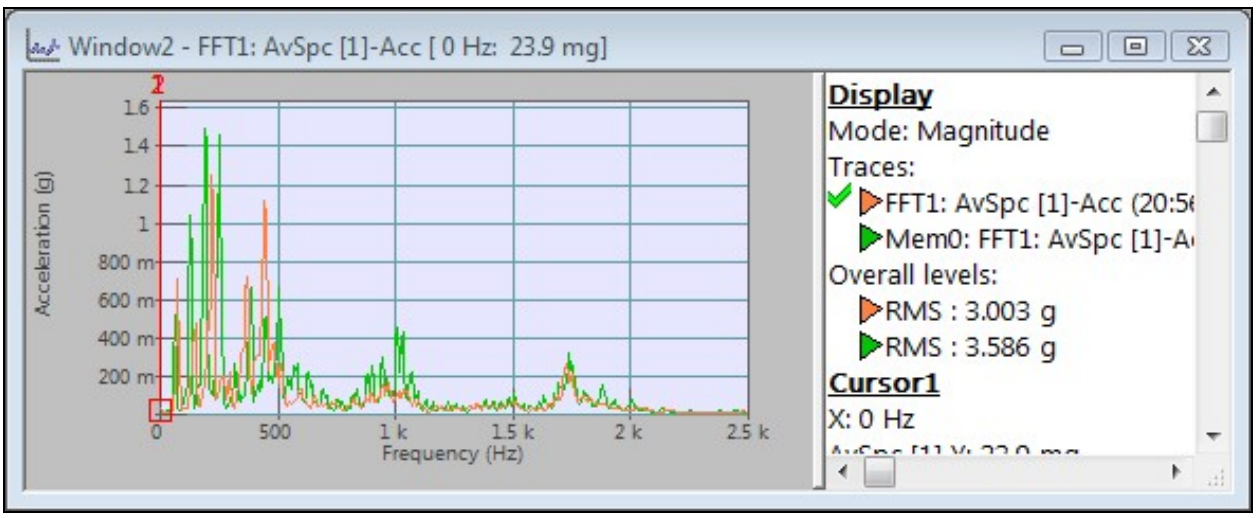
Open infotrace: Opens or closes (toggle) the *infotrace* of the active windows. The *infotrace* contains the trace(s) identification, the cursor and marker values and the section data for the 3D waterfall windows. *See chapter 2 ?Display - § area for details*



Close all: Close all the windows in the active Layout.

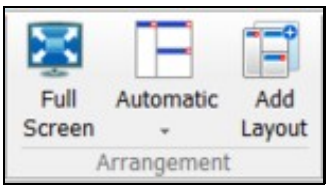


Memorize trace: Creates an instant copy of the active trace in the active window. The memorized trace add incrementally traces called Memx in the current window.



These memorized traces can be added to the save selection using the "add to result selection" entry of the window contextual menu. See memorize trace page for details.

119.2 Arrangement group





Full screen: Put the active windows in full screen mode. The NVGate frame windows will take the whole screen space. The full screen is inactivated by clicking on it or in reducing the window with the upper right button.



Allows arranging automatically the windows in the current layout.



Automatic: Organizes windows in the best possible arrangement according to the type and contents of the graphs.



Cascade: Cascades the windows according to the Windows operating system rules.



Vertical: Tiles windows vertically according to the Windows operating system rules.



Horizontal: Tiles windows horizontally according to the Windows operating system rules.

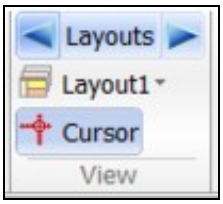


Grid: Tiles windows in order to have all windows with the same size.



Add layout: Creates a new layout. A dialog box used to name the new layout is displayed by clicking on the button. A new tab is created and selected, corresponding to the new layout.

119.3 View group





Browse layouts (CTRL+SHIFT+SPACE): scan the existing layouts. *Note: the 2 latest viewed layouts are kept in the RAM memory. Using the CTRL+SPACE shortcut allows switching between these 2 layouts.*



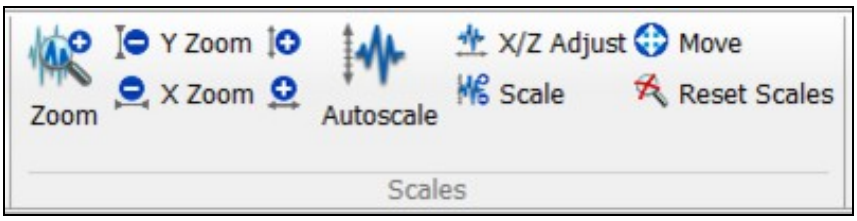
Active layout: Displays the name of the active layout. The selection list enables to activate any existing layout.



Cursor: If this button is activated, the mouse can move the cursor(s) on the displayed graphs.

119.4 Scales group

Control the windows graphical zooms and auto-scaling.



Zoom (CTRL+F6): When this mode is activated, the mouse pointer has following shape: . Left-click drag using the mouse in order to draw a rectangle to zoom into. When the left-button is released, the displayed area corresponds to the area defined by the rectangle. *Note: If the size of the rectangle is smaller than the active signal precision displayed in the window, the zoom is not completed.*

To quit the zoom mode, press the zoom button again: this will activate the cursor mode.

Zoom in Y: Makes the Y-scale two times smaller.

Zoom out Y: Makes the Y-scale two times larger.

Zoom in X: Makes the X-scale two times smaller and sets the minimum and maximum values so that the cursor is in the middle of the graph.

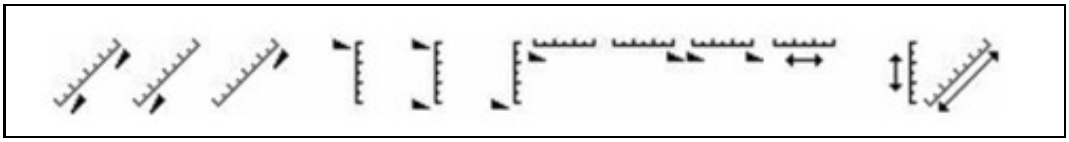
Zoom out X: Makes the X-scale twice as large and sets the minimum and maximum values so that the cursor is in the middle of the graph.

Autoscale (CTRL+A) : Adjusts the Y scale of all the windows in the current layout. The scales are adjusted to the largest trace amplitude (min and max) in each graph. A 10% margin is added to these values to facilitate visibility. *Note: The minimum Y scale width cannot be lower than the active signal precision.*

X/Z Adjust (CTRL+Q): Adjust minimum and maximum values of the X or Z-scale so that every point on the axis is visible.

See chapter 2 ?Display - § Display window/graph menu / X zoom for details

Scale (CTRL+F5): This mode is used to modify scales using the mouse in graphs, by moving the cursor on the scale. The shape of the mouse pointer changes depending on the position of the mouse pointer on the scale:



Use the mouse wheel or the Up/Down arrows to change the scale value. If the Ctrl key is pressed, the changes are five times smaller, for more precise adjustment of the value modified.
To quit the scale mode, press the scale button again: this will activate the cursor mode.

Mouse cursor	Position on the scale and action
	On the lower left part of the scale. Only the minimum value of the scale is modified.
	On the upper right part of the scale. Only the maximum value of the scale is modified.



On the center of the scale. Both minimum and maximum values are modified, in the same direction. This performs a translation of the scale



On the center of the scale, with Shift key pressed. Both minimum and maximum values are modified, in the opposite direction. This zooms in/out.



Move (CTRL+F8): When this mode is activated, the mouse pointer has following shape:  . Left click on the graph and use the mouse to drag.

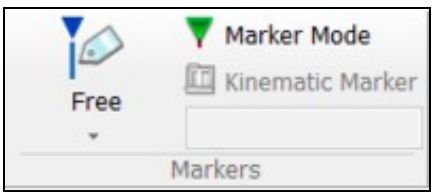
To quit the Move mode, press the Move button again: this will activate the cursor mode.



Reset scale (CTRL+Z): Reset X, Y and Z axis scale of the active window to their default values, which are:

- X scale: max bandwidth
- Y scale: Active input range
- Z scale: default profile/waterfall depth.

119.5 Markers group



Features a complete set of real-time markers that help identifying typical signature and points of exception in both time and spectral graphs.



Marker mode: activates the Marker mode. Once the Marker mode is activated, the mouse pointer has following shape:  . The mouse pointer can be used to modify the marker position and properties.

To quit the Marker mode, press the Marker mode button again: this will activate the cursor mode.



Marker type selection: enables to select the active Marker type.



Free marker: The free marker can be positioned everywhere to add a legend in a spectra, profile, 1/n octave and waterfall section.



Harmonics marker: The harmonic marker can be positioned everywhere in a spectra and waterfall X/Y sections. Computes and displays harmonic values for the selected trace(s).



Peaks marker: The peak marker detects automatically the peaks in the spectra and waterfall X/Y sections. Computes and displays peak values for the selected trace(s).



Maximums marker: The max marker detects automatically the maximum in the spectra and waterfall X/Y sections. Computes and displays max values for the selected trace(s).



Side bands marker: The Sideband marker can be positioned everywhere in a spectra and waterfall X/Y sections. Displays values for a central frequency and side frequencies (left and right) defined by a delta value.



Power band marker: The power-band marker can be positioned everywhere in a spectra and waterfall X/Y sections. It extracts the RMS power in the selected band taking in account the equivalent bandwidth of the weighting window. Computes and displays power in signal range defined by start position and delta.



1/n oct data marker: The 1/n octave data marker can be positioned in CPB spectra and waterfall X/Y sections of the same type. It extracts the list of the band levels in db or linear units into the infotrace. Displays all band values.



Kinematic marker: The Kinematic marker can be positioned everywhere in a spectra and waterfall X/Y sections. The Kinematic marker helps identifying the frequencies (or orders) which match the various rotating speed in machineries. These frequencies are linked with a fundamental one (usually the main shaft rotating frequency) by fixed ratio. These ratios depend on the machinery kinematics.

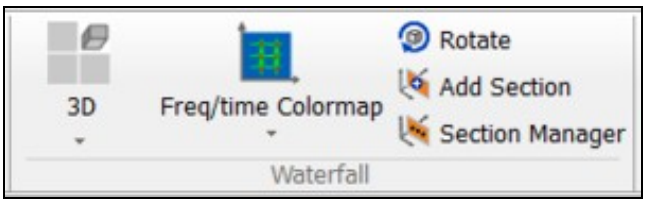


Periods marker: The period marker can be positioned in trigger blocks windows. Operates like an harmonic marker but in the time domain. Computes and displays periodic values for the selected trace(s). The periodic marker allows identifying the periodicity and frequency of repeated phenomena identified into time series graphs.

See Marker page for more details.

119.6 Waterfall group

The Waterfall group offers a wide range of operation in order to go further in your measurement. It is possible to display XY and YZ sections as well as the extraction section. This group provides general purpose tools about the Waterfall 3D graphs.

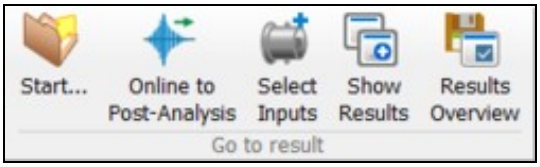


See Waterfall display for more details.

120 NVGate Ribbons: Home

120.1 Go to result group

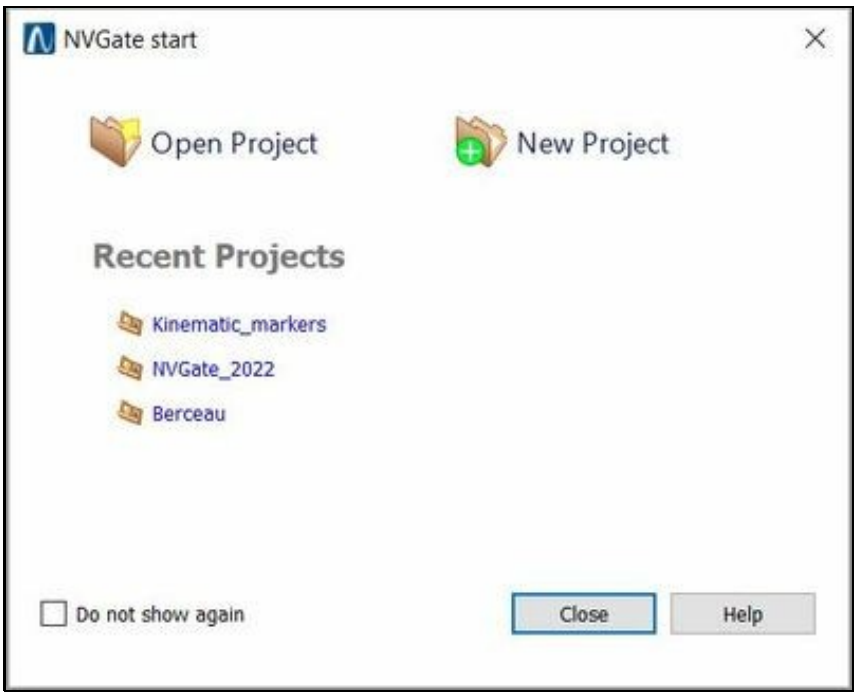
120.1.1 Online mode





Start...: Opens the *NVGate start* dialog which is dedicated to make the first steps in the software.

Note: The NVGate start *dialog is also displayed at each NVGate Start except if the user checks the option* Do not show again *in the dialog.*





Open project: Open an existing project.



New project: Create a new project.

Recent projects: Recently opened projects.



Online to Post-analysis: This button is used to switch from Online mode to Post-analysis mode. This will open the *Select Signal* window which lists all the recorded signals available. The selected signal will be then playback and can be re-injected into any plug-in analyzer (Monitor, FFT, 1/n Octave...). It is also possible to play back a recorded signal through the Output during Online analysis.

See player page for more details.



Select inputs: Opens the *Inputs selection* dialog which allows activating and setting-up the dynamic inputs in a fast and smart way.

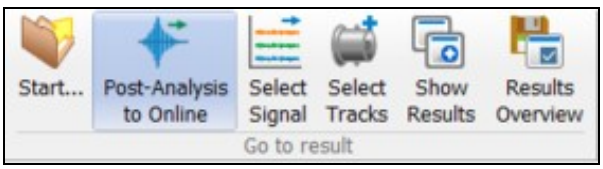


Show results: Opens the *Results* dialog which allows displaying and saving results without connecting inputs or tracks to the plug-in analyzers in advance.



Results overview: Opens the *Results overview* table which summarizes all the displayed and saved result (i.e. present in the Save Selection list)

120.1.2 Post-analysis mode





Post-analysis to online: This button is used to switch from Online mode to Post-analysis mode.



Select signal: Open the *Select signal* dialog to select the signal to be post-analyzed.



Select tracks: Open the *Inputs* table showing the inputs definition of the signal to be post-analyzed.

120.2 Measurement group



Note that another Run/Pause/Stop button is always available in the status bar (bottom left)



Run: (CTRL+R) This button controls the general analysis and recording start. The plug-ins with connected channels/tracks will start their process once the run is activated.

Note: The monitor and the Time Domain Analysis (in free run mode) process is continuous; it do not depends on the run status.
Note: the trigger/start status of the plug-ins may block their process, waiting for an event.""
Warning: Pressing the run button during an analysis leads to reset all current analyses, restarting all averages from 0. The analyzed data will be lost.



Pause: Suspend or un-suspend the current analysis.

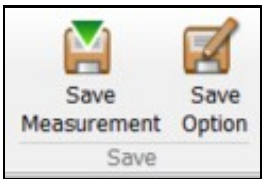
Note: If the recorder is running, it starts / finishes a record.



Stop: (CTRL+S) Stop all the current analyses and recording. After requesting a stop, the plug-ins finish their current block. When all the plug-ins have switched to Stop the analyzer switches to the Stopped status

Note: The analyzed results and recorded signal are saved when the analyzer switch to stop. This is the default behavior. It may be changed from the user preferences.

120.3 Save group





Save measurement: Save the result of the last measurement. This button is available when:

- There is at least one result selected in the save selection,
- The measurement is stopped,
- The result exists.



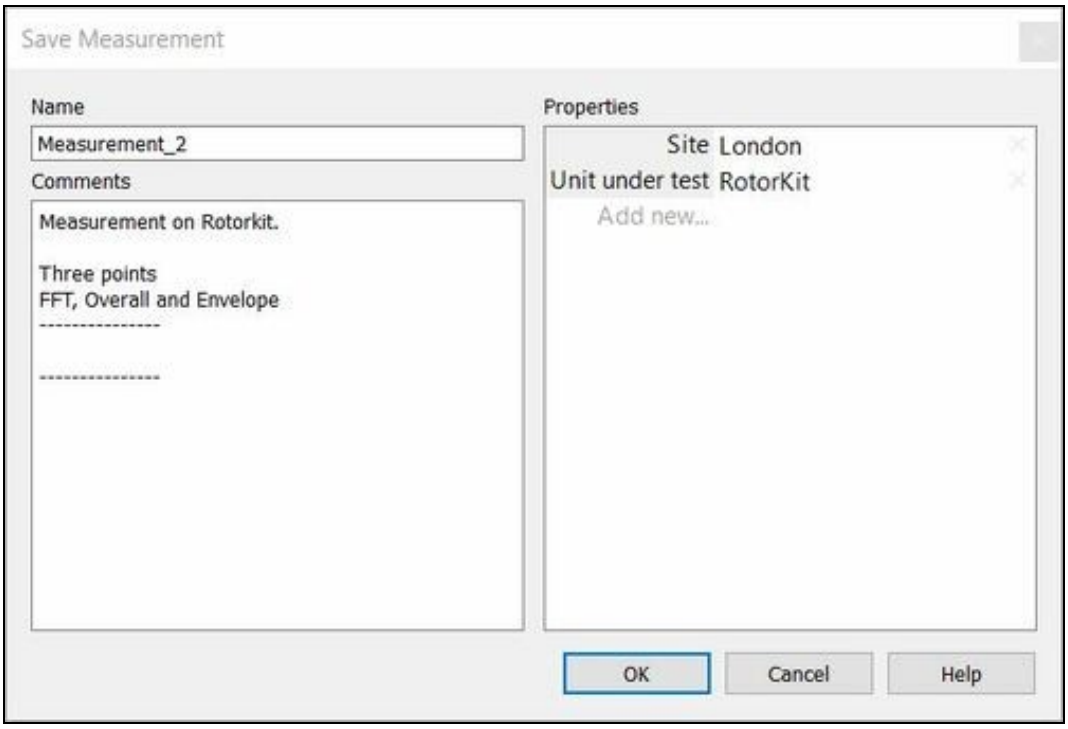
Save option: Define the way the results and signals are saved.

120.3.1 Save measurement

Enables to save the results of a measurement. The results can be saved if:

- There is at least one result selected in the save selection,
- The analyzer is stopped,
- The results exists.

By default the save measurement displays the following confirmation window:



The *Save Measurement* dialog shows the visible properties with their suggested value.

This dialog box allows entering:

- the measurement name to identify your data
- An associated keyword that allows filtering the project manager
- User?s comments (Use the CTRL+Enter to add lines)

In Addition, the measurement can be informed with properties which are used to help retrieving the files and their meaning.

The properties are attached to the measurement and filled while saving the data or by editing the properties from the project manager. The properties belong to 3 different categories:

- The OROS properties are automatically filled by NVGate: Date, Author, Protection, Project name, Signal location and Number and type of saved results.
- The OROS user properties are already created by NVGate. Their values, but must be filled by the operator: Comments, Site, Installation, Intervention, UUT, Serial number, Measurement type and Default type
- The Users parameters are created and filled by the operator while saving or by editing the properties. Ex: *TestCampaign*, *R&DProject* or *Customer name*. Users parameters can be predefined from the ribbon: *Measurement/Preferences/Measurement Properties*

Note that *users? properties will pollinate*. It means the new properties type will be automatically added on the future measurements. The same occurs if you import or copy a measurement which contains unknown users? properties.

The OROS User properties easily cover a wide range of situations. Properties options are:

- Site is for the location of the measurement. It can be a ship, a test track, a test cell, an aircraft or a factory.
- Installation is for the tested machinery. It can be a diesel engine, a car, a jet engine, a pump, a machine tool, etc?
- Intervention describes the type of acquisition/analysis: qualification, overhaul check, prototyping, diagnostic, routine data collection, first run, etc?
- Unit Under Test (UUT) indicates precisely which part is tested: a tire, a bearing, a transmission, etc?
- Measurement type: Describes the type of measuring; Acoustic, diagnostic, rotating, etc..
- Default (or Defect): The identified defect on the UUT.

Managing properties

To enter the property values, click on the right cell of the corresponding line and add text.

To remove a property from the measurement, use the cross on the right side of the corresponding line.

To add a property fill the bottom left cell with the property name and use the tab or click on the right cell to enter its value.

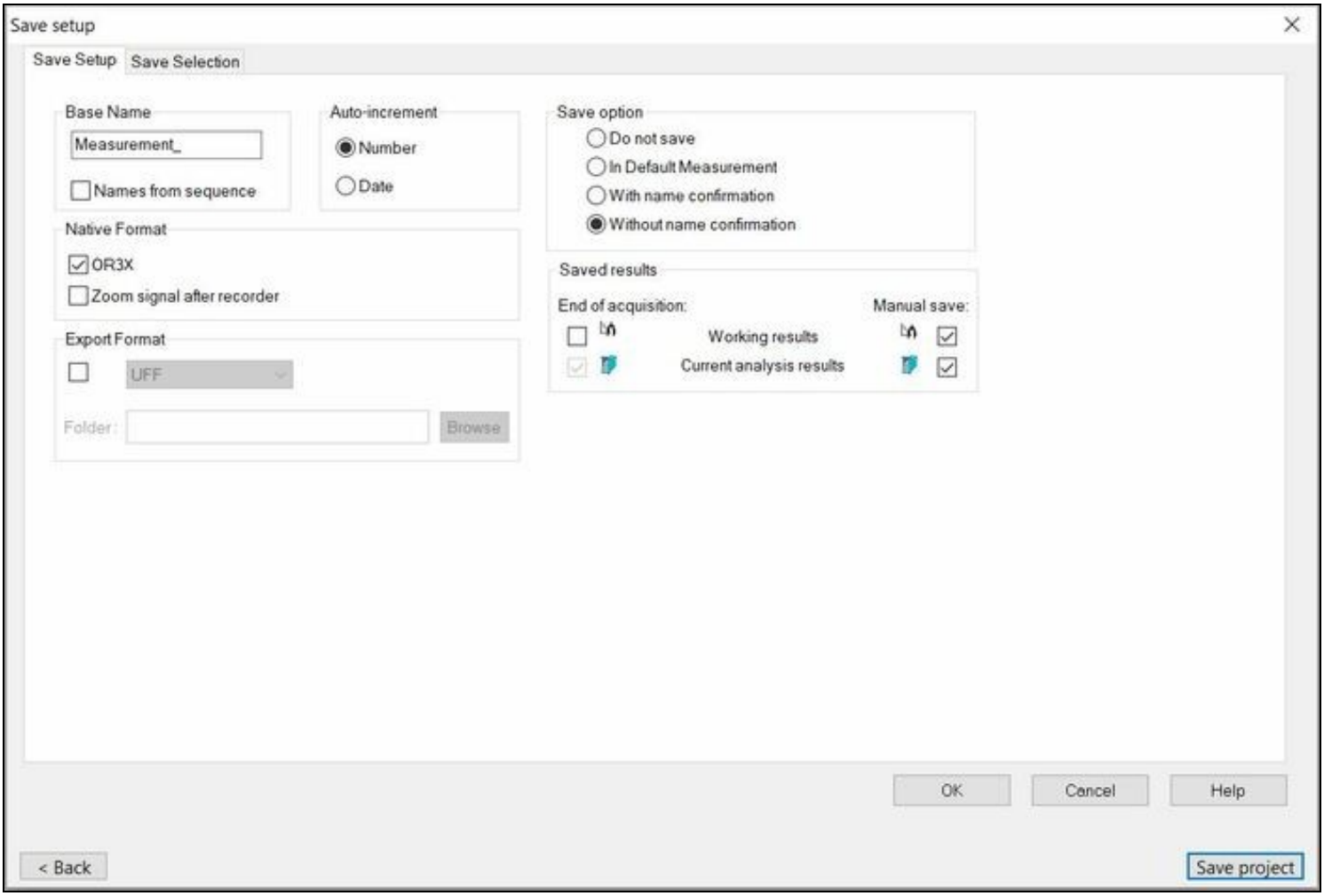
By right clicking on the property line you can hide it or change the suggestion mode. In order to save your entered values from one measurement to the next one, select *Same as previous. Same as today* will reset the suggestion as soon as the date of the latest saved measurement is different from current day.

Note: Measurement?s properties can be edited from the Project Manager *by right clicking on the desired measurement.*

120.3.2 Save option

Define the way the results and signals are saved. It opens the *Save setup* dialog which contains 2 tabs.

120.3.2.1 Save setup tab



- *Base name*: The name the new measurement will have. A suffix is automatically added to the name if the specified name is already in use.
- *Names from sequence*: Select this option to link the measurement name to the corresponding sequence fields of the sequence currently in use.

See also "Sequence" topic from Chapter 5: Reports & Tools.

- *Native format*: Determines whether the measurement should be saved in OR3x format. If not selected, the new measurement will not appear in the project manager.
- *Export format*: Used to export the new measurement in an external format. A folder must be specified to receive the converted result.

See more details about the export formats in the "Export" topic from the "Chapter 7: User preferences".

- *Auto-increment:* Used to insure the new measurement has a unique name.

Number	Adds a number to the Base name. The first available increment is used
Date	Adds date information to the Base name. The date format is *dd-mm-yyyy hh?mm?ss*" or mm-dd-yy *hh?mm?ss* according to the regional settings of the PC

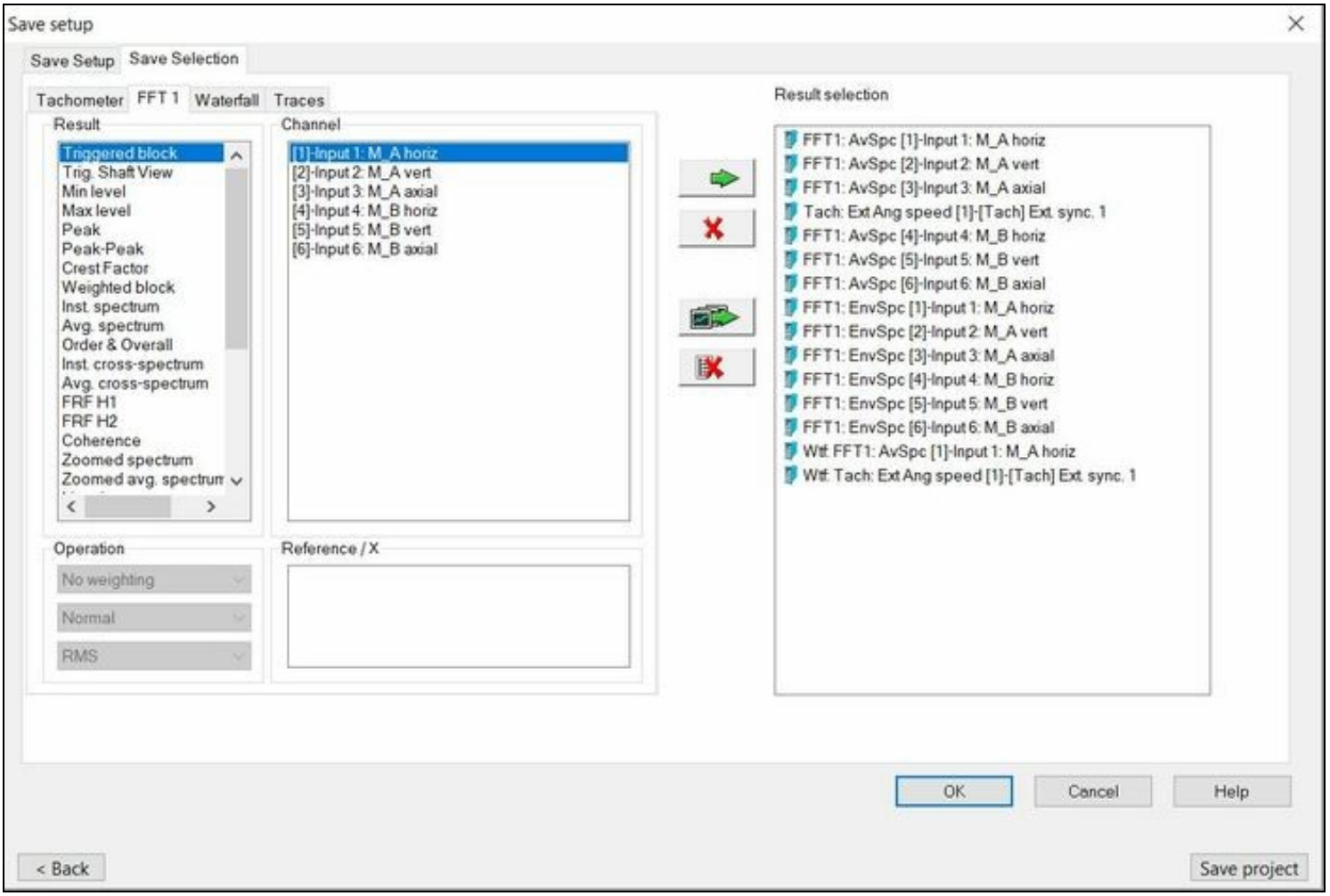
- *Save option*: This option determines the way in which the measurement will be created when the analyzer stops

Do not save	No measurement will be created. The only way to save the results selected is to perform the Save Result command manually
In default measurement	The measurement is created with the name "Default measurement". If a measurement with this name already exists, it is overwritten.
With name confirmation	A dialog box will be displayed when the analyzer stops. It will suggest a name using a Base name and an auto increment choice.
Without name confirmation	The measurement is created with a name automatically generated from the Base name and the auto increment choice.

- *Default keyword*: Used to choose the keyword that will be associated with the new measurement. Refer to the preference section for more information.
- *Saved Results*
- Current Analysis result: Results obtained from an acquisition.
- End of acquisition: open automatically a dialog box to save the results when the analyzer stops.
- Manually: allow to save the results manually.
- Working results: Results obtained after an operation based on already saved analysis results, for example a result calculated with an operator.

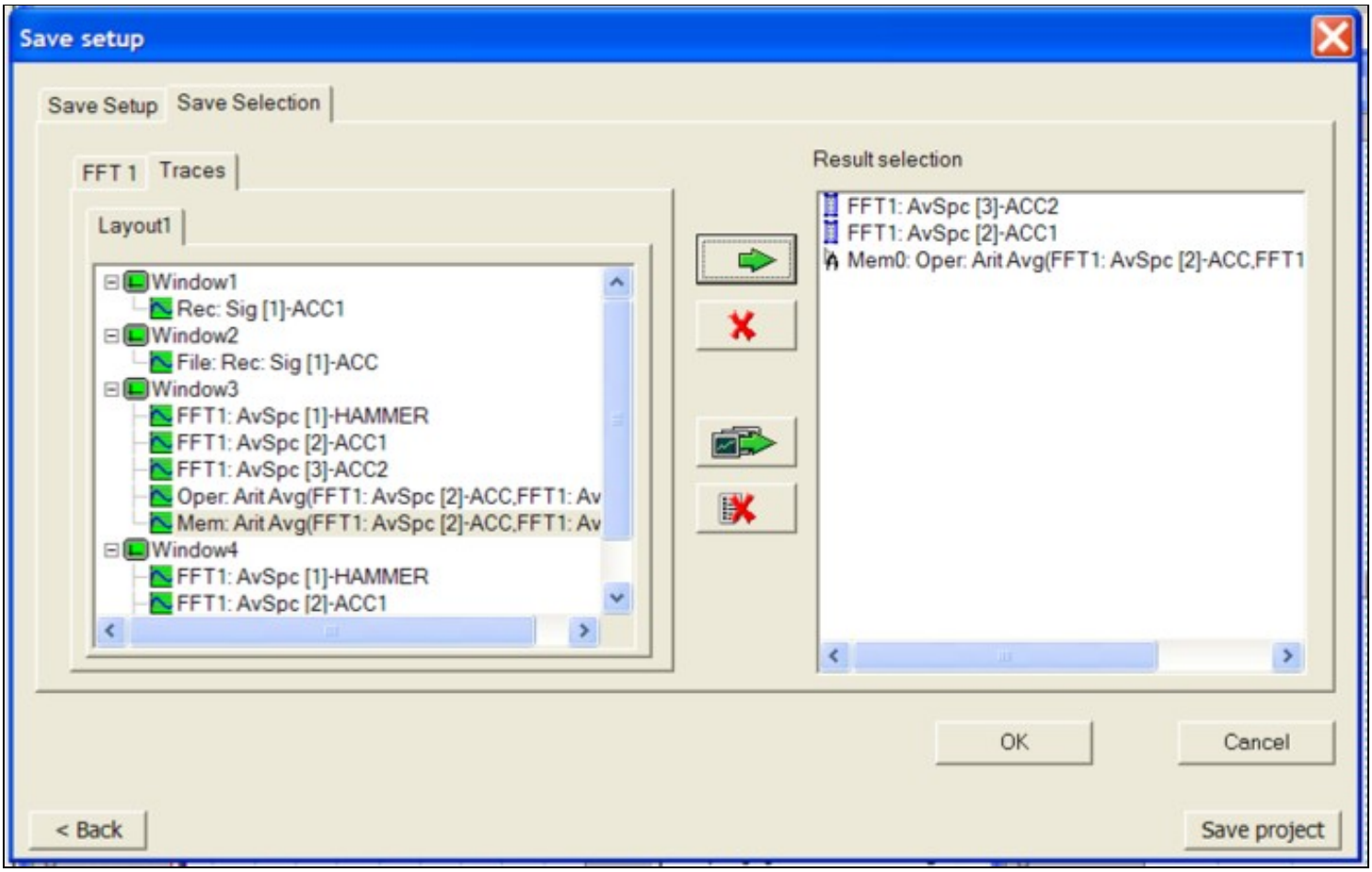
These results can be only saved manually.

120.3.2.2 Save selection tab


Save setup
Save Setup
Save Selection
Tachometer
FFT 1
Waterfall
Traces
Result
Triggered block
Trig. Shaft View
Min level
Max level
Peak
Peak-Peak
Crest Factor
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
FRF H1
FRF H2
Coherence
Zoomed spectrum
Zoomed avg. spectrum
Channel
[1]-Input 1: M_A horiz
[2]-Input 2: M_A vert
[3]-Input 3: M_A axial
[4]-Input 4: M_B horiz
[5]-Input 5: M_B vert
[6]-Input 6: M_B axial
Operation
No weighting
Normal
RMS
Reference / X
Result selection
FFT1: AvSpc [1]-Input 1: M_A horiz
FFT1: AvSpc [2]-Input 2: M_A vert
FFT1: AvSpc [3]-Input 3: M_A axial
Tach: Ext Ang speed [1]-[Tach] Ext. sync. 1
FFT1: AvSpc [4]-Input 4: M_B horiz
FFT1: AvSpc [5]-Input 5: M_B vert
FFT1: AvSpc [6]-Input 6: M_B axial
FFT1: EnvSpc [1]-Input 1: M_A horiz
FFT1: EnvSpc [2]-Input 2: M_A vert
FFT1: EnvSpc [3]-Input 3: M_A axial
FFT1: EnvSpc [4]-Input 4: M_B horiz
FFT1: EnvSpc [5]-Input 5: M_B vert
FFT1: EnvSpc [6]-Input 6: M_B axial
Wtf: FFT1: AvSpc [1]-Input 1: M_A horiz
Wtf: Tach: Ext Ang speed [1]-[Tach] Ext. sync. 1
OK
Cancel
Help
< Back
Save project

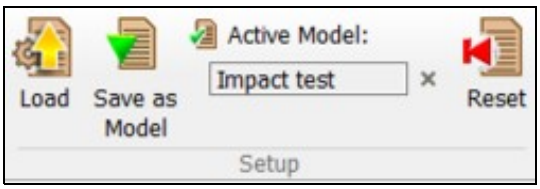
Results provided by the plug-ins

- *Result selection*: List of results provided by the plug-in analyzer selected. Multiple plug-ins may be selected if all results selected are compatible (which means that they can be displayed in the same result window).
- *Channel selection*: List of plug-in analyzer channels connected, available for the result selected.
- *Operation*: in the top combo-box, list of weighting that can be applied to results selected. In the middle combo-box, list of derivation/integration operations which can be applied. In the bottom combo-box, list of display units.
- *Reference / X*: List of plug-in analyzer channels connected. This can be the reference. Available for results that require a reference only (cross-spectrum, for example).
- *Tracked order*: List of tracked orders on channel selected. Available if result selected is an order result.
- *Traces*



List of traces available in the project coming from current analysis results and working results.

120.4 Setup group

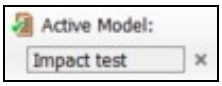




Load setup: Open the *Load setup* dialog, which allows loading setups from Models, Measurements and Projects or creating setups for online or post-analysis.



Save as model: Enable to save the current setup as a Model.

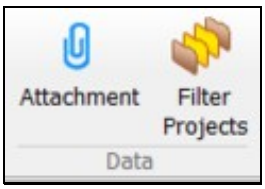


Active model: Display the name of the loaded Model. This Model will remain active until a *Reset setup* is applied or another setup is loaded.



Reset: Close the active Model and set all parameters to the default values.

120.5 Data group





Attachment: Enable to quickly identify if files (reports, pictures, videos....) are attached to the current project. *Note: if the "Default project" is active, the Attachment button is greyed.*



The *Attachment* folder of the current project is empty or does not exist.

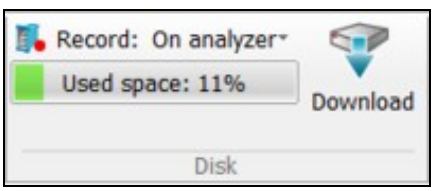


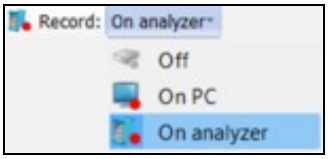
File(s) are located in the *Attachment* folder of the current project.



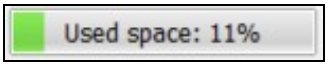
Filter projects: Open the *Filter Project* dialog, which enables selecting the projects to be visible in the *Project manager*.

120.6 Disk group





Record: Display and enable selecting where the recording is performed (analyzer's disk or computer disk) or to stop temporarily the recording (off).



Used space: Give a visual overview of the space available on the disk.



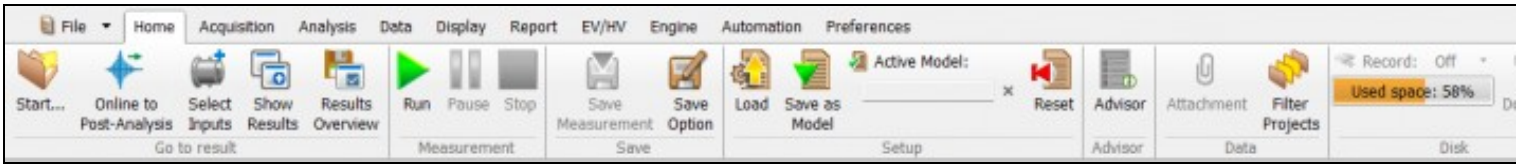
Download: Open the *Mobi-Disk manager* dialog, which lists the signals available on the analyzer's disk and enables selecting the signals to be downloaded on the pc.

120.7 User



User: This button allows selecting the current user. *Note: changing from one user to another one will reset the current NVGate analysis configuration to the default one defined by the new user.*

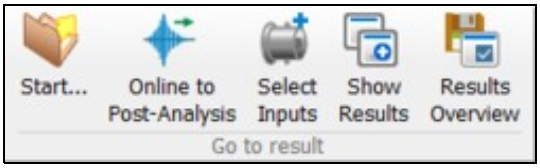
121 NVGate Ribbons: Home Tab



The goal of the Home tab is to make a user friendly tab for doing a measurement. You can load a project, create a setup (using the "go to results" group), start an acquisition, see your data, the disk space and change the user. In fact for a lot of every day application you can stay on this tab, no need to check the other one.

121.1 Go to result group

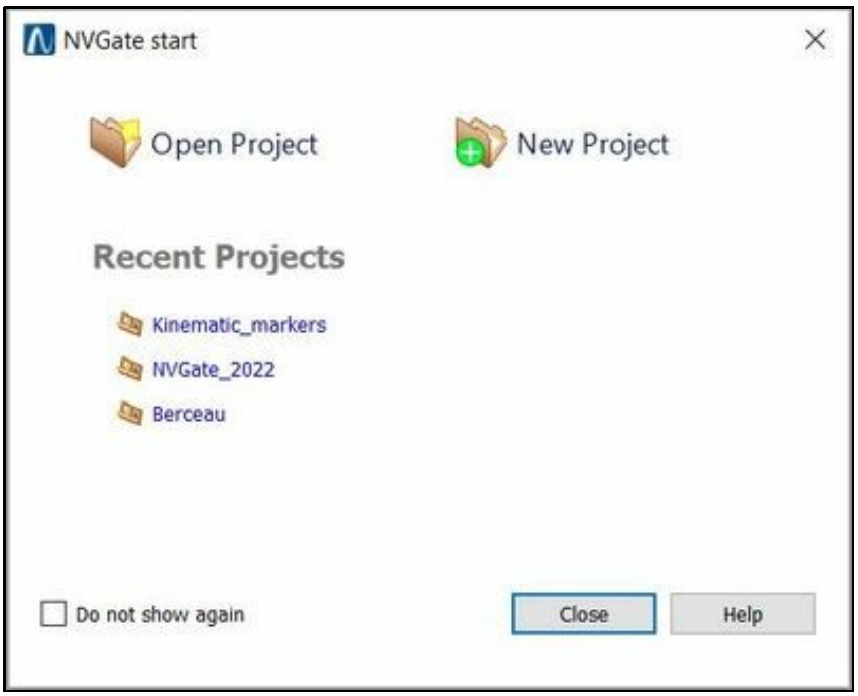
121.1.1 Online mode





Start...: Opens the *NVGate start* dialog which is dedicated to make the first steps in the software.

Note: The NVGate start *dialog is also displayed at each NVGate Start except if the user checks the option* Do not show again *in the dialog.*





Open project: Open an existing project.



New project: Create a new project.

Recent projects: Recently opened projects.



Online to Post-analysis: This button is used to switch from Online mode to Post-analysis mode. This will open the *Select Signal* window which lists all the recorded signals available. The selected signal will be then playback and can be re-injected into any plug-in analyzer (Monitor, FFT, 1/n Octave...). It is also possible to play back a recorded signal through the Output during Online analysis.

See player page for more details.



Select inputs: Opens the *Inputs selection* dialog which allows activating and setting-up the dynamic inputs in a fast and smart way.

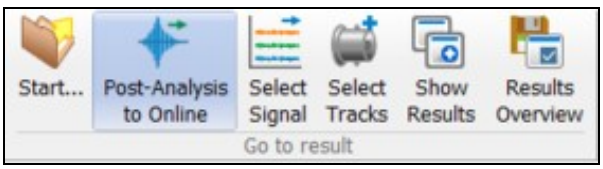


Show results: Opens the *Results* dialog which allows displaying and saving results without connecting inputs or tracks to the plug-in analyzers in advance.



Results overview: Opens the *Results overview* table which summarizes all the displayed and saved result (i.e. present in the Save Selection list)

121.1.2 Post-analysis mode





Post-analysis to online: This button is used to switch from Online mode to Post-analysis mode.



Select signal: Open the *Select signal* dialog to select the signal to be post-analyzed.



Select tracks: Open the *Inputs* table showing the inputs definition of the signal to be post-analyzed.

121.2 Measurement group



Note that another Run/Pause/Stop button is always available in the status bar (bottom left)



Run: (CTRL+R) This button controls the general analysis and recording start. The plug-ins with connected channels/tracks will start their process once the run is activated.

Note: The monitor and the Time Domain Analysis (in free run mode) process is continuous; it do not depends on the run status.
Note: the trigger/start status of the plug-ins may block their process, waiting for an event.""
Warning: Pressing the run button during an analysis leads to reset all current analyses, restarting all averages from 0. The analyzed data will be lost.



Pause: Suspend or un-suspend the current analysis.

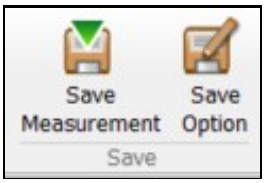
Note: If the recorder is running, it starts / finishes a record.



Stop: (CTRL+S) Stop all the current analyses and recording. After requesting a stop, the plug-ins finish their current block. When all the plug-ins have switched to Stop the analyzer switches to the Stopped status

Note: The analyzed results and recorded signal are saved when the analyzer switch to stop. This is the default behavior. It may be changed from the user preferences.

121.3 Save group





Save measurement: Save the result of the last measurement. This button is available when:

- There is at least one result selected in the save selection,
- The measurement is stopped,
- The result exists.



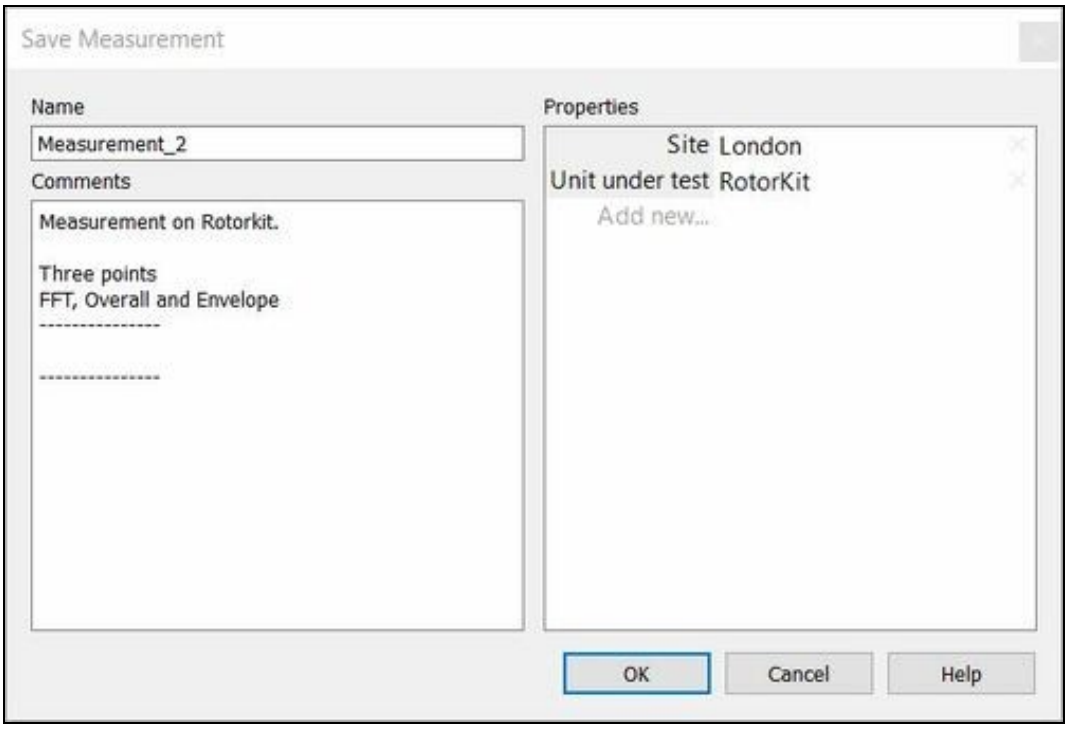
Save option: Define the way the results and signals are saved.

121.3.1 Save measurement

Enables to save the results of a measurement. The results can be saved if:

- There is at least one result selected in the save selection,
- The analyzer is stopped,
- The results exists.

By default the save measurement displays the following confirmation window:



The *Save Measurement* dialog shows the visible properties with their suggested value.

This dialog box allows entering:

- the measurement name to identify your data
- An associated keyword that allows filtering the project manager
- User?s comments (Use the CTRL+Enter to add lines)

In Addition, the measurement can be informed with properties which are used to help retrieving the files and their meaning.

The properties are attached to the measurement and filled while saving the data or by editing the properties from the project manager. The properties belong to 3 different categories:

- The OROS properties are automatically filled by NVGate: Date, Author, Protection, Project name, Signal location and Number and type of saved results.
- The OROS user properties are already created by NVGate. Their values, but must be filled by the operator: Comments, Site, Installation, Intervention, UUT, Serial number, Measurement type and Default type
- The Users parameters are created and filled by the operator while saving or by editing the properties. Ex: *TestCampaign*, *R&DProject* or *Customer name*. Users parameters can be predefined from the ribbon: *Measurement/Preferences/Measurement Properties*

Note that *users? properties will pollinate*. It means the new properties type will be automatically added on the future measurements. The same occurs if you import or copy a measurement which contains unknown users? properties.

The OROS User properties easily cover a wide range of situations. Properties options are:

- Site is for the location of the measurement. It can be a ship, a test track, a test cell, an aircraft or a factory.
- Installation is for the tested machinery. It can be a diesel engine, a car, a jet engine, a pump, a machine tool, etc?
- Intervention describes the type of acquisition/analysis: qualification, overhaul check, prototyping, diagnostic, routine data collection, first run, etc?
- Unit Under Test (UUT) indicates precisely which part is tested: a tire, a bearing, a transmission, etc?
- Measurement type: Describes the type of measuring; Acoustic, diagnostic, rotating, etc..
- Default (or Defect): The identified defect on the UUT.

Managing properties

To enter the property values, click on the right cell of the corresponding line and add text.

To remove a property from the measurement, use the cross on the right side of the corresponding line.

To add a property fill the bottom left cell with the property name and use the tab or click on the right cell to enter its value.

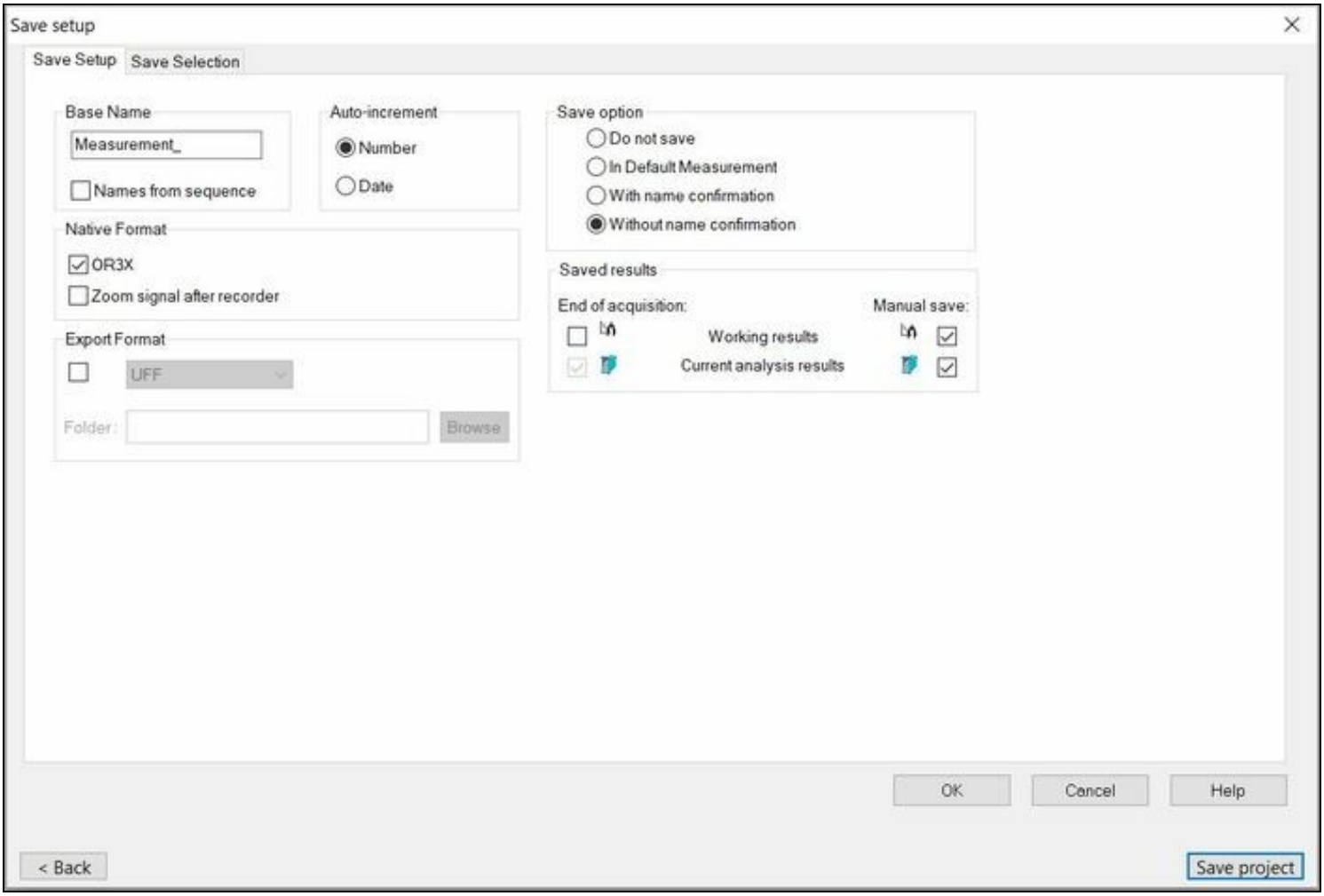
By right clicking on the property line you can hide it or change the suggestion mode. In order to save your entered values from one measurement to the next one, select *Same as previous. Same as today* will reset the suggestion as soon as the date of the latest saved measurement is different from current day.

Note: Measurement?s properties can be edited from the Project Manager *by right clicking on the desired measurement.*

121.3.2 Save option

Define the way the results and signals are saved. It opens the *Save setup* dialog which contains 2 tabs.

121.3.2.1 Save setup tab



- *Base name*: The name the new measurement will have. A suffix is automatically added to the name if the specified name is already in use.
- *Names from sequence*: Select this option to link the measurement name to the corresponding sequence fields of the sequence currently in use.

See also "Sequence" topic from Chapter 5: Reports & Tools.

- *Native format*: Determines whether the measurement should be saved in OR3x format. If not selected, the new measurement will not appear in the project manager.
- *Export format*: Used to export the new measurement in an external format. A folder must be specified to receive the converted result.

See more details about the export formats in the "Export" topic from the "Chapter 7: User preferences".

- *Auto-increment:* Used to insure the new measurement has a unique name.

Number	Adds a number to the Base name. The first available increment is used
Date	Adds date information to the Base name. The date format is *dd-mm-yyyy hh?mm?ss*" or mm-dd-yy *hh?mm?ss* according to the regional settings of the PC

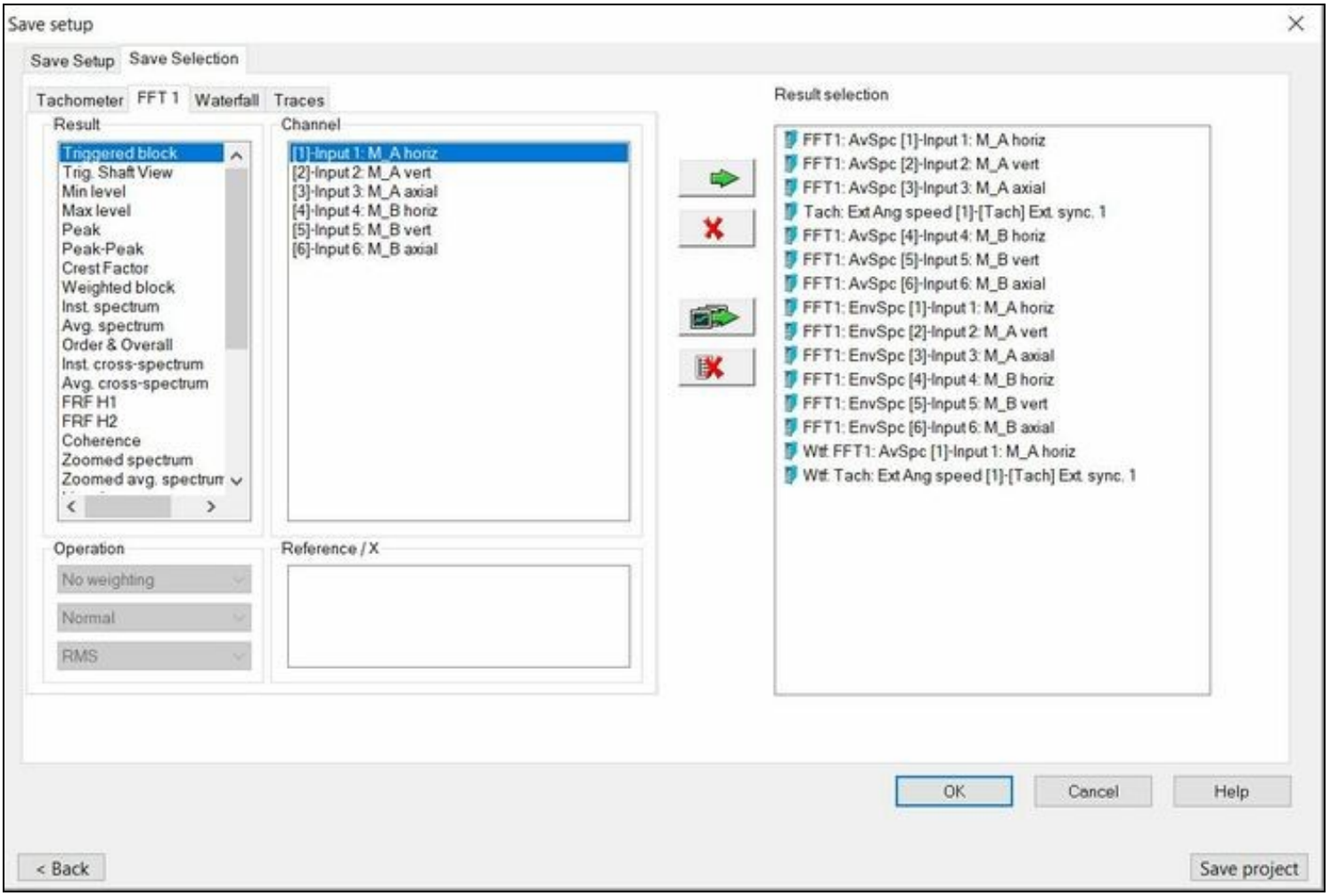
- *Save option*: This option determines the way in which the measurement will be created when the analyzer stops

Do not save	No measurement will be created. The only way to save the results selected is to perform the Save Result command manually
In default measurement	The measurement is created with the name "Default measurement". If a measurement with this name already exists, it is overwritten.
With name confirmation	A dialog box will be displayed when the analyzer stops. It will suggest a name using a Base name and an auto increment choice.
Without name confirmation	The measurement is created with a name automatically generated from the Base name and the auto increment choice.

- *Default keyword*: Used to choose the keyword that will be associated with the new measurement. Refer to the preference section for more information.
- *Saved Results*
- Current Analysis result: Results obtained from an acquisition.
- End of acquisition: open automatically a dialog box to save the results when the analyzer stops.
- Manually: allow to save the results manually.
- Working results: Results obtained after an operation based on already saved analysis results, for example a result calculated with an operator.

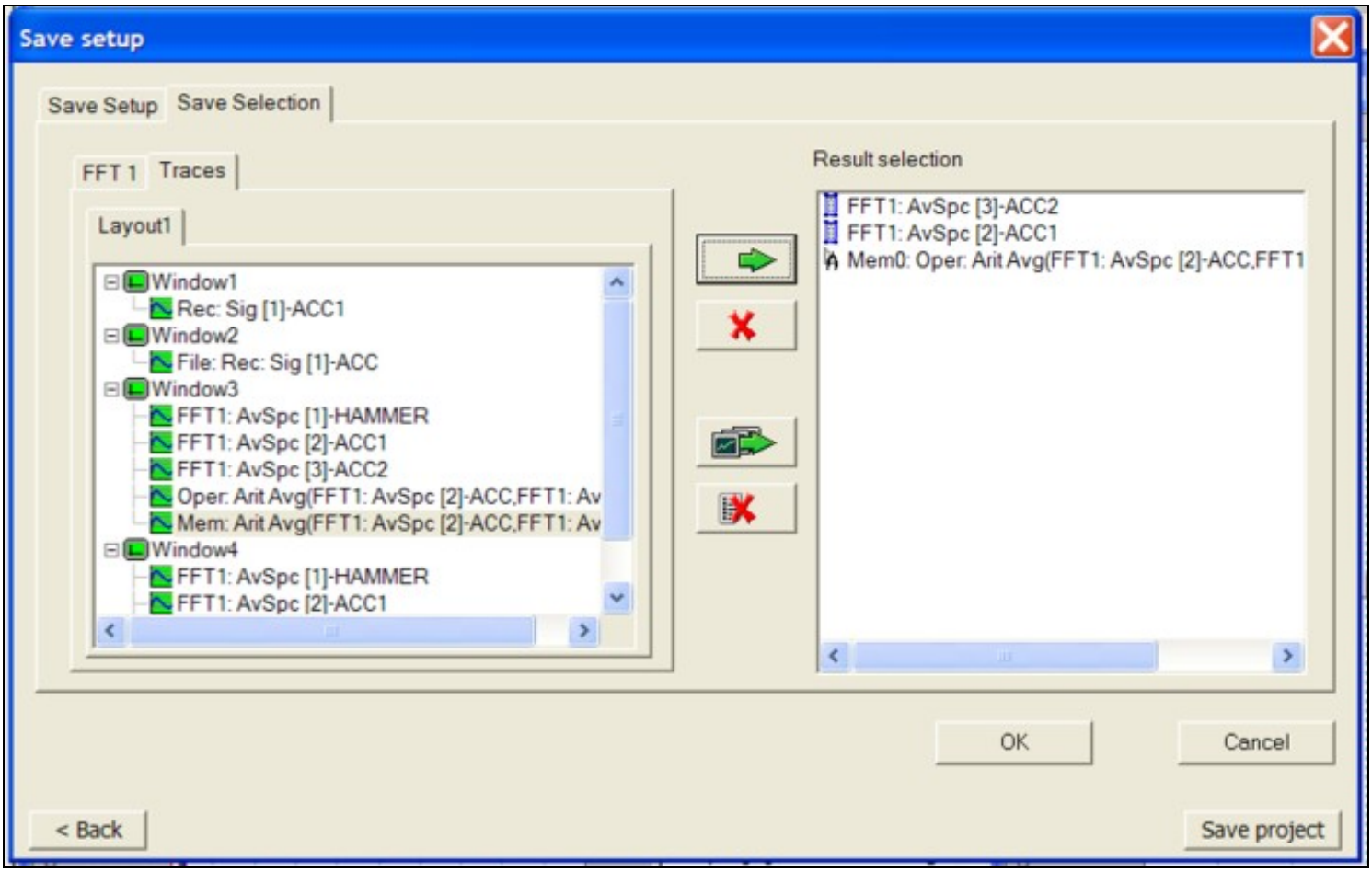
These results can be only saved manually.

121.3.2.2 Save selection tab


Save setup
Save Setup
Save Selection
Tachometer
FFT 1
Waterfall
Traces
Result
Triggered block
Trig. Shaft View
Min level
Max level
Peak
Peak-Peak
Crest Factor
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
FRF H1
FRF H2
Coherence
Zoomed spectrum
Zoomed avg. spectrum
Channel
[1]-Input 1: M_A horiz
[2]-Input 2: M_A vert
[3]-Input 3: M_A axial
[4]-Input 4: M_B horiz
[5]-Input 5: M_B vert
[6]-Input 6: M_B axial
Operation
No weighting
Normal
RMS
Reference / X
Result selection
FFT1: AvSpc [1]-Input 1: M_A horiz
FFT1: AvSpc [2]-Input 2: M_A vert
FFT1: AvSpc [3]-Input 3: M_A axial
Tach: Ext Ang speed [1]-[Tach] Ext. sync. 1
FFT1: AvSpc [4]-Input 4: M_B horiz
FFT1: AvSpc [5]-Input 5: M_B vert
FFT1: AvSpc [6]-Input 6: M_B axial
FFT1: EnvSpc [1]-Input 1: M_A horiz
FFT1: EnvSpc [2]-Input 2: M_A vert
FFT1: EnvSpc [3]-Input 3: M_A axial
FFT1: EnvSpc [4]-Input 4: M_B horiz
FFT1: EnvSpc [5]-Input 5: M_B vert
FFT1: EnvSpc [6]-Input 6: M_B axial
Wtf: FFT1: AvSpc [1]-Input 1: M_A horiz
Wtf: Tach: Ext Ang speed [1]-[Tach] Ext. sync. 1
OK
Cancel
Help
< Back
Save project

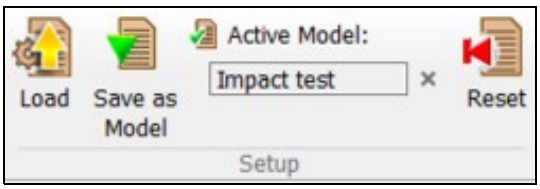
Results provided by the plug-ins

- *Result selection*: List of results provided by the plug-in analyzer selected. Multiple plug-ins may be selected if all results selected are compatible (which means that they can be displayed in the same result window).
- *Channel selection*: List of plug-in analyzer channels connected, available for the result selected.
- *Operation*: in the top combo-box, list of weighting that can be applied to results selected. In the middle combo-box, list of derivation/integration operations which can be applied. In the bottom combo-box, list of display units.
- *Reference / X*: List of plug-in analyzer channels connected. This can be the reference. Available for results that require a reference only (cross-spectrum, for example).
- *Tracked order*: List of tracked orders on channel selected. Available if result selected is an order result.
- *Traces*



List of traces available in the project coming from current analysis results and working results.

121.4 Setup group

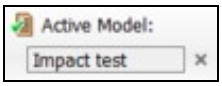




Load setup: Open the *Load setup* dialog, which allows loading setups from Models, Measurements and Projects or creating setups for online or post-analysis.



Save as model: Enable to save the current setup as a Model.



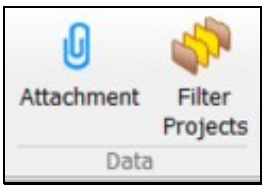
Active model: Display the name of the loaded Model. This Model will remain active until a *Reset setup* is applied or another setup is loaded.



Reset: Close the active Model and set all parameters to the default values.

See setup group page for more details.

121.5 Data group





Attachment: Enable to quickly identify if files (reports, pictures, videos....) are attached to the current project. *Note: if the "Default project" is active, the Attachment button is greyed.*



The *Attachment* folder of the current project is empty or does not exist.

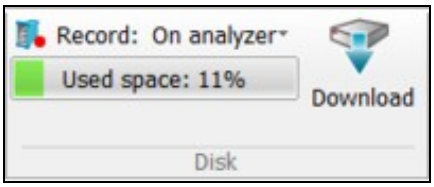


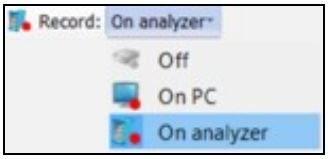
File(s) are located in the *Attachment* folder of the current project.



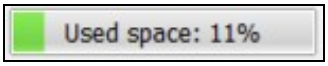
Filter projects: Open the *Filter Project* dialog, which enables selecting the projects to be visible in the *Project manager*. Use the filter and columns sorting to select which set of Project/Measurements will be visible. Click on Filter to view only selected Items, select No Filter to view all Items.The visibility filtering applies on all Item Selection Browsers, Set Selection Browsers and Project Manager.

121.6 Disk group





Record: Display and enable selecting where the recording is performed (analyzer's disk or computer disk) or to stop temporarily the recording (off).



Used space: Give a visual overview of the space available on the disk.



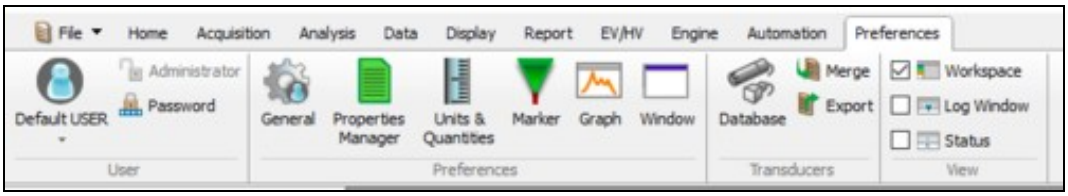
Download: Open the *Disk manager* dialog, which lists the signals available on the analyzer's disk and enables selecting the signals to be downloaded on the pc.

121.7 User



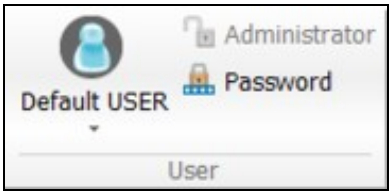
User: This button allows selecting the current user. *Note: changing from one user to another one will reset the current NVGate analysis configuration to the default one defined by the new user.*

122 NVGate Ribbons: Preferences



This tab provides direct access to the user?s definition, user's preferences and sensor database.

122.1 User group



NVGate operates with users? preferences and authorizations. Personalized profiles can be memorized and recalled while starting the software.

A user profile contains:

- Default display preferences (colors, scale type, mode, units, etc..)
- Saving modes (default name, incrementing, confirmation mode, data protection and visibility)
- Waterfall (view, default reference, colors, extractions, filling and type)
- Marker (colors, limits, interpolation)
- Report colors palette
- Units for each physical quantity
- Export modes
- Floating/docked windows location and visibility

By default the user is named ?Default user". User

The user profiles are saved in a file called *NVGate.usr* located in the *NVGate.exe* directory. This file is automatically created at NVGate start when it is absent. Attention: deleting the NVGate.usr file delete all users? preferences including the default setting proposed by OROS.

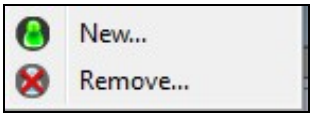
It is possible to temporary change .usr file for special applications. To start NVGate with .usr different from the default one (NVGate.usr) add the following to the command line: -usr=myfile.

122.1.1 Users management

The User group allows managing NVGate users? profiles.



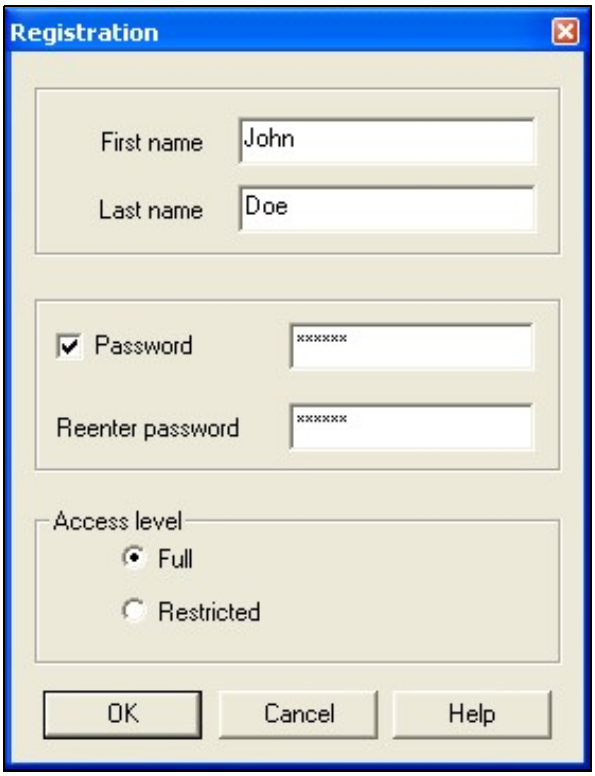
User button: It allows selecting the current user. Attention: changing from one user to another one will reset the current NVGate analysis configuration to the default one defined by the new user.



User button Part2: It allows creating and deleting users from the active .usr profile files.

New: Used to create a new user

122.1.2 Create a new user



First name: First name of the user may be left empty. The first name is automatically formatted so that the first character is in upper case and the others are in lower case letters.

Last name: Last name of the user must be filled in. The last name is automatically formatted in letters.

Password: If selected, the user will have to enter his password to launch NVGate.

Access level

-Full: The user is not limited within NVGate[?]

-Restricted: The user is not authorized to access to all the functions of NVGate. The main characteristics of this type of user are:

Authorized actions	Unauthorized actions
• Create measurements • Modify settings from the Control Panel • Execute macros from the control panel • Load projects from a predefined list • Print reports; Move markers	• Save a project • Close or modify the windows • Modify the settings in the ASB • Use the toolbars that have not been authorized by the administrator

-  **Administrator**: Allows Switching to a non-restricted user profile for administration of the current restricted user rights. In this case the current analyzer setup is not modified.
-  **Password**: Used to change the password. If necessary, the user must enter his current password and then enter the new password

twice



Warning: Due to the GUI modifications, the restricted user profile limitations do not apply on NVGate version 7.00 and further until new notification. It is possible to run NVGate7 with the Legacy V6.00 interface to benefit from the restricted user capabilities. For such purpose runs NVGate7 with the following parameter: -legacy'**.**

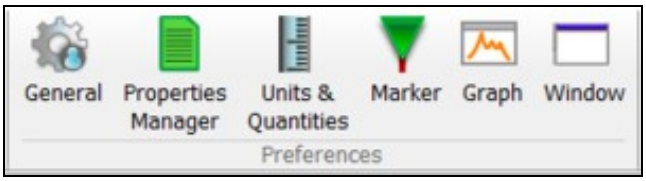
Tips: By default the user is named "Default user".

The user profiles are saved in a file called *NVGate.usr* located in the *NVGate.exe* directory. This file is automatically created at NVGate start when it is absent. Attention: deleting the NVGate.usr file delete all users? preferences including the default setting proposed by OROS.

It is possible to temporary change .usr file for special applications. To start NVGate with .usr different from the default one (NVGAte.usr) add the following to the command line: -usr=myfile.

122.2 Preferences group

These buttons provide direct access to the user?s preferences.



The user?s preferences are gathered in one unique dialog with multiple tabs. Following buttons provide direct access to the user?s preferences:



General: Enter the preferences setting at the 1st tab. It allows customizing the scales font size, the refreshing speed as well as default specialized modes.



Properties manager: Open the measurement properties setup. This tool allows managing the default and user defined properties. These property values are saved with the measurement and used to qualify it. Later, they may be incorporated into reports and for search functions.



Units & Quantities: Open the "Physical quantity" tab of the user?s preferences. It allows creating, modifying and removing the units and physical quantities used by the NVGate interface.

Reminder: NVGate process SI units. The selected Units are used for display only, the data are not modified by the units changes.



Marker: Open the "Marker" tab of the user?s preferences. It allows changing the appearance and the number of the different marker types.



Graph: Open the "Graph" tab of the user?s preferences. It allows changing the appearance of the different graph types.



Window: Open the "Window" tab of the user?s preferences. It allows changing the appearance of the windows, their default arrangement, the number and style of the cursors.

See User Preferences for details.

122.3 Transducers group

This group manages the transducers database which is used by NVGate to automatically setup the inputs and trace front-end status at measurement time.



Database: Opens the transducer database saved on the computer.



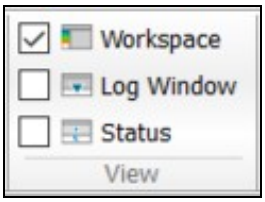
Merge: Merge multiple transducer databases into one. The merged .cdb is the one currently used by NVGate (file: TransducerDB.cdb located in the NVGate.exe directory)



Export: Allows exporting the current database (file: TransducerDB.cdb located in the NVGate.exe directory) in csv format.

See Transducers and calibration for details.

122.4 View group





Workspace: show/hide the workspace window that contains the Analyzer Setting Browser (ASB), the Project Manager (PM) and the Control Panel (CP).



Log window: This window tracks all changes in the analyzer. Logs are arranged in 3 separate tabs:

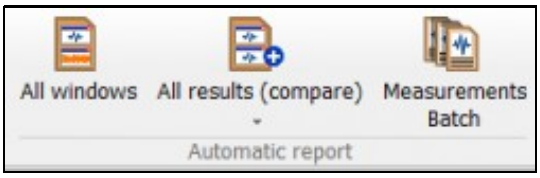
- *Analyzer settings:* Display all users? and dependencies related changes in the ASB.
- *Warning:* Displays dynamic warnings related to the current setup (for example: *A & C acoustic filters are no more available when the sampling frequency is lower than 25.6 kHz*). Raising a warning will automatically show the log window during 3 sec.
- *Macro trace*: log window for macro execution and debugging.



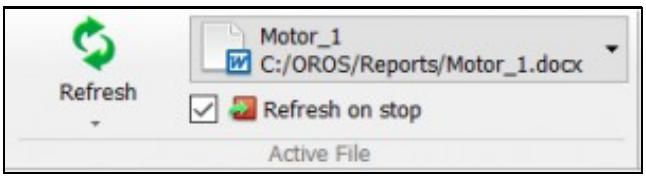
Status: Displays the current status of the plug-ins (*see chapter 1 ASB for details*). General statuses are displayed in the bottom status bar, the Status window is made to show advanced status for accurate control of the acquisition/analyses. To add the statuses in this window, right click in the selected plug-in and select *View states*.

123 NVGate Ribbons: Report

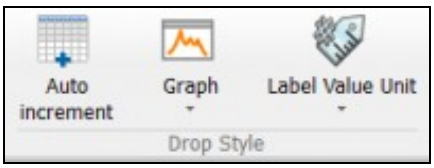
123.1 Automatic report group



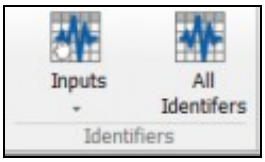
123.2 Active file group



123.3 Drop style group



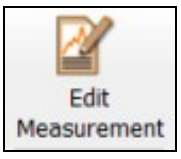
123.4 Identifiers group



123.5 References group



123.6 Edit measurement



123.7 Preferences



123.8 Angle frequency



124 NVGate Sequence

The sequencer is used to import/export/load/view an Excel® file that contains a series of steps. These steps are executed one by one. The sequencer is generally used to operate the Roving hammer impact for modal acquisition, for example.

124.1 Tutorial

124.1.1 Video

The following describes the video contents.

Step 1 ? Create a sequence : How to create a sequence from scratch.

Step 2 ? Import a sequence : How to import an Excel sequence into NVGate.

Step 3 ? Measurement with a sequence : Once measurement is completed, the active sequence will update a set of settings such as Label, Node, Direction? Measurements are also labeled from sequence.

Tip ? Automatic measurement with a sequence : How to get a fully automated sequence of measurements.

Video Download offline

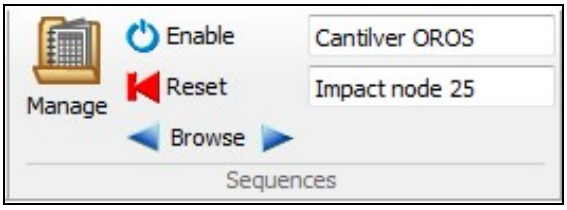
124.1.1.1 Tutorial Data Download

- NVGate Model: List_BLADES_v1, to be copied in the NVGate Models base (usually under C:\OROS\NVGate data\Workbook Library\user). It is the setup used during the tutorial videos.

- The sequence update_DOF.seq is included in the model folder.

Download here

124.2 Sequences group





Manage: Open the Sequence manager and display the sequences list.



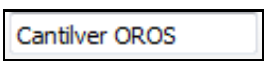
Enable: enable/disable the sequence execution. When the loaded sequence is enabled, the steps are executed each time the analyzer finish an acquisition/analysis (i.e: the general status switch to STOP)



Reset: reset the sequence to the initial step, execute it and disable the sequence.



Browse: Move to the next or previous step in the sequence. Disabled when the sequence is enabled.

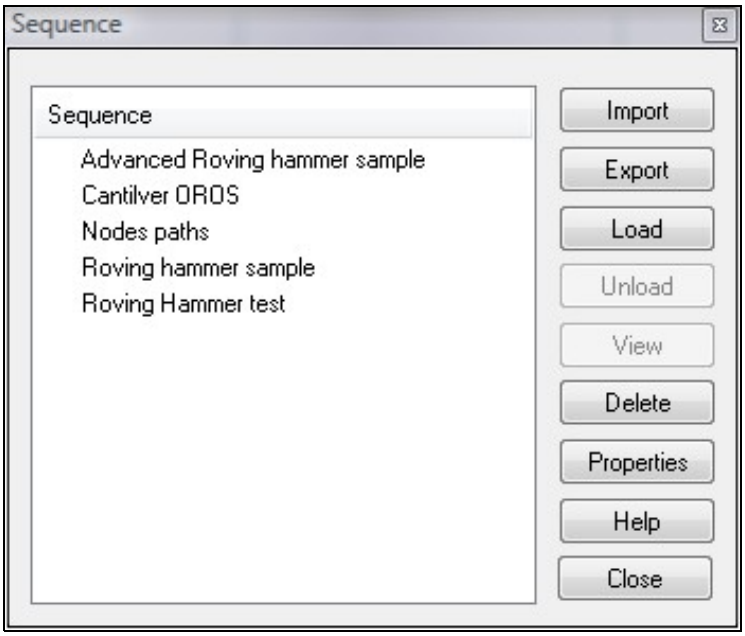


Active sequence name: shows the loaded sequence name.

"impact node 25"

Current step: displays the name of the current step. The current step is the one which has been executed at the last stop.

124.3 Sequence Manager



- **Import**: Import a sequence from an Excel® file, to create a sequence in NVGate format. Sequences in NVGate format are stored in the "Sequence" directory.

Names of sequences in NVGate format are displayed by the sequence manager.
See Source format for more information about sequences in Excel®.

- **Export**: Export selected sequence (in NVGate format) to Excel®.
- **Load**: Load selected sequence. Only the loaded sequence can be executed or opened in the sequence viewer to perform a modal analysis.
- **View**: Open the selected sequence in the Sequence viewer. Only the loaded sequence can be opened in the viewer.

A Sequence is a set of acquisitions. Each acquisition is a set of setting modifications, and it is associated to a measurement. When a measurement is performed, the acquisition associated with it, is called the current acquisition and is designated by the execution pointer (yellow arrow to the left of the sequence tree). At the end of each measurement, next acquisition becomes current and is executed to prepare the next measurement. When an acquisition is executed, all settings assigned to it are applied.

- **Delete**: Delete the selected acquisition.
- **Properties**: Edit sequence properties.



When "Run after setup" is checked, a new measurement is launched automatically after the current acquisition is executed.

124.4 Sequence viewer

 **Run**/**Pause**: When the sequence is not running, it is launched from the current acquisition. The current acquisition is executed to prepare the measurement.

Note: The Pause button operates at the inverse of the enable button in the sequence group ribbon.

 **Reset**: Sets the execution pointer (which designates the current acquisition) to the first acquisition of the sequence.

Note: the reset button operates like the reset button in the sequence group ribbon

 **Back to previous**: The acquisition preceding the current acquisition becomes current and is executed. Disabled if sequence is running.

 **Run next**: The acquisition following the current acquisition becomes current and is executed. Disabled if the sequence is running.

Note: Next and previous button operates like the sequence browser arrows in the sequence group ribbon.

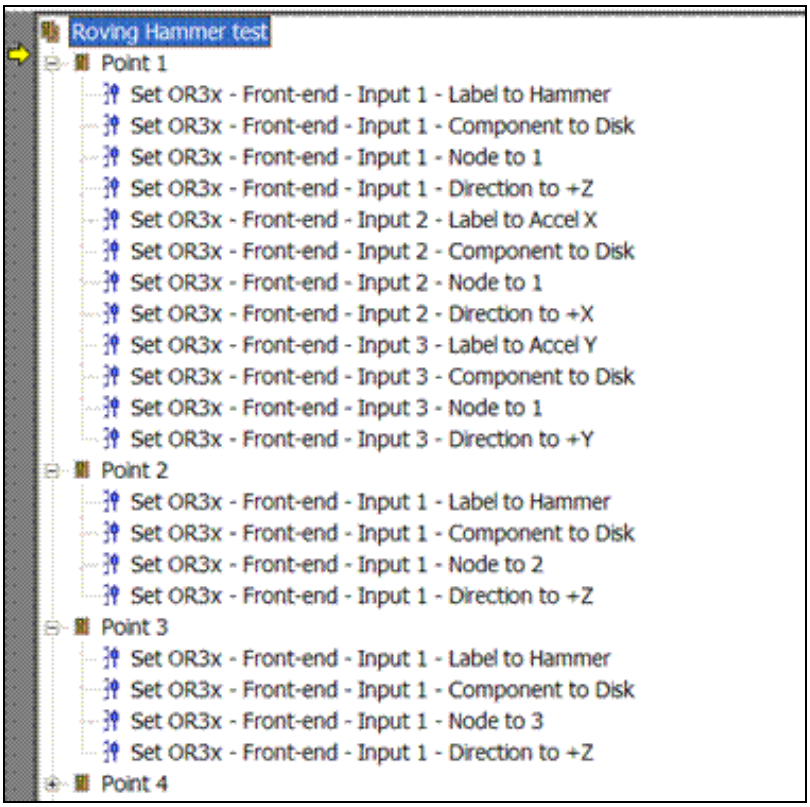
- **Jump to**: Accessible by right-clicking on the acquisition. This acquisition becomes current.

124.5 Source format

"Roving hammer test" sequence in Excel®.

1	Roving Hammer test						
2			Label	Component	Node	Direction	RemoteNodelabel
3	Point 1	Input1	Hammer	Disk	1	+Z	1 +Z
4		Input2	Accel X	Disk	1	+X	
5		Input3	Accel Y	Disk	1	+Y	
6	Point 2	Input1	Hammer	Disk	2	+Z	2 +Z
7	Point 3	Input1	Hammer	Disk	3	+Z	3 +Z
8	Point 4	Input1	Hammer	Disk	4	+Z	4 +Z
9	Point 5	Input1	Hammer	Disk	5	+Z	5 +Z

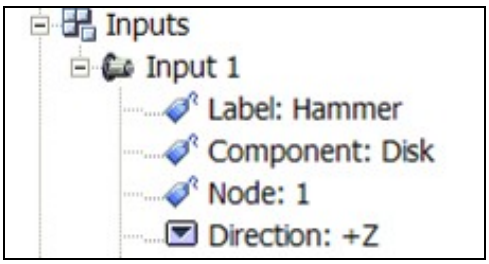
"Roving hammer test" sequence in NVGate



The first Excel® cell is dedicated to sequence name.

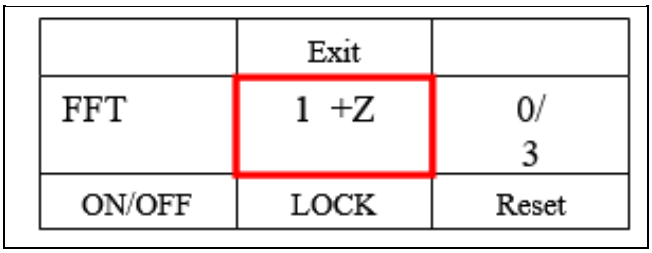
The first column contains the name of acquisitions.

The second column contains, for each acquisition, the key words which identify the NVGate configuration sub-modules.



Second line is composed of the keywords, which identify the NVGate configuration?s settings.

They can be found in the ASB.



	Exit	
FFT	1 +Z	0/ 3
ON/OFF	LOCK	Reset

The column called ?Remote Node Label? is the field displayed by the remote controller.

Number the columns with the channel names sequentially and exclude any that are not assigned.

Menu ?Impact? of the remote controller

These key words in the excel file, should be also defined in the Sequence.ini file which contains alias definitions. An IDNumber is associated to each setting. It can be retrieved from the ASB in NVGate by using shift + right click on the corresponding setting. Settings aliases could be modified by users.

Part of Sequence.ini file

Each couple (sub-module key word, setting keyword) designates a specific setting in the NVGate configuration. The value to assign to this setting is defined in the corresponding cell.

The semicolon character marks the rest of a line as a comment.

124.6 FAQ

How do I load a signal in the player using sequence?

[004.090.233] ==> modify the player signal file. Then, You need to have 2 columns one for the project and just next another one for the measurement. (see picture)

post analyse			
	004.090.233		
Measurement 1	Marine engine test bench	bearing_bush_1200rpm_33kW	
Measurement 2	Marine engine test bench	Reference_1200rpm_33kW	
Measurement 3	Marine engine test bench	Reference_1500rpm_0kW	

125 NVGate Setup Group

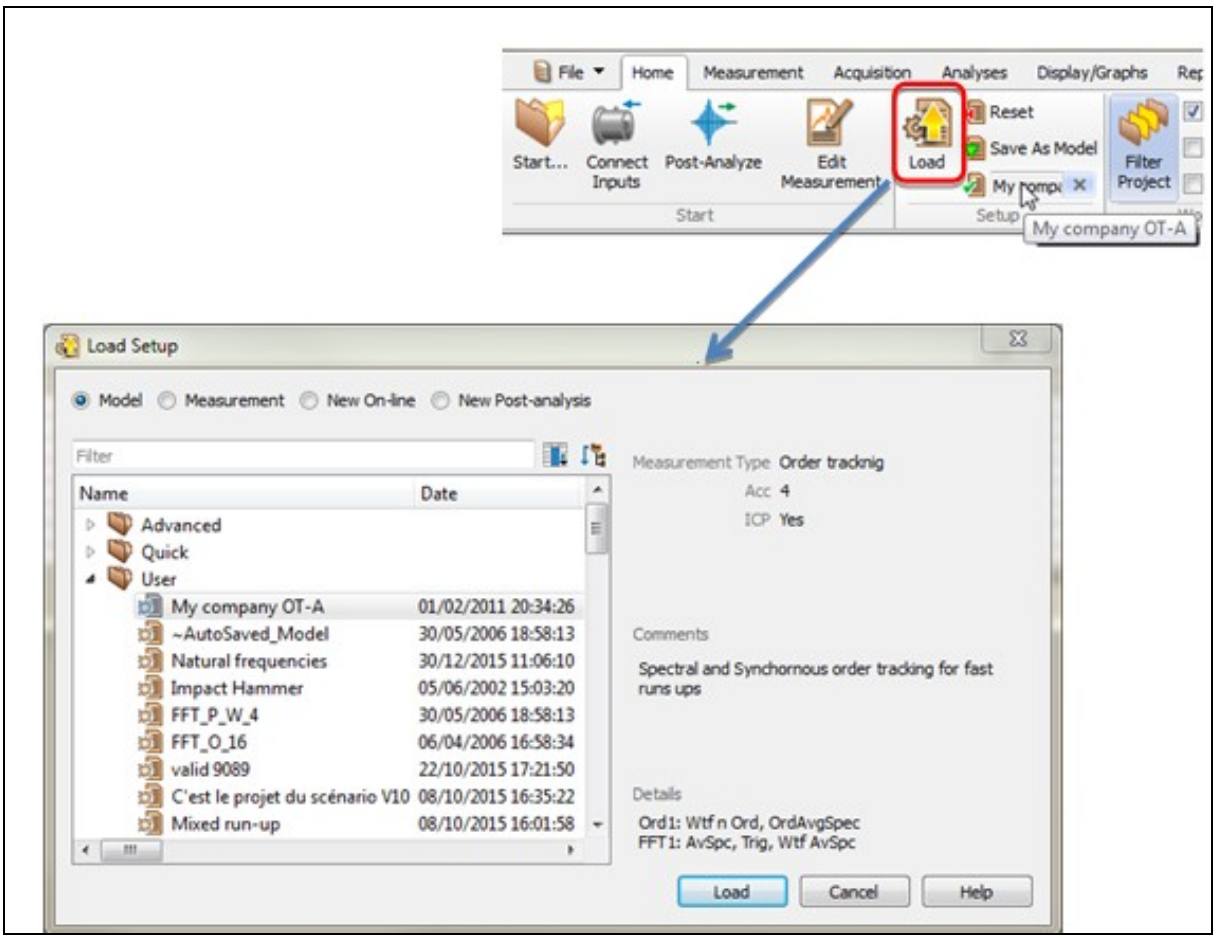
125.1 Setup Group

In both above *open project* cases, the project is opened, no setup is loaded. The Setup is loaded further this first action. There are few ways to load a setup prior being ready for acquisition and analyses.

Check the *Load setup* box in the *open project* dialog in order to select the setup while exiting the *Open project* one.

Use the *Home/Setup/Load* ribbon button.

The load setup dialog behaves as a single Item selection. It allows loading setups from *Models Measurements* and *Projects* or creating setups for on-line or post-analysis:



While in Model or Measurement load, the details section (right bottom side) shows which results are saved by the selected setup.

Load a Model: Loaded *Models* offer additional features;

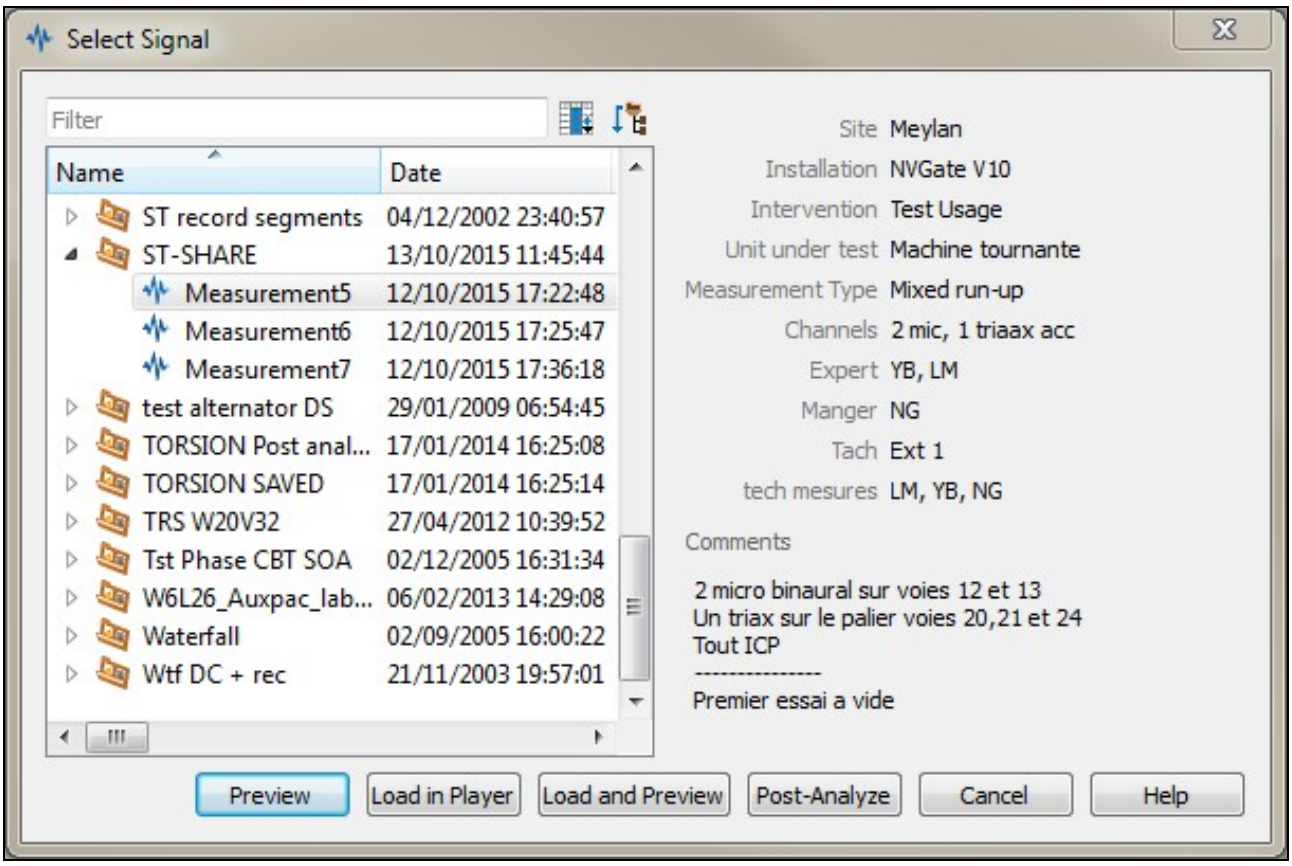
- Model properties will inherit to the measurements
- Loaded Model name reminded in the Ribbon; *Home/Setup* with the icon. This Model will remain active until a reset setup is applied or another setup is loaded.
- When the measurement are shared out of NVGate or collated to NVGate the associated model will be transferred with the measurement.
- Loaded Model can be modified to adjust to current situation. The modified setup is saved in the Measurement, but the original Model remains unmodified. This allows providing predefined setups which are not modified by specific usage (adjustments, operator's error, etc.) ensuring reproducibility.
- You can modify and save the setup with the *Home/Setup/save as model* button . Associated model properties will be proposed in the *save as model* dialog. This allows updating an existing Model keeping its properties.

Load a Measurement's setup: The setup used to generate the results of the selected *Measurement* will be reloaded.

This feature allows reproducing faithfully exiting measurements for prototyping fine tuning or trend analyses. OROS recommend saving all repeated measurements in the same project.

Create a setup from scratch: This sis available for on-line or post-analysis. Both options will reset the current setup to default values before building the new setup.

- On-line opens the Channel selection dialog as usual.
- *Post-analysis* will first require selecting a file to be analyzed with the Select signal dialog. Similarly to select model one the right side of the dialog shows the Measurement properties. This information allows rapidly finding the searched signal.



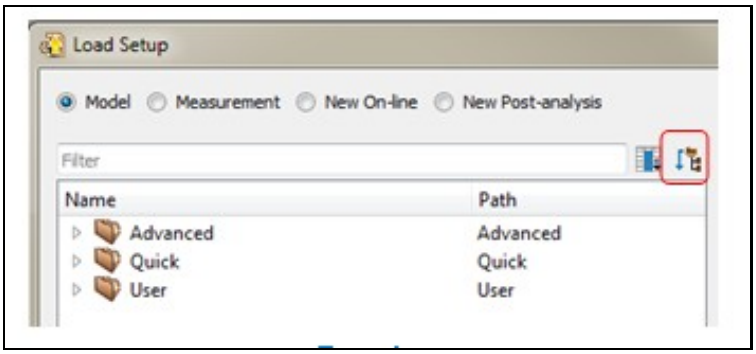
125.1.1 Pre-defined setups

OROS provides various predefined models that contains basic and advanced setup examples of analysis. These setups are available from the Load Model dialog.

This setup contains customized items:

- Front-end setup
- Analysis setup
- Layouts
- Save setup
- Control panel

Select the *Tree view* in the Load setup dialog to see the directories using the *Flat/tree* button



Tree view

Quick directory contains setups of the instrument for either post-processing or on-line analysis.

The mapped directory is the quick directory in the workbook library which is defined in the NVGate Environment paths. Default is: *C:\OROS\NVGate data\Workbook Library\Quick*. It is possible to add additional models in this directory according to your organization chart.

Quick Models name defines the characteristics of the corresponding analyses:

AAA_M_W_N

- AAA is the analysis mode (FFT, REC, ORD, etc..)
- M is the mode: O=On-line, P=Post-analysis
- W is present for waterfall results (profile, 3D)
- N is the number of channels

125.1.1.1 Advanced Models

This directory shows applications-oriented examples.

The mapped directory is the advanced directory in the workbook library which is defined in the NVGate Environment paths. Default is: *C:\OROS\NVGate data\Workbook Library\advanced*.

125.1.1.1.1 User?s models

This directory holds the Models saved by the users of the NVGate installed in the current PC.

126 NVGate Shortcuts

126.1 Shortcuts

126.1.1 Most Famous

This are really useful !

CTRL+A : Autoscale on Y axis

CTRL+R : RUN

CTRL+S : STOP

CTRL+space : Switch 2 last layouts.

CTRL+shift+space : switch all the layouts.

126.1.1.1 General shortcuts

F1	On-Line Help
Ctrl + Space	Move from one layout to the next one.
Ctrl + Tab	Move from one window to another one in the same layout.
Page Up	Change Workspace tab (ASB, Control Panel, Project Manager).
Page Down	Change Workspace tab (ASB, Control Panel, Project Manager).
F10	Freeze the active window.
	Move the cursor to the left.
	Move the cursor to the right.
+	Zoom in on Y axis.
-	Zoom out on Y axis.
/	Zoom out on X axis.
*	Zoom in on X axis.
Shift + F1	Contextual help
Ctrl + Insert	Edit Copy
Shift + Delete	Edit Cut
Ctrl + X	Edit Cut
Shift + Insert	Edit Paste
Alt + Back	Edit Undo
Ctrl + R	Run

Pause	Pause
Ctrl + S	Stop
Ctrl + A	Y axis auto-scale on all windows.
Crtl + Alt + A	Y axis auto-scale on active window.
Ctrl + Shift + A	Auto-range
Ctrl + B	Next Step
Ctrl + C	Copy item content (ASB settings, mask)
Ctrl + V	Paste item content (ASB settings, mask)
Ctrl + D	Save current workbook
Ctrl + Y	Accept acquisition
Ctrl + N	Reject acquisition
Ctrl + 0 to 9	Macro start
Ctrl + P	Print report
Ctrl + Q	Zoom auto-scale on Z axis.
Ctrl + T	Manual trigger
Ctrl + M	Add record marker.
Ctrl + W or Z	Full width on active trace.
Insert	Memorize Trace
Ctrl + Delete	Remove Active Trace
Ctrl + F5, F6, F7, F8, F9, F10	Change the mouse mode (display mode toolbar).
X/Y/Z +Shift + Mouse wheel (up)	Zoom in on (X/Y/Z) axis (+ Ctrl for small steps).
X/Y/Z +Shift + Mouse wheel (down)	Zoom out on (X/Y/Z) axis (+ Ctrl for small steps).
X/Y/Z + Mouse wheel (up)	Translate X/Y/Z axis positively (+ Ctrl for small steps).
X/Y/Z + Mouse wheel (down)	Translate X/Y/Z axis negatively (+ Ctrl for small steps).
Ctrl + F5	Default mode activation (scale mode)
Ctrl + F6	Zoom mode activation
Ctrl + F7	Cursor mode activation
Ctrl + F8	Move mode activation
Ctrl + F9	Rotate mode activation
Ctrl + F10	Marker mode activation
F2 to F9, F11, F12	Macro Hot key

126.1.1.2 Use the mouse wheel for 1D windows

Mouse wheel: move the min, the max or shift a scale.

Note: If you do not have a mouse wheel, you can use the top and bottom arrows.

126.1.1.3 Template Editor

Tab	Browse the objects on the active page
Alt Gr + Tab	Browse the objects on the active page in the opposite direction
Alt + Enter	Last selected object properties
	Move one or several selected controls to the left.
	Move one or several selected controls to the right.
	Move one or several selected controls to the top.
	Move one or several selected controls to the bottom
Suppr	Delete one or several selected controls

126.1.1.4 Use the mouse wheel for 2D windows

126.1.1.5 Cursor mode

Mouse Wheel: right/left move by 5 steps.

Mouse Wheel + CTRL: right/left move by 1 step.

126.1.1.6 Arrow mode

When the pointer is on the X or Y axis and on the min or max value, use the mouse wheel to move 5 pixels.

When the pointer is on the X or Y axis and on the min or max value, use the mouse wheel + CRTL to move 1 pixel.

When the pointer is in the middle of X or Y axis, use the mouse wheel to shift translation of the zoom area 5 pixels.

When the pointer is in the middle of the X or Y axis, use the mouse wheel + CRTL to shift of the zoom area 1 pixel.

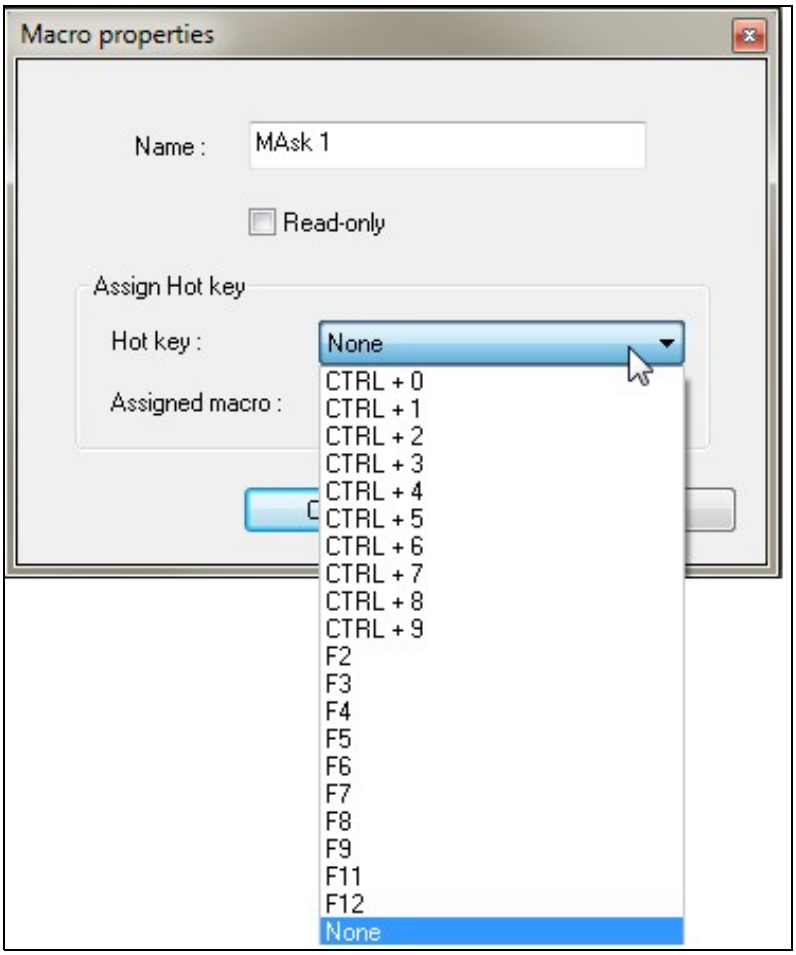
When the pointer is in the middle of X or Y axis, use the mouse wheel + SHIFT to zoom quickly.

When the pointer is in the middle of X or Y axis, use the mouse wheel + CRTL + SHIFT to zoom.

126.1.1.7 Macro

A shortcut keyboard can also be assign to a macro :

Functions key from F2 to F9 + F11 and F12, then CTRL + "x" can be associated to a macro.



Exemple : Do a Macro wich is doing only "Run", assign this macro to an hot keys. Exemple : "F2". So now, you can launch the Run with the F2 keyboard button.

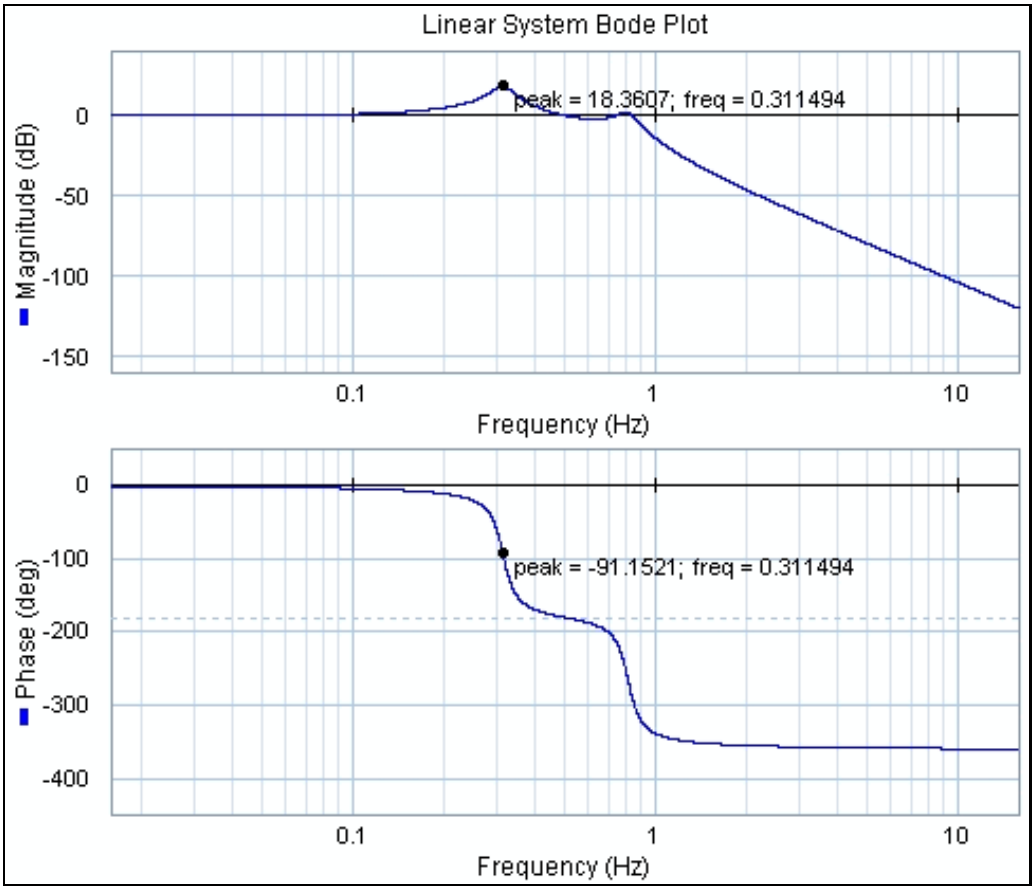
127 NVGate SOA and CBT techniques

This article compares Synchronous Order Analysis (SOA) method to the Constant Band Tracking (CBT) method.

127.1 Applications

127.1.1 Synchronous Order Analysis (SOA)

- Balancing / Phase default detection: Order 1 is being followed. Phase gives the unbalance's position.
- Coast Down using Bode Plot. Critical frequencies can be detected (Amplitude and Phase)



- Orbit analysis / Angle analysis
- Torsional analysis / Crank Shaft Analysis

127.1.2 Constant Band Tracking (CBT)

- Gear Boxes: shocks are numerous, spectra are noisy. Orders are not identified as clearly as they are in the case of large rotating machines such as turbines for instance. What is interesting is their is more energy around one order rather than its amplitude. Computation is performed on a constant width frequency band.

127.1.3 Order Extraction from waterfall

- For investigation. When people don't know precisely what they are looking for (which order or frequency band to follow). The FFT waterfall can be used as a first step evaluation before using eventually SOA or CBT for in-depth analysis.

127.2 Principles

127.2.1 SOA

It is an order analysis method for which the sampling is synchronous with the rotating speed measured from the tachometer. Re-sampling filters are used on the raw signal to give constant angle sampling and a triggered blocks size independent from the rotating speed (the size corresponds to a fixed number of revolutions).
See SOA page for more info.

127.2.2 CBT

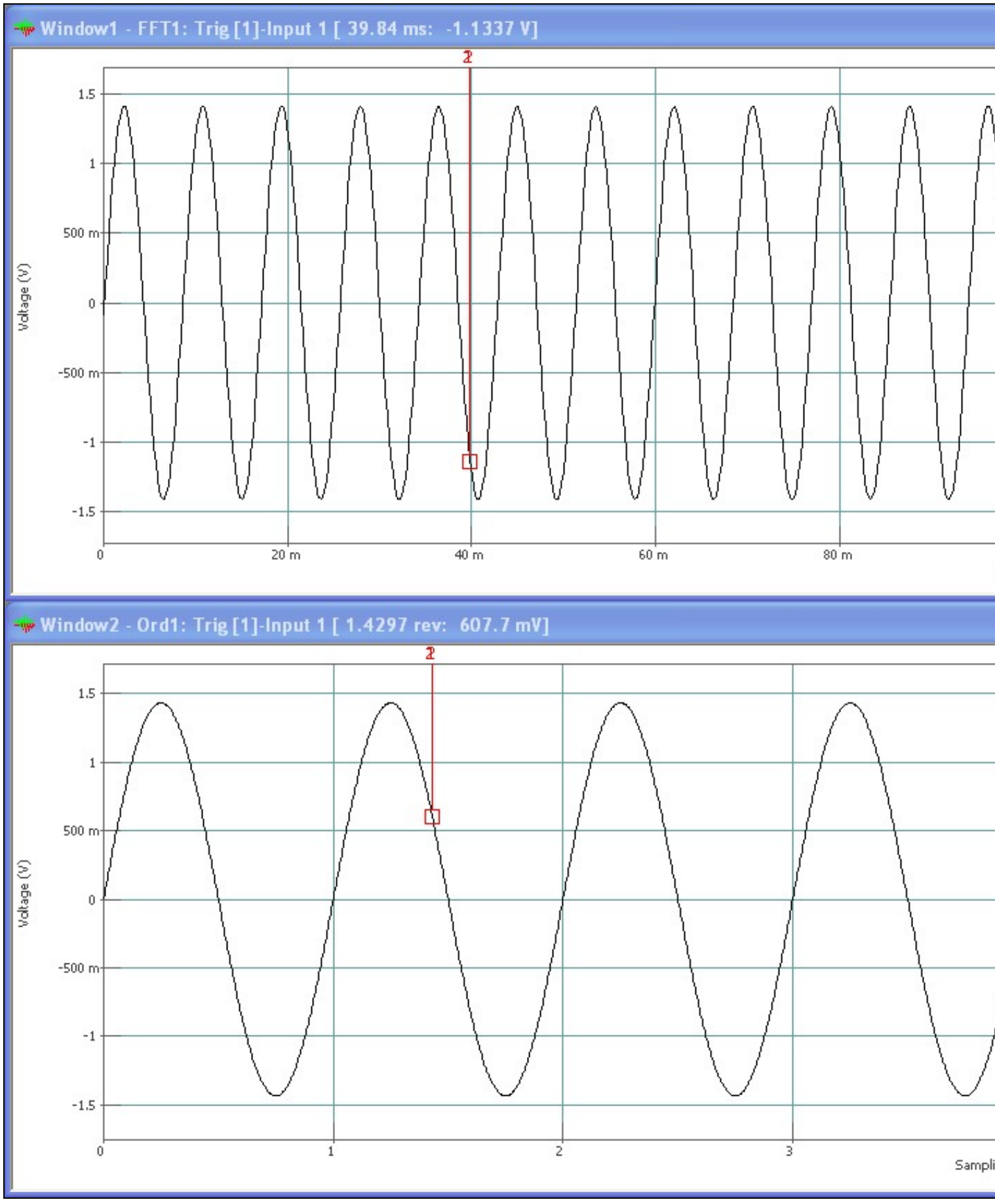
Constant Band Tracking consists of order analysis calculation based on energy summation from FFT data. Since the FFT module is used when tracking orders with the CBT feature, the trigger block duration is constant and no re-sampling is performed there. As a result, the number of rotations contained in one block depends on the rotating speed.

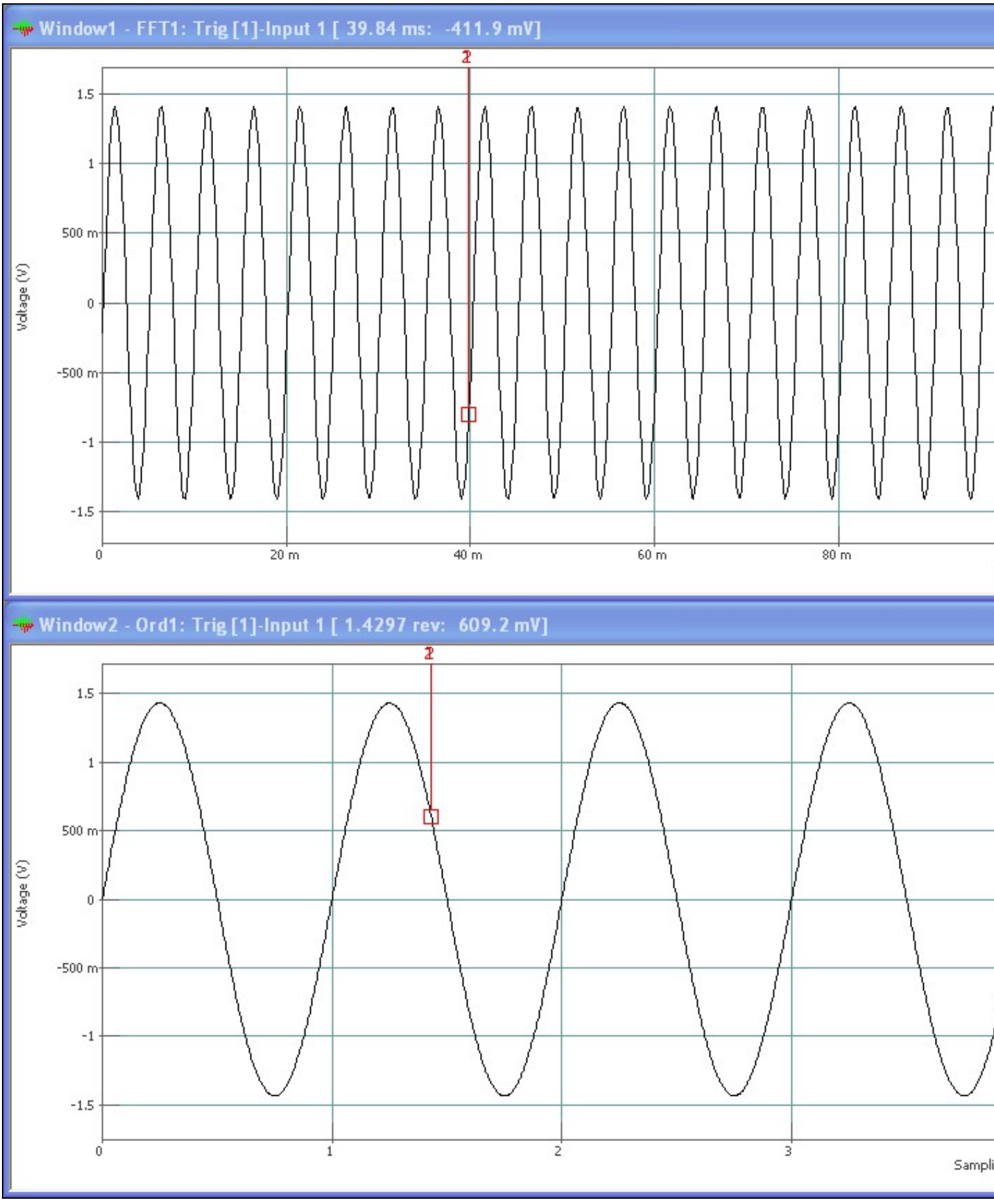
See CBT page for more info.

127.2.3 To sum-up:

- SOA trigger block is based on a constant revolution number defined by the order resolution and in sync with the tachometer pulses.
- FFT trigger block for CBT has a constant time base defined by the frequency resolution.

The example below shows, respectively the FFT trigger block and the SOA trigger blocks at two different rotating speeds of a swept sine.


Window1 - FFT1: Trig [1]-Input 1 [39.84 ms: -1.1337 V]
Voltage (V)
1.5
1
500 m
0
-500 m
-1
-1.5
0
20 m
40 m
60 m
80 m
Window2 - Ord1: Trig [1]-Input 1 [1.4297 rev: 607.7 mV]
Voltage (V)
1.5
1
500 m
0
-500 m
-1
-1.5
0
1
2
3
Sampli


Window1 - FFT1: Trig [1]-Input 1 [39.84 ms: -411.9 mV]
Voltage (V)
1.5
1
500 m
0
-500 m
-1
-1.5
0
20 m
40 m
60 m
80 m
Window2 - Ord1: Trig [1]-Input 1 [1.4297 rev: 609.2 mV]
Voltage (V)
1.5
1
500 m
0
-500 m
-1
-1.5
0
1
2
3
Sampli

- As the rotating speed increases, the FFT trigger block angular resolution decreases (more revolutions within one block) whereas the SOA angular resolution remains the same whatever the rotating speed is.

This has a consequence on the rate of results issued by the SOA plug-in. As a matter of fact, the average time duration is different when running at low speeds or high speeds: it takes longer as the speed decreases.

This is different in the FFT module where the average time is the same for the whole range of speeds.

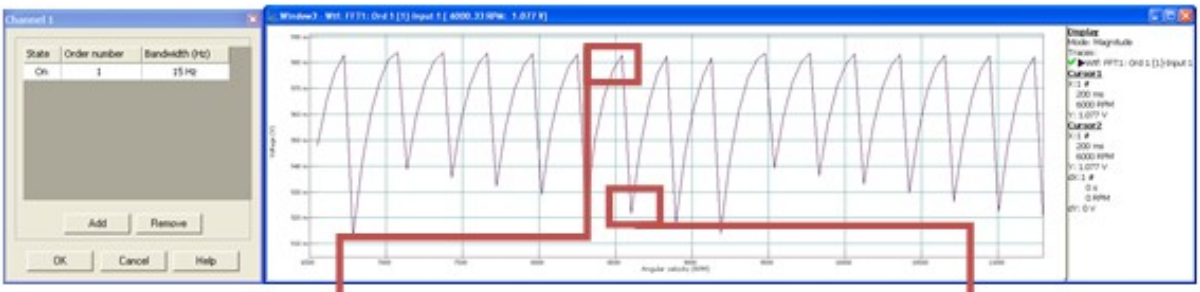
- The SOA averaging is done on the exact same number of revolutions at any time of the measurement whereas the CBT will average different number of revolutions at a separate time of the test depending on the current rotating speed.

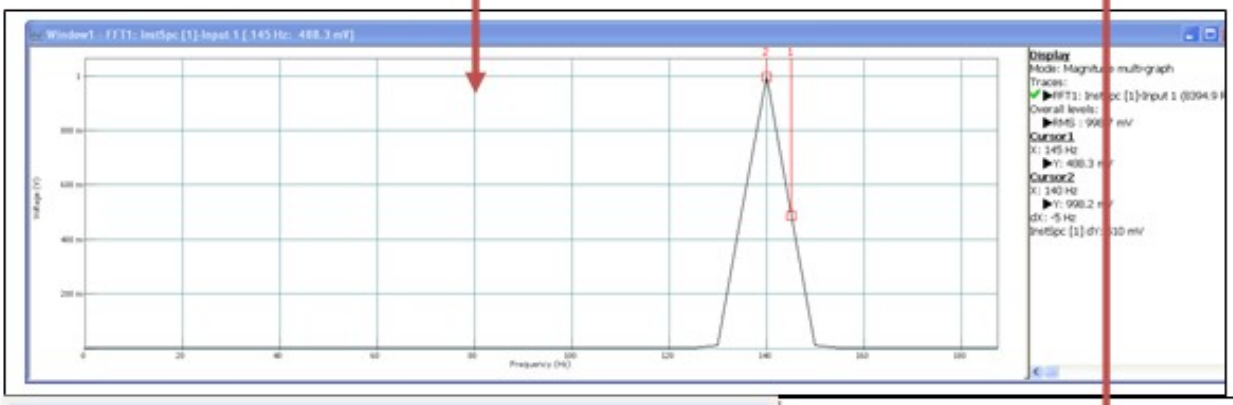
127.3 Swept sine setup emphasizing differences between SOA and CBT techniques

A 1V-RMS swept sine is set up to go from 100 to 200Hz (6000 to 12000RPM). Order 1 is tracked using CBT and SOA. Frequency resolution is 5Hz in the frequency domain (2kHz bandwidth + 401 lines).

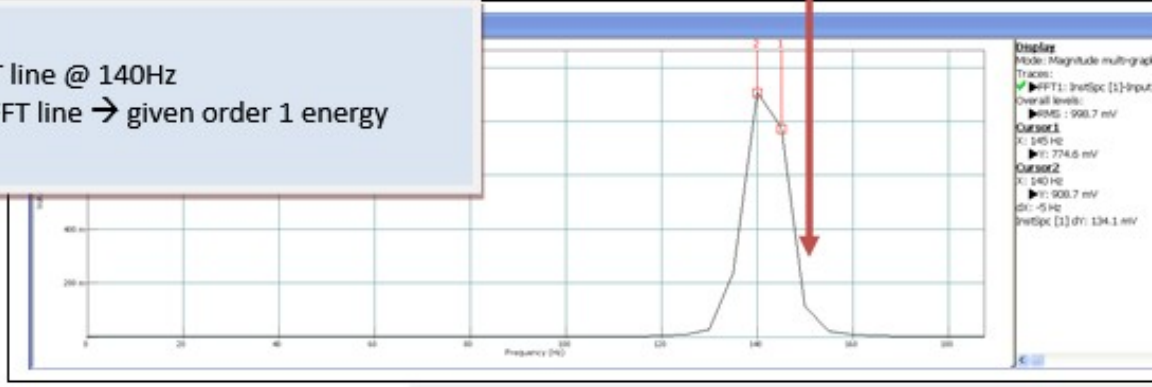
127.3.1 CBT

To begin with, the minimum frequency band (15Hz) is selected for the tracking of order 1. The profile from 6500RPM to 11500RPM for order 1 is the following:





8400 RPM → 140Hz
5Hz resolution → FFT line @ 140Hz
Order 1 on the very FFT line → given order 1 energy complete

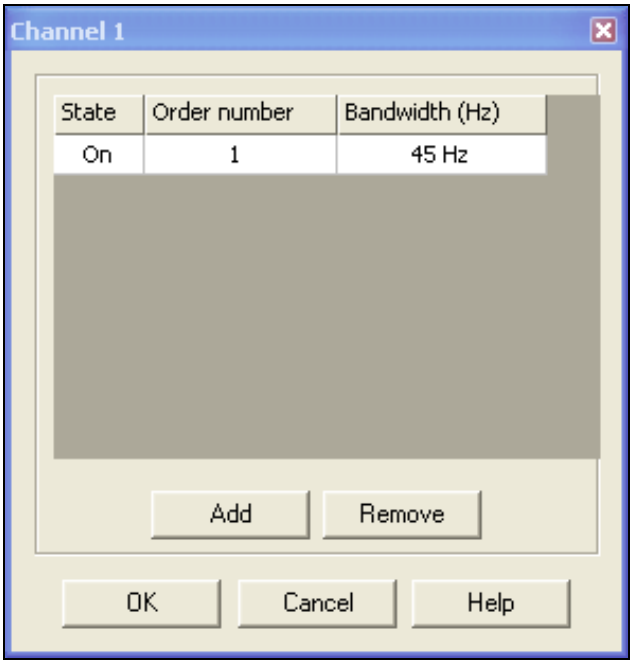


8600 RPM → 143.33Hz
5Hz resolution → FFT line @ 140Hz and 145Hz
Order 1 between 2 FFT lines → energy is distributed on different lines.

Globally, the order track goes from 6500RPM to 11500RPM which is the same as 108Hz to 191Hz. With the 5Hz resolution that has been used, the swept sine matches the FFT lines frequencies 17 times (110Hz, 115Hz,?) during the run-up. It corresponds to the 17 peaks that can be seen on the tracking of order 1. Indeed, at those specific times, energy of order 1 is distributed on frequency lines that are all taken into account by the energy summation performed on the FFT spectrum (15 Hz bandwidth) to get order 1 value.

Now, the bandwidth is modified to 45Hz.

Order 1 profile is then almost steady and now very close to the 1V RMS at any moment.

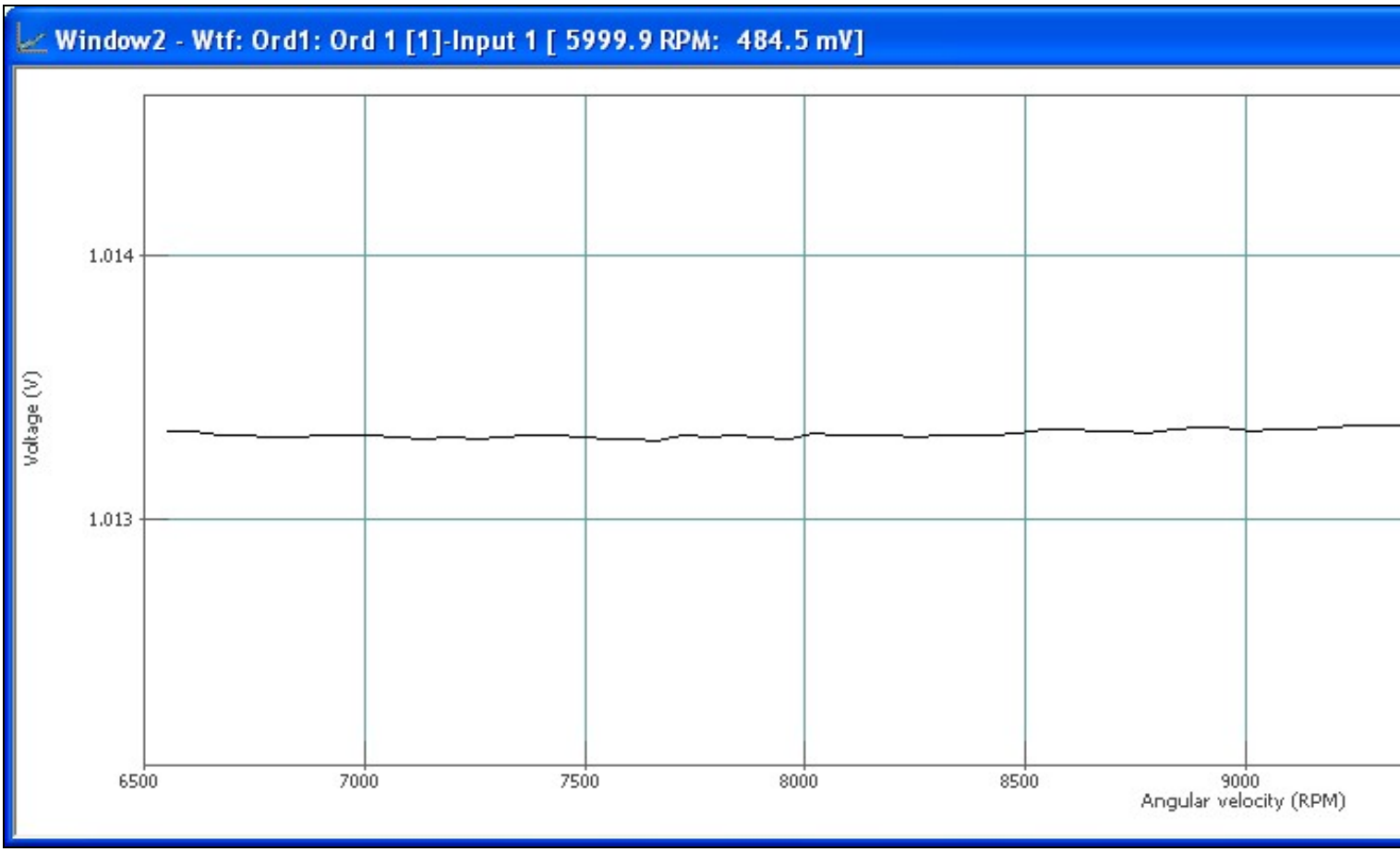




Energy around order 1 in a 45Hz bandwidth is now included in the computed value. As the energy distributed on the lines of the FFT spectrum comes, in this case, only from order 1, we are therefore clearly getting closer to the 1V RMS by enlarging the bandwidth and combining those lines.

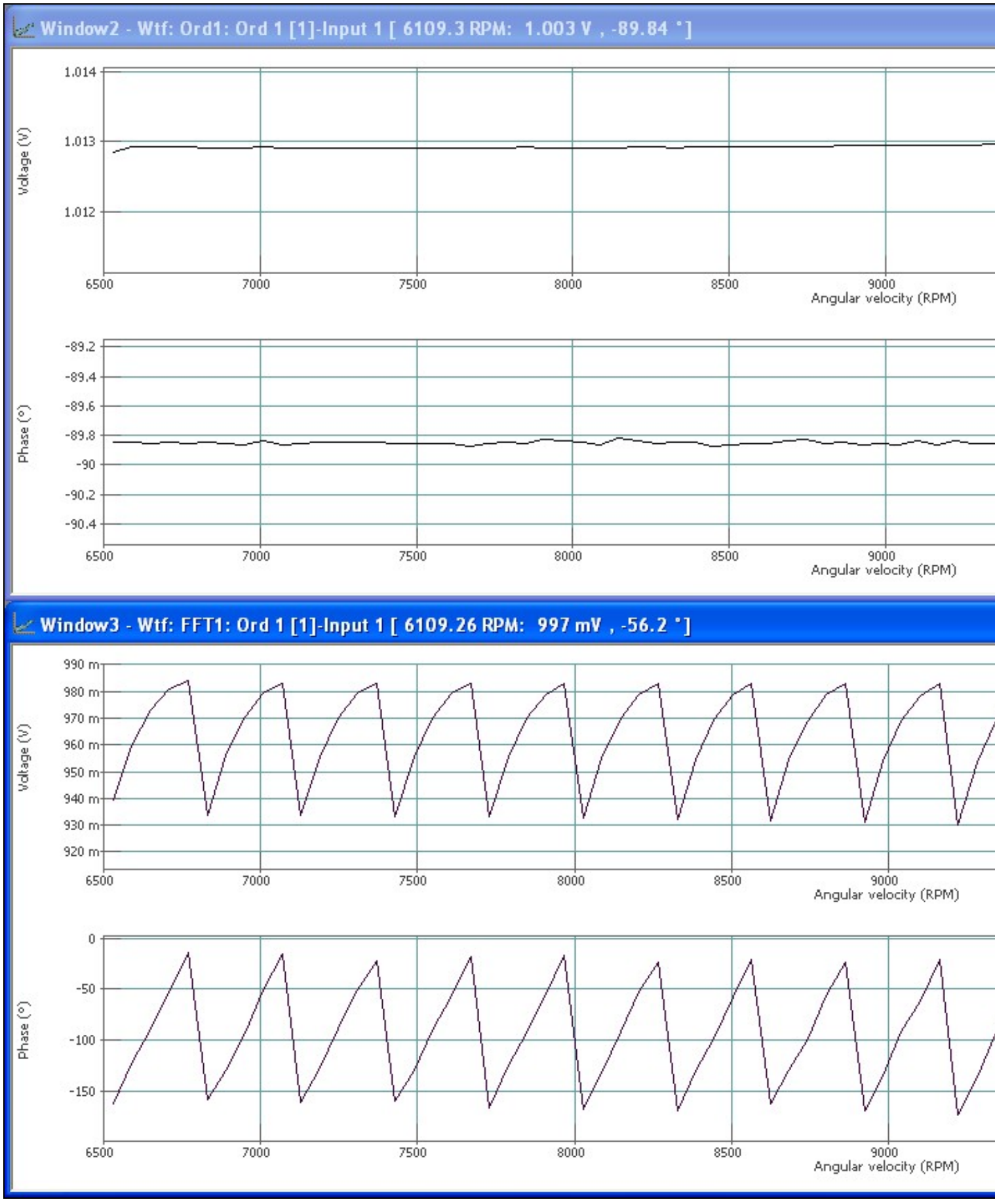
127.3.2 SOA

The order 1 tracked with the SOA plug-in gives a value which is consistent with RPM (see below). The tracked order is never "released" with such technique, no matter what the RPM value is. That is why the result is a straight line and no "steps" are seen in the profile.



127.3.3 Phase information

Below are the complete *Bode* plots (with phase information) of order 1 profiles we get respectively from the SOA plug-in and from the CBT.


Window2 - Wtf: Ord1: Ord 1 [1]-Input 1 [6109.3 RPM: 1.003 V , -89.84 °]
Voltage (V)
1.014
1.013
1.012
6500
7000
7500
8000
8500
9000
Angular velocity (RPM)
Phase (°)
-89.2
-89.4
-89.6
-89.8
-90
-90.2
-90.4
6500
7000
7500
8000
8500
9000
Angular velocity (RPM)
Window3 - Wtf: FFT1: Ord 1 [1]-Input 1 [6109.26 RPM: 997 mV , -56.2 °]
Voltage (V)
990 m
980 m
970 m
960 m
950 m
940 m
930 m
920 m
6500
7000
7500
8000
8500
9000
Angular velocity (RPM)
Phase (°)
0
-50
-100
-150
6500
7000
7500
8000
8500
9000
Angular velocity (RPM)

On the CBT result, the phase information is spread, just like the amplitude, on different lines of the FFT. Unless order 1 perfectly matches a frequency line (phase is then -90°), the phase has no real meaning.

Here again, -90° is obtained 17 times during the run-up which matches the number of lines of the FFT in the frequency/RPM band of interest. The phase information is correct on those specific RPM speed only.

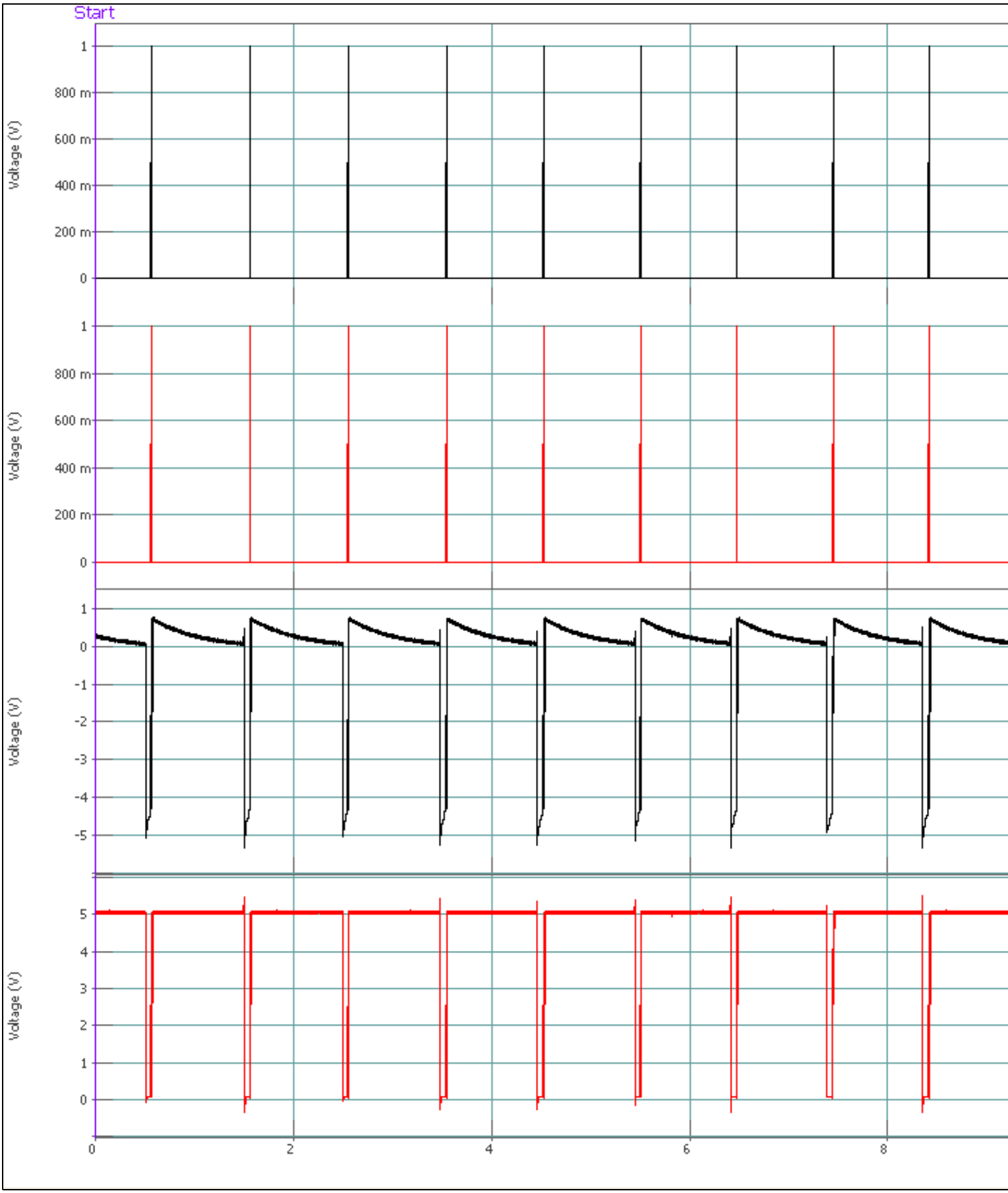
On the contrary, the phase of the SOA is always -90° because the order is "held" during the whole computation process.

127.4 Tachometer setup

The setup of the tachometer is very important for the accuracy of the phase results. Since different setups can lead to slightly different results, it is necessary to know what to pay attention to. The difference between AC and DC coupling will be here emphasized as one of those important settings.

Measurement setup: one tachometer is connected to both Ext Syncs 1 and 2 and both Inputs 1 and 2. The different signals are:

- Train pulses with AC coupling (in black)
- Train pulses with DC coupling (in red)
- Analog signal with AC coupling (in black)
- Analog signal with DC coupling (in red)

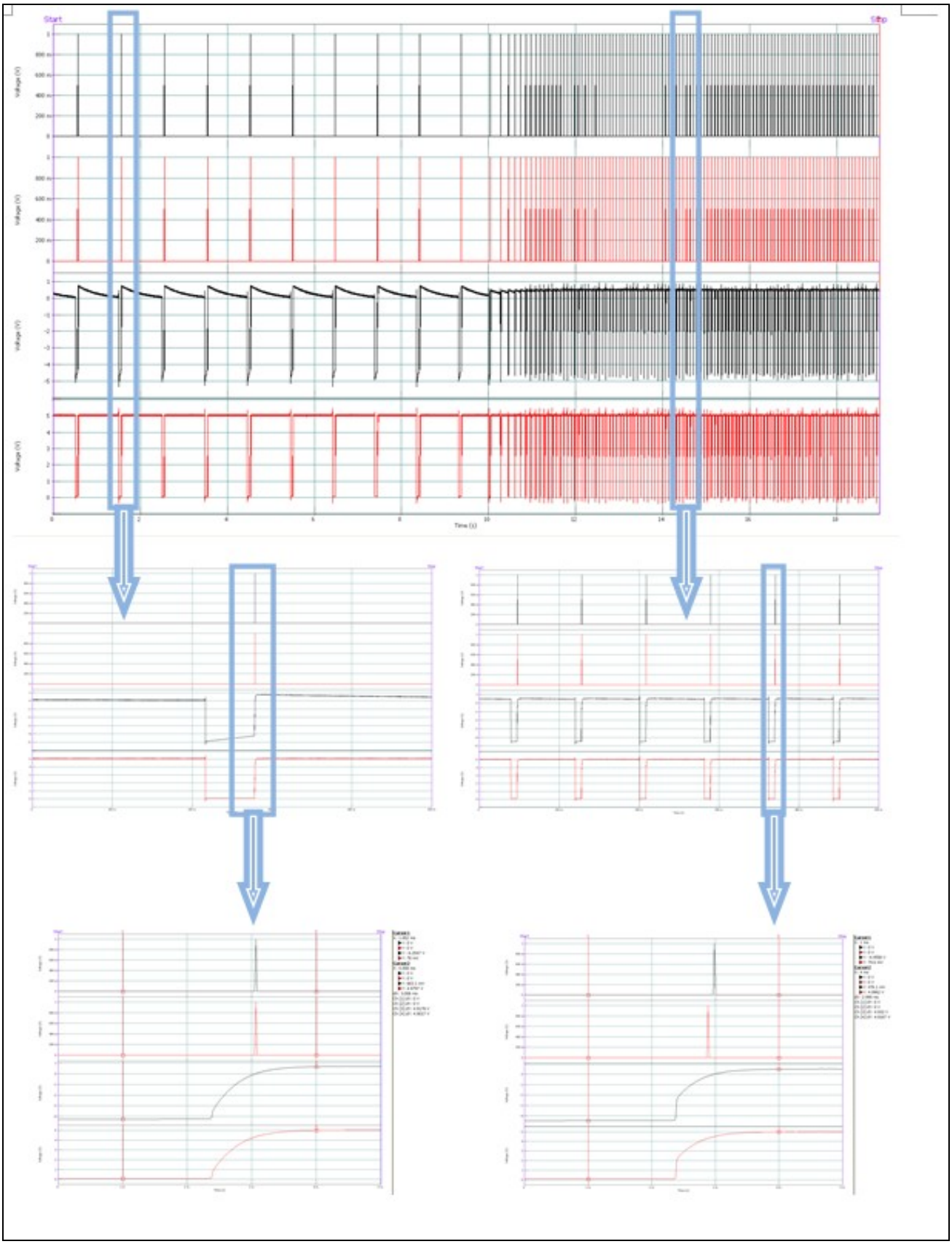

Start
Voltage (V)
1
800 m
600 m
400 m
200 m
0
Voltage (V)
1
800 m
600 m
400 m
200 m
0
Voltage (V)
1
0
-1
-2
-3
-4
-5
Voltage (V)
5
4
3
2
1
0
0
2
4
6
8

The measurement has been performed at 2 different speeds.

AC and DC coupled signals have been set up at low speed to deliver pulses at the exact same time (see below ? bottom left).

When the speed is increased, the *"AC pulses"* and the *"DC pulses"* are not synchronous anymore. This is due to the AC coupling which tends to center the signal around zero. As a matter of fact, since the area below 0 is different when running at low speed and running at high speed (for the same time period), the signal is slightly moved up or down. The threshold crossing happens then at a slightly different time also. That explains the time difference that can be seen, on the bottom-right, between 2 pulses that should normally still happen at the very same time. This time difference induces a phase error.

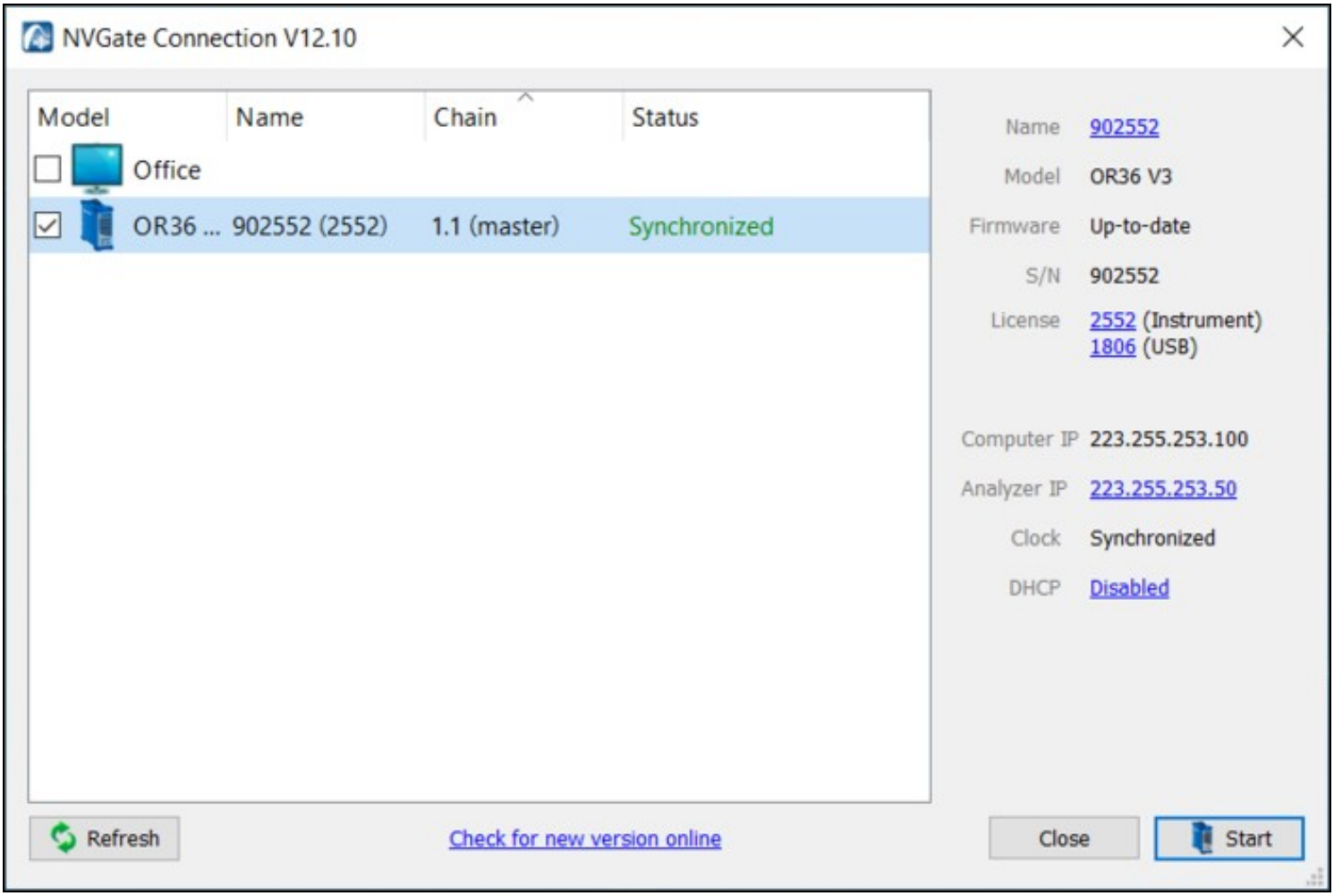
As a conclusion, using a DC coupling is usually recommended for tachometer set up.


Start
Stop
Voltage (V)
Time (s)

128 NVGate Software overview

128.1 Starting the analyser and NVGate

First of all, connect your analyser to the computer and power it on. Then double-click on the NVGate Icon from your desktop. The connection dialog appears. Select operation mode (Connected, Office or multi-instruments).



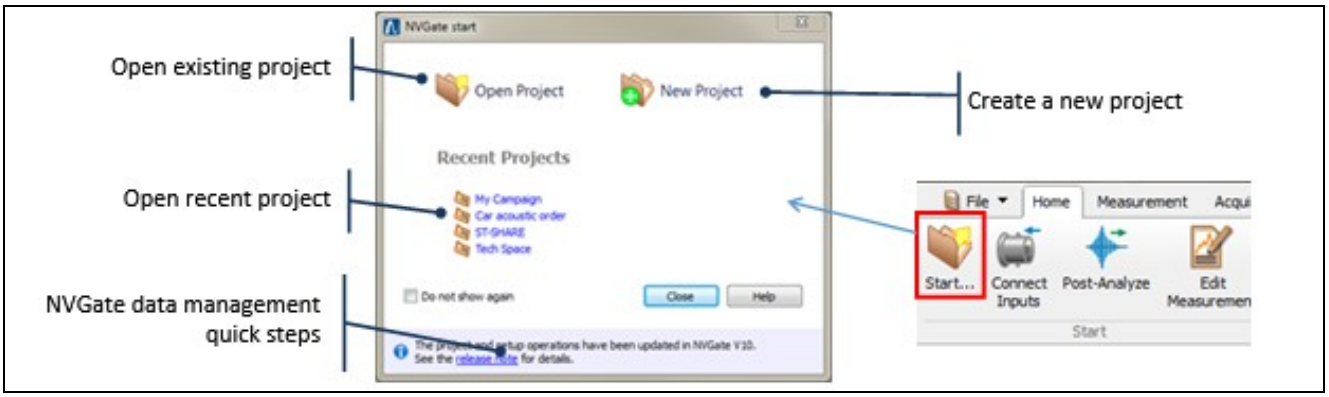
Select the analyser and click on start.

The NVGate splash screen will automatically appears.

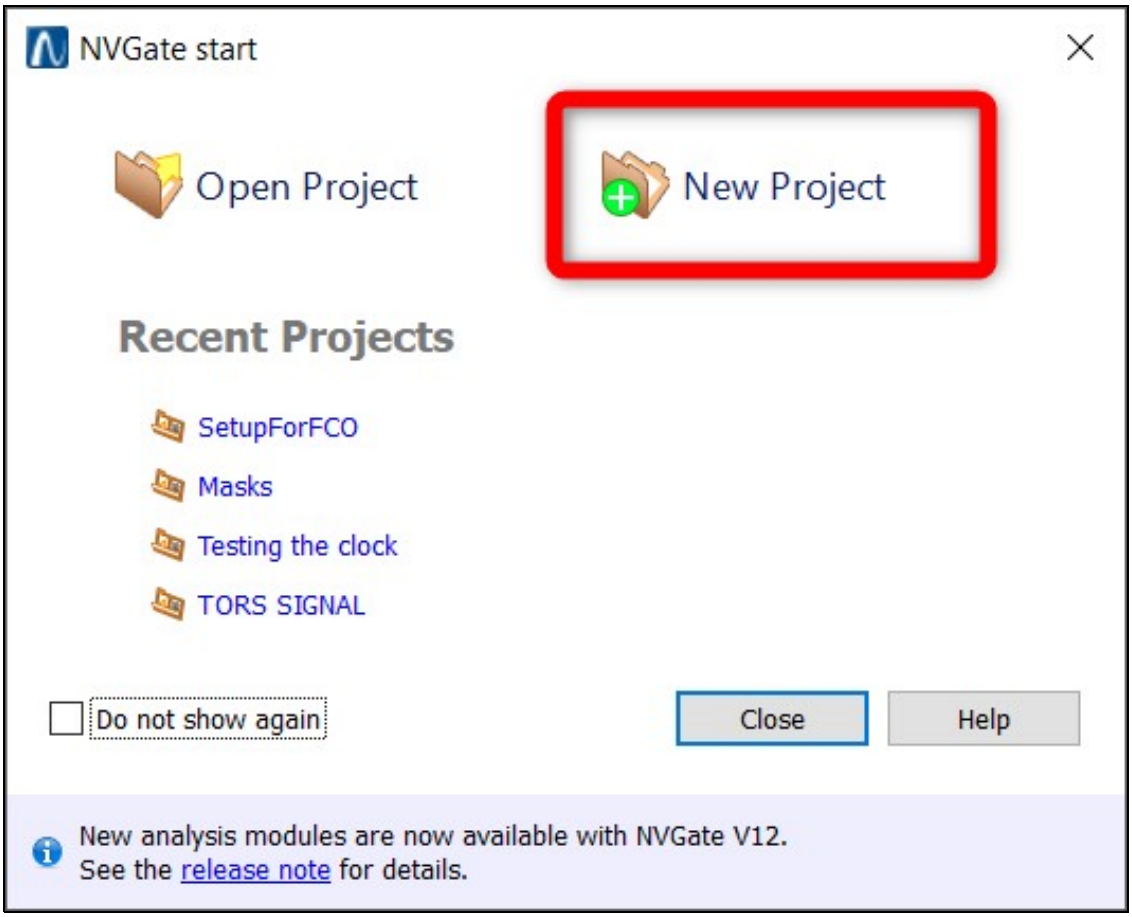


128.1.1 Open/create a project

NVGate will start and the *Start* dialog is proposed:

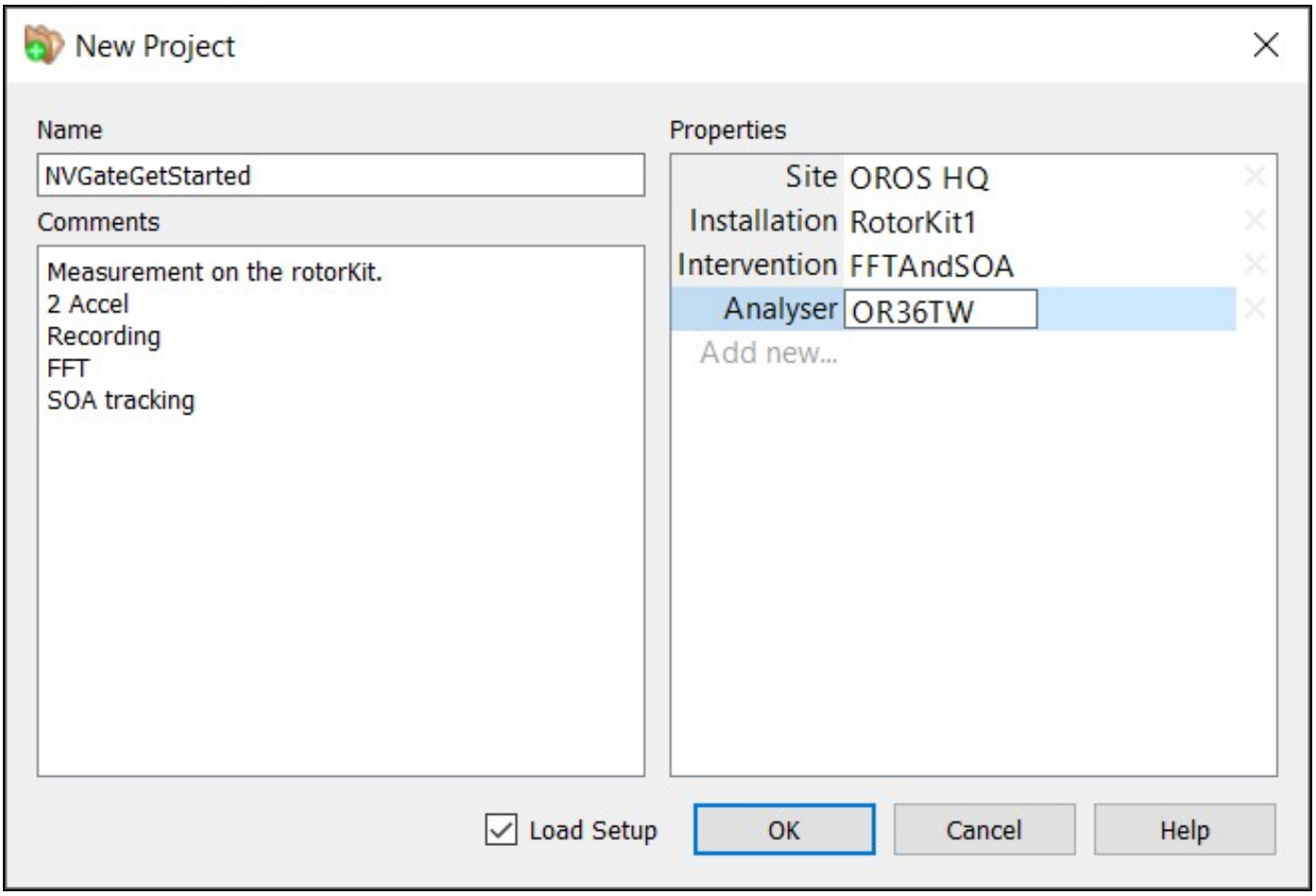


Here we will create a new project :



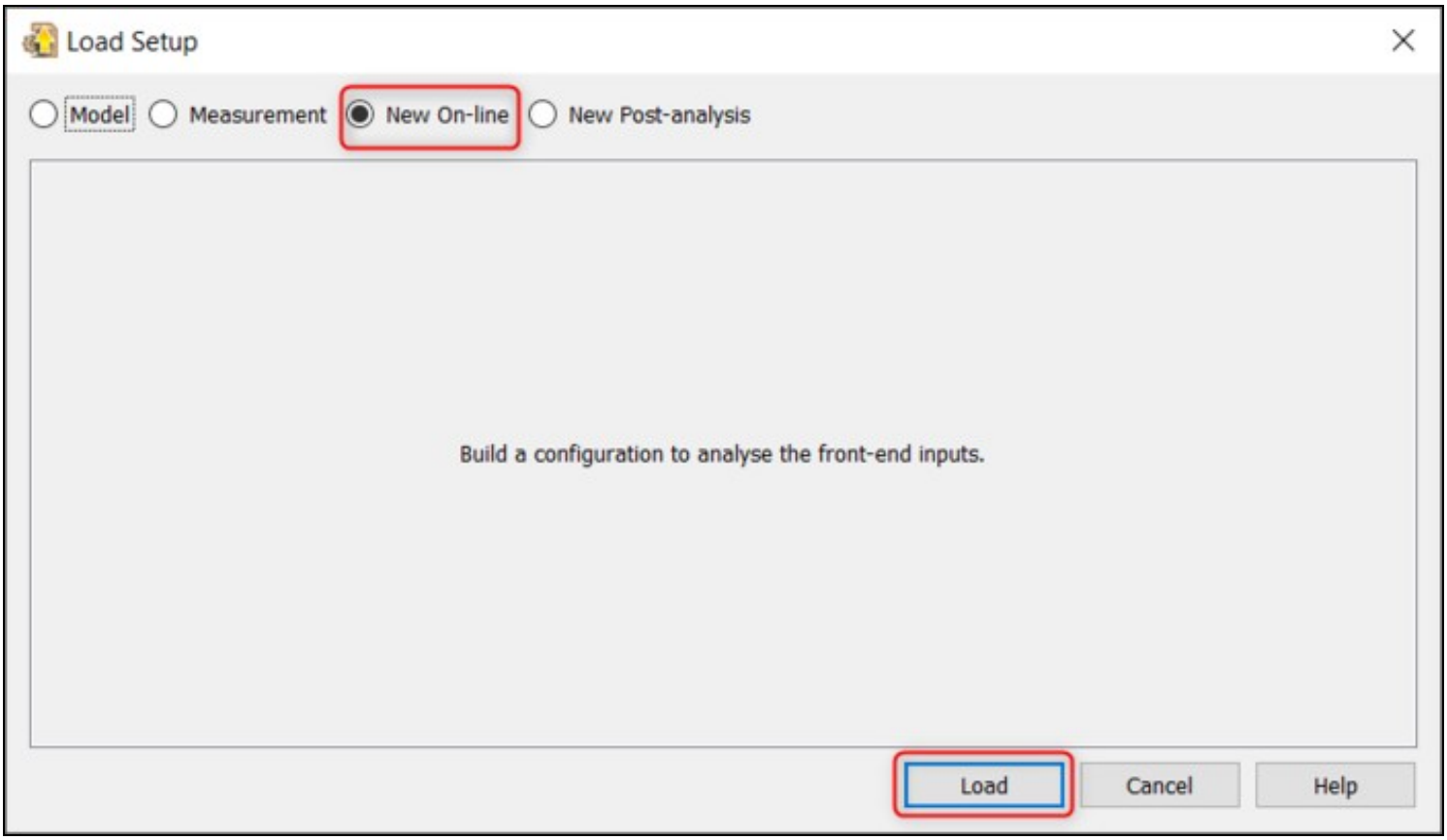
This window is also accessible from the NVGate Ribbon.

This will open the "New Project" definition window. Fill up the necessary properties and comment to describe the context of this project. Check the *Load setup* box and click on the *Ok* button.



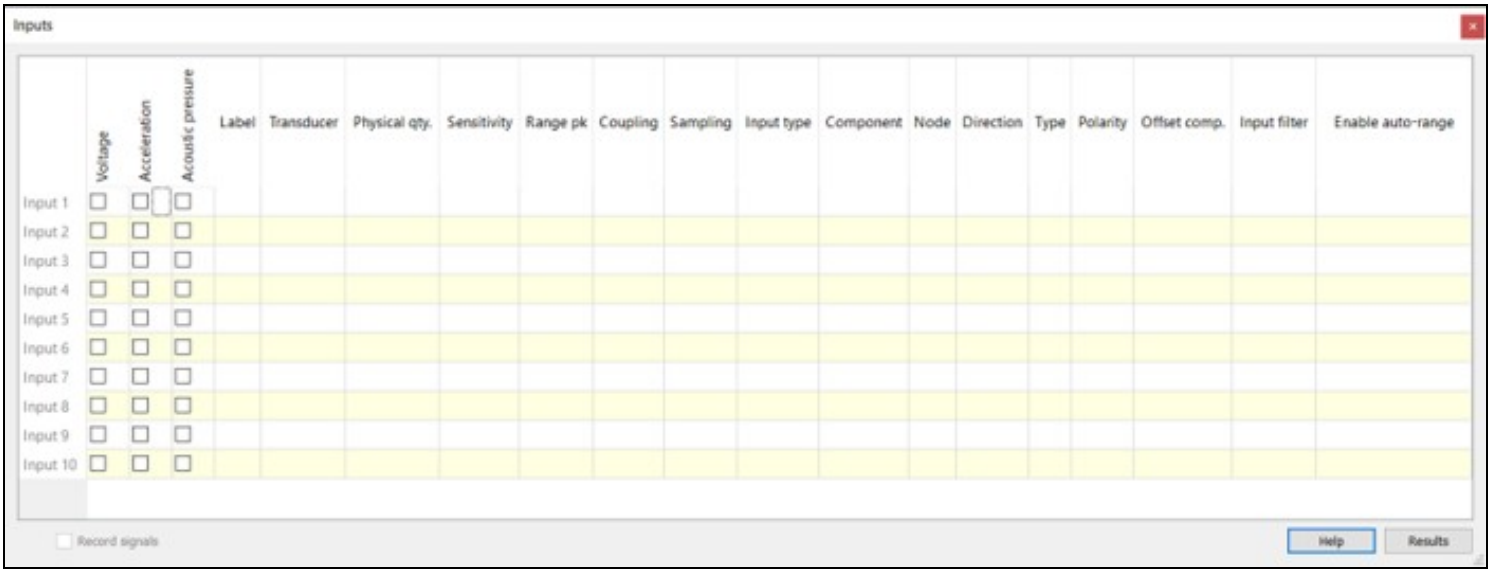
128.1.1.1 Load the configuration

This will open the *Load setup* window. This window allows you to load the configuration from a pre-saved model, a previous measurement, create a new setup or opening a signal for post-analysis. Here we want to setup a new configuration, we will select *New On-Line* :



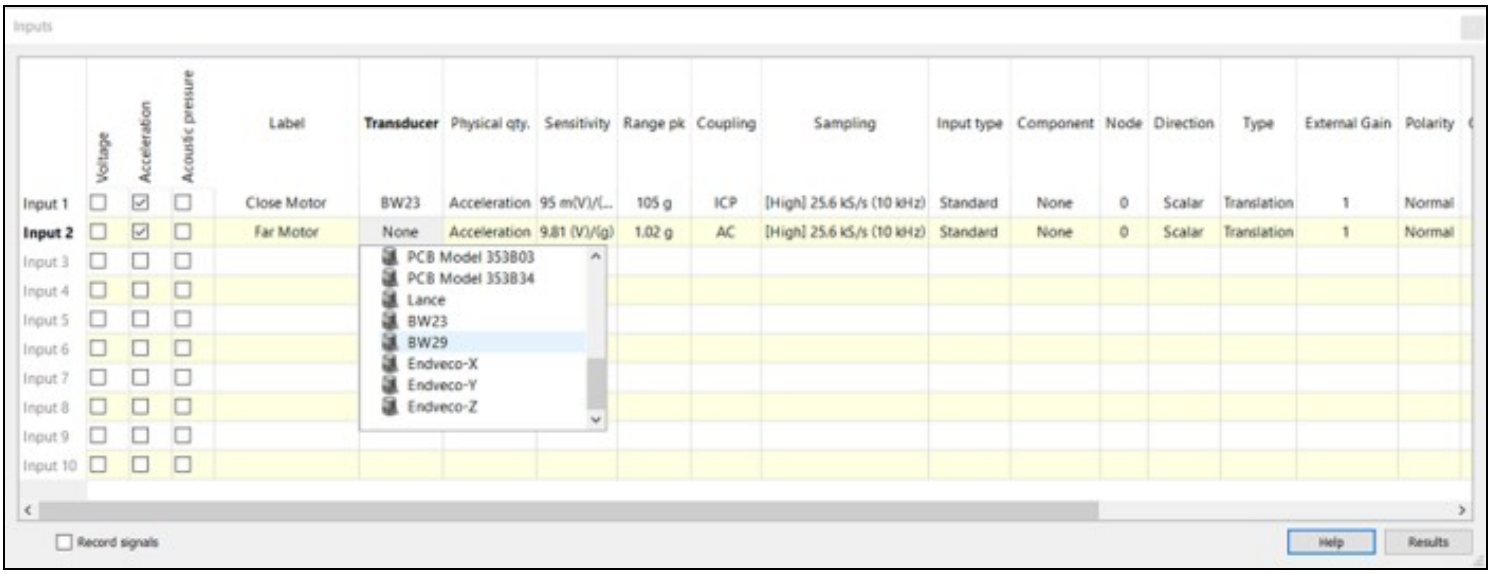
128.1.1.1.1 Select the inputs

Once you click *Load*, the input setup window appears :

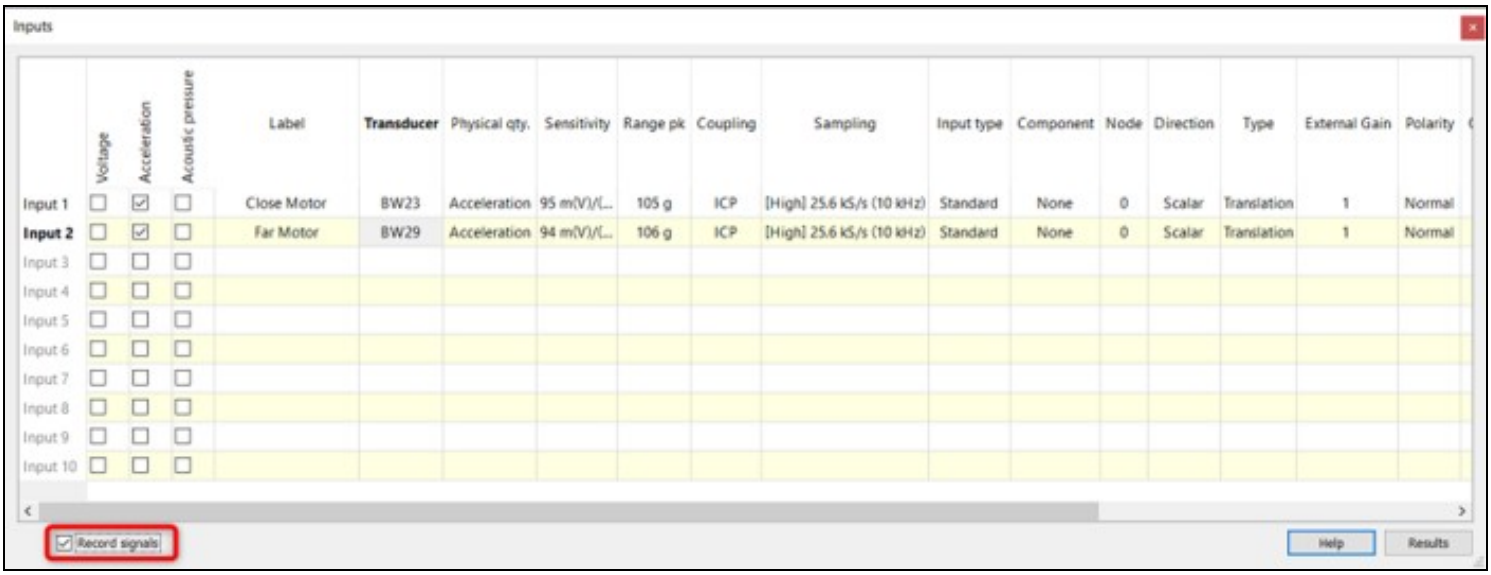


This window can be called anytime from the *GoToResult*. See Input selection for the detail of the parameters.

As we use 2 accelerometers, select check the "Acceleration" boxes for inputs 1 and 2, and select the appropriate sensors in the "Transducer" column for each inputs. If you don't see your specific sensors, please fill your transducer database.



To add the inputs into the recorder, check the *Record signals* box :

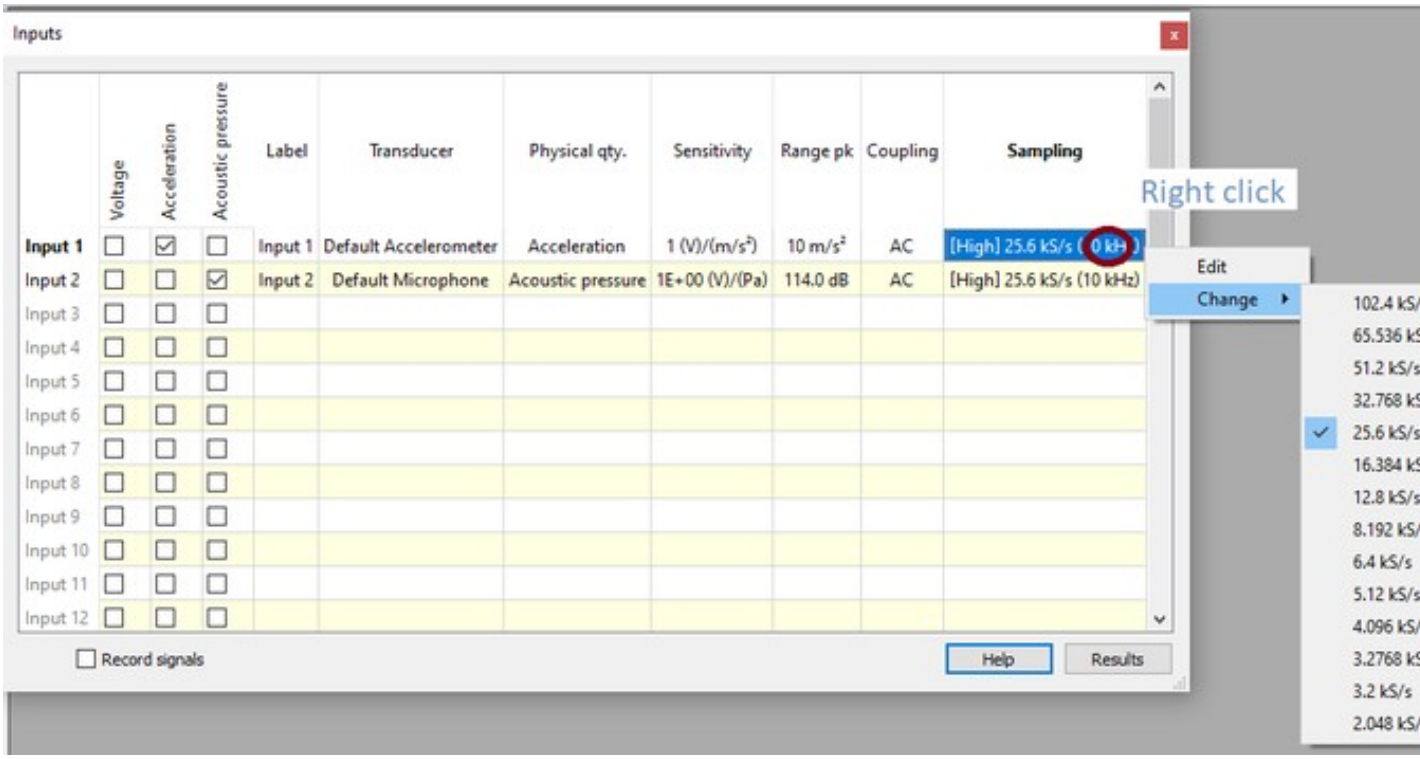


By doing this, any inputs (even if added later) will automatically be connected to the recorder plug-in.

128.1.1.1.2 Edit the Sampling Rate

The sampling rate is the rate to which the signals will be sampled by the analyzer. This will define the maximum frequency that can be analyzed during the online analysis or in post-analysis on the recorded signals. However, a higher sampling rate will need more computational power. You may choose a sampling rate that is twice the highest frequency you want to analyze.

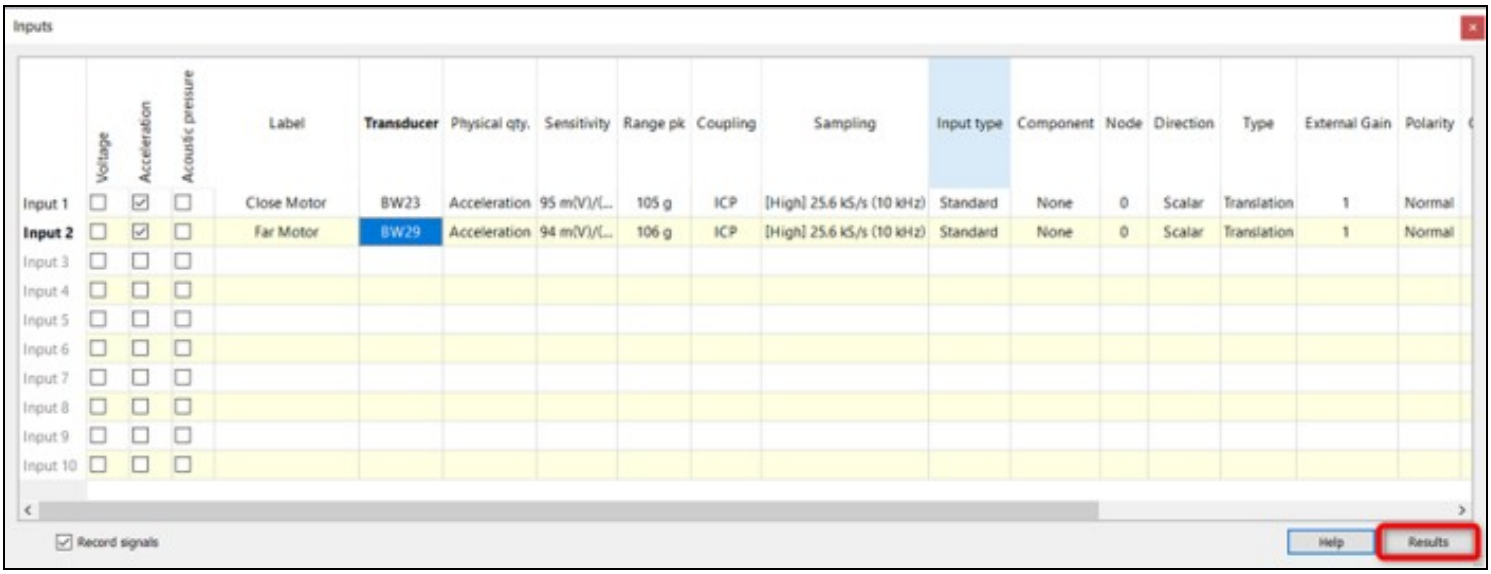
To edit the sample rate, do a right click on the sampling case.



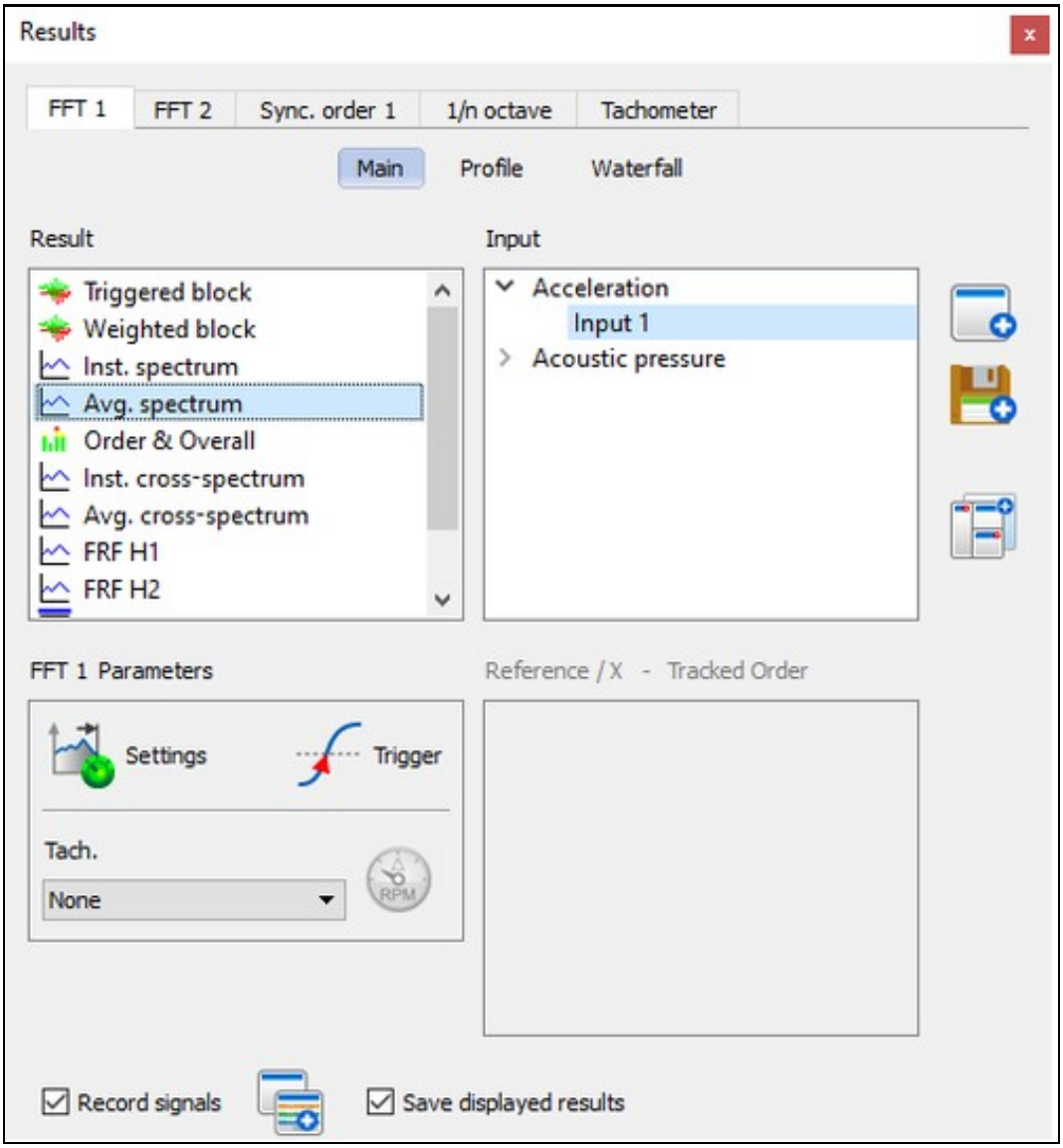
Here we have a 25,6kS/sec that allow us to analyze the data up to 10kHz.

128.1.1.1.3 Setup the analysis

Once the inputs are correctly declared, click on *Results* to setup the analysis :



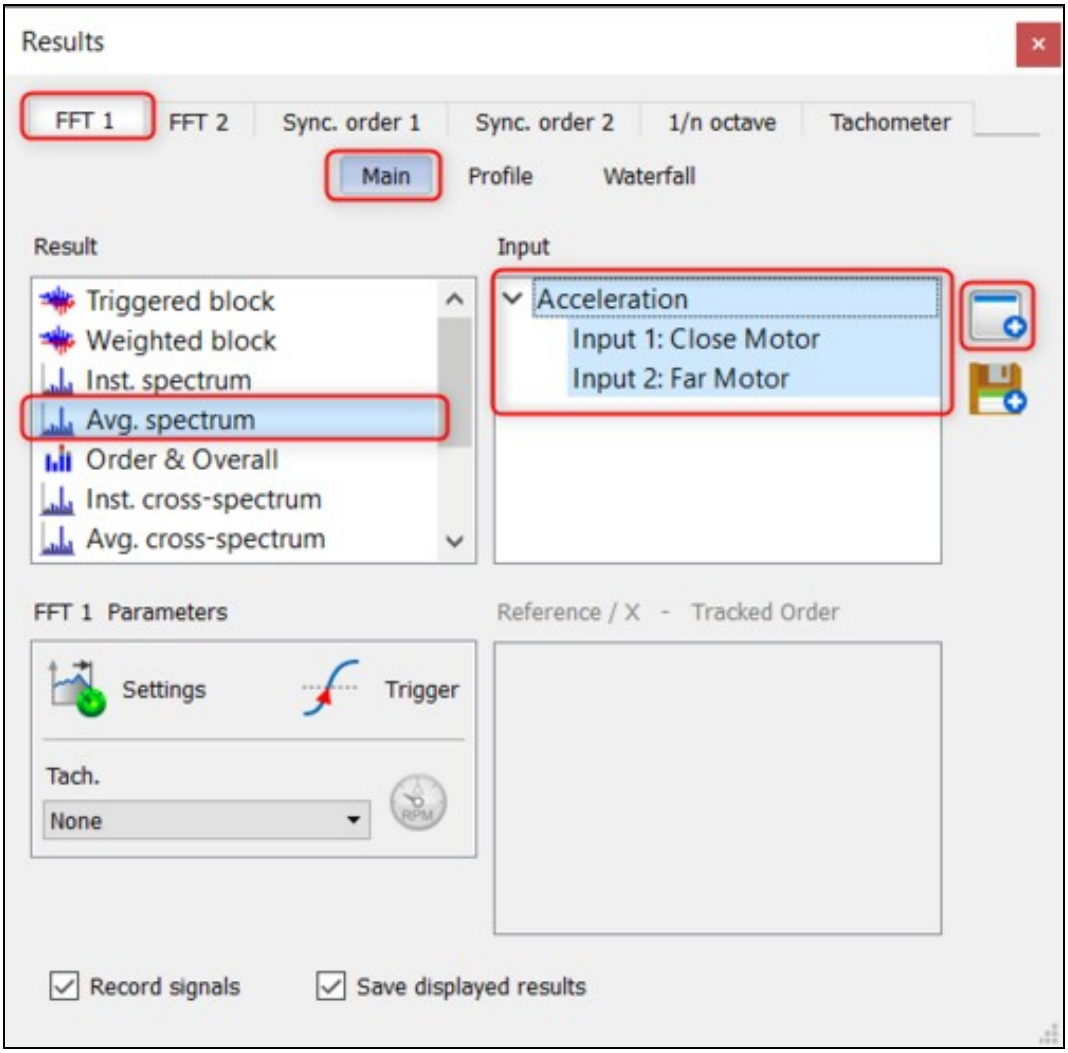
This will open the *Results* window :



This window can be called anytime from the *GoToResult* icons. See the Show result section for detail about this window.

128.1.1.1.4 Displaying the FFT analysis

We will now display the average spectrum for the two inputs :



Once you selected the result you want to display, click on  to display the graph in the current layout.
Make sure you checked the box *Save displayed results* to save the result at the end of the measurement.

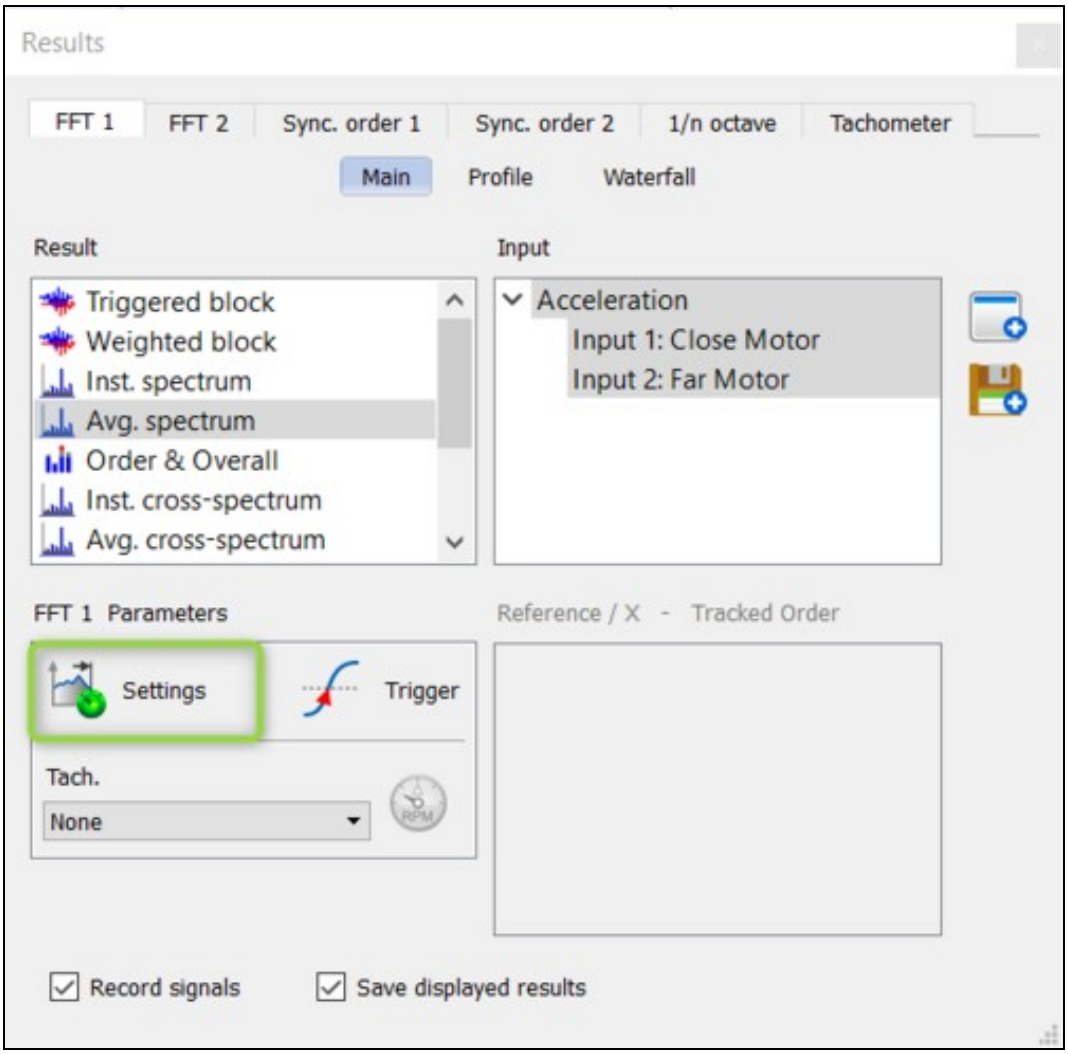
The FFT graph window now appear in the current layout :



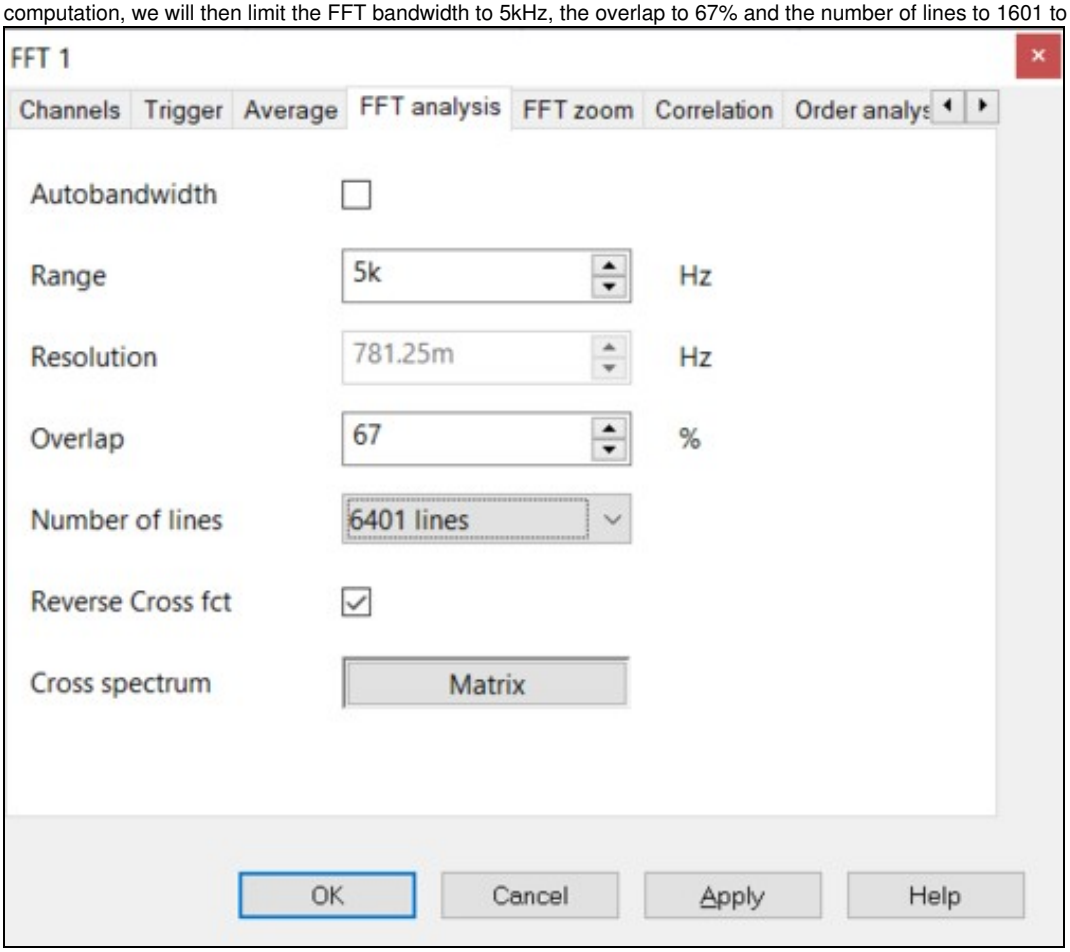
.

128.1.1.1.5 Setting up the FFT analysis

We can now setup the FFT to optimise the analysis. To access to the setup parameters, click on *settings* in the *Show result* window :


Results
FFT 1
FFT 2
Sync. order 1
Sync. order 2
1/n octave
Tachometer
Main
Profile
Waterfall
Result
Input
Triggered block
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
Acceleration
Input 1: Close Motor
Input 2: Far Motor
FFT 1 Parameters
Reference / X - Tracked Order
Settings
Trigger
Tach.
None
Record signals
Save displayed results

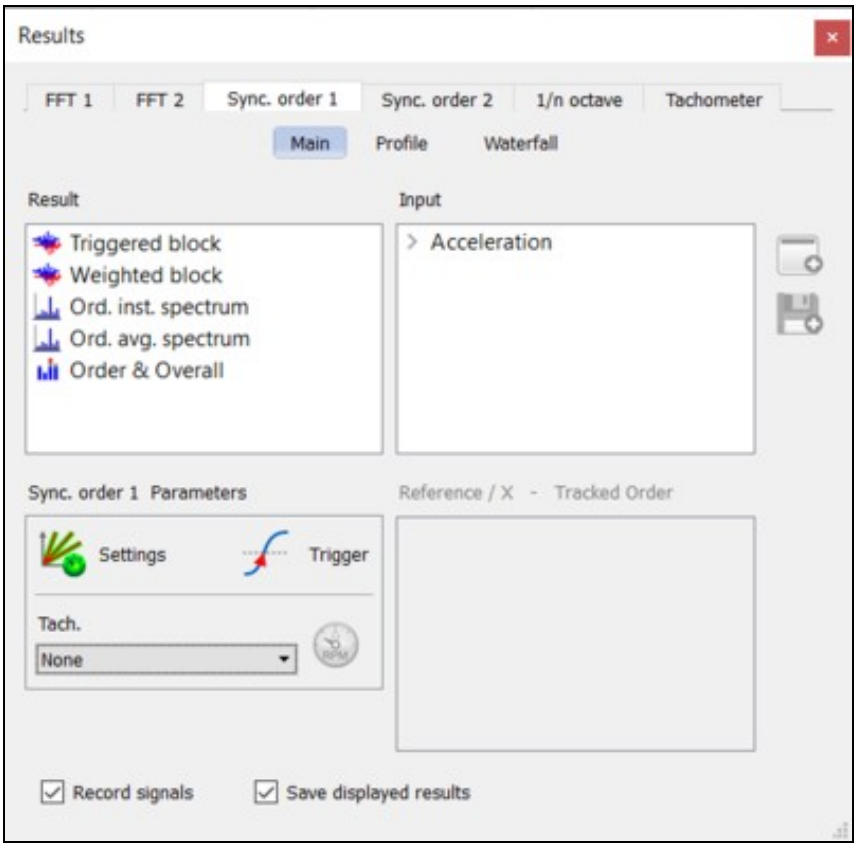
Here, the maximum speed of the motor is 2000RPM. That make the first order at 2000/60 = 33Hz and the tenth order at 330Hz. In order to optimize the computation, we will then limit the FFT bandwidth to 5kHz, the overlap to 67% and the number of lines to 1601 to have a correct precision.



You can then press *OK* to close this window. For details about the parameters, please visit the NVGate FFT page.

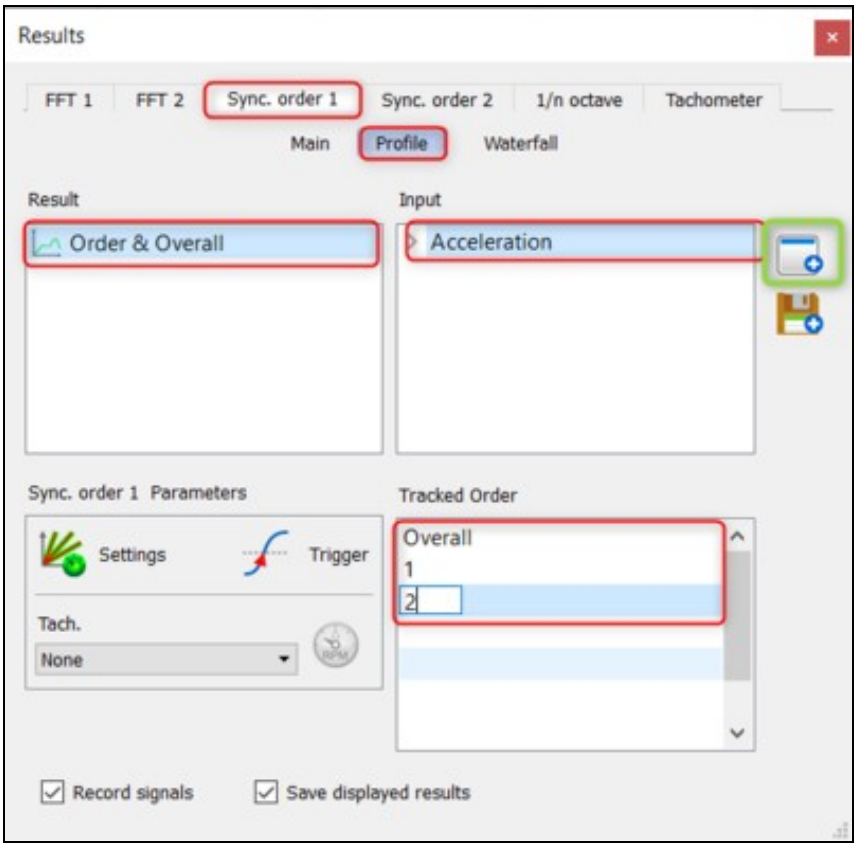
128.1.1.1.6 Adding Order Profile

We can now setup and display the order profile. To do this, select the *Sync. order 1* tab of the *Result* window.

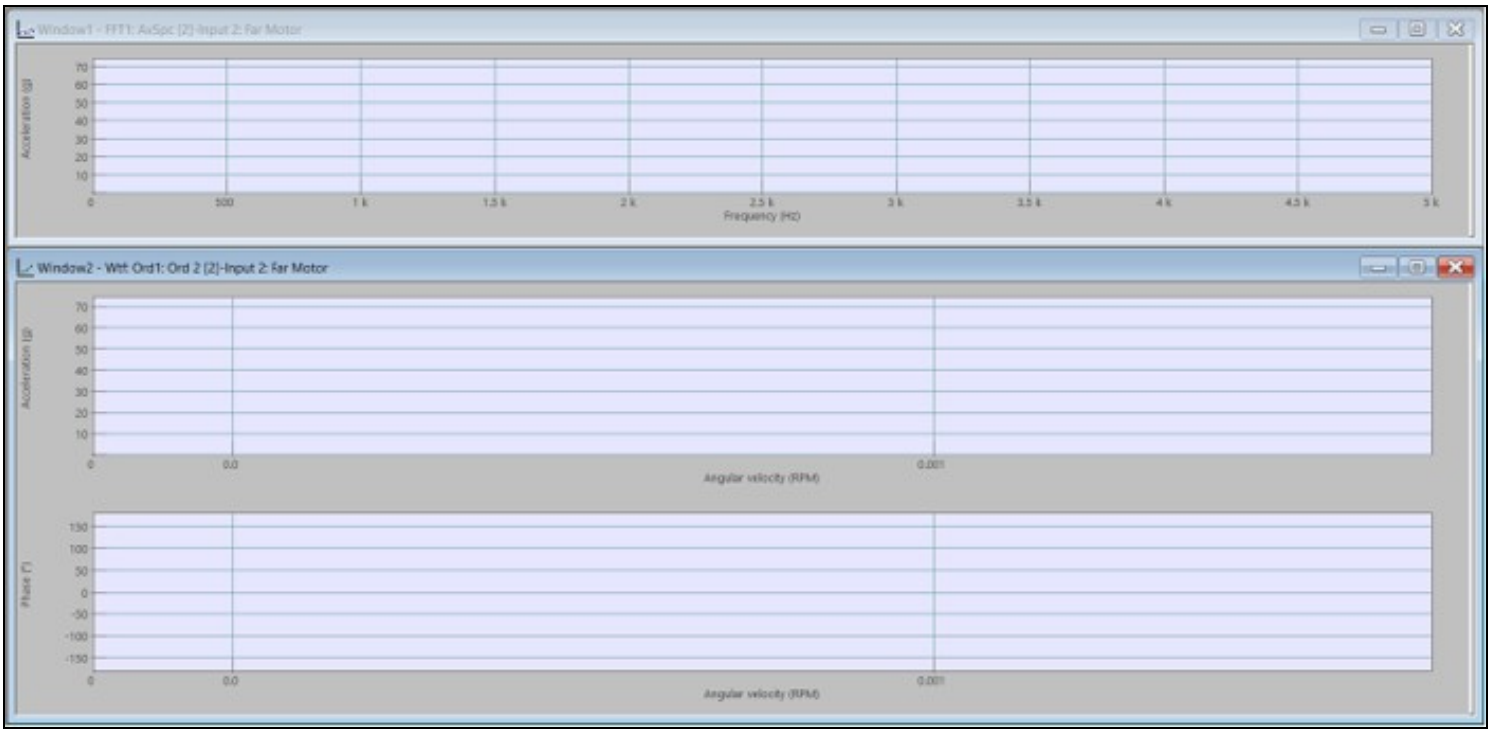


Here, we want to display the first two orders profile for each input. To do so, select the *profile* tab, and select **Order & Overall** under *Result* and **Acceleration** (that will select the 2 acceleration channels) under *input*. To track the 2 first orders, you can simply enter **1** and **2** under the *Tracked Order* section.

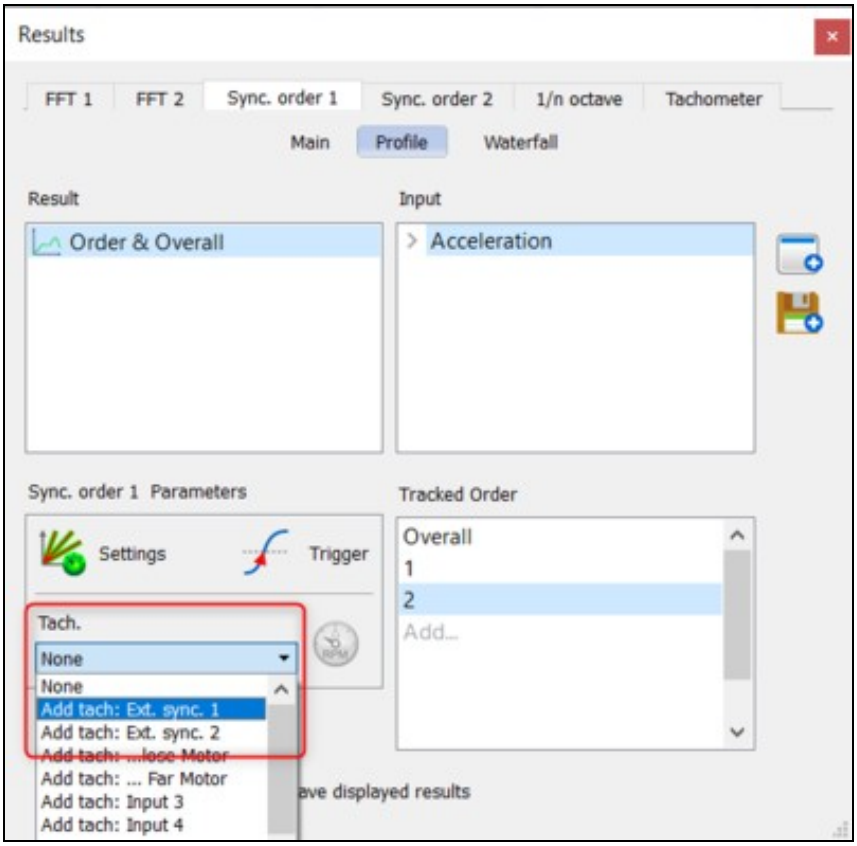
Finally click on  to display:



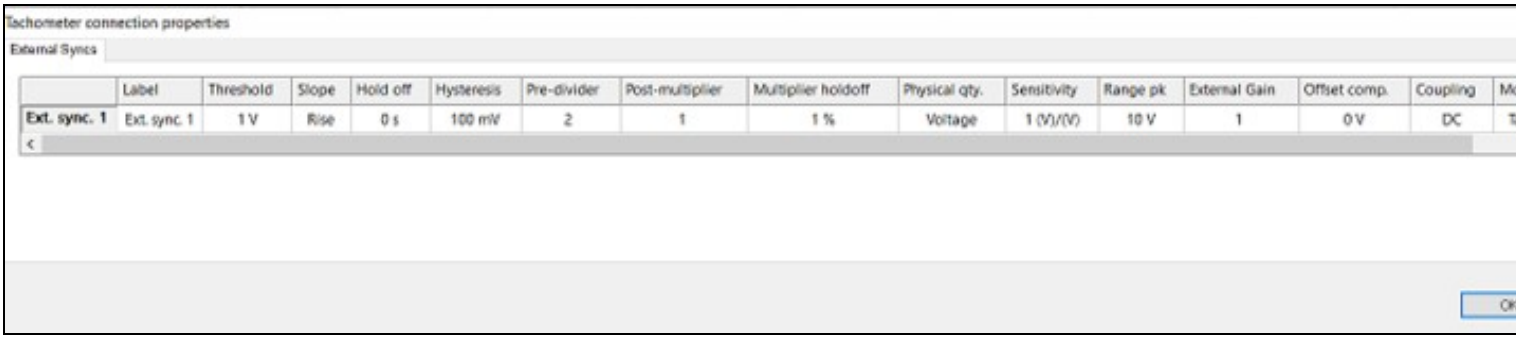
The profile graph is now displayed on the current layout along with the FFT spectrum graph :



We will now need to add and declare the tachometer. To do so, select *Add : Ext. Sync. 1* under *Tachometer* :



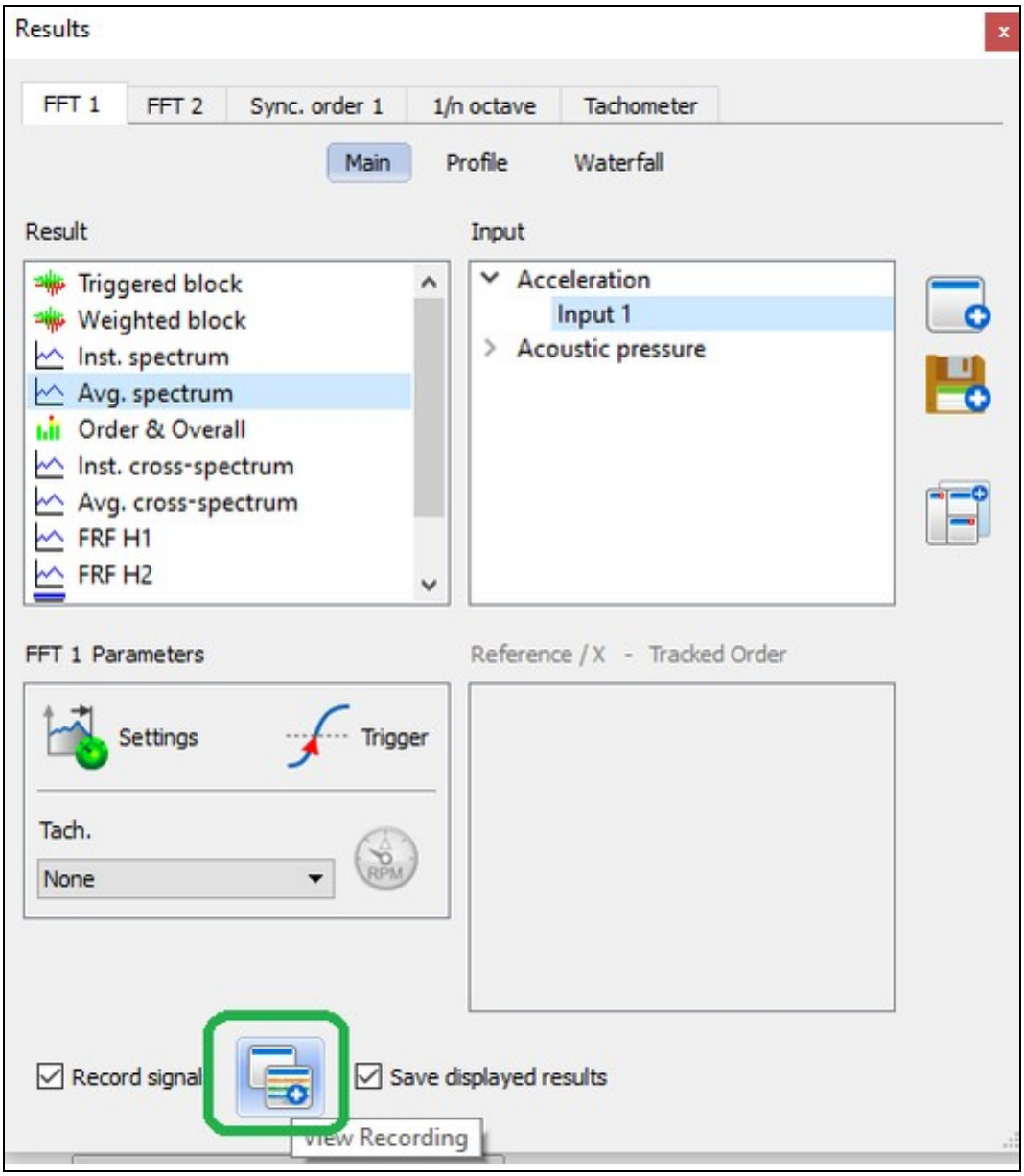
And set the threshold, coupling and Pulse/rev as recommended for your sensor :



Please visit the external sync tachometer page for more details.

128.1.1.1.7 Displaying the recorder

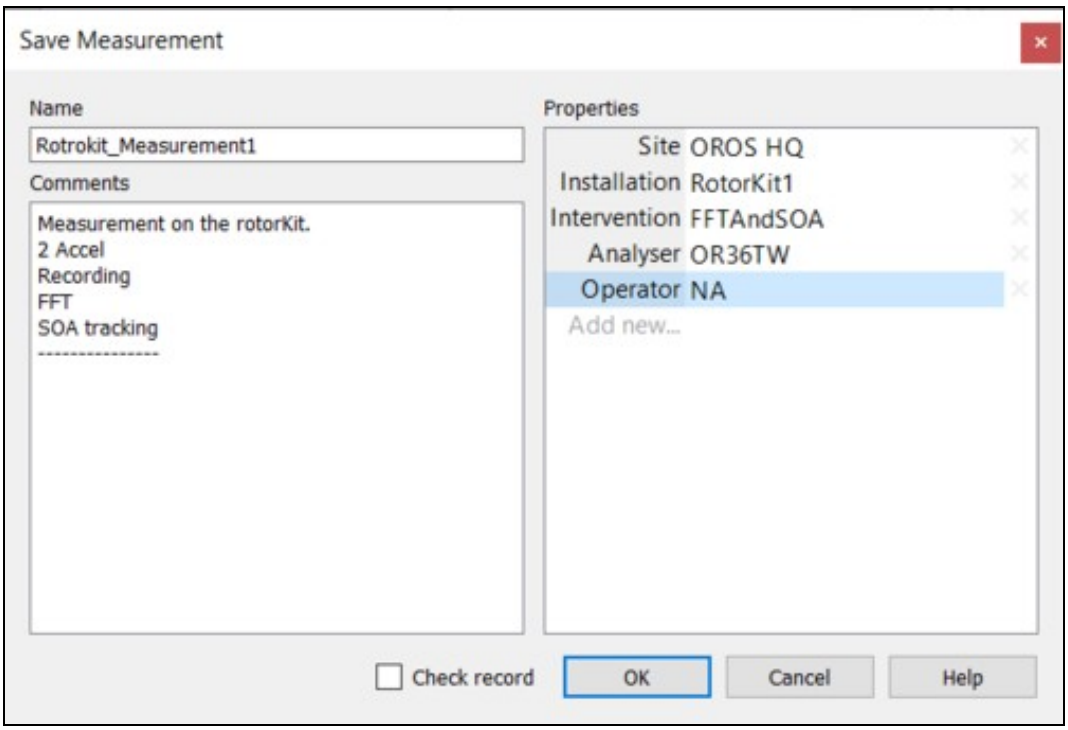
In order to have a complete view of the measurement, you can display the recording of the raw signals by clicking on *View recording* .


Results
FFT 1
FFT 2
Sync. order 1
1/n octave
Tachometer
Main
Profile
Waterfall
Result
Triggered block
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
FRF H1
FRF H2
Input
Acceleration
Input 1
Acoustic pressure
FFT 1 Parameters
Reference / X - Tracked Order
Settings
Trigger
Tach.
None
RPM
Record signal
Save displayed results
View Recording

128.1.1.1.8 Performing and saving the measurement

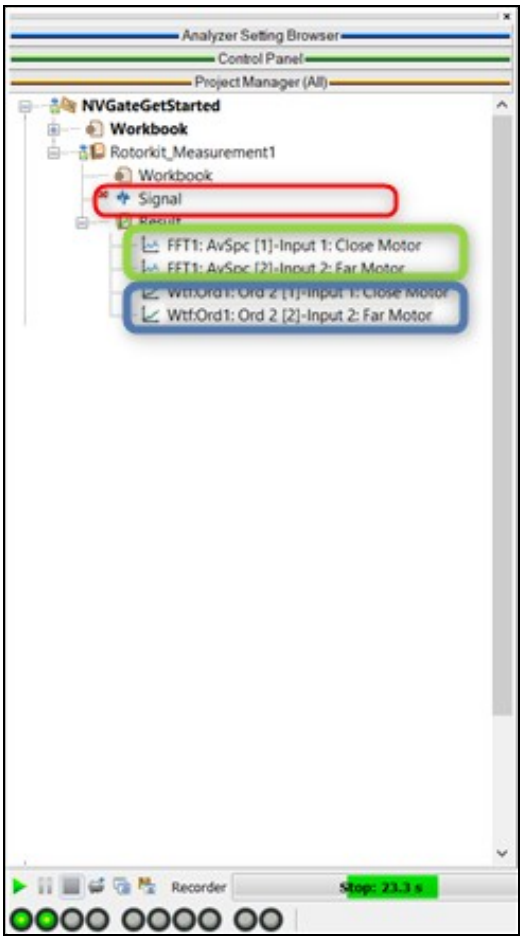
We will now perform the measurement during a run-up of the motor. To do so, put the motor at its lowest speed, start the acquisition by clicking on  , and then stop it with  once you reached the top speed. You will see the graph updating with the last result.

The save measurement window will then be opened. You can fill it with the maximum of information to help ease archiving and the sharing of the data:



128.1.1.1.9 Project manager

And you can find the saved data under the Project name in the Project Manager :

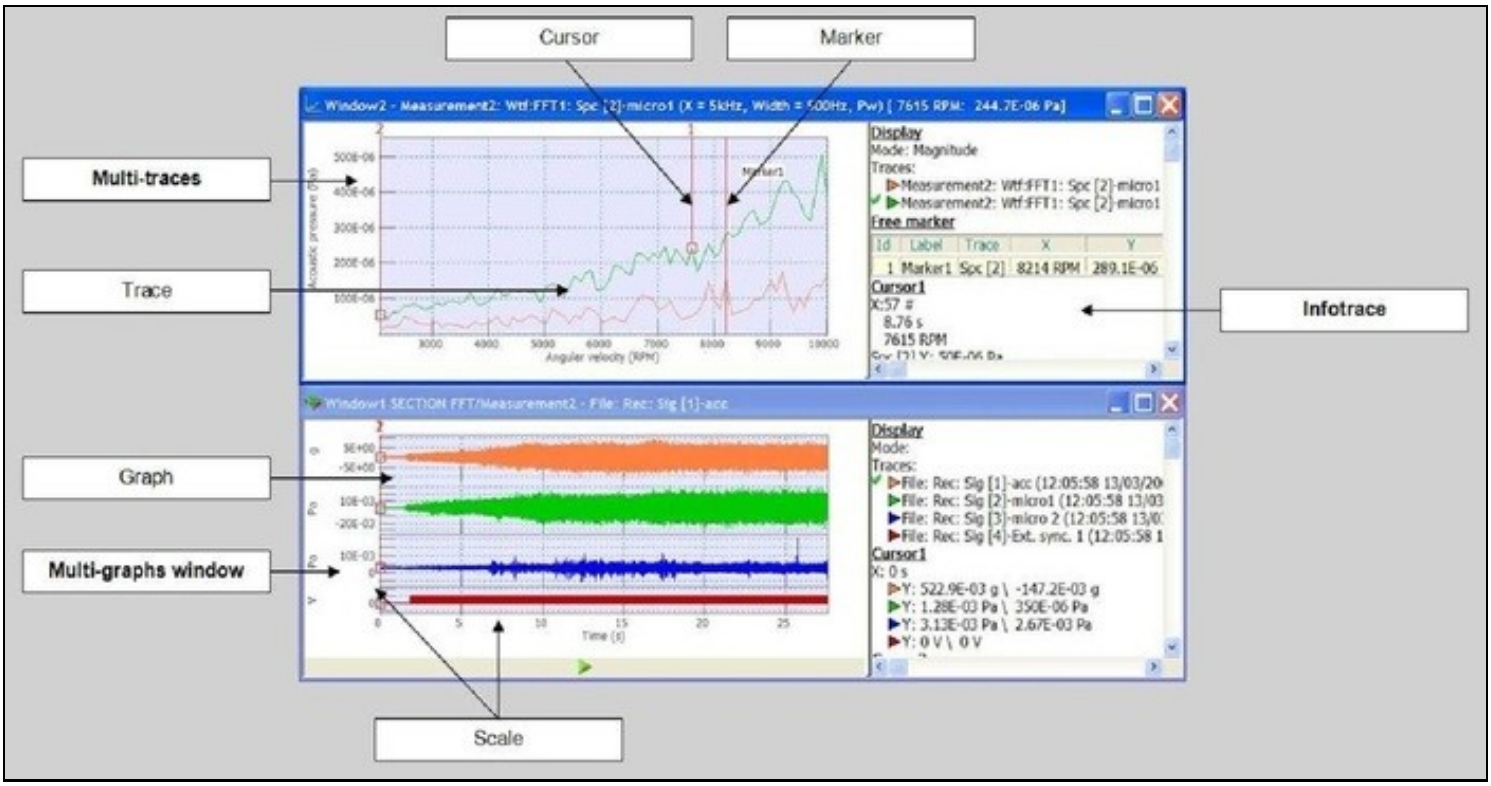


The red area represents the recorded temporal raw data, the green area the FFT results and the blue area the Order tracking results.

128.1.1.1.10 Display

The acquisition is now complete and the results are displayed .

128.1.1.1.11 Display overview

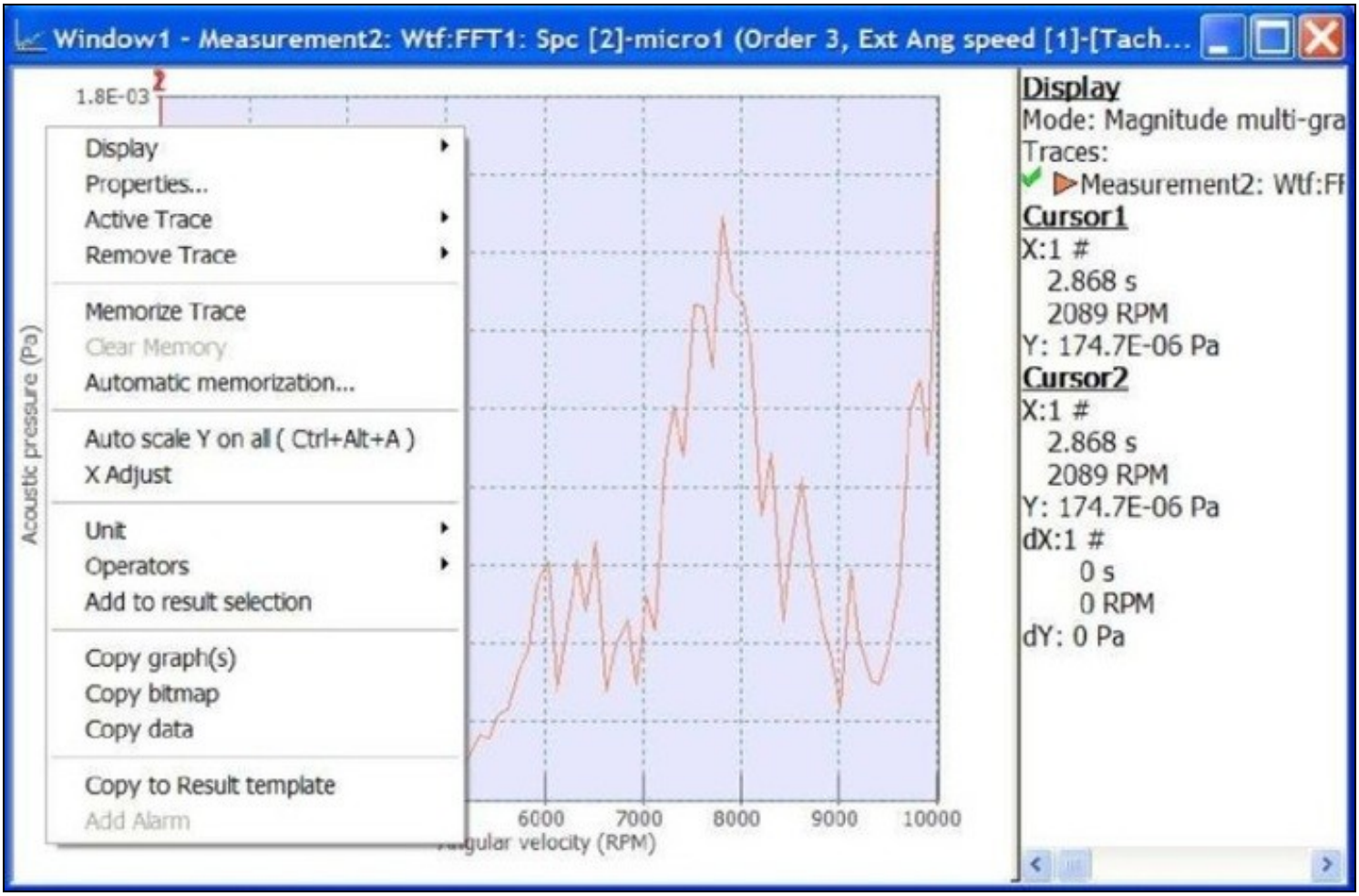


128.1.1.1.12 Contextual menus

Right click on the graph provides access to the scale, zooms and X/Z axis references of the current graph.



Right click on the window to access the local windows properties and actions on the contained traces.



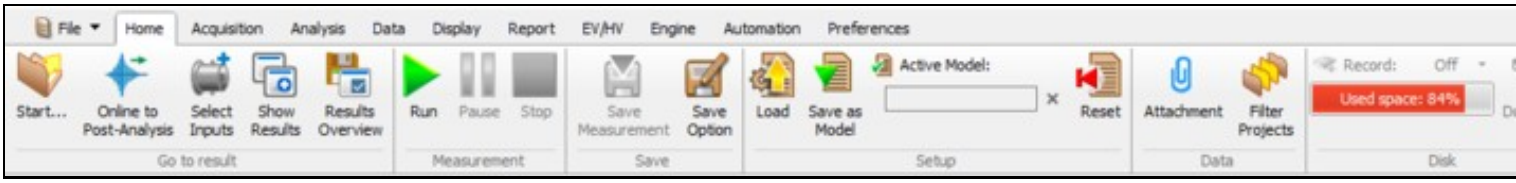
Right click on the *infotrace* allows customization of the displayed information.



128.1.2 Conclusion

Congratulation you have done you're first measurement with NVGate.

The home tab, let you a quick access to all this settings, and more! :



129 NVGate Specification

The following official specifications concern NVGate® software for OR10, OR34, OR35, OR36, OR38 and Mobi-Pack® multi-analyzer instruments. These specifications apply for on-line analysis and post analysis with or without the instrument connected to the PC. This specification applies for NVGate version 12 or upper and Teamwork instruments.

129.1 Modules

NVGate® software is based on a general-purpose platform where optional analysis modules called plug-in analyzers are added.

The FFT plug-in features specific add-on for specialized analysis.

129.1.1 NVGate®Platform

NVGate® platform provides a comprehensive set of tools for noise and vibration acquisition, recording and analysis.

These functions are arranged in 4 parts:

- ***Signal sources*** that condition, provide and store time domain signals.
- ***Shared resources*** that apply simultaneously or independently on distributed signal to plug-in analyzers.
- ***Operational tools*** that increase measurement efficiency and reliability.
- ***General-purpose analysis*** for monitoring and result tracking.

Signal sources	**Front-end**	Controls dynamic inputs, generators, external synchronization/tach. input and parametric (DC) inputs.
	Recorder	Record and store time domain signal on analyzer or PC hard disc. Records dynamic, parametric (DC) and ext. synch/tach inputs with multiple frequencies.
	Player	Visualize, listen, playback on output or generate signals for post-analysis purpose. Based on recorded or imported time domain signal file.
Shared resources	**Filters**	High/low pass, Band/Stop pass, single and double integrator, differentiator, A and C acoustic laws
	Events	Edge detection, DC levels, Delta DC levels, RPM, Delta RPM, Manual, Time period, combinations.
	Weighting windows	Programmable Force and response, Hanning, Hamming, Kaiser Bessel, flat-top, uniform.
	Tachometers	Compute RPM from ext. sync and input pulses, DC, CAN. Fractional, simulated and combined tach.
Operational tools	**Transducers management**	Automatic calibration, database management, calibration history, automatic setup of inputs, TEDS management.
	Masks	Mask editor for spectra, profiles, 1/n octave, order spectra
	Report	On-line report editor, automated report generation, word or Excel files.
	Automation tools	Macros, sequence from Excel® sheet, alarms based on mask comparison, customizable control panel, restricted user profiles, remote controller interface.
General purpose analysis	**Monitor**	4 channels FFT analyzer with input hot swap. Statistical extraction (RMS, Max, Min, Kurtosis) from time domain with programmable band-pass filter.
	Waterfall	Synchronized stack for 2D (spectra) and scalar (order, overall). 3D, color map and profiles displays. Extraction capabilities.

NVGate® Plug-ins analyzers

In addition to the standard functions featured in the software platform, NVGate® can receive additional plug-in analyzers that offer flexible configuration of independent analysis modes.

FFT	**Fast Fourier Transform** - Time to Frequency conversion with multiple average domains, combinable trigger, zooms and cross functions.	General-purpose frequency analysis, machinery signature, modal analysis acquisition (hammer or shaker), machinery diagnostic.
FFT Add-ons		
CBT	**Constant Band Tracking** - Order extraction at constant bandwidth	Gears mesh analysis, gearboxes noise and vibration tracking.
FFTDiag	**Cepstrum, Auto** and cross **correlation**, **DC**, **Min**/**Max, Pk, pk**/**pk** and **crest factor**.	Set of functions dedicated to the diagnostics of industrial machineries.
TDA	**Time Domain Analysis** ?Time view (oscilloscope). True statistical extraction, averaging.	Machinery diagnostic, long term acquisition monitoring, critical acquisition control, large structure damping control, shocks determination, machinery health control, trend analysis.
SOA	**Synchronous Order Analysis** - Time to Order re-sampling with angle or order averaging, acoustic weightings, multiple tach management.	Rotating machinery balancing. In vehicle order to noise correlation R&D. Pump, compressors, turbines and speed reducer/multiplier test.
SOADiag (SOA Add-on)	**Copstrum?,** Auto and cross **correlation**, Revolution **synchronous statistics**, Order transmission Function (**ORF?**), **X** functions	Set of diagnostic functions based on the synchronous order analysis for rotating part transmission and forced vibration extraction.
OCT	**1**/**n Octave Constant Percentage Band filters** - 1/n octave detectors set with multiple averaging modes.	General-purpose industrial noise analysis. Vehicle acoustics R&D. Noise test.
OVA	**Overall Acoustics Detectors** - 3 detectors + 1 peak detection per channel with parallel averaging and acoustic weightings.	Industrial acoustic, sound power measurements. Machinery with cycles, R&D and test.

129.1.2 NVGate® Options

Beside the plug-ins analyzers and their add-on, the 3-Series analyzers software also features options:

IVC	Instantaneous angular velocity converter	Torsional measurements from Ext. Synch inputs
CTE	Combined Tachometer editor	Tachometer math editor - 2 inputs, 1 output
VIN	Virtual Inputs	Real-time math combination of dynamic inputs
VDC	Virtual DC	Real-time math combination of parametric inputs
A-Samp	Angular sampling for SOA	Real-time Angular sampling of inputs

129.2 Signal sources

NVGate®/OROS 3-Series multi-analyzers platform can process signal coming from different sources. These sources are detailed in this section as modules.

129.2.1 Front-end

The front-end module gathers the different input and output settings available in the instrument unit. In addition, the front-end module generates virtual signals (synthesized) when running the office mode (no unit connected to the PC) which is useful for set-up.

Front-end settings

Dynamic inputs	Sampling clock	**102.4 kS/s to 2,048 S/s** or **65.536 kS/s to 3,200 S/s**
		200 V polarization **on**/**off** per block of 8 input

	LEMO[2] connectors management	
	Coupling[3,4]	**AC** (0.35 Hz) - **DC** - **ICP** - **ICP + TEDS** - **AC float - DC float** - **Grounded**
	Node information[3]	**Label** - **component** - **node** - **direction** (± X ,Y,Z) - **type** (translation, rotation)
	Physical quantity[3,4]	Any physical quantity can independently be associated to inputs.
	Sensitivity[3,4]	User defined in **V/unit.**
	Range[2]	**Pk to pk** expressed in the associated unit, (taking in account sensitivity) - **linear** or **dB**
	External conditioner compensation[3]	**Gain** - **polarity** - **offset**.
	Filter[3]	**Any NVGate** filter can independently be applied to each dynamic input (See Filters §)
	Auto-range	Enable/disable auto-ranging independently on any input
Ext. sync inputs	Sampling	over-sampled 64 time the dynamic inputs sampling
	Coupling[3]	**AC** (0.35 Hz) - **DC**
	Information[3]	Label
	Physical quantity[3,4]	Any physical quantity can be associated to inputs.
	Sensitivity[3,4]	User defined in **V/unit**.
	Range[3]	**Pk to pk** expressed in the associated unit, (taking in account sensitivity) - **linear or dB**
	External conditioner compensation[3]	**Gain**, **offset**.
	Edge detection[3]	**Threshold** (in associated unit) - **Edge** (rise, fall) - **Hystersis** - **hold off** (sec)
	Pre-divider[3]	**Hardware - 1** to **255** pulses ? accept up to **375 kpulses/sec**
	Post-multiplier[3]	**1 to 50 pulses/trigger** - Generate higher frequencies on low rate triggers. (ex. GPS)
	Tachometer mode[3]	**Pulse per rev**: 0.5 to 4096 - **average** (n rev) - **min** (detect stopped shaft) and **max RPM** speed - **hold off** (in % of revolution) - **rotation** (clockwise/counterclockwise)
	Torsional mode[2]: Instantaneous angular velocity converter	**Pulse per rev**: 1 to 4096 - **min** (detect stopped shaft) and **max RPM** speed - **sliding average** (1 to 20 samples) - **Missing pulse number**: 0 to 5, **Missing pulses detection** :1 to ±20%: of previous pulses duration- **Filters** (dt, dt², 1/dt)
	Angular sampling[2]: multi-pulse/rev clock used for signal sampling	for **SOA** - **Pulse per rev**: 1 to 4096 continuously (no power of 2 limitation) - Real time, in line **anti-aliasing** - **Missing pulse number**: 0 to 5, **Missing pulses detection**: 1 to ±20% of previous pulses duration ? **Phase reference**: Any tachometer including same input

Outputs	Sampling	Same as dynamic inputs
	Generated signals[3]	Any **outputs signals**, see §outputs - play-back of signal file tracks - DC levels - Inputs playback (Delay > 256 samples)
	Filters[3]	**Any NVGate** filter can independently be applied to each dynamic output (See Filters §)
	Impedance[3]	**50 ohm**, **600 ohm** (only OR36 and 0R38) or grounded

	Gain[3]	**-100 dB** to **+ 120 dB**
	Synchronization[3]	**Free run** or **linked** to acquisitions **runs**
	Level and phase transition[3]	No (**Steps**) - controlled (**ramp**) - user selectable ramp time
	Clipping	User selectable - **protects shaker** and **amplifier**.
	Events (can trig analysis or record)[3]	Outputs **stabilized** - new **step reached** - **start & stop sweep**
	Controls	**Emergency stop** - **mute**/un-mute all
Parametric[1](DC) inputs	Sampling	**12.3 to 12,8 S/s -** 10 Hz to 100 Hz harmonics rejection
	Information[3]	Label
	Physical quantity[3,4]	Any physical quantity can be associated to inputs.
	Sensitivity[3,4]	User defined in V/unit.
	Range[3]	Pk to pk expressed in the associated unit (taking in account sensitivity) - **linear** or **dB**
	External conditioner compensation[3]	**Gain** (-120 dB to +20 dB) - **polarity** - **offset** (< range).
	Auto-range	**Enable**/**disable** auto-ranging **independently on any input**
Auto-ranging	Type	**Normal** - on **Peak** detection
	Margin	Select the first highest range with **0 dB - 3 dB** or **20 dB** margin
	Duration (apply for normal auto-range)	**0** to **10 sec**.
	Peak detection	User select input were to detect peak, auto-range applies on all enabled input at each peak detection.
	Peak parameters settings	**1 to 10** peaks - **sensitivity** (low, normal, high) - **rise**, **fall** or **any edge**.
Checking	ICP *(check not available on OR34)*	Test and report (**Open**, **shortcut**, **ok**) all enabled inputs.
	TEDS	Transducers automatic recognition - Complies with **IEEE 1451.4 2004 Rev. 1.0**

2: Optional features

3: Independent for each input

4: Linked with the transducer database

129.2.2 Front-end results & connections

The following results are available for monitoring and connection to analysis mode (plug-in analyzers)

Dynamic inputs & torsional[1] inputs	Monitoring[3]	Time domain instantaneous signal - Size **256 samples**
	Status led[3] (docking tool bar)	**Overloaded** = red - **overload occurred since last start** = red with yellow center - **ok** = green - **under load** (20 dB below range) = green with yellow center
	Connection[3]	To any: **plug-in analyzer channel, monitor channel, Virtual inputs**, **recorder track**, **edge event detector** & **tachometer**

Ext. Sync inputs	Monitoring[3]	Time domain **instantaneous status** (1 = threshold crossed, 0 = no event) - Size **256 samples**.
	Connection[3]	To any: **start** or **stop averaging** of plug-in analyzers, recorder **start** or **stop recording**, **waterfall start** or **stop acquisition**, **new block trigger** for FFT and SOA and **new slice** for **waterfall** acquisition. To **torsional**, **tachometer** & **angular sampling**
Parametric[1] (DC) inputs & CAN[1]parameters	Monitoring[3]	**Profiles** versus time (**160 ms to 163 sec** user selectable), and **digital/analog view meter**.
	Status led[3]	**Overloaded** = red - **ok** = yellow - **under load** (20 dB below range) = Cyan
	Connection[3]	To any: **recorder track**, **waterfall reference (Z/X axis)** and **profiles**, **level delta level detectors** and **virtual DC**

129.2.3 Recorder / Player

OROS 3-Series/NVGate instruments feature a recorder and a player module that allows users to:

- Record time domain signal, torsional inputs, trigger and parametric input.
- Export or import time domain files.
- Playback time domain files on analyzers outputs during analysis
- Listen to recorded tracks on the PC speakers.
- Post-analyze time domain files using the available plugs-in.

129.2.4 Recorder

The recorder module saves time domain signal into files located on 3-Series analyzer HD, Mobi-Disk™ or PC HD. This is available on 2 different modes:

- **On-line record**, the chosen inputs (Dynamic, ext. sync, parametric) are recorded at selected sampling frequency during acquisition. Real-time analysis is available simultaneously.
- **Time and tracks split**, the chosen recorded tracks (from signal file) are played back in the recorder using the post-analysis mode. The sampling frequency, duration, and/or track arrangement can be changed.

Recorder settings

Bandwidths	Dynamics inputs	**2 groups** of user selectable sampling frequency - From **102.4 kS/s** to **2.048 S/s** (**40 kHz** to **800 mHz**) - available simultaneously
	Ext. sync inputs	**Automatic selection** at Front-end sampling frequency - Resolution is **64 time Front-end sampling frequency**
	Parametric (DC) inputs	**12.5 S/s** (**50 Hz** rejection) - **15 S/s** (**60 Hz** rejection)
Tracks	Number	**6 tracks For O4.** or **38 tracks For OR35, OR36, OR38 and Office licenses.** (32 + 6 ext. Sync) Sum of connected licenses using multiple hardware
	Saved settings / track	**Label** - **Coupling** - **External gain** - Input **range** - **Sampling frequency** and **signal bandwidth - Component** - **Node** number - **Direction** - **Type** - Associated **transducer** - **Unit - Sensitivity** and **Offset** compensation.
Modes	Start to time	Start recording on run or any activated event - **Stop recording when duration ends** - Duration **10 ms** to **available space on target HDD.**
	Start to stop	**Start recording** on **run** or **any activated event** - Stop recording on stop on any activated event - Start and stop event can be the same - Duration **10 ms** to **available space on active drive** (PC or OR3x).
	Time to stop	Memorize the **earliest x seconds** - Stop = **stop** or any **activated event** - Duration **10 ms** to **2 GSamples** (limited by the drive available space)

Triggering	Start recording (new record)	Any **NVGate® event** plus **manual** and **free run**
	Stop recording (end current record)	Any **NVGate® event** plus **manual** and **free run**
	Start delay	Positive = **unlimited** - negative = **128 kSamples**
	Stop delay	Positive = **unlimited** - negative = **0**
Markers	Saved in the record files	Added by tool bar or shortcut - **comment fields** editable during record or at end of acquisition
Signal file	Record on PC HDD	Up to **10** dynamic inputs ? Up to 4 parametric inputs - max total bandwidth **512 kS/s** - (2 MB/s)
	Record on Analyzer SSD	Up to **40 channels** (32 inputs + 6 ext. sync or DC)/instruments - max bandwidth **3.2 MS/s** (12.5 MB/s)
	Format	**Normal**: **32 bits**/sample - **Compressed 16 bits**/sample

Recorder settings (continued)

Management	Download	Discard Analyzer SSD on PC HDD **- Batch download** available - Rate **4 MB/s**
	Upload	Load PC HDD records on the analyzer SSD - Rate **1.4 MB/s**
	Location	All records accessible from the project manager tree
	Hard drive management	**Format** SSD - **Selective delete** - **Sorting** tools

Mobi-Disk™

OR36 Mobi-Pack and OR38 multi analyzers/recorders feature a removable hard drive with 2 ports:

- Parallel High speed port for direct data throughput to the Mobi-Disk™.
- USB 2.0 port for post processing and data management without the instrument.

Connection	1 to 8 Mobi-Disc™	Up to **8 Mobi-disc** connected - Active Mobi-Disc: **1** (user selectable) - **hot swap**
Transfer	Based on the USB 3.0 link	**Download 15 MB/s**

Recorder monitoring

The following displays are available during real-time or post-analysis.

RMS	Overall RMS / input	**Digital** or **analog view-meter**
Signal	Real-time	**Compressed view of entire** recorded signals - Automatic update of time axis.

129.2.5 Player

The player module plays the recorded signal files. This is done one of the following two ways:

- **Post-analysis**, the player tracks take place of the corresponding inputs (Dynamics, Ext. Sync and parametric) to be processed by the plug-in analyzers, recorder, trigger and tachometer
- **Playbacks**, the recorded dynamic input are generated on the instrument outputs simultaneously with standard analysis of the inputs.

Player settings

	File selection	NVGate® **recorded files** - **Imported files** - located on **instrument SSD, Mobi-Dsic™** or on **PC HDD**.
Played section		

	Record selection	**Record number selection** (for multi record files)
	Section definition	User selectable **Start** and **stop offsets** (in sec.) - available in the **file overview window** (marker and slider)
	Duration	**Play backed duration** (User information)
	Repeat	**On/off** - repeat continuously the selection (available only for playback on analyzer output)
Mode	File swap	**Swap loaded files with same tracks number** - applies **identical post-analysis** setup to multiple files.
	Playback	Continuous or step by step (5 ms to 360,000 s)
	Bandwidth	All tracks at lowest frequency (compatible with all plugs-in) or initial record frequencies (no track mix in plugs-in)
Tracks	Number	**Up to 352** according to user's fleet
	Type	**Dynamic input** record (2 sampling frequencies), **parametric** (DC) input record and **ext. sync** record.
	Fixed setting (information) / track	**Label**, **Coupling**, **external gain**, input **range**, **sampling frequency** and **signal bandwidth**
	Modifiable measurement point information settings (apply for post analysis or re-recording) / track	**Component** - **node** number - **direction** - **type**
	Modifiable settings (apply for post analysis or re-recording) / track	Associated **transducer** - **unit** - **sensitivity** - **offset** compensation

Player settings (continued)

Listening	File location	**Analyzer HD** - **Mobi-Disk™** connected with USB or inside the analyzer - **PC HD**
	Playback	One track - from cursor position - repeat displayed signal
Markers	Display	Recorded markers are available in the **file overview**
	Use	Set the start and stop playback offset (user selectable)

Player connections

The following table describes the available connections to the analysis modes (plug-in analyzers and recorder) during post-analysis operation:

Dynamic inputs & torsional Tracks	Preview (multiple file simultaneously)	**Entire file fast overview** (pre-compressed at recording time) - **Track contents** preview, independently (multi-graph display)
	Monitoring (loaded file only)	**Zoom** on selected **play-back section**
	Connection3 (loaded file only)	To any: **plug-in analyzer channel, monitor channel, recorder track**, **edge event detector** and **tachometer**
Ext. sync Tracks	Preview (multiple file simultaneously)	**Entire file fast overview** (pre-compressed at recording time) - **Track contents preview**, independently (multi-graph display)
	Monitoring (loaded file only)	**Zoom** on selected **play-back section**
	Connection[3] (loaded file	To any: **start** or **stop averaging** of plug-in analyzers, recorder **start** or **stop recording**,

	only)	**waterfall start** or **stop acquisition**, **new block trigger** for FFT and SOA and **new slice** for **waterfall** acquisition. To **torsional**, **tachometer** & **angular sampling**
Recorded parametric[1](DC) inputs & CAN parameters	Preview (multiple file simultaneously)	Entire file **fast overview** - **Track contents** preview
	Monitoring (loaded file only)	**Profiles** versus time and **digital** or **analog view meter**.
	Connection[3] (loaded file only)	To any: **recorder track**, **waterfall reference (Z/X axis)** and **profiles**, **level** and **delta level events**.

129.3 Plug-ins analyzers

The following plug-in analyzers are available as options of NVGate® software platform.

129.3.1 Time Domain Analysis - TDA

The TDA plug-in analyzer provides time domain based analyses and visualizations. This plug-in analyzer computes statistical extractions and data compression of long duration oscilloscope views. All results are real time and operations are possible on-line or in post processing. The TDA plug-ins can operate free run or synchronized with the other plug-in analyzers.

TDA Settings

Bandwidths	Oscillator 1	**800 mHz** to **40 kHz** (sampling oscillator 102.4 kS/s to 2,048 S/s)
	Oscillator 2	**512 mHz** to **25.6 kHz** (sampling oscillator 65.536 kS/s to 3,277 S/s)
Time views	Depth	**7200/ABW ABW: the plug-in Analysis Bandwidth.** sec to **100 000** sec (27 hours) - **Independent** on each channel
	Time base (resolution)	**Depth/2048**- **Independent** on each channel
Time span for extraction (averaging)	Type	Continuous sliding with refresh each 256 sample**s** (**Exponential**) - One shot (**Linear**) - Repeated shot (**Repeated linear**)
	Duration	**1/ABW** to **2 10^6/ABW** (ex: 50 ms to 1000 sec @ 2 kHz)
Channels	OR36 & OR38 analyzers	**32 channels** per plug-in for **on line** 32 to 256 in **post-analysis**
	OR34 & OR35 analyzers	**8 channels** per plug-in for **on line** and **post-analysis**
Filters	On each channel	**Any NVGate** filter can independently be applied to each dynamic input (See Filters §)
Triggering	Start analysis	Any **NVGate® event** plus **manual** and **free run**
	End analysis	Any **NVGate® event** plus **manual** and **free run**
	Repeat analysis	On **new start** or **end of averaging**
	Trigger delay	Positive = **unlimited** - negative = **32k Samples**

TDA Results

The following results are available for real time or post-analysis display, report and saving.

Time Views	Overview	**Signal envelope:** Min/Max line for each time step -
	Statistical values	**DC - RMS - Min- Max - Peak - Peak to Peak - Crest factor - Skewness - Kurtosis -** computed on a user defined area of the time view
Extractions	Statistical values	**DC - RMS - Min- Max - Peak - Peak to Peak - Crest factor - Kurtosis -** computed on the Time span ? All values available for **View-meter** and/or **Waterfall profiles**

129.3.2 Fast Fourier Transform analysis - FFT

The FFT plug-in analyzer features multiple vibrations results depending on applied setting. This type of plug-in analyzers computes real-time (on-line or post-processing) Fast Fourier Transform algorithms with multiple averaging domain and trigger capabilities. Up to 4 FFT plug-ins can operate at the same time.

FFT Settings

Bandwidths	Oscillator 1	**800 mHz** to **40 kHz** (sampling oscillator 102.4 kS/s to 2,048 S/s)
	Oscillator 2	**512 mHz** to **25.6 kHz** (sampling oscillator 65.536 kS/s to 3,277 S/s)
Resolution	Lines	**101**, **201**, **401**, **801**, **1601**, **3201**, **6401, 12801 With force DSP and 25601 lines**
	Frequency resolution	**80 µHz** (512 mHz/6401 lines) to **400 Hz** (40 kHz/101 lines)
Averaging	Domain	**Spectral** (power) - **time** (with phase) - **FDSA** (Synchronized with one frequency)
	Type	**Exponential** - **linear** - **repeated linear** - **referenced peak hold** (eq. to tracking filter locked on reference channel frequency) - **peak hold**
	Size	**Duration** or **number of blocks**, unlimited size
	Overlap	**0%** to **99.9%** depending on block size - **retrigger**
Channels	OR36, MP & OR38 analyzers	**32 to 256 ch.** per plug-in for **on line** and **post-analysis**
	OR34 & OR35 analyzers	**8 channels** per plug-in for **on line** and **post-analysis**
Weighting	General	**Uniform - Hanning - Hamming - Kaiser Bessel**
	Modal acquisition	User defined **Force** (rect.) and **Response** (Rect. + exp)
	Assignment	Independently on any channels
Filters	On each channel	**Any NVGate** filter can independently be applied to each dynamic input (See Filters §)
Cross functions	Reference selection	**Full** or **partial matrix** available (all channels can be references)
Zoom	Magnification factor	**2 to 128** by step power of 2
	Min., max and center frequencies	Graphically selectable on wide band spectrum
Triggering	Start averaging	Any **NVGate® event** plus **manual** and **free run**
	End averaging	Any **NVGate® event** plus **manual** and **free run**
	New block	Any **NVGate® event** plus **manual** and **free run**

	Repeat averaging	On **new start** or **end of averaging**
	Trigger delay	Positive = **unlimited** - negative = **32k Samples**
	Automatic	Reject **overloaded blocks**
Blocks rejection Overall	Manual	**Accept** or **Reject** after preview of averaged results (FRF, Coherence)
	Normal	**Accept** all blocks
Overall	Detector	**Quadratic sum of spectra lines** taking in **account weighting window equivalent noise bandwidth**
	Lower and upper frequencies	Selectable into the current FFT bandwidth

FFT Results

The following results are available for real time or post-analysis display, report and saving.

Time averaging	Time domain	**Filtered signal - Triggered block - Averaged Triggered block - Weighted Block - Lissajoux of triggered blocks**
	Spectra	**Complex spectra**
	Cross-functions	Instantaneous **cross-spectra** - averaged **cross-spectra** - **FRF H1** - **FRF H2** - **Coherence**
	Overall	**Overall RMS value** in specified band - **Overall RMS profile** in specified band.
Spectral averaging	Time domain	**Filtered signal - Triggered block - Weighted Block - Lissajous of triggered blocks**
	Spectra	Instantaneous **complex spectra** - averaged **power spectra**
	Zoomed spectra	**Zoomed** instantaneous **complex spectra** - **zoomed** averaged **power spectra**
	Cross-functions	**Instantaneous cross-spectra** - averaged **cross-spectra** - **FRF H1** - **FRF H2** - **Coherence**
	Zoomed cross-function	Instantaneous **zoomed cross-spectra** - **averaged zoomed cross-spectra** - **zoomed FRF H1** - **zoomed FRF H2** - **zoomed Coherence**
	Overall	**Overall RMS value** in specified band - **Overall RMS profile** in specified band.
Synchronous averaging on one frequency (FDSA)	Time domain	**Filtered signal - Triggered block - Averaged Triggered block - Weighted Block - Lissajous of triggered blocks**
	Spectra	Instantaneous **complex spectra** - time domain averaged **power spectra**
	Overall	**Overall RMS value** in specified band - **Overall RMS profile** in specified band.

129.3.3 Constant Band Order Tracking Add-on (CBT)

Constant band order tracking is an optional add-on to the FFT plug-in analyzers. This add-on computes spectrum lines power related to RPM speed. This option adds settings and results to the FFT Plug-ins. Constant band tracking can operate on up to 4 different tachometers at the same time.

CBT Settings

Tracked Order	Number	**8 per channels**
	Max	**0.001** to **800**

	Constant bandwidth	**User selectable per channel** - minimum depend on weighting windows
Computation	Associated tachometer	**Any front end**, **recorded** or **virtual tachometer**
	Peak tracking	On/Off **center bandwidth on nearest peak**
	Order amplitude	Weighting windows eq. noise bandwidth correction

CBT Results

The following results are available for real time or post-analysis display, report and saving.

Scalar	Tracked order	**Digital** (magnitude and phase) or **analog** view-meter
	Cross phase tracking	**Order phases** are **relative** to the same order from a ref. channel
	Overall	**Digital** or **analog view-meter**
Monitoring	Continuous profiles of tracked order	**Profiles** vs. **time** - **profiles** vs. **RPM** - max depth **2048 pts** - user selectable **delta time** - user selectable **delta RPM**
Profiles	One shot acquisition	Tracked order (complex), cross phase orders and overall level can be collected by the *waterfall* profiles.
	References	Time, RPM and DC levels

129.3.4 Diagnostic Add-on (FFTDiag)

FFT Diagnostic is an optional add-on to the FFT plug-in analyzers. This add-on computes a set of useful analysis for machinery diagnostic. Up to 4 FFTDiag can operate on 4 different FFT plug-ins at the same time.

This option adds settings and results to the FFT Plug-ins.

FFTDiag Settings

Envelop demodulation	Activation	Enable/disable on all channels **-** requires **zoom activation**
	Averaging	Spectral domain - FDSA
	Bandwidth	**½ of zoom span - ¼ of FFT bandwidth**
Correlation	Activation	Enable/disable on all channels **-** All other FFT results are affected
	Weighting window	**Uniform - Left** zero padding **- Centred** zero padding

FFTDiag Results

The following results are available for real time or post-analysis display, report and saving.

Scalar	Min/Max	Minimum and maximum amplitude per trigger block
	Peak detectors	**Peak level - Peak to Peak level - Crest Factor -** per trigger block
Others	Cepstrum	**Cepstrum - Zoomed cepstrum**
	Correlation	**Auto-correlation** block **- Cross correlation** block
	Shaft view	Time domain signal on first rotation - angular representation

129.3.5 Synchronous Order Analysis (SOA)

The SOA plug-in analyzer features several results depending on applied settings. Up to 3 SOA plug-ins can operate in parallel.

SOA Settings

Bandwidths	Order span	**6.25** to **400** ? up to **800** with ***ForceDSP***
	Frequency bandwidth	Up to **40 kHz**
	RPM span	Up to **384 000 RPM - Ratio of 64** between Min & Max RPM
Resolution	Lines	**101 - 201 - 401 ? 801 ? 1601** with ***ForceDSP***
	Order resolution	**1 -** ½ - ¼ **- 1/8 - 1/16 - 1/32**
Averaging	Domain	**Spectral** (power) - **revolution** (re-sampled blocs)
	Type	**Exponential** - **linear** - **repeated linear** - **peak hold**
	Size	**Number of blocks**, unlimited size
	Overlap	**0 to 31 revolutions** depending on resolution ? **0 to 359°** into revolution ? Retrigger on **multi-pulse/rev**
Tachometer	Computation base	Any **NVGate'® tachometer** (ext. sync, regular input, DC input, CAN, simulated, Fractional, and combined tach.)
	Phase reference	Tachometer pulse **edge** or pulse **center** requires to analyze the tachometer input
	0° Phase reference	Cosine or sine
RPM	Max speed variation	**1** to **99%** per analyzed block - blocks with higher variation are rejected. No control (set @ 100%)
	RPM range	User selectable **max** & **min RPM**, under and over speed blocks are rejected
Tracked order	Number	**Up to 8** per channels
	Min-Max	**1/32** to **400** ? up to **800** with ***ForceDSP***
	Cross phase tracking	**Order phases** are **relative** to the same order from a ref. channel
Channels	OR36 & OR38 analyzers	**32 channels** per plug-in for **on line** - 32 to 256 in **post-analysis**
	OR34 & OR35 analyzers	**8 channels** per plug-in for **on line** and **post-analysis**
Weighting	Windows selection	**Uniform - Hanning - Hamming - Kaiser Bessel** Applied independently on any channels
Filters	On each channel	**Any NVGate** filter can independently be applied to each dynamic input (See Filters §)
Triggering	Start averaging	Any **NVGate® event** plus **manual** and **free run**
	End averaging	Any **NVGate® event** plus **manual** and **free run**
	New block	Any **NVGate® event** plus **manual** and **free run**
	Repeat averaging	On **new start** or **end of averaging**
	Trigger delay	Positive = **unlimited** - negative = **1/order res** revolution
	Trigger block phase shift	**±720°** - independent for each channel

Overall	Detector	**Quadratic sum of order spectra lines** taking in account **weighting window equivalent noise bandwidth**
	Lower and upper orders	Selectable into order span - from **0,03125** to **800** with ***ForceDSP***

SOA Results

The following results are available for real time or post-analysis display, report and saving.

Revolution averaging	Time domain	**Filtered** signal
	Angle domain (Revolution)	**Triggered** block **- Averaged Triggered** block **- Weighted** block
	Order spectra	**Complex spectra**
	Tracked orders	**Digital** (magnitude & phase) view-meter **- Analog** view -meter
	Overall	**Overall RMS value** in specified order band (digital or analog view-meter)
Spectral (order) averaging	Time domain	**Filtered** signal
	Angle domain (Revolution)	**Triggered block - Weighted Block**
	Order spectra	Instantaneous **complex order spectra** - averaged **power order spectra**
	Tracked orders	**Digital (module and phase)** and/or **Analog** view-meter.
	Overall	**Overall RMS value** in specified order band (digital or analog view-meter)

129.3.6 Diagnostic Add-on (SOADiag)

Order based Diagnostic is an optional add-on to the SOA plug-in analyzers. This add-on computes a set of useful synchronous order transmission extraction tools and analyses. Up to 2 SOADiag can operate on 2 different SOA plug-in at the same time.

This option adds settings and results to the SOA Plug-ins.

SOADiag Settings

Cross-functions	Reference selection	**Full** or **partial matrix** available (all channels can be references) - order domain averaging only.
Angular Correlation	Activation	Enable/disable on all channels **-** All other SOA results are affected simultaneously
	Weighting window	**Uniform - Left** zero padding **- Centred** zero padding

SOADiag Results

The following results are available for real time or post-analysis display, report and saving.

Rev. synchronous Scalars	Min/Max	Minimum and maximum amplitude per trigger block (n rev.)
	RMS, DC	Per trigger block (n rev.)
	Peak detectors	**Peak level - Peak to Peak level - Crest Factor -** per trigger block (n rev.)
Others	Copstrum?	**Cepstrum** of the order spectra
	Cross-functions	**Instantaneous order cross-spectra** - averaged order **cross-spectra** - **ORF? H1** / **H2** -**Coherence ? angular** or **order** domain averaging**.**
	Angular Correlation	**Auto-correlation** block **- Cross correlation** block - angular averaged

	Re-sampled Shaft view	Time domain signal on first rotation ? **angular representation** - **instantaneous** or **revolutions** averaged

129.3.7 1/n octave constant percentage band filter analysis - OCT

The OCT plug-in analyzer features multiple acoustic results depending on applied setting. This plug-in analyzer computes real-time signal (on-line or post-processing analysis) based on digital filters (CPB) and detectors.

OCT Settings

Bandwidths	Sampling oscillator #1 (102.4 kS/s to 2,048 S/s)	Center of **highest 1/3rd** band = **40 kHz** Center of **lowest 1/3rd** band = **100 mHz**
	Sampling oscillator #2 (65.536 kS/s to 3,277 S/s)	Center of **highest 1/3rd** band = **25 kHz** Center of **lowest 1/3rd** band = **100 mHz**
	Frequency span	Highest Band / lowest band **< 2000** (ex. 10Hz - 20kHz)
Resolution	1/n Octave	'*1, 1/3*'**rd, 1/12th, 1/24th**
Averaging	Basic	Linear & repeated linear (20 ms to 60,000 s) exponential (20 ms to 60s)
	Acoustics	**Short LEQ 1 s, Short LEQ 1/8 s, Fast, Slow, Impulse**
	Constant Bandwidth * Time	B*T = **0.2dB, 0.5 dB, 1 dB, 2 dB**
Standards	Detectors	Complies with **IEC 651, IEC 804, ANSI/ASA S1.4-2014** / **Part 1** / **IEC 61672-1:2013 compatible: class 1**
	CPB filters	Complies with **IEC ANSI/ASA S1.11-2014** / **Part 1** / **IEC 61260:1-2014 and IEC 1260 compatible: class 1**

Channels	OR36 & OR38 analyzers	**32 channels** per plug-in for **on line -** 32 to 256 in **post-analysis**
	OR34 & OR35 analyzers	**8 channels** for **on line** and **post-analysis**
Triggering	Start averaging	Any **NVGate® event** plus **manual** and **free run**
	End averaging	Any **NVGate® event** plus **manual** and **free run**
	Repeat averaging	On **new start** or **end of averaging**
Overall	Detectors	**2 parallel overall detectors** linear and weighted (time domain)
	Weighting	**A**, **C**, or **Z** (none) applicable in **10 kHz - 40 kHz** bandwidth

OCT Results

The following results are available for real time or post-analysis display, report and saving.

Spectra	1/n Octave spectra	**Instantaneous** spectra**, averaged** spectra
	Holden spectra	**Minimum** & **maximum** spectra
Overall	Linear	**Digital** & **analog** view meter of time domain overall detector, exact bandwidth is informed
	Weighted	**Digital** & **analog** view meter of **A** or **C** weighted overall levels computed in time domain, exact bandwidth is informed

129.3.8 Overall acoustics sound level meter - OVA

The OVA plug-in analyzer features compatible class 1 sound pressure level measurement according to IEC 61672:2013 standard. This plug-in analyzer computes real-time signal (on-line or post-processing analysis) based on digital filters and detectors.

OVA Settings

Type	Standard	**IEC 651, IEC 804, ANSI/ASA S1.4-2014** / **Part 1** / **IEC 61672-1:2013 compatible: class 1**
	Class	**1**
	Bandwidths	**10 Hz** to **40 kHz** - Adjustable
Channels	OR36 & OR38 analyzers	**32 channels** per plug-in for **on line** - 32 to 256 in **post-analysis**
	OR34 & OR35 analyzers	**8 channels** for **on line** and **post-analysis**
Averaging	Linear	**User selectable** duration **- repeat** mode
	Short leq	**1/8 s - 1 s -** User selectable duration
Triggering	Start averaging	Any **NVGate® event** plus **manual** and **free run**
	End averaging	Any **NVGate® event** plus **manual** and **free run**
	Repeat averaging	On **new start** or **end of averaging**
Detectors	Peak	1 **peak detector**/**Ch**. - **A**, **C** or **Z** (none) weighting -**Independent** for each channel
	Weighting	**3 overall detectors**/**Ch. - A**, **C** or **Z** (none) weighting - **Fast**, **Slow**, **Impulse** and **linear** time weighting - **Independent** for each channel

OVA Results

The following results are available for real time or post-analysis display, report and saving. The following levels can be tracked in profiles up to 100 000 pts. each.

SPL	Time weighted	Instant - max hold - min Hold
	Averaged	Short leq - leq
	Peak	Peak - Time weighted - max hold min hold

129.4 Options

129.4.1 Instantaneous angular Velocity Converter (IVC)

The IVC option converts frequency to voltage from the External synch inputs. It covers torsional and acyclism measurements. The converted signals are made available as standard inputs (or player tracks). This option operates real-time computation and operations are possible on-line or in post processing.

IVC Settings & specs

Rate	Pulse/rev	**0.5** to **4096 -** Up to **1 E6** with pre-divider
	Pulse/rev Frequency	**> 40 kpulse**/**sec** *max*

	Pre-divider	**1** to **255 -** hardware decimation (pulse are not measured)
	Pre-divider frequency	**375 kpulse/sec** max.
Missing pulses	Number	**0 to 5** consecutive pulses **integer or fractional**
	Hold off	**2** consecutive pulses
	Generated signal	'*1st* '**order interpolation**
Tach. phase ref	No missing pulse	First random - continuous offset further
	missing pulse > 0	Last known edge before missing pulse
Resolution	Time	**160 ns** : 1/(SF x 64)
	Angular (with SOA)	350 µRad (20 mdegres) @ 8000 RPM, up to order 10
Pre-processing	Smoothing	Sliding average - **1** to **32** samples
	Filtering	**Any NVGate** filter (See Filters §) incl. dt and 1/dt
Max Speed	Without pre-divider	Max RPM = 2.4 e6/*Pulse per rev* - 12 000 RPM @ 200 pulse/rev
	With pre-divider	Max RPM = 36 e6/*Pulse per rev* - 12 000 RPM @ 200 pulse/rev

IVC Results

The following results are available for real time or post-analysis.

Signals	Number	**1** to **6** (depends on the number of available ext. synch)
	Use	Same as **dynamic inputs** or **recorded** dynamic inputs
	Magnitude	**Torsional** acceleration, velocity & angle ? separated from angular magnitudes (RPM)
View	Type	Signal - filtered signal - **256 samples** frame

129.4.2 Angular sampling (A-Samp)

The angular sampling option allows accurately localizing the order phenomenon angle on cyclic rotating machineries. It uses the pulses delivered by an encoder (or zebra tape or gear teeth) to resample the inputs and torsional signal in the SOA plug-in. This option operates real-time computation and operations are possible on-line or in post processing.

IVC Settings & specs

See front-end/ext. Synch § for details

129.4.3 Virtual inputs (VIn)

The virtual input allows combining front end inputs with polynomial operations to generate a signal (new input). This option covers numerous applications such as vector strain calculation with rosette or dynamic twist measurement on machinery transmission. The virtual inputs are made available as standard dynamic input. A static twist computation based on phase comparison is also available with the Vin + IVC options.

This option operates real-time computation on raw or recorded signal.

VIn Settings

Output	Number	**12** Operators
	Type	**New item** in the active **inputs/tracks list**

	Synchronization	**0° phase shift** with sources and analyzed signal
	Magnitude	**Automatic** or **voltage** if unresolved
Sources	Number	**1** to **32 channels**
	Type	Analyzer **dynamic inputs** or **recorded** dynamic inputs
Output adjustment	Type	***(Input * Coeff + Offset) ^power*** - independent on each output
	Offset	Any real value from **-1 e9 to 1 e9** - ex: -5.67
	Coefficient	Any real value from **-1 e9 to 1 e9** - ex: 12
	Power	Any real value from **-4 to 4** - ex: 0.5
Sources adjustment	Type	***Filtering [(input * Coeff + Offset) ^ power]*** - independent for each source
	Offset	Any real value from **-1 e9 to 1 e9** - ex: -5.67 e-5
	Coefficient	Any real value from **-1 e9 to 1 e9** - ex: 1200
	Power	Any real value from **-4 to 4** - ex: -2.4567
	Filtering	Any NVGate filter
Operators	Type	**Product** - **Sum** - independent on each operator
Twist	Type	**Phase comparison** ? output in **plane angle**
	Correction (zeroing) offset	**-360°** to **+360°**
	Output	**Plane angle** or **torque** with conversion factor

129.4.4 Virtual parameter (VDC)

The virtual parameter (VDC) allows combining front-end parametric inputs (DC) with math operations to generate a calculated parameter (new DC). This option covers numerous applications such as averaged temperature or non linear response transducers. The virtual parameters are made available as standard DC input. This option operates real-time computation on raw or recorded signal.

VDC Settings

Output	Number	**12** Operators
	Type	**New item** in the DC inputs/track list
	Synchronization	**0° phase shift** with sources and analyzed signal
	Magnitude	**User defined**
Sources	Number	**1** to **32 channels**
	Type	Analyzer **DC inputs** or **recorded** DC inputs
Editor	Type	Text
	Variables	**Real** values
	Operators	**+**, **-**, **x**, /, **^**, **=** (affectation)
	Predefined	**Ch x** (Channels signals), **Pi**, **e**
	Trigonometric functions	**Sine**, **Cosine**, **Tangent** - with **Arc** and **Hyperbolic** combination

	Logarithmic functions	**Log2**, **Log10**, **Ln**, **Exp**
	Miscellaneous	**Sqrt**, **Abs, Min, Max, Sum, Avg**
Output characterization	Limits	Min and max: **+/- 1 E9** - In current unit
	Information	**Label** (text)

129.4.5 Combined tachometer editor (CTE)

The CTE option combines 2 actual tachometers with math to generates a calculated angular velocity (new tachometer). It covers various unreachable rotating parts and more specially the CVT gear chain measurements. The combined tachometers are made available as standard tachometer. This option operates real-time computation and operations are possible on-line or post processing.

CTE Settings

Sources	Number	**2**
	Type	**Any NVGate tachometer ?** excepted another CTE
Output	Type	New item in the active tachometers list
	Synchronization	**0° phase shift** with sources and analyzed signal
Editor	Type	Text
	Variables	**Real** values
	Operators	**+**, **-**, **x**, /, **^**, **=** (affectation)
	Predefined	Rmp1, Rpm2 (sources speed), **Pi**, **e**
	Trigonometric functions	**Sine**, **Cosine**, **Tangent** - with **Arc** and **Hyperbolic** combination
	Logarithmic functions	**Log2**, **Log10**, **Ln**, **Exp**
	Miscellaneous	**Sqrt**, **Abs, Min, Max, Sum, Avg, Sign, If, Rint**
Output characterization	Rotation	Clock wise or counter clock wise
	Average	**Sliding** - **1** to **256** revolution
	Speed limits	Min: **0 RPM** - max: **1 200 000 RPM**
	Information	Label (text)

CTE Results

The following results are available for real time or post-analysis

Signals	Number	**4**
	Use	Same as on-line **Tachometer** or **recorded** tachometer
	Magnitude	Angular velocity (RPM)
View	Types	**View meter** - **1** to **100 s** rolling **profile**

129.5 General purpose analysis

The following modules are available as standard features of NVGate® software platform; they feature additional analysis capabilities to regular plug-in analysis modules.

129.5.1 Monitor

The monitor is an independent (dedicated processor) module that continuously processes FFT analysis on 4 channels at the maximum available bandwidth. The aim of this module is to monitor in both domains (time and spectral) 4 inputs and to compute basic indicators for monitoring and triggering purpose.

Monitor settings

Fixed setup	Bandwidth	**ABW = Sampling freq** / **2.56**
	Resolution	**401 lines**
	Average domain	**Spectral** (power)
	Overlap	**0%**
	Average type	**Exponential**
	Weighting windows	**Hanning**
	Trigger	**Free run**
Channels	Number	**4**
	Swap	Between **any active dynamic input - hot swap** capable
Average	Duration	**Instantaneous** (20 ms) to **unlimited**
Overall analysis	Pass band filter	**Butterworth** order **2** to **10 - IIR** type - **Bypass** function
	Upper & lower frequency	**User defined -** can be graphically modified
	Computed indicators	**DC - Max - Min - RMS - Skew - Kurtosis -** Into defined pass band - **overall** if bypass is on
	Average	**User defined** duration **- independent** from spectral averaging

Monitor results and connections

The following results are available for real time or post-analysis display, connection to other modules.

Time domain	Play back	On any output generator - hot swappable
FFT analyzer	Trigger bloc	**1024 samples** - time domain **analyzed bloc**
	Spectra	Instantaneous **complex spectra** - averaged **power spectra**
Overall detectors	Display (digital or analog view-meter)	DC - Max - Min - RMS - Skew - Kurtosis
	Connection	To **level** and **delta level** event detector - to **waterfall profiles**

129.5.2 Waterfall

The waterfall module operates as a stack for plug-in analyzers results. Waterfall module features advanced graphics for 3D and profiles, including extraction tools. It can synchronize results coming from multiple plug-in analyzers and sources in one result.

Waterfall settings

Mode	Continuous	**Circular buffer** of results
	One shot	Fill stack and stop waterfall acquisition
Triggering	Start acquisition	Any **NVGate® event** plus **manual** and **free run**

	Stop acquisition	Any **NVGate® event** plus **manual** and **free run**
	New slice (point or spectra)	Any **NVGate® event** - **manual - free run -** availability of **connected results** - **periodic**

Waterfall settings (continued)

Size	Number of result per acquisition	Up to **95 results + Time**
	Depth	**2** to **100,000** slices or points - depend on PC available memory and requested result - **automatically adjusted** before acquisition
	Depth for stand-alone acquisition	Up to **3 MSamples** per computation DSP
Channels	**Type scalar** (the following results are connectable to waterfall channels)	**Overall levels** (lin and weighted) from OvA and 1/n OCT - **Monitor indicators** (DC, Max, Min, RMS, Kurtosis) - **Orders** (from CBT and SOA) - **Complex orders** (magnitude & phase) - **Overall levels** in selected BW from FFT & SOA (order or frequency) - **TDA** scalar: **DC, Min/max, RMS, Kurtosis, peak, peak-peak, crest factor**
	Type 2D - FFT (the following results are connectable to waterfall channels)	**Triggered** block **- Averaged Triggered** block **- Weighted** Block **- Complex** spectra **- Power** spectra **-Cross-spectra** - **FRF H1** - **FRF H2** - **Coherence - Zoomed** complex spectra - **zoomed power** spectra
	Type 2D - OCT (the following results are connectable to waterfall channels)	**Instantaneous** spectra - **averaged** spectra - **max & min hold** spectra
	Type 2D - SOA (the following results are connectable to waterfall channels)	**Triggered** block **- Averaged Triggered** block **- Weighted** block **- Complex order** spectra **- Power order** spectra

Waterfall results

The following results are available for real time or post-analysis display, report and saving. All stacked results can be saved.

3D	Display	**1 pane** (3D) - **2 panes** (3D + YZ view or 3D + XY view) , **3 panes** (3D + YZ + XY + Extraction view) windows - automatic or user selectable **pane arrangement - Real or imaginary** part and **module or phase** for complex results
	Z axis (X axis for extraction and YZ view)	**Any reference** - **time** - independent for any window - swap reference at any time
	Saving selection	**Entire 3D data** and / or any active **section** (YZ, XY or Extraction)
Profiles	Display	Profile of any scalar - **Real or imaginary** part and **module or phase** for complex results
	X axis	**Any reference** - **Time** ? **Slice** - independent for any window - swap reference at any time

Waterfall Tools

The following results are available for real time or post-analysis display, report and saving.

Sections	YZ Sections (Profiles vs. Ref)	Any order/frequency - **Power** - **Peak** - on selected bandwidth
	XY Sections (Spectra)	Any position in the current ref. - **Min** - **Max** - **Average** - on selected range or all slices
	Order/Frequency extraction (profiles vs. Ref.)	Any order/frequency extraction - **user selectable tach**. - **Power** - **Peak** - on selectable bandwidth - **Max order**
	Number of sections	**Unlimited** - available on result or real-time waterfalls

Linked cursors	General	Single or dual cursor in each view - linked with other graphs
	Linked by value	Linked cursors track the same X value in different windows.
	Linked by reference	Linked cursors track the same acquisition slice in different waterfall windows with different X or Z-axis.

References are: Time - Slice number - DC channels (expressed in physical quantity) - TDA scalars - Monitor levels- any Tachometer

129.6 Shared resources

The following resources are available for each plug-in analyzer (when it is compatible). For example once a trigger is activated it can be applied to FFT and SOA: Then modifying the trigger setting in the resources will apply on all corresponding plug-in.

129.6.1 Triggering

Each plug in analyzer (and recorder) can be started, stopped or triggered (new block) with events defined in the Event module.

Event settings

Edge detector	Source	**Any dynamic input** - Any **recorded** dynamic input
	Label	String for **event identification** (Ex. "Impact" for a hammer impact detection)
	Threshold	Between **min and max range** - use **source unit** (ex. g for an accelerometer)
	Pre-filtering	**A** law - **C** law - any **NVGate filter**
	Slope	**Rise** - **fall**
	Hold off	**0** to **36000** s
	Hystersis	Into source **input range** - use **source unit** (ex. g for an accelerometer)
	Number	**2** edge detectors
RPM speed detector	Source	**Any tachometer -** computed from **dynamic input** or **ext.sync** - any r**ecorded pulses** (through tachometer)
	Label	String for **event identification** (Ex. "start speed" for a run up initial triggering)
	Threshold	Detection into source tachometer RPM range
	Slope	**Run up** - **Run down**
	Hysteresis	**0** to **source** max RPM
	Interpolation	**On** interpolate event occurrence **into revolution** - **Off** event **occur at revolution ends** (new pulse)
	Number	**2 to 6** RPM speed detector
Delta RPM speed detector	Source	**Any tachometer -** computed from **dynamic input** or **ext.sync** - any r**ecorded pulses** (through tachometer)
	Label	String for **event identification** (Ex. "Each 100 RPM" for a run up triggering)
	Lower velocity	**Minimum** RPM speed - Events occurs only for higher source speed
	Higher velocity	**Maximum** RPM speed - Events occurs only for lower source speed
	Delta velocity	Define **velocity step** - **event occur each time** source speed increase or decrease by delta velocity
	Slope	**Run up** - **run down** - **first,** first slope is automatically selected - **any,** event occur on any slope

	Interpolation	**On,** interpolate event occurrence **into revolution** - **Off,** event **occur at revolution end** (new pulse)
	Number	**2 to 6 delta RPM** speed detector
Level detector	Source	Any **parametric (DC)** input - **Monitor scalar** - **Filtered** monitor scalar (Band Pass)
	Label	String for **event identification** (Ex. "temp A" for a recording trigger)
	Type	Monitor scalar - DC - RMS - Max - Min - Kurtosis
	Status	**Above** / **below** - Detection level - available in **lin** or **dB**
	Number	**1** to **4** level detectors

Event settings (continued)

Periodic event	Label	String for **event identification** (Ex. "Hourly" for 1 hour time interval)
	Time interval	**2 ms** to **11 days** - **Synchronized** with analyzer.
	Number	**2** periodic events
Combination	Sources	**Any event - 2** different sources defined as **A** and **B**
	Label	String for **event identification** (Ex. "Time/RPM variation" for a mix between periodic and delta RPM)
	Combination	A **OR** B - A **AFTER** B - A **AND** B (occur in the same bloc)
	Number	**2** event combination
Plug-in synchronization	FFTx result available	Occurs at each **new spectra availability** - Occurs at **end of linear averaging** (repeat and linear) - One event per active FFT plug in (FFT1 to FFT4)
	OCT result available	Occurs at each new 1/n spectra availability - Occur at **end of linear averaging** (leq, short leq, linear repeat)
	SOAx result available	Occurs at each **new spectra availability** - Occurs at **end of linear averaging** (repeat and linear) - One event per active SOA plug in (up to 2)
	TDA result available	Occurs at each new level set (RMS, DC, etc) availability - Occur at **end of linear averaging** (repeat and linear)
	OVA result available	Occurs at each new set of overall level (short LEQ) availability - Occur at **end of short averaging** (repeat and linear)
Generators Synchronization	Event synchronized with **blocks of**:	**Multi-sine** - **random noise** - **chirps**
	Swept sine generator event:	**Swept sine stabilized** (output amplitude established) - **step sine stabilized** (occur x sec after step frequency is reached) - **pure tone stabilized** (output amplitude established)

129.6.2 Output signals

NVGate® proposes a set of generator signals.

Output signals

The following output signals are available as standard and can be independently applied to the front-end outputs.

	Type	Pure tone - Swept sine - Step sine

Sine

	Frequency	**100 µHz** to **40 kHz** - smooth variation between step - resolution **10 µHz**
	Frequency control	Start & stop frequencies - pause/release during sweep - adjustment during pause - step
	Cycle control	One shot - One cycle - continuous sweep between boundaries
	Amplitude control	**Settling time** 100 µs to 10 s - **Stabilization time** 0 s to 1000 s
	Sweep speed	Linear: **300 mHz/s** to **20 kH/s** - Log: **5 mOct/s** to **330 Oct/s**
	Step control	**Synchronized with analysis end** - free run
	Gain control	**-15 dB** to **+60 dB** - **Independent** for each output - Amplitude **variation controlled** by settling time (1 ms to 1000 s)
	Phase control	Offset ±360° - **Independent** for each output - phase **variation controlled** by phase speed (1.5°/s to 360°/s)
	Number	**2 to 6** sine generated simultaneously - with **independent phases and amplitudes** - **synchronized** frequencies
Multi-sine	Frequency span	From **125 mHz** to **40 kHz**
	Amplitude	**0** to **2.5 Vrms** - Settling time **100 µs** to **10 s**
	Resolution	**125 mHz** to **400 Hz** - **101** lines to **6401** lines
	Phase	**Fixed** (all sine have same phase) - **Random**
	Burst	**0** to **100%** - Step **1%**
	Number	**2** to **4 independents** multi-sine

Output signals (continued)

Random noise	Frequency span	From **125 mHz** to **40 kHz** - independent lower and upper frequencies
	Amplitude	**0** to **2.5 Vrms** - Settling time **100 µs** to **10 s**
	Type	**White** - **pink**
	Burst	**0** to **100%** - Step **1% -** Bloc duration**: 2.5 ms to 100 s**
	Number	**2** to **6 independent** and **uncorrelated** random noises
Chirp	Frequency span	From **3.125 Hz** to **40 kHz** - independent lower and upper frequencies
	Amplitude	**0** to **7,07 Vrms** - Settling time **100 µs** to **10 s**
	Size	**256** - **512** - **1024** - **2048** - **4096** - **8192** - **16384**
	Burst	**0** to **100%** - Step **1%**
	Number	**2** to **6 independents** chirps

In addition to these predefined signal, any recorder or imported signal file can be generated synchronously on front-end the outputs.

129.6.3 Filters

The following filters can be applied on front-end inputs, plug-ins analyzers and output generators.

ABW: the analysis bandwidth, of the plug-in or front end where the filter is in use.

High pass	Type	**Butterworth** ? **IIR** type
	Order	**1** to **6**

	Cutoff frequency	**ABW**to **ABW**/**1024**
Low pass	Type	**Butterworth** ? **IIR** type
	Order	**1** to **6**
	Cutoff frequency	**ABW** to **ABW** /**102.4**
Stop/pass band	Type	**Butterworth** ? **IIR** type
	Order	**2** to **10**
	Cutoff frequencies	**ABW** to **0.055** * **ABW**
	Bandwidth	**ABW**/**2** to **0.0075** * **ABW**
Integrators	Type	**HP, Single** or **double**
	High pass frequency	**ABW** /**10 000** or **ABW** /**2 000**
	Integration time	**2 ms** to **500 s**
Differentiators	Type	**Single**
	Average	**Sliding** - **0** to **2 s**
Weightings	Laws	**A** & **C** laws
	Bandwidths	**10** kHz to **40** kHz
All	By-Pass	**Apply**/**bypass** without stabilisation time - independently on each filter
	Application	Same filters set for each plug-in
	Label	Each filter features a user define name

129.7 Notes

The above specifications describe all the guaranteed capacities and performances of the NVGate V12 or upper. Functionalities may change depending on operation mode (connected to a 3-Series unit or office). Plug-in analyzers, options and channel number availability depend on purchased options.

The instruments hardware are described separately in the "Instruments specifications page" OROS reserves the right to modify the specifications without notification.

130 NVGate Status bar

130.1 Status bar

The software interface features a status bar that continuously shows the different status of the hardware, analysis and ongoing actions.



The status bar is divided in 5 parts:

130.1.1 Control Tab

 Allows starting, pausing and stopping the analysis.

See Measurement group for details

130.1.1.1 GoToTesult

|  Allow you a direct access to GoToResult command.

130.1.1.2 Plug-ins progress bars

Shows the individual analysis status of the active plug-ins. The Progress bars appear automatically when the plug-in are activated (i.e: Inputs or tracks are connected to their channels).

Ex: 

Each progress bar displays:

- A progress bar:
- Indicates the current averaging number or analysis duration. In case of un expectable duration, the progress bar continuously run for one side to the other.
- The color indicates the following real time status:
- Green = real-time, all sample are processed.
- Red = the analysis has encountered a non real-time situation, sample have not been analyzed.

- A text: *(AVT) SSSS: AAA*
- AVT = Average type
- SSSS= Plug-in status (Stop, run, Paused, triggering,)
- The text color indicates the current real-time status: Red = not real-time

130.1.1.3 Information area

In the top left of the status bar, contextual information and progress bar appear depending the on-going action. This concern the disk download, the setup and data saving and any long duration process from NVGate.

130.1.1.4 Inputs status LED

Shows the inputs/signal tracks status. The same status is displayed on the front-end LED.

	The input is not active

	The input is under loaded. The signal amplitude is more than 24 dB below the current input range.
	Normal, the signal amplitude is between -24 dB and the input range.
	An overload has been detected since the last run. The signal on the input is no more overloaded .
	The input is overloaded.



A right-click on an active input status LED displays a pop-up menu. It is used to modify the range or any of the input parameters.

130.1.1.4.1 Front-end LED colors

For those who use OR36, Mobi-Pack and OR38 version 2, the front-end LED colors helps knowing what is connected and signal levels.

The LED statuses are:

Status	Color on Front End	Color on XPod
Dynamic inputs normal	Green	none
Dynamic inputs underload	Cyan (clear blue)	none
Every input type overload	Red	Red
Parametric input normal	Yellow	none
Parametric input underload	Clear purple	none
Strain gauges normal	none	Blue
Thermocouple JKTNB	none	Yellow, Green, Brown, Pink, purple
PT 100, PT1000	none	Blue, Grey (low white)

130.1.1.5 Accept/reject

This function is used to accept or reject a measurement when the FFT trigger accept mode is set to manual.

130.1.1.5.1 Accept

 Shortcut: Ctrl + Y. Accepts the last acquisition.

130.1.1.5.2 Reject

 Shortcut: Ctrl + N. Rejects the last acquisition.

130.1.1.6 Battery

Shows the battery and powering status:

	The analyzer is powered by and external power

	The analyzer is running on its battery

The battery level shows the available autonomy. The steps shows: 100%, 75%, 50%, 25% and 10% of battery charge. Note: The battery level is also replicated on the LCD screen of OR36 and OR38.

130.1.1.7 Online to Post-analysis

|  | **Online to Post-analysis**: This button is used to switch from Online mode to Post-analysis mode. This will open the *Select Signal* window which lists all the recorded signals available. The selected signal will be then playback and can be re-injected into any plug-in analyzer (Monitor, FFT, 1/n Octave...). It is also possible to play back a recorded signal through the Output during Online analysis.

See player page for more details.

130.1.1.8 Connection mode

Depending the connection mode an analyzer or a display icon is displayed in the bottom right area.

	Office mode. The software processes data from a signal file (post-analysis) in the PC or simulates the inputs for preparing a measurement setup.
	Connected mode. The hardware is connected. The software runs the analysis on the DSPs directly from the inputs or post-processing signal files from the Mobi-disk.

Note: a fly over the Analyzer icon with the mouse will show the internal temperature and fan status of the analyzer.

130.1.1.9 Acquisition status

	The acquisition and analysis are real-time
	The acquisition is not real-time. The analyzer is not working properly. Both software and hardware should be restarted

131 NVGate Synchronous Order Analysis

Order analysis is a set of specialized measurement techniques often used when making vibration measurements on rotating machine. With the Order Analysis option, you can make RPM profiles, order tracking and order spectrum.

To make order measurements, you must use a proper tach signal which is synchronized with the rotational speed of the machine.

131.1 Outlines

131.1.1 What is Order Tracking?

When doing a measurement on rotating machinery, it is often useful to display a spectrum in the behavior of harmonics or sub harmonics related with the shaft speed.

If the shaft speed varies, each harmonic of the shaft rate needs to appear at a fixed point into the spectrum, so called order.

The basics to make such analysis are to control the sampling rate of the analyzed signals in order to get an equal number of samples independently of the shaft speed.

The classical way uses a tracking ratio synthesizer based on phased locked loop oscillator which generates a constant number of sampling pulses during one shaft revolution. This synthesizer also controls variable cut off frequency of analog anti-aliasing filters. They are adapted to the variable sampling frequency that is itself depending on the frequency bandwidth.

131.1.2 How the OROS Analyzer Works?

131.1.2.1 Basics

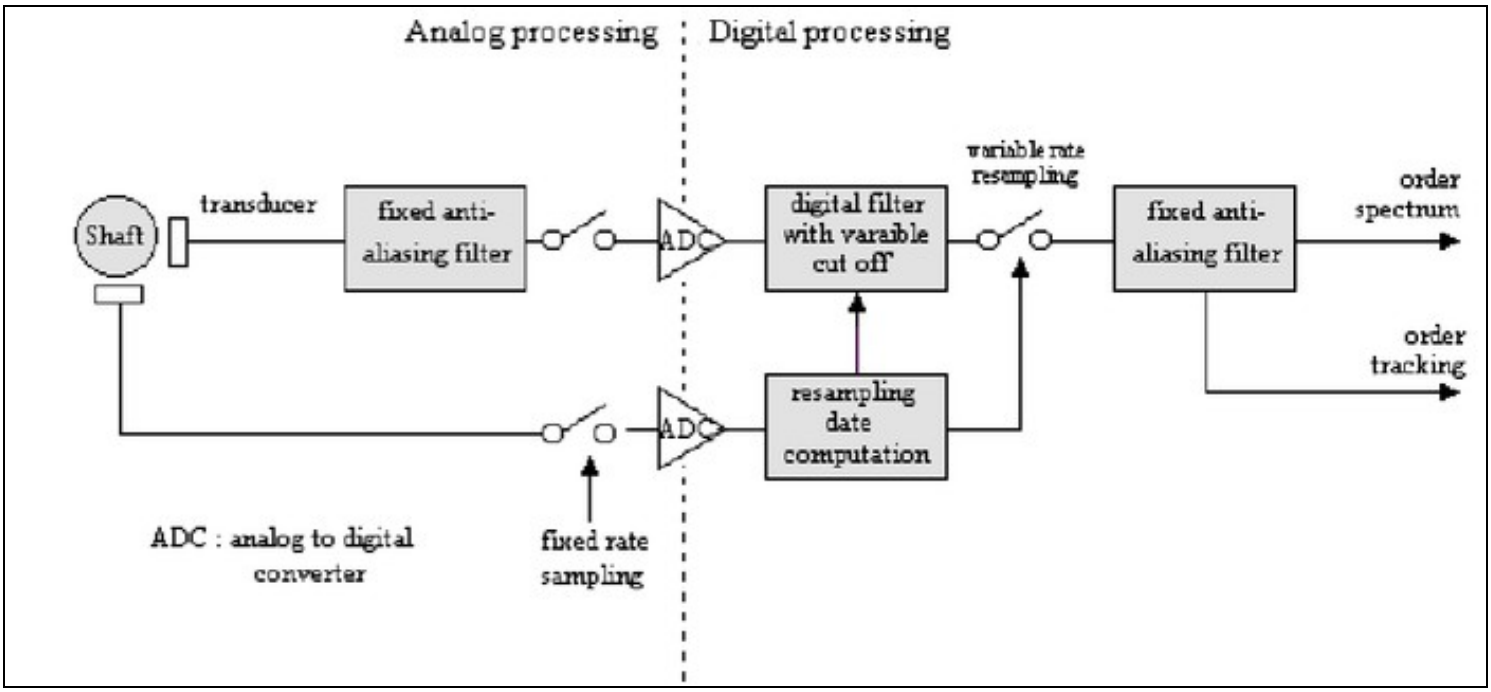
The OROS analyzer is based on a variable digital resampling technique implemented as software in a digital signal processor chip.

This approach gives an improved performance over analog solutions along with reduced hardware cost and reduced complexity.

The figure below shows a general block diagram of digital resampling technique.

The signals to be analyzed are sampled at a constant rate with fixed antialiasing filters. These filters have a slope greater than 200dB per octave in the transition band.

The tach signal is sampled and processed in order to compute sampling rate of tach revolution pulses. The arrival time of a tach pulse is computed using interpolation between 2 samples. This tach processing also computes instantaneous speed in order to adjust the cut off frequency of the low pass digital filter used in resampling.



Block diagram of digital order analyzer

After low pass digital filtering, the analyzed signals are resampled and a standard FFT analysis is done.

131.1.2.2 Resampling date computation

The tach processing first measures date arrival of tach pulses and next computes resampling dates as shown in the figure below:

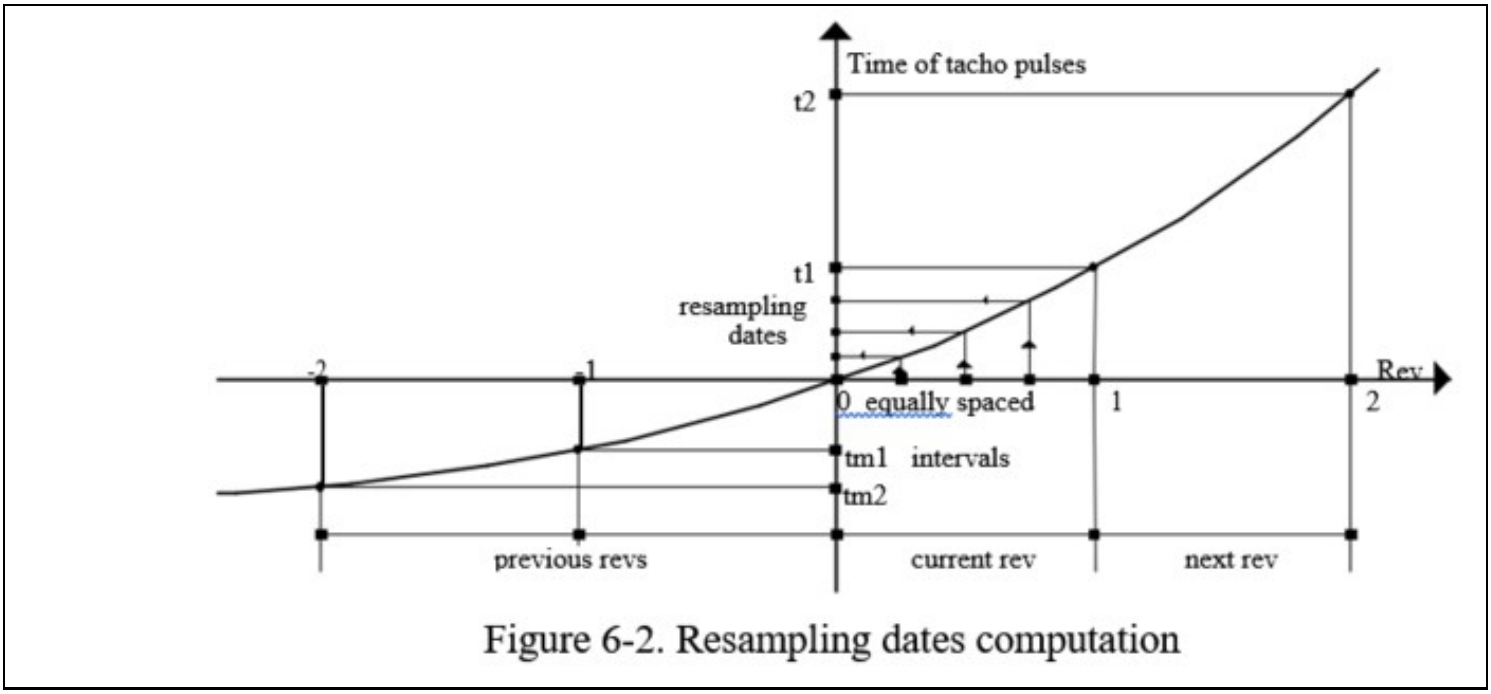


Figure 6-2. Resampling dates computation

For a revolution, resampling dates are computed taking into account current rev duration, next one and both preceding ones.

A function of sampling rate versus revolution or shaft position is evaluated and for the current revolution resampling rates are computed for equally spaced shaft positions.

If the number of tach pulses per revolution is not an integer, the tach processing calculates by interpolation the new dates of the tach pulses in order to always have an integer number of revolution for the resampling process.

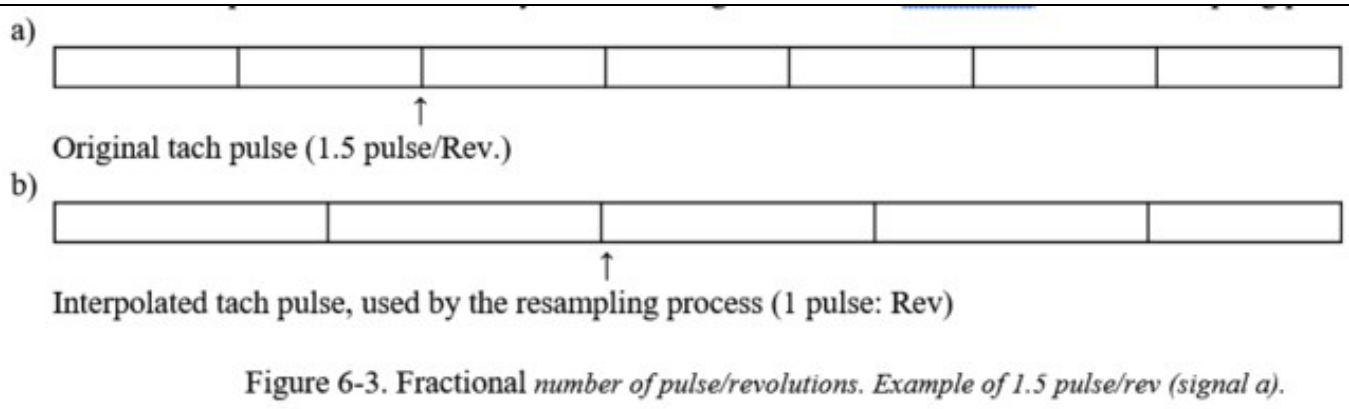


Figure 6-3. Fractional *number of pulse/revolutions. Example of 1.5 pulse/rev (signal a).*

So using backward and forward tach information gives an accurate evaluation of resampling dates. But this method needs to store signals to be analyzed so that when a tach pulse arrives, the analyzer computes dates of the previous revolution (use of digital signal processors).

This method makes no basic assumption about shaft speed variation profile and compared to other methods, it always gives exact resampling dates at the start and the end of a revolution.

So in case of a large speed variation in a revolution, the analyzer can always deliver valuable spectrums. During implementation the operator can adjust the speed variation threshold over which measurements are automatically rejected.

131.1.2.3 Signal resampling

The digital resampling of analyzed signals needs a complementary antialiasing filter whose cut off is continuously adjusted to a frequency equal to the product of the maximum analyzed order by instantaneous shaft speed.

The resampling also needs X signal interpolation between samples. The variable filtering and interpolation is based on an OROS proprietary wich is the most accurate and powerful on the market.

Compared to other methods, the OROS one has the main advantage to be able to work with the full available frequency range of the original sampled signal, so the OROS order tracking analyzer is able to work with signals up to 40 kHz with initial sampling at 102.4 kHz.

131.1.2.4 Signal analysis

The signal analyzer does FFT processing on resampled signal.

This signal is always taken by starting synchronously on a tach revolution pulse in order to be able to deliver absolute phase information of each order.

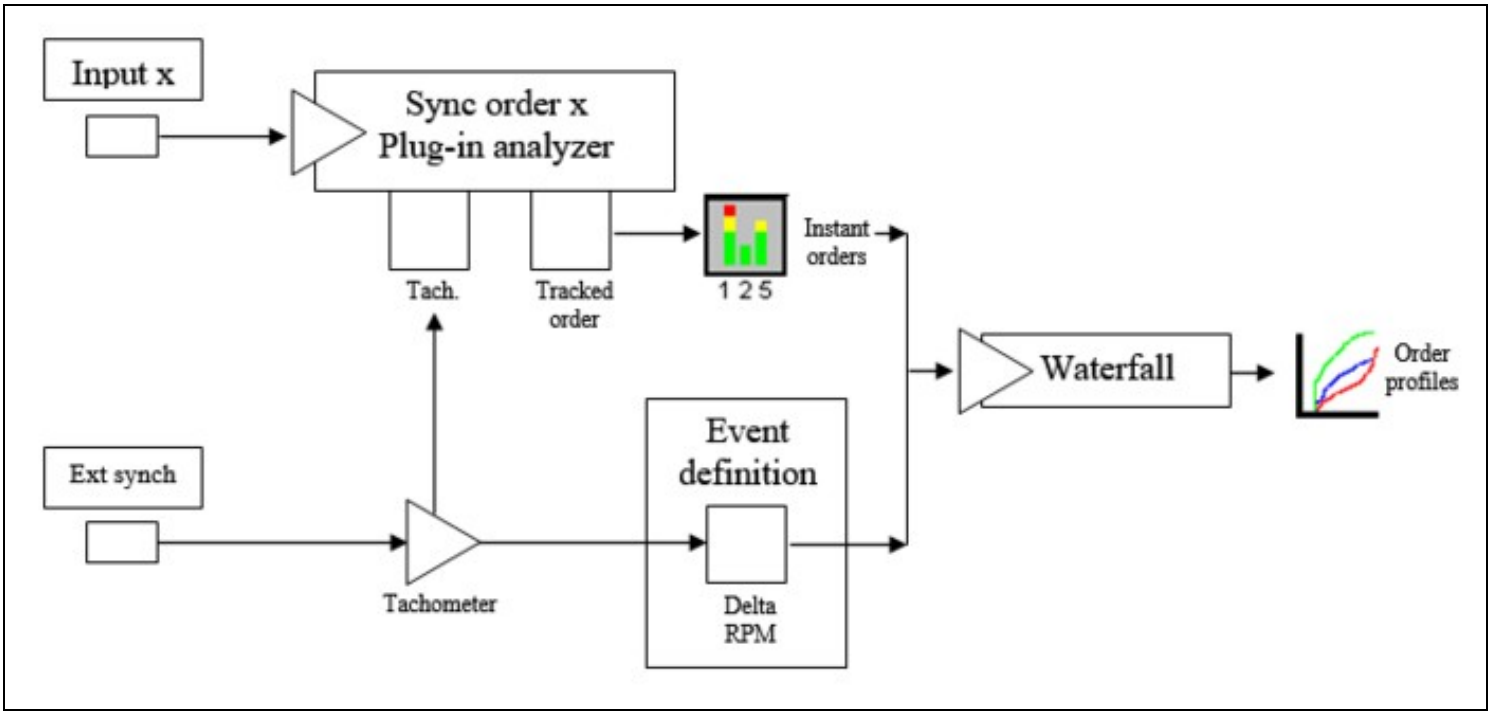
Sub-ranging order analysis is available with order resolution down to 1/32. In this case the FFT processing is done by using signal corresponding to N consecutive shaft revolutions and so gives a 1/N order resolution.

The angular and spectral averaging are implemented. Angular averaging is necessary when absolute phase resolution and/or rejection of signals unrelated to shaft rotation are needed.

Spectral averaging can compute power spectrums and cross power spectrums with associated results. In this mode, weighting windows are available in order to reduce side lobe effects of signals not related to shaft rotation.

131.2 NVGate SOA Plug in

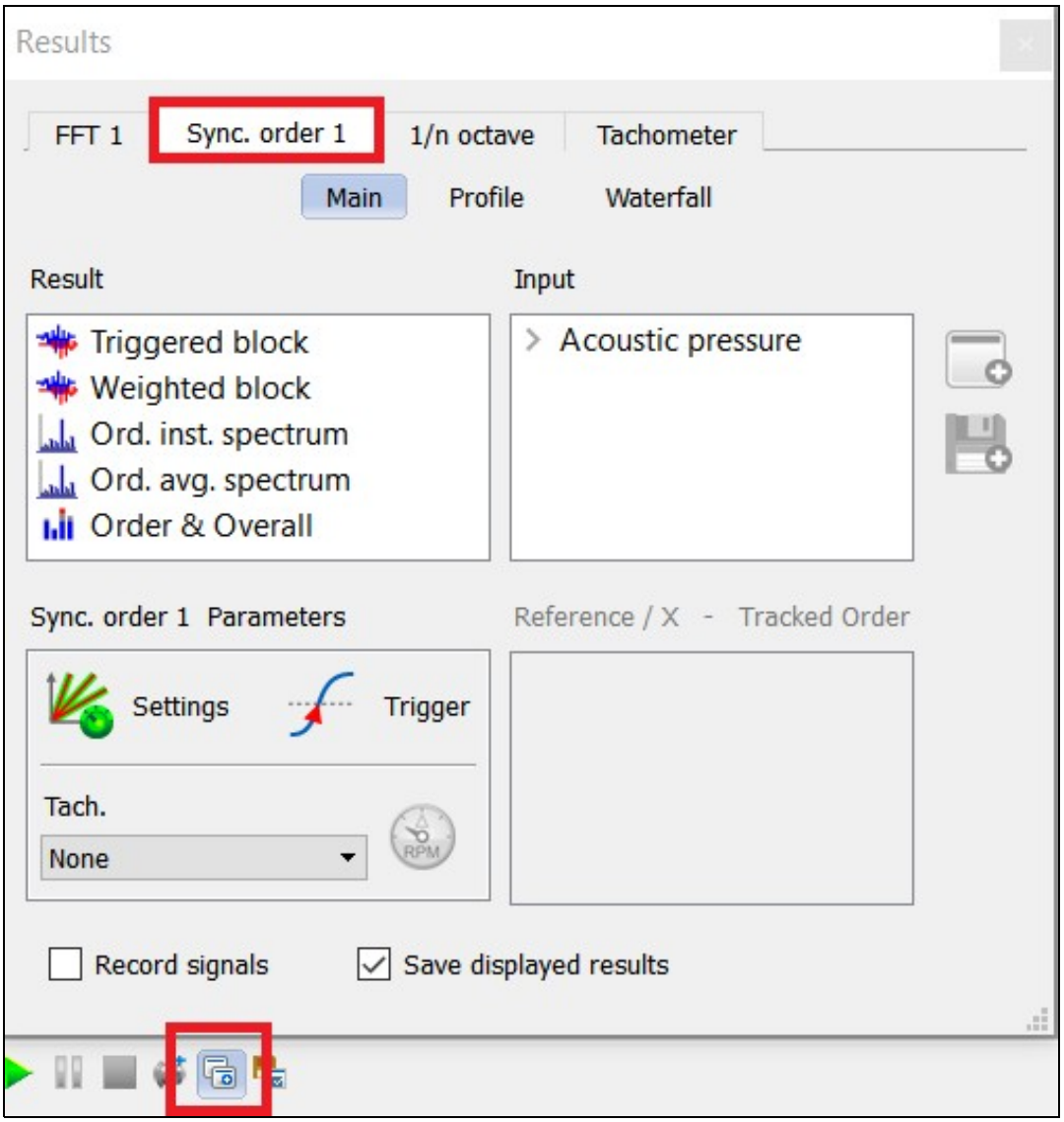
This plug-in is used to perform synchronous order tracking (it is also used to compute time signals in post analysis mode with the Player module).



Set an accurate range peak is advice for more accurate results.

131.2.1 Connect track and display

We advise using GoToResult result Wizard for connecting track and display SOA results.


Results
FFT 1
Sync. order 1
1/n octave
Tachometer
Main
Profile
Waterfall
Result
Input
Triggered block
Weighted block
Ord. inst. spectrum
Ord. avg. spectrum
Order & Overall
Acoustic pressure
Sync. order 1 Parameters
Reference / X - Tracked Order
Settings
Trigger
Tach.
None
RPM
Record signals
Save displayed results

131.2.2 Available results:

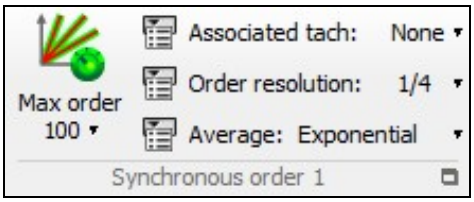
With Resolution being the value of the *Synch. order x/Order FFT /Resolution* setting:

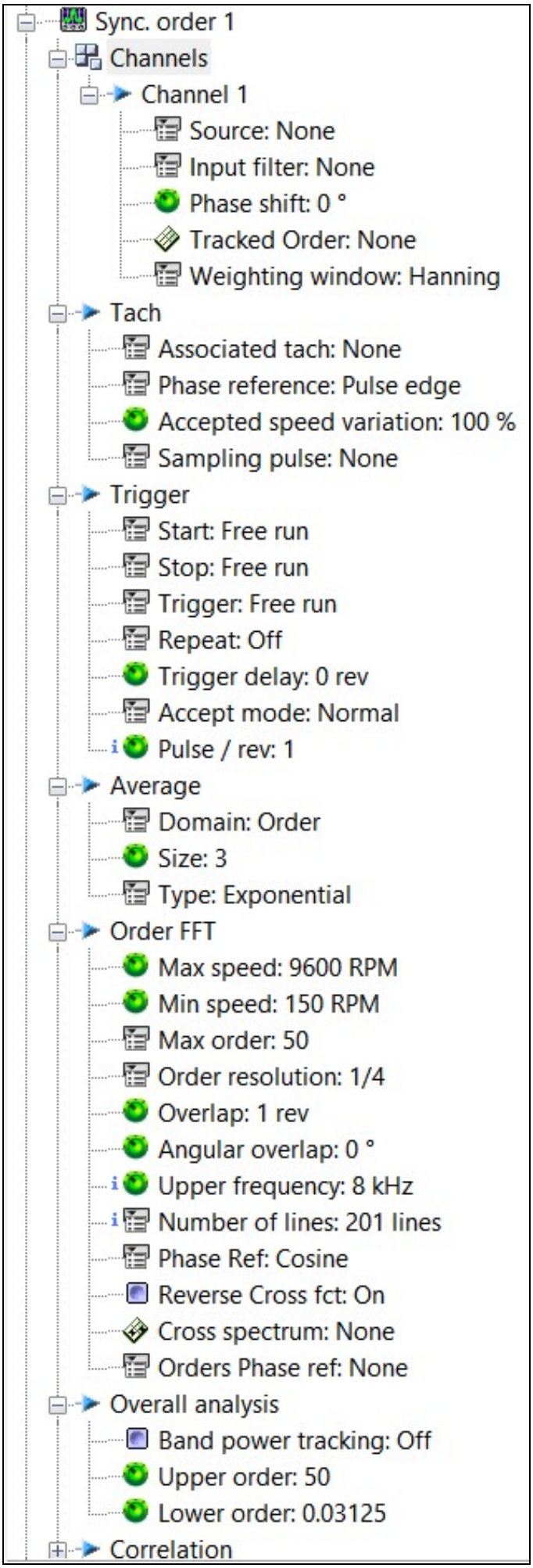
Type	Size	Dimension	Domain	Save
Filtered signal	256 pt	2D	time	Yes
Triggered block	(Resolution-1)*2.56	2D	angle(rev)	Yes
Trigger Shaftview	(Resolution-1)*2,56	2D	angle(rev)	Yes
DC	1pt	1D		Yes
RMS	1pt	1D		Yes
Min level	1pt	1D		Yes
Max level	1pt	1D		Yes
Peak	1pt	1D		Yes
Peak-Peak	1pt	1D		Yes
Crest Factor	1pt	2D		Yes
Avg. block	(Resolution-1)*2.56	2D	angle(rev)	Yes
Avg. Trigger Shaftview	(Resolution-1)*2,56	2D	angle(rev)	Yes
Weighted block	(Resolution-1)*2.56	2D	angle(rev)	Yes
Order spectrum	Resolution	2D	order	Yes
Order inst. spectrum	Resolution	2D	order	Yes
Order avg. spectrum	Resolution	2D	order	Yes
Order & Overall	1 pt	1D		Yes
Inst. Order cross-spectrum	Resolution	2D	order	Yes
Avg. order cross-spectrum	Resolution	2D	order	Yes
ORF H1	Resolution	2D	order	Yes
ORF H2	Resolution	2D	order	Yes
Order Coherence	Resolution	2D	order	Yes
Order profile	2048 pt max	2D	time	Display only
Cepstrum*	Resolution	2D	Roder	Yes
InstCepstrum*	Resolution	2D	Roder	Yes
AvgCepstrum*	Resolution	2D	Roder	Yes
Correlation*	1/((Resolution-1)*2.56)	2D	angle(rev)	Yes
instCorrelation*	1/((Resolution-1)*2.56)	2D	angle(rev)	Yes
AvgCorrelation*	1/((Resolution-1)*2.56)	2D	angle(rev)	Yes
CrossCorrelaion*	1/((Resolution-1)*2.56)	2D	angle(rev)	Yes

InstCrossCorrelaion*	1/((Resolution-1)*2.56)	2D	angle(rev)	Yes
AvgCrossCorrelaion*	1/((Resolution-1)*2.56)	2D	angle(rev)	Yes
Synthesized Orbit	(Resolution-1)*2,56	2D	angle(rev)	Yes
Raw Orbit	Nb Pulse/rev	2D	angle(rev)	Yes

- **Filtered signal**: This result is available if a filter is selected in the *Synch. order x/Channel x/Input filter* setting. It displays the input time signal after filtering it.
- **Triggered block**: This displays the signal after being triggered by the event selected with the *Synch. order x/Trigger/Trigger* setting .
- **Avg. block**: This result is available if the value of the *Synch. order x/Average/Domain* setting is Time. It displays the time signal block average.
- **Weighted block**: This result displays the signal after being weighted by the weighting window selected with the *Synch. order x/Channel x/Weighting window* setting.
- **Ord spectrum**: This result is available if the value of the *Synch. order x/Average/Domain* setting is Time. It displays the result of the Synchronous order processing results after angular averaging.
- **Ord inst. spectrum**: This result is available if the value of the *Synch. order x/Average/Domain* setting is Spectral. It displays the Synchronous order processing results.
- **Ord avg. spectrum**: This result is available if the value of the *Synch. order x/Average/Domain* setting is Spectral. It displays the average order instant spectrum results.
- **Order & Overall**: It displays computation of the orders chosen with the *Synch. order x/Channel x/Tracked order* setting and the Overall level if the *Synch. order x/Overall Analysis/Band power tracking* is set to On.
- **Inst. Order cross-spectrum**: This result is not available if there is no cell checked in the *Synch. Order x /Order FFT/Cross spectrum* matrix. It displays the instant cross spectrum between the 2 selected channels.
- **Avg. cross-spectrum**: This result is not available if there is no cell checked in the *Synch. orderx /Order FFT/Cross spectrum* matrix. It displays the averaged cross spectrum average results.
- **ORF H1**: This result is not available if there is no cell checked in the matrix of the *Synch. Order x /Order FFT/Cross spectrum* matrix. It displays the Order Response Response Function H1, see Appendix for details.
- **ORF H2**: This result is not available if there is no cell checked in the matrix of the *Synch. Order x /Order FFT/Cross spectrum* matrix. It displays the Order Response Function H2, see Appendix for details.
- **Order Coherence**: This result is not available if there is no cell checked in the *Synch. Order x /Order FFT/Cross spectrum* matrix. It displays the ORF H1/H2 ratio.
- **Order profile**: It displays changes in the Order & Overall result.
- **Order AutoCorrelation**: This result is available if correlation is selected in *the Synch. Order x/Correlation* and *Synch. Order x x/Average/Domain* setting value is Time.
- **Order CrossCorrelation**: This result is available if correlation is selected in *the Synch. Order x/Correlation* and *Synch. Order x x/Average/Domain* setting value is Time. This result is not available if there is no cell checked in the *Synch. orderx /Order FFT/Cross spectrum* matrix
- **Inst. Order AutoCorr**: This result is available if correlation is selected in *the Synch. Order x/Correlation* and *Synch. Order x /Average/Domain is* Spectral or Frequency synchronous.
- **Avg. Order AutoCorr**: This result is available if correlation is selected in *the Synch. Order x/Correlation* and *Synch. Order x /Average/Domain is* Spectral or Frequency synchronous.
- **Inst. Order CrossCorr**: This result is available if correlation is selected in *the Synch. Order x/Correlation* and *Synch. Order x x/Average/Domain is* Spectral or Frequency synchronous. This result is not available if there is no cell checked in the *Synch. Order x /Order FFT/Cross spectrum* matrix
- **Avg. Order CrossCorr**: This result is available if correlation is selected in *the Synch. Order x/Correlation* and *Synch. Order x x/Average/Domain is* Spectral or Frequency synchronous. This result is not available if there is no cell checked in the *Synch. Order x /Order FFT/Cross spectrum* matrix

131.2.3 Settings


Max order
100
Associated tach: None
Order resolution: 1/4
Average: Exponential
Synchronous order 1

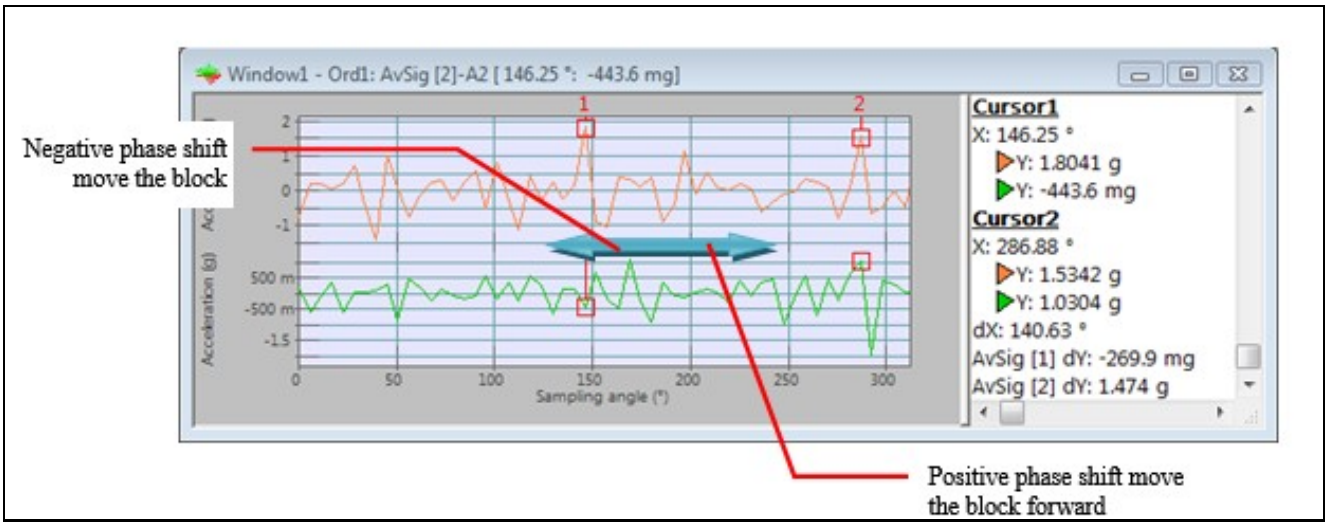

Sync. order 1
Channels
Channel 1
Source: None
Input filter: None
Phase shift: 0 °
Tracked Order: None
Weighting window: Hanning
Tach
Associated tach: None
Phase reference: Pulse edge
Accepted speed variation: 100 %
Sampling pulse: None
Trigger
Start: Free run
Stop: Free run
Trigger: Free run
Repeat: Off
Trigger delay: 0 rev
Accept mode: Normal
Pulse / rev: 1
Average
Domain: Order
Size: 3
Type: Exponential
Order FFT
Max speed: 9600 RPM
Min speed: 150 RPM
Max order: 50
Order resolution: 1/4
Overlap: 1 rev
Angular overlap: 0 °
Upper frequency: 8 kHz
Number of lines: 201 lines
Phase Ref: Cosine
Reverse Cross fct: On
Cross spectrum: None
Orders Phase ref: None
Overall analysis
Band power tracking: Off
Upper order: 50
Lower order: 0.03125
Correlation

Note: Up to 2 SOA plug-in can be present in the software configuration, each of them running independent analyses on the same or different channels.

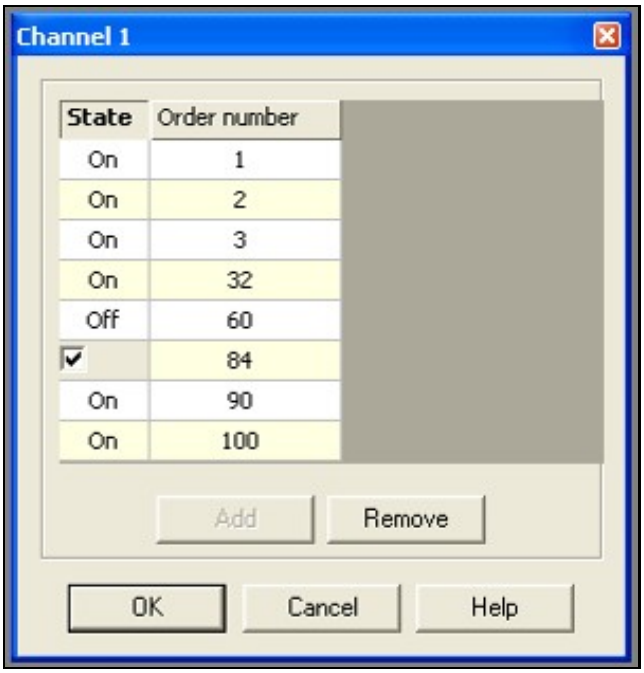
131.2.3.1 Channel

Contains the settings related to the source input.

- **Source**: Input source to be analyzed. It may come from the Front-end input or from the Player in post analysis mode (see the post analysis chapter). In post analysis mode, only the tracks with the same signal bandwidth can be plugged.
- **Input filter**: filter to be used for filtering the source before the analysis. The Filters that are not compatible with the upper frequency of the plug-in cannot be selected (see the Filter builder chapter). The A and C weighting on time domain are available in the NVGate® filter list.
- **Phase shift.** This setting is independent for each channel and can be change in the range of +/- 720° in order to cover up the cycle duration of 4 stroke engines in both directions (forward/backward).



- **Tracked order**: Orders to be tracked by the Synchronous Order Tracking. You can select up to eight different orders per channel, and there are 2 settings for each order:



- **State**: ON if you want the order to be computed
- **Order number**: Select the number of the order you want to track, from 0.001 up to 800
- **Weighting window**: window used to weight the signal before processing. There are 6 fixed windows: Uniform, Hanning, Hamming, Kaiser Bessel, and Flat top; 3 customized windows: Force, Response (see the Time Windows chapter) For the window characteristics, see the Appendix.

131.2.3.2 Tach

Contains the Synchronous order analysis tachometer settings.

- **Associated tach**  : The selected tachometer enables the plug-in to perform Synchronous Order Tracking.
- **Phase reference**: selects the original phase when computing the absolute spectrum phase.

Phase reference	Description
Pulse Edge	The original phase is referenced from the tach edge detection, i.e. the position of the unbalance. It gives the absolute phase.
Pulse Center	The spectrum phase is corrected with the phase of the first order of the tach signal (the correction is applied to all the spectrum lines proportionally to the number of lines). This corresponds to the center of the tach pulse. This setting can be used only if the tach signal is analyzed (the source of the tach must be a source of the analyzer). It gives a relative phase.

For example if the analyzed signal is a pure sine and if this signal is also applied to the tach input (with a threshold of 0 Volt and a positive slope), the measured spectrum phase at the sine frequency is:

Pulse Edge: -90 °

Pulse Center: 0 ° (whatever the threshold level of the tach is)

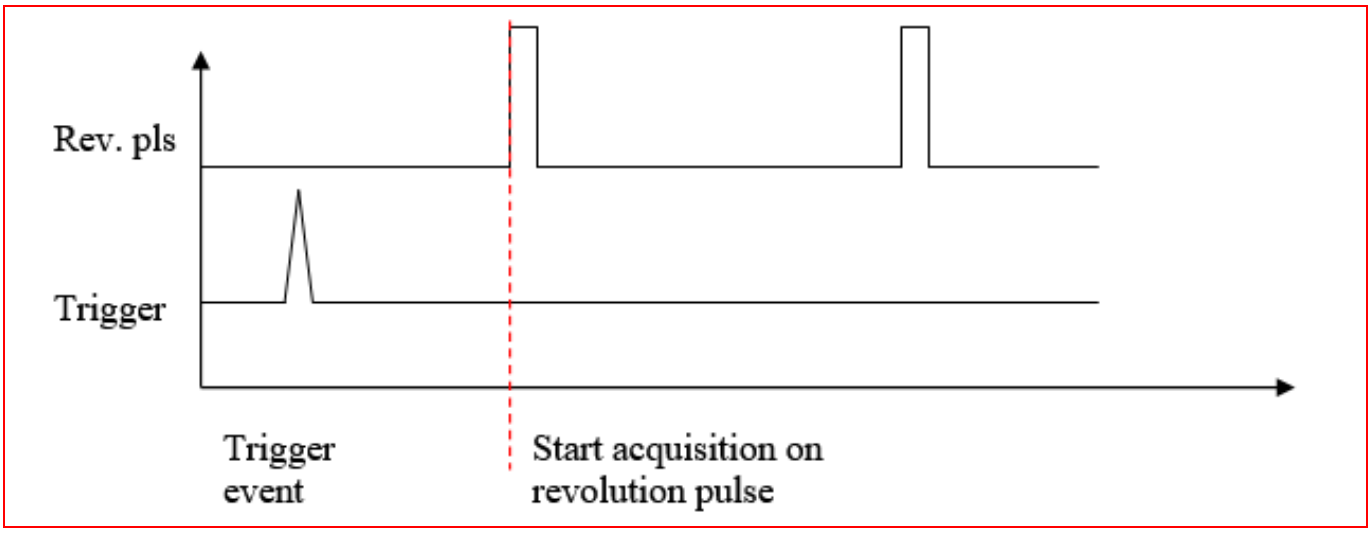
- **Accepted speed variation**: Percentage of variation of the tach speed accepted during one revolution. The default value is 100%. It means that this parameter is not taken account.
- **Sampling pulse**: Select an Ext. Synch input declared as "Sampling". When this setting differ from "none", the angular sampling of the SOA plug-in is based on the actual sampling pulse phase.

The angular sampling allows getting the exact angle (or phase) of the events in the machine cycle. The results are event better using the time domain averaging (i.e. angular).

Please read the sampling page for more info.

131.2.3.3 Trigger

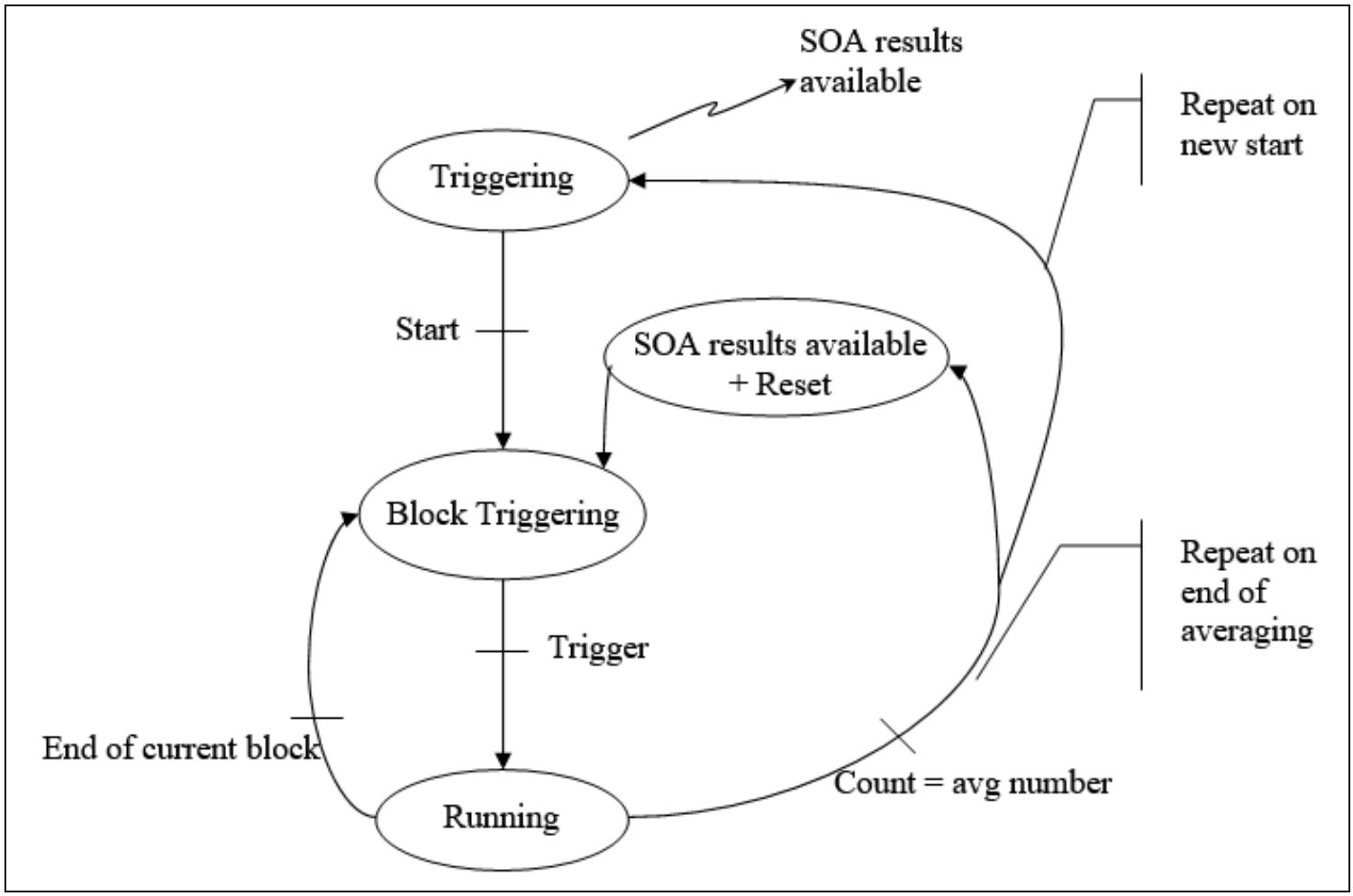
Contains the settings related to triggering events and how to start, and stop signal computation. Note that the trigger is always done on the next available revolution pulse:



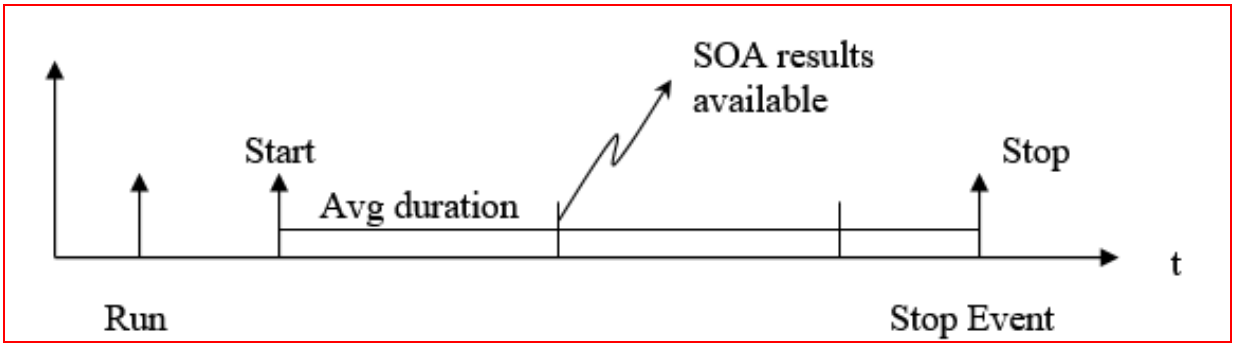
- **Start**: defines the event to start the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Start" condition.
- **Stop**: defines the event to stop the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Stop" condition.
- **Trigger**: defines an event to compute the Order Spectrum on one block of time signal. After the computation, the plug-in waits for a new event to compute another block.

Warning: SOA will not start without any tachometer, the SOA will stay in the status ?triggering?.

- **Repeat**: This setting allows selecting a condition for the plug-in to be restarted. If an event is selected as a Start event, the option New start is available, and when this mode is selected each Start event restarts the plug-in. The mode End of averaging is available when the value of the *Sync Order x/Average/Type* setting is different from the Exponential mode, it restarts the plug-in when the averaging is finished. It is set to "Off" except for linear average when it is set to "End of averaging". In this case, the "Avg duration" gives the periodicity of the average restart.

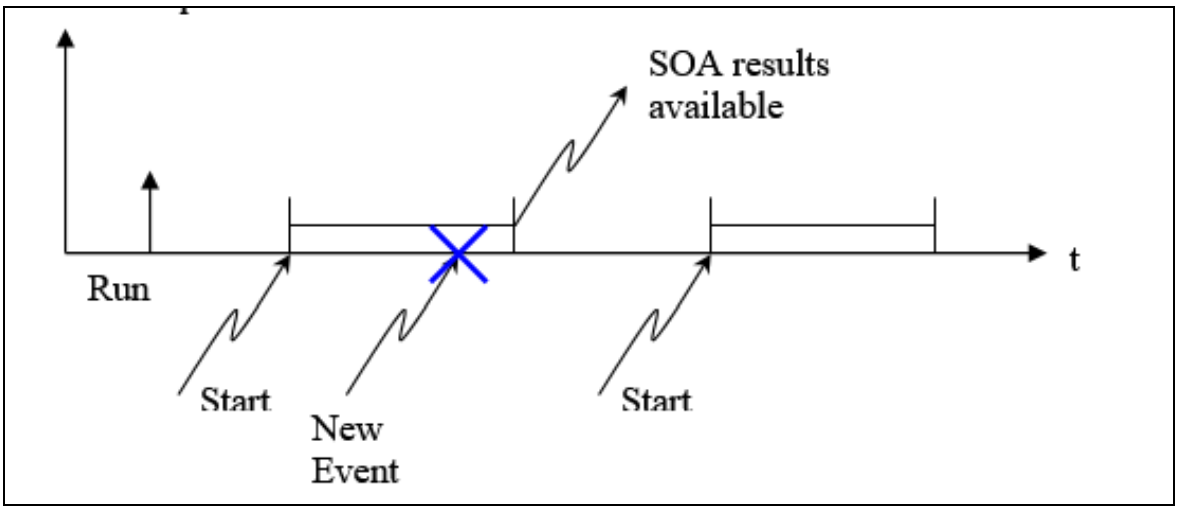

SOA results
available
Repeat on
new start
Triggering
Start
SOA results available
+ Reset
Block Triggering
Repeat on
end of
averaging
Trigger
End of current block
Count = avg number
Running

- Mode Repeat on ?end of averaging?:



The ?Run? corresponds to the start of the analyzer. The start is the beginning of average duration. At the end of the first average, the second average will start and so on till the end of the integration time (even if the last short time integration duration is not over). Each averaging has the same size, except the last that can be smaller.

- Mode Repeat on ?New start?:



The ?Run? trigger the analyzer, but the average begins at the start event (set in the event definition). This averaging stops at the end of average duration or at the stop event. Then the next averaging is waiting for the new start event to occur.

In case a new event occurs during a previous averaging, this start event won?t be effective because the previous average duration is not over, you can only set other event after the end of the previous one.

- Trigger delay: defines a trigger delay in revolution
- Pulse/rev.: defines the number of pulses per revolution of the signal used as trigger source. This setting is available if:
- The SOA is set on spectral averaging
- The "Trigger" event is a "edge detection" event (on analogical or ExtSync channel)

If the setting value is higher than 1, the "Overlap" and the "Overlap in rev" are forced to their maximum and are not modifiable. The overlap between 2 spectra is equal to ((pulse_per_rev-1)/pulse_per_rev) rotations i.e. a delay of 1/pulse_per_rev revolution between 2 spectra. This setting is provided for information only. It is modifiable in the trigger source settings.

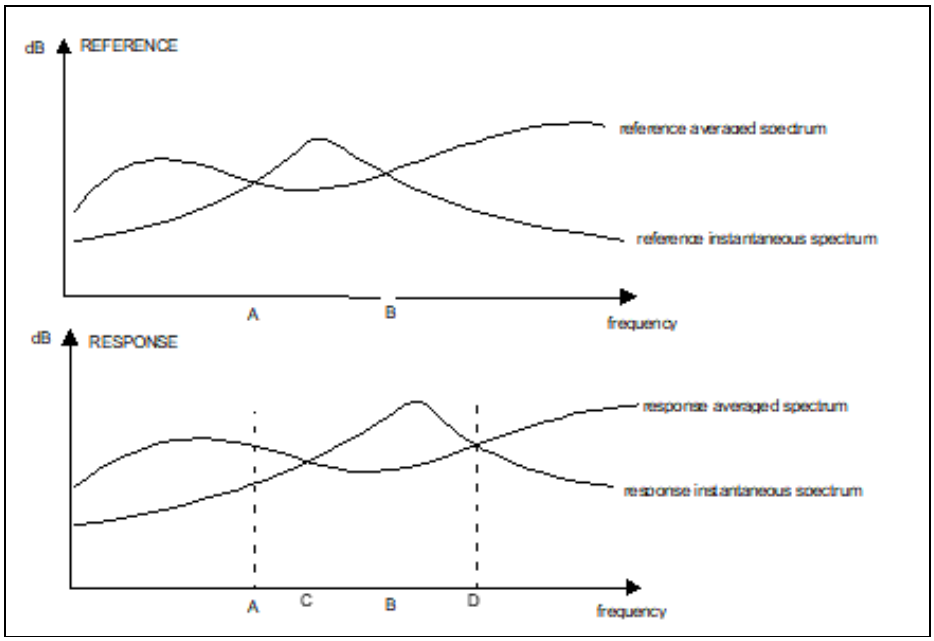
- **Accept mode**: selects the method of rejecting signal blocks.

Mode	**Description**
Normal	All blocks are accepted
Overload rejection	Blocks with an overload are automatically rejected

131.2.3.4 Average

Contains the settings related to the type of averaging of the signals to be computed.

- **Domain**  : You can chose between Spectral and Angular: the spectral domain averaging computes the average after Order spectrum processing, while angular averaging the average before Order spectrum processing.
- **Size**: The number of signal blocks used to compute the average, from 1 up to 1000000000.
- **Type**: The method of averaging the signal. There are four different averaging modes: Linear, Exponential, Peak hold, and Referenced Peak hold.

Type	Description
Linear	Linear averaging of results is carried out on the value of the Size setting from the same sub-module. The plug-in automatically stops when the given number of averages is reached.
Exponential	In this mode of computation, each new average is obtained by adding its previous value the new Order spectrum result divided by the value of the Size setting, and subtracting its previous value divided by the value of the Size setting too.
Peak hold	This method processes the peaks found in their spectrum power density for each channel, and for a number of Order spectrum analysis determined by the size setting. The plug-in automatically stops when a given number of averages is reached. For each order line, each time the value of the instantaneous spectrum is greater than the value of the average order spectrum, the average order spectrum value is equal to the instantaneous order spectrum value. Otherwise, the average order spectrum value is not modified.
Ref Peak hold	

This method processes the peaks found in their spectrum power density for each channel, and for a number of FFT analyses determined by the size setting. The FFT plug-in automatically stops when a given number of averages is reached. When this mode is selected, a new setting called Reference channel appears in the same sub-module; if None is selected, the average processing is the same as the Peak hold mode. If a channel is selected, then there are two different behaviors depending on the channel:

For the reference channel: For each frequency line, each time the value of the instantaneous spectrum is greater than the value of the average spectrum, the average spectrum value is equal to the instantaneous spectrum value. Otherwise, the average reference spectrum value is not modified.

For the other channels: For each frequency line, for each modification of the average reference spectrum, the average channel spectrum is equal to the instantaneous channel spectrum values, even if it is less than the average spectrum value. The modification of the reference and the other channels is synchronized.

In this example, the modified spectrum lines are between **A** and **B** for both reference channel and response channel. The spectrum lines between **B** and **D** in the response channel are not updated. The modification of the reference and response channels is synchronized
Each time the peak value of the reference channel has been modified, the **averaged cross spectrum** is equal to the instantaneous reference spectrum by the response spectrum product. In this example, the modified spectrum lines are between **A** and **B**. The functions as transfer function (where the reference channel is taken into account) will be modified between **A** and **B**.

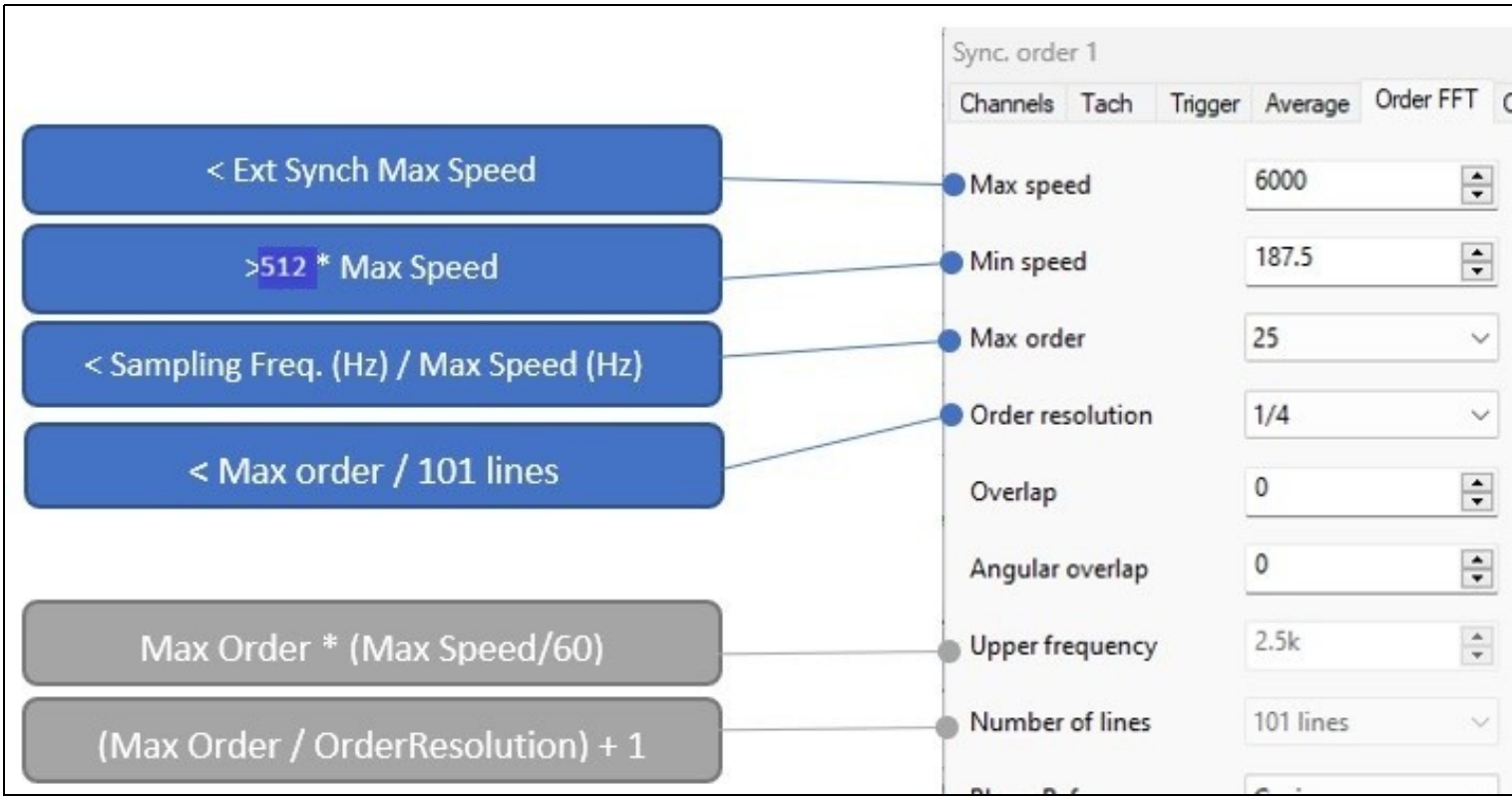
Hidden/fixed: Peak hold and Referenced Peak hold are only available if the Domain setting from the same sub-module is set to Spectral.

- **Reference channel**: channel to be used as a reference in Referenced Peak hold averaging mode. You can choose between the channels that are plugged into the plug-in. If None is selected, the average processing is the same as the Peak hold mode.

Hidden/fixed: This setting is only available when the Referenced Peak hold averaging mode is selected.

131.2.3.5 Order FFT

Transforms the order blocks into order spectra.



- **Max speed**: defines the highest angular speed accepted. All revolutions with a speed higher than Max speed are rejected by the analysis.

The Max speed value is given by:

Max speed (RPM) = Frequency Range (Hz) / Max Order * 60

If a tach is connected to this plug-in, the max speed value is forced to the value defined in tachometer properties.

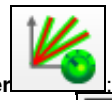
To know more, see § 1.4.2.1 tachometer /tachs.

The SOA Upper frequency is limited by the High sampling of the front-end or by the Max bandwidth of the Player in post-analysis.

- **Min speed**: defines the lowest measured angular speed accepted. All revolutions with a speed lower than Min speed are rejected by the analysis.

The RPM velocity dynamic is defined by:

Max Speed / Min Speed = 512

- 
Max order: defines the highest order that can be computed. Range from 6,25 to 800.
- **Order resolution**  :: Defines the resolution of the Order spectra. Resolution = Max order / Number of lines

Available resolutions are: 1, ½, ¼, 1/8, 1/16 and 1/32 of order

- **Overlap**: defines the amount of overlap of blocks of signal between 2 successive Order FFT computations expressed in revolutions, from 0 to 1/Order resolution For example: if *Order resolution* setting is 1/8, then Overlap range is from 0 to 7.

- **Angular Overlap**: defines the overlap (in angle) corresponding to a rotation fraction. This setting is comprised between 0 and 1 rotation-SOA angular resolution with one rotation equal to 2*PI or 360° depending on the physical quantity used for the angle. The resolution (in radian) is equal to 2*PI/number of samples per rotation (=(number of lines -1)*2.56*order resolution). This setting is only available for a spectral averaging mode (in time domain it is forced to 0 and it is not modifiable). To have the maximal overlap when the resolution is <1, the "Overlap" and the "Overlap in rev" must be at their maximum.
- **Upper frequency**: The Upper frequency that can be processed by the plug-in. It depends on two settings: *Max speed* setting and *Max order* setting. If Max speed is in RPM you have the formula: Upper Frequency = MaxOrder * (MaxSpeed/60). For example Max speed = 770 RPM, Max Order = 100 then Upper Frequency = 100* (770/60) = 1283.333 Hz

Hidden/fixed: fixed

- **Resolution**: The number of lines computed by the Order FFT: this depends on two settings: *Max order* setting and *Order resolution* setting. Resolution = (MaxOrder / OrderResolution) + 1. For example: if Max order = 50 and Order resolution = 1/8, then Resolution = 50 * 8 + 1= 401 lines.

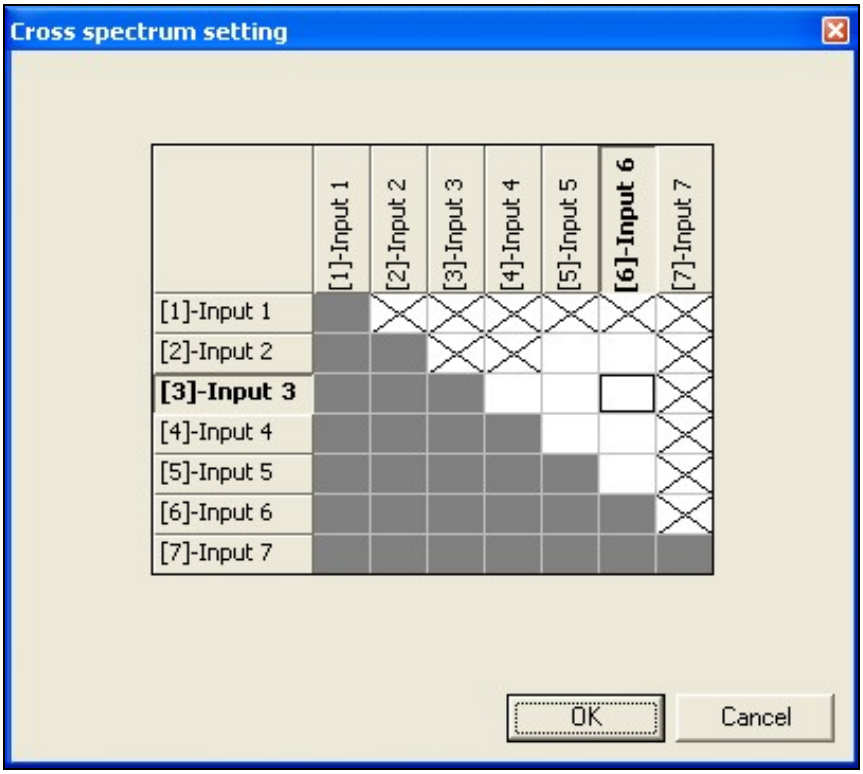
Hidden/fixed: fixed

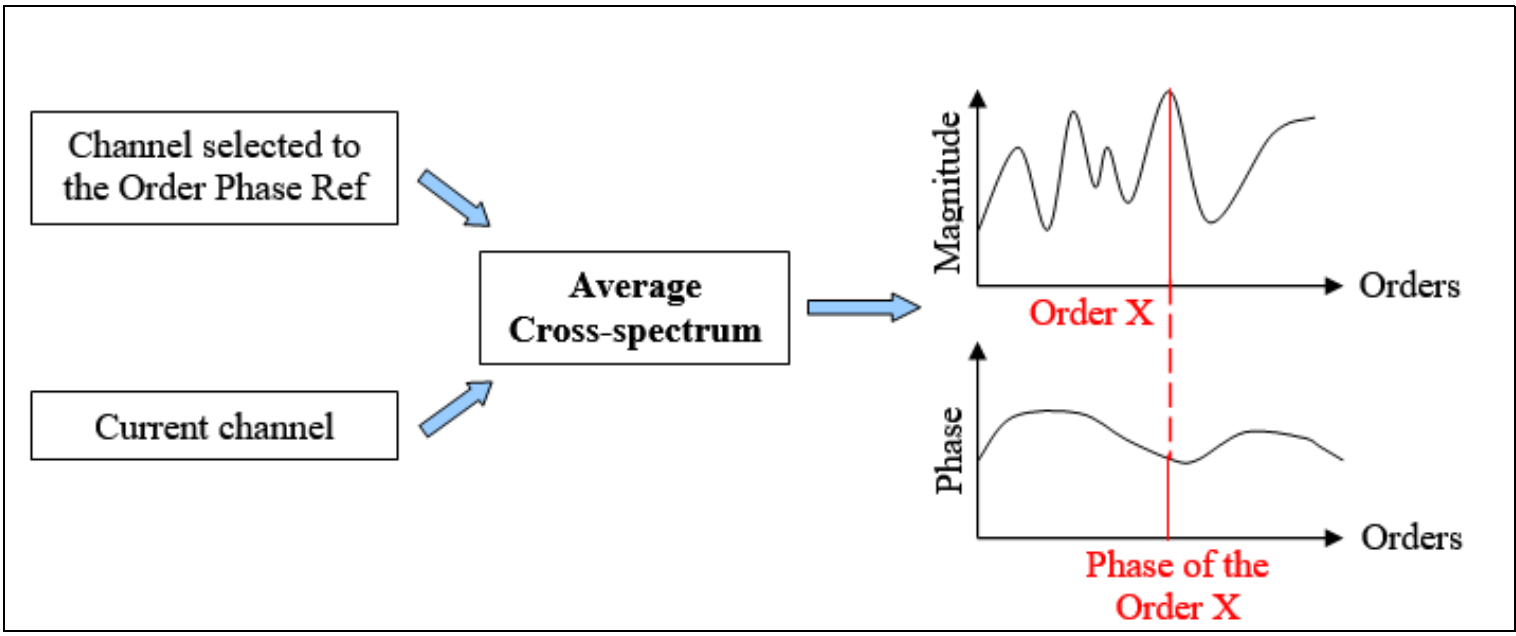
- **Phase Ref**: The phase reference for the computation of the Order FFT

Phase reference	
Cosine	Default value
Sine	Leads to a +90° phase Offset

- **Reverse cross function:** this setting allows calculating the cross function of the greyed part of the Cross spectrum setting. Default value is True except on cascaded mode (multiple hardware) as the number of reference spectrum to be carried between the analyzers may lead to a dramatic loss of performances.

- **Cross spectrum**: Matrix used for the selection of the computed cross spectra. Only the upper half of the matrix can be used; when a box is checked, two cross spectra are computed with each of both channels being the reference. Selecting the cross spectra is necessary to have access to some results: instant order cross spectrum, order average cross spectrum, ORF H1, ORF H2 and Order coherence.





- **Orders Phase ref**: This function allows you to use the cross-spectrum phase value for the phase of the order (relative phase). The cross-spectrum phase is the relative phase between the input signal of the current channel and the reference input signal associated to this channel. Whatever the average mode, the average cross-spectrum is always used to calculate the orders phase.

- No activated: The phase of the order is the spectrum phase of the frequency corresponding to the order value (absolute phase).

To know more, see *§1.5.2.2 Ext Syncs/Tach/Phase Ref p1-115.*

- **Activated**: choose the channel used to calculate the orders phase.

If a channel is selected, ?Phase Ref? in *SOA/Tach* is not activated.

Note: This set up doesn?t change the spectrum phases and consequently doesn?t change the orders phases extracted from a waterfall of spectra.

- **Range**: Frequency range of the plug-in, set automatically in order to process the *Sync Order x/Order FFT/Upper frequency* value. For optimum performance, the *Front End/Input sampling* setting value should be close to the value of the Range setting multiplied by 2.56. For example: for a Range value of 20kHz, the input sampling should be 20000*2.56 = 51.2kS/s.

Hidden/fixed: fixed

131.2.3.6 Overall analysis

Calculation of the order bands sum.

- **Band '***power tracking'*: Switches computation of the overall level result "on or off".
- **Lower Order**: Specifies the lower order of the overall computation order range
- **Upper Order**: Specifies the upper order of the overall computation order range

131.2.3.7 Correlation

Calculation of the Auto Correlation and the Cross Correlation in the angle domain.

The cross-correlation function $\Re xy(\tau)$ gives a measure of the extent to which two signals correlate with each other as a function of the time displacement τ between them.

$$\Re xy(\tau) = y(\tau) \otimes x(-\tau)$$

Where: τ is the time displacement,
$\otimes$ is the convolution symbol
The auto-correlation is a special case where $x(\tau) = y(\tau)$.

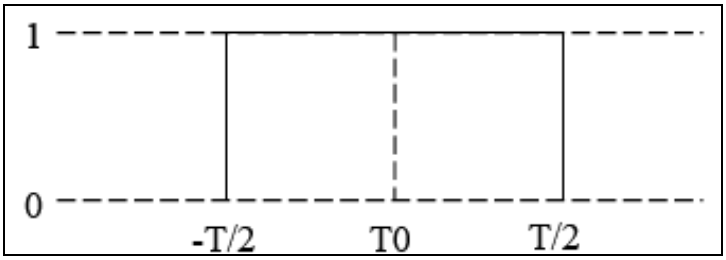
- **Correlation:** Allows to activate or not the calculation of the correlation.

All results of the correlation are in the angle domain with ?T/2 et T/2 where T equal to the duration of the trigger block of the FFT.

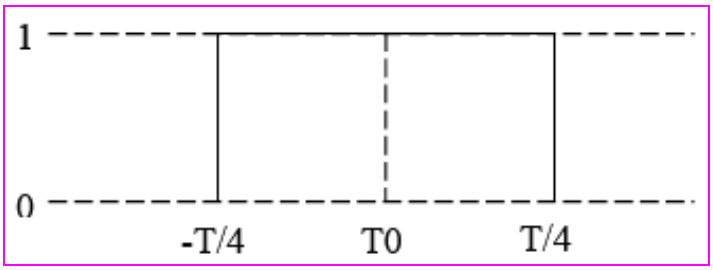
- **Weighting window:** Choose between following values of this setting:

Three types of correlation window are available:

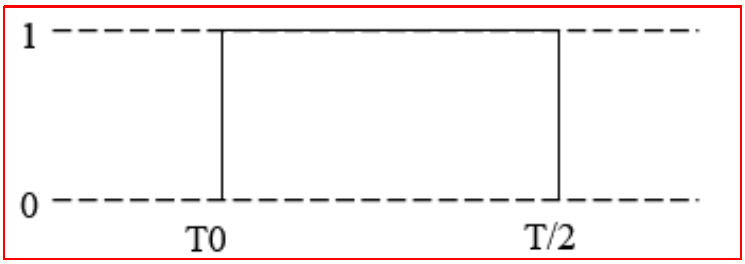
Uniform [-T/2, T/2] (where T is the trigger block length): All the window coefficients are equal to 1. For best results with the Uniform weight window, you should use signal sources that are self-windowing, such as transients, burst, and periodic waveforms (signal period must be a multiple of the weight window length). In order to have the trigger point (T0) at the center of the time trigger block, the trigger Delay must be set to ?T/2**.**



Centered Zero Padding [-T/4, T/4] (where T is the trigger block length): Only the central part of the window (representing the half-length) is not null. This weight window must be used with random noise. In order to have the trigger point (T0) at the center of the time trigger block, **the trigger Delay must be set to ?T/4** (where T is the trigger block length)



Left Zero Padding [0, T/2] (where T is the trigger block length): Only the first half of the window is not null. This weight window must be used with random noise. In order to have the trigger point (T0) at the beginning of the time trigger block, **the trigger Delay must be set to 0.**



If the correlation is activated then all results of the SAO will be affected by the weighting windows of the correlation. When the Correlation setting is deactivated the weighting windows by default (Hanning) is applied on all SOA plug-in. inputs

Notes: Results from the correlation are normalized.

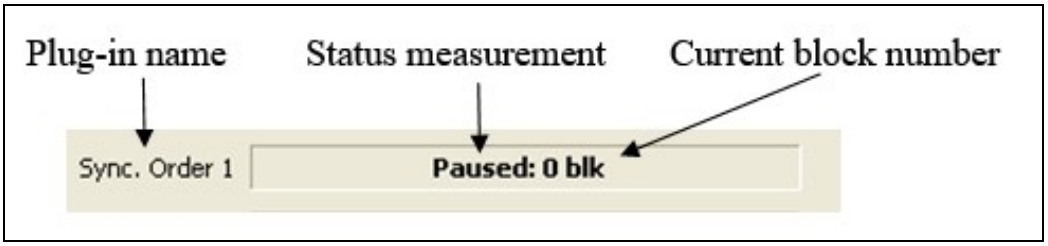
Considerations to obtain good results when making correlation measurement.

- Use input **AC** coupling. Both auto correlation and cross correlation are disturbed by DC offset in the input signal.
- Use appropriate trigger mode and trigger delay. The trigger mode should be different from free run. The trigger Delay must be set to ?T/2 (where T is the time signal block length) with the Uniform and Centered Zero Padding correlation weighted window (and 0 for the Left Zero Padding window). But in some cases, especially with the Centered Zero Padding and Left Zero Padding window (as these function types attenuate parts of the trigger signal block), the trigger Delay must be adjusted to position the input signal with respect to time.

131.2.4 SOA Status

All statuses are available to add to the control panel

131.2.4.1 Sync. Order x



The current plug-in status is synthesized in a special progress-bar. This progress bar is automatically displayed in the ?control panel? when the plug-in is active (i.e. as soon as at least 1 input is connected to the Sync Order plug-in). This status is called ?Sync. Order x? (x is 1 or 2) and it is available in the status ASB tree (see customize control panel).

This setting displays the averaging count (i.e. a current analyzed block number), the plug-in state and the real-time status.

- **State**: block number analyzed
- **Run:** The SOA plug-in is computing order spectra and averaging it.
- **Stop:** The SOA plug-in is stopped.
- **Trig:** The SOA plug-in is waiting for next block; i.e. next trigger event (block triggering) or first start event (triggering)
- **Pause:** The SOA plug-in averaging is paused
- **Waiting:** The SOA plug-in averaging is waiting for the acquisition to be accepted or rejected (in structural mode).

Notes: in exponential averaging mode the average count stops increasing as soon as the set value is reached.

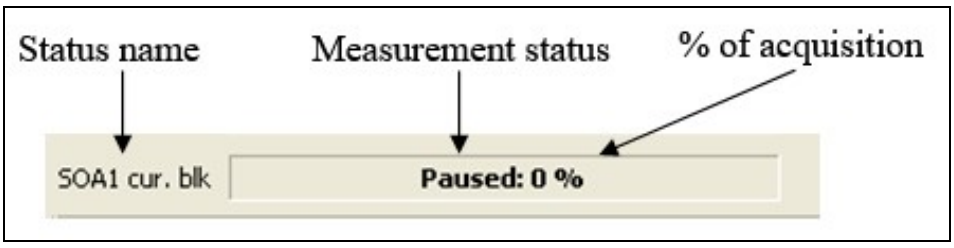
The way the status bar is displayed, depends on the type of averaging selected:

- **?Linear?**, **?Peak hold?** or **?Ref peak hold?:** the progress bar is filled from left to right.
- **?Exponential?**: the progress bar is filled from right to left with a flashing until the end of the acquisition.

The color of the background bar and of the text depends on real-time status:

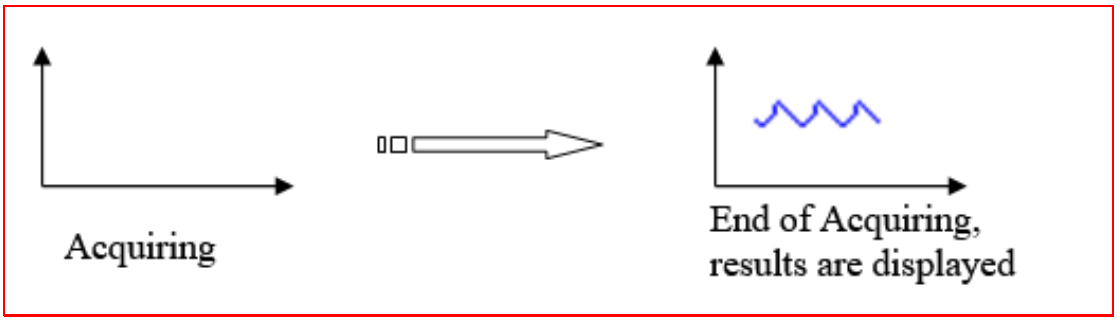
- *Green background and white or black text*: acquisition in real-time.
- *Red background and white or black text*: the current acquisition is not real-time (current block is not analyzed).
- *Green background and red text*: the current acquisition is real-time, but since start not all the blocks were analyzed.

131.2.4.2 SOAx cur.blk



SOA cur. blk is a status that shows if the measurement has been triggered (for long time acquisition) and the progression in the block.

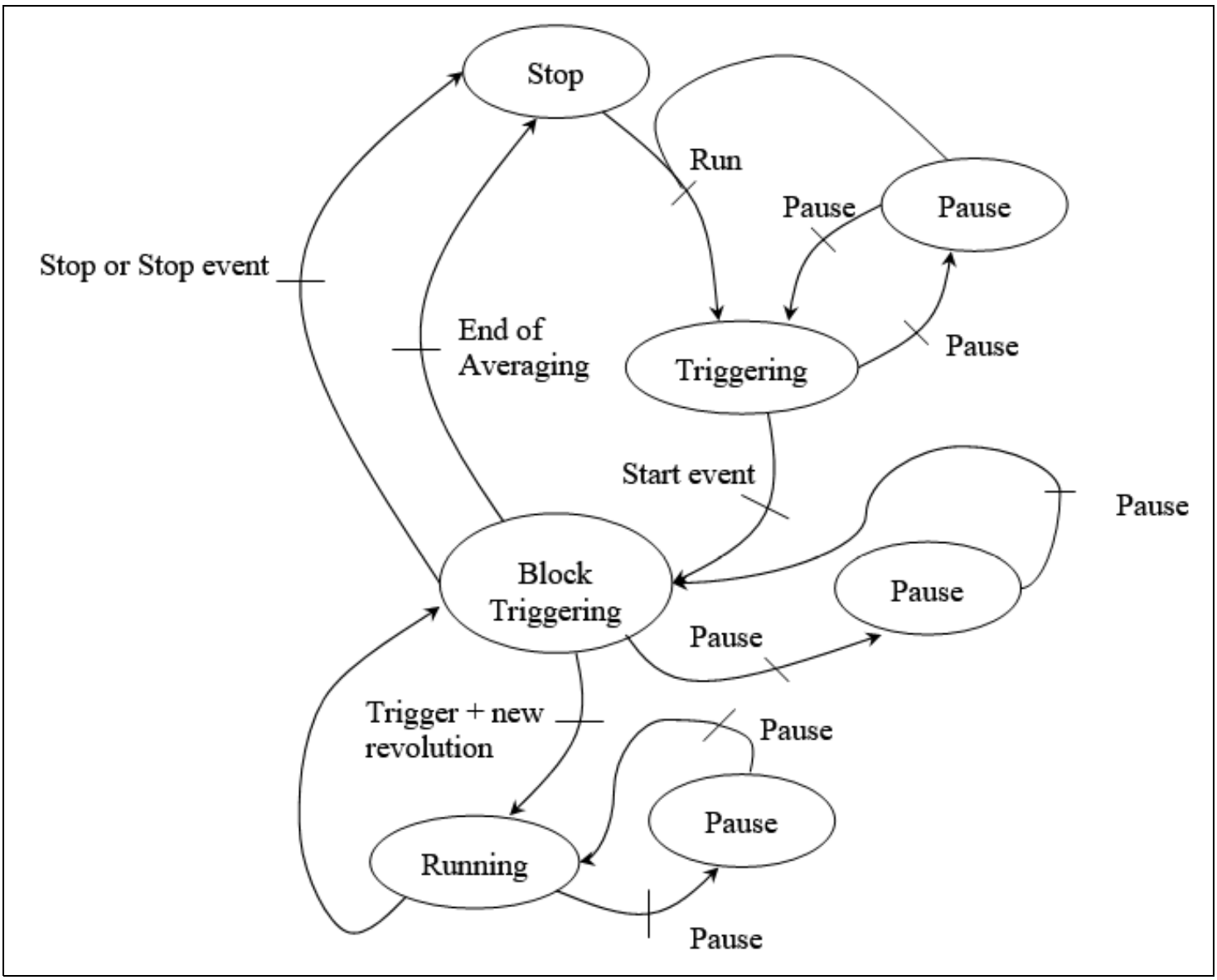
- Triggering:
- Acquiring: displays the evolution of the acquisition in percentage. During the acquiring period, no result is displayed; the result will be display at the end of the acquisition.



- Paused: the acquisition is paused
- Stop: the acquisition is stopped

131.2.4.3 Trigger State

The following scheme describes the different states of the measurement:



The default trigger state is on ?Stop? and waiting for a ?Run? (start or trigger). Then the state become ?Triggering? and is waiting for a start event, the states become ?Block Triggering? and is now waiting for a trigger event for being in the ?Running state. If after one second there is no trigger event, the state comes back to ?Block Triggering?.

The state is ?Stop? after a stop event or at the end of averaging.

Note: all start event, trigger, new revolution or run are ignored in ?free run? mode

131.2.4.4 Count

This status displays the averaging count processed. This status is expressed in analyzed block.

131.2.4.5 Real-time

This status displays if the averaging is in real-time or not (i.e. the current block is analyzed or not). If the corresponding signal were not available at this time, the acquisition is not real-time. That means that the treatment is longer than the acquisition. There are three values for this state:

- ?**OK**?: The acquisition is real-time (all block have been processed and averaged)
- ?**No**?: Acquisition was not real-time (some previous blocks are missing in the average).
- ?**-**?: The acquisition is currently not real-time (current block is not analyzed an averaged).

131.2.4.6 Block overload

This status corresponds to the instantaneous overload indication within 1 SOA trigger block, for instance amplitude overload occurred in the current analyzed block. Note that overloaded block may be automatically rejected (see accept mode).

131.2.4.7 Analysis overload

This status corresponds to overload indication over the measurement period. It means that during the whole measurement period there was (or not) an overload. It memorizes block overloaded.

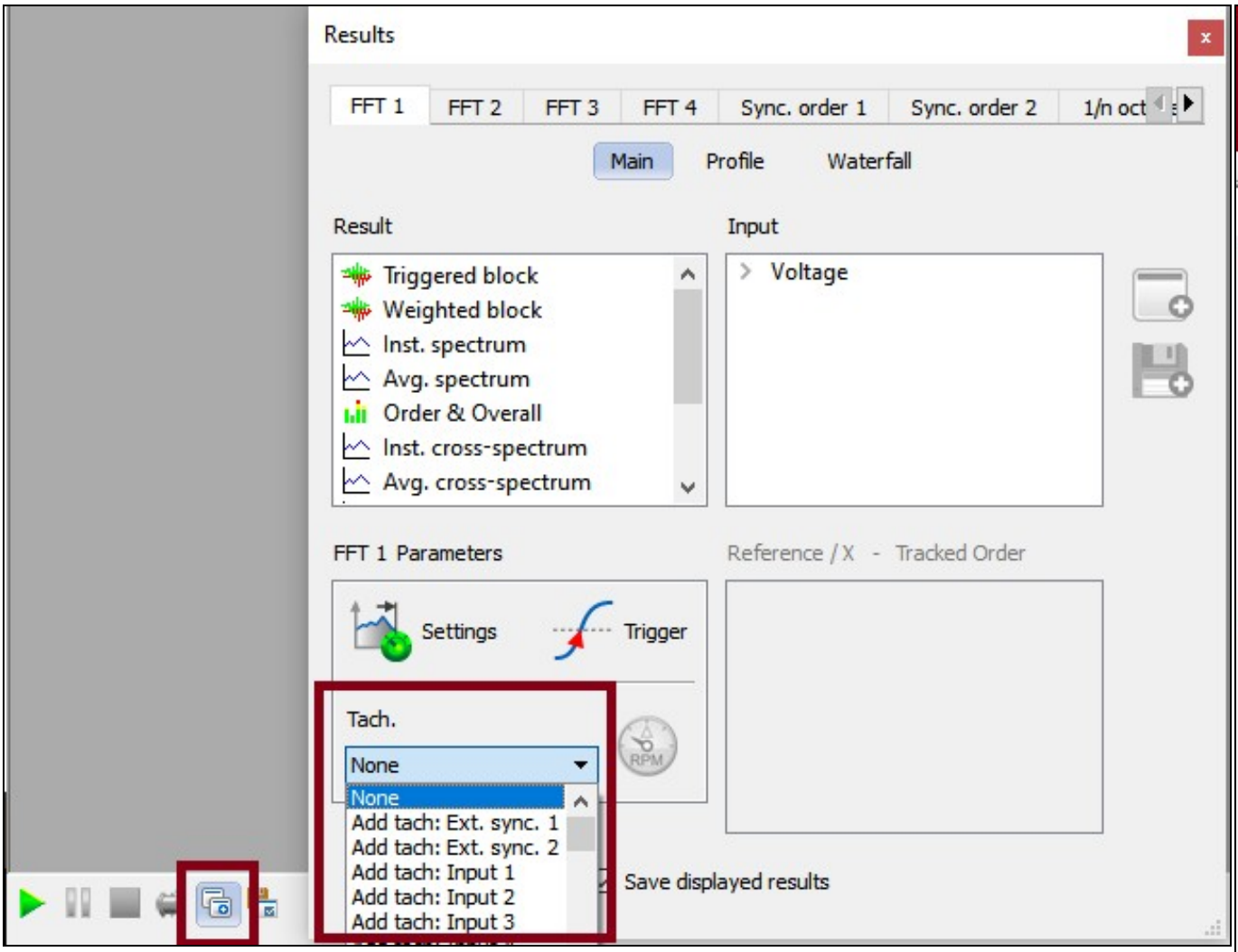
132 NVGate Tachometer

NVGate can set up several tachometer sources, including virtual tachometers in the case of multiple shafts. Tachometers are based on signals that provide pulses/revolution from a CAN bus or from a voltage proportional to the angular velocity.

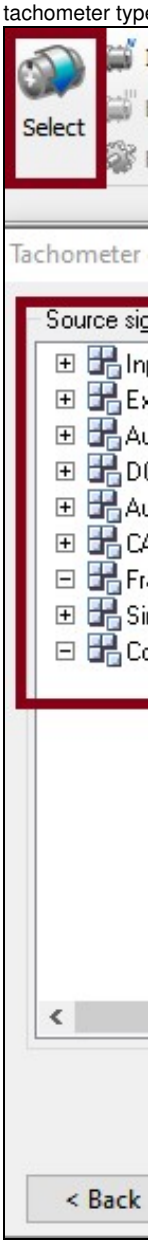
132.1 Connect

Using GoToResult

On this window, only input tachometer and ext. synch tachometers are available. To use it, just open the GoToResults windows, then select the tachometer.



For more advan
tachometer type



Select: Shows

132.2 Available results and display

Type	Size	Dimension	Domain	Save
Filtered signal	256 pt	2D	time	Display only
Angular speed	1 pt	1D	Angular speed	Display only
Ext Tach Angular speed	1 pt	1D	Angular speed	Display only
Virtual Angular speed	1 pt	1D	Angular speed	Display only
RPM Profile	2048 pt max	2D	time	Display only
Ext Tach Profile	2048 pt max	2D	time	Display only
Virtual Tach Profile	2048 pt max	2D	time	Display only

All tachs can be used as a source for the RPM and Delta RPM event type and/or for order analysis (Constant band tracking of the FFT plug-in and Synchronous Order Analysis plug-in analyzers), and/or as a reference for the waterfall plug-in.

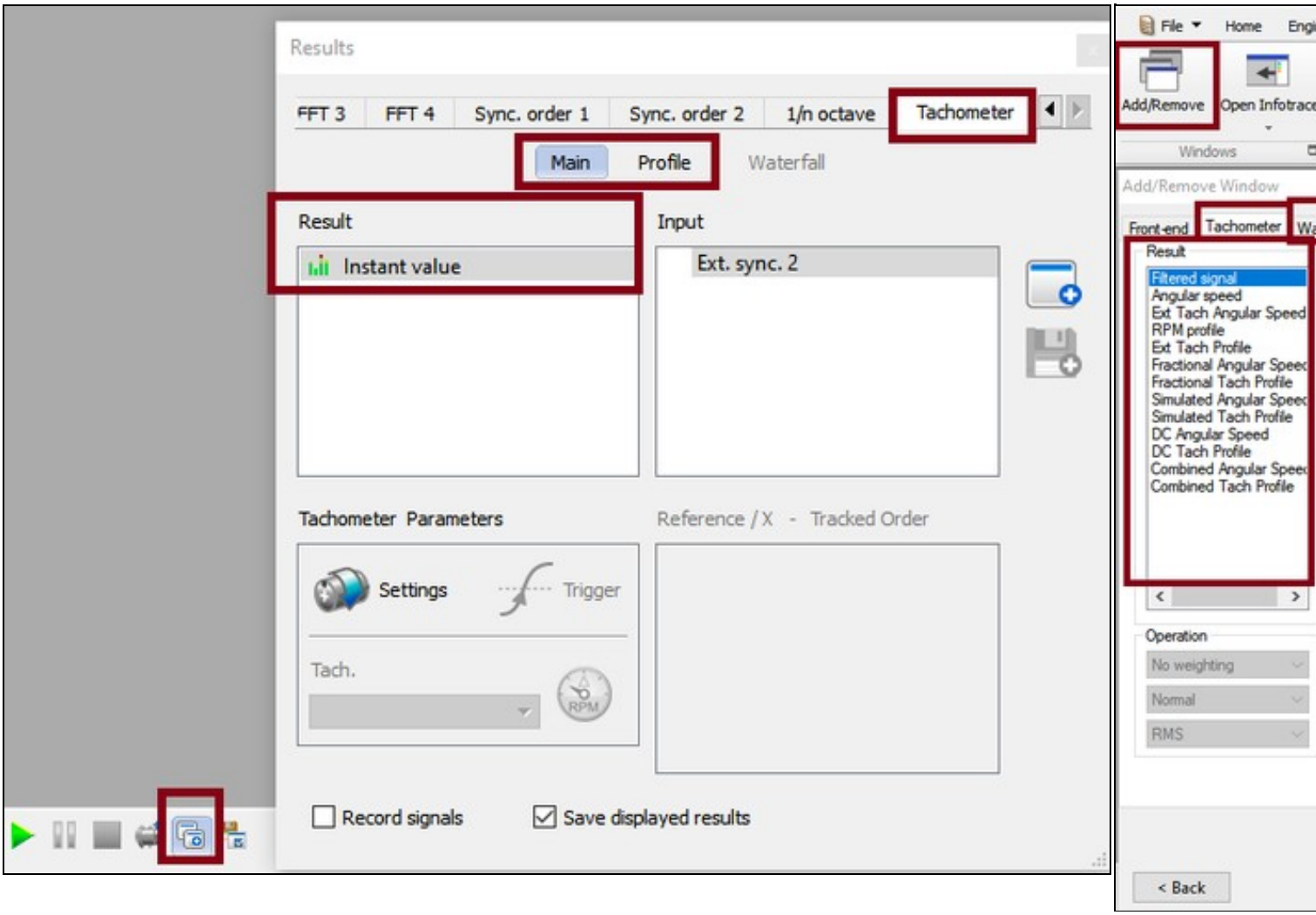
Display

Using GoToResult

You can display scalar values, or profiles using GoToResult windows.

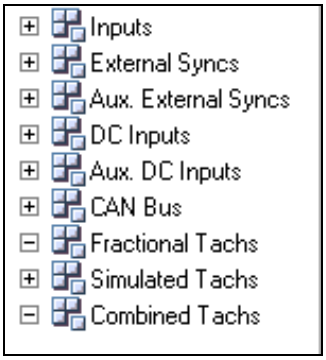
For advanced results, us

Using GoToResult

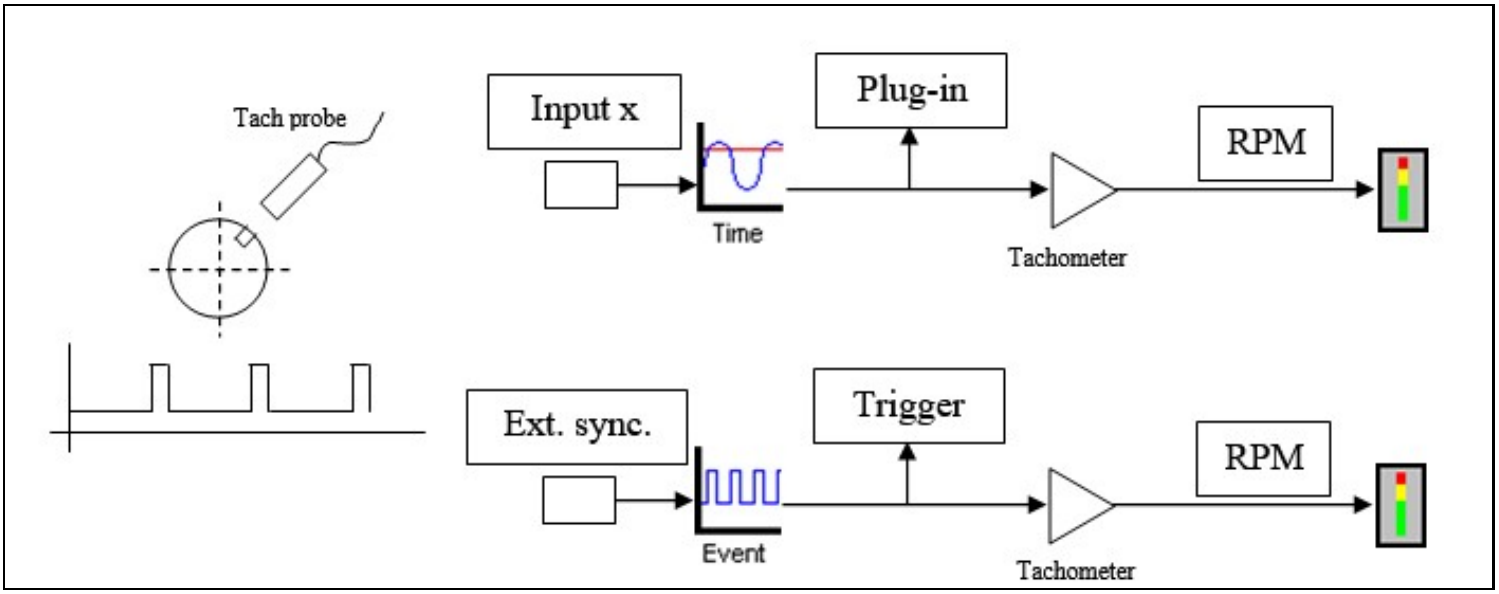


132.3 Tachometer Source

In NVGate we can set up several tachometer sources, including virtual tachometers in the case of multiple shafts. Tachometers are based on signals that provide pulses/revolution from a CAN bus or from a voltage proportional to the angular velocity.



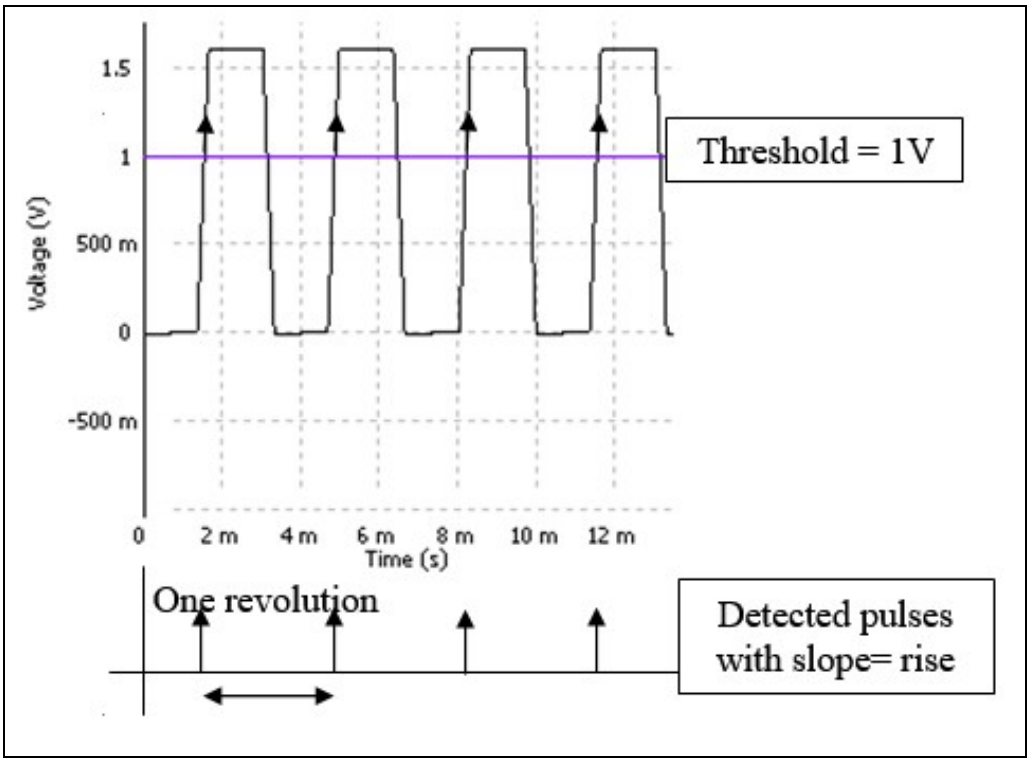
The tach probe that provides the pulse signal can be connected either on an input or on an External sync. The External sync is sampled at 64* the Front-end sampling frequency in order to achieve higher precision in delay or phase measurements.



132.3.1 Input: Tachs

 *Inputs:* Opens the properties dialog for the tachometers based on a dynamic input. Used to define up to 4 tachometers using signal from fast analog inputs (from the Front-end or from the Player).

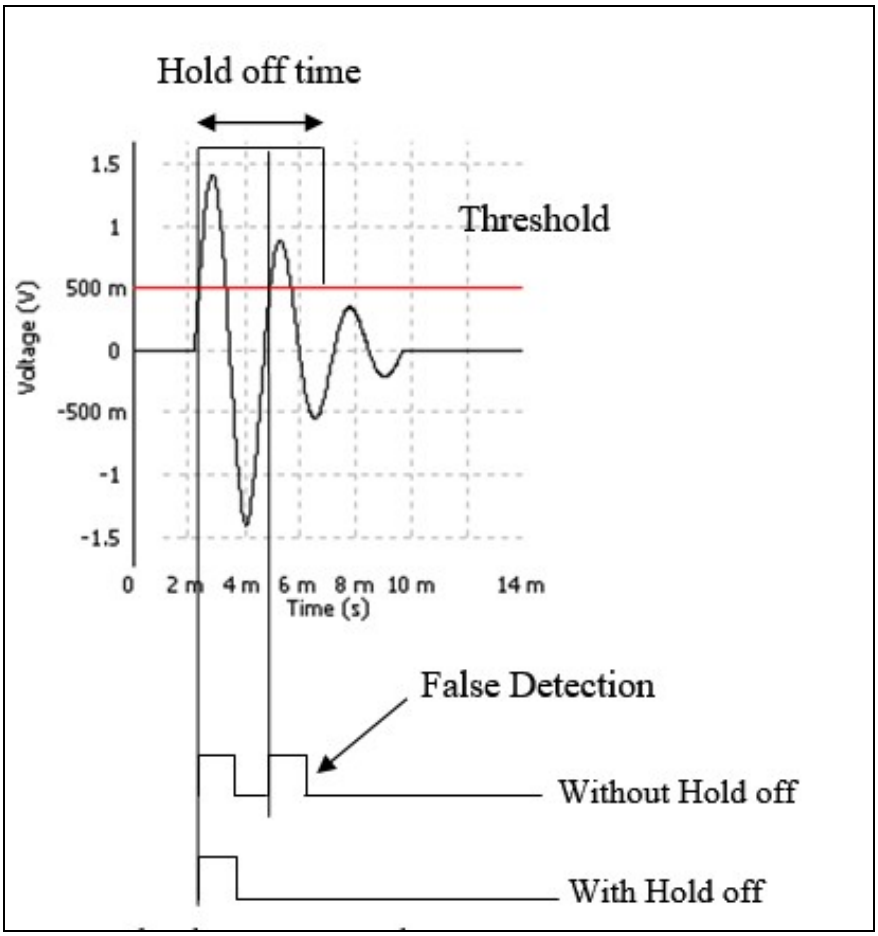
- **Source:**: the tach input signal (NONE by default). The input signal can be any Front-end input in Connected mode, on-line or any Player track in Post-analysis mode (except for the DC input and the Ext. Sync. inputs or tracks). (note : on OR35V1, Input 5 to input 8 are not able to be set as source using an OR35 analyzer.)
- **Input filter**: adds a digital filter before the tach process. The user can choose any filter from the list of the defined filters.
- **Threshold**: sets the signal threshold for tach pulse detection. The threshold is expressed in the same unit as for the input signal. The value can be adjusted between +/- the full scale of the input signal (depending of the input range).



- **Slope**: selects the input signal slope on which a tach pulse is detected.

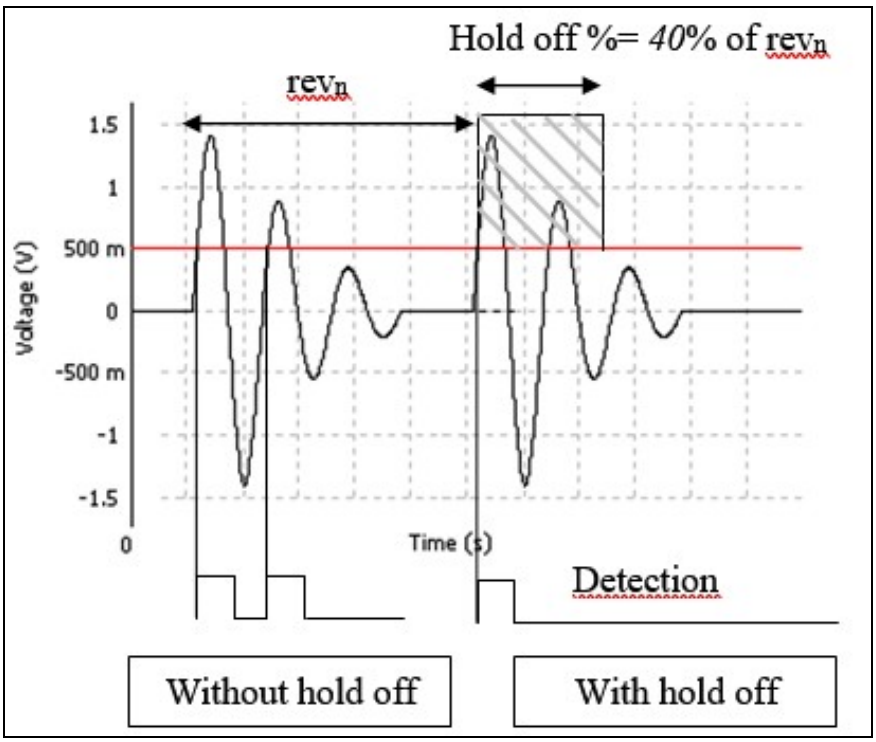
Slope	Description
Rise	Tach pulses are detected on rising edge of the input signal
Fall	Tach pulses are detected on falling edge of the input signal

- **Hold off**: defines the minimum time (expressed in seconds) between two tach pulses used to measure angular speed. If a pulse is detected before this time has expired since the last valid pulse then the new pulse is rejected.



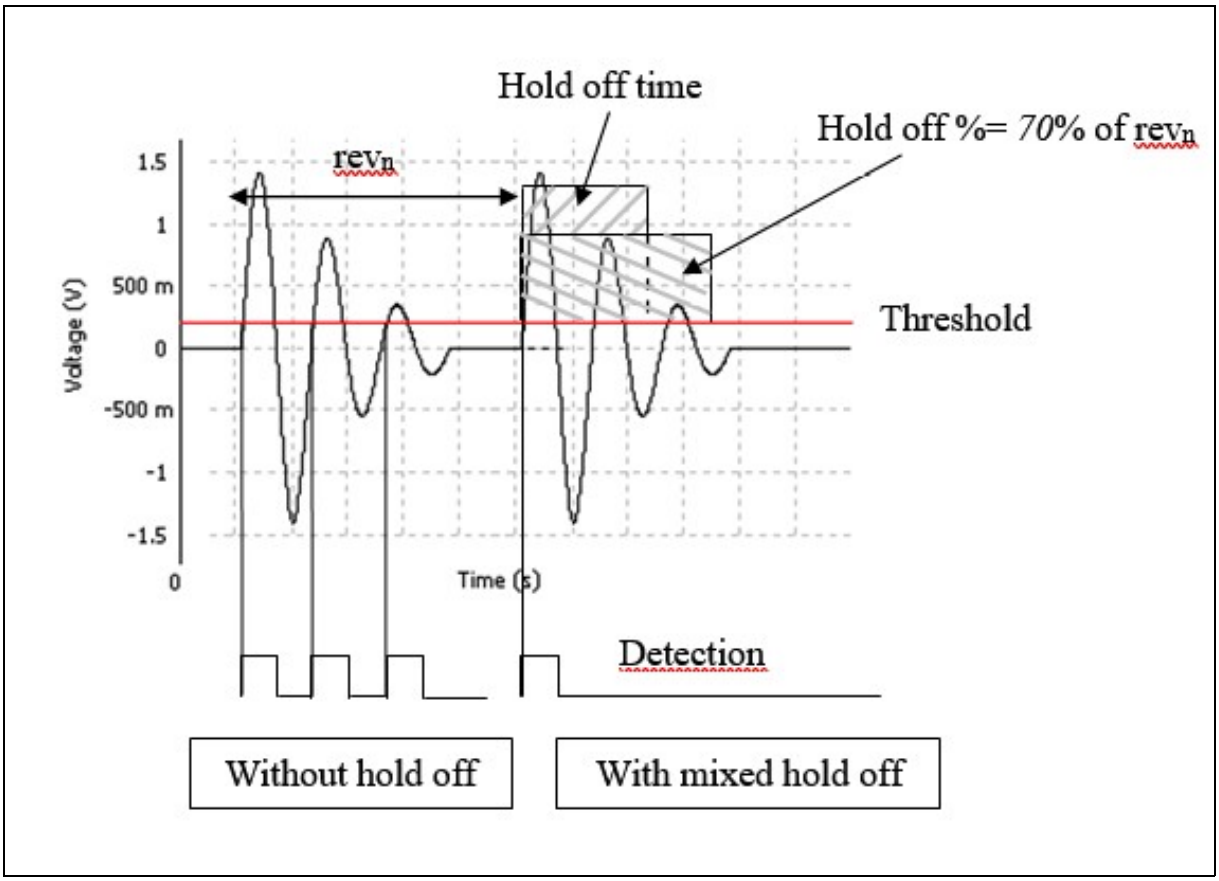
This minimum time is in fact the maximum between the Hold off setting value and the value computed using the last tach period length and the Hold off(% period) setting value. The user can enter any value between 0 and 36000s.

- **Hold off (% period):** defines the minimum time (expressed in % of the last valid tach period) between two tach pulses used to measure angular speed. If a pulse is detected before this time has expired since the last valid pulse then the new pulse is rejected.



This is used to reject angular speed variations that are too large. This minimum time is in fact the maximum between the Hold off setting value and the value computed using the last tach period length and the Hold off(% period) setting value.

- **Mixed Hold off:** in this case, the hold off to be applied is the highest value between hold off time and hold off %.



- **Hystersis**: defines the hystersis around the threshold. The value can be adjusted between 0 and the full scale of the input signal (depending on the input range). If Slope is set to RISE, the input signal must go below Threshold; Hystersis before a new pulse can be detected. If Slope is set to FALL, the input signal must go above Threshold + Hystersis before a new pulse can be detected. This setting is used to reject false pulse detection following, for example, an input signal transition.
- **Pulse / rev**: the number of pulses per revolution. The user can enter an integer value between 1 and 1024. For a non-integer number of pulses per revolution the user must use a virtual tach.
- **Rotation:** This setting defines the way the phase variation is counted: clockwise or counterclockwise for each tachometer.

The rotation side is managed independently for each tachometer (Ext. sync, input, D, combined and fractional). Default setup is *Counterclockwise*;

See *Ext Sync §* for details

- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.
- **Max speed**: predefines a maximum angular speed to preset the scale and order tracking maxima. The limit of Max speed depends on the sampling frequency of the input signal and is equal to: 60 * Fe / (2 * 2.56) for the maximum. The Max speed setting is also used:
- to specify the limit of Y axis of the RPM profile result
- to compute the limit of the maximum order of the SOA plug-in analyzer.
- **Min speed**: defines the lowest measured angular speed. All revolutions with a speed lower than Min speed are forced to 0 RPM. By default Min speed is expressed in RPM. Min speed is automatically adjusted to Max speed/1000 but it is possible to go lower.

132.3.2 Ext. Tach

 : *Ext. Synch*:Opens the properties dialog for the tachometers based on a high speed oversampled Ext Synch input.Big text In acquisition mode, the tach Ext synch comes from the frond end.

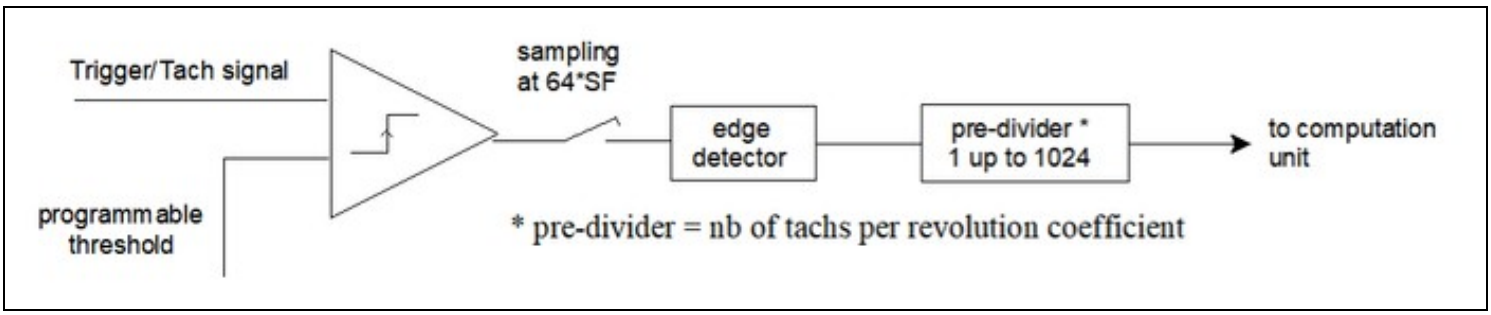
In post analyze, we connect player track on tachometer Ext synch resource.

132.3.2.1 Acquisition mode

External syncs are high speed level comparators that provides accurate events dates for the tachs and trigger. External sync is sampled at 64 time the Front-end sampling frequency in order to achieve higher precision in delay or phase measurements.

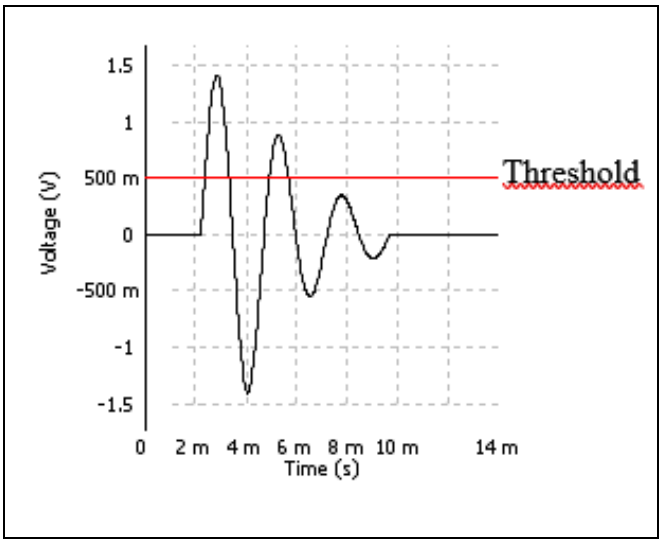
For external sync or tach signals whose frequencies overload the inputs sampling rate, an internal hardware divider is available in order to lower signal frequency. The upper frequency of the external sync must be lower than 64 times the Front-end frequency range. At input frequencies greater than 300 kHz, sensitivity can be decreased due to the electronic circuitry.

In any case the maximum frequency of a signal on an Ext Sync (before any pre-divider has been applied) is 375 kHz.



In acquisition mode, Ext synch channels are front end settings.

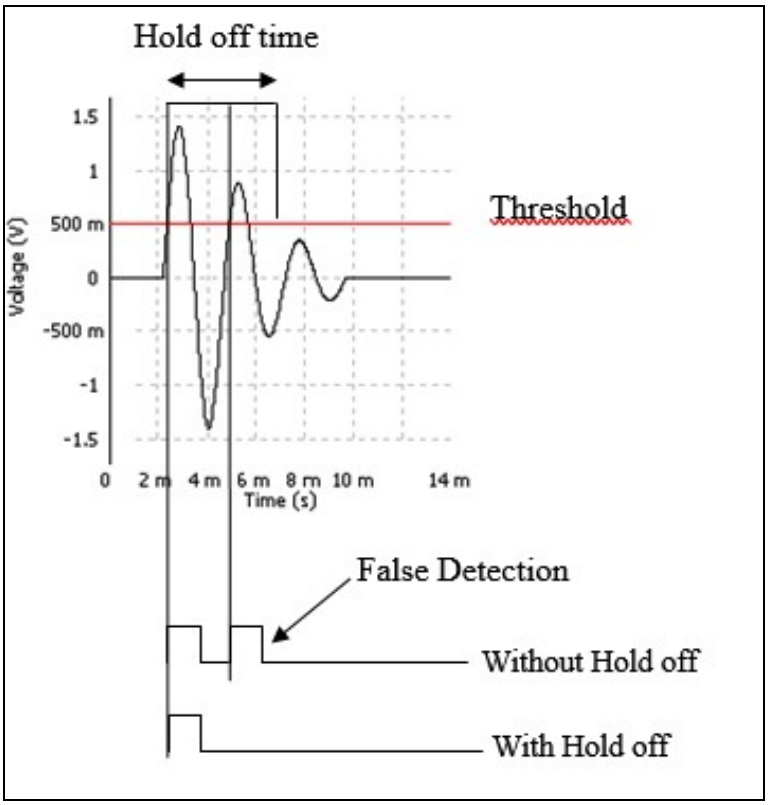
- **Label**: the name of this External Sync. (by default Ext. sync. n, with 1 <= n <= 2). The label of each External Sync is used in the result name and in all connection tools.
- **Threshold**: the detection level.



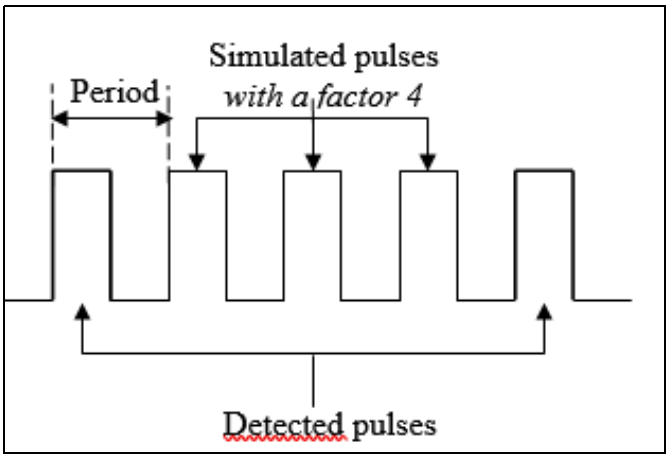
- **Slope**: the slope associated with the threshold that defines the trigger detection.

Slope	Description
Rise	The threshold is reached on rising edge of the External sync. signal
Fall	The threshold is reached on falling edge of the External sync. signal

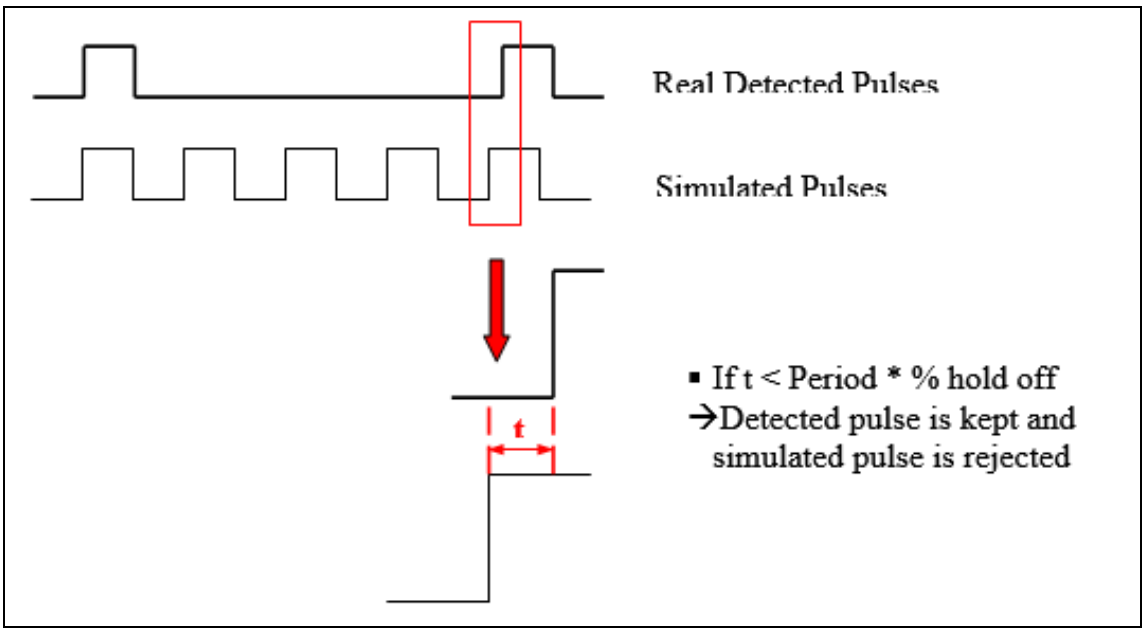
- **Hold off**: defines the minimum time (expressed in seconds) between two pulses. If a pulse is detected before this time has expired since the last valid pulse then the new pulse is rejected. The user can enter any value between 0 and 36000s.



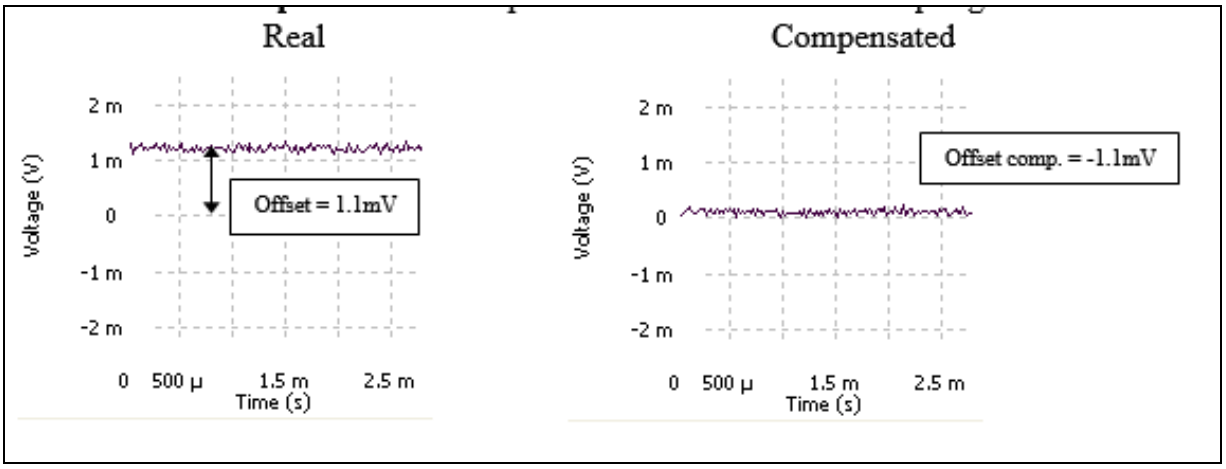
- **Hystersis**: defines the hystersis around the threshold. The value can be adjusted between 0 and the full scale of the input signal (depending on the input range).
- If Slope is set to RISE, the input signal must go below Threshold - Hystersis before a new pulse can be detected.
- If Slope is set to FALL, the input signal must go above Threshold + Hystersis before a new pulse can be detected. This setting is used to reject false pulse detection following, for example, a transition of the input signal. This setting can be displayed in dB.
- **Pre-'***divider'*: Hardware pre-divider is available after the edge detector and is used to reduce the frequency of the signal to be measured. When the tach is enabled, the measured speed takes into account the pre-divider setting when displaying the true RPM value. The user can enter any integer value between 1 and 255. If tach is ?On? this setting it is linked to the ?pulse/rev? setting.
- **Post'***-mutiplier:'* selection of the multiplier factor. It allows the generation of a ?ExtSync? signal which the pulse frequency is multiplied by the selected factor. The user can enter any integer value between 1 and 50. This is particularly useful with slow time base as GPS or standard clock.



- **Multiplier Hold off:** defines the maximum time (expressed in percentage of the last period measured after multiplication) between a detected pulse and a simulated pulse. If a simulated pulse is detected before time has expired since the detected pulse then this pulse will not be added. In this way, the simulated signal is synchronized with the input signal. The user can enter any value between 1% and 99%.



- **Physical qty**.: the physical quantity applied to this External sync. It modifies the sensitivity and range peak units if necessary.
- **Sensitivity**: the sensitivity of the transducer. Changing it updates the range peak.
- **Range pk**.: the maximum input level for this channel, from 300mV up to 40V. For a sensibility of 2 V/m/s^2 those values will be divided by 2 (0.015 m/s^2 and 20 m/s^2) and for a gain of 0.1 those values will be multiplied by 10 (3 V and 400V). This setting can be displayed in dB.
- **External '*gain*'**: this setting can be displayed in dB. This allows the analyzer to offset an external gain: for example if there is an external gain of 3dB, the value may be set to 3dB to retrieve the genuine amplitude of the signal.
- **Offset comp**.: the offset compensation in Volts.



- **Coupling**: the coupling of this external sync.

This article compare the difference beetween coupling AC Vs DC for the tachometer phase.

Coupling	Description
AC	AC coupling with signal ground connected to the analyzer hardware ground and a 0.35 Hz high pass filter.
DC	DC coupling with signal ground connected to the analyzer hardware ground. It is advisable to use the DC coupling when analyzing very low frequency (< 10 Hz frequency range).

- **Mode:** This setting allows selecting available signals generated by the Ext. synch input to be used by the NVGate analysis components.

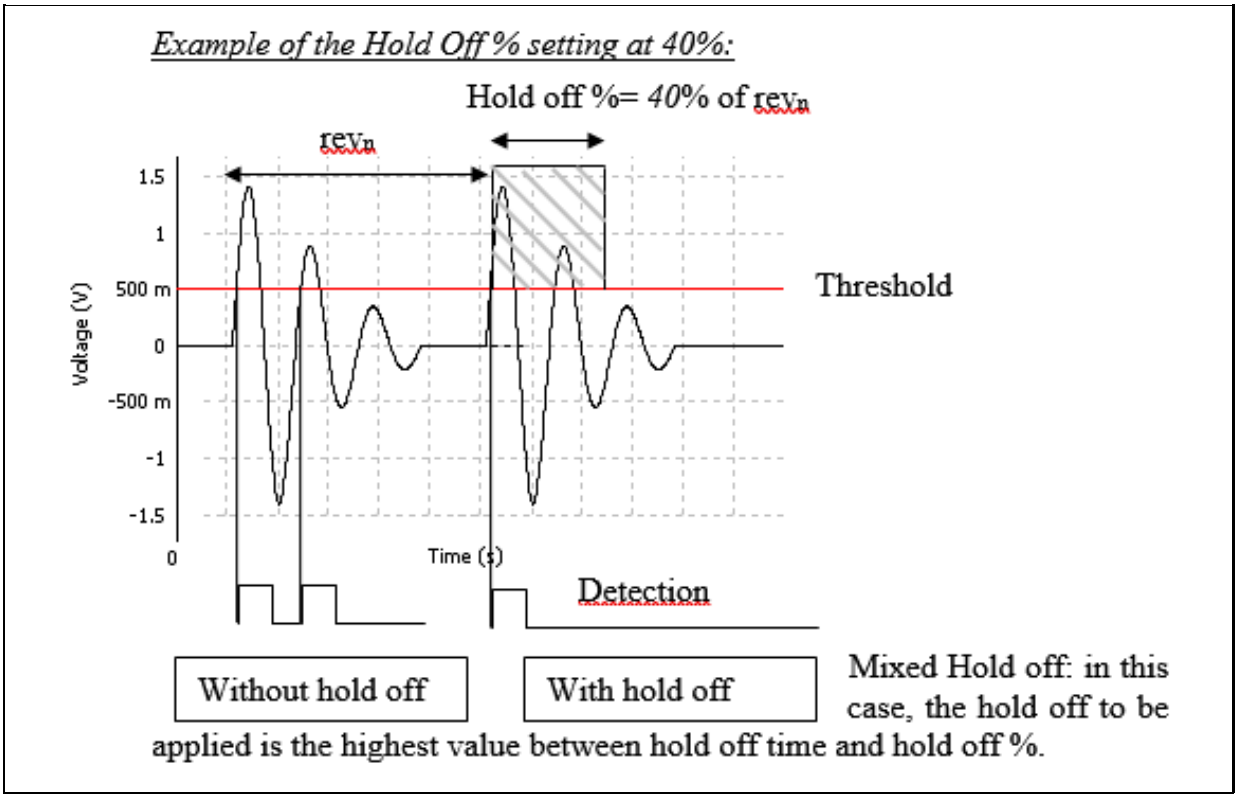
Mode	Description
Trigger	The Input generates events only. It can be used as trigger, start and stop of plug-in analyzers and be recorded. Recorded event occurs as 0/1 V signals. Note that the trigger event remains available on any mode.
Tach	The input generates a tach signal (RPM and revolution phases) in addition to the events.
Torsional	The input generates the instantaneous velocity measured with the F to V converter from a pulses train. The torsional signal is considered as a dynamic input. It appears as Tors # in the inputs list (# being the Ext sync number)
Torsional + Tach	Same as above plus the tach signal is also available. The revolution phase correspond: • to the missing teeth occurrence if missing teeth is > 0 • to the ending of the pulse/rev counting at each revolution (no phase reference) if missing teeth setting is > 0

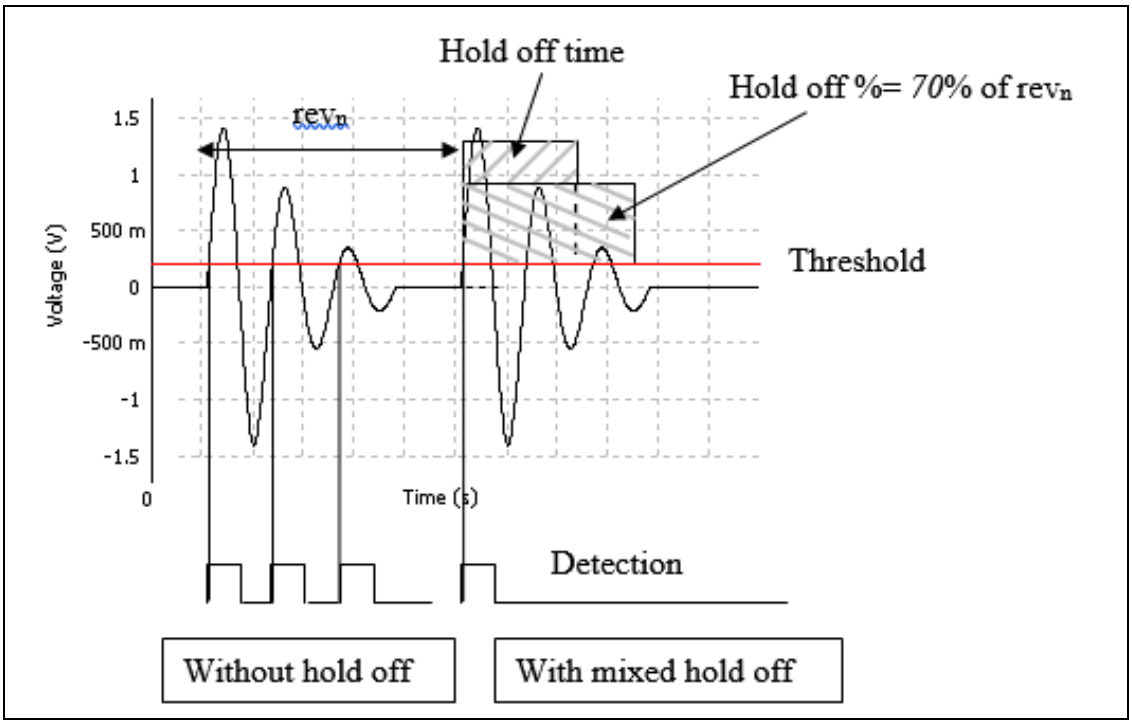
Sampling	The detected pulses on the inputs will be used to synchronize the SOA re-sampling algorithm. The number of pulse/rev is free and may be different from the SAO resolution.
Sampling + Tors	Combine the sampling and the Torsional modes. Both angular re-sampling and instantaneous velocity are provided by the input
Sampling + Tach	Combine the sampling and the Tachometer modes. Both angular re-sampling and RPM measurement are provided by the input
Sampling + tach + tors	Combine the sampling, the Tachometer and the Torsional modes. Angular re-sampling, Tachometer speed and instantaneous velocity are provided by the input

- **Hold off (% period):** defines the minimum time (expressed in % of the last valid tach period) between 2 tach pulses used to measure RPM.

If a pulse is detected before the time has expired since the last valid pulse then the new pulse will be rejected. This is used to reject angular speed variations that are too large. This minimum time is in fact the maximum between the Hold off setting value and the value computed using the last tach period length and the Hold off (% period) setting value.

Hidden/fixed: Hidden if Mode is Trigger or Torsional.



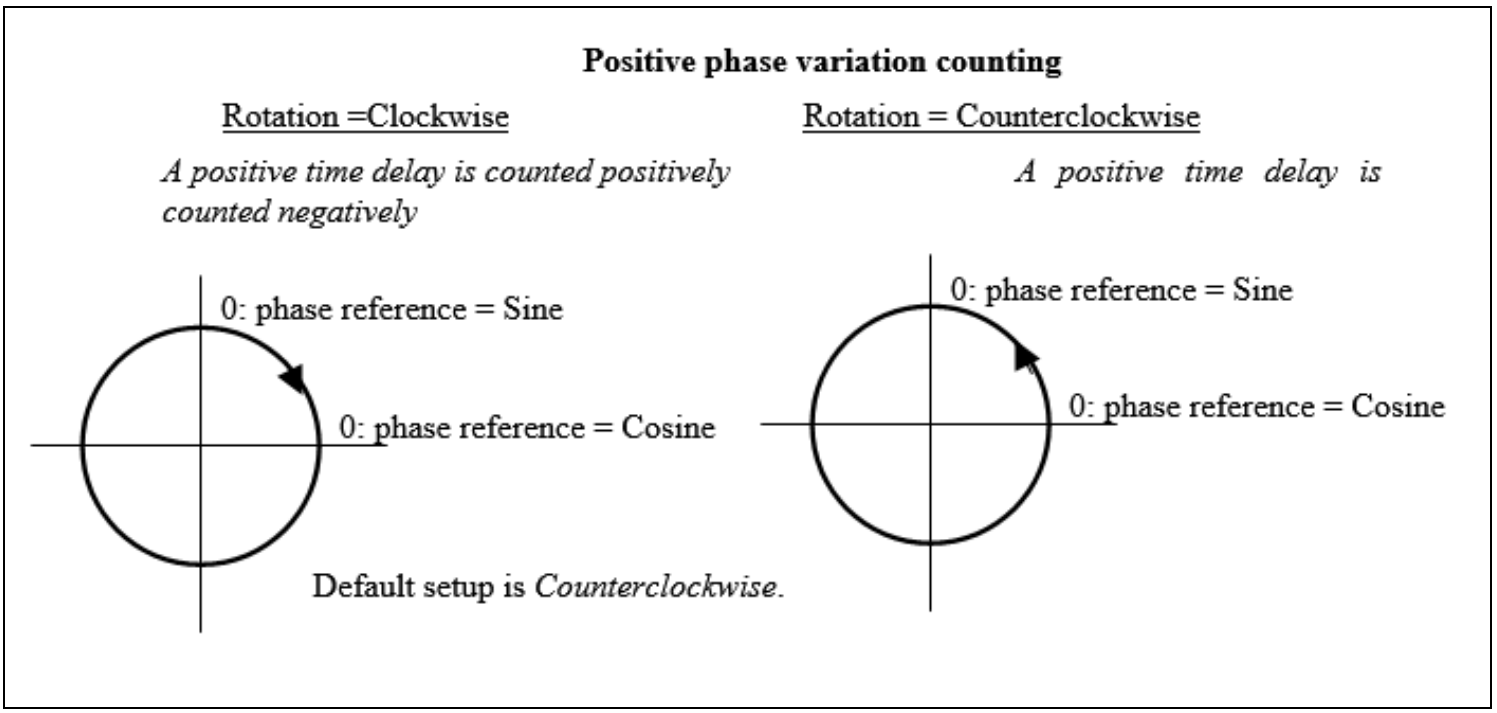


- **Pulse** / **rev**: the number of pulses per revolution. The user can enter an integer value between 1 and 4092. For a non-integer number of pulses per revolution the user must use a virtual tach.

Hidden/fixed: Hidden if Mode is Trigger.

- **Rotation**: This setting defines the way the phase variation is counted: clockwise or counterclockwise for each tachometer.

The rotation side is managed independently for each tachometer (Ext. sync, input, D, combined and fractional).



- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.

Hidden/fixed: Hidden if Mode is Trigger.

- **Max speed**: defines the highest measured angular speed. All revolutions with a speed higher than Max speed are rejected. By default Max speed is expressed in RPM. The limit of Max speed depends on the sampling frequency of the input, on the pulse/rev and on the hold off. If the Max speed value is modified, the Min speed is automatically adjusted according to a speed ratio (*MinSpeed = MaxSpeed / SpeedRatio*). The Speed Ratio value is not able to be modified.
-

The Max speed setting is also used:

- to specify the limit of Y axis of the RPM profile result.
- to compute the limit of the maximum order of the SOA plug-in analyzer.

Hidden/fixed: Hidden if Mode is Trigger.

- **Min speed**: defines the lowest measured angular speed. All revolutions with a speed lower than Min speed are forced to 0 RPM. By default Min speed is expressed in RPM. The user can enter any value between Max speed / 1000 and Max speed. The max Min speed and min Min speed are defined according to the Max speed and Speed ratio.

Hidden/fixed: Hidden if Mode is Trigger.

- **Missing teeth:** read Torsional page

- *Tach:* the system uses the missing teeth occurrence as the phase reference.

Hidden/fixed: Hidden if Mode is Trigger

- **Input filter:** Select the filter to apply on the instantaneous angular velocity signal computed by the torsional converter. The applied bandwidth is the front-end one.

Hidden/fixed: Hidden if Mode is Trigger or Tach

132.3.2.2 In post Analyse

Used to define up to 6 Ext Tachs, using signal from the Ext. Sync. input from the Player). This replaces the Ext Sync (with tach ?On?) from the front-end, in Post-analysis. Then Ext tach is visible, on Track x connect the Ext Sync and then in the Ext tach set the source to Ext Sync.

- **Label**: the name of the tach.
- **Source**: the input signal of the tach (NONE by default). The input signal can be any Front end Ext. Sync. input (in Connected mode on line) or player track (in Post-analysis mode).
- **Pulse** / **rev**: the number of pulses per revolution. The user can enter an integer value between 1 and 1024. For a non-integer number of pulses per revolution the user must use a virtual tach.

Note: In Post-analysis, the number of pulses per revolution is added to the number entered for the acquisition.

- **Rotation:** This setting defines the way the phase variation is counted: clockwise or counterclockwise for each tachometer.

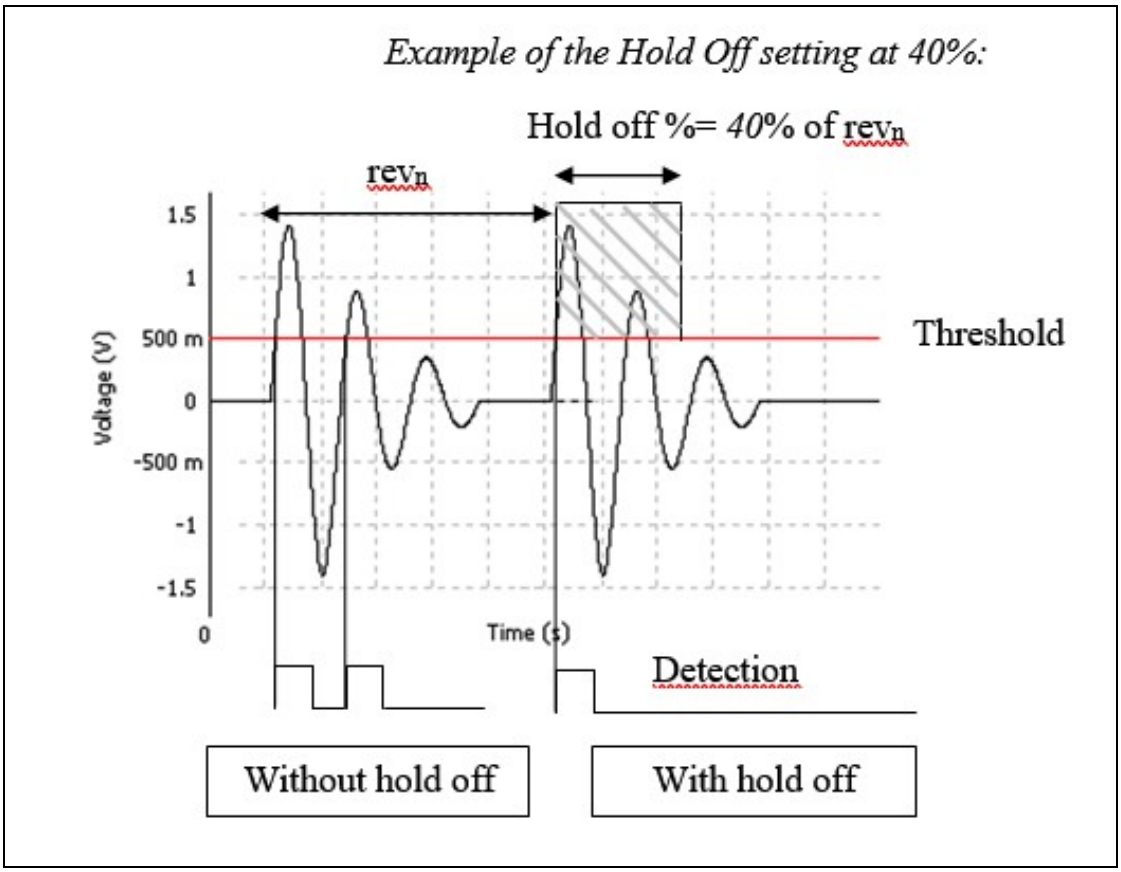
The rotation side is managed independently for each tachometer (Ext. sync, input, D, combined and fractional). Default setup is *Counterclockwise*;

See *Ext Sync §* for details

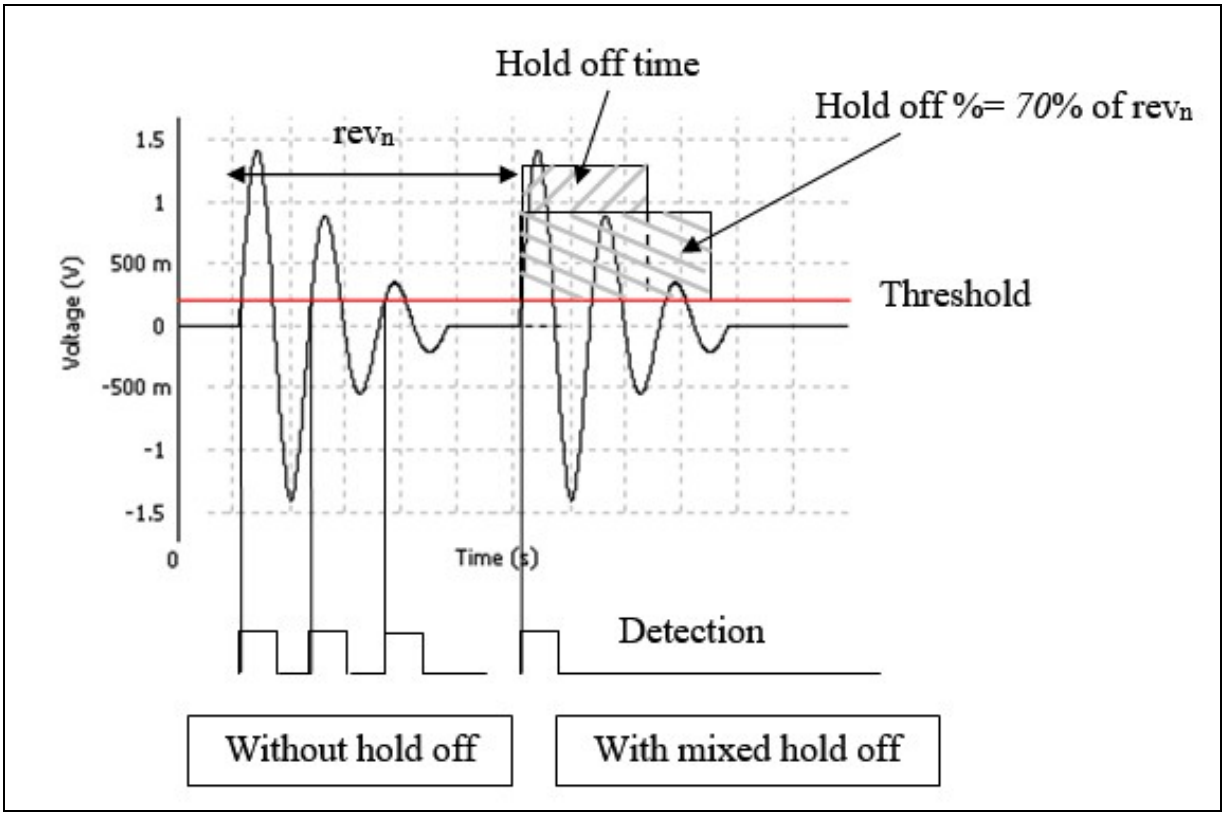
- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.
- **Threshold**: sets the signal threshold for tach pulse detection. The threshold is expressed in the same unit as for the input signal. The value can be adjusted between +/- the full scale of the input signal (depending of the input range).
- **Slope**: selects the slope of the input signal on which a tach pulse is detected.

Slope	Description
Rise	The tach pulses are detected on rising edge of the input signal
Fall	The tach pulses are detected on falling edge of the input signal

- **Hold off**: defines the minimum time (expressed in seconds) between two tach pulses used to measure angular speed. If a pulse is detected before the time has expired since the last valid pulse then the new pulse will be rejected. This minimum time is in fact the maximum between the Hold off setting value and the value computed using the last tach period length and the Hold off (% period) setting value. The user can enter any value between 0 and 36000s.
- **Hold off (% period):** defines the minimum time (expressed in % of the last valid tach period) between two tach pulses used to measure angular speed. If a pulse is detected before this time has expired since the last valid pulse then the new pulse is rejected. This is used to reject angular speed variations that are too large. This minimum time is in fact the maximum between the Hold off setting value and the value computed using the last tach period length and the Hold off (% period) setting value.



- **Mixed Hold off**: in this case, the hold off to be applied is the highest value between hold off time and hold off %.



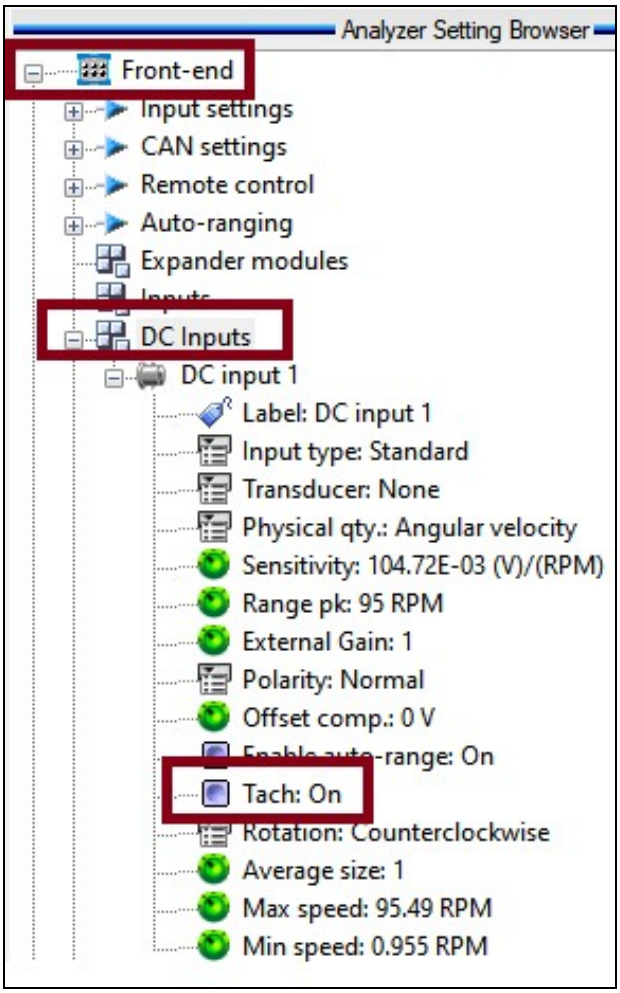
Note: the hold off value in Post-Analysis is added to the time or the percentage already put for the acquisition.

- **Max speed**: predefine a maximum angular speed to preset the scale and order tracking maxima. The limit of Max speed depends on the sampling frequency of the input signal and is equal to: 60 * Fe / (2 * 2.56) for the maximum. The Max speed setting is also used:
- to specify the limit of Y axis of the RPM profile result
- to compute the limit of the maximum order of the SOA plug-in analyzer.
- **Min speed**: defines the lowest measured angular speed. All revolutions with a speed lower than Min speed are forced to 0 RPM. By default Min speed is expressed in RPM. Min speed is automatically adjusted to Max speed/1000 but it is possible to go lower.
- **Missing teeth:** This setting indicates the number of possible consecutive missing teeth (no pulses). In such case depending on the active mode:
- *Torsional:* the system interpolates the missing pulses intervals in order to maintain the instantaneous speed at a continuous level during the missing pulses.
- *Tach:* the system uses the missing teeth occurrence as the phase reference.

132.3.3 DC Tach

Up to 4 tachometers using signal from DC inputs can be activated. It?s particularly interesting if a tachometric transducer which delivers voltage proportional to rotational speed is used for the measurement (the sensitivity is in Volt/RPM). The actual speed is continuously known during the rotation. Be aware that phase measurements are not accurate with the method.

132.3.3.1 Acquisition


Analyzer Setting Browser
Front-end
Input settings
CAN settings
Remote control
Auto-ranging
Expander modules
DC Inputs
DC input 1
Label: DC input 1
Input type: Standard
Transducer: None
Physical qty.: Angular velocity
Sensitivity: 104.72E-03 (V)/(RPM)
Range pk: 95 RPM
External Gain: 1
Polarity: Normal
Offset comp.: 0 V
Tach: On
Rotation: Counterclockwise
Average size: 1
Max speed: 95.49 RPM
Min speed: 0.955 RPM

DC tach on connected mode
On acquisition mode, you need to activate a DC input on the frond tend, then activate the tach option.

Tach: On / Off. Used to activate a tachometer with an RPM level proportional to the DC level. Rotation: Depending on the way you look at a measured shaft or on the convention you are using, the shaft may be considered as rotating clockwise or counterclockwise. This has noticeable impact on the phase of spectra and orders.

Hidden/fixed: Hidden if Tach is Off.

Average size: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.

Max speed: defines the highest measured angular speed. Speeds higher than Max speed are rejected. By default Max speed is expressed in RPM.

The Max speed setting is also used:

- To specify the limit of Y axis of the RPM profile result.
- To compute the limit of the maximum order of the SOA plug-in analyzer.

Min speed: defines the lowest measured angular speed. All revolutions with a speed lower than Min speed are forced to 0 RPM. By default Min speed is expressed in RPM. Min speed is automatically adjusted to Max speed/1000 but it is possible to go lower.

- **Rotation:** This setting defines the way the phase variation is counted: clockwise or counterclockwise for each tachometer.

The rotation side is managed independently for each tachometer (Ext. sync, input, D, combined and fractional). Default setup is *Counterclockwise*;

- **Average size:** defines the average number used to compute the average speed.

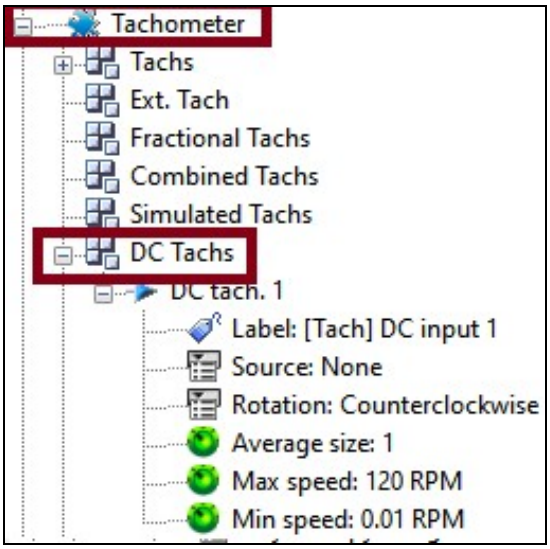
  Notes:

  - The DC Input **physical quantity** must be angular velocity.

The connection of a DC Input is possible using the wizard toolbar and especially the tachometer connection window. If a DC Input is defined as a tach by this way, the set up ?tach? is automatically activated and the physical quantity is forced to angular velocity.

- The **sensitivity** and the **offset** can be automatically updated by calibrating the DC Input

132.3.3.2 Post analyse



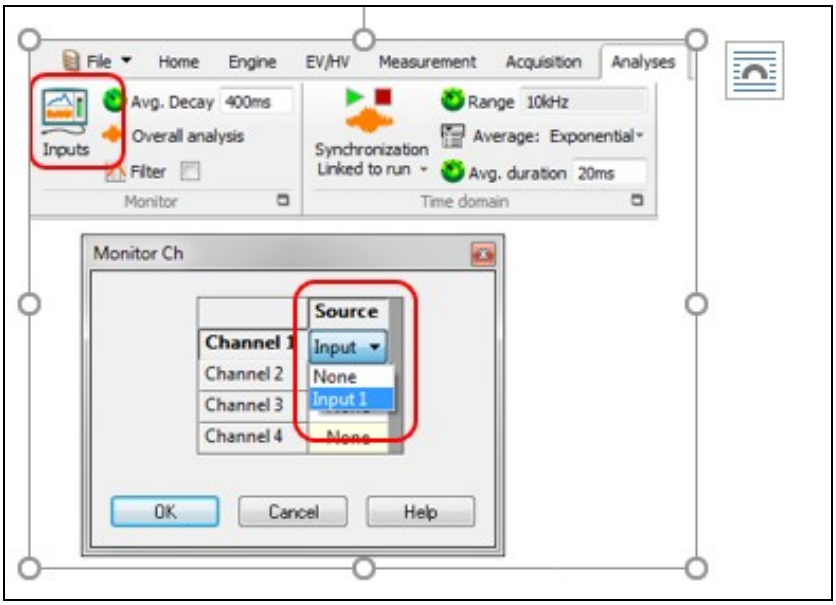
DC Tach in PA
In Post-Analyze, the DC tachs are available.

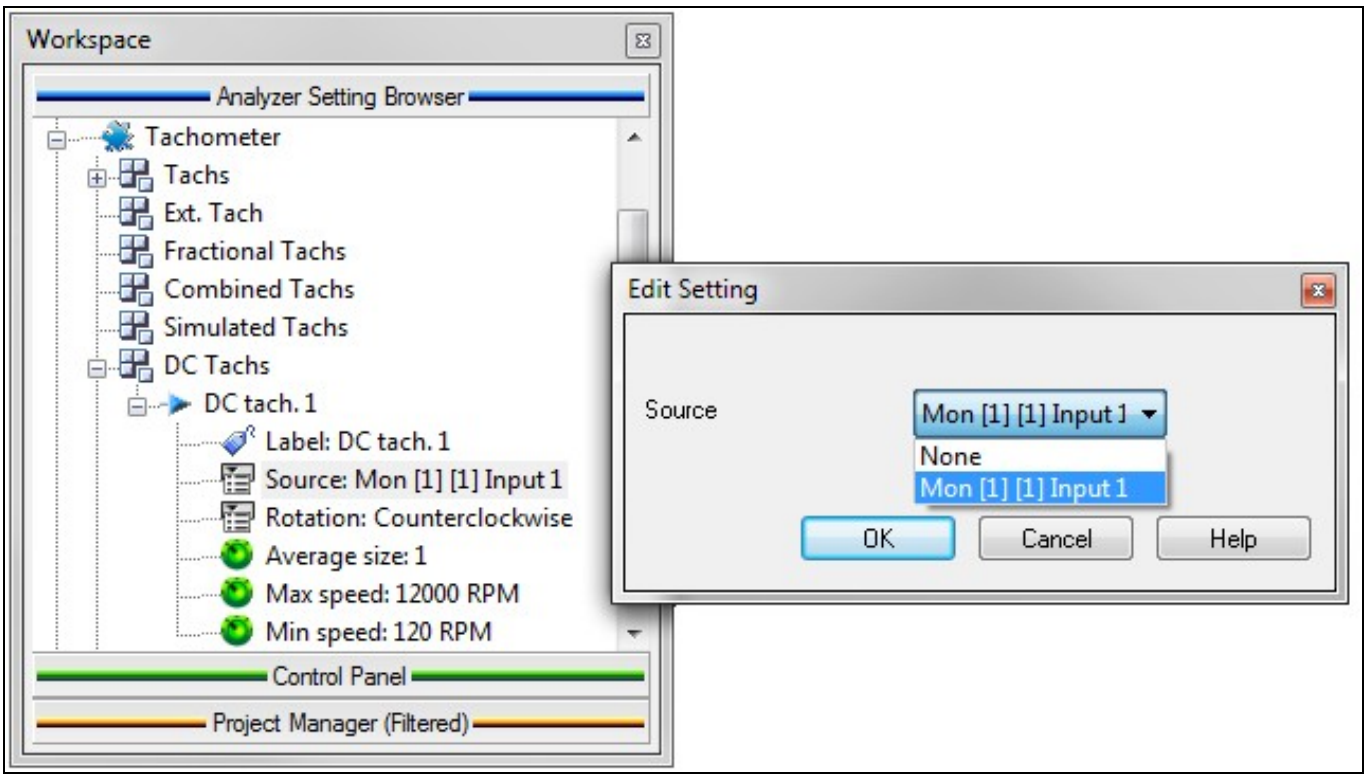
They can be activated and connected to a DC Input available in the signal loaded in the player. Then set up magnitude, sensitivity and offset allow to calibrate the DC Input in post analyze to obtain the correct values of the angular velocity. Settings are the same in acquisition mode.

132.3.3.2.1 Extract a DC tachometer from dynamical input

On post analysis, if you have record a tachometer on a dynamical input, you can extract the DC of this channels using the monitor. Then, define a DC tachometer with the value "monitor DC". The process is as follow :

- Open the ribbon Analyses / Monitor / Inputs button.
- Select the DC tach Track in one Monitor channel.
- From the ASB, add a DC tach and select the *Mon* of selected input as a source.



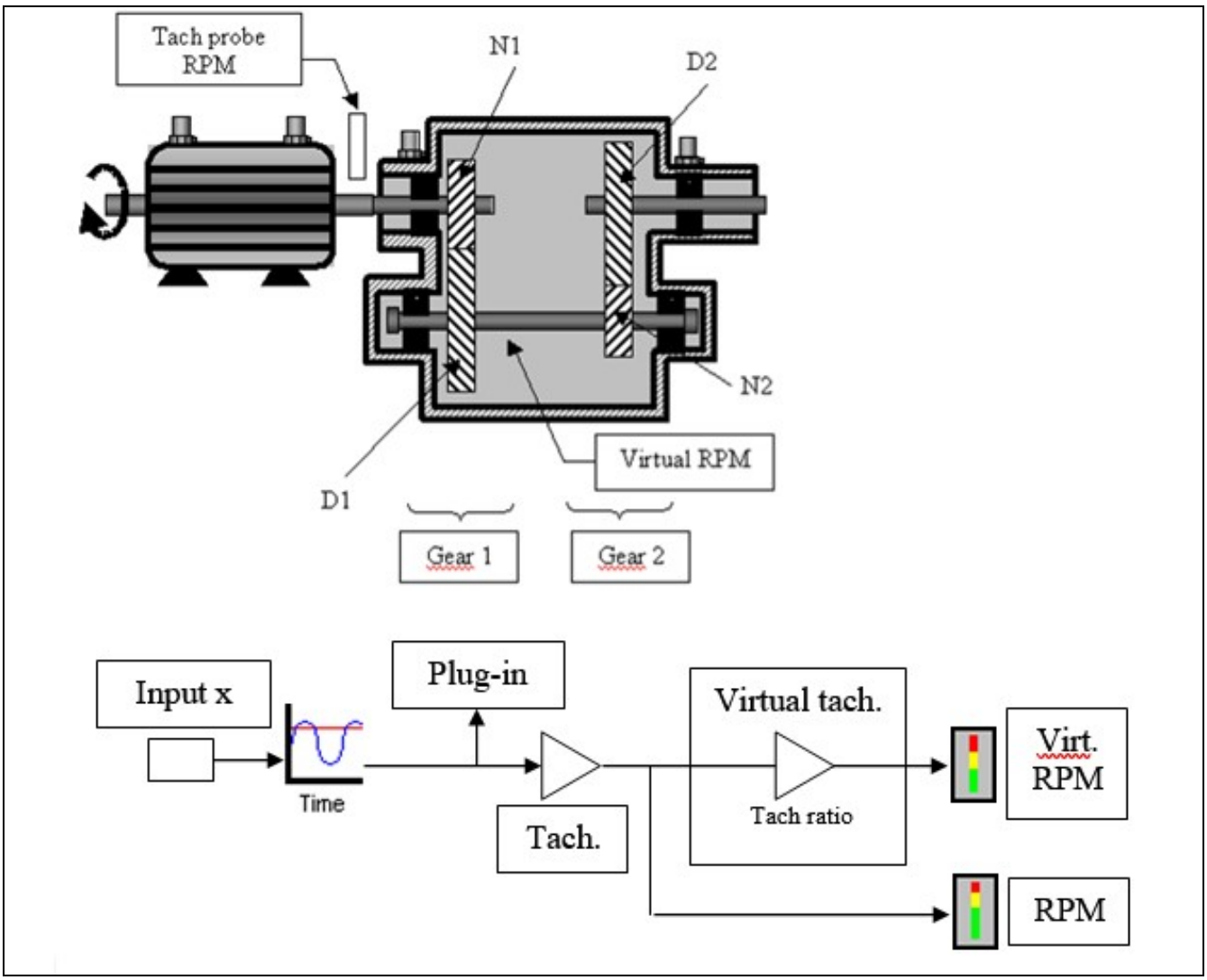


The DC tach is then available for any tachometer usage.

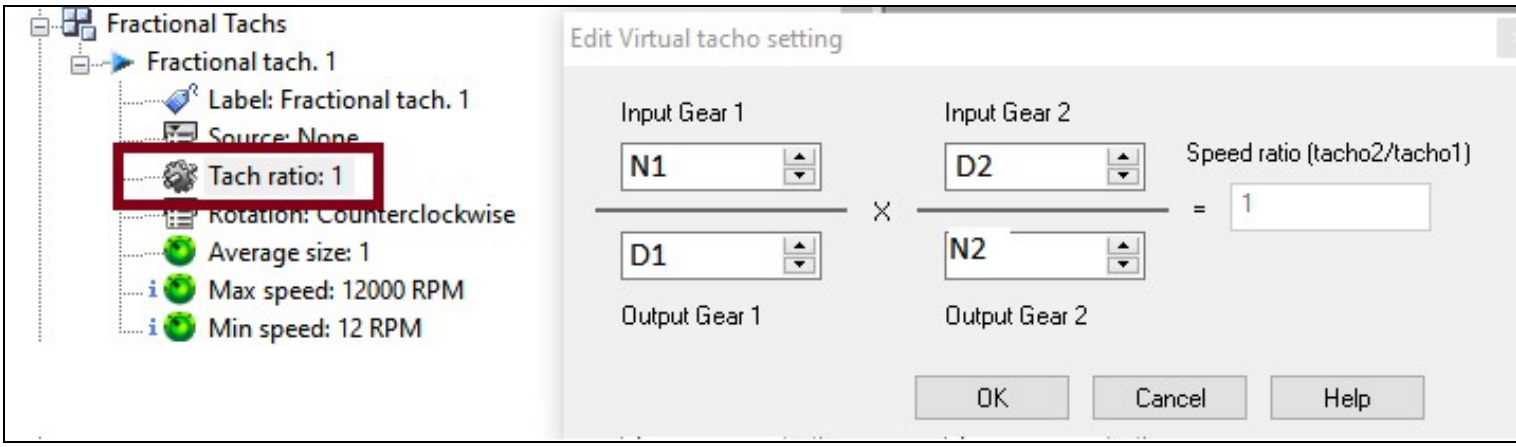
132.3.4 Fractional Tachs

 : *Fractional: Opens the properties dialog for the tachometers that derives from another one. Fractional tach. computes RPM speed for a non accessible shaft by using gear ratio setting. Adapted for gear boxes and transmissions.* Note: the fractional tach. cannot be settled from the *Vision* interface, use the ASB for it. Used to define up to 4 fractional tachs using data from the tach or the Ext Tach.

Virtual tachs computes RPM speed for a not accessible shaft by using gear ratio setting.



- **Label**: the name of the output tach.
- **Source**: the source of a virtual tach can be any tach or Ext. tach.
- **Tach ratio**: this is the ratio between the output angular speed and the input angular speed. This setting is defined by the product of 2 fractions: N1/D1 * N2/D2 where N1, D1, N2 and D2 are integer values. Tach.1 / Tach. Ratio maximum value cannot be higher than 100.



- **Rotation:** This setting defines the way the phase variation is counted: clockwise or counterclockwise for each tachometer.

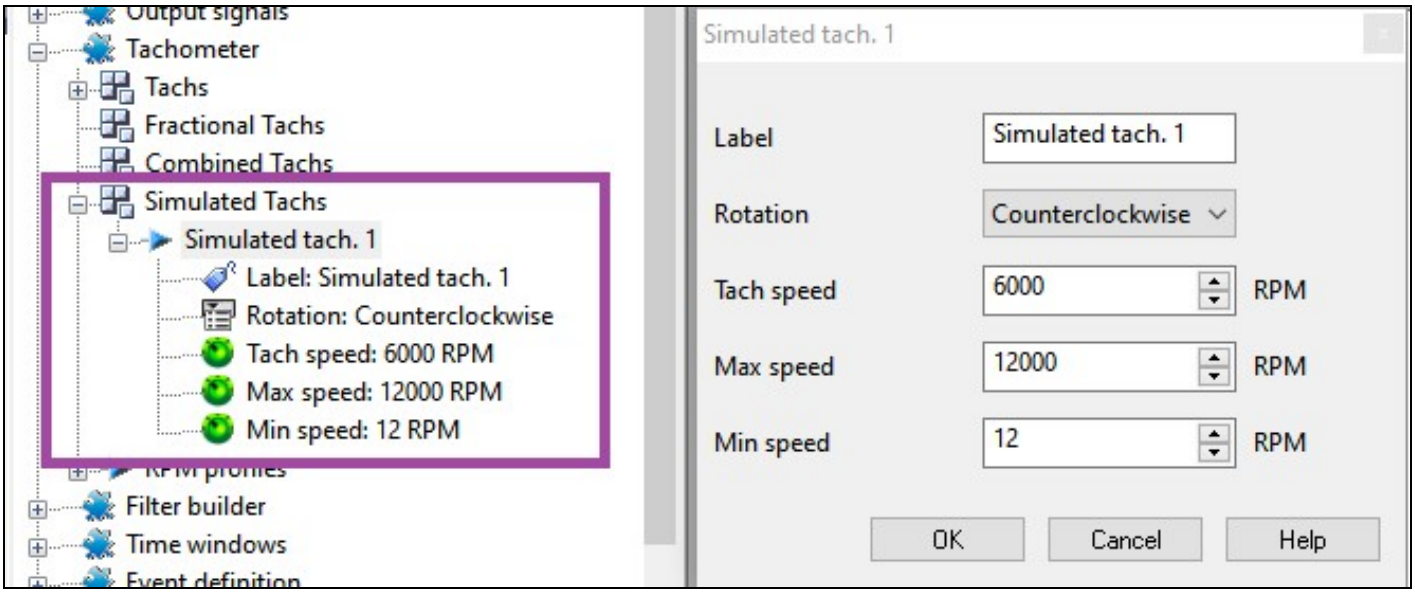
The rotation side is managed independently for each tachometer (Ext. sync, input, D, combined and fractional). Default setup is *Counterclockwise*;

- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.
- **Max speed**: predefine a maximum angular speed to preset the scale and order tracking maxima. The limit of Max speed depends on the sampling frequency of the input signal and is equal to: 60 * Fe / (2 * 2.56) for the maximum. The Max speed setting is also used:
- to specify the limit of Y axis of the RPM profile result
- to compute the limit of the maximum order of the SOA plug-in analyzer.
- **Min speed**: defines the lowest measured angular speed. All revolutions with a speed lower than Min speed are forced to 0 RPM. By default Min speed is expressed in RPM. Min speed is automatically adjusted to Max speed/1000 but it is possible to go lower.

132.3.5 Simulated tachometer

This option is available for customers owning the FFTDiag option.

This feature will allow you to simulate a tachometer with a fixed speed for your measurement. This is useful **when using a real tachometer sensor is not possible** and your shaft is rotating at steady speed.



Setting up the simulated tach

You can use this tachometer as any tachometers to **calculate order spectrums** or save it as a result.

132.3.6 Combined Tach

 : *Combined: Opens the properties dialog for the tachometers computed from other ones. Adapted for CVT. Note: the combined tach cannot be settled from the* Vision *interface, use the ASB for it.*

132.3.6.1 Application

The main application is in automotive : studying vibration due to a CVT gear box. We will first compute the speed of the belt with a continuously variable transmission (CVT)deducing by the speed of the 2 shafts. Then, with this belt speed, we can deduce vibration due to this belt using waterfall or order tracking techniques.

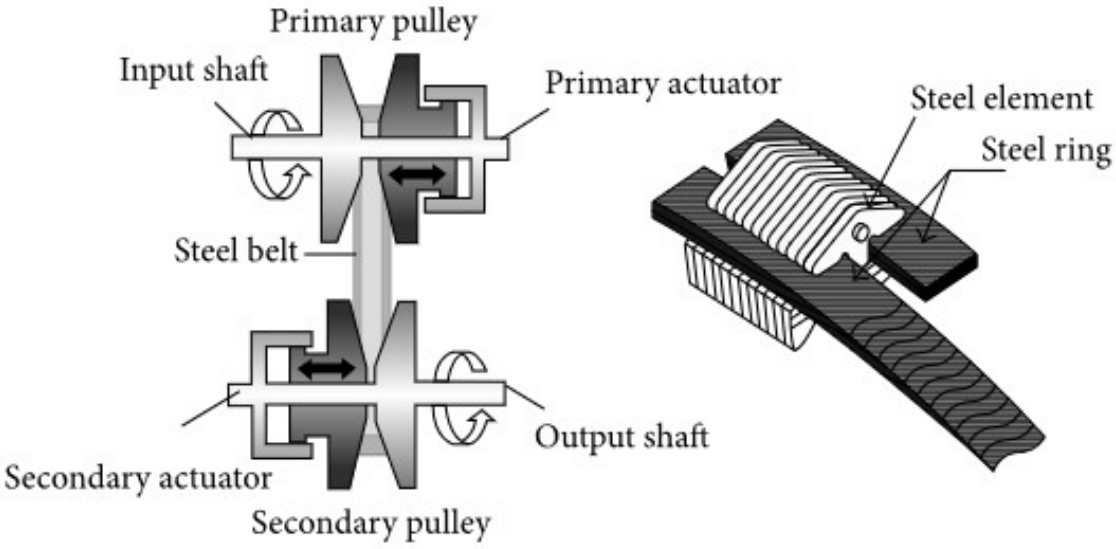


Figure 1

Model of Van Doorne's CVT and metal pushing V-belt [28].

Exemple of study in CVT Vibration : https://www.hindawi.com/journals/sv/2015/857978/

132.3.6.2 How to use

This module allows computing tachometer information (Speed, Phase) relatively to 2 measured tachometers. Up to 4 different combined tachs can be computed simultaneously. The combined tach can be used as any other standard tach.

- **Label**: the name of the output tach.
- **Source 1 & 2**: the calculation sources can be any tach or Ext. tach. Source 1 is called Rpm 1 and Source 2 is called Rpm2 in the formula.
- **Rotation:** This setting defines the way the phase variation is counted: clockwise or counterclockwise for each tachometer.

The rotation side is managed independently for each tachometer (Ext. sync, input, D, combined and fractional). Default setup is *Counterclockwise*;

See *Ext Sync §* for details

- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.
- **Max speed**: predefines a maximum angular speed to preset the scale and order tracking maxima. The limit of Max speed depends on the sampling frequency of the input signal and is equal to: 60 * Fe / (2 * 2.56) for the maximum. The Max speed setting is also used:
- to specify the limit of Y axis of the RPM profile result
- to compute the limit of the maximum order of the SOA plug-in analyzer.
- **Min speed**: defines the lowest measured angular speed. All revolutions with a speed lower than Min speed are forced to 0 RPM. By default Min speed is expressed in RPM. Min speed is automatically adjusted to Max speed/1000 but it is possible to go lower.
- **Formula**: Allows editing the computation formula. The formula uses RPM1 as the speed of Source 1 and RPM2 as the speed of source 2. The computed tach speed is the result of the last line of the editor.

Copy/**paste** from or to a text editor are possible, to simplify the storage of different formula

Attention: All computation are done in SI unit (i.e: Rad/sec) the constant value must be expresses in Rad/sec.

Hereafter an example of computation of the belt speed in a car CVT:

R=97/2

K2=4*R*Pi/2

K3=2*R/Pi/120

Rt=Rpm1/Rpm2

Rtp1=Rt-1

Rtm1=Rt-1

R1=K2/Gp1

R2=1-K3*SQRT(Rtm1/Rtp1)

R1*R2*Rpm1

The formula editor accepts various math operators and functions such as square root, logarithms and power allowing polynomial equations. The following table gives the syntax of the operators and functions;

In/out	*Description*
Chi	Channel i level
N.A.	The output level is the result of the last line in the editor

Operator	*Description*
+	Parameter or constant addition with another parameter or constant
-	Parameter or constant subtraction from another parameter or constant
*	Parameter or constant multiplication by another parameter or constant
/	Parameter or constant division by another parameter or constant
^	Parameter or constant powered by another parameter or constant
=	Parameter affectation with the expression result at the right of sign

Function	*Description*
If(c, t, f)	Returns **t** if **c** is true or **f** if c is false (ex of **c**: I >4)
Rint(x)	Returns the nearest integer of x
Sign(x)	Returns -1 if x < 0, 0 if x = 0 or 1 if x > 0

Function	*Description*
Sin(x)	Returns the sine of expression or parameter x
Cos(x)	Returns the cosine of expression or parameter x
Tan(x)	Returns the tangent of expression or parameter x

ASin(x)	Returns the arc sine of expression or parameter x
ACos(x)	Returns the arc cosine of expression or parameter x
ATan(x)	Returns the arc tangent of expression or parameter x
Sinh(x)	Returns the hyperbolic sine of expression or parameter x
Cosh(x)	Returns the hyperbolic cosine of expression or parameter x
Tanh(x)	Returns the hyperbolic tangent of expression or parameter x
ASinh(x)	Returns the hyperbolic arc sine of expression or parameter x
ACosh(x)	Returns the hyperbolic arc cosine of expression or parameter x
ATanh(x)	Returns the hyperbolic arc tangent of expression or parameter x
Log2(x)	Returns the base 2 logarithm of expression or parameter x
Log10(x)	Returns the base 10 logarithm of expression or parameter x
Log(x)	Returns the base 10 logarithm of expression or parameter x
Ln(x)	Returns the base e (natural) logarithm of expression or parameter x
Exp(x)	Returns the exponential of expression or parameter x
Sqrt(x)	Returns the square root of expression or parameter x
Abs(x)	Returns the absolute value of expression or parameter x
Min(x,y,?)	Returns the minimum level of listed parameters
Max(x,y,?)	Returns the minimum level of listed parameters
Sum(x,y,?)	Returns the sum of listed parameters
Avg(x,y,?)	Returns the average level of listed parameters

Predefined	***Description***
pi	Constant pi (3.1416?). Do not declare any constant with this name
e	Constant e (2.718). Do not declare any constant with this name

Constants and parameters can be defined (except *pi* and *e*) using the = sign; eg: *var1 = pi * 2* or *var2 = rpm1/2*. The constants may be defined only once.

Parameter/constant names must start with a letter and may be ended by a number.

The dot (.) is always the decimal separator independently from the OS preferences and the comma (,) is used as parameter separator.

The editor does not check the dimension of this result. The content of the formula can be copy/paste from any text editor.

132.3.7 RPM Profiles

Defines the RPM profile window display.

-  : *Profile: Set up the tachometer profiles duration. These graphs are available for the Tachometer module in the Add/Remove graph*

dialog.(from 10s to 1200s).

The profile displays continuously the tachometer speeds with a memory depth defined by the *profile* setting.

-  : *Resolution:* defines the shortest time between 2 angular speed values saved in the profile.
- Hidden/fixed: fixed to a value equal to Duration profile / 2048.

132.3.8 Extract tach from FFT waterfall and edit tachometer

Read this page

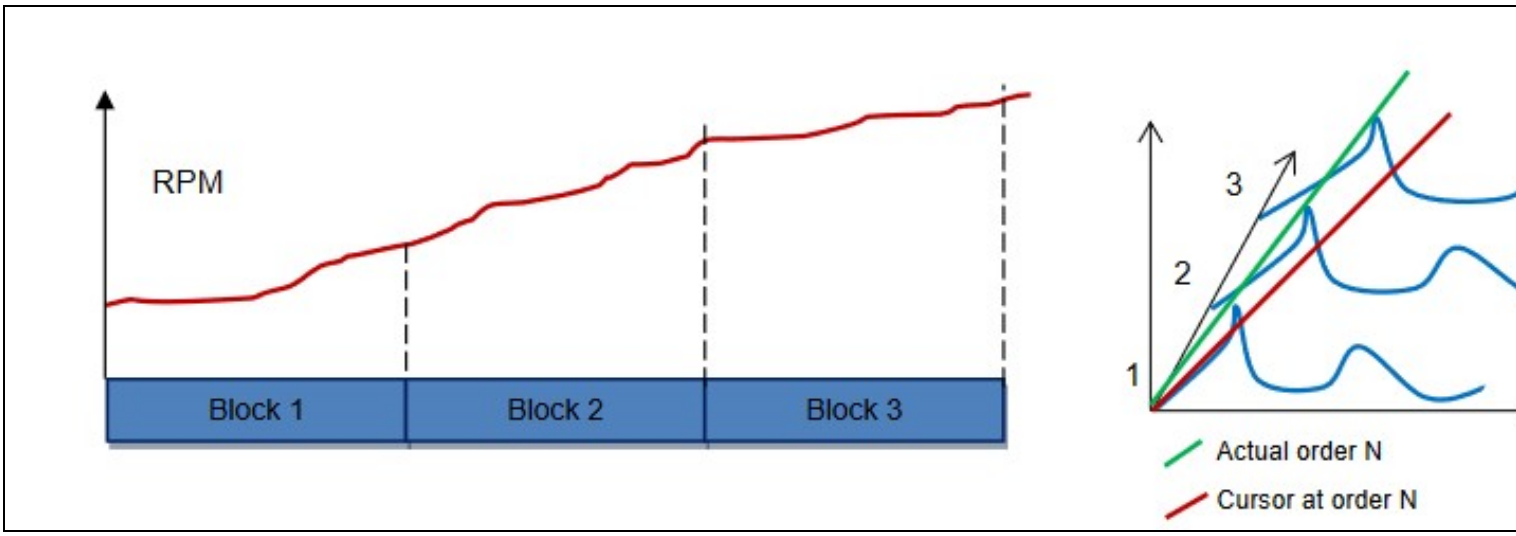
132.4 F.A.Q

132.4.1 What is the difference between FFT1 Tacho in Waterfall, and Ext. angular speed in Waterfall ?

With FFT/SOA tach on waterfall the tachometer iscentered on FFT/SOA blocks

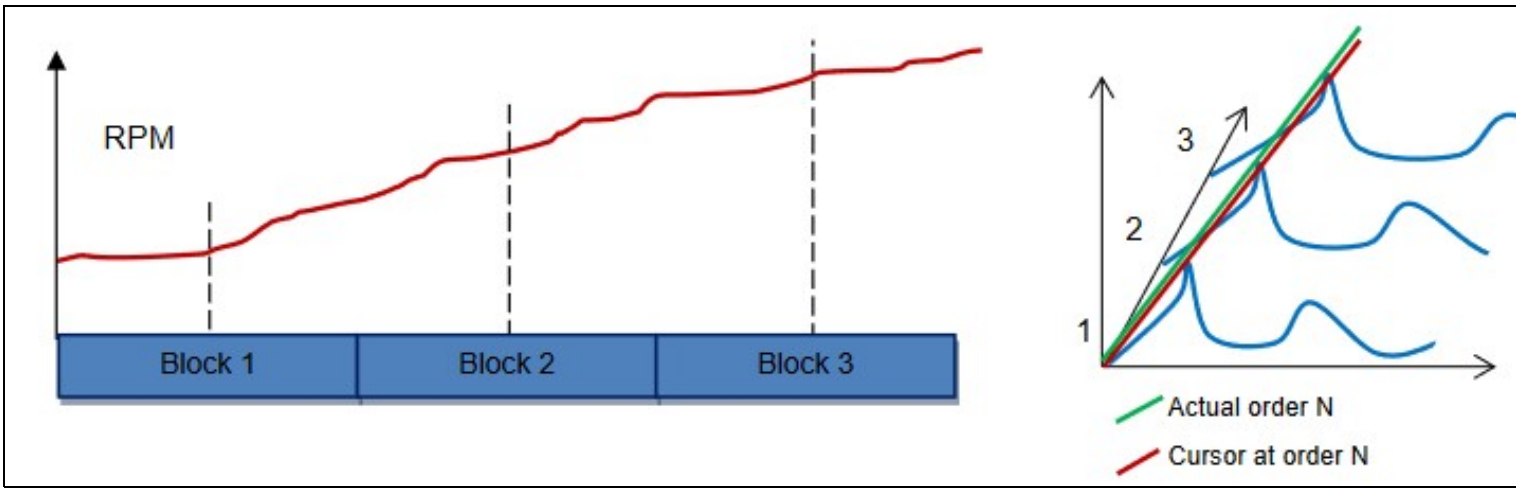
This allows centering tachometer speed at the center of the FFT/SOA trigger block(s). It is useful with long trigger blocks (High resolution analyses) to perfectly match the actual data with the order cursor or section.

With Ext synch tach: The RPM is collected at the end of the analysis block



This situation leads to an offset in the waterfall calculation of the orders (cursors, sections). For a run up, as the angular speed is over evaluated, the order calculation is lower than the actual ones.

With centered tach: The RPM is calculated as the average speed during the block duration to be synchronized with the analyzed data.

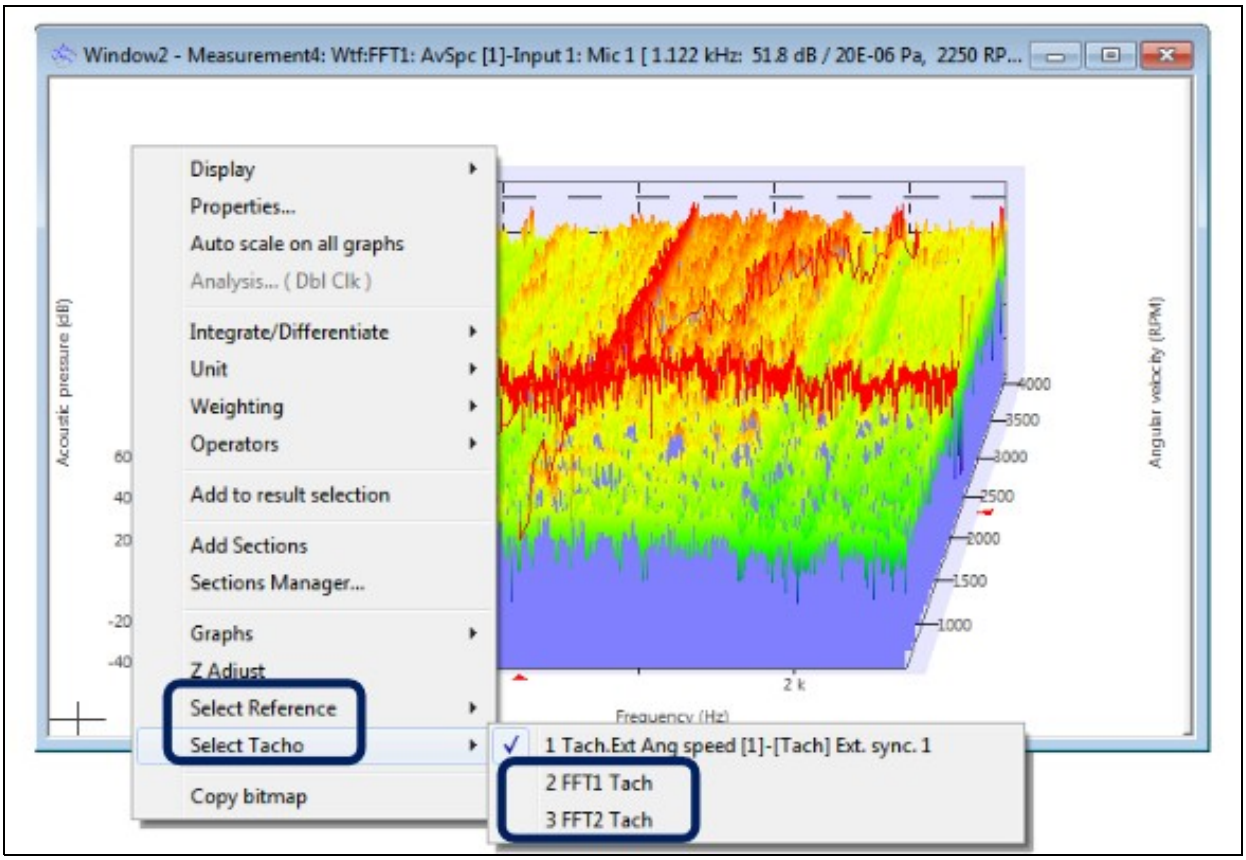


With the centered tachometer, the orders calculations match more accurately the actual orders in waterfall. The computation of the angular speed takes in account the averaging, triggering and overlap used in the plug-in. The centered speed is calculated as:

$$CT = \frac{RPM(End_of_analysis) - RPM(Begin_of_analysis)}{2}$$

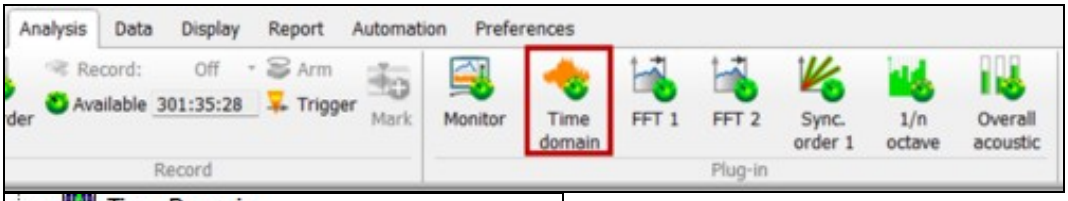
The RPM centering and averaging is done in the analysis plug-in prior to be connected to the waterfall. To use the centered tach simply add the said tachometer to the corresponding plug-in (FFTn or SOAn). These additional tachometers are available in the waterfall as soon as one of the result of the plug-in is added to the waterfall.

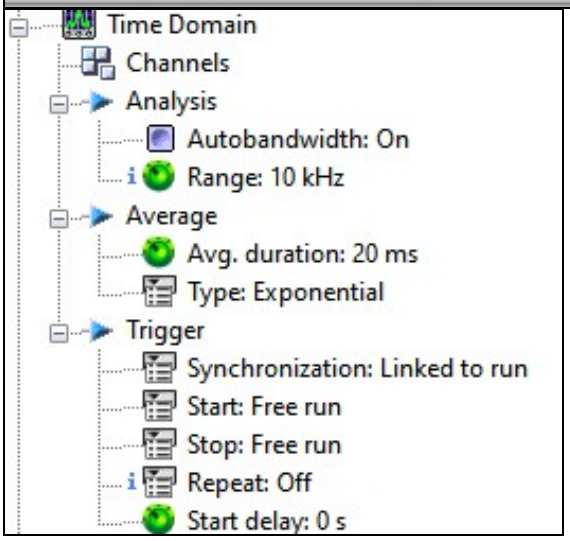
- 1. Add Tach to the Plug-in,
- 2. Add plug-in results (Spectra, orders, etc..) to the waterfall,
- 3. Display the waterfall,
- 4. Select the Plug-in Tach, as a tachometer and reference


Window2 - Measurement4: Wtf:FFT1: AvSpc [1]-Input 1: Mic 1 [1.122 kHz: 51.8 dB / 20E-06 Pa, 2250 RP...
Display
Properties...
Auto scale on all graphs
Analysis... (Dbl Clk)
Integrate/Differentiate
Unit
Weighting
Operators
Add to result selection
Add Sections
Sections Manager...
Graphs
Z Adjust
Select Reference
Select Tacho
Copy bitmap
1 Tach.Ext Ang speed [1]-[Tach] Ext. sync. 1
2 FFT1 Tach
3 FFT2 Tach
Acoustic pressure (dB)
Angular velocity (RPM)
Frequency (Hz)
2 k

133 NVGate Time Domain Analysis

The TDA plug-in is designed to get the most from the time domain signal completing the frequency/order analyses. This plug-in offers flexible signal overview and statistical extraction in parallel.



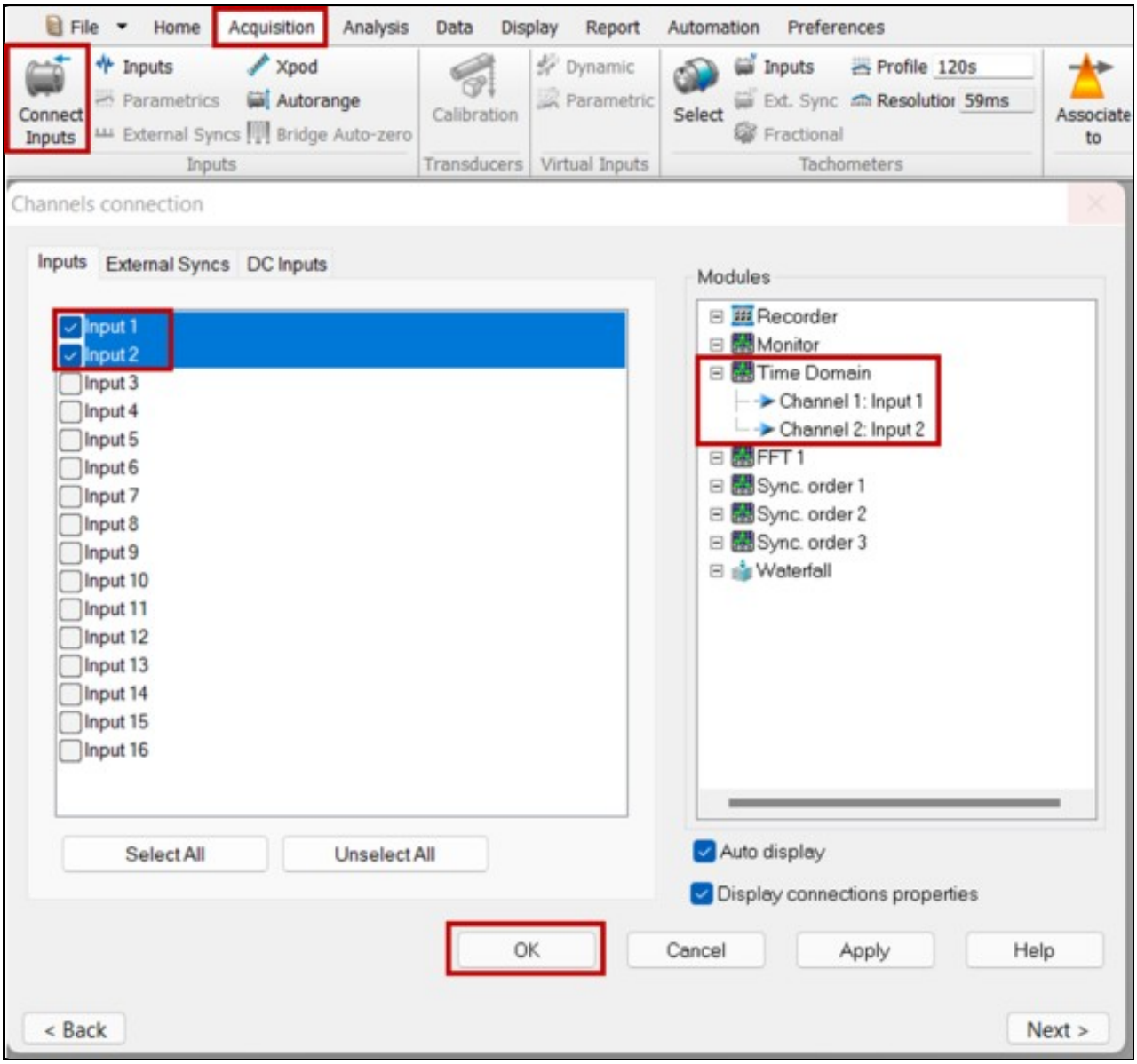


This TDA plug-in provides 2 types of results:

- Time views and associated extracted results. It?s an oscilloscope-like function, to view the time domain series. This does not record the time signal, only their statistical content.
- Statistical scalar result. The TDA computes the statistical content of the connected input on a specific time and average basis. **These scalars levels are available as view meter or profiles** (using the Waterfall Plug-in).

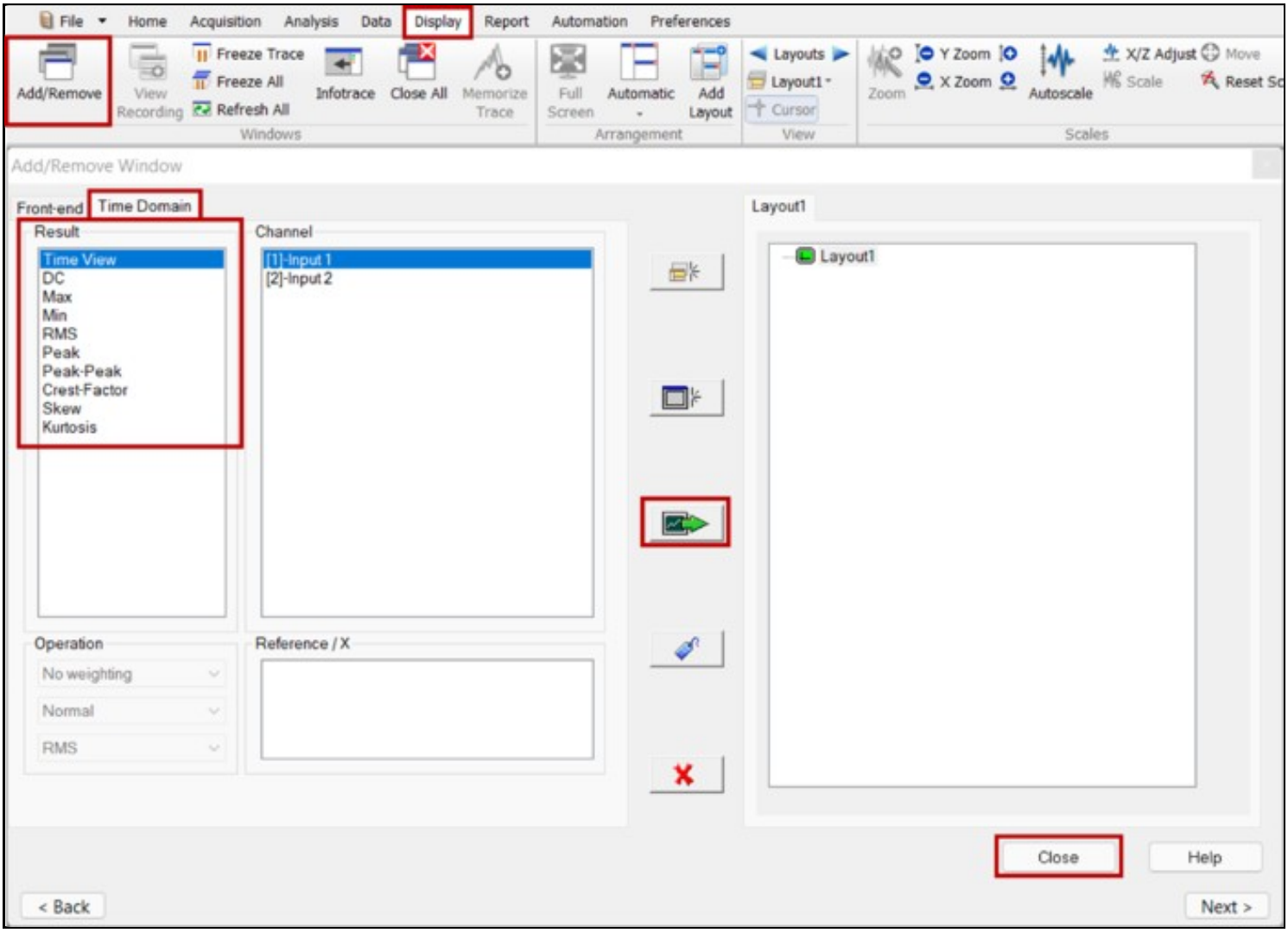
133.1 Connect channels

Click on connect inputs and drag and drop the channels on TDA plug in.


File
Home
Acquisition
Analysis
Data
Display
Report
Automation
Preferences
Connect Inputs
Inputs
Parametrics
External Syncs
Xpod
Autorange
Bridge Auto-zero
Inputs
Calibration
Transducers
Dynamic
Parametric
Virtual Inputs
Select
Inputs
Ext. Sync
Fractional
Profile 120s
Resolution 59ms
Tachometers
Associate to
Channels connection
Inputs
External Syncs
DC Inputs
Input 1
Input 2
Input 3
Input 4
Input 5
Input 6
Input 7
Input 8
Input 9
Input 10
Input 11
Input 12
Input 13
Input 14
Input 15
Input 16
Select All
Unselect All
Modules
Recorder
Monitor
Time Domain
Channel 1: Input 1
Channel 2: Input 2
FFT 1
Sync. order 1
Sync. order 2
Sync. order 3
Waterfall
Auto display
Display connections properties
OK
Cancel
Apply
Help
< Back
Next >

133.1.1 Available results:

The results can be display using the add remove windows:



Type	Size	Dimension	Domain	Save
DC	1pt	1D		Yes
RMS	1pt	1D		Yes
Min level	1pt	1D		Yes
Max level	1pt	1D		Yes
Peak	1pt	1D		Yes
Peak-Peak	1pt	1D		Yes
Crest Factor	1pt	1D		Yes
Kurtosis	1pt	1D		Yes
Time View	2048 pt max	Compressed Time	time	Yes

- **DC**: the average DC value of the time signal
- **RMS**: the RMS value of the time signal (DC being removed)
- **Min**: the minimum level of time signal
- **Max**: the maximum level of time signal
- **Peak**: the absolute value of Min level and Max level.
- **Peak-Peak**: displays the difference between Min level and max level. Peak-Peak level ? 0.

- **Crest factor**: displays the ratio Peak level/RMS level. Characteristics of the Crest Factor:

- Crest Factor ≥ 1
- DC level = 1
- Crest Factor of sinus = $\sqrt{2}$
- Max level = $\sqrt{N}$

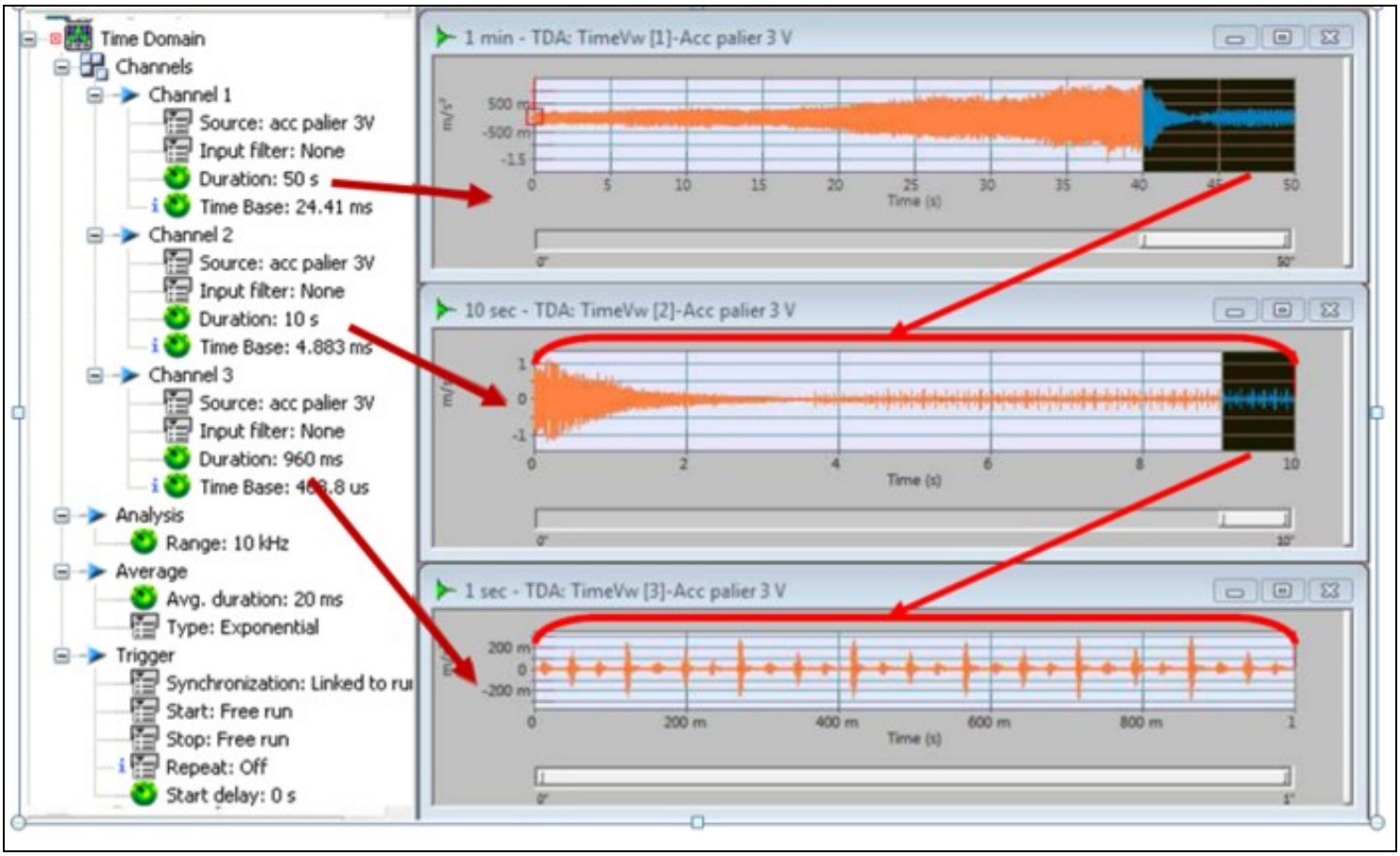
N = number of samples in the triggered block = 2.56*lines number-1

- **Kurtosis**: the kurtosis value (4th order moment) of the time signal
- **Time View**

Profiles of scalar values (Max, Peak-Peak,...) can be displayed using the Waterfall Plug-in.

133.1.1.1 Display

The *Time view* is an oscilloscope-like view of the time domain series which scrolls the signal on a user define duration. The duration of the viewed signal is independent for each channel. That is to say it allows monitoring the same signal on different durations.

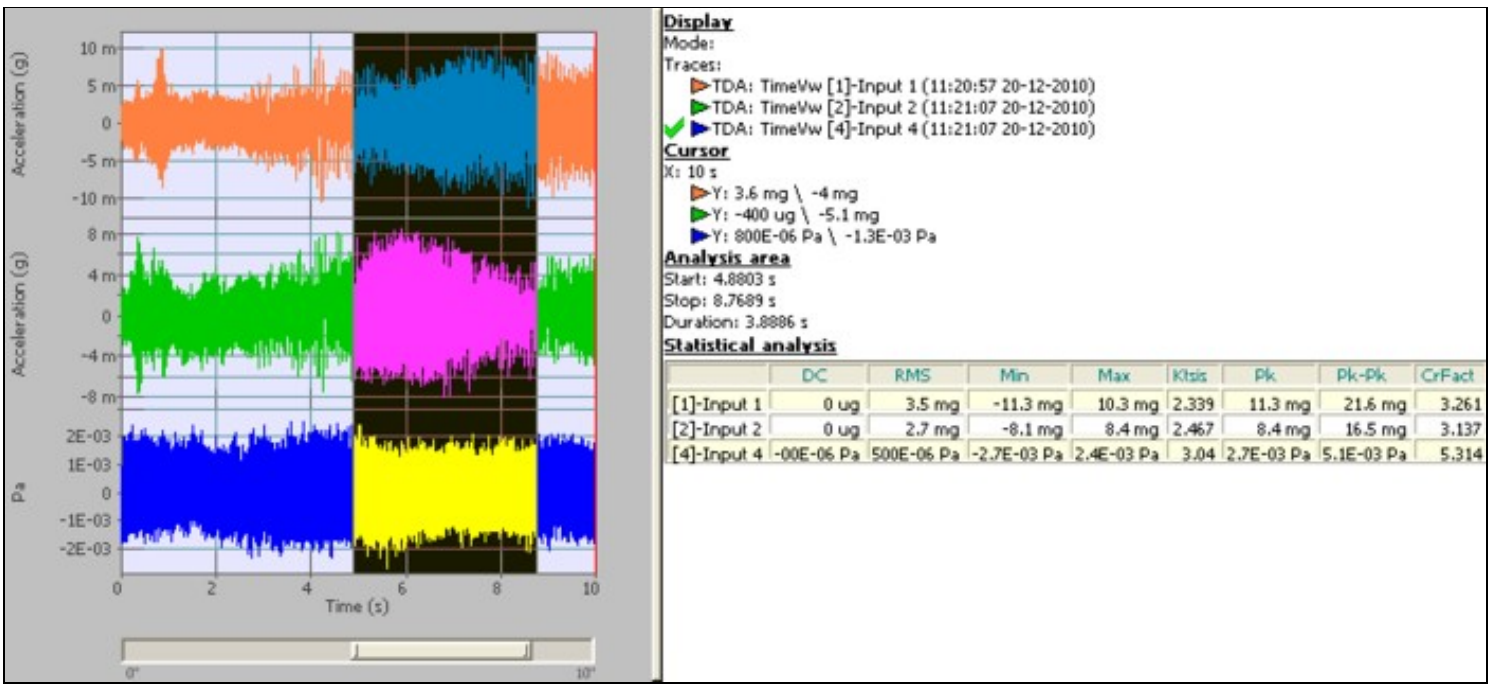


It?s possible to display several TDA channels in same window even if the durations are different. The windows size will be set according to the larger duration.

X zoom is not available at Time View, display is fixed to multi graph.

This window handles 3 cursors:

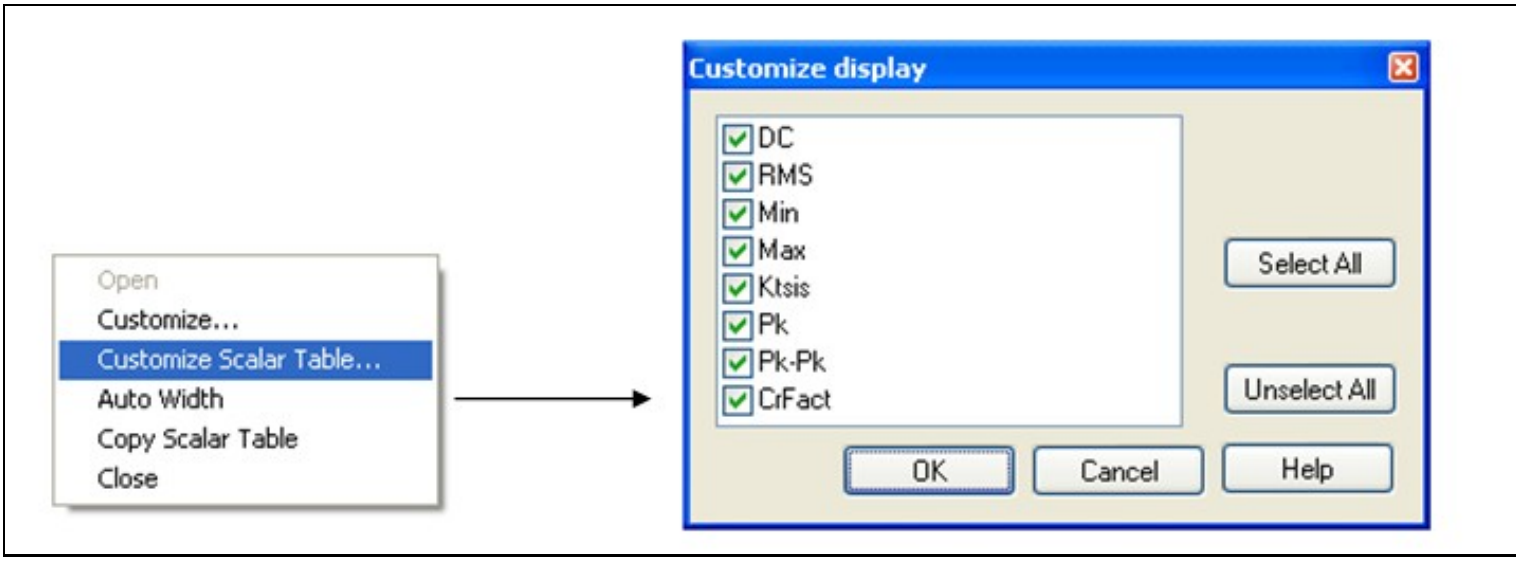
- Main cursor where is retrieved the values displayed at infotrace
- Cursors 1-2 used for selection. The scalar values displayed in the infotrace are computed according to this selection.



	DC	RMS	Min	Max	Ktsis	Pk	Pk-Pk	CrFact
[1]-Input 1	0 ug	3.5 mg	-11.3 mg	10.3 mg	2.339	11.3 mg	21.6 mg	3.261
[2]-Input 2	0 ug	2.7 mg	-8.1 mg	8.4 mg	2.467	8.4 mg	16.5 mg	3.137
[4]-Input 4	-00E-06 Pa	500E-06 Pa	-2.7E-03 Pa	2.4E-03 Pa	3.04	2.7E-03 Pa	5.1E-03 Pa	5.314

Scalar table may be setup to add / remove scalar that may be displayed:

Content of Scalar Table could be copy to export to another application.



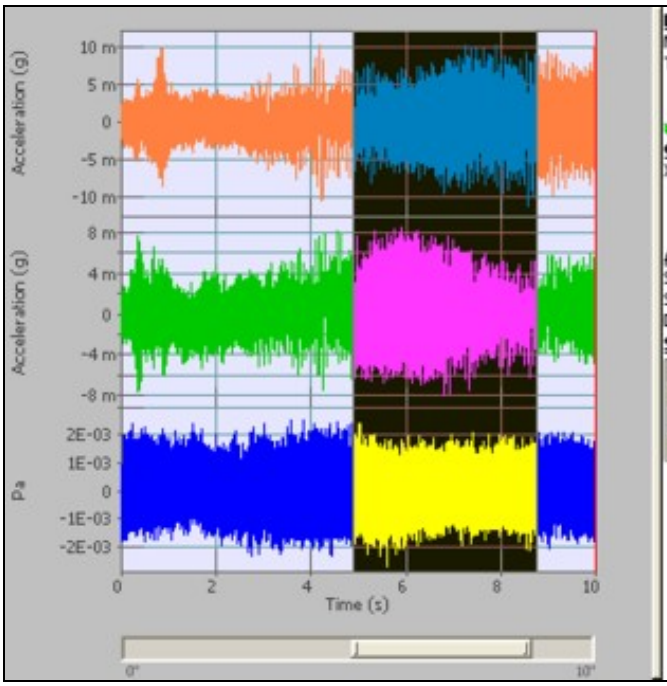
The setup of the monitored duration determines the analysis steps. These steps are indicated in the *Time base* states. The *Time base* is the time interval for each new point in the *Time view* signal. The time view duration is settable from 320 ms to 100 000 s (27 hours) with a 20 kHz bandwidth.

The minimum duration depends on the plug-in bandwidth. For example at 20 kHz with a duration of 10.24 sec, the *Time base* is set at 5 ms. A new point in the *Time view* will occur each 5 ms and the maximum number of points in the graph will be 2048.

The X axis can be either absolute (real date/time) or relative (in buffer duration). It can be changed during acquisition. The default type is relative; it may be changed through the user?s preferences.

In addition to the signal overview, the *Time view* provides statistic extraction of a part of the displayed signal. The extraction takes into account the signal defined in the selected area (reverse video). The results of this extraction are available in the info trace. The following levels are computed in the selected area:

- DC
- RMS (root min square)
- Min. (minimum) lowest amplitude
- Max (maximum) highest amplitude
- Ktsis (kurtosis) 3rd order moment
- Pk (peak) absolute value of the largest amplitude
- Pk-Pk (peak-peak) largest excursion
- CrFact (crest factor) Pk-Pk/RMS
- Kurtosis



Display
Mode:
Traces:
TDA: TimeVw [1]-Input 1 (11:20:57 20-12-2010)
TDA: TimeVw [2]-Input 2 (11:21:07 20-12-2010)
TDA: TimeVw [4]-Input 4 (11:21:07 20-12-2010)

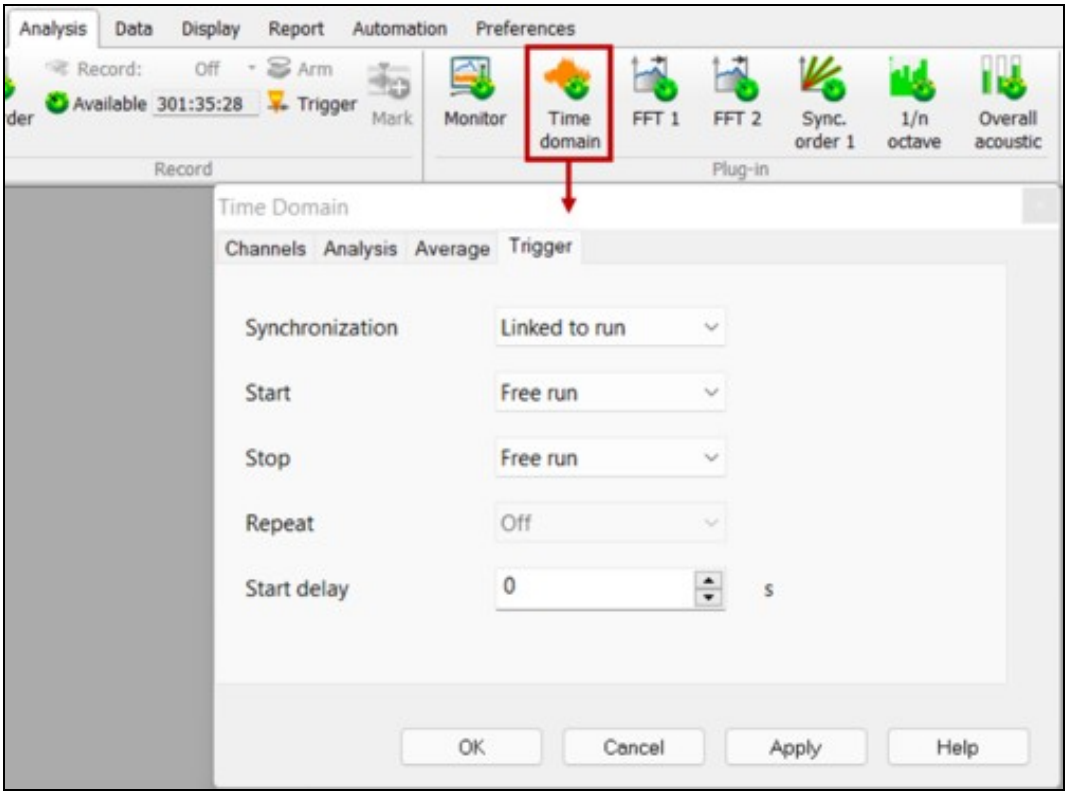
Cursor
X: 10 s
Y: 3.6 mg \ -4 mg
Y: -400 ug \ -5.1 mg
Y: 800E-06 Pa \ -1.3E-03 Pa

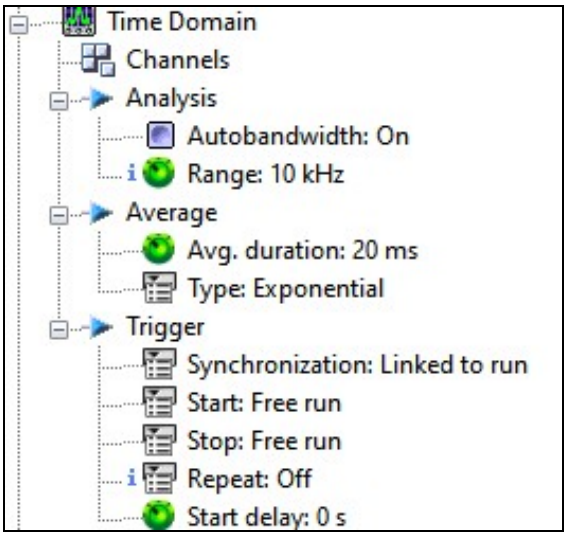
Analysis area
Start: 4.8803 s
Stop: 8.7689 s
Duration: 3.8886 s

Statistical analysis

	DC	RMS	Min	Max	Ktsis	Pk	Pk-Pk	CrFact
[1]-Input 1	0 ug	3.5 mg	-11.3 mg	10.3 mg	2.339	11.3 mg	21.6 mg	3.261
[2]-Input 2	0 ug	2.7 mg	-8.1 mg	8.4 mg	2.467	8.4 mg	16.5 mg	3.137
[4]-Input 4	-00E-06 Pa	500E-06 Pa	-2.7E-03 Pa	2.4E-03 Pa	3.04	2.7E-03 Pa	5.1E-03 Pa	5.314

133.1.2 Settings





- **Synchronization:** Controls the plug-in synchronization with the general analyzer status:
- **Linked to run:** The plug-in is controlled by the general Run / Pause / Stop controls. It operates synchronously with the Other plug-in (except the Monitor)
- **Free run:** The plug-in runs continuously independently from the general Run/Pause/Stop. Note: The start/stop trigger continue to control the plug-in processing
- **Range:** Setup the analysis range for the plug-in. This value is maximized by the front-end sampling frequency divided by 2.56.
  Note: Each plug-in feature an independent bandwidth.
- **Average:** Setup Average type for the statistic extraction. It can be exponential with a sliding decay or linear. Multiple linear averaging are obtained by setting the *TDA/Trigger/Repeat to : End of averaging*
- **Average duration:** Setup the average duration. In Exponential mode it specifies the non decayed part of the signal. In linear mode, it specifies the complete duration. In Linear repeated mode, it specifies the short duration.

133.1.2.1 Channel

Contains the settings related to the source input.

- **Source**: input source to be analyzed. It may come from the input Front-end or from the Player in the post analysis mode (see the post analysis chapter). In the post analysis mode, the tracks with a signal bandwidth lower than the range of the TDA cannot be plugged.
- **Input filter**: filter to be used for filtering the source before analysis. The Filters that are not compatible with the TDA range cannot be selected (see the Filter builder chapter).
- **Duration:** duration of the viewed signal. Minimum value depends on TDA frequency range analysis (360ms for 20kHz bandwidth analysis) whereas maximal value can be up to 100000s. The duration of the viewed signal is independent for each channel.

This setting affects only the Time View, not the scalar results.

- **Time Base:** this read-only setting is the duration of one displayed point in the time view. Time view display is set to a fixed size of 2048 points. Time base is evaluated according to the formula:

$$\text{Time Base} = \text{Duration} / 2048$$

For a duration of 10 s , Time Base corresponds to 4.882812 m.

133.1.2.1.1 Analysis

- **Autobandwidth**: manages the analysis and recording bandwidths automatically. The Inputs selection window allows the use of 2 different sampling rates for the dynamic inputs. It gathers inputs with the same physical quantity into groups, maintaining the same sampling into each group. When inputs are associated with the analysis plug-in, it adjusts its analysis bandwidth to match the inputs ones. Mixing input bandwidths in one analysis plug-in lead to set its bandwidth to the lowest one. Autobandwidth is set by default . When it is enabled in the plug-in, these settings "switch to informative status"

- **Range:** the TDA plug-in frequency range. The analyzer sampling frequency divided by 2.56 limits this range, and the minimum is obtained by dividing this limit by 50000. For example, if the analyzer sampling frequency is 51,2kS/s, then the max range is 20 kHz and the min is 400mHz. In post analysis mode, the Max Bandwidth setting from the Player plug-in provides the analyzer sampling frequency by multiplying the value by 2.56 (ex: if max bandwidth = 20 kHz then the analyzer sampling frequency is 51.2kS/s), otherwise, the analyzer sampling frequency is provided by the input sampling setting from the Front end plug-in input setting sub-module.

133.1.2.1.2 Average

- **Average:** Setup Average type for the statistic extraction. It can be exponential with a sliding decay or linear. Multiple linear averaging are obtained by setting the *TDA/Trigger/Repeat to : End of averaging*

- **Type:** The method of averaging the signal. There are four different averaging modes: Linear, Exponential, Peak hold, and Referenced Peak hold.

Type	Description
Linear	Linear averaging of results is carried out on the value of the Duration from the same sub-module. The TDA plug-in automatically stops when the duration is reached.
Exponential	In this mode of computation, averaging is continuously updated each 256 samples. All scalar results DC, RMS, Min, Max, Peak, Peak-Peak, Kurtosis, are reset with a periodicity equal to the duration of results is carried out on the value of the Duration from the same sub-module. The TDA plug-in automatically stops when the duration is reached.

event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Stop" condition.

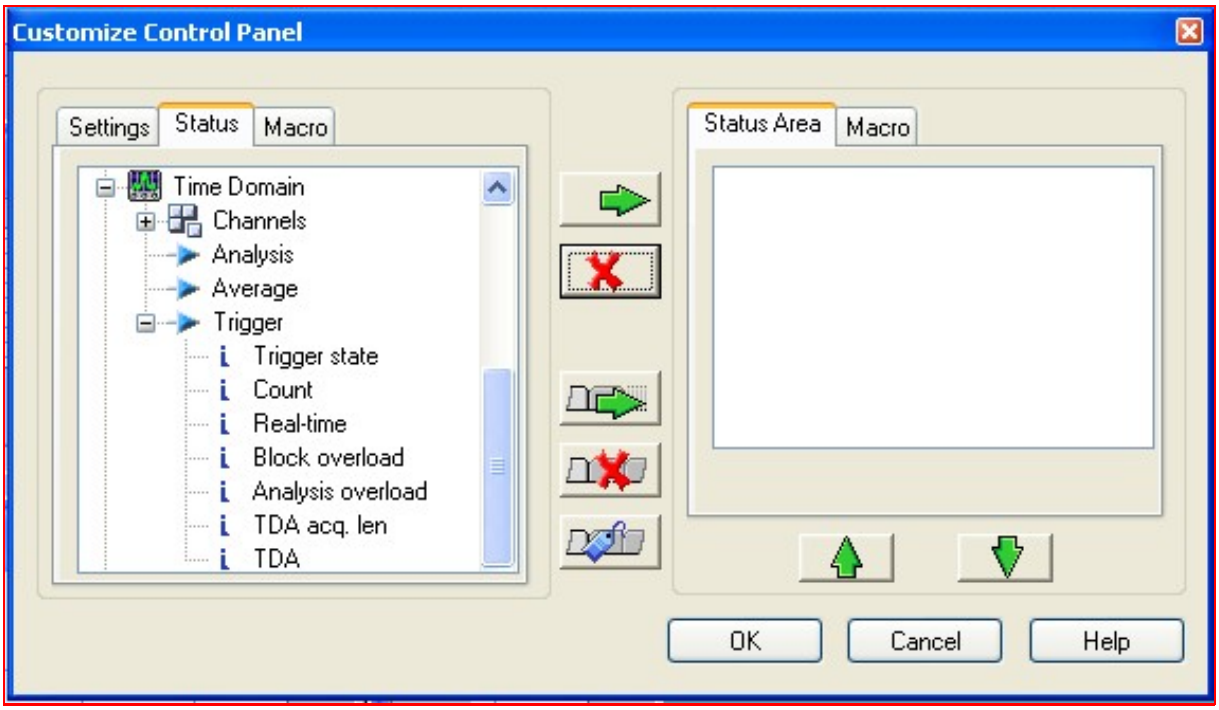
- **Duration**: The duration of the signal used to compute the scalar results available as result. Results are delivered each 256 samples.:This setting affects only the Time View, not the scalar results.

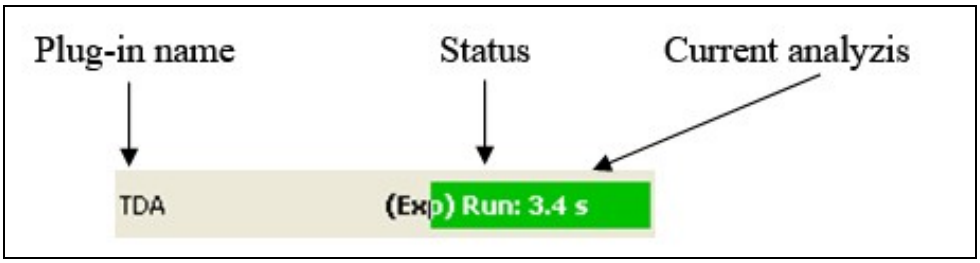
133.1.2.1.3 Trigger

- **Synchronization**: Controls the plug-in synchronization with the general analyzer status:
    - **Linked to run:** The plug-in is controlled by the general Run / Pause / Stop controls. It operates synchronously with the Other plug-in (except the Monitor)
    - **Free run:** The plug-in runs continuously independently from the general Run/Pause/Stop. Note: The start/stop trigger continue to control the plug-in processing. In Free Run mode, the average is forced to Exponential.
- **Start:** defines the event to start the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Start" condition.
- **Stop:** defines the event to stop the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Stop" condition.
- **Repeat:** this setting is used to select a condition for the TDA plug-in to be restarted. If an event is selected as a Start event, the option "New start" is available, and when this mode is selected each Start event restarts the plug-in. The "End of averaging" mode is available when the value of the *TDA /Analysis/Type* is equal to "Linear" mode. This restarts the plug-in when the averaging is finished. For linear average when it is set to "End of averaging", the "Avg duration" gives the periodicity of the average restart. By default the Repeat mode is set to "Off".
- **Start Delay:** time delay applied to the time the start event occurs. The Start Delay could be a negative values to act as a pre-trigger. At default setting of 20kHz analysis, the minimum value for Start Delay is -635ms. The maximum value is 360000s.

133.1.3 TDA status

All statuses are available for the control panel. Statuses are refreshed all the time at roughly 10 Hz.





The current plug-in status is synthesized in a special progress-bar. This progress bar is automatically displayed in the bottom area when the plug-in is active (i.e. as soon as at least 1 input is connected to the TDA plug-in). This status is called ?TDA? and it is available in the status ASB tree (see customize control panel).

This status displays the status and current time, the plug-in state and the real-time status.

- **Run:** the TDA plug-in is computing data and average it
- **Stop:** The TDA plug-in is stopped.
- **Trig:** The TDA plug-in is waiting for next block; i.e. next trigger event (block triggering) or first start event (triggering)
- **Pause:** The TDA plug-in averaging is paused
-

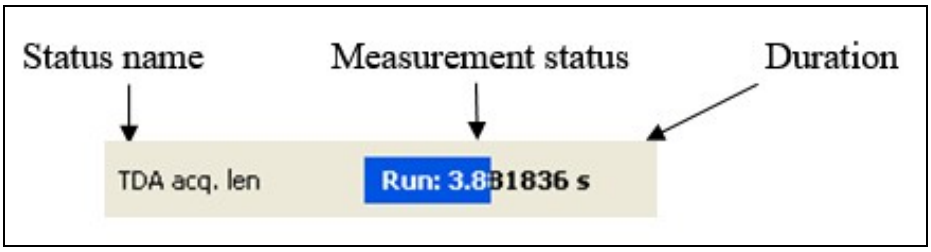
Notes: in exponential averaging mode the average counts stops increasing as soon as the set value is reached.

The way the status bar is displayed, depends on the type of averaging selected:

- **?Linear?:** the progress bar is filled from left to right.
- **?Exponential?**: the progress bar is filled from right to left with a flashing until the end of the acquisition.

The color of the background bar and of the text depends on real-time status:

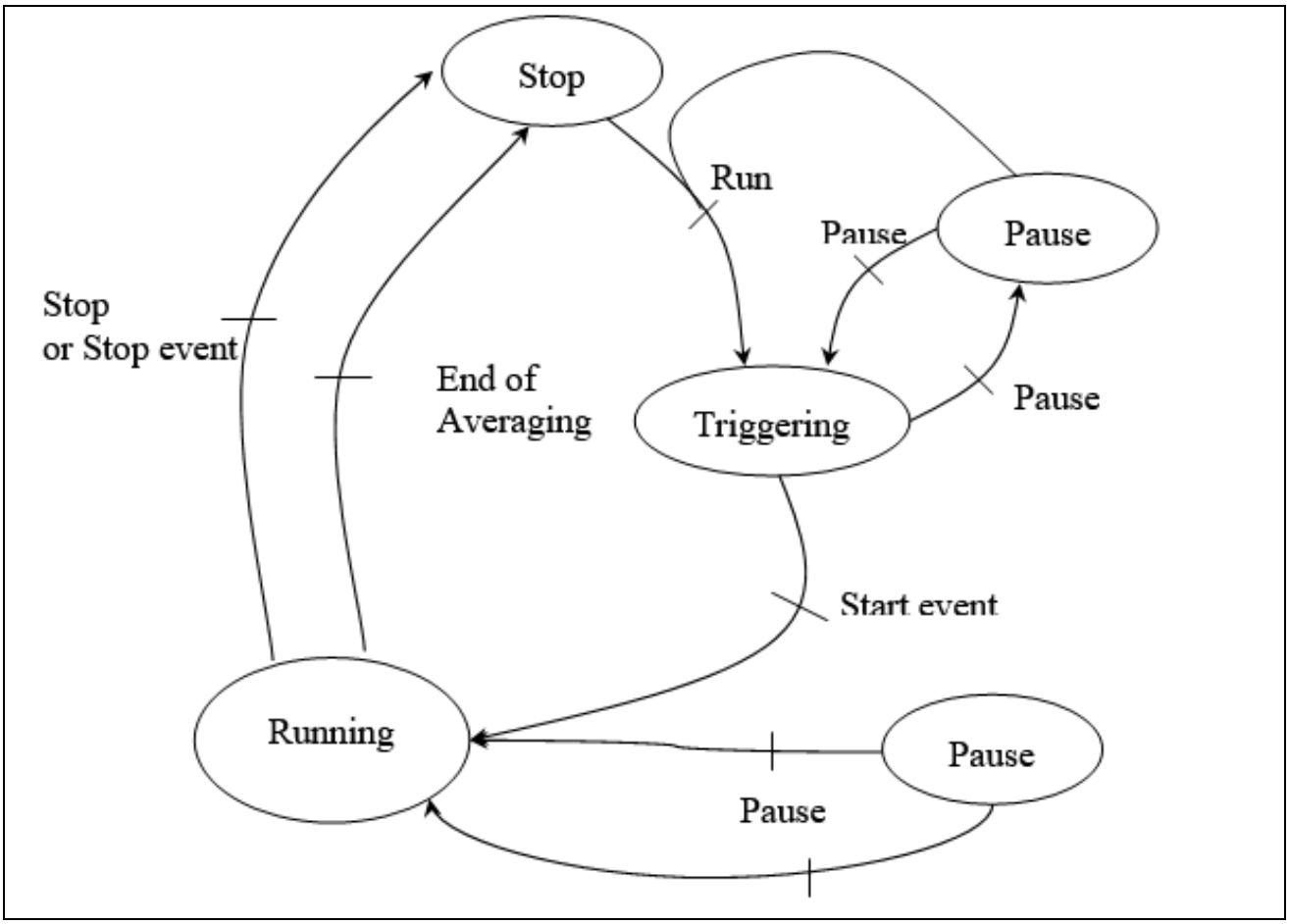
- *Green background and white or black text*: acquisition in real-time.
- *Red background and white or black text*: the current acquisition is not real-time (current block is not analyzed).
- *Green background and red text*: the current acquisition is real-time, but since start not all the blocks were analyzed.



This status displays the progression of the measurement in duration

Trigger State

The following scheme describes the basic statuses evolution of the TDA measurement:



By default the trigger state is on ?Stop? and waiting for a ?Run? (start or trigger). Then the state become ?Triggering? and is waiting for a start event, the states become ?Running?.

The TDA plug-in can run either in the standard plug-in synchronization or totally free run (see Synchronization setting in the TDA settings). While running in the free run mode, the TDA remain in the running mode (not displayed in the status) until the synchronization is changed.

133.1.3.1 Count

This status displays the averaging duration processed. This status is expressed in seconds.

133.1.3.1.1 Real-time

This status displays if the averaging is in real-time or not (i.e. the current block is analyzed or not). If the corresponding signal were not available at this time, the acquisition is not real-time. That means that the treatment is longer than the acquisition.

There are 3 values for this state:

- **?OK?**: The acquisition is real-time (all block have been processed and averaged)
- **?No?**: Acquisition was not real-time (some previous blocks are missing in the average).
- **?-?**: The acquisition is currently not real-time (current block is not analyzed an averaged).

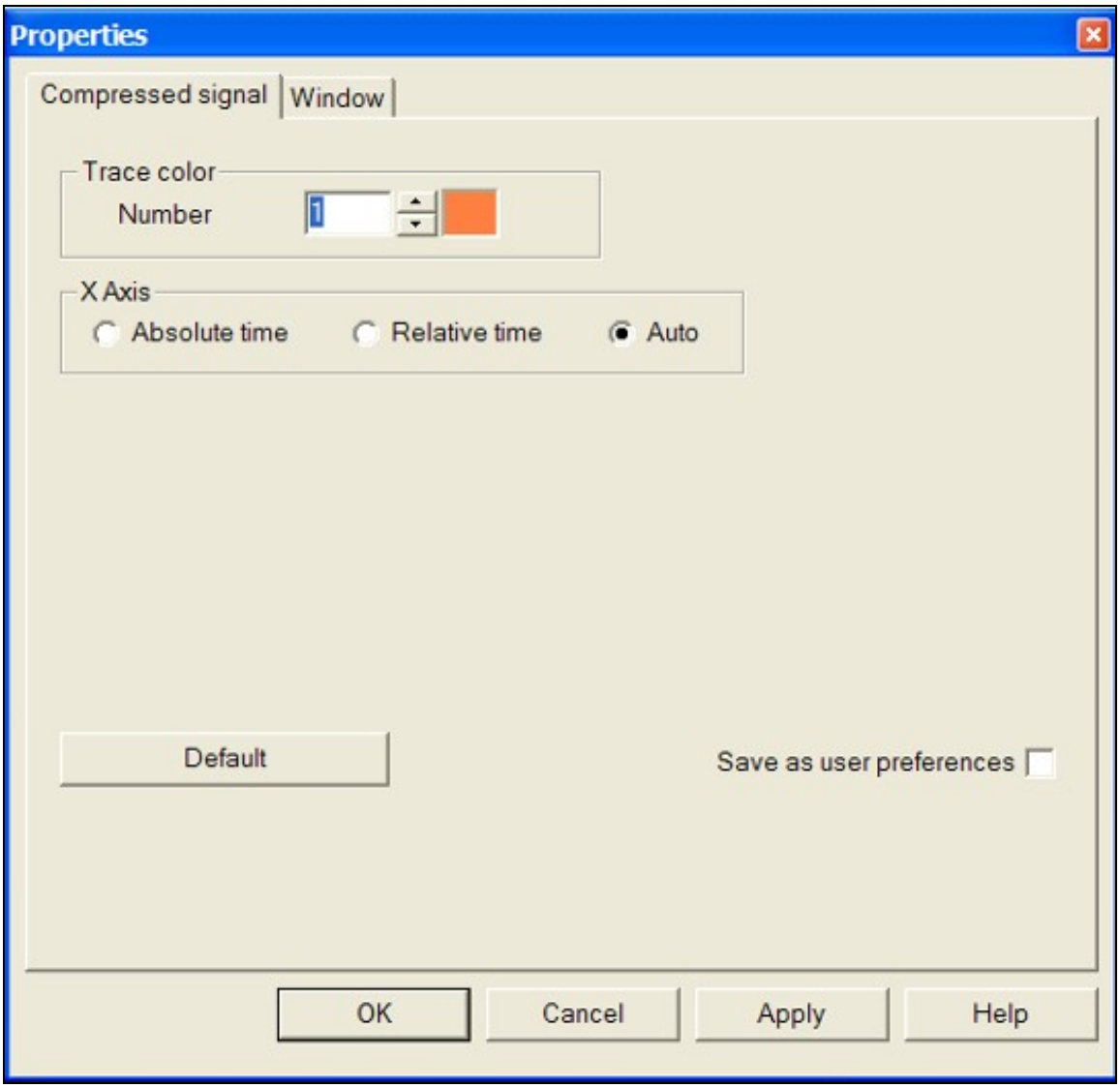
133.1.3.1.1.1 Block overload

This status corresponds to the instantaneous overload indication for TDA plug-in current block, for instance amplitude overload occurred in the current analyzed block.

133.1.3.1.1.2 Analysis overload

This status corresponds to overload indication over the measurement period. It means that during the whole measurement period there was (or not) an overload. It memorizes block overloaded.

133.1.3.1.2 Properties


Properties
Compressed signal
Window
Trace color
Number
1
X Axis
Absolute time
Relative time
Auto
Default
Save as user preferences
OK
Cancel
Apply
Help

- Trace color
- Number: selects the trace number for color modification.
- Color box: click on this box to modify the color of the selected trace.

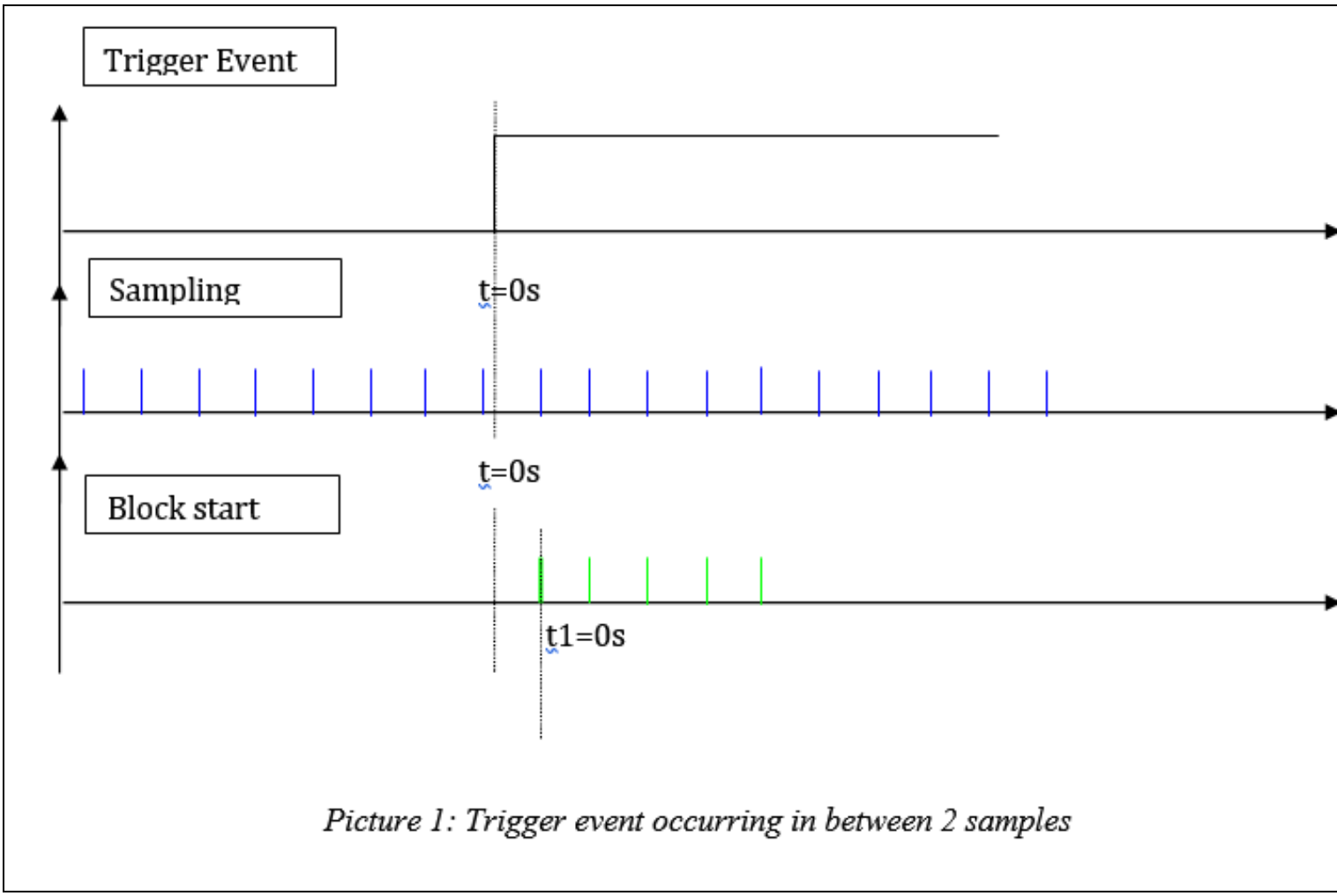
- X Axis
- Absolute time: displays the time from windows format.
- Relative time: displays the duration of the record. The beginning of the record is set to 0.
- Auto: selects absolute or relative time depending on the duration of the record. For records smaller than 2s, the relative time is displayed, for others, the absolute time is chosen.

134 NVGate time shift resampling

Time Shift Resampling with OROS Analyzer and NVGate software

134.1 Introduction

This document intends to highlight internal signal processing of OR3x with regards to phase precision of Time trigger blocks in NVGate. When trigger event occurs in-between two samples of acquisition an error may be introduced in absolute phase measurement of the acquired Time block (see Picture 1). Enhanced signal processing of NVGate allows a user to minimize this error by finding start of trigger even with a much higher precision and performing time shift resampling.



Picture 1: Trigger event occurring in between 2 samples

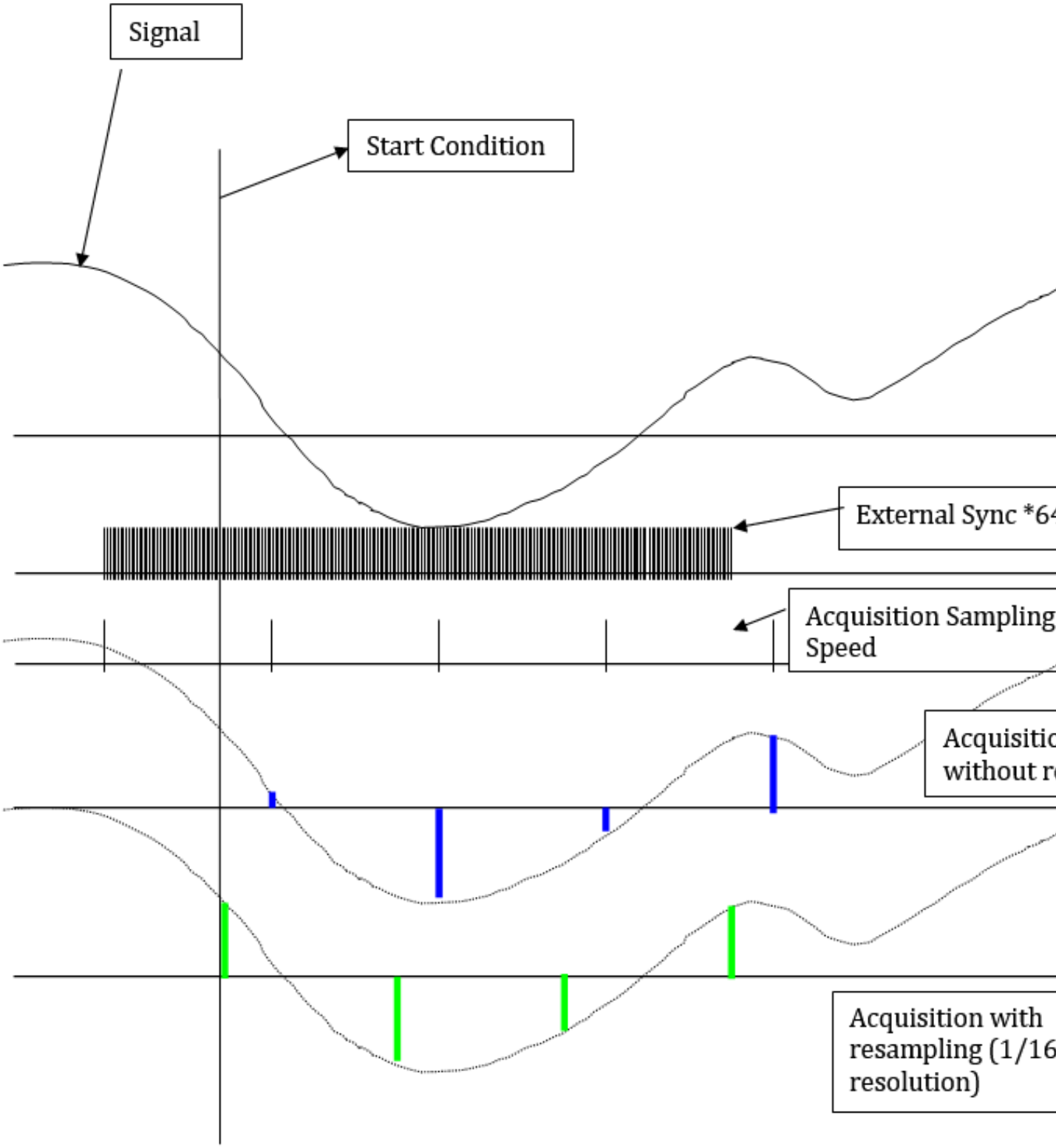
134.1.1 Principles of OR3x enhanced acquisition

134.1.1.1 Oversampled External Sync input

OR3x Front-end features 2 External Sync inputs (2 logic inputs) that have integrated pre-divider enabling oversampling of external trigger channel. For instance, when Input Front End Sampling is set to 102.4kS/s (40 kHz bandwidth) External Sync 1 and 2 have detection precision equivalent to 6.5MHz (#102.4*64). Trigger event resolution therefore increases from 9.7 micro seconds (sample rate @ 102.4 kS/s) to 151 nano seconds.

134.1.1.2 Time Shift Resampling

Enhanced signal processing of OR3x enable phase improvement of trigger block by time resampling of acquired trigger block (at sampling frequency) with a resolution of $1/16^{th}$ of a sample. This is made according to the External Sync precison start event. (See Picture 2)

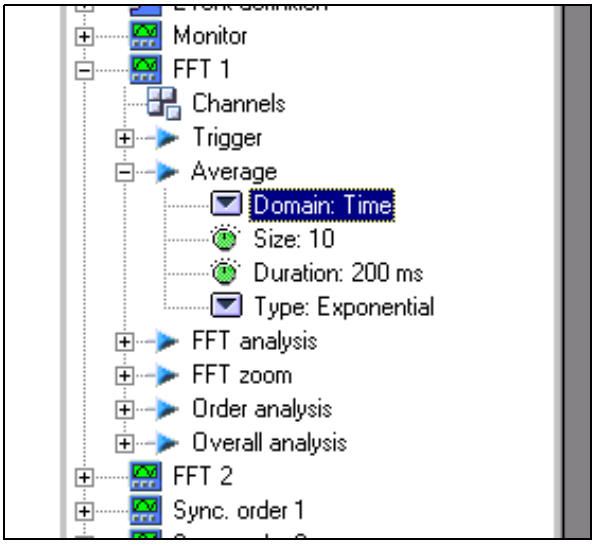


Picture 2: Principle of time shift resampling

134.1.2 Benefits of Time shift resampling

Signal processing for time shift resampling is automatically engaged when "Time" averaging is selected in NVGate FFT plug in (see Picture 3).

When "Time" averaging mode is selected, precision of absolute phase of the trigger block signal is therefore increased by a factor of 16.



Picture 3: Time domain averaging in FFT

134.1.3 Precision calculation:

134.1.3.1 Without time shift resampling

Standard absolute phase error calculation without time shift resampling can be determined as follows (worst case event occurs right after last sample)

$Phase_{error} = (360/2.56)*f/f_e$

Where f is the frequency of interest

f_e is the frequency band of analysis

For instance, for a total analysis band of 20kHz, maximum error at 10kHz frequency will be $Phase_{error} = (360/2.56)*10/20 = 70.3$ deg

134.1.3.2 With Time shift resampling

Standard absolute phase error calculation with Time Shift Resampling can be determined as follow (worst case event occurs right after $1/16^{th}$ of a sample)

$TSR_Phase_{error} = (360/[2.56*16])*f/f_e$

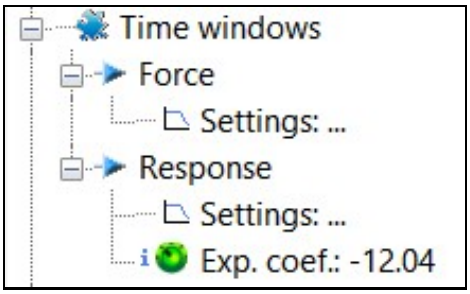
Where f is the frequency of interest

f_e is the frequency band of analysis

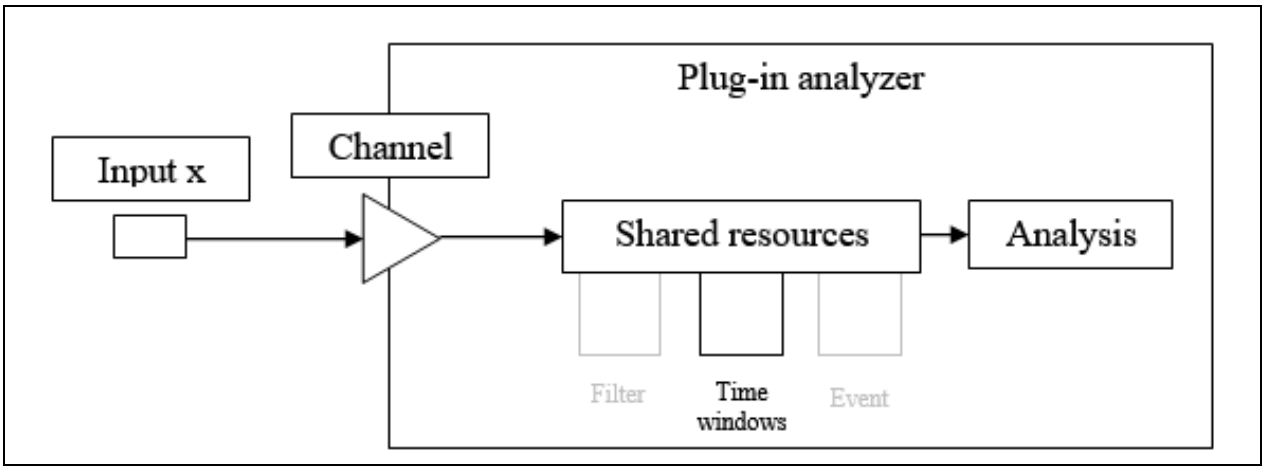
For instance, for a total analysis band of 20kHz, maximum error at 10kHz frequency will be $TSR_Phase_{error} = (360/[2.56*16])*10/20 = 4.4$ deg

NOTE : Time shift oversampling does not affect the phase match between channels (10V range, 0 to 20kHz , +/- 0.02deg on OR36-OR38) it only improves absolute phase information of acquired time block.

135 NVGate Time windows



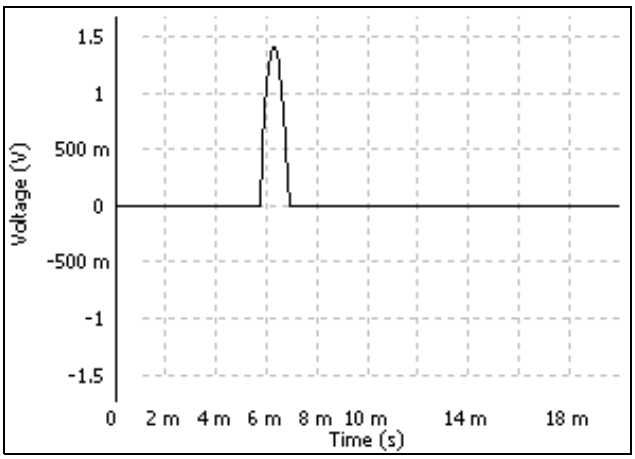
Used to define time weighting windows that can be applied to FFT blocks.



135.1 Video tutorial

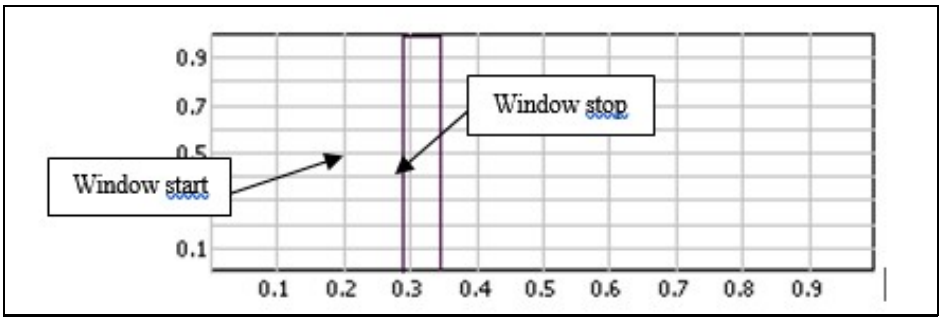
135.1.1 Force

This setting is generally used to set up a uniform time window around the interesting part of the signal such as hammer impact, for example.



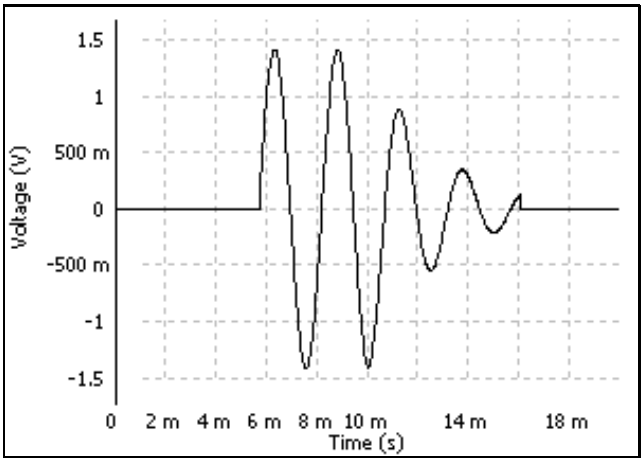
- **Window Start**: Starting point of the window as a percentage of the triggered block size of the plug-in using the window. The block size is the plug-in resolution setting value multiplied by 2.56. ex: for 401 lines resolution the triggered block size is 401*2.56 = 1024 samples.
- **Window Stop**: Stopping point of the window in percentage of the triggered block size of the plug-in using the window. The block size is the plug-in resolution setting value multiplied by 2.56. ex: for 401 lines resolution the triggered block size is 401*2.56 = 1024 samples.

Note: it is possible to adjust the start and stop values graphically by using drag and drop on the graph.



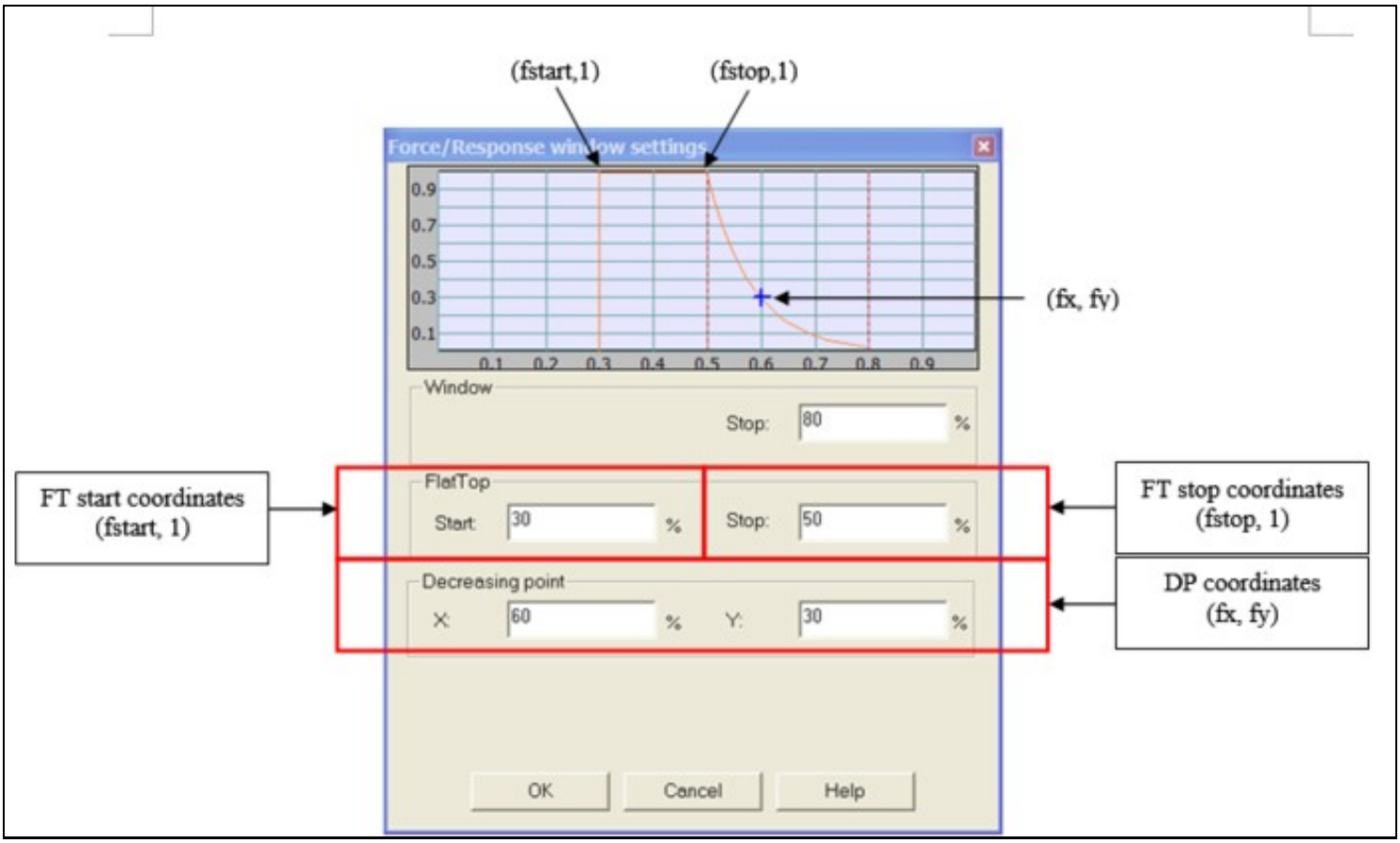
135.1.1.1 Response

This setting is generally used to set up a uniform time window around the interesting part of the signal such as the response of an accelerometer after a hammer impact, for example.



- **Window Stop**: Stopping point of the window as a percentage of the triggered block size of the plug-in using the window. The block size is the plug-in resolution setting value multiplied by 2.56. ex: for 401 lines resolution the triggered block size is 401*2.56 = 1024 samples.
- **Flat top Start**: Starting point of the window flat top as percentage of the triggered block size of the plug-in using the window. The block size is the plug-in resolution setting value multiplied by 2.56. ex: for 401 lines resolution the triggered block size is 401*2.56 = 1024 samples.
- **Flat top Stop**: Stopping point of the window flat top as a percentage of the triggered block size of the plug-in using the window. The block size is the plug-in resolution setting value multiplied by 2.56. ex: for 401 lines resolution the triggered block size is 401*2.56 = 1024 samples.
- **Decreasing point X**: Abscissa of the intermediate point that determines the decreasing coefficient of the exponential function as a percentage of the triggered block size of the plug-in using the window. The block size is the plug-in resolution setting value multiplied by 2.56. ex: for 401 lines resolution the triggered block size is 401*2.56 = 1024 samples.
- **Decreasing '***point Y*': Ordinate of the intermediate point that determines the decreasing coefficient of the exponential function as a percentage of the value of the signal.

$$\text{Exp coeff} = \frac{\ln(fy)}{(fx - fstop)}$$ Fy, fx and fstop are described below

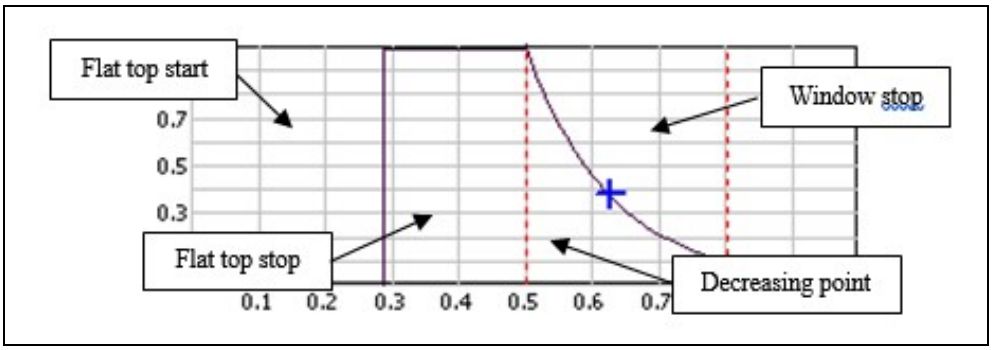


- **Exponential coefficient**: this coefficient is calculated with the coordinates of Decreasing point Y and Decreasing point X.

In this example, it then gives

$$\text{Exp coeff} = \frac{\ln(0{,}3)}{(0{,}6-0{,}5)} = -12{,}04$$

Note: a time window can be applied to several plug-in analyzer channels. The modification of the time window values will be applied to all the channels the time window is active.



Note: it is possible to adjust the values graphically by using drag and drop on the graph.

136 NVGate Tools: AutoReport

Start NVGate directly with a model and a Microsoft report directly set. This is useful for operators in production environments.

136.1 Download

Here

Compatible with NVGate V12.00 or upper.

136.1.1 Presentation

This program will automatically:

1) Launch NVGate in connected mode

2) Create a copy of a word or excel document and open it

3) Open an NVGate Project

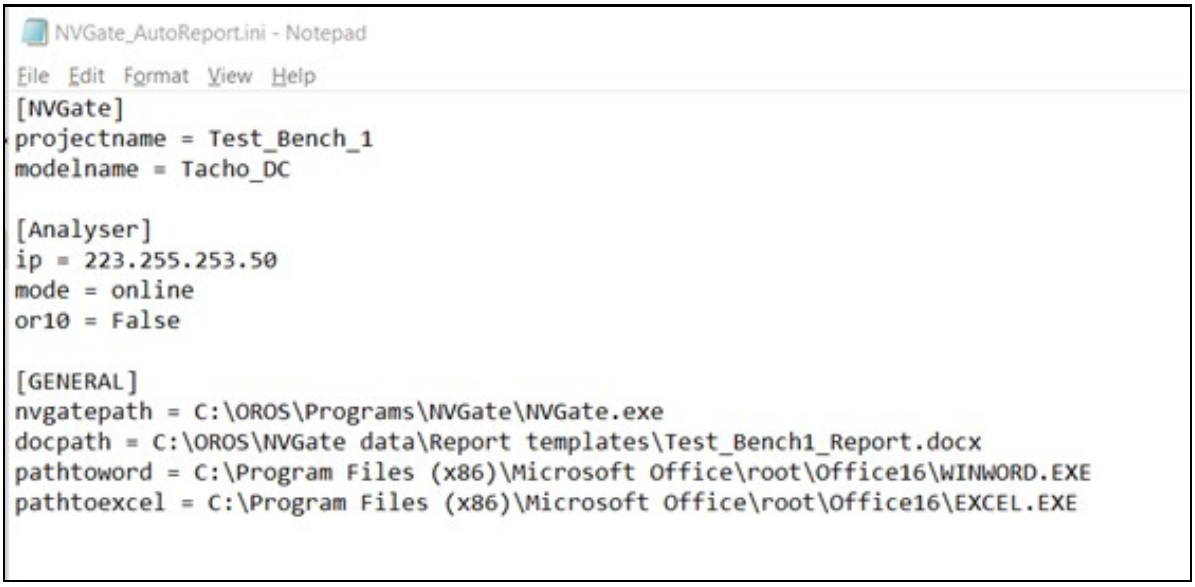
4) Load an NVGate Model

5) Select the opened document in the report Tab

The Refresh.exe, Refreshandprint.exe and RefreshAndSave.exe can be used in a Macro to automatically update and save the report.

136.1.2 Configuration

1) Configure the initialization file (.ini) with notepad.



Tips: To connect with an OR10, type ?or10=True? and use the following IP: 192.168.150.28.

To connect with an OR3X analyzer, the ?DHCP server? option of the analyzer must be disabled.

For both OR3X and OR10, your computer must have a fixed IP address.

? 2) Put the NVGate_AutoReport.exe next to the .ini and launch it. You may create a shortcut to this application on the desktop of your computer.

136.1.3 Bonus:

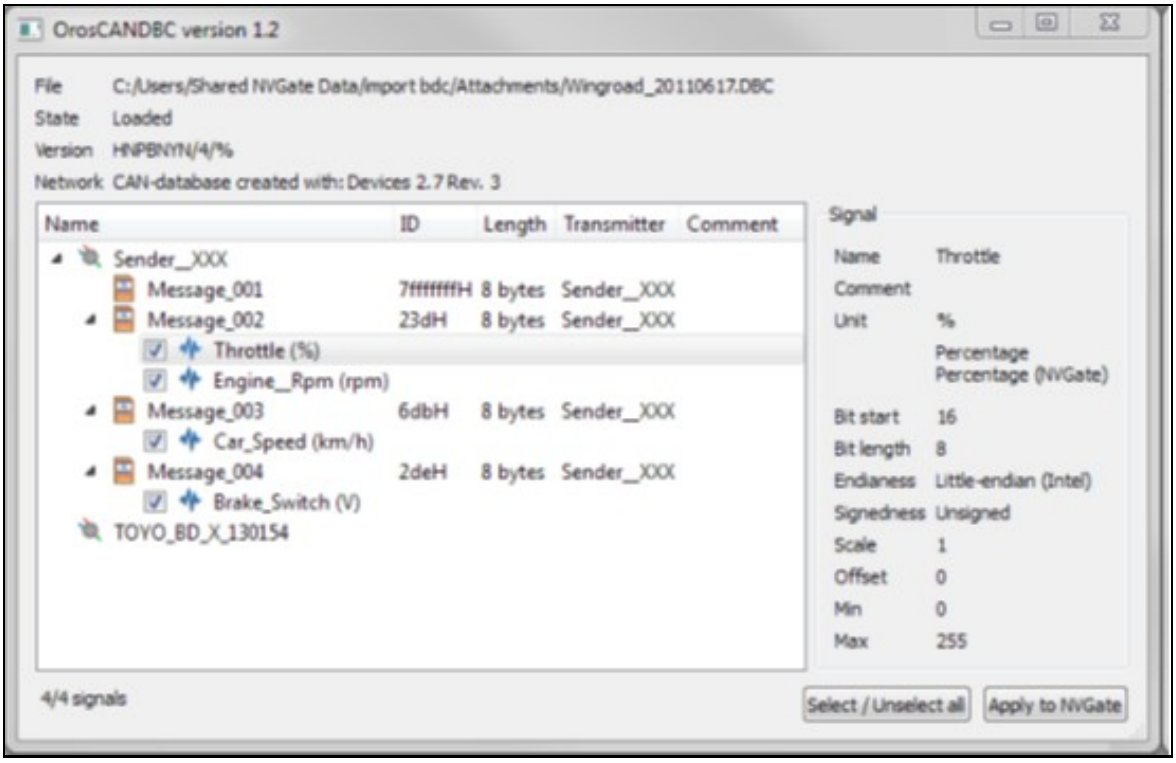
You can put Refresh.exe, RefreshAndSave.exe, and Refreshandprint.exe in C:\OROS\NVGate data\Links.

Refresh will refresh the word/excel document. RefreshAndSave will save the report as ?Current Name + Version_N? Refresh and print will refresh and print the word excel document.

Tips: Select .pdf creator as a default Windows OS printer.

137 NVGate Tools: CanBus Import .dbc

OrosCANDBC software allows importing CAN databases in NVGate. This 3rd party software reads the .dbc file and adjusts the CAN channels in NVGate accordingly.



Download: import .dbc V1.7 from January 2023

Compatibility : NVgate V12 or upper

The software is available for CAN option owners.

Simply unzip and copy the files in your program directory next to NVgate.exe.

137.1 How to use

Open NVGate

Open the oroscandbc.exe

Select the .DBC file

Select the channels

Aplly the channels.
==> channels are directly import into NVGate.

138 NVGate Tools: EditSignal

The "Edit Signal" allows a user to edit part of time signal. It does not affect the initial signal file data. It creates a new file according to the requested modification.

138.1 Package composition installation

Download : Here

- NVGate add-on tool "Edit Signal": *EditSignal.exe*
- It is advised to put the Add-on tool within the NVGate Link Directory "C:\OROS\NVGate data\Links"
- Compatible with NVgate V12.00 or later.

138.2 Video Presentation

138.3 Edit Signal Overview

The "Edit Signal" allows a user to edit part of time signal. It does not affect the initial signal file data, and creates a new file according to the requested modification.

Edit signal should be done according to this step by step procedure:

1- Load and preview signal, only the signal window should be opened

2- Start the "Edit Signal" Add on, from Link

3- Select a mode from Edit Signal

- Zero : Remove all data, set to "zero" for selected part of current track
- Zero All : Remove all data, set to "zero" for selected part of all tracks
- Mean : Interpolate data from selected part of current track
- Cut all : Remove a selected part for all tracks

4- Apply "Free Marker"

5- Compute new Signal

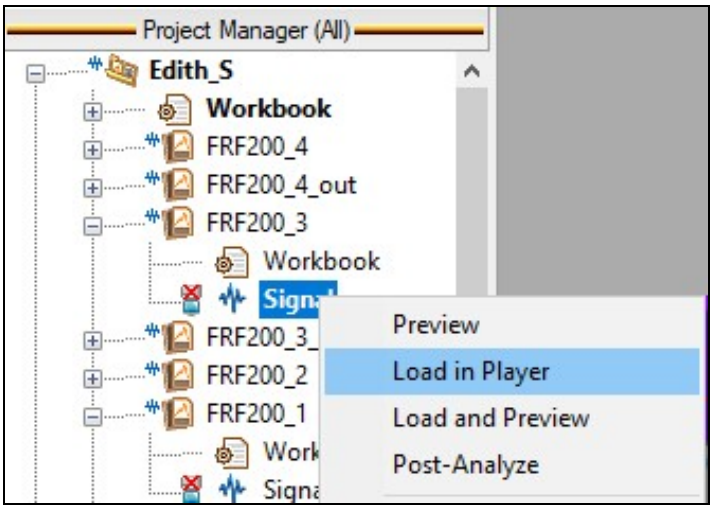
It is possible to affect several parts of signal with loop on steps "3-4" before computing a new signal.

138.4 How To Use

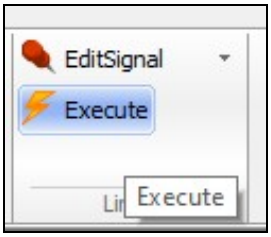
Step by step overview

Edit signal should be done according to the step by step procedure:

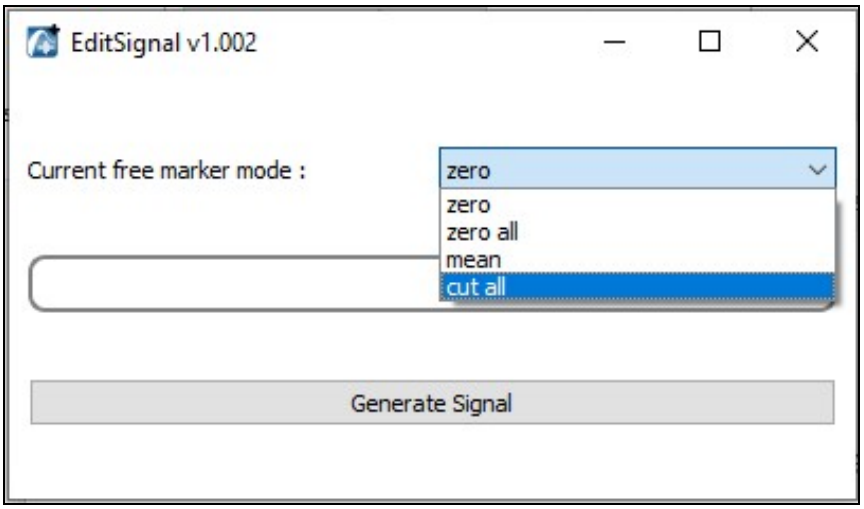
1- Load and preview signal, only the signal window should be opened:



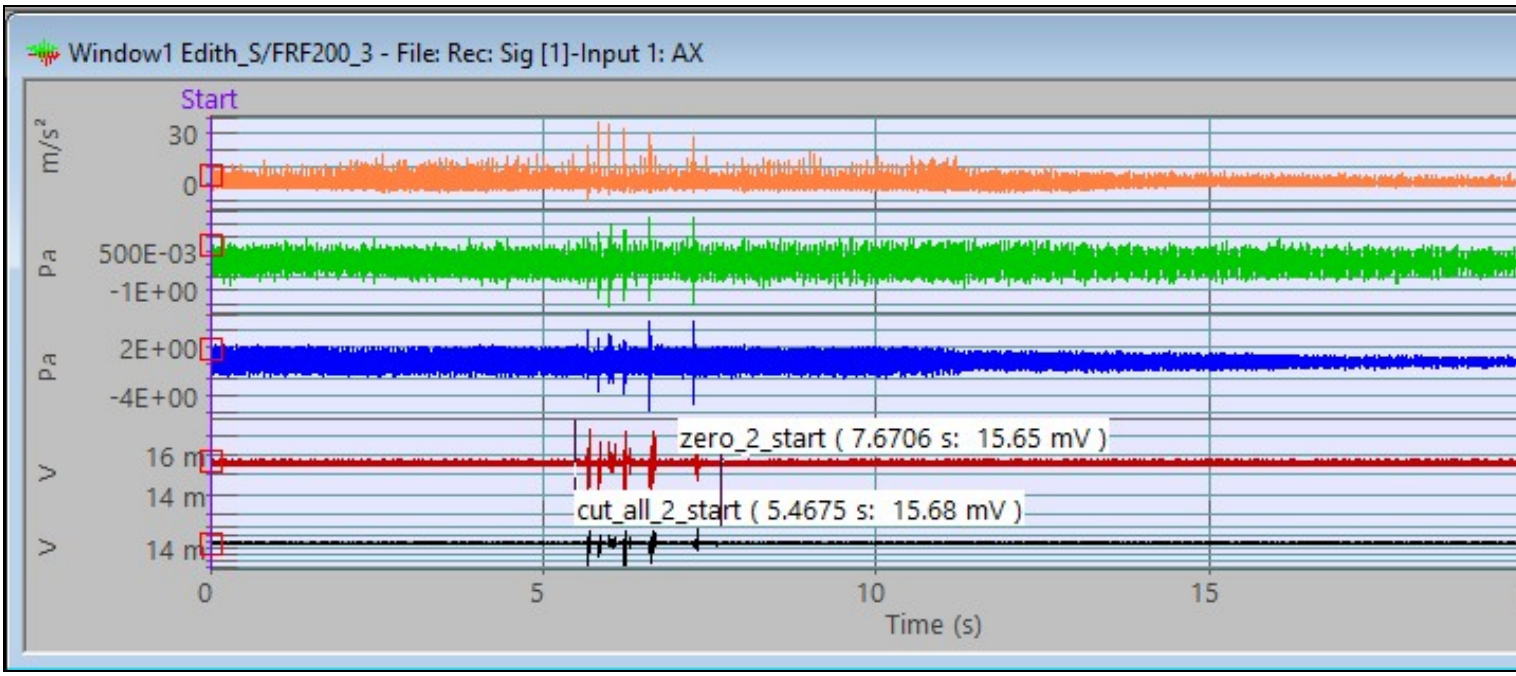
2- Start the "Edit Signal" Add on, from Link toolbar:



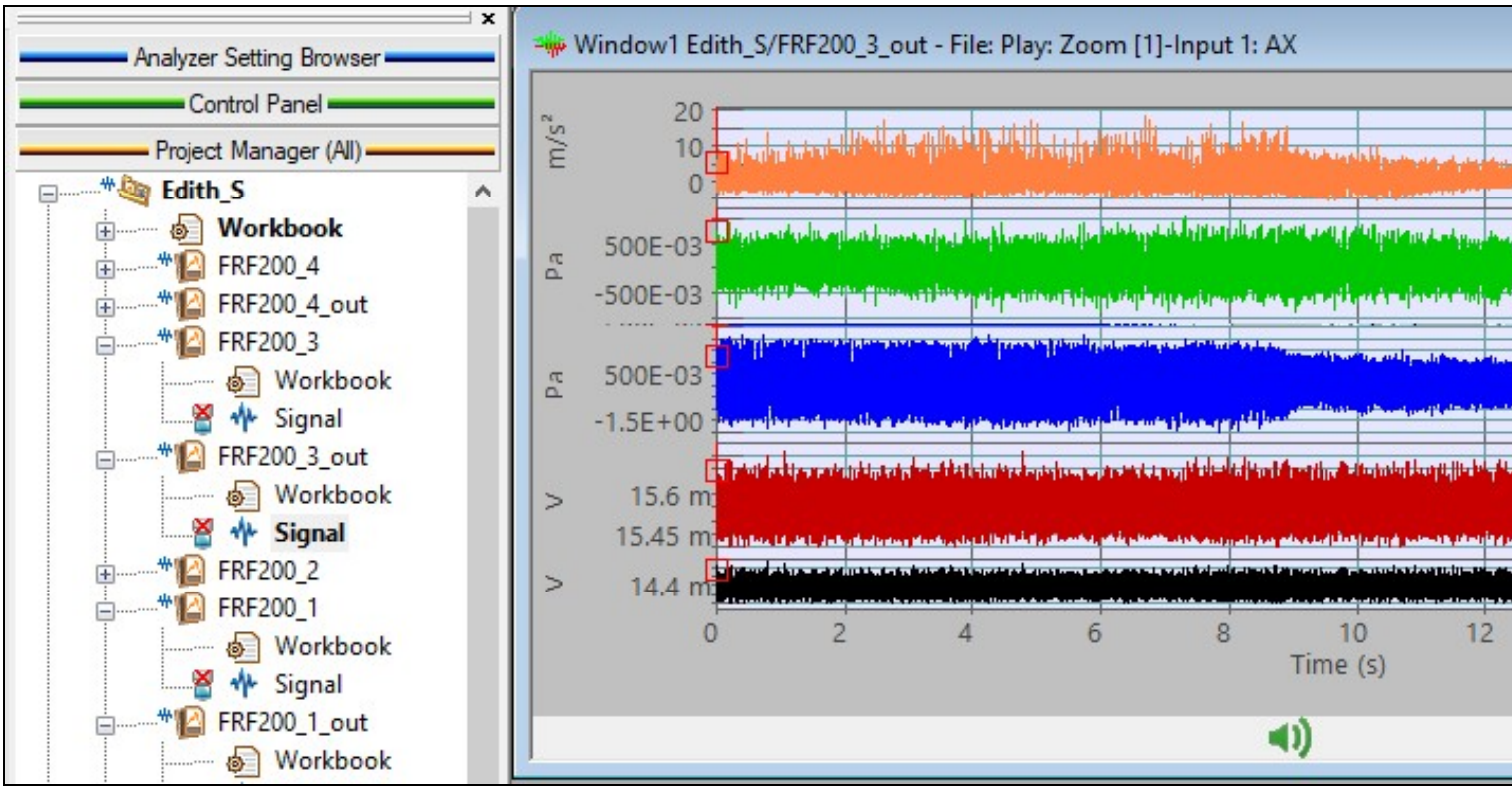
3- Select mode from Edit Signal:



4- Apply "Free Marker" to select area to "cut":



5- "Generate Signal"

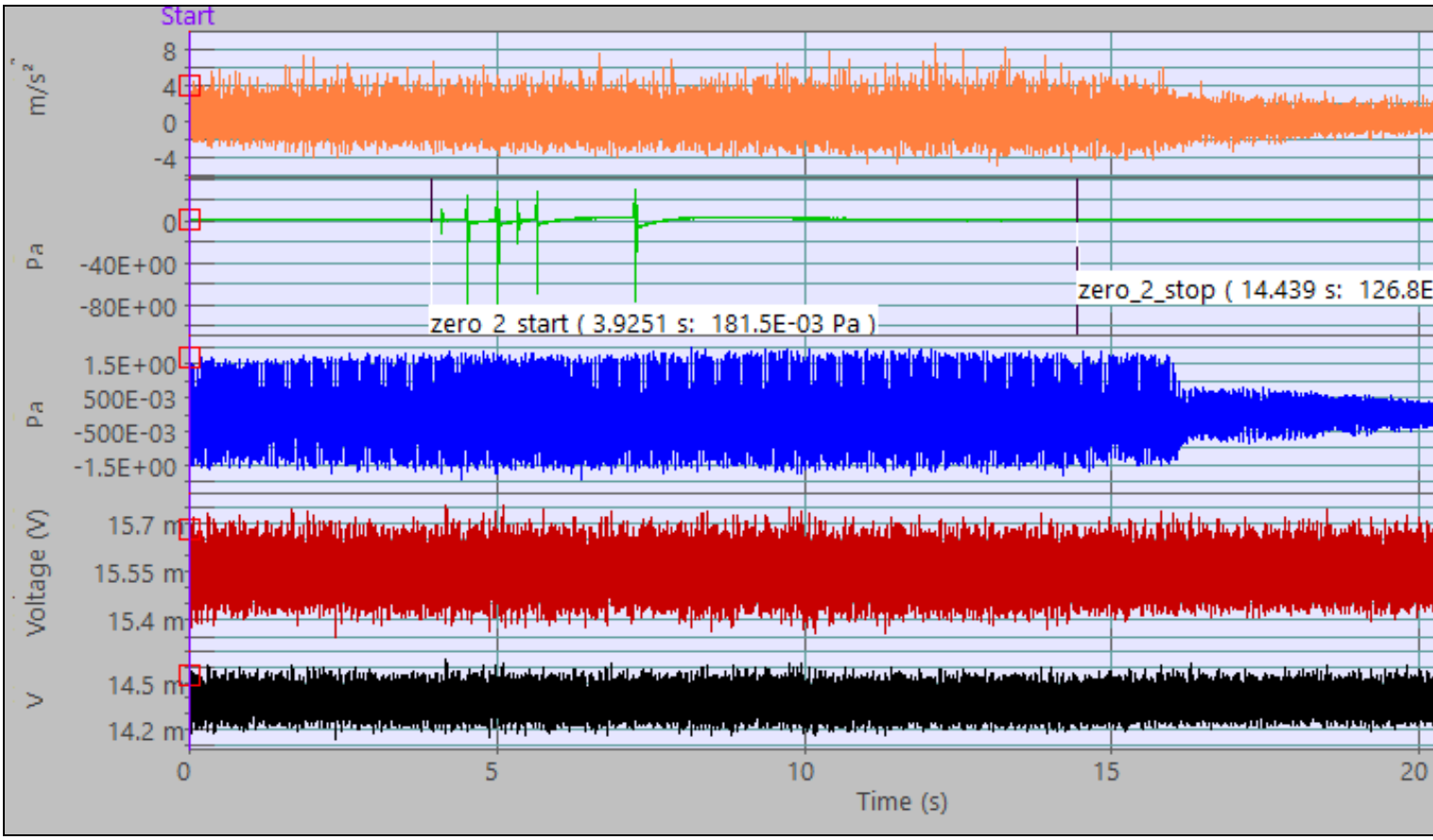


A new file is generated within the same project as the original signal file. For example, signal file "FRF200_3_out" has been created after cutting selected part of signal "FRF200_3"

138.5 Edit Signal Options

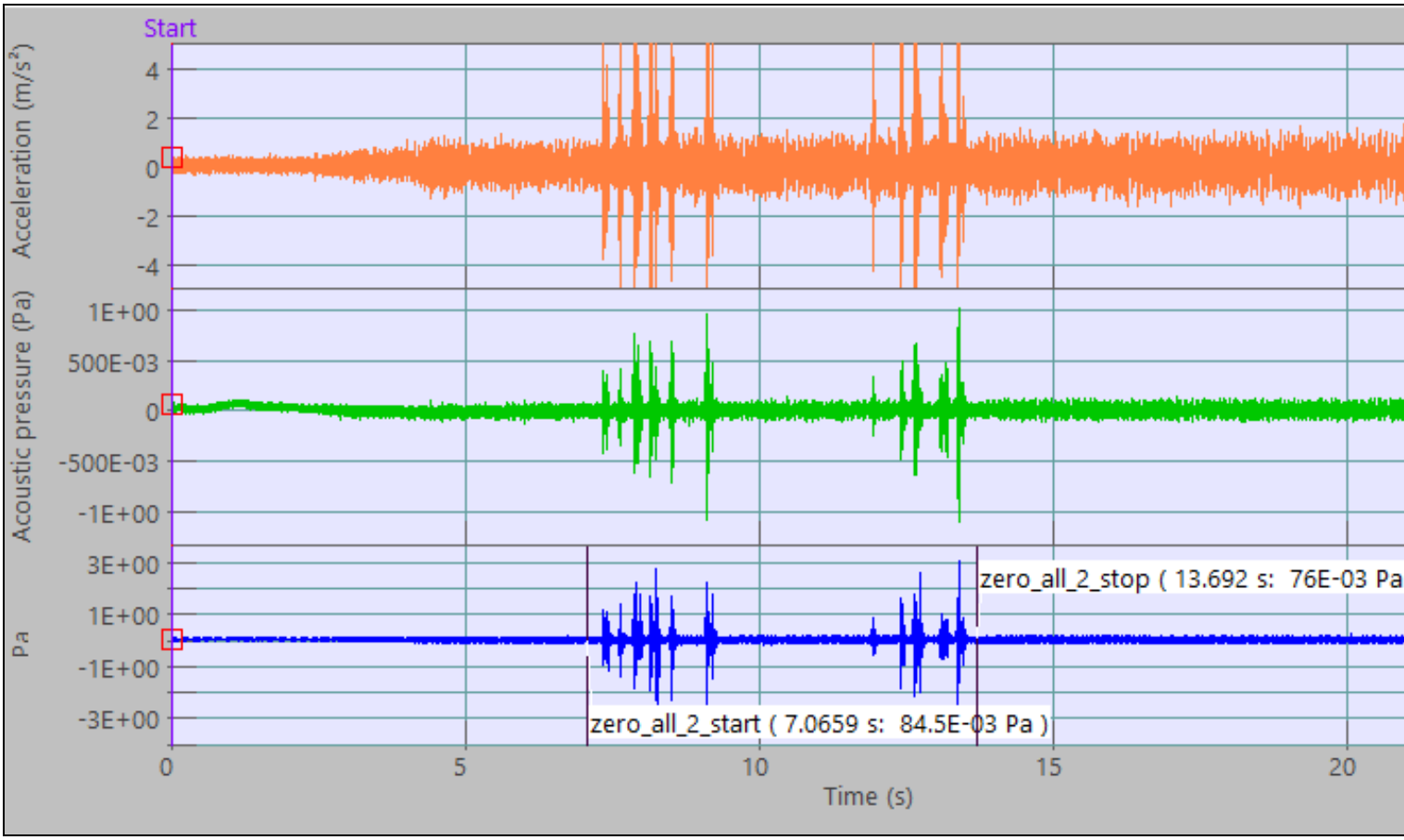
"Zero"

Remove all data : set to "zero" for selected part of current track



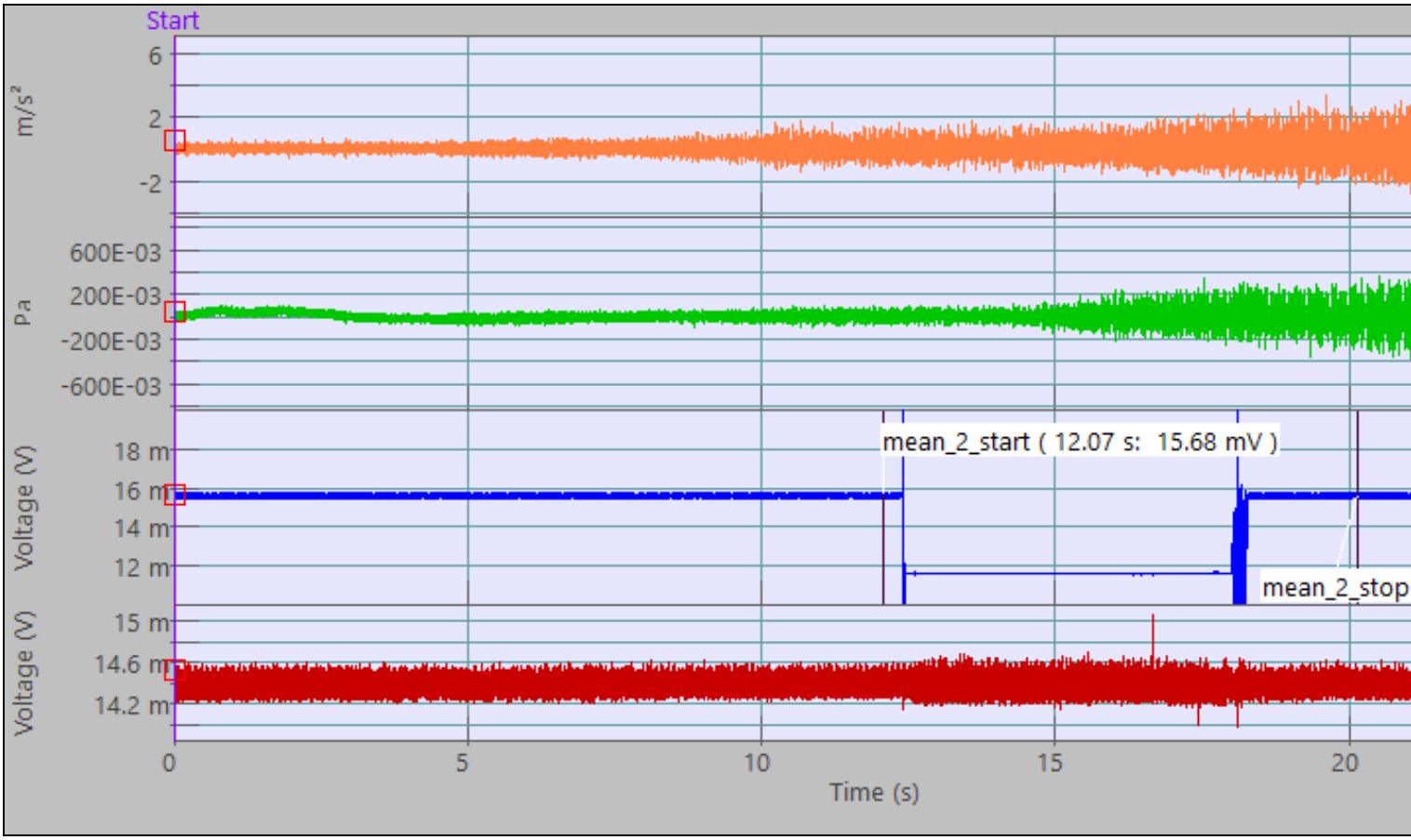
"Zero All"

Remove all data: set to "zero" for selected part of all tracks



"Mean"

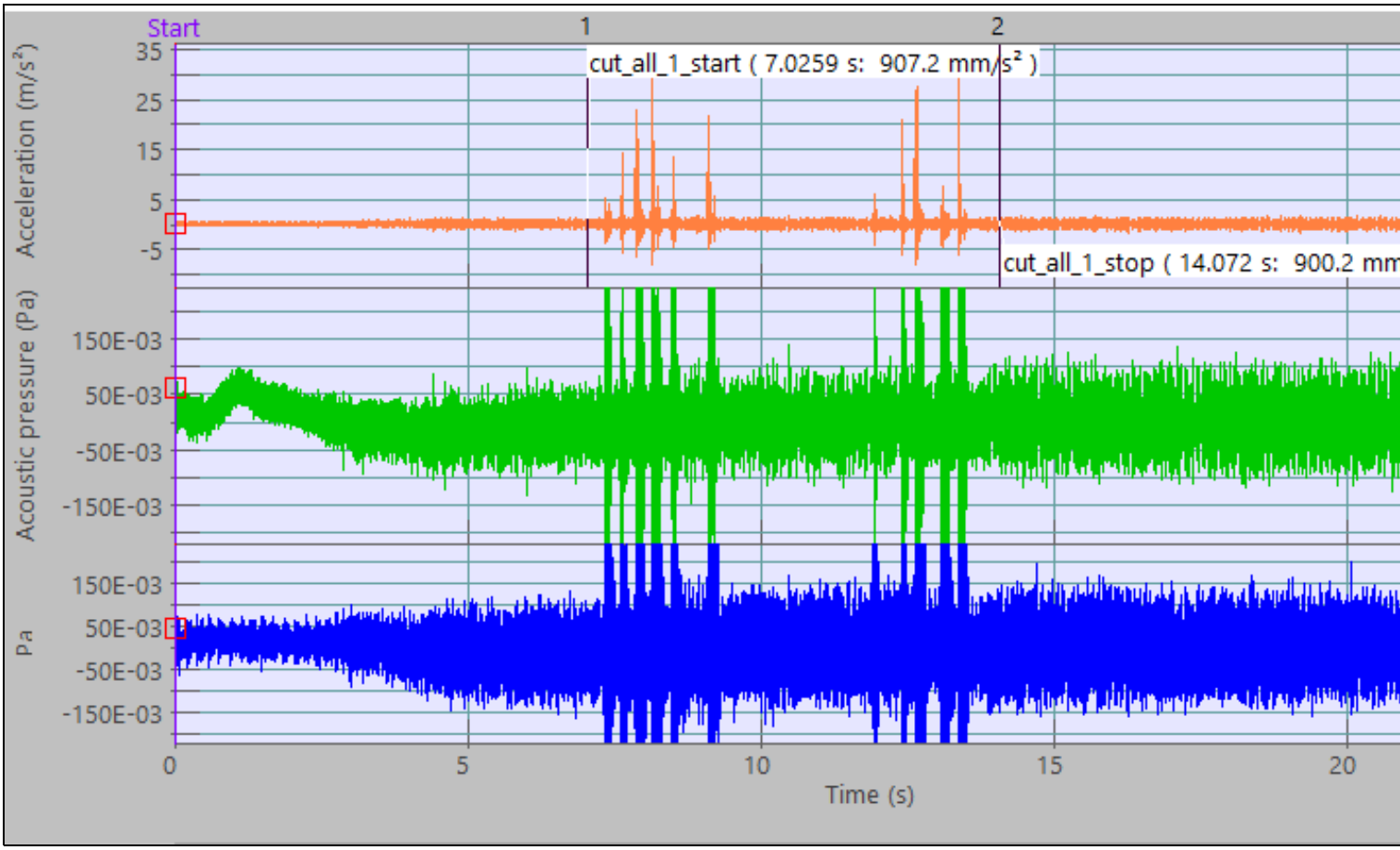
Interpolate data for selected part of current track



This option is useful for track with DC component

"Cut all"

Remove a selected part for all tracks



Features

Current Edit Signal" tool has the following features:

- All tracks within the signal file must be in the same sampling rate
- This tool can not manage Ext-Sync tracks
- Size of edit file depends on available RAM of the PC

Note : Does not work with tachometer records as Ext synch.

139 NVGate Torsional

OROS propose a comprehensive suite for torsional measurements and analyses. It addresses most of the torsional, cyclic and rotational resonances issues. For both R&D and diagnostics, the latest OROS analyzer feature solutions for **transmissions, engines** and **electric machinery vibration analysis**.

On reciprocating machinery (diesel engine, pump) or any acyclic rotating devices (generator,compressor), the cause of torsional vibrations often comes from the non-homogeneity of the angular speed. The analysis of the instantaneous angular speed inside each shaft revolution provides the essential information. Such analysis is helpful for vibrations reduction during prototyping or even for source identification while doing service diagnostics.

The common way to measure instantaneous velocity is to install a coding wheel or a rotary encoder on the shaft. The rate of pulse delivered by such device is directly proportional to the RPM speed during the last pulse interval. On most vibration analysers, this type of measurement needs a specific conditioner(usually optional external boxes) which transforms the pulses train into a DC voltage proportional to the RPM. These conditioner devices are expensive, lead to more cable and are often limited to 2 probes and so on. But the main inconvenience is the phase error they introduce due to their internal response time.
OROS propose an integrated frequency to RPM converter which avoids the above-mentioned inconveniences.

139.1 Frequency to RPM converter (Torsional inputs)

This option transforms each external Synch input into a frequency to RPM converter (called IVC, allows handling up to 6 torsional/acyclic inputs at a time). This integrated converter benefits of the high accuracy of the 3-Series analysers Ext. synch inputs (over sampled up to 6.4 MHz). As a matter of fact the sampling of such pulse rate must be very accurate in order to avoid speed jitter on the result.

139.1.1 Specifications

The IVC (Instantaneous angular Velocity Converter) option features the following main specifications:

· Number of pulses/rev: 1 to 4096

· Max pulse frequency: 40 kHz 64 times oversampled,

· Max angular speed:

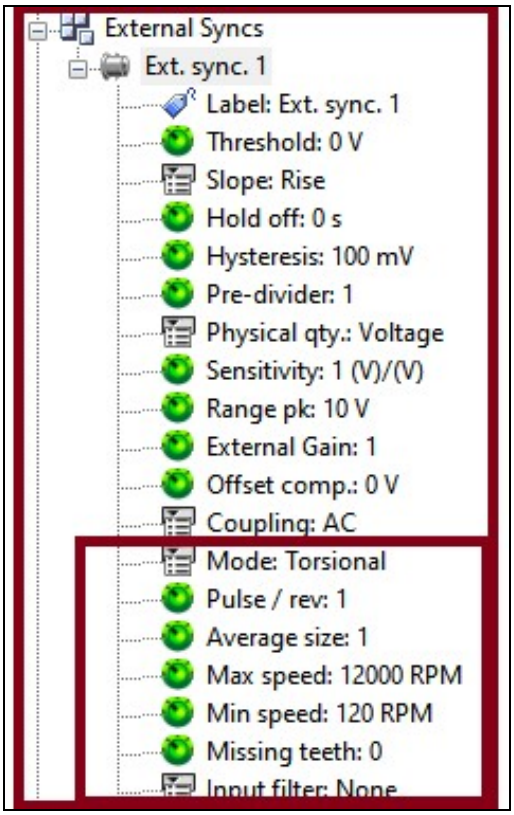
Max RPM = (40 000*64)/pulse per revolution example : 12 800 RPM with 200 Pls/rev

· Missing teeth management: up to 3 consecutive teeth.

· Available filters: HighPass, LowPass; BandPass, StopBand, Integrator (single or double) and differentiator

139.1.2 Ext synch Input. Settings

On the front end, the ext. synch input can be used as a:



- **Mode:** This setting allows selecting available signal generated by the Ext. synch input to be used by the NVGate analysis components.

Mode	Description
Trigger	The Input generates events only. It can be used as trigger, start and stop of plug-in analyzers and be recorded. Recorded event occurs as 0/1 V signals. Note that the trigger event remains available on any mode.
Tach	The input generates a tach signal (RPM and revolution phases) in addition to the events.
Torsional	The input generates the instantaneous velocity measured with the F. to V converter from a pulses train. The torsional signal is considered as a dynamic input. It appears as Tors # in the inputs list (# being the Ext sync number)
Torsional + Tach	Same as above plus the tach signal is also available. The revolution phase correspond: • to the missing teeth occurrence if missing teeth is > 0 • to the ending of the pulse/rev counting at each revolution (no phase reference) if missing teeth setting is 0
Sampling	The detected pulses on the inputs will be used to synchronize the SOA re-sampling algorithm. The number of pulse/rev is f free and may be different from the SAO resolution.
Sampling + Tors	Combine the sampling and the Torsional modes. Both angular re-sampling and instantaneous velocity are provided by the input
Sampling + Tach	Combine the sampling and the Tachometer modes. Both angular re-sampling and RPM measurement are provided by the input
Sampling + tach + tors	Combine the sampling, the Tachometer and the Torsional modes. Angular re-sampling, Tachometer speed and instantaneous velocity are provided by the input

- **Pulse** / **rev**: the number of pulses per revolution. The user can enter an integer value between 1 and 4092. For a non-integer number of pulses per revolution the user must use a virtual tach.

- other parameters are defined on page tachometer: ext synch .

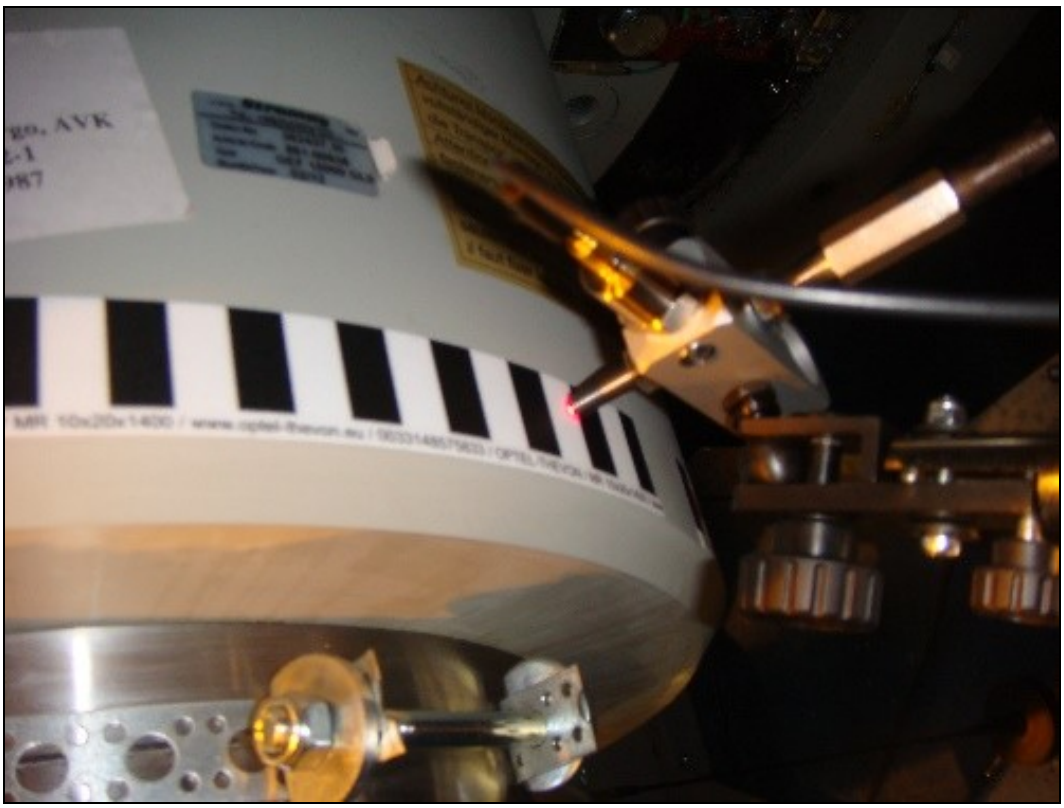
At least the filter which let you integrate or differentiate the RPM speed to get respectively plane angle deviations and angular accelerations for the analyses.

139.1.3 Fractional missing pulses management

The missing pulses are a common situation faced while doing torsional measurement. The missing pulse can come as a feature of the encoder (like the common 60:2 encoders). But most of the measurement done on the industry do not offer the comfort of an encoder or gear teeth access.

- **Missing teeth:** This setting indicates the number of possible consecutive missing teeth (meaning no pulses). In such case depending on the active mode:

The system interpolates the missing pulses intervals in order to maintain the instantaneous speed at a continuous level during the missing pulses.

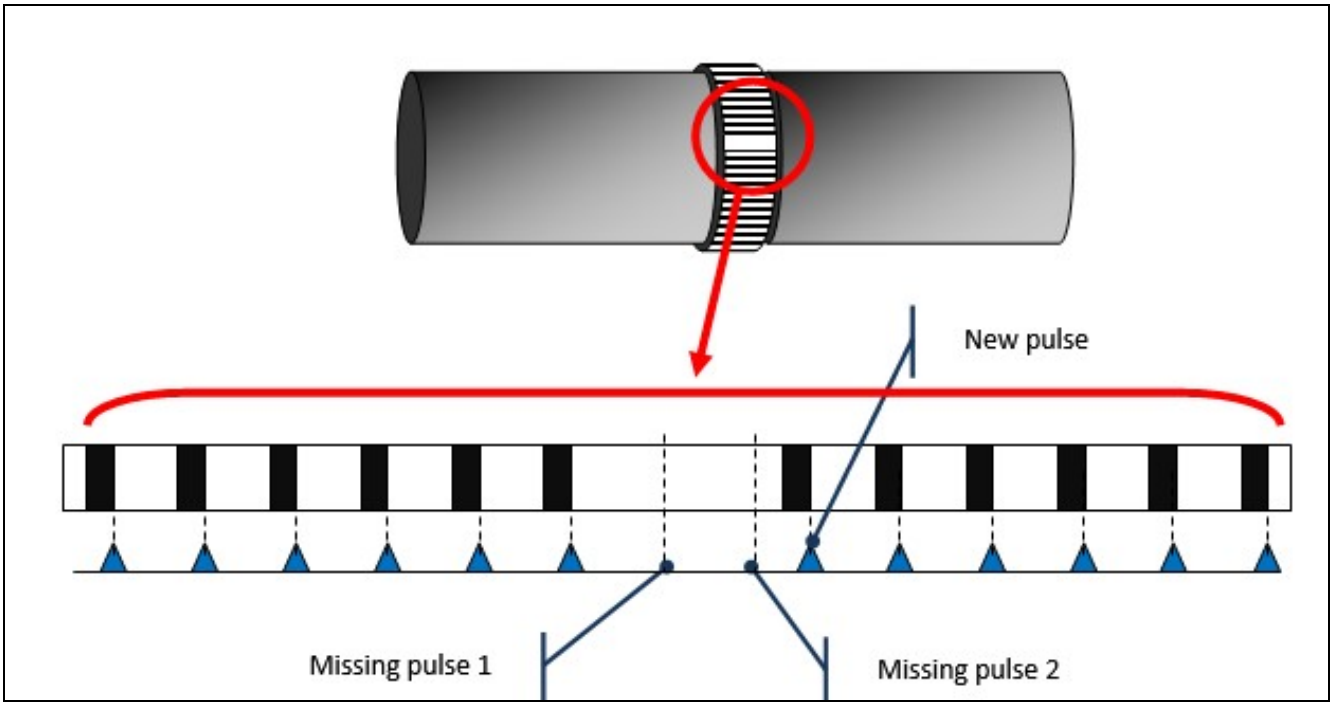


A very useful solution is the piano (or zebra) tape which is glued on the shaft and read by an optical probe: Easy to install and to use.

But the main problem is to have an entire number of pulses. This is never achievable because the various parameters are difficult to control: Black/white period, diameter of the shaft, thickness of the tape/glue. Well, don't try, this is not possible.

The solution is to leave a hole which is interpreted as missing pulse. Due to the above variables it will be a fractional number of missing pulse.

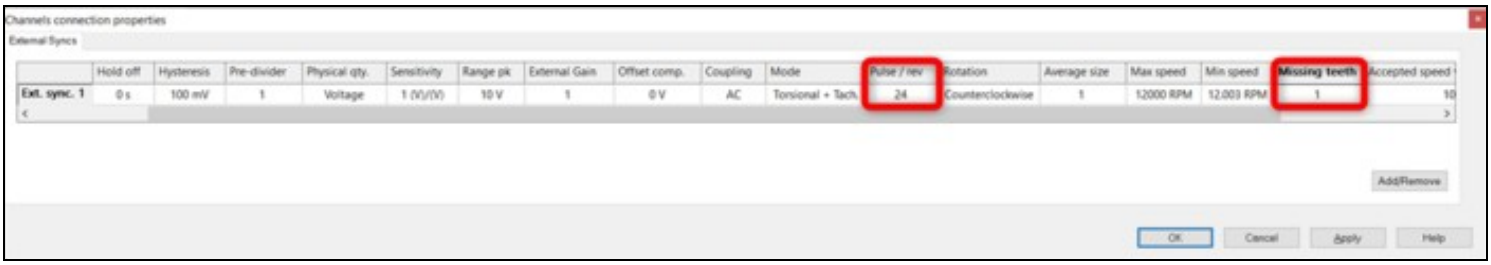
OROS torsional function is able to manage such fractional pulses. It offers to achieve torsional measurement on the field in a simple and easy way.



Piano tape junction for fractional missing pulse management

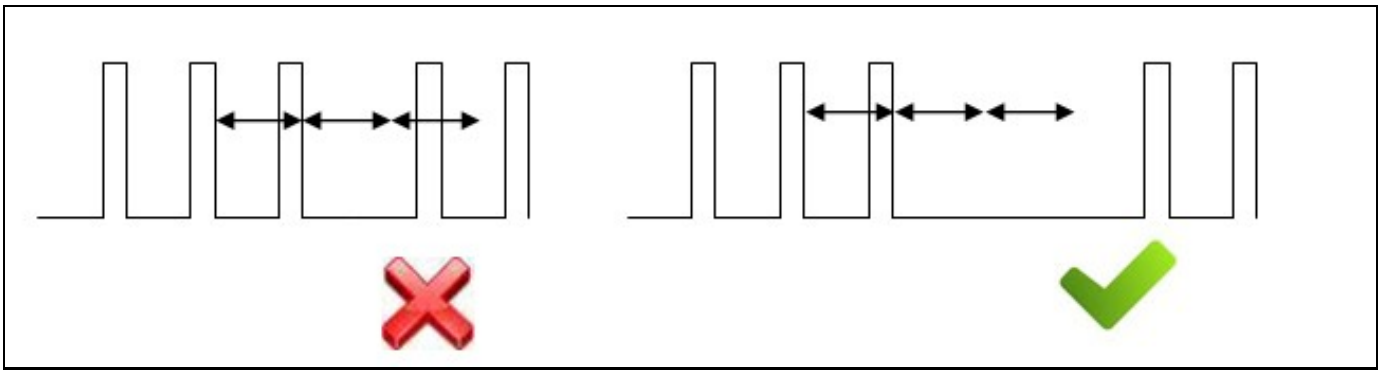
The empty area (missing teeth) length at the piano tape junction must be included between 1 and 3 teeth. The number of missing teeth must be set to the exact number of missing teeth: In this example: 2.

Note: the total number of teeth includes the missing teeth. By example, an encoder with **24 pulse/rev** and **1 missing teeth** must be set as :



The empty area (missing teeth) length at the piano tape junction must be included between 1 and 3 teeth. The number of missing teeth must be set to the exact number of missing teeth: In this example: 2.

Note: the total number of teeth includes the missing teeth.



Attention: The time lap of the first missing pulse must be longer than twice the time lap of the previous pulse interval

It is recommended to set the instrumentation in order to limit the number of missing pulse below 3s: Indeed long interval without pulses will lead to a strong order 1 artefact in the instantaneous speed signal due to interpolation of sample. Remaining below 3s for the missing pulse provide correct measurements.

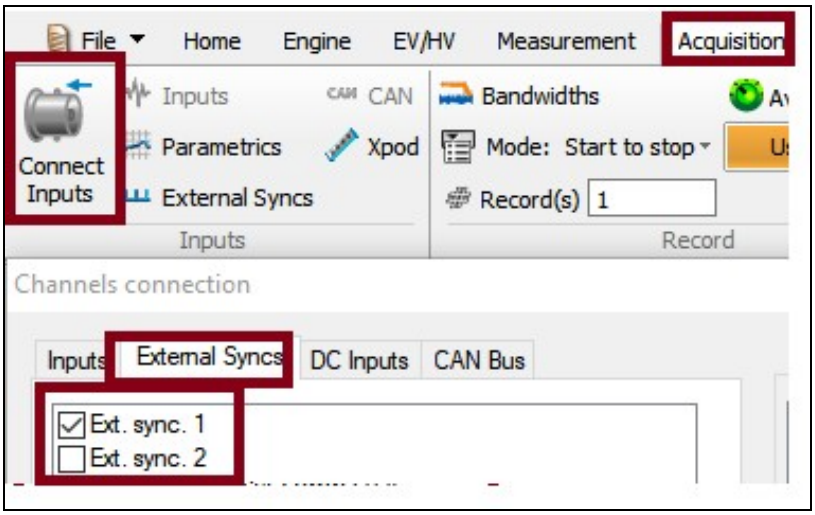
139.1.4 Tutorial

In on-line mode, the torsional inputs appear as additional channels in the channel connection dialog box. They are identified as *Tors. x* from the *Signal Op.* resource (not visible in the ASB). These signals can be dispatched exactly as the standard inputs ones :you can connect them to the record, and to any analysis plug-in.

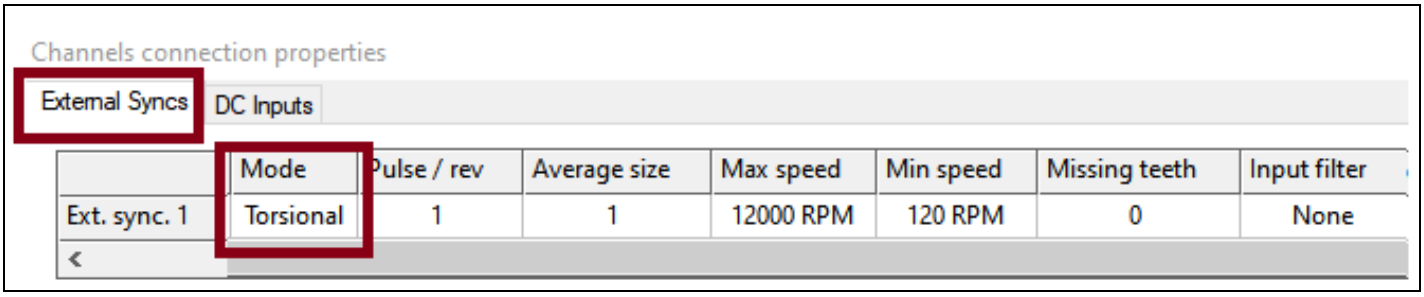
Both instantaneous velocity channel and pulse train can be recorded at the same time.

139.1.4.1 Online mode

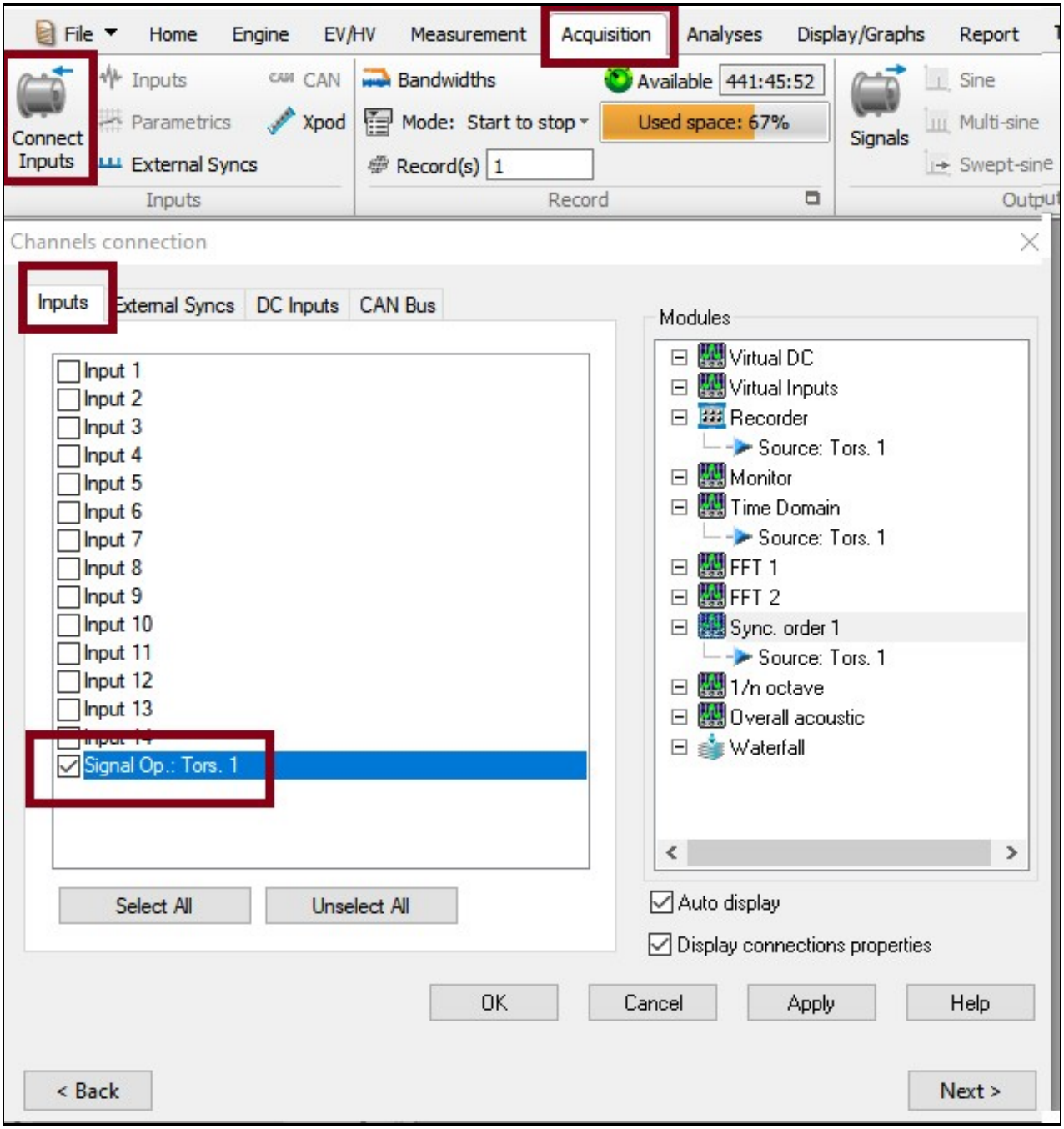
- Plug your tachometer on ext synch channels,
- Activate the Ext-Synch channels and press OK



- Set the ext synch mode as torsional.



- A new input is created : this is the signal of the instantaneous velocity. It can be connected for analysis to any NVGate plug in.



- The non cyclic behaviour of a shaft can be analysed :
    - By the order analysis plug-in, providing order profiles
    - By the time domain analysis plug-in, for RPM over revolution profiles
    - By the FFT analyser plug-in, for displaying the Shaft view to visualize the evolution of speed during one revolution.

- The torsional behaviour of a shaft (crankshaft, alternator) or a driving belt (service belt) can be excited by its acyclic motion. In such a case the phenomena are analysed order by order using the cross-phase tracking capabilities of the SOA Plug-in. In that case 2 or more torsional inputs are used on different locations of the shaft, or on each pulley driven by the belt.

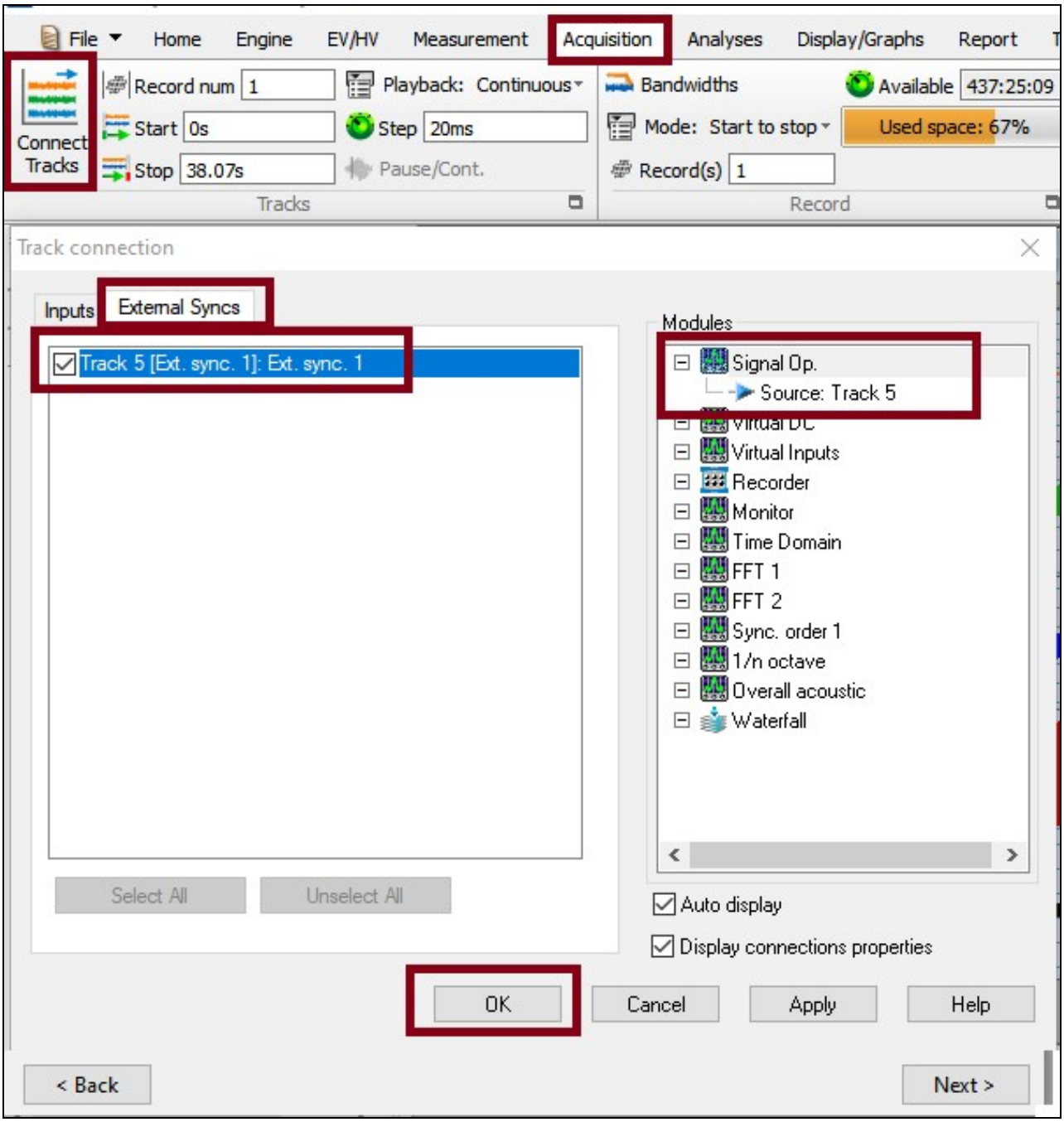
139.1.4.2 Post-processing

For post-analysis purposes, the way to operate depends on the type of recorded signal:

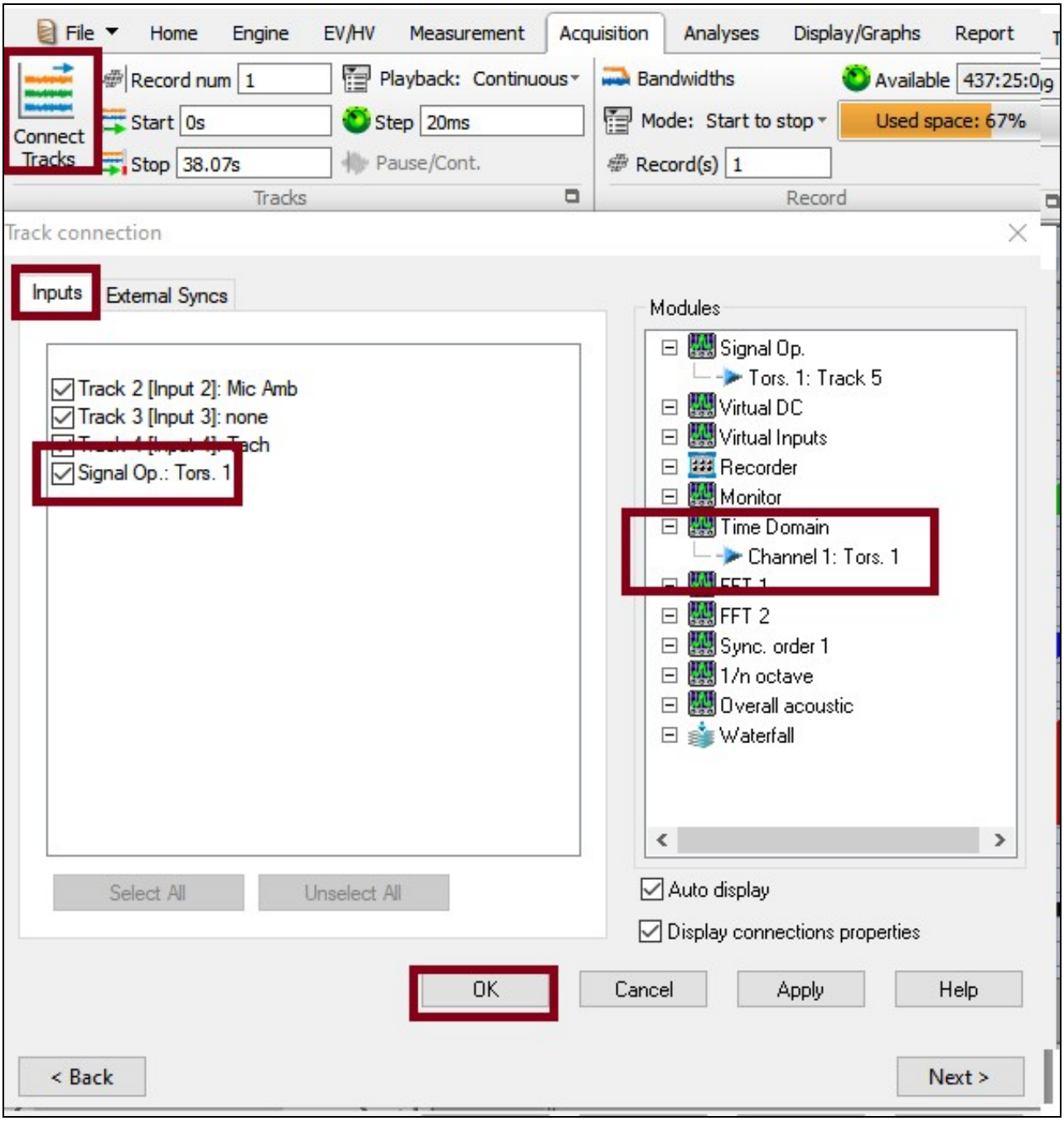
- If the converted signal (Tors x) have been recorded, the post analysis is exactly like for the usual recorded inputs.

- if the pulses have been recorded and not the converted signal, a new resource module called *Signal Operation* is then available for this conversion.

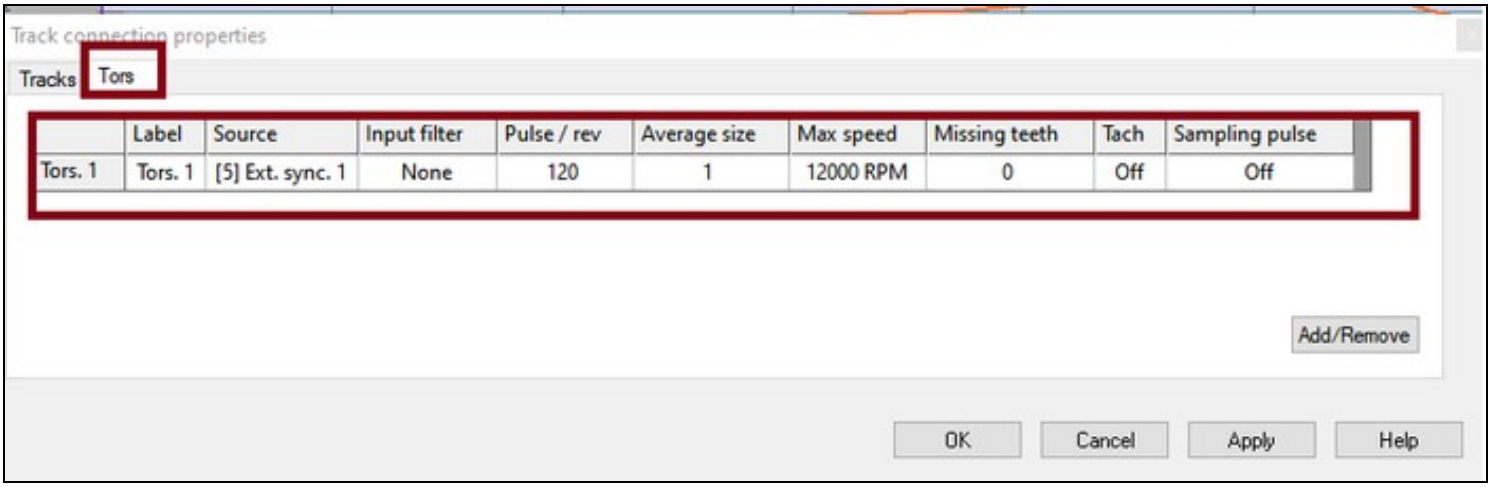
- Do a post analysis on the signal:
    - Click on connect track. Connect the "Ext synch" tracks to "signal op" by a "drag and drop". Press ok.


File
Home
Engine
EV/HV
Measurement
Acquisition
Analyses
Display/Graphs
Report
Connect Tracks
Record num 1
Playback: Continuous
Start 0s
Step 20ms
Stop 38.07s
Pause/Cont.
Tracks
Bandwidths
Available 437:25:09
Mode: Start to stop
Used space: 67%
Record(s) 1
Record
Track connection
Inputs
External Syncs
Track 5 [Ext. sync. 1]: Ext. sync. 1
Modules
Signal Op.
Source: Track 5
Virtual Inputs
Recorder
Monitor
Time Domain
FFT 1
FFT 2
Sync. order 1
1/n octave
Overall acoustic
Waterfall
Select All
Unselect All
Auto display
Display connections properties
OK
Cancel
Apply
Help
< Back
Next >

- ♦ Click again on connect track, a new track "signal op : Tors 1" now appear. It is the converted signal. You can use it in any plug in. press OK.



- ♦ The window below appears. On tab tors, you can define the torsional channel settings.

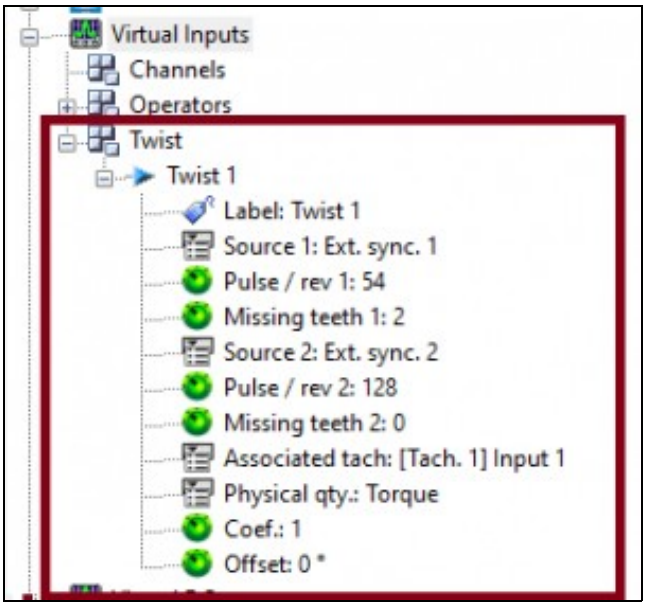


139.2 Twist measurements (static and dynamic)

The twist measurement consists in measuring the angle between the 2 side of a transmission shaft (or belt/chain). The measured angle is directly proportional to the stress and the applied torque. One common application is to choose an appropriate torsional damper.

The twist can be:

- **Static**: measure the transmitted torque and power. This is a not a dynamic result and is not to be analysed.
- **Dynamic** : measure the oscillating stress and resonances. This is a dynamic signal to be analyzed.

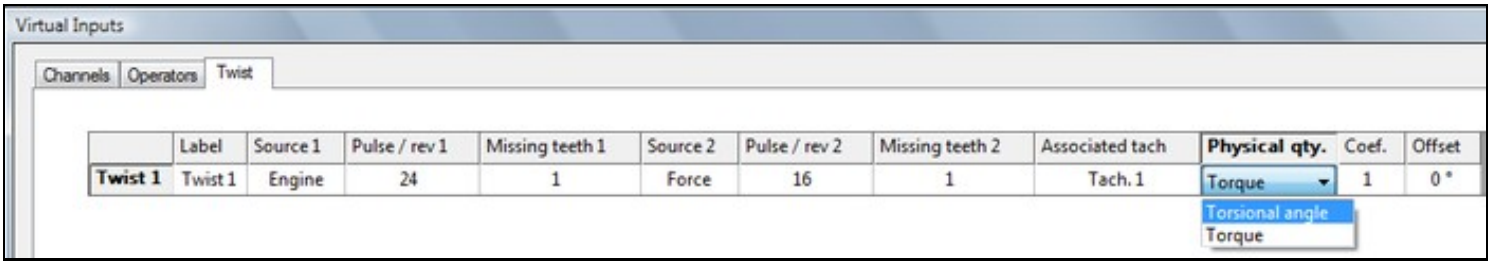


Both signals are calculated simultaneously by the virtual input module.

When the torsional signals are setup, simply connect it to the *Virtual input* plug-in.

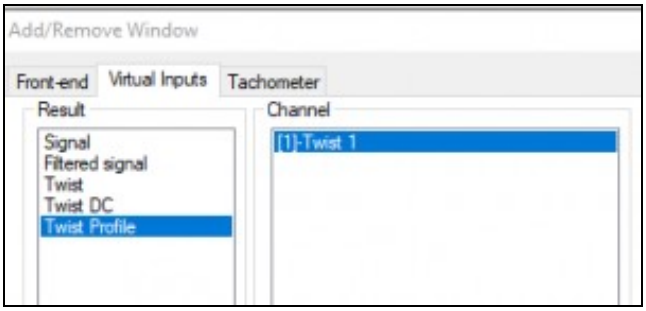
To calculate the phase between the 2 sides of the twist it is necessary having a tachometer. This tachometer can come from any of the inputs or directly from one of the torsional signals using the *Torsional + tach.* mode. Having a missing tooth helps to have better accuracy.

Then click on the *Tools/Virtual inputs/dynamic* button to open the virtual inputs setting. Click on the Twist tab. Select each torsional signal from the *source 1* and *source 2* lists.



The twist will be displayed in angle or torque. The coefficient is used to convert the read angle in torque.

The result are available from the add/Remove windows under the virtual input tab.



139.2.1 Uncorrelated pulse number

Note that any number of pulses/rev can be used for twist computation and these numbers of pulses/rev can either be different on each side.

The following table describes the differences between classical twist measurement and the OROS method:

Classical twist measurement	OROS twist
Twist measurement force having the same number of pulse on each side. The difference between the 2 signals is requiring the same number of sample/rev.	**Twist support different number of pulse/rev signals**. The OROS twist algorithm is based on phase computation rather than pulse timing comparison. Thanks to this the analysis is independent from the number of pulses/rev.
Twist measurement based **on integration of the angular speed** (torsional) **is not stable**	**Twist signal is stable and do not diverge**. Indeed the OROS Twist algorithm does not use integration techniques

139.3 Angular sampling for SOA analysis

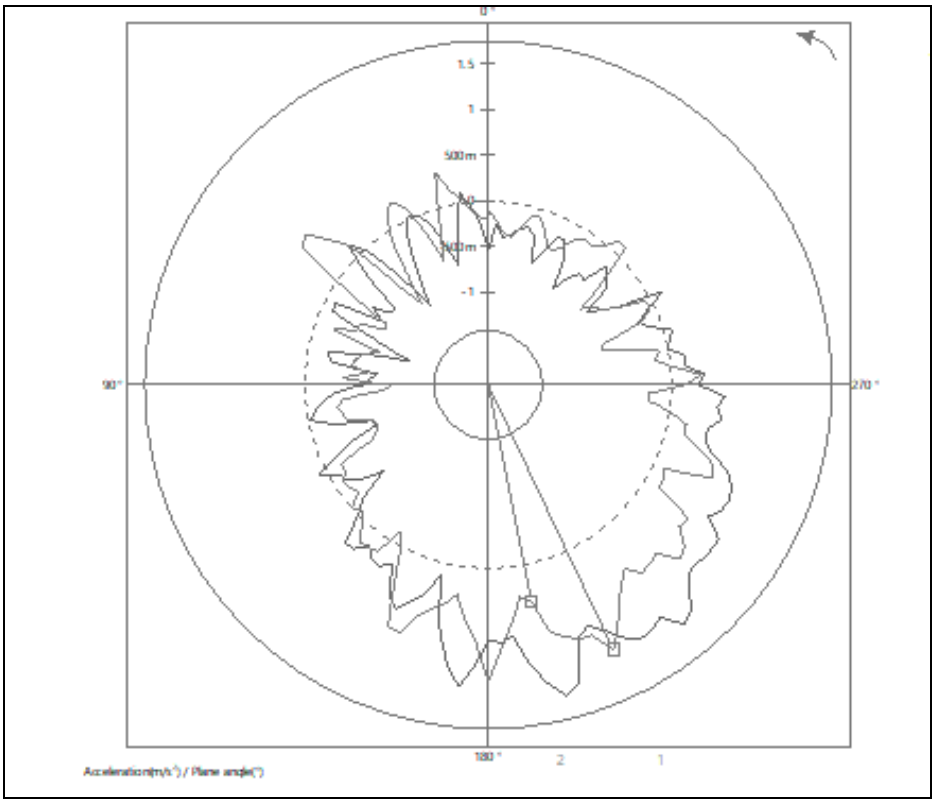
The major improvement comes as a simple setting? with large effects. Indeed the possibility to sample the measured signal with a distributed angle pulses of a rotating shaft provides accurate results.

This applies mainly on machineries which feature cyclic variation of their rotating speed. Main ones are:

- **Engines** (Diesel, Gas, 2/4 strokes)
- Reciprocating **pumps** or **compressors**
- **Transmission** (Torque damper, belt, shaft)
- **Electric machines** (generator, alternator, motor)

The angular sampling allows getting the exact angle (or phase) of the events in the machine cycle. The results are event better using the time domain averaging (i.e. angular).

The following example shows the differences between a usual synchronous order analysis and the same one based on angular sampling. The phase differences are clearly visible especially on the ShaftView graphs.



With and without angular sampling Shaft view on an electric machinery bearing

139.3.1 Operations

In order to use the angular sampling function (Optional) it is necessary to have at least:

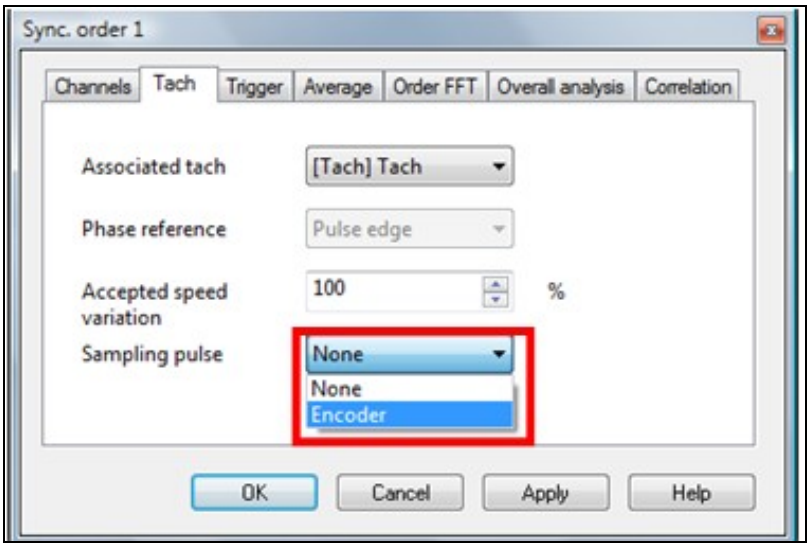
- A pulses train signal with a known number of pulses/rev
- phase reference (usually a 1 pulse/rev signal)

The sampling signal comes from an ext. synch input. The mode must be set to *Sampling* or any of the *Sampling + xxx*

It is necessary to associate a phase reference (the 0°) to the sampling pulse. It can be any tachometer or the sampling input itself. In this last case the 0° will be the first detected pulse or the missing pulse if there are some.

Mode	Phase ref	Hold off (% period)	Pulse / rev	Rotation	Average size	Max speed	Min speed	Missing teeth	Accepted speed variation (±)
Tach		0 %	24	Clockwise	1	10000 RPM	9.989 RPM	1	10 %
Sampling	[Tach] Engine side		16					0	

Then the *Tachometer* and the *Sampling* are assigned to a SOA plug-in.



The *Sampling pulse* setting defines if the angular sampling is activated or not:

- If set to *None*, the SOA will works on the regular way: Interpolation of the sampling dates from the RPM information).
- If set to a sampling input, the SOA will use it for sampling the channels signals

139.3.1.1 Advantages of the OROS solution

The angular sampling is an old technique, which used to be achieved by replacing the sampling clock by an encoder signal. Even if this procedure provides correct order and angles measurement, it has a lot of defects. The technique provided by *oros* corrects these defects.

The following table compares the possible signal alteration and the OROS solution

Traditional angular sampling	**OROS angular sampling**
Results are not alias free. It is not possible to apply anti aliasing as the sampling frequency is not known by the acquisition system.	**Alias free results**. The results are not affected by the alias frequencies thanks to the re-sampling technique. Indeed the analyzer acquires the sample at high freq. (102.4 kS/s) and then re-samples it with a tracking anti-aliasing filter.
The **number of pulses/rev. must be a power of 2**. Because the digital Fourier transform need a power of 2 samples, if you need to analyze it in order domain (n Revolutions) it is compulsory to deliver n^2 samples per revolution.	**Any number of pulse/rev and any angular resolution are possible**. The re-sampling technique used by the SOA allows interpolating the correct number of pulse (n^2) from any acquire number of pulses
Missing pulses are not supported. Obviously the missing pulses will conduct to missing samples.	**Missing pulses are supported**. The OROS torsional measurement is able to interpolate and create the missing pulses. Then the complete pulse sequence is used by the re-sampling algorithm.

NVGate allows achieving angular sampled analysis avoiding the artefacts introduced by the direct angular sampling.

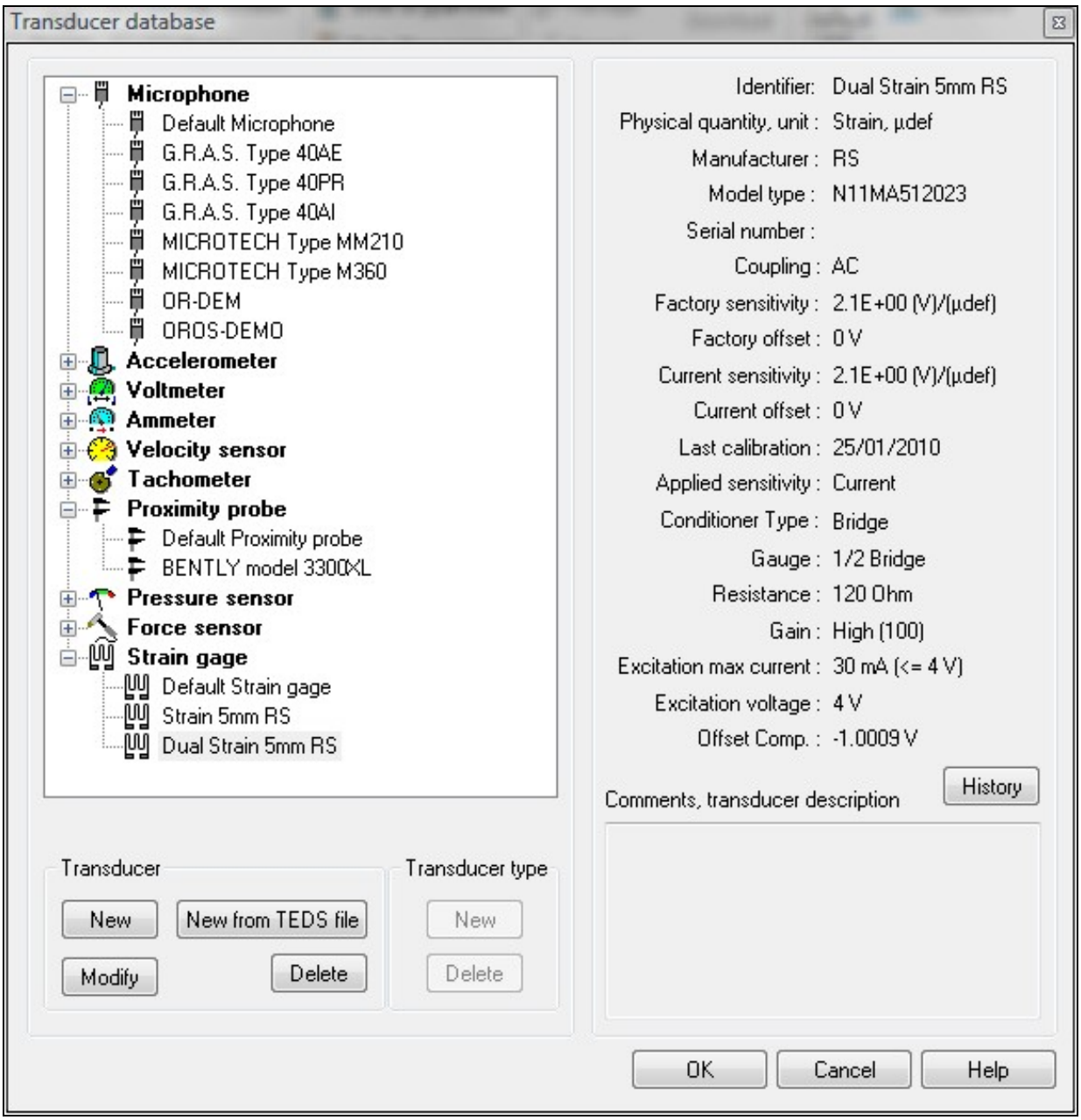
140 NVGate Transducer and Calibration

140.1 Transducer Database

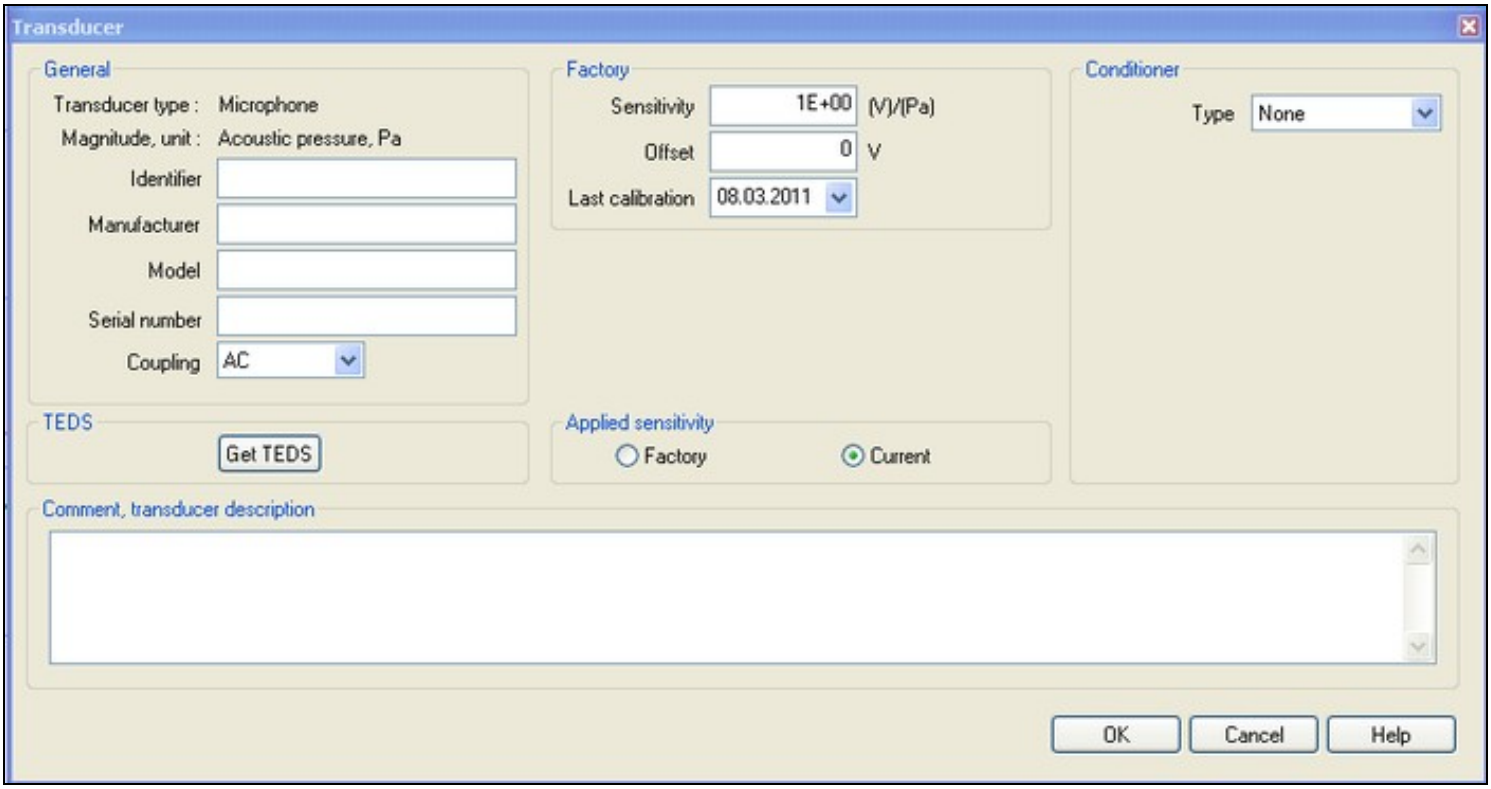
This group manages the transducers database which is used by NVGate to automatically setup the inputs and trace front-end status at measurement time.



Database: Opens the transducer database dialog The left side displays all the transducers in the database in a tree form. They are grouped by type. For each type of transducer, there is a default transducer. The right side displays the information about the selected transducer.



- *New*: This button is available when a transducer or a transducer type is selected. It is called the "new transducer" dialog box. If a transducer is selected, all information related to the transducer is applied to the new transducer.
- *New from TEDS file*: This button allows opening a file .ted and so creating a new transducer with its characteristics in the transducers database.
- *Delete*: This button is not available when a default transducer is selected. It removes the selected transducer from the database.
- *Modify*: This button is not available when a default transducer is selected. It is used to modify the characteristics of the transducer. Clicking on the modify or new button opens the transducer definition dialog box:
- *Transucer type / New*: Create a new type of transducer.
    - **Note:** you need to restart NVGate to apply this new transducer on an Input.



- Transducer type: Can be a pre-defined type (microphone, accelerometer...) or a user-defined type.

- General:

Magnitude, unit: Magnitude and unit associated with the transducer type

Identifier: Name that will be used to identify the transducer. This identifier must be unique. This is the only field that must be filled in. The others contain optional information.

Manufacturer: Name of the company that manufactures the transducer.

Model: Identifies the transducer.

Serial number: Unique identification, this must appear on the transducer itself.

Coupling: When the transducer is connected to an input, this coupling will automatically be set.

- TEDS: By clicking on Get TEDS, a file .ted can be selected to set automatically the characteristic values of the transducer.

- Factory values: Sensitivity, offset, last calibration.

These values can usually be found on the calibration chart of the transducer. For maintenance calibration, use the update button to set the new values

- Current values: Sensitivity, offset, last calibration.

Displays the current sensitivity and offset. The update button may be used to set new values, in the event the transducer is not calibrated with NVGate[?].

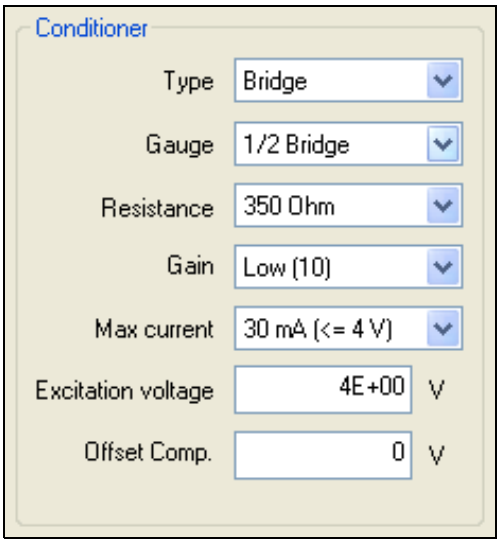
The history button is used to retrieve all calibrations that have been performed on the transducer.

- Applied sensitivity:

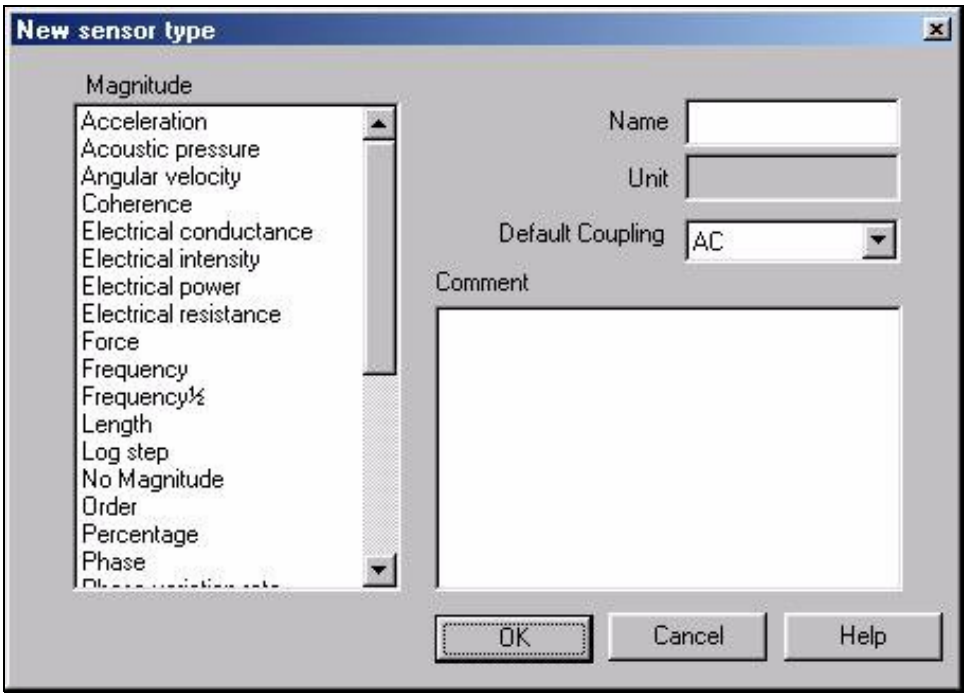
Factory: applies sensitivity of the calibration chart of the transducer.

Current: applies sensitivity read on the TEDS file of the transducer.

- Comment, transducer description: Free text area
- Conditioner: Has to be change if you use and X-Pod conditioner. The XPod is a device that can be fixed on the $OR36_2$/$OR38_2$ side.



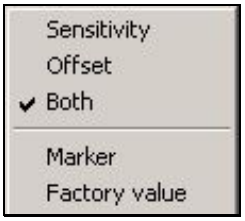
- Type: bridge signal conditioning for strain gauges, dynamic pressure, force and acceleration measurements.
- Gauge type: Full, Half or Quarter bridge mount. The completion resistors are included in the Xpod,
- Resistance: Bridge completion resistor: 120 or 350 Ohms for quarter bridge mount.
- Gain: Bridge gain: 10 or 100 depending on the required precision and range.
- Max current: the provided current can be limited to 30 mA up to 4 V and 12 mA up to 10 V.
- Excitation voltage: Each Xpod provides an excitation voltage from 0 to 10 V.
- Offset Comp.: Bridge offset comp: Can be used for manual balance of the bridge,
- New Transducer Type: This button is available when a transducer type is selected. A new transducer type is necessary when the pre-defined type does not fit the needs. It is used to gather transducers with the same magnitude.



- Magnitude: Magnitude that will be associated with the transducer type and all transducers of this type.
- Name: This name will be used to identify the type. It must be unique.
- Unit: Current unit of the magnitude.
- Default coupling: default coupling value that will be used when a new transducer is created. This value can be changed individually.
- Comment: Free text area
- 
  History:

This tool is used to see how transducer sensitivity and offset change over time. Information about every calibration is displayed, making it easy for the user to see if the transducer behavior is constant.

- Current sensitivity: This is the sensitivity level obtained during the last calibration. If the transducer has never been calibrated, the factory sensitivity is selected. This sensitivity is used when the transducer is selected on an input
- Current offset: This is the offset obtained during the last calibration. If the transducer has never been calibrated, the offset sensitivity is selected. This offset is used when the transducer is selected on an input
- Graph: Displays the calibration values. A pop-up menu is available by right clicking on the graph.

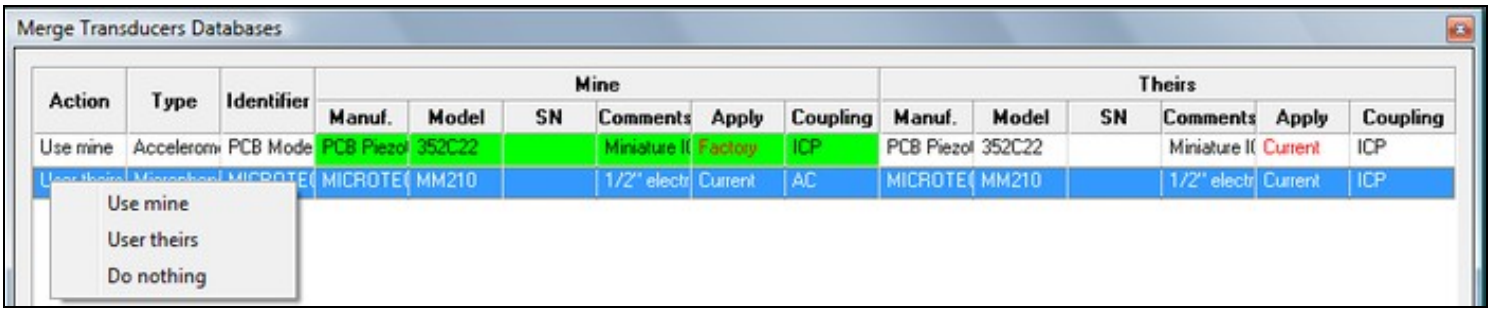


It is used to select the sensitivity graph, the offset graph or both. It is also possible to hide/display the factory values. There is also a marker to highlight the calibration.

-  Merge multiple transducer databases into one. The merged TDB is the one currently used by NVGate (file: *transducers.tdb* located in the *NVGate.exe* directory)

Clicking on *Merge* open the database to merge browser. Both native (.cdb) and comma separated values (.txt) formats are available. For the csv, the format is the same as the export one, with one line per transducer.

In case of conflict (the same transducer does not features the same setup in the 2 databases) a specific dialog box is proposed.



Only conflict lines are displayed.

- On the left side the current NVGate® database called *Mine*
- On the right side the imported one called *Theirs*

The non-matching settings are written in red, and the current choice (the one which will be saved) is shown on a green background. The default choice is to save the current NVGate® settings (*Mine).*

The operator may apply 3 types of operations, selected by a right click on the line of interest:

- *Use mine:* The current NVGate® setting is kept. The calibration histories from the imported and current database are merged.
- *Use theirs:* The imported setting will be applied and saved. The calibration histories from the imported and current database are merged.
- *Do nothing:* The corresponding transducer is ignored and nothing is changed

At the end of the merge operation a summary of the modification is presented



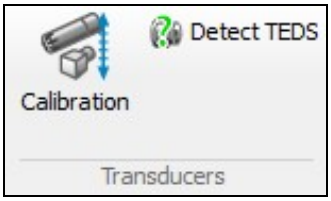
-  Export: Allows exporting the current database (file: *transducers.tdb* located in the *NVGate.exe* directory) in csv format.

The exported file contains one line per transducer with the following field.

	A	B	C	D	E	F	G	H	I	J	
1	Type	Identifier	Manufacturer	Model	Serial Number	Coupling	Sensitivity	Offset	Date	Apply	Comments
2	Accelerometer	DJB Model A/120/V-1	DJB	A/120/V-1		ICP	0.00101936	0	20/08/2003 12:12	Current	
3	Accelerometer	DJB Model A/120/VT-3	DJB	A/120/VT-3		ICP	0.0101936	0	20/08/2003 12:12	Current	
4	Accelerometer	DJB Model A/122/V-1	DJB	A/122/V-1		ICP	0.00101936	0	20/08/2003 12:12	Current	
5	Accelerometer	DJB Model A/131/V (X axis)	DJB	A/131/V		ICP	0.00101936	0	20/08/2003 12:12	Current	Triaxial ICP accelerom
6	Accelerometer	DJB Model A/131/V (Y axis)	DJB	A/131/V		ICP	0.00101936	0	20/08/2003 12:12	Current	Triaxial ICP accelerom
7	Accelerometer	DJB Model A/131/V (Z axis)	DJB	A/131/V		ICP	0.00101936	0	20/08/2003 12:12	Current	Triaxial ICP accelerom
8	Accelerometer	DYTRAN Model 3041A2	DYTRAN	3041A2		ICP	0.0101936	0	20/08/2003 12:12	Current	
9	Accelerometer	DYTRAN Model 3035A	DYTRAN	3035A		ICP	0.0101936	0	20/08/2003 12:12	Current	
10	Accelerometer	DYTRAN Model 3055A1	DYTRAN	3055A1		ICP	0.00101936	0	20/08/2003 12:12	Current	General Purpose ICP A
11	Accelerometer	KISTLER Model 8614A500M1	KISTLER	8614A500M1		ICP	0.00040774	0	20/08/2003 12:12	Current	Miniature ICP Accelero
12	Accelerometer	KISTLER Model 8702B500	KISTLER	8702B500		ICP	0.00101936	0	20/08/2003 12:12	Current	General Purpose ICP A
13	Accelerometer	KISTLER Model 8636C50	KISTLER	8636C50		ICP	0.0101936	0	20/08/2003 12:12	Current	Modal Analysis ICP Ac
14	Accelerometer	PCB Model 352C22	PCB Piezotronics	352C22		ICP	0.00101936	0	20/08/2003 12:29	Current	Miniature ICP Accelero
15	Accelerometer	PCB Model 353B03	PCB Piezotronics	353B03		ICP	0.00101936	0	20/08/2003 12:29	Current	General Purpose ICP A
16	Accelerometer	PCB Model 353B34	PCB Piezotronics	353B34		ICP	0.00101936	0	20/08/2003 12:29	Current	General Purpose ICP A
17	Displacement s	BENTLY model 3300XL	BENTLY	3300XL		AC	3940.16	0	20/08/2003 15:48	Current	
18	Microphone	G.R.A.S. Type 40AE	G.R.A.S.	40 AE		ICP	0.05	0	20/08/2003 15:50	Current	1/2" prepolarized free
19	Microphone	G.R.A.S. Type 40PR	G.R.A.S.	40 PR		ICP	0.0035	0	20/08/2003 15:50	Current	1/4" array microphone
20	Microphone	G.R.A.S. Type 40AI	G.R.A.S.	40 AI		ICP	0.025	0	20/08/2003 15:50	Current	1/2" intensity microph
21	Microphone	MICROTECH Type MM210	MICROTECH GEFELL	MM210		ICP	0.05	0	20/08/2003 15:50	Current	1/2" electret measurir
22	Microphone	MICROTECH Type M360	MICROTECH GEFELL	M360		ICP	0.0125	0	20/08/2003 15:50	Current	1/4" electret measurir

Only the latest site calibration information are exported in the txt file.

140.2 Transducers Calibration



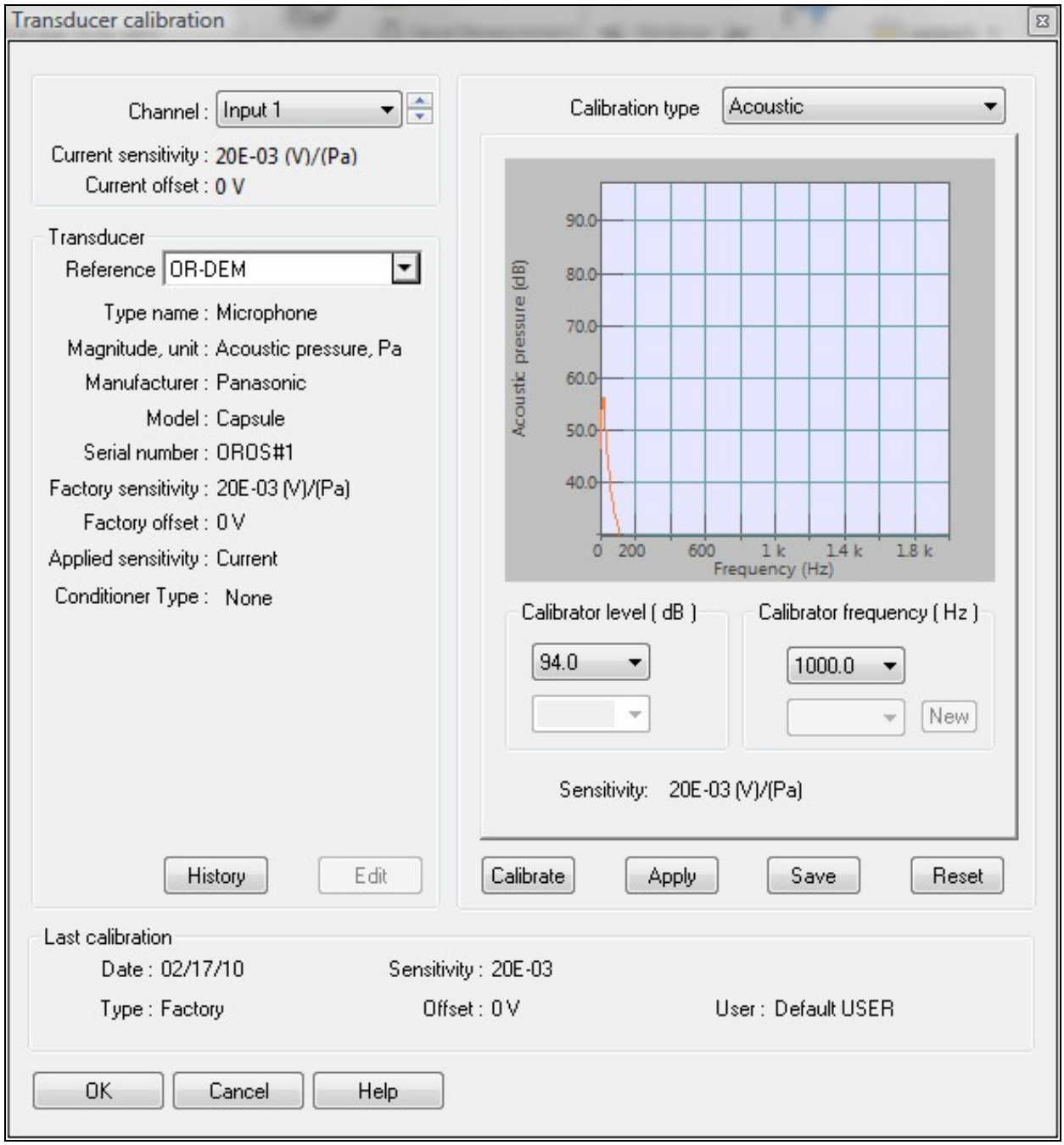
Manage the transducers calibration and automatic recognition prior to measurements:

- 

Calibration: Initiates the calibration procedure tool.

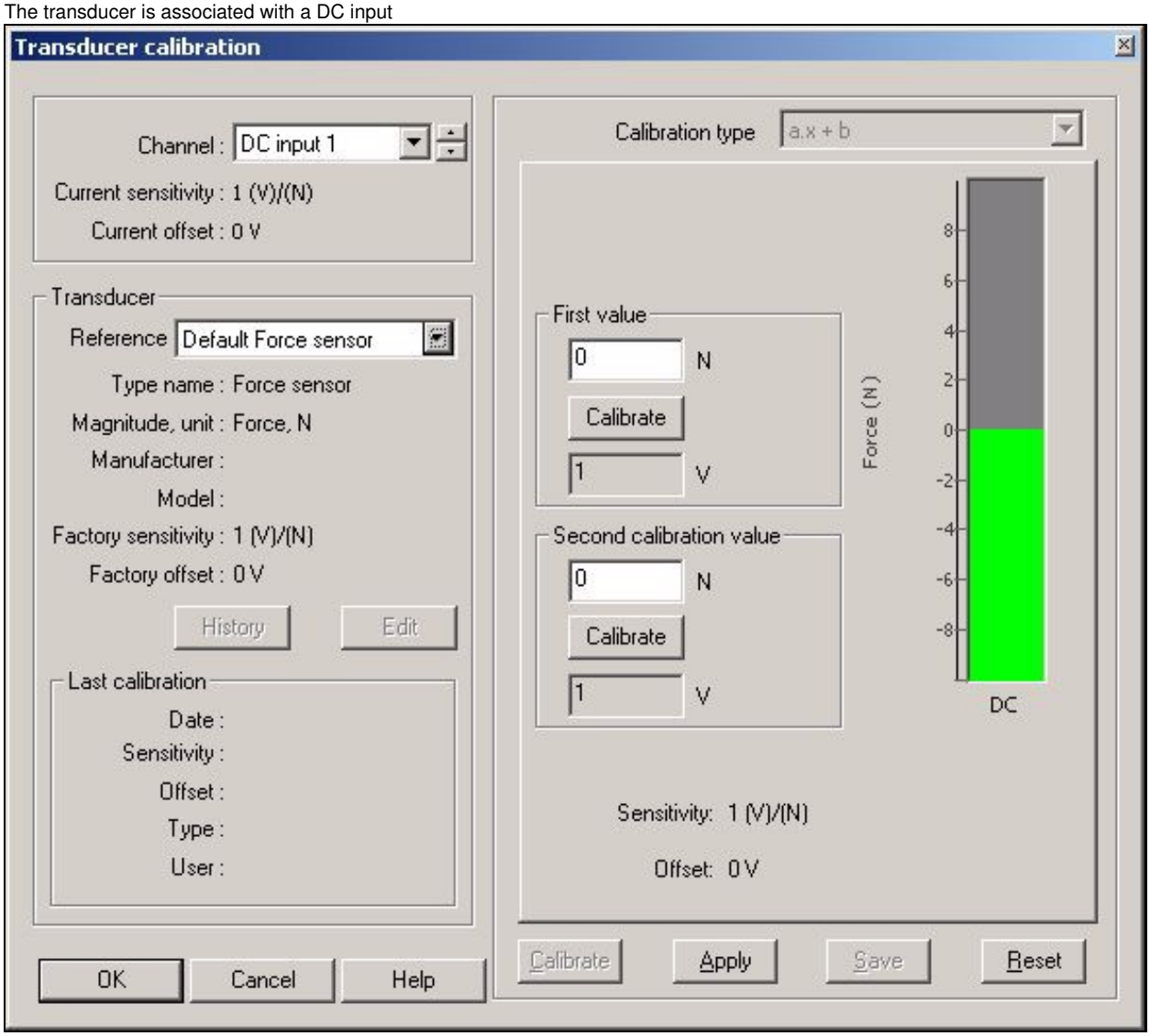
All current analyses and recording must be stopped prior switching to calibration.

The following dialog box is used to calibrate the inputs connected to a transducer.


Transducer calibration
Channel : Input 1
Current sensitivity : 20E-03 (V)/(Pa)
Current offset : 0 V
Transducer
Reference OR-DEM
Type name : Microphone
Magnitude, unit : Acoustic pressure, Pa
Manufacturer : Panasonic
Model : Capsule
Serial number : OROS#1
Factory sensitivity : 20E-03 (V)/(Pa)
Factory offset : 0 V
Applied sensitivity : Current
Conditioner Type : None
History
Edit
Calibration type Acoustic
Acoustic pressure (dB)
90.0
80.0
70.0
60.0
50.0
40.0
0 200 600 1 k 1.4 k 1.8 k
Frequency (Hz)
Calibrator level (dB)
94.0
Calibrator frequency (Hz)
1000.0
New
Sensitivity: 20E-03 (V)/(Pa)
Calibrate
Apply
Save
Reset
Last calibration
Date : 02/17/10
Sensitivity : 20E-03
Type : Factory
Offset : 0 V
User : Default USER
OK
Cancel
Help

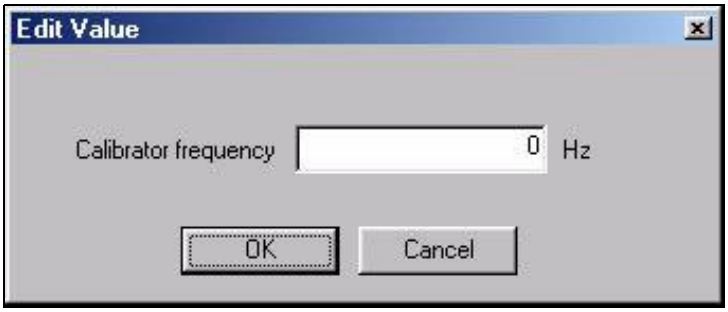
- Channel: This is the channel to be calibrated. It can be selected using the drop-down list or the up and down arrow. It is available for calibration of all dynamic and DC inputs. When a channel is selected, the sensitivity and the offset are immediately updated.
- Reference: This is the transducer selected on the channel. It is necessary to select a transducer in order to calibrate the input. If the transducer used is not in the list, a default transducer can be used. Information about the transducer is displayed.
- History: See "Transducer" chapter p 82. This button is not available when a default transducer is selected, since it does not refer to unique transducer.
- Edit: Similar to the "new transducer dialog".
- Calibration type: This field is automatically updated, depending on the type of transducer selected.

Calibration type	Description
Acoustic	The transducer is a microphone
Vibration	The transducer is an accelerometer (possible unit in g or in m/s²)
Frequency	The transducer is associated with a dynamic input and is not a microphone or an accelerometer
a.x + b	The transducer is associated with a DC input



	The area presents the current level on the DC input and is used to perform the calibration for two values. Once calibration is completed, the new sensitivity and offset are available. • Apply: Applies the new sensitivity to the selected channel. • Save: Applies the new sensitivity to the selected channel and saves the calibration information. This button is not available for a default transducer. • Reset: Restores the current sensitivity of the transducer.

- Acoustic, vibration and frequency calibration: The spectrum measured is displayed. The frequency range is linked to the calibrator frequency. It is possible to right click in the plot area to perform an auto-scale on the Y-axis.
- Calibrator level: Indicates the level of the calibrator. This values is used to determine the new sensitivity of the transducer
- Calibrator frequency: Indicates the frequency of the calibrator. It is used to check that the maximum level measured is at the correct frequency. It is also used to select the best frequency range for the calibration. The most common calibrator frequencies are suggested. It is also possible to choose a user-defined frequency.



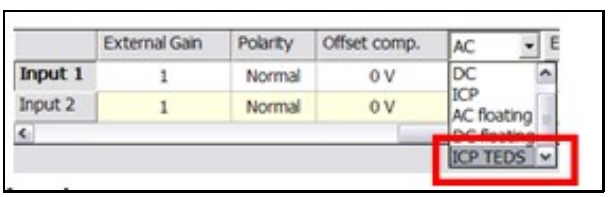
- New: Used to select a user-defined calibrator frequency
- Calibrate: Starts the calibration. The analyzer detects the maximum level, checks that frequency is near the calibrator frequency, and determines the new sensitivity.

NB: In case of 1-DSP analyzer with 4 inputs @ 51,2kHz connected to the octave plug-in, it is not possible to perform the calibration (DSP power limit reached). In such situation, down the sampling frequency to 25,6kHz or disconnecting the inputs from the octave plug-in for the time of the calibration will allow calibrating the sensors.

- Detect TEDS: Start the sequence for detecting transducers (or missing one) equipped with an electronic datasheet inside (TEDS: Transducer Electronic Data Sheet) connected to the front end.

As the TEDS sequence occurs automatically when an input coupling is set to ICP+TEDS, the Detect TEDS button is used for re-checking after transducers or cables modifications. The result of check will be visible on the warning window and may lead to add new transducers to the TDB.

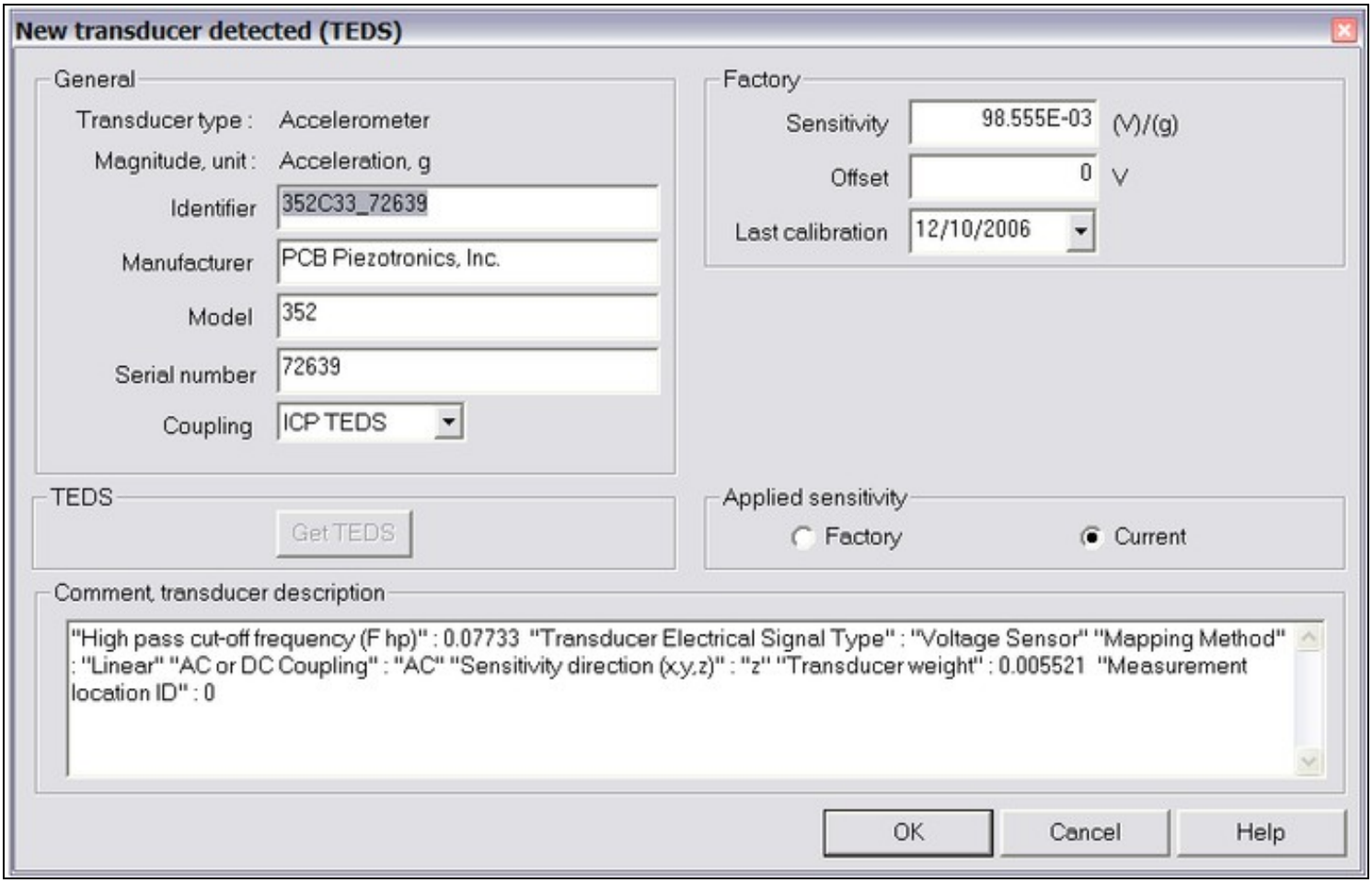
Only the inputs with their coupling set to ICP+TEDS will be checked.



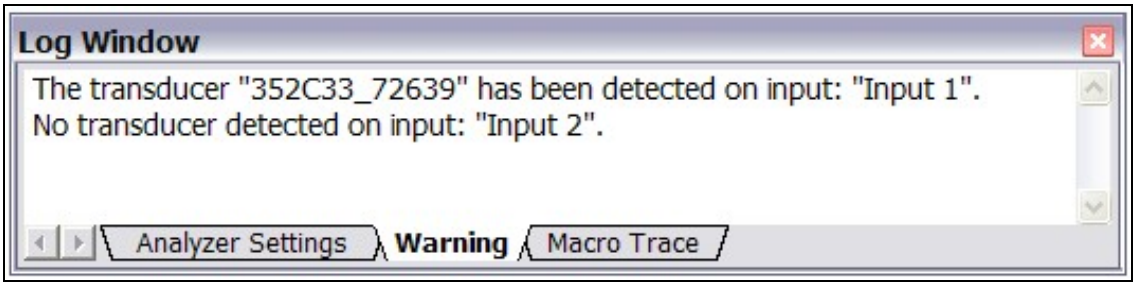
Applying the ICP+TEDS coupling to any (set of) input(s) will activate a recognition sequence on the corresponding input(s). The result can be the following;

- A new transducer (not in the current NVGate® transducers database) is connected to the corresponding input. NVGate® proposes to add the new transducer in the Transducer database. A dialog box lets the user change the transducer properties:

The content of the TEDS is used to fill the transducer properties. The data from the TEDS that have no correspondence in the *transducer database* are copied in the comment area. The name is proposed as the concatenation of type and serial number. User may change it.



- A known transducer (existing in the database) is recognized in the corresponding input. NVGate® will notice it in the log window (which is popped up automatically).



- There is no TEDS transducer connected to the corresponding input. A warning is issued in the log window for each input in this situation.

Warning the TEDS Detection will applies a negative voltage (-5 V) to the corresponding inputs, this may affect incompatible transducers.

OROS 3-Series TEDS management fulfills the IEEE 1451.4 - 2004 revision 1 standard for:

- Accelerometer/Force meter *Template # 25*
- Microphone built in preamplifier *Template # 27*
- Microphone and preamplifier *Template # 28*
- Capacitive Microphones *Template # 29*

The transducers which are compatible with IEEE 1451.4 - 2004 revision 1 are automatically recognized by the OROS 3-Series analyzers. In order to protect transducers that are electrically incompatible with the TEDS reading, there is a special coupling *ICP + TEDS*.

All other transducers types will generate a warning specifying that they are not supported.

There are two ways to add a TEDS transducer to the transducers data base:

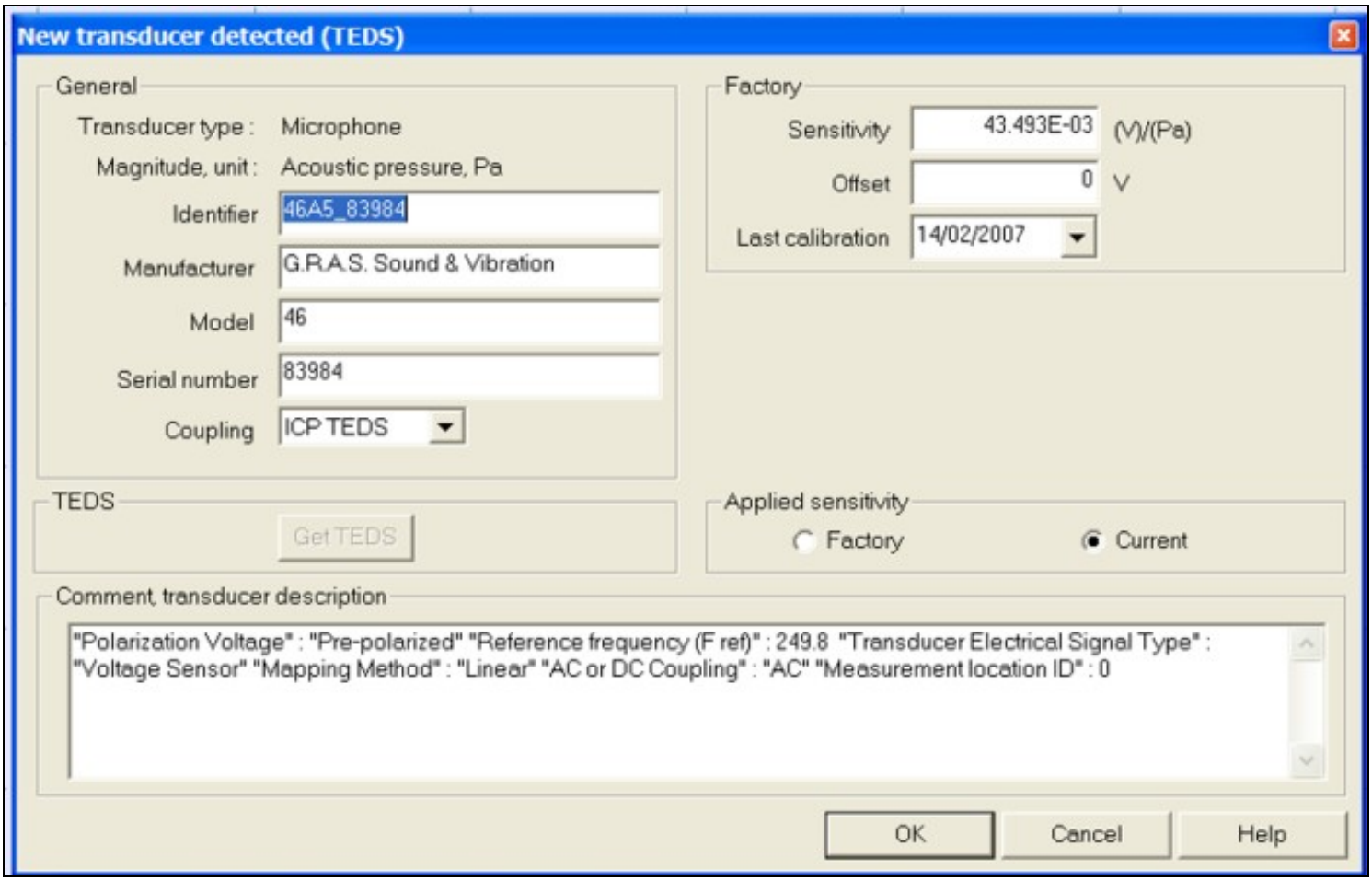
Connect a TEDS transducer on a channel.

Select ICP TEDS for the input coupling.

All the characteristics of the transducer are automatically detected.

A warning confirms that a new transducer has been detected.

The window below is displayed.



The new transducer is added to the transducer database.

- *Used a TEDS File*

To use a TEDS file, click on New from TEDS file in the transducer database window.

By selecting the file, all the characteristics of the transducer are imported in the transducer database where anew transducer is added.

141 NVGate User Preferences

141.1 Introduction

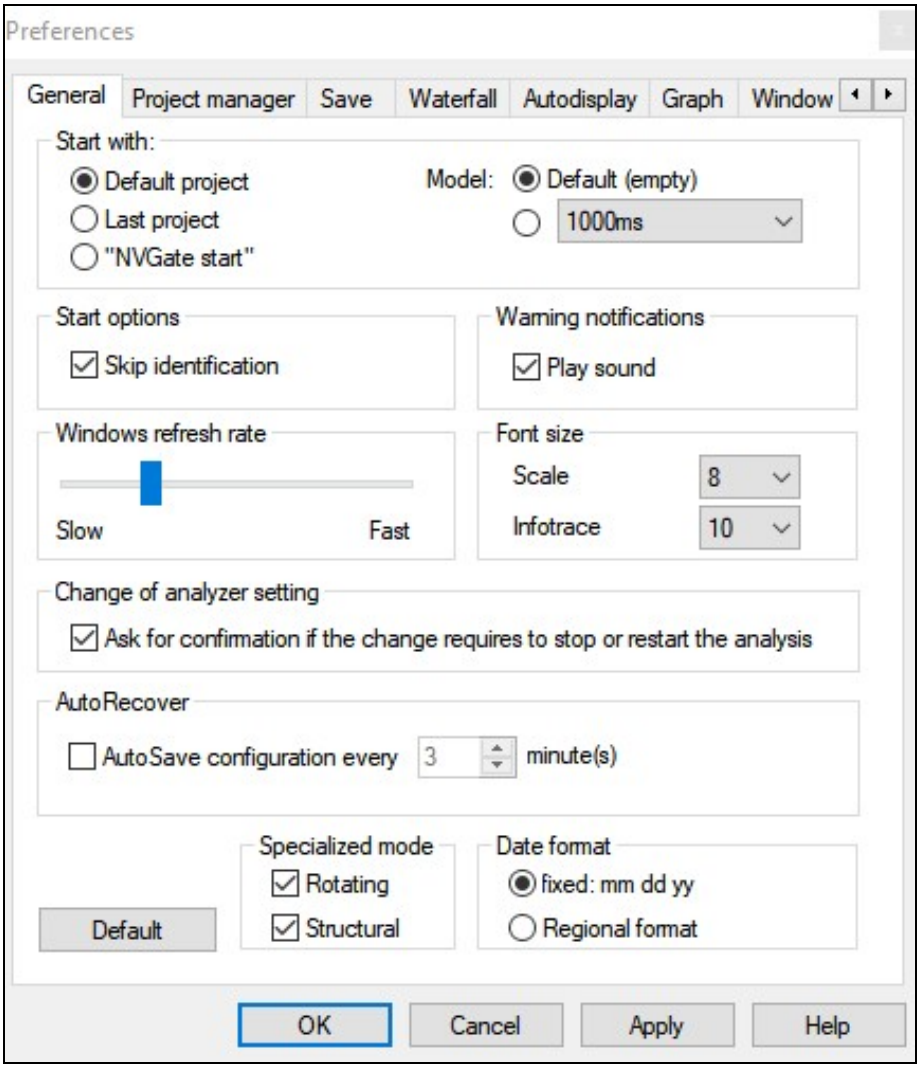
Th user preferences allow modifying and saving your preferred usages for future uses. NVGate propose to share the software use (from a unique PC) between multiple users allowing them to recall their preferences

The user preferences are saved in the user file (.usr).

Users preferences are accessible from the *Home* tab/ *Preferences* group

141.1.1 General

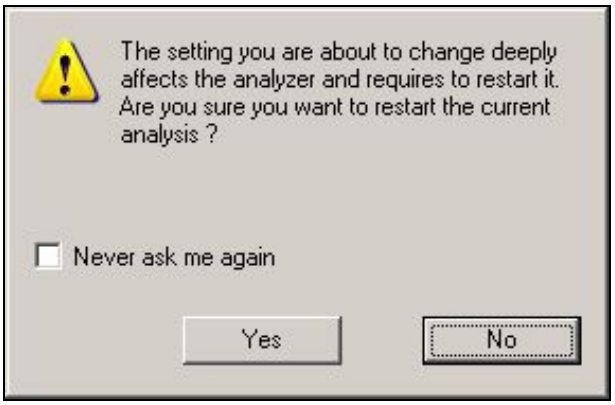
This page is dedicated to general NVGate setting.



- **Default project:** When this option is selected, a new project called "Default project" is created when NVGate is launched.
- **Last project**: When this option is selected, the last project used is loaded when NVGate is launched.
- **Default Model**: This command is only available when the option "Start with default project" is selected. When this option is selected, the new project will be empty and all settings take their default values.
- **Specific Model:** This command is only available when the option "Start with default project" is selected. In this case, the new project is created using a workbook model from the library (using 'Load Model'). Use this option to create a project with some default settings and displays specific to your needs.
- **Skip identification:** This option bypasses user identification prompt. When selected, the last user is automatically selected. This will not work if the user has a password.
- **Play sound:** Option to produce a sound when a warning or an error is received.

Note: Your computer must have speakers for this option.

- **Windows refresh rate:** Used to slow down the window refresh rate. This option should be modified only for heavy configurations or when the host computer has a slow processor.
- **Scale:** Modifies the graph scale font size.
- **Infotrace:** Modifies the Infotrace graph font size.
- **Change of analyzer setting:** When an important setting is modified while the Analyzer is running, a message informs the user that this modification will stop the current analysis.
- **Auto-save configuration:** Define the periodicity of the current setup automatic saving in minutes. In case of abnormal termination, NVGate will propose to recover the last saved setup. Attention if a large signal file is loaded in the player, a copy of this file will be saved periodically. Thus may lead to short freezes of the software and large disk space use.
- **Specialized mode:** choose between 'structural' (this mode is dedicated to the acquisition of modal data (through hammer acquisition or signals provided by up to 6 shakers) or 'rotating' (this mode is dedicated to rotating and reciprocating machines).
- **date format** can be forced to the month/day/year with 2 digits each or matches the regional windows settings. Selecting mm/dd/yy makes date sorting easier.

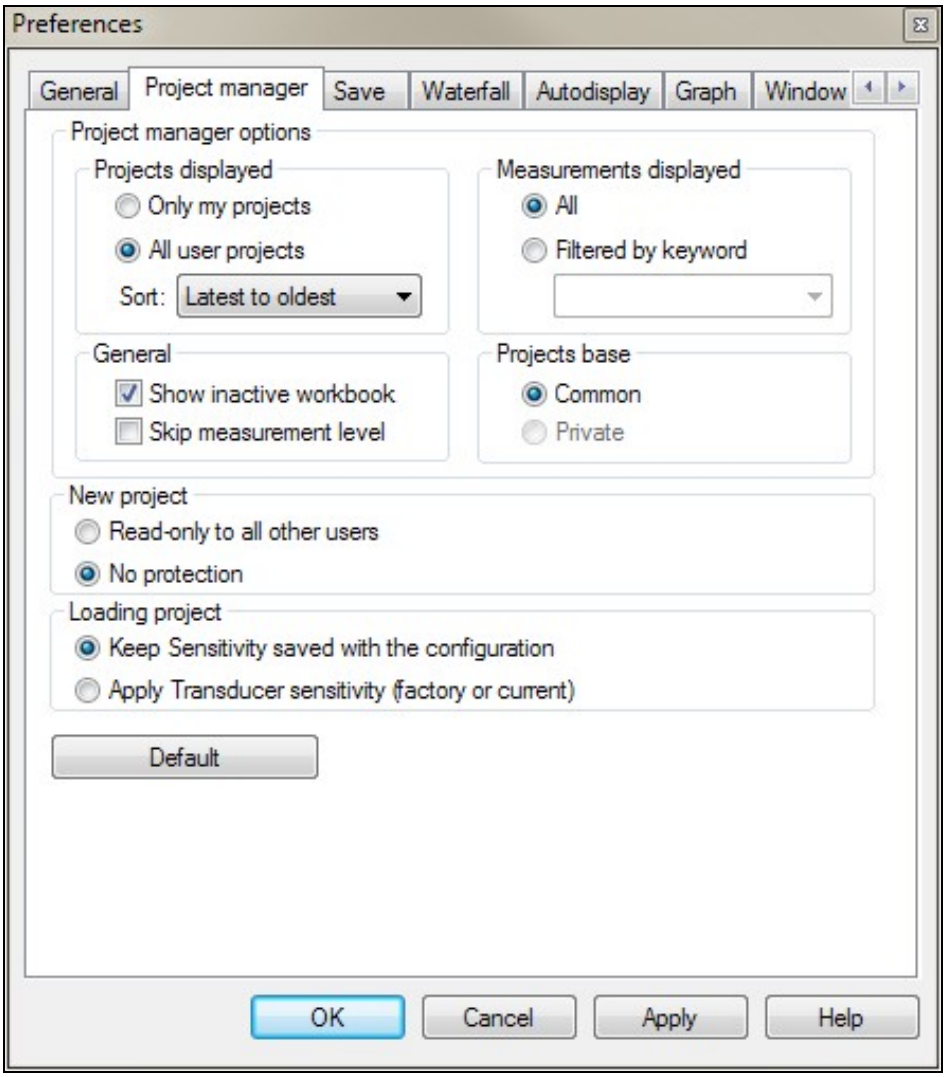


Select this option to block this message.

For users that selected the date as the measurement name auto increment, a choice of date format

141.1.2 Project manager

This preference page is used to configure the project manager.


Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Project manager options
Projects displayed
Only my projects
All user projects
Sort:
Latest to oldest
Measurements displayed
All
Filtered by keyword
General
Show inactive workbook
Skip measurement level
Projects base
Common
Private
New project
Read-only to all other users
No protection
Loading project
Keep Sensitivity saved with the configuration
Apply Transducer sensitivity (factory or current)
Default
OK
Cancel
Apply
Help

141.1.2.1 Project manager options

- **Only my projects:** When this option is selected, only the projects that belong to the current user are displayed. This can be useful when NVGate is used by many users.
- **All user projects:** When this option is selected, the projects that belong to all users are displayed. This can be used to share data or set-ups between different users.
- **Sort:** The projects can be displayed in three different ways in the project manager:

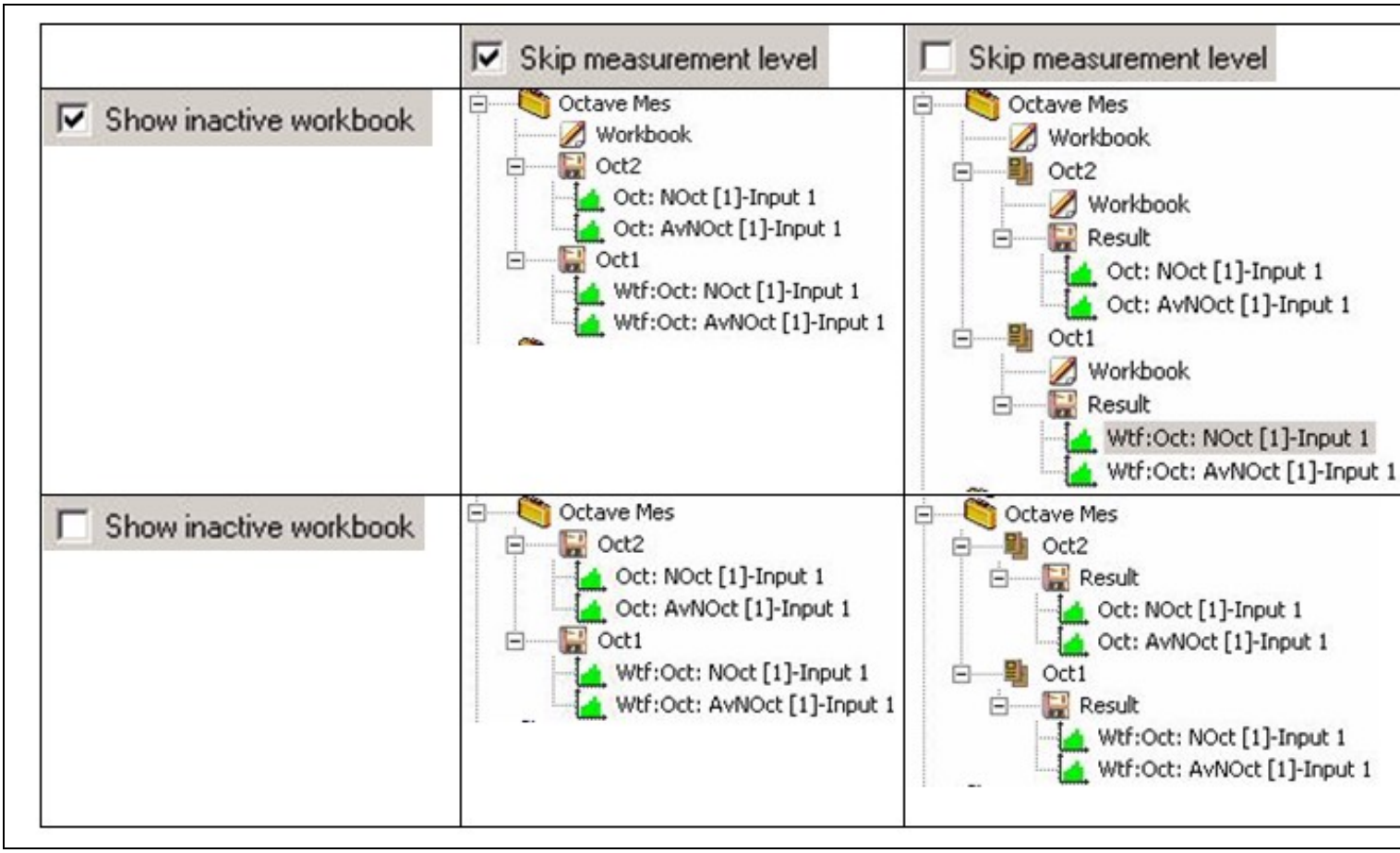
Alphabetical	The projects are classified by their name
Latest to oldest	The projects are classified by date created, with the newest project being at the top of the project manager
Oldest to latest	The projects are classified by date created, with the newest project being at the bottom of the project manager

141.1.2.1.1 Measurements displayed

- **All:** all measurements are displayed even the measurements that do not belong to the current user.
- **Filtered by keyword:** the measurement can be filtered by keyword. The keywords are assigned to the measurement when it is created, or can be changed in measurement properties. This option is very helpful when organizing measurement campaigns.

141.1.2.1.2 General

It is possible to hide all the inactive workbooks and to delete the measurement level. The table below illustrates the differences

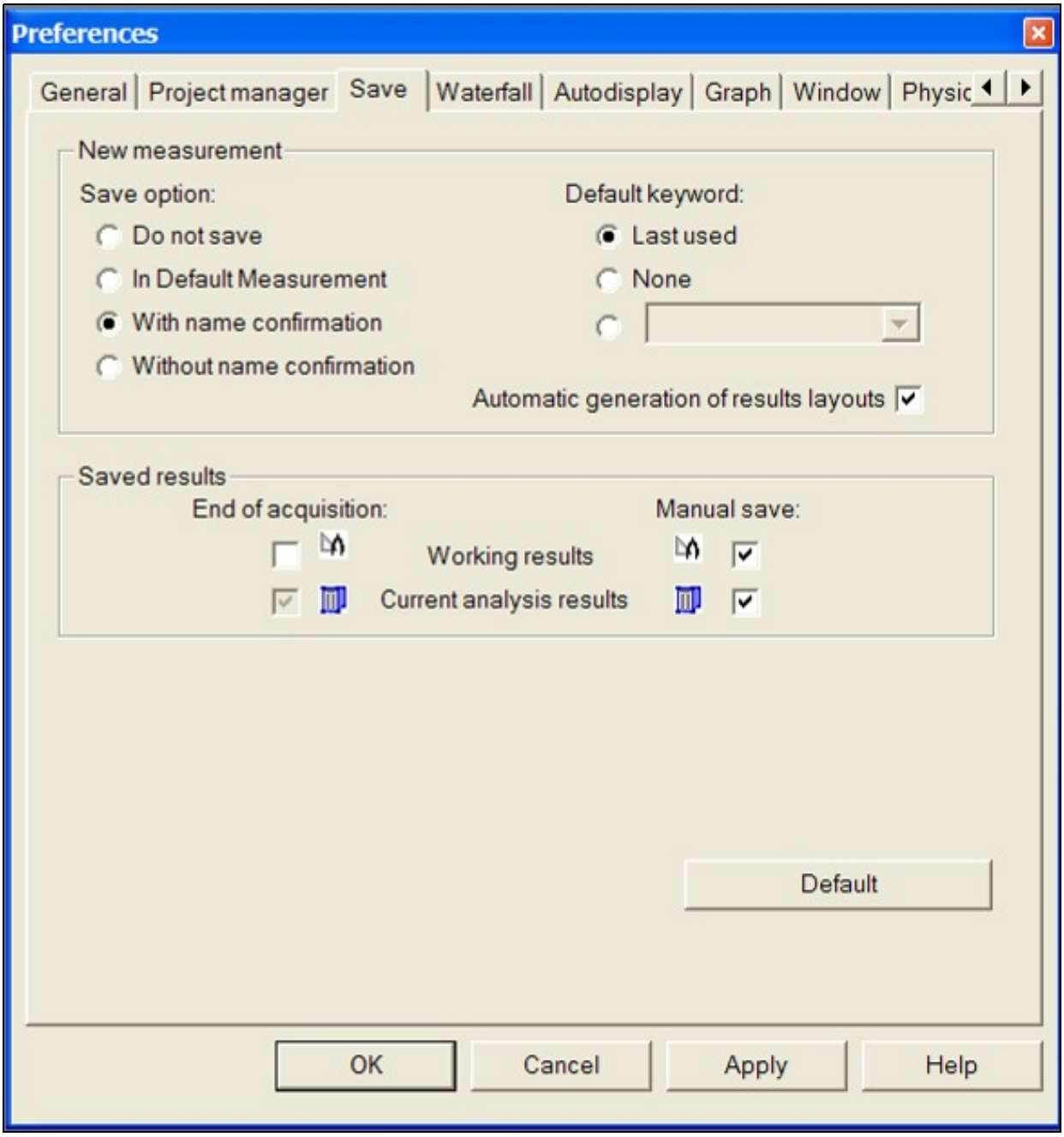


141.1.2.1.3 New project

This option sets the default protection that will be applied to a new project. This protection can be modified later via the project properties.

- **Read-only to all other users:** he current user does not want to allow other users to modify his projects. Other users can load the project, but will not be allowed to modify it.
- **No protection:** Any user can freely modify the current user's project.

141.1.3 Save



141.1.3.1 New measurement

- **Save option:** This option determines the way in which the measurement will be created when the analyzer stops

Do not save	No measurement will be created. The only way to save the results selected is to perform the Save Result command manually
In default measurement	The measurement is created with the name "Default measurement". If a measurement with this name already exists, it is overwritten.
With name confirmation	A dialog box will be displayed when the analyzer stops. It will suggest a name using a Base name and an auto increment choice.
Without name confirmation	The measurement is created with a name automatically generated from the Base name and the auto increment choice.

- **Default keyword:** Used to choose the keyword that will be associated with the new measurement. Refer to the preference section for more information.
- **Automatic generation of results layouts:** by checking this box, measurement will be saved with the corresponding layout and when this measurement will be open it will be possible to modify the current layout.

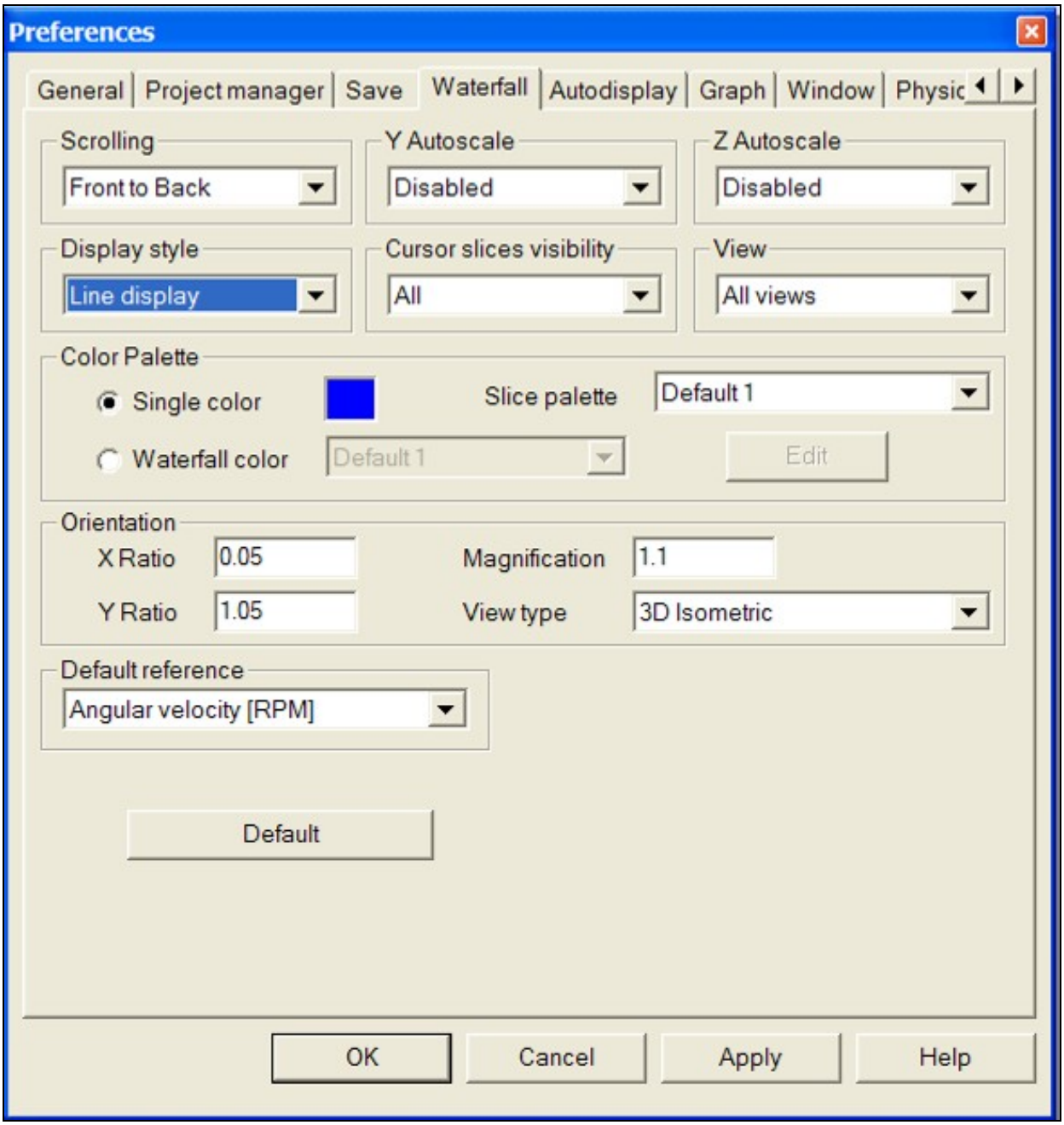
141.1.3.1.1 Saved Results

- **Current Analysis result:** Results obtained from an acquisition**.**
- End of acquisition: open automatically a dialog box to save the results when the analyzer stops.
- Manually: allow to save the results manually.
- **Working results:** Results obtained after an operation based on already saved results, for example a result calculated with an operator, or the computation of results from an edidted measurement such as FRF H2 from a saved H1. These results can be only saved manually.

Default: set all the parameters to their default values**.**

141.1.4 Waterfall

This preference page is dedicated to Waterfall window configuration. Settings specific to the type of result can be modified in the graph preference page.


Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Physic
Scrolling
Front to Back
Y Autoscale
Disabled
Z Autoscale
Disabled
Display style
Line display
Cursor slices visibility
All
View
All views
Color Palette
Single color
Slice palette
Default 1
Waterfall color
Default 1
Edit
Orientation
X Ratio
0.05
Magnification
1.1
Y Ratio
1.05
View type
3D Isometric
Default reference
Angular velocity [RPM]
Default
OK
Cancel
Apply
Help

- **Display style**

Used to select the Waterfall 3D view style. Three display styles are available:

- Line display: in this mode, each spectrum or block is displayed with a filled plane surface defined by the spectrum points. The fill color is the selected color for single color field.
- If Waterfall color is activated, the current palette is used to compute the color of the points and an interpolation is used to display the spectrum. If not, the spectrum is black.
- Point display: in this mode, only points are displayed. There are no links between them. This mode is useful for small computer configurations or for large Waterfalls with many points or a large depth. If the Waterfall color is activated, the current palette is used to compute the point color. If not, the points get the selected signal color.
- Solid display: this is a colored mode: it displays the Waterfall with interpolation between the points of each spectrum and between two consecutive points with the same x value. This mode is the same one used for the color spectrum view.
- **Scrolling**

Used to select the scrolling direction. Two are available:

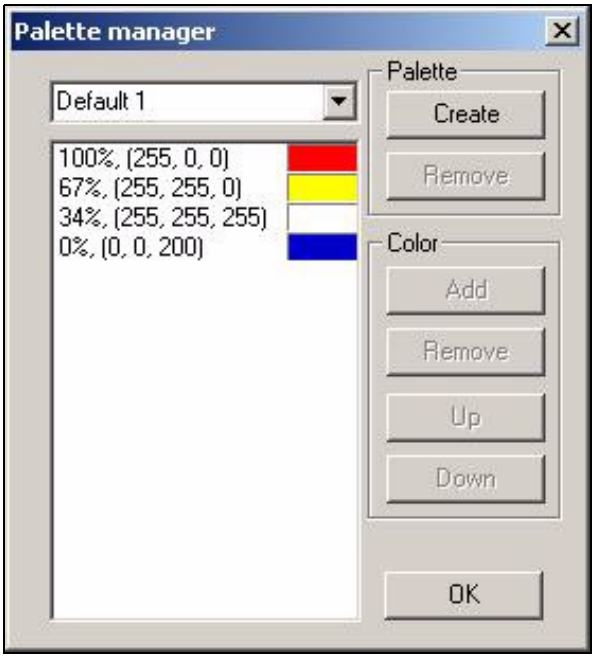
- **Front to back:** the Waterfall is filled from front to back of the displayed box.
- **Back to front**: the Waterfall is filled from back to front of the displayed box.
- **Color palette**

Used to select the color mode used for 3D Waterfall displays. Two modes are available:

- **Single color:** no color interpolation is used for the points. This color is used for filling the plane in Line mode.
- **Waterfall color:** if checked, the selected palette is used for the color rendering and for the color spectrogram mode. The edit button displays the palette manager dialog box.

Palette manager

This dialog box is used to create and edit color palette.



Palette

Create: Creates a new palette.

Remove: Removes the selected palette.

Color

Add: Adds a key color to the palette.

Remove: Removes the selected key color from the palette.

Up: The selected key color move up from one step, if possible.

Down: The selected key color move down from one step, if possible.

Each color of the palette can be edited by clicking on a colored area. The percentage can also be edited by double-clicking on the text zone of each color.

- **Z autoscale**

Used to select an autoscale type. Two kinds are available:

- Disable: no autoscale is activated.
- Continuous: when a spectrum is not within the Z scale values, an autoscale is performed with no margin. This mode is not recommended for computers with limited processing power.
- **Y autoscale**

Used to select an autoscale type. Two kinds are available:

- Disable: no autoscale is activated.
- Continuous: when a spectrum is not within the Y scale values, an autoscale is performed with no margin. This mode is not recommended for computers with limited processing power.

- **Cursor slice visibility**

Used to choose the default slice visibility. Four choices are available:

- All: the default slices are displayed in all areas.
- Only in 3D: the default slices are Display only in the 3D area.
- Only in 2D: the default slices are Display only in the 2D area.
- No display: the default slices are not displayed in any area.
- **Default reference**

Used to select your default reference for your waterfall.

Note: If the measurement is loaded, then the waterfall is displayed as the measurement has been done.

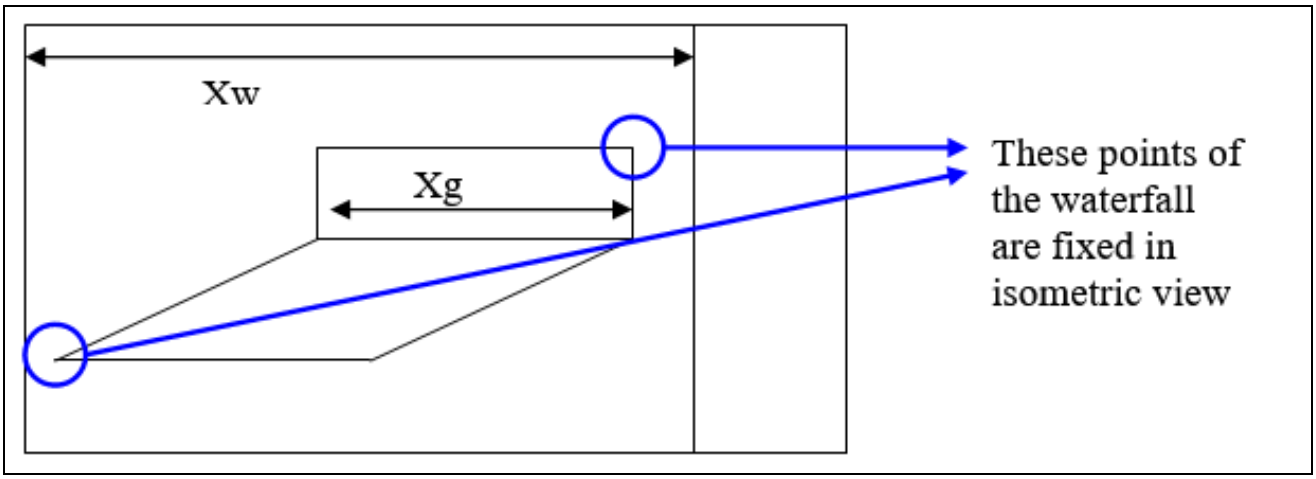
If the Waterfall is displayed, then the reference is the one defined in the user preferences.

- **View**

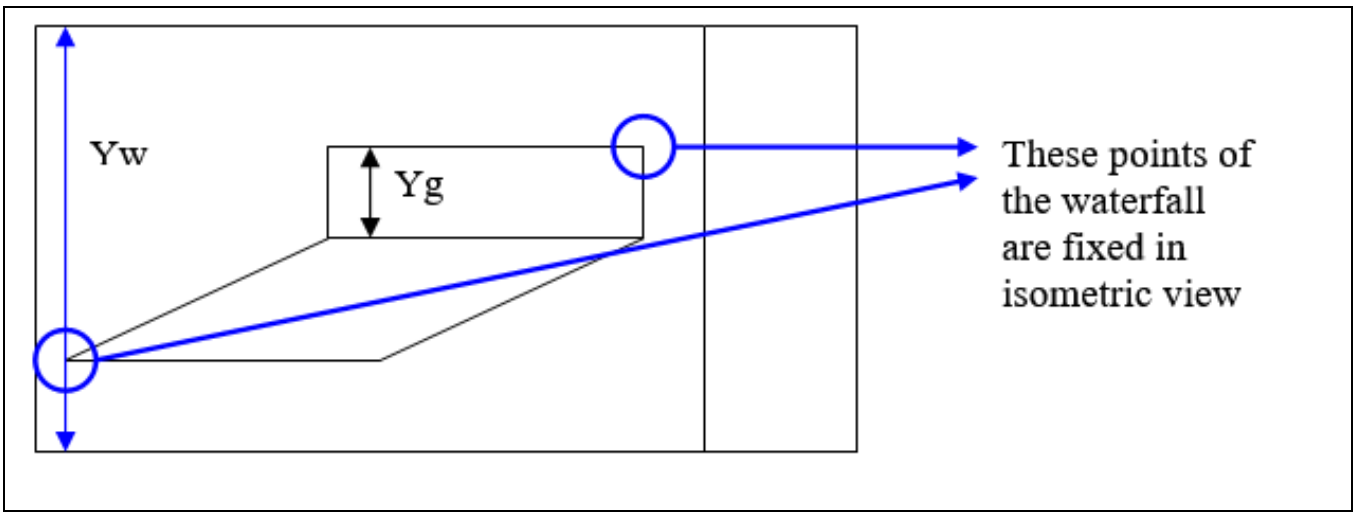
Used to select a view mode in the Waterfall window: two modes are available:

- 3D View: only the 3D view is displayed in the window.
- All views: 3D view and slices areas are displayed in the window.

- **Orientation**
- X ratio: this setting displays the ratio between the window and the waterfall X-axis size.



- Y ratio: this setting displays the ratio between the window and the waterfall Y-axis size.

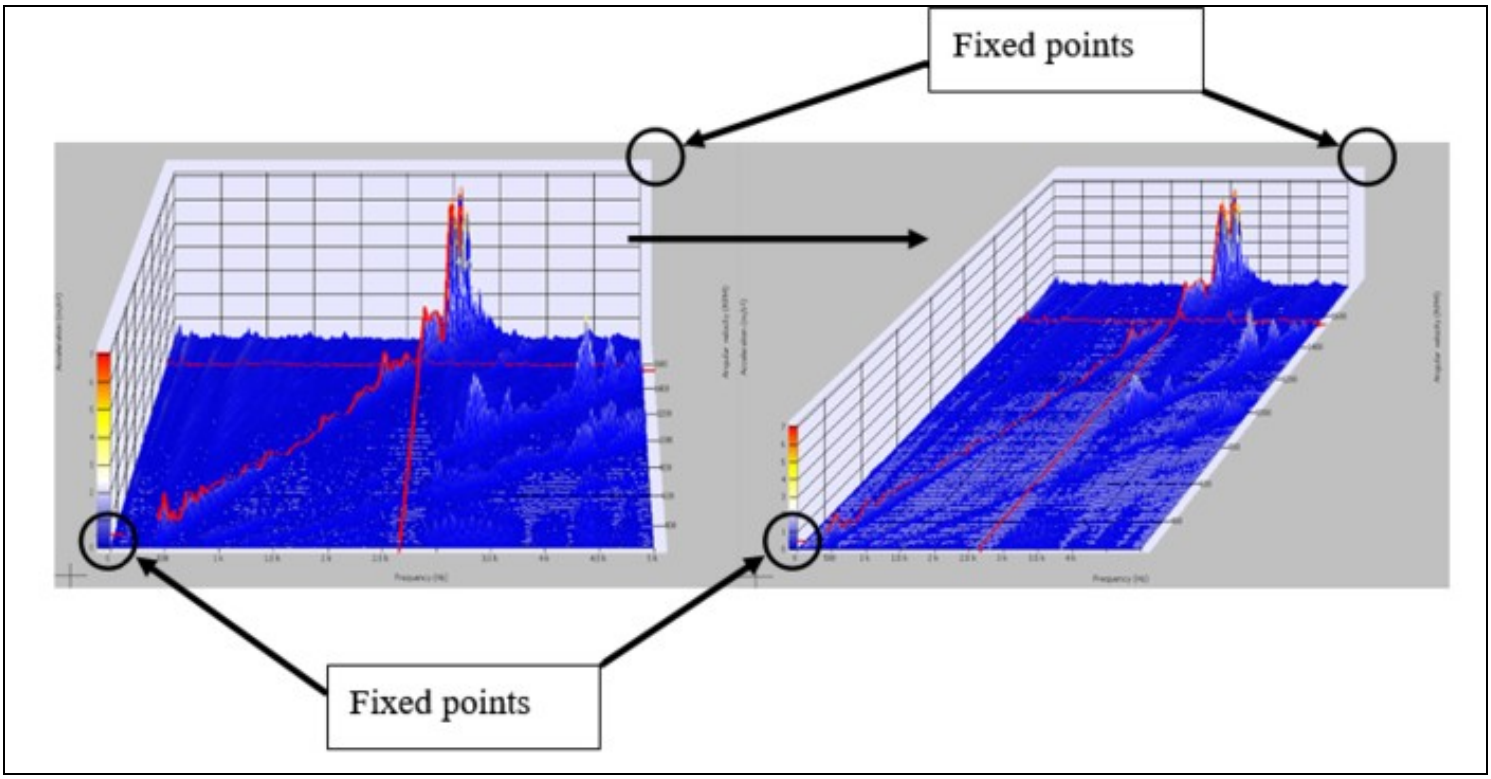


- Magnification: this setting displays the position of the waterfall in the window in term of depth. The waterfall will be far in the window if the cam factor is large.

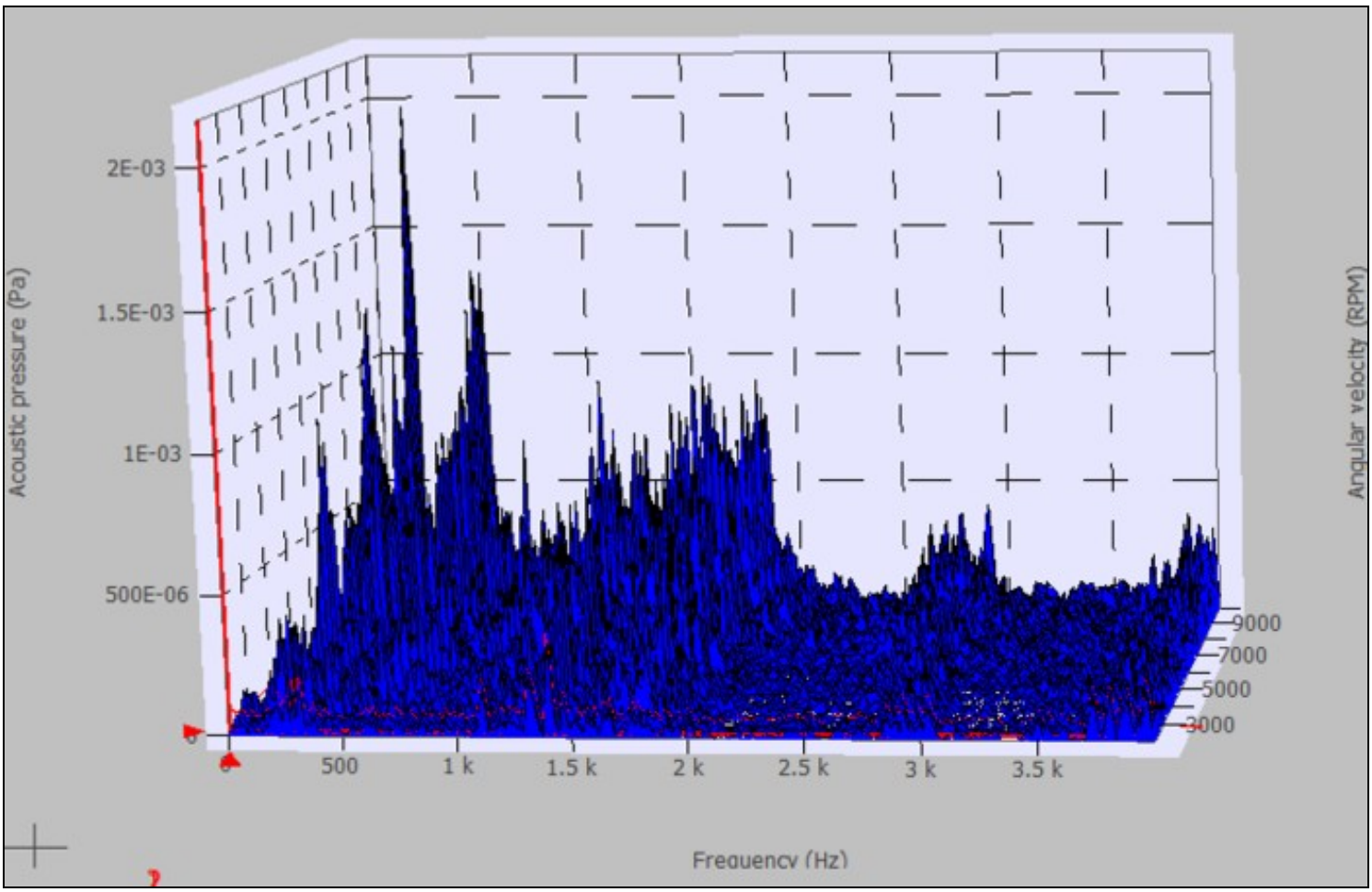
- View type:

- 3D isometric

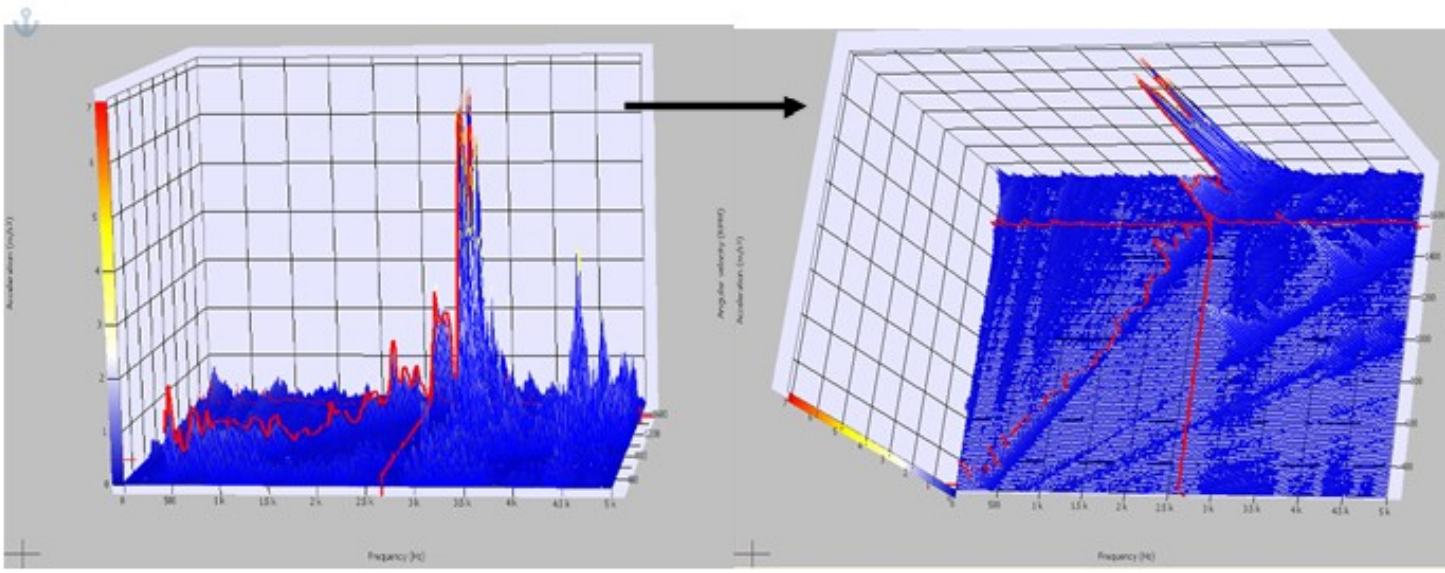
If isometric view is checked: you can change the position and dimension of the waterfall around two fixed points (see above).



• 3D perspective:

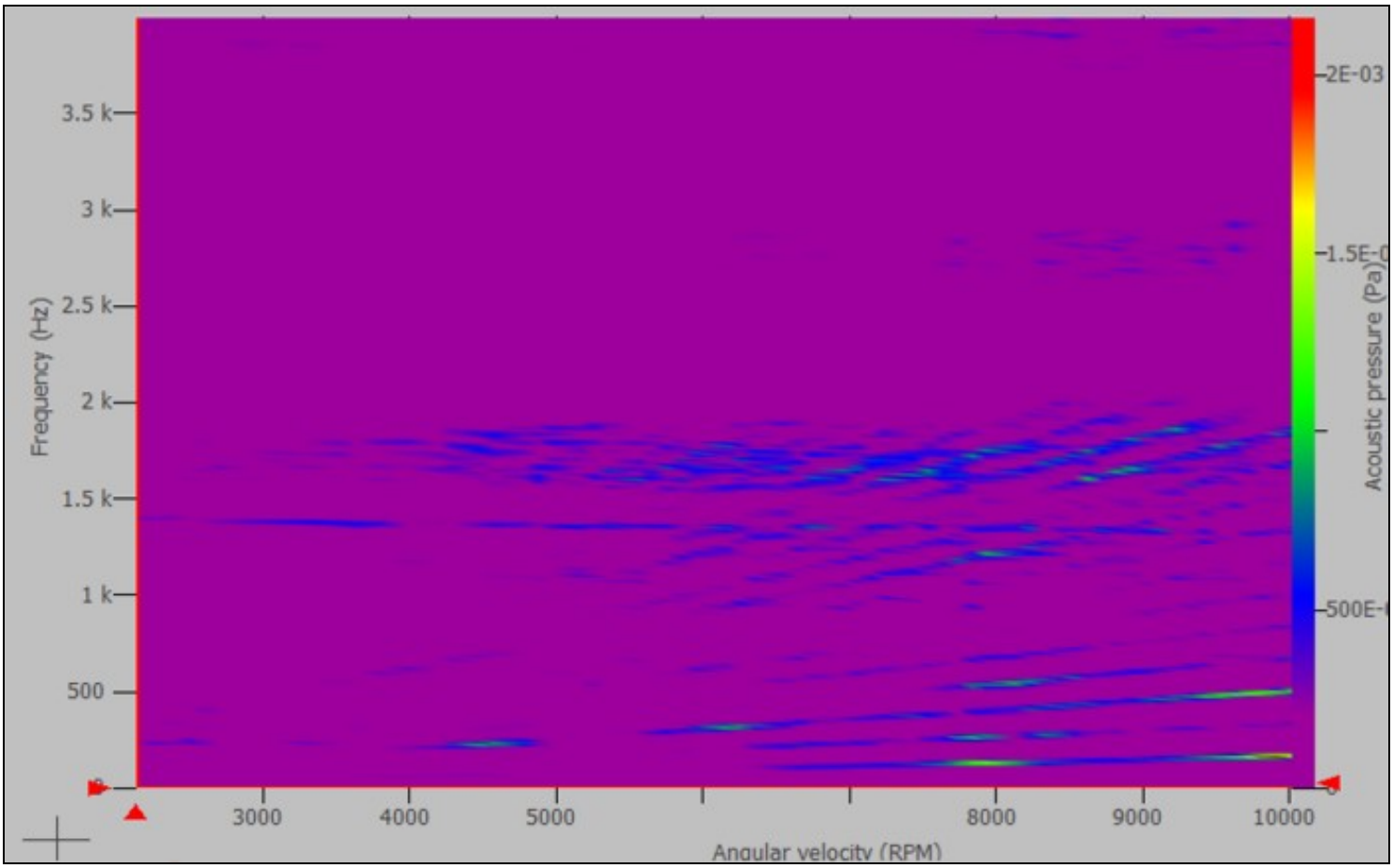


If Perspective is not checked: there is no fixed point, the waterfall can be moved in the 3D space. This view is an orthonormal view.



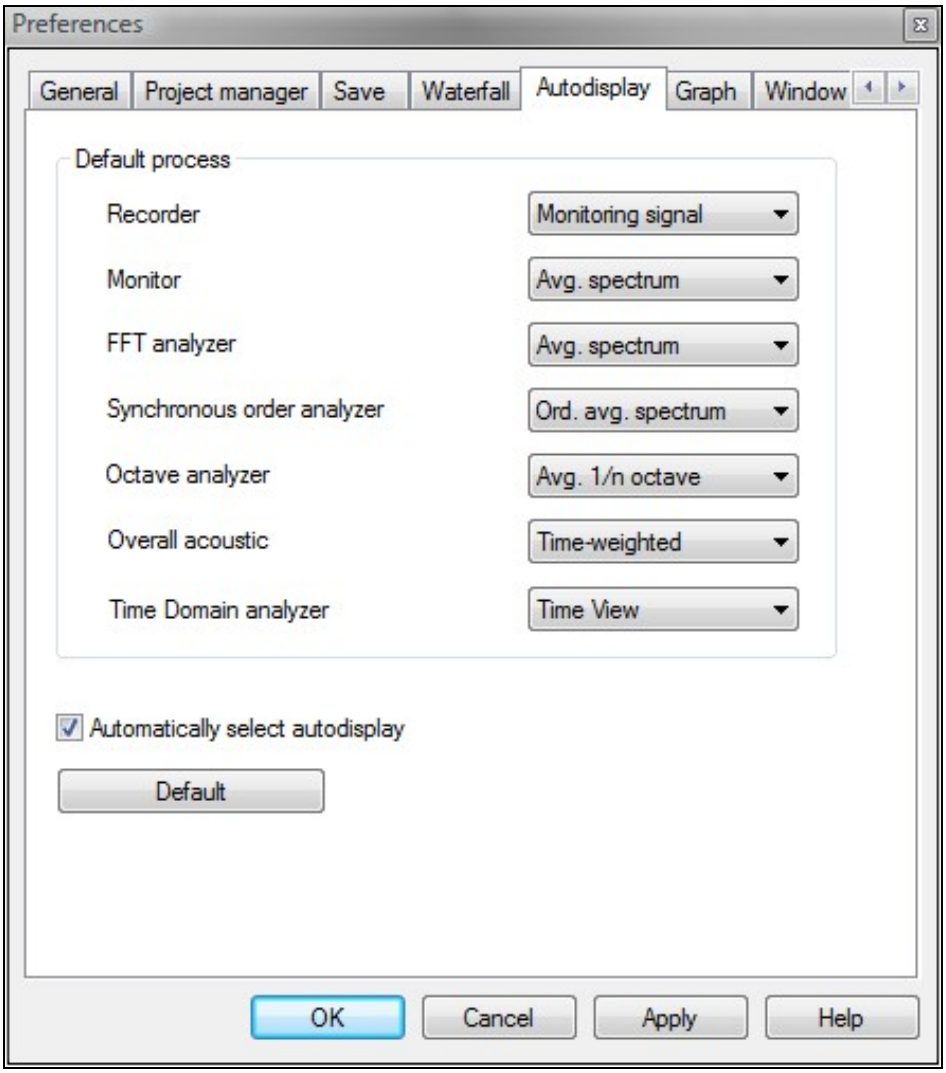
- Freq/Time Colormap:

- Time/Freq Colormap:



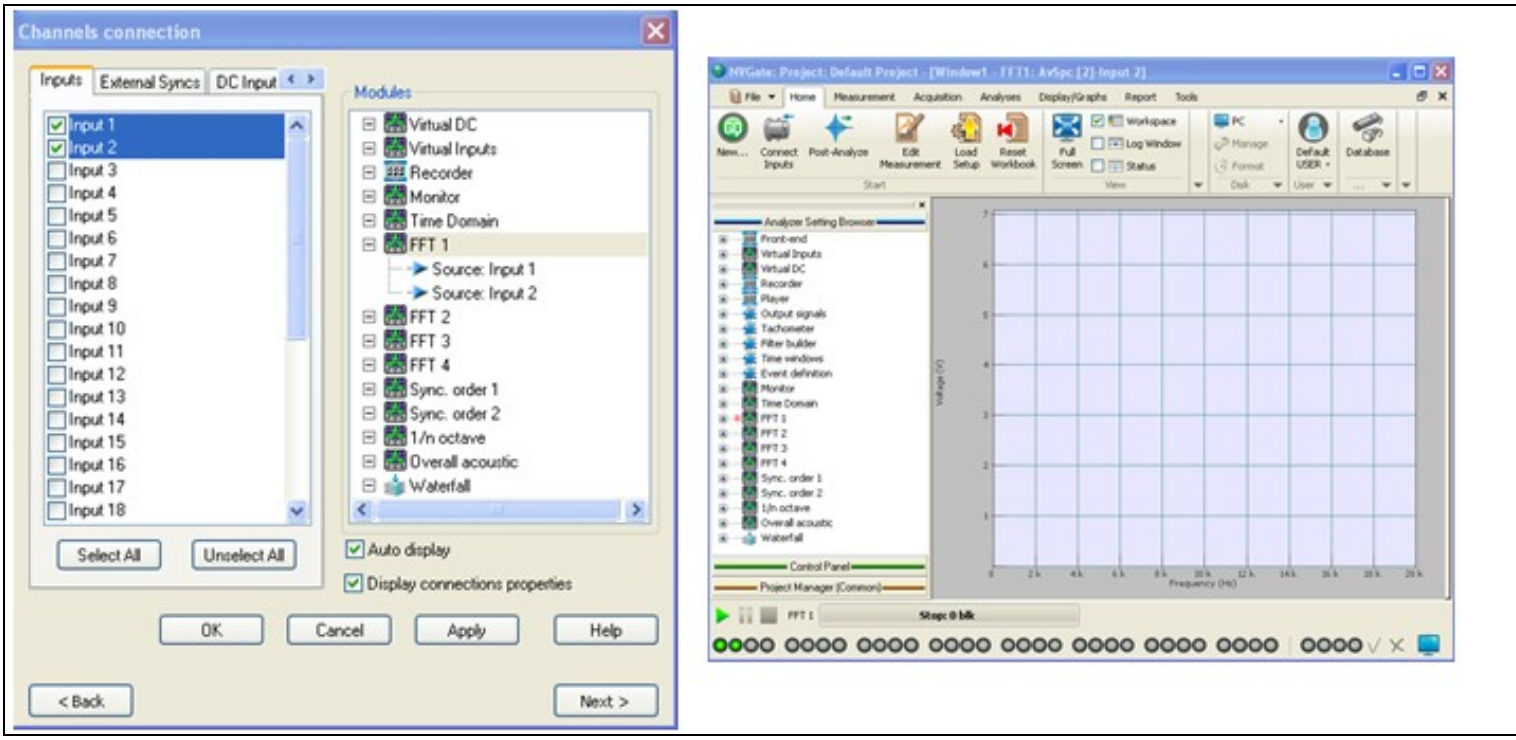
141.1.5 Autodisplay

This preference page is used to set up the type of result to be automatically displayed after input connections. It is possible to select the "Autodisplay" type of result for each available plug-in analyzer.


Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Default process
Recorder
Monitoring signal
Monitor
Avg. spectrum
FFT analyzer
Avg. spectrum
Synchronous order analyzer
Ord. avg. spectrum
Octave analyzer
Avg. 1/n octave
Overall acoustic
Time-weighted
Time Domain analyzer
Time View
Automatically select autodisplay
Default
OK
Cancel
Apply
Help

The plug-in analyzers available results are the same as in the "Add/Remove window" dialog.

Example of a FFT Averaged spectrum result autodisplay:



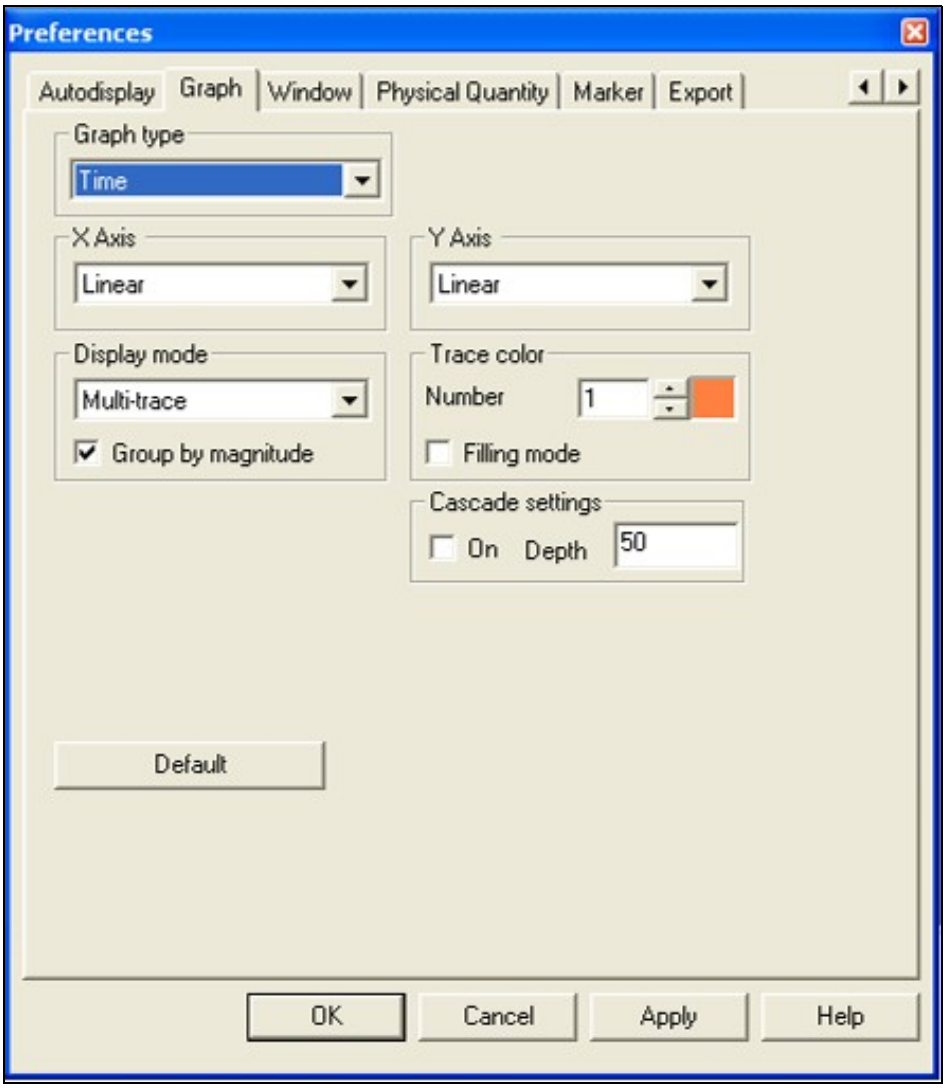
Input connection: The type of result selected in the autodisplay preferences is automatically displayed

141.1.6 Graph

This window allows selecting the graph desired and changing the preferences corresponding to it.

Graph type: Used to select the kind of graph desired.

141.1.6.1 Time


Preferences
Autodisplay
Graph
Window
Physical Quantity
Marker
Export
Graph type
Time
X Axis
Linear
Y Axis
Linear
Display mode
Multi-trace
Group by magnitude
Trace color
Number
1
Filling mode
Cascade settings
On
Depth
50
Default
OK
Cancel
Apply
Help

- **Graph type:** Used to select the kind of graph desired in order to change the preferences.

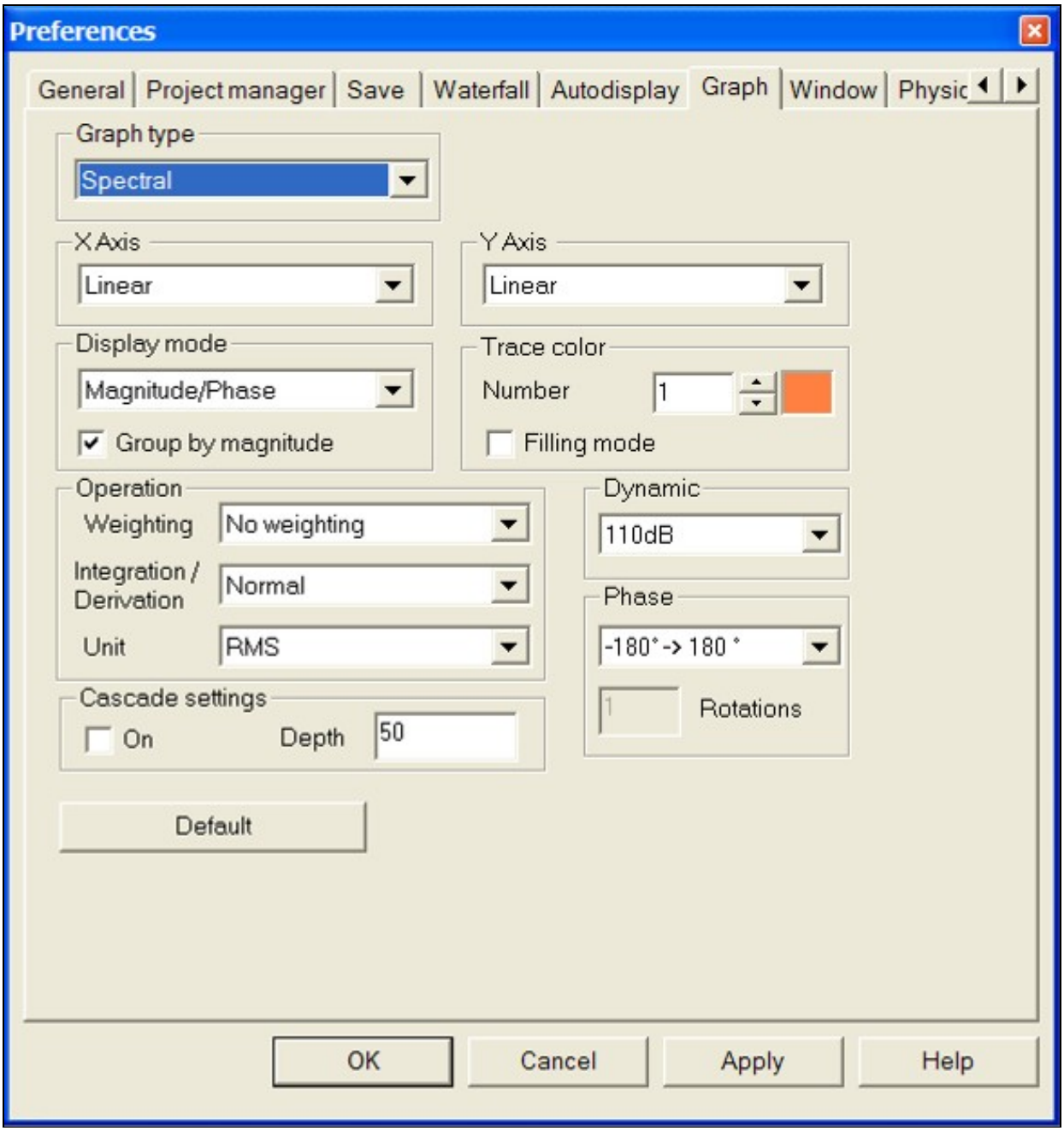
If Magnitude gathering is active, when the window is in a simple multi trace mode (module, phase, real, imaginary... but not in multi trace module/phase, real/imaginary....), one area is created for each different Y magnitude in the window.

- **X-axis:** Select the X scale type. Two kinds of X scale are available (depending on the kind of window).
- Linear
- Logarithmic

- **Y-axis:** Select the Y scale type. Three kinds of Y scale are available (depending on the kind of window).
- Linear
- Logarithmic
- dB

- **Display mode:** Select the display mode to use for this kind of graph. Several display modes are available for each kind of graph.
- **Trace color:** Select the color for each trace of the graph. Only 32 traces can be displayed in the same graph.
  If Filling mode is active, each trace of the window is filled with a color and has a black border. This option is especially useful for multi-graph modes.
- **Cascade settings:** If mode Cascade is 'On' you can select the depth (the Z-axis) of the 3D Cascade view.

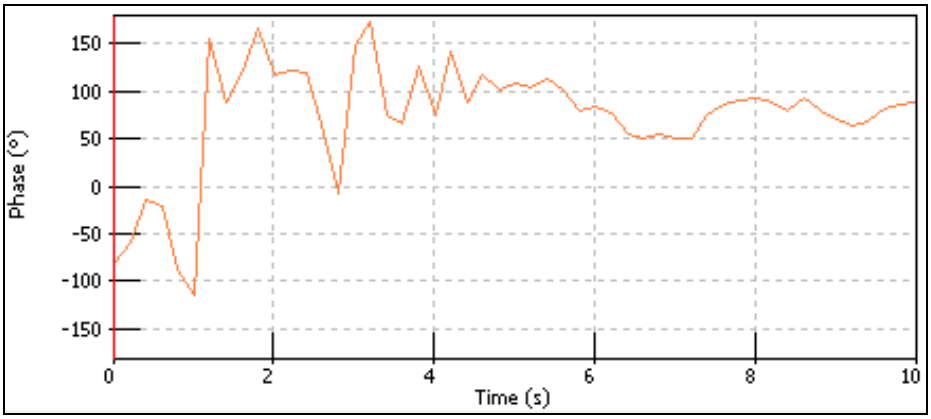
141.1.6.2 Spectral


Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Physic
Graph type
Spectral
X Axis
Linear
Y Axis
Linear
Display mode
Magnitude/Phase
Group by magnitude
Trace color
Number
1
Filling mode
Operation
Weighting
No weighting
Integration / Derivation
Normal
Unit
RMS
Dynamic
110dB
Phase
-180° -> 180 °
1
Rotations
Cascade settings
On
Depth
50
Default
OK
Cancel
Apply
Help

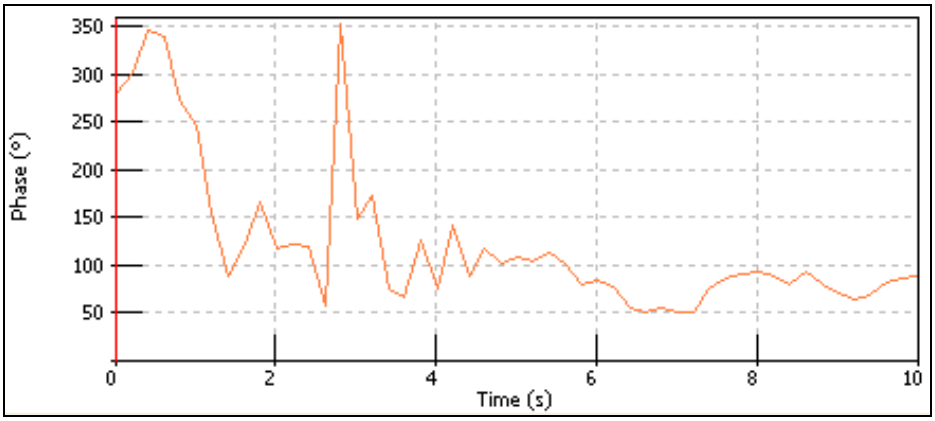
- **X-axis:** Select the X scale type. Two kinds of X scale are available (depending on the kind of window).
- Linear
- Logarithmic

- **Y-axis:** Select the Y scale type. Three kinds of Y scale are available (depending on the kind of window).
- Linear
- Logarithmic
- dB
- **Display mode**
- **Magnitude:** overlays all magnitude traces on a single graph.
- **Phase**: overlays all phase traces on a single graph.
- **Real part**: overlays all real parts traces on a single graph.
- **Imaginary part**: overlays all imaginary part traces on a single graph.
- **Magnitude/phase**: overlays all magnitude traces on the upper graph and all the phase traces on the lower graph.
- **Real/imaginary**: overlays all magnitude traces on the upper graph and all the phase traces on the lower graph.
- **Polar**: overlays all complex traces on a polar graph: þ = magnitude, Ø = phase.
- **Real part 3D**: displays all real part traces as a 3D graph arranged along the Z-axis.
- **Imaginary part 3D**: displays all imaginary part traces as a 3D graph arranged along the Z-axis.
- **Magnitude 3D**: displays all magnitude traces as a 3D graph arranged along the Z-axis.
- **Phase 3D**: displays all phase traces as a 3D graph arranged along the Z-axis.
- **Real part multi-graph**: displays all real part traces using one graph per trace in the same window.
- **Imaginary part multi-graph**: displays all imaginary part traces using one graph per trace in the same window.
- **Magnitude multi-graph**: displays all magnitude traces using one graph per trace in the same window.
- **Phase multi-graph**: displays all phase traces using one graph per trace in the same window.
- **Phase/Magnitude**: overlays all phase traces on the upper graph using 1/3 of window space and all the magnitude traces on the lower graph using 2/3 of the window.
- **Merged Magnitude/Phase**: displays all magnitude and phase part traces as a unique graph.
- **Magnitude gathering**: if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.
- **Trace color**
- **Number:** selects the trace number for color modification.
- **Color box:** click on this box to modify the color of the selected trace.
- **Filling mode**: if selected, all the curves of the windows are filled from:
- the bottom of the area if Y scale is a dB one or Logarithmic one
- the 0 value of the Y scale is linear.
- **Dynamics**
- **90 dB**: resizes the Y-axis to 90 dB dynamics starting from +20 dBV.
- **110 dB**: resizes the Y-axis to 110 dB dynamics starting from +20 dBV.
- **130 dB**: resizes the Y-axis to 130 dB dynamics starting from +20 dBV.
- **150 dB**: resizes the Y-axis to 150 dB dynamics starting from +20 dBV.

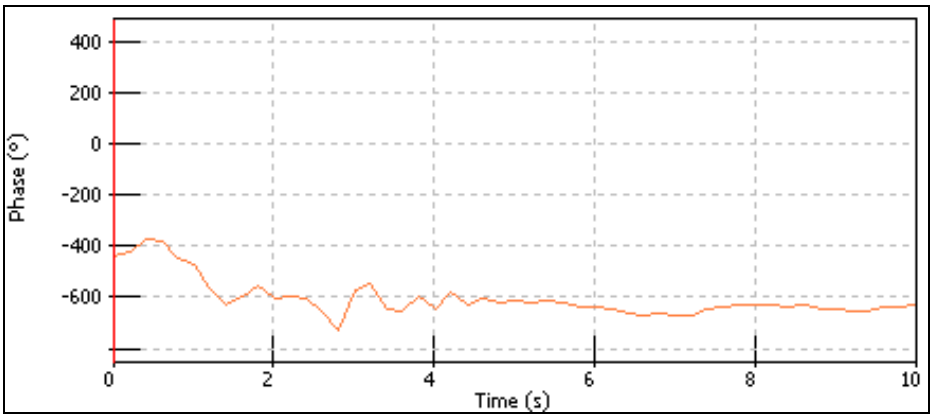
- **Phase**
- **-180° -> 180°**: sets the phase graph Y-axis between ?180° to +180°.



- **0 -> 360°**: sets the phase graph Y-axis between 0 to +360°.

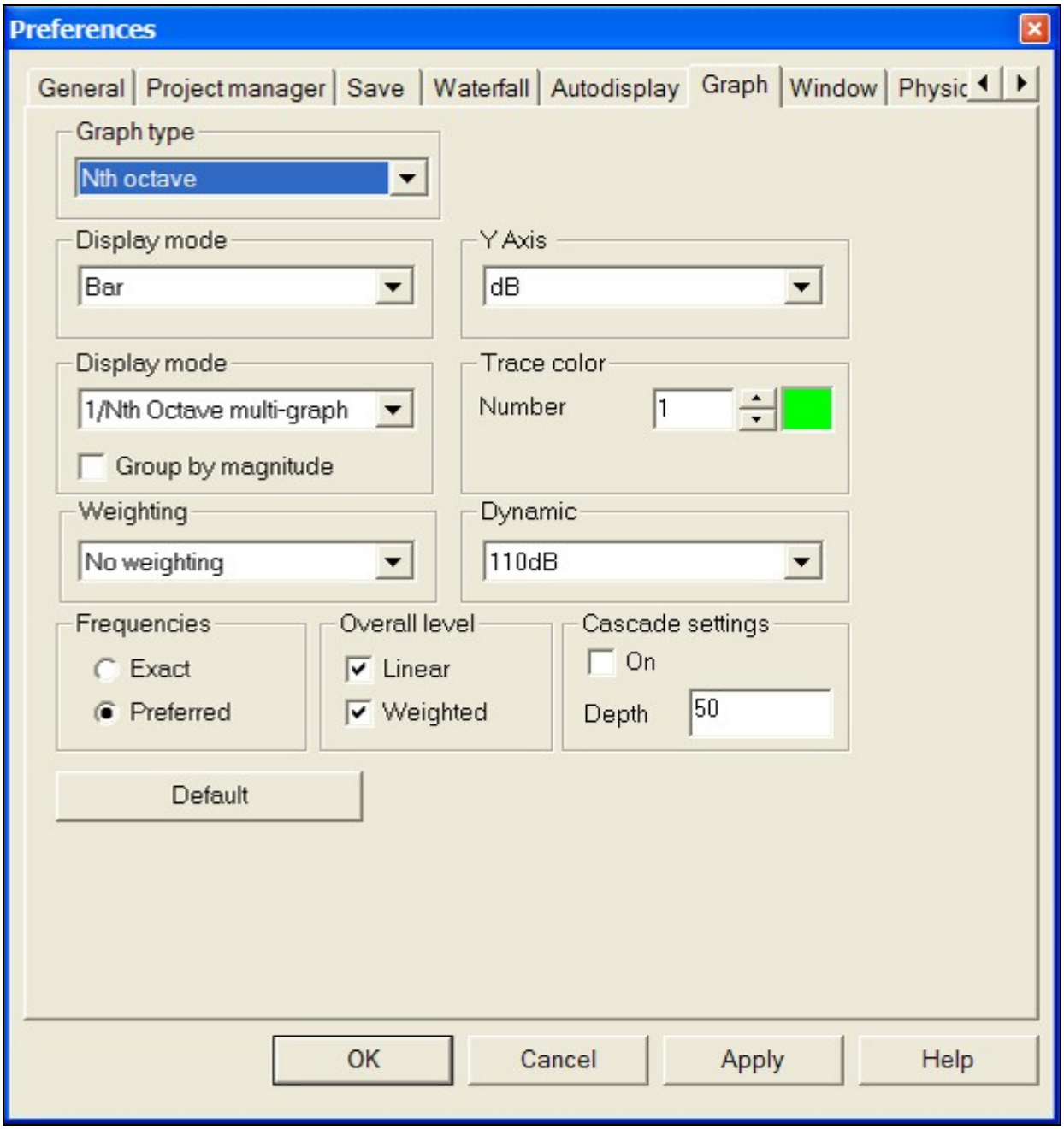


- **Rotations:** sets the number of rotations to be displayed on the Y-axis.



Example for 5 rotations

141.1.6.3 Nth octave


Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Physic
Graph type
Nth octave
Display mode
Bar
Y Axis
dB
Display mode
1/Nth Octave multi-graph
Group by magnitude
Trace color
Number
1
Weighting
No weighting
Dynamic
110dB
Frequencies
Exact
Preferred
Overall level
Linear
Weighted
Cascade settings
On
Depth
50
Default
OK
Cancel
Apply
Help

- **Y Axis**
- **Linear**: uses linear scale for Y-axis units.
- **Logarithmic:** uses logarithmic scale for Y-axis units.
- **dB:** uses reference dB scale for Y axis units.
- **Display mode**
- **Bar:** bar representation
- **Step:** step representation.
- **Rectangle:** overlaid rectangle
- **Filled:** overlaid filled rectangles.
- **Display mode**
- **Multi-trace**: overlays all traces on a single graph.
- **Multi-graph**: one graph for each trace.
- **Magnitude gathering**: if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.
- **Trace color**
- **Number:** selects the trace number for color modification.
- **Color box**: click on this box to modify the color of the selected trace.

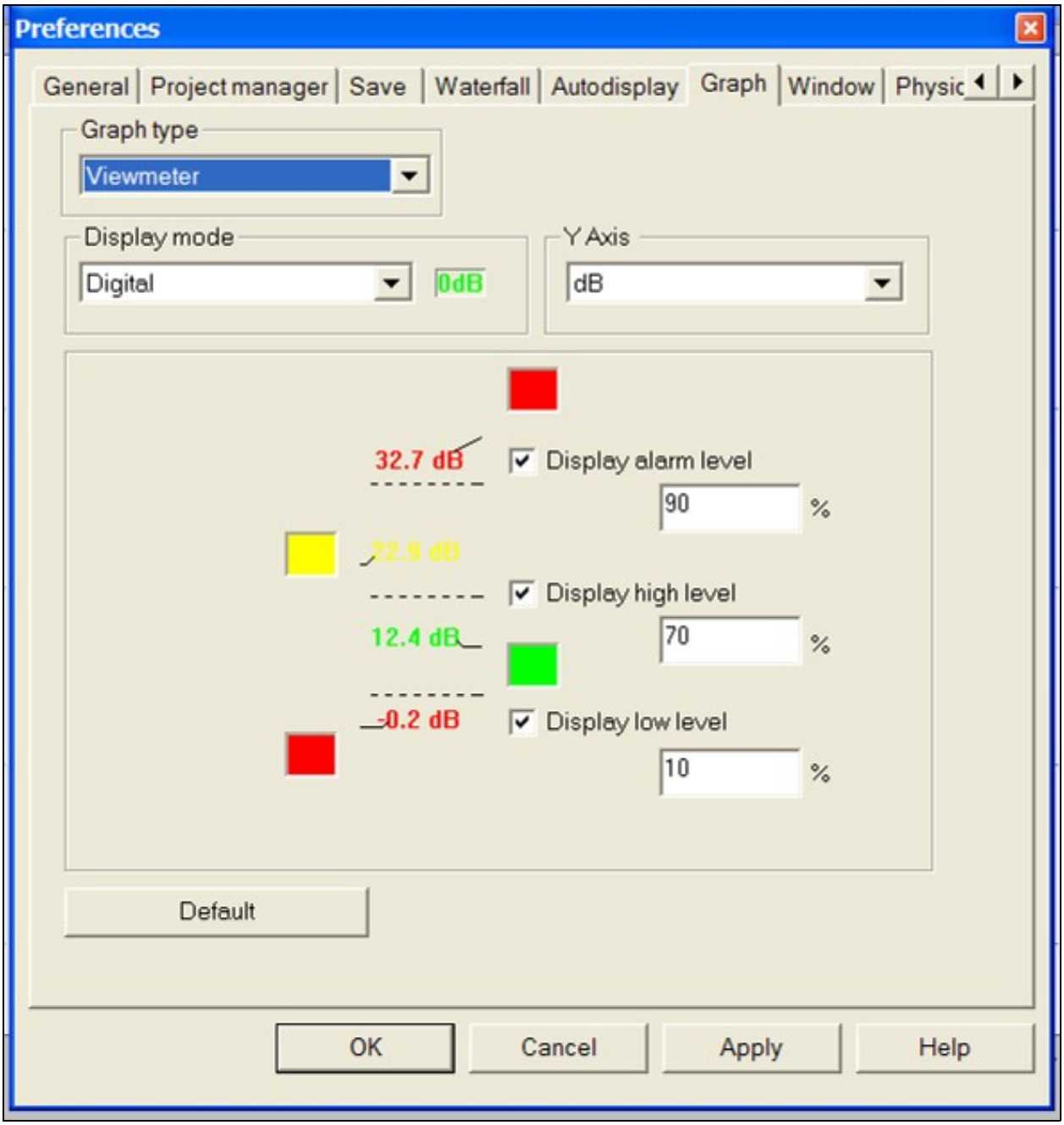
- **Weighting**

Used to select the type of weighting desired.

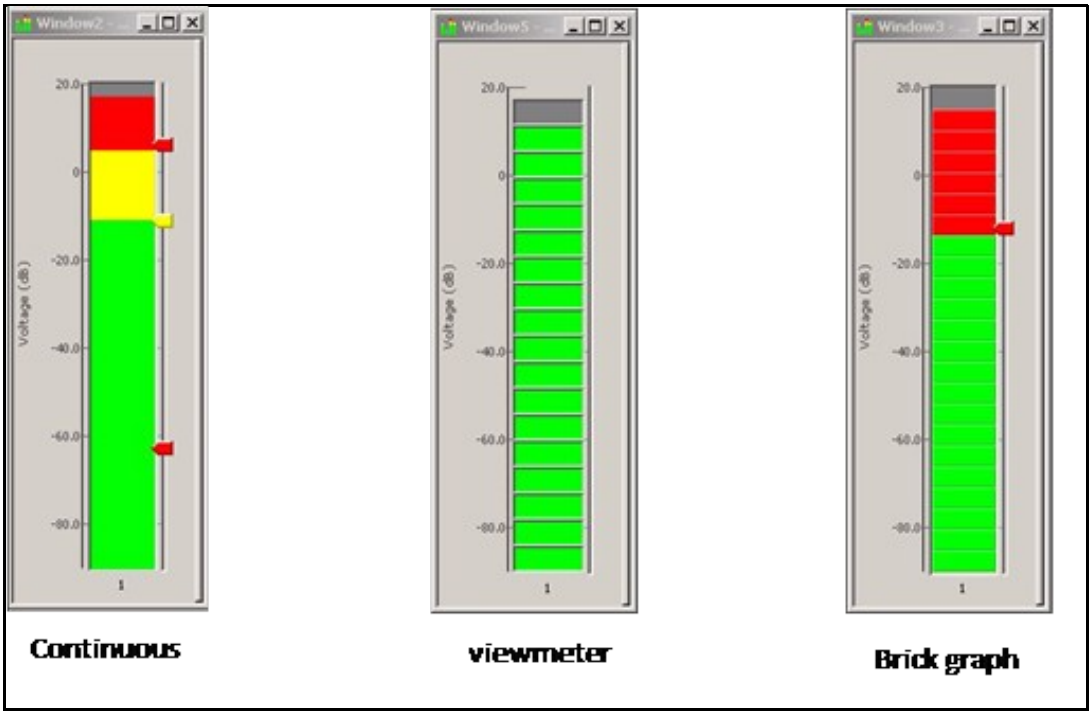
- **Overall level**
- **Linear**: if checked, the linear global level is displayed.
- **Weighted**: if checked and available, the weighted level is displayed.

- **Frequencies**
- **Exact:** displays exact band center frequency.
- **Preferred:** displays preferred frequencies, i.e rounded values for the central frequencies. Preferred frequencies are only available for octave and 1/3rd octave windows: in the octave. If this mode is selected in 12th and 24th octave windows, exact frequencies are displayed.
- **Dynamics**
- **90 dB:** resizes the Y-axis to 90 dB dynamics starting from +20 dBV.
- **110 dB:** resizes the Y-axis to 110 dB dynamics starting from +20 dBV.
- **130 dB:** resizes the Y-axis to 130 dB dynamics starting from +20 dBV.
- **150 dB**: resizes the Y-axis to 150 dB dynamics starting from +20 dBV.

141.1.6.4 Viewmeter


Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Physic
Graph type
Viewmeter
Display mode
Digital
0dB
Y Axis
dB
32.7 dB
Display alarm level
90
%
22.9 dB
Display high level
12.4 dB
70
%
-0.2 dB
Display low level
10
%
Default
OK
Cancel
Apply
Help

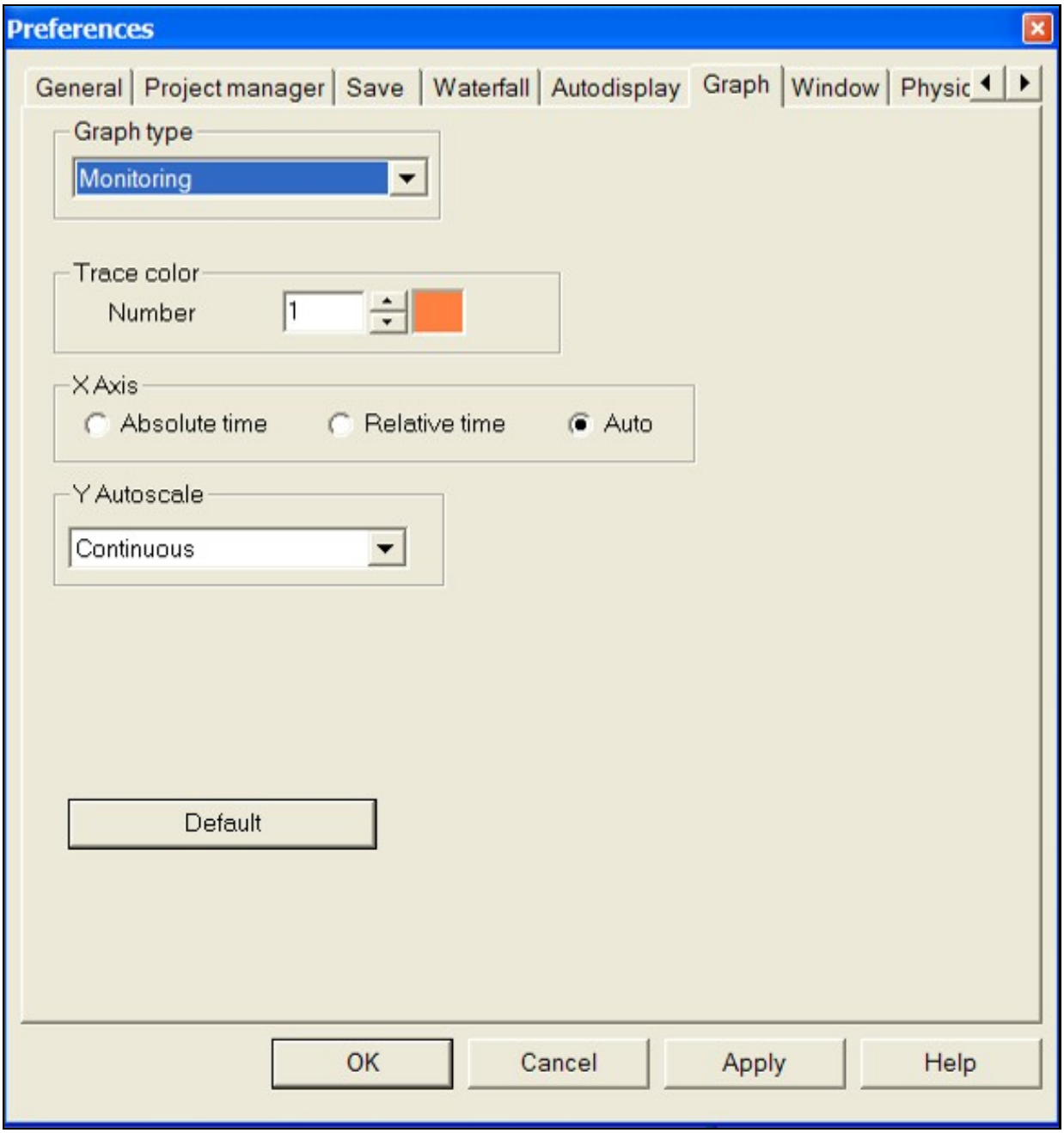
- **Display mode:** There are two types of display:
- Bar graph



- Digital display

- **Y Axis**
- **Linear**: uses linear scale for Y-axis units.
- **Logarithmic**: uses logarithmic scale for Y-axis units.
- **dB**: uses reference dB scale for Y-axis units.
- **Display max, Display min:** Displays the min and the max scalar value as a cursor. The color of the cursor can be freely selected. This property only applies to bar graphs.
- **Display low level:** Changes the color of the display when the value is below this level. The color can be freely selected.
- **Display high level:** Changes the color of the display when the value is higher than this level. The color can be freely selected.
- **Display alarm level:** Changes the color of the display when the value is higher than this level. The color can be freely selected.
- **Brick height:** Defines the height of the bricks for the viewmeter and brick display modes.
- **Save as user preference:** When this box is checked, the value is given as a percentage of the full scale, and may be applied to any graph.

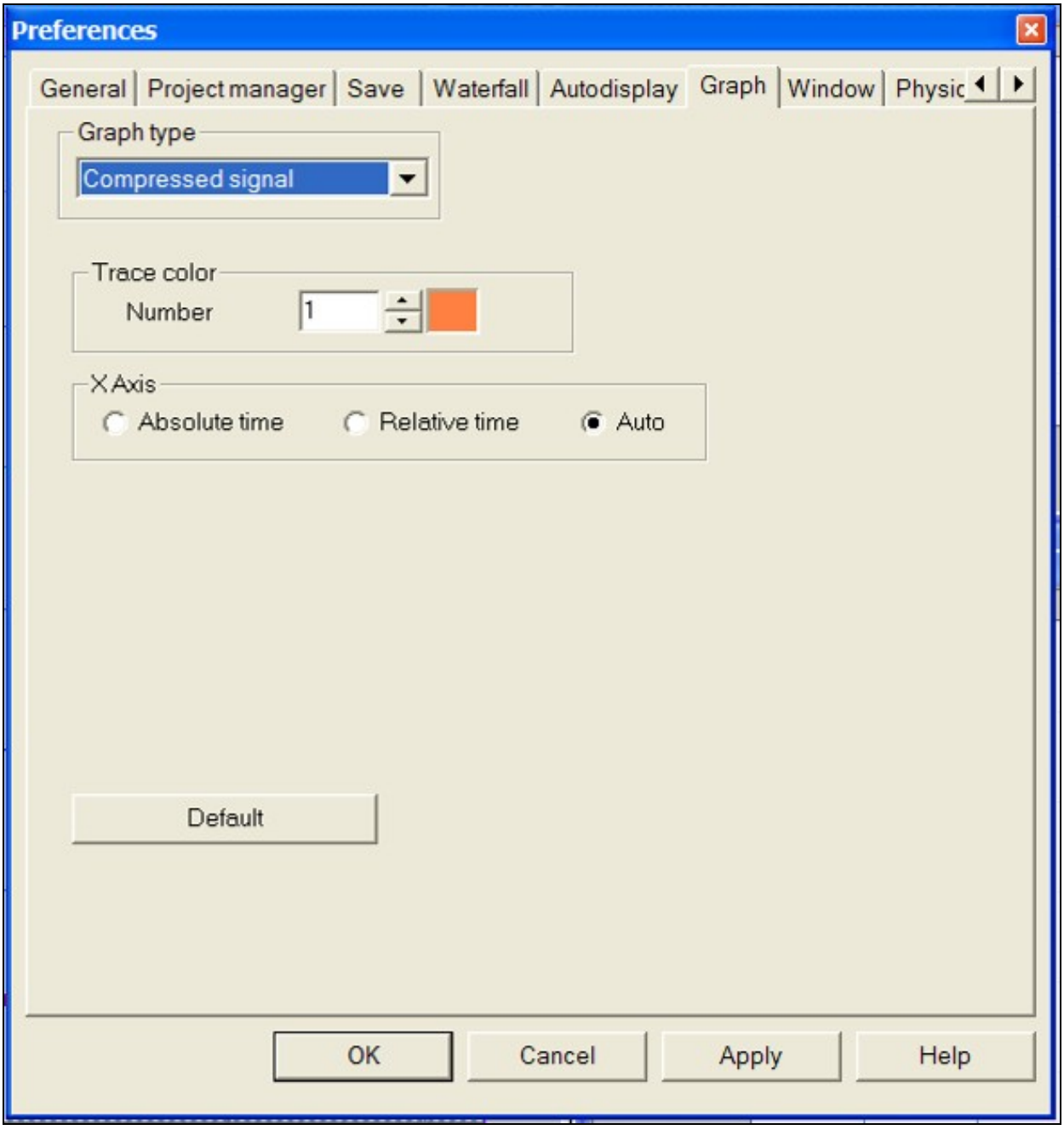
141.1.6.5 Monitoring


Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Physic
Graph type
Monitoring
Trace color
Number
1
X Axis
Absolute time
Relative time
Auto
Y Autoscale
Continuous
Default
OK
Cancel
Apply
Help

- **Trace color**
- **Number:** selects the trace number for color modification.
- **Color box**: click on this box to modify the color of the selected trace.
- **X Axis**
- **Absolute time**: displays the time from windows format.
- **Relative time**: displays the duration of the record. The beginning of the record is set to 0.
- **Auto**: selects absolute or relative time depending on the duration of the record. For records smaller than 2s, the relative time is displayed, for others, the absolute time is chosen.

- **Y Autoscale**
- **Continuous**: the Y scale is automatically adjusted to the current min and max y values of the window traces with a margin to facilitate visibility.
- **Disabled**: Y autoscale is not activated.

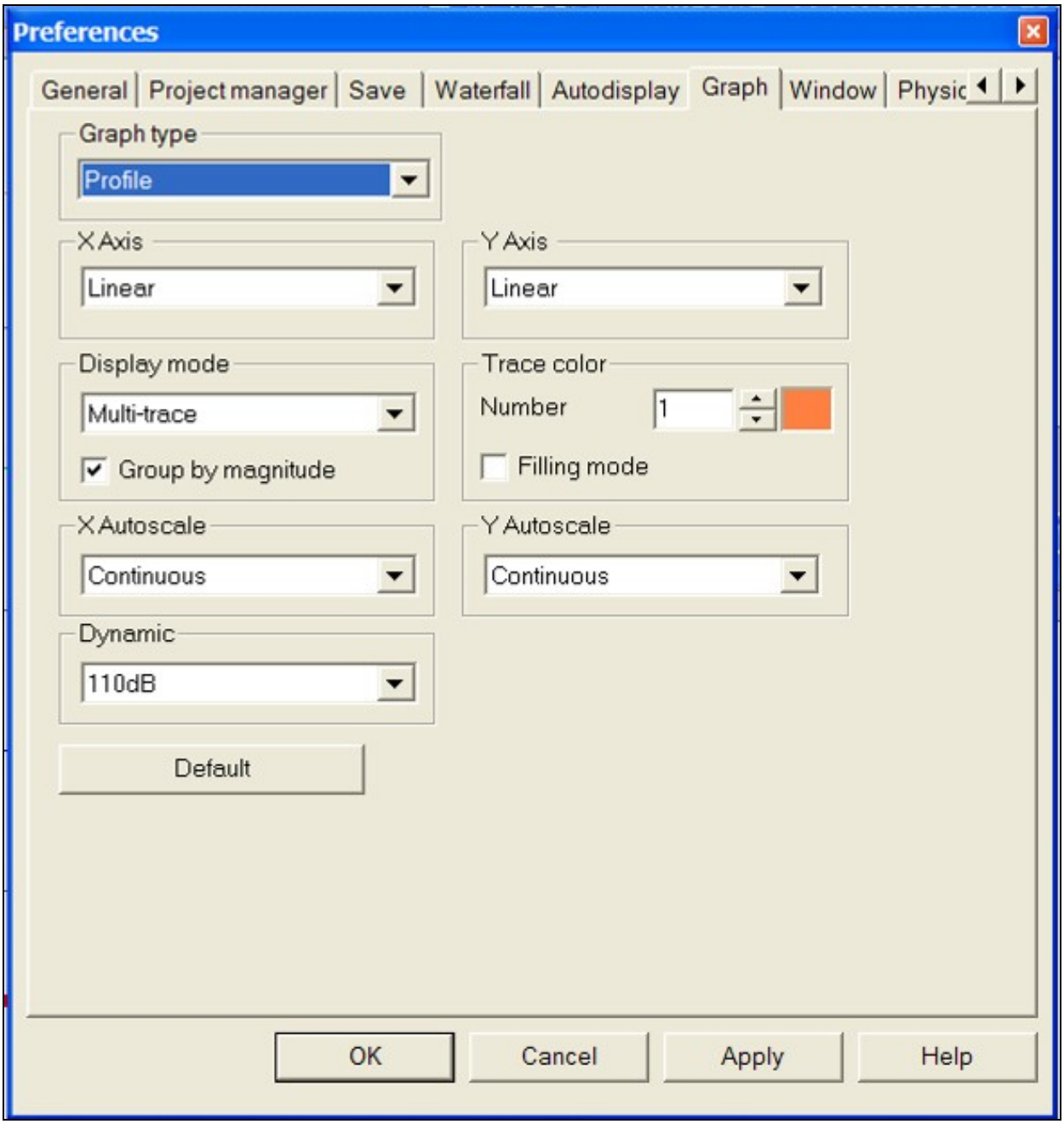
141.1.6.6 Compressed signal



- Trace color
- Number: selects the trace number for color modification.
- Color box: click on this box to modify the color of the selected trace.

- X Axis
- Absolute time: displays the time from windows format.
- Relative time: displays the duration of the record. The beginning of the record is set to 0.
- Auto: selects absolute or relative time depending on the duration of the record. For records smaller than 2s, the relative time is displayed, for others, the absolute time is chosen.

141.1.6.7 Profile

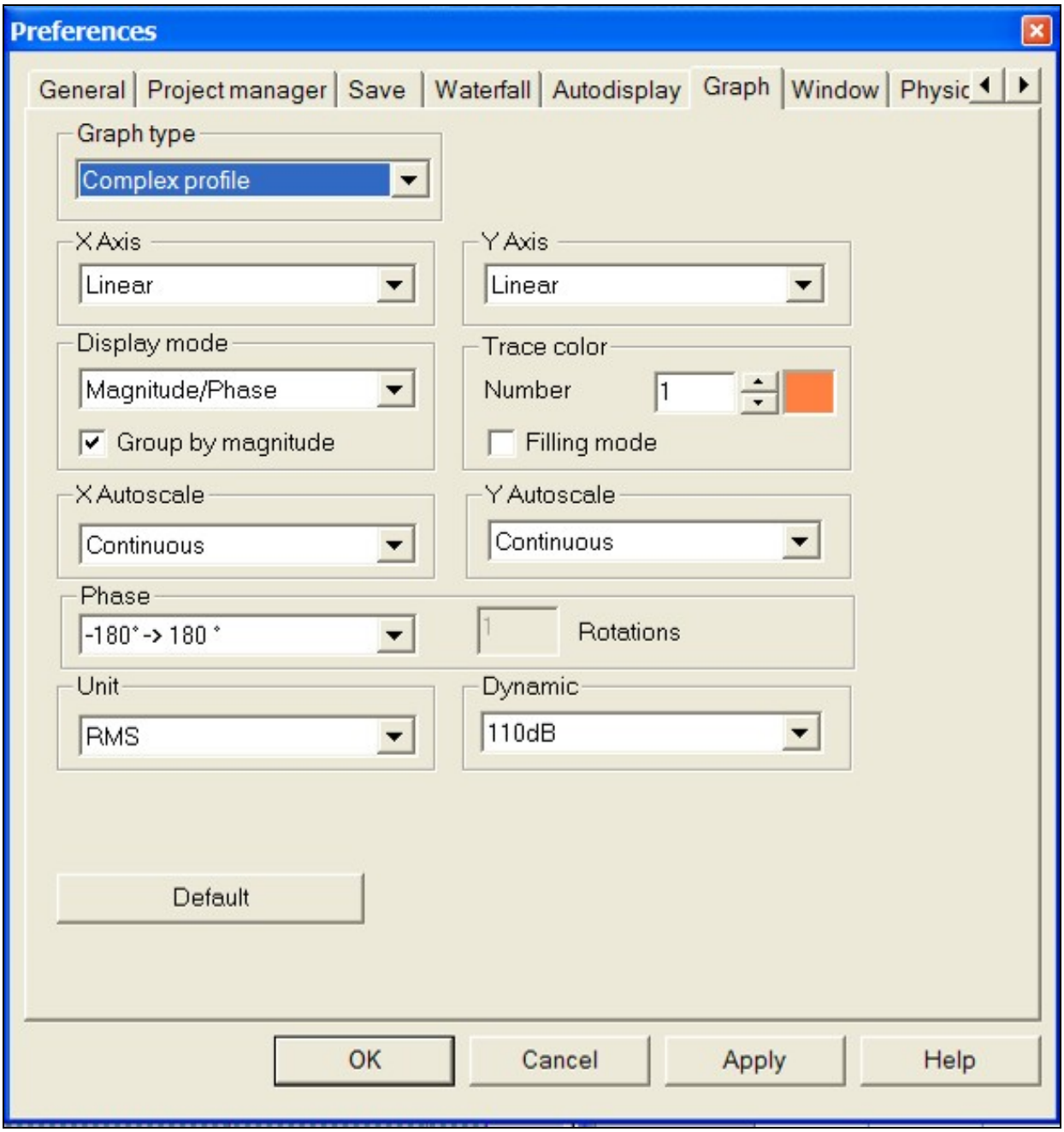


- X Axis
- Linear: uses linear scale for X-axis units.
- Y Axis
- Linear: uses linear scale for Y-axis units.
- Display mode
- Magnitude: overlays all magnitude traces on a single graph.
- Phase: overlays all phase traces on a single graph.
- Magnitude gathering: if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.
- Trace color
- Number: selects the trace number for color modification.
- Color box: click on this box to modify the color of the selected trace.
- Filling mode: if selected, all the curves of the windows are filled from:
- the bottom of the area if Y scale is dB or Logarithmic.
- the 0 value if the Y scale is linear.

- X Autoscale
- Continuous: the X scale is automatically adjusted to the current min and max x values of the window traces.
- Disabled: X autoscale is not activated.

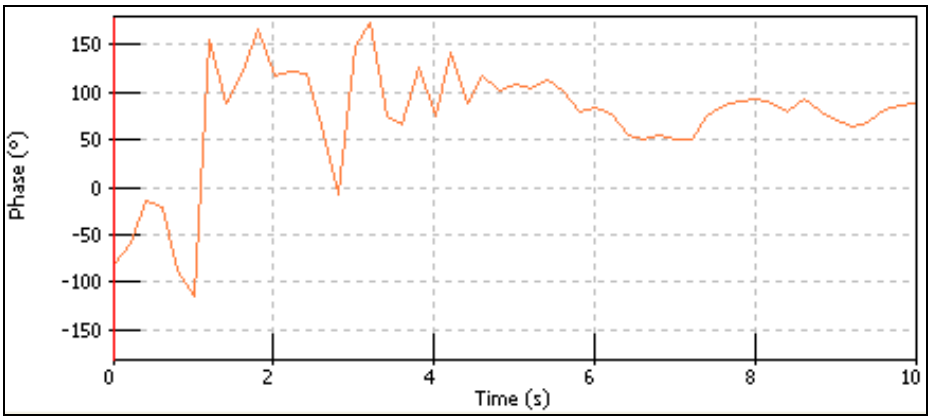
- Y Autoscale
- Continuous: the Y scale is automatically adjusted to the current min and max y values of the window traces with a margin to facilitate visibility.
- Disabled: Y autoscale is not activated.

141.1.6.8 Complex profile

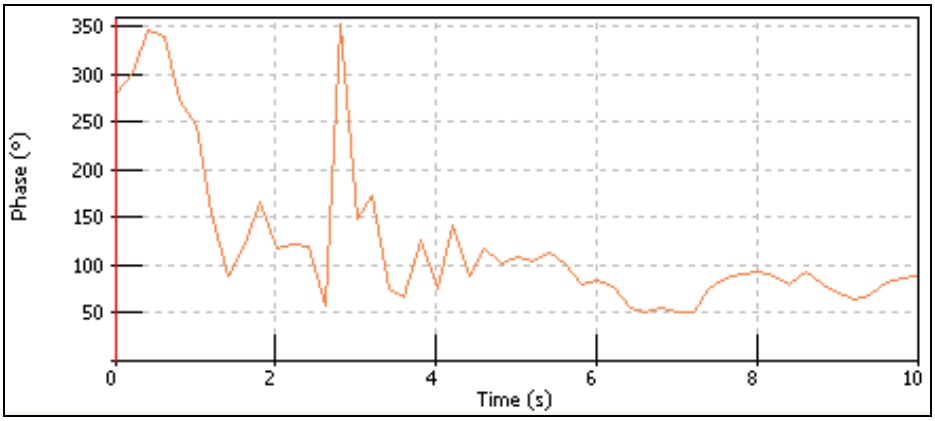

Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Physic
Graph type
Complex profile
X Axis
Linear
Y Axis
Linear
Display mode
Magnitude/Phase
Group by magnitude
Trace color
Number
1
Filling mode
X Autoscale
Continuous
Y Autoscale
Continuous
Phase
-180° -> 180 °
1
Rotations
Unit
RMS
Dynamic
110dB
Default
OK
Cancel
Apply
Help

- X Axis
- Linear: uses linear scale for X-axis units.
- Y Axis
- Linear: uses linear scale for Y-axis units.
- Logarithmic: uses logarithmic scale for Y-axis units.
- dB: uses reference dB scale for Y axis units.
- Display mode
- Magnitude: overlays all magnitude traces on a single graph.
- Phase: overlays all phase traces on a single graph.
- Real part: overlays all real part traces on a single graph.
- Imaginary part: overlays all imaginary part traces on a single graph.
- Magnitude/phase: overlays all magnitude traces on the upper graph and all phase traces on the lower graph.
- Real/imaginary: overlays all magnitude traces on the upper graph and all phase traces on the lower graph.
- Polar: displays in polar coordinates, the phase and the amplitude on a single graph.
- Real part multi-graph: displays all real part traces using one graph per trace in the same window.
- Imaginary part multi-graph: displays all imaginary part traces using one graph per trace in the same window.
- Magnitude multi-graph: displays all magnitude traces using one graph per trace in the same window.
- Phase multi-graph: displays all phase traces using one graph per trace in the same window.
- Phase/Magnitude: overlays all phase traces on the upper graph using 1/3 of window space and all the magnitude traces on the lower graph using 2/3 of the window.
- Merged Magnitude/Phase: displays all magnitude and phase parts traces on a single graph.
- Magnitude gathering: if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.
- Trace color
- Number: selects the trace number for color modification.
- Color box: click on this box to modify the color of the selected trace.
- Filling mode: if selected, all the curves of the windows are filled from:
- The bottom of the area if Y scale is dB or Logarithmic.
- The 0 value if the Y scale is linear.
- Dynamics
- 90 dB: resizes the Y-axis to 90 dB dynamics starting from +20 dBV.
- 110 dB: resizes the Y-axis to 110 dB dynamics starting from +20 dBV.
- 130 dB: resizes the Y-axis to 130 dB dynamics starting from +20 dBV.
- 150 dB: resizes the Y-axis to 150 dB dynamics starting from +20 dBV.

- Phase
- -180° -> 180°: sets the phase graph Y-axis between ?180° to +180°.

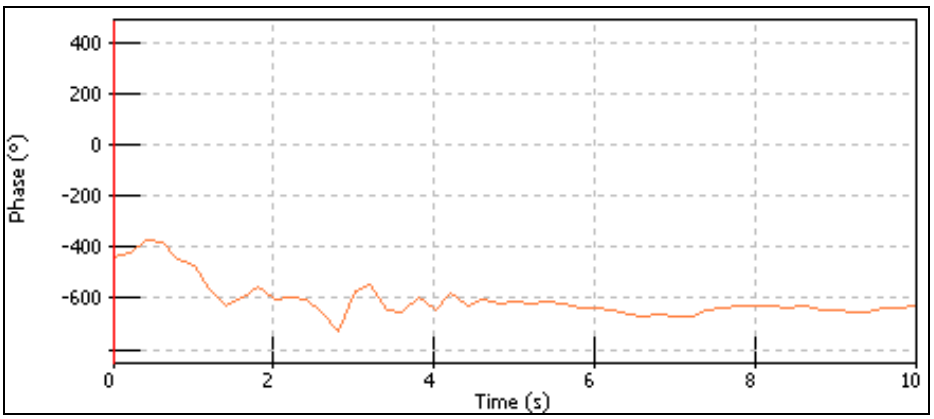


- 0 -> 360°: sets the phase graph Y-axis between 0 to +360°.



-

Rotations: sets the number of rotations to be displayed on the Y-axis.

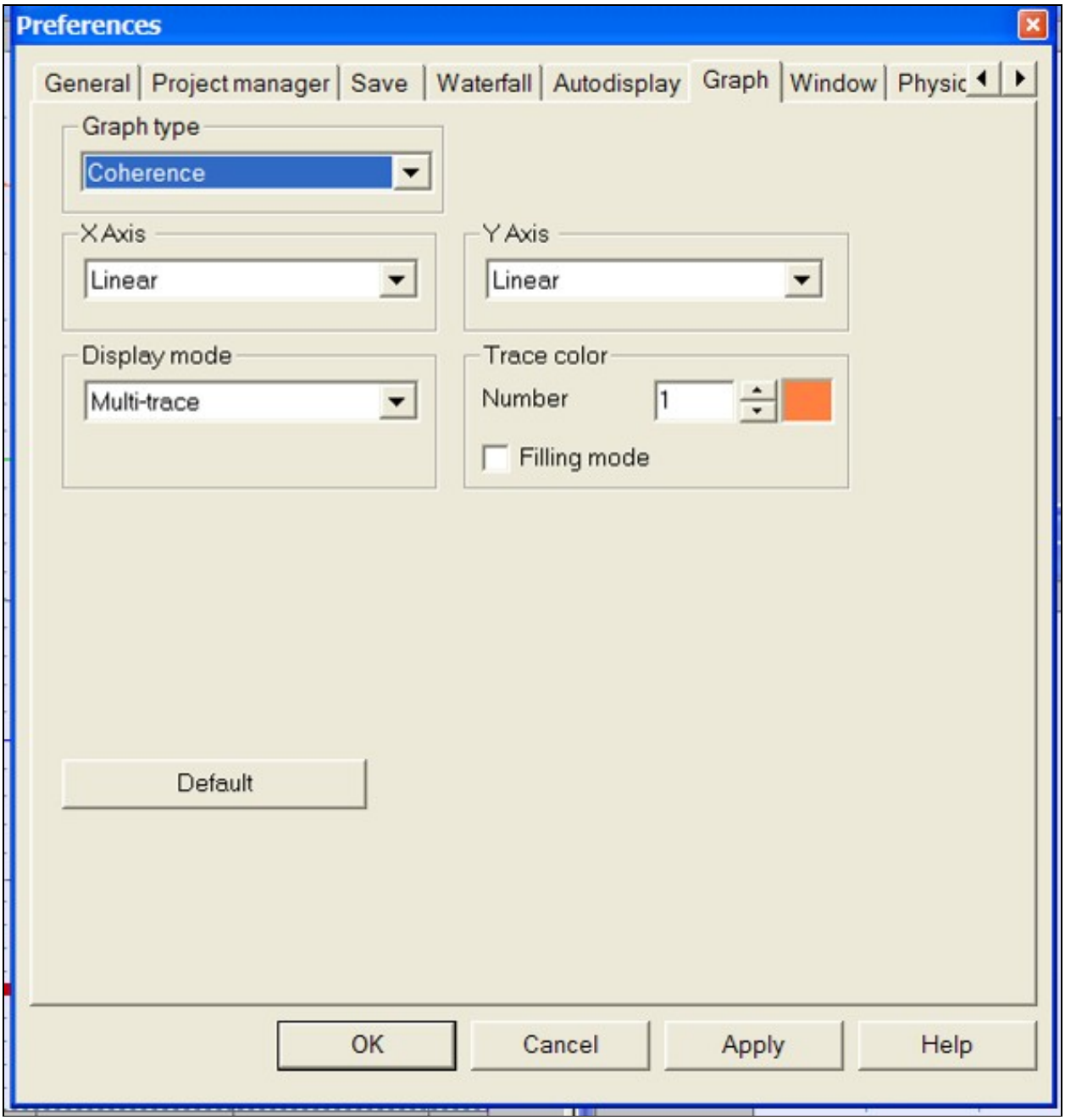


Example for 5 rotations

- X Autoscale
- Continuous: the X scale is automatically adjusted to the current min and max x values of the window traces.
- Disabled: X autoscale is not activated.

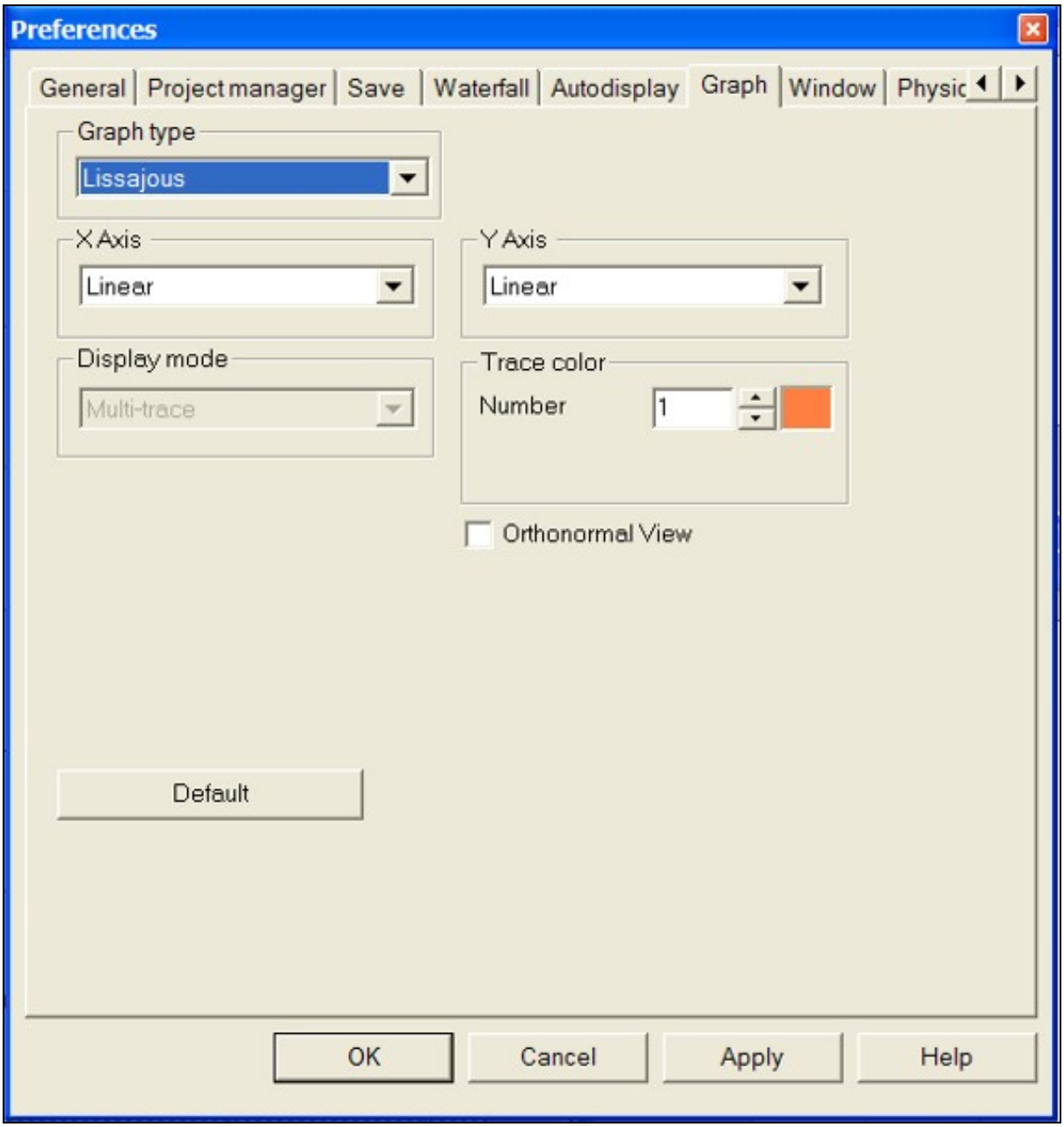
- Y Autoscale
- Continuous: the Y scale is automatically adjusted to the current min and max y values of the window traces with a margin to facilitate visibility.
- Disabled: Y autoscale is not activated.

141.1.6.9 Coherence


Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Physic
Graph type
Coherence
X Axis
Linear
Y Axis
Linear
Display mode
Multi-trace
Trace color
Number
1
Filling mode
Default
OK
Cancel
Apply
Help

- X Axis
- Linear: uses linear scale for X-axis units.
- Y Axis
- Linear: uses linear scale for Y-axis units.
- Display mode
- Multi-graph: overlays all traces on a single graph.
- Multi-trace: displays all traces using one graph per trace in the same window.
- Time multi-trace 3D: overlays all traces on a single 3D graph.
- Magnitude gathering: if this mode is activated and when a multi-trace mode is selected, an area is created for each different Y magnitude: all the signals with the same Y magnitude are in the same area. If there is only one different Y magnitude, all the signals are in the same area.
- Trace color
- Number: selects the trace number for color modification.
- Color box: click on this box to modify the color of the selected trace.
- Filling mode: if selected, all the curves of the windows are filled from:
- the bottom of the area if Y scale is dB or Logarithmic.
- the 0 value if the Y scale is linear.

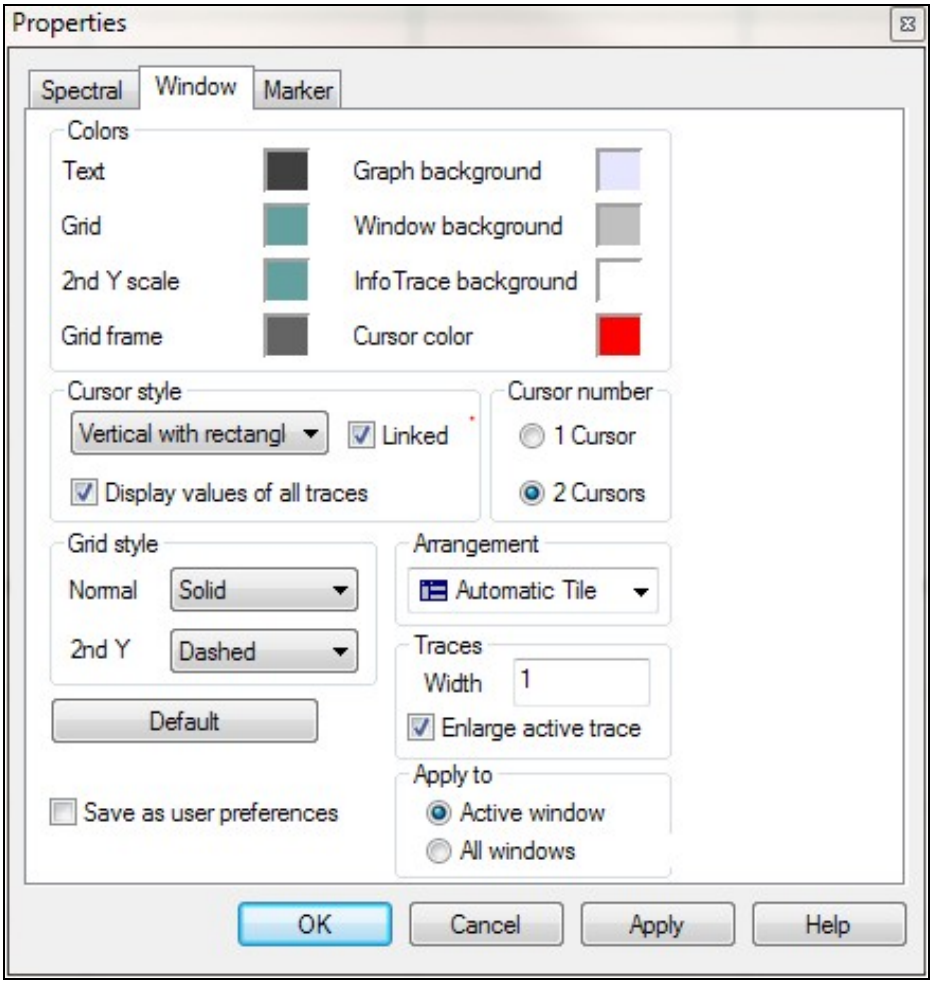
141.1.6.10 Lissajous



- X Axis
- Linear: uses linear scale for X-axis units.
- Y Axis
- Linear: uses linear scale for Y-axis units.

- Trace color
- Number: selects the trace number for color modification.
- Color box: click on this box to modify the color of the selected trace.
-

141.1.7 Window



- Colors: Selects the different colors used in graphical displays.

Text: scale text color in the graph area

Grid: grid color used in graph area

Grid frame: color used for the graph area frame

Cursor: color for the cursors in the graph areas

Graph background: color used in the graph area background

Window background: color used for the background of graphical display windows

Infotrace background: color used for the infotrace background.

- Cursor style

Style: Selects the cursor style in graphical displays. The available styles are:

- Vertical line
- Vertical dashed line
- Vertical with rectangle
- Cross-hair
- Vertical + Horizontal

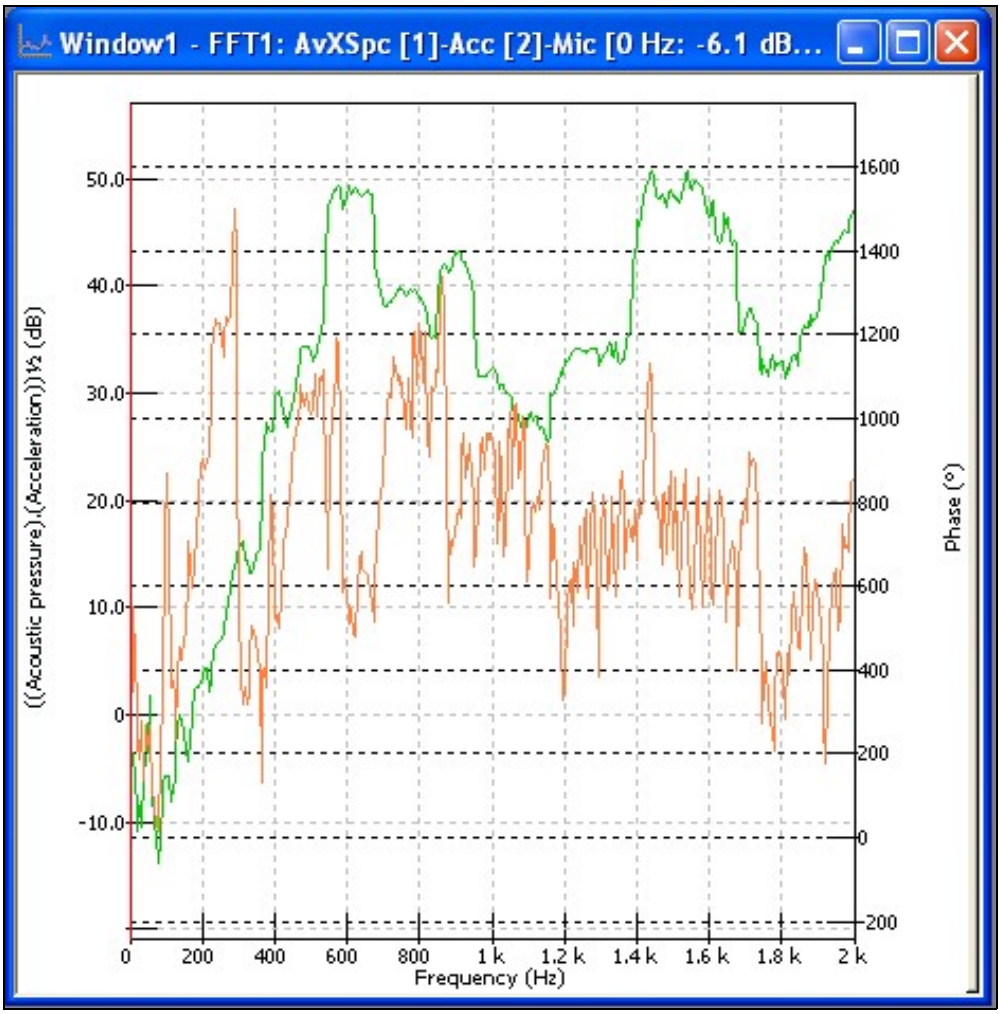
Linked: Enables links between the cursors of several windows: when one cursor moves, the other also moves. See cursor menu section for details.

Display values of all traces: if checked, all Y values for each trace will be displayed, not only for the active trace.

- Cursor number: Enables one or two cursors in the graphical display. Each cursor can be moved independently. The information of each cursor will be displayed (if activated) in the infotrace area. With 2 cursors enabled, the x and y difference will be displayed.
- Grid style: Selects the grid style in the graphical area for the scale and the second Y scale if available. The double grid is available when "Merged Module/Phase" display mode is selected from the window properties.

Grid styles available are:

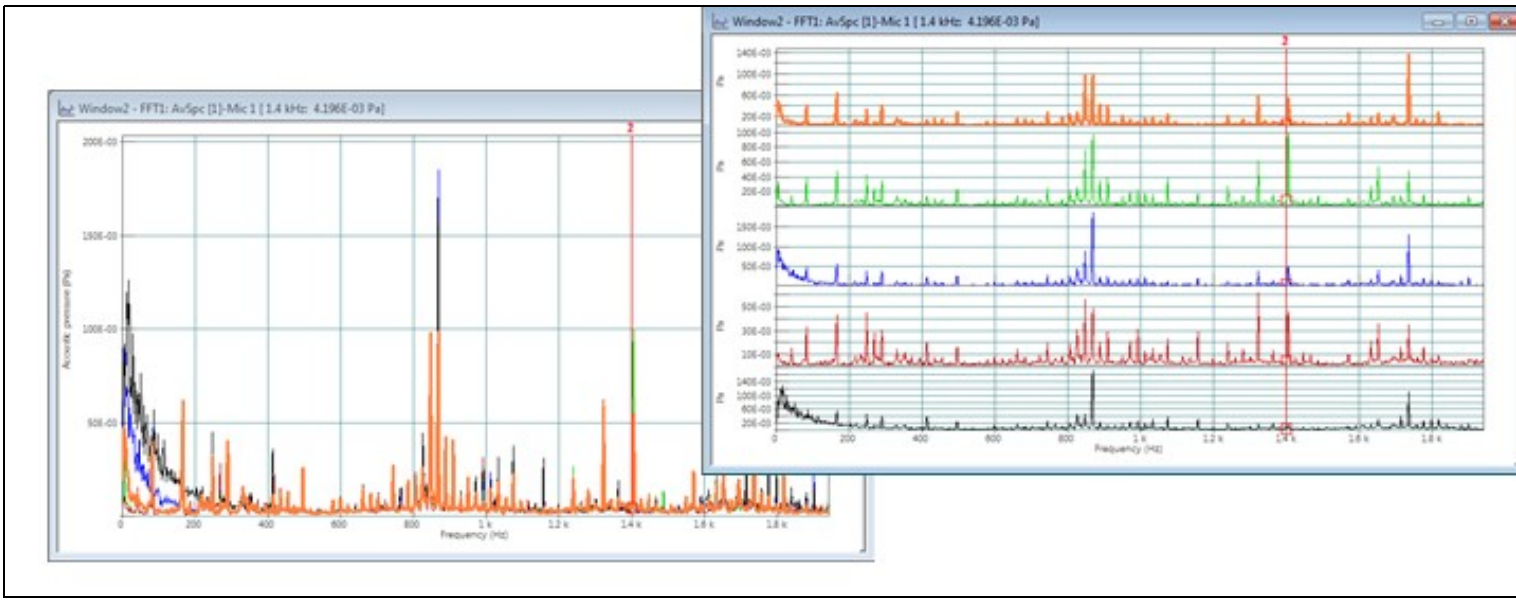
- No grid
- Solid
- Dashed


Window1 - FFT1: AvXSpc [1]-Acc [2]-Mic [0 Hz: -6.1 dB...
((Acoustic pressure).(Acceleration))½ (dB)
50.0
40.0
30.0
20.0
10.0
0
-10.0
1600
1400
1200
1000
800
600
400
200
0
200
Phase (°)
0
200
400
600
800
1 k
1.2 k
1.4 k
1.6 k
1.8 k
2 k
Frequency (Hz)

- Arrangement: Selects the arrangement style used when a new window is created. Arrangements available are:
- No arrangement
- Tile horizontally
- Tile vertically
- Cascade
- Automatic tile

- Highlight active trace

Multi-trace or multi-graph windows are useful with several inputs and multi-analysis operation. This type of graphs features now a way to highlight the active trace. A preference allows activating larger drawing for the active trace (+1 pixel on both sides).



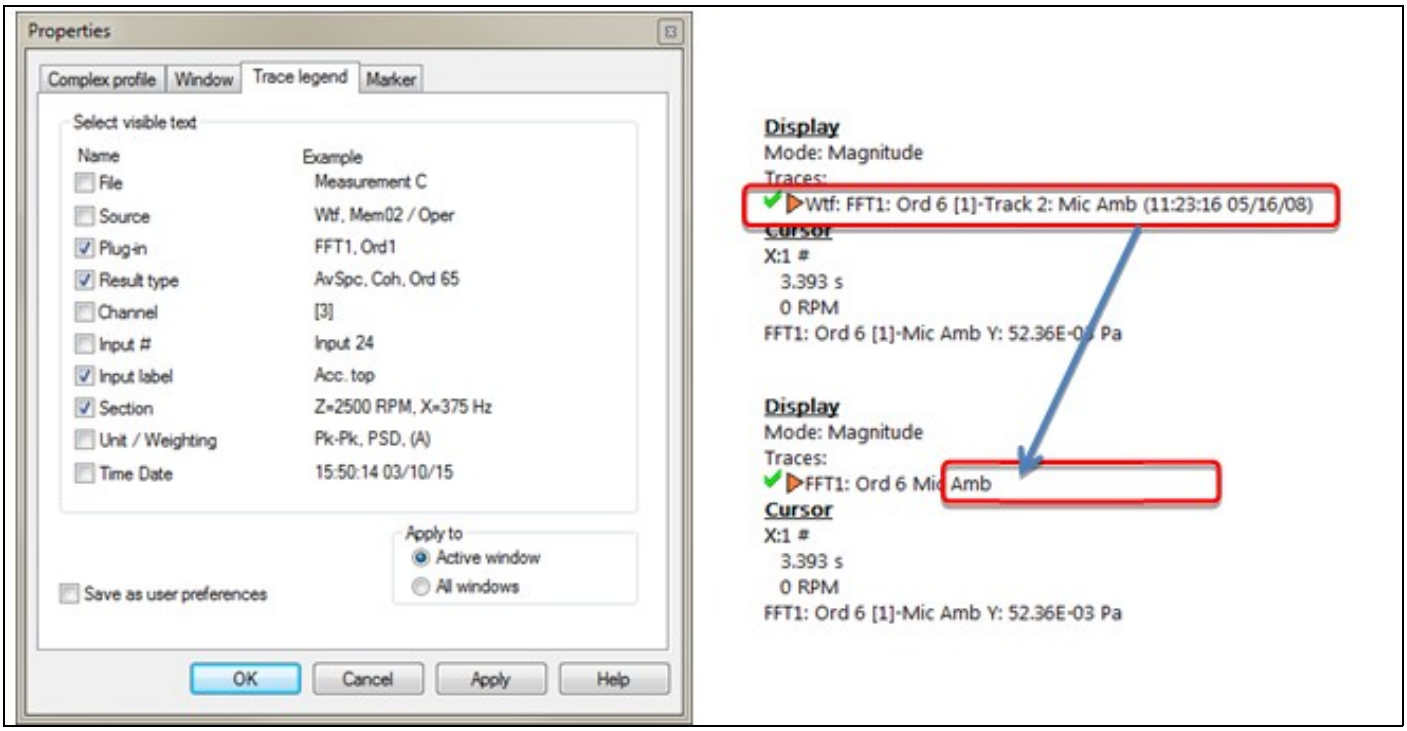
It applies on 2D graphs except the compressed signals view (TDA TimeView, Recorder monitoring, Player signal, zoomed signal and signal preview). Both multi-graphs and multi-trace support this option.

This feature is activated in the default users' preferences. You can de-activate this option from the *Home\Preferences\General* dialog or the contextual windows properties menu: select the *Windows* tab and unselect the "Enlarge active trace" option.

141.1.7.1 Trace legend

Trace identification is necessary and OROS paid attention to provide the maximum of information to identify clearly the results. On the other hand not all the information are necessary depending on the measurement/exploitation context.

NVGate made possible the selection of the viewed and printed data from the infotrace area:

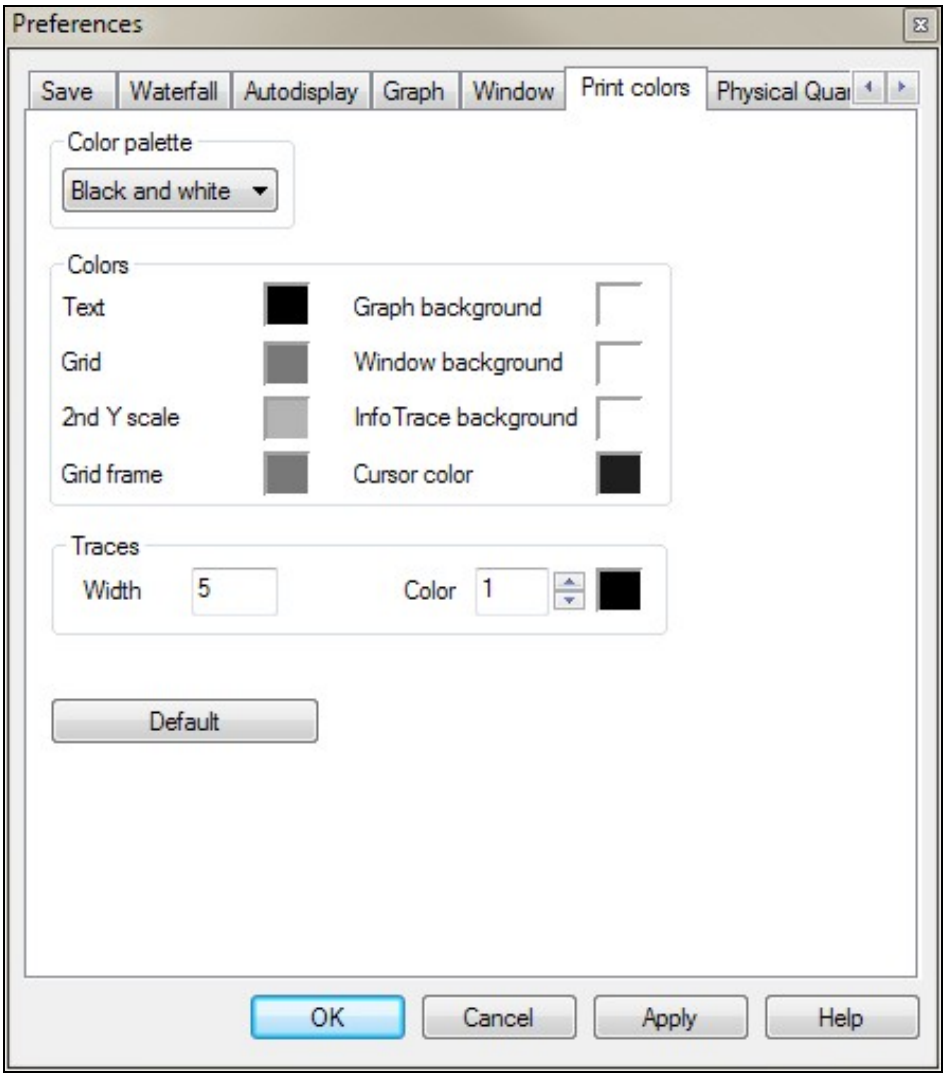


This is accessible from both users' preferences for all new display or locally from the window properties (right click out of the graph) to modify the current window only.

141.1.8 Print colors

This preferences allows setting the way the report or copy/paste out of NVGate are plotted.

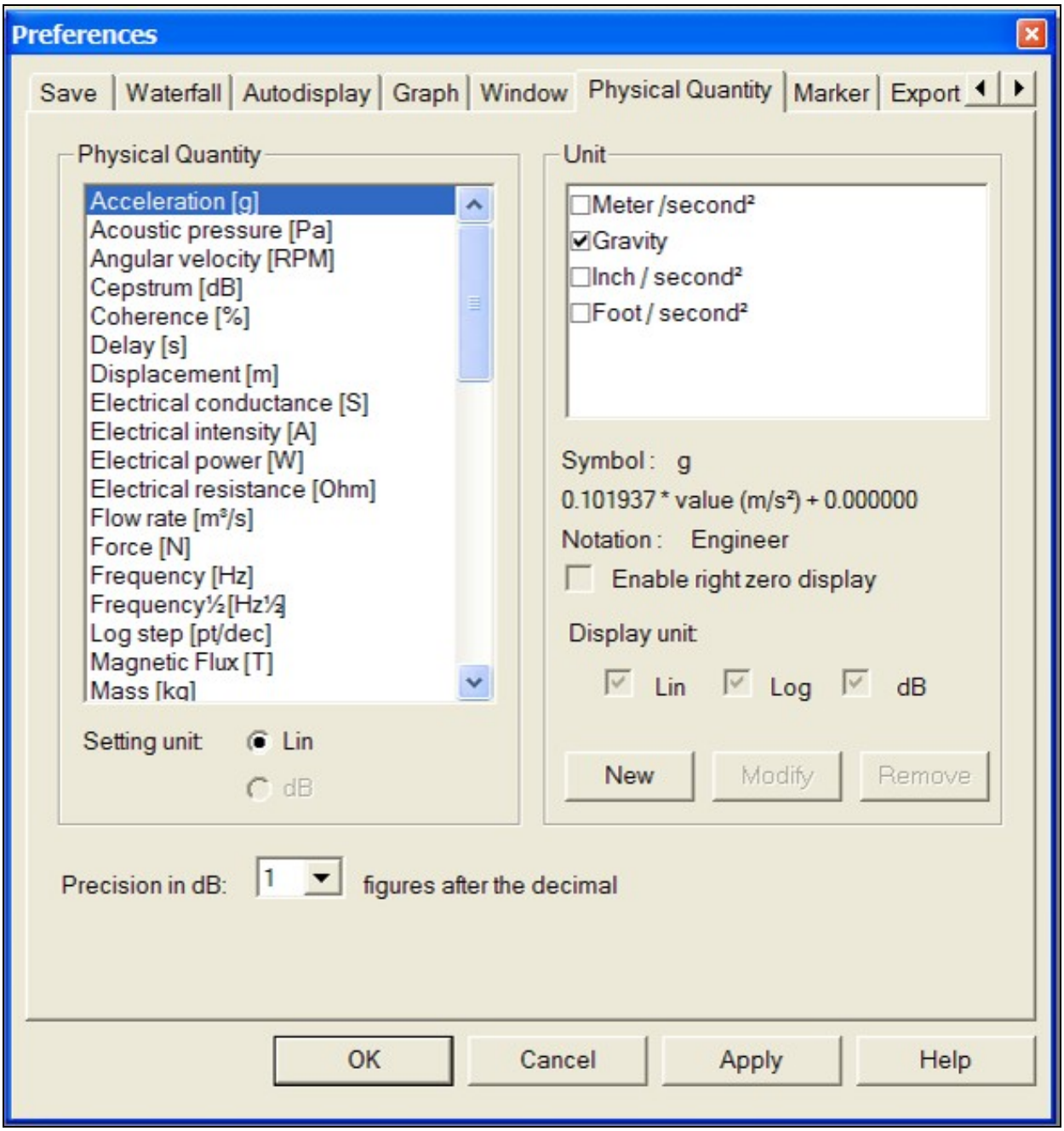
2 palettes are available one for B&W printer the other one for colored export.


Preferences
Save
Waterfall
Autodisplay
Graph
Window
Print colors
Physical Quai
Color palette
Black and white
Colors
Text
Graph background
Grid
Window background
2nd Y scale
Info Trace background
Grid frame
Cursor color
Traces
Width
5
Color
1
Default
OK
Cancel
Apply
Help

Note the trace width depends on the printer resolution (dpi). A width of 1 in the screen correspond approximately to a width of 50 on a laser printer

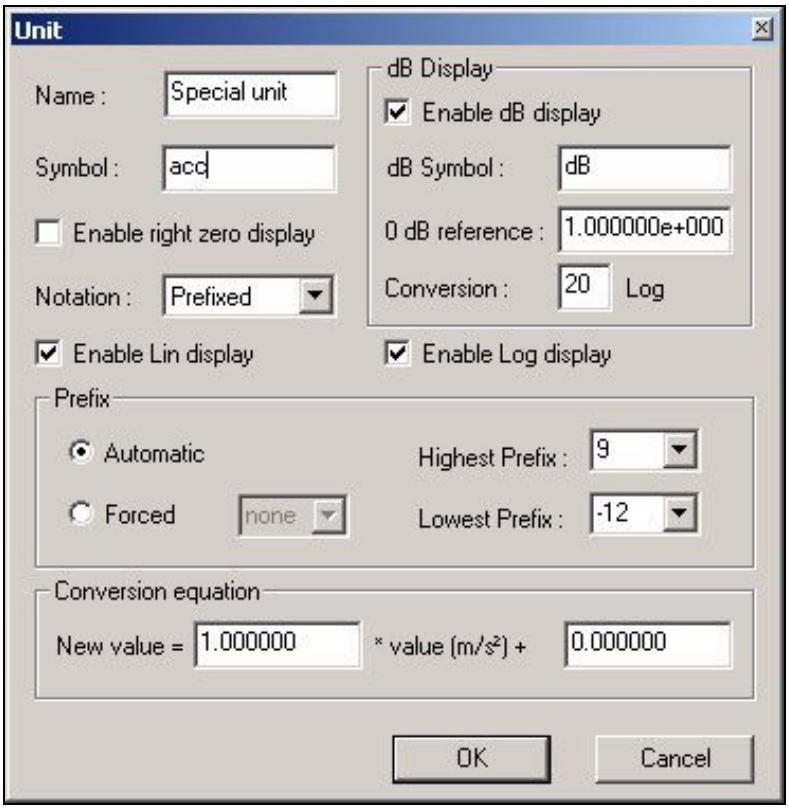
141.1.9 Physical quantity

This preference page is dedicated to the choice of the units and the associated options.



- Physical quantity: Here all quantities that can be managed by NVGate[?] are displayed. This list cannot be modified.
- Unit: Displays the list of available units for the selected quantity. The main information about the unit is displayed just below the list.
- New: Use this button to create a new unit for the selected quantity.

The following dialog box is used to define the units.



Name: Name that will be displayed when the unit is used

Symbol: Symbol that will be used when a value is displayed in this unit

Enable right zero display: If selected, the value will be filled by zero after the decimal

Notation

Fixed: When possible, the value is displayed without any exponent and without a prefix.

Prefixed: Prefix (u, m, k, M) used as exponent preference.

Engineer: Values are displayed with exponents in multiples of 3 (-9,-6,0,3,6,9,12...)

Scientific: Values are displayed with exponents so that only one figure is used before the decimal

Time: Should only be used to display date and time

The following table shows the effect of the notation on the display of three values: 20000 m/s², 70700 m/s², 0.0002091 m/s²

	Fixed	Prefixed	Scientific	Engineer
Right zero display enabled	20000 70700 2.091 E-4	20.00 k 70.7 k 209.1 u	2.000 E4 7.07 E4 2.091 E-4	20.00 E3 70.7 E3 209.1 E-6
Right zero display disabled				

	20000 70700 2.091 E-4	20 k 70.7 k 209.1 u	2 E4 7.07 E4 2.091 E-4	20 E3 70.7 E3 209.1 E-6

Enable Lin display: Authorizes or not the use of a linear scale when displaying a result with this unit in a graph

Enable Log display: Authorizes or not the use of a logarithmic scale when displaying a result with this unit in a graph

- dB Display
- Enable dB display: Authorizes or not the use of dB scale when displaying a result with this unit in a graph
- dB symbol: This symbol will be added to the value when expressed in dB.
- 0 dB reference: Value used has the dB scale reference.

Example 2 E-5 Pa for Acoustic pressure in Pa

- Conversion: Used to convert linear values to dB values.

Example:

20 for Acoustic pressure in Pa because dB Value = 20*log (Lin_Value/2e-5), but 10 for the unit representing power.

- Prefix: If Automatic is selected, the lowest and highest prefix can be selected from the two lists on the right

If forced is selected, the value is always displayed with the selected prefix

- Conversion equation: Displays the coefficient to use for converting an SI value to a given units.

Example:

Value in_ = 0.101936 * Value in SI + 0 where Value in SI is m/s^2

Value in Celsius = 1* Value in Kelvin - 273.15

- Hide view meter decimal digit(s) : This settings is only available for angular velocity. If the settings is selected the visualization of the view meter angular velocity will not have decimal digit.

141.1.9.1 Modify

Use this button to modify the selected unit. Only units created by the user can be modified. Refer to "New unit" for description of the parameters.

141.1.9.1.1 Remove

Use this button to remove the selected unit. Only units created by the user can be removed.

141.1.9.1.2 Precision in dB

General option (applied to every unit) to define the number of figures displayed after the decimal when using dB display.

141.1.9.1.3 FAQ Spare units and physical quantities

141.1.9.1.3.1 How can i have more than 4 spare units ?

Please ask OROS customer.care@oros.com for having a specific "Orosunit.ini" file with up to 50 spares unit.

141.1.9.1.3.2 How do i create a specific physical quantities ?

NVGate Features 4 "Spare units" to be used when requested physical quantity does not exist in the software. Actually these spare units are physical quantities. It is possible to rename it an choose the associated units

The procedure is as follow

1. Open the file orosunit.ini from the installation directory

2. In the MAGNITUDE DEFINITION section goes to the Spare ones

3. Set corresponding Ids to 0

4. Add a line QuantityName = new name

5. Start NVGate and create associated units

Example to create Dynamic Stifness magnitude:

```
;    --- User free---
;-------------------------
[Spare1]
Id = 38
Ids = 10038                    <- Set to 0
QuantityName = Dyn. Stiffness   <- Add
EqDim = m:0
Number = 1
Unit1 = NoUnits
TypeUFF = 0
SettingUnit = 1
```

exemple 2 : for having Inertance copy past this

[Spare1]

Id = 38

Ids = 0

QuantityName = Inertance

EqDim = m:2|s:-1|kg:-1|rad:1

Number = 1

Unit1 = NoUnits

TypeUFF = 0

SettingUnit = 0

141.1.9.1.3.3 How do i use Asian caracters on physical quantity ?

For using special characters (ex Asian languages) the orosunit.in file must be encoded as UTF-8.

141.1.9.1.3.4 How do I rename, the name "Spare1"?

- You need to rename "spare1" (or spare2 or spare3....) on the file orosunit.ini, (note : it is twice on the file on the begin and on the middle.)
- Then, the tips is to modify the translation file to give to "spare1" the name than you want to use. (here the process to translate)

Note that the orosunit.ini file is overwritten at each new install of NVGate.So please do a copy of this file if you have edit it

141.1.10 Marker

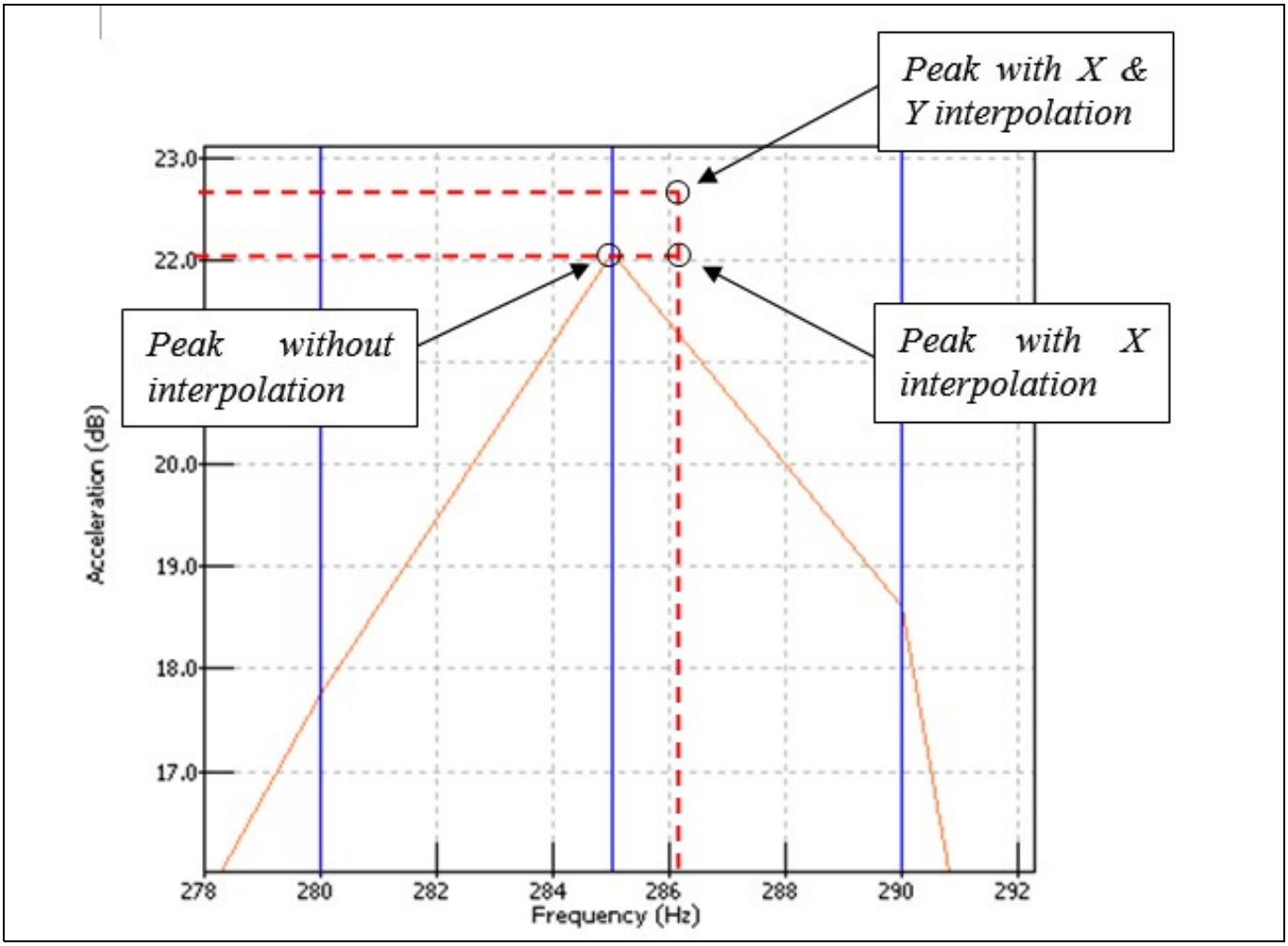
141.1.10.1 Free Marker page

141.1.10.1.1 Style

Selects marker drawing style used in graphical area. The available marker drawing styles are:

- Vertical line
- Vertical dashed line
- Vertical with rectangle
- Cross-hair
- Vertical + Horizontal

- Marker color: Selects the marker color used in the graphical area.
- Number color: Selects the marker number color used in the graphical area.
- Associated to active trace: If checked, the marker added will be associated with the active trace: the markers display the values only for the active signal. If not checked, the markers display all the values when not associated with a signal.
- Interpolation: This setting selects the interpolation of values displayed in the marker table.
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.



Note: the interpolated values of free markers will be available only if the free marker is placed on a peak. The peak detection criteria are the same as the peak marker adjusted in the User preferences. The marker can be moved by 1/32 step. The x value is computed with the selected weighted window.

141.1.10.1.2 Label setup

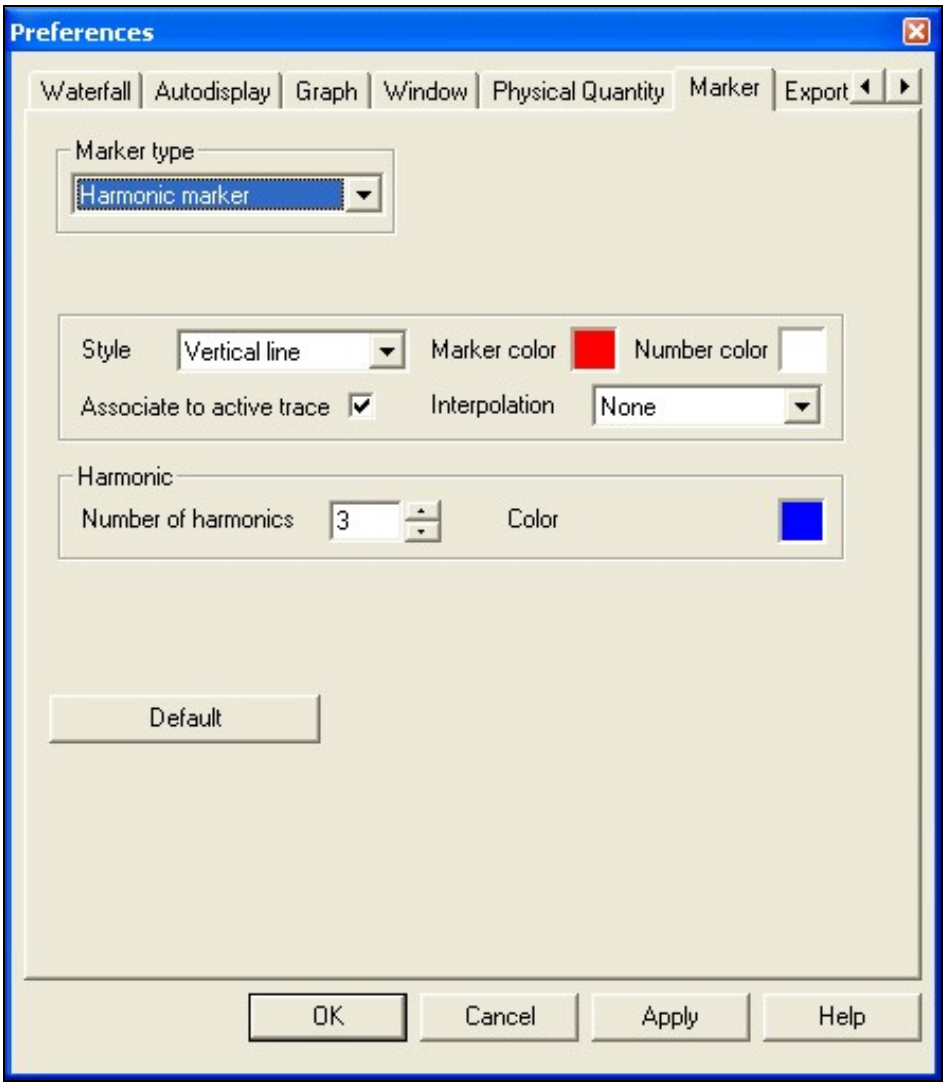
- Text color: Selects label color.
- Background color: Selects label background color.
- Display current position: displays automatically the coordinates of the selected point.

141.1.10.1.3 Line setup

- Display line: If checked, a line between marker and label is displayed
- Line color: Selects line color
- Line style: Selects line style. Available styles are:
- Full line
- Dashed line

For more details on the marker use, see the "Markers" topic from the "Chapter 2: Display".

141.1.10.2 Harmonic marker page

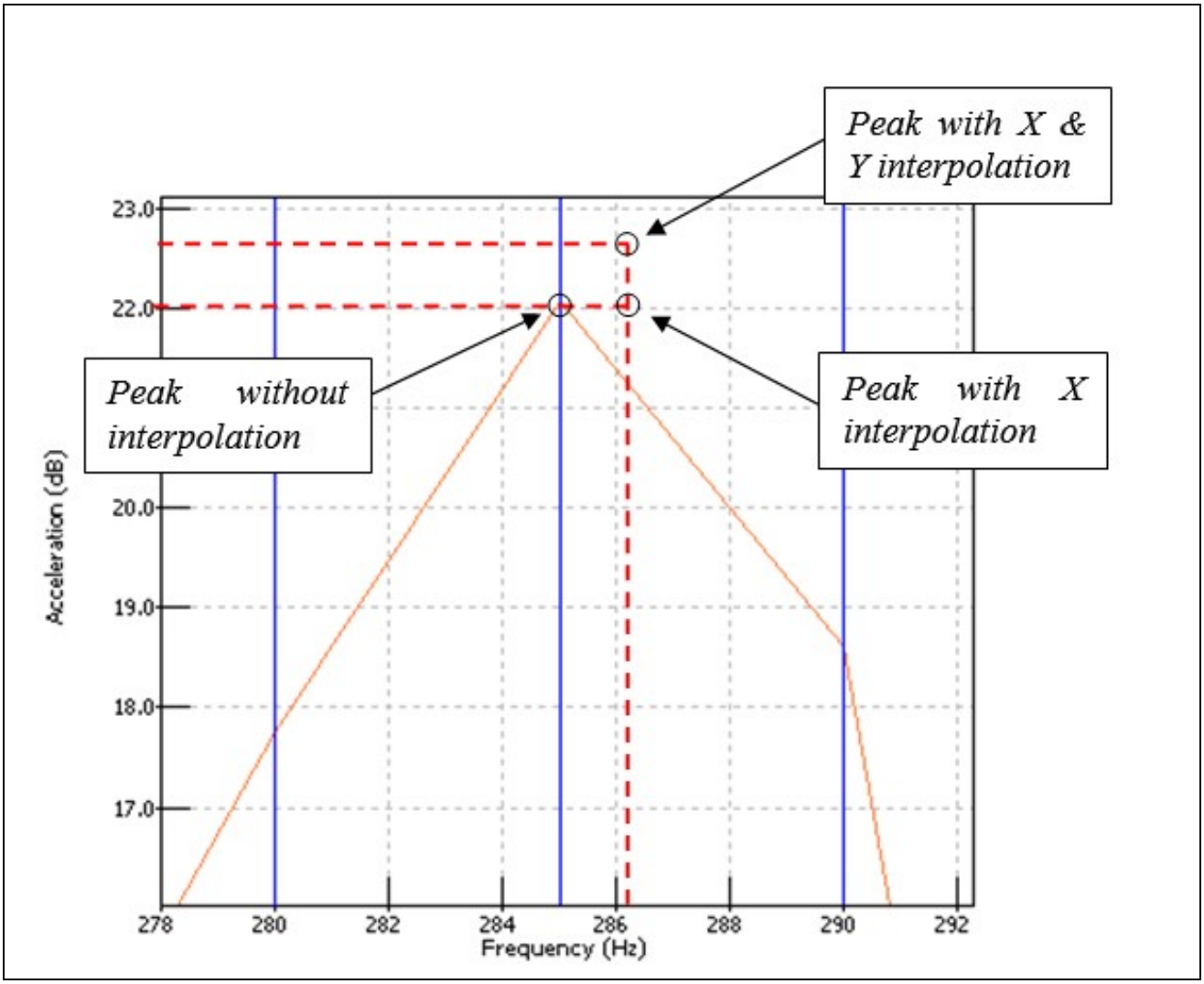


141.1.10.2.1 Style

Selects marker drawing style used in graphical area. The available marker drawing styles are:

- Vertical line
- Vertical dashed line
- Vertical with rectangle
- Cross-hair
- Vertical + Horizontal

- Marker color: Selects the marker color used in the graphical area.
- Number color: Selects the marker number color used in the graphical area.
- Associated to active trace: If checked, the marker added will be associated with the active trace: the markers display the values only for the active signal. If not checked, the markers display all the values when not associated with a signal.
- Interpolation: This setting selects the interpolation of values displayed in the marker table.
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.



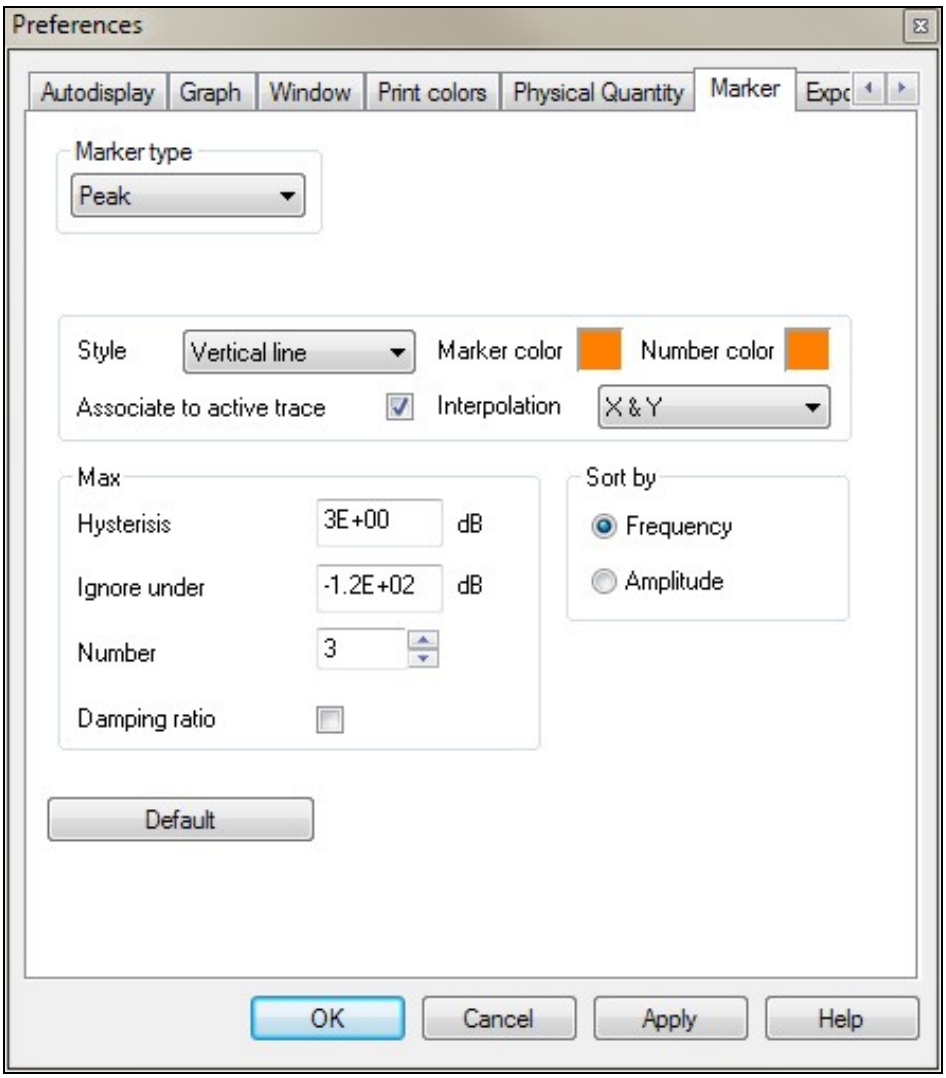
Note: the interpolated values of harmonic markers will be available only if the harmonic marker is placed on a peak. The peak detection criteria are the same as the peak marker adjusted in the User preferences. The marker can be moved by 1/32 step. The x value is computed with the selected weighted window.

141.1.10.2.2 Harmonic

- Number of harmonics: Selects the number of harmonics to find.
- Color: Selects harmonics color.

For more details on the marker use, see the "Markers" topic from the "Chapter 2: Display".

141.1.10.3 Peak marker page

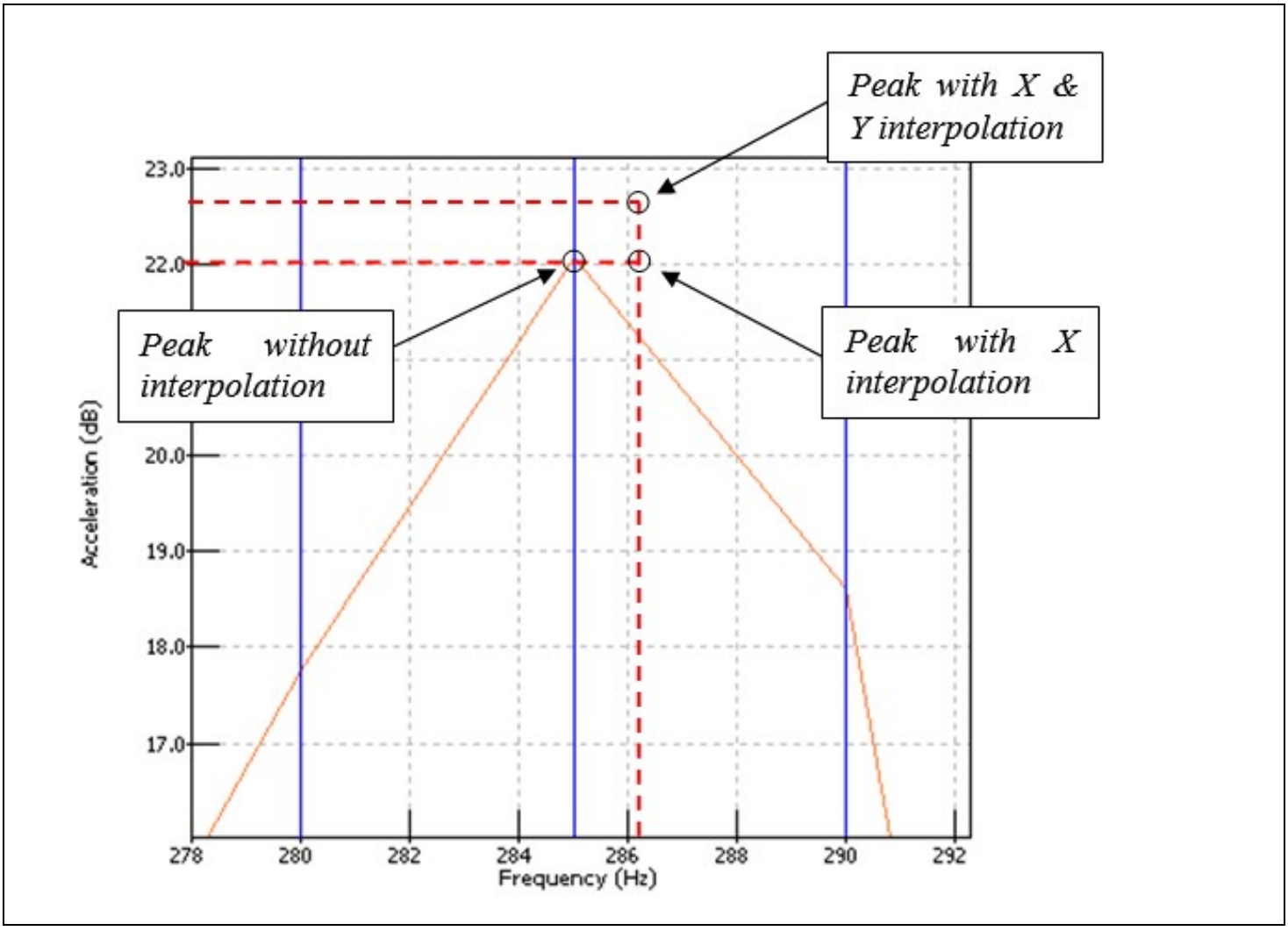


141.1.10.3.1 Style

Selects marker drawing style used in graphical area. The available marker drawing styles are:

- Vertical line
- Vertical dashed line
- Vertical with rectangle
- Cross-hair
- Vertical + Horizontal

- Marker color: Selects the marker color used in the graphical area.
- Number color: Selects the marker number color used in the graphical area.
- Associated to active trace: If checked, the marker added will be associated with the active trace: the markers display the values only for the active signal. If not checked, the markers display all the values when not associated with a signal.
- Interpolation: This setting selects the interpolation of values displayed in the marker table.
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.



141.1.10.3.2 Max

- Number of peaks: Selects the number of peaks to find.
- Threshold: Defines the threshold used for the detection of peaks.
- Ignore under: Defines the absolute threshold used for the detection of peaks.

141.1.10.3.3 Sort by

In the Infotrace the 'Peak Marker Table' can be sort by:

- Frequency: in the marker table, results are displayed from the lowest to the highest frequency.
- Amplitude: in the marker table, results are displayed from the highest to the lowest amplitude.

141.1.10.3.4 Find peak algorithm

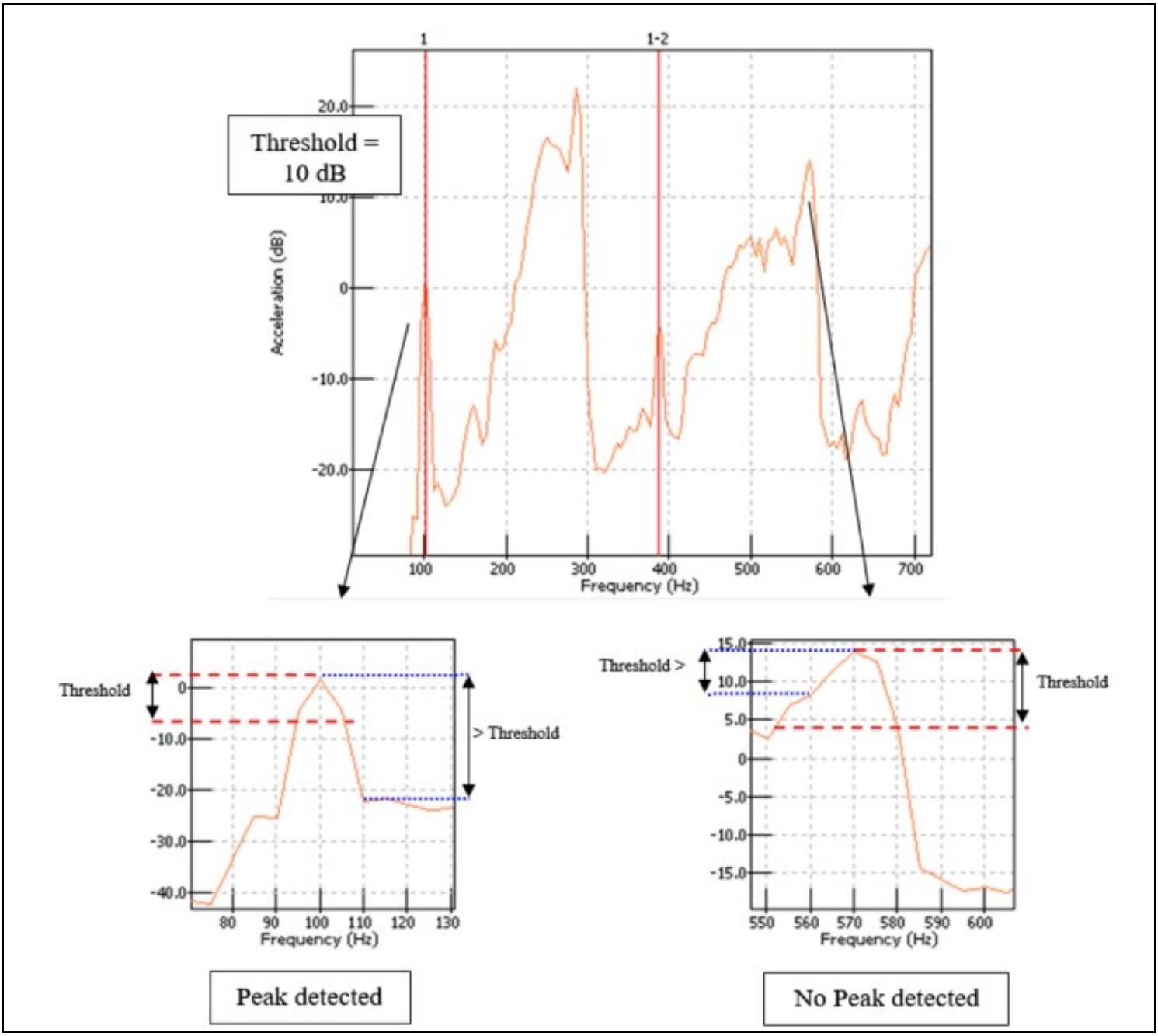
Finding peaks is only available for the Spectrum and Cross Spectrum traces. It looks for the peaks of the selected trace. It can be applied to the current frozen window or to all frozen windows in the workspace.

A spectrum line is detected as a peak if the two following conditions are met:

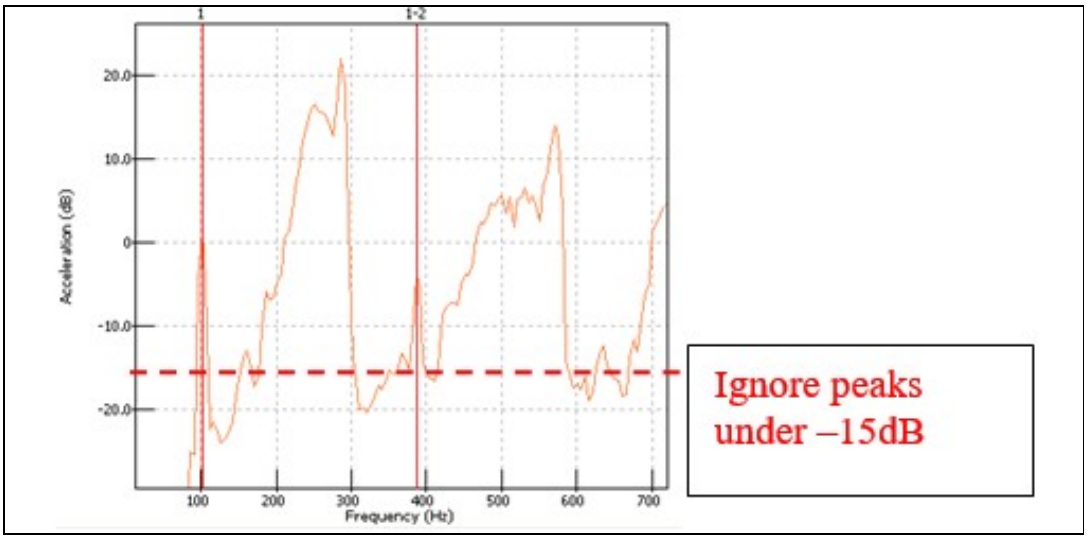
- The two adjacent spectrum line levels are lower than the central spectrum line level.
- The two following spectrum line levels are lower than the central spectrum level minus the peak threshold.

The next two pictures show how peaks are detected. The difference between the two figures is that the second peak threshold is greater than the first one and the peak is not detected.

- Threshold: In the example below, the "Threshold" is 10 dB.


1
1-2
Threshold = 10 dB
Acceleration (dB)
20.0
0
-10.0
-20.0
100
200
300
400
500
600
700
Frequency (Hz)
Threshold
0
-10.0
-20.0
-30.0
-40.0
> Threshold
80
90
100
110
120
130
Frequency (Hz)
Peak detected
Threshold >
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
Threshold
550
560
570
580
590
600
Frequency (Hz)
No Peak detected

- Ignore under: Does not display the detected peak if the peak is under this value. In the example below, the "ignore under" value is ?15 dB.



141.1.10.3.5 Damping ratio

damping ratio is calculated for each detected peak. The calculation is based on the Half-power-band-width method, where DR is the damping ratio:

$$\Delta\omega = bandwitdh\ @(peak\ _\ amplitude\ -\frac{1}{\sqrt{2}})$$

$$\omega_R = peakfreque\ ncy$$

$$DR = \frac{\Delta\omega}{2\omega_R}$$

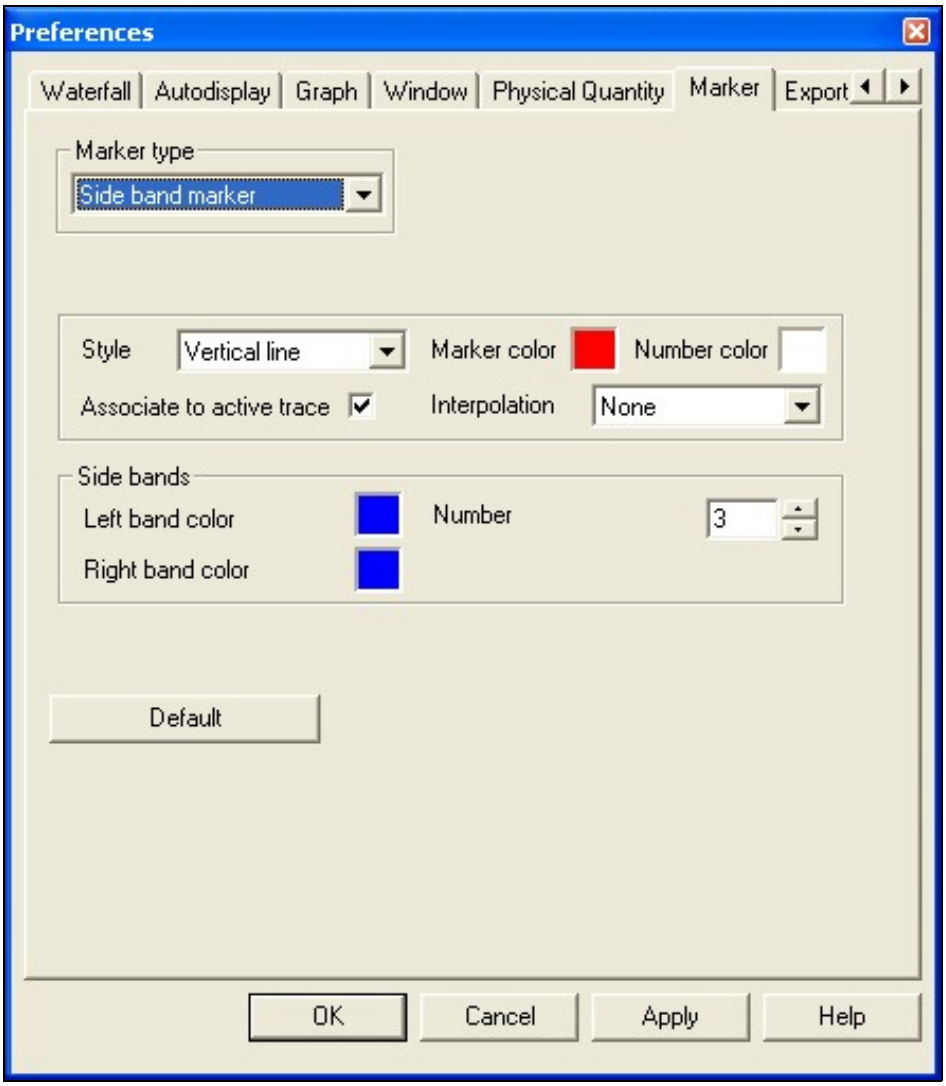
The calculation of the damping factor is activated through the marker properties or preferences.

When it is activated an additional column is added in the corresponding marker table.

Warning, using nonhomogeneous weighting windows (i.e.: equivalent noise bandwidths are not the same) on FRF channels leads to incorrect peak interpolation and damping results.

For more details on the marker use, see the "Markers" topic from the "Chapter 2: Display".

141.1.10.4 Side band marker page


Preferences
Waterfall
Autodisplay
Graph
Window
Physical Quantity
Marker
Export
Marker type
Side band marker
Style
Vertical line
Marker color
Number color
Associate to active trace
Interpolation
None
Side bands
Left band color
Number
3
Right band color
Default
OK
Cancel
Apply
Help

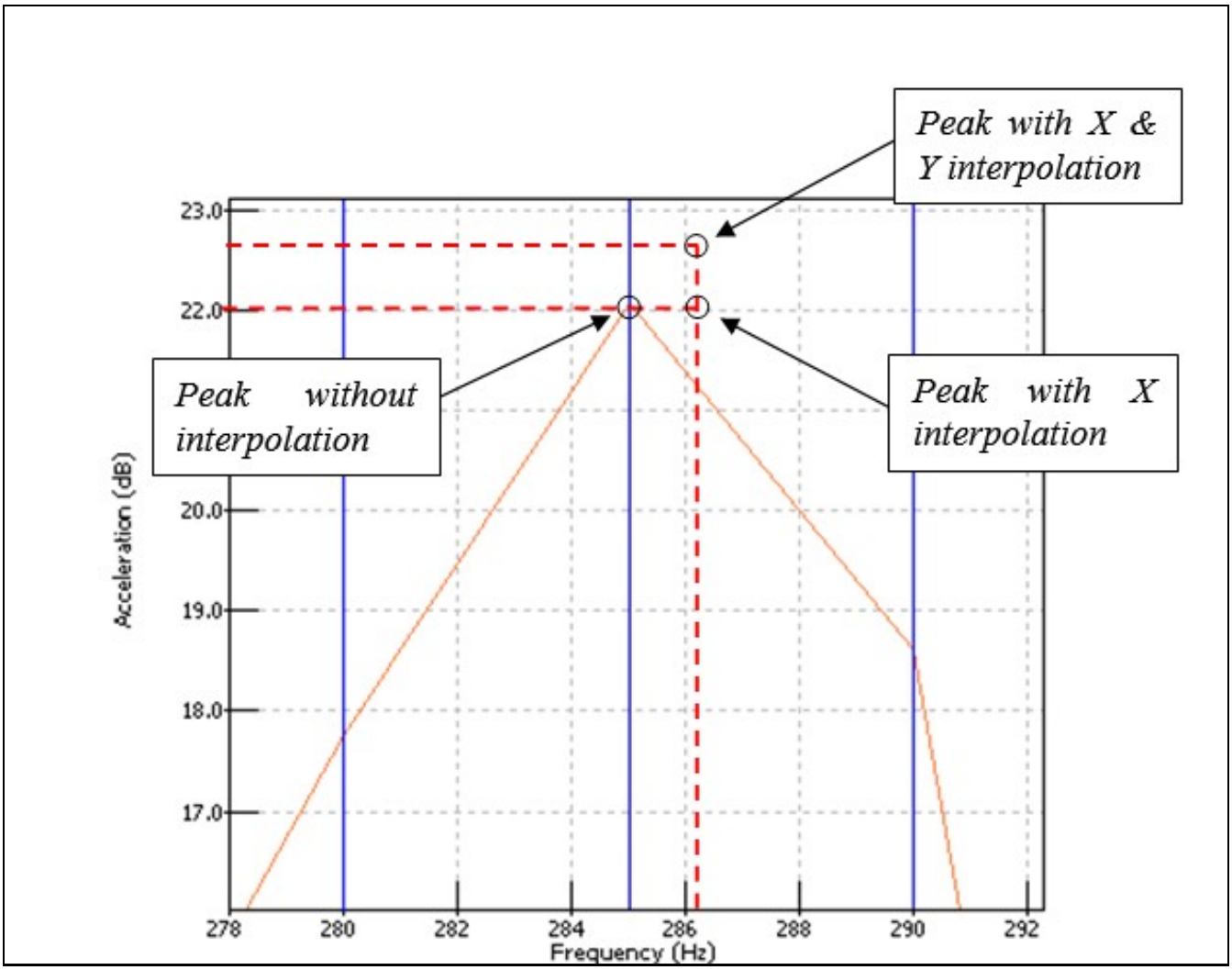
141.1.10.4.1 Style

Selects marker drawing style used in graphical area. The available marker drawing styles are:

- Vertical line
- Vertical dashed line
- Vertical with rectangle
- Cross-hair
- Vertical + Horizontal

141.1.10.4.2 Marker color

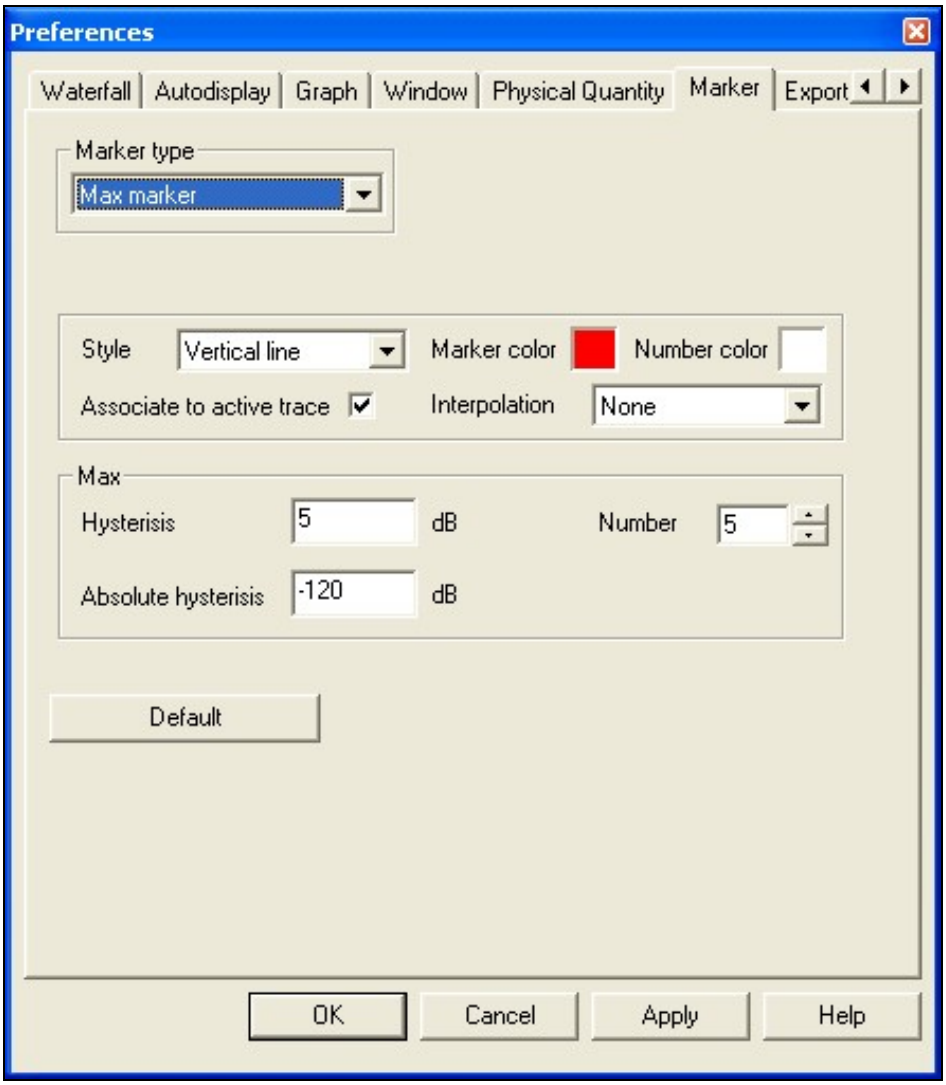
- Number color: Selects the marker color used in the graphical area.
- Associated to active trace: If checked, the marker added will be associated with the active trace: the markers display the values only for the active signal. If not checked, the markers display all the values when not associated with a signal.
- Interpolation: This setting selects the interpolation of values displayed in the marker table.
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.



141.1.10.4.3 Side bands

- Left band color: Selects left band color
- Right band color: Selects right band color
- Number: Selects number of side bands to compute.

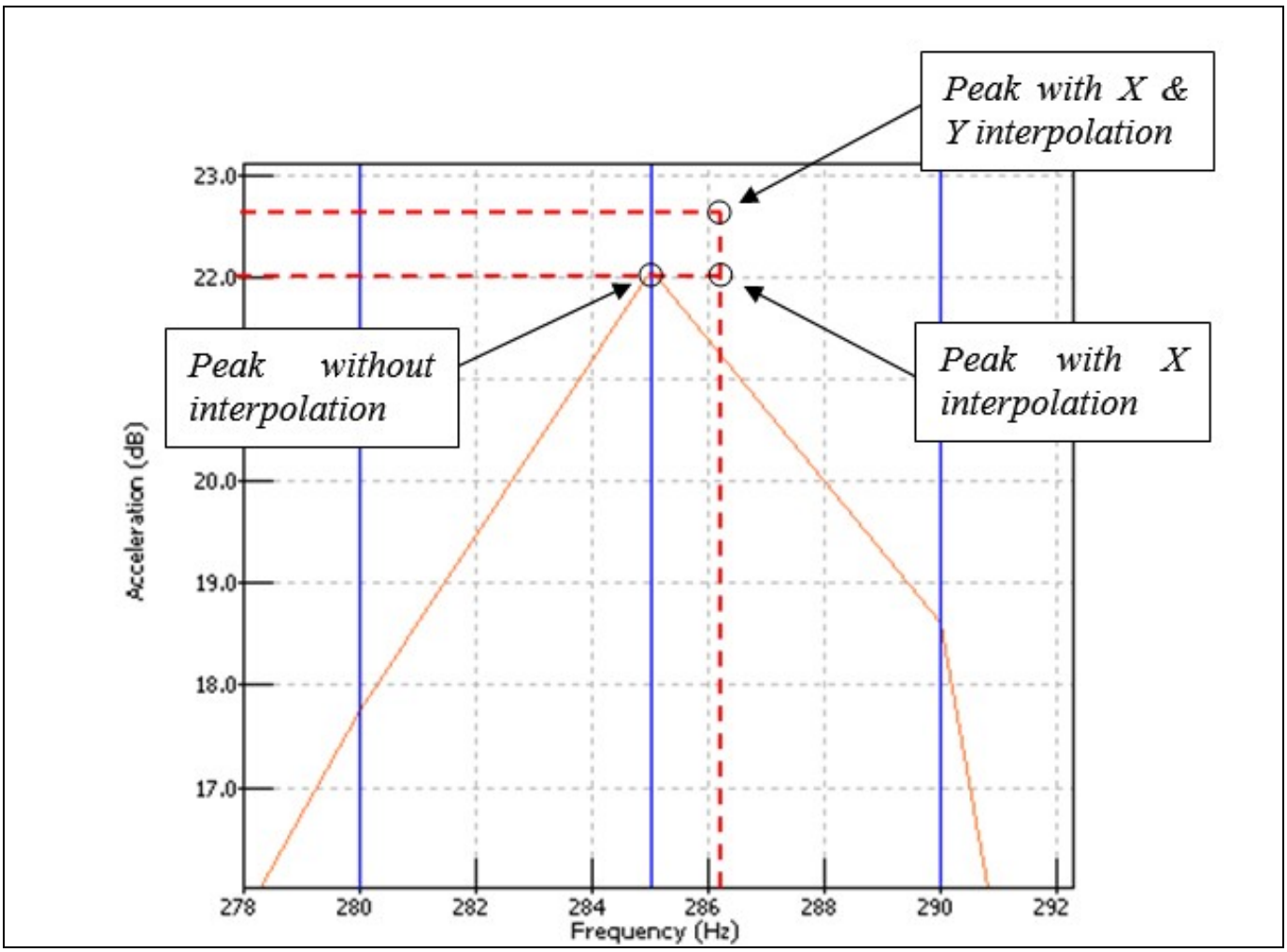
141.1.10.5 Max marker page



141.1.10.5.1 Style

Selects marker drawing style used in graphical area. The available marker drawing styles are:

- Vertical line
- Vertical dashed line
- Vertical with rectangle
- Cross-hair
- Vertical + Horizontal
- Marker color: Selects the marker color used in the graphical area.
- Number color: Selects the marker number color used in the graphical area.
- Associated to active trace: If checked, the marker added will be associated with the active trace: the markers display the values only for the active signal. If not checked, the markers display all the values when not associated with a signal.
- Interpolation: This setting selects the interpolation of values displayed in the marker table.
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.



141.1.10.5.2 Damping ratio

Damping ratio is calculated for each detected peak. The calculation is based on the Half-power-band-width method, where DR is the damping ratio:

$$\Delta\omega = bandwitdh\ @(peak_amplitude - \frac{1}{\sqrt{2}})$$

$$\omega_R = peakfreque\ ncy$$

$$DR = \frac{\Delta\omega}{2\omega_R}$$

The calculation of the damping factor is activated through the marker properties or preferences.

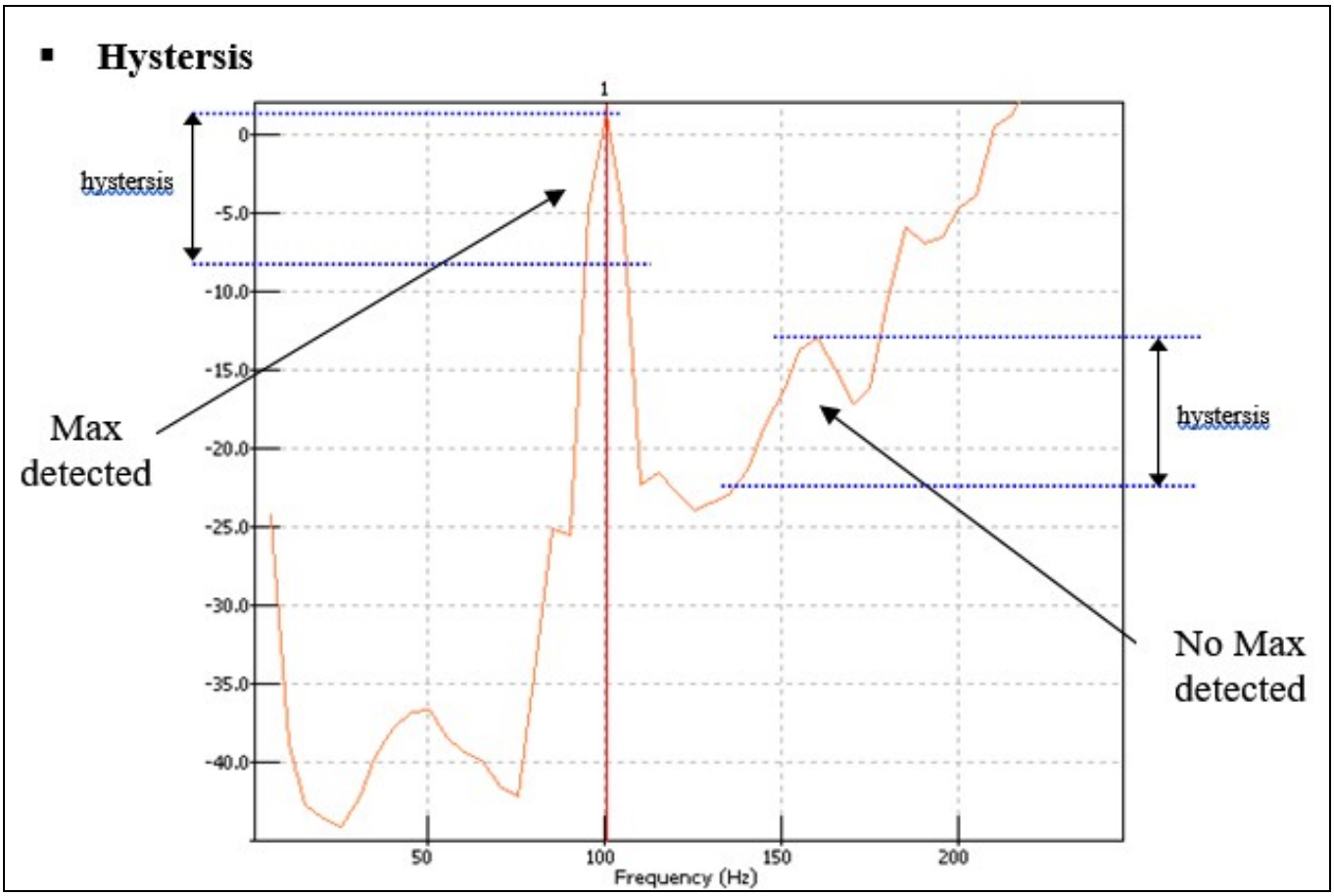
When it is activated an additional column is added in the corresponding marker table.

Warning, using nonhomogeneous weighting windows (i.e.: equivalent noise bandwidths are not the same) on FRF channels leads to incorrect peak interpolation and damping results.

For more details on the marker use, see the "Markers" topic from the "Chapter 2: Display".

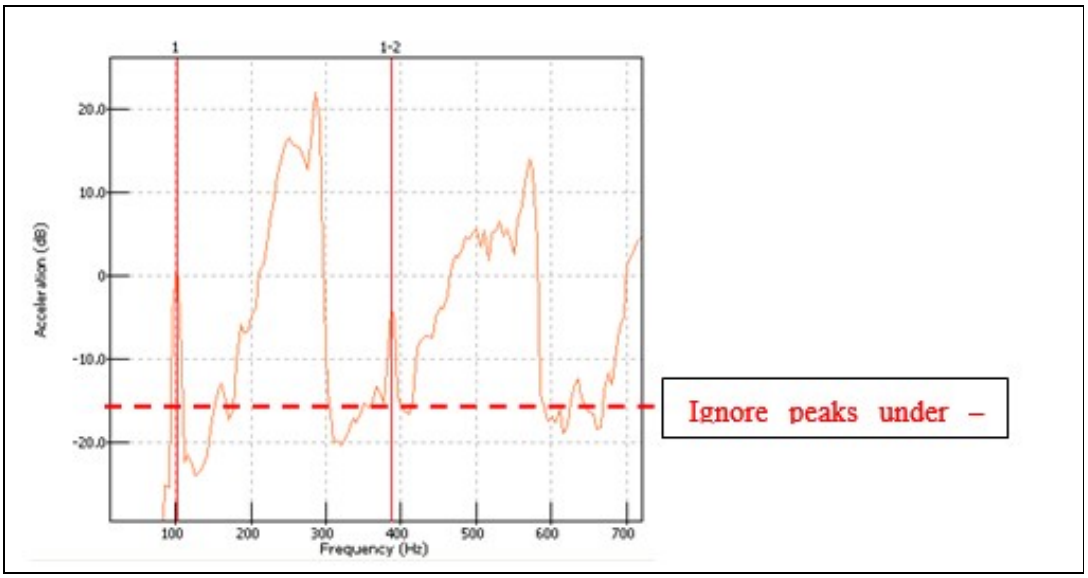
141.1.10.5.3 Find max algorithm

Looks for the maximum of the selected trace. It can apply to the current frozen window or to all frozen windows in the workspace A maximum is defined as a local maximum such that the variation in size of spectral density of ray, in relation to other local maximum surrounding it, is greater than a set threshold.

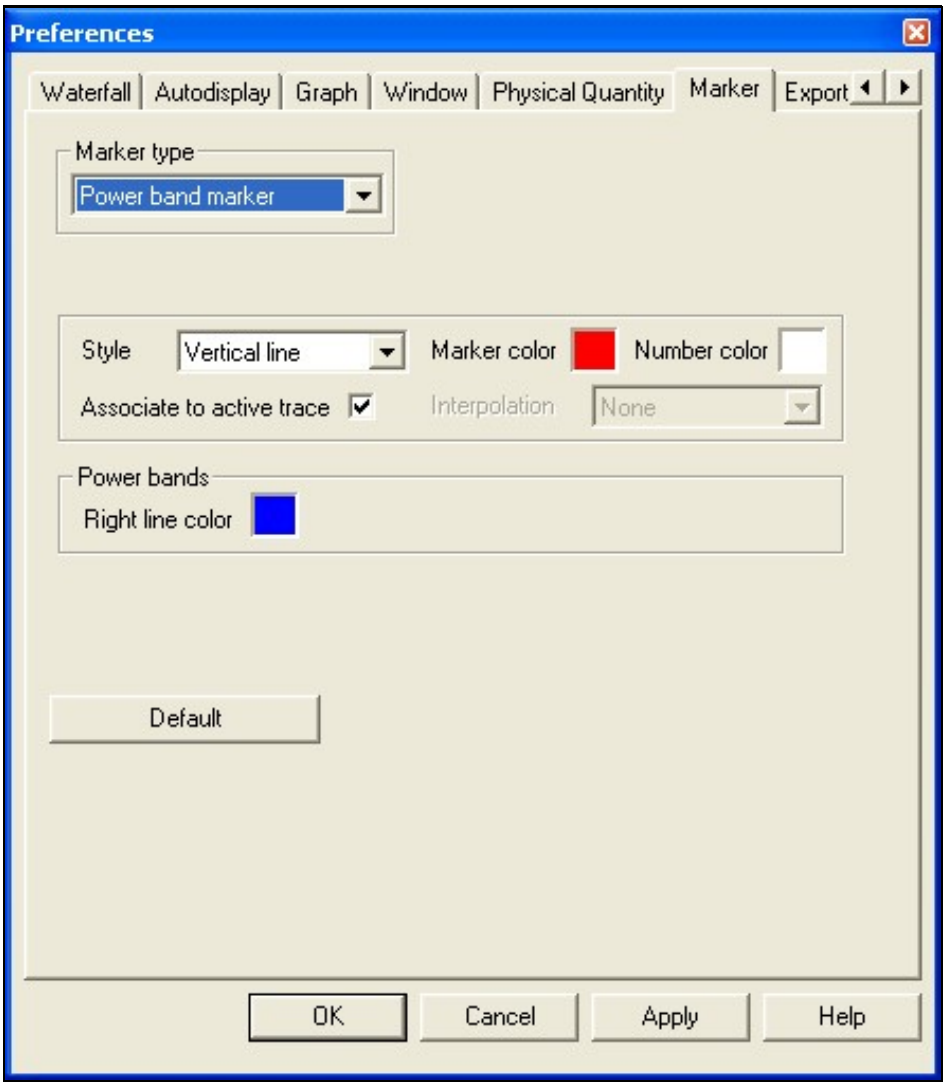


The following diagram shows how the maxima are searched for different maximum threshold values. In the first figure, the maximum threshold allows to find 2 maximum while in the second figure a larger maximum threshold found only one maximum.

- Ignore under: Does not display the detected peak if the peak is under this value. In the example below, the "ignore under" value is ?15 dB.



Power band marker page



141.1.10.5.4 Style

Selects marker drawing style used in graphical area. The available marker drawing styles are:

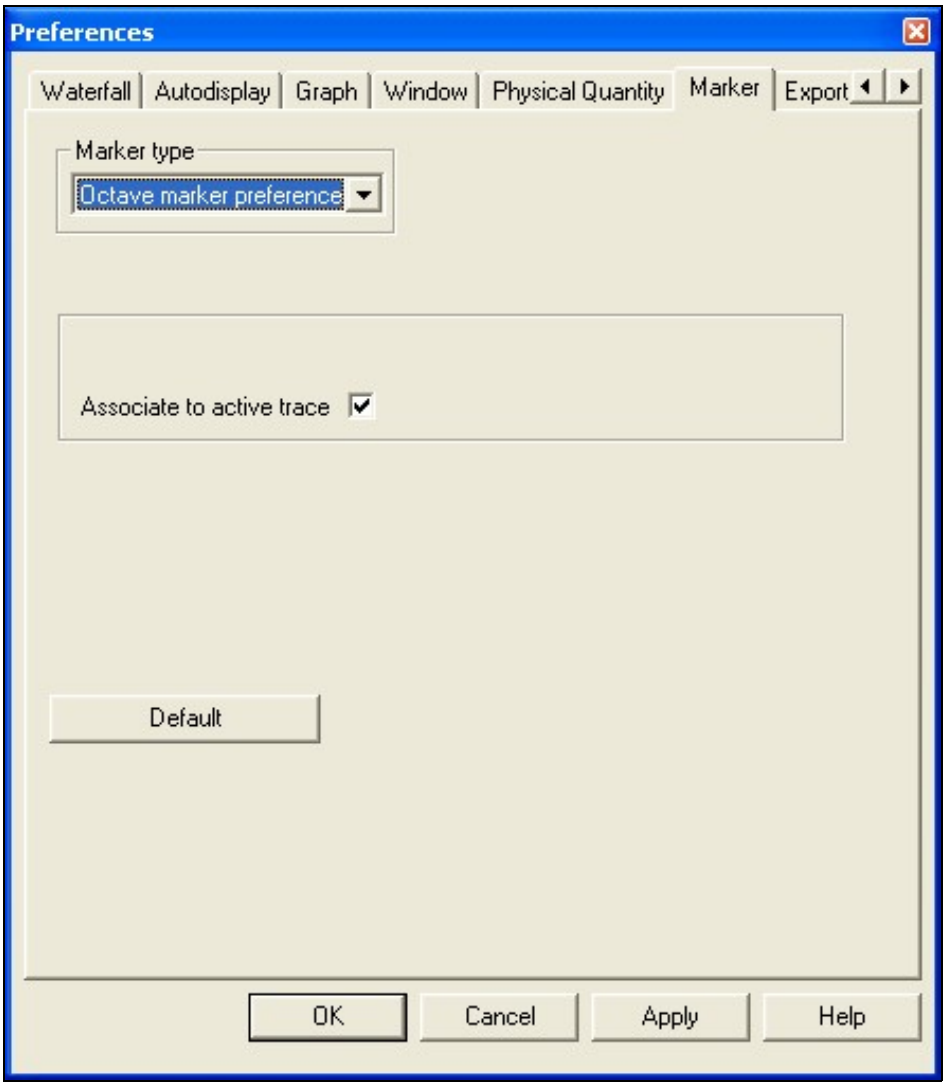
- Vertical line
- Vertical dashed line
- Vertical with rectangle
- Cross-hair
- Vertical + Horizontal

- Marker color: Selects the marker color used in the graphical area.
- Number color: Selects the marker number color used in the graphical area.
- Associated to active trace: If checked, the marker added will be associated with the active trace: the markers display the values only for the active signal. If not checked, the markers display all the values when not associated with a signal.

141.1.10.5.5 Power bands

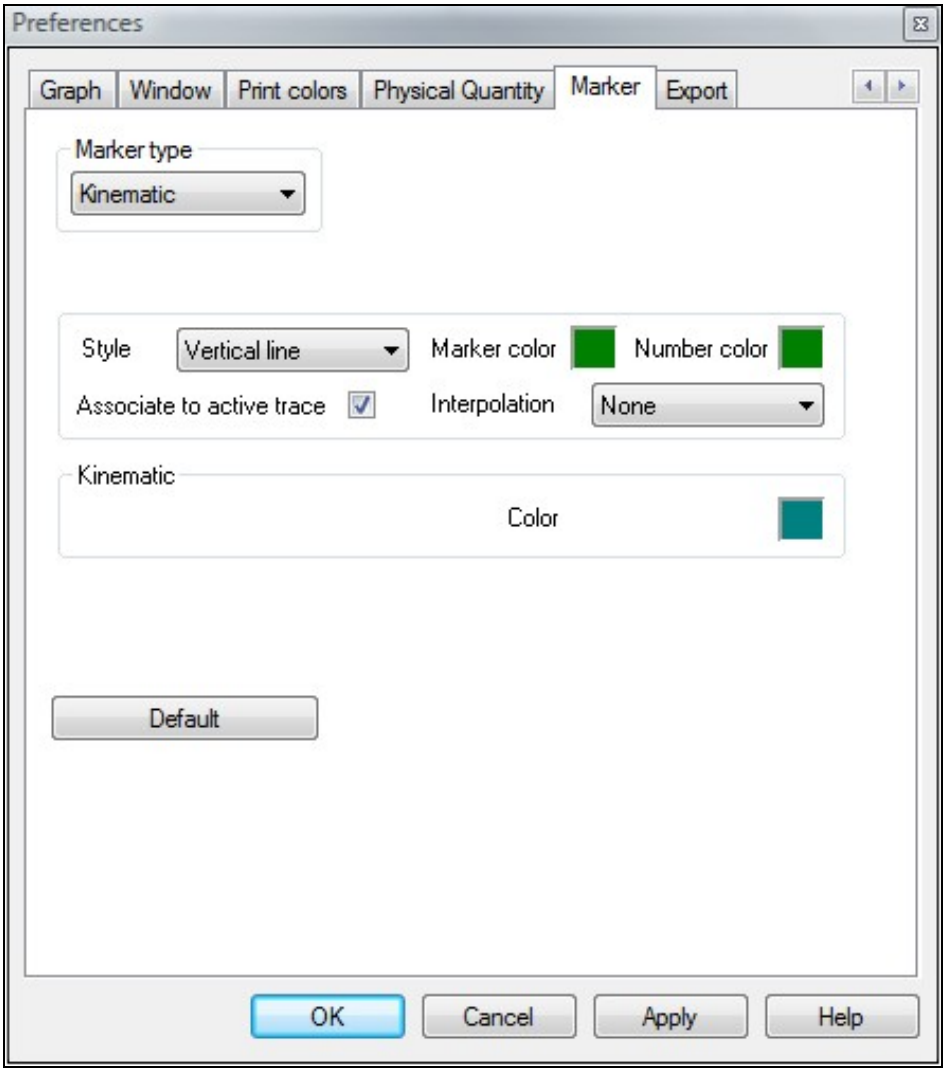
- Right line color: Selects right line color.

141.1.10.5.6 Octave marker page



- Associated to active trace: If checked, the marker added will be associated with the active trace: the markers display the values only for the active signal. If not checked, the markers display all the values when not associated with a signal.

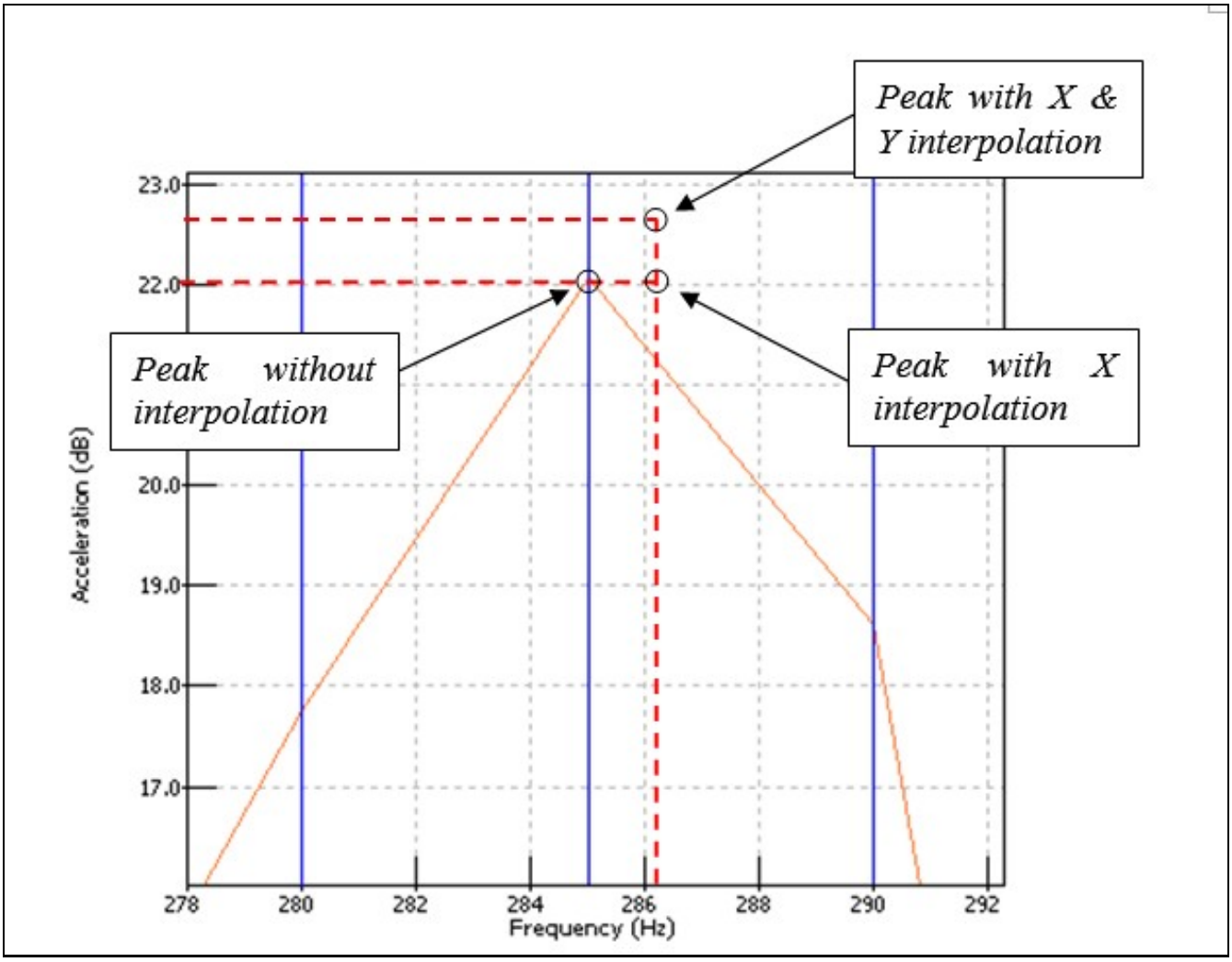
141.1.10.5.7 Kinematic marker page



Selects marker drawing style used in graphical area. The available marker drawing styles are:

- Vertical line
- Vertical dashed line
- Vertical with rectangle
- Cross-hair
- Vertical + Horizontal

- Marker color: Selects the marker color used in the graphical area.
- Number color: Selects the marker number color used in the graphical area.
- Associated to active trace: If checked, the marker added will be associated with the active trace: the markers display the values only for the active signal. If not checked, the markers display all the values when not associated with a signal.
- Interpolation: This setting selects the interpolation of values displayed in the marker table.
- None: no interpolation applied.
- X: x interpolation is active.
- X & Y: x and y interpolations are active.



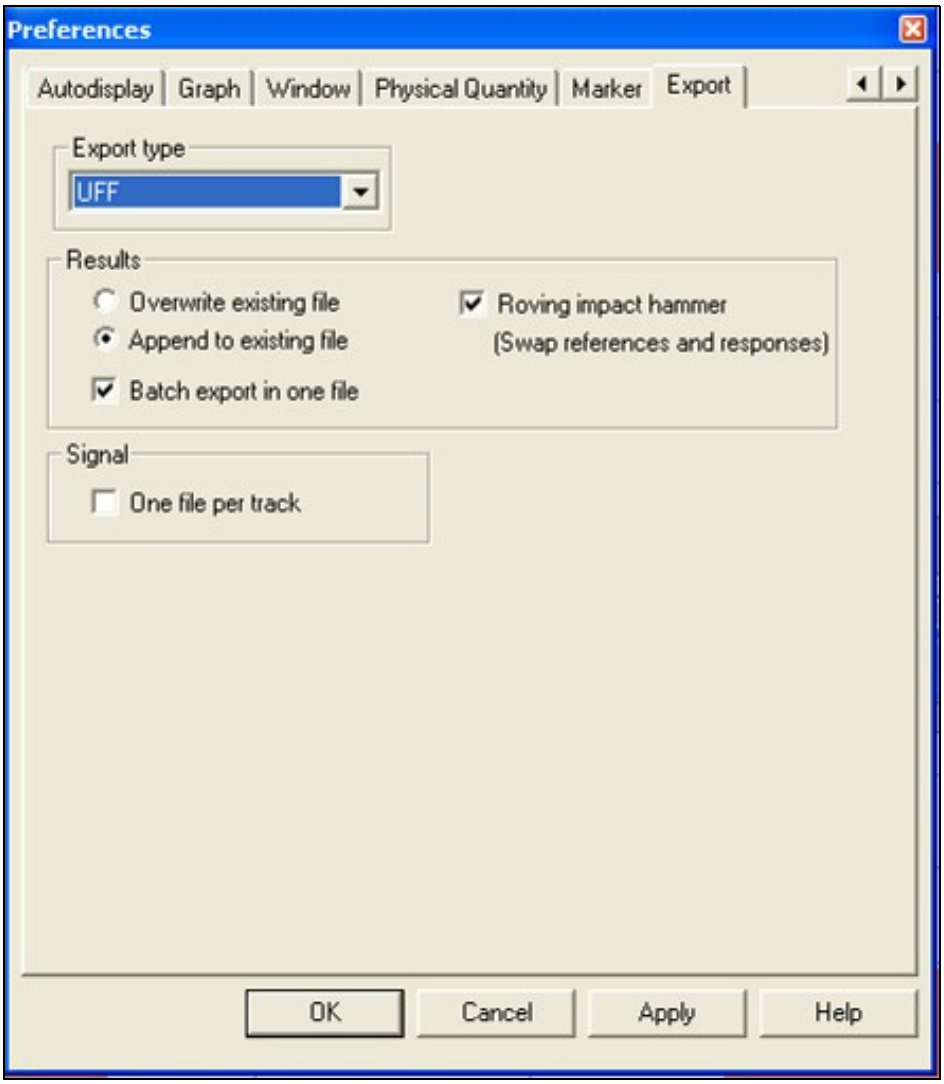
Note: the interpolated values of harmonic markers will be available only if the harmonic marker is placed on a peak. The peak detection criteria are the same as the peak marker adjusted in the User preferences. The marker can be moved by 1/32 step. The x value is computed with the selected weighted window.

141.1.11 Export

This function is used to configure the way data is converted to a specified format.

141.1.11.1 UFF

UFF58 time export is ASCII so that resulting export file size may quite large. Time to export UFF58 files may be long according to the ASCII file size being exported.



Note: UFF export format also stores the result physical quantity. Please ensure that the software you will use to load the UFF file is set to the same physical quantity as the imported file.

141.1.11.1.1 Results

- Roving impact hammer: This option is used only when converting cross-spectra, FRH, coherence. Depending on the habits, the response and the reference may be different. For instance, to use a UFF converted file in Smart office software, the option must be selected.
- Overwrite existing files: you can overwrite existing files by new results.
- Append to existing files: you can append new results to existing files.
- Batch export in one file: The same features are associated to batch export, allowing the export of multiple acquisitions (from on project or several ones) in one unique file.

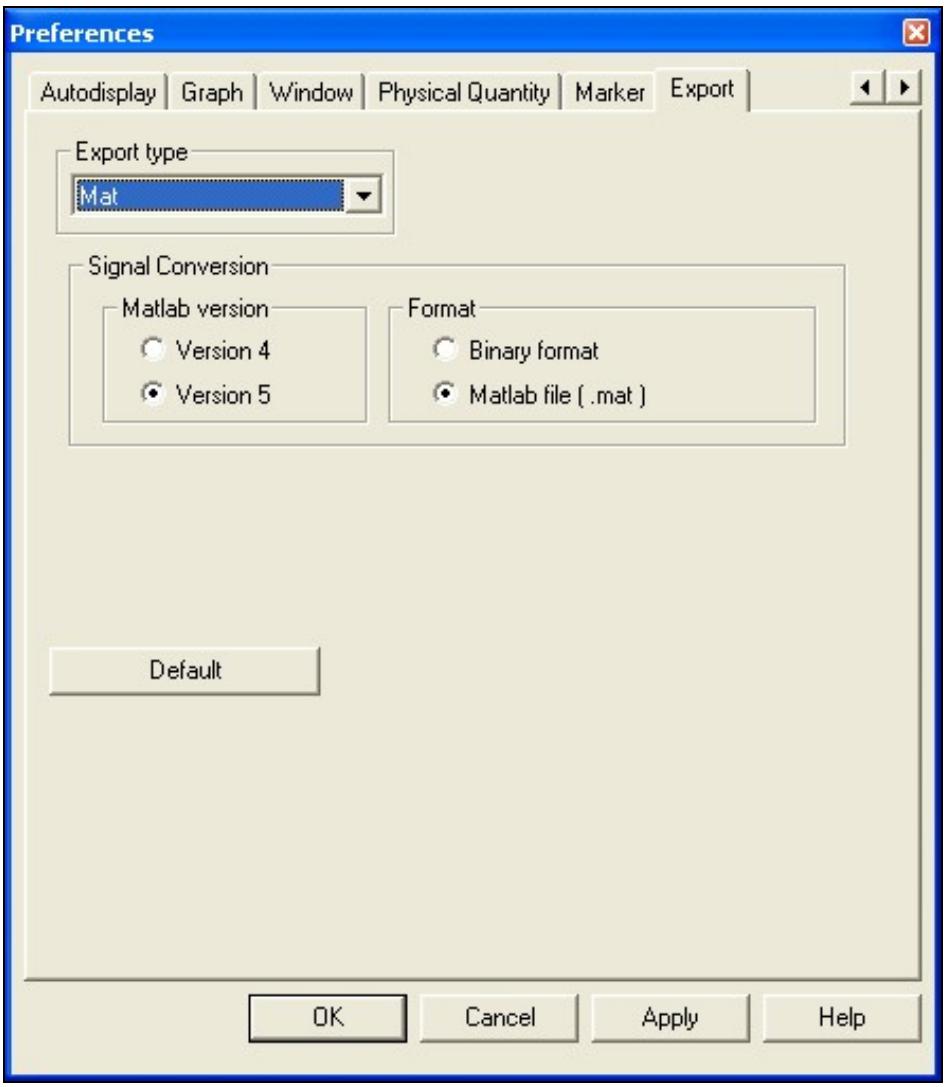
141.1.11.1.2 Signal

- One file per track: When a signal file is converted to UFF, every track is saved in a separate file if this option is selected.
- Note : If signal is more than 2Go, it will be automatically split on "one file per track".

141.1.11.2 Mat

Matlab export requires that the PC virtual memory be adjusted to double the size of the native OROS time recording.

For instance for a 500Mb OROS time data record to be converted into Matlab, you may need to adjust the PC virtual memory to 1Gb.



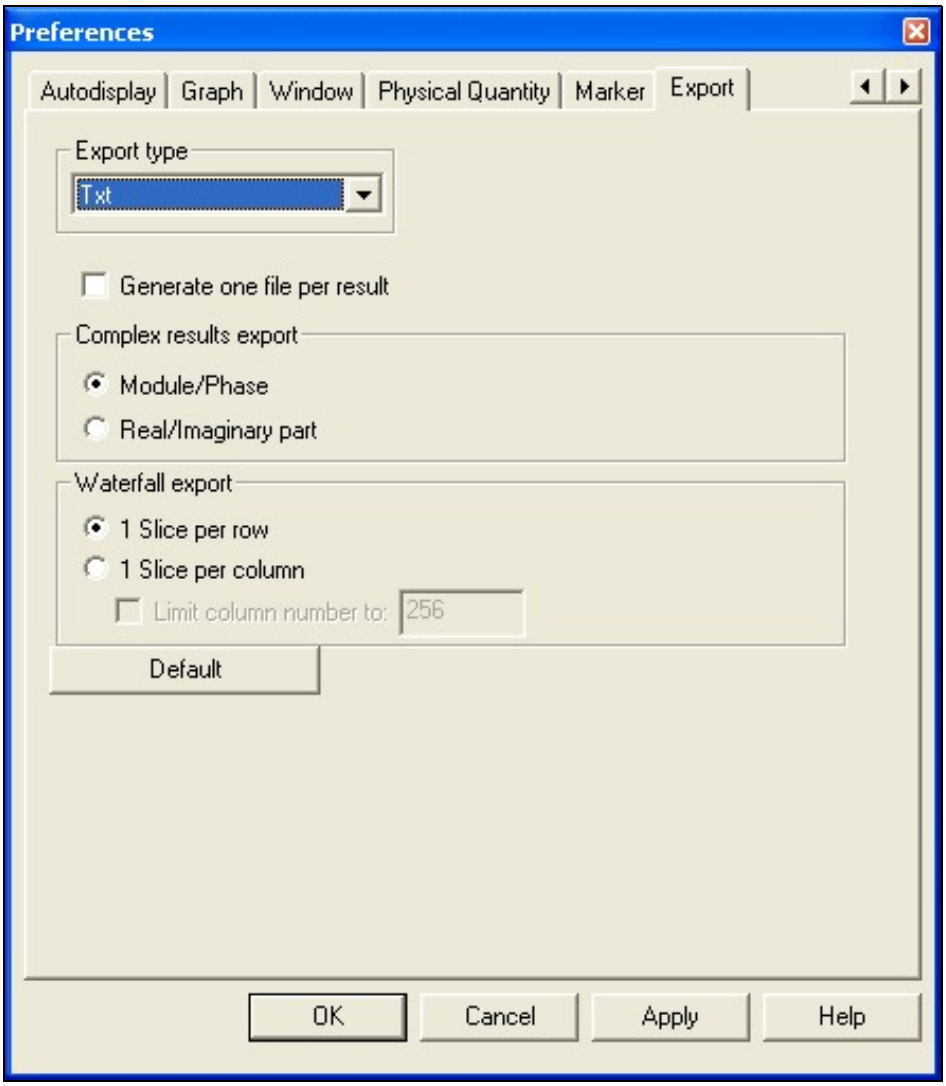
141.1.11.2.1 Matlab version

Used to select the matlab version of the created file. Refer to your installed version to find out which version you should select.

141.1.11.2.2 Format

- Binary format: The conversion of a signal file generates a matlab file containing the description of the track and one binary file containing the data itself. A procedure for reading the data in matlab has to be written.
- Matlab file (.mat): The conversion of a signal file generates a matlab file containing the description of the track and the data itself. Very large file may be difficult to open in Matlab.

141.1.11.3 Txt



141.1.11.3.1 Generate one file per track

When a result file is converted to txt, every result is exported to a dedicated file.

141.1.11.3.2 Complex results export

- Module/Phase: Complex result are in the Module / phase format.
- Real/Imaginary part: Complex results are in Real / Imaginary part format.

141.1.11.3.3 Waterfall export

- 1 slice per row: The Waterfall is displayed in the exported file so that each line represents a slice of the Waterfall (a spectrum for instance). If the Waterfall contains 50 slices, and the spectra contain 401 lines, the text file will contain 50 lines and 401 columns.
- 1 slice per column: The Waterfall is displayed in the exported file so that each column represents a slice of the Waterfall (a spectrum for instance). If the Waterfall contains 50 slices, and the spectra contain 401 lines, the text file will contain 401 lines and 50 columns.
- Column limitation: When the one slice per column option is selected, it is possible to specify the maximum number of columns that should be created. If the result contains more slices than this number, it is split. This option should be selected when the file is opened with a spreadsheet editor, because the number of columns in this editor might be limited (256 for Excel).

141.1.11.3.4 .txt description format

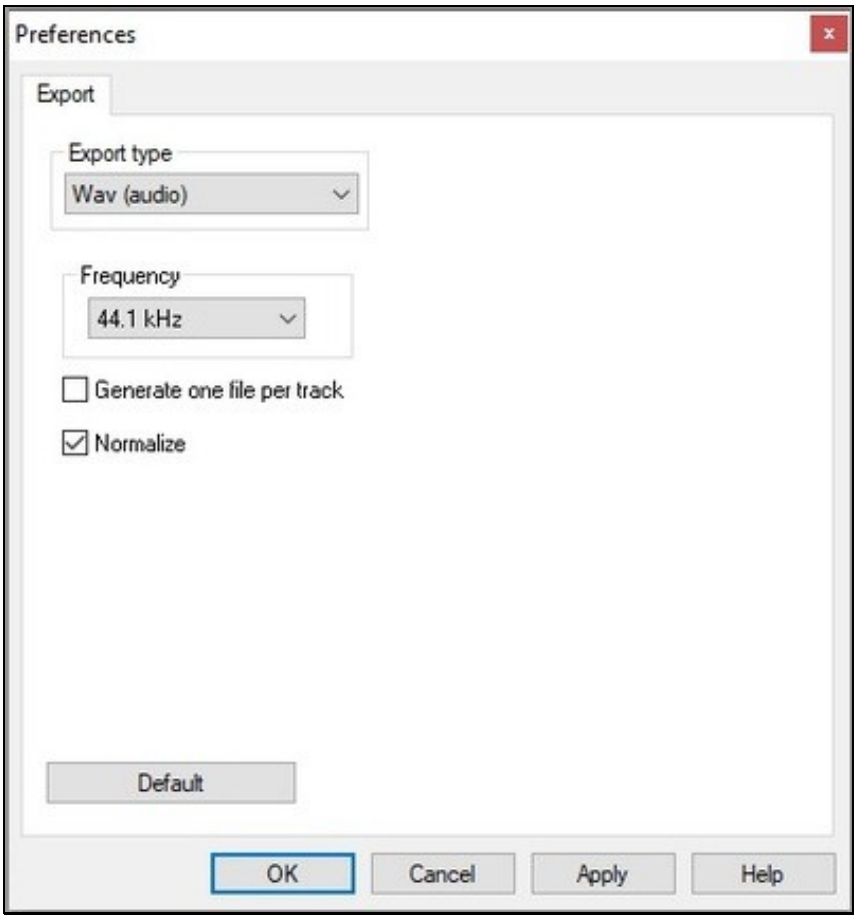
See this page

141.1.11.4 Wav (audio)

This option only applies to the conversion of signals to audio wav files, not to standard wav files.

Exported wav file sampling frequency depends on OROS native file sampling frequency.

OROS native files containing more than 16 tracks will automatically be exported in single tack wav file (one file per track, despite export preference option being unticked).



Compatibility table (OROS to Wav):

OROS native file sampling frequency (kS/s)	Wav audio formats (kHz)
102.4	44.1, 48, 96
65.5536	44.1, 48, 96
51.2	44.1, 48
32.768	44.1, 48
25.6	44.1, 48
20.48	44.1, 48
16.384	44.1, 48
12.8	44.1, 48
10.24	44.1, 48

141.1.11.4.1 Frequency

Sets the frequency of the converted file. The frequency can be 44.1 kHz, 48 kHz or 96 kHz. It might not be possible to convert the OROS file to the target frequency. It depends on the recording frequency of the OROS file.

141.1.11.4.2 Generate one file per track

When a signal file is converted to wav, every track is saved in a separate file if this option is selected.

141.1.11.4.3 Normalize

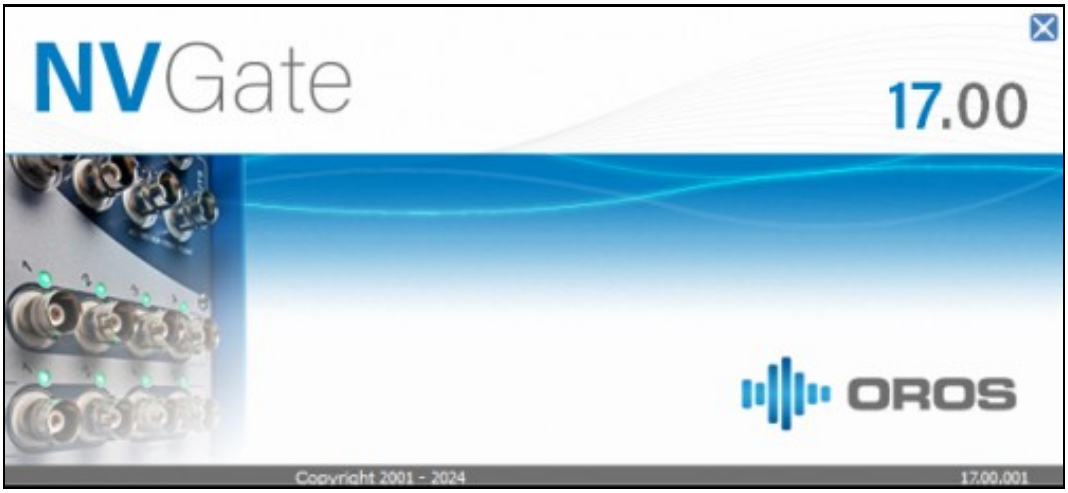
A WAV audio file is sampled within [-1;1] Y axis values. By default the export is done according full Range peak of the recorded track file to the WAV scale [-1;1]. If the dynamic of the recorded signal is low regarding the range peak, WAV level could become too low to be playback on speaker. Activate the "Normalize" option so that the export is done according to true level of the signal to be exported. Min and Max of the signal will be taken into account to generate WAV audio file betweenrange [-1;1] corresponding to [Min;Max]. ATTENTION : Signal level become no more valid for comparison while using "Normalize" Option.

- Without "Normalize" option : [-Range Peak ; Range Peak] --> [-1 ; 1]

- With "Normalize" option : [Signal Min ; Signal Max] --> [-1 ; 1]

142 NVGate V17: Install Process

NVGate V17 is now available.



142.1 What's new ?

Read the release note NVGate V17.

142.2 Compatibility

NVGate V17 is compatible with the following OROS instruments: O4 - OR10 - OR35TW - OR36 TW - OR38 TW.

If you're using an older system like the OR34, OR35 V1, OR36 V1/V2, or OR38 V1/V2, please reach out to your local OROS distributor or contact us directly at customer.care@oros.com to learn more about our Trade-in offers. Upgrade now to unlock the full potential of our latest systems!

If you're using an OR35TW, please review the notice for important information.

142.3 What do you need ?

142.3.1 Keys

A reader mode is available without license.

The normal version is available for OROS customers under warranty or maintenance contract.
You need to ask your local OROS distributor or customer.care@oros.com for the .zip keys.

142.3.1.1 Download NVGate version

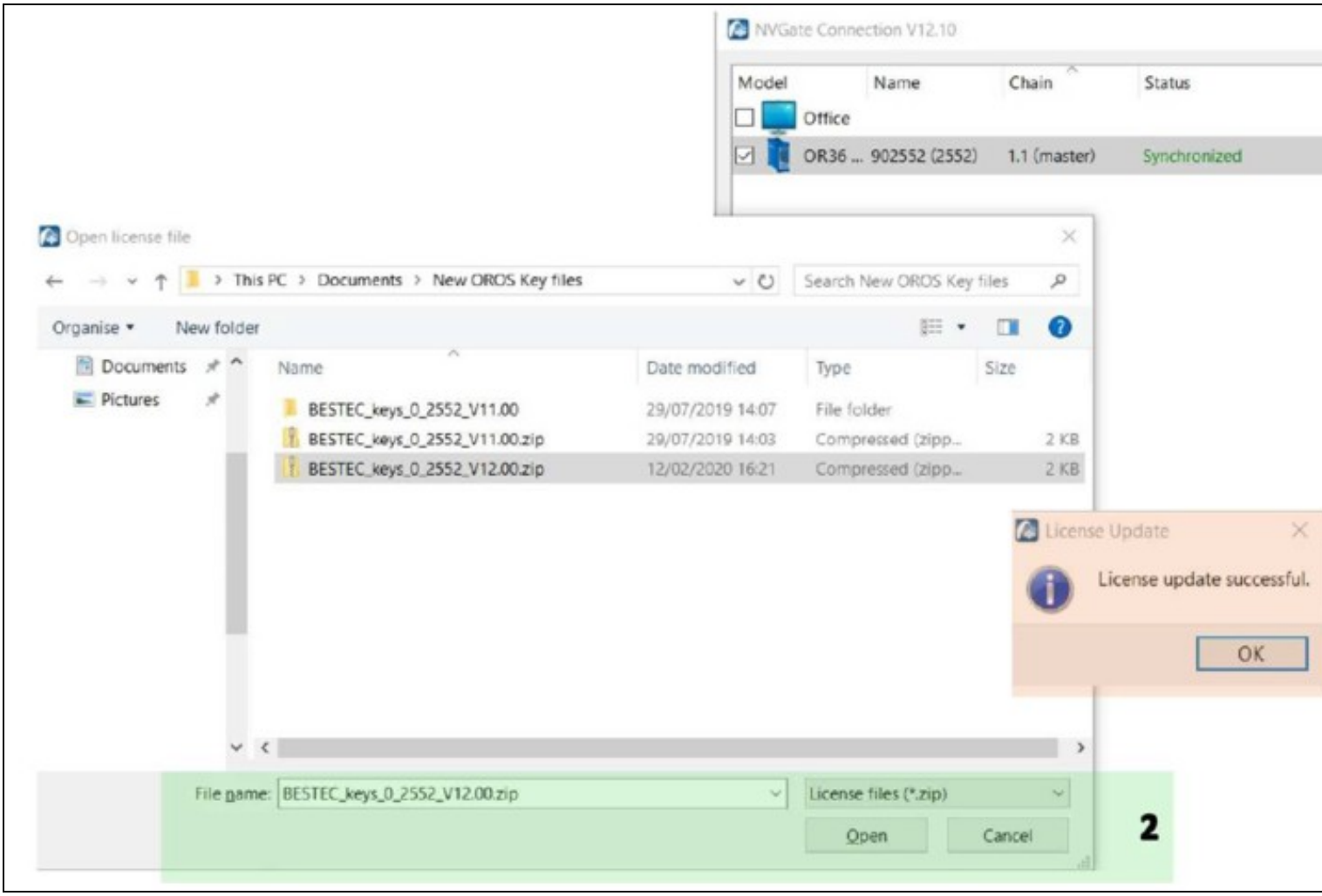
Download NVGate V17 (You need to log in into www.myoros.com first)

142.4 Install Process

- Extract NVGate version
- Launch the setup.exe and follow the instructions.(No need to input the key during the install)
- When the window "NVGate environment" appears, press ok.
- Start NVGate, the window below is displayed.

142.4.1 update the keys

- 1) Select the item (analyzer or dongle) for which you want to update the license keys.
- 2) Select the **.ZIP** archive containing your new license key files.
- 3) The license key files will be automatically copied in the NVGate installation folder and the keys of your analyzer and USB dongle will be encrypted.



- **update firmware**



Firmware: click on update firmware, it will automatically update the firmware.

That's all. NVGate is updated.

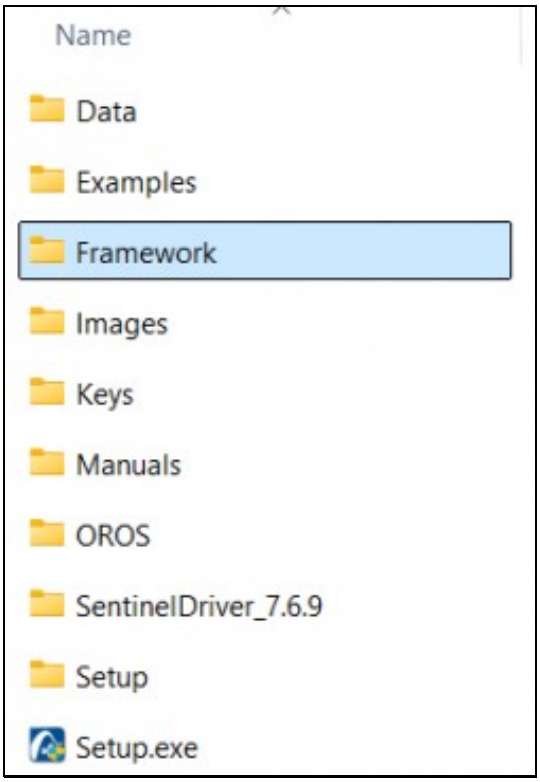
142.5 Troubleshooting

Read this page for any troubleshooting when you encrypt the keys

142.6 FREE OROS Framework

The OROS Framework, including the powerful **NVDrive** and **Toolkit**, enables extensive customization for real-time control and post-processing in noise and vibration analysis.

The Framework package is located in the 'Framework' folder within the NVGate V17 installer, available for download here.



The OROS Framework is provided at no cost, offering powerful customization tools for your needs. While technical support and bug fixes are not included, you can purchase dedicated support and coaching services for expert guidance and tailored assistance, ensuring you get the most out of its full potential.

142.7 Notice for OR35TW Users

At OROS, we are dedicated to continuously improving signal recording performance. With the advancements in technology, starting from NVGate 2023, signals are now recorded directly to the PC by default to ensure optimal performance. If you're using this default setting, you're all set!

However, if you own an OR35TW system delivered before June 2024 (serial numbers between 902854 and 904639) and rely on features such as D-rec mode, cascade (multi-analyzer) mode, or recording signals directly in the analyzer, an internal hard drive upgrade to a higher-performing version will be necessary to maintain full functionality.

The great news is, if your system is under warranty, covered by a service contract, or you?re upgrading to NVGate V17, the hard drive replacement will be performed free of charge when your system is sent to an OROS maintenance center. Additionally, if you're calibrating your system, the hard drive will be upgraded at no extra cost!

142.8 Old versions

142.8.1 NVGate2022 V16

https://wiki.oros.com/index.php?title=NVGate_V16:_Install_Process

142.8.2 NVGate2022 V15

https://wiki.oros.com/index.php?title=NVGate_2022:_Install_Process

143 NVGate V17: Release note

OROS strives to be closer to its users, carefully listening to needs and requests. For that reason, OROS regularly releases new versions. Customers under contract automatically benefit from each release.



This new major version of NVGate unlocks the full potential of OROS Framework, empowering you with **advanced customization** options and **complete control over your data** ? keeping you ahead with cutting-edge tools for efficient and tailored signal management at no additional cost.

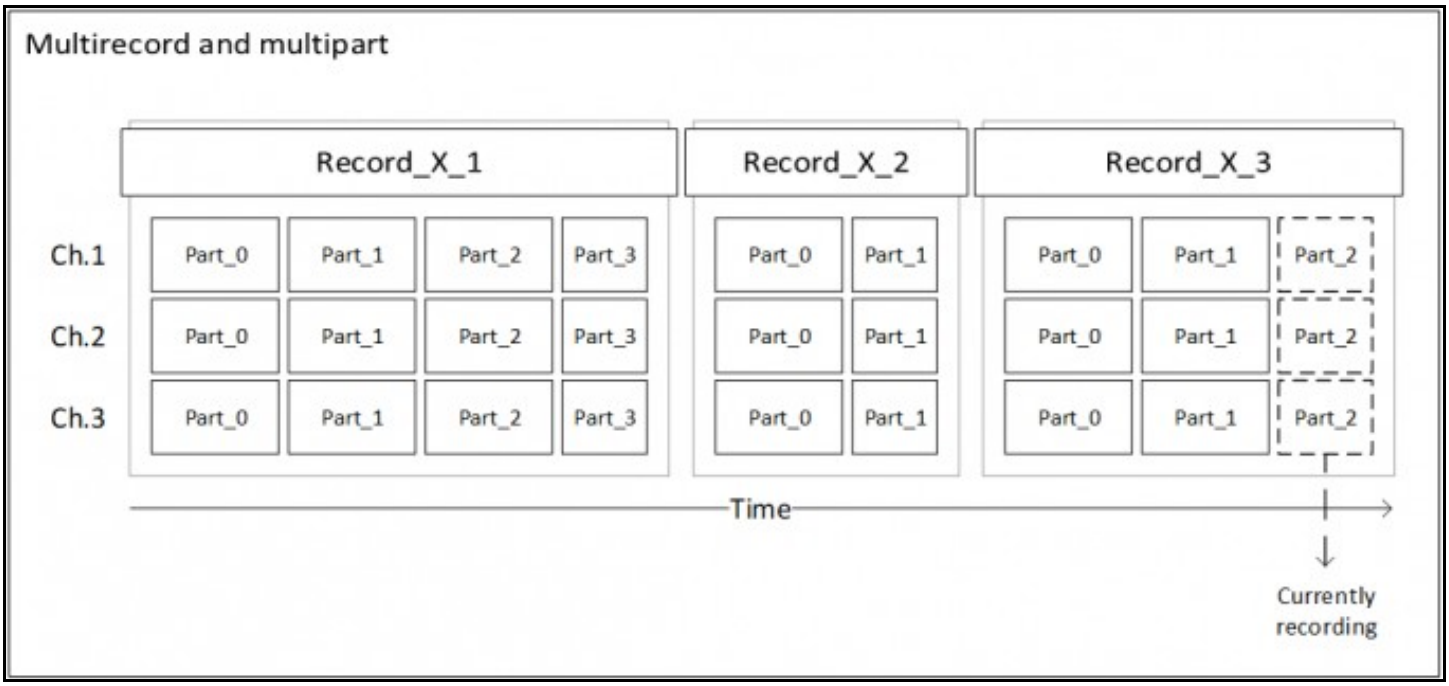
This release note describes the content of the version, with operating details.
To download and install NVGate V17, check this page.
Compatibility: NVGate V17 is compatible with the following OROS instruments: O4 - OR10 - OR35 TW - OR36 TW - OR38 TW.

143.1 New Data Structure: Redefining Flexibility for Modern Signal Management

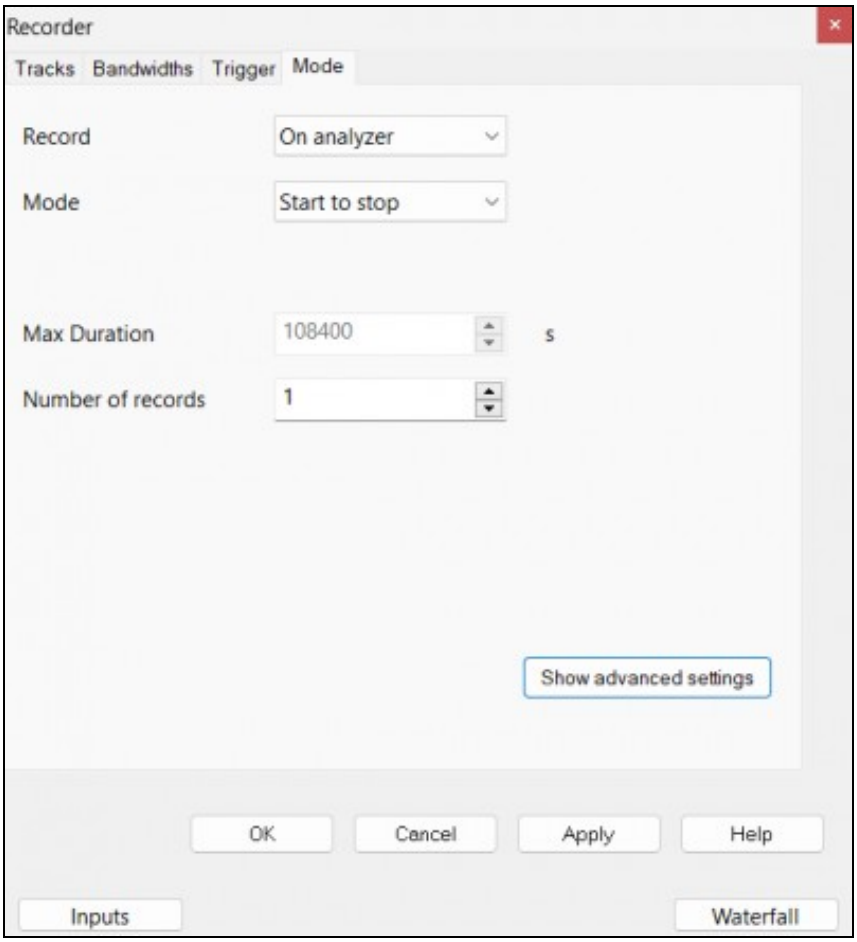
Time signals are now stored using a brand-new structure that optimizes both signal processing and data management.

143.1.1 Multiple Parts and Recorder Configuration

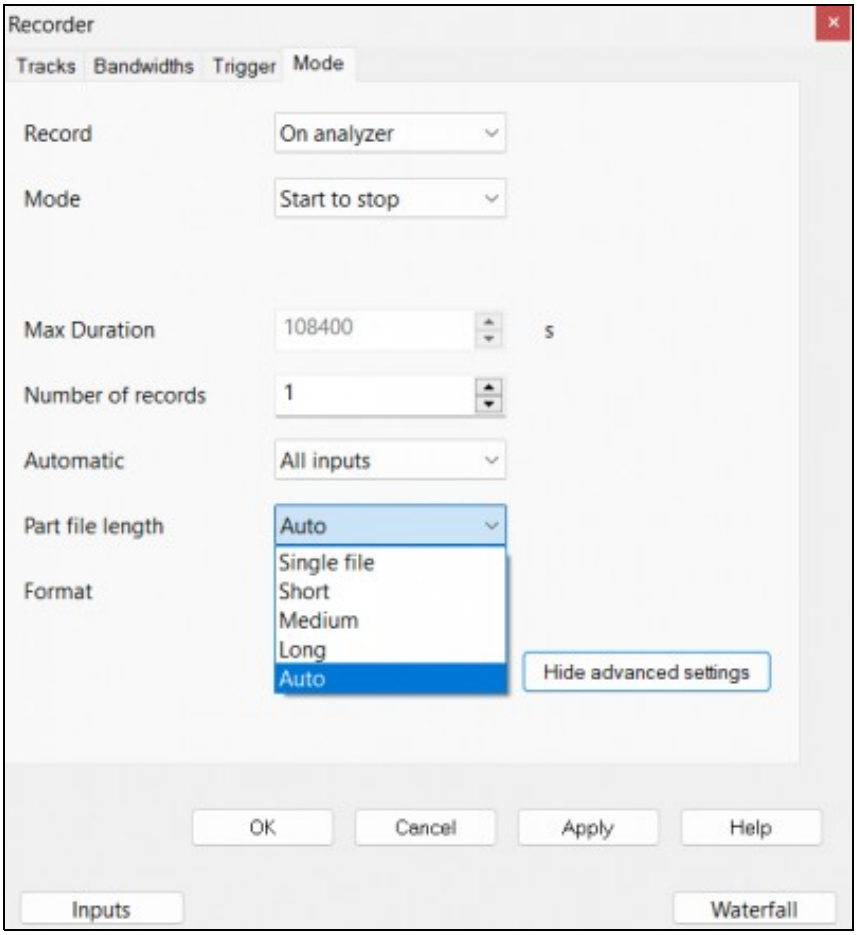
Users have the flexibility to configure each time signal to include multiple records, with each record further divided into parts of customizable lengths.



By default, the recorder is configured with a single record and the part length set to 'Auto' as below:



The duration of a part can be configured in the advanced settings as below:

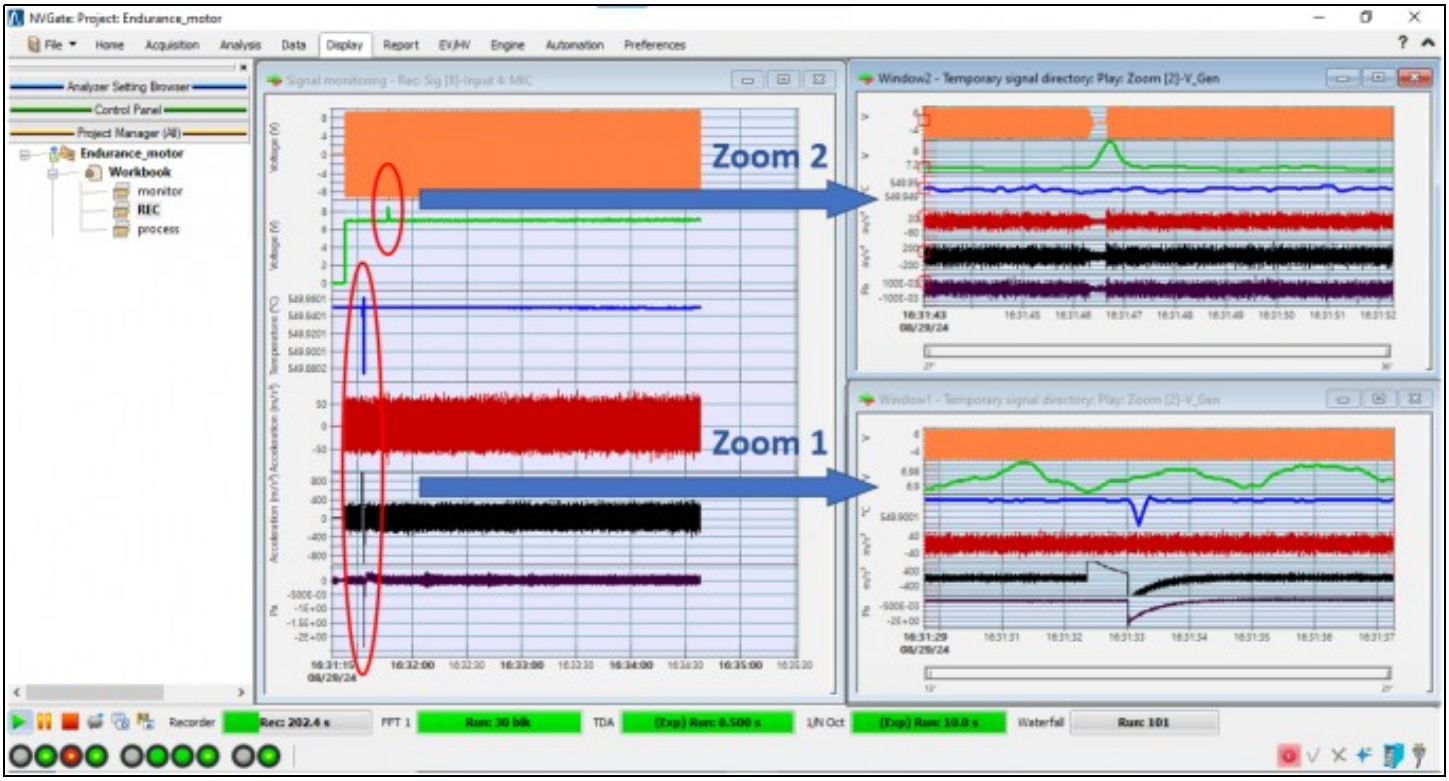


- Single file: Only 1 part per signal.
- Short: Part length is set to 64 seconds.
- Medium: Part length is set to 640 seconds.
- Long: Part length is set to 1920 seconds.
- Auto: The part length depends on the recording mode:
    - "Start to stop" mode: Part length is set to 640 seconds.
    - "Start to time" mode:
        - If duration is longer than 100 hours, then part length is set to 1920 seconds;
        - If duration is between 10 and 100 hours, then part length is set to 640 seconds;
        - If duration is between 5 and 10 hours, then part length is set to 128 seconds;
        - If duration is less than 5 hours, then part length is set to 64 seconds.
    - "Time to stop" mode: For duration of 1024 seconds or longer, the part length is set to 64 seconds. For shorter duration, the first power of 2 greater than duration/16 is selected. A minimum part length is enforced when the total record bandwidth is high. When the combined bandwidth of all recorded inputs exceeds 256 kHz, 512 kHz, or 1024 kHz, the minimum part length is set to 8, 16, or 32 seconds, respectively.

143.1.2 Key New Features introduced by the New Data Structure

143.1.2.1 Real-Time Zoom

Drag and drop the section of the signal you're interested in while recording, and the selected part will be instantly zoomed in. You can zoom in on multiple sections simultaneously in different windows, enhancing your real-time analysis and visualization capabilities.



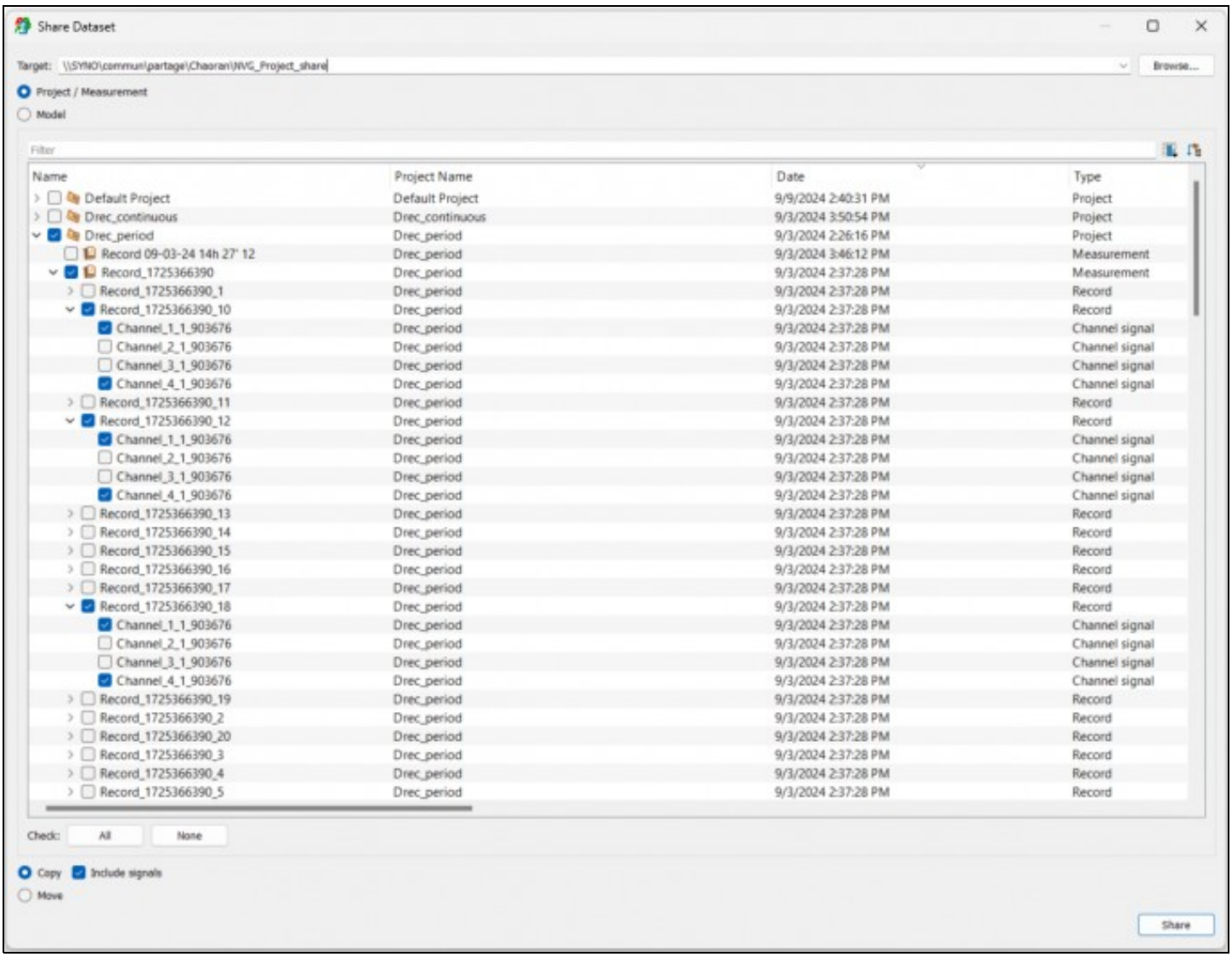
143.1.2.2 Concurrent Analysis

Included for free in NVGate V17, NVDrive and Toolkit allow you to read time signals in real-time, even during recording. This powerful capability enables post-analysis of time signals while recording continues, significantly accelerating your decision-making process ? all at no additional cost.

For example, the analyzer can run standalone on-site, autonomously without the need for a PC. Time signals are continuously stored in a ring buffer within the analyzer. Users can remotely download and post-analyze any portion of the time signal stored in the buffer, providing flexible, real-time data access and analysis.

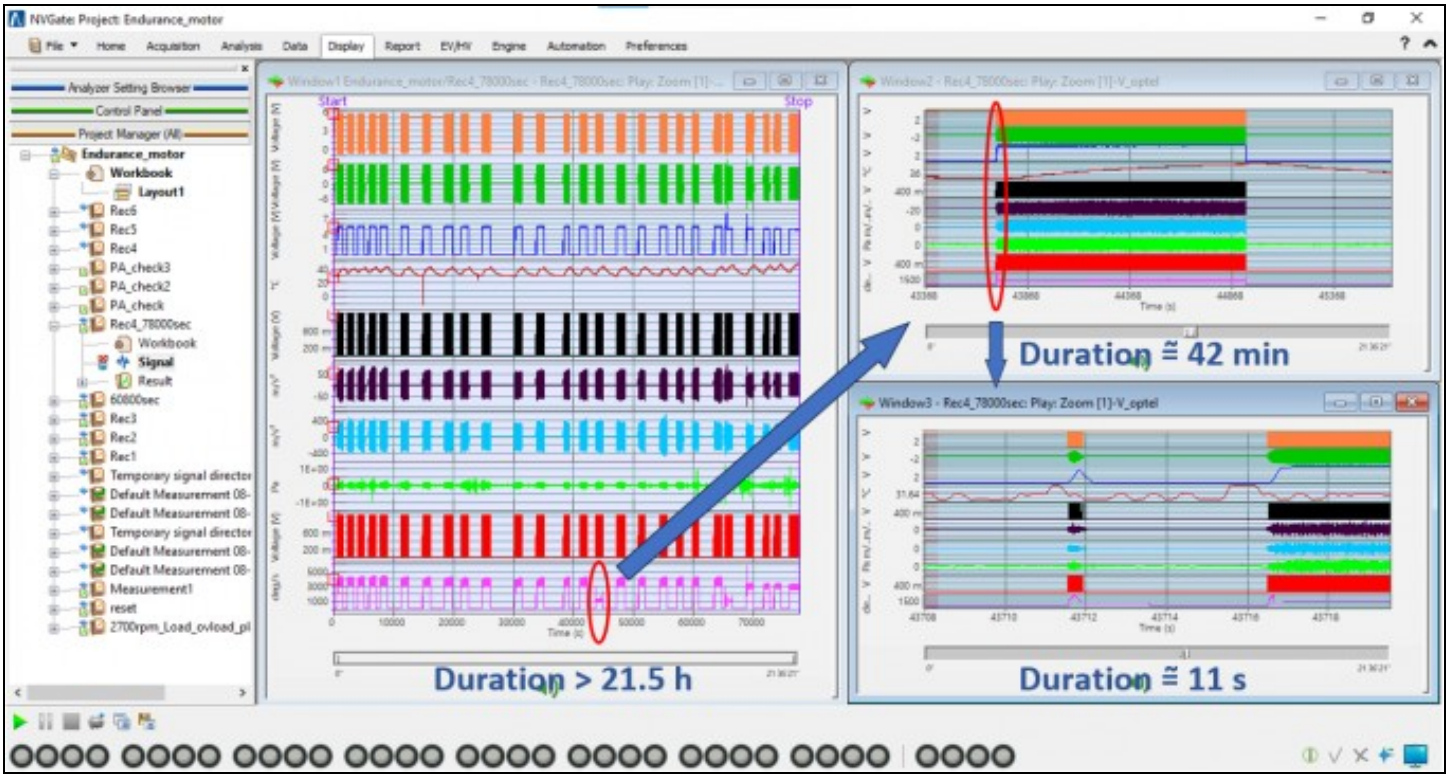
143.1.2.3 Selective Sharing

Share or collate specific input channels and/or records selectively to enhance team collaboration and streamline data exchange. This feature is particularly valuable for teams handling complex and large datasets, allowing for more targeted and efficient teamwork.



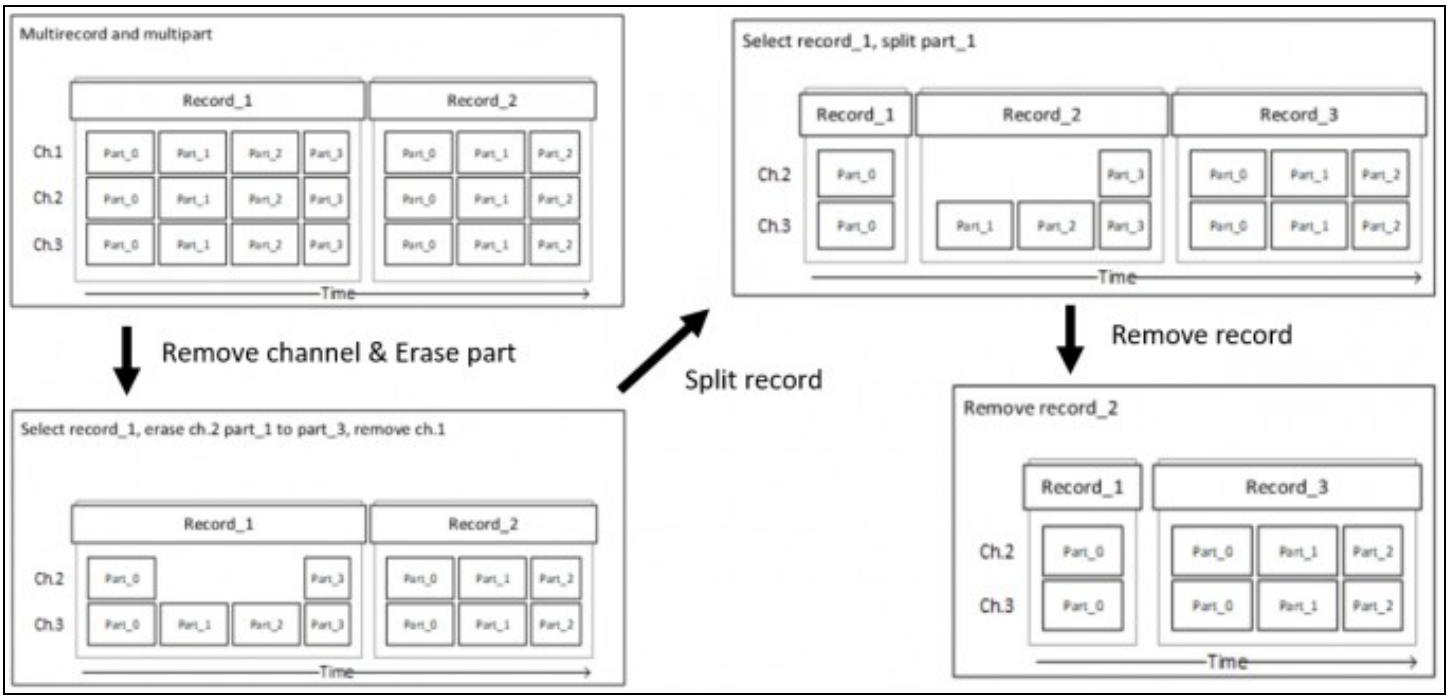
143.1.2.4 Large Signal Handling

Extensive signals are managed effortlessly, with hours of data displayed instantly and without lag. Simply drag and drop the section you're interested in, and zoom into segments as short as a few seconds, even within massive datasets. This allows for detailed analysis without any performance issues. For example, the time signal shown below spans over 21 hours, with a size exceeding 60GB?and you can instantly investigate any part of the signal down to just a few seconds.



143.1.2.5 Segment & Edit

Signals are saved in manageable parts, enabling focused analysis and efficient data management. This structure offers enhanced control and flexibility when handling complex datasets, with the added benefit of conserving disk space by erasing unnecessary segments. For example, using the toolkit which is included for free in NVGate V17, you can easily perform various time signal manipulations such as removing channels, erasing segments, splitting records, or deleting entire records.



143.2 OROS Framework: Free of Charge, Unleash Customization, Unlock Limitless Potential

The **OROS Framework**, now available at **no cost**, equips users with the powerful **NVDrive** and **Toolkit**, enabling unparalleled customization capabilities for real-time control and post-processing in noise and vibration analysis, offering the flexibility to tailor solutions to specific workflows and needs.

Seamless Custom Development

Whether building a tailored calculation tool or a fully automated test bench, the OROS Framework offers everything you need to effortlessly create and integrate your own solutions. Build programs that control OROS analyzers and collect real-time signals and measurement results from NVGate for further processing with ease.

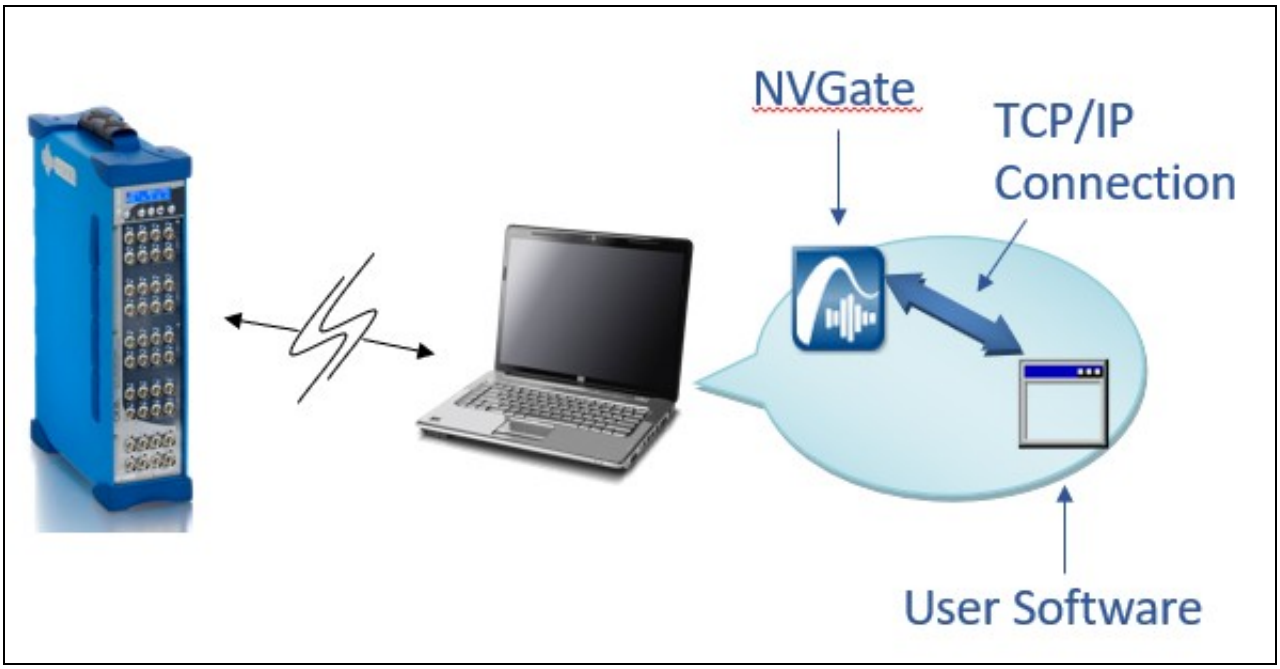
Tailored Solutions and Full Support

The OROS Framework?s components are designed to adapt to your specific workflow. Whether you need real-time control or post-processing power, there?s a solution within the Framework to meet your needs. Whether you prefer to develop independently or require full support, OROS has you covered. If programming isn?t your strength, or if you prefer a turnkey solution, our team is ready to assist. We can work closely with you to customize the software or manage the entire process, delivering a complete solution tailored to your needs. This can be done directly by OROS or through a trusted local partner.

Choose Your Path to Integration

143.2.1 NVDrive

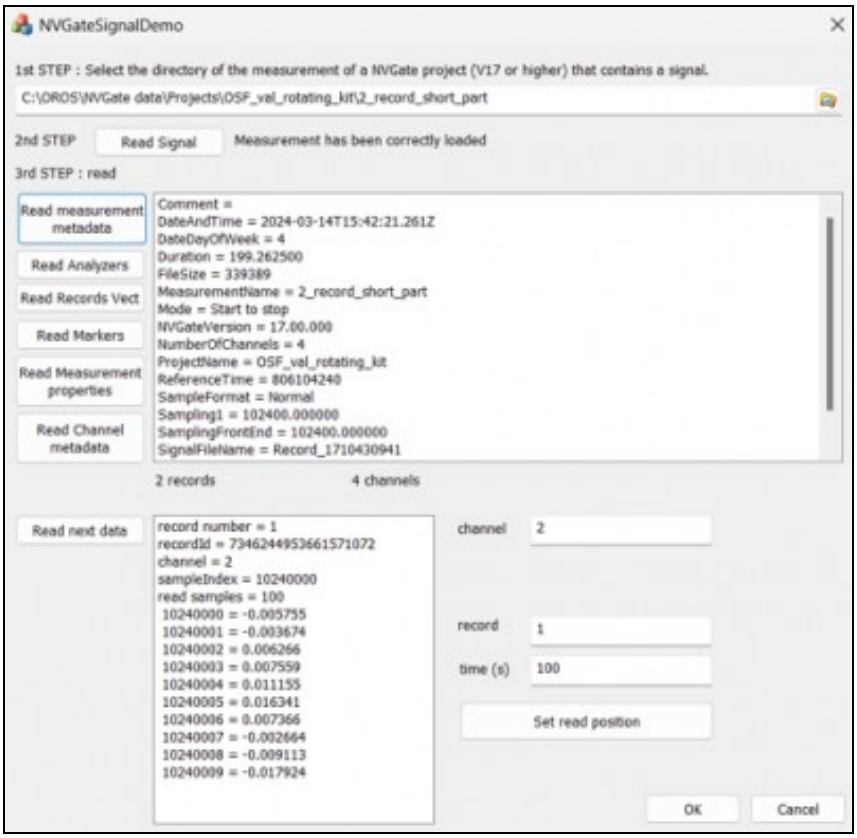
Ideal for full control and real-time operations. The TCP/IP-based NVDrive API allows you to manage NVGate entirely from your own applications - handling system configuration, real-time data acquisition, post-analysis, and more. It supports implementation in any programming language, with examples available in Python, C++, and Matlab.

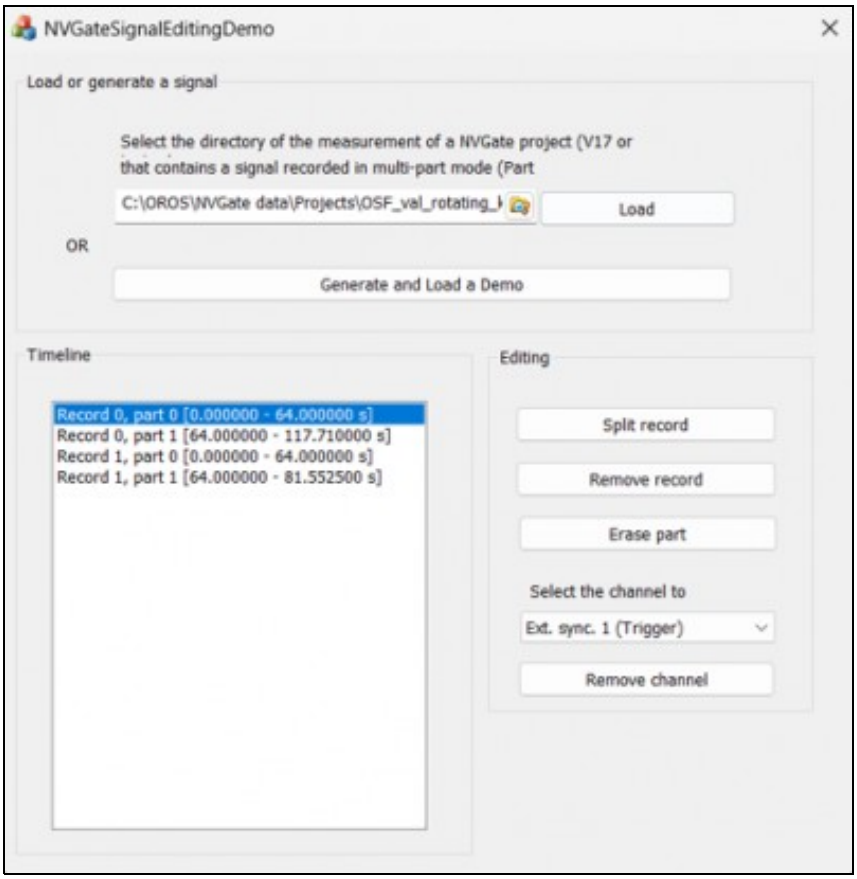


143.2.2 Toolkit

Perfect for post-processing and file management. With the NVGate DLL library, you can read and modify time signal and measurement result files outside NVGate. Effortlessly post-process data, read time signals, and access results like spectra, bode plots, and waterfall displays. With support for numerous programming languages, and example scripts in Python and C++, the toolkit simplifies integration into your workflows.

Below are toolkit examples that demonstrate reading and editing time signals, respectively.





143.3 Wish added

15371: Direct 3d or RGB display : automatic detection.

143.4 New release of solutions

The following solutions have been updated for compatibility with NVGate V17. Download links are provided below:

Modal: V5.9

ORBIGate: V7.3

Sound Quality Lite: V1.3

Monitoring: V1.1

144 NVGate V18: Install Process

NVGate V18 is now available.



144.1 What's new ?

Read the release note NVGate V18.

144.2 Compatibility

NVGate V18 is compatible with the following OROS instruments: O4 - OR35TW - OR36 TW - OR38 TW.

If you're using an older system like the OR34, OR35 V1, OR36 V1/V2, or OR38 V1/V2, please reach out to your local OROS distributor or contact us directly at customer.care@oros.com to learn more about our Trade-in offers. Upgrade now to unlock the full potential of our latest systems!

If you're using an OR35TW, please review the notice for important information.

144.3 What do you need ?

144.3.1 Keys

A reader mode is available without license.

The normal version is available for OROS customers under warranty or maintenance contract.
You need to ask your local OROS distributor or customer.care@oros.com for the .zip keys.

144.3.1.1 Download NVGate version

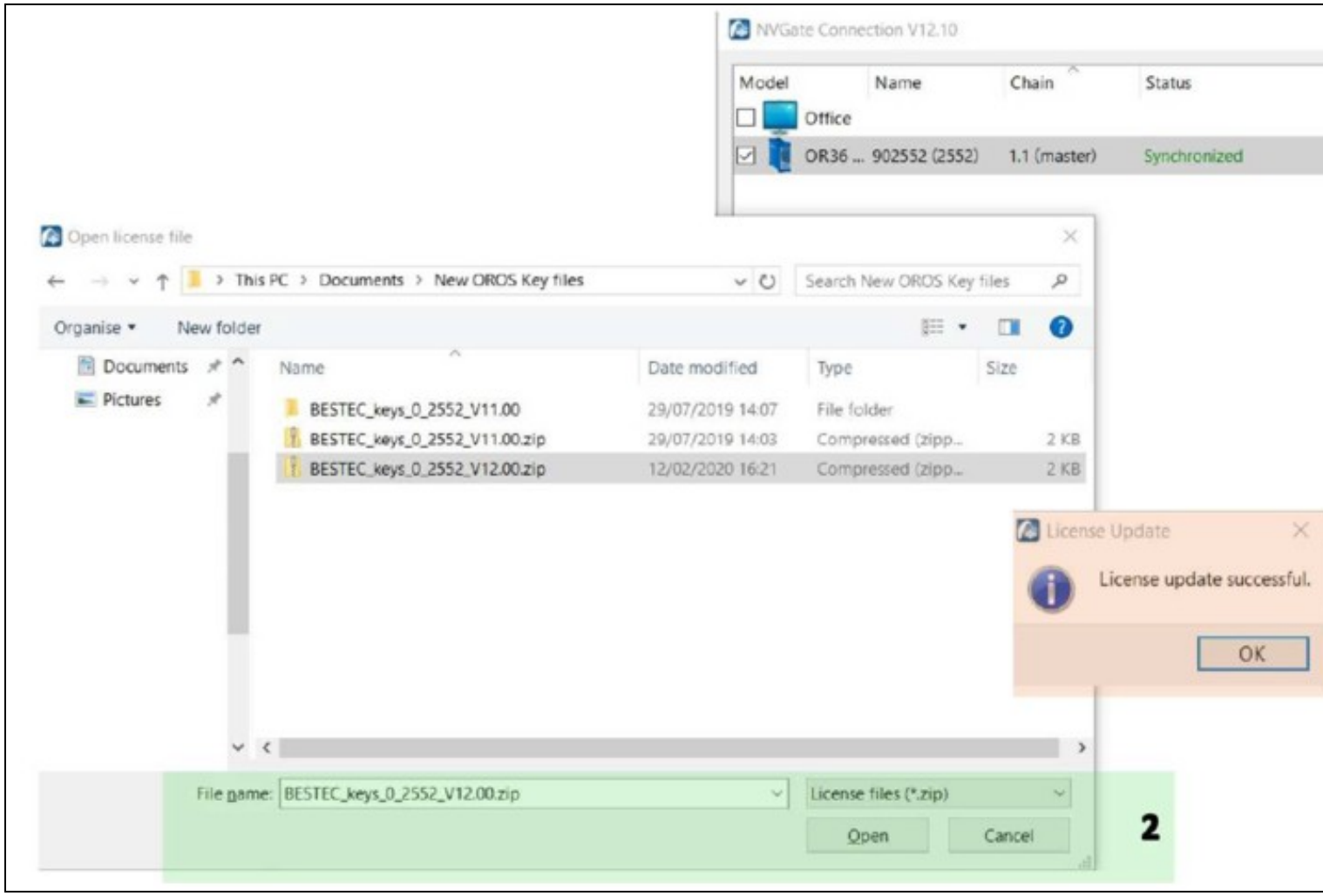
Download NVGate V18 (You need to log in into www.myoros.com first)

144.4 Install Process

- Extract NVGate version
- Launch the setup.exe and follow the instructions.(No need to input the key during the install)
- When the window "NVGate environment" appears, press ok.
- Start NVGate, the window below is displayed.

144.4.1 update the keys

- 1) Select the item (analyzer or dongle) for which you want to update the license keys.
- 2) Select the **.ZIP** archive containing your new license key files.
- 3) The license key files will be automatically copied in the NVGate installation folder and the keys of your analyzer and USB dongle will be encrypted.



- **update firmware**



Firmware: click on update firmware, it will automatically update the firmware.

That's all. NVGate is updated.

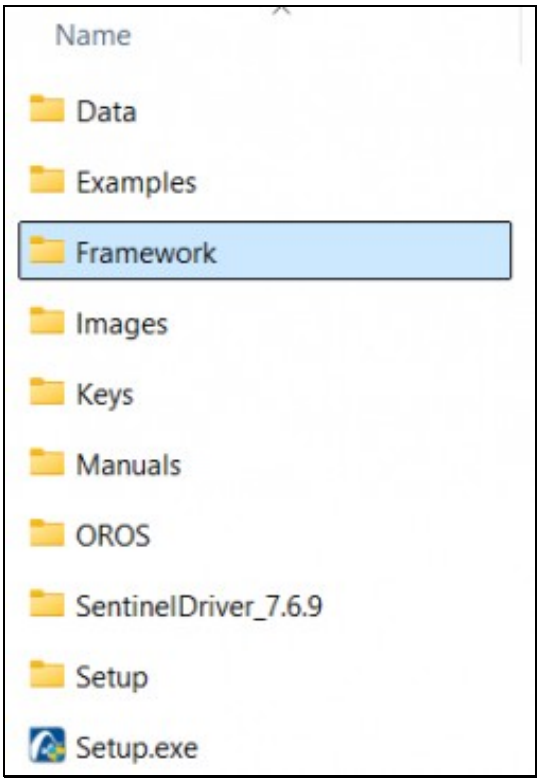
144.5 Troubleshooting

Read this page for any troubleshooting when you encrypt the keys

144.6 FREE OROS Framework

The OROS Framework, including the powerful **NVDrive** and **Toolkit**, enables extensive customization for real-time control and post-processing in noise and vibration analysis.

The Framework package is located in the 'Framework' folder within the NVGate V18 installer, available for download here



The OROS Framework is provided at no cost, offering powerful customization tools for your needs. While technical support and bug fixes are not included, you can purchase dedicated support and coaching services for expert guidance and tailored assistance, ensuring you get the most out of its full potential.

144.7 Notice for OR35TW Users

At OROS, we are dedicated to continuously improving signal recording performance. With the advancements in technology, starting from NVGate 2023, signals are now recorded directly to the PC by default to ensure optimal performance. If you're using this default setting, you're all set!

However, if you own an OR35TW system delivered before June 2024 (serial numbers between 902854 and 904639) and rely on features such as D-rec mode, cascade (multi-analyzer) mode, or recording signals directly in the analyzer, an internal hard drive upgrade to a higher-performing version will be necessary to maintain full functionality.

The great news is, if your system is under warranty, covered by a service contract, or you?re upgrading to NVGate V18, the hard drive replacement will be performed free of charge when your system is sent to an OROS maintenance center. Additionally, if you're calibrating your system, the hard drive will be upgraded at no extra cost!

144.8 Old versions

144.8.1 NVGate2022 V17

https://wiki.oros.com/index.php?title=NVGate_V17:_Install_Process

144.8.2 NVGate2022 V16

https://wiki.oros.com/index.php?title=NVGate_V16:_Install_Process

145 NVGate V18: Release note

OROS continues to invest in practical innovation that helps users move faster from measurement to decision. With NVGate V18, the focus is clear: remove workflow bottlenecks, extend analysis reach in demanding transient conditions, simplify setup, and reward loyal customers with immediate new value. Customers under contract automatically benefit from each release.



NVGate V18 is now available. This new update of the OROS signal analysis platform delivers smarter workflow flexibility, broader synchronous order analysis coverage, easier sensor configuration, and upgrade benefits designed to make every NVGate investment go further.

This release note describes the content of the version, with operating details.

To download and install NVGate V18, check this page.

Compatibility: NVGate V18 is compatible with the following OROS instruments: O4 - OR35 TW - OR36 TW - OR38 TW. Depending on the hardware options and version, some instrument features may or may not be available.

>> 4 practical improvements to speed up measurement, analysis, and upgrade value



Dual NVGate instances

Run live measurement and offline post-analysis in parallel on the same PC, with no second license required.



SOA dynamic speed ratio extension

Follow variable-speed rotating events much further into low speed while keeping synchronous order results continuous and phase-accurate.



Pre-loaded sensor library

Skip manual transducer entry and get correct measurements faster with ready-to-use sensor definitions.



Loyalty reward upgrades

Upgrade to V18 and unlock extra value with **D-Rec** and **TDA** for eligible customers.

145.1  Dual NVGate instances: parallel workflow on one PC

NVGate V18 now allows users to run Online mode for live recording and real-time analysis and monitoring while running Office mode for post-analysis and reporting on the same PC at the same time, without requiring a second license.

This means users no longer have to choose between acquiring data and learning from it. Until now, many teams had to wait until the end of the test before starting deeper review, or they had to dedicate a second PC and a second NVGate license to keep the workflow moving. NVGate V18 changes that.

With Dual NVGate instances, the test can keep running while analysis, comparison, and reporting already begin. One instance remains focused on secure measurement. The other can be used to inspect previously recorded data, compare runs, apply post-processing, prepare deliverables, and accelerate decision-making while the campaign is still in progress.

The benefit is immediate: faster turnaround, better workstation utilization, and a much smoother path from raw data to actionable insight.

This is especially valuable for long-duration tests such as endurance campaigns, startup and shutdown sequences, or environmental programs. Engineers can begin extracting insight before the measurement is over, reducing dead time and improving responsiveness.

It is equally powerful in production, end-of-line, and acceptance workflows. While the next unit is already being measured, the previous run can be reviewed and turned into a result. Teams gain speed without sacrificing continuity.

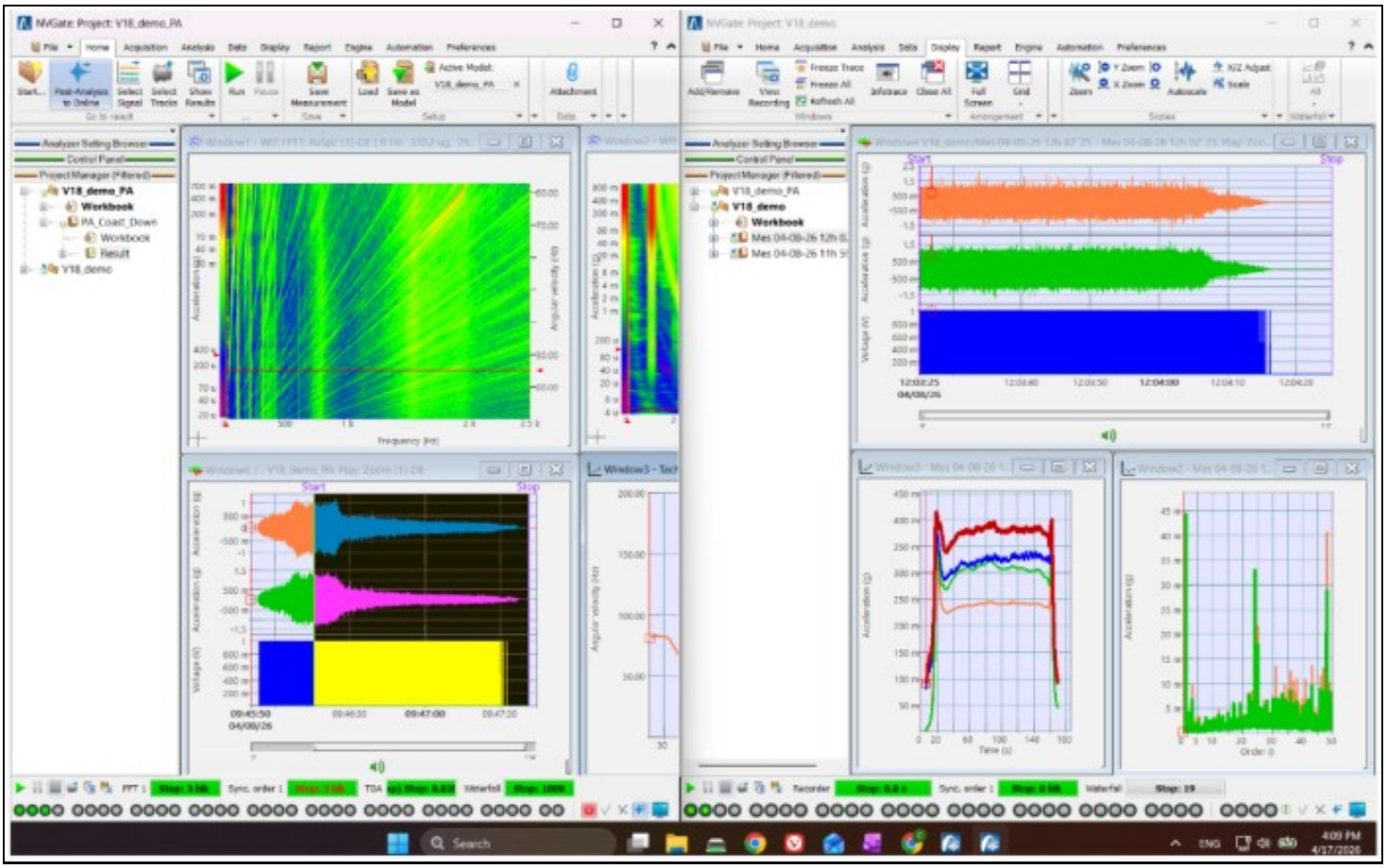
OROS makes this workflow especially robust because, in Online mode, acquisition and real-time computation are handled by the analyzer onboard DSPs. Users can therefore push the PC harder for Office-mode post-analysis and reporting without compromising measurement reliability.

Our promise is simple: **double your workflow, not your license fees.**

After installation, you will see two icons. The first icon 

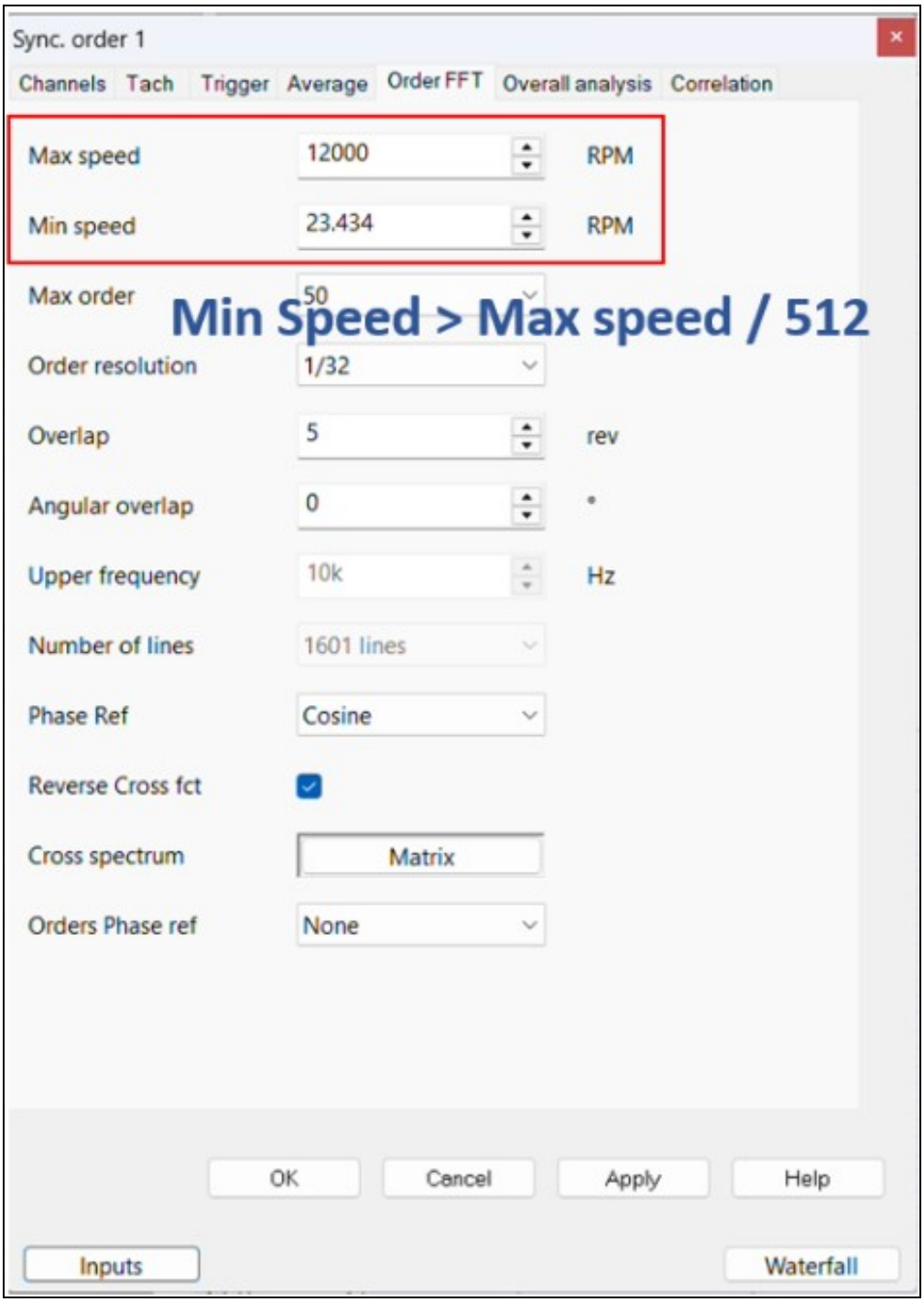
allows you to launch the first NVGate instance and select the desired mode (Online or Office). Simultaneously, you can use the second icon

to start a second NVGate instance, which will operate in Office mode only.



145.2 SOA dynamic speed ratio: broader transient coverage

NVGate V18 extends the dynamic rotational speed range for **Synchronous Order Analysis (SOA)**. The Max/Min speed tracking ratio increases from 64 to 512, allowing the analyzer to keep producing synchronous order results much further into the low-speed end of a run-up, run-down, or spool-down event.


Sync. order 1
Channels
Tach
Trigger
Average
Order FFT
Overall analysis
Correlation
Max speed
12000
RPM
Min speed
23.434
RPM
Max order
50
Min Speed > Max speed / 512
Order resolution
1/32
Overlap
5
rev
Angular overlap
0
°
Upper frequency
10k
Hz
Number of lines
1601 lines
Phase Ref
Cosine
Reverse Cross fct
Cross spectrum
Matrix
Orders Phase ref
None
OK
Cancel
Apply
Help
Inputs
Waterfall

In rotating-machine testing, the most revealing behavior often happens during speed changes, not during steady operation. Engineers need one SOA setup that can follow the machine through a broad speed excursion without forcing extra workaround blocks, duplicated setups, or fragmented post-processing.

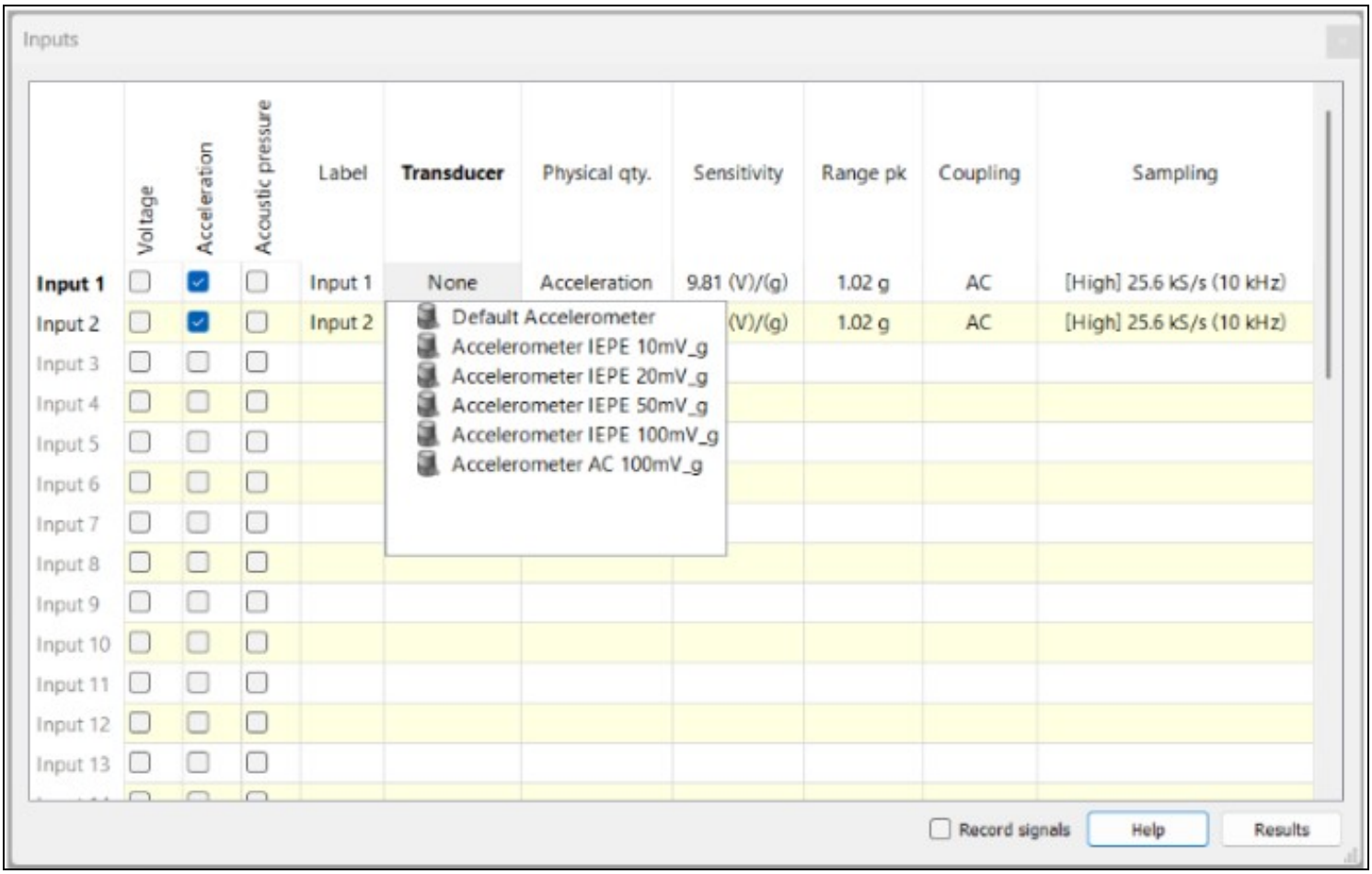
That is exactly where NVGate V18 delivers. It helps users stay inside one coherent synchronous analysis workflow for longer, even when the machine speed drops dramatically. This improvement is especially relevant for high-variation rotating systems such as turbochargers, turbines, compressors, and e-motors.

The real value is not just the number, but the practical gain: fewer split measurements, fewer workarounds, and a broader transient coverage while maintaining the phase-accurate SOA behavior that users rely on for balancing, torsional analysis, and rotor-dynamic interpretation.



145.3 Pre-loaded sensor library: faster setup, fewer mistakes

NVGate V18 now includes a pre-loaded sensor library. The sensor database now contains settings for the most commonly utilized sensors, such as Accelerometers, Microphones, Velocity sensors, Proximity probes, Force sensors (including Hammers), and tachometers. Users can conveniently select their required sensor from a simple dropdown list instead of first creating entries manually.



This seemingly simple improvement does have day-to-day impact. It saves time, reduces repetitive entry work, improves consistency across teams, and avoids common mistakes in scaling, sensitivity, and units.

It also makes NVGate easier to demonstrate, easier to deploy, and easier to use for new or occasional users. For distributors, trainers, field engineers, and mixed-skill teams, this means less setup friction and a faster path to a correct first result.

In short, it helps users spend less time configuring and more time measuring with confidence.

145.4  Loyalty reward upgrades: gain more when you upgrade

NVGate V18 is not only about new software capabilities. It is also about giving existing customers more value from their upgrade.

With this release, customers updating their software or upgrading older hardware receive **D-Rec** for free. Customers who already have the Diag module also receive **TDA** for free.

D-Rec brings a more autonomous, rugged, field-oriented recording workflow. It turns the analyzer into a true stand-alone recorder for field use, available from power-on to power-off without a PC or connection. Users can prepare the setup in NVGate, start and control the recording directly from the analyzer LCD and buttons, and recover the signals later for detailed analysis.

This is especially useful for field troubleshooting where carrying a laptop is inconvenient, for unattended or lightly attended recording over long operating windows, for commissioning or service rounds with repeatable preconfigured measurements, and for capture-first workflows where the priority is to secure the right data now and analyze it later.

TDA adds more diagnostic visibility in the time domain. It complements frequency and order analysis with time views and statistical indicators such as Peak, Pk-Pk, Crest Factor, Skew, and Kurtosis. This makes it especially useful for bearings, gearboxes, transmission components, and probe-based gap or position monitoring.

Loyal customers do not just update ? they gain new ways to record and diagnose.

145.5 Bug fixing

- 15791: The unit of the data is not exported in .oxf file
- 15788: Export in .wav channel by channel not working correctly
- 15785: Sequence Run after setup, does not work on V17
- 15723: NVGate cfg on japanese PC, windows is cut off
- 15766: Filter project option is not kept , if you restart NVGate on V17
- 15740: Octave band 40kHz disapear
- 15724:Double click add a cursor on zoom signal
- 15721: Show advanced setiing can not be translate
- 15774: Recorder issue with time zone negative.

All add-on compatibility issues have been resolved, and all add-ons are now fully functional.

146 NVGate Virtual Input

146.1 Virtual Inputs

The virtual inputs consist of an intermediate processing stage inserted between the front end and the analyses. Each input (or player tracks) can be drag & dropped to the virtual inputs plug-in. A virtual input (i.e. the result of calculation between inputs called *Operators*) is generated as a standard input. It can be used in the following processes:

- Plug-in analyzers (FFTx, SOA,x, 1/n OCT, TDA, etc..)
- Recording
- Monitoring
- Triggering
- Output generators

The active *Operator* are made available in the connection trees (i.e. the signal distribution dialog boxes from the *Acquisition* tab) for a standard use. Signals Operators are 100% in phase with the front end inputs or player tracks.

This structure allows multiple formulas to be applied, such as:

- Difference of 2 signals (negative coeff.)
- Quadratic sum (Ch power = 2, operator power = ½)
- Ratio of 2 signals (ch power = -1)
- Weighted sum or products
- Etc…

146.1.1 Channel

Each channel represents an operand for the operators. Each channel applies a polynomial to the input signal and a filter.

$$Channel_c = \left(Filter\left(Input\right) \times A_c + B_c\right)^{P_c}$$

- **Source**: input source to be processed. It may come from the input Front-end or from the Player in the post analysis mode (see the post analysis chapter).
- **Input filter**: filter to be used for filtering the source before analysis. The Filters that are not compatible with the Front-end range cannot be selected (see the Filter builder chapter). The A and C weighting on time domain are available.

For filter characteristics, see the Appendix.

- **Coef**: This value is multiplied with each sample of the incoming signal (source setting). Any real value (i.e: -5.334). The **Coef** is the A member in the following formula :

$$(A*i+B)^P$$

- **Offset**: This value is added to each sample of the incoming signal (after applying the coef). Any real value (i.e: -1.5 E-3). The **Offset** is the B member in the following formula : $(A*i+\mathbf{B})^P$

- **Power**: This value is used to power with each sample of the incoming signal (after applying the coef and the offset).

Any real value (i.e: -0.5 for $\sqrt{\frac{1}{A \times i + B}}$) The **Power** is the P member in the following formula :

$(A*i+B)^{\mathbf{P}}$

146.1.2 Operators

The *Virtual inputs* plug-in generates signals from operators. The operator gathers the polynomial member in one signal. There are 12 operators available.

- **Label**: Used to identify the results from the operator. The operator label is used in place of the input label.
- **Sources**: The list of operand to be used by the operator. The operands are selected from the Virtual Inputs active channels. Up to 12 channels can be used in one operator.

Operator: The operation between the channels. There are 2 different operators;

$$Operator_n = (\sum_i Channel_i \times A_i + B_i)^{P_n} \text{ For sum operations}$$

$$Operator_n = (\prod_i Channeli \times A_i + B_i)^{P_n} \text{ For product operations}$$

- **Coef**: This value is multiplied with each sample of the outgoing signal. Any real value (i.e: -5.334). The **Coef** is the A member in the following formula : $(\mathbf{A}*Op+B)^P$
- **Offset**: This value is added to each sample of the outgoing signal (after applying the coef). Any real value (i.e: -1.5 E-3). The **Offset** is the B member in the following formula : $(A*Op+\mathbf{B})^P$
- **Power**: This value is used to power each sample of the outgoing signal (after applying the coef and the offset).

Any real value (i.e: -0.5 for $\sqrt{\frac{1}{A \times Op + B}}$) The **Power** is the P member in the following formula :

$(A*Op+B)^{\mathbf{P}}$

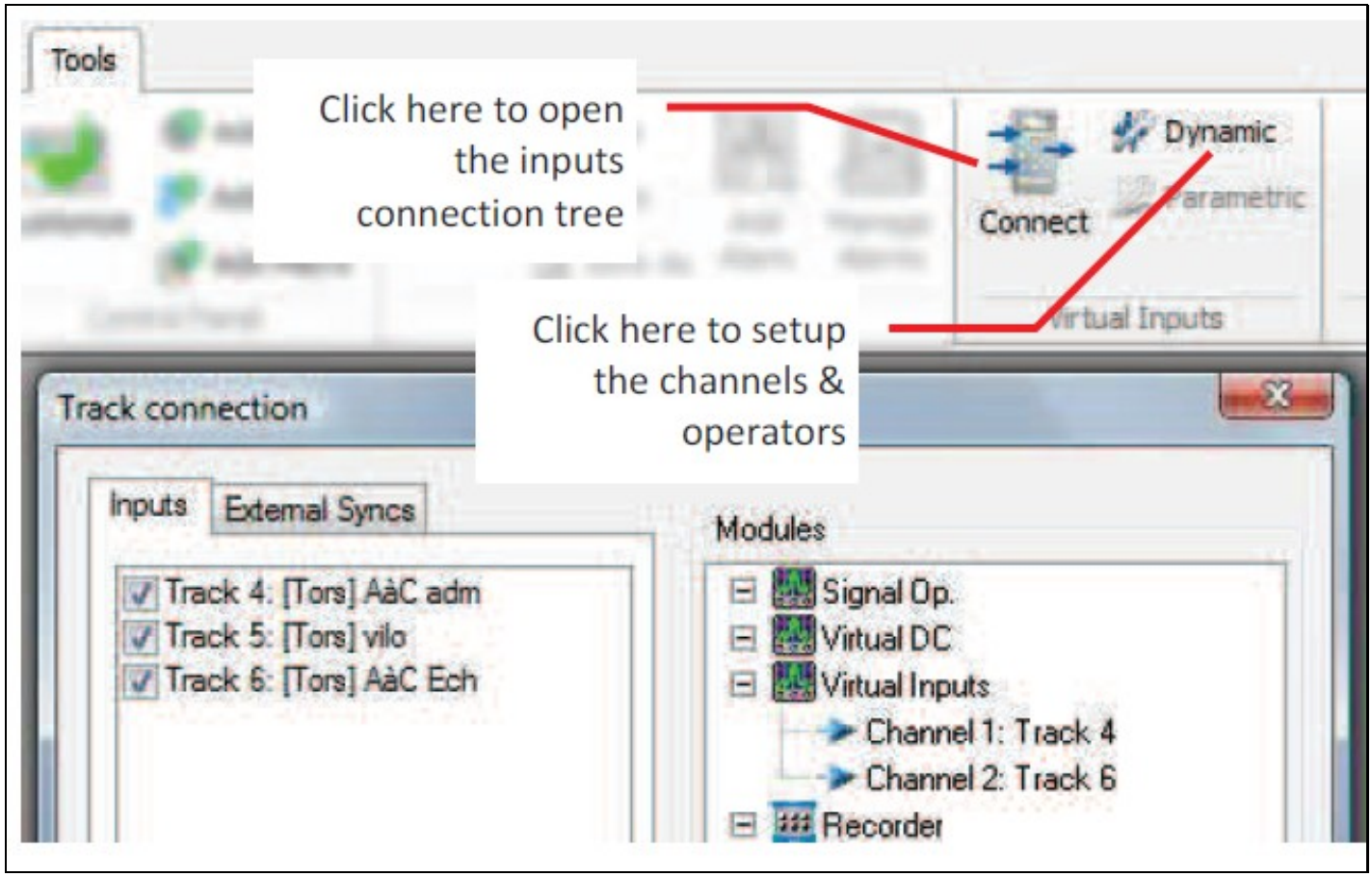
Note: if the software is able to solve the dimension formula between the channels and the operator (including the coef/offset/power), the output magnitude will be automatically applied. If not, the output will be proposed in Volts.

146.1.3 Twist

Read torsional page

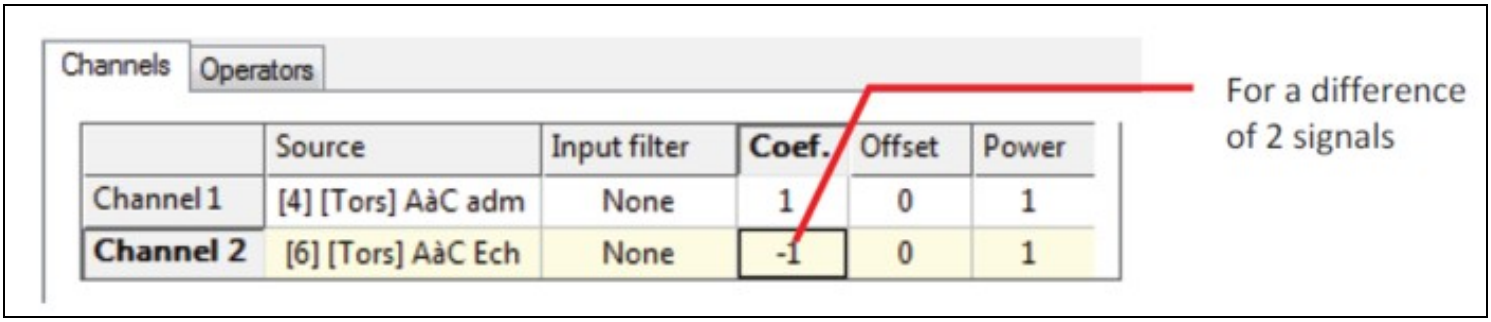
146.1.4 Tutorial

- First connect the tracks on the virtual inputs plug in.



- For each channel, you can apply this equation :

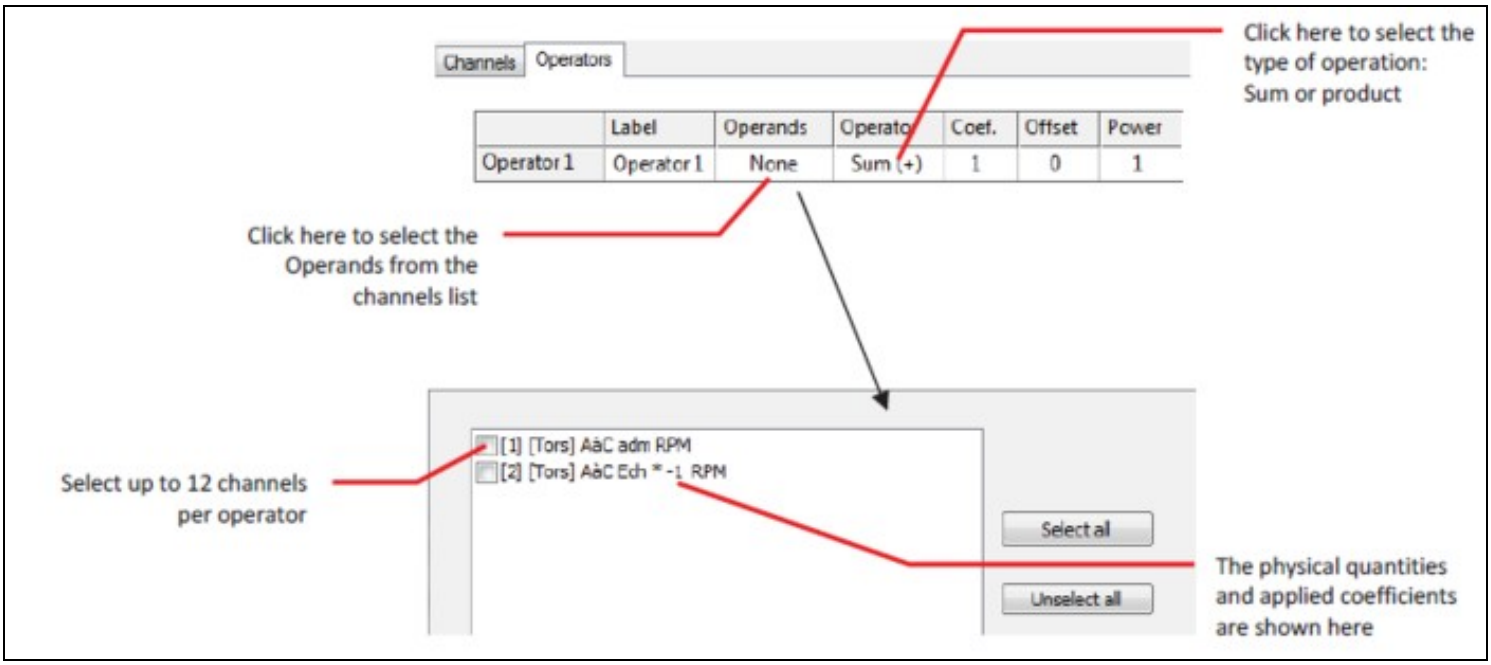
$$Channel_c = (Filter(Input) \times A_c + B_c)^{P_c}$$



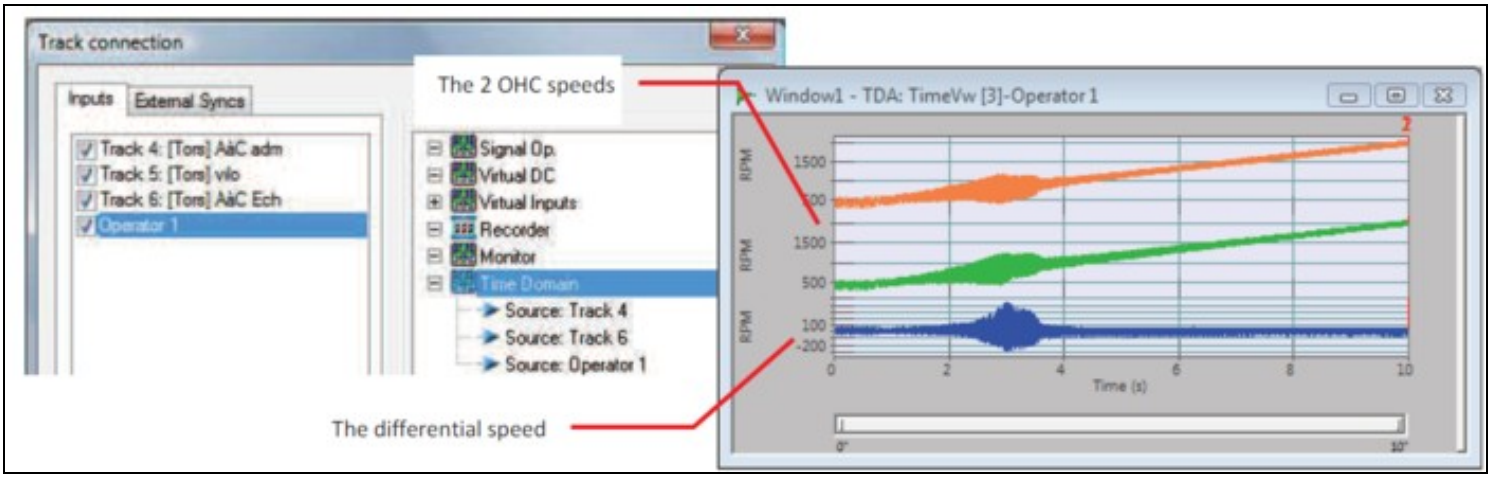
- On operator tab, you can create several operators and sum or multiply the channels selected, and apply a new equation.

$$Operator_n = (\sum_i Channel_i \times A_i + B_i)^{P_n} \text{ For sum operations}$$

$$Operator_n = (\prod_i Channeli \times A_i + B_i)^{P_n} \text{ For product operations}$$



- Then a new channel "operator 1" appears on connect input, then you can use this channel like any other NVGate dynamical input.



146.2 Virtual DC

The Virtual DC plug-in allows mixing any parametric inputs (universal, DC or Aux. DC) together in order to generate internal signal used for:

- Recording
- Monitoring (view meter ? profiles)
- Triggering: Level/Delta Level
- Waterfall references (Z/X axis)
- Tachometer (DC Tach)

146.2.1 Channel

The DC channels must be connected to the Virtual DC plug-in before using it in an operator:

- **Source**: input source to be process. It may come from the DC Front-end or from the Player DC tracks in the post analysis mode (see the post analysis chapter).

146.2.2 Operators

The *Virtual DC* plug-in generates signals from operators. The operators compute the channels sample in one signal. There are 12 operators available.

- **Label**: Used to identify the results from the operator. The operator label is used in place of the input label.
- **Physical quantity**: Define the output signal physical quantity. This setting is not automatic and must be set by the user. The software does not check the dimension equation of the generated signal.
- **Equation**: editor for the math formula to compute. The result of the last line of the editor is the signal generated by the operator.

Formula editor

The formula editor accepts various math operators and functions such as square root, logarithms and power allowing polynomial equations. The following table gives the syntax of the operators and functions;

In/out	***Description***
Chi	Channel i level
N.A.	The output level is the result of the last line in the editor

Operator	***Description***
+	Parameter or constant addition with another parameter or constant

-	Parameter or constant subtraction from another parameter or constant
*	Parameter or constant multiplication by another parameter or constant
/	Parameter or constant division by another parameter or constant
^	Parameter or constant powered by another parameter or constant
=	Parameter affectation with the expression result at the right of sign

Function	*Description*
If(c, t, f)	Returns **t** if **c** is true or **f** if c is false (ex of **c**: I >4)
Rint(x)	Returns the nearest integer of x
Sign(x)	Returns -1 if x < 0, 0 if x = 0 or 1 if x > 0

Function	*Description*
Sin(x)	Returns the sine of expression or parameter x
Cos(x)	Returns the cosine of expression or parameter x
Tan(x)	Returns the tangent of expression or parameter x
ASin(x)	Returns the arc sine of expression or parameter x
ACos(x)	Returns the arc cosine of expression or parameter x
ATan(x)	Returns the arc tangent of expression or parameter x
Sinh(x)	Returns the hyperbolic sine of expression or parameter x
Cosh(x)	Returns the hyperbolic cosine of expression or parameter x
Tanh(x)	Returns the hyperbolic tangent of expression or parameter x
ASinh(x)	Returns the hyperbolic arc sine of expression or parameter x
ACosh(x)	Returns the hyperbolic arc cosine of expression or parameter x
ATanh(x)	Returns the hyperbolic arc tangent of expression or parameter x
Log2(x)	Returns the base 2 logarithm of expression or parameter x
Log10(x)	Returns the base 10 logarithm of expression or parameter x
Log(x)	Returns the base 10 logarithm of expression or parameter x
Ln(x)	Returns the base e (natural) logarithm of expression or parameter x
Exp(x)	Returns the exponential of expression or parameter x
Sqrt(x)	Returns the square root of expression or parameter x
Abs(x)	Returns the absolute value of expression or parameter x
Min(x,y,?)	Returns the minimum level of listed parameters

Max(x,y,?)	Returns the minimum level of listed parameters
Sum(x,y,?)	Returns the sum of listed parameters
Avg(x,y,?)	Returns the average level of listed parameters

Predefined	***Description***
pi	Constant pi (3.1416?). Do not declare any constant with this name
e	Constant e (2.718). Do not declare any constant with this name

Constants and parameters can be defined (except *pi* and *e*) using the = sign; eg: *var1 = pi * 2* or *var2 = rpm1/2*. The constants may be defined once only.

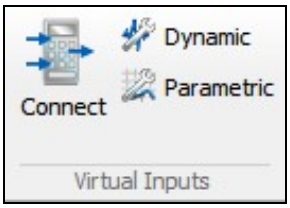
Parameter/constant names must start with a letter and may be ended by a number. The dot (.) is always the decimal separator independently from the OS preferences and the comma (,) is used as parameter separator.

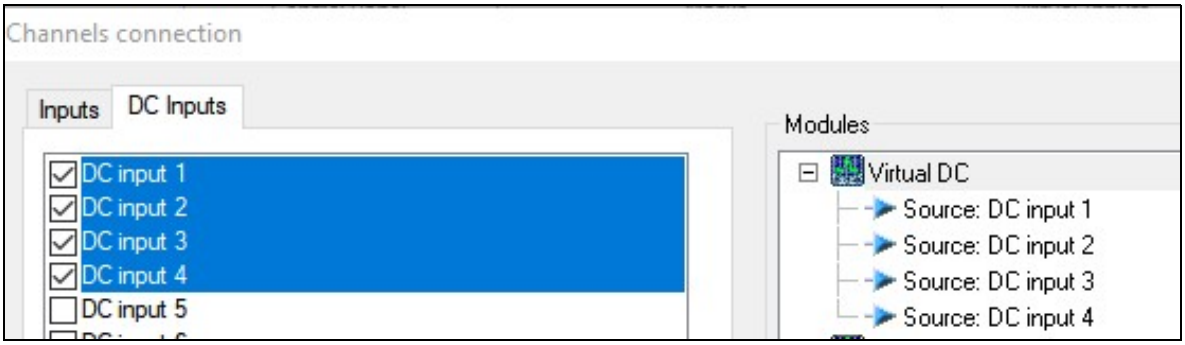
The editor does not check the dimension of this result. The content of the formula can be copy/pasted from any text editor.

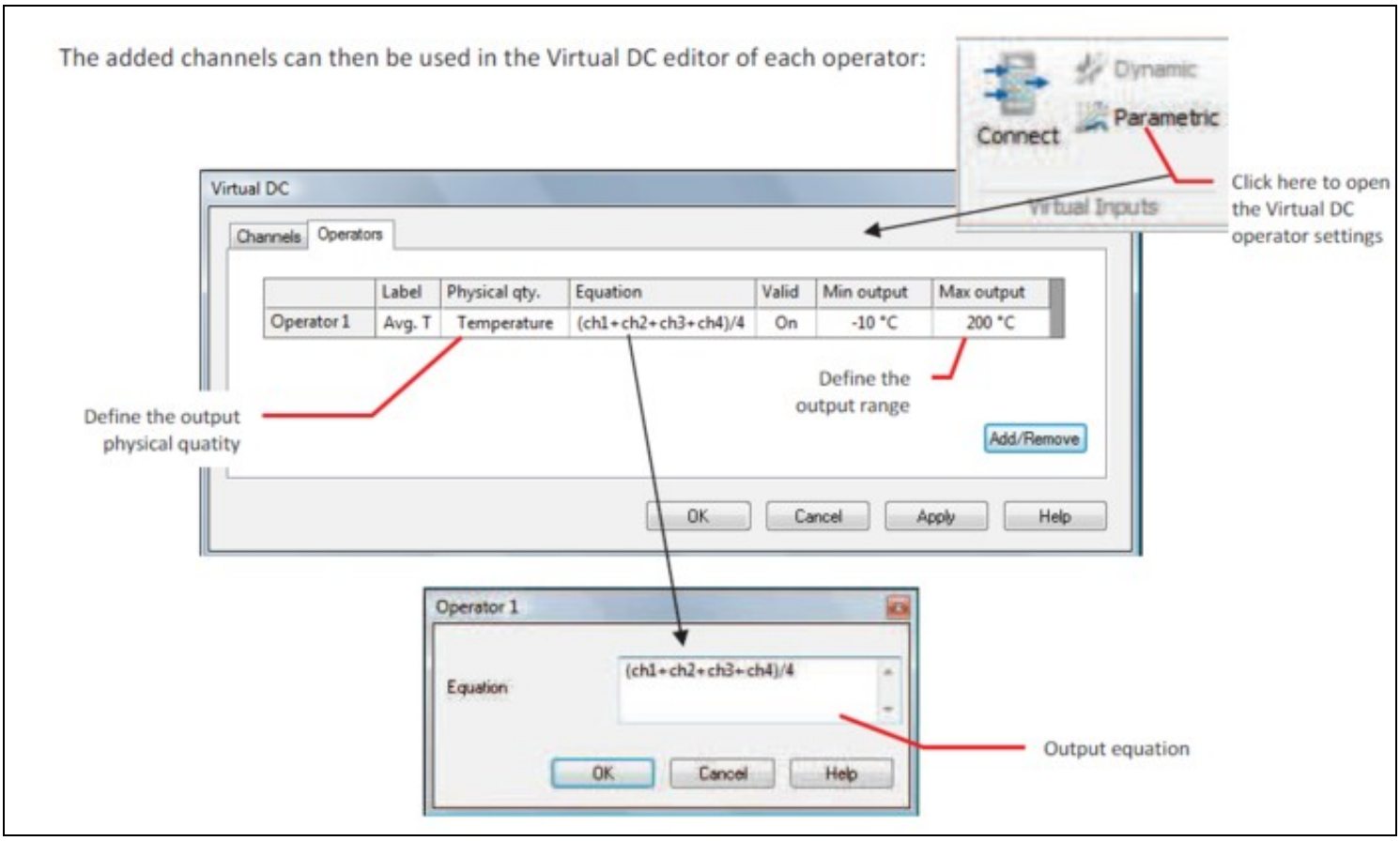
- **Valid**: Indicates if the operator is valid or not. To be valid an operator must process one of the virtual DC channel in its equation
- **Min output** / **Max output**: define the output range. These settings are expressed in the unit of the selected magnitude of the operator.

146.2.3 Tutorial

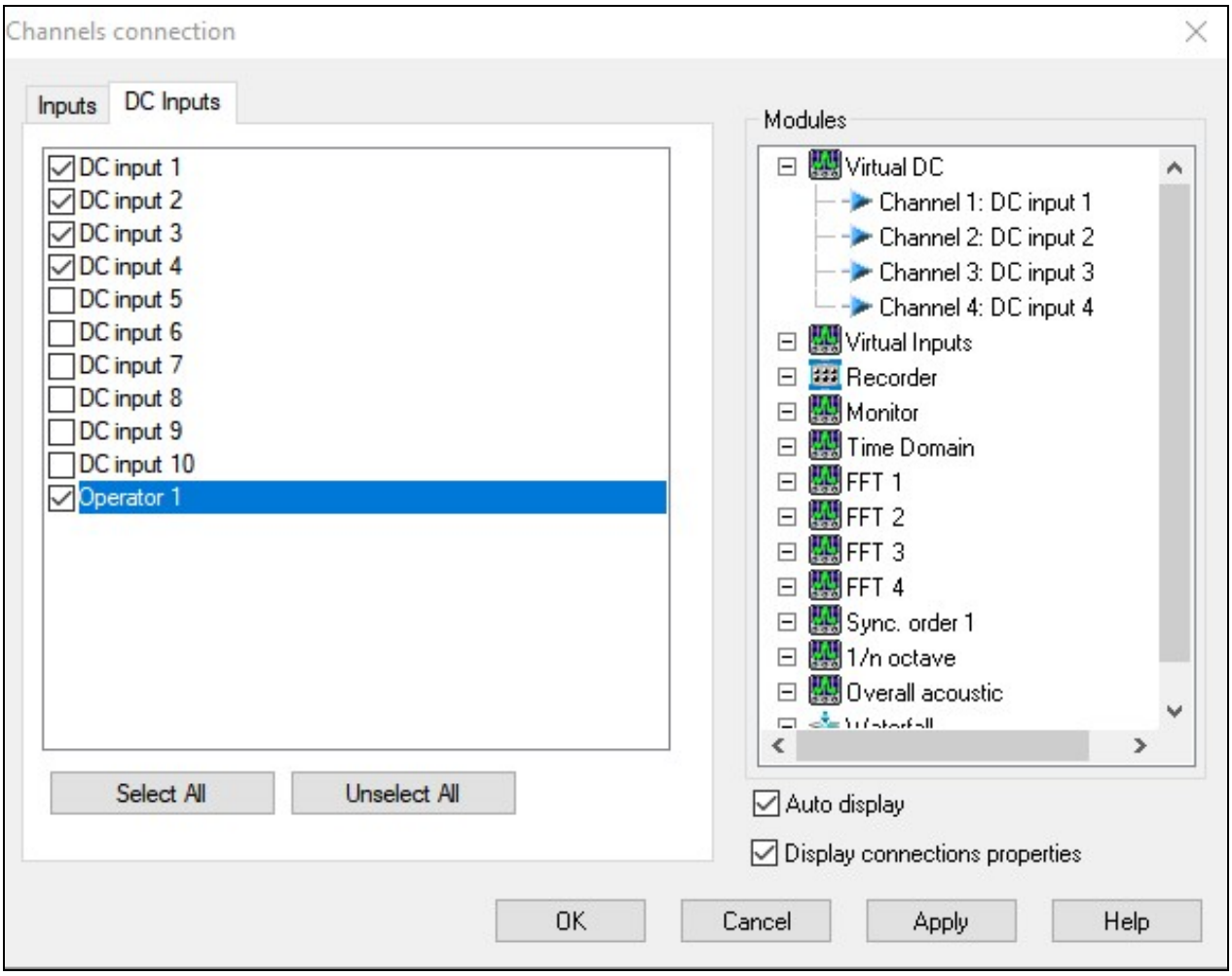
First connect the DC channels to the virtual DC plug in.







A new track "operator 1" is now created and appears on channels connection. You can use it as any other DC input.

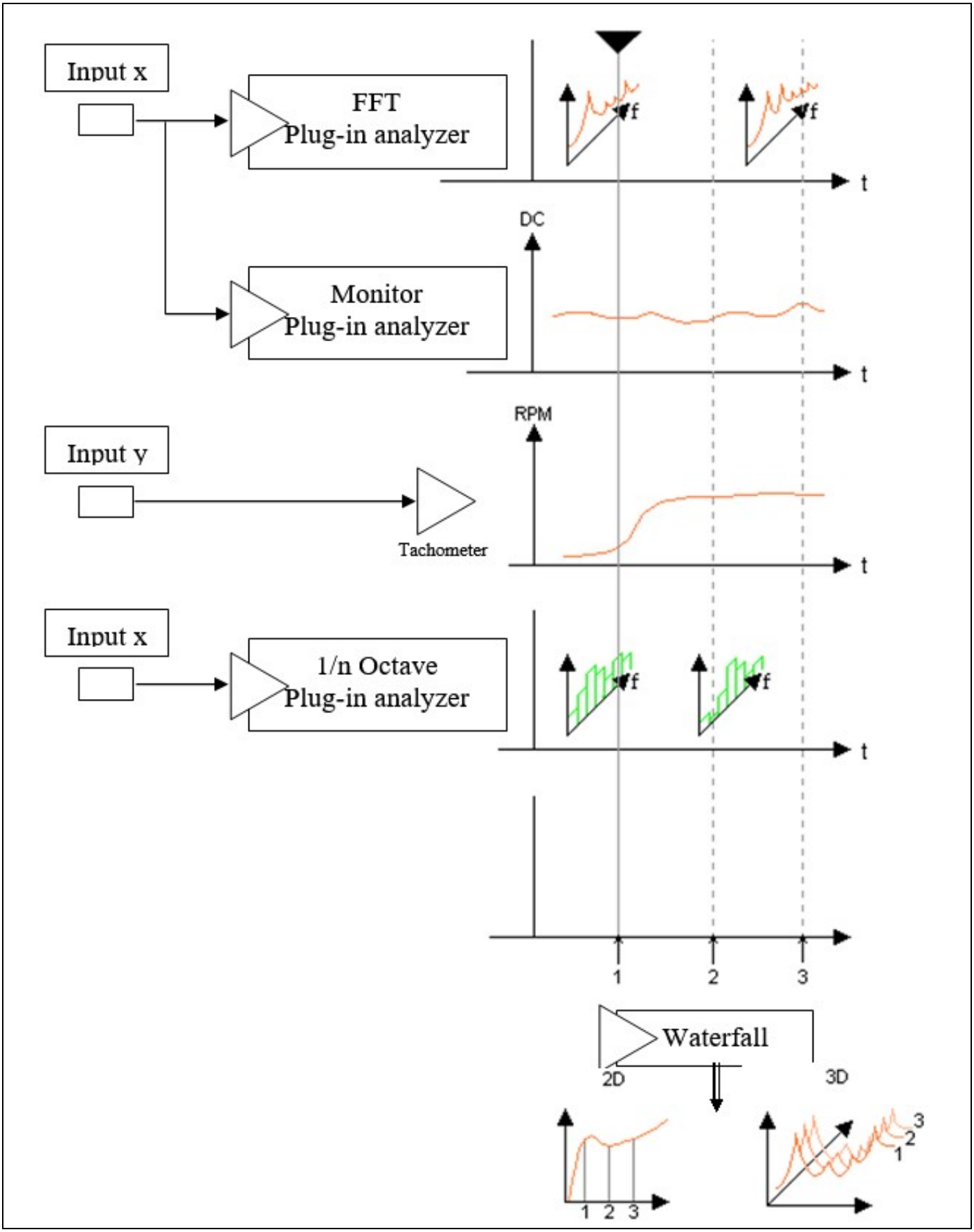

Channels connection
Inputs
DC Inputs
DC input 1
DC input 2
DC input 3
DC input 4
DC input 5
DC input 6
DC input 7
DC input 8
DC input 9
DC input 10
Operator 1
Select All
Unselect All
Modules
Virtual DC
Channel 1: DC input 1
Channel 2: DC input 2
Channel 3: DC input 3
Channel 4: DC input 4
Virtual Inputs
Recorder
Monitor
Time Domain
FFT 1
FFT 2
FFT 3
FFT 4
Sync. order 1
1/n octave
Overall acoustic
Auto display
Display connections properties
OK
Cancel
Apply
Help

147 NVGate Waterfall

The Waterfall module is used to stack data from NVGate plug-ins, such as Spectra, 1/n Octave, RPM, DC, or any scalar data values into one graph. Data is displayed as slices that are synchronized and can be sorted by references (time, RPMs or DC channel). We can display 3D data or profile (2D).

147.1 Overview

The following scheme describes the waterfall slices collection behavior. When selected event (trigger) occurs, the latest computed data from each associated plug-in are collected into the current slice. Then data can be displayed into 2D (for scalar) and 3D graph in function of each reference.


Input x
FFT
Plug-in analyzer
f
f
t
DC
Monitor
Plug-in analyzer
t
RPM
Input y
Tachometer
t
Input x
1/n Octave
Plug-in analyzer
f
f
t
1
2
3
Waterfall
2D
3D
1 2 3
1 2 3

	3D	2D (profiles)
FFT	* Triggered block * Weighted block * Inst. Spectrum * Average Spectrum * Inst. Cross Spectrum * Average Cross Spectrum * FRF H1 * FRF H2 * Coherence * Inst. Zoom Spectrum * Average Zoom Spectrum * Zoom Cross Spectrum * Zoom Average Cross * Zoom FRF * Zoom Coherence	* Overall Power * Order x
Sync. Order	* Triggered block * Weighted block * Order Inst. Spectrum * Order Average Spectrum	* Order x * Overall Power
1/n Octave	* 1/n Octave * Average results: - AvNoct - MinOct - MaxOct	* Overall level: OvrLin * Overall Weighted level: OvrWgt
Overall acoustic		- Lxypeak - Lxy inst * Lxy eq 1/8s * Lxy eq 1s * Lxy eq t *X* = Applied weighting (A or C), in case of Z selection (no weighting) X is not displayed. *Y* = Applied time filter (None, Fast, Slow or Impulse), If none is selected (no time filtering) Y is not displayed. t = Short time integration duration. T
Tachometer		* Tach Angular Speed (ref) * Virtual Angular Speed (ref) * Ext Tach Angular speed (ref) * DC Tach speed (ref) * Combined tach speed (ref) * Fractionnal tach (speed)
Front end		• DC (ref) • CAN (ref)
Monitor		• Monitor DC • Monitor RMS • Monitor Peak • Monitor Peak-Peak • Monitor Crest-Factor • Monitor Skew • Monitor Ktsis

		• Monitor Max • Monitor Min
Time domain		• DC • RMS • Max • Min • Peak • Peak-Peak • Crest-Factor • Ktsis
N.A.		• Time (ref) always selected • Slice (ref) always selected

Computation SPUs

Unlike other plug-in, the memory of the waterfall depend on the capacity of the PC and others applications running on it. The depth of the waterfall is function of the free memory of your PC, and is limited to around 3 millions samples per DSP.

147.2 Tutorial

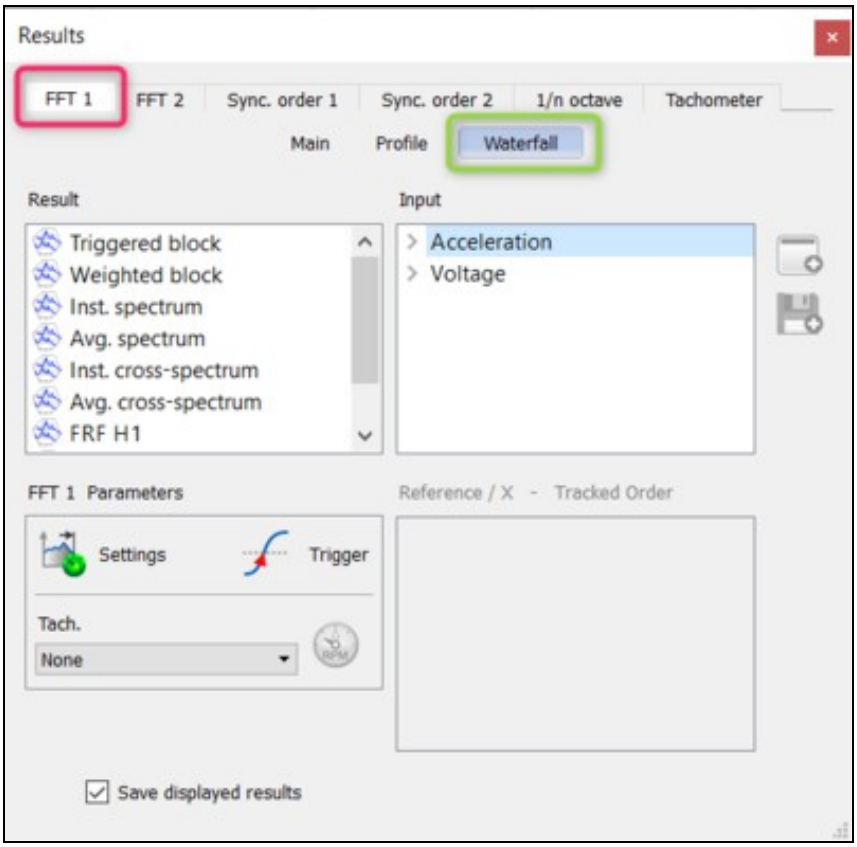
147.2.1 Waterfall connection

This section will show the different ways to add results into the waterfall.

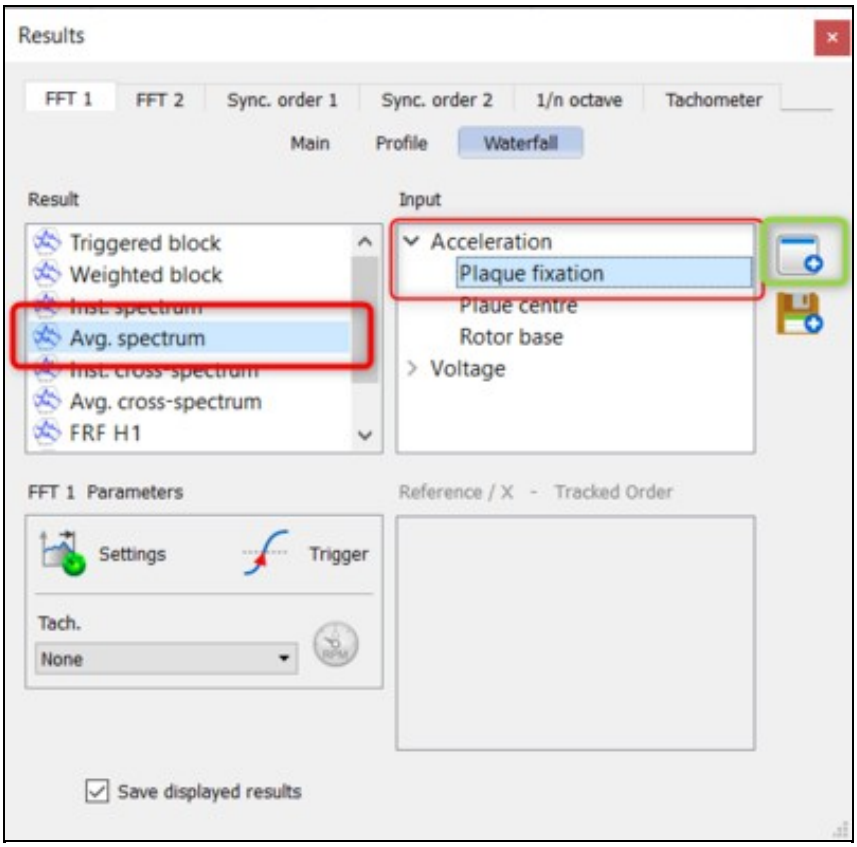
147.2.1.1 From the Show Result window

The Show Results window is the most common way of adding a result in the waterfall. Here I will show you how to simply display a waterfall of the average spectrum for an acceleration input.

First, open the Show Result window, go in the *FFT 1* tab, and reach the *Waterfall* section :



Then, select *Avg. Spectrum* and the first input. Finally, click on  to display the waterfall :



The 3D view of the waterfall is displayed.

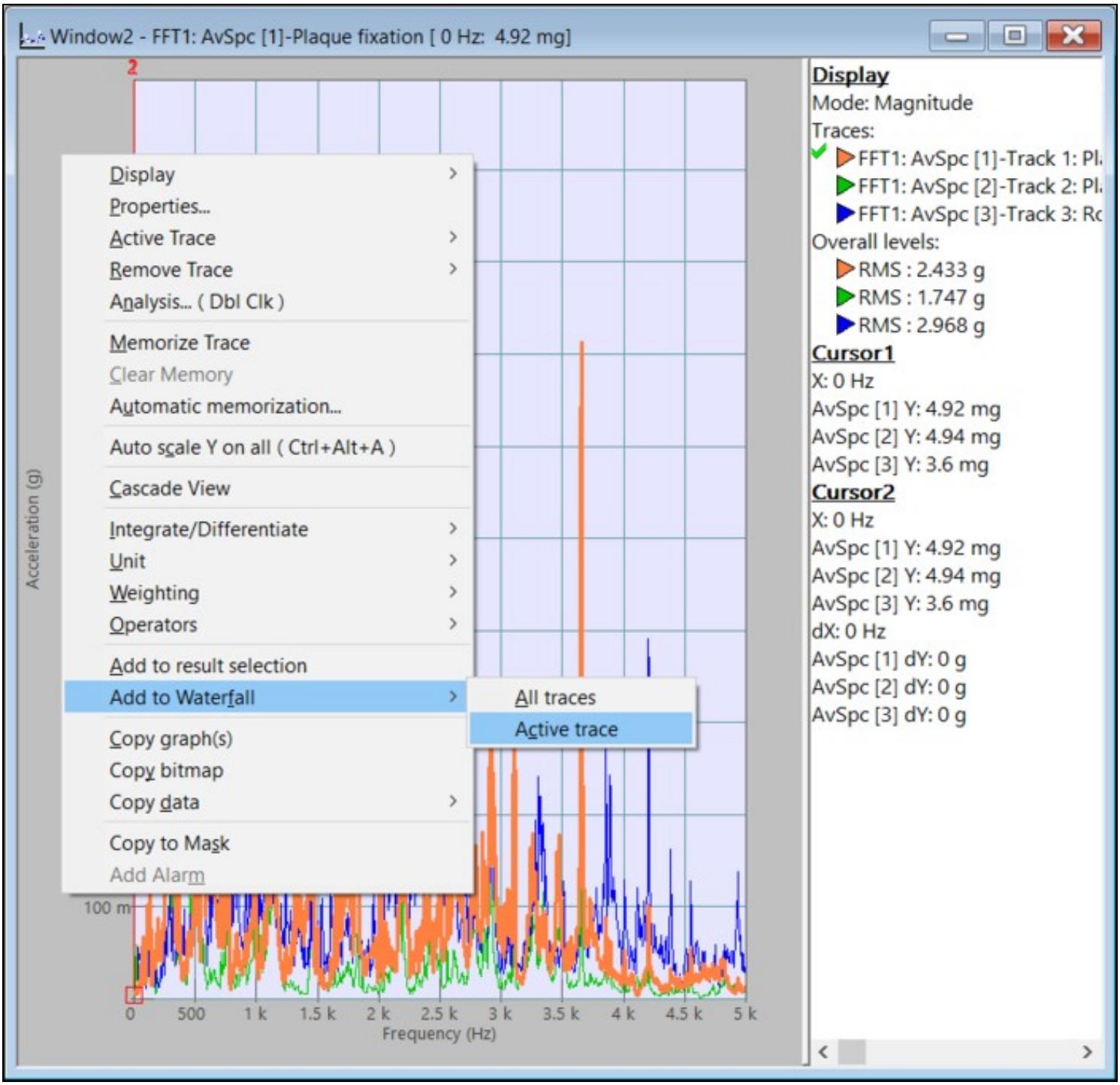
For more detail please see NVGate Software overview.

See also the RT60 with interrupted source tutorial video, where this method is used.

147.2.1.2 From the graph window

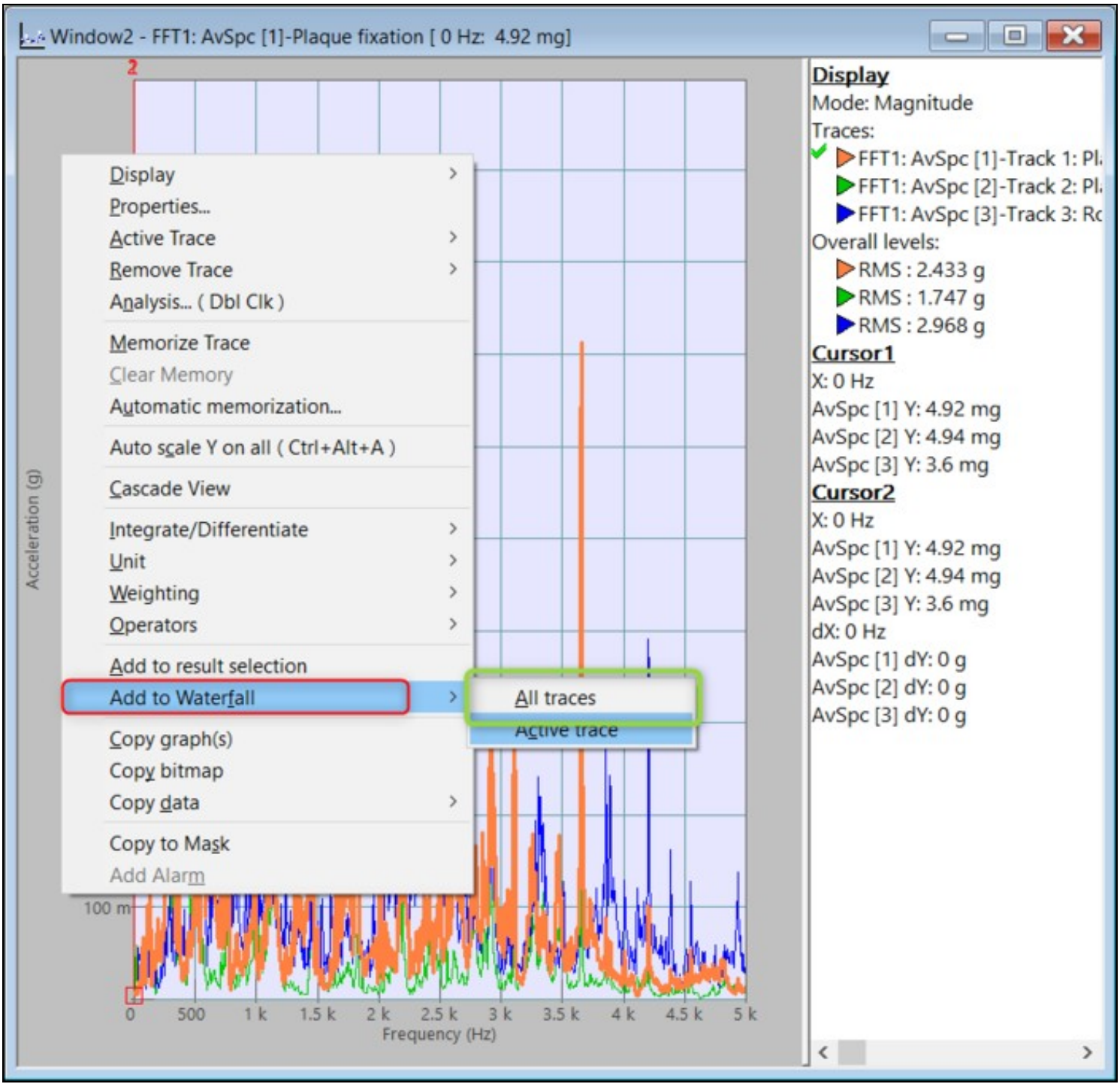
This method will allow you to add the result from a currently displayed graph into the waterfall. This will work with any result of NVGate compatible with the waterfall. As previously, we will add the Average spectrum **of all the channels** into the waterfall.

First of all, right-click on the grey border of the graph and go in the *Add to Waterfall* section :

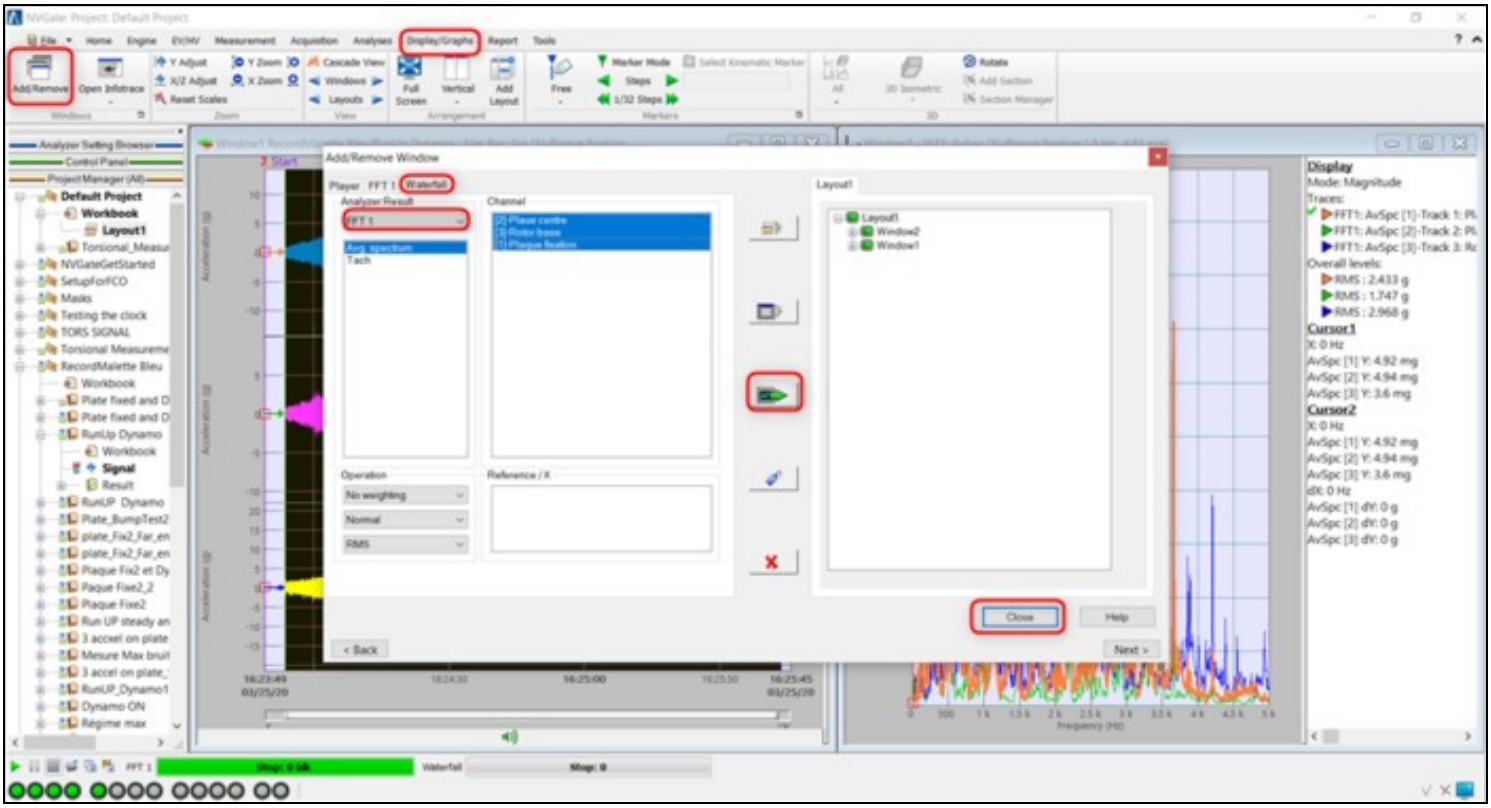

Window2 - FFT1: AvSpc [1]-Plaque fixation [0 Hz: 4.92 mg]
Display
Mode: Magnitude
Traces:
FFT1: AvSpc [1]-Track 1: Pl
FFT1: AvSpc [2]-Track 2: Pl
FFT1: AvSpc [3]-Track 3: Rc
Overall levels:
RMS : 2.433 g
RMS : 1.747 g
RMS : 2.968 g
Cursor1
X: 0 Hz
AvSpc [1] Y: 4.92 mg
AvSpc [2] Y: 4.94 mg
AvSpc [3] Y: 3.6 mg
Cursor2
X: 0 Hz
AvSpc [1] Y: 4.92 mg
AvSpc [2] Y: 4.94 mg
AvSpc [3] Y: 3.6 mg
dX: 0 Hz
AvSpc [1] dY: 0 g
AvSpc [2] dY: 0 g
AvSpc [3] dY: 0 g
Display
Properties...
Active Trace
Remove Trace
Analysis... (Dbl Clk)
Memorize Trace
Clear Memory
Automatic memorization...
Auto scale Y on all (Ctrl+Alt+A)
Cascade View
Integrate/Differentiate
Unit
Weighting
Operators
Add to result selection
Add to Waterfall
Copy graph(s)
Copy bitmap
Copy data
Copy to Mask
Add Alarm
All traces
Active trace
Acceleration (g)
100 m
0
500
1 k
1.5 k
2 k
2.5 k
3 k
3.5 k
4 k
4.5 k
5 k
Frequency (Hz)

- **All Traces** will add all of the traces in the graph into the waterfall
- **Active Trace** will only add the active trace of the graph into the waterfall.

Here, we will select **All Trace**, as we want to add all the channels of the FFT plug-in.

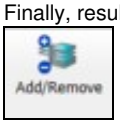


All the traces have been added, and the waterfall can be displayed from the Add/Remove windows menu of theDisplay/Graphs tab of the Ribbon :



The *3D view* of the waterfall is now displayed in the current layout.

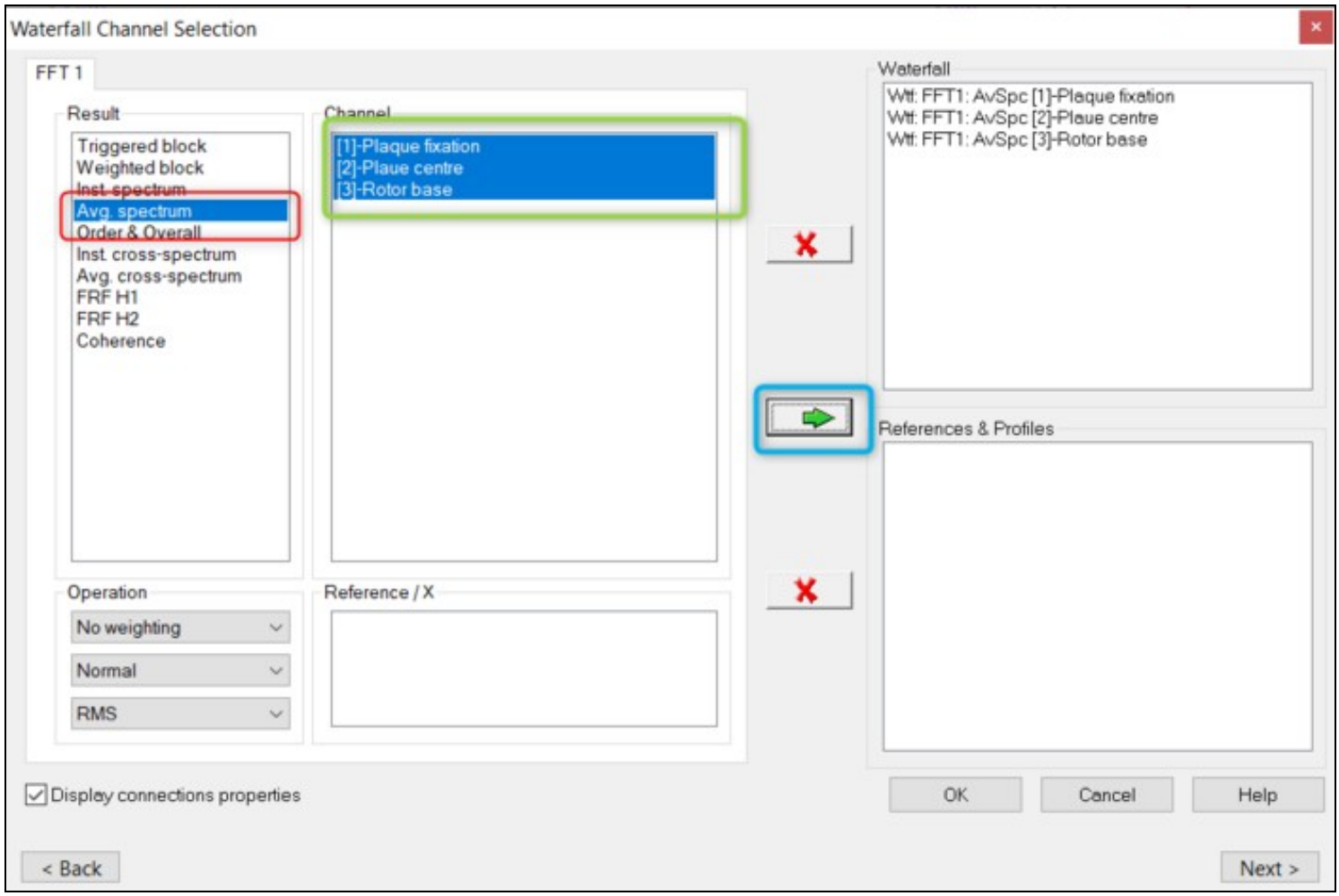
147.2.1.3 From the waterfall plug-in menu

Finally, results can be add into the waterfall directly from the waterfall menu. To do so, go into the Analyses tab of the NVGate ribbon, and click on 

in the waterfall section :



This will open the waterfall menu. Here, select the result (*Avg. Spectrum*), the channels you want to add (in that example, all the channels), and finally click on the green arrow  :


Waterfall Channel Selection
FFT 1
Result
Triggered block
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
FRF H1
FRF H2
Coherence
Channel
[1]-Plaque fixation
[2]-Plaue centre
[3]-Rotor base
Waterfall
Wtf: FFT1: AvSpc [1]-Plaque fixation
Wtf: FFT1: AvSpc [2]-Plaue centre
Wtf: FFT1: AvSpc [3]-Rotor base
References & Profiles
Operation
No weighting
Normal
RMS
Reference / X
Display connections properties
OK
Cancel
Help
< Back
Next >

Click on *OK*, the results have been added to the waterfall. You can now display it with the method described in the previous section.

147.2.2 Waterfall profile display

We saw in the previous section that a waterfall collect all-along the acquisition results from NVGate plug-ins, like a spectrum, in a single graph. Now if we connect to the waterfall a plug-in that is not delivering a complete trace, but a single scalar value, the collection during the acquisition off all these successive scalar values will result in a simple curve in the waterfall. This is what is called a **Profile** in NVGate.

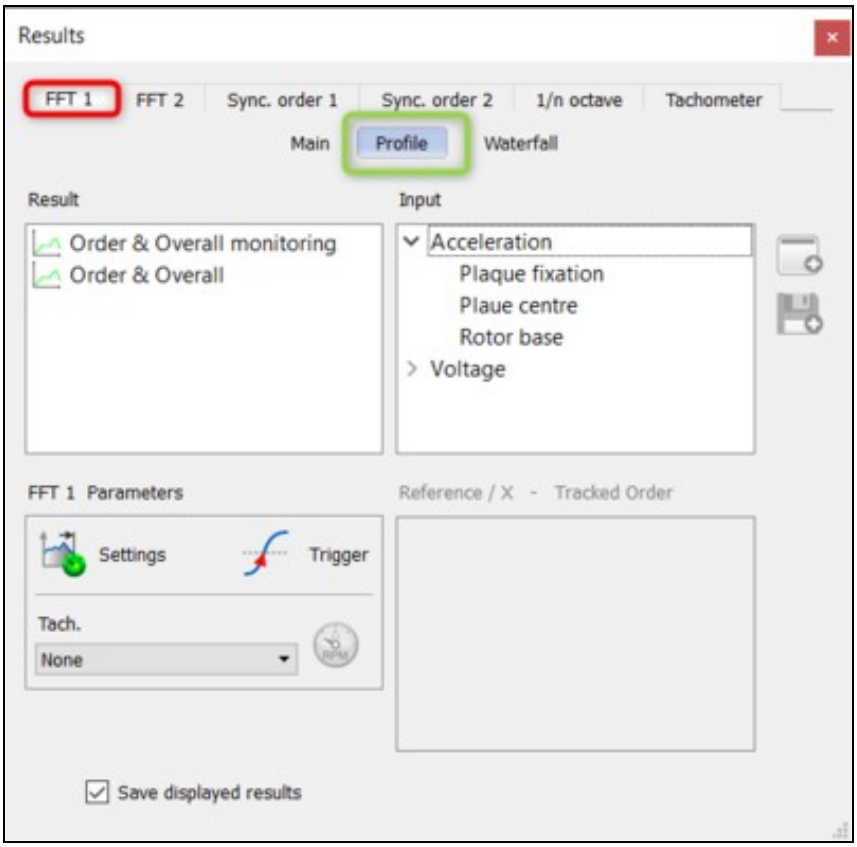
A profile can be used to plot trend over the time for DC inputs, Overall RMS level and Bode plots of Orders over the RPM value of the shaft.

In this section, I will show you how to display a profile of the Overall RMS level on a channel connected the the FFT 1 plug-in. I will present the three same methods presented in the previous section.

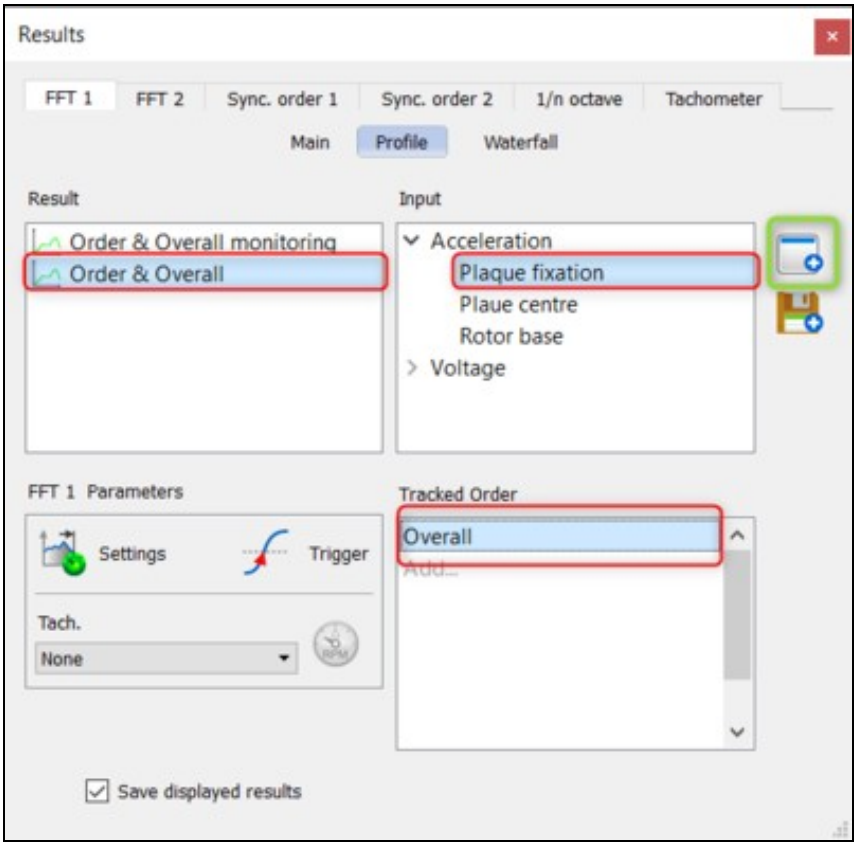
147.2.2.1 From the Show Result window

The Show Results window is the most common way of adding a result in the waterfall. Here I will show you how to simply display a Profile of the overall level for an acceleration input.

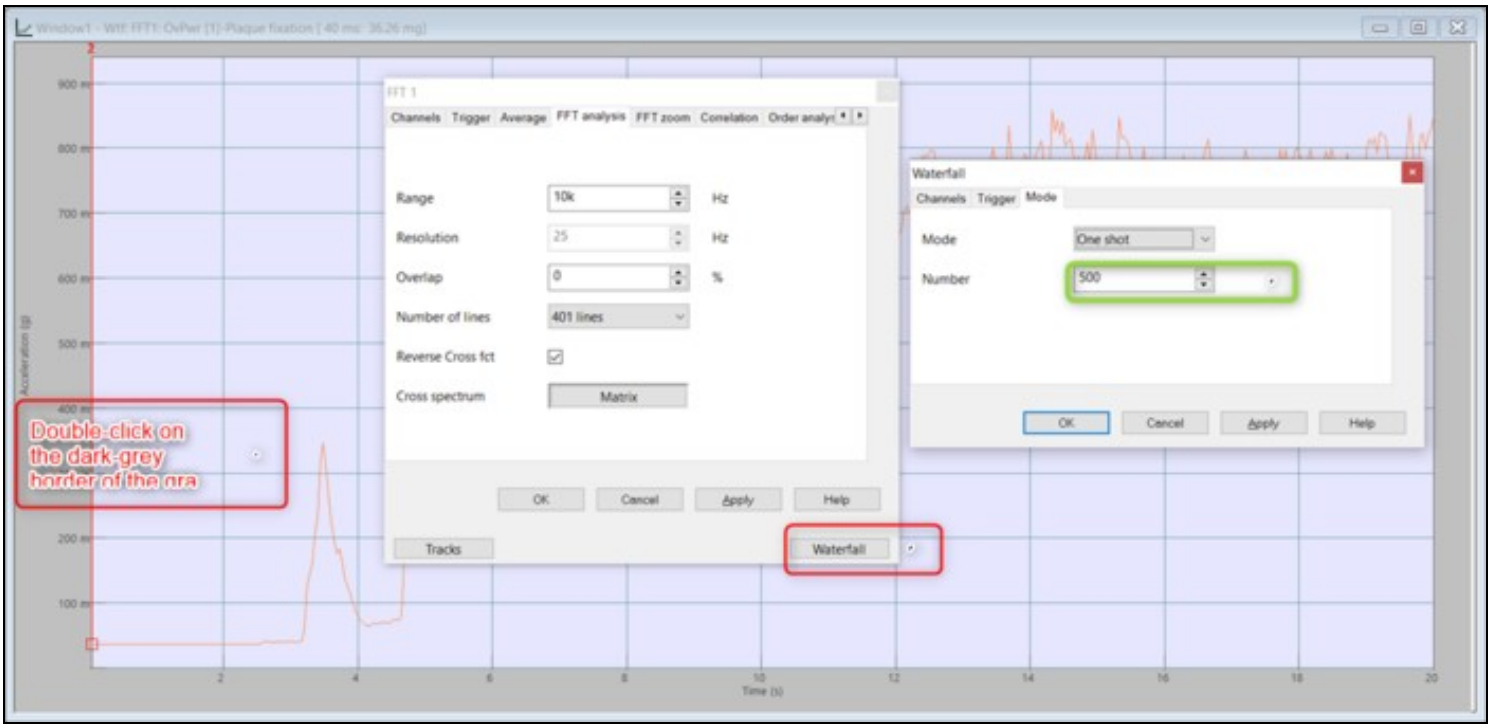
First, open the Show Result window, go in the *FFT 1* tab, and reach the *Profile* section :



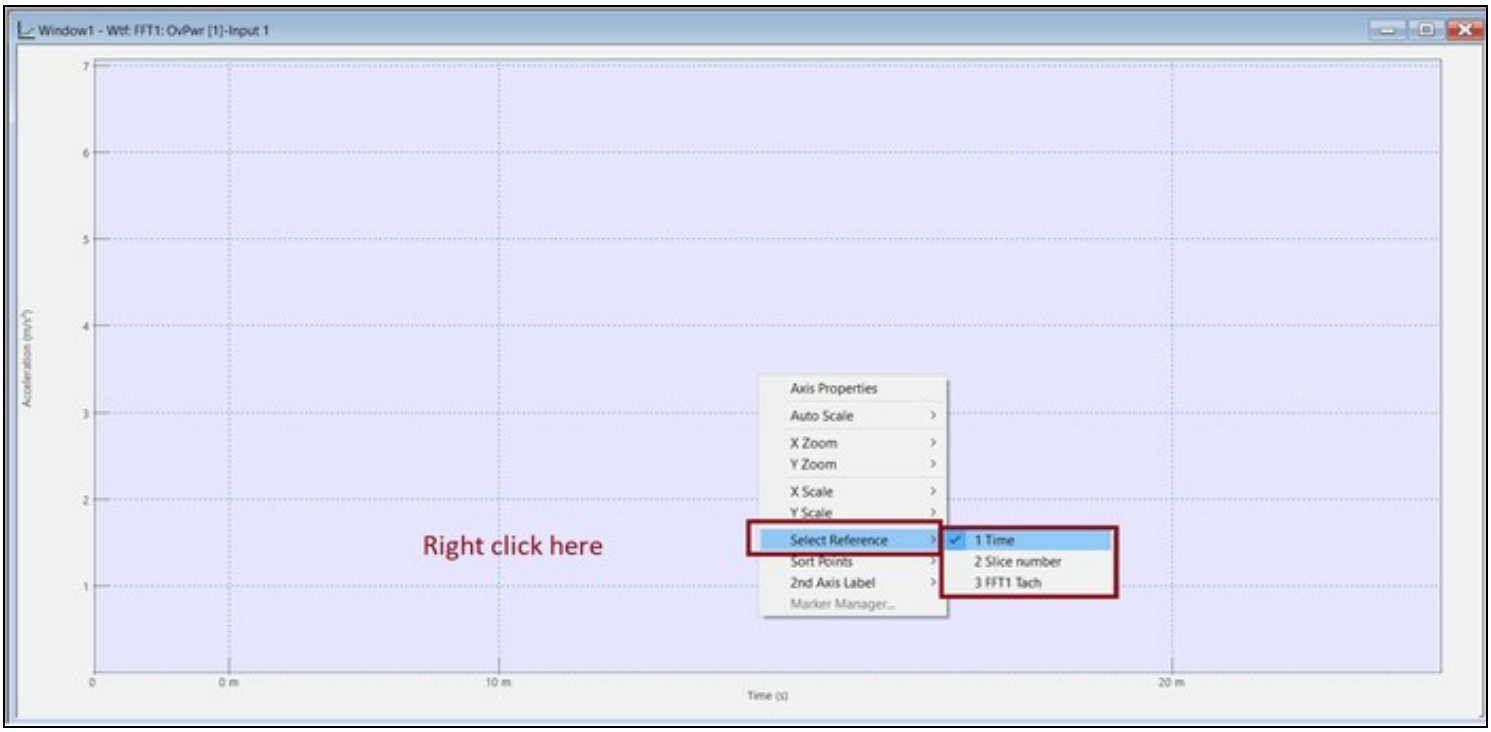
Then, select *Order & Overall* and the fist input. In the *Tracked order* section, select *Overall*. Finally click on  to display the waterfall :



The profile window is now displayed in the current layout, and you can run the acquisition. However, you may need to adapt the depth of the waterfall to contain all the data. To do so, double-click on the dark grey border of the graph, in the FFT menu, select *Waterfall*. In the *Mode* tab of the waterfall, modify the *Number* parameter :



To change the profile reference , right click on the graph : select reference.



For more detail please see NVGate Software overview, and the following sections.

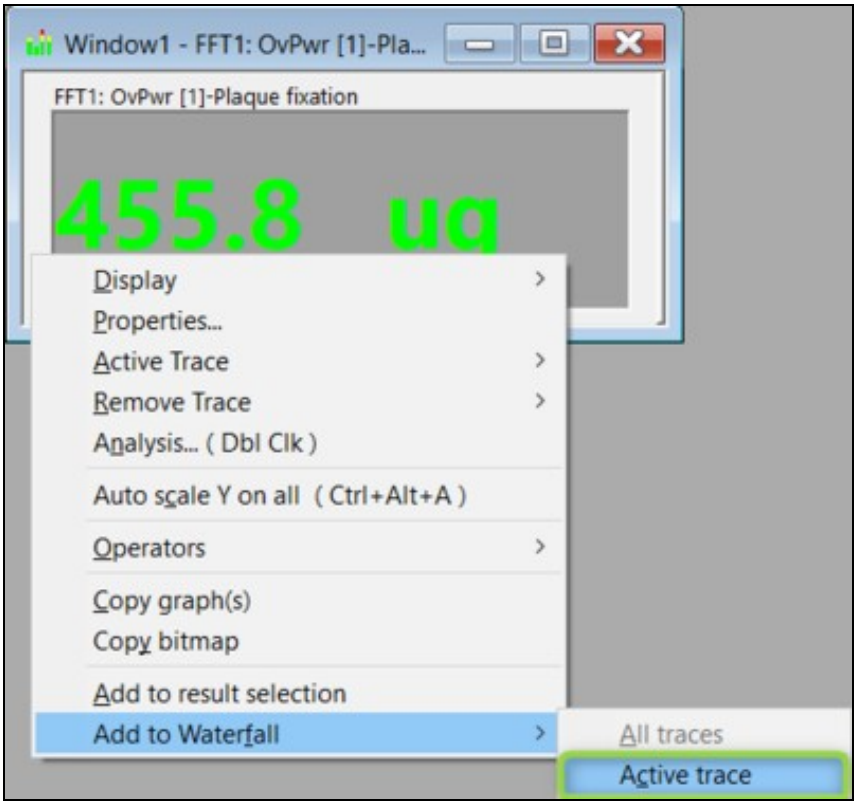
147.2.2.2 From the graph window

As we did for the standard waterfall, we will now see how to add a scalar value in the waterfall to create a profile directly from the result window.

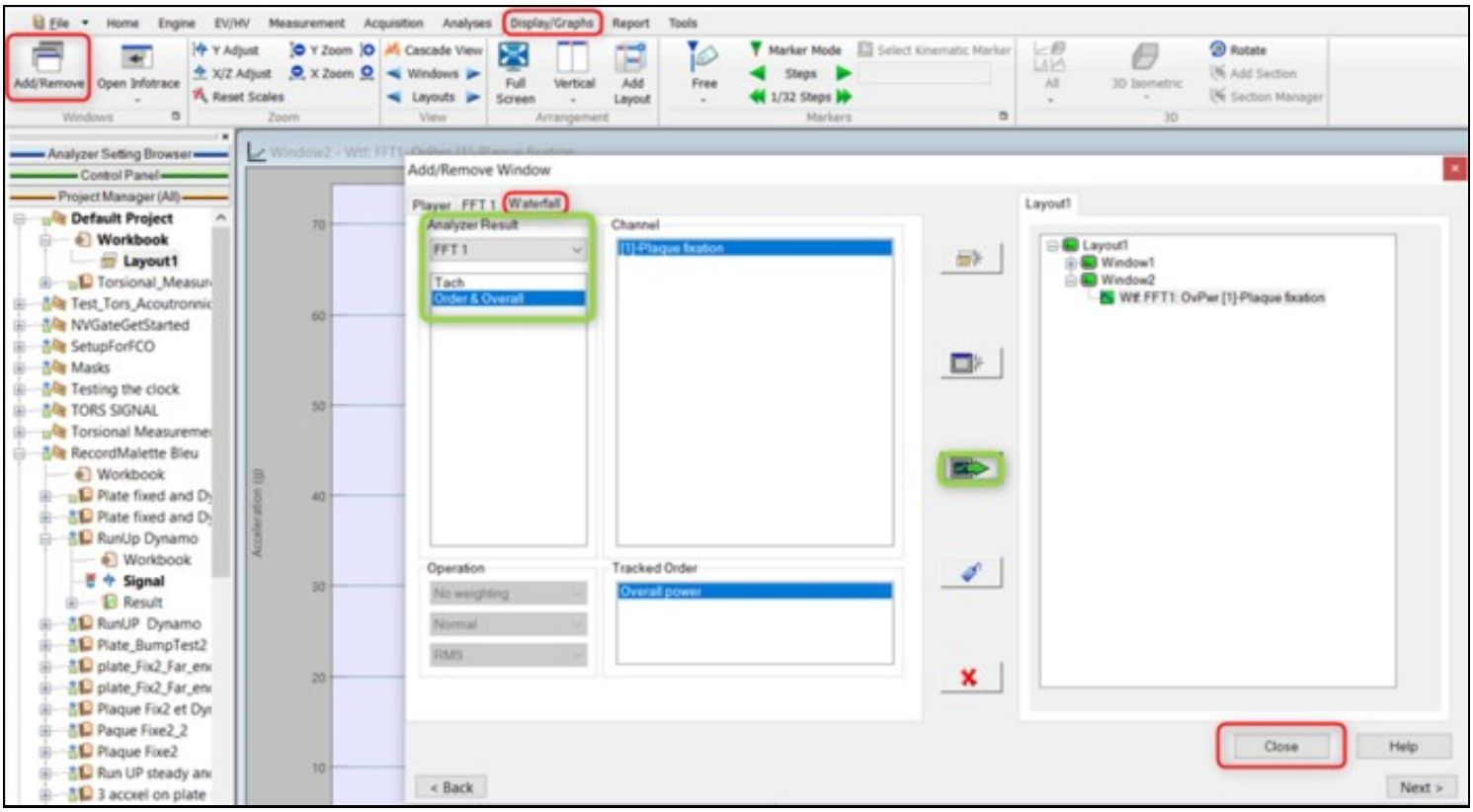
Here, we have displayed the *Overall level* an acceleration input from the FFT plug-in :



Right_click on the border of the window and go in the *Add to waterfall* section. There is only one trace in the window here, so only *Active trace is available. :*



After clicking on *Active Trace*, the *Overall Level is added in the waterfall. We will now use the same method to display the profile. go in the Add/Remove windows menu of theDisplay/Graphs tab of the Ribbon :*



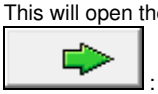
The profile is now displayed in the current layout. As previously, you may need to adapt the depth of the profile.

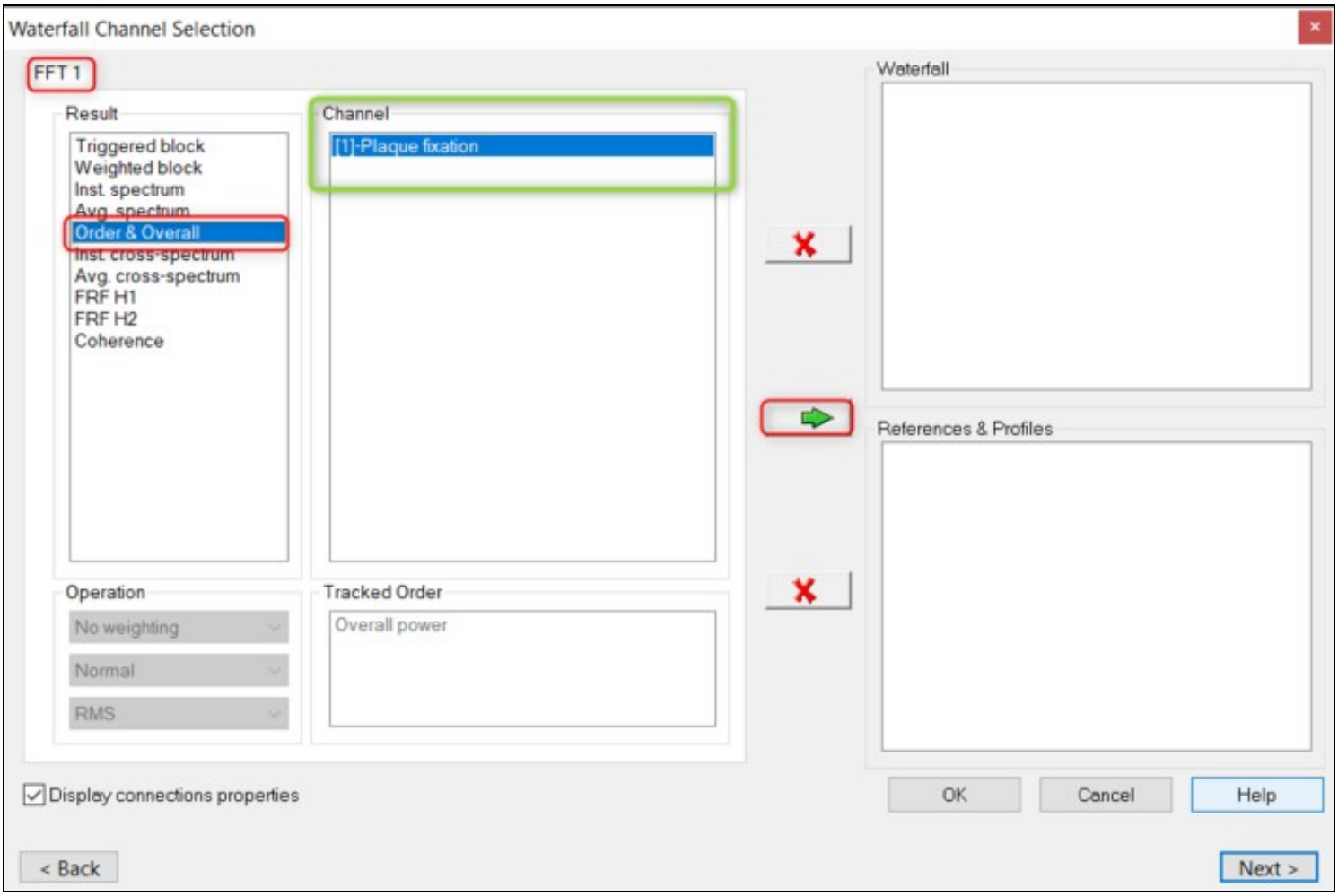
147.2.2.3 From the waterfall plug-in menu

As for other results, scalar results can be added into the waterfall directly from the waterfall menu. To do so, go into the Analyses tab of the NVGate ribbon, and click on 

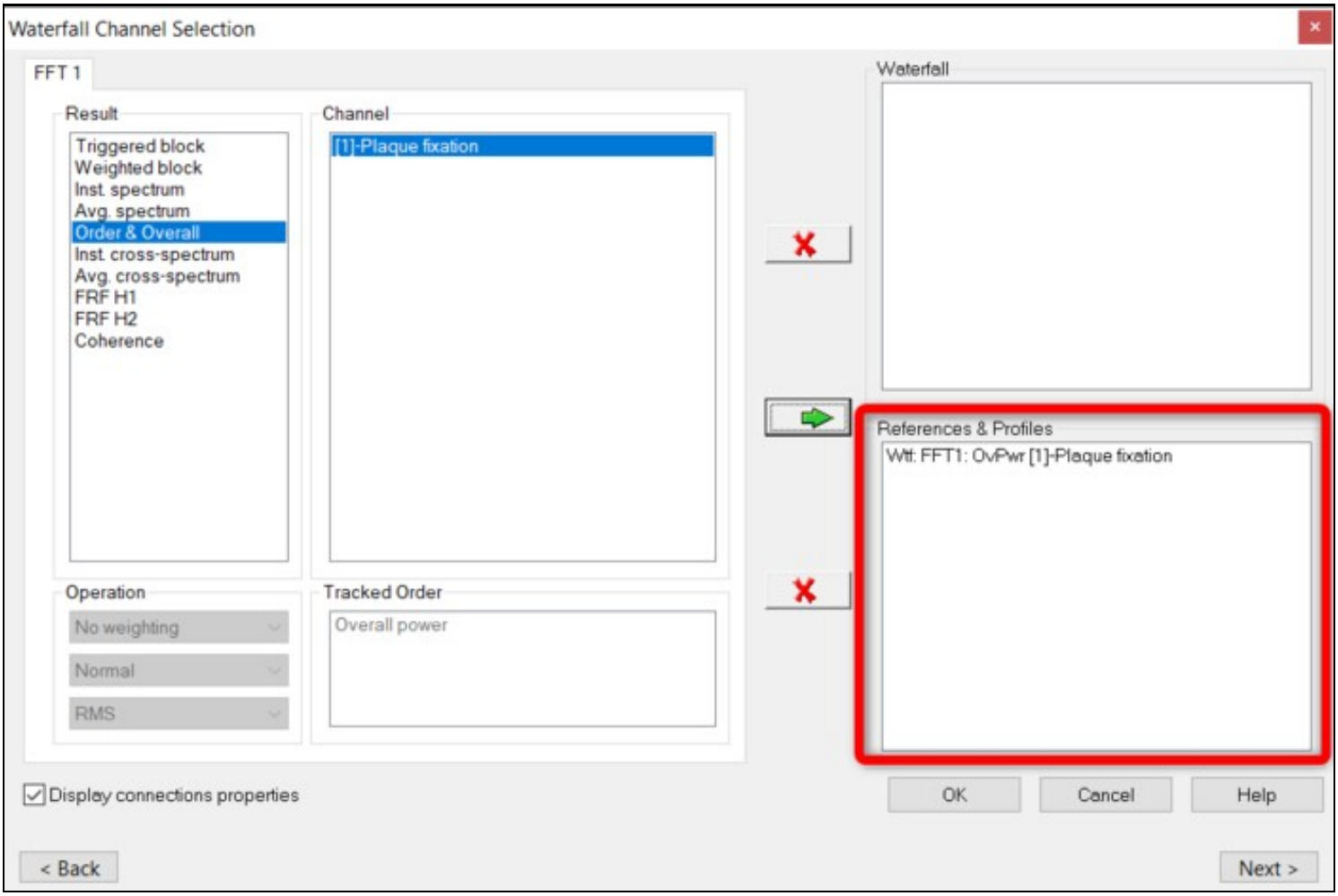
in the waterfall section :



This will open the waterfall menu. Here, select the result (*Order & Overall*), the channels you want to add, and finally click on the green arrow  :


Waterfall Channel Selection
FFT 1
Result
Triggered block
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
FRF H1
FRF H2
Coherence
Channel
[1]-Plaque fixation
Waterfall
References & Profiles
Operation
No weighting
Normal
RMS
Tracked Order
Overall power
Display connections properties
OK
Cancel
Help
< Back
Next >

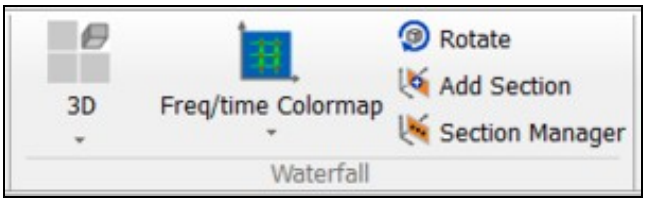
After clicking on  , the trace is added in the *References and Profiles* section :



Click on *OK*, the results have been added to the waterfall. You can now display it with the method described in the previous section.

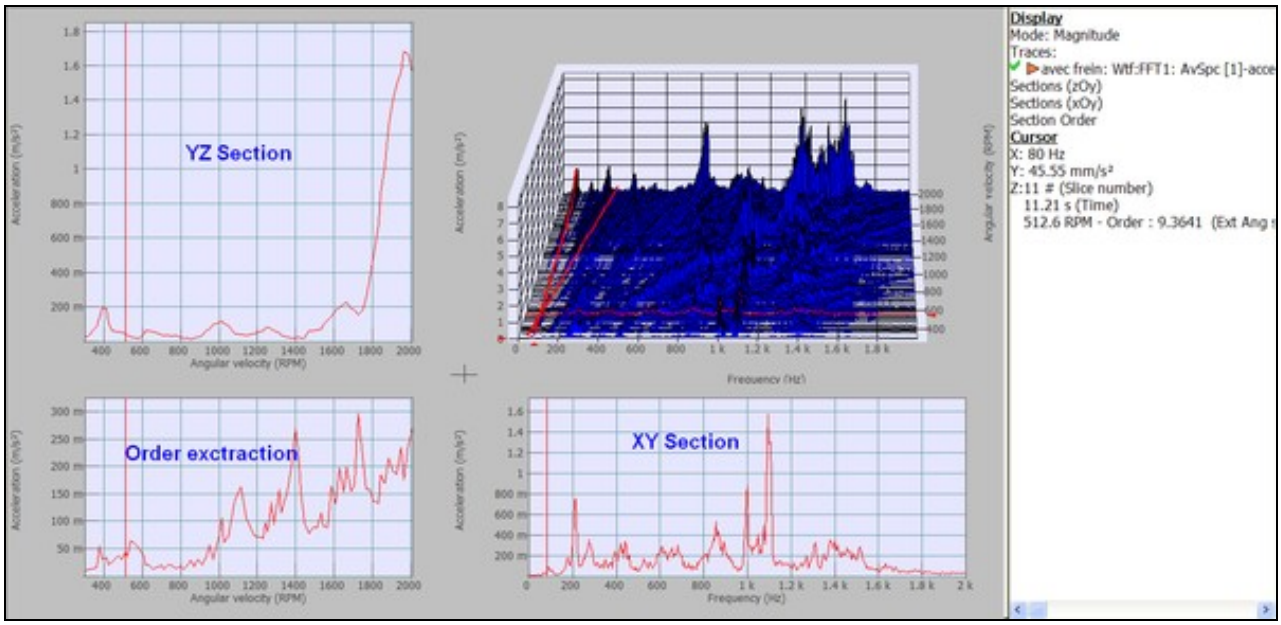
147.3 Waterfall Display

The Waterfall window offers a wide range of operation in order to go further in your measurement. It is possible to display XY and YZ sections as well as the extraction section. From the Display/Graph tab and the 3D group, this group provides general purpose tools about the Waterfall 3D graphs.





Display Waterfall sections: This multi-action button enables selecting the areas of the Waterfall window to be displayed. The Waterfall window is composed of 4 main areas:





3D only: Shows the 3D graph only. This graph can be a 3D plot or a color map.



X/Y only: Shows the X/Y extraction graph only. This graph contains the spectra at the cursor position and the X/Y sections.



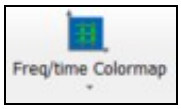
Y/Z only: Shows the Y/Z extraction graph only. This graph contains the time (or ref) profile at the cursor position and the Y/Z sections.



Extraction only: Shows the Order/frequency extraction graph only. This graph contains the order/frequency profile at the cursor position and the extraction sections.



All graphs: Shows all the graphs in a matrix.



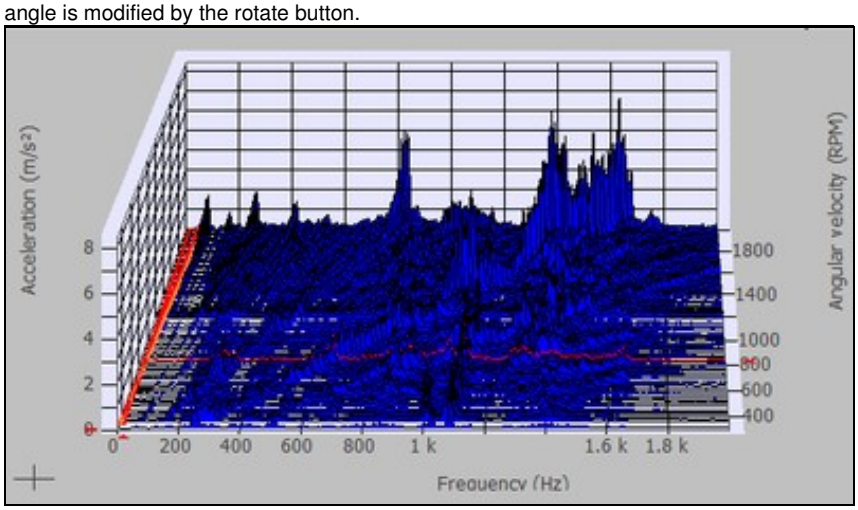
3D waterfall graph or ColorSpectrum view: Enables selecting the type of view for the Waterfall window.



3D perspective: Plot the spectra (or trigger blocks) in a true 3D space, taking in account the perspective. The global orientation of the gathered spectra can be changed using the rotate button. This type of view allows looking at the waterfall from any side.

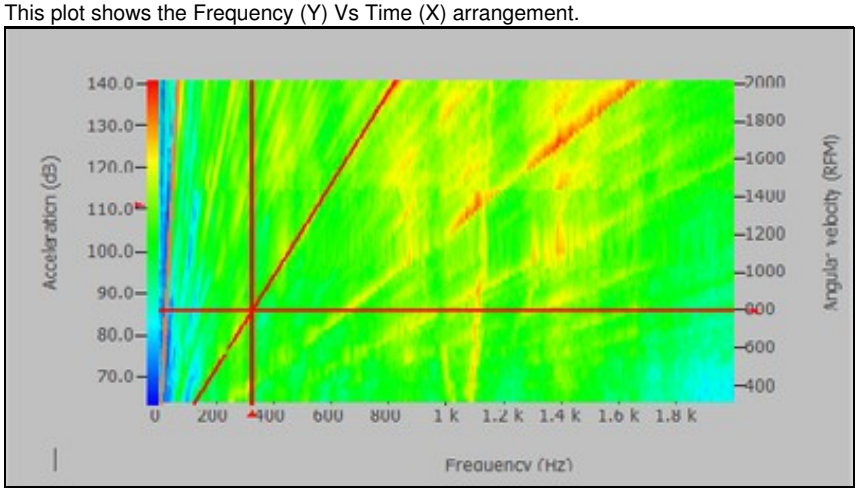


3D Isometric: Plot the spectra (or trigger blocks) along a Z axis with the same scale whatever is the position. The Z axis angle is modified by the rotate button.





Frequency/time color map: Plot the spectra (or trigger blocks) on 2D map with the color representing the point amplitude. This plot shows the Frequency (Y) Vs Time (X) arrangement.





Time/frequency color map: Plot the spectra (or trigger blocks) on 2D map with the color representing the point amplitude. This plot shows the Time (Y) Vs frequency (X) arrangement.



Rotate: Toggle the rotating mode. Allows rotating the 3D graphs with the mouse when enabled. Disabling this item return the mouse to the previous mode.



Add section: Add a copy of the cursor location in each of the 3 extraction graphs. Waterfall display provides extraction of section from the 3D space.



Section manager: Open the Waterfall *Section manager* dialog.

Cursors give information about the displayed Waterfall trace (current X, Y and Z coordinates are available from the *Infotrace*).

Move the cursors either by using the drag & drop in the 3D view or by using the arrow pad of the keyboard (the cursor mode 

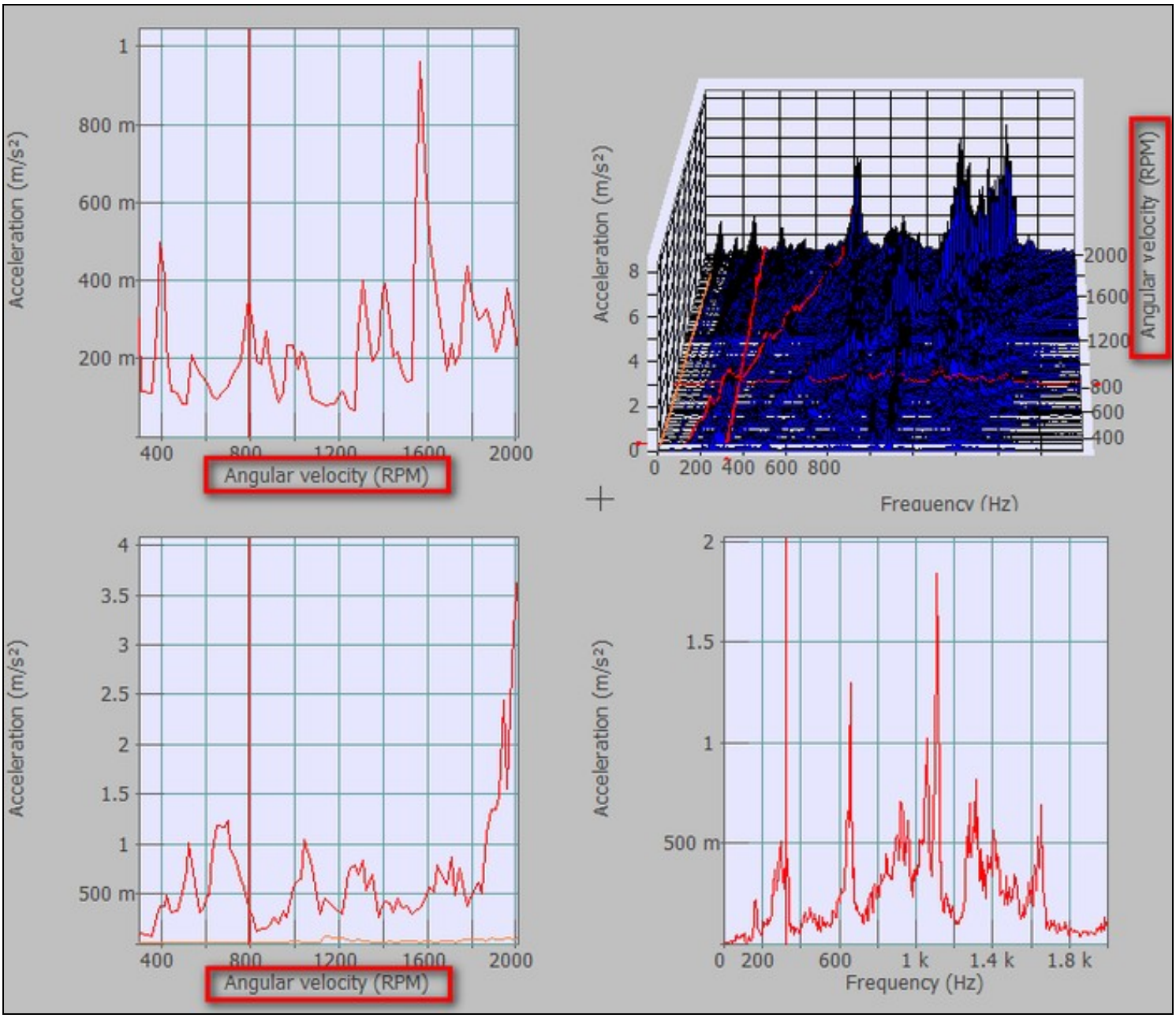
must be selected).

Tip: Move the mouse over the cross in the middle of the window and click in order to resize manually the graph window.

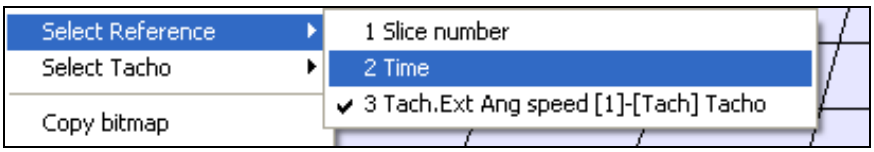
147.3.1 References

The waterfall data are arranged in accordance to the active reference. A reference is a scalar value (RPM, DC level, RMS, Parametric input) stored with the waterfall data.

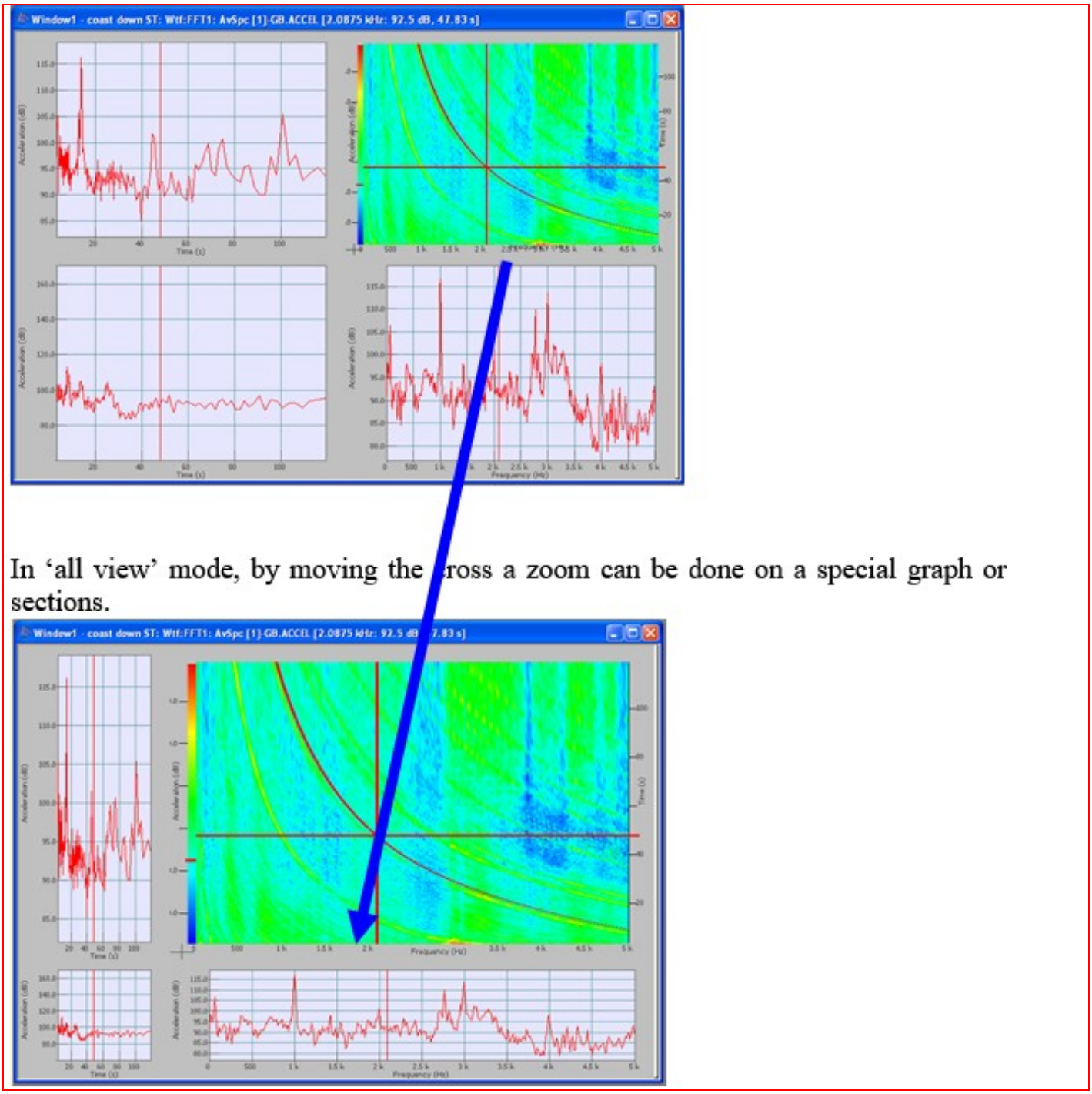
Right click on the grey part of the graph to select the active reference.


Acceleration (m/s²)
1
800 m
600 m
400 m
200 m
400
800
1200
1600
2000
Angular velocity (RPM)
Acceleration (m/s²)
8
6
4
2
0
0 200 400 600 800
Frequency (Hz)
2000
1600
1200
800
600
400
Angular velocity (RPM)
Acceleration (m/s²)
4
3.5
3
2.5
2
1.5
1
500 m
400
800
1200
1600
2000
Angular velocity (RPM)
Acceleration (m/s²)
2
1.5
1
500 m
0 200
600
1 k
1.4 k
1.8 k
Frequency (Hz)

The displayed data are then sorted regarding the reference value.



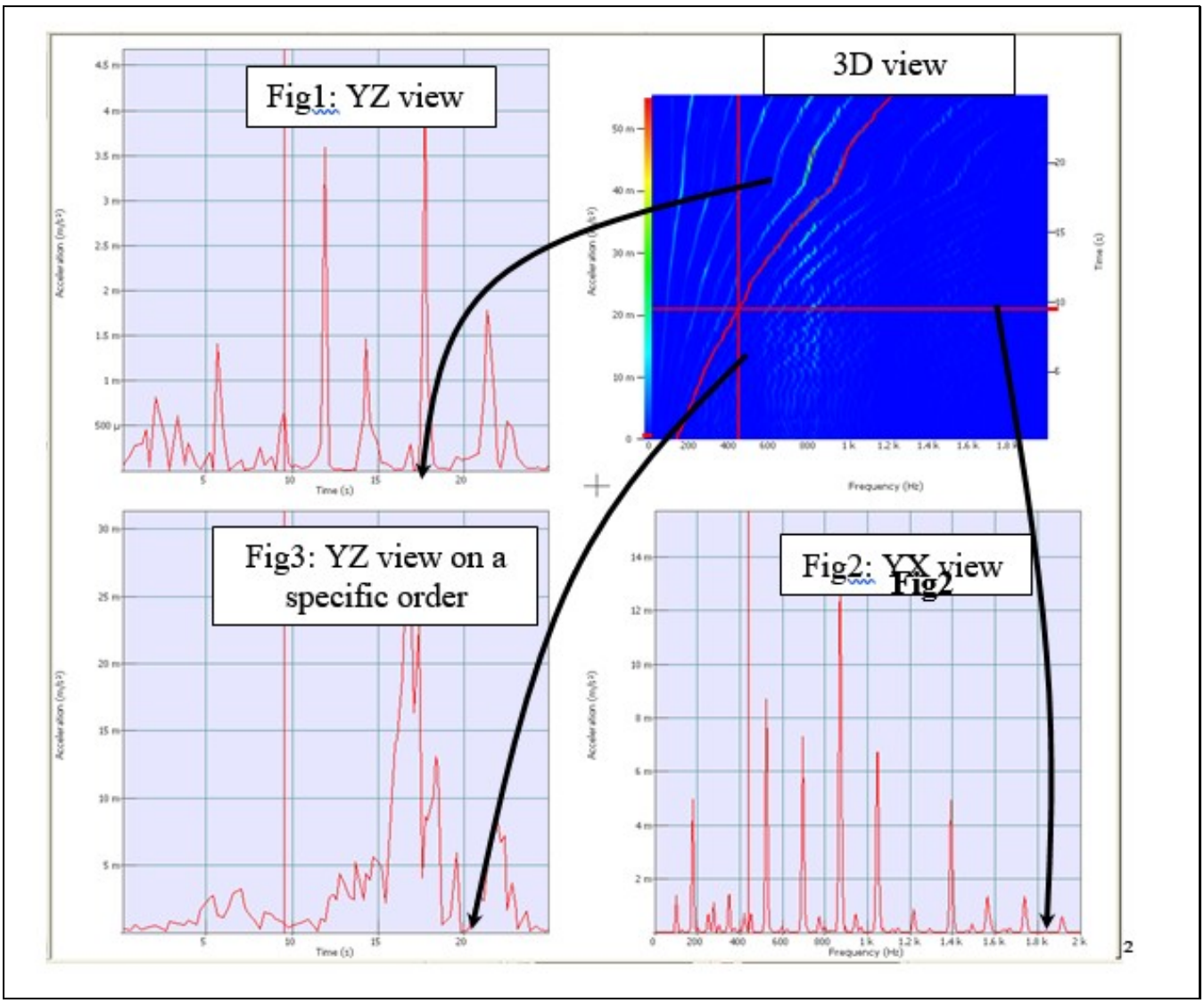
A threshold is available on a waterfall by pressing the ?y? button (or ?ctrl y? for more precision).



147.3.1.1 Sections

-  Add section: Add a copy of the cursor location in each of the 3 extraction graph

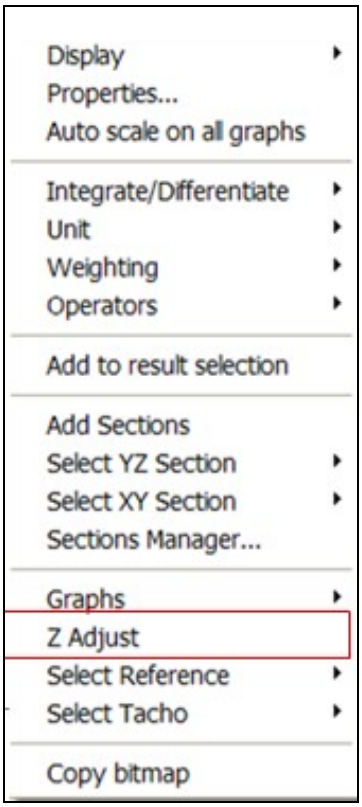
Waterfall display provides extraction of section from the 3D space



These sections are linked with cursors of the 3D view:

- Fig1: for a fixed value of the X-axis of the 3D view,
- Fig2: For a fixed value of the reference
- Fig3: for a fixed value of the order (follow the evolution of an order) or frequency for order spectra waterfall.

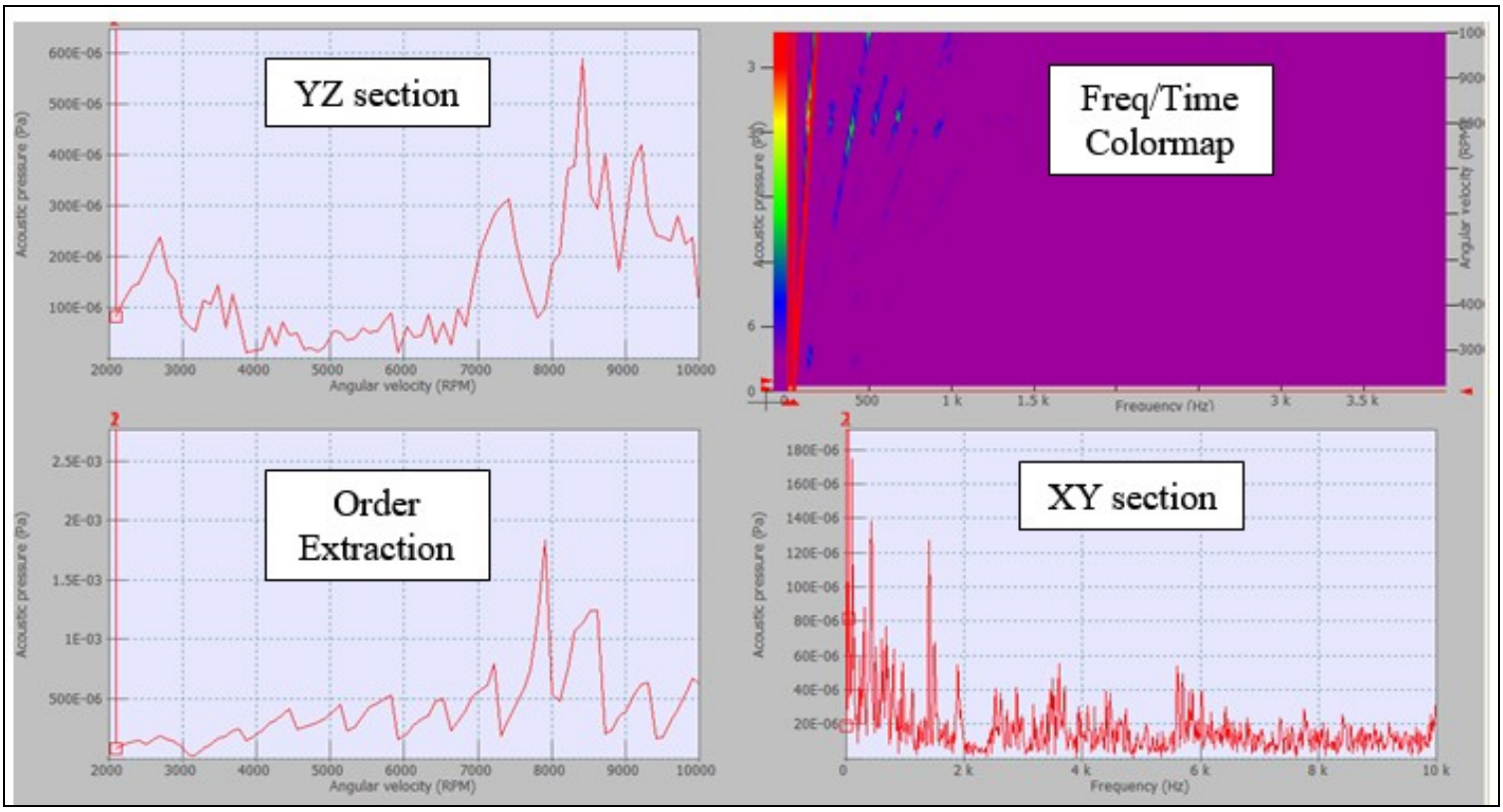
During the acquisition, an autoscale is available on the z-axis (reference) if ?z Adjust? is active.



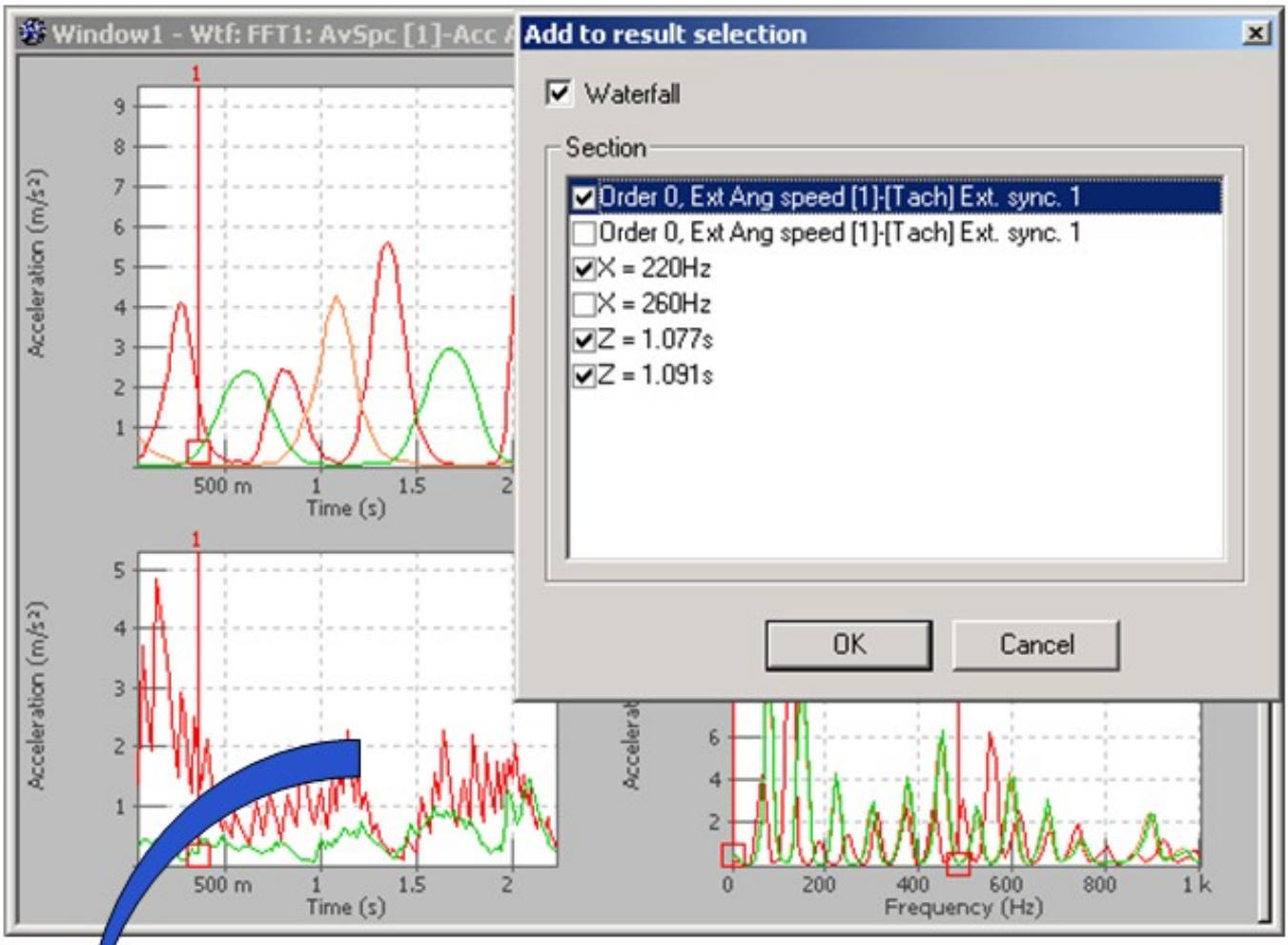
- **Add section:** Creates a new section at the current position of the cursor. The extraction section is created only if a tach has been selected in the Waterfall.
- **Select YZ section:** Selects the active trace in the YZ graph. Useful to get the value of the cursor for this section
- **Select XY section:** Selects the active trace in the XY graph. Useful to get the value of the cursor for this section
- **Select extraction section:** Selects the active trace in the extraction graph. Useful to get the value of the cursor for this section

The ?Select Tacho? mode allows tracking an order in function of the selected tachometer. The extraction order could be done in function of the selected tacho. 4 Graphs are available for the windows allowing tracking different results:

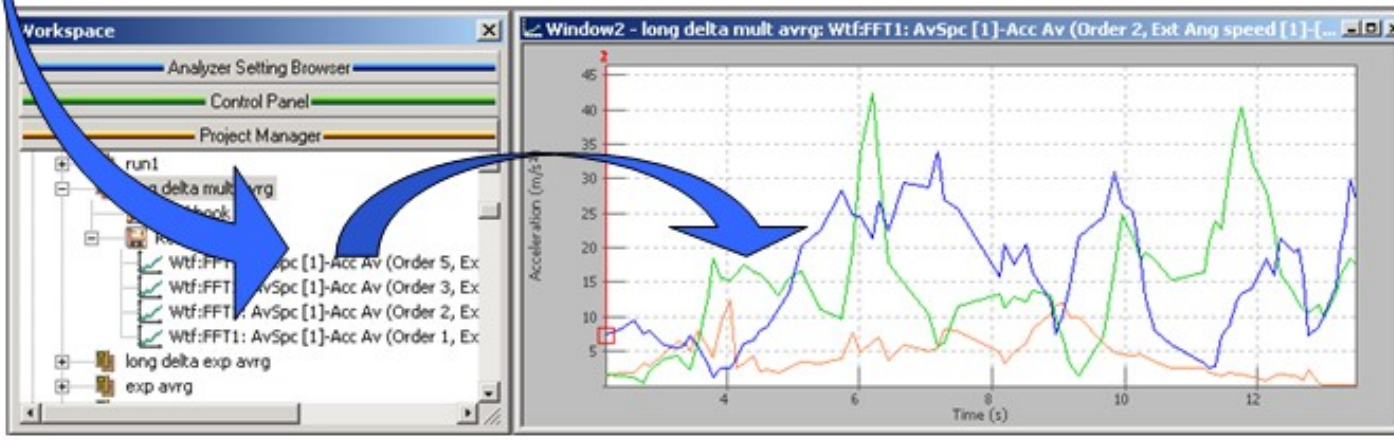
- 3D view: you can select by right-clicking on it an isometric view, a perspective view, a freq/time colormap or a time/freq colormap (useful to track orders). The 3D view is the default view.
- YZ section,
- Order extraction (only available if a tachometer is active).



The sections are displayed in these 2D views. The sections can be managed in the section manager windows. In the section manager, add section made a copy of each cursor (Frequency, Reference, Order) in all displayed windows. These memorized traces could be added to result by the ?add to result selection.The waterfall sections can be saved as independent results (spectra, reference profiles, extracted profiles). The selection is achieved using the "Add to result selection" entry from the waterfall window contextual menu.



At this step, you can select the result to be saved from the list of available waterfall results.



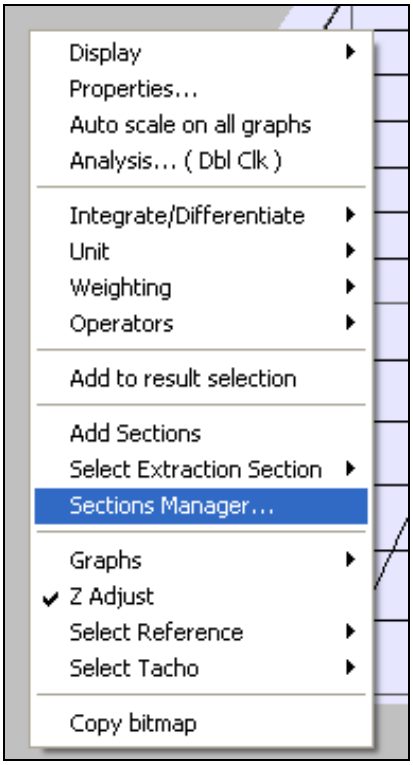
After being saved, the sections became independent results, reducing the amount of saved data when you are focusing only on extracted data.

147.3.1.2 Section manager

You can fine tune the section parameters by using the section manager available by right clicking on the Waterfall window. For example, you want to visualize the first order.

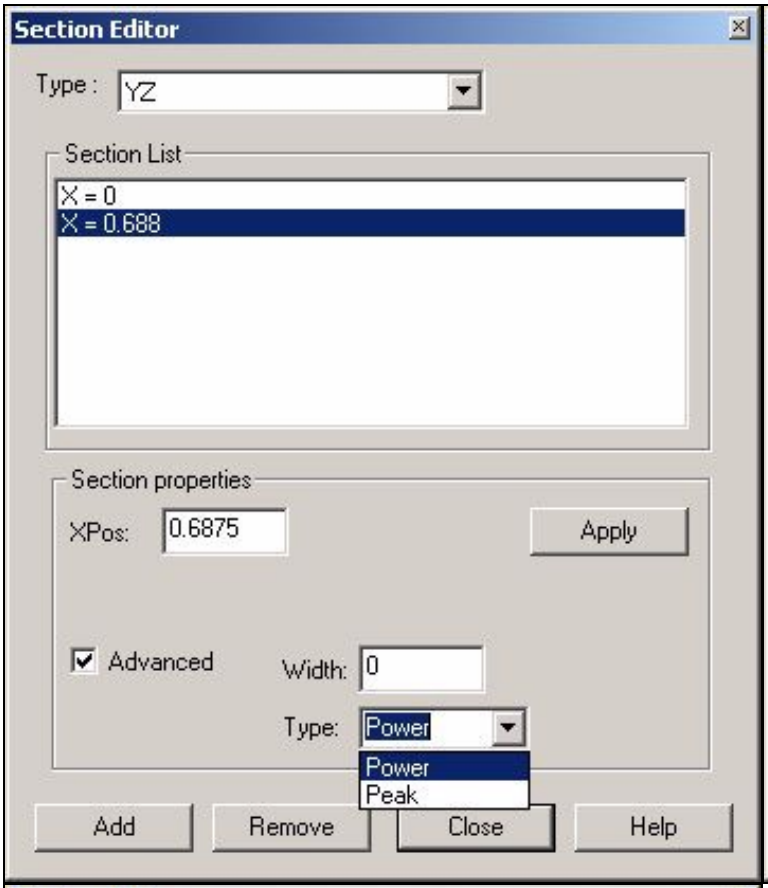
-  Section manager: Open the waterfall section manager.

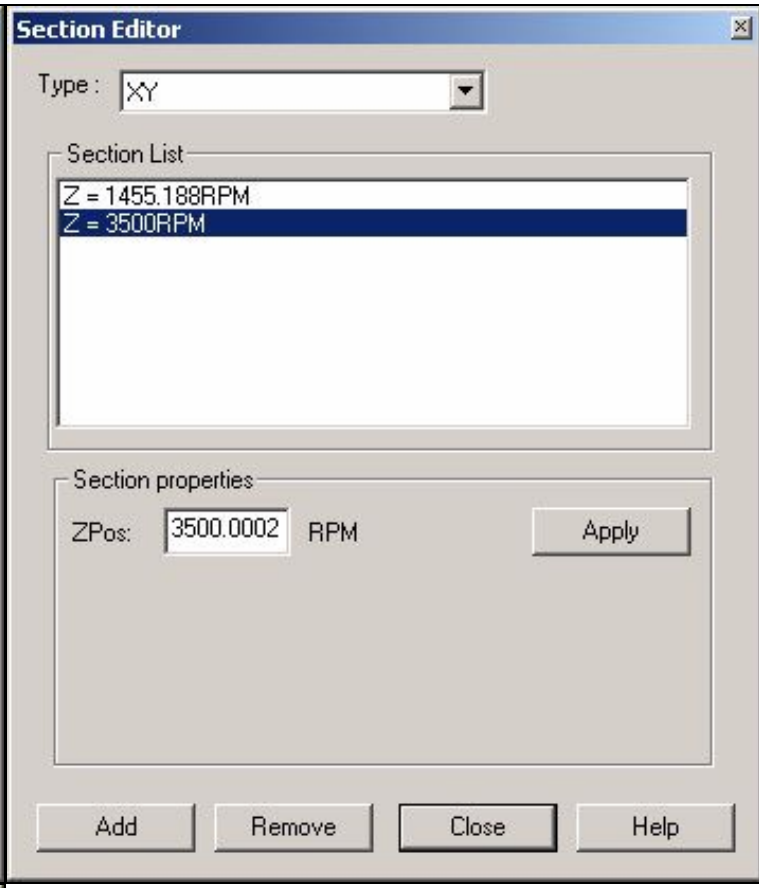
or, right click in the grey part of the graph and select Section manager.

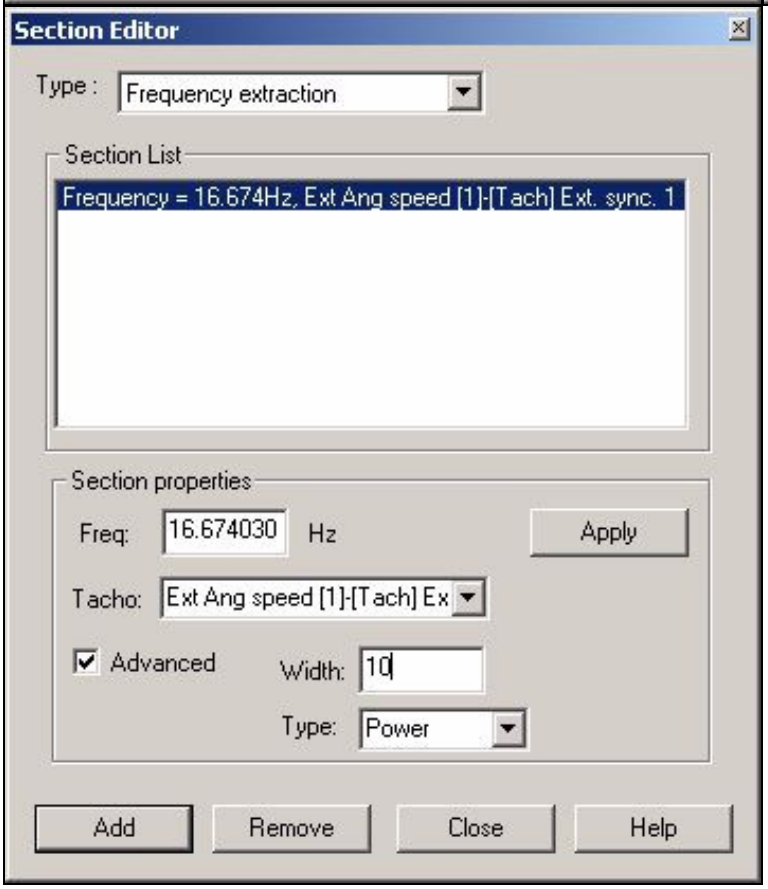


- Section manager: This dialog box is used to create and modify sections.

To modify a section, select the desired type and the desired section then modify the Section properties and click "Apply". To create a new section, Select the type, set the desired properties and click "Add". To remove a section, select the desired type and the desired section, then click "Remove".


Section Editor
Type : YZ
Section List
X = 0
X = 0.688
Section properties
XPos: 0.6875
Apply
Advanced
Width: 0
Type: Power
Power
Peak
Add
Remove
Close
Help


Section Editor
Type : XY
Section List
Z = 1455.188RPM
Z = 3500RPM
Section properties
ZPos: 3500.0002 RPM
Apply
Add
Remove
Close
Help


Section Editor
Type : Frequency extraction
Section List
Frequency = 16.674Hz, Ext Ang speed [1]-[Tach] Ext. sync. 1
Section properties
Freq: 16.674030 Hz
Apply
Tacho: Ext Ang speed [1]-[Tach] Ex
Advanced
Width: 10
Type: Power
Add
Remove
Close
Help

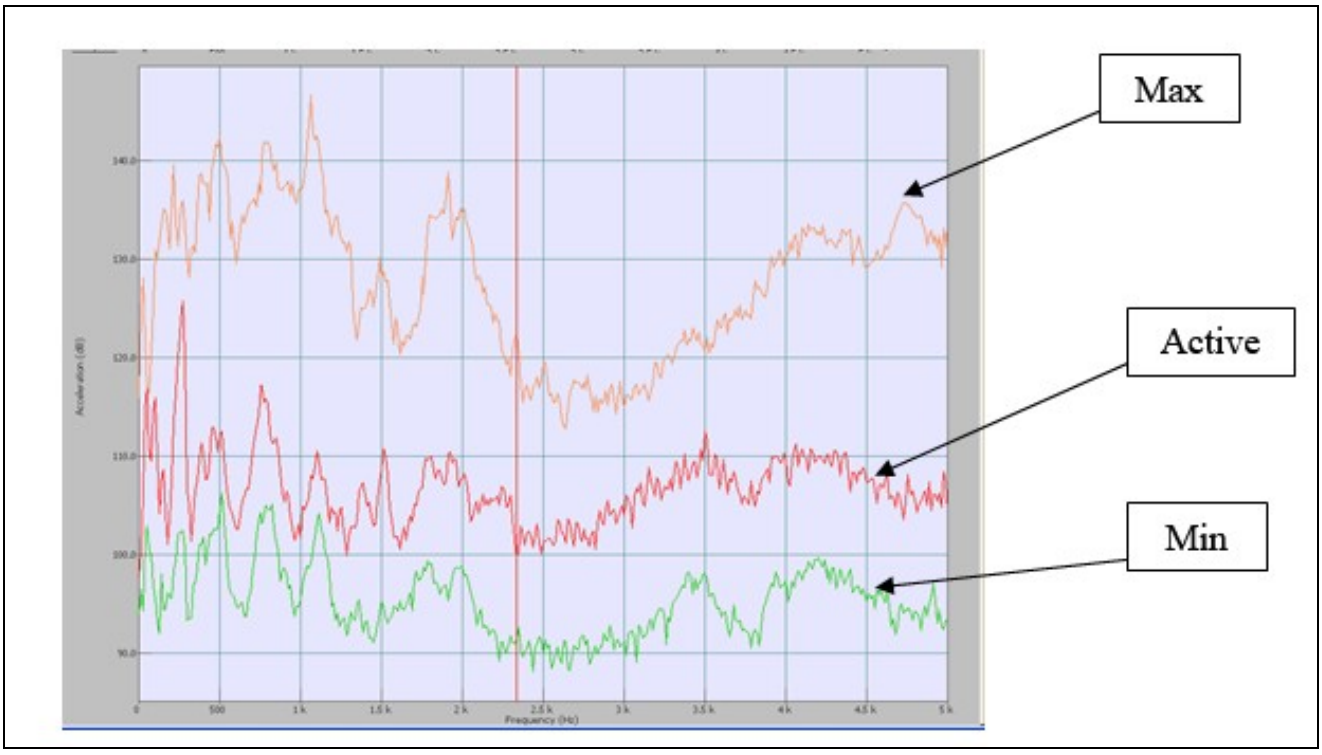
- Section properties: The XPos, ZPos, Freq or Order defines the position of the section in the Waterfall. When the "Advanced" box is checked, it defines the center of the band. The width is used when the "Advanced" box is checked. It defines the bandwidth.

The advanced sections are:

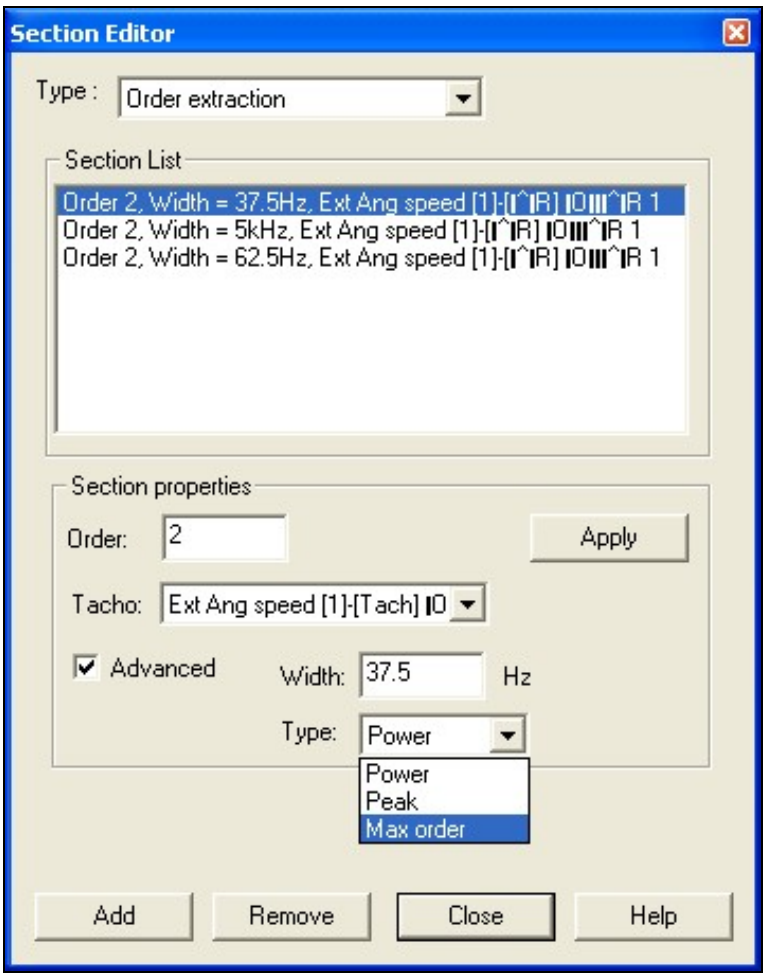
Type	Sections	Type of result	Description
Power	YZ, Order and Frequency extraction sections	Frequency, order and octave spectra	Calculates the power within the band
Peak	YZ, Order and Frequency extraction sections	Frequency, order and octave spectra	Detects the highest value
RMS	YZ sections	Triggered and resampled block	Calculates the RMS value within the band
Average	YZ sections	Triggered and resampled block	Calculates the average value within the band
Min	YZ sections	Triggered and resampled block	Detects the minimum value within the band
Max	YZ sections	Triggered and resampled block	Detects the maximum value within the band

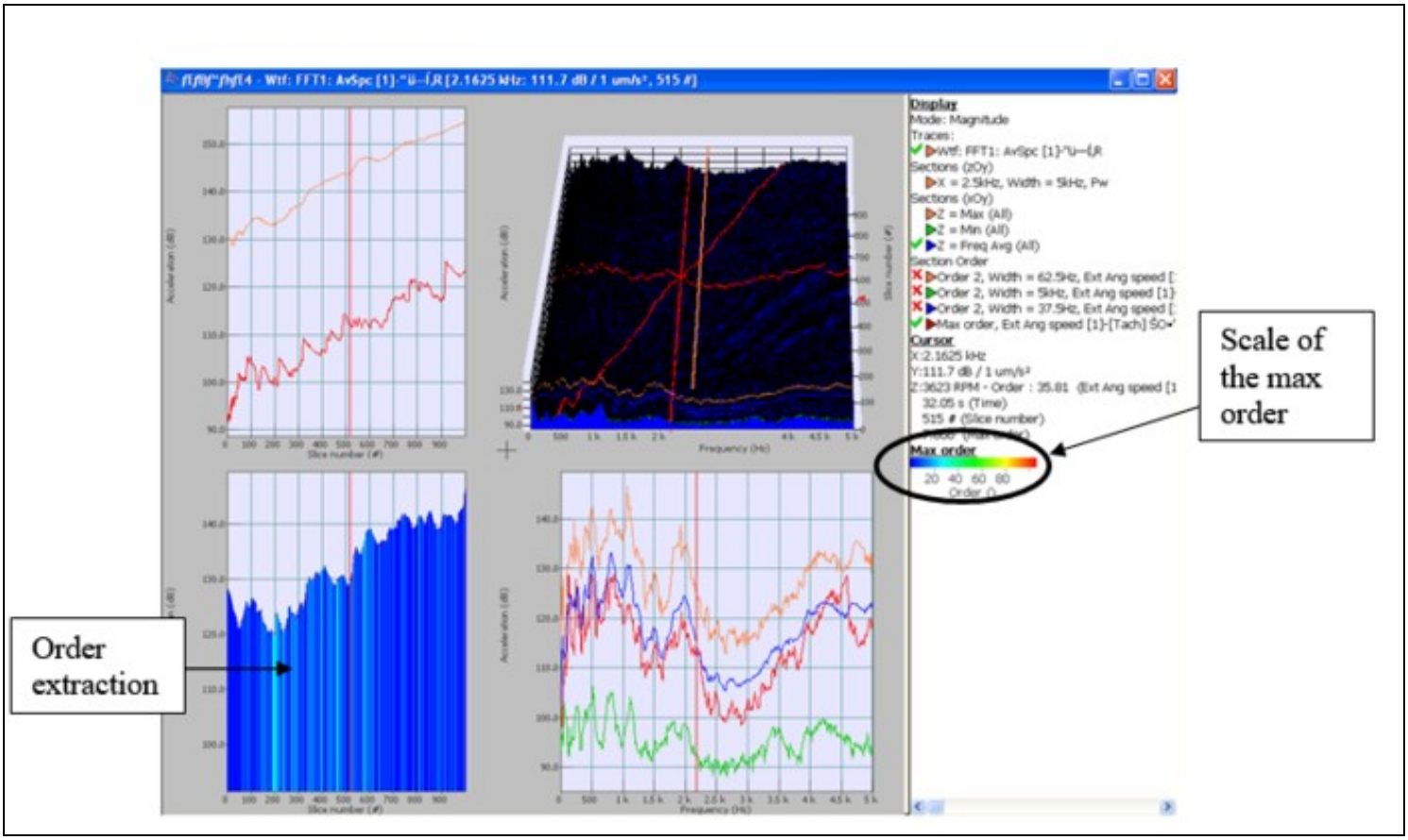
- *Z-Operator*:

This Operator is available on XY extraction view and 3 operators are available: Min, Max and Arithmetic Average.



- *Order Extraction*:





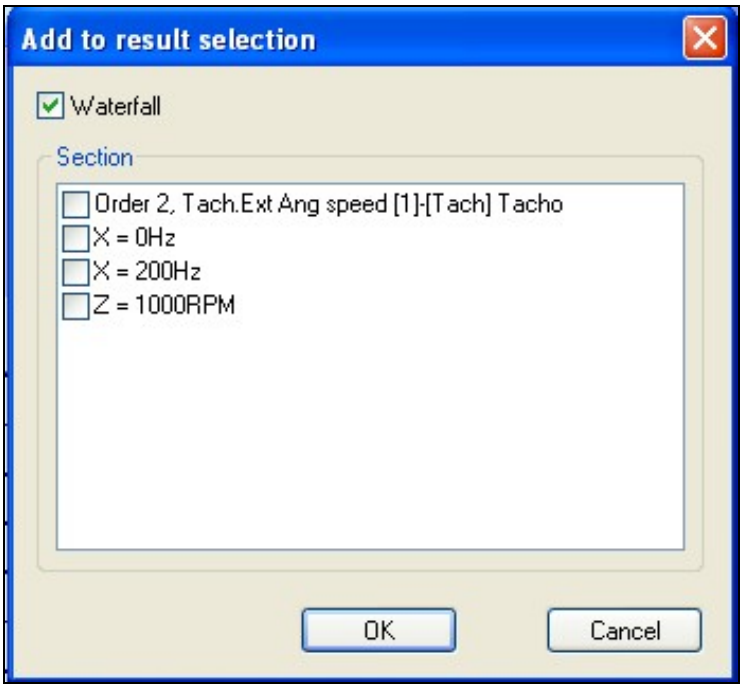
This Operator take data spectrum by spectrum, for each spectrum there is a determination of the max value and of the corresponding order. Using this operator it is possible to detect on which orders it is useful to work. Note: The Max Order cannot be saved in result (not available in the ?Add to result selection?).

147.3.1.3 Save results

This section gets you to select and save the Waterfall results.

Right click on the Waterfall window and select **Add to result selection**. A window that allows you to select the results to be saved is displayed:

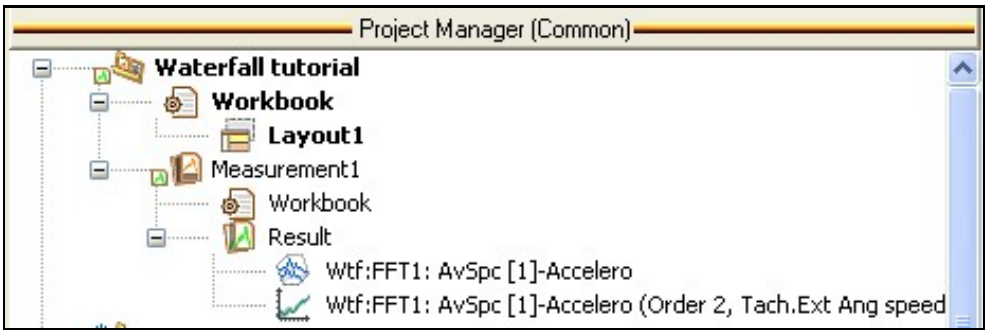
- The entire Waterfall results
- The extraction section (in this case it is the order 2 section) independently
- The XY section independently
- The YZ section independently



Click on **OK**.



Click on: *Measurement/Save/ Save Measurement*, your results selection will be automatically saved:



147.4 Settings

147.4.1 Glossary

This section will explain specific vocabulary of the Waterfall.

- **Slice**: this represents one acquisition of the Waterfall. A slice is a set of scalar and spectrum data acquired at the same time. The Waterfall is a stack slices.
- **Depth**: this is the maximum number of slices you can acquire on the Waterfall.
- **Section**: section at the current position of the cursor. The extraction section is created only if a tach has been selected in the Waterfall (see chapter 2 Display, Waterfall window menu).
- **Reference**: A scalar collected by the waterfall acquisition that can put in order the slices. The reference corresponds to the X-axis of the profiles and the Z-axis of the 3D graphs.
- **Profiles or 2D Results**: profiles of a scalar evolution in function of time or any reference associated with the waterfall

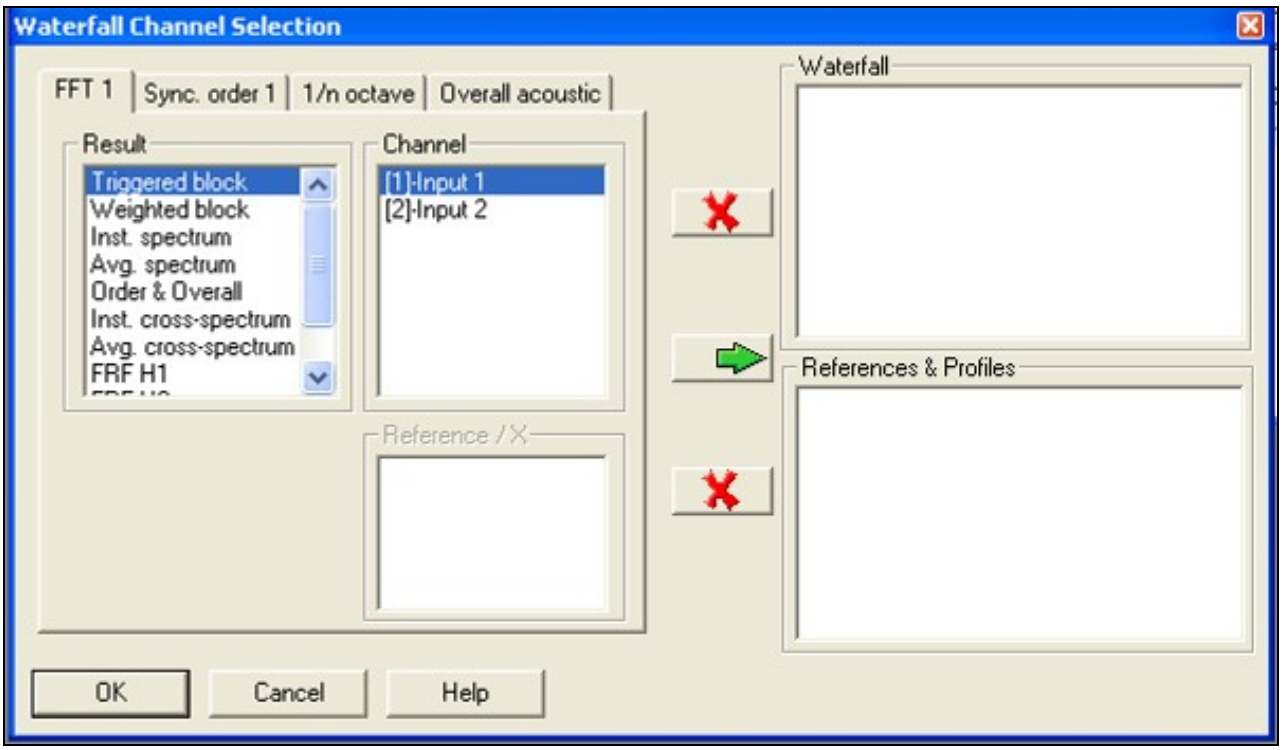
- **Results 3D**: spectra collected by the waterfall acquisition putted in order by a reference. These types of results are displayed in 3D graphs (3D, isometric or color-spectrogram).

147.4.1.1 Channel

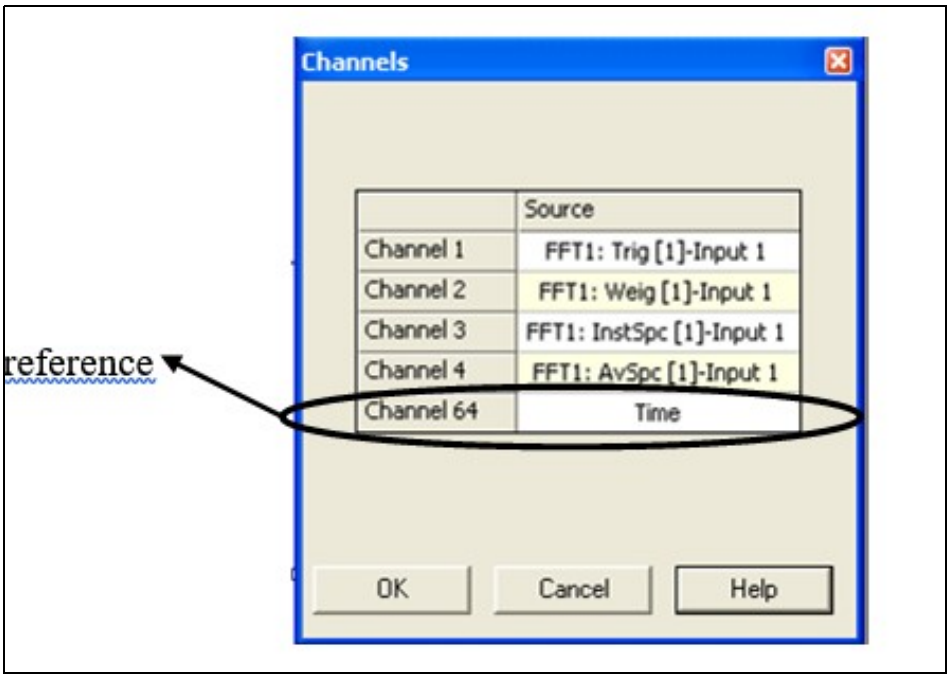
The different channels are available by putting selected inputs in the plug-in.

It contains the results to be picked up by the Waterfall.

The following window lets you select for each analysis plug-in, the channel related to the result.



- **Source**: In the ASB the channels are different from other ASB channels, the source of channel 1 and following are the results. The source of channel 64 and previous ones are the references. By default the time reference is always associated with a result source.



147.4.1.1.1 Trigger

Contains the settings related to triggering events and how to start and stop signal computation.

- **Start**: selects the event to start the waterfall acquisitions. This setting selects the event, which enable acquisition that is to say data collection does not operate while start event is no occurred. Any event can be chosen among the list of defined events. By default only the Free run and Manual events are available. Additional events can be defined in the "Event Definition" shared resource. The start time corresponds to the zero of the waterfall time scale. By default start is set to "free run" this allows waterfall acquisition to start immediately after run.
- **Stop**: selects the event to stop the waterfall acquisitions. This setting selects the event, which ends acquisition that is to say data collection, does not operate after stop event occurred. Any event can be chosen among the list of defined events. By default only the Free run and Manual events are available. Additional events can be defined in the "Event Definition" shared resource.
- **Trigger**: selects the event that trigs waterfall acquisitions. This setting selects the event which trig acquisitions that is to say a new data collection occur each time trigger event occurred. If trigger is set to periodic (period 20ms) the Waterfall acquisition will operate as fast as possible, this can hang user interface during acquisitions. The first time a source is selected for the Waterfall, if trigger = Periodic, then the event corresponding to the availability of the source results is assigned to the trigger. Ex: Setting FFT1 spectra into the waterfall plug-in will set Trigger to ?FFT1 result available?. By default the trigger is set to ?Periodic? with a period of 20.

List of events	Description
Manual	This event occurs when the user requests a manual trigger.
Events from Event module	see Event module
FFTx result available	This event is in the list if a signal is connected to an FFTx channel source. This event occurs when an FFT measurement starts. This event is generated at each calculation of a new spectrum in exponential averaging and at the end of averaging in linear.
Oct result available	This event is in the list if a signal is connected to an Octave channel source. This event occurs when an Octave measurement starts. This event is generated at each new spectrum calculated (every 256 samplings) for CBT, Fast, Slow, Impulse and exponential averaging. For the others averaging this event is generated at the end of averaging on t.
Order x result available	This event is in the list if a signal is connected to an Order x channel source. This event occurs when an Order x measurement starts. This event is generated at each calculation of a new spectrum in exponential averaging and at the end of averaging in linear.
Overall acoustic result available	This event is in the list if a signal is connected to an Overall acoustic channel source. This event occurs when an Overall acoustic measurement starts. This event is generated at each new spectrum calculated (every 256 samplings) for CBT, Fast, Slow, Impulse and exponential averaging. For the others averaging this event is generated at the end of averaging on t.
Periodic	This event simplifies the instrument setup by shortcutting periodic event activation. Selecting periodic for the trigger will make appears the period setting.

There is two ways to trigger the waterfall:

- The analyzer is running, it keeps in memory last measurements. Then with the waterfall you can select some specific results (for example for ?rpm or ?time).
- The plug-in triggering, at the end of each average the plug-in send an event. The plug-in put the rhythm into the waterfall. This mode is the default mode.

147.4.1.1.2 Mode

Contains the settings related to the Waterfall display mode.

- **Mode**:

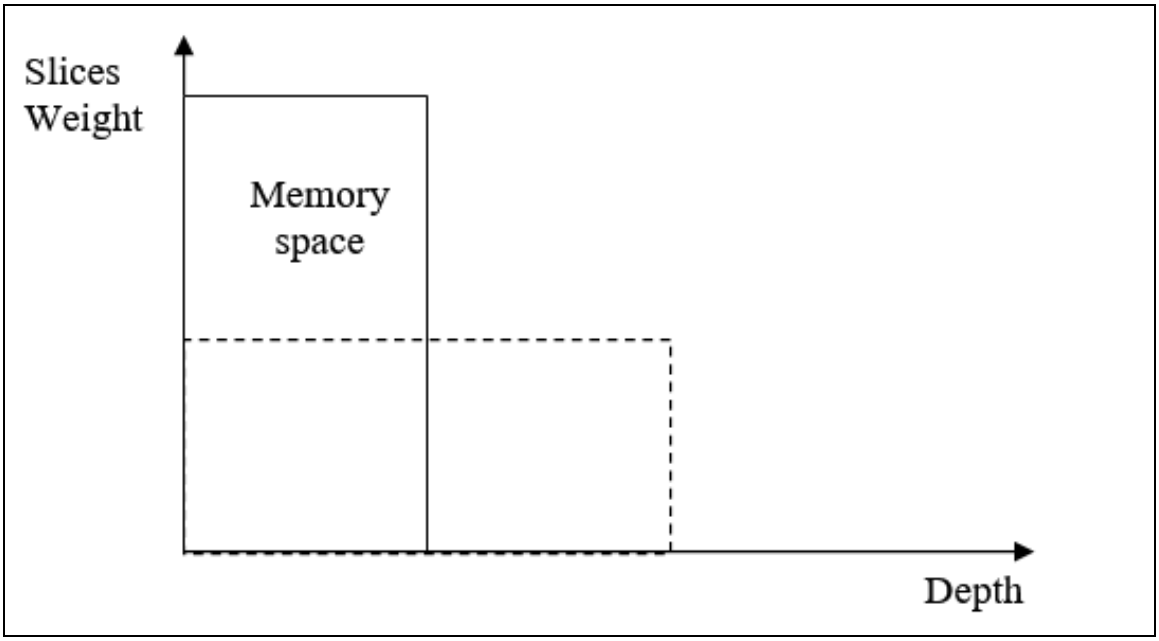
Off: the Waterfall is inactive. This mode is useful to check your signal and your settings before the analysis.

One shot: the Waterfall is active between ?start? and ?stop?, there?s only one acquisition (for example: coast downs or run ups). The Waterfall ends on stop or when the number of slices is full.

Continuous: this mode memorizes the n last slices (selected number of slices) before the stop event. This mode is similar to the ?time to stop? mode of the recorder. This mode is different from the monitoring; the continuous mode is storage of measurement (for example: detection of ultimate strain).

- **Number**: the number of Waterfall slices (from 2 to 100 000). If the Waterfall trigger is a Delta RPM event, the "Event number" of this Delta RPM event is assigned to the number of Waterfall slices.

The waterfall depth is managed automatically, allowing the user to get the larger slices/points number depending on the current available physical memory on the PC running NVGate. This functionality protects waterfall or profiles acquisition from memory overloads. That means the depth of the Waterfall is a function of slices weight (which depend on the type of analysis).



The area is fixed. If the slices weight are important, then the depth would be small.

The area is function of the free memory space available when you select to use the Waterfall. The memory space has to be exactly the same during all the measurement that means the measurement could hang if you start another application on your computer during the measure.

The acquisition/display and save memory usages are managed separately and are sequenced. It result a larger of data managed by the waterfall and secured acquisition.

NVGate takes advantage of 64bits PC memory (> 2 GB) for larger memory allocation for the Waterfall. As NVGate remains a 32-bit application, PC memory is not used above 4 GB.

The following table summarizes the evolutions of the waterfall depth (for a given configuration: 32 ch 3,201 lines and PC):

For example a waterfall of 32 ch 3,201 lines handles up to:

PC configuration	Slices
XP 32 bit 2GB RAM	260
Win7 64 bit 4GB RAM	640

NB: In the stand-alone mode, the depth is limited (about 3 million samples per DSP) due to the analyzer memory size.

Notes:

- **OVA**: if the waterfall trigger selected were « OvA Leq result available », the slices number would depend on durations (average duration « T » and short duration « t ») from the sub module Average in Overall acoustic.

Average type	Slices number
short Leq (t)	T/t
short Leq 1/8s	T/t
short Leq 1s	T/t
Linear, with repeat = End Of Averaging	T
Linear, with repeat != End Of Averaging	Independent

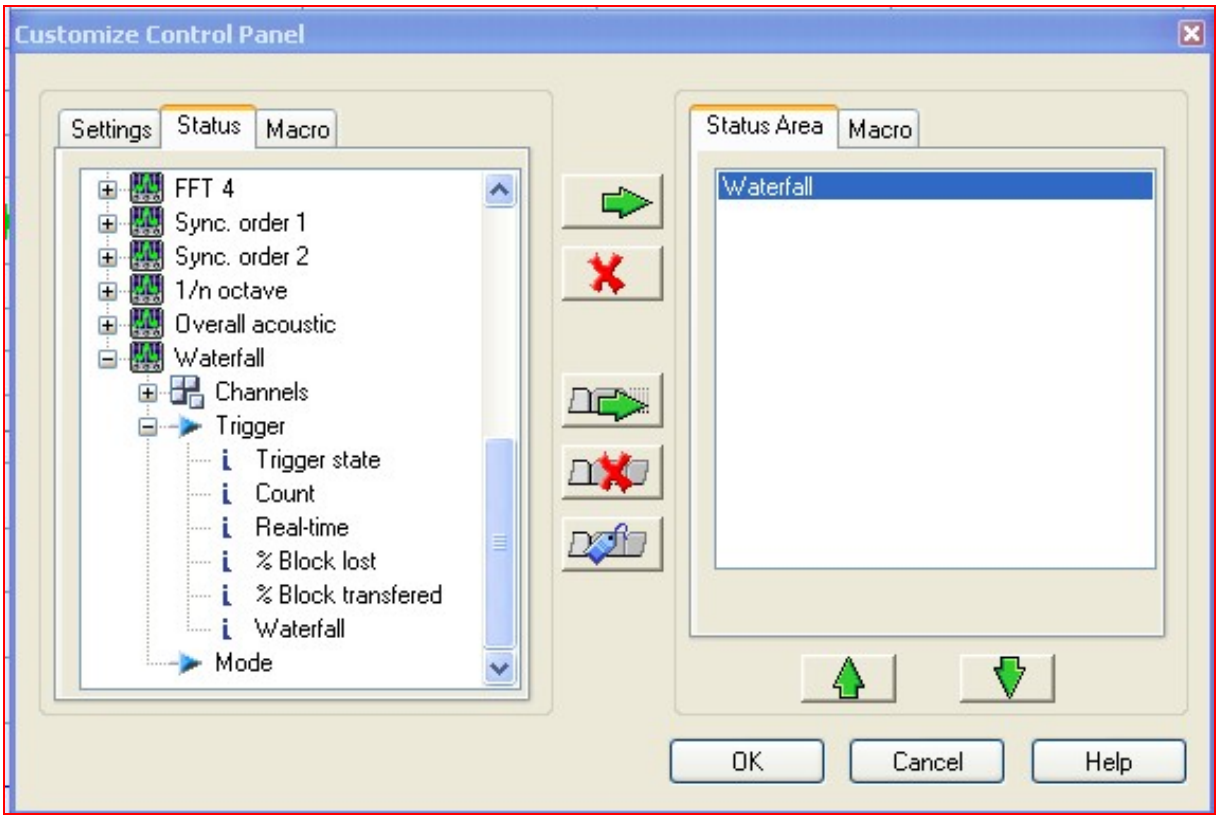
- **1/N Octave**: if the waterfall trigger selected were « Oct result available », the slices number would depend on durations (average duration « T » and short duration « t ») from the sub module Average in 1/N Octave.

Average type	Slices number
Linear, with repeat = End Of Averaging	T
Linear, with repeat != End Of Averaging	Independent
Repeat	T/t
Exponential	Indepedent
Constant BT	Independent
short Leq 1/8s	T/t
short Leq 1s	T/t
Fast	Independent
Slow	Independent
Impulse	Independent

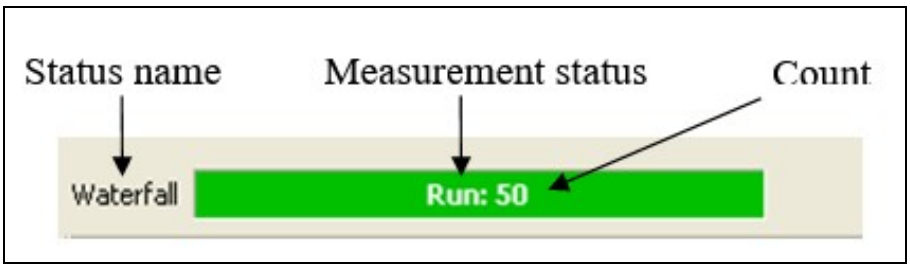
The on line display uses more power and could slow displays but acquisitions and analyses remain real-time.

147.5 Waterfall status

All statuses are available to add to the control panel



147.5.1 Waterfall



The current plug-in status is synthesized in a special progress-bar. This status bar is automatically displayed in the ?control panel? when the plug-in is active (i.e. as soon as at least 1 input is connected to the Waterfall plug-in). This status is called ?Waterfall? and it is available in the status ASB tree (see customize control panel).

This status displays the slice number acquired in the waterfall, the plug-in state (Run, Paused or Stop) and the real-time status.

The way the status bar is displayed, depends on the mode selected:

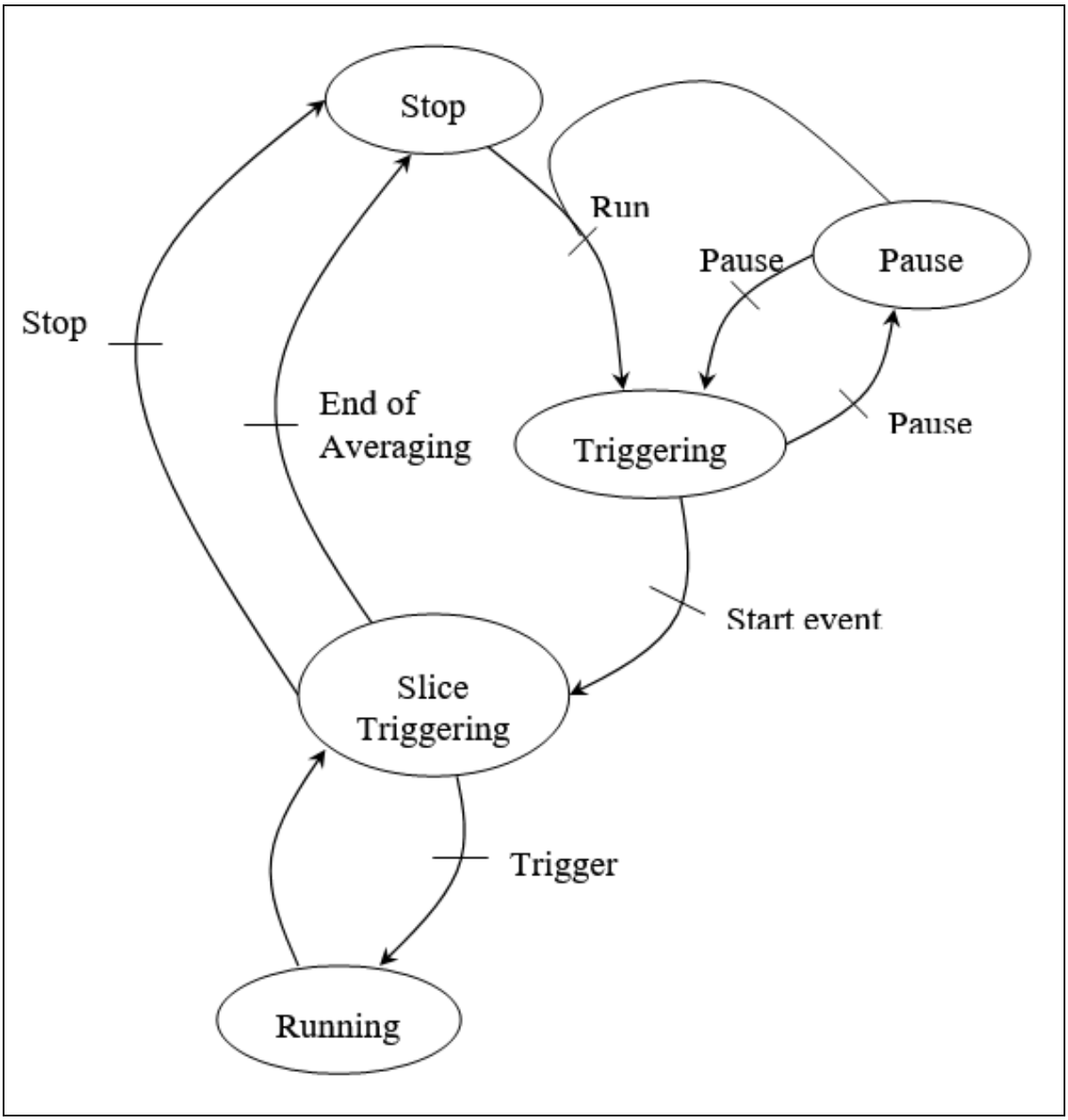
- ?One shot? mode: the progress bar is filled from left to right.
- ?Continuous? mode: the progress bar is filled from right to left with flashing until the end of the acquisition.
- ?Off? mode: the progress bar is empty with the text ?Off? inside.

The color of the bar and of the writing let you know what happens during the acquisition:

- *Green background and white or black text*: acquisition in real time.
- *Red background and white or black text*: the current acquisition is not real time.
- *Green background and red text*: the current acquisition is real time, but a previous acquisition was not real time.

147.5.1.1 Trigger State

The following scheme describes the different states of the measurement:


Stop
Run
Pause
Pause
Stop
End of
Averaging
Triggering
Pause
Start event
Slice
Triggering
Trigger
Running

By default the trigger state is on ?Stop? and waiting for a ?Run? (start or trigger). Then the state become ?Triggering? and is waiting for a start event, the states become ?Block Triggering? and is now waiting for a trigger event for being in the ?Running state.

The state is ?Stop? after a stop event or at the end of averaging.

147.5.1.1.1 Count

This status displays the averaging count, that total number of slices already acquired.

147.5.1.1.1.1 Real-time

This status displays if the averaging is in real-time or not (i.e. the current block is analyzed or not). If the corresponding signal were not available at this time, the acquisition is not real-time. That means that the treatment is longer than the acquisition. There are three values for this state:

- **?OK?**: The acquisition is real-time.
- **?No?**: One previous acquisition was not real-time.
- **?-?**: The acquisition is currently not real-time.

147.5.1.1.1.2 % Block lost

During an acquisition, results are stocked on the analyzer DSP in a buffer storage (limited to 4 MSample per DSP). If the depth of the waterfall is larger than this, then the PC must empty this buffer storage during acquisition (then the PC can store more results). The DSP to PC transfer takes place as soon as the waterfall acquisition starts depending on connection status (stand alone, poor quality). This process continuously empties the DSP memory. A block is lost if the DSP to PC transfer is not able to get it before the DSP memory is full.

In ?one shot? mode and for depth smaller than X the acquisition is preferred to the displaying, i.e. the display takes place at the end of acquisition

In ?continuous? mode or for depth larger than X, the displaying is preferred to the acquisition, in order to quickly see any changes during the measurement, some blocks may be lost.

147.5.1.1.1.3 % Block transferred

This status displays the percentage of block that the PC could have recovered from the DSP buffer storage.

Note that: %Block lost + %Block transferred = 100%.

147.6 FAQ

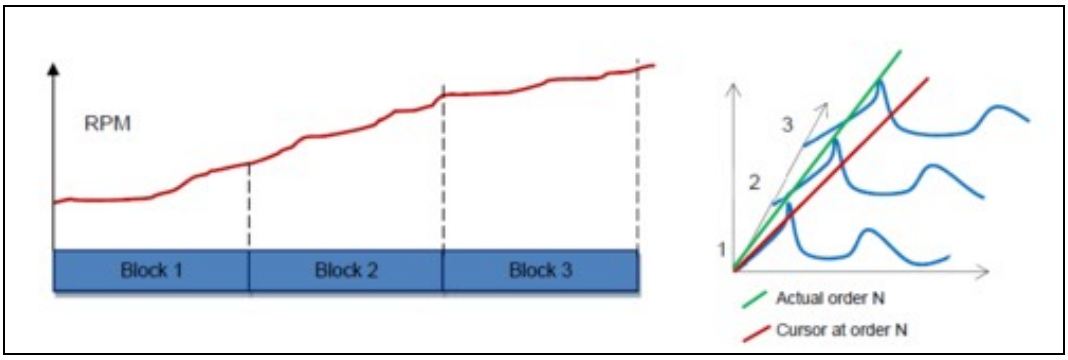
147.6.1 FFT1 Tach vs EXT synch tach

What?s the different between Ord1 Tach. and Tach.Ext Ang speed?

The waterfall and profile provide new capabilities that improve readability and accuracy: Tachometer centered on FFT/SOA blocks.

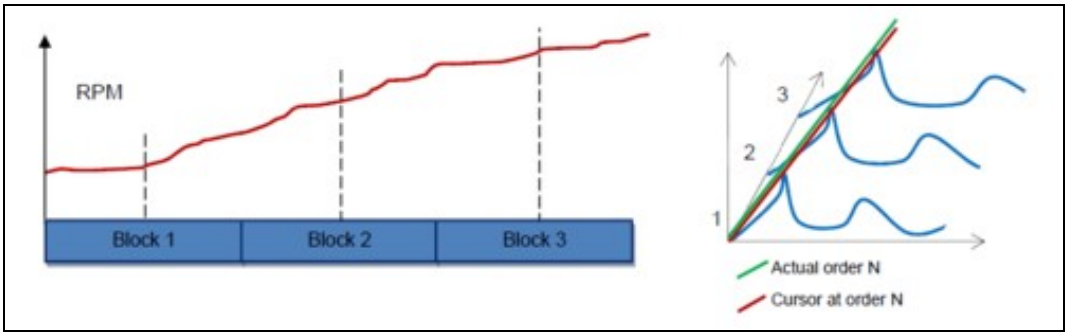
This allows centering tachometer speed at the center of the FFT/SOA trigger block(s). It is useful with long trigger blocks (High resolution analyses) to perfectly match the actual data with the order cursor or section.

With classical tach (ext tach angular speed): The RPM is collected at the end of the analysis block.



This situation leads to an offset in the waterfall calculation of the orders (cursors, sections). For a run up, as the angular speed is over evaluated, the order calculation is lower than the actual ones.

With centered tach (FFT Tach or ORD Tach): The RPM is calculated as the average speed during the block duration to be synchronized with the analyzed data.



With the centered tachometer, the orders calculations match more accurately the actual orders in waterfall. The computation of the angular speed takes in account the averaging, triggering and overlap used in the plug-in. The centered speed is calculated as:

CT = (RPM (end of block) + RPM (begin of block)) / 2

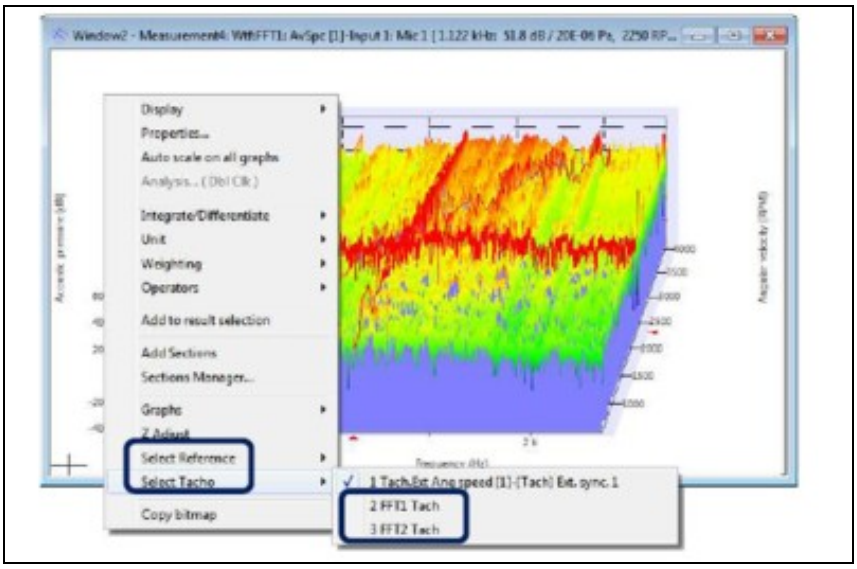
The RPM centering and averaging is done in the analysis plug-in prior to be connected to the waterfall. To use the centered tach simply add the said tachometer to the corresponding plug-in (FFTn or SOAn). These additional tachometers are available in the waterfall as soon as one of the result of the plug-in is added to the waterfall.

1. Add Tach to the Plug-in,

2. Add plug-in results (Spectra, orders, etc..) to the waterfall,

3. Display the waterfall,

4. Select the Plug-in Tach, as a tachometer and reference


Display
Properties...
Auto scale on all graphs
Analysis... (Dbl Clk)
Integrate/Differentiate
Unit
Weighting
Operators
Add to result selection
Add Sections
Sections Manager...
Graphs
Z Adjust
Select Reference
Select Tacho
Copy bitmap
1 Tach:Ext Ang speed [1]-(Tach) Ext. sync. 1
2 FFT1 Tach
3 FFT2 Tach

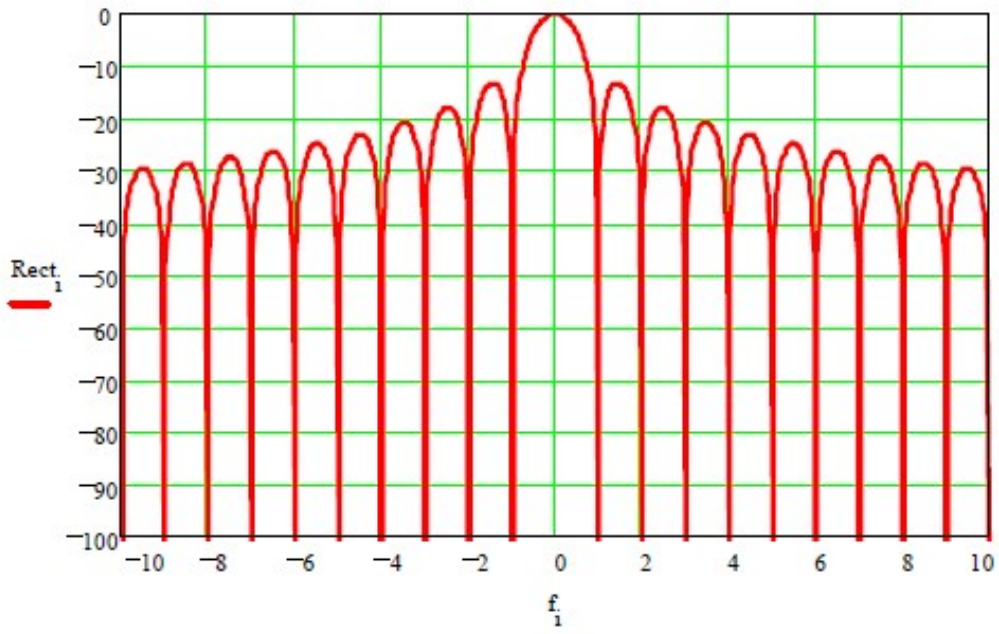
148 NVGate Weighting Windows appendix

148.1 Weighting windows Calculation

148.1.1 Rectangular Window

$a0 := 1 \quad a1 := 0 \quad a2 := 0 \quad a3 := 0 \quad a4 := 0$

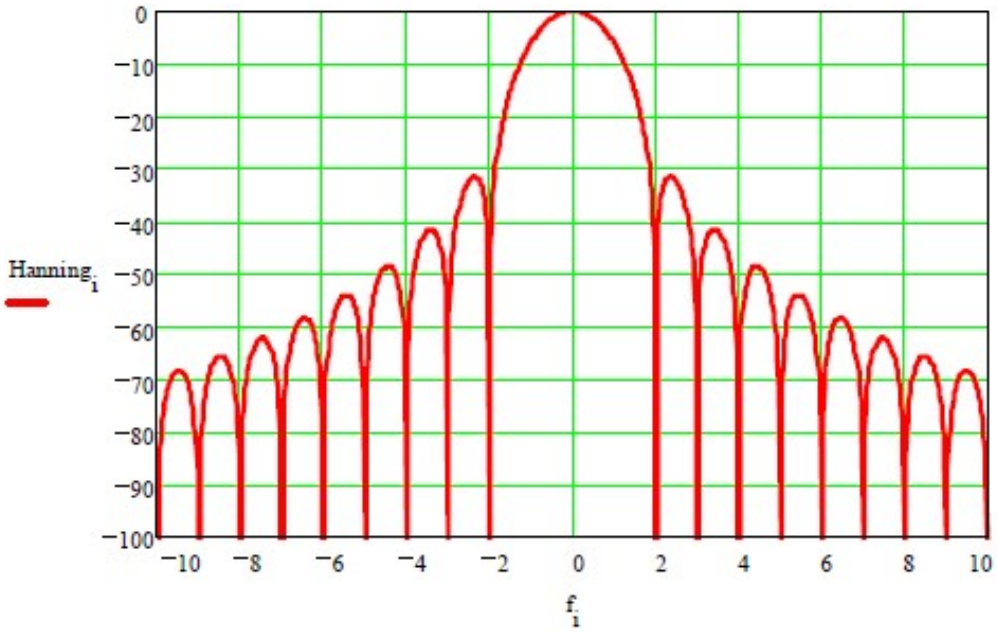
$ENBW := a0^2 + 0.5 \cdot \left(a1^2 + a2^2 + a3^2 + a4^2\right) \quad ENBW = 1$



148.1.2 Hanning Window

$a0 := 1 \quad a1 := 1 \quad a2 := 0 \quad a3 := 0 \quad a4 := 0$

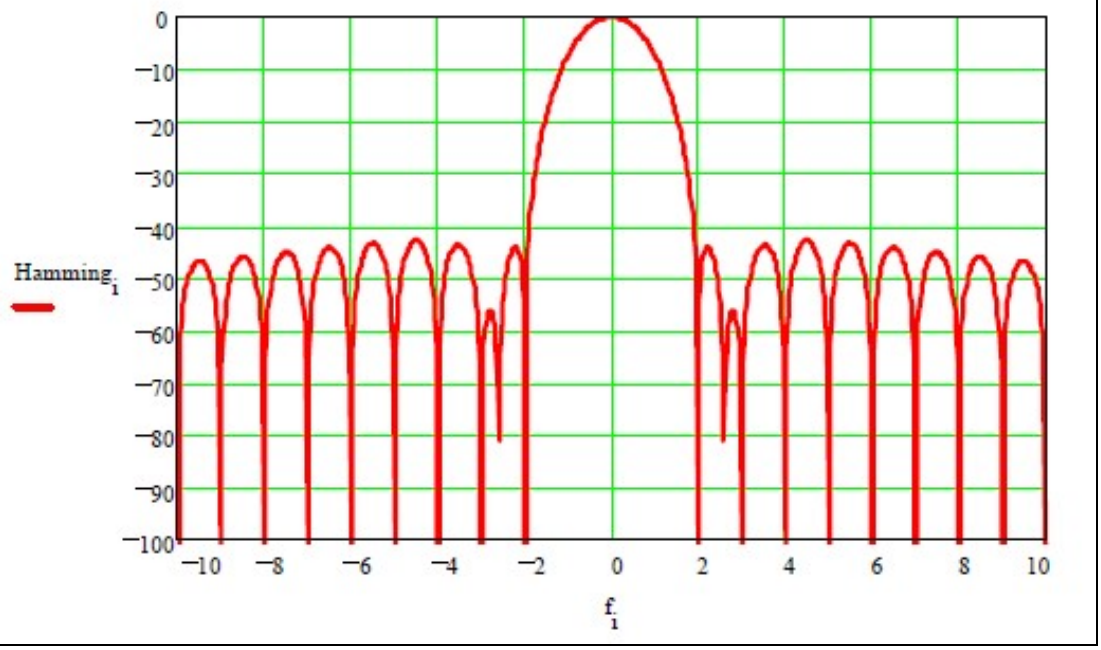
$ENBW := a0^2 + 0.5 \cdot \left(a1^2 + a2^2 + a3^2 + a4^2\right) \quad ENBW = 1.5$



148.1.3 Hamming Window

$a0 := 1 \quad a1 := 0.852 \quad a2 := 0 \quad a3 := 0 \quad a4 := 0$

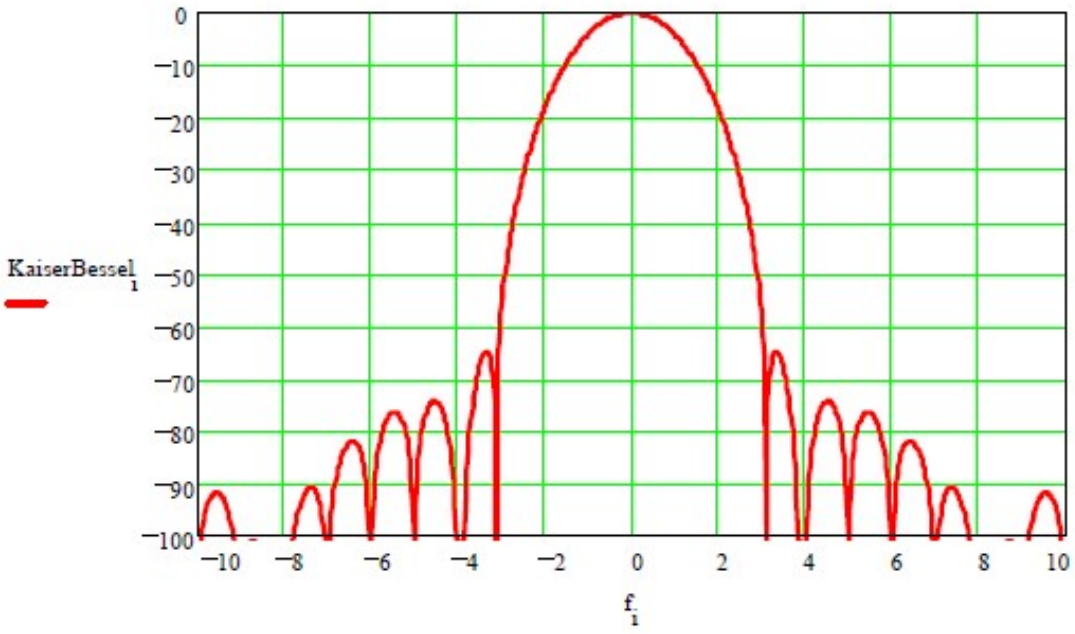
$ENBW := a0^2 + 0.5 \cdot \left(a1^2 + a2^2 + a3^2 + a4^2\right) \quad ENBW = 1.36$



148.1.4 Kaiser-Bessel Window

$a0 := 1 \quad a1 := 1.238 \quad a2 := 0.244 \quad a3 := 0.002 \quad a4 := 0$

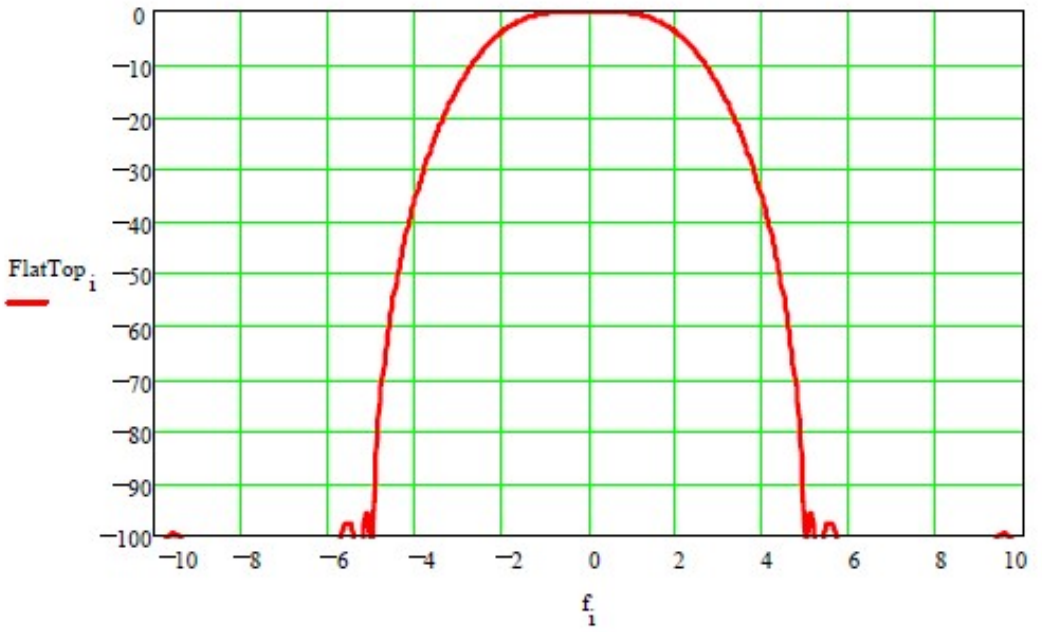
$ENBW := a0^2 + 0.5 \cdot \left(a1^2 + a2^2 + a3^2 + a4^2\right) \quad ENBW = 1.8$



148.1.5 Flattop Window

$a0 := 1 \quad a1 := 1.933 \quad a2 := 1.286 \quad a3 := 0.388 \quad a4 := 0.033$

$ENBW := a0^2 + 0.5 \cdot \left(a1^2 + a2^2 + a3^2 + a4^2\right) \quad ENBW = 3.77$



148.1.6 Exponential Window

The calculation of the damping factor for the exponential window is:

e^{-xi} where $x = \dfrac{-\log(0.25)}{0.25 \times FFT_SIZE}$

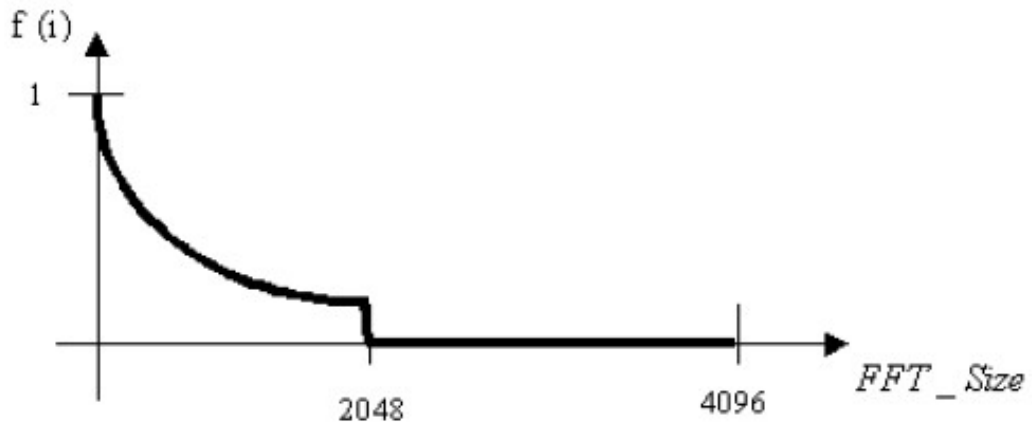
with:

FFT_SIZE = FFT number of samples

i goes from 0 to $\dfrac{FFT_SIZE}{2}$

Example:

If $FFT_SIZE = 4096$, then the exponential is $e^{\frac{-\log 0.25}{0.25 \times 4096} \times i}$ with i equal to 0 to 2048.



Keywords : ENBW

149 NVGate X-Pod: Temperature probe conditioner

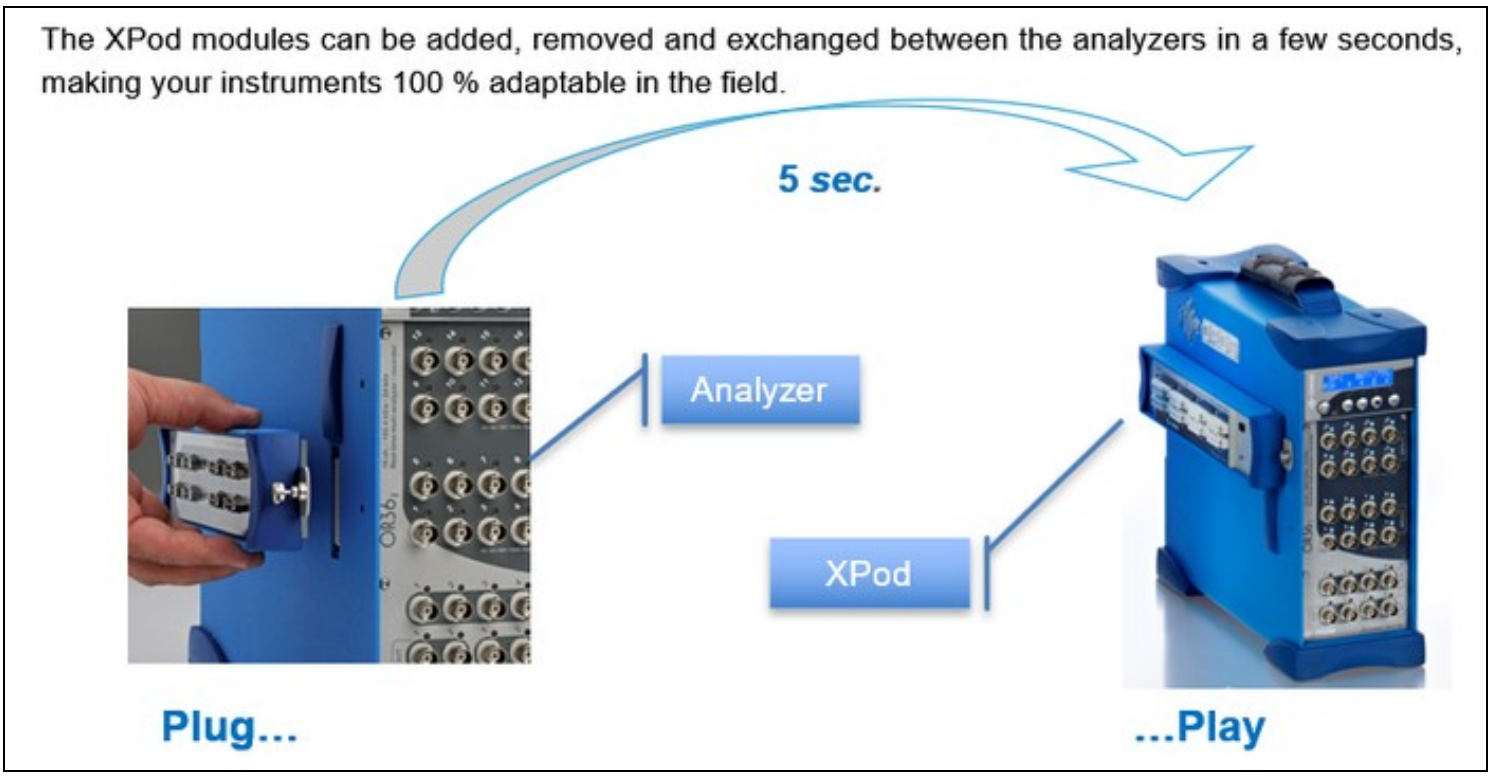
This Xpod handles thermocouples and RTD transducers.



- **PT100, PT1000 and J, K, T, N, E**
- Integrated **linearization**
- Automatic **cold junction compensation**
- Standard flat pin **connectors**

149.1 Expander modules

The XPod is a device that can be fixed on OR3X TW analyzer. Each XPod is associated to a block of 8 inputs.



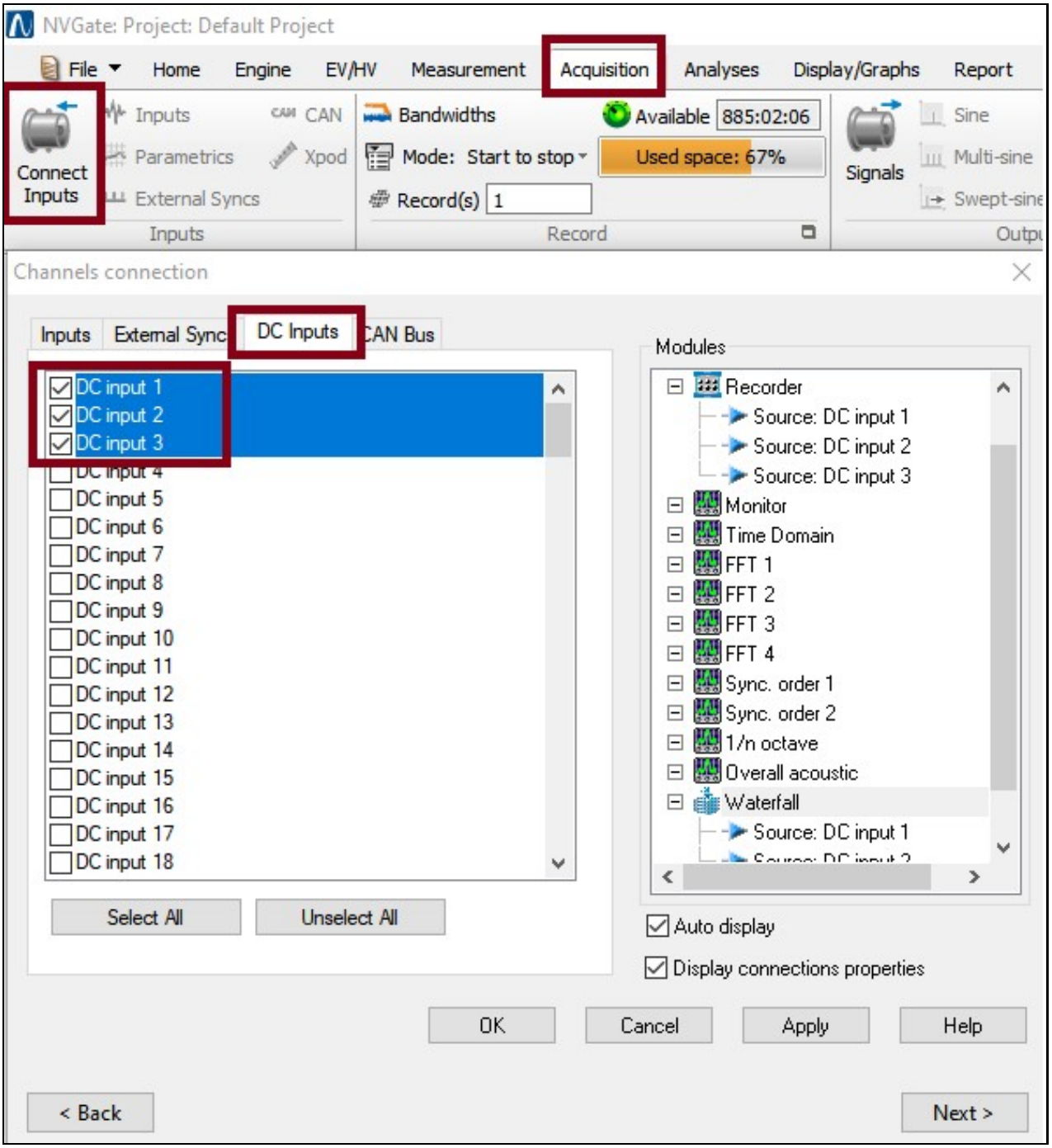
In the connected mode, when an XPod is present each corresponding input can be routed to:

· The BNC input (Standard)

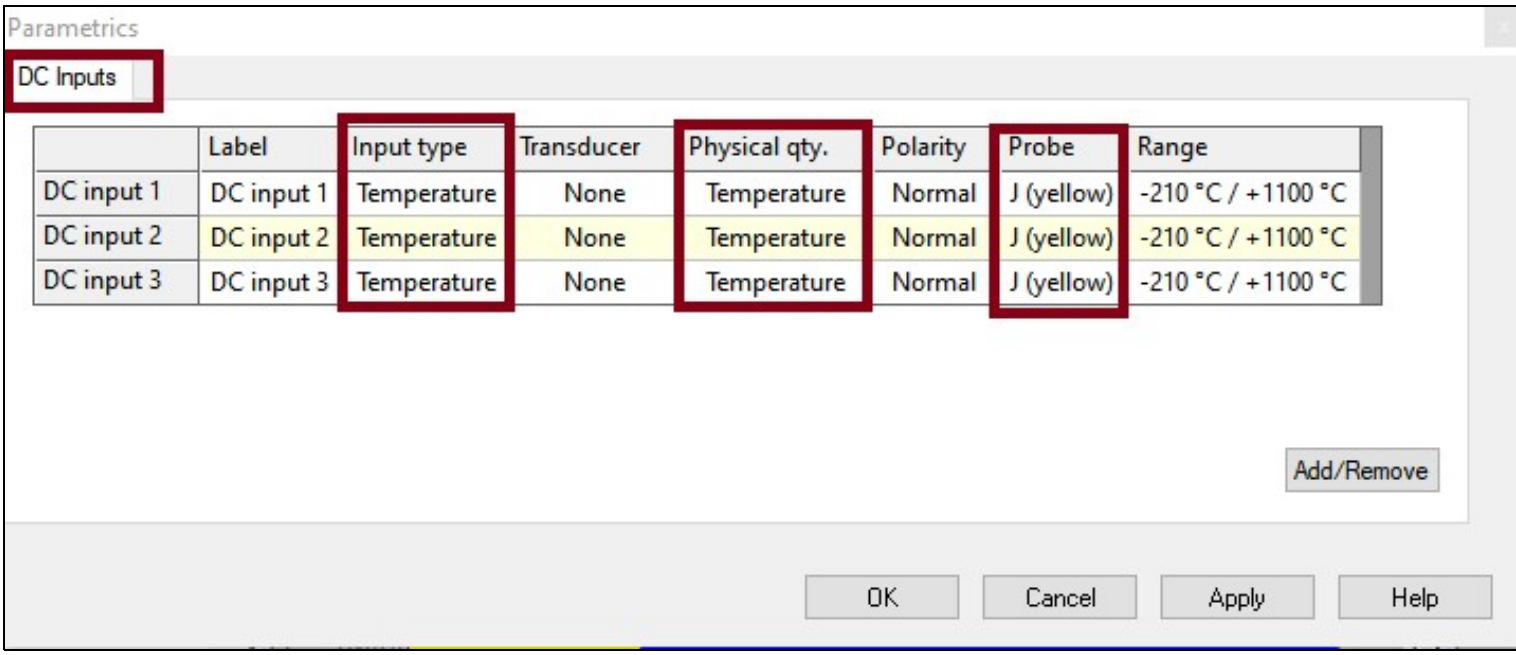
· The XPod connector

149.2 Tutorial

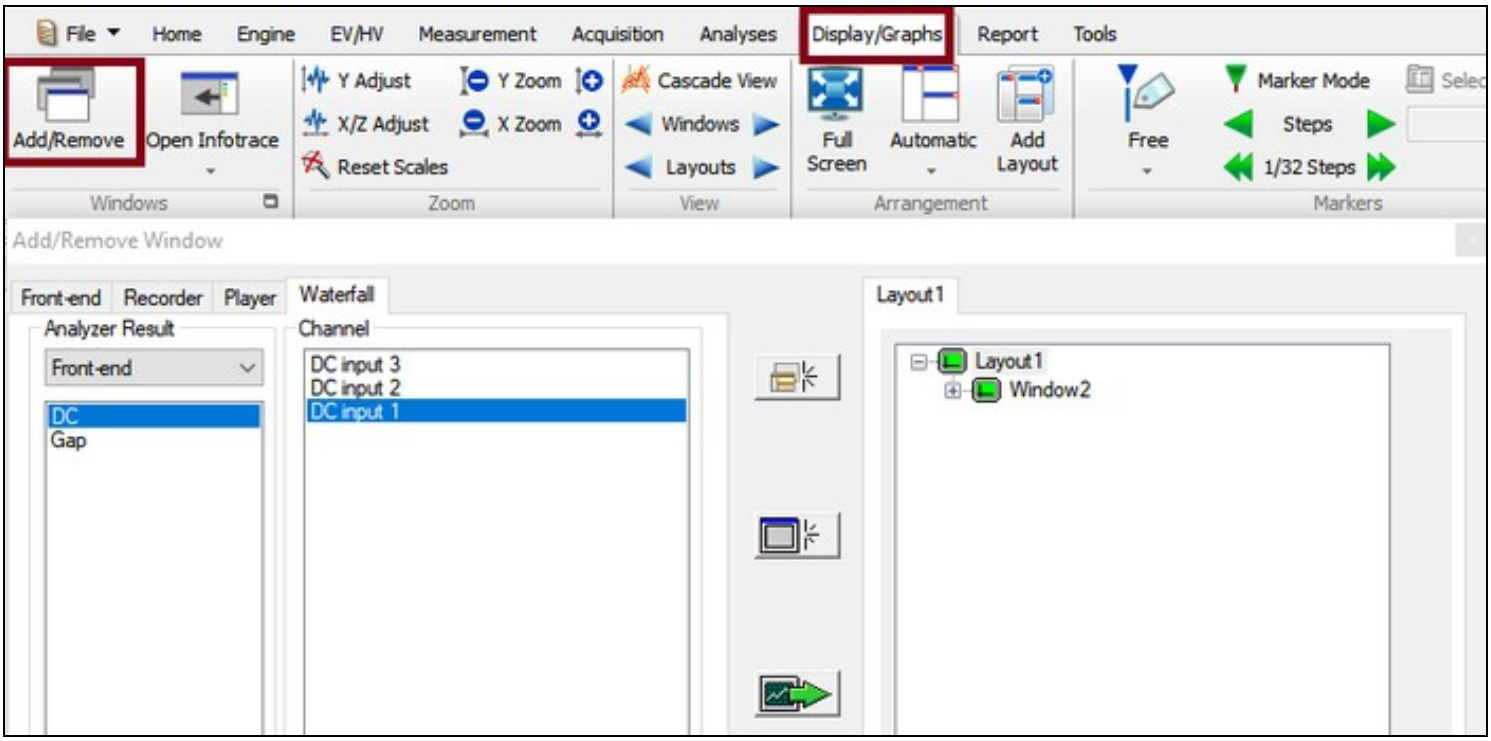
- First connect Xpod to the analyzer and connect your temperature probes.
- Start Analyzer
- Start NVGate
- **Select a DC Input** and put in in a "plug in" (recorder, waterfall (for profile)...)



- On settings, put:
    - "input type" : temperature
    - "physical qty": temperature,the type of
    - **probe**: type of probe that you are using. (range will be automatically set.)



- click on add/remove windows to deal about the display

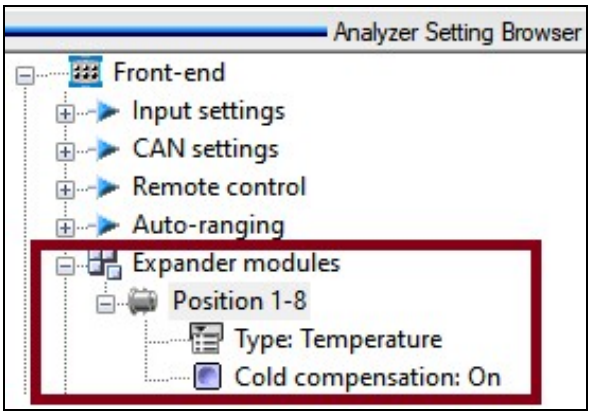


149.3 Settings

149.3.1 General Xpod settings

- **Type**: For acquisition setup preparation, the XPod presence can be simulated in the office mode:

One XPod type selector is available for each XPod position.



- **Cold Compensation**: Enable or disable the internal cold junction compensation for the corresponding active Temperature Xpod. This setting enables the compensation of the connectors metal junction thermocouple voltage at the Xpod side. It uses the Xpod internal temperature measurement (2 locations/Xpod) to correct the measured temperatures.

149.3.2 Input settings

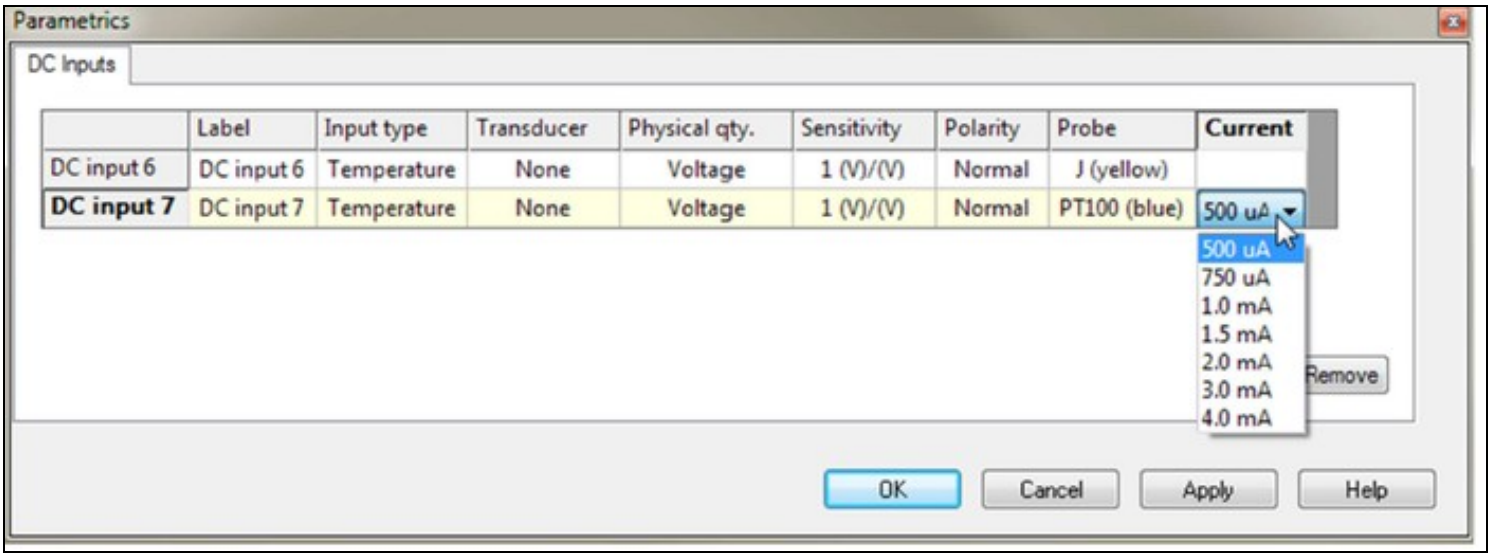
DC Inputs

	Label	Input type	Transducer	Physical qty.	Polarity	Probe	Range	Current
DC input 1	DC input 1	Temperature	None	Temperature	Normal	J (yellow)	-210 °C / +1100 °C	
DC input 2	DC input 2	Temperature	None	Temperature	Normal	K (green)	-200 °C / +1300 °C	
DC input 3	DC input 3	Temperature	None	Temperature	Normal	T (brown)	-200 °C / +390 °C	
DC input 4	DC input 4	Temperature	None	Temperature	Normal	N (pink)	-200 °C / +1200 °C	
DC input 5	DC input 5	Temperature	None	Temperature	Normal	E (purple)	-200 °C / +800 °C	
DC input 6	DC input 6	Temperature	None	Temperature	Normal	E (purple)	-200 °C / +800 °C	
DC input 7	DC input 7	Temperature	None	Temperature	Normal	PT100 (blue)	-190 °C / +850 °C	2.0 mA
DC input 8	DC input 8	Temperature	None	Temperature	Normal	PT1000 (grey)	-190 °C / +850 °C	500 uA

- Input type : define the X-Pod
- Probe: Define the type of temperature probe connected on the XPod:
    - ♦ Thermocouple : J, K, T, N, E
    - ♦ RTD: PT100, PT1000, PT100 3 wires

For each type of probe the Temperature range is shown in the ?Range? setting.

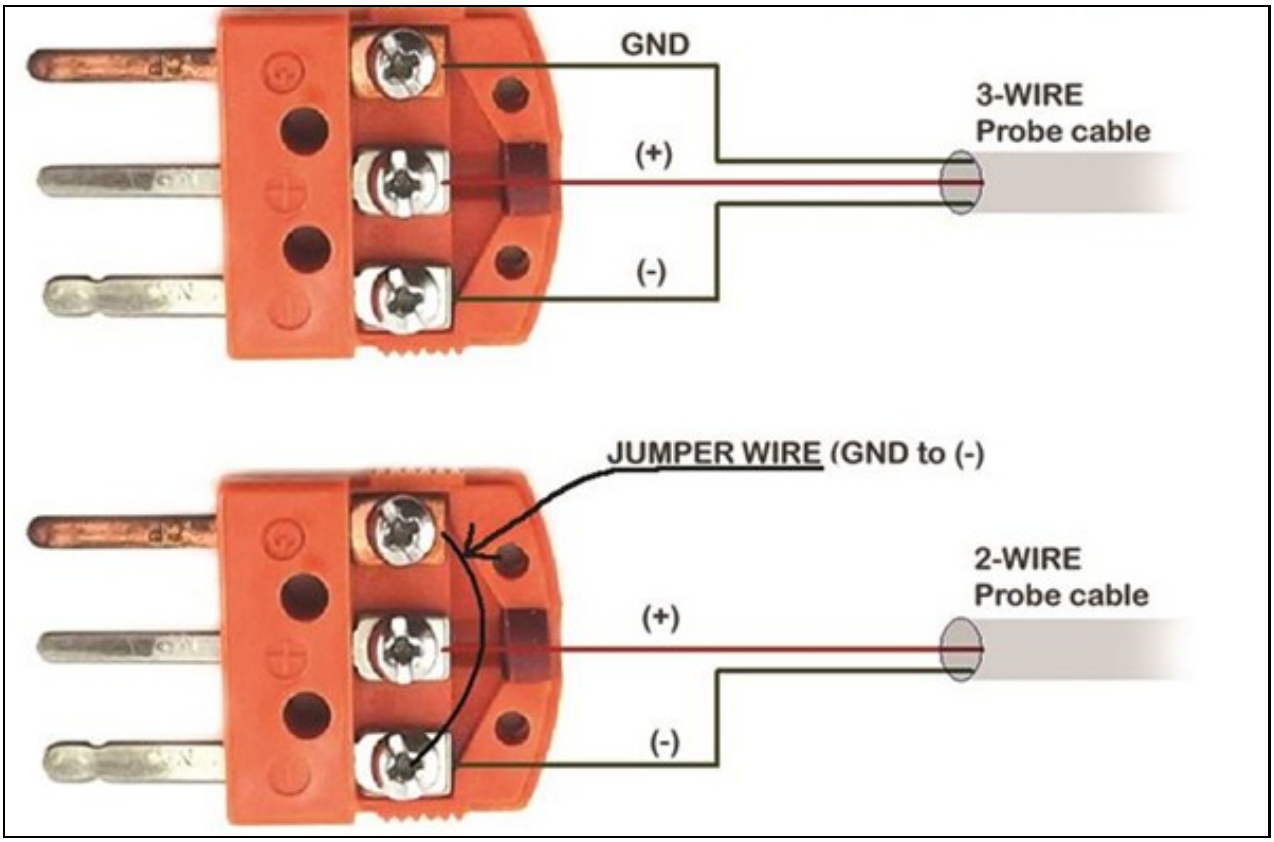
While using RTDs (PT100 PT1000), the applied current can be selected



(the standard is 500 uA)

149.3.3 Sensor Connector

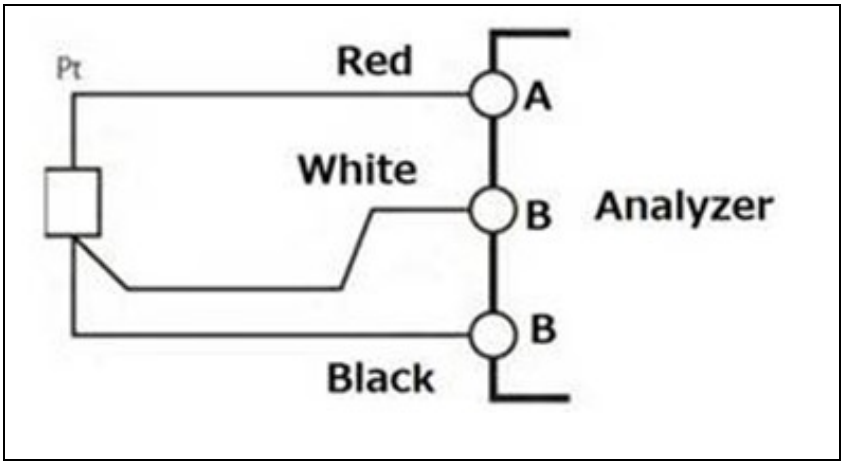
This is a standard connection. If you buy a temperature sensor it is already a cable like this :

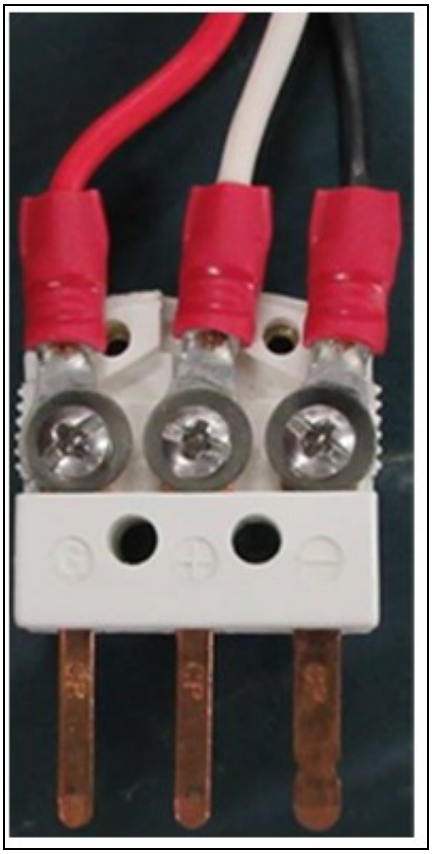


note : for a 2 wire probe the third pin is optional. It is working with a 2 pin connector.

149.3.3.1 ABB PT 100 sensors

Some PT100 sensors have "A B B" indicator and not Gnd, - , + . In this case you need to cable the PT100 like this:





"-" is the "black" cable, the current source. It is the biggest pin.

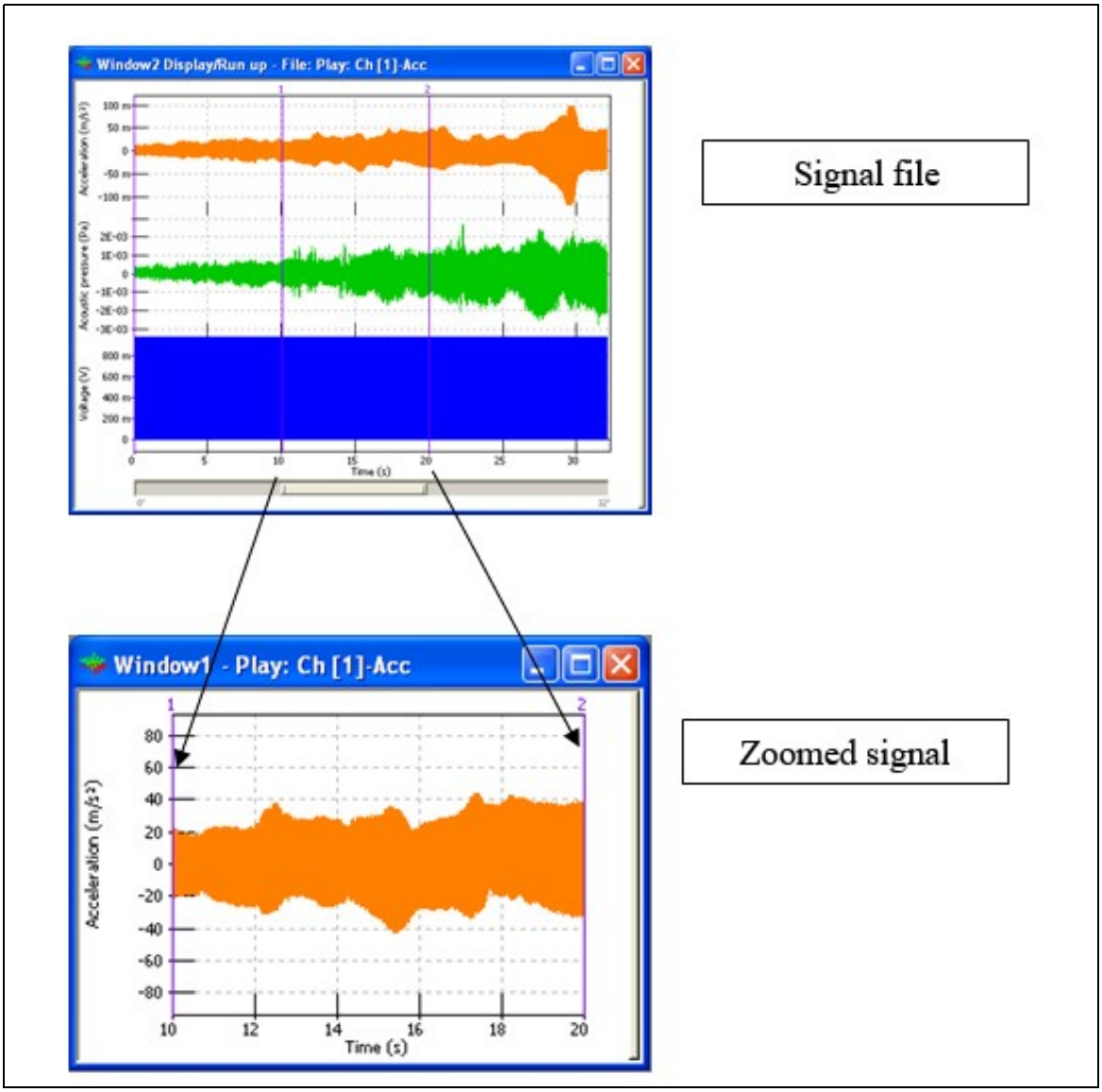
+: is the "white cable" is the point than we measure on the midle pin.

Gnd :(A: red color) is the ground pin.

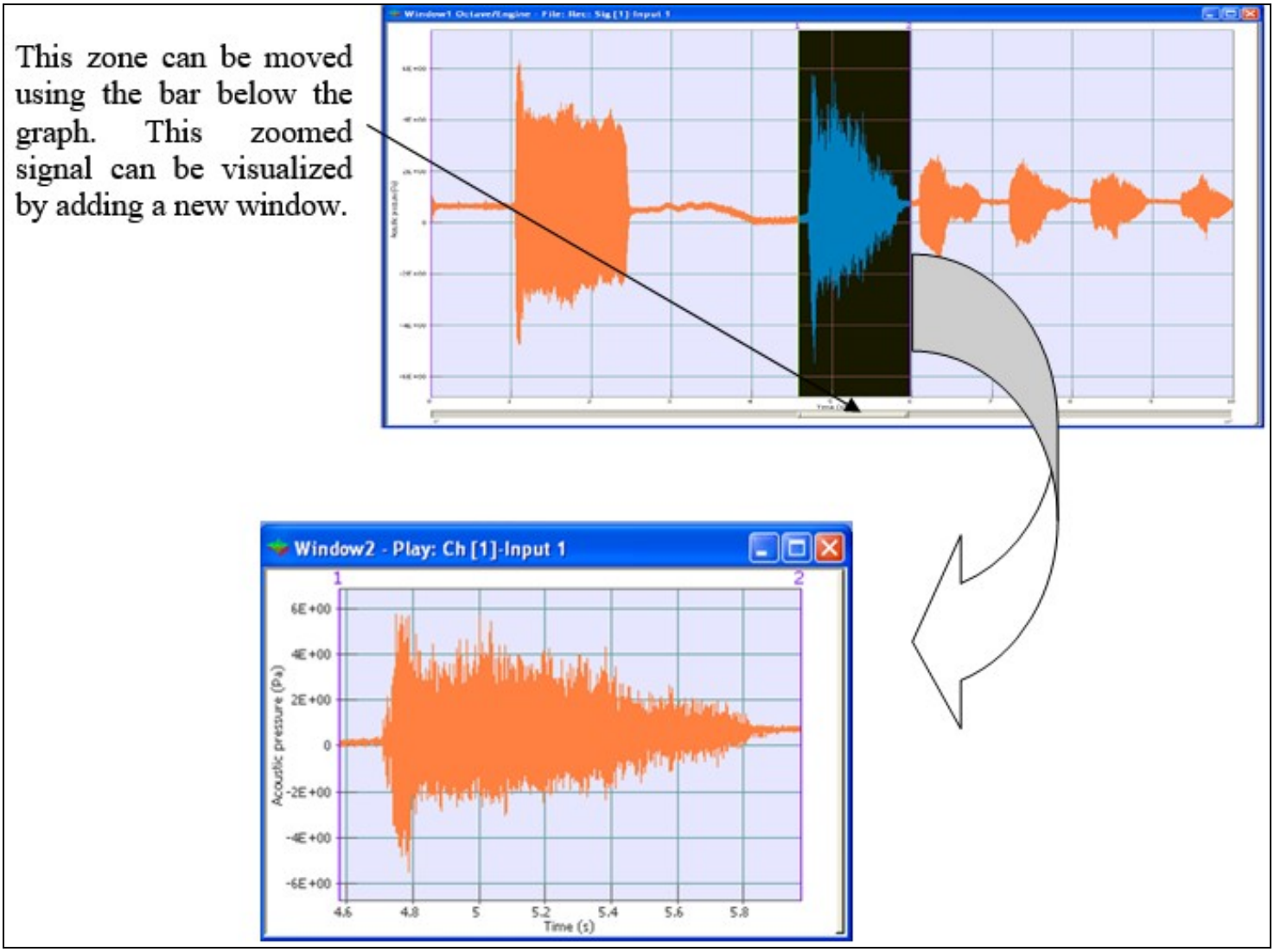
X pod is measuring beetween "+" and "gnd"

150 NVGate Zoomed signal

150.1 Zoomed signal



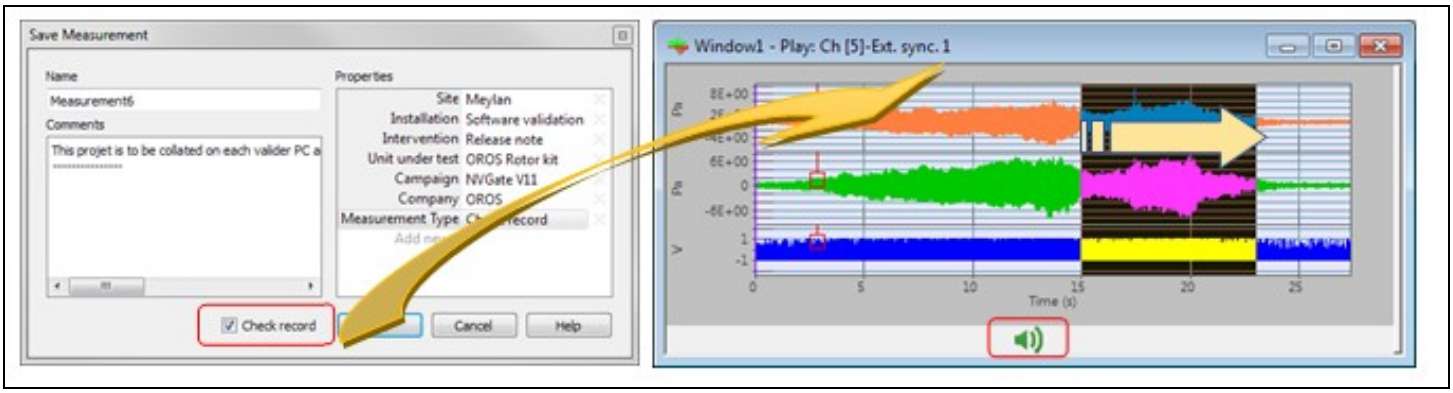
This kind of zoom can be done by ?drag & drop? to the selected zone you want to analyze.



After displaying the zoomed signal, on the recorded signal you can modify your zoom at any time. All changes will be displayed automatically in the zoomed signal as soon as the zoomed zone is modified.

150.1.1 Check record

Check record function is used to **verify the signal data in detail after acquisition**. When NVGate records a signal, the save window displays the zoomed signal view of the saved measurement. The signal is displayed after closing the window with OK.



It is then possible to:

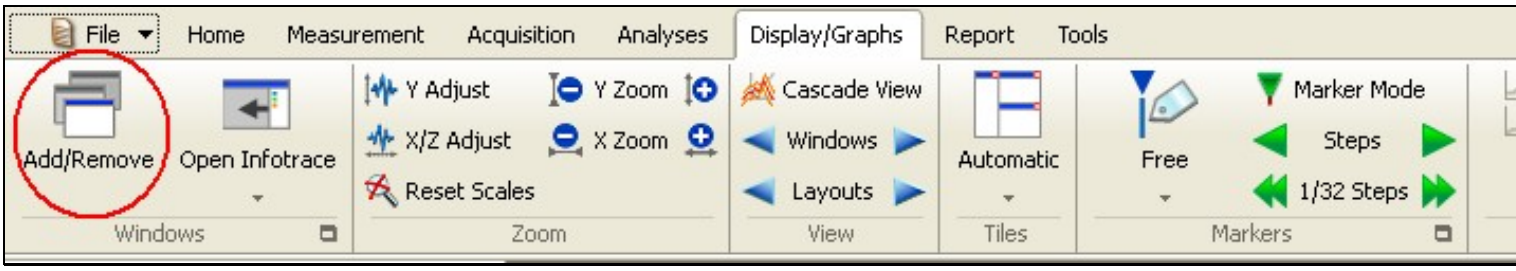
- **Zoom into the signal** by drag & dropping on the graph.
- **Listen to the tracks** through the PC loudspeaker by clicking on the loudspeaker icon. Select the listened track with the up/down arrows.

151 NVGate: How do I

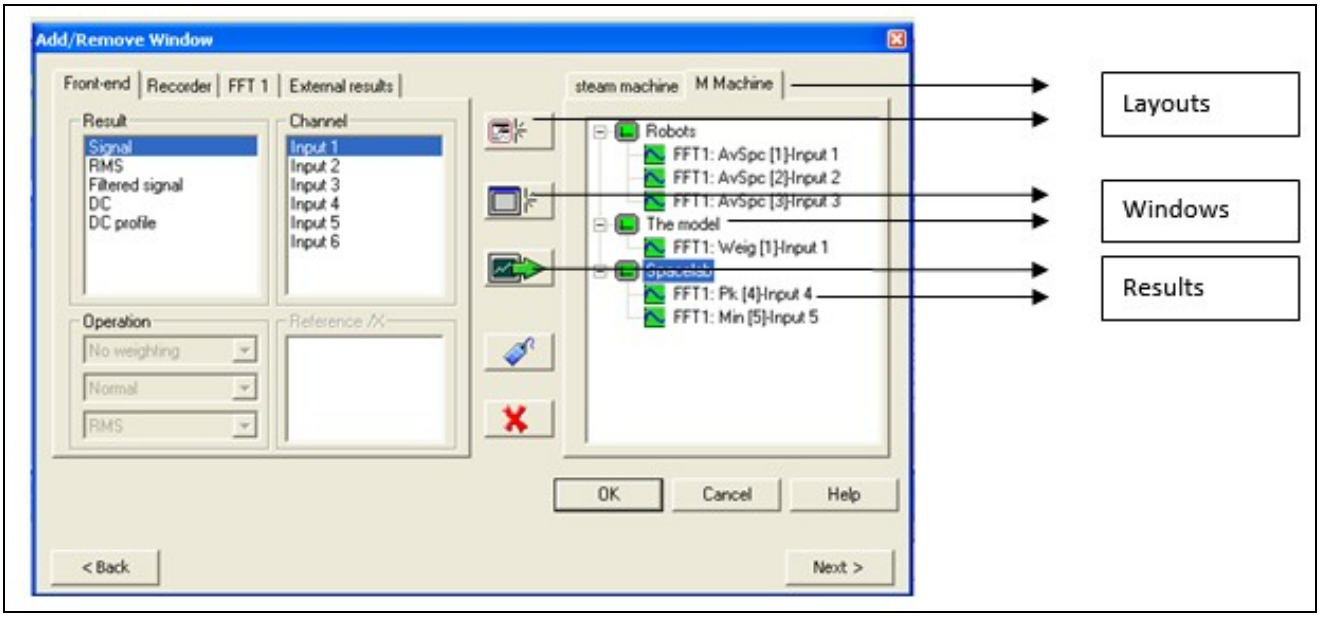
151.1 How do I?

151.1.1 How do I display numerous results?

To display result you have to use this button:



Then the "add/remove" window appears.

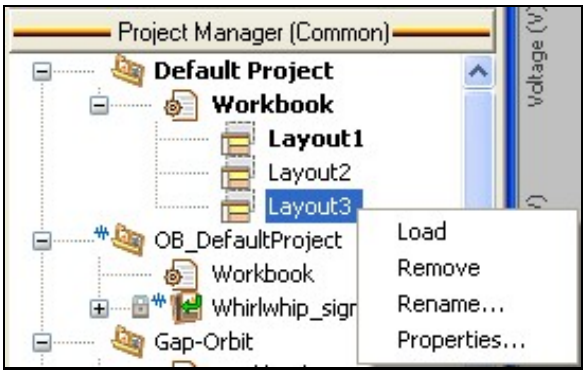


Remember that: the results are stored in windows, and the windows are stored in a layout. You can display results, windows and layouts by using the center buttons. You can see on the right side how the results windows and layouts are stored.



If you click on OK, it will display the active Layout and automatically arrange the windows. Moreover, it?s possible to rearrange the windows by this icon:

And to have a window always on top by clicking on the upper left of the window.
If you want to change to another layout you have to click here, in the Measurement tab:



A layout is linked to a workbook. If you want to cancel a layout you have to right click on the workbook in the project manager.

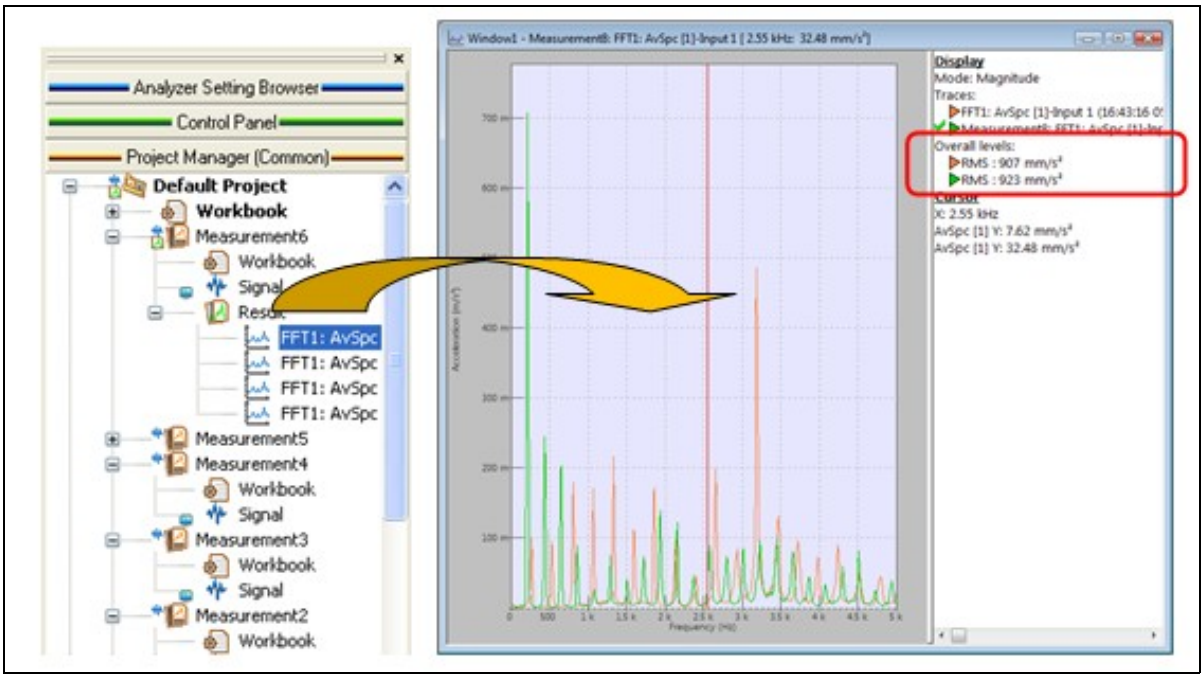
It?s now possible for you to display numerous results by using NVGate®.

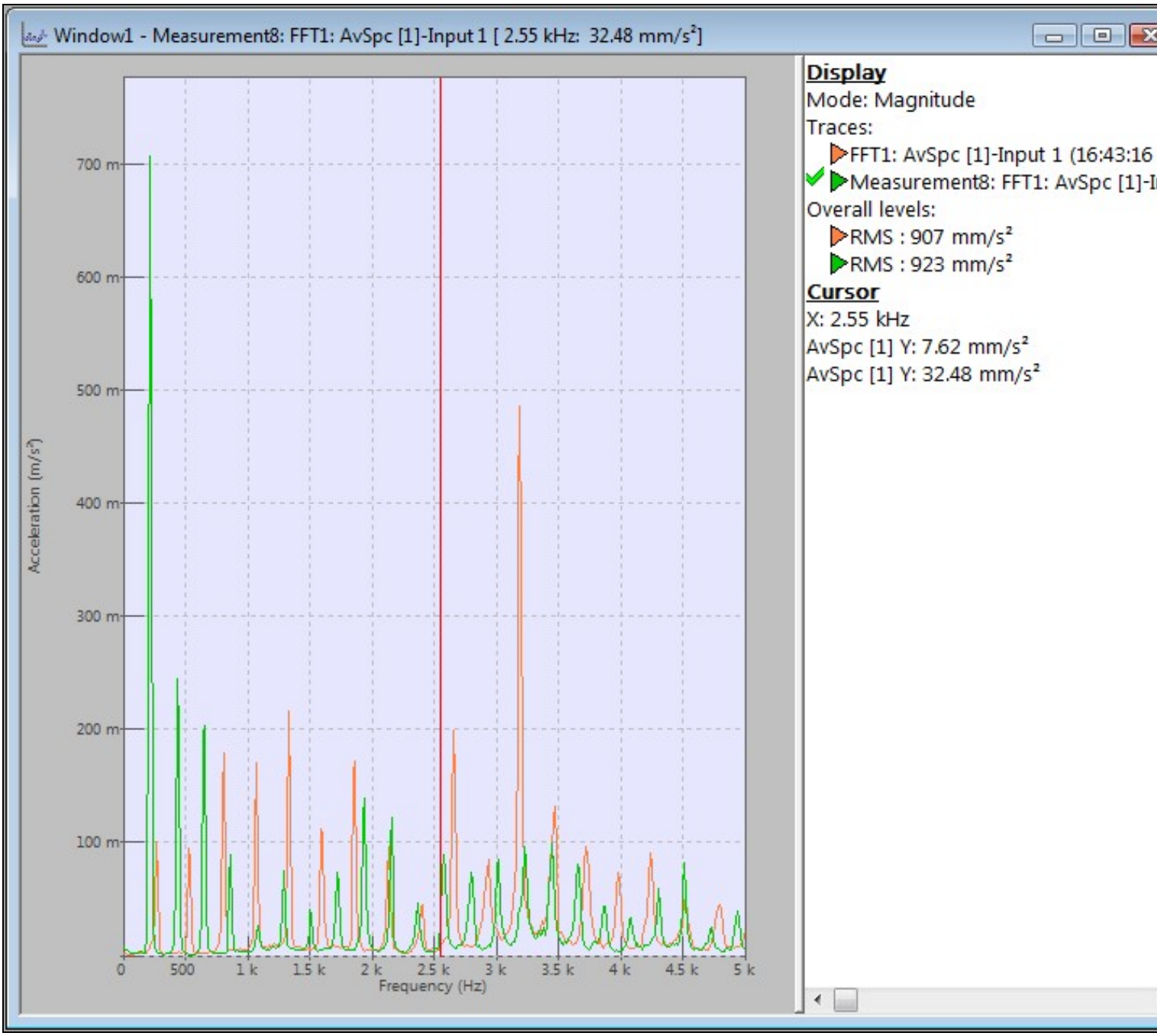
151.1.2 How do I compare current analysis with saved results?

While doing measurements on machinery or device, it is often interesting to compare current acquisition (or post- processing result) with previous measurement results. The goal is then to visualize the differences between the acquisitions in order to see trends or to identify typical defect signature.

This type of operation can be achieved easily with your NVGate software.

First you need to have saved results in your project manager. Then make an acquisition or post-processing of your unit under test noise or vibrations.




Window1 - Measurement8: FFT1: AvSpc [1]-Input 1 [2.55 kHz: 32.48 mm/s²]
Display
Mode: Magnitude
Traces:
FFT1: AvSpc [1]-Input 1 (16:43:16
Measurement8: FFT1: AvSpc [1]-I
Overall levels:
RMS : 907 mm/s²
RMS : 923 mm/s²
Cursor
X: 2.55 kHz
AvSpc [1] Y: 7.62 mm/s²
AvSpc [1] Y: 32.48 mm/s²
Acceleration (m/s²)
700 m
600 m
500 m
400 m
300 m
200 m
100 m
0
500
1 k
1.5 k
2 k
2.5 k
3 k
3.5 k
4 k
4.5 k
5 k
Frequency (Hz)

In order to compare your current analysis with one previous results;

From the project manager, expand the project and the measurement where your results is saved

Click on the result icon and drag & drop it in to the current analysis windows.

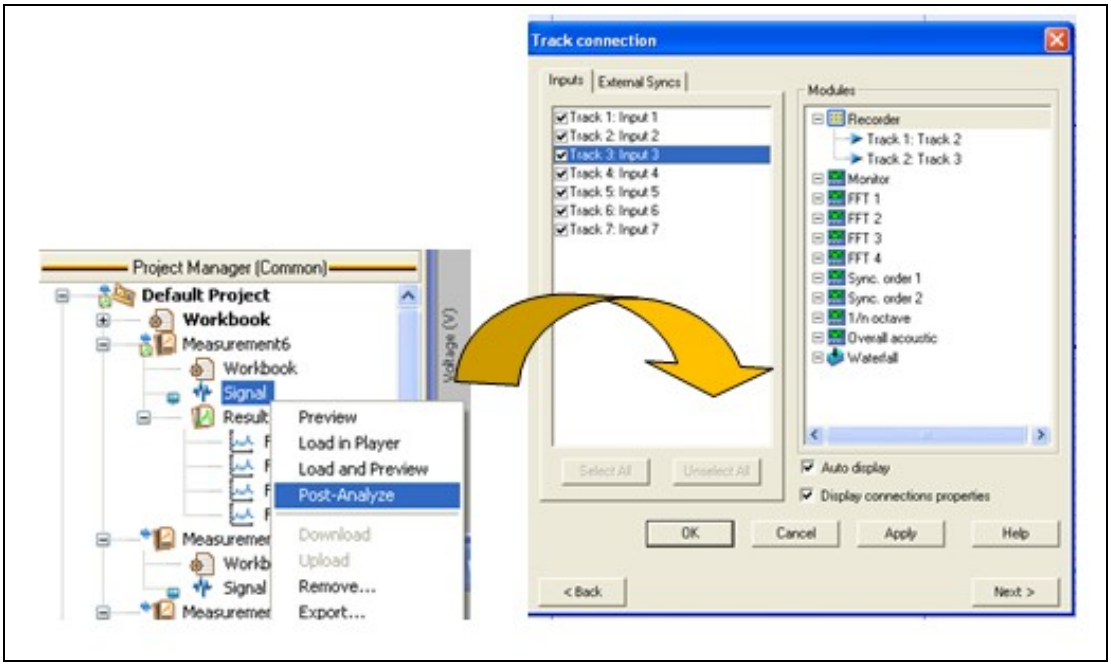
If you want to remove the saved results from the acquisition windows select it as an active trace (use up/down arrows) and press CTRL + DEL in order to remove it. This is also available from the *Properties* contextual menu *Remove trace?* entry.

This feature is also useful for fast simple result comparison.

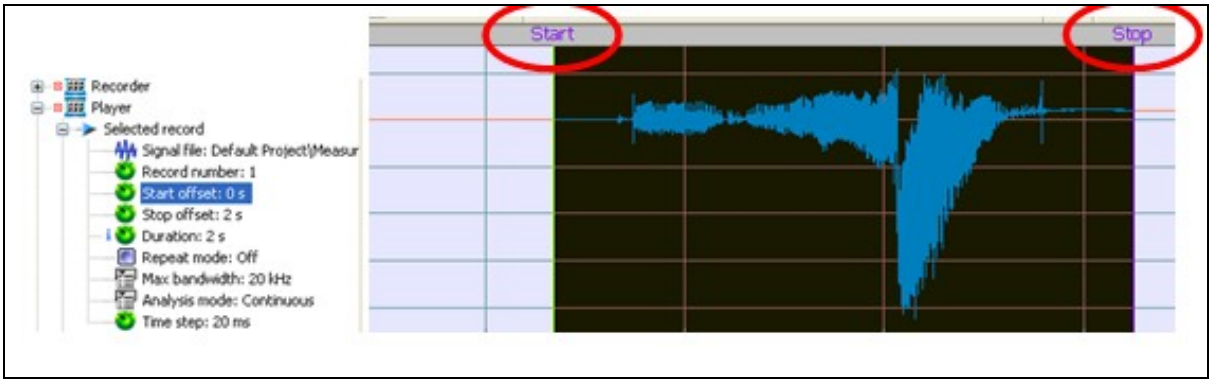
Note: it is possible to achieve the same function from the *Add/Remove?* entry of the *Windows* menu. When the dialog box is displayed, the saved results can be selected and displayed in the acquisition windows from the *Externals results* tab.

151.1.3 How do I split my signal files?

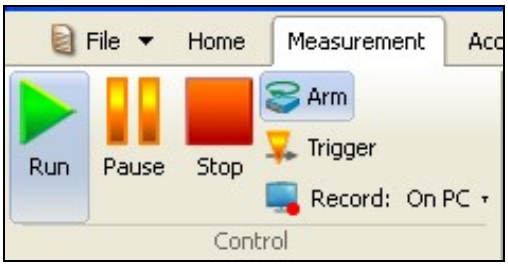
First, you have to post analyze the signal file. The shortest way is to go on the project manager and right click "post analyze" on the signal file. Then you have to put your useful track in the recorder plug-in and click on OK.



Now you have to define the period that you want to re-record by using start offset and stop offset on the player settings or on the graph.



Finally, you just have to click on RUN.

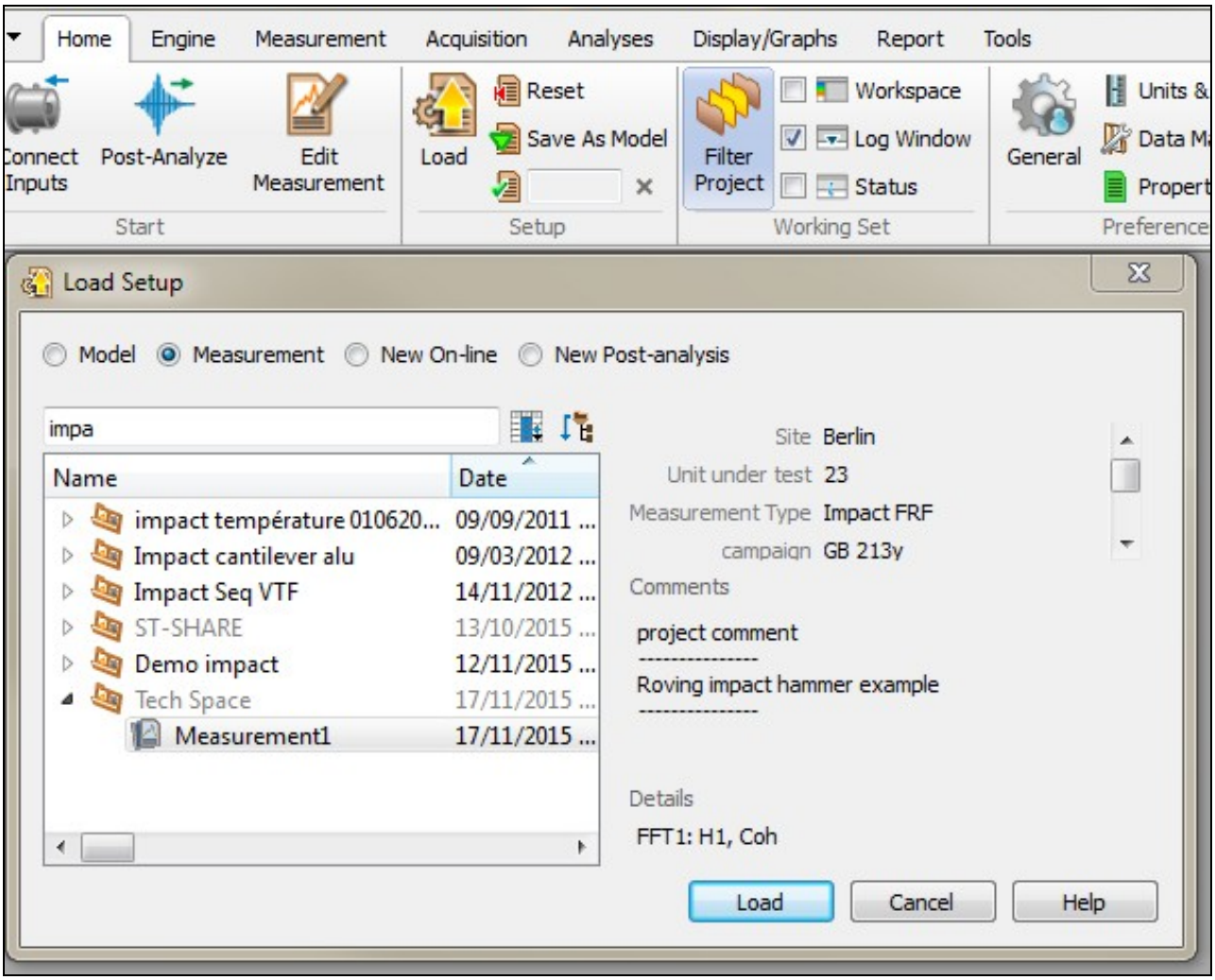


Congratulation, you have split your signal!

151.1.4 How do I perform the same measurement as a previous one?

NVGate manages measurement results into projects. For each measurement there are result (and or signal data) and a workbook. The workbook contains the settings used during the measurement.

You can easily setup again your analyzer to redo measurement with exact configuration as the one of measurement: select "Load setup" from the home tab


Home
Engine
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
Connect Inputs
Post-Analyze
Edit Measurement
Start
Load
Reset
Save As Model
Setup
Filter Project
Workspace
Log Window
Status
Working Set
General
Units &
Data M
Propert
Preference
Load Setup
Model
Measurement
New On-line
New Post-analysis
impa
Name
Date
impact température 010620...
09/09/2011 ...
Impact cantilever alu
09/03/2012 ...
Impact Seq VTF
14/11/2012 ...
ST-SHARE
13/10/2015 ...
Demo impact
12/11/2015 ...
Tech Space
17/11/2015 ...
Measurement1
17/11/2015 ...
Site Berlin
Unit under test 23
Measurement Type Impact FRF
campaign GB 213y
Comments
project comment

Roving impact hammer example

Details
FFT1: H1, Coh
Load
Cancel
Help

Use the filter and/or sort by properties to target the measurement to be reproduced, check your selection from the information on the right side of the dialog and click on *Load*.

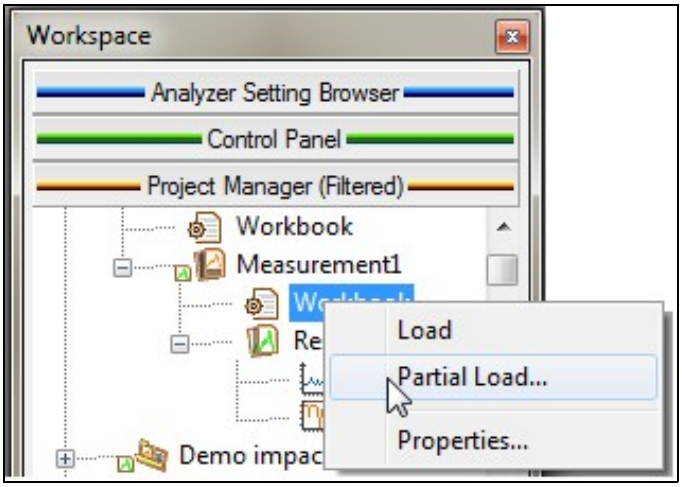
The analyzer will be setup as it was for the selected measurement for

---

- Analyzer setting
- Control Panel
- Layouts
- Save Setup
- Print Setup

It is also possible to partially load configuration by choosing the part to apply again. From the Project manager right click on the workbook of the measurement and select *Partial load*



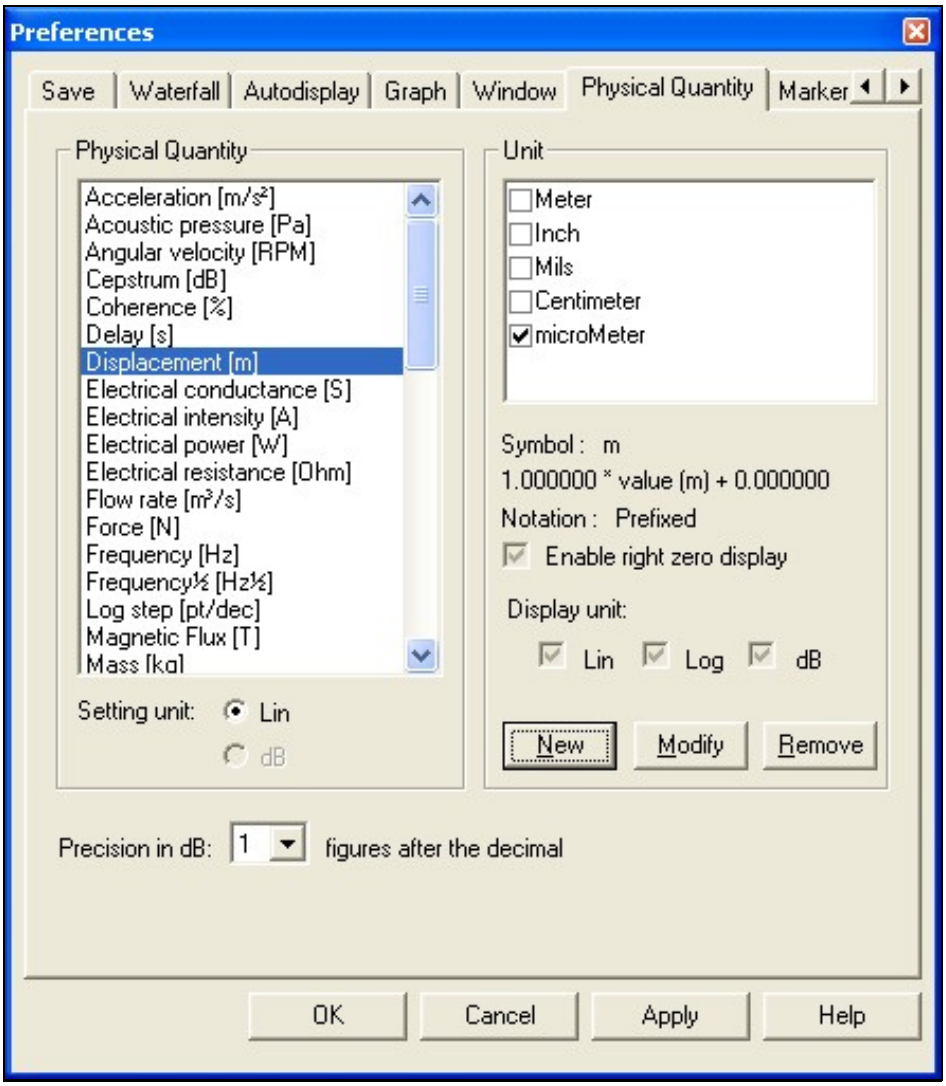


151.1.5 How do I display a trace with different units?

By default, NVGate displays trace using SI unit. For each physical quantity you can select the associated unit.

The association unit to physical quantity is independent for each user. The unit association and definition are located in the *User preferences*.

To modify the used units, go in the Home tab and select "Units & Quantities" in Preferences.





On the opened dialog box select the "Physical Quantity" Tab.

At this stage you may select the desired unit for each physical quantity from the proposed predefined units list. The unit association does not modify your results, all measurement data are saved in SI unit.

How do I create my own unit?

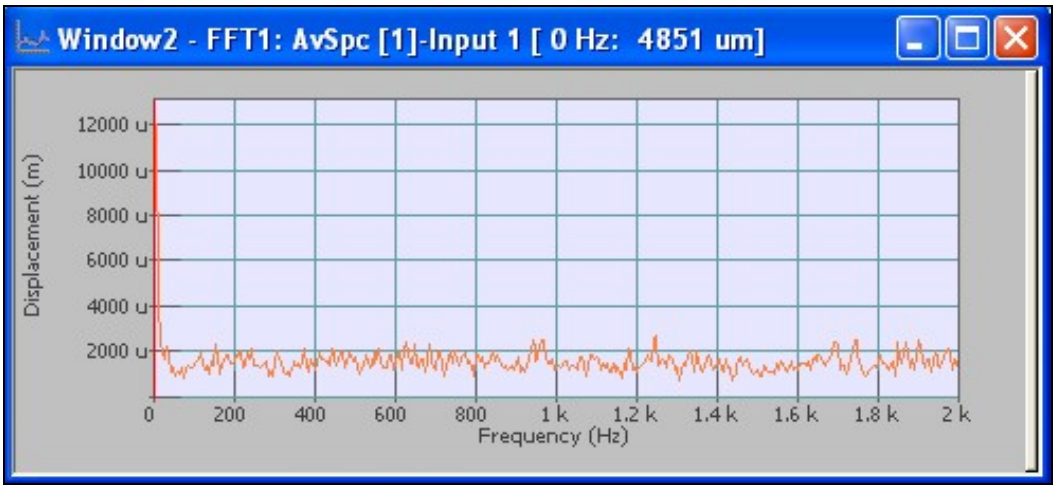
Most units are predefined into NVGate. If the requested unit does not exist in the proposed list, you can create, customize and use your own unit; Select the concerned physical quantity and press "New" in the *unit* area.

From the new dialog box you can define the *name*, *symbol*, *dB reference*, etc?

When all is defined, simply click on "Ok" and select this new unit for the concerned physical quantity.

The unit change are applied immediately to all displayed data current acquisition as well as saved data.

How do I prefix the used units?



By default the units of NVGate® are automatically pre-fixed between pico (E-12) and Gigas (E+9). In the frame of the unit definition you can force the prefix to one (µm for example). Select *Forced* in the *prefix* area and choose the requested prefix, then click "Ok". Then each displacement result displayed by NVGate® will use this unit and prefix:

151.1.6 How do I measure data which with the physical quantity not yet defined?

Despite most of the standard physical quantities are predefined into NVGate®, special requests such as unreferenced physical quantity or multiple units for one Physical quantity may occurs. Into the NVGate® unit management there are 4 additional spare units available. These may be customized to define your own units. For more detail see the reference manual chapter 7

Note: The user preference for unit affects displayed result only. Calculation is always done using the SI unit.

151.1.7 How do I automatically start with my preferred setup?

How do I make sure to get exact setting for each measurement?

Doing daily or weekly measurements, leads to use the same setup basis. As an example, the transducers and their channels affectation as well as the bandwidth are often predefined by your test?s environment. In the same way the analysis setups stay the same for each analysis type (spectra, order

FRF, acoustic profiles, etc.).

Projects load can achieve it, but in this case all the measurements are stored in one project. Using project will save all the setting modifications you?ve made for one specific measurement in your future setup. There is another way to manage predefined setup; the use of models.

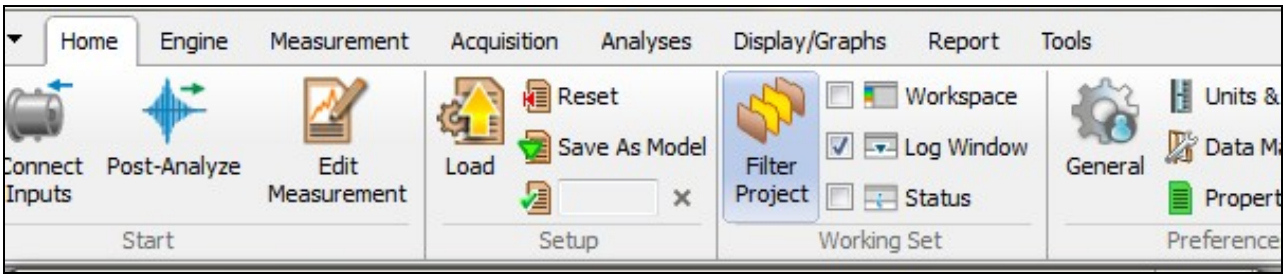
Models are copies of workbook, which content the analyzer and NVGate setup. The difference between workbook and models is that models cannot be changed by setup modification. Whatever the setting you modify, the model will remain the same at next recall.

The way to use the models is very simple. Make your analysis setup. Save it in a model using the *Save as model* button form *Home/Setup*

Then you may choose to start automatically on one of these setups by selecting it in your preferences. Click on the *Home/Preferences/General* button:

In this case you will start on a new project (default) with your preferred setup

During the test you may have to proceed to different analyses type. The models will be useful to store all your acquisition in a unique project. When you need to change the setup, choose the corresponding model from the *Load Setup in the Home tab*.



Notes: The models are saved in the NVGate Data directory (default is *C:\OROS\NVGate data\Workbook Library\User*). You can exchange it between different NVGate installations using the Share/Collate transfer functions.

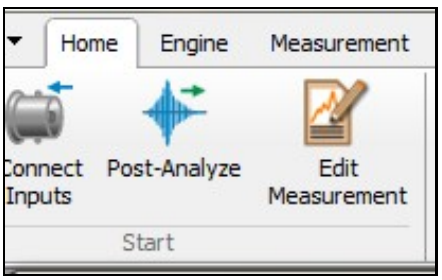
The model saves all the setup of the analyzer including the toolbar arrangement, associated signal files etc?

151.1.8 How do I get my results in the same format?

When a user has saved several measurements with the same kind of data in it, it is possible to edit one measurement and apply the very same layout display to the rest of the measurements. It is basically electronic reporting. As an example, it can then be used to make easier an automatic generation of paper reports.

The display duplication from one measurement to another is a 3-steps procedure:

Edit a measurement by right clicking on it or in *Home/Start*

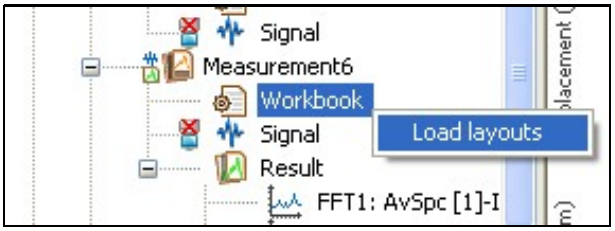


?and display the saved results the way you want, with cursors, markers?:

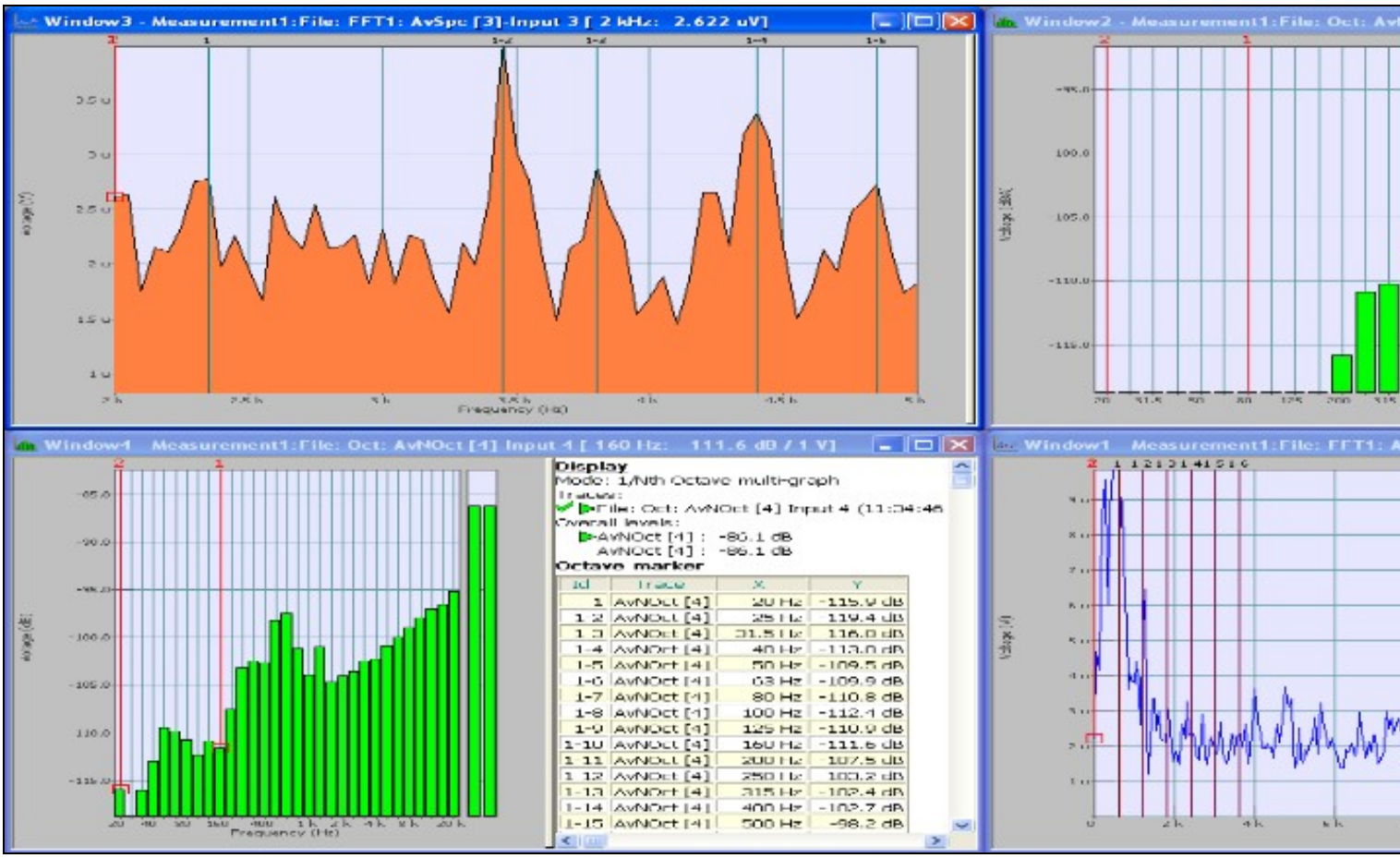


Close the measurement that has been edited or click again on Edit Measurement in the Home tab and save it when *NVGate* asks to.

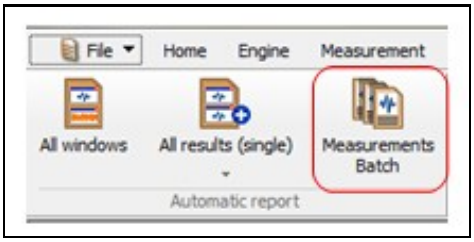
Edit a different measurement and then right click on the *Workbook* of the measurement you previously edited in order to do a *Load Layouts*.



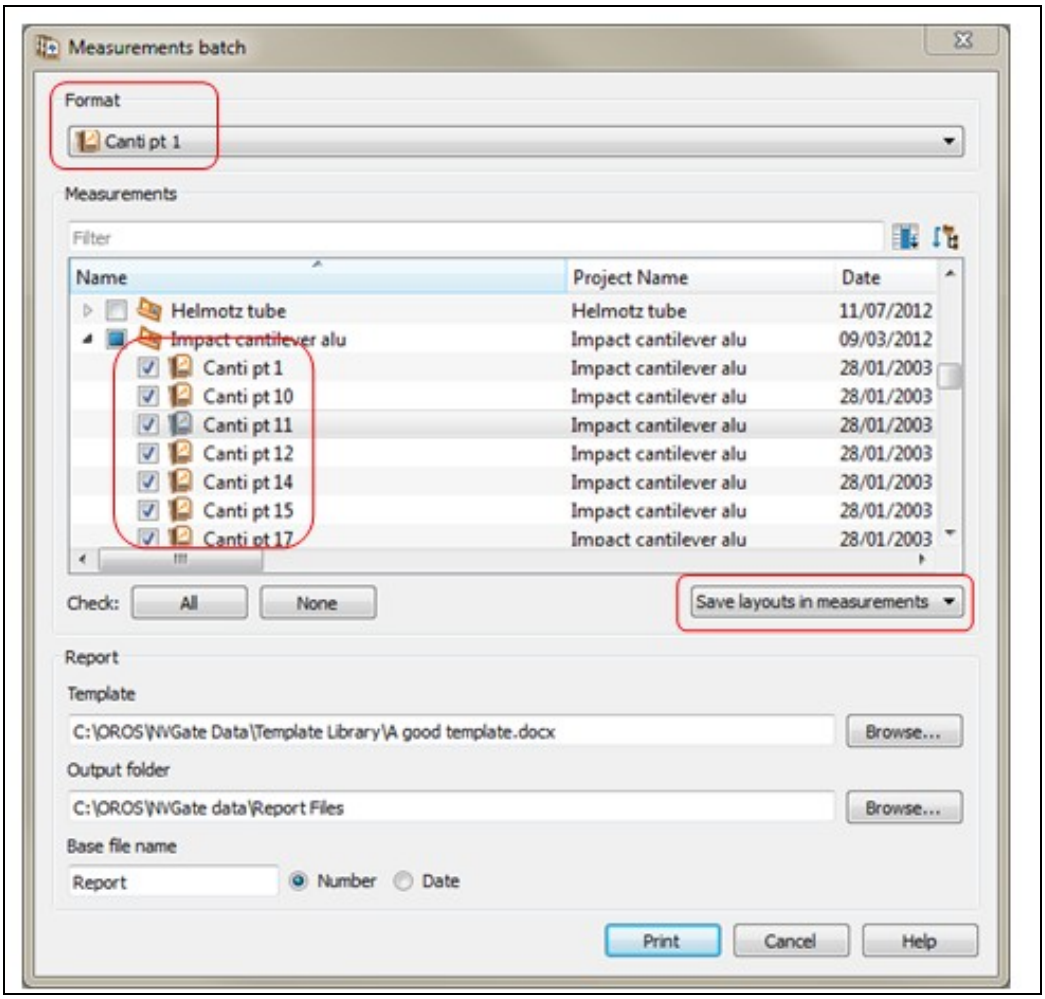
The measurement you are editing uses now the exact same display, cursors and markers as the previous one.



For batch on multiple measurement use the Batch report feature (Report/Batch measurement)



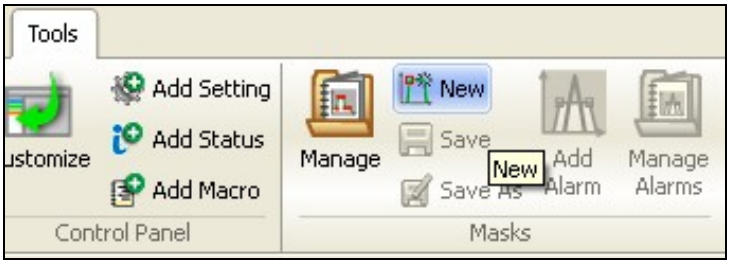
Select the edited measurement with the requested Layouts as *Format.*


Measurements batch
Format
Canti pt 1
Measurements
Filter
Name
Project Name
Date
Helmotz tube
Helmotz tube
11/07/2012
Impact cantilever alu
Impact cantilever alu
09/03/2012
Canti pt 1
Impact cantilever alu
28/01/2003
Canti pt 10
Impact cantilever alu
28/01/2003
Canti pt 11
Impact cantilever alu
28/01/2003
Canti pt 12
Impact cantilever alu
28/01/2003
Canti pt 14
Impact cantilever alu
28/01/2003
Canti pt 15
Impact cantilever alu
28/01/2003
Canti pt 17
Impact cantilever alu
28/01/2003
Check:
All
None
Save layouts in measurements
Report
Template
C:\OROS\WGate Data\Template Library\A good template.docx
Browse...
Output folder
C:\OROS\WGate data\Report Files
Browse...
Base file name
Report
Number
Date
Print
Cancel
Help

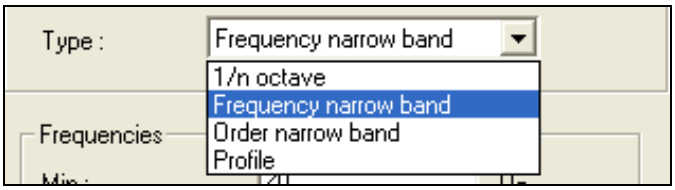
Choose the set of measurements to be changed and select *save layouts in measurements.* Then print it. Each measurement of the selection will now show the layouts of the *Format* one while editing it.

151.1.9 How do I trigger on a mask crossing?

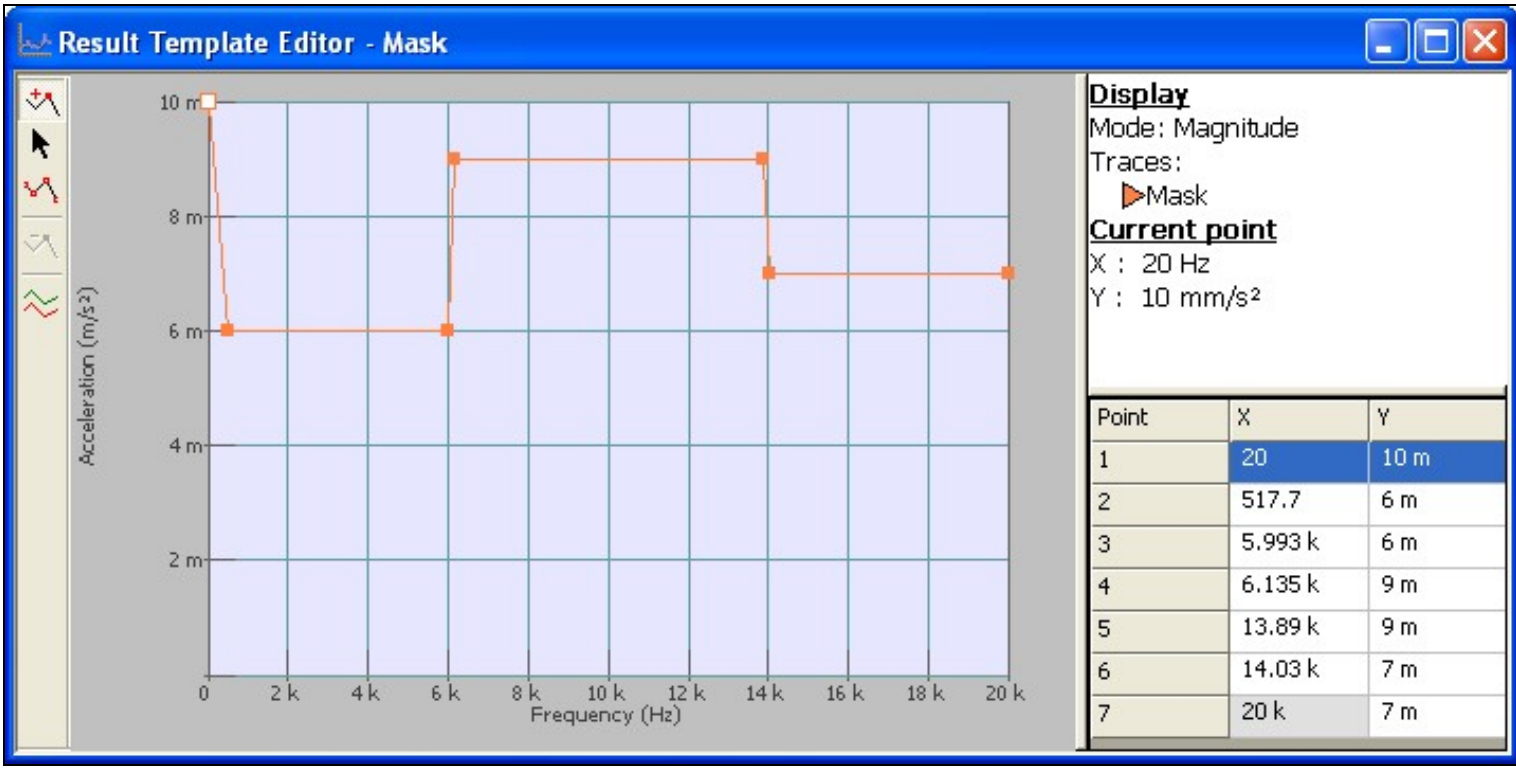
First of all, a template (mask) needs to be created from the *Tools* tab.



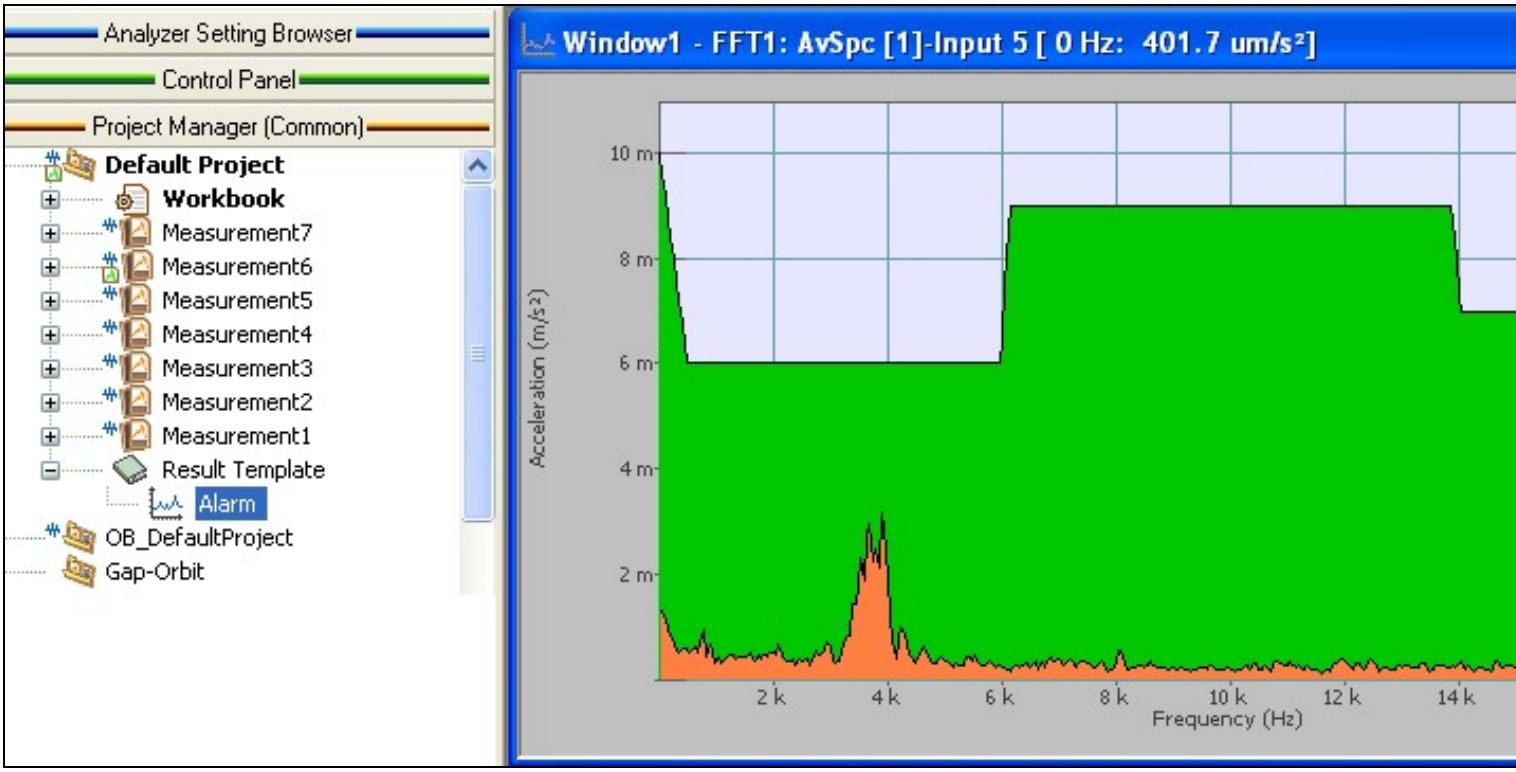
When creating the template, it is important to make sure the template will actually match the type of result next to be used for the triggering.

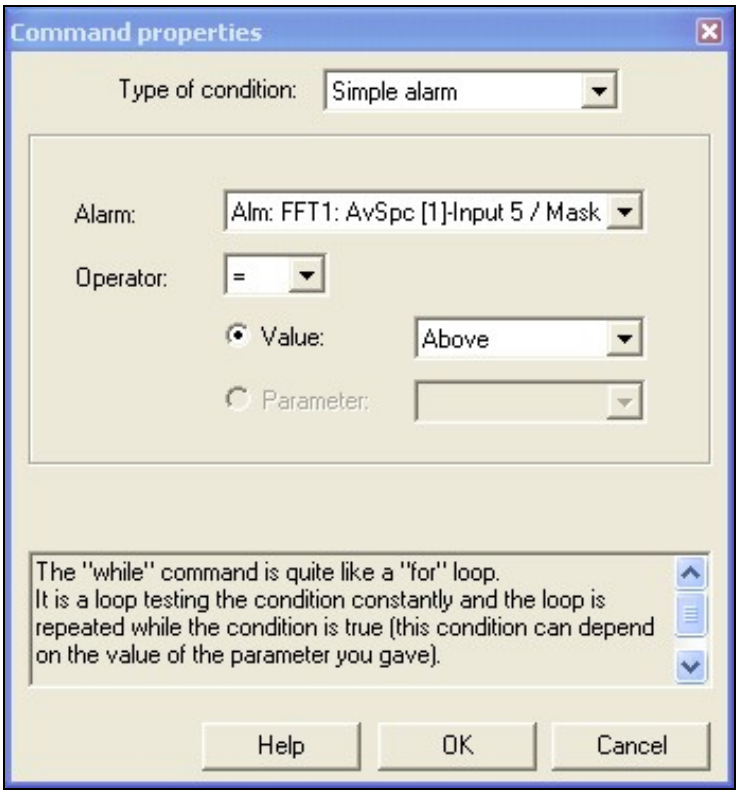


The template is then created points by points. The position of each point is defined either graphically or by keying in the exact coordinates in the table.



Then, the newly created mask has to be drag & drop into the proper window to create an alarm.





The alarm is activated by a right click in the grey area of the window to select, through *Add Alarm*, which trace will be compared to the mask. In case of multiple traces in the same window, multiple alarms can of course be created.

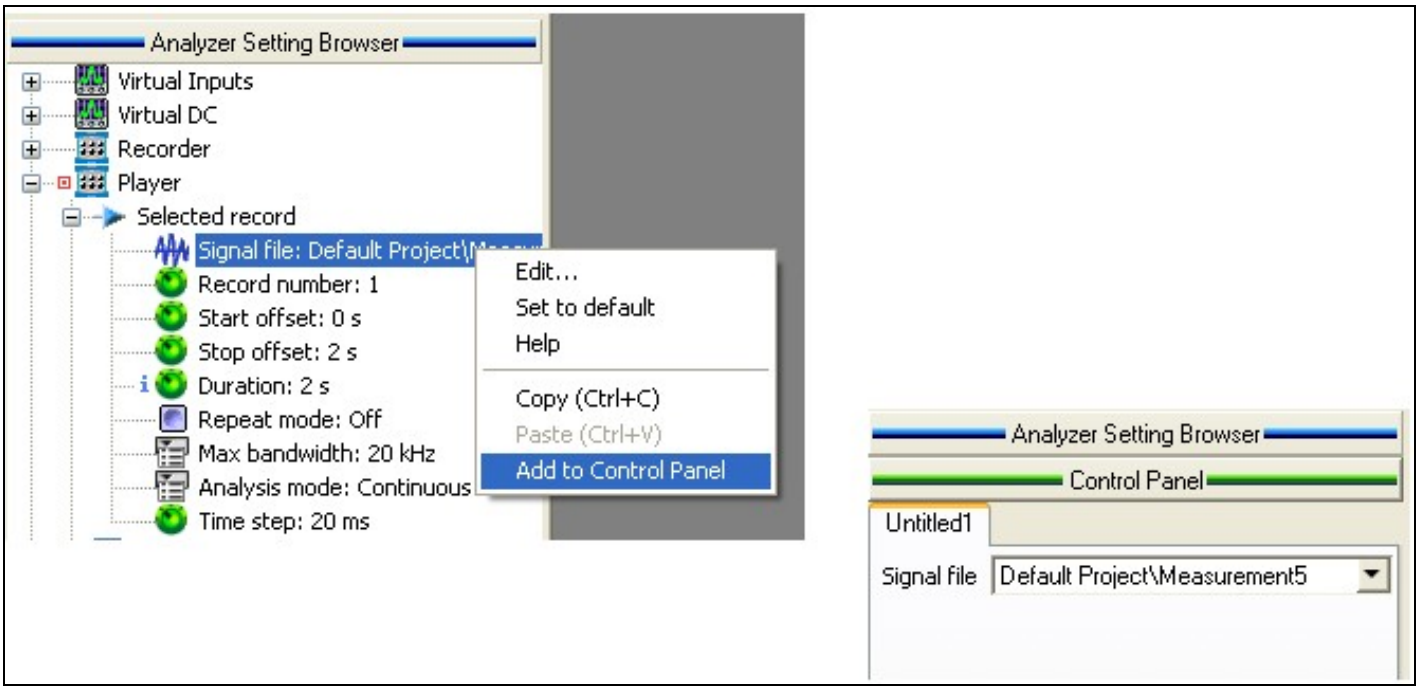
An alarm can be used to trigger any kind of events but ONLY from a macro where it is, there, considered as a *"type of condition"*. Therefore, it can be decided which condition the user will monitor (the trace stays under the mask, the trace crosses the mask,?)

151.1.10 How do I Post-analyze all my signals with the same setup?

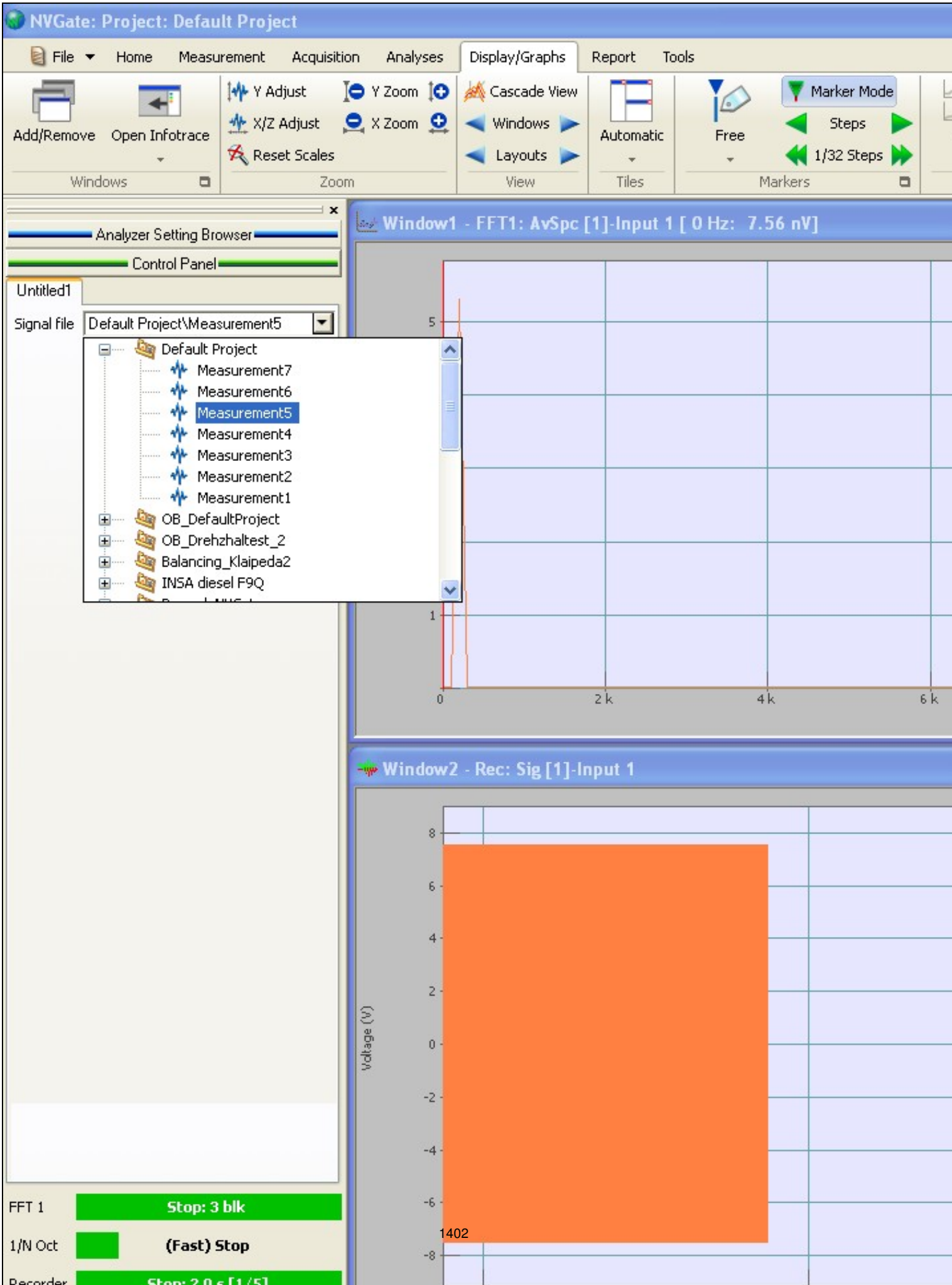
I measured several systems with same parameters and I want to post-Analyze these signal files with the same setup.

Create the Post-Analysis project and perform the analysis setup

Add the setting "selected record" into the Control Panel.



After each run, change the record and run again.

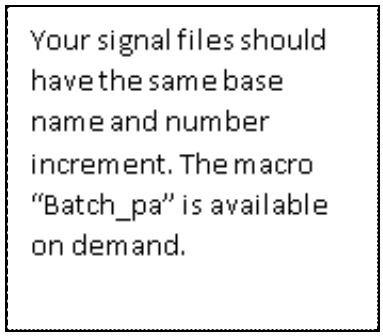

NVGate: Project: Default Project
File
Home
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
Add/Remove
Open Infotrace
Windows
Y Adjust
X/Z Adjust
Reset Scales
Y Zoom
X Zoom
Zoom
Cascade View
Windows
Layouts
View
Automatic
Tiles
Free
Marker Mode
Steps
1/32 Steps
Markers
Analyzer Setting Browser
Control Panel
Untitled1
Signal file
Default Project\Measurement5
Default Project
Measurement7
Measurement6
Measurement5
Measurement4
Measurement3
Measurement2
Measurement1
OB_DefaultProject
OB_Drehzhaltest_2
Balancing_Klaipeda2
INSA diesel F9Q
Window1 - FFT1: AvSpc [1]-Input 1 [0 Hz: 7.56 nV]
5
1
0
2 k
4 k
6 k
Window2 - Rec: Sig [1]-Input 1
8
6
4
2
0
-2
-4
-6
-8
Voltage (V)
1402
FFT 1
Stop: 3 blk
1/N Oct
(Fast) Stop
Recorder

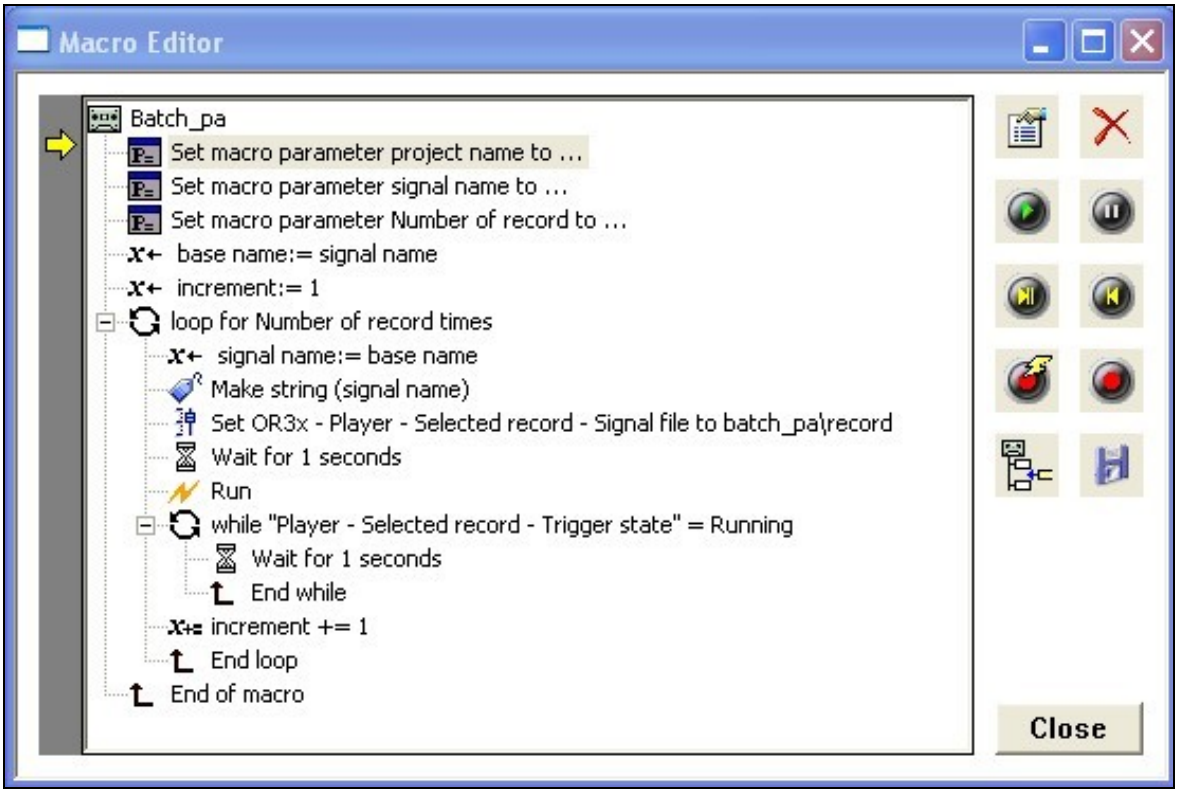
The same analysis settings are used for each signal file.

To go further, use Macro functions

You could automate the switch between each signal file using Macro functions.

Your signal files should have the same base name and number increment. The macro ?Batch_pa? is available on demand.





152 NVGate: Properties

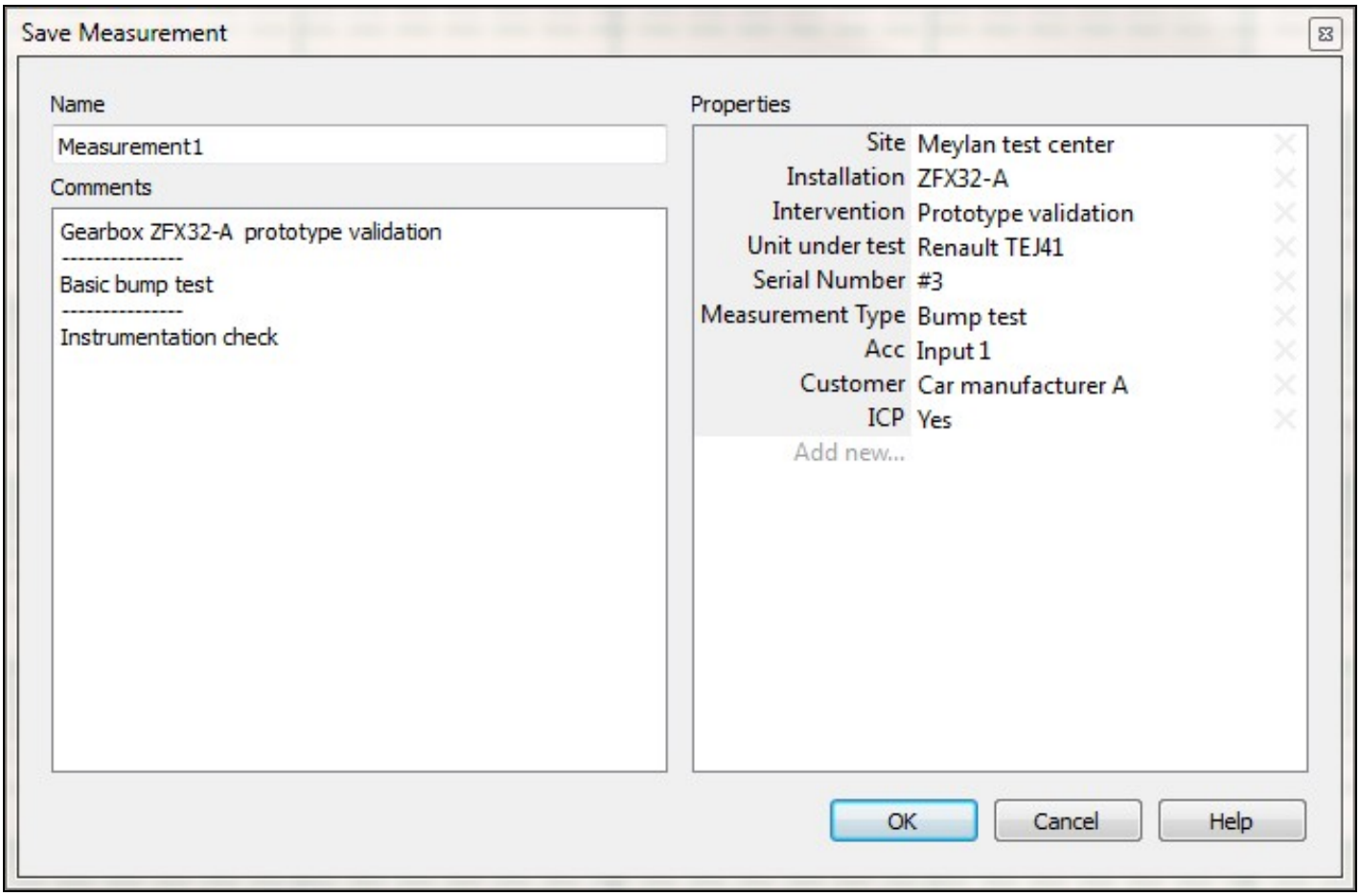
152.1 Properties overview

The properties are used as meta-data to enrich projects, models and measurements. They are informed while saving the items or by editing the properties from the project manager.

The properties belong to 3 different categories:

- The **OROS** properties are automatically informed such as *Dates*, *Author*, *Project* and *Saved results type*
- The **OROS user** properties are predefined to be informed by the user: *Comments, Site, Installation, Intervention, Measurement type, UUT, Serial number*
- The **Users** properties are created and filled by the operator while saving or by editing the properties. Ex: *Customer name*, *Transducer type*

While saving data (Project, Model or Measurement) the save dialog box proposes the following layout (same for Project, Model and Measurement):



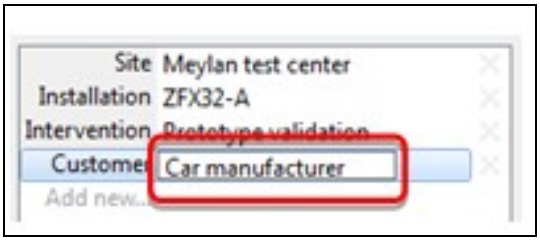
On the left side the Item's name and the comments. Current Project and Model comments will inherit to the Measurements.

On the right side the OROS user and User properties. Current Project and Mode properties will inherit to the Measurements.

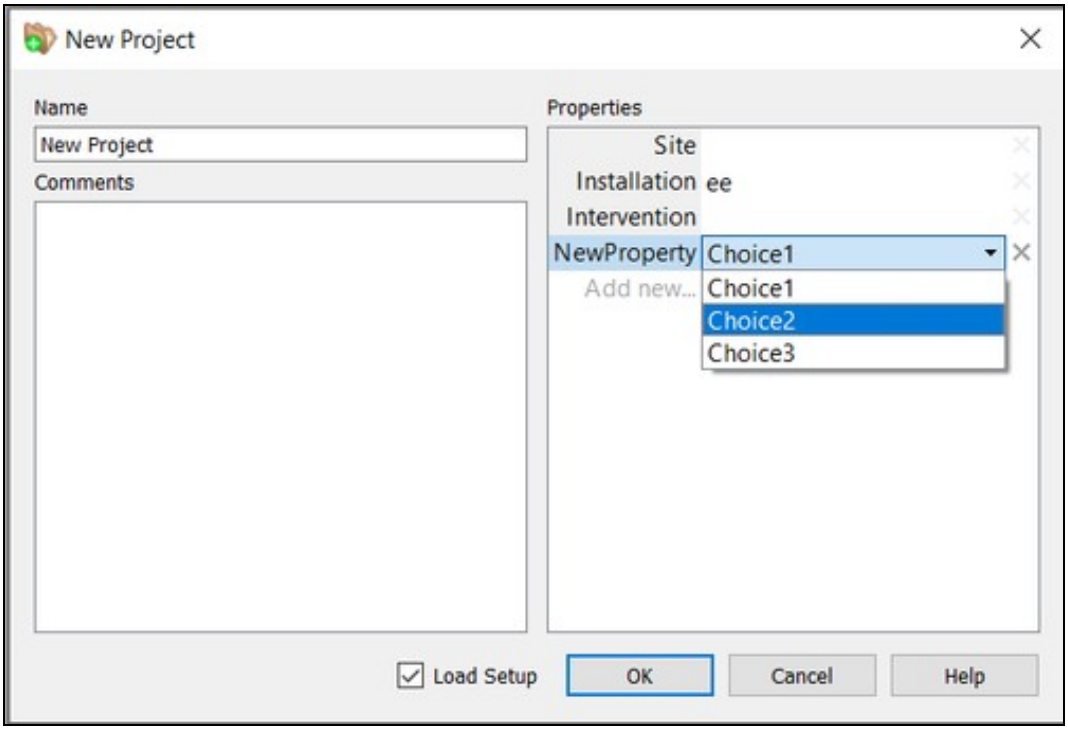
152.1.1 Saving Data

152.1.1.1 Enter properties values

To fulfill a property, click on the right cell of the corresponding line and add or edit text. To remove a property from the measurement, use the cross on the right side of the corresponding line.



The user is given the possibility to fill in the content of a property from a drop-down list of predefined choices as shown in the window below:

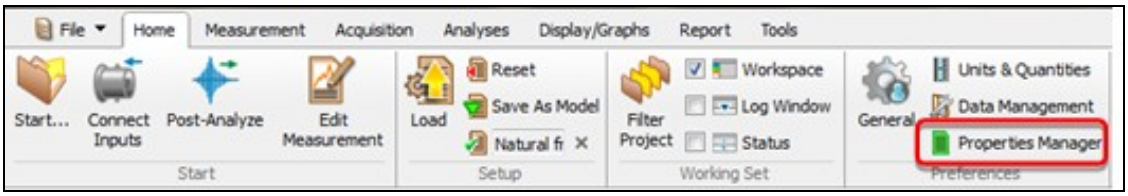


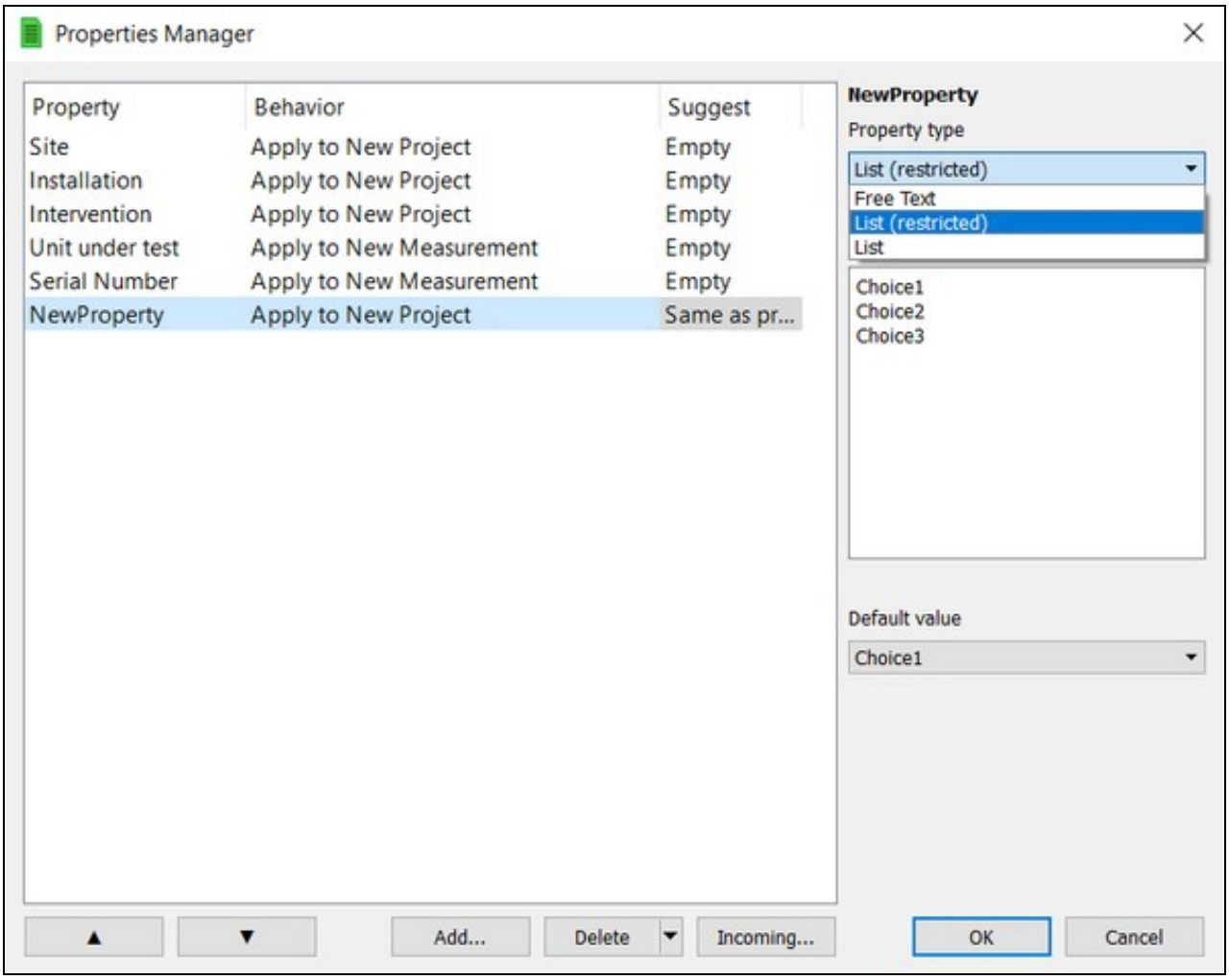
Filling in a predefined choice for a property (when for example creating a new project)

Below, we will explain how to proceed.

152.1.2 Manage properties

The properties visibility, behavior and association are managed through the properties manager. This is accessible form the NVGate ribbon: *Home/Preferences/Properties manager*





Selecting the property LIST type during the properties management

152.1.2.1 Behaviour

- **Apply to new** "Item": will show the property while saving the corresponding "Item"

152.1.2.1.1 Suggest

- **Empty***:* No suggestion
- **Same as previous**: Allows changing the property content after multiple measurements Ex: n measurements per units in a set sequence of acquisitions.
- **Same as today**: Operates as the **Same as previous** but is reset to **Empty** at 24:00 every day. Useful for day by day measurement like consulting.

152.1.2.2 Property Type: Free Text/List

After selecting a property, the property type can be selected. Three choices are available:

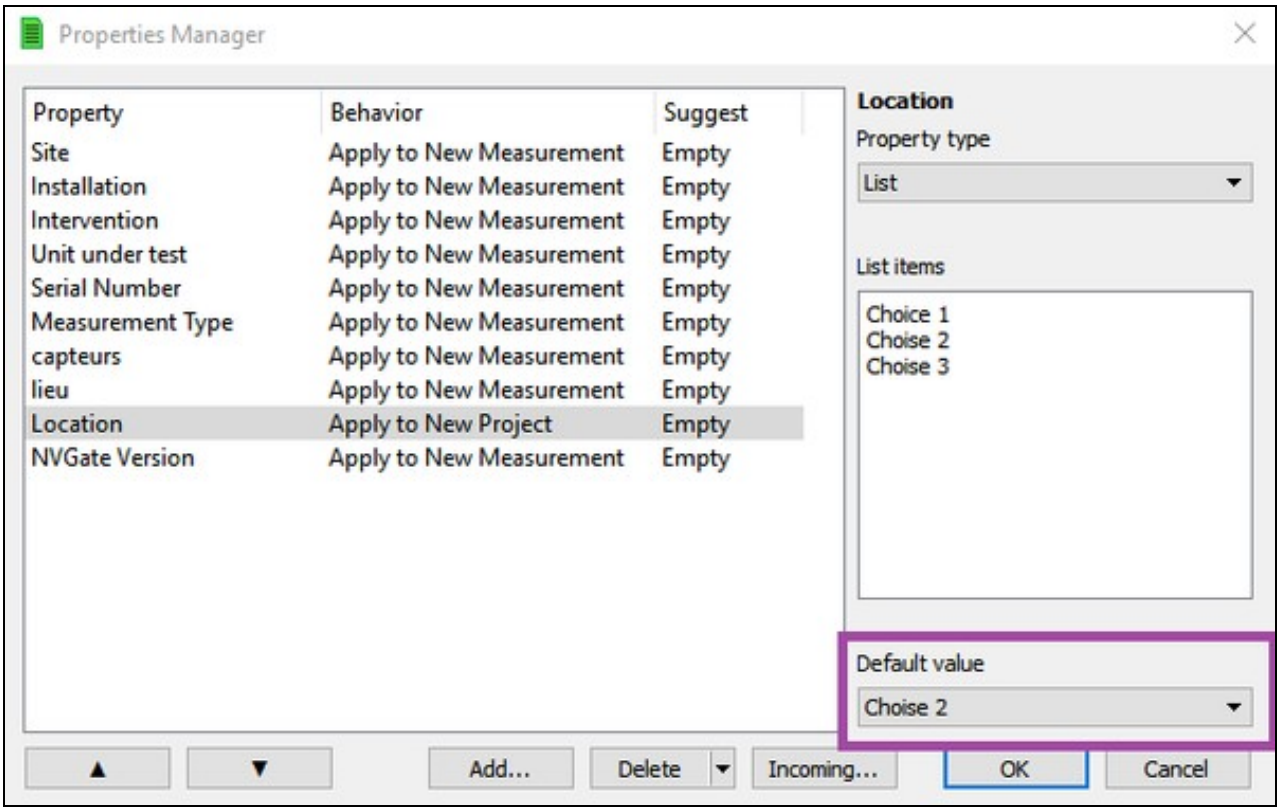
Free text: The user can enter any text freely when filling the property information.

List (restricted) : Fill-in the **List items** in the **Properties manager**. Then, when saving a project, a measurement or a setup the user will be able to **select the item from a combo list** as shown below.

List: : This option is a mix of the "Free text" and "List (restricted)" option. During a save (measurement, setup or project), the list is proposed as a combo but free text still can be entered. For that the list items should be entered in the properties manager for the selected property. In this case, the property will be given the free text content but the list will not be populated with this new entry. If this is required, the list of that property can be modified in the properties manager.

- Setting up the **Default value** for the property item.

For properties which are declared as **list**, it is possible to define their default value:

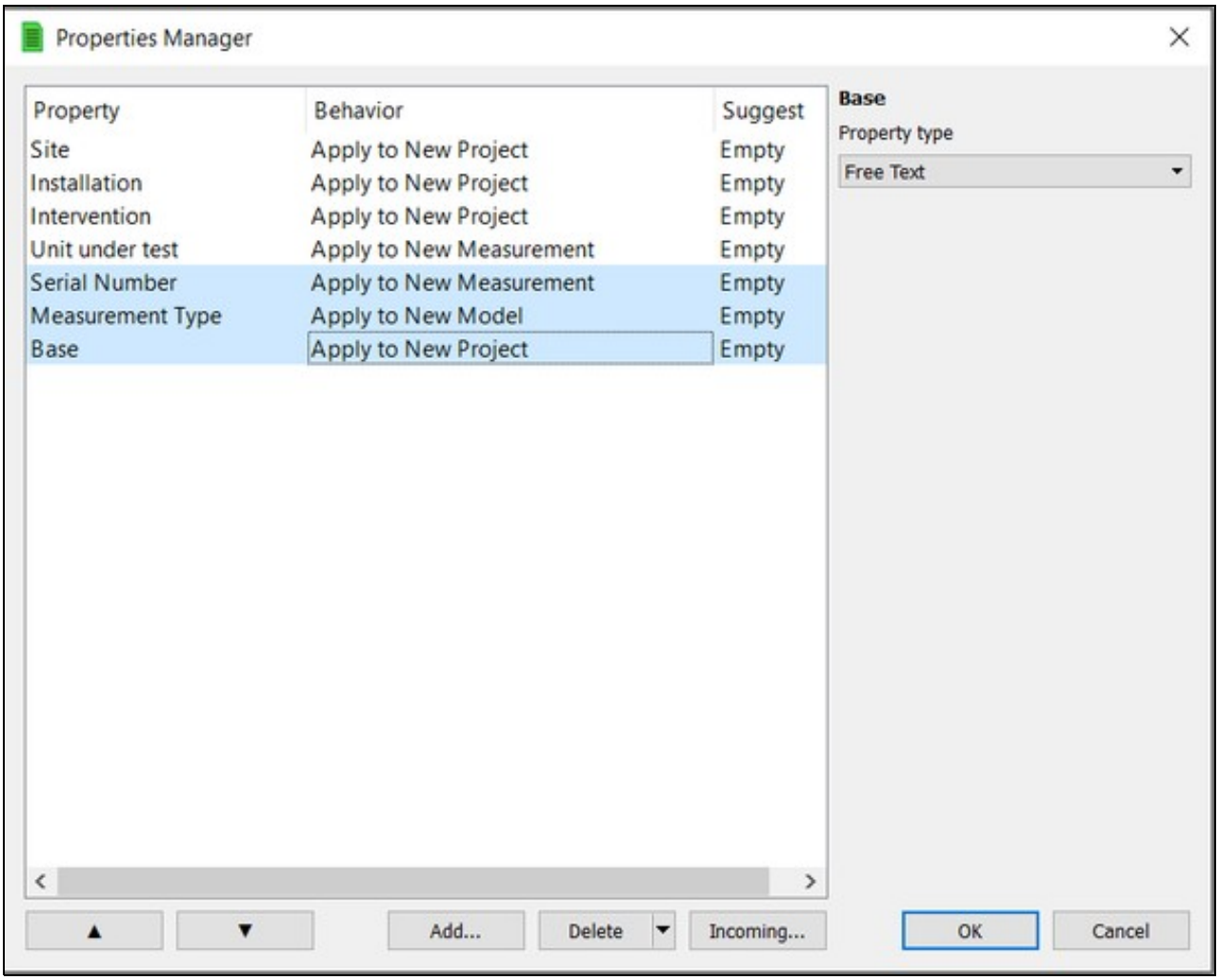


Setting up the default selection from the list

152.1.2.3 Multi-selecting to modify several properties at once

A user can simply select multiple properties (using CTRL + Click) to achieve an action (Modify behavior, Modify suggest or Delete) on all of them at once.

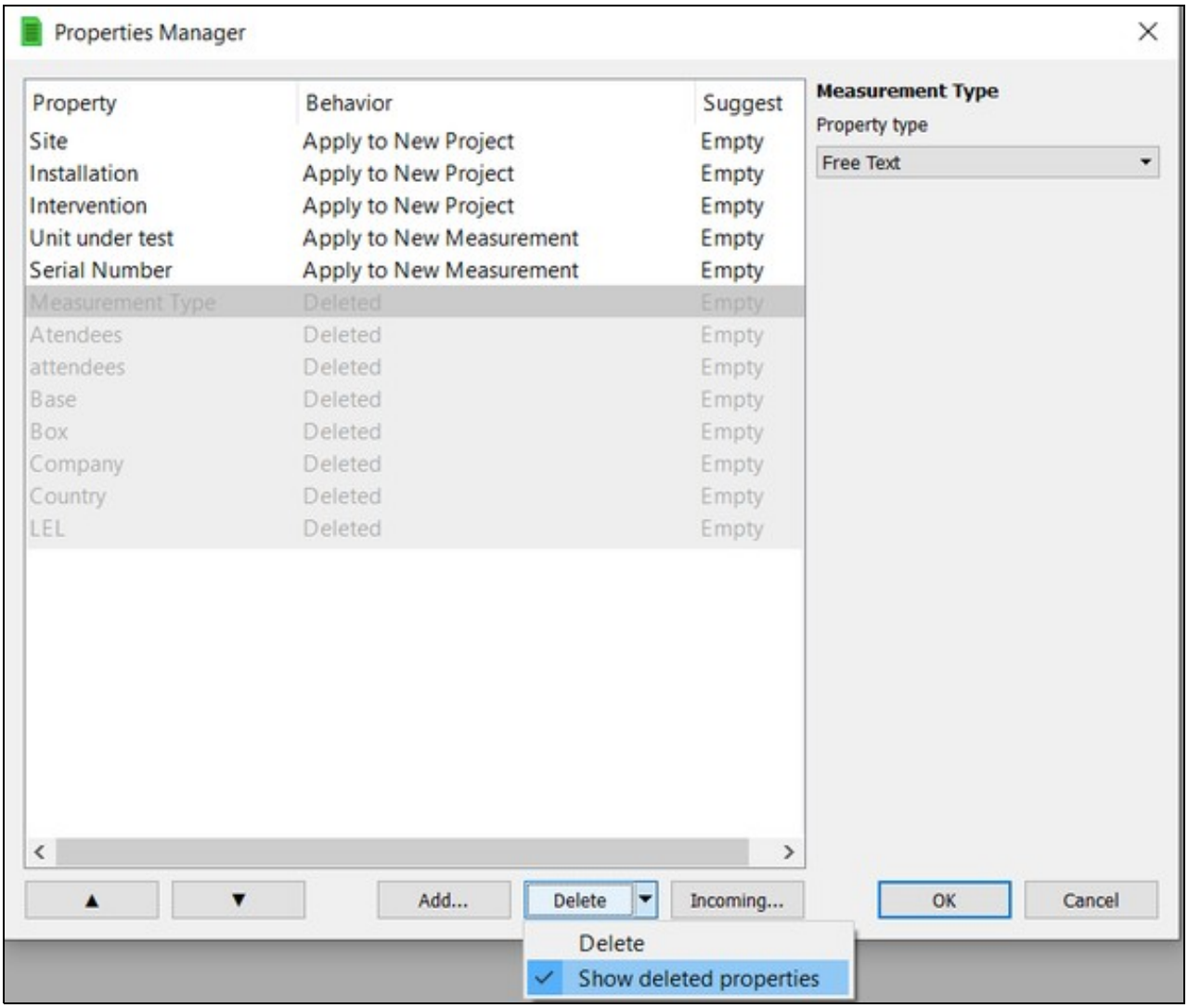
152.1.2.4 Deleting existing properties


Properties Manager
Property
Behavior
Suggest
Site
Apply to New Project
Empty
Installation
Apply to New Project
Empty
Intervention
Apply to New Project
Empty
Unit under test
Apply to New Measurement
Empty
Serial Number
Apply to New Measurement
Empty
Measurement Type
Apply to New Model
Empty
Base
Apply to New Project
Empty
Base
Property type
Free Text
Add...
Delete
Incoming...
OK
Cancel

Deleting existing properties

The selected properties will be deleted from the database. The multi-selection enables to delete several properties at once.

Once deleted, the properties can still be shown using the "Show deleted properties" (Option accessible from the delete button using the down arrow. The property can be recovered by modifying the behavior to something other than "deleted" as shown from the window below.



Show deleted properties

Tips: How to completely reset your properties base?

'To achieve this, you must delete the files "userPropertiesLibrary" and "userPropertyPolicies" which can be found at this location: C:\Users\Name\AppData\Local\OROS\NVGate'

152.1.2.5 Managing the incoming properties

This feature allows a user to choose how to deal with **properties coming from imported NVGate projects, measurements and models** (after an import or a collate for example).

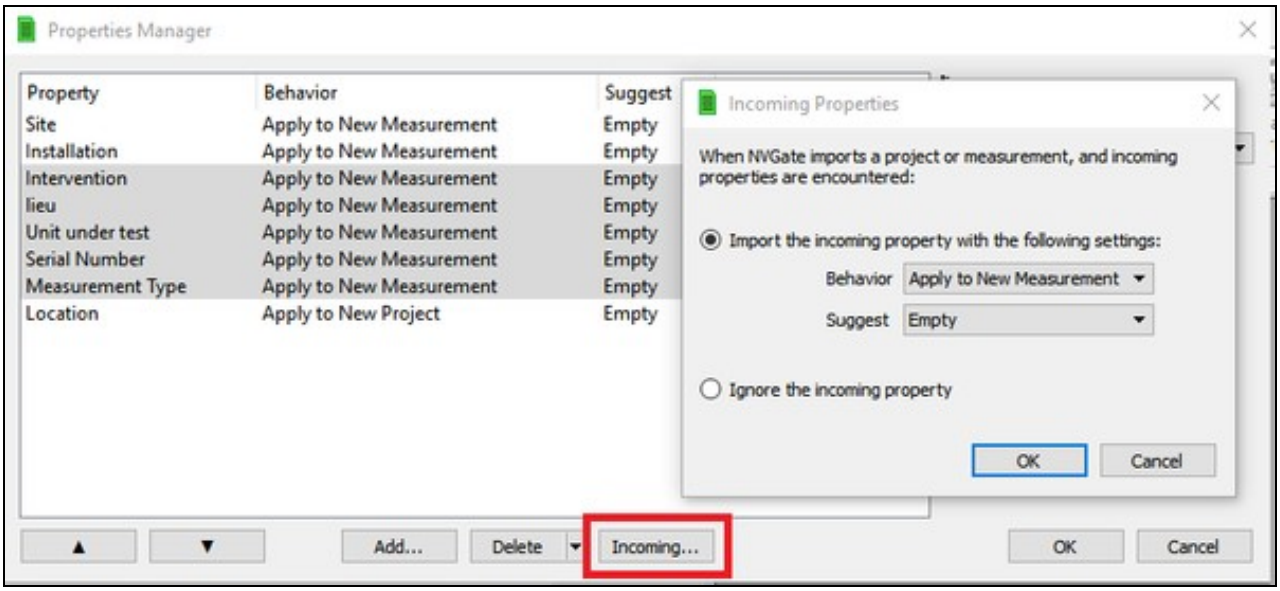
You can select what will happen to a property when the import occurs. The behavior is adjusted after pressing the button "Incoming ?"

2 main choices are available: Import or Ignore

- Import: When this behavior is selected, the user needs to select the following settings:
- "behavior": apply to a new project, to a measurement, to a model, or don?t apply it (Nothing).
- "suggest": empty, same as previous, same as today.

To update the properties for a team who use several PCs, select this option, then import a project, measurement, models on the PCs. The new properties will be including on the new PC, including combo list.

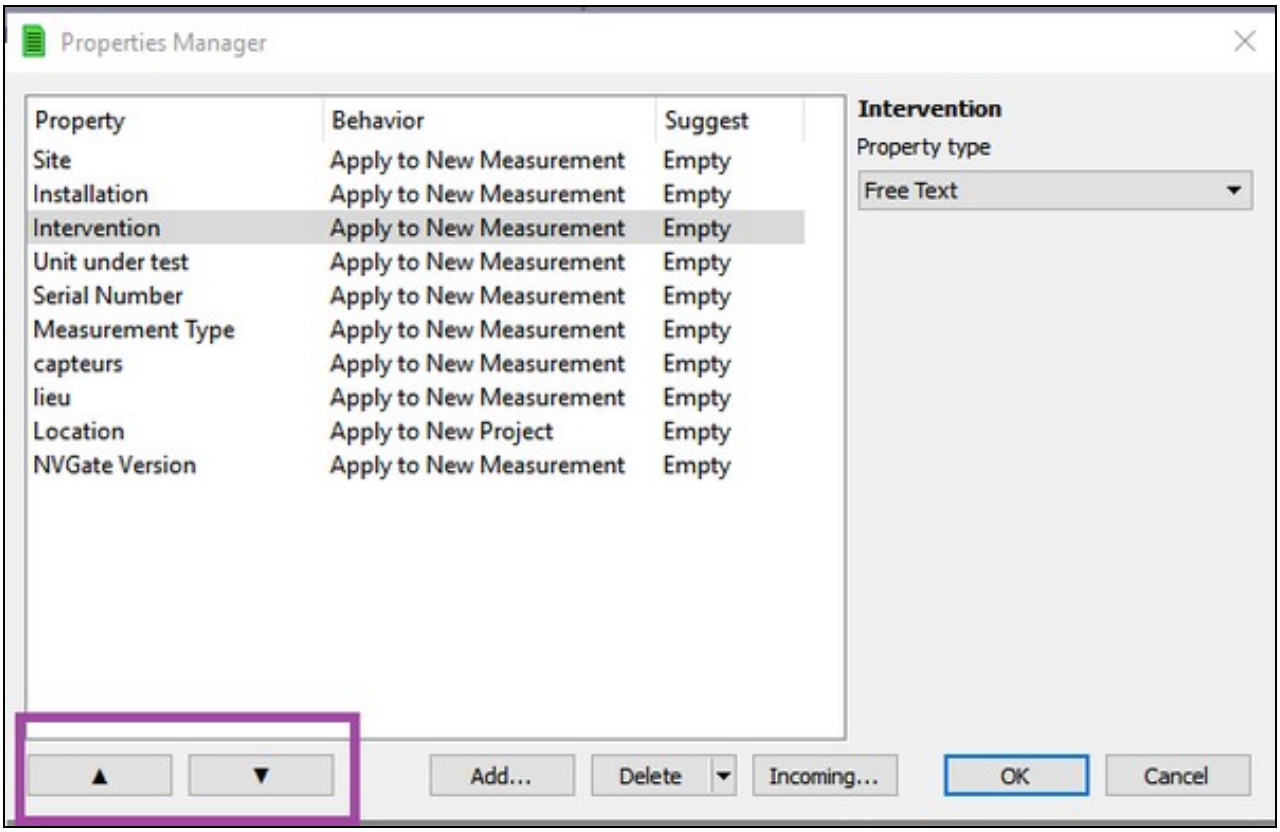
- Ignore: When this behavior is selected, the property will actually take the status deleted right at the import level.



Setting up what will happen to a property during an import

152.1.2.6 Sorting the properties

It is now possible to rank properties (after selecting them) to change their order:



152.1.3 How to manage the list of properties independently from NVGate?

The list of properties used in NVGate can be found in the *userPropertiesLibrary.upl* file located in following folder: *C:\Users\user\AppData\Local\OROS\NVGate*.
The properties behavior is defined in the *userPropertyPolicies.xml*, located in the same folder. Both files can be edited independently from NVGate.

152.1.3.1 Structure of the *userPropertiesLibrary.upl* file

All the properties are listed in this file. A property is defined with 4 main fields:

1) Property ID

The property ID must have this form: *user.username.propertyname*. The username can be freely chosen (but must be different from ?oros?). Choose a name that cannot conflict with the user name of incoming properties (imported from projects/measurements/models).The propertyname can be freely chosen too.

2) Title

The title can be identical to the propertyname given in the property ID.

3) Type

There are 3 different property types:

◊ text
◊ constrained list
◊ unconstrained list (the user can type a value that is not in the predefined list).

4) Value

In case of a property defined as a list (constrained or unconstrained), all the possible values are listed. The default value is specified.

The file structure is described below, with the example of Property 1 as text, Property 2 as unconstrained list and Property 3 as constrained list.

NB: NVGate software automatically creates default properties (such as ?site?,?installation?,?intervention?). They are hidden if the incoming properties are set to ?hidden?).

File header

```
<libraryUserProperties version="1.0">
<properties version="1.0">
```

Property 1 as type "text"

```
<property version="1.1">
<propertyId>user.username.Property1</propertyId>
<title>Property1</title>
<value></value>
<type>text</type>
</property>
```

Property 2 as type "unconstrained list"

```
<property version="1.1">
<propertyId>user.username.Property2</propertyId>
<title>Property2</title>
<value></value>
<type>enumerated</type>
<enumerated version="1.1" flavor="unconstrained">
<value>Value1</value>
<value default="true">DefaultValue</value>
<value>Value3</value>
</enumerated>
</property>
```

Property 3 as type "constrained list"

```
<property version="1.1">
<propertyId>user.username.Property3</propertyId>
<title>Property3</title>
<value></value>
<type>enumerated</type>
<enumerated version="1.1" flavor="constrained">
<value>Value1</value>
<value default="true">DefaultValue</value>
<value>Value3</value>
</enumerated>
</property>
```

File footer

```
</properties>
</libraryUserProperties>
```

152.1.3.2 Structure of the *userPropertyPolicies.xml* file

The properties policy are defined in this file. The 2 main fields are:
1) applyTo:

- ◊ nothing
- ◊ project
- ◊ measurement

◊ model
◊ hidden

2) presetPolicy:

◊ empty
◊ sameAsPrevious
◊ sameAsToday

The **sortWeight** field enables to change the order of the properties in the list. When using the policies ?sameAsPrevious? and ?sameAsToday?, NVGate saves the values typed by the user in the field ?value? and the date in the field ?date?.

The file structure is described below, with the example of the 3 properties listed in the *userPropertiesLibrary.upl* file. At the end of the file, the policy of the incoming properties (imported from projects/measurements/models) is defined.

File header

```
<nvgateUserPropertyPolicies version="1.0">
<list>
```

Property 1

```
<userPropertyPolicy version="1.1" propertyId="user.username.Property1">
<applyTo>nothing</applyTo>
<presetPolicy>empty</presetPolicy>
<value></value>
<date></date>
<sortWeight>1</sortWeight>
</userPropertyPolicy>
```

Property 2

```
<userPropertyPolicy version="1.1" propertyId="user.username.Property2">
<applyTo>nothing</applyTo>
<presetPolicy>empty</presetPolicy>
<value></value>
<date></date>
<sortWeight>2</sortWeight>
</userPropertyPolicy>
```

Property 3

```
<userPropertyPolicy version="1.1" propertyId="user.username.Property3">
<applyTo>nothing</applyTo>
<presetPolicy>empty</presetPolicy>
<value></value>
<date></date>
<sortWeight>3</sortWeight>
</userPropertyPolicy>
</list>
```

Policy of incoming properties

```
<default>
<userPropertyPolicy version="1.1" propertyId="default">
<applyTo>hidden</applyTo>
<presetPolicy>empty</presetPolicy>
<value></value>
<date></date>
</userPropertyPolicy>
</default>
```

File footer

```
</nvgateUserPropertyPolicies>
```

153 NVGo



NVGo



Developer	Oros SA
Type	Data Acquisition, Recorder
First release	2018
Latest Version	V1.1.10253 - June 2023
Download	.apk Here
Operating system:	Android (only working with OR10 Hardware)
Language	English
Official website	oros.com and here!

153.1 NVGo

NVGo is the MODS monitoring software for android devices. This app is designed to:

- Manage *Templates* for OR10 front-end and record setup.
- Adjust the front-end and recorder settings.
- Continuously monitor the signals in different domains (level, time and spectral).
- Start & stop recording.
- Add properties and comments to records.
- Manage records in OR10 memory.

153.1.1 Installation

1. Download the latest NVGo Android Package Kit (.APK) on your Tablet or smartphone. Use the download link on the right.

2. On your Android device select the NVGo .apk file, then choose install.

3. Authorize the installation of unknown sources to install it directly

If the install is not working you need to enable APK installs on your Android device

1) Navigate to your phone settings menu then to the security settings and/or private live protection.

2) Enable the Install from Unknown Sources option. (can be on specific autorisation)

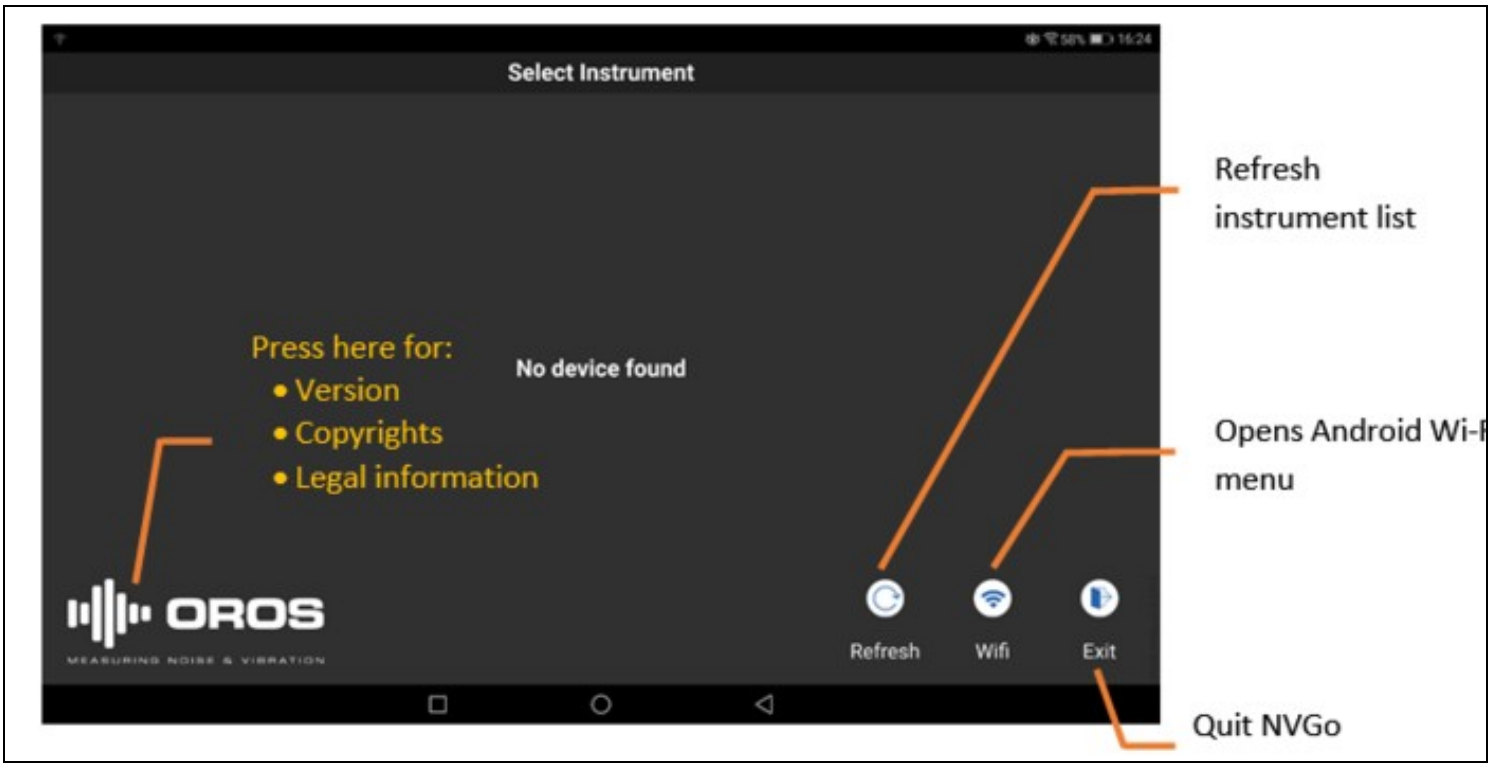
3) Use a file browser and navigate to your download folder.

4) Tap the APK to begin the installation process.

The app should safely install.

153.1.2 Connection to OR10

1. Start NVGo from the Android device.



2. Power on the OR10 hardware.

3. Wait for power-on to complete, until you get the main menu on the OR10 screen.

4. Press the "Wi-Fi" button on NVGo. The Android Wi-Fi menu is displayed.



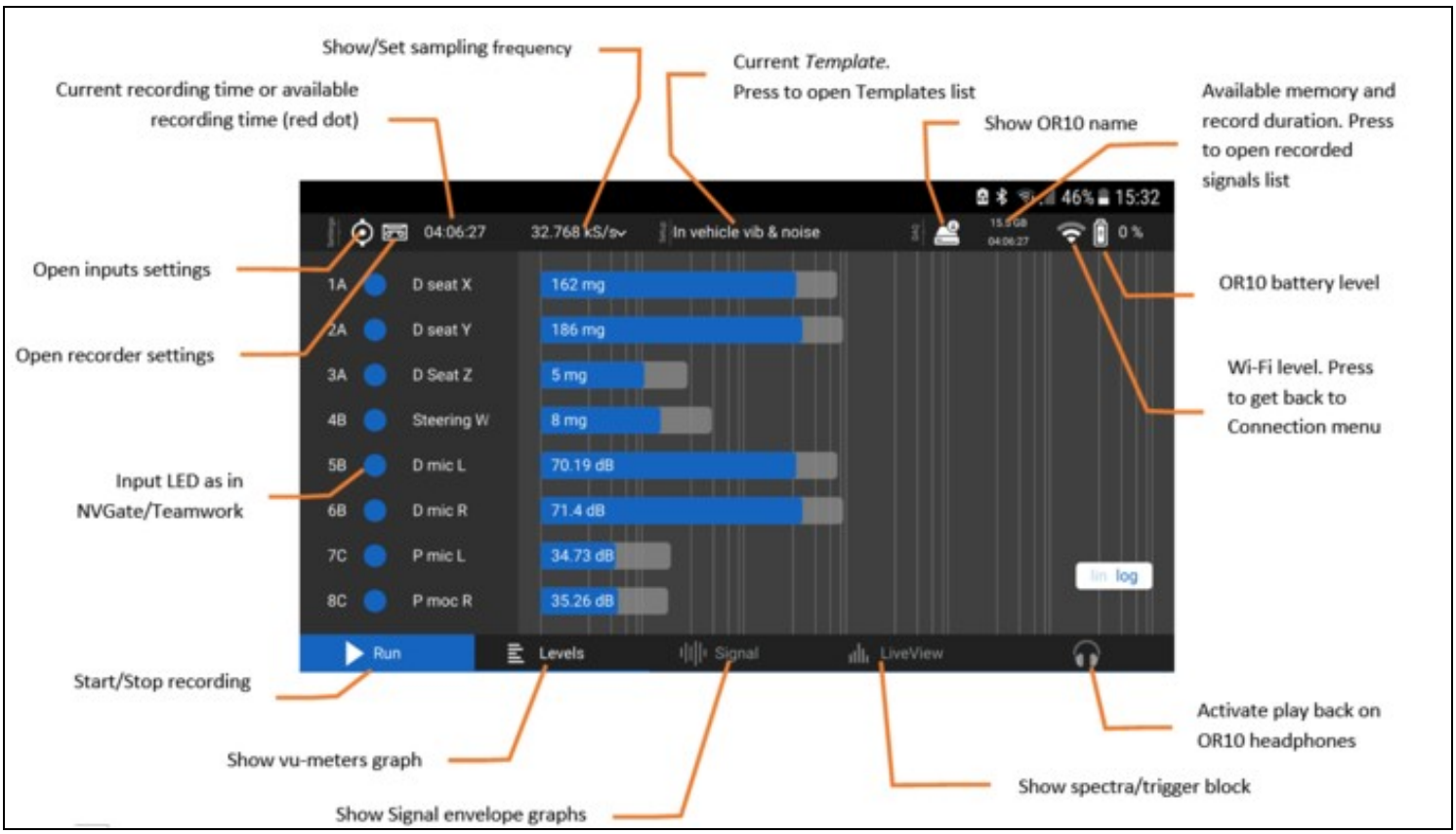
5. Connect to the OR10. (default password is : 12345678)

6. Press Android back (<) button to return to NVGo.



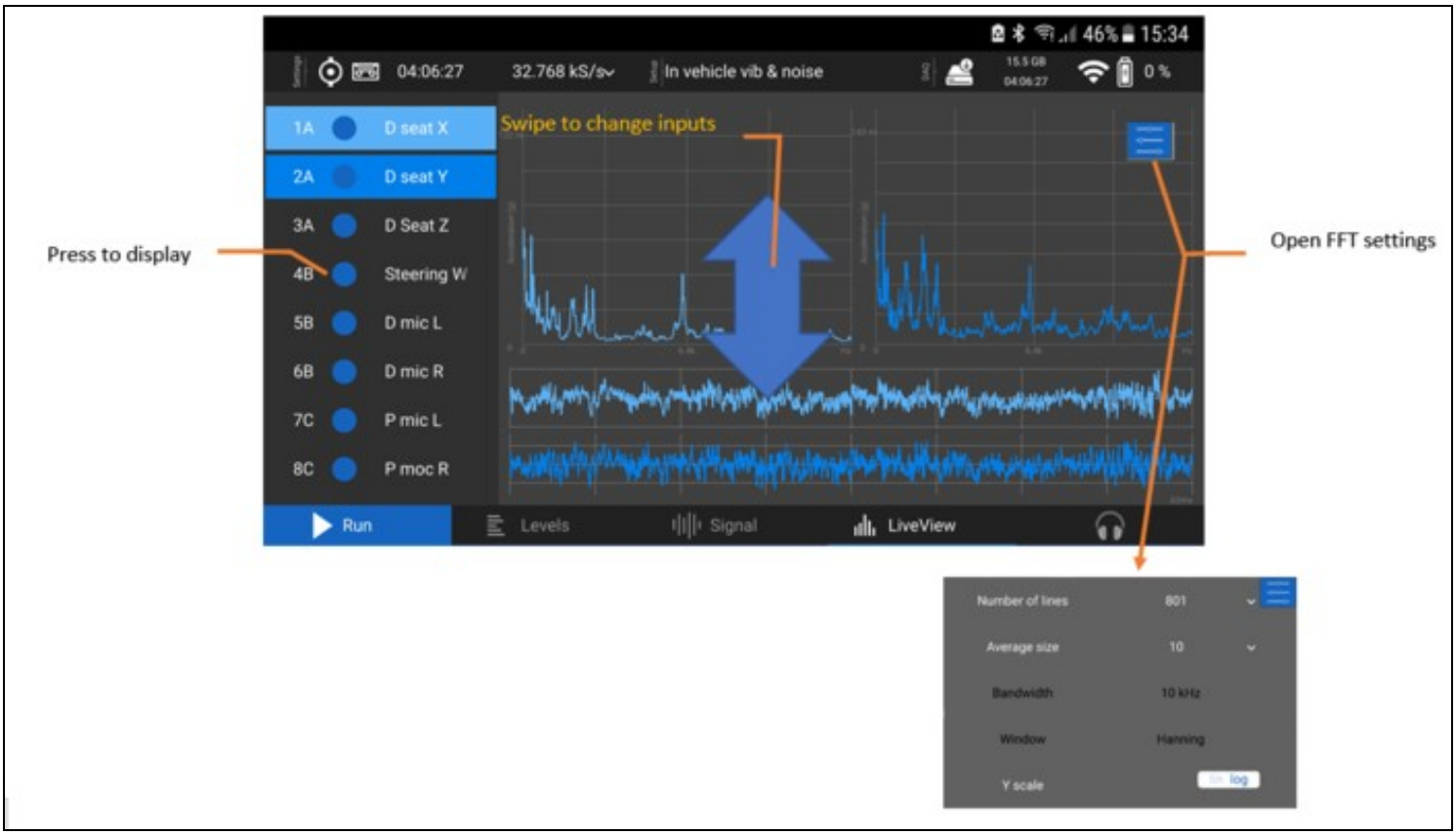
Refresh the instrument list. When your OR10 appears showing "Ready", click on it to start NVGo with this instrument.

Main screen :



153.1.2.1 LiveView

LiveView screen shows the spectra and trigger blocks of the 2 highlighted inputs of the left column.



Displayed inputs are changed by swiping the graph up/down. It is also possible to select the displayed inputs by pressing the selected input from the left column.

FFT settings allows for adjusting averaging and resolution. The Y scale may be set to linear or log. This preference is saved in the Android device.

153.1.2.2 Signal

Signal shows the raw data envelope of the 2 highlighted inputs of the left column.



Displayed inputs are changed by swiping the graph up or down. It is also possible to select the displayed inputs by pressing the selected input from the left column.

Y scale is continuously adjusted to input ranges. When the 2 active inputs show the same units, both Y scales are identical.

153.1.2.3 Levels

Levels shows the RMS and Peak levels of all dynamic inputs together.



153.1.2.4 Playback

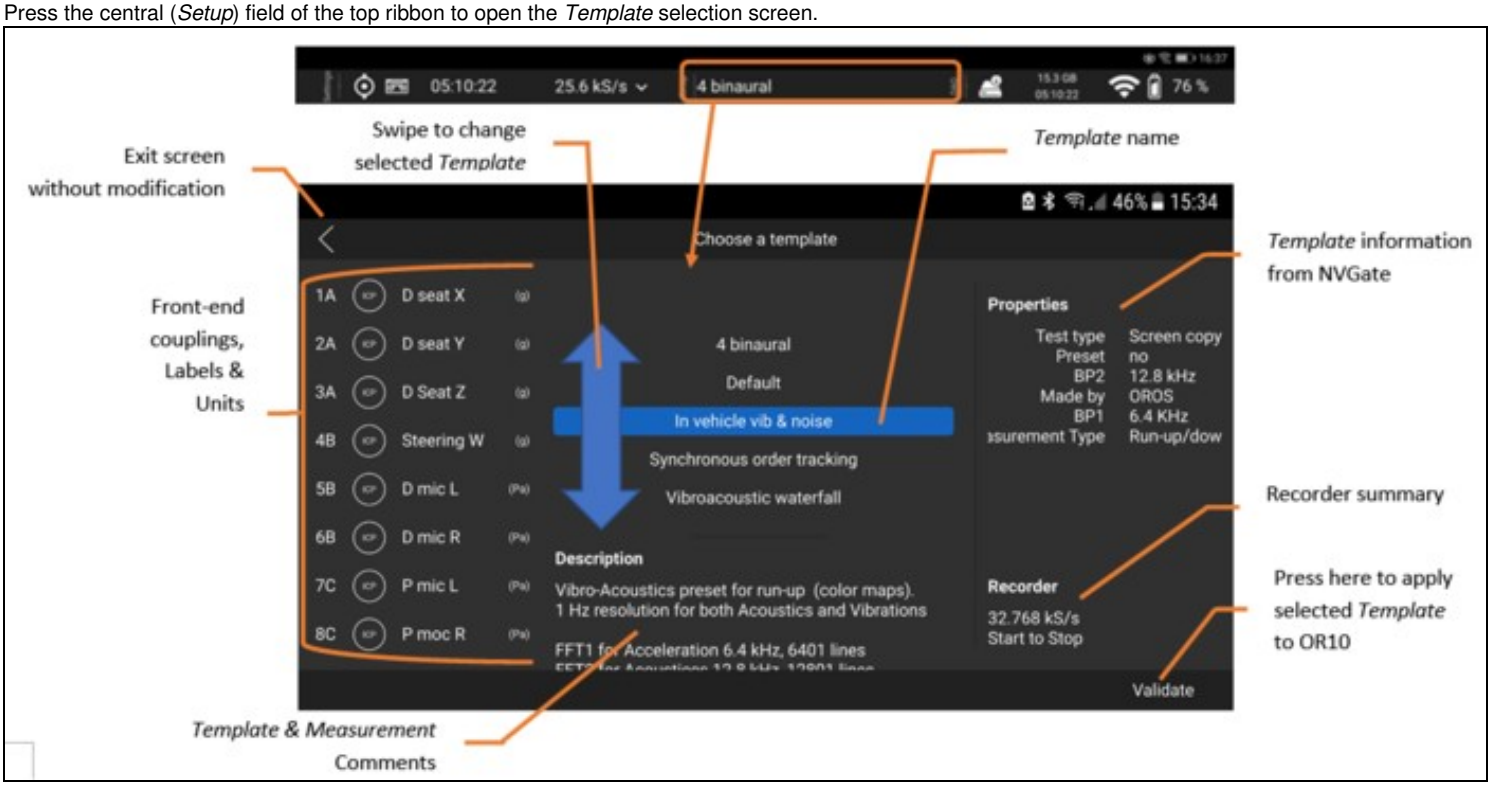
Press the headphone icon on bottom right of the main screen to activate the playback. The 2 active inputs (blue background on the *Signal* and *LiveView* screens) are replayed on the OR10 headphone plug. The volume is automatically adjusted. Caution, the playback volume is dependent on the used headphone impedance. Signal amplitudes close to the range peak may generate high volume with low impedance headphone. Usage of very low impedance below 60 Ohms is not recommended. The stereo allocation of the played signals may be inverted by pressing the headphone button until the 2 background colors are inverted.

153.1.3 Setting up the OR10

153.1.3.1 Loading a Template

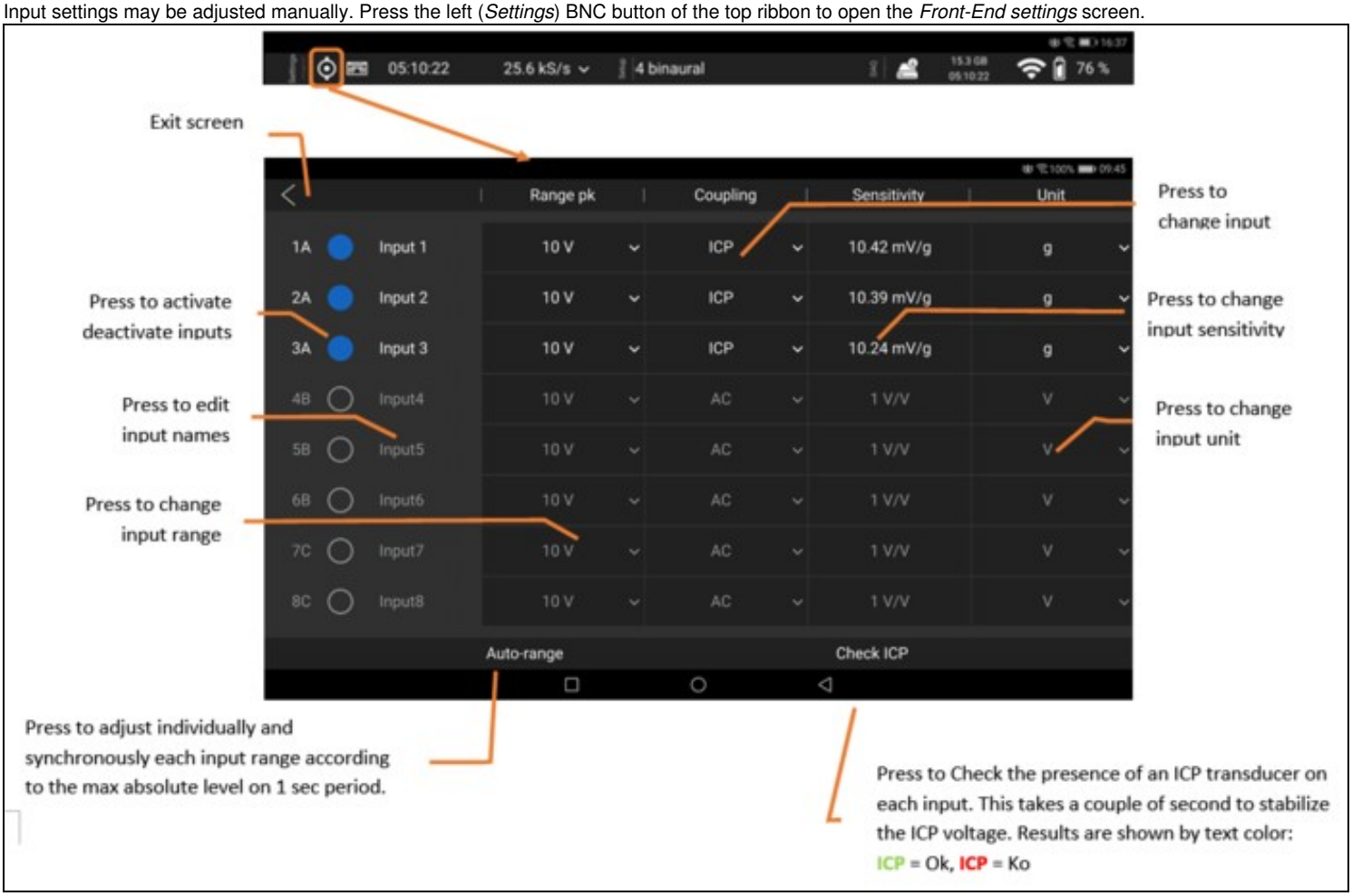
The *Templates* are generated and added to the OR10 memory with NVGate (see NVGate Template generation §). They are used in the same way NVGate *Models* is in order to setup the front-end with predefined settings. The *Template* properties and description will be saved in the *Measurements* made with it.

Press the central (*Setup*) field of the top ribbon to open the *Template* selection screen.



153.1.3.2 Adjust the Front-End

Input settings may be adjusted manually. Press the left (*Settings*) BNC button of the top ribbon to open the *Front-End settings* screen.



153.1.3.3 Adjust the Sampling Frequency

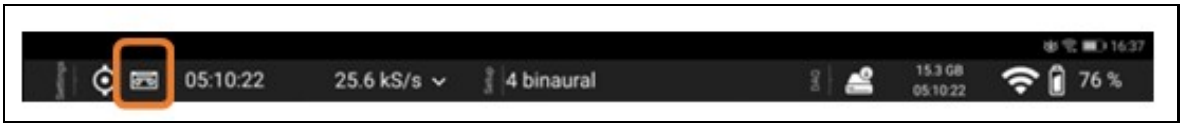
The sampling frequency is always displayed in the main screen. Simply select the desired sampling rate from the Top Ribbon drop down menu.



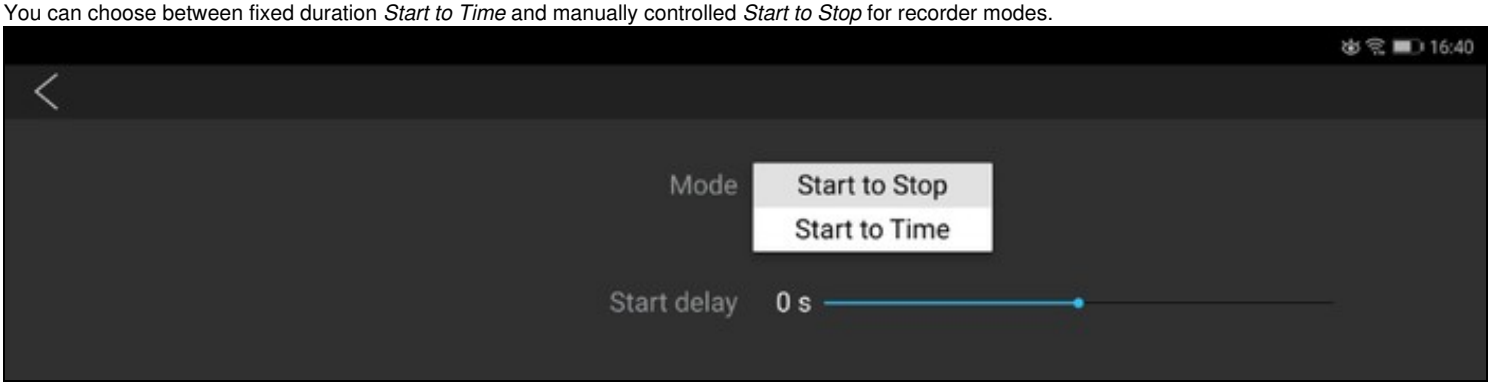
This menu is not available when the OR10 is recording.

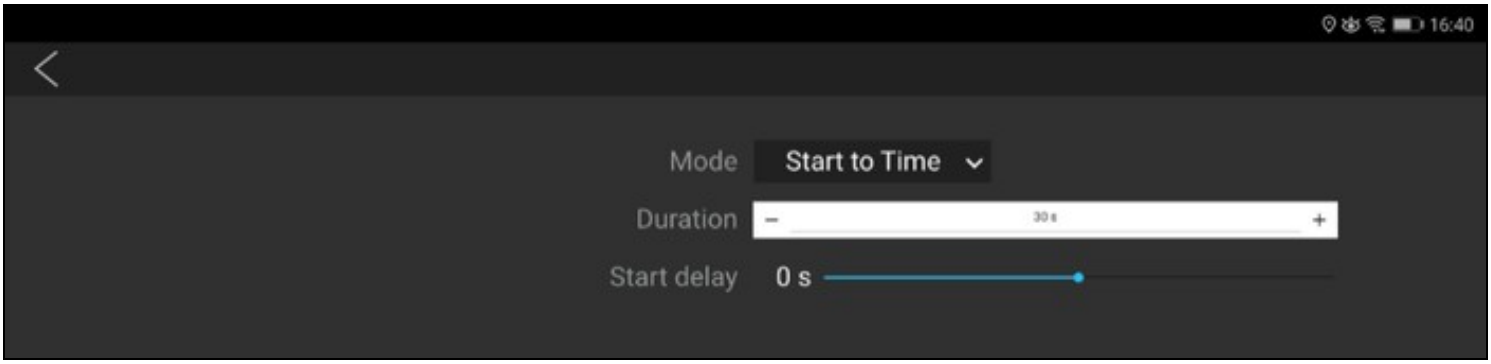
153.1.3.4 Adjust the Recorder

The recorder mode and duration may be adjusted. On the left (*in Settings*), press the recorder button on the Top Ribbon to open the *Recorder Settings* screen. This menu is not available when the OR10 is recording.



You can choose between fixed duration *Start to Time* and manually controlled *Start to Stop* for recorder modes.



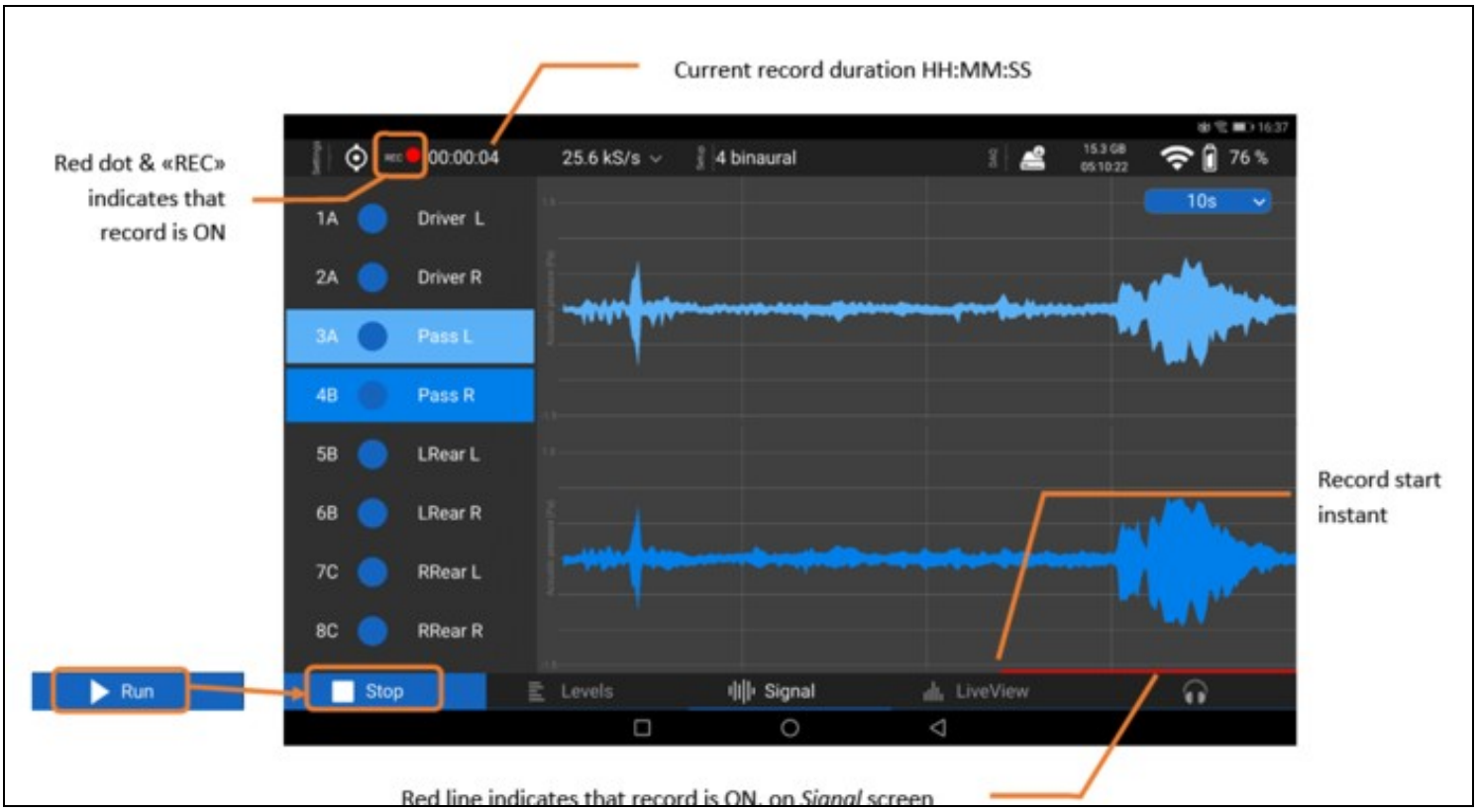


For *Start to Time*, the duration should be updated by editing the field or using the +/- buttons.

153.1.4 Make a Recording

153.1.4.1 Start Recording

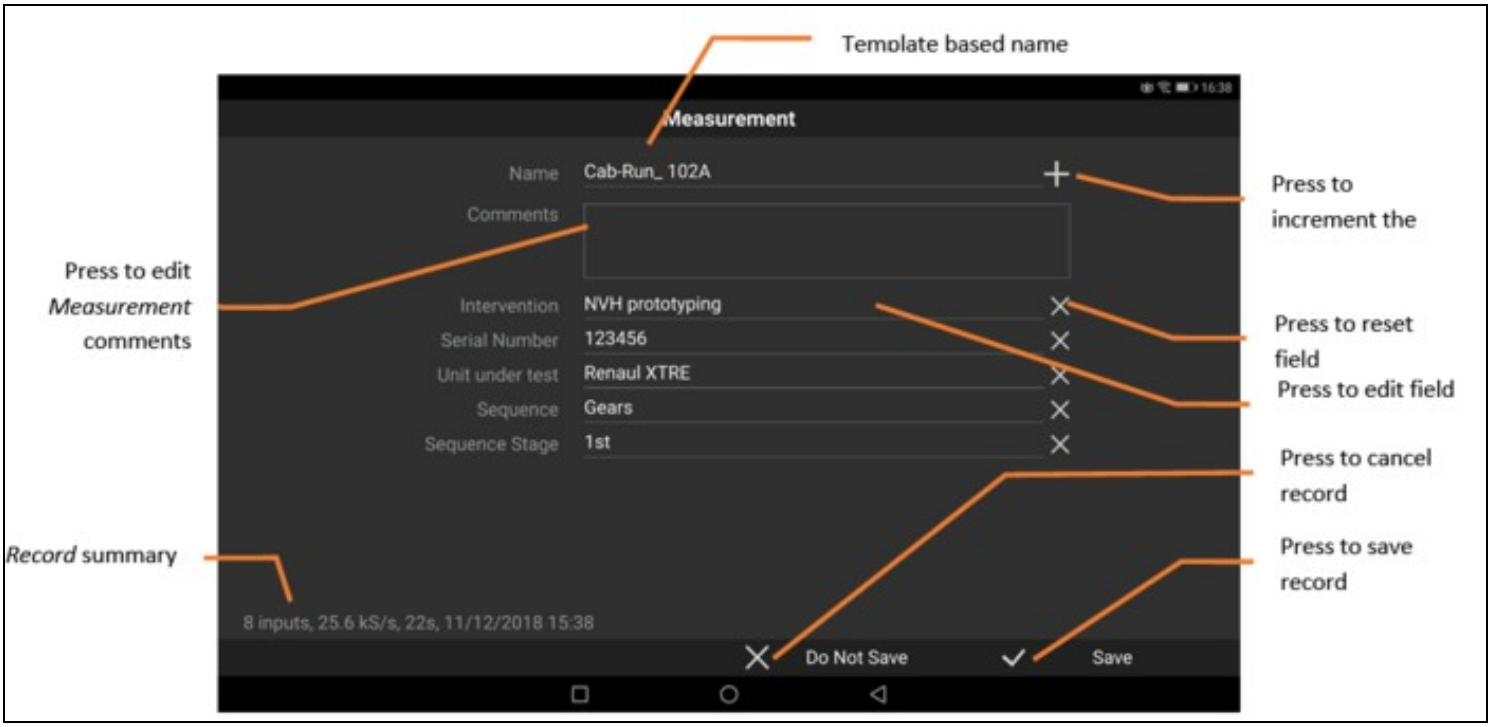
When the OR10 setup is done, the system is ready to start acquiring and saving the input data. To start the recording, press the bottom left *Run* button or press the "REC" button on the OR10.



To stop the recording, press *Stop* on the bottom left or press the "REC" button on the OR10. In *Start to Time* mode, the recording will stop automatically when the duration time is reached.

153.1.4.2 Save & Inform Recorded Data

When the record is finished, the save screen is shown.



Recordings are saved with the predefined base name of *Template*. A combination of 3 numbers and a letter is added to manage the multi-acquisitions:

- Letter is incremented while using the same *Template* for multiple acquisitions (called RUNs)
- Number is incremented and letter reset when *Template* is changed.
- Number and letter are automatically incremented to avoid overwriting existing files in the OR10 memory.

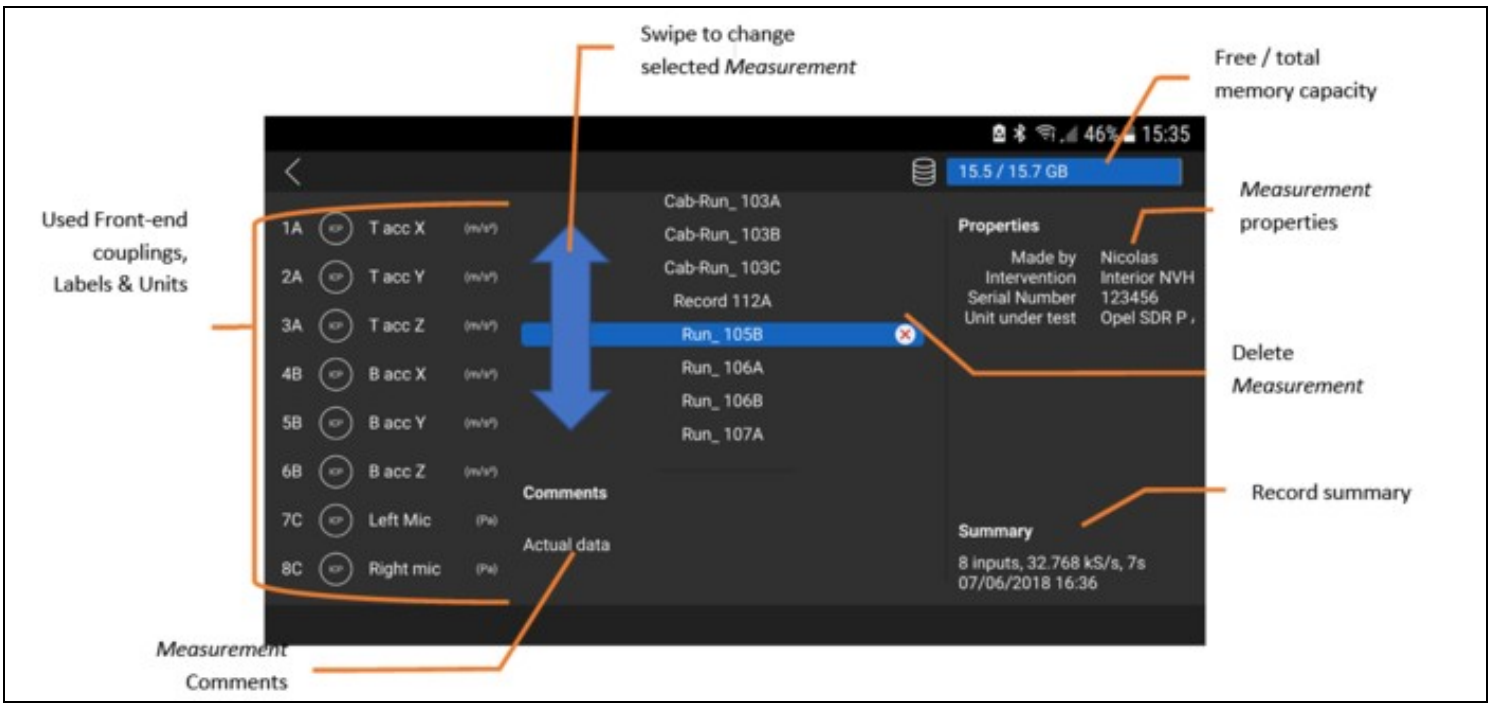
In that way, each RUN of a measurement type will be called: *BaseName_102A, BaseName_102B, BaseName_102C*, etc?

All the properties with contents are saved with the recorded data. Saved properties will be associated to the *Measurement* when records are imported into NVGate.

153.1.4.3 Check OR10 Memory Content

You may browse the OR10 recorded data from NVGo. Press on the Capacity field (DAQ) which is in the Top Ribbon on the right.





The Record list screen is displayed.

154 OR10 MODS

MODS is a set of hardware and software components that can be combined to serves multiple noise & vibration measurement applications. OR10 is the multimodal instrument for MODS.

This will help you efficiently handling your new instrument. Please read it carefully before operating your MODS components.

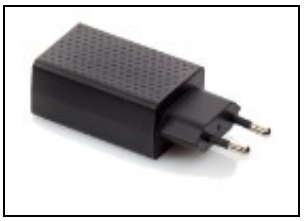
154.1 Package contents

Your OR10 is delivered with accessories, software and licenses according to the ordered configuration.

1. OR10 Instrument, with 4 or 8 dynamic inputs, 2 ext. sync inputs and optional software licenses for NVGo android App, Standalone interface and NVGate PC software



2. USB-C power supply designed to power OR10, and charge internal battery.



3. USB-C cable for power supply.

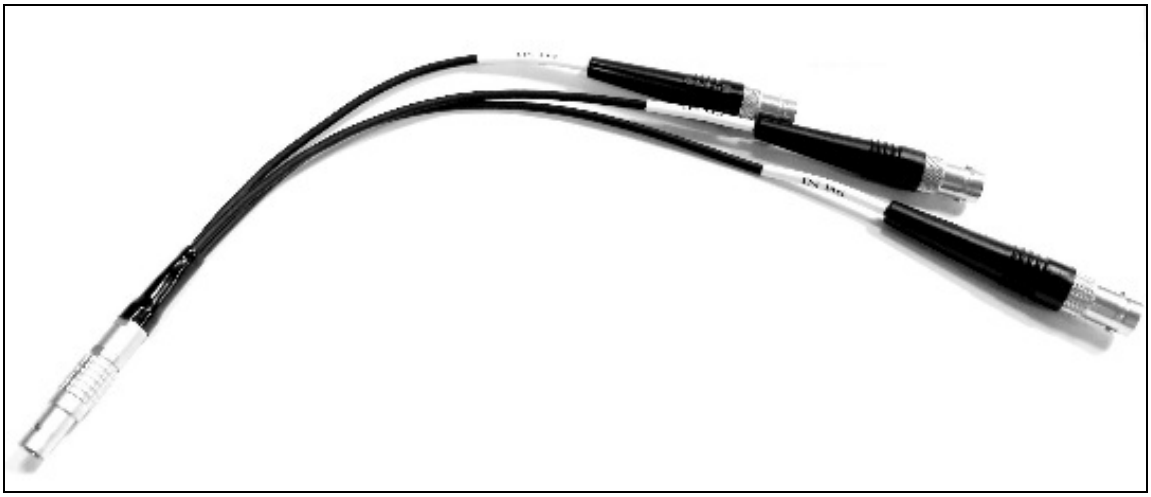


4. Specific Ethernet cable for operating OR10 from PC with NVGate software.



5. Lemo to BNC adapters cables: 3 models:

-



A: Dynamic inputs 1 to 3

B: Dynamic inputs 4 to 6

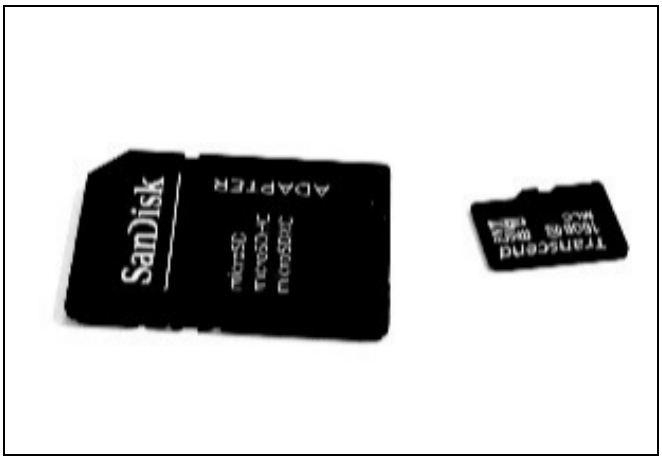
C: Dynamic inputs 7 & 8 plus Ext. Sync 1 & 2. Input 8 and Ext. Sync 1 are sharing the same BNC.
Note: these mini-LEMO connectors are spring locked. Pull-on outer ring to remove the connector.

6. GPS antenna. 

7. External Wi-Fi antenna to extend wireless range. Works for both NVGo Apps on tablet or smartphone and NVGate on PC



8. CAN bus cable (Optional)



9. µSD card adapter for PC.

10. Carrying bag.

154.1.1 Instrument description



154.1.2 Starting OR10

Connect the USB-C cable to the OR10 on one side and to the power supply on other side. Plug the power supply into the mains. The OR10 beeps 2 times to acknowledge power supply presence.

154.1.2.1 How to use the touch screen

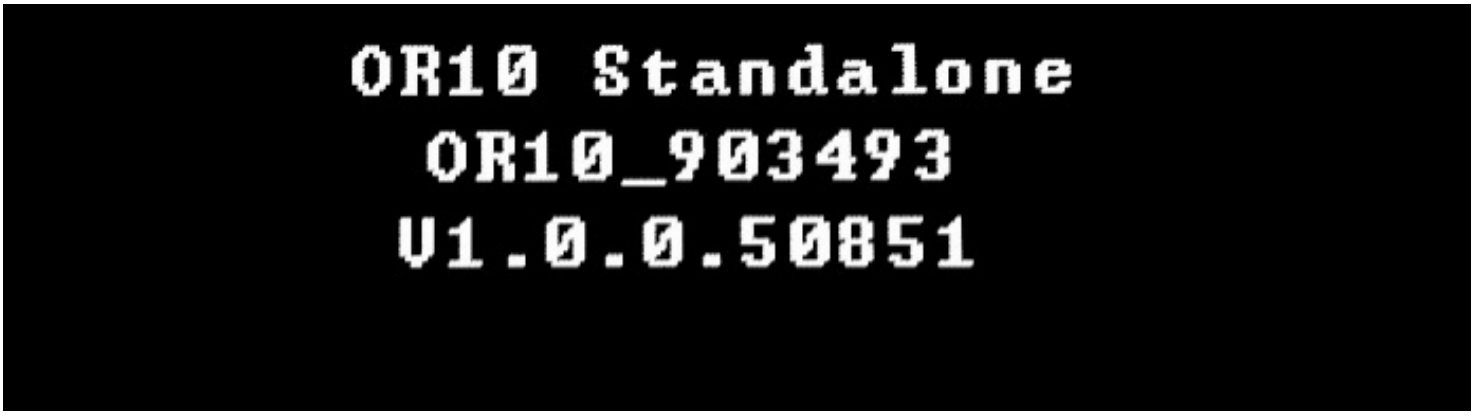
The OR10 touch screen does not react to short Presss. Use longer press (200 ms to 0.5 second) for proper operations with the touch screen. The up and down arrows on the screen can be pressed using the physical buttons.

154.1.2.2 Powering on/Off



Press the On/Off button from Top panel until OR10 beeps. The instrument shows the following screen:

If you power-on the OR10 in battery mode (No USB-C power supply), the system requires confirmation. This behavior is compulsory for shipping devices with Li-Ion batteries by Airplane. Press Yes or down arrow to start.



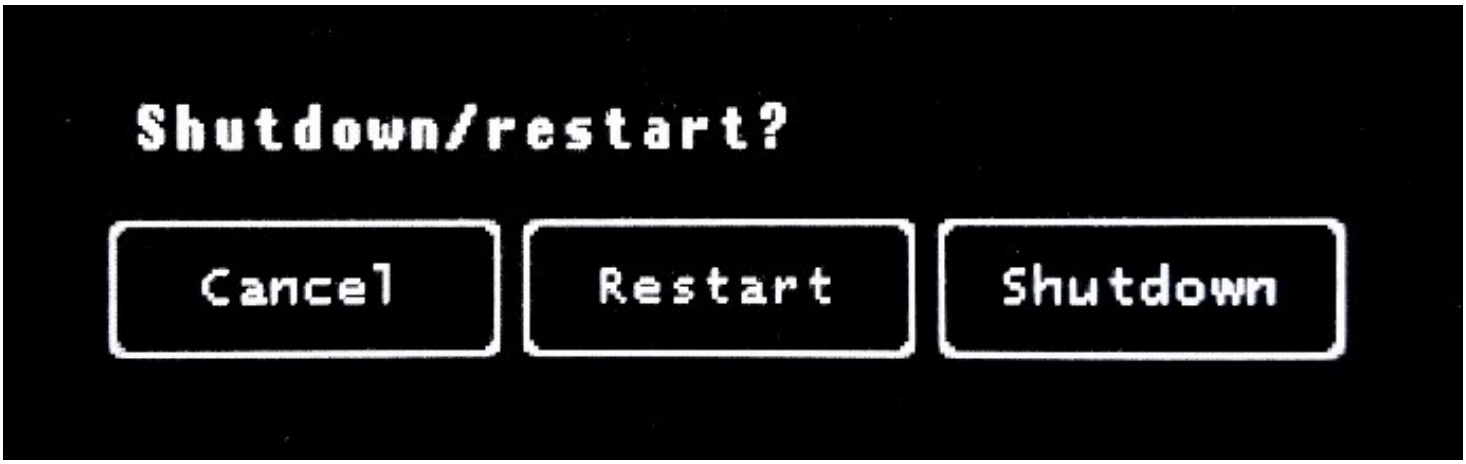
The system shows the serial number and the middleware version.

If you have a standalone license it is replaced by the following one:

Your OR10 is now ready to be operated with the purchased licenses.

To power off the OR10, Press the On/Off button quickly once. The screen will show:

-



Press on Shutdown to power off.

- Maintain the pressure until the OR10 rings. OR10 will shutdown just after pressure release.

154.1.3 Connecting to OR10

154.1.3.1 To PC through Ethernet

The OR10 Wi-Fi is automatically disabled when the OR10 is connected to NVGate with the Ethernet cable. Connect the delivered Ethernet cable between the OR10 and the PC. The Ethernet protocol used by OR10 is IP V6. Check that your PC's Ethernet adaptor is properly configured for IPV6 connection. IP addresses are automatically managed.

154.1.3.2 To PC or Tablet through Wi-Fi

Attention, NVGate is a real-time software which need to process gap free signal (no missing samples). OR10 being a DAQ, it sends continuously raw data to the PC. Using Wi-Fi connection is not recommended in buried environments or with high channel * sampling frequency configuration. Using a wired Ethernet ensures gap free acquisition and stable operations

154.1.3.2.1 Enable and setup OR10's access point

Verify the OR10 Wi-Fi is activated from the following menu on the instrument.



Press the instrument menu on top left of main screen. Then press the Wi-Fi button, the Wi-Fi menu is displayed.



Enable the Wi-Fi and install the Wi-Fi antenna (black) on the top of OR10.
Caution, do not invert the Wi-Fi (Black) and GPS (Orange) antenna. This may break the connector pins.

Bandwidths and locations must be adapted to the country where you operate the OR10 if you plan to use Wi-Fi.

Bandwidths: Pressing the top right button toggle the bandwidths between n / 2.4 GHz and ac / 5 GHz**.**

Locations: the location is adjusted from the NVGate *Connection* dialog. This usage does not require licenses.

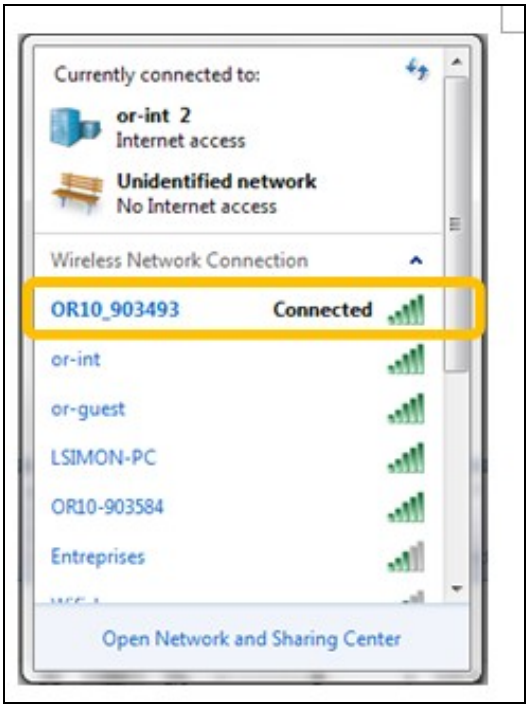
Caution: the 5 GHz bandwidth is not compatible with World location. Selecting this combination from OR10 screen will block the OR10 Wi-Fi.

154.1.3.2.2 Connect to the access point

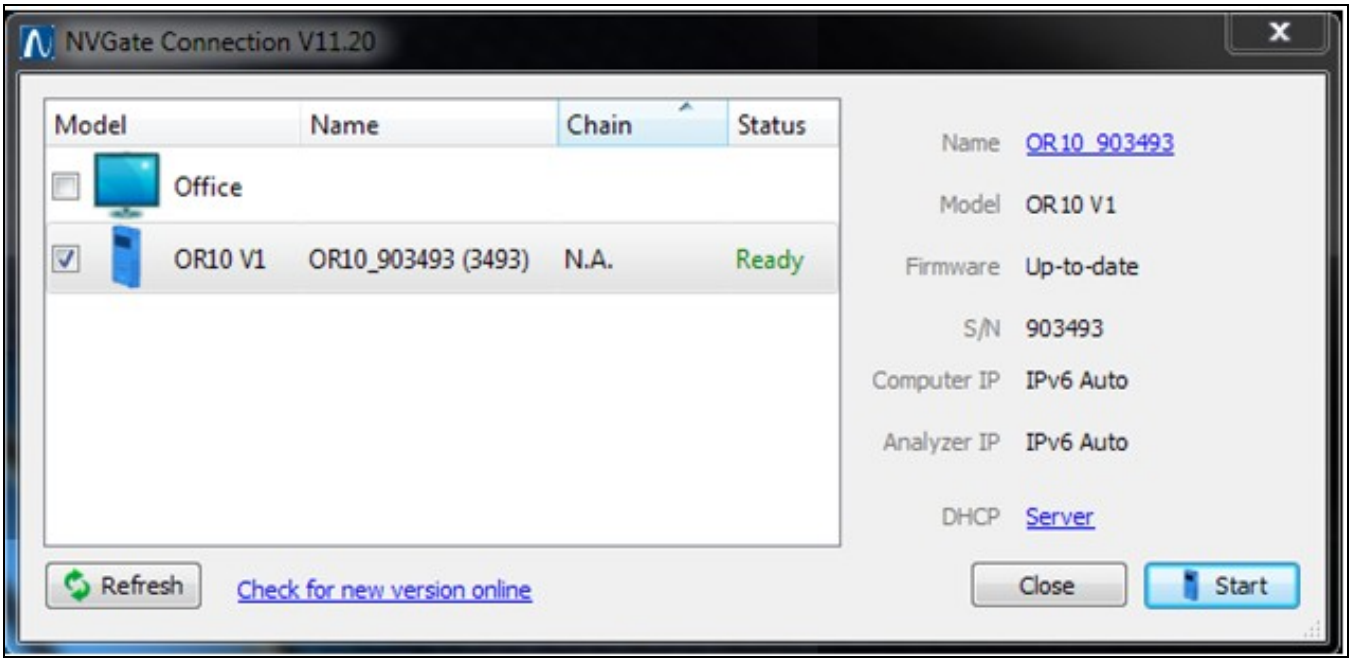
The Ethernet protocol used by OR10 is IP V6. Check that your PC's Ethernet adaptor is properly configured for IPV6 connection. IP addresses are automatically managed.

Open the wireless connection dialog and select the OR10. Your OR10 SSID is: *OR10_XXXXXX* where *XXXXXX* is your OR10 S/N.

A password is requested. Default password is "12345678". It is recommended to update this password to ensure data security and avoid interferences or malwares.



Start NVGate from the PC. No licenses are requested at this point. The *NVGate connection* window in displayed:



If your instrument is not visible, click on *Refresh* to update the list. with Windows 10, if the OR10 is not visible, it may be necessary to allow "Manage random addresses" from the OR10 Wi-Fi connection properties.

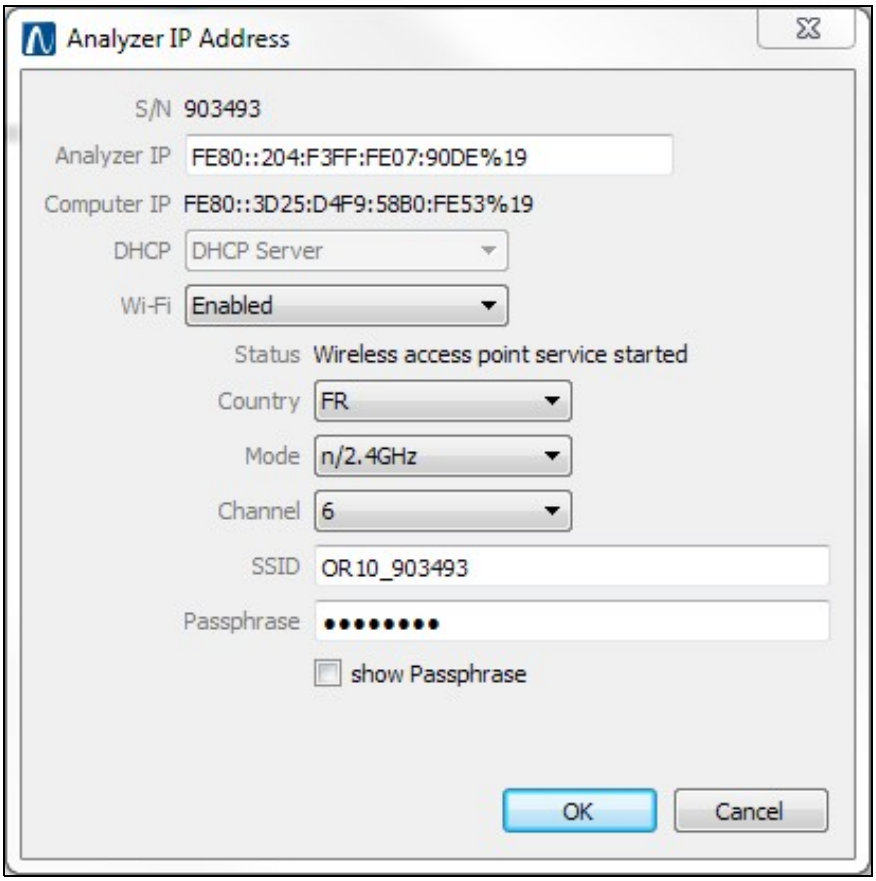
Select the instrument, the right panel will show OR10 information. Hyperlinks allow modifying contents/settings.

For Wi-Fi setup, click on Server, the IP dialog is displayed.

Mode and *Country* must be adjusted to local standards.

Channel allows optimizing the Wi-Fi performances and bandwidth jamming. Available channels depend on selected *Country*. Contact your IT services to adjust it.

It is recommended to modify the default password.



Your OR10 is now connected to the PC within local regulation standards. Click on Ok and on *Start* from the NVGate connection dialog to launch NVGate software with the OR10 as a front-end.

154.1.4 Accessing OR10 data

OR10 data consist of *Templates* (setups) *and Measurements* saved in the µSD memory.

154.1.4.1 Using the µSD card adapter

Press the instrument menu on top left of main screen. Then, press Swap SD button.



The swap procedure starts, it takes just a few seconds:

1. When the OR10 asks: Swap SD card? press *Yes* to continue

2. Then OR10 proposes: Remove and insert new SD card. Remove the µSD card from the chassis aperture on the right side of the OR10 by push-pulling the card on the slot.

3. Plug the µSD in the adapter and plug it to the PC.

4. Browse the SD card from your PC. Files & directories are available for Copy/Paste/Delete. Directories and files types are discussed in next chapters.

5. When your data are collected, re-plug the µSD car into the OR10 slot, and press Done to continue.

OR10 restarts. It will be ready to operates when the Main menu of the standalone interface is shown.

154.1.5 MODS OR10 Software

154.1.5.1 NVGate

Read NVGate home page

154.1.5.2 Stand alone operation

Read OR10 stand alone operation page

154.1.5.3 NVGo: Android OR10 Aplication

Read NVGo Android Apllication page

155 OR3X Hardware Instruments

155.1 OROS Teamwork instruments Range

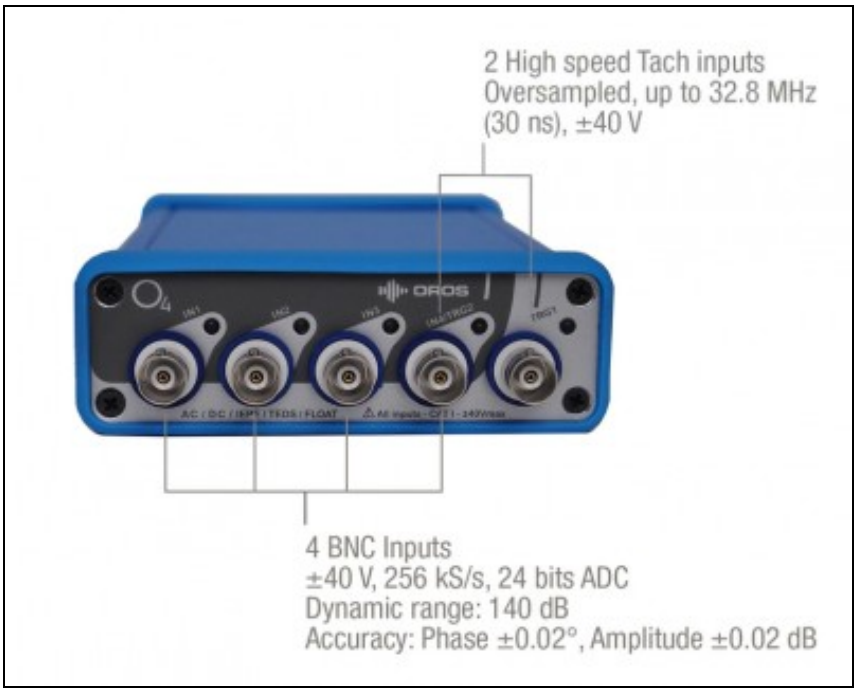
This manual applies to the whole OROS Teamwork instruments range.



Dear customer, thank you for purchasing an OROS Teamwork instrument. The Teamwork instruments are designed to fulfill industrial applications of noise and vibration measurement and analysis. Your new instrument covers most of the measurement situations in the Automotive, Manufacturing and Automation, Energy & Process, Aerospace and Marine industries. It applies for real-time/Post-analyses as well as recording/playback of a raw signal. These instruments are suitable for field, on board and laboratory operations. They are also capable of remote/standalone measurements without any operator at their side. OROS Teamwork analyzers mainly run while connected to a Windows PC that drives the control and analysis software.

155.1.1 O4 analyzer

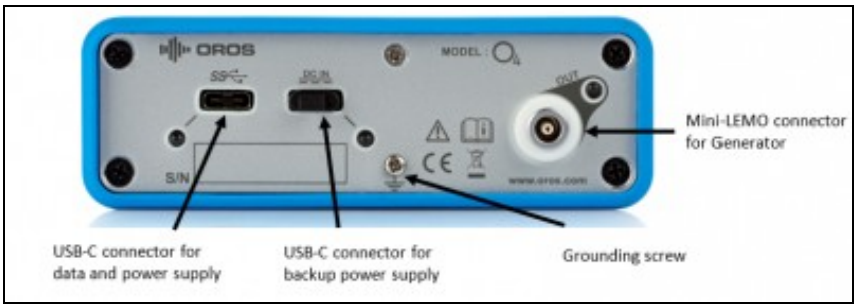
O4 is a compact analyzer. It offers 2 or 4 dynamic inputs with 2 ext. sync.



155.1.1.1 Back Panel

The back panel includes:

- USB-C connector for data and power supply
- USB-C connector for back-up power supply
- Mini-LEMO connector for Generator (Mini-LEMO-to-BNC adaptor is provided)



155.1.1.2 DC POWER SUPPLY AND POWERING ON

O4 instrument is powered by DC power through USB 3.0 Power Delivery protocol, which can be provided through a USB computer port or external DC supply. When the computer can power O4 (8 W) with a single cable, the LEDs on the back panel are lit as shown below:



155.1.1.2.1 OLD PC

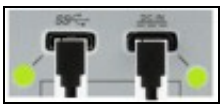
When the computer port is not powerful enough to supply O4, this could happen with old PCs without a USB 3.0 port. Then a backup power source is required, with a maximum of 5 volts and 2 amps.

In case of back-up powering, please follow the instructions:

1. Connect the back-up power first and wait until the LED turns green



2. Connect the first USB port to PC and wait until the LED turns green.

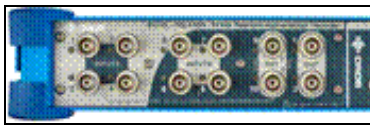


All the connections of O4 instruments comply with SELV (Safety Extra Low Voltage) conditions.

155.1.2 OR35/OR36/ORMP/OR38 Teamwork instruments

OR35, OR36, ORMP & OR38 cover high end applications with multi-channels chassis. They offer from 4 to 32 universal inputs, 2 ext. synch, 2 generators and optional auxiliary channels supporting generators, trigger/tach and parametric inputs.

155.1.2.1 Front Panels

	OR38	OR36/MP	OR35
Inputs	1 to 32 Universal	1 to 16 Universals	4 or 8 Universal + 2 Dynamic
Outputs	Generators 1 & 2	Generators 1 & 2	Generators 1 & 2
Triggers	External Sync.1 & 2	External Sync 1 & 2	External Sync 1 & 2 in // with Dynamic
Auxiliaries	4 DC, GEN or Ext synch (Depending on the purchased options)	4 DC, GEN or Ext synch	No
Overview			


READY D-rec
OROS
INPUTS
AUX
OUT
EXT
OR38 2
32 ch. - 102.4 kS/s - 24 bits
Real-time multi-analyzer / recorder
all inputs : ± 40 V - Cat. I


READY D-rec
OROS
INPUTS
AUX
OUT
EXT
OR36 2
16 ch. - 102.4 kS/s - 24 bits
Real-time multi-analyzer / recorder
all inputs : ± 40 V - Cat. I

The universal inputs gather both dynamics and parametric input in the same board and connectors. The type of use of the universal inputs is selectable by software (NVGate®) during the analyzer operations. The universal inputs fulfill all the performances, precision and operability of each specific input type. All the connections are Very Low Safety Voltage.

155.1.2.1.1 Inputs LED colors

For each input connector LED shows the current status:

Color	Input type	Signal level
Green	Dynamic	FS<ref>Full scale</ref>-30 dB < Signal < FS
Cyan	Dynamic	0 < Signal < FS-30 dB
Red	Dynamic/Parametric	Signal > FS (Overload)
Yellow	Parametric	FS-30 dB < Signal < FS
Purple	Parametric	0 < Signal < FS-30 dB
Off	Inactive	N.A.

155.1.2.2 Lateral panel

With the universal inputs and the adapted connection kit (Not available for ORMP), the OR35, OR36 and OR38 can hold signal conditioning modules called XPod (dockable e**XP**ander m**od**ule).



The XPod is a device that can be fixed on the OR35/OR36/OR38 side. Each XPod is associated to a block of 8 inputs.

The following optional XPod are available:

- Bridge signal conditioning for strain gauges, dynamic pressure and force measurements.
- Thermocouple and RTDs for temperature measurements.

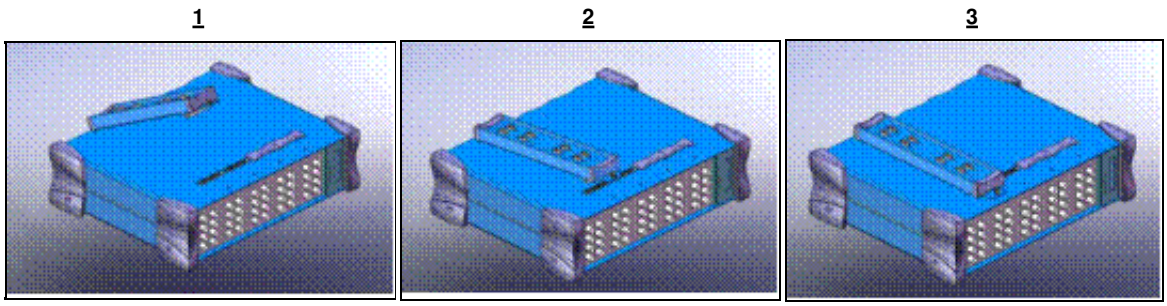
To fix the XPod on the analyzer:

1. **Warning:** do not plug or unplug the XPod when the analyzer is powered on, shut it down for this operation.

2. Lock the XPod hook in the notch on the back of the analyzer,

3. Lower the XPod to the corresponding connector on the top of the analyzer,

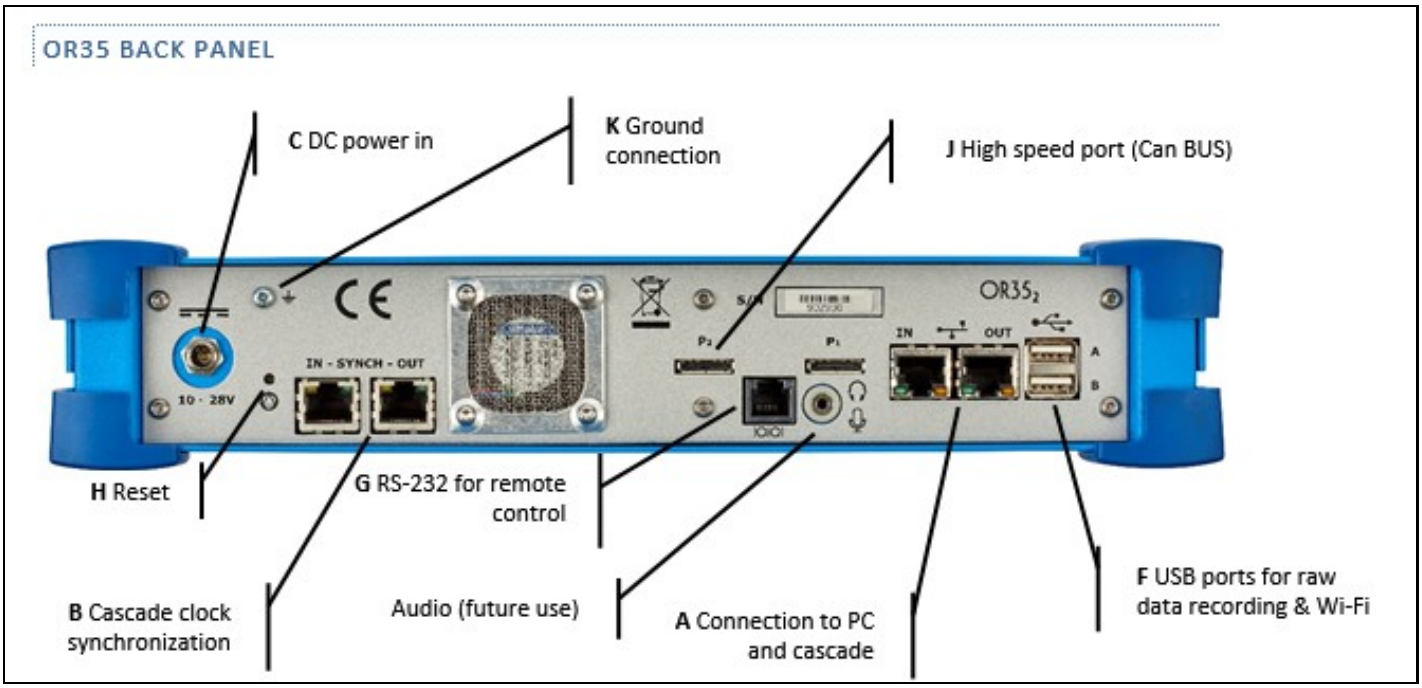
4. Secure the XPod on the analyzer with the screw on the extension key of the XPod



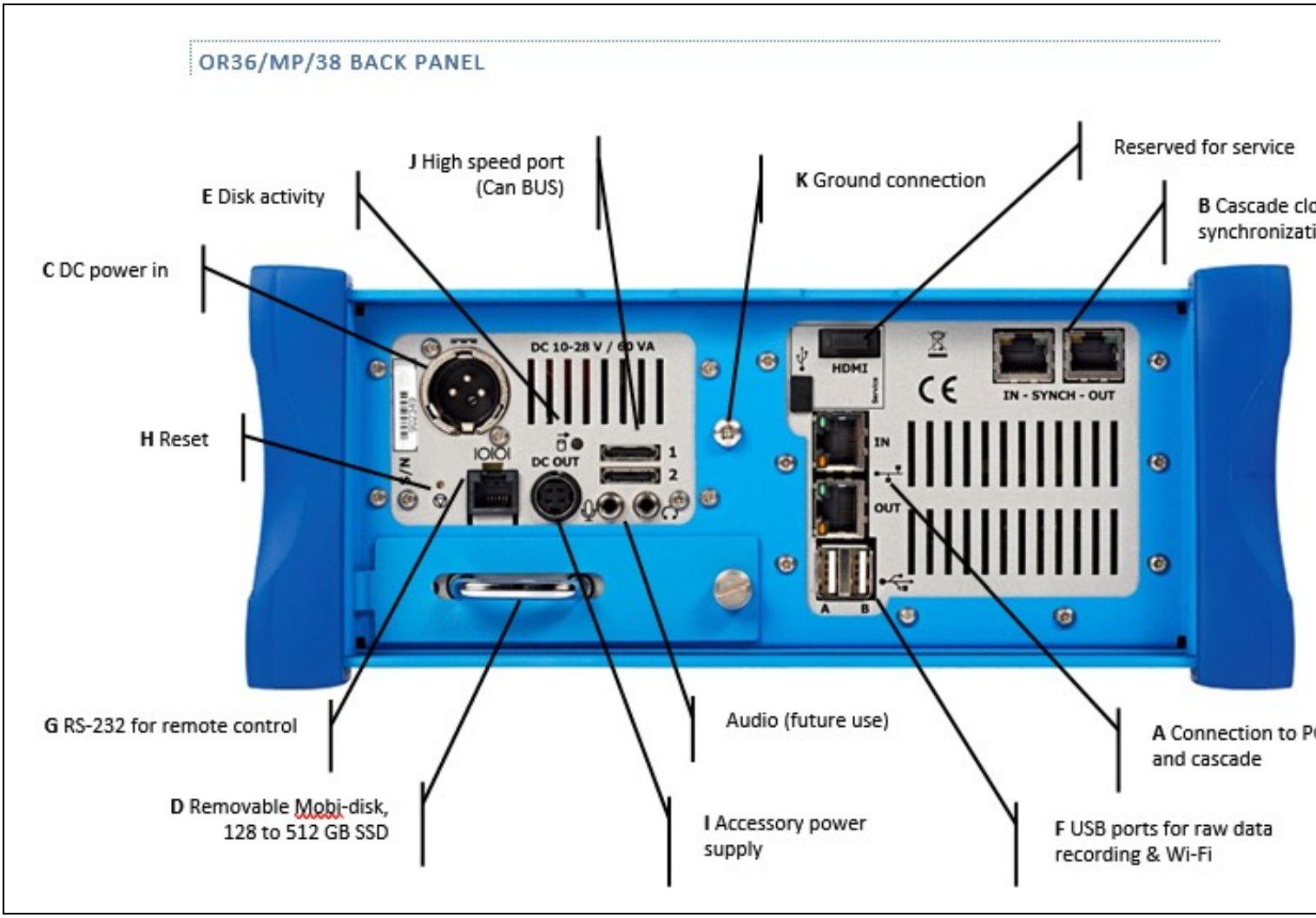
Note: When travelling, fix the XPod to the analyzer to avoid any damage. In the absence of an XPod, secure the rubber cover on the analyzer. There are two rubber covers on the XPod, which allows having a cover left if one is lost.

155.1.2.3 Back Panels

The back panel supports the connectivity, power supply and accessories connections.



OR35 instrument complies with SELV (Safety Extra Low Voltage) conditions.



All the connections of OR36, ORMP and OR38 instruments comply with SELV (Safety Extra Low Voltage) conditions.

155.1.2.3.1 Back panel connectors description

- **A**: Two Ethernet (1 Gb/s) connectors: One for connection to PC and one for cascade of analyzers.

Connect the PC to IN. In cascade mode connect the PC to first analyzer (master) to IN. Next units are daisy chained (OUT -> IN, OUT- > IN, etc?) in cascaded mode. The cables required are Category 5 un-shielded twisted-pair. Use the blue cables.

- **B**: 2 clock synchronization connectors (100 Mb/s Ethernet). Please do not use while using a sole analyzer. Daisy chain from Master unit to the next one in cascaded mode (OUT -> IN, OUT- > IN, etc?). On the Mobi-Pack, synchronization connectors are on the front panel
- **C**: DC power in XLR connector (Not available on ORMP). To be plug with the external power supply. Warning, do not mix the instrument power supply types.
- **D**: Mobi-disk. The Mobi-Disk holds the recorded raw data. So please power off the analyzer prior removing or inserting it. When using the analyzer without the Mobi-disk plugged in, use the obturator cover to protect the internal parts of the analyzer.
- **E**: Disk activity LED: The LED will flash while data are written on or read from the disk.
- **F**: USB 2.0 for raw data recording: To record on an external disk, power off the analyzer, remove the Mobi-Disk (put the obturator cover), plug your USB memory device and power on. The raw data will be saved on the memory device. Caution, the write speed on your memory device may lead to a throughput error, check the performance before using it for actual measurements
- **G**: Interface connector: RS-232 for remote control through RJ11 connector
- **H**: Reset. To be used when your analyzer does no respond to any command. Insert a paper clip in the hole and press smoothly.
- **I**: Accessory Power supply. This connector provides power supply for external use (transducer, tachometer, etc? power supply). The available voltage and power are:

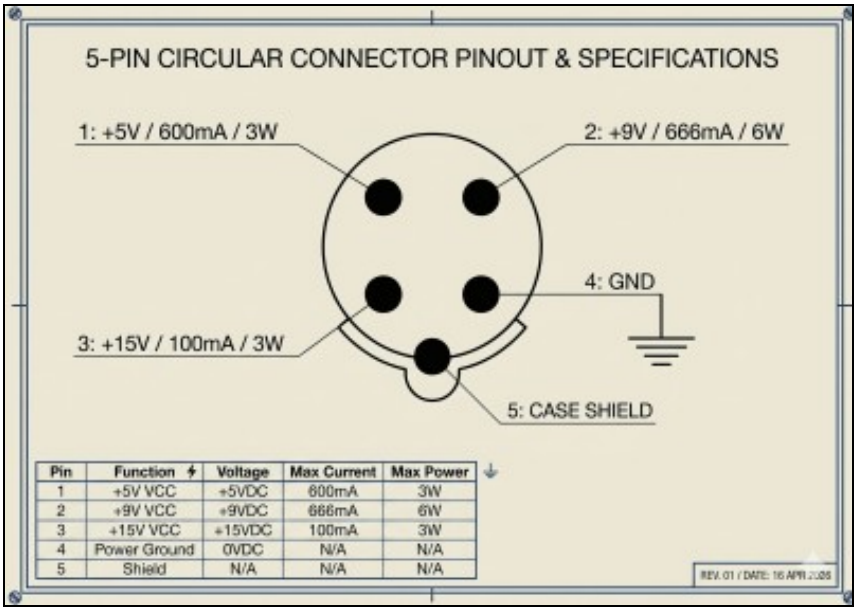
1. +5V, 3W, 1.6 A

-

2. +9V, 6W, 650 mA

-

3. +15V, 6W, 25 mA



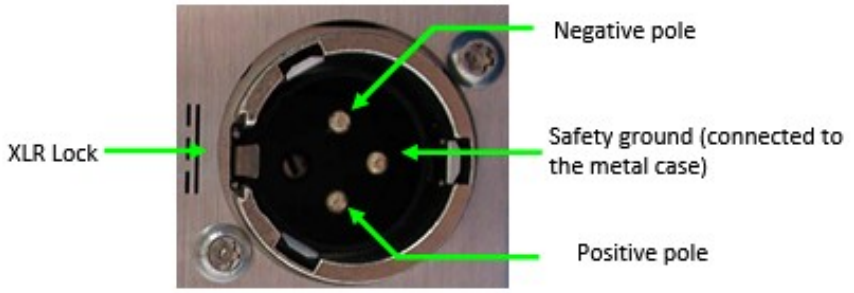
Pin	Function	Voltage	Max Current	Max Power
1	+5V VCC	+5VDC	600mA	3W
2	+9V VCC	+9VDC	666mA	6W
3	+15V VCC	+15VDC	100mA	3W
4	Power Ground	0VDC	N/A	N/A
5	Shield	N/A	N/A	N/A

- **J**: High speed port: Used for connection the CAN bus probe
- **K**: Ground connection. Use this screw to connect the analyzer to the ground potential

155.1.2.4 DC Power supply

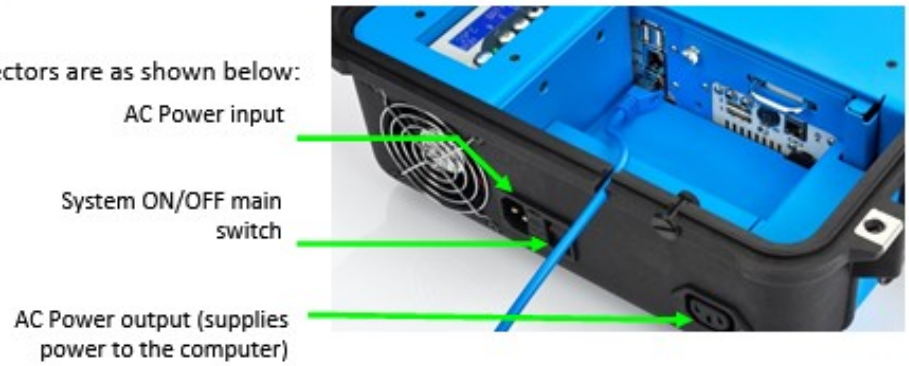
OR36 & OR38 CONNECTOR

These analyzers are powered by an external power supply through the DC power supply connector:

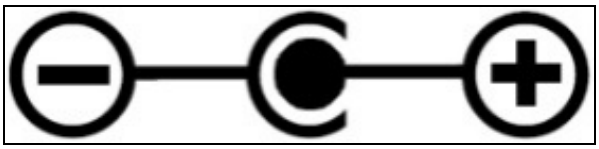


ORMP CONNECTORS

The power supply connectors are as shown below:



155.1.2.4.1 OR35 connector



OR35 features a coaxial connector. Center is positive terminal; outer ring is negative and ground terminal:

The analyzers may be powered from an external DC voltage[6] to replace the external power supply. The power voltage and current must fulfill the following conditions:

155.1.2.4.2 OR35 Power supply

Power	< 30 VA	
External AC Power supply	Voltage	110 to 220 VAC 1.7 A max
	Frequency	50/60 Hz
DC in	Range	10 V to 28 V
	Overload protection	Absolute maximum < 40 V / > 31 V poles are disconnected
Battery	Type	Built-in 89 Wh Li-ion 8 modules (UN38.3 certified)
	Autonomy	**3 h** (4 ch 1 DSP 12.8 kS/s)
	Charge time	**3 h** (typical)
	Charge conditions	DC power supply > 12V

155.1.2.4.3 OR36/ORMP Power supply

Power	< 60 VA	
External AC Power supply	Voltage	110 to 220 VAC / 1.7 A max
	Frequency	50/60 Hz
DC in (Not applicable to the ORMP)	Range	12 V to 28 V (DC voltage < 17 V will discard the battery)
	Overload protection	**31 V** (over this voltage DC poles are short-circuited)
Battery	Type	**NiMh** 11 modules (no memory effect)
	Autonomy	**2 h (**4 ch 1 DSP 12.8 kS/s)
	Charge time	**2 h 30 min** (typical)
	Charge conditions	DC power supply > 18 V

155.1.2.4.4 OR38 power supply

Power	< 100 VA	
External AC Power supply	Voltage	110 to 220 VAC / 2.0 A max
	Frequency	50/60 Hz
DC in	Range	15 V to 28 V (DC voltage < 22 V will discard the battery)
	Overload protection	**31 V** (over this voltage DC poles are short-circuited)

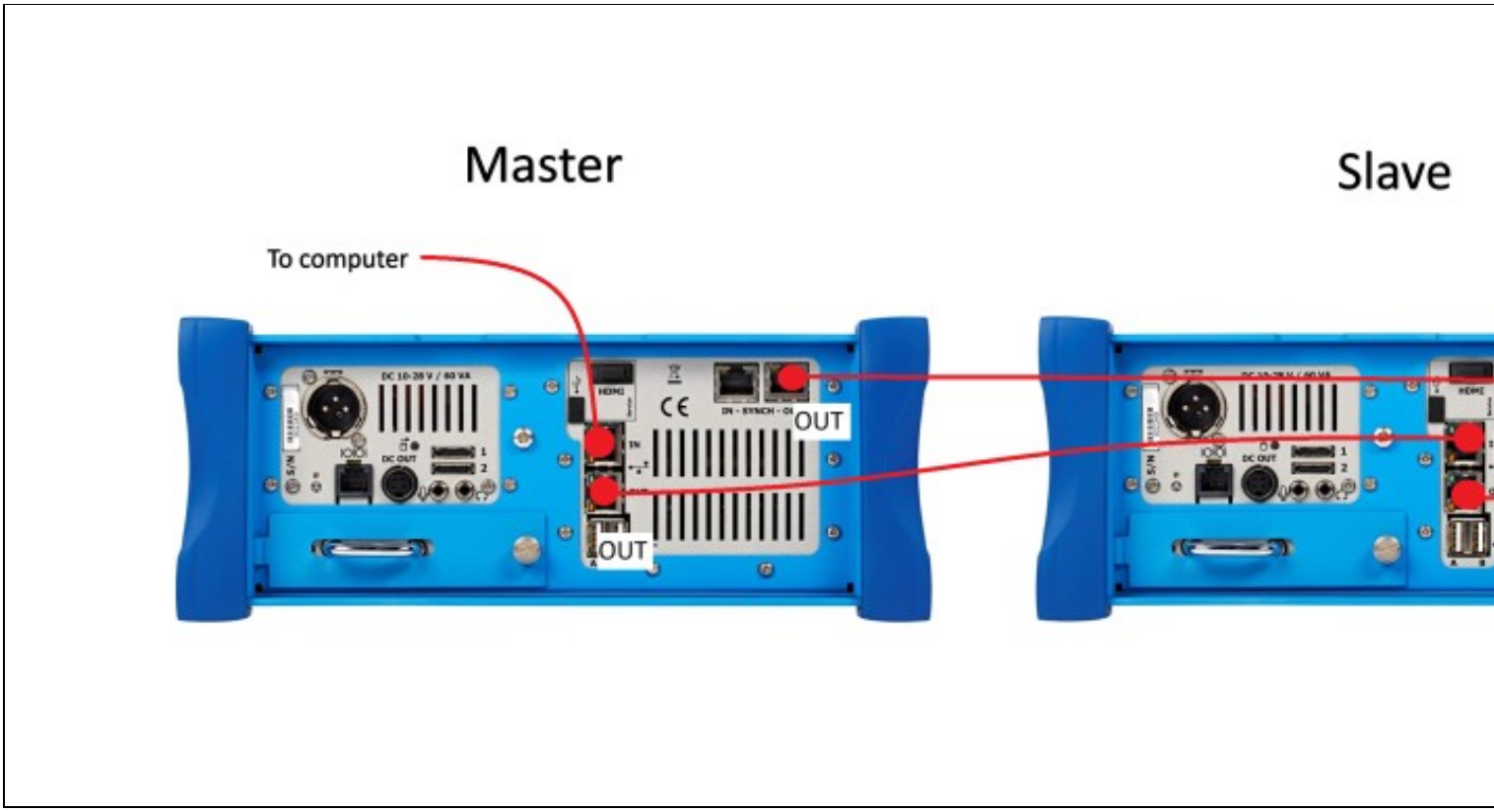
Battery	Type	**NiMh** 17 modules (no memory effect)
	Autonomy	**2 h** (8 ch 1 DSP 12.8 kS/s)
	Charge time	**3 h** (typical)
	Charge conditions	DC power supply > 24 V

Note: All External power supplies accept mains supply voltage fluctuations up to ±10 % of the nominal voltage; Transient overvoltage up to the levels of Cat II; Temporary overvoltage occurring on the mains power supply.

Note: Externals power supplies provided by OROS must operate in the range of -10°C to +40 °C

155.1.2.5 How to connect analyzer in cascade?

The way to connect your TW analyzers together and use them as a chain is the one under.



For hardware connections, take a look at part 1.2.9 here.

155.1.3 Batteries

OROS Teamwork instruments contains an internal battery block particularly useful for autonomous operations (except for OR34) or in case of temporary power failure (all OROS Teamwork instruments).

The batteries of OROS Teamwork instruments are designed to provide maximum trouble-free life. To obtain the longest battery life, please follow the following advice:

- Caution: Temperature above normal room temperature will shorten battery life. If OROS Teamwork instruments is stored or shipped at more than 40°C (104°F), recharge it before running the system.
- Charge the battery in cool area. The battery is charging when an OROS Teamwork instrument is plugged to a power supply. Charge stops when the Front Panel indicates 100%.
- Caution: Never store OROS Teamwork instruments with a discharged battery.

All batteries gradually lose their charge (the higher the temperature is, the quicker the batteries lose their charge). If you store your system for a long time without using it, recharge the batteries every two or three months. This practice will extend battery life.

155.1.4 Fan

The cooling fan is used to reduce the temperature inside OROS Teamwork instruments. From the Front Panel the user can manually switch it on or switch off (for very sensitive acoustic measurements).

The fan operation will be automatically forced when the temperature inside the OROS Teamwork instruments reaches 50°C and stops at 43°C.

Warning: Do not cover the Teamwork instrument in order to let the ventilation operate properly.

155.1.4.1 Temperature and fan management

Internal temp	System status	Fan
70°C (158 °F)	Absolute maximum rating	Off
65°C (149 °F)	Forced shutdown, do not operate	Off
60°C (140 °F)	Normal	Forced max
50°C (122 °F)	Normal	Automatic Fast
45°C (113 °F)		
40°C (104 °F)	Normal	Automatic Slow
35°C (95 °F)		
30°C (86 °F)	Normal	Off
0°C (32 °F)		
-5°C (23 °F)	OK with 1 min/°C Warmup	Off
-20°C (-4 °F)		
-25°C (-13 °F)	Storage, do not operate	Off
-35°C (-31 °F)	Absolute minimum rating	Off

155.1.4.2 Powering on/off OR35- OR36/ORMP - OR38

The Teamwork instrument feature an LCD screen on the front panel.

To start OR35/OR36/ORMP/OR38 instruments, press the On/Off button of the Front Panel. "OROS-3 Series Powering up" is displayed on the LCD screen.



Instrument auto-tests are performed until "System OK ?" appears on the screen or "Ready D-rec" if the D-rec option is available.

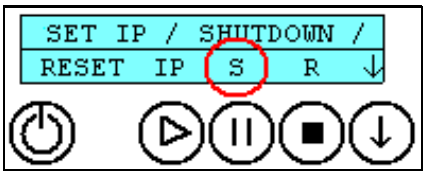
If auto-tests return an error message, please contact your OROS Support.

Power off OR35/OR36/ORMP/OR38 instruments by pressing on the On/Off button of the front panel for a few seconds until "Shutdown" appears on the screen or by pressing on the right-hand button of the front panel «?", then on the second button for "S" (Shutdown) and confirm by pressing "Y" (Yes).

From the LCD screen:

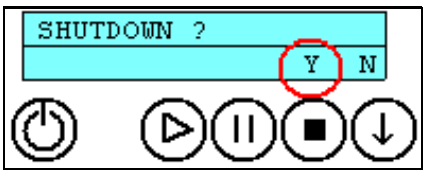


Press the right-hand button for "?". The following menu is displayed:



This menu allows to:

- shutdown the analyzer (second button for "S")
- reset the analyzer (third button for "R")
- go back to the first menu (fourth button for "?").



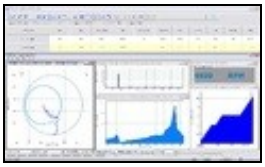
Answer "Y" for Yes

If Instrument does not respond, press the On/Off button until it turns off. Then, power it on again after a few minutes.

156 ORBIGate

ORBIGate Software





Developer	Oros SA
Type	Turbomachinery, Rotating machinery diagnostics, Data Acquisition, Orbit Analysis, Vibration.
First release	2007
Latest Version	V7.2 - 2023
Download	Here
Operating system:	Windows 10, Windows 11 (and W7) (see PC requirements)
Language	English, Japanese
Official website	ORBIGate on oros.com and here!

156.1 Quick View

156.2 ORBIGate 7.2,what's new ?

156.3 Install

156.4 User's Guide

156.5 FAQ

- Run out compensation
- Phase Measurement and Polar diagrams
- Macro: Run, wait X seconds, Stop

156.6 Practical

ORBIGate Rotorkit Demo Data

157 ORBIGate DemoData

How to demonstrate ORBIGate 6 :

157.1 Introduction

This document shows a way to demonstrate the main features of ORBIGate 6.x through a scenario. The used data come from measurements on a rotor kit equipped with fluid bearings.

The data contain 2 major issues:

- Oil Instability causing subharmonic phenomenon
- Critical speed causing large orbit

To display result, use this icon:



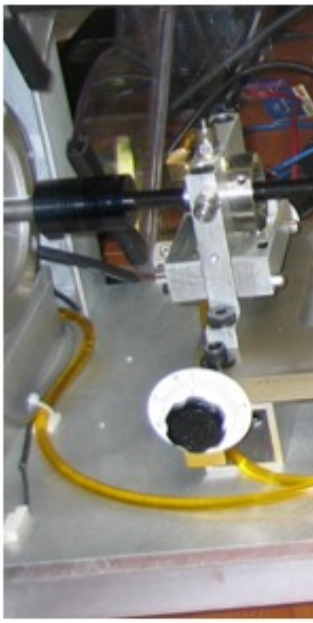
157.2 Rotor Kit sensor picture

157.2.1 Rotor Kit

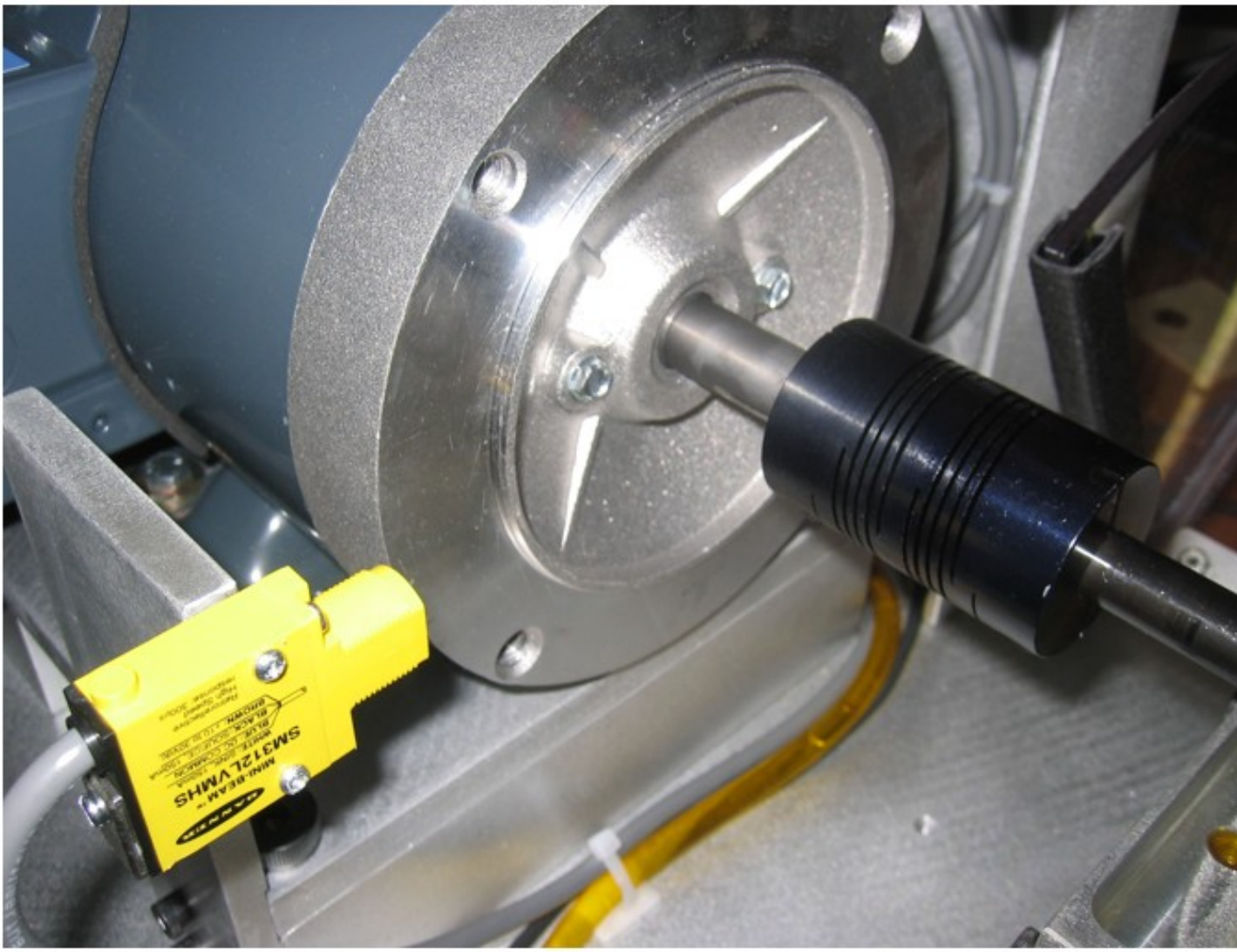


Electric Motor

Rotor

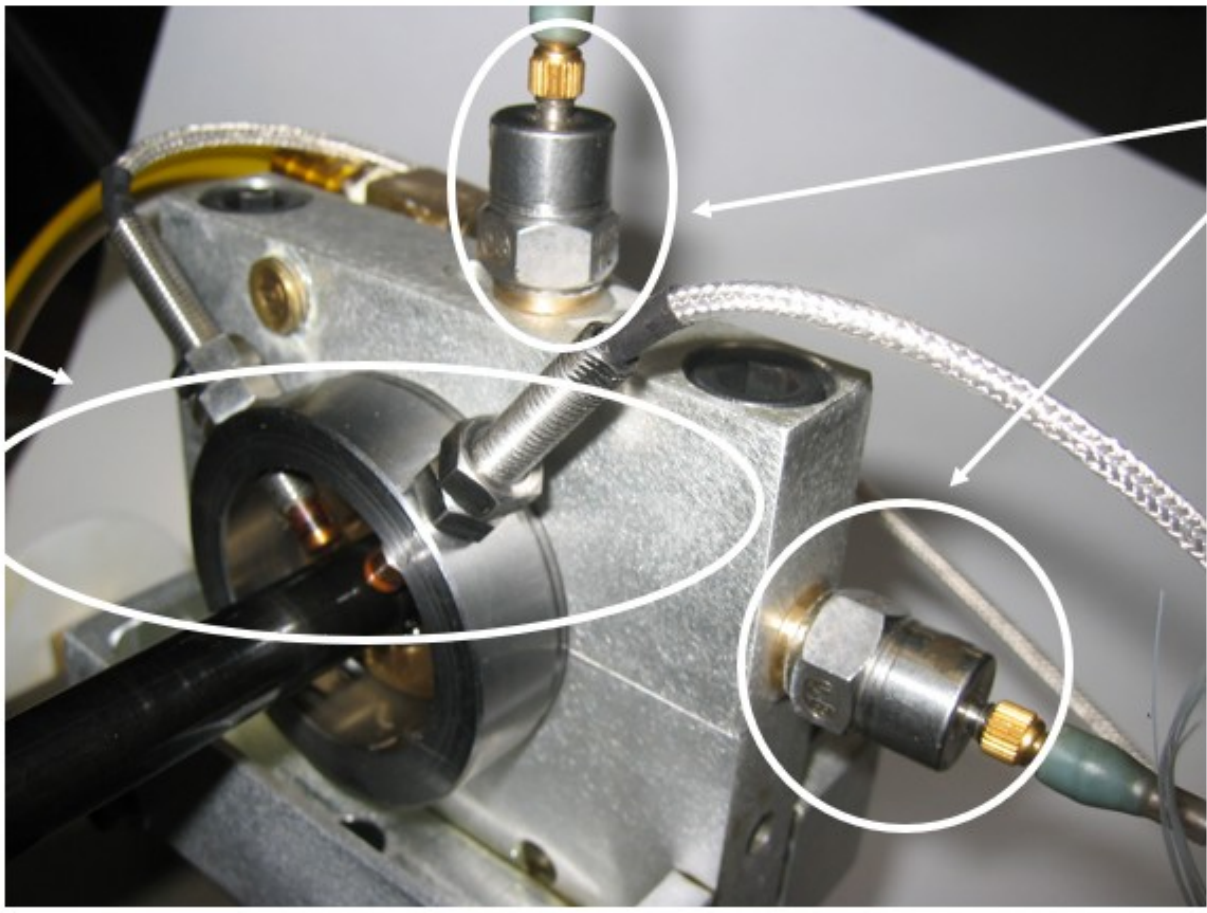


157.2.2 Keyphasor



157.2.3 Sensor

1 Pair
Point

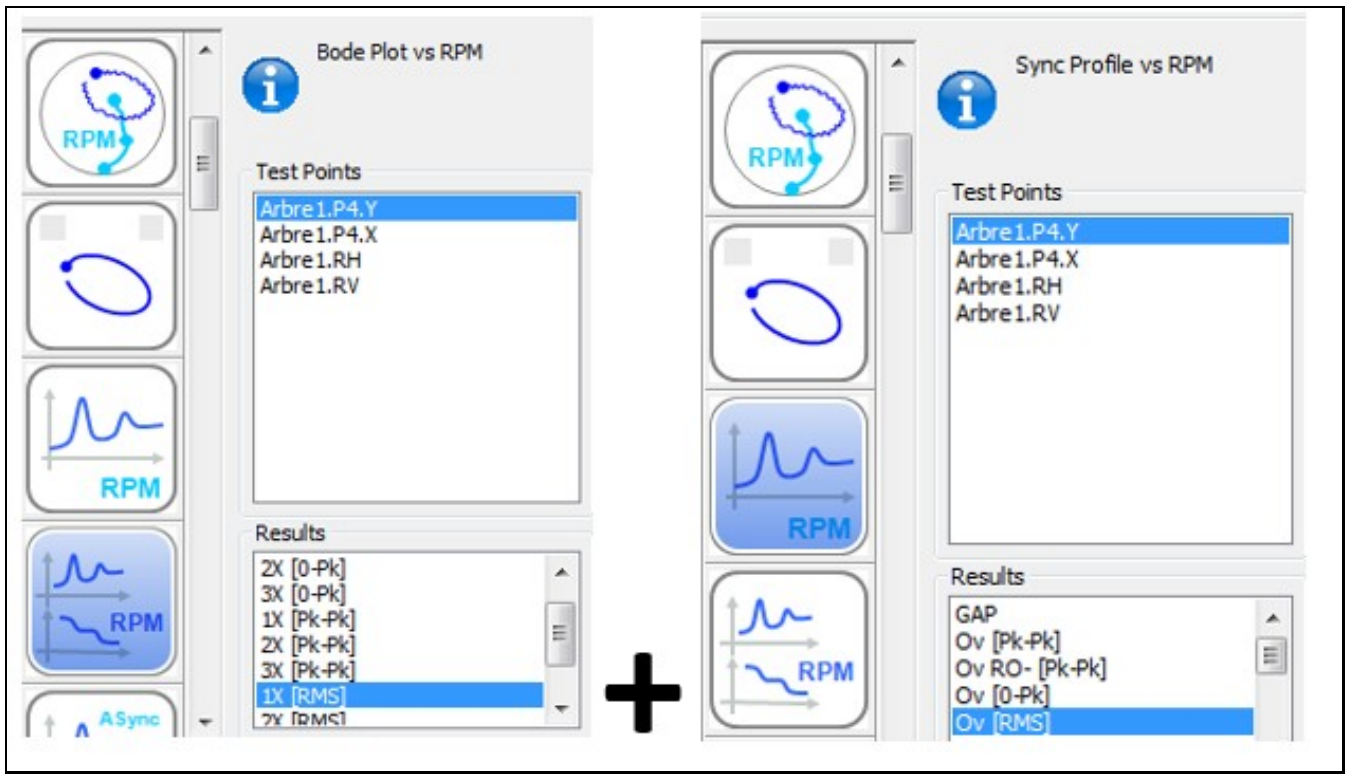


157.3 Instructions

157.3.1 Oil instability diagnostic

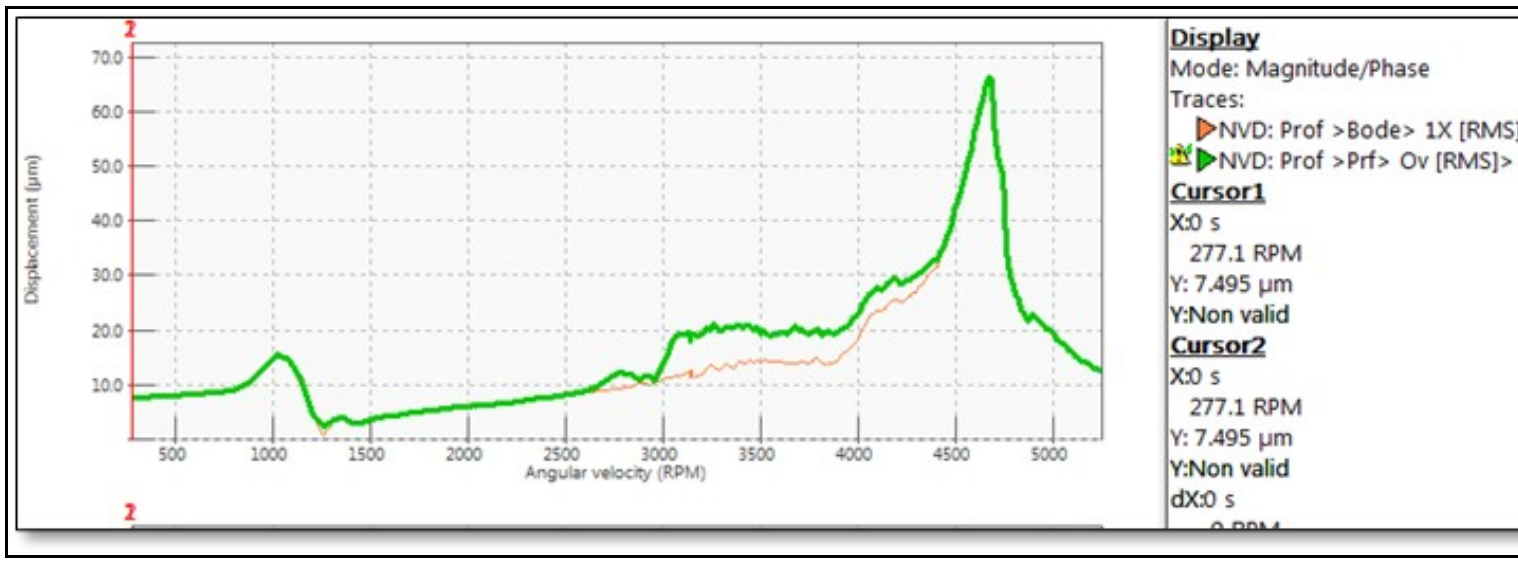
- In File tab, "load measurement", select the *demo_rotokit_OROS.obg*

- Add/Remove result window to display :
- Speed profile
- Bode Plot vs RPM of 1X [RMS] overlaid by profile OVL [RMS] vs RPM

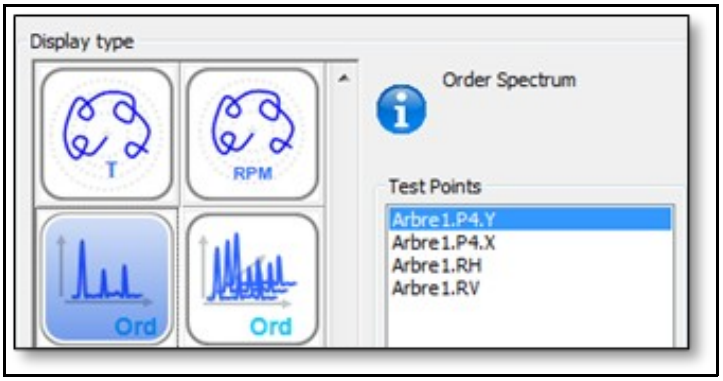


For a good health machine, 1X should be overlaid with Overall because there is only imbalance.

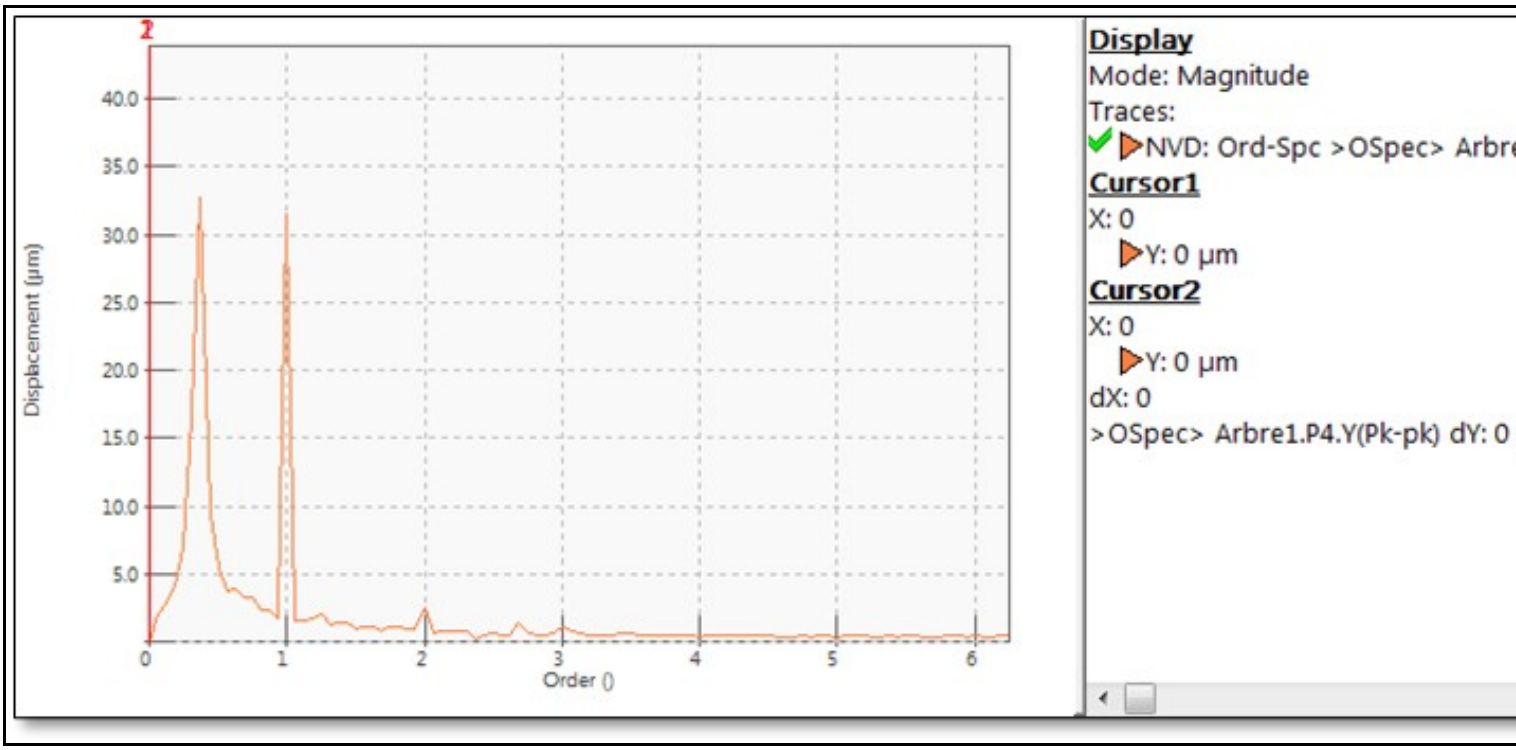
However there is a speed range while overall level is higher than 1X level.



- To investigate what orders (in addition to 1X) are carrying energy in this speed range, let's display the synch spectrum:

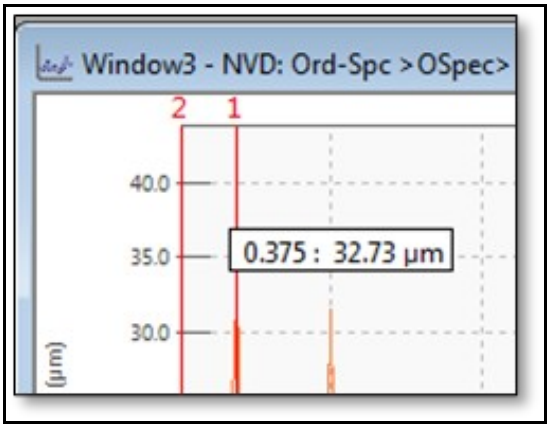


- Place navigation cursor in the speed range of interest and look at the synch order spectrum:



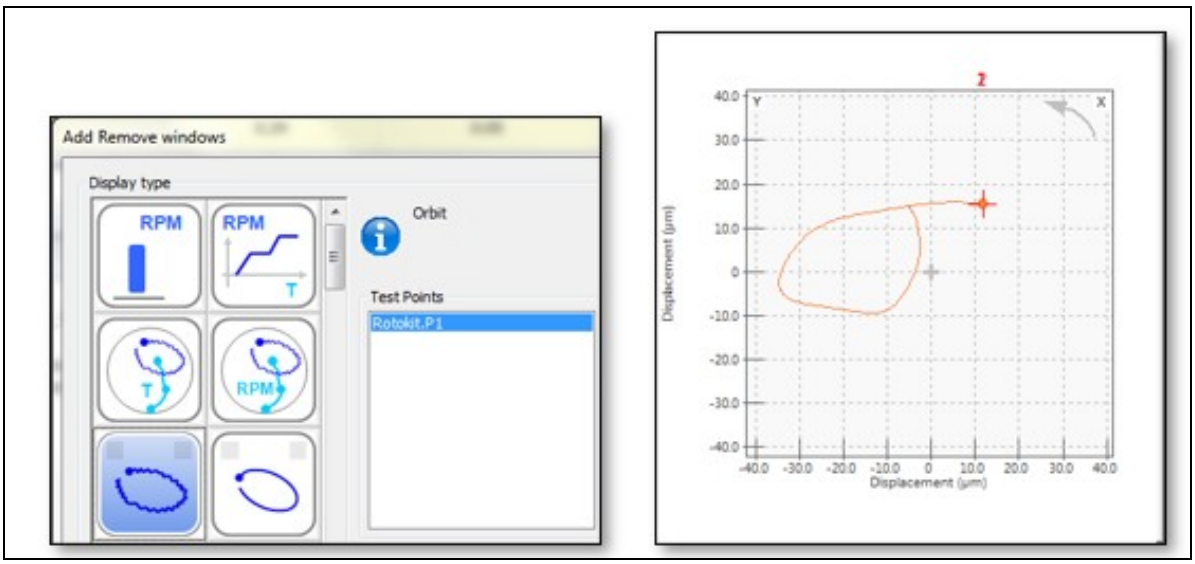
• Subharmonic issue occurs in this speed range

• Place windows cursor in the order spectrum to know which is subharmonic order



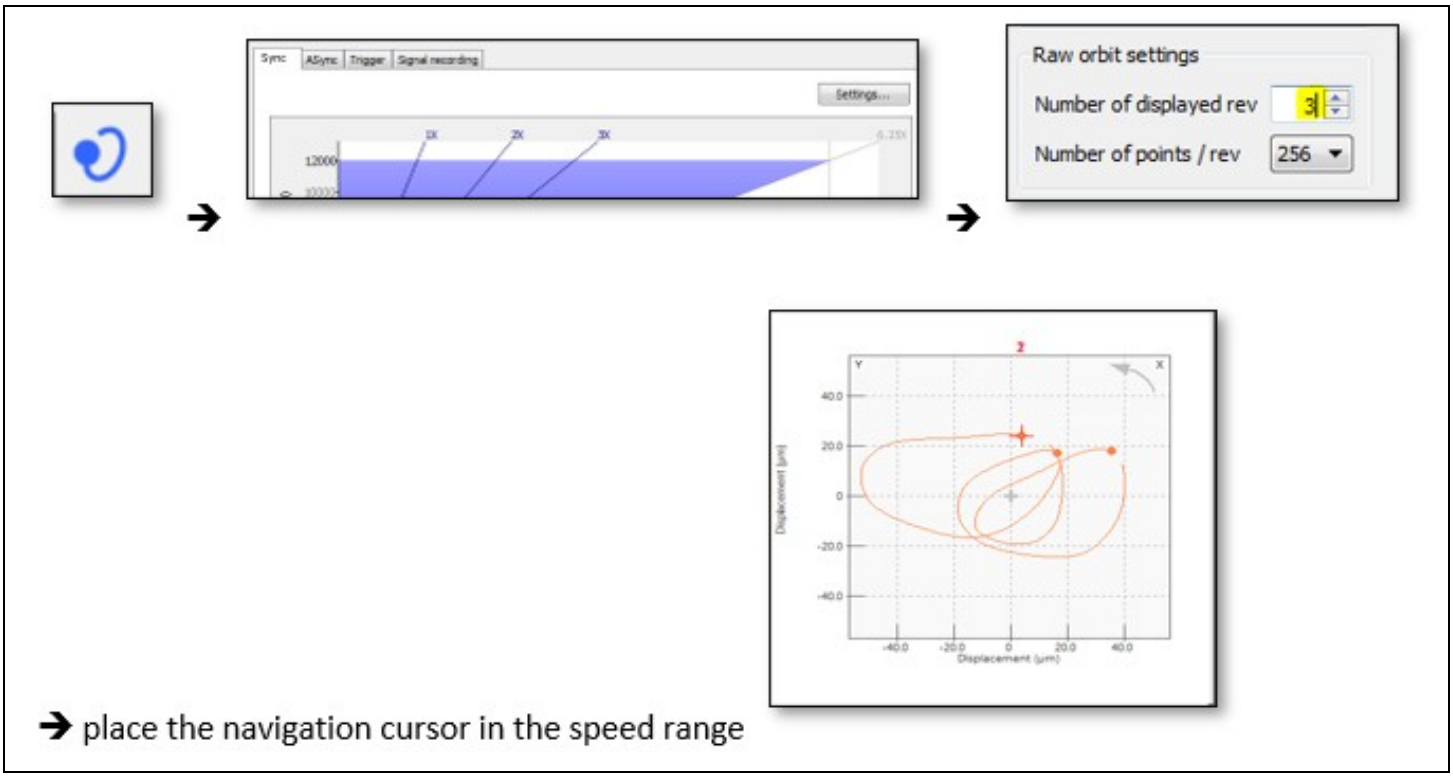
• 0.375 order means the issue cycle is completed roughly each 3 revolutions, so it could be helpful to display orbits (3 displayed revolutions)

• First, display raw orbit

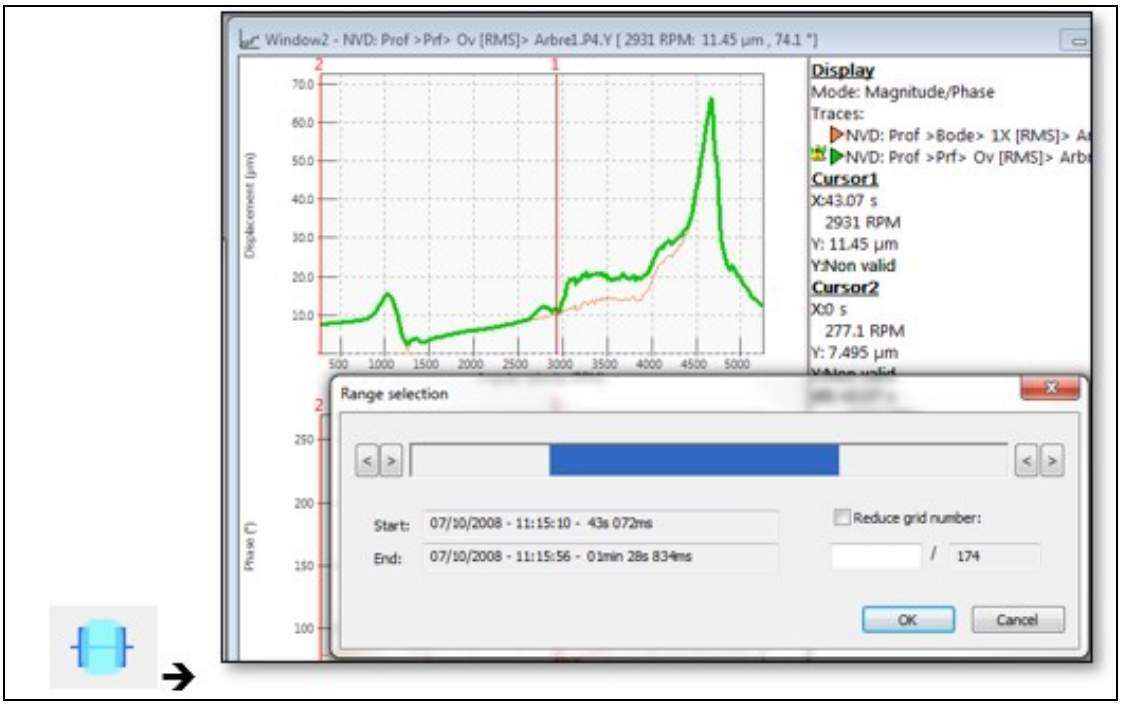


• Then, change analysis settings to display 3 orbits

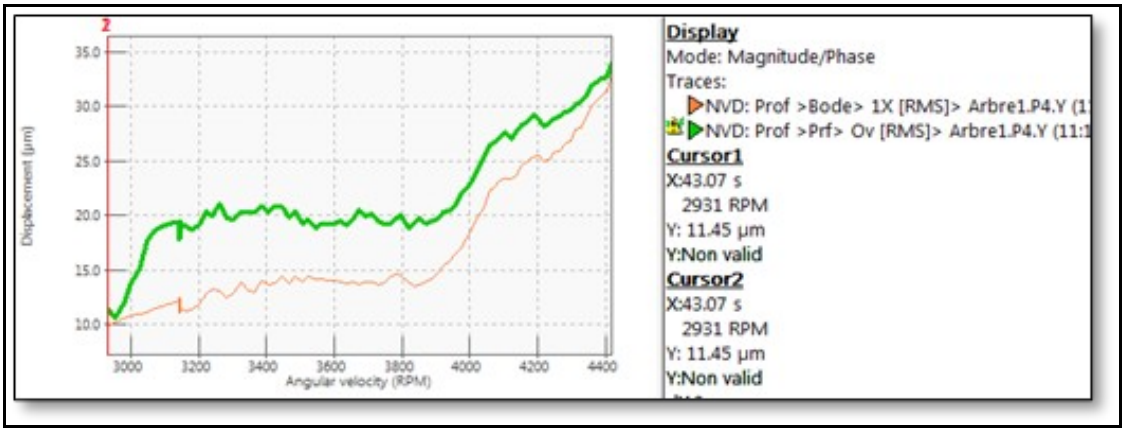
•



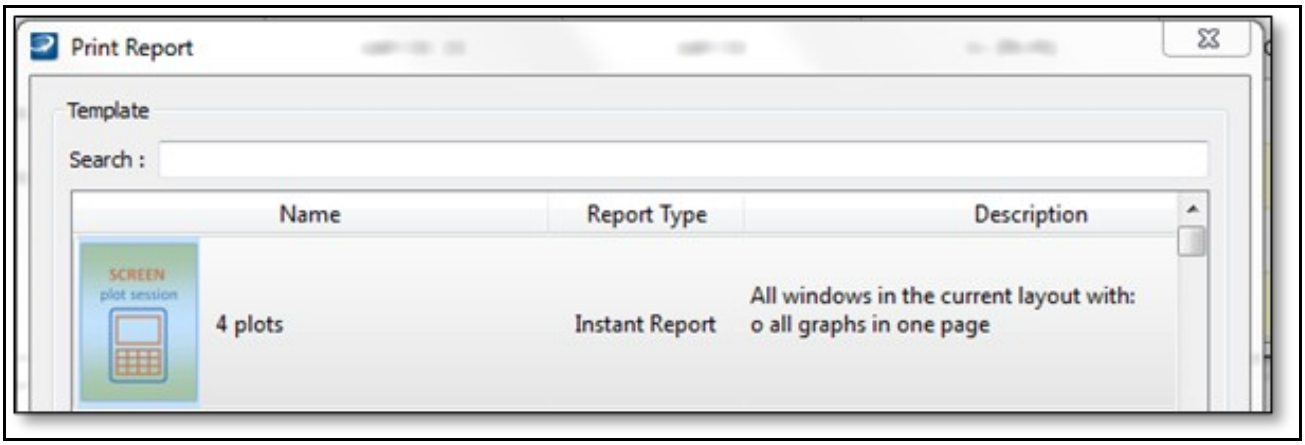
- To generate report for this first issue, let's hide the second issue (critical speed). So let's focus on data related to oil instability. Select the data range of interest (with the mouse on the blue bar)



- Then the bode plot looks like this view:



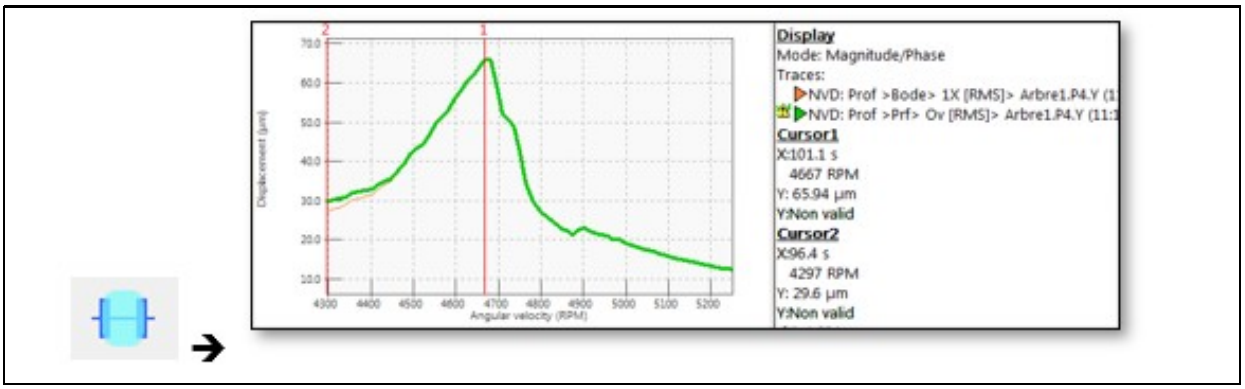
- Place the cursor to display relevant result and generate a report:



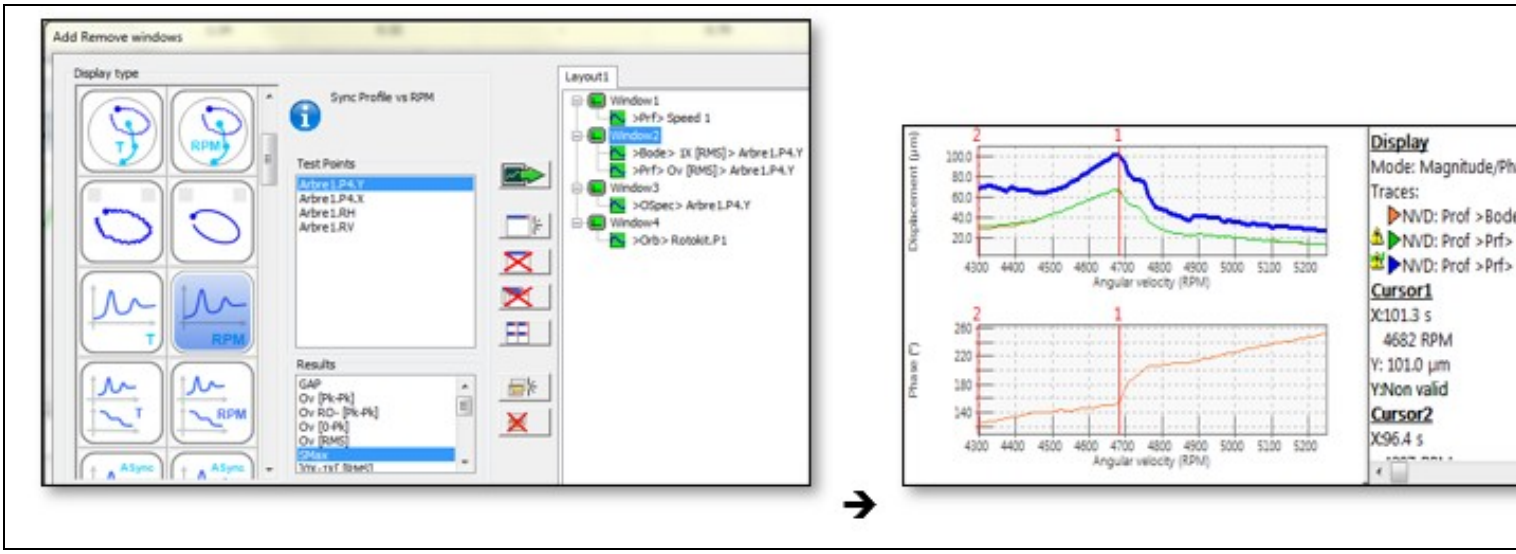
157.3.2 Critical speed

Let's focus now at the critical speed to know the frequency of the first bending shaft mode and the orbit size at this frequency

- Change the data around the critical speed



- Add Smax (orbit size) to the window2 so that the SMAX is display with 1X and Overall



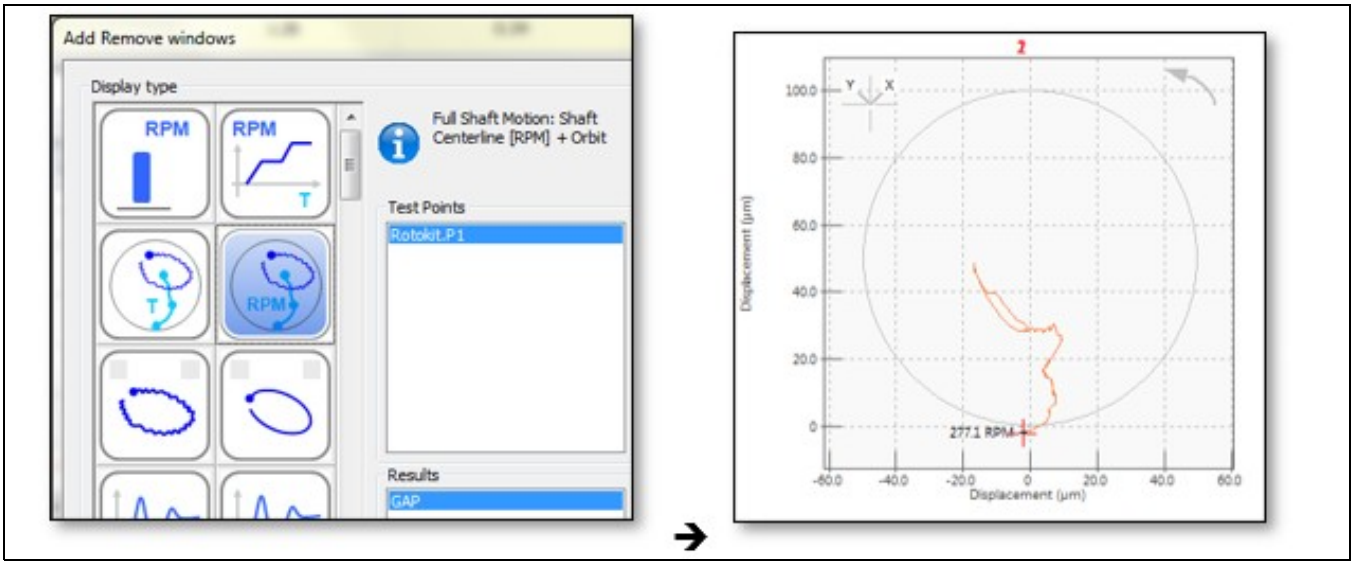
- Place the cursor at the critical speed and generate a new report

---

157.3.3 Shaft center line

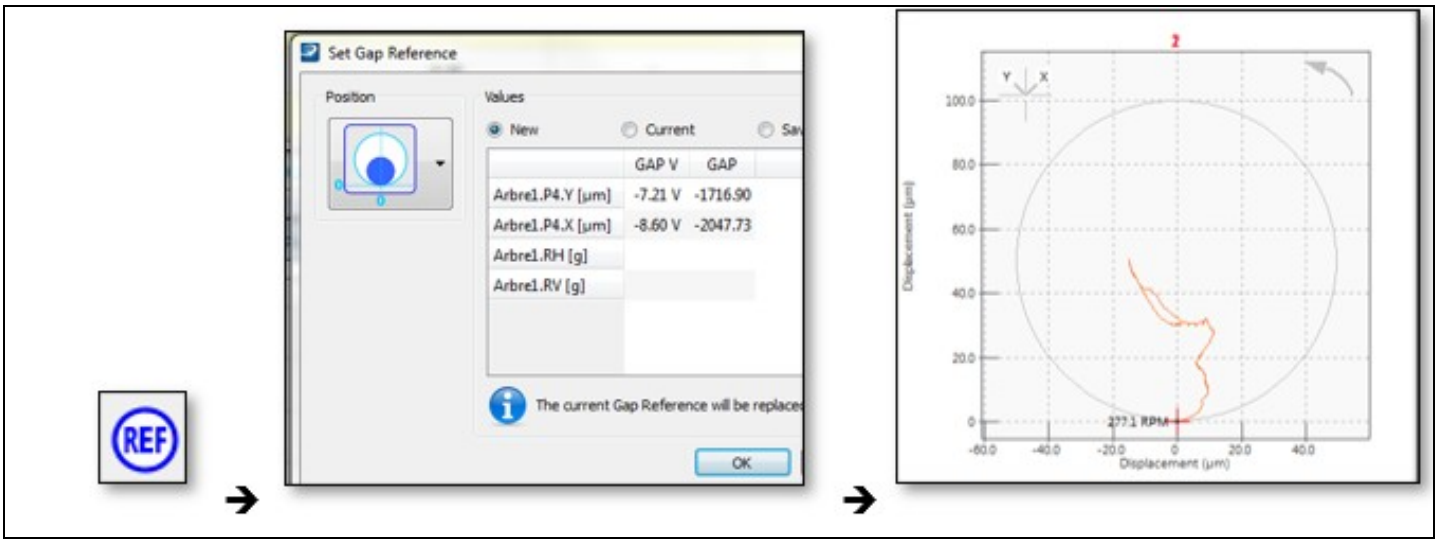
How to display the shaft center line and use the GAP reference:

- Display the shaftcenter line:



- The shaft centerline is not perfectly starting from the clearance circle, so we need to reset the gap reference at the lowest speed (when the shaft is assumed to lay at the bearing bottom).

- Select the lowest speed with the navigation cursor and press on GAP reference:



The shaft center line is now starting at the bottom of the clearance circle

All this demo have been done in the navigation mode, no need to post-analyze signal, all results are saved during the measurement !

158 ORBIGate Manual Install

158.1 Installation

158.1.1 Download

Download Last Version of ORBIGate.

158.1.2 Equipment required for the installation

USB drive containing ORBIGate software installation setup ?Setup.exe?.

NVGate software must have been installed first.

158.1.3 Installation of NVGate software

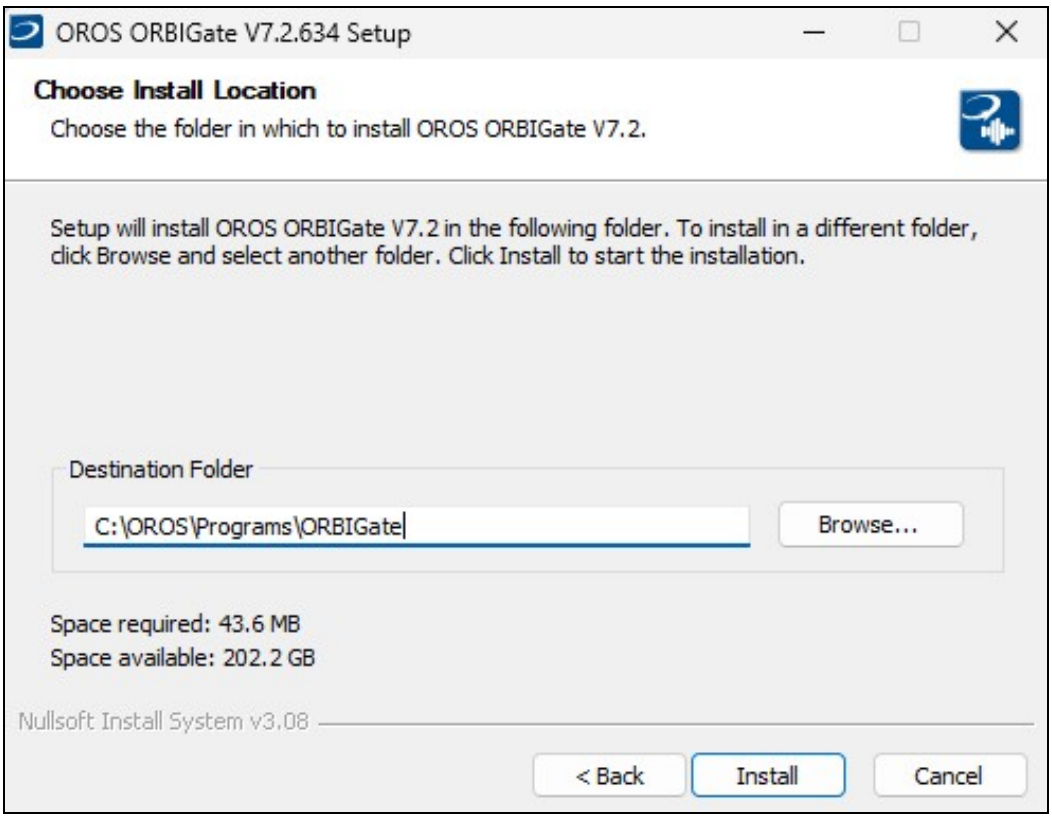
First you need to install NVGate.

158.1.4 Installation of ORBIGate software

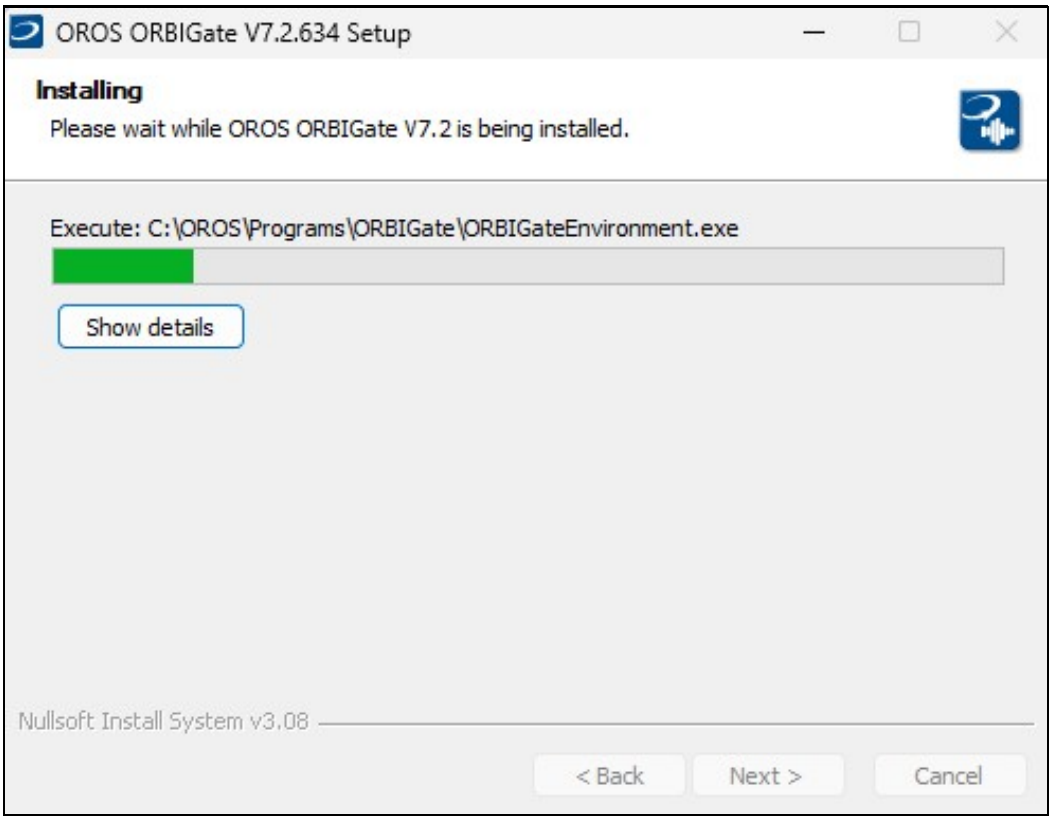
Run " Setup.exe" program, and the following window is displayed:



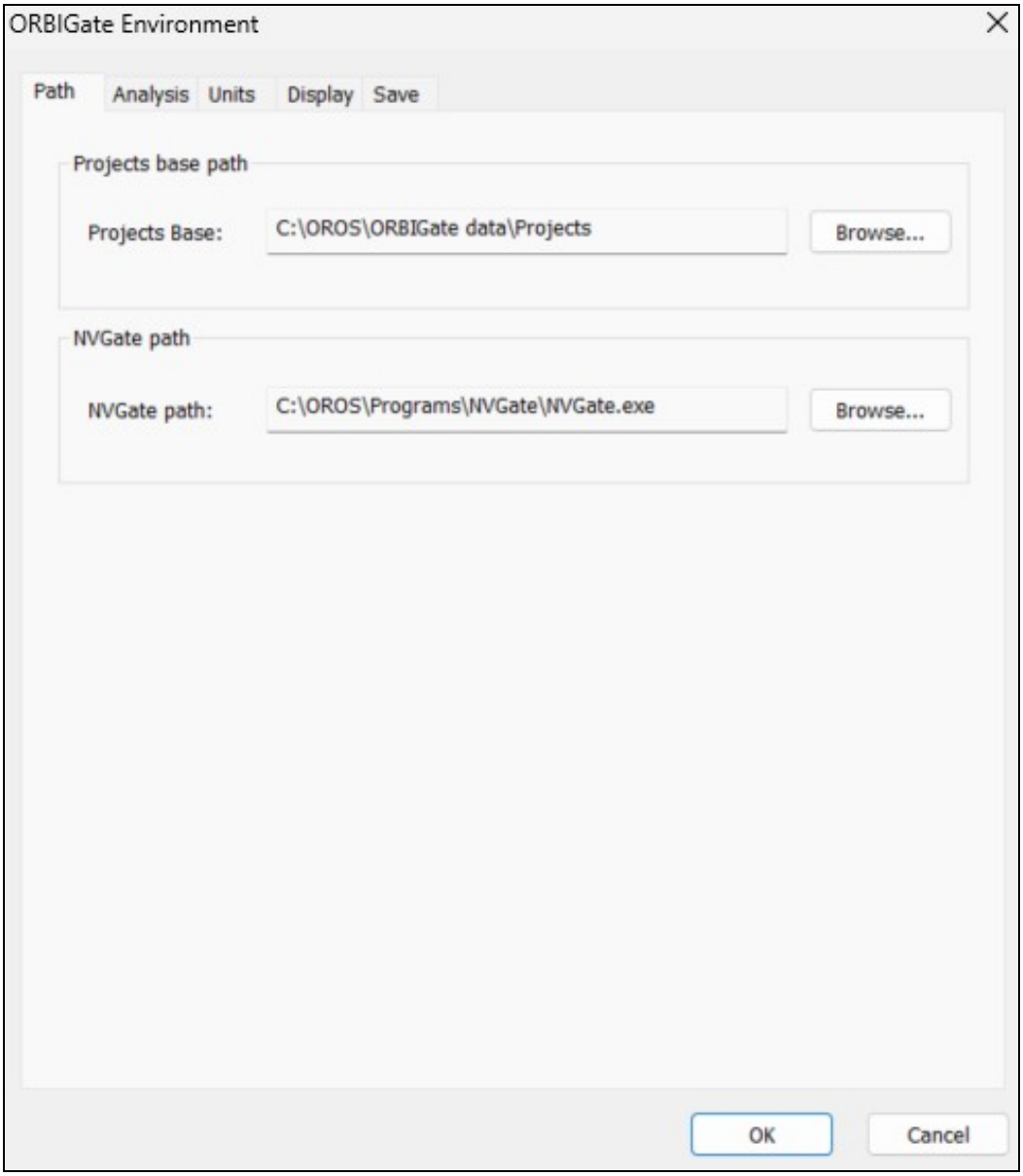
Click on ?Next?, and the following window is displayed:



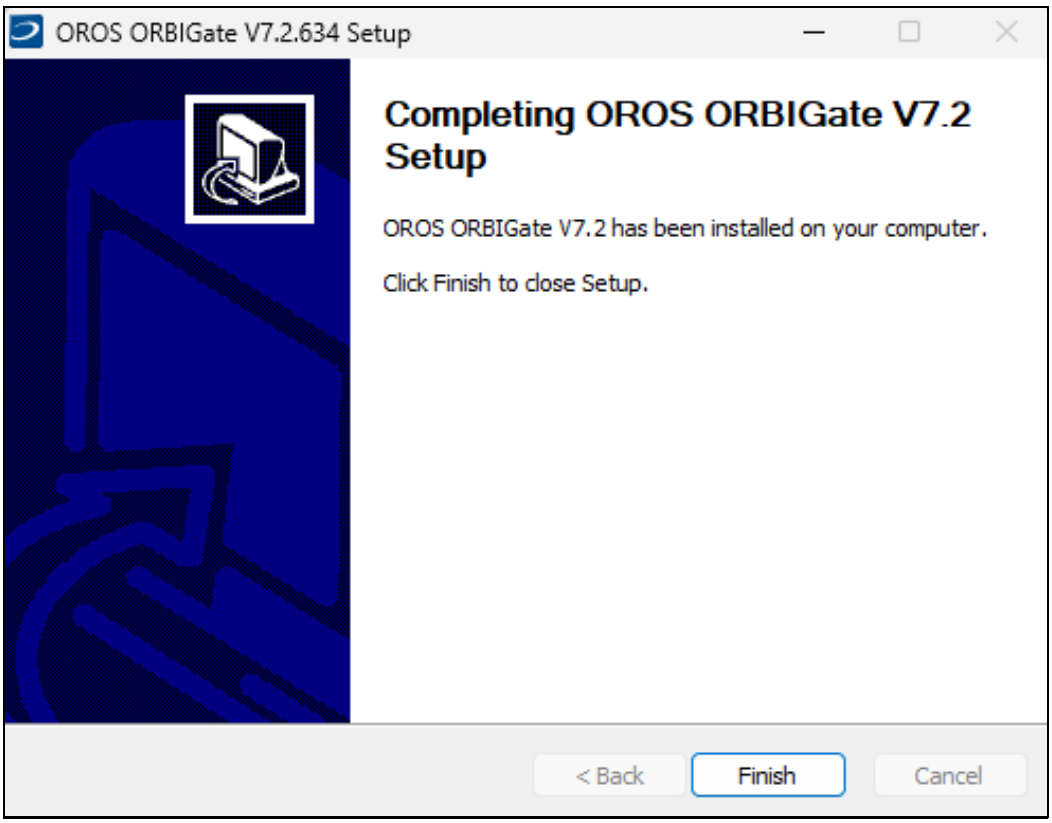
Select the installation directory. It is highly recommended to keep the default location: C:\OROS\Programs\ORBIGate. Click on ?Install?, and the following window is displayed:



The installation pauses to let the user specify the directory of NVGate as well as the ORBIGate project base. By default, the project base path is C:\OROS\ORBIGate data\Projects:



Click on ?OK? and wait until the following window is displayed:



Click on ?Finish? to exit the setup wizard, and OROS ORBIGate software is successfully installed.

NOTE: Before launching the software, please plug OROS USB dongle if your license is dongle locked, or connect the PC to the analyzer and launch NVGate in the connected mode if your license is instrument locked.

159 ORBIGate Manual User's guide

159.1 Getting started

This chapter is an overview of the main features and set-up steps of the ORBIGate software. More details are provided in later chapters of the operating manual. The Set-Up wizard lets you quickly go through the steps to get started.



The set up toolbar

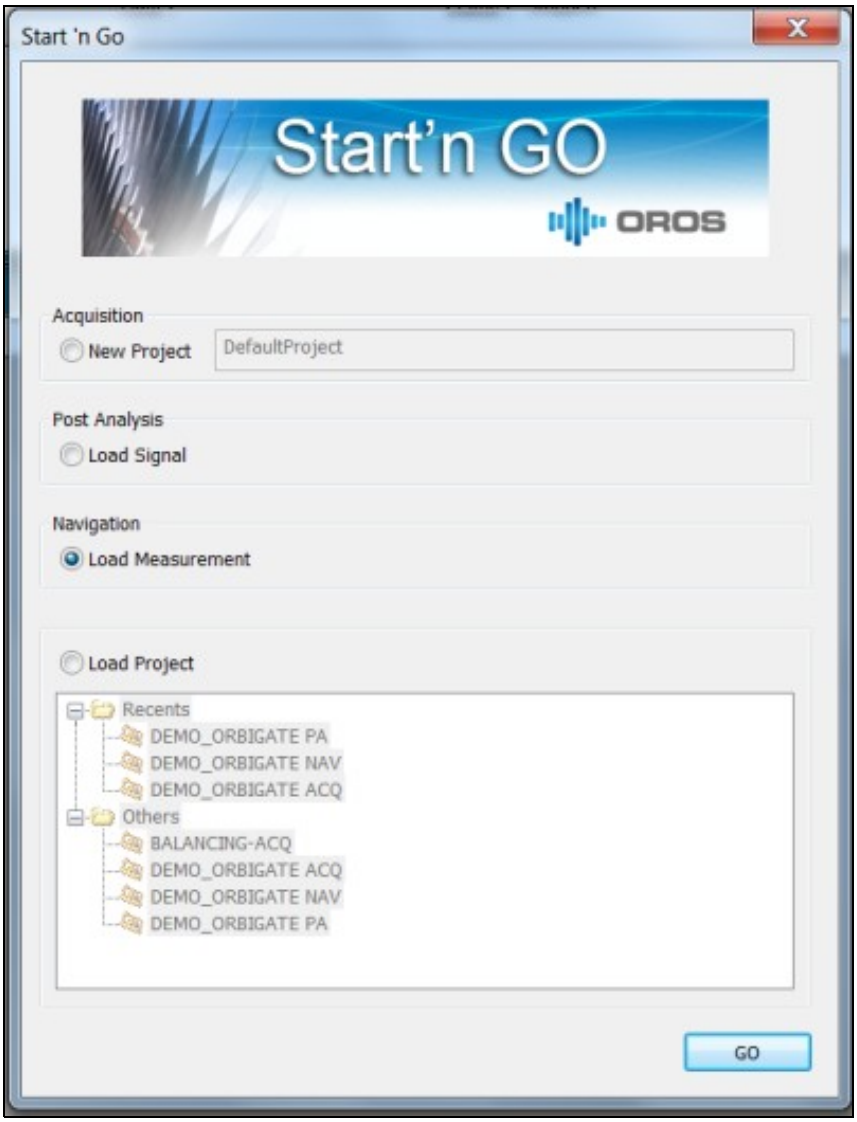
The Start?n Go window appears when ORBIGate software is opened. The user has 3 choices to get started from this window: Create New Project, Load Project and Load Measurement:

- Choosing "Load Project" allows the user to load measurement settings.

- Choosing "Load Measurement", will load the acquired measurement data.

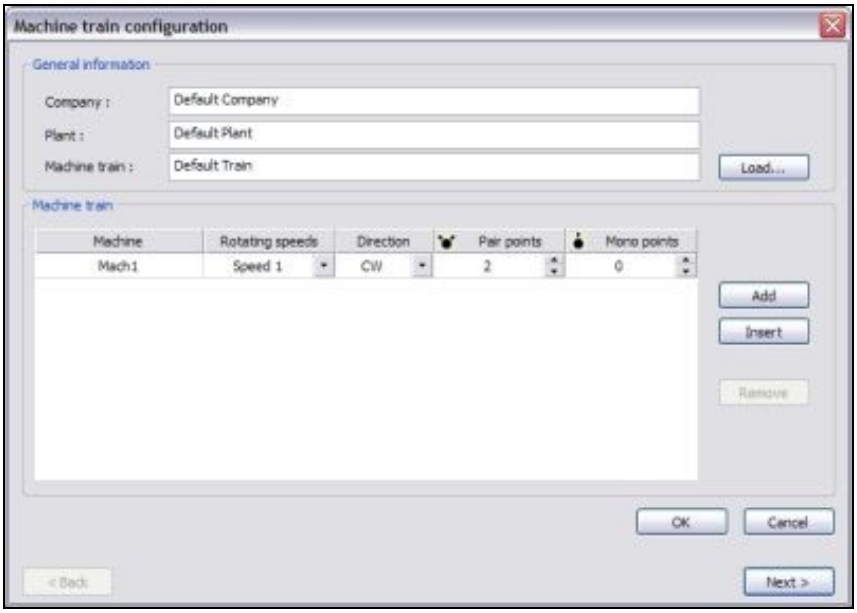
- Choosing "Load Signal" will allow the user to display a measurement based on a recorded signal.

To get started, choose "Create New project" and press GO.


Start 'n Go
Start'n GO
OROS
Acquisition
New Project
DefaultProject
Post Analysis
Load Signal
Navigation
Load Measurement
Load Project
Recents
DEMO_ORBIGATE PA
DEMO_ORBIGATE NAV
DEMO_ORBIGATE ACQ
Others
BALANCING-ACQ
DEMO_ORBIGATE ACQ
DEMO_ORBIGATE NAV
DEMO_ORBIGATE PA
GO

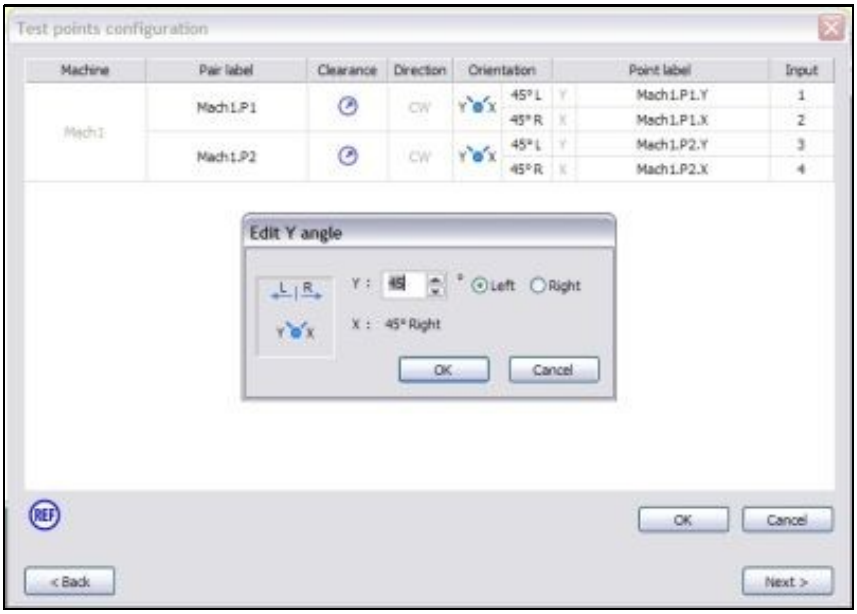
The Start ?n Go window

The next step is to configure the machine train.



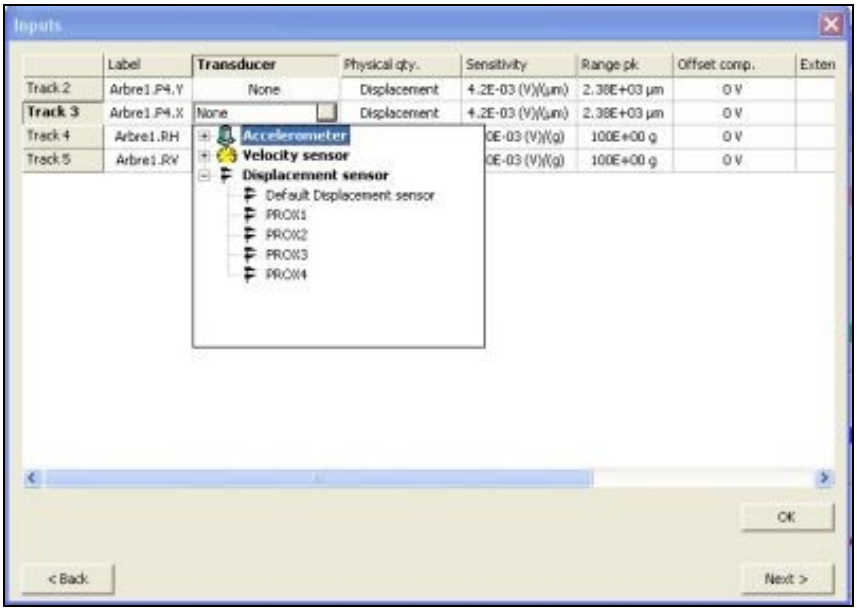
The machine train configuration

The test point?s configuration screen is where the probe orientations are configured. It is also where the labels can be modified.



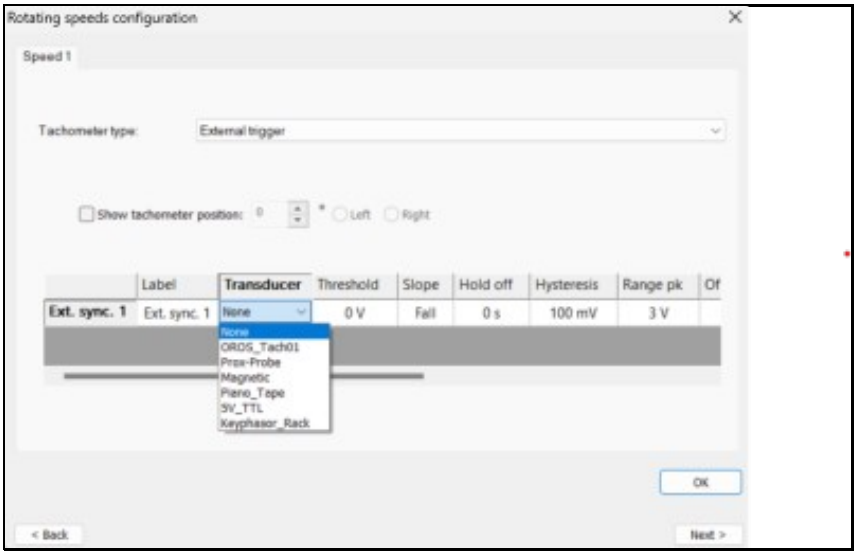
The test points configuration

The next step is to configure the analyzer input properties (coupling, sensitivity etc?).



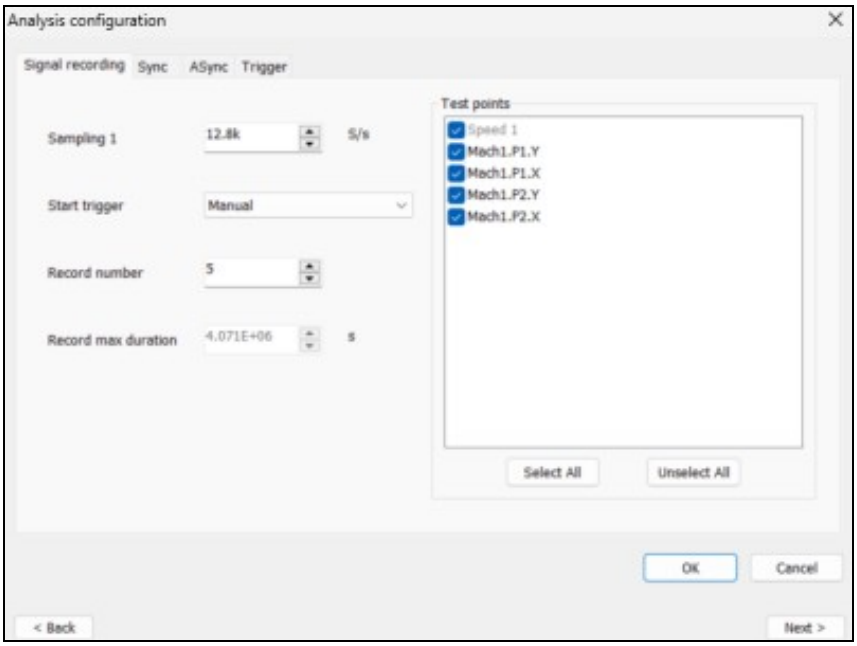
The inputs configuration

The following step is to configure the speed properties.



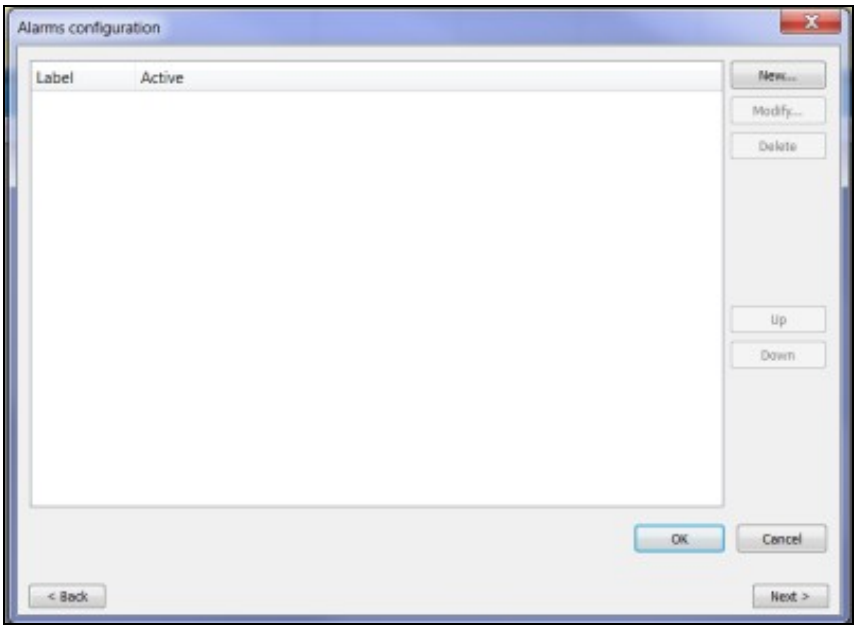
The rotating speed configuration

The Analysis dialog box allows for the configuration of everything related to the analysis. There is a choice of 3 types of analysis: Sync analysis, ASync analysis, and signal recording.

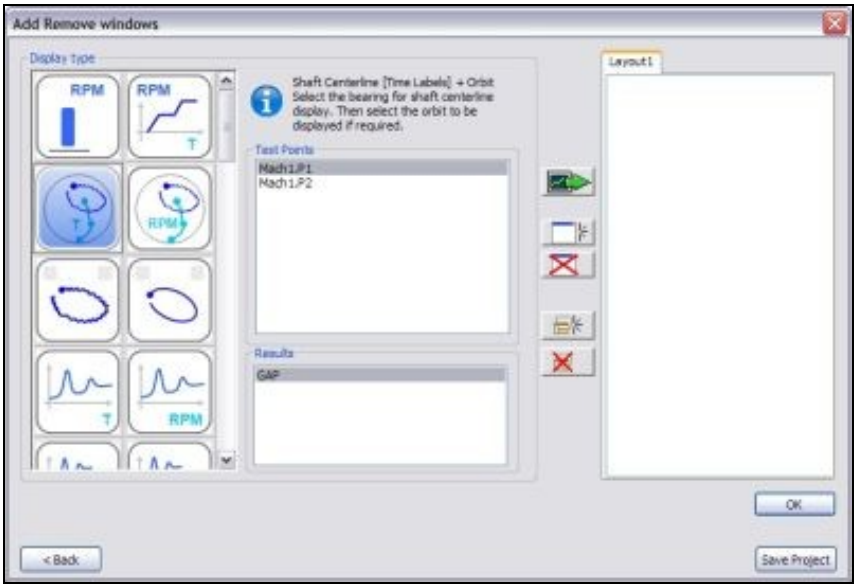


The analysis window configuration

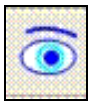
The next step, is the set-up of the alarms: alarm conditions and alarm actions. For the getting started stage, one doesn?t need to go through that step and can just press next.

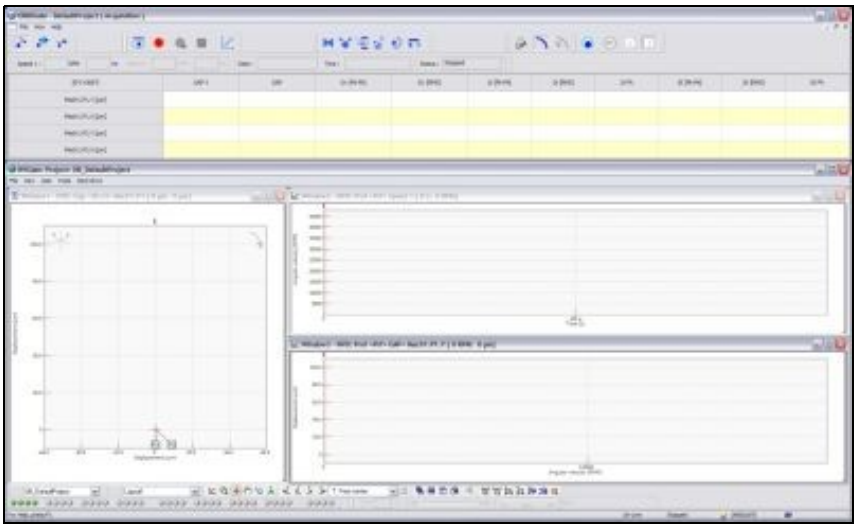


The final step is to display the graphical windows. After choosing the graphical windows, click the "Save project" button to save the project.



The Add/remove window configuration

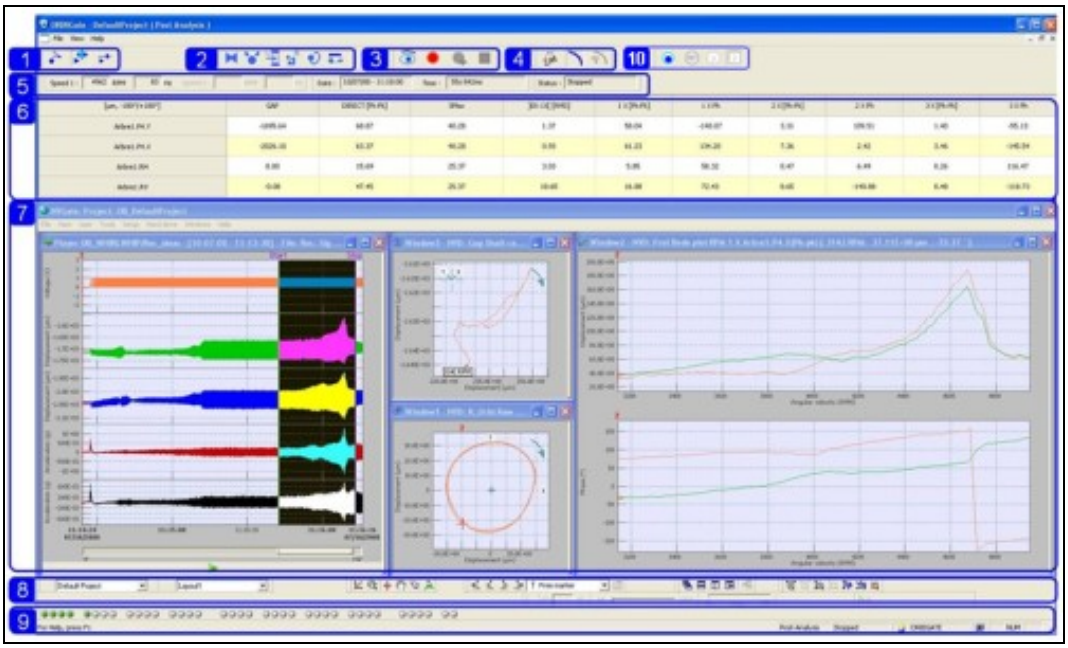
The test is ready to be run. Clicking on the monitoring icon  as shown on the window below, will display the results.



The acquisition working environment

159.2 Working environment

159.2.1 Workspace



The working environment

The ORBIGate solution interface is made of a number of toolbars and displays organized as in the figure above. The reference indexes from the figure are:

1. Analysis Mode Toolbar

2. Set-Up Toolbar

3. Operation Toolbar

4. Run-Out Toolbar

5. ORBIGate status zone

6. Overview grid

7. Display zone

8. Display toolbar

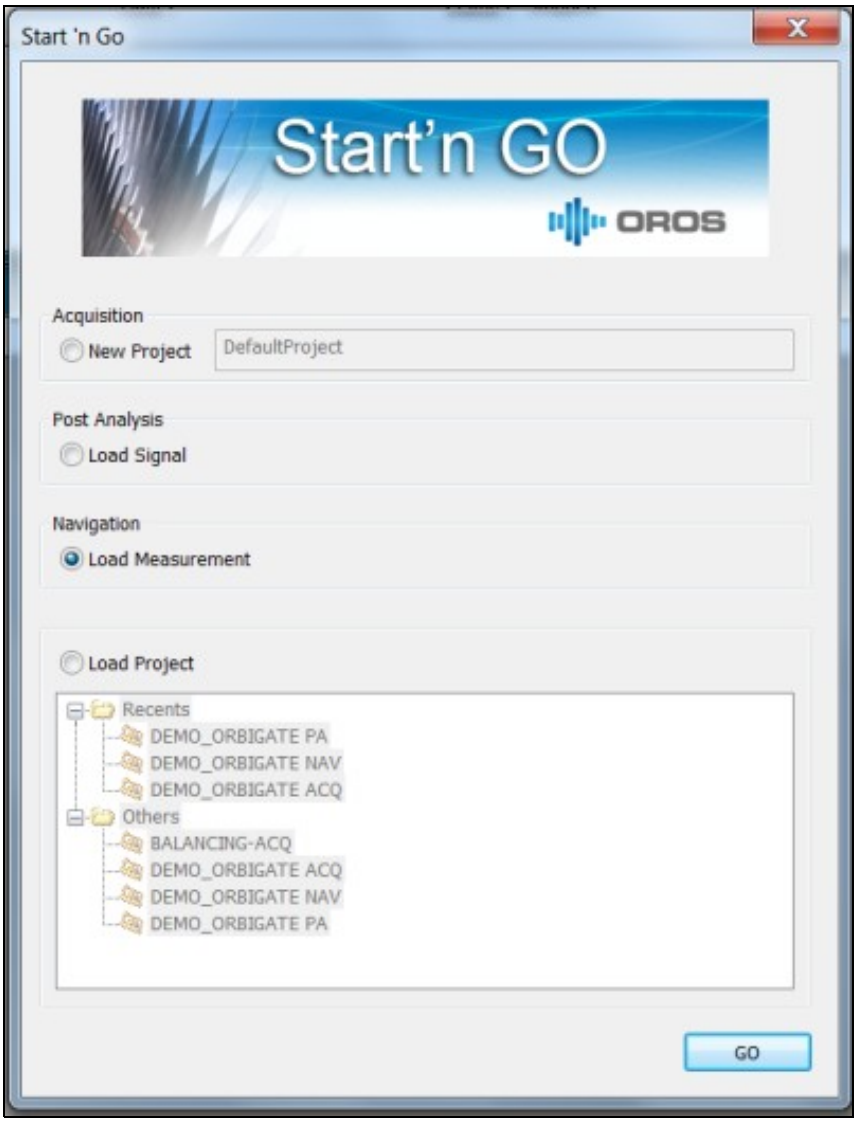
9. Hardware status zone

10. Clearance circle and reference voltage toolbar

159.2.2 Start?n Go

The Start?n Go function helps the user to immediately start the test or set-up. If a set-up has already been defined, it can be loaded at this stage. Otherwise, a new project can be created.

If the objective is to analyze a measurement, it can be loaded through the Start?n Go interface as shown below.


Start 'n Go
Start'n GO
OROS
Acquisition
New Project
DefaultProject
Post Analysis
Load Signal
Navigation
Load Measurement
Load Project
Recents
DEMO_ORBIGATE PA
DEMO_ORBIGATE NAV
DEMO_ORBIGATE ACQ
Others
BALANCING-ACQ
DEMO_ORBIGATE ACQ
DEMO_ORBIGATE NAV
DEMO_ORBIGATE PA
GO

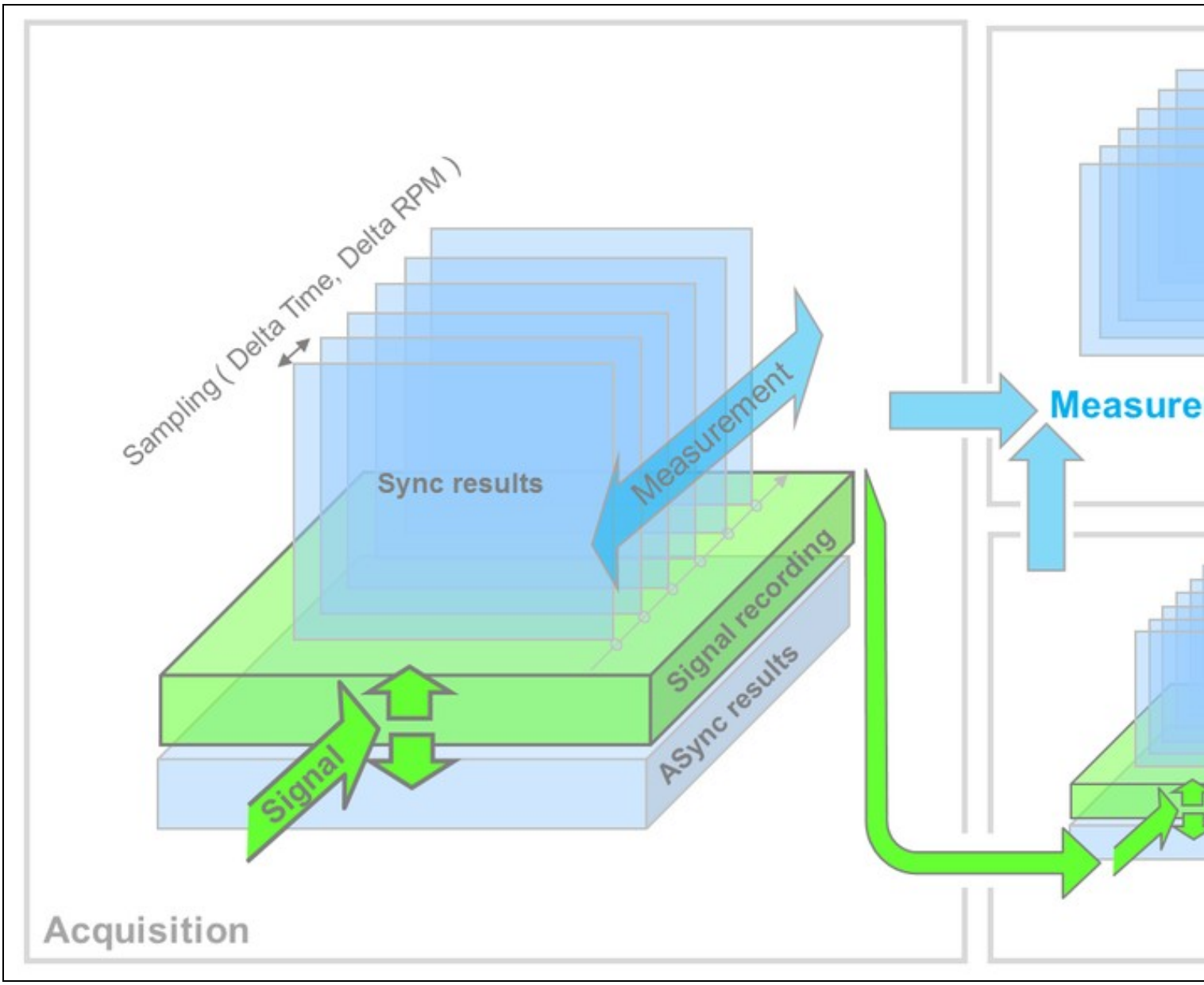
The Start?n Go window

In order to avoid overwriting project names, the "GO" button is protected: It will automatically be grayed if an existing name is entered.

If the purpose is to go through a post analysis, a signal should be loaded. The signal to be loaded should be located in the current NVGate project database. The signal should contain at least one tachometer channel recorded on the external trigger. This signal can be recorded from NVGate or ORBIGate.

159.2.3 Acquisition, Post Analysis, Navigation: 3 Modes to operate ORBIGate

ORBIGate can be operated in three modes: the Acquisition mode, the Post Analysis and the Navigation mode. The user can switch from one to the other by using the operating mode icon toolbar as displayed below. The objective is to investigate measurement data: this is achieved by **loading a Measurement File in the Navigation Mode**. This measurement can be saved in the acquisition mode or in the post analysis mode.



- The acquisition mode is used to acquire measurement data. A **Measurement** file and/or a **Signal** file can be acquired. The acquisition mode is chosen by pressing the first icon.
- The post analysis mode is used to create a **Measurement** file data based on a recorded **Signal**. The post analysis is selected by pressing the second icon.
- The navigation mode is used to load, study and report a **Measurement** file that was acquired in the Acquisition mode or in the Post Analysis mode. The navigation mode is selected by pressing the third icon.



The operating mode toolbar

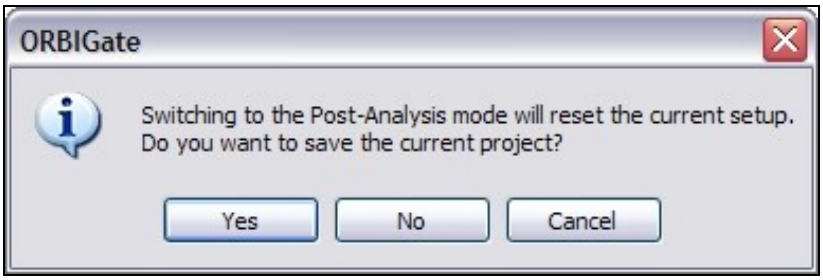
159.2.4 Project and Measurement Management

159.2.4.1 Project management and operating modes

Projects are used to save a set-up. It controls both the acquisition set-up and the display set-up.

Projects are saved in the directory defined at the installation and modifiable with the "environment" software. The default path is "C:\OROS\ORBIGate data\Projects". One directory is created for each saved project.

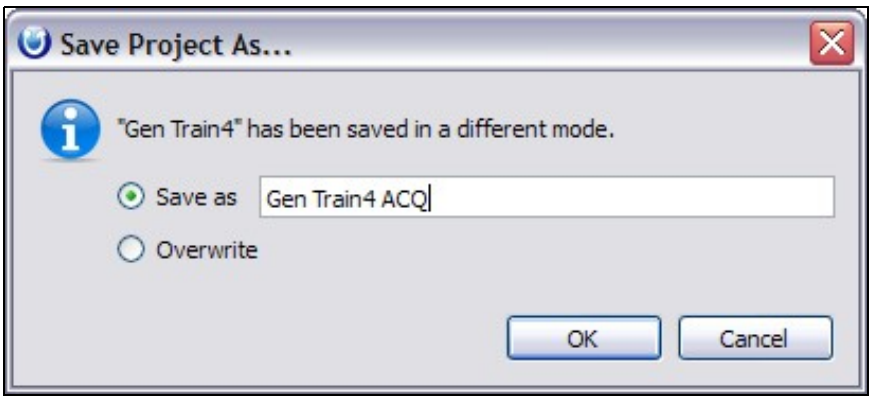
When switching from one mode to the other, it is important to remember that the set-up is not the same. For this reason, the set-up is reset when the user switches modes. It is recommended to save the project when going from one mode to another. Consequently, when going from one mode to another, the following message appears in order to avoid losing the current set-up by mistake. In the figure below, as an example, the message appearing when switching to the Post Analysis mode is displayed.



Switching to the offline mode

159.2.4.2 Saving a project

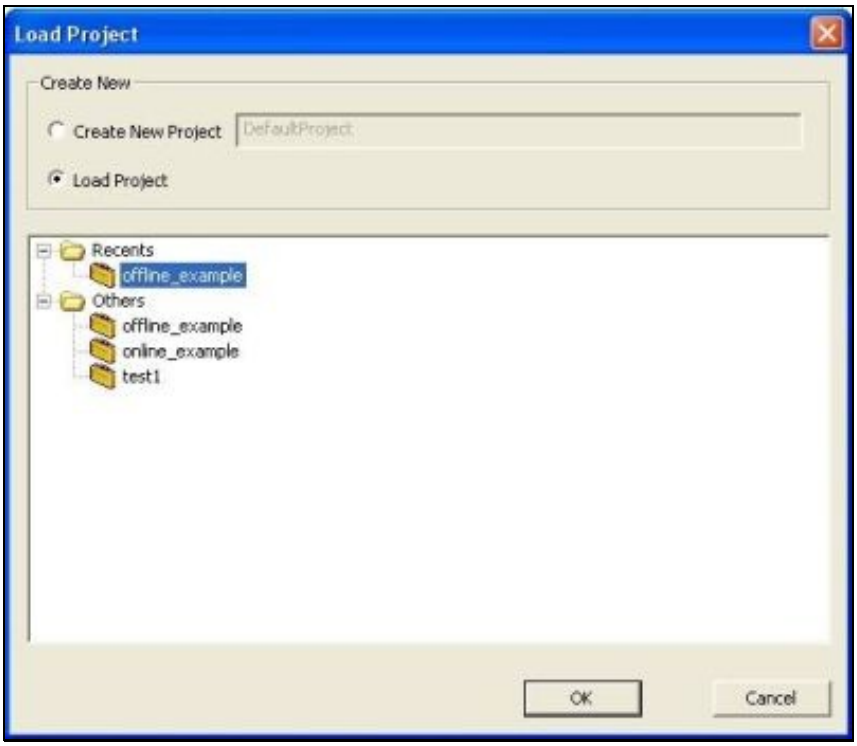
It is possible to save a project in different ways: either at the end of the setup wizard or through the "file menu". When switching from one mode another, it is recommended to save the project in each mode (for example, "test1 ACQ", "test1 PA", "test1 NAV") as the configuration is different. ORBIGate tracks any risks of overwriting projects when changing modes. A project was saved in one of the three modes (Acquisition, Post Analysis, and Navigation). Then, if after changing mode one attempt to overwrite the project, the below message is displayed. It proposes either provide a new name (recommended) or gives the flexibility to overwrite the existing one (not recommended).



Save overwriting check

159.2.4.3 Loading a project

A project can be loaded through the menu and the command "Load?" (As shown in the picture below) or through the Start?n Go window.



Loading a project

159.2.4.4 Removing a project

It is possible to remove projects through the project windows by selecting the project and pressing "Delete" on the keyboard.

159.2.4.5 Measurement management

A measurement allows storing data during a test. The data are saved when pressing the record icon. A measurement name is given at the end of the test. The list of data saved is shown in the function table in the "Displays" chapter.



The record measurement icon

Measurement data is saved in a file with the extension "OBG". It is possible to share this file with other users (it is for example possible to send this file through e-mail). In order to be usable, this file should be placed directly in the "ORBIGate data" directory or in one of the projects directory.

By default, the measurement file is saved in the project directory used for the measurement.

159.2.4.6 Loading a measurement

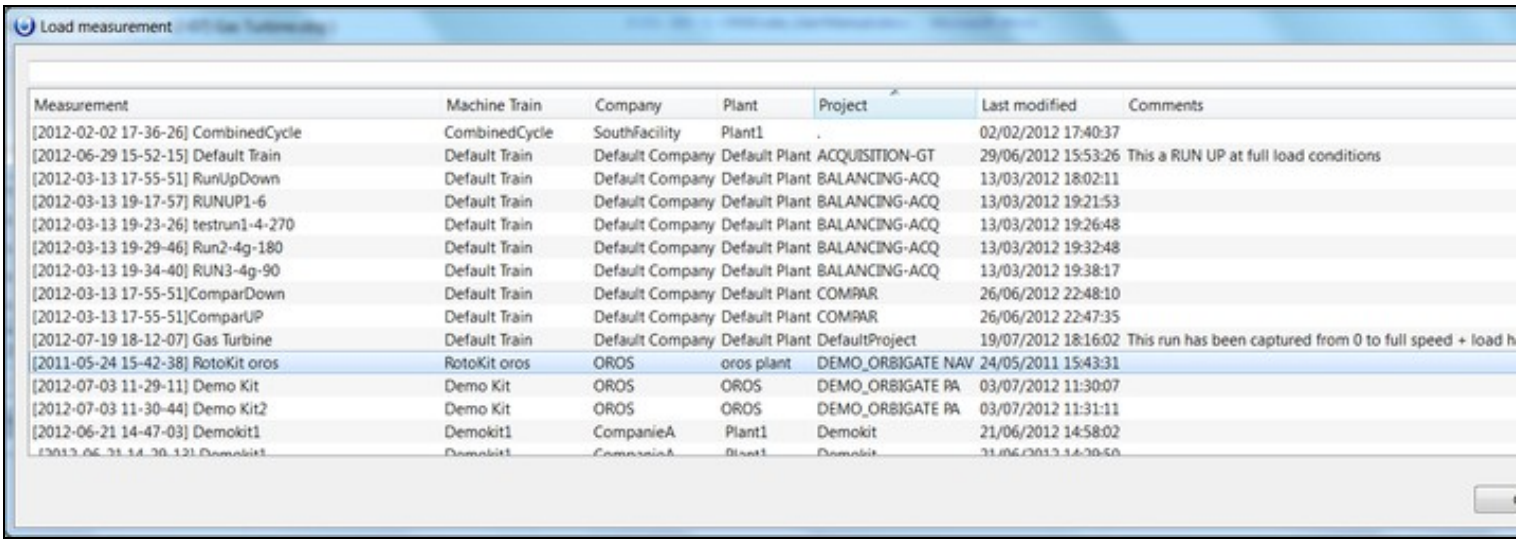
A measurement is loaded through the command "File/Load Measurement". The following window is displayed. The measurements can be browsed through the measurements database interface.

Files can be **sorted** based on their:

- Measurement name

- Machine train, Company, Plant
- Project
- Date
- Comments

One can also search for keywords coming from any of the columns. The interface looks as below.



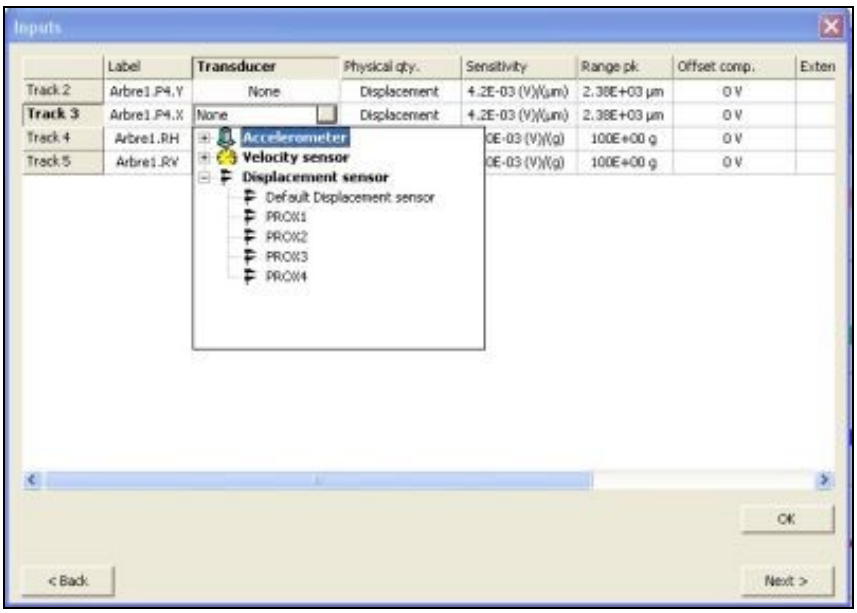
Measurement database interface

159.2.5 Sensor database

The sensor database is a great tool to store the sensors used frequently. When using it, the user can just choose the sensor from the database without redefining them each time. The sensor database should be completed in NVGate before starting ORBIGate.

When using ORBIGate, the sensor can be selected by clicking in the transducer column of the selected input. The sensor database is automatically displayed. Only the appropriate sensors are shown. For the pair points, the usable sensors are accelerometers, velocity probes, and displacement probes. For the mono points all sensors from the sensor database can be used.

Once the sensors are selected, the set-up of the input is automatically done according to the predefined properties of the sensor.



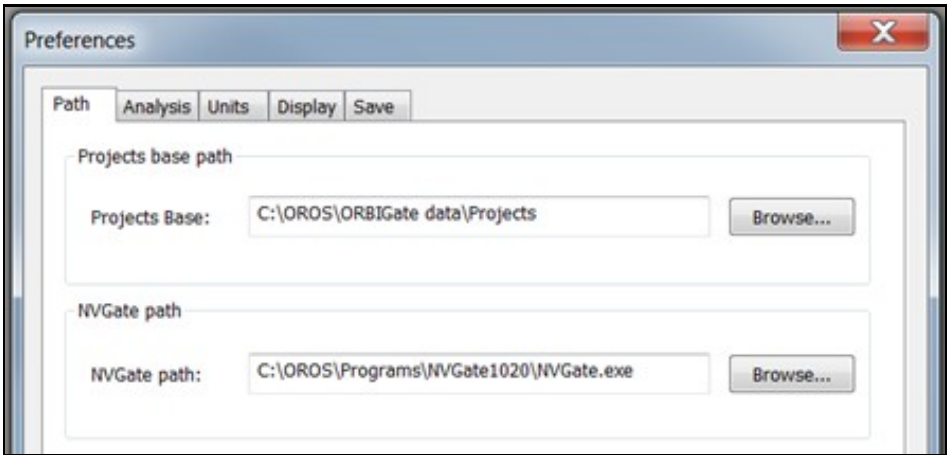
159.2.6 User preferences

User preferences allow storing set-ups that will be kept from one project to the other.

159.2.6.1 Path preferences

The location of the ORBIGate data can also be specified through this dialog window.

The preferences allow storing the paths used for operating ORBIGate. The NVGate.exe position can be selected at this level.



Path preferences

159.2.6.2 Analysis preferences

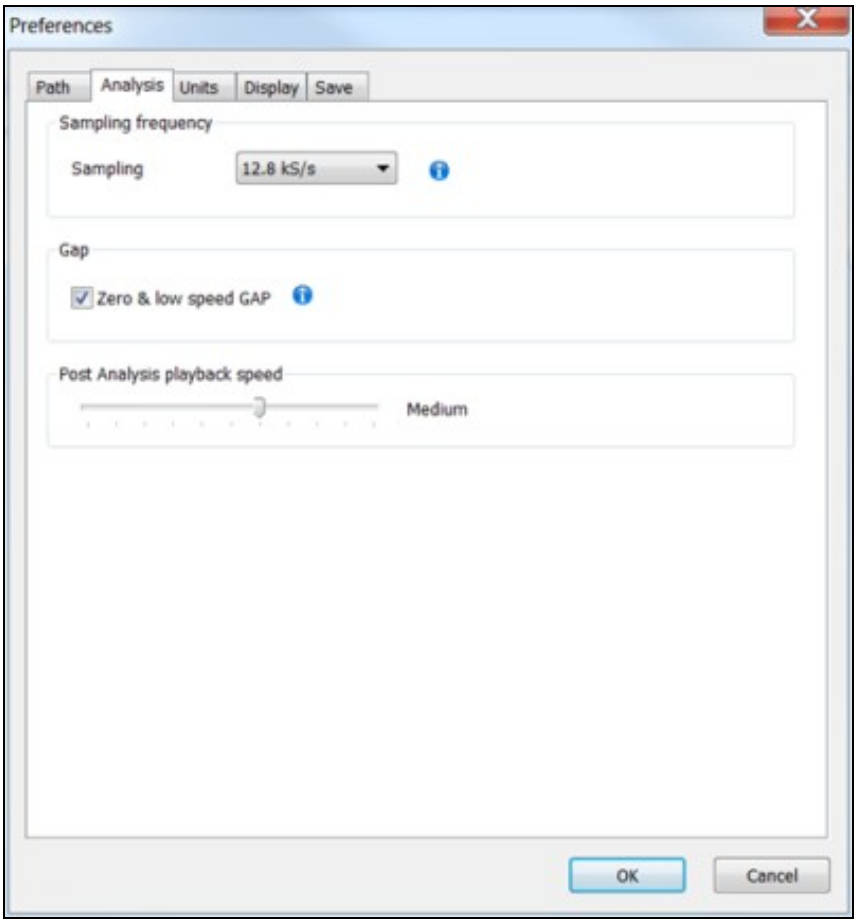
In the preferences, it is also possible to:

- **Sampling frequency**: Select the maximum sampling frequency allowed for the analyzer. Among others, it enables the user to limit the DSP load. Placing the mouse on the ?i? icon will give local contextual information.

- **Gap** / **Zero & low speed GAP**: Enable the acquisition in the measurement of the Gap at Zero and low speed from ASync analysis. For that:

    - Corresponding ASync channels should be connected
    - ASync analysis resolution is recommended to be set to high resolution to fit the low speed conditions (typically at least 0.625 Hz as set by default).

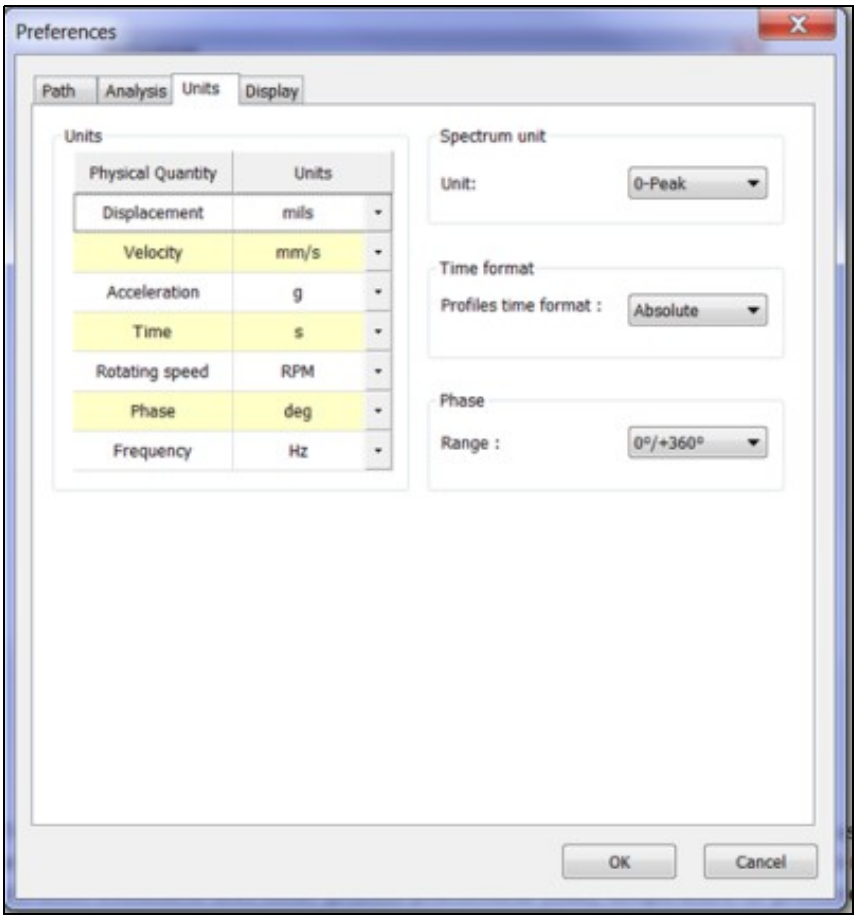
- **Post Analysis playback speed**: It is possible to setup Post analysis signal playback speed in the user preferences: this allows controlling the post processing speed of the results. Increasing playback speed may introduce down sampling of the results collection in the measurement. It will cause results to be collected less often. When the objective is to control the visualization speed of the results it is recommended to use the navigation mode which is designed for that purpose.



Analysis preferences

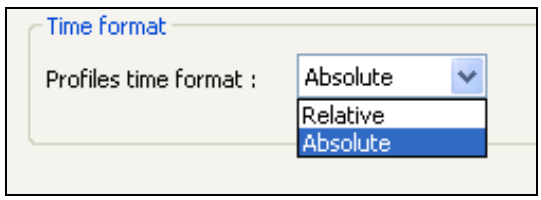
159.2.6.3 Units preferences

- **Units**: Users from different countries use different units: it is possible to select the unit used for each physical quantity in the window below.

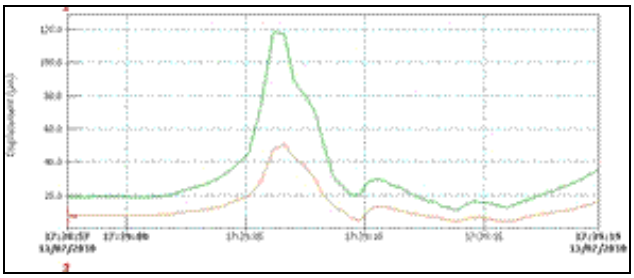


- **Spectrum unit** can be 0-Peak or Peak-Peak. It can be modified locally in the window as well.

- **Time format**: Trends can be displayed with the absolute time or relative time as an X-Scaling. Time scale is especially useful when speed is not changing (steady state measurements) and when one wants to relate the vibration evolutions with other process phenomena (load, temperature or pressure changes). In order to get the absolute dating on the X axis, the corresponding preference should be chosen in the ?preferences?, as shown in the window below.



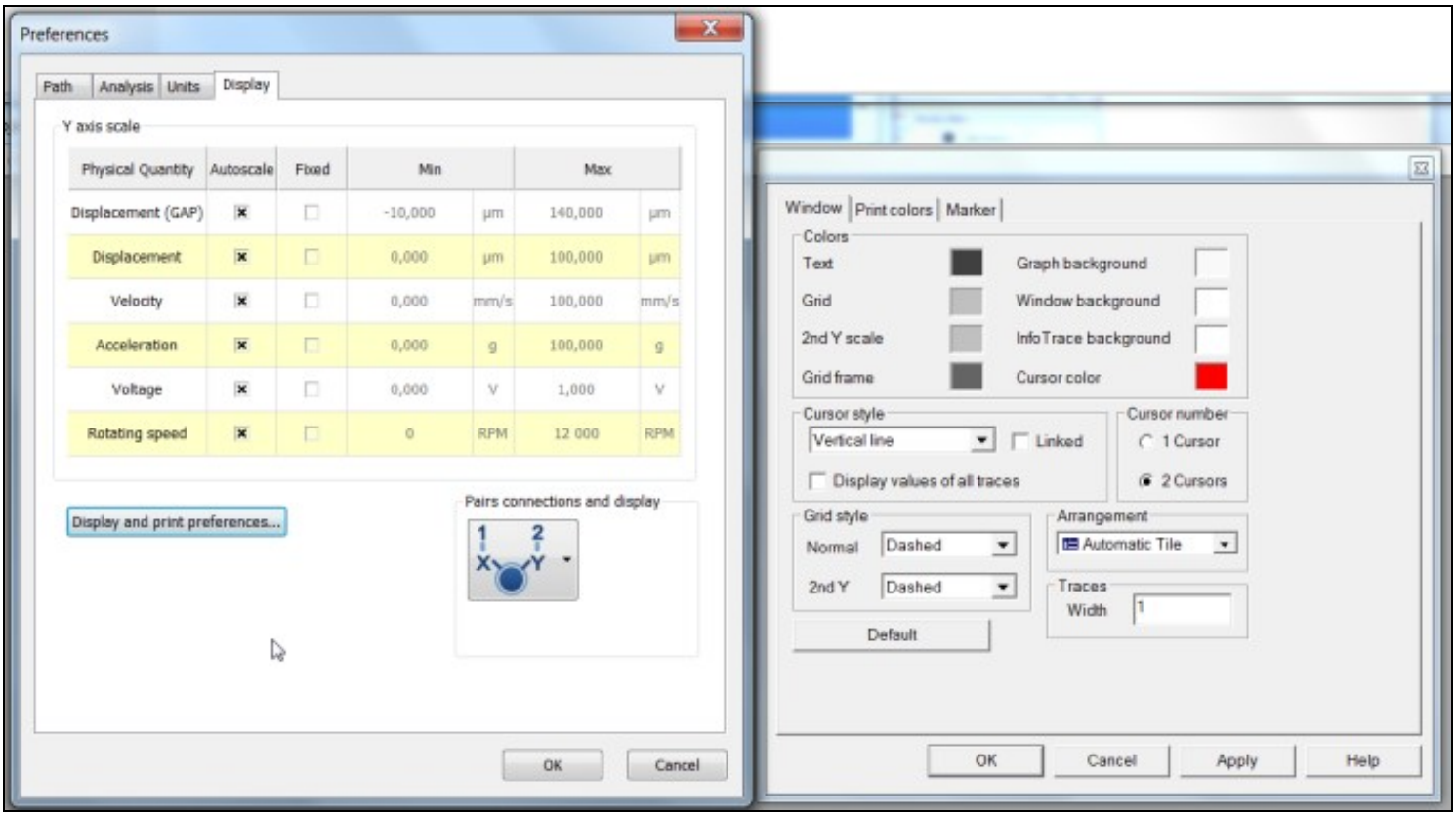
Absolute time scaling for trend plots



Absolute time scaling for trend plots

- **Phase**: The phase can selected to be displayed as 0°/360° or -180°/+180°.

159.2.6.4 Display preferences

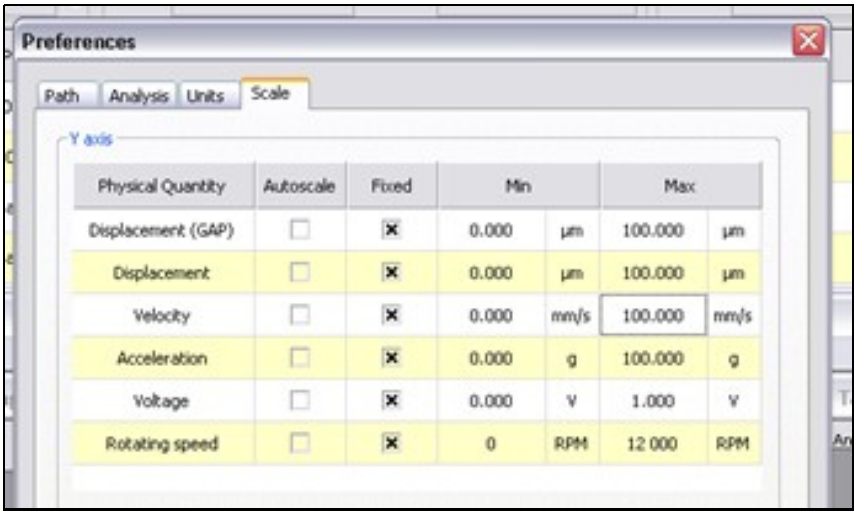


Display and print preferences window

They are two options for the Y scaling settings: Auto scale or Fixed

- "Auto scale" corresponds to an "Auto scale up": the scale grows continuously adapting to the maximum spectrum value.
- The "fixed" allows to setup the maximum value for a graph

These values are defined by physical units (chosen in the ?units? tab).



To apply the selection, one should press the corresponding toolbar icon to apply the scaling (second icon displayed). This is done for the current layout. The scaling preferences window can be accessed directly by using the ?scaling preferences icon?.

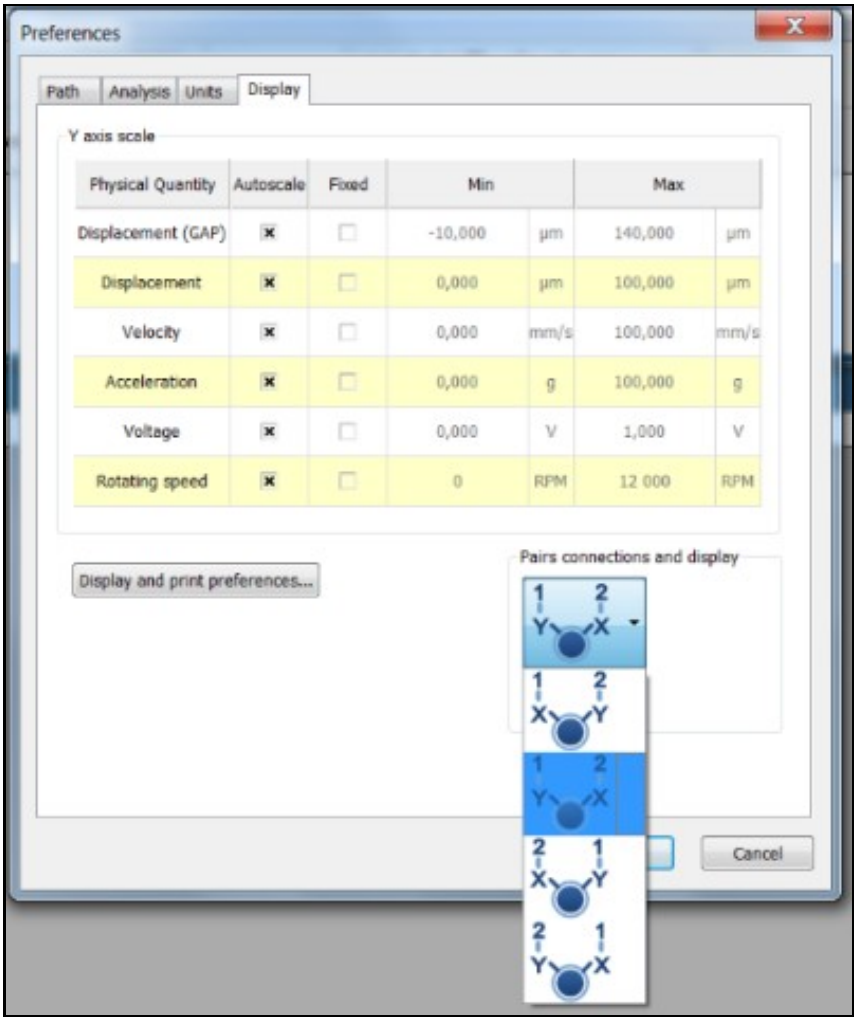


?Scaling preferences? and ?apply scaling? toolbar icons

159.2.6.4.1 XY preferences

This preference aims at providing a better flexibility for the configuration of the probes positions in the graphics (Orbit, Shaft Centerline and Polar). This is meant to adapt to the different situation that may occur when connecting the systems to the buffered outputs on the online monitoring systems.

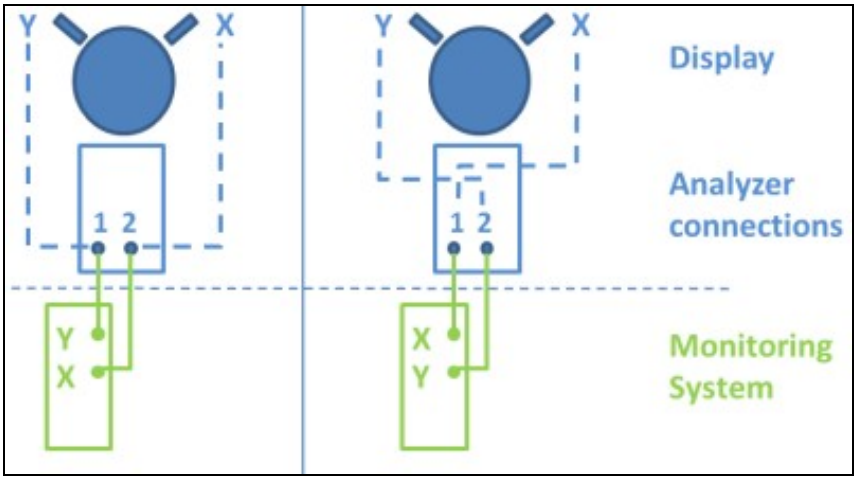
Note: *New XY preferences are taken into account for a new configuration.*
For example: if a project was saved with older XY preferences, these older preferences will be taken into account.



	Probe settings preference

159.2.6.4.2 Probes connections to the analyzer inputs

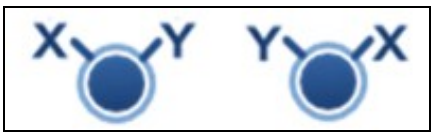
Depending on the buffered outputs connections provided on the online monitoring systems, the user may have to choose between connecting the X first or the Y first. The choice is now available.



Probe connections

159.2.6.4.3 XY or YX display

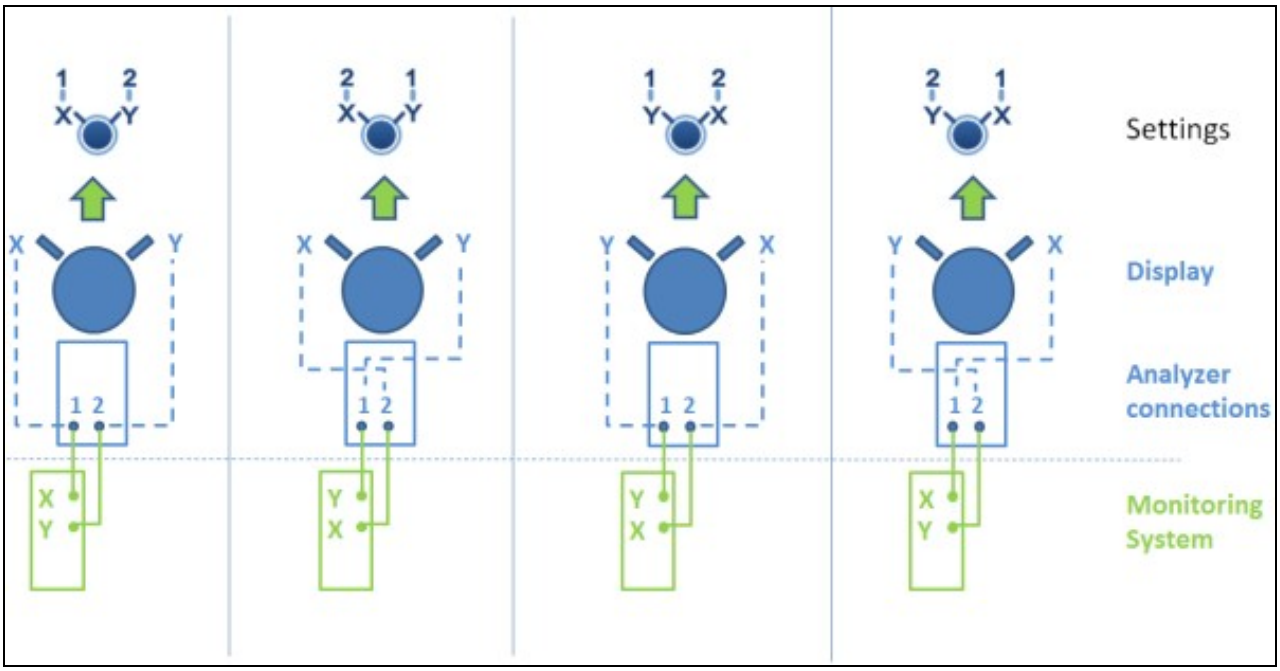
The same preference above allows to choose also if one want to display orbits, shaft centerline and polar with the Y on the left or the Y on the right.



XY or YX orbit visualization

159.2.6.4.4 Preferences choices

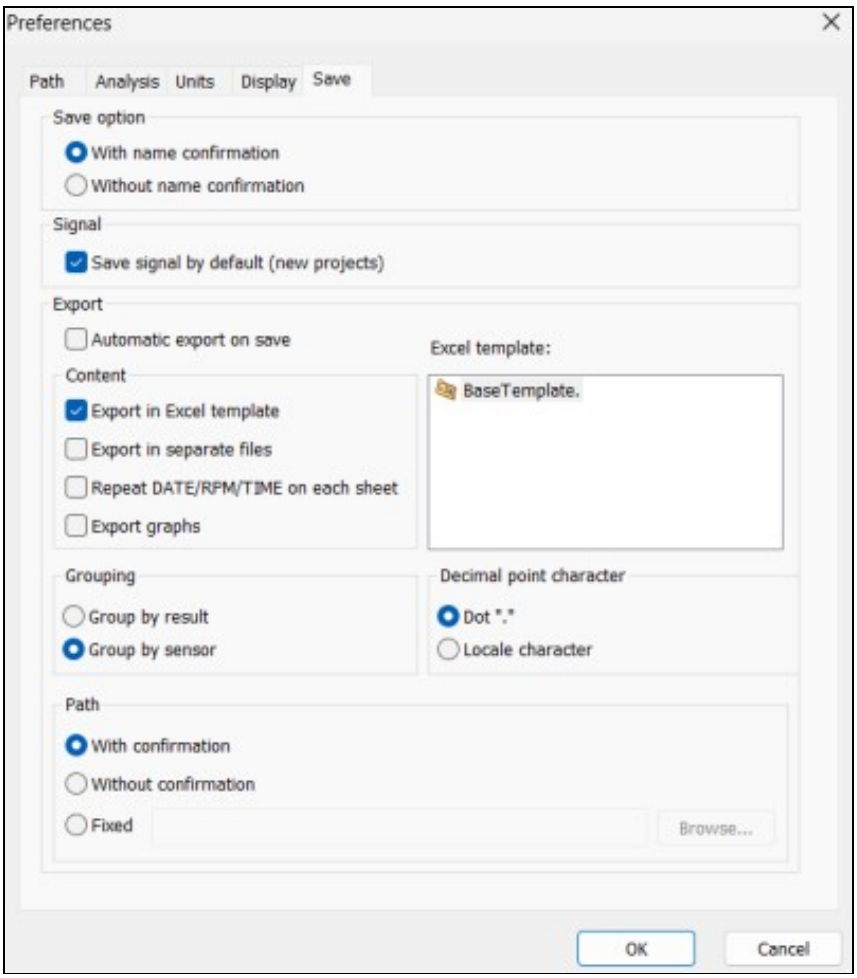
Consequently, there are 4 choices to allow the different configurations they are summarized in the graph below.



4 choices for probes connections preferences

159.2.6.5 Save preferences

The save preferences options are shown below.



Save preferences dialog

Save

The save option can be ?With name confirmation? or ?Without name confirmation?.

- If it is set to ?With name confirmation?, when pressing stop, a dialog window is issued with fields available for editing the measurement name and comments. This setting is preferably used as a standard.
- In some cases, the choice ?Without name confirmation? can be made: in particular when using an automatic stop based on alarms (cf the dedicated chapter for Alarms). The name used to save the measurement is the default one (based on date & time).

Export

Data can be exported either in Acquisition, Post Analysis or Navigation mode.

- To export in acquisition mode or post analysis, the option ?Automatic export on save? should be used.
- In navigation mode, one should use the function ?export? from the file menu to trigger the export.

In both cases, the measurement is exported with the choosen preferences as described below.

Content

The export function uses MS Excel to export the data. The exported data are the data contained in the current loaded measurement (data contained in the grid columns).

- An option is also to export the data in separate CSV files.
- Checking the line ?Repeat DATE/RPM/TIME on each sheet? will export this information on each spreadsheet of the Excel report
- ?Export Graphs? will copy all the graphs displayed currently and paste them in a spreadsheet called ?GRAPHS?.

Grouping

The grouping option allows exporting the data by grouping them either:

- By result (one spreadsheet for each type of results)
- By Sensor (one spreadsheet for each sensors)

Once the data have been exported, it is possible to reopen the Excel file and customize it within MS Excel. Then this file can be saved into the directory ?C:\OROS\ORBIGate data\Templates? to become a new export template. This new report template can be used for data exported from the same project (same number of channels).

Path

The path of the exported document can be setup using this function. The default path is the directory of the project. It is where the file will be exported if the option ?without name confirmation? is selected.

159.3 Set-up

The set-up concerns the acquisition parameters and the display parameters.

159.3.1 Acquisition

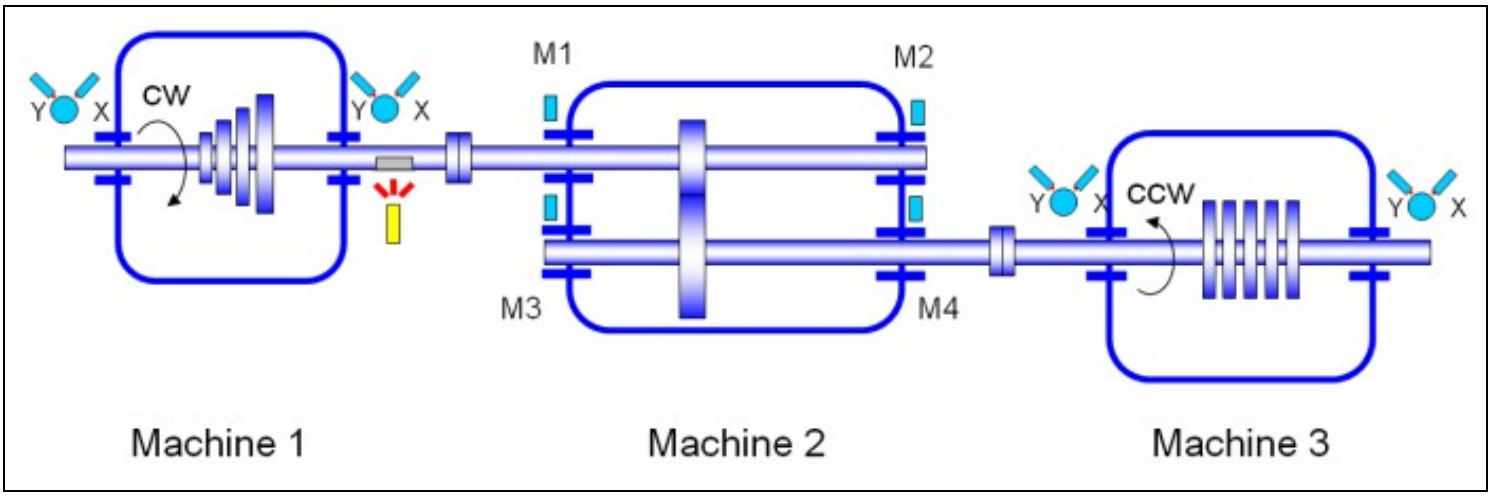
159.3.1.1 Machine train

The initial step is to type in the machine train configuration. From that point, a set-up of the inputs is automatically displayed.



First step, the machine train configuration

The interface allows the user to enter a configuration such as the one displayed on the figure below:



A typical machine train

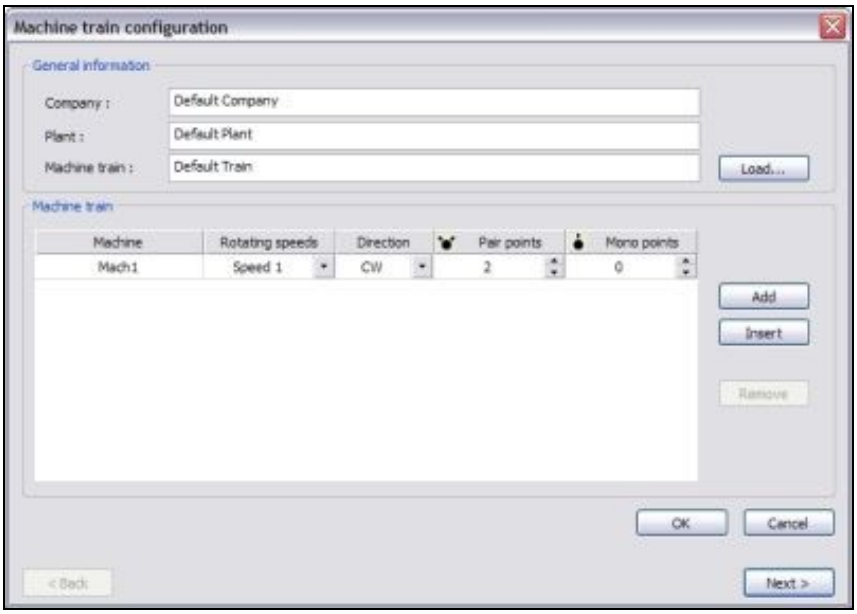
The first step is to enter the general information:

- The company name,
- The plant name
- The machine train name.

This information will be used

- In the report edition.

- It also helps when "loading a machine" as keywords.



The machine train configuration

Then, it is time to enter the machine train details. It is possible to enter machines by pressing "add" or "insert". The machine name is automatically entered and can be modified by simply clicking in the machine cell.

A rotating speed can be selected. Up to 2 speeds can be chosen for each machine train.

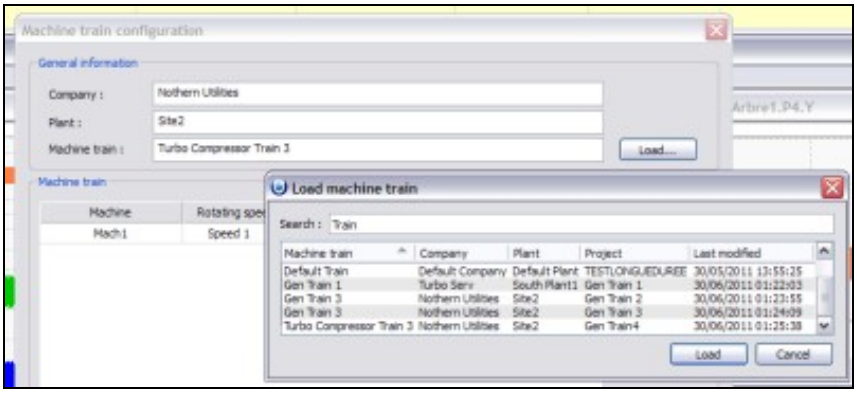
The rotation direction can be selected: CW or CCW

Then, a number of pair points and mono points should be selected:

	Pair points are sensors such as proximity probes that go by set of pairs in order to display Orbits and Shaft centerline. Velocity probes and displacement probes can also be selected. In that case they are automatically integrated to get a displacement physical quantity.
	Mono points are extra sensors that come as standalone sensors. Accelerometers or velocimeters or axial proximity probes are typically used.

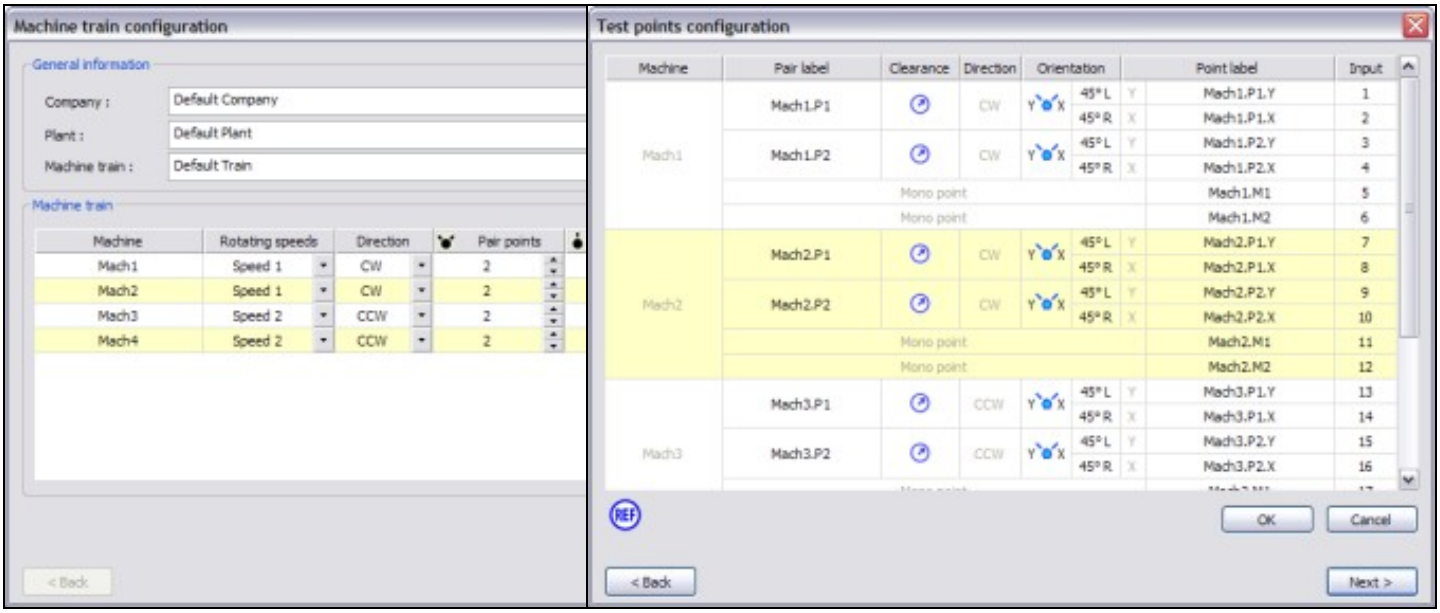
159.3.1.1.1 Machine train LOADING

- The Machine train reload function allows loading a machine train that was saved in another project.
- Machine train configuration and parameters reload (inputs, configuration, gap reference etc?).
- Machine train search and sorting by key word: Machine train, Company, Plant, Project, Date.



Machine train loading

It allows reloading the information contained into the two first windows (below).



Tip: This function is particularly useful when a user switches from the acquisition mode where a signal has been saved to the post analysis mode. Once in the post-analysis mode, it is then easy to reload the machine train of the acquisition project.

159.3.1.2 Test points configuration

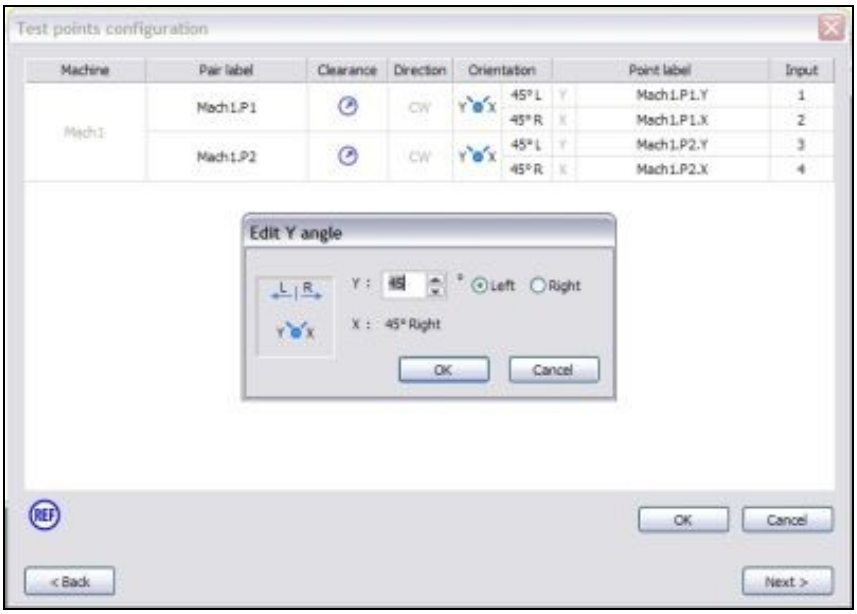
The test point configuration allows the set-up of the properties of the test points: channel label name and probes orientation.



Step 2, the test points configuration

As shown on the figure below, the test point?s configuration allows entering:

- The labels of the pair points
- The Clearance circle radius
- Proximity probes angular positioning: it is possible to choose the orientation of the probes by clicking on the probe orientation icon. The dialog box appears as displayed. The probes orientation can be set by steps of 1°. The angle between the probes is always 90°.
- The label of the measurement point
- The hardware input connection



The test points configuration

The default hardware input connection can be modified as in the figure below. It allows the user for example to inverse channel Y and X if those have been connected inversely.



Input connection choice

- Rotation direction is reminded in the test points configuration window
- Cells can be copy/pasted (including the probe orientations).

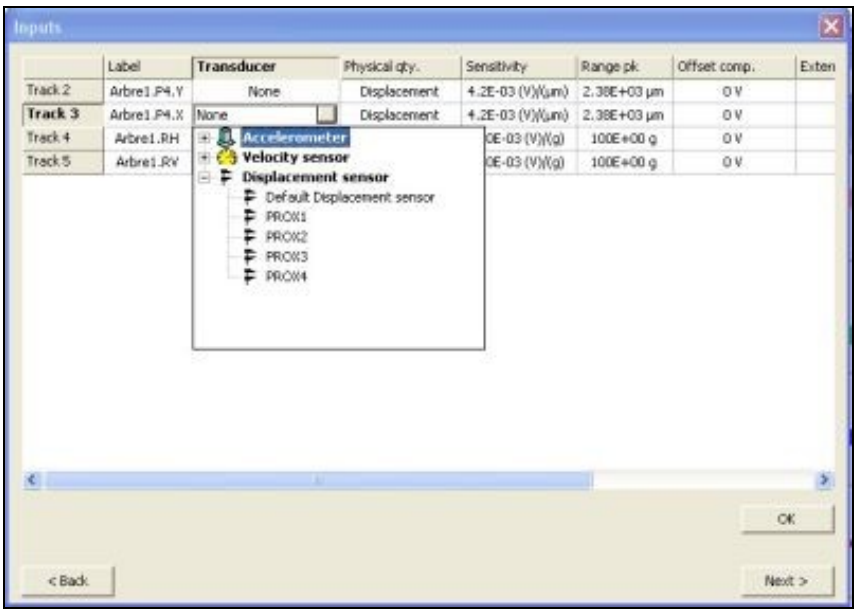
159.3.1.3 Inputs

The input properties are set-up through the input window accessed by clicking on the icon as shown on the figure below.



Step 3, The Inputs configuration

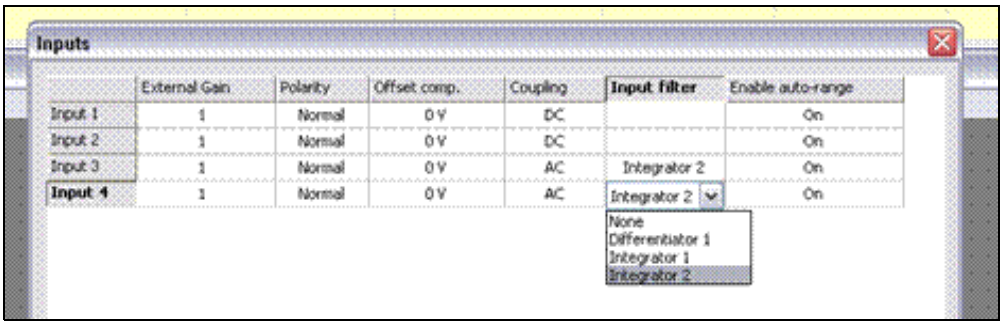
In the input window, the user can enter the setup of the input channels associated to the test points. Most of the input set-up can be collected from the sensor properties chosen from the sensor database.



The inputs configuration

Integration

- Pair points are always displacement values (because they are meant to display orbits). So Accelerometer or velocity probes are integrated once or twice.
- Monopoints can be integrated or derivate as desired during acquisition.



Monopoints integration

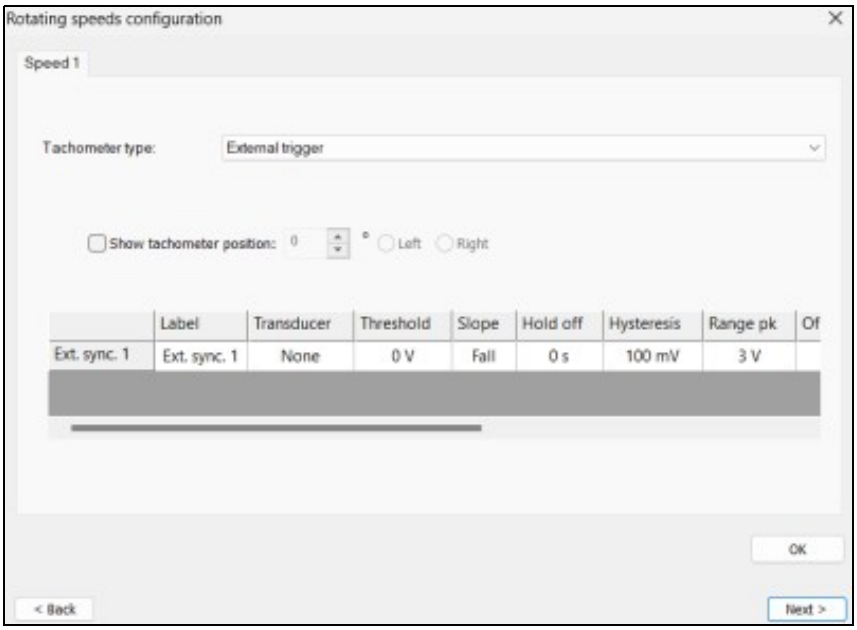
159.3.1.4 Tachometer



Step 4, The tachometer configuration

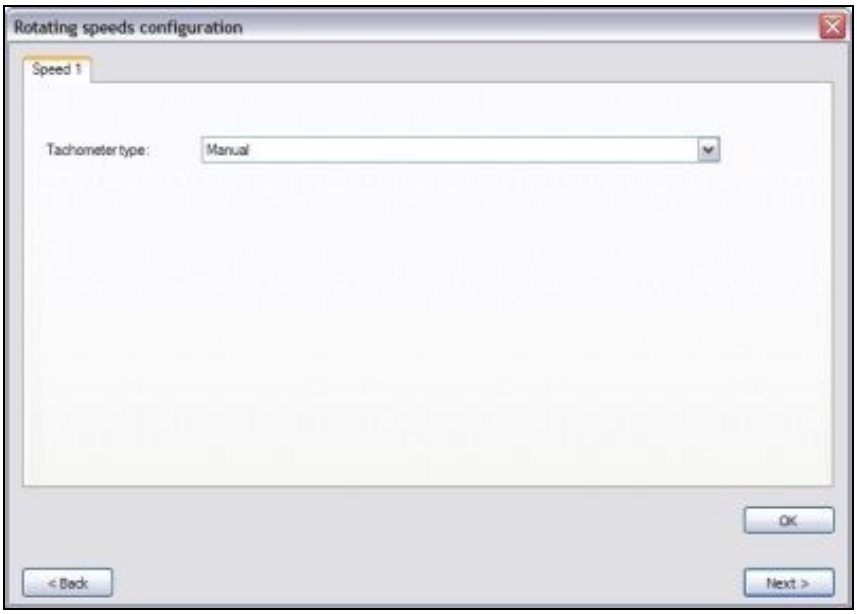
The properties of the speed measurement can be entered in the "Speeds" window: Three different modes are enabled.

The tachometer type can be set-up as: "External trigger". In this case, the speed is measured based on a tachometer sensor plugged to the external trigger channel.



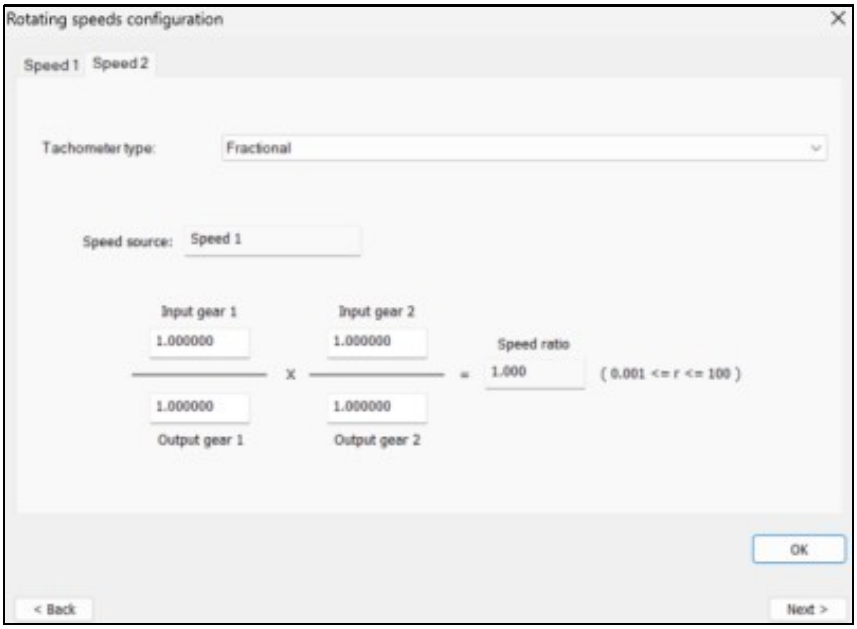
External trigger configuration

If no speed can be measured, it is possible to use the "Manual" tachometer. This supposes that the speed is stable and is defined by the user in the analysis window. In that case, the user should not rely on the phase results.



The manual tachometer type

If a gear box is used in between two machines. It is possible to define a tachometer that depends on the ratio between each gear wheel. For that, the type "Fractional" should be selected.



The fractional tachometer type

In this case, it is not necessary to measure the second tachometer. It can be simply calculated from the first sensor and the gear ratio.

159.3.2 Analysis

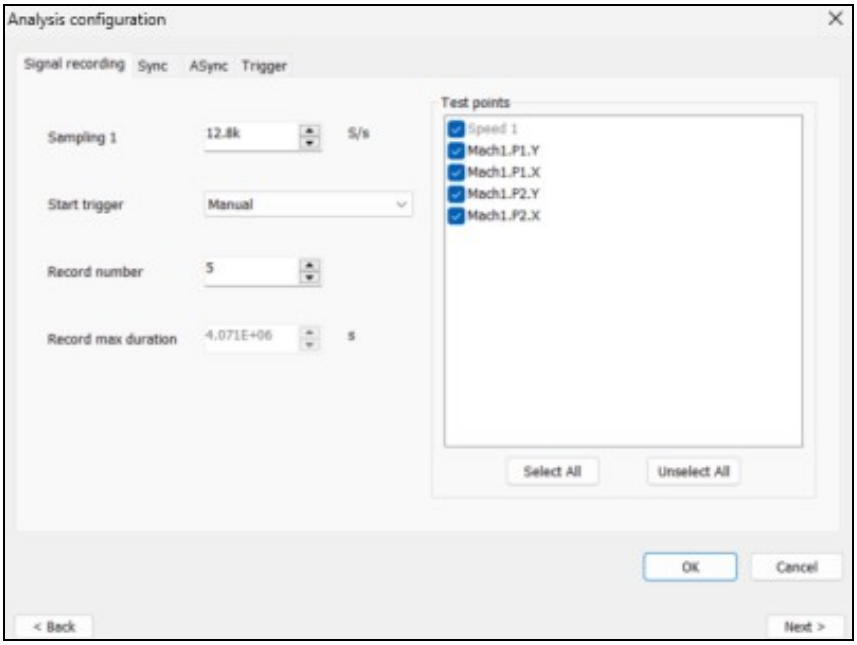
The analysis set-up window can be accessed through the icon shown below.



Step 5, the analysis set up

ORBIGate is able to complete several types of analysis simultaneously: Sync analysis (Order Tracking analysis for the so called NX data), ASync analysis (FFT Analysis) and Signal Recording for the raw time data recording.

- Sync Analysis is referring to the Analysis Synchronous with the Rotating Speed (results coming from the SOA Analysis). There are two kinds of display X axis for the Sync spectrum: Frequency or Order. The Sync spectrum is available in the Navigation mode.
- ASync Analysis is referring to standard FFT analysis: It also gives a frequency spectrum. It is ASynchronous with the rotating speed: one advantage is that it can be monitored without any rotating speed.

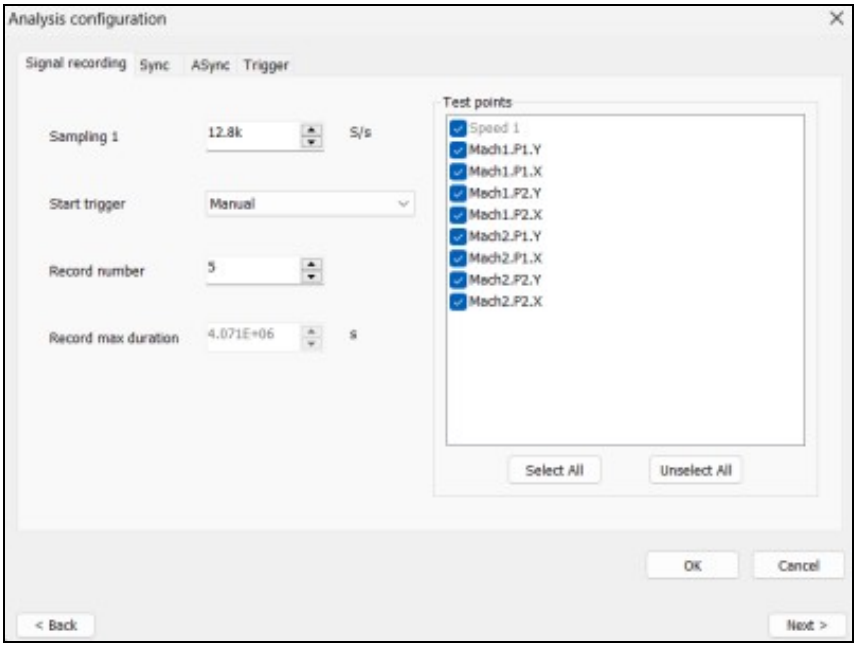


Step 5, the analysis set up

When you press OK on this window, you might need to wait for a few seconds before it actually proceeds. It is the time allocated to connect the analysis plug-ins.

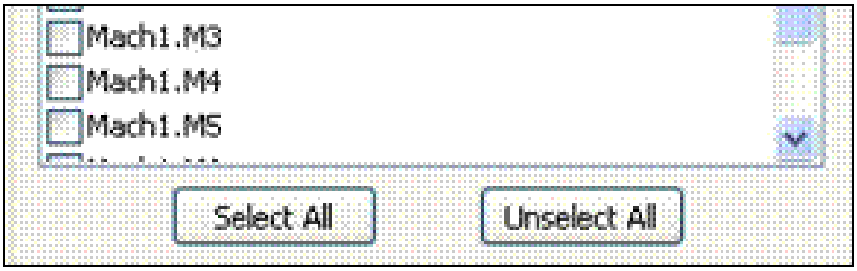
159.3.2.1 Signal recording

The signal recording allows the user to capture the full time domain signal with no gap. It is also possible to capture the signal by portions: one signal file will be issued. This signal file can be post-processed using ORBIGate or NVGate post analysis module.



The signal recording set-up

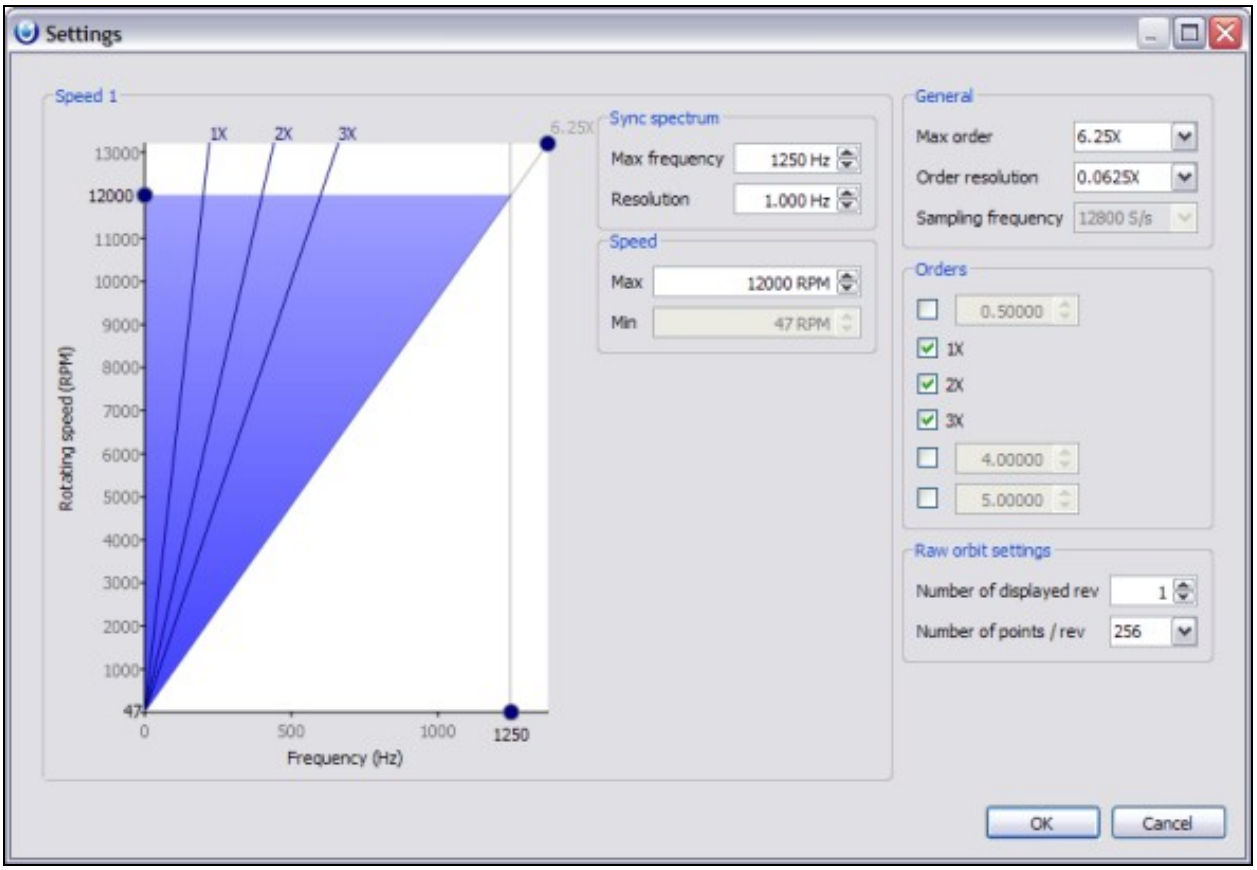
- The signal recording can be triggered using a manual start or can be synchronized with the measurement recording.
- The signal can be recorded in every case, including when no tachometer is detected.

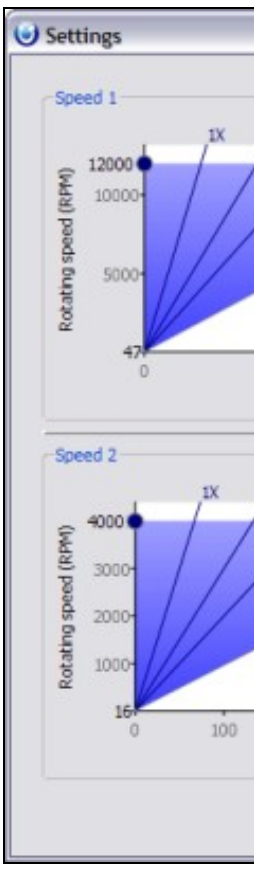


Select and Unselect all window

159.3.2.2 Sync analysis

- The "All In One" interactive settings panel has been designed to make the settings as easy as possible for the user by displaying all available choices:
- Order synchronous analysis: Max order, order resolution and selected orders
- Frequency synchronous analysis (Sync spectrum): Max frequency, Resolution
- Rotating speed: Max and Min speed (Ratio between Max and Min speed is 256). When the speed is "manual", its value is chosen here as well.
- Number of displayed revolutions and number of points per rev





Sync analysis settings

Settings can be entered by hand or modified graphically on the image.

NX analysis allows to set-up what orders will be calculated and displayed as:

- NX orbits
- Grid

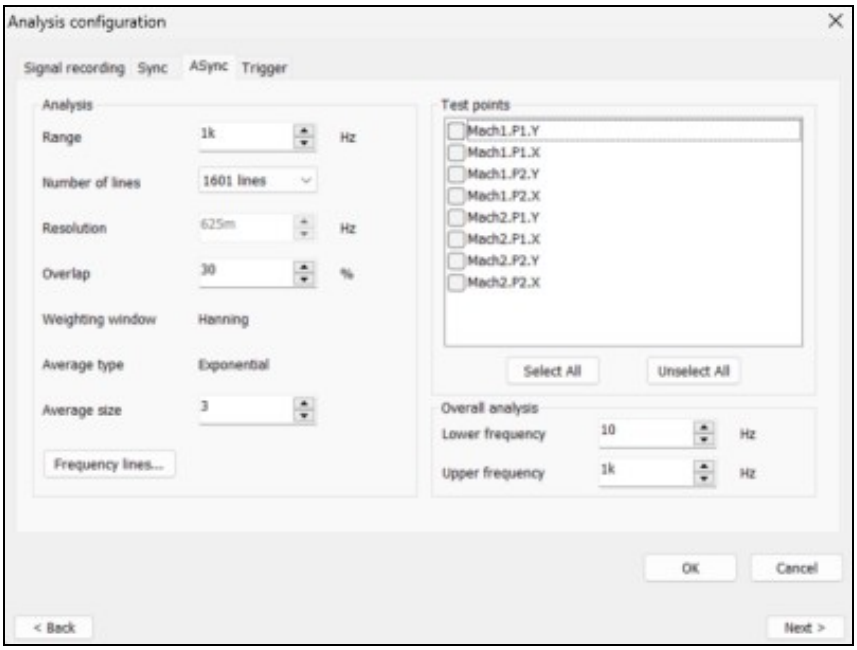
It is possible to calculate up to 3 default orders: 1X (Order 1), 2X (Order 2), 3X (Order 3) as well as 3 custom orders.

The user can specify how many rotations will be displayed for the raw orbit as well as how many points per rotation.

159.3.2.3 ASync analysis

In addition to the NX recording, it can be interesting to acquire an FFT analysis. In that case, the FFT parameters used can be defined in the following window.

An interesting use of ASync monitoring is that it can operate without a keyphasor signal.



Signal recording, Sync, ASync, Trigger

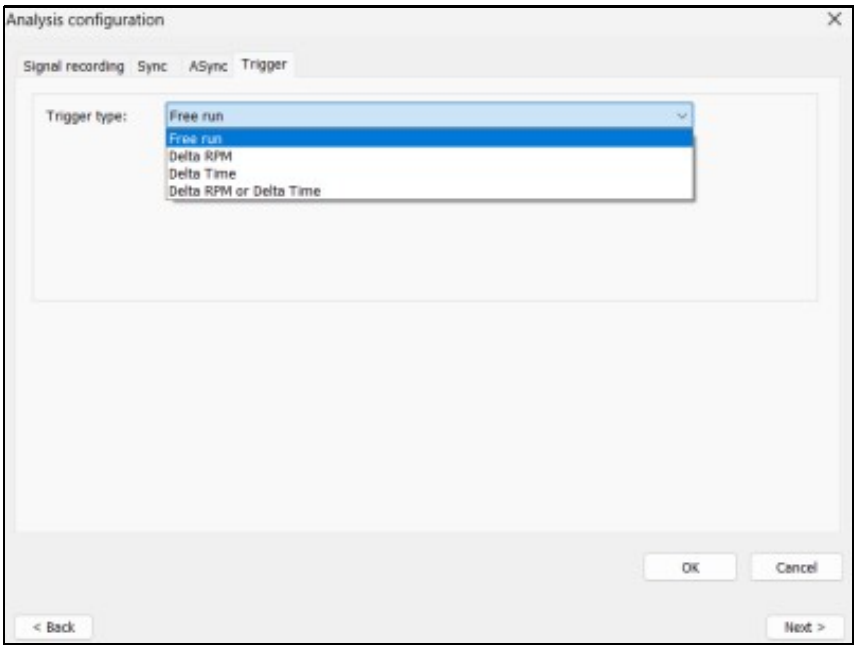
The Overall level between two cut off frequencies can be determined as shown in the window above. This value will be noted as "OvB AS" (it is a RMS quantity).

159.3.2.4 Trigger

Finally, it allows selecting the sampling frequency used for saving the data in the array.

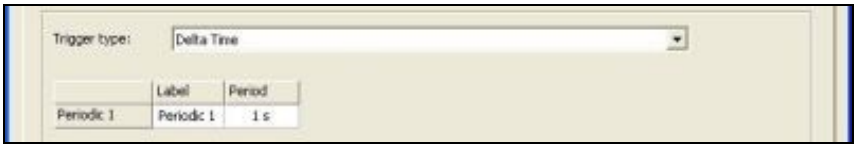
Four different types of triggers are possible:

- Free Run: The data is saved in the array without any specific frequency specified.
- Delta RPM: The data is saved in the array every increase (or decrease) of speed with a defined step.
- Delta Time: The data is saved with a time period.
- Delta RPM or Delta Time: The data is saved with a "or" condition. It is saved every DeltaRPM steps or DeltaTime steps depending on which comes first. This trigger type is especially interesting when machines go through a start-up with a sequence of Run-up sessions and stable speeds sessions.



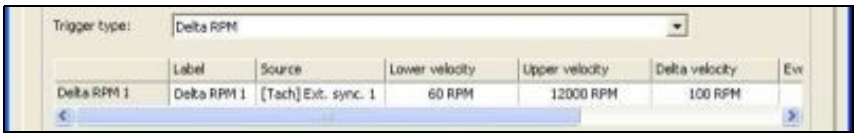
nx Recording, free run sampling

Delta Time is used to collect data for a specific amount of time.



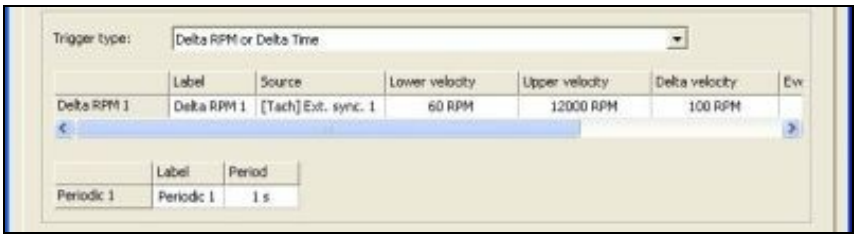
nX Recording, Delta Time sampling

Delta RPM is used to collect data every increase (or decrease) of the rotating speed.



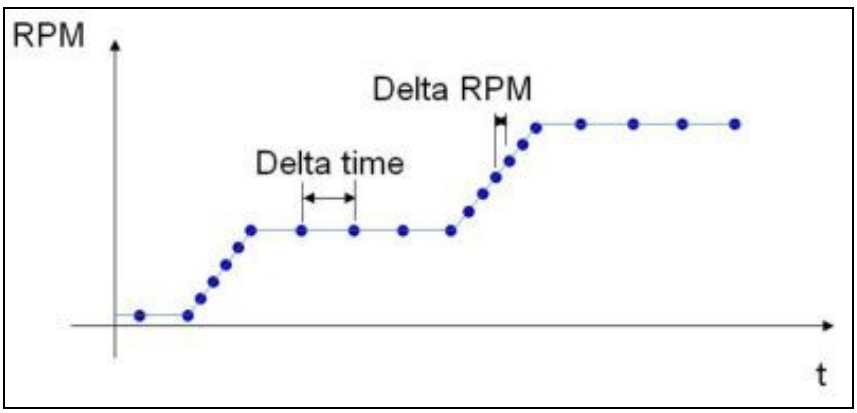
nX Recording, Delta RPM sampling

In some cases it is interesting to be able to mix the two above conditions as shown in the window below.



nX recording, the Delta RPM or Delta Time sampling

As a matter of fact, when the machine start-up is made of run ups and stable speed sequences as displayed on the figure below, it is interesting to alternate the delta RPM condition and delta time. In that case, the software detects which condition comes first. The amount of saved data is optimized: a high sampling during the run up periods (using delta RPM) and a lower sampling during the stabilization periods. These periods can be very long and often don?t have many changes in terms of vibrations.



A typical machine start-up

159.3.3 Alarm conditions and actions

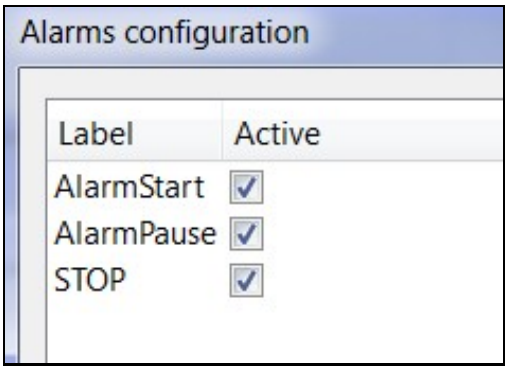
Alarm conditions and actions are set-up through icon 6 of the set-up toolbar.



Step 6, the alarm conditions and actions

159.3.3.1 Configurating Alarms

A list of alarms can be created for one particular project. The alarm can be activated or not.



Alarms list

The first thing to do is to give a name to the alarm. For example, "AlarmStart" as displayed in the window above. There is no chronology aspect in the list: each activated alarm condition is checked permanently.

The alarms are saved in the project. They should be configured for each project, as channels may be different from one machine to another.

159.3.3.1.1 Alarm conditions

An alarm is made of a condition and an action. If the condition is fulfilled, the action is started.

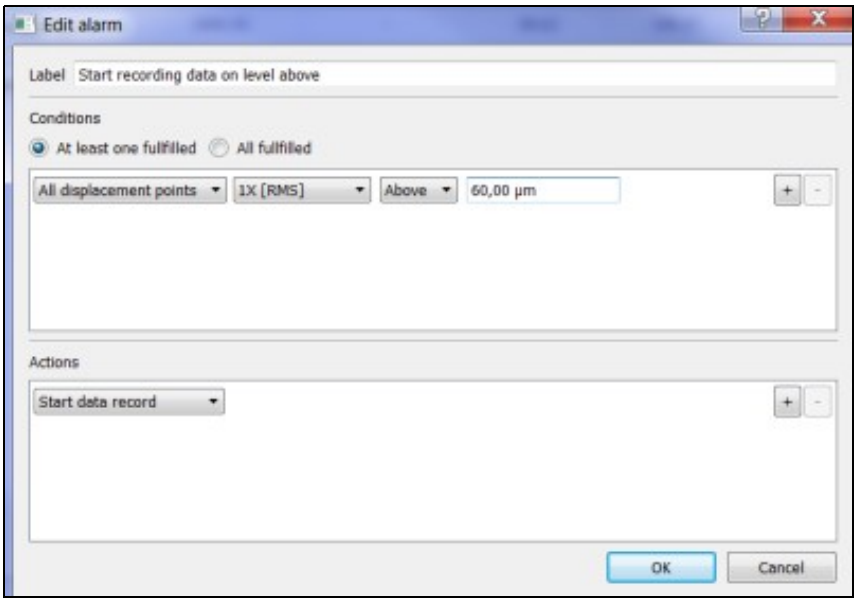
The condition test is done for a number of:

- Measurement points
- Parameters (1X, Overall etc ?)
- Below / Above
- A value

It should be specified if **all tests have to be fulfilled** or **at least one of them should be fulfilled**.

In the example shown in the window below one should read:

If among "All displacement points", one of them has its 1X[RMS] component going above 60 microns, then the data record should be started.



"Alarm start" configuration

159.3.3.1.2 Alarm actions

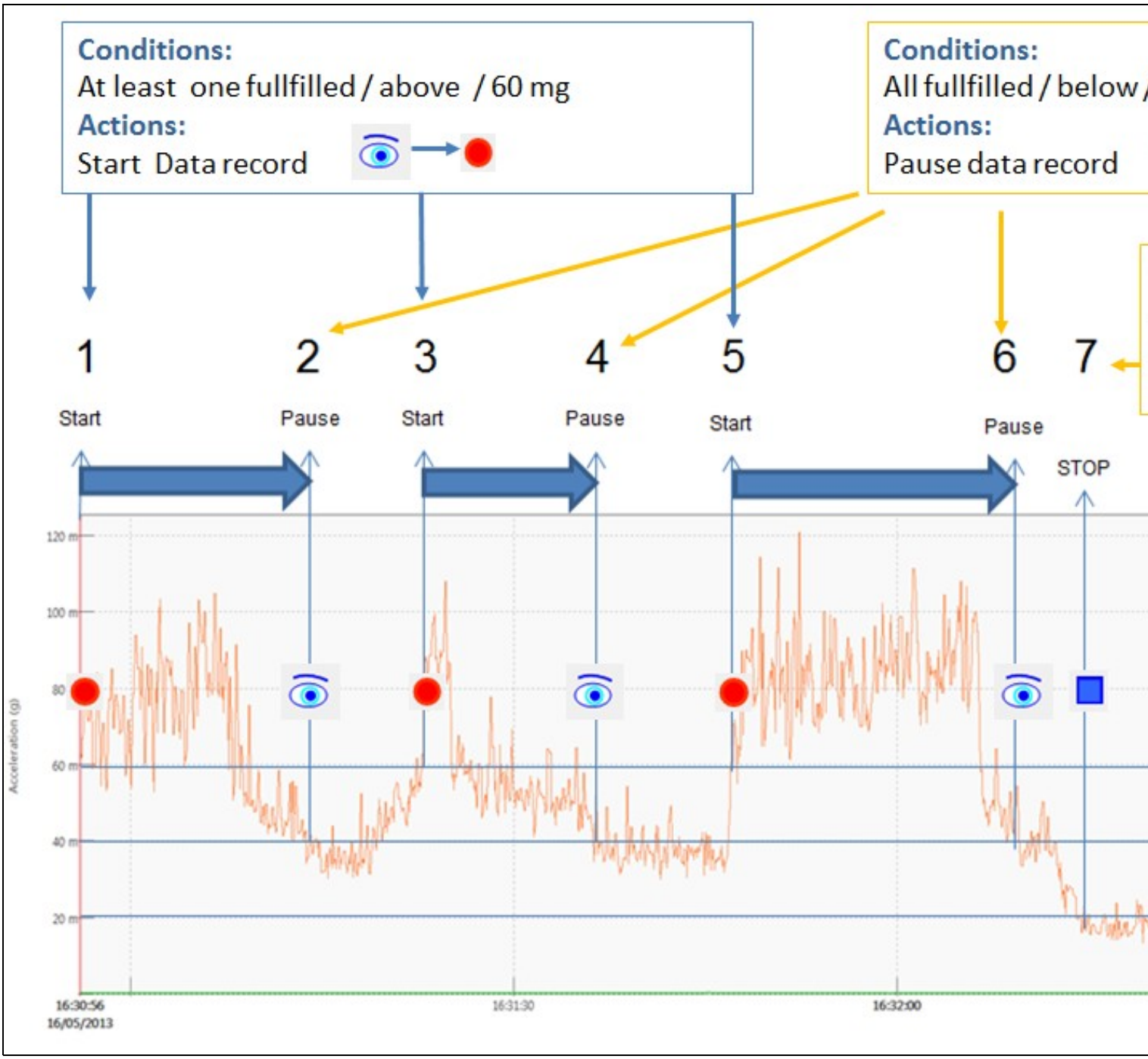
If the alarm condition is fulfilled, then a number of actions can be achieved (like "Start data record" as shown in the window above).

159.3.3.2 Alarm operation

When using the alarm, one needs to start the monitoring



in order to start monitoring data and check conditions. From that point, the conditions are checked and actions started. Here is below an example of data record started on alarms and data record pause when the level goes down.


Conditions:
At least one fullfilled / above / 60 mg
Actions:
Start Data record
Conditions:
All fullfilled / below /
Actions:
Pause data record
1
2
3
4
5
6
7
Start
Pause
Start
Pause
Start
Pause
STOP
120 m
100 m
80
60 m
40 m
20 m
Acceleration (g)
16:30:56
16/05/2013
16:31:30
16:32:00

Example of operations between data record and data monitoring

159.3.4 Displays

A large number of displays can be selected depending on the needs of the user.

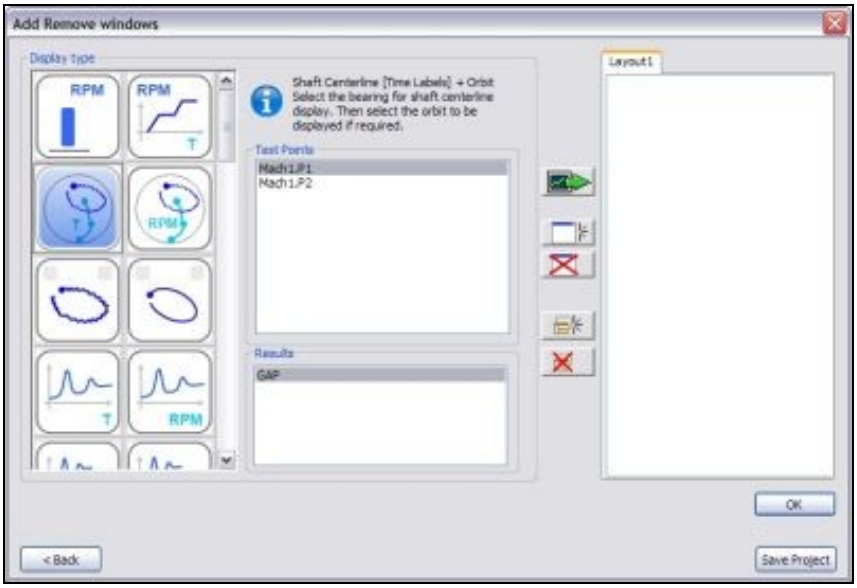
159.3.4.1 Adding and removing a window

Graphic windows can be shown or removed using the "add/remove window" icon as shown in the toolbar below.



Step 7, the add/remove window

The graphics to be displayed are chosen from the "Display type" section on the left side of the "Add/Remove" window. One type of display should be chosen. Then, the test points to be displayed should be chosen and finally the results type. When the selection is done the trace can be added (by clicking on the icon as indicated on the table below).



The add/remove window

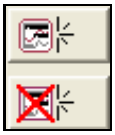
It is possible to have multiple traces on the same graph or several graphs per window.

	Allows adding a trace to a graph. If there is no graph, a new one is automatically created.
	Add a new graph. Delete the selected graph.

Layouts:

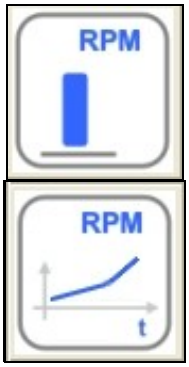
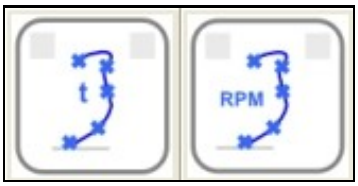
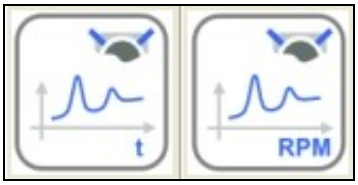
Use the layout feature to display more graphics on the same screen. Several graphic layouts can be configured. During the actual test, the different layouts can be swapped using the command "CTRL+SHIFT+SPACE".

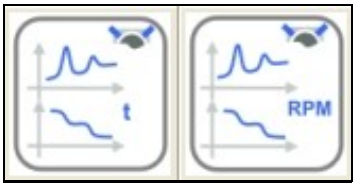
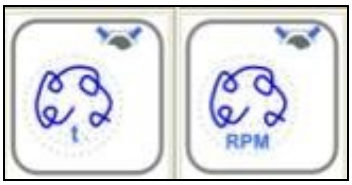
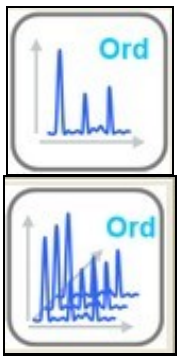
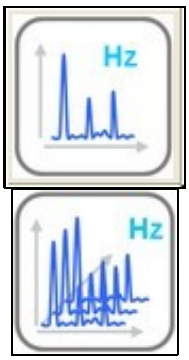
The layout can also be selected in the display toolbar or in the graphic zone.

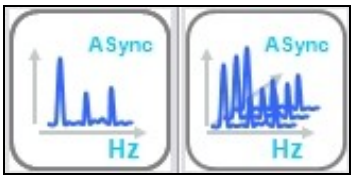
	Add a new layout Delete the selected a layout

Additional graphics are displayed in online mode. The available graphics are described in the following table.

- Layouts can be renamed by right clicking in the window area
- Windows can be renamed by right clicking on their label
- Windows and traces can be deleted by right clicking on them

Display		Acquisition & Post Analysis	Saved and displayed in Navigation mode
	RPM vu-meter and profile	YES	YES
	Full Shaft Motion	YES	YES
	Raw Orbit	YES	YES
	nX Orbit	YES	YES
	Shaft Centerline with Time/RPM ticks	YES	YES
	Profile vs. Time/RPM	YES	YES

	Bode Diagram vs. Time/RPM	YES	YES
	Polar plot with time/RPM ticks	YES	YES
	Signal vs. angle	YES	YES
	Order spectrum	YES	YES
	Frequency spectrum	YES	YES
	Sync Vumeters	YES	YES
	Recorded Signal	YES	NO

	Monitoring Shaft View	YES	NO
	Signal vs. time	YES	NO
	ASync Monitoring	YES	YES
	Async Vumeters	YES	YES

Functions table

159.3.4.2 Infotrace

The infotrace displays information about the graph:

- **Graph mode:** magnitude, real...
- **List of traces with their states:** available or not / displayed in all areas or not / not displayed. You can move into the infotrace to select a specified trace and to follow cursor?s value of this trace. Memorized traces are also displayed in the list (Memx)
- **Overall levels:** Displays the RMS level in 2D windows containing spectra or time signals.
- **Cursor information:** x, y, order, dx, dy if available
- **Marker arrays:** Using keyboard arrows, you can select the active trace in the infotrace.



159.3.4.3 Scalar results

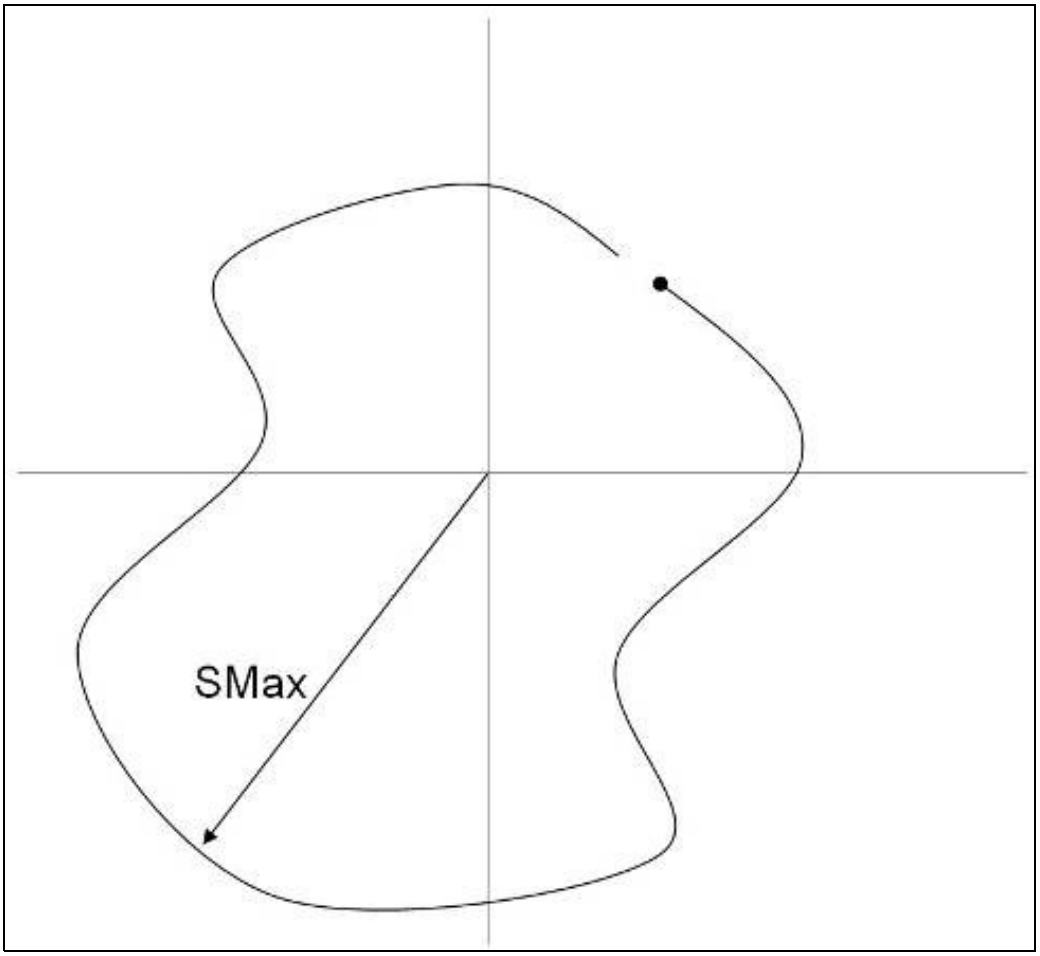
Graphic windows should be added and removed through ORBIGate "add/remove window" function.

- Overall values are available simultaneously in the overview grid as: RMS, pk-pk and 0-pk values. They are calculated on the synchronous signal blocks available for the orbit.
- nX orders are also available as RMS values in the grid and as trends vs. Time or RPM

The Sync grid allows visualizing the main required parameters during a measurement: the grid columns can be setup by double clicking on one of the columns or by a right click. The "Sync grid settings" appears as shown beside.

- Ov RO- : It is the overall value corrected by the Run Out whenever a run out correction is applied.
- nX Vectors can be shown as 0-Pk or Pk-Pk (depending on the preference) or RMS
- Smax

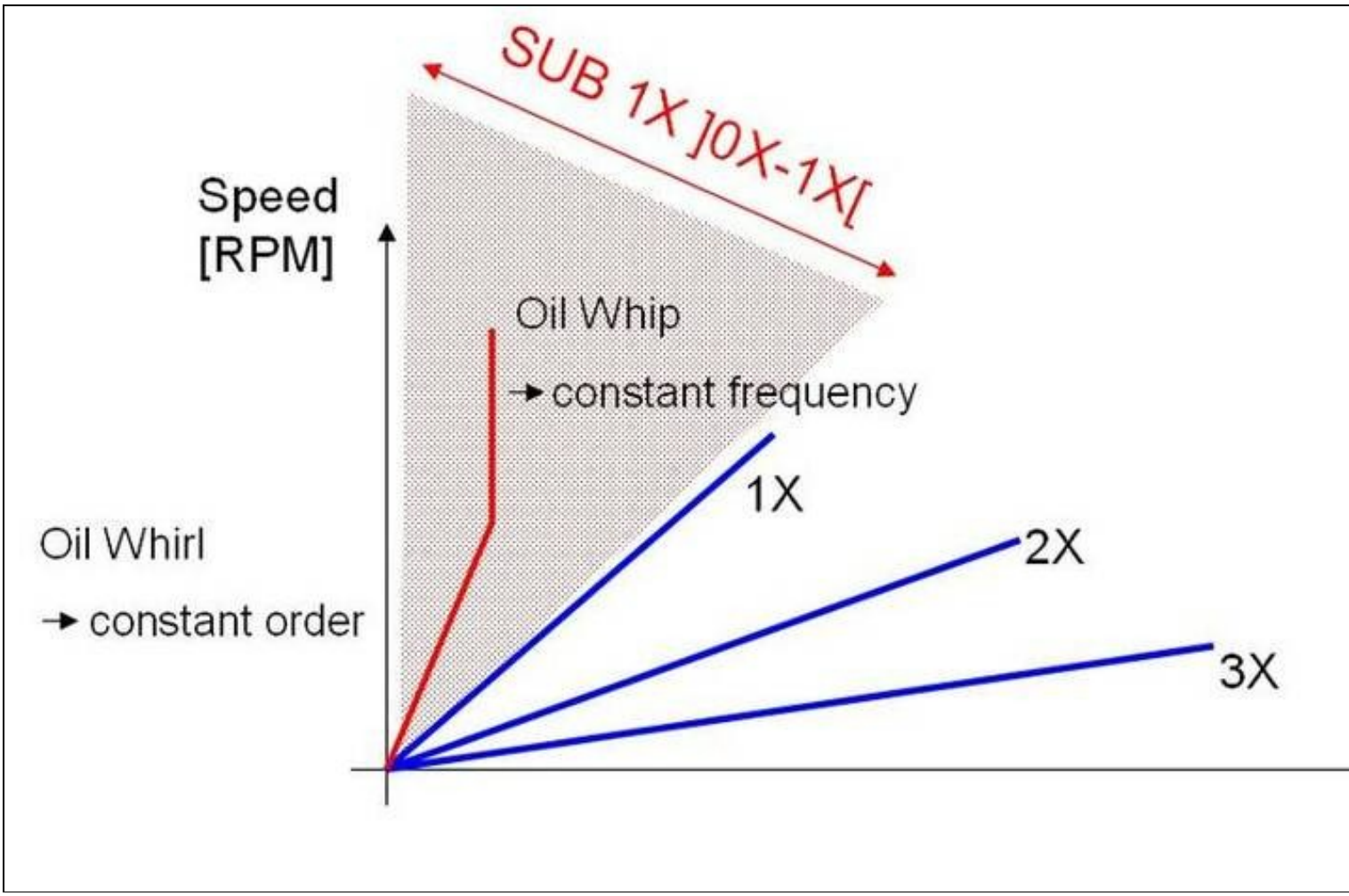
SMax is defined as the maximum value of the radius of the orbit, as displayed on the graph below.



SMax definition display

- SUB1X

SUB1X is a value that gives the vibration energy contained in the sub harmonic region. Its purpose is to evaluate instabilities such as oil whirl and oil whip.

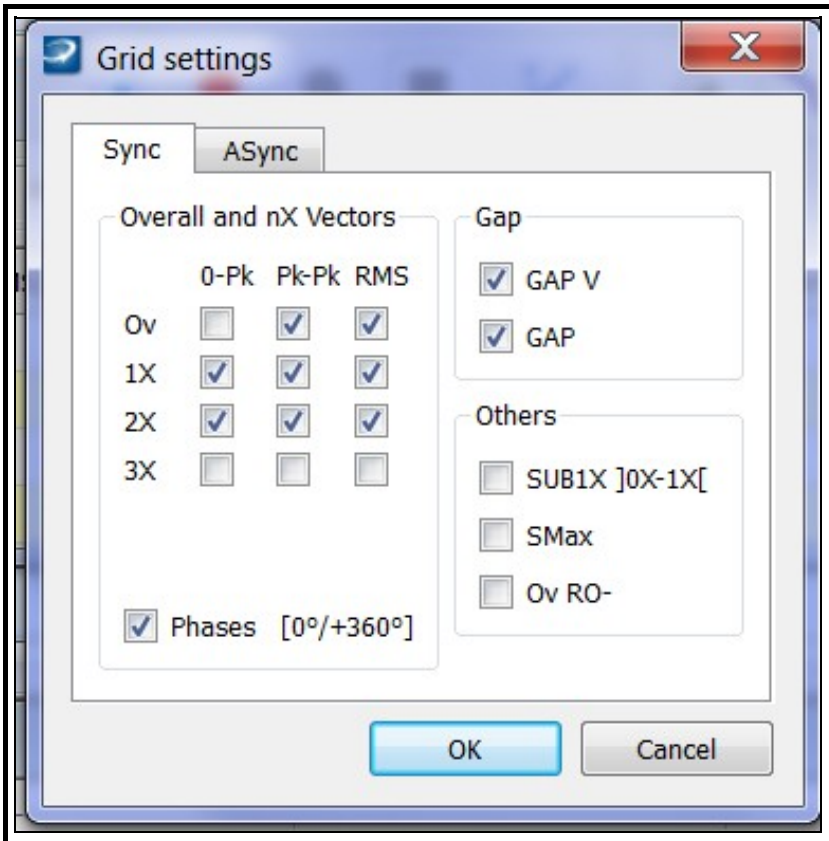


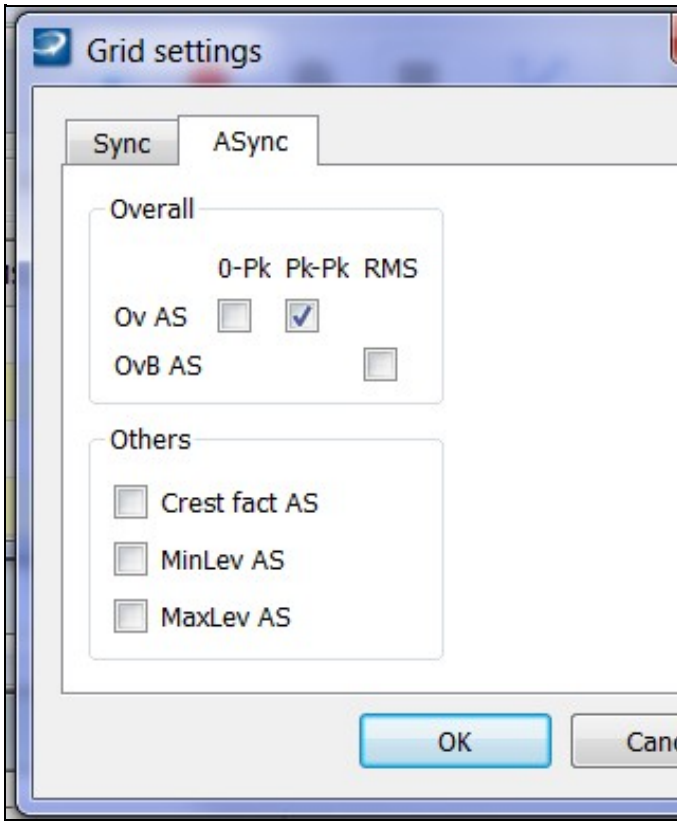
This value is displayed in the array and can also be displayed as a RPM profile or time profile.

159.3.4.4 The grid

Results from the Synchronous and ASynchronous analysis are available in the grid. The grid can be configured by a right click on it.

There are two tabs available in the grid: one for setting up the Sync analysis and one for the ASync analysis.



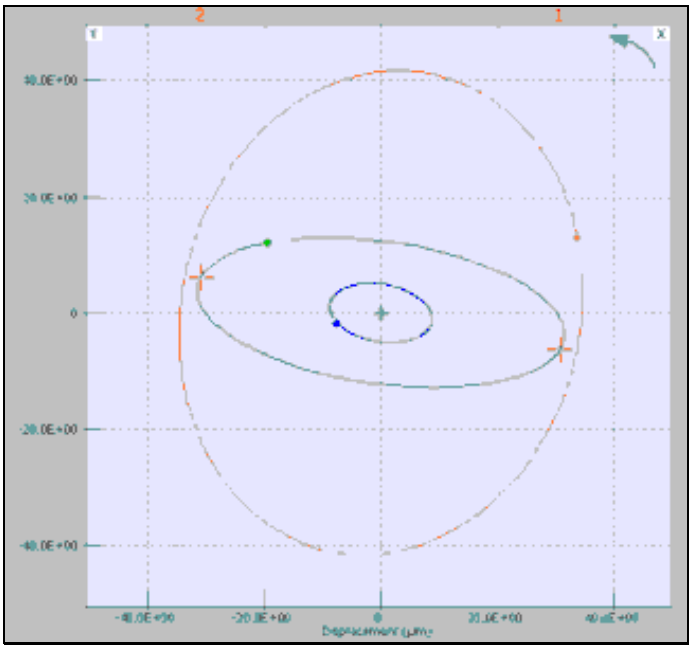


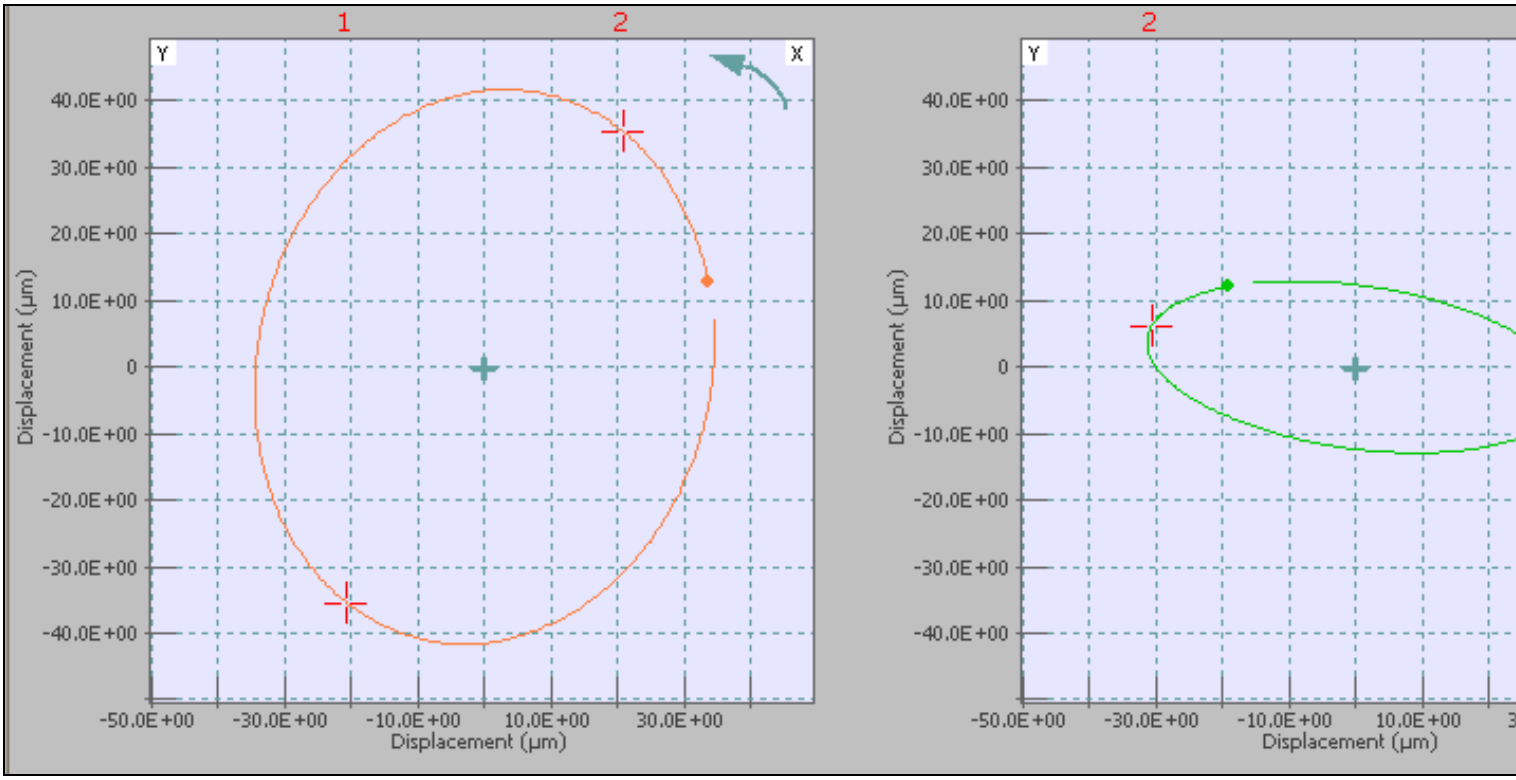
Grid Sync results settings	Grid ASync results settings

In the grid, Async results are noted with the initials AS after the result name.

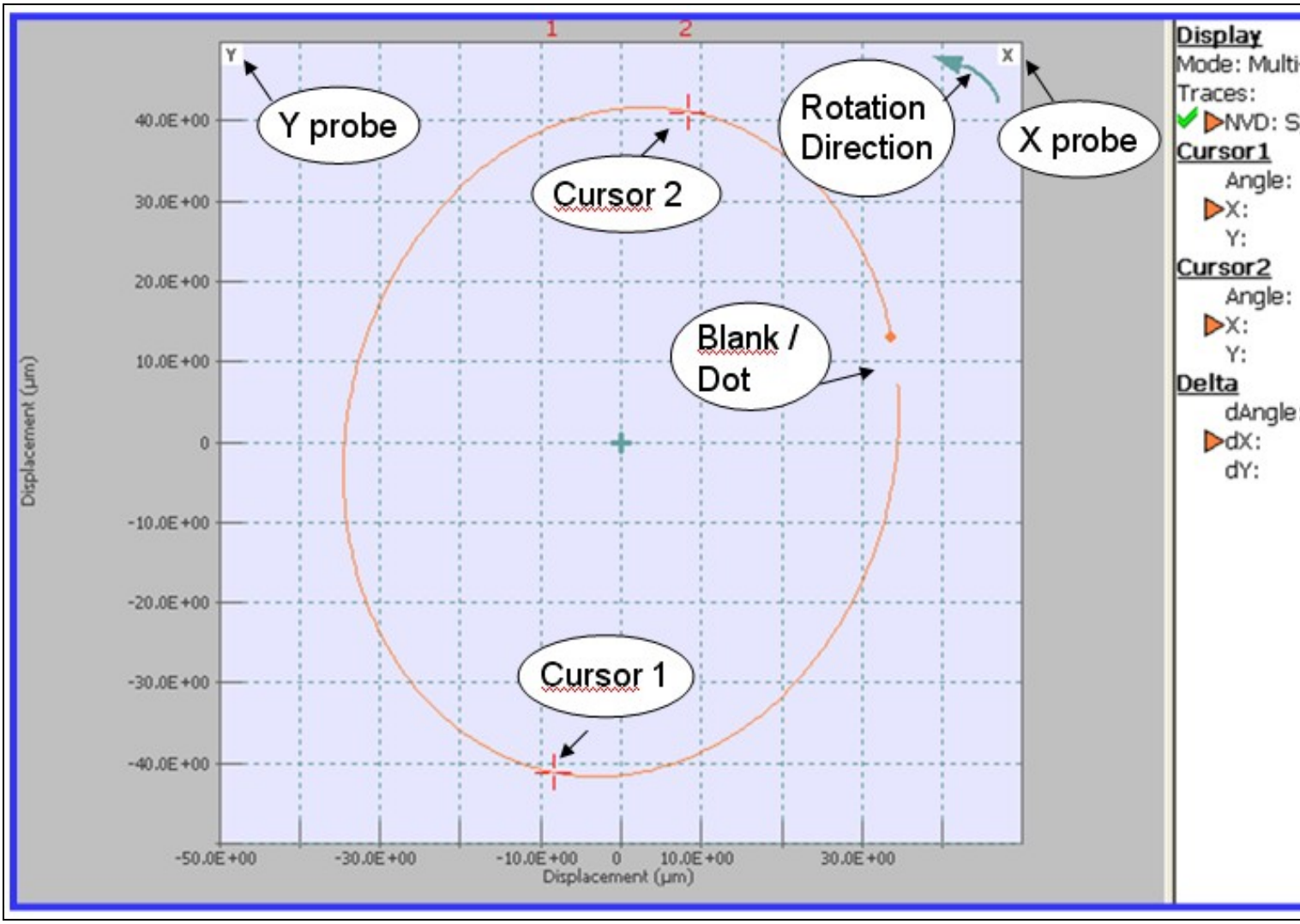
159.3.4.5 The orbit

The Orbit can be displayed in a multi-trace mode or in a multi-graph mode.



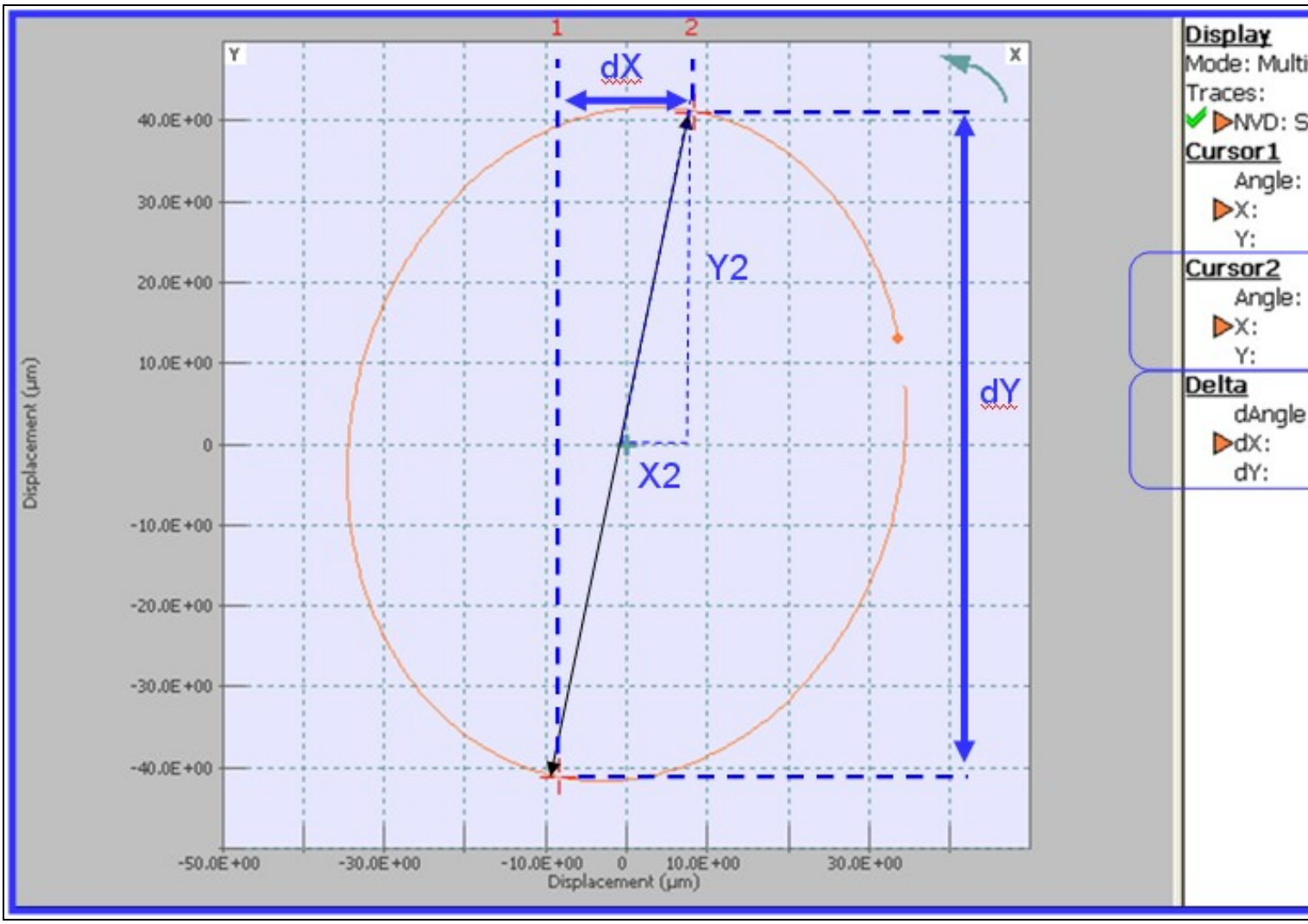


- The Orbit display shows the important parameters of the test:
- Rotation direction
- Blank/Dot indication
- X and Y probes position.
- The cursors are synchronized and can help to describe the deflection of the shaft as shown in figure 47. For example, each cursor 1 displayed is synchronized from one graph to another.



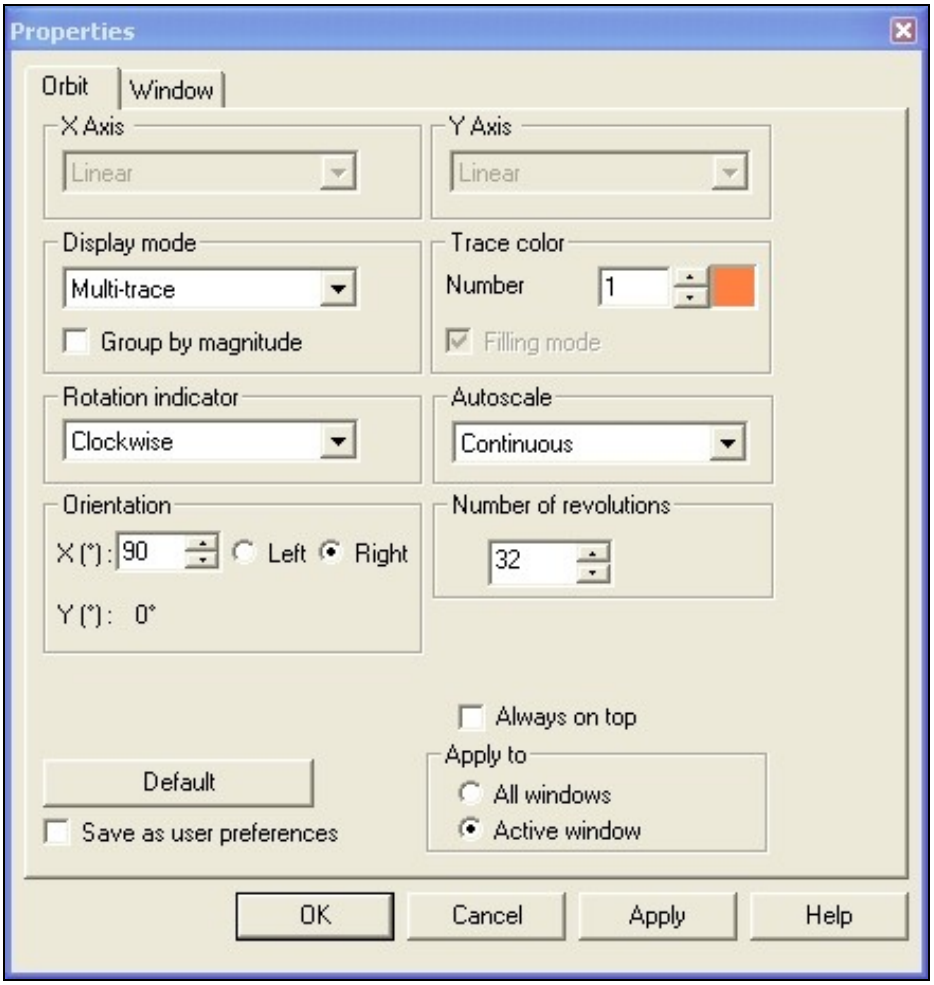
The Orbit display

The orbit cursors let the user measure a number of dimensions of the orbit. It is accessed by dragging to the left the info trace section (on the right side of the orbit window).



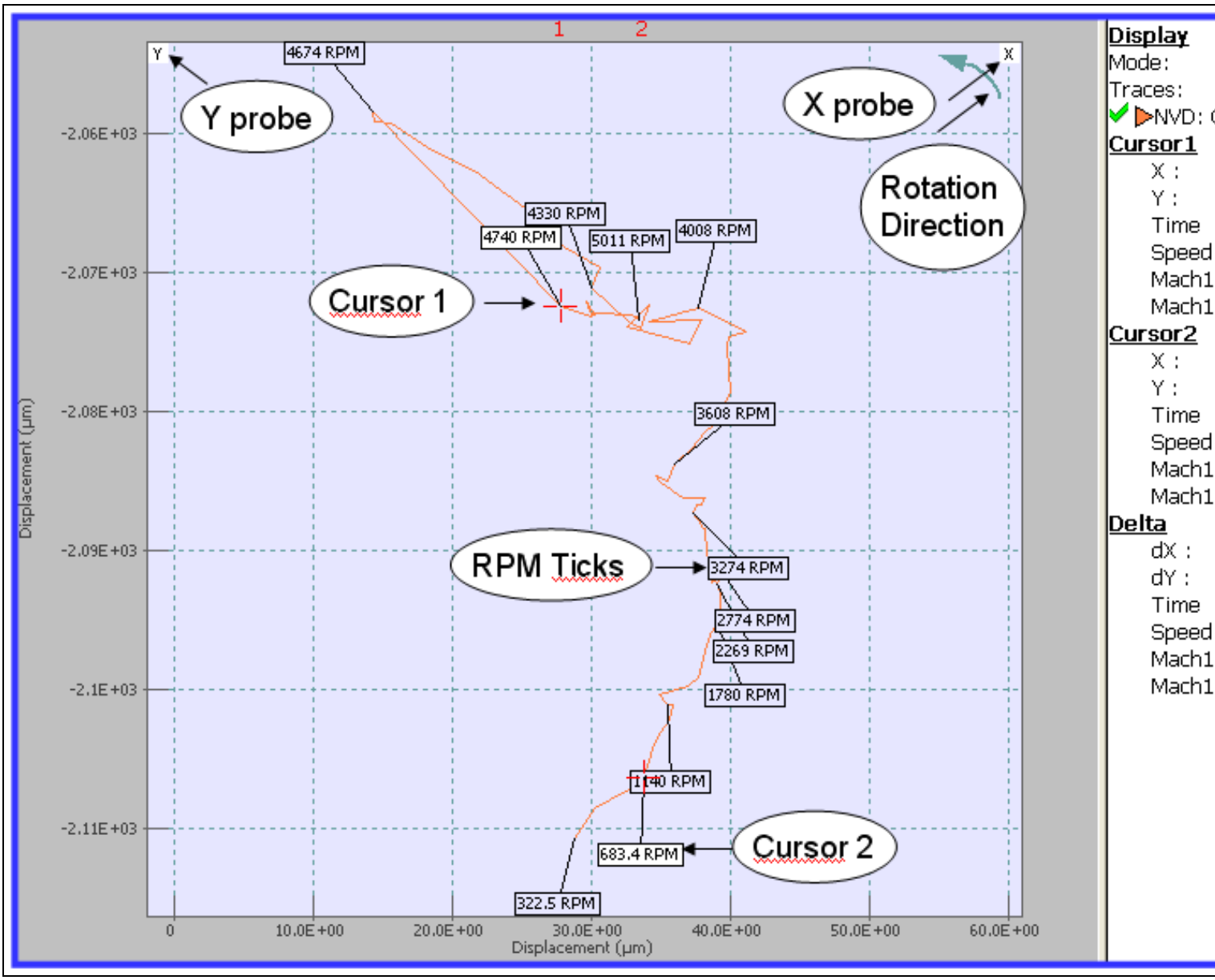
The Orbit cursors

The options of the Orbit window can also be modified by using a right click and selecting properties.



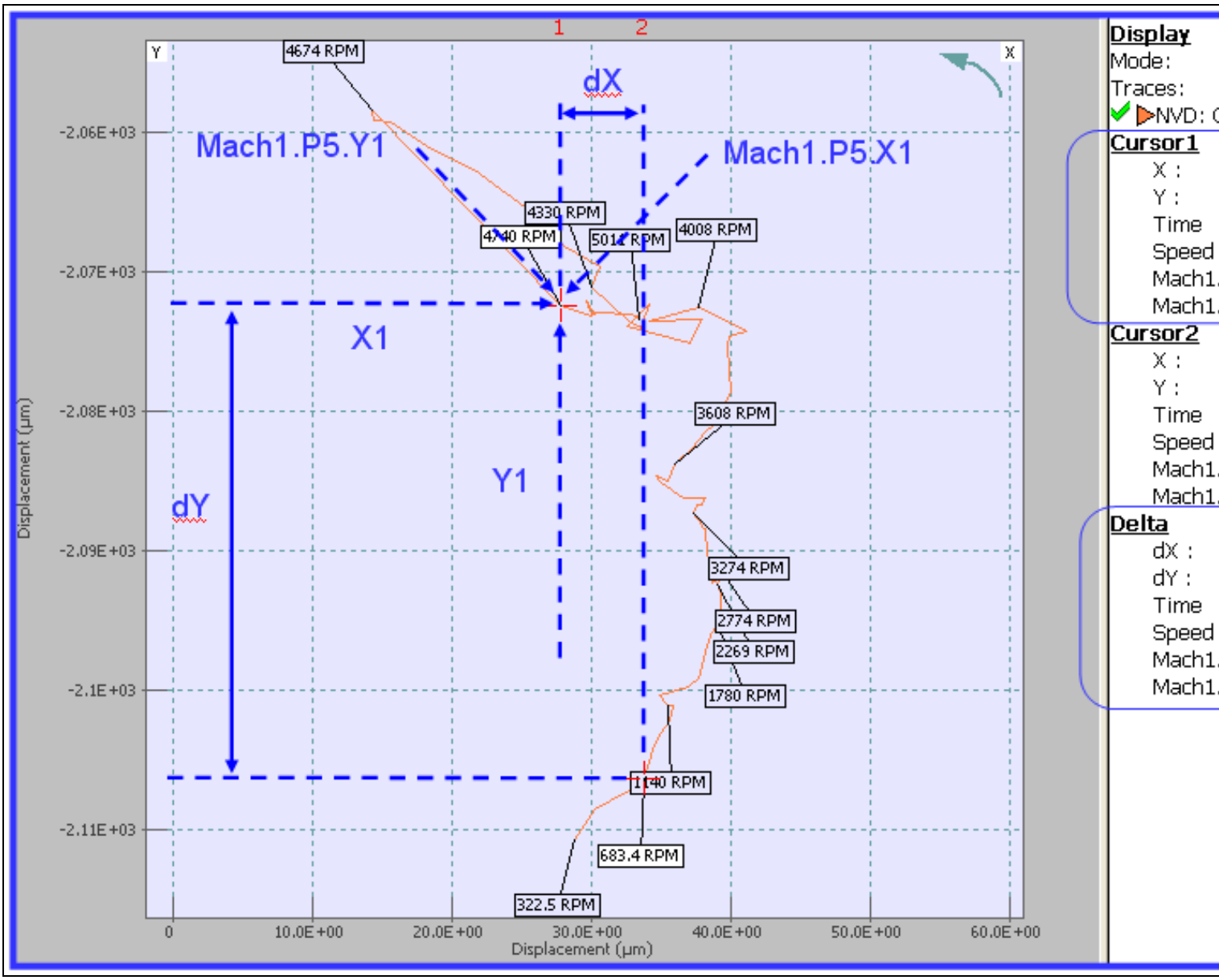
159.3.4.6 The shaft centerline

- The Shaft center line (also called GAP) display shows the important parameters of the test:
- Rotation direction,
- X and Y probes position



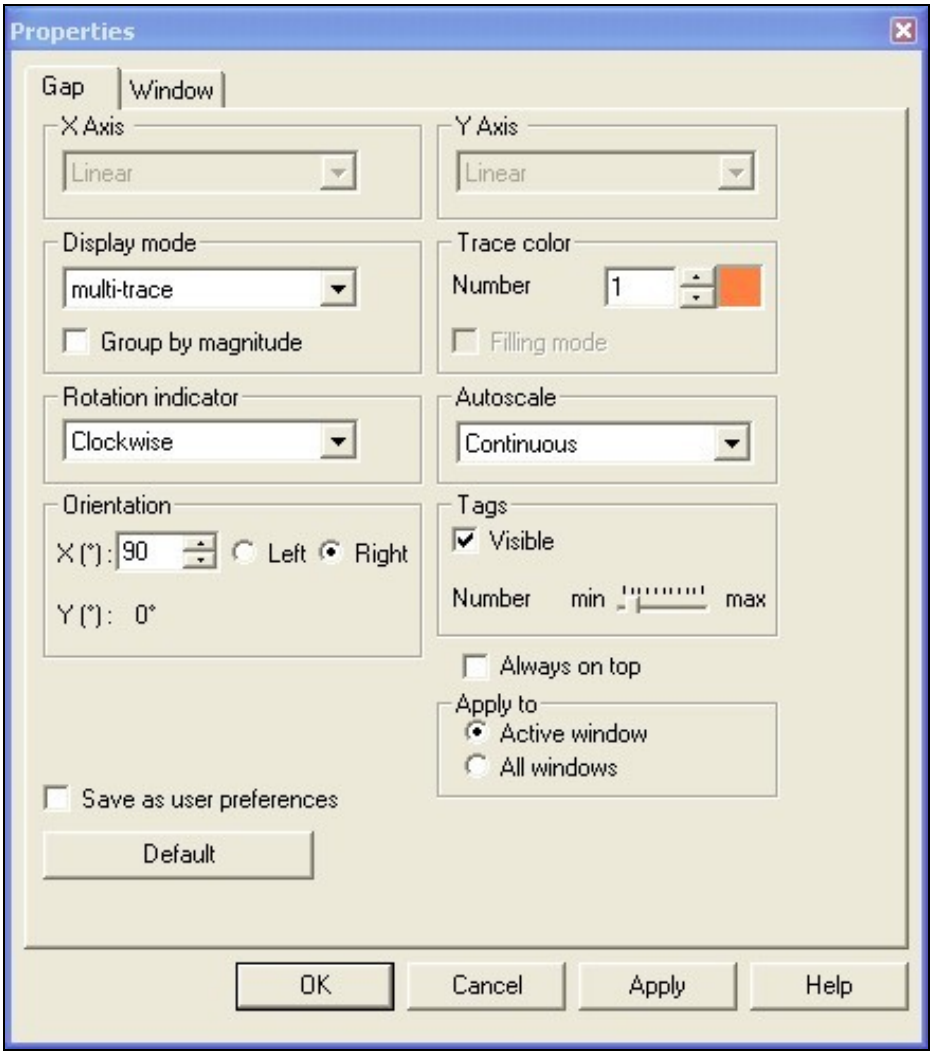
The Shaft Centerline display

The shaft center line cursors let the user measure a number of dimensions of the shaft center line position. It is accessed by dragging to the left the info trace section (on the right side of the shaft center line window).



The Shaft Centerline cursors

The options of the Shaft Center line window can also be modified by using a right click and selecting properties.



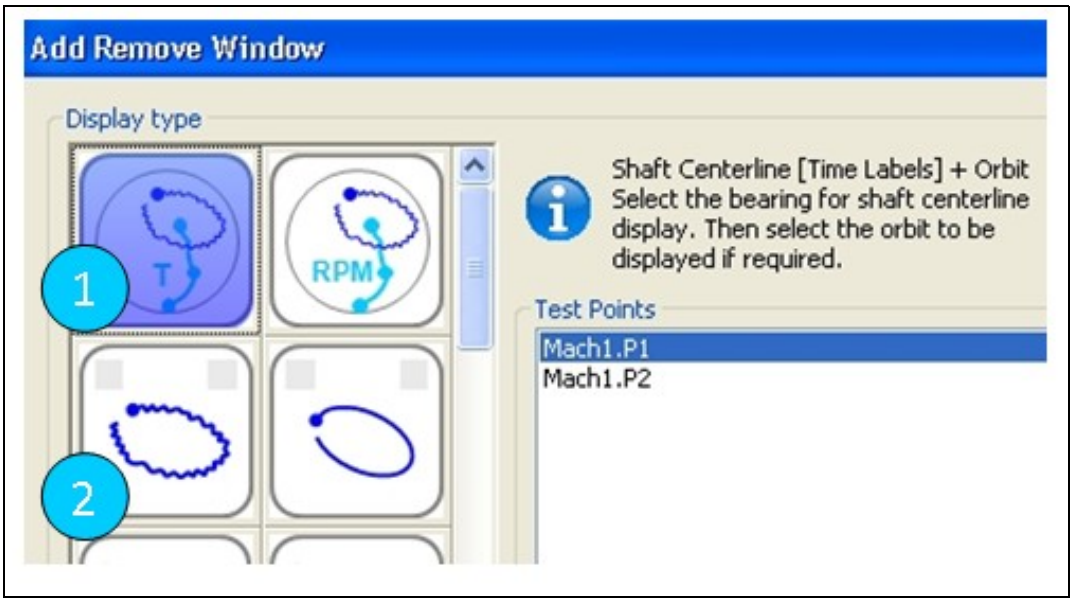
The Shaft centerline display properties

The cursor in the tags section can be moved to select the number of tags in the shaft center line display.

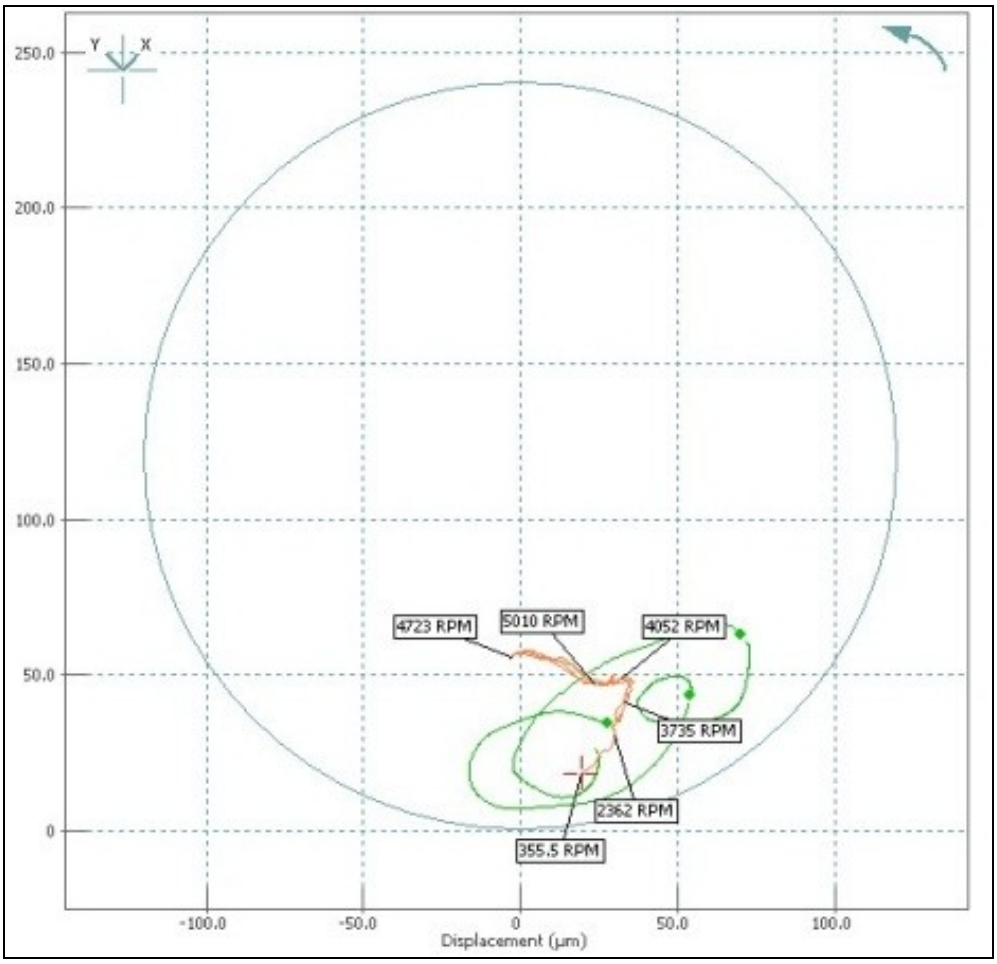
159.3.4.7 The full shaft motion

The Full Shaft Motion is displayed using the add/remove window in two steps. One should select first the Shaft Centerline display and then select the orbit. The orbit can be a raw orbit or an nX orbit.

An information section has been added in the add/remove window to describe specific information for the selected plot. The way to display the Orbit+Shaft Centerline + Clearance circle is described in the information section of the shaft centerline window.



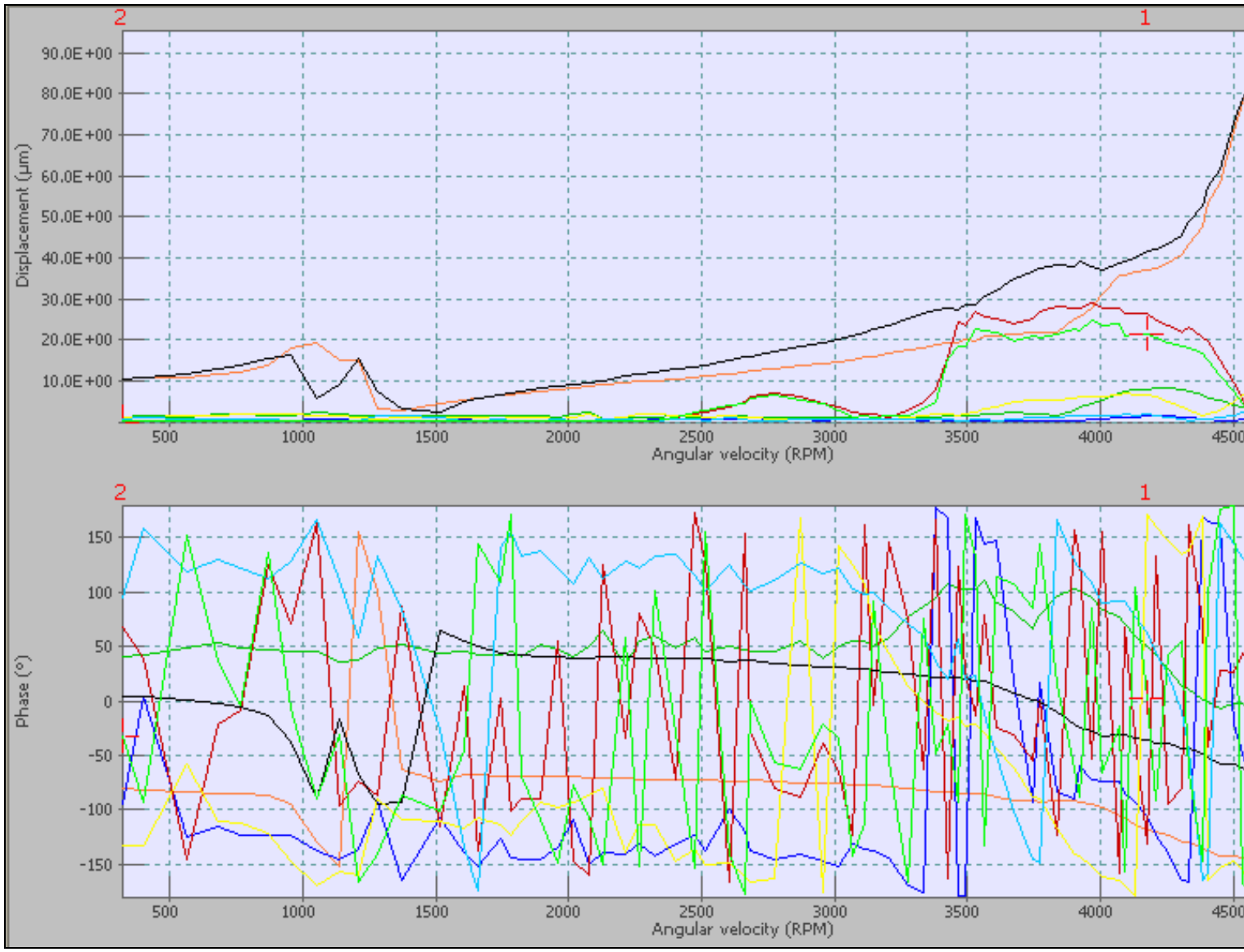
The Full shaft motion in the add/remove window



The Full Shaft Motion: Orbit & Shaft Centerline

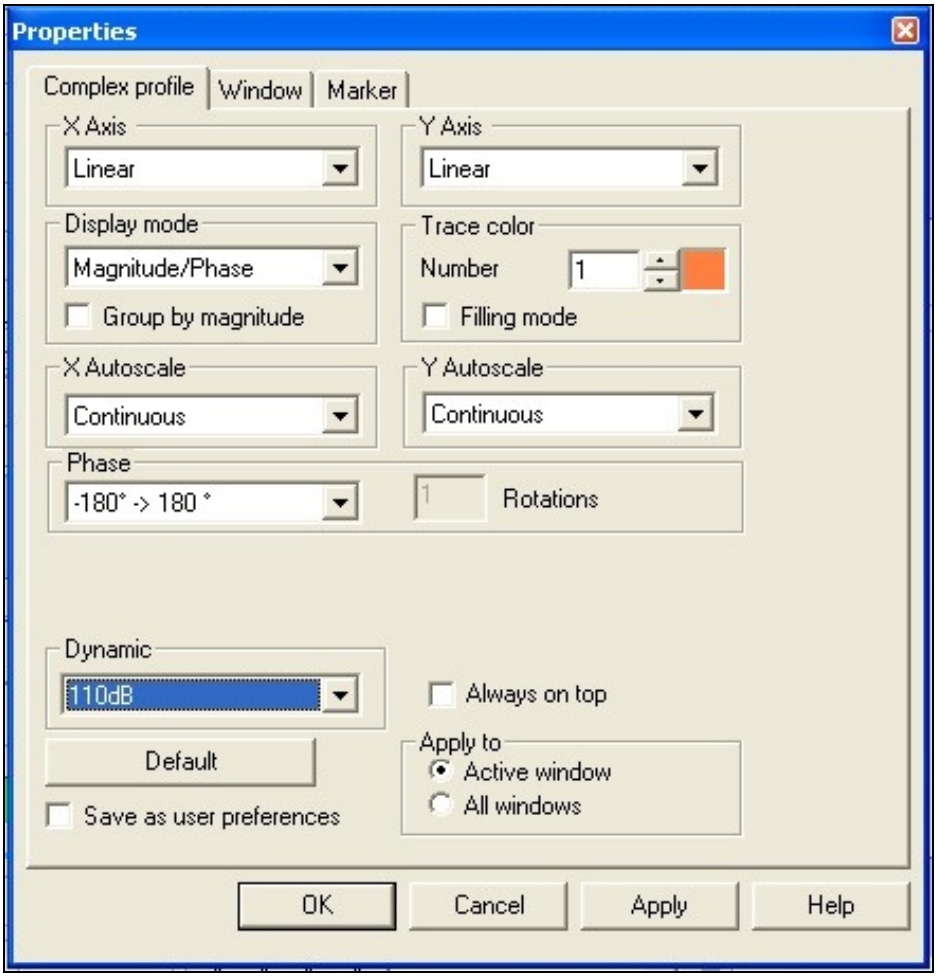
159.3.4.8 The Bode diagram

The Bode Diagram is one of the most useful graphics used for turbo machinery vibrations. It allows for displaying vibration levels as a function of rotating speed or time.


2
1
90.0E+00
80.0E+00
70.0E+00
60.0E+00
50.0E+00
40.0E+00
30.0E+00
20.0E+00
10.0E+00
Displacement (µm)
500
1000
1500
2000
2500
3000
3500
4000
4500
Angular velocity (RPM)
2
1
150
100
50
0
-50
-100
-150
Phase (°)
500
1000
1500
2000
2500
3000
3500
4000
4500
Angular velocity (RPM)

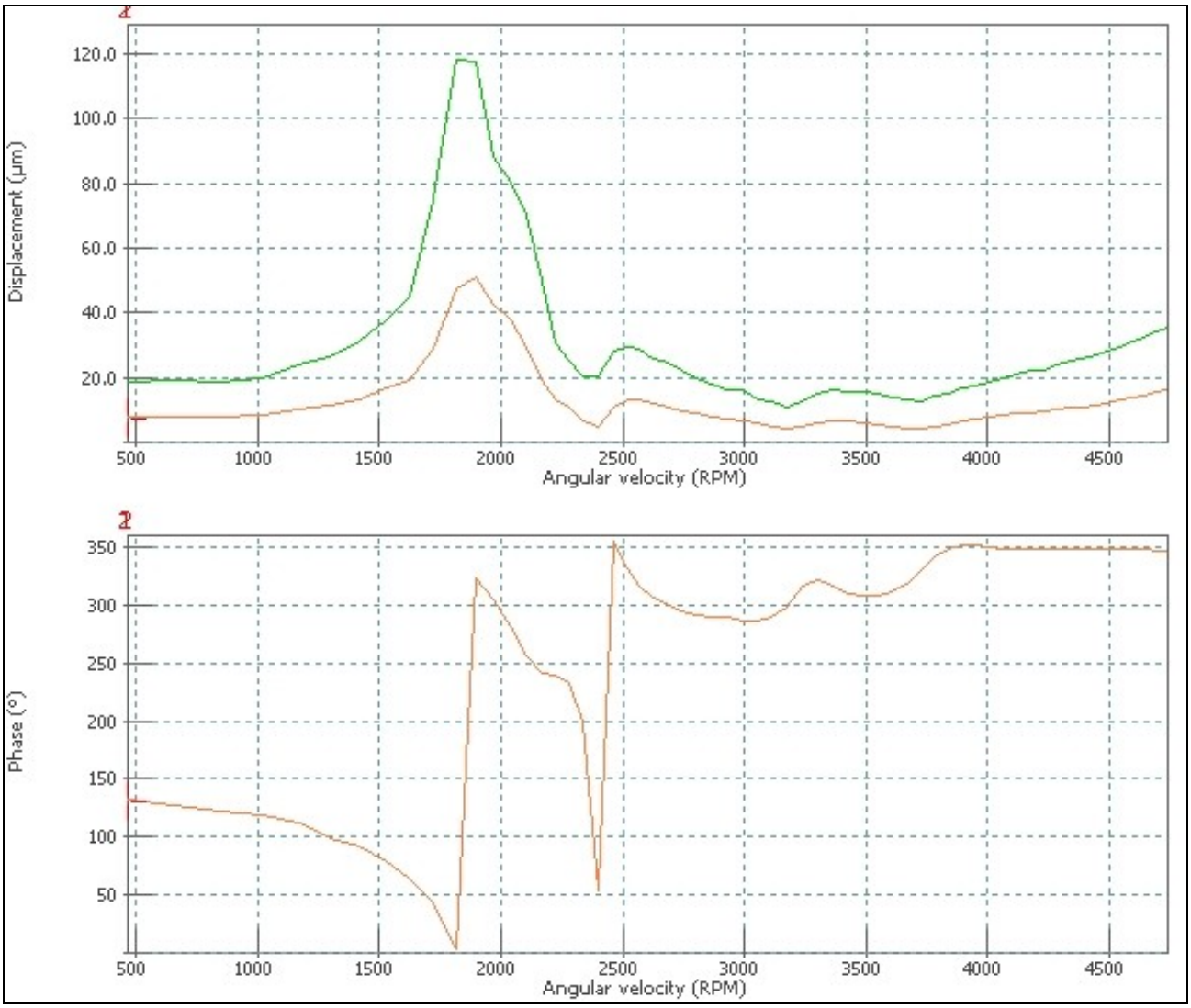
The Bode diagram display

The properties can be accessed by right clicking on the graphic. At this point, it is possible for example to modify the cursor style used for the window.



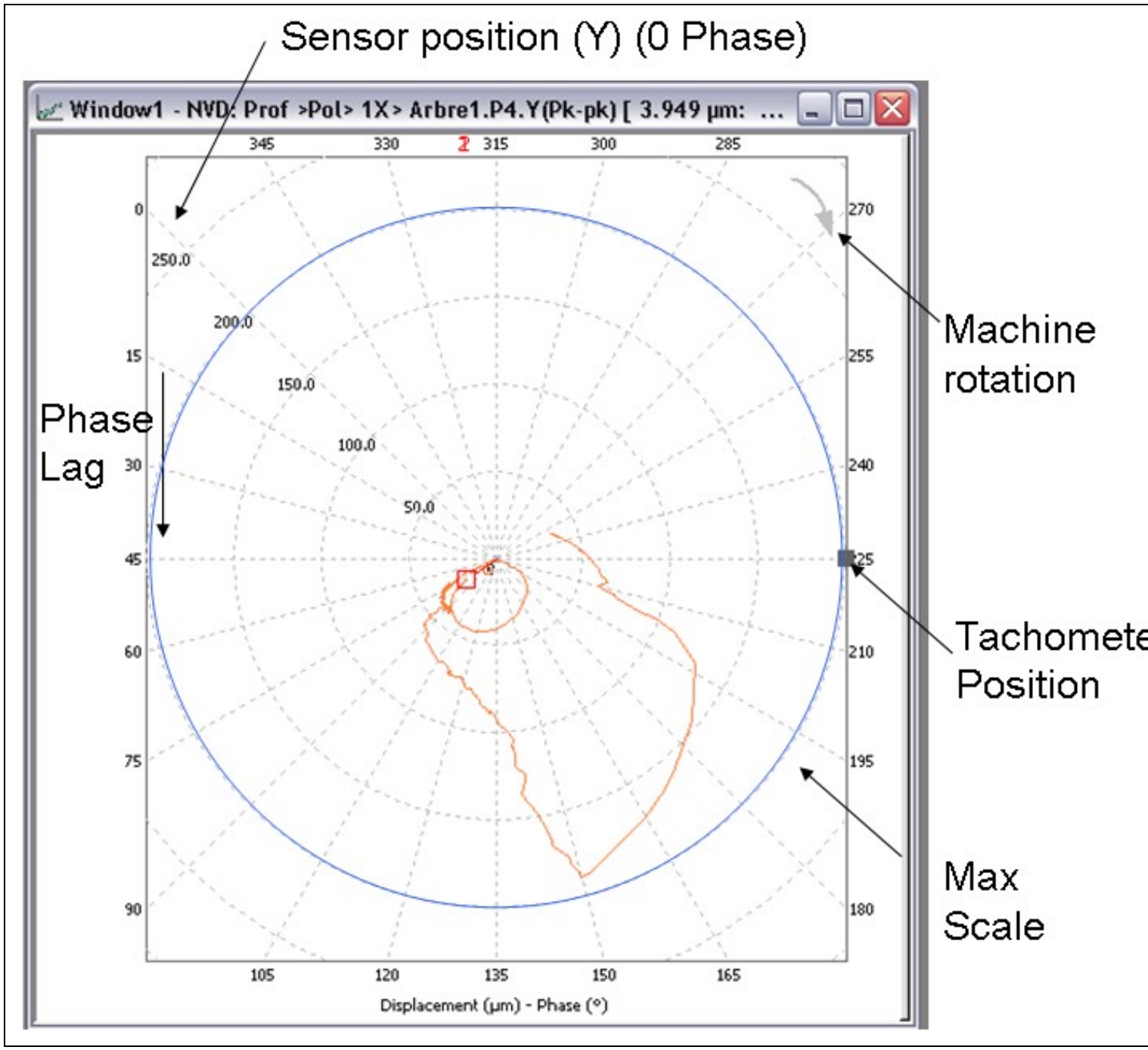
The Bode diagram properties

1X Amplitude, and Phase and the Direct can be displayed together on the same plot. This is achieved by choosing first to display a Bode Diagram with the 1X result, then select a profile with the "Direct" selection and adding it in the Bode window. This graph is particularly useful to see to check the evolutions of other components than the 1X data (such as sub synchronous components for example).



159.3.4.9 The polar diagram

- For turbo machinery measurements the expected polar diagram should have the following features:

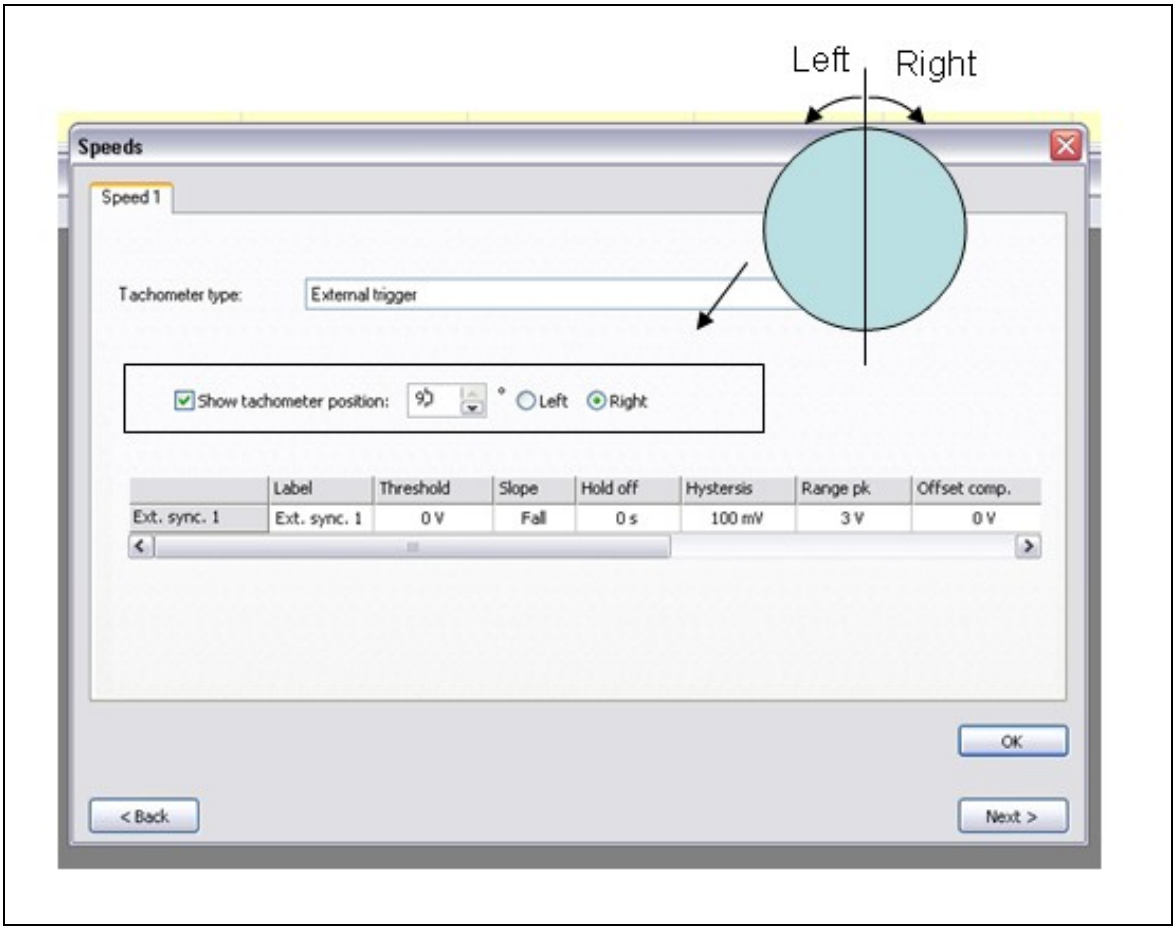


Typical polar graph display

- 0 Phase positioned as the measured probe
- Phase lag positive counting in opposite direction as machine rotation
- Machine Rotation & Keyphasor position indication
- (0,0) at center

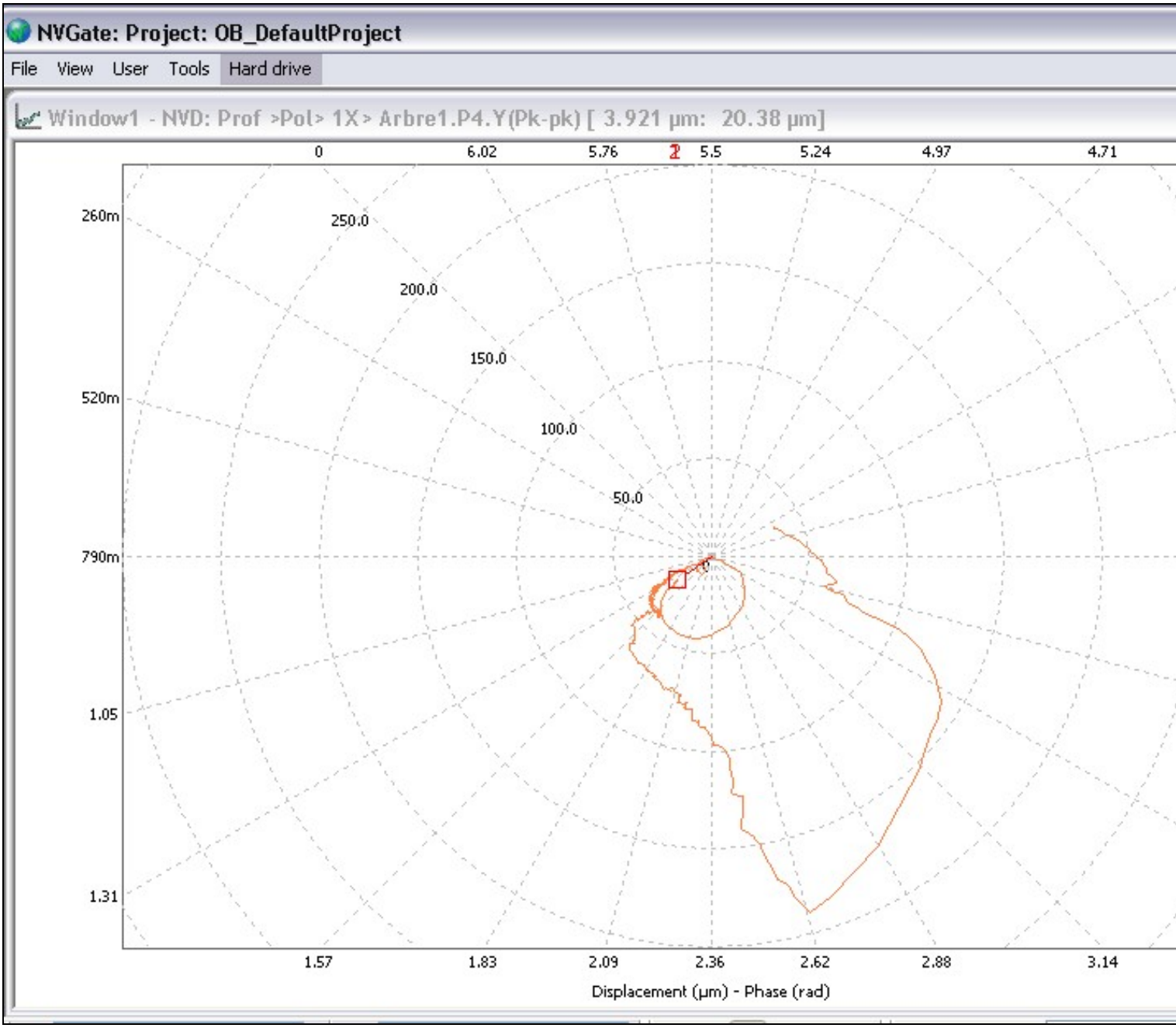
159.3.4.9.1 Tachometer (KeyphaSor) position

- The Tachometer position is indicated in the "Speeds" dialog box.



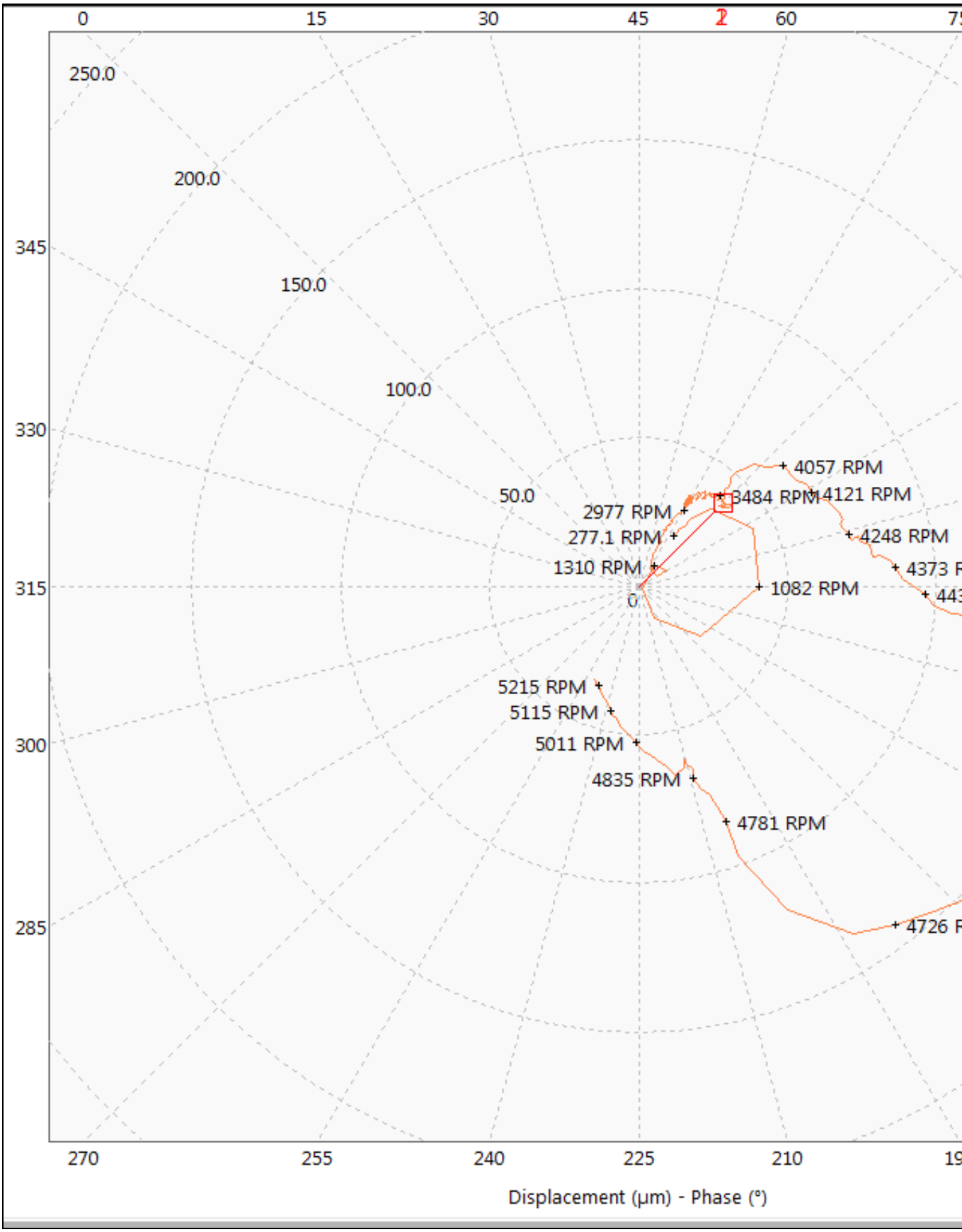
159.3.4.9.2 Polar graph scaling

- Using a fixed scale, the polar graph is displayed so that the (0, 0) origin is at the graph center so that results coming from different sensors can be easily compared.



159.3.4.9.3 Polar graph tags

Tags are available for the polar graphs: it can be "time tags" or "RPM" tags. This choice is available in the add/remove window.



159.4 Data acquisition

Once the set-up is done, the user can proceed to data acquisition.

159.4.1 Operation control

At this stage, three possibilities exist:

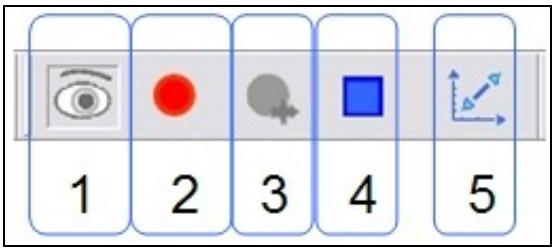
1. Monitor the data, without saving.

2. Record the data (displayed in the array).

3. Record the time domain data (for further post analysis).

4. Stop.

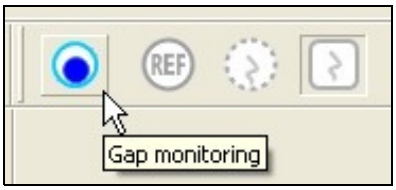
5. Update Scaling preference.



The operating toolbar

159.4.2 GAP Monitoring

The GAP monitoring function allows the user to check the GAP and GAP Voltage even when the machine is at rest or running at very slow speed. It is useful also to determine the DC Offset.

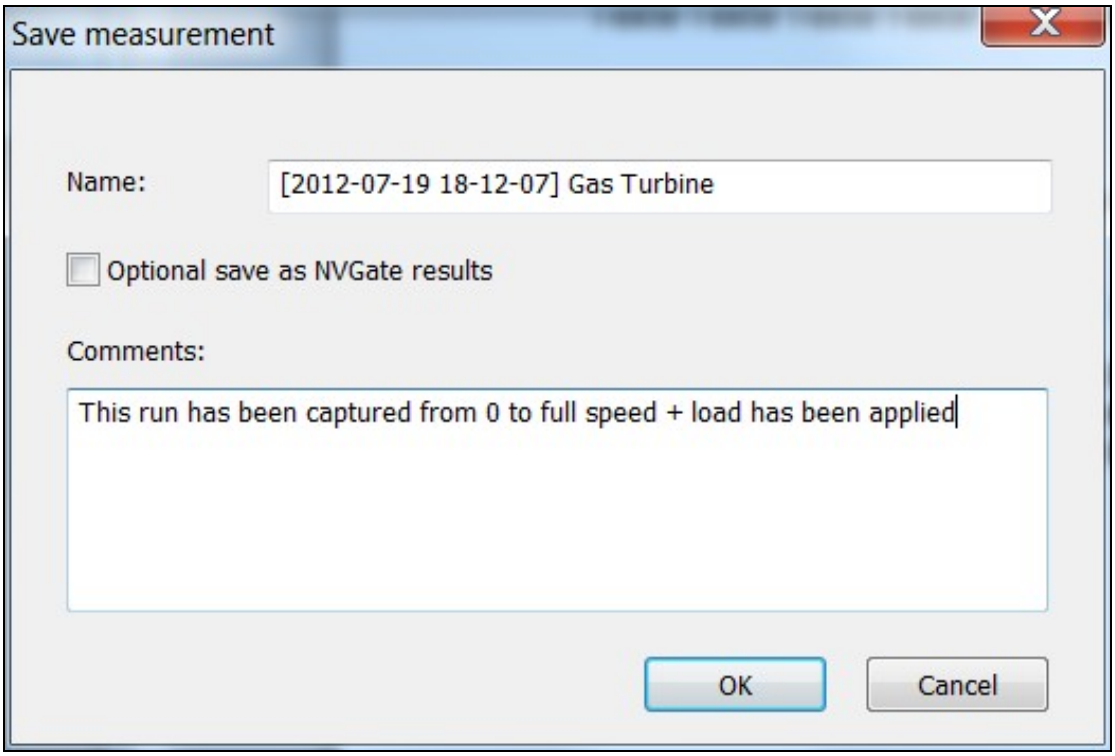


GAP monitoring toolbar

159.4.3 Saving data

When an array record or a time domain record has been started, saving the file is automatically recommended as shown in the dialog box.

By checking "Optional save as NVGate results", the displayed results are also saved within the NVGate project manager as NVGate results. It allows comparing traces from the NVGate project manager.



The Save measurement dialog box

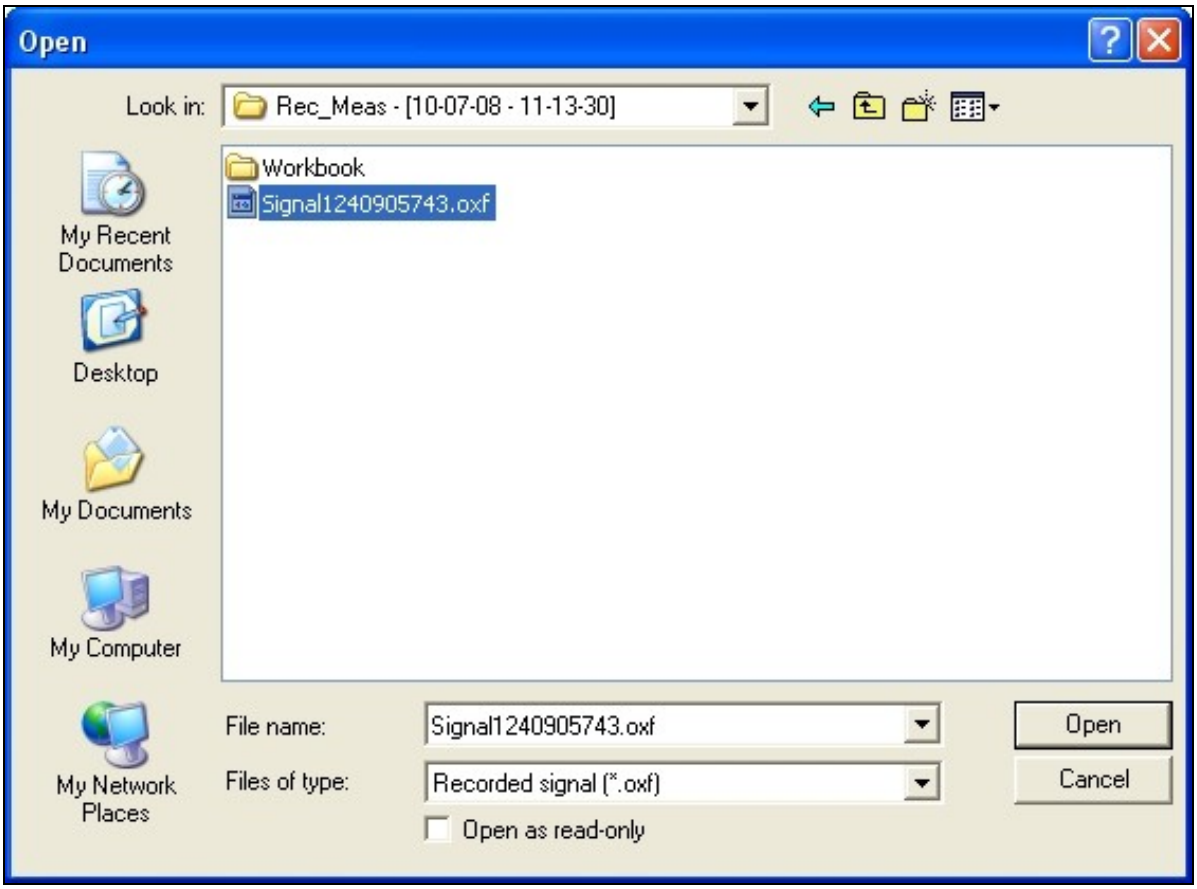
It is important to be able to correlate the measurements with the conditions under which it has been recorded. For that purpose, it is possible to enter a comment for each measurement. This is achieved when saving a measurement as shown on the screen nearby. It is possible to do it for a new measurement or for an existing measurement using the function "save measurement as...". The comment can be printed in the reports. It is also displayed during the measurement load in the database interface as shown in the display above.

159.5 Post analysis

159.5.1 Loading a signal

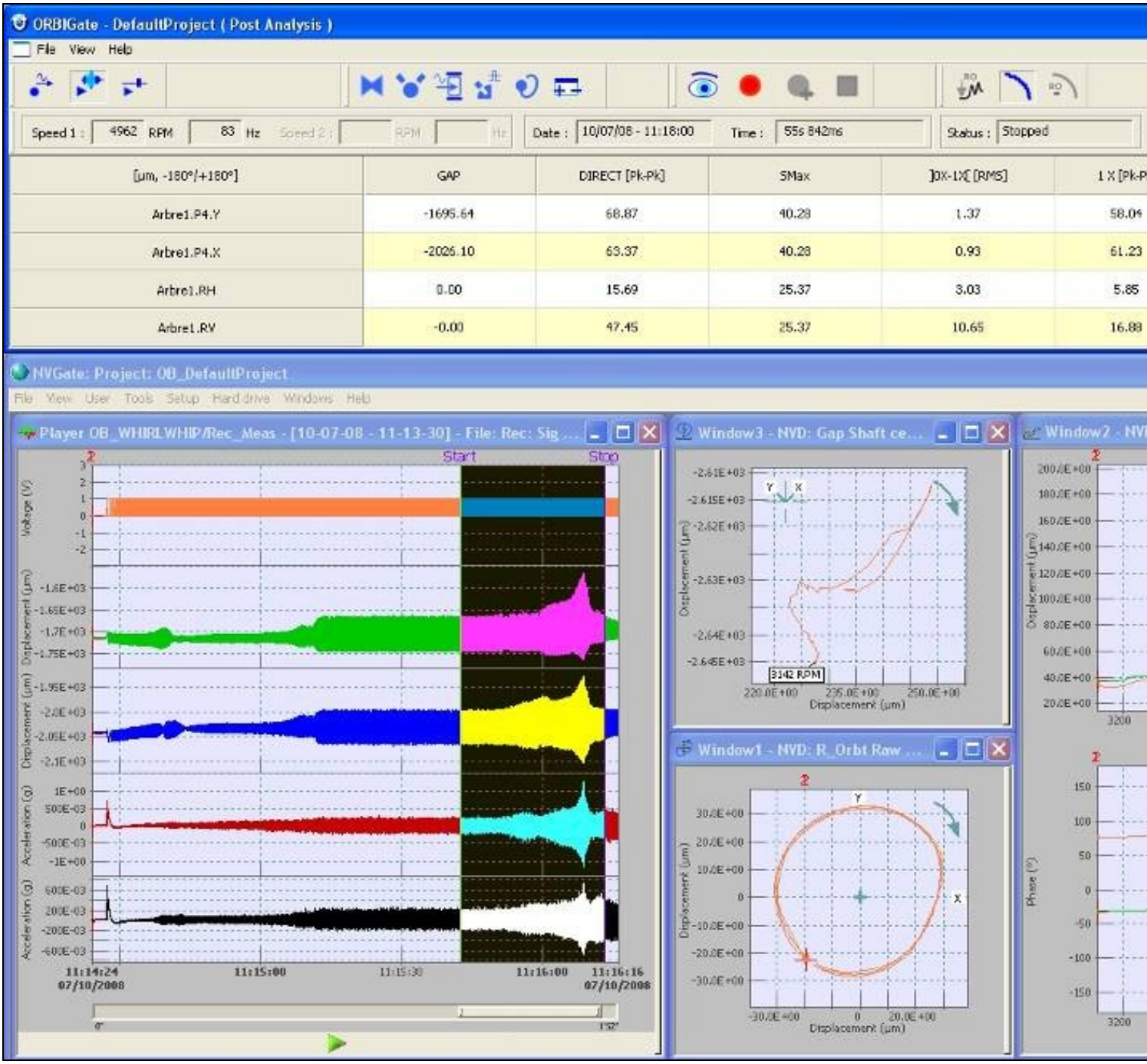
A new measurement can be created based on a time domain signal previously recorded. In that case, the first step is to load a signal with the oxf format. **Then one should go through the analysis set-up as previously described in chapter 4. It follows the same principles as a real time acquisition.** One can save a measurement as in the acquisition mode.

The signal to be loaded should be located in the current NVGate project database. The signal should contain at least one tachometer channel recorded on the external trigger. This signal can be recorded from NVGate or ORBIGate.



Post Analysis signal selection

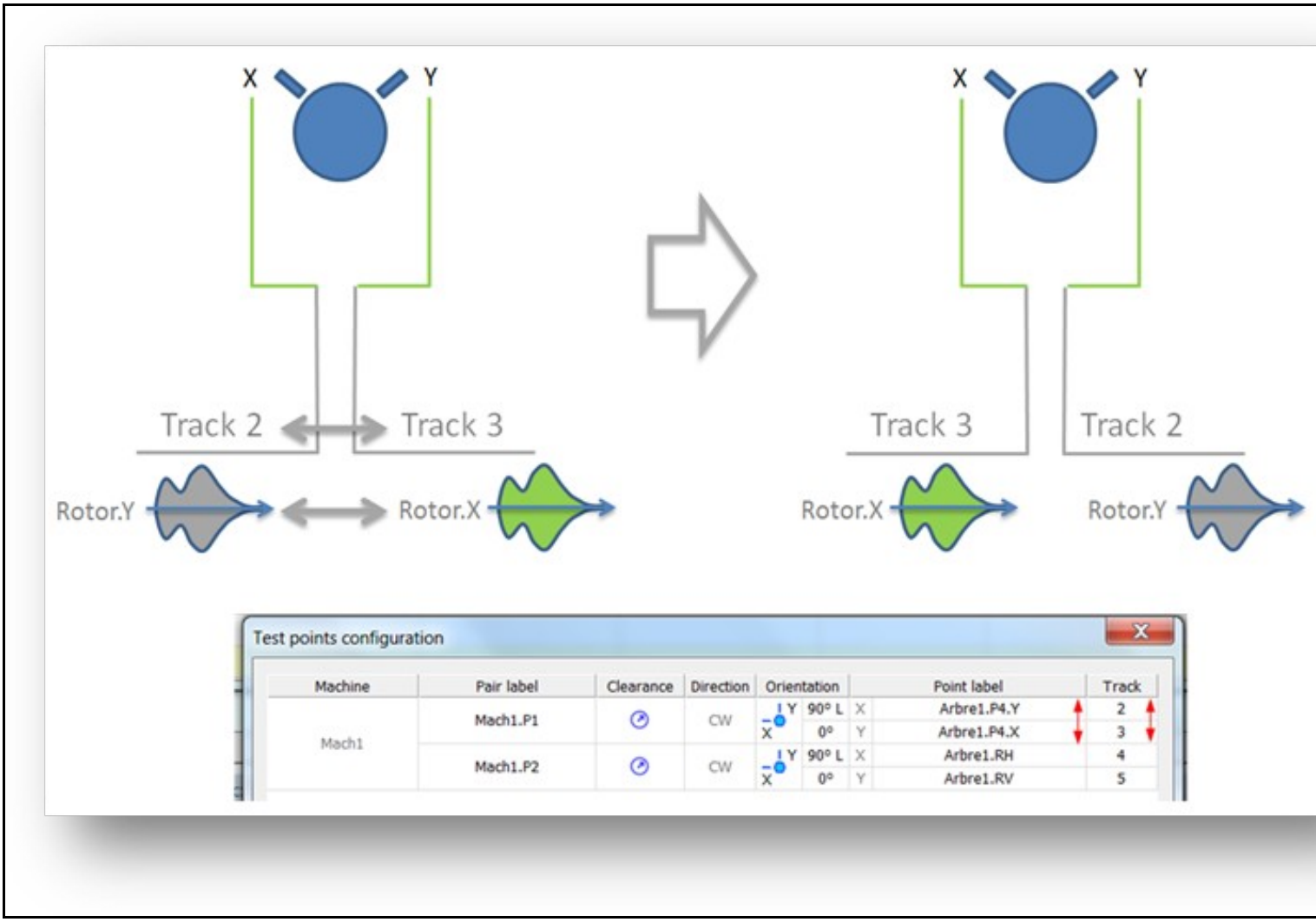
Once the signal is loaded, it will appear as in the window below:


ORBIGate - DefaultProject (Post Analysis)
File View Help
Speed 1 : 4962 RPM 83 Hz Speed 2 : RPM Hz
Date : 10/07/08 - 11:18:00 Time : 55s 842ms
Status : Stopped
[µm, -180°/+180°] GAP DIRECT [Pk-Pk] SMax]0X-1X[[RMS] 1 X [Pk-P
Arbre1.P4.Y -1695.64 68.87 40.28 1.37 58.04
Arbre1.P4.X -2026.10 63.37 40.28 0.93 61.23
Arbre1.RH 0.00 15.69 25.37 3.03 5.85
Arbre1.RV -0.00 47.45 25.37 10.65 16.88
NVGate: Project: OB_DefaultProject
File View User Tools Setup Hard drive Windows Help
Player OB_WHIRLWHIP/Rec_Meas - [10-07-08 - 11-13-30] - File: Rec: Sig ...
Start
Stop
Voltage (V)
Displacement (µm)
Acceleration (g)
11:14:24
07/10/2008
11:15:00
11:15:30
11:16:00
11:16:16
07/10/2008
Window3 - NVD: Gap Shaft ce...
3142 RPM
Displacement (µm)
Window1 - NVD: R_Orbt Raw ...
Window2 - NV
Phase (°)

Post analysis working environment

Loading a signal which has different XY preferences:

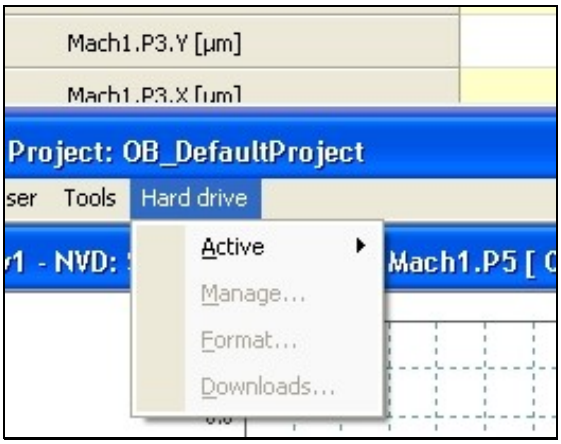
When a user loads a signal which has been recorded with a different preference, as shown on the figure below. The user needs to inverse the tracks and the labels.



Loading a signal with different XY preferences

159.5.2 Hard drive Management

- The Hard drive management is accessible through ORBIGate.
- In addition, the recorded signal can be post-processed directly from the hardware. There is no need to download it to the PC. One can also stay in the connected mode and consequently it is not required to exit the software.



Hard drive management

159.6 Navigation mode

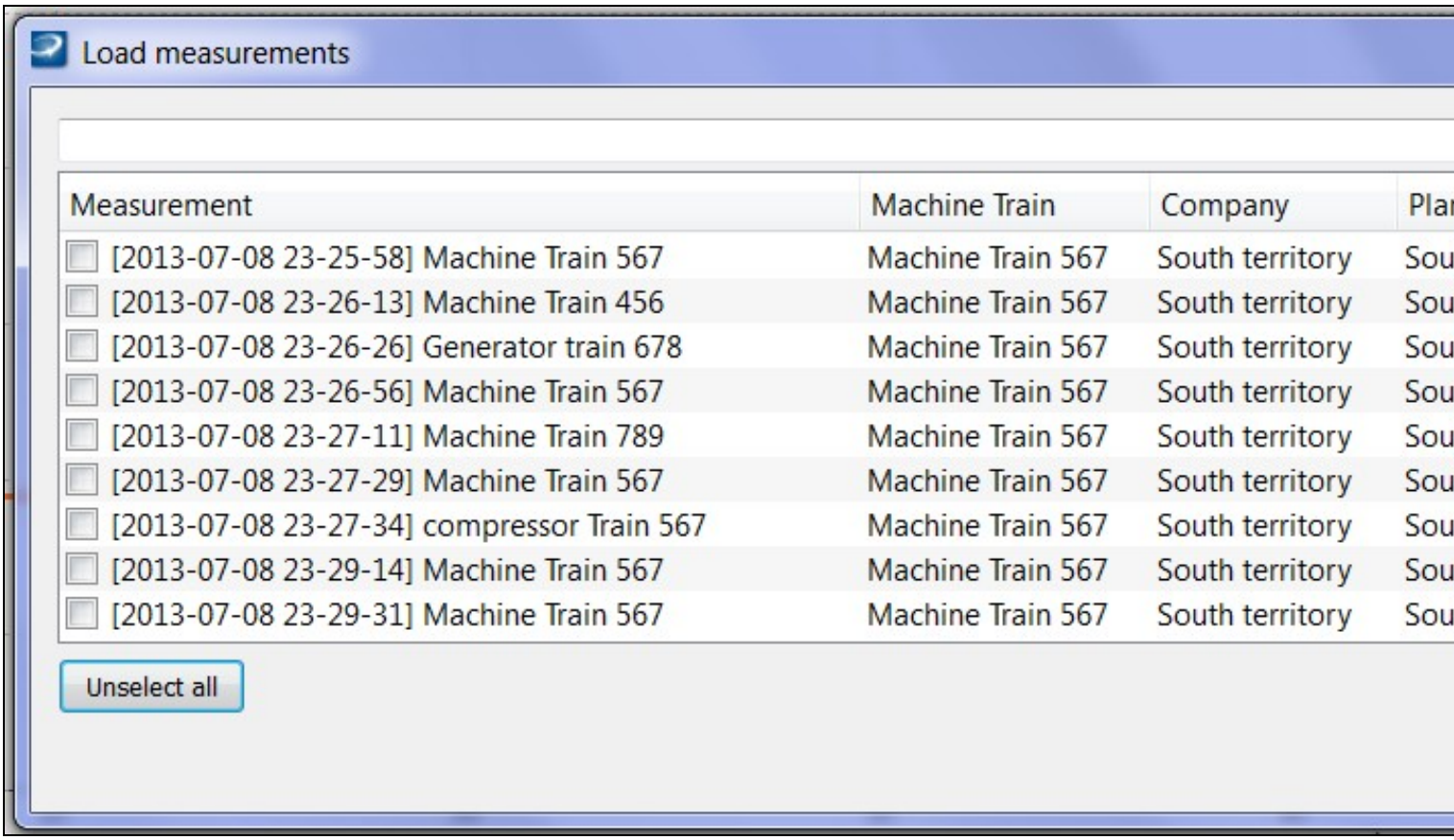
159.6.1 Loading one measurement

A measurement or several measurements is loaded through the command "File/Load Measurements". The following window is displayed. The measurements are browsable through the measurements database interface.

Files can be **sorted** based on their:

- Measurement name
- Machine train, Company, Plant
- Project
- Date
- Comments

One can also search for keywords coming from any of the columns. The interface looks as below.



Measurement database interface

Once the measurement is loaded, one can look at it in the navigation mode.

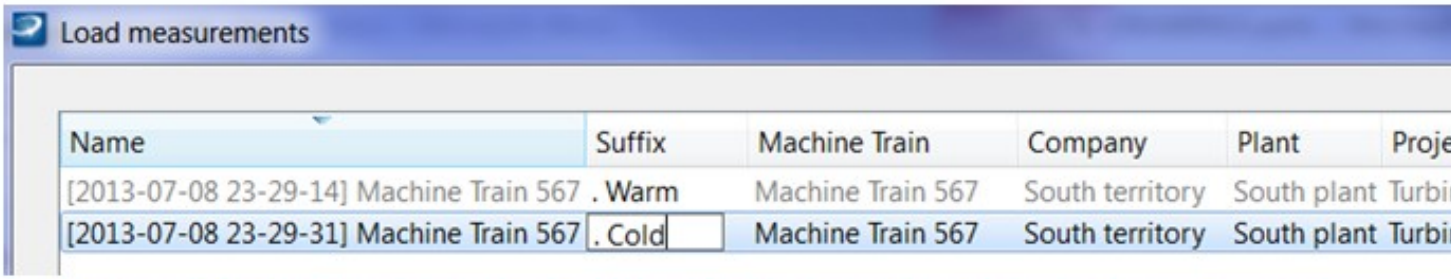
159.6.2 Loading measurements

One can load several measurements in order to compare the results. In that case, one should tick at least two measurements from the list from the above window.

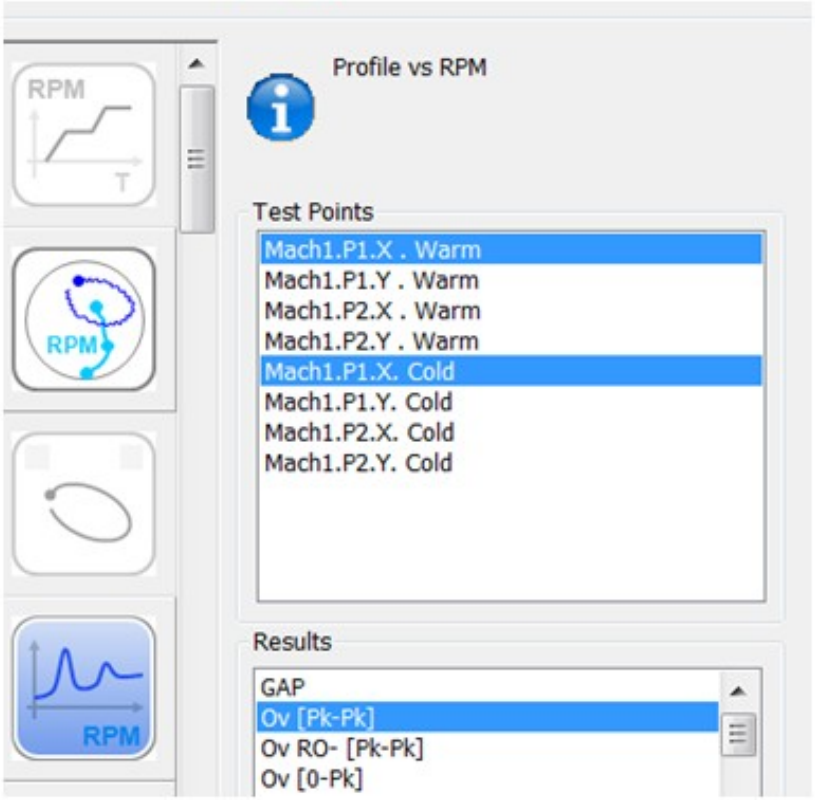
In the comparison mode, each trace is labeled with an extension (suffix) that is added to the test point labels: that will be added to measurement name and traces names during the operation in the comparison mode. This will make the comparison easier when it is achieved on the same machine.

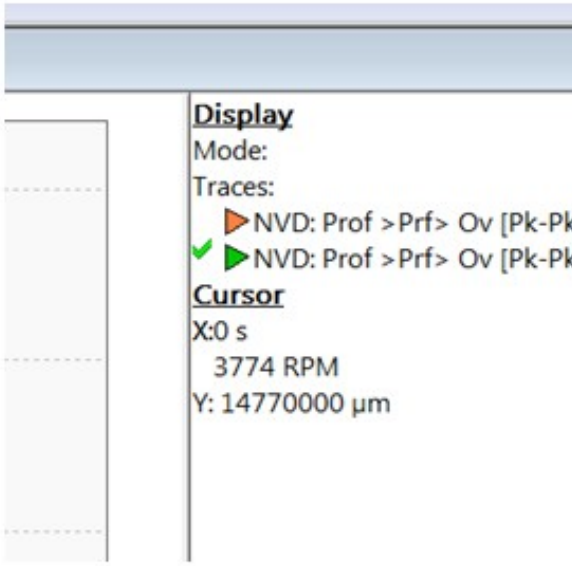


Renaming the measurement for an easier comparison



1. Modifying the measurement and channels name





2. Selecting graphics, test points and results to be displayed

3. Visualizing data

Steps when comparing measurement data

- If a user chooses to load several measurements and enters comparison mode. The navigation functionalities will be restricted in that case.

159.6.3 Navigation main cursor

Once a measurement has been saved, the next step is to be able to use it for analysis and reporting. The navigation mode of ORBIGate allows looking through the data using the navigation cursor.



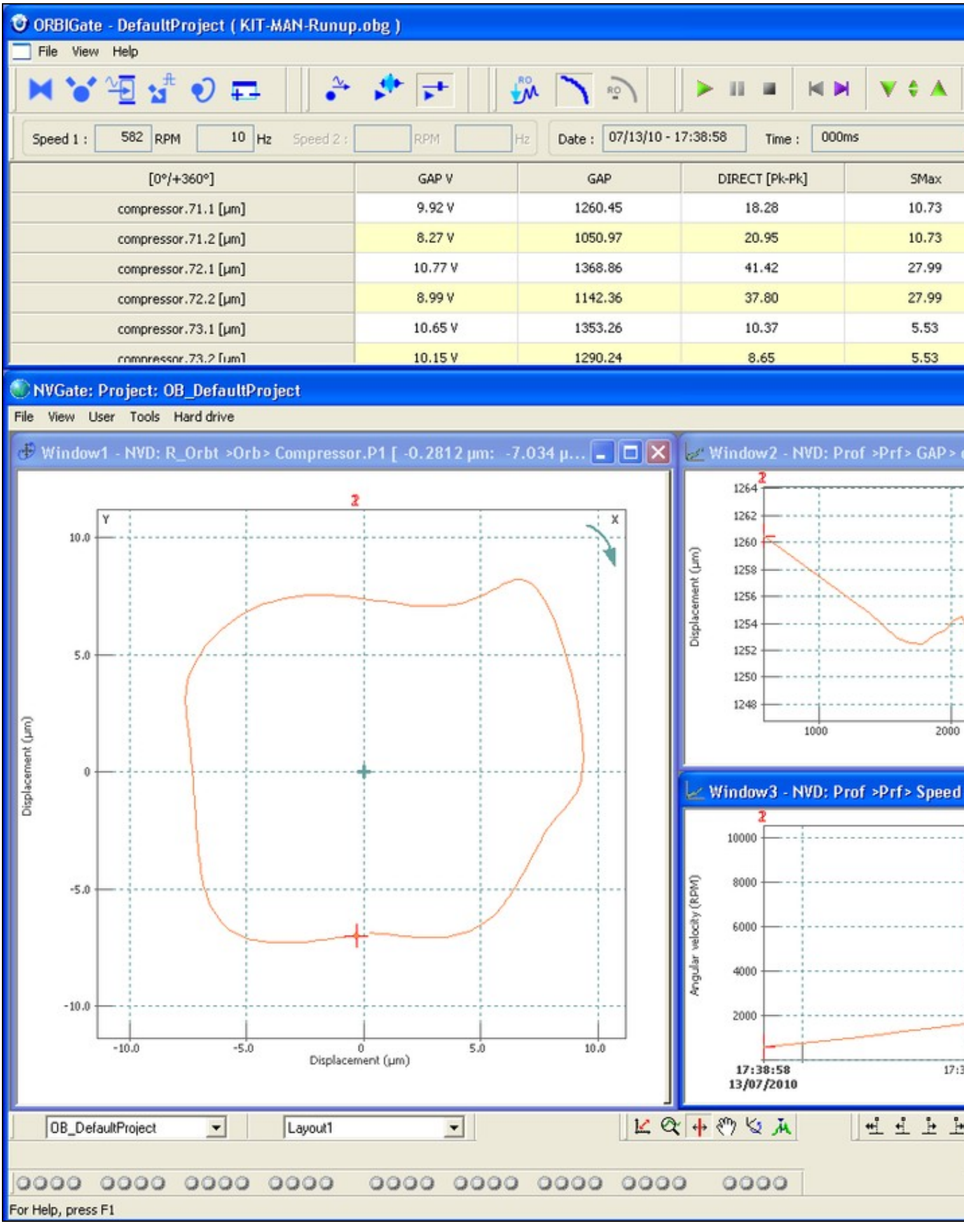
The navigation toolbar and cursor

Using the navigation cursor, it is possible to go through data that have been saved for different RPMs and different dates.

	By pressing play, the navigator sweep the time history
	The pause button allows to pause the sweep
	The stop button stops the sweep
	The Backward button allows to go one step back
	The Forward button allows to go one step forward
	The decrease button allows to reduce the sweep speed
	The reset button allows to reset the sweep speed to the default value
	The increase button allows to increase the sweep speed
	The navigation cursor can be grabbed with the mouse and moved
	The Range selector interface allows to select a range of the measurement

It is also possible to sweep forward and backward the history using the keyboard arrows.

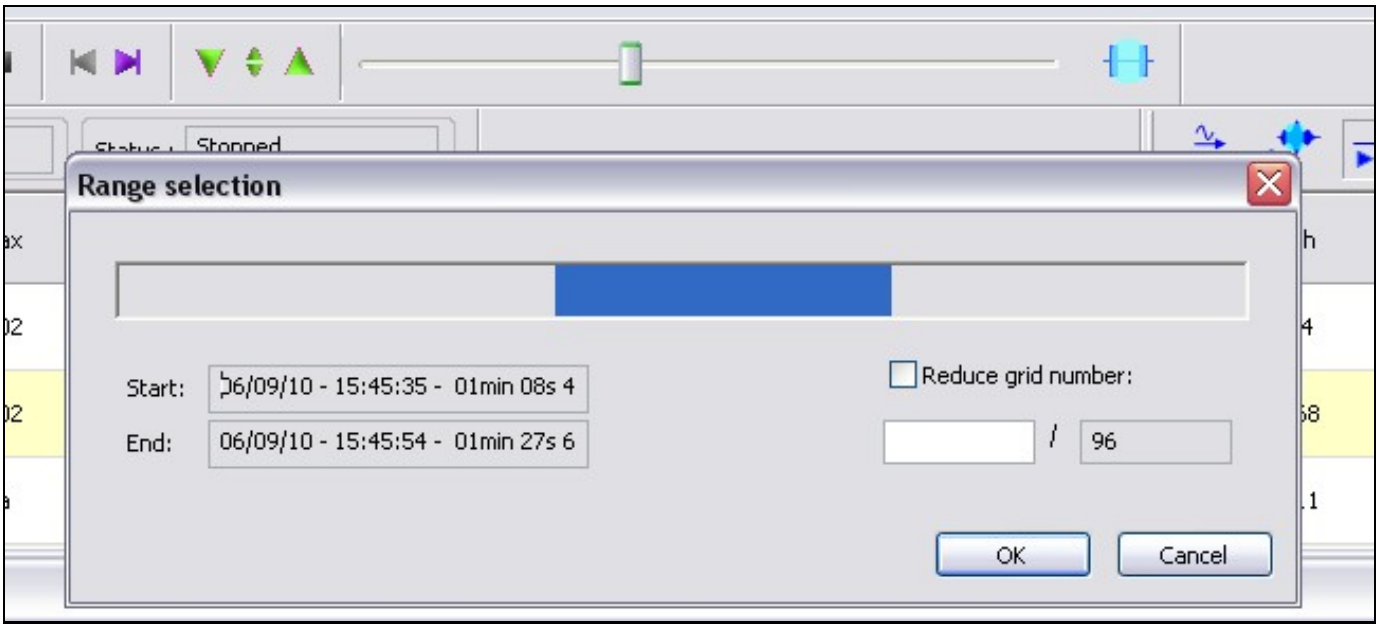
Using the navigation cursor, all the data is updated in the graphic zone.


ORBIGate - DefaultProject (KIT-MAN-Runup.obg)
File View Help
Speed 1 : 582 RPM 10 Hz Speed 2 : RPM Hz
Date : 07/13/10 - 17:38:58 Time : 000ms
[0°/+360°] GAP V GAP DIRECT [Pk-Pk] SMax
compressor.71.1 [µm] 9.92 V 1260.45 18.28 10.73
compressor.71.2 [µm] 8.27 V 1050.97 20.95 10.73
compressor.72.1 [µm] 10.77 V 1368.86 41.42 27.99
compressor.72.2 [µm] 8.99 V 1142.36 37.80 27.99
compressor.73.1 [µm] 10.65 V 1353.26 10.37 5.53
compressor.73.2 [µm] 10.15 V 1290.24 8.65 5.53
NVGate: Project: OB_DefaultProject
File View User Tools Hard drive
Window1 - NVD: R_Orbt >Orb> Compressor.P1 [-0.2812 µm: -7.034 µ...
Displacement (µm)
Window2 - NVD: Prof >Prf> GAP>
Displacement (µm)
Window3 - NVD: Prof >Prf> Speed
Angular velocity (RPM)
17:38:58
13/07/2010
OB_DefaultProject
Layout1
For Help, press F1

The working environment in the navigation mode

159.6.4 Range Selection

The Range Selector allows the user in the Navigation mode to select one part of the measurement range. The range selection allows choosing the START DATE/RPM value and the END DATE/RPM value. For doing that, the user should grab the Start/End of the blue line and drag it to the expected value.



Range selection

During that stage the number of data available in the measurement can also be resampled in order to reduce the amount of data. The "Nb grid selected" value gives the amount of array exported to the report.

The selected range can be saved as a new measurement using the file menu "save measurement as ?"

159.7 Run Out Correction

The Run Out error can be corrected on the displayed results. This can be done in the navigation mode but also in real time or during post analysis using the toolbar shown below.



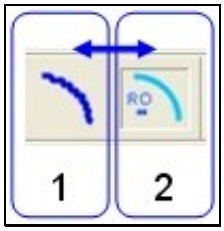
The Run Out toolbar

For that, the first step is to define a *Slow Roll* during the test. The selection of the *Slow Roll* is done by pressing the following icon.



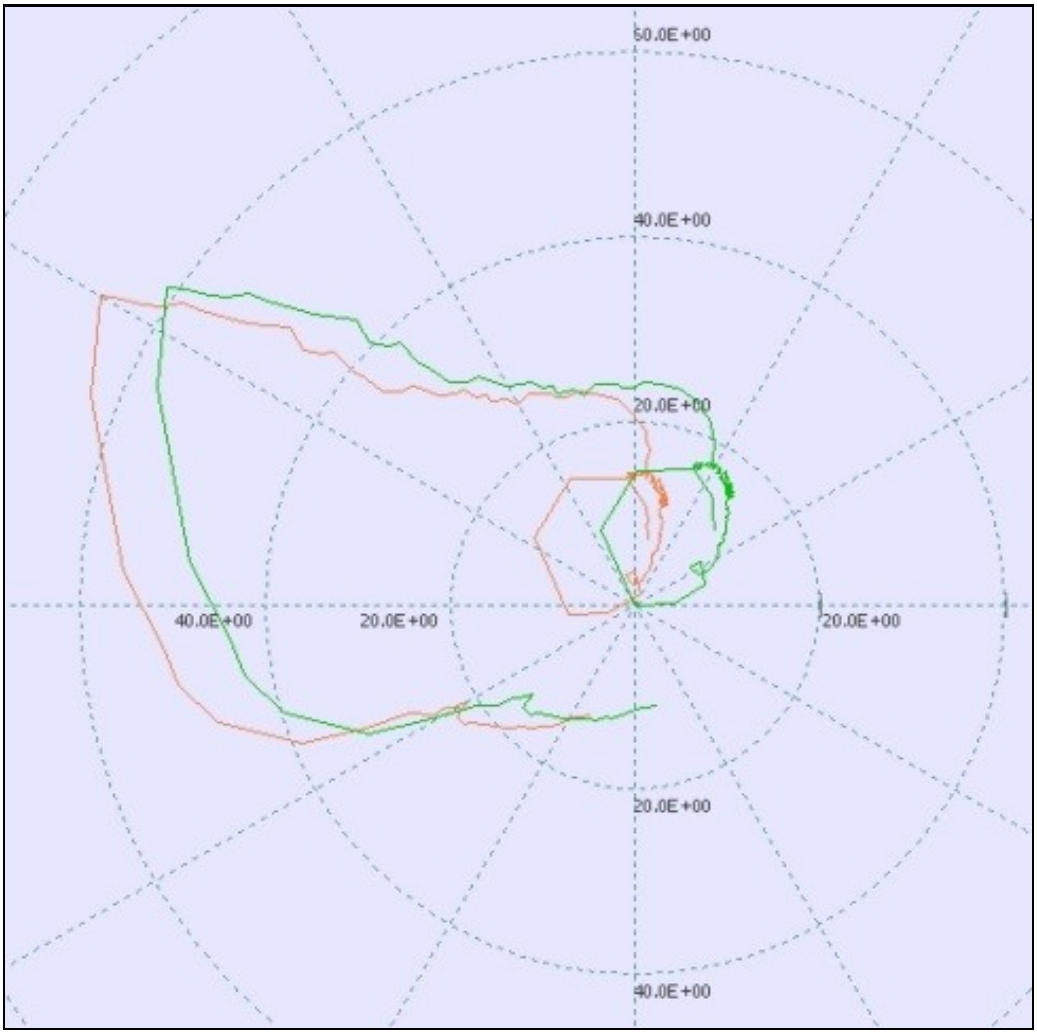
Slow Roll selection icon

Once this is done, one can switch from corrected results to uncorrected results using the two icons below:

	1- Uncorrected 2- Corrected

Switching from corrected to uncorrected results

On the graph below, one can see the effect of the correction at the polar diagram of order 1. Such a graph can be created by saving the polar diagram in the NVGate project manager using the function "optional save as NVGate result".



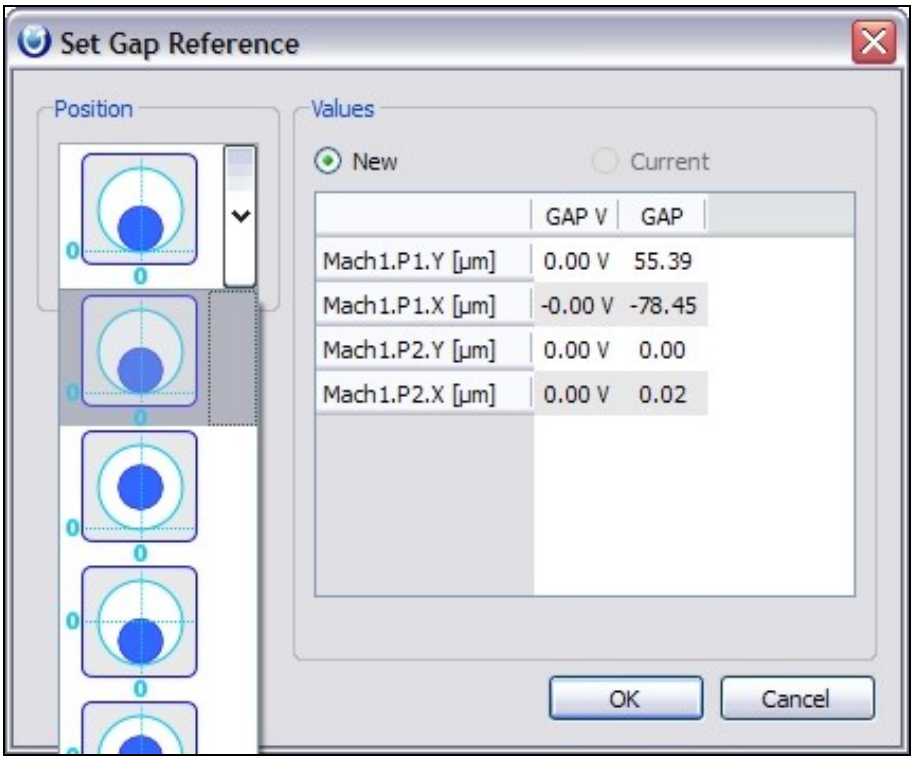
A 1X polar diagram with and without run out correction

159.8 Reference voltage determination

159.8.1 GAP reference offset determination

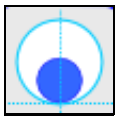
The GAP Reference Offset can be determined by pressing the "Reference Offset" icon. It is used to position the shaft centerline referred to the (0, 0) of the plot.

Two choices are possible: the reference offset can be determined when the shaft is at bottom or when it is at center. In most cases it is carried out at bottom when the machine is at rest. In this case, the position is well known. When the machine is already running and one wants to start a shutdown, the only possibility is to choose the calibration "at center".

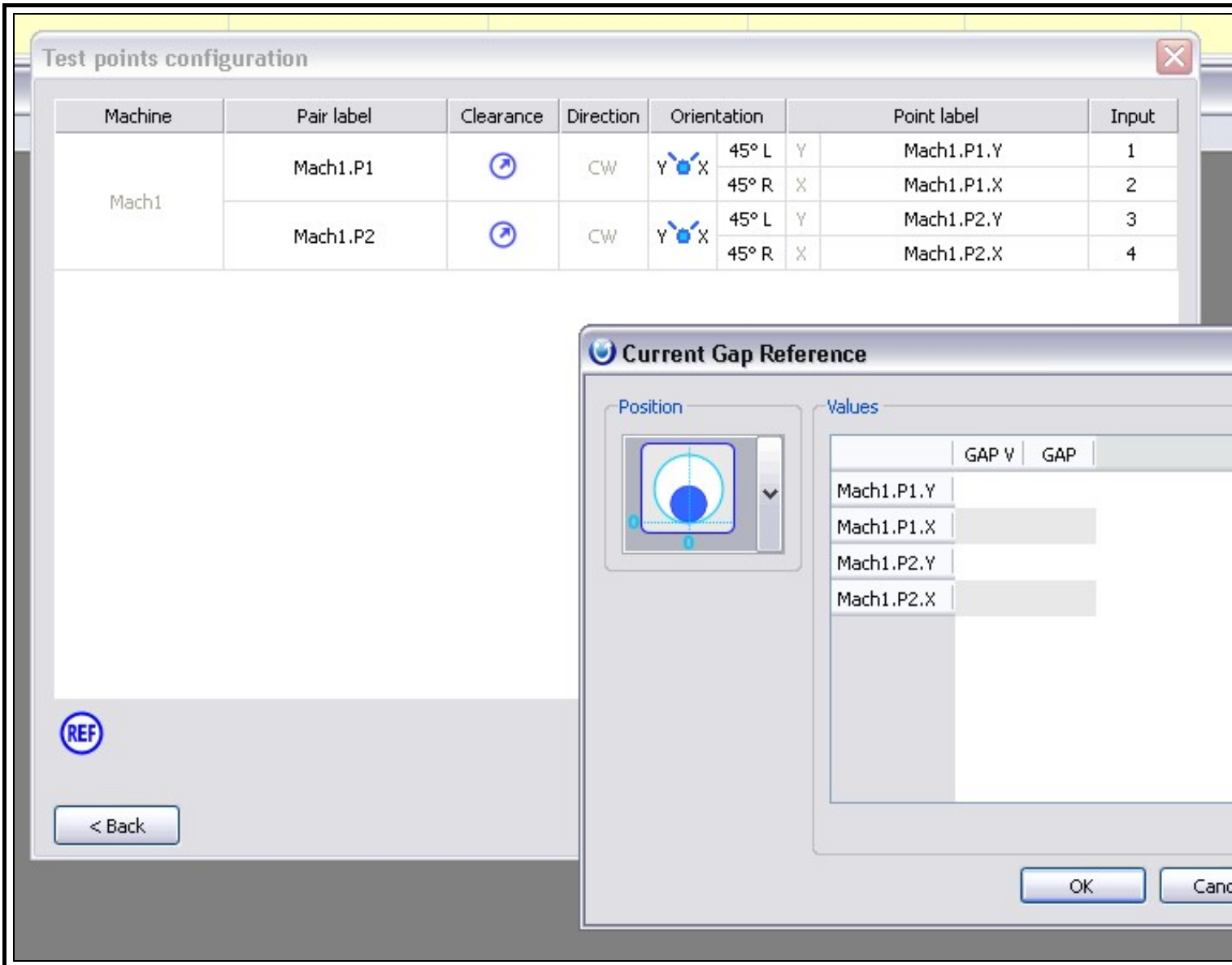


Gap reference voltage determination

- One action to be carried out before achieving a Full Shaft Motion display is the gap voltage reference determination. Actually, the shaft centerline has to be positioned in a coordinate system referred to a (0, 0) origin. To achieve that, the measured GAP voltage (DC component of the signal) should be associated to a known (or at least assumed) position of the shaft.

• Typically, at rest, the shaft is assumed to be laying on the bottom of the bearing:	

The reference values can be accessed in two ways: In the test point?s configuration or through the toolbar icon.

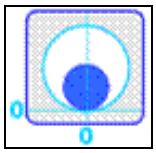
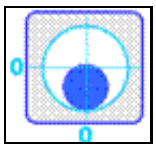
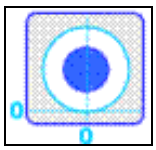
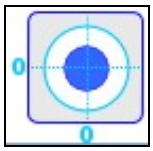


- *Reference in the "test points" configuration window*

In this window the current values can be visualized or entered by hand.

When accessing the "set gap reference" values through the toolbar icon. The values measured (shown in the grid) appear in the table when the button "new" is checked. If the button "current" is checked, the current values are shown.

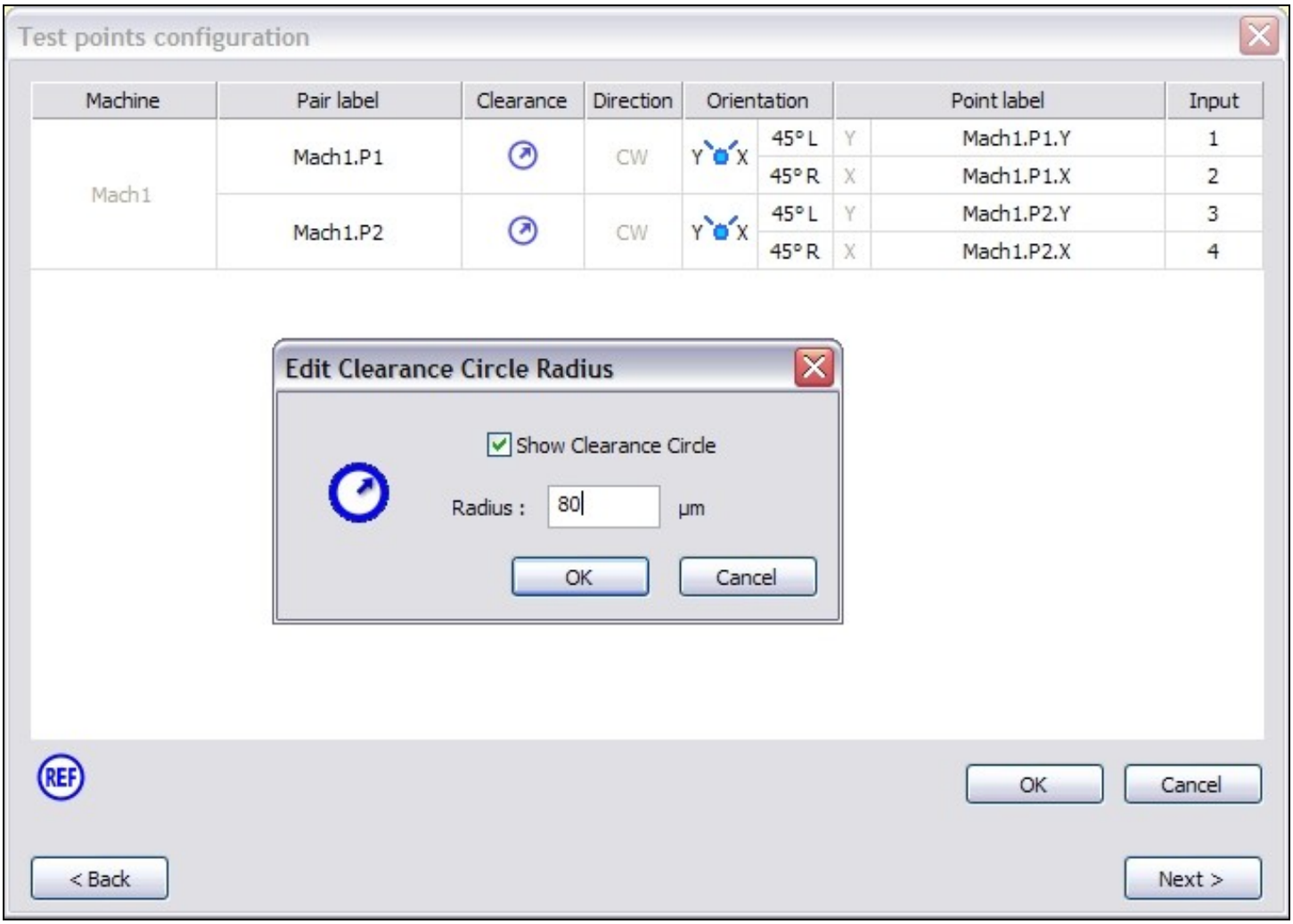
At this stage, one should choose the corresponding position of the shaft and the preference for the 0 position (0 at center or 0 at bottom): Four choices are possible:

	0 at bottom	0 at center
• Shaft assumed at bottom:		
• Shaft assumed at center:		

The gap reference is saved in the measurement and in the project as well as in the machine train.

159.8.2 Bearing clearance circle

The bearing clearance radius can be entered and so the GAP clearance circle can be displayed. The value is entered in Microns or Mils depending on the unit defined in the preferences. If the choice is made to be "Show Clearance Circle", the circle will be shown automatically when a shaft centerline is displayed. If a value is not entered the circle won?t be shown and the shaft centerline will be displayed as standard.

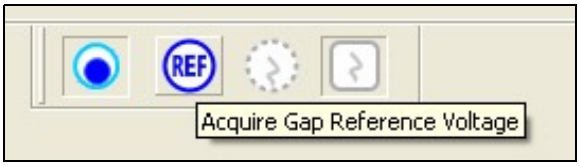

Test points configuration
Machine
Pair label
Clearance
Direction
Orientation
Point label
Input
Mach1
Mach1.P1
CW
45° L
Y
Mach1.P1.Y
1
45° R
X
Mach1.P1.X
2
Mach1.P2
CW
45° L
Y
Mach1.P2.Y
3
45° R
X
Mach1.P2.X
4
Edit Clearance Circle Radius
Show Clearance Circle
Radius :
80
µm
OK
Cancel
REF
OK
Cancel
< Back
Next >

Bearing clearance radius set-up

159.8.3 Acquiring the Gap reference voltage

Full shaft motion (Orbit+ Shaft centerline + Clearance circle) can be displayed simultaneously on the same plot for having a full display of the shaft motion.

The shaft centerline can be displayed taking the offset reference voltage into account or not. This choice is made through the 2 new icons implemented in version 3: "Apply Gap Reference Voltage" or "Disable Gap Reference Voltage". In order to see the Shaft Centerline displayed together with the Clearance Circle, one should use "Apply Gap Reference Voltage".



Apply gap reference voltage for shaft centerline representation

159.9 Exporting

In offline mode, it is possible to start the report tool. The report tool uses MS Excel to export the data. The exported data are the data contained in the current loaded measurement (data contained in the array columns).

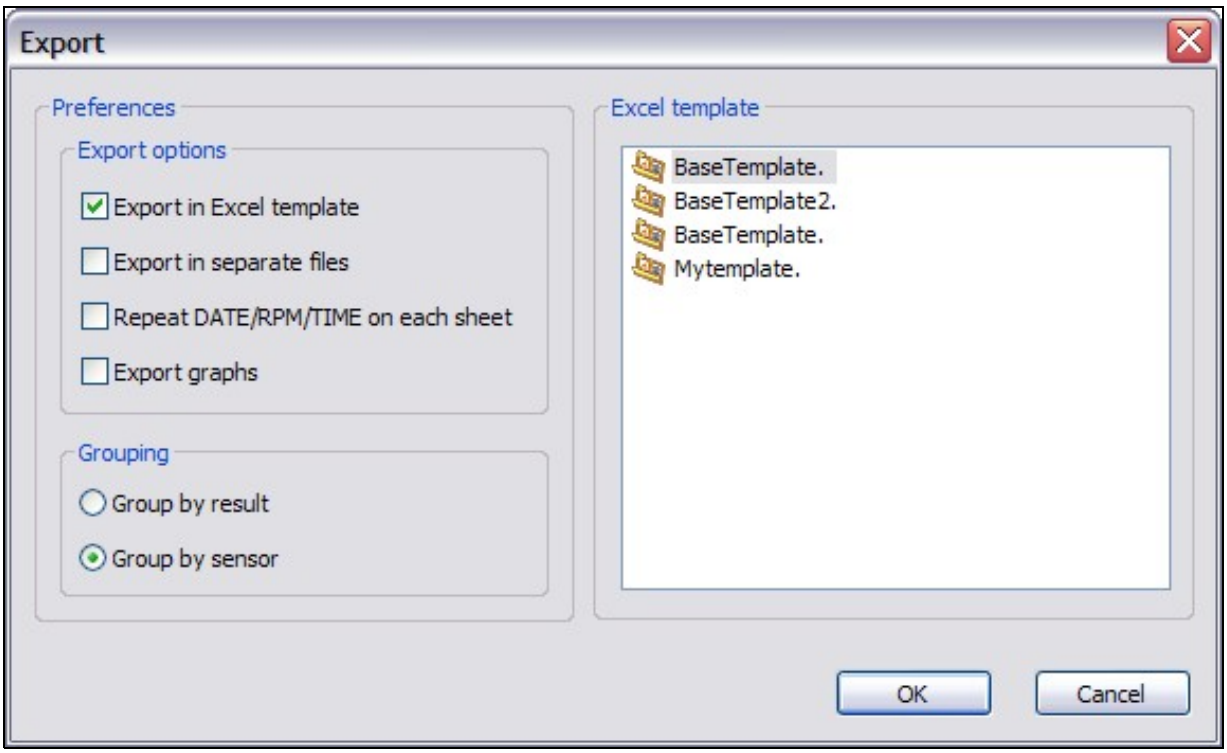
- An option is also to export the data in separate CSV files.

- Checking the line "Repeat DATE/RPM/TIME on each sheet" will export this information on each spreadsheet of the Excel report.

- "Export Graphs" will copy all the graphs displayed currently and paste them in a spreadsheet called "GRAPHS".

The grouping option allows exporting the data by grouping them either:

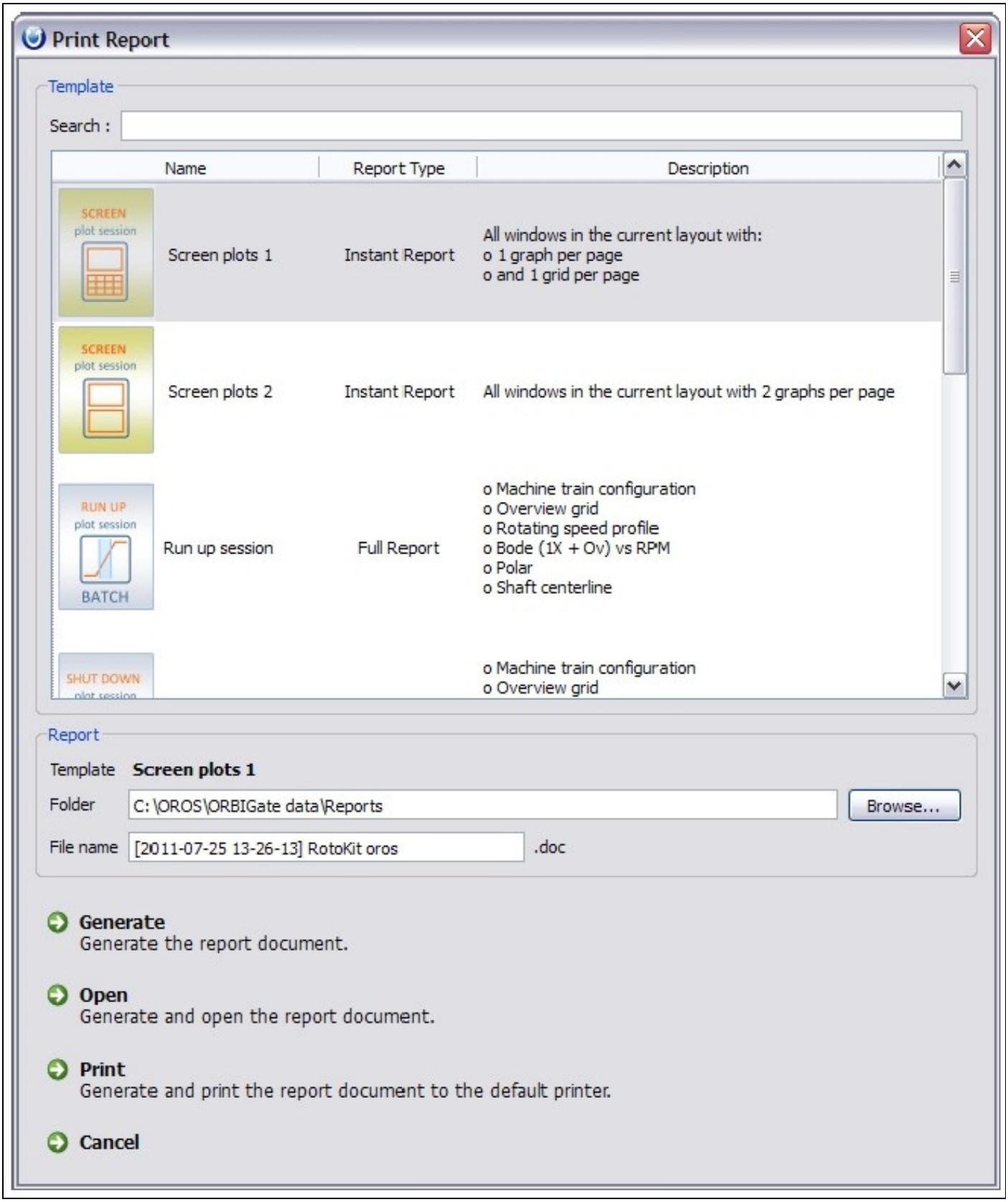
- By result (one spreadsheet for each type of results)
- By Sensor (one spreadsheet for each sensors)



The export set up window

Once the data has been exported, it is possible to reopen the Excel file and customize it within MS Excel. Then this file can be saved into the directory "C:\OROS\ORBIGate data\Templates" to become a new template. This new report template can be used for data exported from the same project (same number of channels).

159.10 Reporting


Print Report
Template
Search :
Name
Report Type
Description
SCREEN
plot session
Screen plots 1
Instant Report
All windows in the current layout with:
o 1 graph per page
o and 1 grid per page
SCREEN
plot session
Screen plots 2
Instant Report
All windows in the current layout with 2 graphs per page
RUN UP
plot session
BATCH
Run up session
Full Report
o Machine train configuration
o Overview grid
o Rotating speed profile
o Bode (1X + Ov) vs RPM
o Polar
o Shaft centerline
SHUT DOWN
plot session
o Machine train configuration
o Overview grid
Report
Template
Screen plots 1
Folder
C:\OROS\ORBIGate data\Reports
Browse...
File name
[2011-07-25 13-26-13] RotoKit oros
.doc
Generate
Generate the report document.
Open
Generate and open the report document.
Print
Generate and print the report document to the default printer.
Cancel

There are two ways to make a report:

FULL REPORT: The template decides what is going to be printed: windows to be printed in the report don?t need to be displayed by the user. The Full report is a batch report, accessible in the navigation mode.

INSTANT REPORT: Print all windows displayed in the current layout (on screen). The online report is available anytime during a test.

One of the great advantages is that the report template doesn?t need to be changed according to the number of test points.

The print report setup window

---

160 ORBIGate Phase Measurement

PHASE MEASUREMENT and POLAR DIAGRAMS in ORBIGATE

The phase measurement is used most commonly to position an unbalance. A corrected result, based on the phase measurement should be given so it is able to locate the unbalance rapidly. This can be done using the slot in the shaft as a reference.

First, we'll go through the parameters influencing a phase measurement. A phase result is obtained as displayed in figure 1: **It represents how late the signal (for a particular frequency) is seen by the sensor (for example a proximity probe) after the slot has passed by the keyphazor probe.** The frequency considered here is the rotating speed (1X).

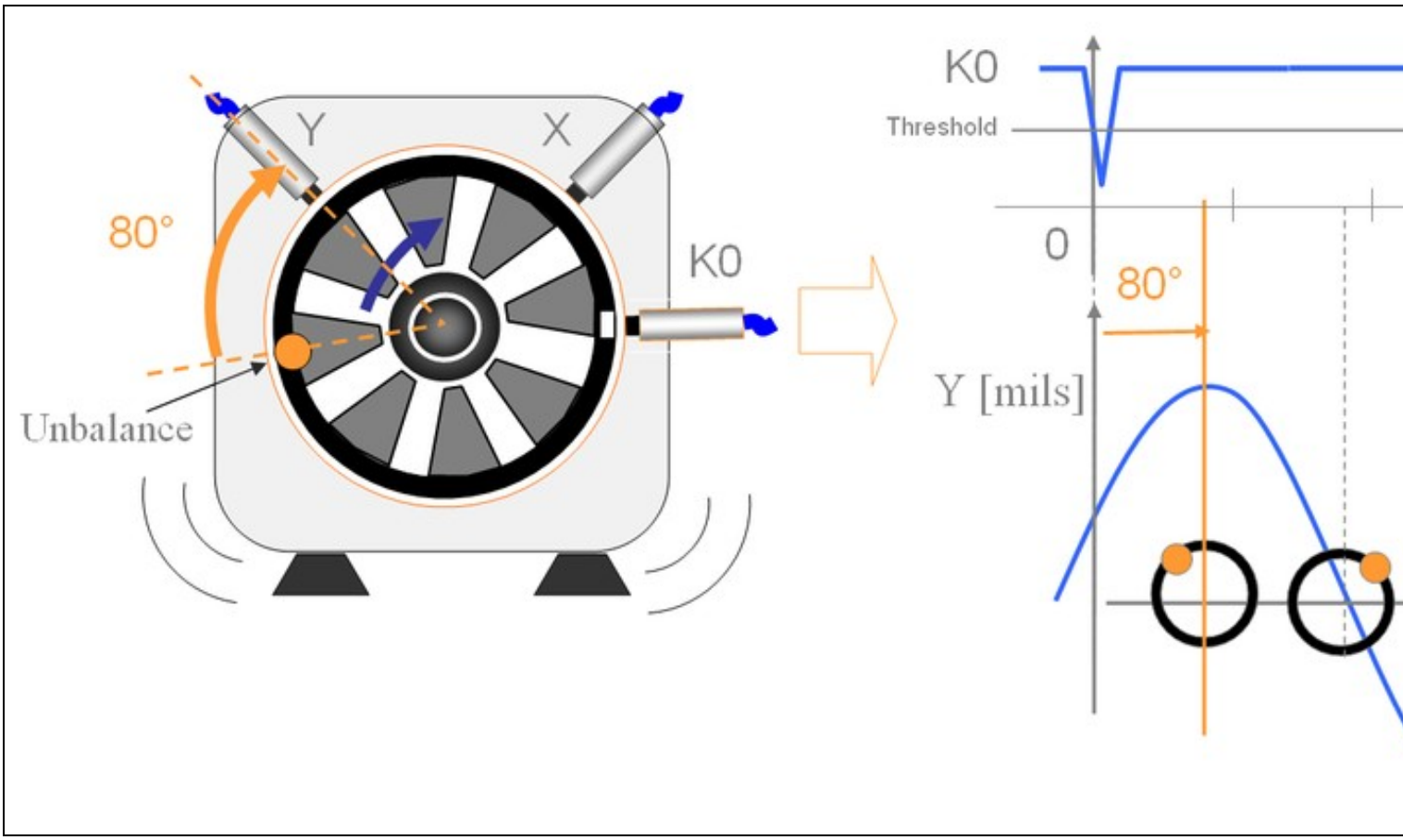


Figure 1. 1X phase measurement

160.1 Phase Measurement

160.1.1 Lag / Lead convention

Phase is used to compare the timing of two events in different signals. If an event occurs later in time than a reference event, then it lags the reference event. Similarly, if an event occurs before the reference event, then it leads the reference event.

The convention used in most vibration measurement is to measure phase LAG with a **positive number**, sometimes called *positive phase lag*. On the opposite a usual mathematical definition would give a negative sign to a LAG and a positive sign to a LEAD. We'll stay focus on the usual mechanical convention showing a LAG with a positive number. **ORBIGATE uses the phase lag convention and gives a positive value for the phase lag.**

For example, let's take the vibration signal shown in the figure below. The spike in the Keyphasor provides the timing reference. The event of interest is the first positive peak of the vibration signal that occurs **after (to the right of)** the Keyphasor event. Because the first positive peak occurs after the Keyphasor event, the time delay between the two events is referred to as the phase LAG.

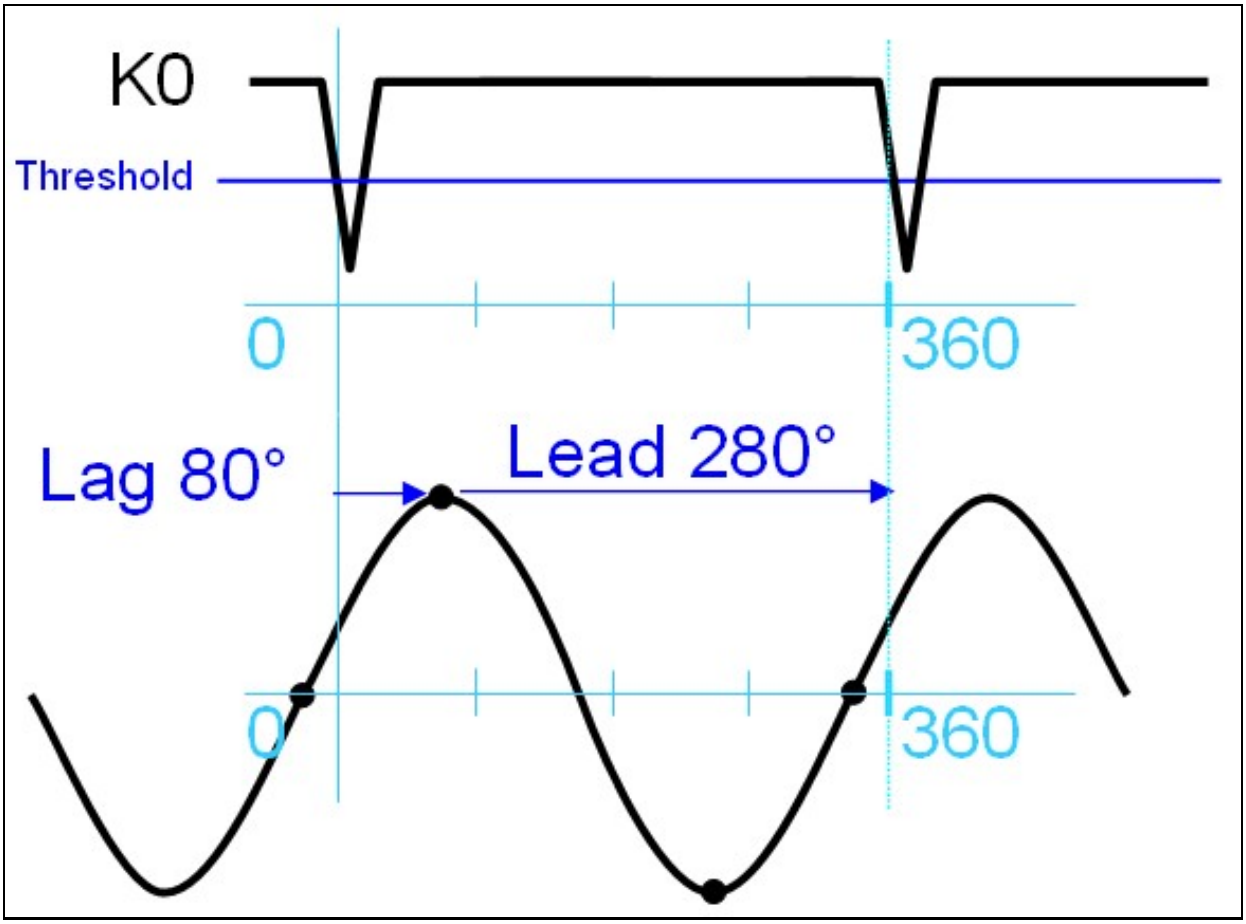


Figure 2. Lag / Lead convention

A phase LAG between 180° and 360° is SOMETIMES CALLED a phase LEAD, and could be expressed as a negative number between -180° and 0°. We will look at this convention in the following chapter ("2.2 0/360 or -180/180").

160.1.2 0°/360° or -180°/180° convention

The convention -180°/180° shows the phase with a negative sign when the lag is larger than 180° as displayed in the figure below:

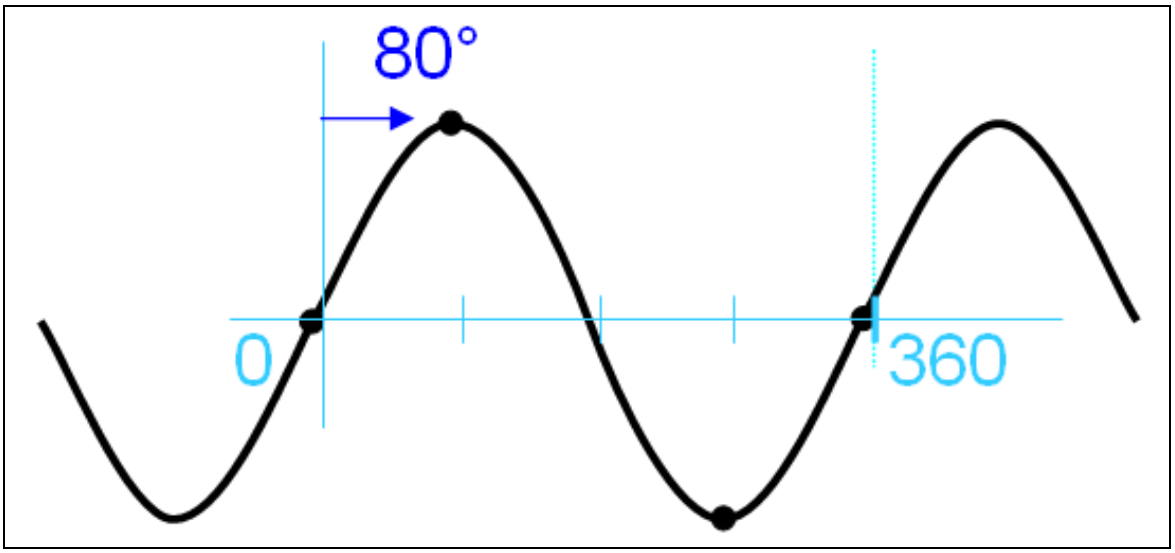
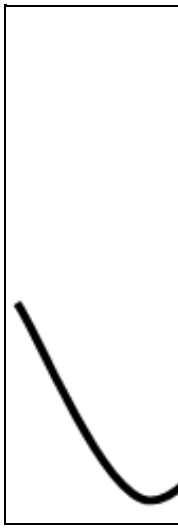
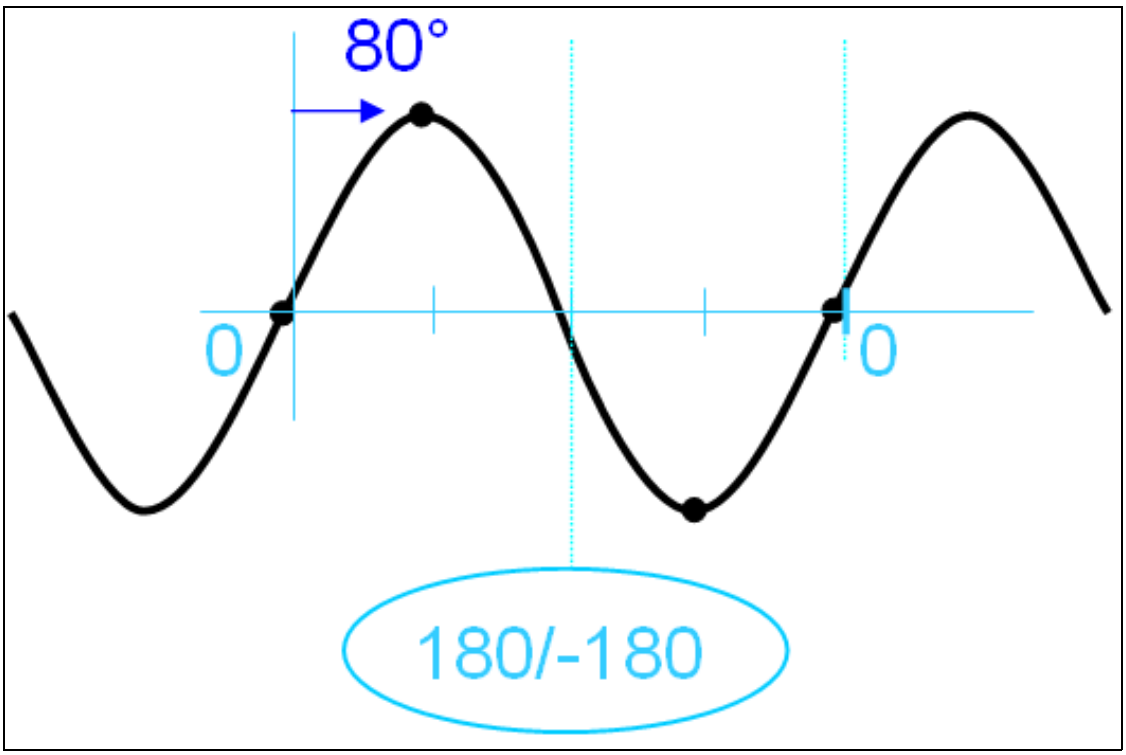
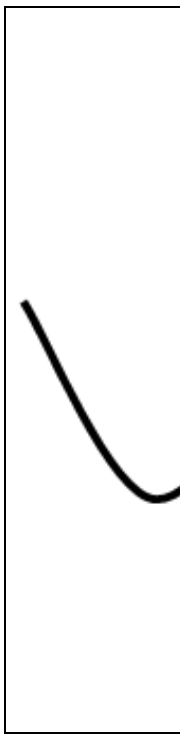
	Small Phase LAG (<180°)	
0°/360°		
-180°/180°		

Figure 3. 0 °/360 ° or -180 °/180 ° convention

By default, the 0/360 ° convention is used.

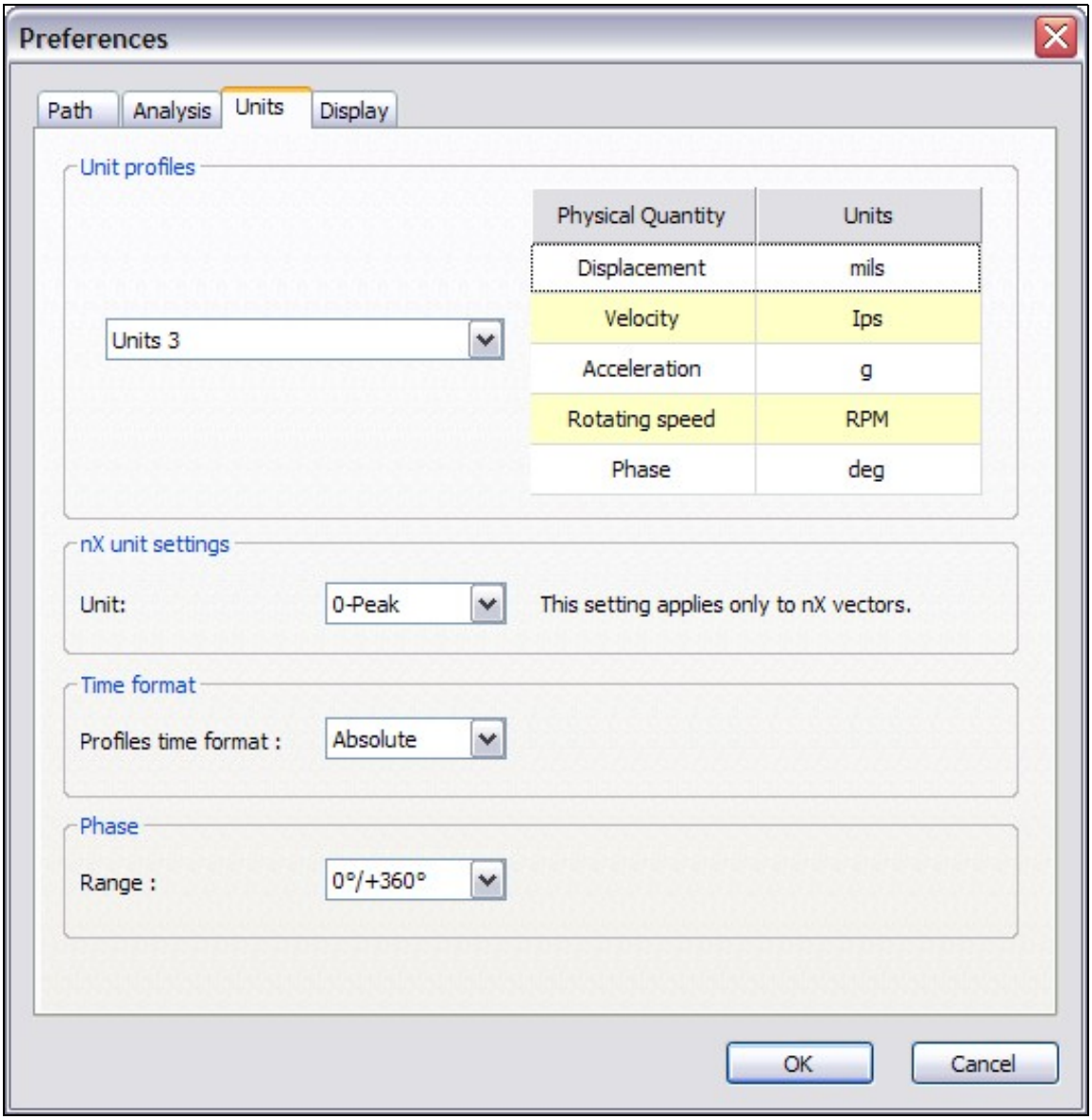
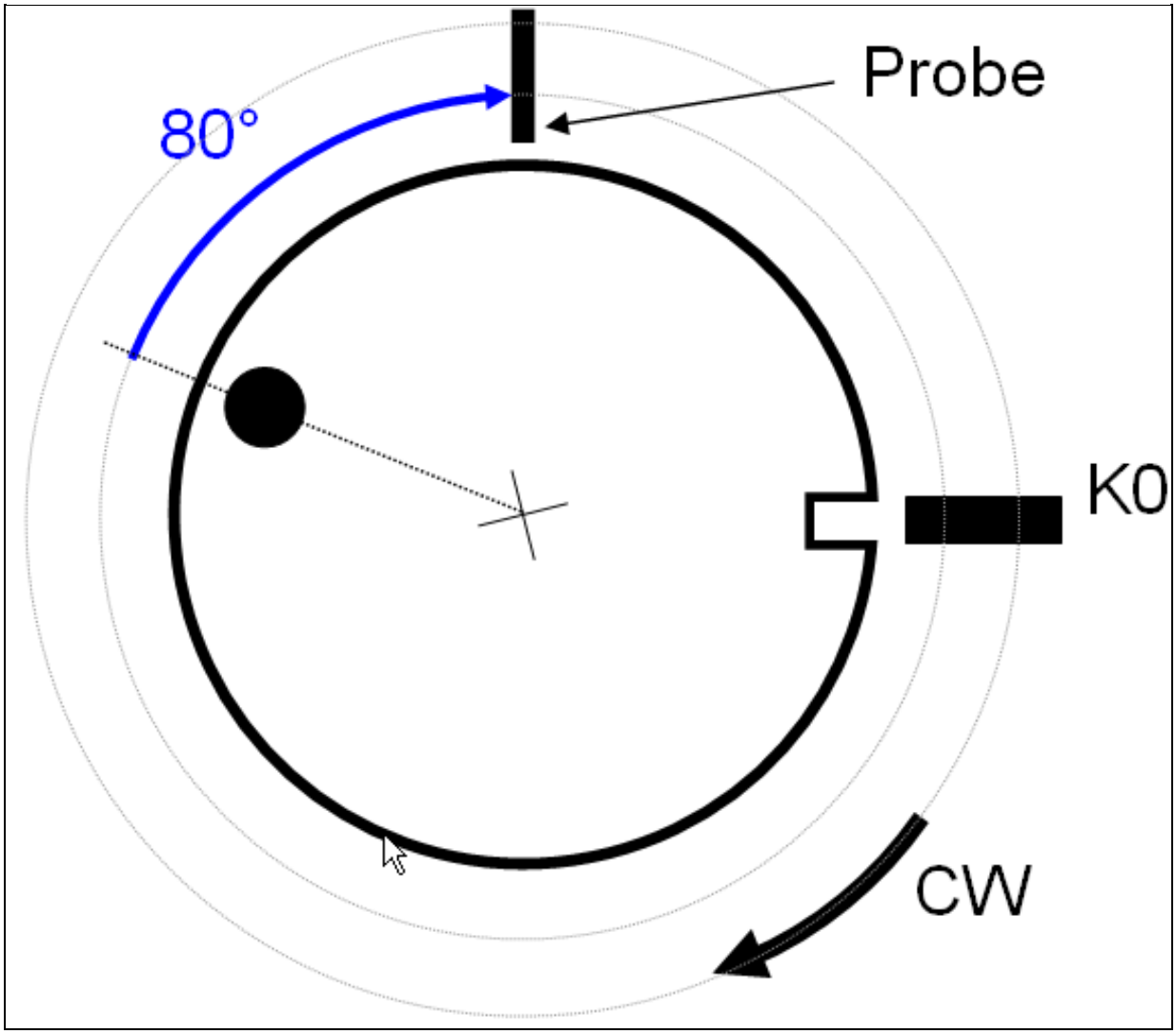


Figure 4. 0 °/360 ° or -180 °/180 ° convention

160.1.3 Rotation Direction (CW /CCW) influence

Changing physically the rotation direction of the machine changes the phase measurement.

	Physical Phenomena	
CW		

CCW

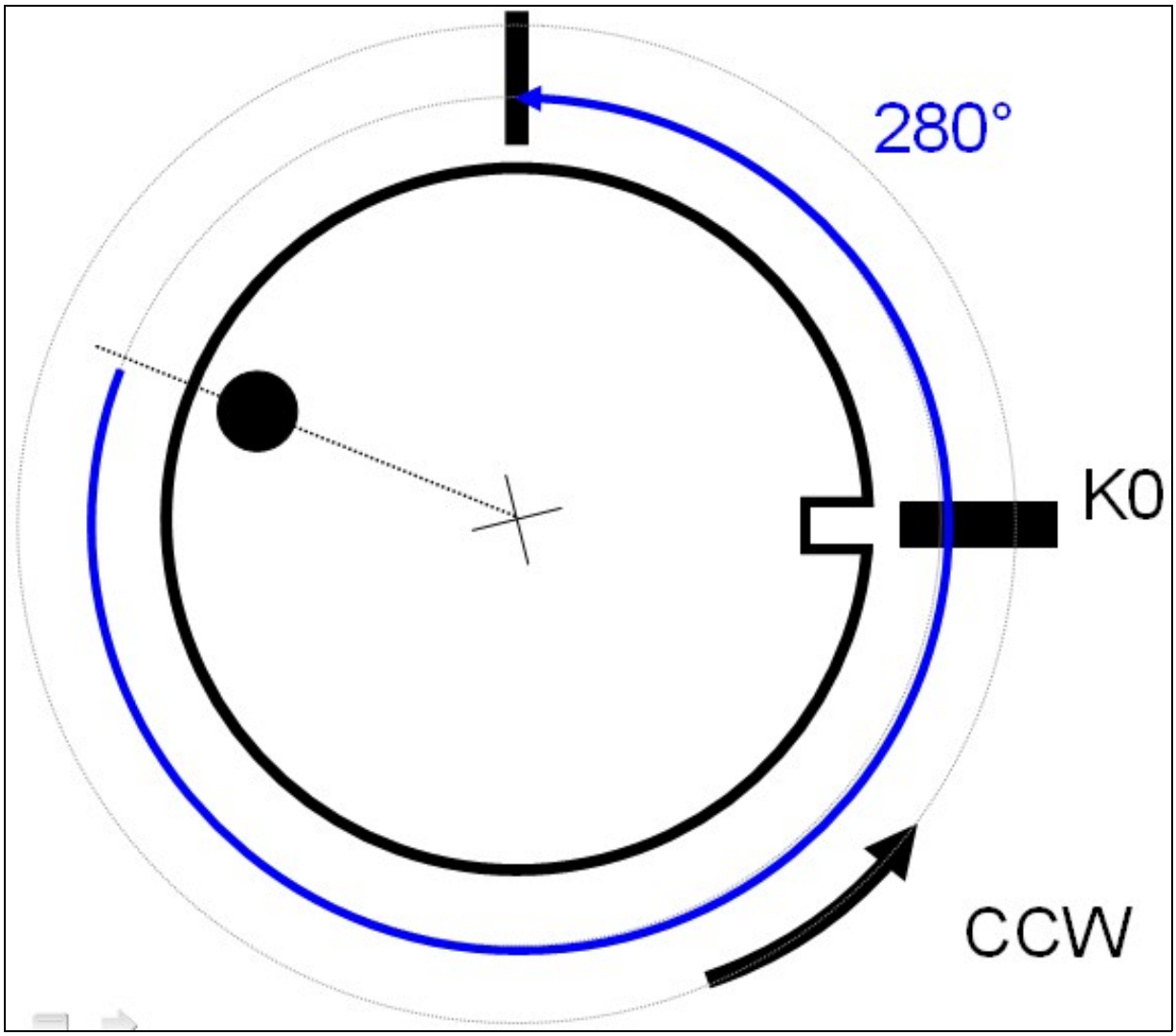
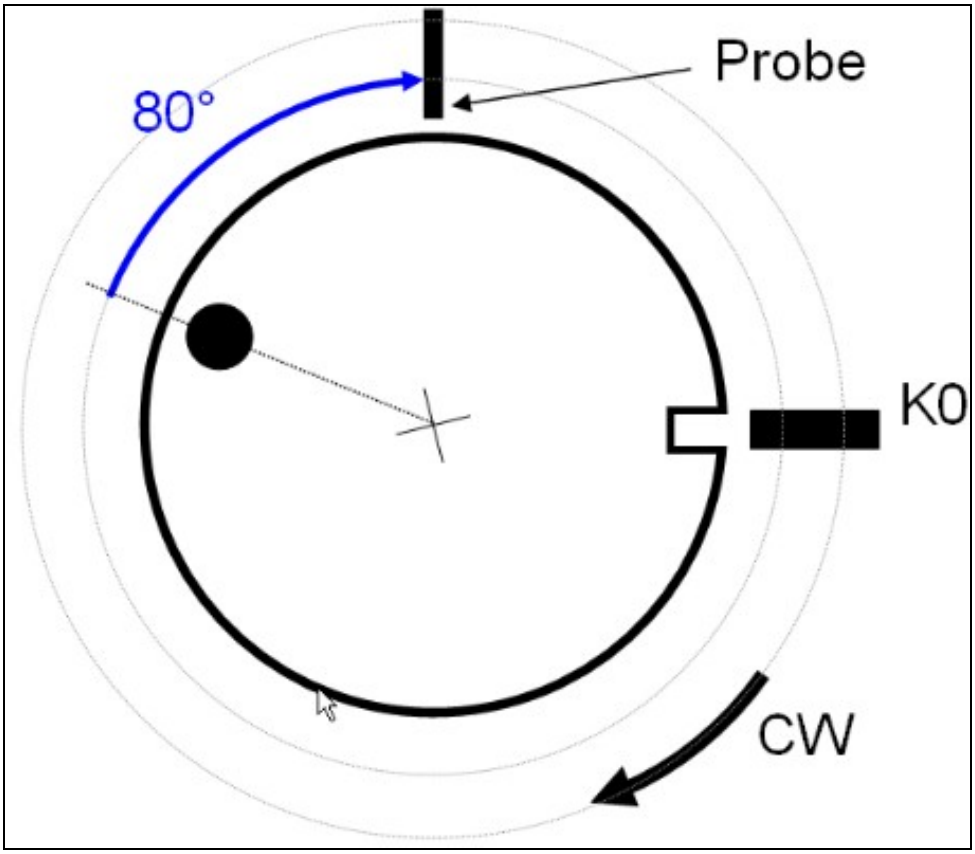
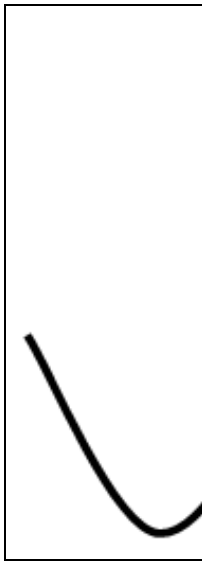


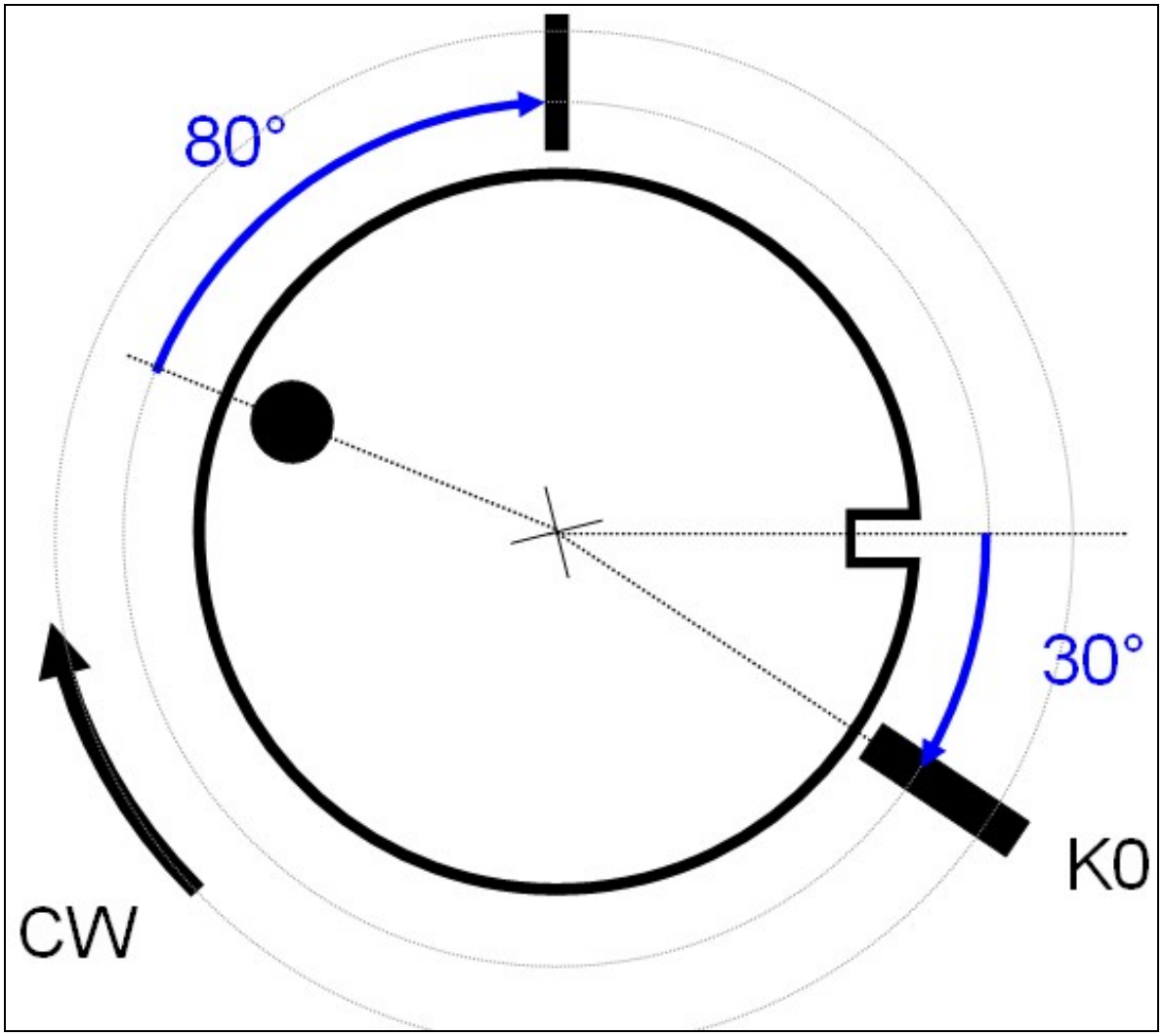
Figure 5. Machine rotating CW or CCW give different results

160.1.4 Keyphasor position influence

The phase result depends on the Keyphasor position (more exactly on the angle between the Sensor and the Keyphasor). It can be clearly seen from the figures below.

	Physical Phenomena	
Position 1		

Position
2



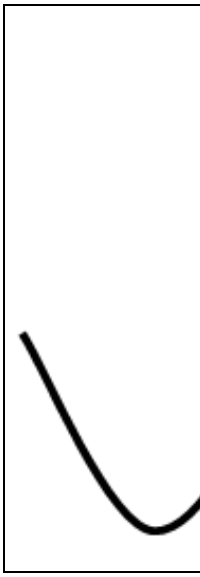


Figure 6. Different Keyphasor positions give different phase results

The keyphasor position can be setup in the software. It is only used for display purposes of the phase in the polar diagram. The value given for the keyphazor position doesn't change the value of the phase.

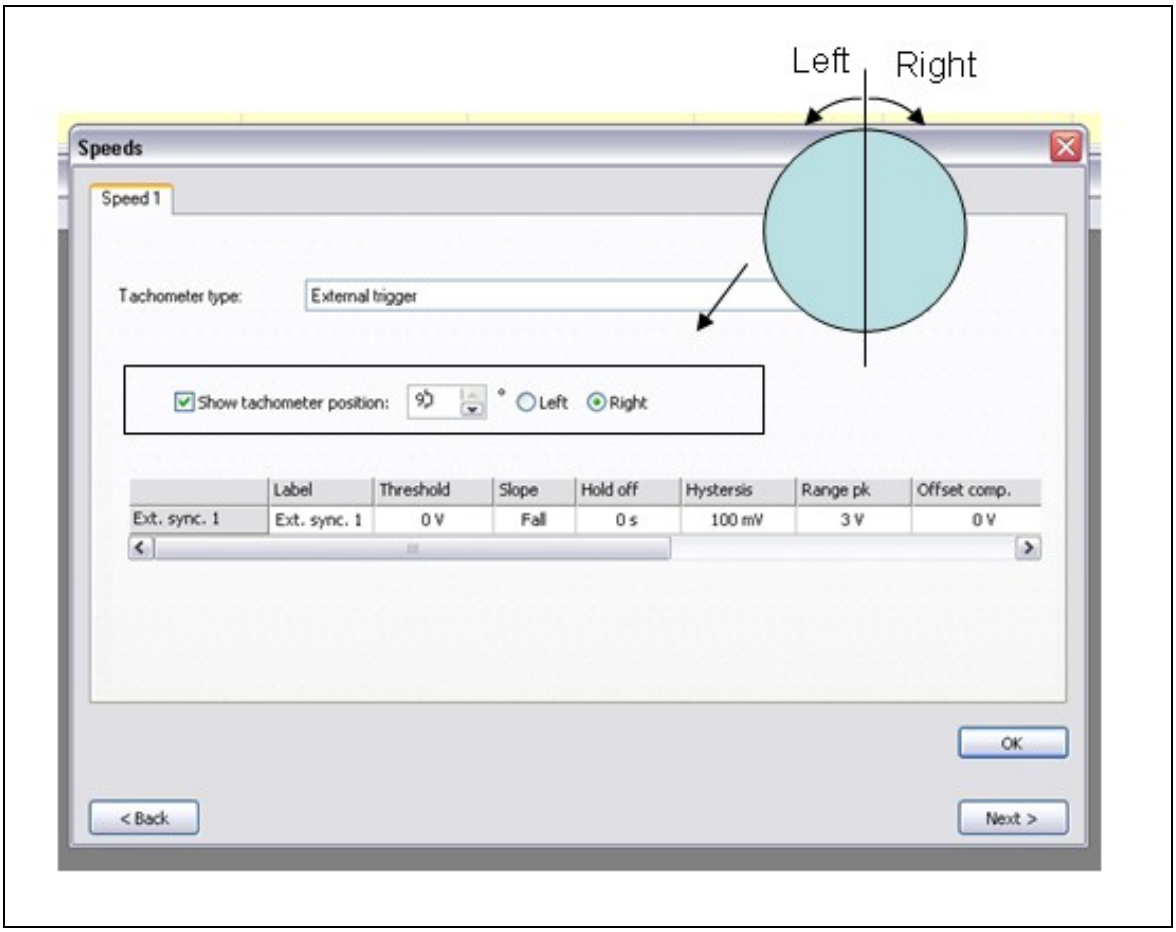


Figure 7. Different Keyphasor positions give different phase results

160.1.5 Trigger Slope

The phase value may vary slightly depend on the fall/rise trigerring condition. In ORBIGate this value can be selected as shown in figure 8. In some other system on the market this value is sometimes fixed. In the ADRE system it is fixed to "fall".

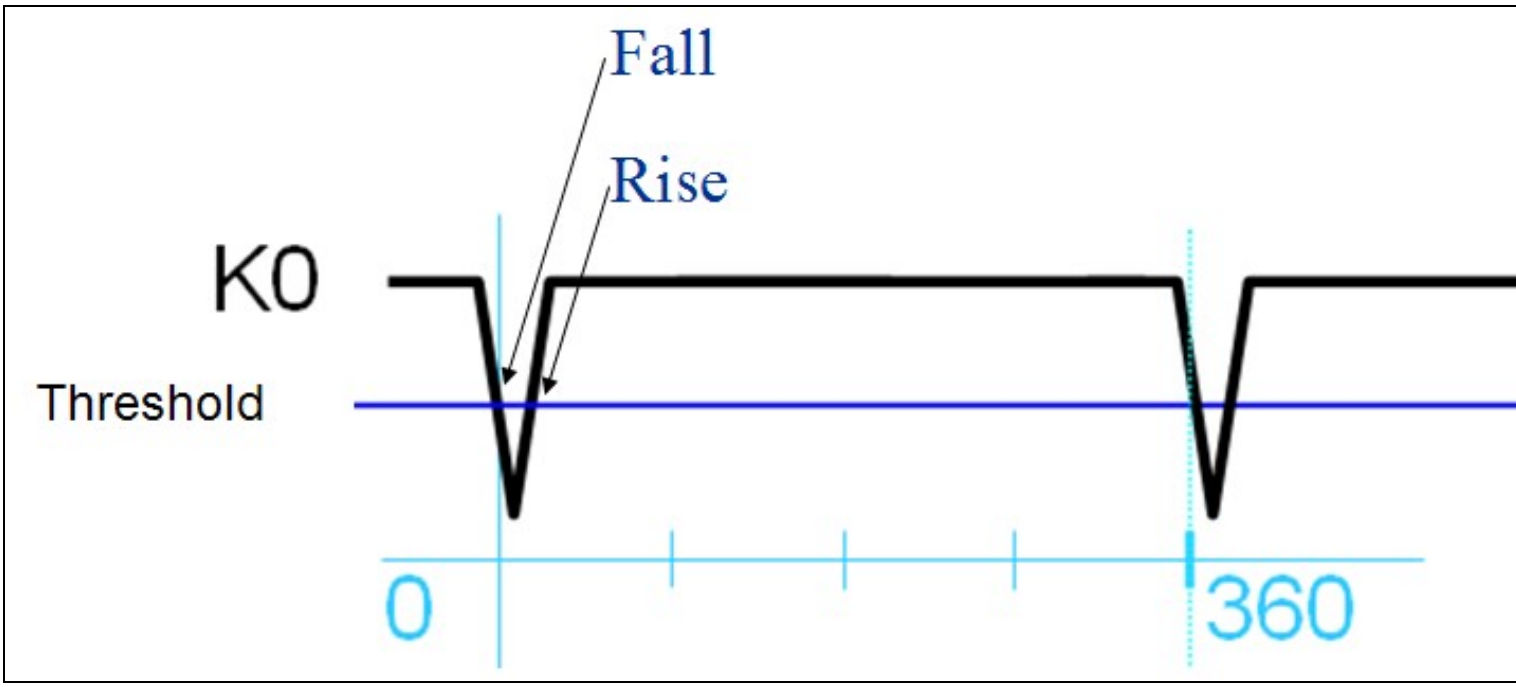


Figure 8. Fall/Rise trigerring condition

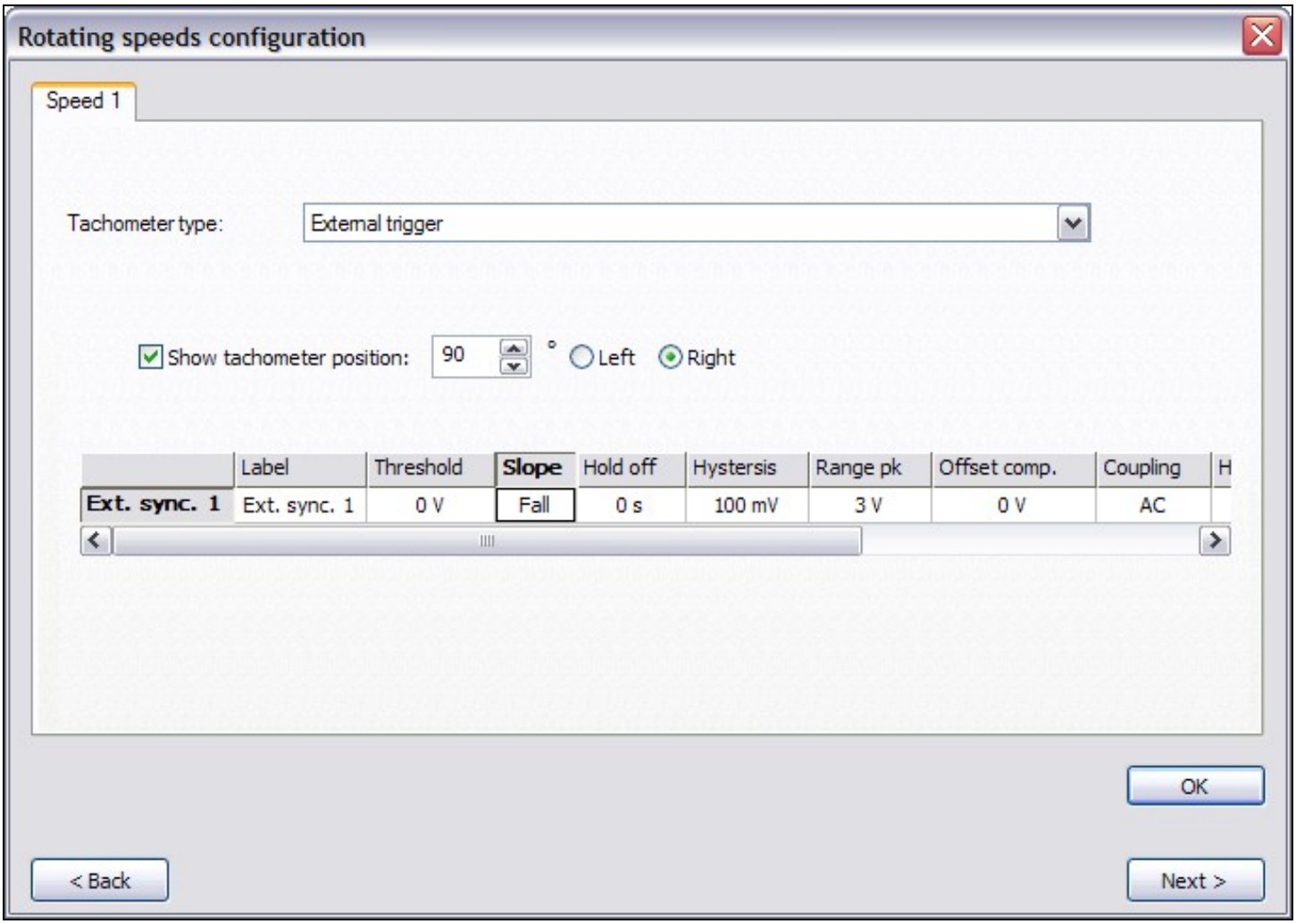

Rotating speeds configuration
Speed 1
Tachometer type:
External trigger
Show tachometer position:
90
°
Left
Right
Label
Threshold
Slope
Hold off
Hystersis
Range pk
Offset comp.
Coupling
Ext. sync. 1
Ext. sync. 1
0 V
Fall
0 s
100 mV
3 V
0 V
AC
OK
< Back
Next >

Figure 9. Different Keyphasor positions give different phase results

160.2 Phase display

160.2.1 Overview grid

The phase value of order one is shown in the grid in the column (1X Ph)

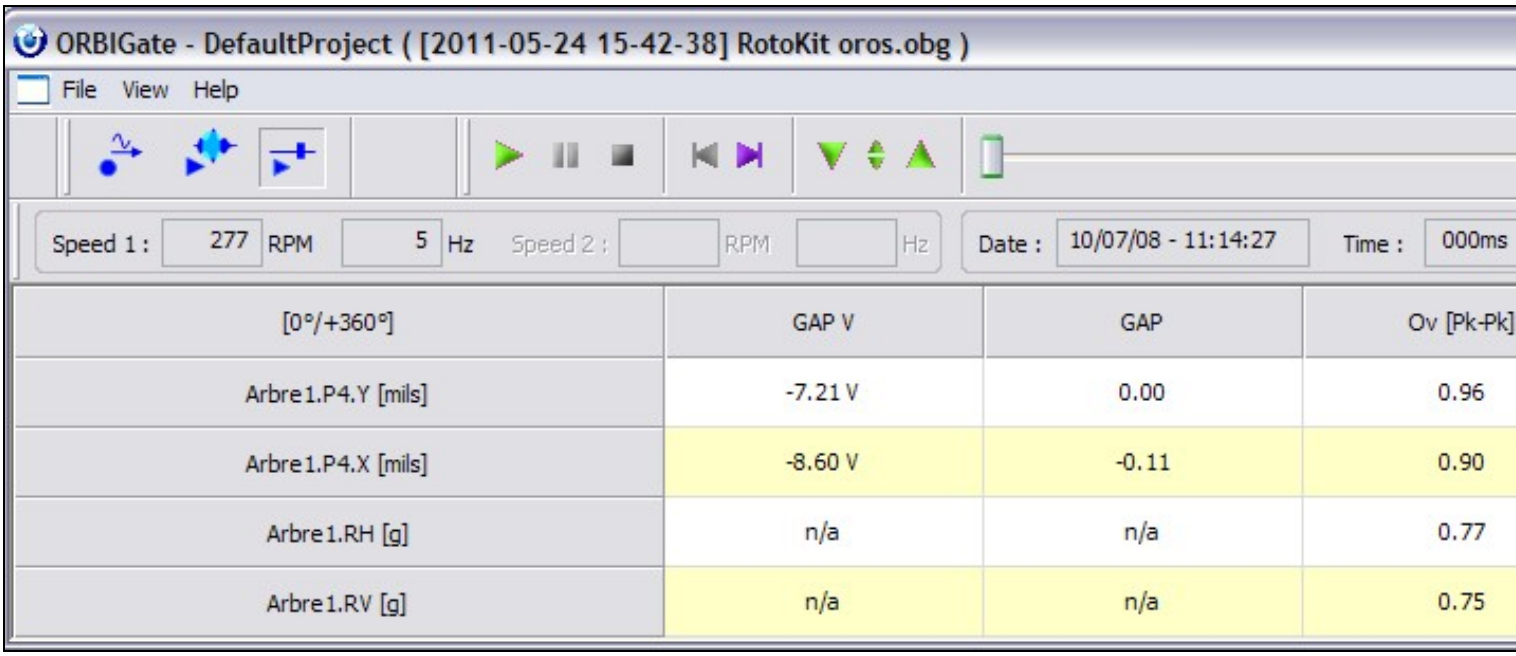


Figure 10. Phase display in ORBIGate

160.2.2 Bode Diagram

- In the Bode diagram, it is possible to show the phase on several phase rotations: For that, a right click should be done on the Bode diagram and choose the number of rotations. By default it is 1, giving 0/360°.

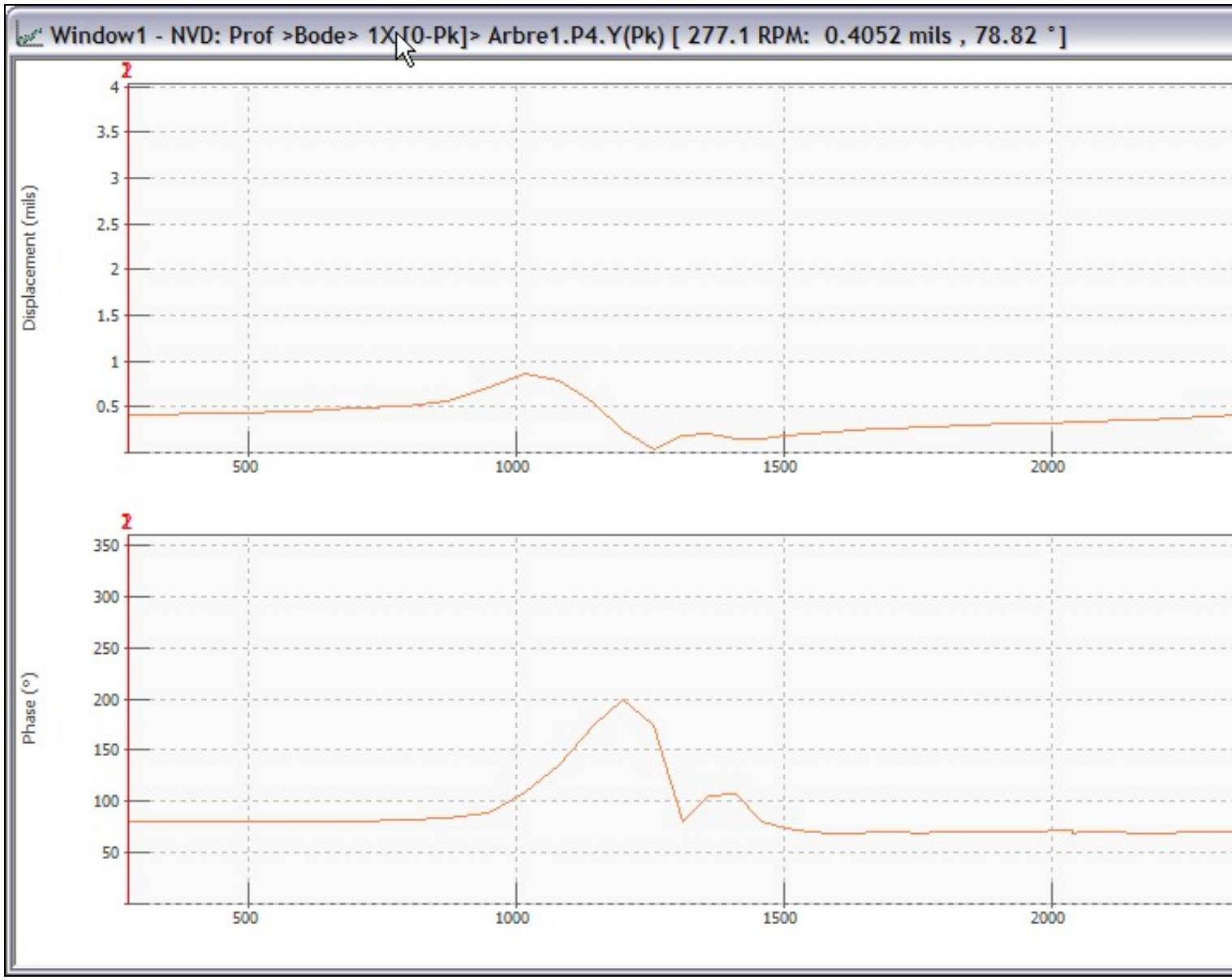

Window1 - NVD: Prof >Bode> 1X[0-Pk]> Arbre1.P4.Y(Pk) [277.1 RPM: 0.4052 mils , 78.82 °]
Displacement (mils)
4
3.5
3
2.5
2
1.5
1
0.5
500
1000
1500
2000
Phase (°)
350
300
250
200
150
100
50
500
1000
1500
2000

Figure 11. Phase display in ORBIGate

160.2.3 Polar Diagram

A typical machine configuration is shown as below:

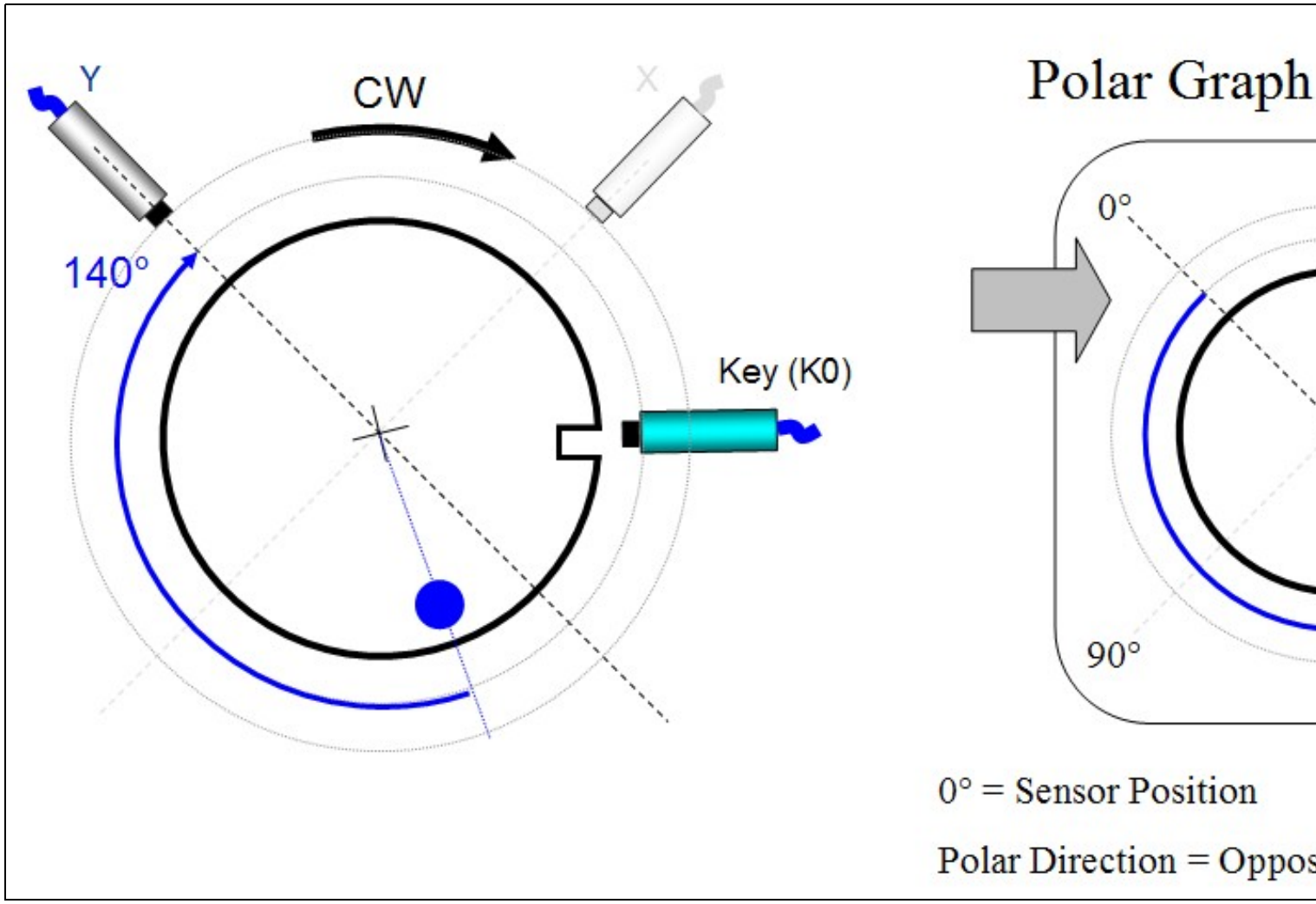


Figure 12. Phase display in ORBIGate

The main features of the ORBIGate polar diagram are:

- 0 Phase positioned as the measured probe
- Phase lag positive counting in opposite direction as machine rotation
- Machine rotation indication (CW or CCW arrow)
- Keyphasor position indication (as setup described in chapter 2.4 and figure 7)
- (0,0) at center

So, the polar diagram shows where is the unbalance located referred to the key slot (position of the keyphazor).

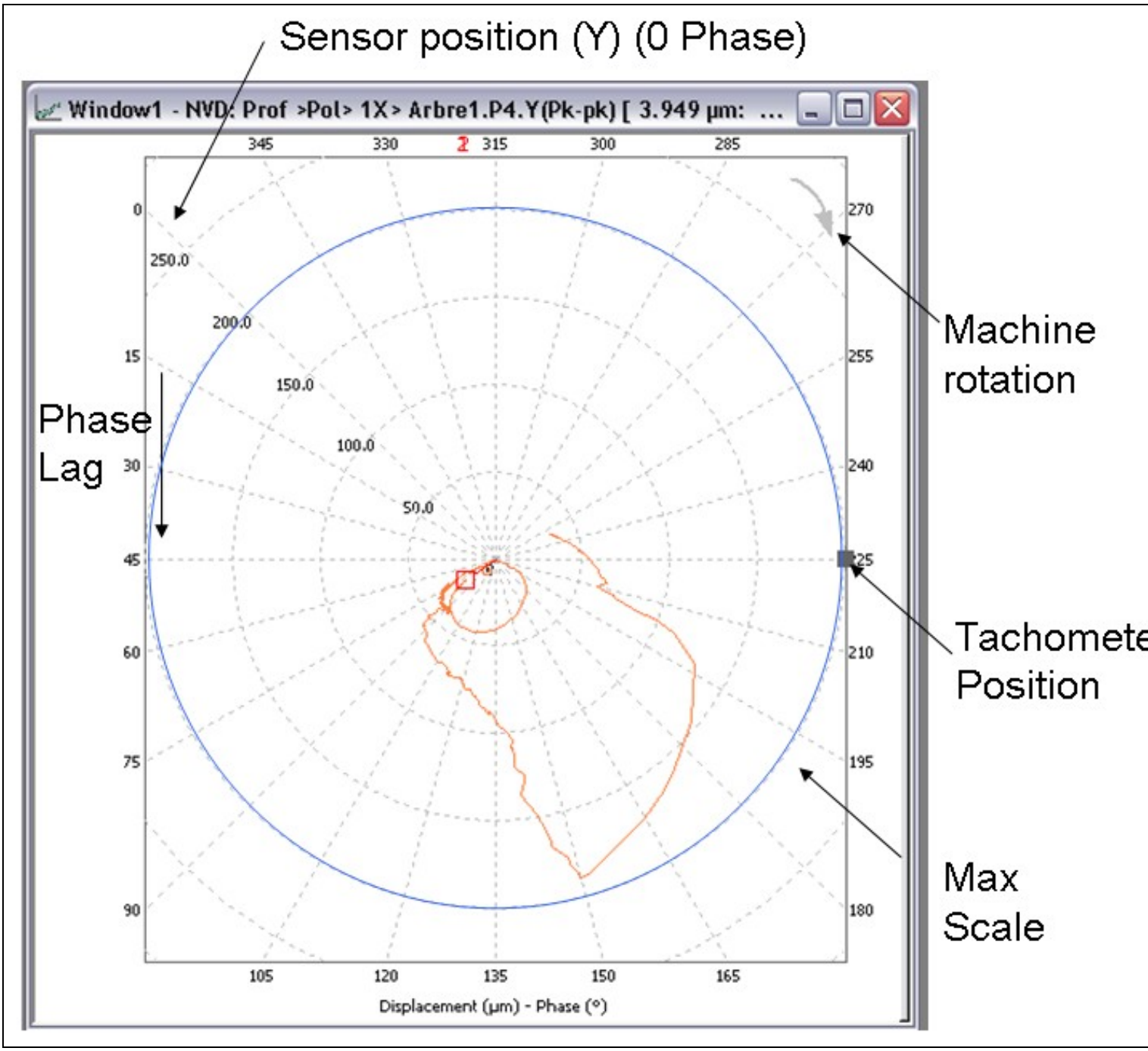


Figure 13. Phase display in ORBIGate during a run-up

160.3 Summary

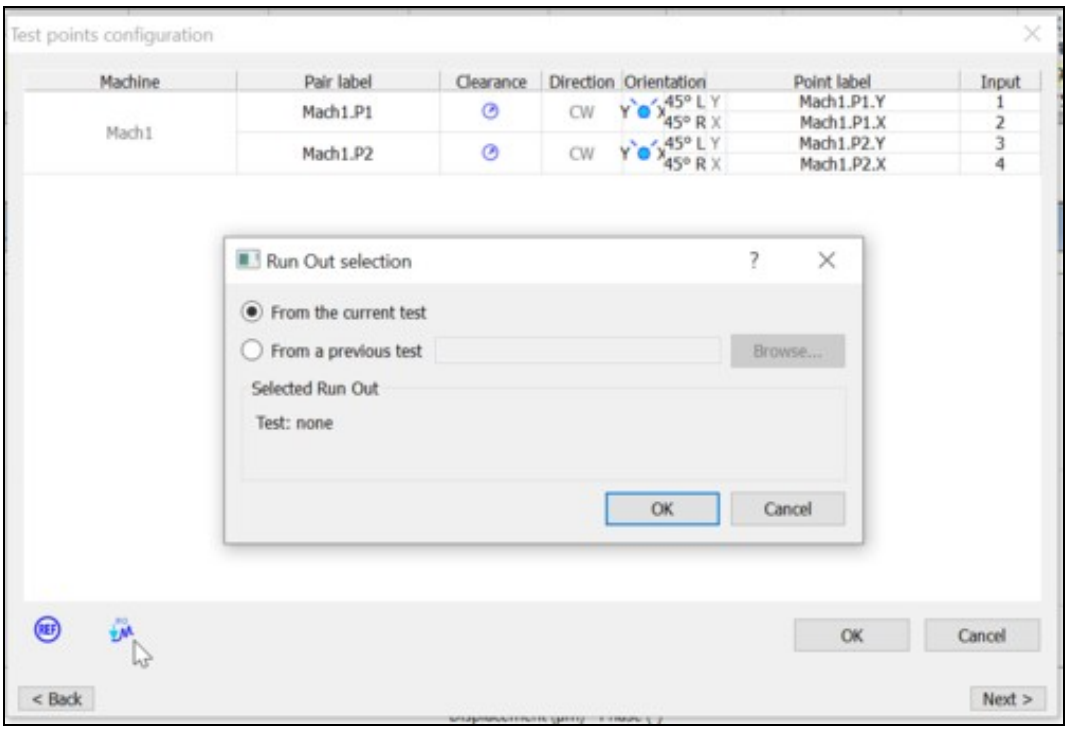
- The phase can be shown in several types of diagrams: Overview grid, Vumeter, Bode and Polar.
- ORBIGate uses the lag convention.
- The phase lag gives a positive value of the phase in ORBIGate.
- It is possible to choose (in the preferences) the convention between -180°/180° and 0/360°. By default it is 0/360°.
- In the Bode diagram, it is possible to show the phase on several phase rotation: for that it is necessary to right click on the Bode diagram and choose the number of rotations.
- It is possible to choose to trigger the phase count on the rise or the fall of the keyphazor pulse. By default it is Fall.
- In the polar diagram, the phase rotates in the opposite direction of the machine rotation.
- In the polar diagram, the 0° is shown as the position of the sensor (proximity probe, velocity probe or accelerometer).
- In the polar diagram, the keyphazor position is shown as setup in the interface.

161 ORBIGate Run Out from a measurement

Available from ORBIGate V7 or more.

Determining a Run Out correction

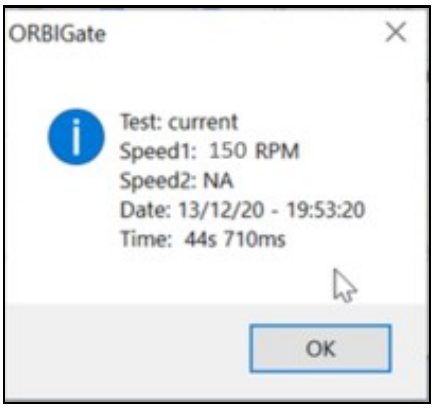
When no "Run Out correction" has been determined yet: the following selection should be chosen after pressing the "Run Out" icon in the "Test points configuration"



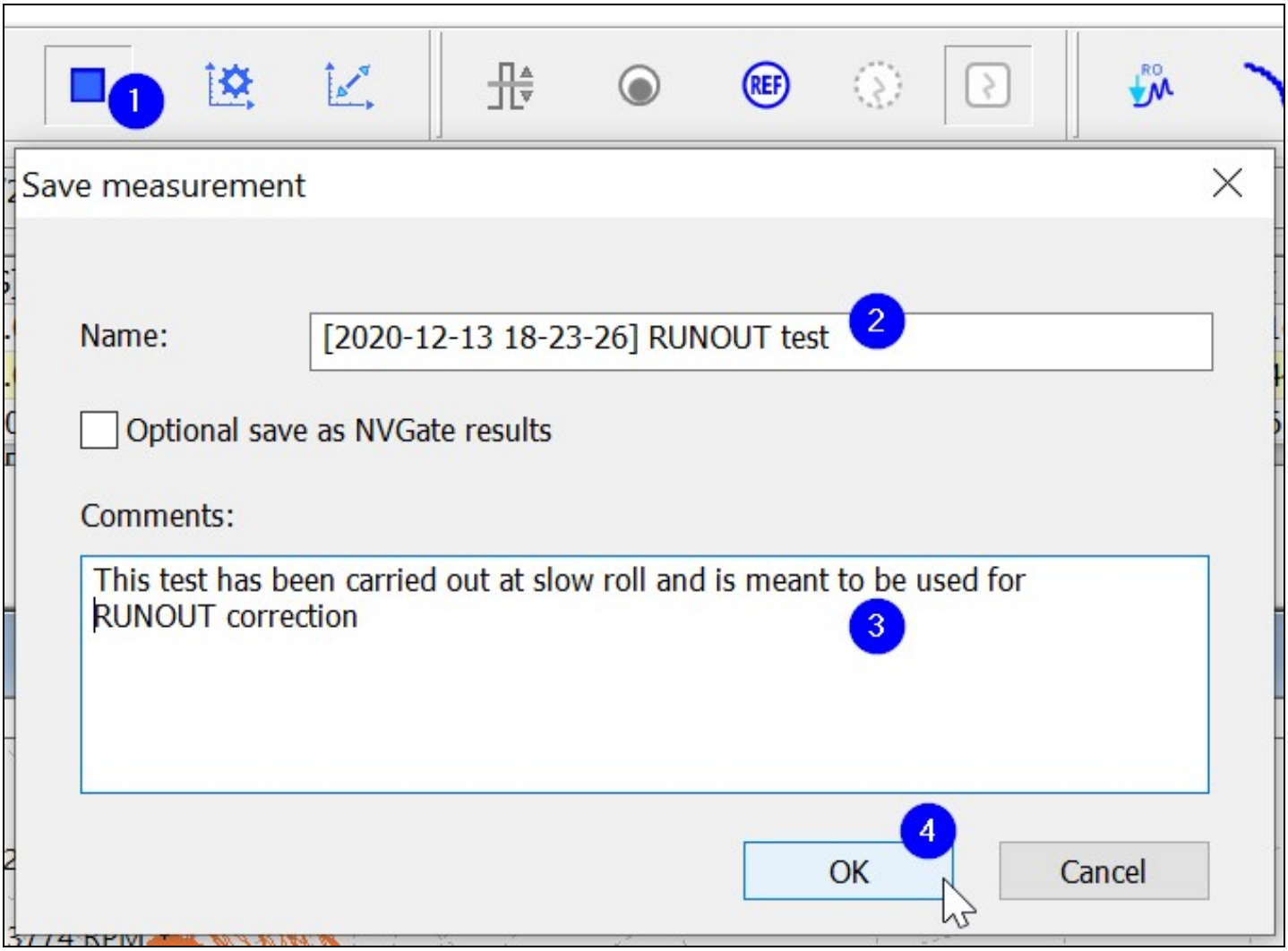
Start a "Measurement record (1) and "Apply the current position as Slow Roll" (2)



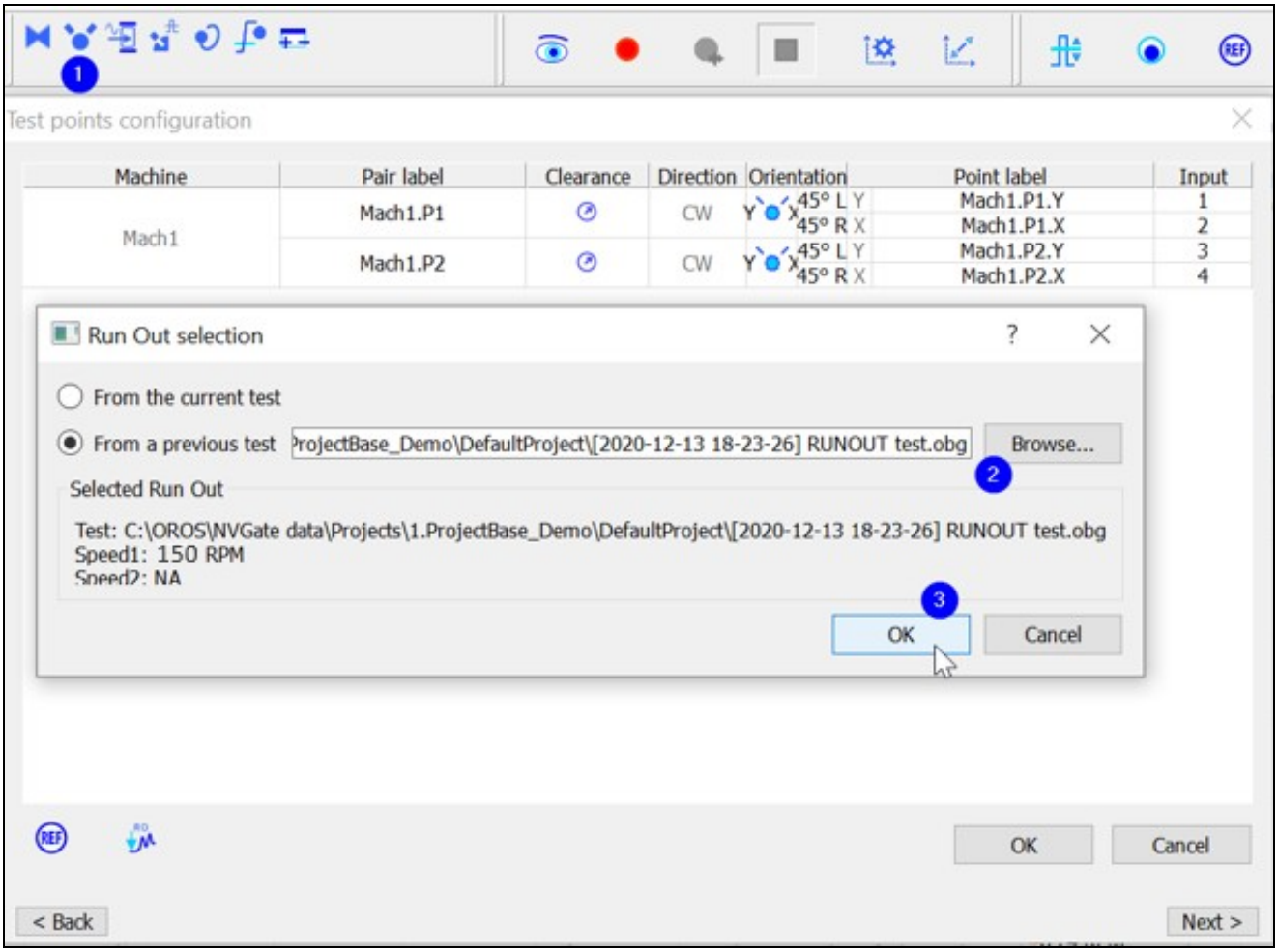
The following dialog window appears



Save the measurement after pressing "Stop"



Using a RunOut correction from a different measurement



From that point, the Runout correction which is used is the one saved in the specified file (in the example: "[2020-12-13 18-23-26] RUNOUT test.obg".

Note:

- If the project is saved: this setting will be saved and reloaded during a future use.
- In this case, the runout selection is greyed at all times (



) during the acquisition. If one wants to select a new "RunOut correction": one should activate the "From the current test" option from the "test points selection/Run Out selection" dialog.

- If a measurement is selected for RunOut and doesn?t contain any saved "Run Out" correction, one won?t be able to use it for Run Out correction
- If a measurement file should be used for Run Out correction but it was not saved with this correction, it is still possible to do it. Load this measurement in the navigation mode, select the Run Out (after having selected "from the current test") and select "Save measurement as ?" from the file menu.

Using the Run Out correction in the navigation mode

If one save a measurement using a specific "Run Out measurement file" (in the example above : "[2020-12-13 18-23-26] RUNOUT test.obg"), it will be saved together with the measurement and remembered when loading it in the navigation mode. At that point, one can still change the option or select an other correction file.

162 ORBIGate Run Wait Stop Macro

Note: Free of charge. Works with ORBIGate V6.8 or later. Download : here

This macro completes the following:

- Run
- Wait x seconds. (x is define by user).
- Stop.

How to use:

- Extract
- Launch ORBIGate
- Launch Orbigate_Runstop.exe

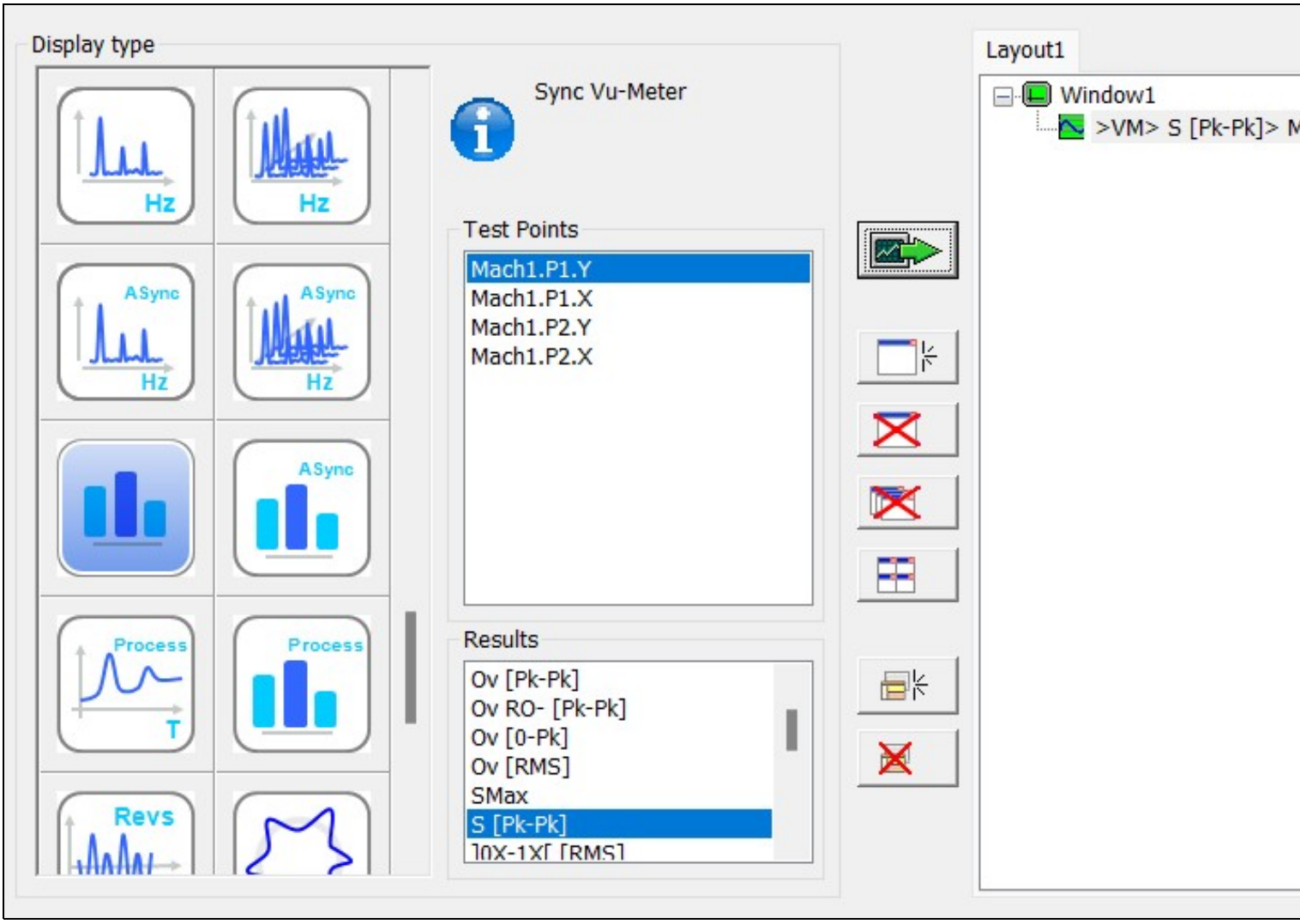
163 ORBIGate: what's new

Same as our main platform NVGate, the dedicated turbomachinery vibration solution ORBIGate keeps progressing as well bringing new features.

163.1 ORBIGate 7.2

Main new features in **ORBIGate 7.2**:

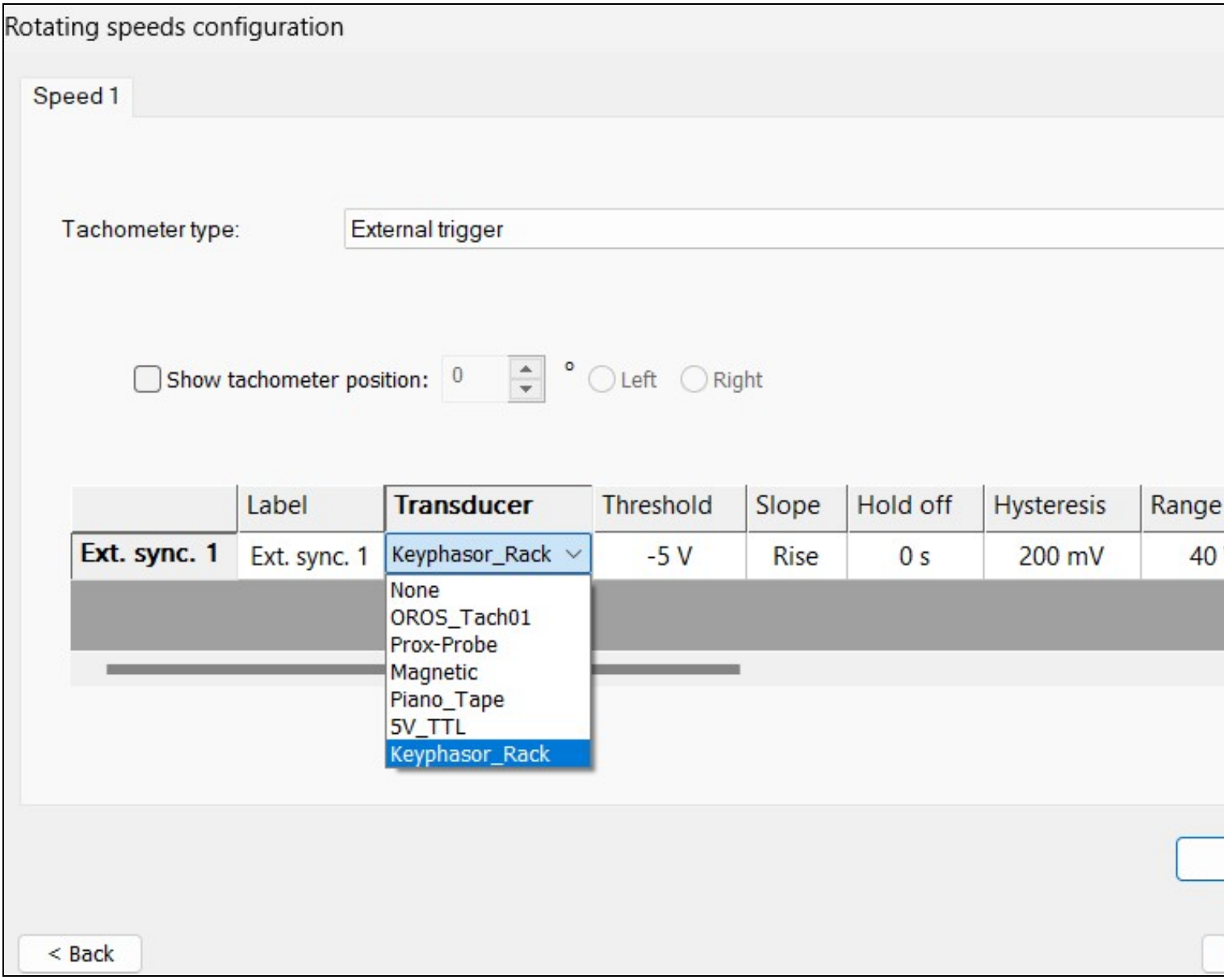
- To comply with the latest standard **ISO 20816**, in addition to Smax, the indicator **S [Pk-Pk]** for the maximum shaft vibration is also available now.



- **Tachometer setup** becomes hassle-free: Setting up Ext. Sync. input and reading shaft speeds correctly is now easier than ever!

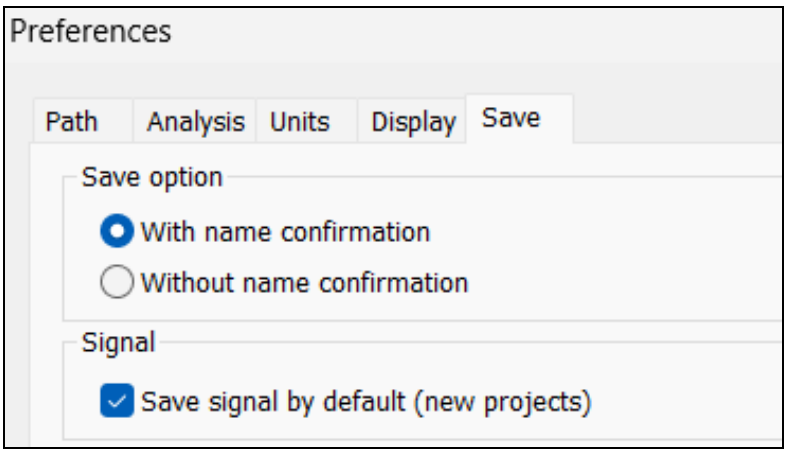
When pulses from tachometers are acquired by Ext. Sync. inputs, user needs to know the delivered outputs in order to correctly set up parameters such as threshold, coupling, range peak and so on. In addition, properly setting up max speed, which is linked to the shaft speed, is crucial for a successful rotating machine analysis. However, sometimes it could be difficult for the users to understand all these settings.

The most common **rotating speed sensors**, such as keyphasor from a monitoring rack, are now available in the transducer database. User simply selects the sensor from the transducer list, and the tachometer settings are ready.



The transducers in the list can be **customized**, and **new transducers** can be added by editing the file ?Tachometers.tdb?, which can be found in the installation directory of NVGate.

- A new option is added in user preferences. From now on, time signals are saved by default, avoiding empty-hand situation due to slight negligence.



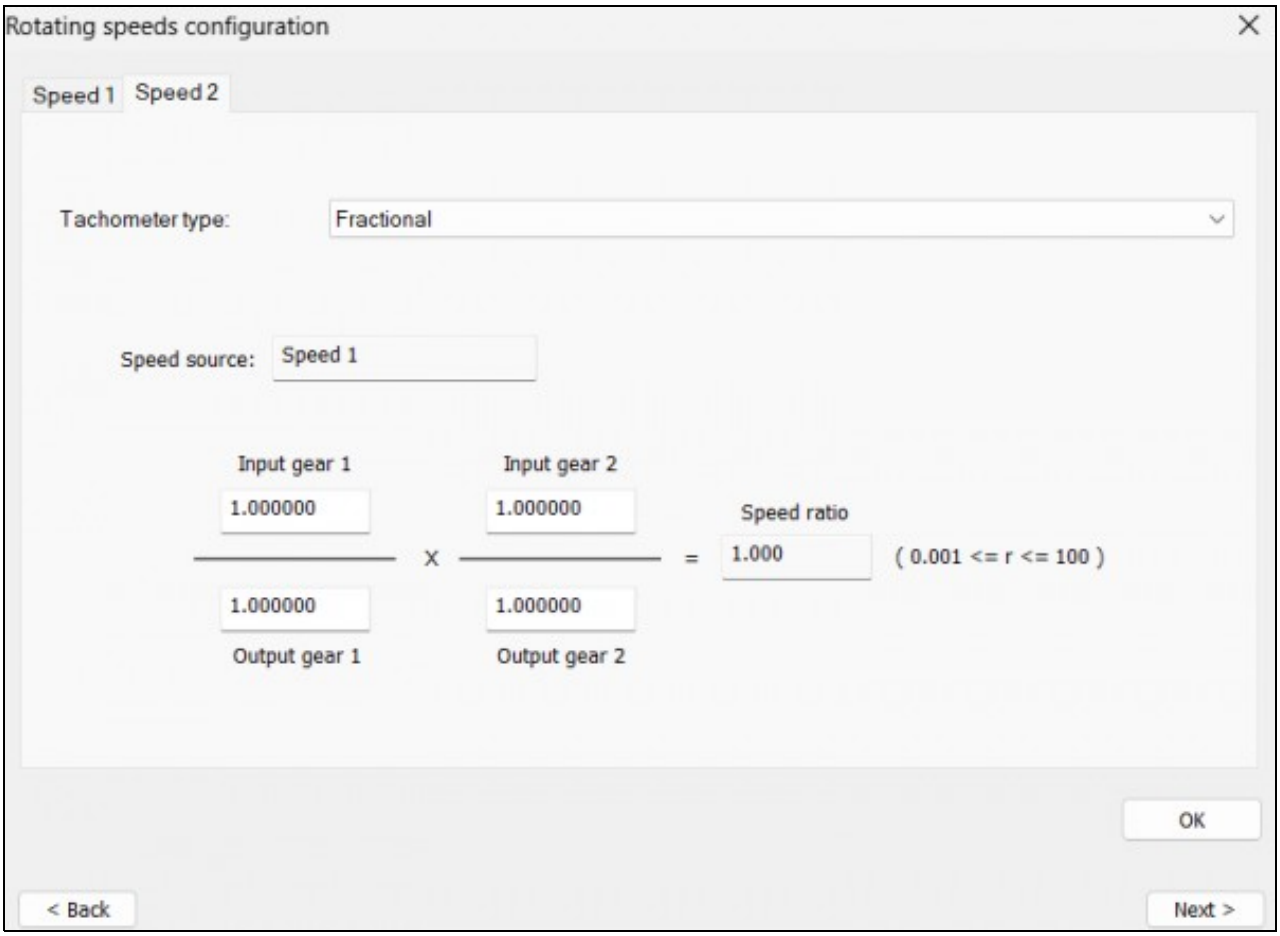
- Fully compatible with NVGate 2023.

163.2 ORBIGate 7.1

Main new features in **ORBIGate 7.1**:

- ORBIGate can now be used on **daisy chained systems** like NVGate does (Tested with 88 channels. Tell us if you need more).
- Virtual tach gear ratio upgraded to 100:

Measuring vibrations on multi-shaft machines such as gear boxes may require positioning several tachometer sensors. For a non-accessible shaft, RPM speed can be computed by using the gear ratio setting. This **fractional tachometer** feature has been extent, and the ratio can be up to 100 now! (it used to be 2 only)



- Fully compatible with NVGate 2022.

164 OROS Hardware

Hardware
Official documentation ? user guides, specifications and support resources.

164.1 ? How to Use

?? Analyzers

? **OROS Analyzer Overview**
General overview of the FFT Spectrum Analyzer

?? **O4**
Hardware instruments ? user guide

?? **OR35TW · OR36TW · OR38TW**
Hardware instruments ? user guide

?? **OR10**
OR10 extension modules

? Accesories Modules

? **XPod: Strain Gauge**
Strain gauge conditioner

?? **XPod: Temperature**
Temperature probe conditioner

? **CAN BUS**
NVGate CAN BUS interface

? **Wi-Fi**
Wireless operation guide

164.2 ? PC

? **PC Requirements** ? Minimum and recommended configuration to run NVGate and OROS software.

164.3 ?? General Notice

?? **Notices and General safety instructions**
Mandatory safety instructions before operating OROS equipment

? **General warranty conditions**
Available on partnerzone (internal link)

164.4 ? Specifications

O4 OR10 OR35TW · OR36TW · OR38TW

? Datasheet ? Datasheet ? **Datasheet**

164.5 ? Miscellaneous

- ? **Input structure** ? Architecture of analog input channels
- ? **FAQ Battery** ? Frequently asked questions about battery power
- ?? **DSP Computation SPU** ? Digital signal processing information
- ? **Reboot Multiple Analyzers** ? Coordinated reboot procedure for multi-analyzer setups

165 OROS Hardware reboot analyzer together

This add on in beta version will reboot several analyzer together.

165.1 Download

- https://orossas.sharepoint.com/:u:/g/support/EVja_V07JE1EmDIU3ln8d9sBolUw8_1gXzxygE38oyYGXw?e=1PLnYA

165.2 Process

- Putty must be installed, at least v0.76 (https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html)
- Set analyzers IP list into list_ip.txt file, one per line
- You can change delay between reboot into reboot_hard.bat, tempo variable
- Then run reboot_hard.bat script

165.3 FAQ

If the analyzer is off and you want to start it, you need a reboot box. Ask OROS if you need it.

166 PC Requirements

Minimum	1 GB (Waterfall depth depends on available memory of RAM) / 250 MB free on HD + storage for measurements and signals / 1024 x 768 display
Minimum	**CPU : Quad core processor** (Desktop : Intel Core i3 or Ryzen 3, Laptop : Intel Core i5 or Ryzen 5. Do NOT use AMD Raedon as a graphical board) **RAM : 4 GB** (This "low Ram" will impact the "waterfall depthness") **GPU : VRAM 1 GB**, 1024 x 768 display **Storage : HDD**, 1 GB+ storage for signals
Recommended	**CPU : Quad core processor** (Desktop : Intel Core i5 or Ryzen 5, Laptop : Intel Core i5 or Ryzen 5. Do NOT use AMD Raedon as a graphical board) **RAM : 16 GB** **GPU : VRAM 2 GB**, 1920 x 1080 display (not 4K screen) **Storage : SSD**, 1 GB free + storage for signals
Intensive	**CPU : Six core processor** (Desktop : Intel Core i7 or Ryzen 7, Laptop : Intel Core i7 or Ryzen 7. Do NOT use AMD Raedon as a graphical board) **RAM : 32 GB** **GPU : VRAM 2 GB**, 1920 x 1080 display (not 4K screen) **Storage : SSD**, 1 GB free + storage for signals
Connections	**OR3 XTW and OR10** : Type: **Ethernet 1000 BASE-T**, 1 Gb/s : Connector: **RJ45** **O4: USB 3.0 type C** for data & Power > 7 watts For removable disk: **USB 3.0** / For dongle key: **USB 2.0**
Operating systems	**Windows 10** / **Windows 11** (32 bits or 64 bits) / **For report: Microsoft Office 32 bits only** (not 64bits) (Excel-word Professional edition):

167 Re-install on a new PC and keep the same configuration

If you want to keep the same configuration from a PC to another one let's find the file than you need to manually transfer.

167.1 On install folder of NVGate (next to NVGate.exe) transfer:

key files:

- EncryptDongleKey_XXXX.bat
- EncryptHardwareKey_YYYY.bat
- h_XXXX.cfg
- o_YYYY.cfg

With: XXXX : serila number of analyzer YYYY : serial number of usb dongle.

exemple:



Sensor database file:

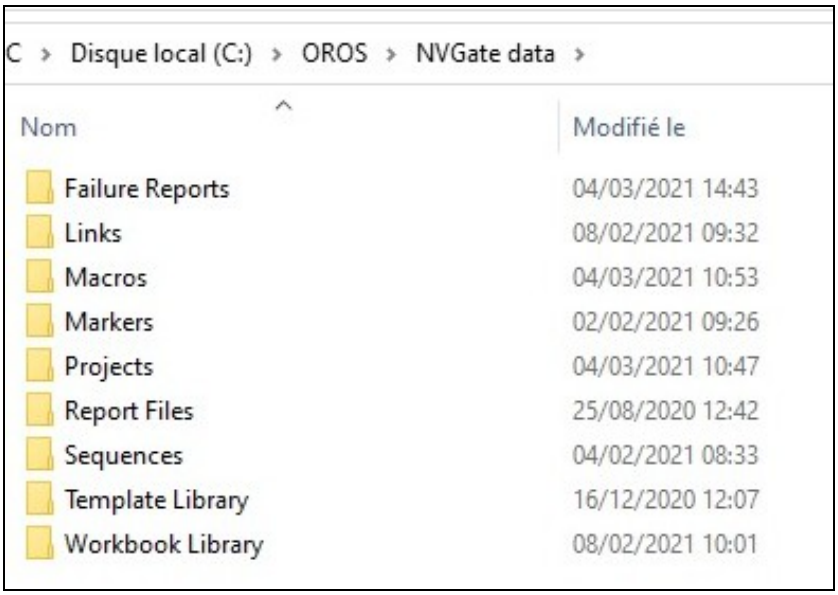
transducerdb.cdb

User preference:

NVGate.usr

167.1.1 NVGate project database

Here you will have the projects, macro, model sequence wich are saved.



By default it is here : C:\OROS\NVGate data\

(if it is not : You can find the project database of NVGate launching NVGatecfg.exe (next to NVGate.exe), here you will find the local foler of your database.)

To keep the exact same configuration, We advise to tranfer all the folder on this database (projects, links, macro, workbook library.....) to the new PC.

168 Repair record

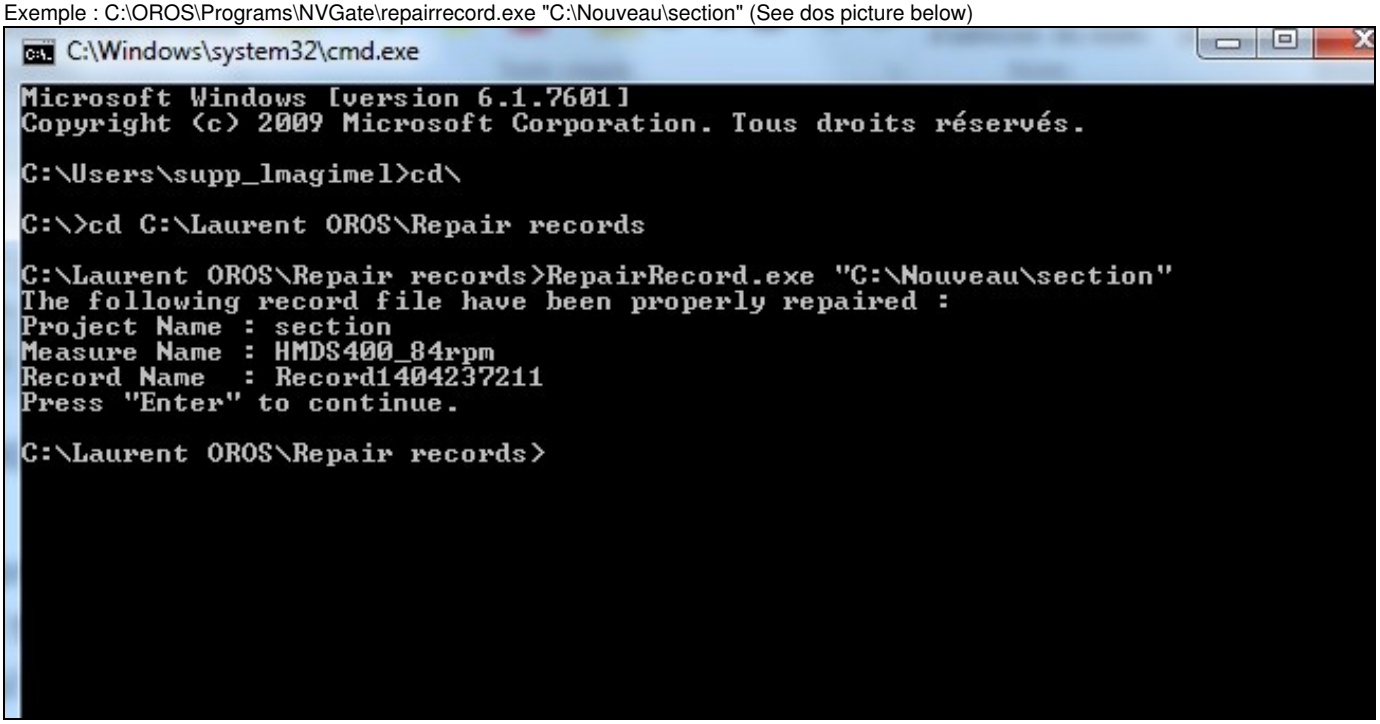
This is development tools wich allow you to recover a corrupt signal.

- First do a copy of the signal that you want to recover . Put it in another directory than NVGate project base. (Warning : This is really important using this tool can delete all the signal on a folder !)
- Download repairrecord.exe the last version below:

repairrecord.exe from may 2024 https://orossas.sharepoint.com/:u:/g/support/Ef-ZqaJ4fuRDlMeGXYnY-6cB-ITCt9Kp9_sF8aUIm1Qy_w?e=SLzPYk

- Extract all the file and put it next to NVGate.exe (by default : C:\OROS\Programs\NVGate)
- Launch a "dos prompt" .
- Put the command line after RepairRecord.exe then the folder of the NVGate project that you want to recover .

Exemple : C:\OROS\Programs\NVGate\repairrecord.exe "C:\Nouveau\section" (See dos picture below)



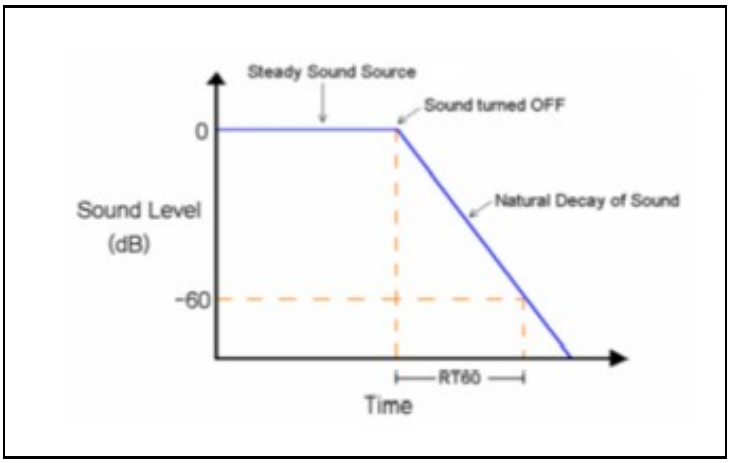
- The software is scanning all the signal in the folder and try to recover it, if he can?t recover the signal, the signal can be delete?.
- Now you can import the signal in NVGate.
- I recommend to re-record the signal with NVGate, (from player to recorder) then I recommend to be careful about the end of the signal. (By re-recording the signal, you can delete the end.)

169 RT60 Calculator

Reverberation in acoustics is the persistence of sound after a sound is produced. Reverberation, or reverb, is created when a sound or a signal is reflected causing a large number of reflections to build up and then decay as the sound is absorbed by the surfaces of objects in the space ? which could include furniture, people, and air.

Definition: RT60 means '" Reverberation time - 60 dB". In other words, it means "how long a sound needs to decrease to 60 dB from it is initial energy level".

RT60 Measurement is used to define the Reverberation Time of a room in order to qualify this one.



169.1 Principle

The principle is to measure the RT60 for each third octave frequency band. Then, all these bands are combined to determine a global reverberation time.

169.1.1 Configuration

According to this method, the following plug-ins of NVGate are used:

- OCT plug-in: to have the energy level by frequency band
- Waterfall plug-in: to analyze the OCT profile
- Noise generator: you can use an OROS OR3X analyzer to generate a noise

The corresponding NVGate project is already done. You can find it in the folder "RT60 NVGate Project". An example is also available below.

Notes: This program is working with NVGate V11.00 and later.

169.1.2 Calculation

After the measurement, import the data into the excel sheet. This document combines each frequency band and automatically calculates the reverberation time.

Please find the mentioned excel sheet in the folder "OROS RT60 Calculator". A tutorial is also available below.

169.2 Package

169.2.1 Download

Please contact your local distributor for access to the RT60 package.

Schedule a demo Get a quotation Contact support

169.2.2 Package composition

- NVGate project folder
- NVGate project
- OROS Calculator Folder
- RT60 Calculator.xlsm

169.3 RT60 Measurement

169.4 How to use RT60 NVGate model

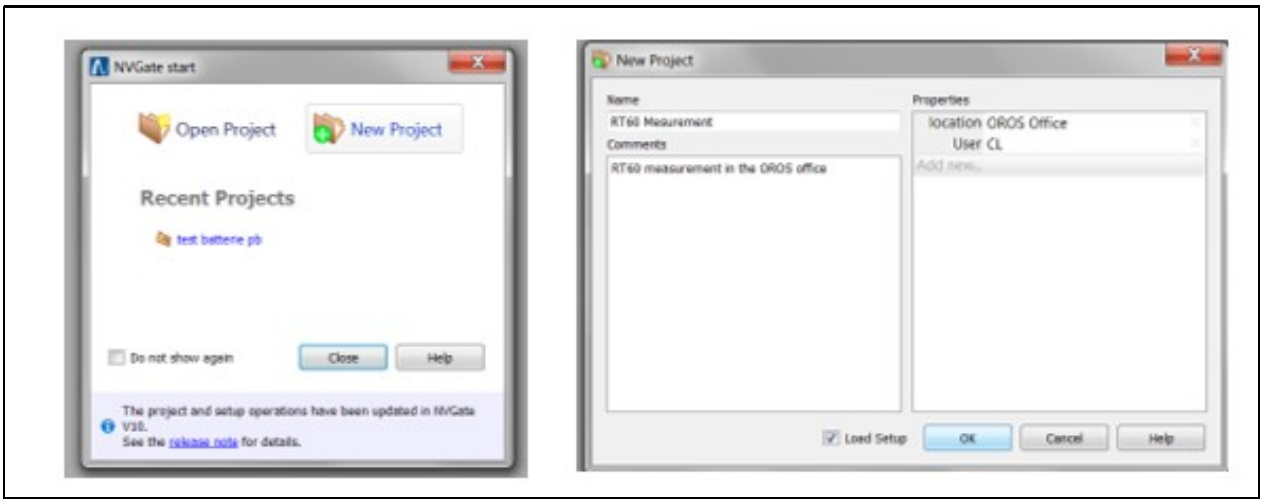
169.4.1 Video Full tutorial

Note : The configuration project create on the video(step 1 to 7) is directly on the package, do not need to rebuild it.

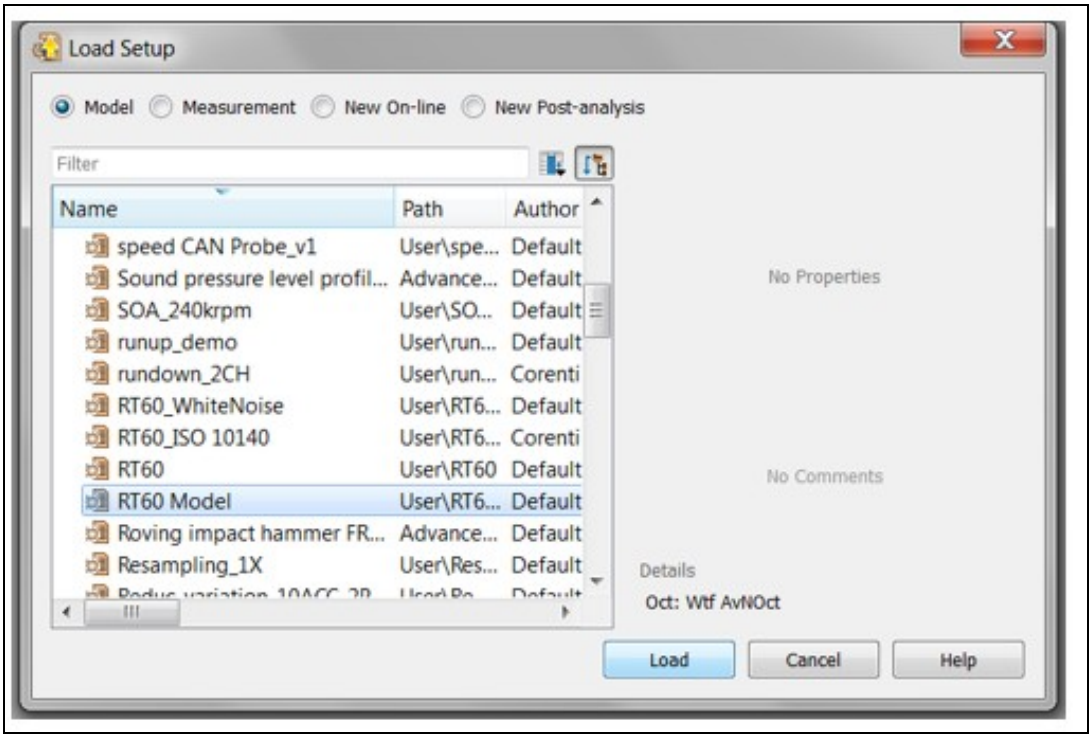
169.4.2 Import the NVGate model into NVGate and perform the measurement

1- Copy the entire folder "RT60 third octave" and paste it into your NVGate model database. By default, the NVGate model database is located in: "C:\OROS\NVGate data\Workbook Library\User".

2- Create a new project in NVGate.



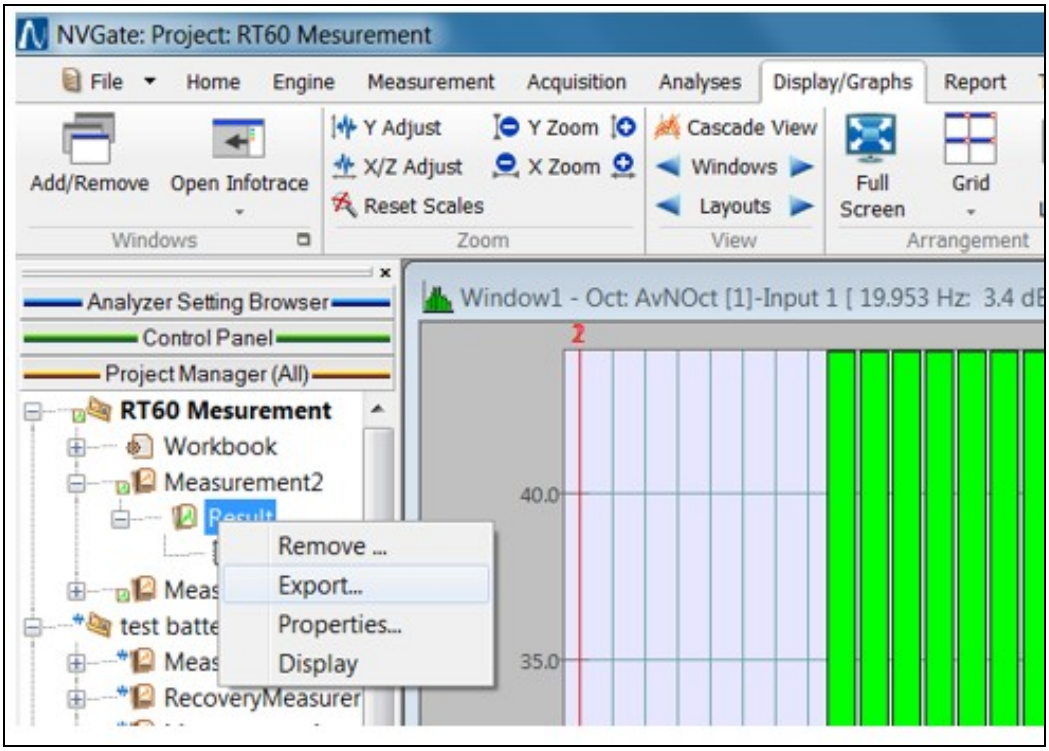
3- Then, select the "RT60 Model" in the next window and click on "load".



4- Adjust the threshold of the EDGE 1. This event should start the waterfall.

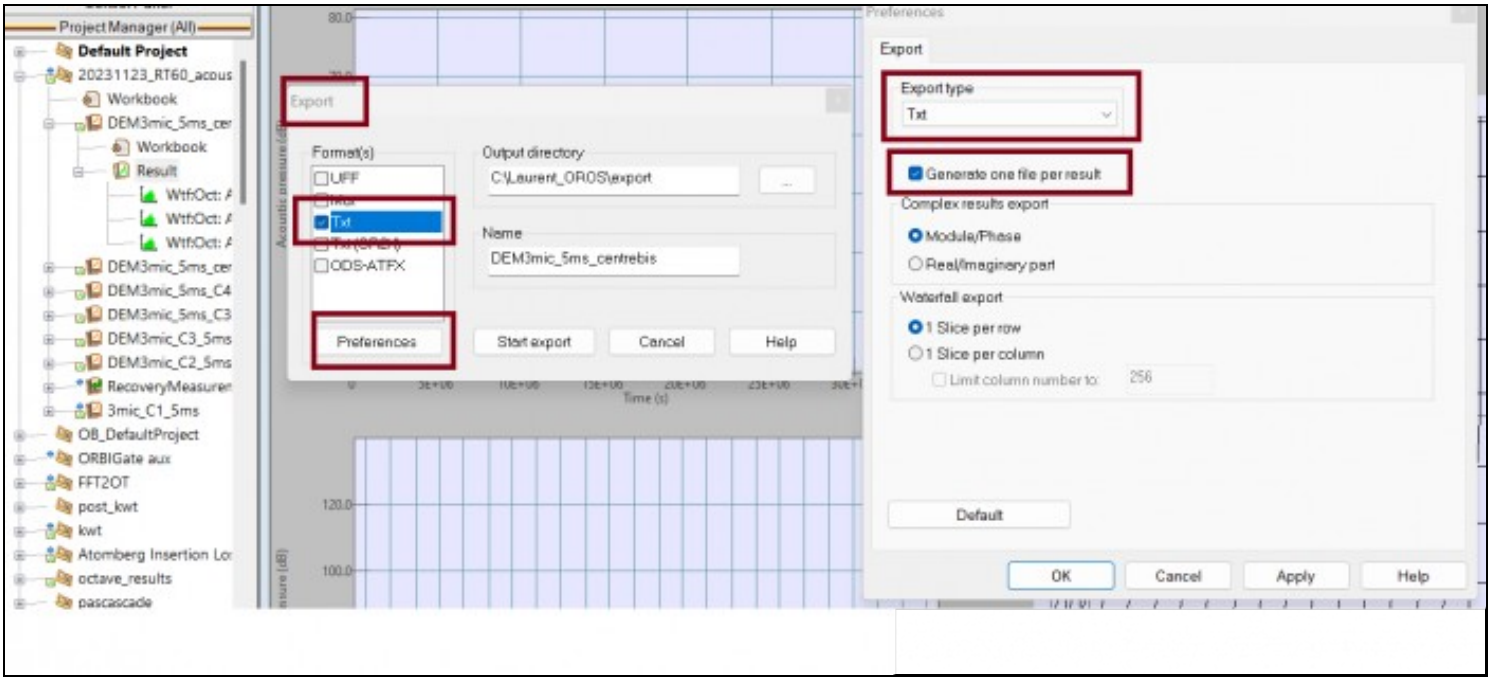
5- Your measurement is ready; just start the measurement and stop your sound source just after.

6- Your measurement is saved and located in the project manager. There, right click on the result of your measurement and select export.



7- Finally, export your result in a .txt format.

On user export preference, use : "generate one file per result"



8- open the "OROS RT60 Calculator.xlsm".

169.5 How to use the OROS RT60 Calculator

169.5.1 Import file

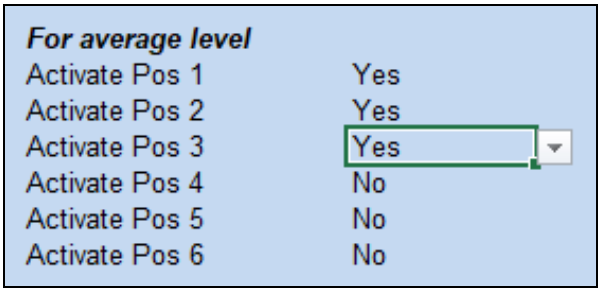
1) In the tab "pos 1" of the Excel file "OROS RT60 Calculator", click on the "Import data position 1" button.



2) Then, select the .txt file to import.

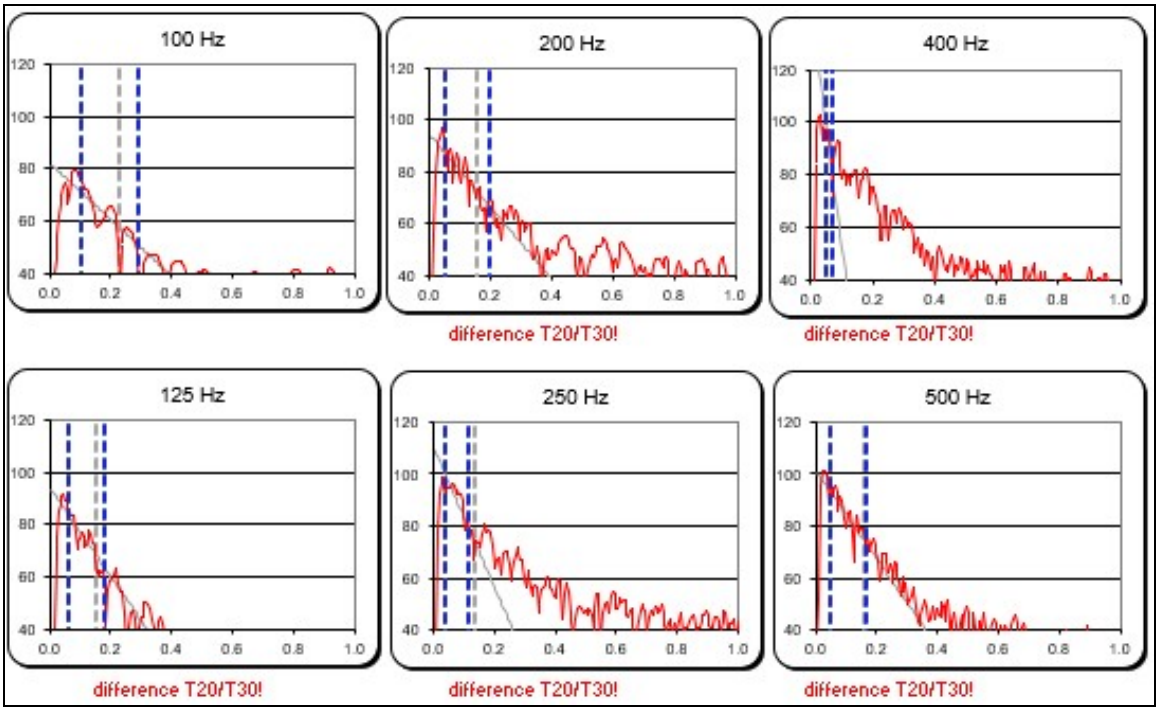
3) Import the data of the other positions (using the same procedure).

4) In the "average level" tab, the average level of all the imported positions is automatically calculated. It is possible to deactivate a position in the settings tab:



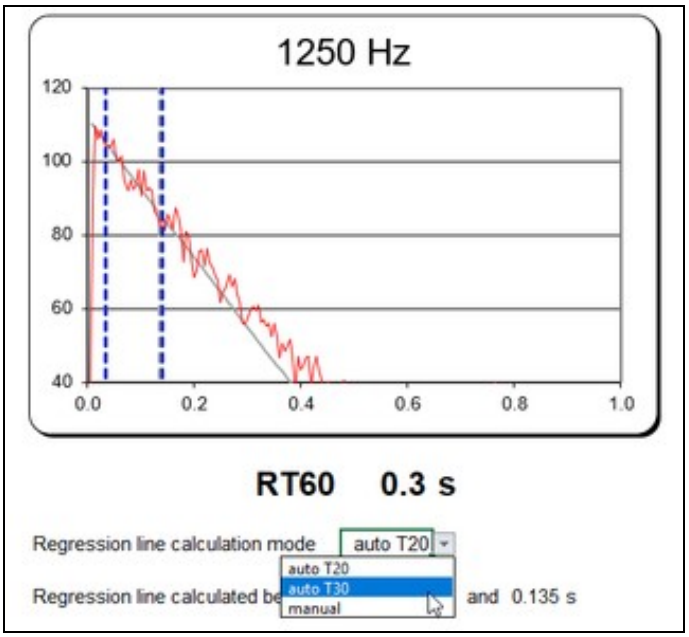
In this example, the average level ? and RT60 - will be calculated for positions 1, 2 and 3.

5) In the "overview" tab, you can have a look at the decay curve of each third octave band and check the regression line.

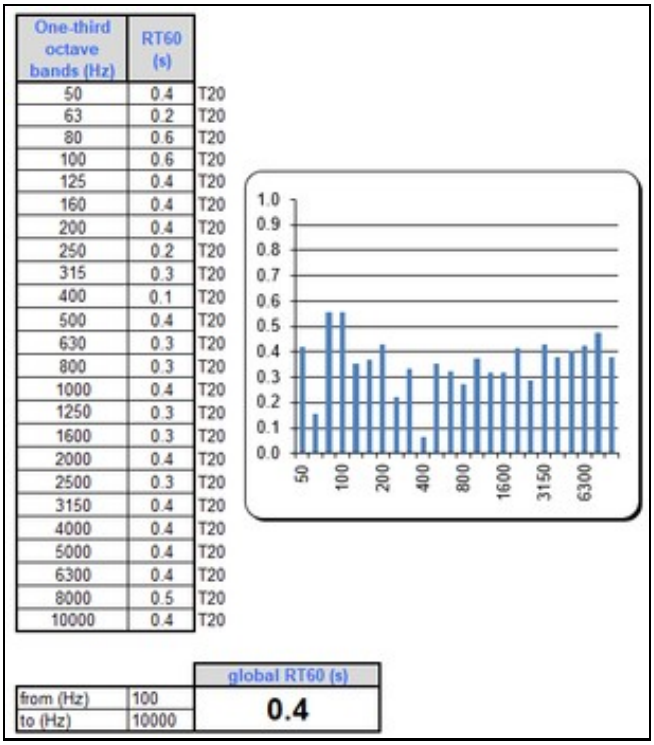


Part of the "overview" tab

6) If needed, it is possible to change the calculation mode (T20 / T30 / Manual) to see which one better fits the curve. For that, go to the tab corresponding to the third octave band frequency.



7) The report includes the RT60 values and the calculation mode (T20 / T30 / Manual ("m")) for each third octave band, a graph and the global RT60 value. You can change the frequency band for the global RT60 computation (from? to?).

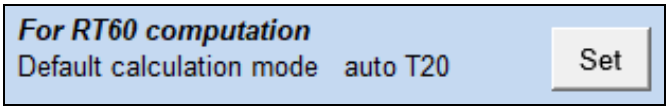


One-third octave bands (Hz)	RT60 (s)	
50	0.4	T20
63	0.2	T20
80	0.6	T20
100	0.6	T20
125	0.4	T20
160	0.4	T20
200	0.4	T20
250	0.2	T20
315	0.3	T20
400	0.1	T20
500	0.4	T20
630	0.3	T20
800	0.3	T20
1000	0.4	T20
1250	0.3	T20
1600	0.3	T20
2000	0.4	T20
2500	0.3	T20
3150	0.4	T20
4000	0.4	T20
5000	0.4	T20
6300	0.4	T20
8000	0.5	T20
10000	0.4	T20

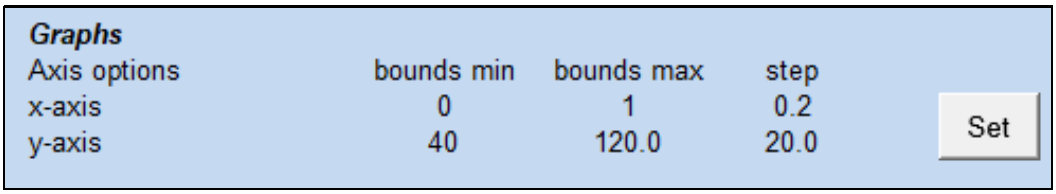
		global RT60 (s)
from (Hz)	100	0.4
to (Hz)	10000	

169.5.2 Tips

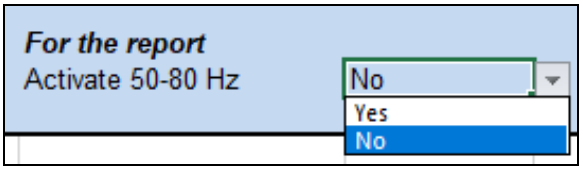
1) In the settings tab, you can change the calculation mode for all third octave bands:



2) In the settings tab, you can choose the bounds of the graphs and click on "set" to change automatically the axis of all graphs.



3) To not display the 50, 63 and 80 Hz values in the report, adjust the following fields in the settings tab:



4) if any issue using the excel file "impulsive source" use this one "RT60 calculator impulsive source_corr" from november 2023

Schedule a demo Get a quotation Contact support

170 Sound Intensity Manual

Sound Intensity presentation - Easy to use, application-oriented for your efficiency

170.1 Installation

170.1.1 Equipment required for the installation

USB drive containing OROS Sound Intensity software installation setup "setup.exe".

NVGate software must have been installed first.

Adobe Acrobat Reader must have been installed.

OROS Sound Intensity dongle.

170.1.2 Installation of NVGate software

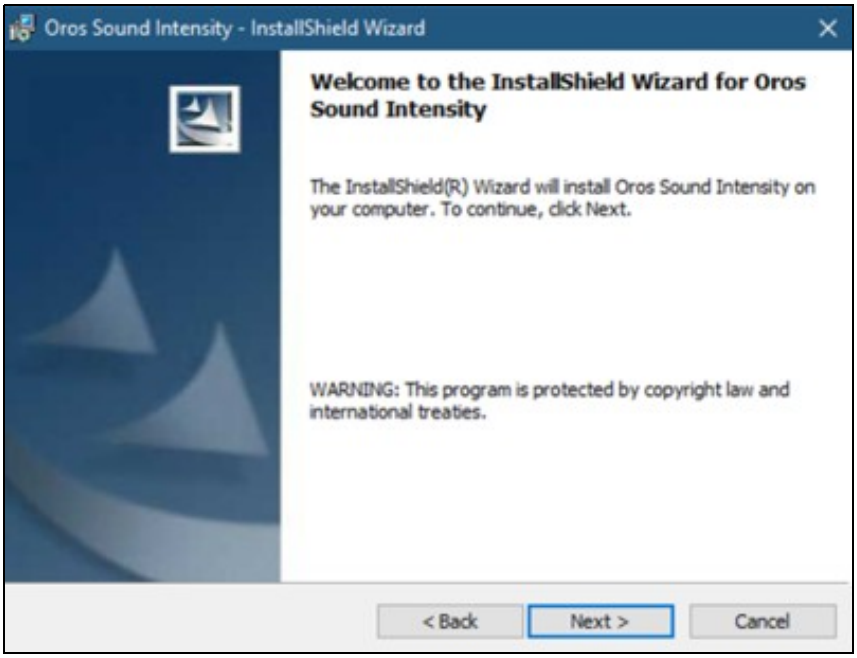
First you need to install NVGate.

170.1.3 Installation of Sound Intensity software

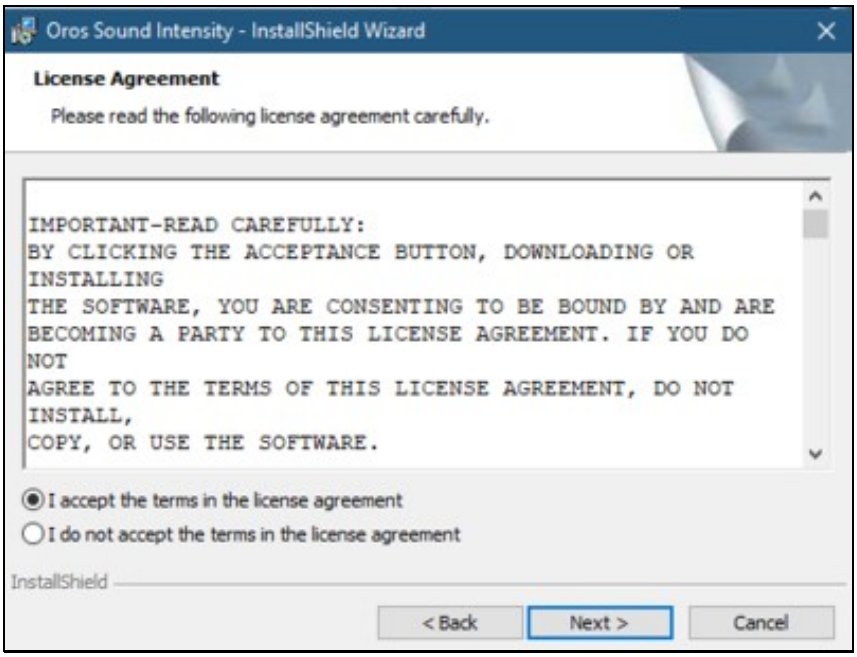
Run " setup.exe " program, and the following window is displayed:



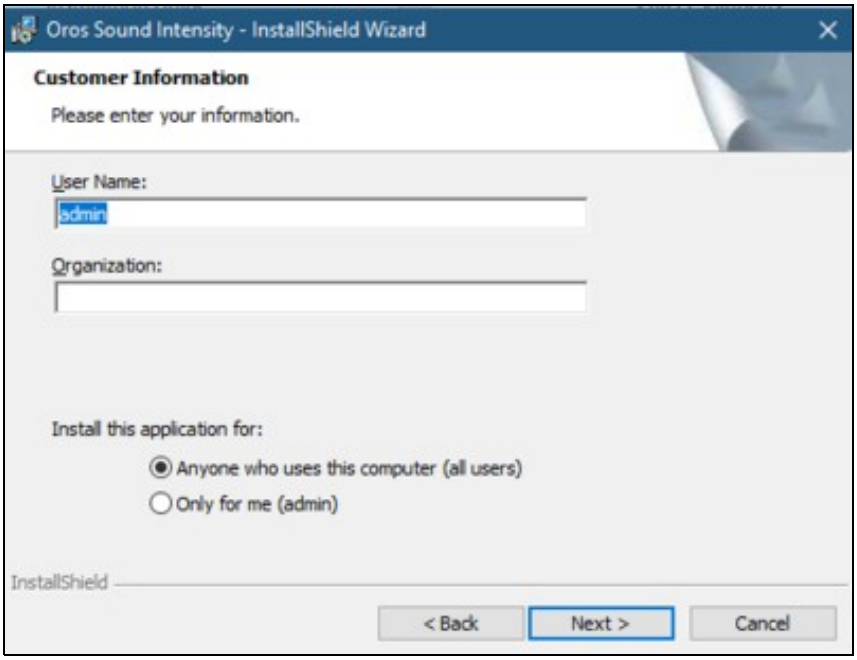
Click on ?Next >?, and the following window is displayed:



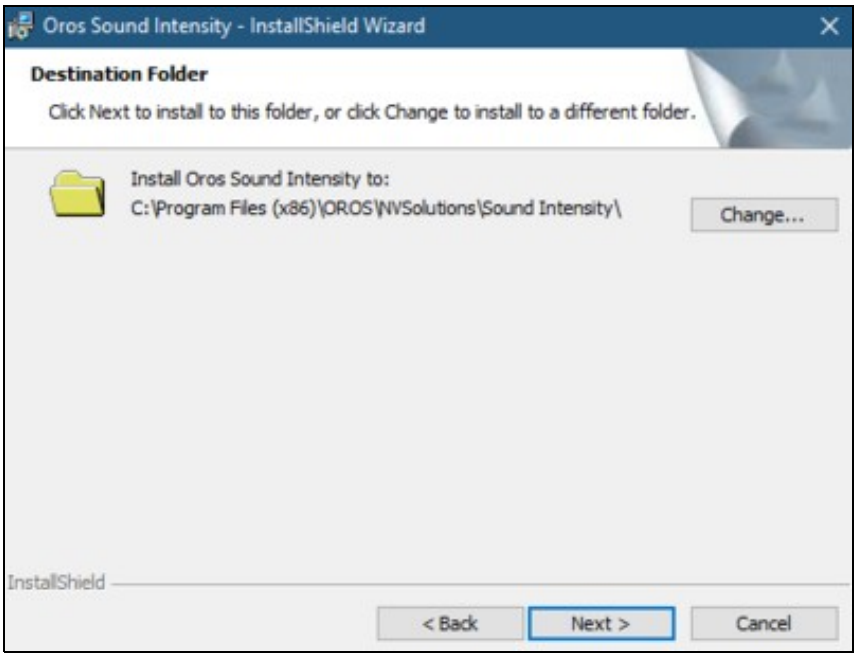
Click on ?Next >?, and the following window is displayed:



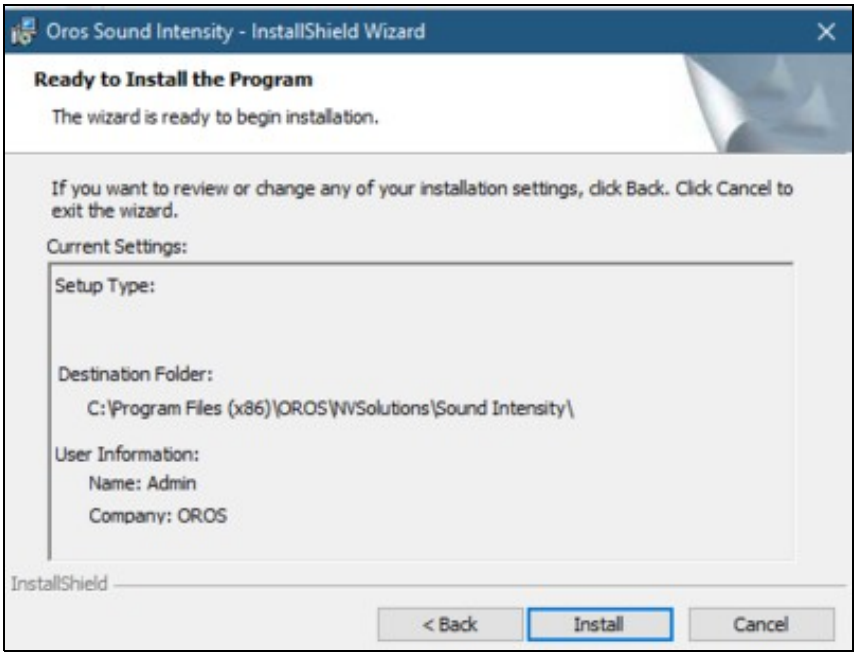
Read the terms in the license agreement and check ?I accept the terms in the License Agreement? if you agree. Click on ?Next?, and the following window is displayed:



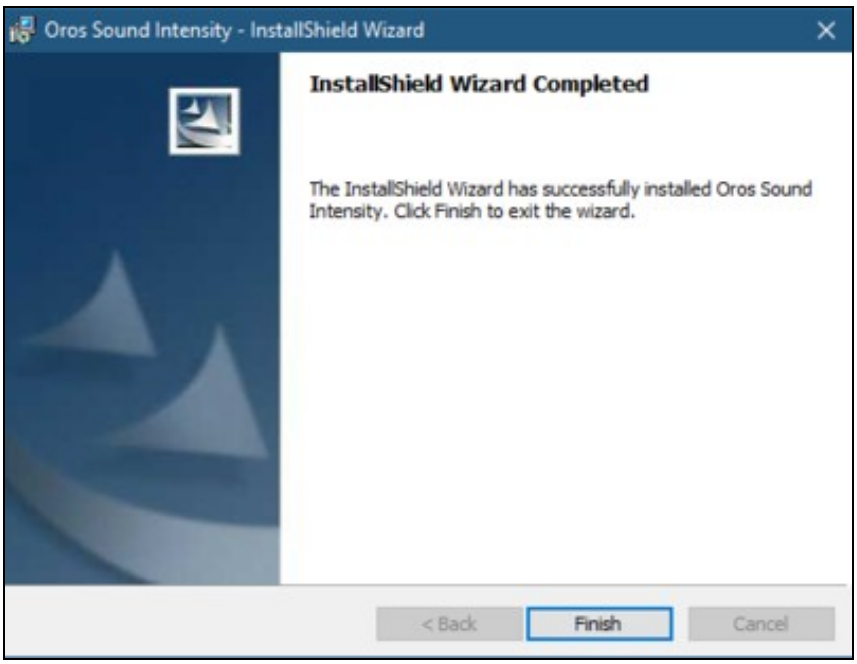
Input the information and click on ?Next >?, and the following window is displayed:



Select the installation directory, and click on "Next", the following window is displayed:



Click on ?Install?, and let the setup wizard proceed to the full installation. Do not abort the installation process. When it is done, the following window is automatically displayed:



Click on ?Finish? to exit the setup wizard, and OROS Sound Intensity software is successfully installed.

NOTE: Before launching the software, please make sure that both the general OROS USB dongle and the dedicated Sound Intensity USB dongle are plugged.

170.2 Update the keys

This process have to be done if you have update the software and/or add a new option in the software.

-Download Haloren and Halorid here.

-Plug your dongle

-Launch Haloren.exe

-Search the .duf (provide by your local support)

-click on "code".

The dongle is updated.

Known issue. : If this is not working, launch Halorid.exe, clik on "read data" and send a print screen to your local support.

171 SOUND INTENSITY User's manual

171.1 Measuring Sound Power using Sound Intensity: The basics

The sound power radiated by a noise source equals the sum of the scalar products of the sound intensity vectors by the elementary area vectors over a surface enclosing the sound source.

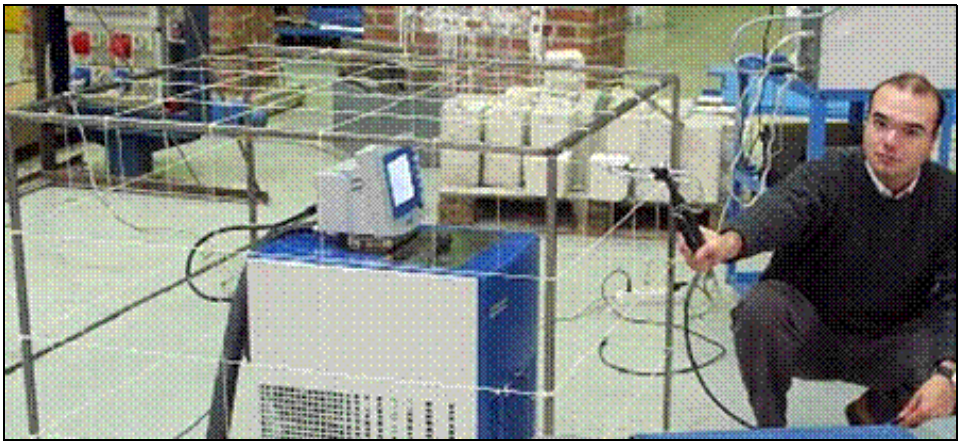
The OROS Sound Intensity package has 2 main objectives:

1. Calculate the sound power of a source from intensity measurements;

2. Allow a 3D representation of the sound emission distribution on the measurement grid.

The procedure followed by the software complies with the prescriptions of the International Standard ISO 9614. Such a tool is particularly helpful when one of the field indicators specified in the standard does not satisfy the necessary requirements. As a matter of fact, in some cases, the measurements must be repeated by successive refinements of the measurement grid. It's plain that this procedure could be rather time consuming.

The standard requires the definition of a measurement surface which encloses completely the noise source under test. Typically, the measurement area is a parallelepiped composed of five faces. Each of these faces is decomposed into discrete areas where measurement points will be positioned.



Typical Sound Intensity measurement

Each of these areas is called measurement segment or segment. In ISO 9614 Part I, each segment is associated with a measurement position whereas ISO 9614 Part II prescribes to scan the faces. The data stored during the measurement are the pressure and sound intensity levels in 1/1 or 1/3 octave bands.

According to the standard requirements the following information are also necessary have to be entered by the operator or calculated by the software:

- Description of the test source (Dimensions, etc. ?)
- Description of the test environment (Air temperature, Static pressure, etc. ?)
- Place and date of the measurements
- Expected grade of accuracy
- Test Equipment (Sound Intensity Probe type and S/N, Microphone pair etc ?)
- Calibration set-up and procedure
- Pressure Residual Intensity index (also known as PRI Index)
- Geometric parameters of the measurement surfaces and segments

During the measurement, the sound pressure spectrum and sound intensity spectrum have to be monitored and are usually displayed in real time (1/1 or 1/3 octave spectra or even narrow band FFT spectra). The real time performances of the OROS PC Pack enable the program to show and import directly any pressure and intensity data from the analyzer, allowing thus a real time control of the measurement. It is possible to set up the acquisition procedure (measurement sequence or random access to the data structure) to decide in which way to fill up the segments or how to complete the measurements. A three dimensional visualization both of pressure and intensity fields on the measurement surfaces is displayed using color contour

plots.

The calculation of the indexes defined by the standard giving information about the quality of the determination and hence its grade of accuracy is calculated repeatedly:

- Temporal variability indicator
- Pressure - Intensity indicator
- Negative partial power indicator
- Non uniformity indicator

If one of the indexes does not meet the requirements, the test procedure should be modified.

The Sound Power Level is calculated for each surface and each frequency complying with the ISO 9614-1 flowchart showing directly the steps the user must take in order to comply with the Standard requirements. A table gives a comprehensive insight of the field indicators computed for each surface taken into account in the sound power computation. The acquisition and calculation procedures include the treatment of one-octave and one-third-octave band data as well as FFT data. The Sound Power levels are calculated for each surface and can be displayed also for the overall measurement surface with or without "A" weighting. Finally the following parameters are displayed:

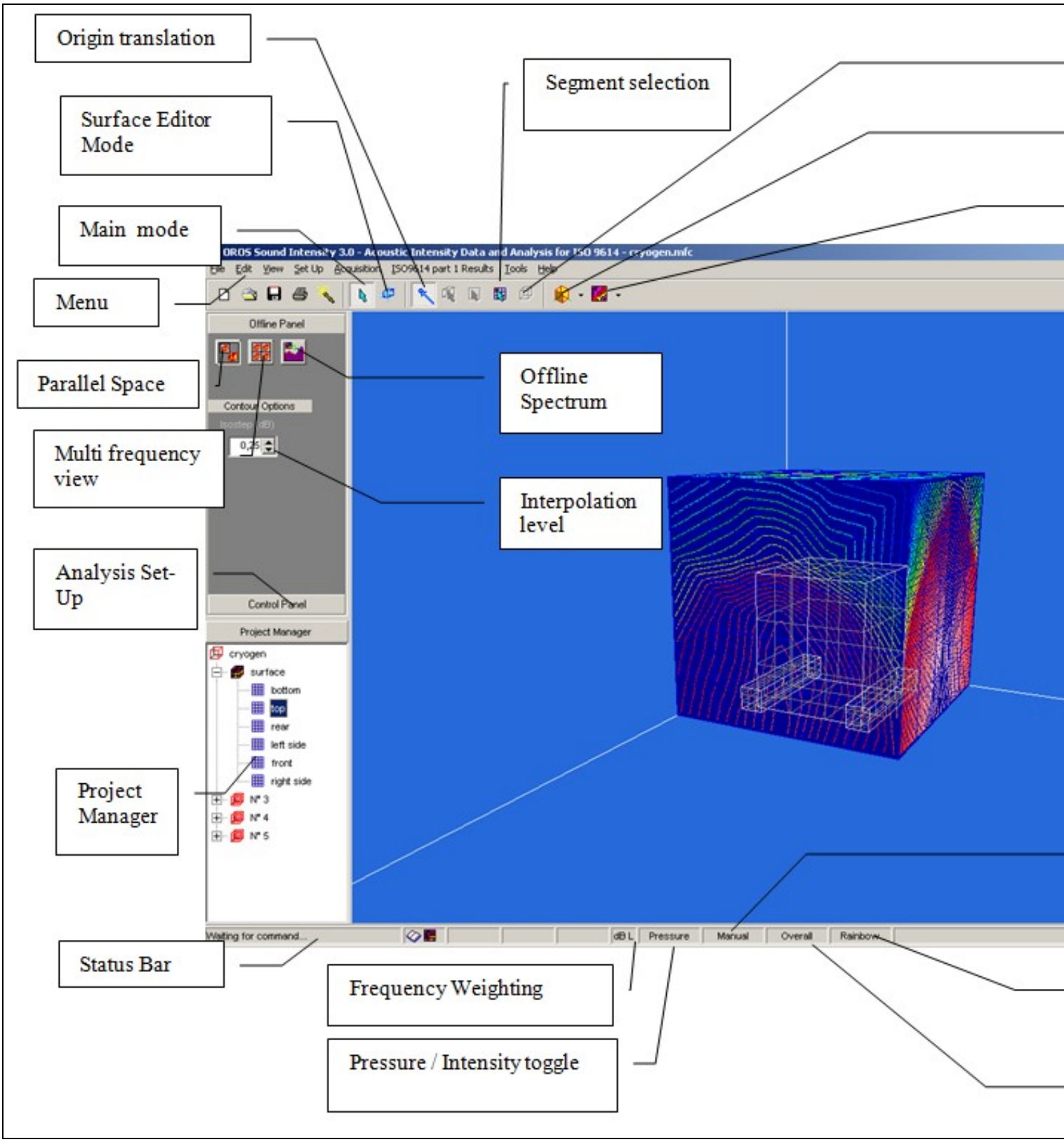
- Sound power level spectrum
- Sound Power Report

171.2 Operating Modes

The software is organized around two main modes that correspond to two steps of the measurement procedure:

- Measurement surface and environment design using the **Surface Editor Mode**
- Measurement set-up, data acquisition and analysis using the **Main Mode**

The following figure shows the main user interface during the **Main mode**:

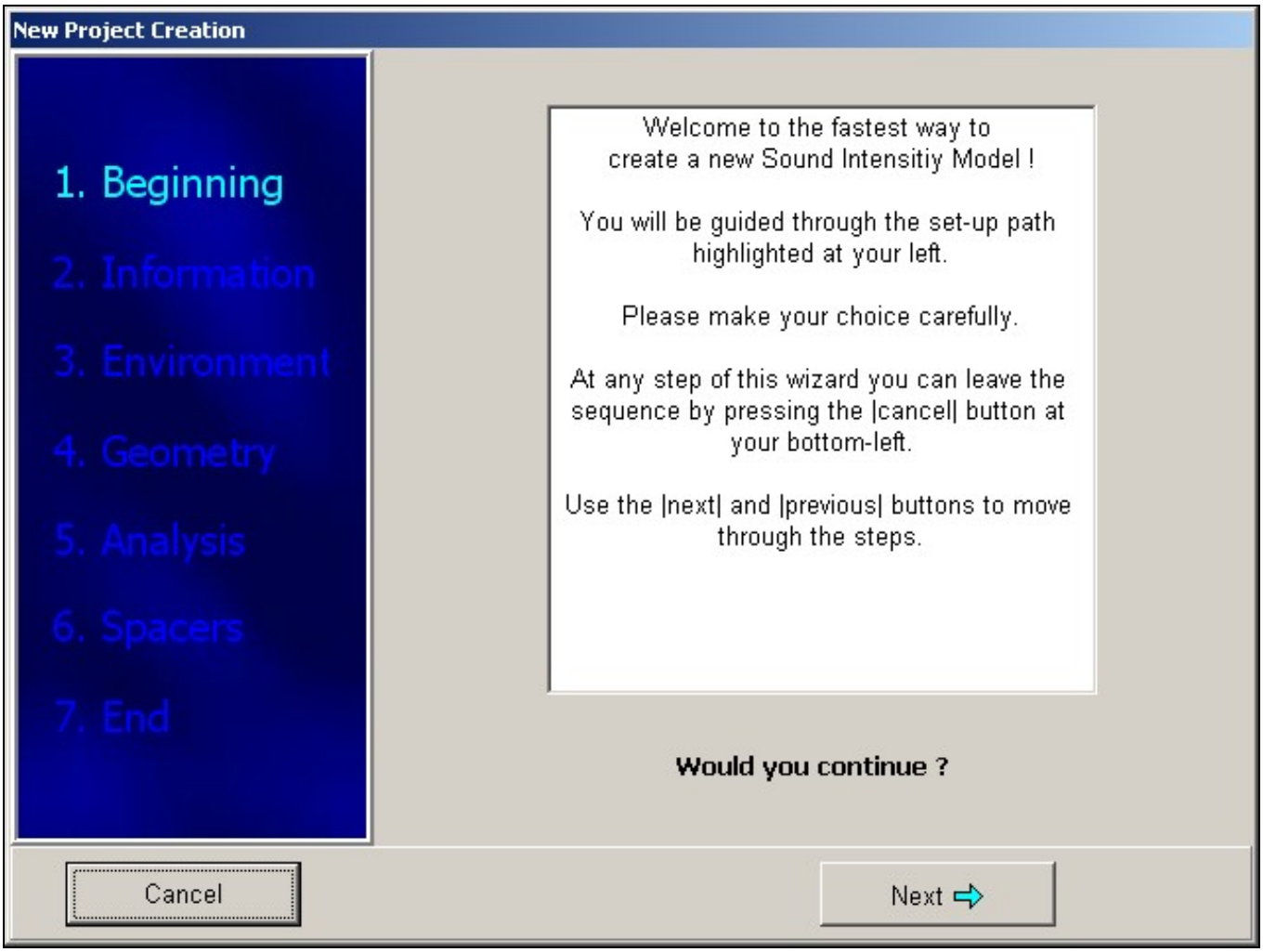

Origin translation
Segment selection
Surface Editor Mode
Main mode
Menu
Parallel Space
Multi frequency view
Analysis Set-Up
Project Manager
Status Bar
Offline Spectrum
Interpolation level
Frequency Weighting
Pressure / Intensity toggle
Offline Panel
Contour Options
Control Panel
Project Manager
cryogen
surface
bottom
top
rear
left side
front
right side
N° 3
N° 4
N° 5
Waiting for command...
dB L
Pressure
Manual
Overall
Rainbow

Main operation mode screenshot

These 2 modes have different objectives and consequently different functionalities will be active according to the active mode. One mode or the other is selected by pressing the corresponding icon in the task bar.

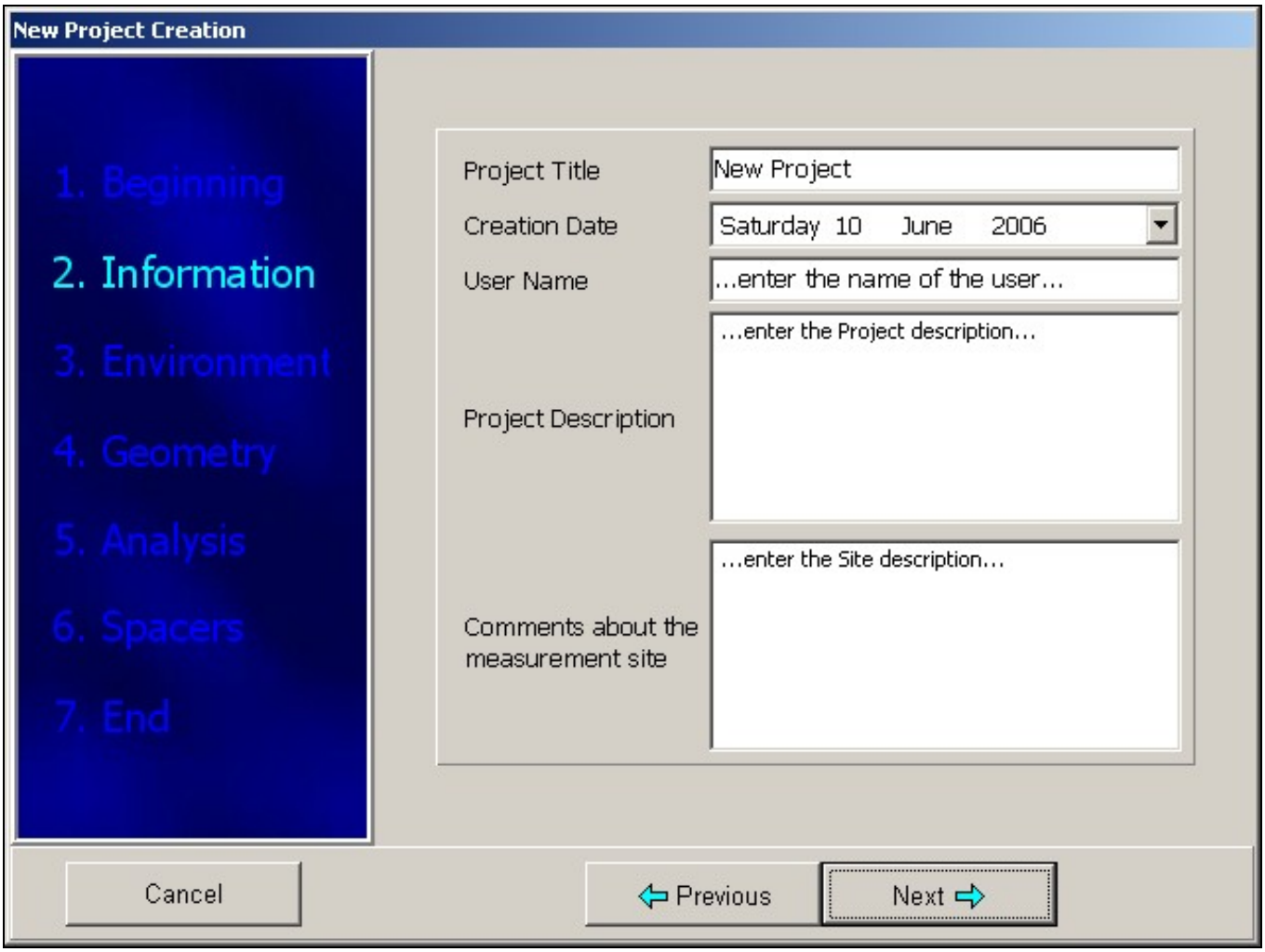
171.3 Wizard

The wizard is the fastest way to start with a new model. To start the wizard, select the wizard command from the file menu. The windows shown in the following figure will start guiding you through the next steps.



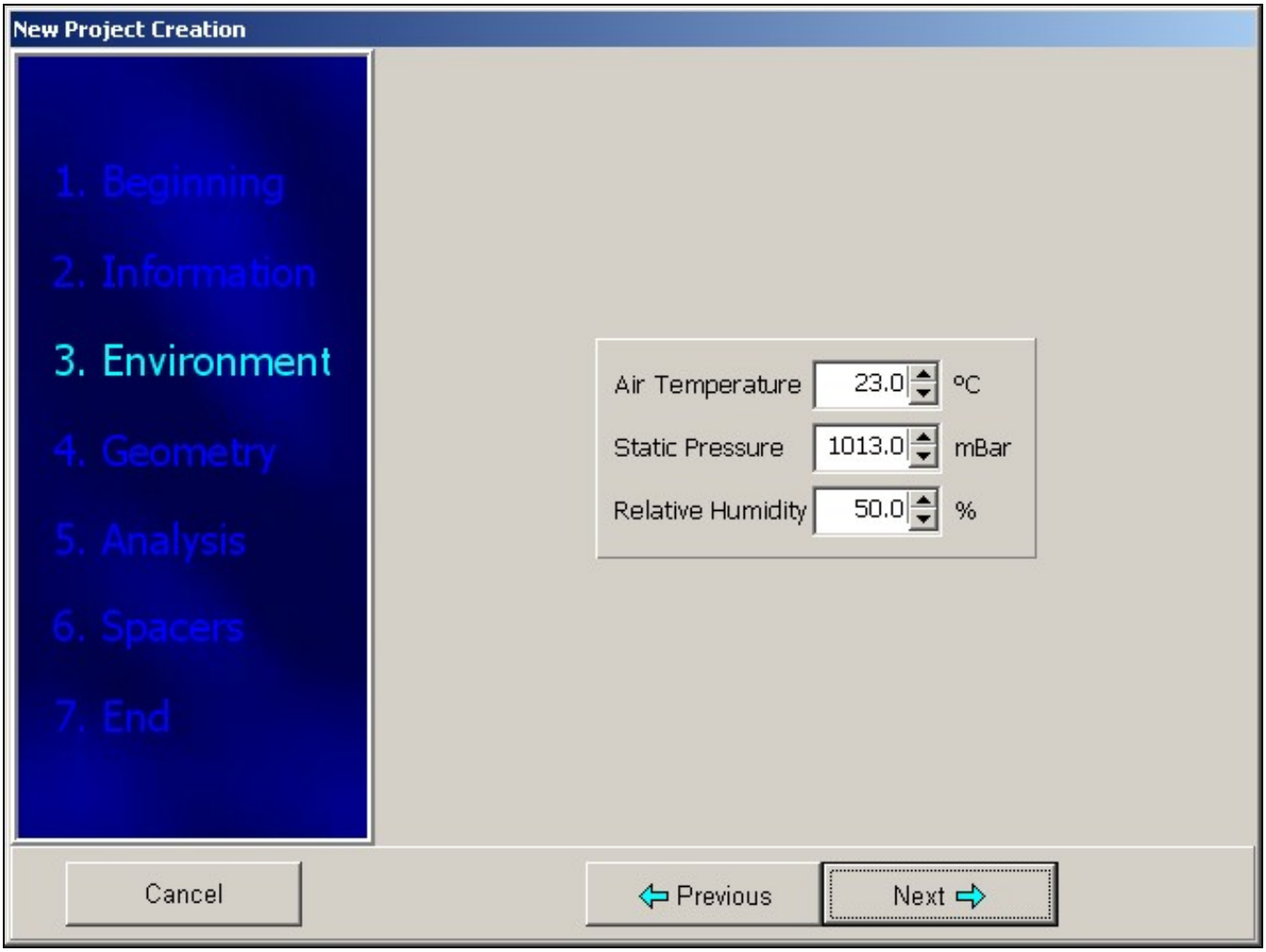
Start of the wizard

Clicking the Next button, the software will display the subsequently window, concerning the Project Name, the Creation Date, the User Name, the Project Description and the Comments.

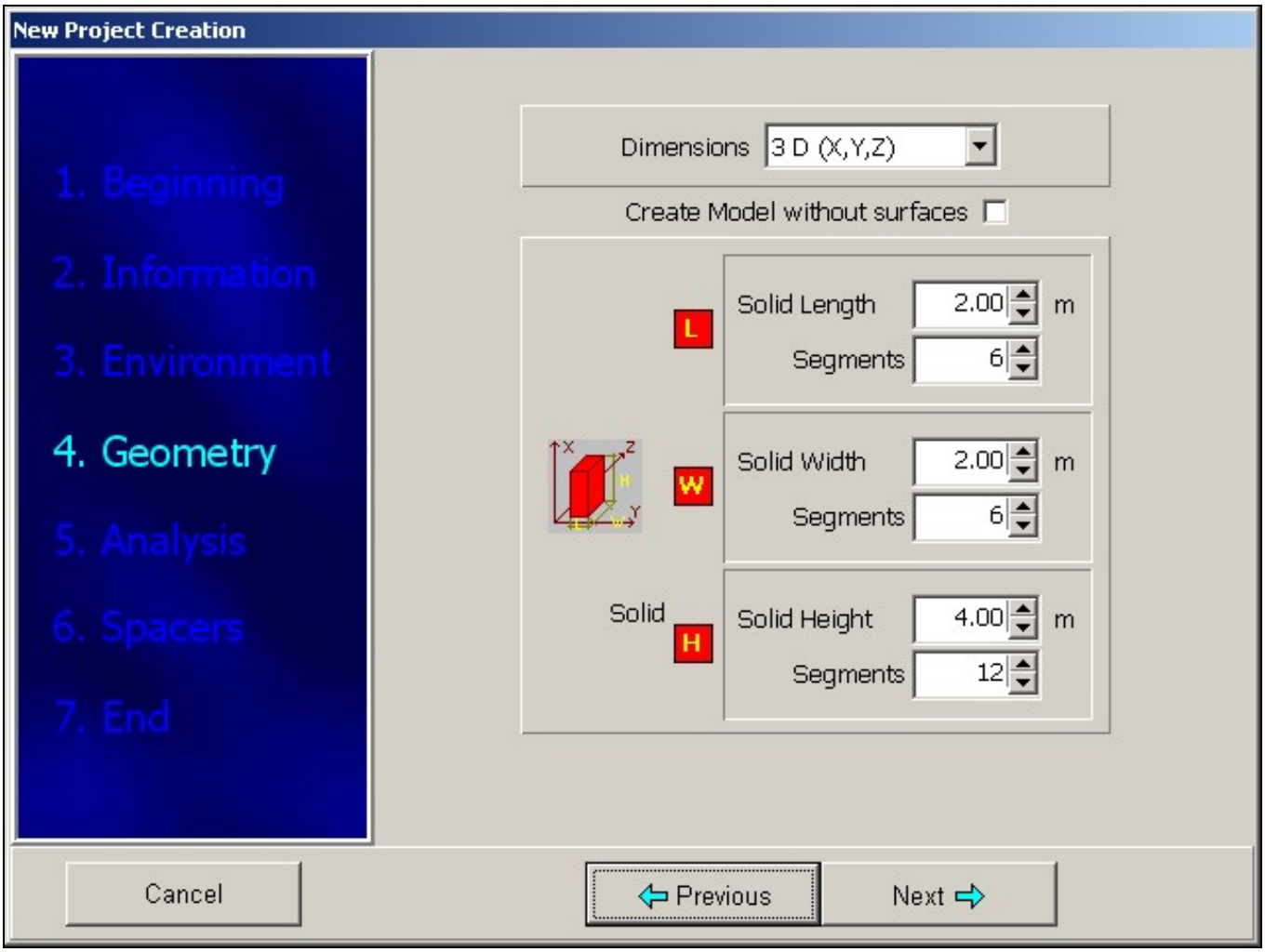


Information section of the Wizard

The next step is to enter the environmental data, such as Temperature, Static Pressure and Relative Humidity.

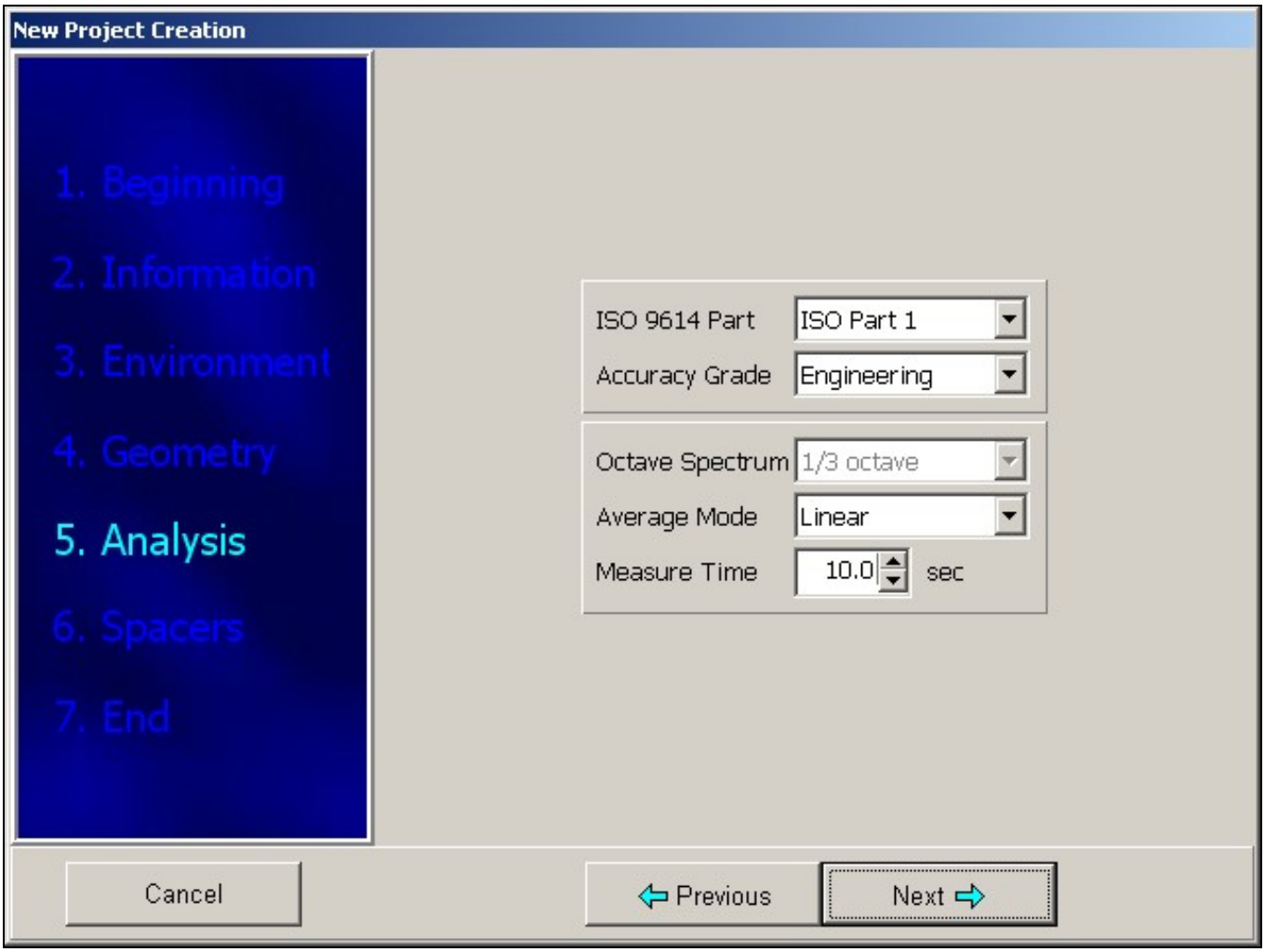


Then the user has to choose the type of project (2D or 3D), the dimensions of the control surface enveloping the sound source and the number of segments for each dimension.



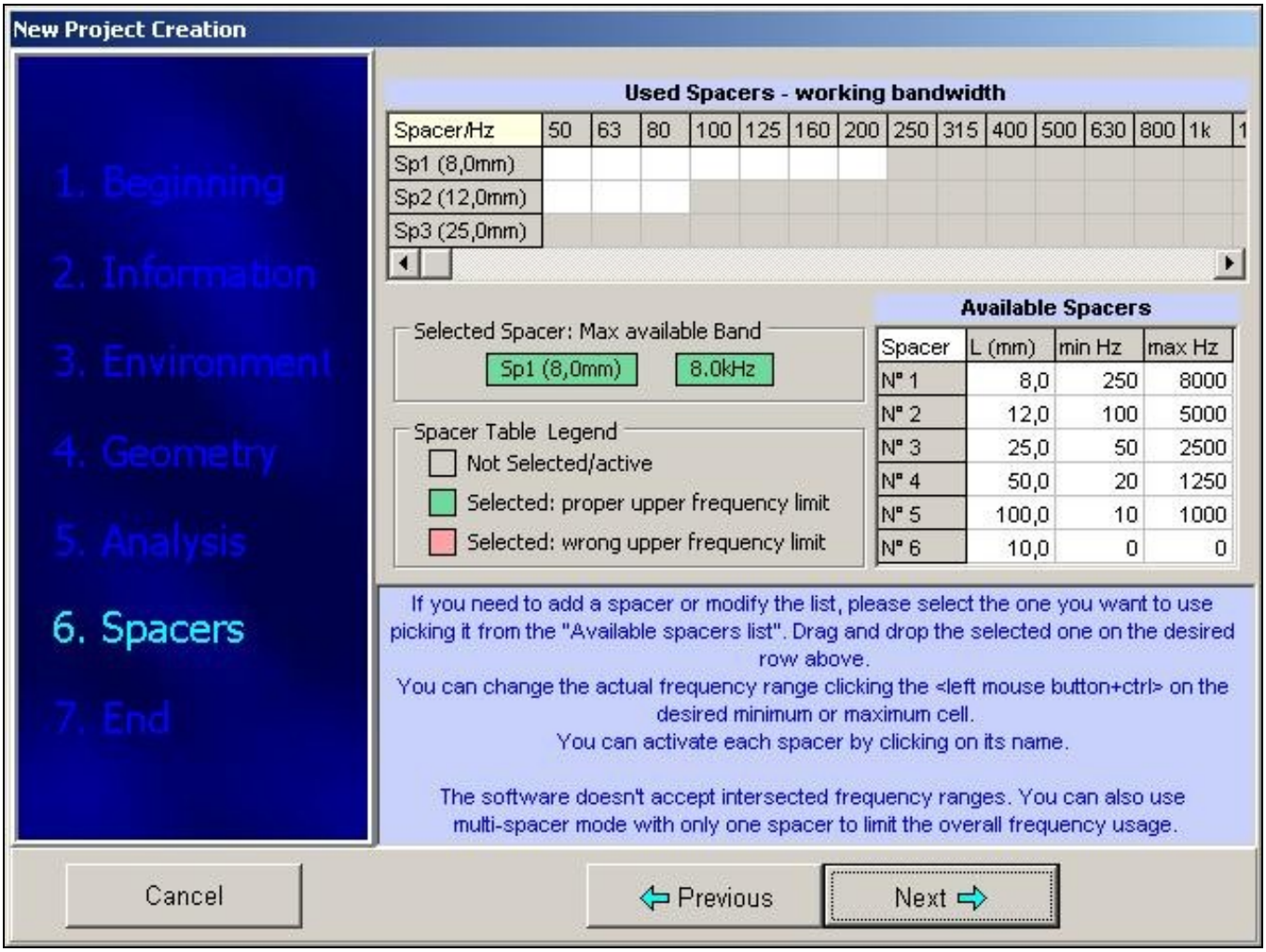
Geometry of the control surface.

The 5th section concerns with the selection of the analysis parameters. The user has to choose the Standard to use for the determination, the Grade of Accuracy, the Averaging Mode and the Averaging Time.



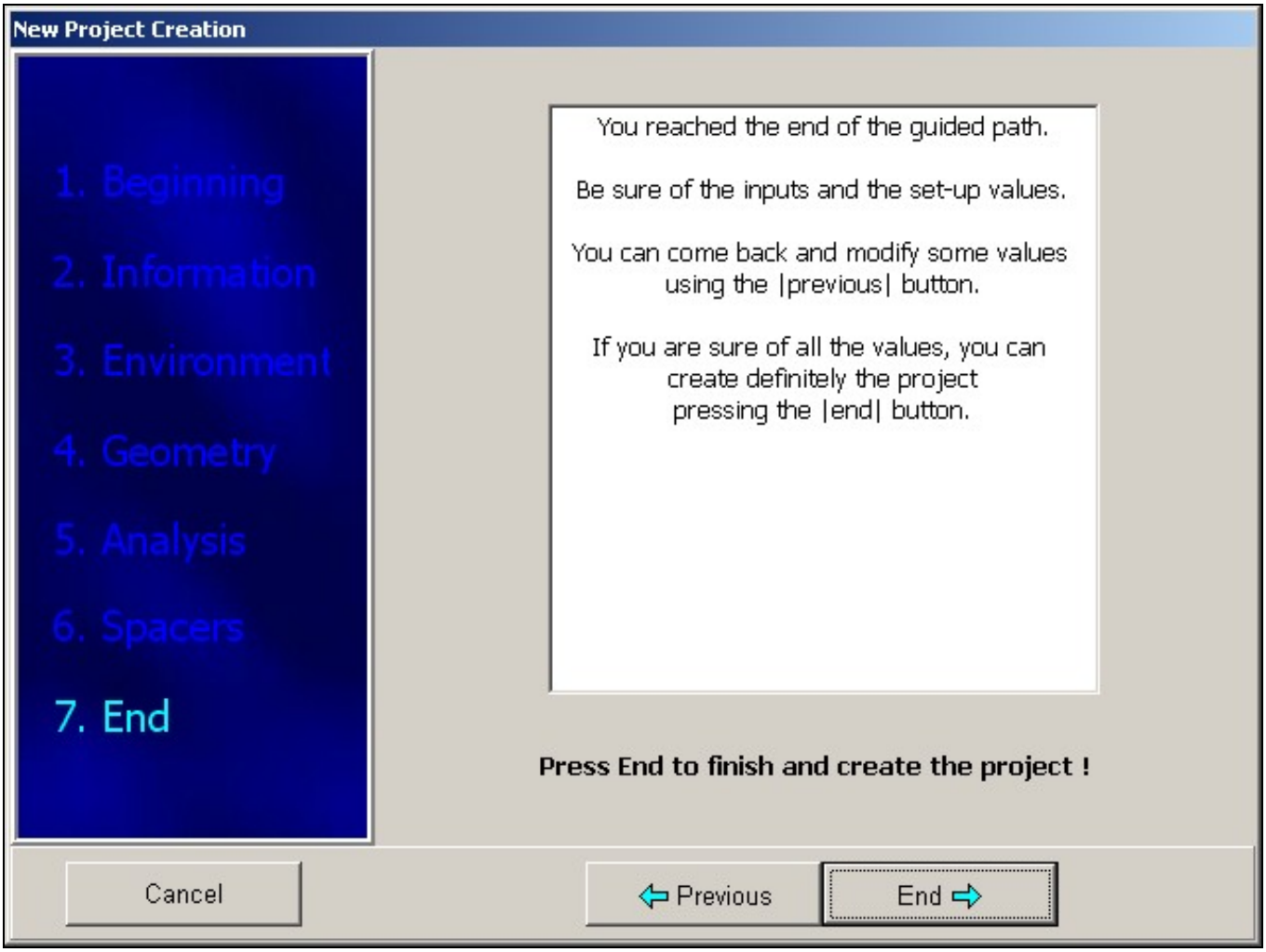
Set up of the analysis parameters.

In the next window, the user has to select the spacers used to cover the frequency span of interest.



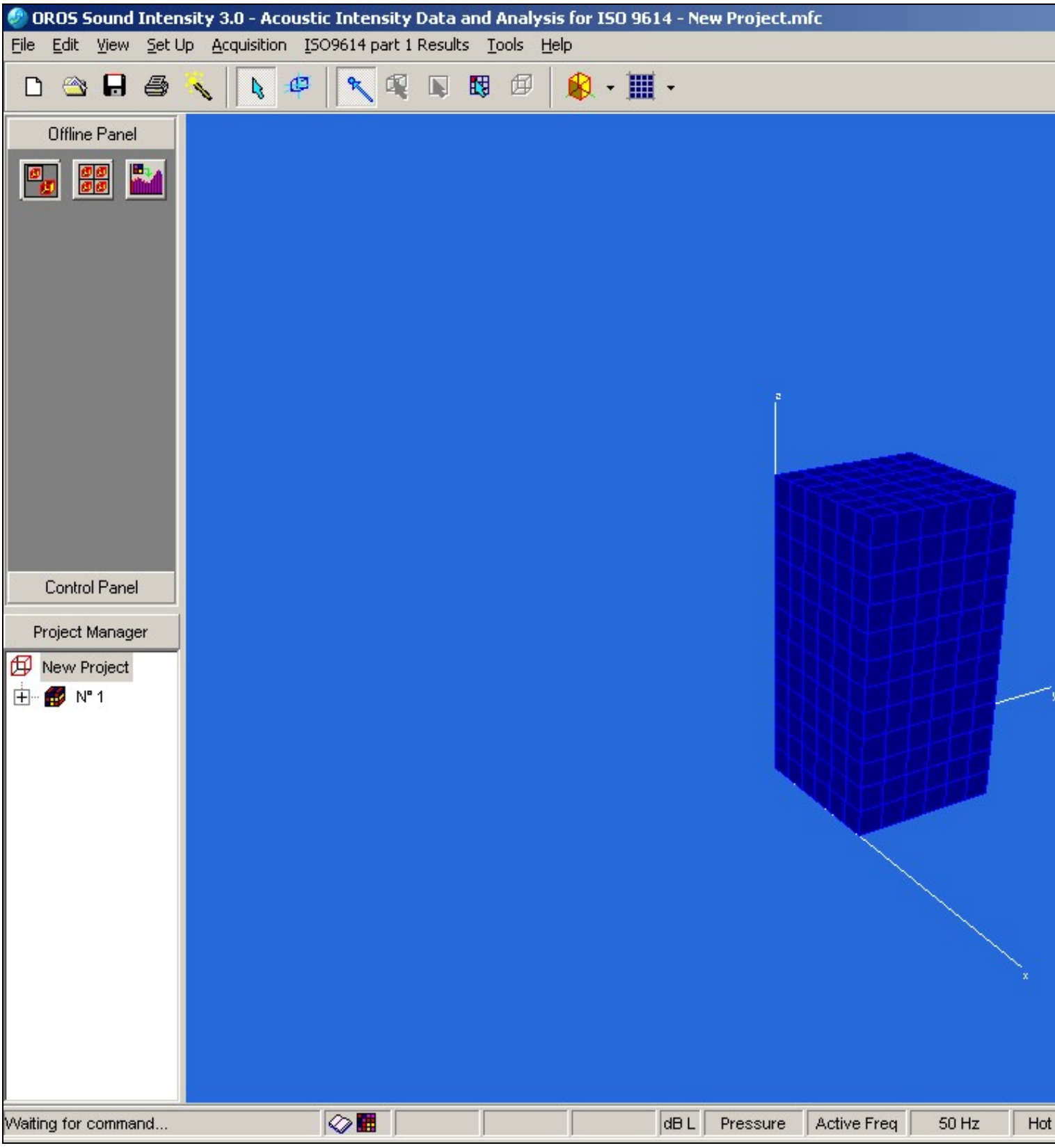
Spacer selection.

Select from the *available spacers list* the spacers you want to use during the measurement. Drag and drop the selected spacer on the desired row. To change the frequency range, click with the left mouse button on the frequency cell related to the desired spacer. The relevant frequency span lights up in green. To change the frequencies, the user has to click with the left mouse button on the lower or the highest frequency of interest while pushing the ctrl button on the desired minimum and maximum cells. You can activate each spacer by clicking on its name. The software rejects intersected frequency spans. You can also use multi-spacer mode selecting only one spacer to limit the overall frequency usage. Finally click on the Next button to reach the end of the wizard.



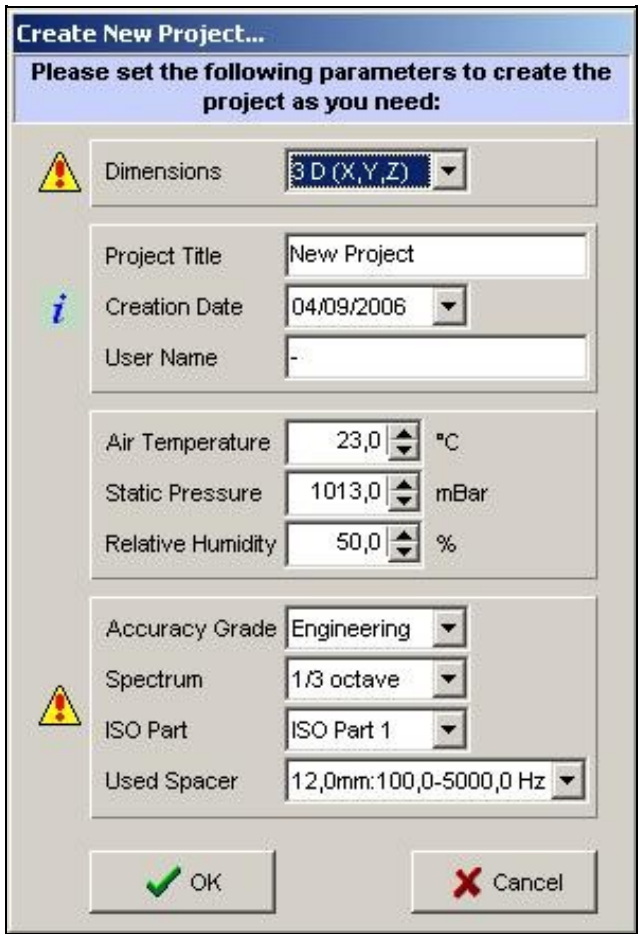
End of the wizard procedure.

Then the measurement surface will be displayed and the user will be able to start the sound power determination according to the Set-up edited in the previous sections.



Begin of the determination after the Wizard Setup.

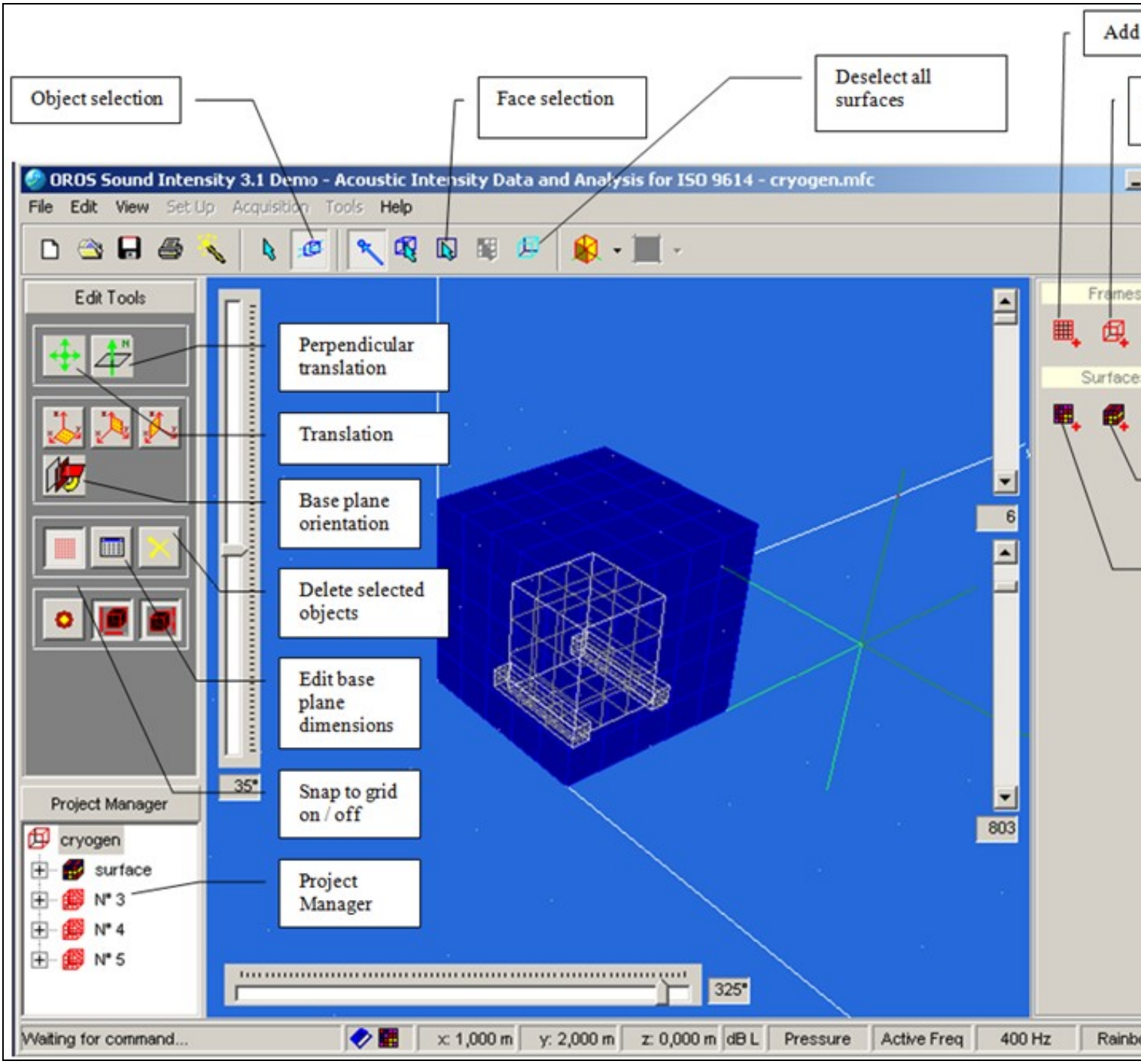
It is also possible to start with the short Wizard by pressing the "New Project" button in the Main Menu: it offers to the users to input the main project properties:



	Create a new project

171.4 Surface Editor Mode

The first thing to do when starting a new project is to define the geometry of the measurement surface and the structure of the contained objects. In the **Surface editor mode**, the screen changes as shown:



It's noteworthy the presence of a reference plane (dotted plane) functional to the generation of the surfaces. In fact each operation starts placing the first point of the object on this building plane.

Notice that there are two kinds of editable objects in this operation mode:

- **Frames**
- **Surfaces**

Frames are parallepipedic elements used to represent the source and its environment Surfaces are parallepipedic elements used to represent the measurement surfaces. They can be divided into segments, each one defining a measurement position. Measurement data can only be acquired or saved on a **surface** and not on a **frame.** Objects (Surfaces or Frames) are composed of one or several **faces** decomposed into **segments.** The above displayed figure shows the surface editor interface. In addition, the user can modify created object. In particular objects faces can be translated horizontally or vertically.

171.4.1 D display tools

The 3D display tools described in this section are available when the corresponding option was purchased.

Using the mouse left button and specific keyboard keys (Ctrl and Alt) the 3D displays can be handled for:

- Translating the display origin: Drag with left mouse click. The **Origin translation** icon must be toggled on (for further details see Section 2).
- Rotate the display: Ctrl key + Drag with left mouse click
- Zoom the display: Alt key + Drag with left mouse click

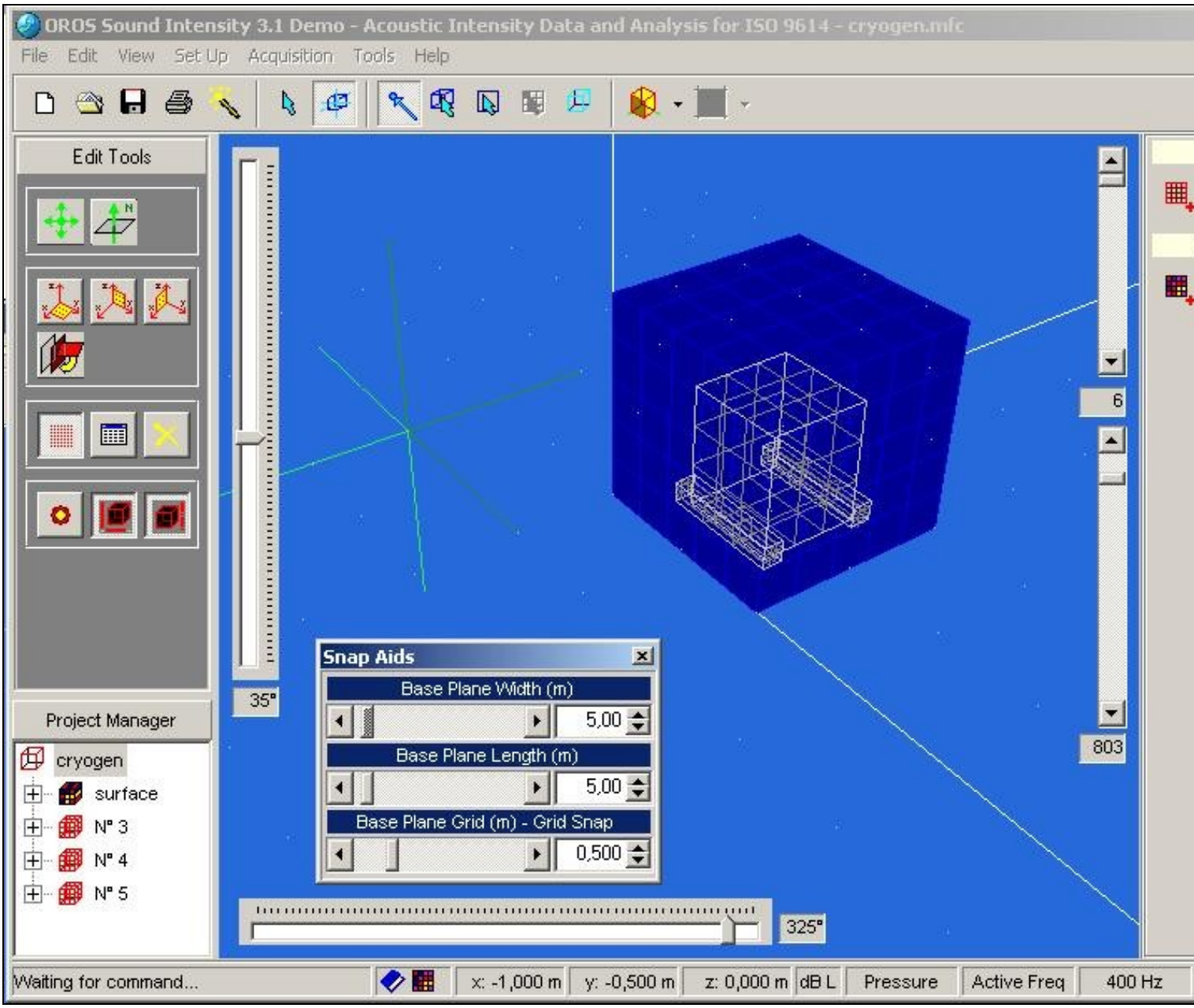
171.4.2 Base Plane

While carrying out all the editing operations the snap function can be used in order to make the cursor move stepwise on the base plane.

All the editing commands are referred to the **Base Plane** that is the dotted surface on which the cursor can move.

The length of the step and the base plane extension can be set up by activating the button "Edit base plane dimensions" and dragging the bars to reach the required extension and the distance between two consecutive points.

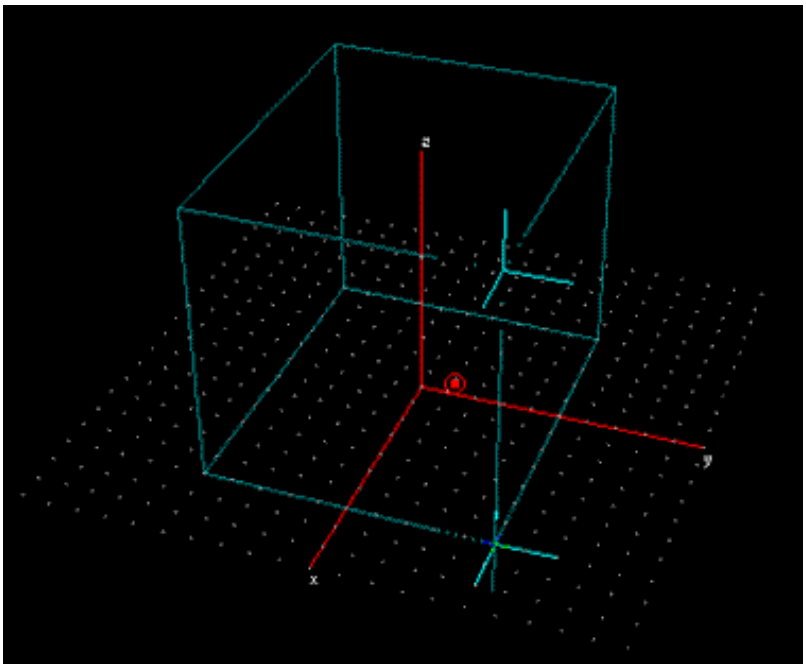
The window and the relevant commands are shown in the following figure.


OROS Sound Intensity 3.1 Demo - Acoustic Intensity Data and Analysis for ISO 9614 - cryogen.mfc
File Edit View Set Up Acquisition Tools Help
Edit Tools
Project Manager
cryogen
surface
N° 3
N° 4
N° 5
Snap Aids
Base Plane Width (m)
5,00
Base Plane Length (m)
5,00
Base Plane Grid (m) - Grid Snap
0,500
35°
325°
6
803
Waiting for command...
x: -1,000 m
y: -0,500 m
z: 0,000 m
dB L
Pressure
Active Freq
400 Hz

Graphic editor mode and Aids toolbar

171.4.3 Adding Objects & Faces (Surface or Frames)

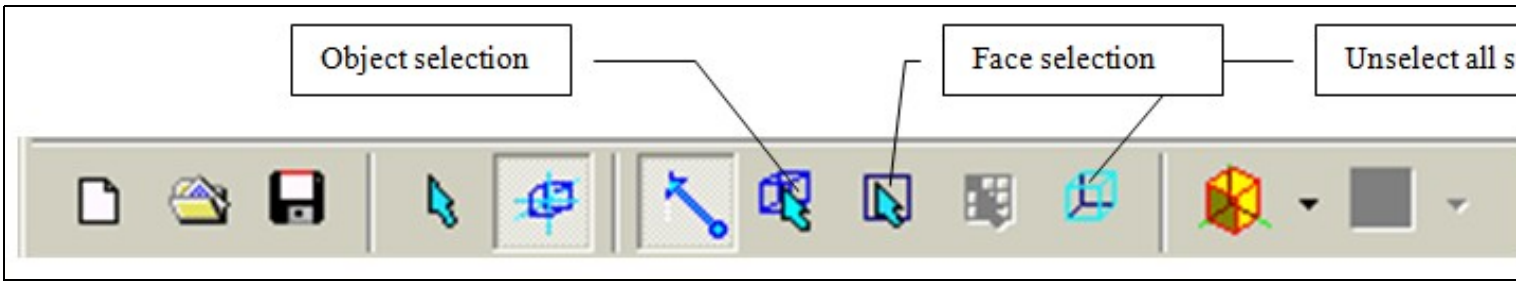
To build a new frame or measurement surface, select the corresponding object on the tool bar shown in the right part of the screen when you are in the graphic editor mode and click with the left mouse button on the point you want to start from. Then drag the cursor on the dotted plane until you have reached the length required for the first side. Click left again and drag the cursor to build the base rectangle. At this stage you can "extrude" the third dimension and finish to build the surface by clicking the left mouse button in the place you want to put the third point.



Surface generation

171.4.4 Element Selection

In the Surface Editor mode several objects modification can be achieved if the element is previously selected. The element can be selected by using the selection icons placed on the task bar. Selection can be made on a segment, a face on an entire object or even several objects (It is always possible to select more than one object at a time). To unselect the selected element, one additional click on it or the use of the "**unselect"** icon will do the job. Selected elements are highlighted with a specific color.



Main tool bar

171.4.5 Element type Filtering

Before performing any modifications to the geometry, the user must decide if the actions have to be undertaken over frames or over measurement surfaces. To do this he has to select the object type using the appropriate command under the *Edit / Selection* Menu.

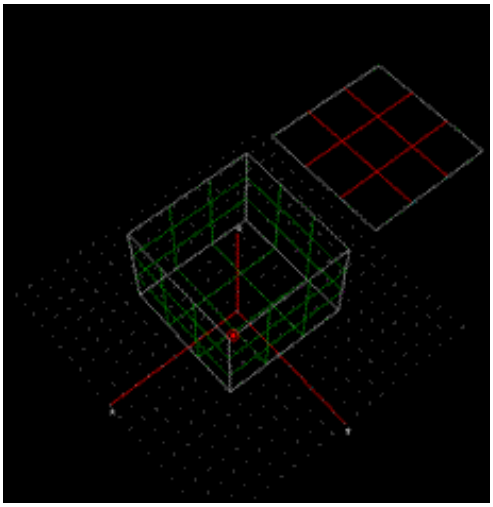
171.4.6 Element Translation

In order to be able to make geometric modifications (horizontal and vertical translation) an element (object or face) to perform the operation on should be selected (as described in section 3.4).

The **Snap to grid** function can be used to help objects be translated stepwise.

171.4.6.1 Translation

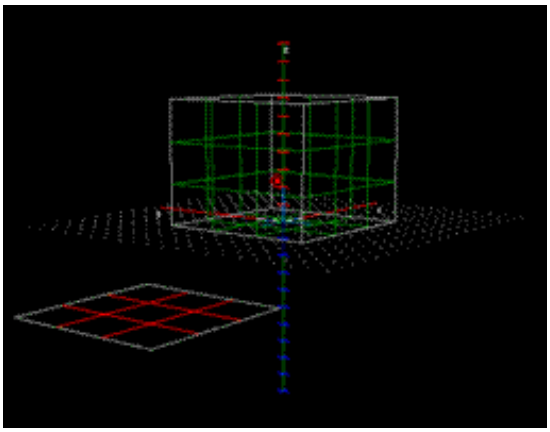
With this command it is possible to move a selected element (object or face) in the graphic editor interface by keeping it parallel to the base plane. In this case, click with the left mouse button and drag the cursor in the desired direction.



Horizontal translation

171.4.6.2 Perpendicular Translation

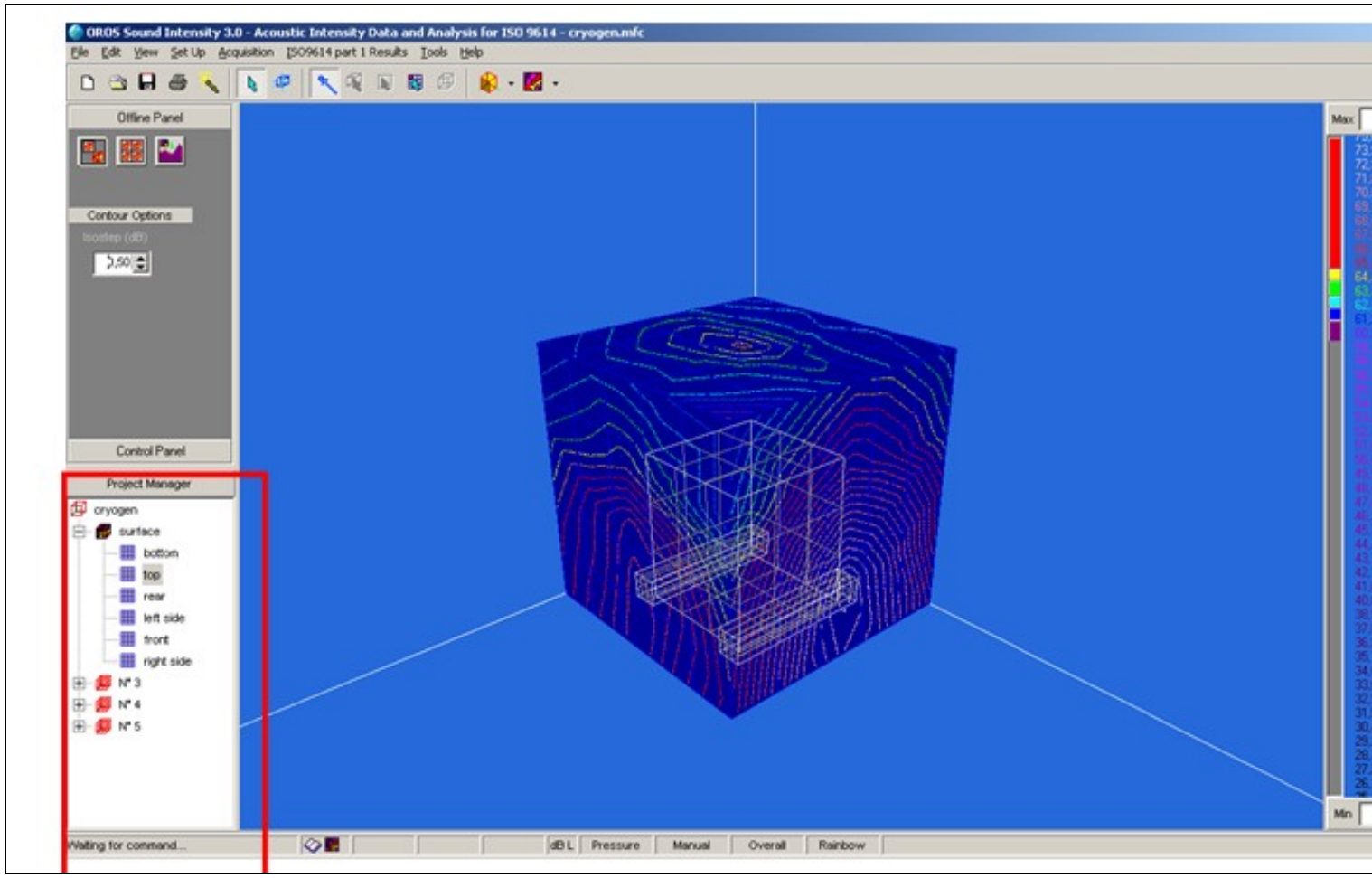
This command is useful for moving the selected plane orthogonally to the dotted reference plane. You have to click the left mouse button also in this case and drag the cursor in the desired direction. Click the right mouse button or press the Esc button to quit the command.



Vertical translation

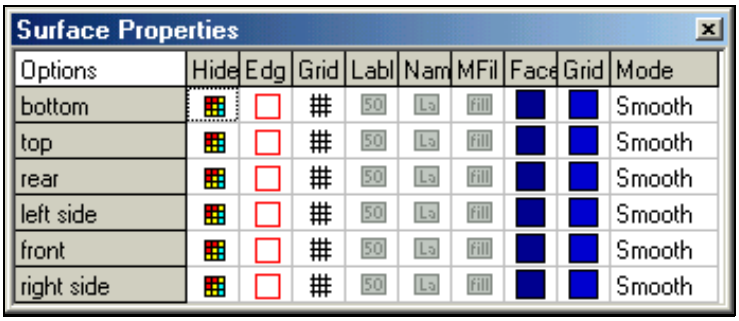
171.5 Project Manager

The **Project Manager** is always visible in the lower left part of the main window, as shown in the following figure. The tree structure shows the objects introduced in the projects by means of an icon. Each frame or surface can be decomposed in the single faces expanding the structure.



Project manager location

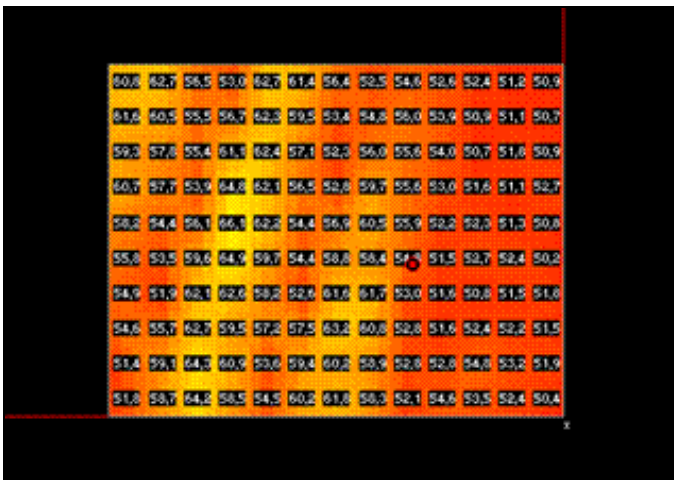
The user can see the properties of each item of the tree structure by selecting it and clicking with the right mouse button on the relevant icon. The properties change according to the item the user select from the project manager. Choosing "**Properties**" from the pop-up menu obtained for the whole surface, the user activates the window shown below:



Graphic properties window for a surface

The first column enables ? disables the drawing of a surface, the edge column enables ? disables the drawing of the edges of the surfaces, the Grid column enables to show the grid subdivision for the surfaces.

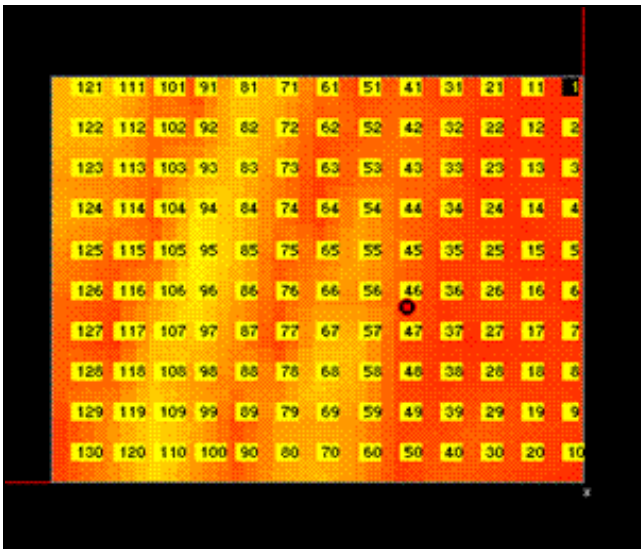
The **Label** column switches on ? off the figures associated with each segment (pressure or intensity data).



Pressure values distribution over a measurement surface

The **Name** column enables to show ? hide the name of each surface.

The **Mfill** column enables to show the filling sequence for each surface: it switches on ? off the figures associated with the filling sequence adopted for a surface.

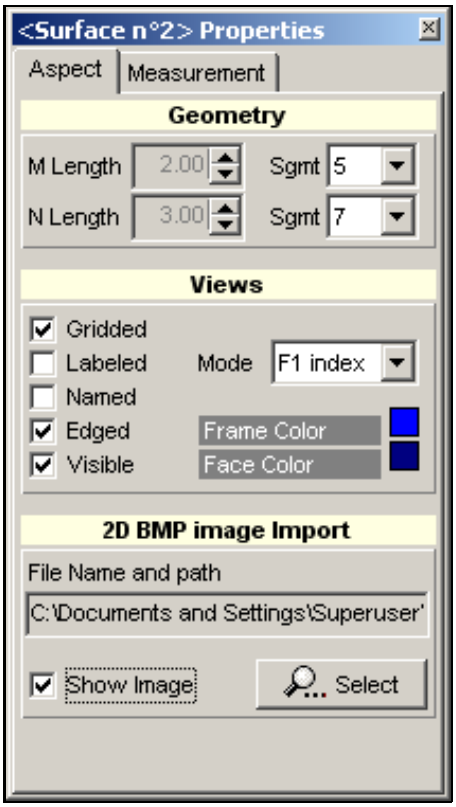


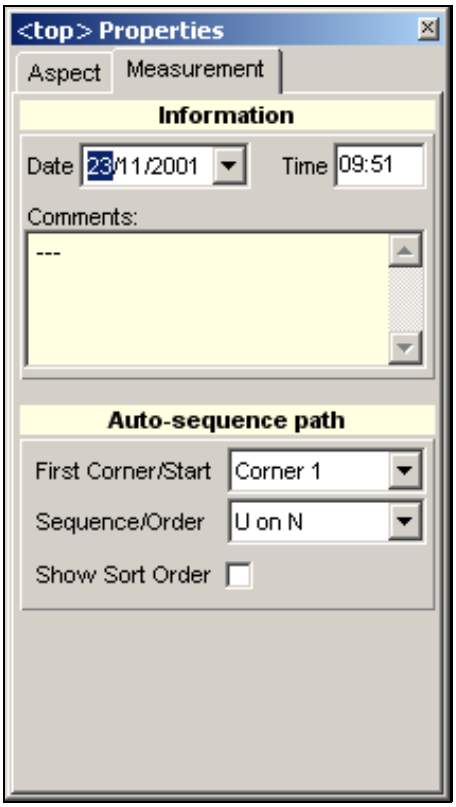
Filling order of a measurement surface

The black cell in the upper right corner is the starting point for the filling up which has to be set up with the project structure menu (see Project structure Section).

The last three columns are useful to set-up colors for the face and the grid of each face.

If the user selects the **Surface Properties** for a sub-surface, the program will open the following windows.



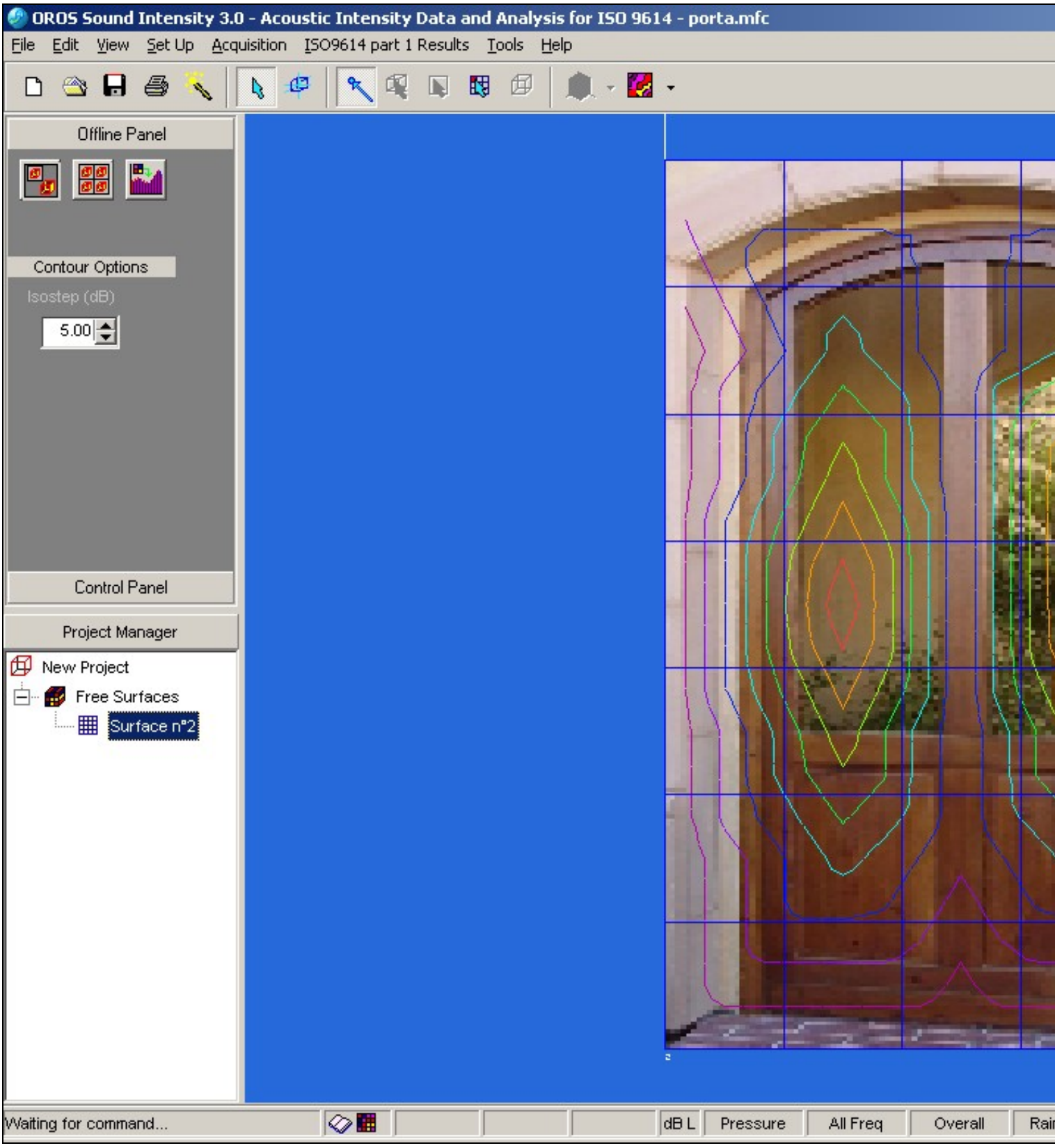


Properties window for a sub-surface

This window enables the user to set up and configure several surface properties:

Aspect Tab

- Number of horizontal and vertical subdivision of the surfaces;
- Drawing properties;
- Frame color;
- Overlay image (for 2D projects).


OROS Sound Intensity 3.0 - Acoustic Intensity Data and Analysis for ISO 9614 - porta.mfc
File Edit View Set Up Acquisition ISO9614 part 1 Results Tools Help
Offline Panel
Contour Options
Isostep (dB)
5.00
Control Panel
Project Manager
New Project
Free Surfaces
Surface n°2
Waiting for command...
dB L
Pressure
All Freq
Overall

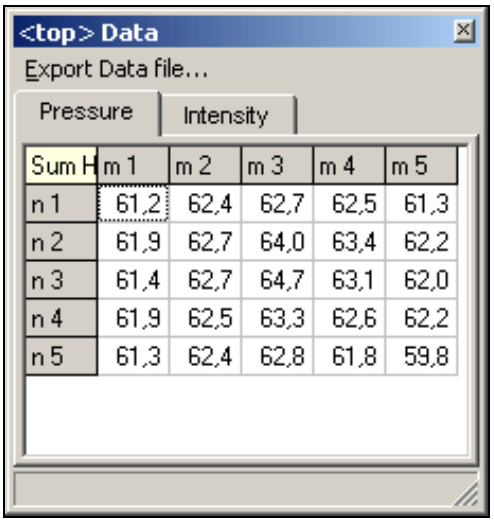
Overlay image.

Measurement Tab

- Date and time of edition for the properties,
- Filling procedure.

The **Surface Data** command shows a window containing *Pressure* and *Intensity* tabs, and enable the editing of the data loaded for the relevant surfaces.

Data can be exported in .txt files clicking on the relevant menu.



Project structure and Pressure tab

It is very important to distinguish the measurement surface from the frames. For this reason the measurements surfaces are described by coloured parallelepipeds and the frames by red gridded parallelepipeds.

Surfaces

Concerning the properties for the Surfaces, the user can set up:

- the number of subdivisions for each surface,
- the starting point to begin to fill the cells,
- The filling order.

In this way the user has to select, at first, the corner of the rectangle from which he begins to import and store the data.

The sort mode order can be chosen between two types:

- **Z**: the filling procedure goes on until it reaches the end of a row or a column, then it starts to fill the next row or column in the same direction of the first one.
- **U**: the filling procedure goes on until it reaches the end of a row or a column, then it starts to fill the next row or column in the opposite direction used for the first one.

The same window can be used also to select the surfaces for editing the geometry and to delete them. To select a surface the user has to double click on the frame or surface icon describing the item. The corresponding icon will light up. Then the user can enter the editing mode and choose if he wants to perform a geometry editing command (see the relevant section) or delete it. To delete the selected surface(s), click on the remove button.

The properties command activates a window. The first column enables to hide the frame corresponding to the selected cell. The second column hides the borders for the selected frame and the third activates/deactivates the grid. The name column enables to show the name linked to a surface. Finally the face and the grid columns can be used to change the color of these items for the selected frame.

171.6 Test Set-Up

The Analysis set-up is achieved with the **Main Mode** on.

171.6.1 Equipment Set-Up

In this window the user can choose the analyser Type and Model, select the microphone pair, the spacer length, and set up the remote control button functions.

Before starting a new real time acquisition session the user has to set up the analysis parameter. To do this, select the equipment group from the **Set Up** menu.

In the **Analyzer** tab the user can choose the Model of the analyzer used for the application. This task can be performed by clicking the relevant box and choosing the right item from the drop down menu. Another option is the selection of the NVGat.exe file. That can be done browsing the content of the Programs folder and selecting the relevant file.

In the **Inputs** tab it is possible to set up the channels coupling, the channel gain (the same for both channels), the probe gain (as info) and the polarisation voltage for the microphones (as info). In the case the user is employing an OR 3X analyser, it is possible also to select the physical channels attached to the intensity probe.

The **Probe** tab allows the user to select the probe type, the model, to enter the serial number, to set up the probe serial remote control and the keyboard shortcuts.

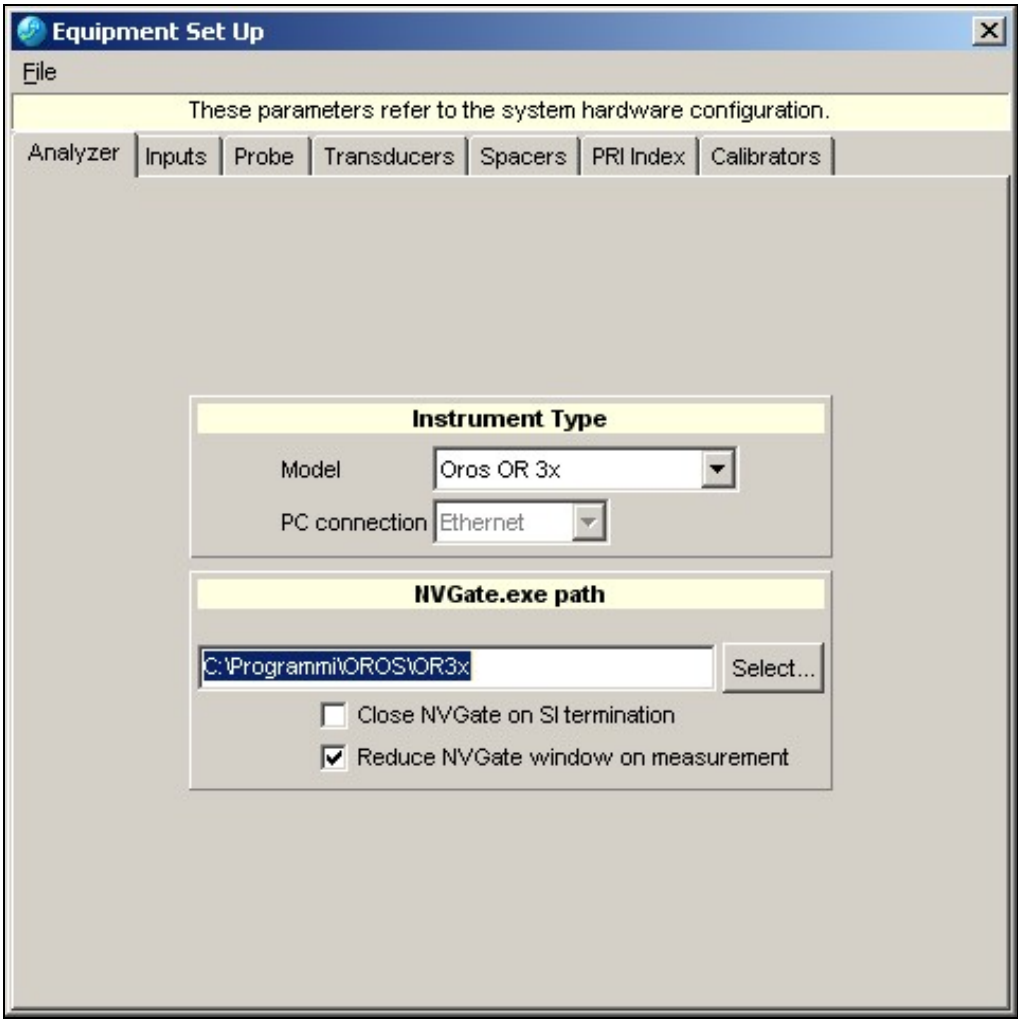
The **Transducers** tab enables the user to select the microphone pair by means of a drop down menu linked to a transducer database. The value for the sensitivity will be loaded in the relevant fields of the table at the bottom of the window. All these values can be edited by clicking the table fields.

The table shown in the **Spacer** tab must be used to set-up the spacer length and the measurement frequency span for each one. The spacers defined in this tab are the only ones visible and selectable during the editing and arrangement of the spacers in the Analysis Set-up.

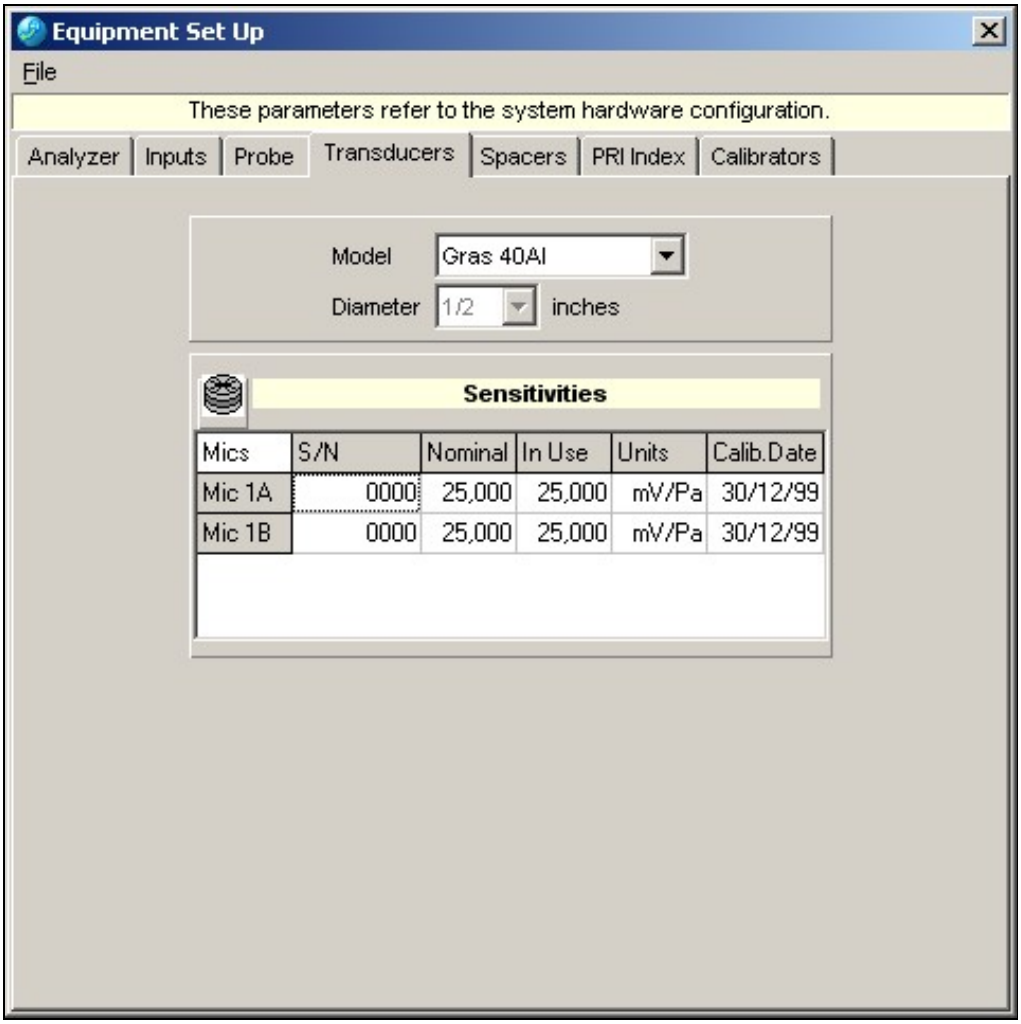
The **PRI index Tab** shows the ***Pressure Residual Intensity Index*** for the measurement chain in use (both numerically and graphically) and the comparison with the IEC 61043 Standard Limits. Using the Load and Save buttons, the user can retrieve from or write to the disk several PRI profiles. Pushing the Set IEC 61043 PRI limits button, the default limits specified in the standard are loaded. The PRI here used is referred to the actual measurement chain and it follows the advices of the standards: the PRI is the one for the 25mm spacer. During the measurement the software automatically computes, depending on the spacer in use and its frequency range, the corrected values for each active frequency band. The values of the PRI spectrum can be edited typing in the Lp and Li cells (useful if the user has the probe/system calibration chart from the producer or the Calibration Laboratory).

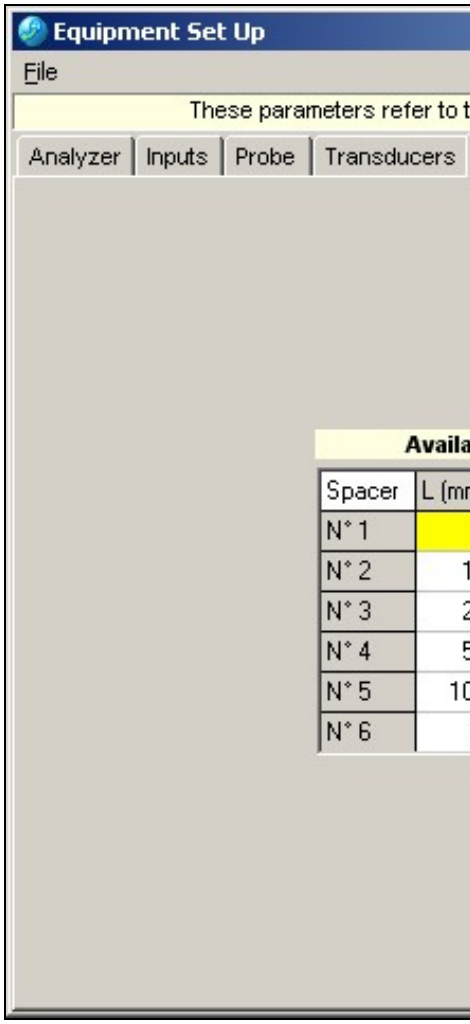
In the **Calibrators** tab the user has to enter the data of the calibrators that can be used both for pressure and phase calibration (Manufacturer - model, Serial Number, Calibration level and frequency).

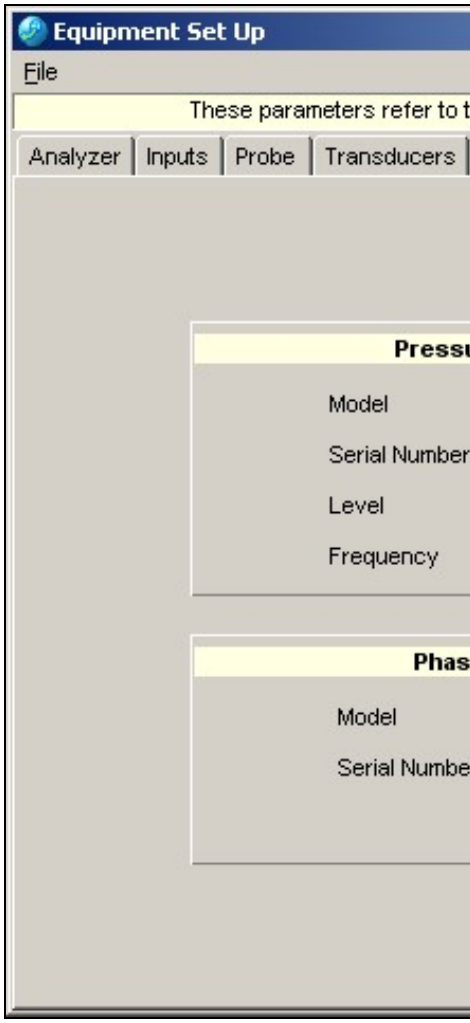
The user has to pay particular attention to the parameters edited in these fields because they can heavily affect the sound power determination.


Equipment Set Up
File
These parameters refer to the system hardware configuration.
Analyzer
Inputs
Probe
Transducers
Spacers
PRI Index
Calibrators
Instrument Type
Model
Oros OR 3x
PC connection
Ethernet
NVGate.exe path
C:\Programmi\OROS\OR3x
Select...
Close NVGate on SI termination
Reduce NVGate window on measurement


Equipment Set Up
File
These parameters refer to t
Analyzer
Inputs
Probe
Transducers
Coupling
Range
Probe Gain
Polarization
Channel 1
Channel 2


Equipment Set Up
File
These parameters refer to the system hardware configuration.
Analyzer
Inputs
Probe
Transducers
Spacers
PRI Index
Calibrators
Model
Gras 40AI
Diameter
1/2
inches
Sensitivities
Mics
S/N
Nominal
In Use
Units
Calib.Date
Mic 1A
0000
25,000
25,000
mV/Pa
30/12/99
Mic 1B
0000
25,000
25,000
mV/Pa
30/12/99


Equipment Set Up
File
These parameters refer to t
Analyzer
Inputs
Probe
Transducers
Availa
Spacer
L (mr
N° 1
N° 2
N° 3
N° 4
N° 5
N° 6


Equipment Set Up
File
These parameters refer to t
Analyzer
Inputs
Probe
Transducers
Pressu
Model
Serial Number
Level
Frequency
Phas
Model
Serial Numbe

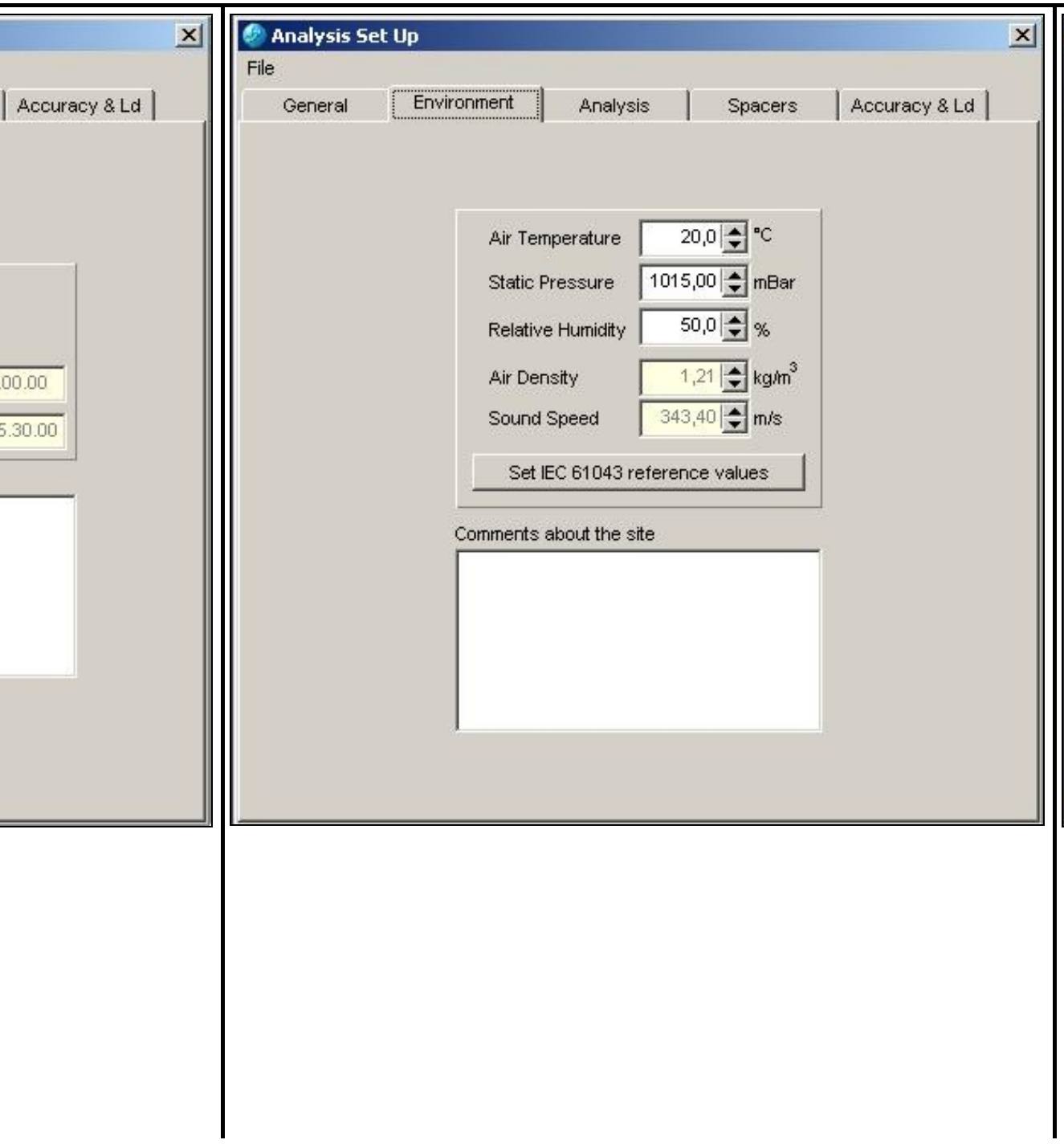
Tabs for the equipment set-up

171.6.2 Analysis Set-Up

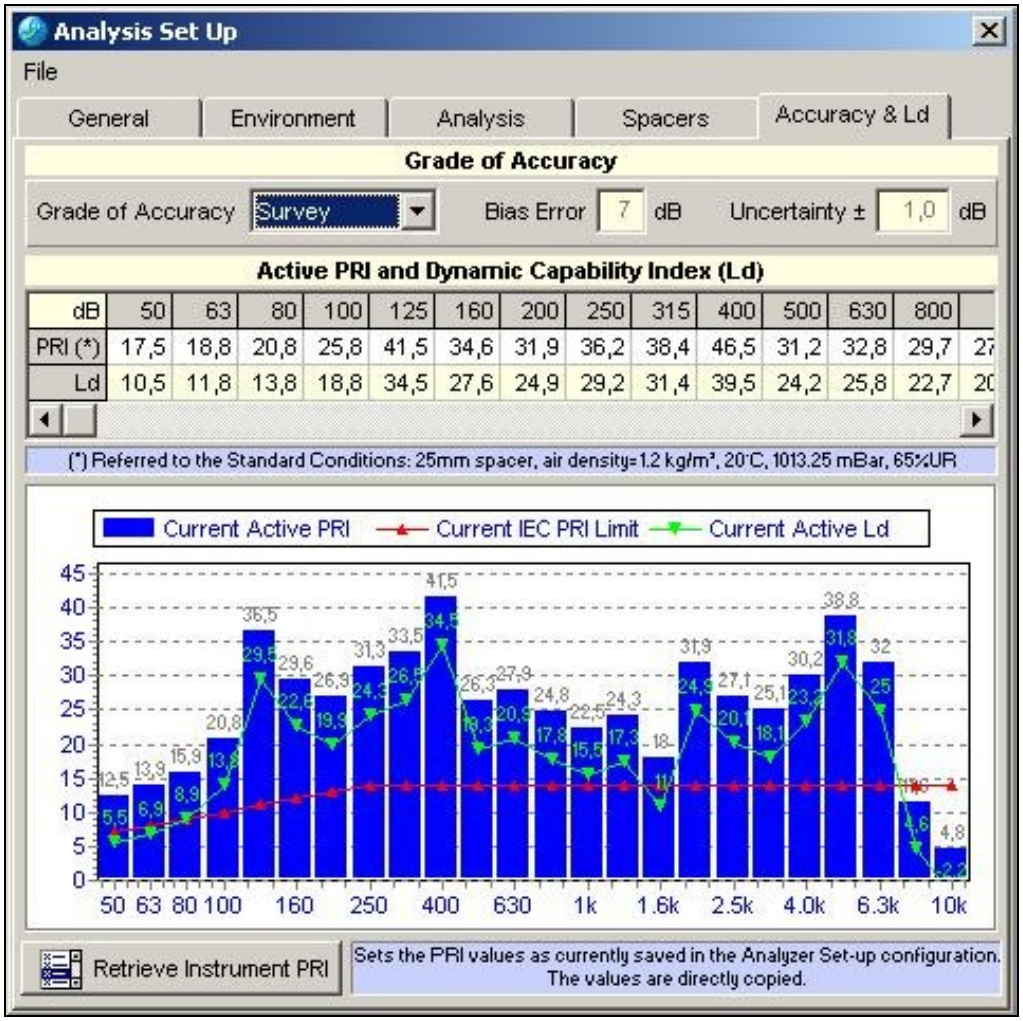
In the **Analysis Set Up** the user can enter and modify several settings referred to:

- The project data;
- The environmental settings;
- The FFT Analysis parameters;
- The spacers set up to cover the whole frequency span of interest;
- The grade of accuracy for the power determination.

Also in this case the user has to pay particular attention to the parameters edited in these fields because they can heavily affect the sound power determination.




Accuracy & Ld
0
630
800
1k
1.25
Available Spacers
min Hz
max Hz
,0
250
8000
,0
100
5000
,0
50
2500
,0
20
1250
,0
10
1000
,0
0
0
u want to use picking
he desired row above.
button+ctrl> on the
ne.
also use multi-spacer
usage.


Analysis Set Up
File
General
Environment
Analysis
Spacers
Accuracy & Ld
Grade of Accuracy
Grade of Accuracy
Survey
Bias Error
7
dB
Uncertainty ±
1,0
dB
Active PRI and Dynamic Capability Index (Ld)
dB 50 63 80 100 125 160 200 250 315 400 500 630 800
PRI (*) 17,5 18,8 20,8 25,8 41,5 34,6 31,9 36,2 38,4 46,5 31,2 32,8 29,7
Ld 10,5 11,8 13,8 18,8 34,5 27,6 24,9 29,2 31,4 39,5 24,2 25,8 22,7
(*) Referred to the Standard Conditions: 25mm spacer, air density=1.2 kg/m³, 20°C, 1013.25 mBar, 65%UR
Current Active PRI
Current IEC PRI Limit
Current Active Ld
45
40
35
30
25
20
15
10
5
0
50 63 80 100 160 250 400 630 1k 1.6k 2.5k 4.0k 6.3k 10k
Retrieve Instrument PRI
Sets the PRI values as currently saved in the Analyzer Set-up configuration.
The values are directly copied.

Tabs for the analysis set-up properties

In the **General** tab the user can set up the project title and the user's name by entering the data in the relevant fields. To select the creation date click in the area and select the right one from the calendar.

The **Environment** tab can be used to enter the air temperature and the static pressure data. The air density will be computed according to the above entries. The user can also specify the information about the relative Humidity.

Through the **Analysis** tab the user can set up the averaging mode (linear or exponential) and the averaging time or the number of averages. The averaging time will be computed accordingly to the selected number of averages.

In the **Spacers** tab the user can select the spacers to use during the sound power determination and set up the frequency span for each one of them (and to cover the entire frequency span of interest).

If the user need to add a spacer or modify the list, he has to select the one he wants to use picking it from the Available spacers list (it is possible to modify this list only in the Equipment Set Up area).

The user has to Drag and drop the selected spacer on the desired row from the list.

Dragging and dropping the selected spacer in the desired row of the list placed in the upper part of the window, the user will be able to edit the frequency span covered by each one of them (modifying what is suggested in the table of the Equipment Set Up area).

To change the actual frequency range the user has to click the <ctrl> + "left mouse button" on the desired minimum or maximum frequency cell.

The software checks:

- if the spacers used are coherent with the actual spacer list set in the Equipment Set Up area
- if the higher frequency limit of the spacer if compatible (finite approximation criteria) with its physical length

and warns the user by both the coloured label and the message box confirmation closing this area.

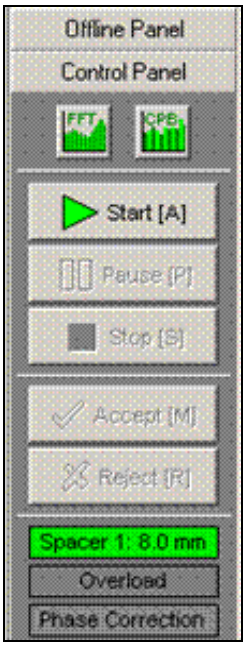
Each spacer can be activated by clicking on its name. The relevant frequency span lights up in green. Please note that the software:

- doesn't accept intersected frequency ranges coming from more than one spacer
- requires that at least one spacer is selected
- warns if the range is not compatible

Please pay great attention about the PRI because Field indicators depend strictly on used spacers.

Summarizing the PRI usage:

- There is one **Equipment PRI** spectrum that refers to the measurement chain in the Equipment Set-Up area, and it represent the characteristic of the instrumentation used for the nominal spacer established by the standard at the 25mm length.
- There is the **Active PRI** spectrum used in the actual measurement and it is in the Analysis Set-Up area; it is affected by the spacer lengths finally used, dynamically computed upon the frequency bands associated to the spacer itself. Choosing different spacers combination with different frequency ranges, it is possible to see the effect directly in the following **Accuracy and Ld.** tab.



Control Panel

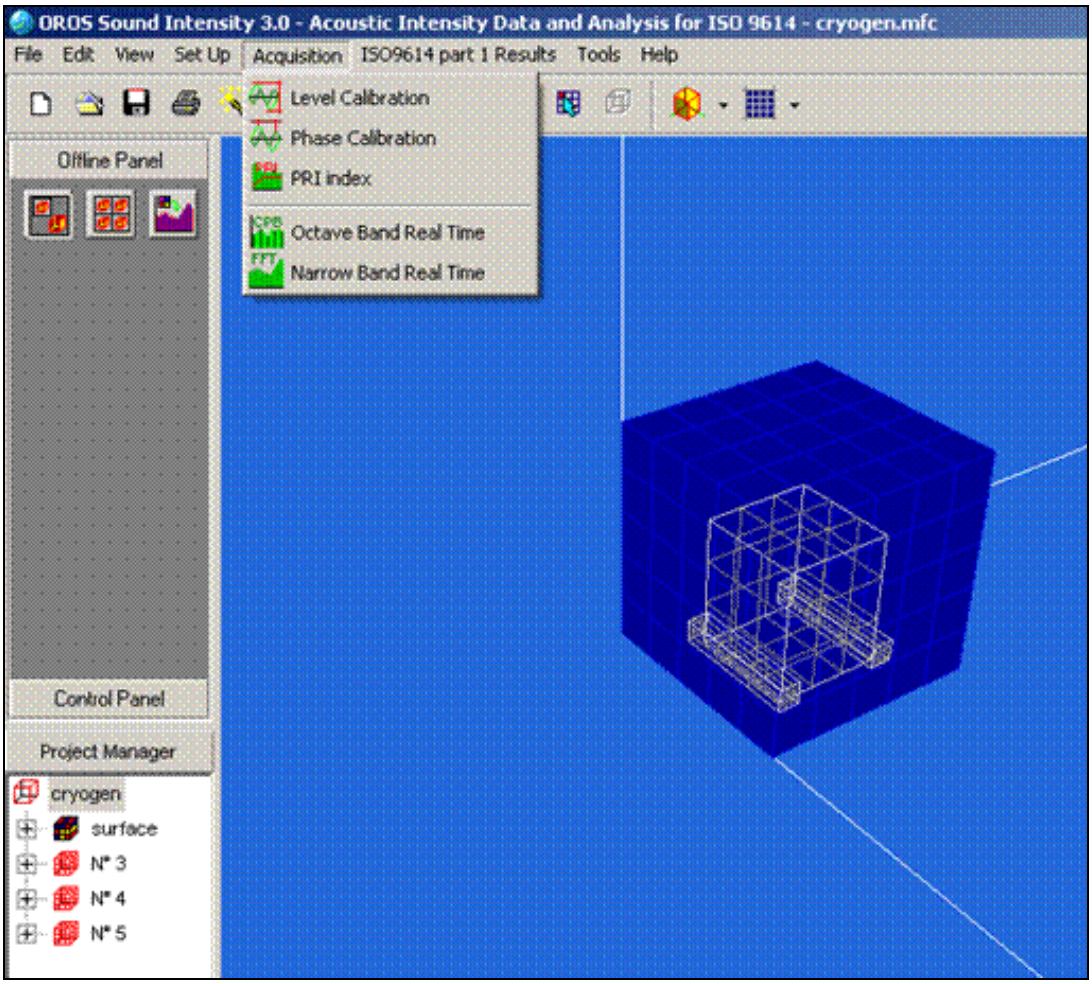
In the **Accuracy and Ld tab** the user can:

- set up the desired grade of accuracy among the types defined in the ISO 9614 Standard;
- find out or edit the pressure/residual intensity index stored for the apparatus;
- see the graph of the dynamic capability index of the selected measurement chain;
- Manually retrieve the values of the dynamic capability index from the file saved in the **Analyzer** set up configuration.
- It is also possible, pressing the lower button, to get (reset) the default PRI spectrum saved in the Equipment Set-Up Area.

171.7 Acquiring Sound Intensity & Sound Pressure

Data acquisition is achieved with the **Main Mode.** The functions described hereafter can be accessed in two ways:

- The **Control panel** for the real time acquisition, placed in the left part of the screen
- The **Acquisition menu**, functional to various real time measurements:
- Level calibration
- Phase calibration
- PRI Index
- Octave Band Real Time
- Narrow Band Real Time


OROS Sound Intensity 3.0 - Acoustic Intensity Data and Analysis for ISO 9614 - cryogen.mfc
File
Edit
View
Set Up
Acquisition
ISO9614 part 1 Results
Tools
Help
Level Calibration
Phase Calibration
PRI index
Octave Band Real Time
Narrow Band Real Time
Offline Panel
Control Panel
Project Manager
cryogen
surface
N° 3
N° 4
N° 5

So, data acquisition can be performed for two kinds of operations:

- System calibration
- Real time acquisition and analysis

The display mode and the commands are shared between the two applications.

171.7.1 Calibration

The calibration procedure can be divided into three parts:

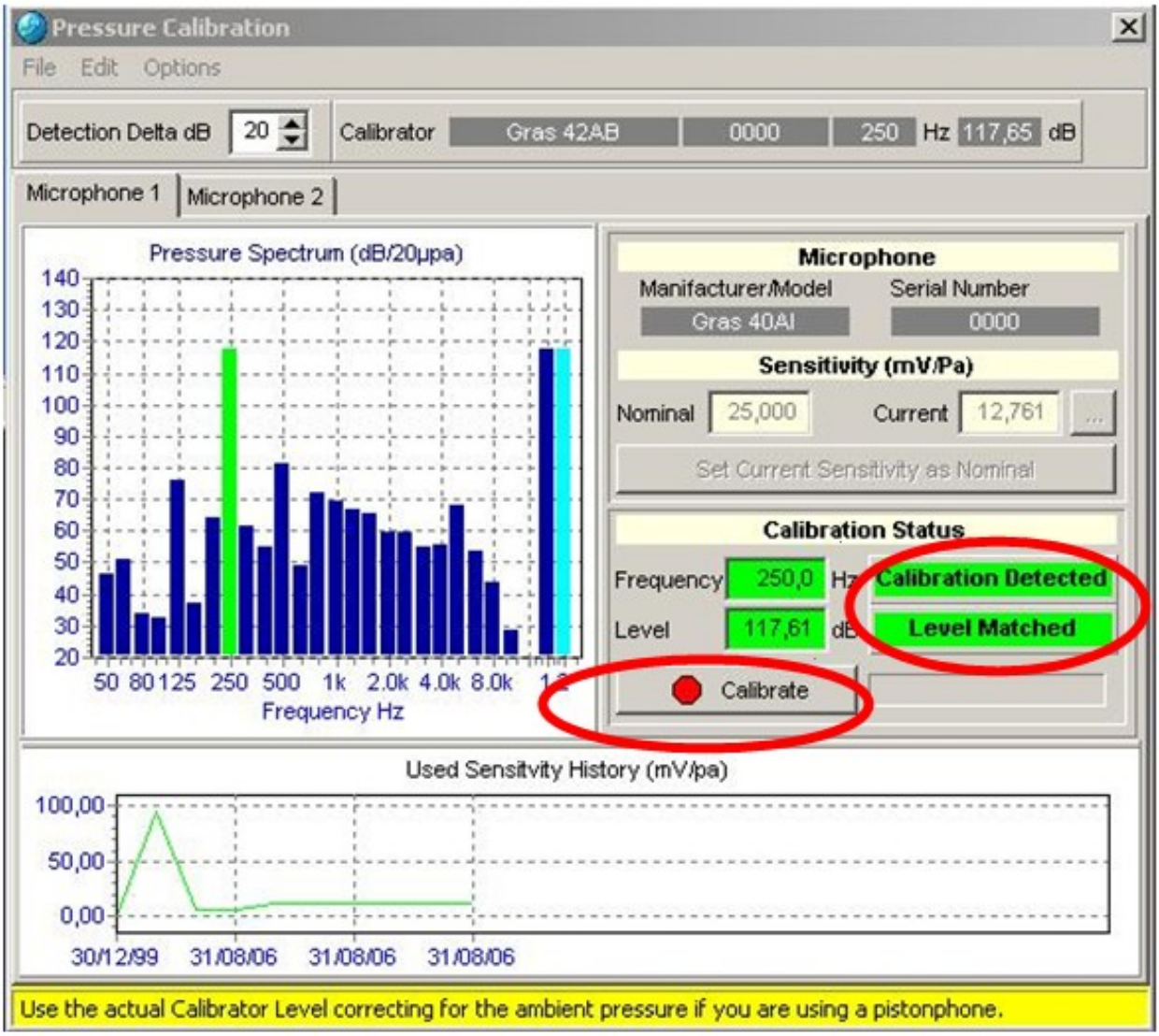
- Pressure;
- Phase;
- Pressure residual intensity (PRI) index.

171.7.1.1 Pressure Calibration

The first and most common procedure is the one for pressure calibration.

The first step is to configure the calibrator type and the measurement chain from the Equipment Set Up menu. The procedure has to be adopted both for the microphones and the calibrator clicking the relevant fields and selecting the items from the database table. The transducer sensitivity will be updated according to the information stored for the equipment set-up.

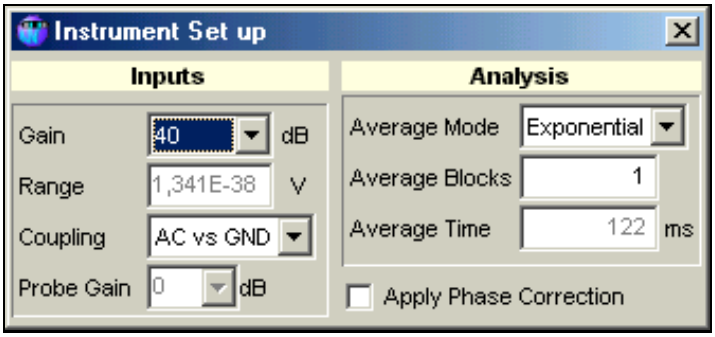
Then the user has to fit the calibrator on one of the two microphones and activate it. Pressing the **Start** button the program will activate the procedure. If the analyser has not been activated yet, the program will ask if the user wants to perform the operation at this time. Once the analyser has been initialised, the application will try to detect the signal and begins the automatic calibration procedure. If the **Calibration detected** and the **Level Matched** box lights up in red, pressing the **Calibrate** button the software performs the stability check and the new sensitivity is suggested in a message box.


Pressure Calibration
File Edit Options
Detection Delta dB 20
Calibrator Gras 42AB 0000 250 Hz 117,65 dB
Microphone 1
Microphone 2
Pressure Spectrum (dB/20µpa)
140 130 120 110 100 90 80 70 60 50 40 30 20
50 80 125 250 500 1k 2.0k 4.0k 8.0k
Frequency Hz
Microphone
Manufacturer/Model
Gras 40AI
Serial Number
0000
Sensitivity (mV/Pa)
Nominal 25,000
Current 12,761
Set Current Sensitivity as Nominal
Calibration Status
Frequency 250,0 Hz
Level 117,61 dB
Calibration Detected
Level Matched
Calibrate
Used Sensitvity History (mV/pa)
100,00
50,00
0,00
30/12/99 31/08/06 31/08/06 31/08/06
Use the actual Calibrator Level correcting for the ambient pressure if you are using a pistonphone.

Pressure calibration

The user could accept the measurement results and this way transfer to the internal database the new value that will be used for the following measurement. It is convenient to verify the last accepted value starting again the acquisition, verifying that the **Level Matched** box lights up in green. Fitting the calibrator on the other transducer it is possible to perform the calibration on the second channel.

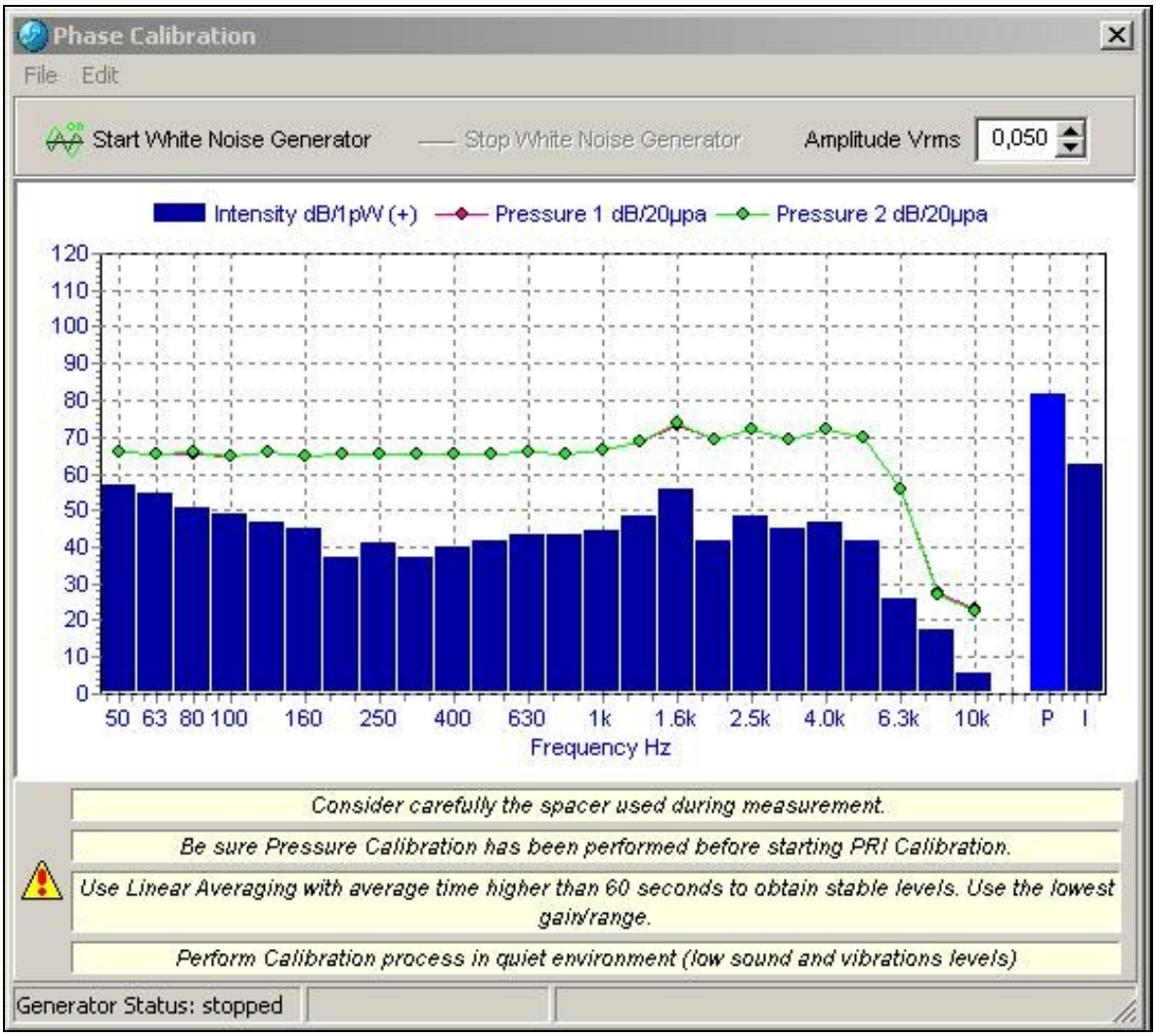
The lower part of the window shows the corrected sensitivity history for each transducer. It is always possible, during the measurement, to recall the **Instrument Set up** window clicking with the left mouse button on and change the instrument set-up varying the **Range**, the **Average Mode** (linear or exponential) and the **Average Time**.



Instrument set-up during calibration

171.7.1.2 Phase Correction

This calibration type has to be performed using a white noise generator and a coupler to set the microphones in such a way as to put them in the same conditions with regards of the sound pressure waves. First of all fit the microphones in the calibrator coupler and plug in the cable connecting the analyzer to the generator. Then press the **Start** button in the "**Built in white noise generator**" section. The analyzer generator will then begin to reproduce a white noise at the level specified by the Built in white noise generator **Gain**.


Phase Calibration
File Edit
Start White Noise Generator
Stop White Noise Generator
Amplitude Vrms
0,050
Intensity dB/1pW (+)
Pressure 1 dB/20µpa
Pressure 2 dB/20µpa
120
110
100
90
80
70
60
50
40
30
20
10
0
50 63 80 100 160 250 400 630 1k 1.6k 2.5k 4.0k 6.3k 10k P I
Frequency Hz
Consider carefully the spacer used during measurement.
Be sure Pressure Calibration has been performed before starting PRI Calibration.
Use Linear Averaging with average time higher than 60 seconds to obtain stable levels. Use the lowest gain/range.
Perform Calibration process in quiet environment (low sound and vibrations levels)
Generator Status: stopped

Phase calibration screen shot

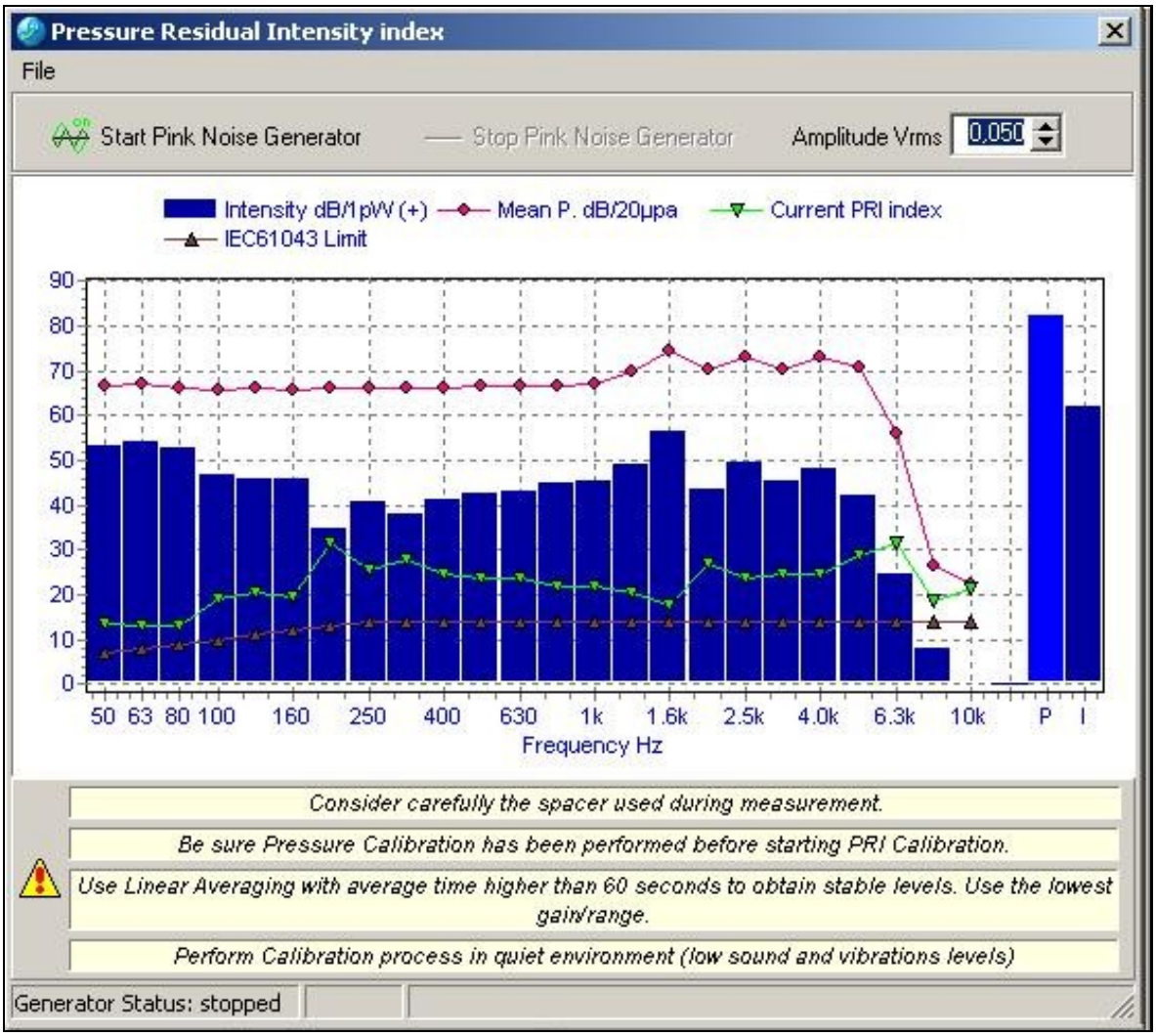
Press the **Start White Noise Generator** button to proceed with the calibration procedure. Then use the control panel to start the measure. Be sure pressure calibration has been performed before starting the procedure. Use linear averaging to obtain stable level. The time needed to perform the whole calibration process is about three minutes.

When the acquisition stops, it is possible to show the corrected intensity values by selecting the "**Apply correction**" tick in the instrument Set-Up window.

171.7.1.3 PRI Index determination

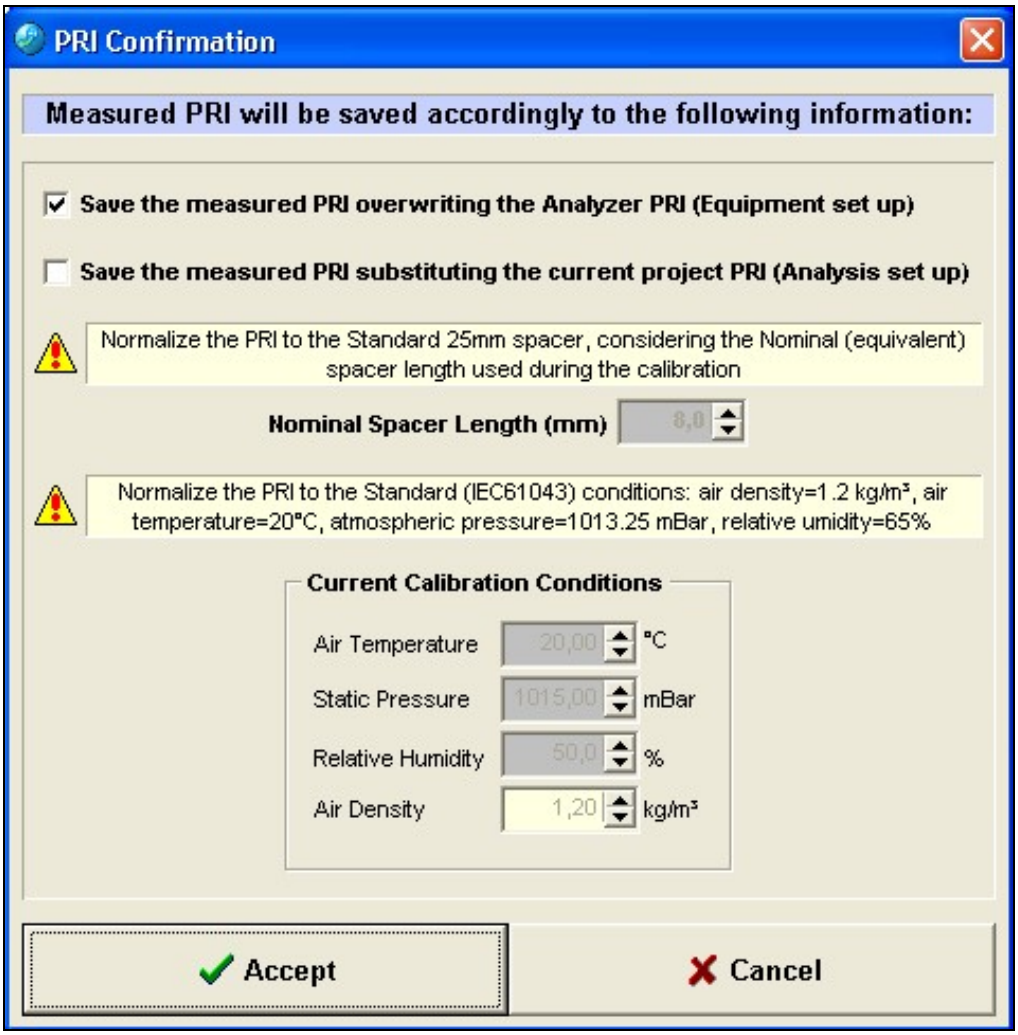
This procedure is very similar to the Phase correction process, but concerns with the setting up of the equipment and the data input for the pressure residual intensity index, related to the grade of accuracy the user wants to achieve.

In the case of real time procedure, fit the probe in the coupler of the calibrator, turn the pink noise generator on, set up the instrument in the **Set up** / **Equipment** menu (see next sections) and select the "**Start"** button in the Control Panel to start the acquisition. At this stage the software asks the user to select only one spacer with the full frequency span activated. This expedient has to be used only to perform this measurement the right way: a single spacer with a full frequency range in the actual environmental conditions is the conditions in which the calibration has to be done. After this step the user can go back to their desired configuration of the spacers and frequency ranges.



Pressure - residual intensity index calibration

The user should select a linear average of, at least, 60 ? 120 seconds in order to obtain a meaningful PRI index. Pressing the "**Accept**" button, the data will be transferred to the internal database. The program will take these values into account during the sound power level determination. When the user accepts the measurement, the software proposes the following window:



PRI confirmation area

The application gives information about the status of the environmental conditions, just to make the user is notified that the spectrum of the acquired data will be adjusted to normalize it to the standard condition and to the spectrum length required by the standard (25 mm). The spectrum will be saved, according to the check box selection, in the Analyzer Set-Up area and/or in the Analysis Set-Up Area. Please read chapters 5.1 and 5.2 to delve into application PRI management.

171.7.2 Sound Pressure & Sound Intensity Acquisition

Data acquisition is achieved with the **Main Mode** on (Cf. Section 2)

171.7.2.1 Acquisition control panel

Actions to operate the acquisition are achieved through the control panel interface.

Auto progress:

When it is pressed, the selection of the cells during the acquisition is done as defined in the sequencing path of the measured surfaces.



Octave band real time acquisition

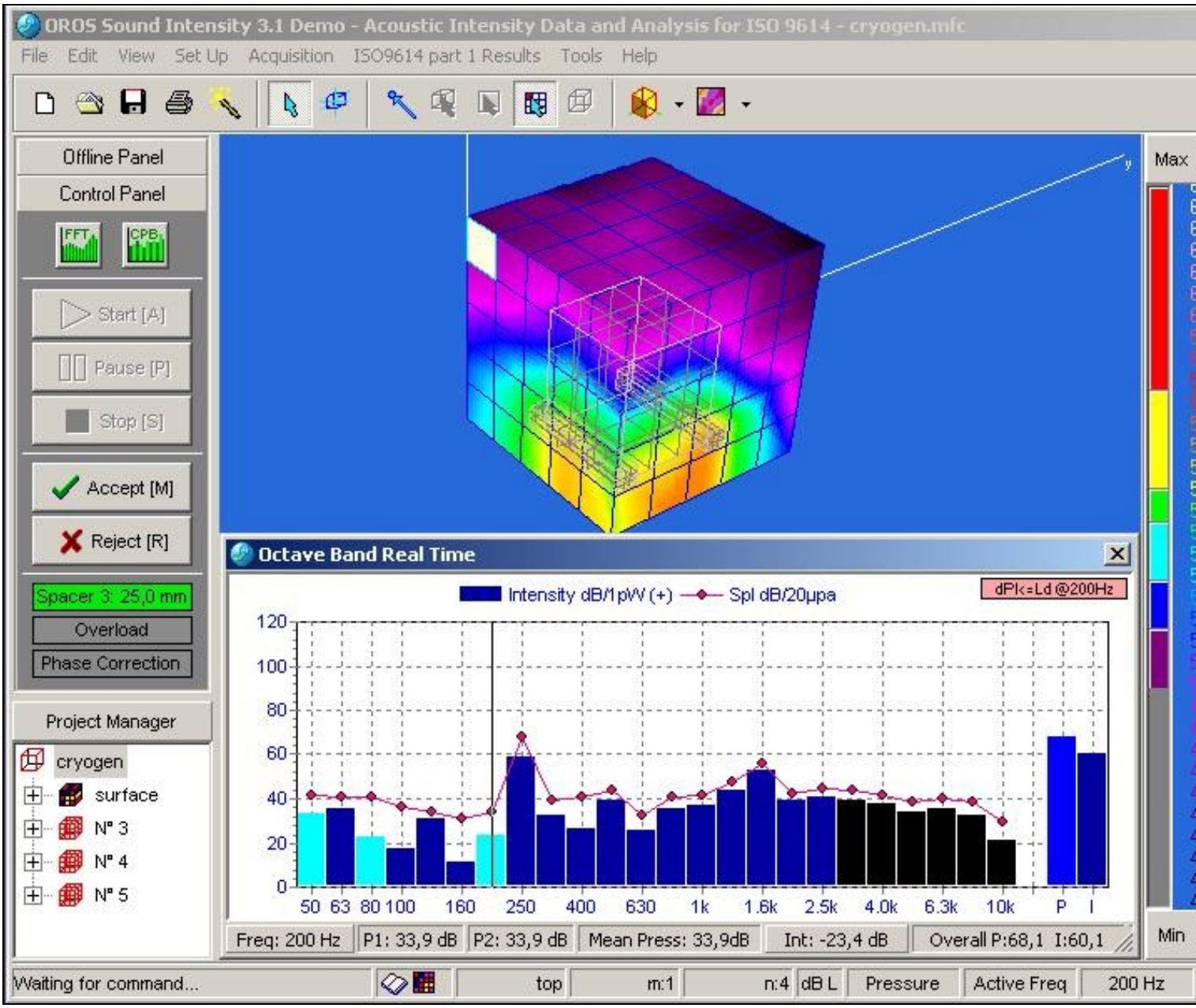
171.7.2.2 Real Time Octave

The user can start the real time acquisition procedure by pressing the relevant button in the main interface window. This action will open the window shown.

Press the segment selection tool and choose a position on the measurement grid to import the data into it.

Press the Start button to begin the acquisition.

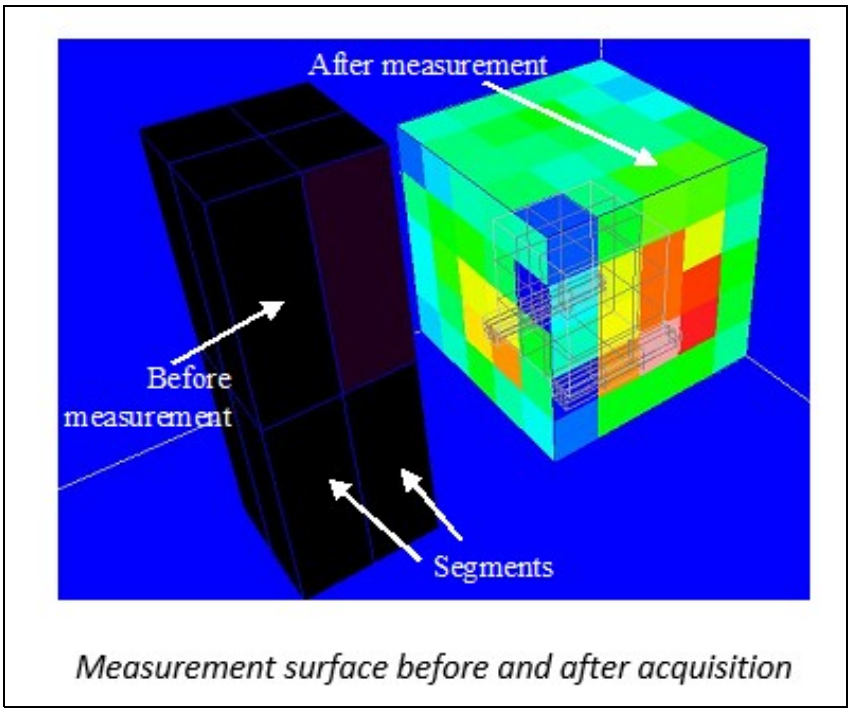
Press the Save button to store the data in the project structure.



Octave band real time acquisition

171.7.2.3 Measurement Steps

Before acquiring any data, the measurement surface is represented with a default colour. As soon as data is stored on a segment, a color is associated with it, showing immediately what segments have been measured and what segments have not.



Measurement surface before and after acquisition

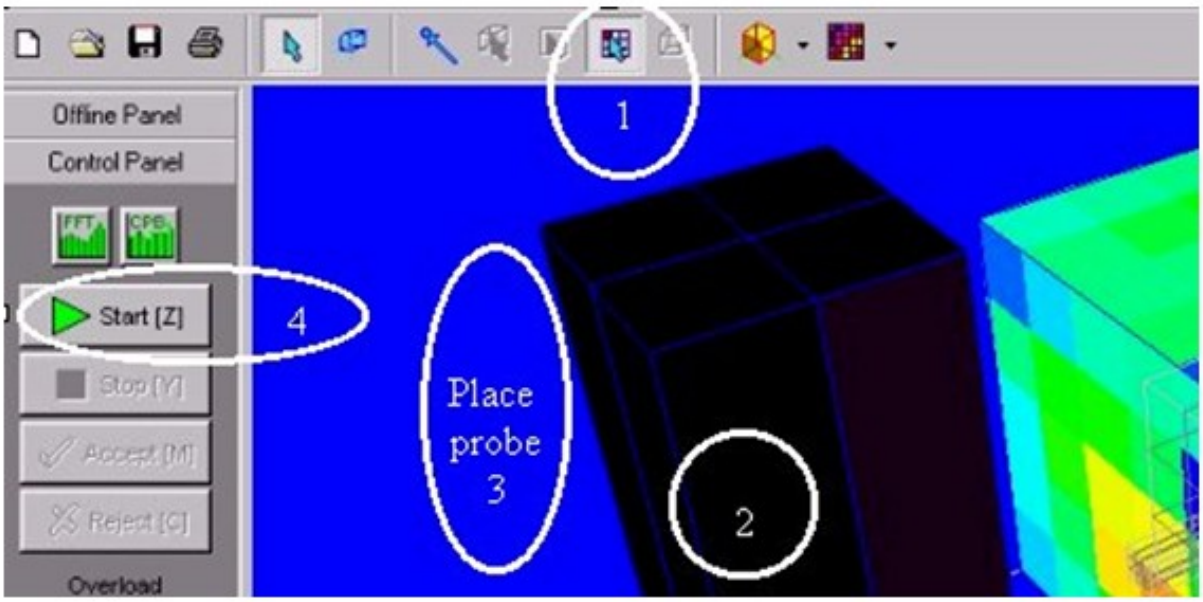
171.7.2.4 Measurement procedure

1. Click on « **Segment selection** » for selecting a segment

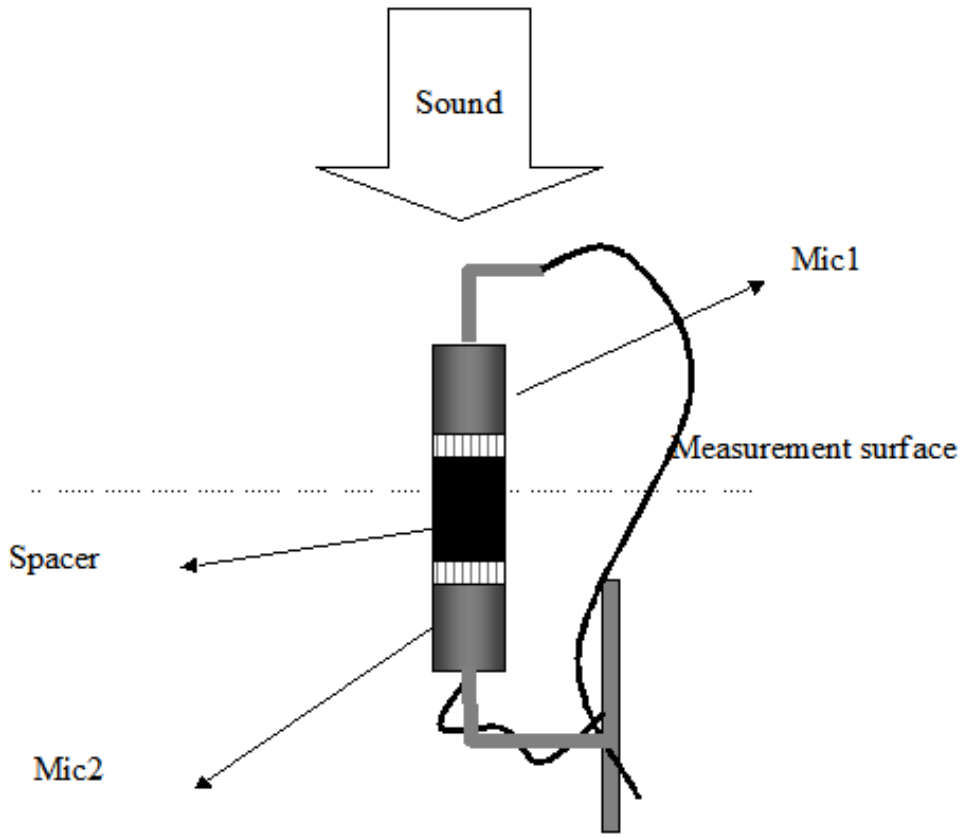
2. Select a segment where the measurement will be carried out (the segment should become white).

3. Place the probe with the p-p axis perpendicular to the measurement surface as shown by the following figure.

4. Press **Start** (the selected segment should blink during the measurement). Please note that the analysis set-up should be done using a « linear average » so that the measurement stops automatically after a defined averaging time.



Steps for segment selection and measurement start



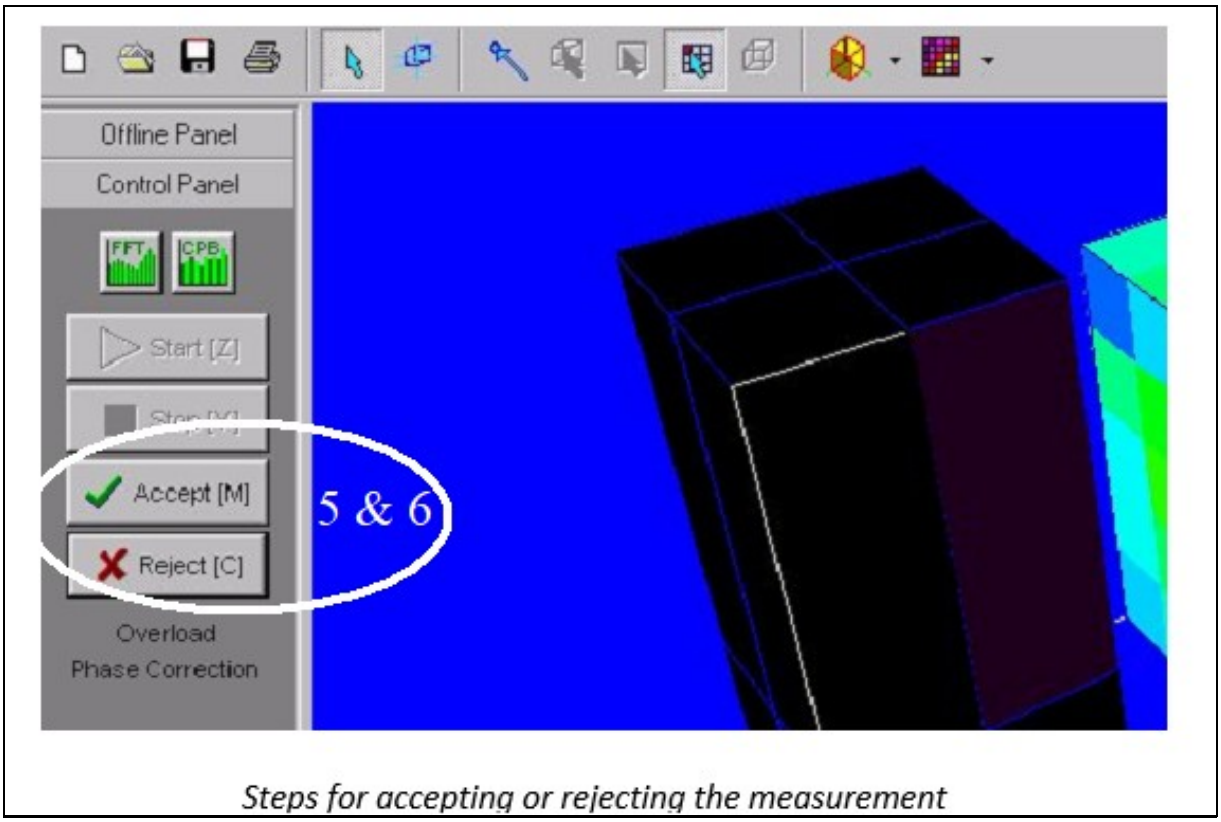
Probe position relative to the Segment

5. Press **Accept** to save the segment measurement

6. Press **Reject** if the measurement was not satisfying

7. If the measurement is satisfying go to next segment

8. If the measurement is not satisfying start the measurement again on the same segment



Steps for accepting or rejecting the measurement

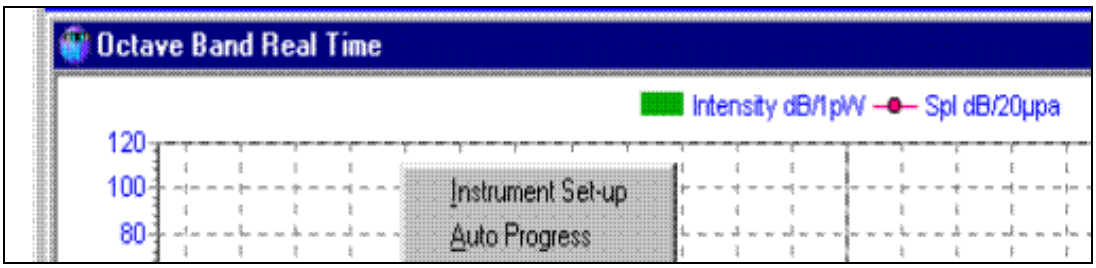
Shortcut keys as displayed on the above picture may be used in order to operate the software from the keyboard.

171.7.2.5 Auto progress & Set-Up Shortcut

By right clicking on the real time graph:

* You can activate the « Auto progress » function: If selected, pressing « accept » after a measurement will make the segment selection progress a step forward.

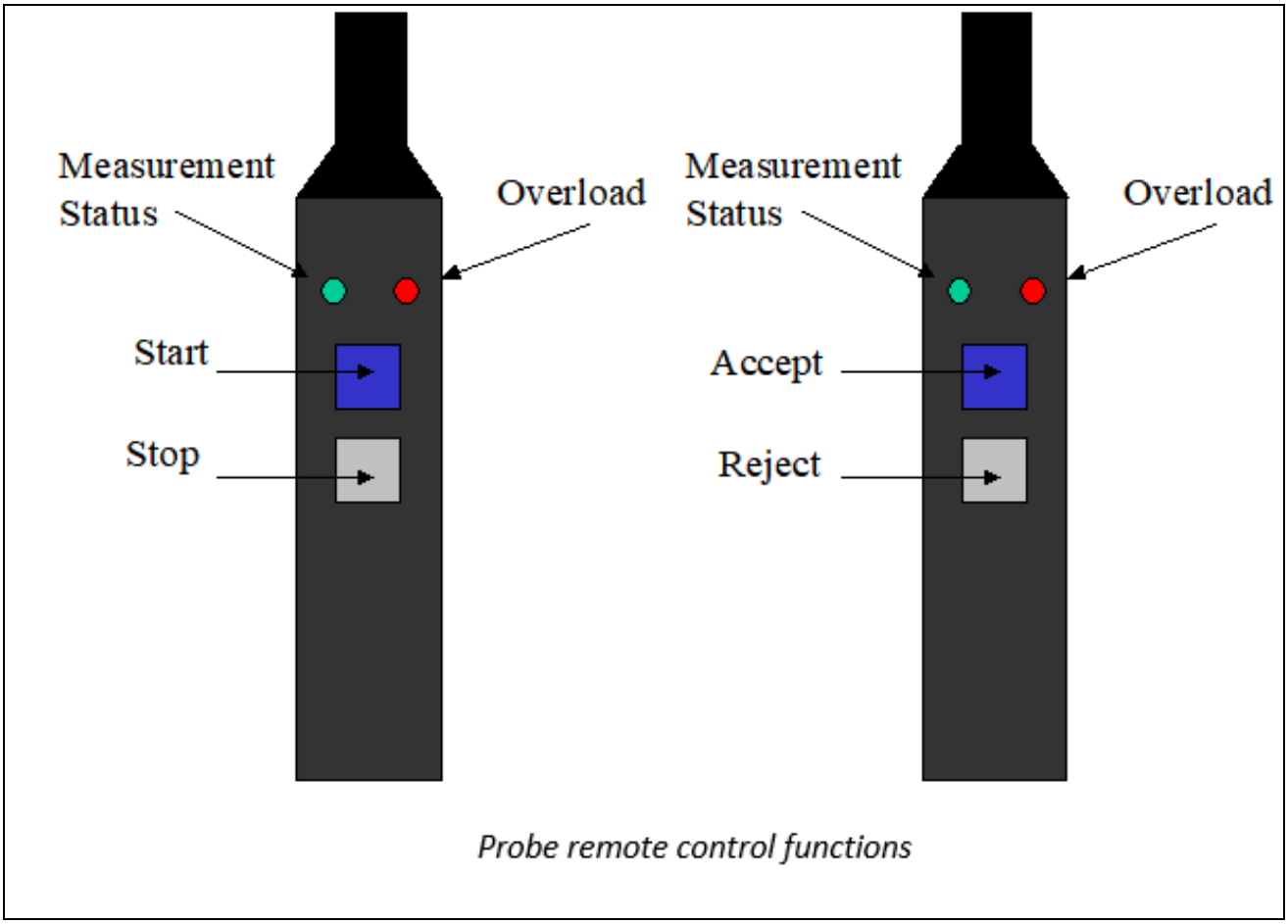
* You can also activate the «Instrument Set-Up» shortcut to change measurement parameters.



Auto progress and Instrument Set-Up shortcut

171.7.2.6 Remote control operation

As often in Sound Intensity measurements, the system should be operated remotely from the PC. For this purpose, the GRAS and the Microtech Geffel remote control are configured to allow this. Two buttons operate in the same way as the **Start**/**Stop** and **Accept**/**Reject** as described above in the previous section and as represented by the following picture. In addition, 2 LEDS assists the operator. The first LED of the probe shows the measurement status: measurement running, waiting for accept/reject or stopped. The second LED shows if any overload has occurred: this information may help the operator in his decision to accept or reject the measurement.



Probe remote control functions

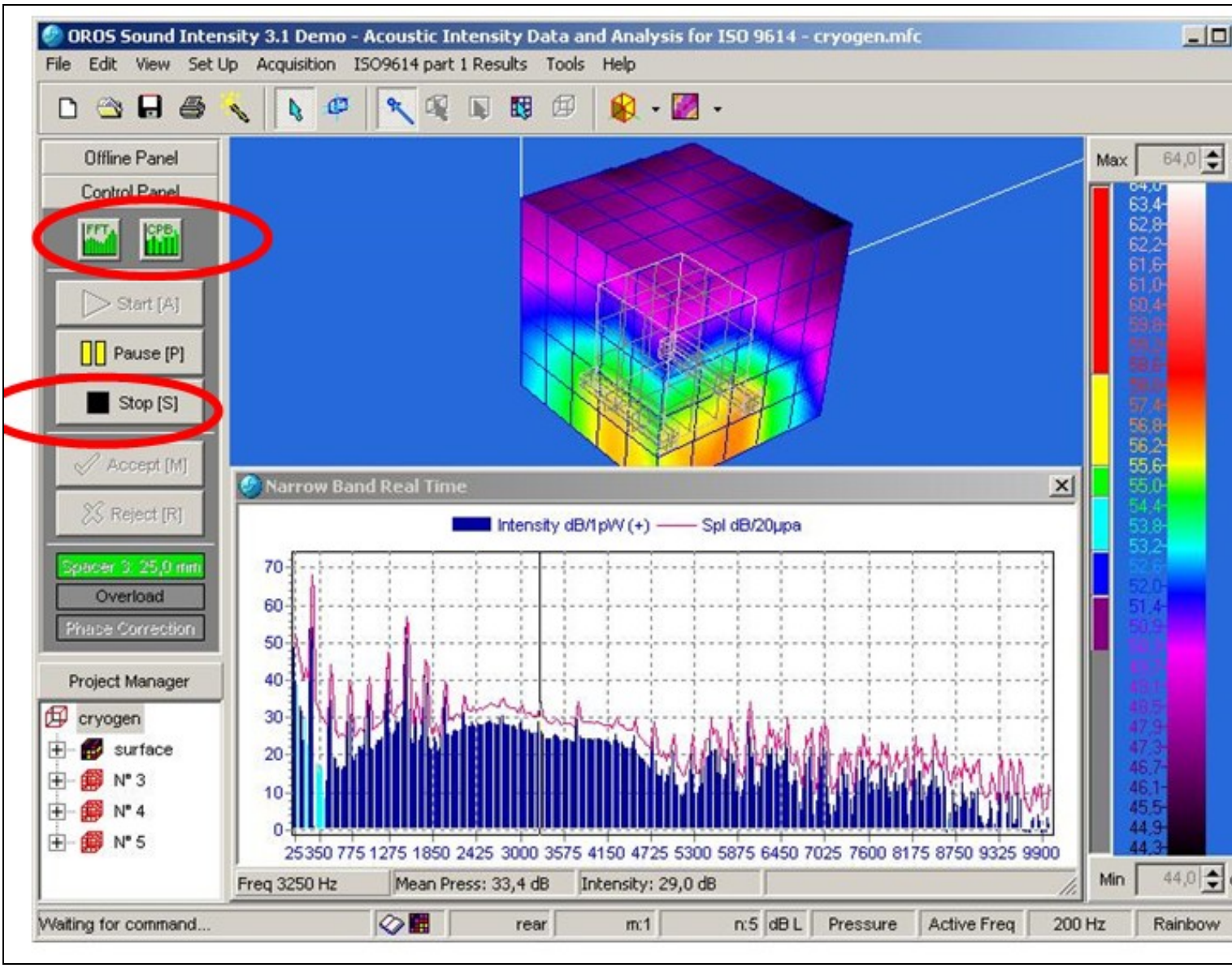
171.7.2.7 Narrow band Analysis

In several cases it is very important to perform narrow band analysis to better understand noise causes. In this occurrence, an FFT analysis can be performed directly using the real time performances of the OR 25 PC Pack.

First, the user must click on the **Real Time FFT Analysis** button, placed in the upper part of the **Control Panel**. Then a new window opens, and the analysis starts as soon as the user clicks on the **Start** button.

To stop the acquisition, click on the **Stop** button.

It's noteworthy that data acquired with this procedure can't be stored in the project and then are not taken into account during sound power determination according to the ISO Standard.

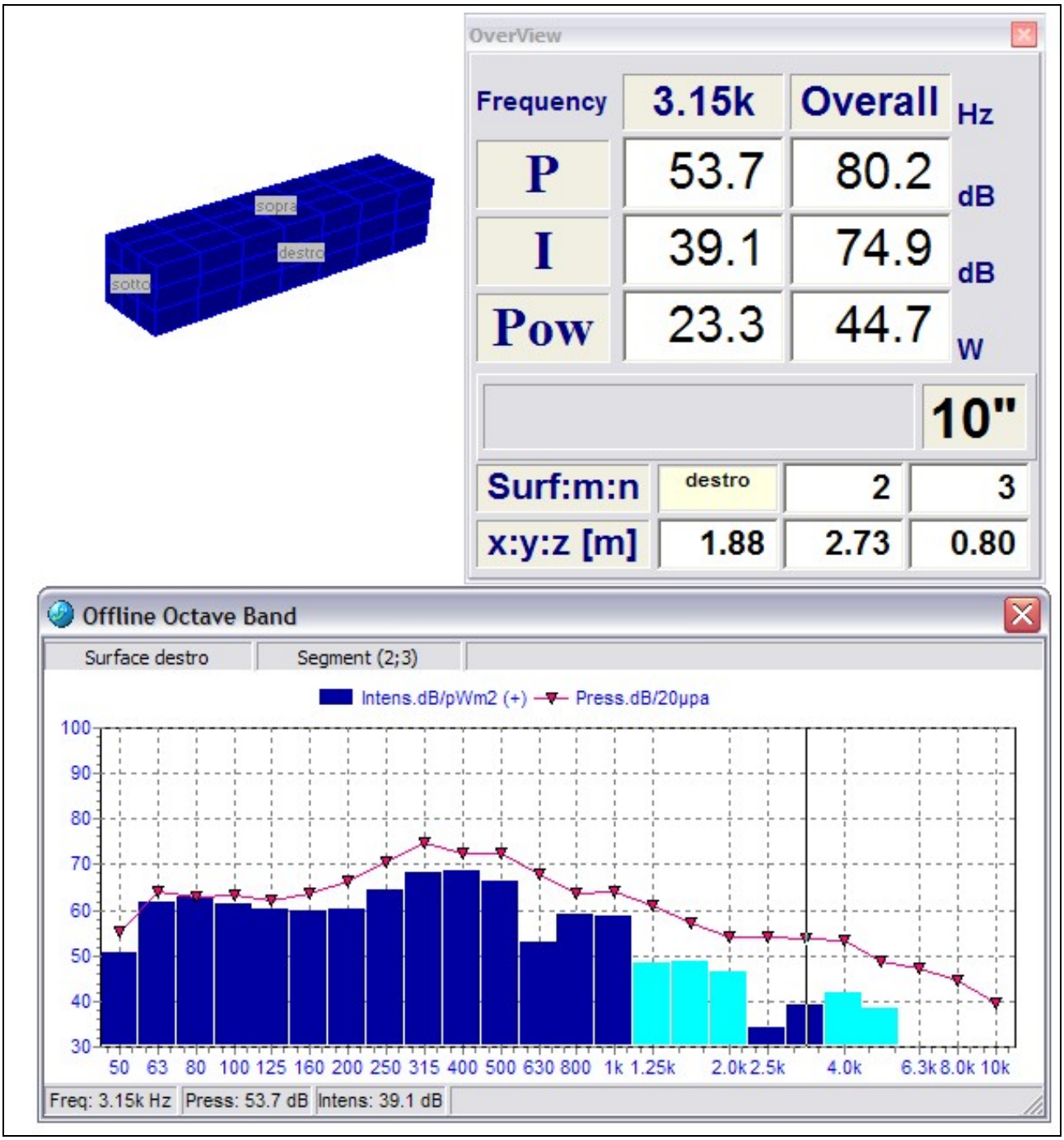


171.7.2.8 Overview grid

The overview grid has been designed to enhance a number of points. In particular, the main one is to make the important information very visible from a distance. The overview grid benefits to the acquisition as well as the analysis.

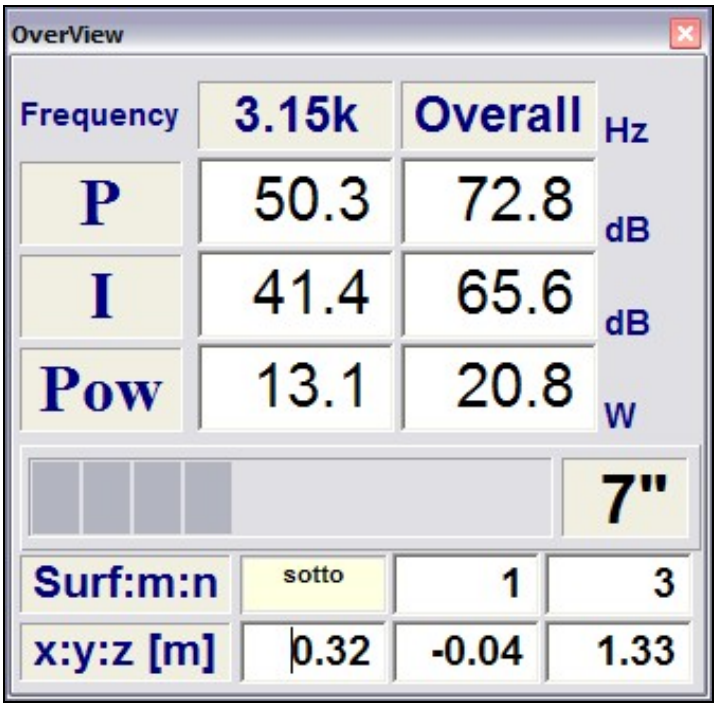
It let the user:

- Improve greatly the visibility of the measured values such as the sound pressure, the intensity level or the power level through the surface of the selected cell. It is given either for a defined frequency or for the overall level.



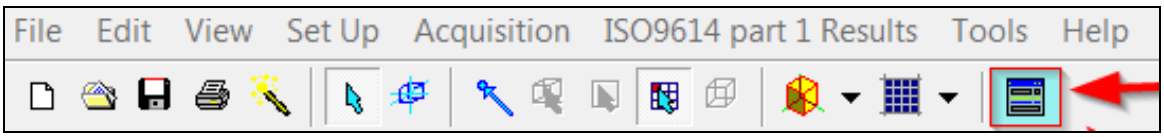
Overview grid

- Shows clearly the geographic position of the measured point in "Meters". It is particularly useful for positioning the altitude of the measurement points.
- Clearly displays the coordinate position of the measured cell in the surface.
- Large progress bar in order to make the evolution and status of the linear averaging very visible.



Overview grid during acquisition

The overview grid is activated by clicking on the following icon as shown by the red arrow on the next figure



Showing the overview grid

171.8 Results & Noise Distribution Analysis

The Analysis set-up is achieved with the **Main Mode** on.

There are four ways to display the results:

- **Color display;**
- **Multi frequency view**;
- **Parallel Space**;
- **Off line Octave Spectrum**.

171.8.1 Color Display of pressure and intensity fields

The display tools described in this section are available when the corresponding option was purchased.

Using the mouse left button and specific keyboard keys (Ctrl and Alt) the 3D displays can be handled as:

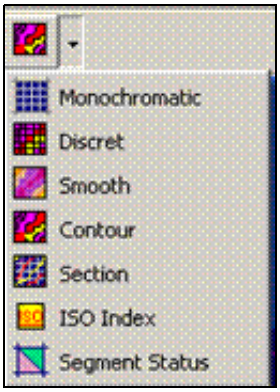
- Translating the display origin: Drag with left mouse click. The **Origin translation** icon must be toggled on (Cf. section 2).

- Rotate the display: Ctrl key + Drag with left mouse click
- Zoom the display: Alt key + Drag with left mouse click

171.8.2 Visualization set up

171.8.2.1 Display modes

There are seven display modes available to represent pressure and intensity fields:

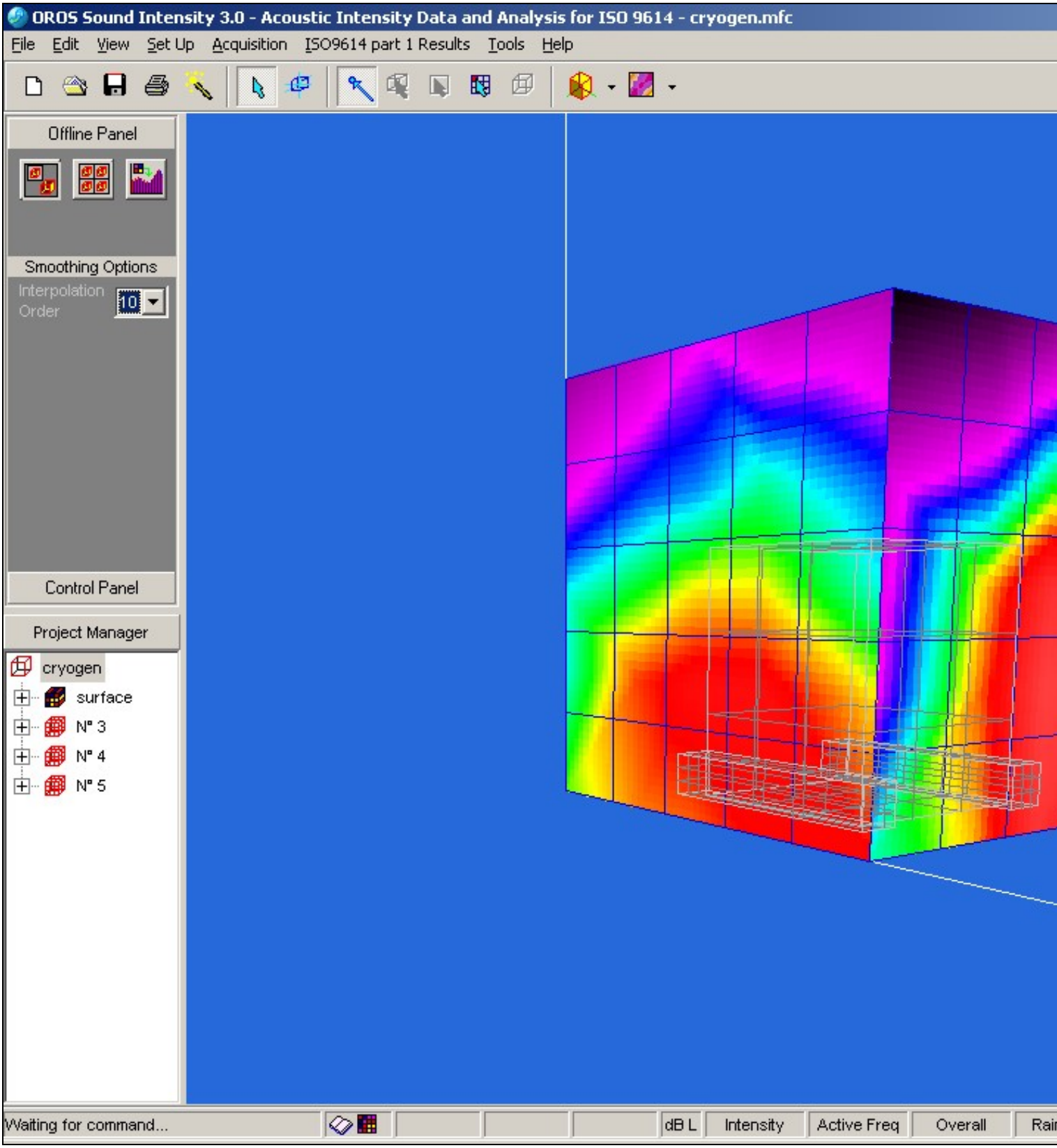


Display modes.

1. Monochromatic: useful to depict the measurement surface with the active measurement segment on (blinking);

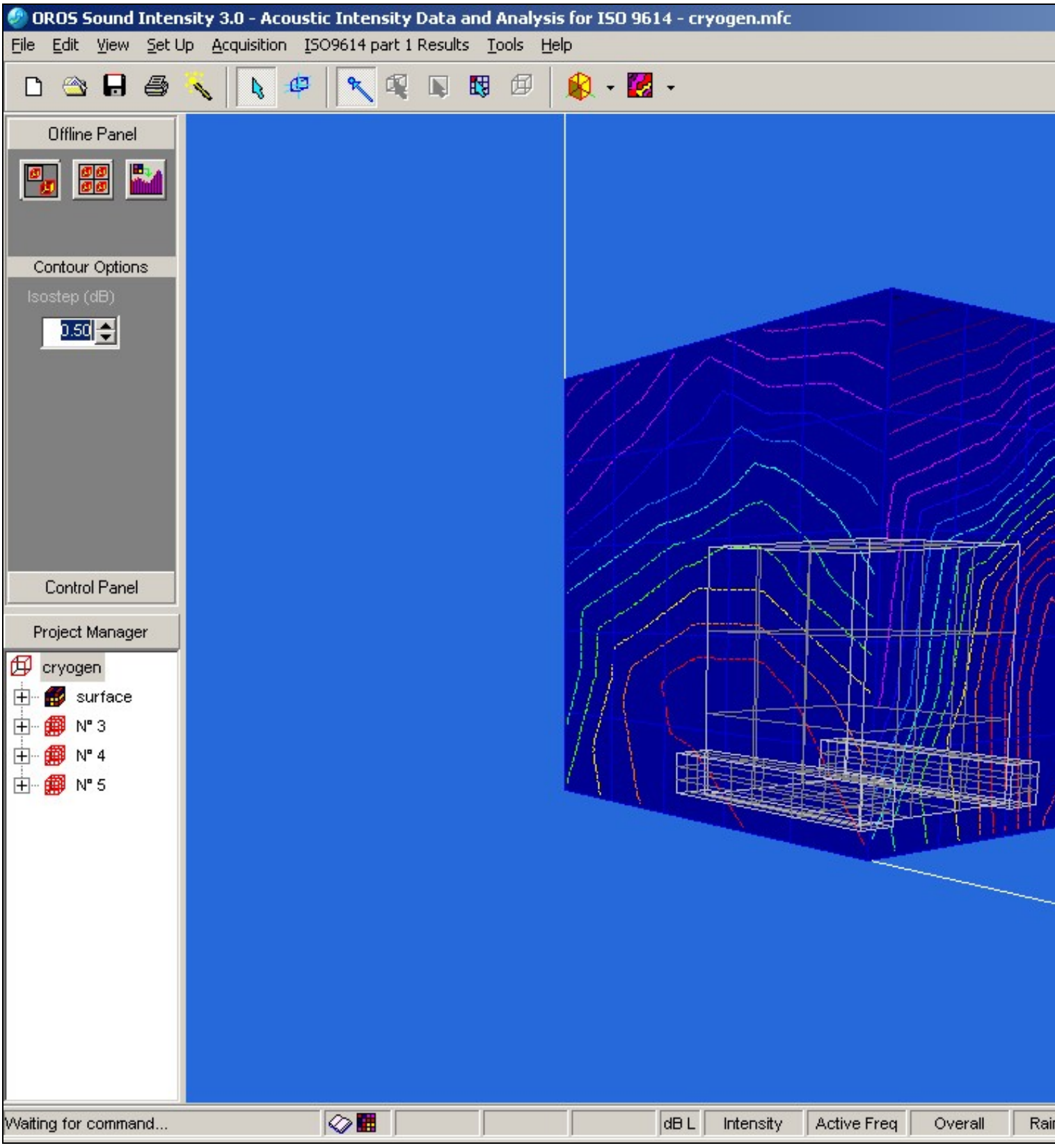
2. Discrete: can be used during acquisition to differentiate measured segments from not yet considered segments;

3. Smooth: the easiest way to portray a continuous distribution of pressure and intensity fields over the geometry of the device under test. A linear interpolation order for the smoothing of the contours can be selected in the range 1-10;


OROS Sound Intensity 3.0 - Acoustic Intensity Data and Analysis for ISO 9614 - cryogen.mfc
File Edit View Set Up Acquisition ISO9614 part 1 Results Tools Help
Offline Panel
Smoothing Options
Interpolation Order
10
Control Panel
Project Manager
cryogen
surface
N° 3
N° 4
N° 5
Waiting for command...
dB L
Intensity
Active Freq
Overall

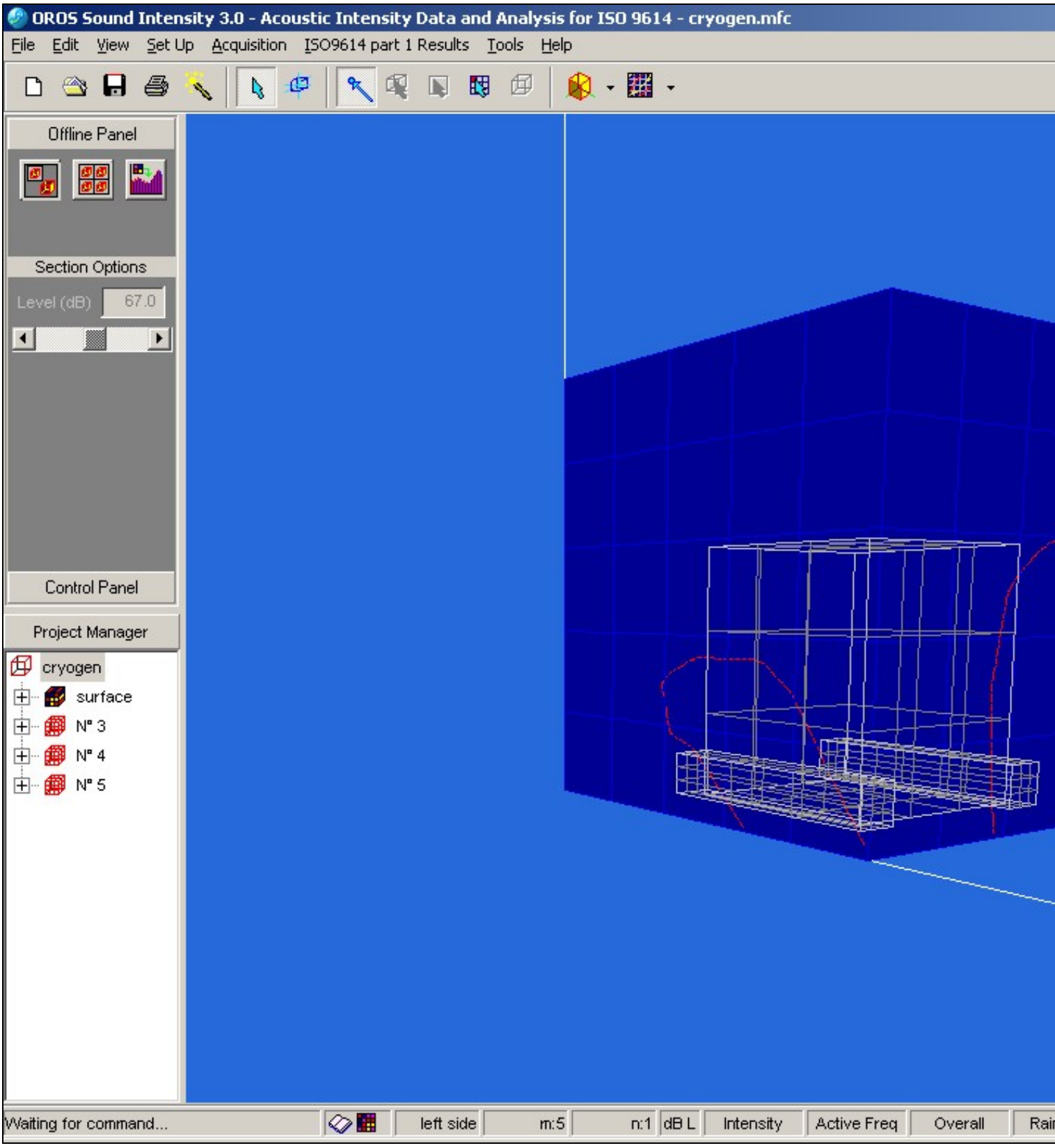
Smooth contour plot of the intensity field.

4. Contour: with this option the user can plot equal-pressure and equal-intensity lines over the measurement surface. It's also possible to select the step difference for two consecutive curves to increase the number of lines within the representation.



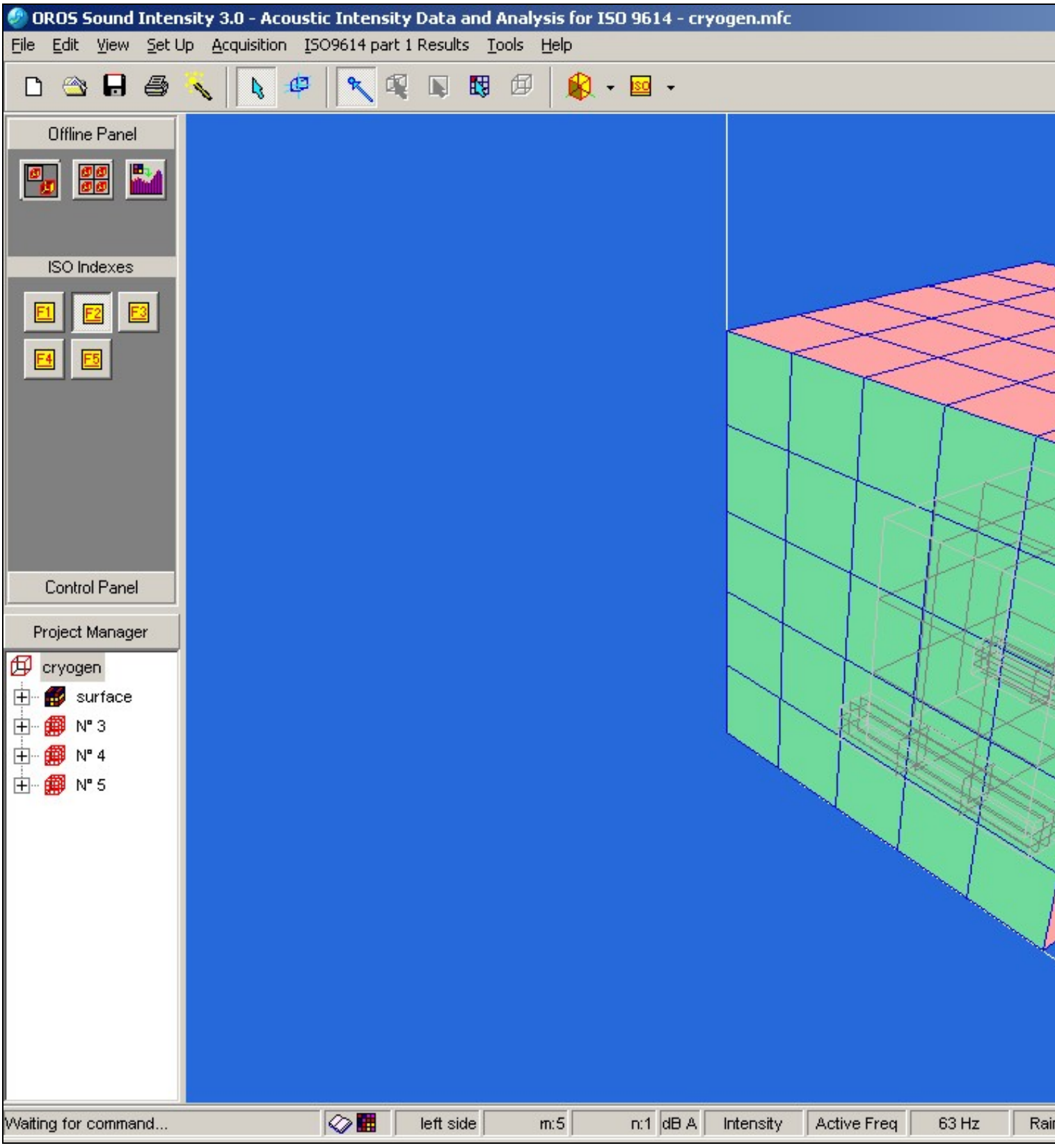
Contour representation of the intensity field.

5. Section: useful to display a single line pertinent to a specific pressure or intensity level. For example, in the following figure is represented the contour plot for an intensity level of 67 dB re 1pW/m^2.



Section representation of the intensity field.

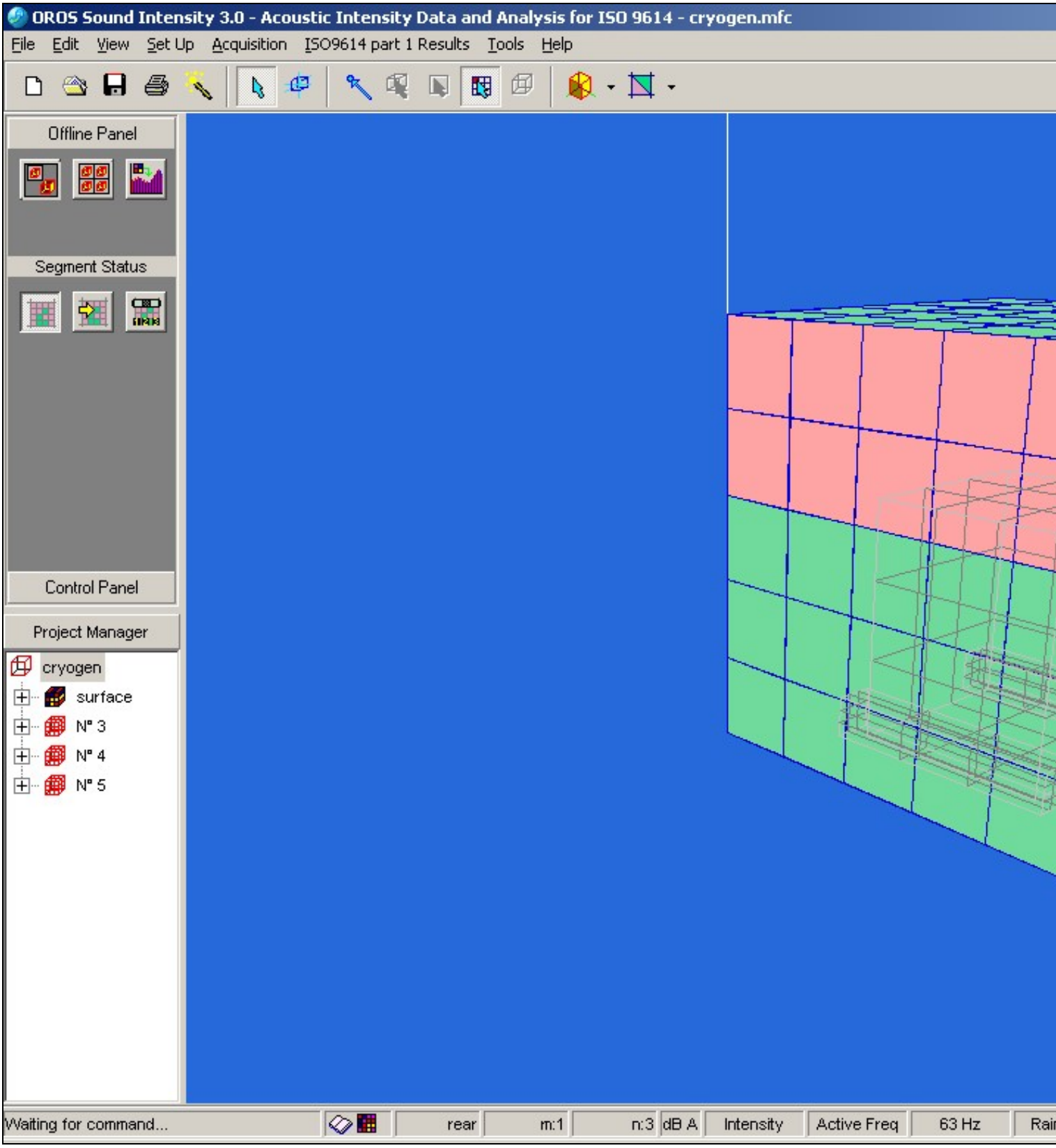
6. ISO Index: this mode is useful to represent the measurement surfaces complying or not complying the Standard requirements according to the selected accuracy of the determination. Complying faces are light up with green, not complying are light up with red.



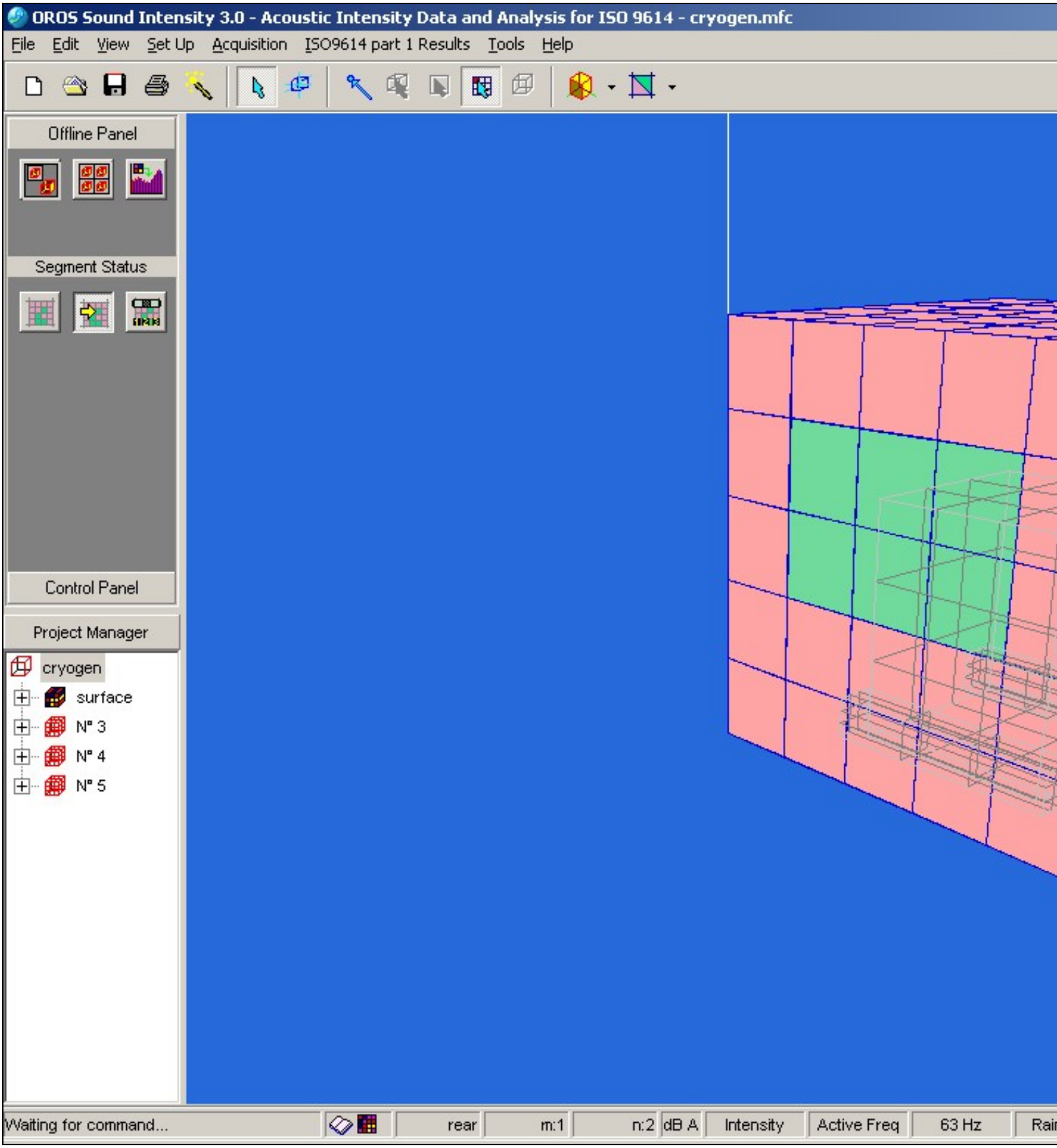
ISO Index view.

7. Segment Status: the segment status view type has three functions:

- Segment status visualization and activation/deactivation: The segments can be activated for the use in sound power determination (green) or deactivated (red) in the case the user doesn't want to use them during the sound power determination. The software will compute the Sound Power according to the selected choices.

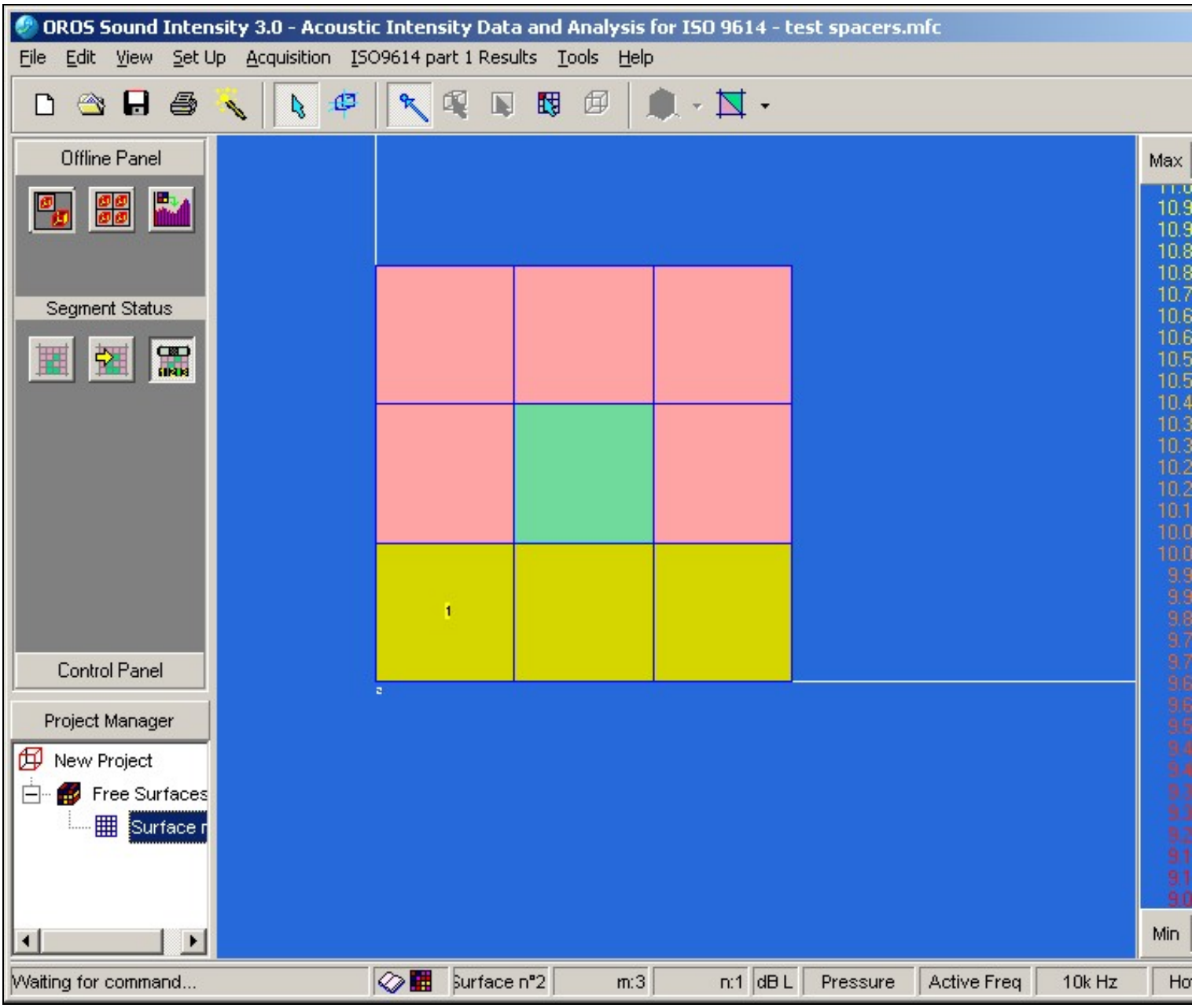


- Segments in which data were imported: the user can see at a glance the segments where data were imported (green cells).



Segments in which data were imported

- Spacer used for the measured face: this mode allows the user to display the spacers used for a measurement surface. Red segments have not been measured yet with any spacer, green segments have been measured with all the spacers defined for the project, and yellow segments have been measured with some of the available spacers. Scrolling the frequencies, the user can see the spacers used in the various frequency ranges with a specific spacer.



Spacers used for the measurement surface

171.8.2.2 Display settings

There are several display configurations the user can activate by clicking on the display area with the right mouse button. Basically there are three types of set up:

- **dB scale**: if the user clicks on the dB (A) ? linear selector, the graphs will display the chosen weighting.
- **Frequency selection**: use this command to choose among the frequency bands the one you want to display. It is also possible to show the overall (frequency sum) values for each segment.
- **Pressure ? intensity** layer: the user can display the relevant data related to the chosen frequency on the contour maps by selecting the pressure or the intensity layer.

171.8.2.3 Color Scales

By clicking right on the color scale the user activates the pop-up menu he can employ to select the different available types of color scale:

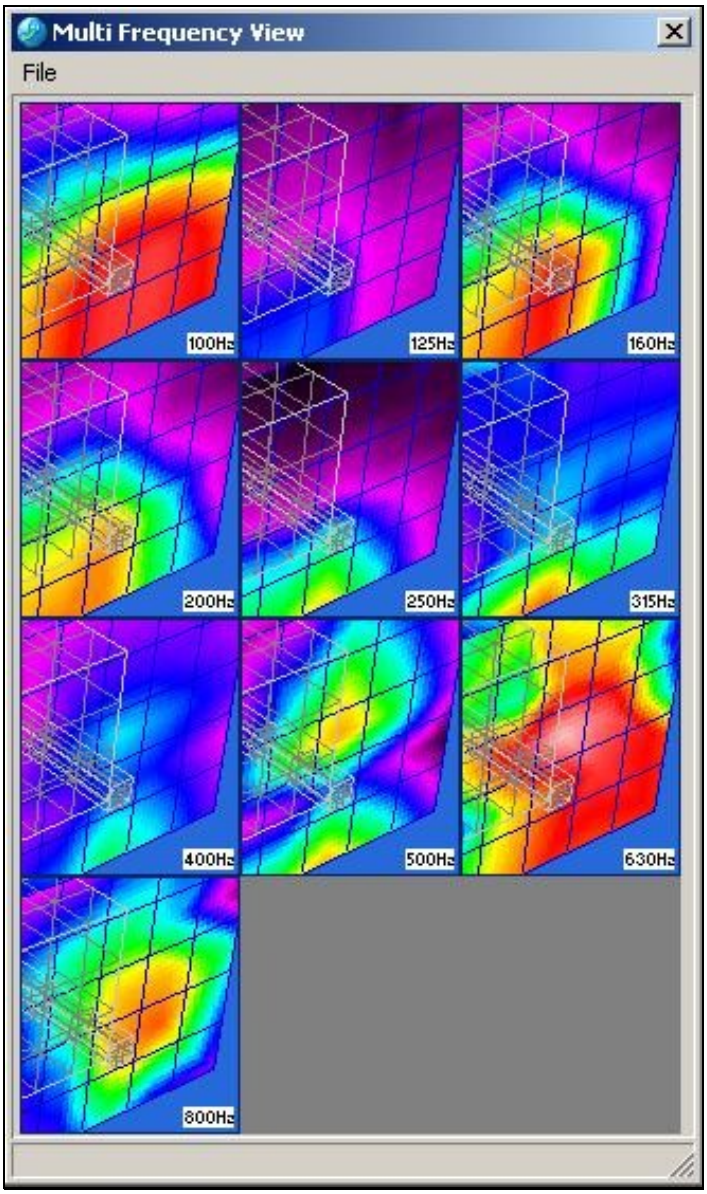
- **Hot (fire)**
- **Cold (water)**
- **Absolute**
- **Rainbow (editable)**
- **Black and white**
- **Mono red**
- **Mono green**
- **Mono blue**

The **Rainbow** scale is editable. To edit this scale click with the left mouse button on the color you want to extend. By dragging the cursor you will be able to increase or decrease the range of this color on the scale.

When you have finished editing your new scale the display will be automatically updated with the new color scale settings.

171.8.3 Multi Frequency

The **Multi frequency** spectrum view has been developed to show simultaneously several frequency plots in one shot.

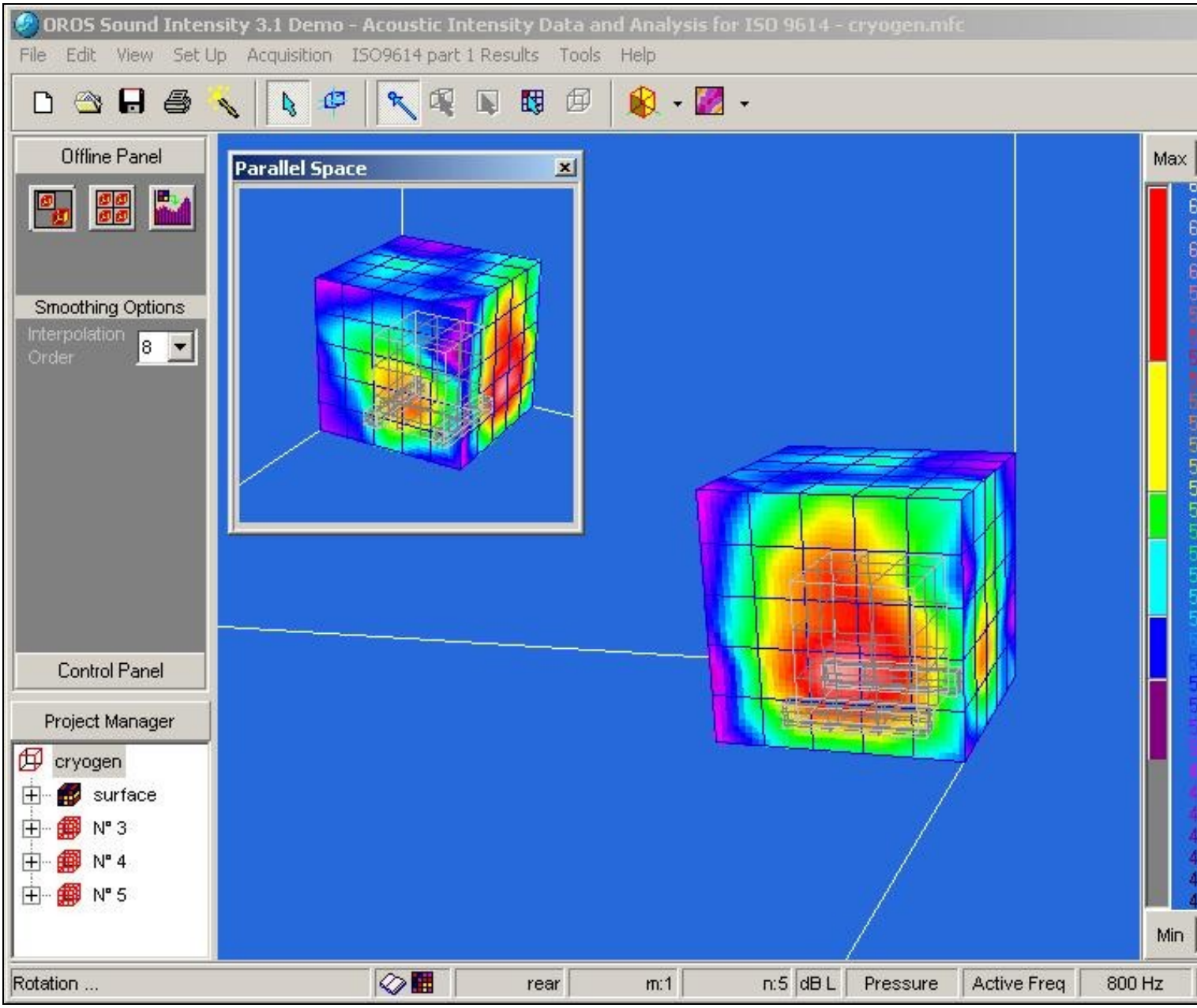

Multi Frequency View
File
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz

Multi frequency view

To activate this command click on the relevant button and select the frequencies you want to show. Then click on the **Next** button and select the area you want to see in the multi spectrum view window. Click at first the top right point of the selection window and then the bottom right one. The program will open a new window showing the surfaces for the selected frequencies.

171.8.4 Parallel Space

Using the **Parallel space** outlook it is possible to show the same surface from different points of view. Select the command by pressing the relevant button. This action will open the new parallel space window.



Parallel space sight

Rotate and zoom the object in the parallel space window until you reach the desired point of view.

When the represented object is in the required position press the right mouse button to show the pop up menu and fix a parallel space.

From now on the usual representation and parallel space will be linked during pan, zoom and rotation operations.

171.8.5 Off-line octave spectrum

The **Cell selection** cursor has been developed to activate functions for a single cell:

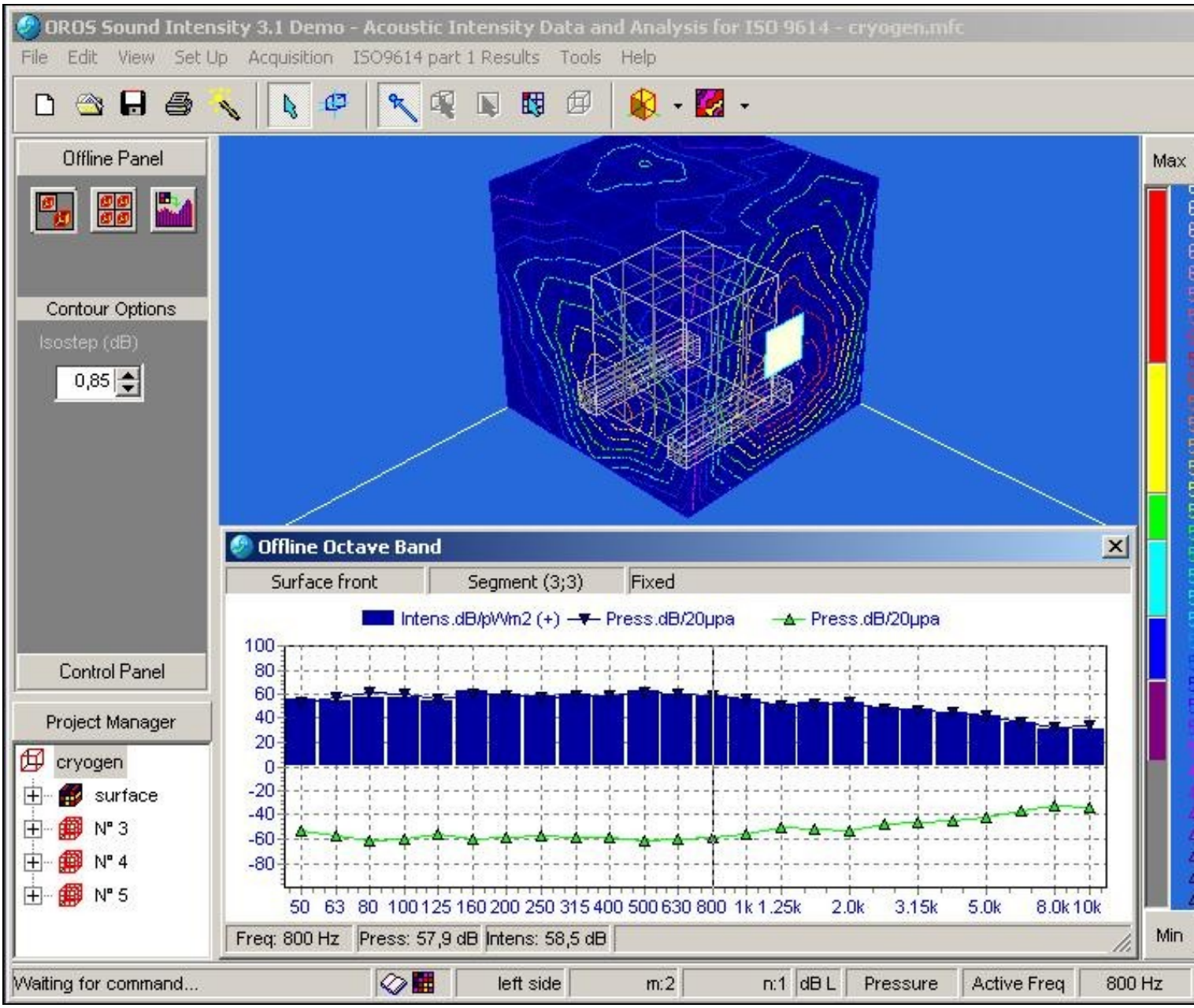
- Displays data for:
  - Pressure
  - Intensity
  - P-I Index

This second command must be used with the dynamic cell spectrum button in the left part of the main window.

In any case the user has to point the cursor to the cell he wants to highlight and the spectrum will be updated according to the data stored for that particular segment.

To fix a particular segment just click on it. The segment lightens and the user will be able to move the cursor around the screen without changing the spectrum shown in the window.

To switch from a kind of representation to another (for example from pressure to intensity graphs) click on the window title with the right mouse button.


OROS Sound Intensity 3.1 Demo - Acoustic Intensity Data and Analysis for ISO 9614 - cryogen.mfc
File Edit View Set Up Acquisition ISO9614 part 1 Results Tools Help
Offline Panel
Contour Options
Isostep (dB)
0,85
Control Panel
Project Manager
cryogen
surface
N° 3
N° 4
N° 5
Max
Min
Offline Octave Band
Surface front
Segment (3;3)
Fixed
Intens.dB/pVVm2 (+)
Press.dB/20µpa
Press.dB/20µpa
100
80
60
40
20
0
-20
-40
-60
-80
50 63 80 100 125 160 200 250 315 400 500 630 800 1k 1.25k 2.0k 3.15k 5.0k 8.0k 10k
Freq: 800 Hz
Press: 57,9 dB
Intens: 58,5 dB
Waiting for command...
left side
m:2
n:1
dB L
Pressure
Active Freq
800 Hz

Off-line spectrum mode

Clicking with the right mouse button, it's possible to have options for the Offline spectrum. For example, the options are:

- Bipolar intensity;

- Y-axis: Autorange, fixed unzoom;

- Label: intensity, pressure;

- Export image file (as bmp or metafile);

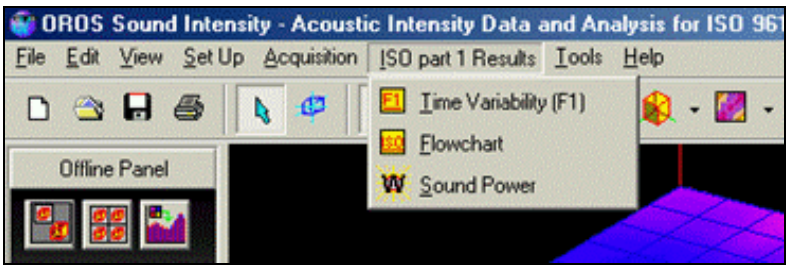
- Export data (as txt file).

171.9 Sound Power using ISO 9614 Part 1

Sound Power is calculated with the **Main Mode** on (Cf. Section 2)

To access the **Result** analysis, click on the **ISO part 1 Results** and select the correct item among (see Fig. 56):

- **Time variability Index F1**
- **ISO Flowchart**
- **Sound Power computation**



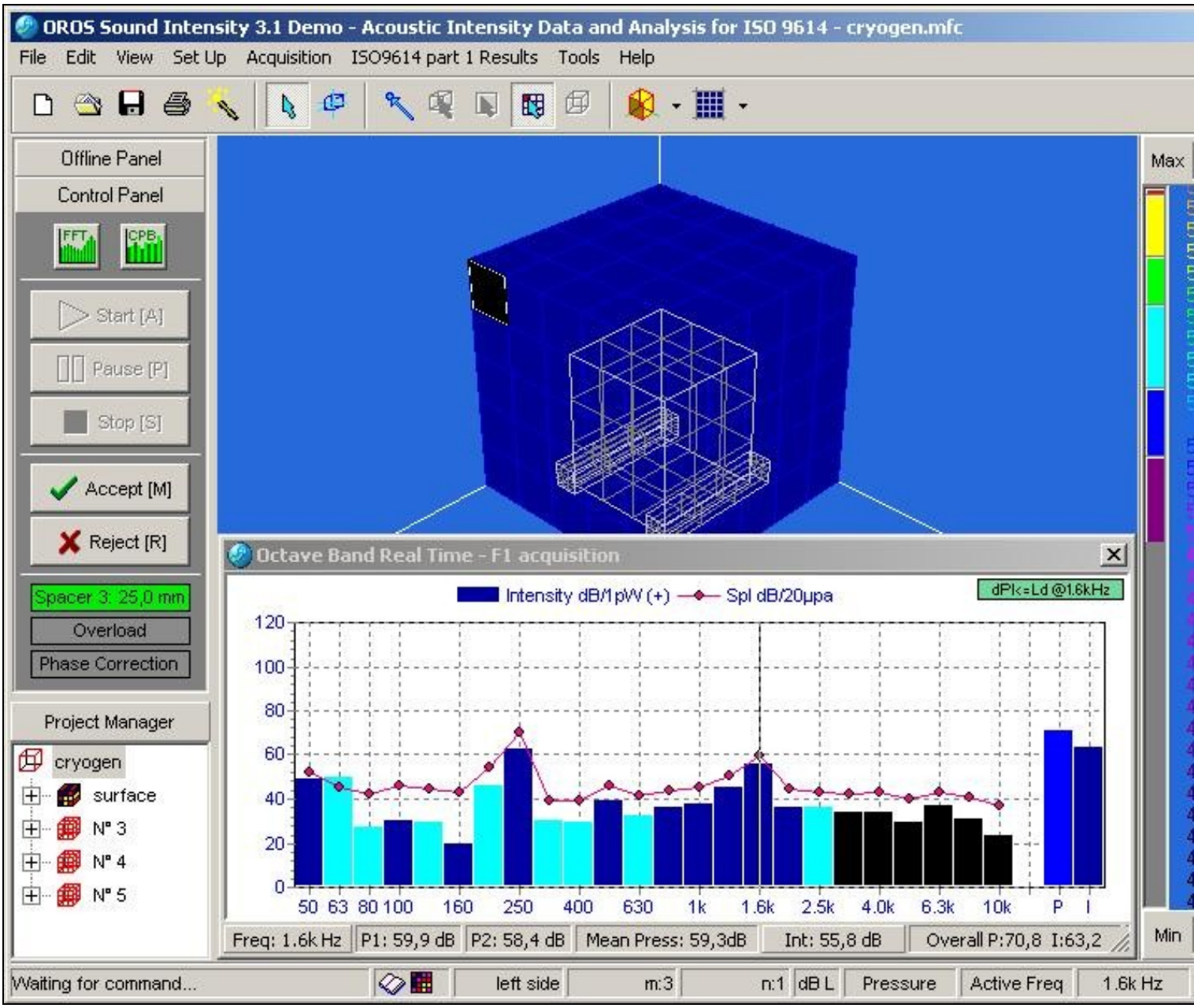
ISO part 1 Results

171.9.1 F1 Index

Before starting the sound power determination, according to the ISO 9614-1 Standard, you will have to determine the temporal variability of the sound emitted by the sound source. In this case you should prepare at first a set of measures and import them into the program.

The first step is to select a surface in the tree structures placed on the left part of the window.

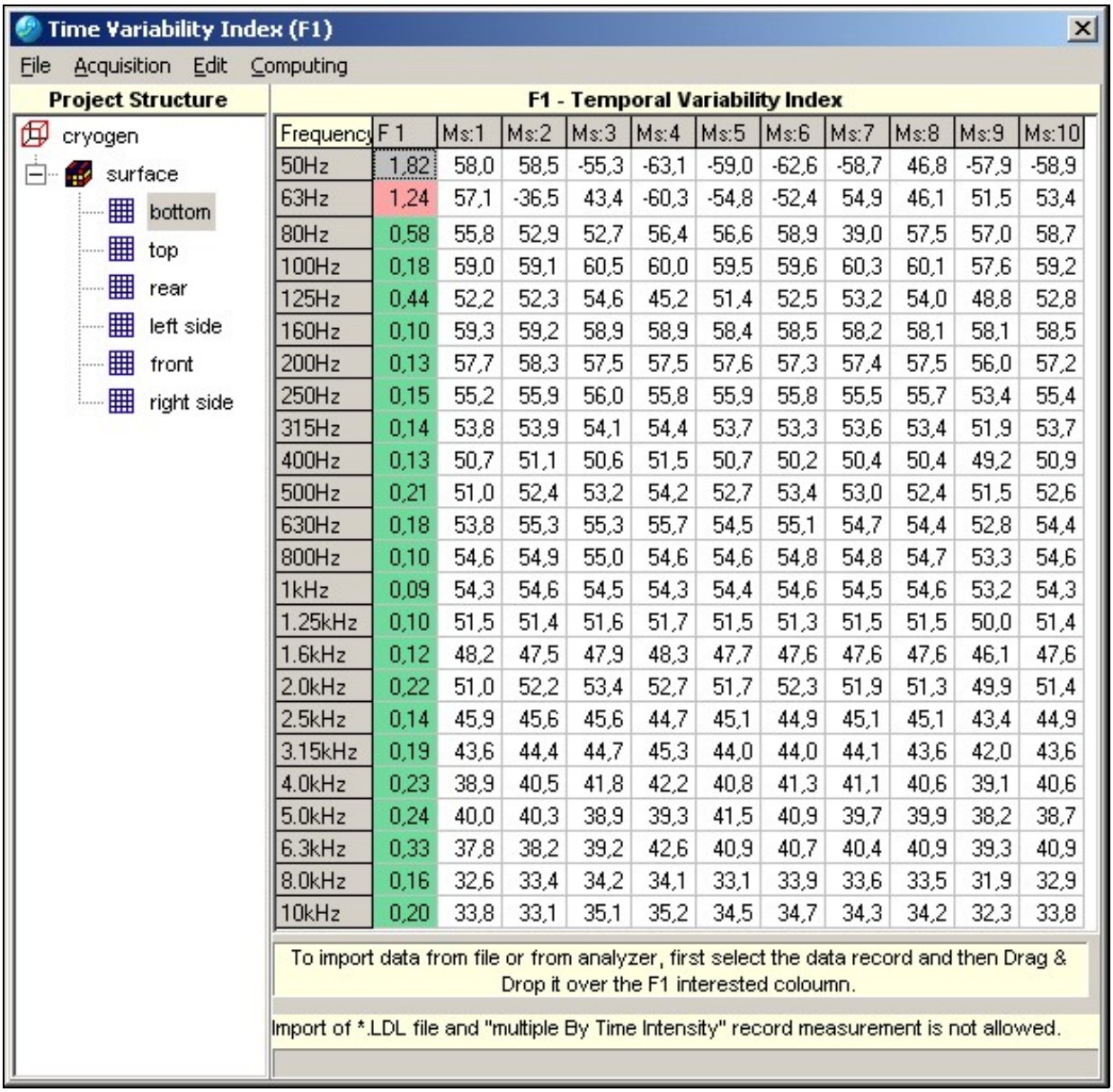
The best choice is to use the real time acquisition. In this case, select a column to import data into it. Then pick the **Octave band real time** command from the acquisition menu.


OROS Sound Intensity 3.1 Demo - Acoustic Intensity Data and Analysis for ISO 9614 - cryogen.mfc
File Edit View Set Up Acquisition ISO9614 part 1 Results Tools Help
Offline Panel
Control Panel
FFT
CPB
Start [A]
Pause [P]
Stop [S]
Accept [M]
Reject [R]
Spacer 3: 25,0 mm
Overload
Phase Correction
Project Manager
cryogen
surface
N° 3
N° 4
N° 5
Max
Min
Octave Band Real Time - F1 acquisition
Intensity dB/1pW (+)
Spl dB/20µpa
dPl<=Ld @1.6kHz
120
100
80
60
40
20
0
50 63 80 100 160 250 400 630 1k 1.6k 2.5k 4.0k 6.3k 10k P I
Freq: 1.6k Hz
P1: 59,9 dB
P2: 58,4 dB
Mean Press: 59,3dB
Int: 55,8 dB
Overall P:70,8 I:63,2
Waiting for command...
left side
m:3
n:1
dB L
Pressure
Active Freq
1.6k Hz

Real time F1 Acquisition

Pressing the **Start** button the acquisition goes on until the analyzer reaches the total average time. Then you can store the measurements by pressing the **Save** button. Repeat the procedure until the total number of samples is reached.

To set up the acquisition parameters click with the right mouse button on the real time acquisition window and select from the pop-up menu the **Instrument set-up** item.



Frequency	F 1	Ms:1	Ms:2	Ms:3	Ms:4	Ms:5	Ms:6	Ms:7	Ms:8	Ms:9	Ms:10
50Hz	1,82	58,0	58,5	-55,3	-63,1	-59,0	-62,6	-58,7	46,8	-57,9	-58,9
63Hz	1,24	57,1	-36,5	43,4	-60,3	-54,8	-52,4	54,9	46,1	51,5	53,4
80Hz	0,58	55,8	52,9	52,7	56,4	56,6	58,9	39,0	57,5	57,0	58,7
100Hz	0,18	59,0	59,1	60,5	60,0	59,5	59,6	60,3	60,1	57,6	59,2
125Hz	0,44	52,2	52,3	54,6	45,2	51,4	52,5	53,2	54,0	48,8	52,8
160Hz	0,10	59,3	59,2	58,9	58,9	58,4	58,5	58,2	58,1	58,1	58,5
200Hz	0,13	57,7	58,3	57,5	57,5	57,6	57,3	57,4	57,5	56,0	57,2
250Hz	0,15	55,2	55,9	56,0	55,8	55,9	55,8	55,5	55,7	53,4	55,4
315Hz	0,14	53,8	53,9	54,1	54,4	53,7	53,3	53,6	53,4	51,9	53,7
400Hz	0,13	50,7	51,1	50,6	51,5	50,7	50,2	50,4	50,4	49,2	50,9
500Hz	0,21	51,0	52,4	53,2	54,2	52,7	53,4	53,0	52,4	51,5	52,6
630Hz	0,18	53,8	55,3	55,3	55,7	54,5	55,1	54,7	54,4	52,8	54,4
800Hz	0,10	54,6	54,9	55,0	54,6	54,6	54,8	54,8	54,7	53,3	54,6
1kHz	0,09	54,3	54,6	54,5	54,3	54,4	54,6	54,5	54,6	53,2	54,3
1.25kHz	0,10	51,5	51,4	51,6	51,7	51,5	51,3	51,5	51,5	50,0	51,4
1.6kHz	0,12	48,2	47,5	47,9	48,3	47,7	47,6	47,6	47,6	46,1	47,6
2.0kHz	0,22	51,0	52,2	53,4	52,7	51,7	52,3	51,9	51,3	49,9	51,4
2.5kHz	0,14	45,9	45,6	45,6	44,7	45,1	44,9	45,1	45,1	43,4	44,9
3.15kHz	0,19	43,6	44,4	44,7	45,3	44,0	44,0	44,1	43,6	42,0	43,6
4.0kHz	0,23	38,9	40,5	41,8	42,2	40,8	41,3	41,1	40,6	39,1	40,6
5.0kHz	0,24	40,0	40,3	38,9	39,3	41,5	40,9	39,7	39,9	38,2	38,7
6.3kHz	0,33	37,8	38,2	39,2	42,6	40,9	40,7	40,4	40,9	39,3	40,9
8.0kHz	0,16	32,6	33,4	34,2	34,1	33,1	33,9	33,6	33,5	31,9	32,9
10kHz	0,20	33,8	33,1	35,1	35,2	34,5	34,7	34,3	34,2	32,3	33,8

F1 index table for bottom surface

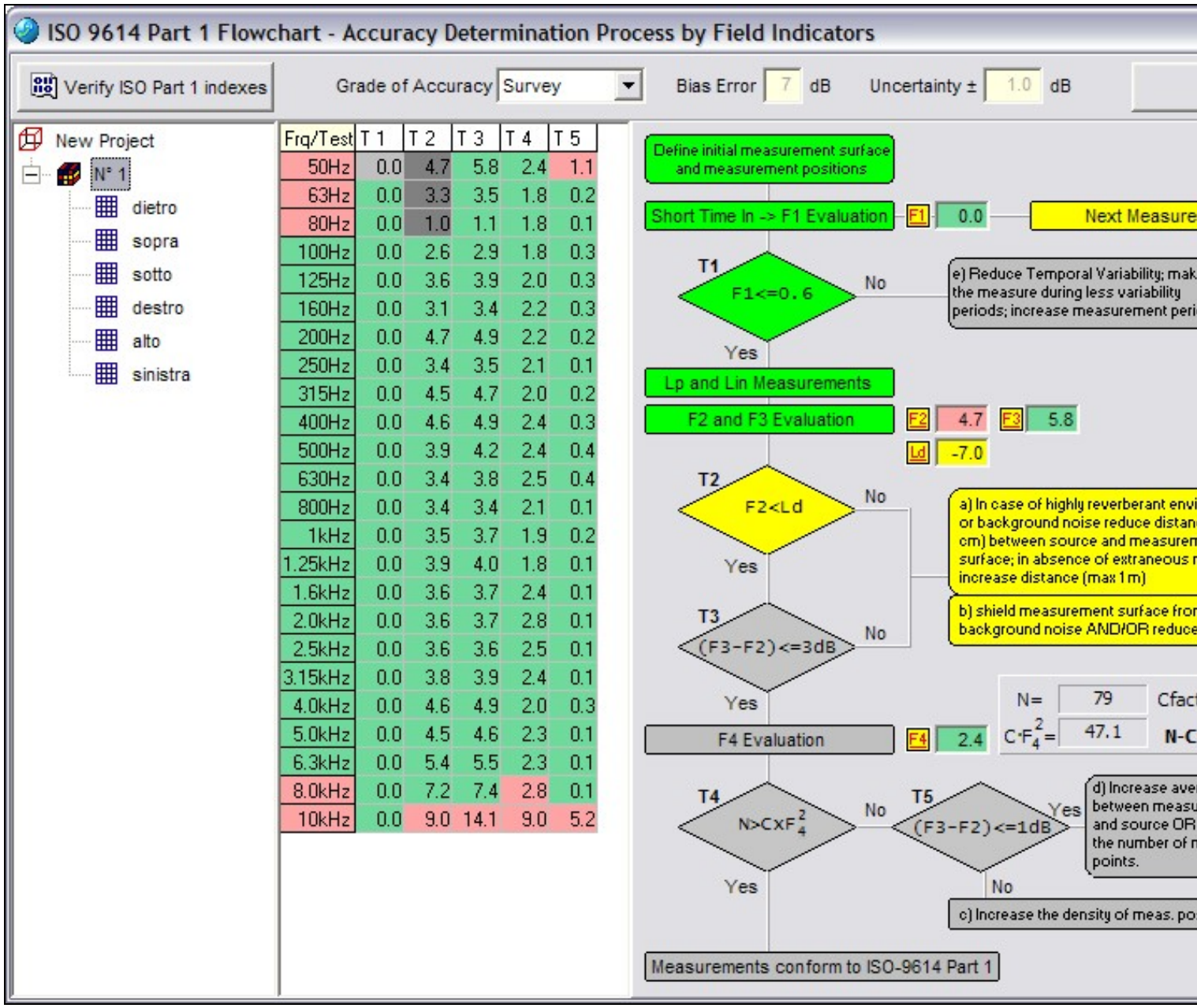
When you have finished the acquisition you can come back again in the **ISO Part 1 Results** menu and select from the **Computing** menu "Verify all F1 indexes". The program will compute this index for all the surfaces and will show the index value at each frequency for all the surfaces. If the Standard requirements are not met for some frequencies, then the program will show the correspondent F1 value in a red cell. Otherwise the cell will be marked in green.

171.9.2 ISO 9614-1 Flowchart

The field indicators described in the ISO 9614-1 Standard, compulsory for the accuracy determination process, can be accessed by the **Analysis** menu once the user has imported all the data related to the model. To make the program perform the calculations required, the user has to access the menu "**Computing**" and run the command "**Verify ISO Indexes**".

- It shows the criteria for both each surface and also for the whole measurement surface
- One can also modify the choice of the accuracy grade after the measurement and see its effect on the criteria requirements of the ISO 9614 standards.
- One can also see directly the ($N\text{-}CF_4^2$) result and see how close it comes to 0.

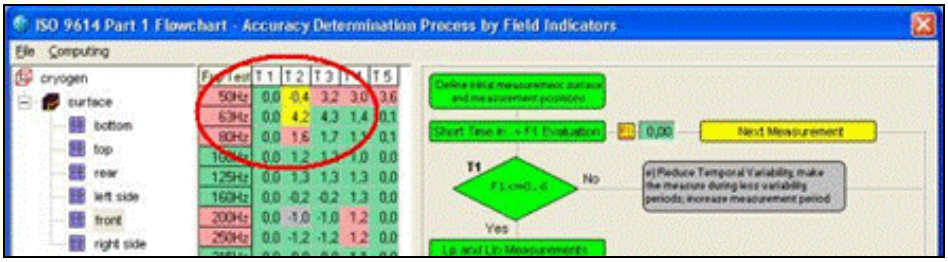
By selecting a surface contained in the tree structure on the upper left part of the window, the user can show the related flowchart and the values for the four indexes F1, F2, F3 and F4. In case of non-conformity with the accuracy determination process described in the ISO standard, the frequency and the index which are not up to the Standard requirements, lights up in red and the flowchart shows the action the user has to undertake to reach the grade of accuracy he wants (see Fig. 59).


ISO 9614 Part 1 Flowchart - Accuracy Determination Process by Field Indicators
Verify ISO Part 1 indexes
Grade of Accuracy
Survey
Bias Error
7
dB
Uncertainty ±
1.0
dB
New Project
N° 1
dietro
sopra
sotto
destro
alto
sinistra
Frq/Test
T 1
T 2
T 3
T 4
T 5
50Hz 0.0 4.7 5.8 2.4 1.1
63Hz 0.0 3.3 3.5 1.8 0.2
80Hz 0.0 1.0 1.1 1.8 0.1
100Hz 0.0 2.6 2.9 1.8 0.3
125Hz 0.0 3.6 3.9 2.0 0.3
160Hz 0.0 3.1 3.4 2.2 0.3
200Hz 0.0 4.7 4.9 2.2 0.2
250Hz 0.0 3.4 3.5 2.1 0.1
315Hz 0.0 4.5 4.7 2.0 0.2
400Hz 0.0 4.6 4.9 2.4 0.3
500Hz 0.0 3.9 4.2 2.4 0.4
630Hz 0.0 3.4 3.8 2.5 0.4
800Hz 0.0 3.4 3.4 2.1 0.1
1kHz 0.0 3.5 3.7 1.9 0.2
1.25kHz 0.0 3.9 4.0 1.8 0.1
1.6kHz 0.0 3.6 3.7 2.4 0.1
2.0kHz 0.0 3.6 3.7 2.8 0.1
2.5kHz 0.0 3.6 3.6 2.5 0.1
3.15kHz 0.0 3.8 3.9 2.4 0.1
4.0kHz 0.0 4.6 4.9 2.0 0.3
5.0kHz 0.0 4.5 4.6 2.3 0.1
6.3kHz 0.0 5.4 5.5 2.3 0.1
8.0kHz 0.0 7.2 7.4 2.8 0.1
10kHz 0.0 9.0 14.1 9.0 5.2
Define initial measurement surface and measurement positions
Short Time In -> F1 Evaluation
F1
0.0
Next Measure
T1
F1<=0.6
No
e) Reduce Temporal Variability; mak
the measure during less variability
periods; increase measurement peri
Yes
Lp and Lin Measurements
F2 and F3 Evaluation
F2
4.7
F3
5.8
Ld
-7.0
T2
F2<Ld
No
a) In case of highly reverberant envi
or background noise reduce distan
cm) between source and measurem
surface; in absence of extraneous
increase distance (max 1 m)
Yes
T3
(F3-F2)<=3dB
No
b) shield measurement surface fro
background noise AND/OR reduce
Yes
N=
79
Cfact
C·F4²=
47.1
N-C
F4 Evaluation
F4
2.4
T4
N>CxF4²
No
T5
(F3-F2)<=1dB
Yes
d) Increase ave
between measu
and source OR
the number of
points.
Yes
No
c) Increase the density of meas. po
Measurements conform to ISO-9614 Part 1

Flowchart for the accuracy determination process

Please, remember that the field indicators automatically take into account the different spacers used during the determination for the different frequency ranges.

In the particular case in which the Ld value at the considered frequency is less than zero (this situation may arise if the PRI combined with the accuracy grade, the selected spacer and the environment conditions), the software highlights the F2 cells with the yellow color (and if the user select the segment, the software highlights the field "Ld." under the "F2" field in yellow also): this fact warns the user to check the consistency and correctness of the Capability Index (in relation to the PRI).



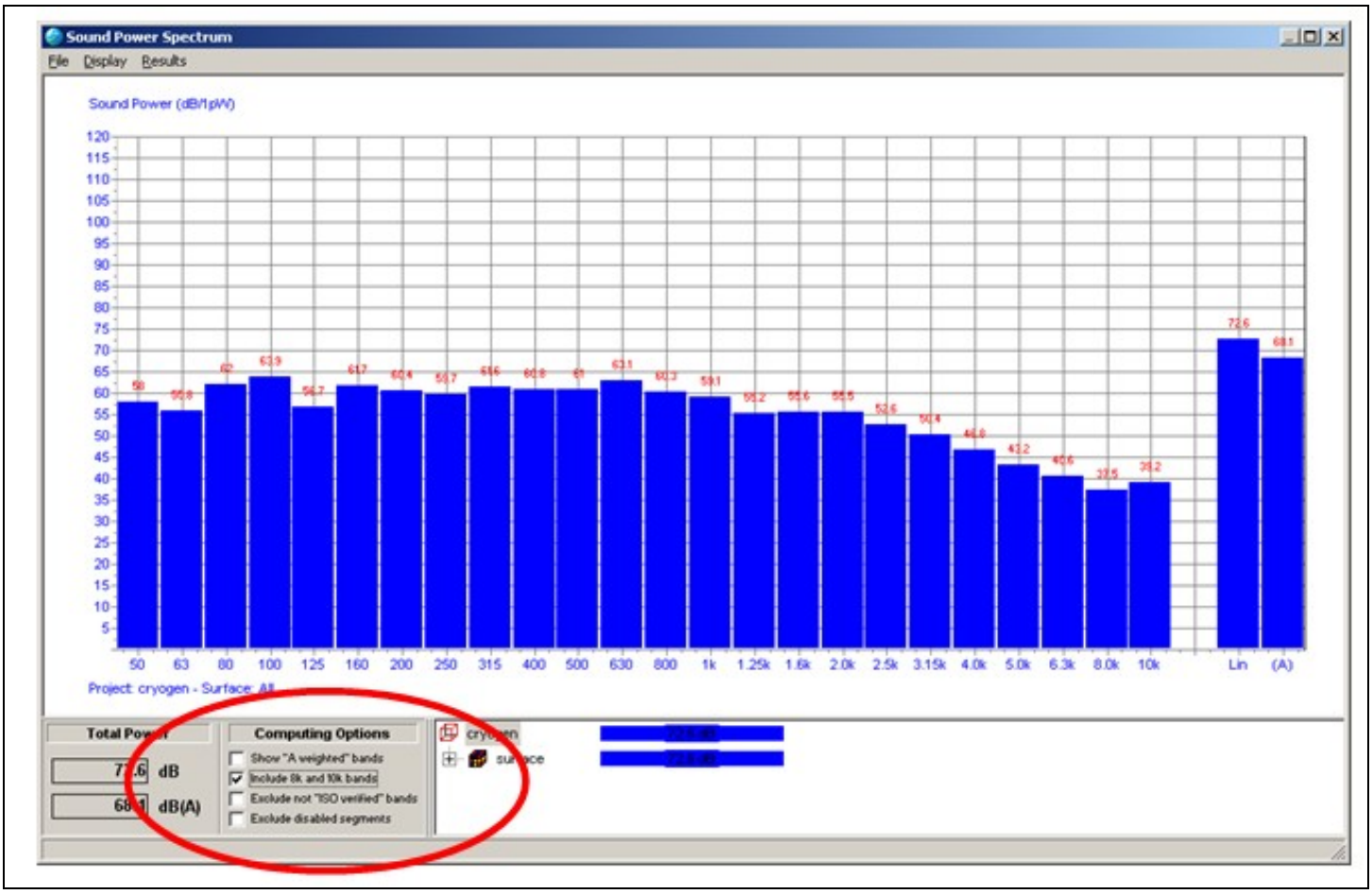
Capability index check

171.9.3 Sound Power

The **Analysis** menu contains also the command to enter the sound power result section. This part of the program gives the user a complete insight of the sound power radiated from the source and a ranking of the measurement surfaces. The tree structure can be browsed to show the emission spectrum of the overall measurement surface or the sound power spectra of the other surfaces enveloping the sound source.

The bars and the relevant values shown in the right lower part give a more practical insight of the power levels associated to the surfaces and express also the numerical value for each of them. A tick in the lower part of the window enables the user to choose if he wants to keep into account also the frequency bands not in accordance with the standard requirements or to discard them from the computation and the visualization. In the lower left part of the window the user can choose if he prefers to

- Show the overall power values expressed in terms of Linear or "A" weighted sound power levels [dB (L) or dB (A)].
- Include or not the 8k Hz and 10 kHz bands in the power computation (the standard limits the power computation at 6.3 kHz)
- Exclude or not, in the power computation, the bands not verified by the indicators
- Exclude or not, in the power computation, the segments previously disabled manually (graphical selection).



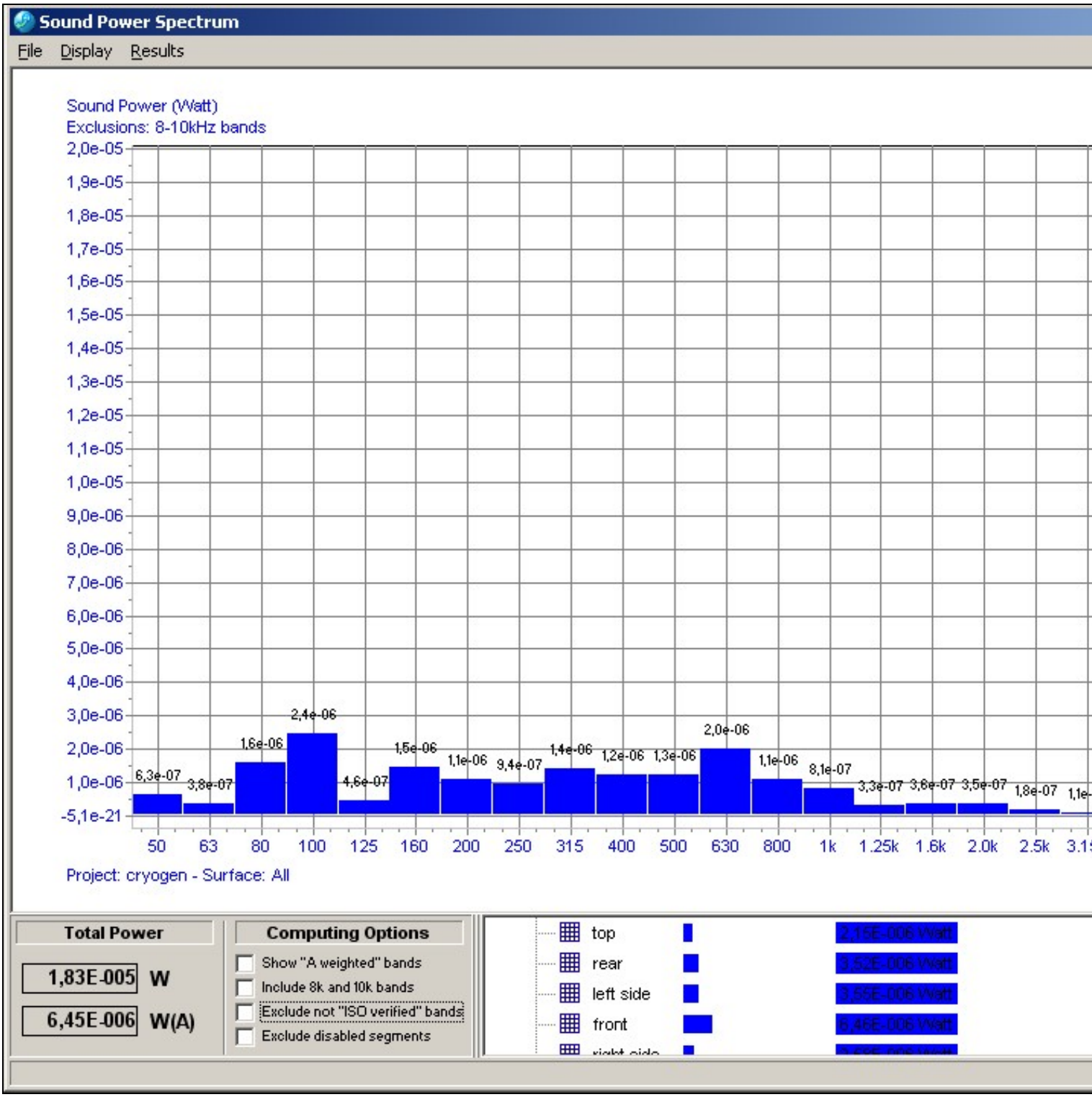
Sound power level determined for a measurement surface [dB]

There are three menus in the main bar allowing the user to perform several actions:

- The **File** / **Print report** menu creates a standard report containing the relevant data of the project and the power results for the overall surface enveloping the sound source.
- The **File** / **Export File** and **Copy to clipboard** options enable the user to make a copy of the graph and to export it in a report.

In the Display menu the user can set-up the histogram in such a way to show the spectrum as power levels expressed in Watt or in dB. To switch from one kind of representation to the other select the right option from the **Display** / **Units** menu. With the **Display** / **Label** command the user can visualise the labels showing the numerical values for each bar of the spectrum.

You can zoom the diagram by clicking with the left mouse button on the desired position and dragging a window from the upper left side to the lower right side of the portion you want to enlarge. To unzoom just drag a window from the lower right to the upper left side.


Sound Power Spectrum
File Display Results
Sound Power (Watt)
Exclusions: 8-10kHz bands
2,0e-05
1,9e-05
1,8e-05
1,7e-05
1,6e-05
1,5e-05
1,4e-05
1,3e-05
1,2e-05
1,1e-05
1,0e-05
9,0e-06
8,0e-06
7,0e-06
6,0e-06
5,0e-06
4,0e-06
3,0e-06
2,0e-06
1,0e-06
-5,1e-21
6,3e-07
3,8e-07
1,6e-06
2,4e-06
4,6e-07
1,5e-06
1,1e-06
9,4e-07
1,4e-06
1,2e-06
1,3e-06
2,0e-06
1,1e-06
8,1e-07
3,3e-07
3,6e-07
3,5e-07
1,8e-07
50 63 80 100 125 160 200 250 315 400 500 630 800 1k 1.25k 1.6k 2.0k 2.5k
Project: cryogen - Surface: All
Total Power
1,83E-005 W
6,45E-006 W(A)
Computing Options
Show "A weighted" bands
Include 8k and 10k bands
Exclude not "ISO verified" bands
Exclude disabled segments
top
rear
left side
front

Labels and linear power spectrum [Watts(A)]

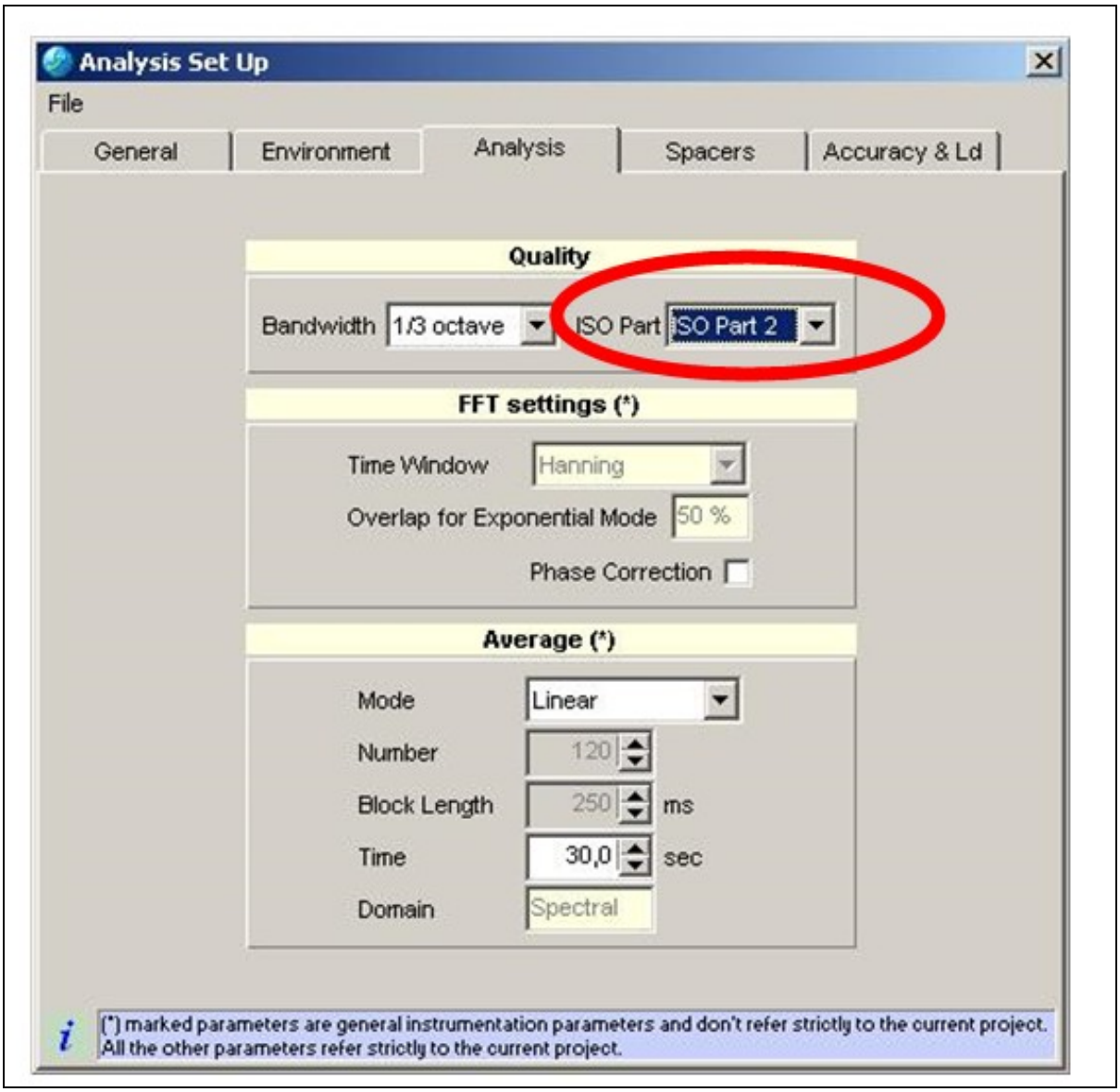
171.10 Sound Power using ISO 9614 Part II

The tools described in this section are available when the corresponding option was purchased.

171.10.1 Settings

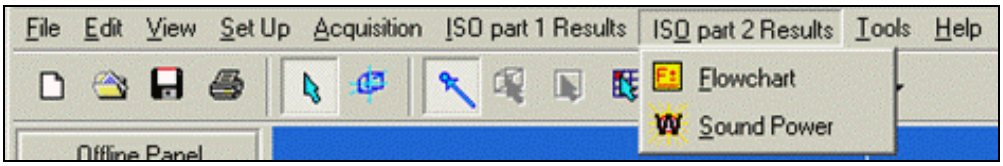
Before starting a new project using the ISO part 2 option, the user has to organize the application trough the **SET UP** menu. As shown in the following window, (bottom part of ***Analysis*** Tab) the user has to set the ISO Part field to "ISO Part 2". According to ISO 9614-2 standard, only Engineering and survey methods are available.

The program functionalities are the same as illustrated in the previous chapters, but the flowchart, the measurement mode and measurement implementation follow the specifications of the ISO 9614-2 standard.



Analysis set up for ISO Part 2 determination

In particular, the **ISO part 2 Result** menu is available. Using this menu, the user can access the ***Flowchart*** and the ***Sound Power determination*** sub-menus.

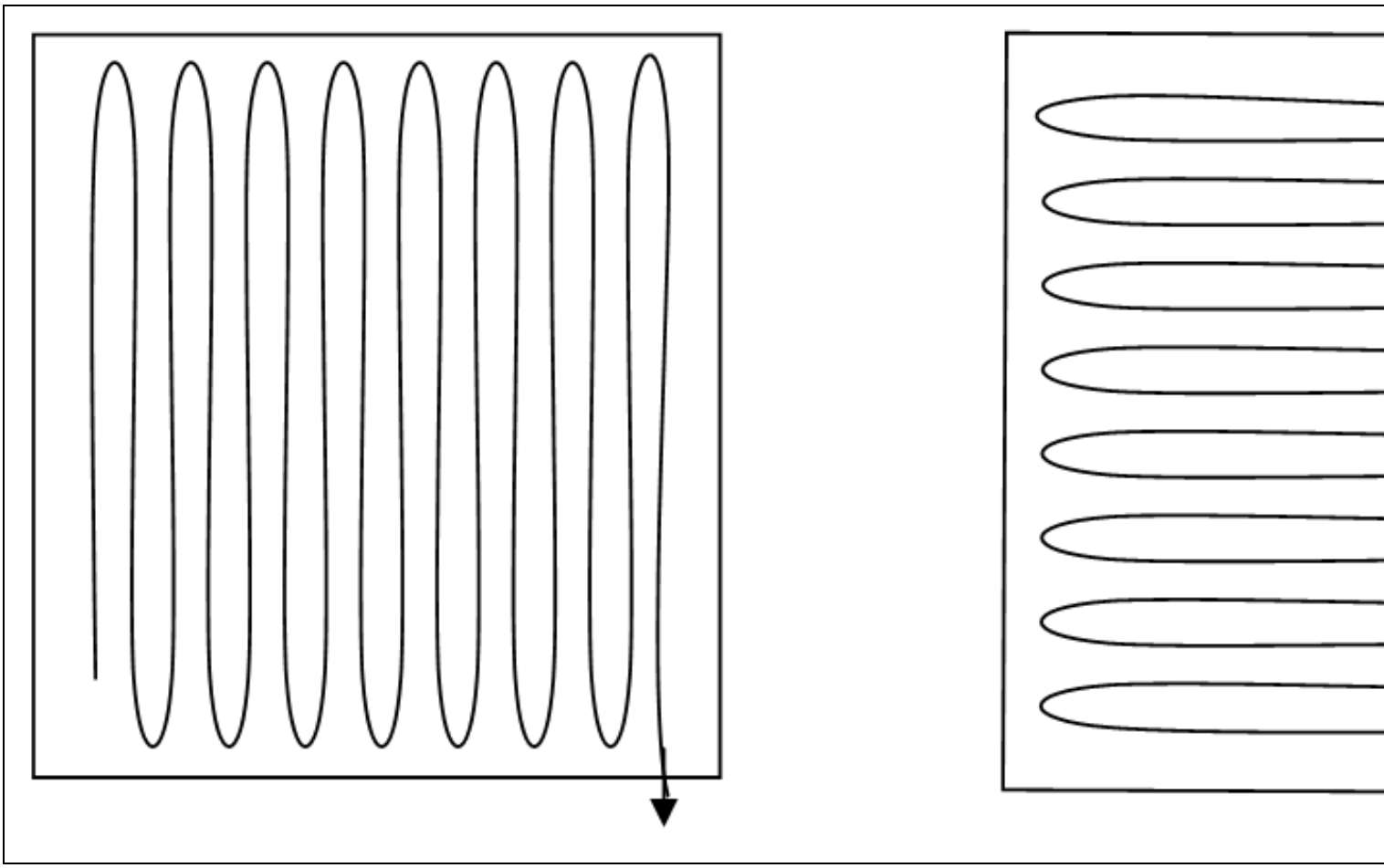


Menu for ISO part 2 Results

171.10.2 ISO 9614-2 Flowchart

According to the above Standard, the user has to perform two sound power level measurements for each surface, scanning each area or segment by means of two orthogonal paths.

For this purpose the user has to apply the real time acquisition procedure.



Orthogonal scanning paths

Once performed the first sound power level measurement (first scanning direction), the user has to:

- Verify the Flowchart.
- Set up the ***Reference Sound Power*** data, using the relevant command in the **Computing** menu.

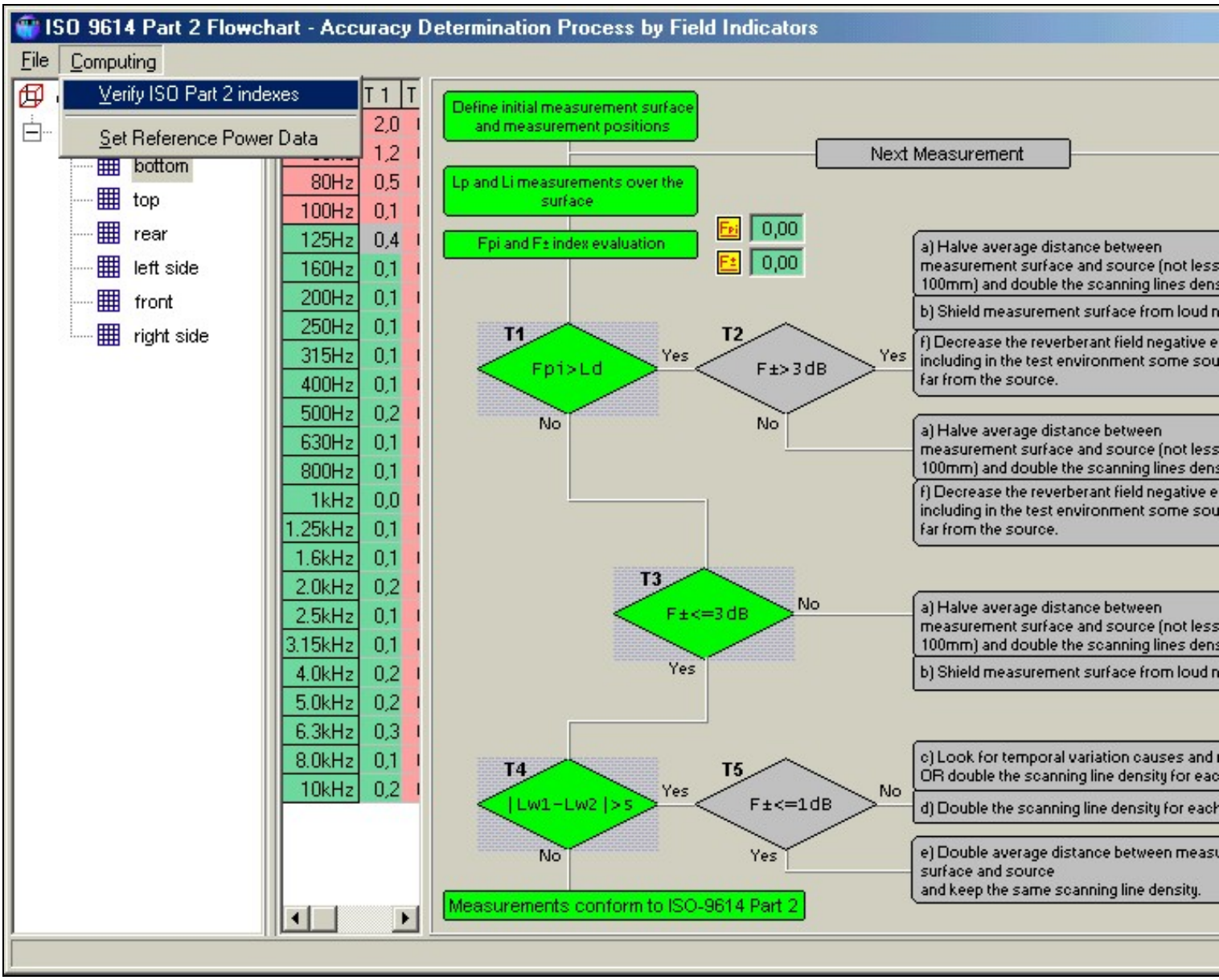
For each sub ? surface and for each frequency band, the flowchart shows the indexes values and, in case of failure, the actions the user has to undertake in order to fulfill the standard requirements.

In this way the data acquired during the first scan are transferred in a buffer, ready to be used for the second part of the determination process.

At this time the user has to perform the second power level measurement and then test again the determination process using the ***Verify ISO Part 2*** indexes command.

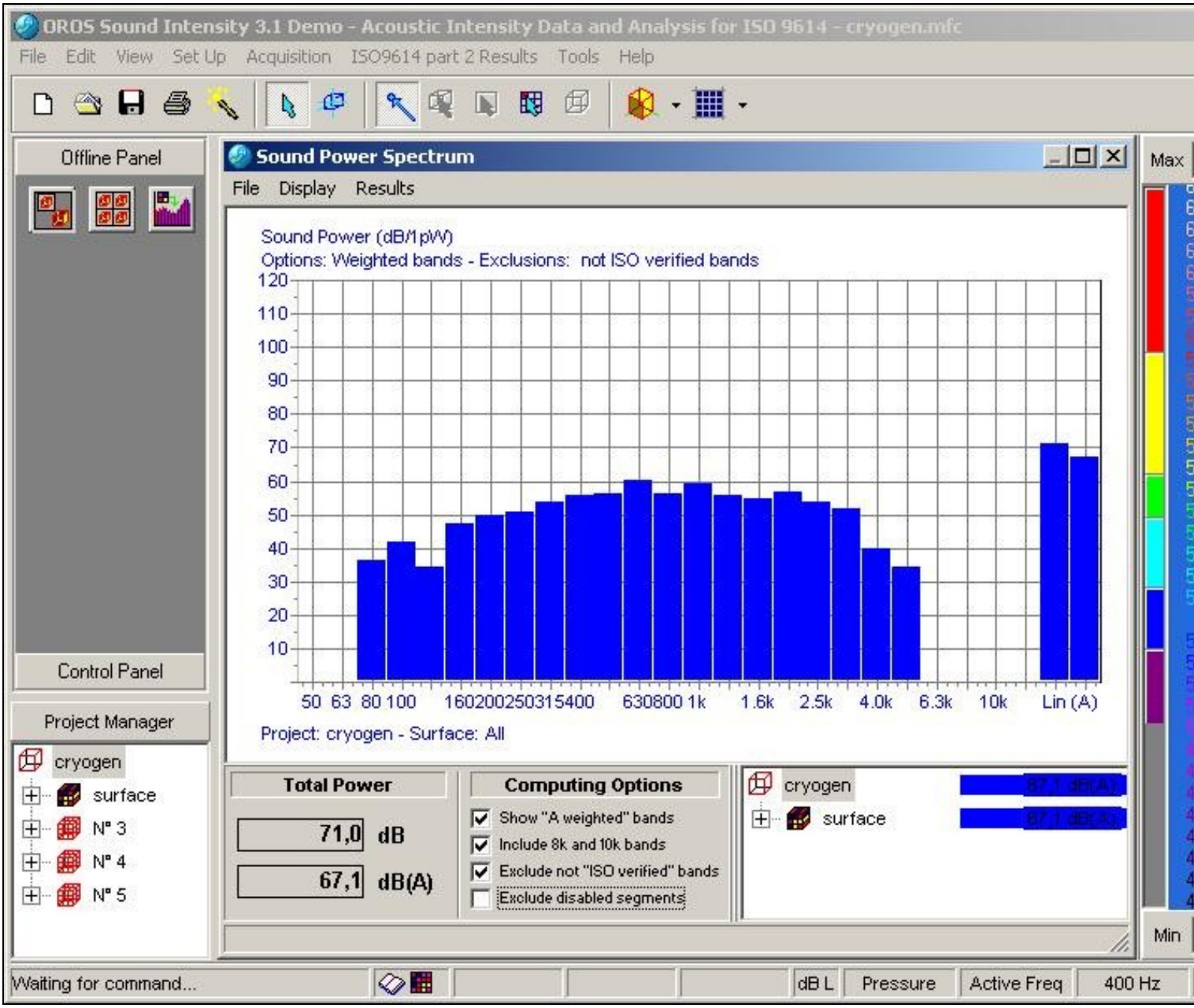
If the ISO indexes meet the standard requirements and the flowchart is light up in green, the user can close the Flowchart window and access the ***Sound Power calculation*** menu to compute the Sound Power Level Values. Otherwise it should be necessary to repeat the procedure by carrying out a second scan.

For this purpose, under the **File** menu it is possible also to **save** and **load reference files** for further analysis.



171.10.3 Sound Power level calculation

Once verifying the flowchart, the user can access the sound power determination area of the application trough the ***ISO Part 2*** / ***Sound Power menu***.



1/3 octave sound power level calculation

In the left part of the window the user can easily see the sound power level value obtained for each measurement surface and for the overall surface. In the right part a graph is shown of the 1/3 octave sound power spectrum referred to the surface selected in the left part.

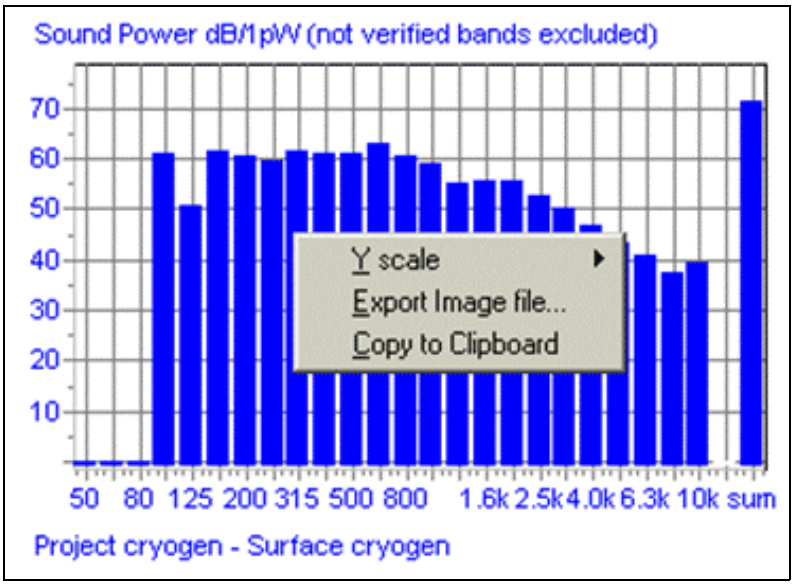
The user can choose to show **Linear** or "**A weighted**" data and to **exclude** or **include not ISO verified bands** selecting the relevant option in the lower part of the window. The graph will update accordingly.

Clicking on the graph area with the right mouse button, several options become available:

- **Y scale** (Auto zoom, Fixed, De-zoom),
- **Export Image File?** (to export the window image in bitmap or metafile format),
- **Copy to Clipboard** (to copy to clipboard the window image).

Note that it is always possible to zoom the graph by clicking with the left mouse button and dragging the cursor from the left to the right side.

To pan the view click the right mouse button and drag the cursor. To de-zoom use the relevant command or drag the cursor from the right side to the left side holding the left mouse button down.



Visualization options for the sound power spectrum

Concerning the menus, several alternatives are available:

File:

Print Report: to print a standard report concerning the sound power determination data;

Export image file: to export the window image in bitmap or metafile format;

Copy to clipboard: to copy into clipboard an image of the graph;

Exit: close the window.

Display:

Units: to switch between

dB scale

Watt scale

Label (toggle on ? off power values on the graph)

Tree Bar length

◊ 1

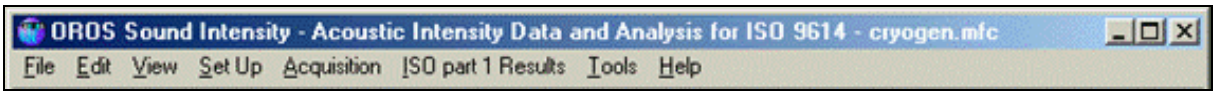
◊ 1.5

Results:

Compute Sound Power: Useful to compute again the overall sound power level and verify the determination process.

171.11 Reference Manual: Menus Organization

The menu bar is placed in the upper part of the screen which contains the following menus:



Menus Organization

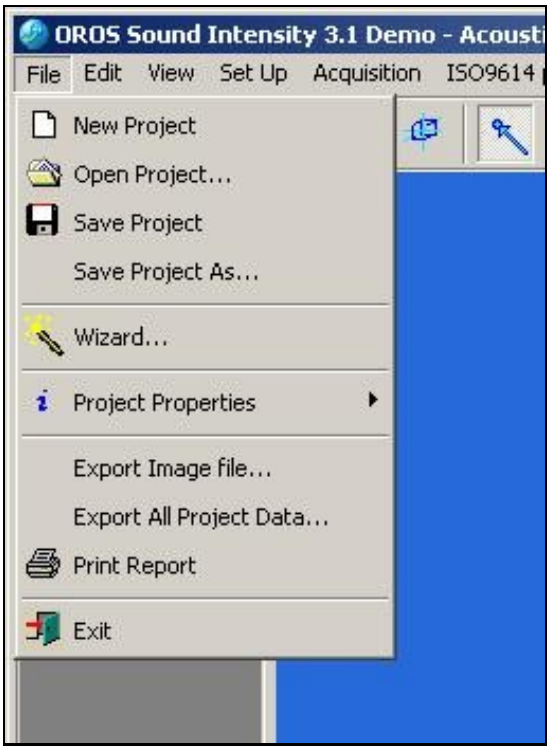
- ***File***
- ***Edit***
- ***View***
- ***Set Up***
- ***Acquisition***
- ***ISO Part 1 Results***
- ***Tools***
- ***Help***

The meaning of these menus is explained in the following sections.

171.11.1 File Menu

This menu contains the following commands:

- **New project**: open a new project,
- **Open project**: open an existing project,
- **Save Project**: save the current project,
- **Save Project as?**: save the project in the position and with the name specified by the browser,
- **Export Image File**: you can export an image in BMP or JPG format,
- **Print Report**,
- A list of the latest opened projects,
- **Exit**: quit the program.



File Menu Organization

171.11.2 Edit Menu

It enables the user to show and set up several parameters:

- **Properties**



Edit ? Properties Menu

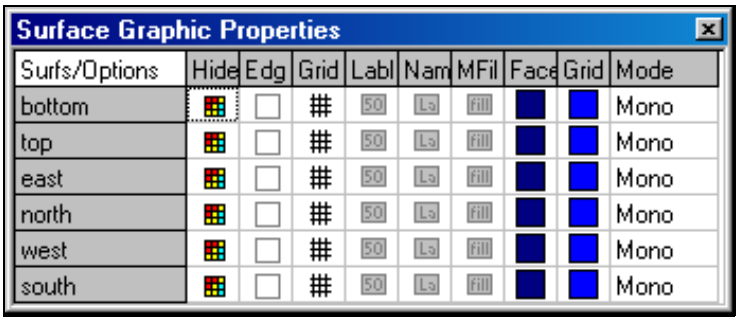
- **Frames**: by using the table shown below the user can set up the frames properties.



Frame graphic properties

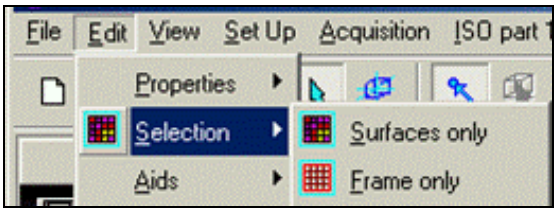
In this case it is possible to decide to hide or show a frame, his edge and grid. The user can also show the frame name on the display or decide to change the frame color.

- **Surfaces**: as stated above, but it is also possible to show the numeric value together with the pressure level measured for the segment (Label), to change the face or the grid color and show the sequence the program will use to import acoustic data on the selected surface (Mfill).



Surface graphic properties

- **Selection**: this command can be used when it is necessary to choose on what the user wants to perform a command.



Edit ? Selection Menu

- **Surface only**
- **Frames only**
- **Aids**: this is an advanced set up for the user who wants to edit the display in a different way from the standard one.



Edit ? Aids Menu

- **Angle bars**: useful to rotate the objects along the Z axis and the build plane;
- **Zoom bars**: can be used to change the observer's point of view.

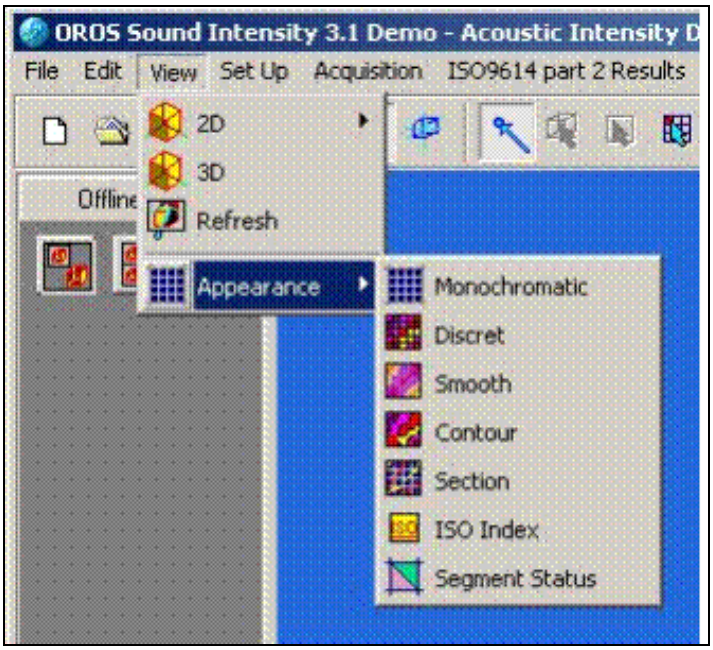
171.11.3 View Menu

This menu enables the user to choose between several different kinds of view:



View Menu

- **2D**: Left, right, up, down, front, back surfaces,
- **3D isometric**: it puts the objects in a standard three dimensional point of view,
- **Refresh**: the objects on the screen are refreshed with the new setting,
- **Appearance**: the user can show the surfaces using four different kinds of representation.

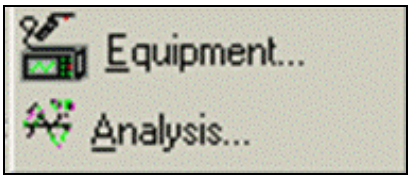


View ? Appearance Menu

- **Monochromatic**;
- **Measure**: each segment has an associated color depending on the measured pressure level;
- **Smooth**: linear interpolation of the color scale between two adjacent segments;
- **ISO 9614 Index**: green: OK, red: index failure.

171.11.4 Set UP Menu

This menu enables the user to choose between two different set up:



Set-Up Menu

- **Equipment**
- **Analysis**

The meaning of these menus has just been explained in the previous sections.

The user has to set up:

- The general data about the title, the project engineer and the date of issuing of the file (as info);
- The required grade of accuracy, the bandwidth and the frequency range of interest (compulsory);
- The environmental data during the measurements (as info).

171.11.5 Acquisition

In the acquisition menu, the user can find the commands to:

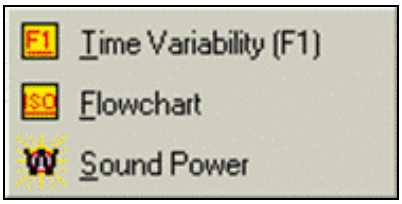
- Perform a level calibration
- Perform a phase calibration
- Perform a PRI Index Acquisition for the instrumentation
- Start the real time Octave Band Acquisition
- Start the real time Narrow band Acquisition



Acquisition Menu

171.11.6 ISO Part 1 Results

The meaning of the command explained in this subsection has been explained in earlier chapters. Please refer to the relevant sections.

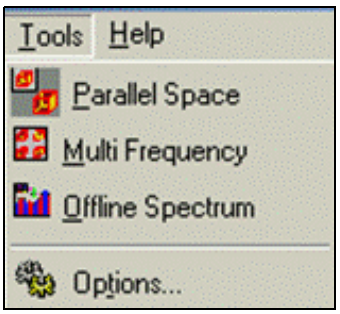


ISO Part 1 Results Menu

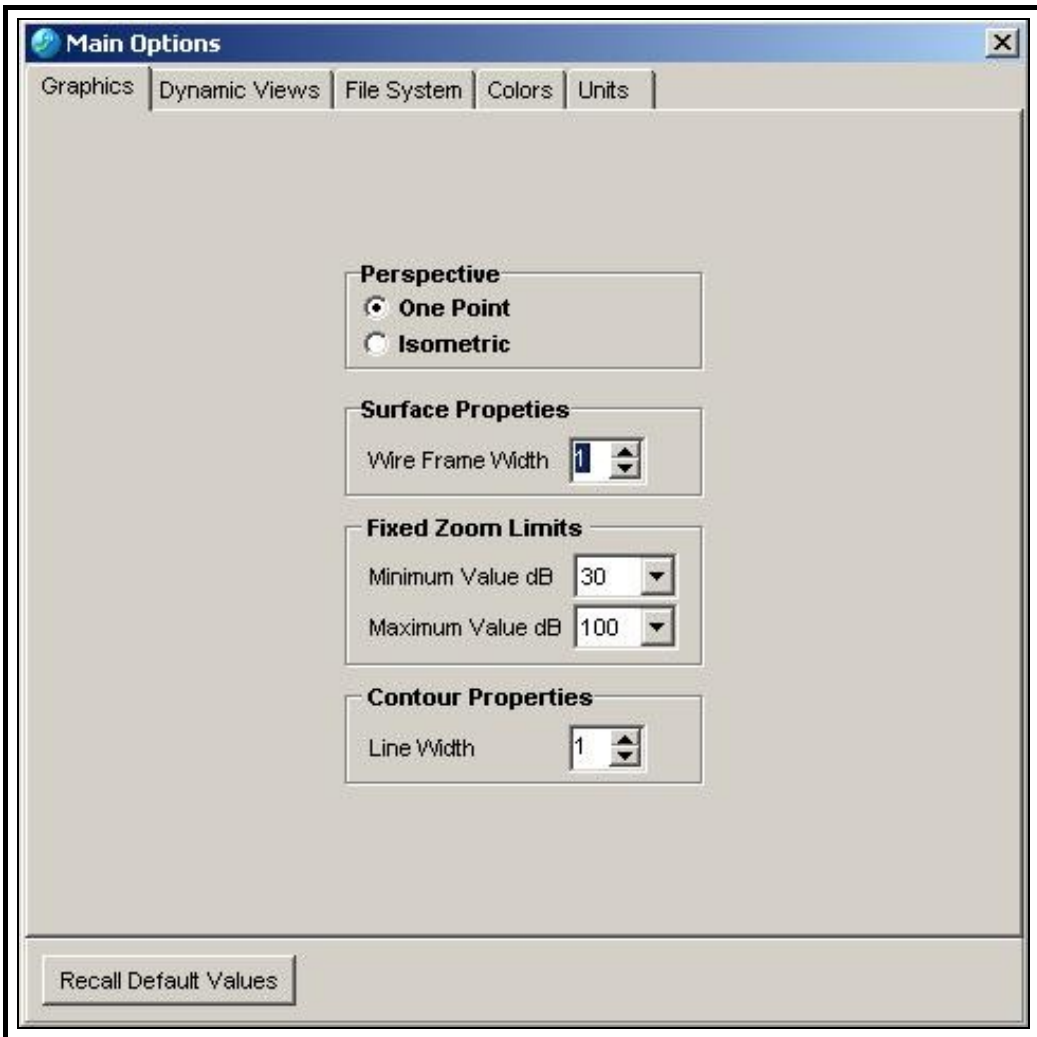
- **F1 Time Variability**
- **ISO Flowchart**
- **Sound Power**

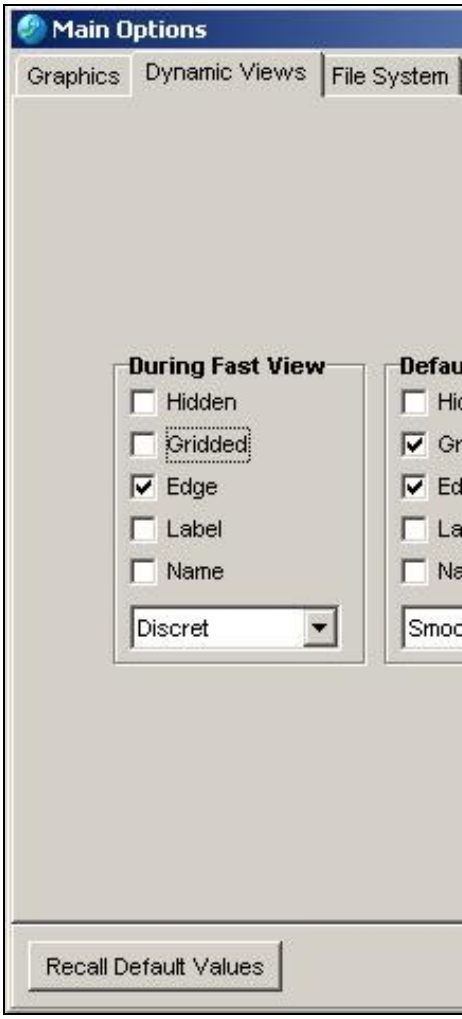
171.11.7 Tools Menu

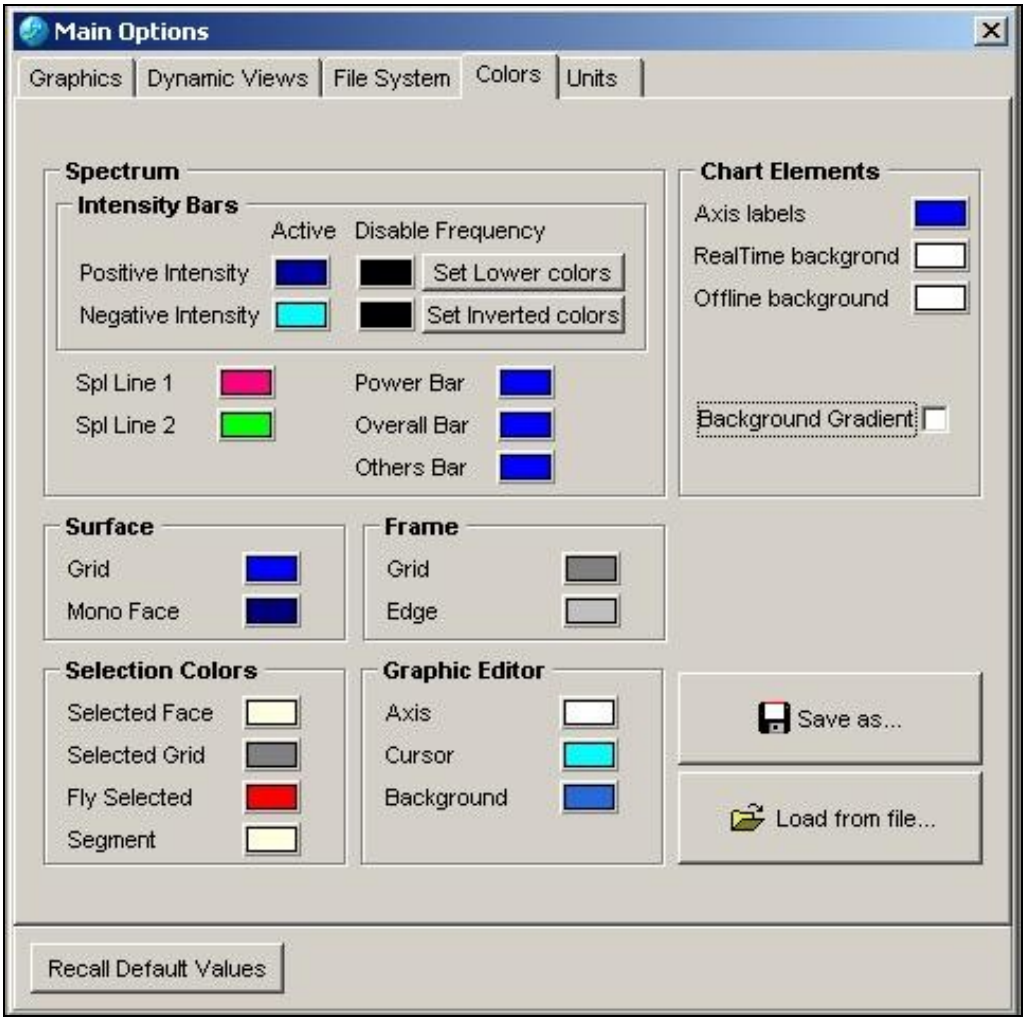
In this menu, you'll find out the commands to:

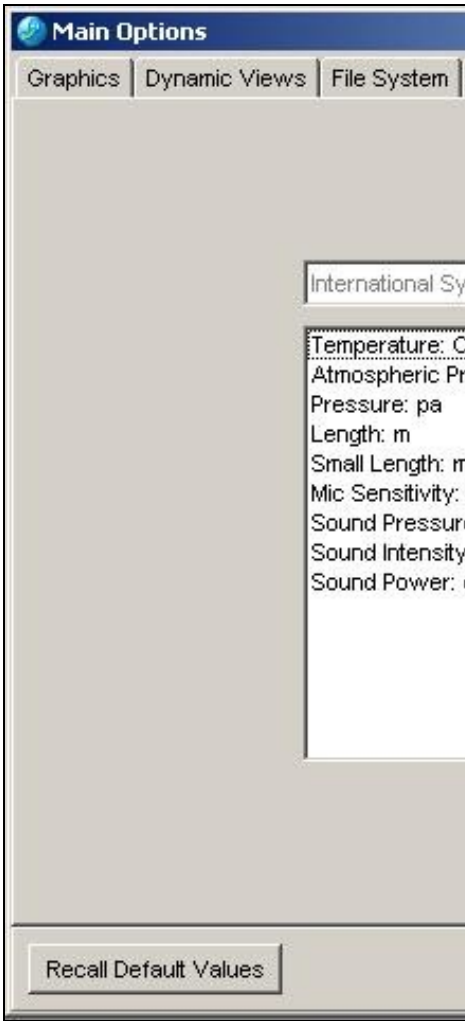


- **Parallel Space**
- **Multi-frequency**
- **Off-line spectrum**
- **Options**: The options are represented in the following tables






Main Options
Graphics
Dynamic Views
File System
Colors
Units
Spectrum
Intensity Bars
Active
Disable Frequency
Positive Intensity
Set Lower colors
Negative Intensity
Set Inverted colors
Spl Line 1
Spl Line 2
Power Bar
Overall Bar
Others Bar
Chart Elements
Axis labels
RealTime backgrond
Offline background
Background Gradient
Surface
Grid
Mono Face
Frame
Grid
Edge
Selection Colors
Selected Face
Selected Grid
Fly Selected
Segment
Graphic Editor
Axis
Cursor
Background
Save as...
Load from file...
Recall Default Values


Main Options
Graphics
Dynamic Views
File System
International Sy
Temperature: C
Atmospheric Pr
Pressure: pa
Length: m
Small Length: m
Mic Sensitivity:
Sound Pressur
Sound Intensity
Sound Power:
Recall Default Values

In the **Graphics** tab is possible to set-up the perspective type, the wire frame width and the limits for the fixed zoom of the windows used during real time acquisition.

The **Dynamic view** tab is functional to the representation type during Fast view, Editing and Default mode.

In the **File system** tab the user can set-up the number of last edited projects visible in the File Menu and reset recent files.

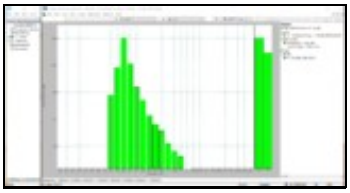
The **Colors** tab can be used to change the layouts of the windows for:

- the spectrum representation,
- the surface representation,
- the frame representation,
- the colors for the active selection,
- the colors used during the Graphic Editor Mode,

Finally, in the **Units** tab, is provided a collection of the Physic Units used by default during program operation.

172 Sound Power

Sound Power Software



Developer	Oros SA
Type	Sound Power,Noise, Octave band analysis, Data Acquisition.
First release	2011
Latest Version	V3.20.2 (september 2021)
Download	Here
Operating system:	Windows 10 (and W7) (see PC requirements)
Language	English
Official website	SoundPower on OROS.com and here!

- Install
- Manual

- Sound power "washing machine edition"

- Release note Sound Power 3.20

173 Sound Power 3 20

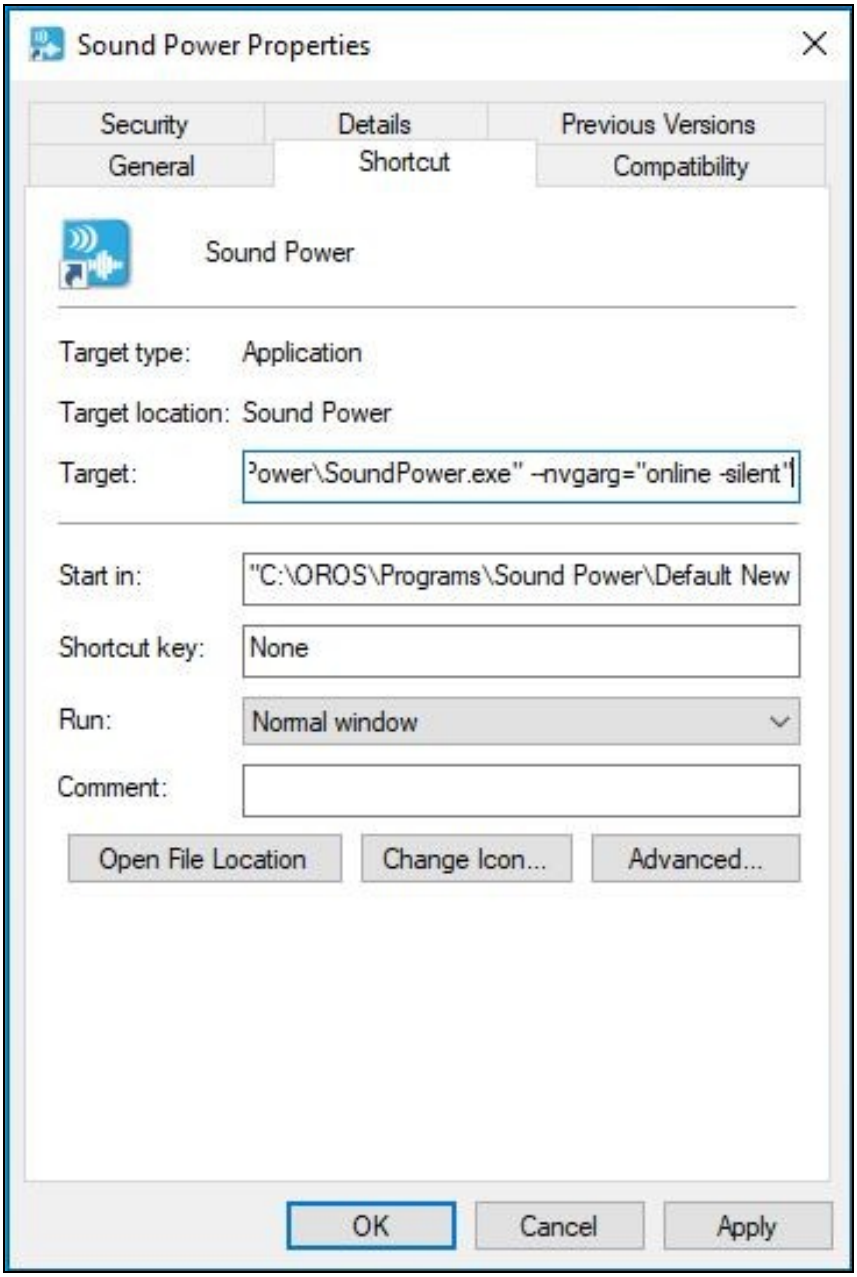
174 Download

Sound Power version 3.20 can be downloaded here.
Compatibility with NVGate V14.00.004 or upper.

175 New functions

175.1 New commands available

New commands are available to customize the start of Sound Power. They can be used in cmd (right after the commande SoundPower.exe) or also changing the Sound Power shortcut properties:



All the commands can be combined together, for example: SoundPower.exe -project=myProjectName -setup="C:\OROS\Sound Power data\Setups\mySetup.xls" -nvgarg="online -ListHardIpAddr=223.255.253.50 -silent"

The commands are detailed in the following sections.

175.1.1 Start SP with a predefined project

-project=myProjectName

175.1.2 Start SP with a predefined setup

-setup="C:\OROS\Sound Power data\Setups\mySetup.xls"

175.1.3 Start SP directly in the connected mode

-nvgarg="online -ListHardIpAddr=223.255.253.50 -silent"

With this command the NVGate start window is skipped. Sound Power will start NVGate directly in the connected mode. The analyzer's IP address must be mentioned. With the optional argument -silent, NVGate splash screen will not be displayed.

The same command can be used to start SP in office mode: -nvgarg="office"

175.1.4 Allow OROS Drive

-orosdrive=4006
Orosdrive enables the use of further commands to drive SoundPower with an external program. Contact OROS Customer Care for more information.

175.2 User identification

It is possible to skip the user identification: the SoundPower.usr file has to be modified for that. You can download a modified SoundPower.usr file here. It should be placed in both NVGate and SoundPower folders.

175.2.1 How to modify SoundPower.usr?

In NVGate folder, rename SoundPower.usr in NVGate.usr. Start NVGate. In the General preferences, activate "Skip user identification". Close NVGate. Rename NVGate.usr in SoundPower.usr. Copy SoundPower.usr in the Sound Power folder.

Restricted mode: SP operator cannot save the changes made in an existing setup. If any changes are made in the setup, they will not be saved when leaving SoundPower. This is thought to secure the setup and avoid any overwriting issues by mistake. It is anyway possible to switch user during the SoundPower session (click on user/change...). If you switch to the user SP manager, you then have the possibility to save the setup.

175.3 Frequency range for the overall level

The new function of NVGate 2021, allowing the user to choose the low and high frequencies for the overall level computation in OCT Plug-in has been integrated in Sound Power.

175.3.1 How to benefit from this function?

- This function is compatible with OR3X TW analyzers only. V1 and V2 hardware series (including OR34) are not compatible.
- Make sure to use a compatible Sound Power project. This project is installed automatically for a first installation of Sound Power. If a previous version was installed on your computer, replace the "Sound Power" project under C:\OROS\NVGate data\Projects with this one.
- The low and high frequencies used for the computation of the overall level can be found in the Setup Browser, under K correction / Frequency range / Sound Power level. If you are using a setup built with a previous version, the settings cannot be modified but the measurements can be performed anyway. Contact OROS Customer Care to adjust the setup to enable the modification of the frequency range.

Note: If your analyzer is not compatible with ths function, it is necessary to use the following Sound Power project.

176 Update of the Excel templates

The Sound Power templates delivered with Sound Power software have been updated:
- previously, the K2 max value was 2. To comply with ISO 3744:2010, K2 max value is now 4.
- addition of the absolute criteria for the background noise (ISO 3744:2010, Section 4.2.2). If the background noise measured in the room is lower or equal to the spectrum given in the standard and the source level is above this spectrum at each frequency band, the background noise condition is fulfilled.

177 Sound Power Install

*The Sound Power Solution is meant to work in combination with its associated Analyzer software **NVGATE®**. In this way, the full power of the **NVGATE®** platform and associated multi channel **INSTRUMENT HARDWARE** is made fully available for your one clear objective: measuring Sound Power.*

This "**INSTALLATION GUIDE"** will guide you through the installation of the Sound Power software and help you run it for the first time. It will explain in particular the way the installation should be done in parallel to NVGATE® and to the Instrument Hardware.

177.1 First Check

177.1.1 Recommended PC configuration

See PC Requirement page.

177.1.1.1 Equipment required for the installation

- donwload the last version on www.myoros.com
- A NVGate dongle that is OROS Sound Power authorized.

177.2 Installation

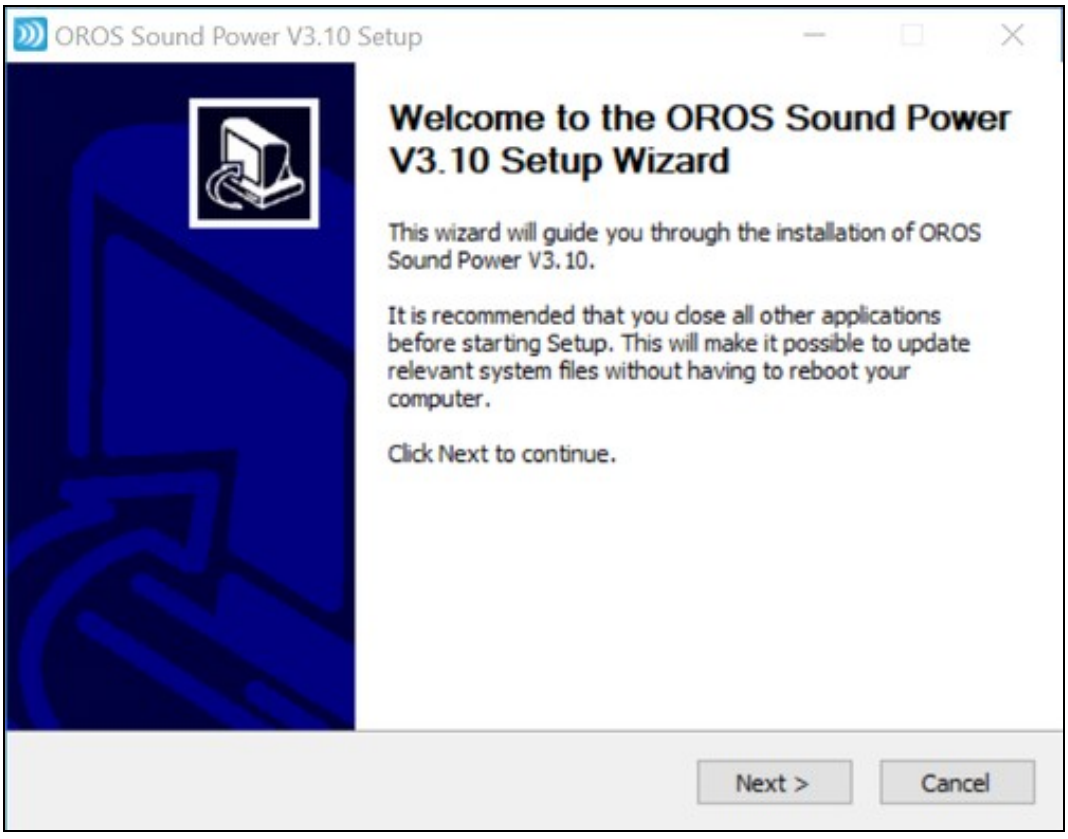
177.2.1 Installation of the NVGate software

NVGate must be installed properly on the PC before starting the installation of Sound Power.

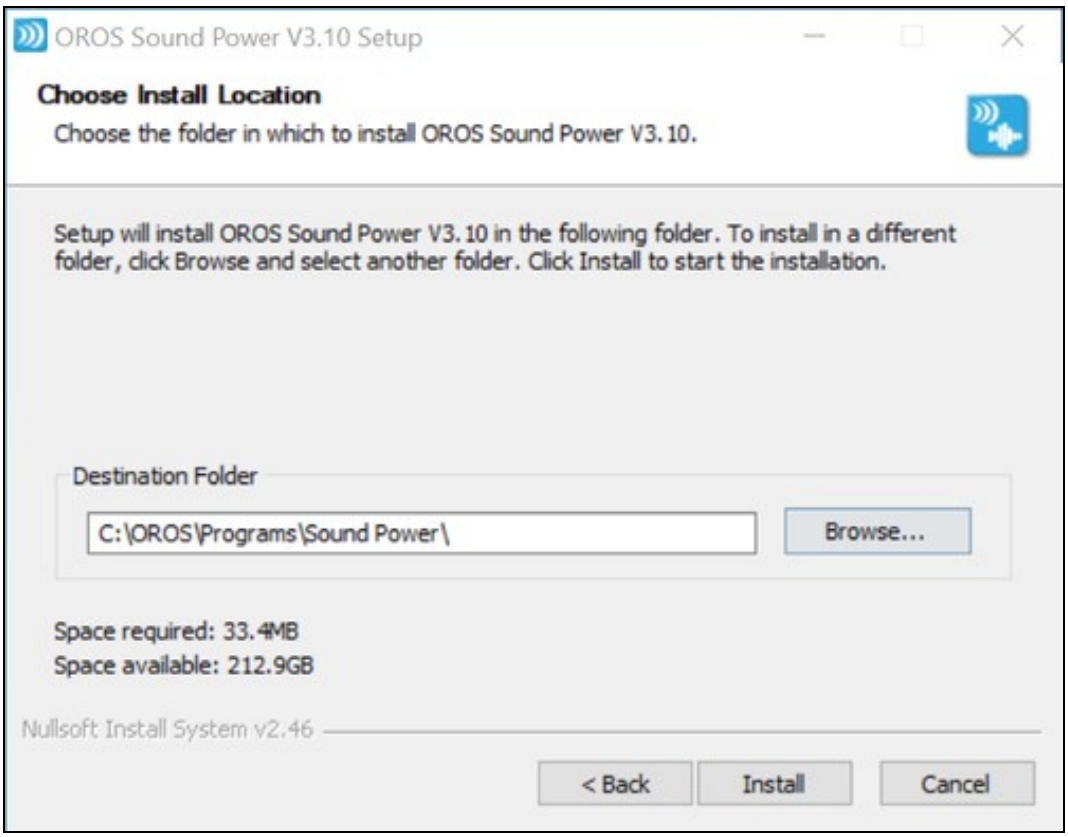
177.2.2 Installation of the Sound Power Solution

Ensure NVGate is installed and running on the PC before starting the installation of Sound Power.

Run the "setup.exe" program, and the following window is displayed:

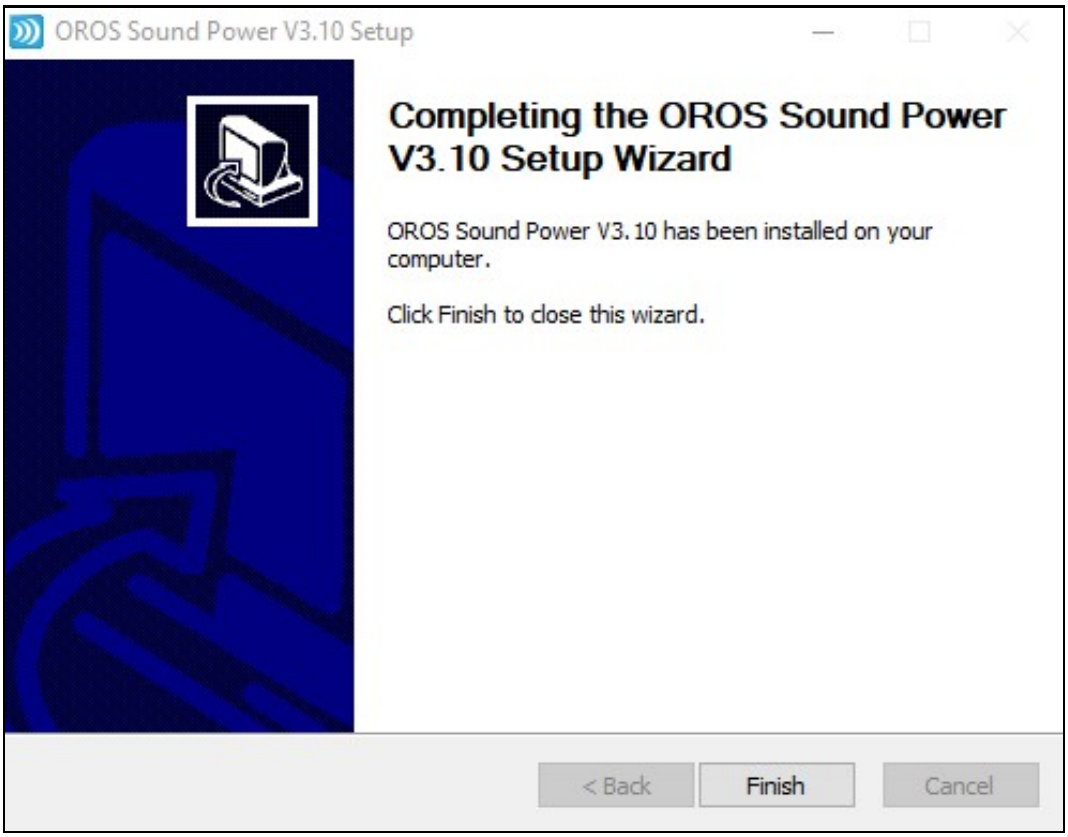


Click on "Next >", and the following window is displayed:

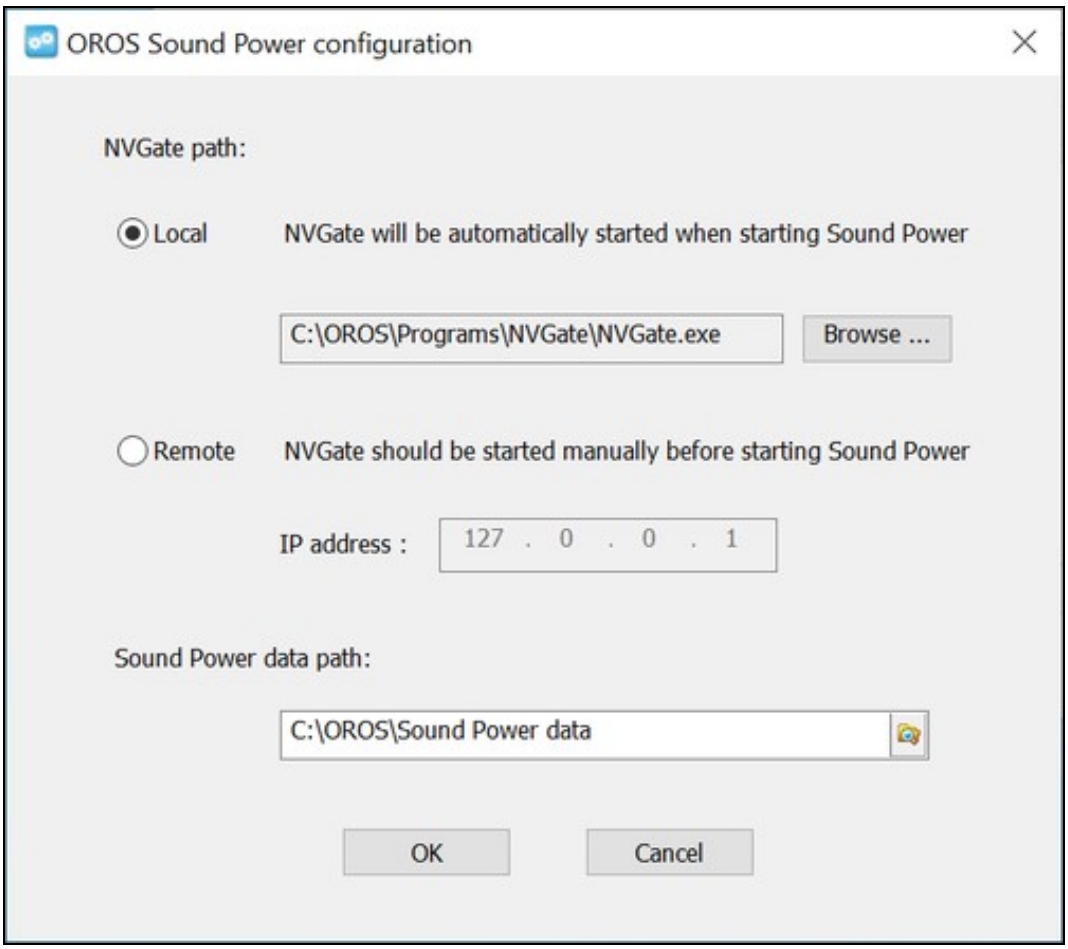


Select the installation directory. It is highly recommended to keep the default location: C:\OROS\Programs\Sound Power. Installing Sound Power in the NVGate directory (as it is by default) enables links between the Sound Power Online Help and the NVGate? Online Help.

Click on ?Install? to begin the installation, and wait until the following window is displayed:



Click on ?Finish?, and the following window is displayed:



If NVGate is installed on the same PC:

- Choose "Local" and indicate the path for "NVGate.exe". By default, it is: "C:\OROS\Programs\NVGate\NVGate.exe".

If you are using NVGate from another PC:

- Choose "Remote" and indicate the IP address of this second PC.

If later you want to change the Sound Power configuration:

- Launch SoundPowerConfig.exe" from "C:\OROS\Programs\Sound Power".

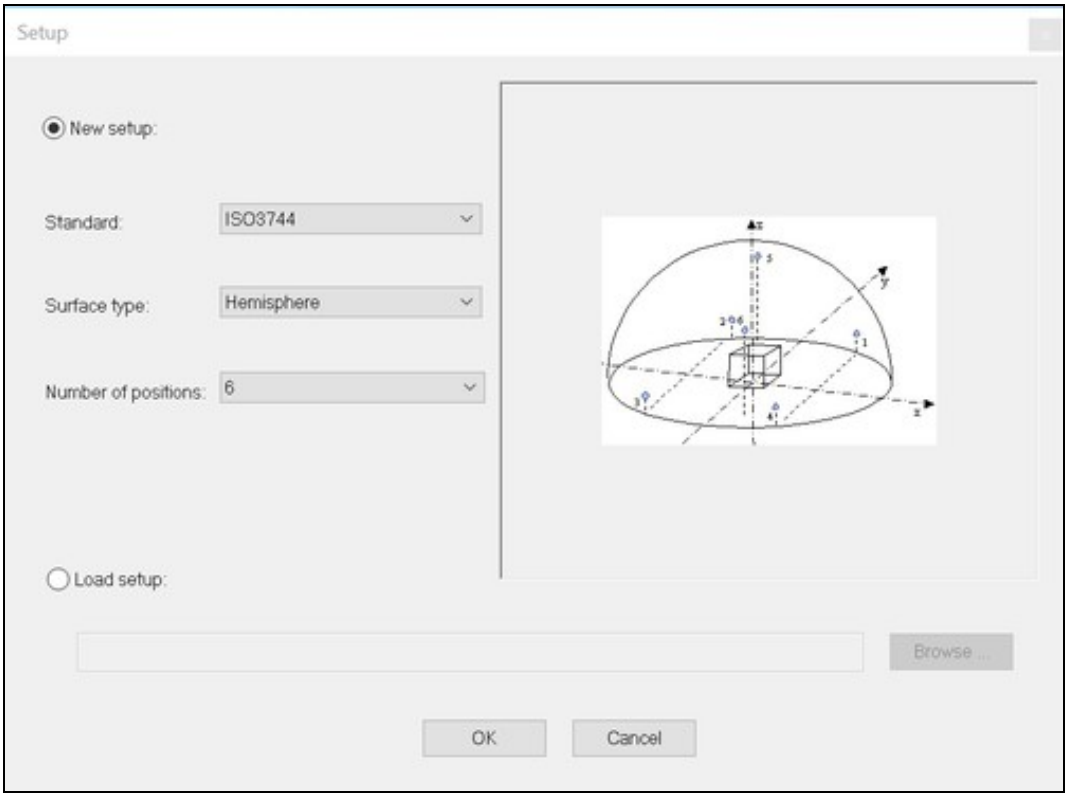
At this stage:

Plug in the **Dongle** to use Sound Power in **Office Mode**

Plug in the **Hardware** to use Sound Power in the **Connected Mode**.

And then, run "Sound Power".

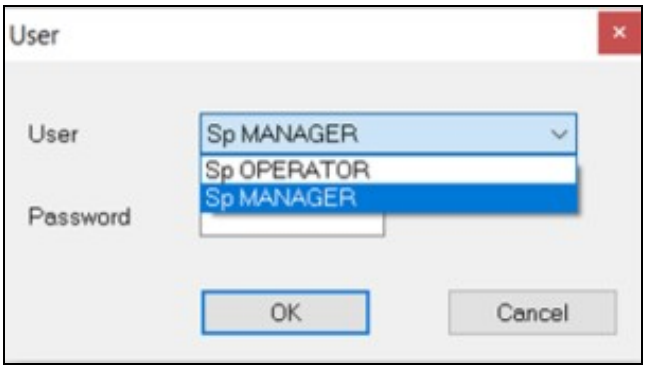
The following window is displayed:



You can create a new setup by choosing the Standard, the Surface type and the Number of positions of your experiment or you can load a setup that is already created.

Click on "OK".

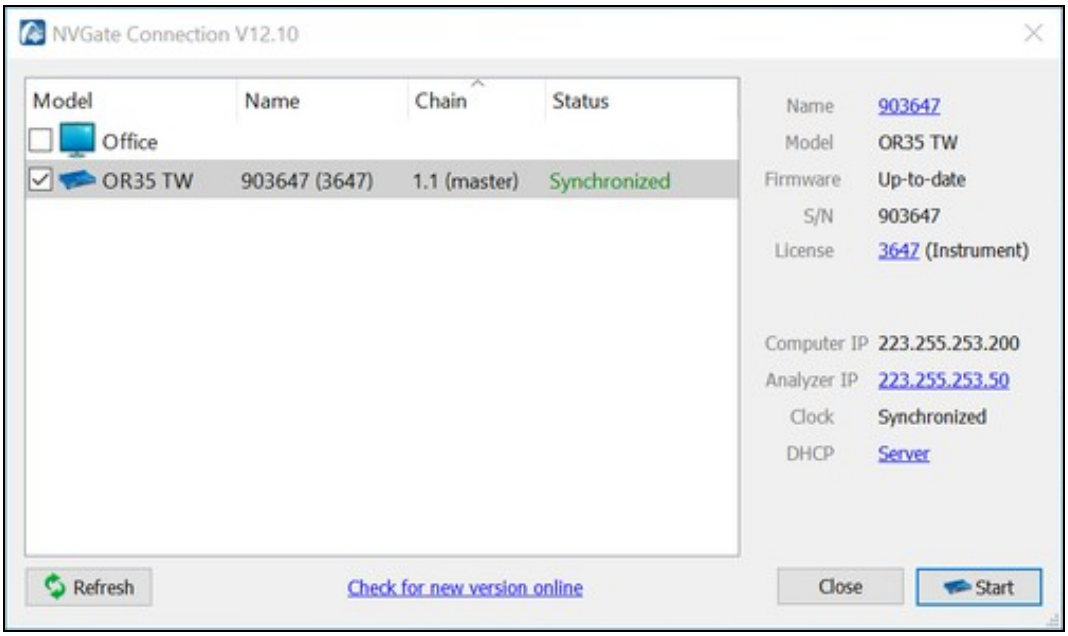
If NVGate has not been started previously, the following window is first displayed:



Choose to start as operator or manager using a password.

Notice: The access level for the first user has to be "full".

Then, the following window is displayed:



Choose to start Sound Power in "Connection to hardware" or in "Office mode".

177.2.3 Updating the Software version

Uninstall the previous version of Sound Power installed on the PC. Then **Start the installation of the new version**.
Please follow the procedure described above.

177.2.4 Troubleshooting

Sound Power may not start. In this case, one of the following error messages is returned:

« File Sound Power.ini not found ! »

Run the Sound Power configuration program (Launch "SoundPowerConfig.exe" from "C:\OROS\Programs\Sound Power")

« File Sound Power.ini not valid ! »

Run the Sound Power configuration program (Launch "SoundPowerConfig.exe" from "C:\OROS\Programs\Sound Power")

« Couldn't start NVGate ! »

- *Check the path of "NVGate.exe" in the Sound Power configuration program (Launch "SoundPowerConfig.exe" from "C:\OROS\Programs\Sound Power")*

« Connection to NVGate has failed ! »

1. If the NVGate location is = Local:

- *Check that NVGate is running. If not, escape from Sound Power and run it* again.
- *Check that NVGate can start on its side.*

2. If NVGate location is = Remote:

- *Check that NVGate is running on the remote PC.*
- *Check that the IP address of the remote PC is correct in the Sound Power configuration program (Launch "SoundPowerConfig.exe" from "C:\OROS\Programs\Sound Power").*

« You don't have the permission to use OROS Sound Power ! »

- *Ensure that you are using a dongle that is configured for Sound Power*
- *Contact your OROS Agent*

« Sound Power project not found ! »

- *Check the path of "NVGATE.EXE" in the Sound Power configuration program (Launch "SoundPowerConfig.exe" from "C:\OROS\Programs\Sound Power") and validate (press "OK) in Local. If you are operating Sound Power in a Remote location, copy the "Sound Power" directory from the folder of installation of Sound Power into the default base.*

178 Sound Power Manual

The Sound Power Level generated from a source is the value used to quantify its sound emission properties. Because this result should be comparable from one test place to another, the measurement should be created following a particular test procedure. This procedure is defined by international standards, which are selected depending principally on the source type, the test environment, and the accuracy required. The OROS SOUND POWER Solution has been designed to let you achieve that type of test in the most efficient and accurate way.

The "getting started" on-line help explains in detail the three main steps:

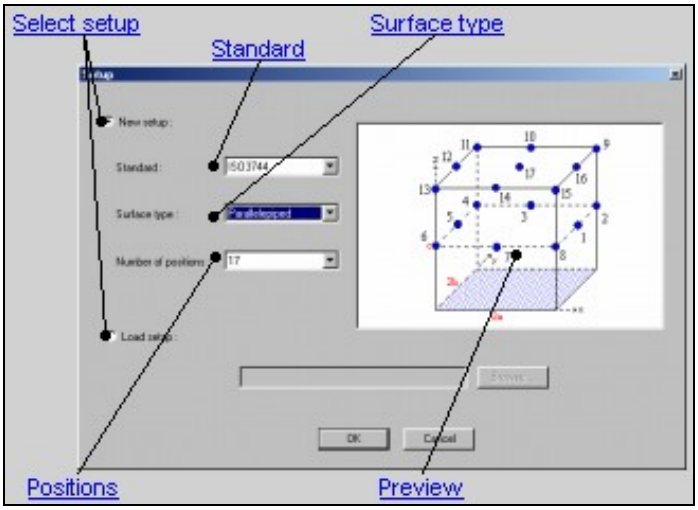
- Setup
- Measurement
- Report

It is using an applied approach where explanations are given as questions in case you have any during a standard measurement process. The "getting started" on-line help will let you get the most out of your Sound Power Solution and set you on the right track.

178.1 Sound Power Environment

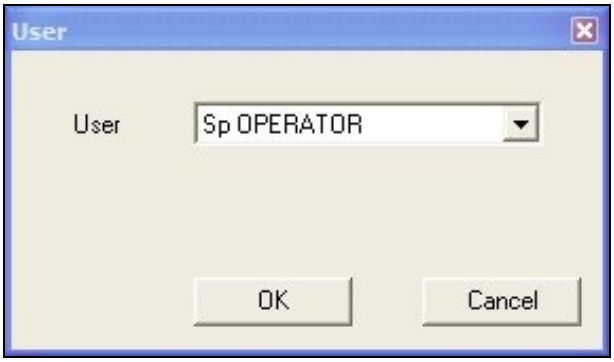
178.1.1 Starting with Sound Power Software

When Sound Power starts, the following window is displayed. You can select to open an existing Setup or begin with a new one that you setup in this dialog:



178.1.1.1 User Management

The Sound Power Solution uses predefined users. There are two predefined users: the "SP OPERATOR" and "SP MANAGER". The SP Operator runs the application in a standard way.



In case the application needs to be customized, the user can log itself as "SP Manager". In this case, a password will be requested: the password is "soundpower". Logging in as SP Manager will let the user modify the "Sound Power" project in NVGate.



Warning: Modifying the "Sound Power" project could create problems in the operation of the application. In such a case, the default "Sound Power" project should be kept as a back up and restored. Otherwise the Sound Power application should be reinstalled.

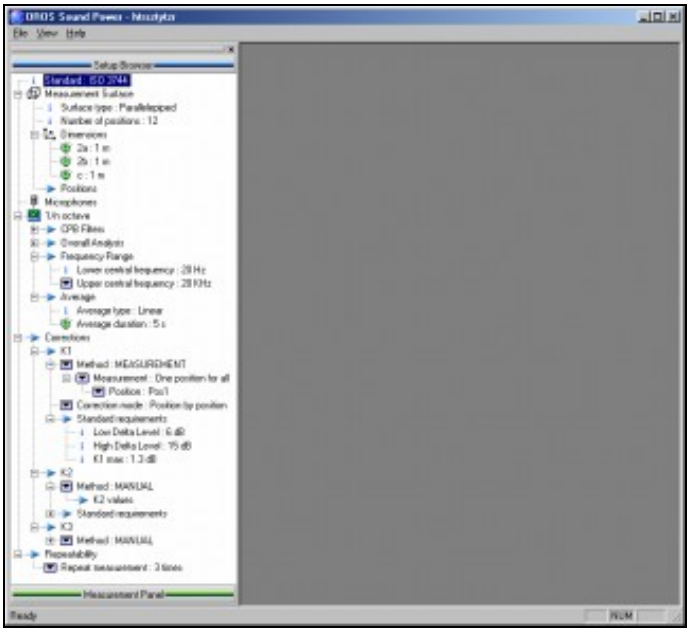
178.1.2 Functioning Modes

There are three main steps to carry out a measurement process.

178.1.2.1 Setup

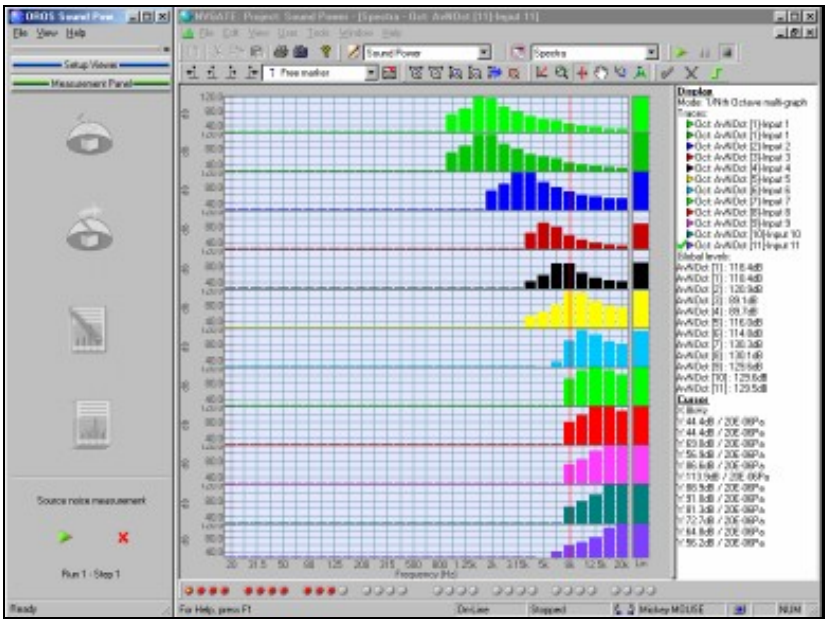
Using the Sound Power Software, the first step of the measurement is the configuration of the test setup. The setup browser will let you define the measurement surface, microphone positions, input connections and measurement steps. Then, the analysis parameters such as the test duration will be described. The final step of the test setup configuration concerns the corrections and validity tests described by the international standards.

You should have a display like the following one:



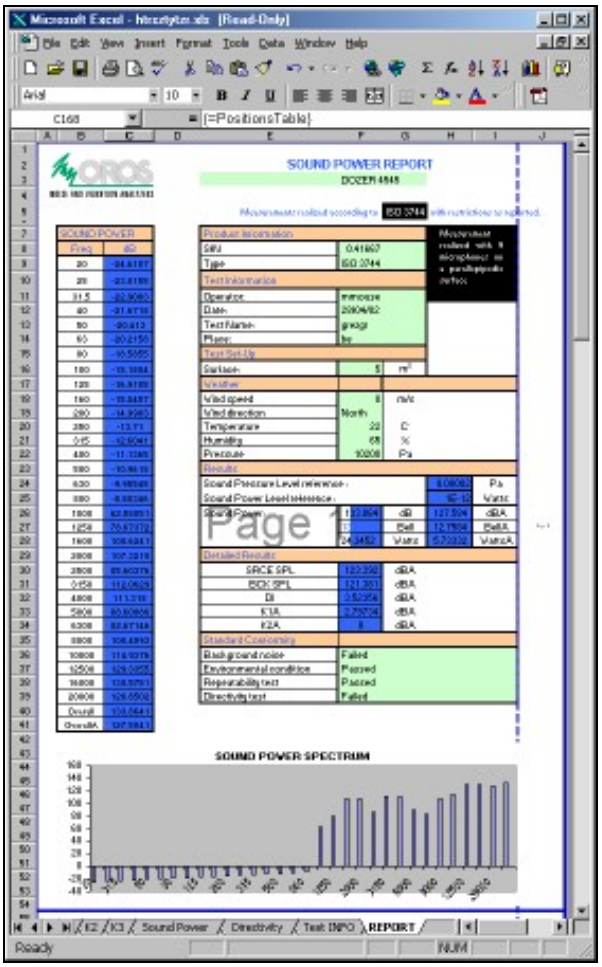
178.1.2.2 Measurement

During the second step, a test setup can be reloaded and a measurement panel displayed. Only at this stage can the measurement be started. The data is obtained and Sound Power results are automatically calculated, giving straight away calculated corrections and standard validation.



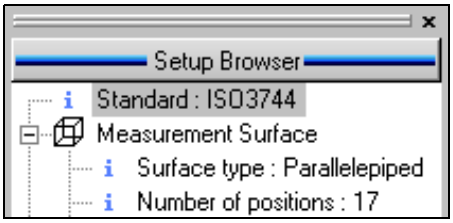
178.1.2.3 Report

The third and last step is the automatic generation of the Sound Power report as a customized document in Microsoft Excel®.



178.1.3 Create a New Setup

The Setup creation is based on the use of a template. Create the new Setup from the first "Setup" window, then you can find the information from Sound Power in the **Setup Browser** tab in the workspace:



Note: The icon means the setting is only for user information, it cannot be changed.

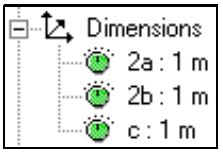
178.1.4 Open a Setup

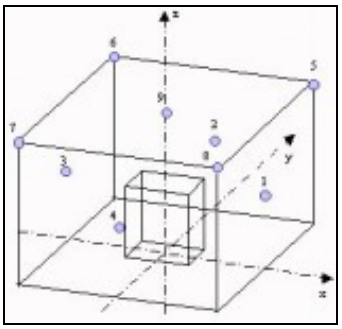
When you choose to open a Setup, Sound Power allows you to select an Excel® file template. You can select a default template to open or you can choose to open one of your saved ones. This action avoids you having to redo your settings each time you begin a measurement process.

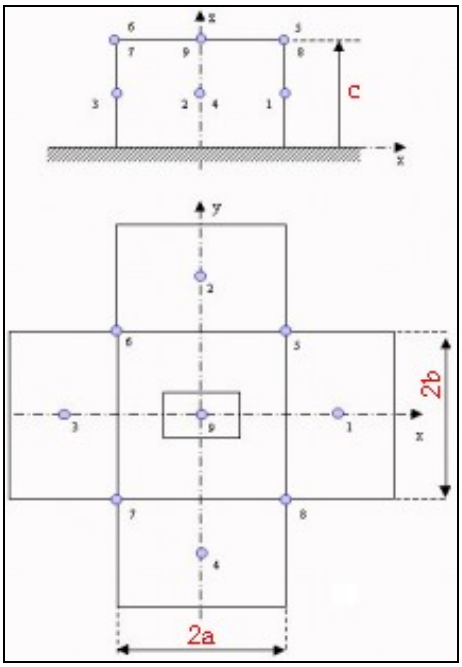
178.2 Setup Browser

178.2.1 Dimensions

In the **Setup Browser** tab from the workspace, enter the dimensions of the surface in meters (double click on a setting to get it).





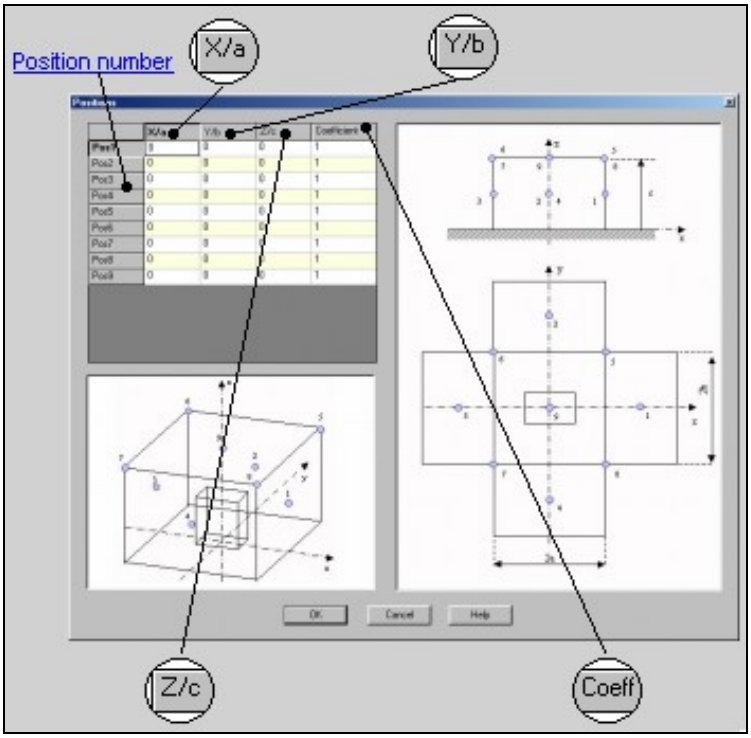


Note: For the hemispheric surface, just enter the radius value.

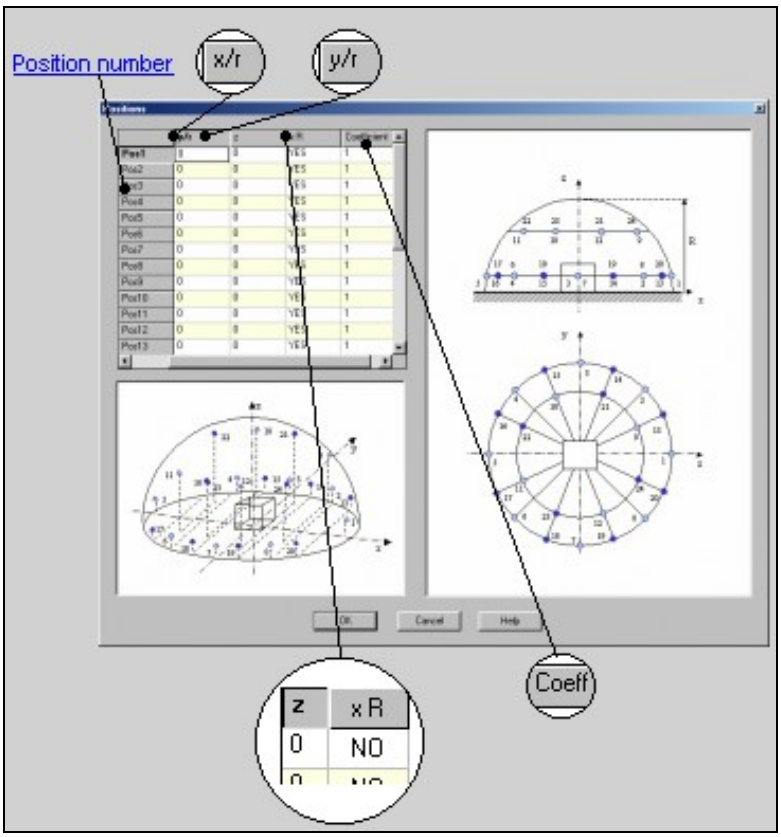
178.2.1.1 Positions

Set-up the microphone positions by entering the value in the table. To access the table, double click on **Position** from the **Source** module in the **Setup Browser** tab from the workspace.

For a parallelepiped surface type, the following table is displayed:

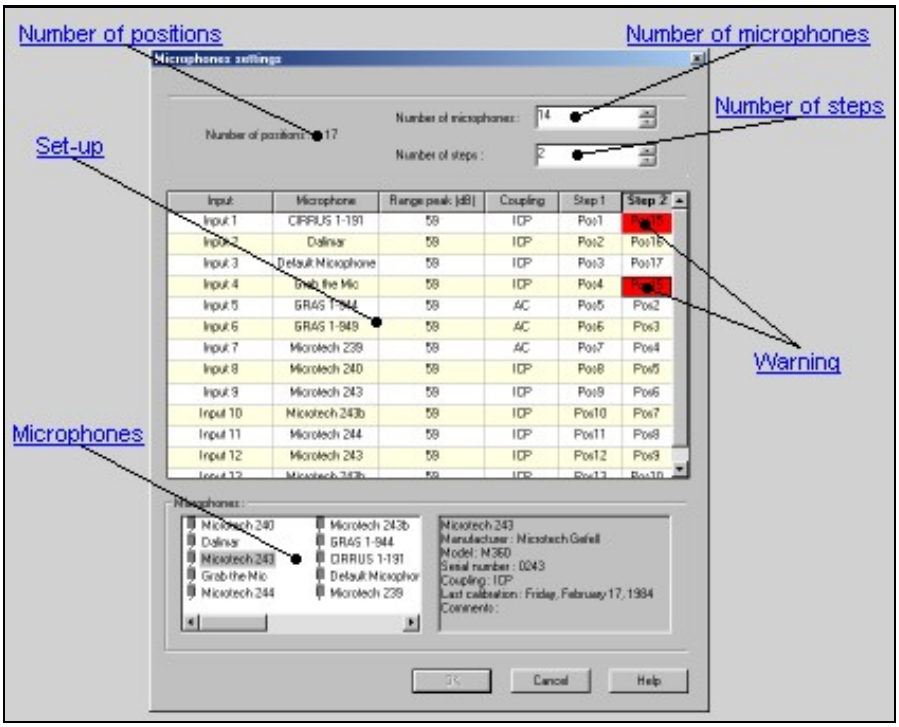


For a sphere surface type, the following table is displayed:



178.2.1.2 Microphone Settings

In the **Setup Browser** tab from the workspace, double click on the **Microphones** module, and the following window is displayed:



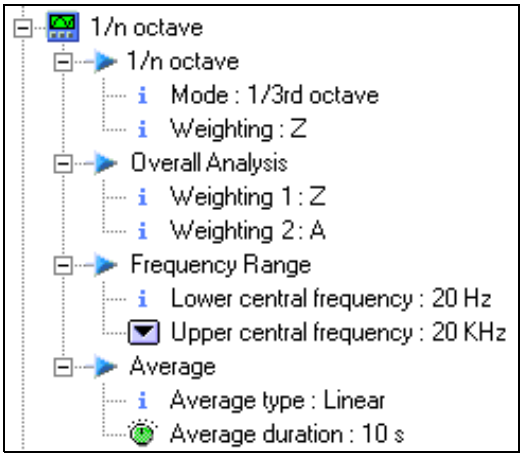
Note: By default all the inputs are set to Default microphone in the Microphone column. So if you do not have any microphones in your transducer database, enter the new microphones from NVGate® (click on the following button to see how to do it). Then from Sound Power software, click on **Update transducer database** from the **Tools** menu.

Tip: Double click on the **Coupling** column header and select **a parameter** in order to assign this parameter to all the inputs.

178.2.2 Analysis

178.2.2.1 1/n Octave

The 1/n octave module allows you to setup the analysis. You can only change the Upper central frequency and the Average duration. All other settings are for user information.



1/n octave: The analysis is done in the 1/3 octave mode with no weighting process.

Overall Analysis: The results of the overall analysis are given as Z weighted levels and A-weighted levels. Refer to measurement screen configurations for details on levels display.

Frequency Range: The analysis can be done between two available frequency bands:

[20 Hz; 10 KHz] or [20 Hz; 20 KHz]. The lower frequency is fixed.

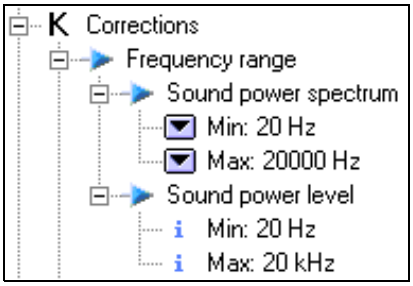
Average: Set the measurement average duration.

178.2.3 Standard conformity

178.2.3.1 Corrections

178.2.3.1.1 Frequency range

The Frequency range sub-module allows you to set the frequency range into which you want the correction to be done.



Sound power spectrum: Frequency range where the correction is applied on the sound power spectrum.

Sound power level: Frequency range where the correction is applied on the sound power level. This range corresponds to the one set in the 1/n octave module.

178.2.3.1.2 K1 correction

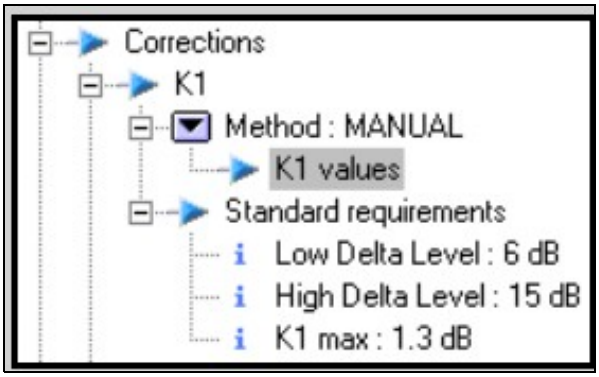
This type of correction is about the background noise.

There are three methods to define the K1 correction factor (Manual, File or Measurement).

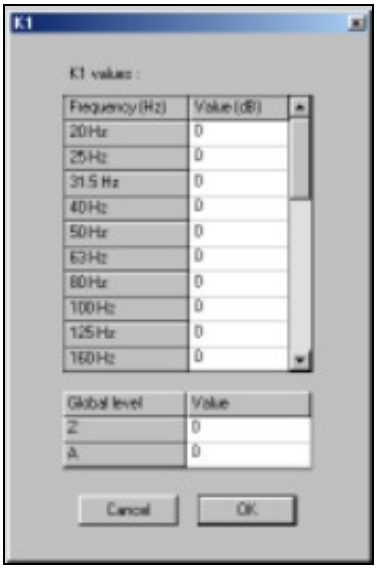
178.2.3.1.2.1 K1 manual determination

The manual method allows you to enter the K1 value for each frequency between [20 Hz; 20 KHz] or [20 Hz; 10 KHz] according to the frequency range you have selected.

The Standard requirements are for user information (given by the selected standard).



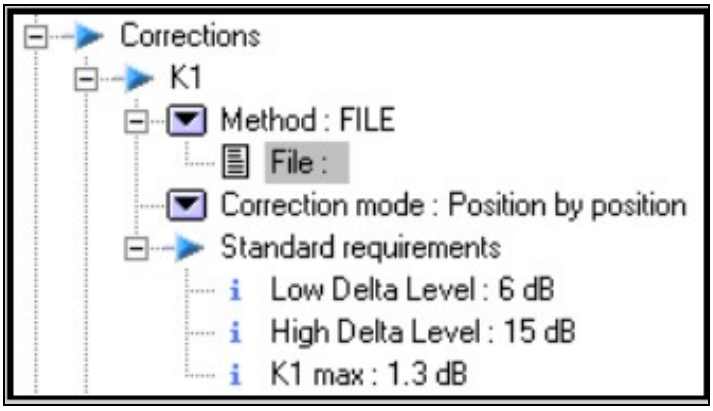
Double click on the **K1 values** setting, the following window is displayed:



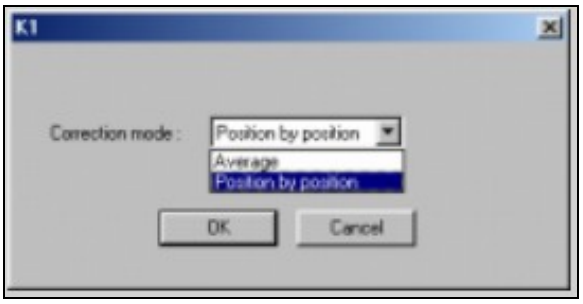
K1 file determination

The file method allows you to load the K1 value from a saved setup.

The Standard requirements are for user information (given by the selected standard).



Double click on the **Correction mode** setting, the following window is displayed:



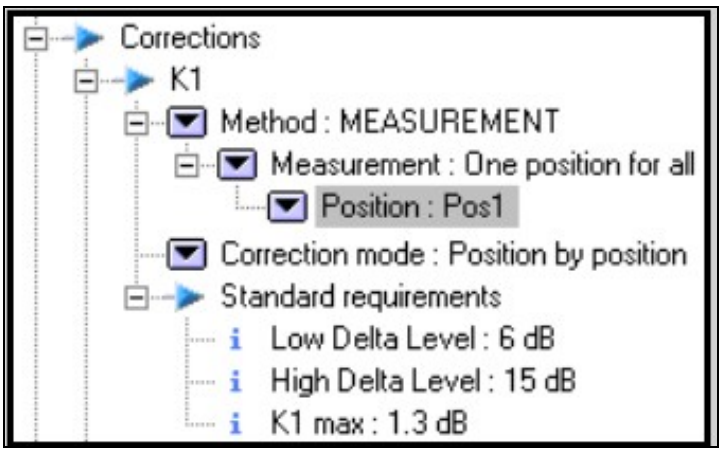
Average correction mode: source average in relation to the background noise average.

Position by position correction mode: each source position in relation to its background noise equivalent.

178.2.3.1.2.2 K1 measurement determination

The measurement method allows you to measure the K1 value.

The Standard requirements are for user information (given by the selected standard).

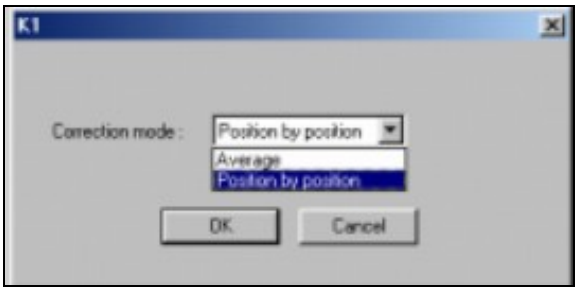


You have two possibilities to do the Measurement:

One position for all: determines the K1 only for one position then the value is assigned to all positions (select the position number).

All positions: determines the K1 for each position.

Double click on the **Correction mode** setting, the following window is displayed:



Average correction mode: source average in relation to the background noise average.

Position by position correction mode: each source position in relation to its background noise equivalent.

178.2.3.1.3 K2 correction

This type of correction is about the measurement environment.

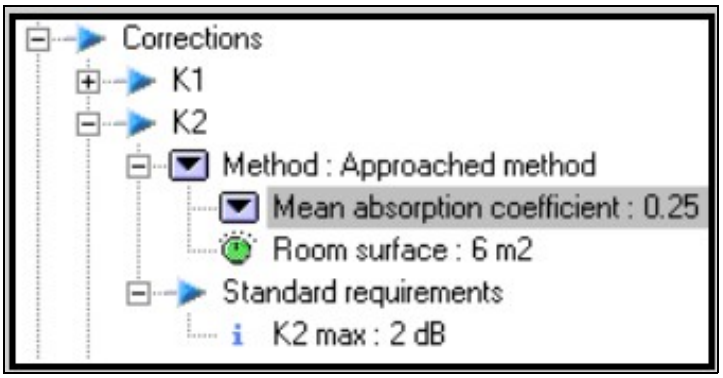
There are five methods to define the K2 correction factor (Approached method, File, Manual, Reference source or RT 60).

The File and Manual methods are explained in the K1 topic.

178.2.3.1.3.1 K2 Approached method determination

This type of method is mainly used for the room tests.

The Standard requirements are for user information (given by the selected standard).

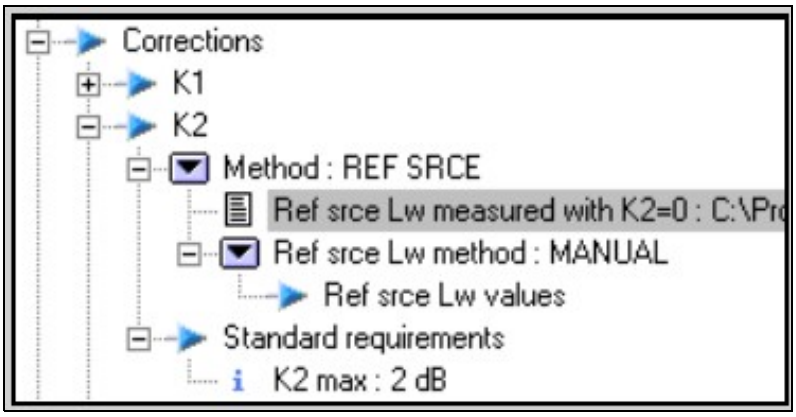


Enter the values of the **mean absorption coefficient** of the room (depends on the type of material constituting the room) and the **room surface** by double clicking on the settings.

178.2.3.1.3.2 K2 Reference source determination

The reference source method allows you to load the K2 value from a file.

The Standard requirements are for user information (given by the selected standard).



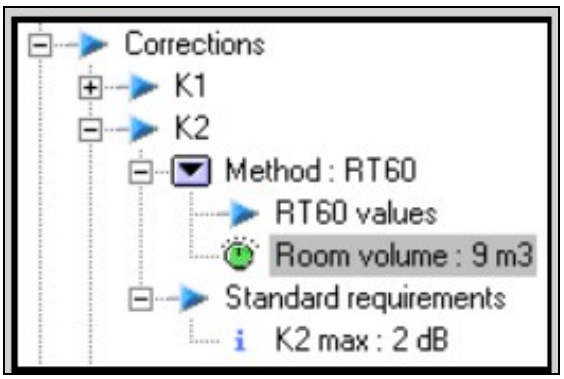
This method means that the sound power of the source with K2=0 was previously measured and saved in a file (get the file by double clicking on **Ref srce Lw measured with K2=0**).

Ref srce Lw method (Manual or File): select the reference source measurement method in the measurement environment.

178.2.3.1.3.3 K2 RT 60 determination

This type of method is mainly used for the room tests with known RT60 values.

The Standard requirements are for user information (given by the selected standard).



Enter the values of the **RT60** of the room and the **room volume** by double clicking on the settings.

178.2.3.1.4 K3 correction

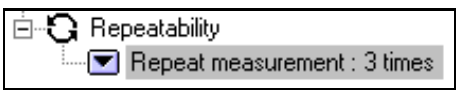
This type of correction is an additional correction.

There are two methods to define the K3 correction factor (File or Manual). The File and Manual methods are explained in the K1 topic.

178.2.3.2 Repeatability

The repeatability module allows you to make the measurement either 1 time or 3 times. If you select 3 times, it means that the average is calculated between the two results which have a difference less than 1 dBA. If the three results have a difference of less than 1 dBA, the average is calculated between the two higher results.

Double click on **Repeat measurement** to access it.



178.3 Manage your Setup

Manage your setup from the **File** menu. There are 4 ways to manage your setup:

New Setup: allows you to load a new template among those suggested by default.

Load Setup: allows you to load a saved template or to load a default template from a folder.

Save Setup: saves the current setup.

Save Setup As: saves the current setup with a name you specify.

178.4 Measurement Panel

178.4.1 Background Noise

178.4.1.1 Background Noise Correction

To carry out the background noise process click on the **Measurement panel** tab from the workspace.

The background noise can be measured in the case where "Measurement" is selected as a K1 method (in the Setup browser). Then you should click on the  button in order to initialize the background noise process (the background noise measurement does not start by clicking on this button). The Setup browser tab becomes Setup viewer, which means that you cannot change any setting.

Notes:

? a dialog appears if the transducers that you are using have not been calibrated.

? if the K1 method is set to File or Manual, the button above will be grayed.

Your screen is split in two parts: Sound Power (the controller) and NVGate® (the display).

During the background noise setup, NVGate® creates 2 layouts:

- LEVELS (shows all the A weighted input levels)
- SPECTRA (shows average 1/N octave signals and Z weighted global levels)

Notes: the number of traces in the layout display can change according to the K1 measurement setting ("One position for all" or "All positions").

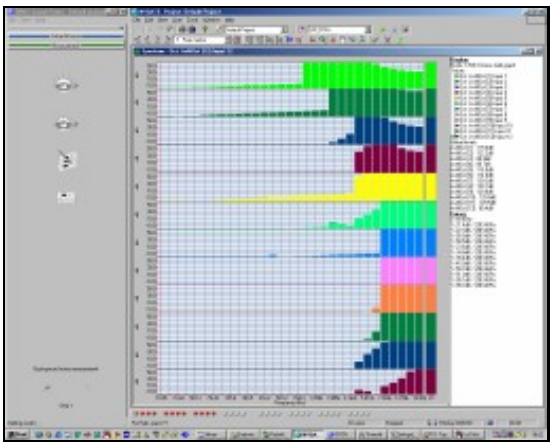
You can also switch from one layout to the other during the run.

When the software is ready to start the background noise measurement, the following tool appears at the bottom of the Measurement Panel:



178.4.1.2 Background Noise Measurement

1. To start the measurement, click on the button from the **Measurement Panel** (the status bar indicates "Running..."). You should have a display like the following one:



2. Wait few seconds for the results (the status bar indicates "Getting results...")

178.4.2 Source Noise

The source noise process is started from the **Measurement panel** tab from the workspace.

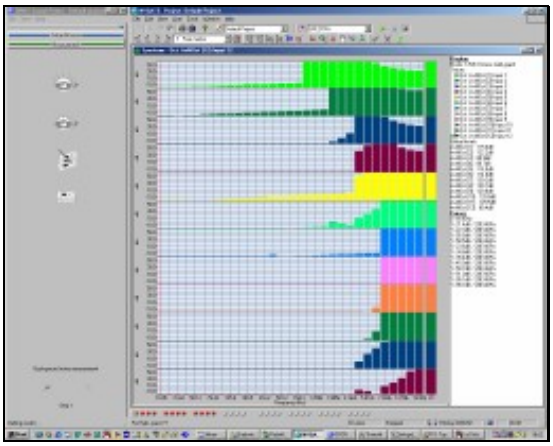
Click on the  button in order to initialize the source noise process, NVGate® software updates the input connections (the source noise measurement does not start by clicking on this button). The Setup browser tab becomes Setup viewer, which means that you cannot change any setting.

When the software is ready to start the source noise measurement, the following tool appears at the bottom of the Measurement Panel:



Source Noise Measurement

1. To start the measurement, click on the "RUN" button from the **Measurement Panel** (the status bar indicates "Running..."). You should have a display like the following one:



The number of runs depends on the number of steps you have selected in the microphones dialog in the setup browser and on the number of repeatability you have selected (1 or 3 times).

Tip: For example if you have selected 3 times for the repeatability and 2 steps in the microphones you will have to click the run button 6 times:

Run1 - Step1	Run1 - Step2
Run2 - Step1	Run2 - Step2
Run3 - Step1	Run3 - Step2

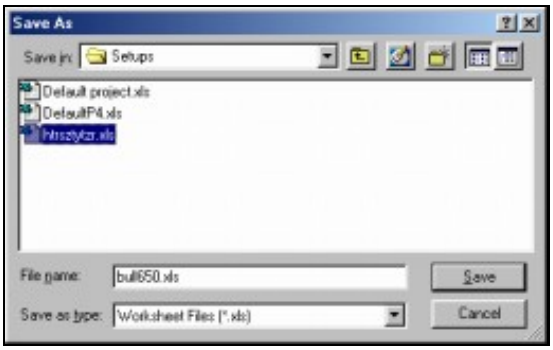
2. Wait few seconds for the results (the status bar indicates "Getting results...")

178.5 Report Edition

178.5.1 Fill out your report

When the measurement is finished, click on the  button from the **Measurement Panel** in order to fill out the report and check the calculated results, such as Sound power (dB and dBA), etc.

You have three tabs containing fields that you can fill out (double click on a cell to get the field) in order to make your report properly:



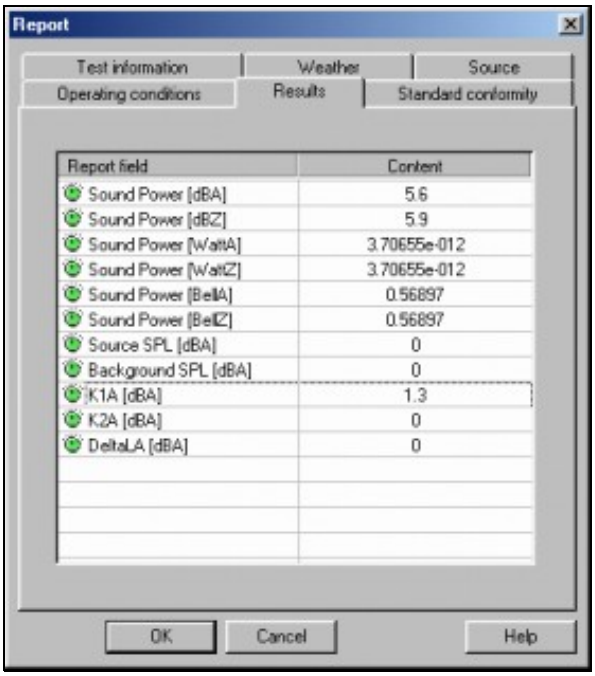
Once it is finished, click on **OK**, you can select to save the measurement or not. If you select to save the measurement, the following window appears:

Specify the file name and click on **Save**.

178.5.2 Results

The Results tab shows the information about the correction factors (K1, K2) and indicates the calculated results, such as Sound Power in dBZ and dBA, etc.

You cannot enter any data into these fields.



178.5.3 Standard conformity

The Standard conformity tab shows you the information about:

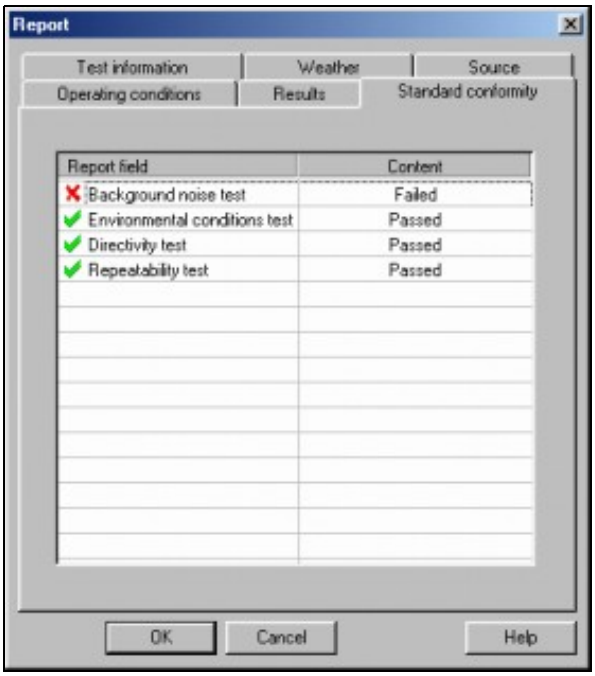
Background noise test: this test is only about the "Low Delta Level". If the difference between the source level and the background level is up to the "Low Delta Level" given by the standard, the test is failed.

Environmental conditions test: this test is only about the K2 correction factor. If the K2 values are up to the one given by the standard, the test is failed. If the test is failed, the K2 values set in the report will be the K2 max given by the standard.

Directivity test: the directivity calculation is made between the maximum and minimum levels measured in dBA. If the difference between the max and min is up to the position number, the test is failed (cf. standard ISO 3744). So it is recommended that you do another measurement process with a greater position number.

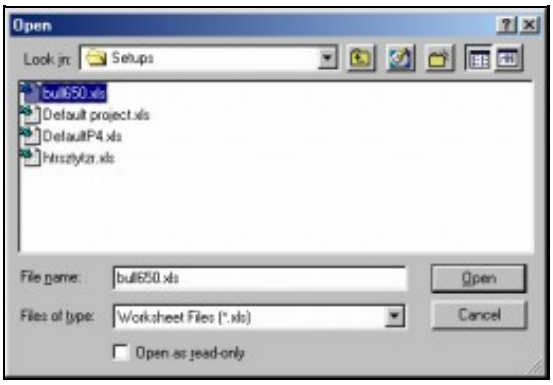
Repeatability test: this test is significant if you have selected a 3 time repeatability test. The average is calculated between the two results which have a difference less than 1 dBA. If the three results have a difference less than 1 dBA, the average is calculated between the two higher results. The test is failed if the three results have a difference up to 1 dBA.

You cannot enter any data into these fields.

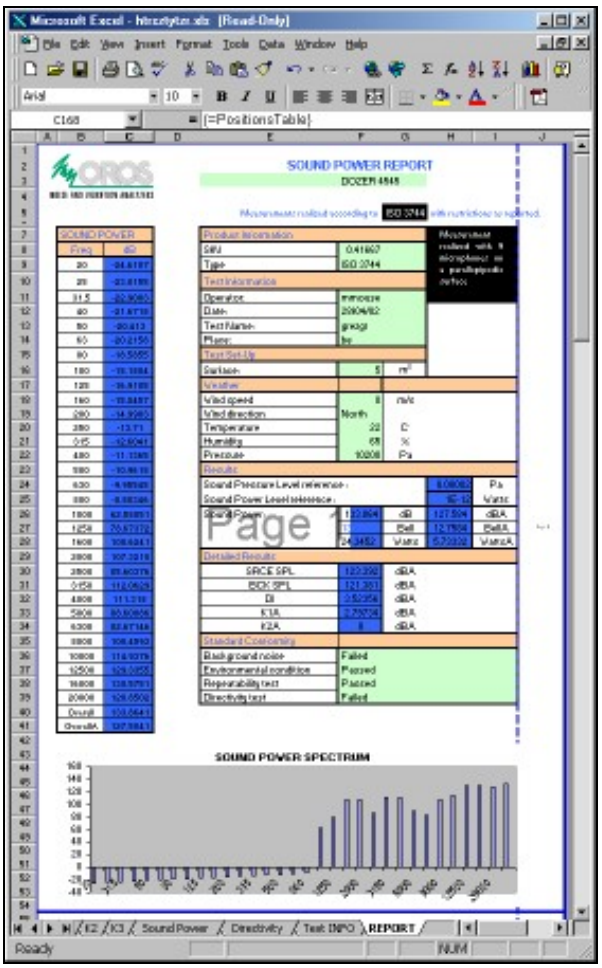


178.5.4 Report Preview

When the report is filled out, click on the  button from the **Measurement Panel** in order to open the report you want to see. The following window appears:



Select the saved setup and click on **Open** (an Excel worksheet is displayed containing all the information about your setup and measurement). Your report should look like the following one:



178.5.4.1 Report Customization

You have the possibility to choose what information you want to display in the "Report" dialog from the Sound Power software. If you want the modifications to appear each time a user loads a SETUP, customize it in Excel first. To do this:

1. From the **Measurement Panel**, click on the  button in order to open the Setup you want to modify.

2. Once the Setup is opened in Excel, select the "Report INFO" tab, so you should see the following sheet:

REPORT INFOS

	Value	Report it ? (YES/NO)
TEST INFORMATION		
Test name	bull test	YES
Operator name	jo	YES
Date	Friday, May	YES
Time	10:15:59	NO
Location	B.E	YES
Comments		NO
WEATHER		
Wind speed (m / s)	1	YES
Wind direction	North	YES
Temperature (C°)	22	YES
Relative Humidity (%)	60	YES
Barometric pressure (Pa	0	YES
SOURCE		
l1 (m)		NO
l2 (m)		NO
l3 (m)		NO
Type		NO
Manufacturer		NO
Model reference	LB650	YES
Serial Number	22152	YES
Power (Watts)		NO
Manufacturing year		NO
OPERATING CONDITIONS		
RPM	1	NO
Voltage (V)	0	NO
Current (A)	0	NO
Line frequency (Hz)	0	NO
Comments		NO
RESULTS		
SND POWER dBA	133.1058	YES
SND POWER dBLin	132.67702	YES
SND POWER Watts A	20.444684	YES
SND POWER Watts Lin	18.522618	YES
SND POWER BelIA	13.31058	YES
SND POWER BelILin	13.267702	YES
SRCE SPL dBA	127.4161	YES
BCK SPL dBA	127.42299	YES
K1A	1.3	YES
K2A	0	YES
DI	0.0105457	YES
STANDARD CONFORMITY		
Background noise	Failed	YES
Repeatability test	-	YES
Directivity test	Failed	YES
Environmental Condition	Passed	YES
DETAILED RESULTS		
Frequency Details (p2)		YES
Positions Details (p3)		YES
Set-Up Details (p4)		YES

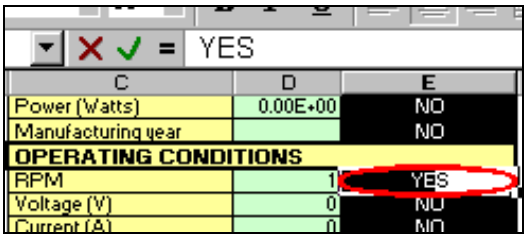
erage run | DL | K1 | **Report INFO** | K2 | K3 | Sou

Legend:

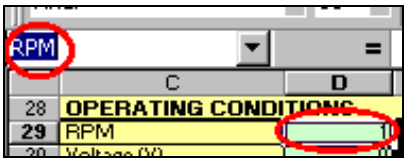
	Value entered by the user from Sound Power
	Description
	Value entered by the user from Excel
	Data "calculated" by Sound Power

From this sheet, the titles of each part are displayed as tabs from the "Report" dialog in Sound Power (Test Information, Weather, Source, etc...).

3. Click on the cell corresponding to the data you want to see in the report. For example, the RPM data, and type YES.

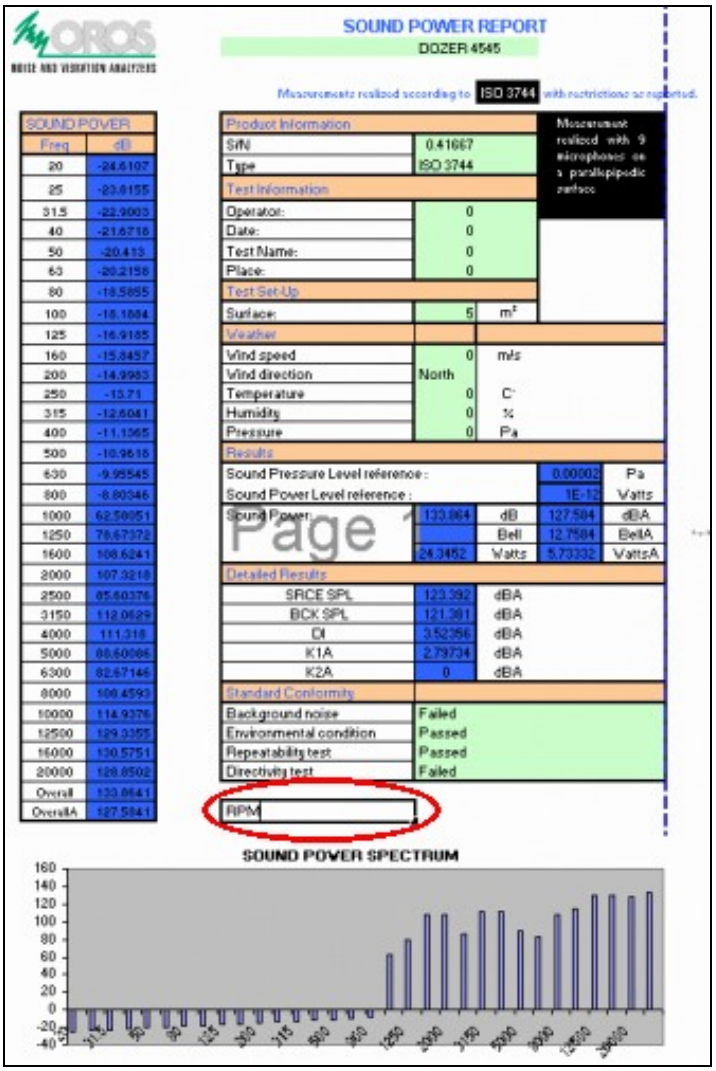


4. Click on the green cell corresponding to RPM and then click on the label cell.

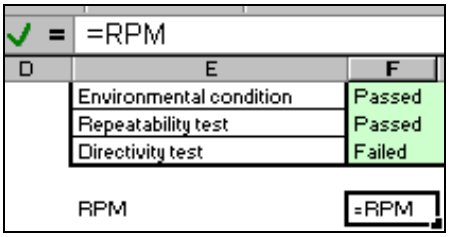


5. When RPM is highlighted, press **CTRL+c** to copy the value (be careful to do not change the value) and then click on the **Report** tab.

6. Click on a free cell and type RPM as a title for the data you are about to insert as described in the following picture.



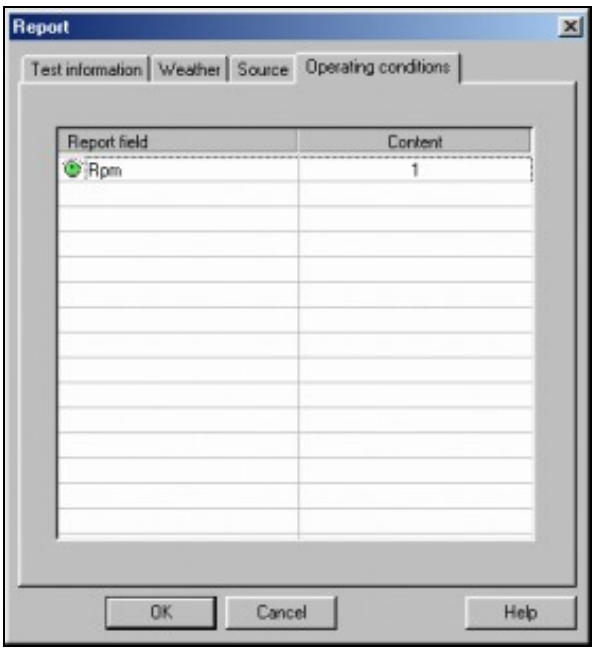
7. Click on the cell next to the previous one then type = and press **CTRL+v** in order to paste the label previously copied.



Press **Enter** to apply the computation.

8. Save your Setup from Excel. The next time the Setup will be loaded, the RPM field will be activated, so the user will be able to enter a value for the RPM.

9. The result of this procedure is available from Sound Power in the Measurement Panel by clicking on the  button.



178.6 Tutorial

178.6.1 Welcome to the tutorial

This tutorial is designed to teach you quickly how to use the Sound Power software. Along the way, you will learn the basic steps of building a Setup.

These quick and easy lessons take you step by step through the process of displaying traces, creating a setup, saving a setup etc.

The First lesson

You will learn how to create and save a setup.

The Second lesson

This lesson will teach you to load a saved setup and to make a measurement.

178.6.2 First Lesson

178.6.2.1 Context:

The aim is to create and prepare a setup to study the noise of a construction vehicle, like a bulldozer for example. The idea is to re-load the created setup afterwards, making the software operation easier for the daily user.

Suppose that you need 12 positions to make your measurement according to the standards and you have only 6 microphones at your disposal. The standard you have to select is the ISO 6395 with a sphere surface.

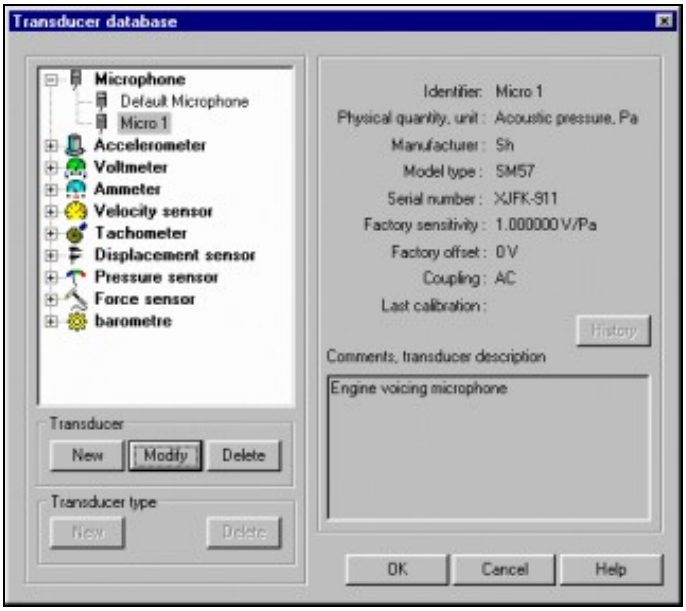
178.6.2.1.1 Preliminary step (create the microphones needed)

This step explains how to create the 6 microphones that you need to carry out the measurement process (this is made from NVGate® software).

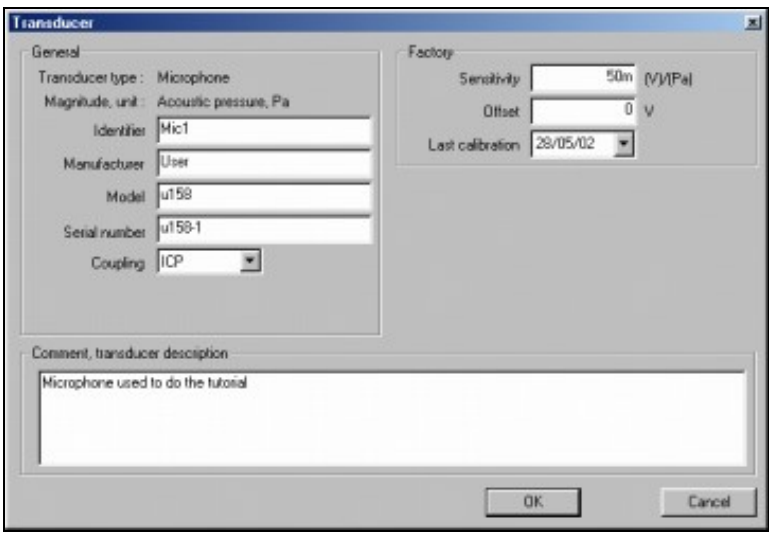
1. From the **Start** menu, select **Programs**, **NVSolutions** then start **Sound Power On-line Help** in order to read the Sound Power HTML Help from NVGate®.

2. Switch to NVGate® software.

3. From the **Tools** menu, select **Transducers** then **Definition** and the following window is displayed:



4. Select **Microphone**, and click on **New** from the "Transducer". The following window is displayed:



Identify the first microphone by naming it "Mic1". Feel free to fill out the "Manufacturer", "Model" and "Serial number" fields as you like.

For the "Coupling", select **ICP** and enter **50m**(V)/(Pa) for the microphone sensitivity. Click on **OK** when finished.

Note: If you have LEMO connectors on your hardware, select **AC** for the coupling setting instead of ICP.

5. Repeat step 4 for each microphone. Identify the 6 microphones by Mic1, Mic2, ..., Mic6. Only change the "Identifier" and "Serial number" fields for each microphone.

6. When you have created the 6 microphones, click on **OK** from the "Transducer database" window and then switch back to Sound Power software.

7. From the **Tools** menu, select **Update transducer database**.

178.6.2.1.2 Create a Setup

This step shows you how to load a default setup and create a new one.

1. Select **New Setup** from the **File** menu.

2. From the Surface type, select **Sphere** and number of positions = **12**. Click on **OK**. You can choose whether or not to save the current setup.

3. In this case, the radius of the sphere must be 32 meters (this value is used for the hemisphere surface computation), so double click on the **Dimensions** setting and enter 32. Click on **OK**.

4. Double click on **Positions** from the Setup Browser and take a look at the positions coordinates in order to place your microphones, click on **OK**.

5. Double click on **Microphones** from the Setup browser. Set the Number of microphones to 6. The number of steps is adjusted to 2. Suppose that the measured levels are close to 100dB, so you have to set the range peak closer to this value. Type 100 in each Range peak cell of the inputs (the value is automatically adjusted taking into account the microphone sensitivities).

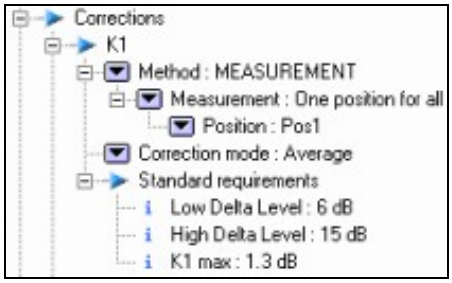
6. Set the positions in the Step 2 column like in the following table and click on **OK**:

Step 1	Step 2
Pos1	Pos7
Pos2	Pos8
Pos3	Pos9
Pos4	Pos10
Pos5	Pos11
Pos6	Pos12

7. In the 1/n Octave module from the Setup Browser, set the Upper central frequency to **20KHz** and the Average duration to 15s.

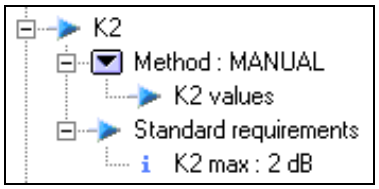
8. Knowing that all positions can be measured only in two steps in this particular case and that it is not necessary to measure the background noise for all the positions, we choose to measure it only at the position 1. To achieve that, we do the setup as it is described below.

In the Corrections module, set for K1:

Method: Measurement **Measurement:** One position for all **Position:** Pos1 **Correction mode:** Average	

9. Taking into account that the measurement is carried out outdoors, we consider that the environmental correction K2 is null.

For K2:

Method: Manual	

Double click on **K2 values** and set all the values to 0dB. Click on **OK**.

10. Taking into account the method accuracy required, no weather correction should be implemented, so the K3 correction factor will not be displayed in the Setup Browser.

11. Double click on **Repeat measurement** from the Repeatability module, set the value to **3 times**.

178.6.2.1.3 Save a Setup

1. From the **File** menu, select **Save Setup as**.

2. Name the Setup Tutorial_setup1 and specify the location: the directory C:\Program Files\OROS\OR38\NVSolutions\SoundPower\Setups is the one installed by default, but you can choose any other location.

178.6.3 Second lesson

The aim of the second lesson is to go through a realistic measurement process (load a setup, display traces, measurements and results, generate a report).

Switch to the **Measurement Panel** tab from the workspace.

178.6.3.1 Load a Setup

You are going to load the Setup saved in the first lesson.

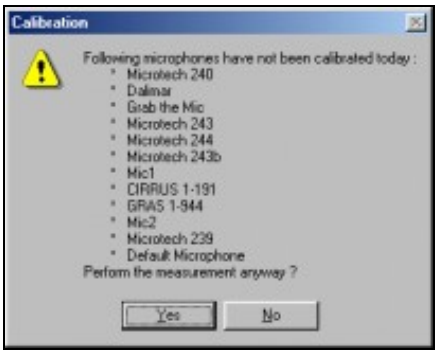
1. From the **File** menu, select **Load Setup**.

2. Select **Tutorial_setup1** and click on **Open**.

178.6.3.1.1 Measurement process

There are several steps during the measurement: the transducer calibration, the background noise measurement and the source noise measurement.

1. Start the background noise measurement process by clicking on the  button. A dialog is displayed that warns you in case your microphones have not been calibrated today.



Click on **No**.

2. Calibrate your microphones

3. When the calibration is OK, click on the  button in order to initialize the background noise measurement process (the background noise measurement does not start by clicking on this button).

4. To start the measurement, click on the  button from the **Measurement Panel** (the status bar indicates "Running..."). The measurement lasts 15 seconds (as defined in the first lesson of the tutorial). When the averaging is finished, wait for the results to download (the status bar indicates "Getting results...").

5. Click on the  button in order to initialize the source noise measurement process (the source noise measurement does not start by clicking on this button).

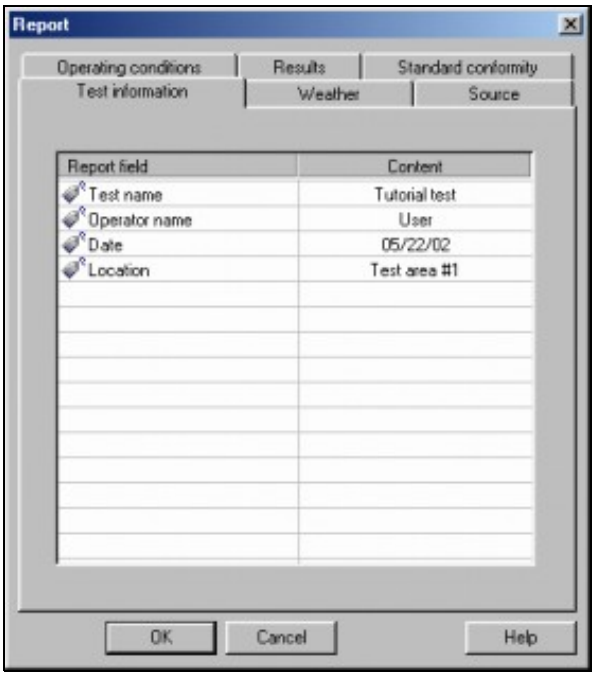
6. To start the measurement, click on the  button from the **Measurement Panel** (the status bar indicates "Running...") until the end of the measurement (Run1-Step1, Run2-Step1, Run3-Step1, Run1-Step2, Run2-Step2, Run3-Step2).

Note: As you have selected 2 steps (it means that you do not have enough microphones to do the measurement in one step) in the measurement process, you will have to change either the microphone positions or to move the source between the 2 steps.

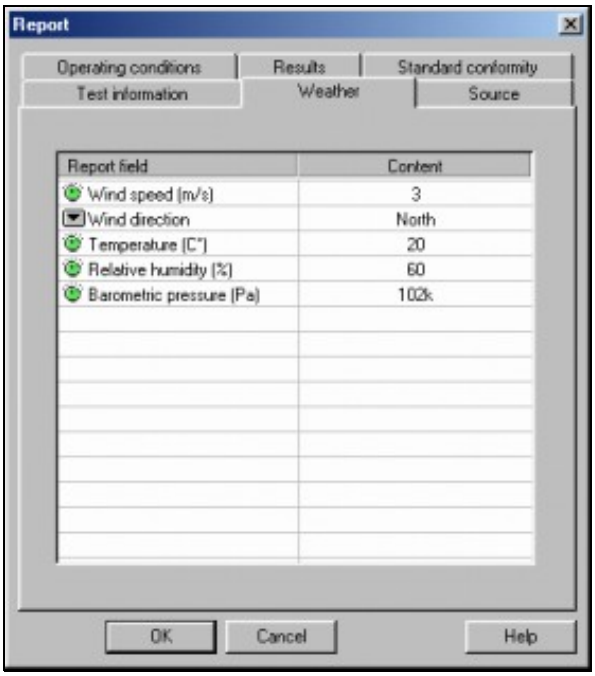
178.6.3.1.2 Fill out and generate a report

Fill out your report before printing in order to find all the information about the weather conditions, user name and the many other features.

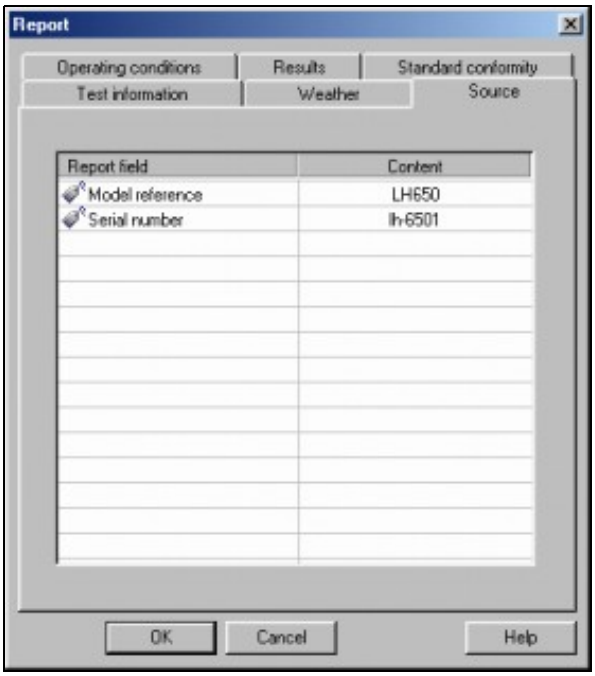
1. When the measurement is finished, click on the  button from the **Measurement Panel** in order to fill out the report like the following one:


Report
Operating conditions
Results
Standard conformity
Test information
Weather
Source
Report field
Content
Test name
Tutorial test
Operator name
User
Date
05/22/02
Location
Test area #1
OK
Cancel
Help

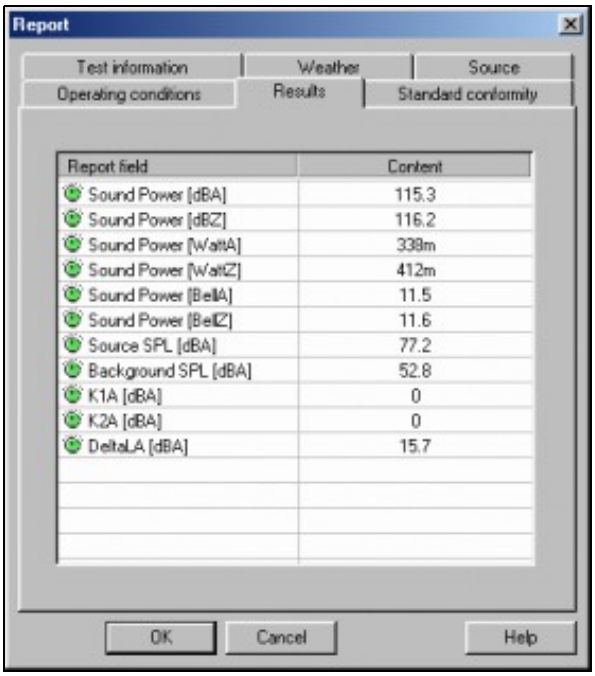
2.


Report
Operating conditions
Results
Standard conformity
Test information
Weather
Source
Report field
Content
Wind speed (m/s)
3
Wind direction
North
Temperature (C°)
20
Relative humidity (%)
60
Barometric pressure (Pa)
102k
OK
Cancel
Help

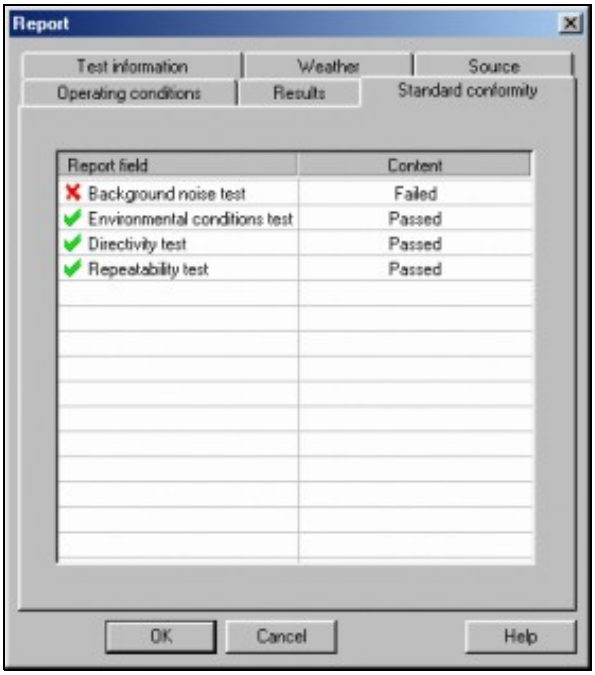
3.


Report
Operating conditions
Results
Standard conformity
Test information
Weather
Source
Report field
Content
Model reference
LH650
Serial number
lh-6501
OK
Cancel
Help

4.


Report
Test information
Weather
Source
Operating conditions
Results
Standard conformity
Report field
Content
Sound Power [dBA]
115.3
Sound Power [dBZ]
116.2
Sound Power [WattA]
338m
Sound Power [WattZ]
412m
Sound Power [BelA]
11.5
Sound Power [BelZ]
11.6
Source SPL [dBA]
77.2
Background SPL [dBA]
52.8
K1A [dBA]
0
K2A [dBA]
0
DeltaLA [dBA]
15.7
OK
Cancel
Help

5.



In this case for example, the Background noise test has failed. It means that you may have to go once again through a measurement process until all the tests will be positives.

6. Click on **OK**.

178.6.3.1.3 Save the measurement

The "Save" dialog is displayed, then select **Yes**. Name the Setup: Tutorial_measurement1. Specify the location (in order to avoid mixing your measurement results with setup templates, place it in another location than the "Setups" and "Templates" directories). Click on **OK**.

178.6.3.1.4 Preview your report

Click on the  button from the **Measurement Panel** in order to visualize the report corresponding to the measurement you have made: the last saved measurement file will be proposed by default.

179 Sound Power Washing Machine IEC 704

Sound Power for Cycle Machines

The software add?in called "SPAddin Cycle" allows a user to determine the Sound Power Level for cycle machines. It is dedicated today to the measurement of Sound Power on washing machines as defined in the standard IEC704: 6 microphones around a source fixed against a wall.

1. Installation and run specificities

- Download it here V1.02: https://orossas.sharepoint.com/:u:/g/support/EUs_-jyRcOBEnMoecotapQsBk8B7iIkCs6nv_bqCl-Hkng?e=vhbODM
- The Add?in is installed in a second step after the standard Sound Power base module.
- After installing the software please replace the file "IEC704_PW6" (installed in the directory "C:\OROS\OROS Program files\Sound Power\Setups") by the new one provided in the directory "
- The Add?in will install a specific "Sound Power" project in NVGate. If a user wants to use the standard Sound Power base module, they can reinstall the Base Module so that the standard "Sound Power" project will be reinstalled.

2. Getting Started

- In order to start the software in this mode one should use the load option from the setups directory: "IEC704_PW6.xls".

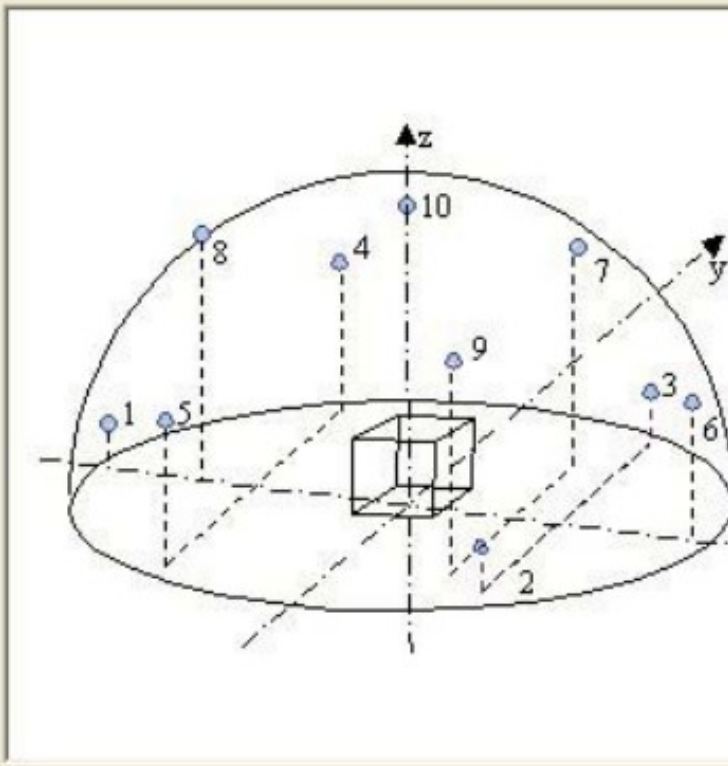
Setup

New setup:

Standard: ISO3744

Surface type: Hemisphere

Number of positions: 10



Load setup:

Browse ...

OK

Cancel

Open

Look in: Setups

Default measurement.xls

Default setup.xls

IEC704_PW6.xls

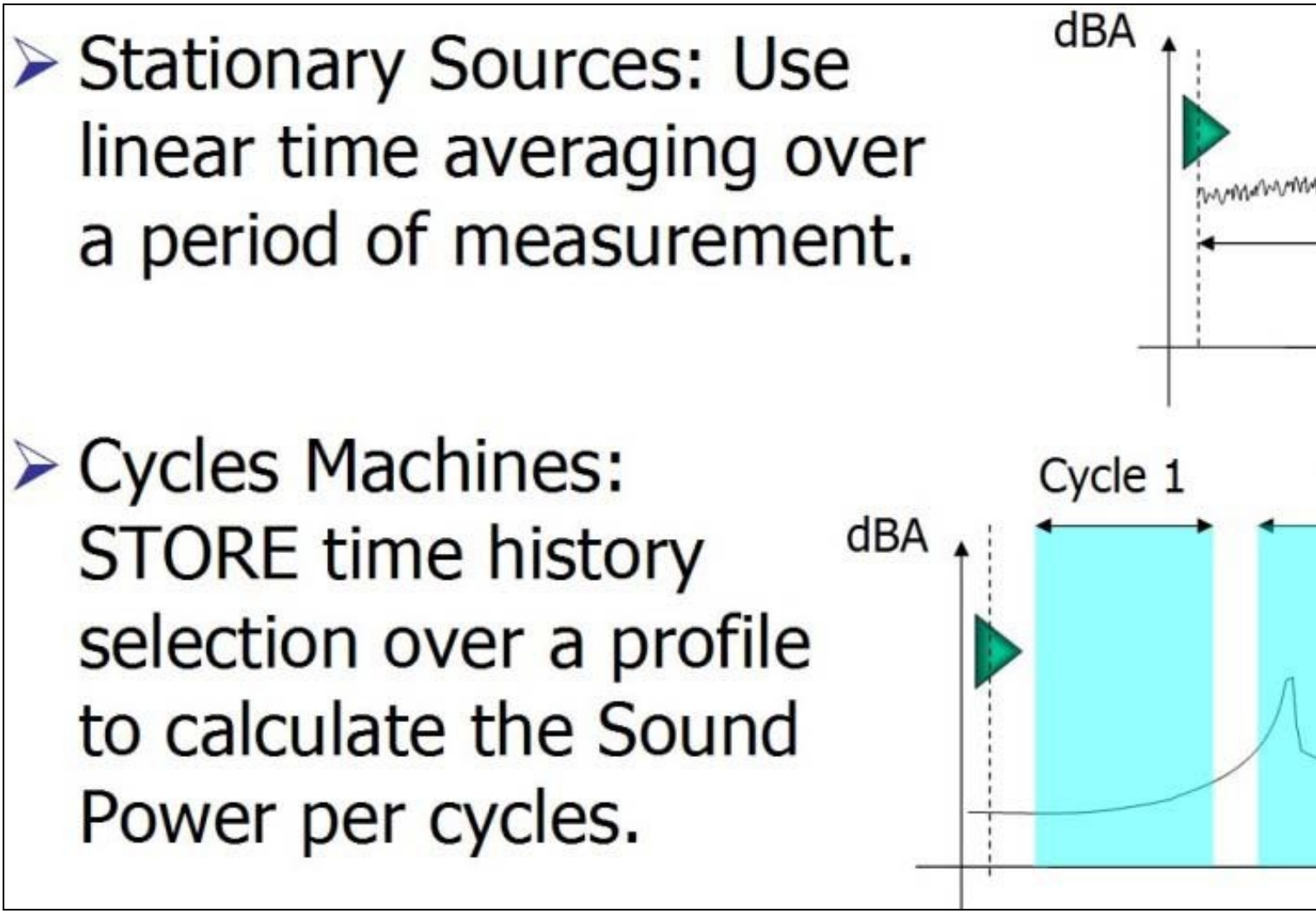
File name: IEC704_PW6.xls

Open

3. Application

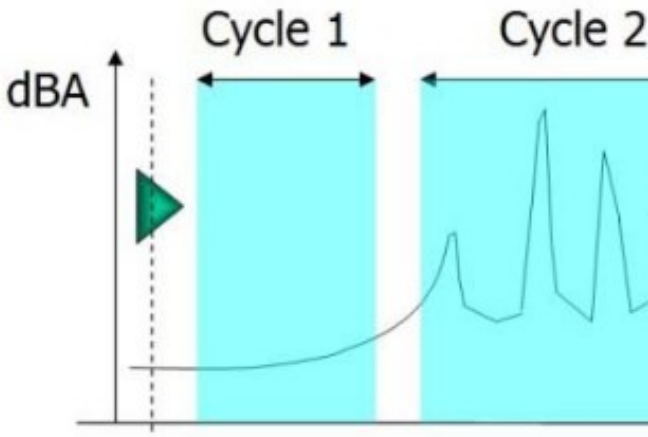
As shown in the figure below, there are two ways to determine the Sound Power level relatively to measurement start and stop:

- We consider the full phase between the Start and Stop. This is the case for the base module of the Sound Power solution.
- We cut the measurement periods in a number of cycles: for the sound power on washing machines there are two cycles: washing and spinning.

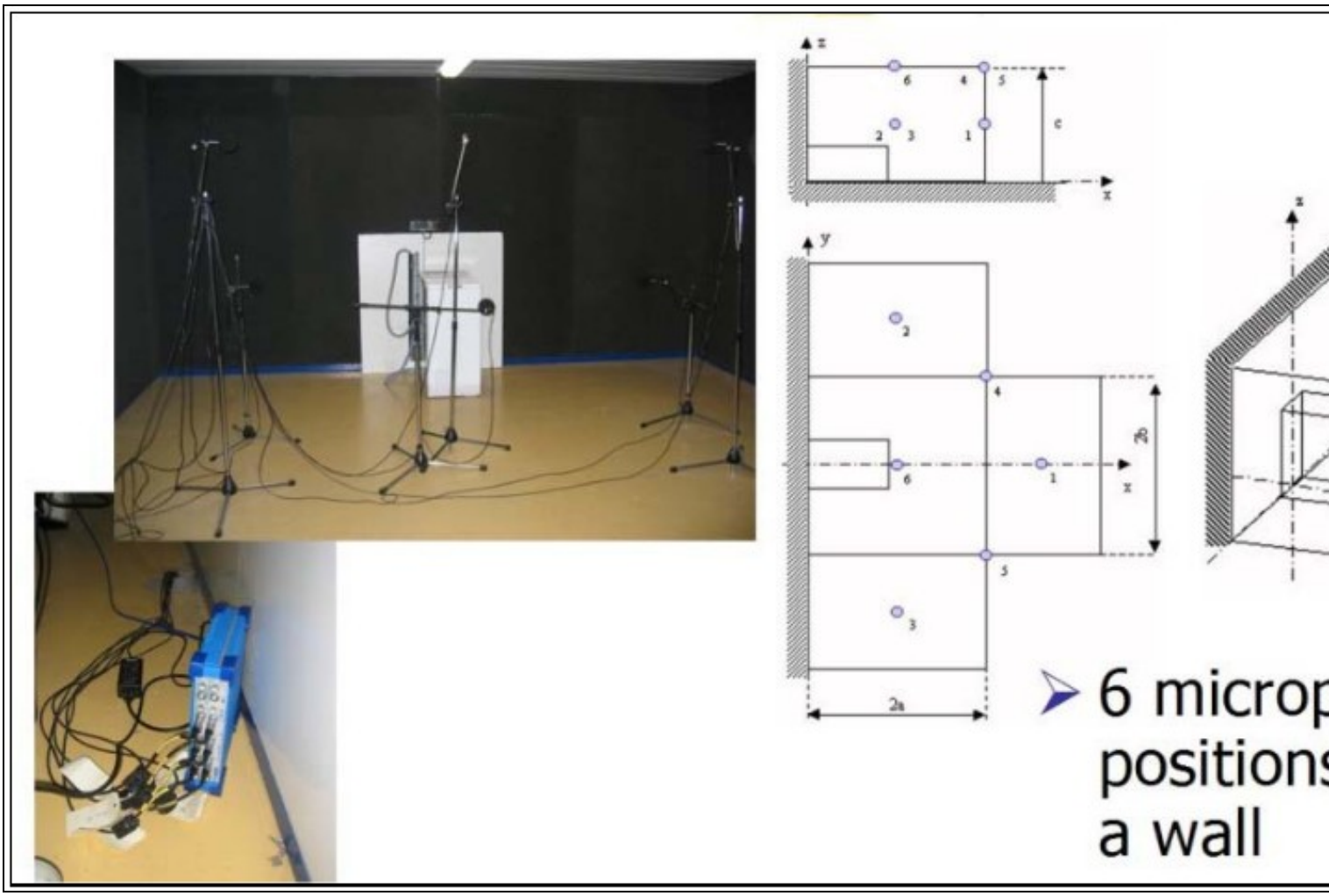


Sound Power measurements on washing machine: the system will record the full time history on the 6 microphones so that the user can choose the appropriate period. There are a number of features available thanks to the power delivered from the 3?series analyzers: All channels are measured simultaneously, the short Leq1s are acquired, and all microphone positions are averaged simultaneously. The measurement time can be quite long: acquiring the signal over 3 hours.

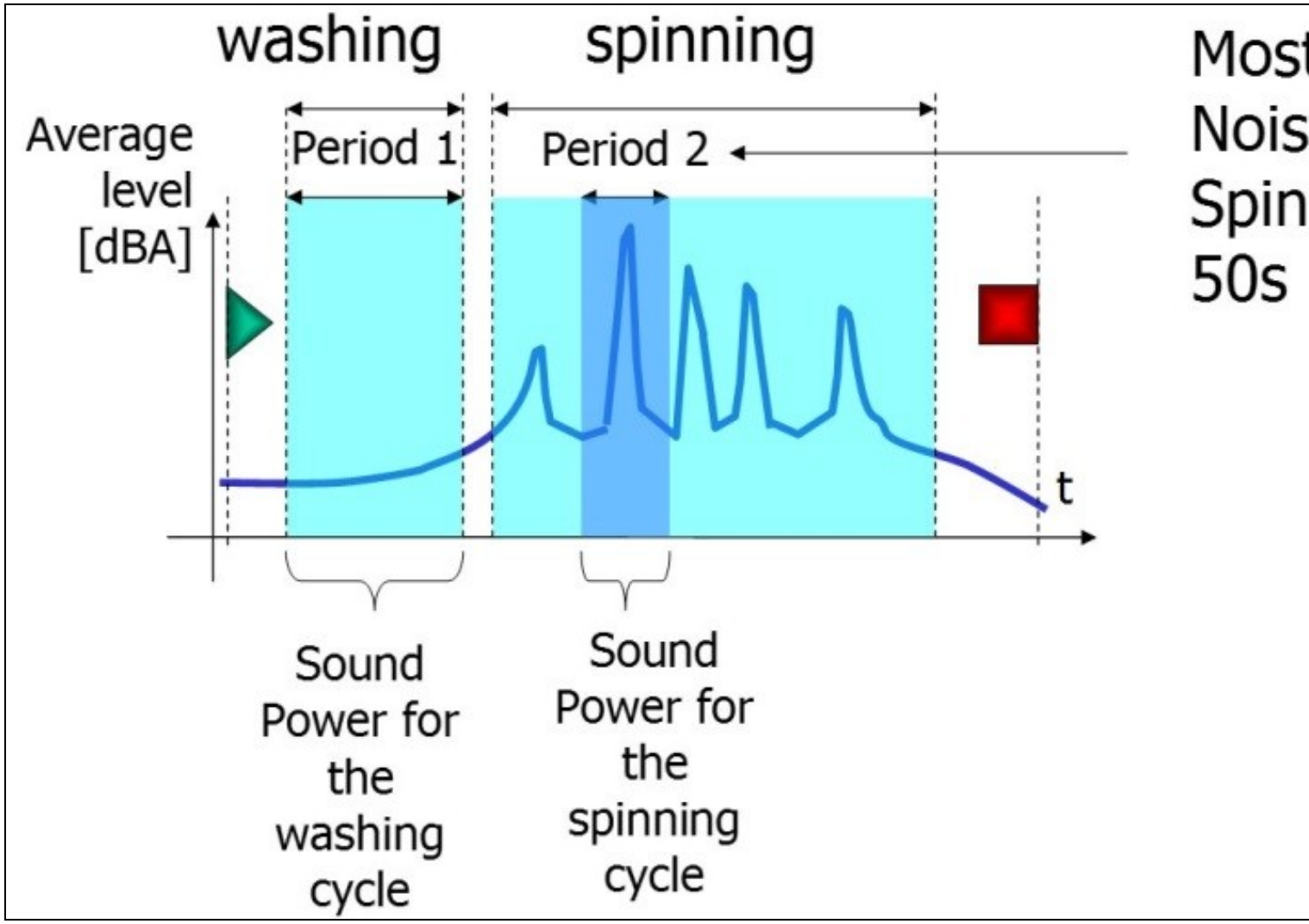
- All channels measured at once
- Short Leq 1s time history
- Averaged over all the microphone positions
- Measurement time can be long: 3 hours for washing machines



Below is a picture of the particular setup used.

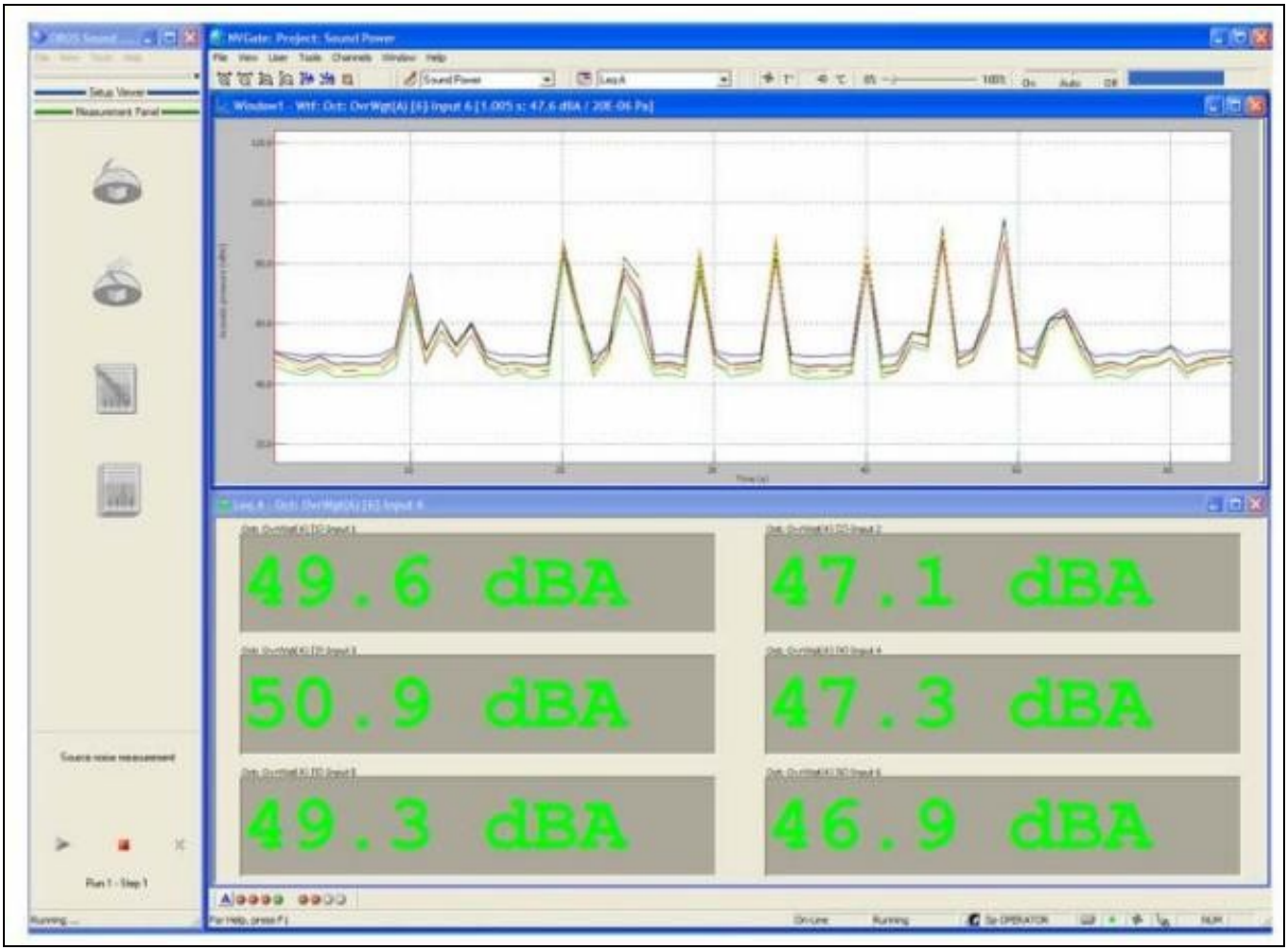


The noisiest period among several spinning events is automatically detected by the software.



4. Software Interface

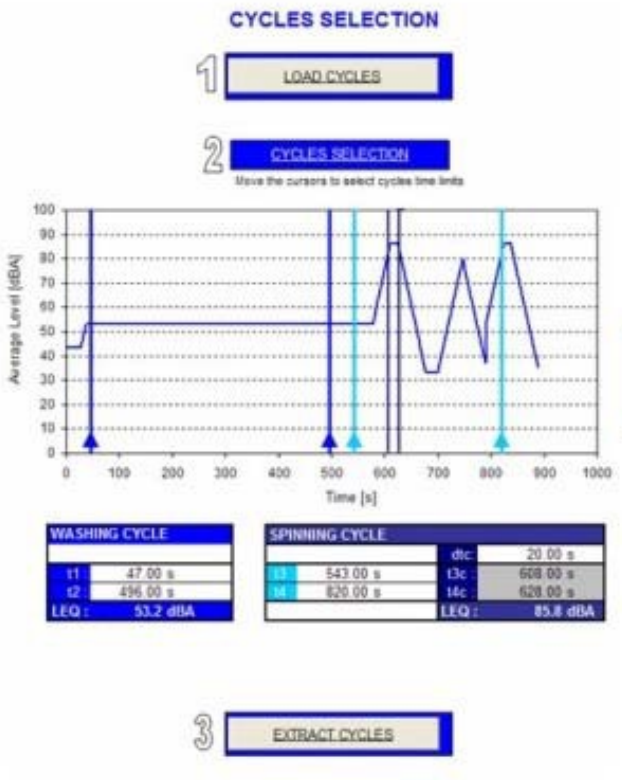
During the acquisition, it is possible to acquire the 6 leq profiles (for the 6 microphones).



The Sound Power level is determined during the Sound Power report session as shown below. There are 3 main steps in the data treatment. The first step is to load the data by pressing load cycles.

The second step is to process to cycles selection: A user chooses the washing period and the spinning period. The most noisy period is automatically detected The data are used for the final Sound Power Reporting.

- 1. Load Cycles
- 2. Cycles selection
- 3. Extract Cycles → Average the spectrum in this selected time ranges
- 4. Report



180 Sound Quality Lite

180.1 Installation

180.1.1 Download

Download Last Version of Sound Quality Lite V1.2.

180.1.2 Equipment required for the installation

USB drive containing OROS Sound Quality LIte software installation setup "SoundQualityLiteSetup.msi".

NVGate software must have been installed first.

180.1.3 Installation of NVGate software

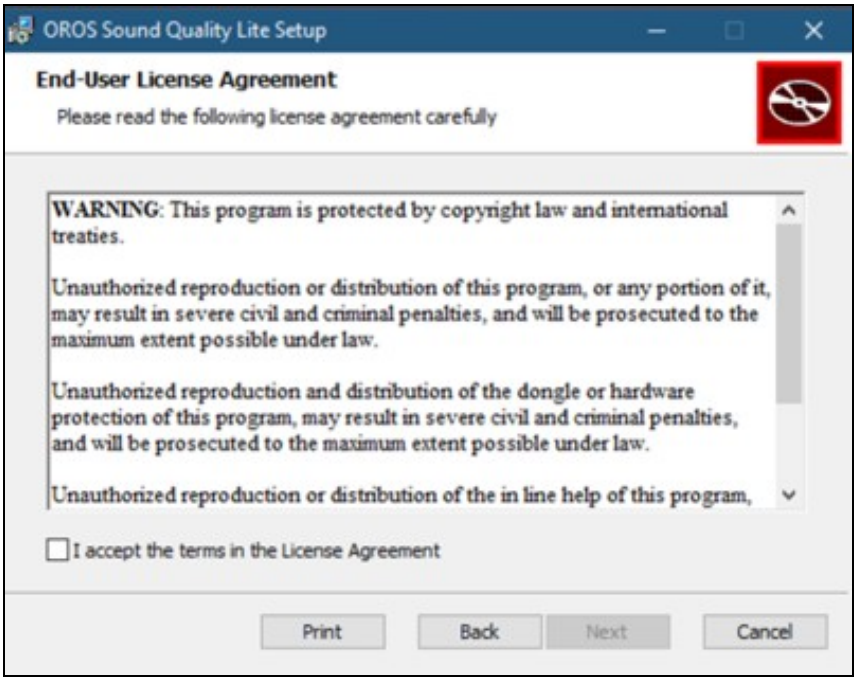
First you need to install NVGate.

180.1.4 Installation of Sound Quality Lite software

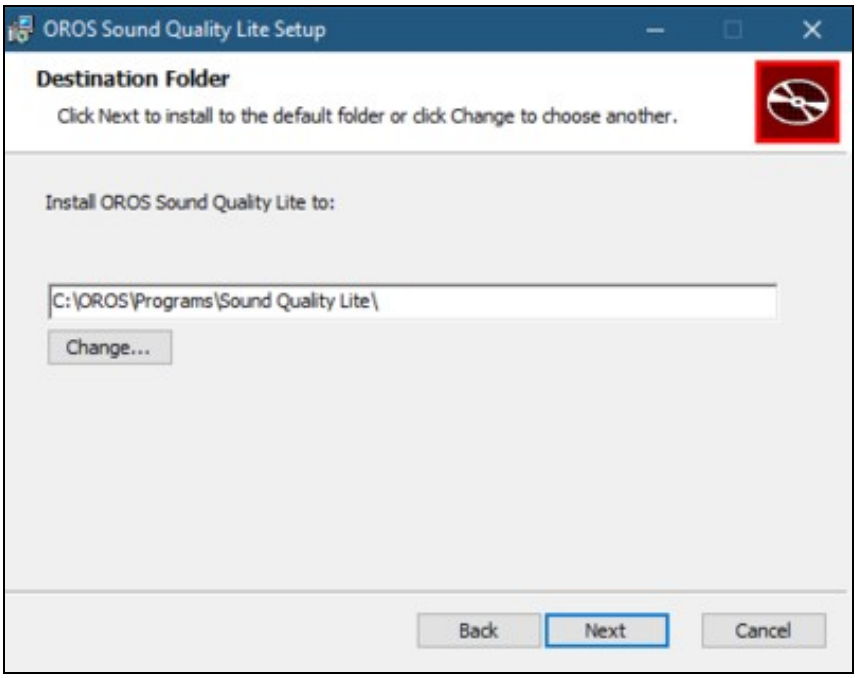
Run the ?SoundQualityLiteSetup.msi? program, and the following window is displayed:



Click on ?Next?, and the following window is displayed:



Read the terms of the license agreement and select "I accept the terms in the license agreement" if you agree. Click on ?Next?, and the following window is displayed:



Select the installation directory. It is highly recommended to keep the default location: C:\OROS\Programs\Sound Quality Lite. Click on ?Next?, the following window is displayed:



Click on ?Install?, and wait until the following window is displayed:



Click on ?Finish? to exit the setup wizard, and OROS Sound Quality Lite software is successfully installed.

NOTE: Before launching the software, please plug OROS USB dongle if your license is dongle locked, or connect the PC to the analyzer and launch NVGate in the connected mode if your license is instrument locked.

180.2 User Interface

180.2.1 Introduction

OROS Sound Quality Lite is a software providing:

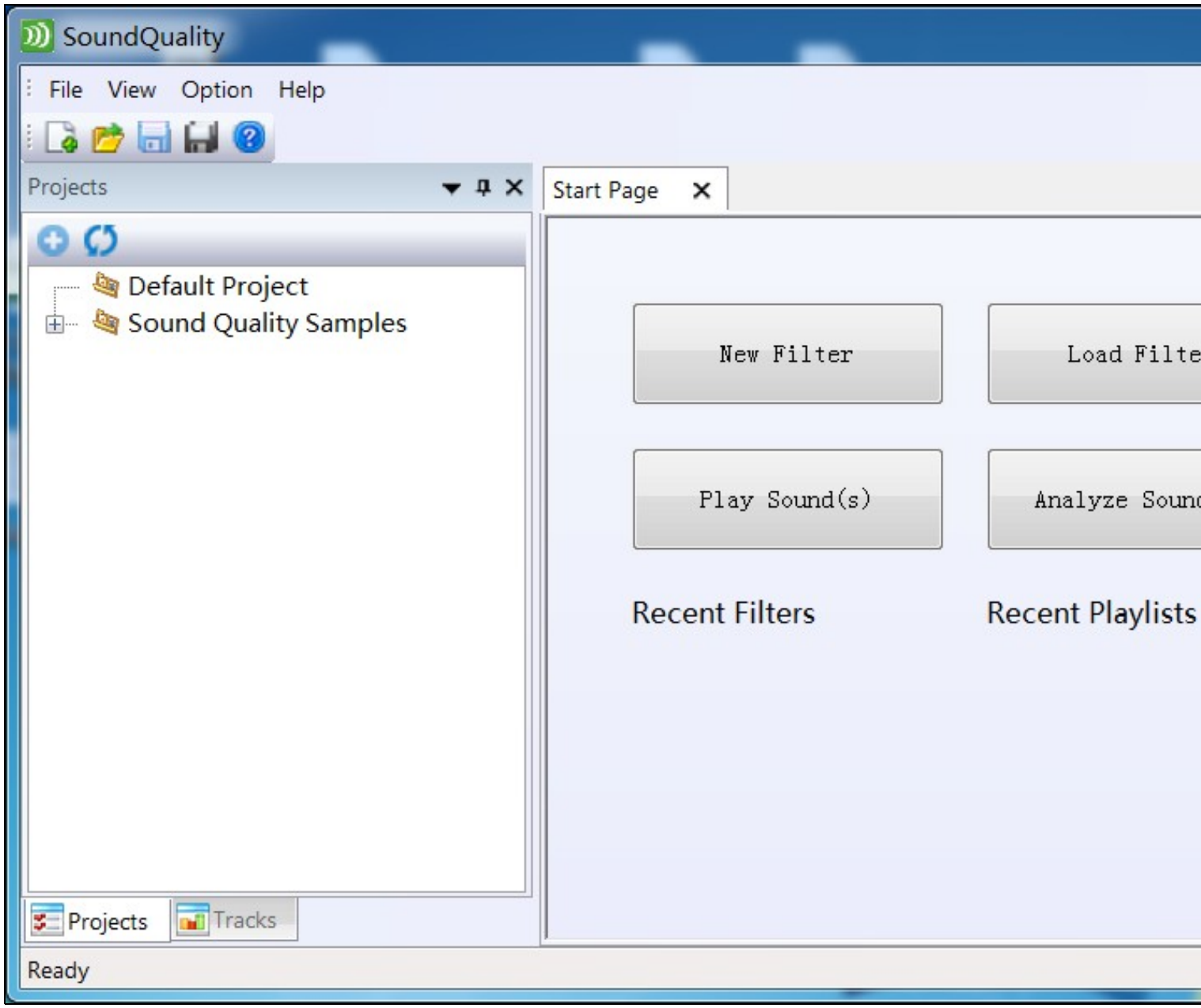
- An auditory model optimized according to psychoacoustics results,
- An interactive filter set for designing and analyzing sound,
- And a tool for playback and comparison.

Click



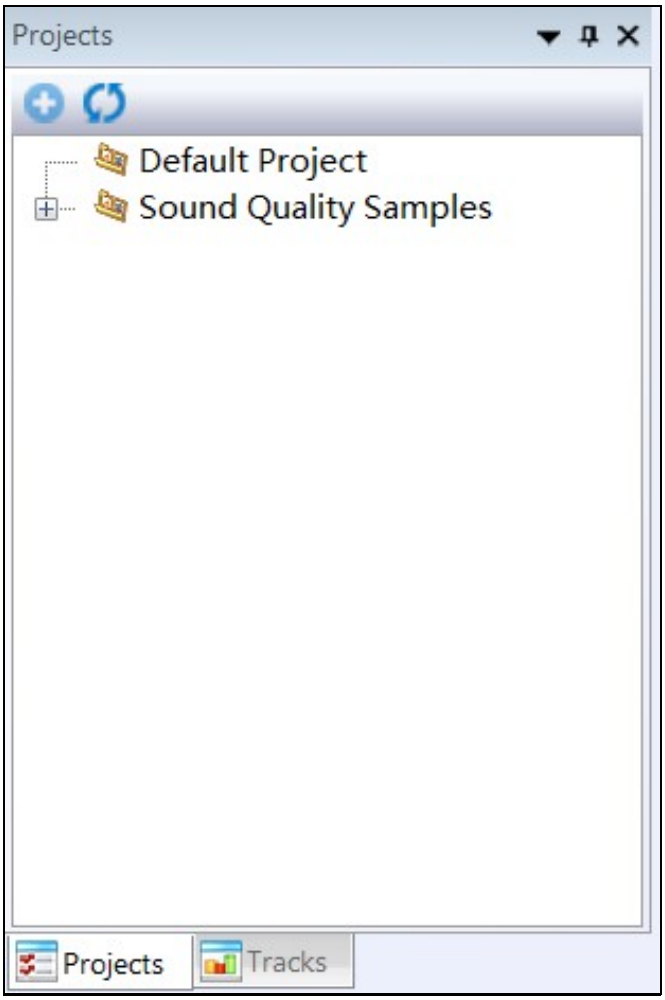
To launch the software. The NVGate software is required to work and will be started automatically if not already running.

The following window is displayed when it is ready.


SoundQuality
File
View
Option
Help
Projects
Start Page
Default Project
Sound Quality Samples
New Filter
Load Filte
Play Sound(s)
Analyze Sound
Recent Filters
Recent Playlists
Projects
Tracks
Ready

180.2.2 Project manager

On the left part, the *Project Manager* is shown. The project manager is synchronized with the NVGate project manager. Training samples are installed together with the software: 'Sound Quality Samples' and may be used when first using the software.



180.2.3 Main Page

On the right, the main functionalities are shown.

- '**New Filter**' & '**Load Filter**' - Filter design and interactive filtering
- '**Play Sound(s)**' - Sound playback
- '**Analyze Sound(s)**' - Psycho-acoustic parameter calculation

Click on each button to active the responding page.

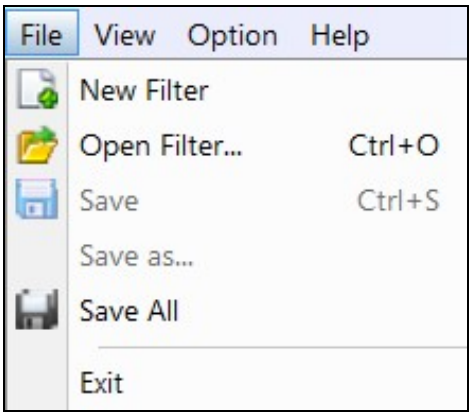
'Recent Filters' and 'Recent Playlists' will also be shown below.



Sound Quality Lite start page

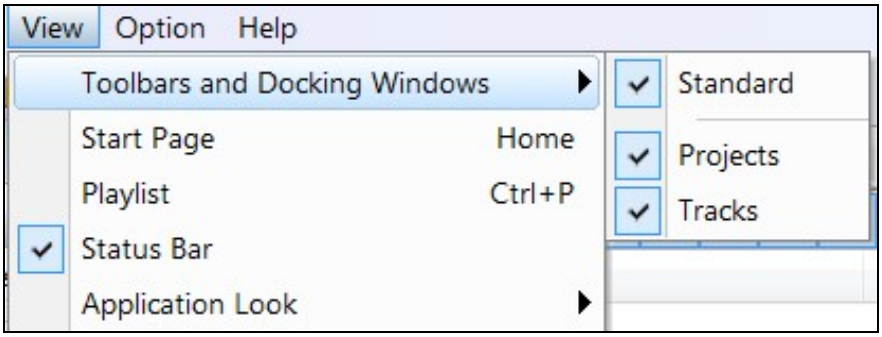
180.2.4 Menu

- File
- Create, open and save Filters
- Exit the module.



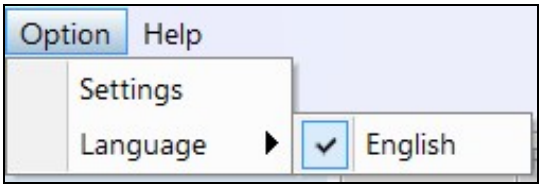
File menu

- View
- Elements
- Switch among different pages

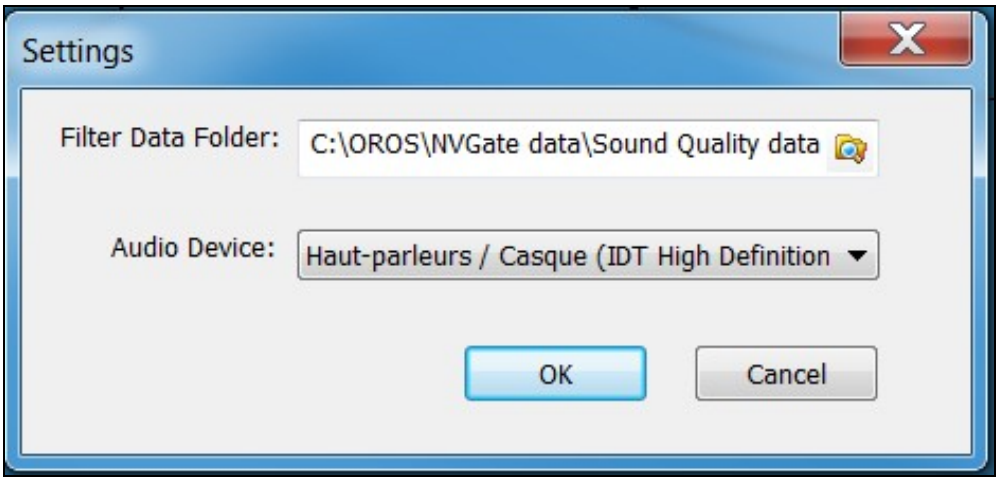


View menu

- Option
- Settings for filter folder and audio device
- Language



Language settings



Settigs dialog box

- Help
- Tutorial for the SoundQuality module

Hereafter the functionalities will be introduced step by step.

180.3 Psychoacoustics Parameters Calculation

The Psychoacoustics module calculates Articulation Index (**AI**), Loudness (**LO**), Sharpness (**SH**), Roughness (**RO**), Fluctuation strength (**FL**), Tonality (**TO**) and out of the sound signal.



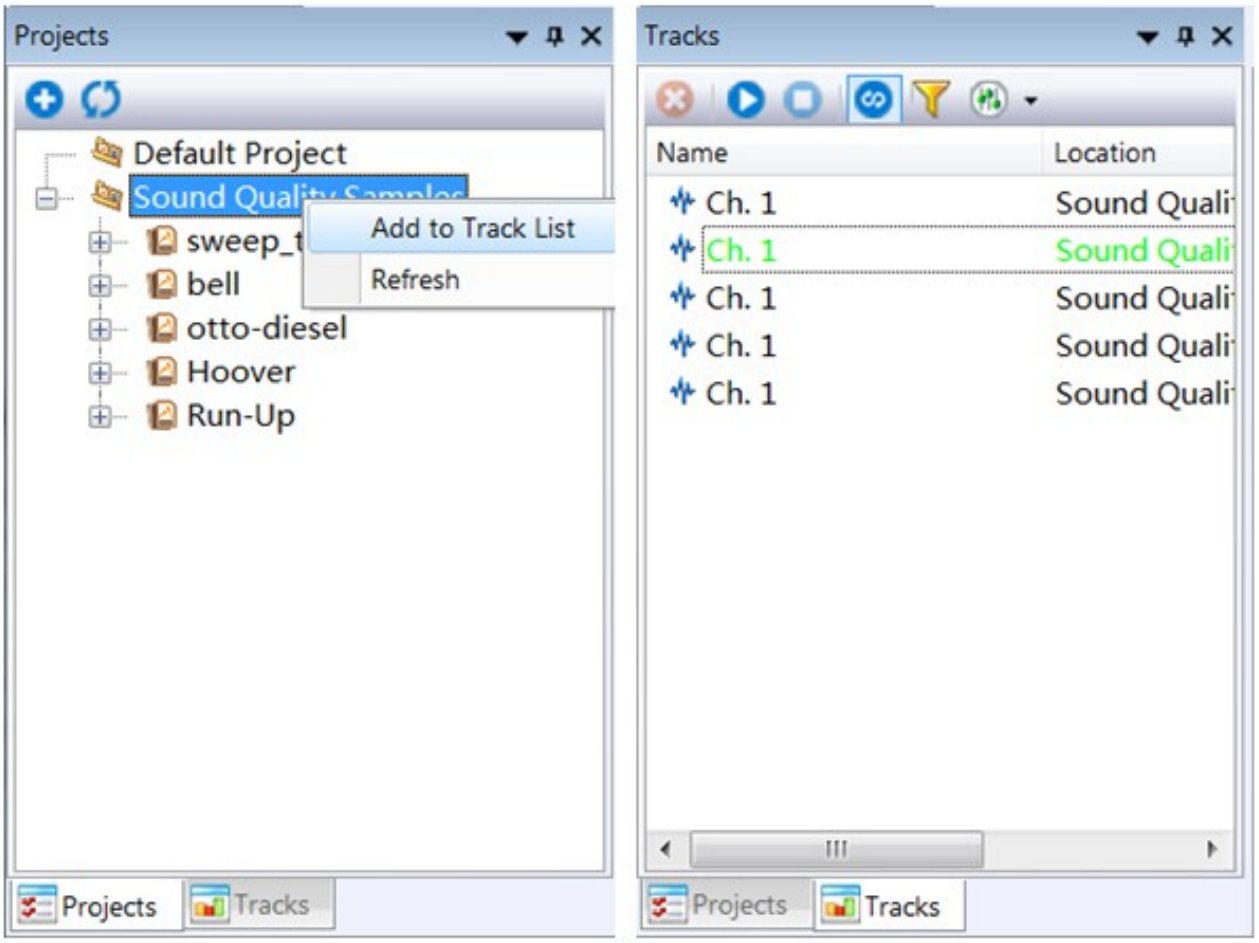
Psychoacoustics results selection

180.3.1 Step 1: Add sound track into Track List

At the lower part of the window, there is 'Projects' and 'Tracks' page.

- 'Projects' shows the projects in NVGate Projects folder.
- 'Tracks' lists all pre-selected sound channel, and provide a clearer way to access to the signal to be analyzed.

Right click on the project or sound sample to be analyzed, and click 'Add to Track List' to add to 'Tracks'.



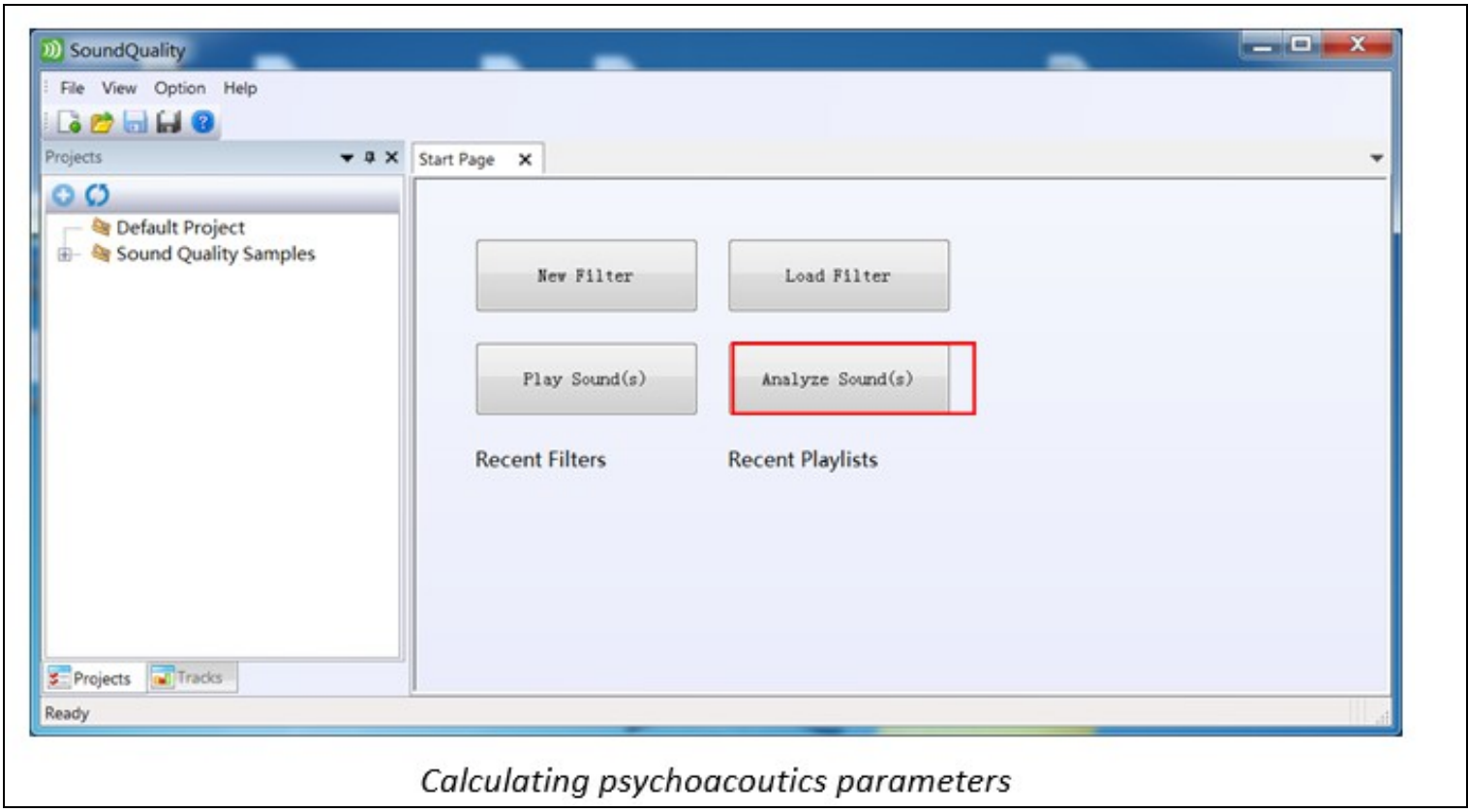
Adding tracks

Once there are new measurements in NVGate, it is necessary to 'Refresh' accordingly in the 'Projects'.



180.3.2 Step 2: Analyze Sounds

On the 'Start Page', Click on 'Analyze Sound(s)' button to turn to 'SoundAnalysis' page.

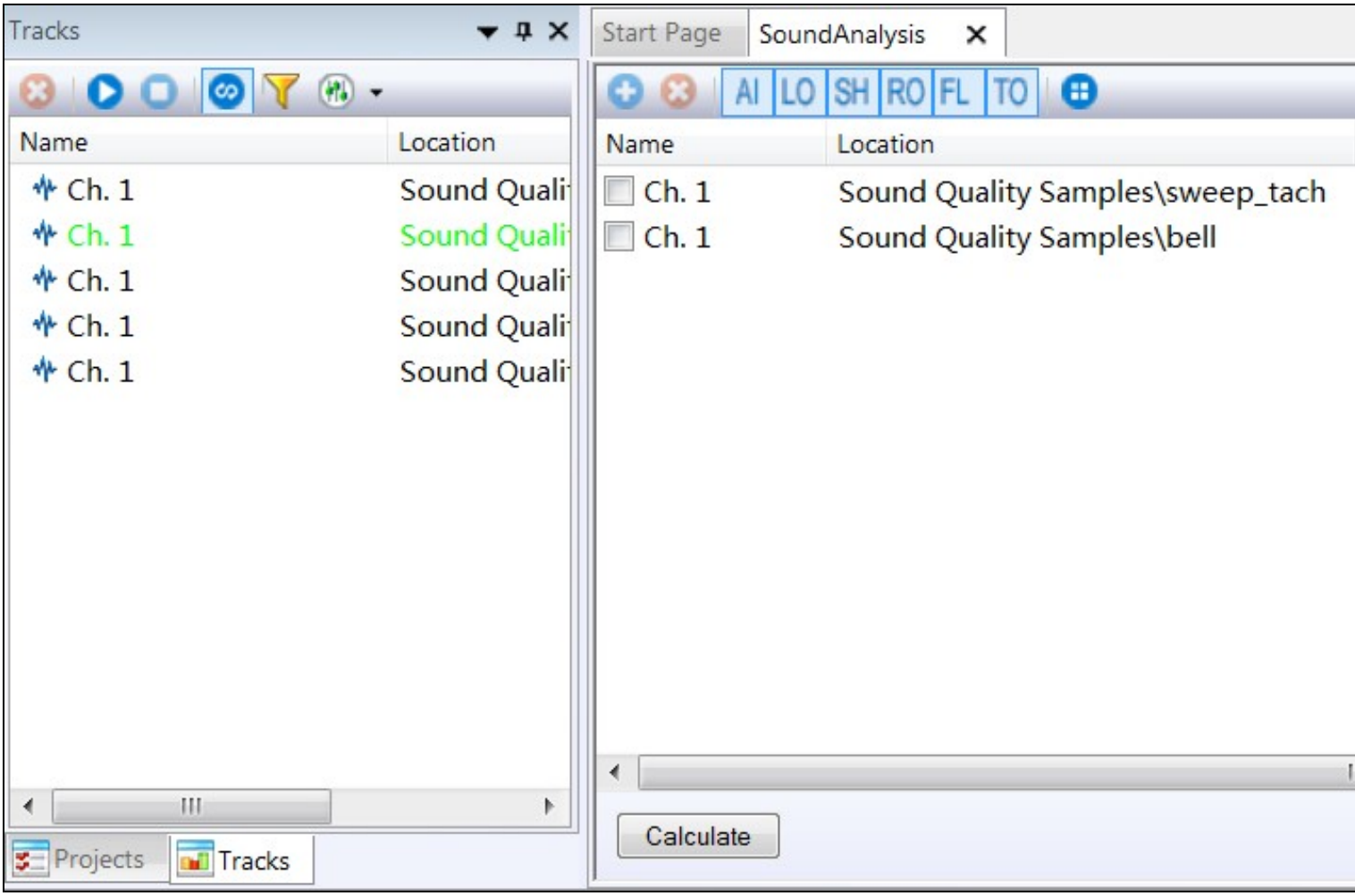


Calculating psychoacoutics parameters

180.3.3 Step 3: Choosing the psychoacoustics parameters to be analyzed

Drag and drop signals from 'Tracks' to the right window to do the analysis.

Click on the checkboxes to select or deselect PSY parameters to be calculated.



Psychoacoustics metrix selection

By clicking on the checkbox in front of the signal name, all the parameters will be selected.

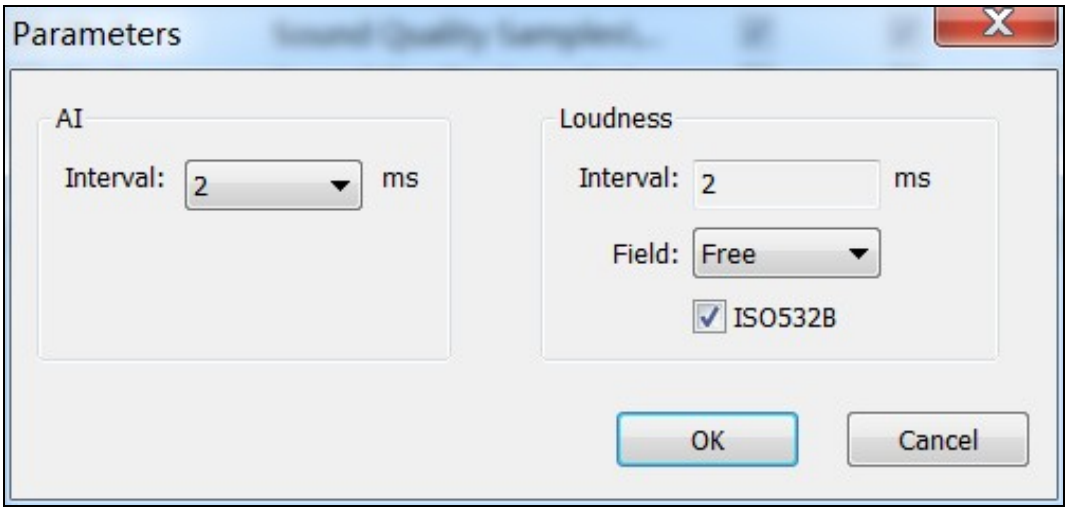
By clicking on the checkbox on top of the parameter, all the signals will be selected.

180.3.4 Step 4: Modify analysis parameters

Press



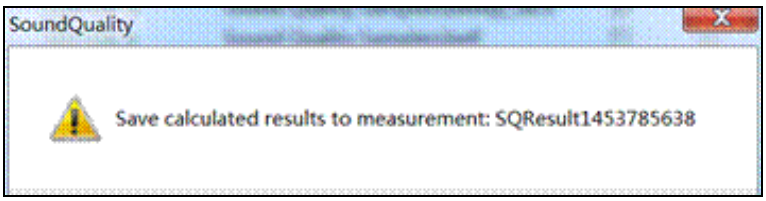
to change parameters for AI and Loudness.



AI and Loudness parameters selection

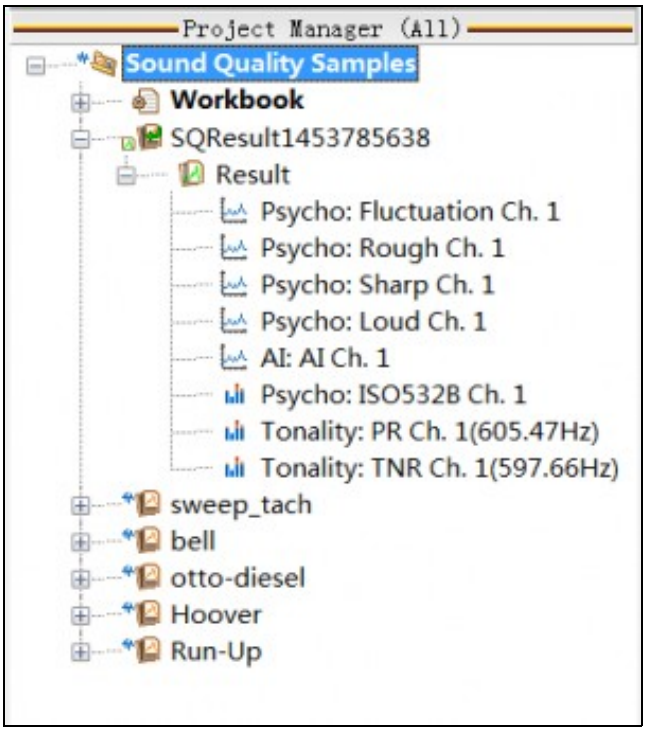
180.3.5 Step 5: Calculate and review results

Press 'Calculate' button to do the calculation. Results will be saved as a measurement and can be viewed in NVGate. Name of the measurement is in the format SQResult and numbers.



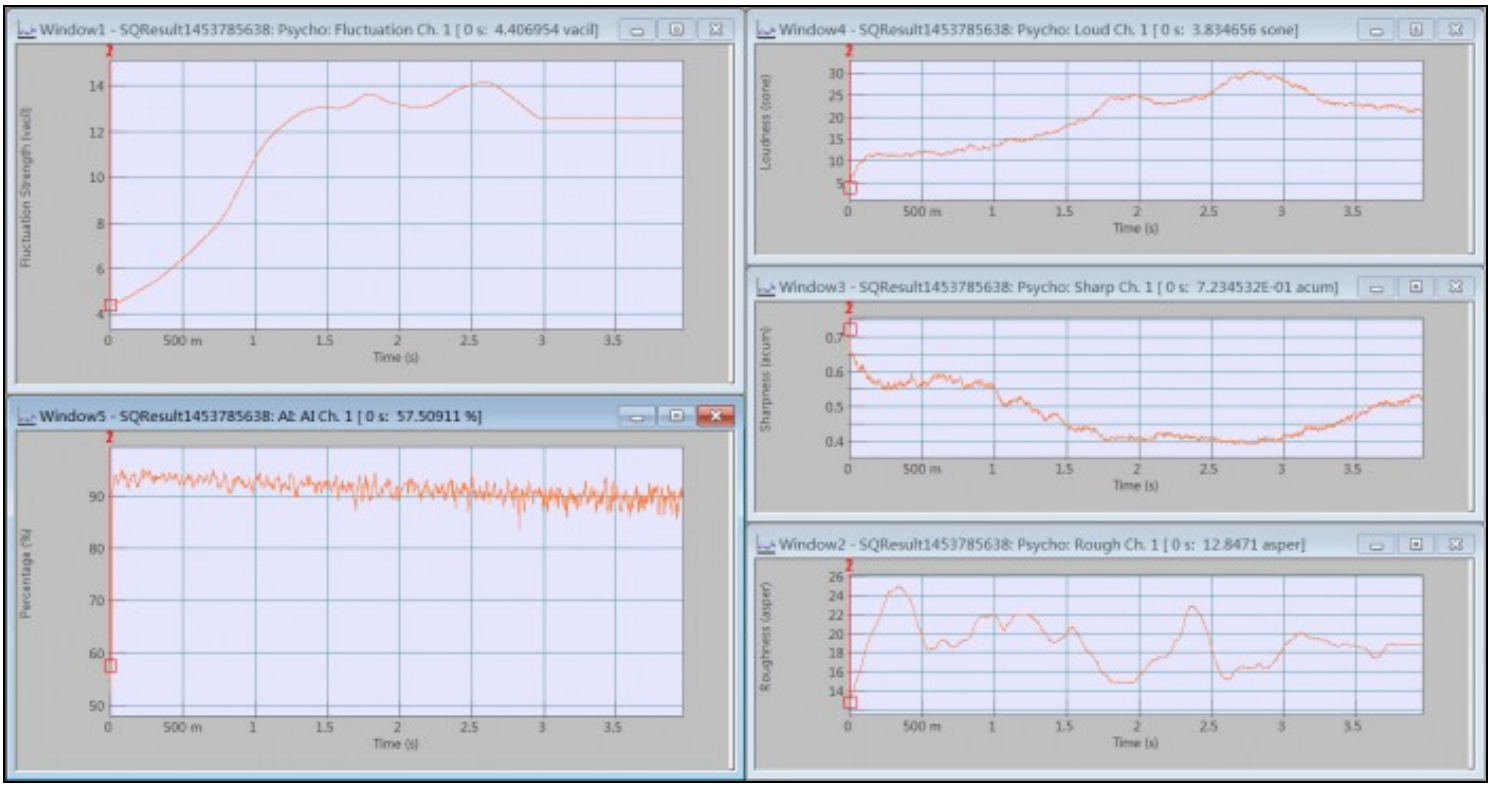
Saving psychoacoustics results

In the measurement, all calculated results are included.

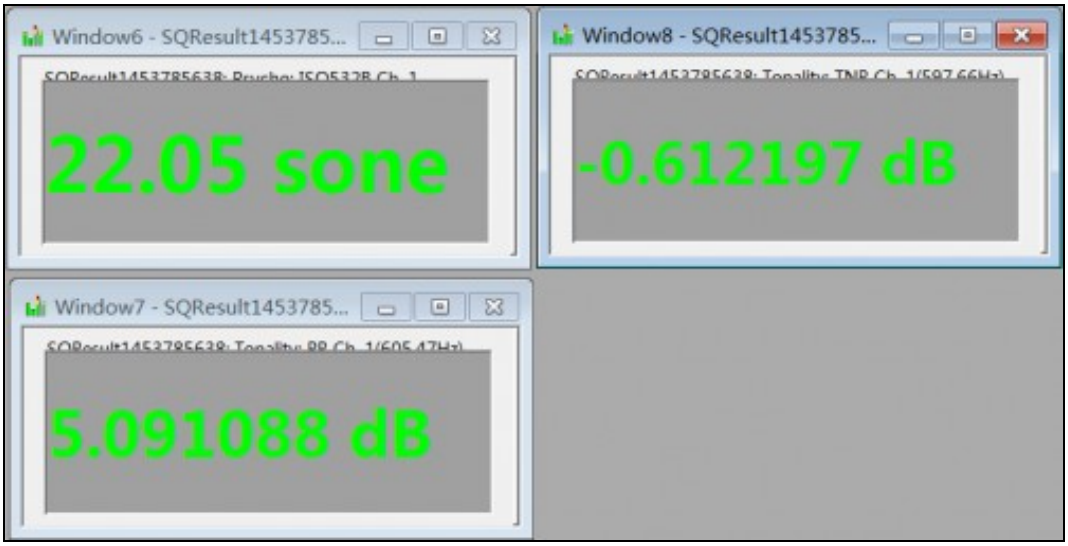


Psychoacoustics results in the project manager

User may Drag&Drop these results to see the curve or number.



Psychoacoustics results profiles display



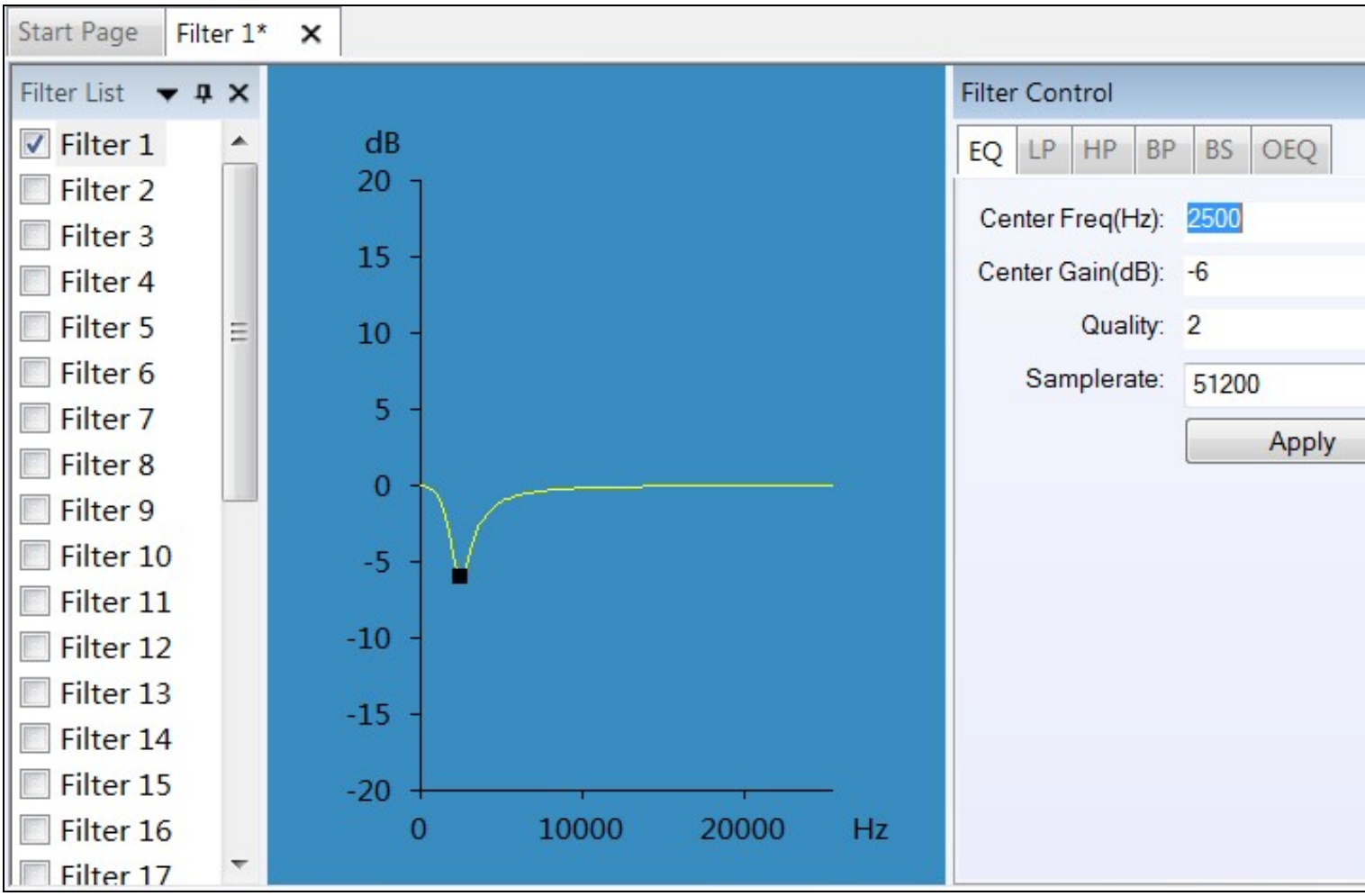
Psychoacoustics results vumeters display

180.4 Filtering

The interactive filtering is used for filter design, interactive filtering and playback with online filters.

180.4.1 Step 1: Filter setup

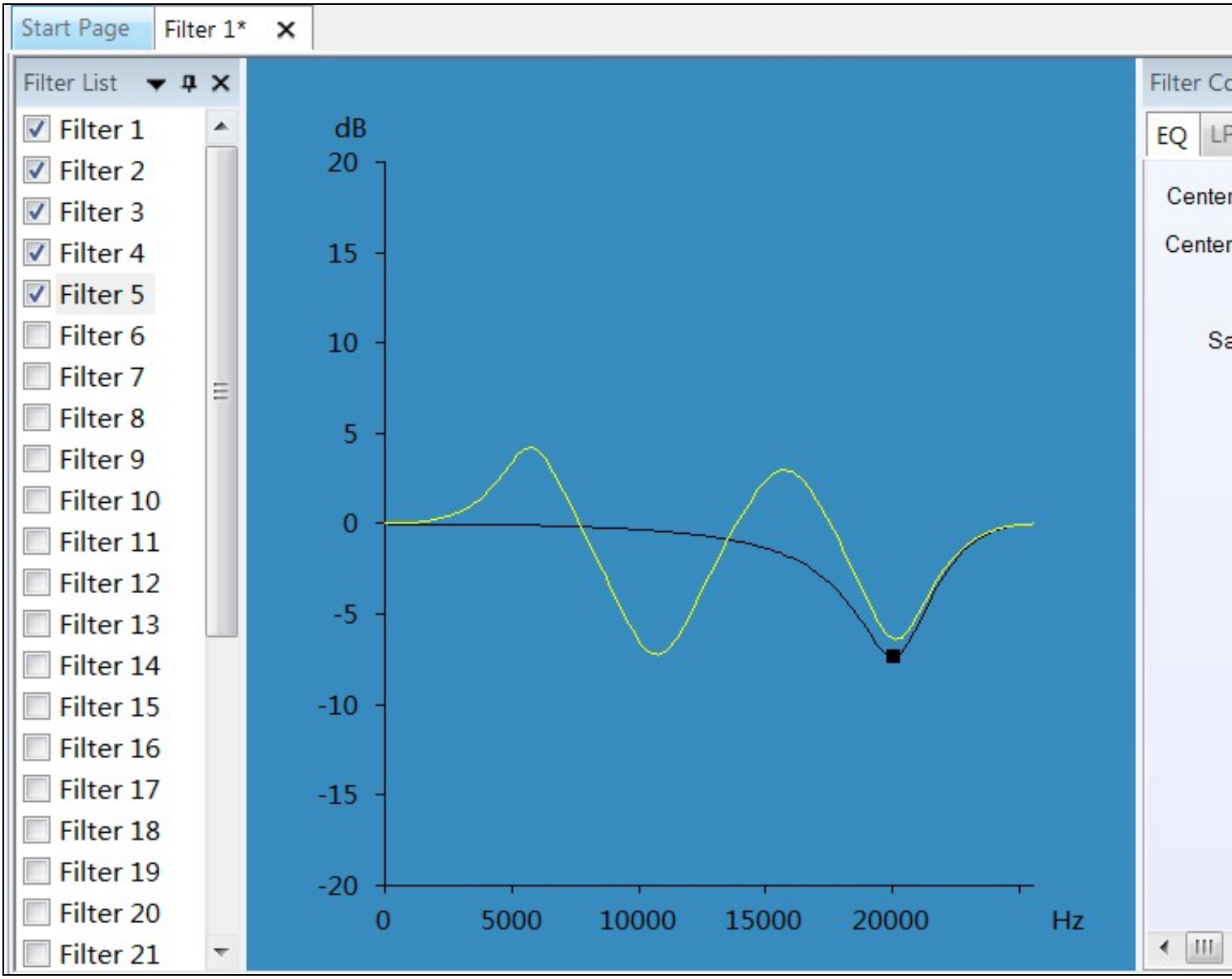
The Filter Explorer (FE) is a powerful tool that lets you design various IIR filter types (low pass - LP, high pass - HP, band pass - BP, band stop - BS, equalizer - EQ and order equalizer - OEQ) using different design algorithms (first/second order filters, higher order Butterworth and Chebychev filters). All the parameters of the different kinds of filters are listed in the further chapter "Filter Design setup parameters".


Start Page
Filter 1*
Filter List
Filter 1
Filter 2
Filter 3
Filter 4
Filter 5
Filter 6
Filter 7
Filter 8
Filter 9
Filter 10
Filter 11
Filter 12
Filter 13
Filter 14
Filter 15
Filter 16
Filter 17
dB
20
15
10
5
0
-5
-10
-15
-20
0
10000
20000
Hz
Filter Control
EQ
LP
HP
BP
BS
OEQ
Center Freq(Hz): 2500
Center Gain(dB): -6
Quality: 2
Samplerate: 51200
Apply

Equalizer filter example

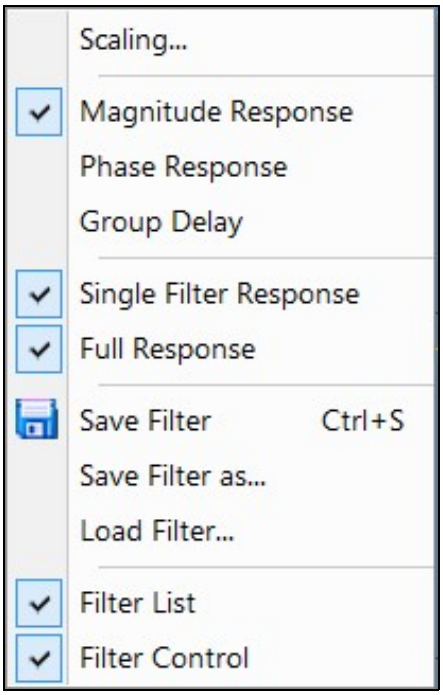
The design parameters can be specified either numerically or graphically using the mouse. Designed filters can be saved to a file and loaded afterwards and may then be redesigned.

The Filter Explorer allows you to design, save and apply a cascade of up to 32 filters. In a cascade various filter types and filters of different orders can be mixed. Note that online filtering performance depends on the number of cascaded filters, the overall filter order and the computational power of your computer. Single filters can be added and removed from the cascade easily by checking the box.



Single (black curve) response and cascaded filters response (yellow curve)

Filters are designed by specifying their magnitude response. The Filter Explorer displays the magnitude response, the phase response or the group delay of a single filter (single filter curve) or of the filter cascade (full response curve in Yellow).



Contextual menu (right click) when designing a filter

Click on

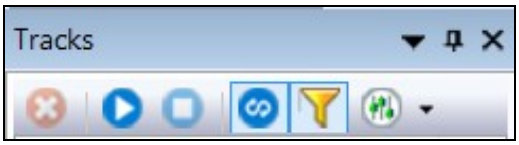


to save the filter.

180.4.2 Step 2: Using filters

The effect of designed filters can be approved by online-filtering of a sound. The filter may be redesigned while online filtering.

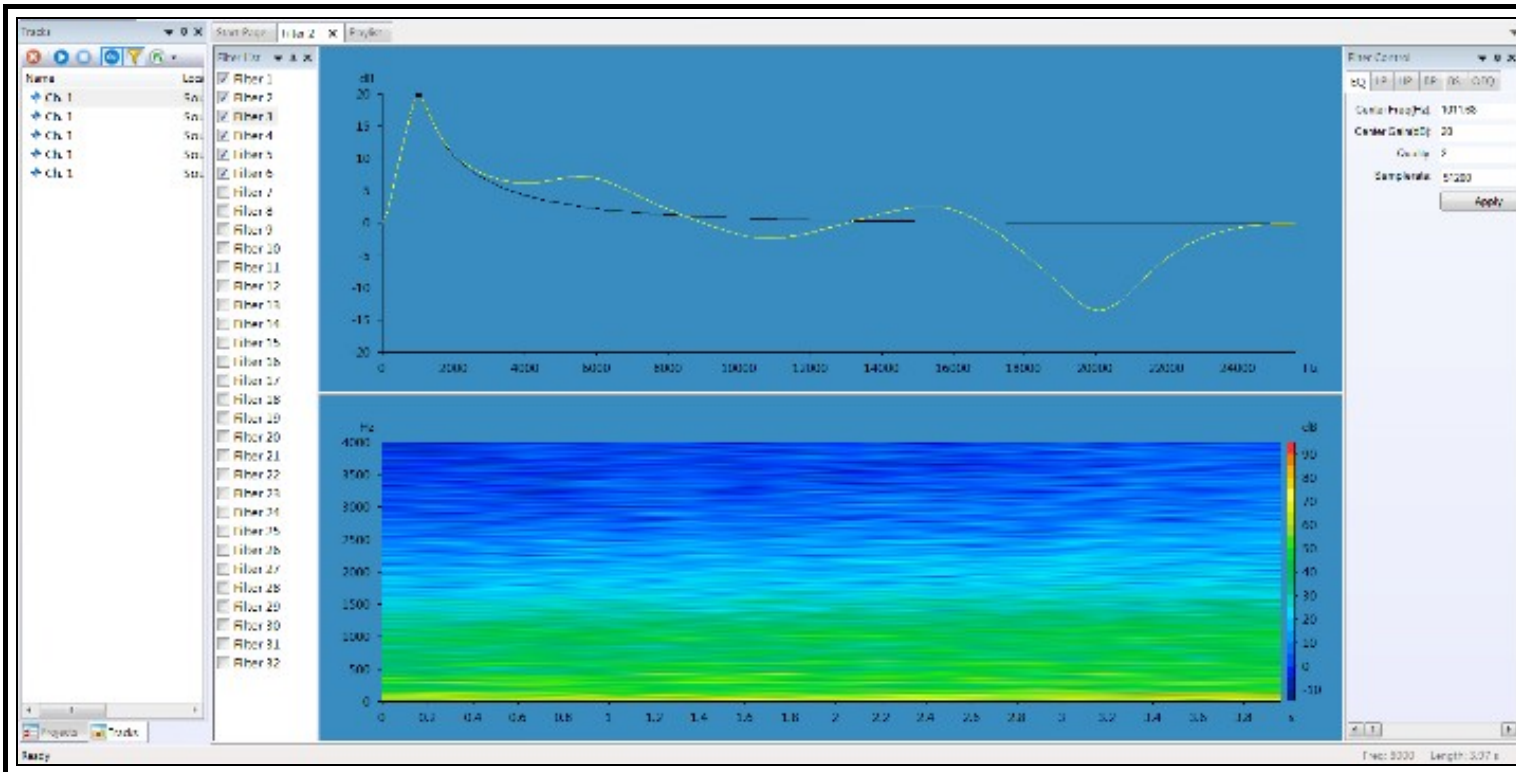
- Play Control
-  : Play
-  : stop
-  :loop
- [[Image:SOUND_QUALITY_28.png]: use filter
-  : delete track
-  :use headset equalization



Play control toolbar

The selected track with darker background is the one to be filtered.

The colormap showed below is the filtered spectrogram. And it is changed simultaneously with the interactive filter set. Of course, when showing the colormap, the user can select proper filters. In the example below, the difference caused by applying different 'Filter 3' could be seen on the colormap.



Example before changing filter 3

180.4.3 Filter design setup parameters

Filters can be set up in different ways. In the Sound Quality Lite Explorer:

Equalizer (EQ), low pass (LP), high pass (HP), band pass (BP), band stop (BSTP) filters and order equalization (OEQ) can be designed.

All filters are realized as digital IIR filters. All filters except equalizer filters (EQ & OEQ) are designed by transforming an analog prototype low pass into the digital domain. Butterworth and Chebyshev designs are available for higher order filters.

In the Filter Control Panel, design parameters can be selected independently for each filter type. All possible design parameter are listed in the table below.

Parameter	Description	Default	Available for
Center Freq. (Hz)	Center frequency of the band pass part	sample_rate/4	EQ
Center Gain (dB)	Magnitude response in dB at the center frequency	-3 dB	EQ & OEQ
Quality	Center frequency divided by bandwidth	2	EQ & OEQ
Design Order	Order of the analog prototype low pass	1	variable order
Design Type	Type of analog prototype low pass	first order	not EQ
Pass Band Freq.(Hz)	For band pass/stop filters upper pass frequency.	sample_rate/4 (for LP and HP)	not EQ
Pass Band Atten.(dB)	Attenuation at pass frequency (upper and lower pass frequencies for band pass/stop filters)	3 dB	not EQ
Max.Transition Width (Hz)	Transition width between pass band and stop band. The smaller the transition width the steeper the filter and the higher the order.	sample_rate/400	variable order
Min.Stop Band Atten.(dB)	Minimum attenuation at the stop frequencies	10 dB	variable order
Center Freq.(Hz)	Center frequency	sample_rate/4	BP, BSTP

Band Width (Hz)	Upper pass frequency - lower pass frequency	sample_rate/200	BP, BSTP
Band Width Type	Absolute or frequency dependent	Absolute	BP, BSTP
Band Width Fraction	Divider for frequency dependent bandwidths	1	BP, BSTP
Order	Order of the order filter	1	OEQ

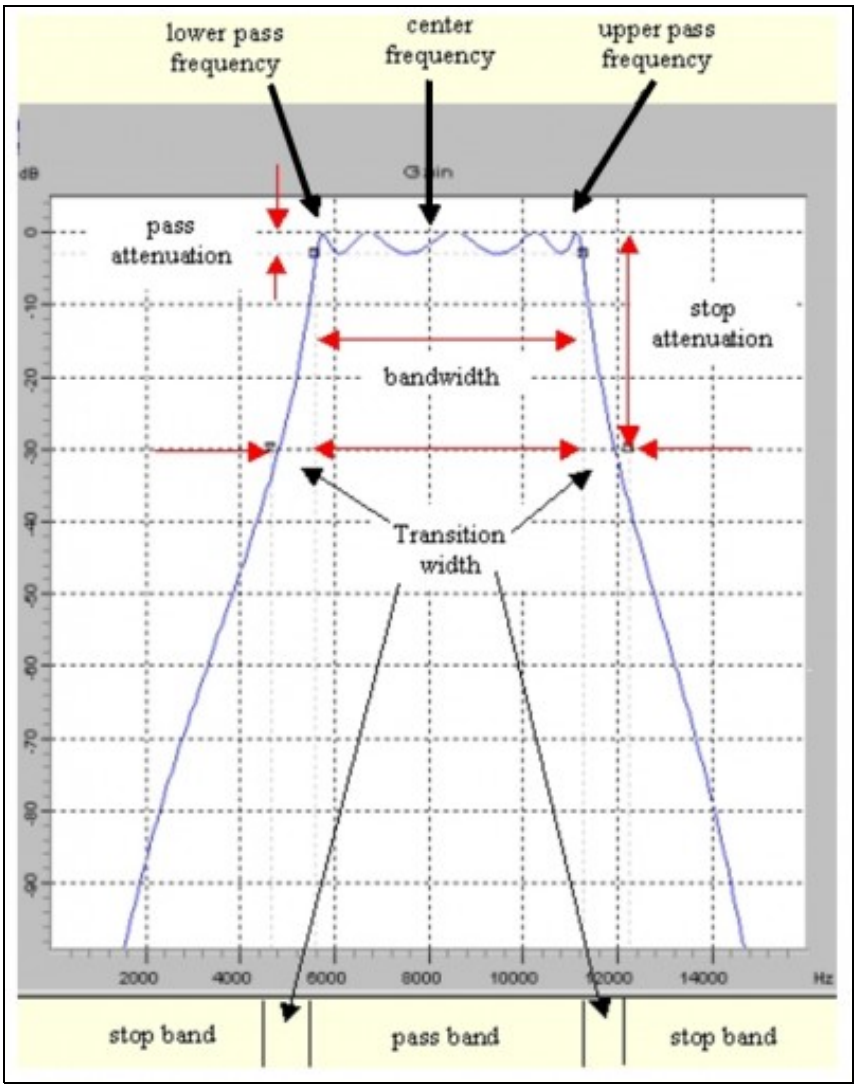
Filter design setup parameters table

180.4.3.1 Graphical Filter Design

All design parameters can be set numerically or graphically by changing the coordinates of squares in the magnitude response display. The squares can be moved by placing the mouse arrow over the black square until it is highlighted blue. Then, the square which represents certain design parameters can be moved as long as the left mouse button is pressed.

180.4.3.1.1 Example

The graphical filter design is explained for a Chebyshev band pass filter with a center frequency of 8 kHz and one octave bandwidth (5657 Hz) and a prototype order of 5. The order of the digital filter is 10. The transition width between pass band and stop band is 1 kHz. The attenuation in the stop band is more than 30 dB. The ripples extent from 0 dB to -3 dB (+3dB attenuation). The center frequency of 8 kHz is the geometrical mean of the upper pass frequency (11314 Hz) and the lower pass frequency (5657 Hz).



Filter settings example

180.4.3.1.1.1 Defining the pass attenuation, the bandwidth and the upper pass frequency

The left upper square (square 1) and the right upper square (square 2) define the pass attenuation and the upper and lower pass frequency.

The vertical movement (pass attenuation) of square 1 and square 2 is coupled. The horizontal movement (lower and upper pass frequency) is coupled by the bandwidth relation. If the bandwidth depends on frequency, square 1 can not be moved horizontally. It will be moved automatically when square 2 is moved. If the bandwidth does not depend on frequency the center frequency is kept constant when square 1 is moved and the bandwidth is kept constant when square 2 is moved.

180.4.3.1.1.2 Defining the stop attenuation and the transition width

The left lower square (square 3) and the right lower square (square 4) define the minimum stop attenuation and the transition width. The vertical movement (minimum stop attenuation) of square 3 and 4 is coupled. The transition width is changed by horizontal movement of square 3 or square 4.

180.4.3.2 LP/HP ? Low/High Pass Filter

180.4.3.2.1 Fixed order Filters

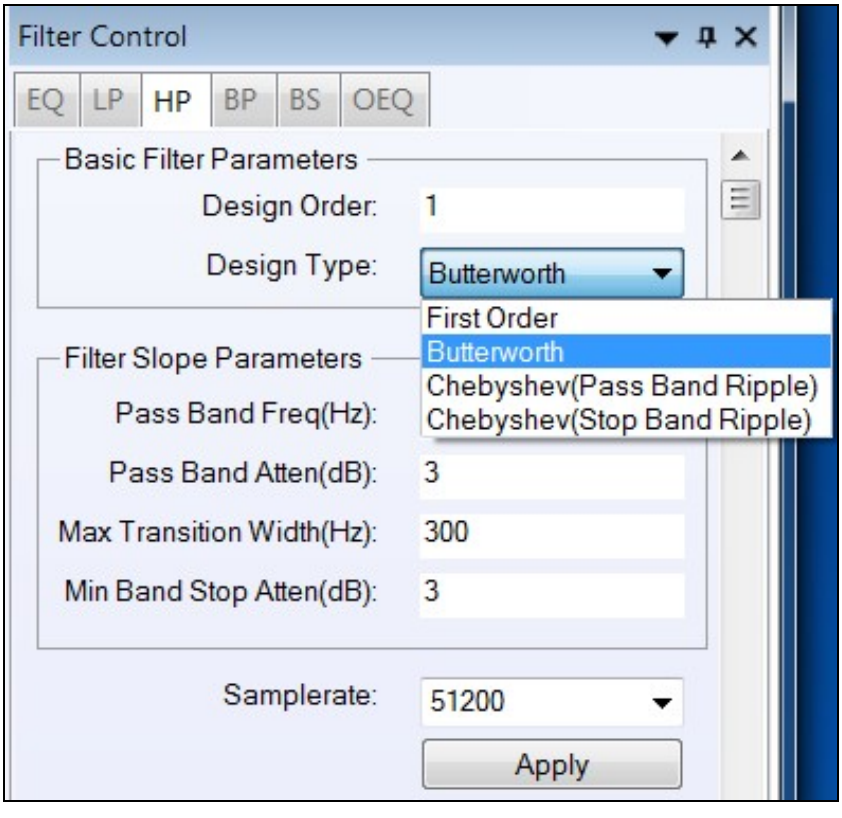
- **Low/high pass** filters are defined by a single point of the magnitude response (pass frequency, pass attenuation). If the pass attenuation is 3 dB the pass frequency is often called the cut-off frequency.

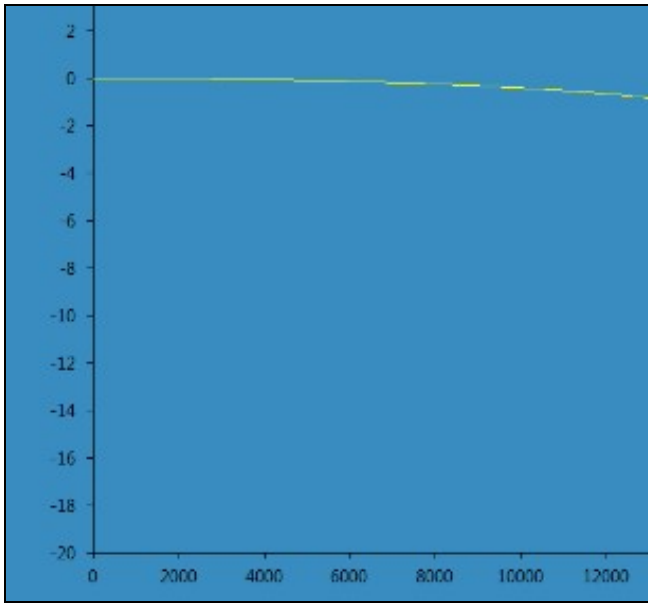
  - **For low pass** filters the band below the pass frequency is the pass band and the band above the pass frequency the stop band. The maximum gain of 0 dB is at dc.
  - **For high pass** filters the band above the pass frequency is the pass band and the band below the pass frequency the stop band. The maximum gain of 0 dB is at the nyquist rate.

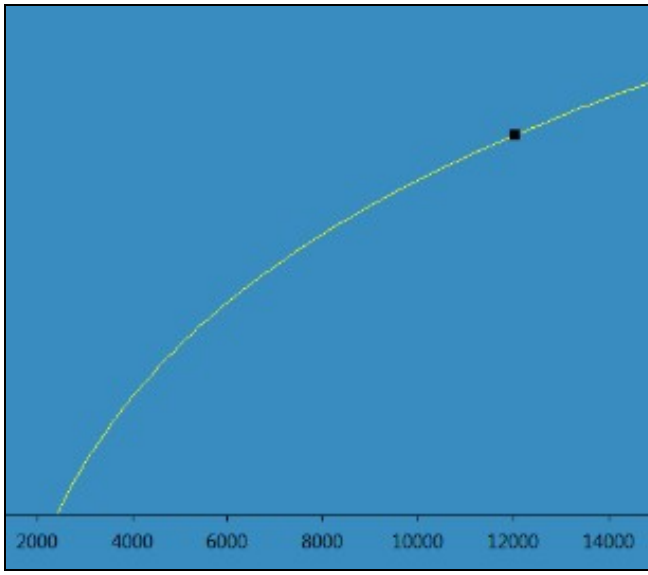
180.4.3.2.2 Higher order Filters

Variable order **low/high pass** filters are defined by one point of the magnitude response (pass frequency, pass attenuation) and the prototype order.

180.4.3.2.3 FILTER DESIGN SETTINGS





HP/LP Settings	*Low Pass filter*
	
	High Pass filter

180.4.3.3 BP/BS? Band Pass/Stop Filter

180.4.3.3.1 Fixed order Filters

Band pass/stop filters are defined by two points of the magnitude response [(lower pass frequency, pass attenuation), (upper pass frequency, pass attenuation)]. The difference between upper and lower pass frequency is the bandwidth. The bandwidth is often defined as the frequency difference between the 3 dB attenuation points.

- **For band pass** filters the band in between the pass frequencies is the pass band. Frequencies below and above the pass band characterize the stop band. The maximum gain of 0 dB is at the center frequency in the pass band.
- **For band stop** filters the band between the pass frequencies is the stop band. Frequencies below and above the stop band characterize the pass band. The maximum gain of 0 dB is at dc and at the Nyquist rate.

180.4.3.3.2 Higher order Filters

Butterworth and Chebyshev (pass band ripple or stop band ripple) designs are available for higher order filters.

- The Butterworth low pass has a monotone magnitude response.

- Chebyshev filters have either ripples in the pass band or in the stop band. Due to the ripples Chebyshev filters have steeper magnitude characteristics than Butterworth filters with the same filter order.

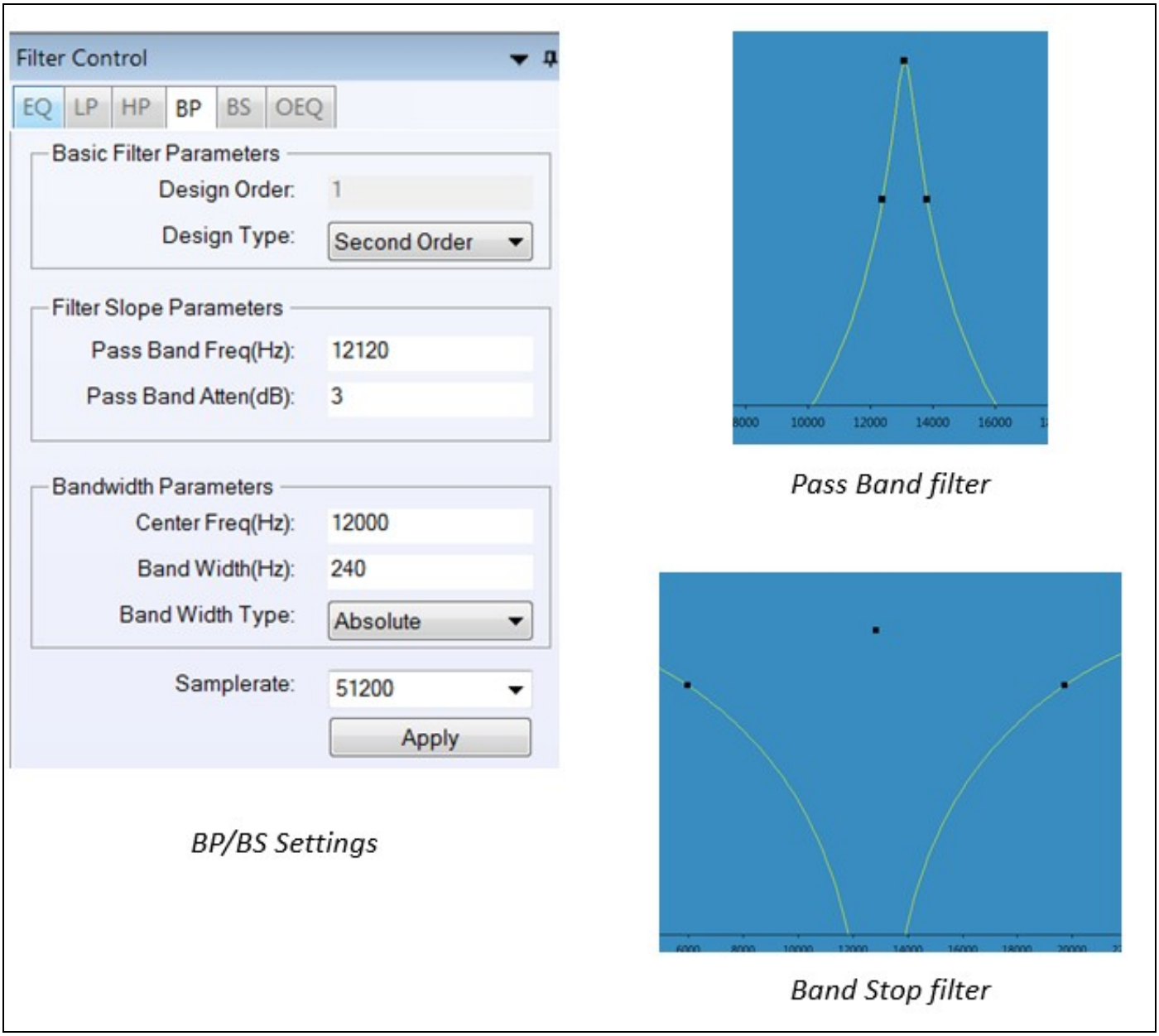
In OROS Sound Quality Lite, either a first Butterworth order or higher order Butterworth and Chebyshev filters can be designed. For band bass/stop filters the digital filter order is two times the prototype order otherwise it is identical to the prototype order.

Band pass/stop filters are defined by two points of the magnitude response [(lower pass frequency, pass attenuation), (upper pass frequency, pass attenuation)] and the prototype order.

For Chebyshev filters with pass band ripples the pass attenuation is equal to the extent of the ripples in the pass band. The order is computed so that a minimum attenuation is achieved at one stop frequency for low/high pass filters and at the lower and the upper stop frequency for band pass/stop filters. Since only integer orders can be realized the stop attenuation of the digital filter is in general slighter better than specified. The frequency difference between pass and stop frequency is the transition width.

- **For band pass** filters the lower stop frequency is defined as one transition width below the lower pass frequency. The upper stop frequency is defined as one transition width above the upper pass frequency.
- **For band stop** filters the lower stop frequency is defined as one transition above the lower pass frequency. The upper stop frequency is defined as one transition width below the upper pass frequency.

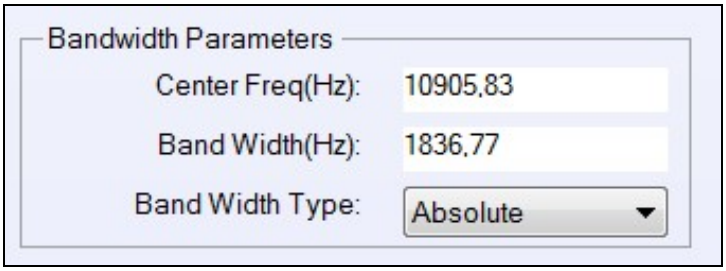
180.4.3.3.3 Filter design settings



BP/BS Settings

180.4.3.3.4 Bandwidth of Band Pass and Band Stop filters

The lower pass frequency (f_lower) is defined as the bandwidth subtracted from the upper pass frequency (f_upper). The bandwidth can be specified in several ways in the Filter Control Panel either directly or dependent on frequency and the bandwidth type. Available bandwidth types are Absolute, Octave, Bark and ERB. Except for the type Absolute an additional divider (fraction) can be specified. For example if the bandwidth type is Octave and fraction is 3 then the bandwidth is 1/3 Octave.



Bandwidth parameters

Band Width Type	Description
Absolute	bandwidth independent of frequency. Center frequency is the arithmetical mean of upper and lower pass frequency. f_center = (f_lower+f_upper)/2
Octave	f_upper = 2^(1/fraction)*f_lower and f_center = sqrt(f_lower*f_upper). Center frequency is the geometrical mean of upper and lower pass frequency.
Bark	approximated critical bandwidth according to Zwicker
ERB	auditory bandwidth according to Moore (smaller than critical bands especially for frequencies below 500 Hz)

180.4.3.4 EQ ? Equalizer Filter

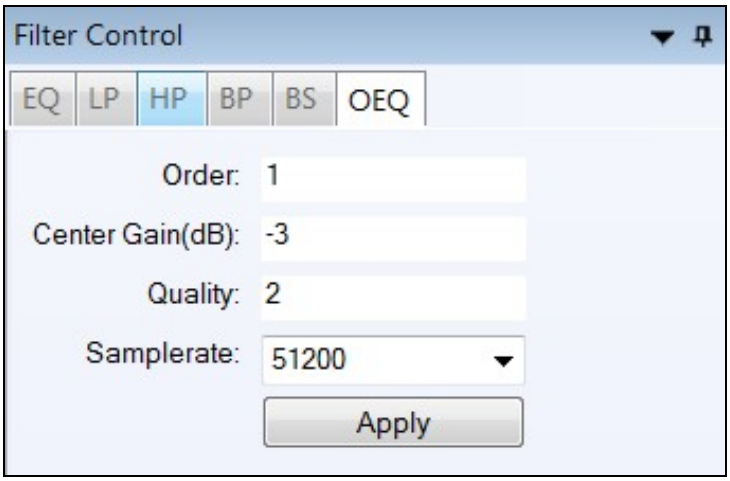
Equalization filters are second order IIR filters. They are defined by 3 parameters (center frequency, center gain and quality factor). The forward and backward coefficients of these filters are obtained from these 3 parameters. Form function of an equalization filter with center frequency of 649 Hz, gain of 12.6 and quality factor of 2.



Equalizer filter settings

180.4.3.5 OEQ ? Order Equalizer Filter

The order equalizer filter makes sense if a tach signal was recorded. In this case it requires to have been saved on the ext trigger channel.



Order equalizer filter settings

The definition of order equalization filters is identical to the definition of equalization filters except that the form function is order dependent (Order = frequency/RPM´60. Order equalization is valid only if a RPM function is linked to the sound file. If not, designing such a filter will have no effect on the sound file.

180.5 Playback

In the playback module, the user is able to setup a playlist to do comparison listening with or without saved filters.

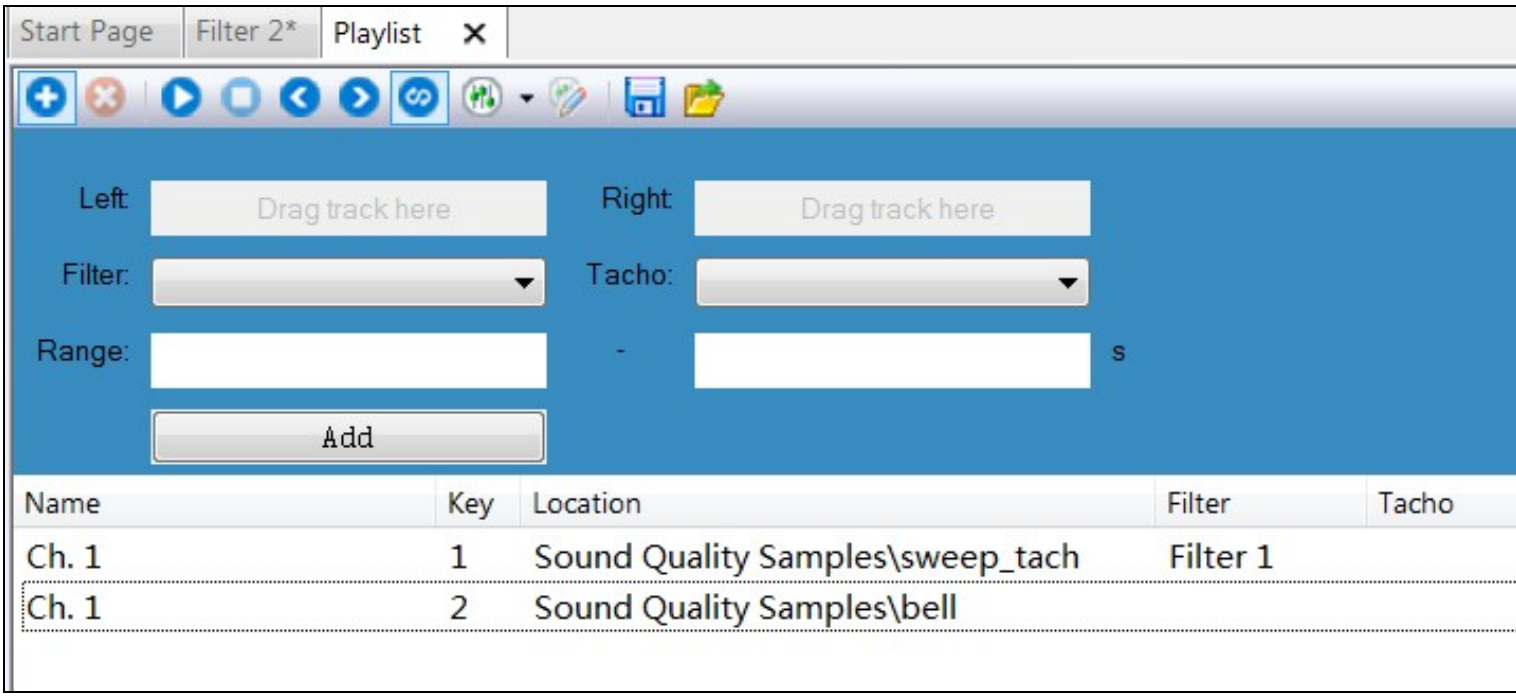
180.5.1 Step 1: Playlist setup

Common way to add a sample to the playlist is

- Drag one track to 'Left' or 'Right' channel.
- Select a saved filter or not.
- Choose the reference tach.
- Input the time range.
- Click on 'Add' to add.
- Continue with other tracks.

Another way to proceed is to Drag & Drop sound samples from the track list to the 'Playlist' window.

- Basic information will be shown, such as Name, Location, Tach info and Range.
- 'Key' is automatically assigned to each sample. User can switch among these samples using number keys on the keyboard.



Playlist window

180.5.2 Step 2: Play and Listen

Drag & Drop sound samples from the track list to the 'Playlist' window.

Click on these buttons to



Playback toolbar

 Play	 Use filter
 Stop	 Delete track
 Previous	 Use headset equalization
 Next	 Edit filter
	

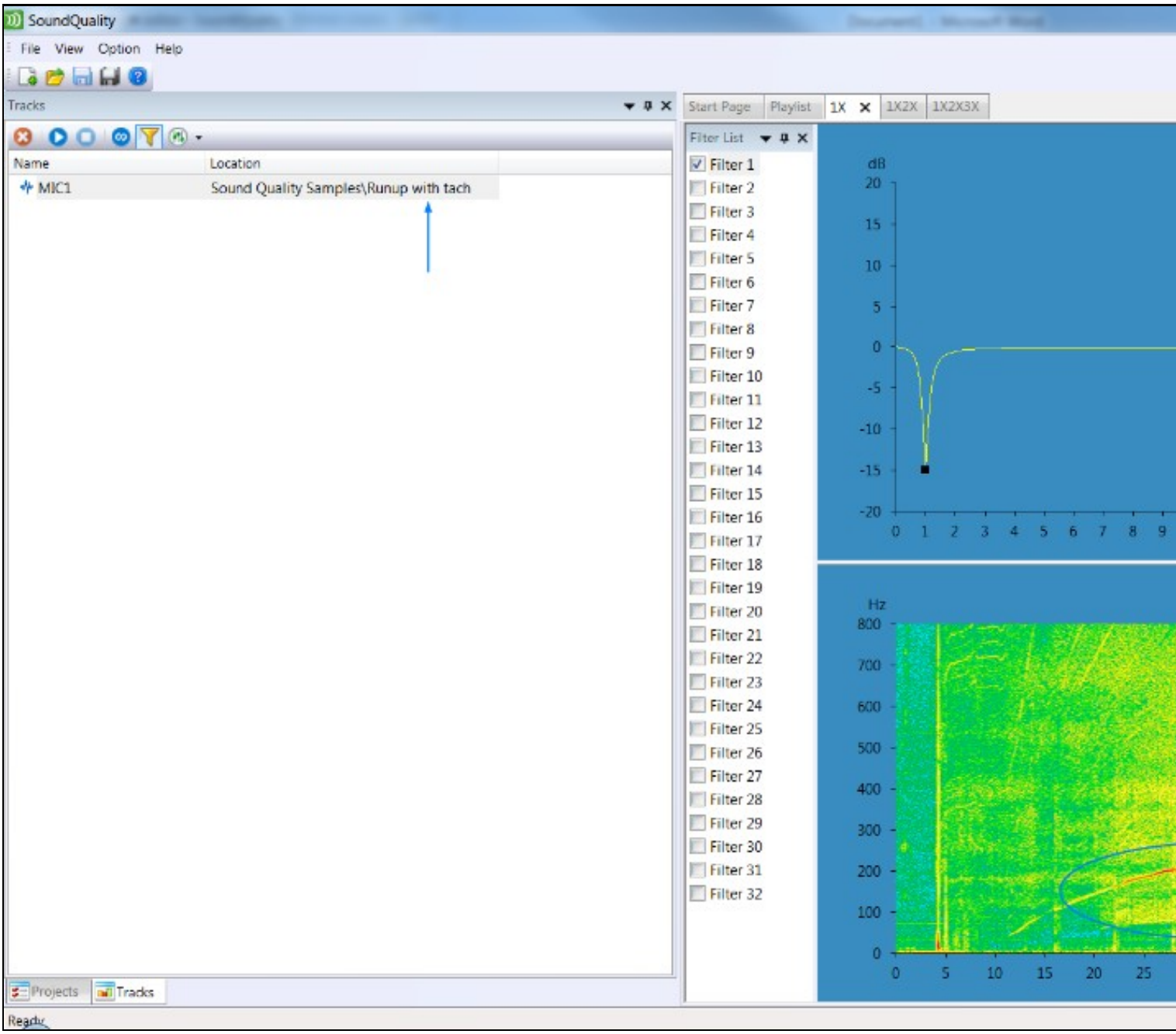
Loop	Save and open playlist

Toolbar icons

180.6 Filtering Orders

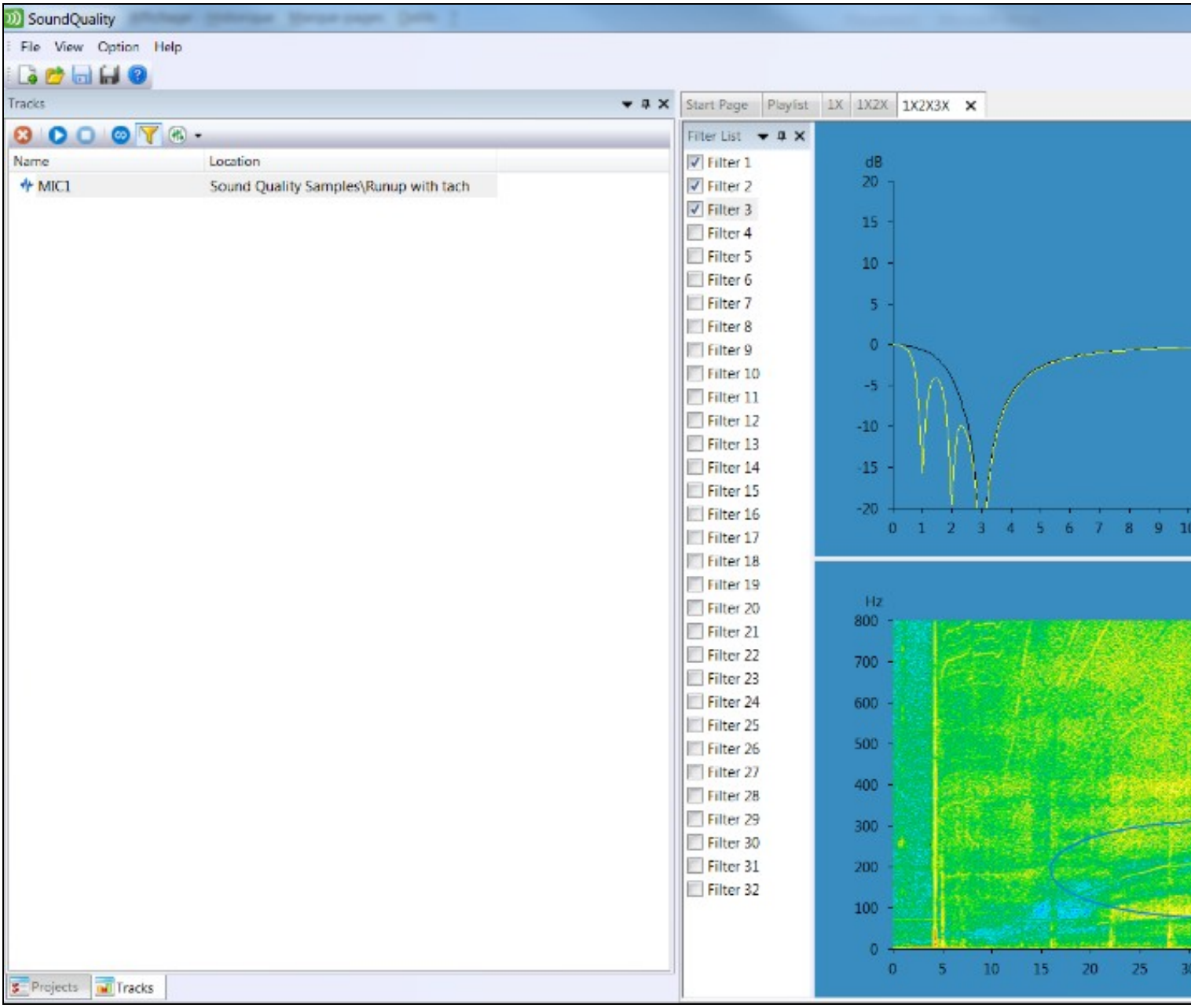
In order to filter out orders from a signal, one must use a signal with a tach recorded on the external trigger. Among the "Sound Quality Samples" installed with the version, there is one signal called "Runup with Tach": this signal can be used for order tracking filtering.

1. Create a filter with only 1X filtered. The 3X can be seen on the spectrogram



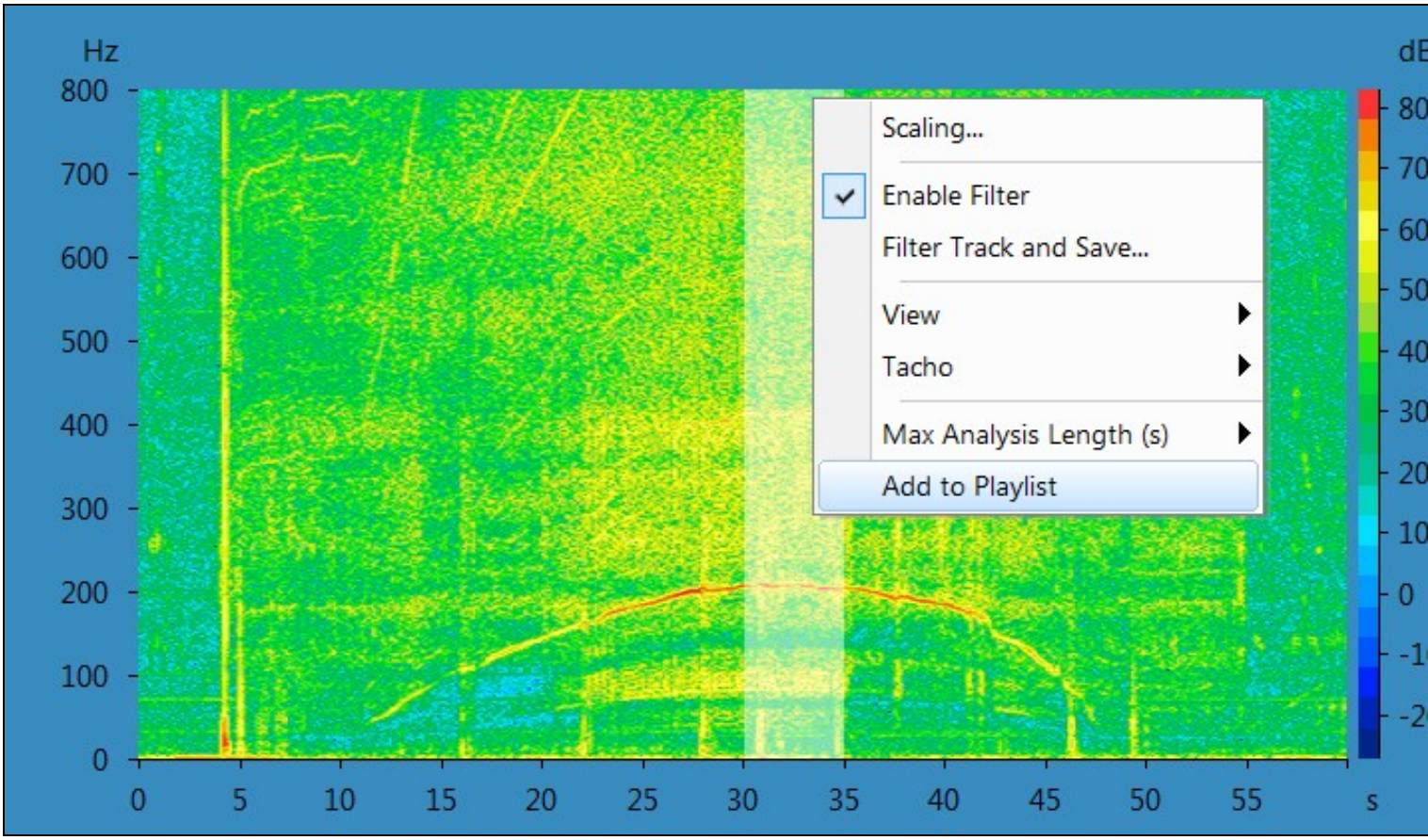
Filtering orders, step 1

2. Create a filter with 1X, 2X and 3X filtered. One see the 3X filtered.



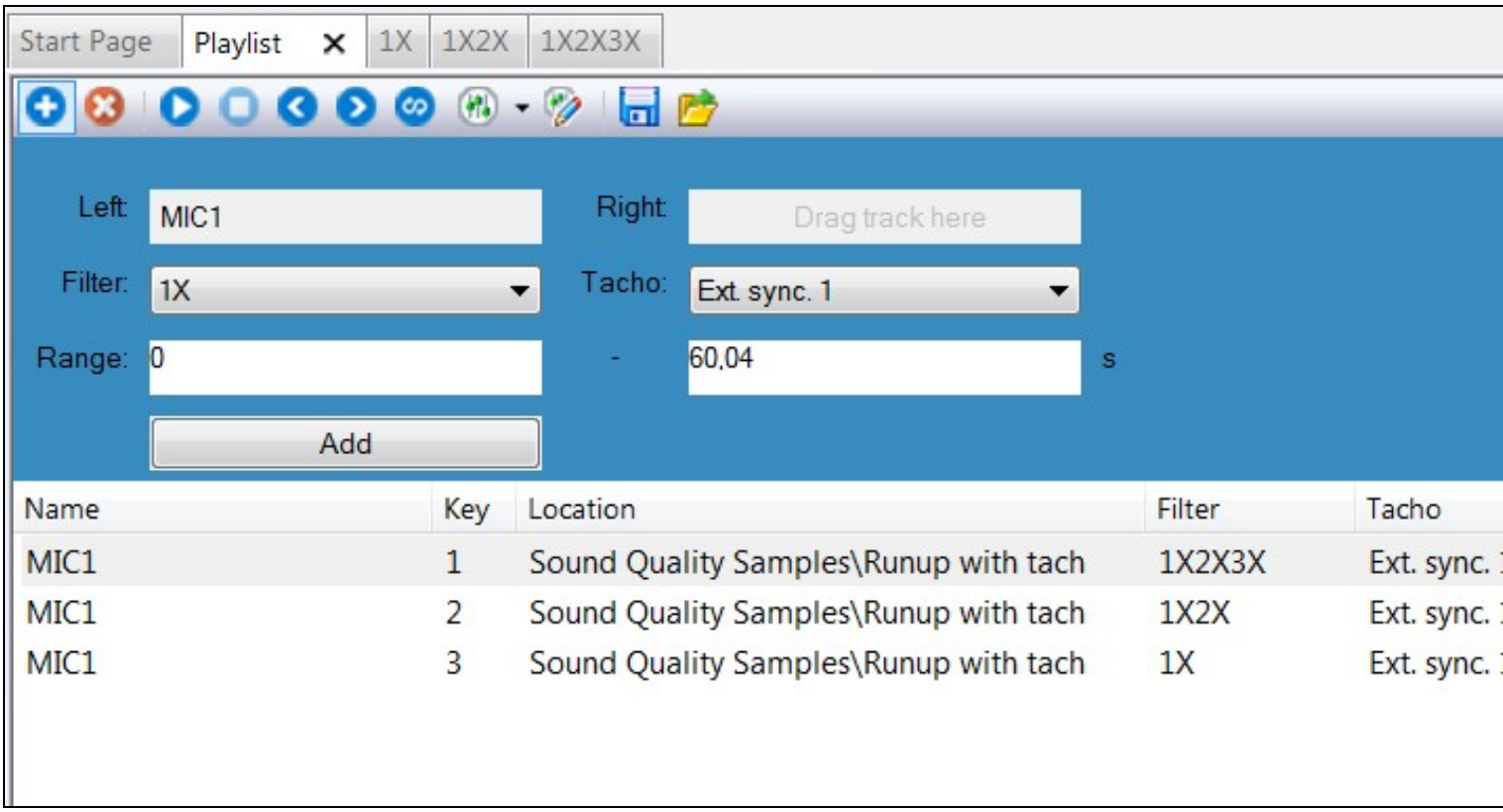
Filtering orders, step 2

One should choose, a time range to be played and add it in the playlist as shown below:



Filtering orders, step 3

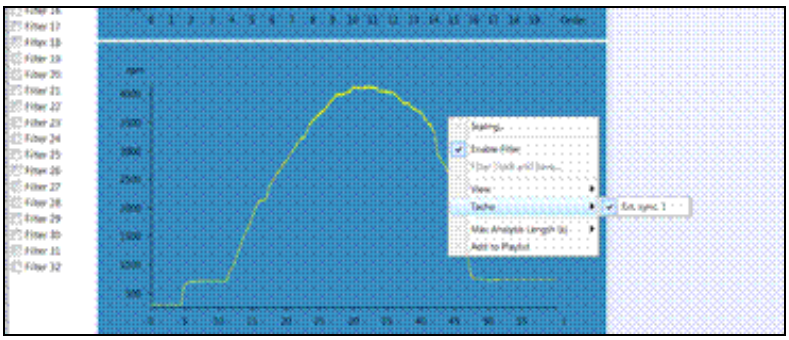
Listening to them sequentially through the playlist below, one can ear the difference and the effect of the 3X filtering.



Playlist dialog

Showing the tach profile:

By a right click in the graph area and choosing view "Tach", one can display the Tach profile



Tach profile

180.7 Psychoacoustics theoretical background

180.7.1 Loudness

The loudness analysis computes loudness versus time and specific loudness versus critical-band rate versus time pattern. Stationary signals are analyzed in accordance with DIN 45631 and ISO 532B. By including nonlinear post-masking algorithms, non-stationary signals can also be analyzed.

In order to calculate further psychoacoustical parameters like Roughness, data are stored with a time resolution of 2 ms.

Loudness computations should be used for all situations, where the human hearing system is the final receiver. E.g.: Two vacuum cleaners may have different loudness, although their A-weighted sound pressure level is the same.

The basic scheme for the loudness calculation according to Zwicker is as follows:

- For each time interval the sound levels in 20 approximated critical bands are computed using a third octave filter bank.
- The critical band levels are weighted according to the transfer from the sound field through the outer and middle ear.
- The weighted critical band levels are called excitation levels.
- The excitation levels are transformed to specific loudness (core loudness) values.
- The transform from excitation to specific loudness depends on the excitation at threshold in quite (E_{THQ}).

E_{THQ} depends on frequency for frequencies below 1 kHz and may be individually different for normal hearing and hearing-impaired persons.

The nonlinear post-masking algorithm is applied to the core loudness values.

After post-masking, frequency and level dependent (upward) spectral masking is modeled which results in 240 specific loudness values at the interval of 0.1 Bark.

By integrating the specific loudness, the loudness at this time interval is computed.

The only parameter for the basic loudness calculation is the type of sound field which can be Free or Diffuse.

The analysis time interval is fixed to 2ms.

The number of frames to be computed according to the chosen analysis time range is given in the dialog.

The following table summarizes the parameters of the loudness parameters dialog.

Parameter	Description
Sound Field	The sound field parameter matches the calculation according to the recording conditions. It can be set to free or diffuse sound field conditions. Default: Free
Time interval	The time interval is fixed to 2 ms. This high temporal resolution corresponds to the temporal resolution of the human ear and is needed in order to calculate roughness out of specific loudness.
NISO532B	Compute stationary Loudness according to ISO532B

Loudness parameters table



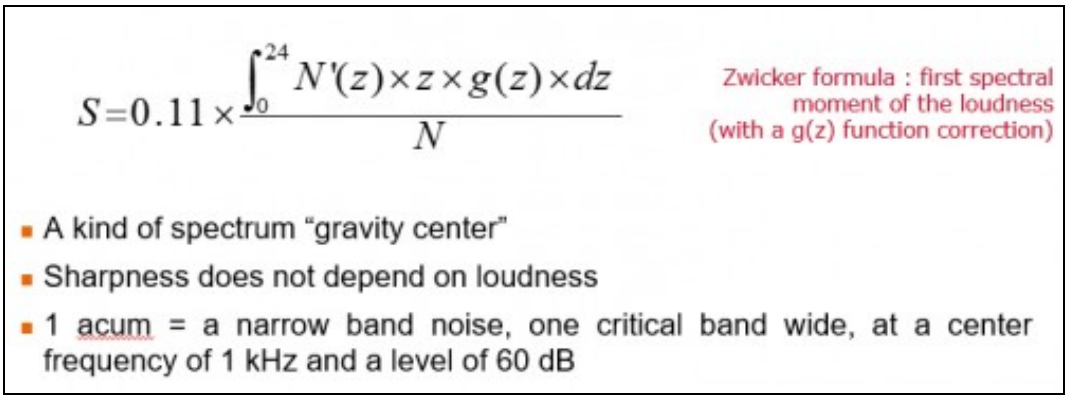
Loudness parameters dialog

180.7.2 Sharpness

Sharpness is computed by the integration of the weighted specific loudness values.

In order to incorporate temporal integration effects, loudness and sharpness are low pass filtered.

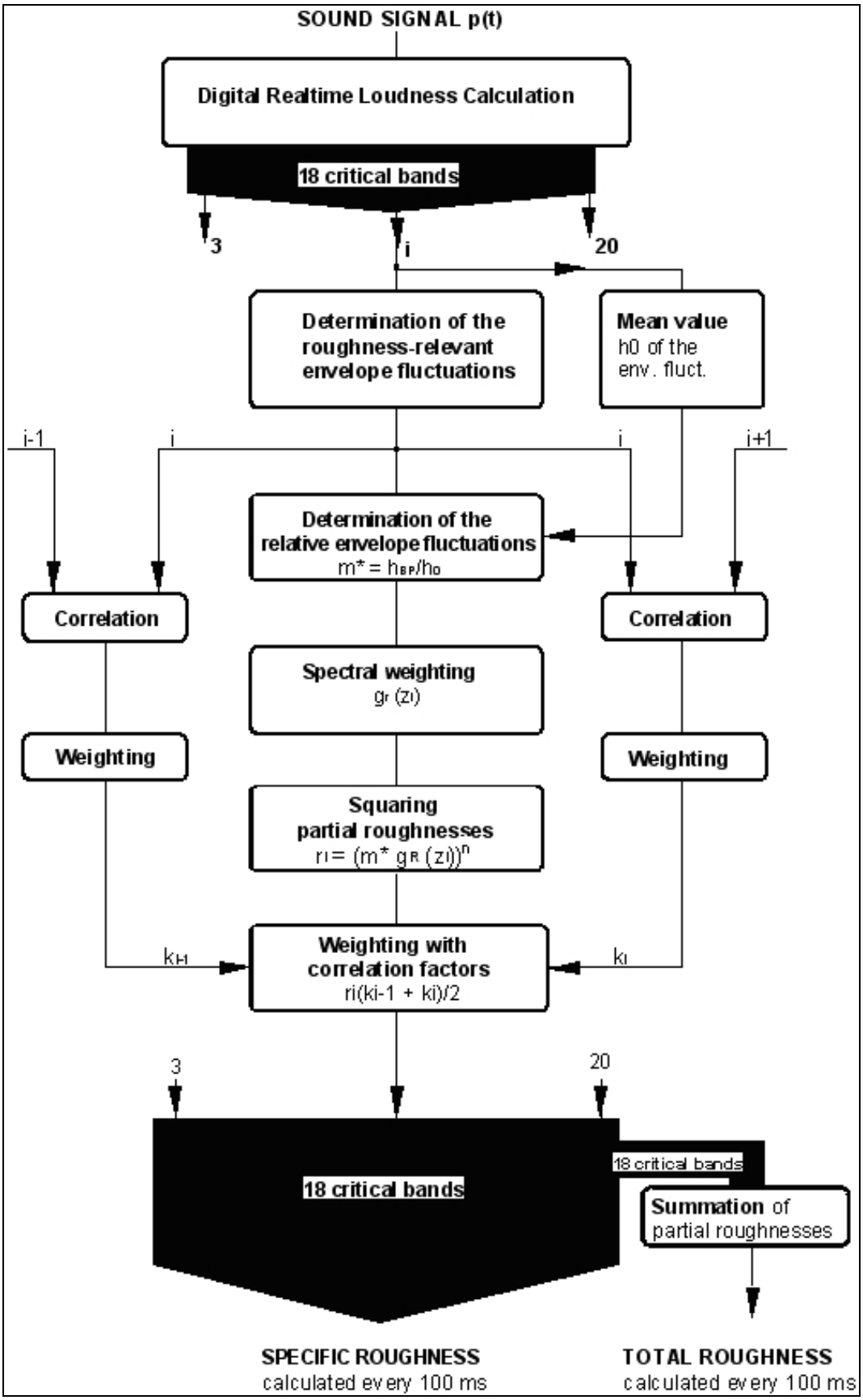
Sharpness is compute according to Zwicker DIN 45692 method.



180.7.3 Roughness

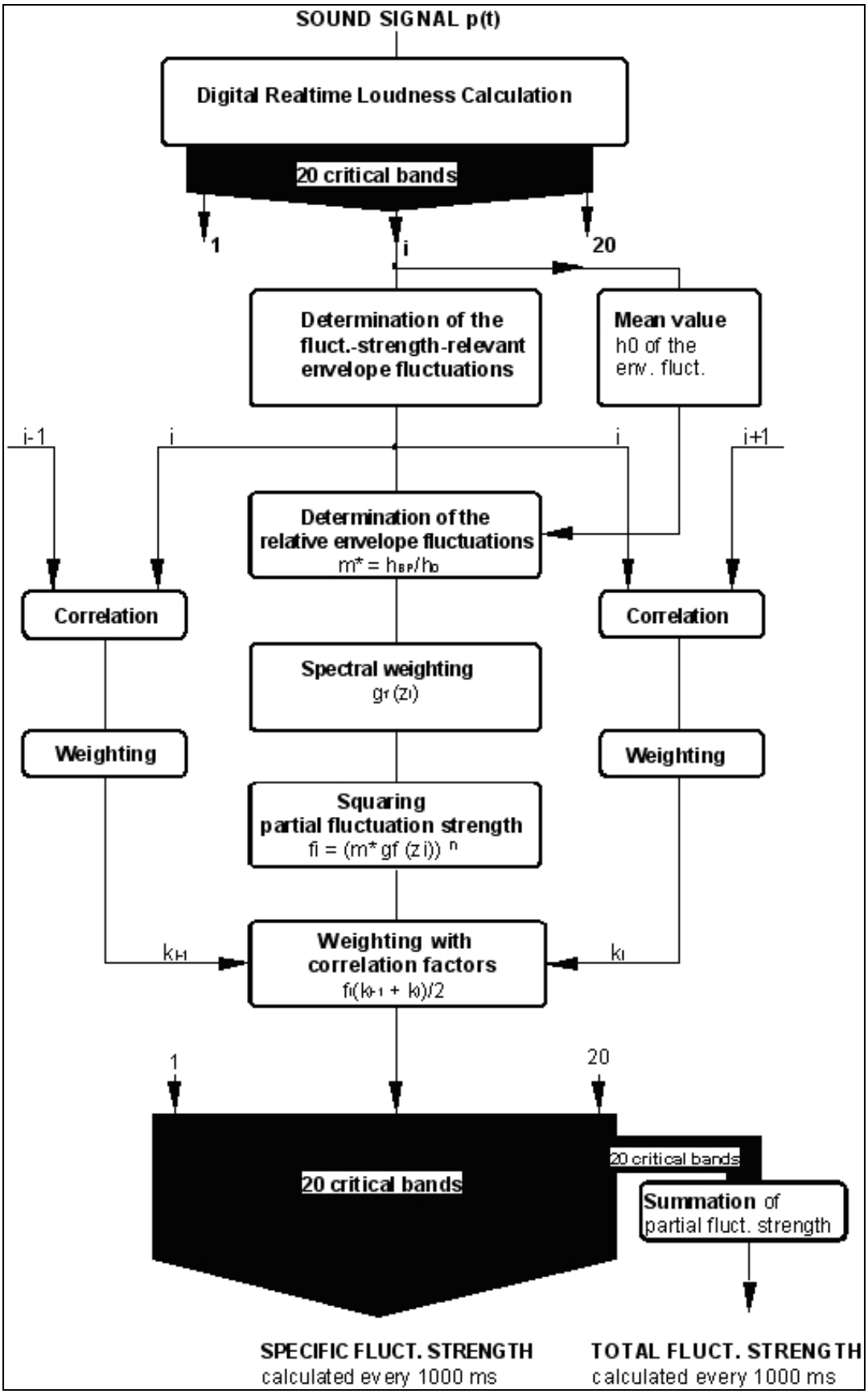
Spectral analysis of roughness and fluctuation strength yields additional data for time varying signals. Almost all technical signals show modulations and fluctuations produced by periodic or stochastic processes. Sharpness, loudness spectrum, roughness spectrum and fluctuation strength spectrum are the fundamental parameters for the calculation of annoyance or sound quality. The unit for roughness is Asper (1 Asper = 100 cA). The unit for fluctuation strength is Vacil (1 Vacil = 100 cV).

The Roughness Sequence Length defines the length of the (loudness) data window which is used to compute specific roughness and overall roughness for a point in time. The data windows overlap by a certain amount because the sequence length is always longer than the time interval. The most reliable results are obtained with a roughness sequence length of 500 ms. For short signals (< 2 s) a sequence length of 200 ms may be useful.


SOUND SIGNAL p(t)
Digital Realtime Loudness Calculation
18 critical bands
3
i
20
Determination of the roughness-relevant envelope fluctuations
Mean value h0 of the env. fluct.
i-1
i
i
i+1
Determination of the relative envelope fluctuations
m* = hBP/h0
Correlation
Correlation
Spectral weighting
gr (zi)
Weighting
Weighting
Squaring partial roughnesses
ri = (m* gR (zi))n
kH
ki
Weighting with correlation factors
ri(ki-1 + ki)/2
3
20
18 critical bands
18 critical bands
Summation of partial roughnesses
SPECIFIC ROUGHNESS
calculated every 100 ms
TOTAL ROUGHNESS
calculated every 100 ms

180.7.4 Fluctuation Strength

The Fluctuation Strength Sequence Length defines the length of the (loudness) data window which is used to compute specific fluctuation strength and overall fluctuation strength for a point in time. The data windows overlap by a certain amount because the sequence length is always longer than the time interval. The most reliable results are obtained with a fluctuation sequence length of 1000 ms. For short signals (< 4 s) a sequence length of 500 ms may be useful.


SOUND SIGNAL p(t)
Digital Realtime Loudness Calculation
20 critical bands
1
i
20
Determination of the fluct.-strength-relevant envelope fluctuations
Mean value h0 of the env. fluct.
i-1
i
i
i+1
Determination of the relative envelope fluctuations
m* = hBP/h0
Correlation
Correlation
Spectral weighting
gf (zi)
Weighting
Weighting
Squaring partial fluctuation strength
fi = (m* gf (zi)) n
kH
kI
Weighting with correlation factors
fi(k-1 + k)/2
1
20
20 critical bands
20 critical bands
Summation of partial fluct. strength
SPECIFIC FLUCT. STRENGTH
calculated every 1000 ms
TOTAL FLUCT. STRENGTH
calculated every 1000 ms

180.7.5 Tonality

OROS SQ *Prominence Analysis* gives objective measures on the prominence of tonal components in a sound. OROS SQ offers two different approaches to compute the prominence of tonal components:

180.7.5.1 The Tone-to-Noise Ratio (TNR) and the Prominence Ratio (PR).

The TNR is computed either according to ANSI S1.13-1995 or to the new draft of the E DIN 45681?2002.

The PR is computed according to ANSI S1.13-1995.

The TNR is defined as the ratio of the power of the tone to the power of the critical band centered on that tone (excluding the tone power).

Masking effects by components from outside the critical band are not taken into account.

A tone becomes just audible when its TNR exceeds the frequency dependent masking index *av*.

All measures are based on time averaged FFT power spectra using a *Hanning* window.

180.7.5.2 TNR method according to E DIN 45681-2002

The procedure according to E DIN 45681-2002 is based on a time averaged **A-weighted** FFT power spectrum.

The averaging time for stationary sounds must be at least 30 s.

The frequency resolution of the power spectrum may not exceed 4 Hz.

Tones are automatically identified at local maxima in the averaged spectrum above 100 Hz

where the level is at least 6 dB above the mean level of the surrounding critical band.

In general more than one spectral line with the following properties represent a tone:

• ?	• level within 10 dB range of the maximum tone line level.
• ?	• tone bandwidth must be small (not too many tone lines)
• ?	• tone slopes must be greater than 27dB/Octave (difference between highest level and level of adjacent lines not too small)

The last two properties are called the *clarity criterion,* which is not required for non-stationary sounds.

The noise power in a critical band is computed by an iterative procedure that excludes **all** tonal components in the critical band. Critical bands are always centered on tones.

The powers of all tones within a critical band are added to the total tone power.

The TNR is the level difference of the total tone power to the noise power.

The measure DL is the difference of the TNR to the masking index (**DL** = ***TNR '''***- '**av**).

The maximum DL is taken as the result.

Negative DL's are set to a lower limit which depends on the tone frequency and the FFT frequency resolution.

The masking index depends on the frequency of the tone. It amounts to ?2 dB around 200 Hz and decreases to ?6 dB for frequencies up to 16 kHz.

Frequency (Hz)	DL=TNR-av (dB)	av (dB)	TNR (dB)
100	-12,4	-2,0	-14,4
200	-12,4	-2,0	-14,5
500	-13,0	-2,3	-15,3
1000	-14,4	-2,8	-17,2
2000	-17,1	-3,5	-20,6
5000	-21,9	-4,5	-26,4
10000	-25,9	-5,2	-31,2

*Masking Index a'**v** 'and lower limits for DL and TNR (FFT frequency resolution=3,9 Hz) according to E DIN 45681-2002.*

If the tone frequencies in a sound vary slightly over time, the procedure must be applied for 12 time intervals of 10 s.

Then, the energetical mean of the maximum DL (**mean DL**) for each time interval is taken as the result.

In the case of intervals without tones, DL is set to the lower limit of a 1kHz tone before averaging.

A tone penalty between 0 and 6 dB is computed depending on mean DL and given in the text report window.

The maximum DL over all time intervals (**max DL**) is also computed.

In addition the power spectrum averaged over the whole analysis time range

and the maximum DL for that global spectrum (**global DL**) is computed.

If the time interval is equal to the analysis time range, then mean DL, max DL and global DL are all identical.

DL = TNR - a'*v* '(dB)	Penalty (dB)
<= 0	0
0 < DL <= 2	1
2 < DL <= 4	2
4 < DL <= 6	3
6 < DL <= 9	4
9 < DL <= 12	5
12 < DL	6

Penalty depending on DL according to E DIN 45681-2002.

180.7.5.3 TNR method ANSI S1.13 1995

The procedure according to ANSI S1.13 1995 is based on a time averaged **unweighted** FFT power spectrum.

A minimum of 25 independent power spectra over a time of at least 15 s must be averaged.

The separation of spectral lines belonging to a tone or to masking noise is not defined clearly in ANSI S1.13 1995.

Therefore the identification of tones in the spectrum as well as the computation of tone level is achieved using the E DIN 45681-2002 procedures.

If there is more than one tone within a critical band, the critical band is centered on the tone with the highest level (primary tone).

The power of the tone with the second highest level (secondary tone) is added to the total tone power if its frequency is close enough.

The noise power is the power in the critical band centered on the primary tone excluding the tone power

and the power of a secondary tone if it exists.

The TNR is the level difference of the total tone power to the noise power.

The maximum TNR for all tones in the power spectrum is taken as the result.

The masking index is not taken into account.

TNR's below -4 dB are set to the lower limit as defined in E DIN 45681-2002.

A tone is classified as prominent when its TNR exceeds 6 dB (10 dB above the average masking index of -4 dB).

If the tone frequencies vary slightly over time, the procedure may be applied at a certain time interval (not specified in ANSI S1.13 1995).

Then the energetical mean of the maximum TNR for each time interval (**mean TNR**) is computed.

In the case of intervals without detected tones, TNR is set to the lower limit of a 1kHz tone as defined in E DIN 45681-2002 before averaging.

The maximum TNR for all time intervals (**max TNR**) is computed.

In addition the power spectrum averaged over the whole analysis time range

and the maximum TNR for that global spectrum (**global TNR**) is computed.

The global TNR is the result according to ANSI S1.13 1995.

If the time interval is equal to the analysis time range then mean TNR, max TNR and global TNR are all identical.

180.7.5.4 AI (Articulation index)

Intelligibility is for voice communications, the capability of being understood - the quality of language that is comprehensible. Intelligibility has several meanings: clearness, explicitness, lucidity, comprehensibility, perspicuity, legibility, plain speaking, etc.

One of the earliest attempts to measure by machine the intelligibility of a speech transmission system, the Articulation Index was developed by Bell Telephone Laboratories in the 1940's.

AI is based on the idea that the response of a speech communication system can be divided into twenty frequency bands, each of which carries an independent contribution to the intelligibility of the system, and that the total contribution of all the bands is the sum of the contributions of the individual bands. (AI may also be measured using one-third octave or octave bands.) Signal-to-noise ratios are computed for each individual band, then weighted and combined to yield an intelligibility score.

The AI (ANSI S3.5-1969) varies in value from 0 (completely unintelligible) to 1 (perfect intelligibility). An AI of 0.3 or below is considered unsatisfactory, 0.3 to 0.5 satisfactory, 0.5 to 0.7 good, and greater than 0.7 very good to excellent. Apart from the ANSI standard, other definitions of the AI exist, such as Unikeller used in the automotive industry, NVH and more. The differences are the weighting and speech levels used in each third octave bands.

OROS SQ enables to compute the Articulation Index according to 3 methods: the ANSI S3.5-1969, the unikeller and the NVH. Both are based on the calculation of the third octave spectrum of the signal (from the band 200 Hz to the band 6300 Hz) and a comparison with a third octave reference speech spectrum. The difference spectrum is then weighted by a set of coefficients depending on the method chosen. The generic form of the calculation is :

*AI = W * (Vref + A ? V) / N*

W is the spectrum of weighting coefficients, *Vref* is the speech reference spectrum, *V* is the signal spectrum.

For NVH, *A = 30 et N = 30*.

The ***Text Report*** window gives detailed information on the Prominence Analysis computation parameters and results.

For each analysis time interval the results for up to 10 detected tones with the highest TNR and PR measures are reported.

The highest measures for each analysis time interval are the ones shown in the graphs *PR vs.Time* and *TNR vs.Time*.

The next figure shows the computation parameters and the results for the first analysis time interval (Frame 1):

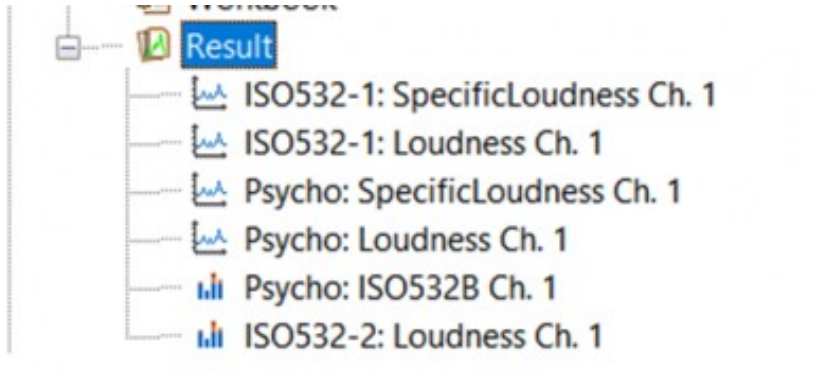
In the computation parameters the realized FFT frequency resolution can be found.

The Prominence Analysis results for the first time interval are shown.

More than 10 tones were detected in frame 1.

180.8 FAQ about loundness

When we compute the loudness in Sound Quality Lite we get the above list of results in NVGate.



Let?s find below the explanation of this loudness

? **ISO532-1** Specific loudness ch 1 According to the standards ISO532-1 : It is computed on the whole signal, it computed a loudness value in every 2 ms.

? **ISO532-1**: Loudness ch1 According to the standards ISO532-1 : the spectrum is computed on the whole signal. The standards is for stationary signal.

? **Psycho:** Specific Loudness ch1? and ?Psycho:loudness ch 1 Not standardize loudness, but based on DIN 45631/A1-2010. (One value every 2 ms for profile, and compute on the whole signal for the spectrum)

? **Psycho IS0 532 B:** According to IS0 532 B. It is computed on the whole signal, the standard is used for stationary signal, so there is only one value.

? **ISO532-2**: Loudness Ch1: ISO532-2 standard : It is the ?American Loudness standard? (This standard replaces ISO 532 A (loudness according to Stevens) and it is based on ANSI S3.4-2007 standard for calculating stationary loudness according to Moore. It is computed on the whole signal, the standard is used for stationary signal, so there is only one value.

180.8.1 Short history about loudness:

There is 2 main ways to compute the loudness

- **The ?European? way : Zwicker method**

ISO 532-1 (release in 2017) this standards is a revision and based on ISO 532 B. It is based on DIN 45631/A1 standard for determining both stationary and time variable noise according to Zwicker.

The new standards ISO 532-1 add:

- avoid any uncertainty regarding the practical implementation. - Better continuity and comparability than earlier calculations.

- **The ?Amercian? Way**.

ISO 532-2 this standards is based and replaced ISO 532 A (loudness according to Stevens).

The standard is based on the American ANSI S3.4-2007 standard for calculating stationary loudness according to Moore and Glasberg.

181 Translate NVGate

How to translate NVGate :

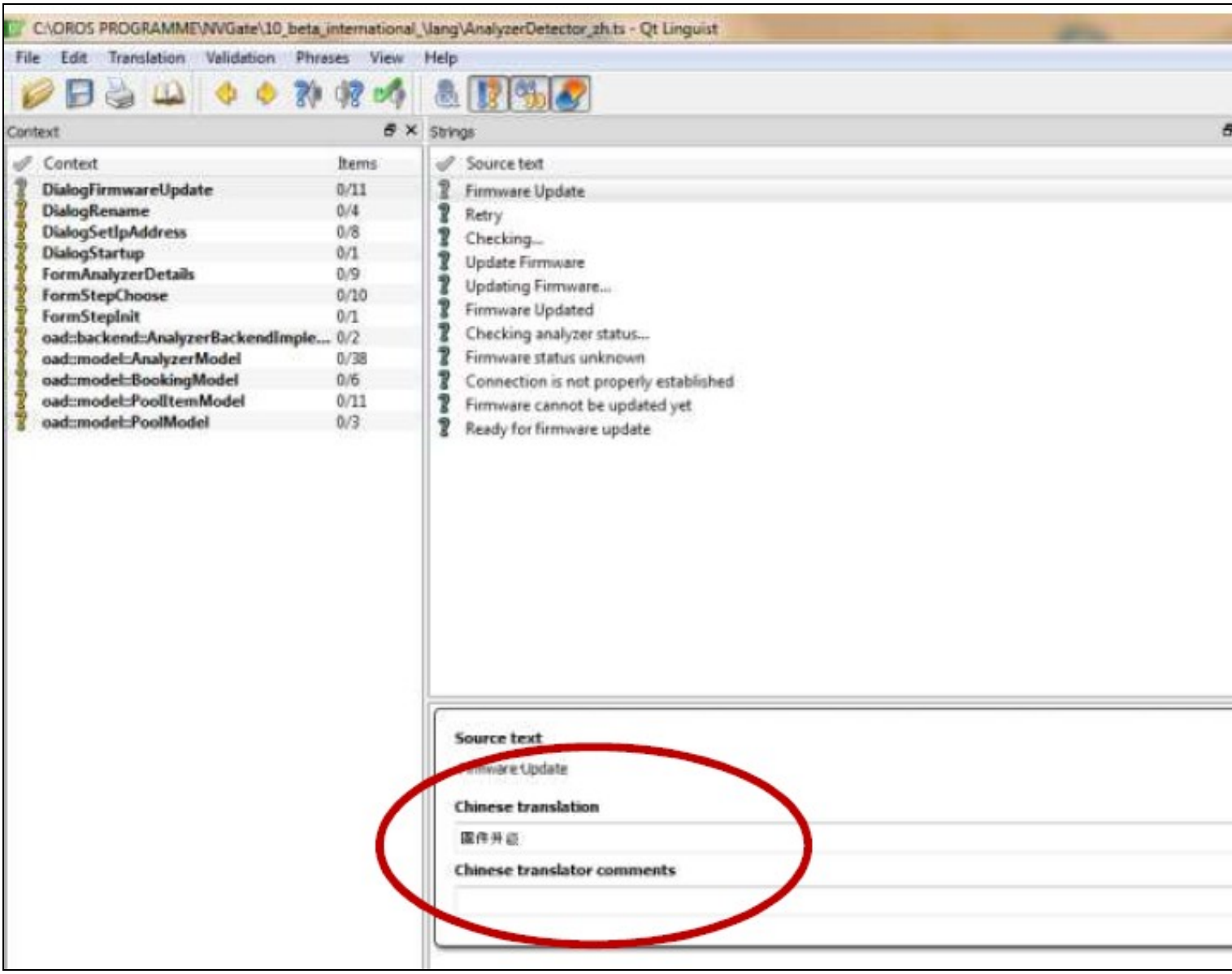
?Fantastic writing in English is kind of disreputable, but fantastic writing in translation is the summit.?

To translate .qm files in your own language, unzip NVGate_translation_files.zip (ask customer.care@oros.com) and open the .ts files using the Qt Linguist software (see link below) (or your own compatible translation tool.)

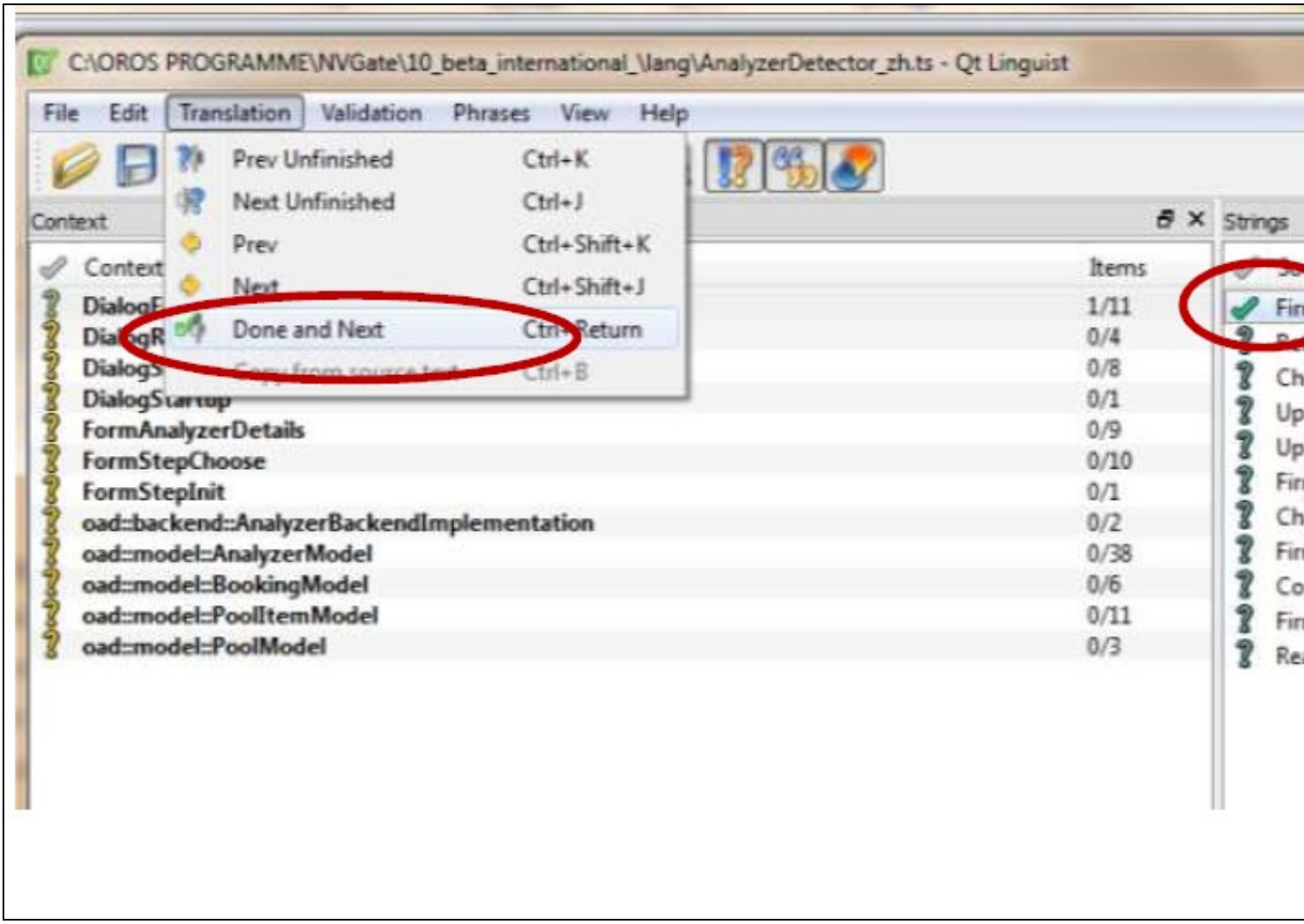
https://partnerzone.digigram.com/s/qfAAngB4Trzo5SG

Go on file open, and open the file ts, with the name of your language (See the ISO 639-1 language code of the translated language. For example, "ja" for Japanese, ?zh? for chinese). (Note that you have several .ts file to translate.)

On the red circle below you need to put the translation.(If you have % inside the text you need to keep it (for example %1 or %2.)



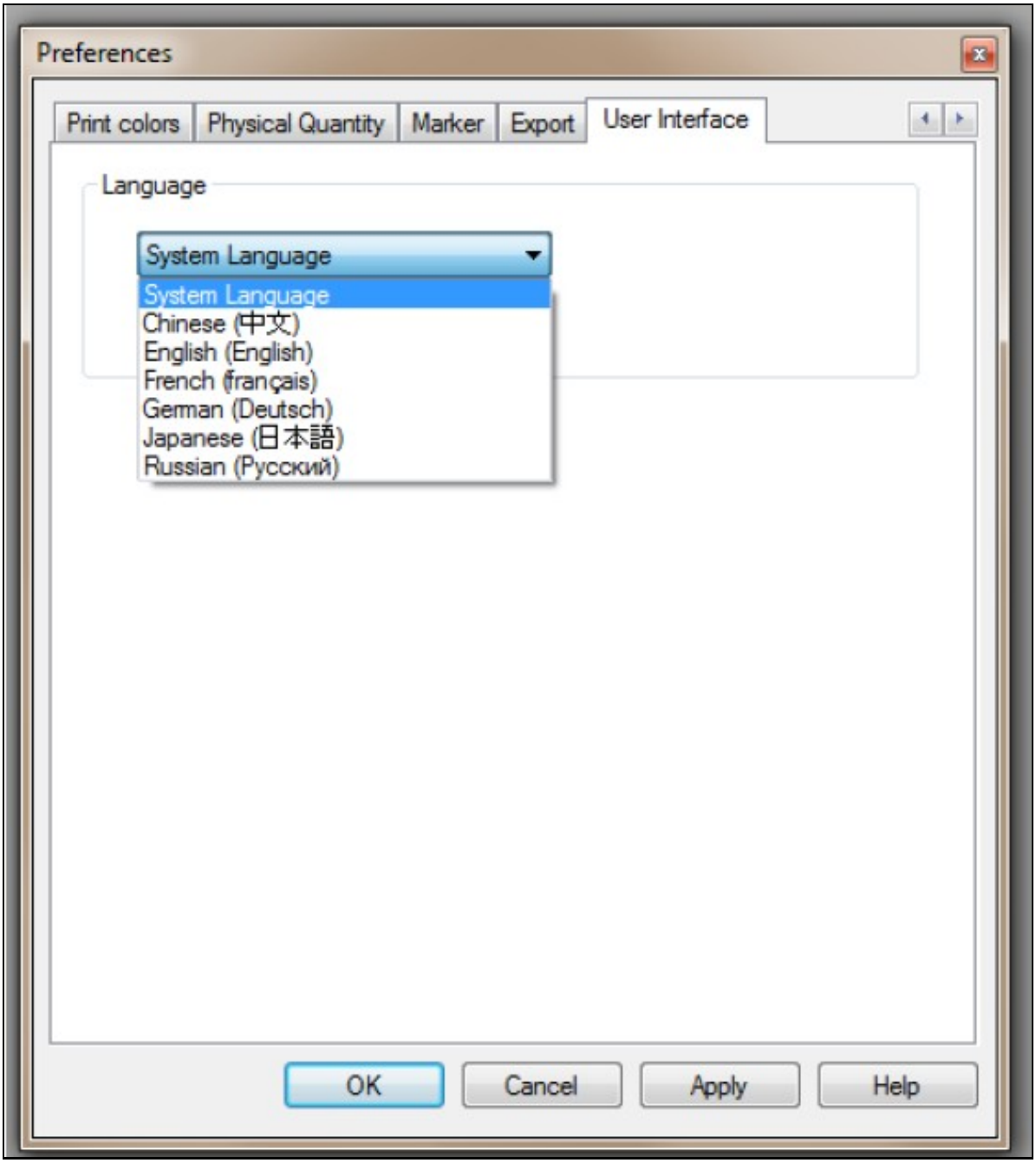
Once this is done, you need to validate the translation using (ctrl + return). Then you will have a green thick.



Once you have finished the translation and the entire thick are green, you need to generate a binary .qm files (in Qt Linguist, use the File / Release menu).

-Then copy the translated .qm files into the "lang" subfolder in NVGate installation directory.

NVGate will be automatically launched in the language of your operating system. (I mean if you?re operating system is windows in Chinese, NVGate will be launch with the file _zh.qm). It can also be change on the user preference of NVGate.)



After finishing the translation, send the translation file .ts and .qm to OROS customer.care@oros.com . OROS will automatically put these files on the new release of NVGate. Also when OROS will add a new function you will only have to translate the word which is missing. If you have any question do not hesitate to contact us customer.care@oros.com

182 Tutorial ODS modal

Instructions for using MODAL ODS (time signals) with NVGate

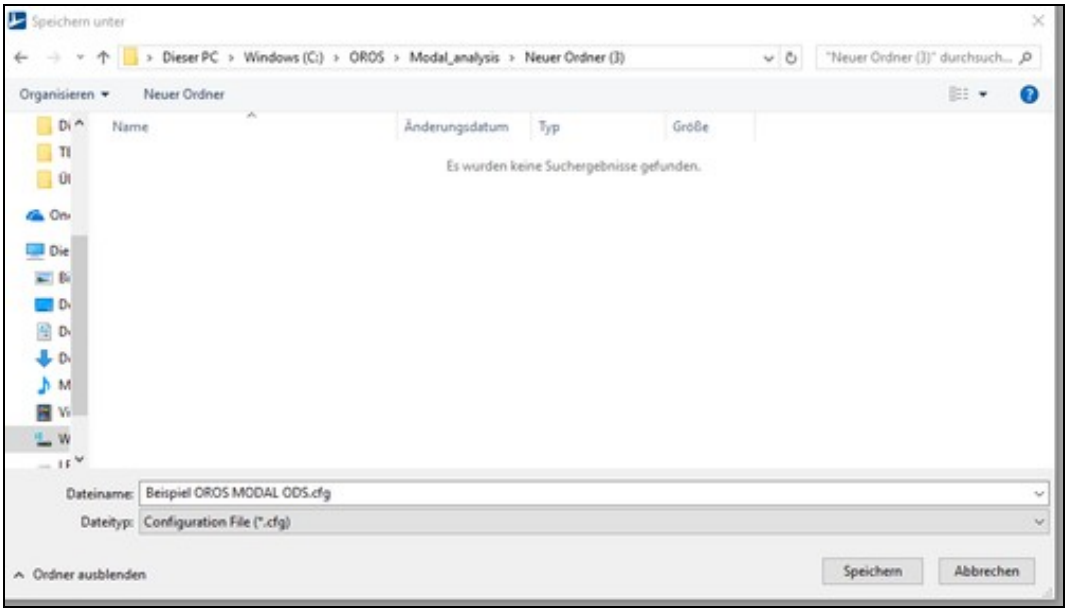
182.1 Video Tutorial

182.2 Create a project in OROS Modal

Start OROS Modal with your corresponding dongle. After starting, go to "File" -> "New ..." Select any folder on the hard drive for your OROS Modal projects.

ATTENTION: OROS Modal does not automatically create new folders for every project . This need to manually perform and is strongly recomme choose.

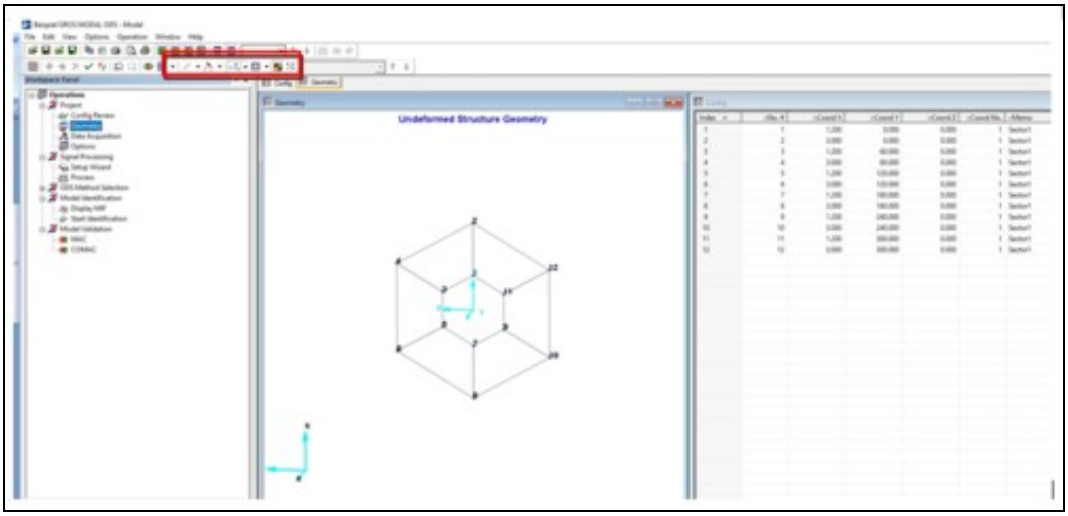
Rename you the .cfg file to your kipper and put them in the previously newly created folder from. Close to the window with "Save":



182.3 Create geometry

The geometry can be created in several ways. Import an existing geometry, create it with the help of OROS Modal or copy a table with the coordinate data of the individual points in OROS Modal (e.g. previously created in Excel).

The individual ways can be looked up in detail in the OROS Modal manual. The structure in this example is as follows:



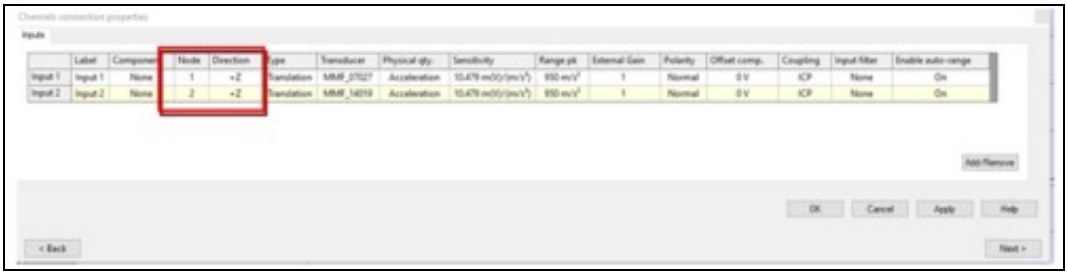
182.4 time data in NVGate

182.4.1 Create Project

Create a new project in NVGate.

For the ODS deflection shape are at least two sensors needed. In this case, accelerometers. A brake disc serves as the test object . This is made to vibrate with a pulse and the time data are recorded. The structure to be examined is normally in a stable working condition.

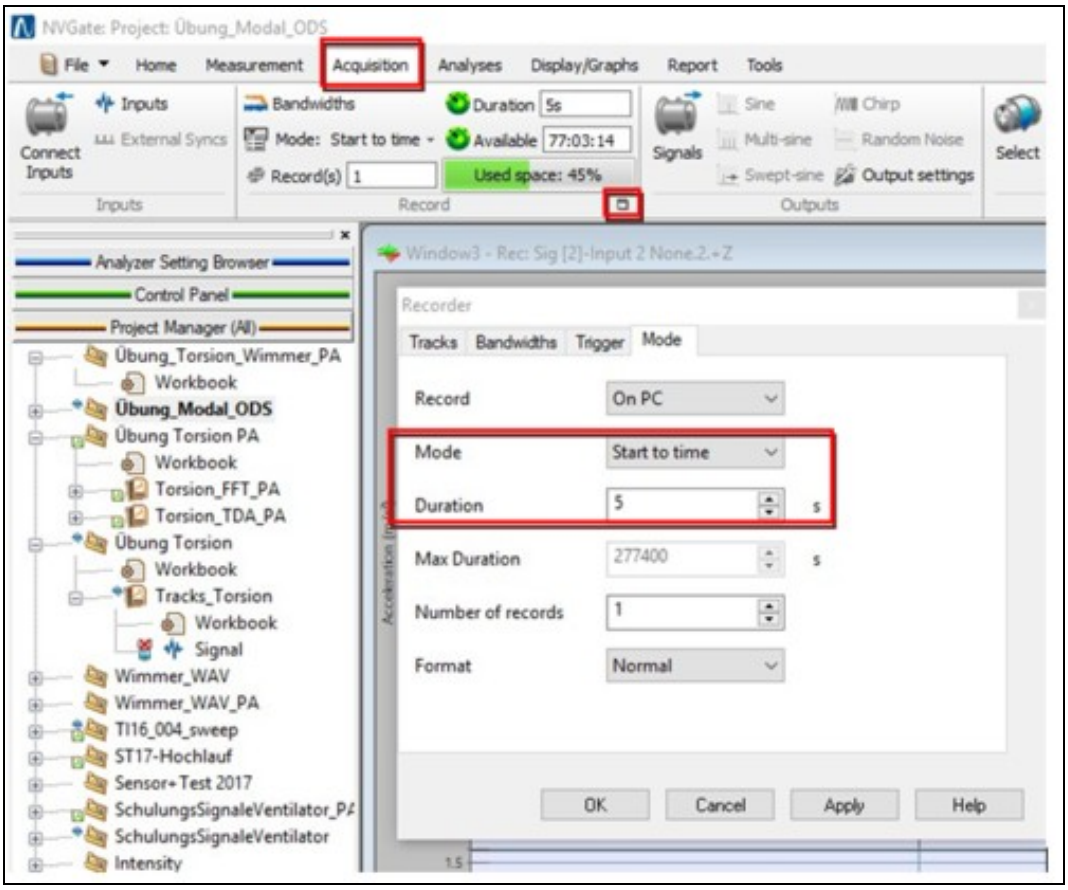
Activate the required channels with the recorder and configure the sensors as usual. In addition , the point to be measured and the measuring direction of the sensor must be specified in the ?Channel connection properties?. This must be adjusted after each measurement until all measuring points have been measured. In our example, input 1 always remains in the same place as a reference , the second moves away the other points in the structure.



182.5 Recorder settings

In the recorder settings in the "Acquisition" tab, the recorder mode must be switched to "Start to time". The desired recording duration can then be selected as desired.

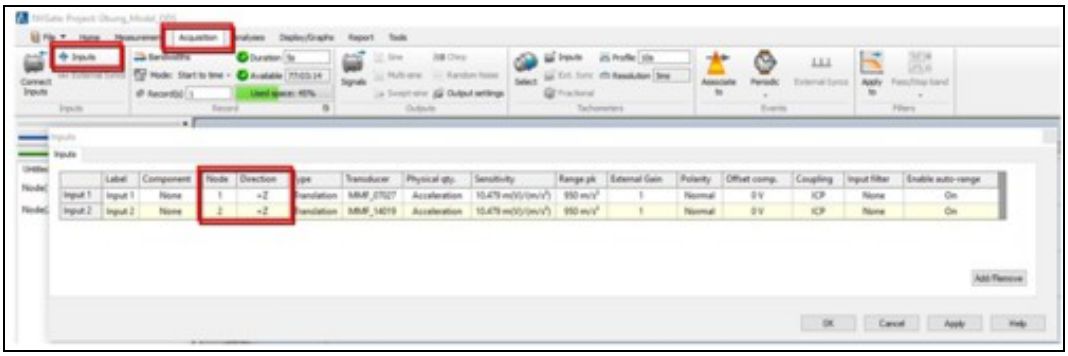
The ?Start to time? function ensures that all time measurements are exactly the same length at all points. If these are not of the same length, OROS Modal cannot process the data.



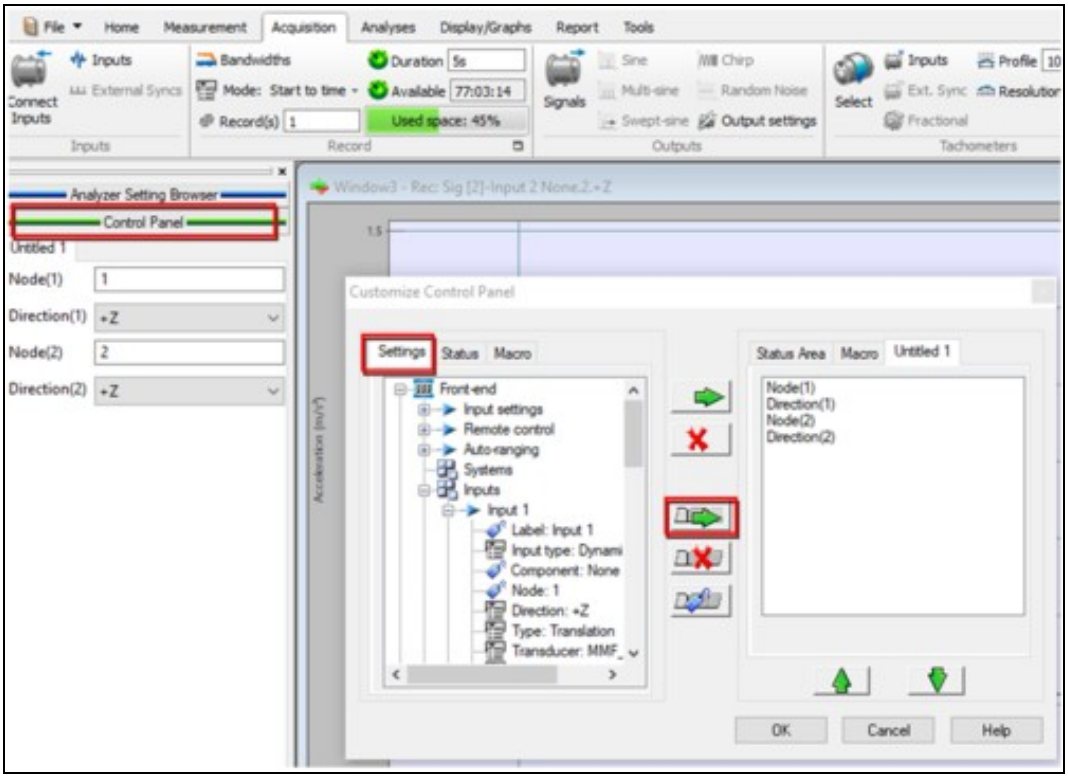
182.5.1 Recording of the time signals

Time signal recording can either be started manually or triggered by certain events (see manual).

It is important to adjust the node information (Node) and the measurement direction (Direction) in the "Channels connection properties" after each measurement:

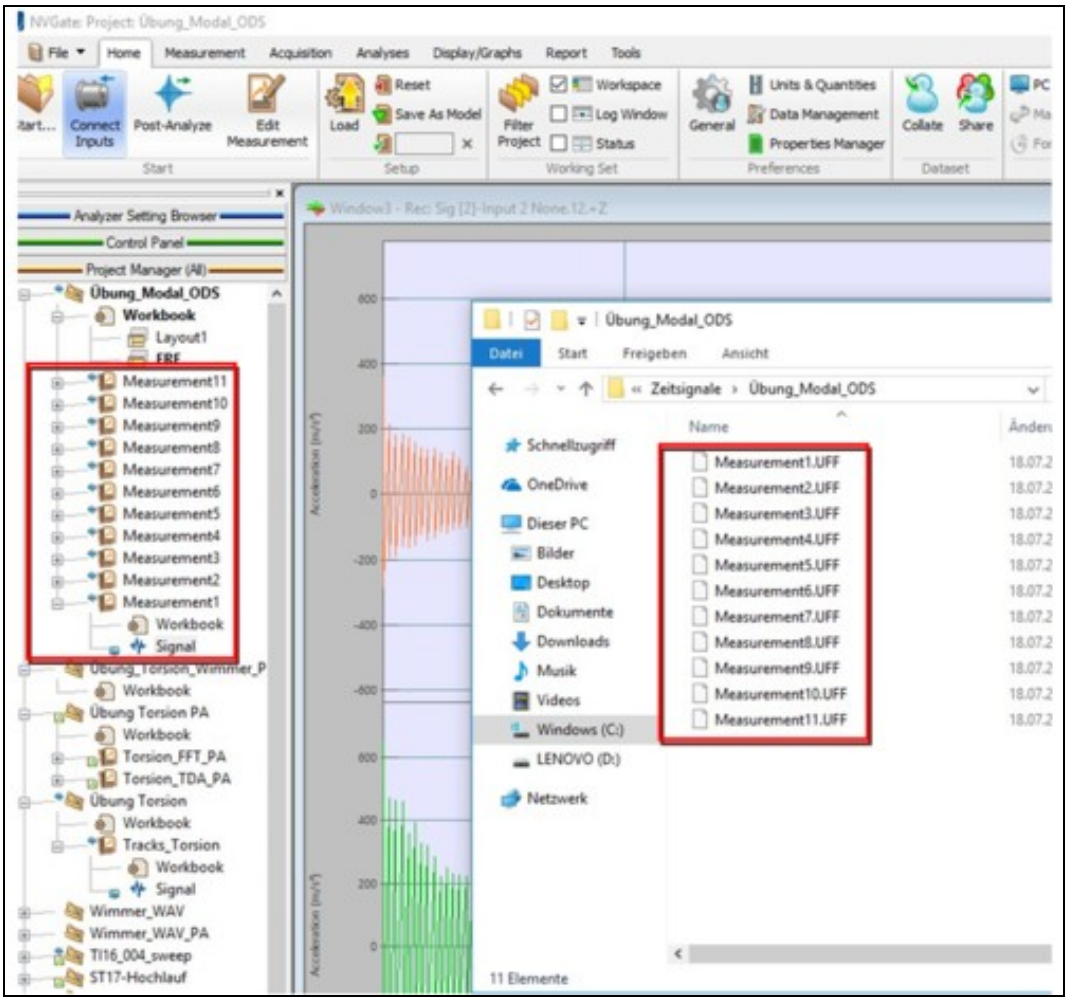


These functions can also be added to the Control Panel for faster access:



You can reach the ?Customize Control Panel? menu by right-clicking in the Control Panel. Then create a new layout with the button marked in the middle of the window and then select the desired ?Settings? and add them to the window using drag & drop. Then confirm with "OK".

Now make the different time measurements:


NVGate: Project: Übung_Modal_ODS
File
Home
Measurement
Acquisition
Analyses
Display/Graphs
Report
Tools
Connect Inputs
Post-Analyze
Edit Measurement
Load
Reset
Save As Model
Filter Project
Workspace
Log Window
Status
General
Units & Quantities
Data Management
Properties Manager
Collate
Share
Start
Setup
Working Set
Preferences
Dataset
Analyzer Setting Browser
Control Panel
Project Manager (All)
Übung_Modal_ODS
Workbook
Layout1
Measurement11
Measurement10
Measurement9
Measurement8
Measurement7
Measurement6
Measurement5
Measurement4
Measurement3
Measurement2
Measurement1
Workbook
Signal
Übung Torsion PA
Workbook
Torsion_FFT_PA
Torsion_TDA_PA
Übung Torsion
Workbook
Tracks_Torsion
Workbook
Signal
Wimmer_WAV
Wimmer_WAV_PA
TI116_004_sweep
ST17-Hochlauf
Window3 - Rec: Sig [2]-Input 2 None,12.+Z
Übung_Modal_ODS
Datei
Start
Freigeben
Ansicht
« Zeitsignale › Übung_Modal_ODS
Name
Schnellzugriff
OneDrive
Dieser PC
Bilder
Desktop
Dokumente
Downloads
Musik
Videos
Windows (C:)
LENOVO (D:)
Netzwerk
Measurement1.UFF
Measurement2.UFF
Measurement3.UFF
Measurement4.UFF
Measurement5.UFF
Measurement6.UFF
Measurement7.UFF
Measurement8.UFF
Measurement9.UFF
Measurement10.UFF
Measurement11.UFF
11 Elemente

Signal acquisition in NVGate is now complete.

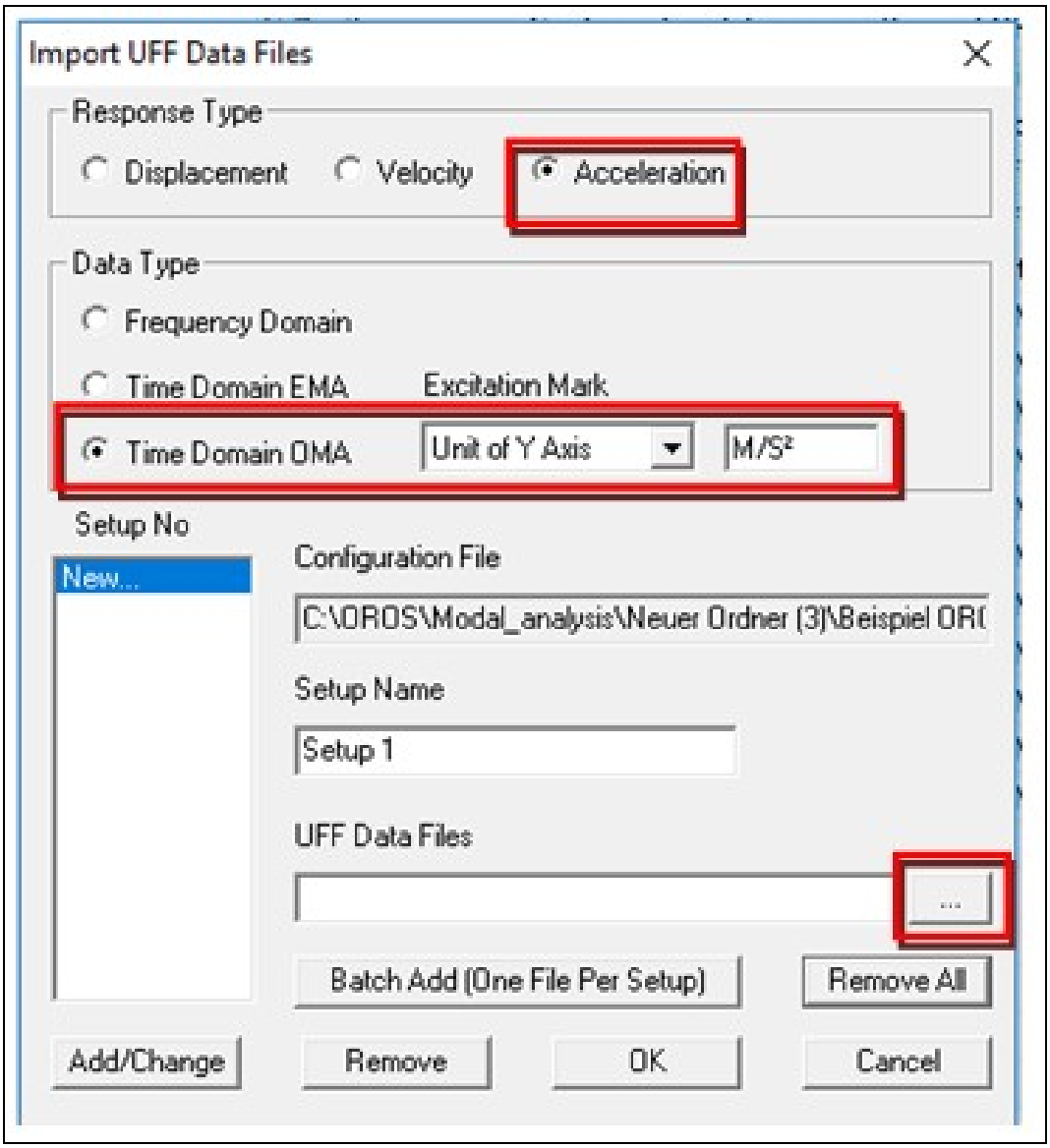
182.6 Import into OROS Modal

Now go to ?File? -> ?Import? -> ?Data Files (UFF)?. Choose the following:

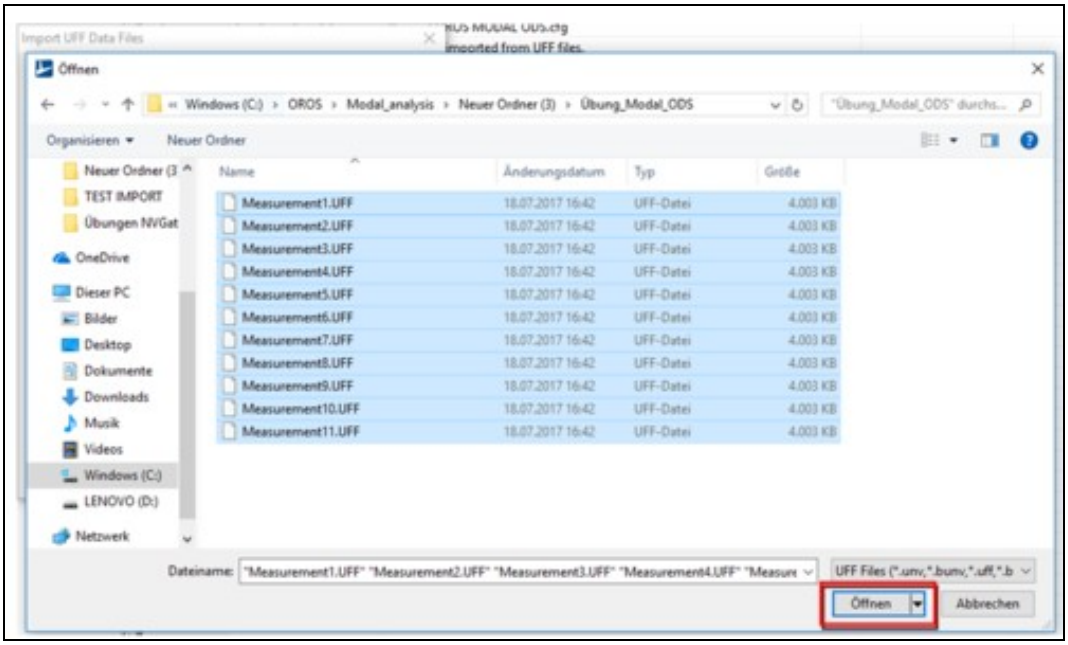
- "Response Type" Acceleration

- "Data Type" Time Domain OMA

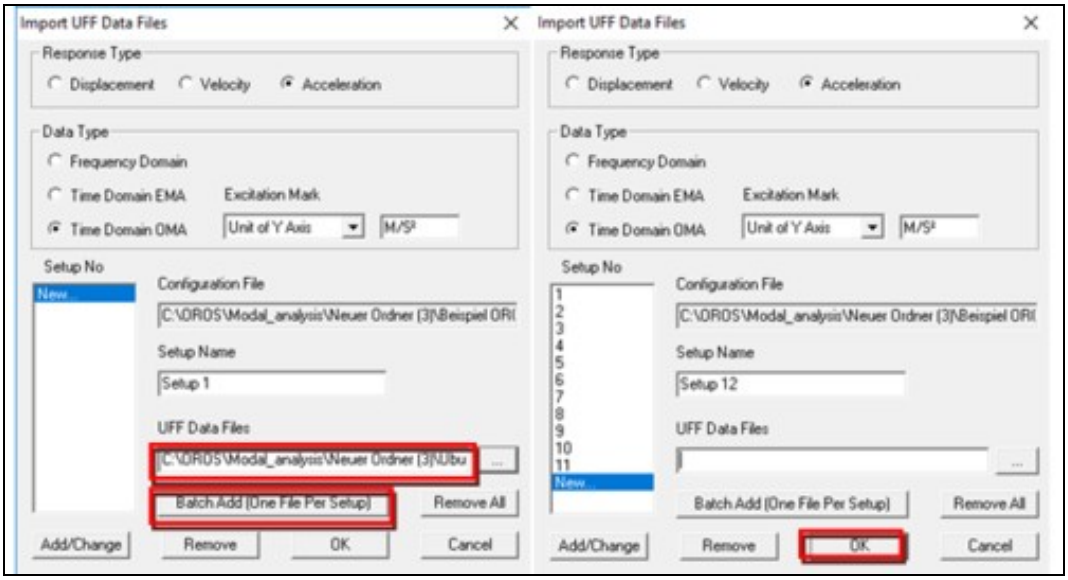
- "Excitation Mark" -> Unit of Y Axis -> m / s² Then select the UFF files using the "..." button



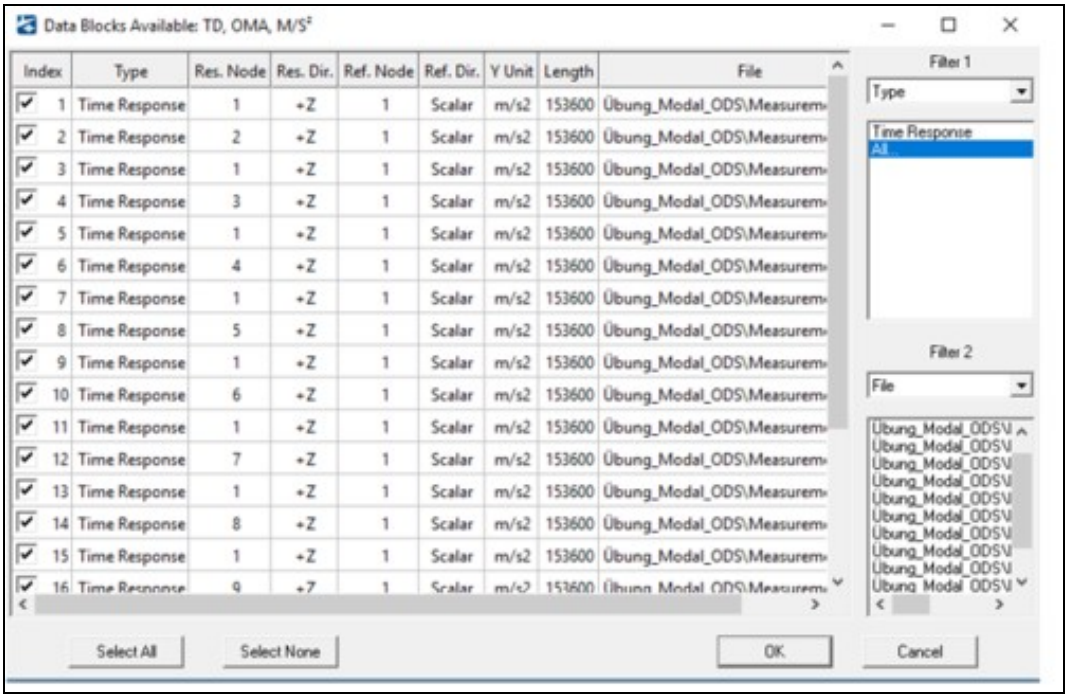
Then select the previously created UFF files and click on "Open":



Then use the "Batch Add" function and confirm with "OK":



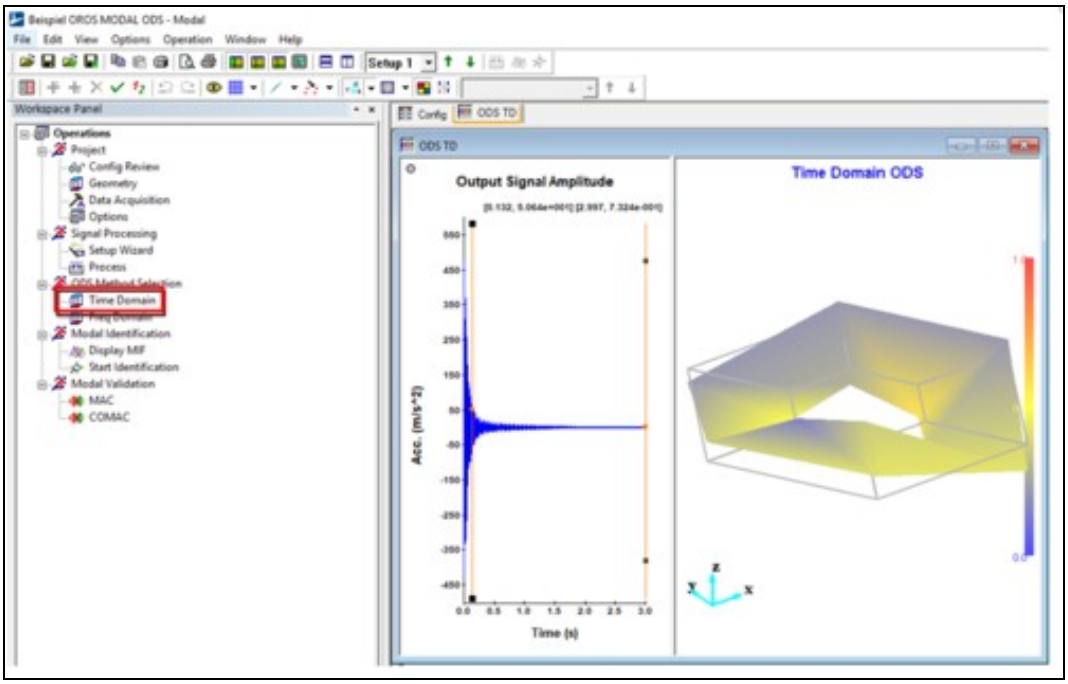
The available data will now be displayed. Errors in the excited nodes or directions can be made here, then confirm with "OK":



182.7 Show result

182.7.1 Time domaion

Now click on ?Time Domain? in the ?ODS Method Selection? menu item in the ?Workspace Panel?. The waveform is then displayed:



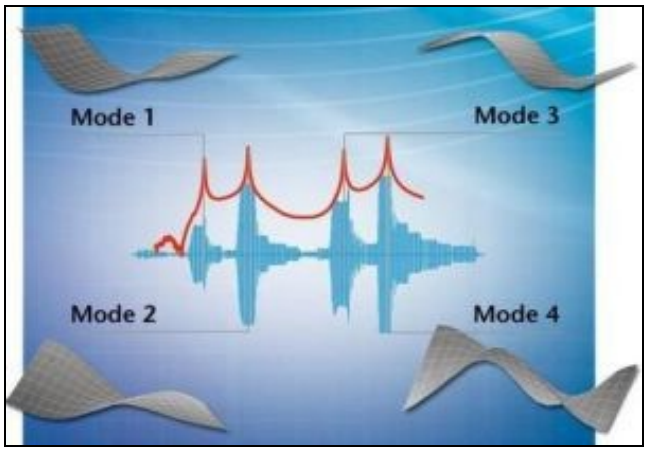
182.7.2 Frequency domain

You need to pass by the signal processing module and compute the PSD on the time signal, then Frequency ODS will be available.

183 User case

Modal

- Effect of Coupling Types on Rotor Vibration
- Experimental Modal Analysis of A Car Semi-Axle
- Operational modal
- OMA on Bridge
- OMA on Cable
- OMA on Industrial Robots
- Modal on Wind Turbine
- Modal Test of Rollover Protection Structure
- Predicting Dynamic Behavior of Cantilever Beams using FEA and validating through EMA



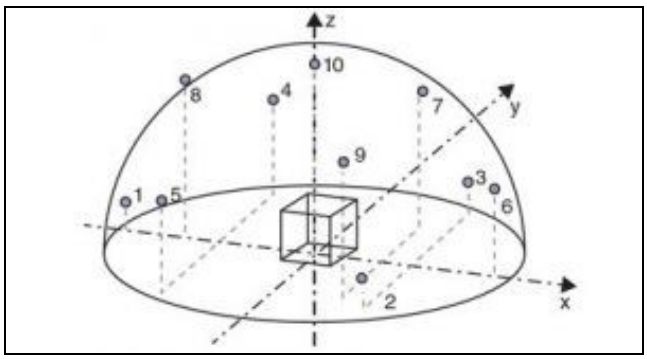
Damage Detection

- Aerospace Structures
- Civil Infrastructures
- Naval Structures



Sound Measurements

- NAH Applied to Localize Sources on Geared Electric Motor
- Floor Standing Heating Boilers Sound Power Measurement
- Sound Measurement of Concrete Block Press
- Sound Power Measurements on Construction Equipment
- Underwater Sound Source Localization Using NAH
- Sound Source Localization and Mapping Using Acoustic Intensity Method for Noise Control in Automobiles and Machines
- Signal Acquisition and Processing



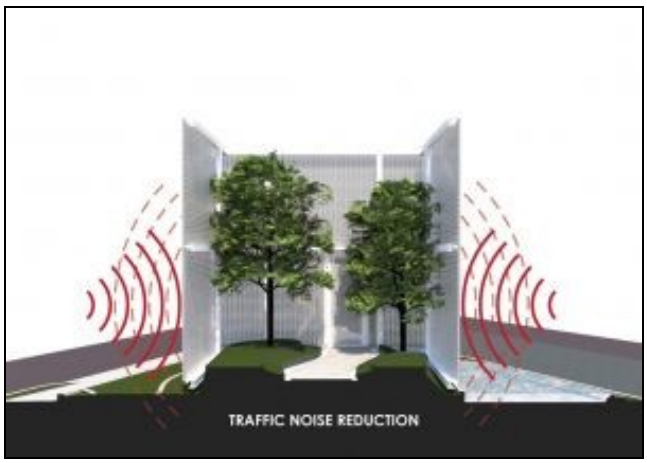
- Critical Speeds Determination
- Dynamic measurement on a bladed turbine disk
- Experimental Investigation of Vibration Analysis of Multi-Crack Rotor Shaft
- In Helicopter Measurements
- Laser Based Vibration Measurement for Bearing
- Measuring IRIG markers in NVGate
- Torsional vibration Measurements on Engine Timing
- Temporary Vibration Monitoring
- Vibration and Dynamic Strain Gauge Measurements on Aero Engine Test Bench
- Use of the Vibroacoustic Transfer Function Built for the Prediction of Noise Radiated to other Vibrational States
- Wireless Vibration Monitoring on Aircraft Engine
- Vibration Measurement of CI Engine Using FFT Analyzer

Other Measurements



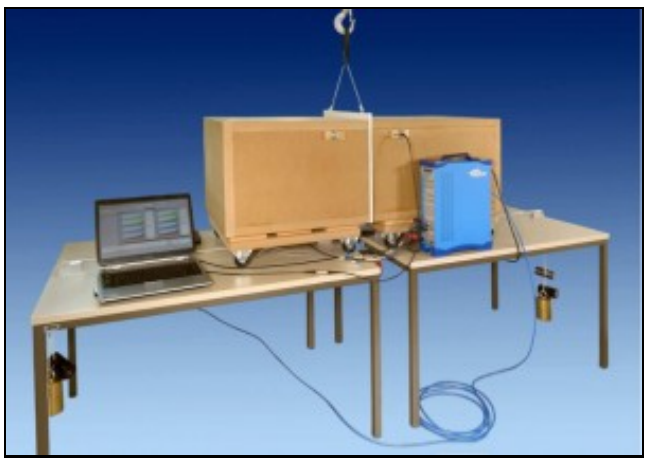
Noise & Vibration Reduction

- Aircraft Noise Reduction
- Impact Testing and Damper Design to Reduce Cutting Tools Vibration



Validation & Acceptance

- Design and Development of TMD for Centrifugal Pump
- Gearbox Factory Acceptance
- Procedure Validation Using Reduced Scale Rigs
- Structural Characteristics of Drop Test Frame



- Dynamics and Diagnostics of Vertical Rotors With Nonlinear Support Stiffness's
- Diagnostic of Shock Absorber's During Road Test With Use of Vibration FFT and Cross-Spectrum Analysis
- Impact of Traffic Vibration on Heritage Structures
- Health Diagnosis of High Speed Ball Bearing Using Acoustic Emission Technique
- Measuring Hearing Protection Performance Results

Scholarly Articles

- Analyse Accélérométrique pour l?optimisation de la performance et la prévention des risques en cyclisme
- Lamper, Justin, "Insertion loss of a simple plywood noise enclosure" (2012). Graduate Theses, Dissertations, and Problem Reports
- Shaft Misalignment Detection using Stator Current Monitoring : International Journal of Advanced Computer Research
- Study the Impact of Metro-Rail Induced Vibration on Structures
- Experimental Investigation of Misalignment Effects on Rotor Shaft Vibration and on Stator Current Signature

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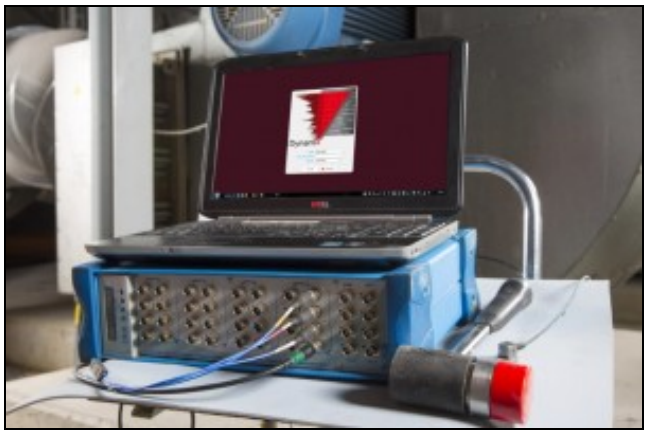
Maintenance

- Predictive Maintenance on Wind Turbines
- Predictive Maintenance of Roller Mills
- ICR Vibro-Acoustics



Other

- Dynamx Blog
- Interfacing OROS NVGate with DynaWorks
- VEM Vibration Study



184 User note: FFT averaging

NVGate provides many settings for averaging results. This document aims to describe these functions and parameters for averaging data results. This document focuses on averaging available at FFT modules. These are quite similar settings for SOA modules.

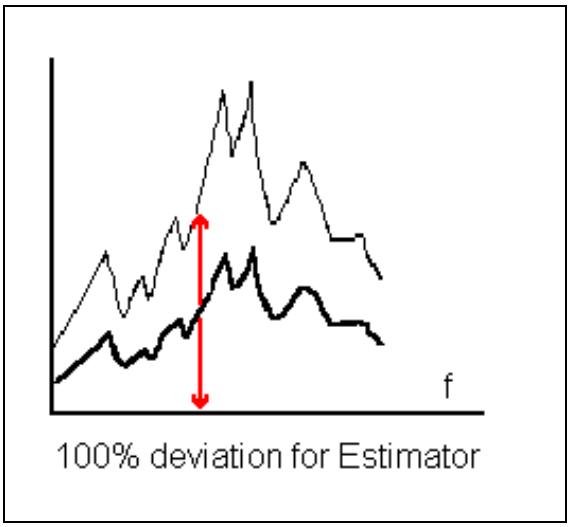
184.1 Why averaging?

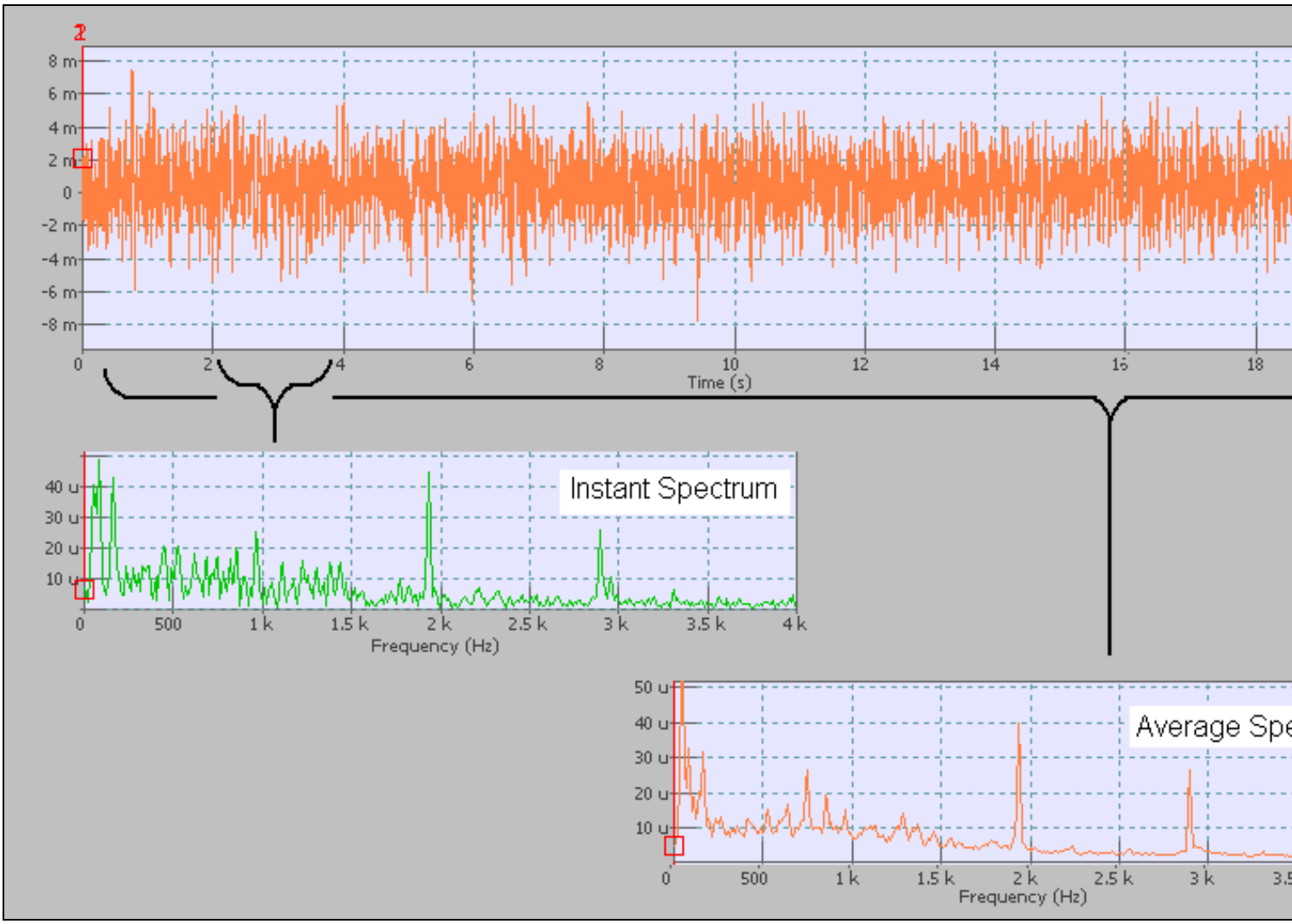
There are many reasons that lead to average measurement to provide accurate results.

FFT analysis is performed on an extract of time signal which is called "trigger block"

Averaging enables compliance with the basics FFT hypothesis.

- Get a analysis on a stationary signal data.
- Reduce input noise, averaging increase the signal/noise ratio.
- By definition FFT estimator provides 100% standard deviation.




2
8 m
6 m
4 m
2 m
0
-2 m
-4 m
-6 m
-8 m
0
2
4
6
8
10
12
14
16
18
Time (s)
40 u
30 u
20 u
10 u
Instant Spectrum
0
500
1 k
1.5 k
2 k
2.5 k
3 k
3.5 k
4 k
Frequency (Hz)
50 u
40 u
30 u
20 u
10 u
Average Spe
0
500
1 k
1.5 k
2 k
2.5 k
3 k
Frequency (Hz)

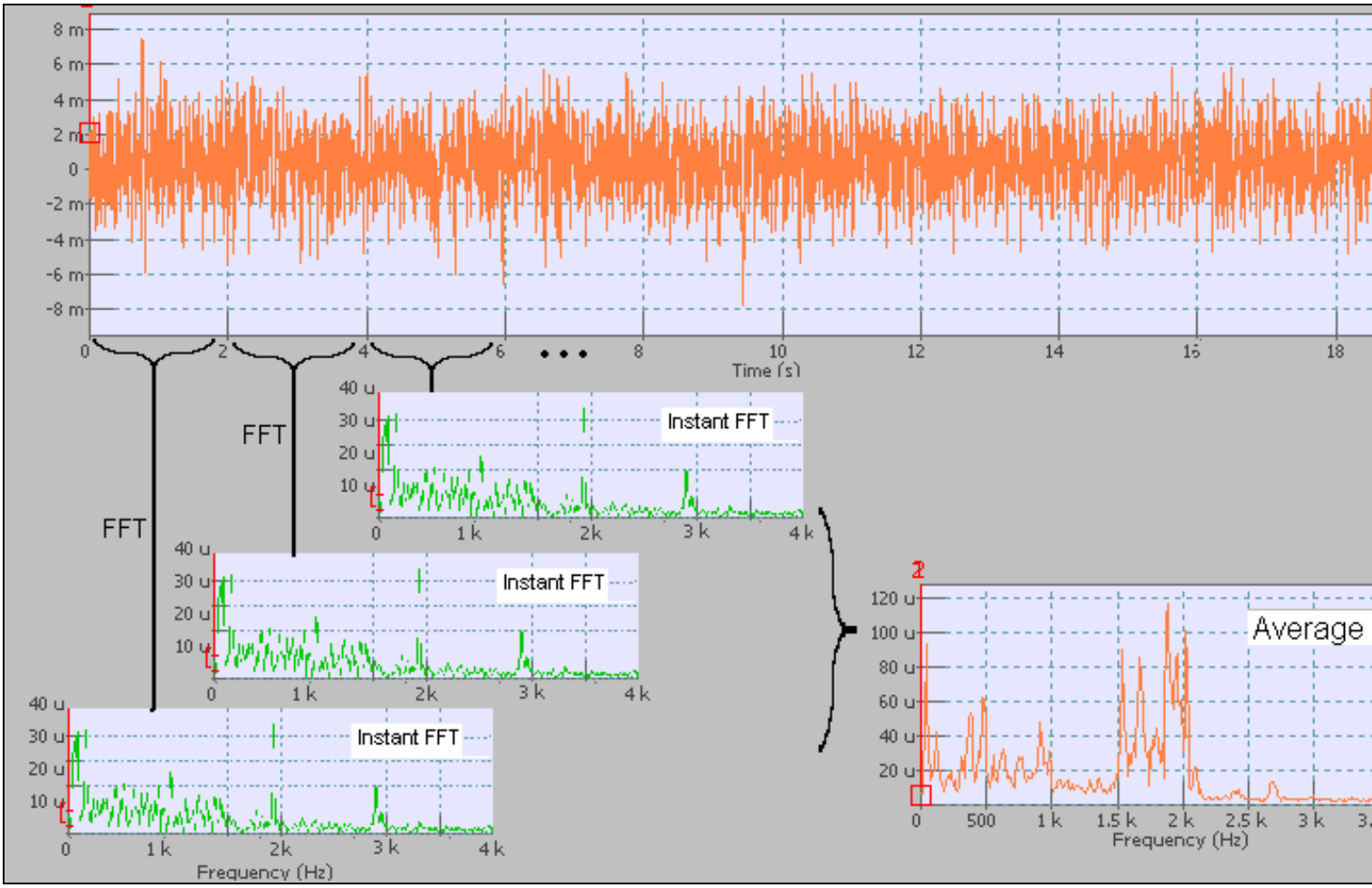
Averaging parameters should be setup according analysis and tracked phenomena.

184.1.1 Averaging Domain

Averaging could be done in either **Frequency** or **Time Domain**.

184.1.1.1 Frequency Average

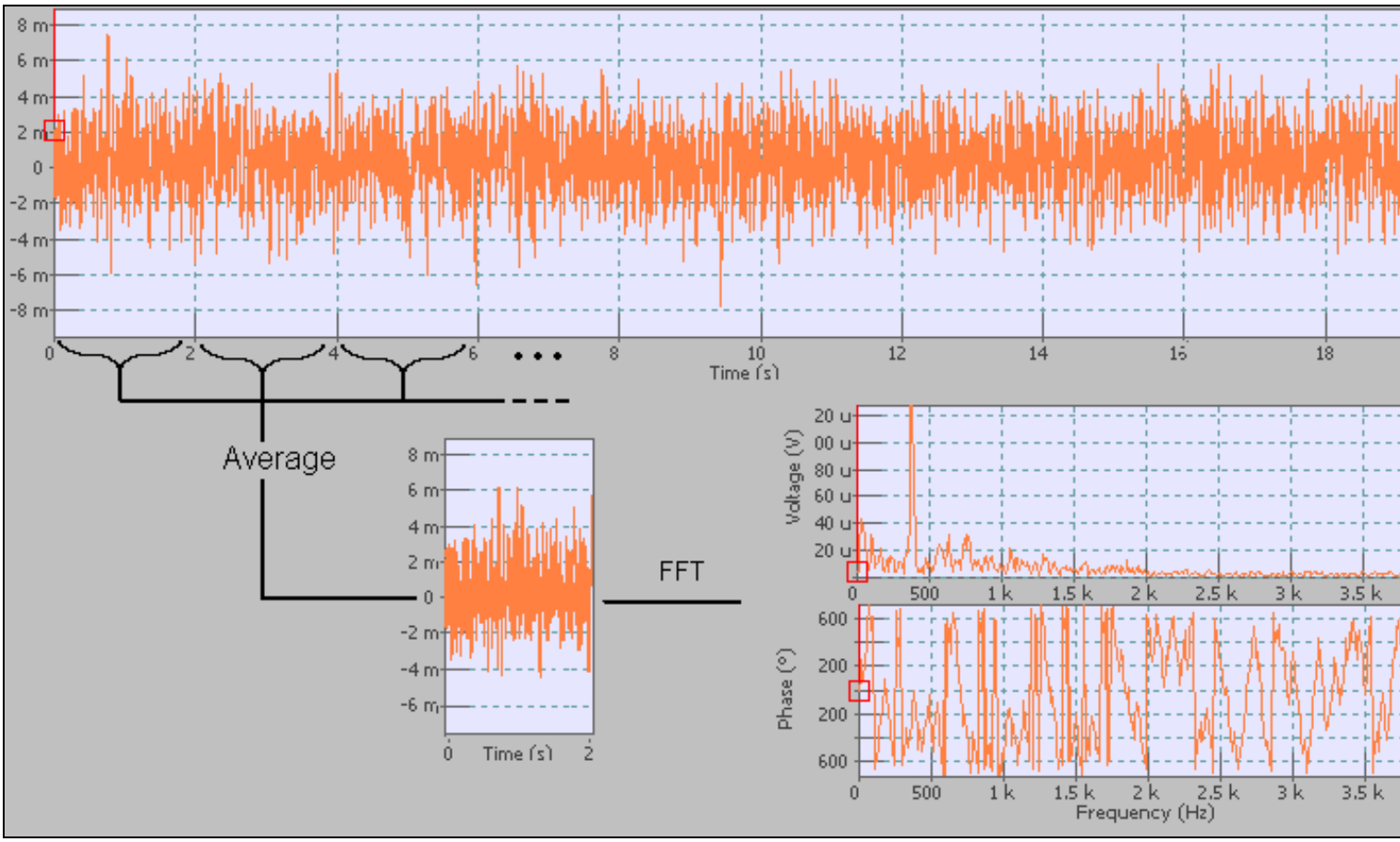
Each signal block generates an FFT, the average result is the average of the spectrum :



Data result is available for magnitude only. There is no information about the phase.

184.1.1.2 Time Domain

The average is performed in time domain, the FFT is computed on the average time signal data



It results complex data that can be displayed in Magnitude and Phase (or Real Imaginary).

Time domain averaging makes sense for synchronous time block, it must be use with a trigger for block synchronization, otherwise the average will not make sense.

This average is useful to avoid getting results from external sources. For example, in a noisy factory, setting a trigger linked to a specific machine will prevent from receiving noise from other machine.

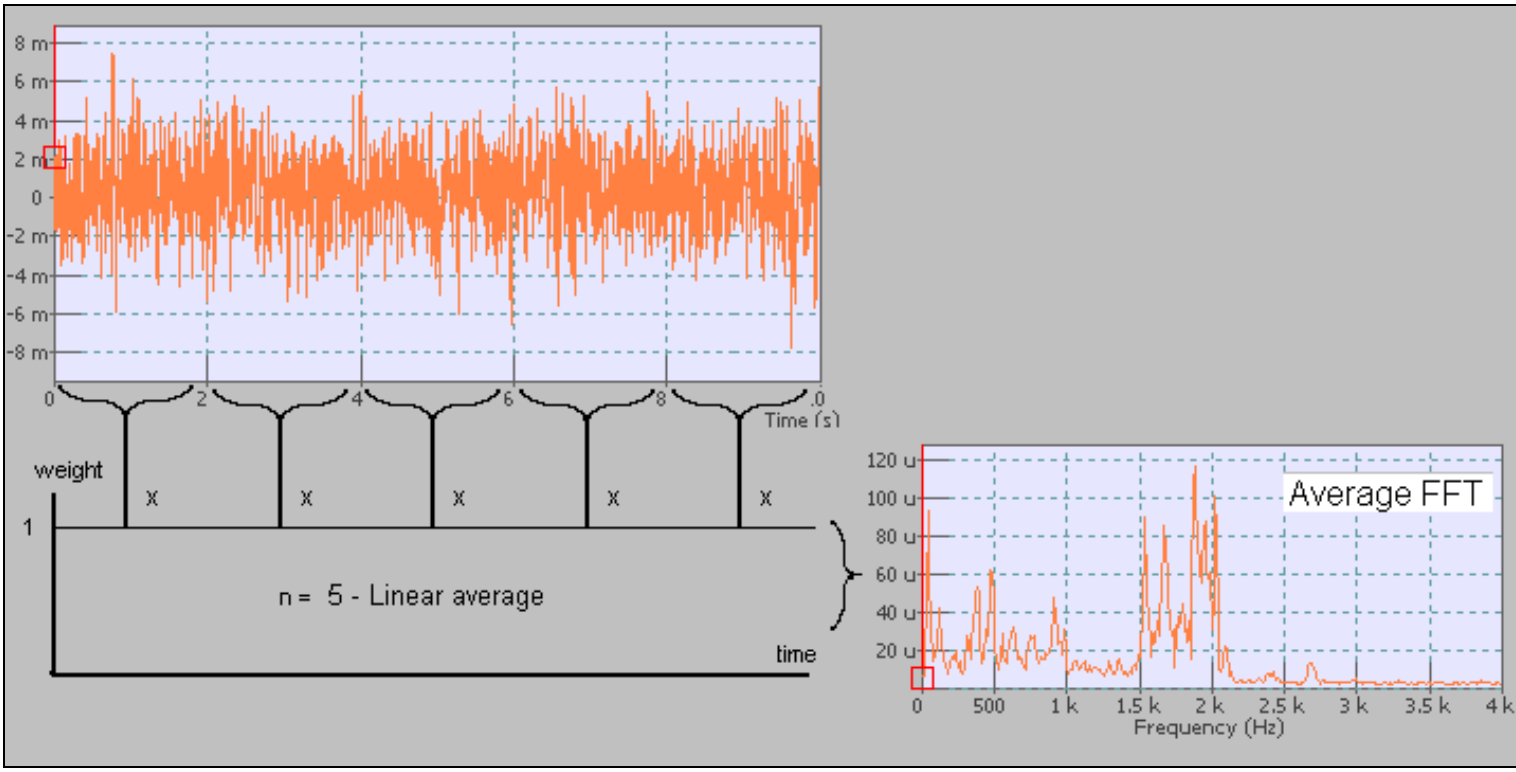
There is an additional average type named **Frequency Synchronous** or **FDSA.** This is based on Frequency domain average but it acts as Time domain average. It uses one frequency line (specifies by user) as a phase reference, each FFT is recomputed so that the phase of this reference frequency is set to "0".

This allows to focus on a specific phenomena even if there is no trigger available to perform Time domain analysis.

184.1.2 Average Type

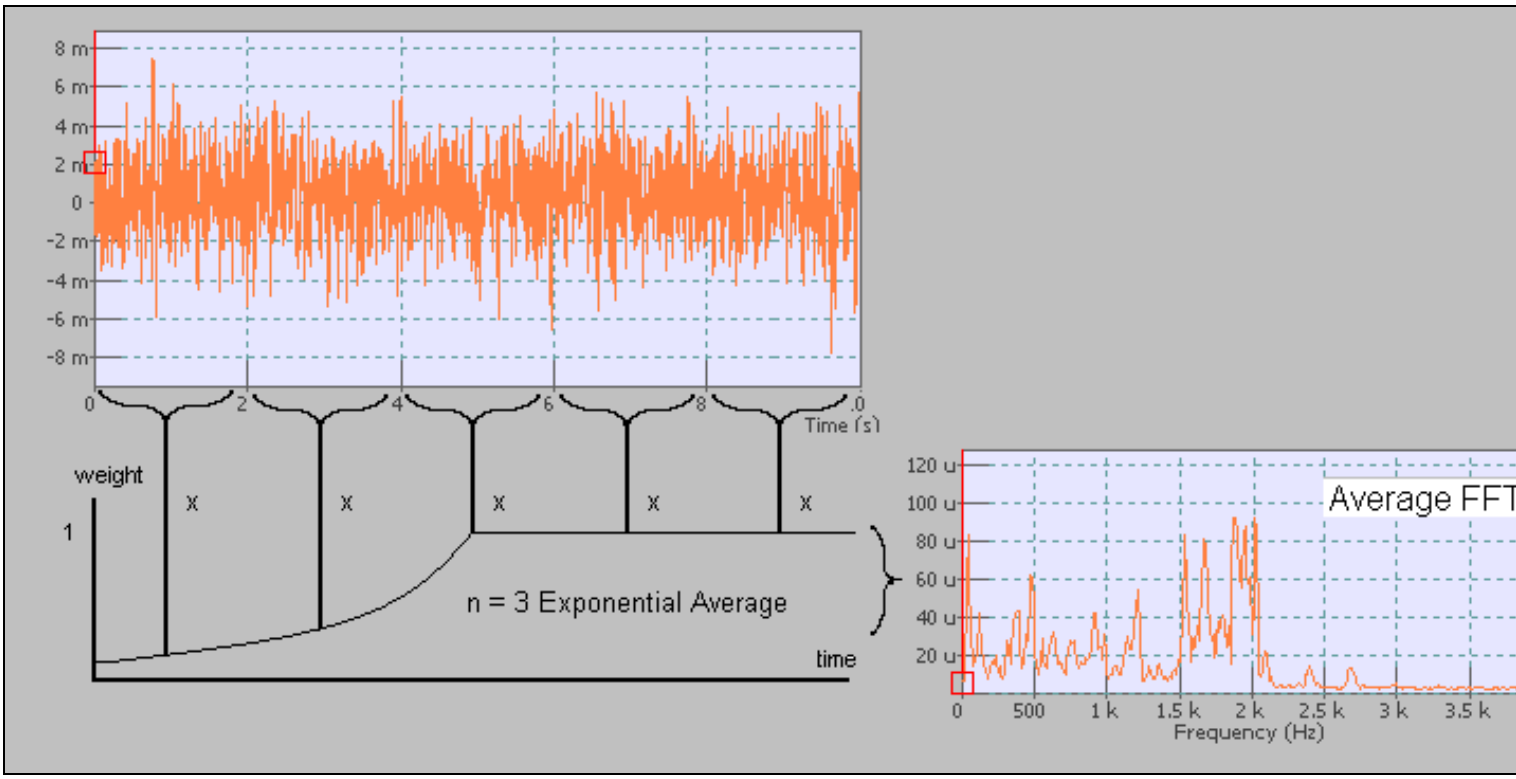
184.1.2.1 linear average

For the **linear average**, each "n" spectrum gets the same weight for the averaging. Its usually set for long time averaging result. The result is according the global level of energy for each narrow band during the duration of measurement.



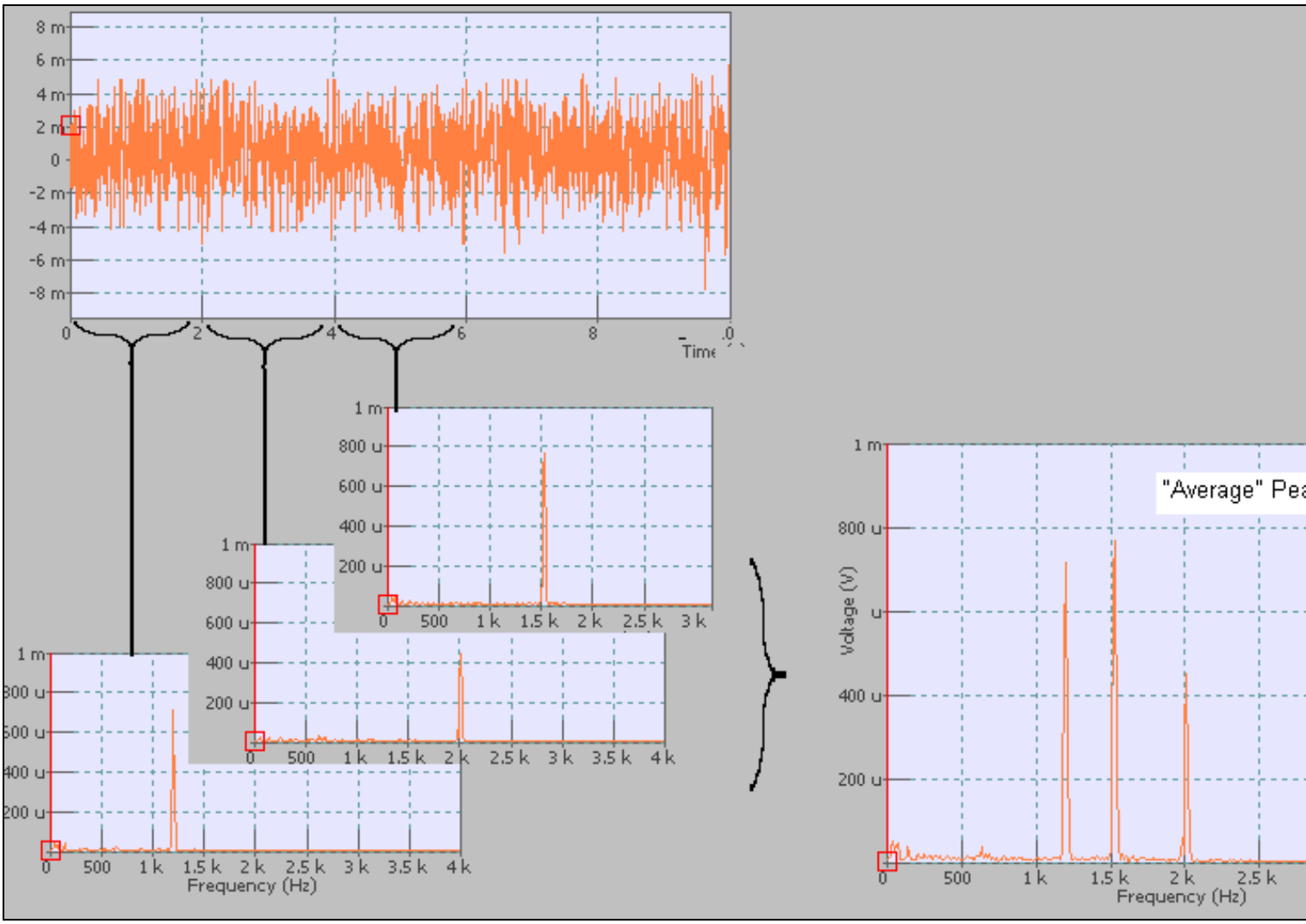
184.1.2.2 Exponential Average

The **Exponential Average** is computed with a linear average for the last "n" spectrums whereas older spectrum have a lower weight. Exponential averaging provides an infinite sliding result. This is commonly used with a low value of average. As it keeps the student variation in memory for a short time, this is a good setting for monitoring or tracking non-temporary phenomena.



184.1.2.3 Peak Hold average

The **Peak Hold average** is not a mathematical average. The peak hold provides a result that corresponds, at each band, for the maximal value of each the "n" spectrum. It is useful to get the maximal values as a worst case of measurement:


8 m
6 m
4 m
2 m
0
-2 m
-4 m
-6 m
-8 m
0
2
4
6
8
Time
1 m
800 u
600 u
400 u
200 u
0
500
1 k
1.5 k
2 k
2.5 k
3 k
3.5 k
4 k
Frequency (Hz)
"Average" Pea
Voltage (V)

184.1.2.4 Ref. Peak Hold average

In the same way the **Ref. Peak Hold average** is not a mathematical average.

It is basically the same feature as the Peak Hold average. The main difference is that it collects and holds the data of the spectrum according to a new peak on the reference channel.

This technique is used for some modal tests with a shaker excitation to reject non-linear phenomena. In this case, the Ref. Peak Hold average is used as a tracking filter linked with excitation frequency.

We advice to read ref peak hold averaging on FFT page for more info.

185 Wifi operation

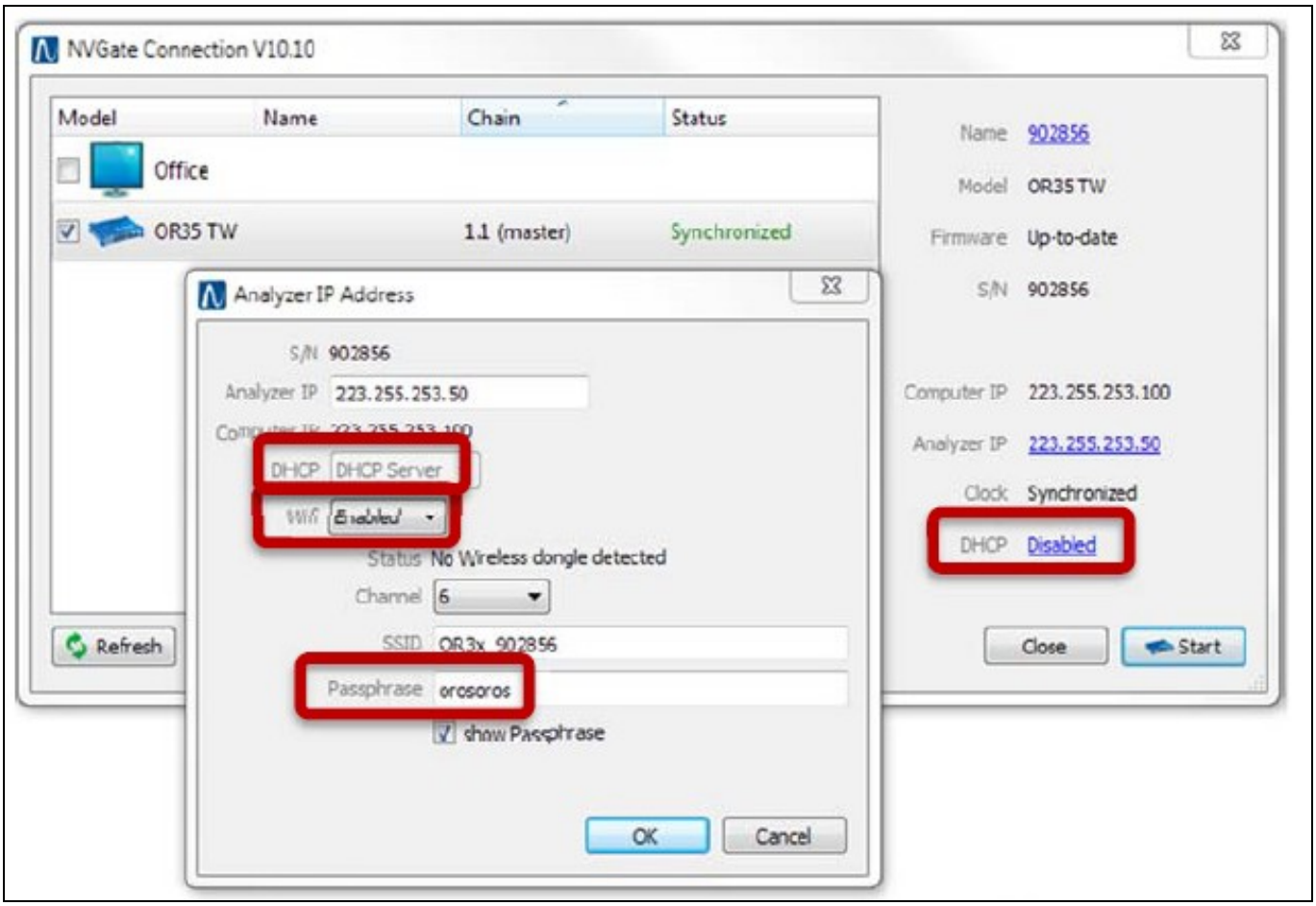
Wi-Fi operations

Hardware: OR3X TW

Software NVGate : V10 - V11 - V2021 or more (incompatibility with NVgate V12)

All Teamwork instruments support Wi-Fi operation . It is necessary to purchase the Wi-Fi dongle (ORNV-WIF-D) form OROS. Wi-Fi operation is not compatible with other Wi-Fi dongles type. The analyzer must be configured once prior to access it through Wi-Fi.

Process



1. Connect your PC to the analyzer with the Ethernet cable.

2. From the Connection dialog.

3. Select DHCP server

4. Enable the Wi-Fi.

5. Enter the password and click on Ok (default password is : "12345678" (... or "orosoros")

6. Plug the Wi-Fi dongle to the USB port on the back plane of the analyzer and restart the analyzer

7. Check your PC's Wi-Fi configuration application: The configured analyzer SSID should appear.



8. Connect to the Analyzer by Wi-Fi: use the configured pass-phrase.



9. Unplug the network cable BEFORE you launch NVGate

10. Launch NVGate

11. In the startup screen NVGate connection the analyzer is available for running NVGate through Wi-Fi

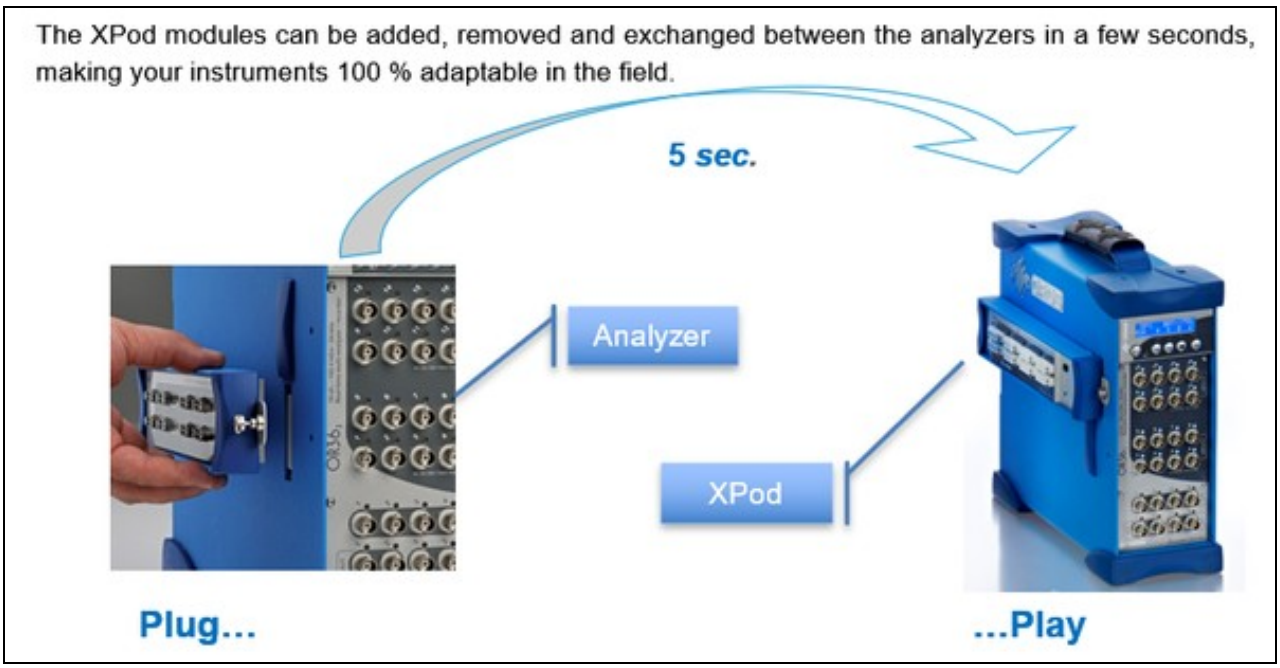
186 XPod Bridge - Strain gauge

OROS analyzers feature optional XPod Wheatstone bridge conditioner.



186.1 Expander modules

The XPod is a device that can be fixed on OR3X TW analyzer. Each XPod is associated to a block of 8 inputs.



In the connected mode, when and XPod is present each corresponding input can be routed to:

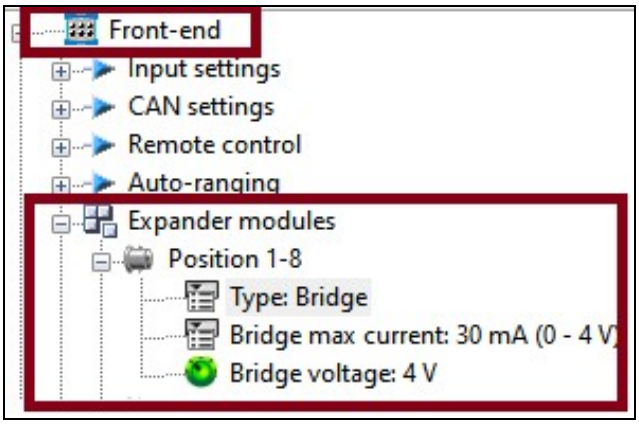
· The BNC input (Standard)

· The XPod connector

186.1.1 General Xpod settings

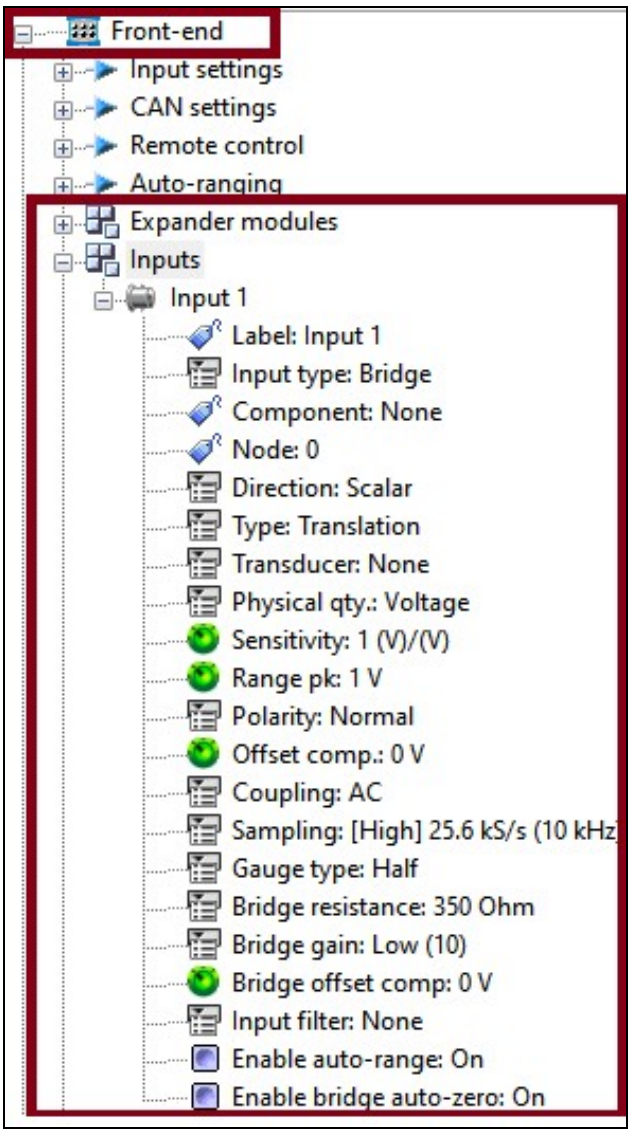
- **Type**: For acquisition setup preparation, the XPod presence can be simulated in the office mode:

One XPod type selector is available for each XPod position.



- **Bridge max current**: Select the max excitation current for the corresponding active Bridge Xpod. Each bridge Xpod excitation current can be limited to 30 mA up to 4 V and 12 mA up to 10 V.
- **Bridge voltage**: Select the excitation voltage for the corresponding active Bridge Xpod. From 0 to 10 V.

186.1.2 Input settings



For each input, you can select the following options dedidctaed for Xpod gauge:

- **Type:** bridge signal conditioning for strain gauge.
- **Gauge type**: Full, Half or Quarter bridge mount. The completion resistors are included in the Xpod.
- **Resistance**: Bridge completion resistor: 120 or 350 Ohms for quarter bridge mount.
- **Gain**: Bridge gain: 10 or 100 depending on the required precision and range.
- **Max current**: the provided current can be limited to 30 mA up to 4 V and 12 mA up to 10 V.
- **Excitation voltage**: Each Xpod provides an excitation voltage from 0 to 10 V.
- **Offset Comp.**: Bridge offset comp: Can be used for manual balance of the bridge.

186.2 Connection

The Xpods feature 8 connectors on the side of the analyzer. The connectors correspond to the front-end channels located at the Xpod level by set of 8.

CORRESPONDANCE TABLE

XPod connectors	Corresponding input	Analyzer front-end (BNC)			
		Slot 1-8	Slot 9-16	Slot 17-24	Slot 25-32
A	↔	1	9	17	25
B	↔	2	10	18	26
C	↔	3	11	19	27
D	↔	4	12	20	28
E	↔	5	13	21	29
F	↔	6	14	22	30
G	↔	7	15	23	31
H	↔	8	16	24	32

186.2.1 Type

The bridge conditioner XPod is delivered with its own connector + a connection kit with the following characteristics:

On the Xpod - Sub-D 9 pin - Female

Connector kit - Sub-D 9 pin - Male - Screwed connector bloc - Removable metal cover

186.2.2 Cables

We recommend using the following cable characteristics for wiring a strain gauge:

- Twisted pairs

- 6 wires

- Independent ground shields for each pair

186.2.3 Connectors Pinout

CONNECTORS PINOUT



Figure 1 - Bridge conditioner connector - Top view

PIN DESCRIPTION

Pin #	Signal name	Description
1	V +	Bridge excitation voltage - 0 to 4 V with 30 mA 4 to 10 V with 12 mA
2	IHBC	Internal ½ bridge center - 2 completion resistors - 1 kΩ each
3	In -	Negative differential input
4	S +	Bridge positive sensing (reserved for special application)
5	TEDS	Transducer electronic data sheet wire (reserved for future use)
6	GND	Ground
7	In +	Positive differential input
8	IQBC	Internal ¼ bridge center – 1 completion resistor - 120 Ω or 350 Ω
9	S -	Bridge negative sensing (reserved for special application)

186.2.4 Bridge connection

186.2.4.1 Quarter bridge

QUARTER BRIDGE

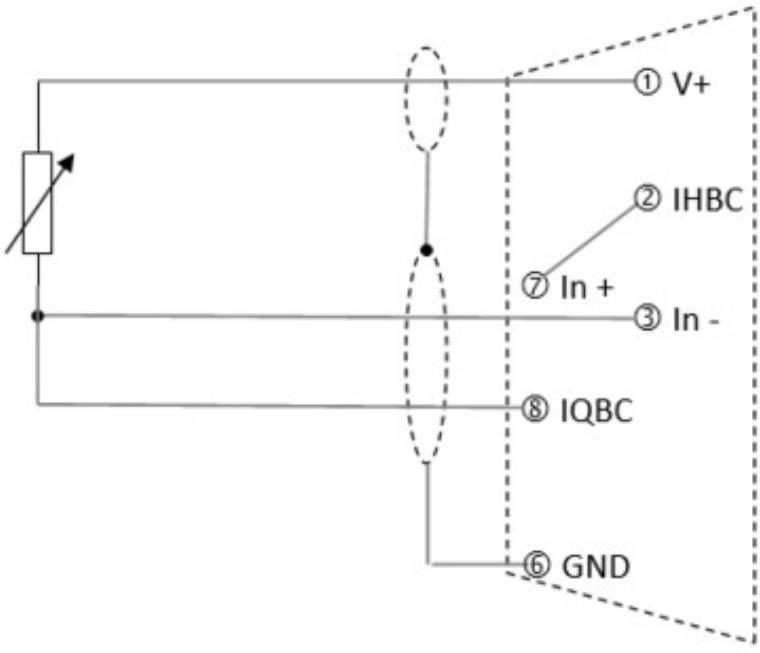
This mounting type is the simplest as only one resistor has to be installed. This simplicity is paid on the Metrologic side.

Pros:

- Easy to install
- Not expensive
- Low price.

Cons:

- Sensitive to temperature
- Sensitive to wire length and resistance in 2 wire cabling
- Lower sensitivity
- For short cable only (< few meters)



186.2.4.2 Half bridge

HALF BRIDGE

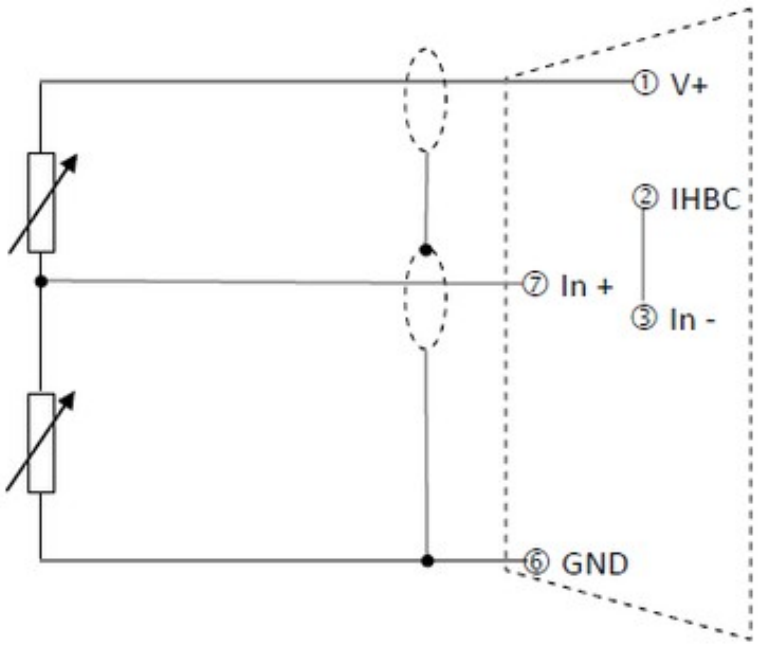
The half bridge mounting presents the compromise with interest from both ¼ and full bridge.

Pros:

- Easy to install (2 gauges),
- Temperature compensated,
- Good sensitivity with opposite resistors mounting,
- Static traction cancellation

Cons

- For short cable only (< few meters)



186.2.4.3 Full bridge

FULL BRIDGE

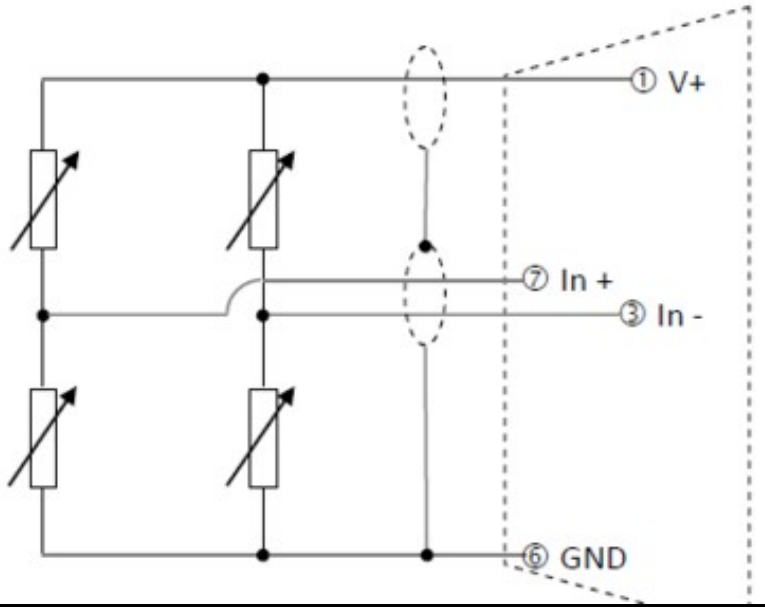
The full bridge mounting provide the most accurate and reliable results. On the other hand it not easy to assemble. Full bridges are almost mounted in pre-assembled force, pressure and torque transducers.

Pros:

- Temperature compensated,
- Very good sensitivity and accuracy

Cons:

- Complicated installation number of gauges, alignment.



186.2.5 download

Download : OROS BRIDGE CONDITIONERS XPOD? CONNECTIONS in .pdf

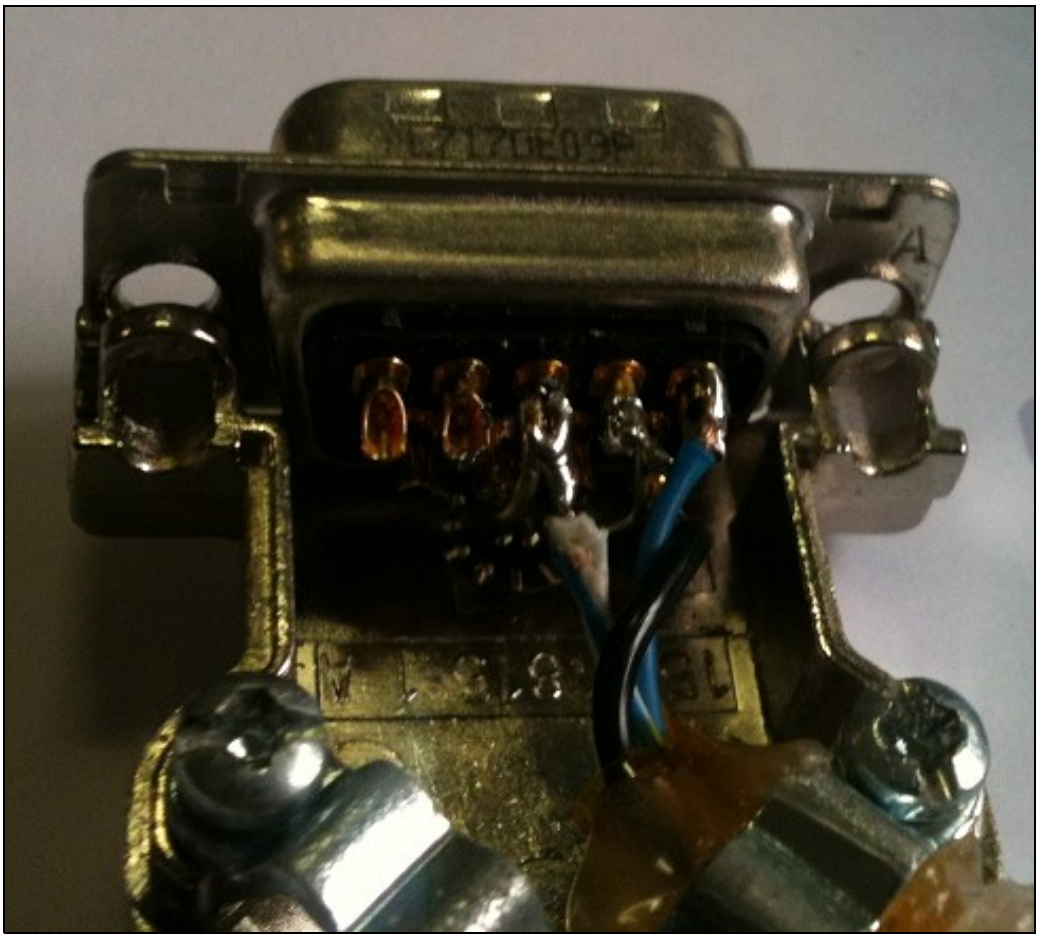
186.3 Tutorial: how to set up XPOD conditioners for strain gage

186.3.1 Hard Connection

Let us see how to proceed a half bridge connection.

Use a male SUB D 9 pins connector and a "bullet proof" cable like Ethernet cable to link the strain gauges to the connector.





Then solder the connector pins according to the pin-out diagram below:

CONNECTORS PINOUT



Figure 1 - Bridge conditioner connector - Top view

PIN DESCRIPTION

Pin #	Signal name	Description
1	V +	Bridge excitation voltage - 0 to 4 V with 30 mA 4 to 10 V with 12 mA
2	IHBC	Internal ½ bridge center - 2 completion resistors - 1 kΩ each
3	In -	Negative differential input
4	S +	Bridge positive sensing (reserved for special application)
5	TEDS	Transducer electronic data sheet wire (reserved for future use)
6	GND	Ground
7	In +	Positive differential input
8	IQBC	Internal ¼ bridge center – 1 completion resistor - 120 Ω or 350 Ω
9	S -	Bridge negative sensing (reserved for special application)

QUARTER BRIDGE

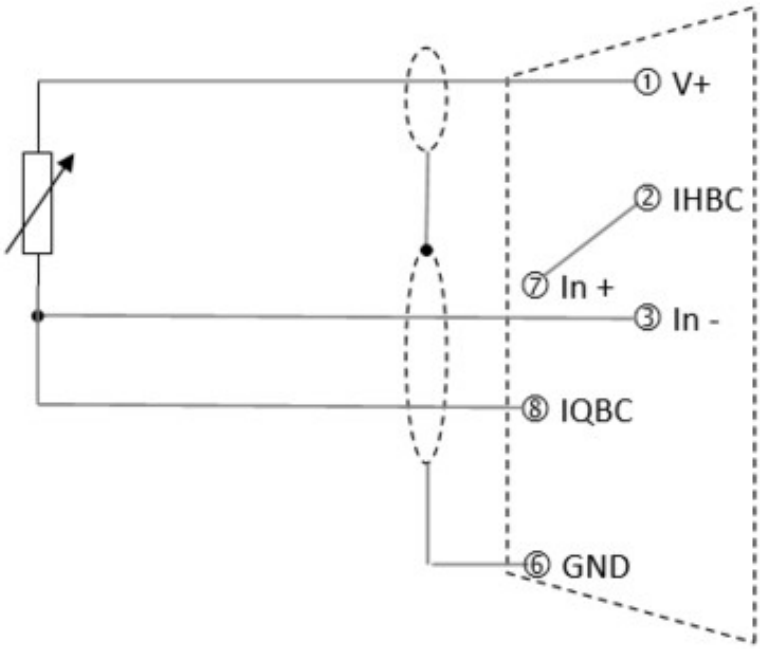
This mounting type is the simplest as only one resistor has to be installed. This simplicity is paid on the Metrologic side.

Pros:

- Easy to install
- Not expensive
- Low price.

Cons:

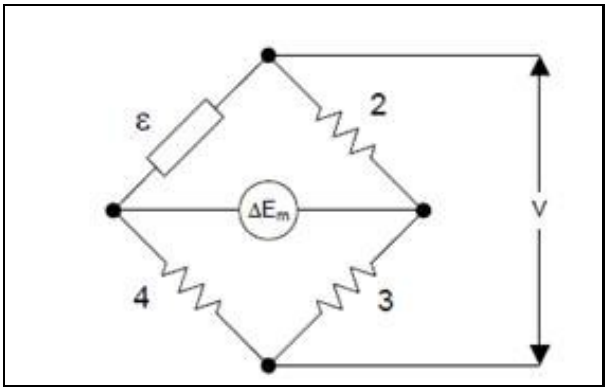
- Sensitive to temperature
- Sensitive to wire length and resistance in 2 wire cabling
- Lower sensitivity
- For short cable only (< few meters)



186.3.2 Set up NVGate

186.3.2.1 Sensitivity

In quarter bridge configuration, the gauge is usually glued toward the beam direction to measure the bending for example. In this case the right formula is



$$\frac{\Delta E_m}{V} = \frac{S_G \cdot \varepsilon}{4} \frac{2}{(2 + S_G \cdot \varepsilon)}$$

Where

- S = ?Em/V is the sensitivity (*V / µdef)
- e , 2, 3 et 4 are the resistivity of the gauge or generated by the hardware depending on the type of the

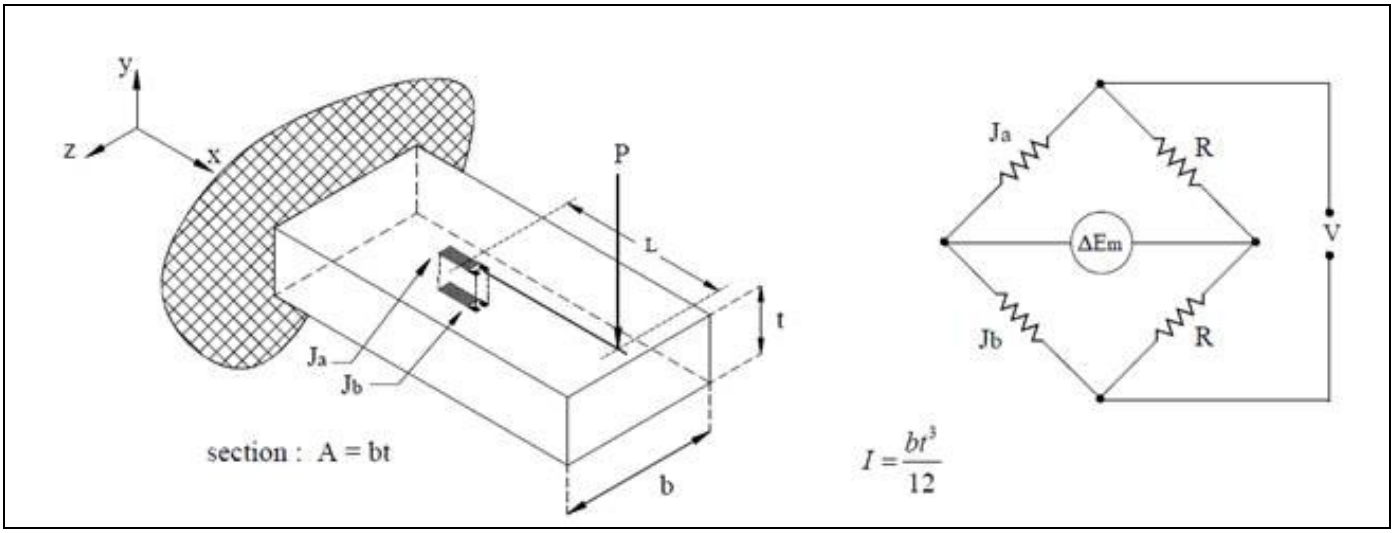
bridge.Here, 2, 3 and 4 are XPOD internal resistors

- V, the excitation voltage (in NVGate, the settings is "Expender module/Bridge voltage")
- ?Em, the strain measurement voltage
- r, equal to R1/R4=R2/R3 often equal to 1.
- Sg is the gauge factor (often equal to 2 x 1E-06 volts per micro-def
- n, the number of gauges (For full bridge, it?s 4. For ¼ bridge it?s 1.)

You can notice that the sensitivity is not linear with the stress ? = ?L/L. For low strain, the formula is equivalent to:

$$\frac{\Delta E_m}{V} = \frac{S_G \cdot \varepsilon}{4}$$

For a half-bridge configuration, it is possible to glue 2 gauges toward the beam direction as shown in the figure below:



In this case, the sensitivity is linear and is equal to:

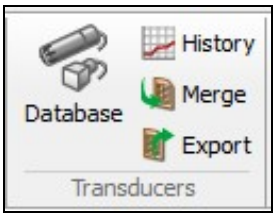
$$\frac{\Delta E_m}{V} = \frac{S_G \cdot \varepsilon}{2}$$

So the fact that 2 gauges are used instead of only one gets the bridge sensitivity twice better.

186.3.2.2 NVGate setup

It is advised to first add a "transducer" in NVGate database in order to register the bridge configuration.

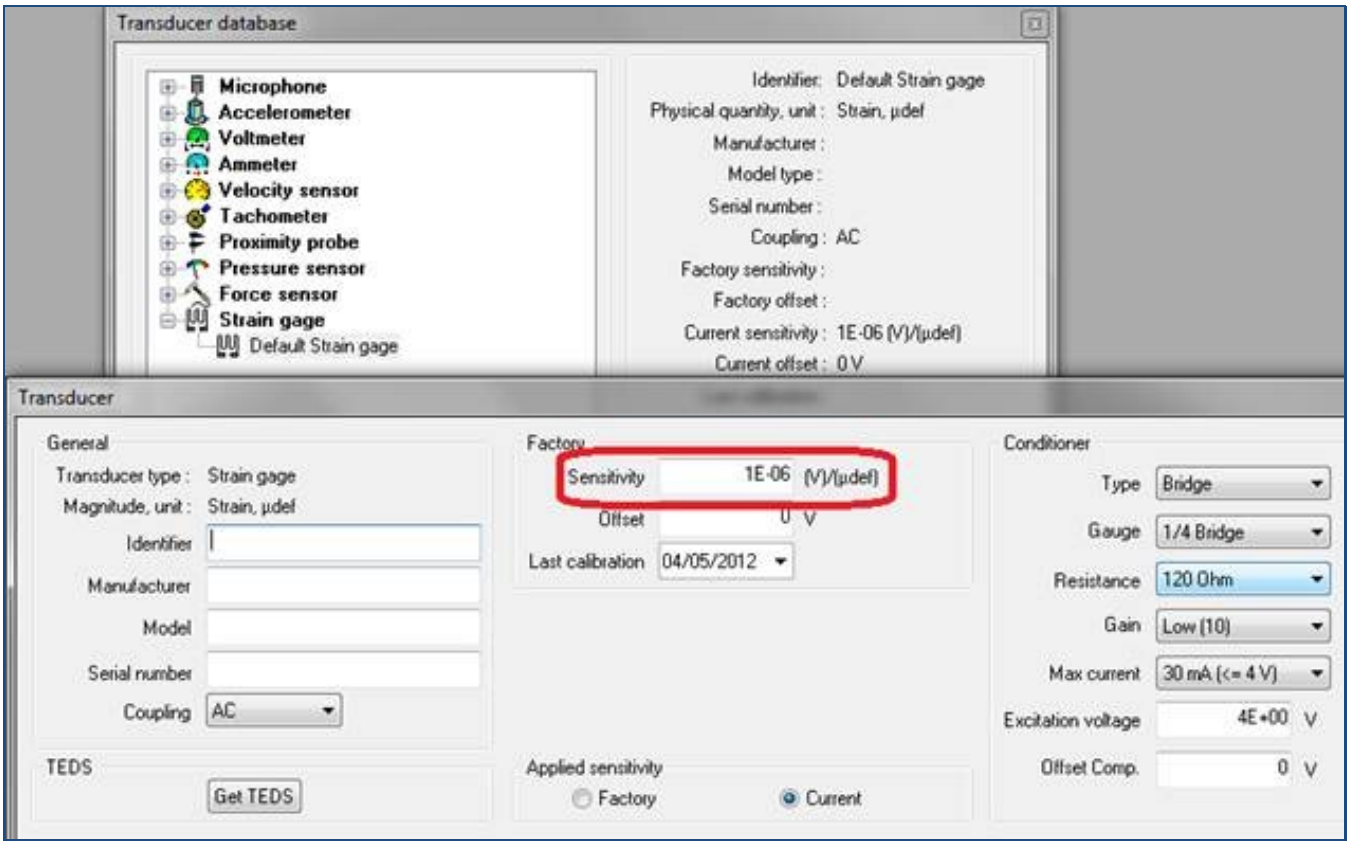
Browse *the Home menu > Transducer tab > Database*



Add a new transducer which is in fact a bridge configuration.

In the *Conditioner* area, fill the Gauge bridge type, the gauge resistance, the excitation voltage and so on.

The sensitivity to be filled is the bridge?s one (in red below). So, it is necessary to compute this sensitivity according to the above formula.

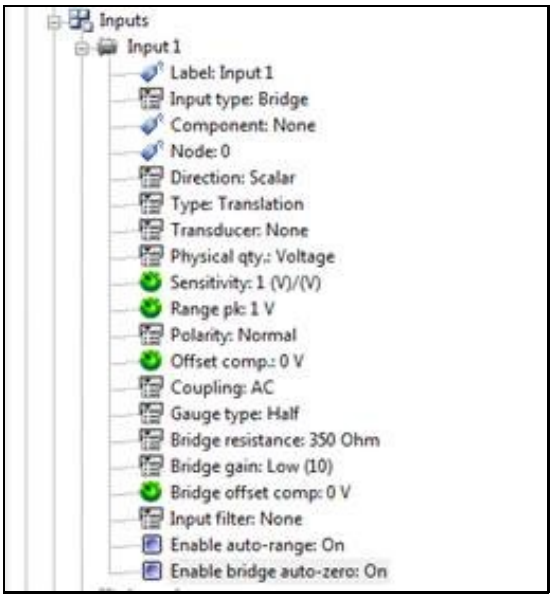


186.3.2.3 Measurement

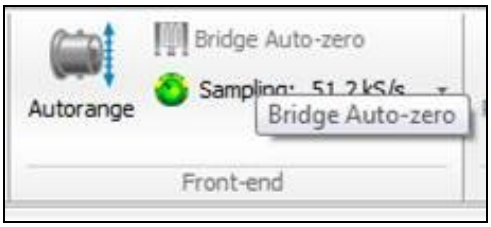
The XPOD contains 8 inputs. In case of XPOD connection, the 8 BNC inputs are disabled for using the XPOD inputs.

These XPOD inputs can be connected to different plug-ins like FFT or Time domain analyzer for example.

Then the bridge has to be balanced through the Bridge Auto-zero feature (this option has to be setup to ON in the Input settings).



Press on « Bridge Auto-zero » from the "measurement" tab to start the bridge balancing. This step may last about 30 seconds.



Now, the measurement is ready to start.

186.4 Compute main stress with rosette

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