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1 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".

2 NVGate Can BUS

2.1 CAN Bus

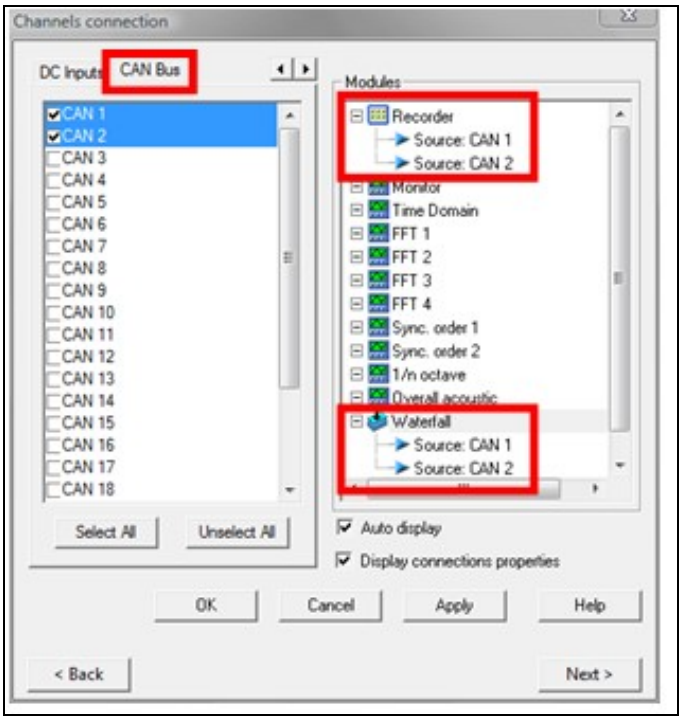
Car Area Network (CAN) bus is great source of data easily collected into vehicles, jet engines and power generation machineries. This Network provides real-time parameters that can be used to correlate measurements and/or evaluate their influence. As an example, the correlation of noise and vibration 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.

2.1.1 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.

2.1.2 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.

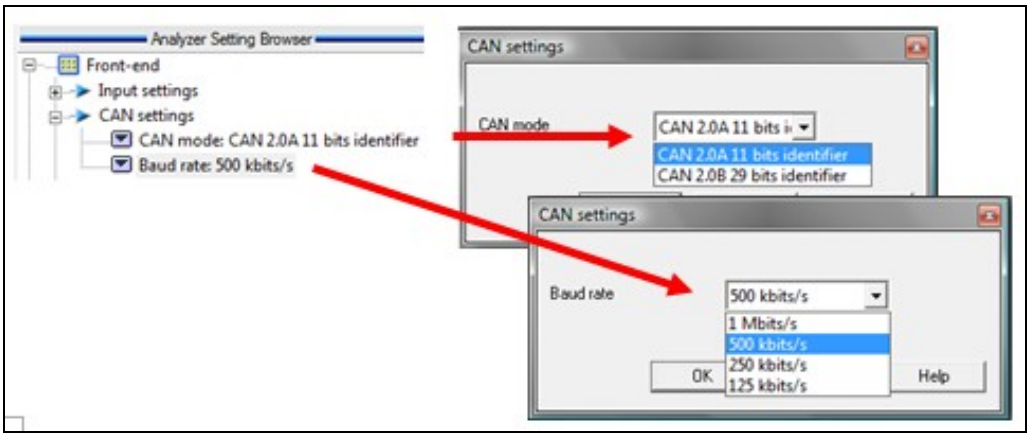
CAN parameters configurations are saved in a model, workbook or project and are easily recalled for further utilization.

2.1.3 Can-Bus general Settings

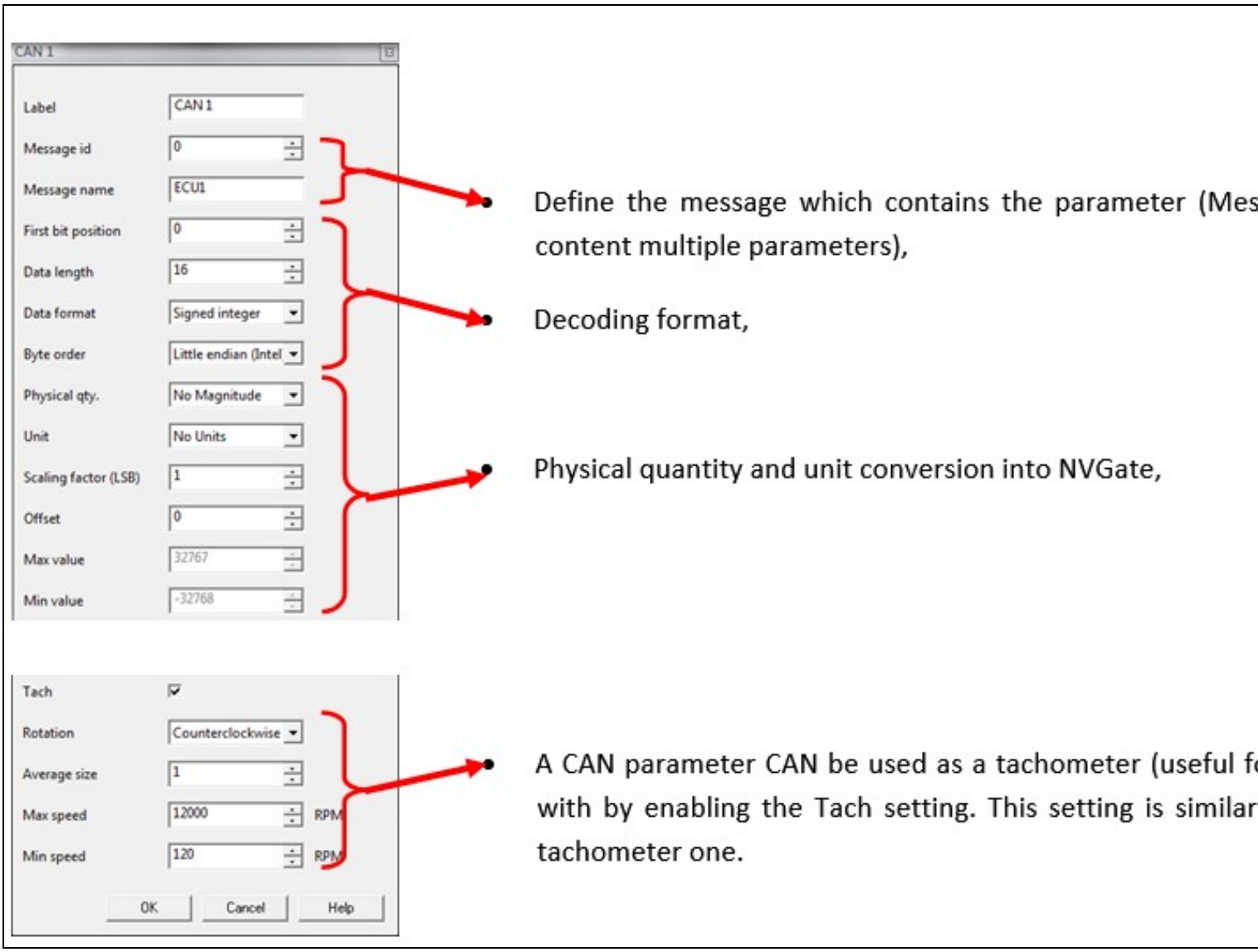
When connected to a CAN-bus the parameter encoding has to be setup in the software allowing their collection by the hardware.

- **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.

2.1.4 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.

2.1.5 import .dbc file

*We are able to **import CanBus .dbc file** to automatically import the settings. Read this page.*

3 NVGate Connection Wizard

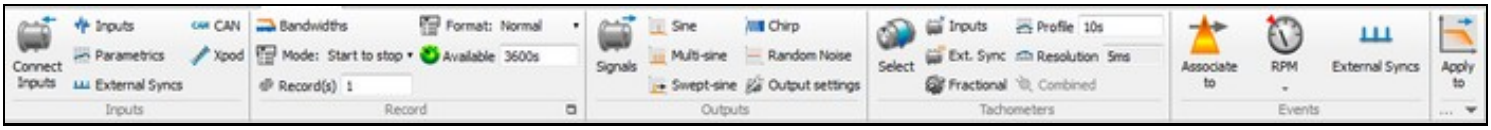
3.1 Connection wizards

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:

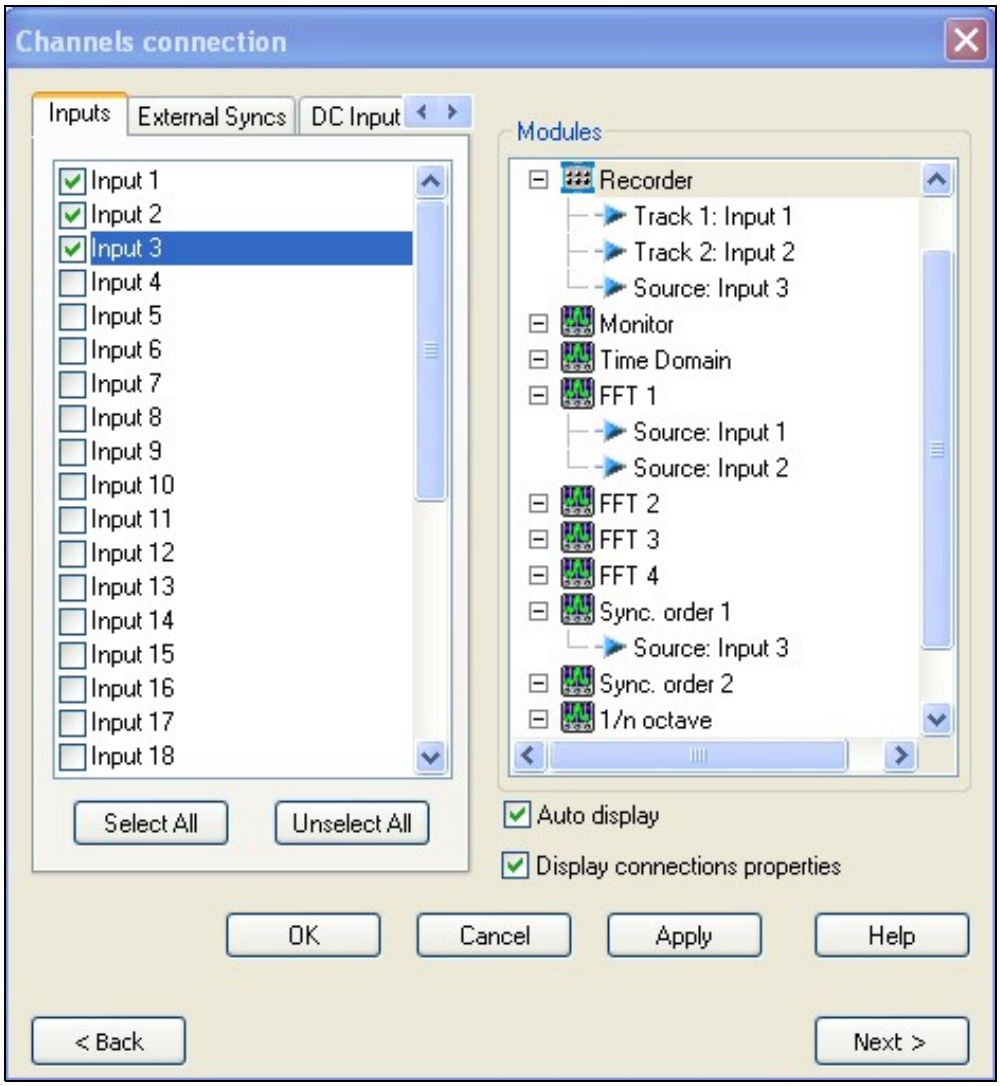


The contextual menu of the "collections" of entries from the ASB

3.1.1 Inputs

3.1.1.1 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.

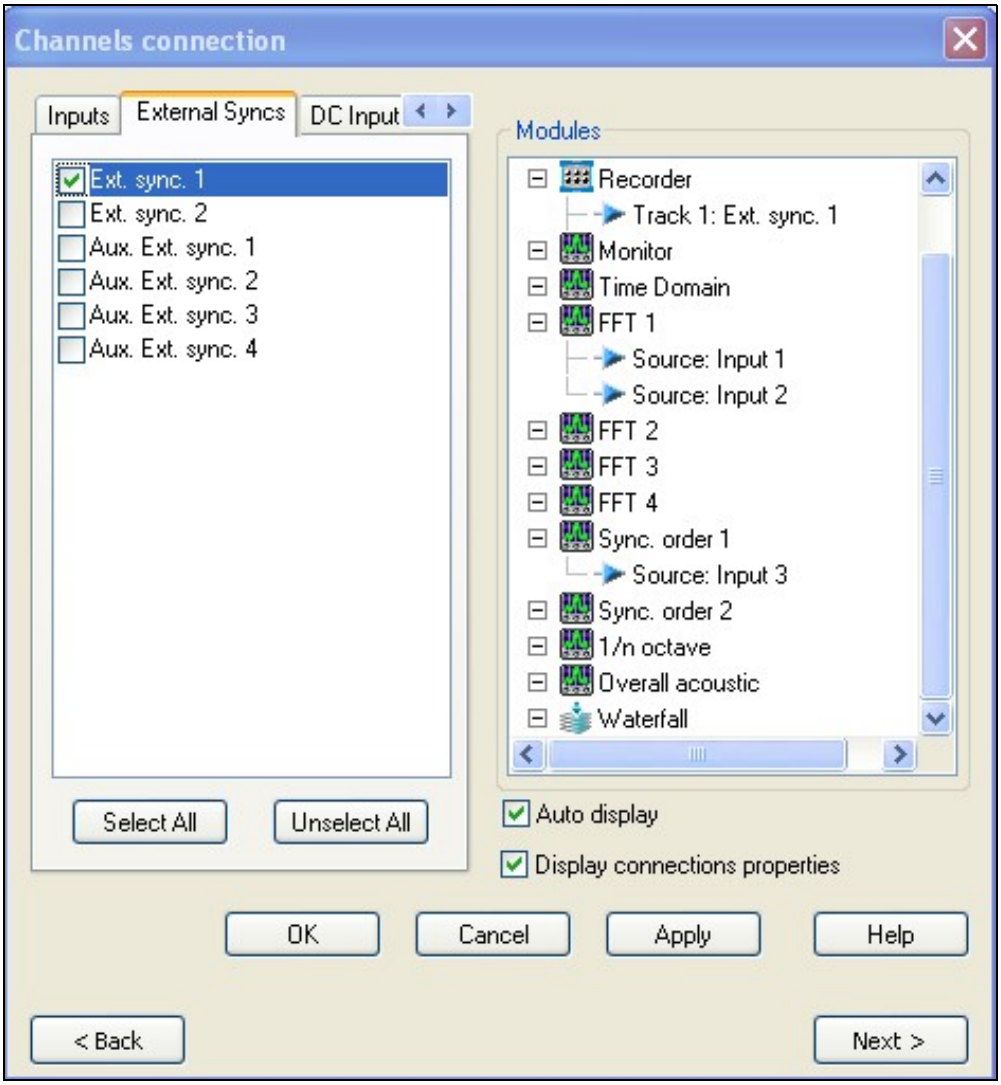

Channels connection
Inputs
External Syncs
DC Input
Input 1
Input 2
Input 3
Input 4
Input 5
Input 6
Input 7
Input 8
Input 9
Input 10
Input 11
Input 12
Input 13
Input 14
Input 15
Input 16
Input 17
Input 18
Select All
Unselect All
Modules
Recorder
Track 1: Input 1
Track 2: Input 2
Source: Input 3
Monitor
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.

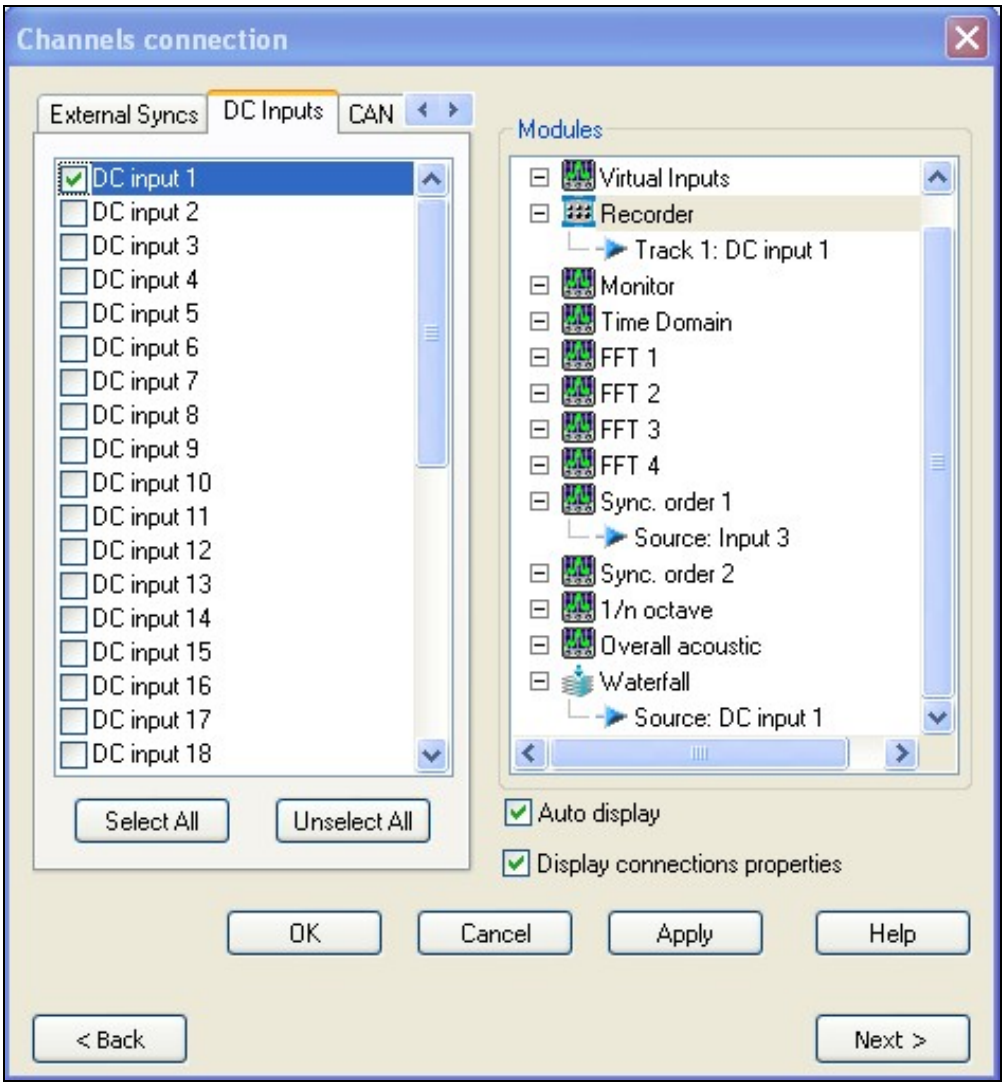
3.1.1.1.1 External Syncs

In the same way, the selected External Syncs could be connected to the recorder.



3.1.1.1.1.1 DC Inputs

Using drag & drop, connect the selected Inputs to the Recorder and/or to the waterfall.



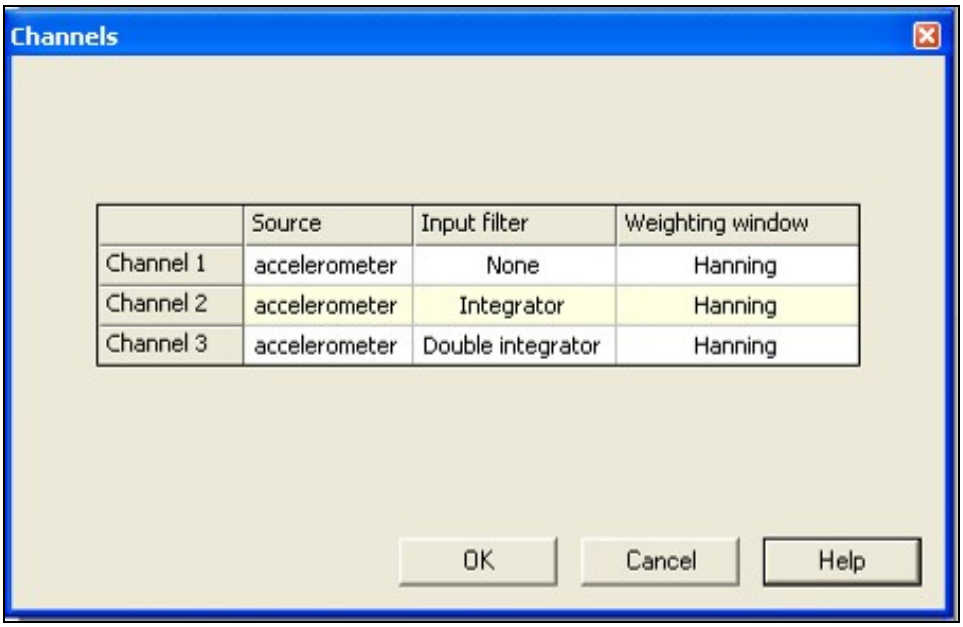
At any time you can add or remove the channel you selected in a plug-in analyzer by right clicking on it and by selecting remove. You have also the opportunity to **select** or **unselect all** channels.

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.

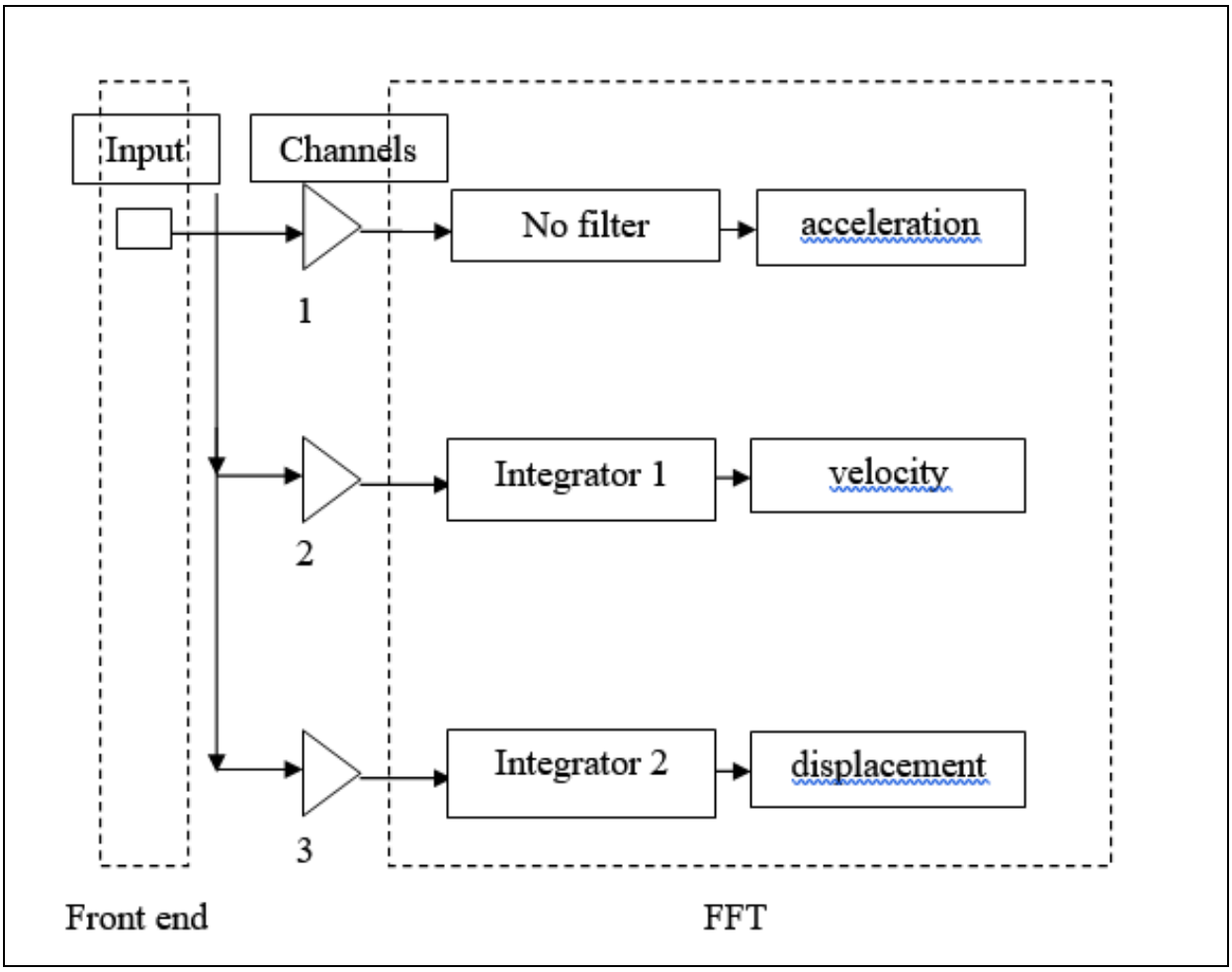
Example:



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.

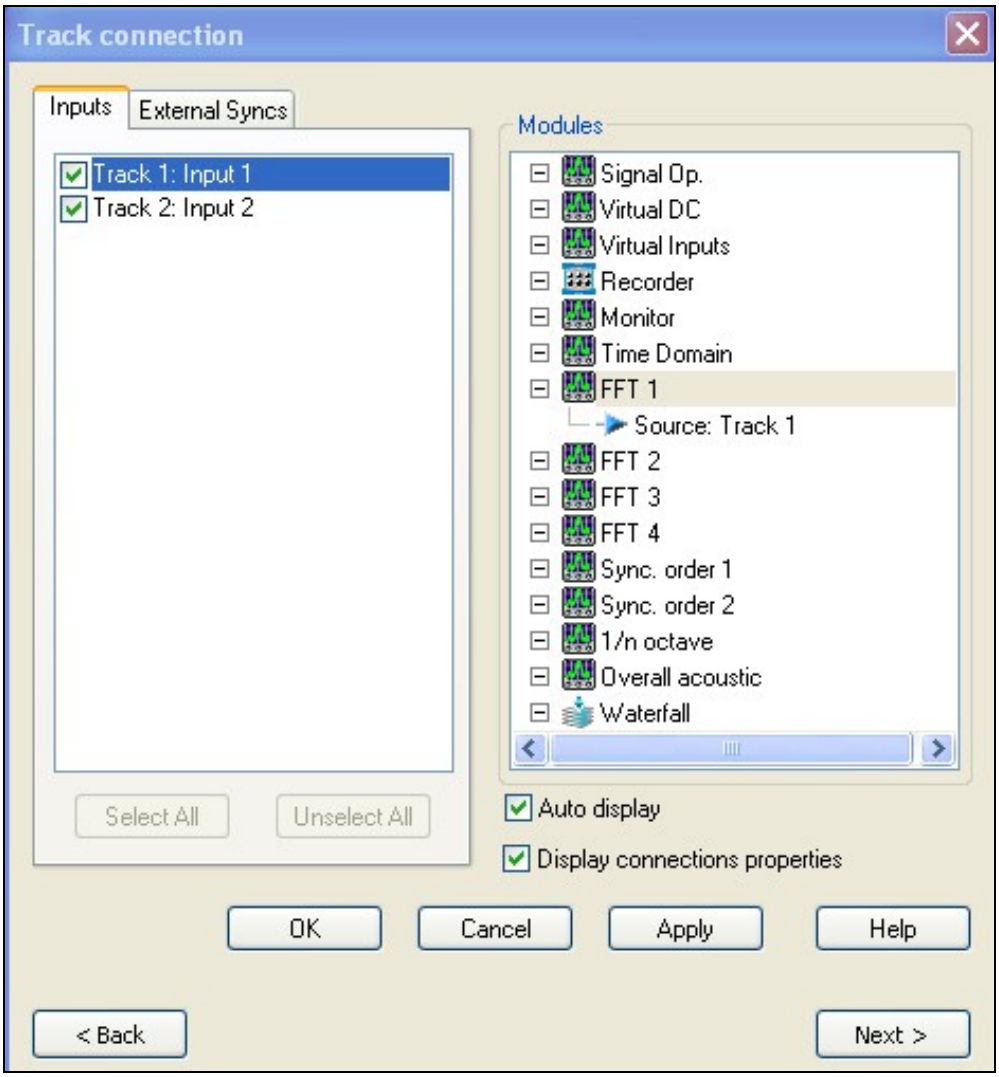
During Order Analysis, you can track up to 8 orders by channel, but you can put up to 8 channels by input. That means for 2 inputs you can track 16 orders and so on.


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.

3.1.1.1.2 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



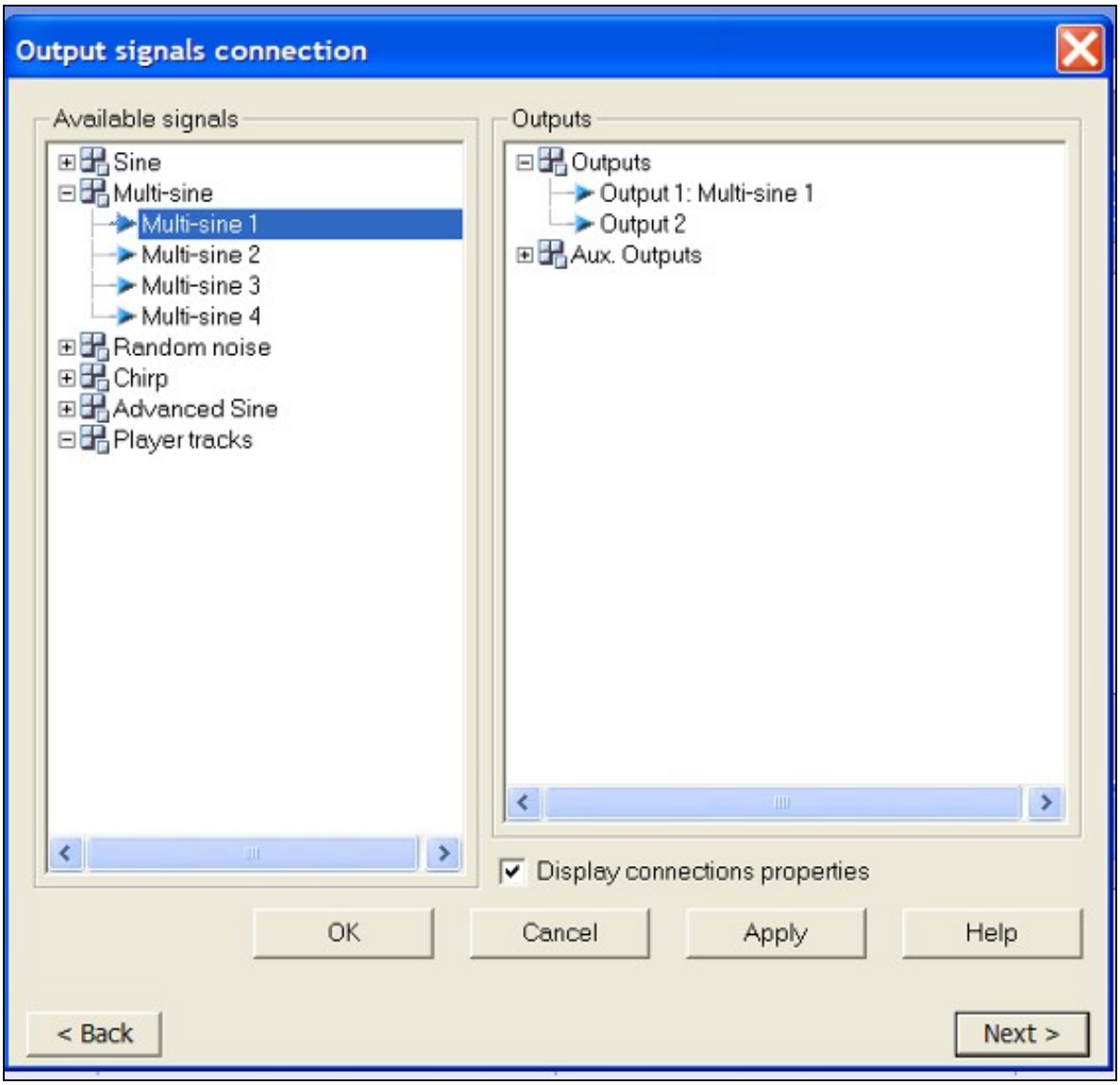
Used to activate or remove one or several tracks and connect or disconnect them to or from one or several analyzers. Player tracks connection dialog is only available in Post analysis mode.

- **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.

3.1.1.1.3 Outputs

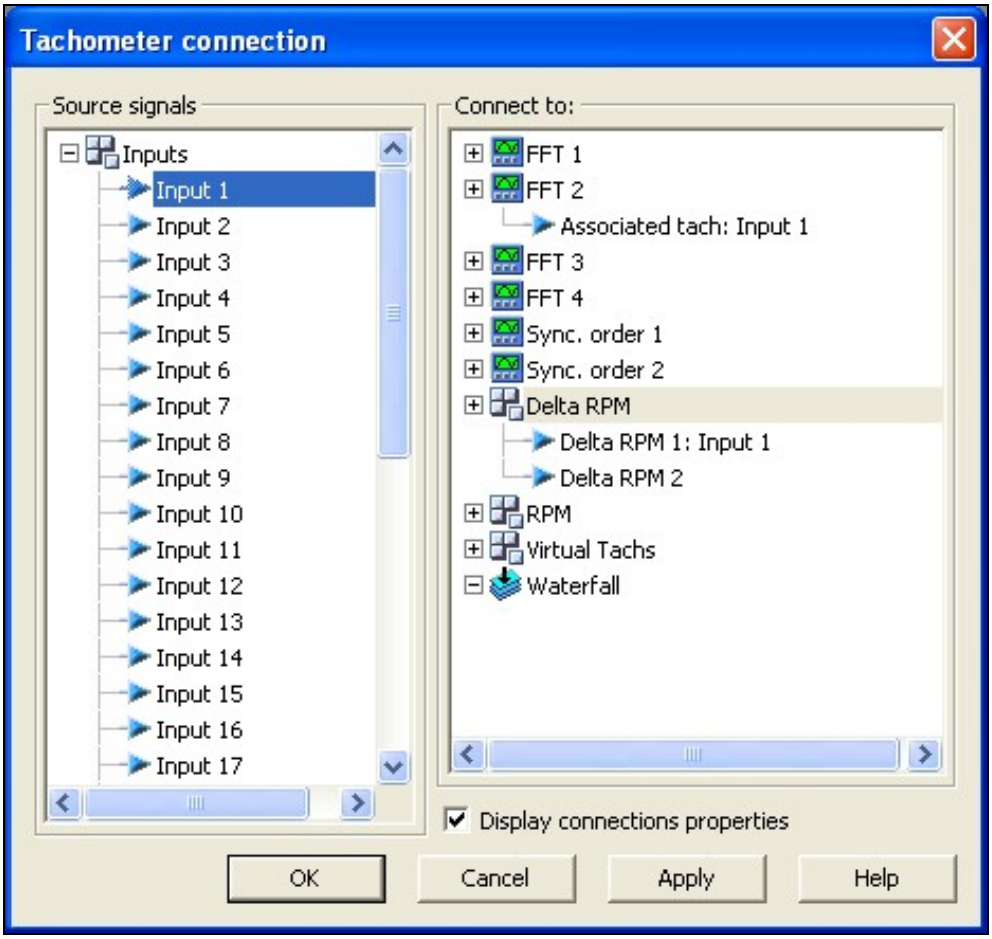
To connect output signals on *outputs* or *Aux. outputs* simply drag and drop available signals on outputs.



Properties of all connected signals and outputs will be displayed and available to modify in the following window.

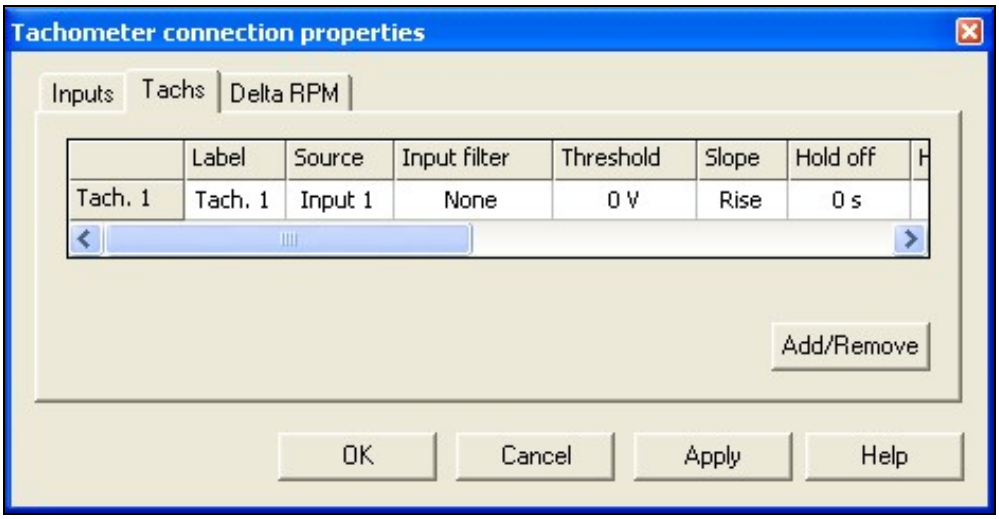
3.1.1.1.4 Tachometer

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.

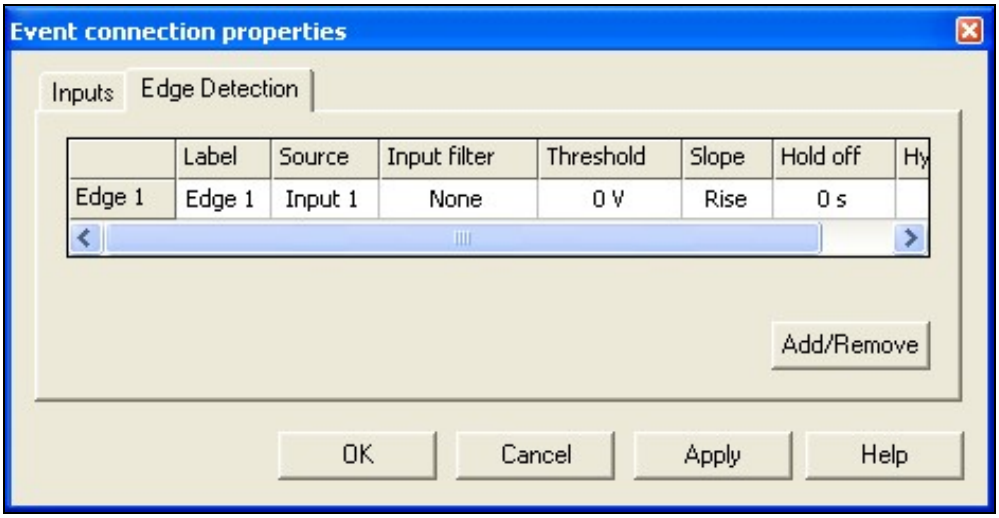
Properties of all connected inputs, tachometers and delta RPM will be displayed and available to modify in the following window.



3.1.1.1.5 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.

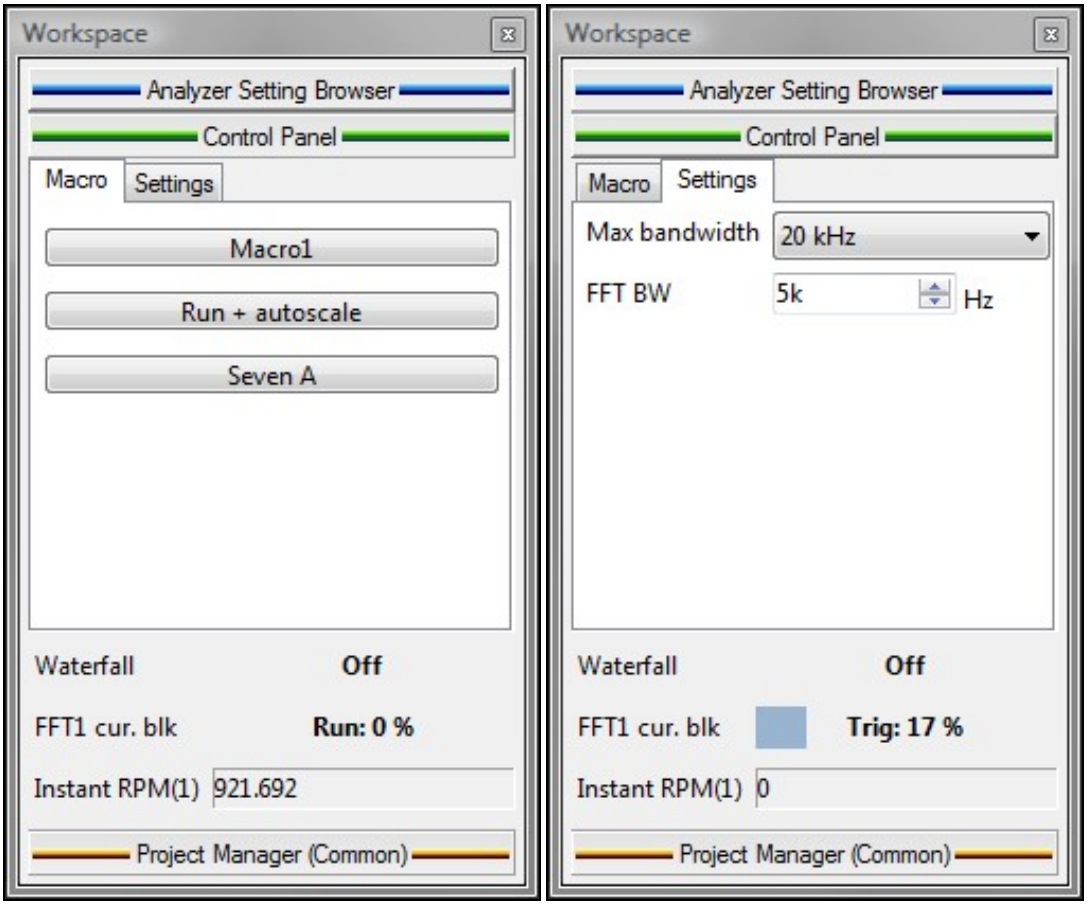
4 NVGate Control Panel

4.1 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.

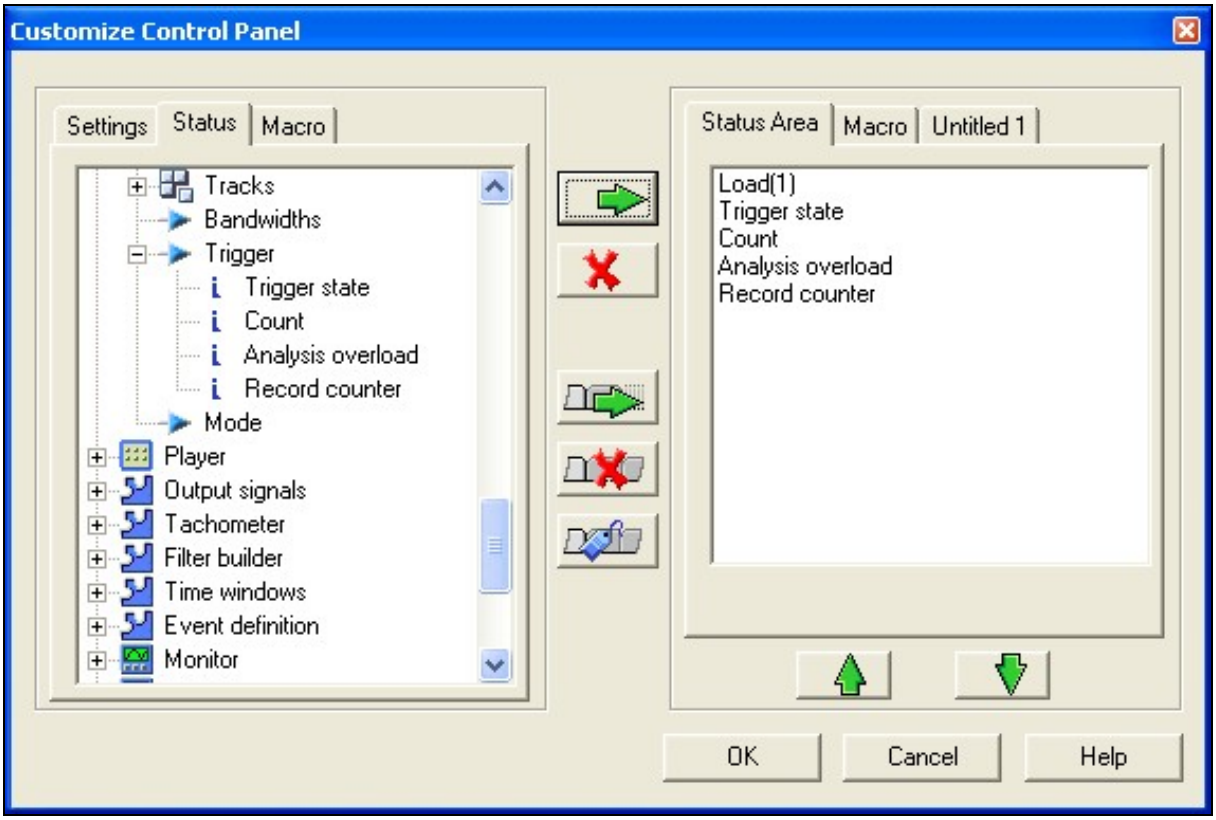
4.1.1 Tabs



- **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.

4.1.1.1 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.

5 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.

5.1 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,

5.1.1 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.

5.1.1.1 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.

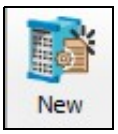
For D, E, and F, the inputs modification can be applied to a group of inputs. In the first menu set the inputs you want to change to Y (or set All to Y to modify all inputs simultaneously). Then set the coupling or range for example. It will apply to all the selected channels.

5.1.2 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.

5.1.2.1 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

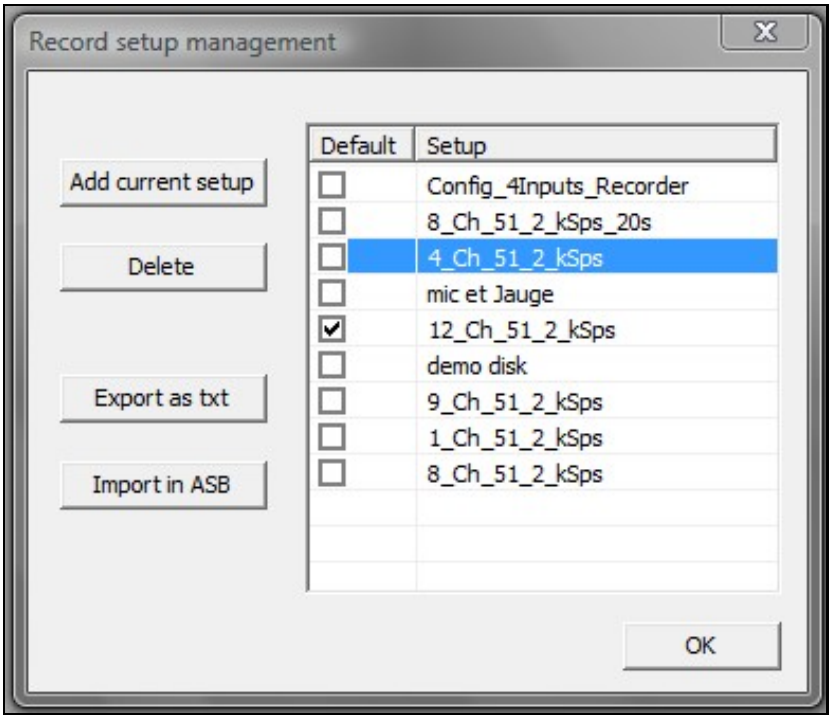
3. Recorder properties

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.

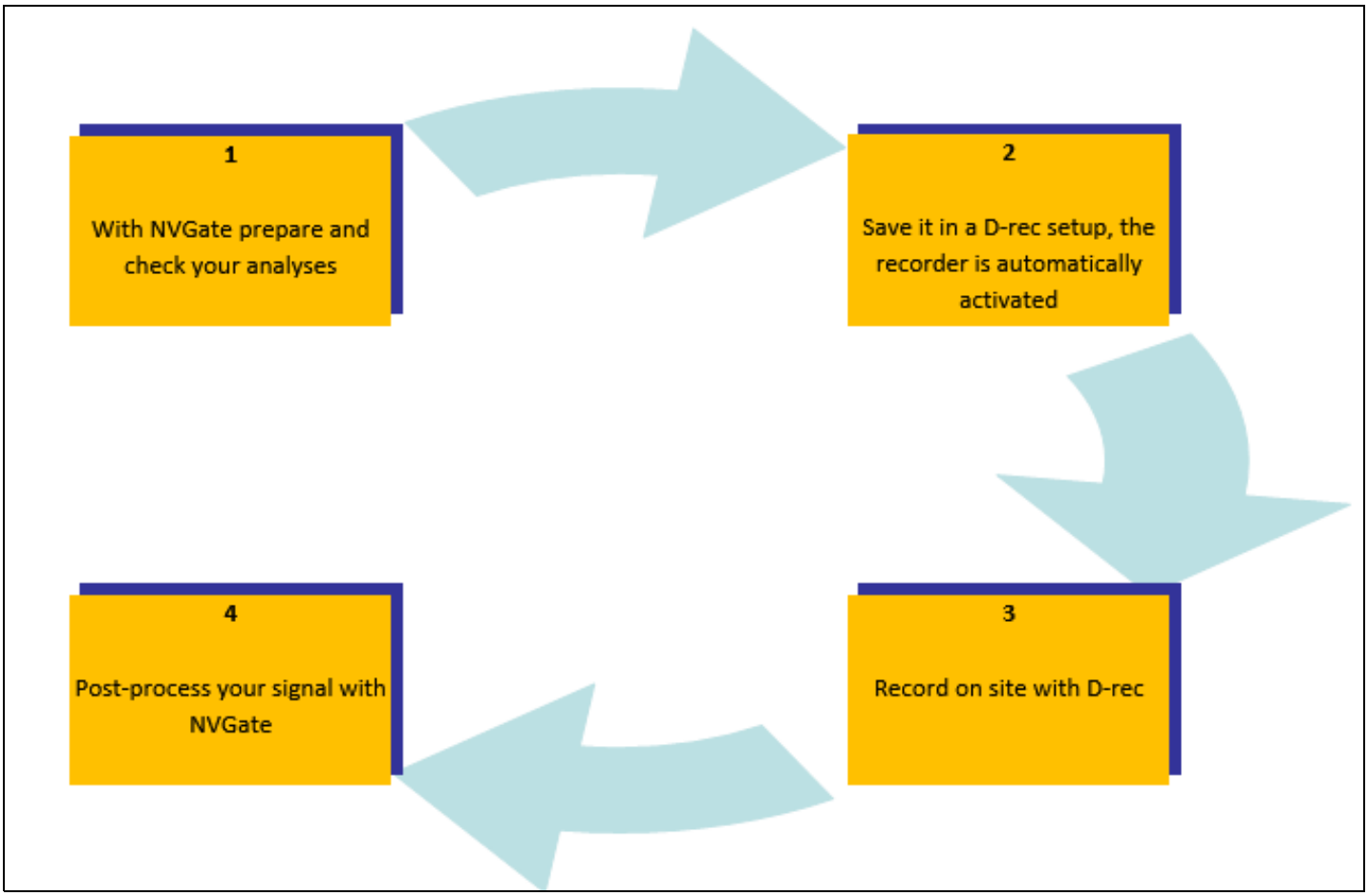
Each setup can be exported in text file to be used as a trace of the D-rec settings when using it on-site. Of course it is possible to control the front-end and recorder settings with the LCD menus, but a paper sheet or file overview is more comfortable to install the transducers and cables. To create 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.

5.1.2.2 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.

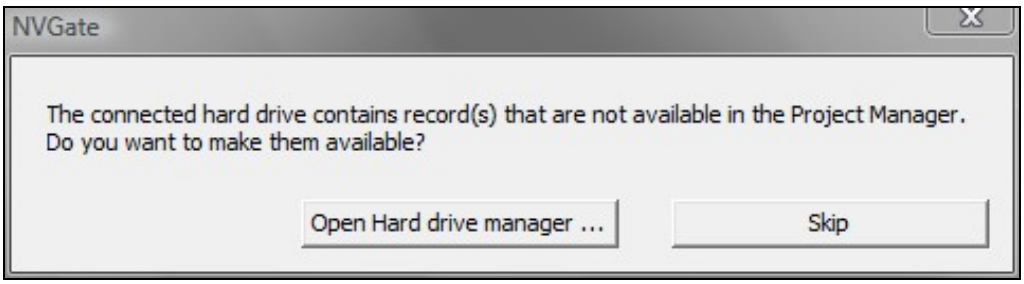
5.1.3 Part 3: recovering the signal with NVGate

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.

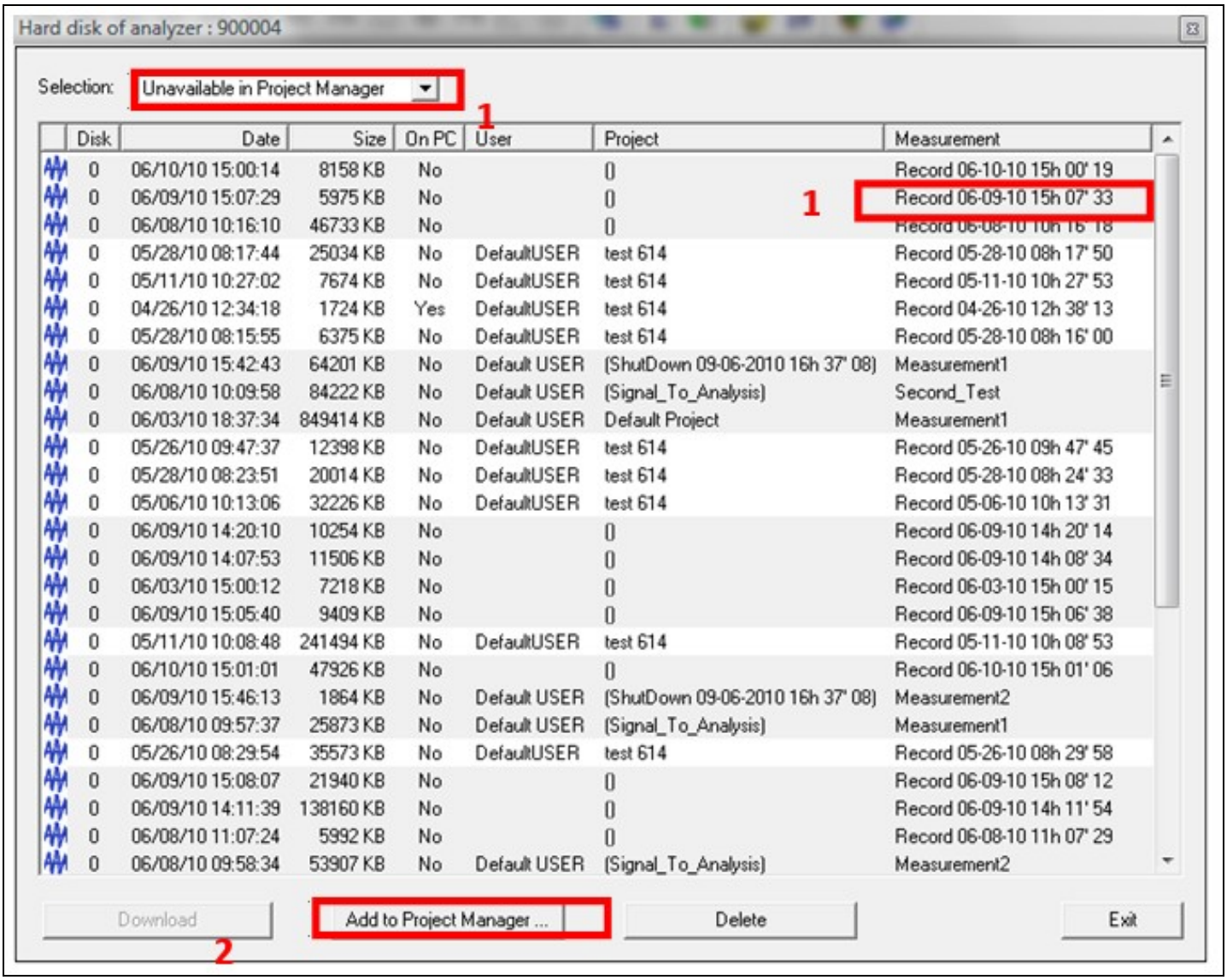
To recover these files in the project manager:

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.

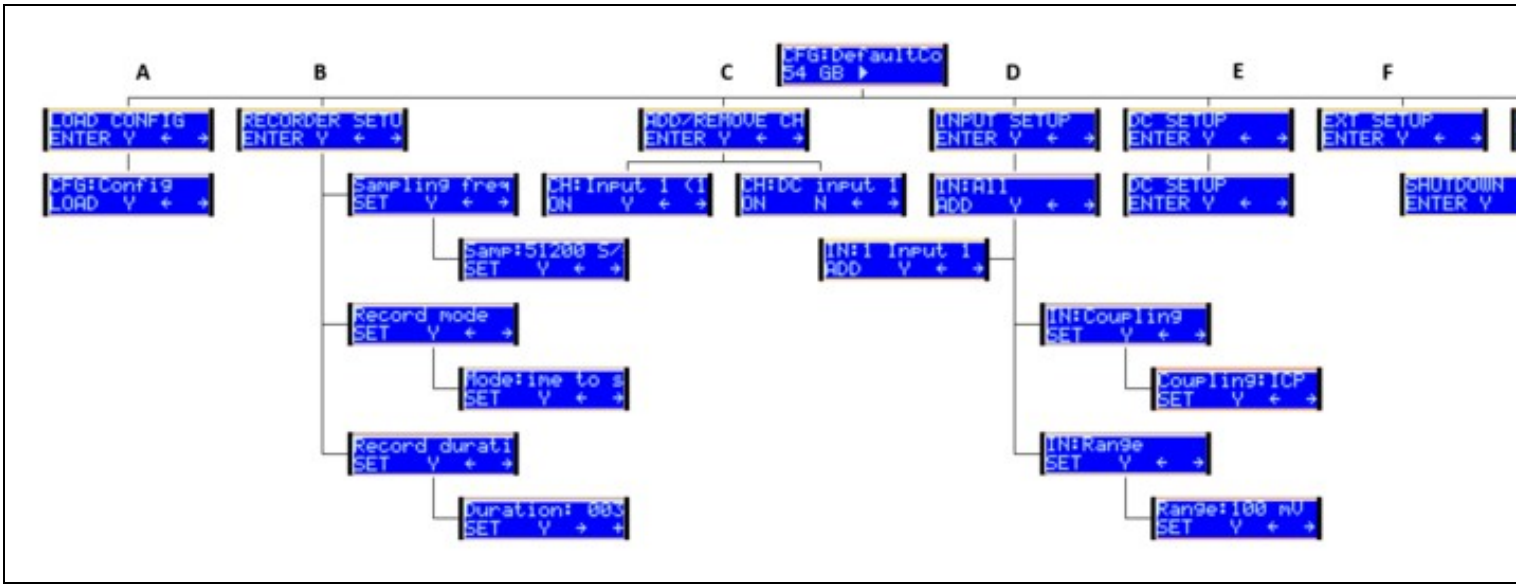
2. Press the bottom "Add to Project Manager" button to add these records into one of your projects.

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.



5.1.4 D-rec menus Organization chart



Note: Some sub-menus are not described in this diagram.

5.1.5 Video exemple

Washing machine vibration analysis *(using D-rec @30Seconds*).

6 NVGate dataset management

6.1 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.

6.1.1 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.
- ?

6.1.1.1 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)

6.1.1.2 Self-description

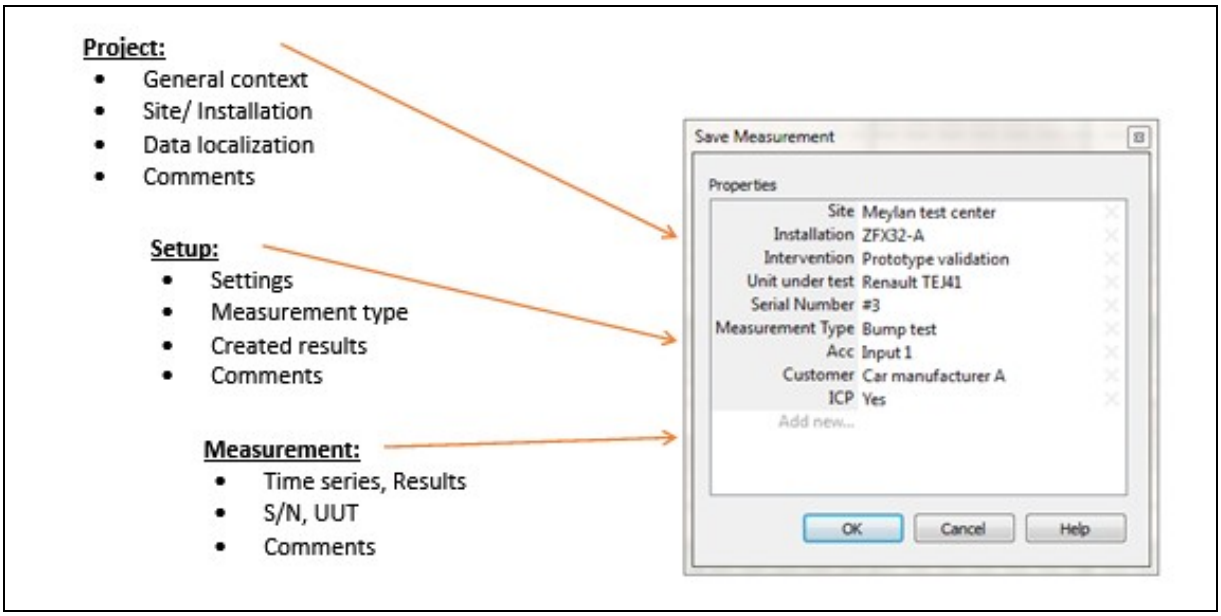
Each item holds properties that describe what is not available from the workbook, data and additional files. Properties are fulfilled by users or automatically according to the current context.

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.

6.1.1.3 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

6.1.1.4 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.

6.1.1.5 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.

6.1.1.6 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.

6.1.1.7 Data archiving

The Share/Collate allows efficiently archiving and retrieving data on your PC, on an external drive or through the network.

6.1.1.8 Properties

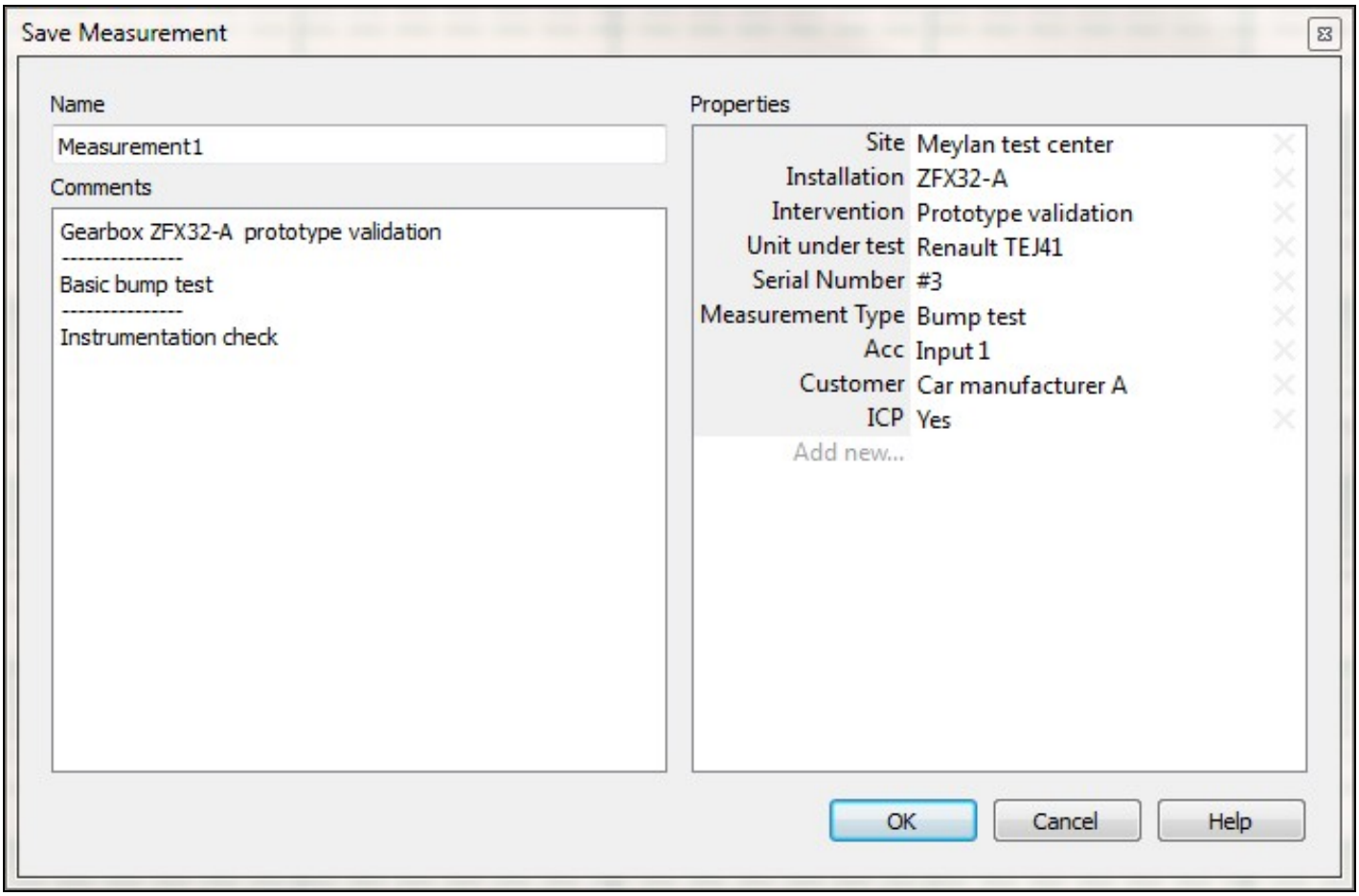
The properties are used as meta-data to enrich projects, models and measurements. They are informed while saving the items or by editing the properties from the project manager.

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):

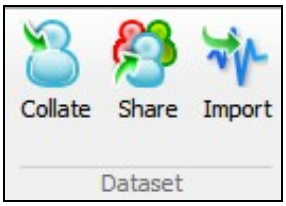


On the left side the Item?s name and the comments. Current Project and Model comments will inherit to the Measurements.

On the right side the OROS user and User properties. Current Project and Mode properties will inherit to the Measurements.

6.1.2 Share and collate dataset

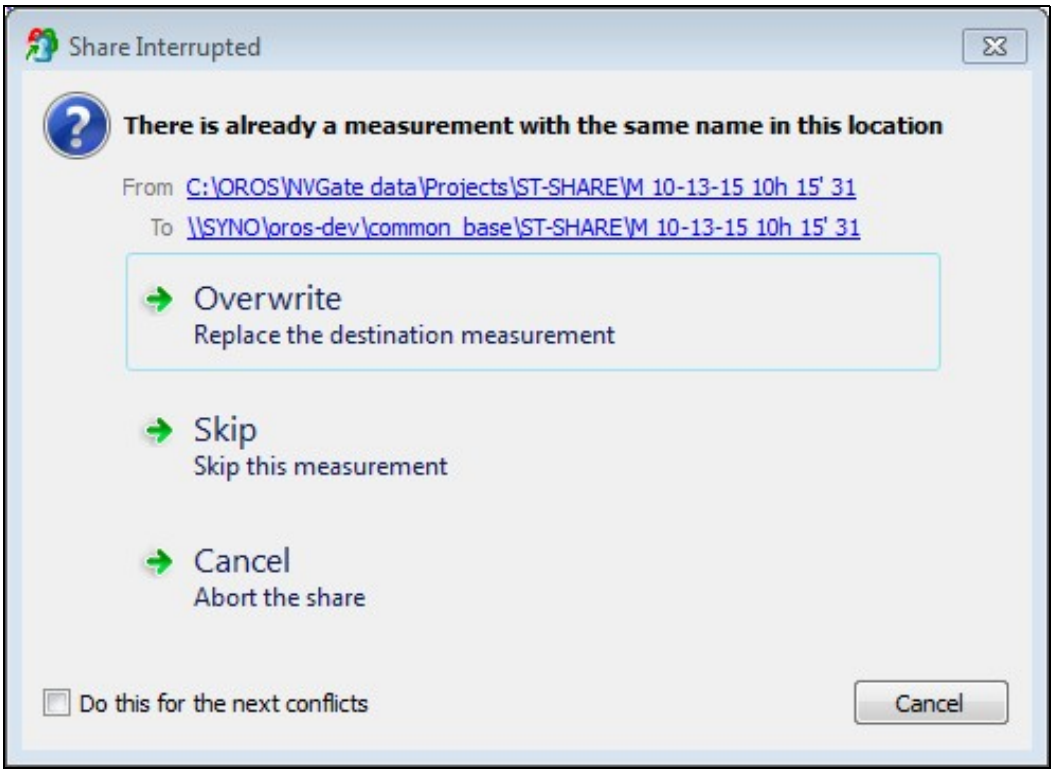
This function transfers Projects, Measurements, Models and associated attachments from the NVGate Data to a common directory and reciprocally.



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 .

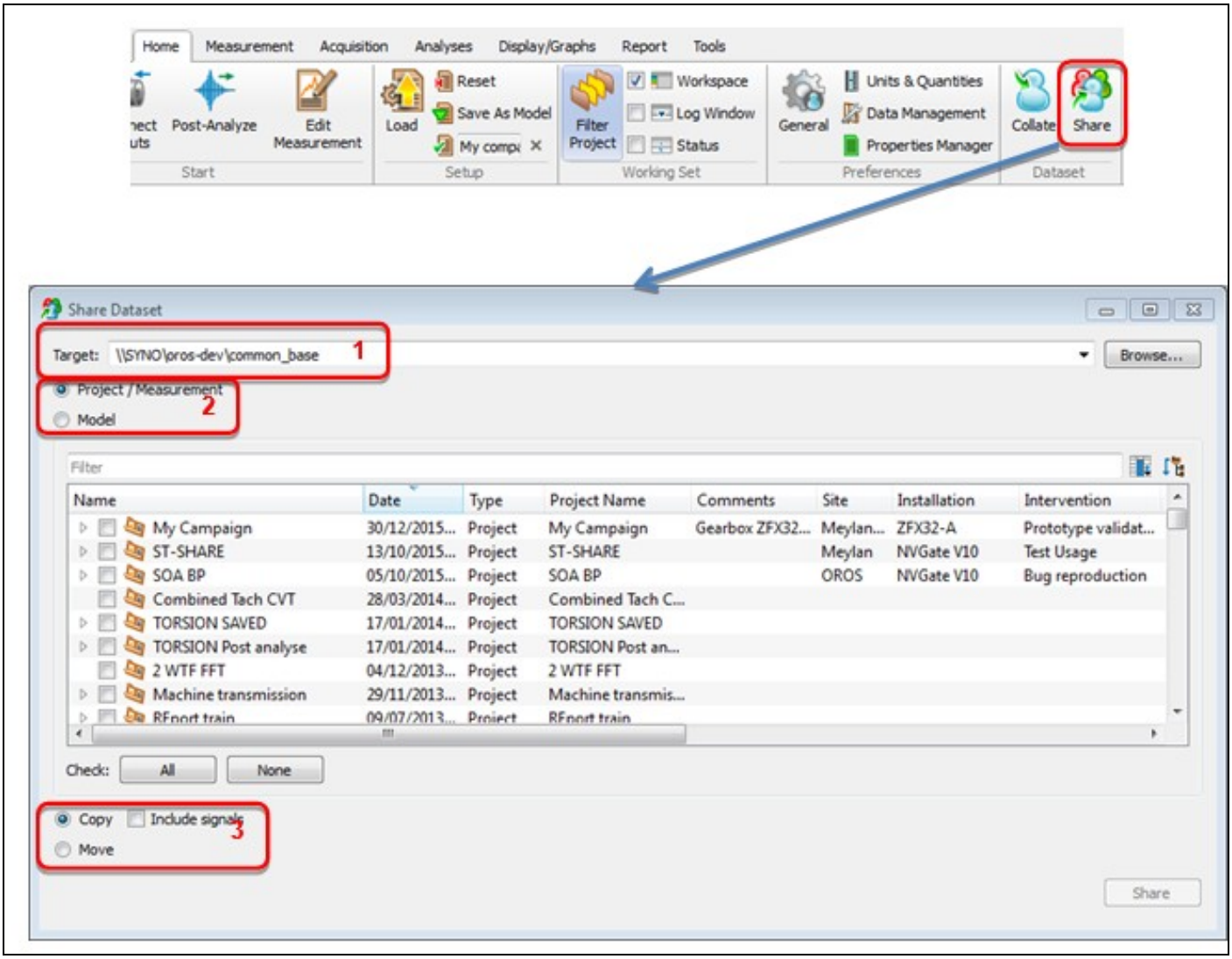


When possible, source and target directory are accessible through the hyperlinks.

Data Traceability Each transfer (share and Collate) generates a report in 2 ways:

6.1.2.1 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.

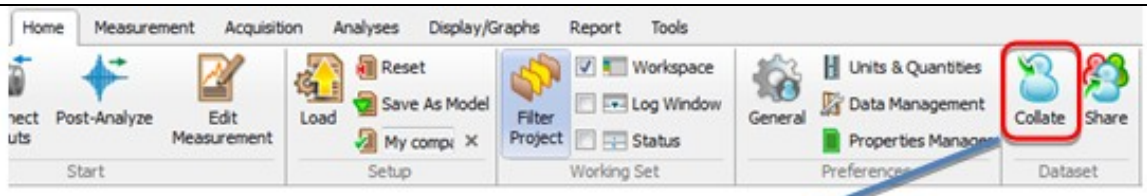
Note: that *Share* can also be used for dataset backup on the NVGate PC, an external disk or on the network.

6.1.2.2 Collate Datasets

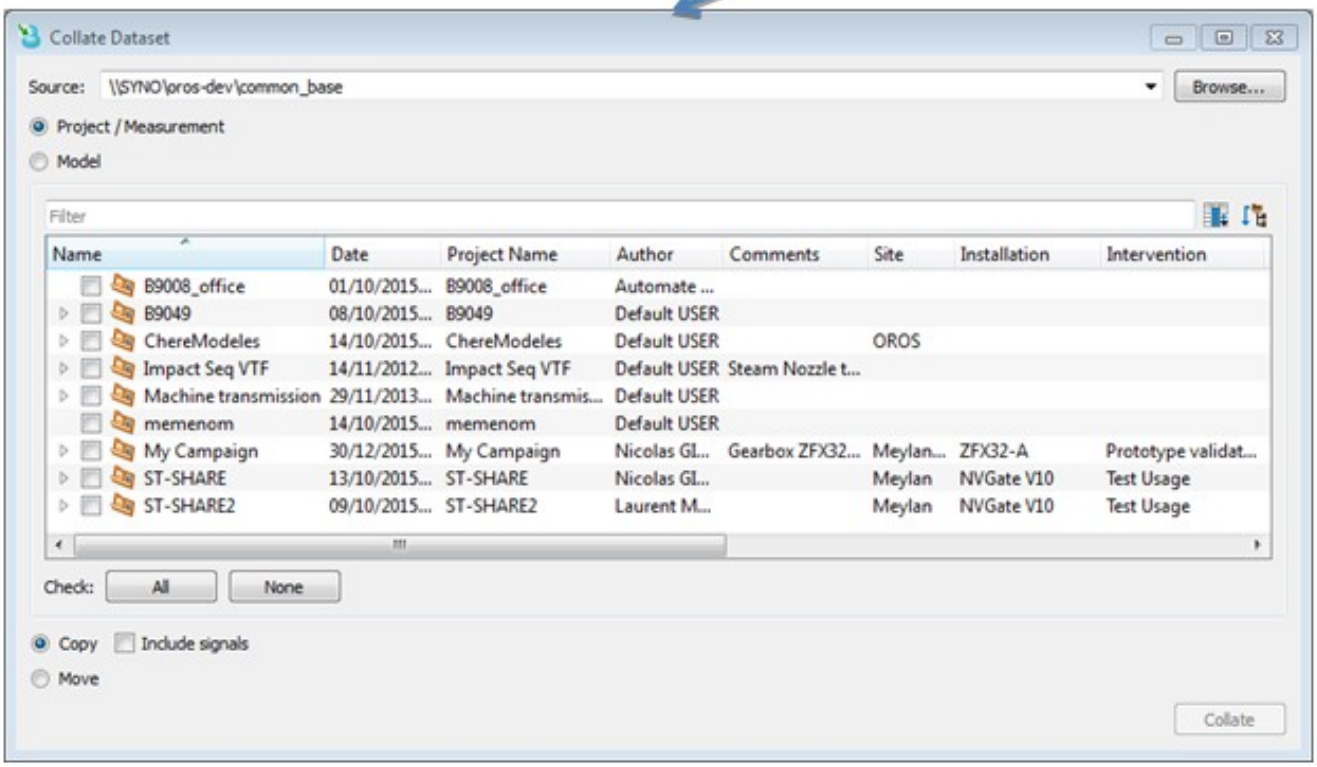
Collate [k??le?t] verb. To gather together information from different sources in order to study it carefully

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.

6.1.2.3 Import

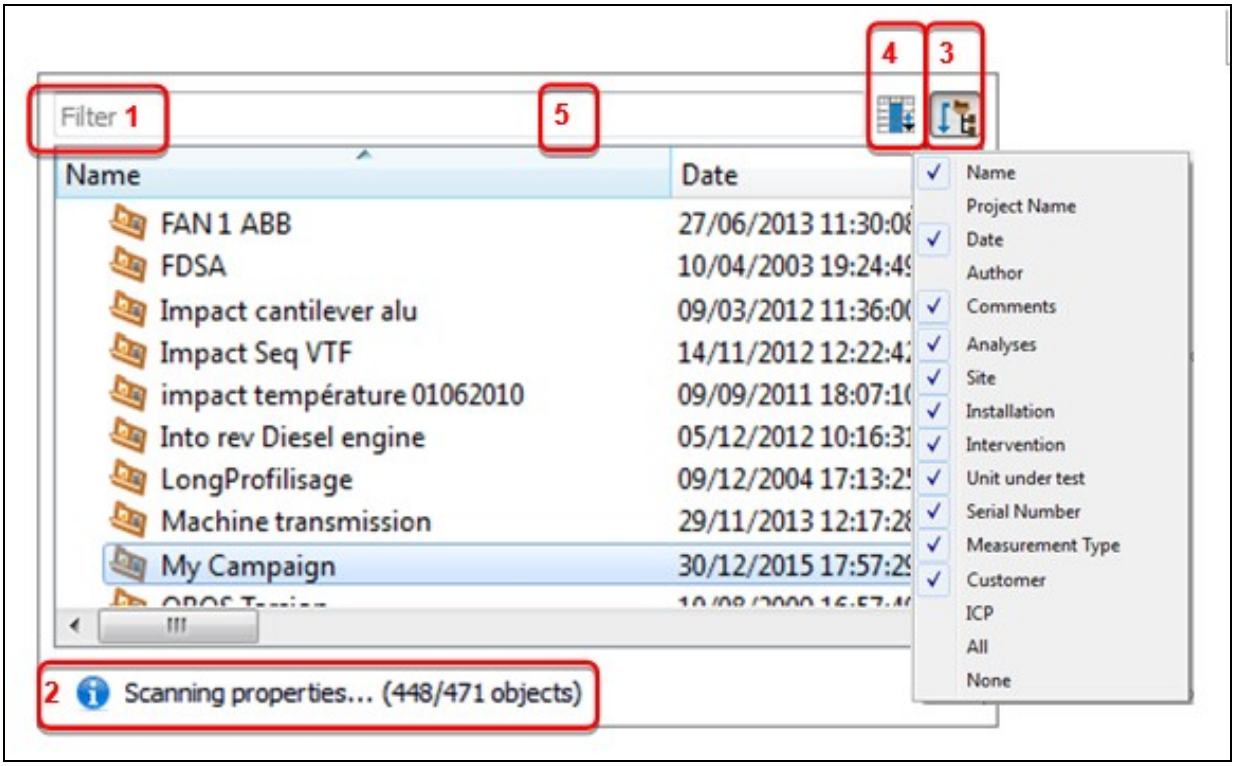
See Export/import.

6.1.3 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.

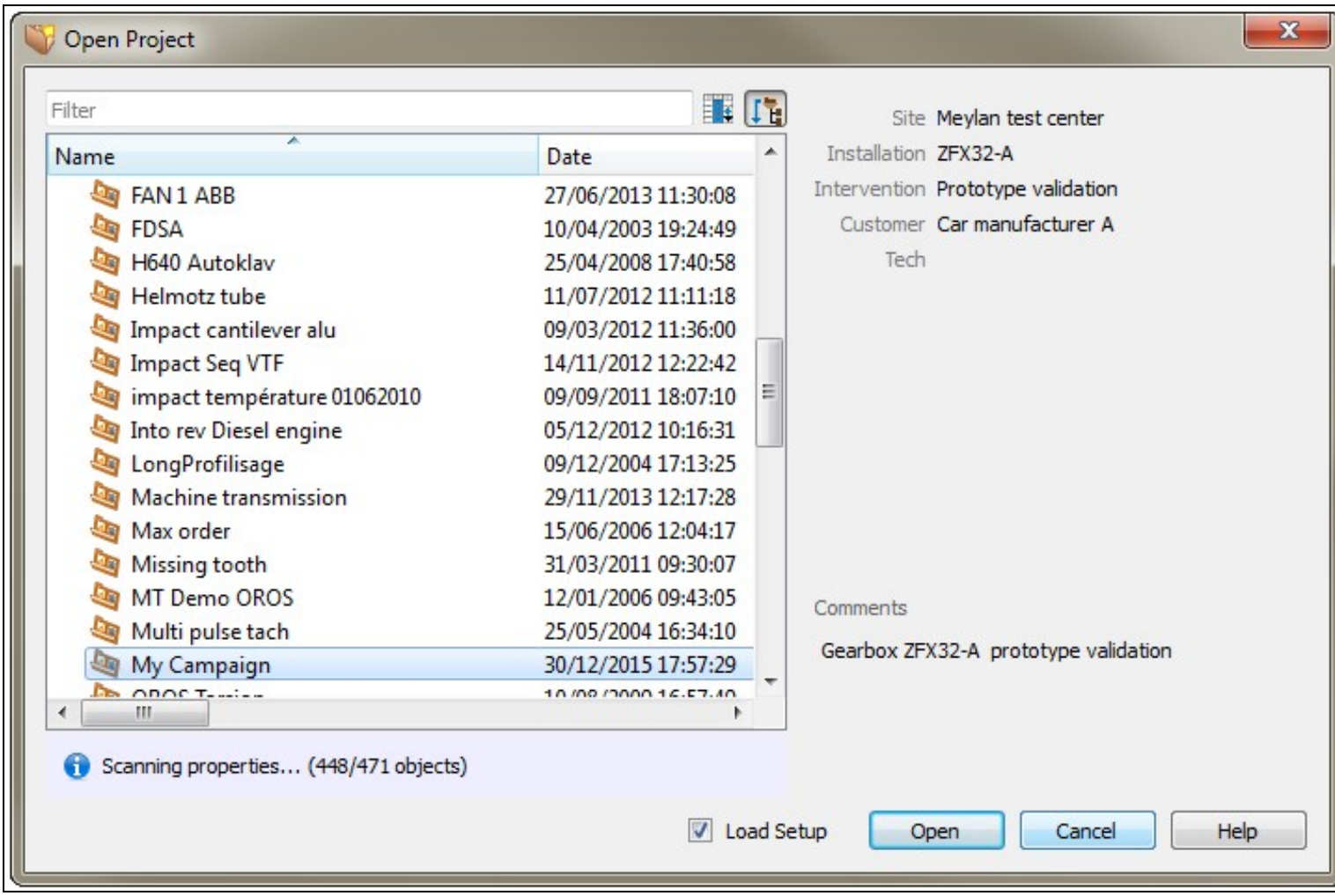
5. Show/Hide properties. Right click on the properties line to select which ones are visible in the columns.

6.1.3.1 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.

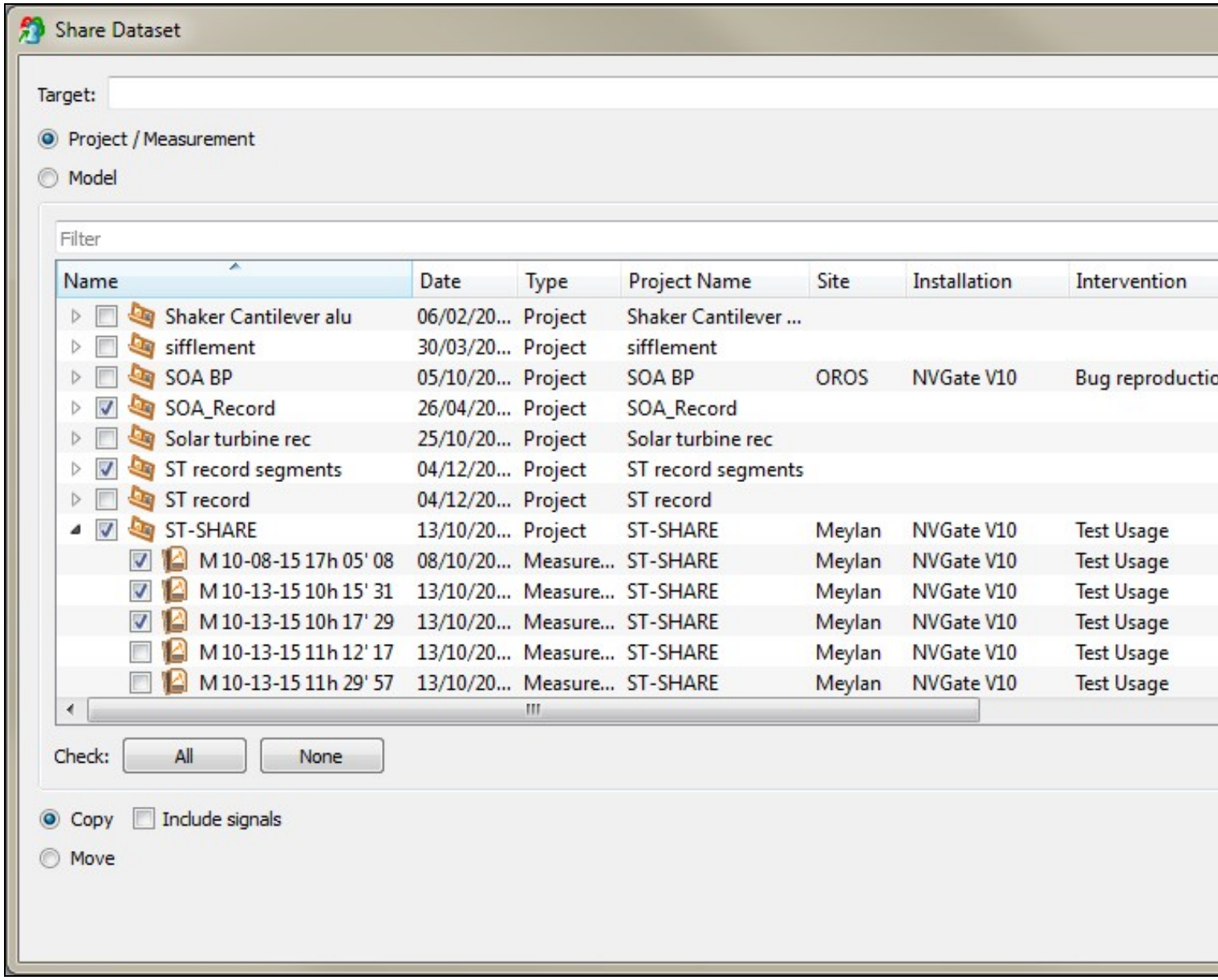


Drag & drop the right border to resize the dialog. The complete properties table appears to filter by properties as in the *Set selection dialog*.

6.1.3.2 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

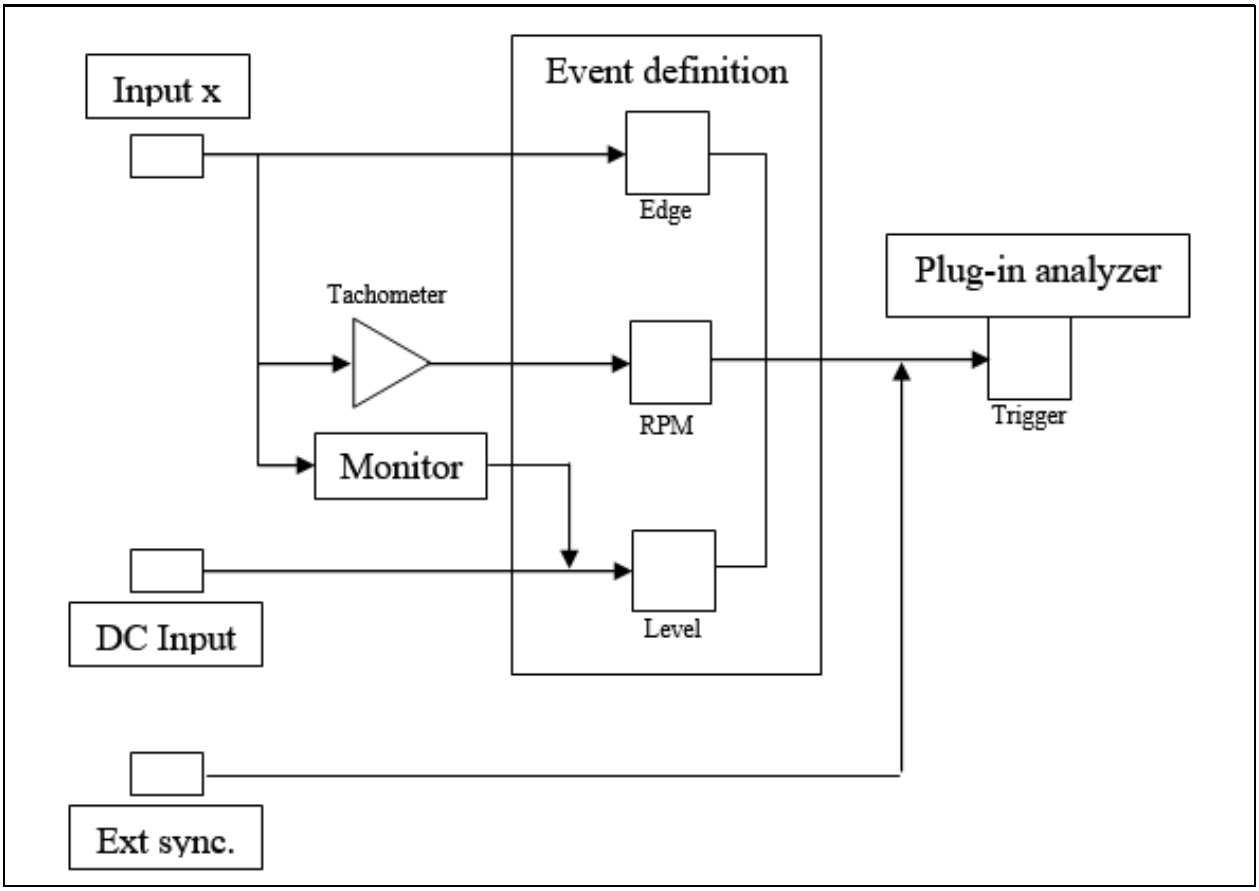


The Set selection browser features check boxes on the left sides for *Item*s selection. The properties table allows efficient filtering, offering fast selection of a coherent set of data.

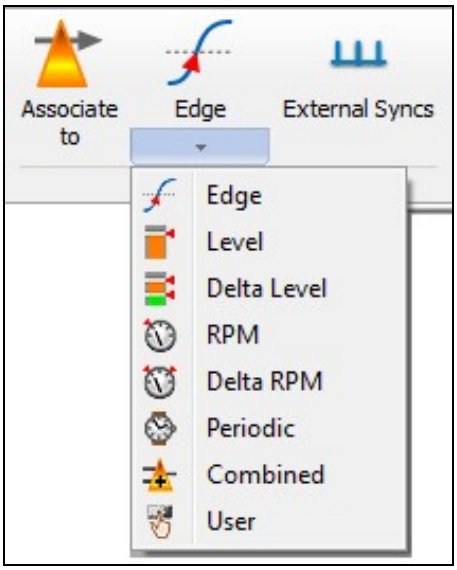
7 NVGate Event definition

7.1 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.

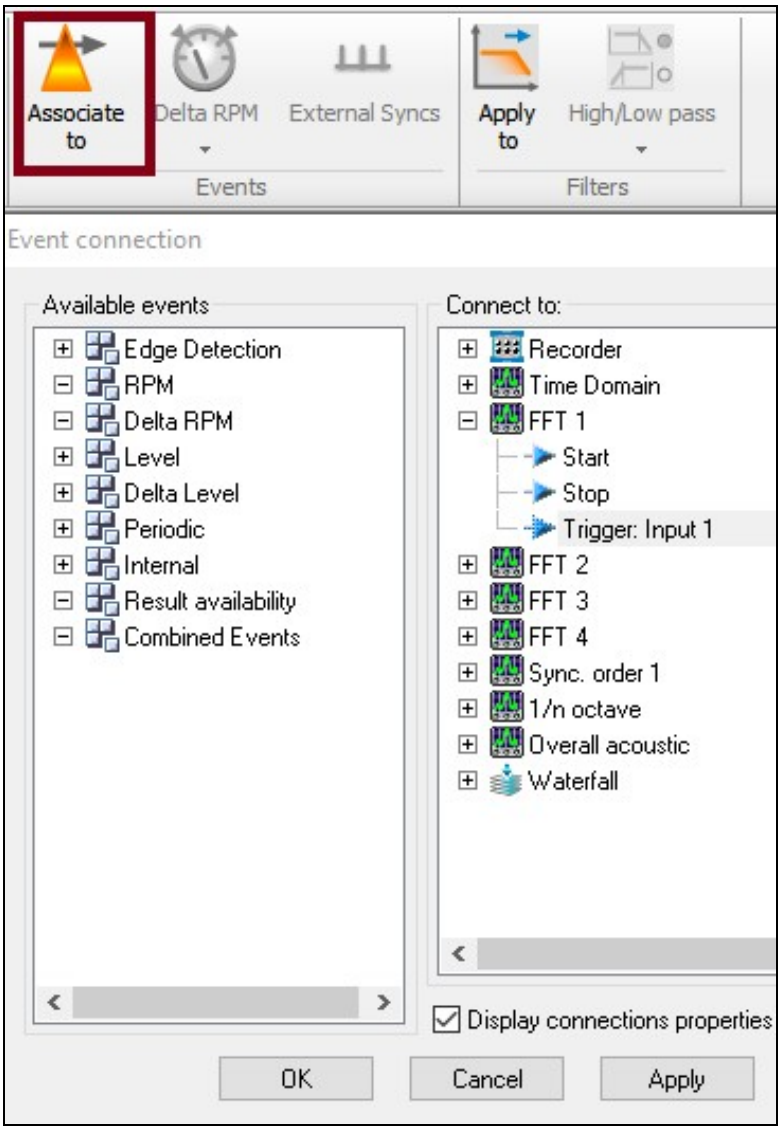


7.2 Connect



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:

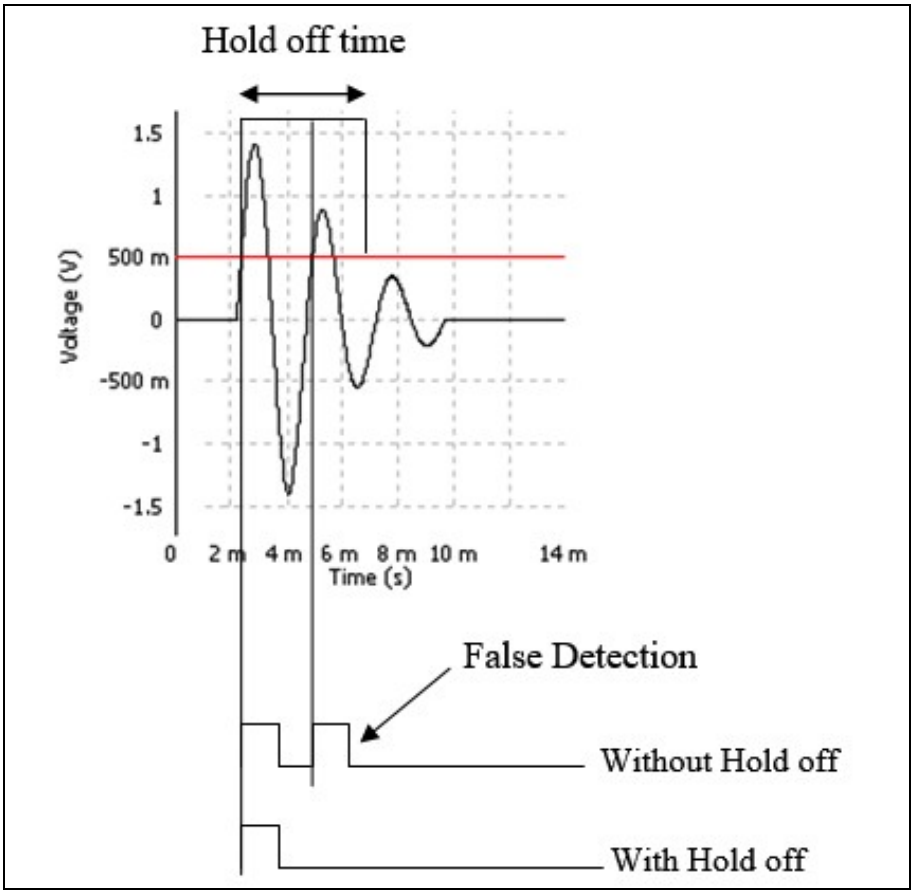
7.3 Edge detection


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.

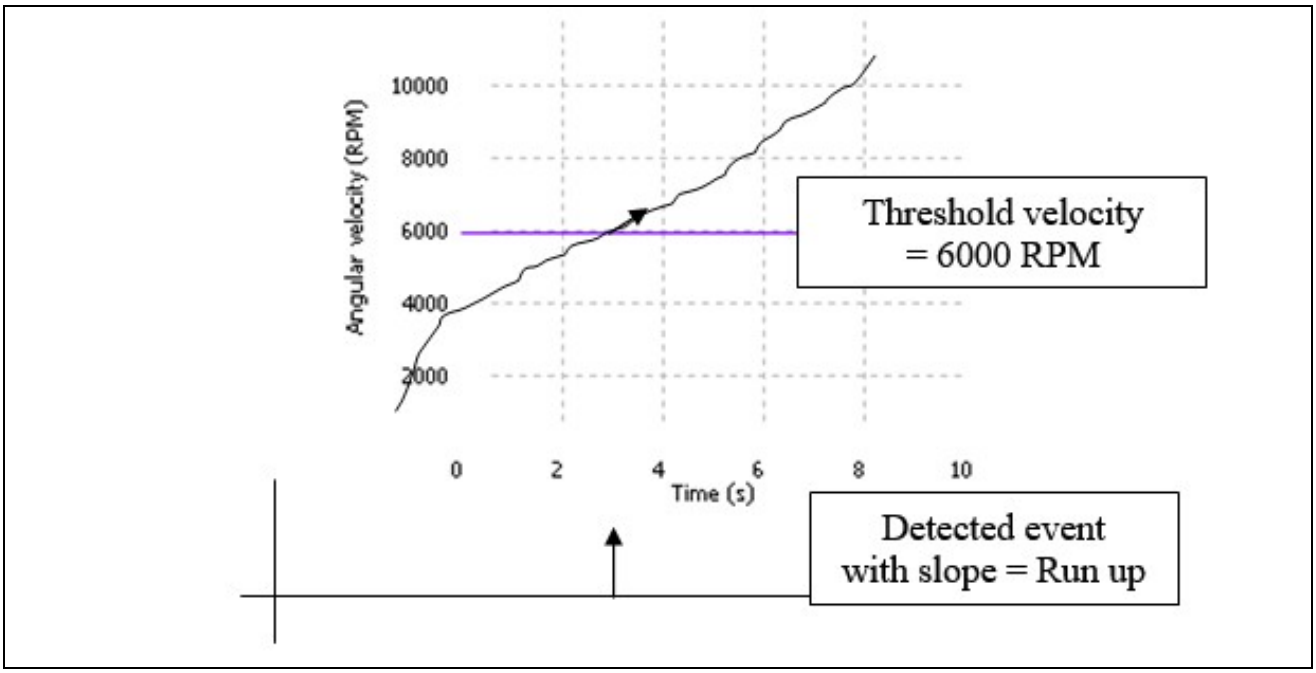


- **Hystersis**: defines the hystersis around the threshold. The value can be adjusted between 0 and the full scale of the input signal (depending on the input range). If Slope is set to RISE, the input signal must go below Threshold - Hystersis before a new event can be detected. If Slope is set to 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.

7.4 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.

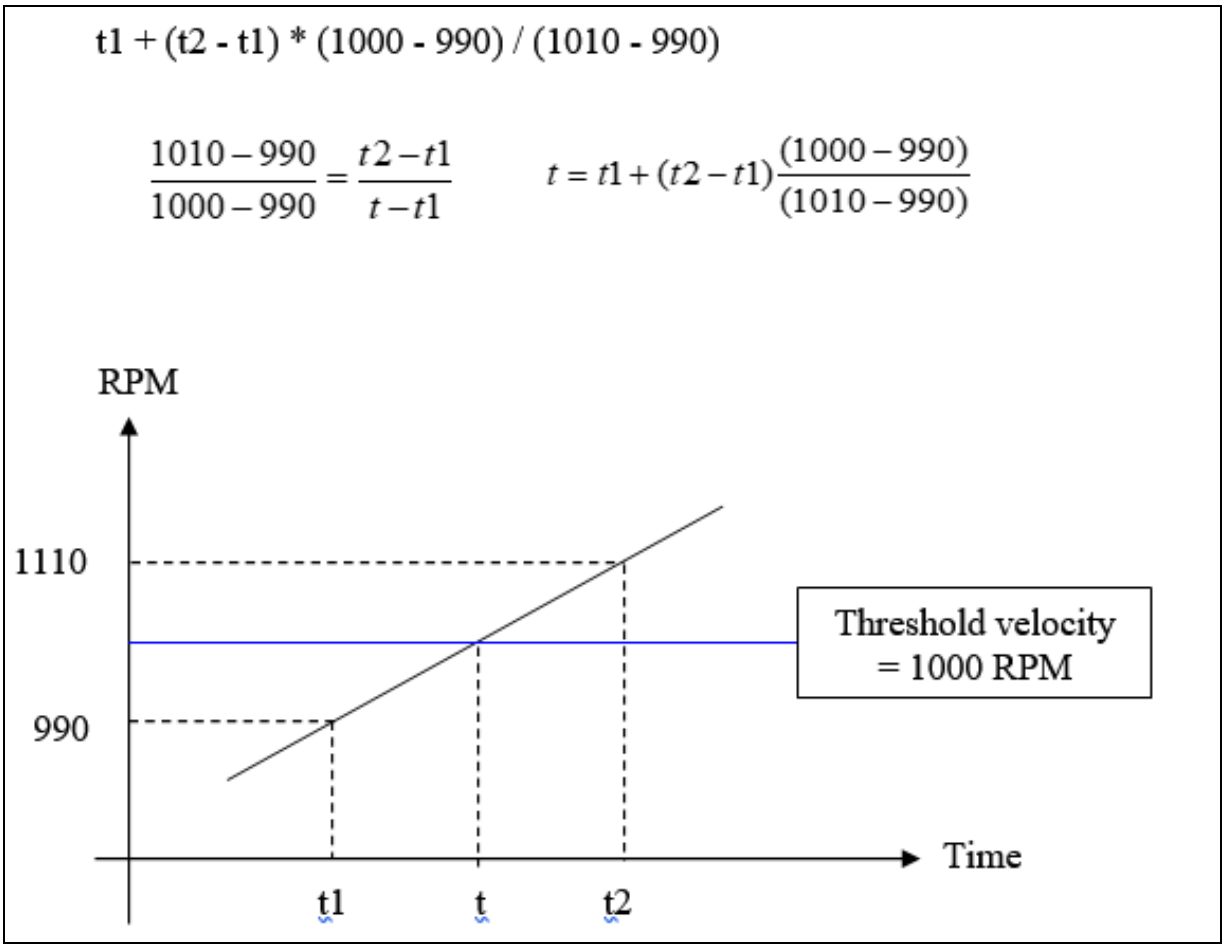
- **Label**: the name of the event (by default RPM n, with 1 <= n <= 2).
- **Source**: selects the tach source. The user can choose any active tach as the source of the RPM event.
- **Threshold velocity**: defines the threshold velocity for detecting an event. The user can enter any value between the 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

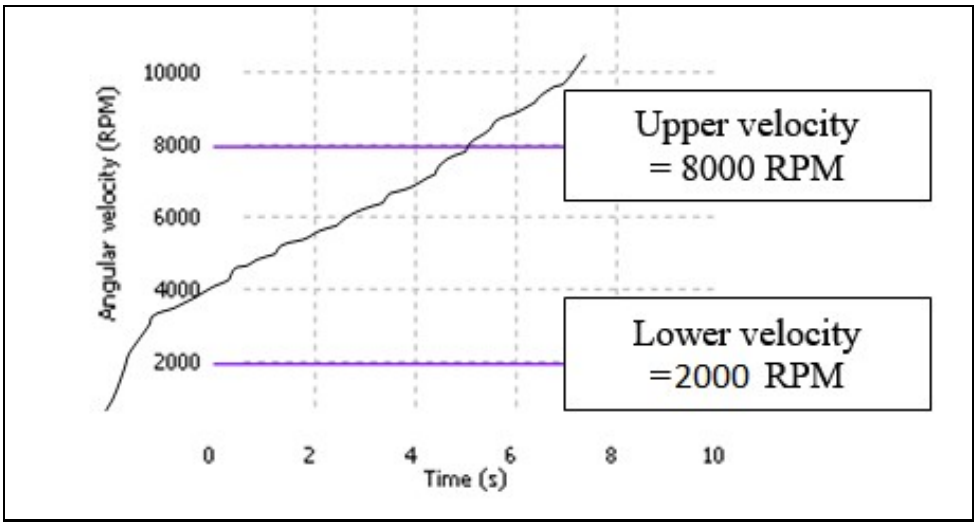


- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.

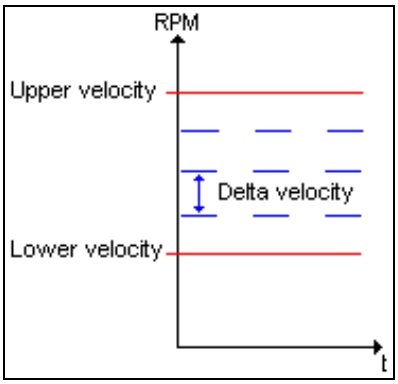
7.5 Delta RPM

 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.



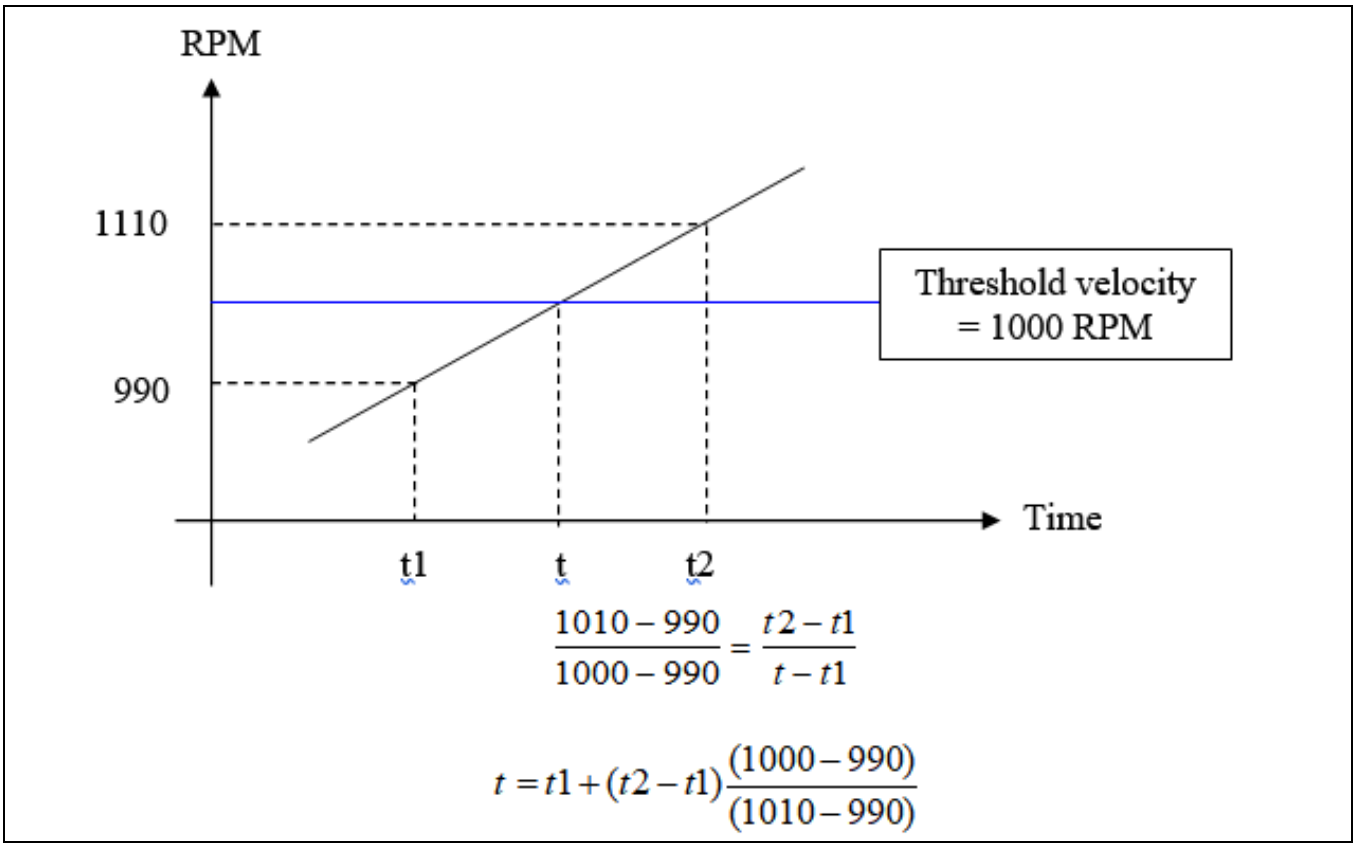
- **Number of events**: the number of events between Upper velocity and Lower velocity (considering Delta velocity).

$$Number\ of\ events = \frac{Uppervelocity - Lowervelocity}{Deltavelocity} + 1$$

- **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.

7.6 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.

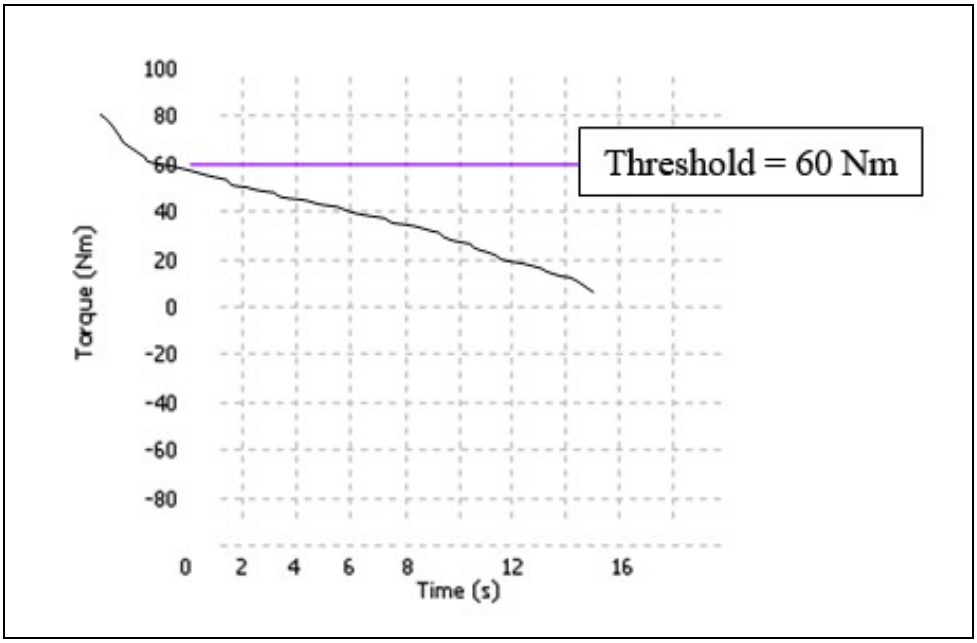
- **Label**: the name of the event (by default Level n, with 1 <= n <= 4).
- **Source**: selects a DC input or a Monitor channel as source of the level event.
- **Type**: the type of measurement for level detection.

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.

7.7 Delta level

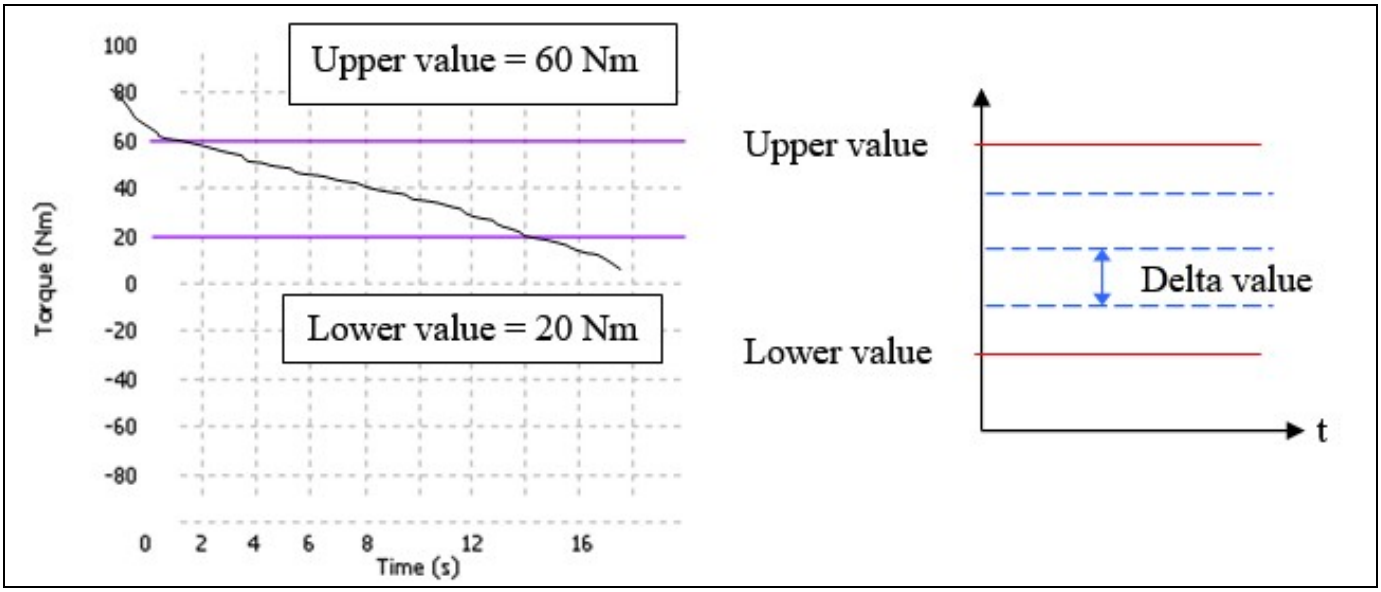

This module is used with DC inputs (optional) and/or associated with the Monitor module. It is used to trigger a plug-in by step. This trigger can be applied to any plug-in analyzer including Waterfall and Recorder.

- **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

7.8 Periodic

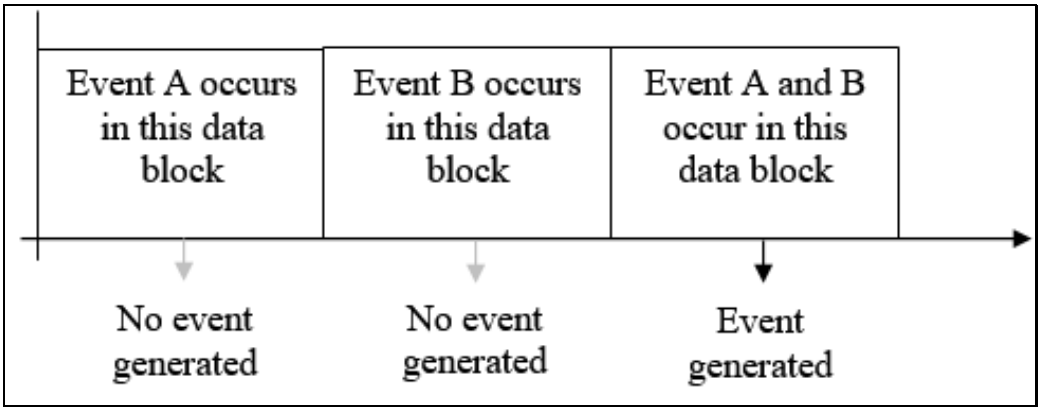

Periodic: Used to trigger a plug-in by periodic step. This event can be applied to any plug-in analyzer including Waterfall and Recorder.

- **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.

7.9 Combined events


Combined: Generates an event which is the result of a combination of 2 events. Possible combinations are: OR, AND and AFTER.

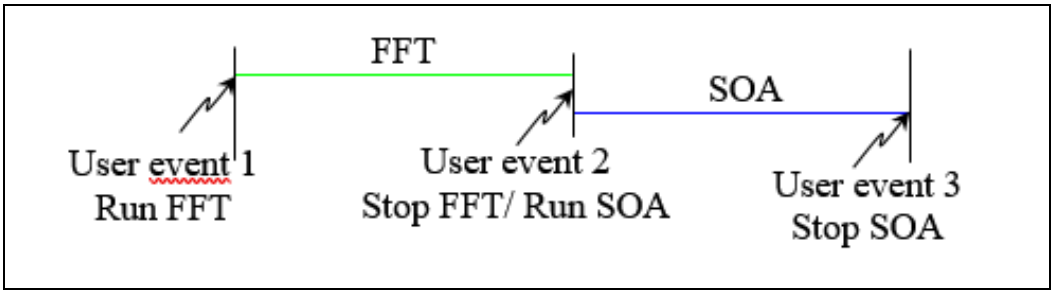
- **Label**: the name of the event (Default: *Combination n*, with 1 <= n <= 2).
- **Event A**: defines the first operand of the combined event. The user can choose any defined event as operand except for a combined event.
- **User**: defines the user used to detect a new event from the two operands, 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.

7.10 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.

7.11 External Synch


External synch: Properties of the Ext synch trigger inputs.

7.12 Monitoring Solution

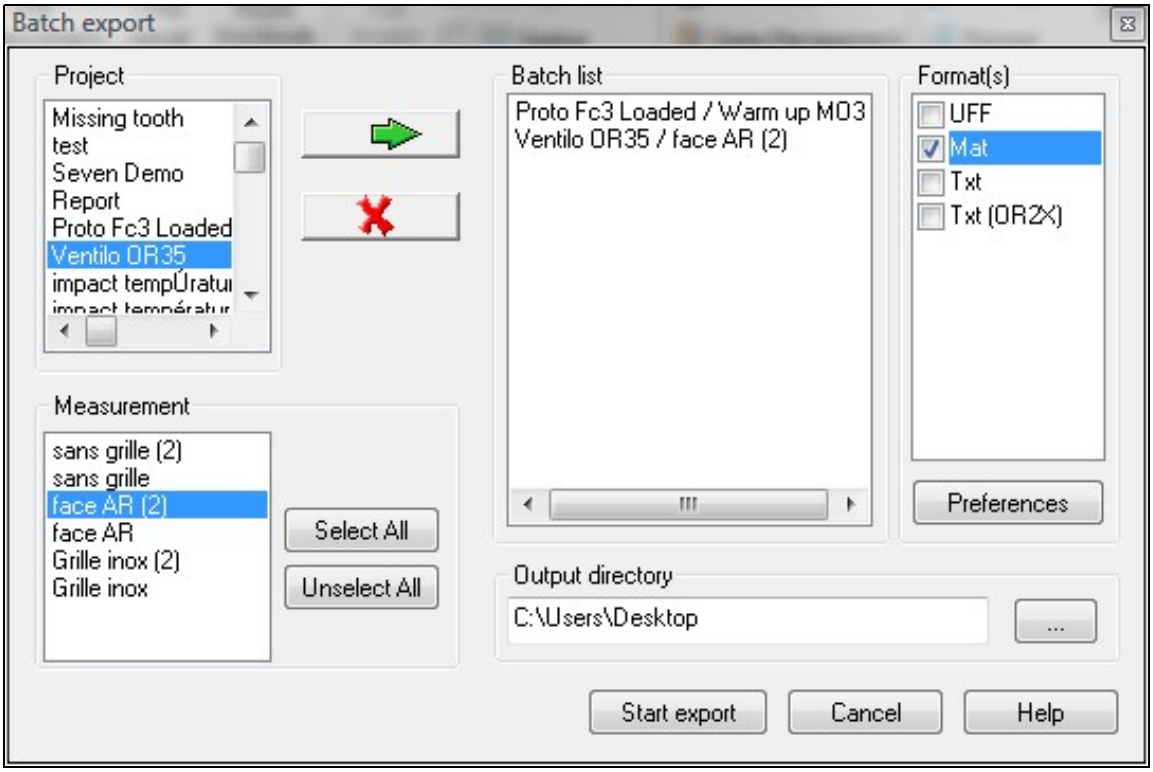
If you would like more advanced trigger and actions, please have a look on the the monitoring solution.

8 import

8.1 Export

8.1.1 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.

8.1.1.1 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

8.1.1.2 Import

8.1.1.2.1 Import project

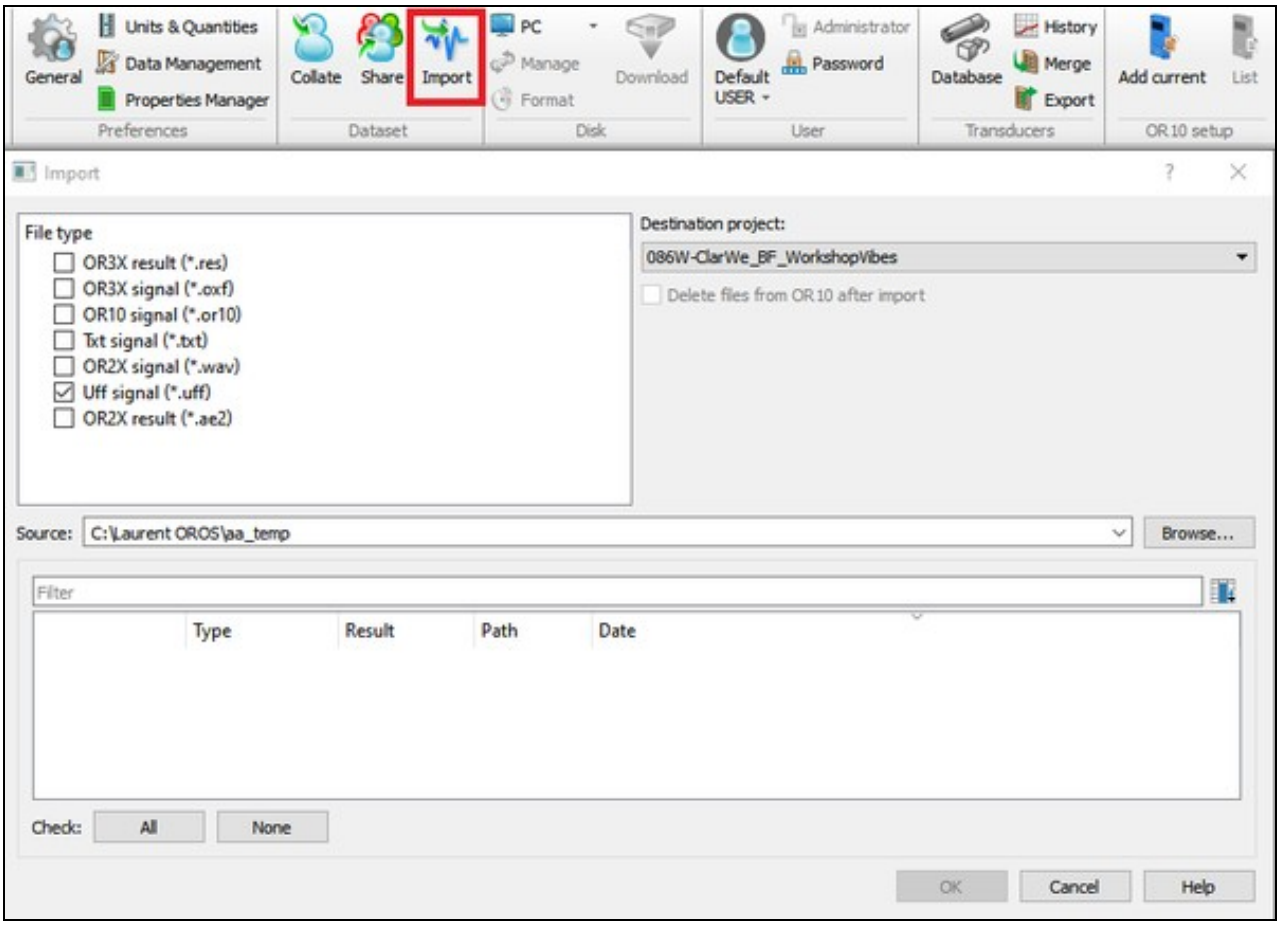
This command is used to import project that are not in the project database. It makes a copy of the project and makes it available to the current user, or whoever created the project. If a project already exists in the project base, a ~ (tilde) will automatically be added.

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.

8.1.1.2.2 Import Files

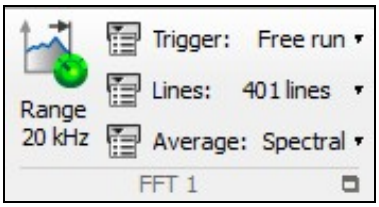
This command is used to import results or signals. It makes a copy of the file and makes it available to the current user, or whoever created the file. The file will be included in a measurement If a measurement already exists in the project, a ~ (tilde) will automatically be appended.

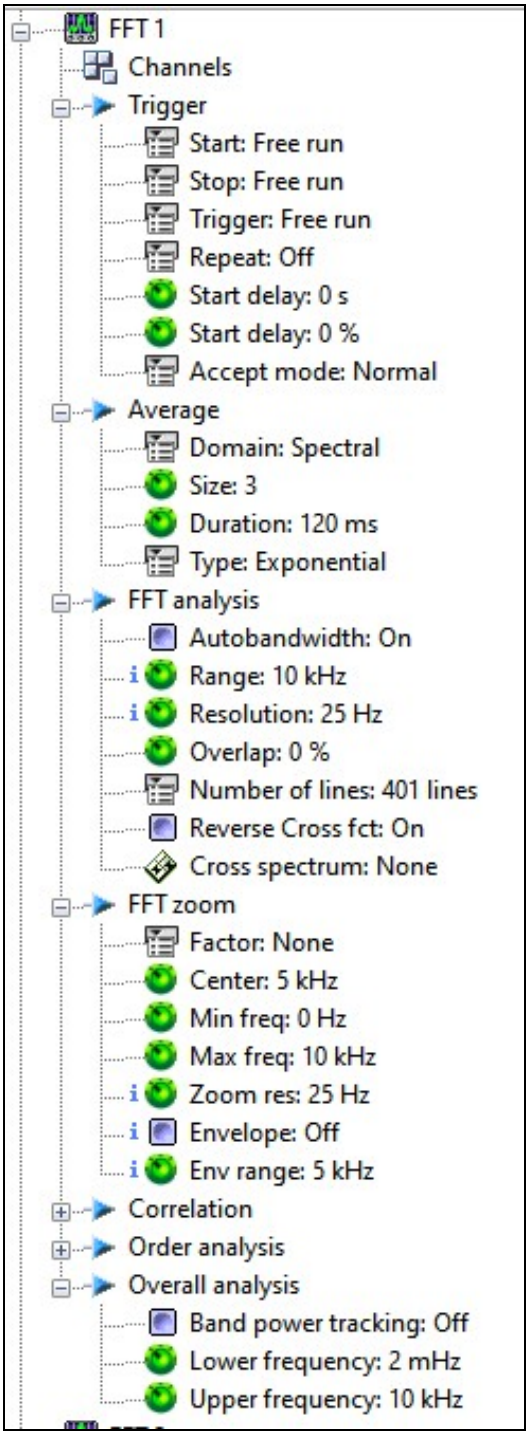


- Destination project: Determines which project will receive the new measurement
- File type: One or several types can be selected. File type may be OR2X or OR3X.
    - **Note :** Time signal .UFF files needs to have sampling frequency compatible with NVGate Front end. WAV signal files does not have 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.

9 NVGate FFT


Trigger: Free run
Lines: 401 lines
Range
20 kHz
Average: Spectral
FFT 1


FFT 1
Channels
Trigger
Start: Free run
Stop: Free run
Trigger: Free run
Repeat: Off
Start delay: 0 s
Start delay: 0 %
Accept mode: Normal
Average
Domain: Spectral
Size: 3
Duration: 120 ms
Type: Exponential
FFT analysis
Autobandwidth: On
Range: 10 kHz
Resolution: 25 Hz
Overlap: 0 %
Number of lines: 401 lines
Reverse Cross fct: On
Cross spectrum: None
FFT zoom
Factor: None
Center: 5 kHz
Min freq: 0 Hz
Max freq: 10 kHz
Zoom res: 25 Hz
Envelope: Off
Env range: 5 kHz
Correlation
Order analysis
Overall analysis
Band power tracking: Off
Lower frequency: 2 mHz
Upper frequency: 10 kHz

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.

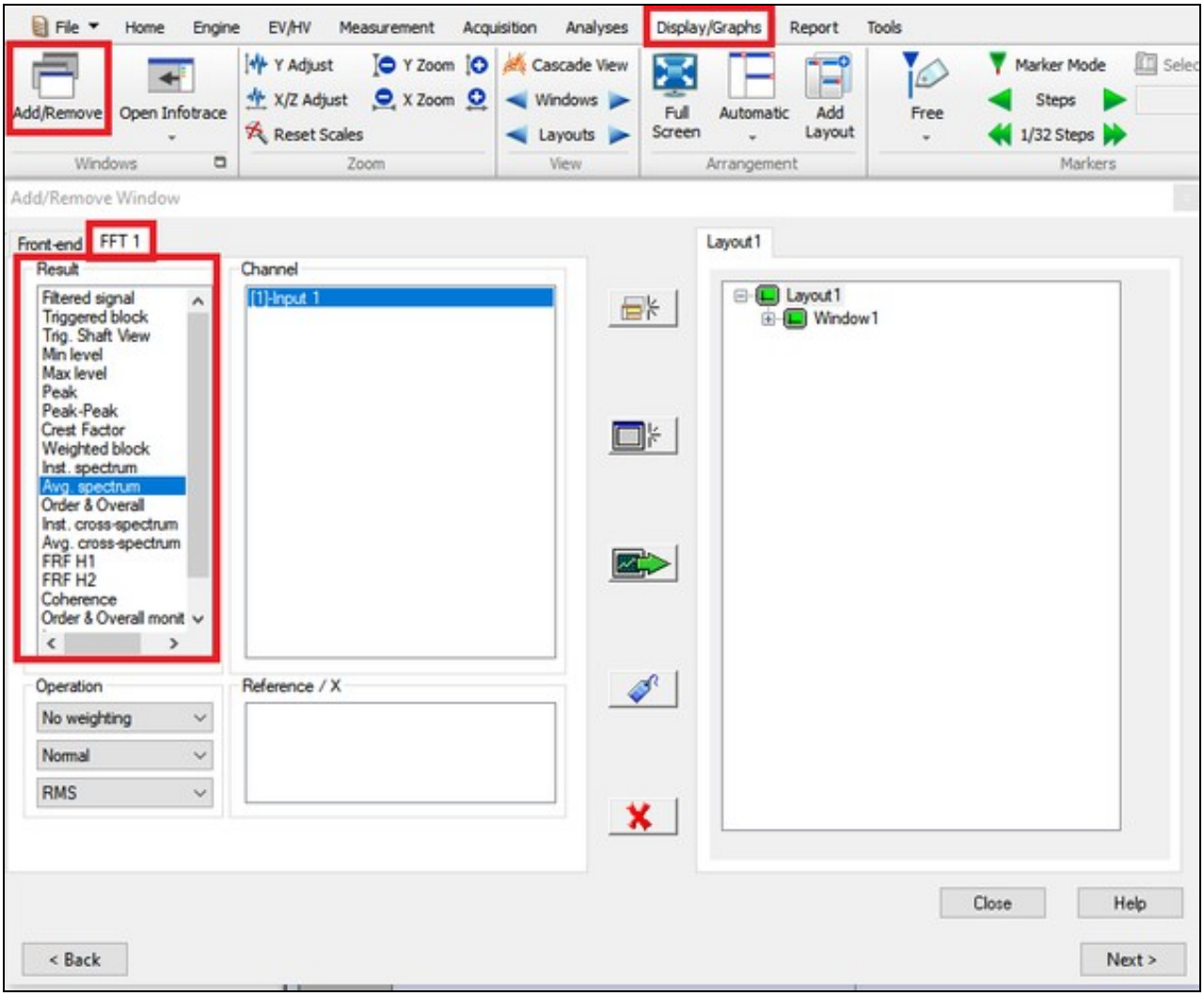
9.1 Video tutorial

We advise using GoToResult for performing FFT.

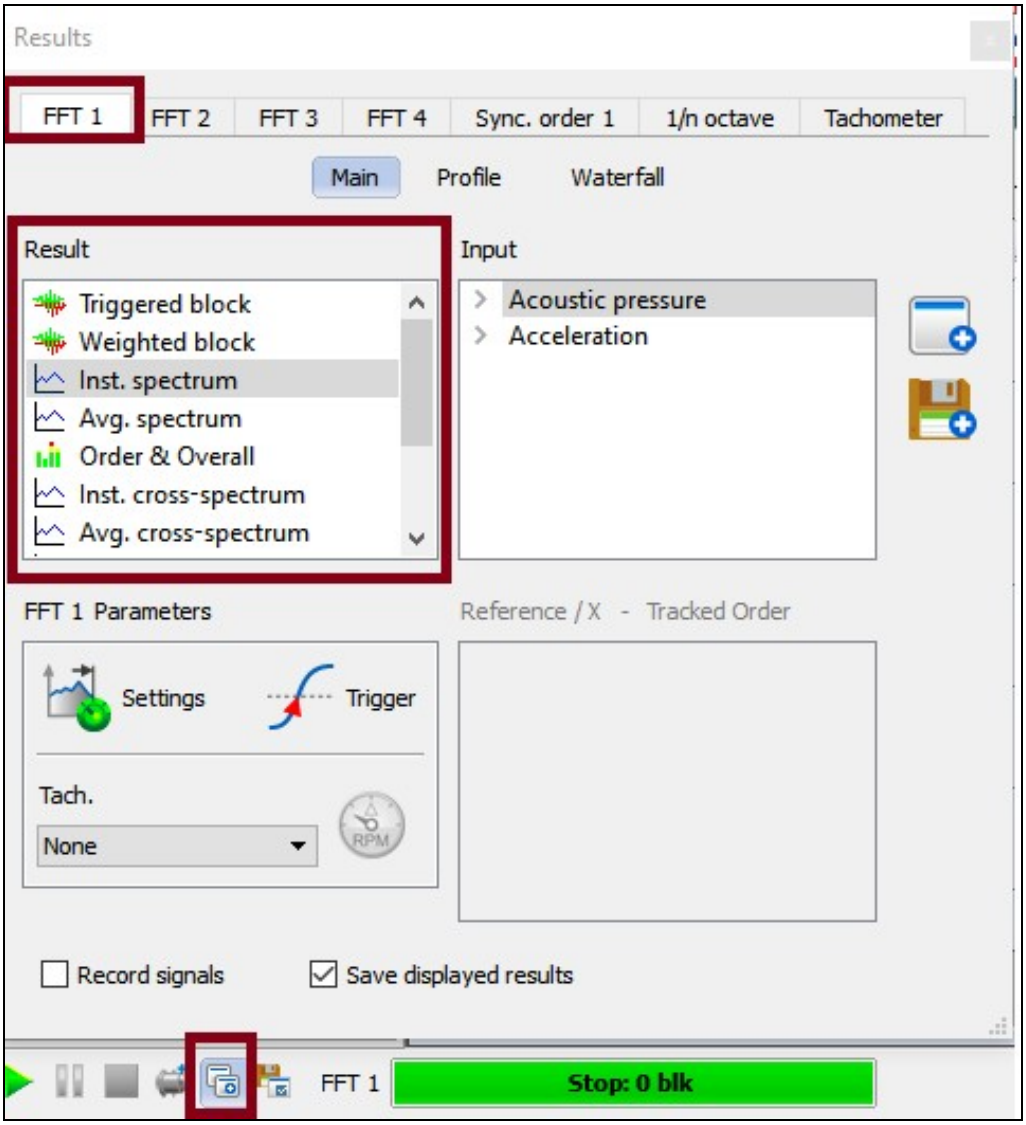
9.2 Display available results

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

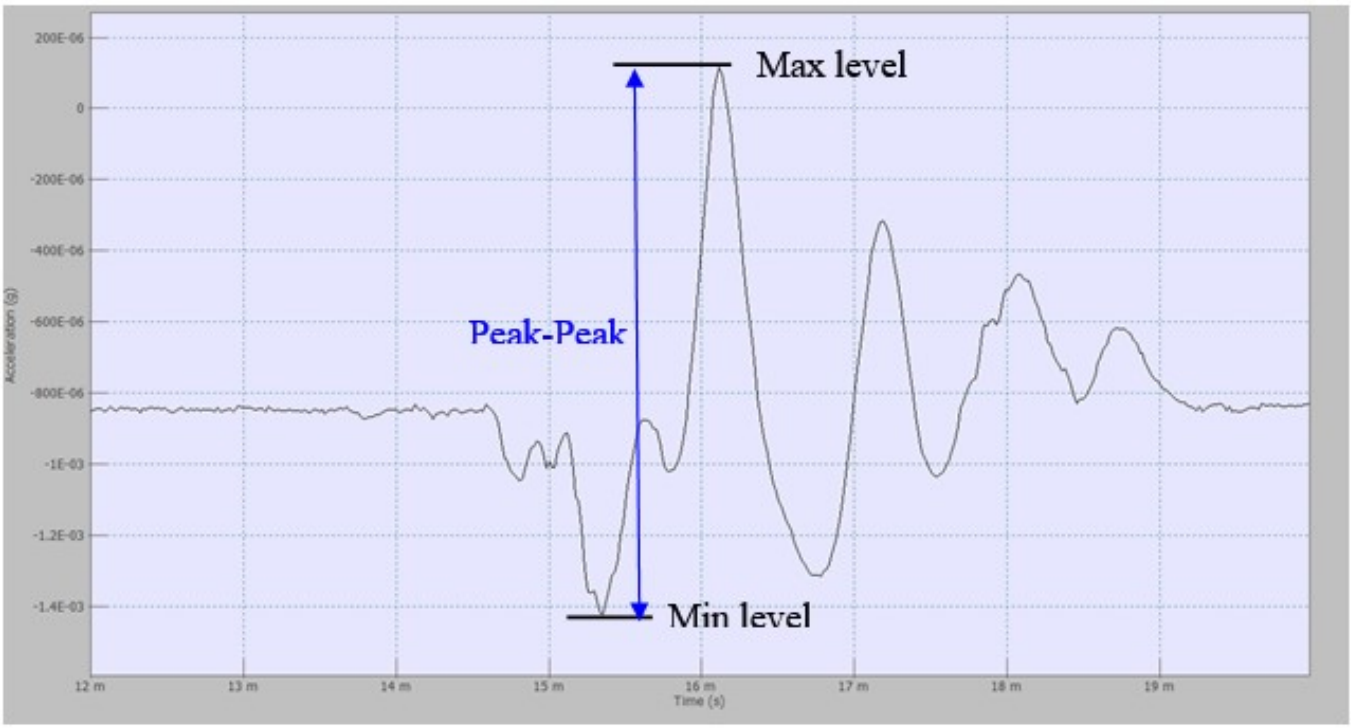
The results available are as follows : With Resolution being the value of the *FFT x/FFT analysis/Resolution* setting

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.

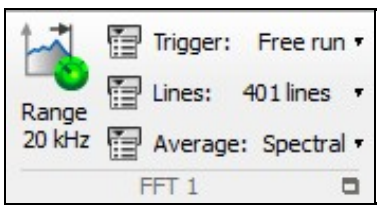
- **AutoCorrelation**: This result is available if correlation is selected in *the FFT x/Correlation* and *FFT x/Average/Domain* setting value is Time.
- **CrossCorrelation**: This result is available if correlation is selected in *the FFT x/Correlation* and *FFT x/Average/Domain* setting value is Time. 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.

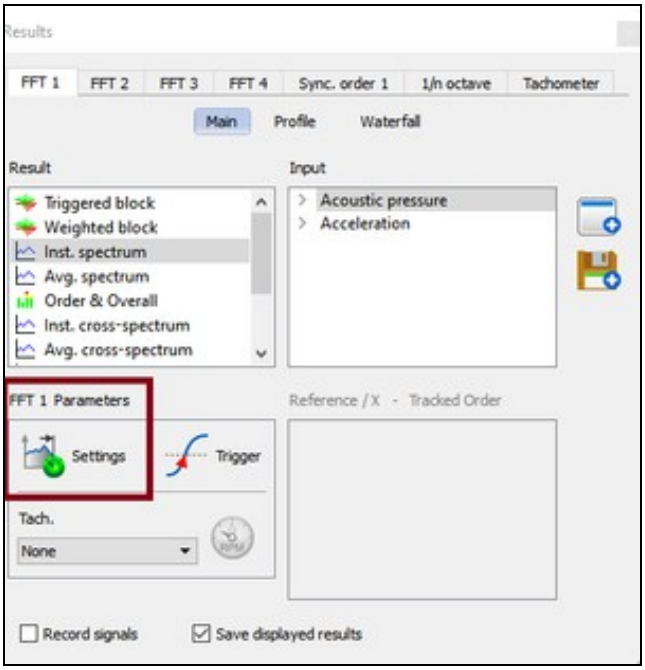
9.3 Settings

There are several ways to access the settings : We advise the first one.

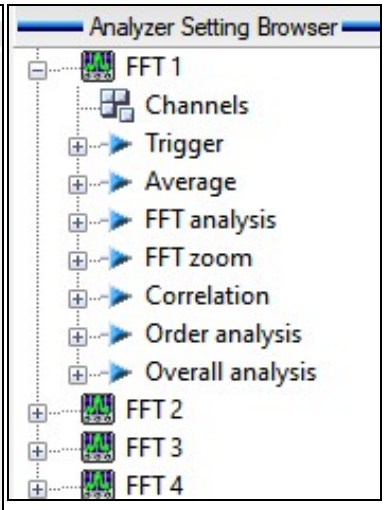
GoToResults **ASB(Analyzer Setting Browser)** **Ribbon**



GoToResults

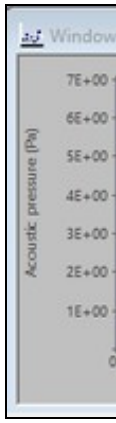


ASB(Analyzer Setting Browser)



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.



9.3.1 Channel

Contains the settings related to the source input.

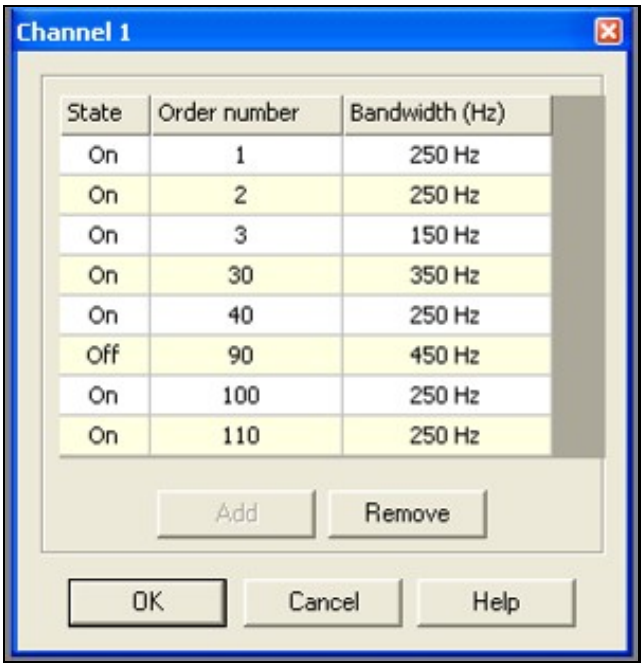
- **Source**: input source to be analyzed. It may come from the input Front-end or from the Player in the post analysis mode (see the post analysis chapter). In the post analysis mode, the tracks with a signal bandwidth lower than the range of the FFT cannot be plugged.
- **Input filter**: filter to 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

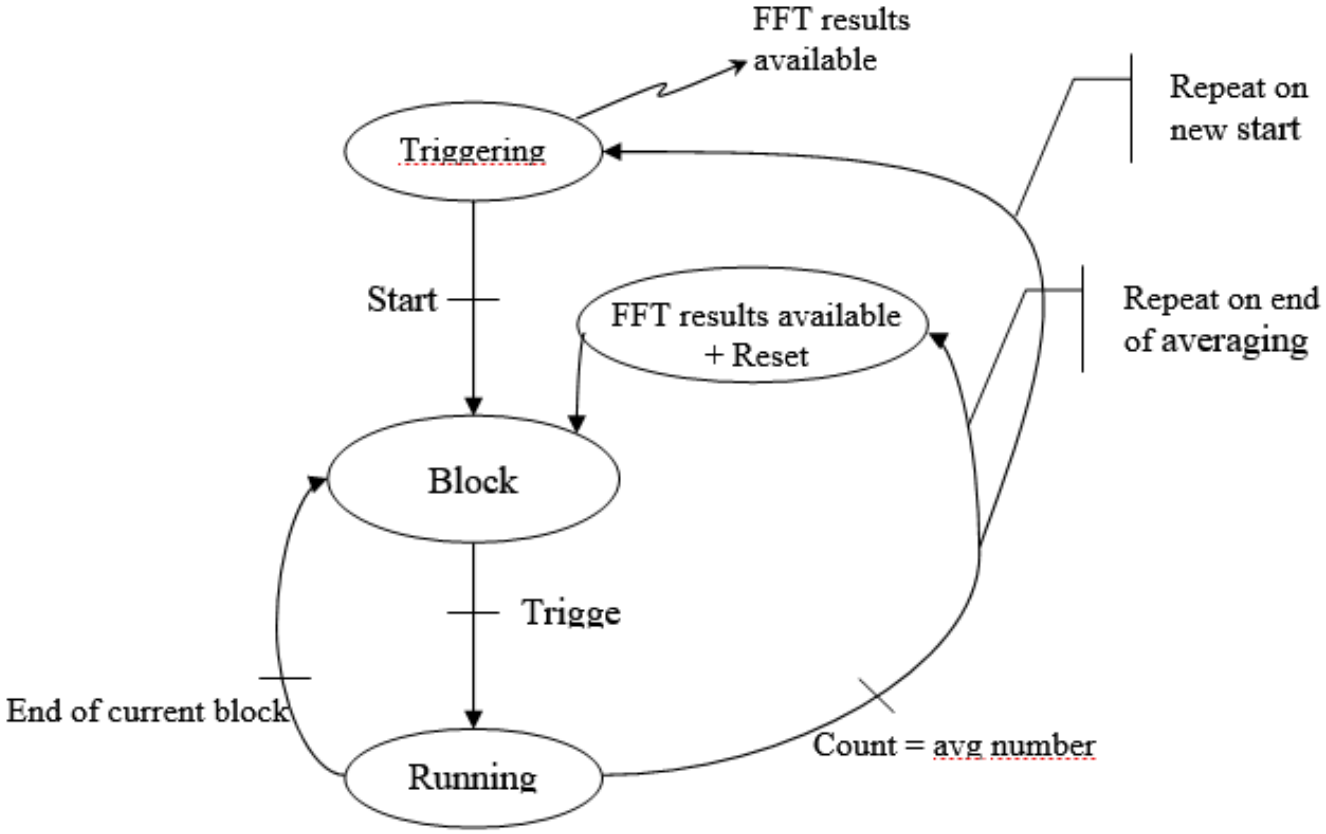
- **Order number**: Select the number of the order you want to track, from 0.001 up to 800.
- **Bandwidth**: Select the bandwidth used to compute the energy of the order from *3*FrequencyRange/(NumberOfLine-1)* up to *FrequencyRange* with *FrequencyRange* being the value of the setting Range from the 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.

9.3.2 Trigger

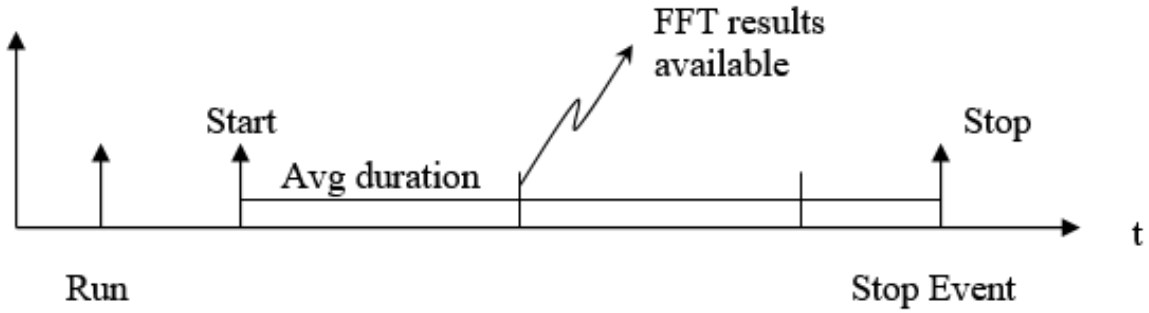
Contains the settings related to trigger events and how to start, and stop signal computation.

- **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:

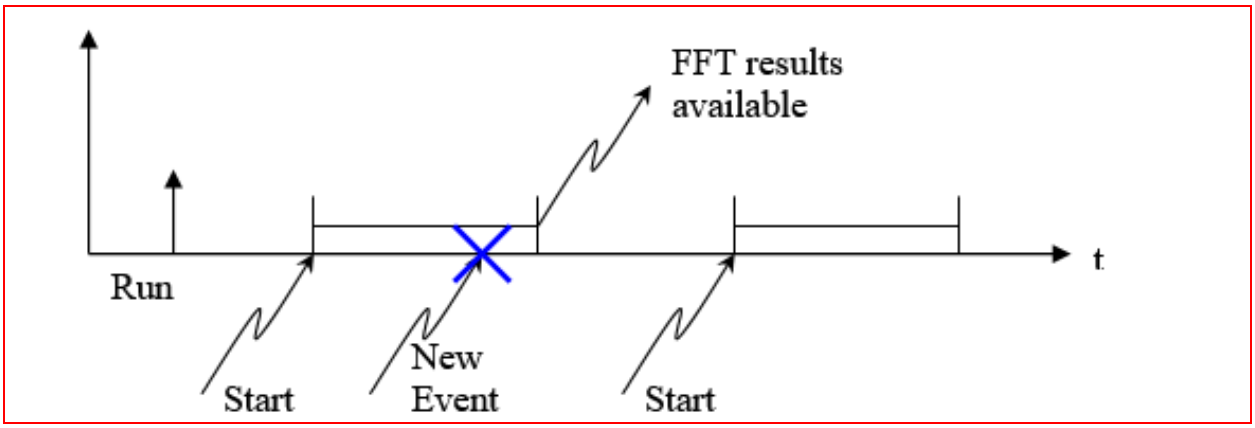


- Mode Repeat on 'end of averaging':



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.

9.3.3 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*.

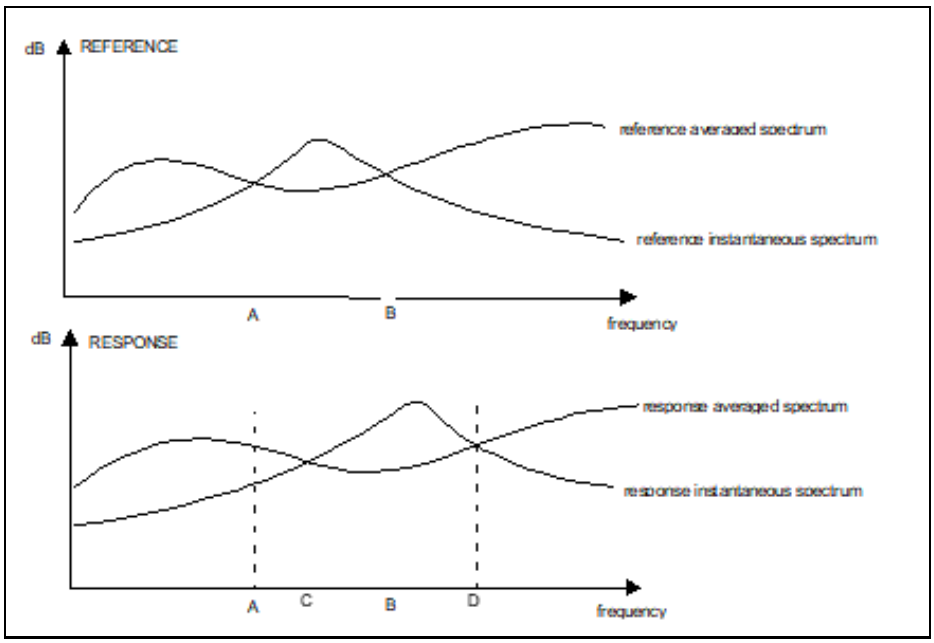
- **Size**: The number of signal blocks used to compute the average, from 1 up to 1000000000.
- **Duration**: The duration of the signal used to compute the average. This depends on four other settings: Size from the same sub-module, and Range Overlap and Resolution from the FFT Analysis sub-module. 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.

9.3.4 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%.

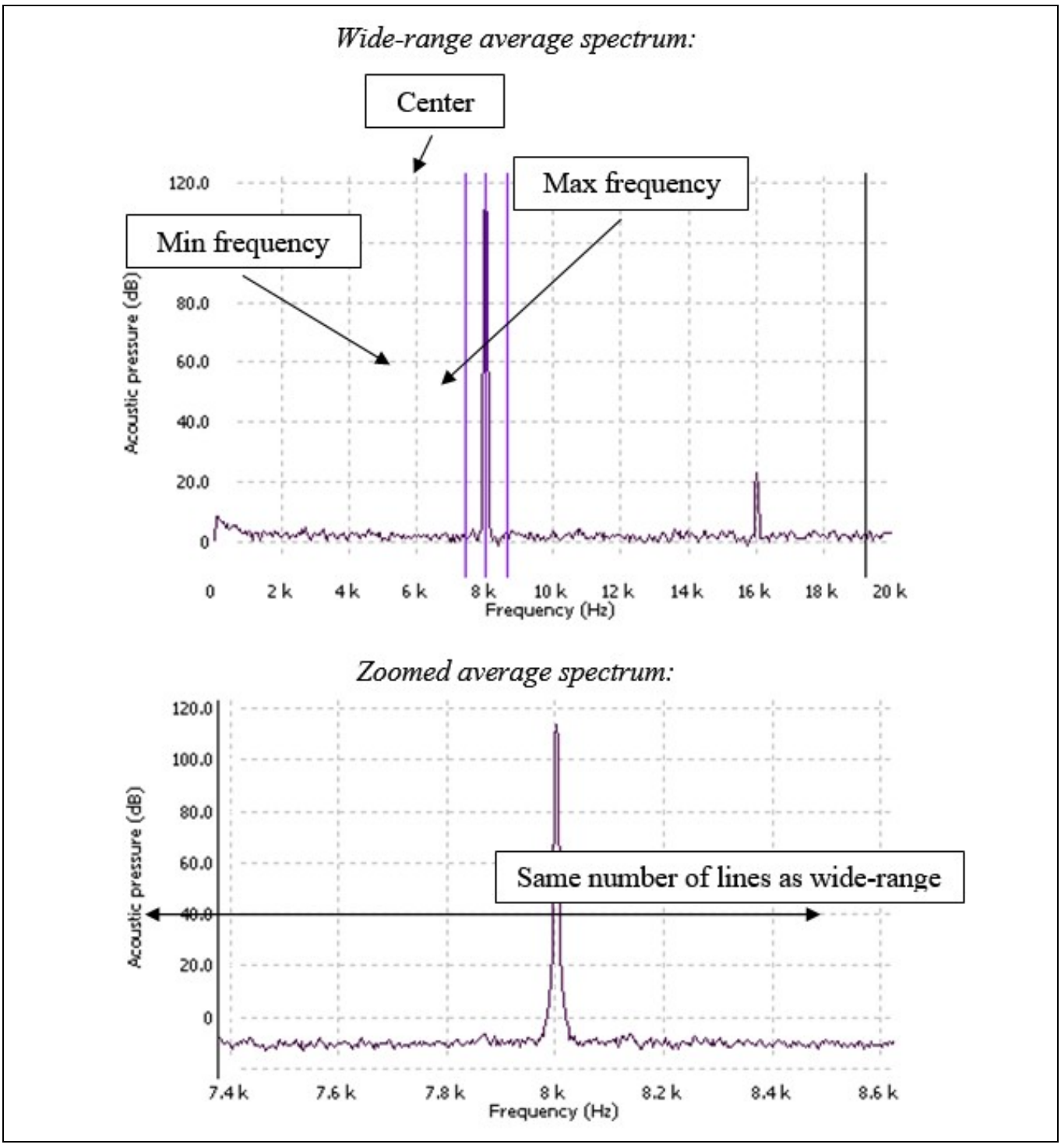
Note: When the overlap exceeds 99%, NVGate does not inform if you lost real-time. At this moment, NVGate is performing as fast as it can by taking the last trigger block than can be computed by the processor.

- **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"

9.3.5 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:

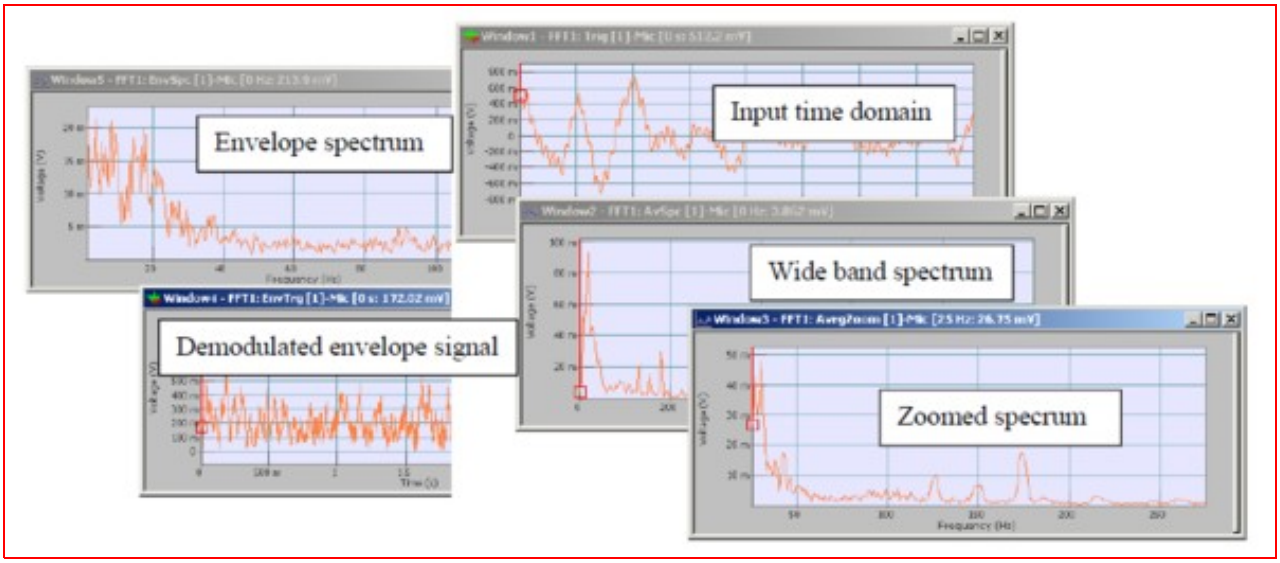
- Set **Factor** and **Center** (min and max values are update automatically with the center frequency) if the zoom would be done around a central frequency well defined. By modifying Factor, max and min frequencies will be automatically set to define zoom limits.
- Set **max** and **min** frequencies (center and factor are update automatically) if the limits in frequency would be fixed on specific values.

9.3.5.1 Envelope

Read the user note for more info about envelope analysis.

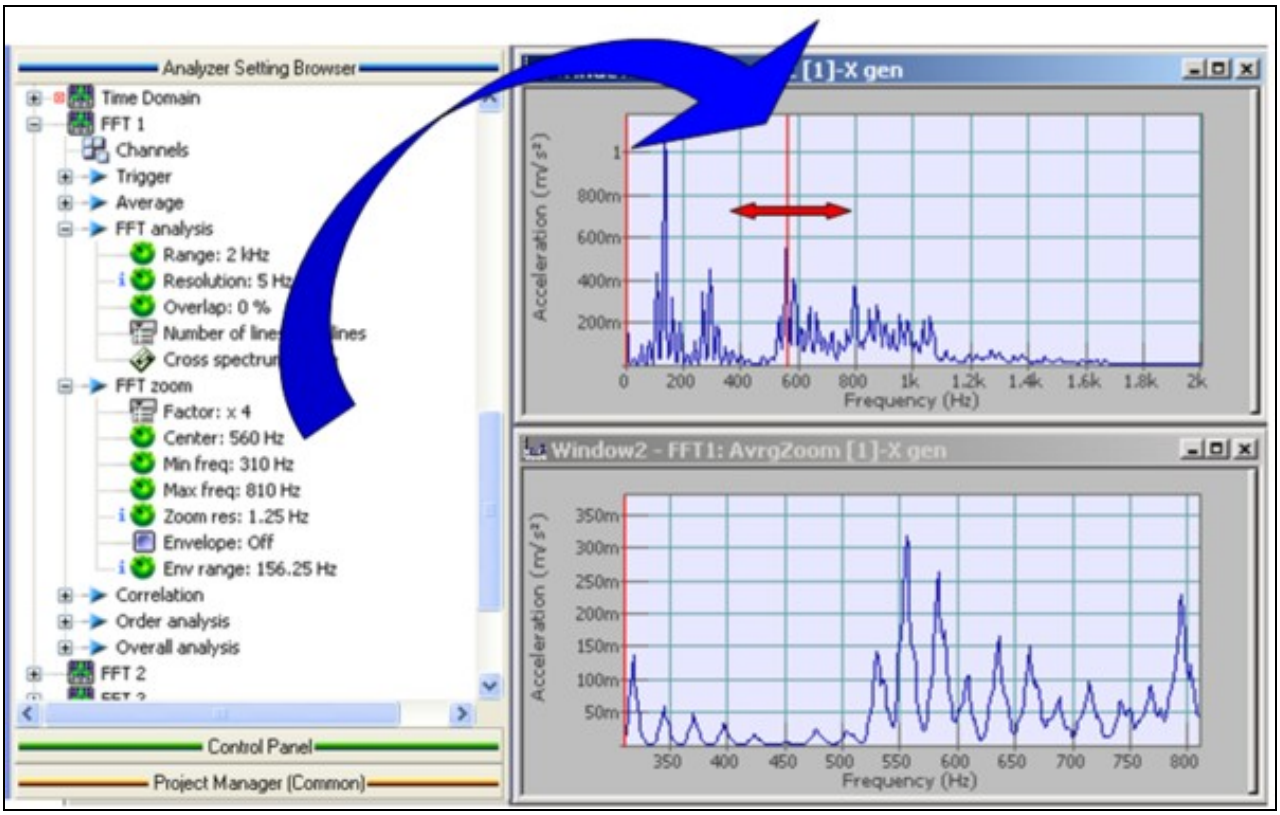
FFT plug-in integrates as a standard an amplitude demodulation analysis that provides envelope results. Even demodulated time domain signal and envelope spectra can be handled for real time display, result saving and report generation. Envelope demodulation is linked to the FFT zoom activation. When 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.

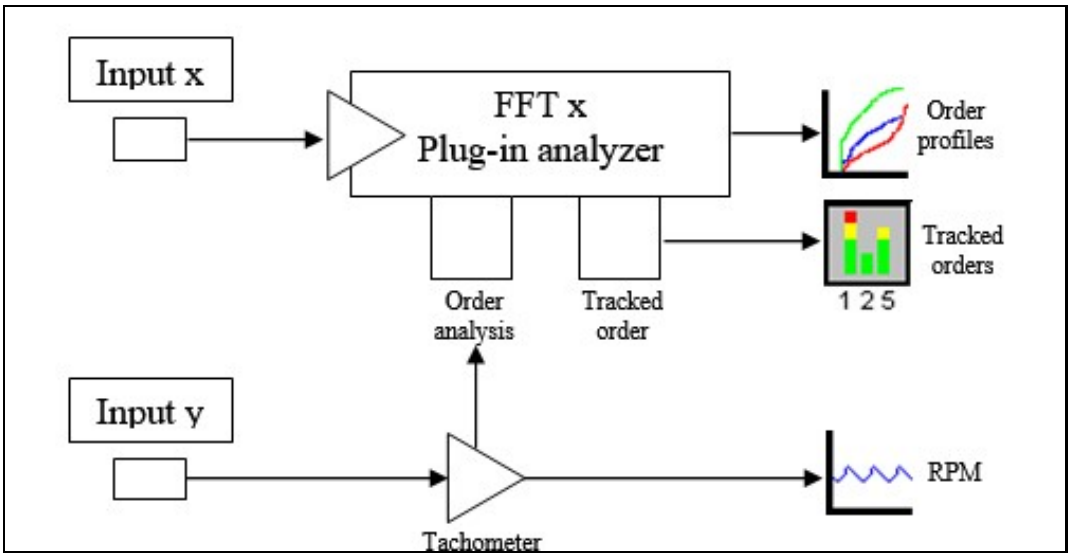


As an example (see fig below) you can easily focus on spectra area using the zoom center setting as a cursor in the wideband FFT spectra. Then it is efficient to move the center of the FFT zoom from one peak to the order as a cursor. In cab also be useful to control pass-band filter limits, directly from the corresponding spectra. Try it when you use the monitor filter scalar values.

9.3.6 CBT: Order analysis

Read the dedicated CBT page for more info.

Contains the settings related to constant band tracking operations.



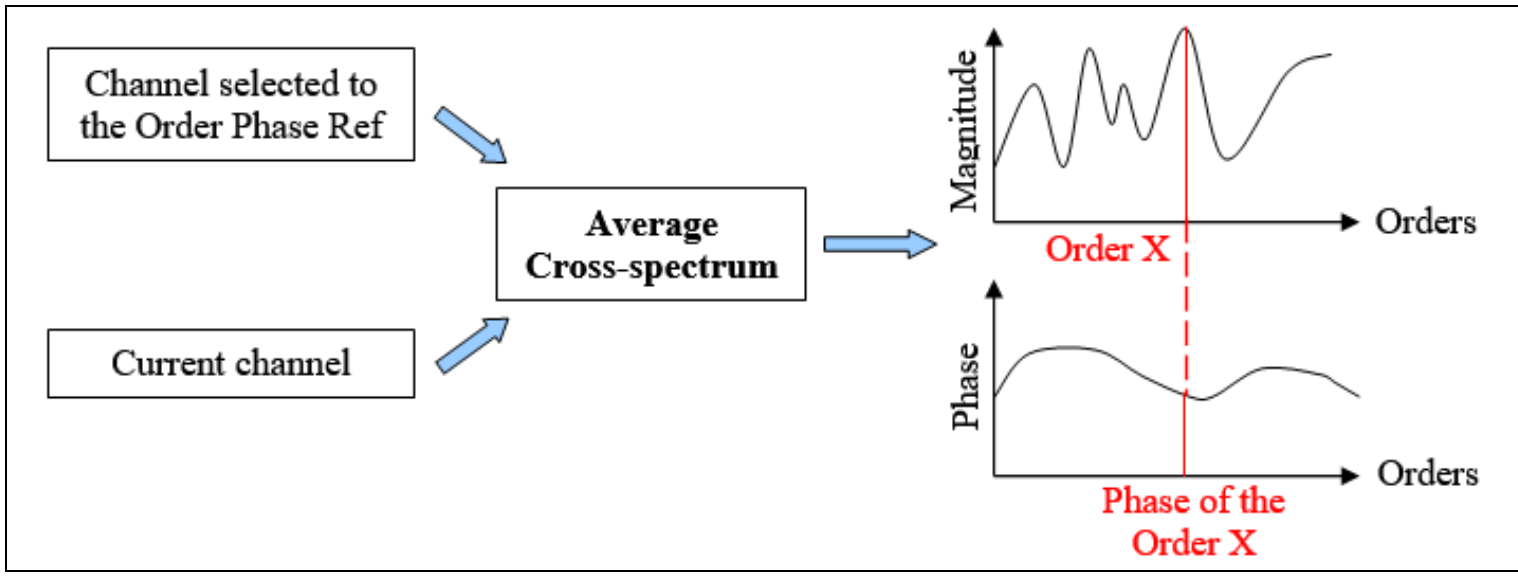
- **Associated tach**: The selected Tach enables the FFT plug-in to perform Constant Band Tracking.

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.

9.3.7 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 $x(\tau) = y(\tau)$.

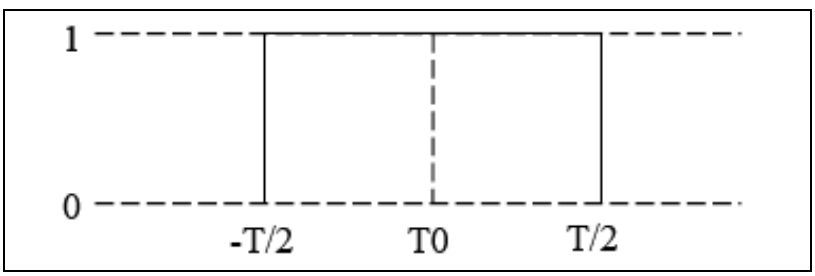
- **Correlation:** Allows to activate or not the calculation of the correlation.

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.

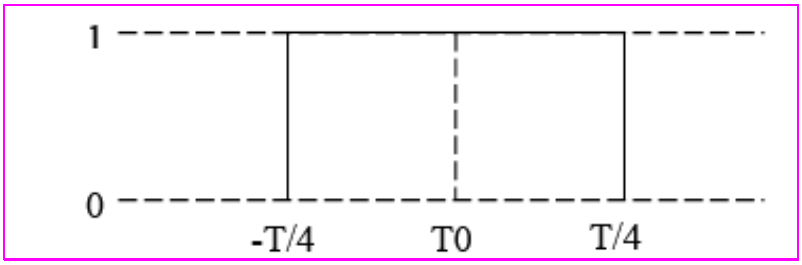
- **Weighting window:** Choose between following values of this setting:

Three types of correlation window are available:

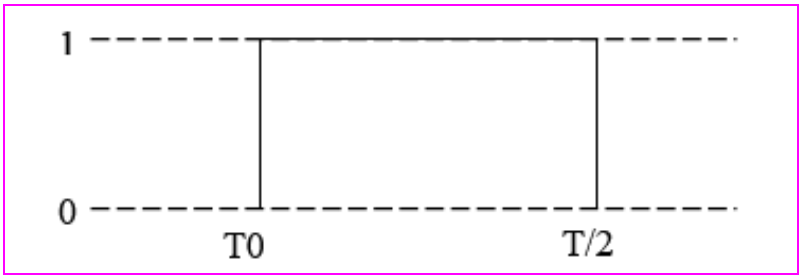
Uniform [-T/2, T/2] (where T is the trigger block length): All the window coefficients are equal to 1. For best results with the Uniform weight window, you should use signal sources that are self-windowing, such as transients, burst, and periodic waveforms (signal period must be a multiple of the weight 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.

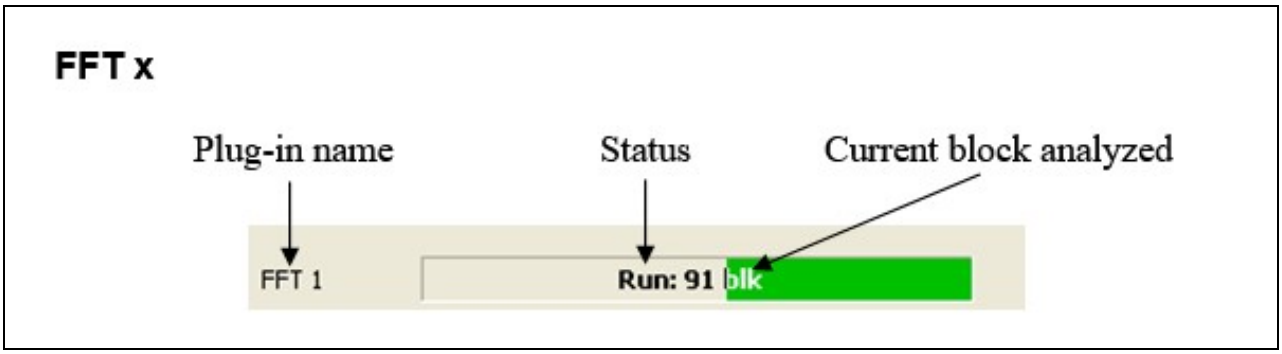
9.3.8 Overall analysis

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.

9.4 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:

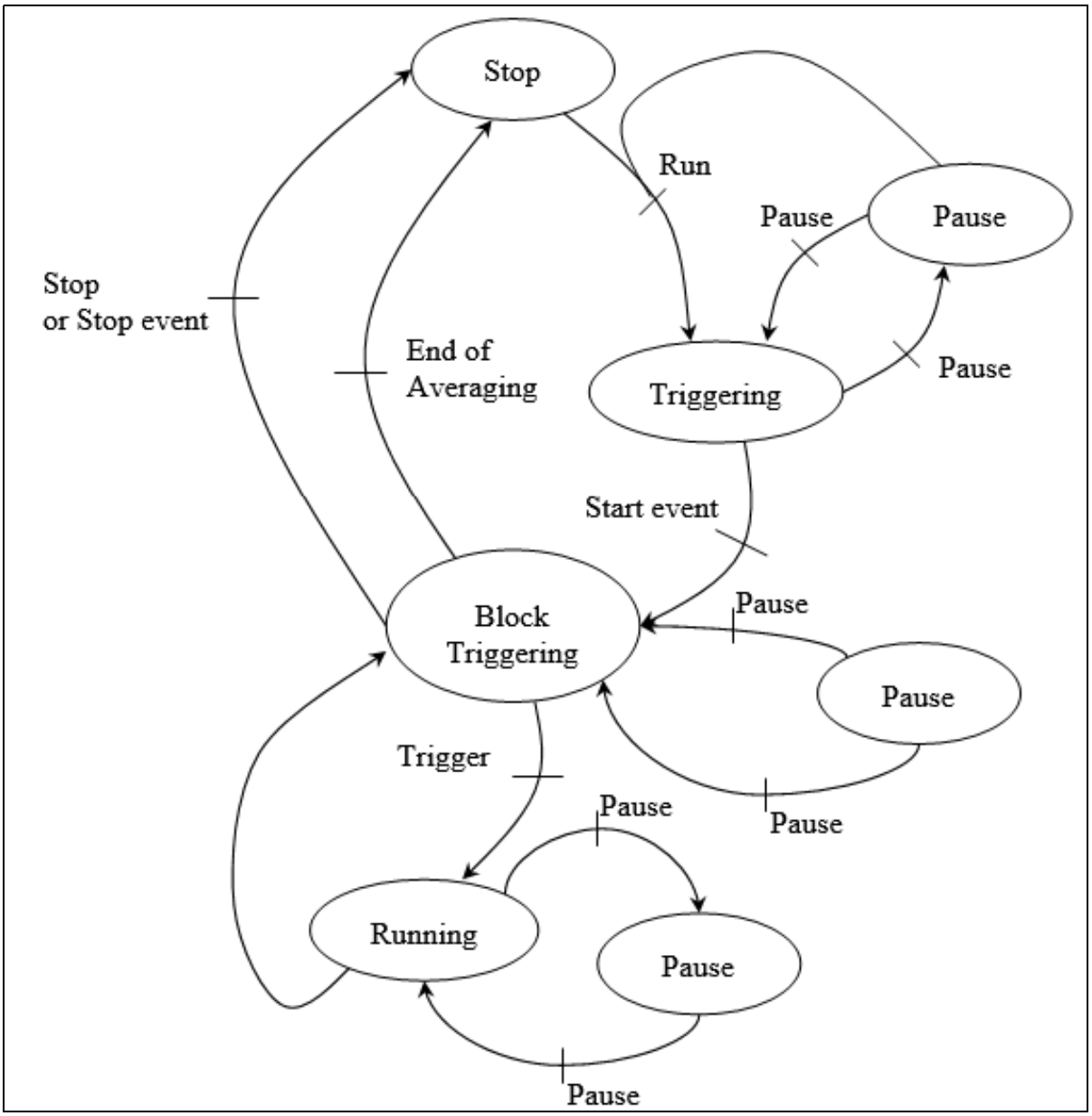
- **?Linear?**, **?Peak hold?** or **?Ref peak hold?:** the progress bar is filled from left to right.
- **?Exponential?**: the progress bar is filled from right to left with a flashing until the end of the acquisition.

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.

9.4.1 Count

This status displays the averaging count processed. This status is expressed in analyzed block.

9.4.1.1 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).

9.4.1.2 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).

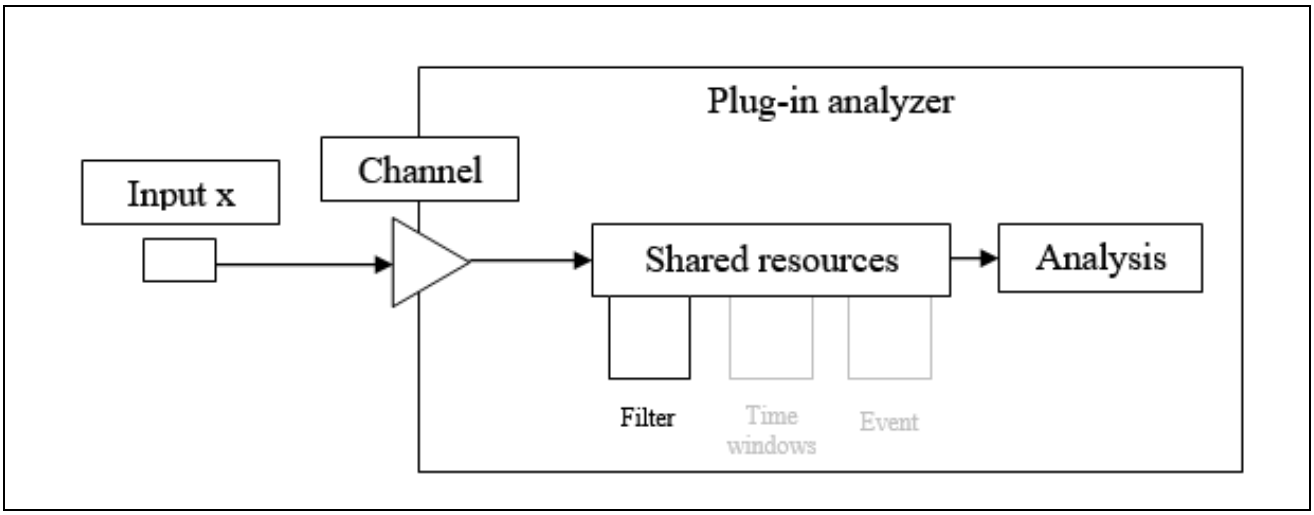
9.4.1.3 Analysis overload

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.

10 NVGate Filter Builder

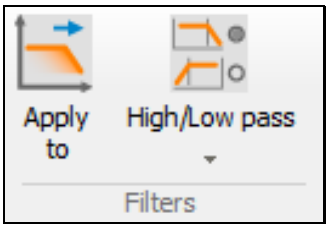
10.1 Filters

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).

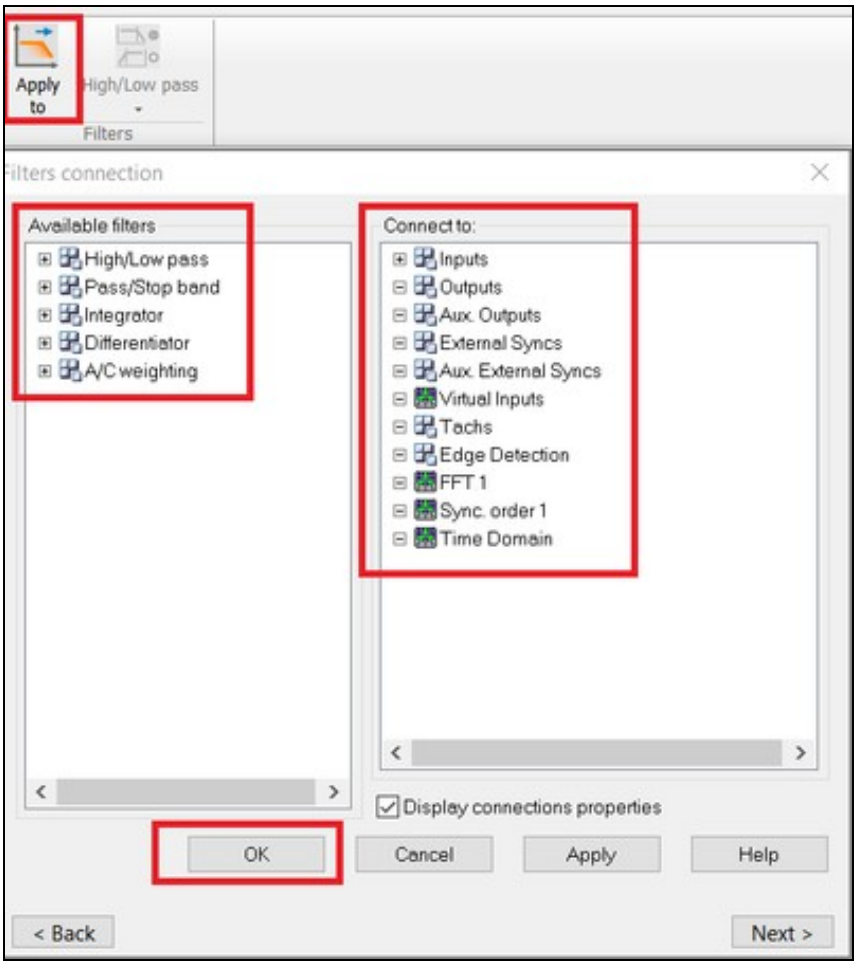


10.1.1 Connect a filter

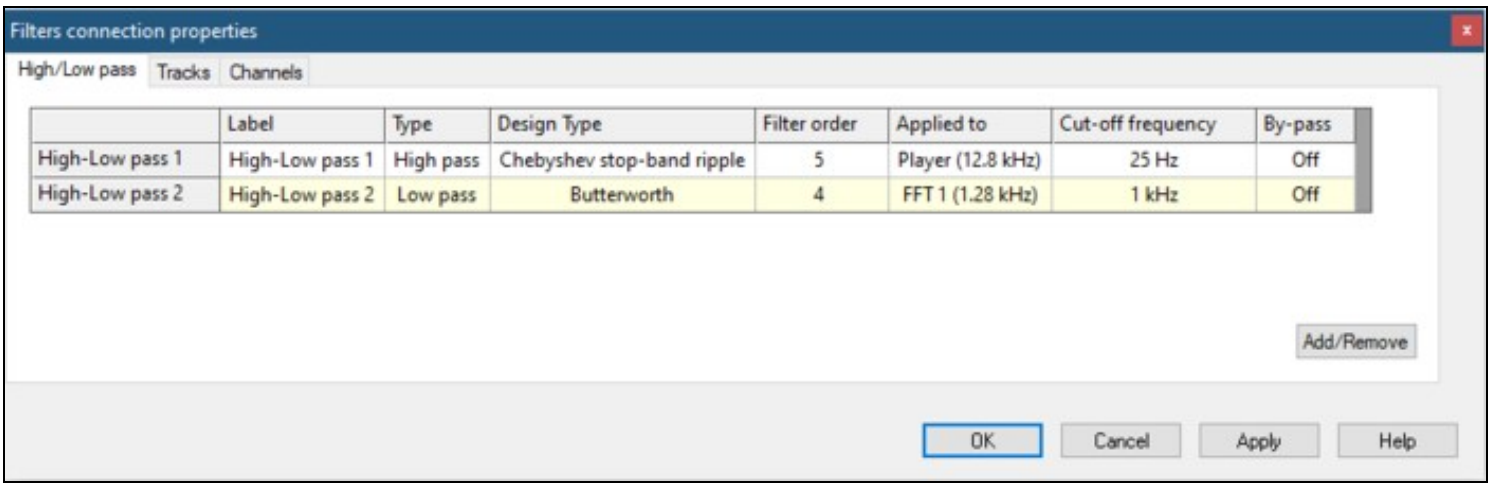
In the acquisition tab, The left button (*Apply to*) allows users to choose where to apply the filters. The right button (*Filter builder*) allows users to setup the properties of the filters.



 *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.

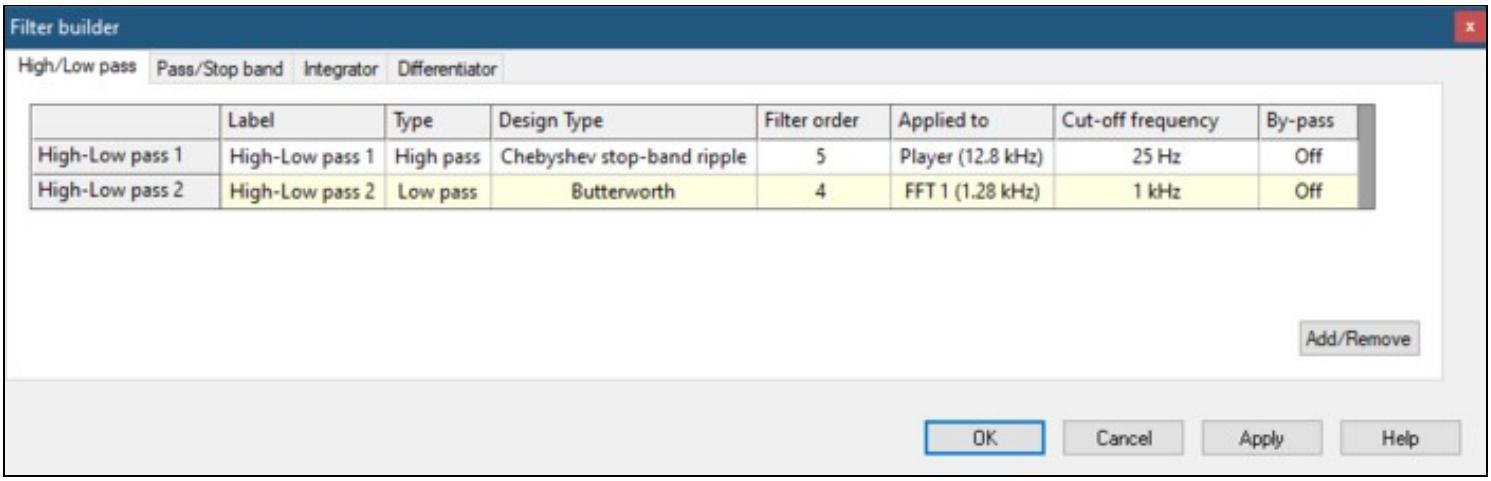


Note: Due to the bandwidth compatibility, once a filter is applied to a module (ex: a plug-in channel), it can only be used to the same plug-in channels. The front-end is considered as a plug-in.

10.1.1.1 Filter builder

10.1.1.1.1 High-Low pass

 : Used to design a high-pass filter or a low-pass filter (Butterworth, Chebyshev Type I, and Chebyshev Type II).



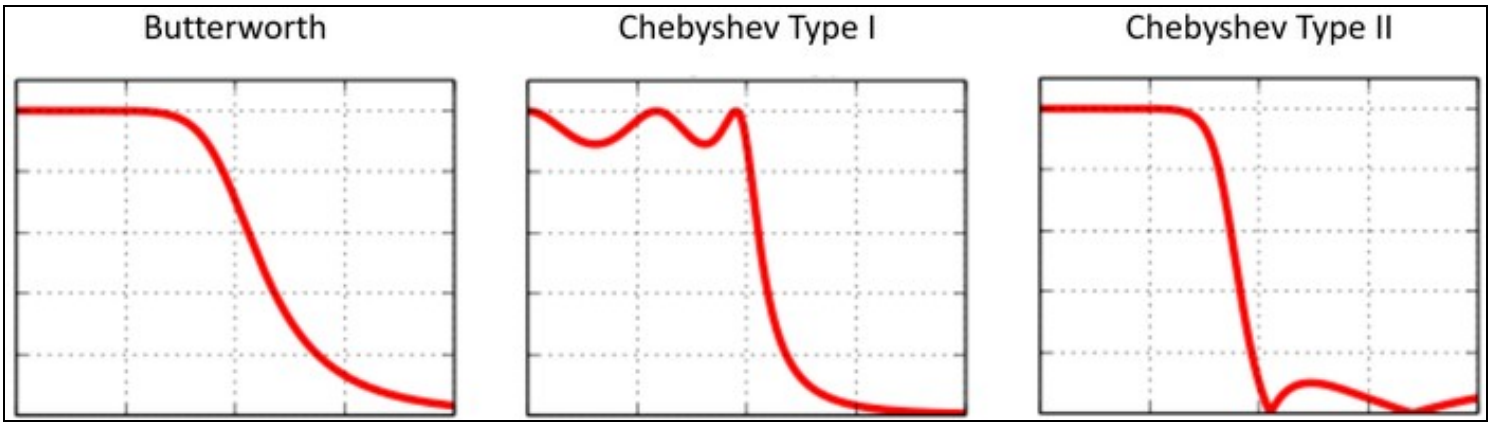
- **Label**: The name of the filter (by default High-Low pass n, with 1 ? n ? 4).
- **Type**: The type of the filter - Low pass or High pass.
- **Design Type**: The analog prototype filter - Butterworth, Chebyshev band-pass ripple (Type I), or Chebyshev stop-band ripple (Type II).

  The Butterworth filter has flat response in both the pass band and stop band, but its transition band is wide.

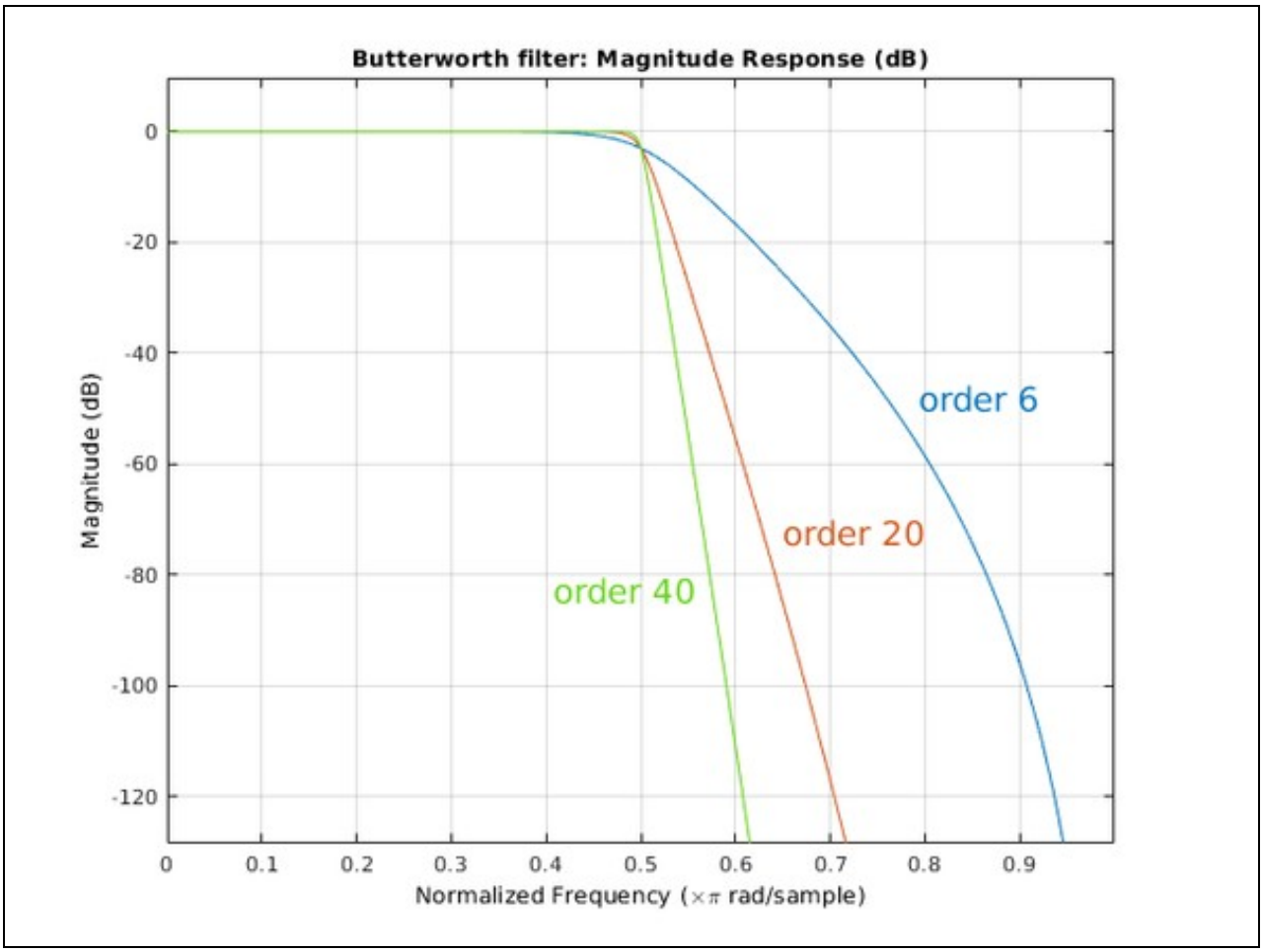
  The Chebyshev type I (band-pass ripple filter) has the steepest roll-off among the three filters, and its response in the stop band is flat. However, it has ripples in the pass band.

  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).

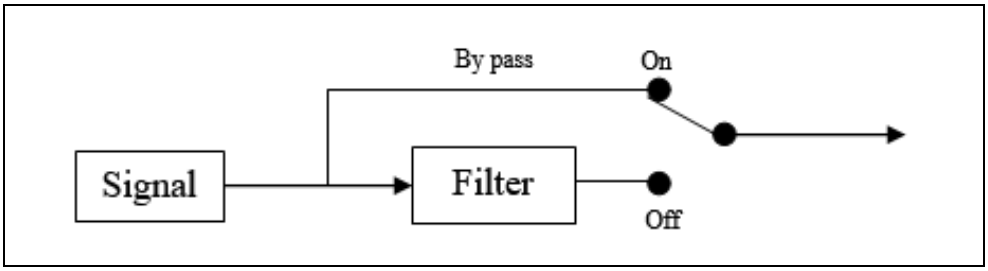
Apply to	Description
Front-end (20 kHz)	To be used on any resources and monitor
FFTx (10 kHz)	To be used on the FFT x analyzer only

  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.

10.1.1.1.2 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).

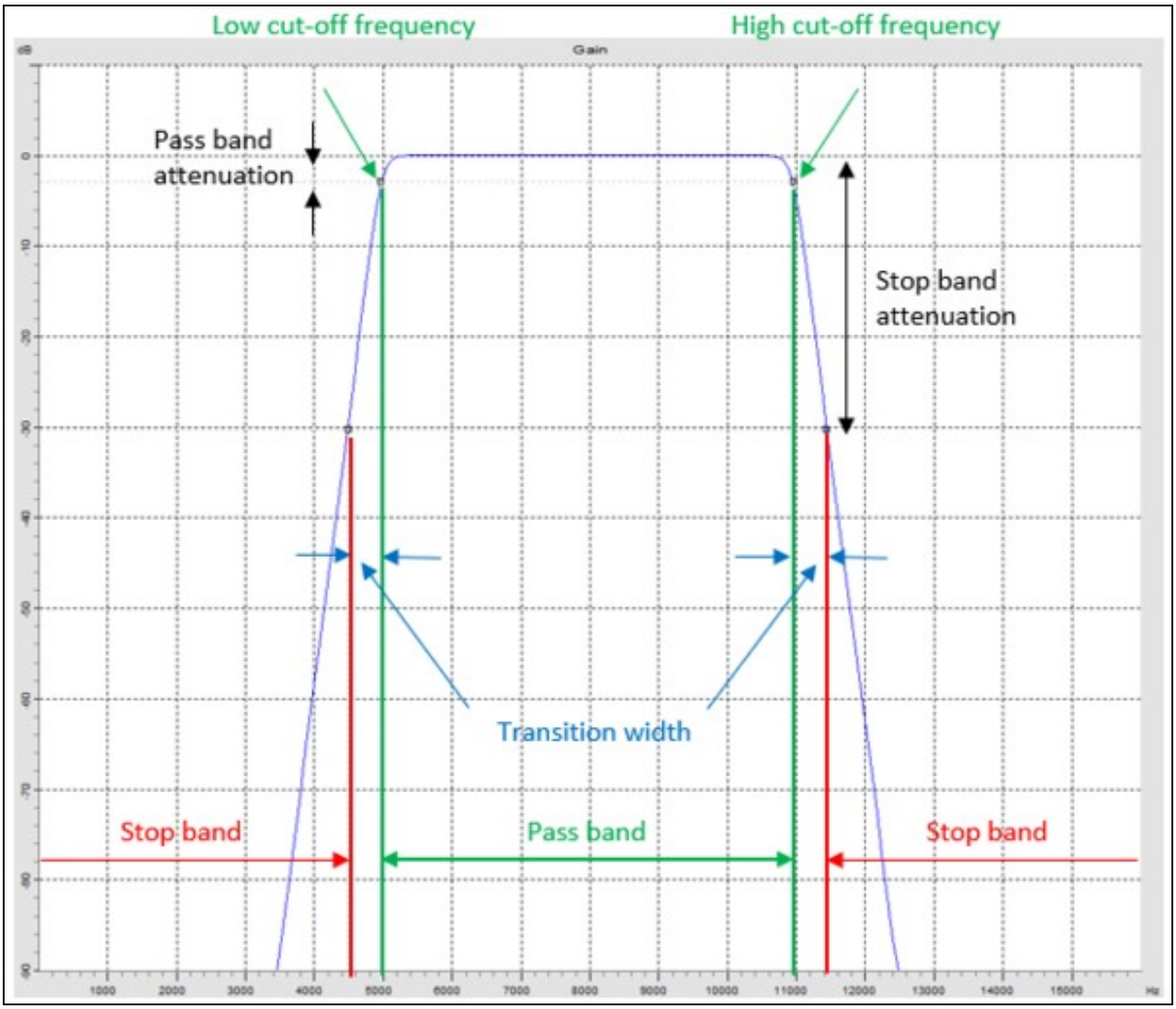
Apply to	Description
Front-end (20 kHz)	To be used on any resources and monitor
FFTx (10 kHz)	To be used on the FFT x analyzer only

  Note that even if plug-ins run in the same bandwidth, it?s not possible to share filters between different plug-ins.

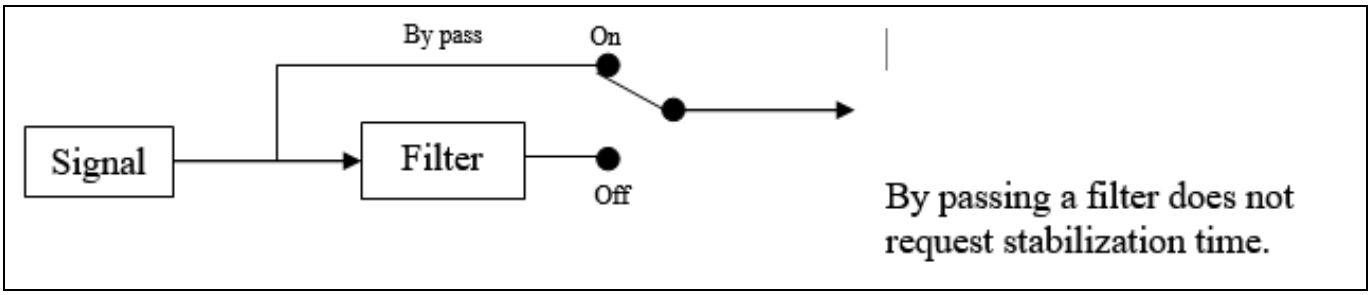
- **Low cut-off frequency** and **High cut-off frequency**: The low cut-off frequency of the filter f_{low} and the high cut-off frequency of the filter f_{high}, as shown in the following figure.
  Their values need to meet the following conditions in the connected and office mode:

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.



10.1.1.1.3 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:

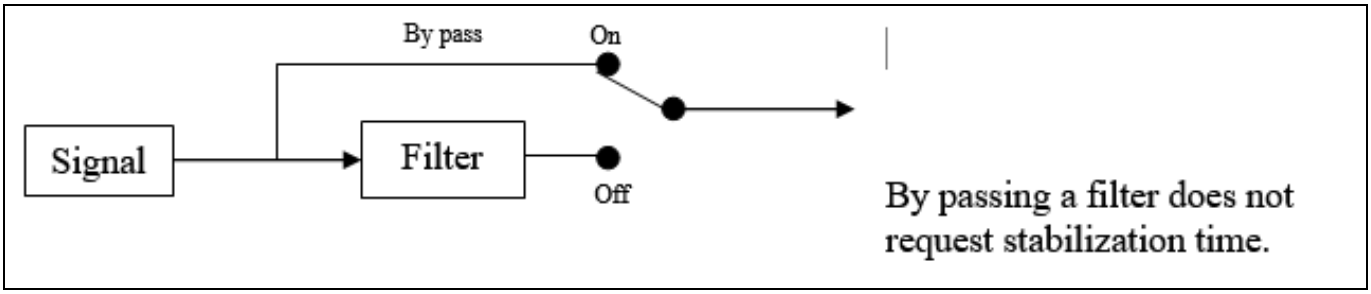
$$S(f) = \frac{1}{j\frac{w}{w0}}$$

$\omega 0 = \frac{2\Pi}{T}$ 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.

10.1.1.1.4 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.

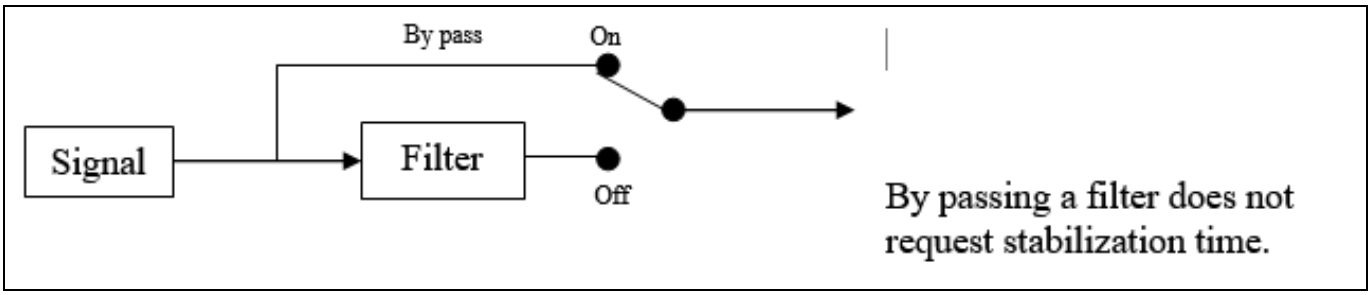
- **Avg. duration**:Filter average duration. By default, the average duration is equal to 0s. This value can be modified by the user. This setting is used to specify the exponential average duration of the differentiator filter

$X_{mean}(n)$ = ?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.

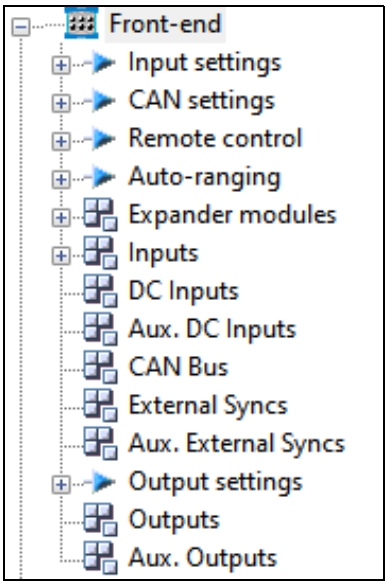
The following formula is applied to the averaged signal:

$Y(n) = (X_{mean}(n) - X_{mean}(n-1)) / f_s$. 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.



11 NVGate Front End



The Front-end module contains the settings that control the analyzer inputs, outputs, Ext Sync, and auxiliaries, DC channels, Can bus.

11.1 Available results:

Type	Size	Dimension	Domain	Save
Signal	256 pt	2D	time	Display only
DC	1 pt	1D	time	Display only
DC profile	2048 pt max	2D	time	Display only
RMS	1 pt	1D		Display only

- **Signal:** The input time signal after sampling at the *Input settings/ Input sampling* rate
- **DC:** The DC input signal after sampling at the *Input settings/ DC input sampling* rate
- **DC profile:** Changes in the DC input signal during the *Input settings/DC profile duration* time
- **Output Signal:** The output signal
- **Aux Output Signal:** The auxiliary output signal

11.2 Input settings

The Input settings sub-module controls the Front-end general parameters that apply to all channels.

- **High Input sampling** and **low Input sampling**: the dynamic input/output sampling frequency (in Samples/second). Changing this will set the bandwidth for all plug-in analyzers and recorders to the following value: Sf / 2.56.

We allow 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 (except for SOA and overall acoustic plug in). Mixing input bandwidths in one analysis plug-in leads to set its bandwidth to the lowest one.

Sampling frequency	Frequency range
102.4 kS/s	40 kHz bandwidth
65.536 kS/s	25.6 kHz bandwidth
51.2 kS/s	20 kHz bandwidth
32.768 kS/s	12.8 kHz bandwidth
25.6 kS/s	10 kHz bandwidth
16.384 kS/s	6.4 kHz bandwidth
12.8 kS/s	5 kHz bandwidth
8.192 kS/s	3.2 kHz bandwidth
6.4 kS/s	2.5 kHz bandwidth
5.12 kS/s	2 kHz bandwidth
4.096 kS/s	1.6 kHz bandwidth
3.2768 kS/s	1.28 kHz bandwidth
3.2 kS/s	1.25 kHz bandwidth
2.048 kS/s	800 Hz bandwidth

- **DC input sampling Optional, depends on hardware options**: the sampling frequency (in Samples/second) = SF_Slow of DC Inputs (parametric). 2 sampling frequencies are proposed. This sampling frequency are multiple of 1/32 of dynamical input sampling.

@51.2kS/s we have:

- 15 S/s
- 12.5 S/s.

These values may be adjusted and slightly varies to match the dynamic inputs sampling frequency submultiple. In both cases, the 10 Hz multiple (10 to 80 Hz) are rejected by a multi-notch filter.

Please note, the following rejectors are used for V1 hardware:

DC input sampling	Description
15 S/s	The sampling frequency applied to the DC inputs is 15 samples/second, and the 50 Hz component of the signal is rejected at lower than -78dB
12.5 S/s	The sampling frequency applied to the DC inputs is 12.5 samples/second, and the 50 Hz component of the signal is rejected at lower than -78dB

- **Note**: the DC input sampling is available with the presence of optional DC inputs on OR35, OR36, OR38 and Mobi-Pack hardware only. With the OR36-V2, OR38-V2 and MP-V2, the parametric sampling of the universal input is automatically managed and not displayed. In this last case, the rejected frequencies are the harmonics of 10 Hz.

- **DC profile duration***: the duration of the DC profile must be a multiple of 1/SF_Slow, with SF_Slow is the DC input sampling. Its minimum value is 10 / SF_Slow, and its maximum value is 2048 / SF_Slow.
- **Inputs x-y 200V***: enables the 200V power supply on the corresponding block of 8 inputs LEMO connectors. There are up to 4 blocks of 8 inputs LEMO depending of the hardware configuration (input 1-8, input 9-16, input 17-24 and input 25-32)
- **Check ICP**: run an ICP check. The analyzer checks if an ICP transducer is correctly connected to each input for which the coupling is ICP. The analyzer checks the ICP connection by measuring DC polarization voltage through time averaging and opens a window with the results:
- Short circuit: DC voltage < 4 V (the sensor may be faulty)
- ICP detected: DC voltage between 4 V and 20 V (an ICP sensor is detected)
- No connection: DC voltage > 20 V (no ICP sensor is detected), open circuit
- Unstabilized input: DC voltage was not stabilized after 40 s.
- ICP current: Select the current injected in the inputs with active ICP coupling. The standard current is 4 mA. For super small transducer, the 4 mA * 28 V power dissipation increase dramatically the temperature transducer. This may be unsuitable with wax fixation (melting). The 2 mA ICP current allow dividing by 2 the transducer temperature.
- **Detect TEDS:** Run a TEDS detection. The analyzer detects if a TEDS transducer is connected to an input with the ICP TEDS coupling. All the characteristics of the transducer are detected and it automatically appears in the transducer database.
- **Bridge Auto-zero:** The Bridge Xpod features an automatic bridge balancing using voltage offset injection. The bridge balancing process duration is about 20 sec. Process information are provided in the NVGate status bar (bottom left). After balancing, the Offset compensation is modified according to the requested compensation voltage.

11.3 Remote Control

This module defines the content of some of the remote control (option) screens. The values of the following settings will configure the remote control display.

- **Selected tach:** The tach to be used for RPM display in the Rotating screens
- **User field 1**: The content of this setting (text) will be displayed in the upper user field of the remote control
- **User field 2**: The content of this setting (text) will be displayed in the lower user field of the remote control

User?s fields are useful to follows acquisition sequences. The content of the user field 1 & 2 can be fulfilled by the sequencer, indicating the operator the point of impact or transducer position for example.

Please note the remote control is no longer delivered with OROS analyzers.

11.4 Auto-ranging

Keywords : Autorange, auto range, auto-range, autoranging, auto ranging

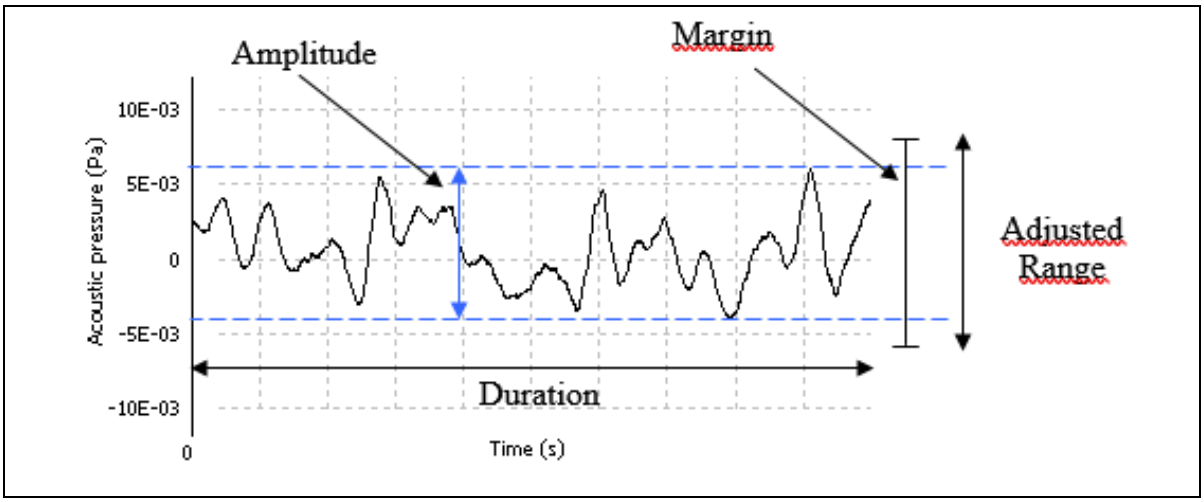
Auto-ranging consists of making an automatic adjustment of the Input ranges to the levels of the signals present on input. It concerns only inputs for which the Enable auto-range is set to On. It can be done in two ways: Normal auto-range or Peak detection auto-range.

The normal auto-range must be used when the input signal level (Peak to peak) is stationary.

The peak detection auto-range must be used if there are spikes or large variations in the selected input. The computation takes into account (for all channels) data read during each spike of the selected input. This mode is useful if there are spikes in the selected input as in modal analysis, for example.

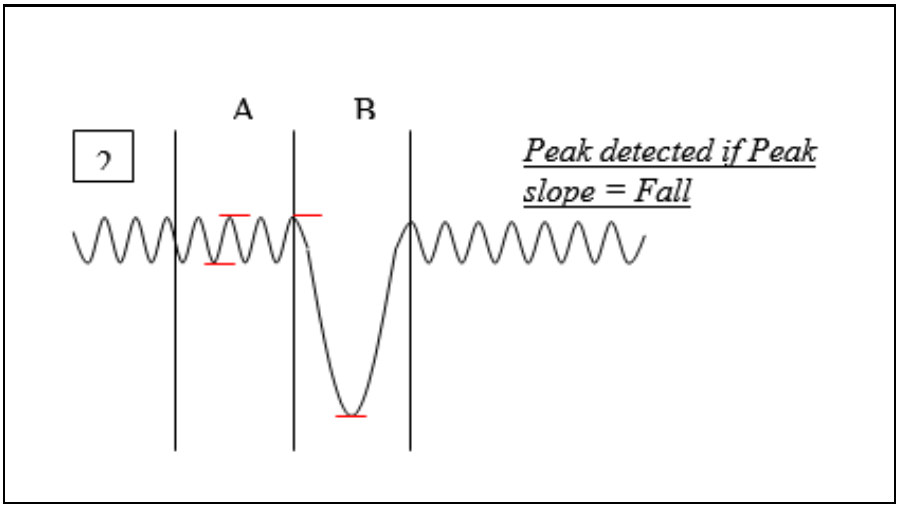
- **Auto-range**: button used to run the auto-range. If a Peak detection auto-range is running, the user can press this button to cancel the auto-range.
- **Peak detection on**: the input selected for peak detection (in a peak detection auto-range). If this value is "none", it is a normal auto-range. The list contains all the inputs for which the enable auto-range is set to On.

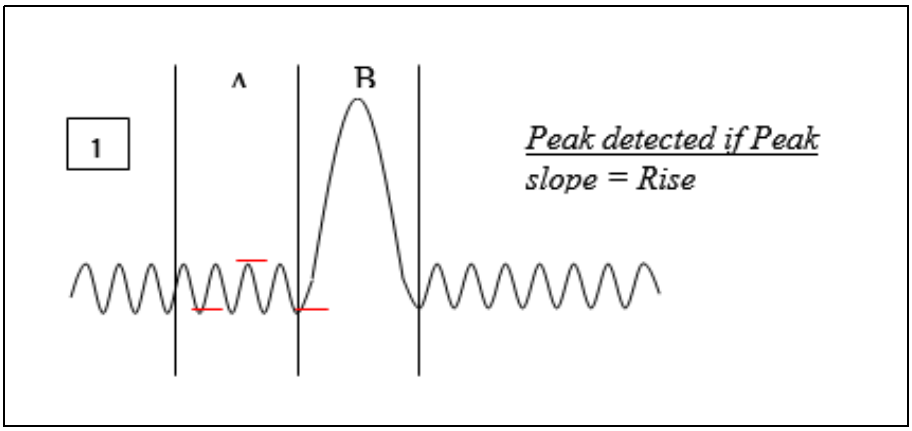
None: normal auto-range

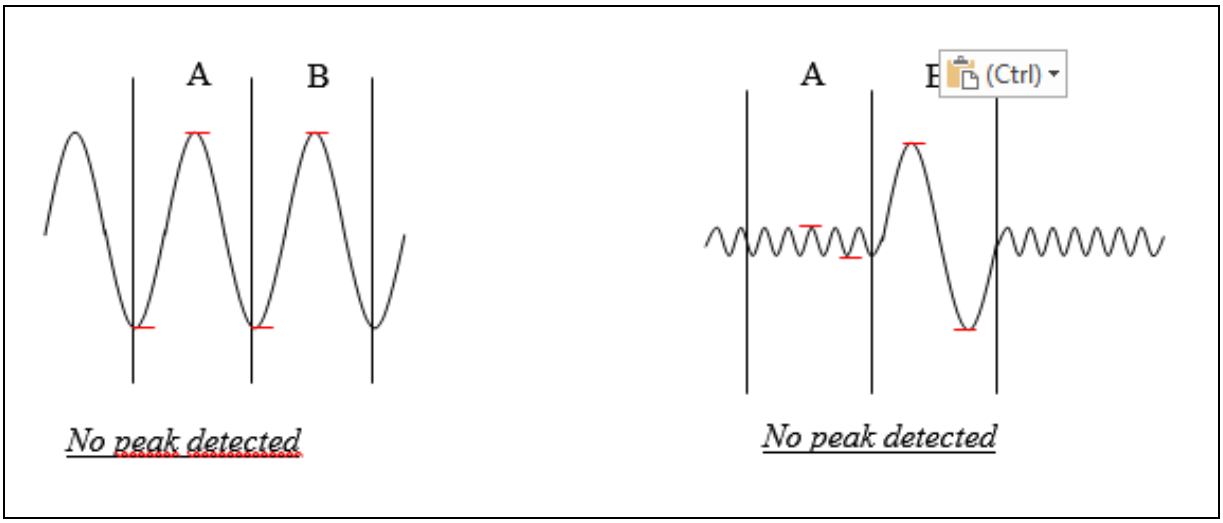


Input x: auto-range on peak.

Auto-range starts when Input x amplitude value changes dramatically according to a defined factor (Edge detection).







Margin: the margin in dB added to the max detected to determine the new range.

Margin	Description
no	the max detected becomes the new range
3 dB	add 3 dB to the max detected to compute the new range
20 dB	add 20 dB to the max detected to compute the new range

- **Duration**: duration of the normal auto-range.

Hidden/fixed: hidden in Peak detection auto-range mode.

- **Peak slope**: the peaks are detected only with this slope.

Hidden/fixed: hidden in Normal auto-range mode.

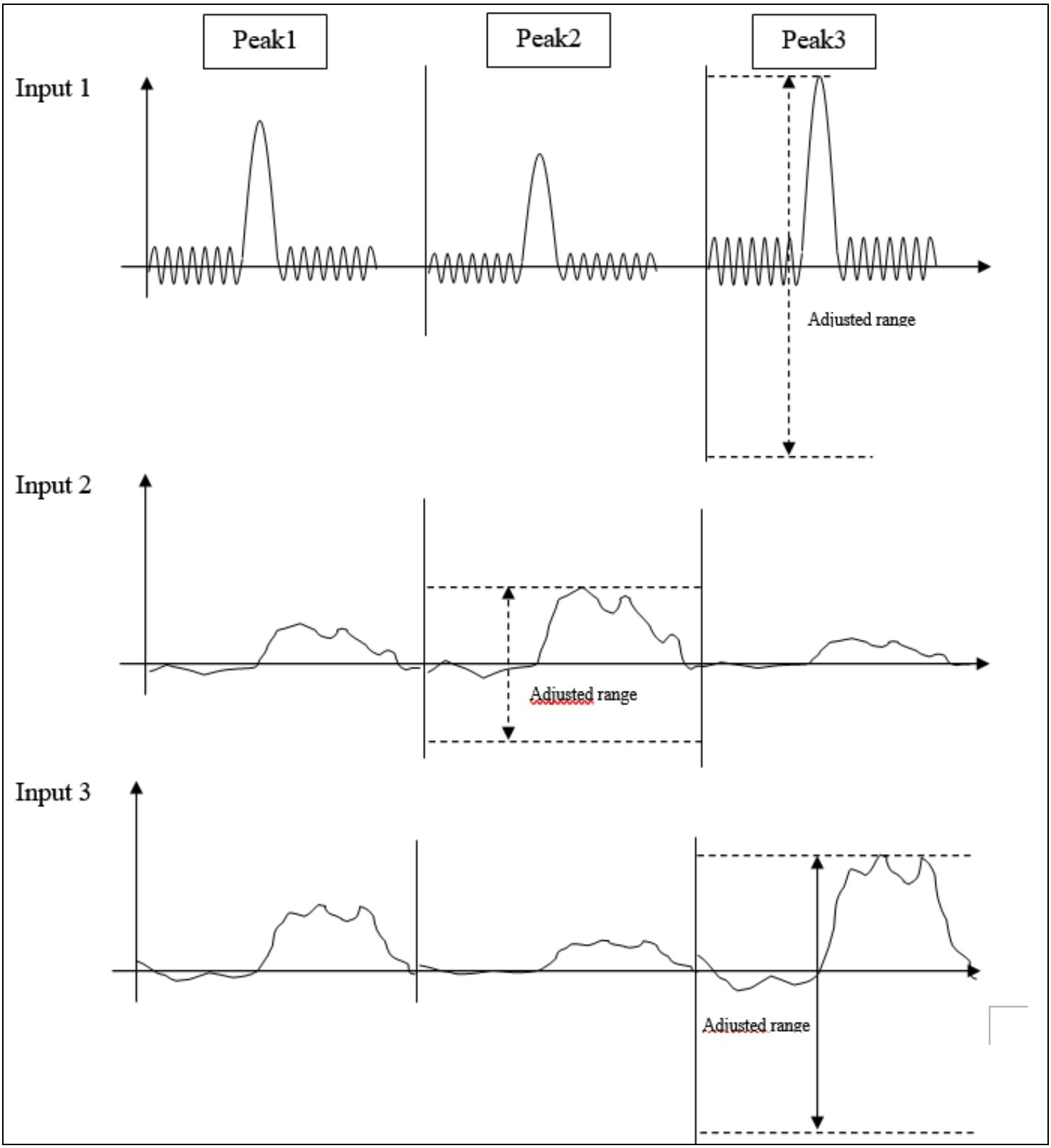
Peak slope	Description
Rise	Auto-range on a rising edge (1)
Fall	Auto-range on a falling edge (2)
Any	Auto-range on any edge (1 or 2)

- **Number of peaks**: the number of peaks to detect in order to achieve the Peak detection auto range. It can vary from 1 to 10.

Hidden/fixed: hidden in Normal auto-range mode.

For example: Peak number = 3, Peak detection = input 1 and inputs 2 and 3 are connected to the analyzer and available for auto-ranging. The inputs 2 and 3 will be auto-ranged during the 3 peak detections and the maximum detected range will be kept for each input.

Peak detection with a hammer works well with a low sampling frequency (less than 13.8 kS/s). With higher sampling rate it may be difficult to detect the peaks.


Peak1
Peak2
Peak3
Input 1
Adjusted range
Input 2
Adjusted range
Input 3
Adjusted range

- **Edge detection**: corresponds to the factor value that is used to detect the input x amplitude variations.

Edge detection	Description
Low sensitivity	Factor = 100
Normal	Factor = 20
High sensitivity	Factor = 3

Hidden/fixed: hidden in Normal auto-range mode.

11.5 Expander modules Xpod

The XPod is a device that can be fixed on OR3X TW analyzer. Each XPod is associated to a block of 8 inputs.

11.5.1 X-Pod Strain gauge Bridge

Read this page

11.5.2 X-Pod: Temperature probe conditioner

Read this page

11.6 Inputs

Contains all the settings related to the dynamic input x such as transducer type, sensitivity, coupling.

Each input (#1 to N#) can be configured for dynamic or parametric measurement. Activating an input from the *Inputs* list or the *DC list*, will make the input operate respectively with dynamic or parametric sampling, conditioning and analyses.

Settings for dynamic inputs

- **Label**: the name of this input (by default Input n, with 1 <= n <= 320+). The label of each input is used in the result name and in all connection tools.
- **Input Type**: When an XPod is present on one 8 input set, the corresponding inputs can be independently redirected to the Xpod conditioning. The settings bridge is to use for strain gauges conditioning.
- **Component**: the name of the structure to which the sensor is attached. *Hidden/fixed: only visible in the structural mode.*
- **Node**: the name (usually a number) of the point of measurement.

Hidden/fixed: only visible in the structural mode

- **Direction**: identify the axis and the direction of the measurement defined by the position of the sensor

Hidden/fixed: only visible in the structural mode

Direction	Description
Scalar	Sensor measuring in the scalar direction
-X	Sensor measuring in the negative X direction
+X	Sensor measuring in the positive X direction
-Y	Sensor measuring in the negative Y direction
+Y	Sensor measuring in the positive Y direction

-Z	Sensor measuring in the negative Z direction
+Z	Sensor measuring in the positive Z direction

- **Type**: the kind of measurement (if direction is different from scalar).

Hidden/fixed: only visible in the structural mode.

Type	Description
Translation	Sensor measuring translation in the selected direction
Rotation	Sensor measuring rotation along the selected axis in the selected direction

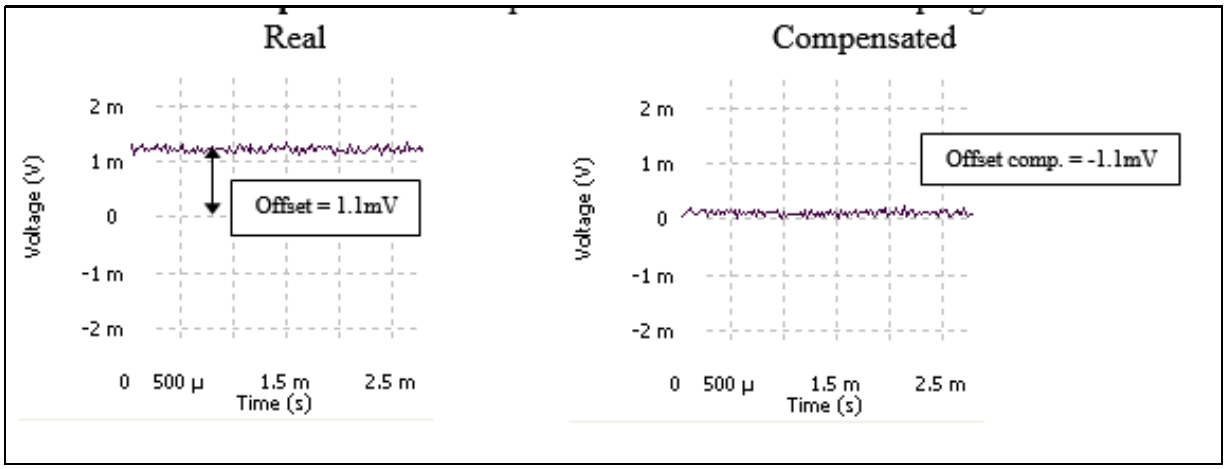
- **Transducer**: the transducer connected to this input. Selecting a transducer will automatically modify the sensitivity.
- **Physical '***qty'*.: the physical quantity applied to this input. It modifies the sensitivity and range peak units if necessary.

Hidden/fixed: fixed if a transducer is selected for this input.

- **Sensitivity**: transducer sensitivity. Changing it updates the range peak.
- **Range '***pk'*.: the maximum input level for this channel, from 17.5mV (100 mV on V2 hardware) up to 40V for a sensibility of 1 V/V. For a sensibility of 2 V/m/s^2 those values will be divided by 2 (0.0087 m/s^2 and 20 m/s^2) and for an external gain of 0.1 those values will be multiplied by 10 (0.175V and 400V). This setting can be displayed in dB.
- **External gain**: This enables the analyzer to take into account an external attenuation or amplification: for example if there is an external gain of 3dB, you can set the value of this setting to 3dB to retrieve the genuine amplitude of the signal. This setting can be displayed in dB.
- **Polarity**: The polarity applied to the signal. If the value is "inverted", positive and negative values are inverted. For example, if the signal value is 4 Volts with "Normal" polarity, it will be -4 Volts with "Inverted" polarity.

Polarity	Description
Normal	Normal polarity
Inverted	Positive and negative values are inverted

- **Offset comp**: the offset compensation in Volts for DC coupling.



- **Coupling**: the input coupling.

Coupling	Description
AC	AC coupling with signal ground connected to the analyzer hardware ground and a 0.35 Hz first order 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 frequencies (< 10 Hz frequency range).
ICP	AC coupling with ICP current source (nominal 4 mA). Signal ground is connected to the analyzer hardware ground.
AC floating 40V	AC coupling with signal ground floating. This position is used to avoid ground loop problems (absolute input voltage values are ? 40V).
DC floating 40V	DC coupling with signal ground floating. This position is used to avoid ground loop problems.
ICP TEDS	AC coupling with ICP current source (nominal 4 mA). Signal ground is connected to the analyzer hardware ground. This coupling allows inverted current for TEDS detection.

- **Gauge type:** Full, Half or Quarter bridge mount. The completion resistors are included in the X-Pod

Hidden/fixed: fixed if the input type is standard/bridge.

- **Bridge completion resistor:** 120 or 350 Ohms for quarter bridge mount

Hidden/fixed: fixed if the input type is standard/bridge.

- **Bridge gain:** 10 or 100 depending on the required precision and range

Hidden/fixed: fixed if the input type is standard/bridge.

- **Bridge offset comp:** Can be used for manual balance of the bridge

Hidden/fixed: fixed if the input type is standard/bridge.

- **Enable auto-zero:** authorizes the automatic balance on this input or not

Hidden/fixed: fixed if the input type is standard/bridge.

- **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).

- **Enable auto-range**: On / Off. "On" allows the auto-range to change the range peak of this input. "Off" will set the input range unchanged.

11.7 DC input

Contains all the settings related to the DC input x (optional) such as transducer type, sensitivity. Parametric inputs sampled at Low freq (16 bits for hardware V1 or 24 bits) that provide accurate and stable DC measurement.

Each DC input (#1 to 32#) can be configured for dynamic or parametric measurement. Activating an input from the *Inputs* list or the *DC list*, will make the input operate respectively with dynamic or parametric sampling, conditioning and analyses.

Settings for parametric inputs

- **Label**: the name of this DC input (by default DC input n, with 1 <= n <= 8). The label of each DC input is used in the result name and in all connection tools.

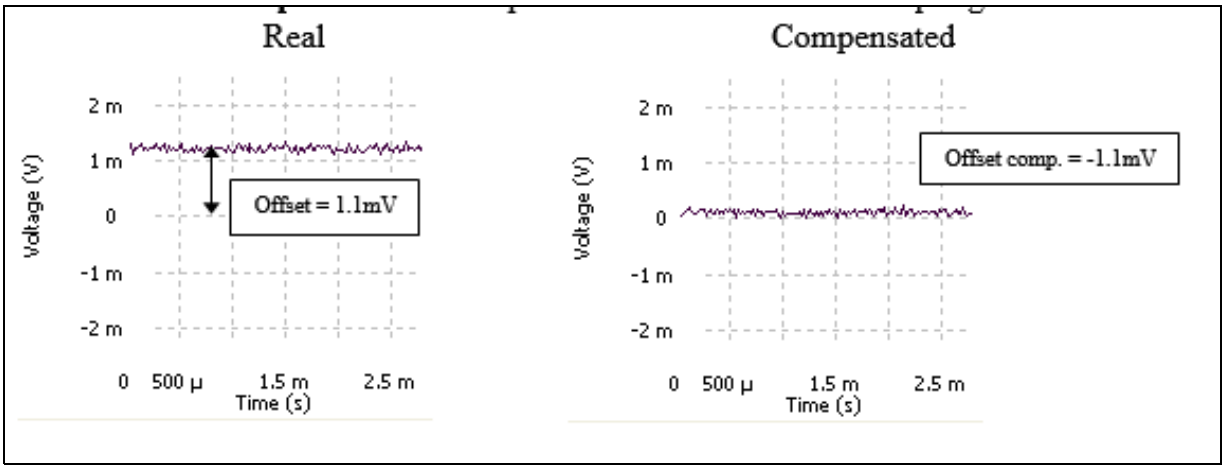
- **Transducer**: the transducer connected to this DC input. Selecting a transducer will automatically modify the sensitivity.
- **Physical qty**.: the physical quantity applied to this DC input. It modifies the sensitivity and range peak units if necessary.

Hidden/fixed: fixed if a transducer is selected for this DC input.

- **Sensitivity**: transducer sensitivity. Changing it updates the range peak.
- **Range pk**.: the maximum input level for this channel, from 156mV up to 10V. For a sensibility of 2 V/m/s^2 those values will be divided by 2 (0.078 m/s^2 and 5 m/s^2). This setting can be displayed in dB.
- **External gain**: This enables the analyzer to take into account an external attenuation or amplification: for example if there is an external gain of 3dB, you can set the value of this setting to 3dB to retrieve the genuine amplitude of the signal. This setting can be displayed in dB.
- **Polarity**: The polarity applied to the signal. If the value is "inverted", positive and negative values are inverted. For example, if the signal value is 4 Volts with "Normal" polarity, it will be -4 Volts with "Inverted" polarity.

Polarity	Description
Normal	Normal polarity
Inverted	Positive and negative values are inverted

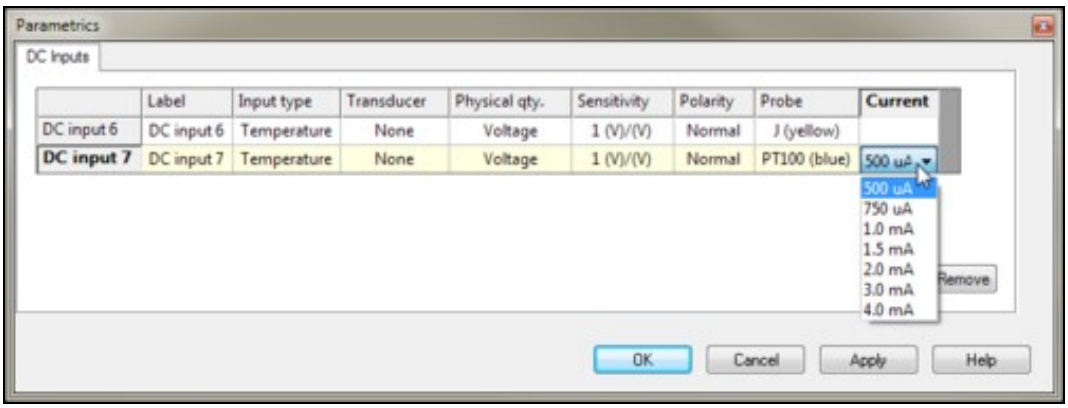
- **Offset comp**.: the offset compensation in Volts.



- **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, the applied current can be selected



Hidden/fixed: Hidden if the input type is standard.

- **Enable auto-range**: On / Off. It allows the auto-range to change the range pk of this DC input.

- **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 clock wise or counter clock wise. This has noticeable impact on the phase of spectra and orders.

If you put tachometer : ON, we advised to read the tachometer part for more details.

11.8 Simulated DC Inputs

You need the option virtual input (VI-DC) to see this option.

Contains all the settings related to the simulated DC input x (optional) such as value, physical quantity. Parametric inputs are sampled at Low freq

Each Simulated DC inputs (#1 to 32#) can be configured for parametric measurement. Activating an input from the *Inputs* list or the *DC list*, will make the input operate respectively with parametric sampling, conditioning and analyses.

Settings for simulated DC Inputs

- **Value** : Value of the input. Be aware that this value can be controlled by an external developer program.
- **Max**: maximum allowed for the parameter "value".
- **Min**: minimum allowed for the parameter "value".
- **Significant digits**: Maximum number of digits that the parameter "value" can take. Also be aware that the maximum significant digits value is 7. Note that 8 is accepted but only value which are power of 2 can be shown with 8 digits because NVGate is a 32 bits software.
- **Precision**: Rounds value to the closest power of 10. For instance, with precision = 0.1, rounds 2.62 to 2.6. A new input is ignored if the difference with the current input is smaller than precision/2.

11.9 CAN Bus

Car Area Network (CAN) bus is great source of data easily collected into vehicles, jet engines and power generation machinery. 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.

Read this dedicated page

11.10 Aux. DC inputs

Optional, depends on hardware options.

Parametric inputs sampled at Low freq (16 bits) provide accurate and stable DC measurements.

Contains all the settings related to the DC located on the "aux" part input

See "DC Inputs" for setting details.

11.11 External Syncs

Externals syncs are high speed levels comparator that provides accurate events date for the tachs and trigger. External sync is sampled at 64 tim the Front-end sampling frequency in order to achieve higher precision in delay or phase measurements.

For more details : Read ext synch tach part.

11.12 Aux. External Syncs

Contains all the settings related to the auxiliary External sync. x such as threshold, slope, tach.

See External Syncs for. Aux. External Syncs setting details.

11.13 Output settings

Read output page for details.

11.14 Outputs

Contains all the settings related to the output x.

Read output page for details.

11.15 Aux. Output

Contains all the settings related to the auxiliary output.

12 NVGate Macro

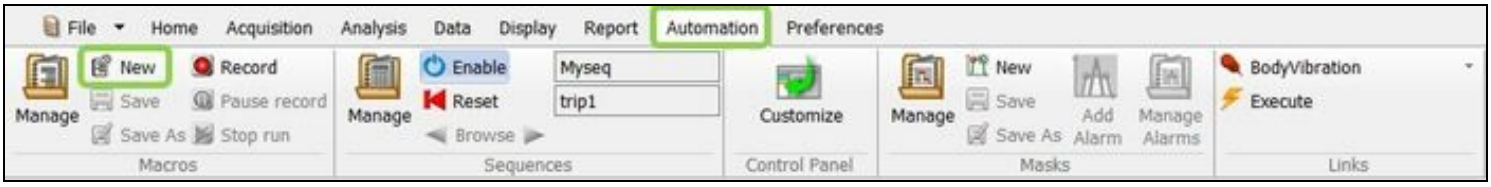
12.1 Tutorial

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.

12.1.1 Creating a new Macro

Go in the "Automation" tab of the NVGate ribbon, and select "New" in the Macro group:

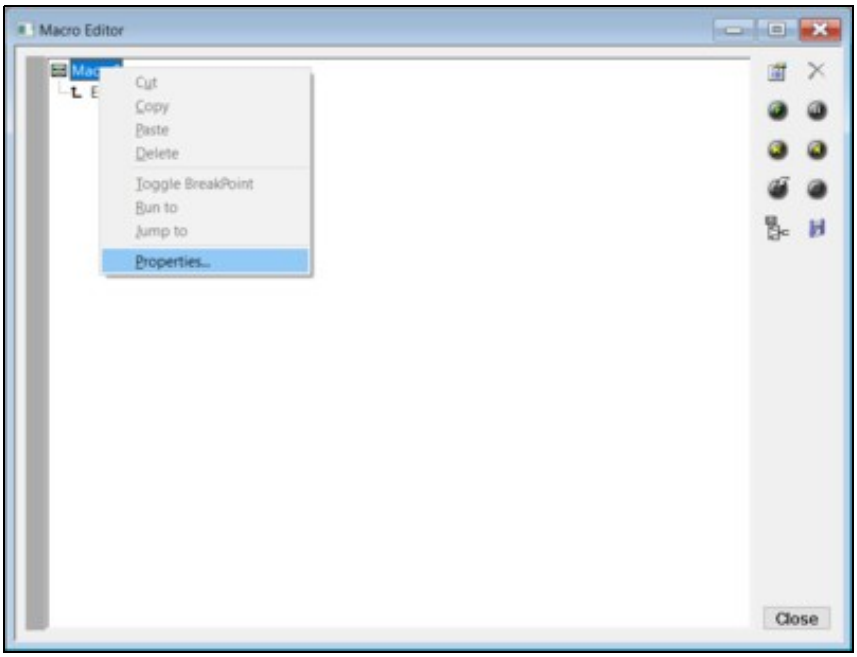


12.1.1.1 Add a parameter

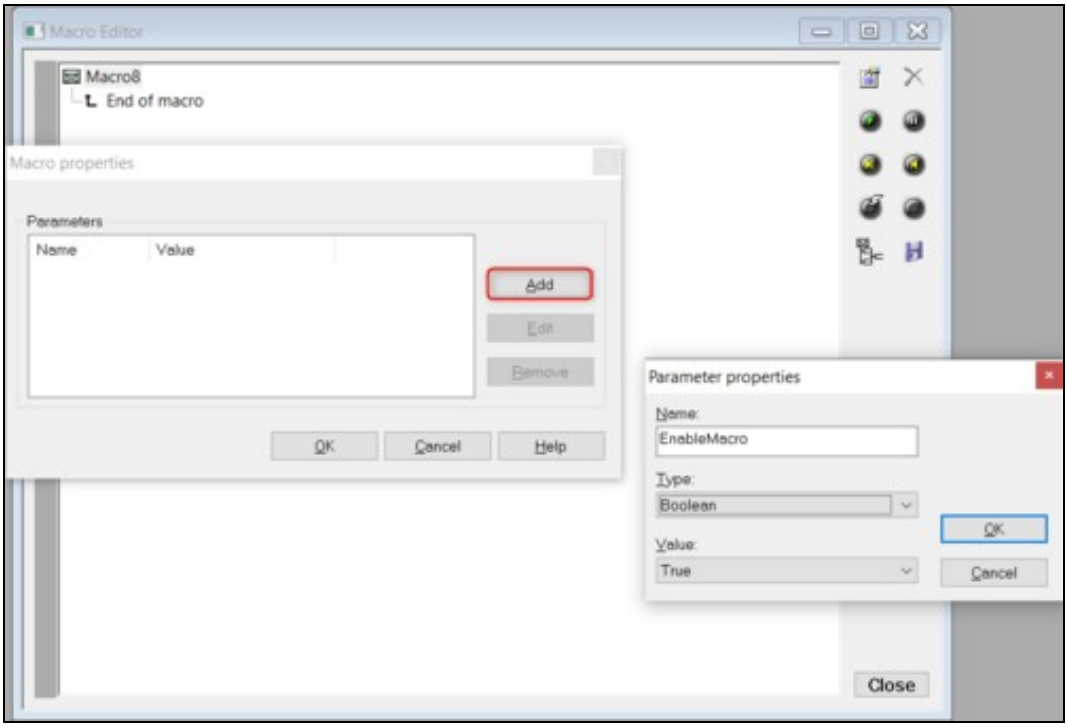
This will open the Macro editor :

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":

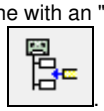


Then click on "Add", and define the Boolean parameter "EnableMacro" as follows:



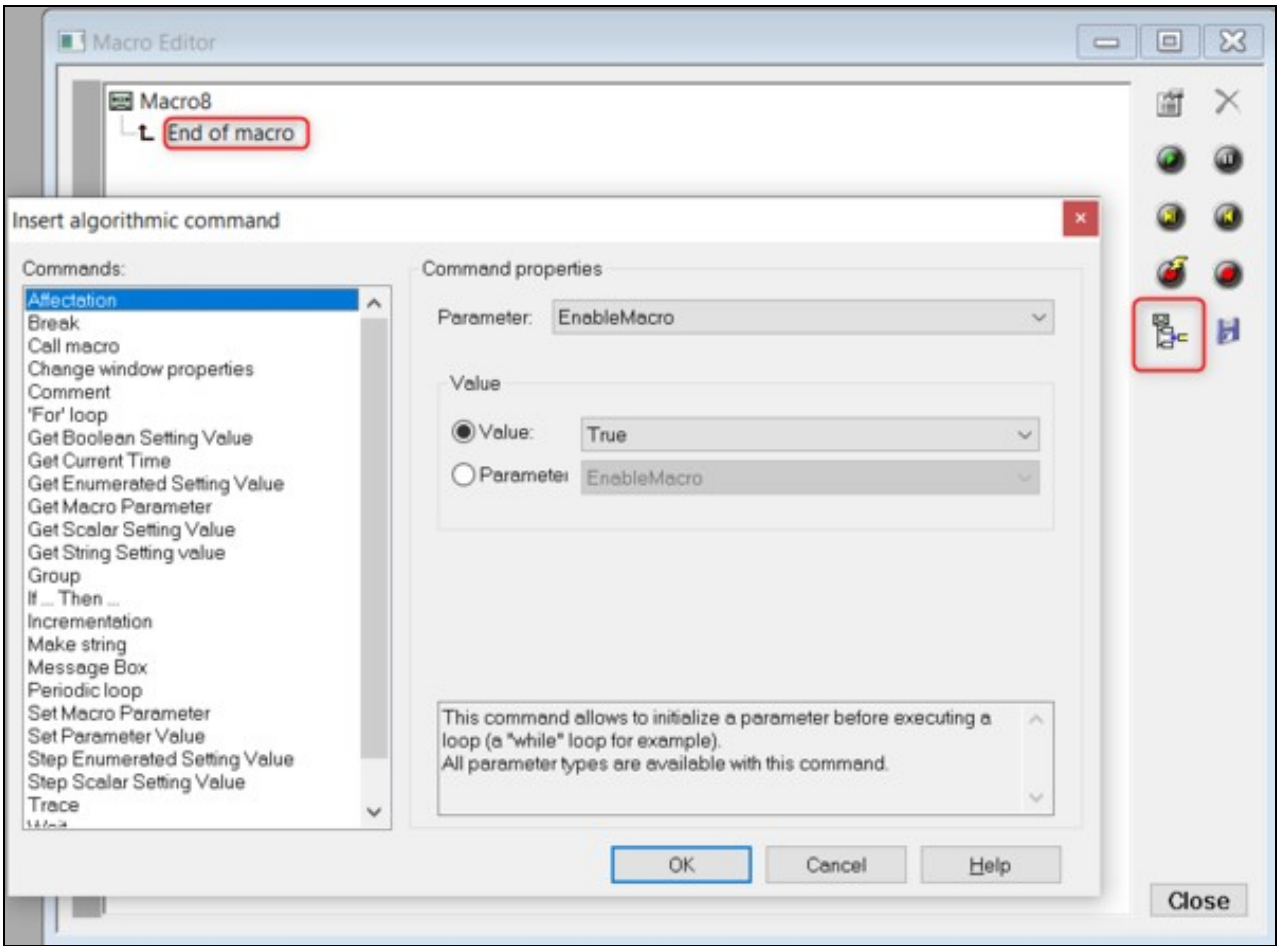
12.1.1.2 Affectation

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 :

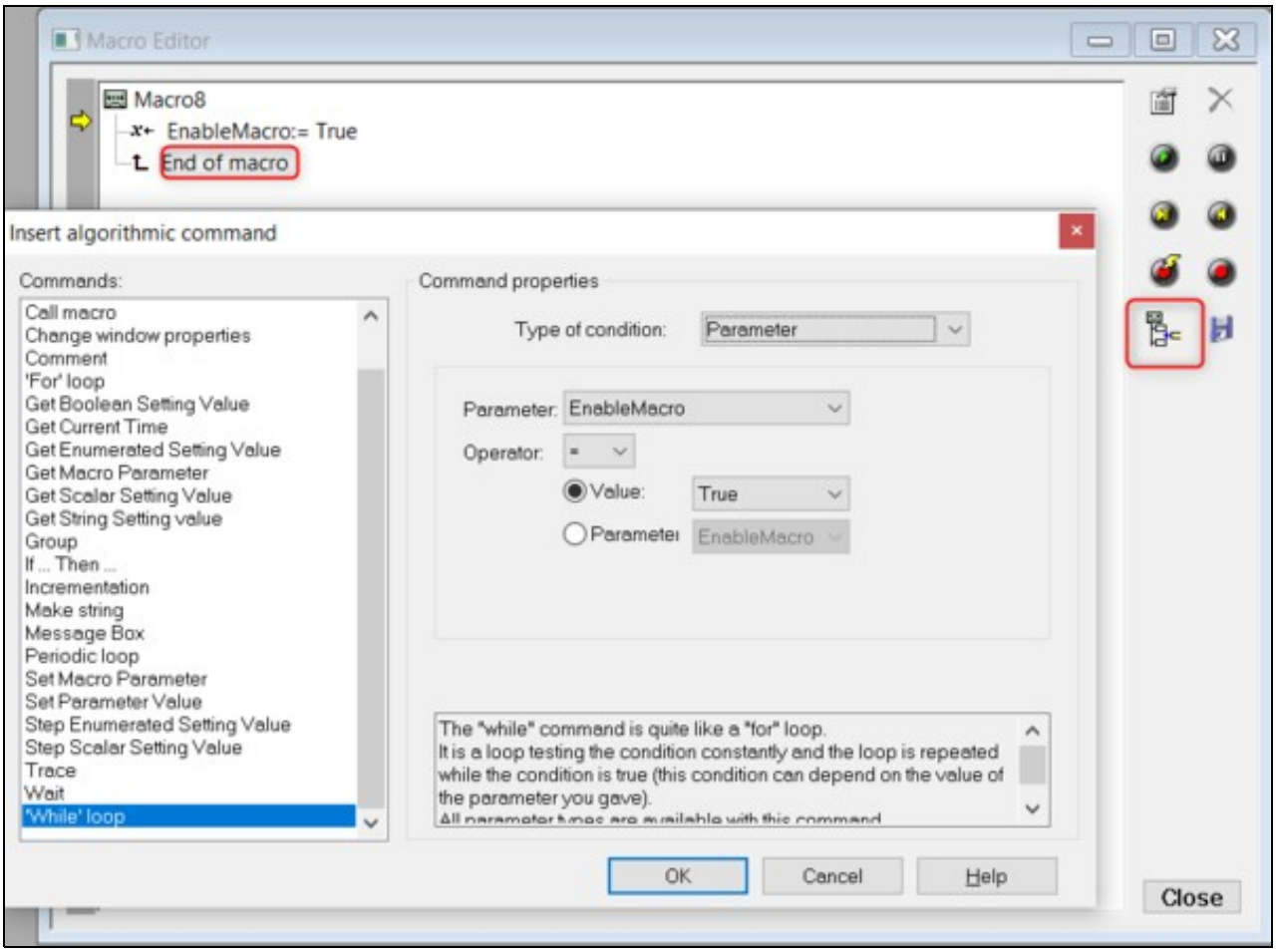


You can now change the value of "EnableMacro" by double-clicking on the Affectation command.

12.1.1.3 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".

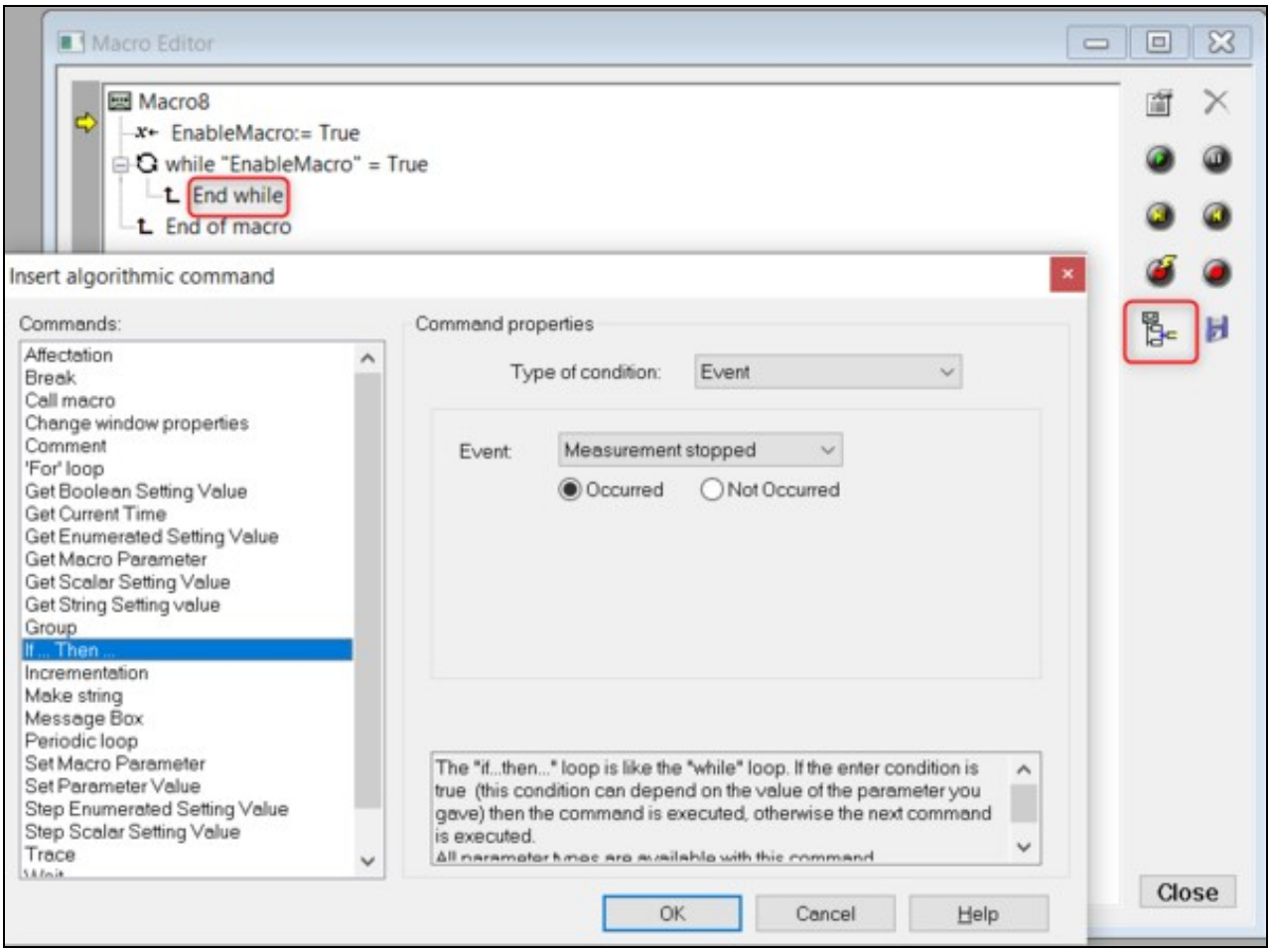
The while loop is an Algorithmic command, and will be added the same way as the Affectation command. Click on "End of Macro", click on the  icon and select "while loop". Then set the loop as follows :



12.1.1.4 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 :



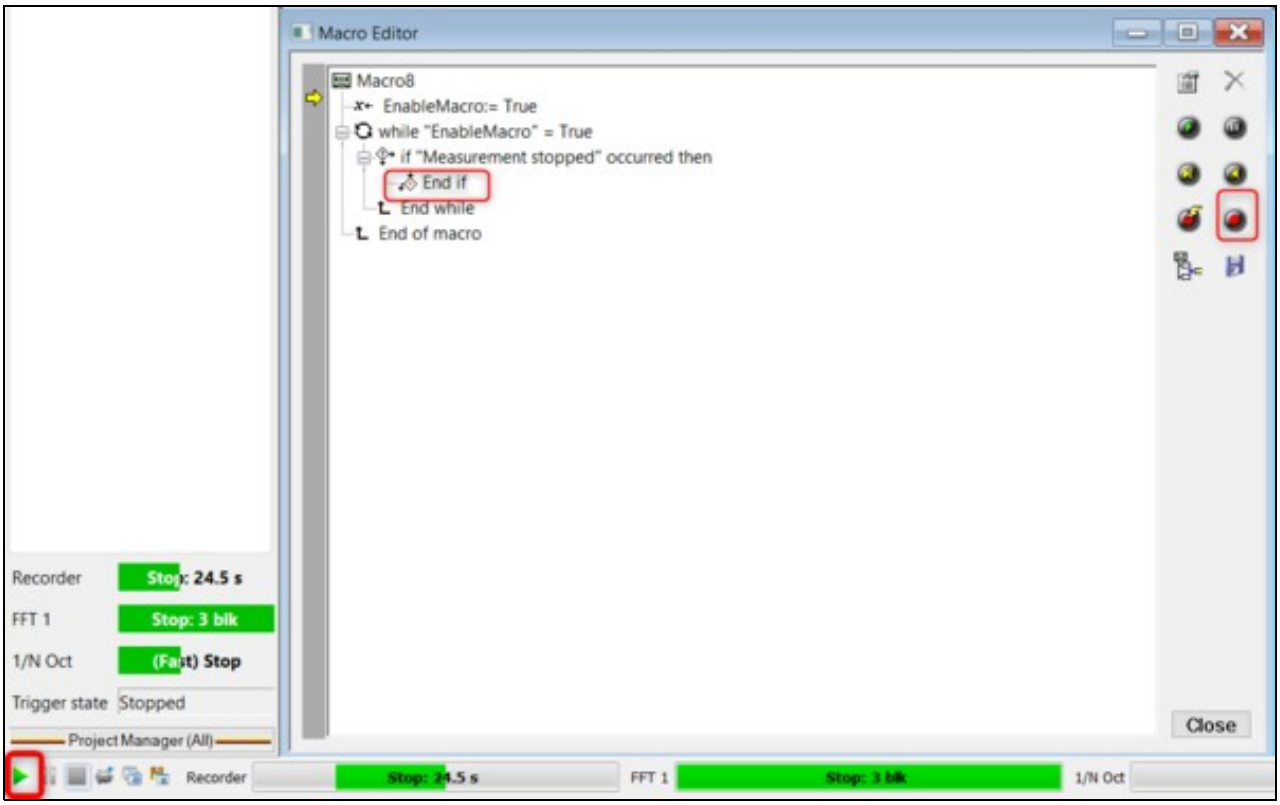
12.1.1.5 Add the Run Command

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.

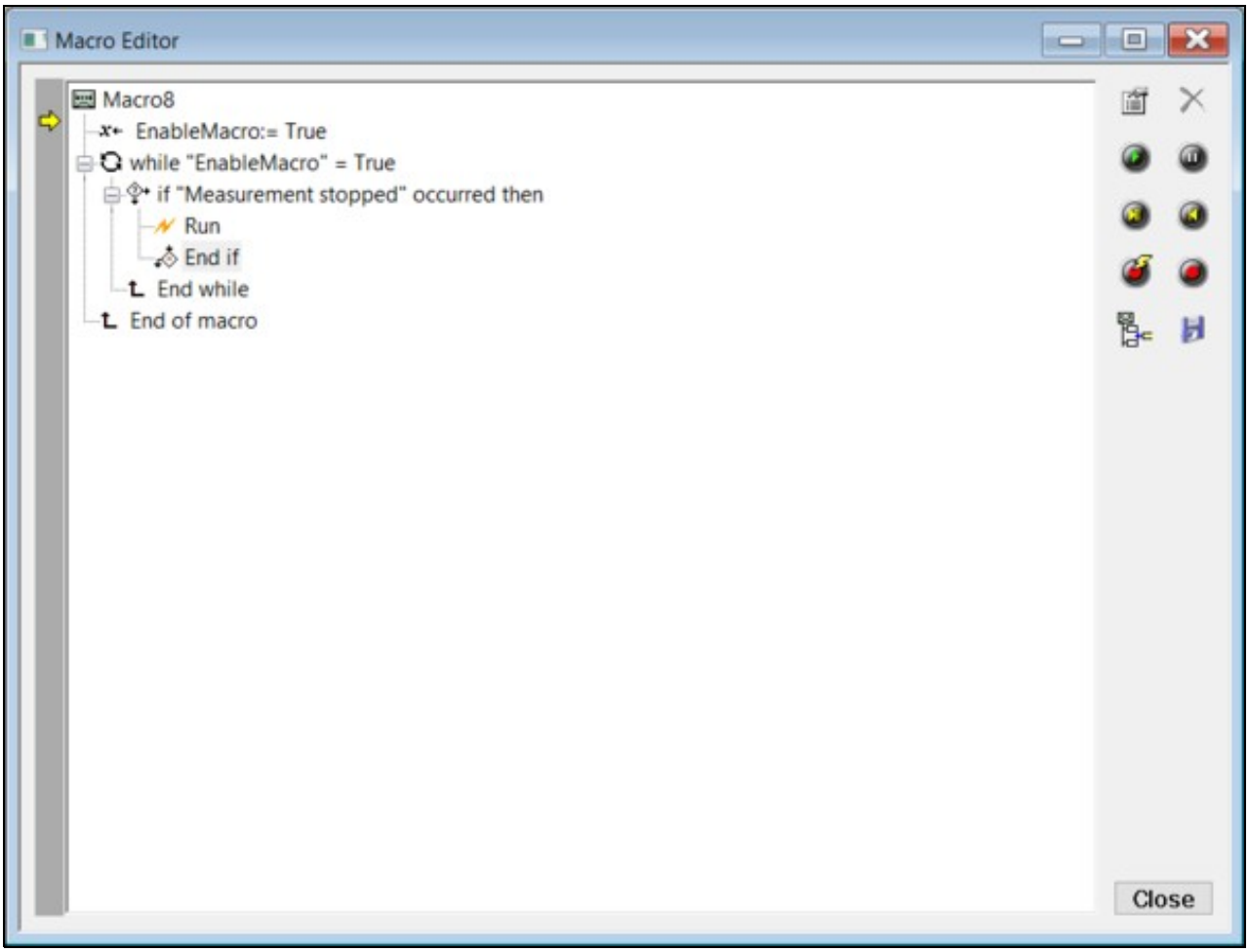
The "record on line"  command will add the NVGate command in the macro and execute it at the same time. By example, clicking on  and  will add the "Run" command in the macro and start the acquisition in NVGate. Clicking on  and then  will add the "Run" command in the macro, but will not start the acquisition 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 :



12.1.1.6 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".

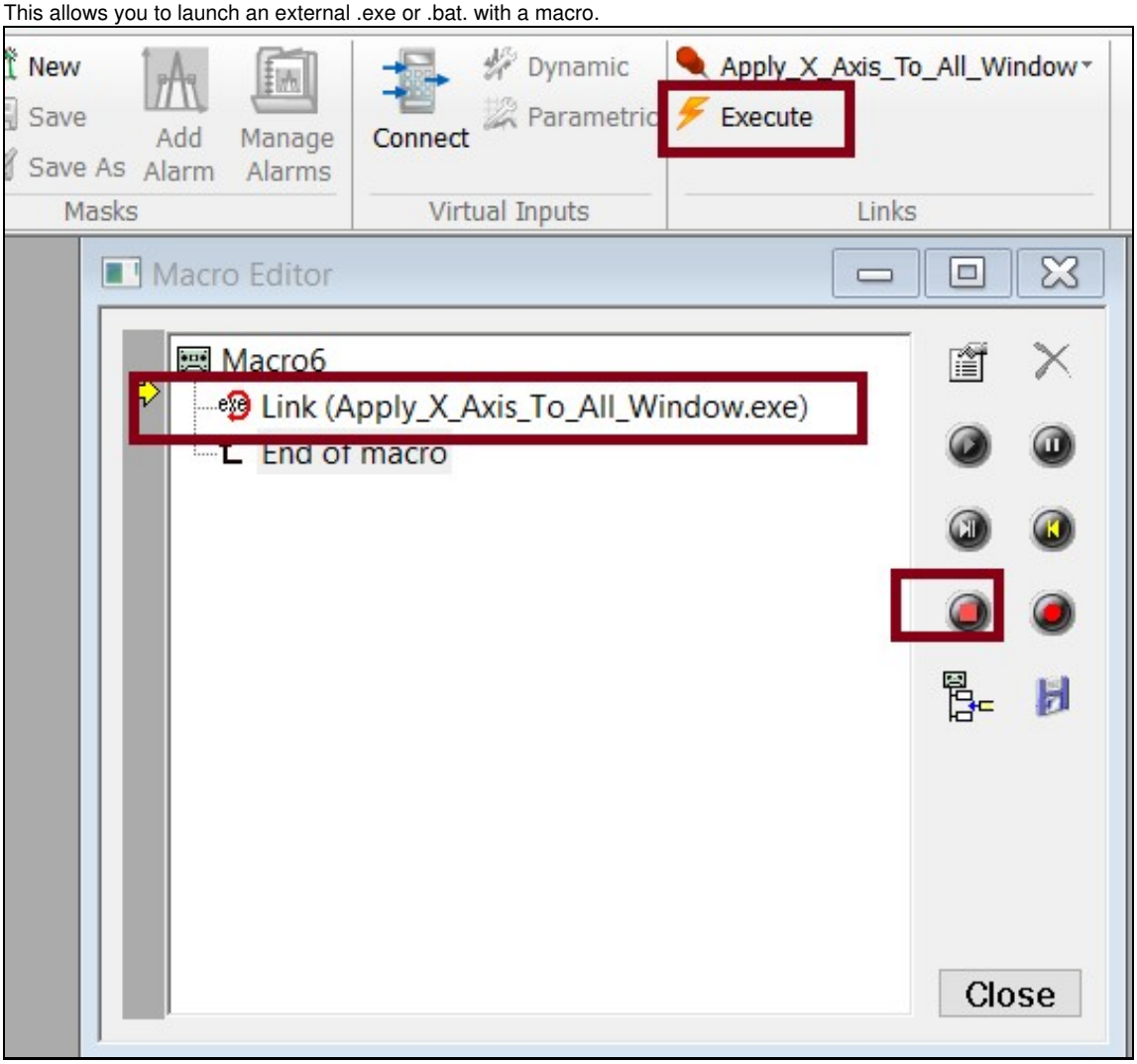
You can stop the macro anytime by using the "pause" option of the macro editor  and set the "EnableMacro" parameter on "False".

12.1.1.7 Launch the Macro

Use the control panel to launch the macro in NVGate.

12.1.1.8 Execute a .exe in a macro

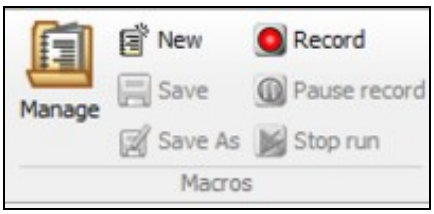
This allows you to launch an external .exe or .bat. with a macro.



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".

12.1.2 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.

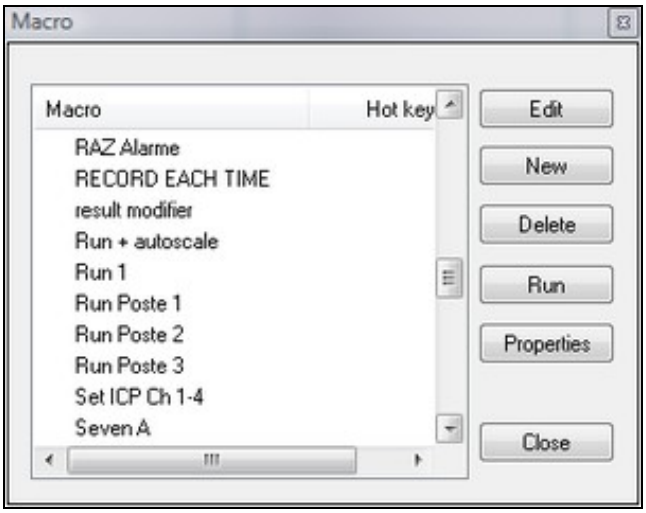

Pause record: Pause the ongoing macro record. User actions are not yet recorded. Available if macro is being recorded.

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.

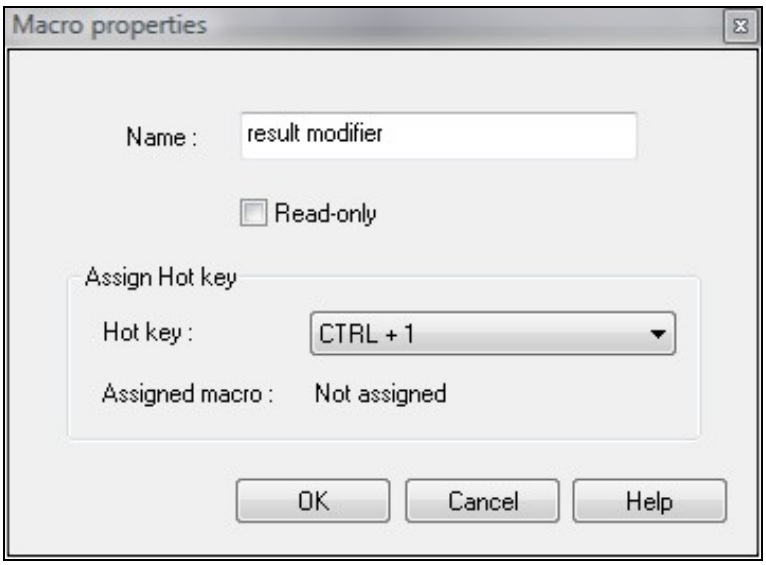
12.1.2.1 Macros Manager

Display the macros list and the associated hot-keys. A hot-key is a shortcut to run the macro.



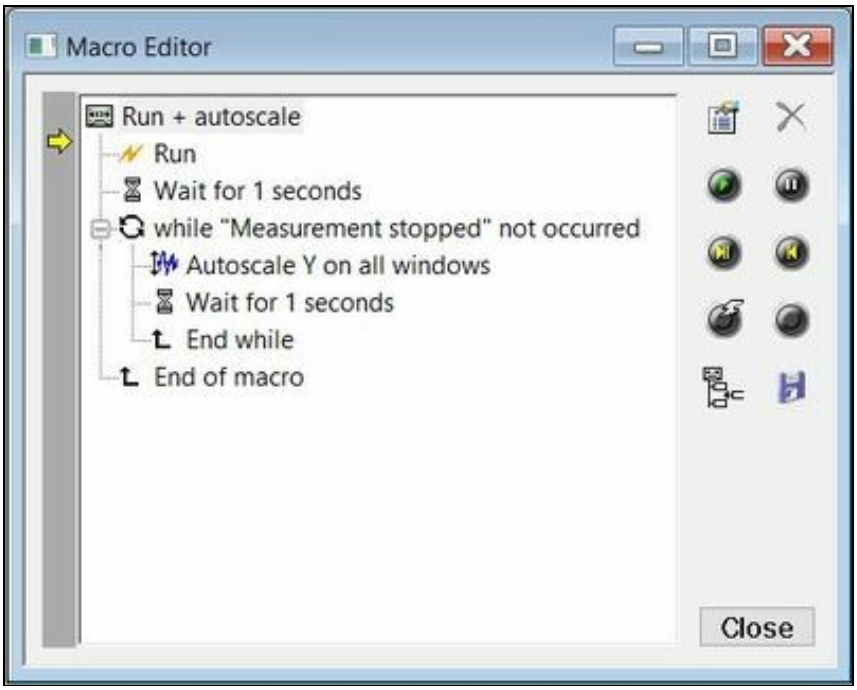
Note: the three first hot keys are automatically assigned in the "Macro" menu from the OR38/OR36 Front Panel, labeled as "0", "1" and "2".

- **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.

12.1.3 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.

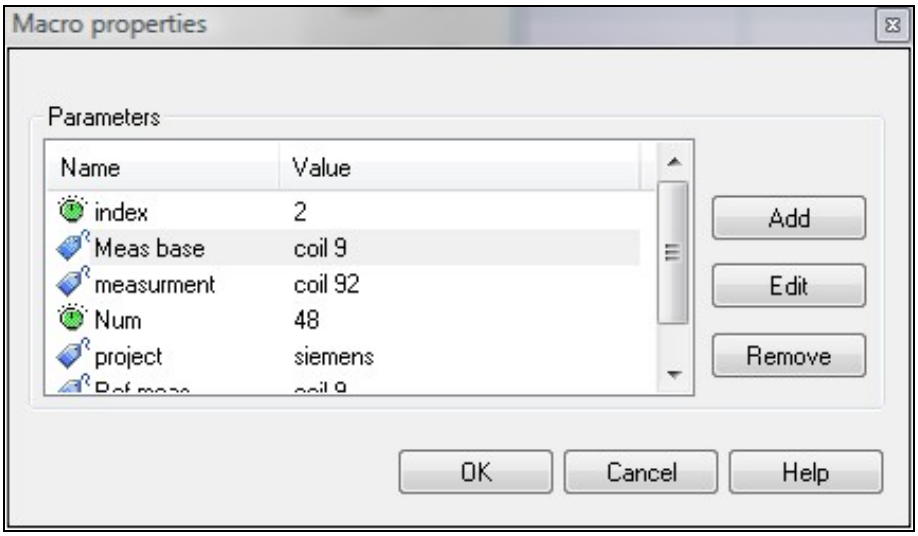
Record off-line: Record commands in the macro. The record off line mode applies the user actions only when the macro will start. The commands corresponding to actions are recorded and inserted in the macro before the selected command. This command is enabled if the macro is not running and it is not 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.

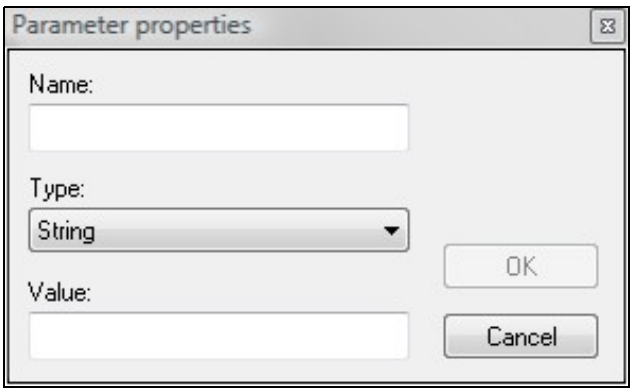
Save: Save the macro.

12.1.3.1 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...)

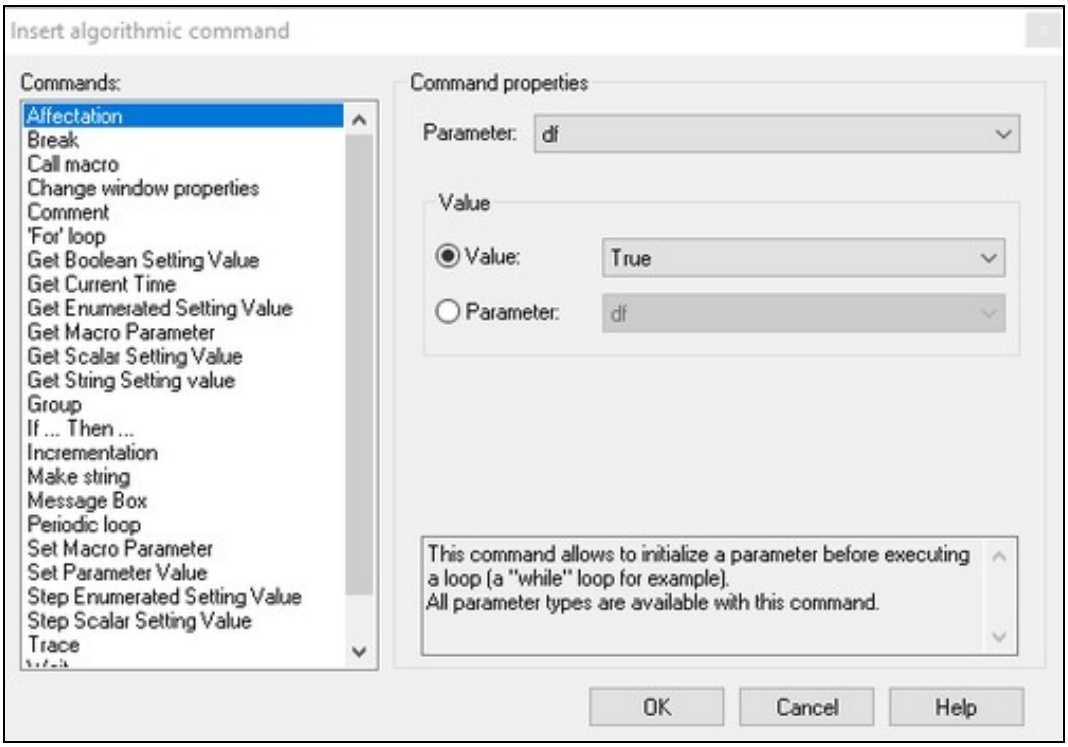
- **Value**: default value of parameter
- **Edit:** Open the "Parameter properties" dialog box, which is used to edit the parameter selected in parameters list. It is possible to change the

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.

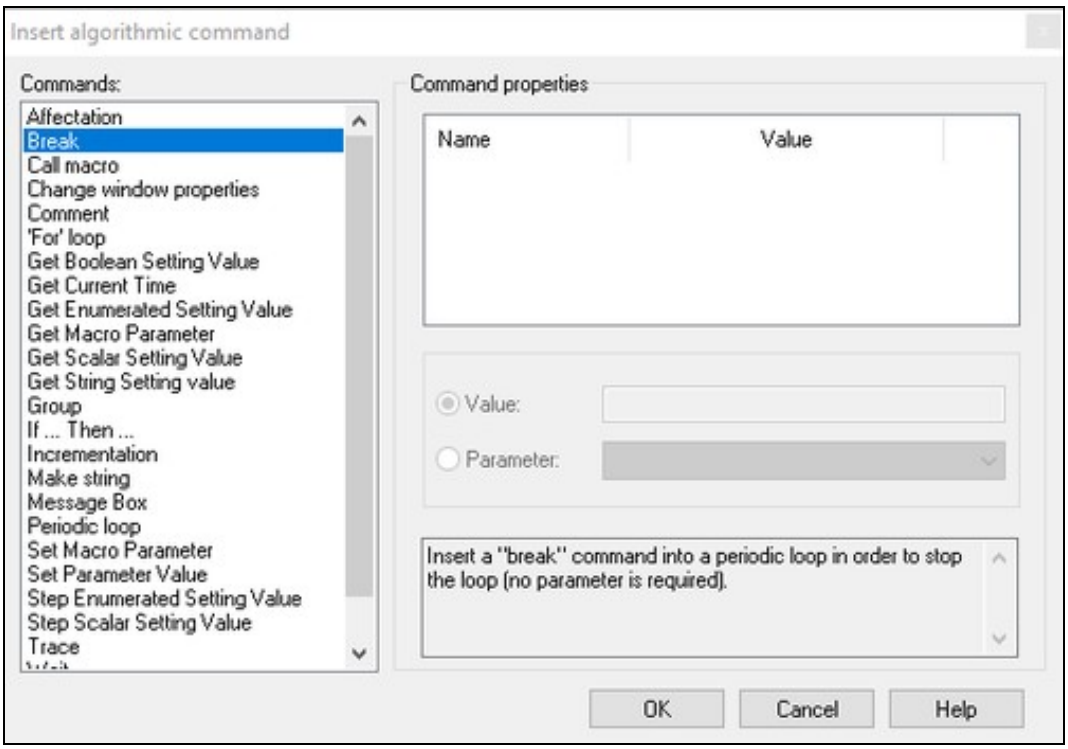
12.1.3.2 Algorithmic commands

12.1.3.2.1 Affectation



Sets a value to a parameter. The new value can be defined by a parameter.

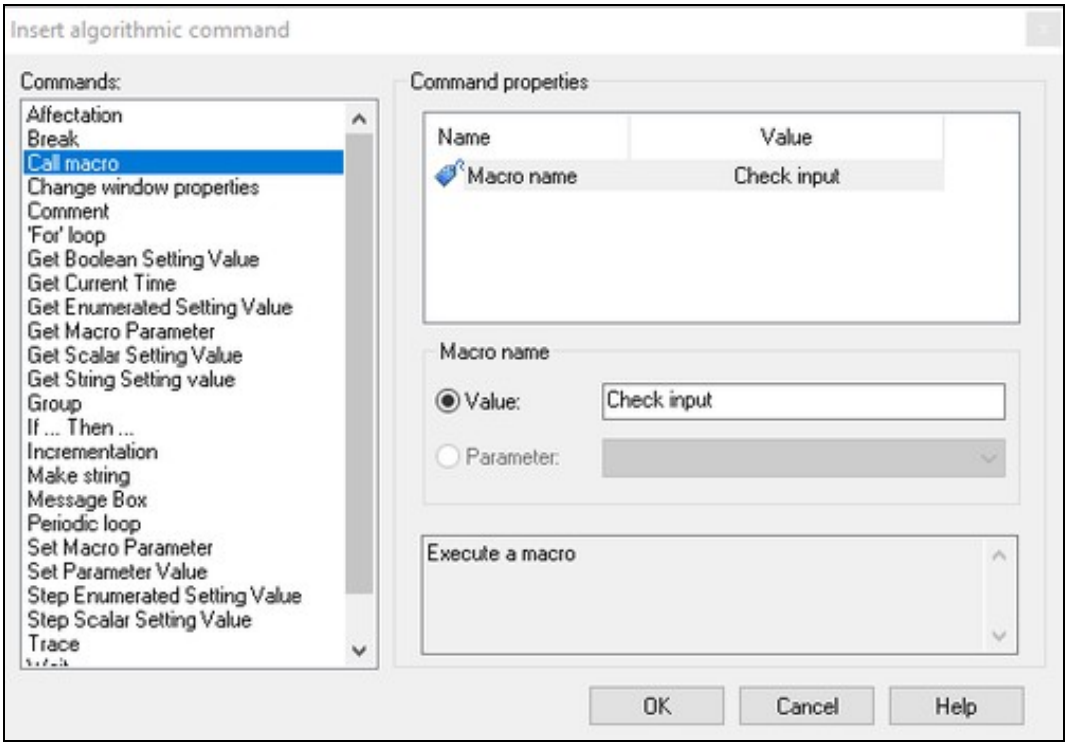
12.1.3.2.2 Break



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".

12.1.3.2.3 Call Macro

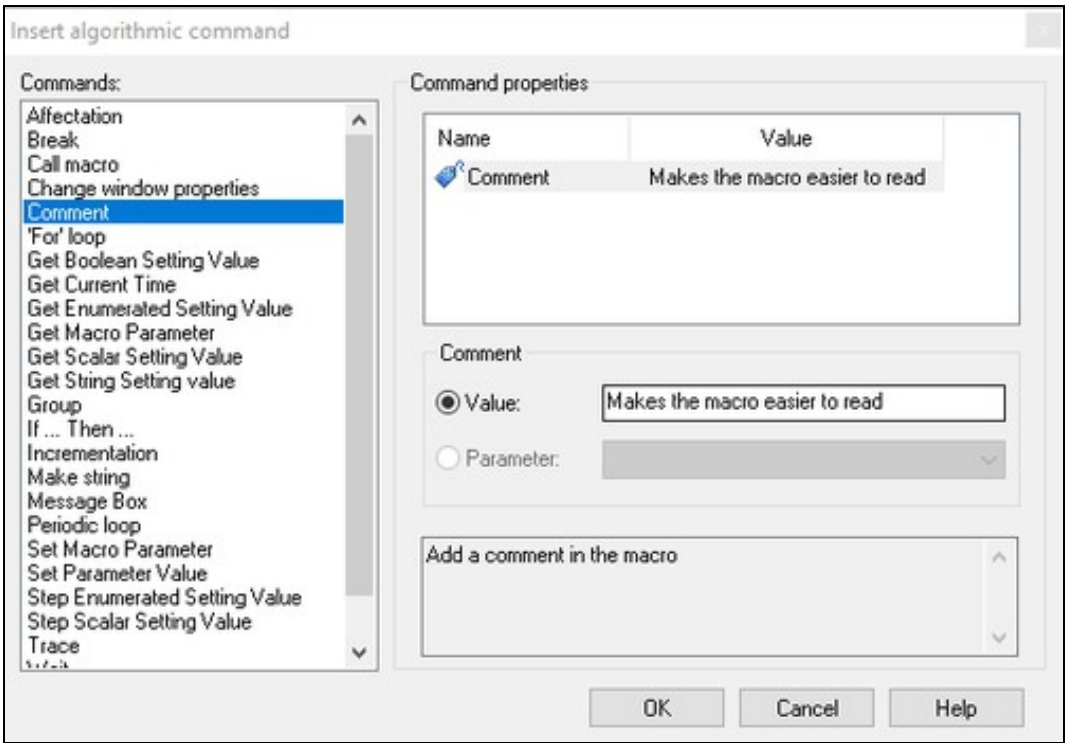
Calls another macro.



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.

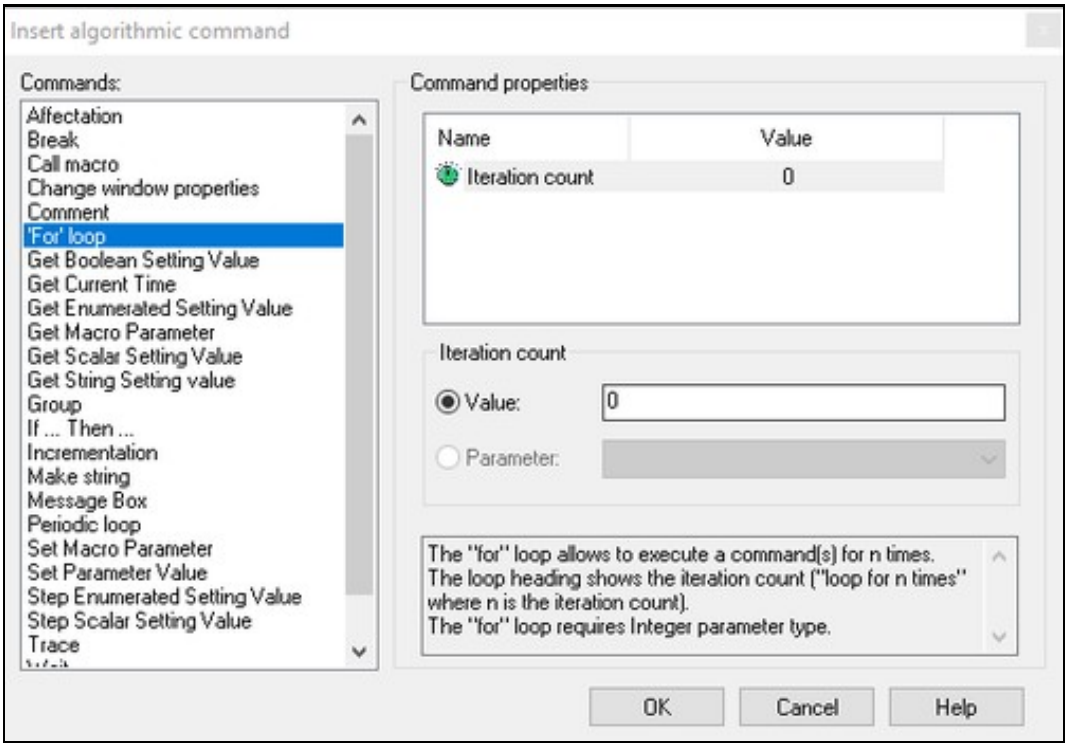
12.1.3.2.4 Comment

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.

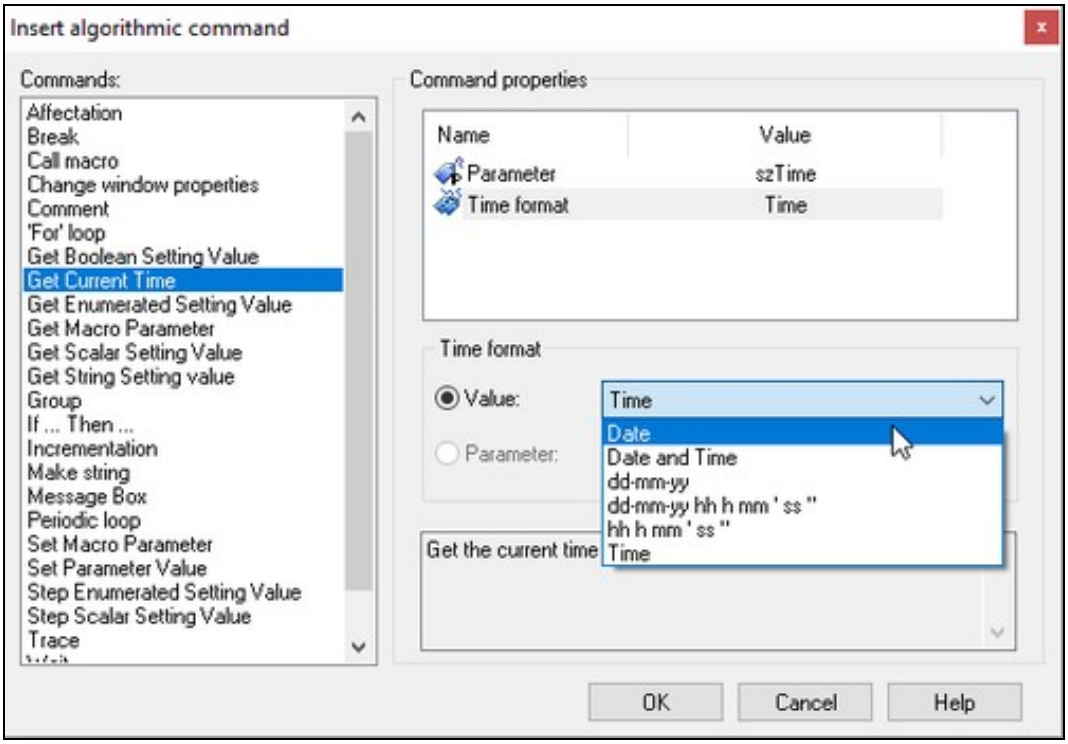
12.1.3.2.5 "For" loop



Runs a set of commands several times. The number of iterations can be defined by an integer value or by an integer parameter.

12.1.3.2.6 Get Current Time

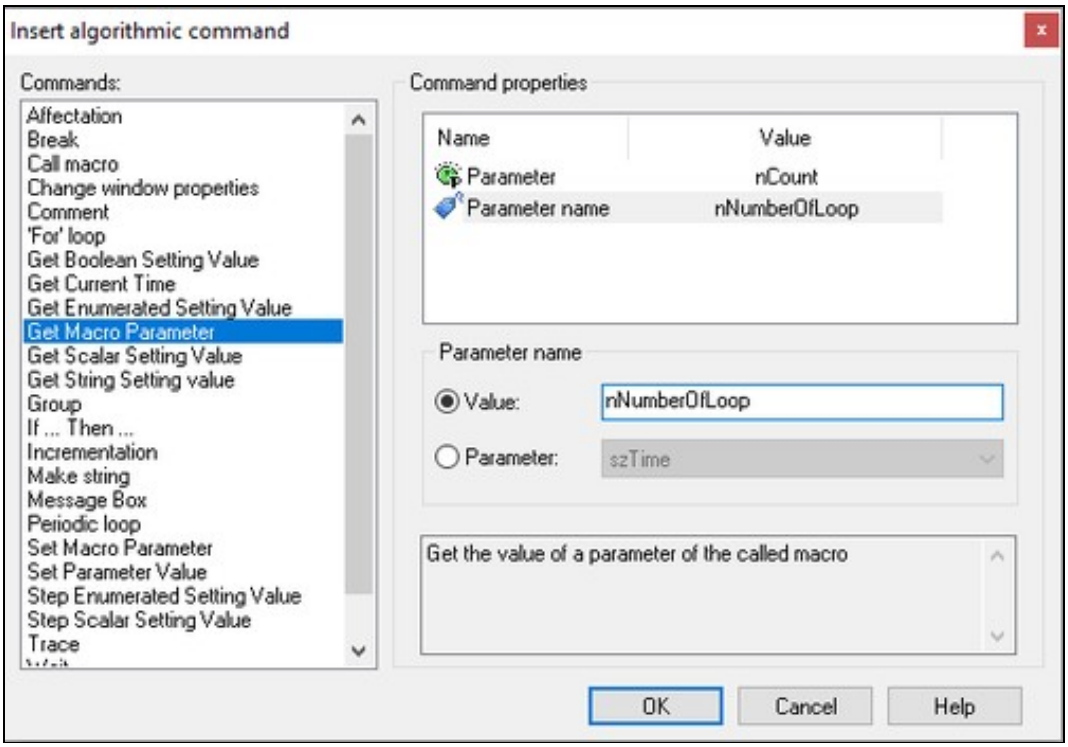
This command retrieves the time and stores it in a string parameter. This string may be use to send a trace, to create a measurement name...



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.

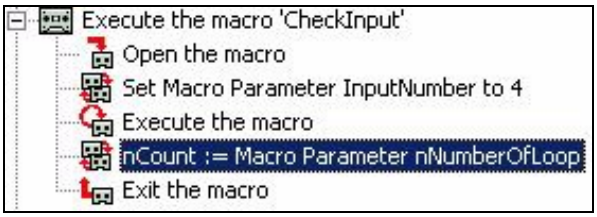
12.1.3.2.7 Get Macro Parameter

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.

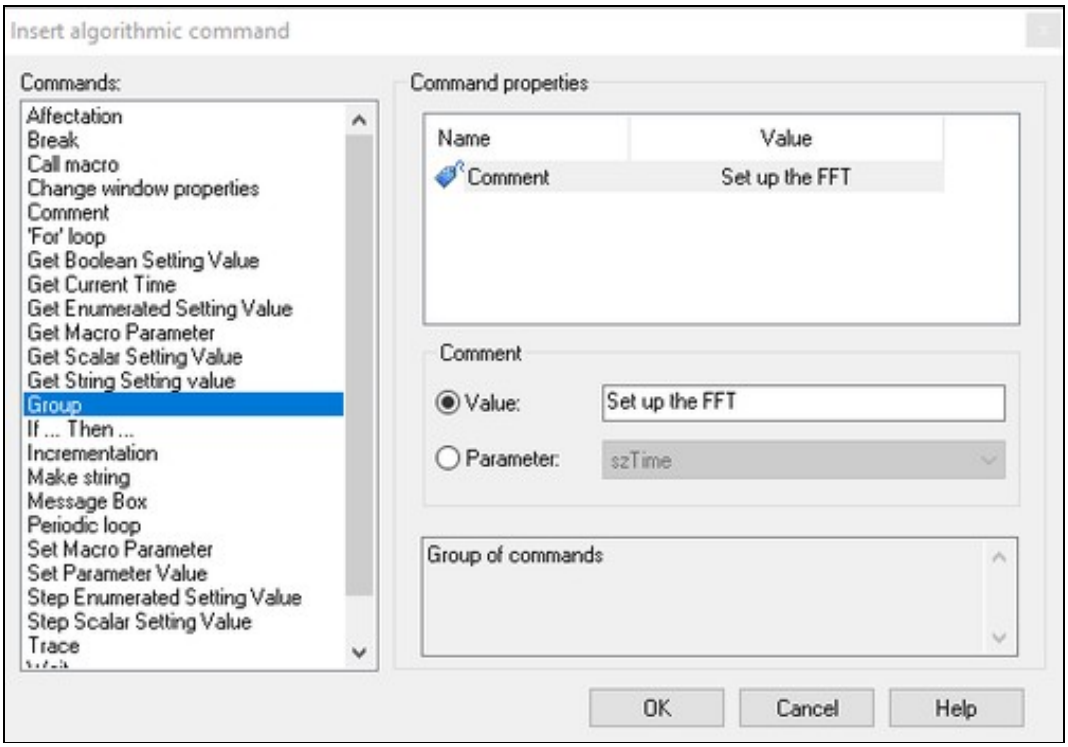
"Parameter name" is the name of the parameter in the called macro.

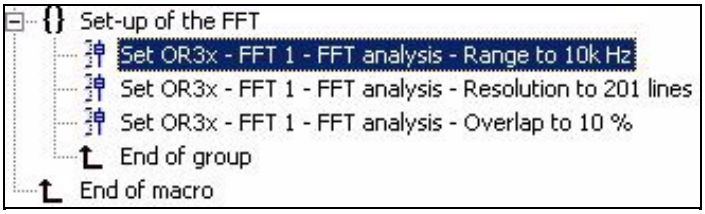


In this example, the command gets the value of the parameter nNumberOfLoop of the macro CheckInput and sets this value to the parameter nCount of the calling macro.

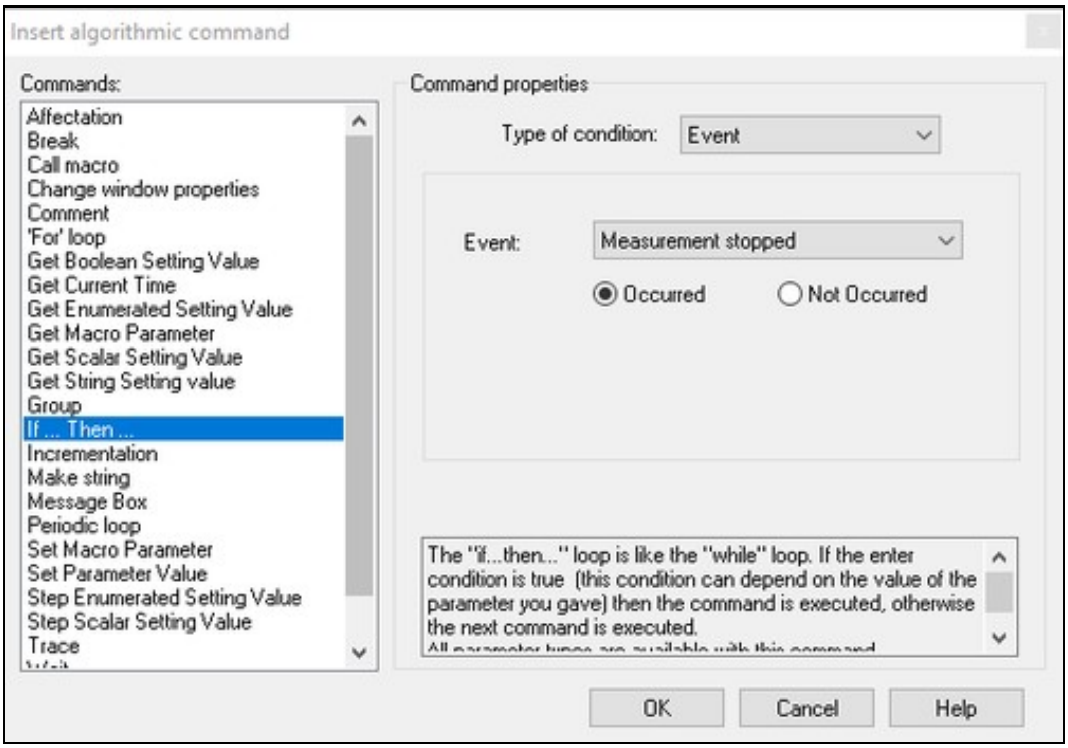
12.1.3.2.8 Group

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.





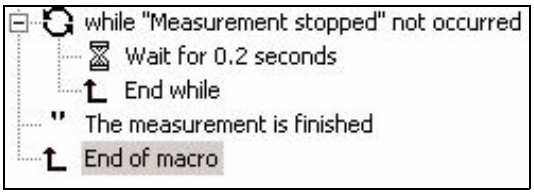
12.1.3.2.9 If?Then?



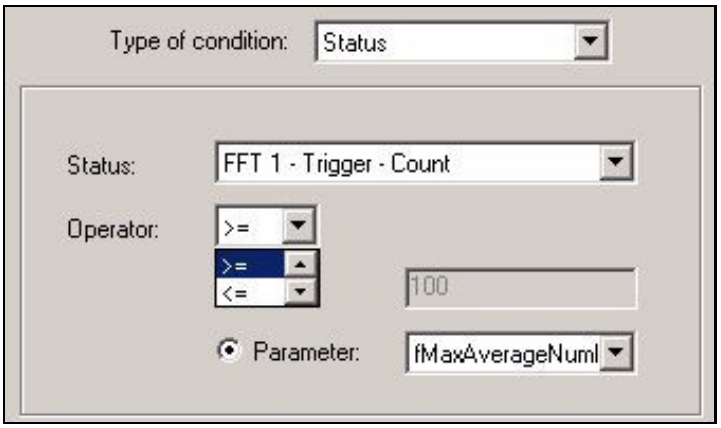
Runs a set of commands according to a condition. The condition can depend on an event, status value or parameter. The event condition can be "event x occurred" or "event x not occurred".

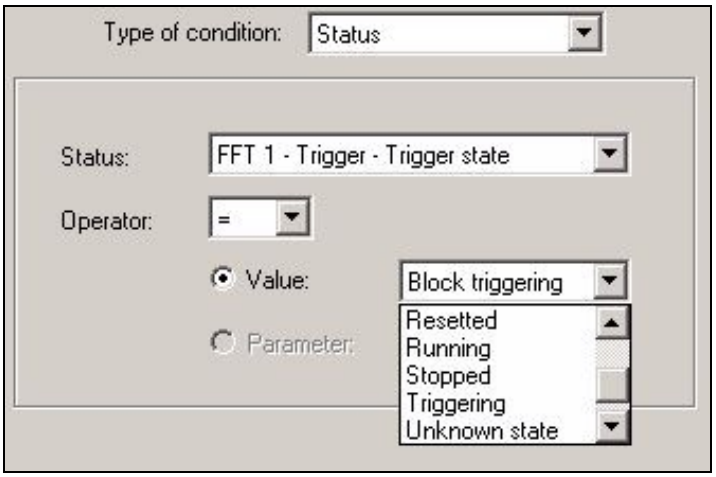
There are five types of conditions:

- **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.

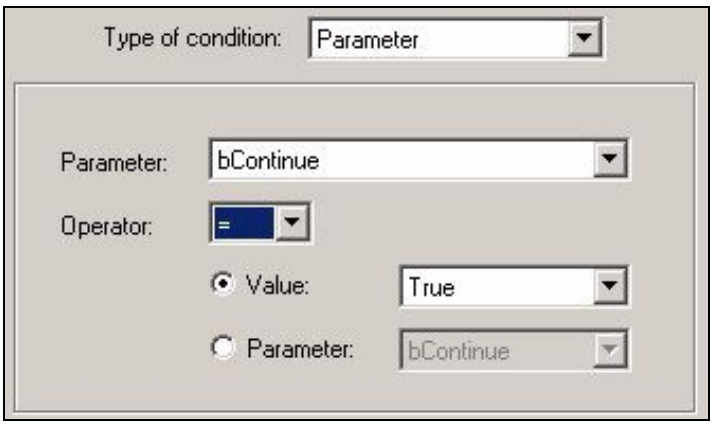


- **Status:** All analyzer statuses can be used for this condition. Depending on the type of status, it is possible to compare its value to a list of possible values or perform a logical test (?=?, ?!=?,?<=?,?>=?) with a constant or a parameter.

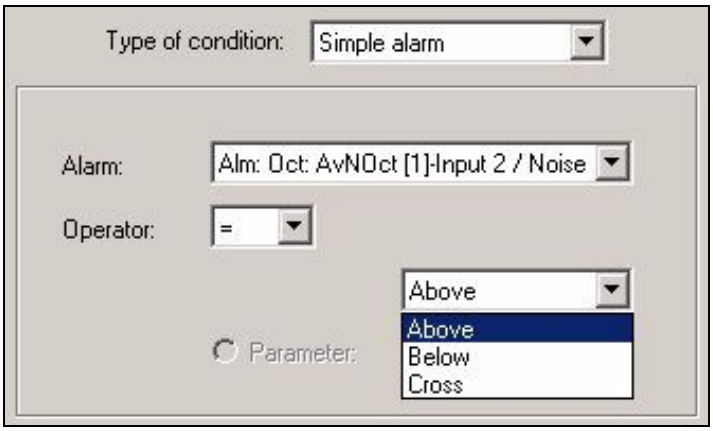




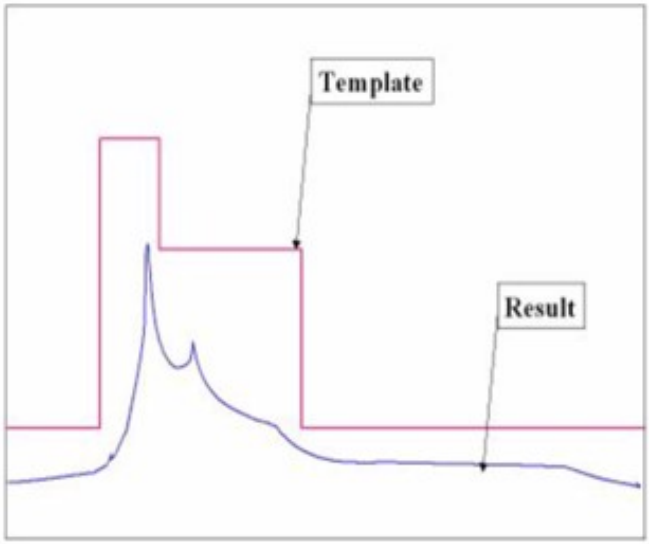
- **Parameter:** The macro parameter of can be compared to a constant or to another parameter.



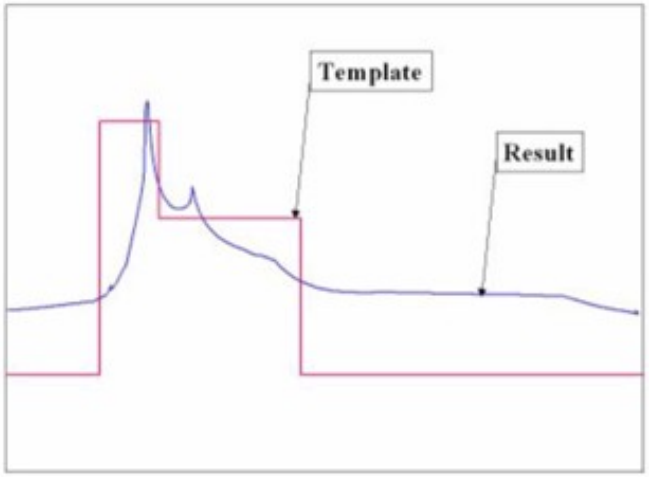
- **Simple alarm:** This condition is available only when at least one alarm on a simple template result has been declared.



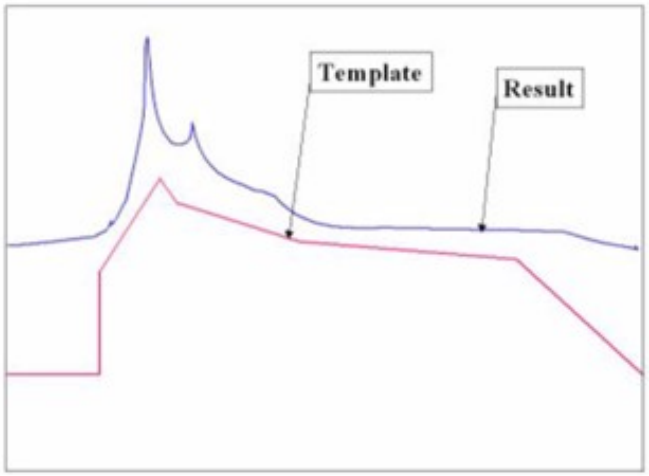
- **Alarm results**



Operator	Test	Condition value
=	Above	False
!=	Above	True
=	Cross	False
!=	Cross	True
=	Below	True
!=	Below	False

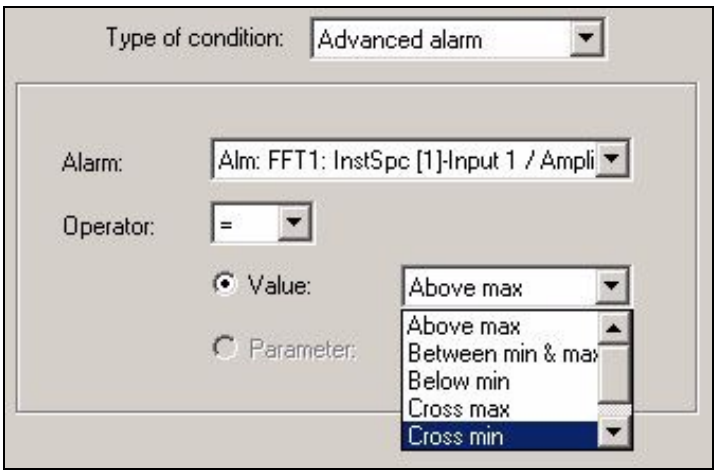


Operator	Test	Condition value
=	Above	False
!=	Above	True
=	Cross	True
!=	Cross	False
=	Below	False
!=	Below	True

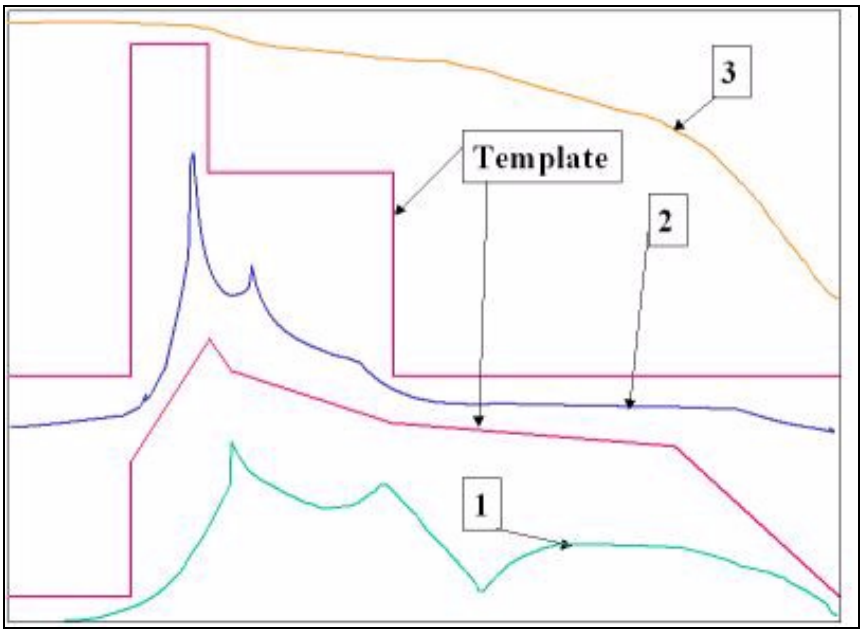


Operator	Test	Condition value
=	Above	True
!=	Above	False
=	Cross	False
!=	Cross	True
=	Below	False
!=	Below	True

- **Advanced alarm:** This condition is available only when at least one alarm on a double template result has been declared.

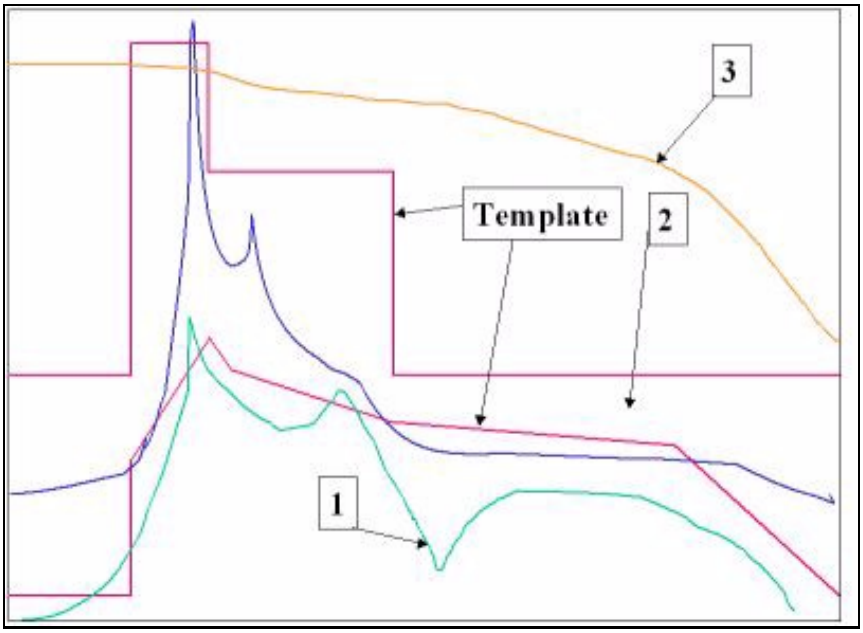


- **Advanced Alarm results**



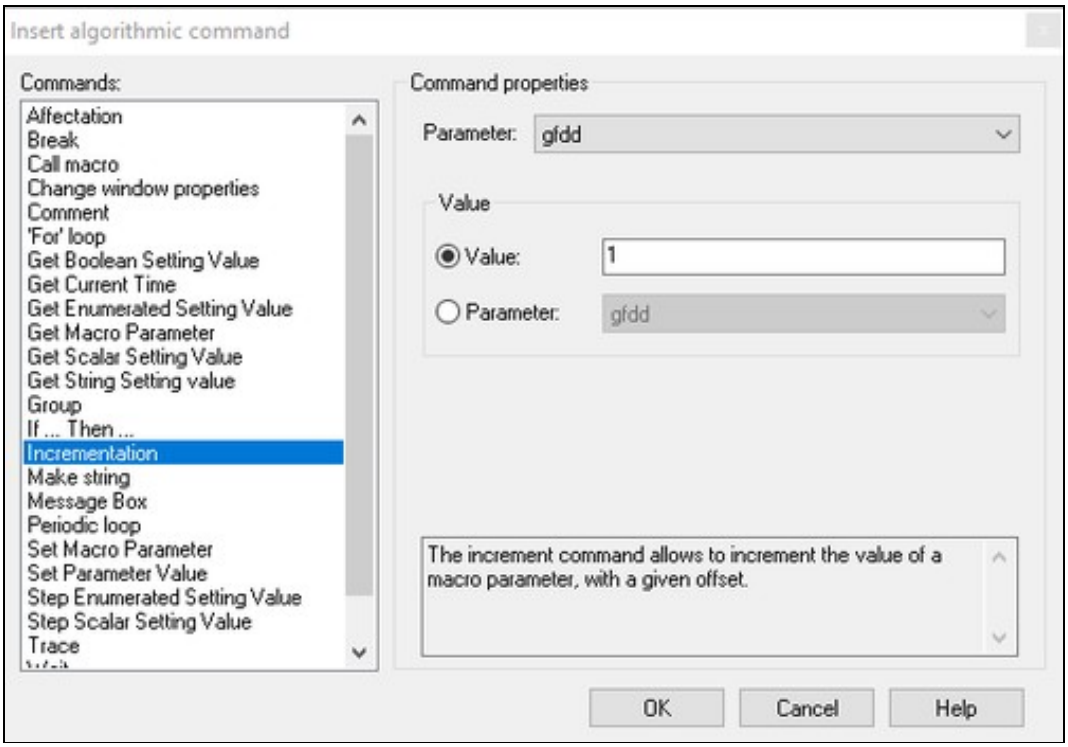
Operator	Test	Condition value for 1	Condition value for 2	Condition value for 3
=	Above max	False	False	False
!=	Above max	True	True	True
=	Cross max	False	False	True
!=	Cross max	True	True	False
=	Between min & max	False	False	False
!=	Between min & max	True	True	True
=	Cross min	True	False	False
!=	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

12.1.3.2.10 Incrementation



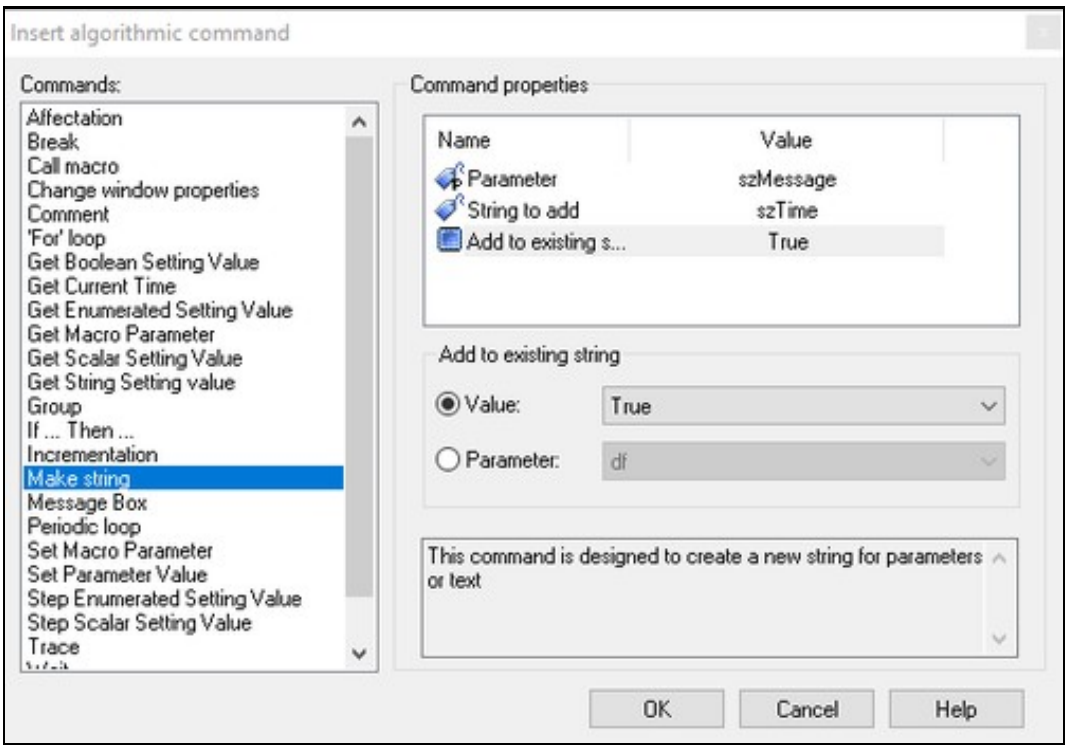
The increment command is used to increment the value of a macro parameter with a given offset.

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.

12.1.3.2.11 Make String

Command used to create a string.

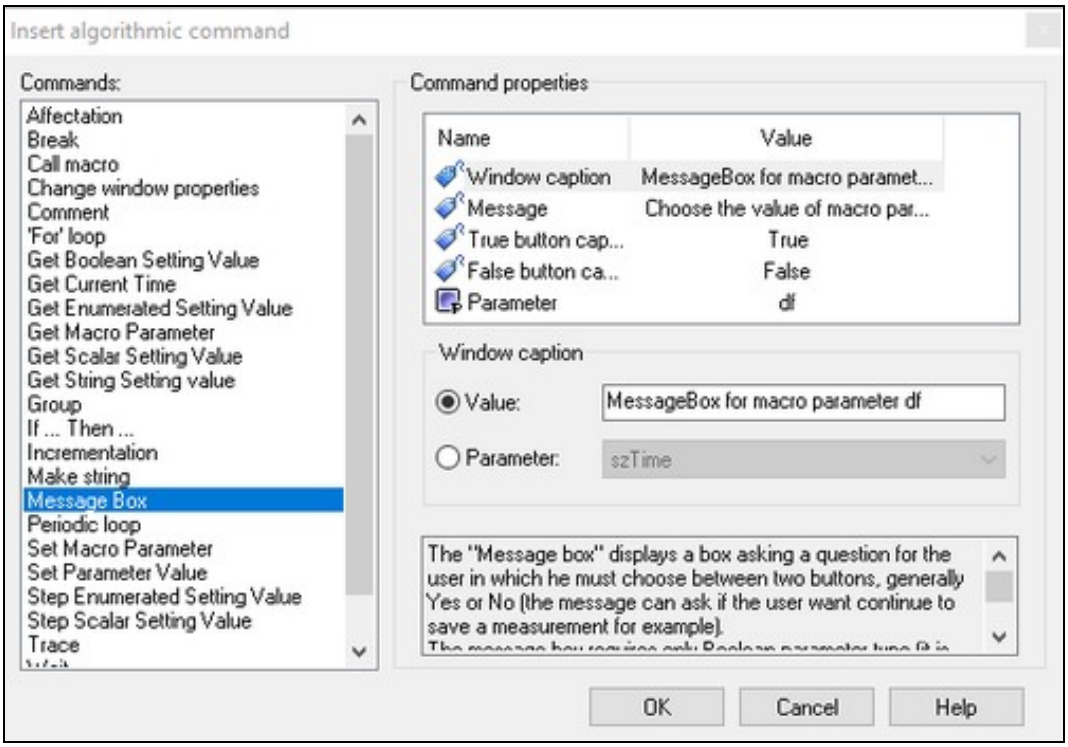


"Macro parameter" is the string that is modified. It can only be a String parameter.

"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

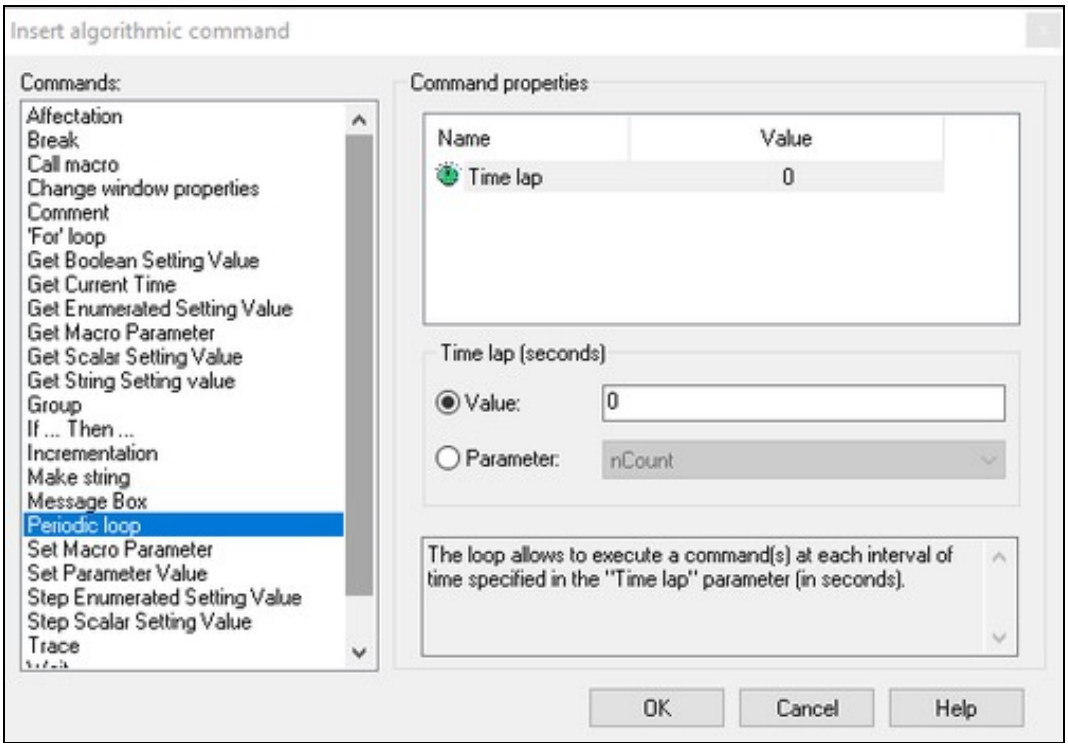
12.1.3.2.12 Message box



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.

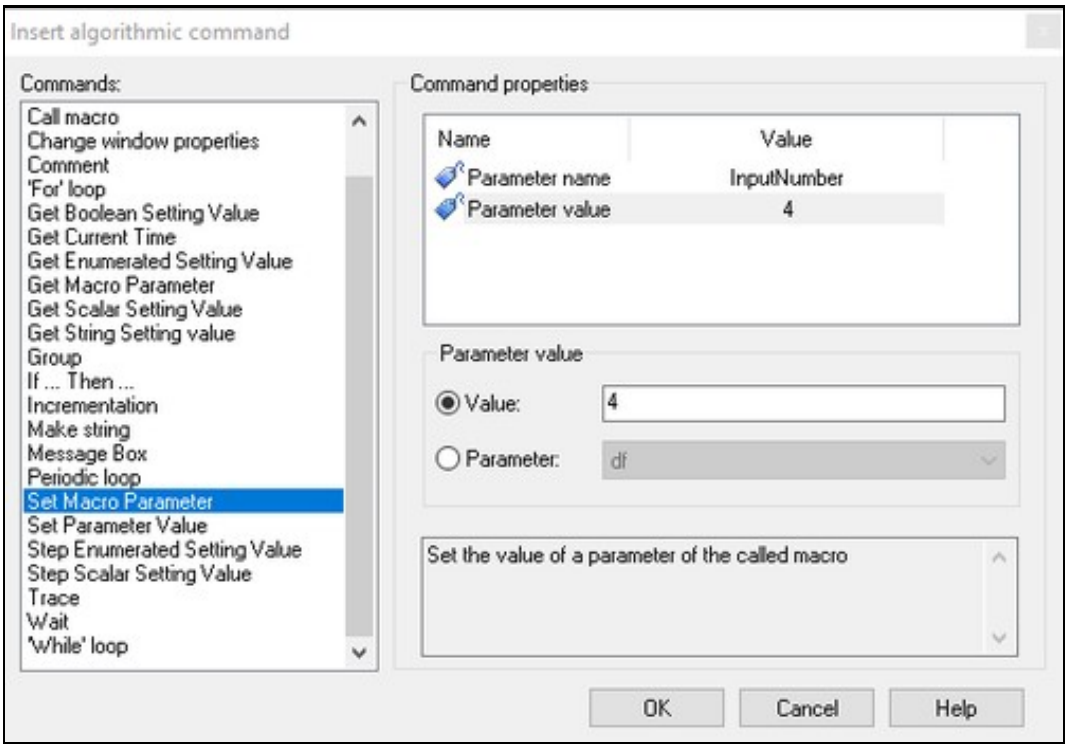
12.1.3.2.13 Periodic loop



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.

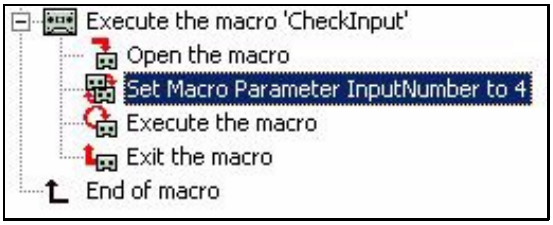
12.1.3.2.14 Set Macro parameter

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.

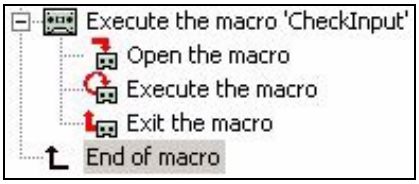


"Parameter name" is the name of the parameter in the called macro.

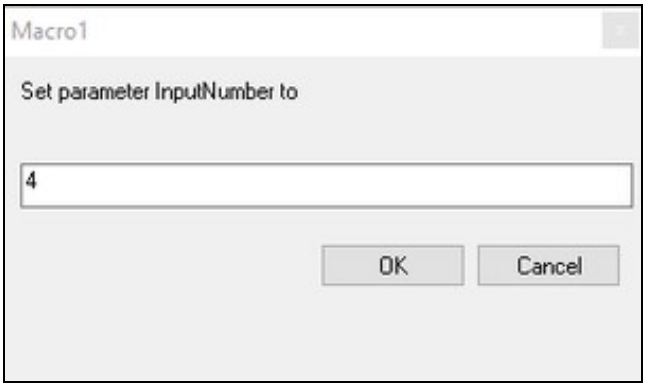
"Parameter value" is the value the parameter must take.



In this example, the command sets the value of the parameter InputNumber of the macro CheckInput to 4.

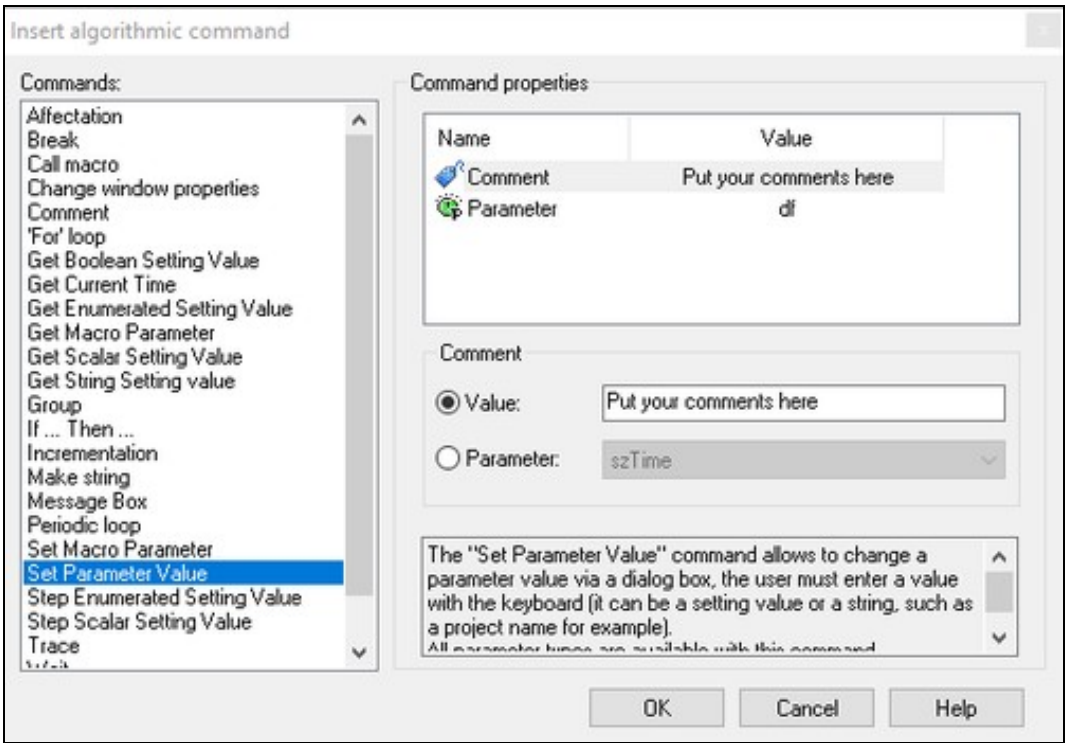


When the macro is running, a dialog box is displayed, which is used to change the value of a parameter.



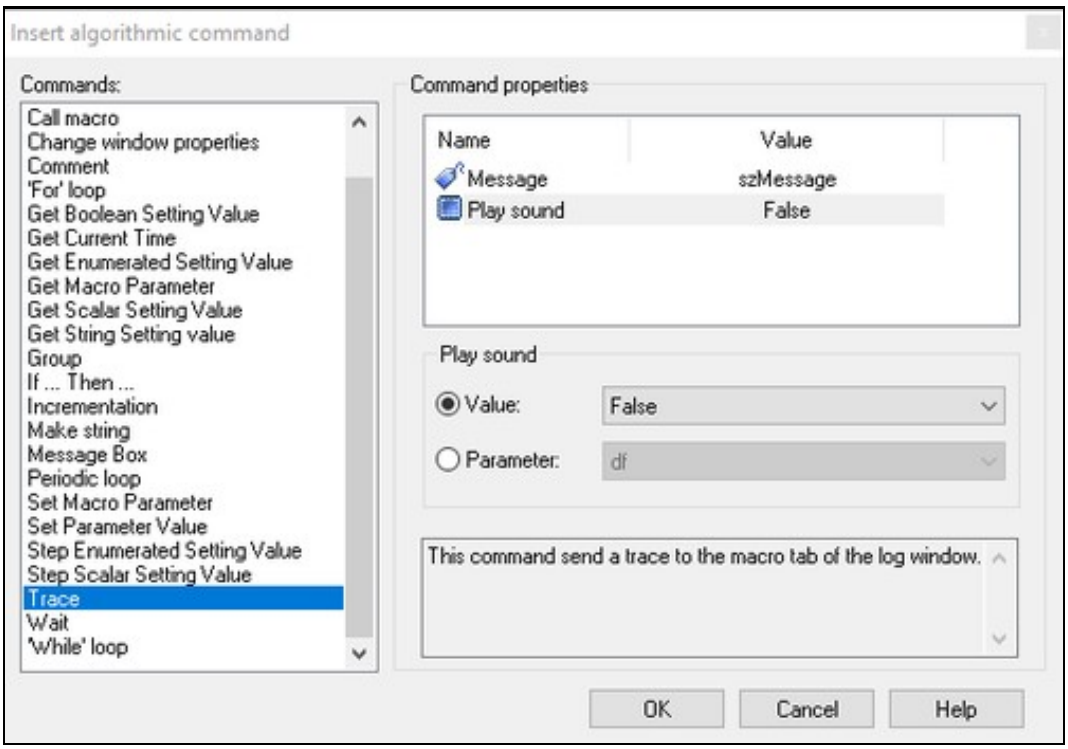
The message generated in the top of the dialog box can be defined in the "command properties". A control is used to edit the parameter value. A click on the OK button changes the parameter value, and closes the dialog box. A click on the Cancel button closes the dialog box without changing parameter value.

12.1.3.2.15 Set Parameter Value



12.1.3.2.16 Trace

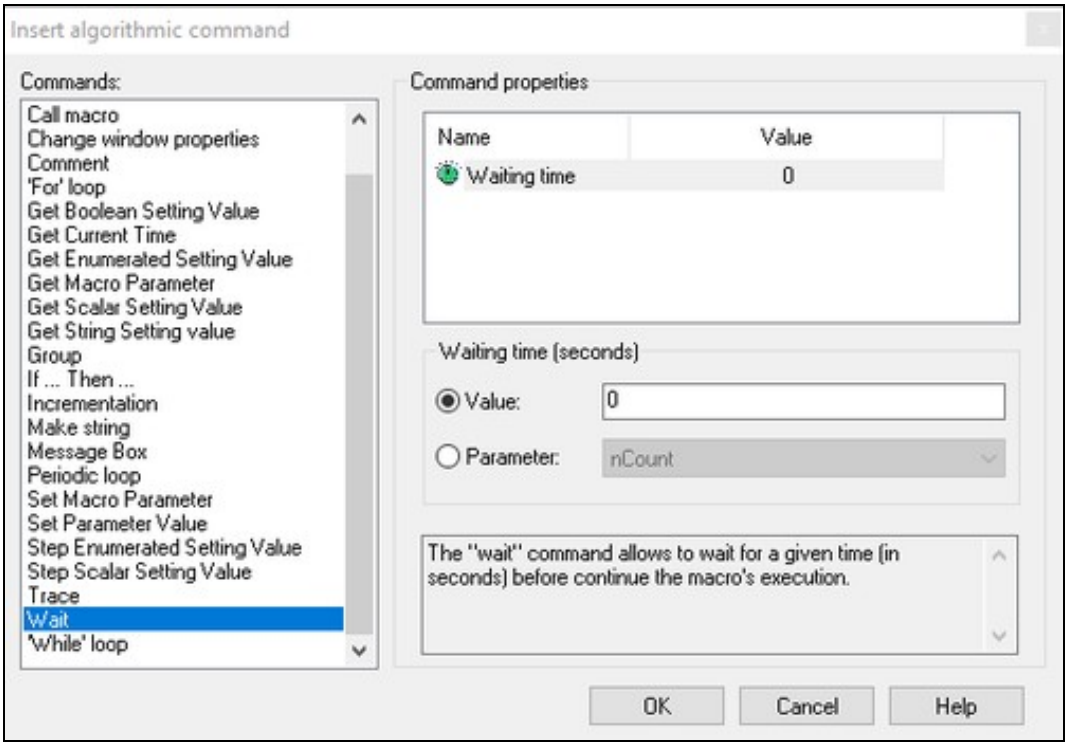
Command used to send a message in the log window.



"Message" is the text that is displayed in the log window.

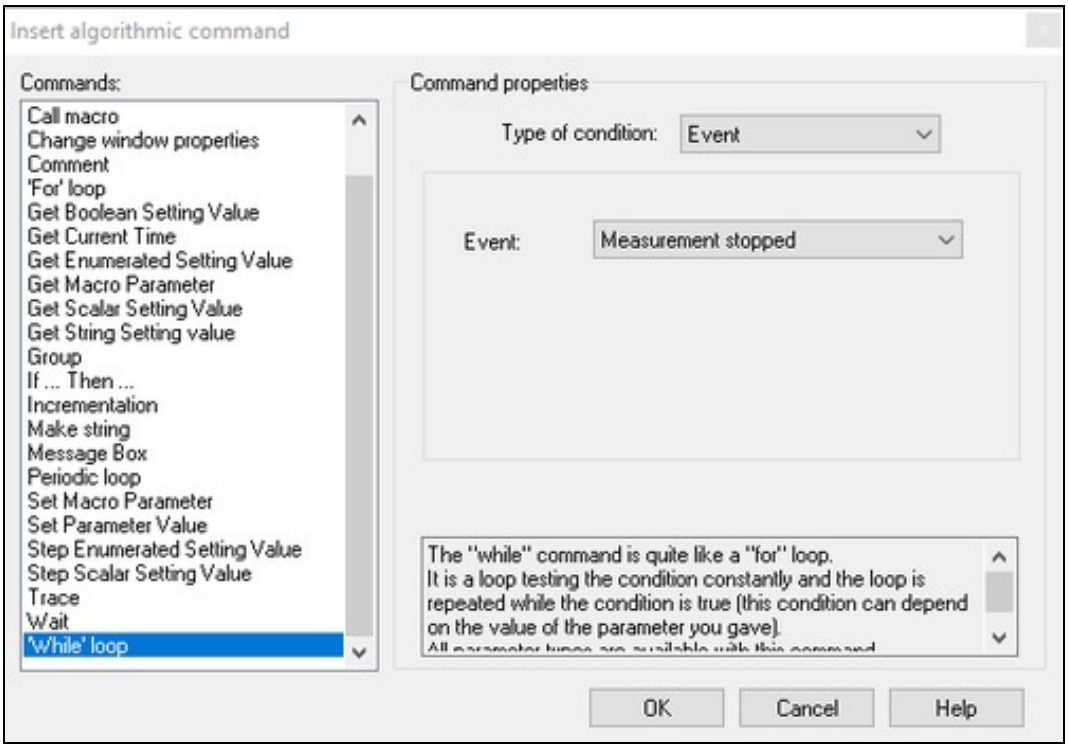
"Play sound" is used to play a sound when the message is sent. The host computer must have speakers connected.

12.1.3.2.17 Wait



Waits for a given time. The wait time is specified in seconds.

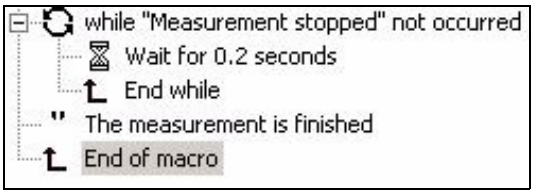
12.1.3.2.18 "While" loop



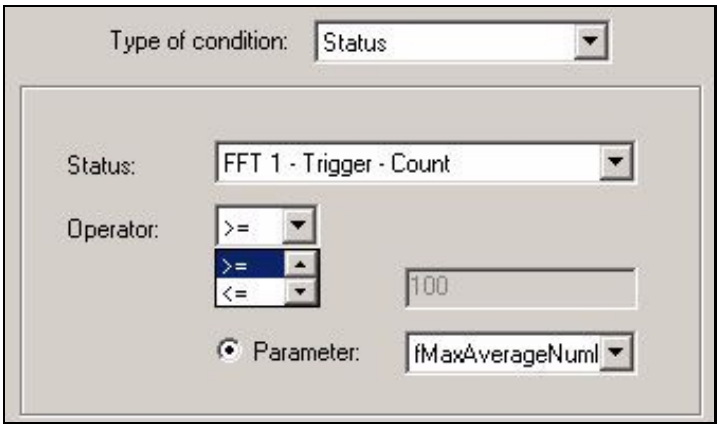
Runs a set of commands several times until the condition is false. The condition can depend on an event, status value or parameter. The event condition can be "event x occurred" or "event x not occurred".

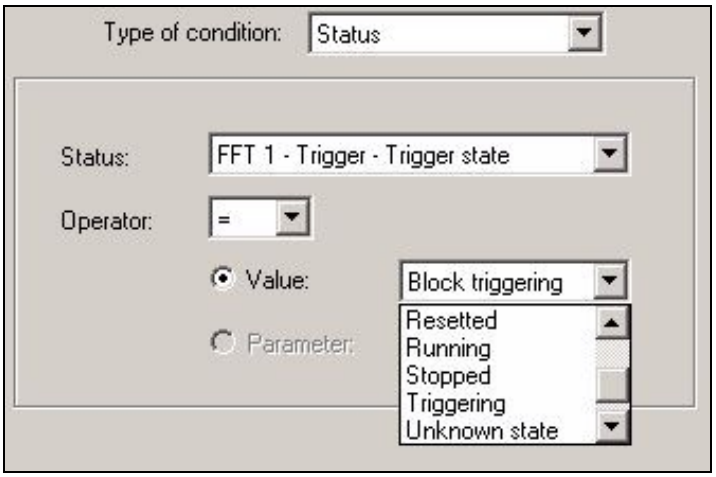
There are five types of conditions:

- **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.

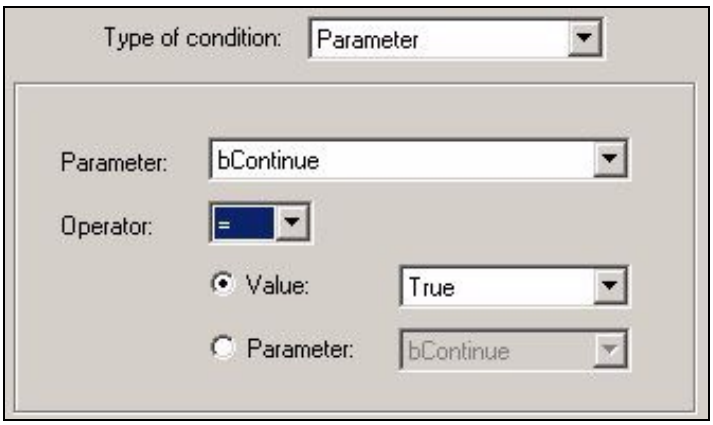


- **Status:** All analyzer statuses can be used for this condition. Depending on the type of status, it is possible to compare its value to a list of possible values or perform a logical test (?=?, ?!=?,?<=?,?>=?) with a constant or a parameter.

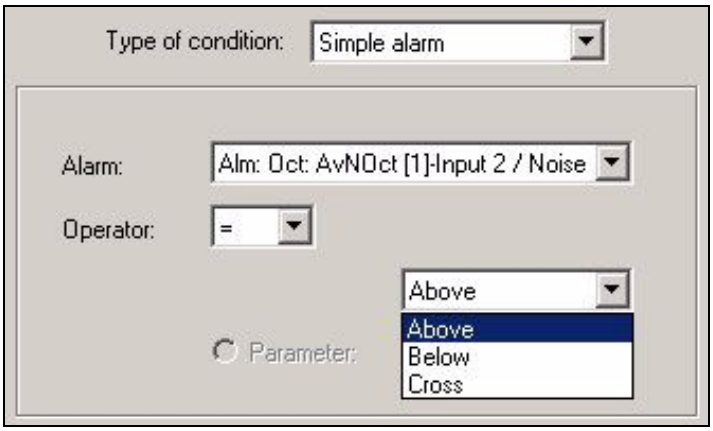


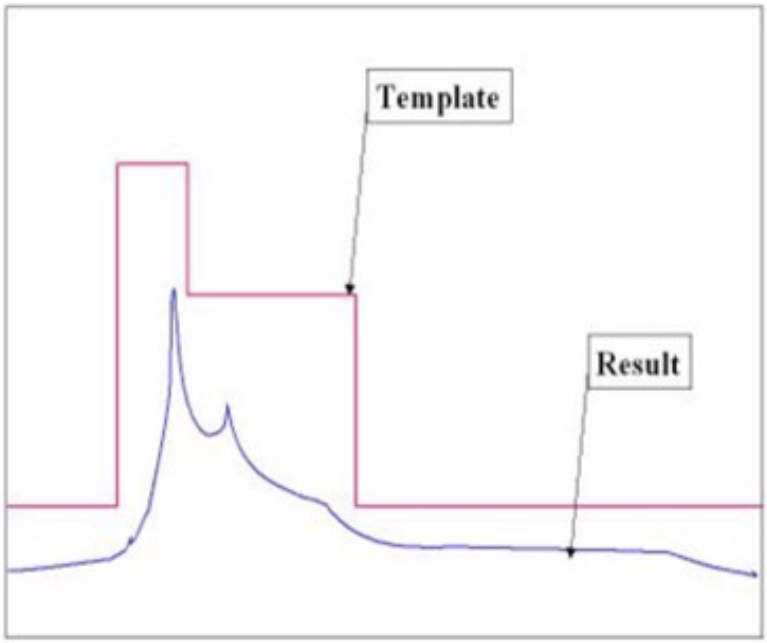


- **Parameter:** The macro parameter of can be compared to a constant or to another parameter.

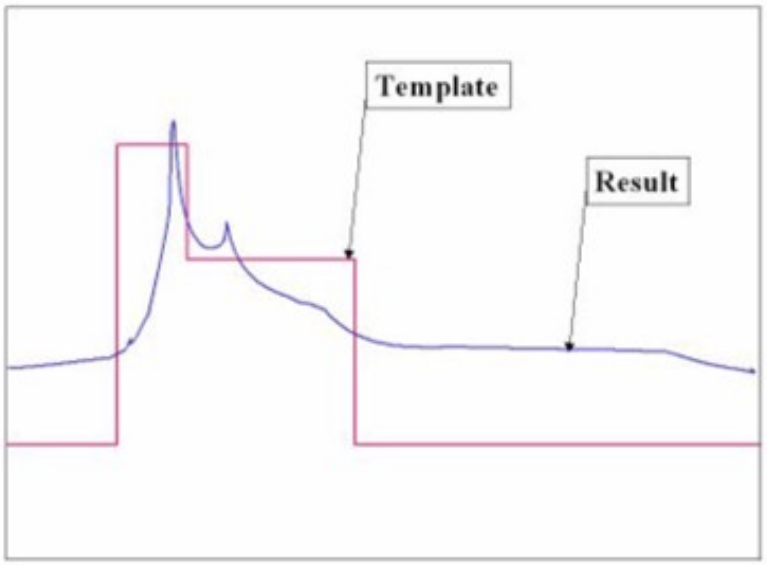


- **Simple alarm:** This condition is available only when at least one alarm on a simple template result has been declared.

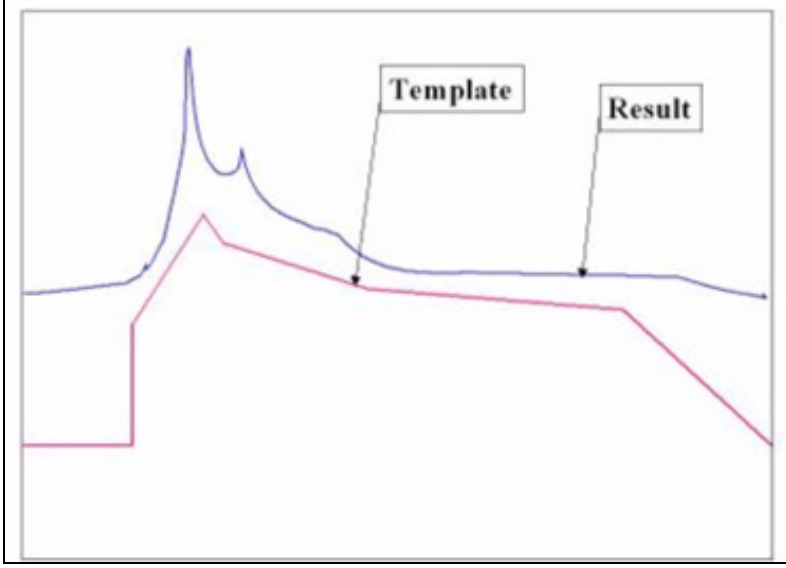




Operator	Test	Condition value
=	Above	False
!=	Above	True
=	Cross	False
!=	Cross	True
=	Below	True
!=	Below	False

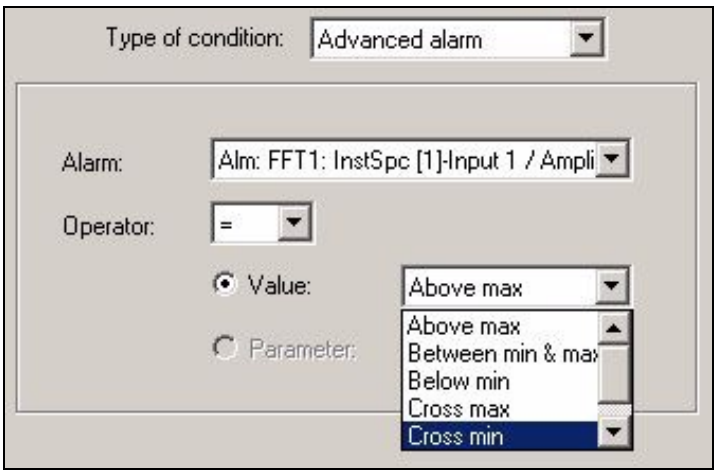


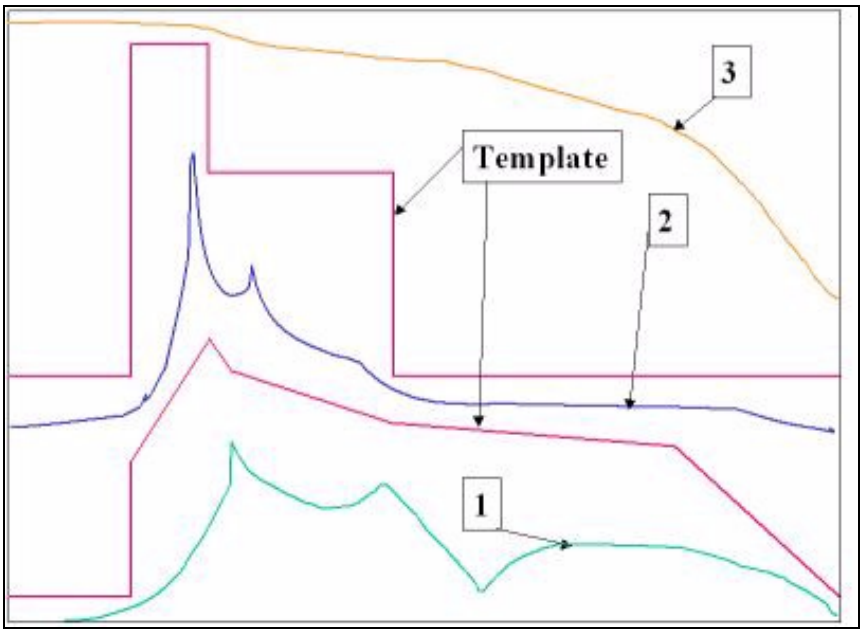
Operator	Test	Condition value
=	Above	False
!=	Above	True
=	Cross	True
!=	Cross	False
=	Below	False
!=	Below	True



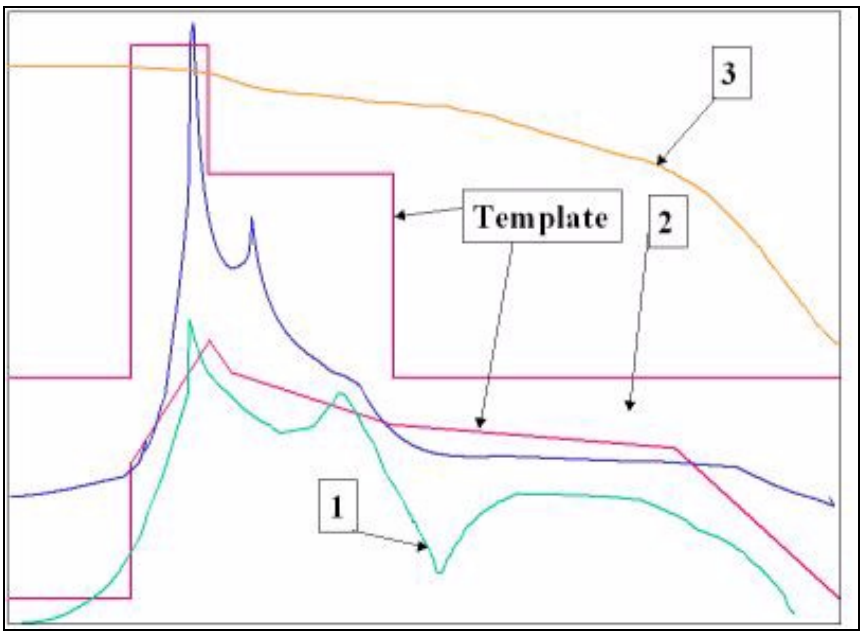
Operator	Test	Condition value
=	Above	True
!=	Above	False
=	Cross	False
!=	Cross	True
=	Below	False
!=	Below	True

- **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

12.1.3.3 Editor contextual menu

12.1.3.3.1 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.

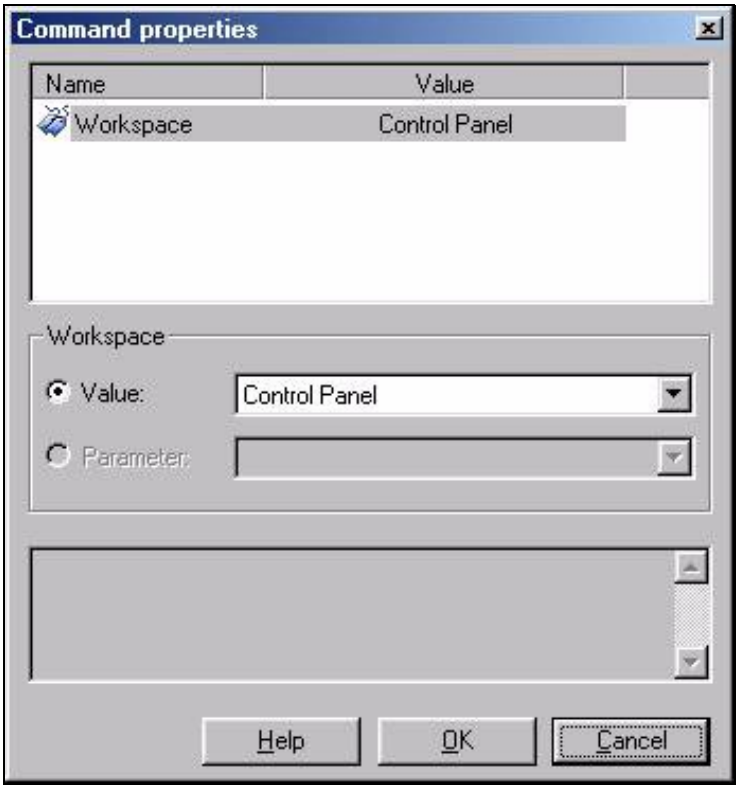
- **Delete:** Deletes the command selected. Available if the item selected in the macro tree is a command item (not "end of loop" or "end of macro item).
- **Toggle break point**

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.

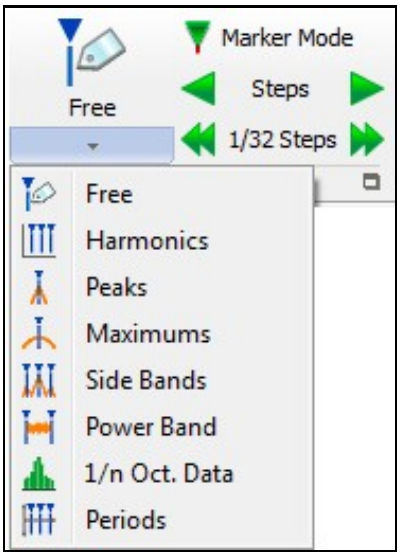
During macro execution (see Run button), the execution stops on the first command where a toggle break point is placed.

- **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.

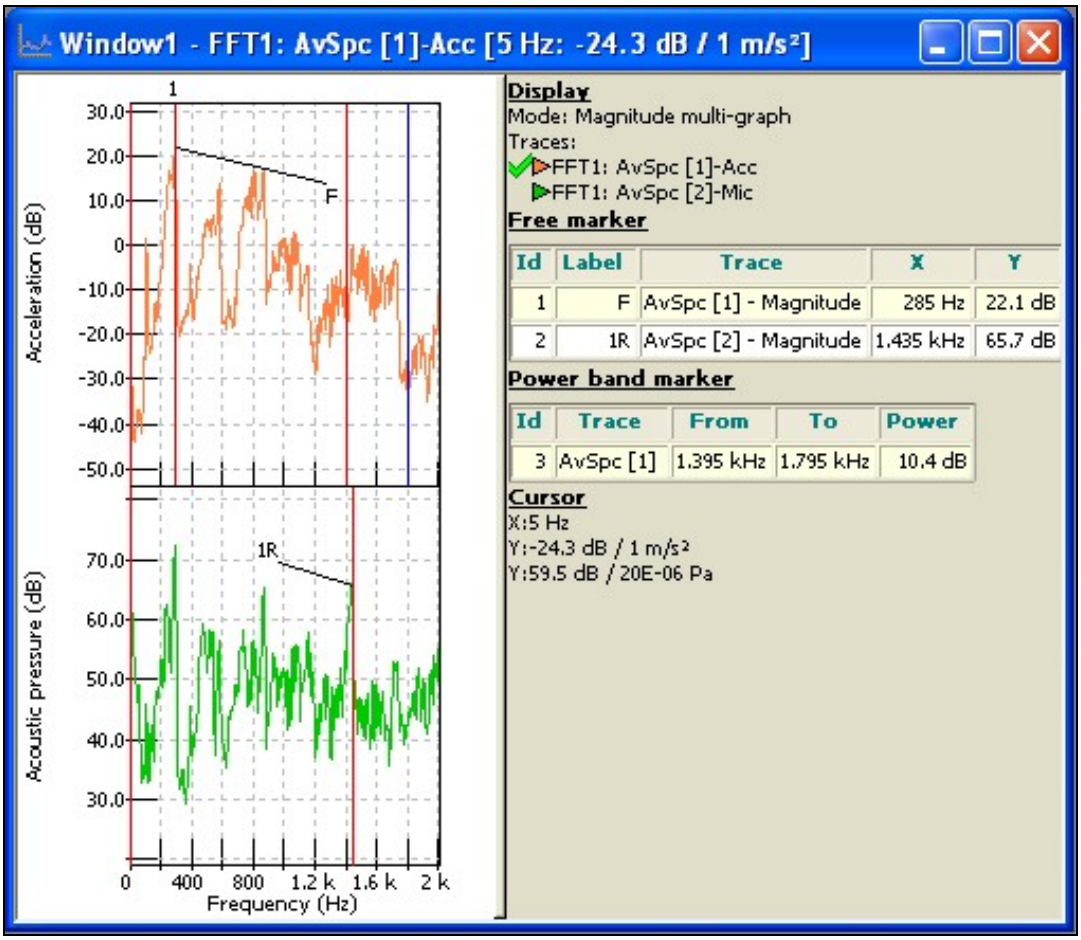
13 NVGate Marker



NVGate features a complete set of real-time markers that help identifying typical signature and points of exception in both time and spectral graphs.

13.1 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								

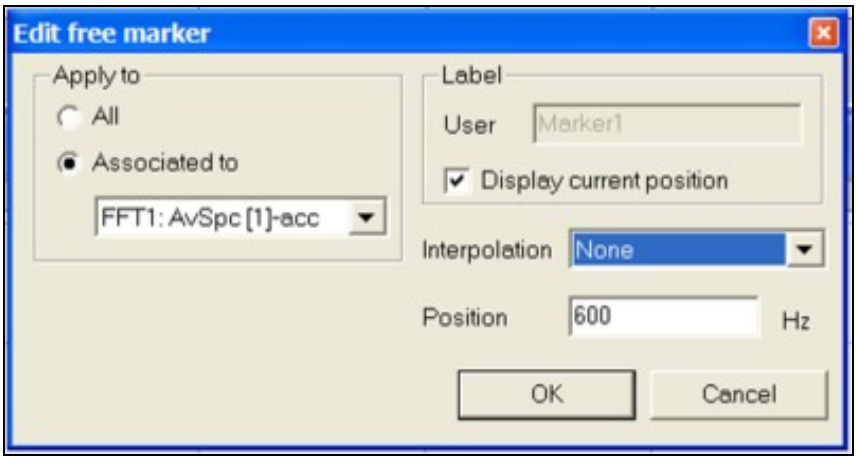
13.1.1 Free marker

- 

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.

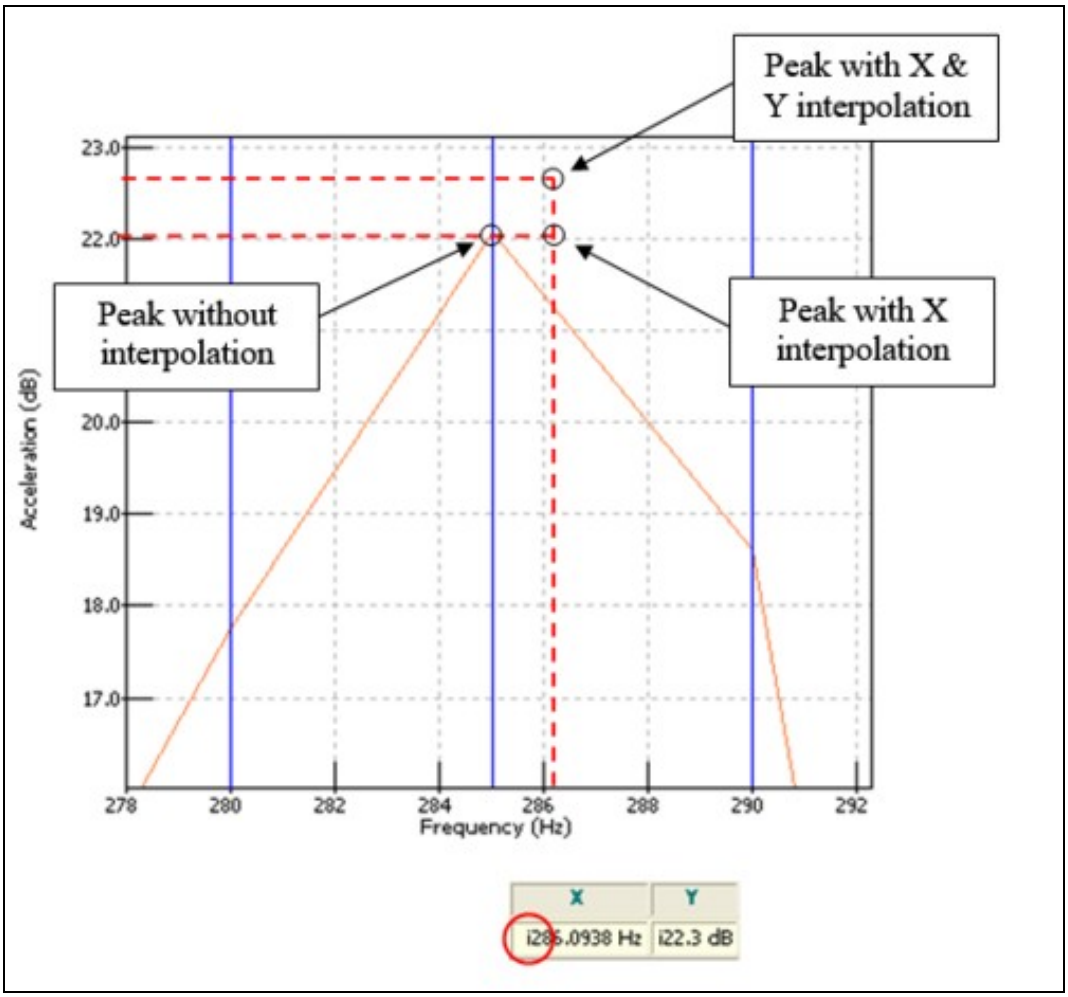
When available, a free marker can be placed and moved within a graph to track specific values. A label can be associated with each free marker.

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.

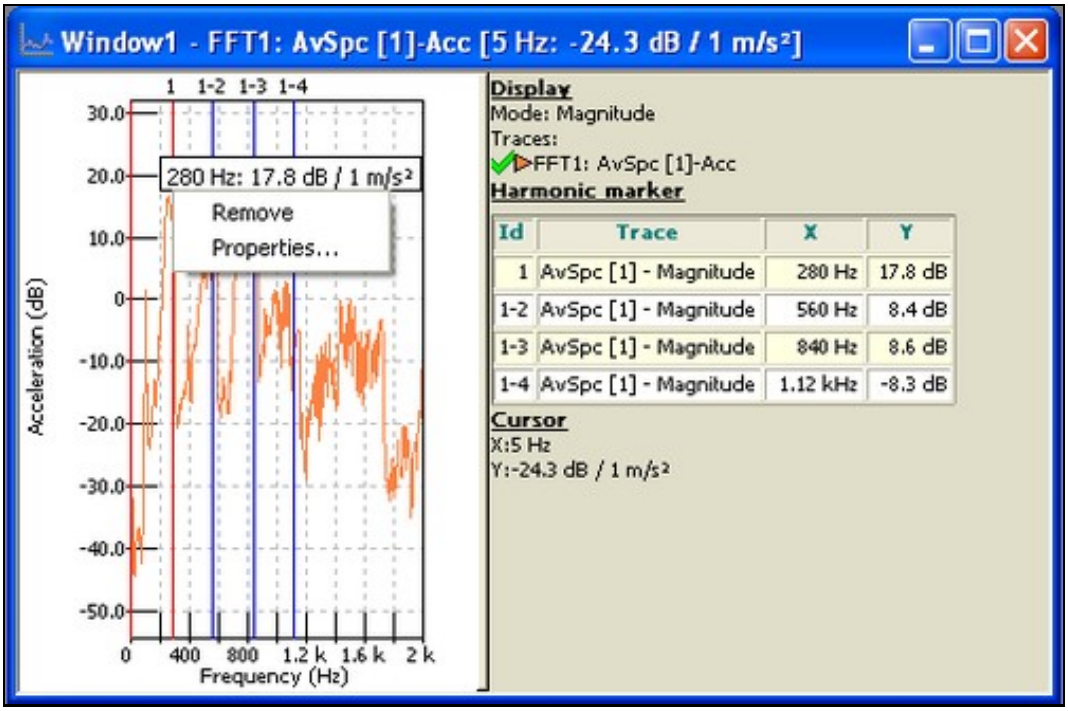
- Apply to
- All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
- Associated to: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.

13.1.1.1 Harmonic marker

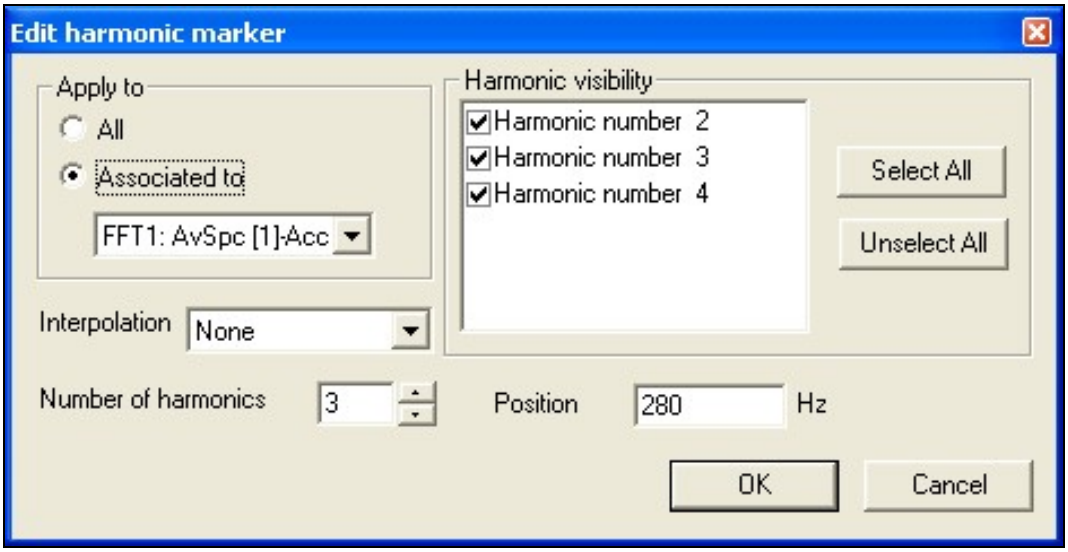
- 

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).

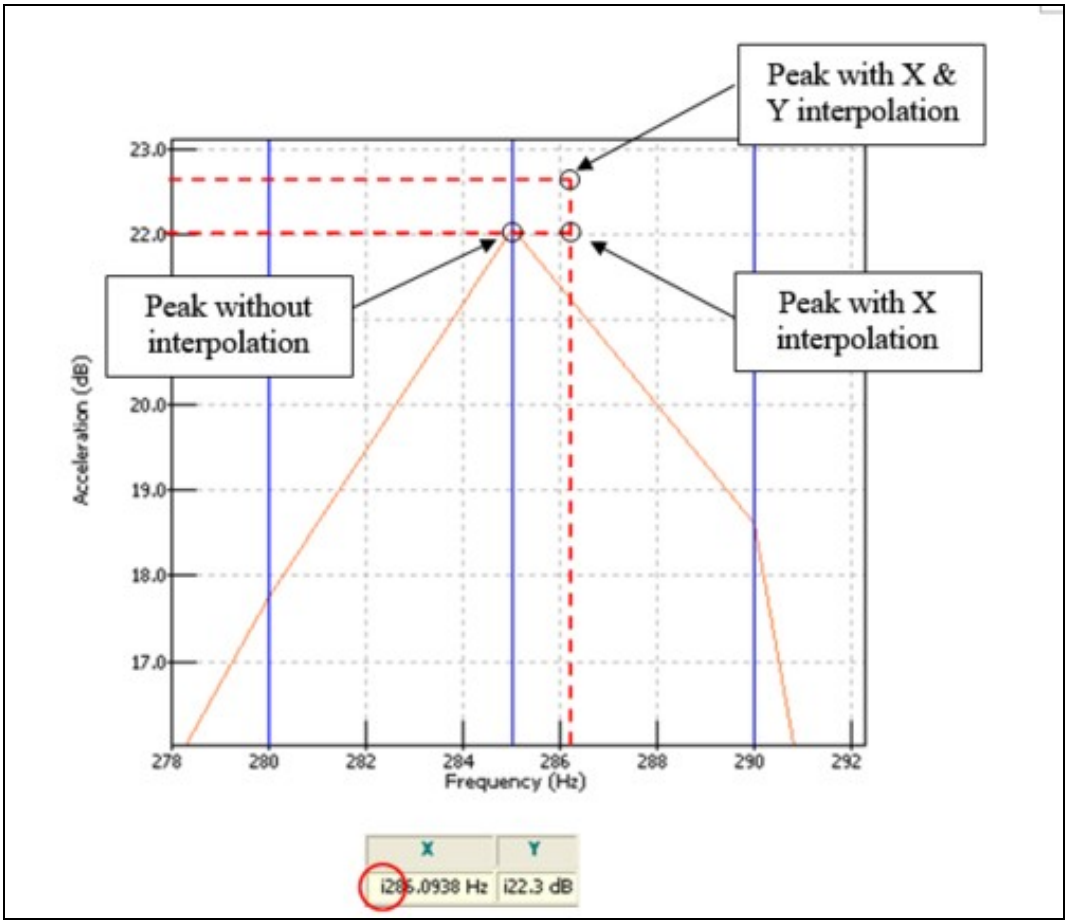


Harmonic marker properties



- 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.



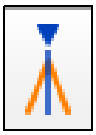
When the interpolation function is active, the interpolated value is preceded by a "i".

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.

13.1.1.2 Peak marker

•

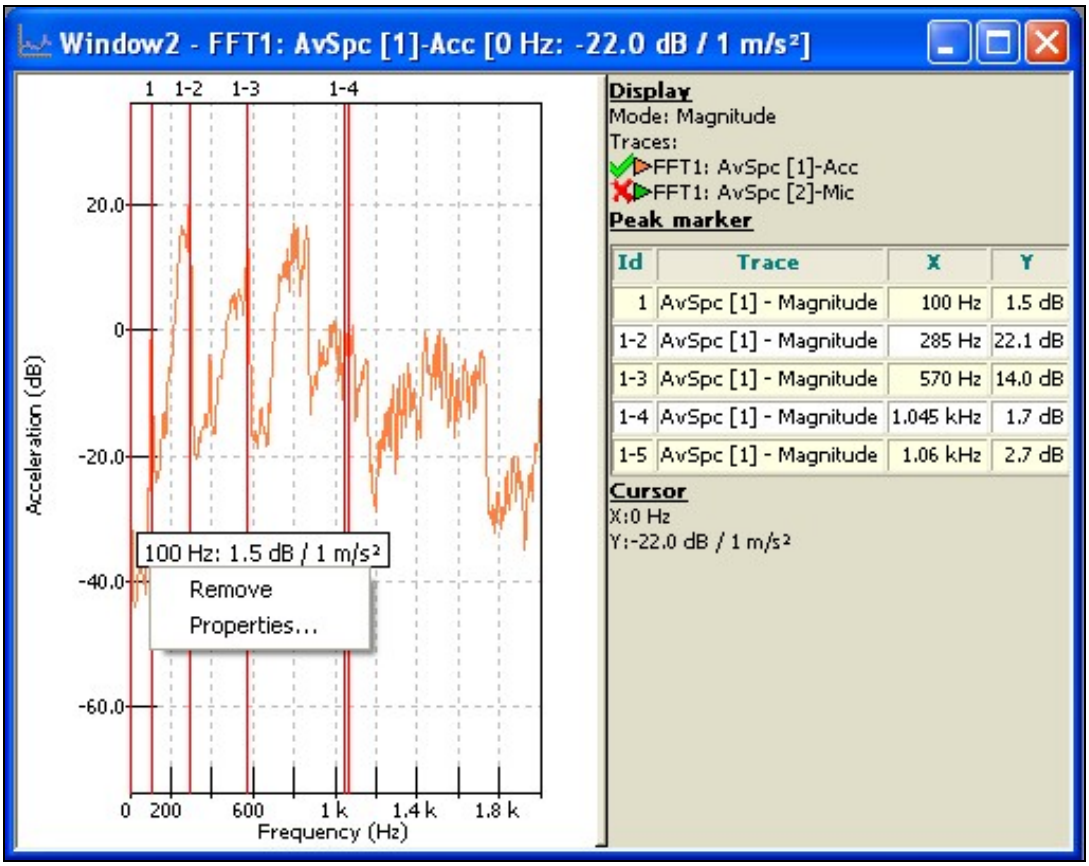


Switch the cursor to add a set of peak detection markers in the clicked graph. The peak marker detects automatically the peaks in the spectra and waterfall X/Y sections.

Computes and displays peak values for the selected trace(s).

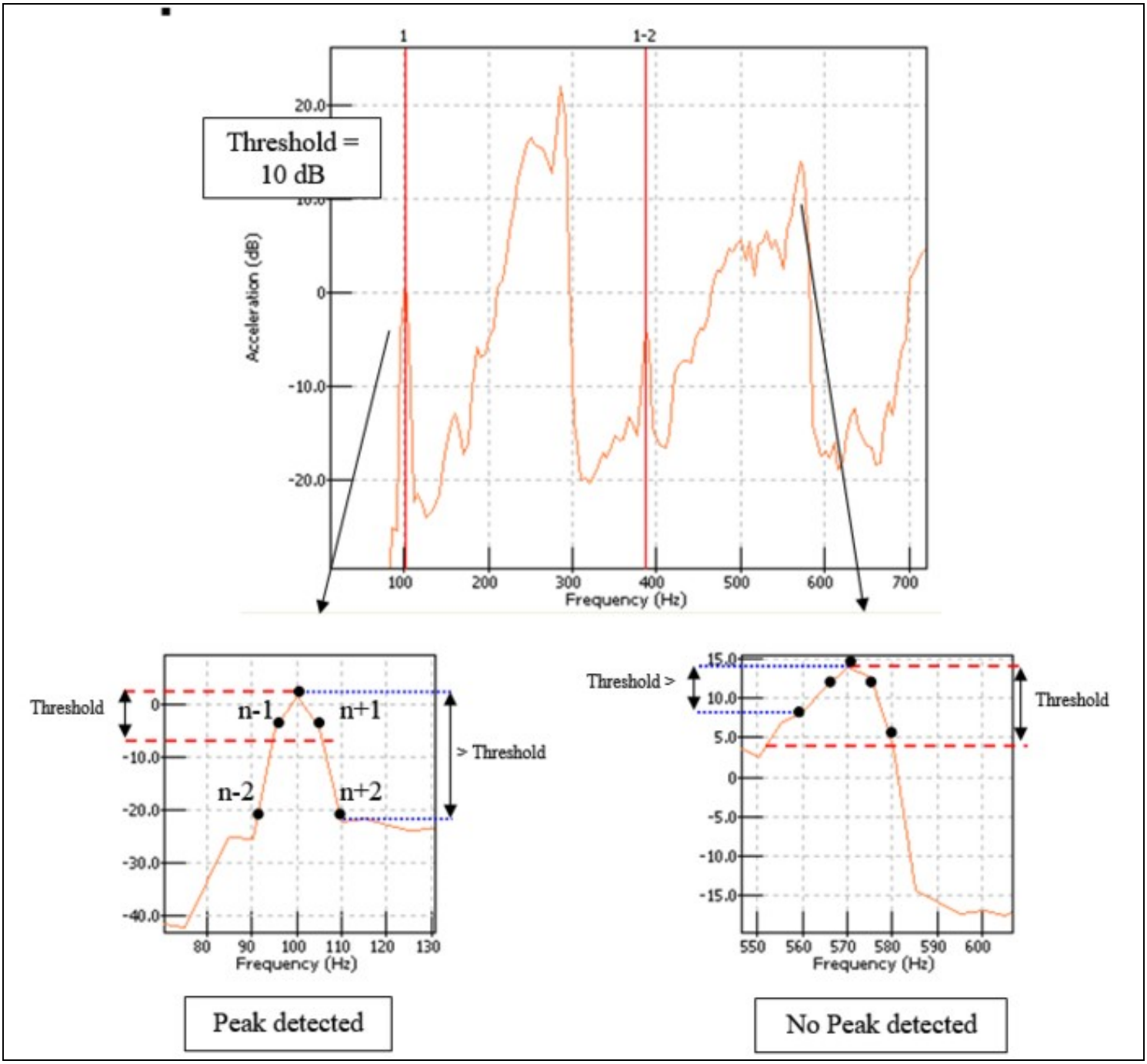
A spectrum line is detected as a peak if two following conditions are matched:

- 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

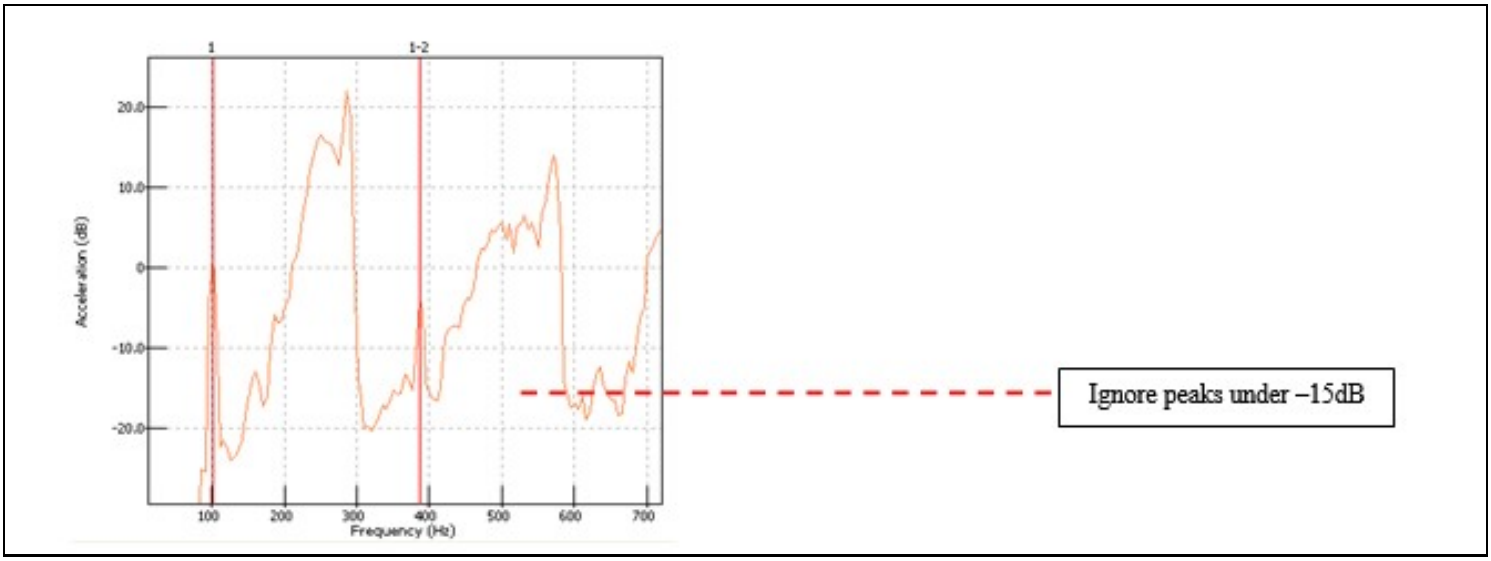


Peak marker properties

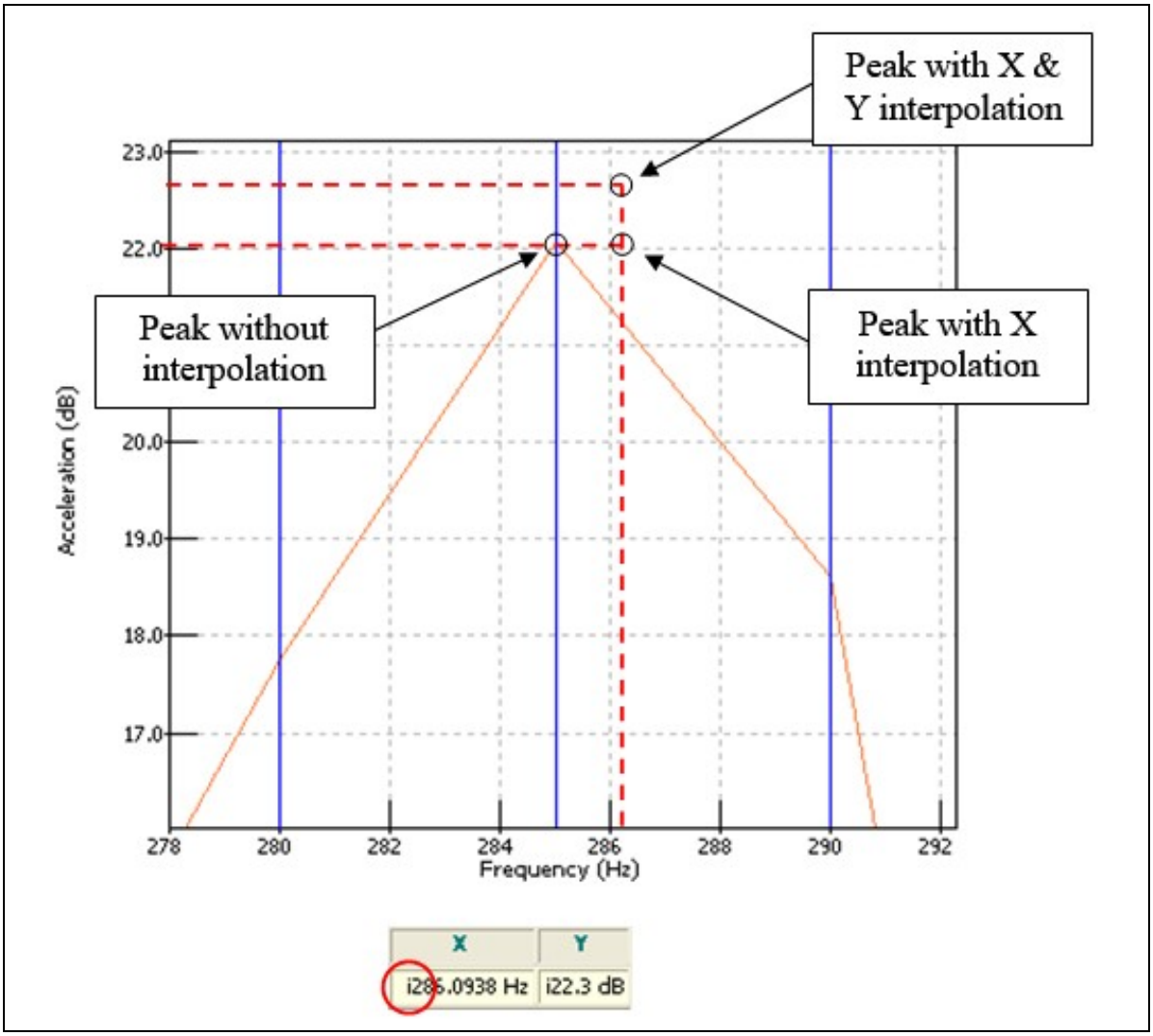
- Threshold: In the example below, the "Threshold" is 10 dB.



- 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".

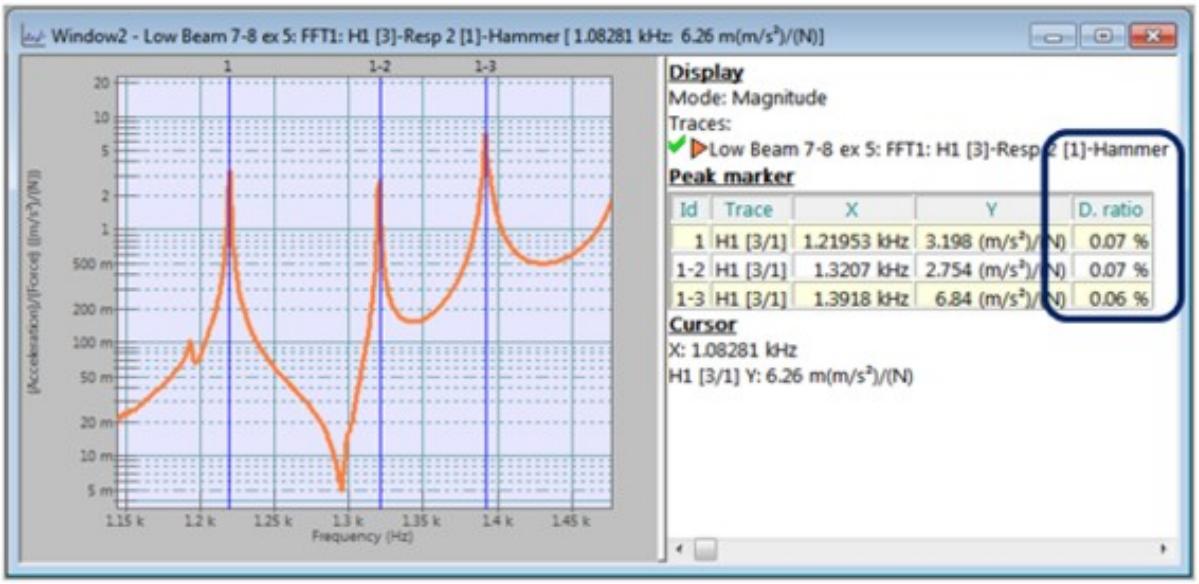
- Apply to
- All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
- Associated with: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.
- 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.

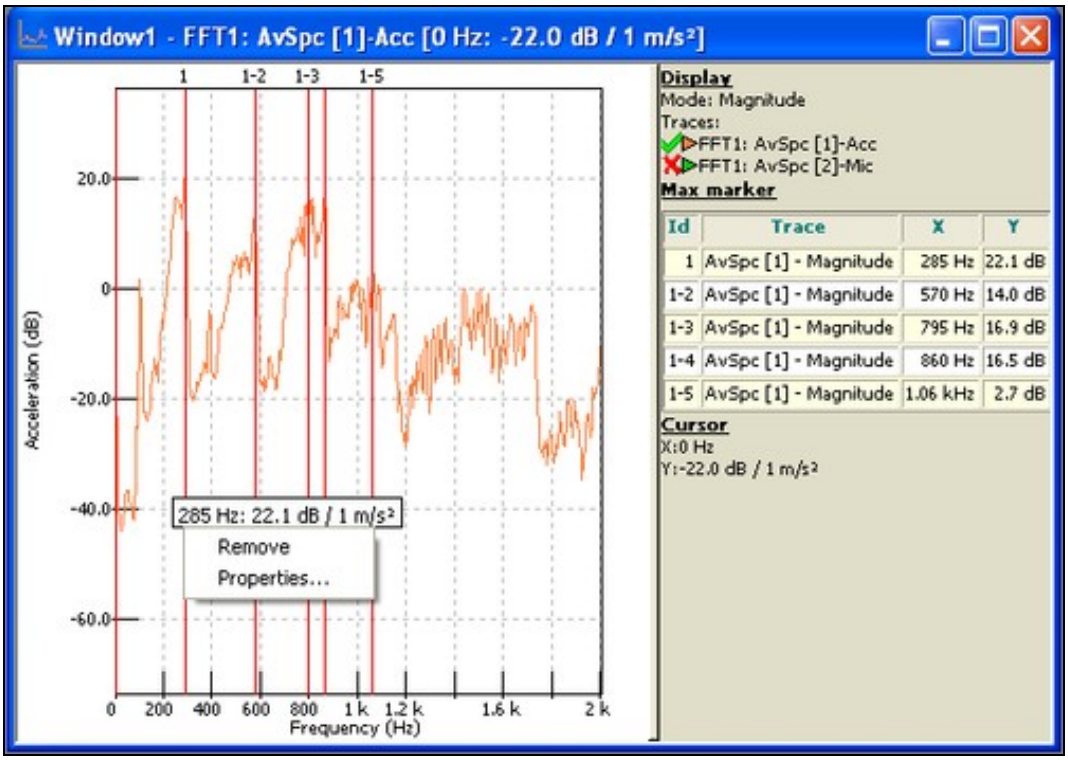
13.1.1.3 Max marker

- 

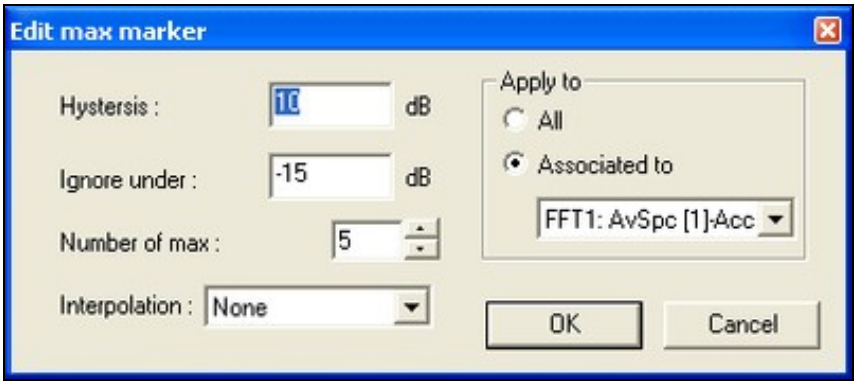
Switch the cursor to add a set of maximum detection markers in the clicked graph. The max marker detects automatically the maximum in the spectra and waterfall X/Y sections.

Computes and displays max values for the selected trace(s).

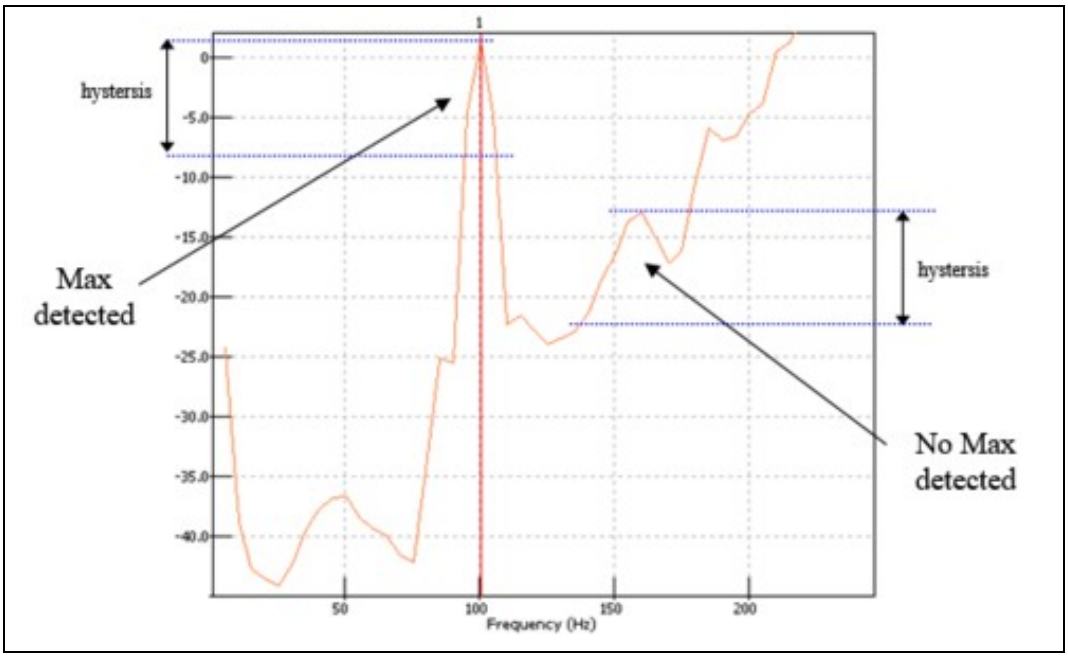
A maximum is defined as a local maximum such that the variation in size of spectral density of ray, in relation to other local maximum surrounding it, is greater than a set threshold



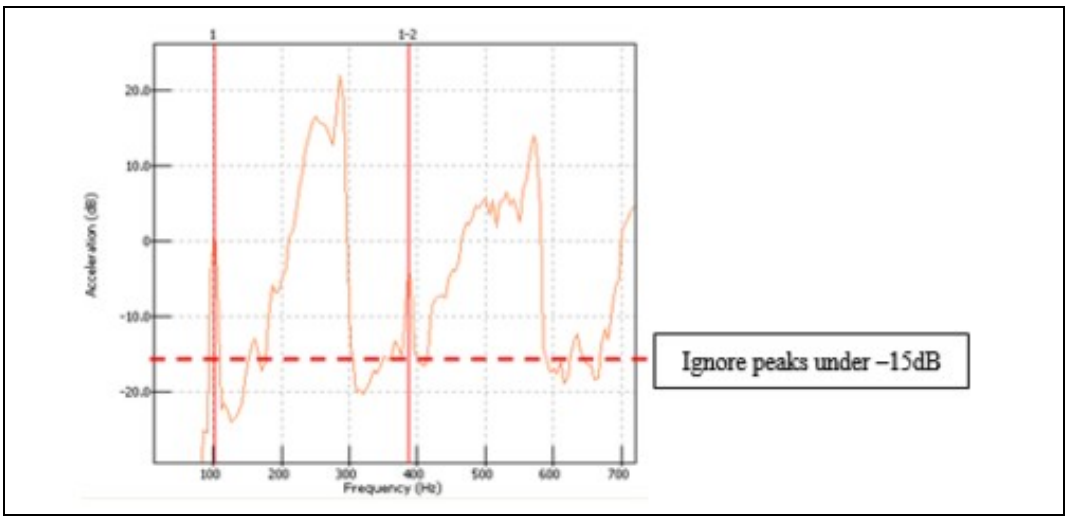
Max marker properties



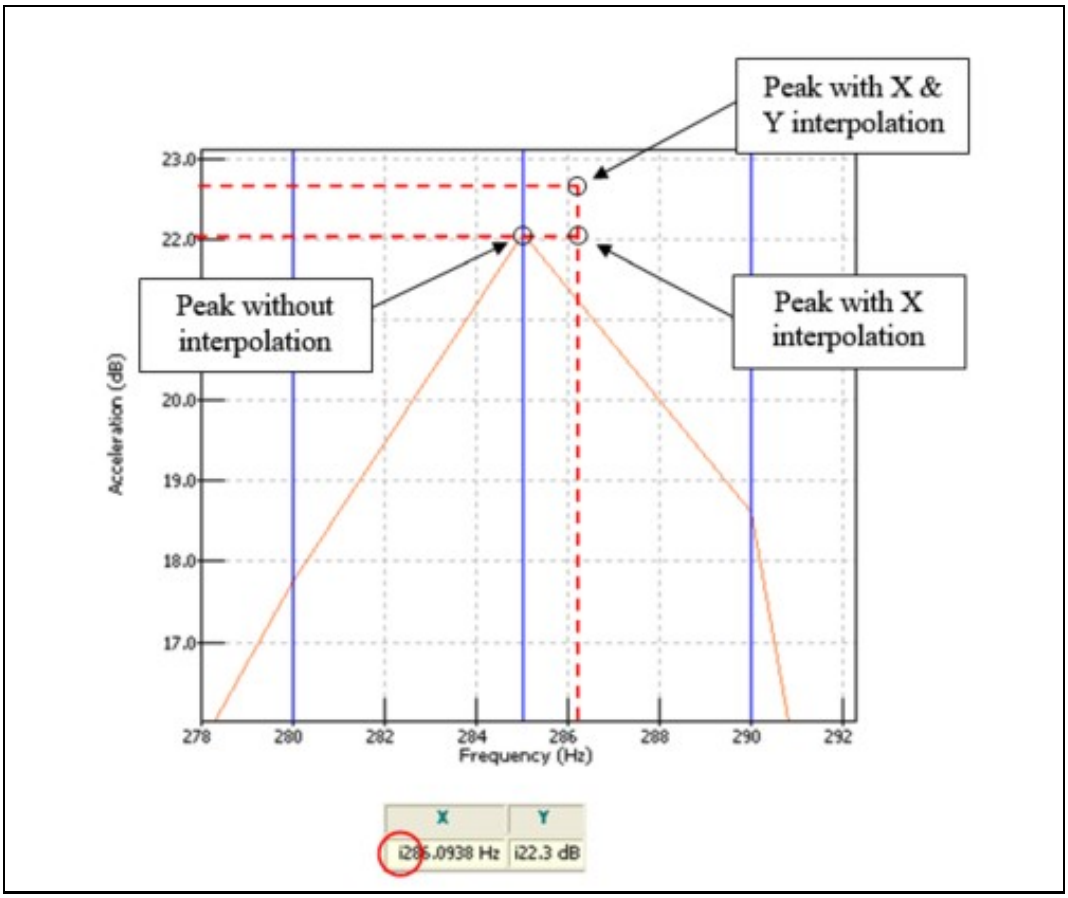
- Hystersis



- 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".

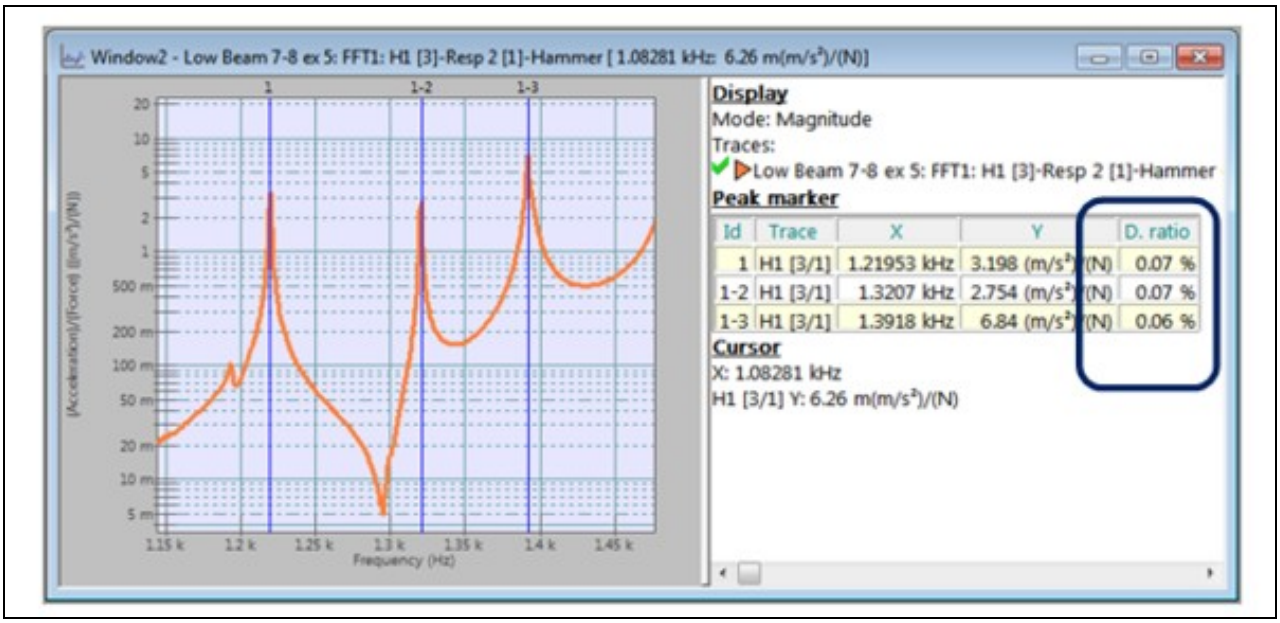
- Apply to
- All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
- Associated to: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.
- 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.

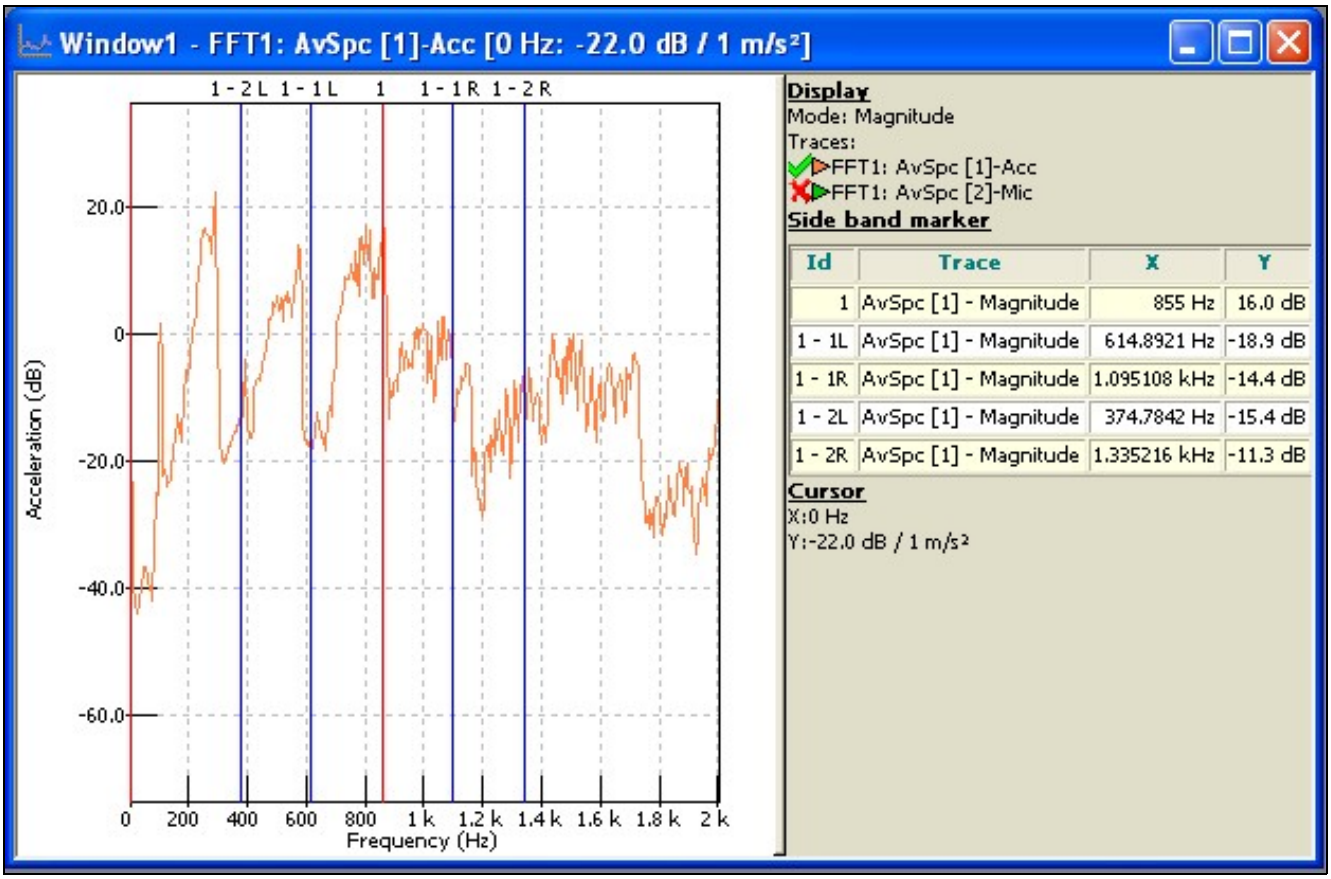
13.1.1.4 Side band marker

- 

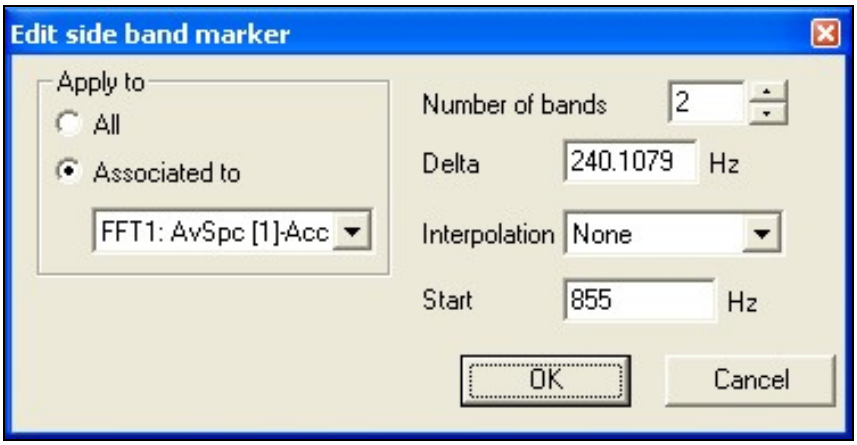
Switch the cursor to add a side band marker at the clicked location. The Sideband marker can be positioned everywhere in a spectra and waterfall X/Y sections

Display values for a central frequency and side frequencies (left and right) defined by a delta value.

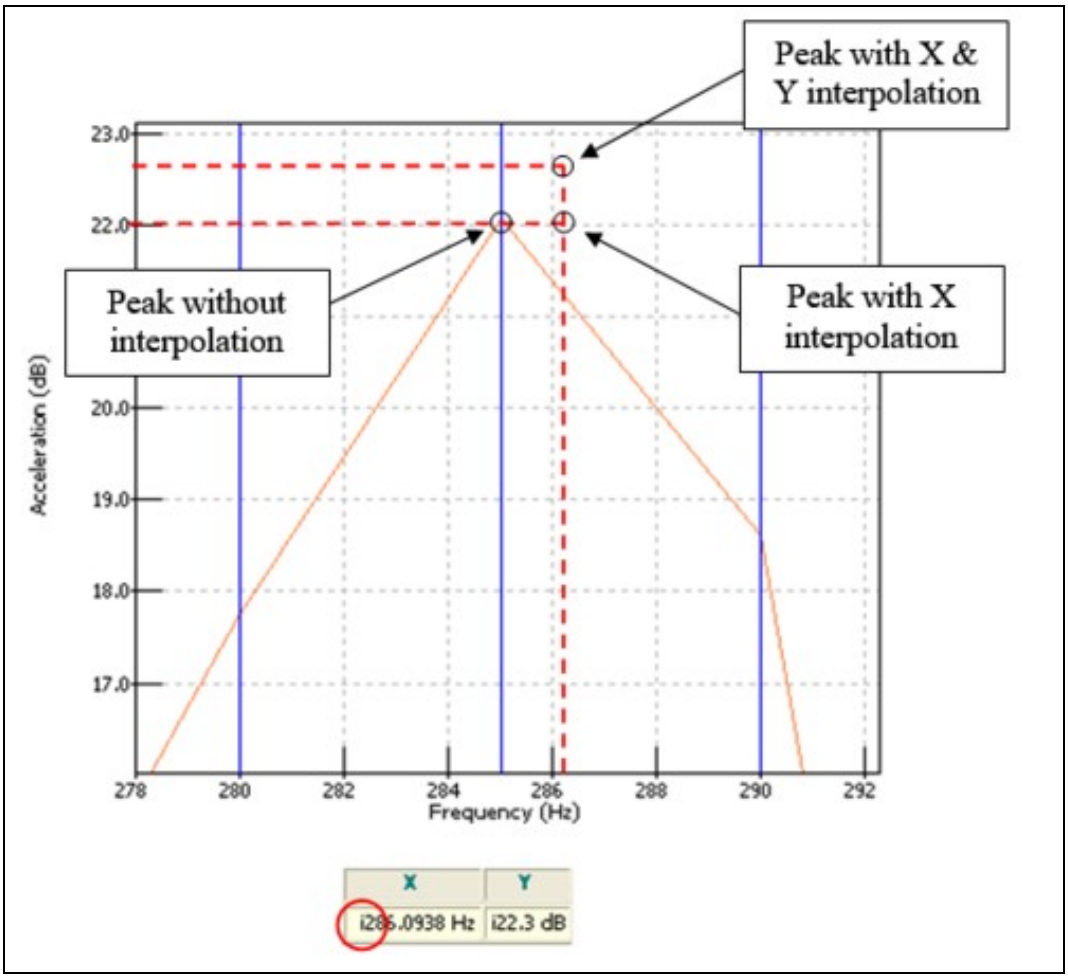
The management of side band markers selects the assumed porter and the first side band of modulation. The position of the cursor during the selection of the porter or the first side band is previously interpolated on the frequency axis, taking into account the frequency response of the weighting window 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.

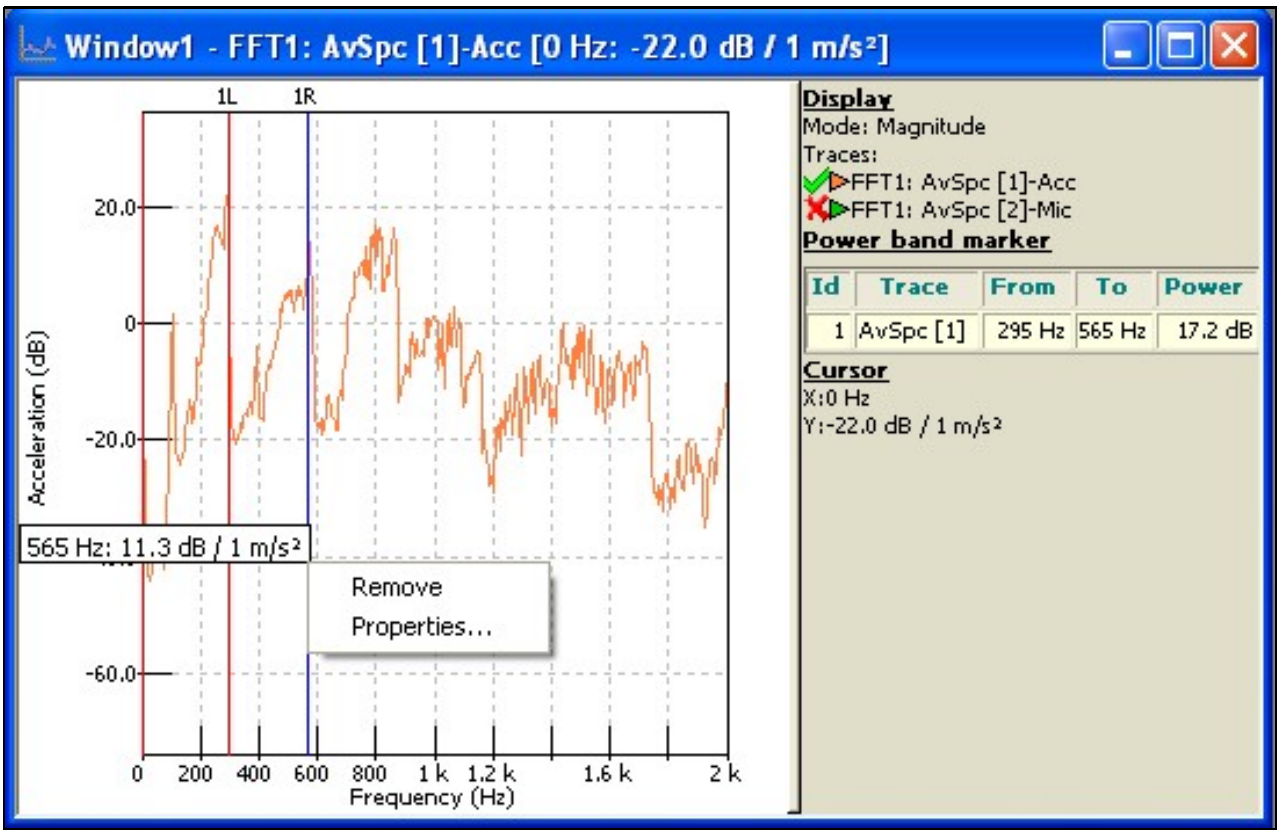
- Apply to
  - ♦ All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
  - ♦ Associated with: the marker is associated with only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.

13.1.1.5 Power band marker

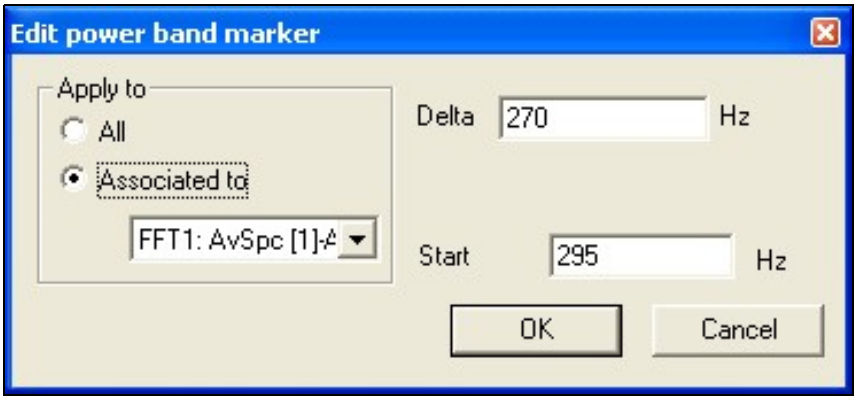
-

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



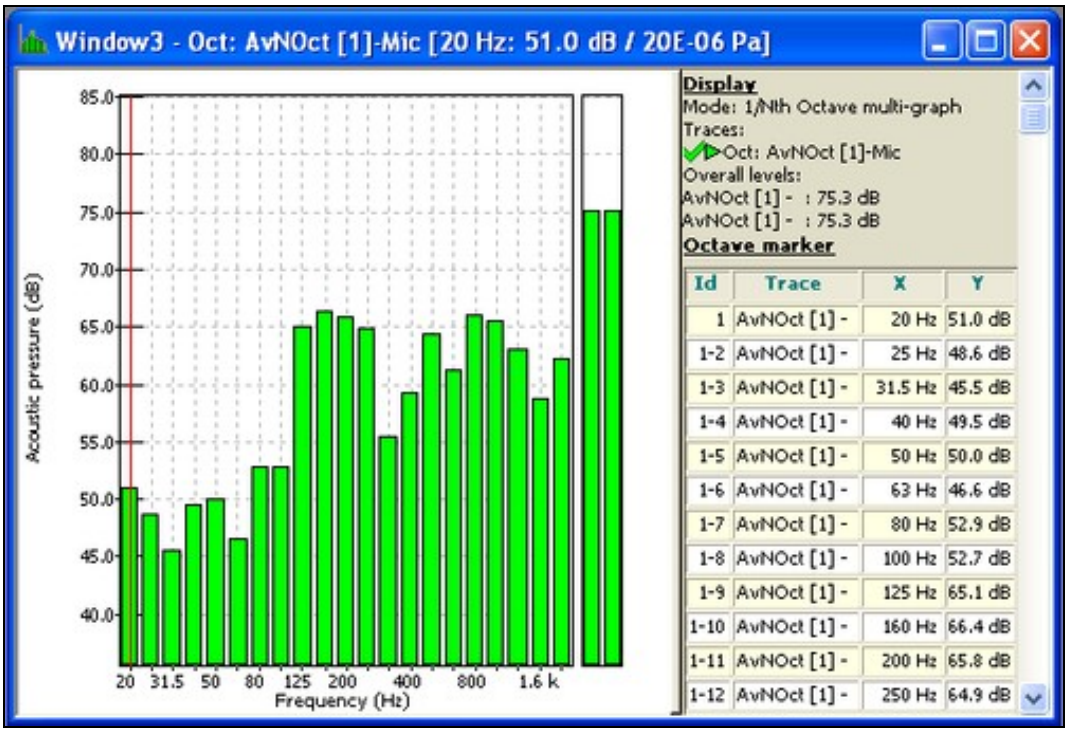
- Start: Start value for the power band computation.
- Delta: Bandwidth used for the computation.
- Apply to
    - ♦ All: the marker is associated with all curves of the graph. All Y values will be computed and displayed in the free marker tab.
    - ♦ Associated with: the marker is associated to only one trace of the graph. If active is selected, the marker is applied to the current active trace of the graph.

13.1.1.6 1/n Octave data marker

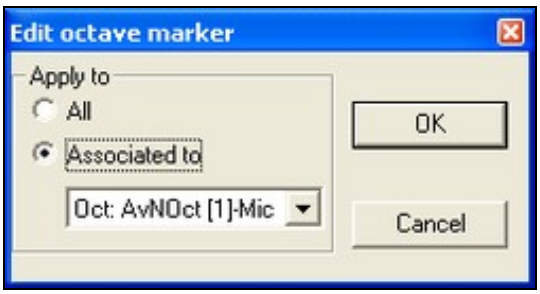
-

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.

13.1.1.7 Kinematic markers

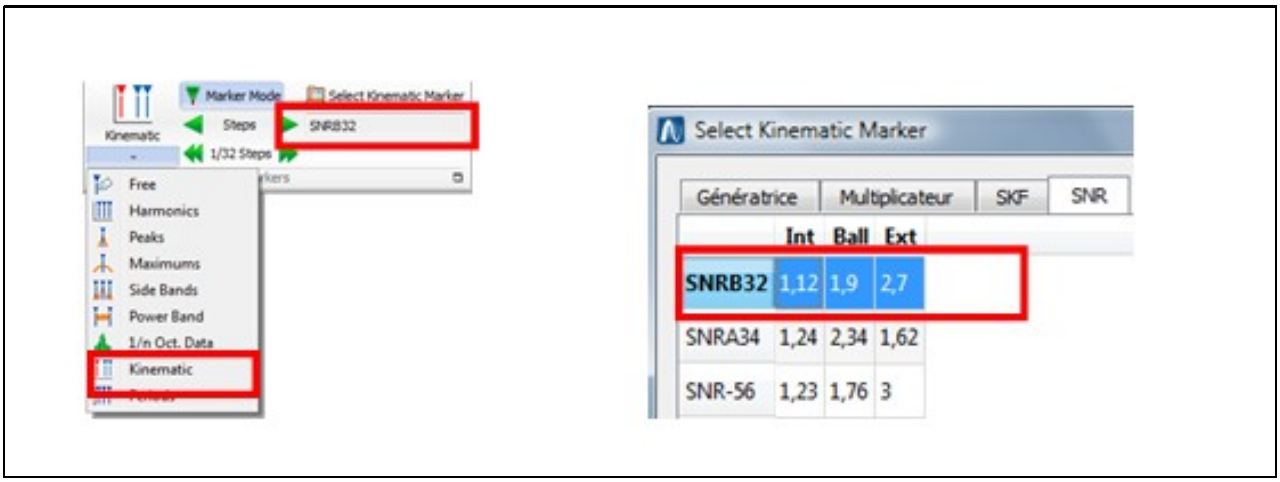
-

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.

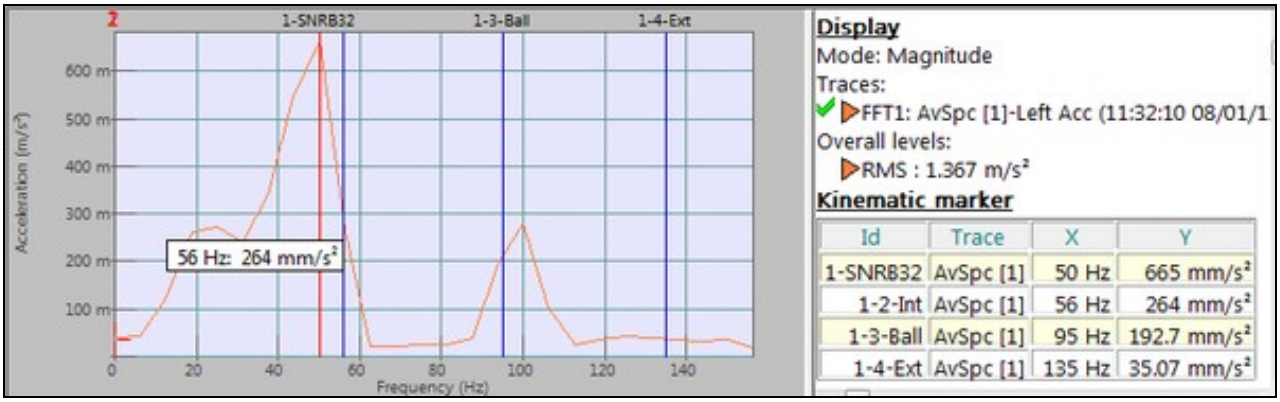
The Kinematic marker helps identifying the frequencies (or orders) which match the various rotating speed in machineries. These frequencies are linked with a fundamental one (usually the main shaft rotating frequency) by fixed ratio. These ratios depend on the machinery kinematics.

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.

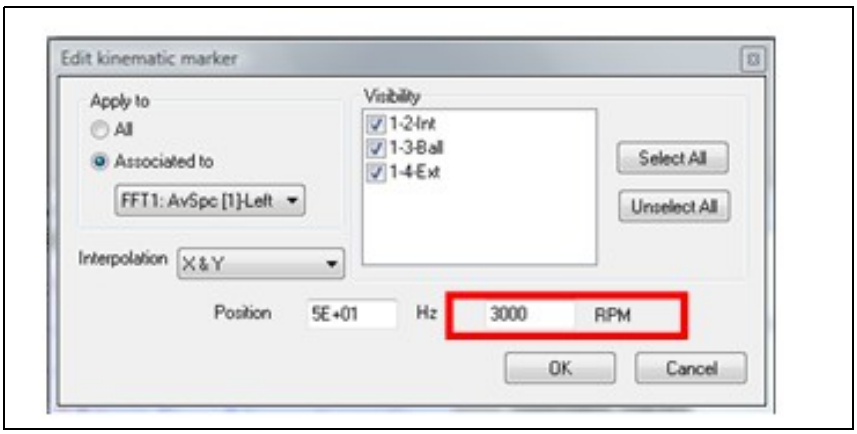


Then it becomes possible to select one marker from the list. Click *Select Kinematic Marker* button to open the selection dialog. Select one line from the table of the current tab and close the dialog box. The corresponding marker will be applied double clinking on a spectral graph.



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.

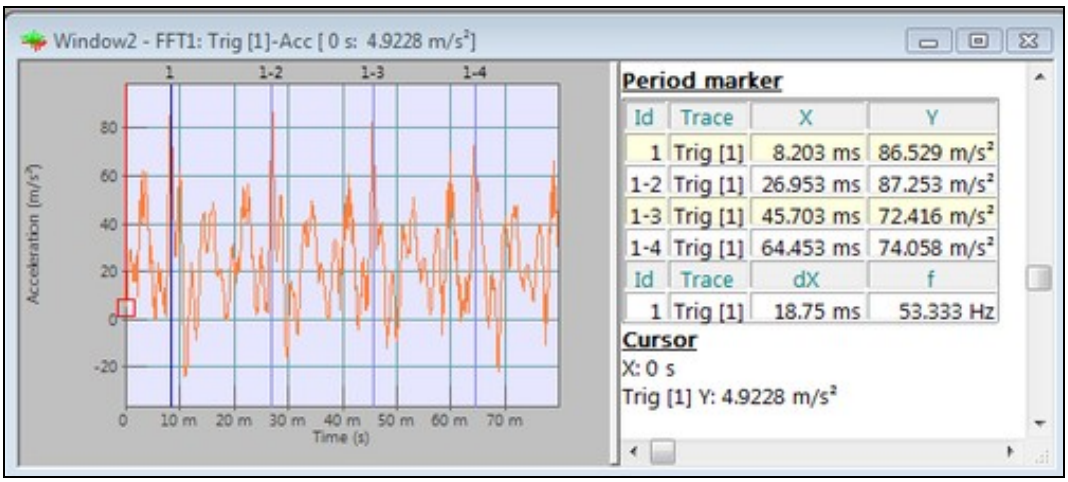
The files may be modified to adjust the kinematics ratio. The files content are read every time the select kinematic marker is opened. No need to exit the NVGate software for update.

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.*

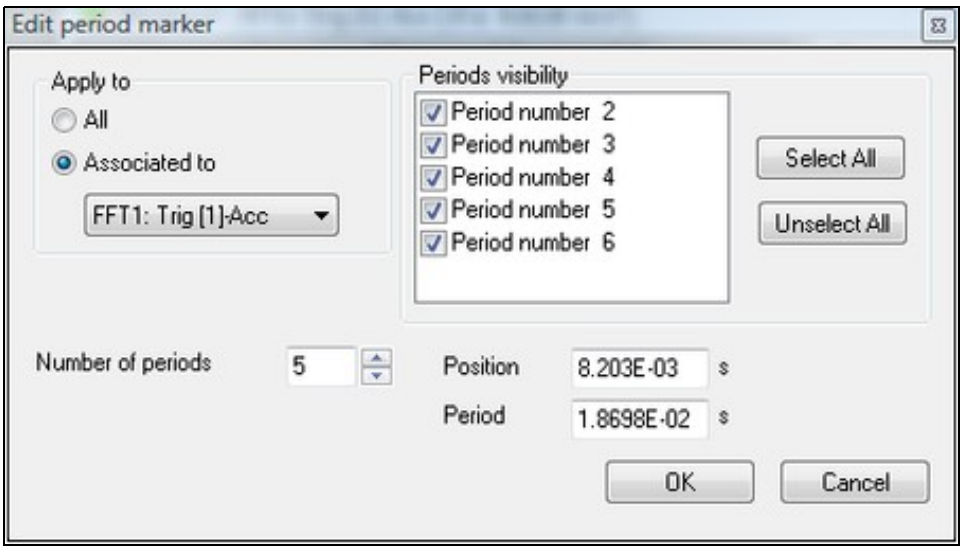
The kinematic marker operations are similar to the harmonics one.

13.1.1.8 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.

13.1.1.9 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.*

13.1.2 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:

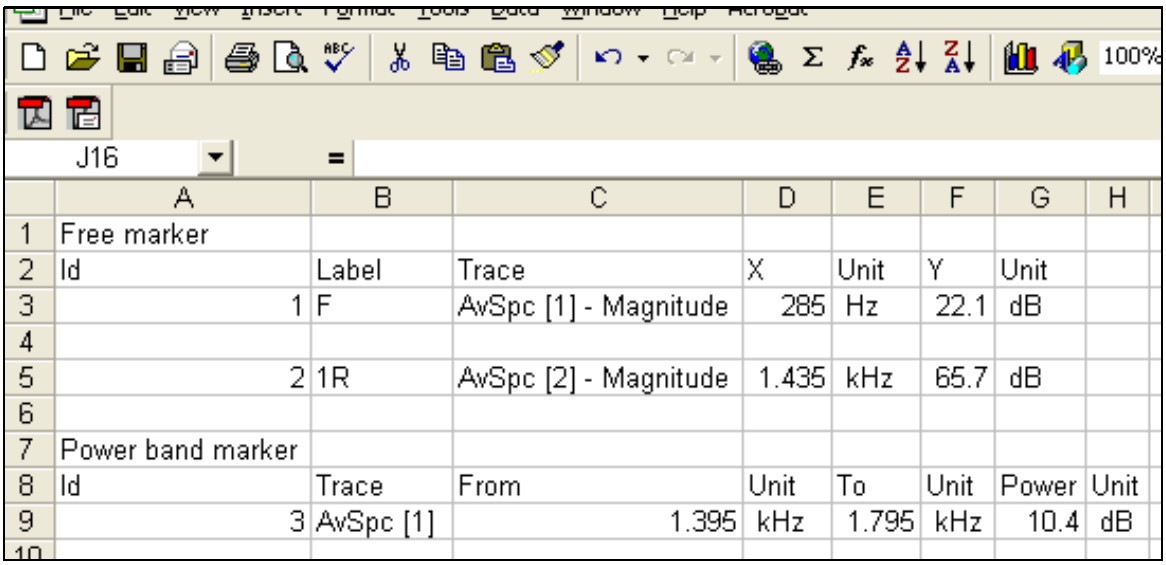
For Word®:

Free marker

Id Label Trace X Unit Y Unit

1 Marker Sig [1] 0.00141 s 5.453 V

For Excel®:



J16 =

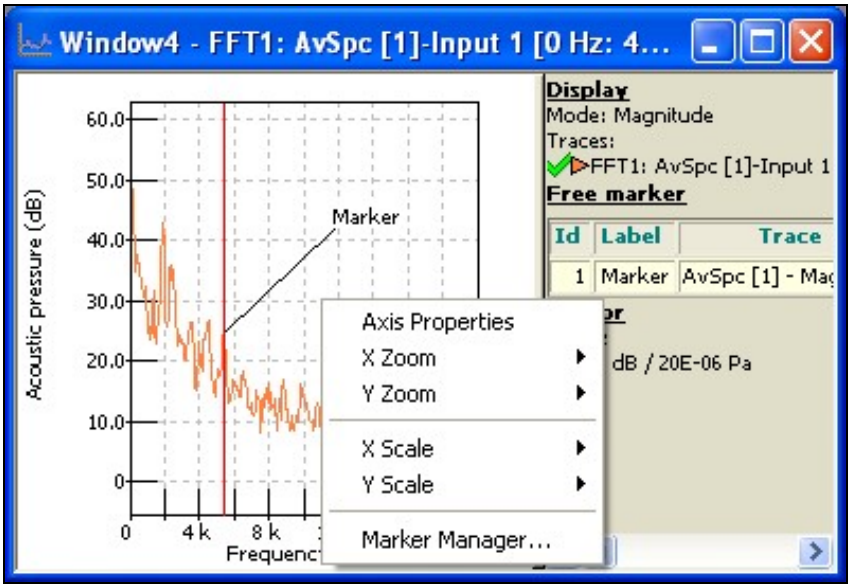
	A	B	C	D	E	F	G	H
1	Free marker							
2	Id	Label	Trace	X	Unit	Y	Unit	
3	1	F	AvSpc [1] - Magnitude	285	Hz	22.1	dB	
4								
5	2	1R	AvSpc [2] - Magnitude	1.435	kHz	65.7	dB	
6								
7	Power band marker							
8	Id	Trace	From	Unit	To	Unit	Power	Unit
9	3	AvSpc [1]	1.395	kHz	1.795	kHz	10.4	dB

13.1.3 Marker table in reports

The marker table can be droped in the report template. See NVGate Report for details.

13.1.4 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.



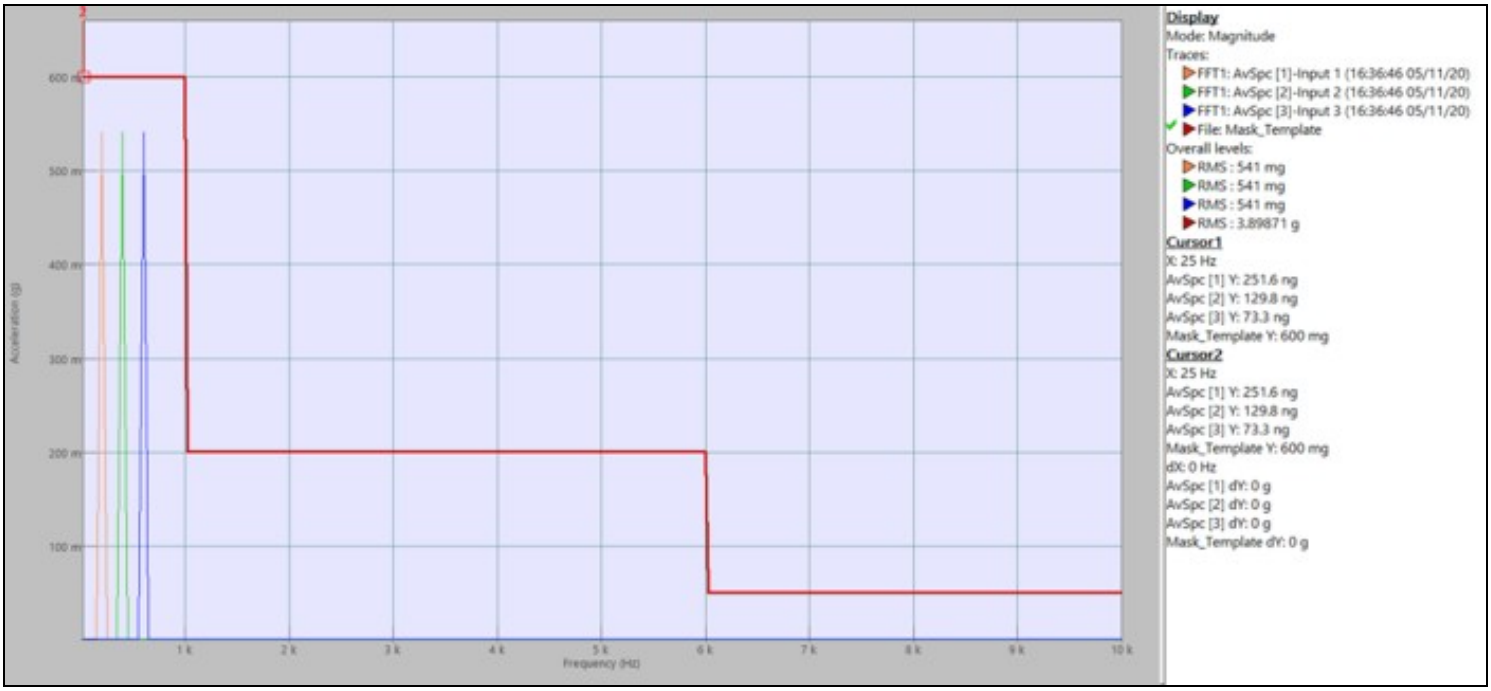
- **Select All:** Checks all the items of the list
- **Unselect All:** Uncheck all the items of the list.
- **Remove:** Removes all checked markers from the window
- **Properties:** Displays the properties dialog of the active marker of the list.

14 NVGate Mask And Alarm

The Masks (also called *Mask*) are used to compare a measured result with a template.

14.1 Tutorial

Here is an example of a template plotted over the FFT spectrum for three inputs.



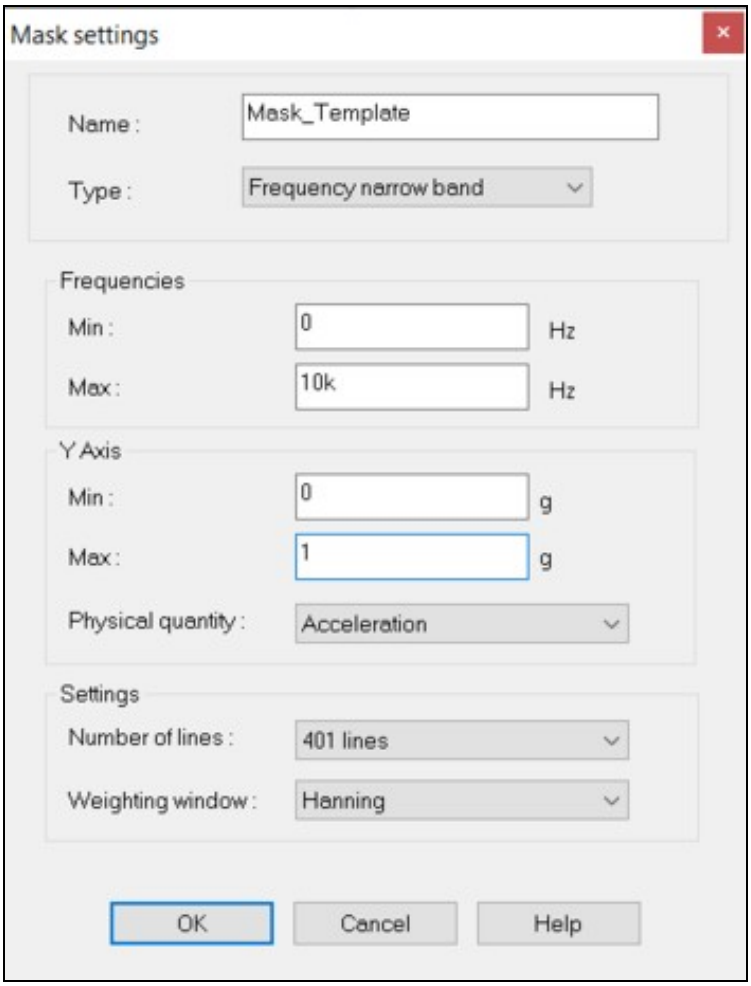
This tutorial will show you how to use a mask and an alarm to start the recording of 3 inputs when the FFT spectrum of the first input crosses the mask. To do that, we will need a to use a mask, an alarm and a macro. The setup must contain three input channels connected to the recorder and the FFT plugins. The average spectrum must be displayed. The starting event of the recorder must be set on "Manual Trigger".

14.1.1 Setup a mask

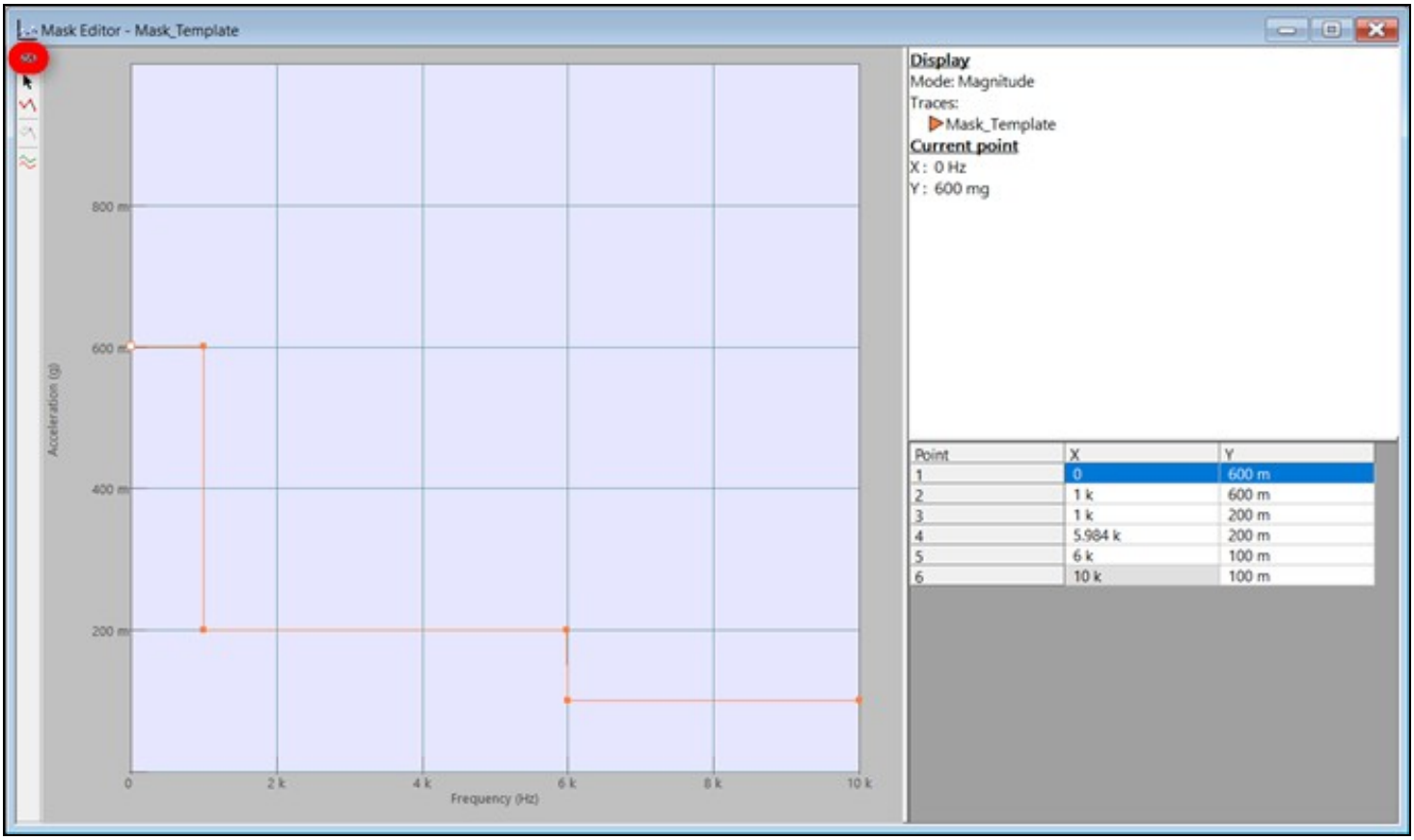
The Mask group can be found in the "Automation" tab of the NVGate Ribbon.

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

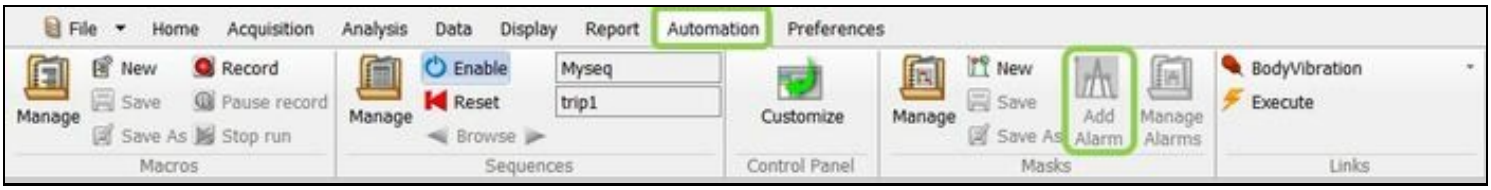
You can then draw the template by adding points with the mouse and adapt the coordinates in the info-trace :



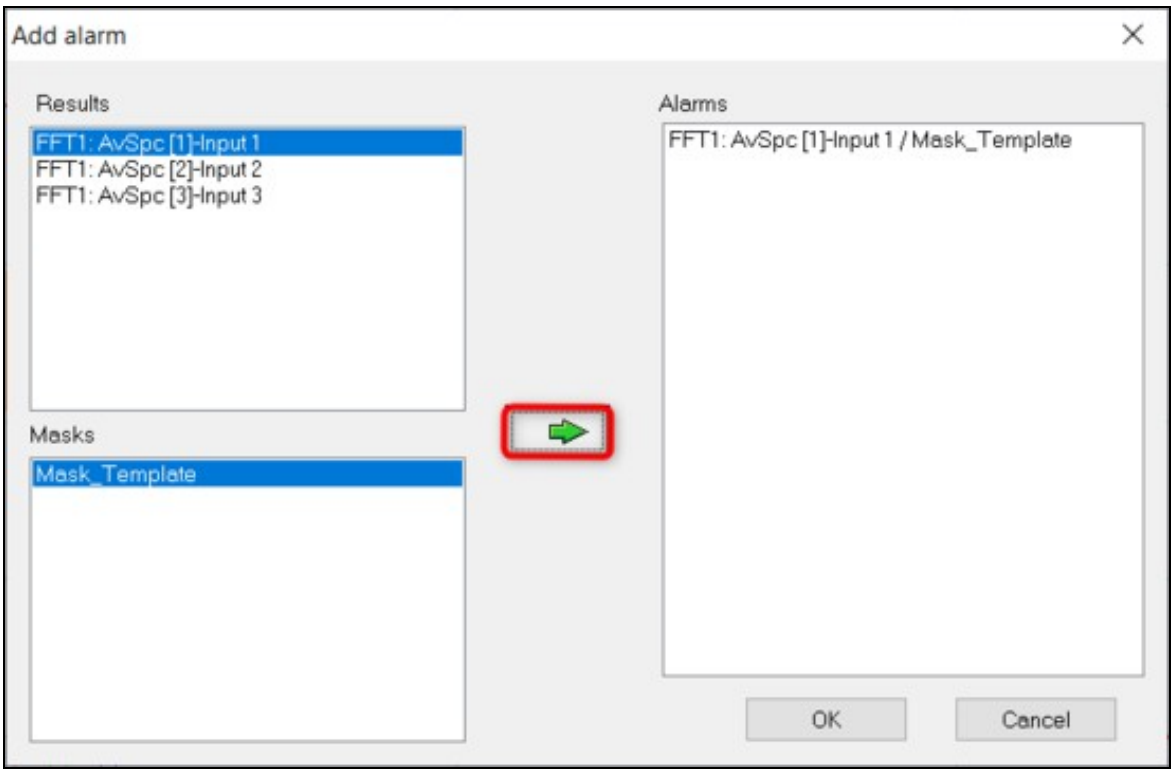
Once you close the window, the mask is then created under the project in the project manager and can be dropped into the result graph, here the FFT spectrum :

14.1.1.1 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 :

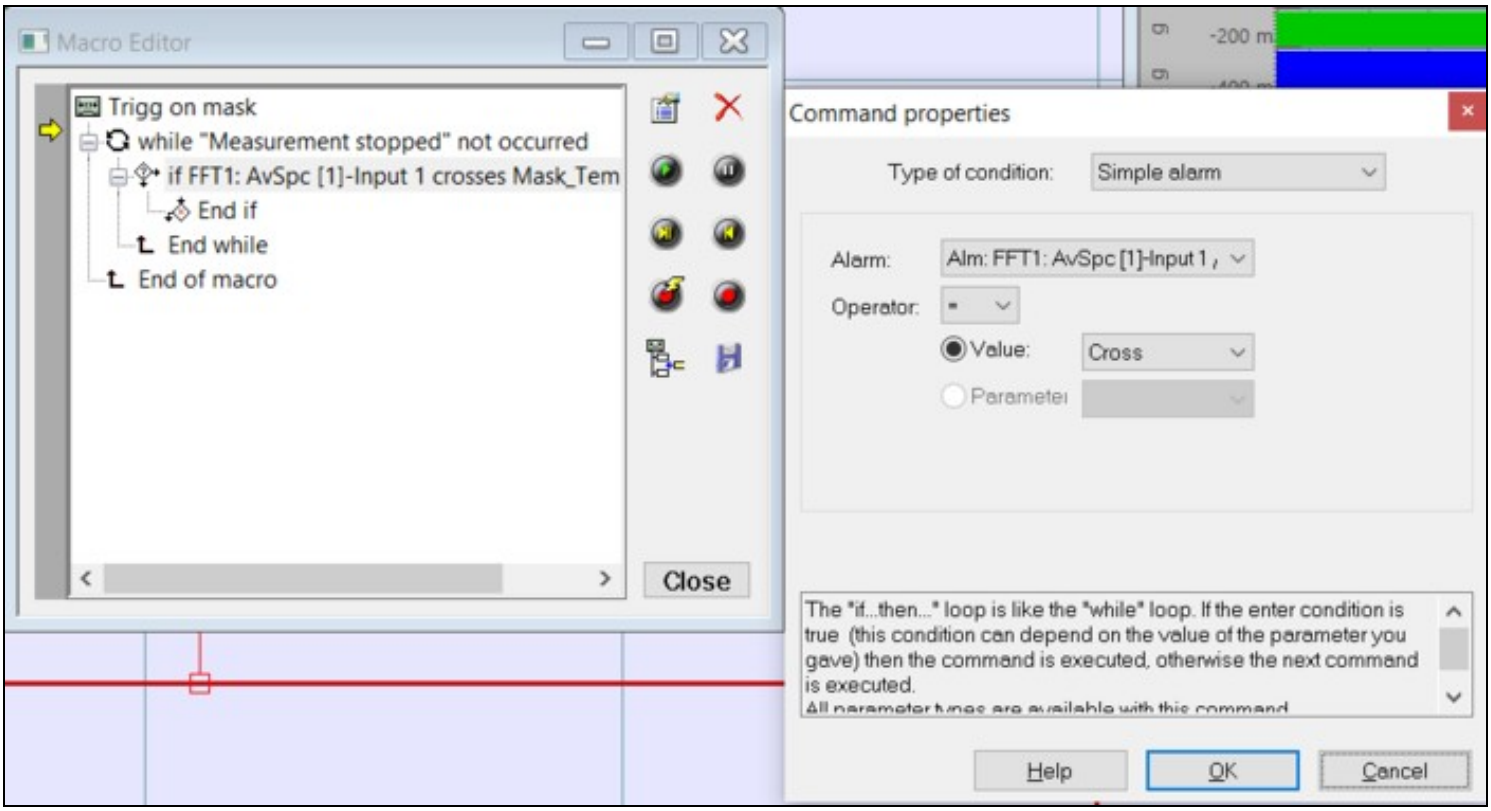


Then, in the next window, create the alarm between the mask and the selected curves :

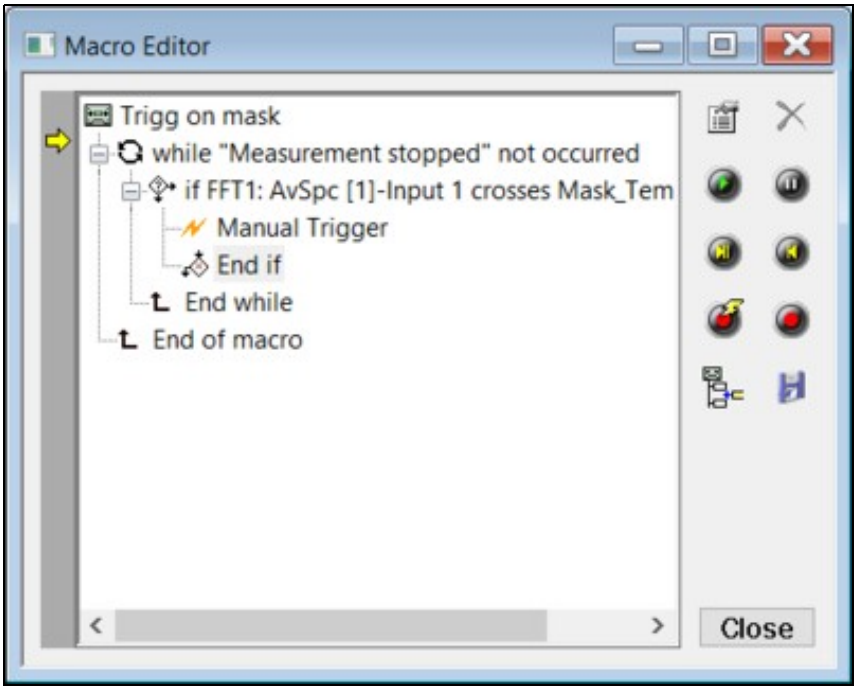


14.1.1.2 Setup the Macro

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 :



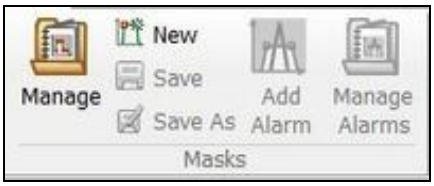
Then, add the "Manual trigger" (by using the record option of the the Macro) into the If command.



14.1.1.3 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.

14.1.2 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.

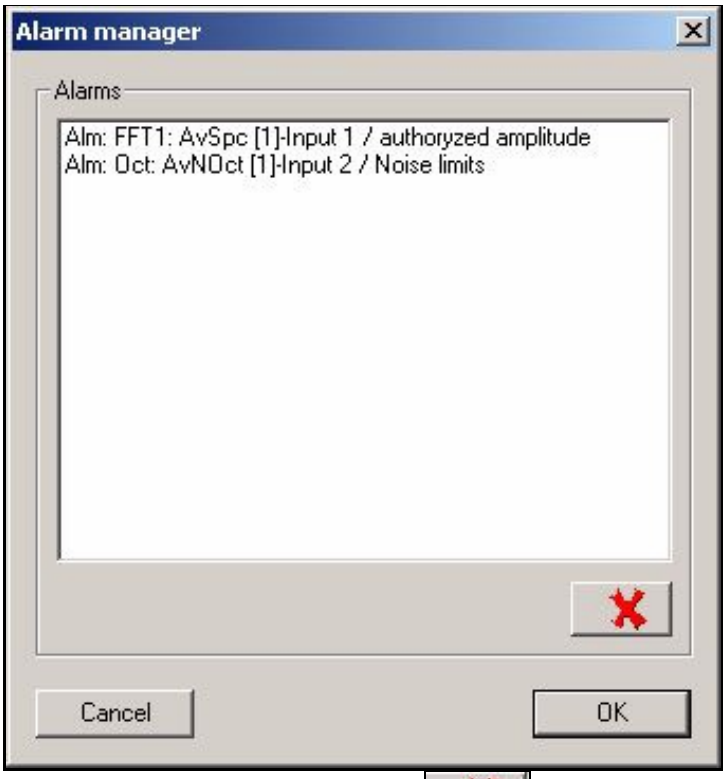
Disabled if a template is already edited.

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)

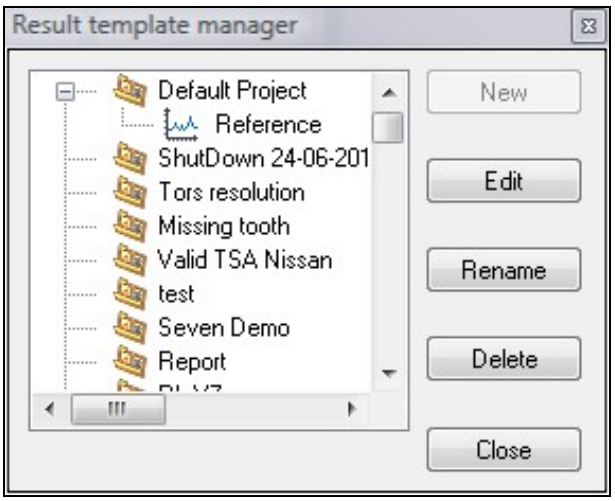
Manage alarms: Open a dialog box displaying the list of available alarms.



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.

14.1.3 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.

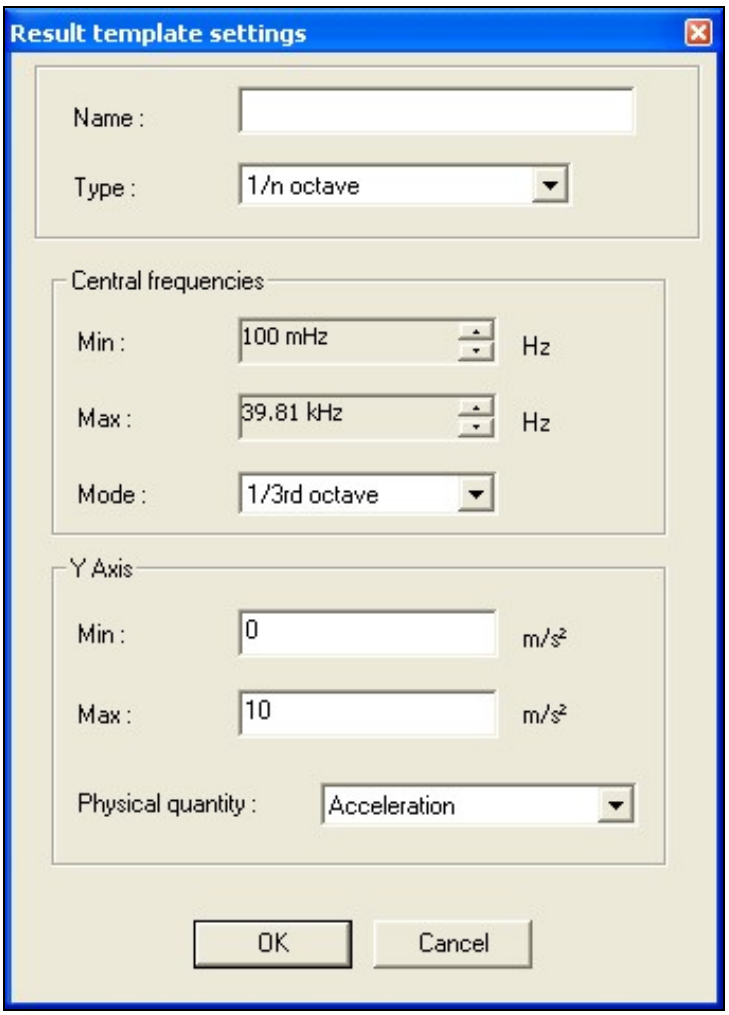
- **Edit:** Edits the mask selected in the list.

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.

14.1.4 Mask settings

14.1.4.1 1/n octave mask settings



14.1.4.1.1 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.

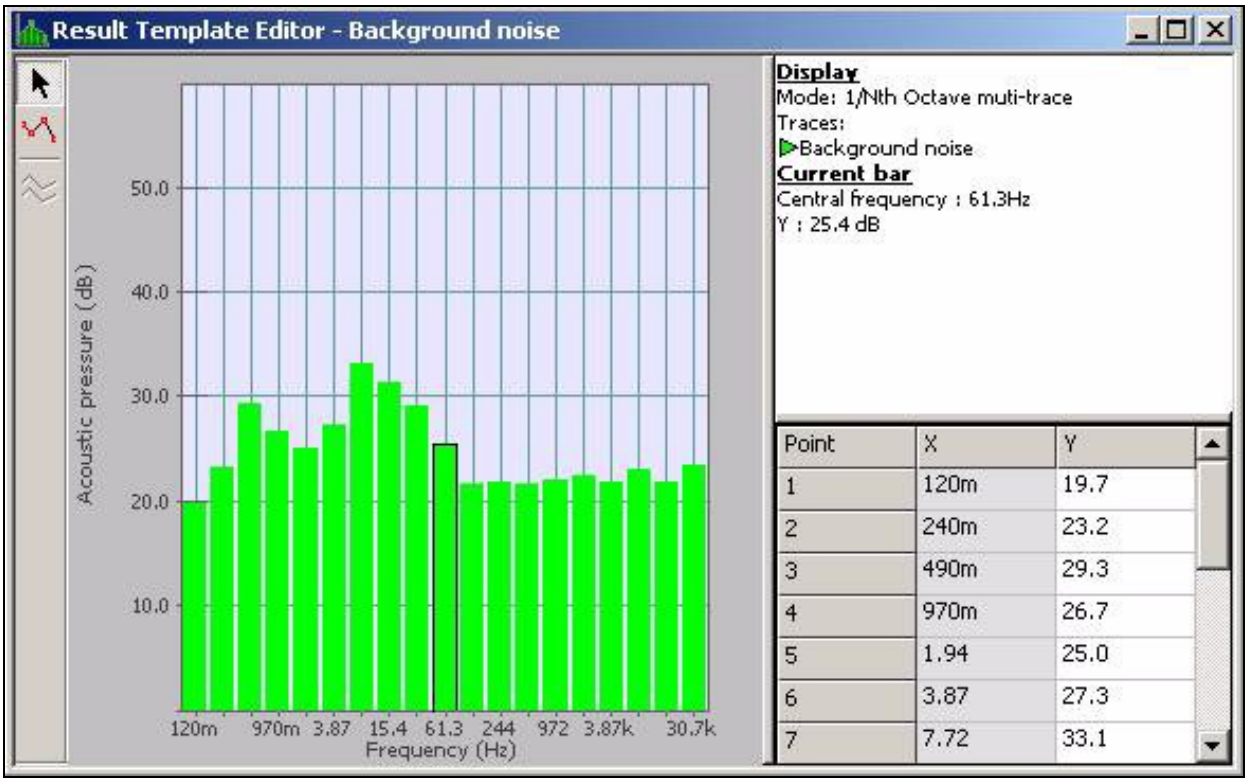
The possible values are

- Octave
- 1/3rd octave
- 1/12th octave
- 1/24th octave

14.1.4.1.2 Y axis

- Min: Minimum value on Y-axis.
- Max: Maximum value on Y-axis.
- Physical quantity: Physical quantity represented on Y-axis.

14.1.4.2 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.

14.1.4.2.1 Graph contextual menu

- Y scale: Switches between linear and dB scale on the Y-axis.

14.1.4.2.1.1 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.

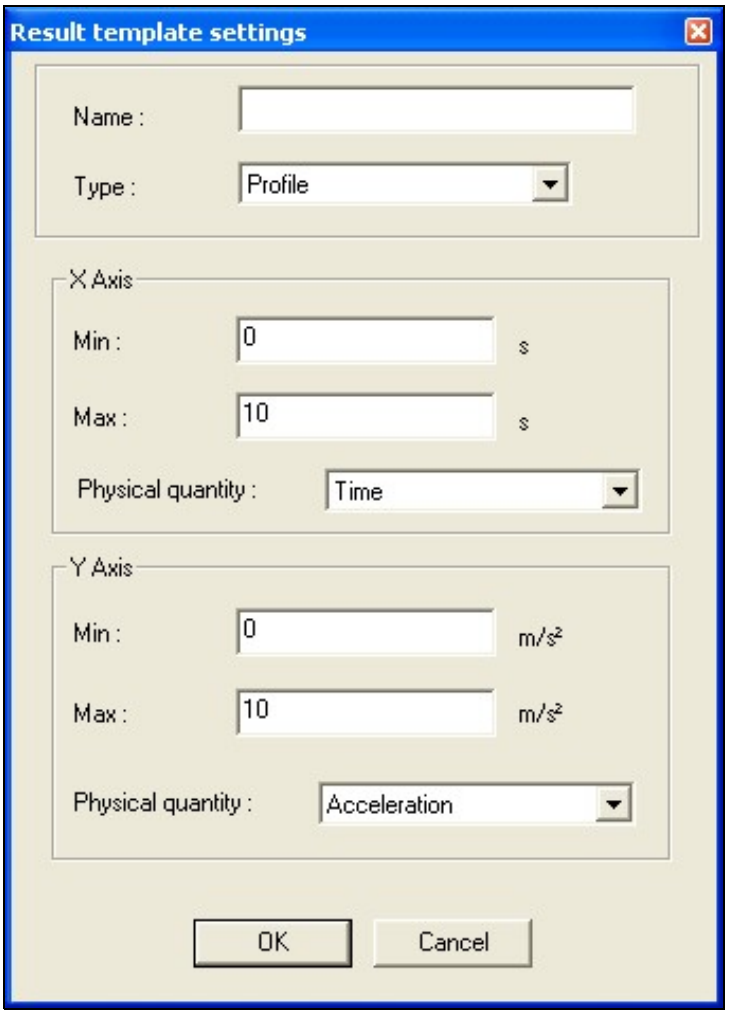
- Paste special: The edit grid or a part of the edit grid may be filled by editing the grid content in Excel®, and then copying and pasting from the clipboard.

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.

14.1.4.2.2 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

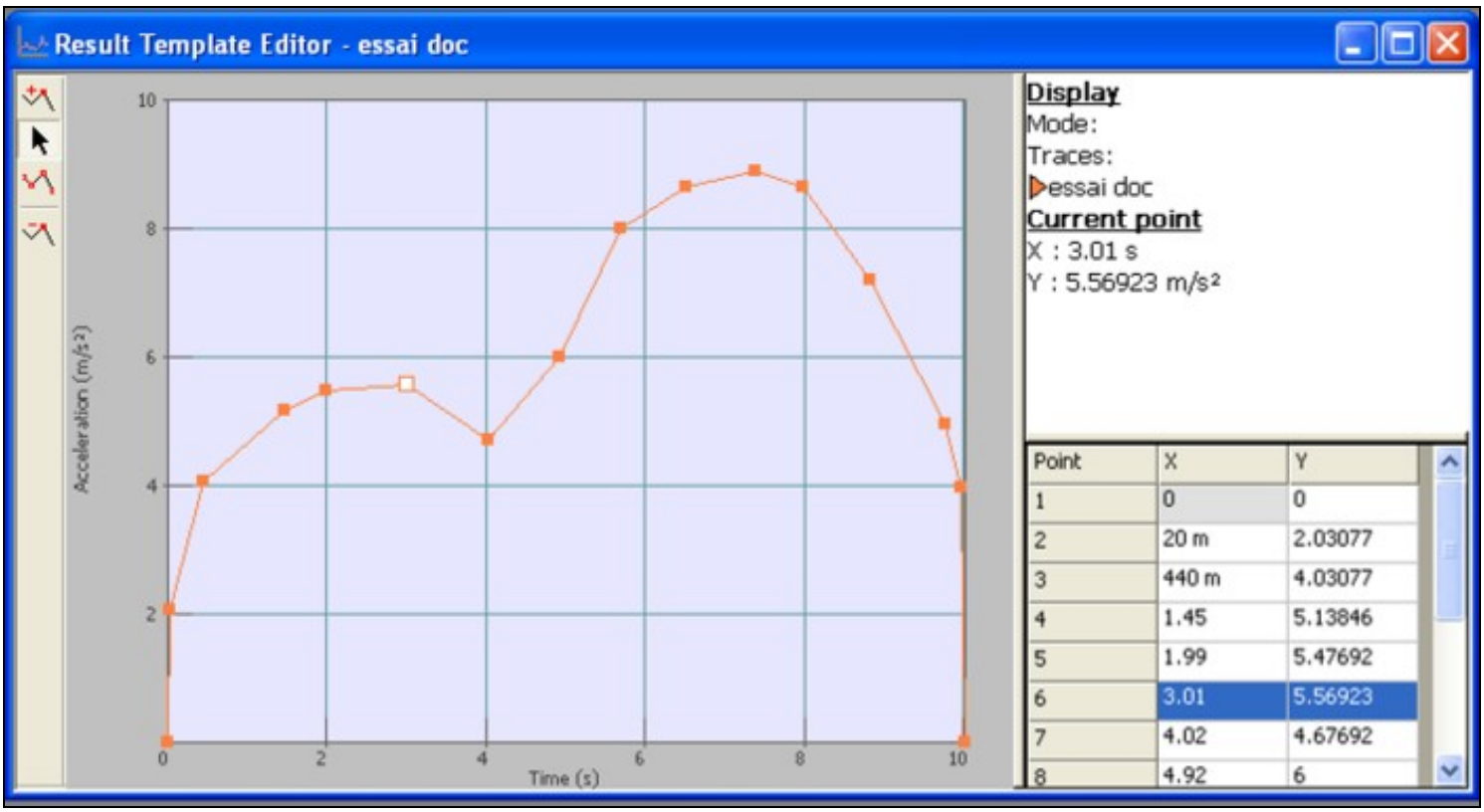
14.1.4.2.2.1 X axis

- Min: Minimum value on X-axis.
- Max: Maximum value on X-axis.
- Physical quantity: Physical quantity of the reference (represented on X axis).

14.1.4.2.2.2 Y axis

- Min: Minimum value on Y-axis.
- Max: Maximum value on Y-axis.
- Physical quantity: Physical quantity represented on Y-axis.

14.1.4.2.3 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.

14.1.4.2.3.1 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.

14.1.4.2.3.2 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.

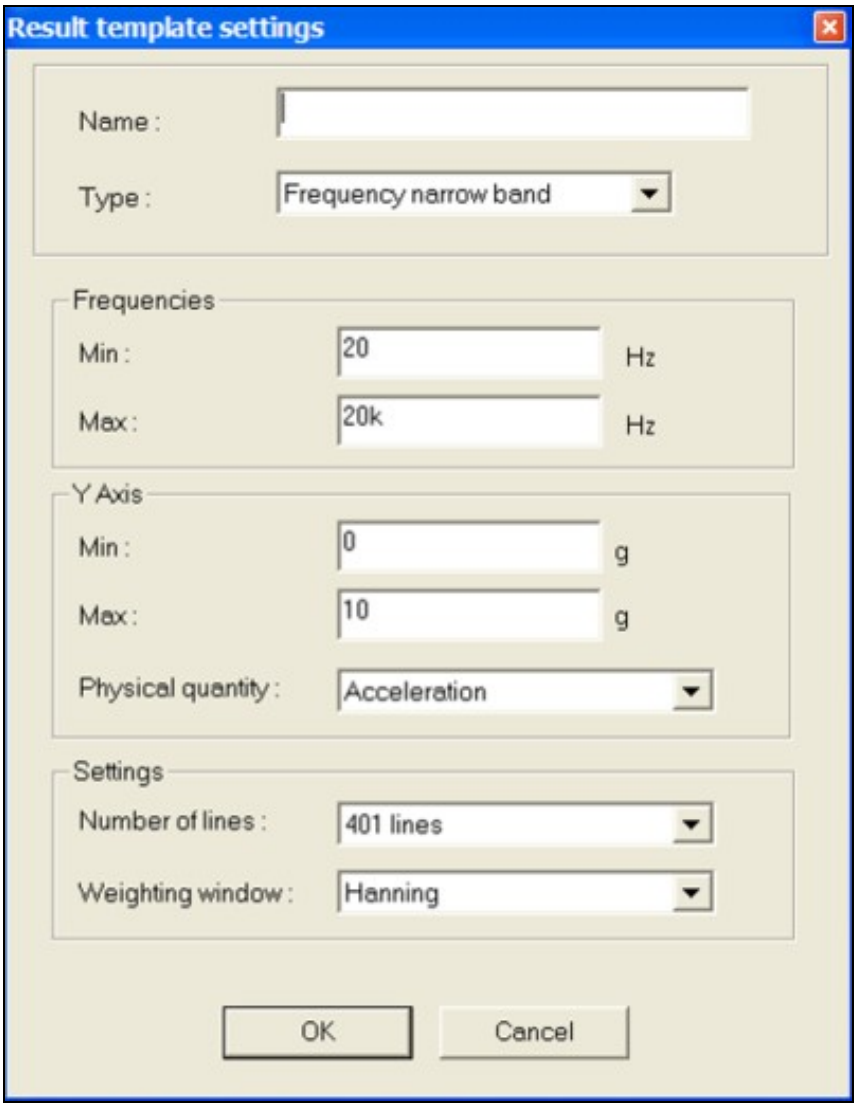
- Paste special: The edit grid or a part of the edit grid may be filled by editing the grid content in Excel®, and then copying and pasting from the clipboard.

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.

14.1.4.2.4 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

14.1.4.2.4.1 Frequencies

- Min: Minimum value on X-axis.
- Max: Maximum value on X-axis.

14.1.4.2.4.2 Y axis

- Min: Minimum value on Y-axis.
- Max: Maximum value on Y-axis.
- Physical quantity: Physical quantity represented on Y-axis.

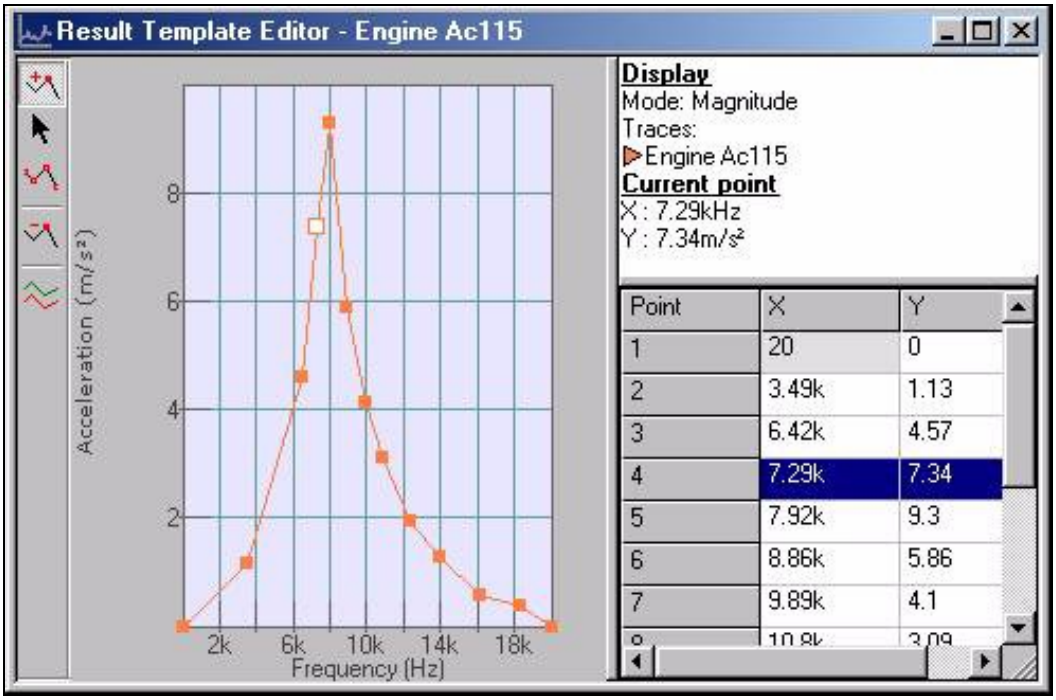
14.1.4.2.4.3 Settings

- 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

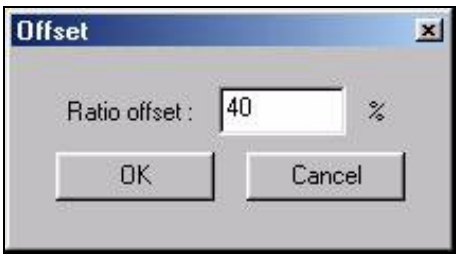
14.1.4.2.5 Frequency narrow band mask editor



- 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).

14.1.4.2.5.1 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.

14.1.4.2.5.2 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.

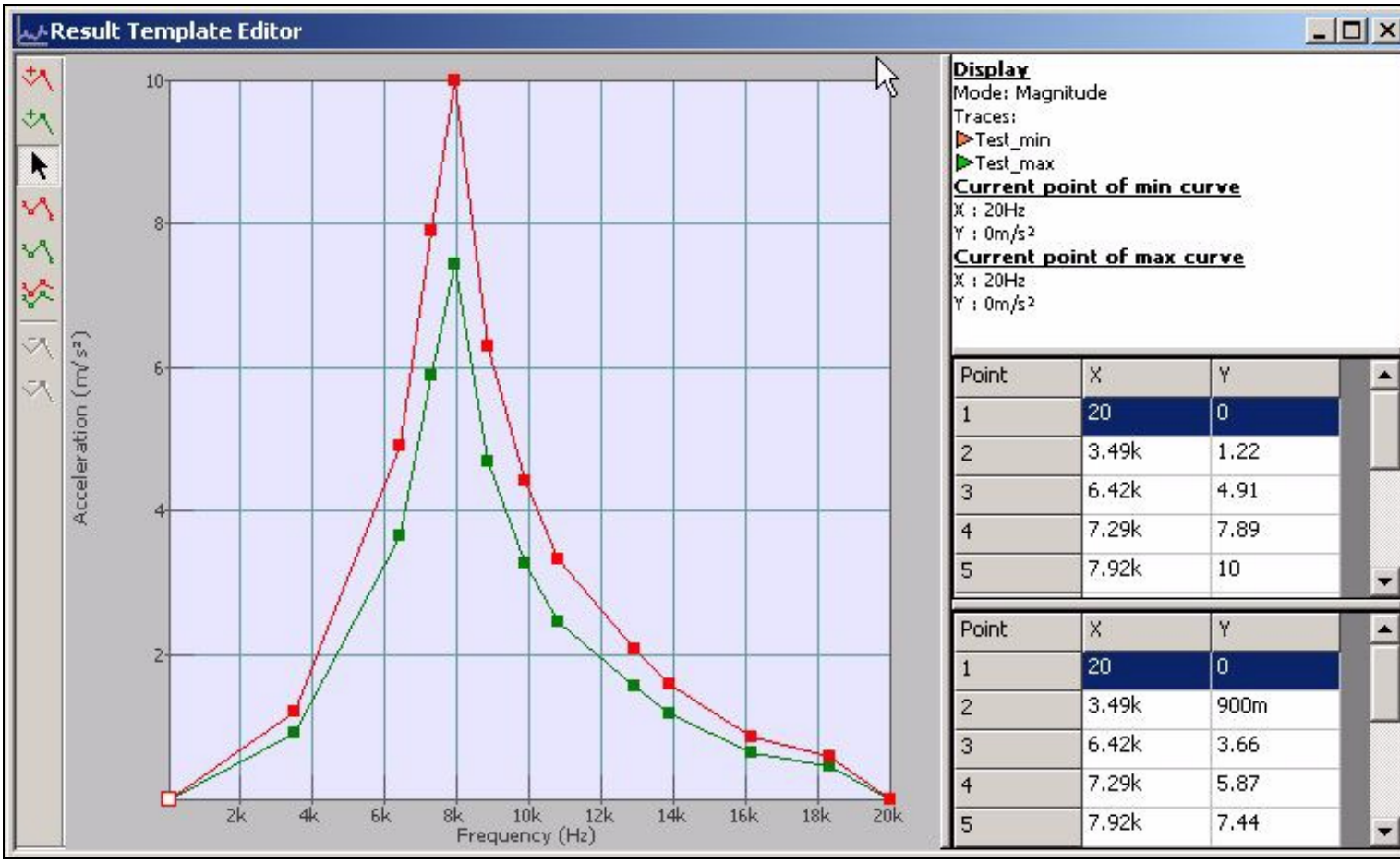
A value is validated by clicking on another cell or pressing the enter key.

- 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.

14.1.4.2.5.4 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.

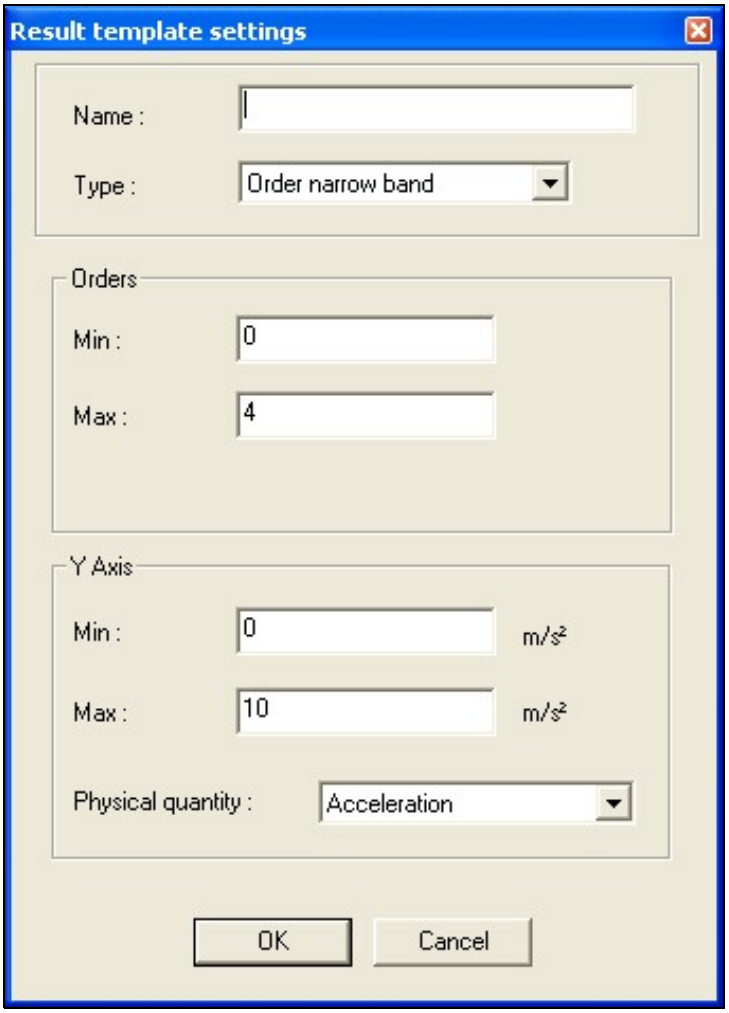
- Paste special: The edit grid or a part of the edit grid may be filled by editing the grid content in Excel®, and then copying and pasting from the clipboard.

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.

14.1.4.2.6 Order narrow band mask settings



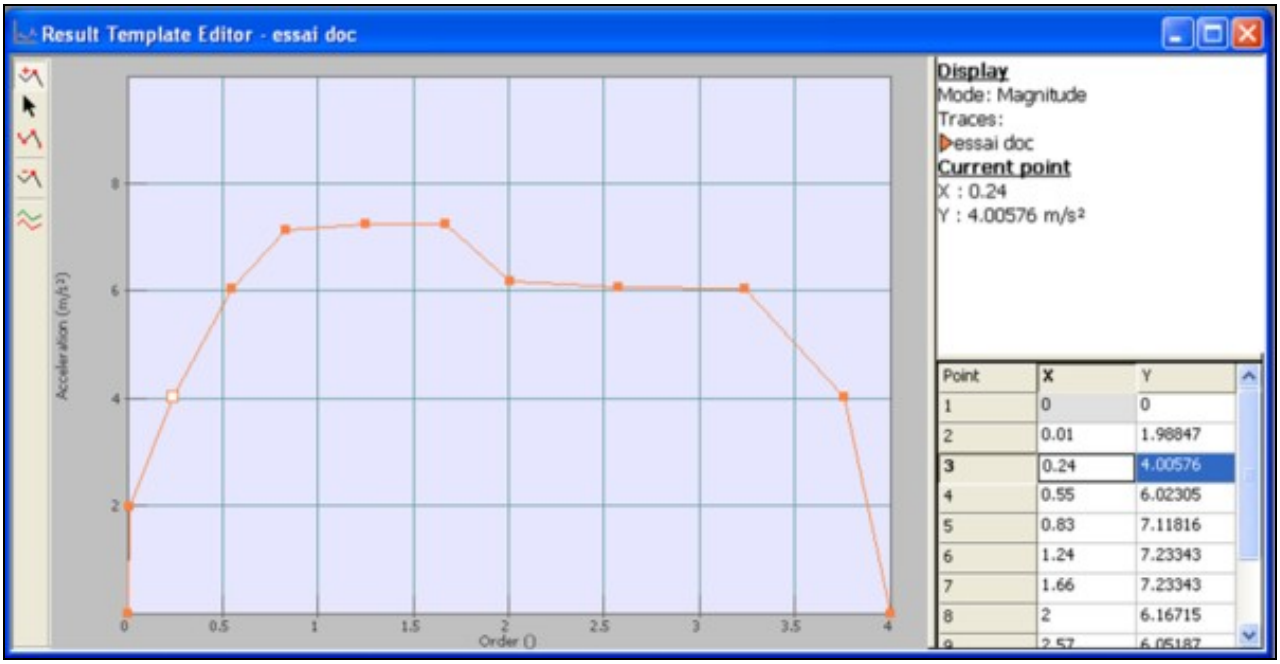
14.1.4.2.6.1 Orders

- Min: Minimum value on X-axis.
- Max: Maximum value on X-axis.

14.1.4.2.6.2 Y axis

- Min: Minimum value on Y-axis.
- Max: Maximum value on Y-axis.
- Physical quantity: Physical quantity represented on Y-axis.

14.1.4.2.7 Order narrow band mask editor

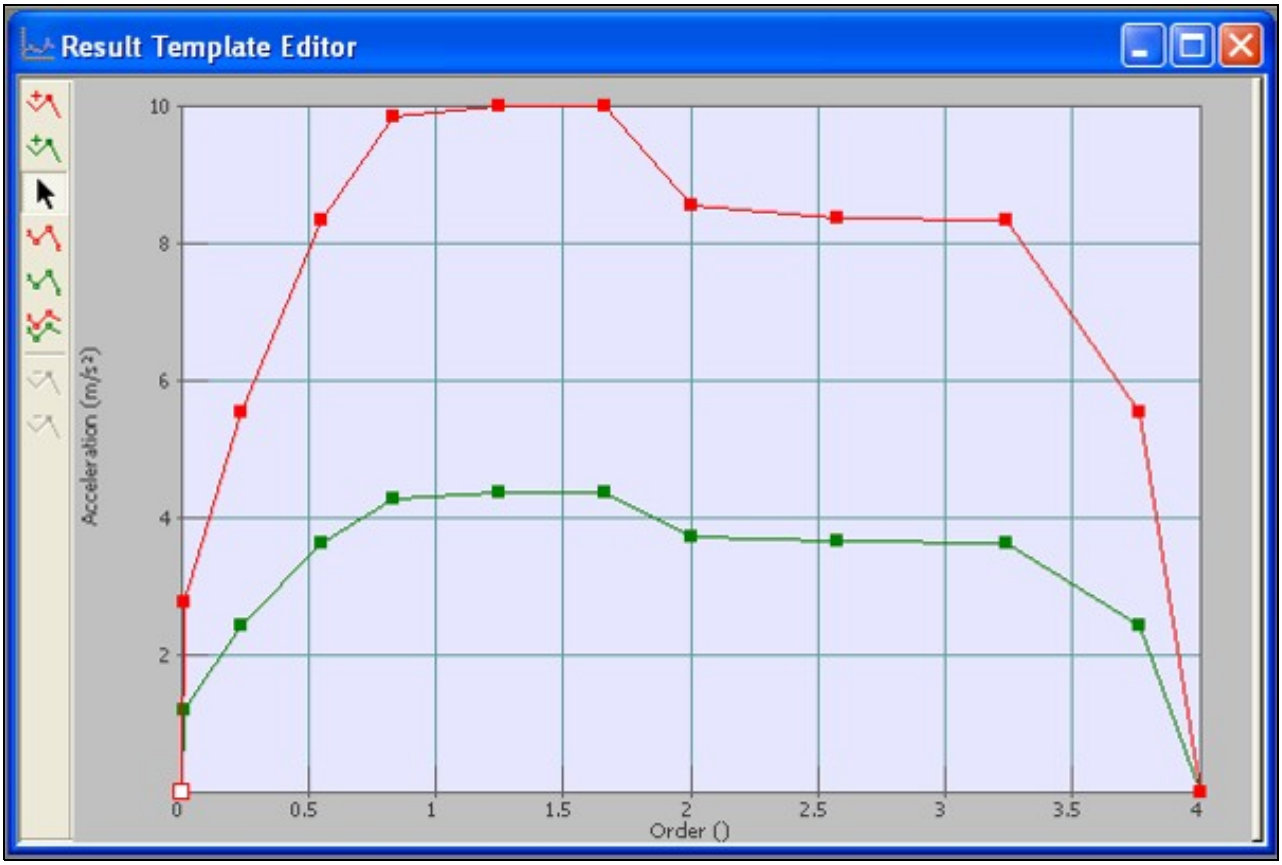


- Add a point  : Switches to "Add point" mode. In this mode, a new point is created by clicking in the graph area.
- Select a point  : Switches to "Select" mode. The point is selected by clicking on it. It can be moved by dragging and dropping it. The drop area is limited by the next and previous point 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).



14.1.4.2.7.1 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.

14.1.4.2.7.2 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.

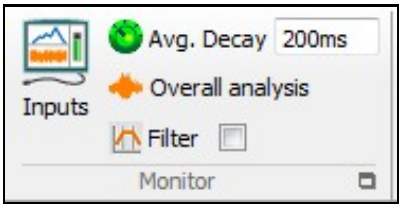
The X-coordinates of the first and last point cannot be edited. The corresponding cells are disabled.

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.

15 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.



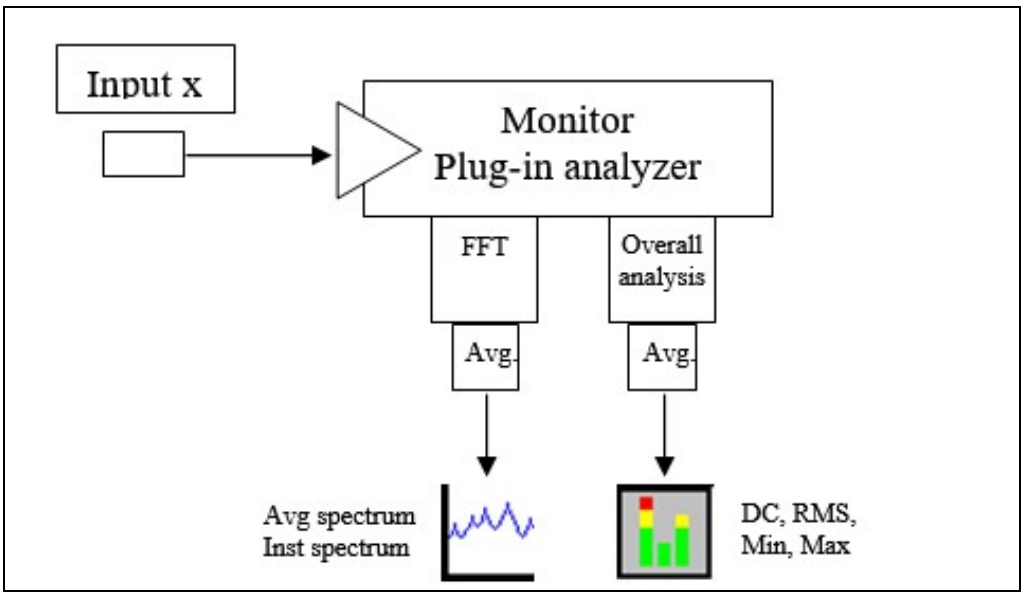
The second capability of the monitor is to extract statistical components of the signal in a specific bandwidth. Extracted levels can be used for triggering and waterfall references.

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.

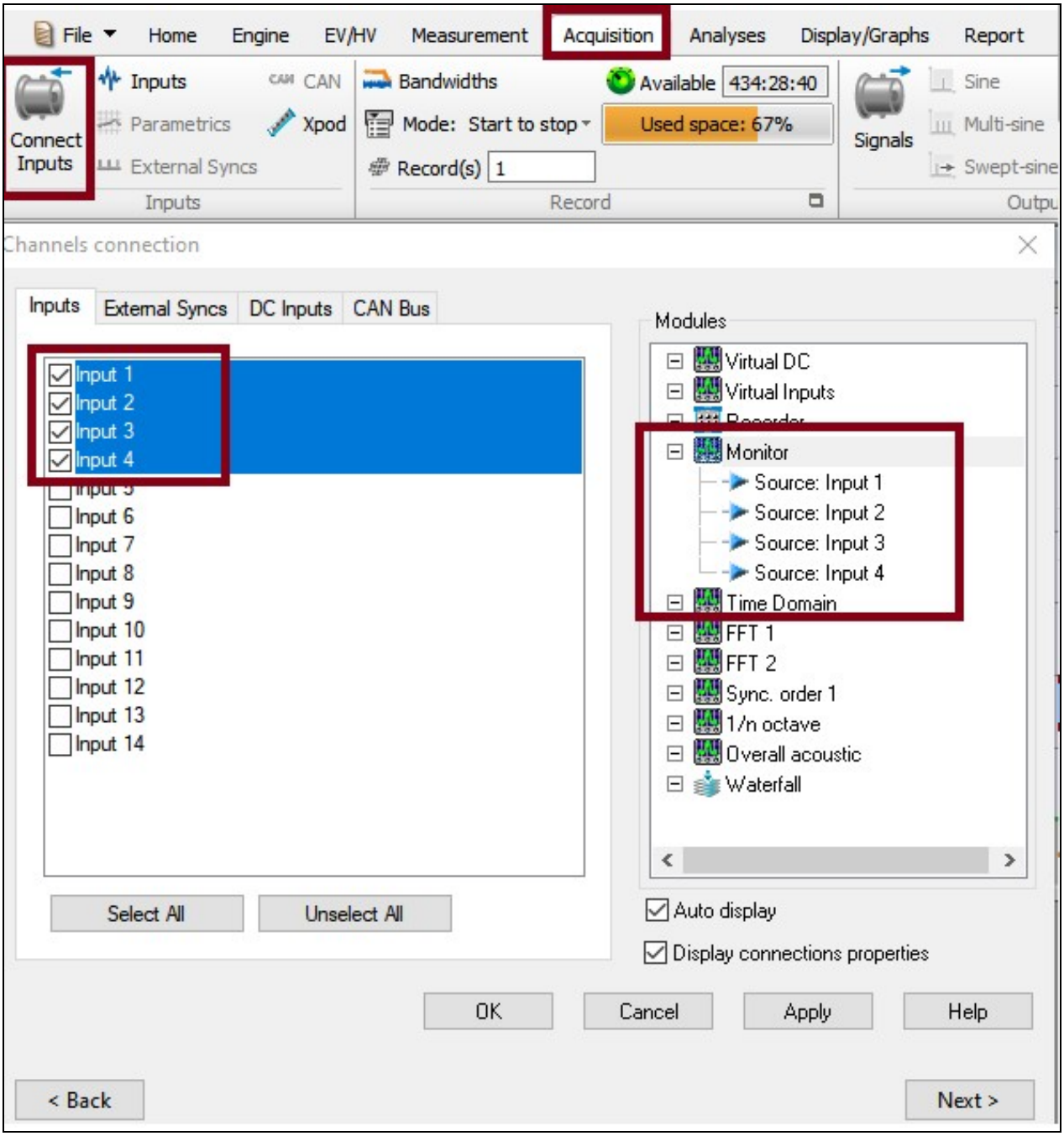
15.1 Monitor

The Monitor input can be connected and hot swapped independently of any plug-in analysis. It is used to monitor one or several signals.

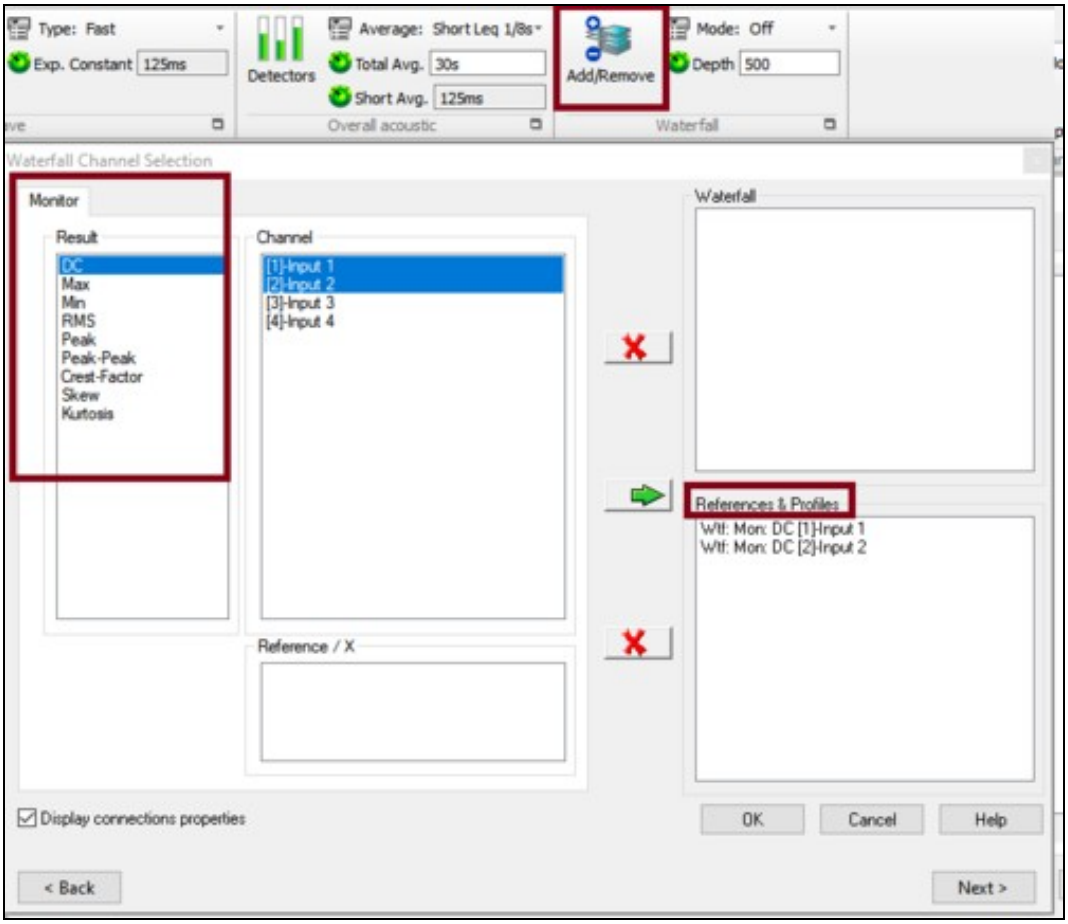


15.2 Connect tutorial

- Click on tab: Acquisition, connect Input, then drag and drop the channels on monitor.

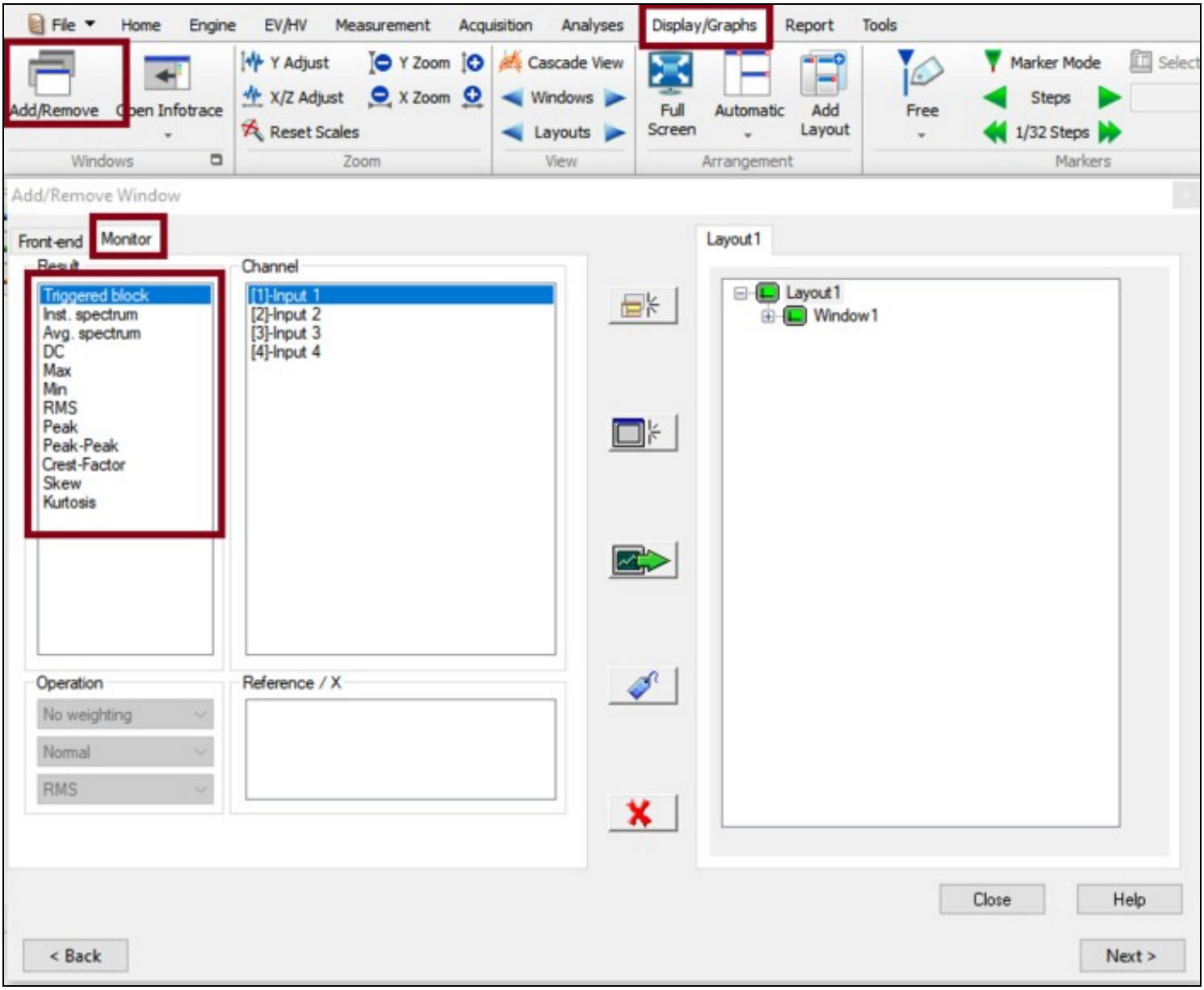


- note that you can have a scalar profile by putting the scalar into the waterfall.



15.3 Display and Available results

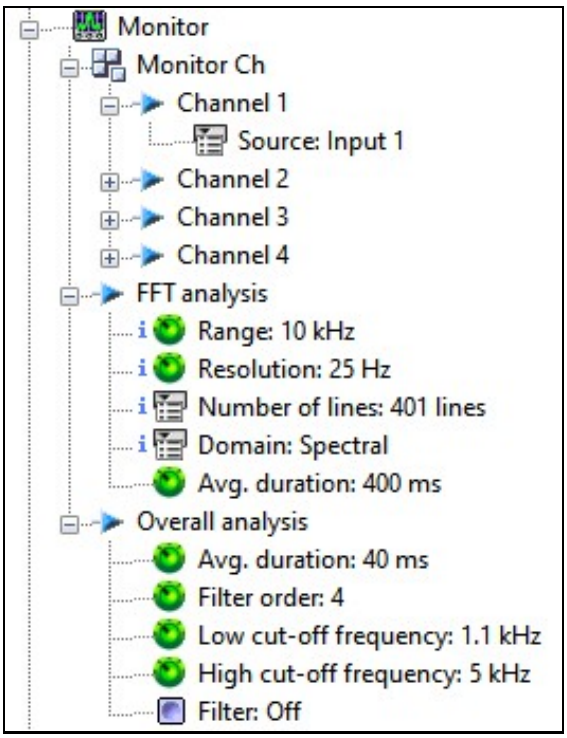
You can display the results using add/remove windows.


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

15.4 Settings

15.4.1 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.

15.4.2 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.

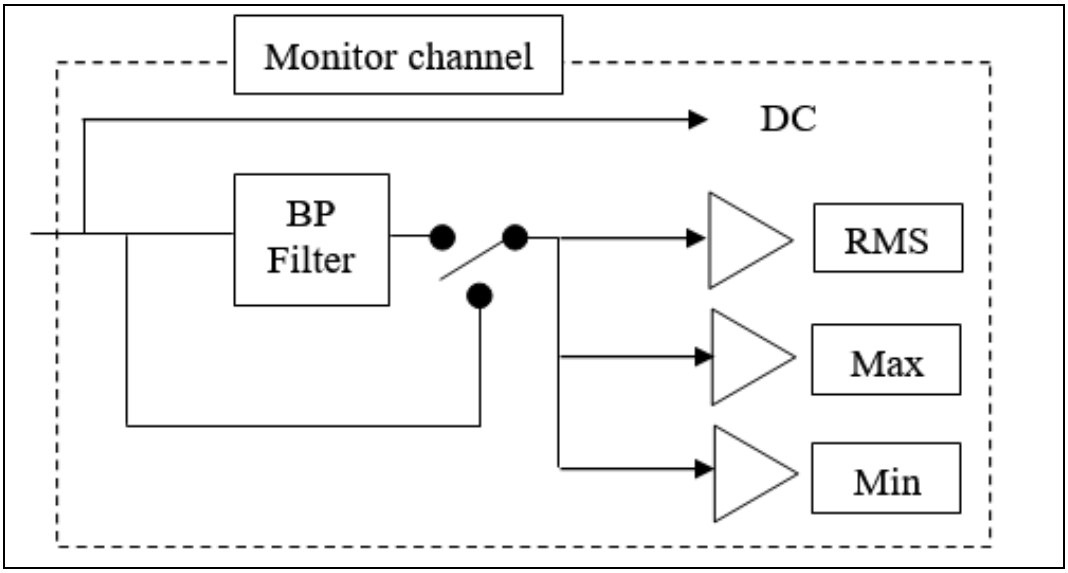
Hidden/fixed: fixed to 401 lines

- **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.

15.4.3 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.

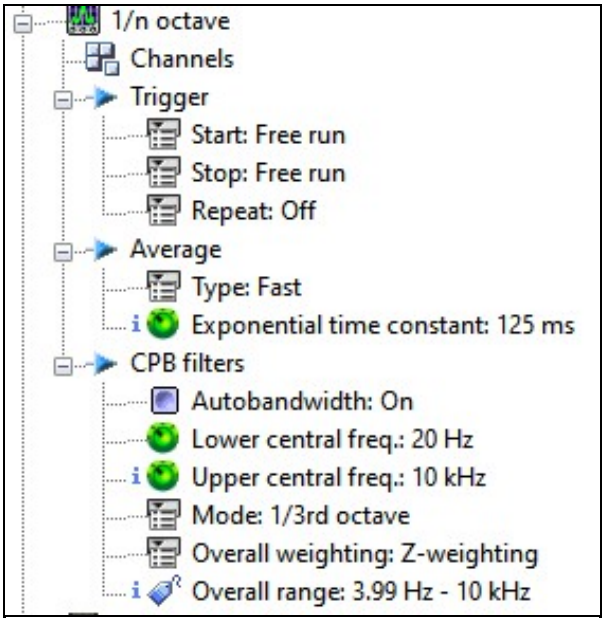
- **Filter order**: the order of the filter: 2, 4, 6, 8 or 10.
- **Low cut-off frequency**: the low cut-off frequency of the filter. Its minimum value is 0.055 * FR, where FR is the input frequency range. However, the following conditions must also be fulfilled:

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.

16 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.

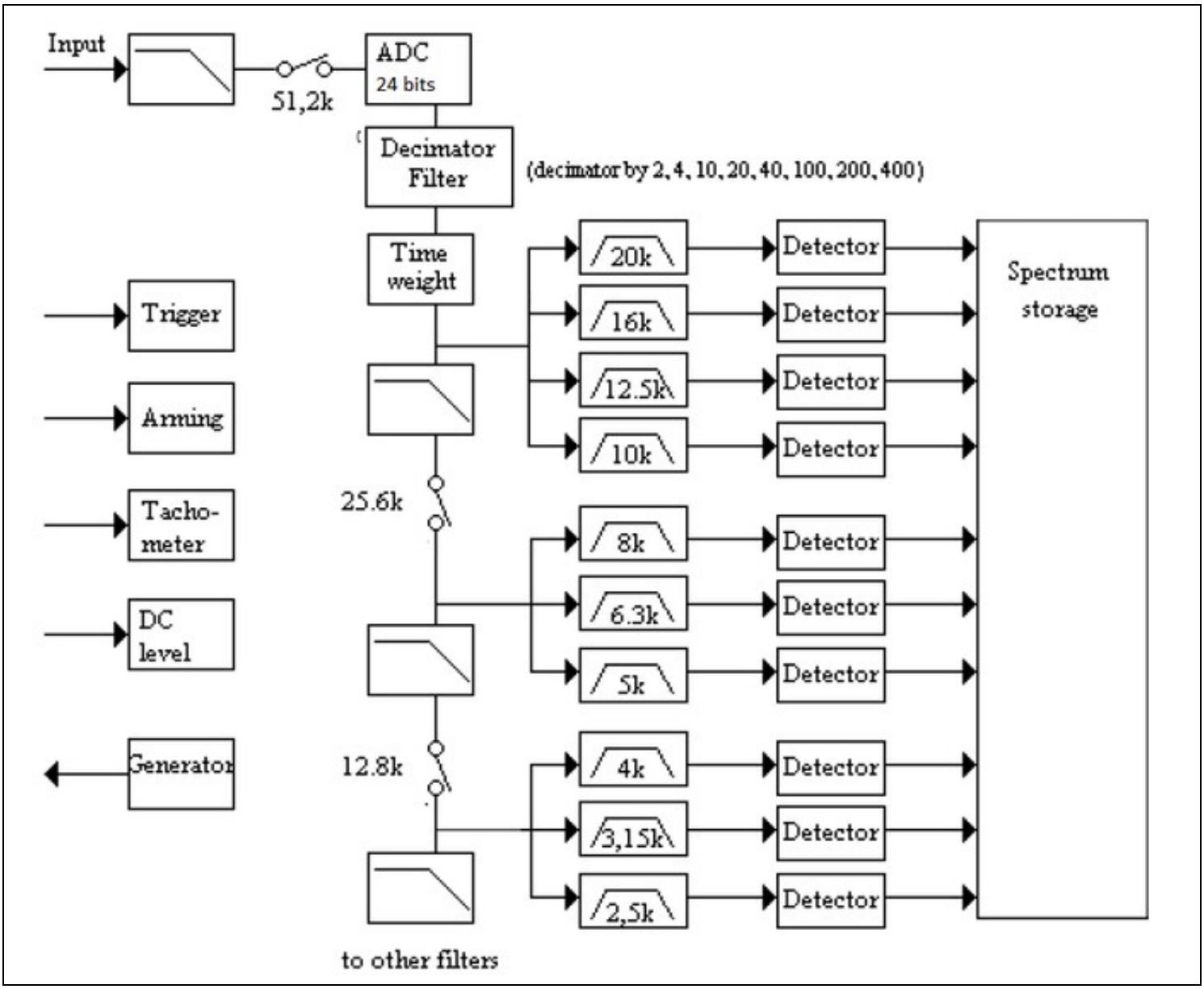
A lot of averaging modes are available and to comply with acoustic standards, detectors also provide Fast, Slow, Impulse and LEQ averaging.

Octave Tracking is available with time, RPM, or any ?V triggering.

16.1 Structure and Operation overview

16.1.1 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 6^{th} 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.

16.1.2 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 1/3^{rd} octave
- $fc = 1000 * 10^{(n+0.5)/40}$ for 1/12^{th} octave
- $fc = 1000 * 10^{(n+0.5)/80}$ for 1/24^{th} 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.

1/3^{rd} octave filter bank:

- can have up to 31 filters (with 1 to 1000 frequency ratio),
- covers range from 100 mHz to 20 kHz.

For 1/12^{th} octave:

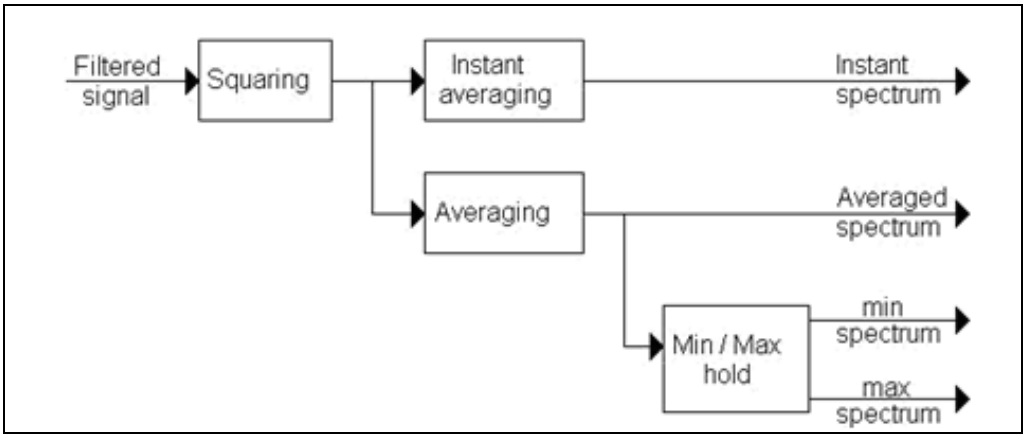
- the filter bank gets 4 filters for each useful bandwidth of 1/3^{rd} filters, i.e. 124 filters,
- covers range from 92 mHz to 21.8 kHz.

For 1/24^{th} octave:

- the filter bank gets 8 filters for each useful bandwidth of 1/3^{rd} filter, i.e. 248 filters,
- covers range from 90 mHz to 22.1 kHz.

16.1.3 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.

16.1.4 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.

16.2 Software use and settings

16.2.1 Connect track and display

We advice using GoToResult result Wizard for connecting track and displaying Octave results.

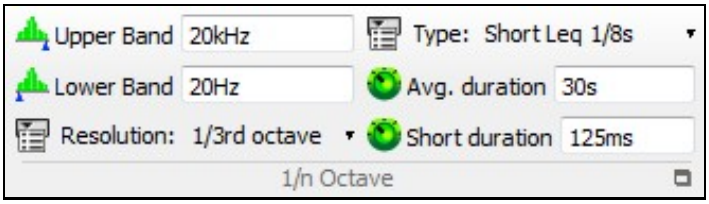
16.2.2 Display Available results:

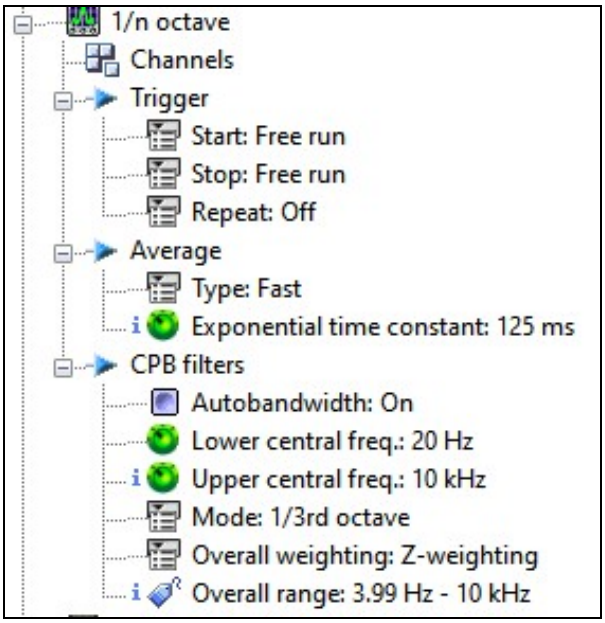
Type	Size	Dimension	Domain	Save
1/n octave	FilterNumber	2D	spectral	Yes

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.

16.2.3 1/n Octave Settings





16.2.3.1 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.

16.2.3.2 Trigger

Contains the settings related to triggering events and how to start and stop signal computation.

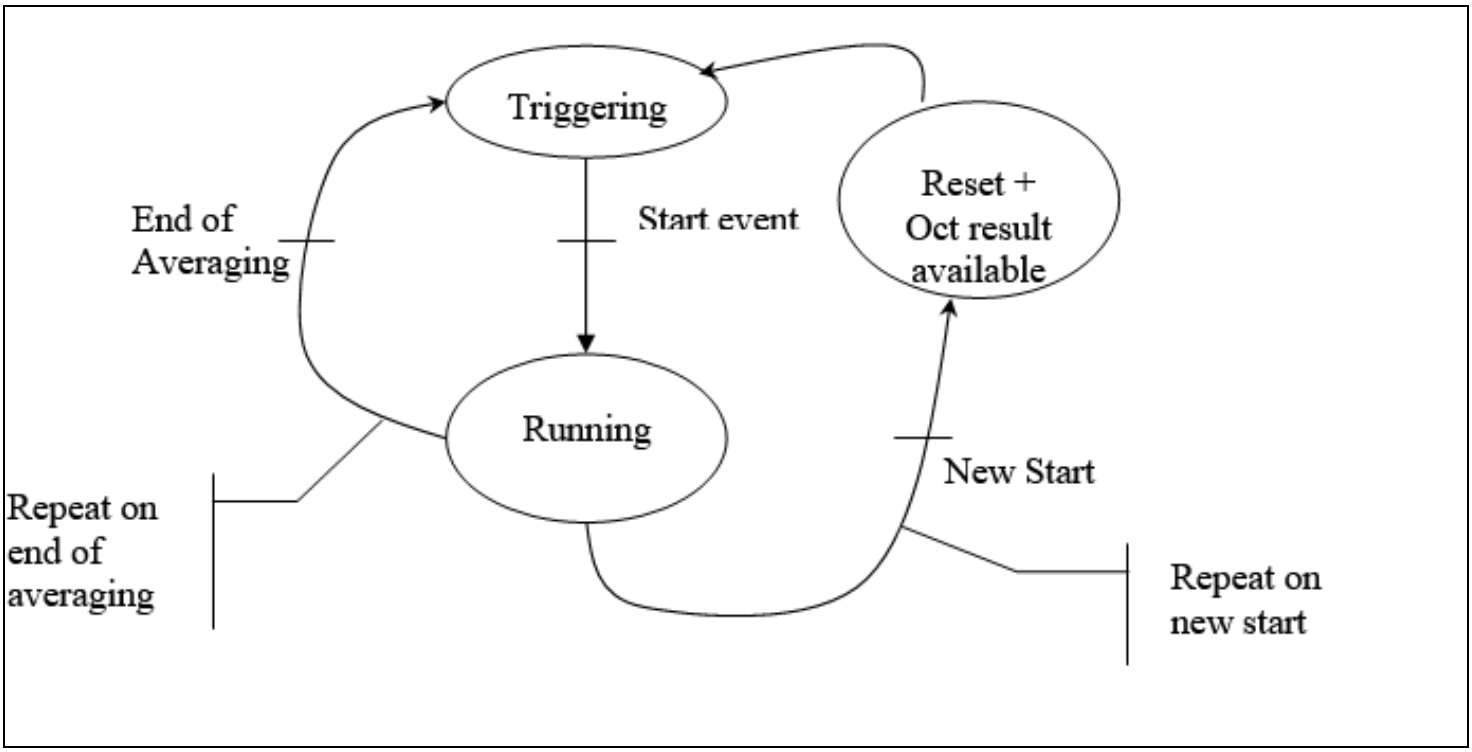
- **Start**: defines the event to start the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Start" condition.
- **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.

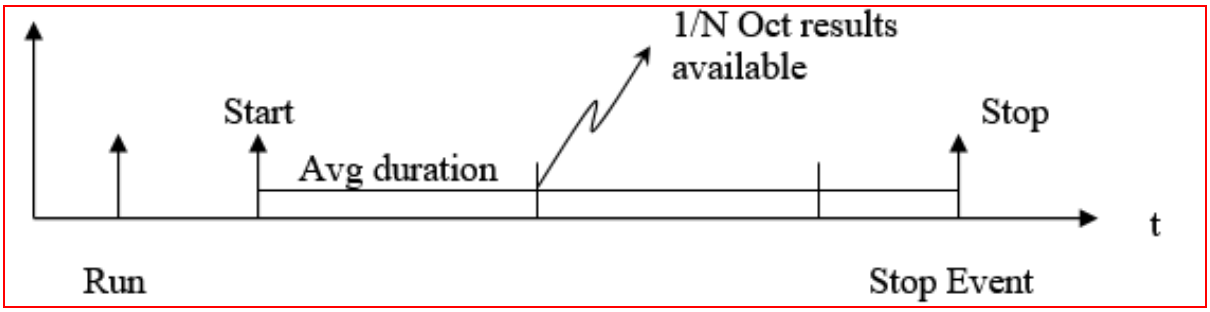
Hidden/fixed: the average type sets the authorized repeat modes.

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:

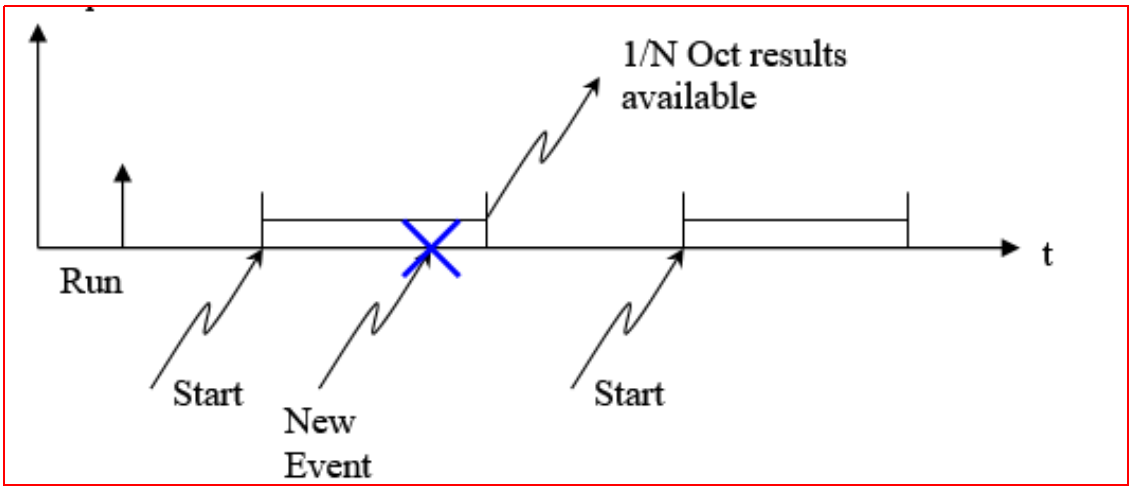


- Mode Repeat on ?end of averaging?:



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.

16.2.3.3 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)

16.2.4 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.

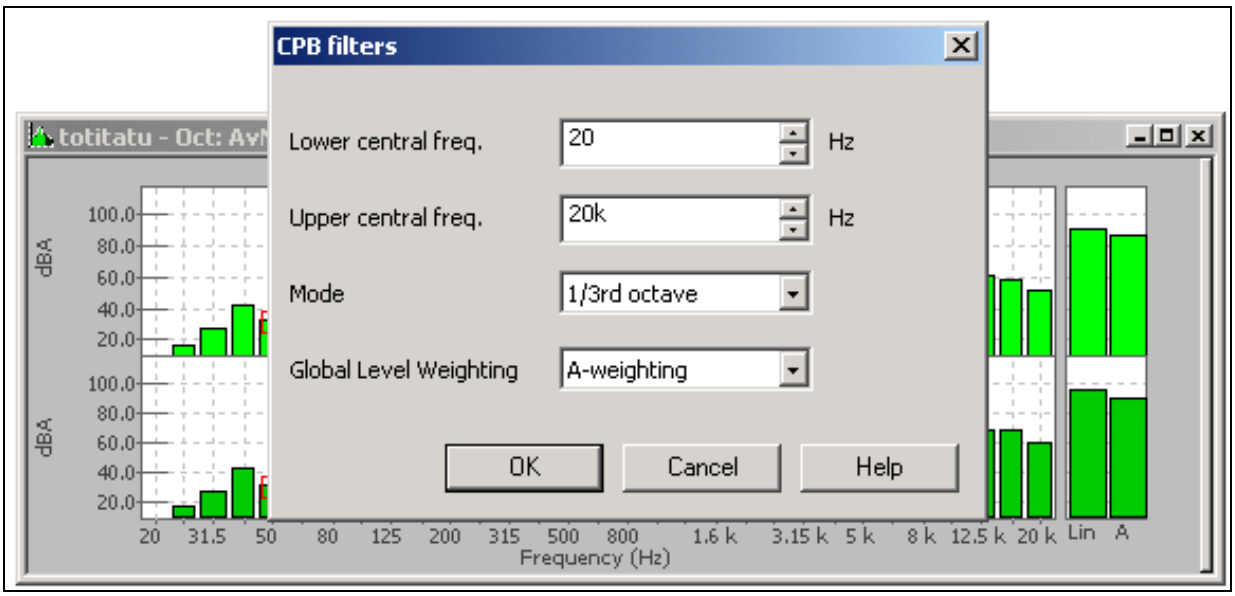
Note: For having the last band compatible with the Class #1 standard, the front end sampling frequency need to cover the full band. Exemple: for having Class #1 compatible for 1/3 octave 20kHz the sampling frequency need to be 65,536kS/s. If you let the sampling frequency at 51.2kS/s (20kHz bandwith) 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

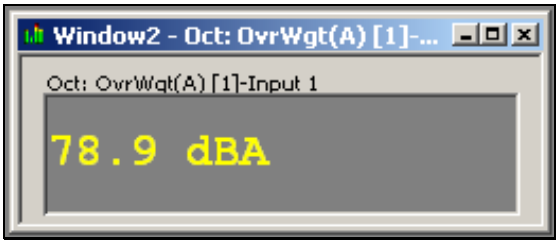
- **Global Level weighting:**

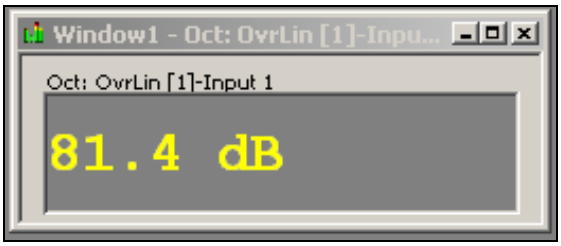
Weighted overall levels of the1/n Octave Plug-in are now computed in the time domain (weighting filter and detector). Processing weighting in the time domain provides accurate measurement for non-stationary signals (impulsive).



The type of time domain weighting (A or C) is selected in the ASB setting *1/n Oct / CPB filters / Global level weighting.*

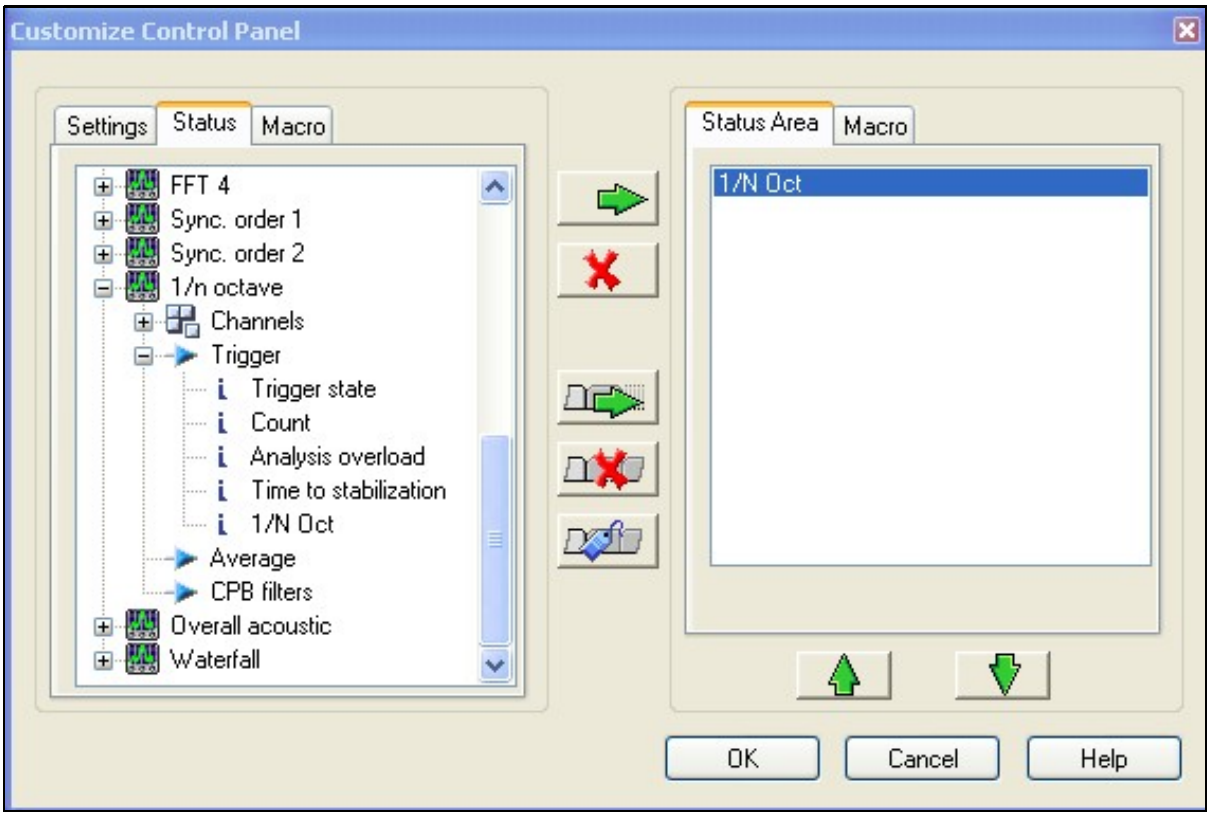
These overall values can be displayed in view meter.



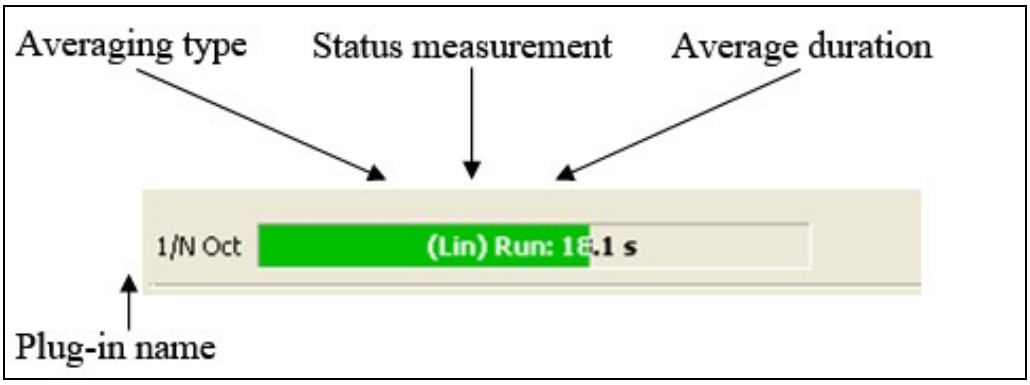


16.3 1/n Octave status

All statuses are available to add to the control panel



16.3.1 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:

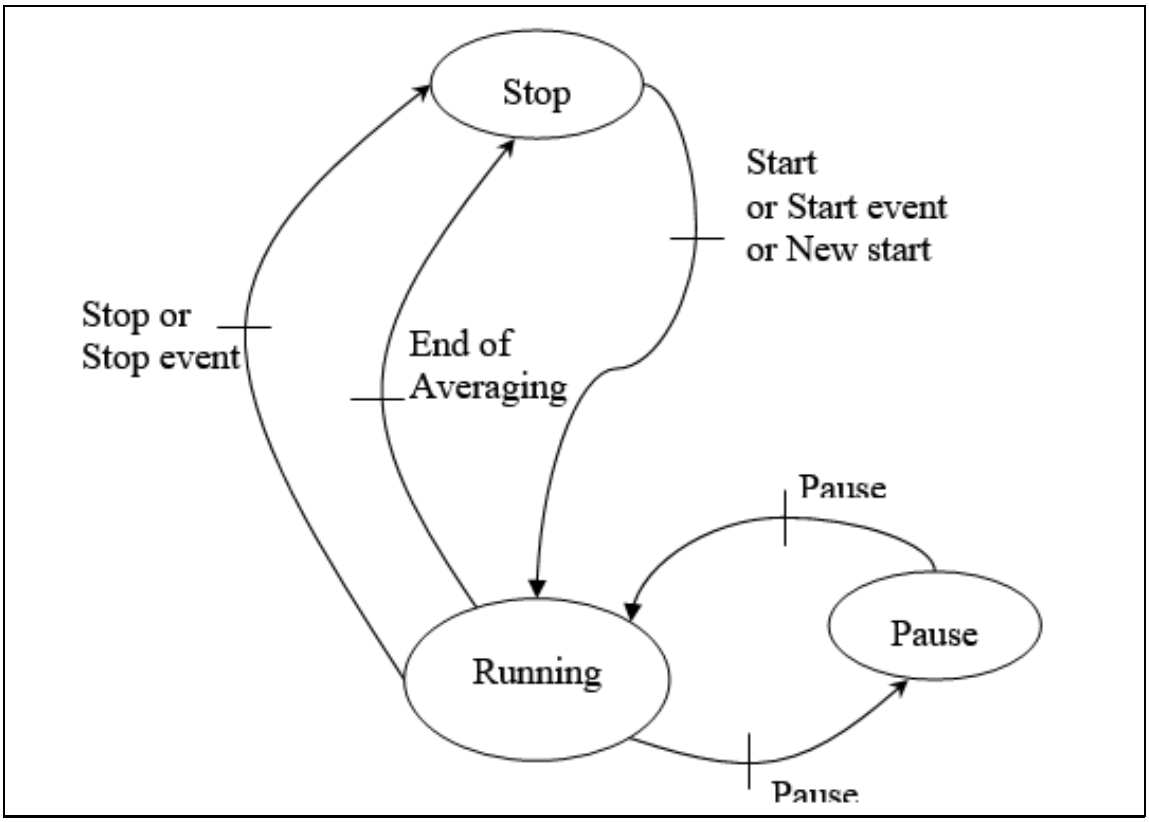
- **Linear, Repeat, Short Leq:** display the Average Duration. The status bar is displayed from left to right. The text displayed indicates the state of the acquisition (Run, Paused or Stop) with the time.
- **Cst BT, Fast, Slow, Impulse:** the status bar is a ?snake? type; the text displayed indicates 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.

16.3.2 Trigger state

The following scheme describes the different states of the measurement:



16.3.3 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).

16.3.4 Analysis overload

This status displays if during the acquisition, there was an amplitude overload (or not) of the analyzed inputs.

16.3.5 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

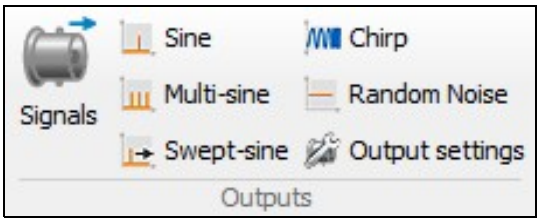
1/3 octave	1
1/12 octave	4
1/24 octave	8

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.

17 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.

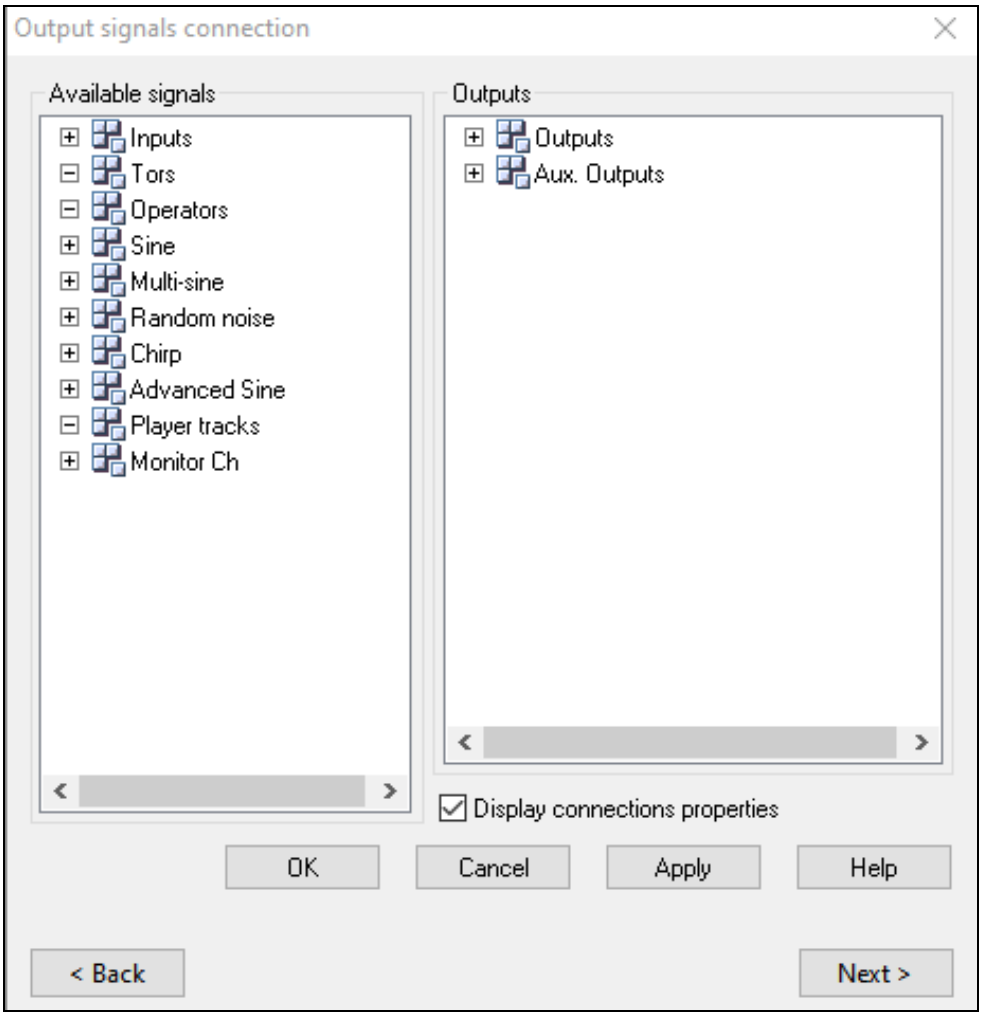
17.1 Connect



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.

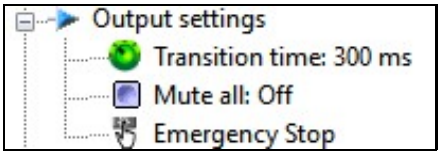
-  *Signals:* Shows the list of available signals and let the users connect it to the outputs. You can easily connect signal with a "drag and drop" on the windows below.



17.2 Settings

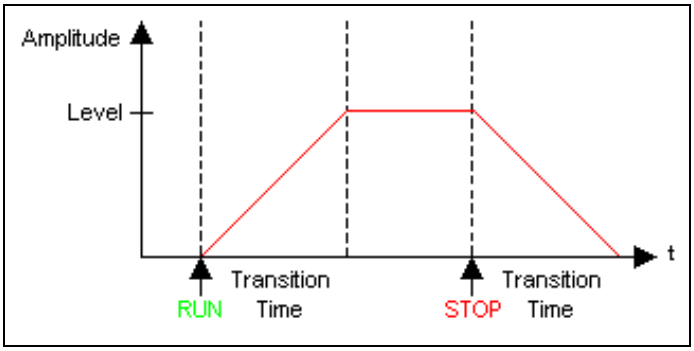
17.2.1 Output general settings

 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"

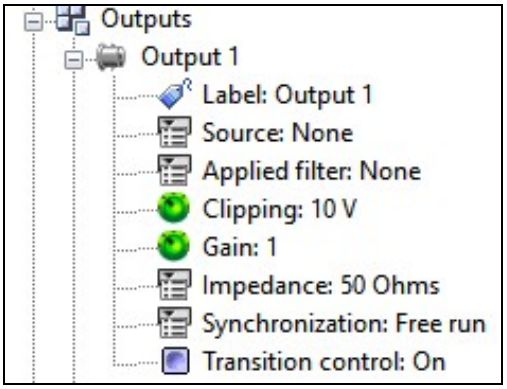


- **Mute '***all***'**: On / Off: When "On", all the outputs are set to zero. The value of this setting is automatically set is "On" when the *Emergency Stop* setting from the same sub-module is pushed.

'*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.

17.2.2 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.

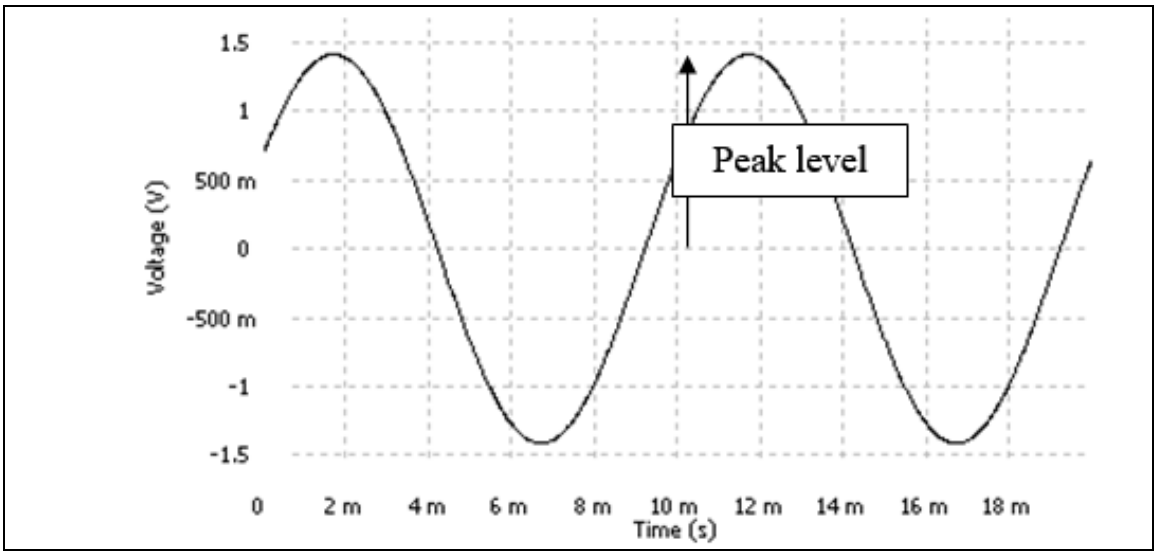
- **Transition control**: On / Off. If the value of this setting is "On" the *Output settings/transition time* is applied when this output is activated or disabled.

17.3 Signal available

17.3.1 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.

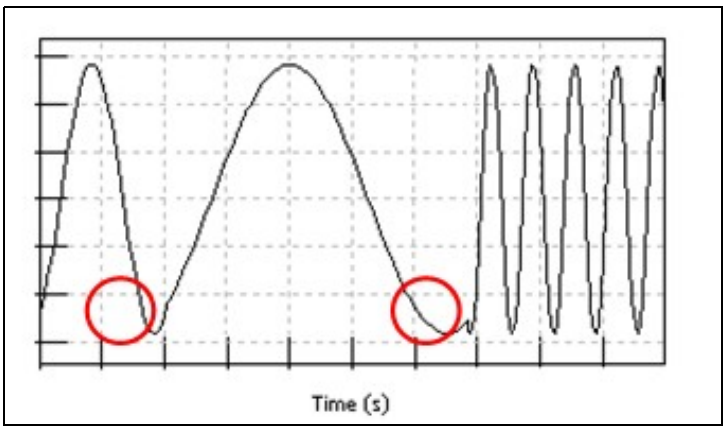


- **Frequency**: sine frequency.

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.



17.3.2 Multi-sine

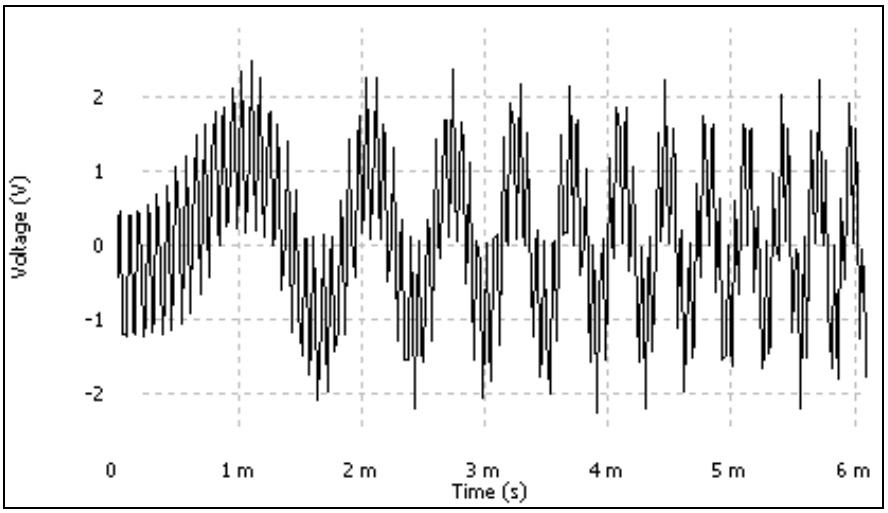
 : Multi-sine: Opens the *Multi-sine* properties dialog for adjustment.

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.

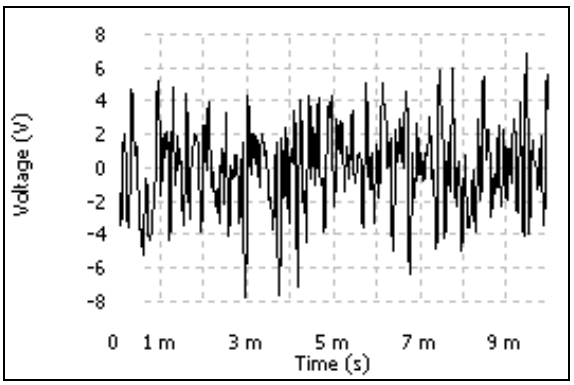
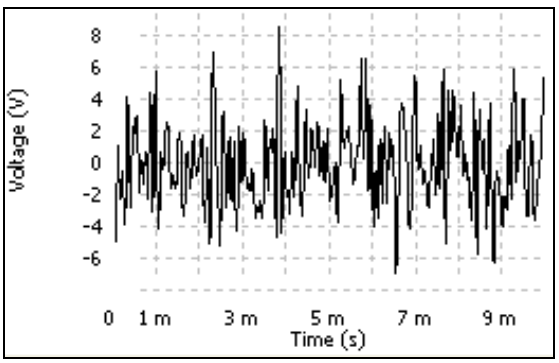
Used to generate and configure up to 2 multi-sines. The multi-sine is computed by adding sine signals whose frequencies are power of two sub-modules of sampling frequency. So with the FFT analyzer, each sine signal can be exactly at an analysis frequency line and there is no leakage due to analysis window. Due to its specific structure, using a rectangular analysis window for FFT analysis on a multi-sine excitation is recommended.

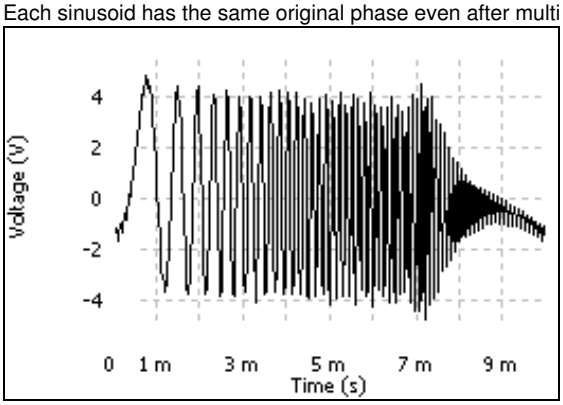
The phase between sine signals can be controlled in order to get a low crest factor or randomized, but with a higher crest factor.

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.

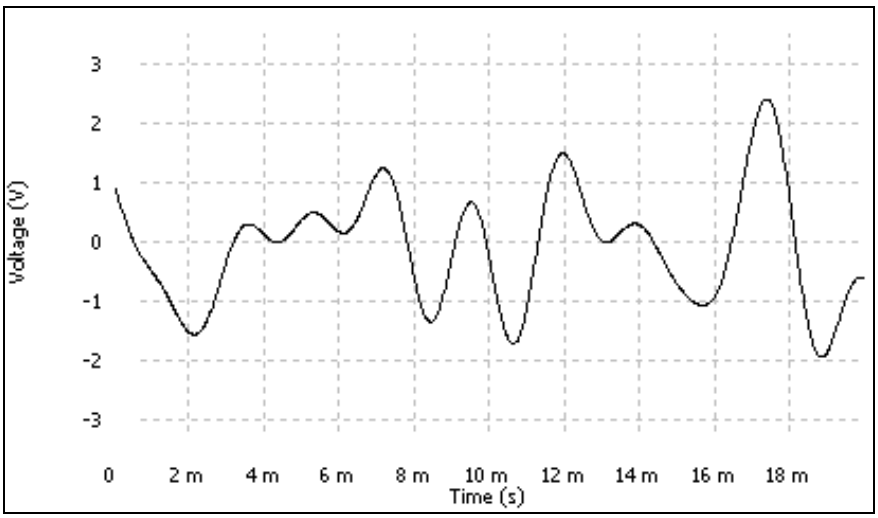
Burst setting in Multisine generators will shorten the time during which the output signal is active despite the signal block being of the same length. All bandwidth frequencies are present in each burst but may not be complete cycles as block period is truncated. Two bursts being identical (respectively fixed or random phase) they are 100% correlated. Two random bursts from two separate generators will not be correlated signals.

17.3.3 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.

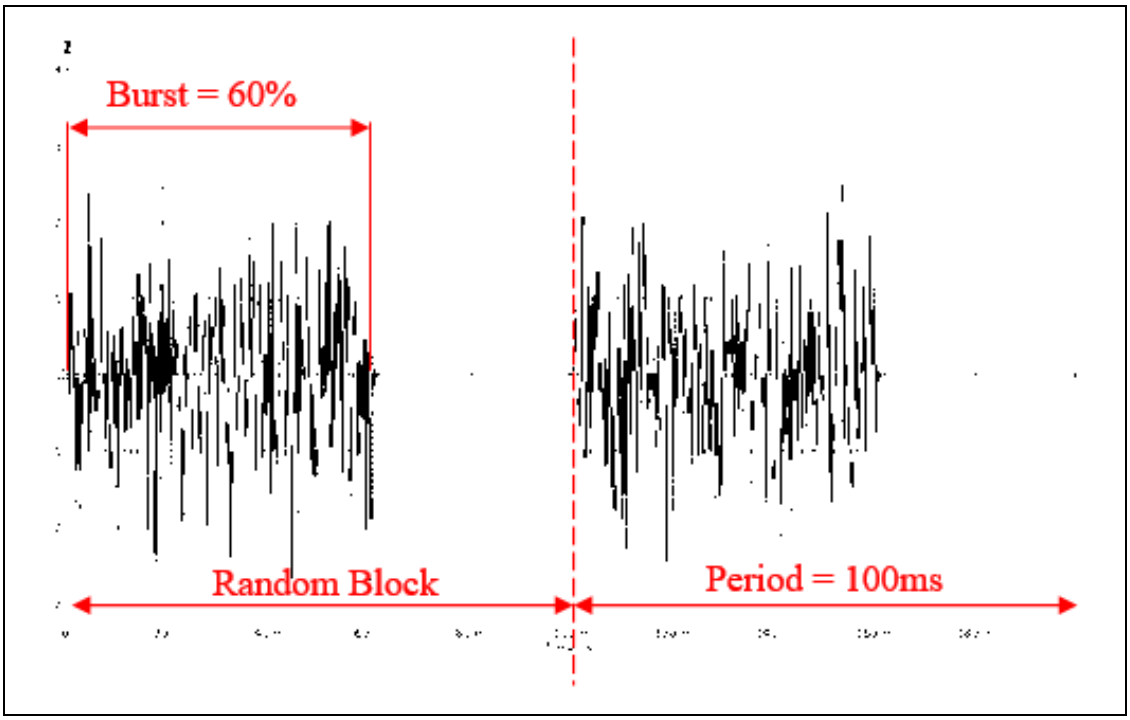
Signal block is recalculated each time. All frequencies of generator bandwidth are taken into account with a resolution of Fs/16384 (Fs being front end sampling frequency), this resolution is independent from FFT resolution. Consequently signal content of each FFT trigger block is not the same meaning 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**:

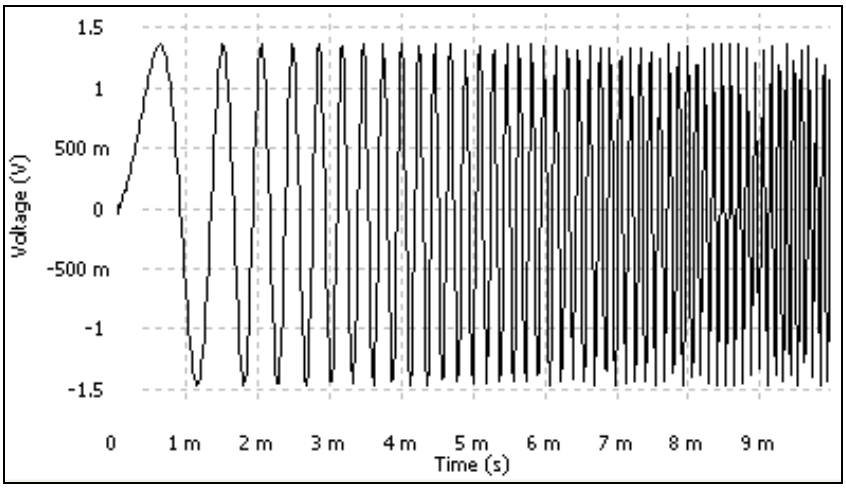
Type	Description
White	White noise has the same distribution of power for all frequencies, so there is the same amount of power between 0 and 500 Hz, 500 and 1,000 Hz or 20,000 and 20,500 Hz.
Pink	Pink noise has the same distribution of power for each octave, so the power between 0.5 Hz and 1 Hz is the 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.

17.3.4 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.



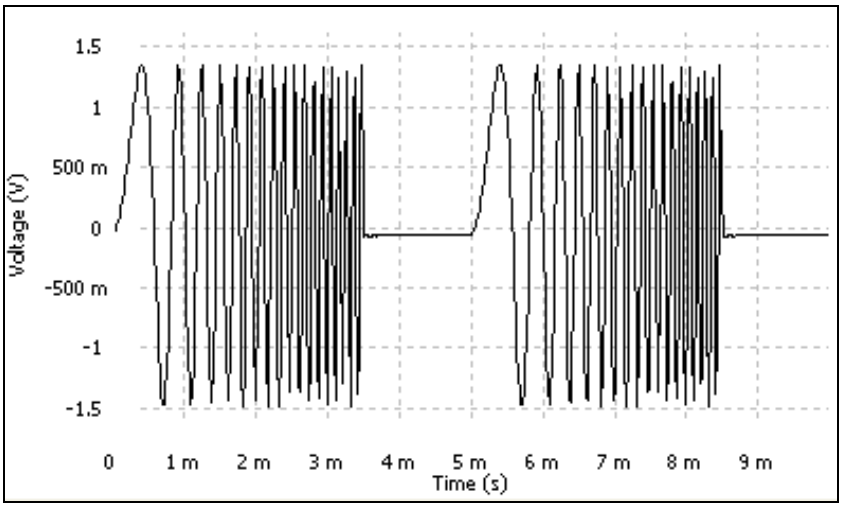
- **Lower frequency**: the lower frequency of the Random noise frequency range. Its minimum value is equal to SF / (2.56 * 6400), where SF is the sampling frequency and 6400 + 1 is the resolution.
- **Upper frequency**: the upper frequency of the chirp frequency range. Its maximum value is SF / 2.56, 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

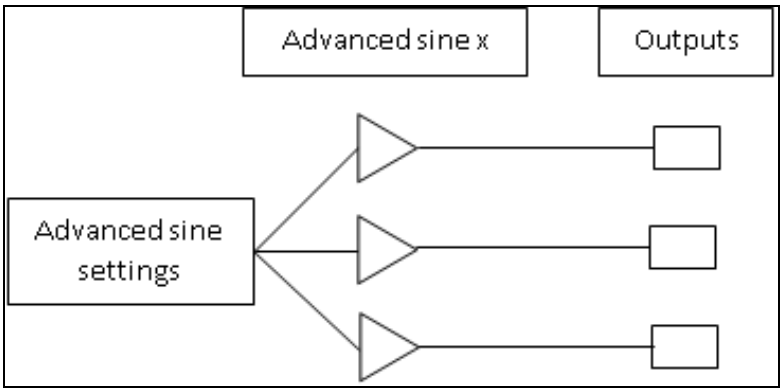
Burst = 70



17.3.5 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.



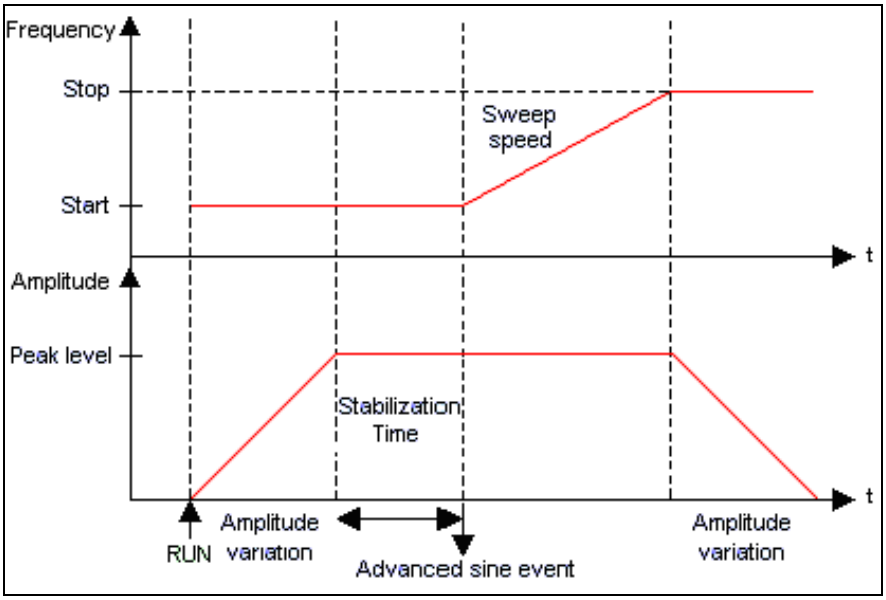
- **Gain**: Each advanced sine has a gain setting with a 0dB reference that is the value of the *Advanced sine settings/ Peak level setting*
- **Phase offset**: All the advanced sine have the same phase reference. This setting is used to set a phase offset between them.

17.3.5.1 Advanced sine settings

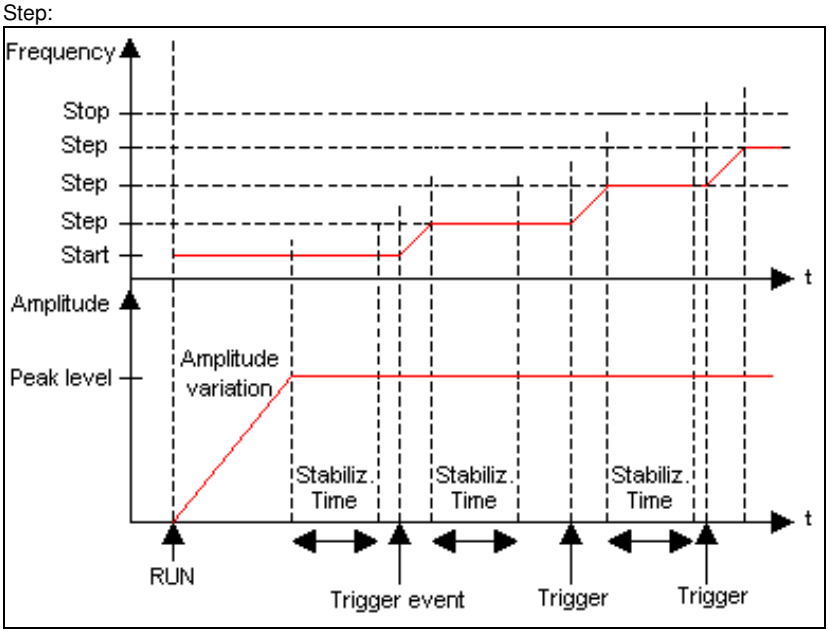
This sub-module contains the settings related to the main advanced sine generator, including the advanced sine mode setting, stabilization time, amplitude variation...

- **Mode**:

Mode	Description
Sweep:	The advanced sine performs a continuous sweep of the frequencies between Start Frequency and Stop Frequency



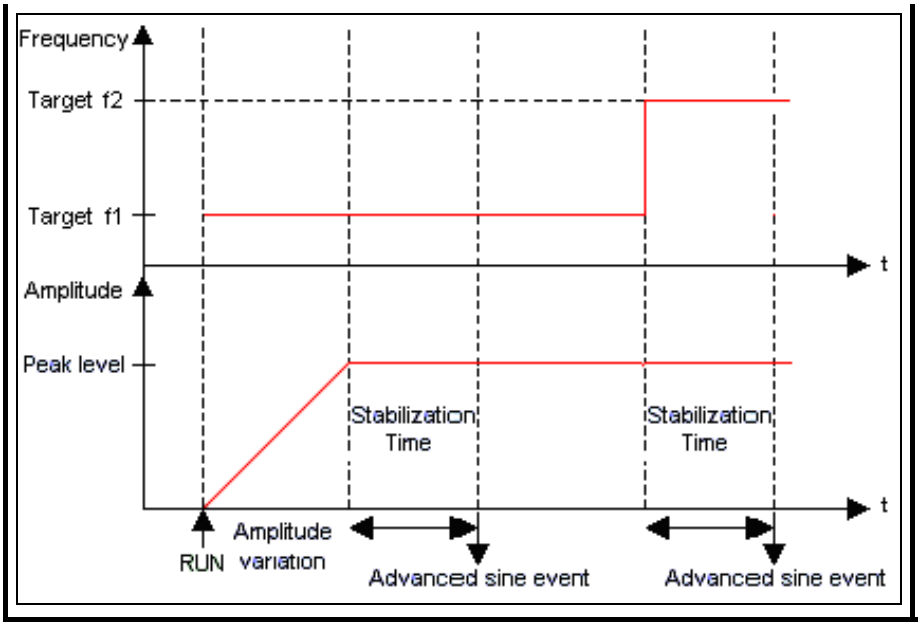
Step:



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).

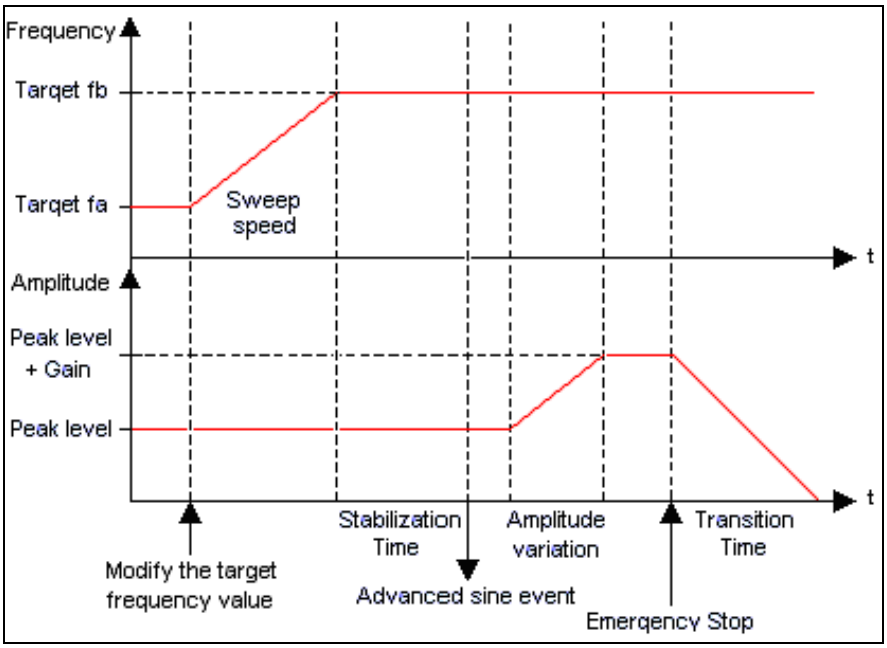
3. In ?Free run?, if the generator is already stabilized at the run event, then a stabilized event is generated at this moment.

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:

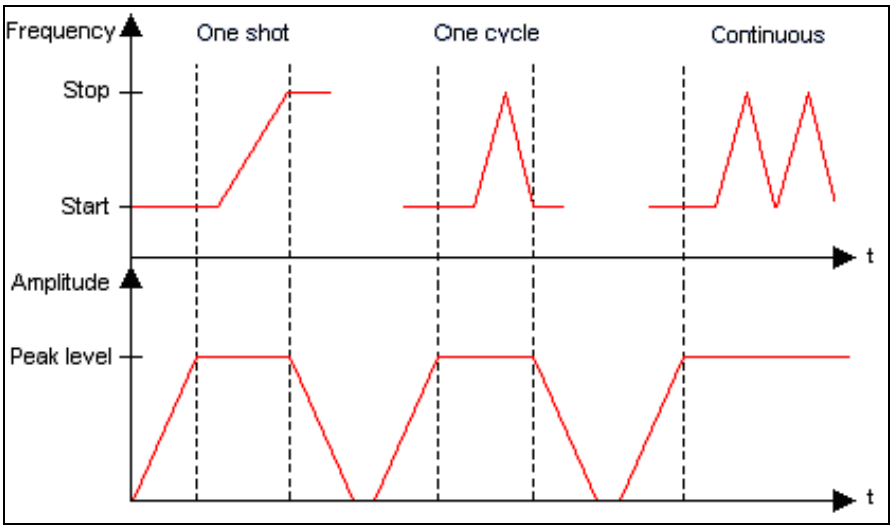
Mode	Sweep	Step	Pure tone
Sweep variation	visible	fixed to Lin	hidden

- **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

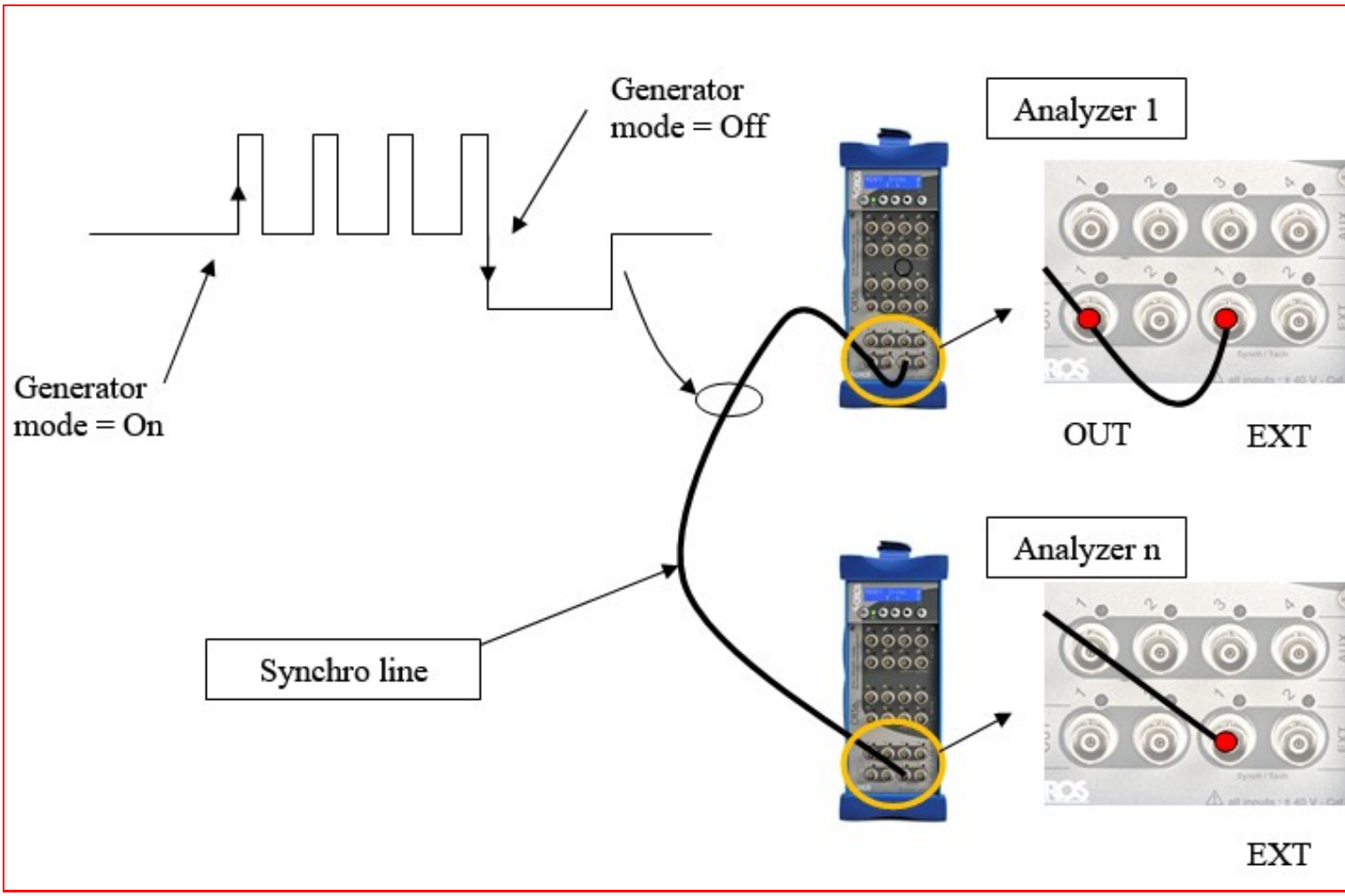
- **New step**: The event that triggers the sweep of the advanced sine to the next step

Hidden/fixed:

Mode	Sweep	Step	Pure tone
Sweep type	hidden	visible	hidden

17.3.6 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

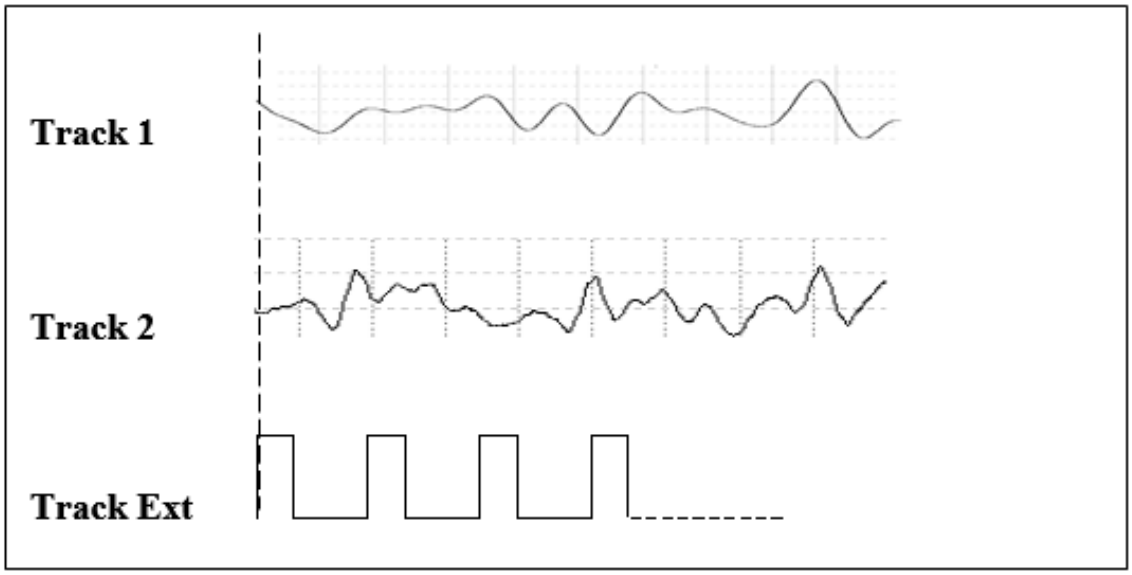
6. Add ext. sync track to the recorder on each unit

7. Set same recording duration on each unit

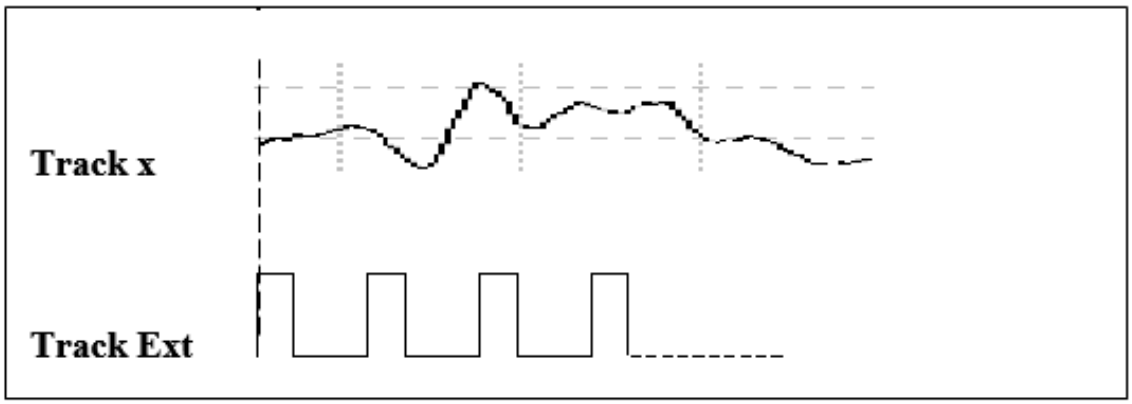
8. Run each unit

9. Set *generator mode = on* to start record

Record on Analyzer 1

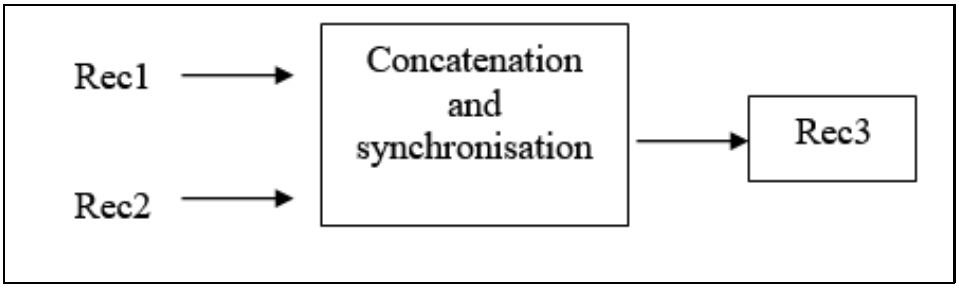


Record on Analyzer 2

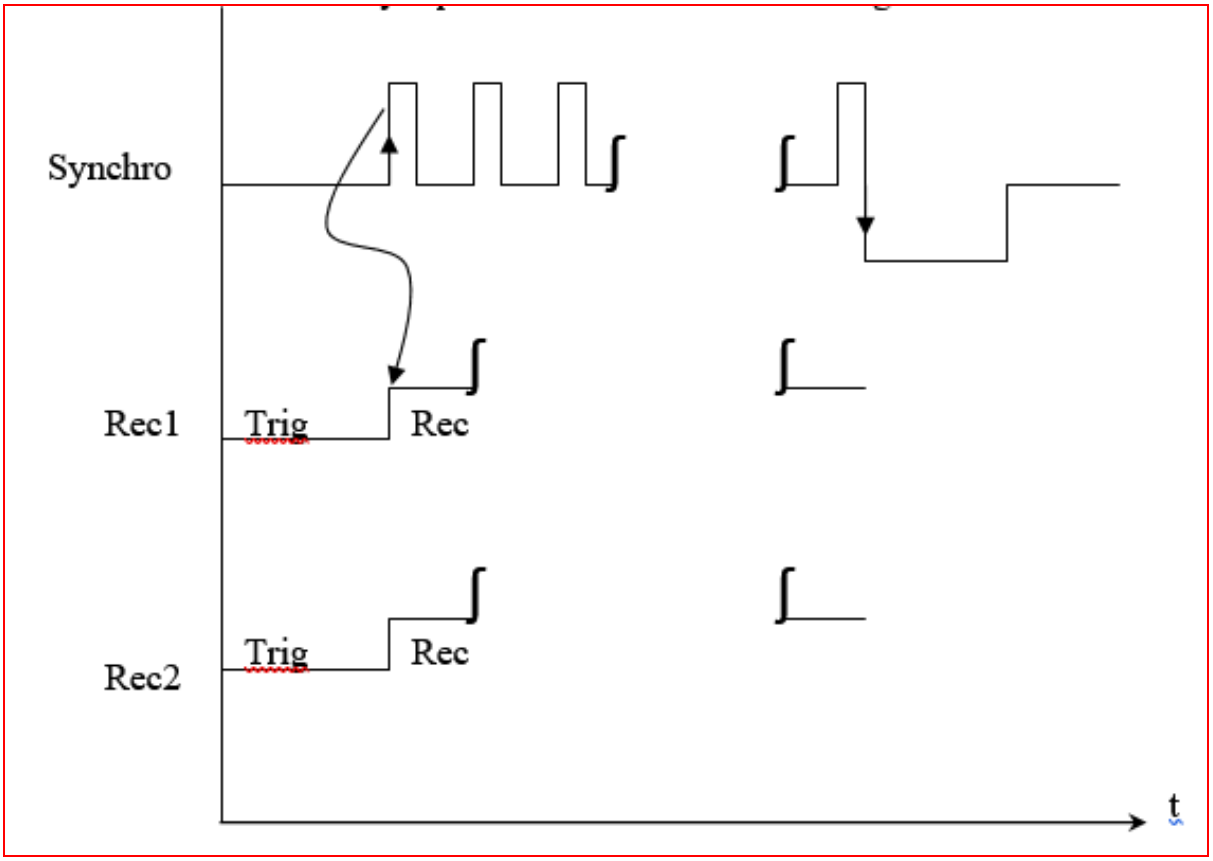


10. Download all recorded files on one PC

11. Launch ?Track Assembler?



The concatenation synopsis is shown on the following scheme:



More information on the Track Assembler in ?Operation on multiples Hardware?.

17.4 Listening track

There are 3 ways to listen track:

17.4.1 Input: listen during measurement

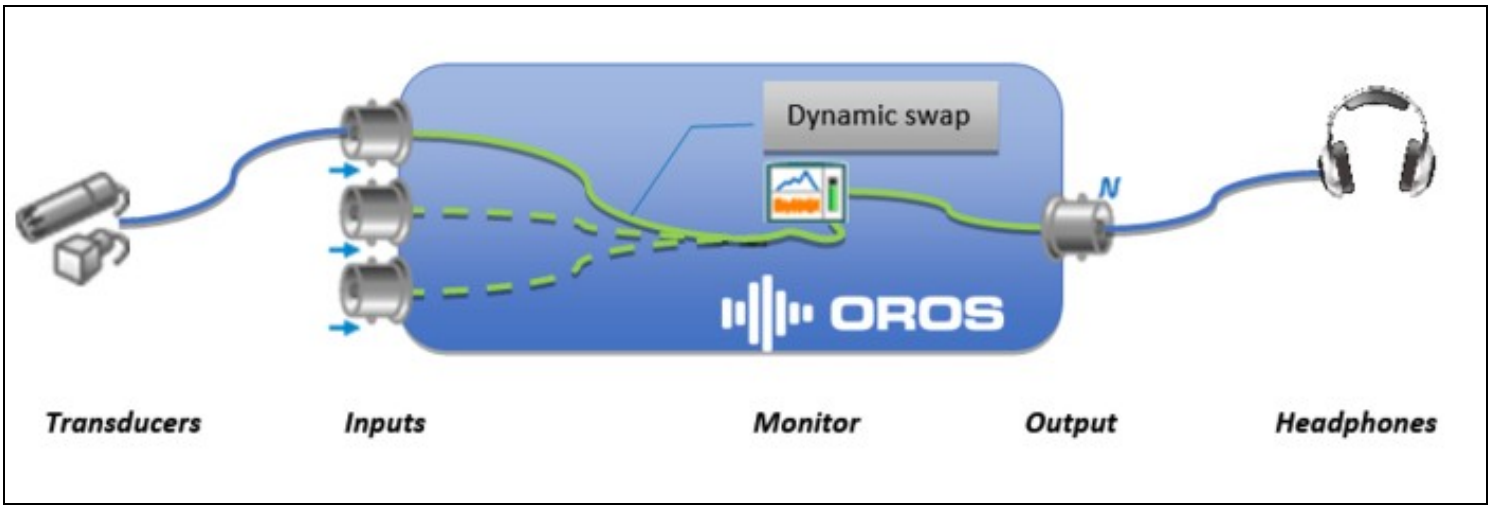
Back to the roots of vibration analysis: Everybody knows that our ears and brain is the best instrument to feel and interpret vibration signals. This is also why we take so much care in removing these NVH signals from our machines, vehicles and appliances. The audio playback of vibration (or any other) 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.

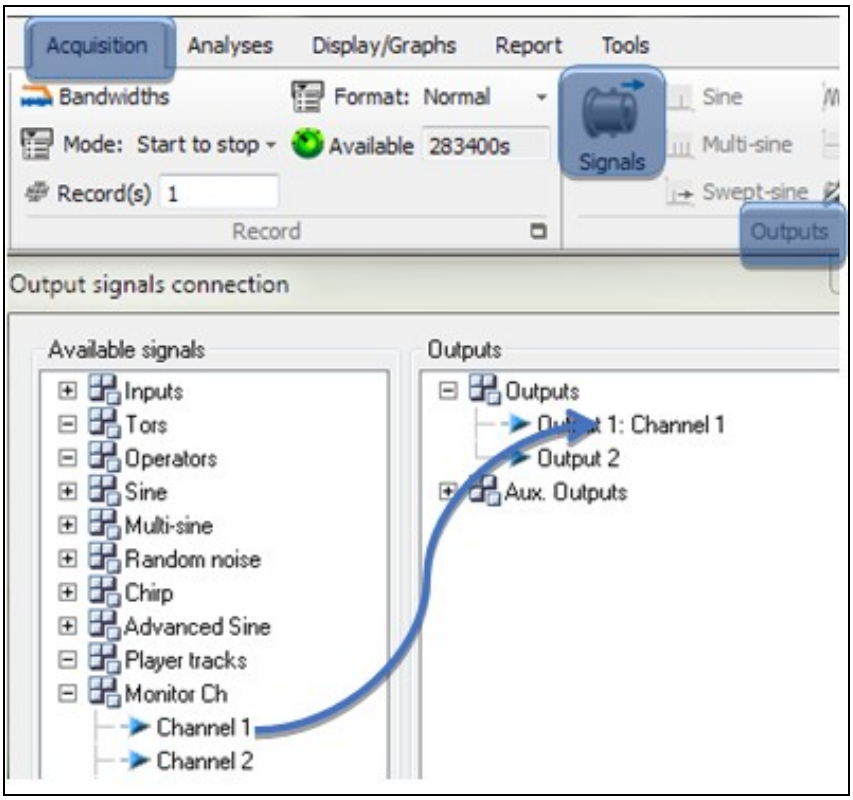
17.4.1.1 Monitor channels : Hot Swap

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.

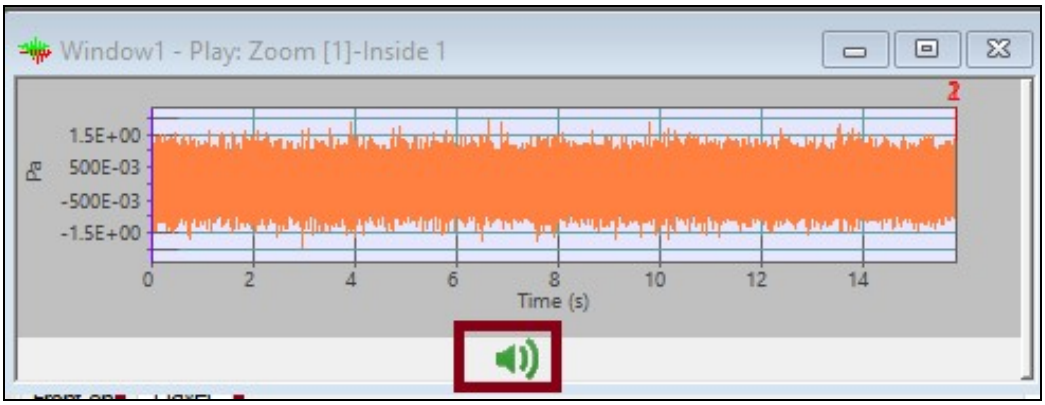


Then you can add any front-end input to the monitor channel. The selected input signal will replicate (play) on the output. You can swap from one input to another at any time including during the run and signal recording.

NB: Remember to switch the output impedance to 600 ? for better listening quality.

17.4.1.2 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.

17.5 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.

17.5.1 Example : playing a triangle signal on analyzer output

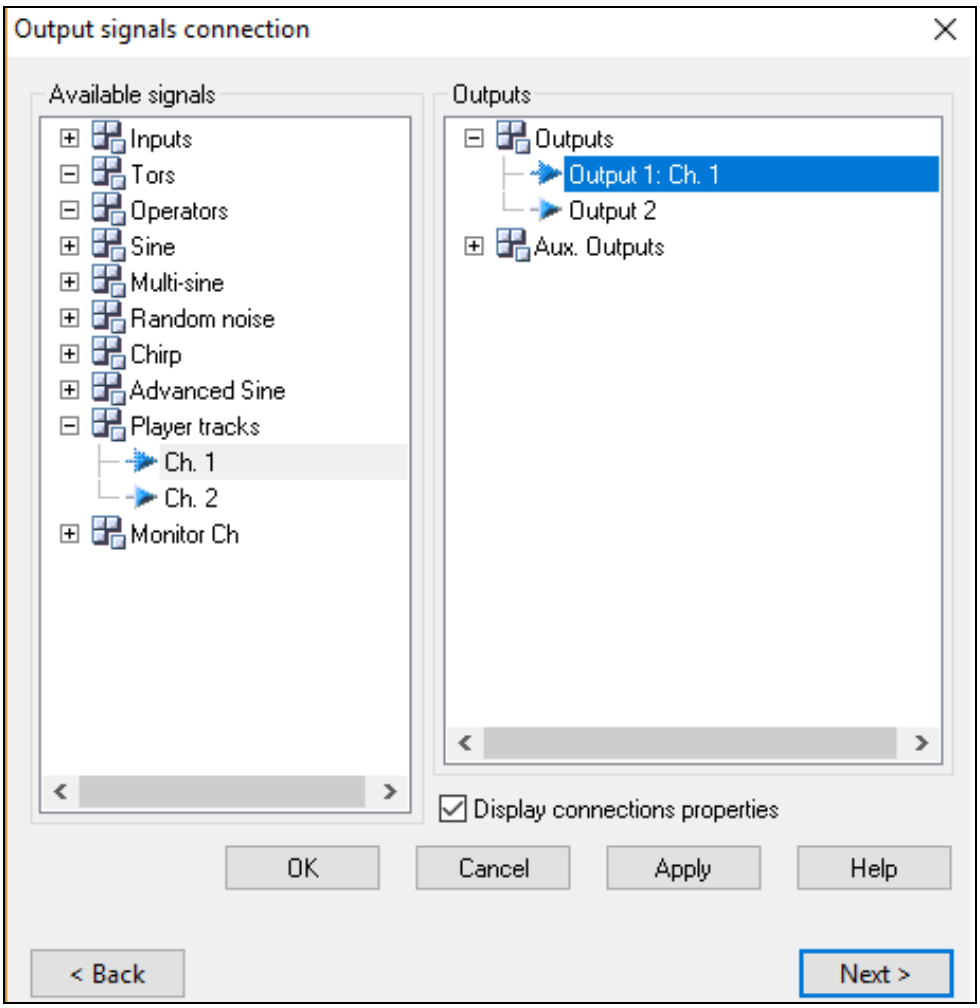
? Generate a triangular signal with an application (Matlab,?) or an online site (example: http://onlinetonegenerator.com/);

? Save this signal in .wav;

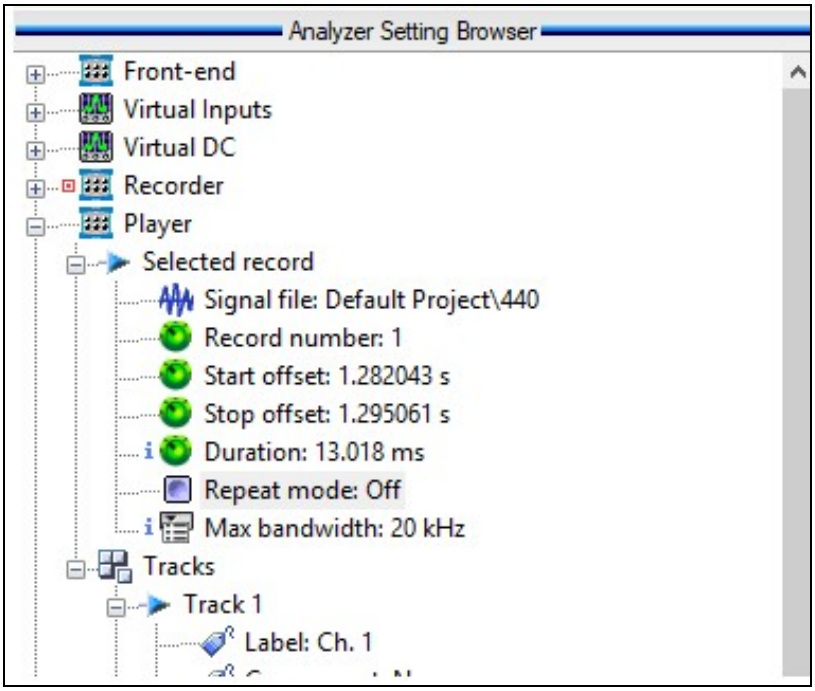
? In NVGate, import this signal (File / Import / Files / OR2X Signal (* .wav, .mat, .UFF...);

? 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:

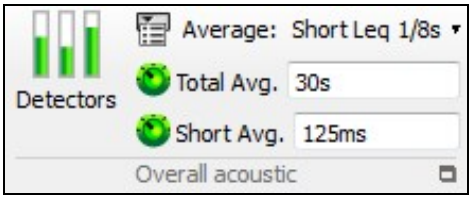


?If you want to play this signal repeatedly, you must change the "Repeat mode" parameter in "Analyzer Setting Browser":



18 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.



18.1 Overview

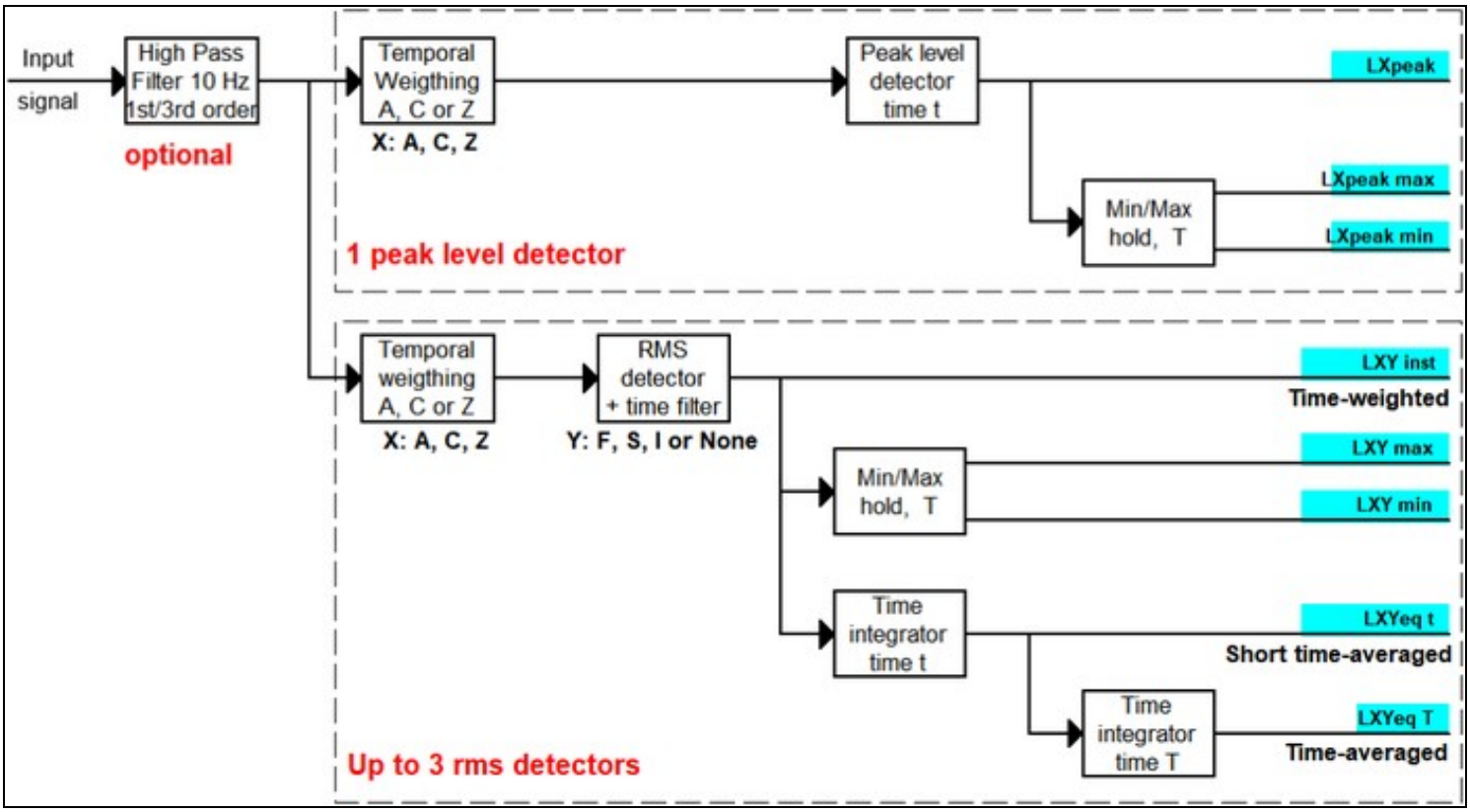
ORNV-OVA operates as the other plugs-in.

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.

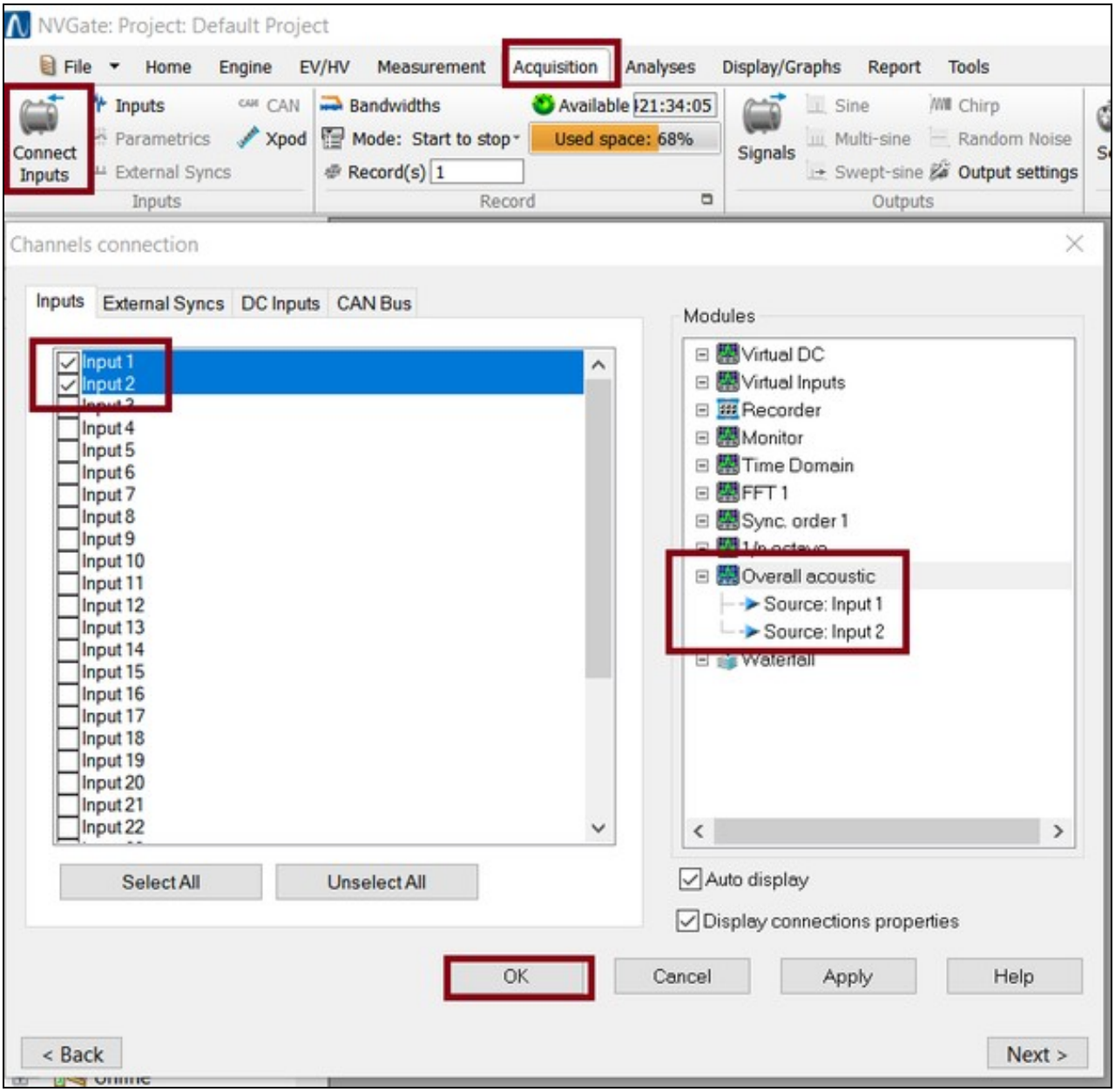
The following scheme describes the way signals are processed in the instrument.



Note: Available results are labeled in blue.

18.1.1 Connect

To connect the channels, use the connect input on acquisition tab.



18.1.2 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

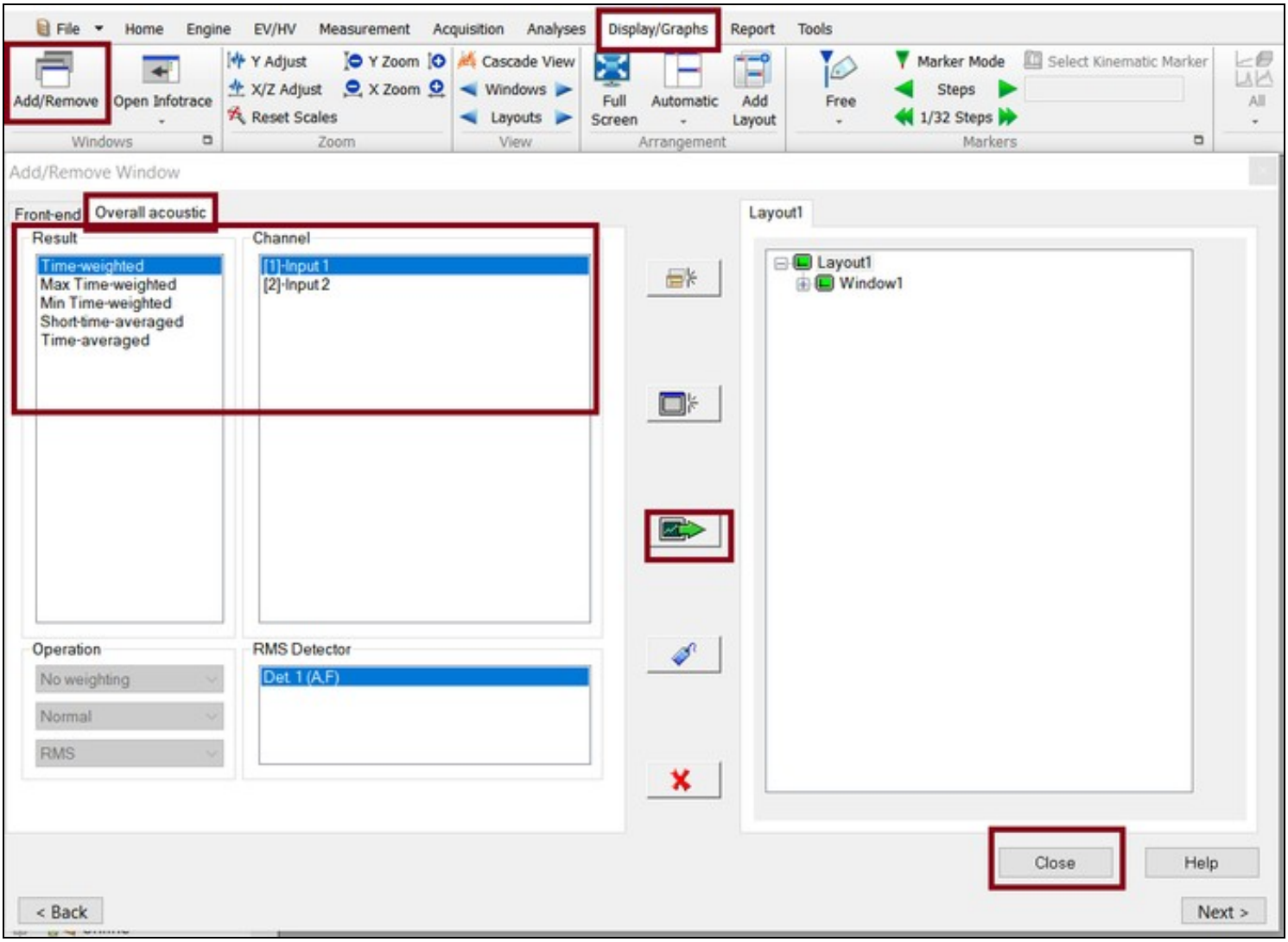
t = Short time integration duration. This duration is repeated until T.

T = Integration duration. T = ? t

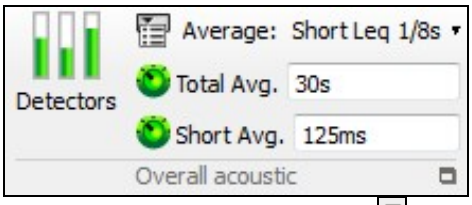
Response of A and C filters are fully conformant with above mentioned standards for all available frequency ranges, but in order to be have a sound level meter fully conformant with these standards a frequency range of 20 kHz or greater must be used.

18.1.2.1 Display

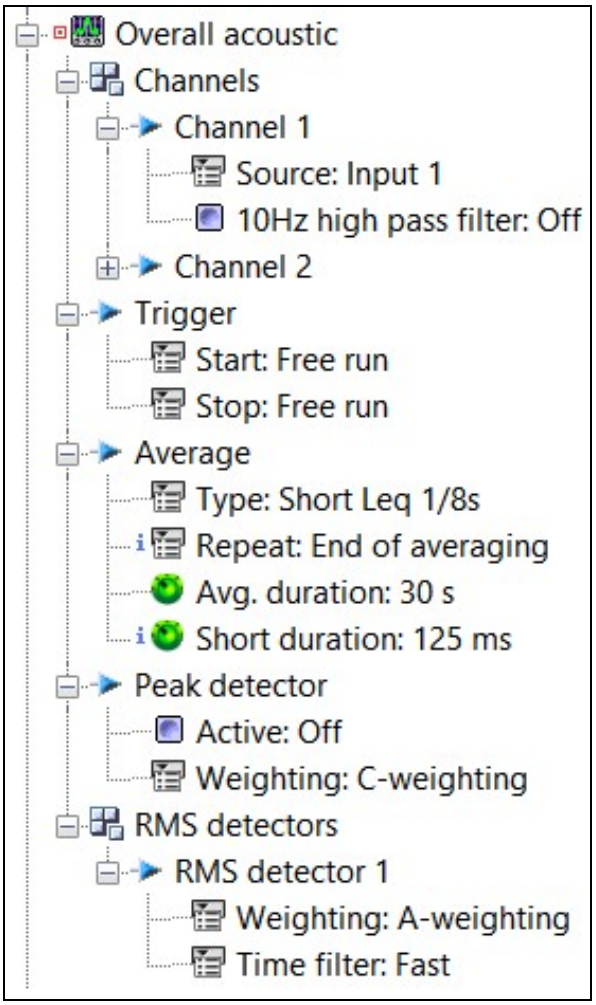
To display the results, use the Add/remove windows on *display/graph tab*


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 >

18.1.3 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.



18.1.3.1 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.

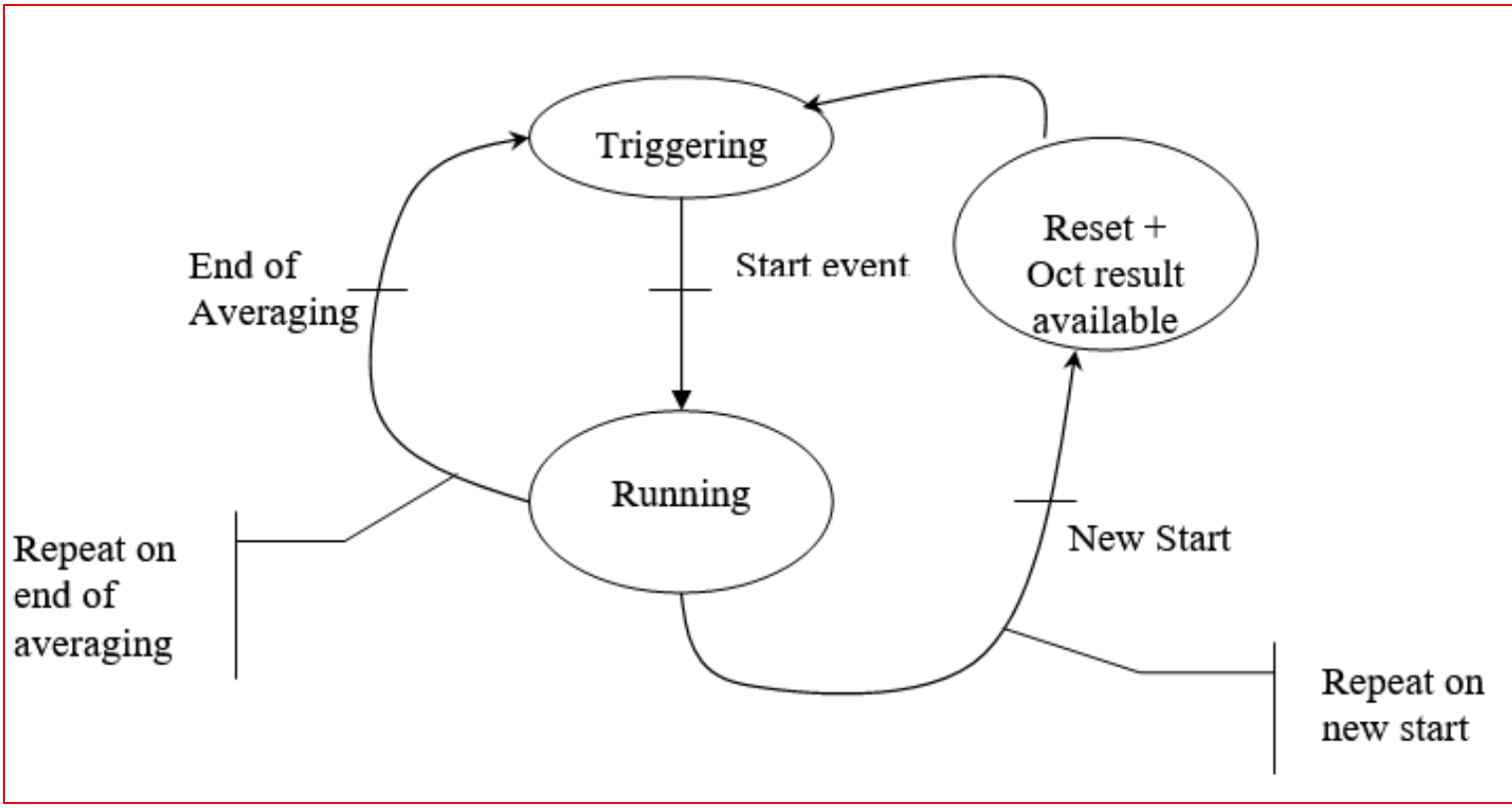
18.1.3.1.1 Trigger

Contains the settings related to plug-in start and stop signal computation.

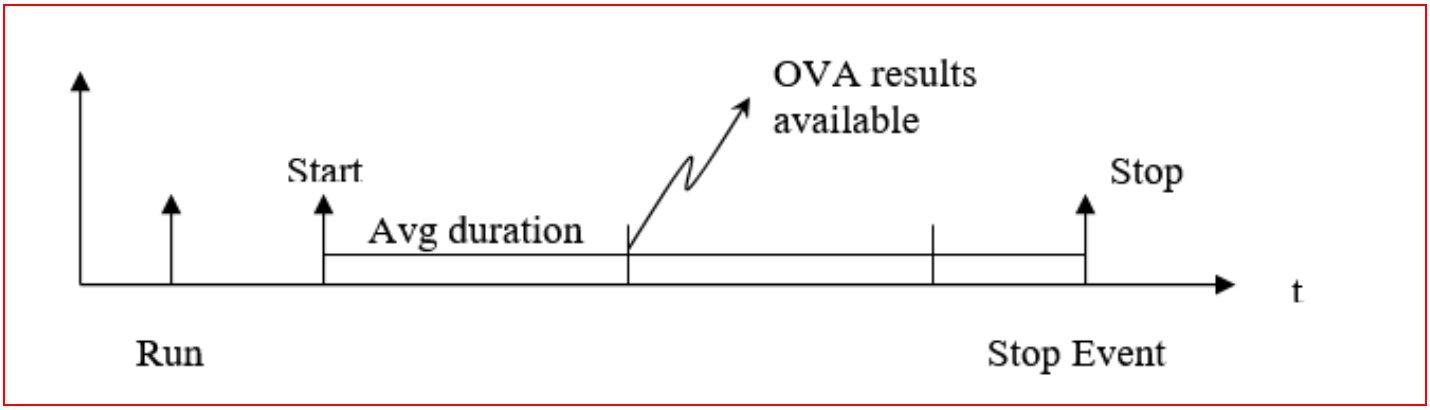
- Start: selects the event to start the averaging or short averaging. Any event can be chosen among the list of defined events. By default only the Free run and Manual events are available. Additional events can be defined in the "Event Definition" shared resource.
- Stop: selects the event to stop the 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:

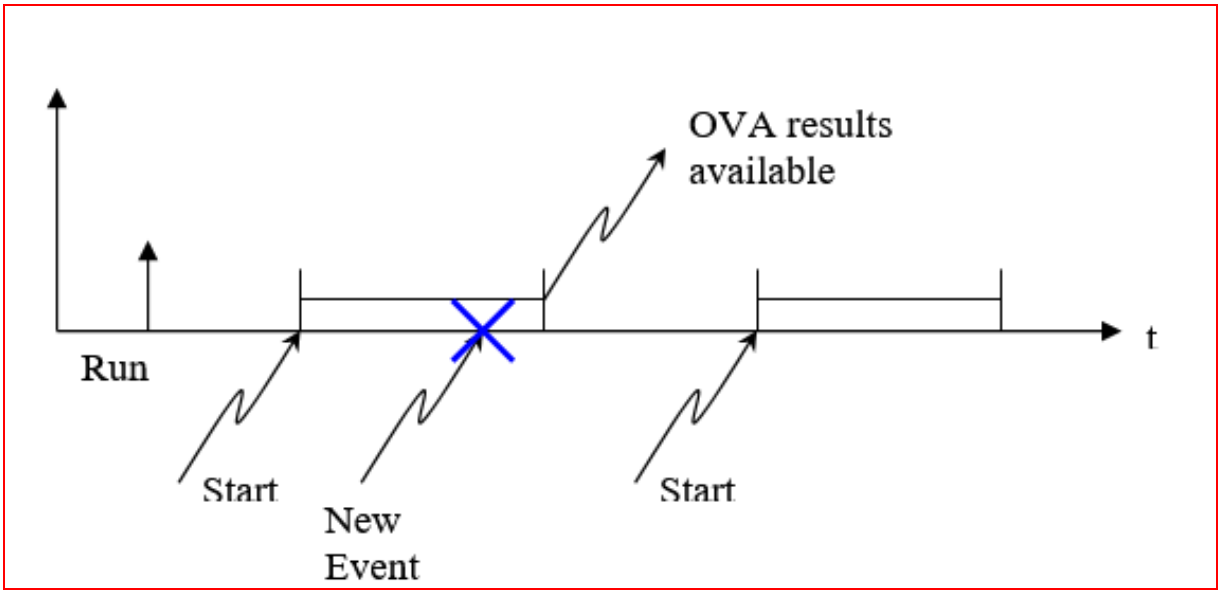


- Mode Repeat on ?end of averaging?:



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.

18.1.3.1.2 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.

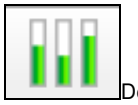
- Average duration: sets the integration duration. T = ? t, this settings is available for every type. If you change the short duration, the average duration will be automatically adjust to the closest value multiple of the short duration.

- 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)

18.1.3.1.3 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.

18.1.3.1.4 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

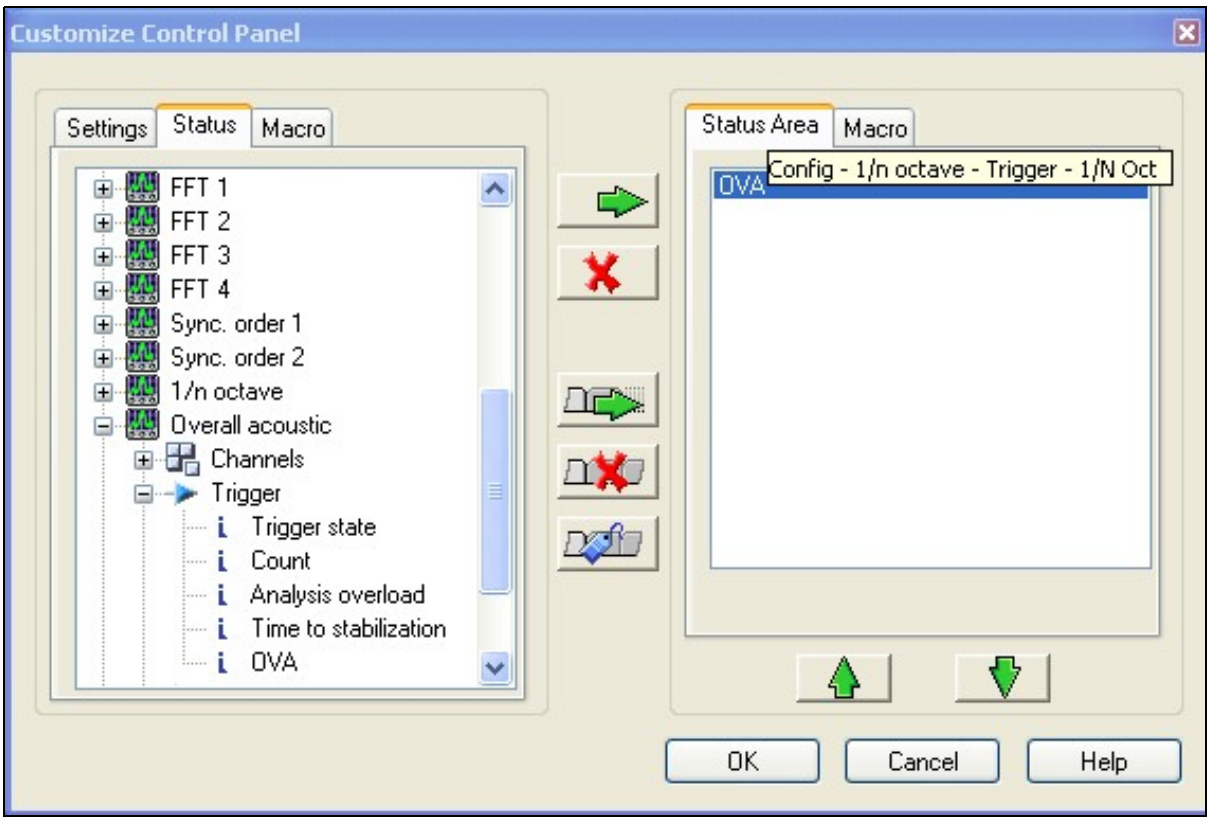
Fast	Corresponds to an exponential averaging with a fixed "Exponential time constant" of 0.125s. *Refresh* is performed when new instantaneous spectrum is available (periodicity: (1/(fs*2,56))*256 with fs the input sampling frequency) The *event " OVA Leq result available"* corresponds to the periodicity ((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

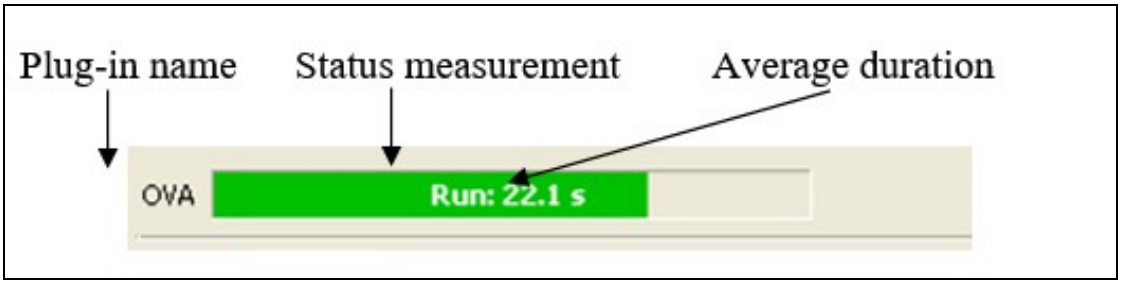
Note: Time filters are available for all frequency ranges

18.1.4 OVA status

All statuses are available to add to the control panel



18.1.4.1 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.

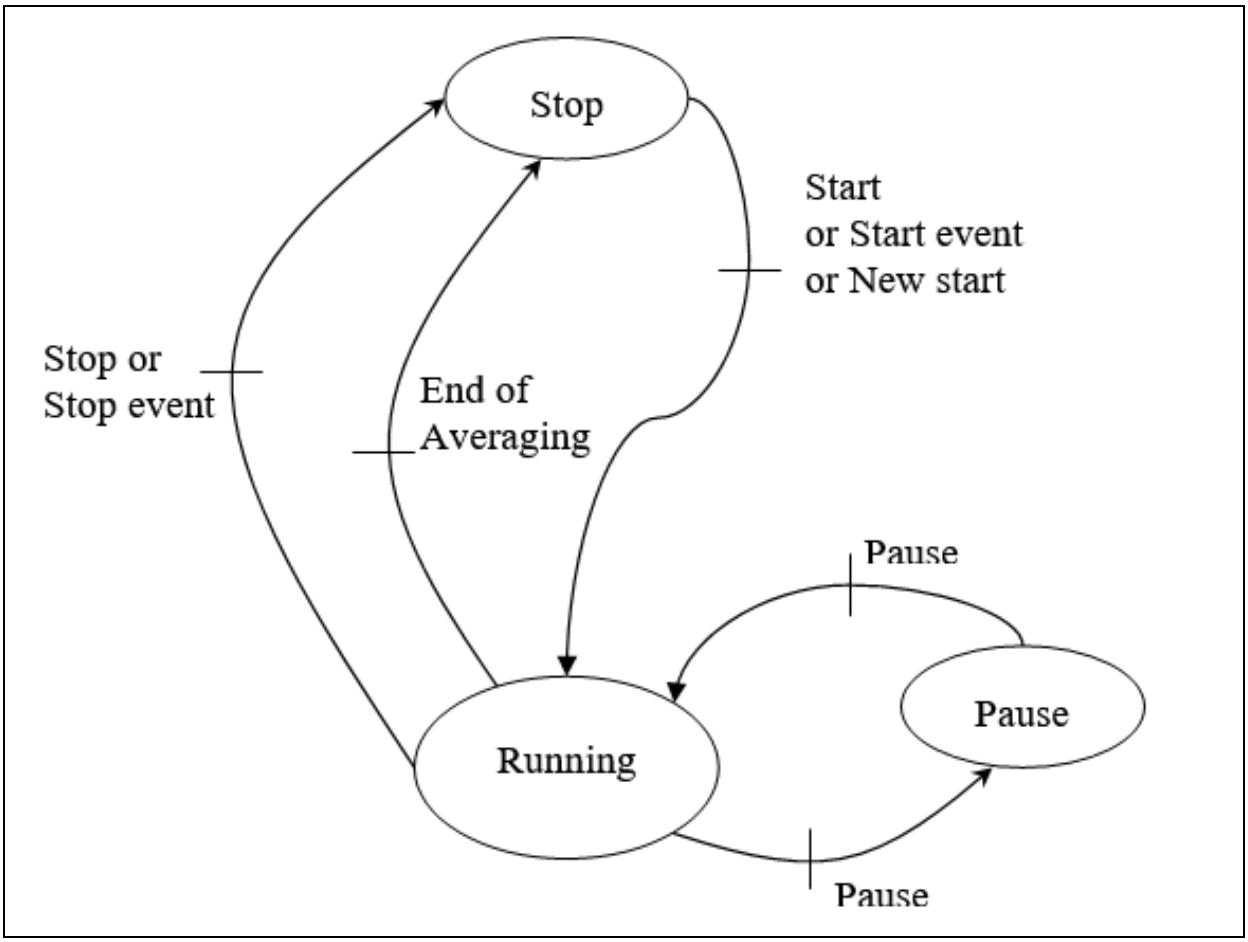
The status bar is displayed from left to right (whatever the type average is: Short Leq 1s, Short Leq 1/8s, Short Leq (t) or Linear), and the text displays the average duration with the measurement state (Run, Paused, Stop).

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.

18.1.4.1.1 Trigger state

The following scheme describes the different states of the measurement:



18.1.4.1.1.1 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).

18.1.4.1.1.2 Analysis overload

This status displays if during the acquisition, there were an overloaded period (or not).

18.1.4.1.1.3 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.

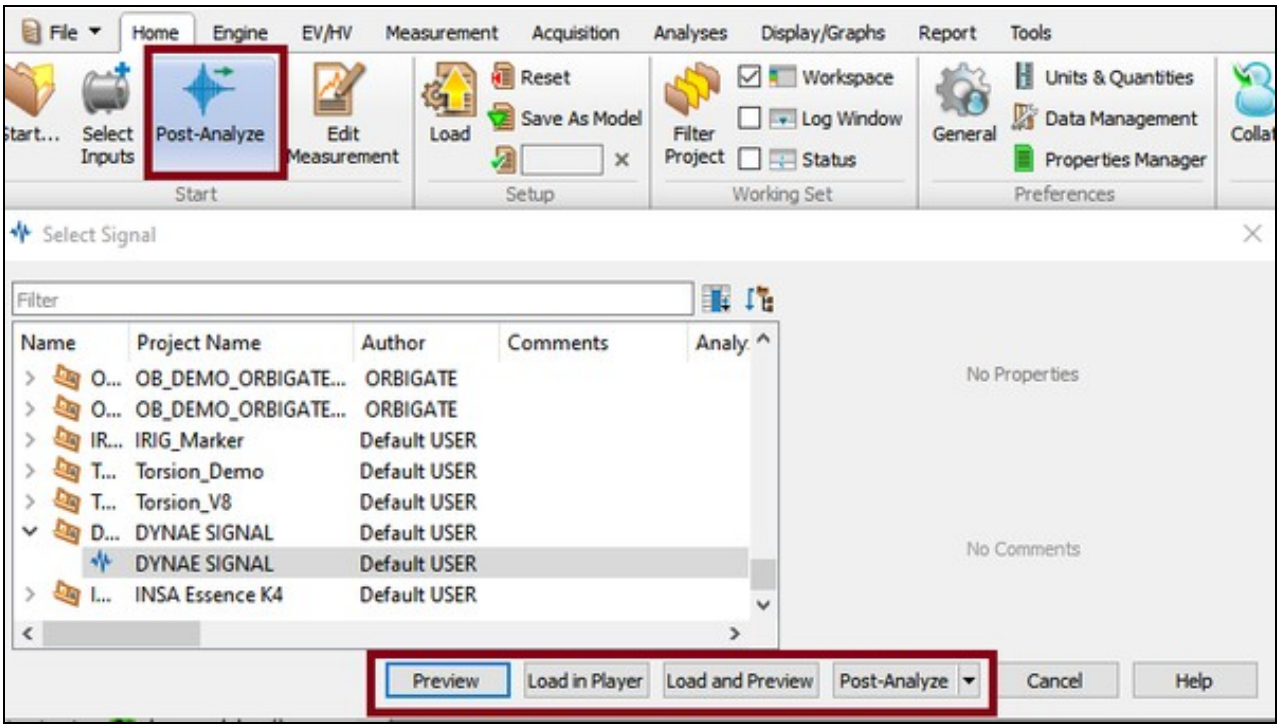
19 NVGate Player

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.

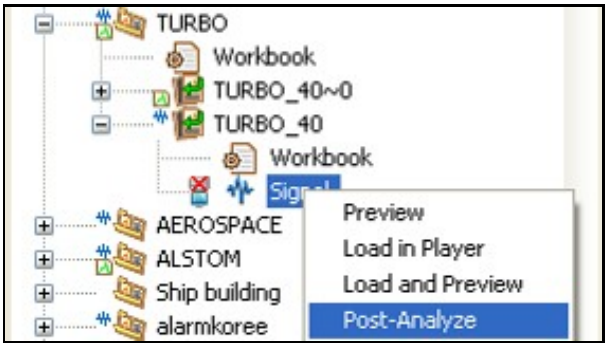
This page will present you the different usages of the player.

19.1 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.

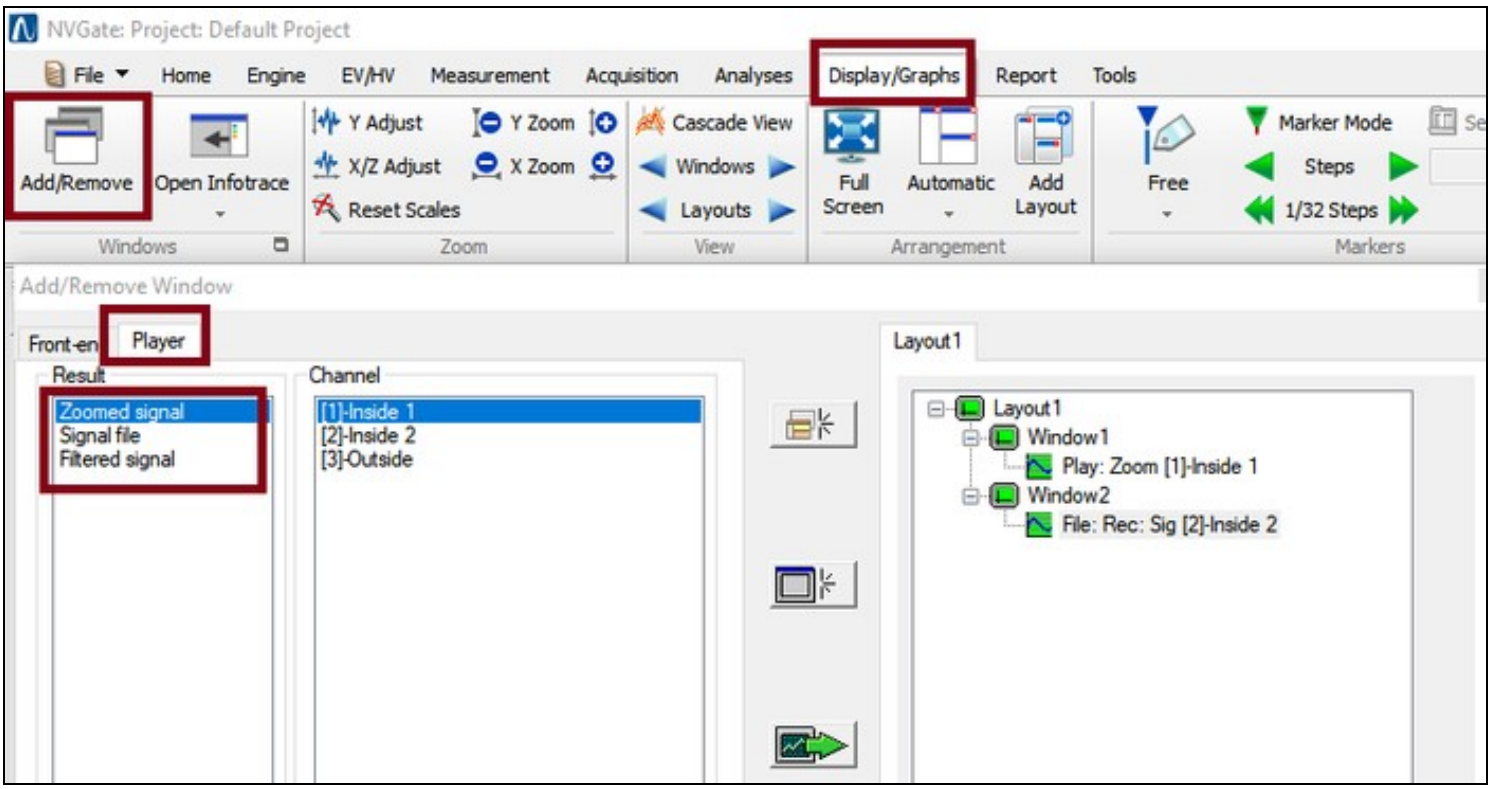
3. **Load & Preview** is a combination that lets you see the envelope of the recorded signal you loaded.

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).

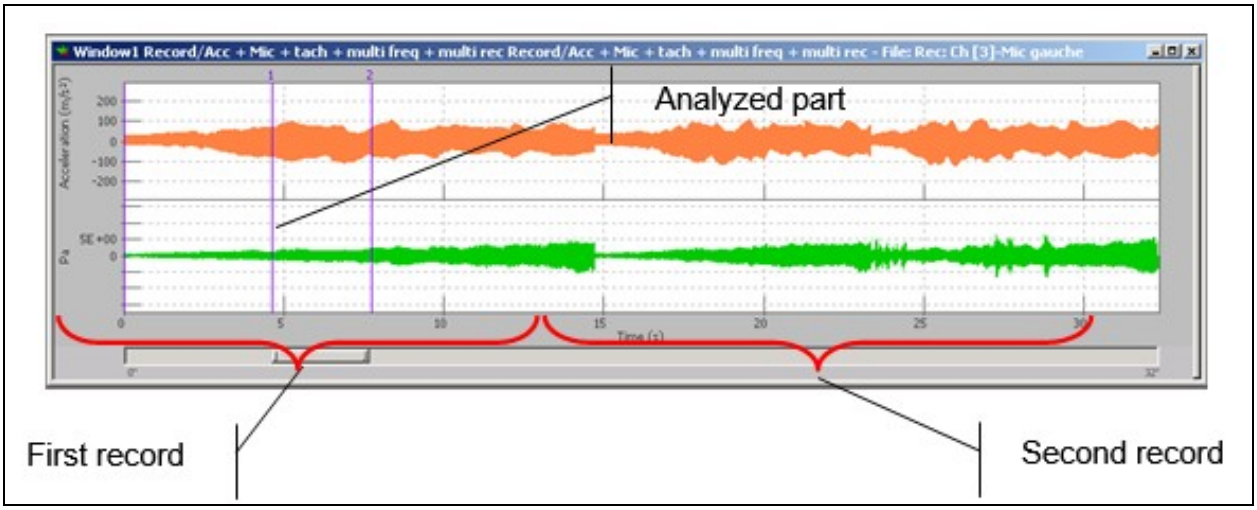
5. **Post analyze/Keep record setup** is a combination that lets you see the envelope of the recorded signal you are loading, switch to post-analysis, and keep the setup used during the record signal by replacing dynamical input of the frontend by the player tracks. *Note:* ***'if the record setup contains 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".

19.1.1 Display the signal

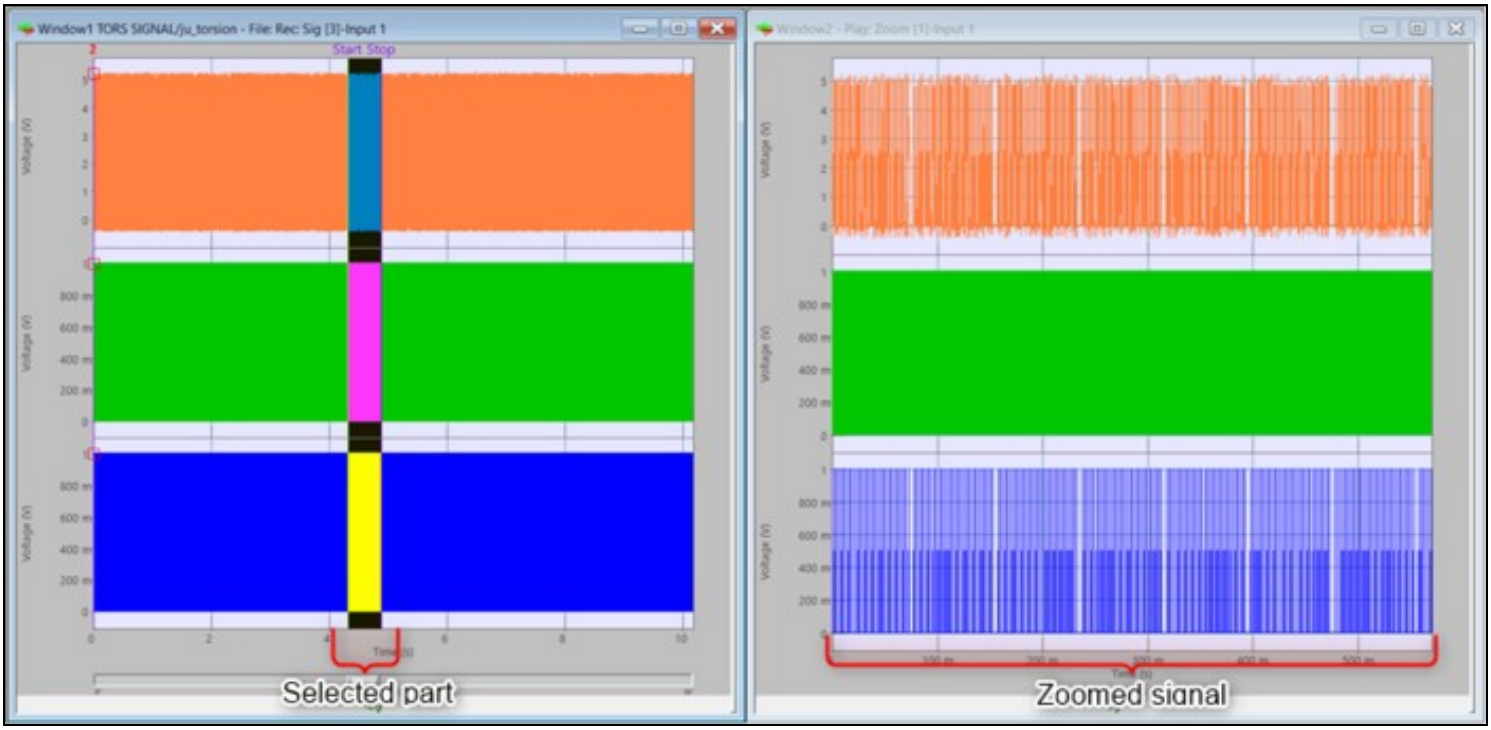
NVGate® proposes 2 different types of windows for displaying the signal.



- 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

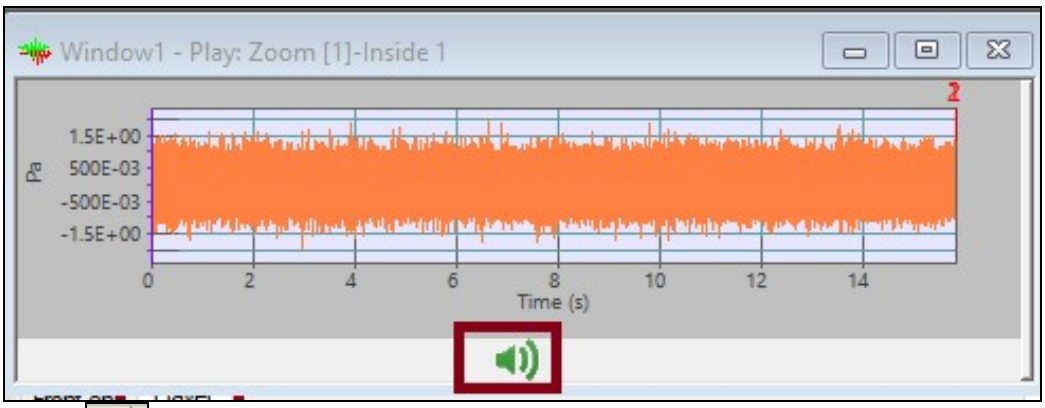
Type	Size	Dimension	Domain	Save
Signal File	2048 compressed pt max	2D	Compressed time	Display only

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.

19.1.2 Playback on PC speaker

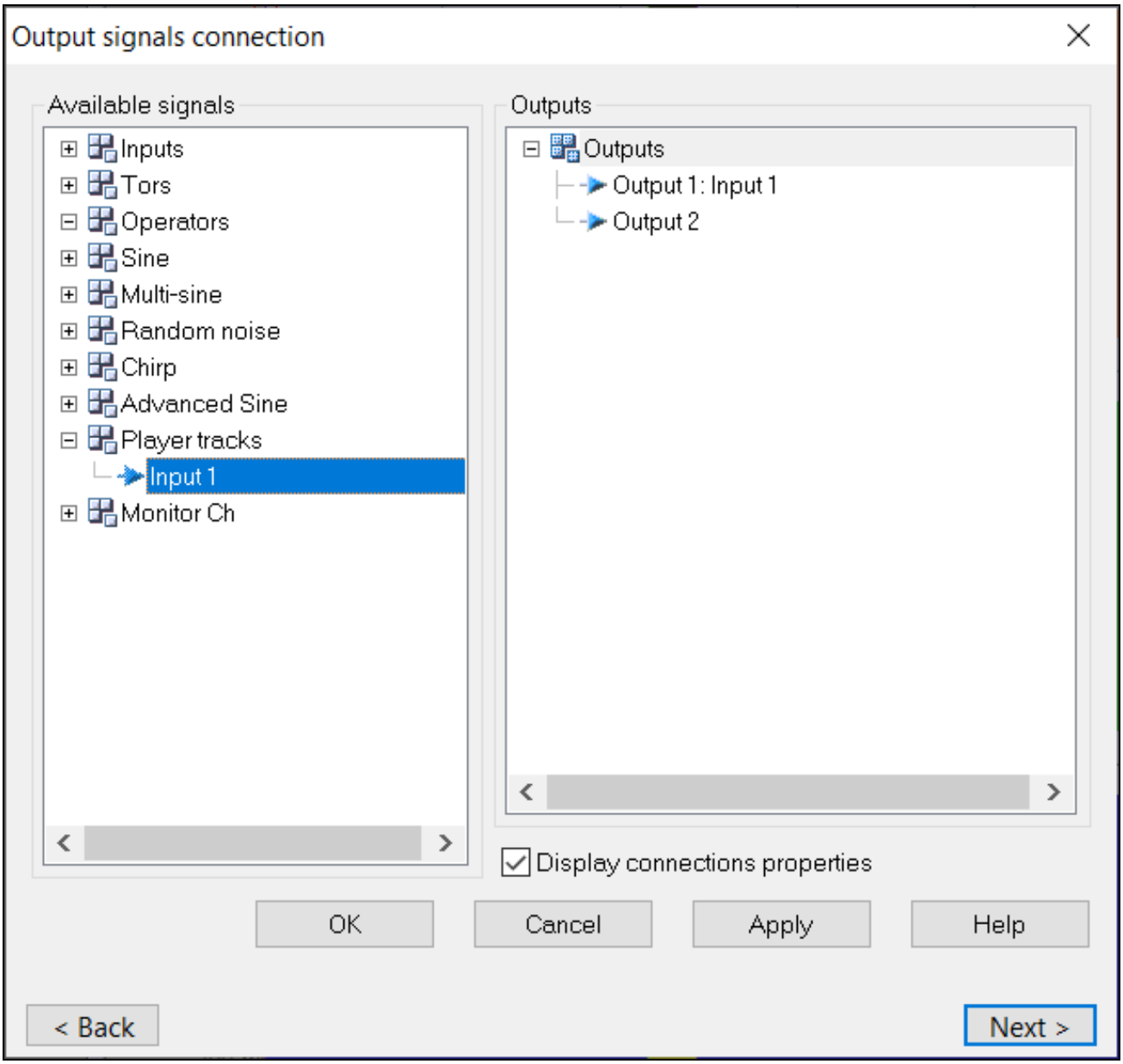
From any of the previous configurations, the recorded signal can be listened through the PC loudspeakers.



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.

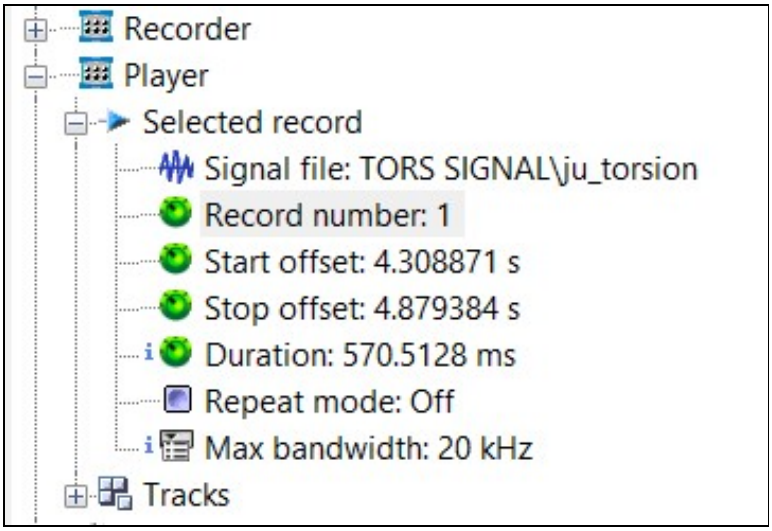
19.1.3 Connect the player tracks on the output

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 >

19.1.4 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

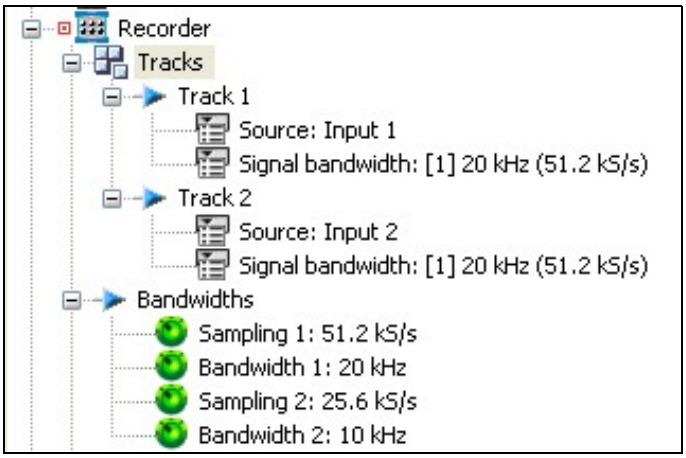
- **Repeat '***mode***'**: On/Off: used to repeat playback of the selected part of the signal indefinitely. The repeat mode is not enabled in post-analysis mode.

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.

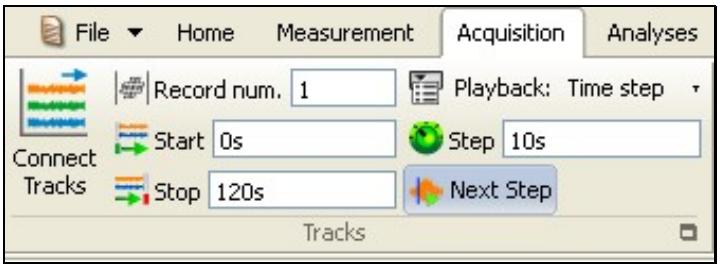
ON-LINE	POST ANALYSIS					
Recorded file	**Player**	**Plug-in analyzer**				
Signal Bandwidth 1	Signal Bandwidth 2	Selected Max Bandwidth	Plug-in analyzer x			Plug-in analyzer y
			Selected Bandwidth	Available Input	Selected Bandwidth	Available Input
20 kHz	5 kHz	5 kHz	5 kHz	#1 & #2	5 kHz	#1 & #2
20 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.

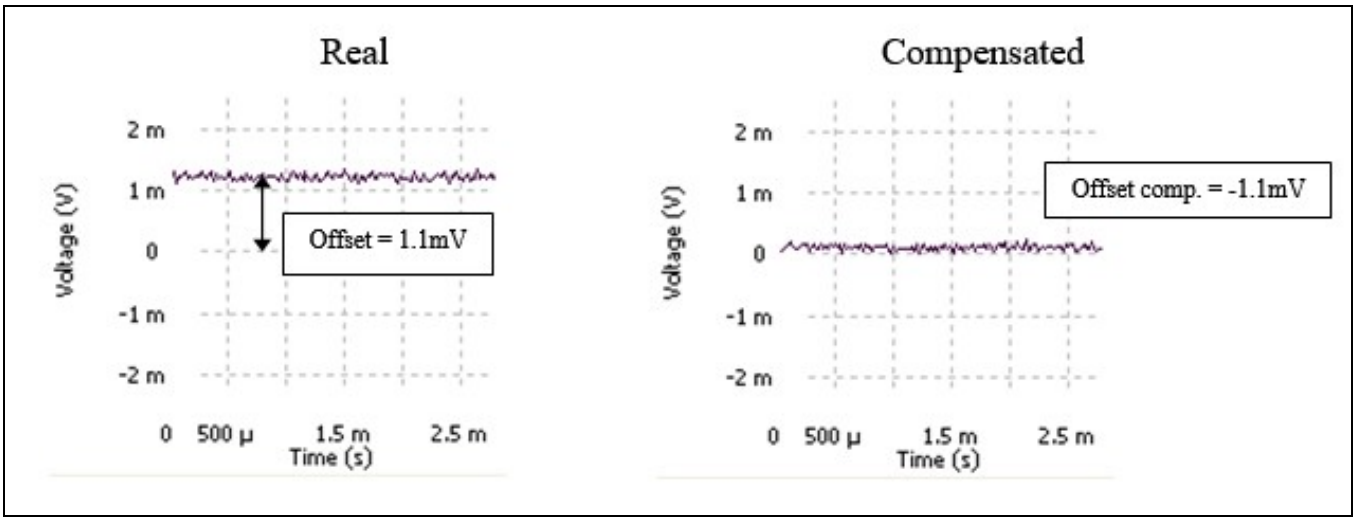


Hidden/fixed: Visible in the post analysis mode

19.1.4.1 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*

19.1.5 Post analysis Video

```
@1min 27s is example of post analysis on the signal
```

20 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.

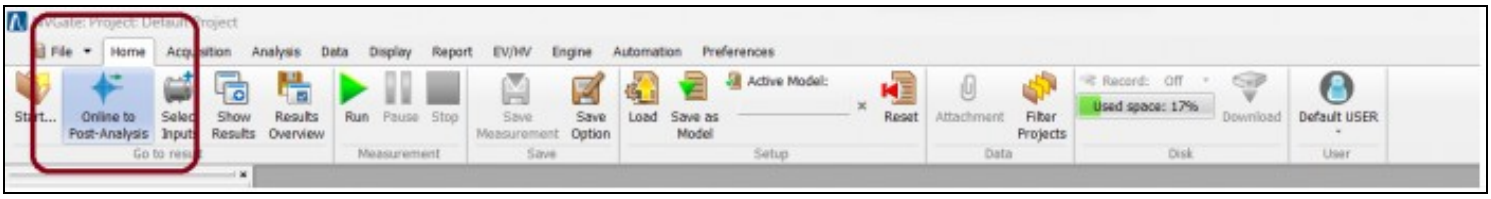
The post analysis mode can be made in connected (starting NVGate with the analyser) or office mode (starting NVGate with the dongle). However, we strongly advise to perform post analysis in Office mode, as the communication between the PC and the analyser will limit the performances. To do so, the signal must have been downloaded from the analyser to the computer.

20.1 Tutorial

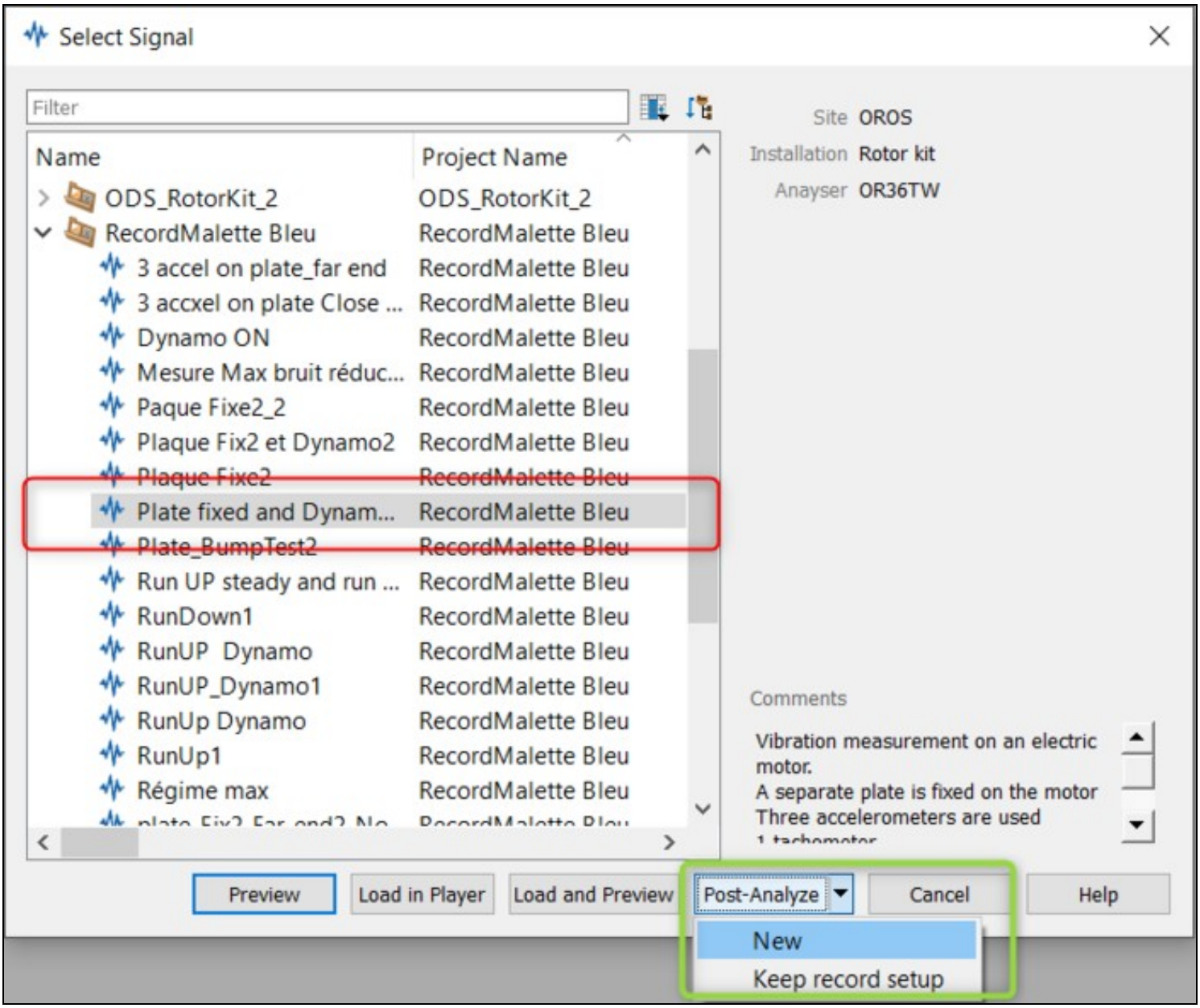
In this tutorial, we will perform the post analysis of a signal recorded during a previous measurement with an OR36TW. The post analysed record is a run-up, a run-down, and a phase at steady speed of an electric motor. The electric motor is linked to a Dynamo and a plate is attached to the its base. 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.

20.1.1 Loading the signal

switch to post analyse more from the "home" tab

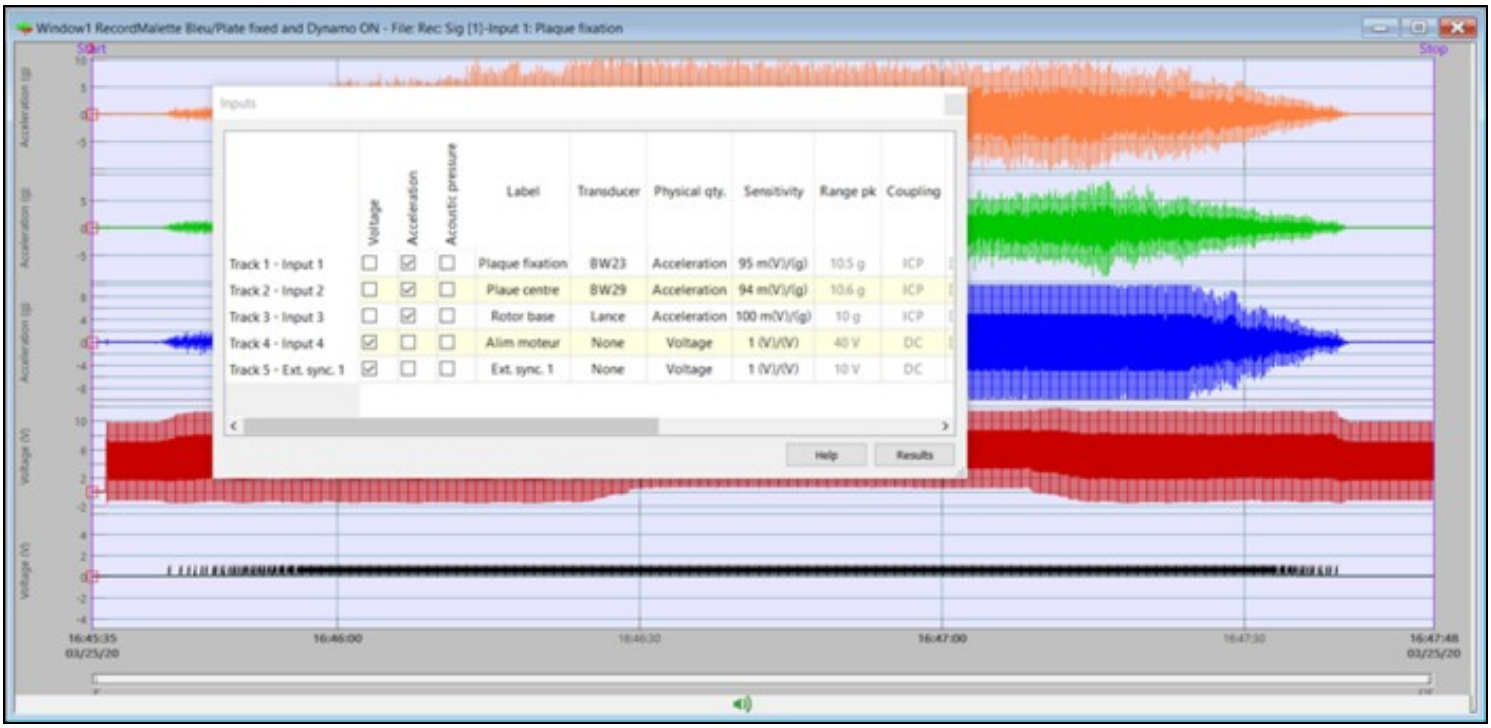


After clicking the *Select Signal* window is open. This window allow you to select the signal you want to load. Here, I select the record "Plate fixed and Dynamo" and slect *New* under the *Post Analyze* button :


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 :

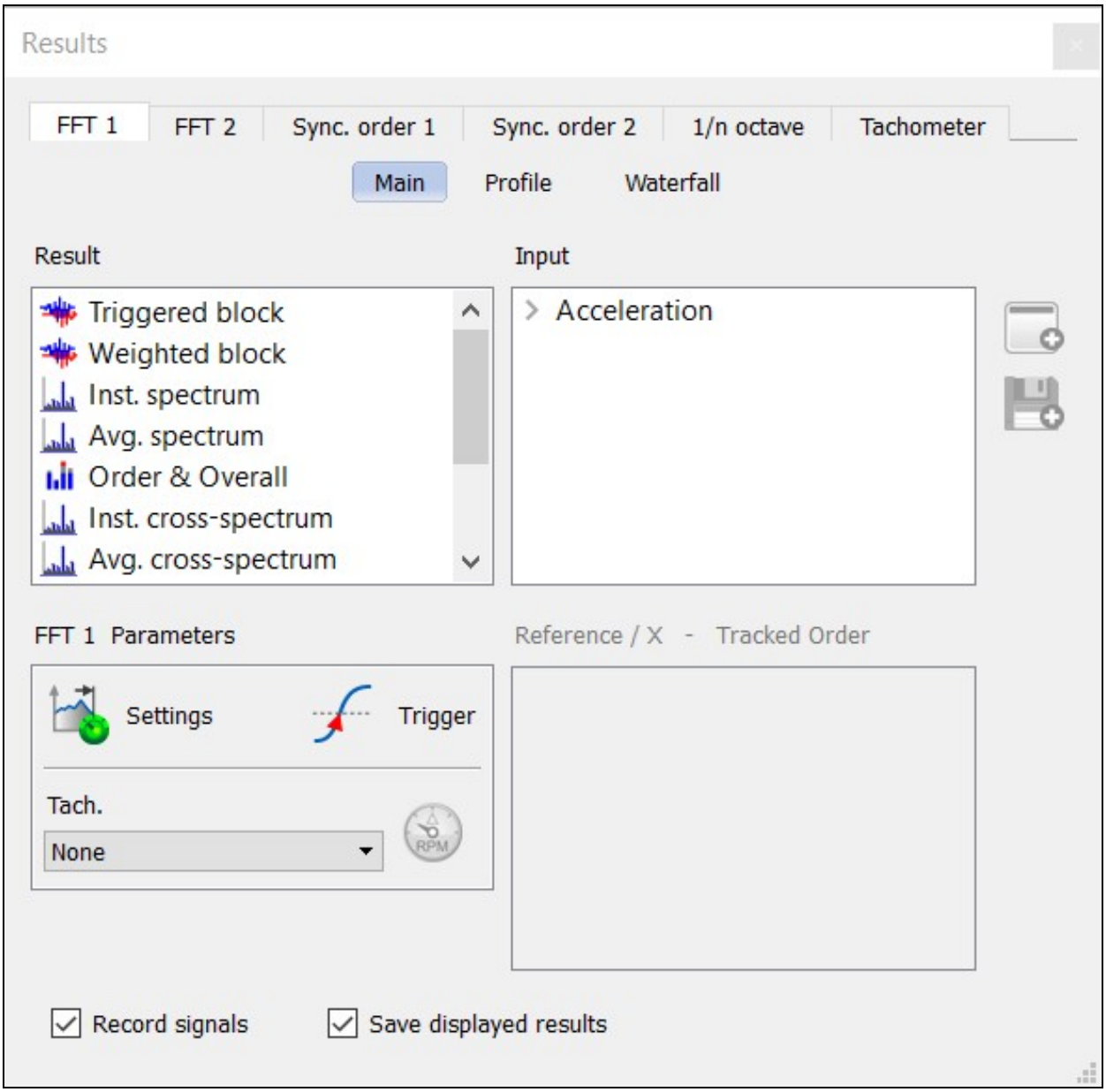


You can see that the frontend inputs are replaced by the tracks of the record.

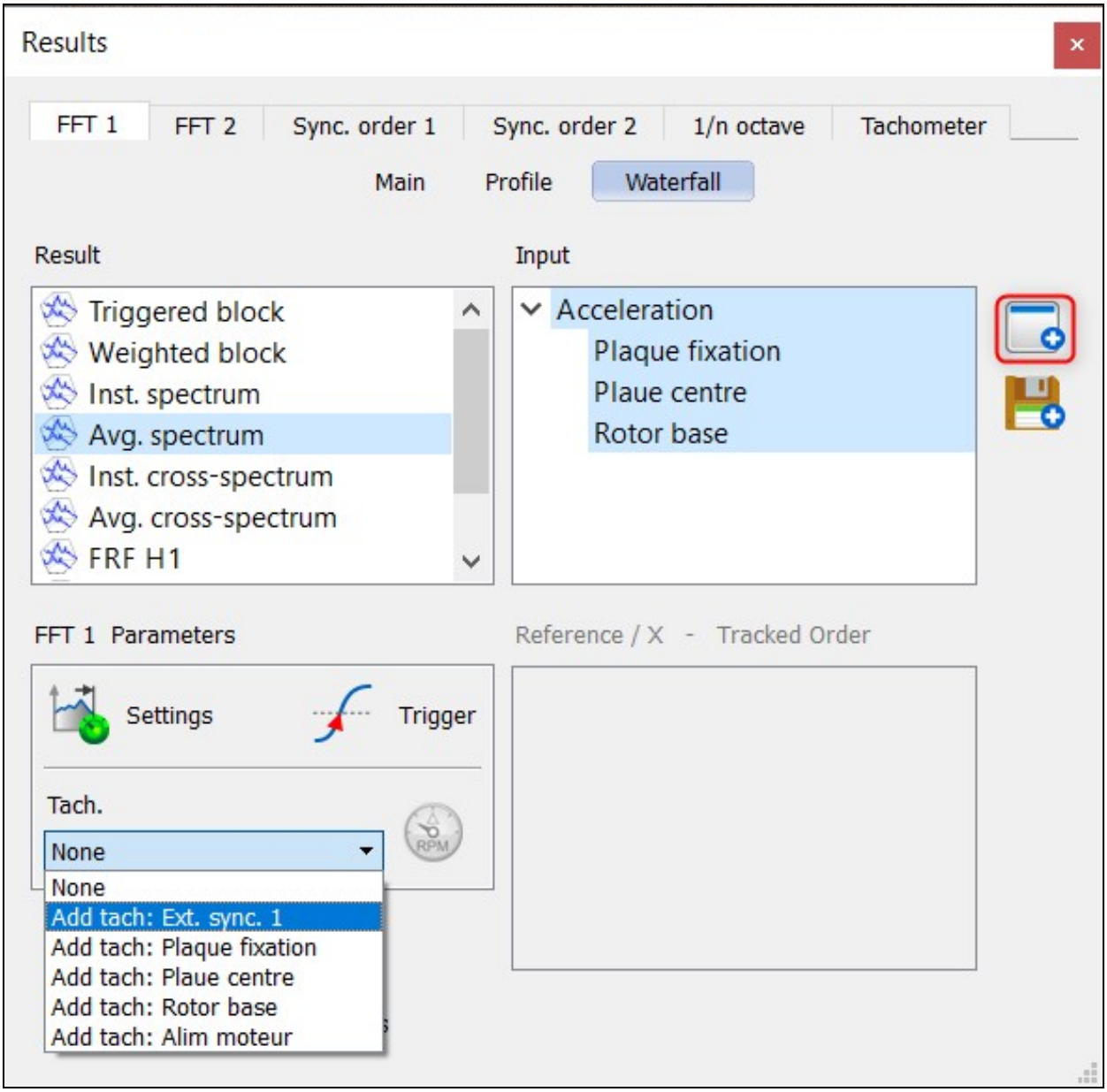
20.1.2 Connect the tracks in the plug-ins

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.

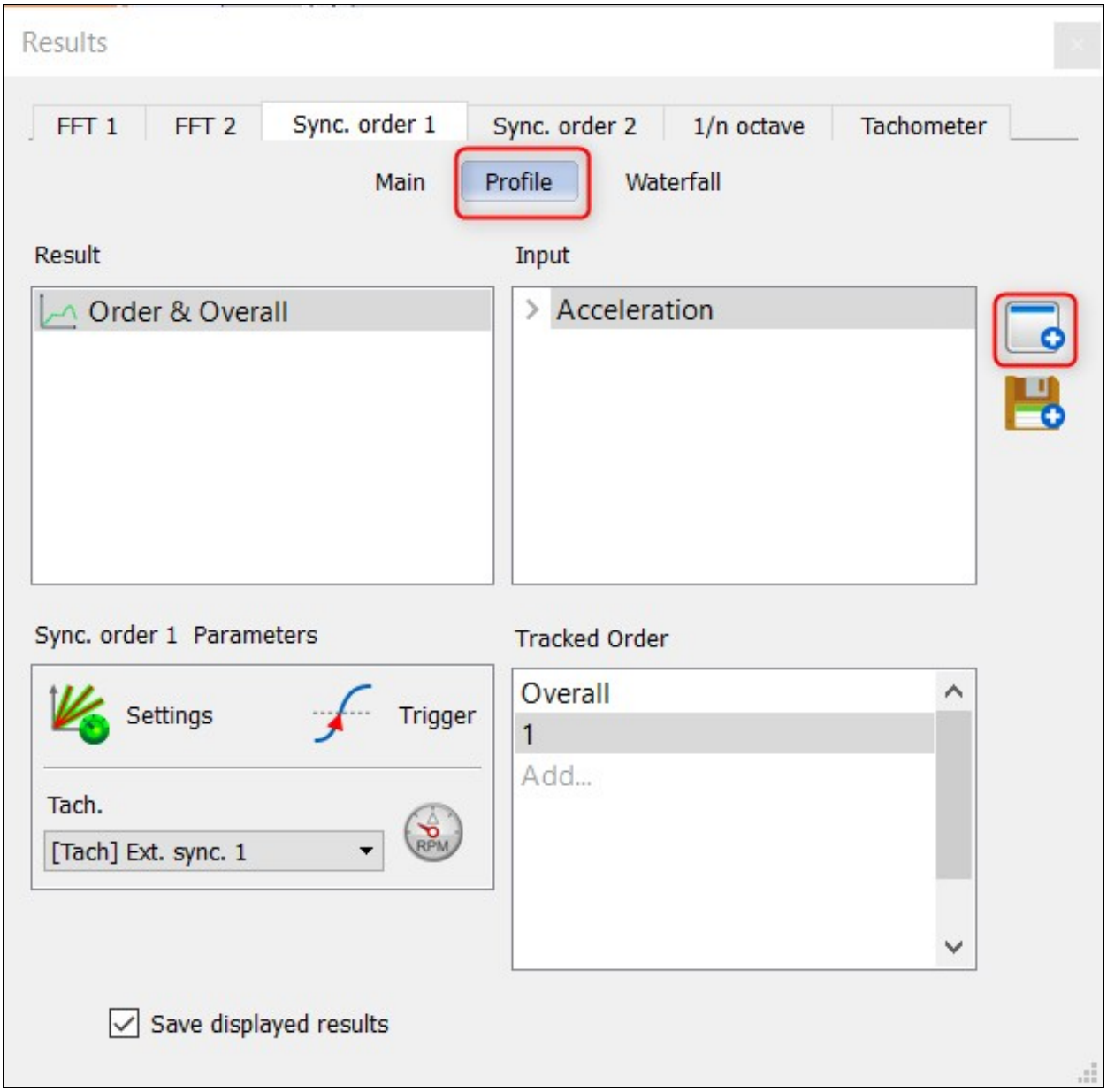
To connect the tracks in the different NVGate plug-in, click on *Result* to open the *Show result* window:


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

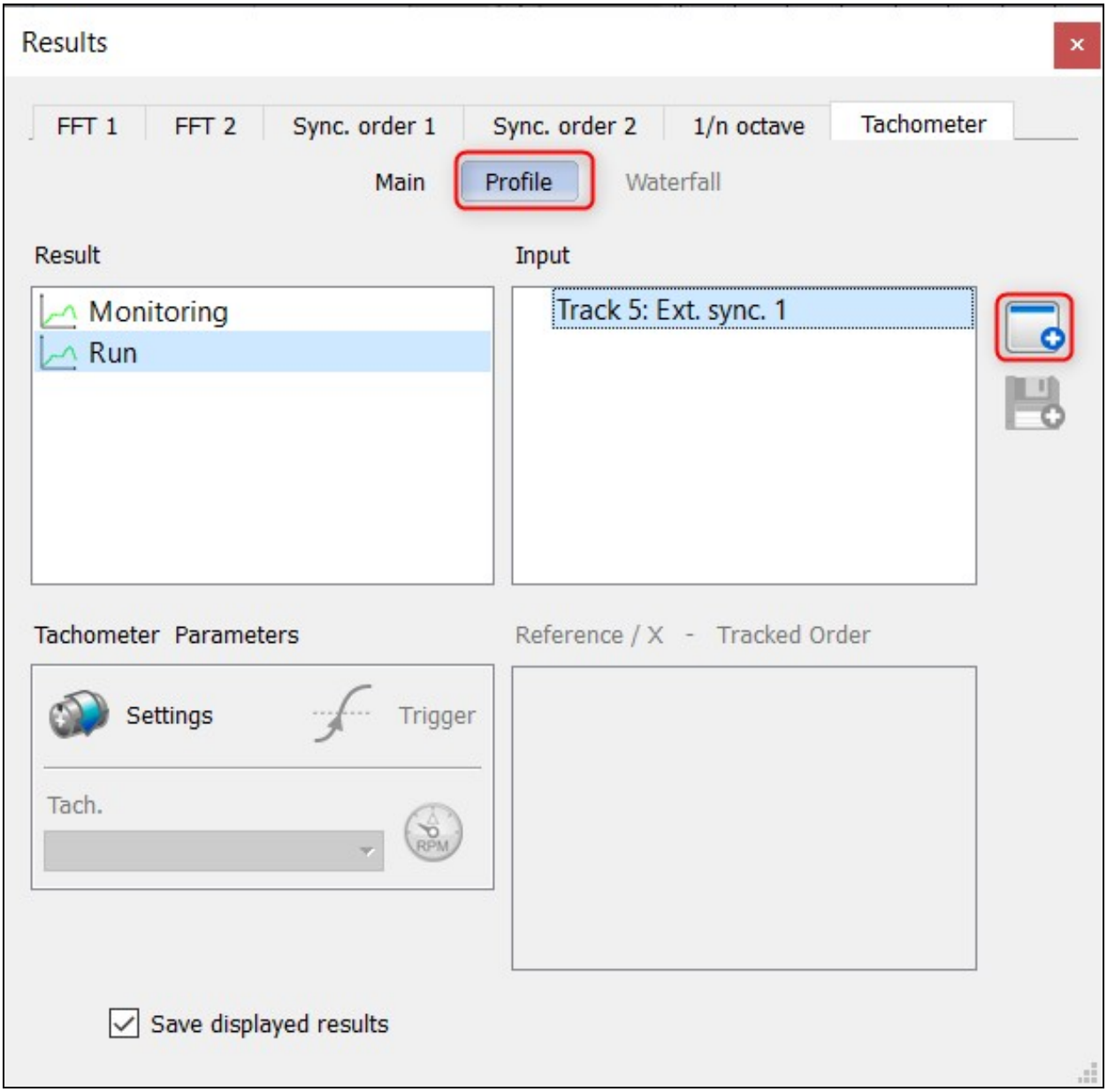
We can now connect the tracks in the FFT module to display the waterfall :



In the SOA plug-in to display the profile:

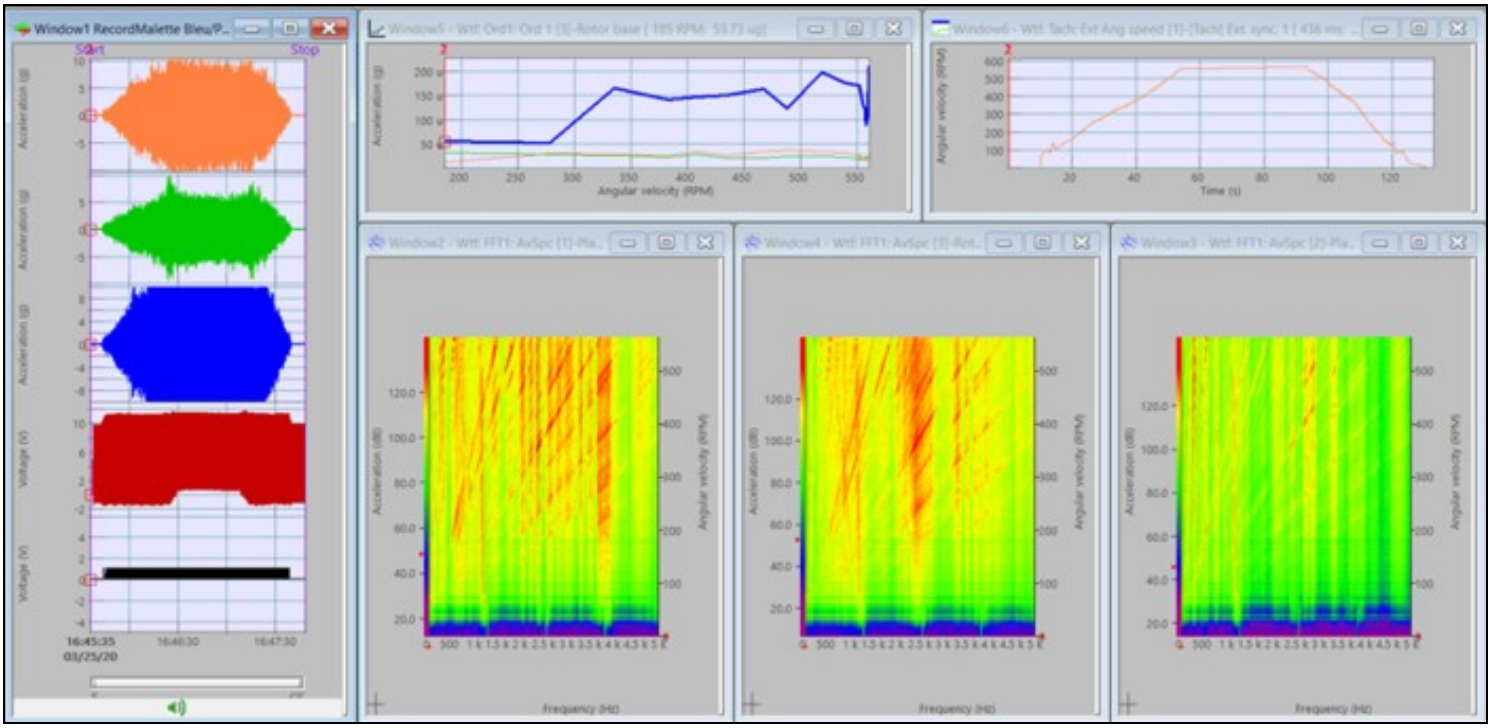


And in the tachometer section to display the tachometer profile:



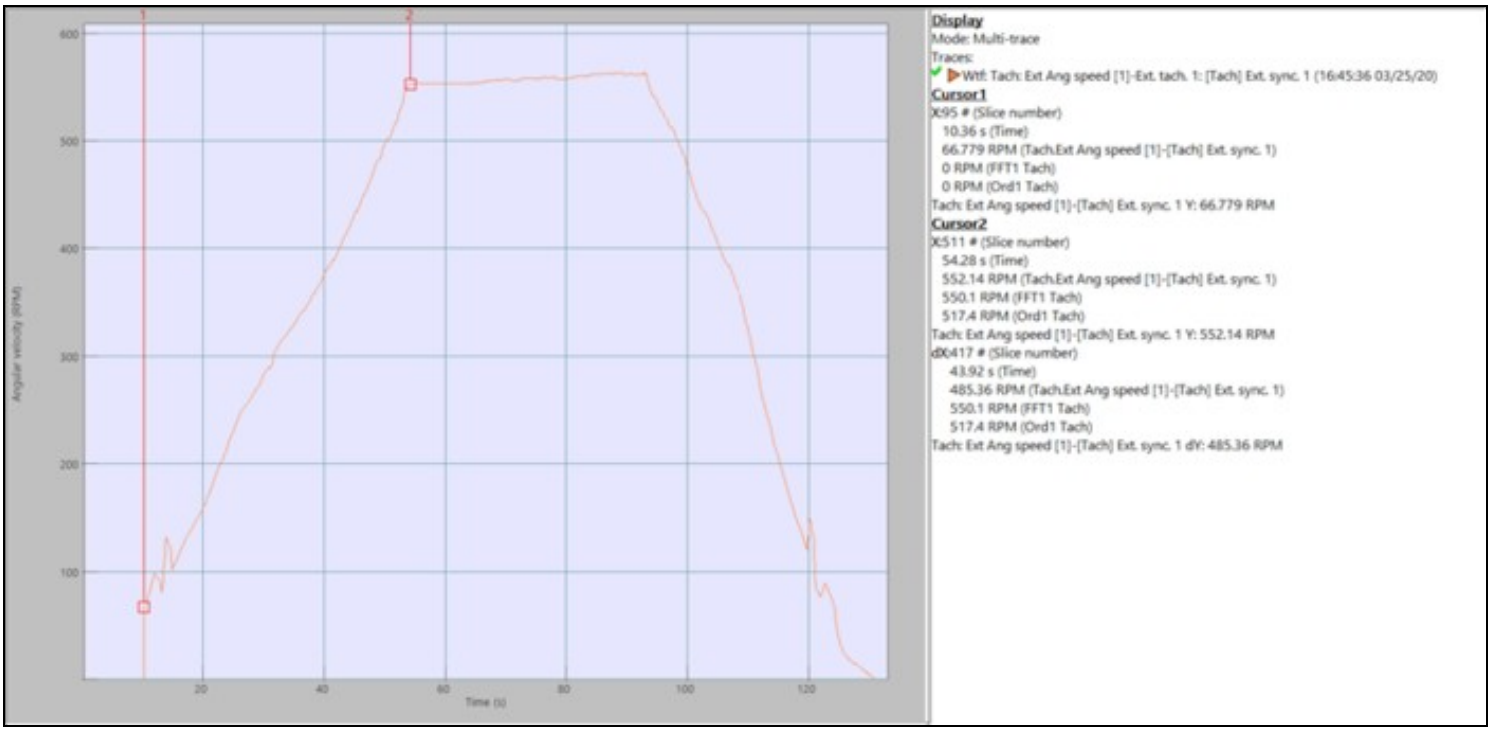
- **Note :** please refer to the NVGate software tutorial and the plug-ins pages to correctly setup each modules and displays.

After displaying all the wanted results, I can run the acquisition by the same manner as On-line mode, by clicking on  :

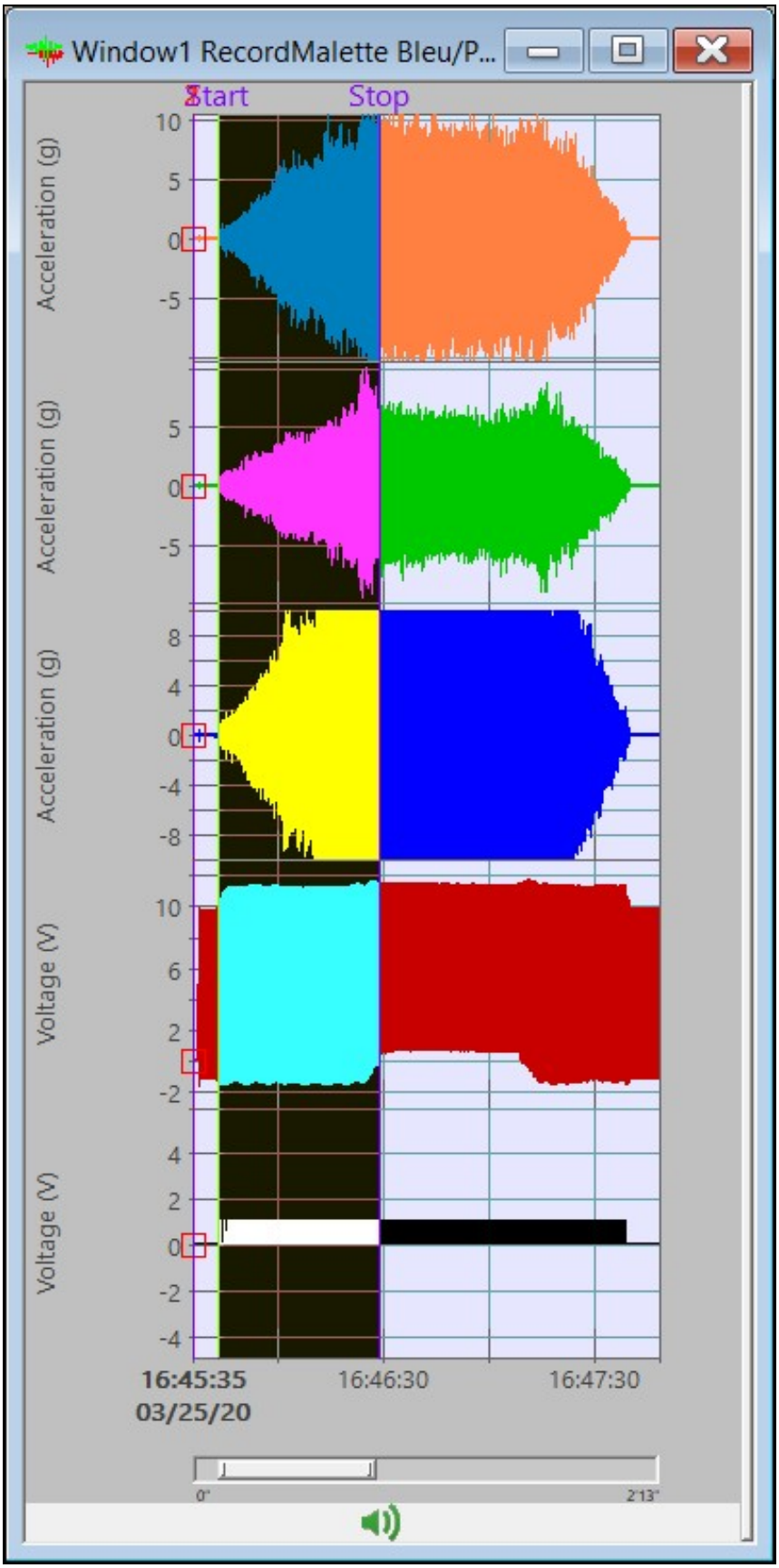


20.1.3 Selecting specific ranges

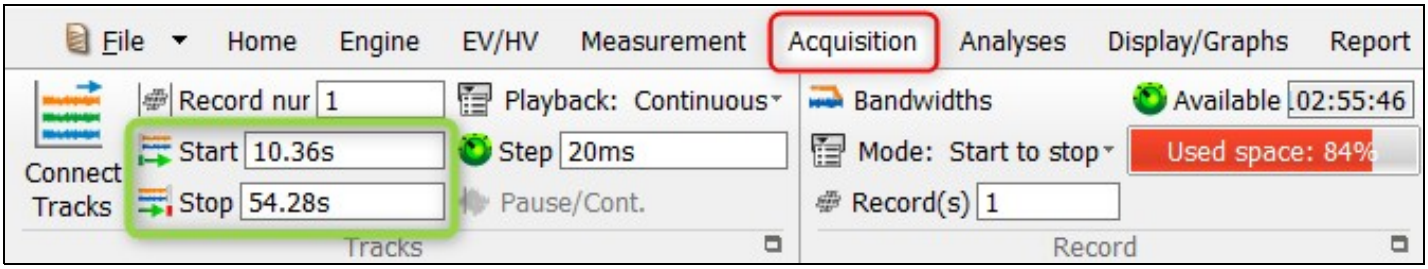
After this first acquisition, the three phases of the measurement, the run-up, steady state ans run-down, are clearly visible on the tacho profile, and I can use the cursors to find each starting and ending points :



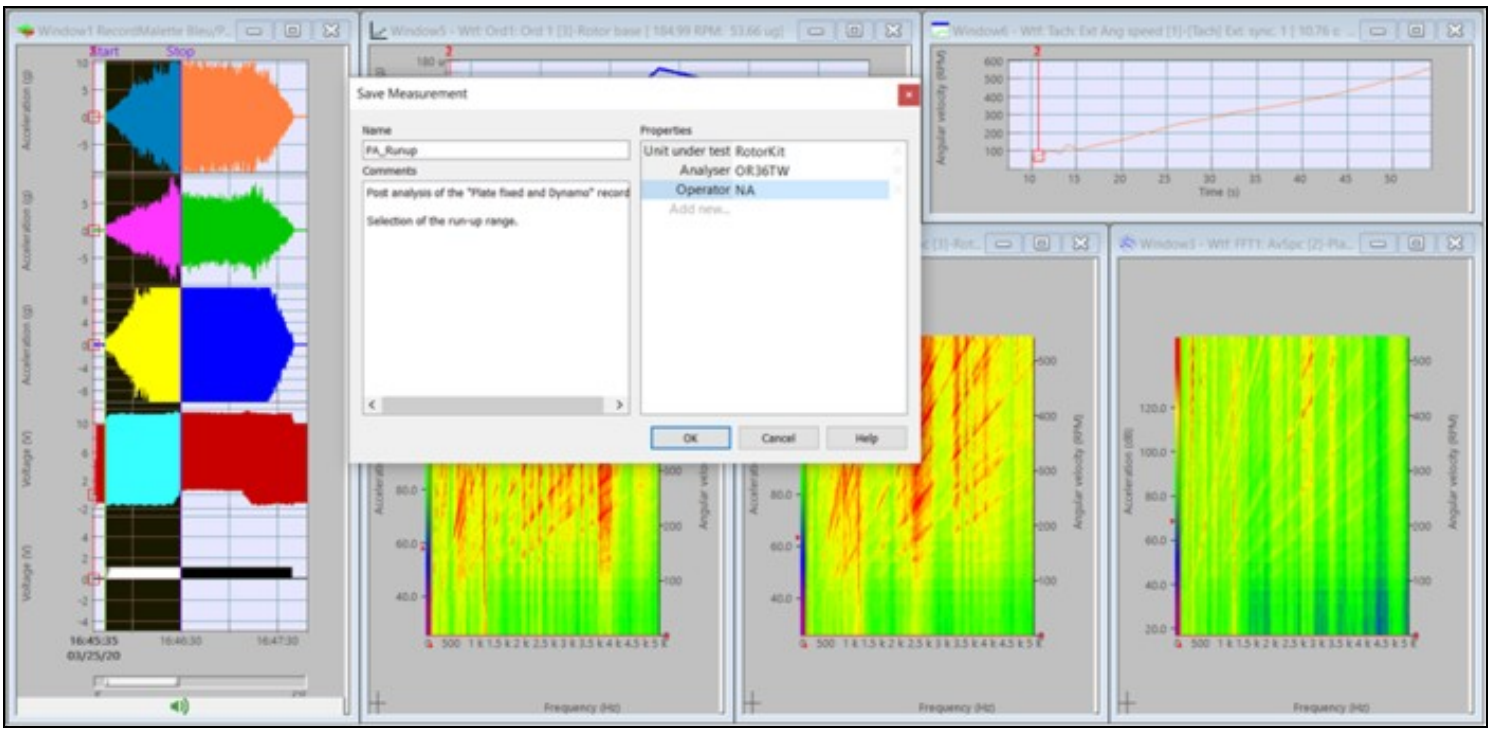
We can now select the specific ranges to separate our analysis on the three states of the record and create our new measurements. The run-up is between 10.36 and 54.28 seconds on the record. We can either select the run-up's range with the mouse in the player :


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:

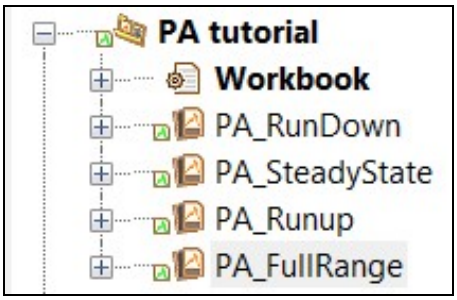


Once the range is selected, you can run the acquisition by clicking on  . Only the selected range will be analysed, and you can then save the results :



20.1.4 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).

20.2 Parameters

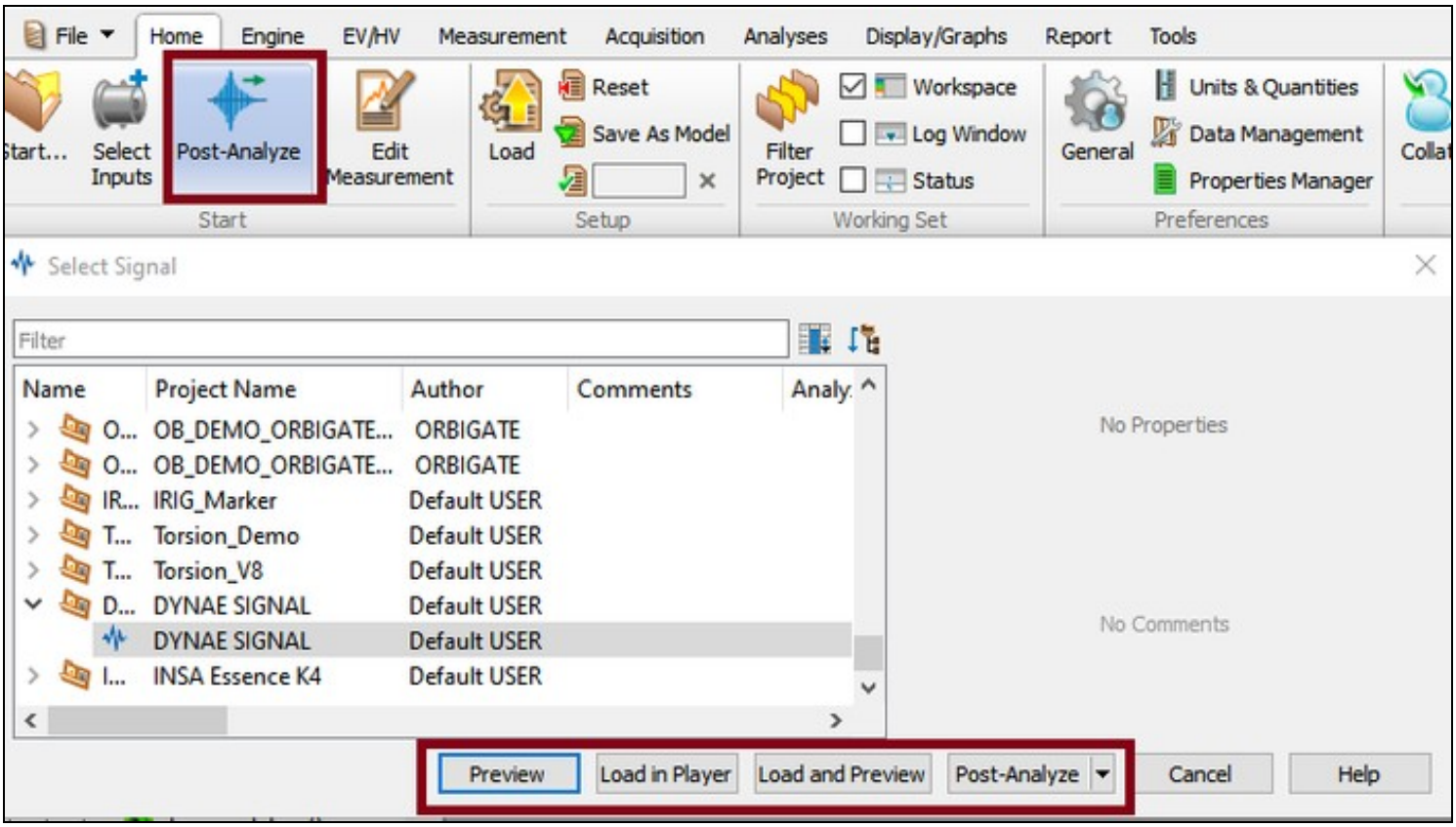
20.2.1 Loading a signal

In this section, we detail the two different method to load a signal and switch to post analysis mode.

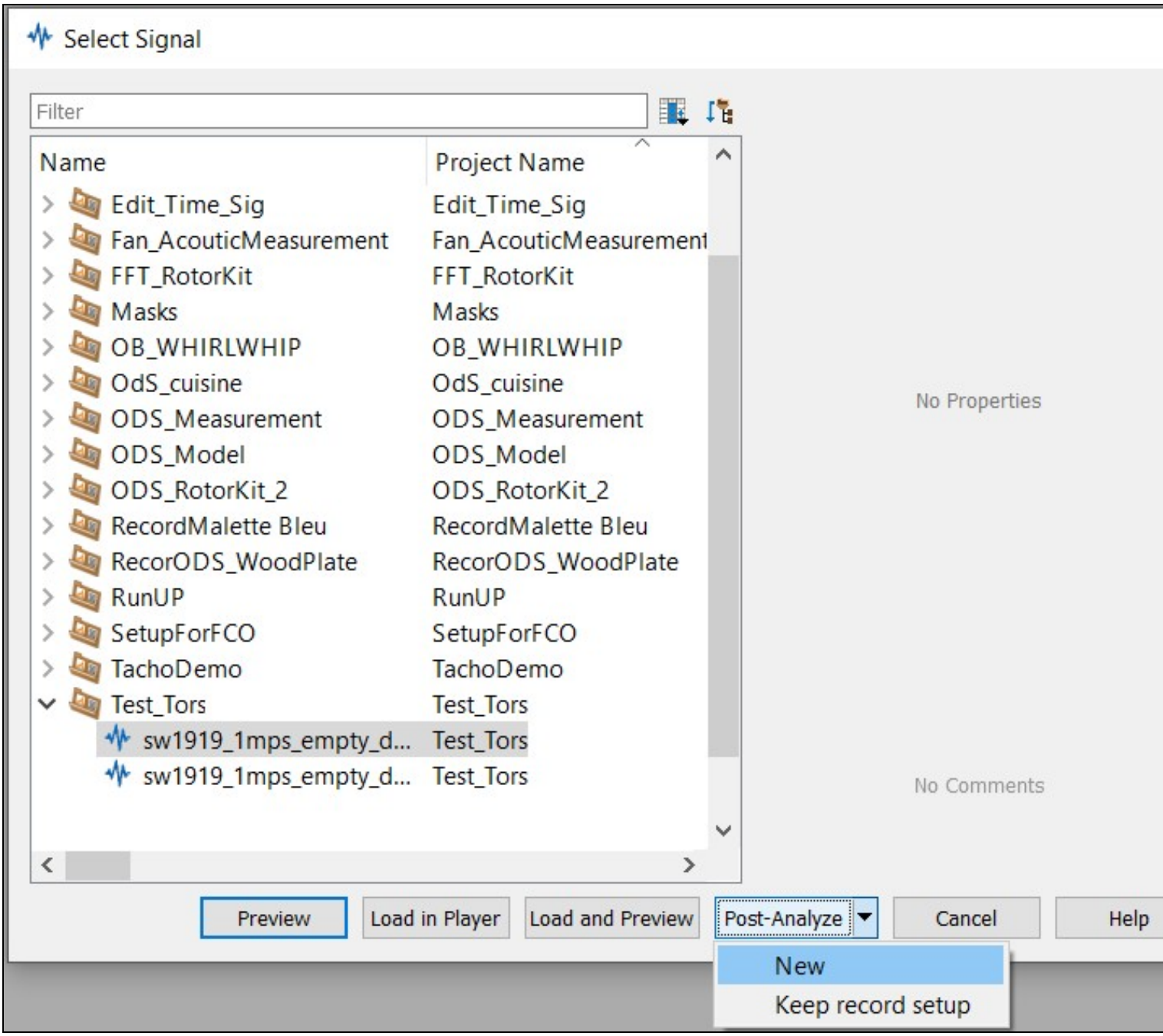
20.2.1.1 New setup option

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.

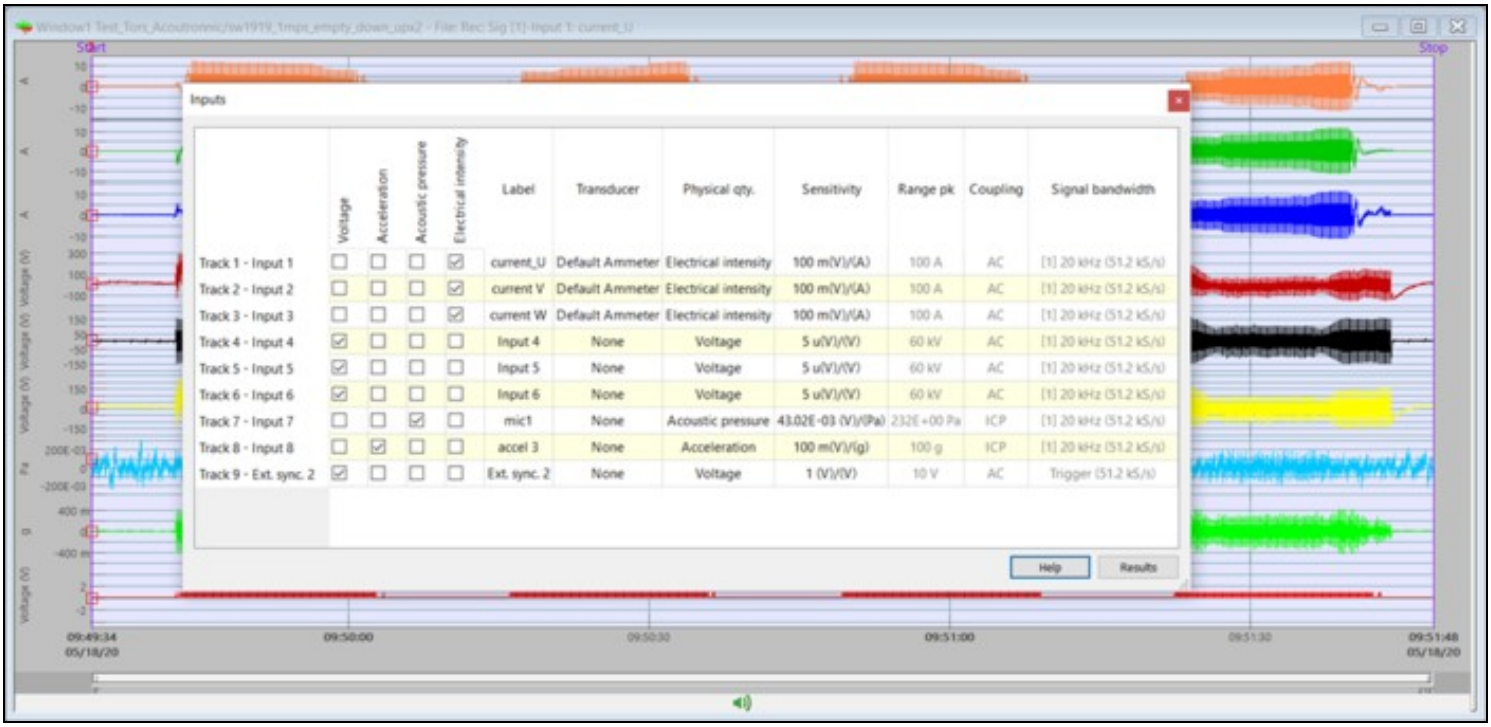
- From the Home tab / Start group, press the *Post-Analyze* button. This will display a selection of signal files available for post-analysis:



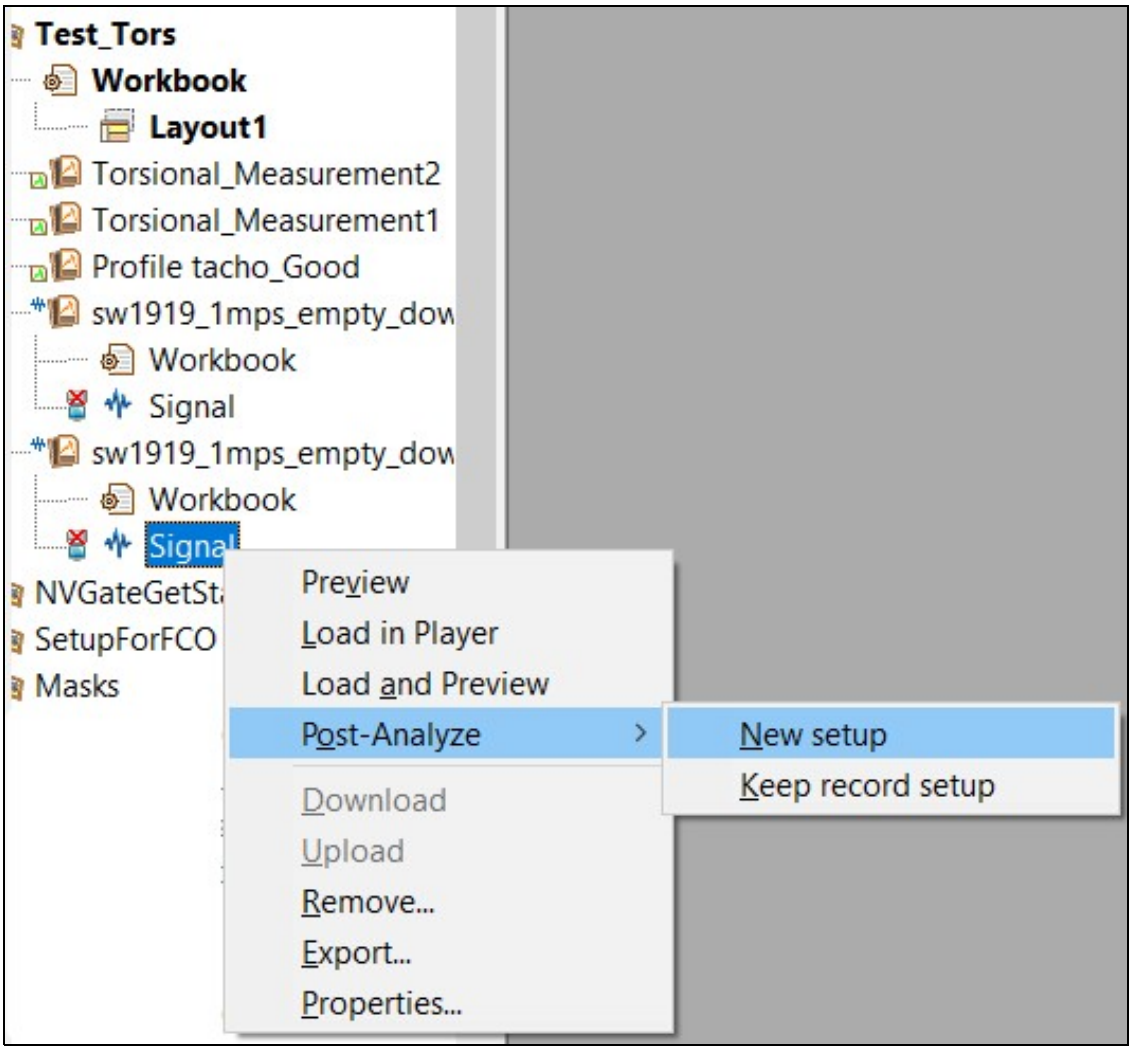
Click on the descending arrow to select **New**:


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

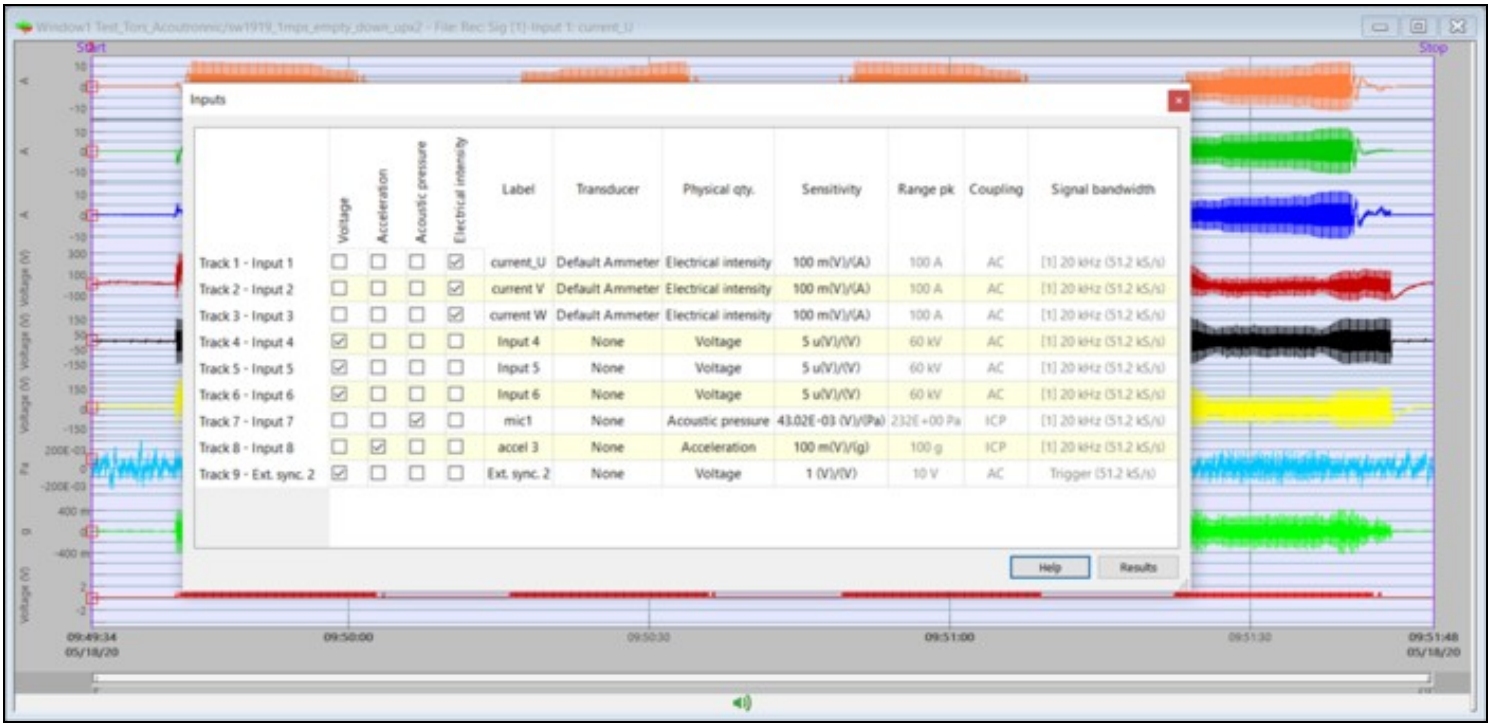
This will open the **connection properties** widow, and you can connect your tracks in the different module to perform your post analysis.



- 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.

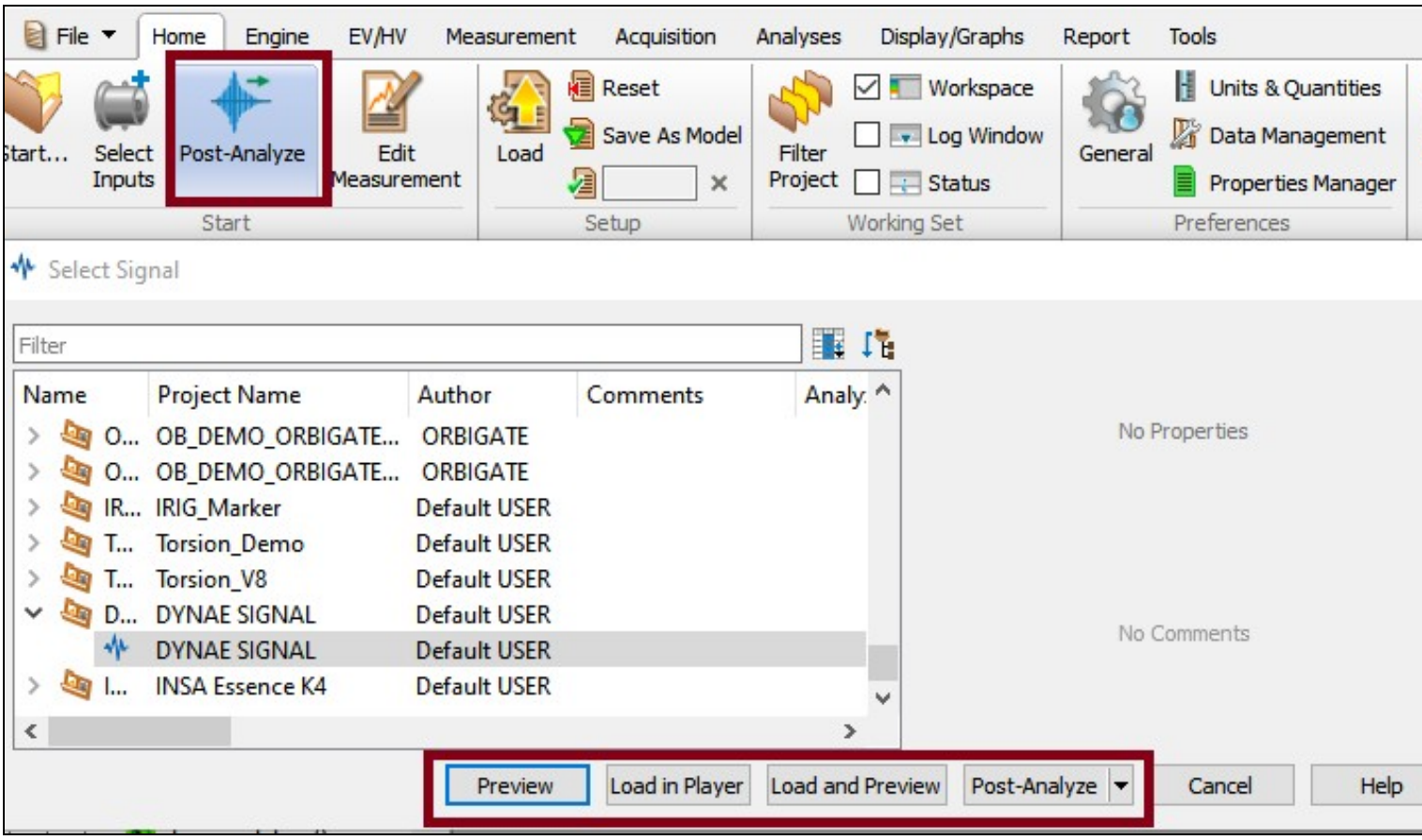


if you are already in **post analyse mode**, the current setup will not be deleted if you load a new record with this method. Therefore, you can use this method to post Analyse two record witht the same analysis setup. However, the records must have the same track number and type.

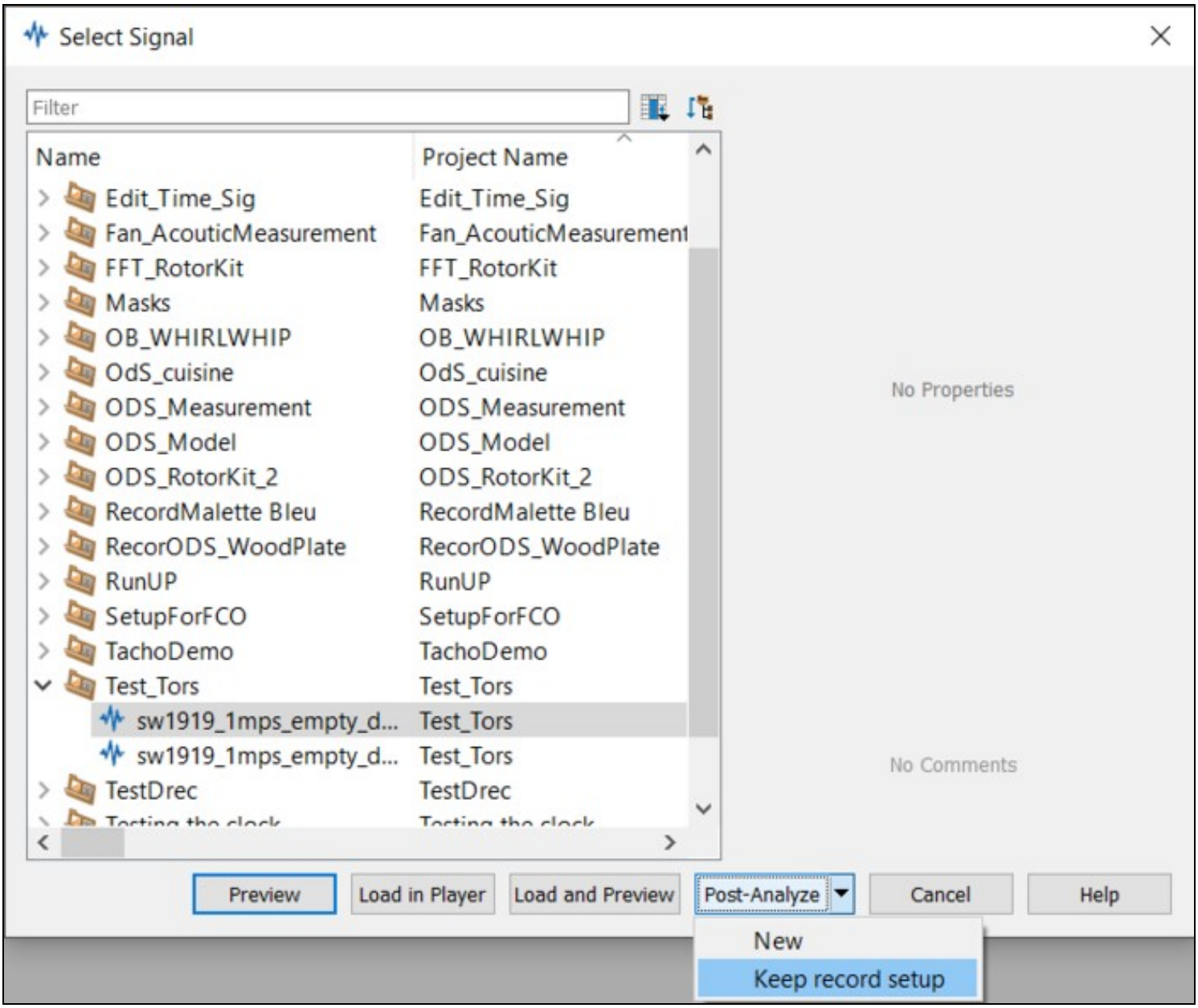
20.2.1.2 Keep recording setup option

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.

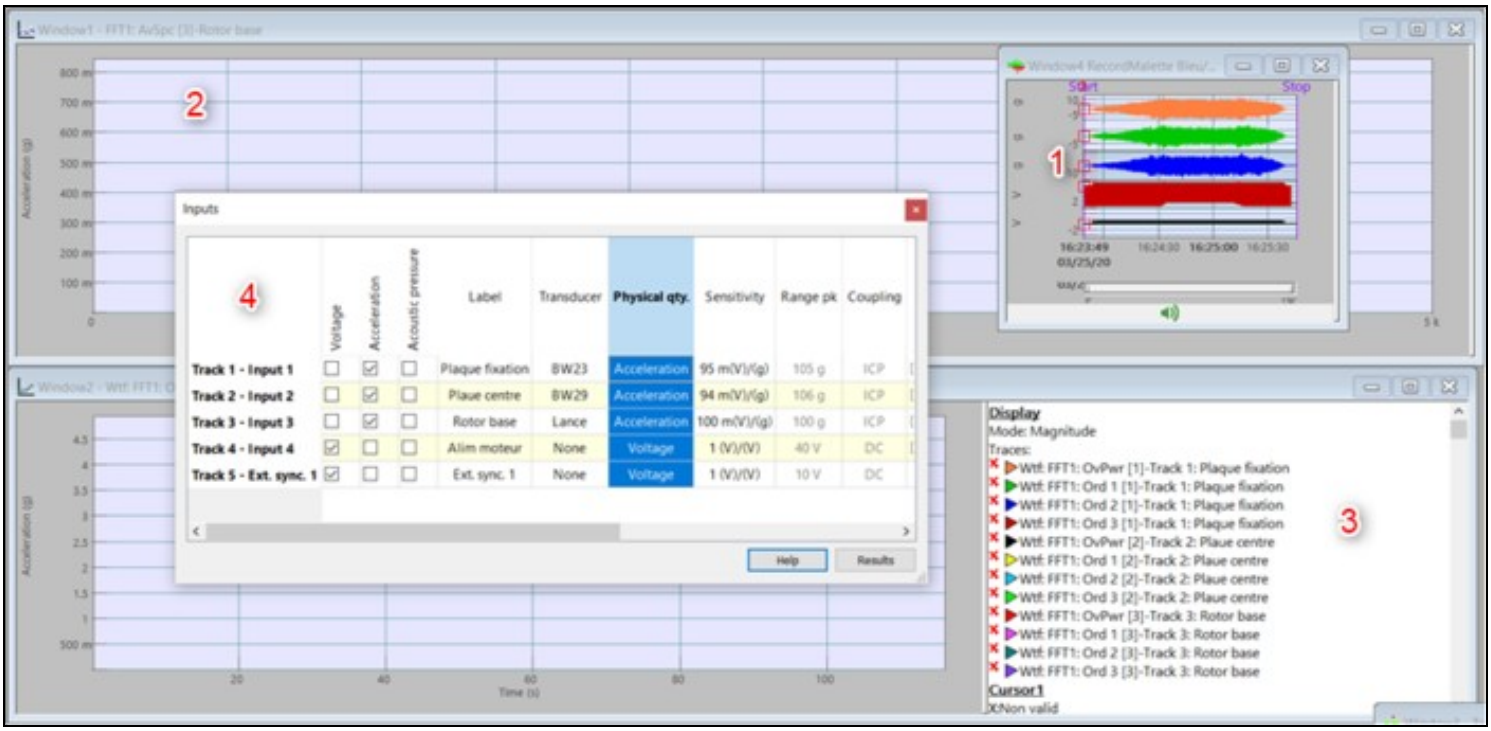
- From the Home tab / Start group, press the *Post-Analyze* button. This will display a selection of signal files available for post-analysis:



Click on the descending arrow to select **Keep record setup**:

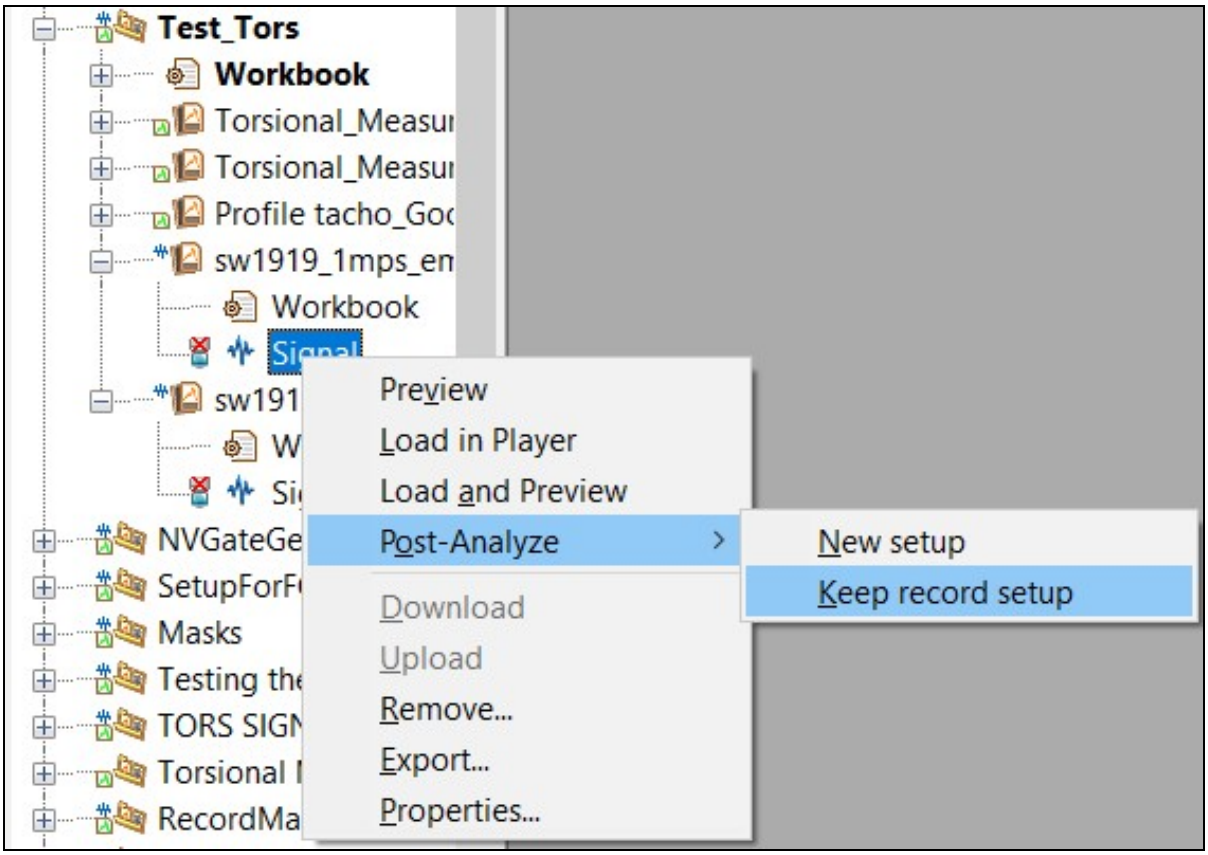

Select Signal
Filter
Name
Project Name
Edit_Time_Sig
Edit_Time_Sig
Fan_AcouticMeasurement
Fan_AcouticMeasurement
FFT_RotorKit
FFT_RotorKit
Masks
Masks
OB_WHIRLWHIP
OB_WHIRLWHIP
OdS_cuisine
OdS_cuisine
ODS_Measurement
ODS_Measurement
ODS_Model
ODS_Model
ODS_RotorKit_2
ODS_RotorKit_2
RecordMalette Bleu
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.

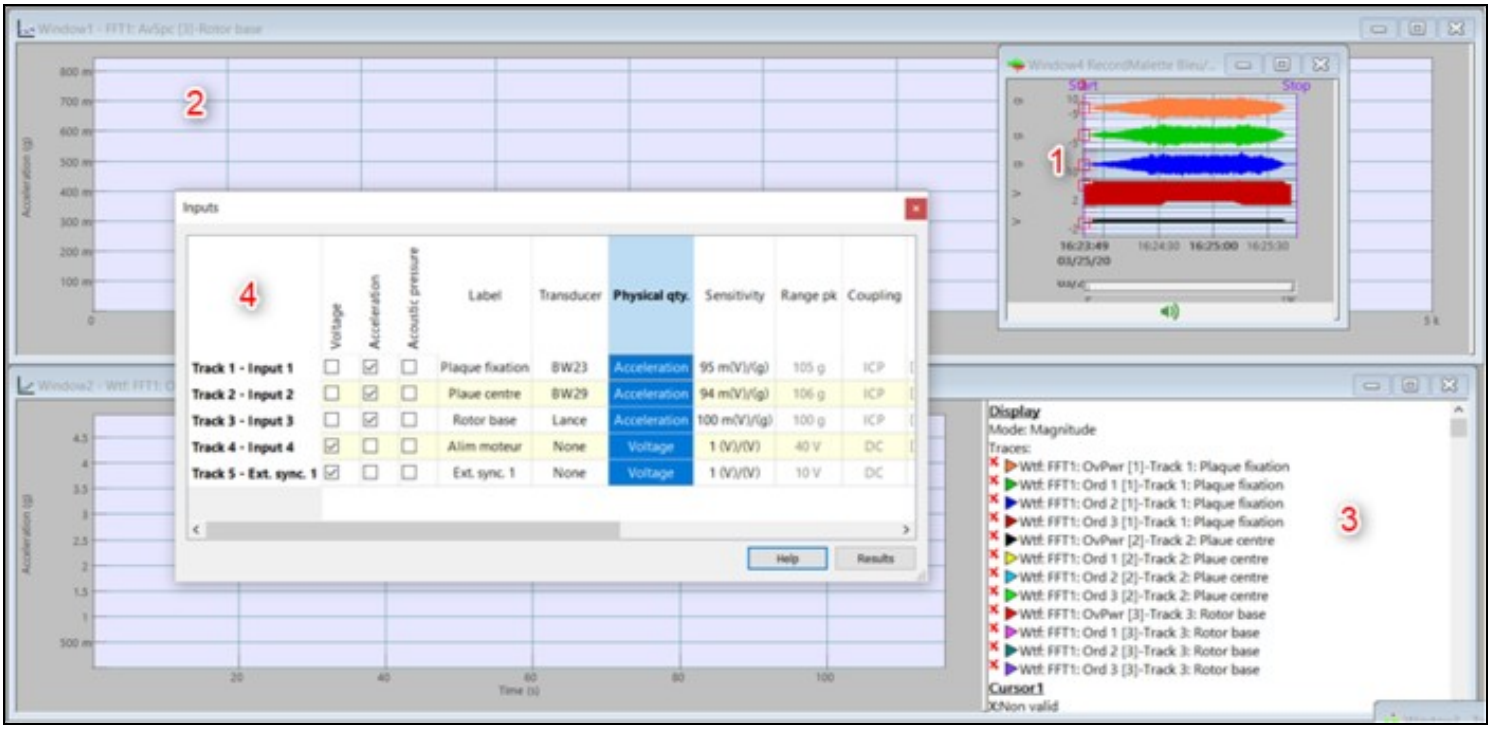


The opened plug-in are setup the same way as during the acquisition. So you can change these setup, as you would do for an online real time analysis.

- 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 :

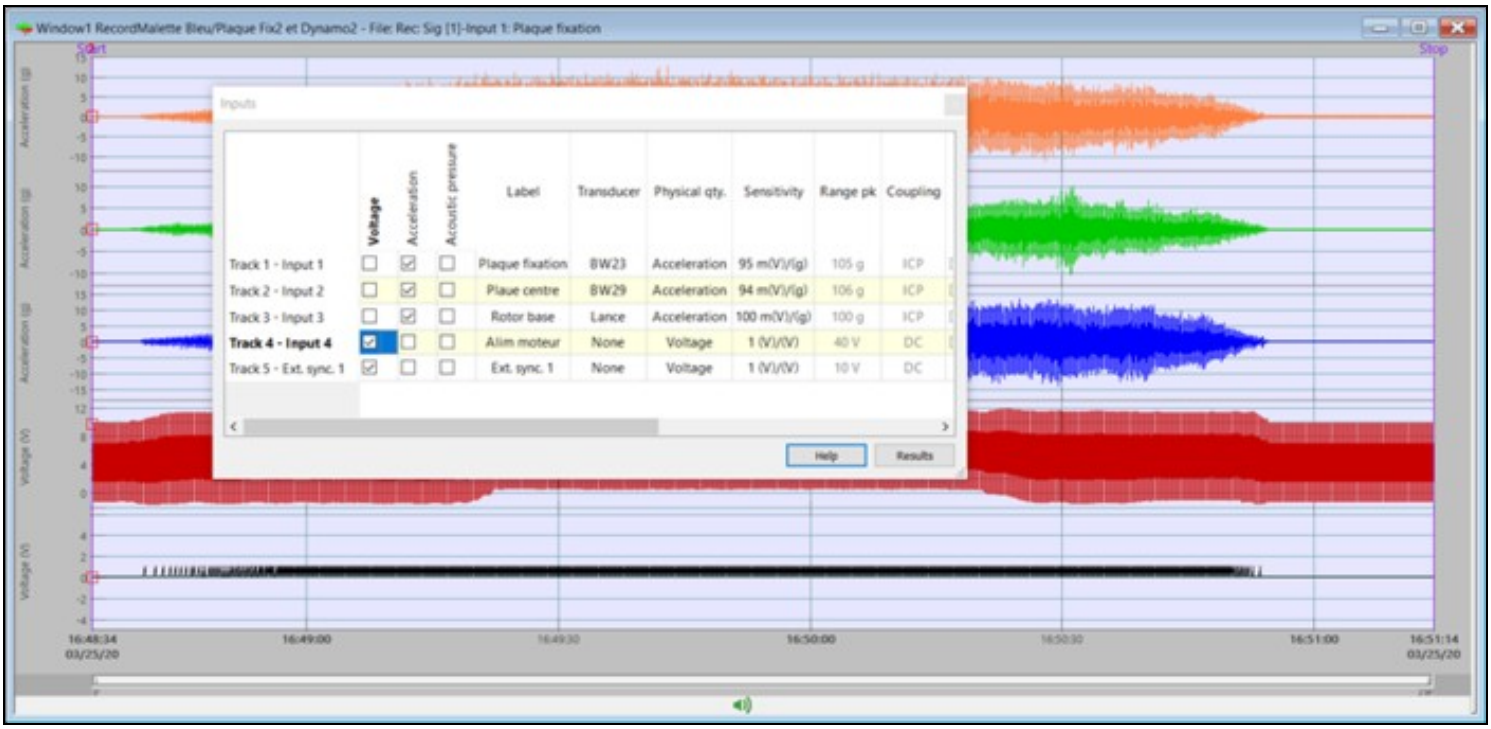
20.2.2 Connecting the tracks in NVGate

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.

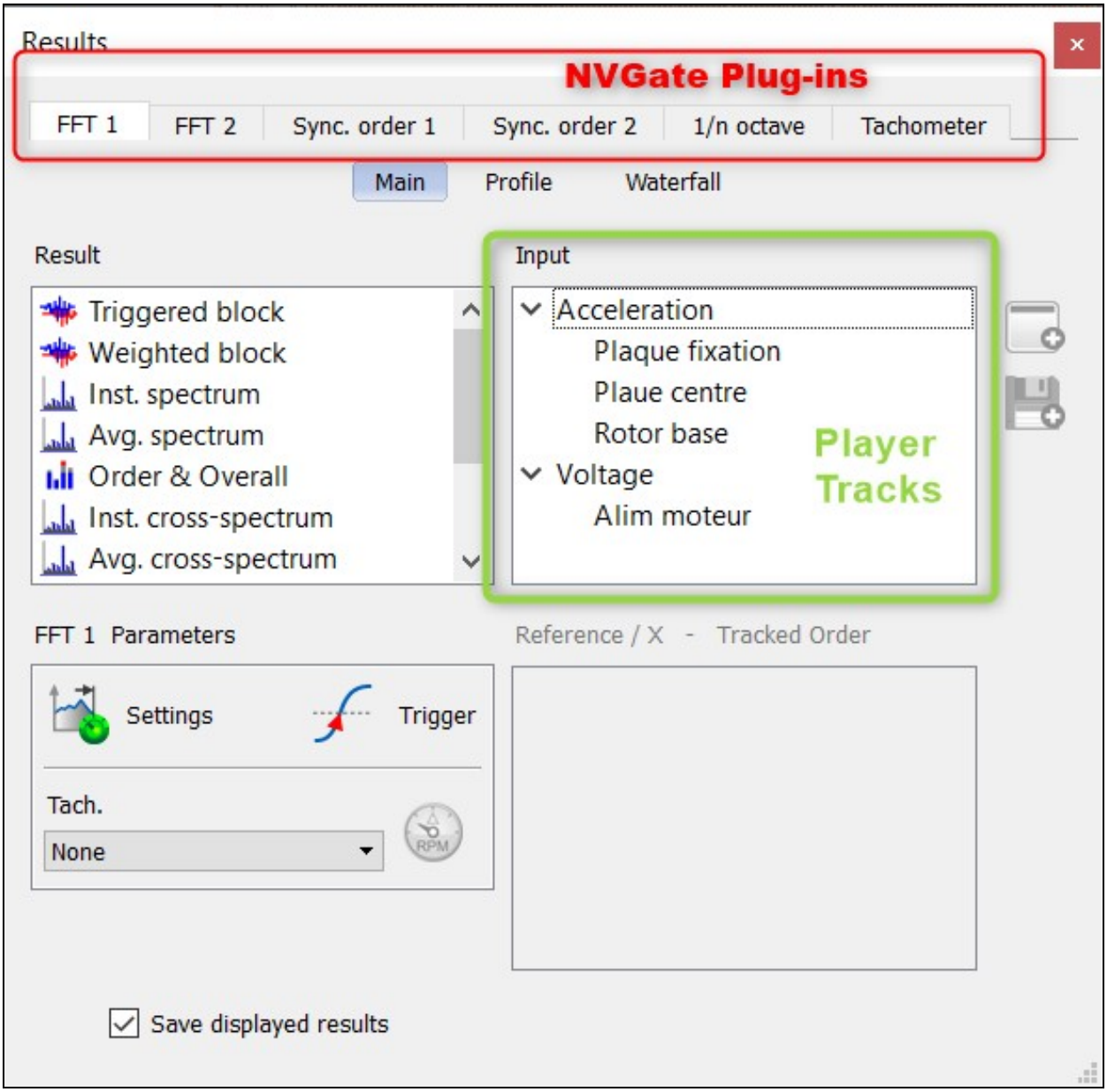
20.2.2.1 Connect tracks to the different modules

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.

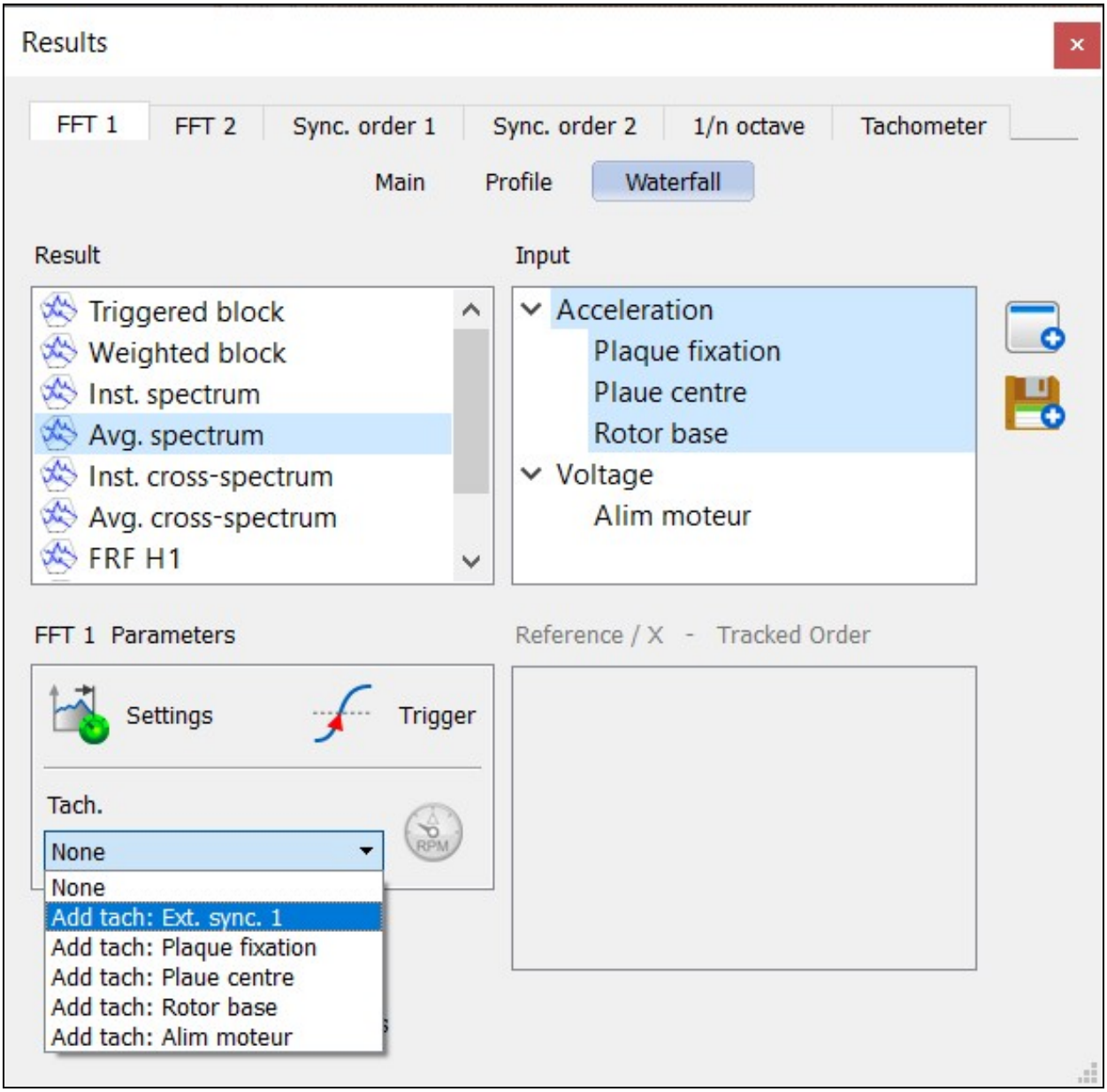
Once the record is load, the player window and the connect tracks window appears:

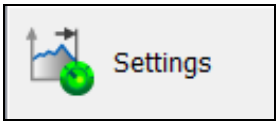


As in on-line mode, I can click on *Result* to display the *Result window* and connect the different tracks. The tracks appears in the **Input** section:

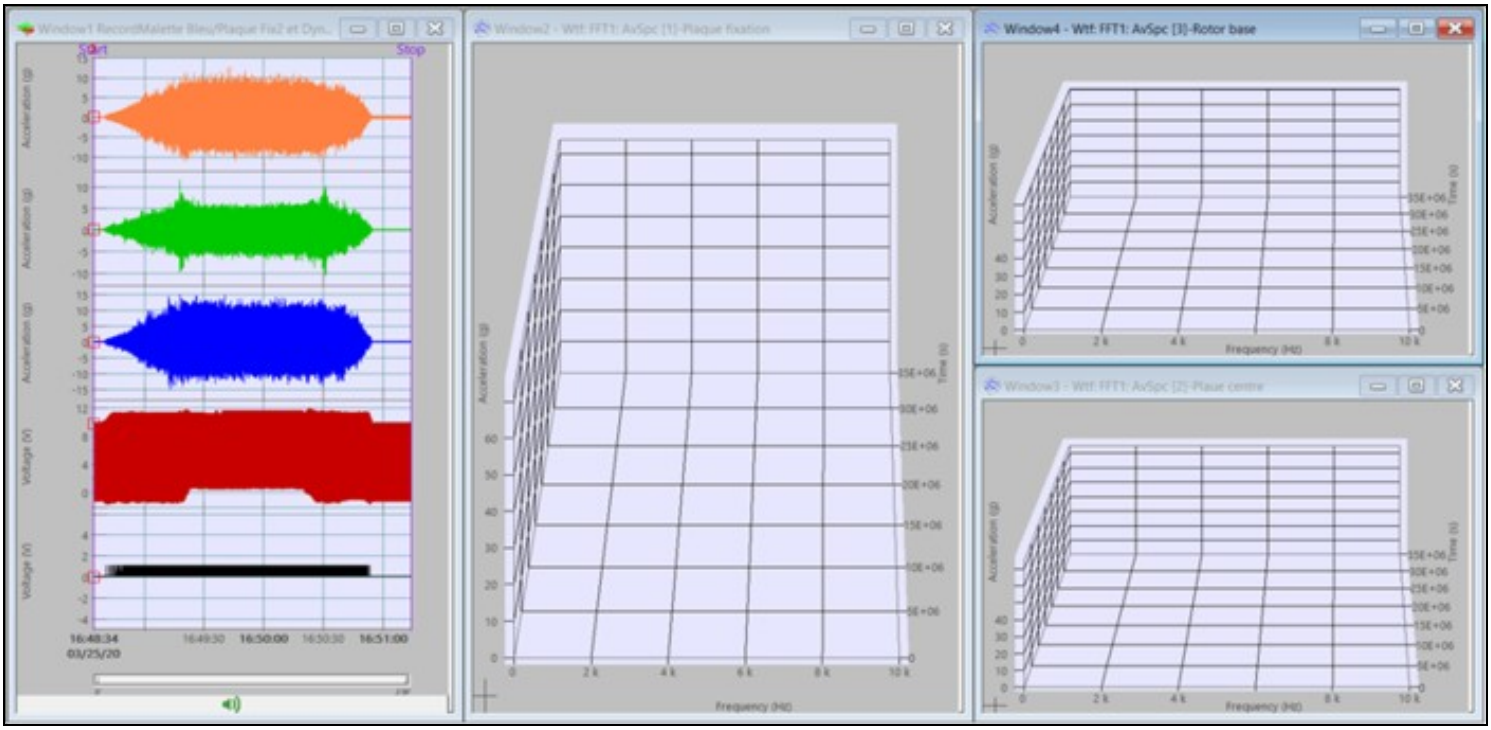


I can now create a waterfall of the Average spectrum of my accelerometers inputs, and add the tachometer Ext. Sync. channel as reference :



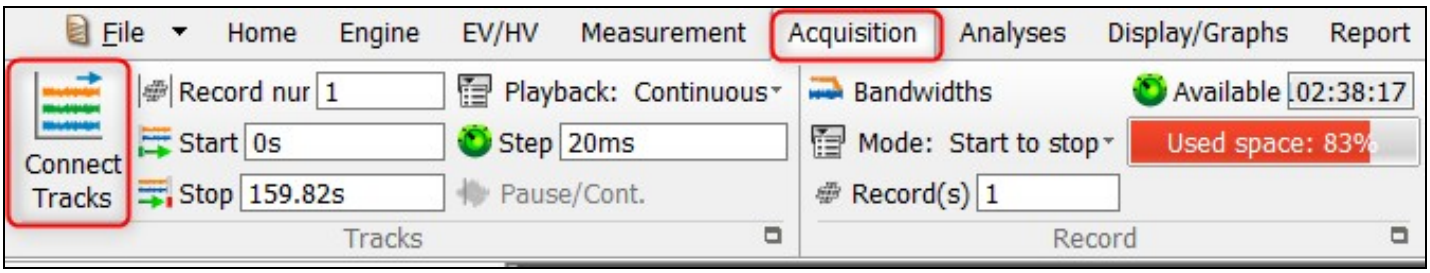
Then click on 

to adapt the setup of the FFT, and then  to display the waterfalls:

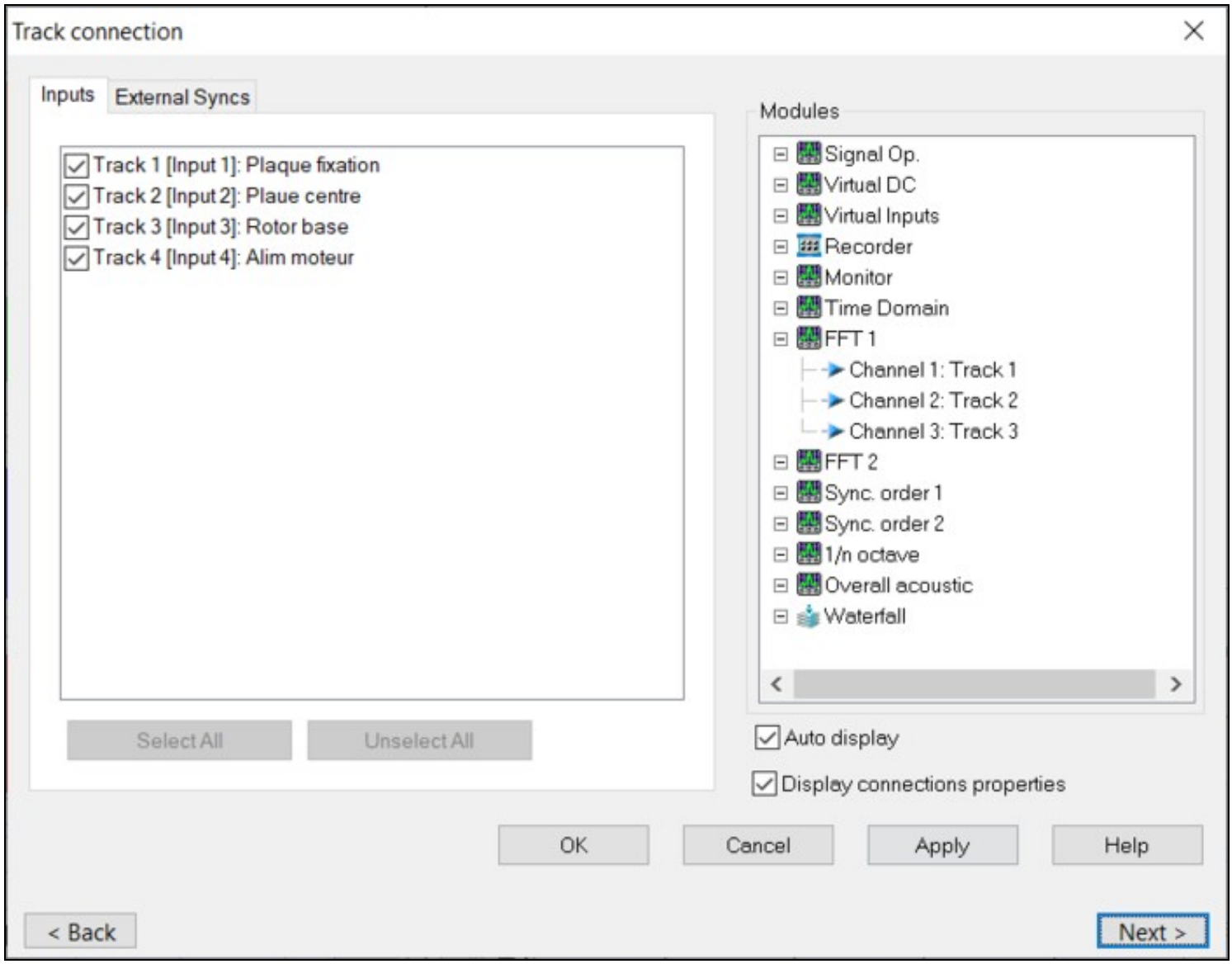


20.2.2.1.1 Connect tracks to the TDA plug-in

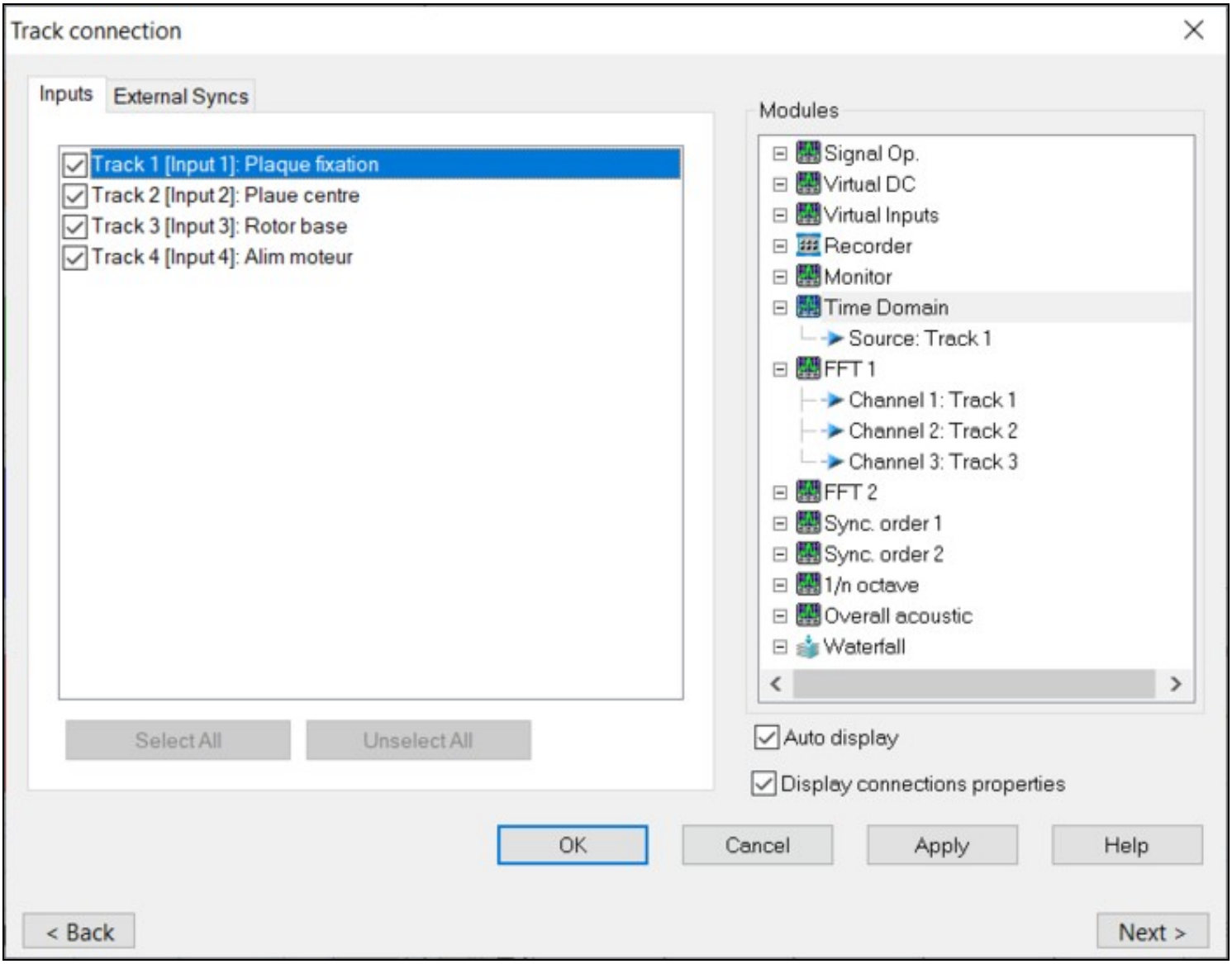
To connect tracks to the TDA plug-in, you cannot use the *Result window*. To use this module in post analysis, go into the Acquisition tab of the NVGate ribbon. Select *Connect Tracks* (which replace *Connect Inputs* of the on-line mode):



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.

20.2.2.2 Connect a tachometers as a torsional channels

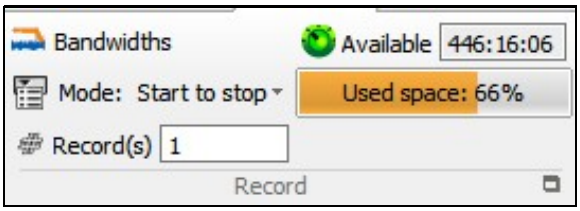
Post Analysis if often used for torsional measurement. for details about channel connection, you can directly visit the NVGate Torsional analysis wiki page.

20.3 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.

21 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:

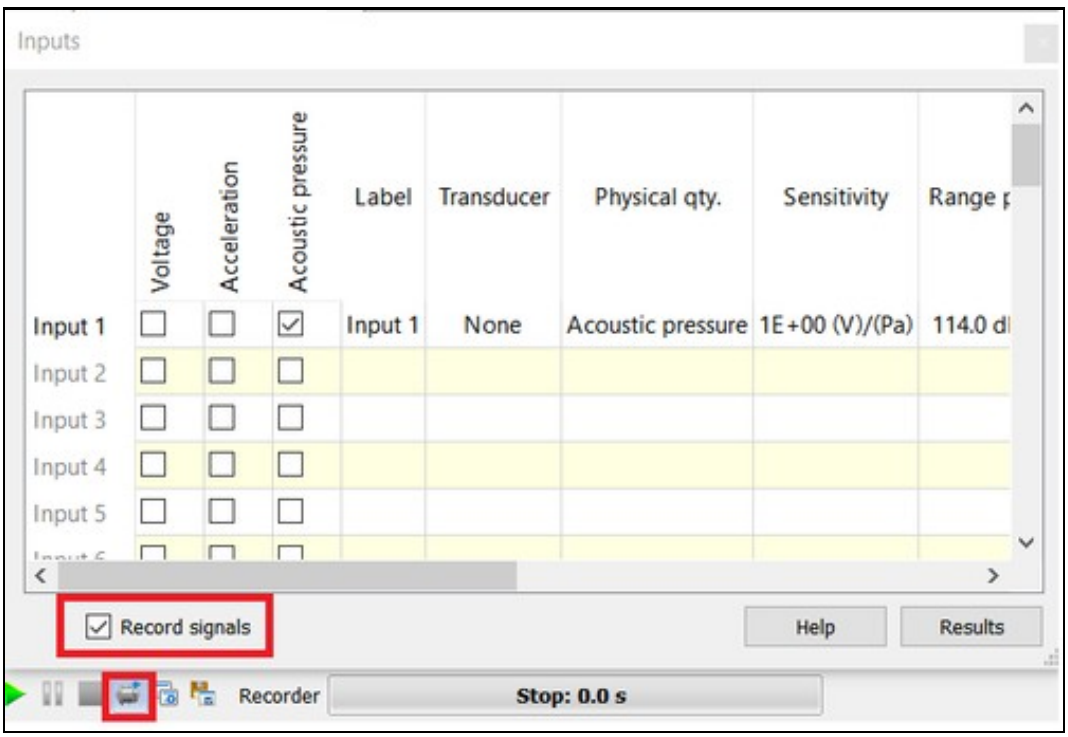
- One for parametric inputs
- One for external synch inputs
- Up to 2 for other inputs

The user can select a trigger event to start the acquisition of a record and another one to stop the record.

21.1 Tutorial

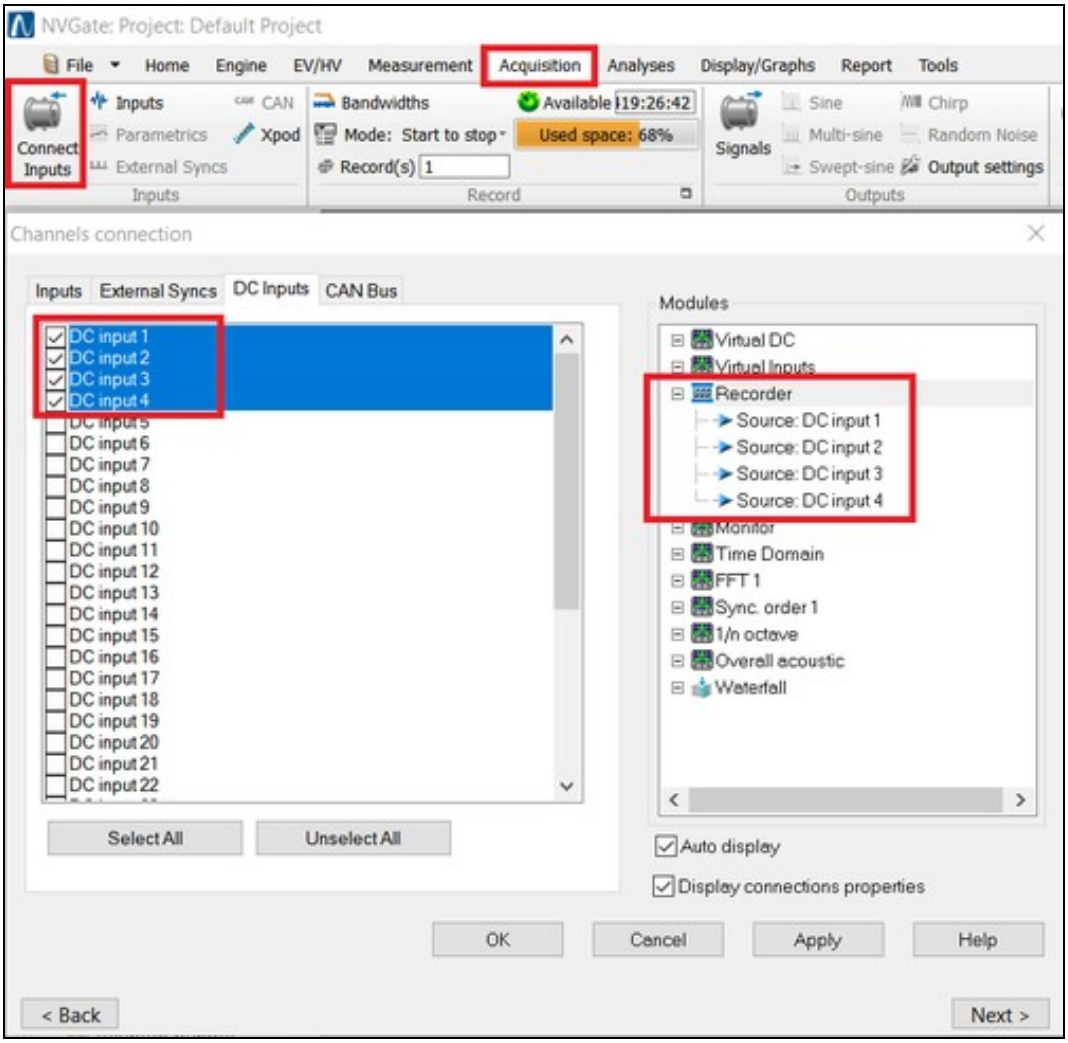
21.1.1 Using Go to result

Just click on "record signals" using Go to result windows. The track will be automatically recorded.



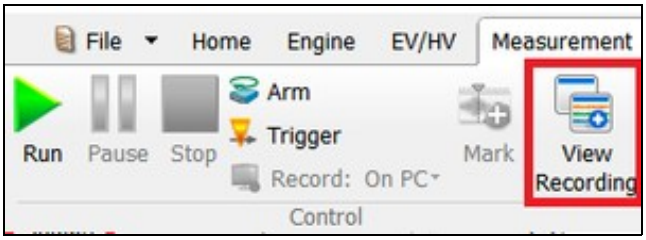
21.1.2 Using Connect Inputs

For connecting, DC channels, Can Bus, Xpods,(...) we advise users to enable the input and do a drag and drop into the recorder.



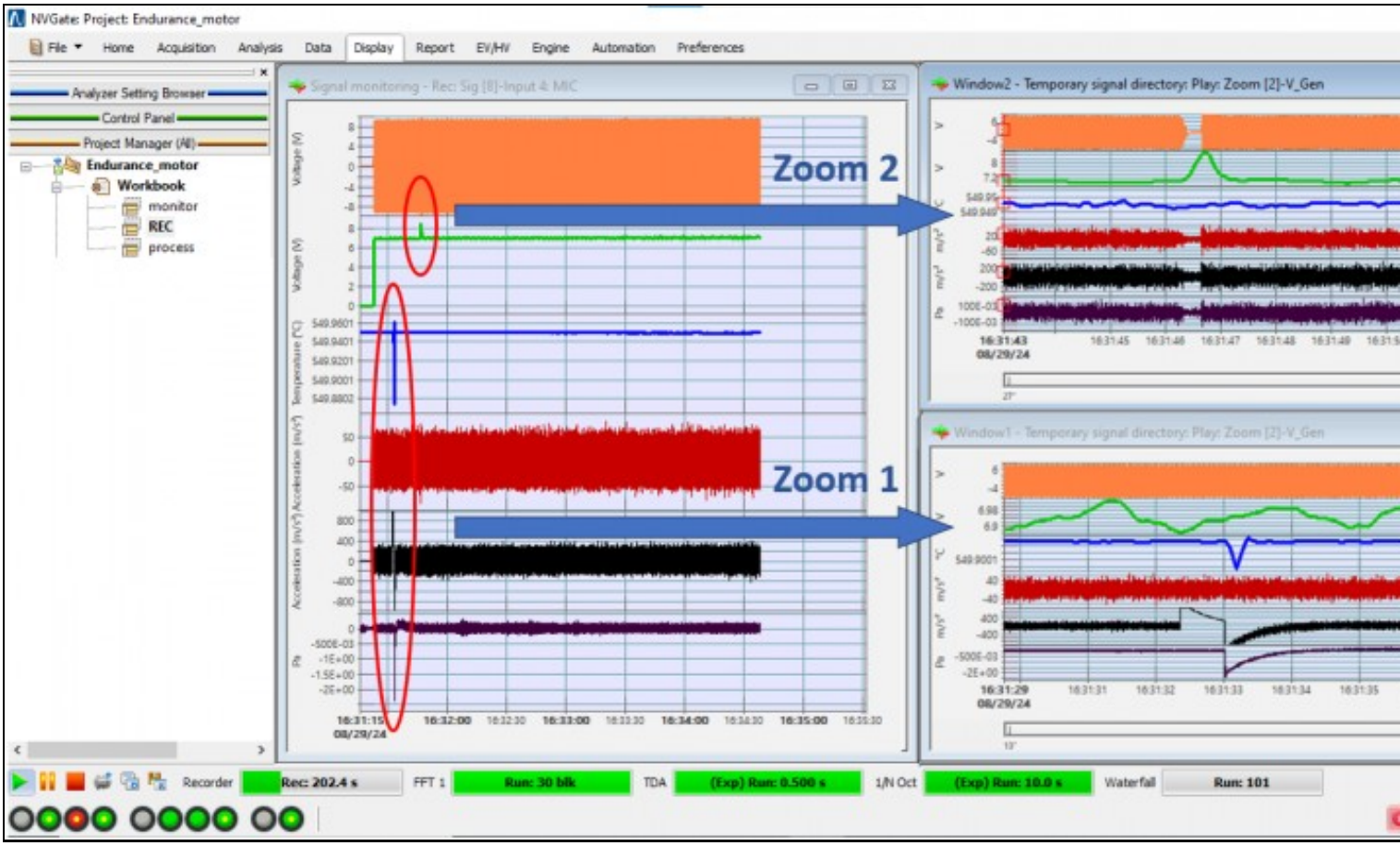
21.1.3 Display

On measurement tab, click on view recording.



21.1.3.1 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.



21.2 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.

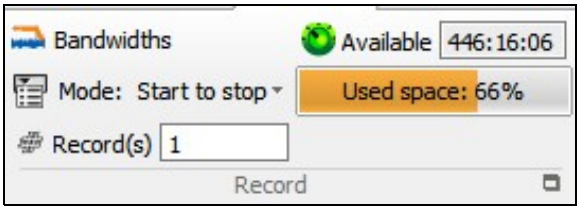
RMS: RMS level measured on a recorded input signal computed on the selected bandwidth.

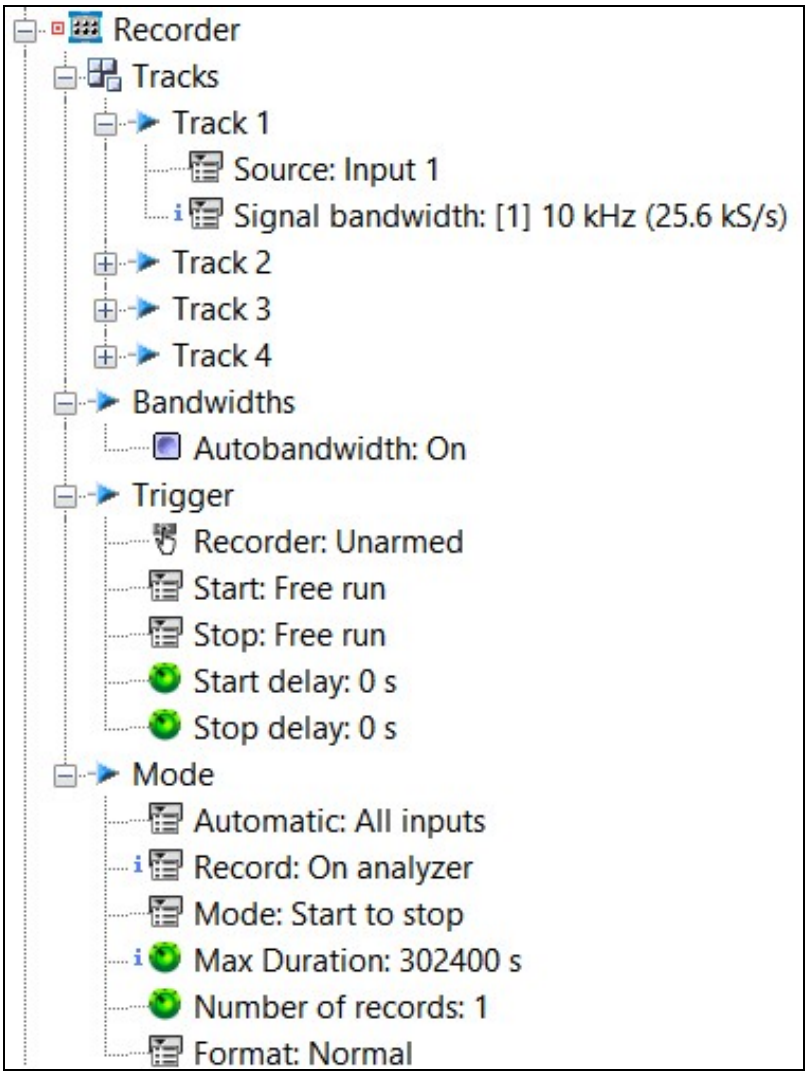
Monitoring signal: this result displays the compressed input signal after frequency decimation. The result is only updated during recording.

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.

21.3 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.

21.3.1 Tracks

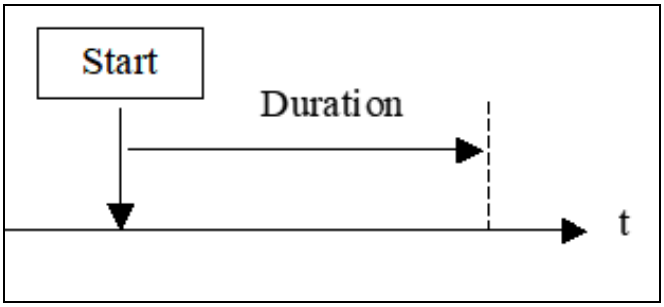
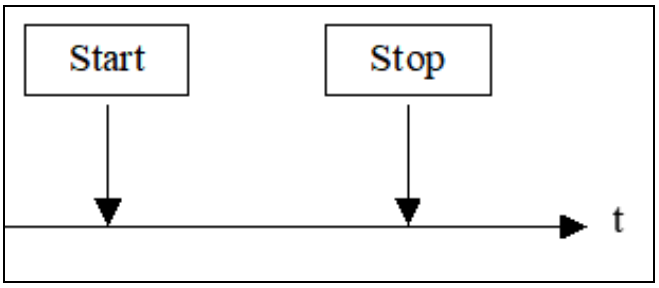
Used to configure the track x to be recorded.

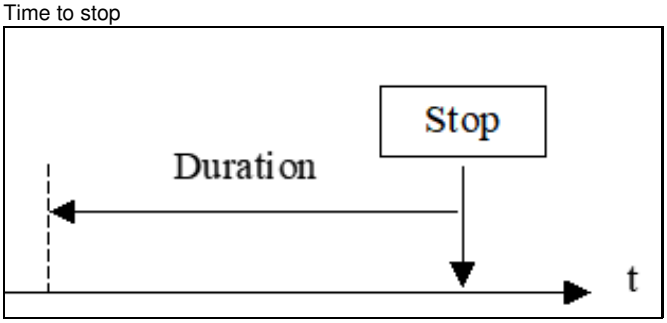
- **Source**: signal to be recorded. It may come from the input Front-end or from the Player in post analysis mode (see "Post analysis" topic chapter 6).
- **Signal bandwidth**: frequency bandwidth of the recorded track. This value is equal to the sampling frequency of the recorded signal divided by 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.

21.3.1.1 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) :)

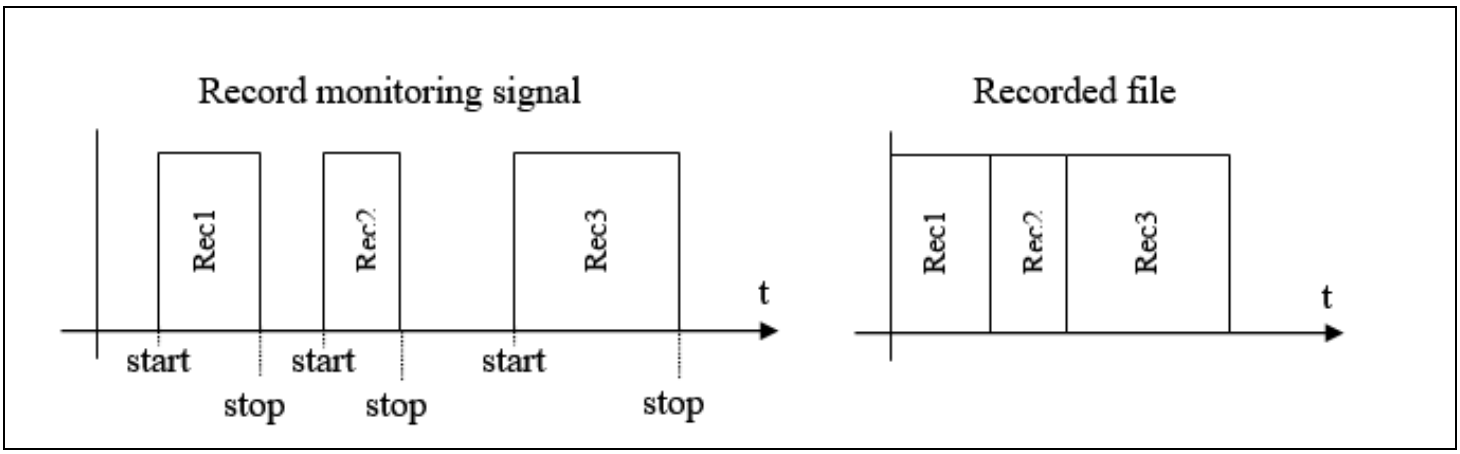
If the Record is on the PC the max size is 1048576 blocks of 2048 samples .

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.

21.3.1.1.1 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".

21.3.1.1.2 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.

21.3.1.2 Autobandwidth

21.3.1.2.1 Principle

Autobandwith manages the analysis and recording bandwidths automatically.

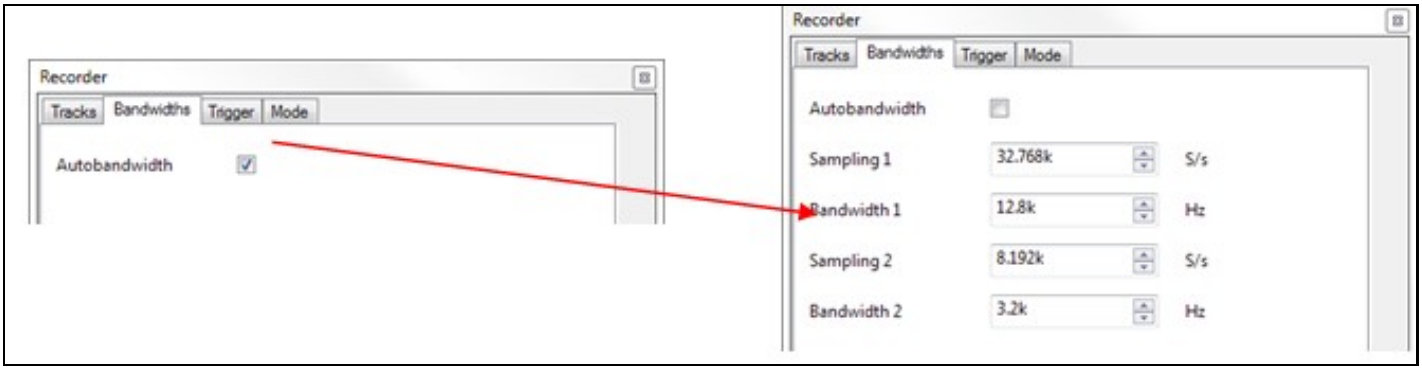
The *Inputs selection* window **allows the use of 2 different sampling rates for the dynamic inputs**. It gathers inputs with the same physical quantity into groups, maintaining the same sampling into each group.

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.

21.3.1.2.2 Recorder

When inputs are associated with the recorder, it adjusts the recording bandwidths channel by channel.

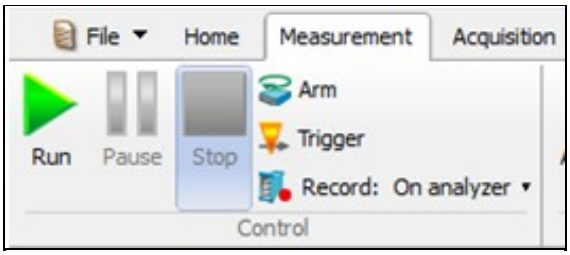


Deactivating the recorder's *Autobandwidth* allows managing the dynamic inputs sampling from the recorder. It is recommended to keep the recorder *Autobandwidth* active unless the recording signal must be a lower frequency than the analysis.

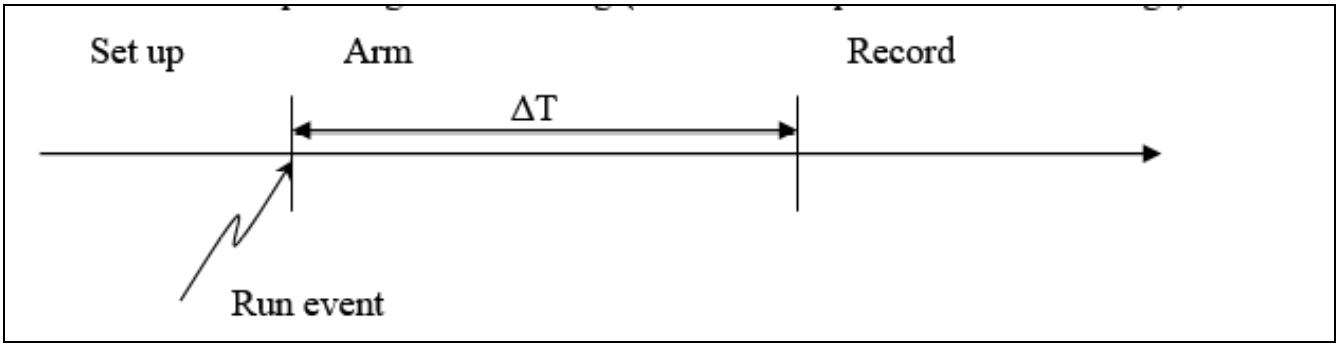
21.3.1.3 Arming

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.

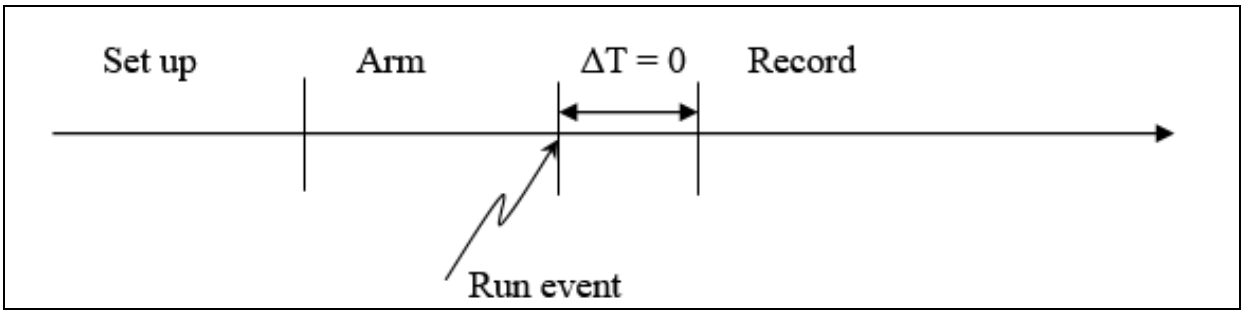
The recorder is armed automatically when pressing the RUN button. This operation may take a couple of seconds. It is possible to pre-arm the recorder allowing an immediate start of the recorder. This is available from the *Measurement* tab of the *Vision* interface:



- 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).

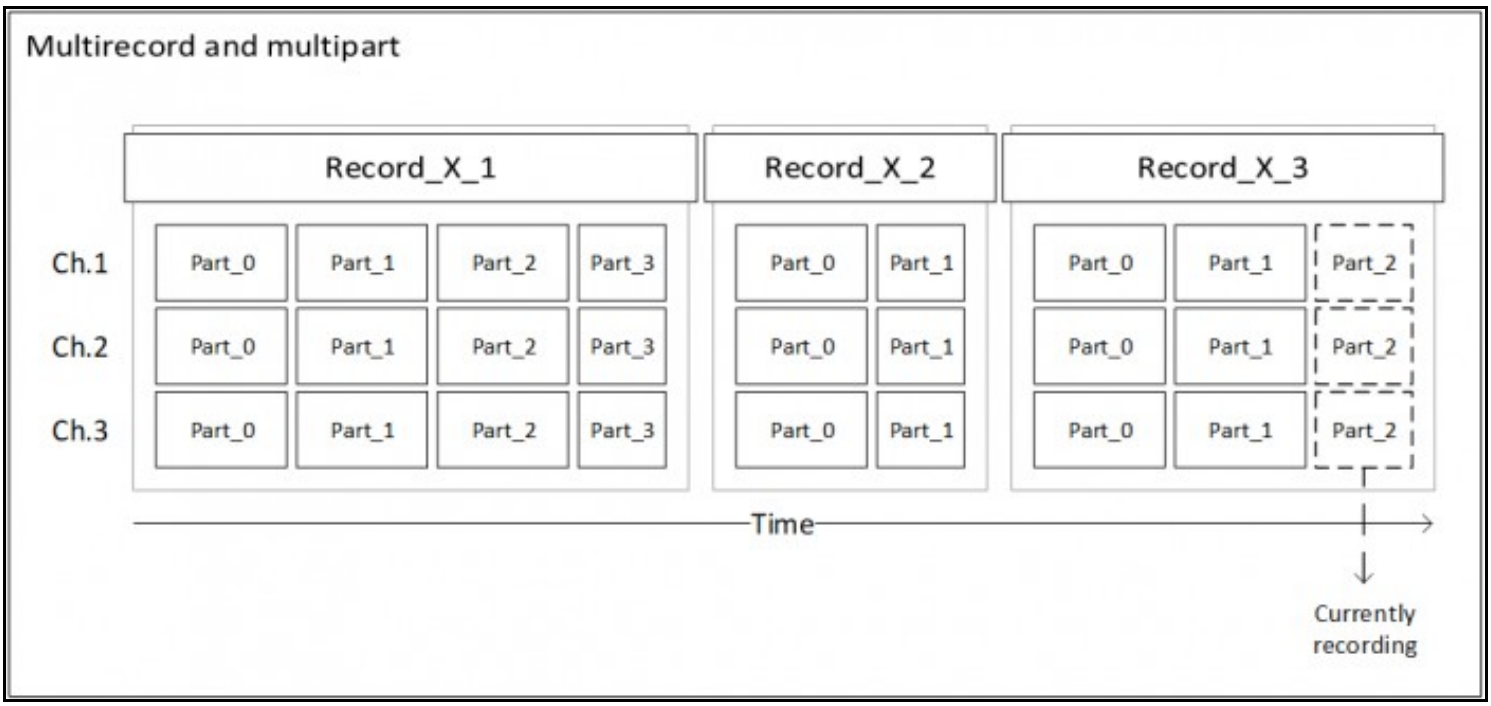


- Armed record: after the setup the recorder is armed (i.e. backup of the record settings allowing more security for you record). Then at any moment, when the recorder is armed, a ?Run event? starts the record instantaneously (?T = 0).

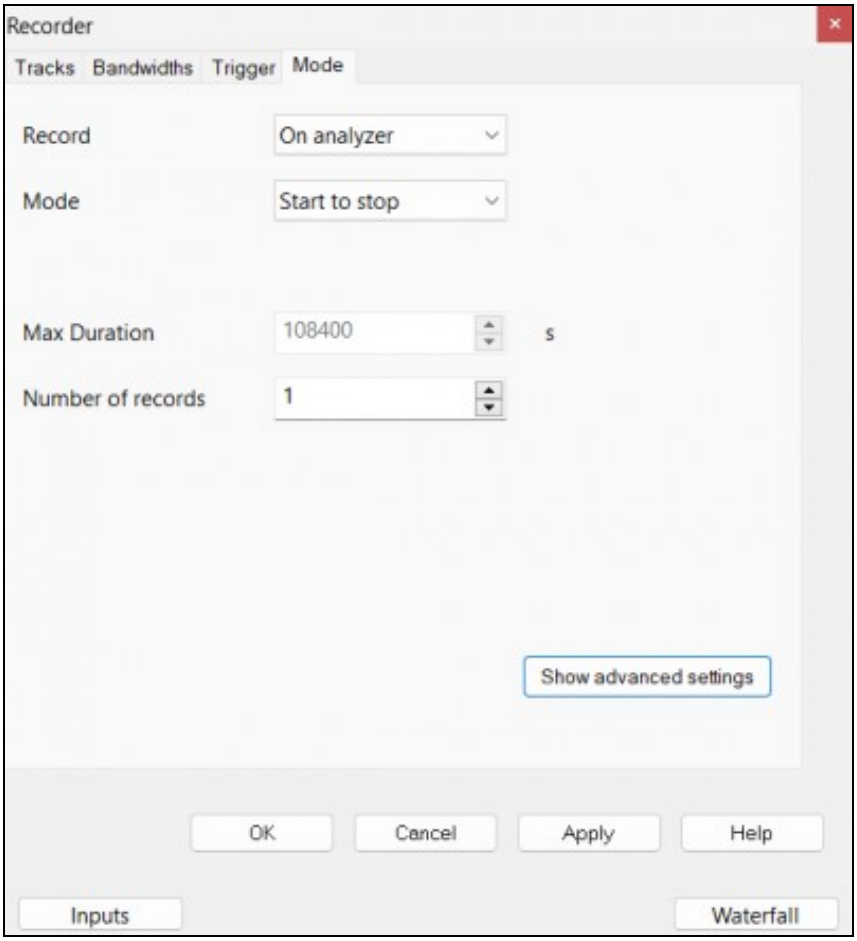


21.3.2 Part file length

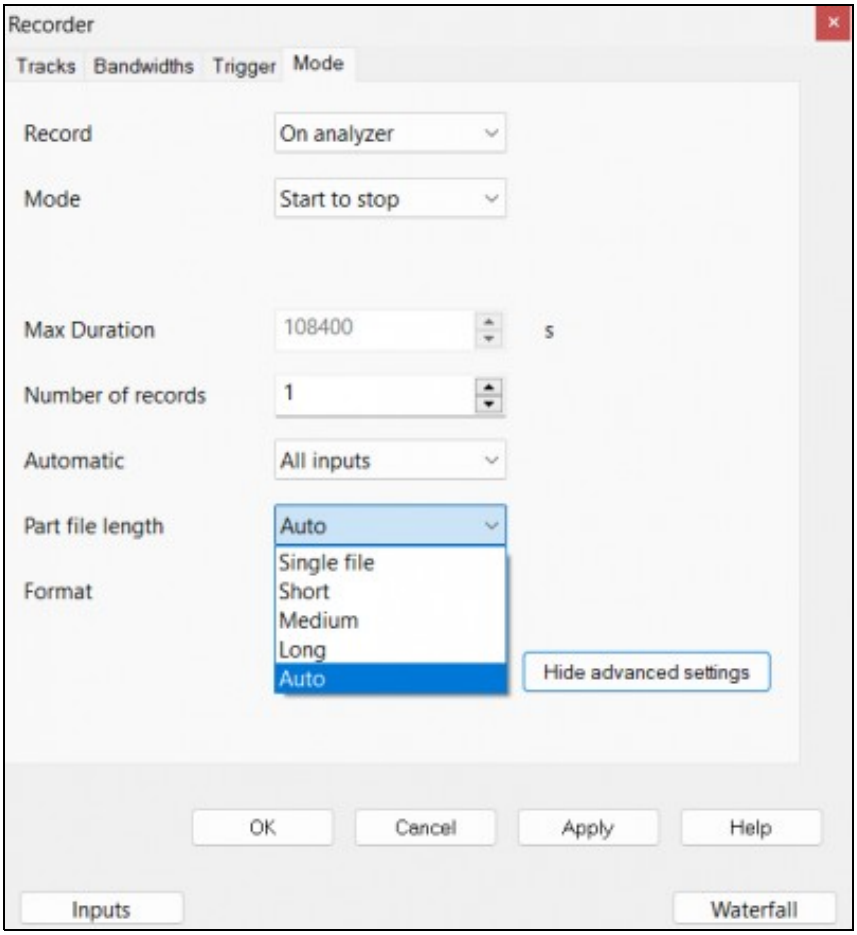
Since NVGate V17, Users have the flexibility to configure each time signal to include multiple records, with each record further divided into parts of customizable lengths.



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.

21.4 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.

21.5 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.

22 NVGate Report

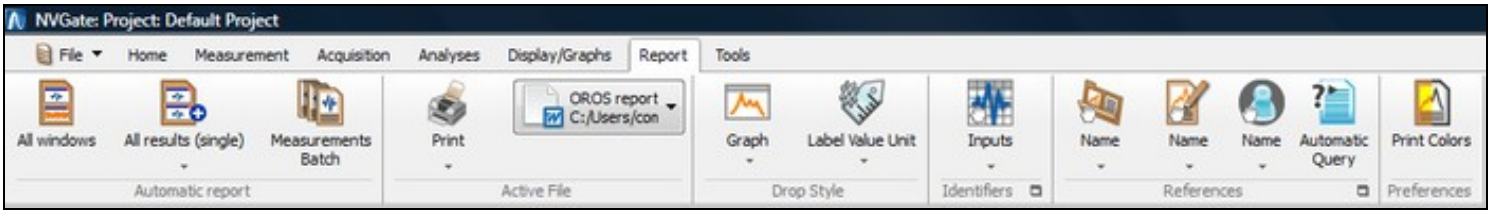
Powered by the Vision interface and still based on the use of templates, the NVGate reporting toolset focuses on intuitive transfer of analyzer?s data, leaving to MSOffice the page setup and extra content.

22.1 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



22.2 Tutorial

22.2.1 Introduction

22.2.1.1 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.

22.2.1.1.1 Equipment

- OR3X Analyzer
- PC with NVGate
- Ethernet link
- Microsoft Word/Excel
- 1 signal

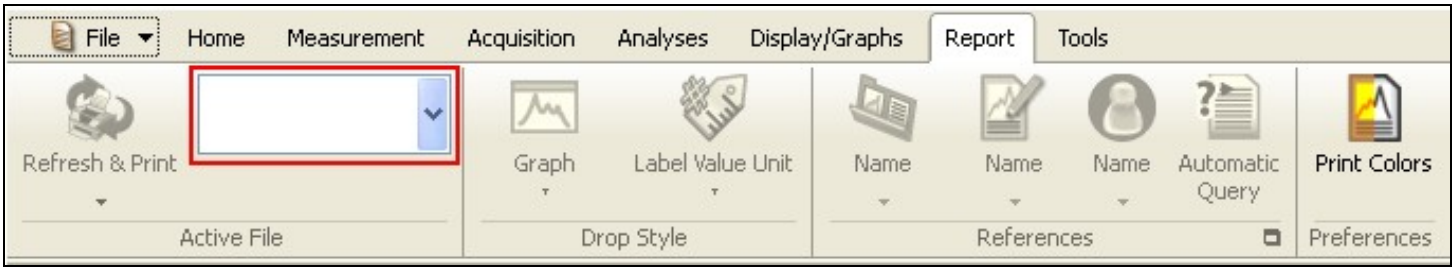
You can create a report in On-line mode or in Office mode.

22.2.1.2 Procedure

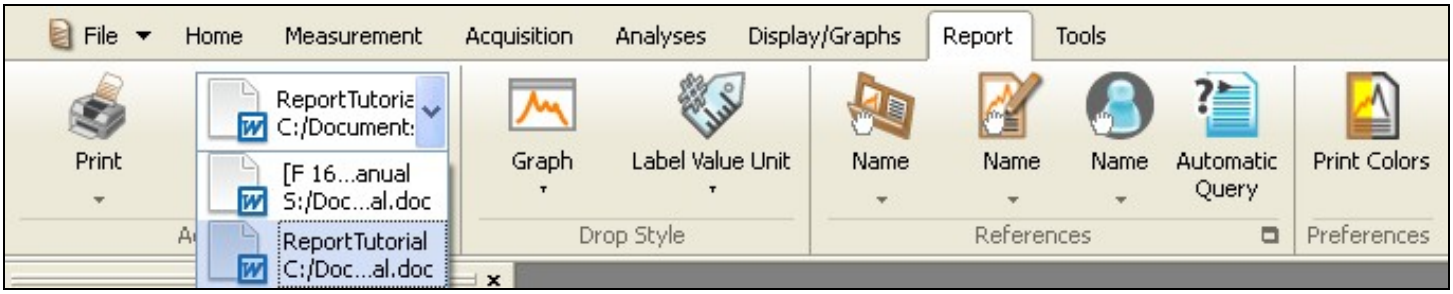
22.2.1.2.1 Active file

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.

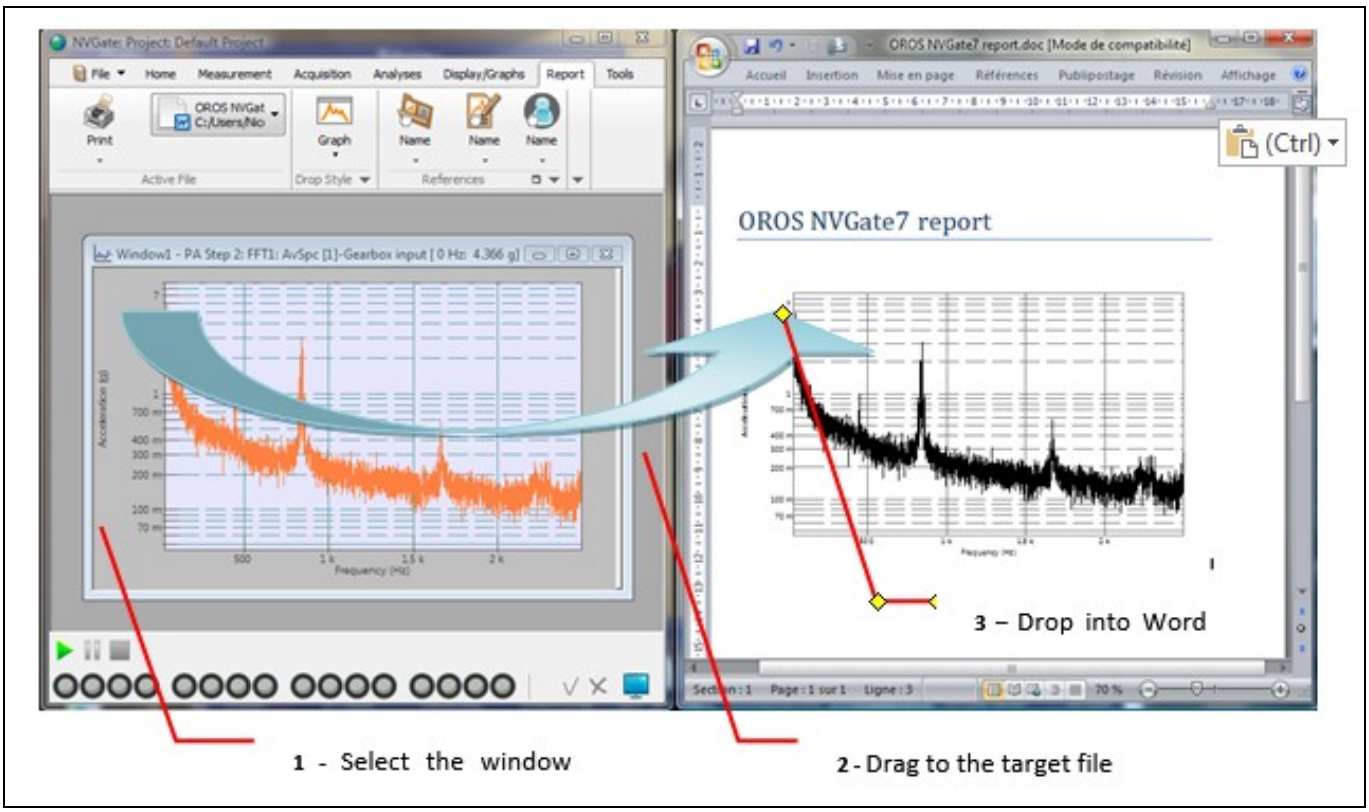
NVGate items are identified by a tag in the template. The tags are editable in Excel cells, hidden text in Word (apply the ¶ mode to see the tags).

It?s better to work in ¶ mode while doing the report to avoid any drag and drop inside a tag.

22.2.1.2.2 Deposit NVGate items

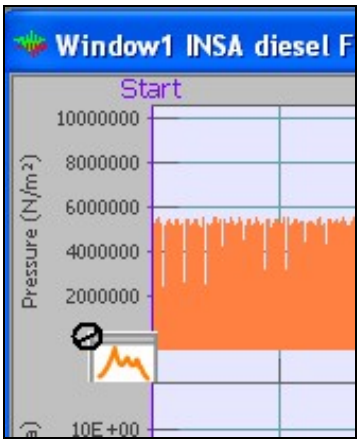
The reporting operations are based on the use of Drag & Drop; Select an item from NVGate and drop it into the template. The software will add a TAG in the target file and then update it with the corresponding NVGate data.

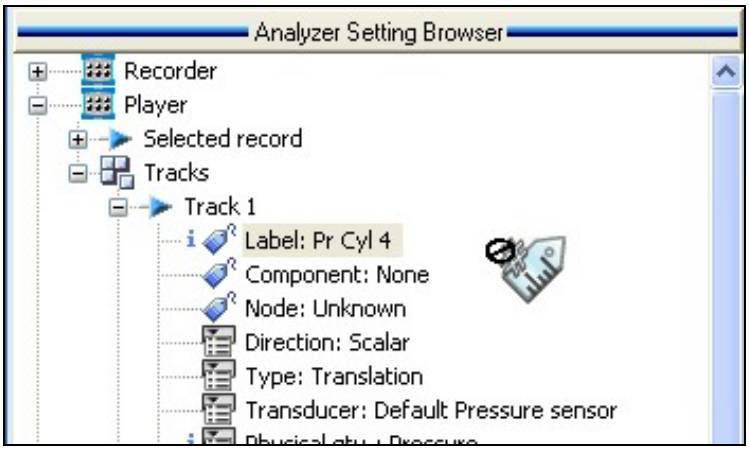
To add a graphical result(s) into a Word document, click on the corresponding window area (grey area), then drag & drop it at the chosen location in the template:



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:

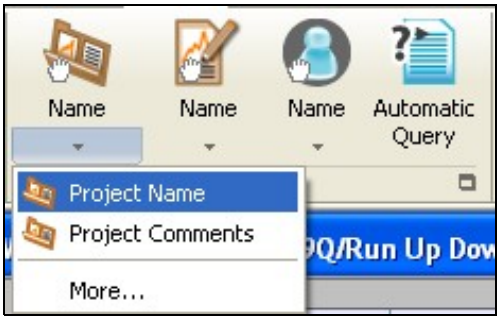
Equipment:¶

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.

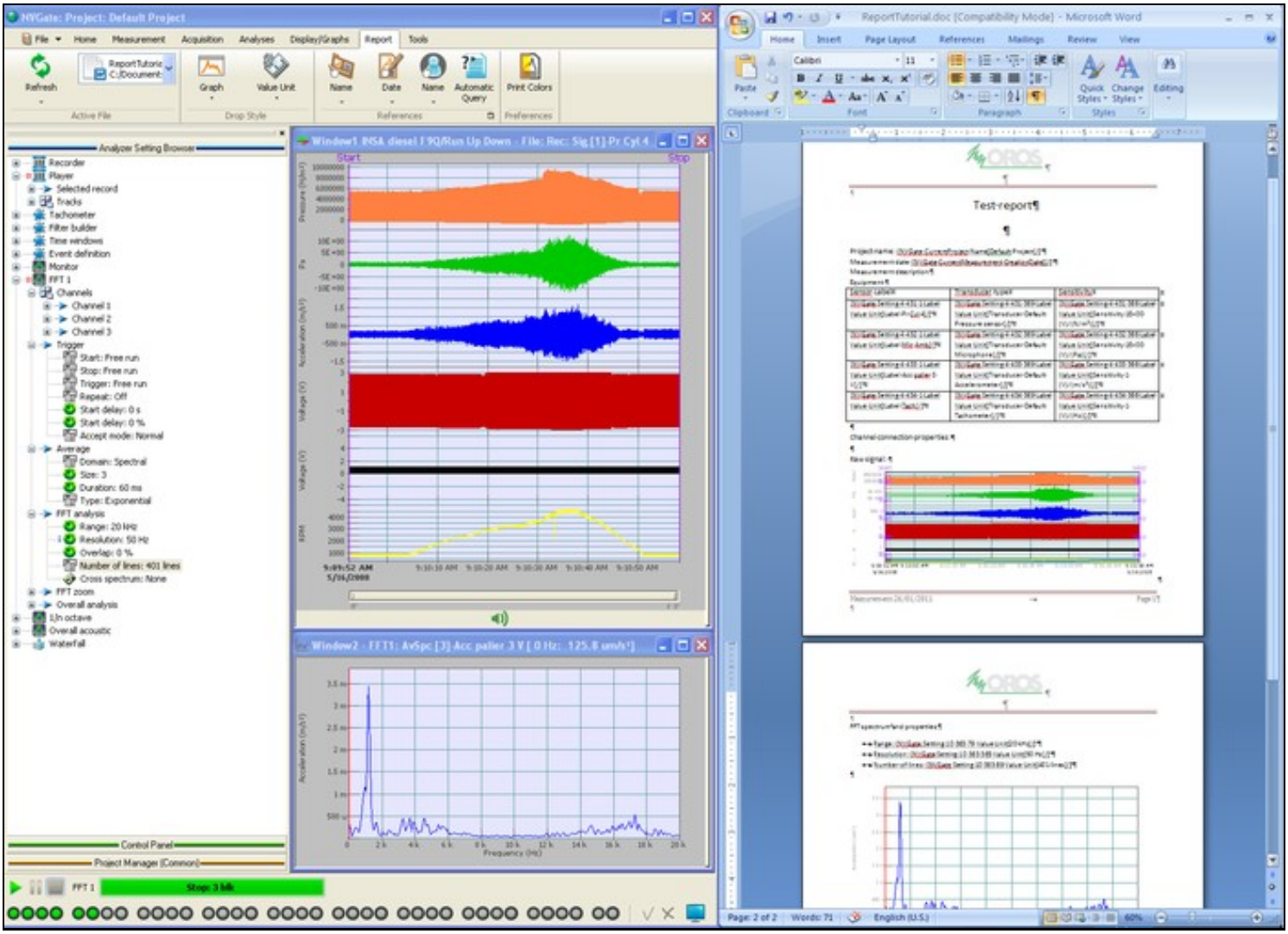
Drag and drop these items directly from the group.

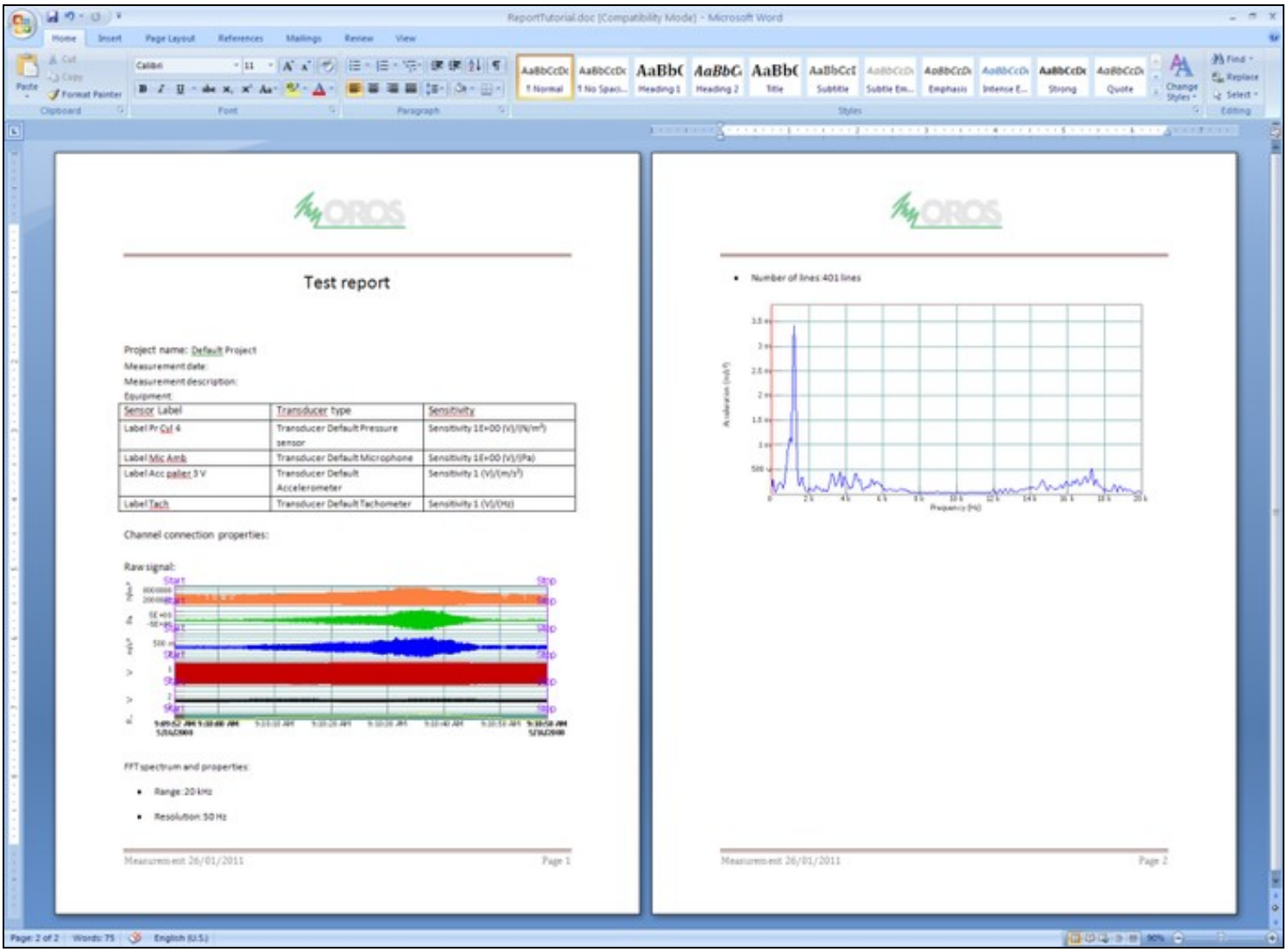
Select More to see the whole set of properties

22.2.1.2.3 Example of template:

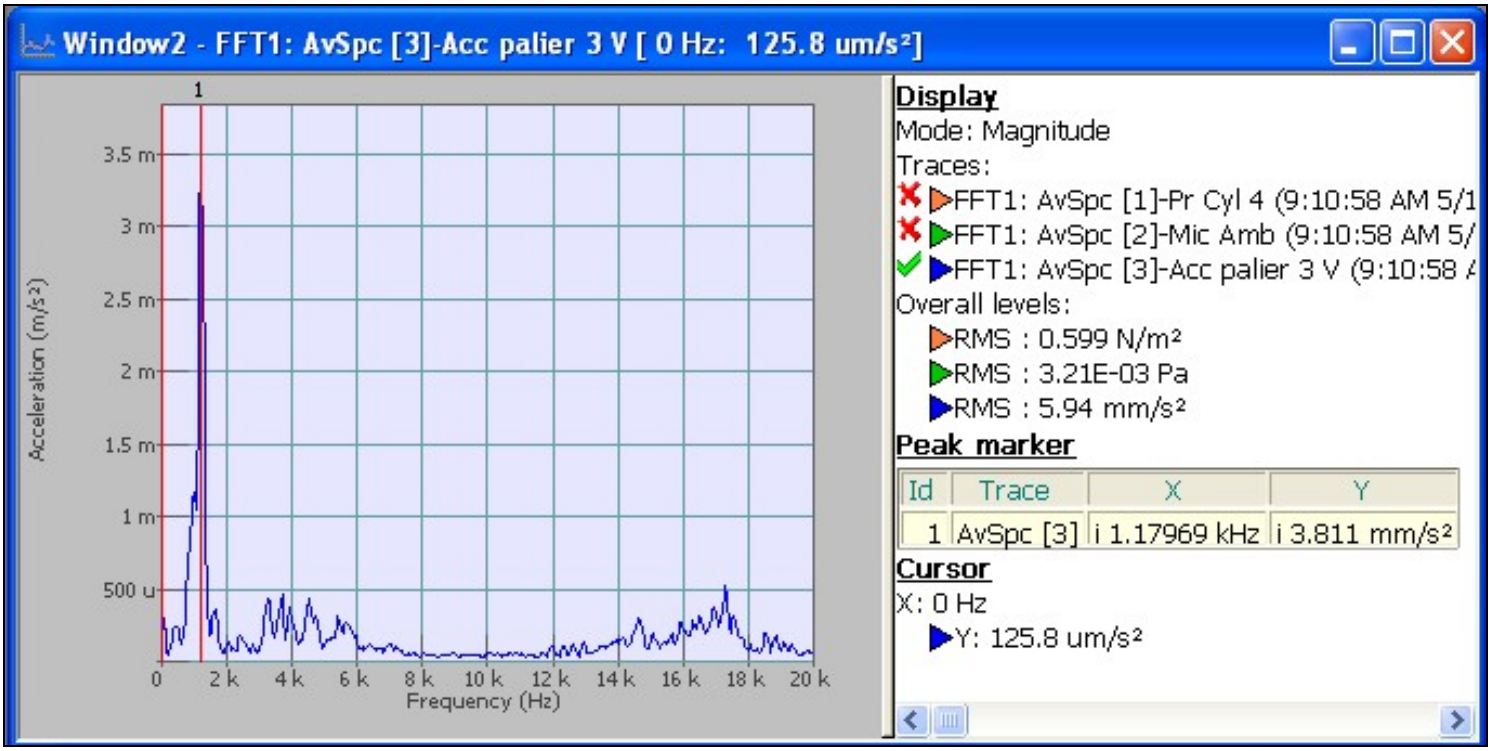
In the first lines, the Project name and date were inserted. Then a table with all sensors specifications was added.

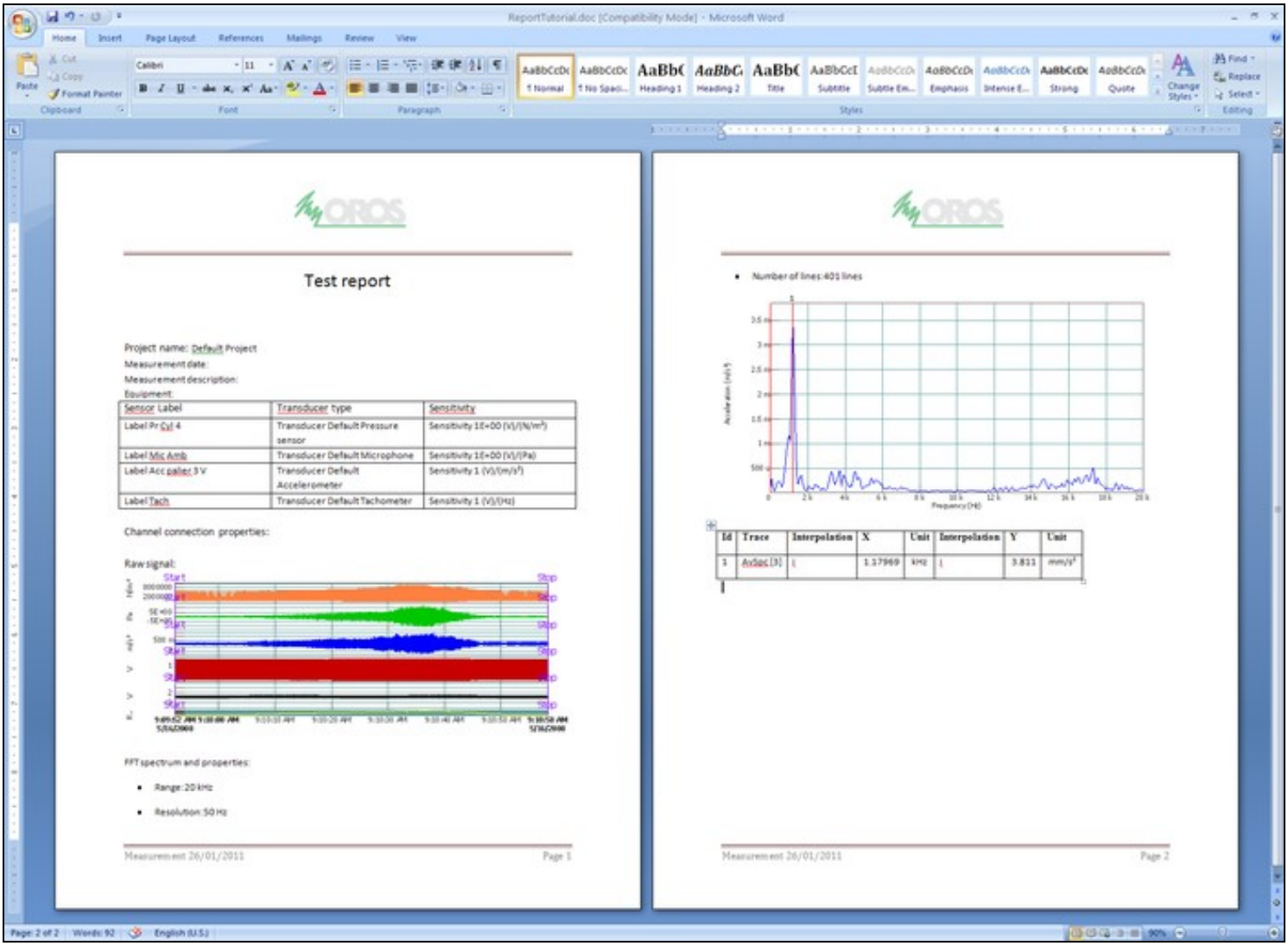
A drag and drop of the time signal was done. After post-analyzing the time signal, a FFT spectrum was displayed in NVGate and finally dragged and dropped in the template with some FFT settings (frequency range, resolution and number of lines).


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
Page: 2 of 2
Words: 75
English (U.S.)

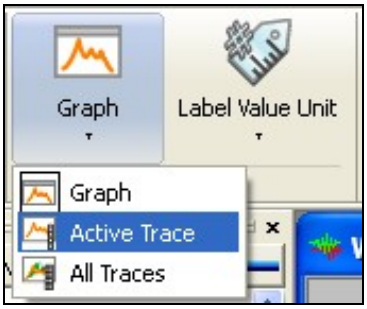
You can also put markers on graphs and display the Marker table by drag and drop from the infotrace.

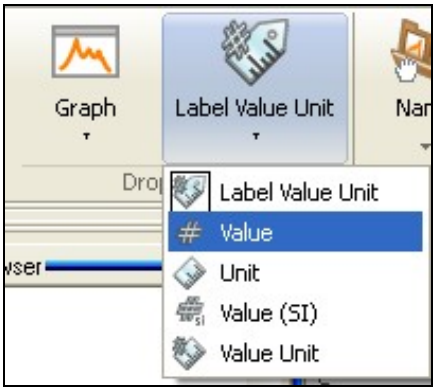



ReportTutorial.doc [Compatibility Mode] - Microsoft Word
Test report
Project name: Default Project
Measurement date:
Measurement description:
Equipment:
Sensor Label
Transducer type
Sensitivity
Label Pr Cyl 4
Transducer Default Pressure sensor
Sensitivity 1E+00 (V)/(N/m²)
Label Mic Amb
Transducer Default 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
1
AvSpec [3]
1.17969
kHz
3.811
mm/s²
Measurement 26/01/2011
Page 2

22.2.1.2.4 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.

22.2.1.2.5 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.

22.2.1.3 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

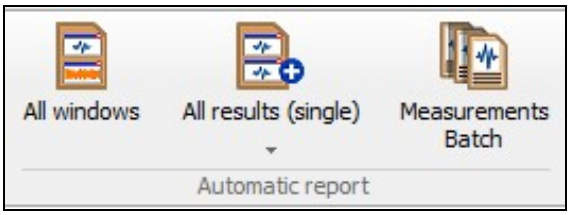
The *Automatic report* group makes the 1, 2 and 3 steps automatically.

The report templates are built up with the *Reports* tab, and then the report generation is available from the *Measurement* and *Reports* tabs.

22.3 Settings

22.3.1 Automatic report tools

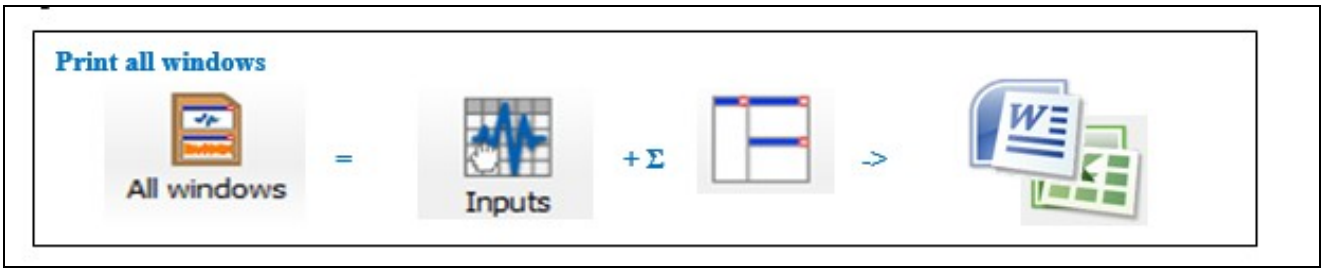
The *Automatic report* group is located the left side of the R*eport* ribbon.



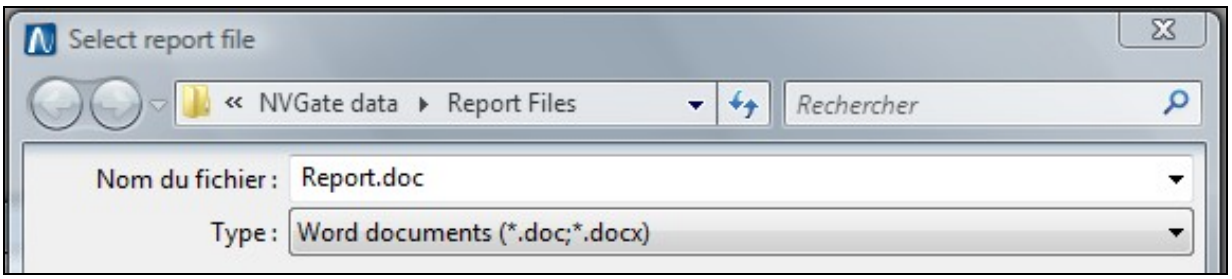
It features 3 fully automated report generations and a batch function for multiple measurements reports

22.3.1.1 Print all windows

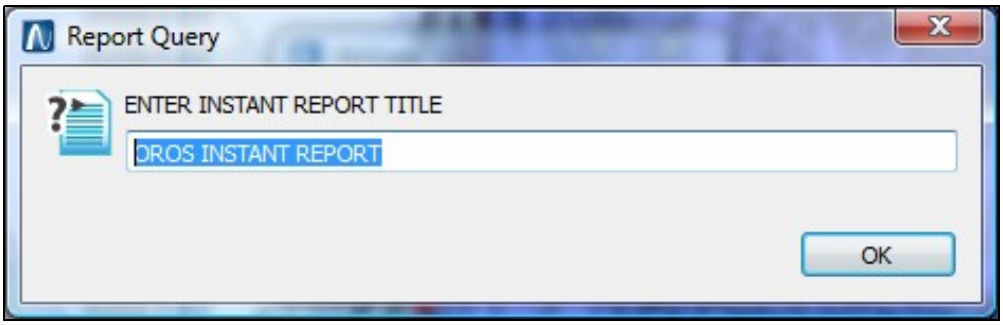
This function allows printing all the displayed graphs in a comprehensive report, without requiring setup any template. Simply press the *All windows* button to get your data plotted in a word file.



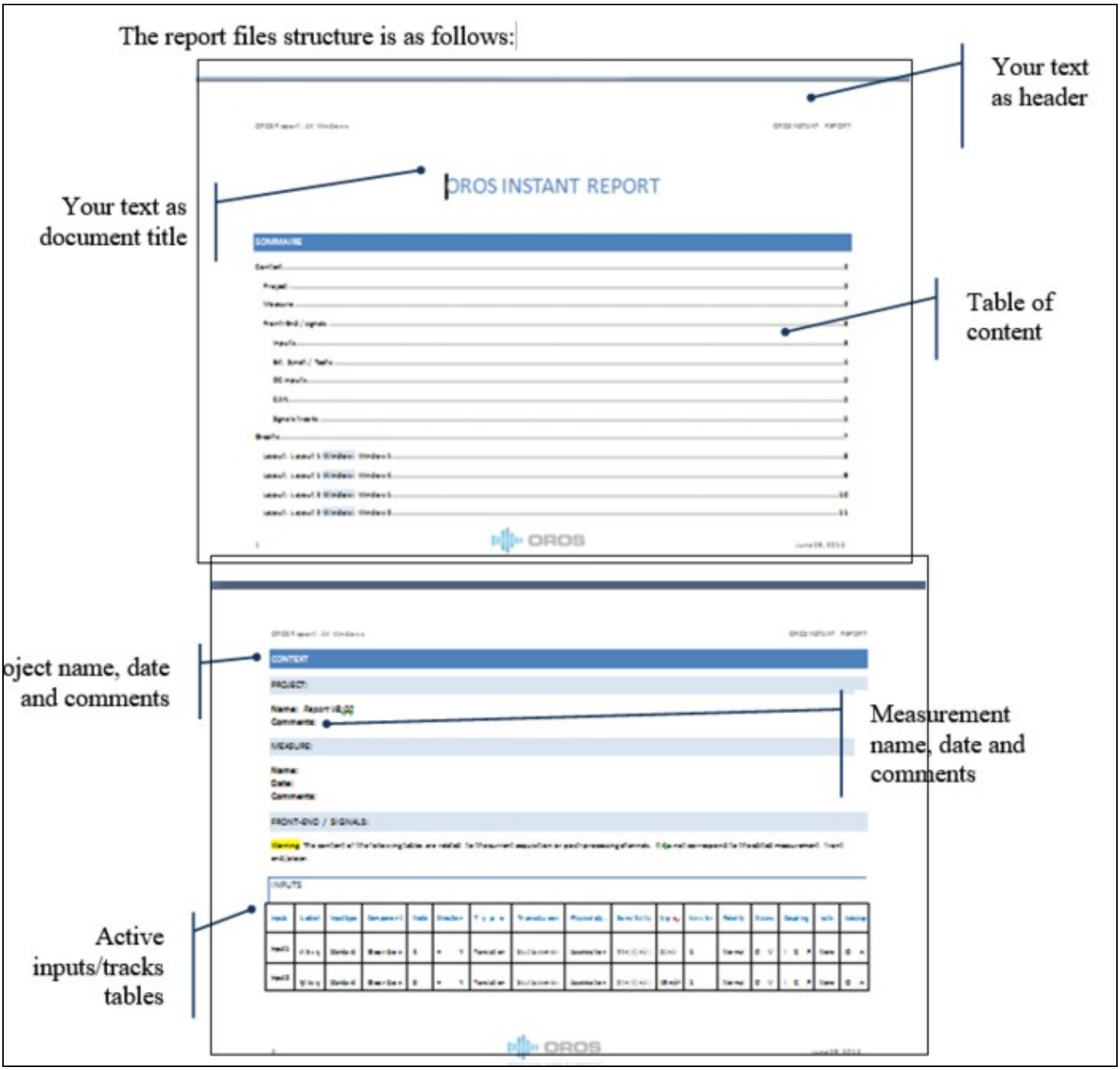
First, a location and name are requested for the report file.



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:

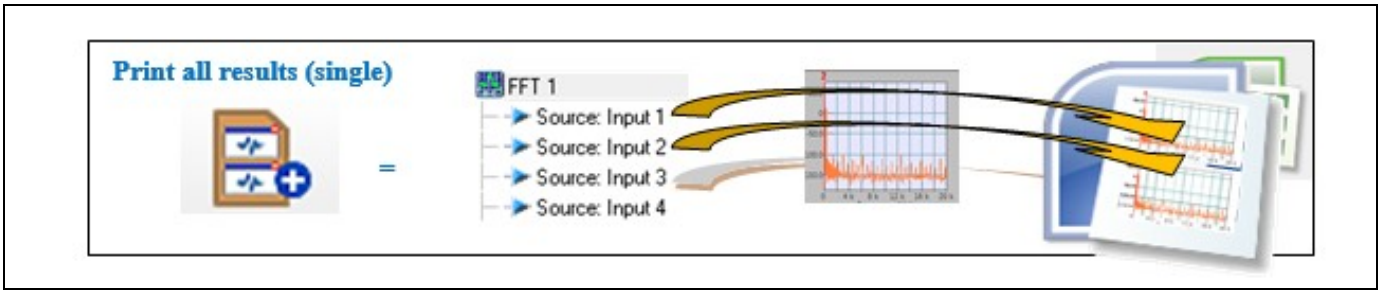


Then for each existing *Layout*,

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)

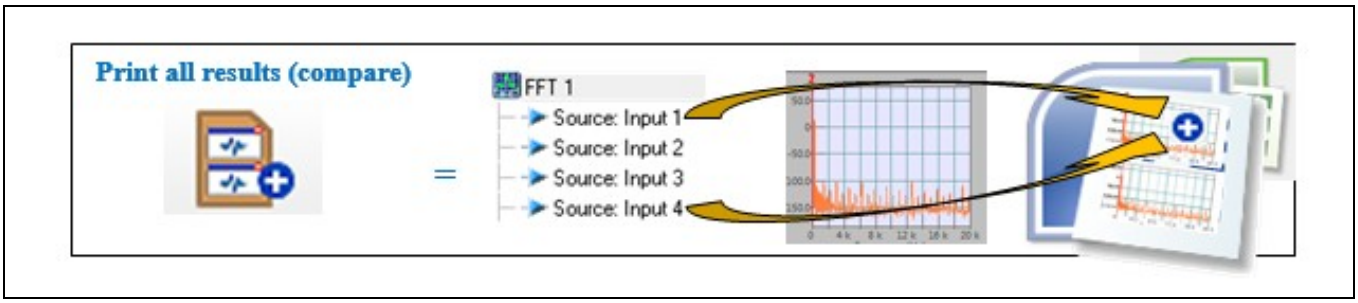
Layout 2: Window 2 FFT Trigger bloc: inputs 1 to 8 (8 plots)

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

22.3.1.1.1 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.

22.3.1.1.1.1 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.

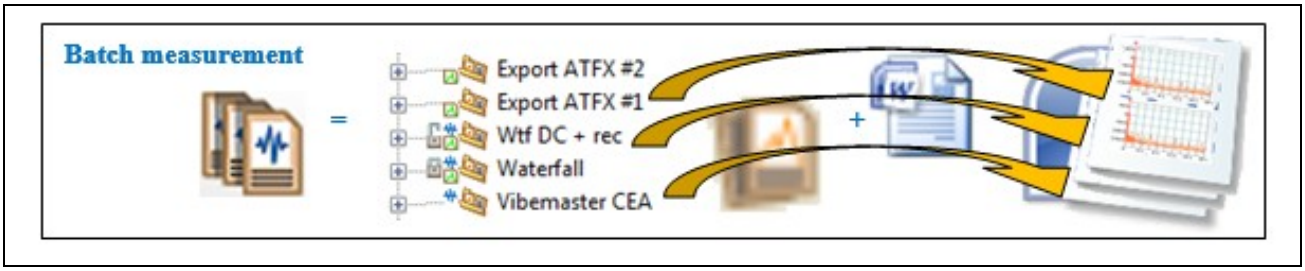
The report is based on predefined templates. You may adapt these templates in order to change contents (ex: your company logo, or add specific setting or marker).

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.

22.3.1.1.2 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.



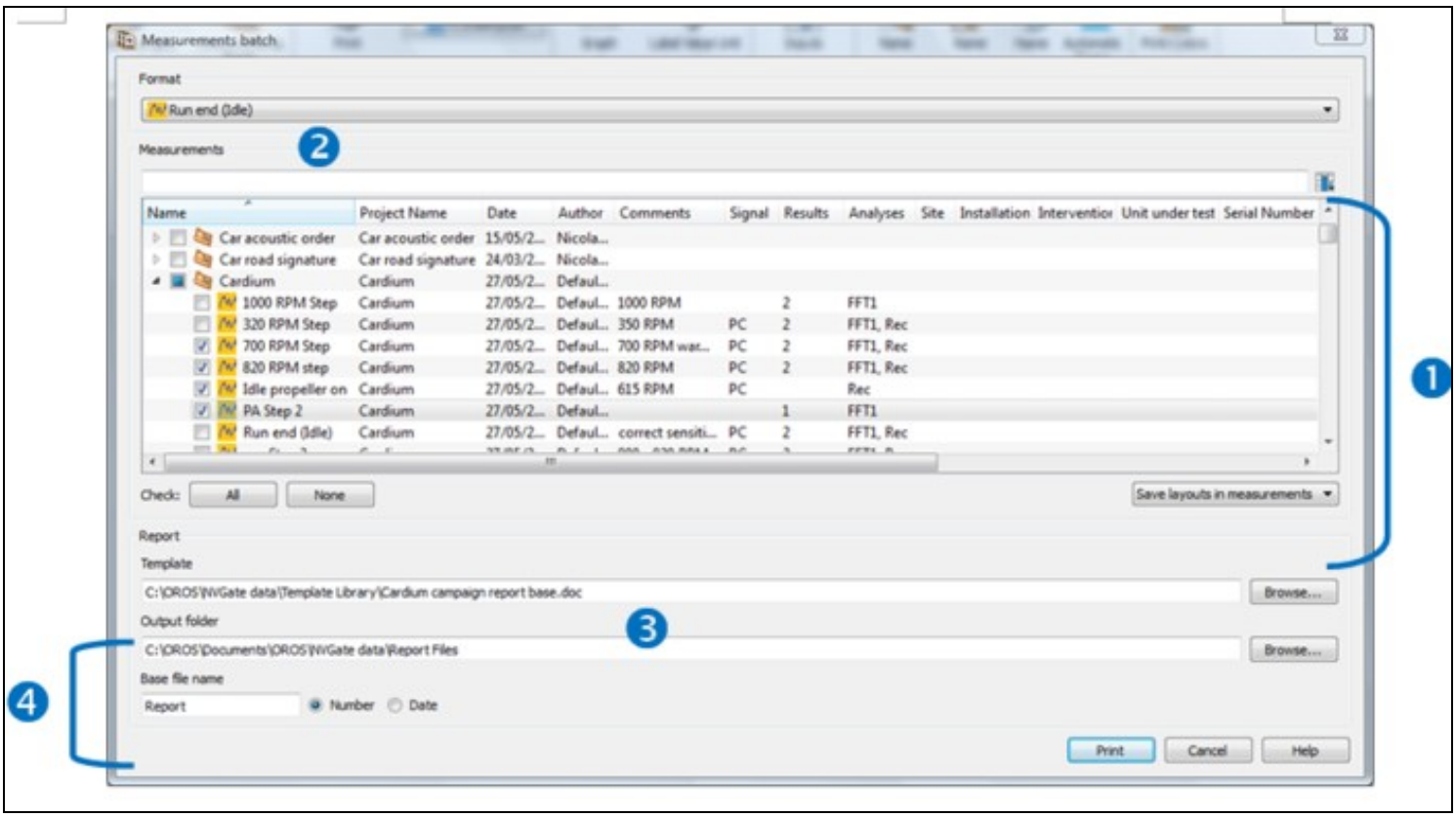
The inputs are:

- 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.

22.3.1.1.2.1 Data selection

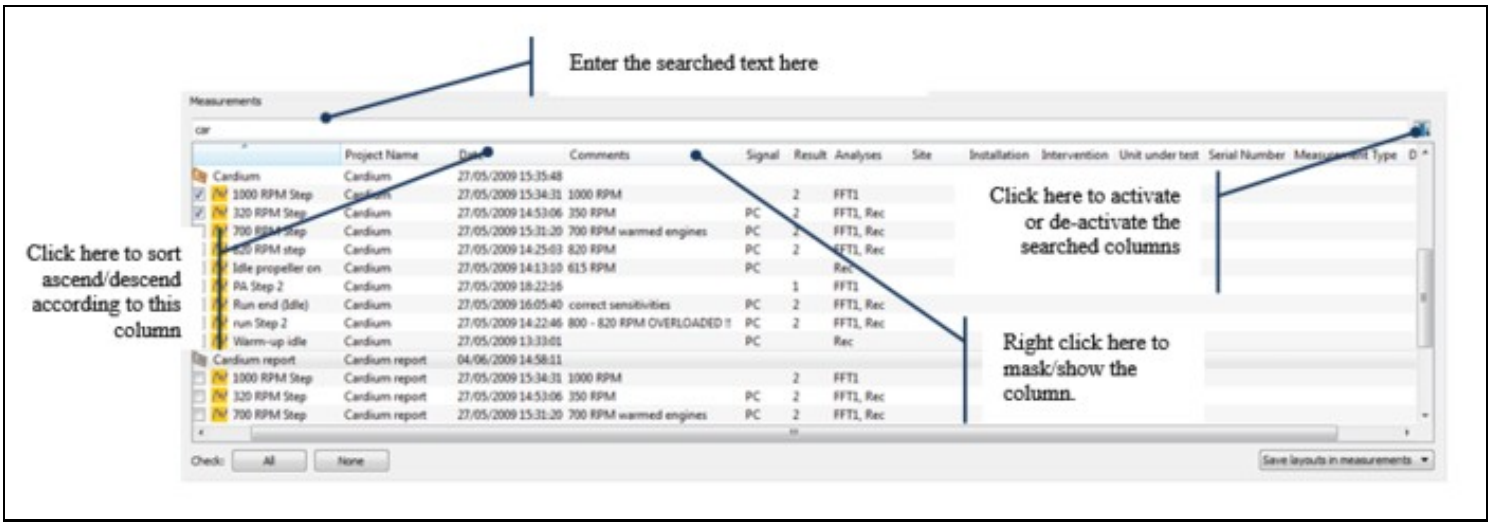
The measurements selection is helped by a search engine which filters the project manager measurements according to their properties.

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.



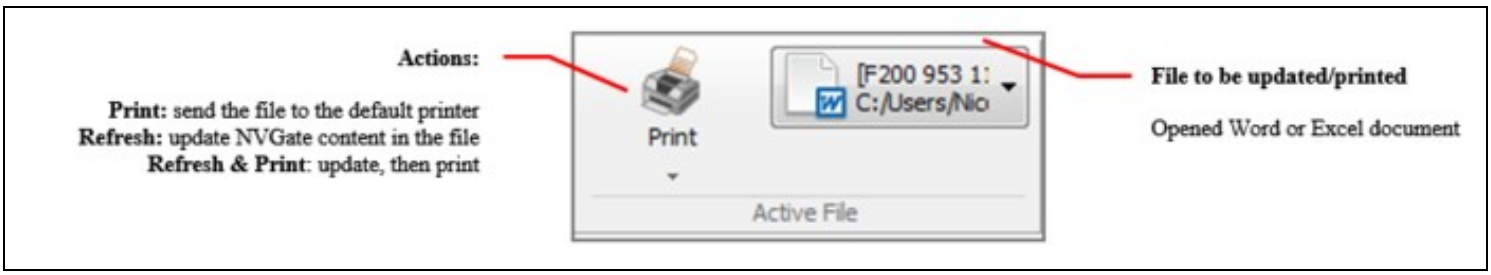
The measurements are sorted by column content (alphanumerical sort) by left clicking on the column header.

22.3.1.1.3 "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.

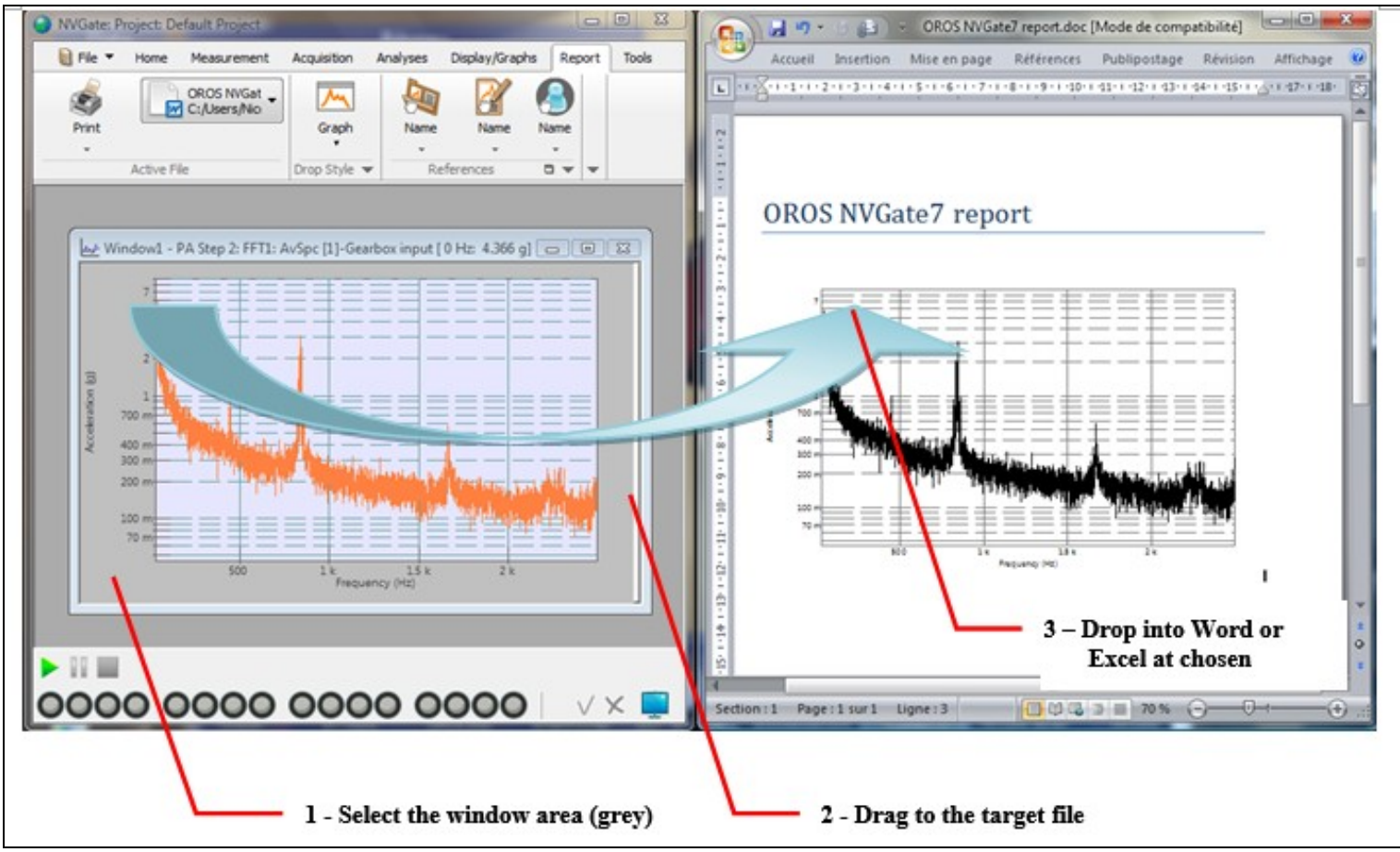


Building up a template

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:

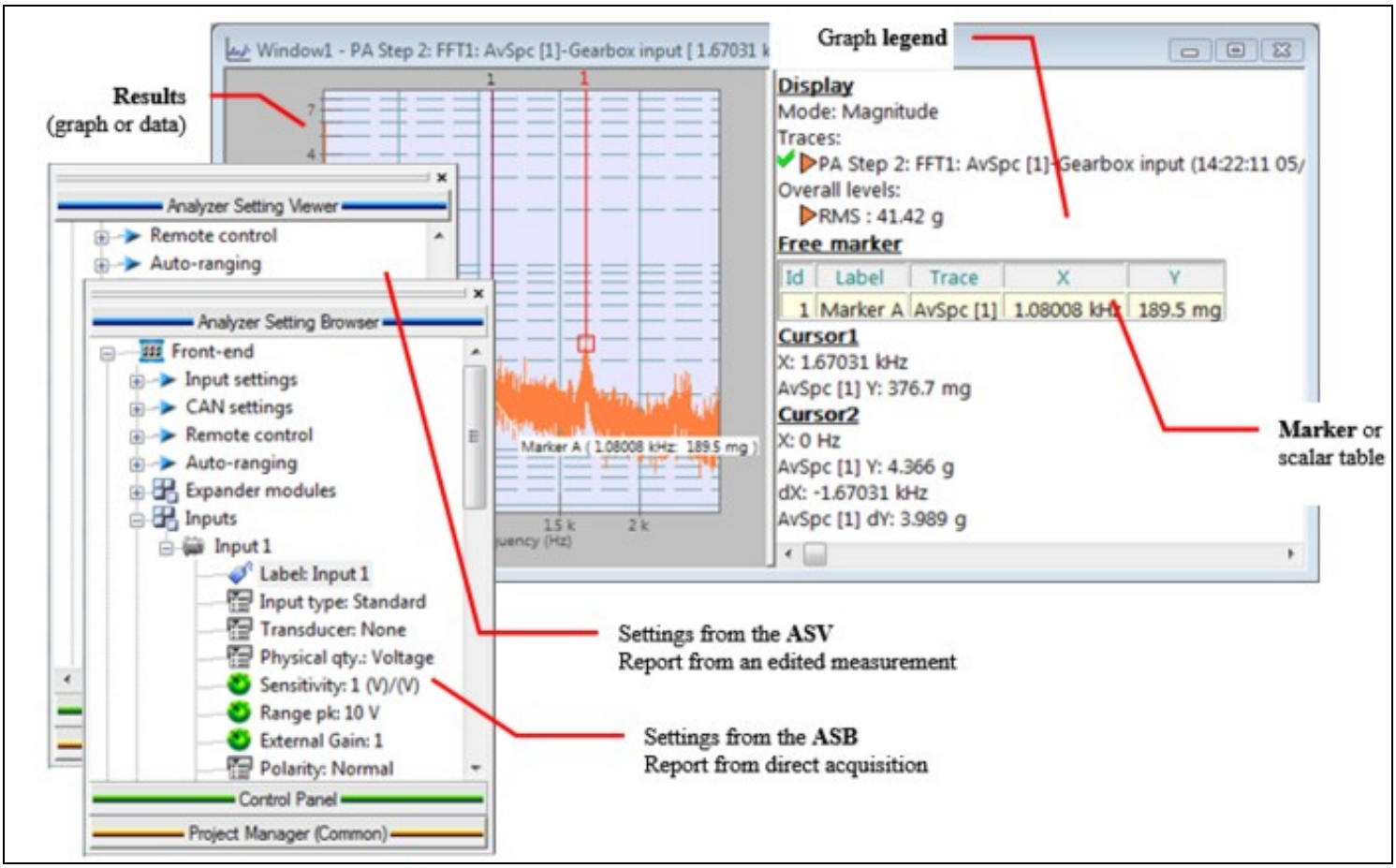
- ***[NVGate Graph Layout1 Window1]*** ***For a window***
- ***[NVGate Data ActiveTrace Layout1 Window1]Table[/]*** ***For a result dataset***
- ***[NVGate Setting 1 1 3 Label Value Unit]****Range pk 10 V*[/] ***For a setting***
- ***[NVGate CurrentMeasurement Comments]*****My comments here** [/] ***for 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)

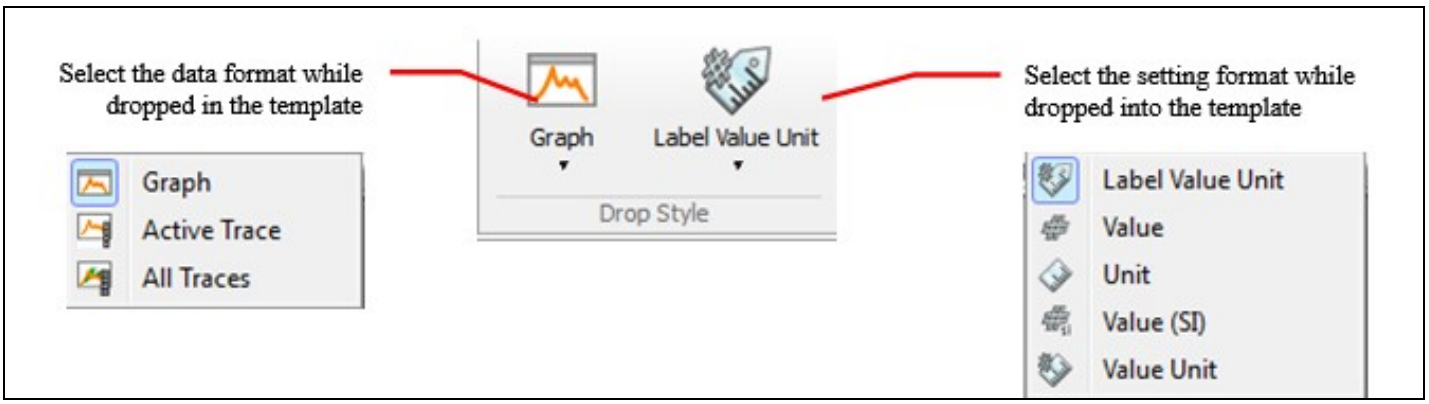
22.3.1.1.4 Available items for report

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.



22.3.1.1.5 "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.



22.3.1.1.5.1 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.

22.3.1.1.5.2 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

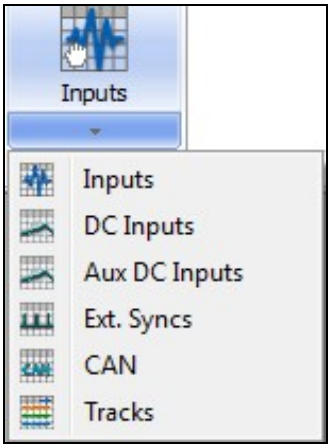
- Unit = V/g (depending on the active preferences)
- ***Value (SI)*** will deposit the dragged setting value in the SI units (m, A,V, s, etc?). This options force the value to be expressed in SI.

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

22.3.1.1.5.3 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:

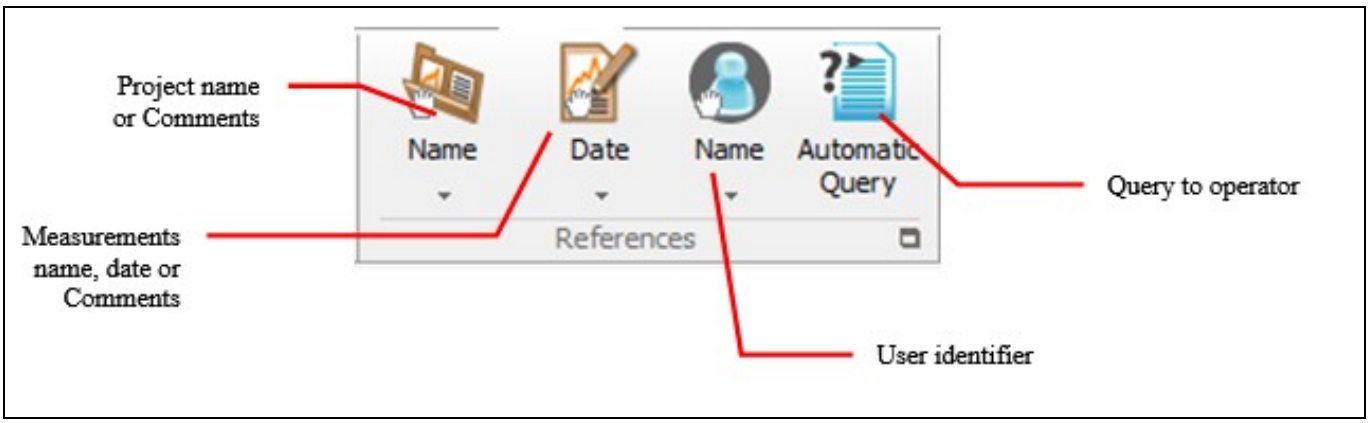
Inputs	Label	Input type	Component	Node	Direction	Type	Transducer	Physical qty.	Sensitivity	Range
Input 1	left Bearing	Standard	Gear box	4	+ Y	Translation	Default Accelerometer	Acceleration	198 m/(V)/(m/s²)	50.5 m
Input 2	Right bearing	Standard	Gear box	6	+ Y	Translation	Default Accelerometer	Acceleration	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.

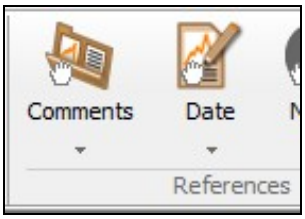
22.3.1.1.6 "References" group

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.



22.3.1.1.6.1 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:

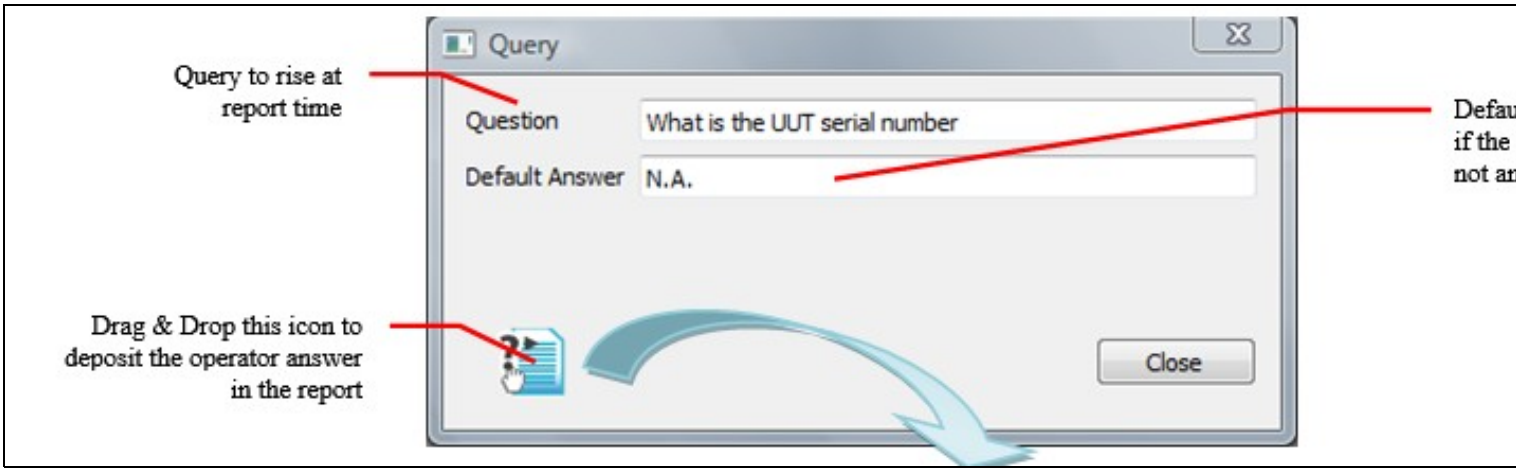
- The ***OROS*** properties are automatically filled by NVGate: Date, Author, Protection, Project name, Signal location and Number and type of saved results.
- The ***OROS user*** properties are already created by NVGate. Their values, but must be filled by the operator: Comments, Site, Installation, 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.

22.3.1.1.7 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.

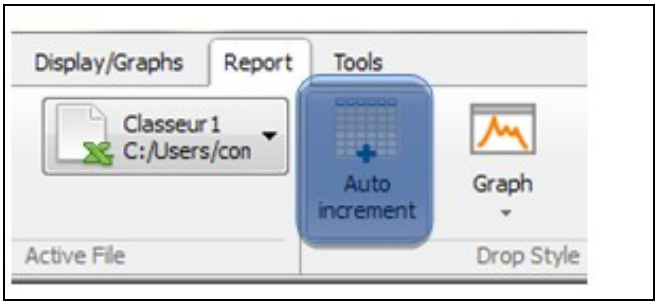
Operations: Click on the *Automatic query*, a dialog is displayed:



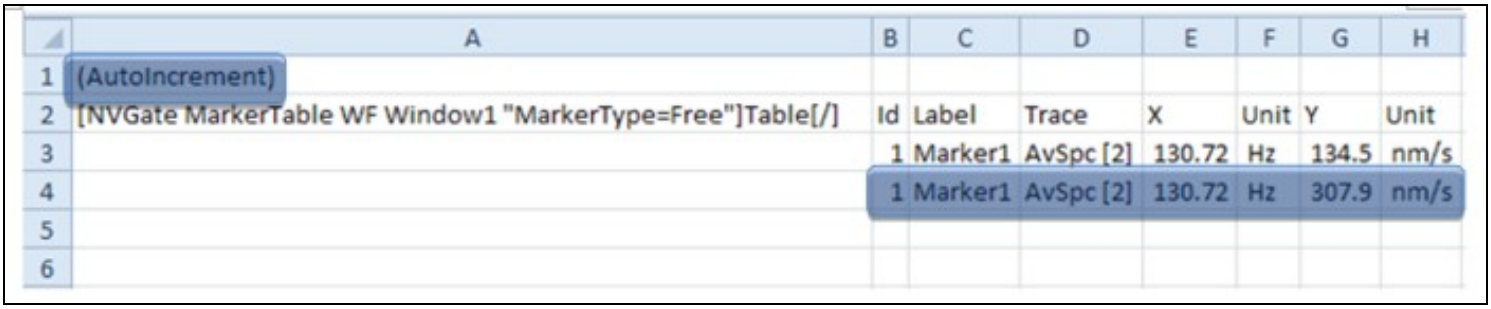
The query can be issued (dropped) in the report document as many time as required. The question will be raised only once for each different query.

22.3.1.2 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?).

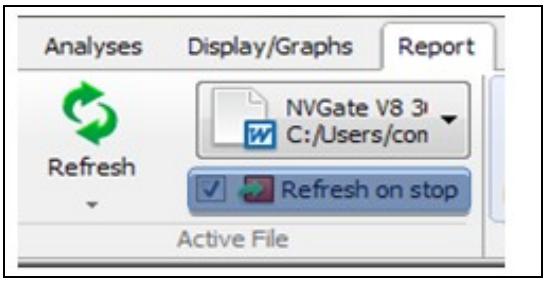
Getting the frequency, amplitude and phase of a set of components (bump test) is now fast and secured using the auto-incremented marker table coupled with a sequence for the identification data.

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)

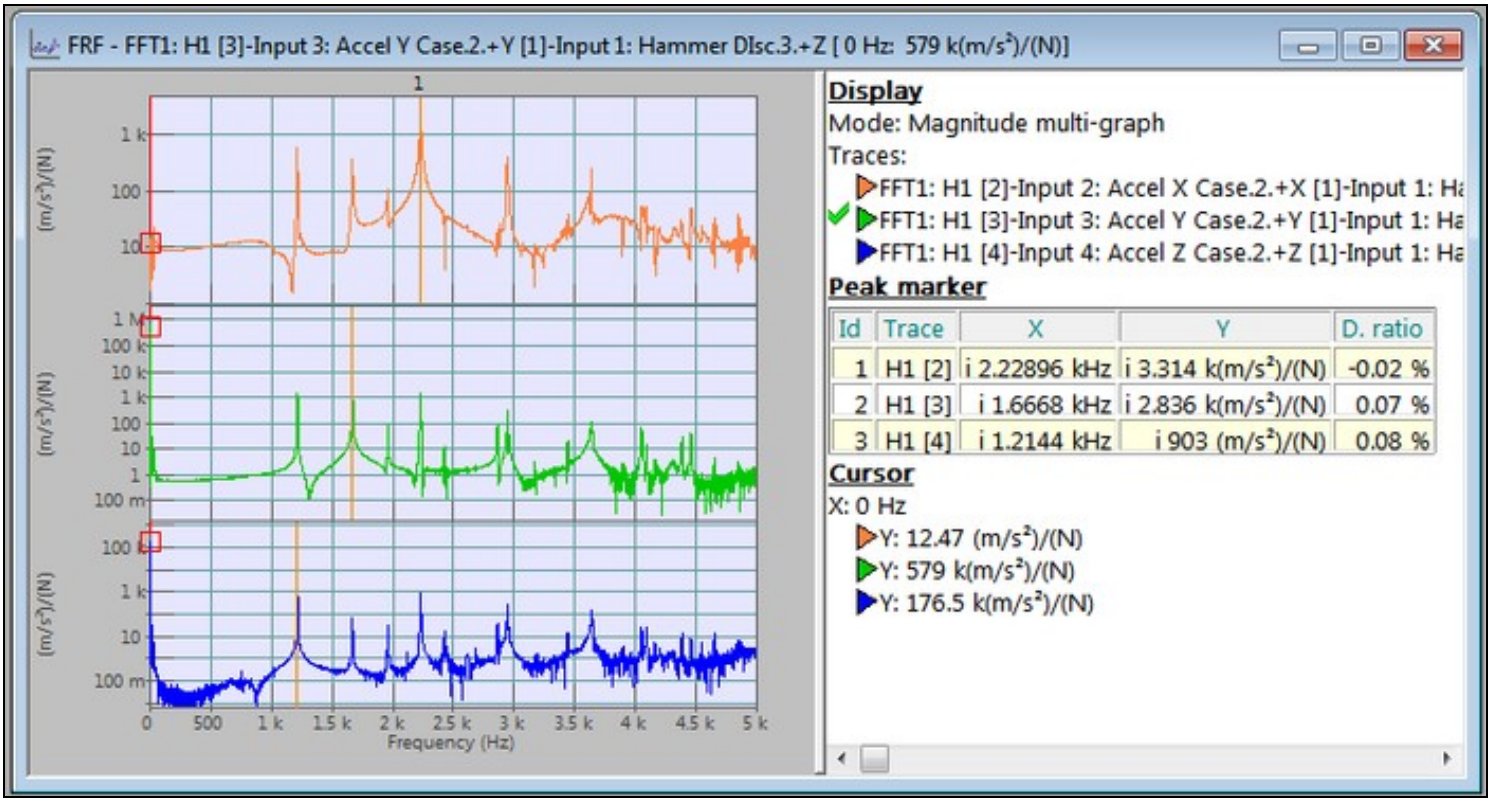
22.3.1.3 Refresh report on end of analysis

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.



22.3.1.4 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>

22.3.1.4.1 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

22.3.1.4.2 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[/]*

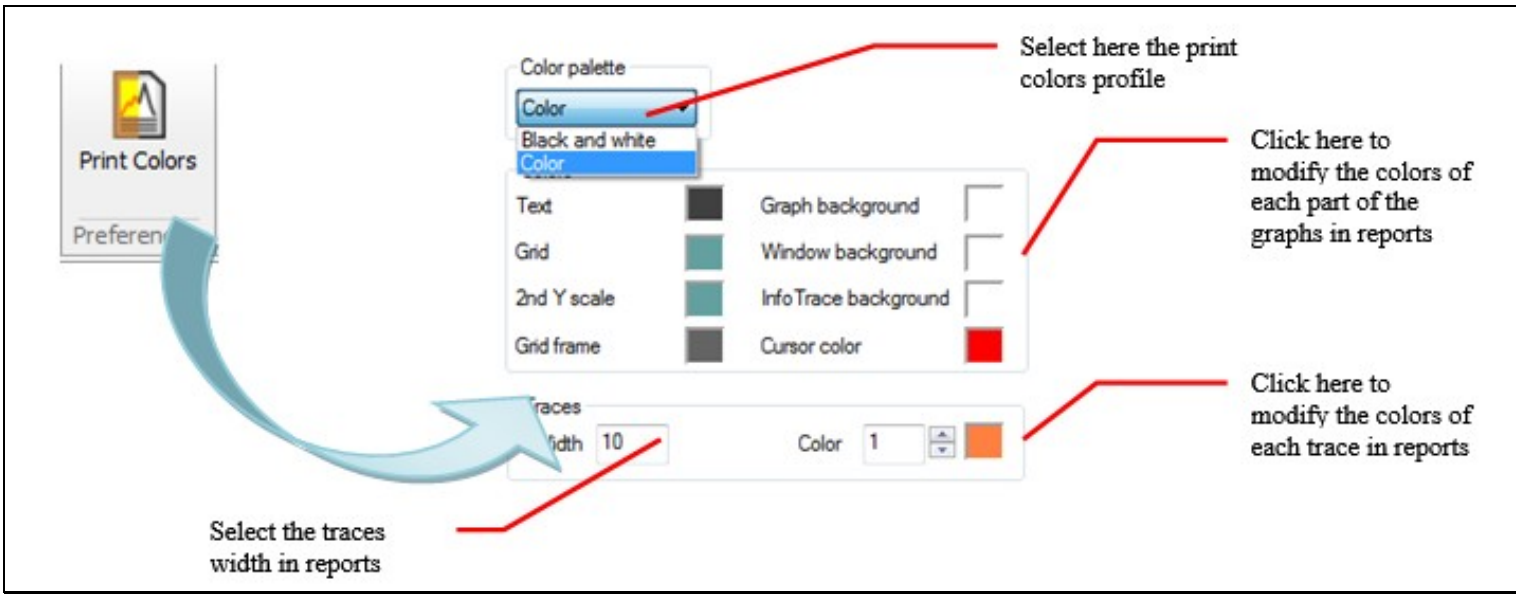
Assuming the column 3 and 6 are for the interpolation indicator, the table will look at:

(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

22.3.1.5 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.

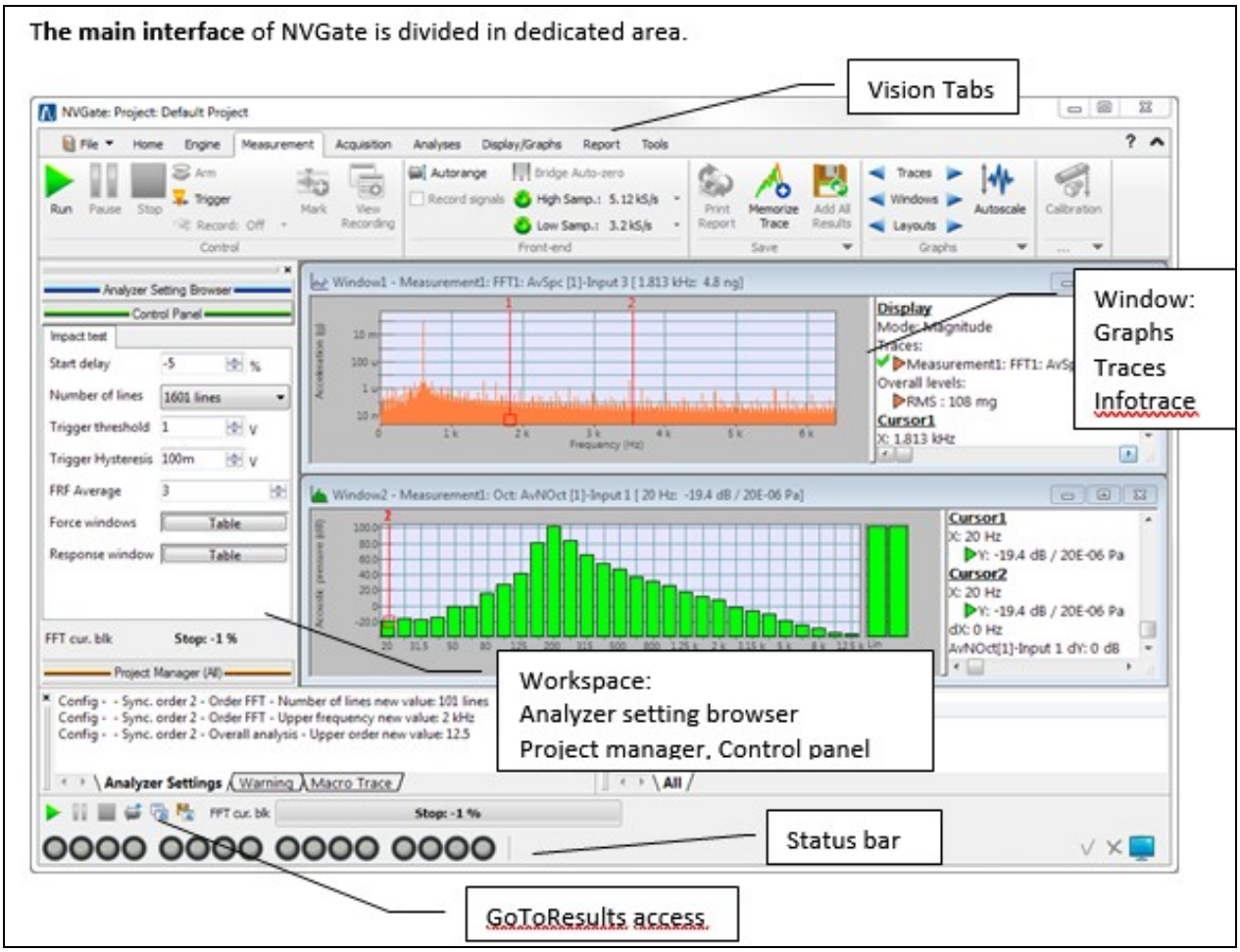
Specific colors and traces widths preferences are used for the graphs in reports. Moreover, 2 different profiles allow managing both colored and black and white reports.



The Print color profile is saved in the active user preferences set. The changes apply to the active reports at each refreshment time.

23 NVGate Ribbons overview

23.1 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

23.1.1 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.

23.1.1.1 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

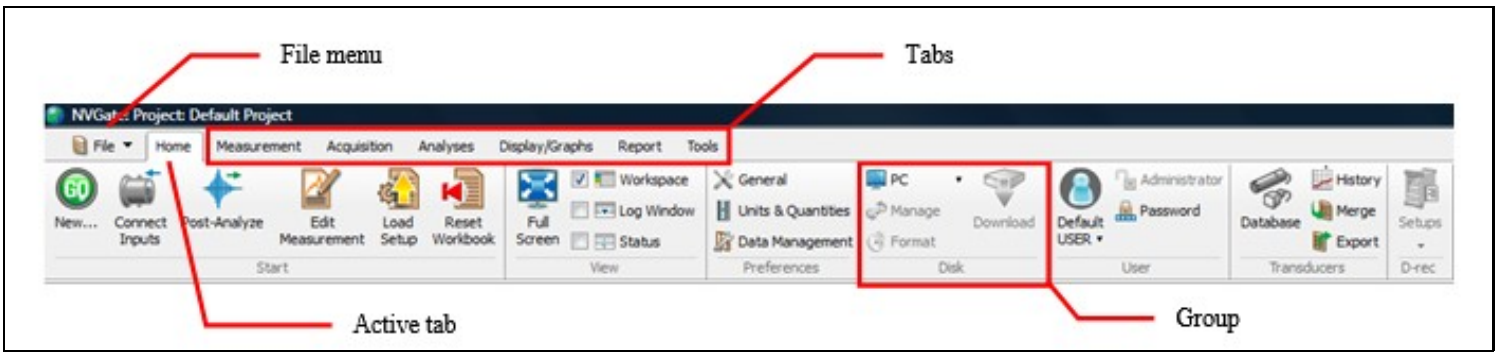
The principal goal the instrument is to measure noise and vibrations. The tabs corresponding to such operations are gathered at the top left of the interface: Home & Measurements.

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.

23.1.1.1.1 Tab & groups

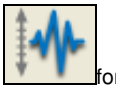
The interface layer features 7 standard tabs (optional tab are also visibles). Each tab contains a set of groups which gathers settings, info and buttons about one topic (e.g. disk, FFT or transducers).



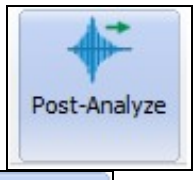
23.1.1.1.2 Actions

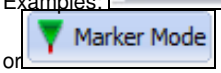
The groups contain buttons, setting and check boxes of different types:

Buttons: Left click on it leads to an action or opens a dialog box.

Examples:  for auto scale or  for inputs connection

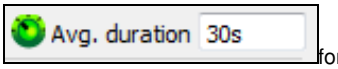
Status buttons: These buttons work like the standard ones but they can be activated or de-activated. They are used for changing a state. An activated button is slightly darkened.

Examples: 

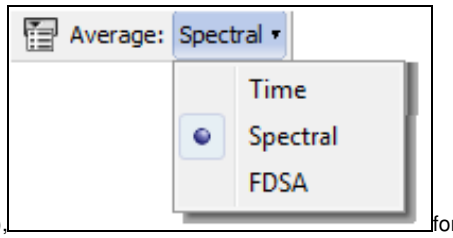
that switches between **on-line** and **post-analysis** modes,
or 

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.

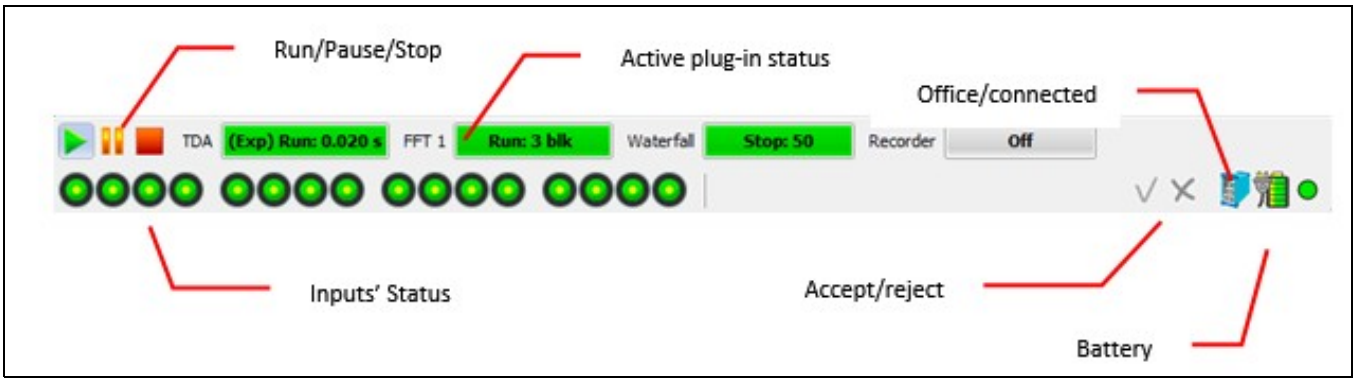
Examples are: Marker, or User selection.

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.

23.1.1.1.3 Status bar

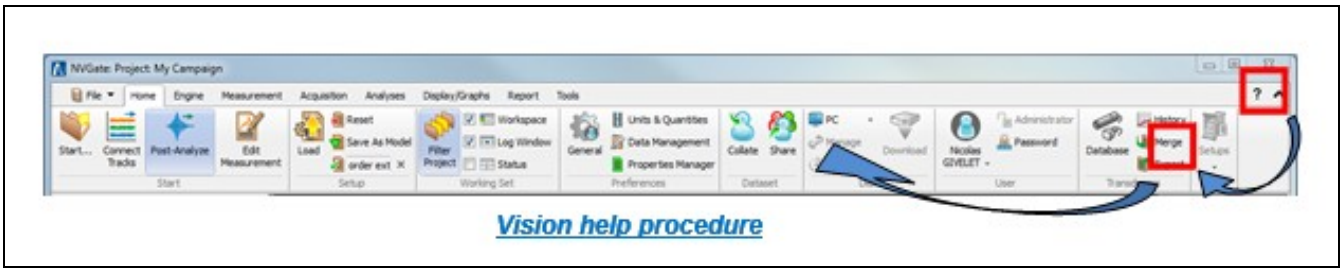
At the bottom of the screen a fixed status bar maintains a continuous monitoring of the inputs and analysis:



See status bar page for more info

23.1.1.1.4 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.

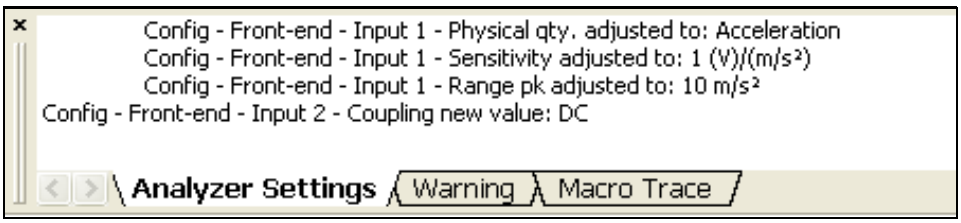
Note that the latest pdf reader software is supported with NVGate: Acrobat reader 32 or 64 bits and Acrobat and any other pdf reader. The ability to open the manual at the corresponding pages is supported by Adobe? products only. OROS recommend using acrobat reader using the on-line help functionality.

23.1.1.1.5 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.

23.1.1.1.6 Log window



In the Home tab, tick/untick the Log window

to show/hide the Log window (Analyzer settings, Warning and Macro Trace information).

23.1.2 File Menu

23.1.2.1 Project

23.1.2.1.1 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*

23.1.2.1.2 Load

Opens the dialog box to load a project. Select a project from the current base.

23.1.2.1.3 Save:

Saves the current project. If the current project is the default project, the Save command will act as the Save As.

23.1.2.1.4 Save As:

Saves the current project with a new name

23.1.2.2 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.

23.1.2.3 Recent projects

Displays the list of the most recent projects used by the current user.

23.1.2.4 Recent measurements

Displays the list of the most recent measurements used by the current user.

23.1.2.5 Help

23.1.2.5.1 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.

23.1.2.5.2 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.

23.1.2.5.3 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

23.1.2.5.4 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

23.1.2.6 Exit

Exit NVGate.

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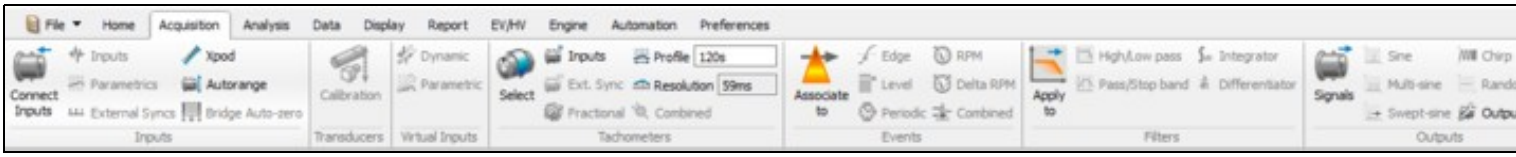
24 NVGate Ribbons: Acquisition Tab

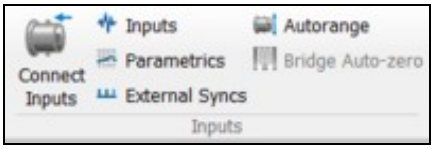


This tab provides all the necessary entries to setup the front-end and the use of any channels in details. It separates the acquisition channels setup from the outputs, triggering, tachometer, and filters ones.

While switching to post-analysis the inputs group is swapped to player track group which control the player operations, track connections and track setup.

24.1 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.

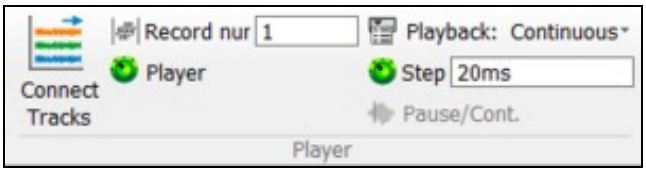
External syncs: Allow modifying the digital trigger inputs properties. Available when at least one Ext synch input is active.

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.*

24.2 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.

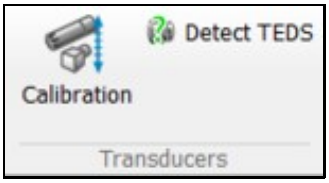
- *Continuous:* the signal analyses are processed as fast as possible between the start and stop offset.
- *Time step:* the signal analyses are processed step by step. The step duration is defined by the *Step* setting (see hereafter). Each new step is manually (or automated by a macro) triggered through 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.

24.3 Transducers calibration

Enables to calibrate the sensors. This group is active only in connected mode.



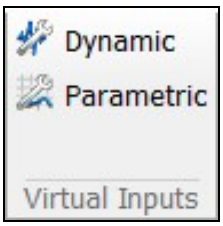
Calibration: Open the calibration procedure tool.

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.

24.4 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.

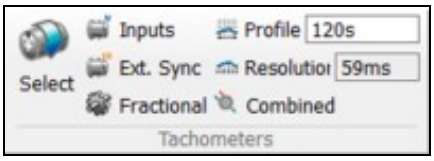
Parametric: Allow modifying the virtual parametric input properties. Available when at least one input is connected to the Virtual DC plug-in (Use the *Connect Inputs* button from the Inputs group for that).

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.

24.5 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.

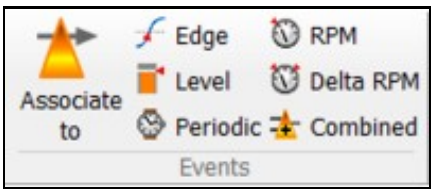
Resolution: Define the shortest time between 2 angular speed values saved in the profile.

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.

24.6 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.

24.7 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.

24.8 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.

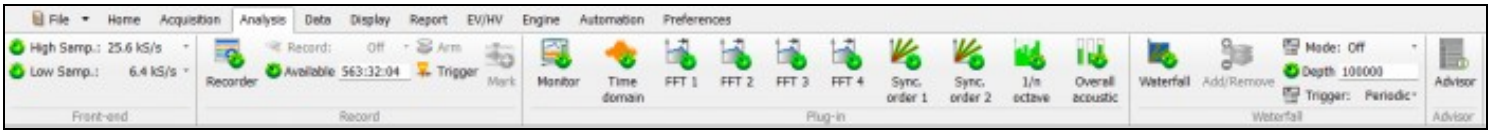
 **Chirp**: Open the Chirp properties dialog for adjustment.

 **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.

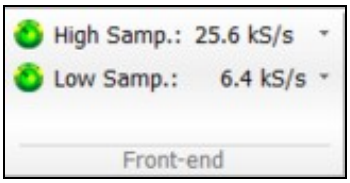
Read Output page for details.

25 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.

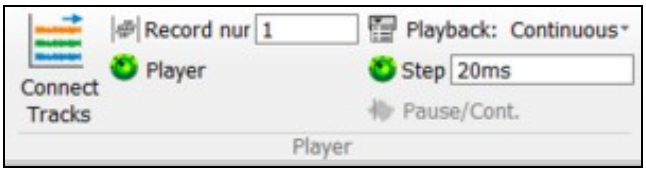
25.1 Front-end group



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.

25.2 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

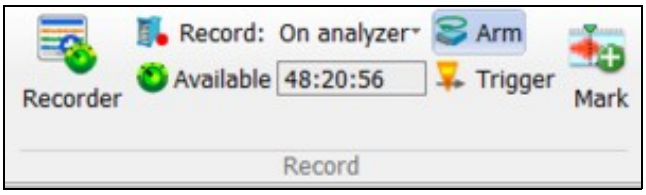
Playback mode: Allows choosing between a continuous and a step/step post-process.

- *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.

25.3 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.

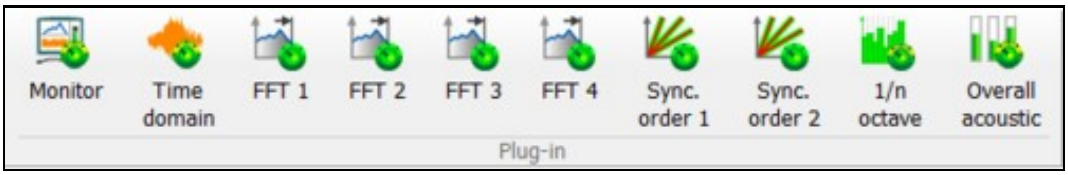
Note 1: modifying a setting of the analyzer will disable the arming. It is then necessary to re-arm it.
Note 2: the recorder can be armed from the ASB: (Recorder /Trigger/ Recorder).

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.

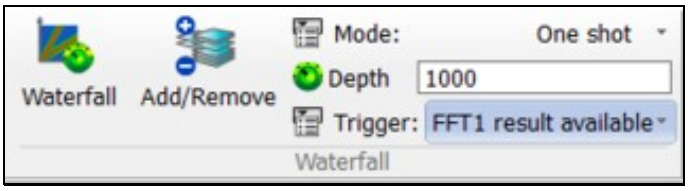
25.4 Plug-in group



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

25.5 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:

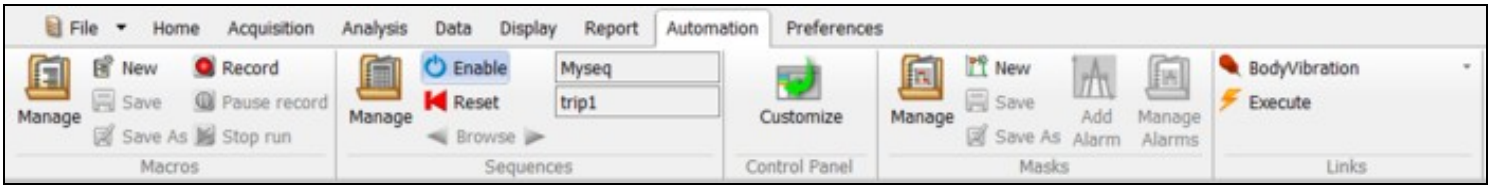
- One shot: the waterfall is fulfilled in one shot from its start trigger to the stop one.
- Continuous: the plug-in is fulfilled as a rolling buffer (FiFo) memorizing the last data only.

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.

26 NVGate Ribbons: Automation

The "Automation" tab contains powerful and helpful tools to automate repetitive tasks made with the analyzers.



26.1 Macros group

See Macro Page

26.2 Sequences group

See Sequence Page

26.3 Control Panel

See Control Panel Page

26.4 Masks group

See Mask/alarm Page

26.5 Links group

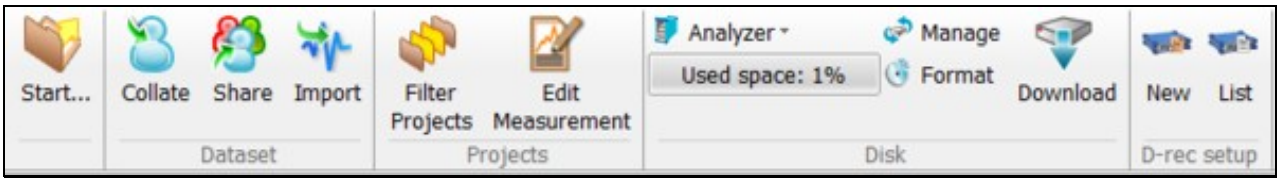
This part of the "Automation" tab provides a link to external software. Once a target is selected, each mouse click on the *Execute* button launches the target software. As a reminder, the target software can be any executable file from windows (.bat, .exe, shortcuts, etc...). Simply add one target in 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.

27 NVGate Ribbons: Data

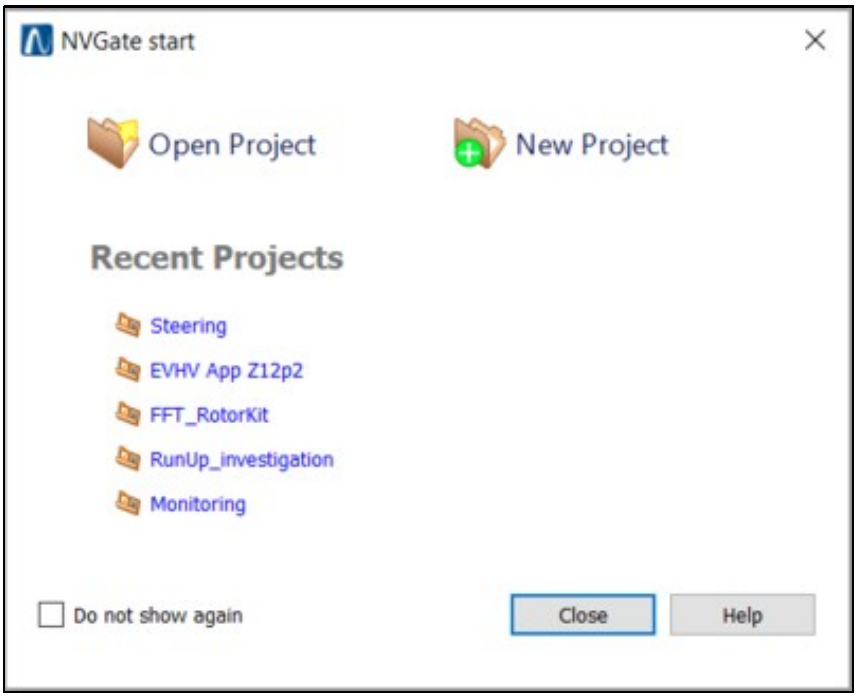


This tab provides functions to deal all your data, transfer Projects, Measurements, Models, export and import your data, filter the Project Manager.

27.1 Start

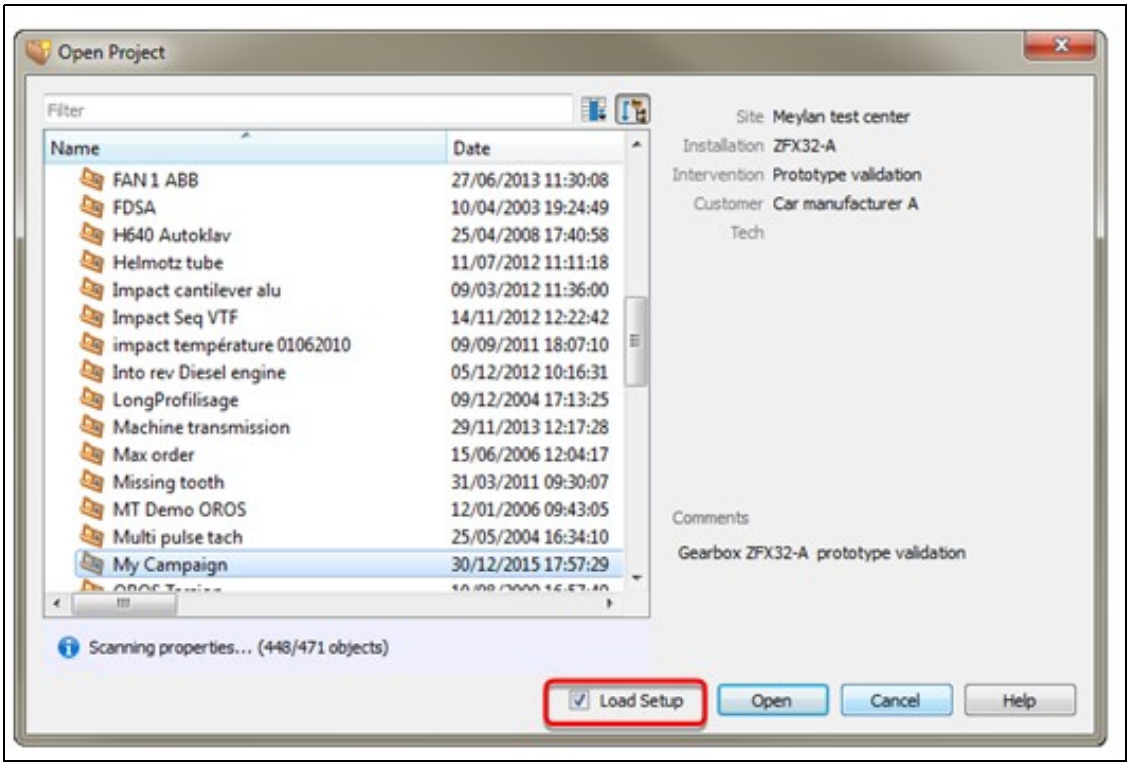

Start?: Opens the *NVGate start* dialog which is dedicated to make the first steps in the software. The *NVGate start* dialog is also displayed at each NVGate Start, except if the user checks the option *Do not show again" in the dialog.*

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.



27.1.1 Open Project

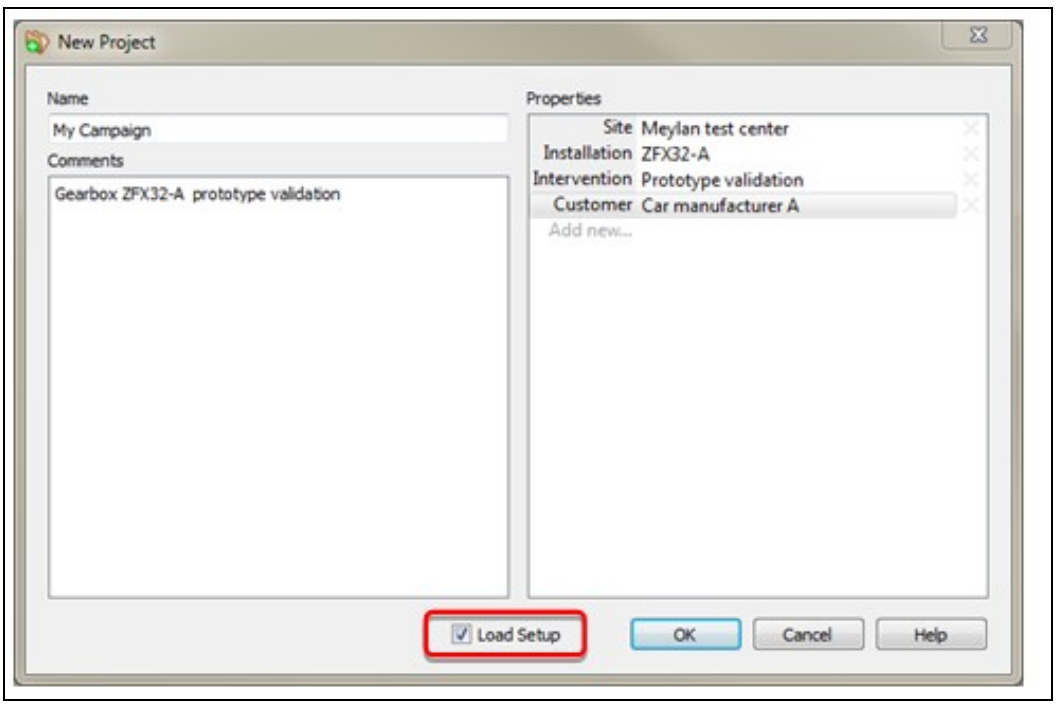
Selecting *Open project* opens the *Open Project* dialog which behaves as the single Item selection.



Select your project and click *Open* button.

27.1.2 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.

27.2 Dataset

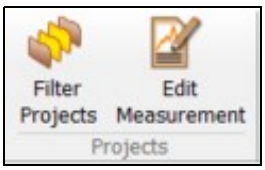
Collate: Enable to copy or move Projects / Measurements / Models from a specified source to the current Projects database.

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.

27.3 Projects

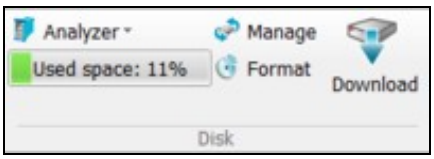


Filter projects: Open the *Filter projects* dialog, which allows selecting the projects to be visible in the Project Manager.

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.

27.4 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.

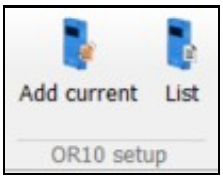
 **Manage**: Open the disk manager in order to manage the signal files saved on it.

 **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.

27.5 OR10 setup

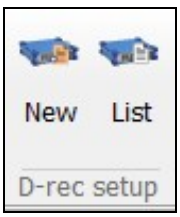


 **Add current**: Add the current setup to the OR10 or generate a file to be copied on the OR10 µSD card.

 **List**: Open the *OR10 templates management* dialog, which lists all the setups available on the OR10.

27.6 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.

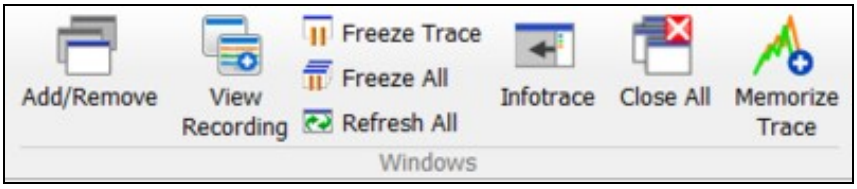
 **List**: Open the *Record setup management* dialog which allows managing the setups saved in the analyzer. The D-rec setups can be written, removed, imported and exported from this dialog.

Read D-rec dedicated page for details.

28 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.

28.1 Windows group



This part of the "Display" tab manages the windows creation, their refreshment and the *infotrace* view/hide.

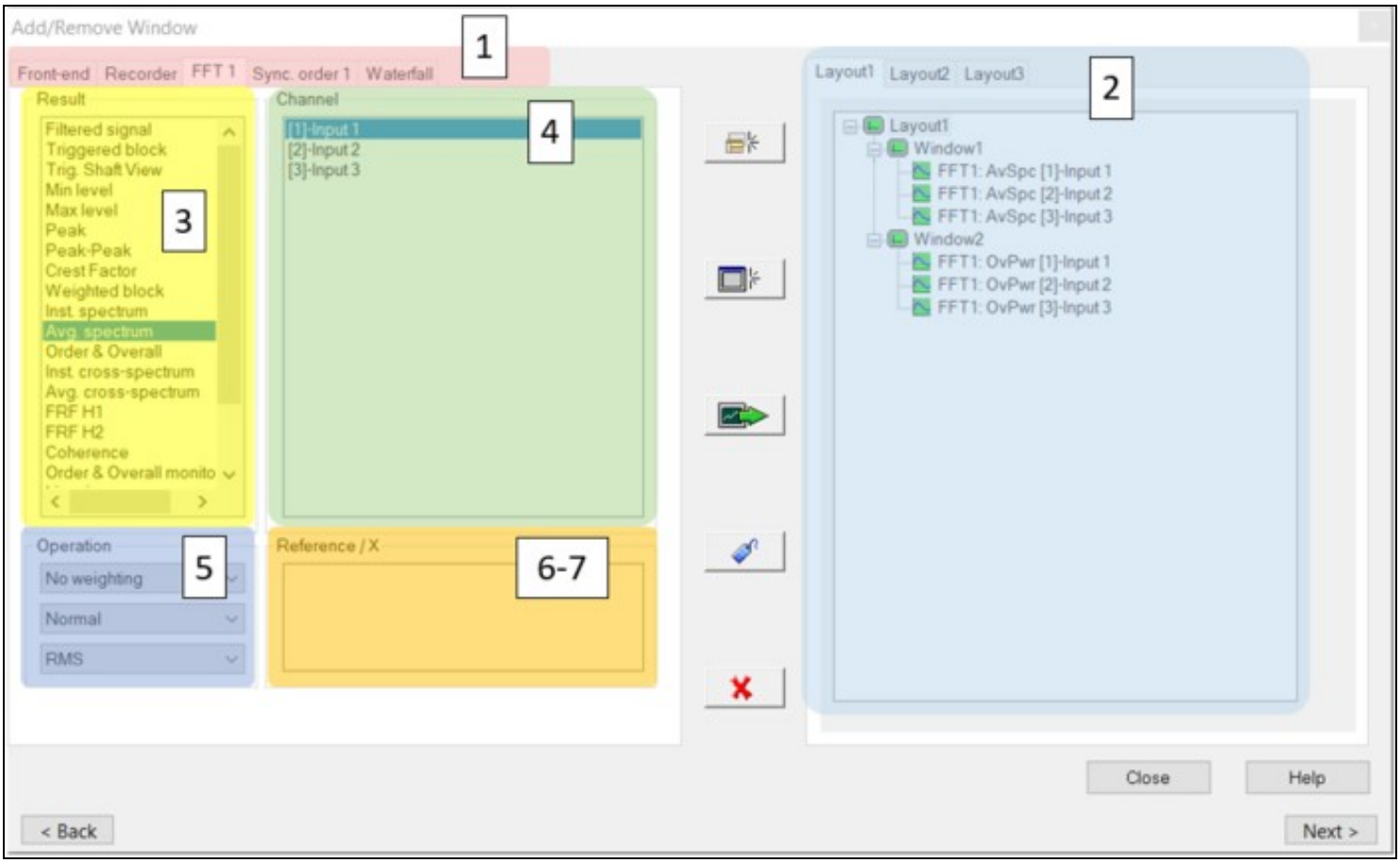
See windows-graph page

28.1.1 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.

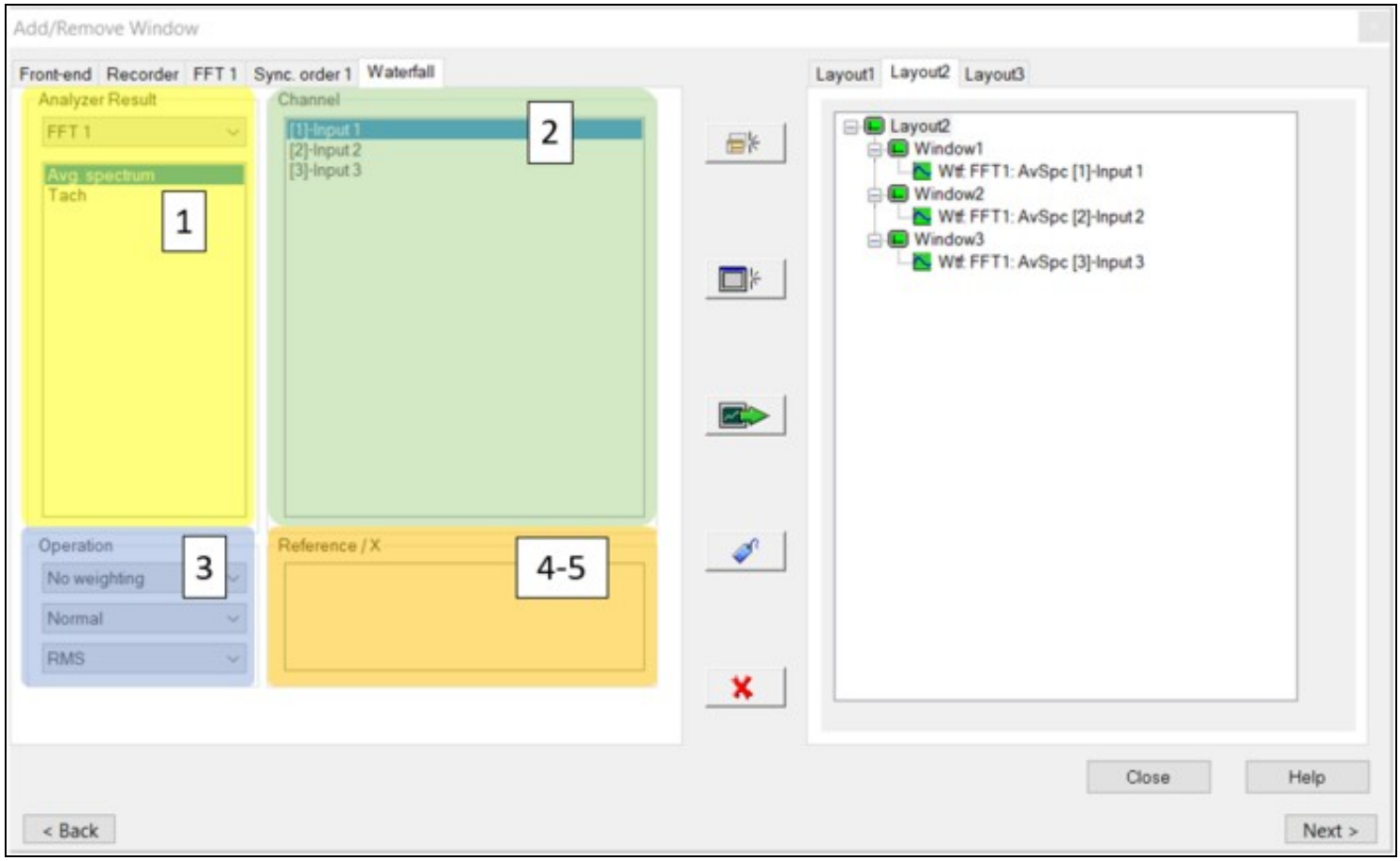

Creates a new window, in the layout of the selected tab. A dialog box used to name the new window is displayed by clicking on the button.


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.

28.1.2 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.

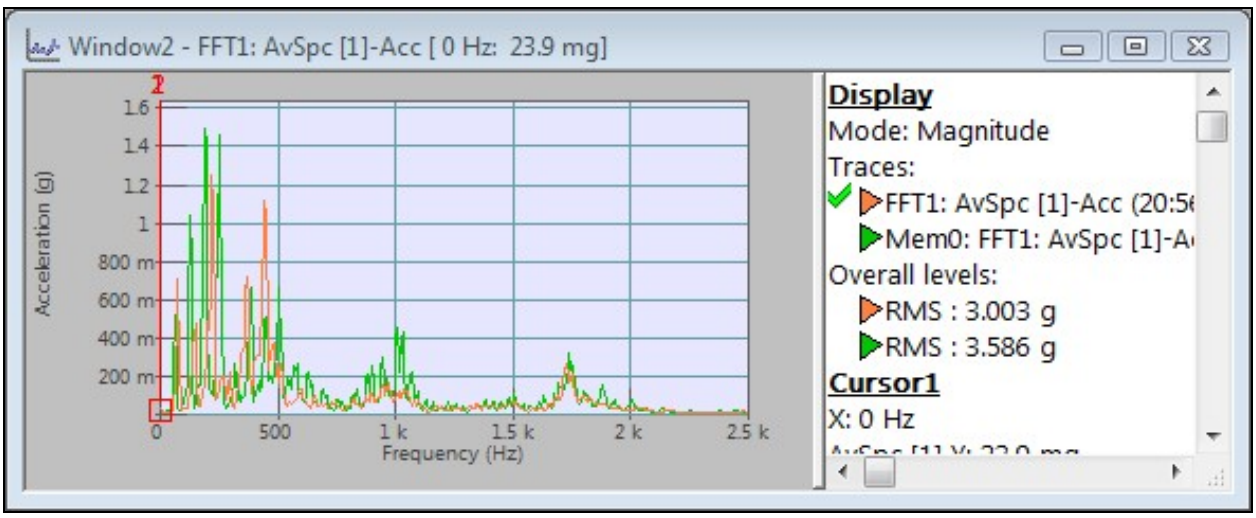
Freeze all traces: Freeze/unfreeze (toggle) all the displayed traces in the active Layout

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*

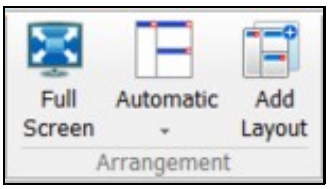
Close all: Close all the windows in the active Layout.

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.

28.2 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.

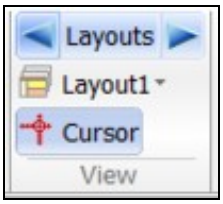
Vertical: Tiles windows vertically according to the Windows operating system rules.

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.

28.3 View group



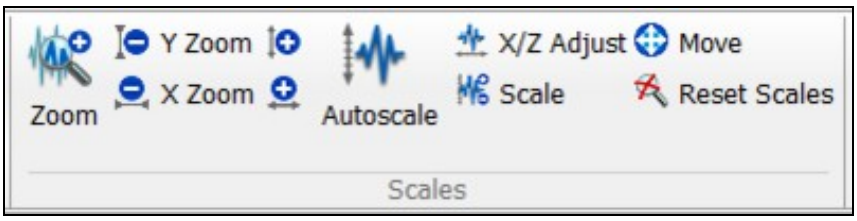
Browse layouts (CTRL+SHIFT+SPACE): scan the existing layouts. *Note: the 2 latest viewed layouts are kept in the RAM memory. Using the CTRL+SPACE shortcut allows switching between these 2 layouts.*

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.

28.4 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.

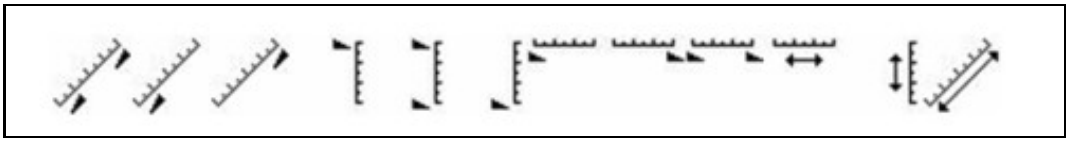
Zoom out X: Makes the X-scale twice as large and sets the minimum and maximum values so that the cursor is in the middle of the graph.

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.

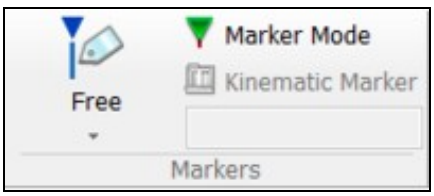
Move (CTRL+F8): When this mode is activated, the mouse pointer has following shape:  . Left click on the graph and use the mouse to drag.

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.

28.5 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.

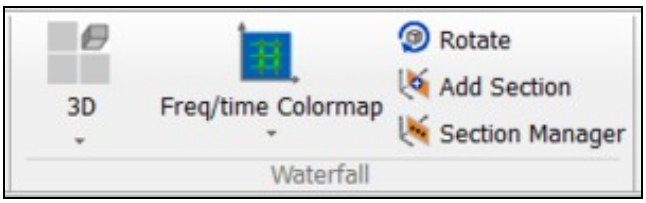
Kinematic marker: The Kinematic marker can be positioned everywhere in a spectra and waterfall X/Y sections. The Kinematic marker helps identifying the frequencies (or orders) which match the various rotating speed in machineries. These frequencies are linked with a fundamental one (usually the main 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.

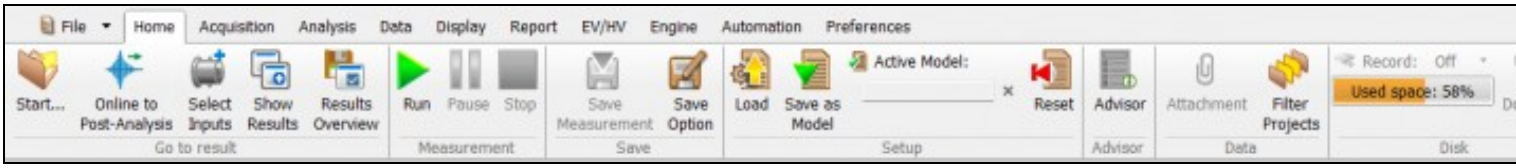
28.6 Waterfall group

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.

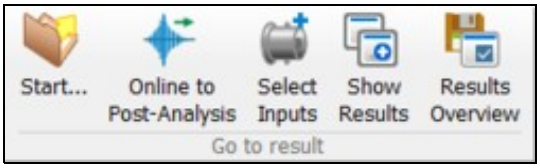
29 NVGate Ribbons: Home Tab



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.

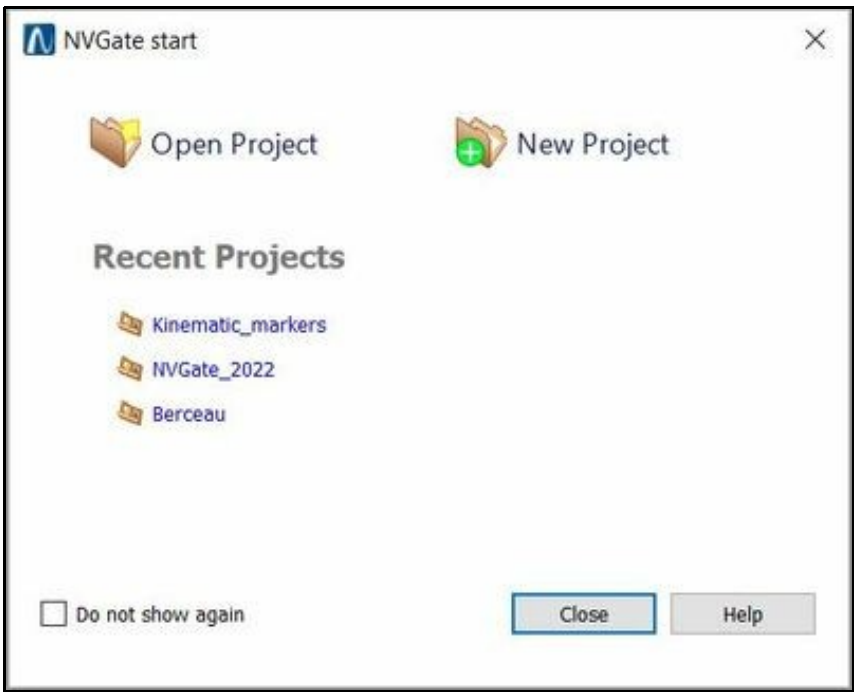
29.1 Go to result group

29.1.1 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.

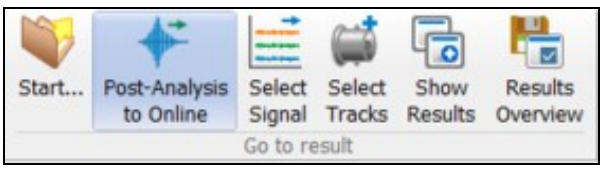
See player page for more details.

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)

29.1.2 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.

29.2 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.

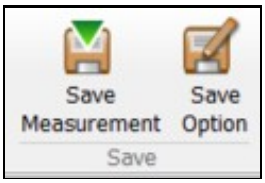
Pause: Suspend or un-suspend the current analysis.

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.

29.3 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.

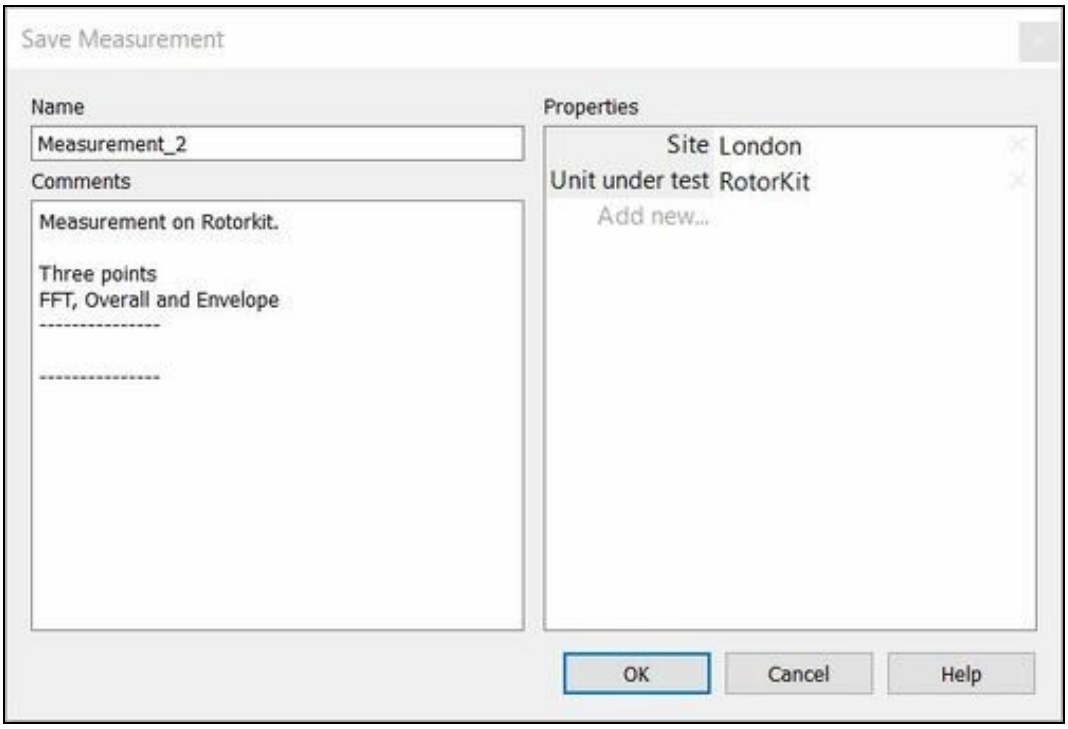
Save option: Define the way the results and signals are saved.

29.3.1 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.

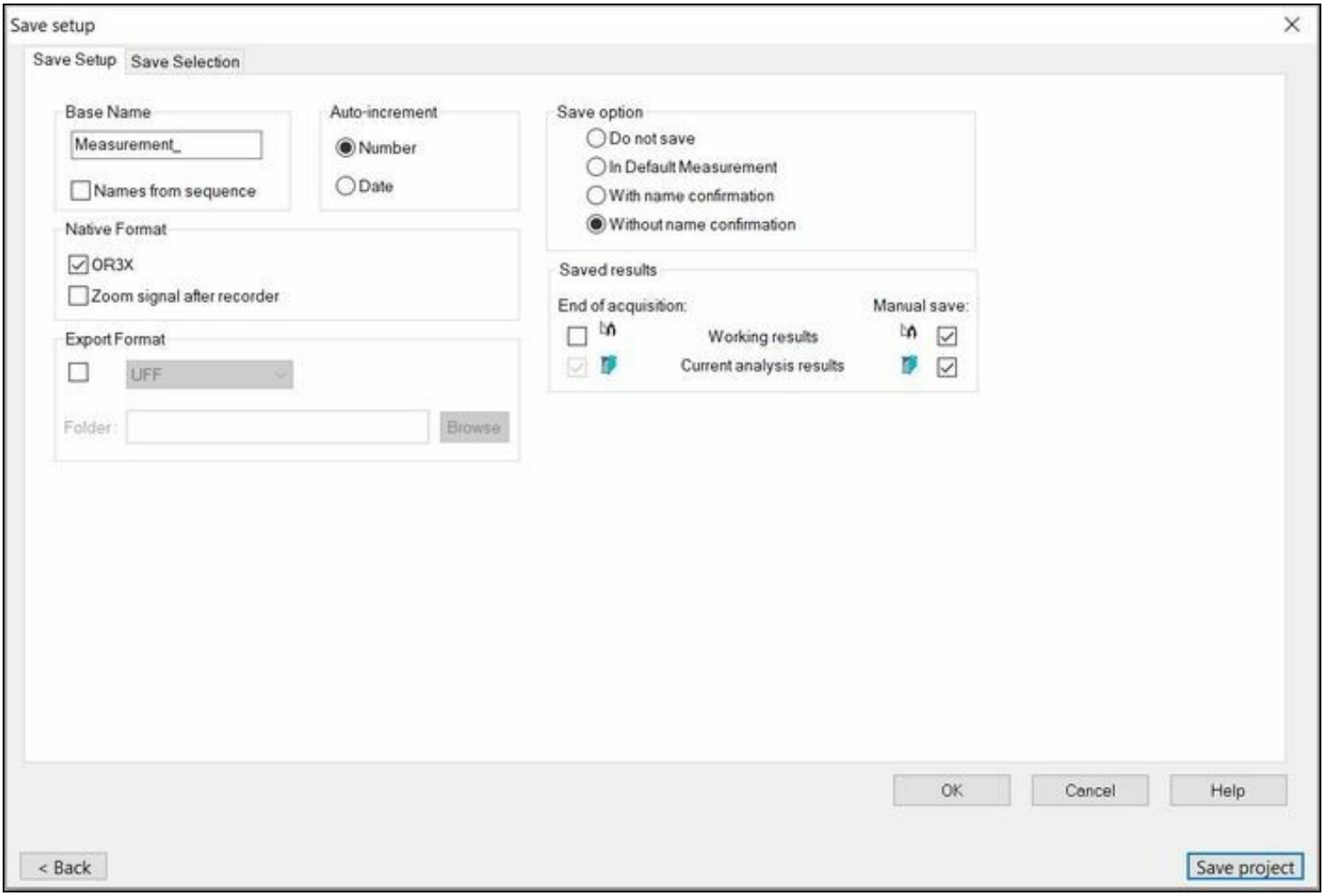
By right clicking on the property line you can hide it or change the suggestion mode. In order to save your entered values from one measurement to the next one, select *Same as previous. Same as today* will reset the suggestion as soon as the date of the latest saved measurement is different from current day.

Note: Measurement?s properties can be edited from the Project Manager *by right clicking on the desired measurement.*

29.3.2 Save option

Define the way the results and signals are saved. It opens the *Save setup* dialog which contains 2 tabs.

29.3.2.1 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

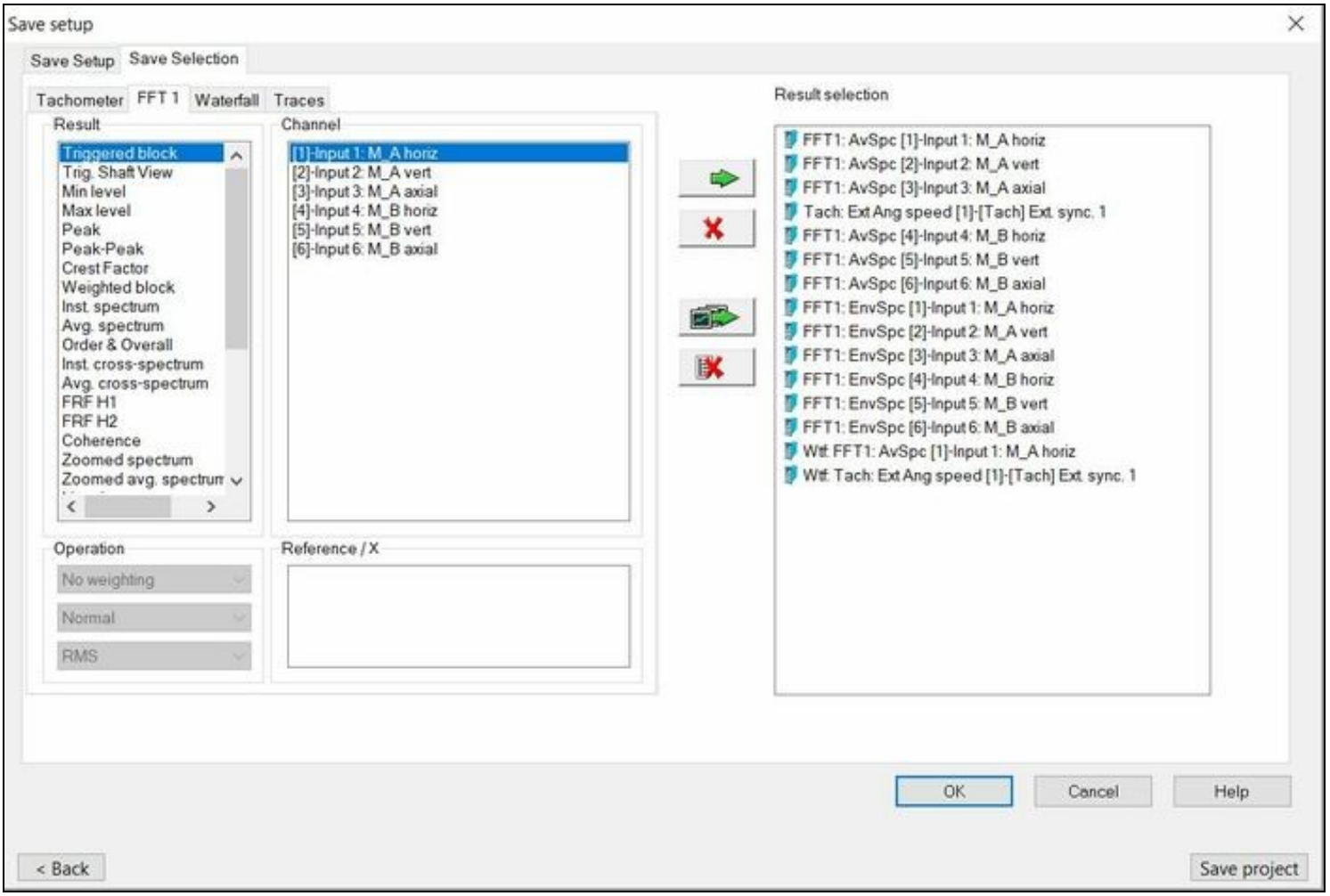
- *Save option*: This option determines the way in which the measurement will be created when the analyzer stops

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.

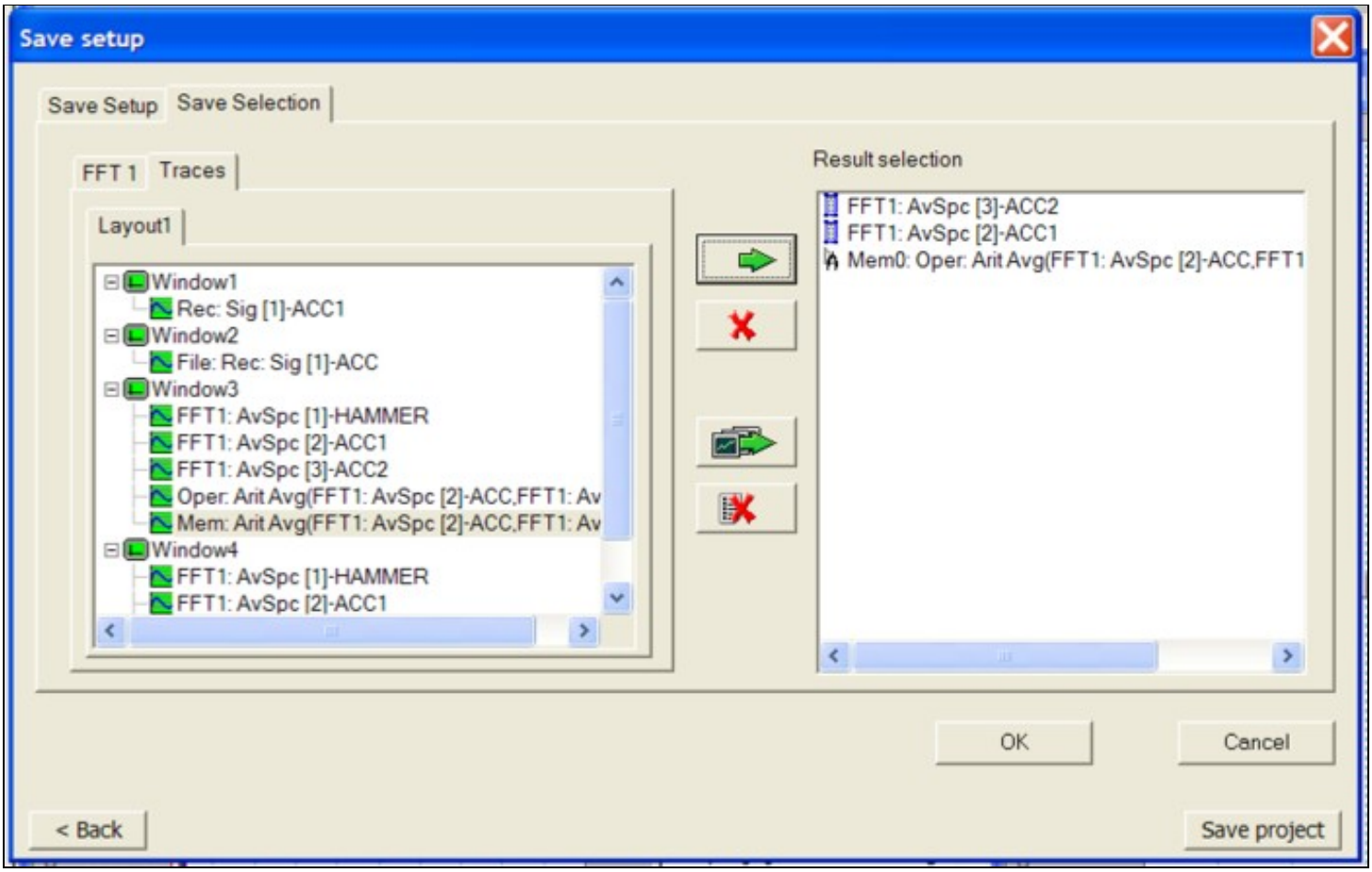
These results can be only saved manually.

29.3.2.2 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

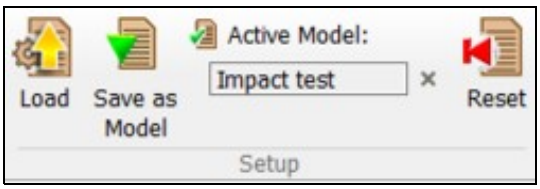
Results provided by the plug-ins

- *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*



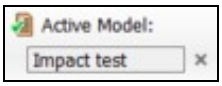
List of traces available in the project coming from current analysis results and working results.

29.4 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.

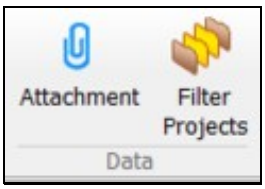


Active model: Display the name of the loaded Model. This Model will remain active until a *Reset setup* is applied or another setup is loaded.

Reset: Close the active Model and set all parameters to the default values.

See setup group page for more details.

29.5 Data group



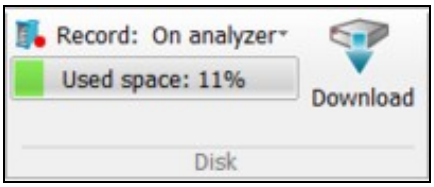
Attachment: Enable to quickly identify if files (reports, pictures, videos....) are attached to the current project. *Note: if the "Default project" is active, the Attachment button is greyed.*

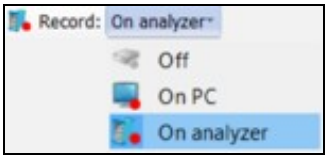
The *Attachment* folder of the current project is empty or does not exist.

File(s) are located in the *Attachment* folder of the current project.

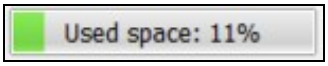
Filter projects: Open the *Filter Project* dialog, which enables selecting the projects to be visible in the *Project manager*. Use the filter and columns sorting to select which set of Project/Measurements will be visible. Click on Filter to view only selected Items, select No Filter to view all Items.The visibility filtering applies on all Item Selection Browsers, Set Selection Browsers and Project Manager.

29.6 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).



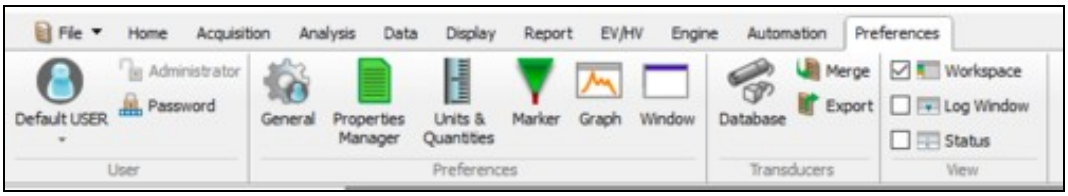
Used space: Give a visual overview of the space available on the disk.

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.

29.7 User

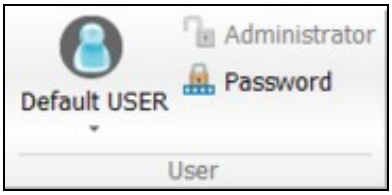
User: This button allows selecting the current user. *Note: changing from one user to another one will reset the current NVGate analysis configuration to the default one defined by the new user.*

30 NVGate Ribbons: Preferences



This tab provides direct access to the user?s definition, user's preferences and sensor database.

30.1 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

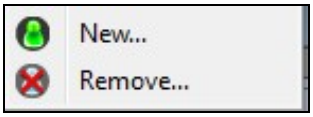
The user profiles are saved in a file called *NVGate.usr* located in the *NVGate.exe* directory. This file is automatically created at NVGate start when it is absent. Attention: deleting the NVGate.usr file delete all users? preferences including the default setting proposed by OROS.

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.

30.1.1 Users management

The User group allows managing NVGate users? profiles.

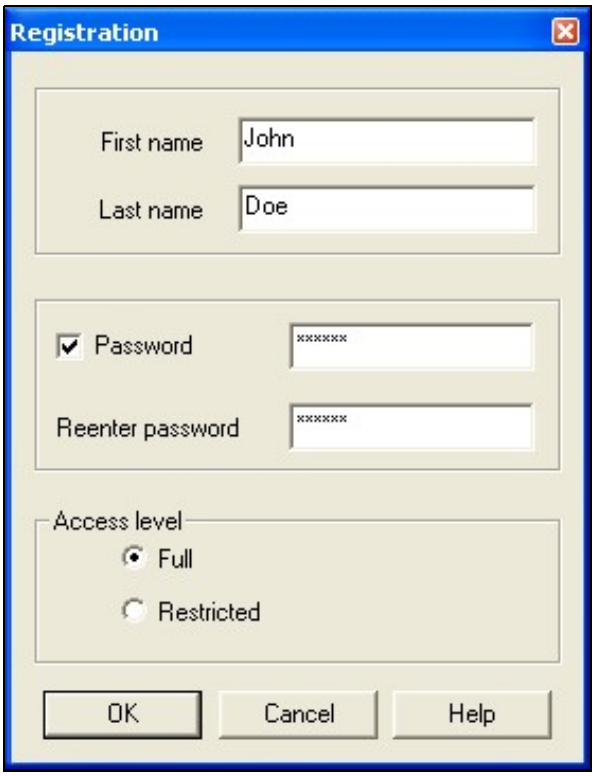
User button: It allows selecting the current user. Attention: changing from one user to another one will reset the current NVGate analysis configuration to the default one defined by the new user.



User button Part2: It allows creating and deleting users from the active .usr profile files.

New: Used to create a new user

30.1.2 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'**.**

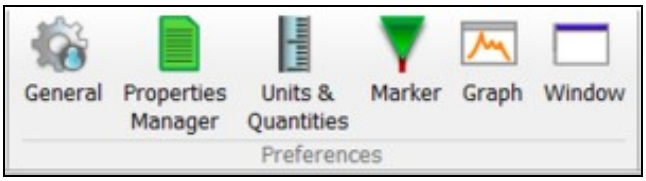
Tips: By default the user is named "Default user".

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.

30.2 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.

30.3 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.

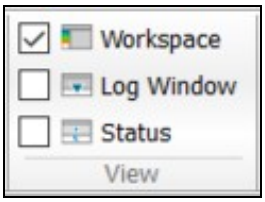
Database: Opens the transducer database saved on the computer.

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.

30.4 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*.

31 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.

31.1 Tutorial

31.1.1 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

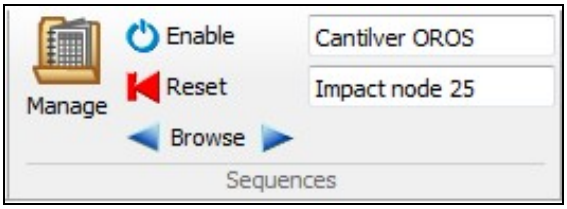
31.1.1.1 Tutorial Data Download

- 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

31.2 Sequences group

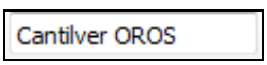


Manage: Open the Sequence manager and display the sequences list.

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.

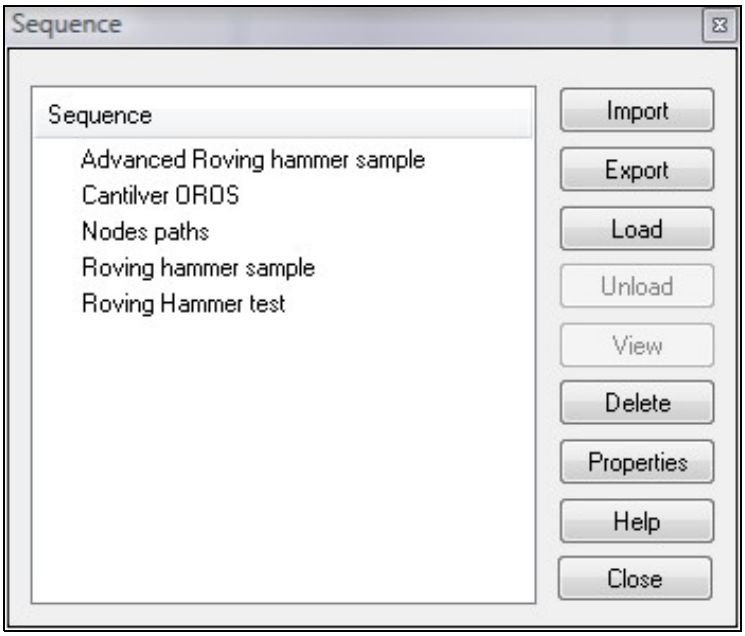


Active sequence name: shows the loaded sequence name.

"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.

31.3 Sequence Manager



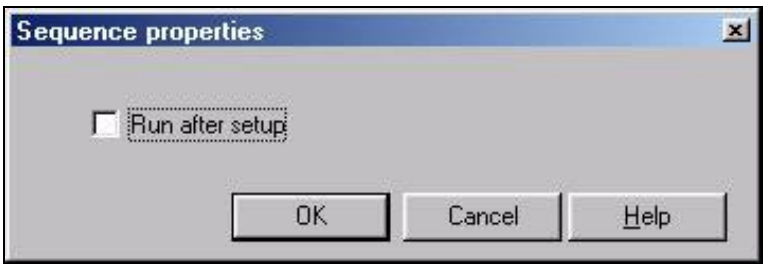
- **Import**: Import a sequence from an Excel® file, to create a sequence in NVGate format. Sequences in NVGate format are stored in the "Sequence" directory.

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.

31.4 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.

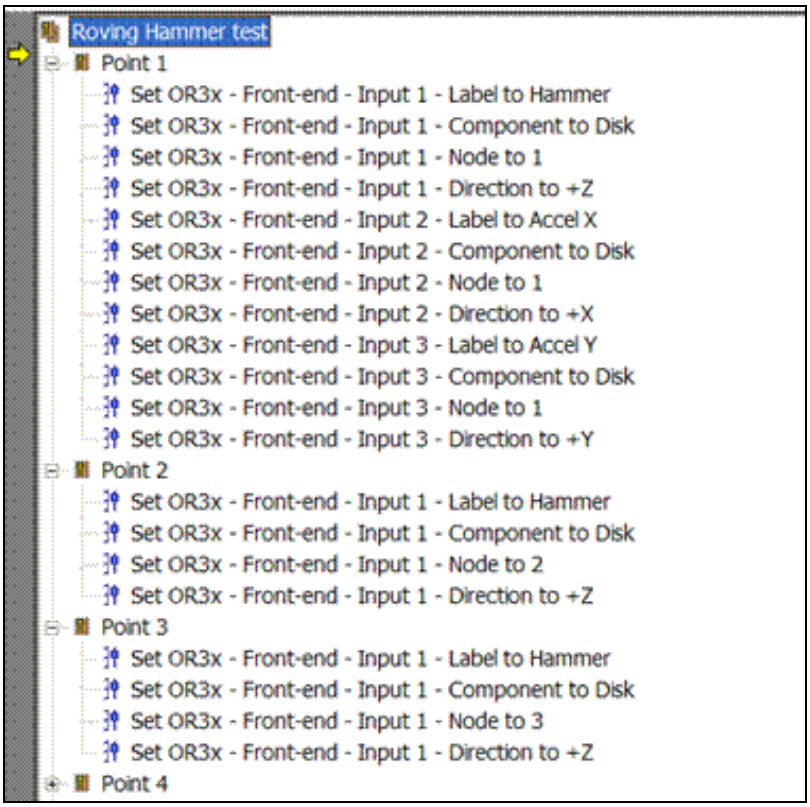
- **Jump to**: Accessible by right-clicking on the acquisition. This acquisition becomes current.

31.5 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

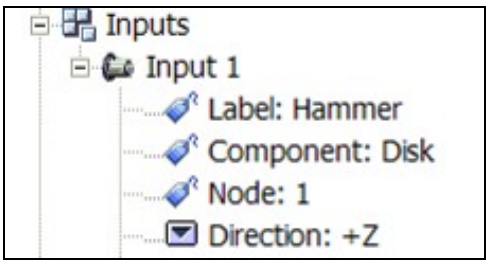
"Roving hammer test" sequence in NVGate



The first Excel® cell is dedicated to sequence name.

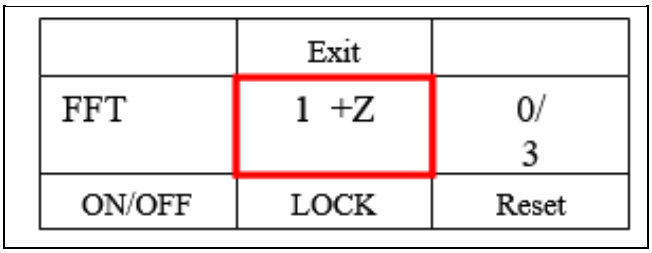
The first column contains the name of acquisitions.

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.

31.6 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	

32 NVGate Shortcuts

32.1 Shortcuts

32.1.1 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.

32.1.1.1 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

32.1.1.2 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.

32.1.1.3 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

32.1.1.4 Use the mouse wheel for 2D windows

32.1.1.5 Cursor mode

Mouse Wheel: right/left move by 5 steps.

Mouse Wheel + CTRL: right/left move by 1 step.

32.1.1.6 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.

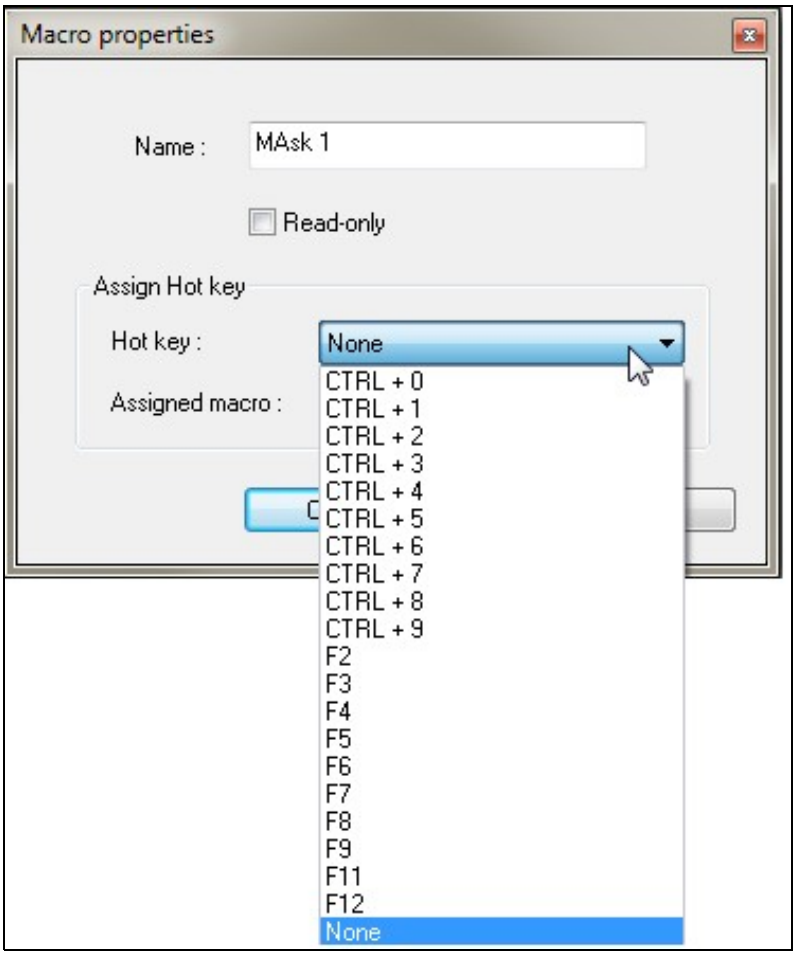
When the pointer is in the middle of X or Y axis, use the mouse wheel + SHIFT to zoom quickly.

When the pointer is in the middle of X or Y axis, use the mouse wheel + CRTL + SHIFT to zoom.

32.1.1.7 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.

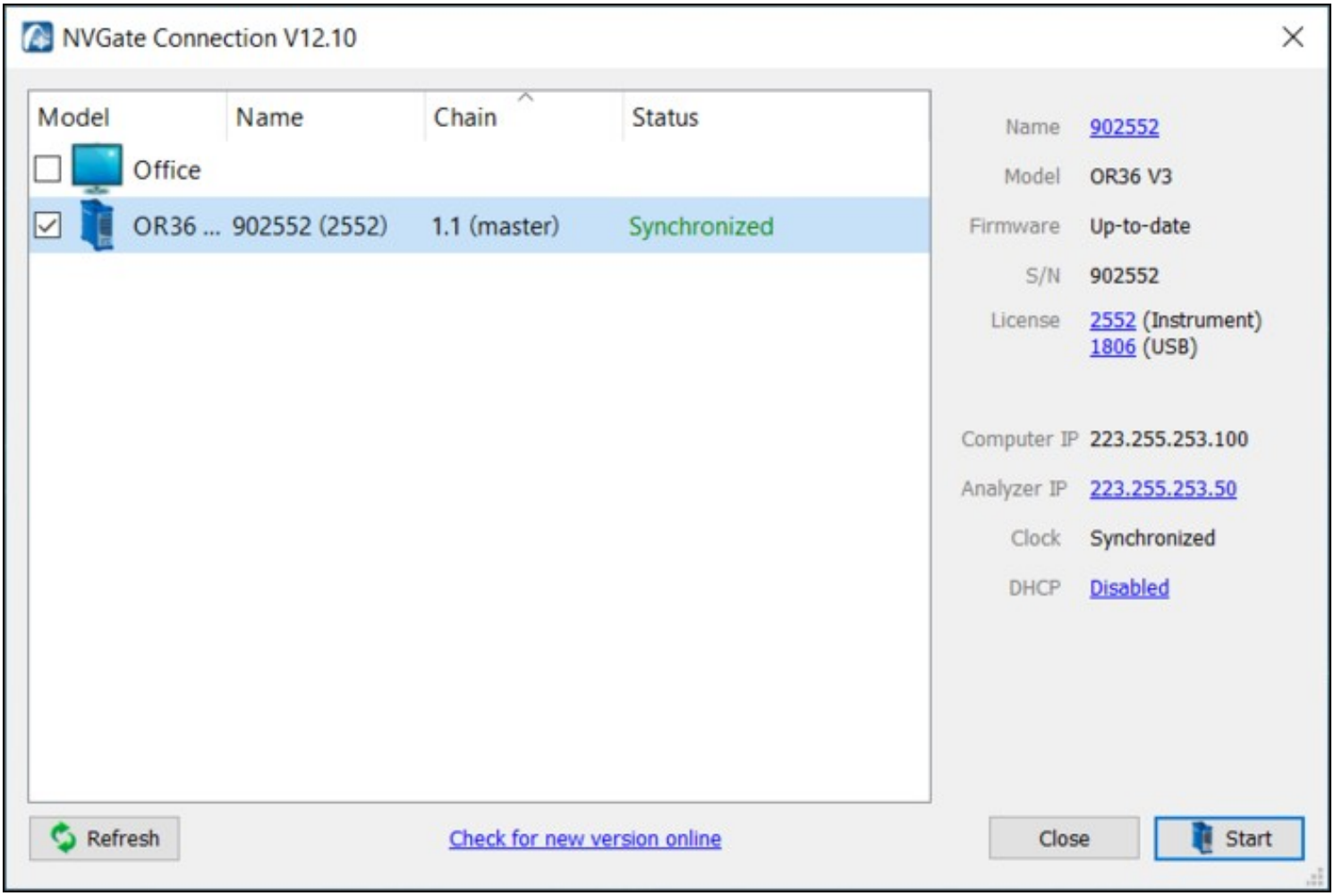


Exemple : Do a Macro wich is doing only "Run", assign this macro to an hot keys. Exemple : "F2". So now, you can launch the Run with the F2 keyboard button.

33 NVGate Software overview

33.1 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).

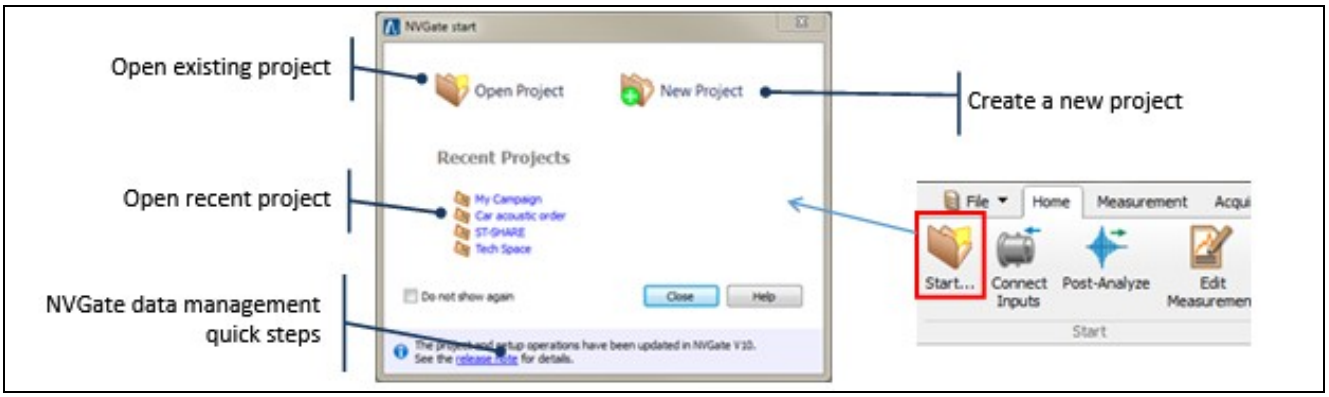


Select the analyser and click on start.

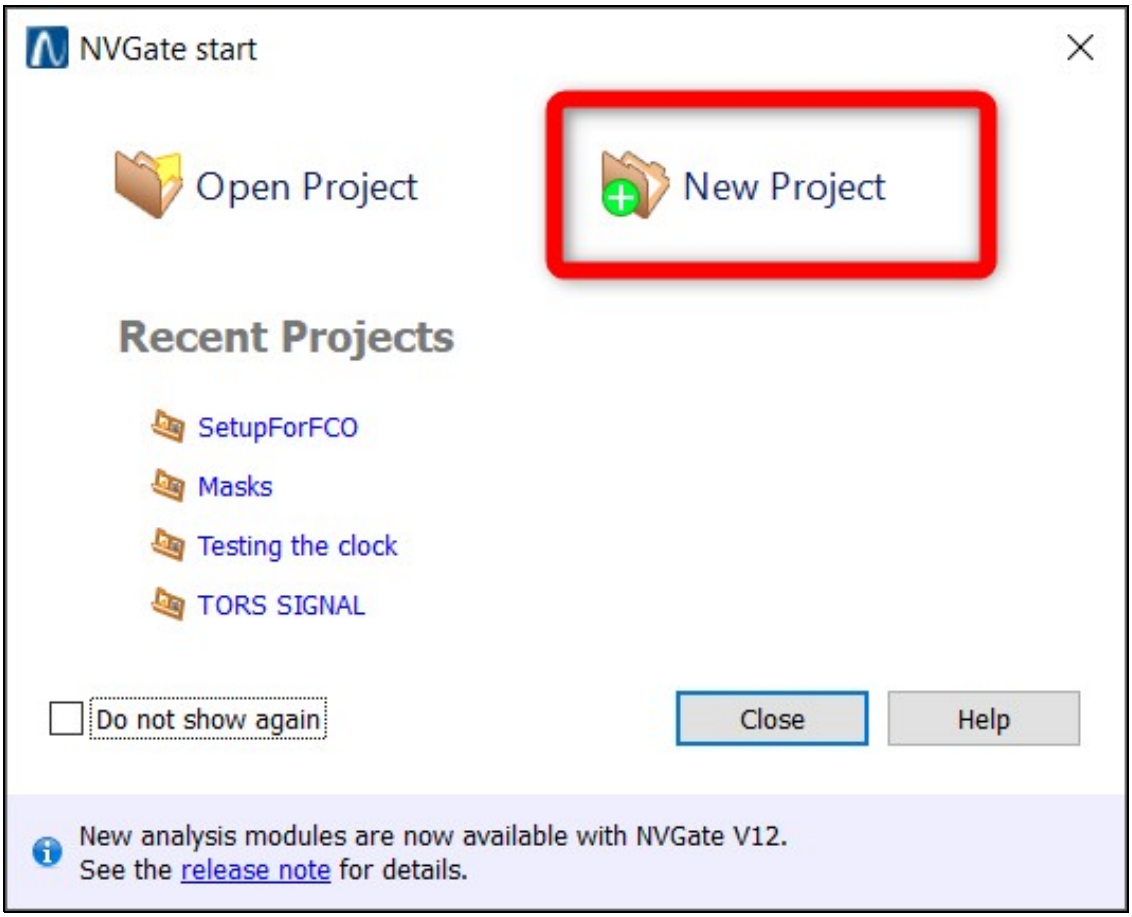
The NVGate splash screen will automatically appears.

33.1.1 Open/create a project

NVGate will start and the *Start* dialog is proposed:

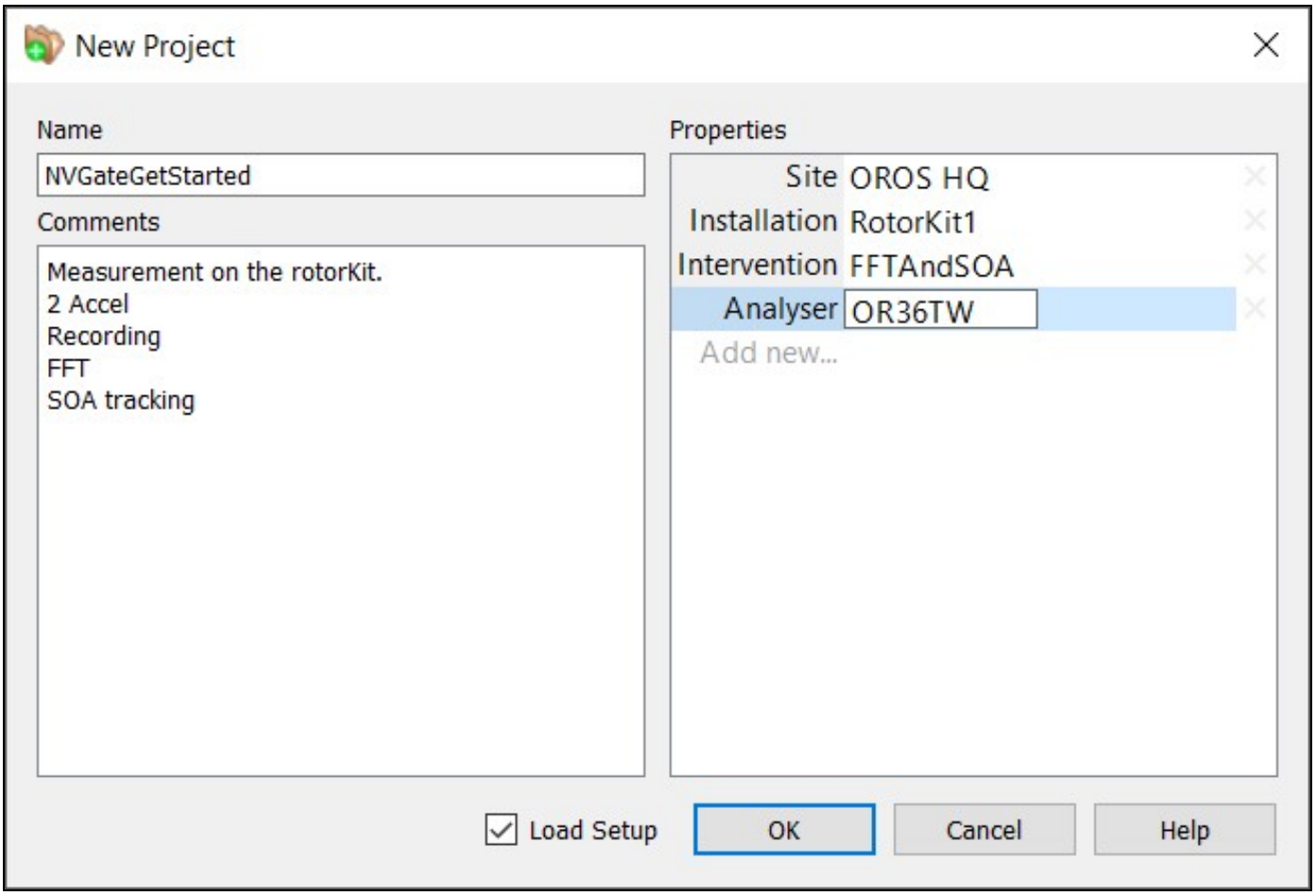


Here we will create a new project :



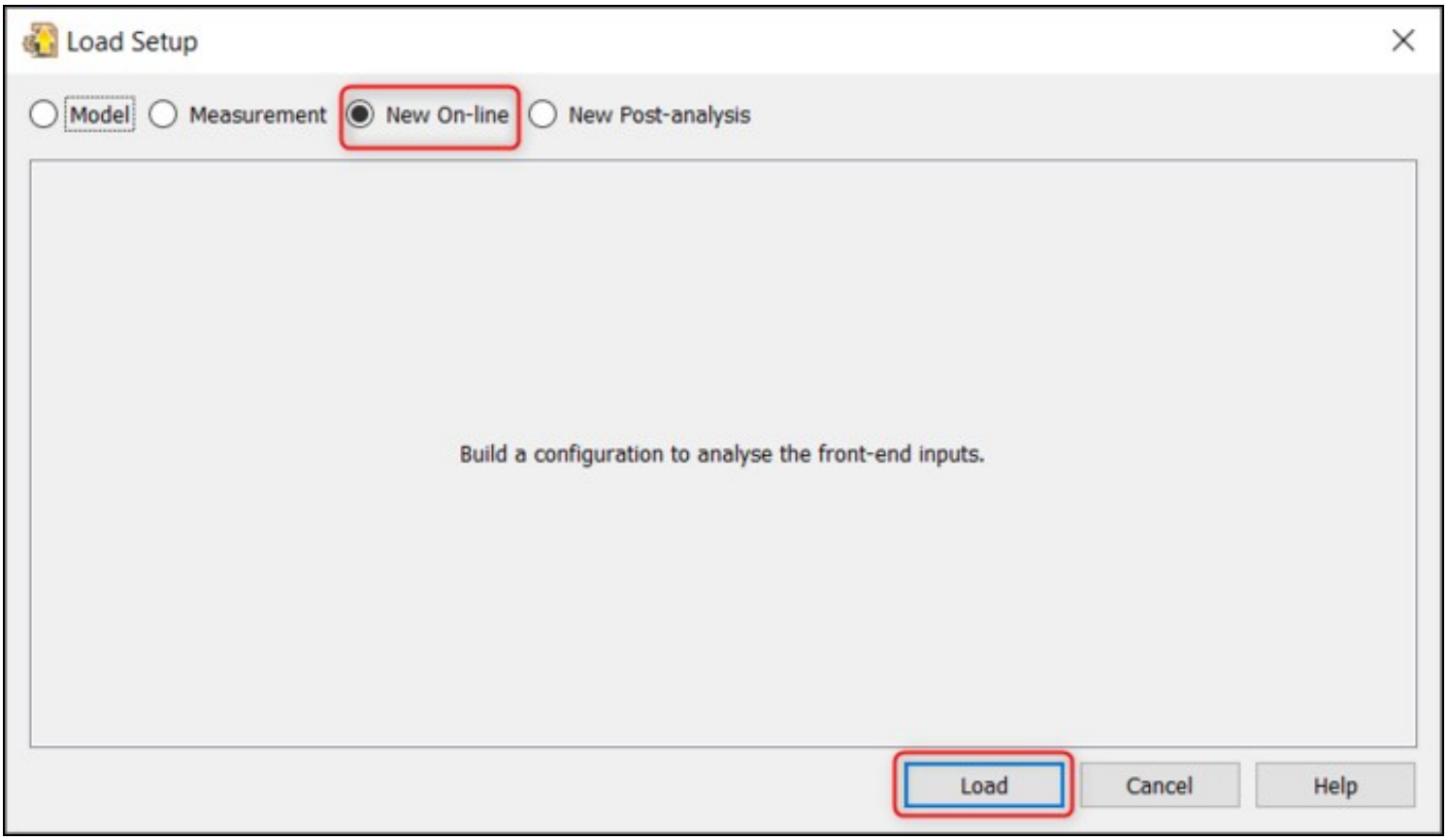
This window is also accessible from the NVGate Ribbon.

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.



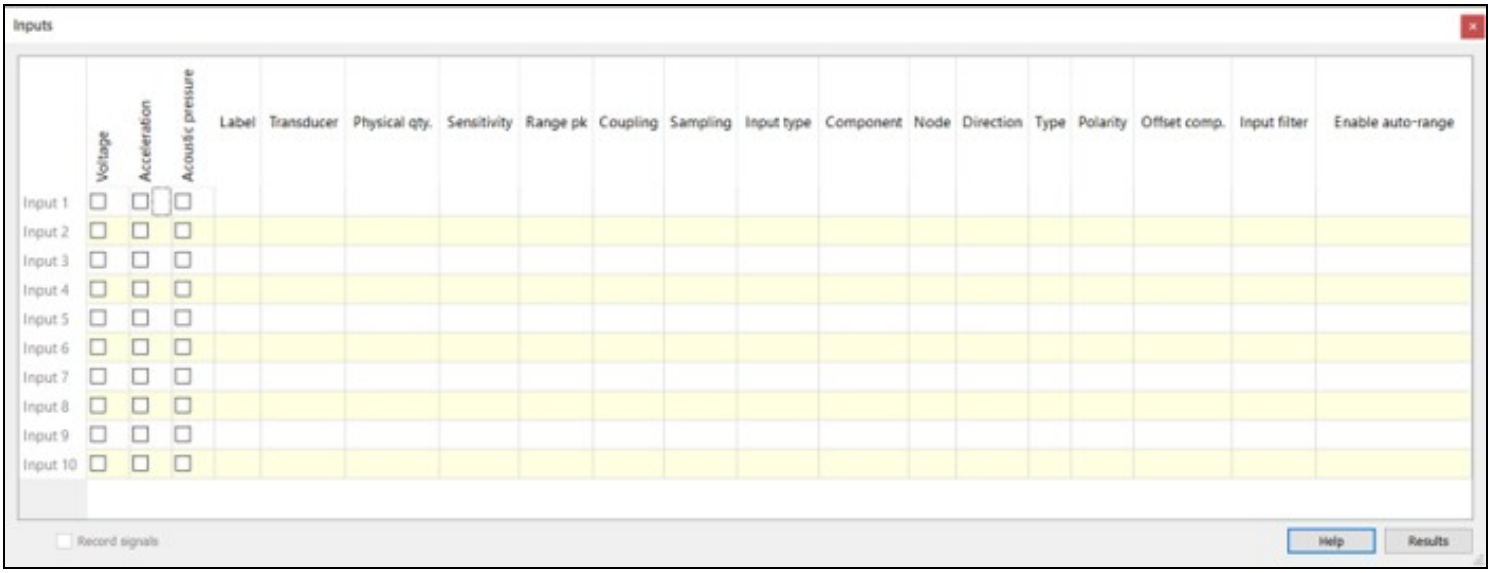
33.1.1.1 Load the configuration

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* :



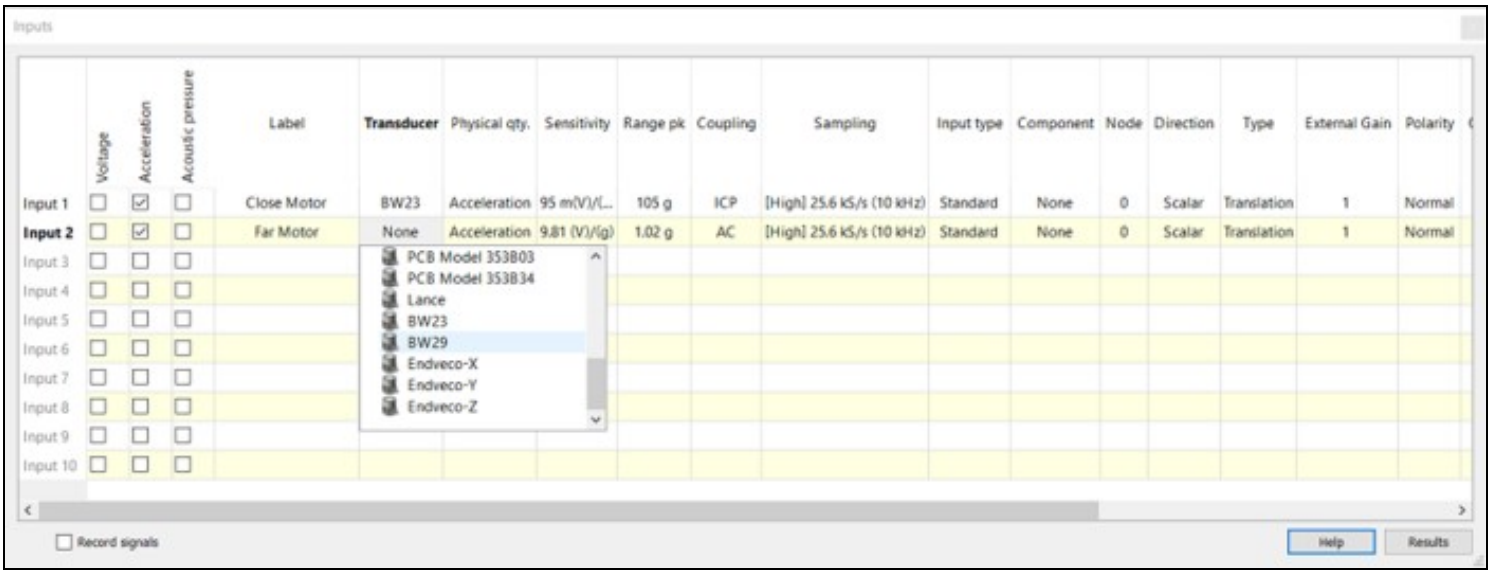
33.1.1.1.1 Select the inputs

Once you click *Load*, the input setup window appears :

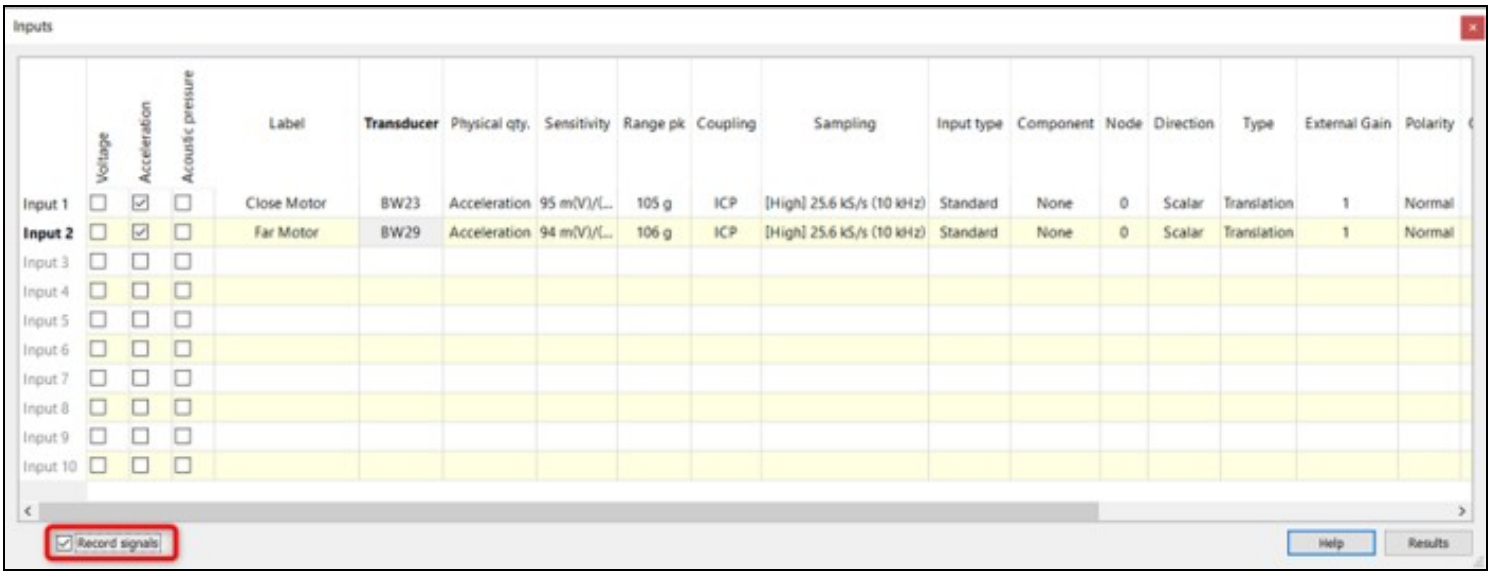


This window can be called anytime from the *GoToResult*. See Input selection for the detail of the parameters.

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 :

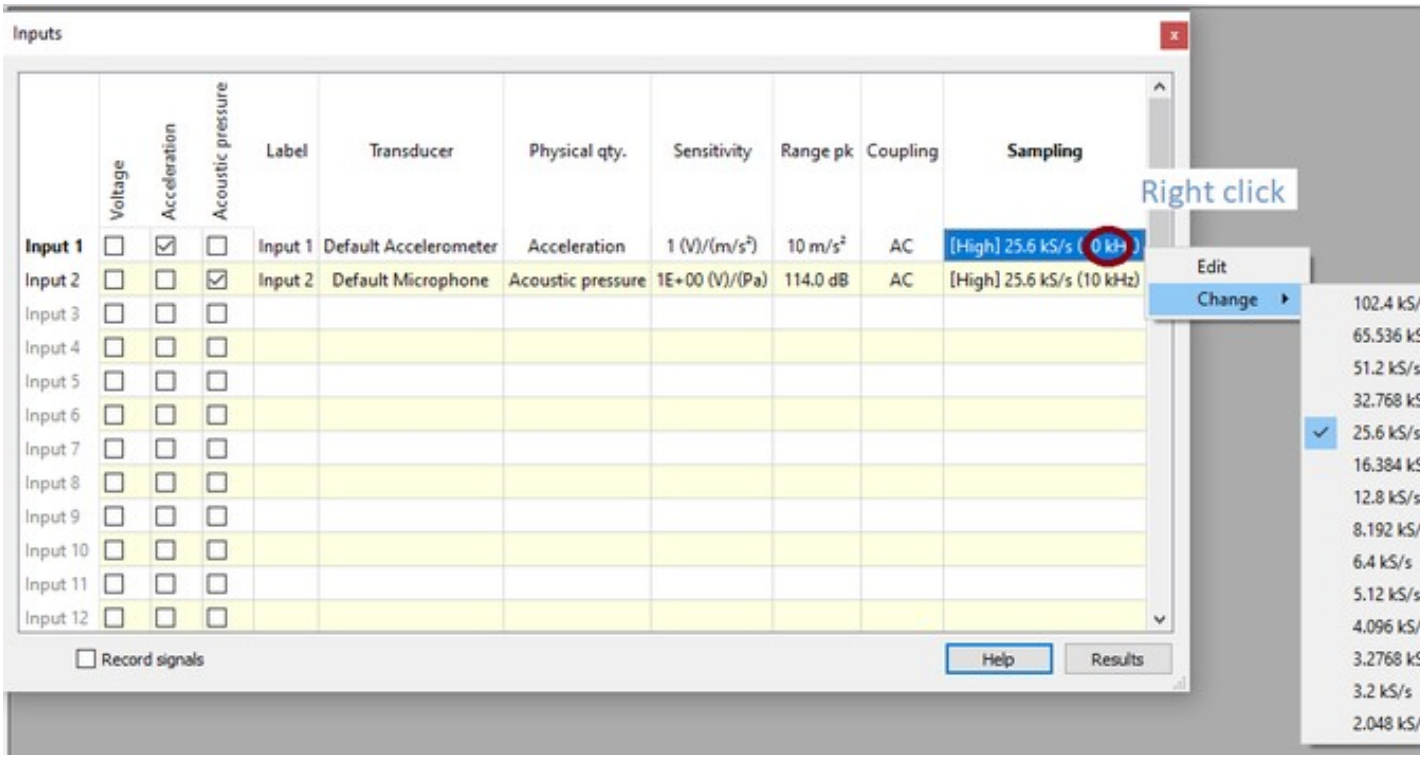


By doing this, any inputs (even if added later) will automatically be connected to the recorder plug-in.

33.1.1.1.2 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.

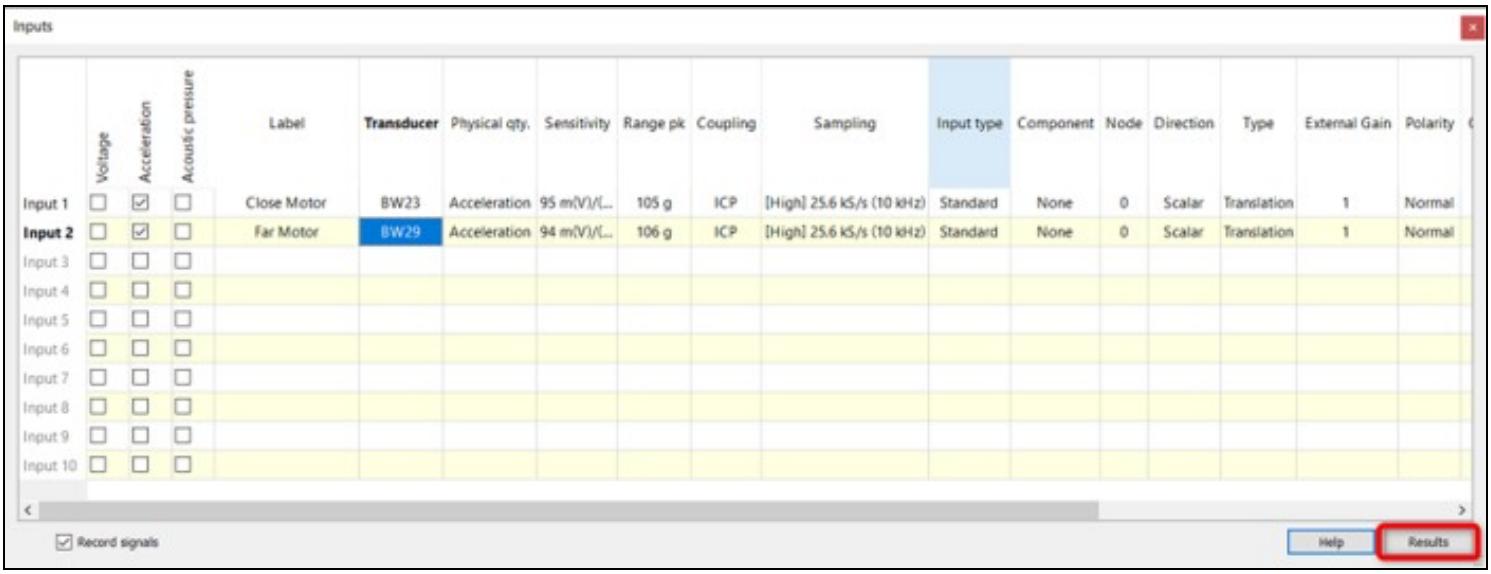
To edit the sample rate, do a right click on the sampling case.



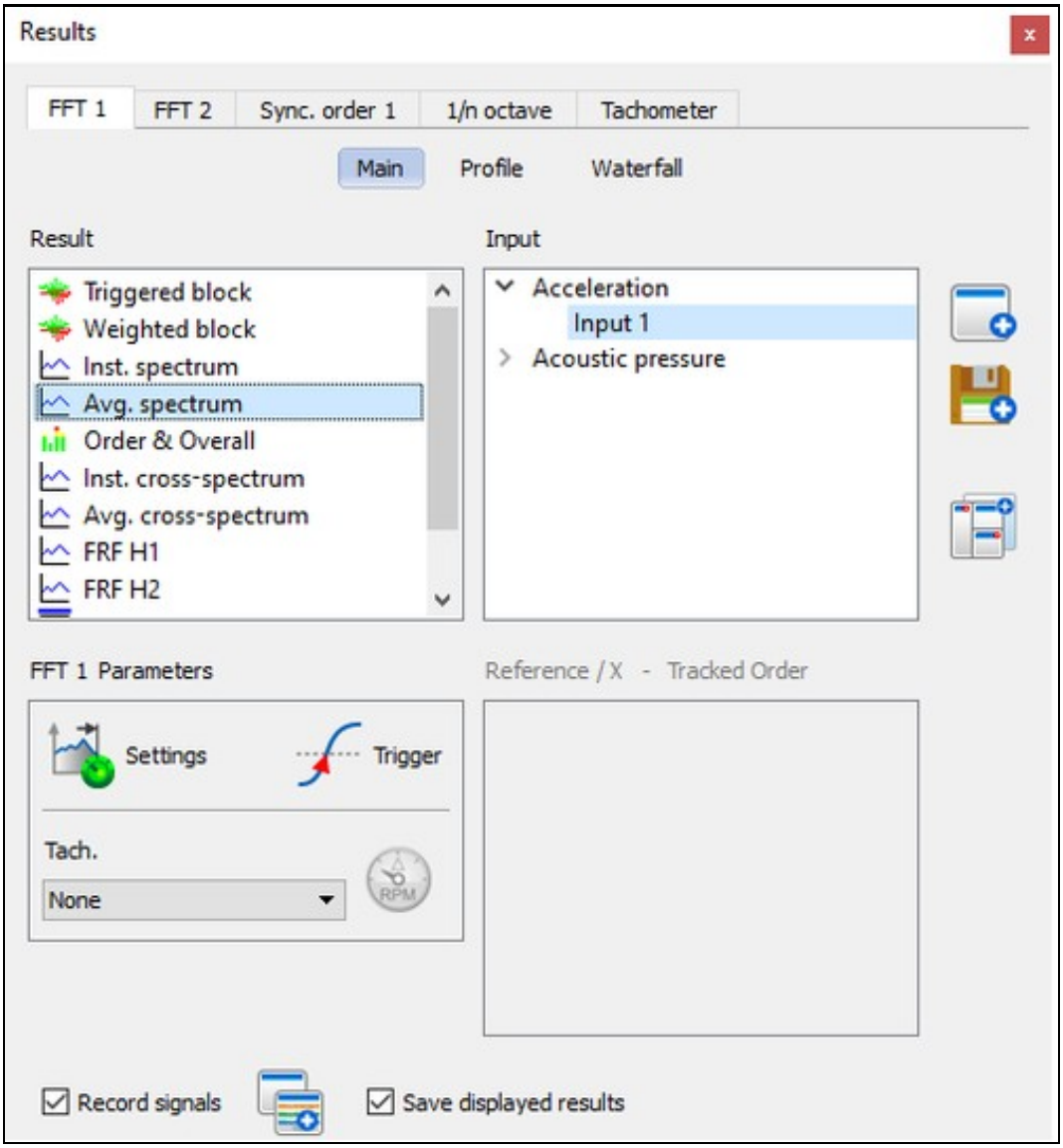
Here we have a 25,6kS/sec that allow us to analyze the data up to 10kHz.

33.1.1.1.3 Setup the analysis

Once the inputs are correctly declared, click on *Results* to setup the analysis :



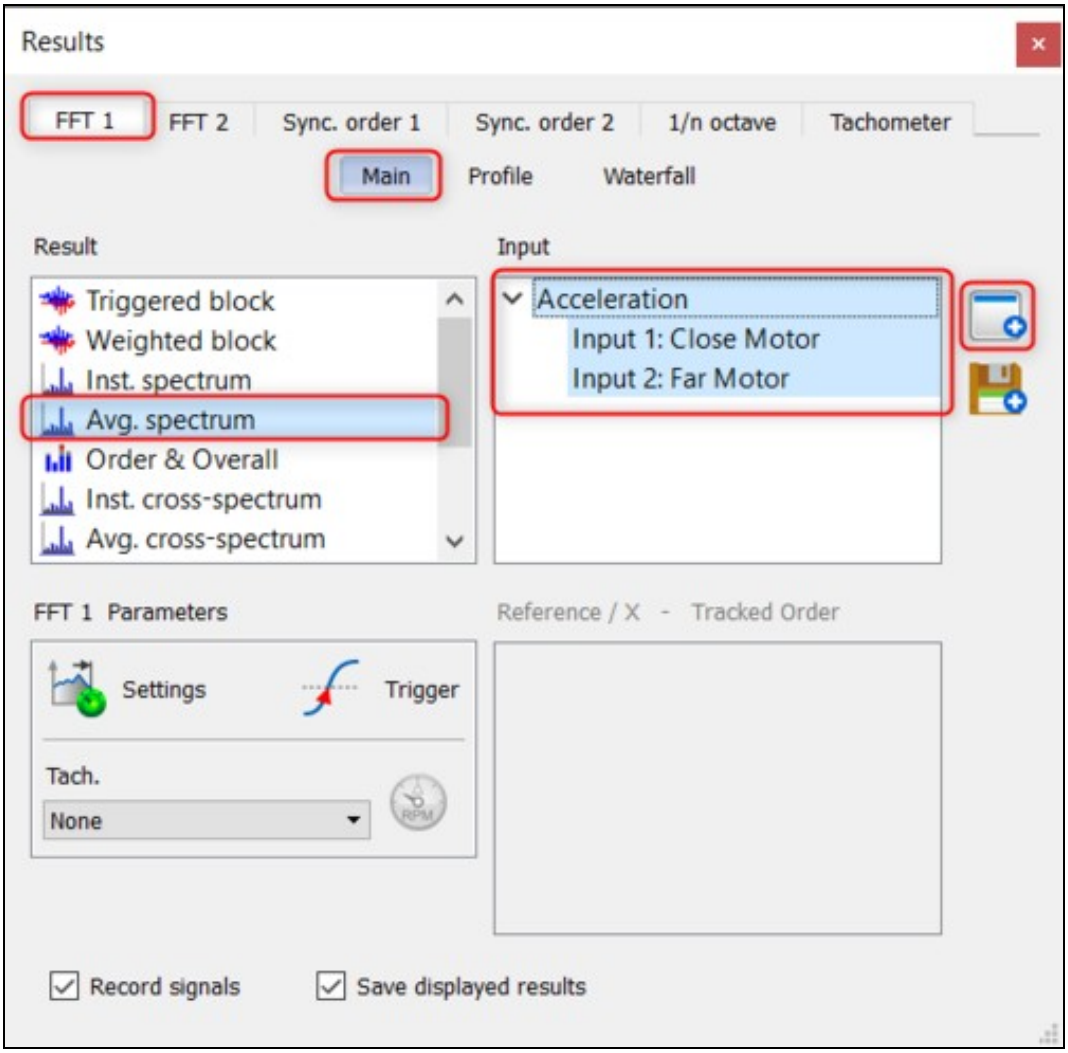
This will open the *Results* window :



This window can be called anytime from the *GoToResult* icons. See the Show result section for detail about this window.

33.1.1.1.4 Displaying the FFT analysis

We will now display the average spectrum for the two inputs :



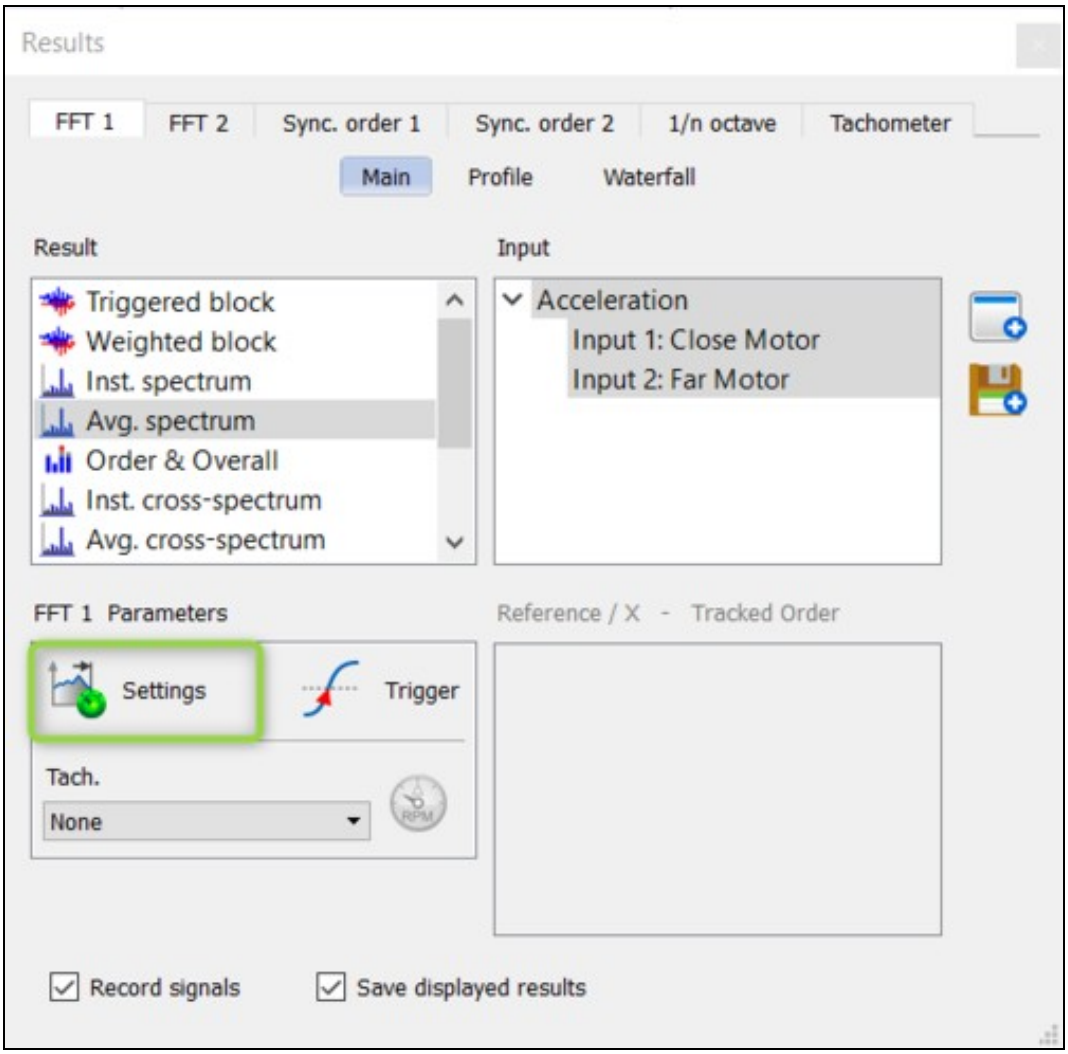
Once you selected the result you want to display, click on  to display the graph in the current layout.
Make sure you checked the box *Save displayed results* to save the result at the end of the measurement.

The FFT graph window now appear in the current layout :

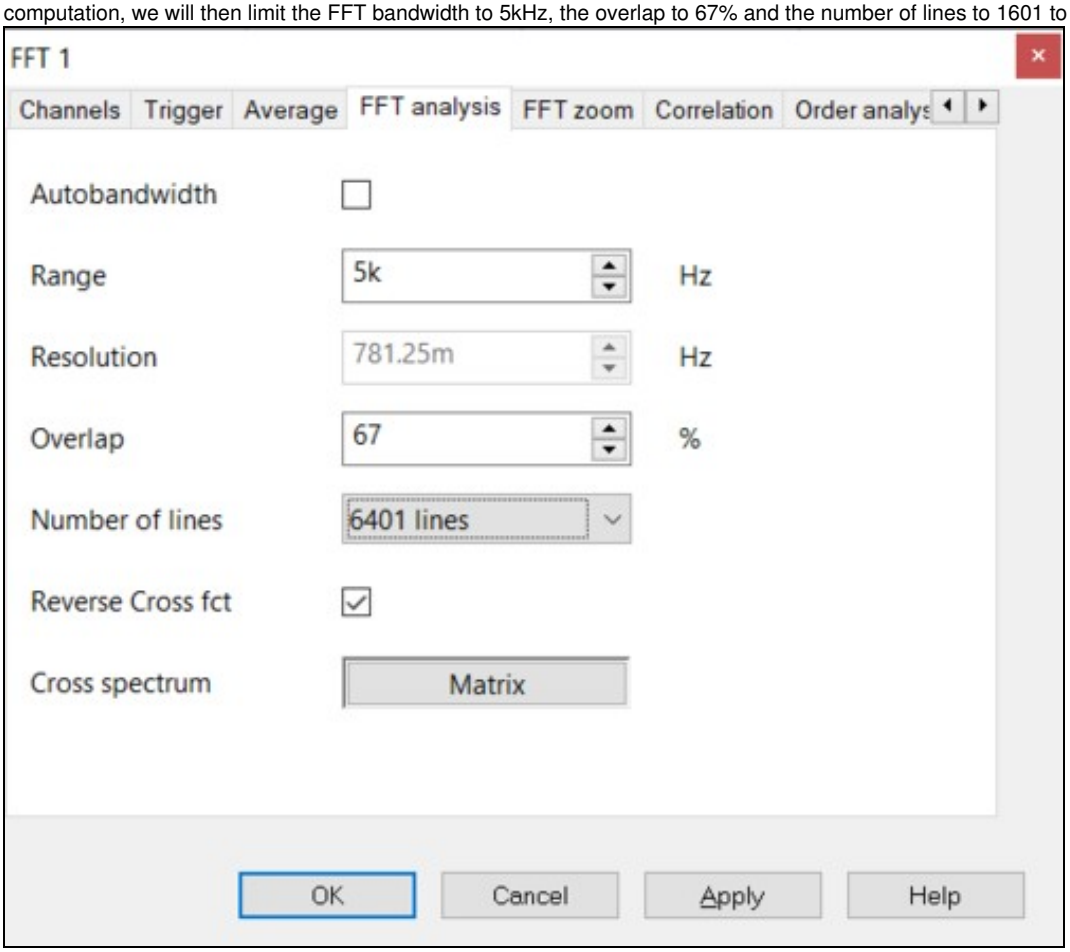
.

33.1.1.1.5 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

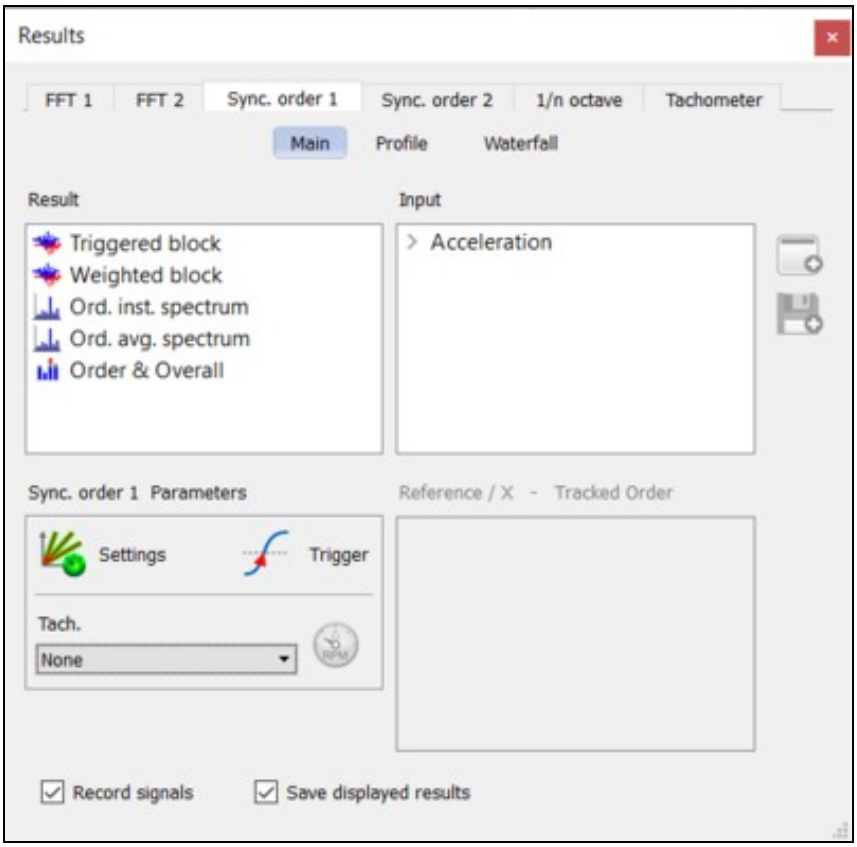
Here, the maximum speed of the motor is 2000RPM. That make the first order at 2000/60 = 33Hz and the tenth order at 330Hz. In order to optimize the computation, we will then limit the FFT bandwidth to 5kHz, the overlap to 67% and the number of lines to 1601 to have a correct precision.



You can then press *OK* to close this window. For details about the parameters, please visit the NVGate FFT page.

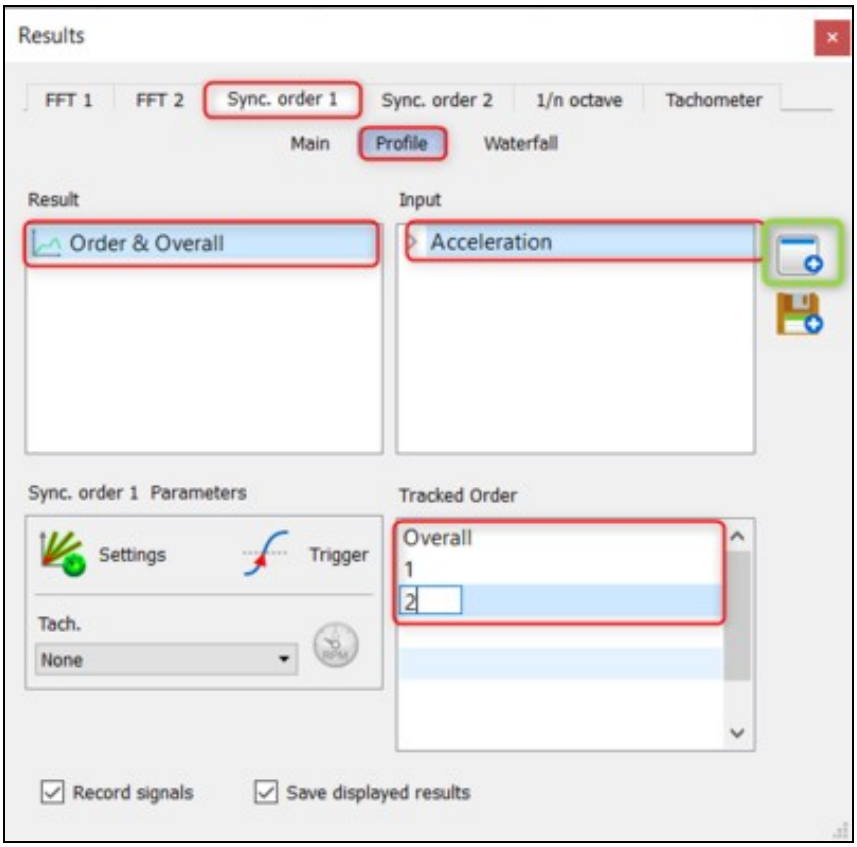
33.1.1.1.6 Adding Order Profile

We can now setup and display the order profile. To do this, select the *Sync. order 1* tab of the *Result* window.

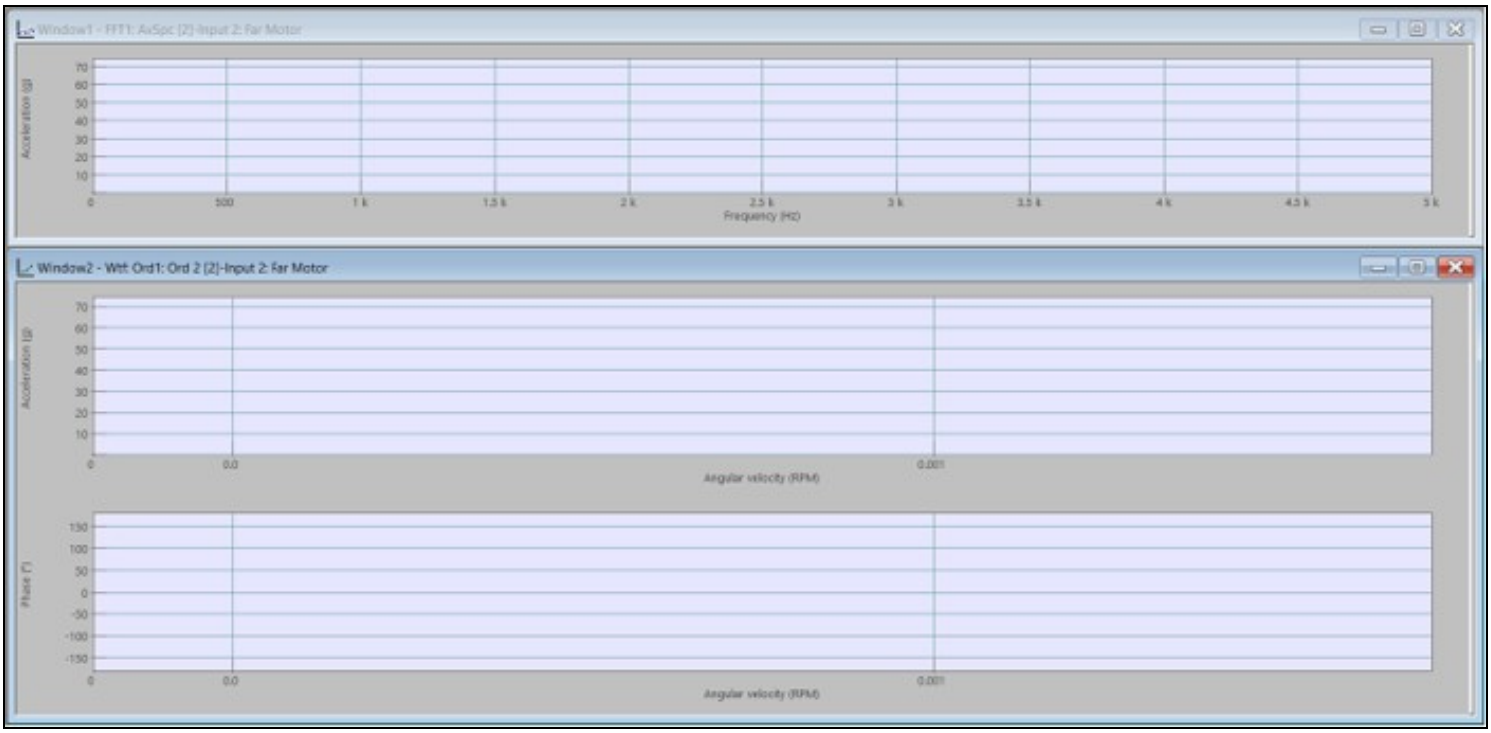


Here, we want to display the first two orders profile for each input. To do so, select the *profile* tab, and select **Order & Overall** under *Result* and **Acceleration** (that will select the 2 acceleration channels) under *input*. To track the 2 first orders, you can simply enter **1** and **2** under the *Tracked Order* section.

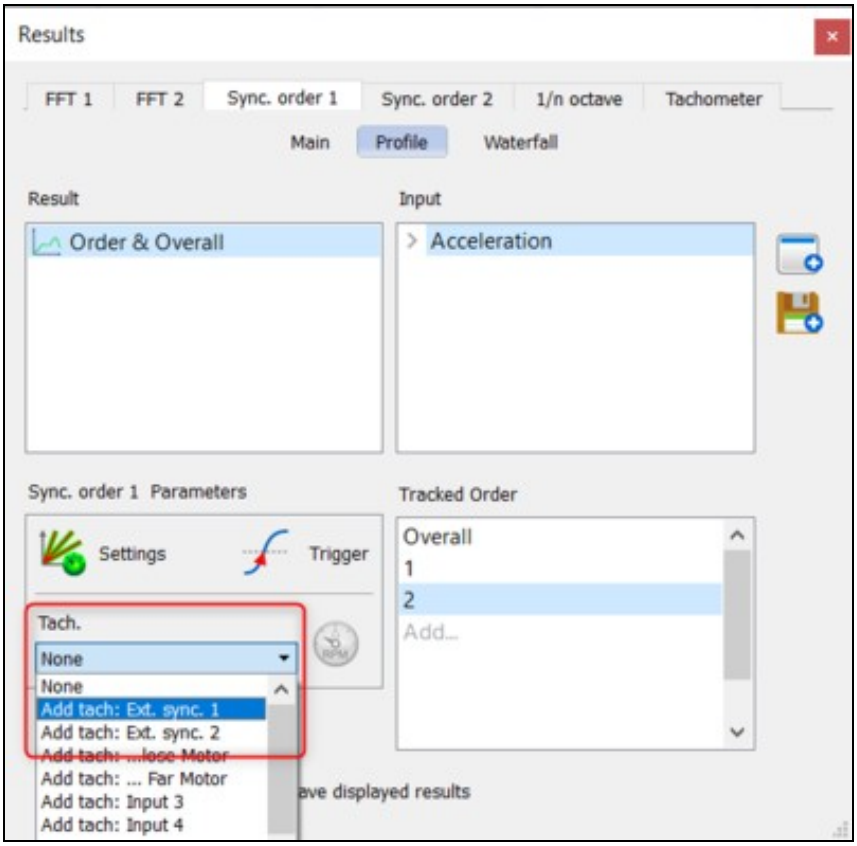
Finally click on  to display:



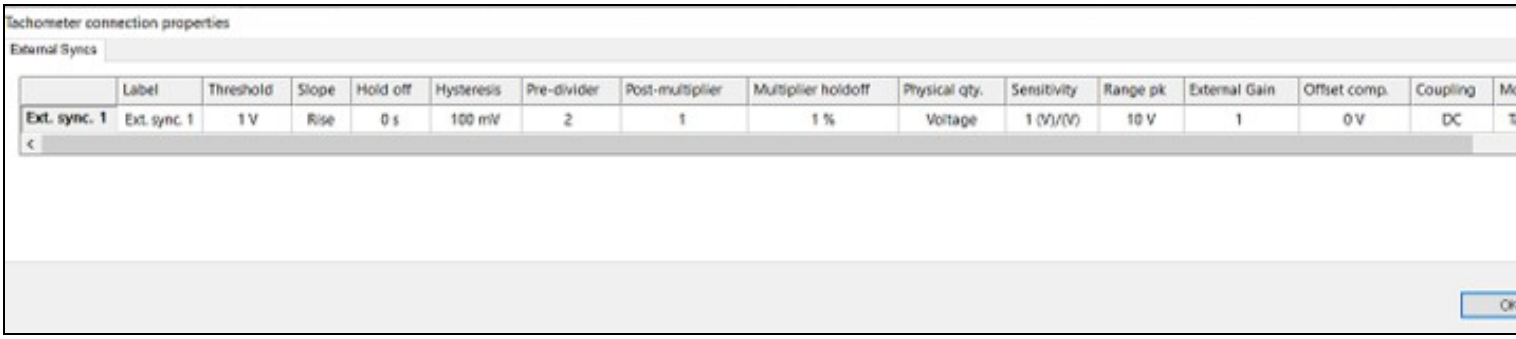
The profile graph is now displayed on the current layout along with the FFT spectrum graph :



We will now need to add and declare the tachometer. To do so, select *Add : Ext. Sync. 1* under *Tachometer* :



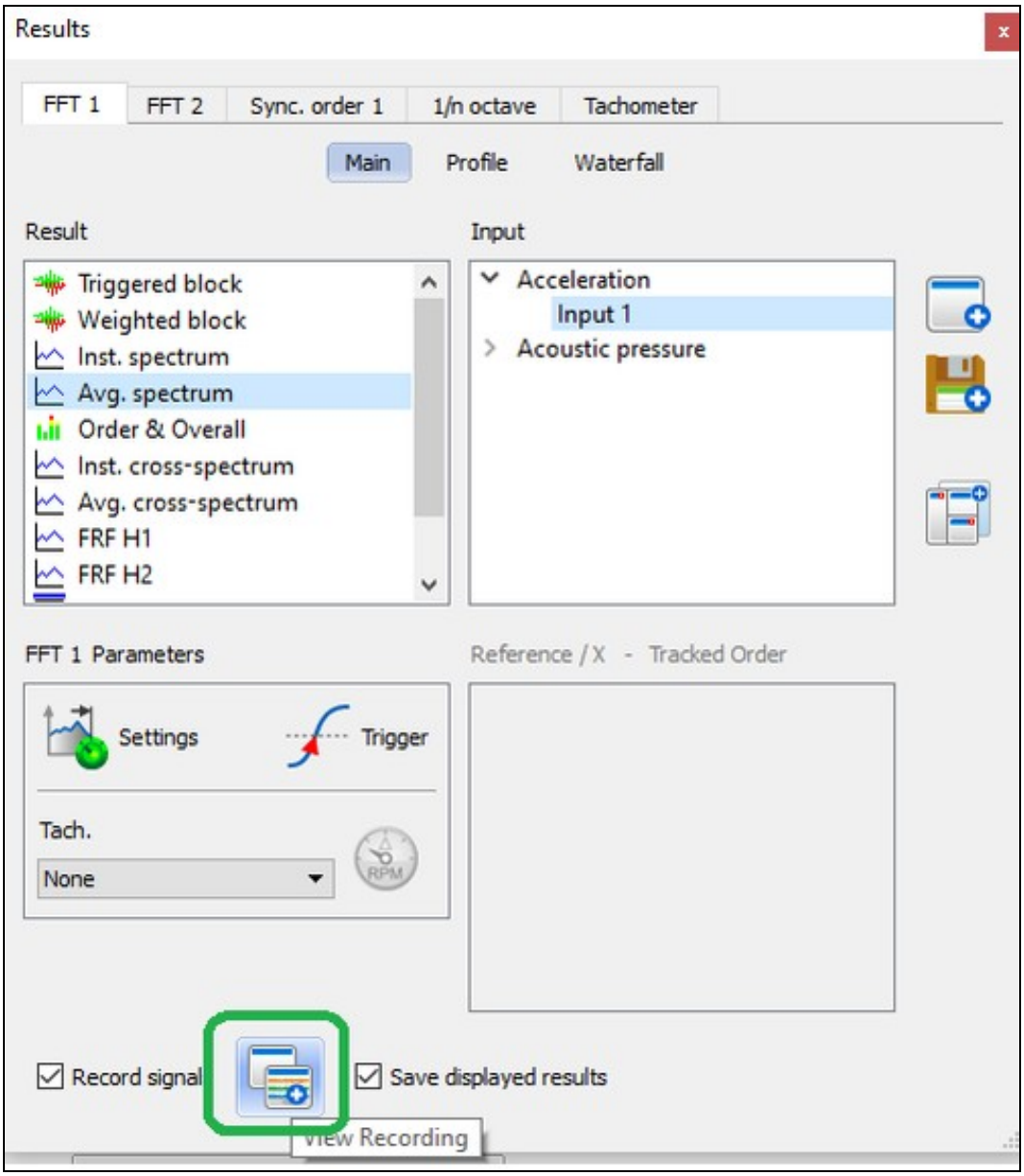
And set the threshold, coupling and Pulse/rev as recommended for your sensor :



Please visit the external sync tachometer page for more details.

33.1.1.1.7 Displaying the recorder

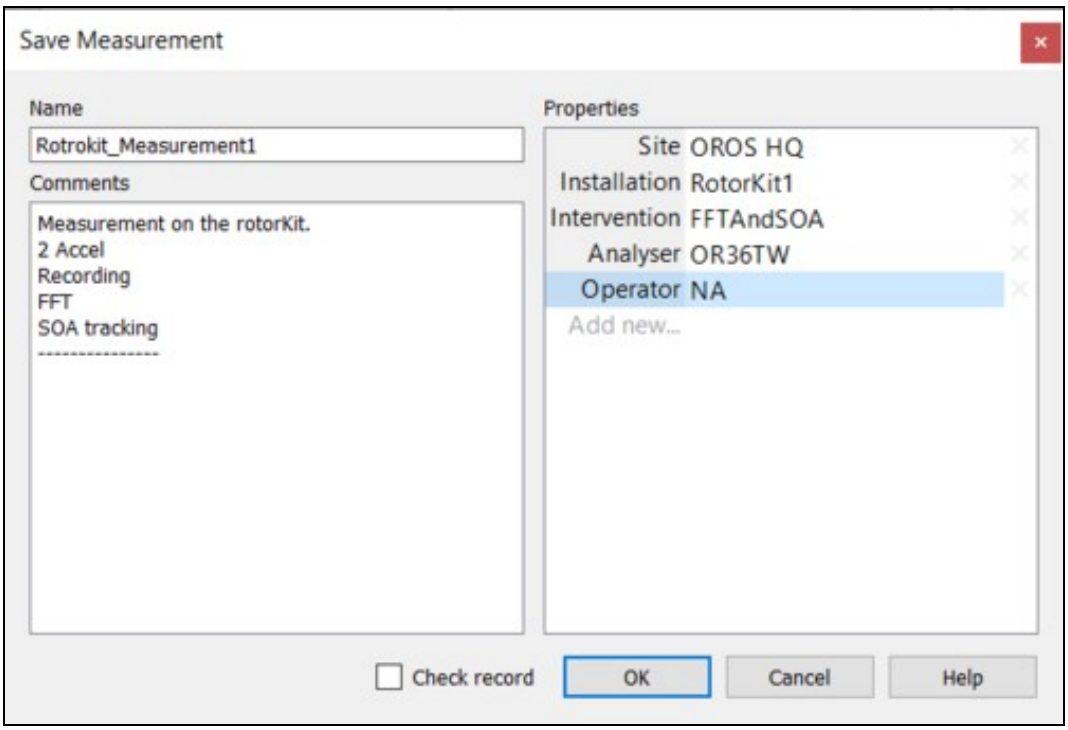
In order to have a complete view of the measurement, you can display the recording of the raw signals by clicking on *View recording* .


Results
FFT 1
FFT 2
Sync. order 1
1/n octave
Tachometer
Main
Profile
Waterfall
Result
Input
Triggered block
Weighted block
Inst. spectrum
Avg. spectrum
Order & Overall
Inst. cross-spectrum
Avg. cross-spectrum
FRF H1
FRF H2
Acceleration
Input 1
Acoustic pressure
FFT 1 Parameters
Reference / X - Tracked Order
Settings
Trigger
Tach.
None
RPM
Record signal
Save displayed results
View Recording

33.1.1.1.8 Performing and saving the measurement

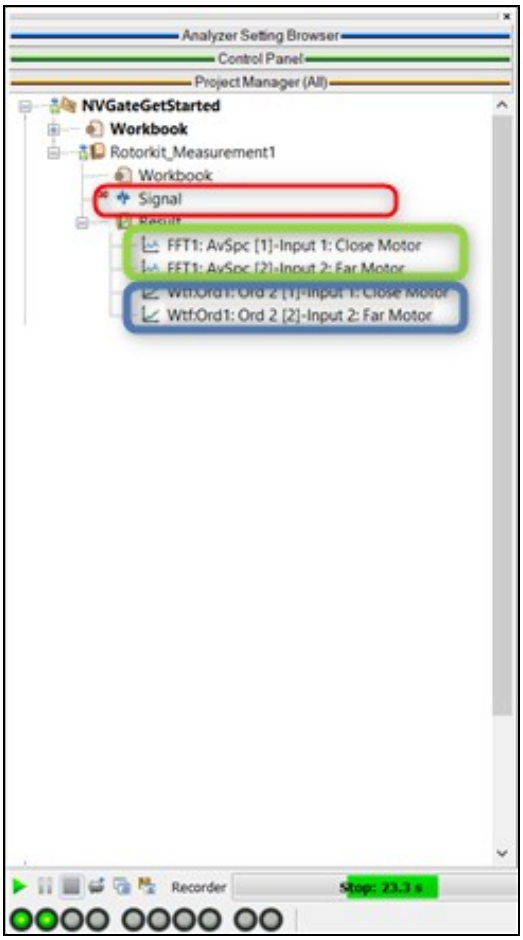
We will now perform the measurement during a run-up of the motor. To do so, put the motor at its lowest speed, start the acquisition by clicking on  , and then stop it with  once you reached the top speed. You will see the graph updating with the last result.

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:



33.1.1.1.9 Project manager

And you can find the saved data under the Project name in the Project Manager :

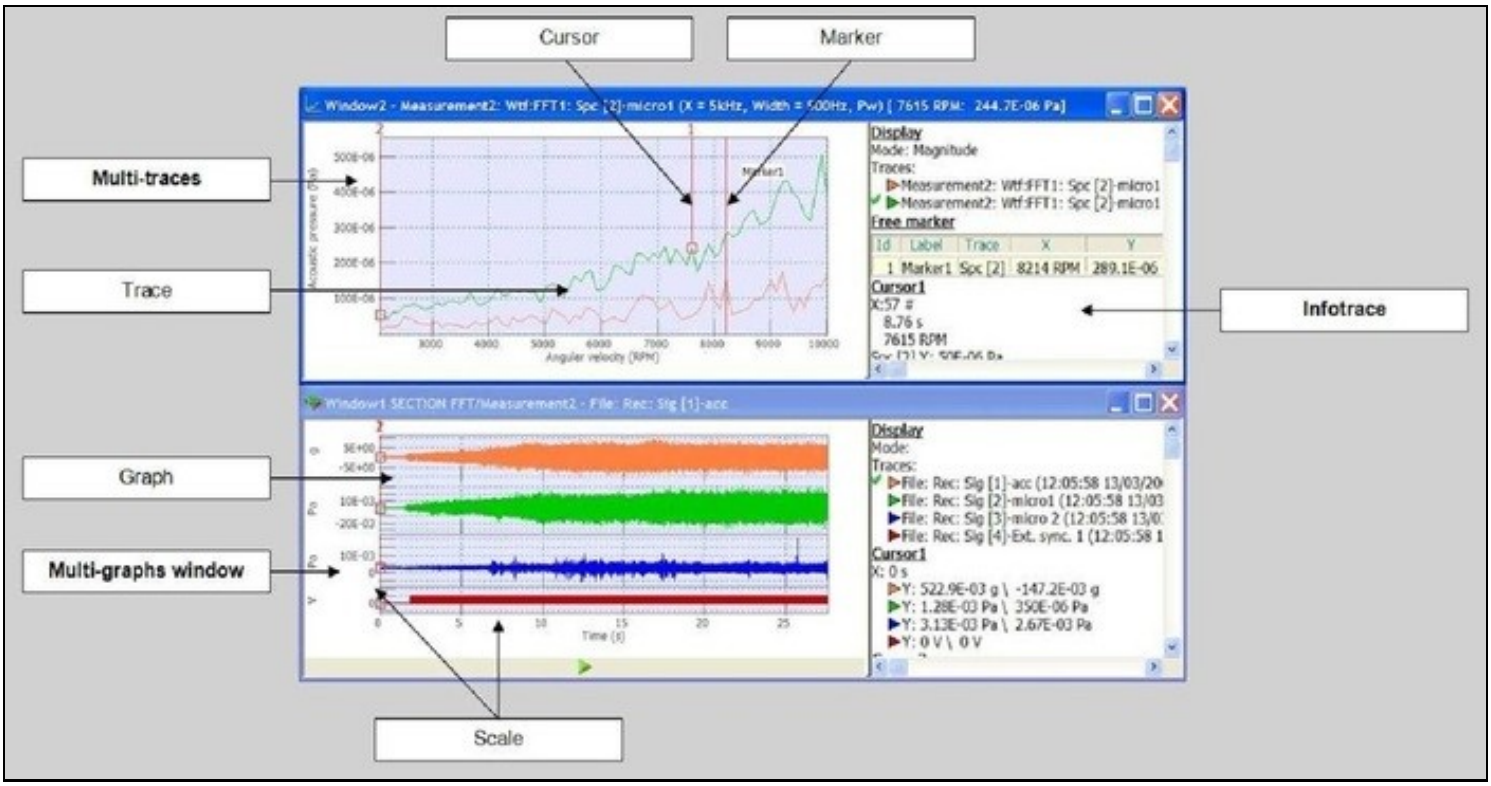


The red area represents the recorded temporal raw data, the green area the FFT results and the blue area the Order tracking results.

33.1.1.1.10 Display

The acquisition is now complete and the results are displayed .

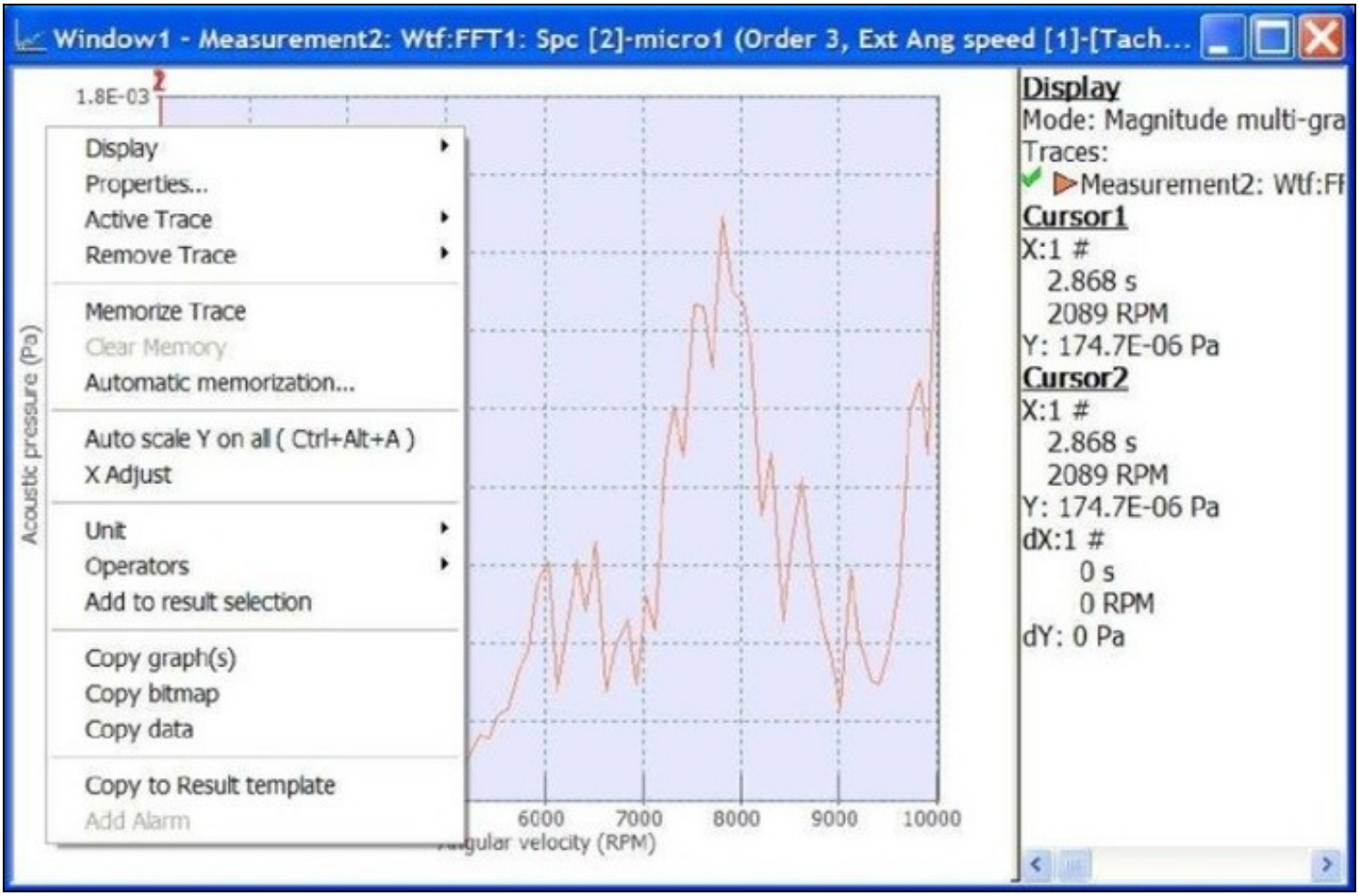
33.1.1.1.11 Display overview



33.1.1.1.12 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.

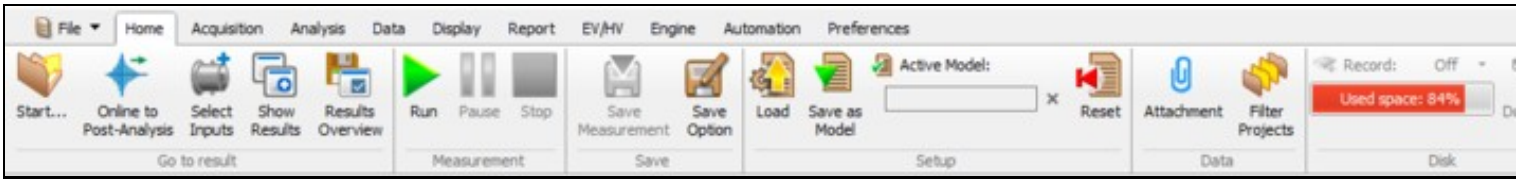


Right click on the *infotrace* allows customization of the displayed information.

33.1.2 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! :



34 NVGate Status bar

34.1 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:

34.1.1 Control Tab

 Allows starting, pausing and stopping the analysis.

See Measurement group for details

34.1.1.1 GoToTesult

|  Allow you a direct access to GoToResult command.

34.1.1.2 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

34.1.1.3 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.

34.1.1.4 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.

34.1.1.4.1 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)

34.1.1.5 Accept/reject

This function is used to accept or reject a measurement when the FFT trigger accept mode is set to manual.

34.1.1.5.1 Accept

 Shortcut: Ctrl + Y. Accepts the last acquisition.

34.1.1.5.2 Reject

 Shortcut: Ctrl + N. Rejects the last acquisition.

34.1.1.6 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.

34.1.1.7 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.

34.1.1.8 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.

34.1.1.9 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

35 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.

35.1 Outlines

35.1.1 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.

35.1.2 How the OROS Analyzer Works?

35.1.2.1 Basics

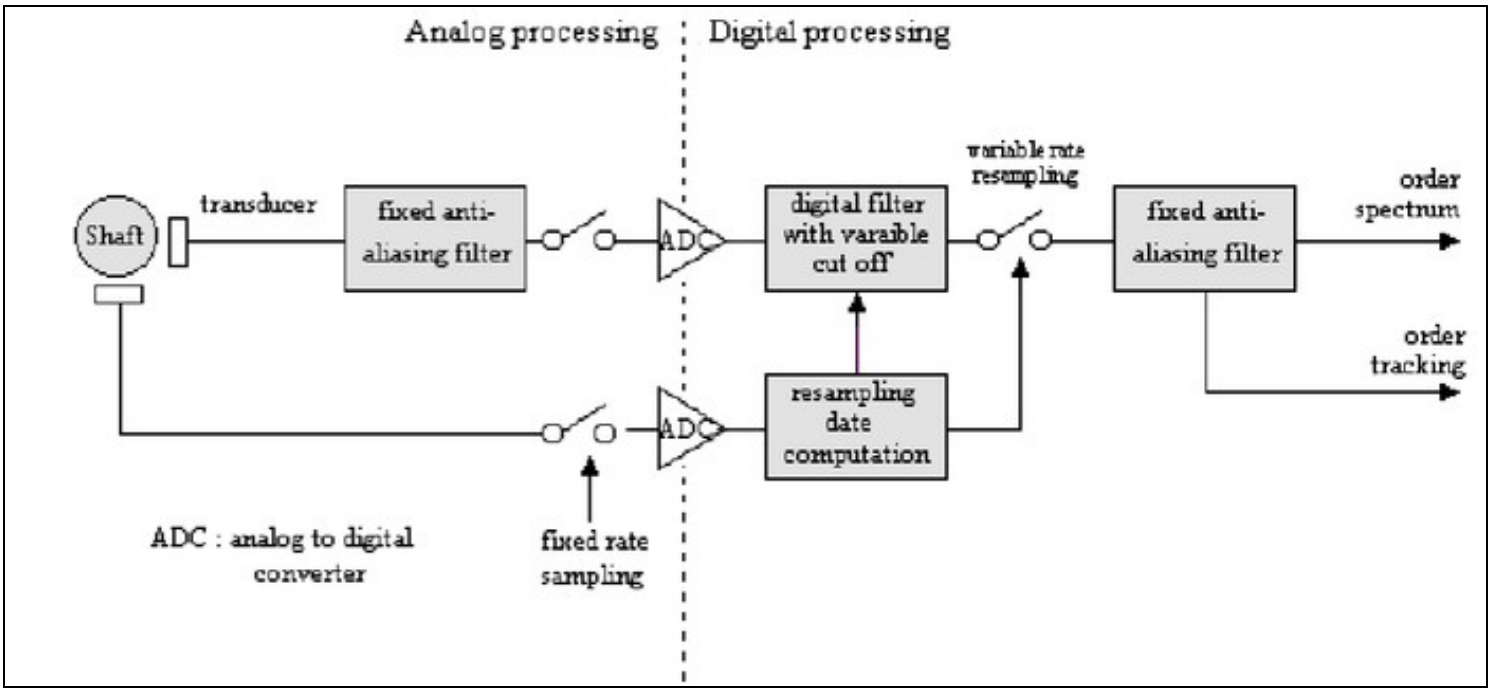
The OROS analyzer is based on a variable digital resampling technique implemented as software in a digital signal processor chip.

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.

35.1.2.2 Resampling date computation

The tach processing first measures date arrival of tach pulses and next computes resampling dates as shown in the figure below:

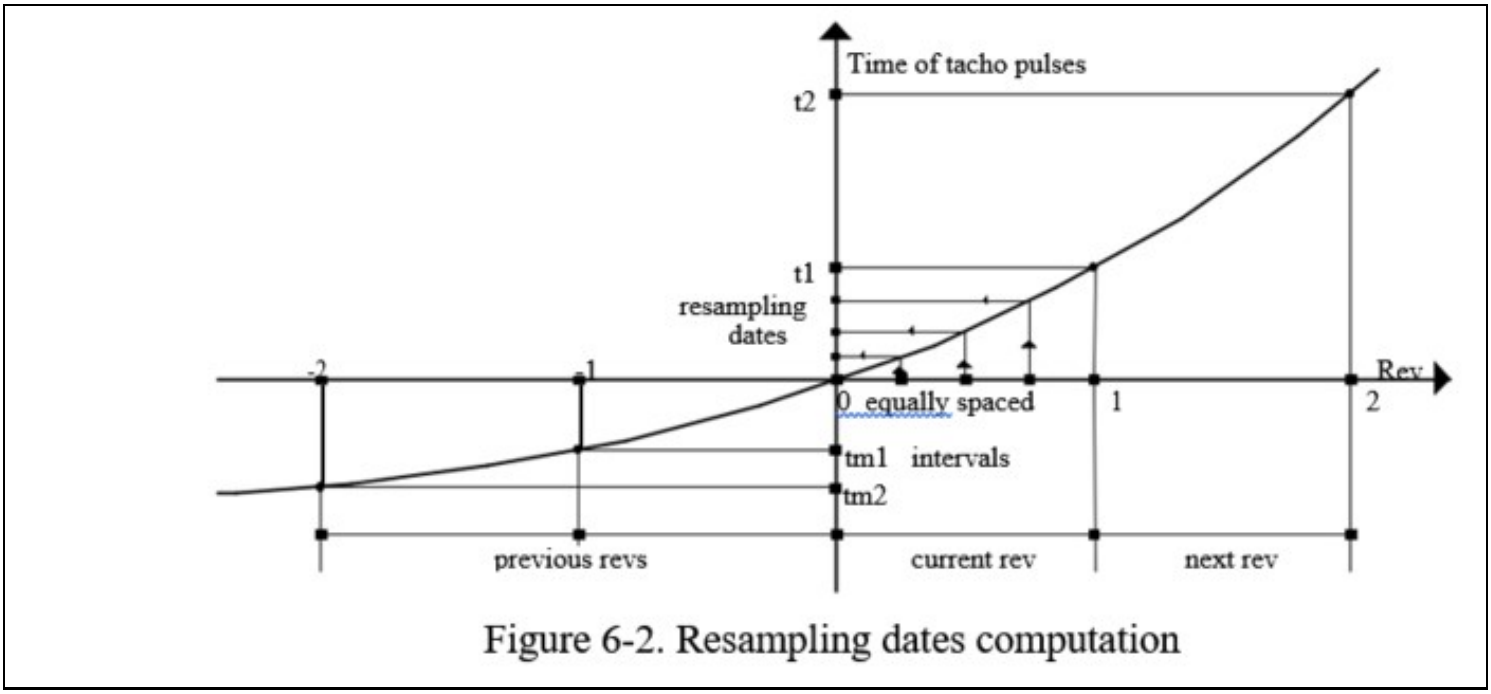


Figure 6-2. Resampling dates computation

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.

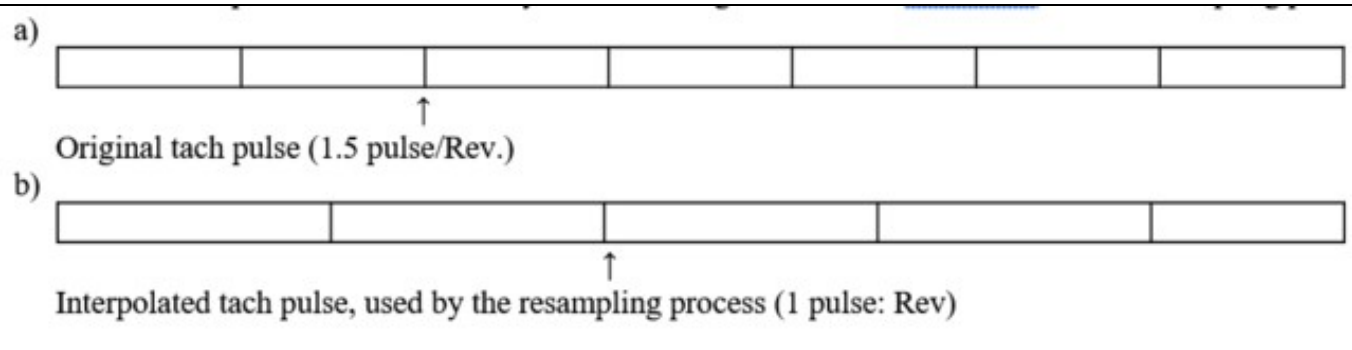


Figure 6-3. Fractional *number of pulse/revolutions. Example of 1.5 pulse/rev (signal a).*

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.

35.1.2.3 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.

35.1.2.4 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.

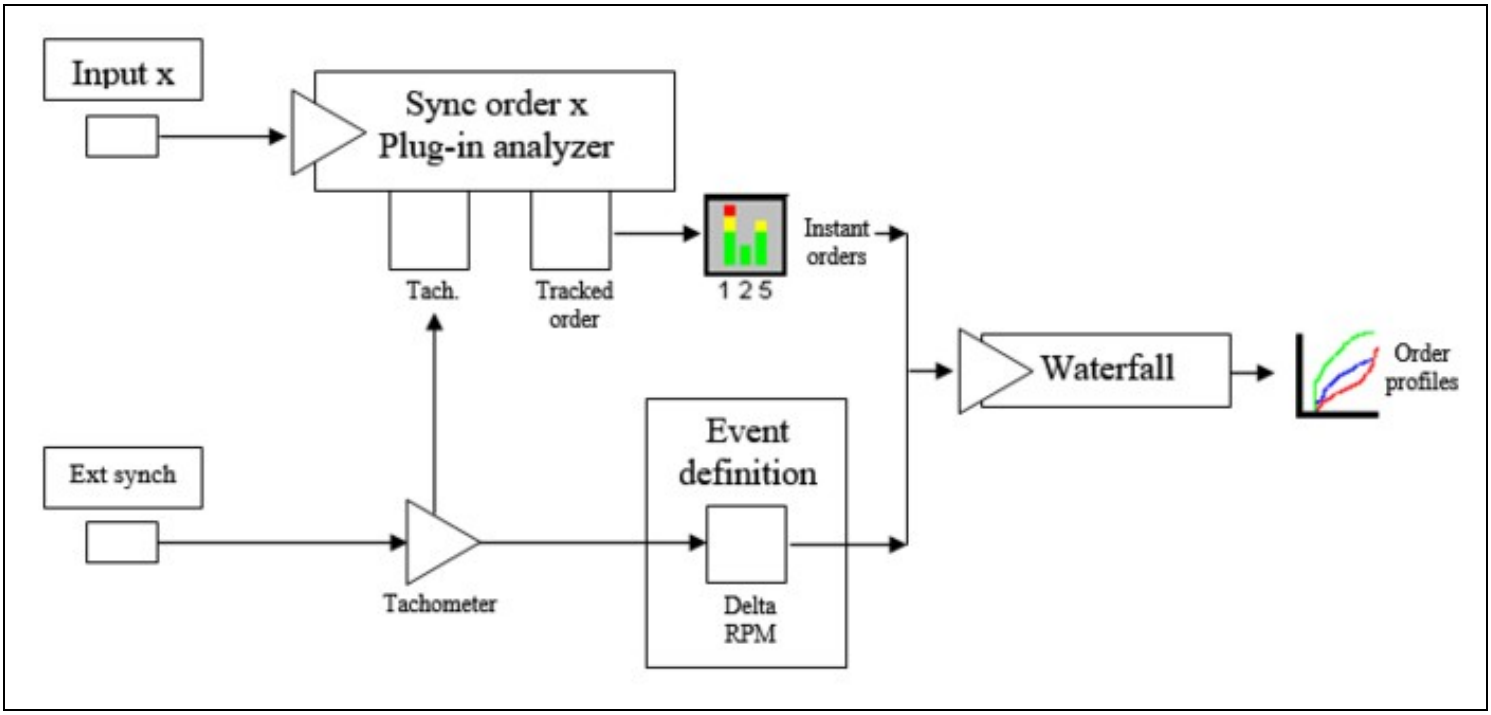
Sub-ranging order analysis is available with order resolution down to 1/32. In this case the FFT processing is done by using signal corresponding to N consecutive shaft revolutions and so gives a 1/N order resolution.

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.

35.2 NVGate SOA Plug in

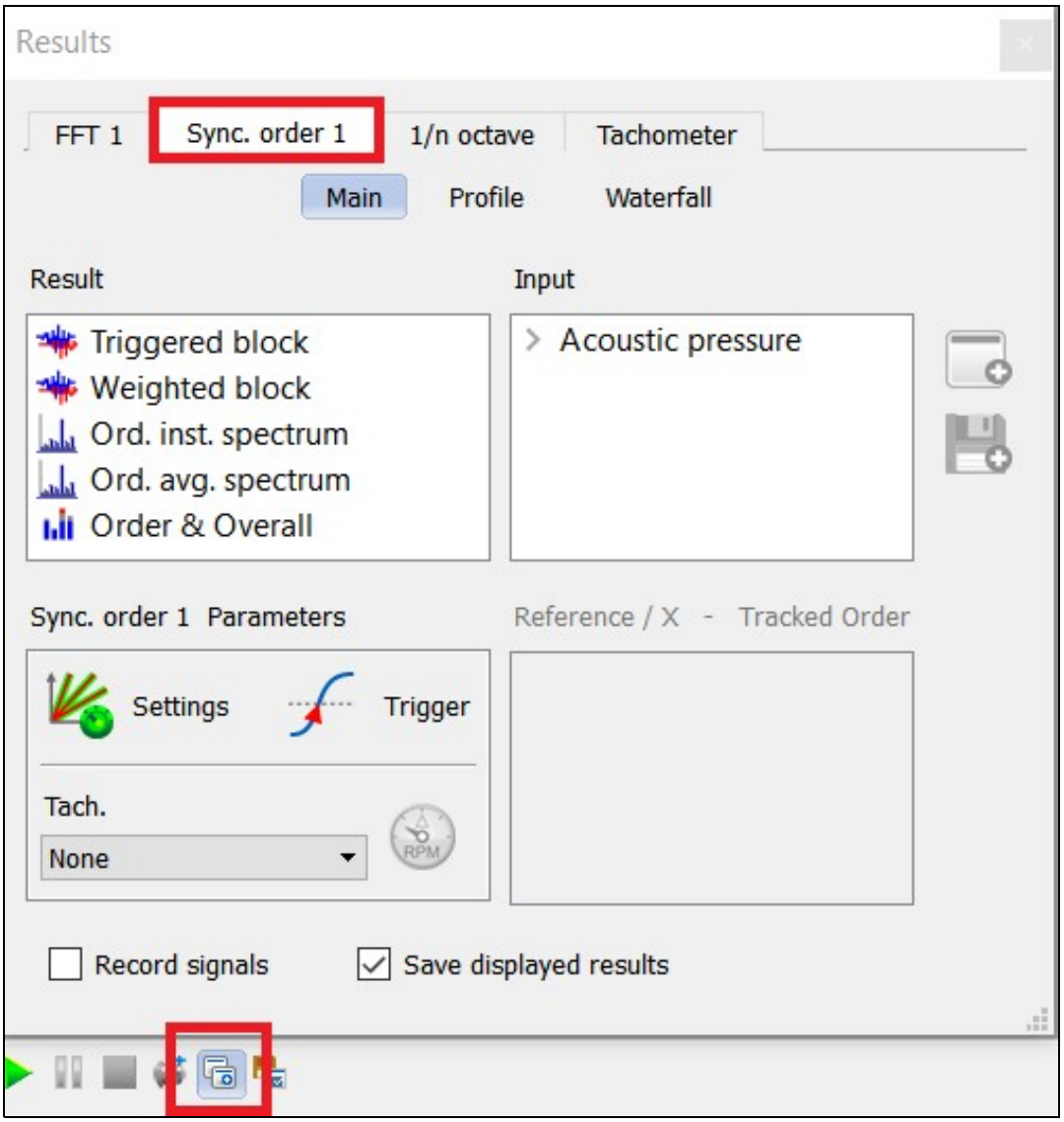
This plug-in is used to perform synchronous order tracking (it is also used to compute time signals in post analysis mode with the Player module).



Set an accurate range peak is advice for more accurate results.

35.2.1 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

35.2.2 Available results:

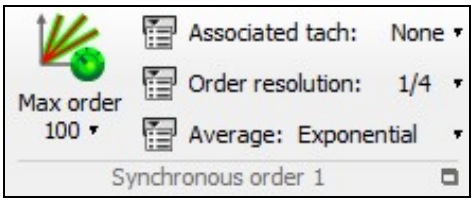
With Resolution being the value of the *Synch. order x/Order FFT /Resolution* setting:

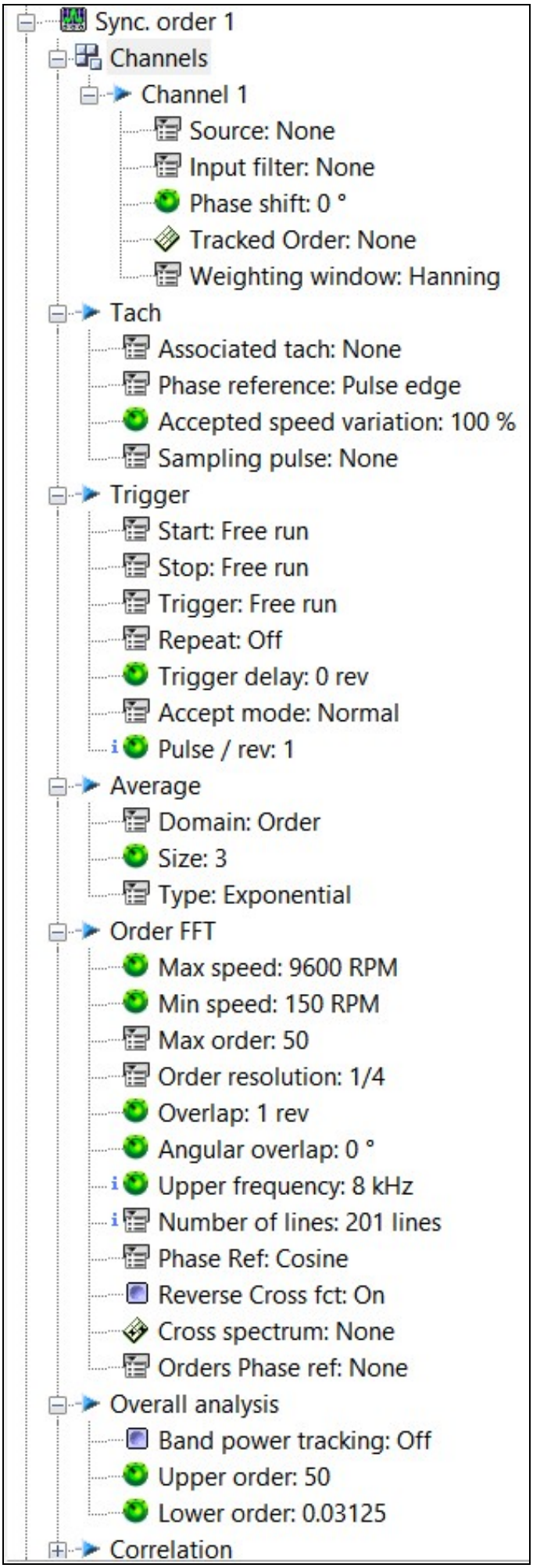
Type	Size	Dimension	Domain	Save
Filtered signal	256 pt	2D	time	Yes
Triggered block	(Resolution-1)*2.56	2D	angle(rev)	Yes
Trigger Shaftview	(Resolution-1)*2,56	2D	angle(rev)	Yes
DC	1pt	1D		Yes
RMS	1pt	1D		Yes
Min level	1pt	1D		Yes
Max level	1pt	1D		Yes
Peak	1pt	1D		Yes
Peak-Peak	1pt	1D		Yes
Crest Factor	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

35.2.3 Settings


Max order
100
Associated tach: None
Order resolution: 1/4
Average: Exponential
Synchronous order 1

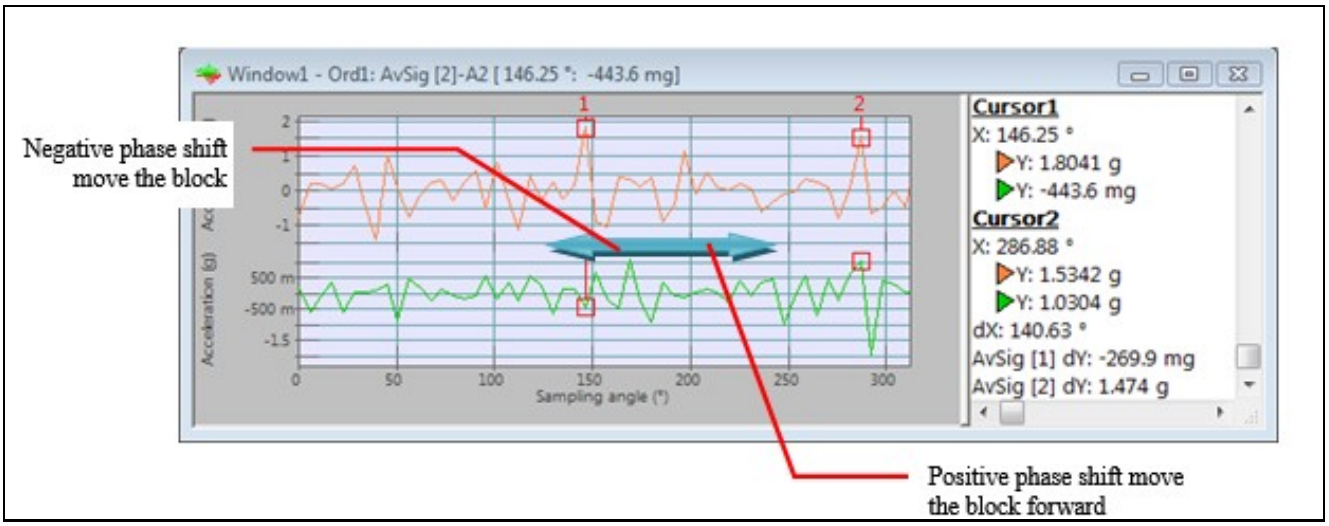

Sync. order 1
Channels
Channel 1
Source: None
Input filter: None
Phase shift: 0 °
Tracked Order: None
Weighting window: Hanning
Tach
Associated tach: None
Phase reference: Pulse edge
Accepted speed variation: 100 %
Sampling pulse: None
Trigger
Start: Free run
Stop: Free run
Trigger: Free run
Repeat: 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.

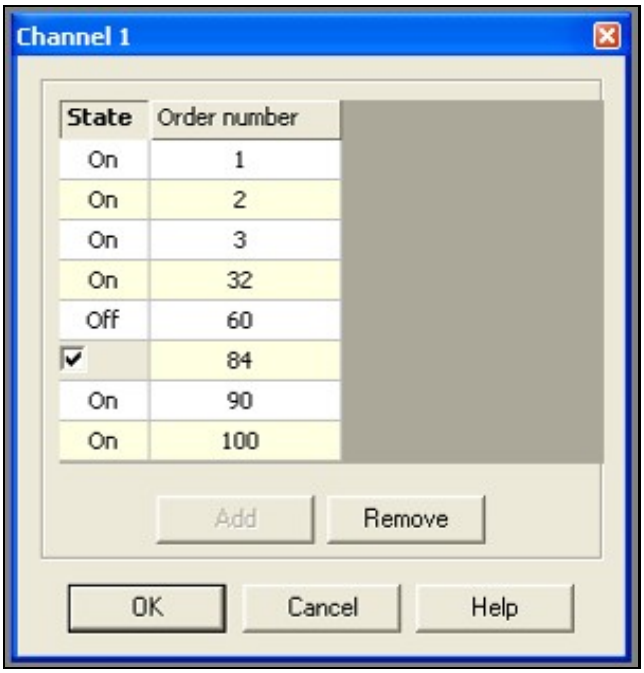
35.2.3.1 Channel

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.

35.2.3.2 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)

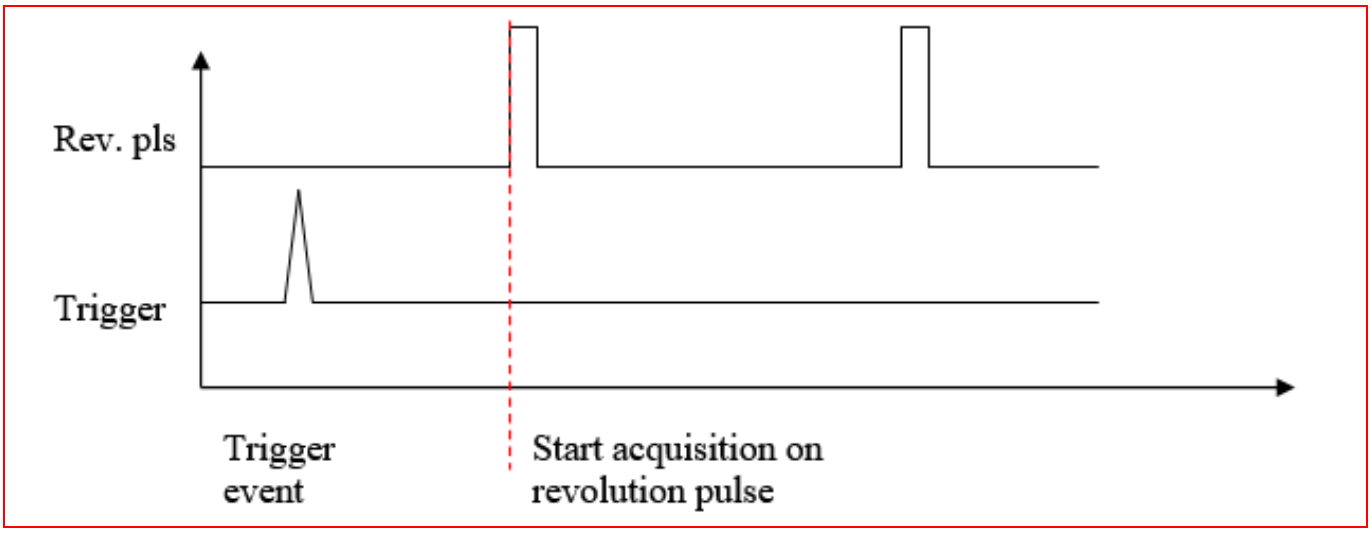
- **Accepted speed variation**: Percentage of variation of the tach speed accepted during one revolution. The default value is 100%. It means that this parameter is not taken account.
- **Sampling pulse**: Select an Ext. Synch input declared as "Sampling". When this setting differ from "none", the angular 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.

35.2.3.3 Trigger

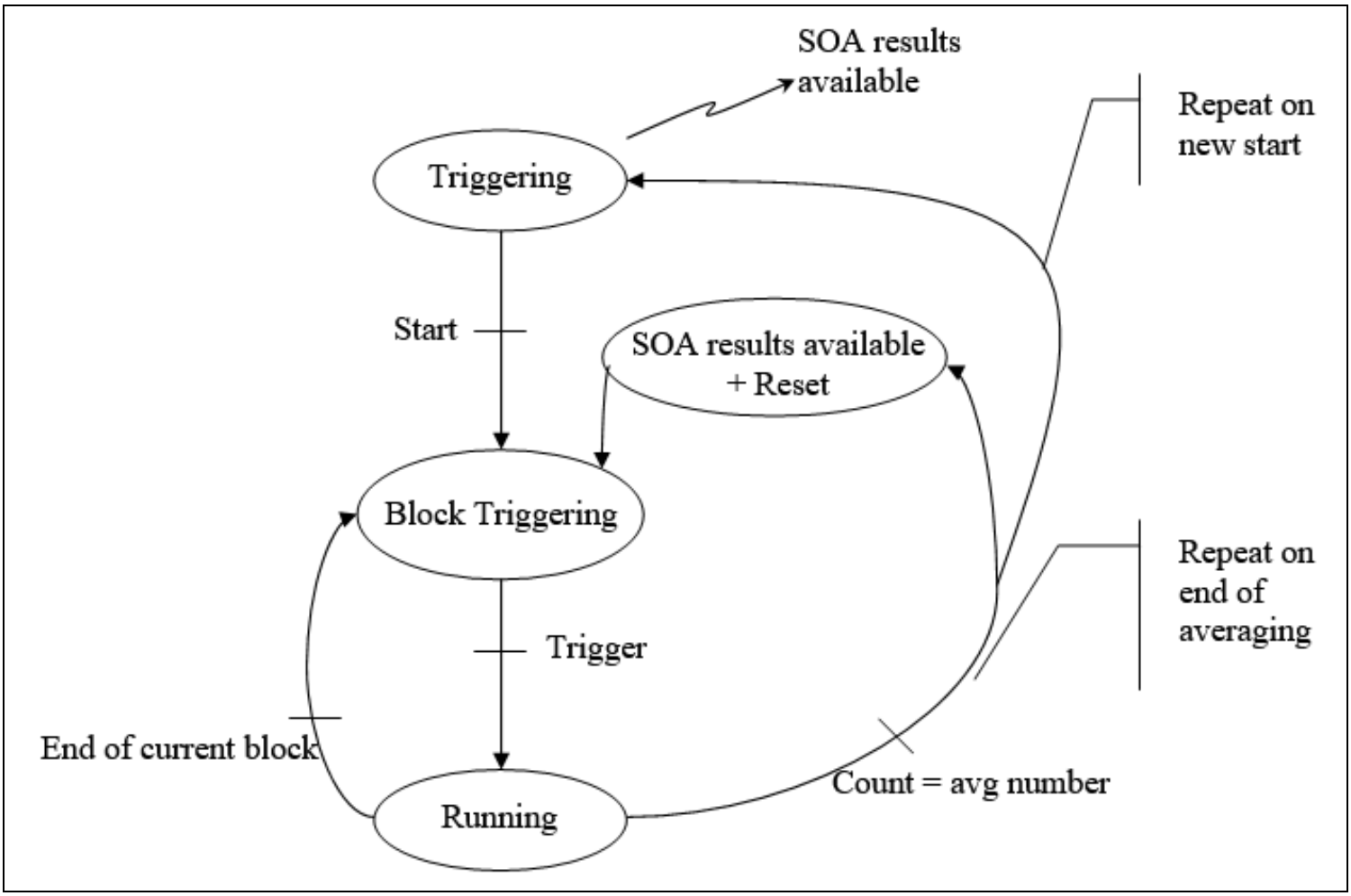
Contains the settings related to triggering events and how to start, and stop signal computation. Note that the trigger is always done on the next available revolution pulse:



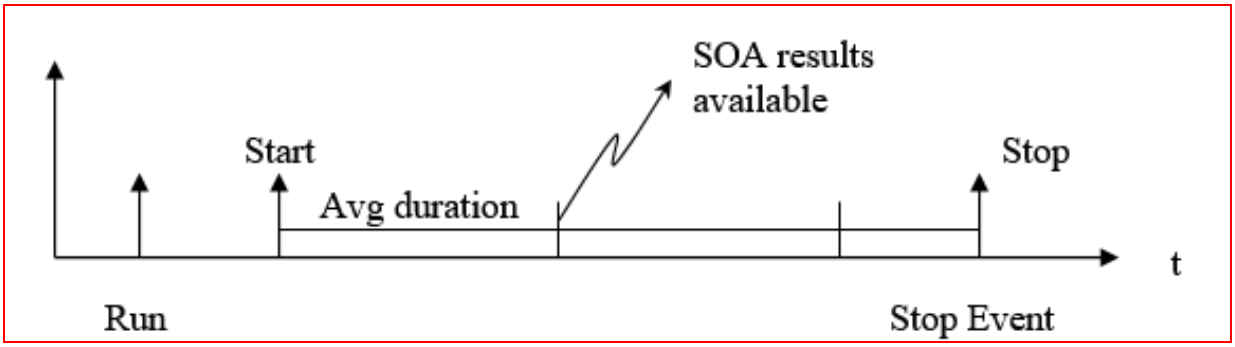
- **Start**: defines the event to start the analysis. The user can choose any event among the list of defined events. By default only the Free run and Manual events are available. The user can define another event in the "Event Definition" shared resources and then use this event for the "Start" condition.
- **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.

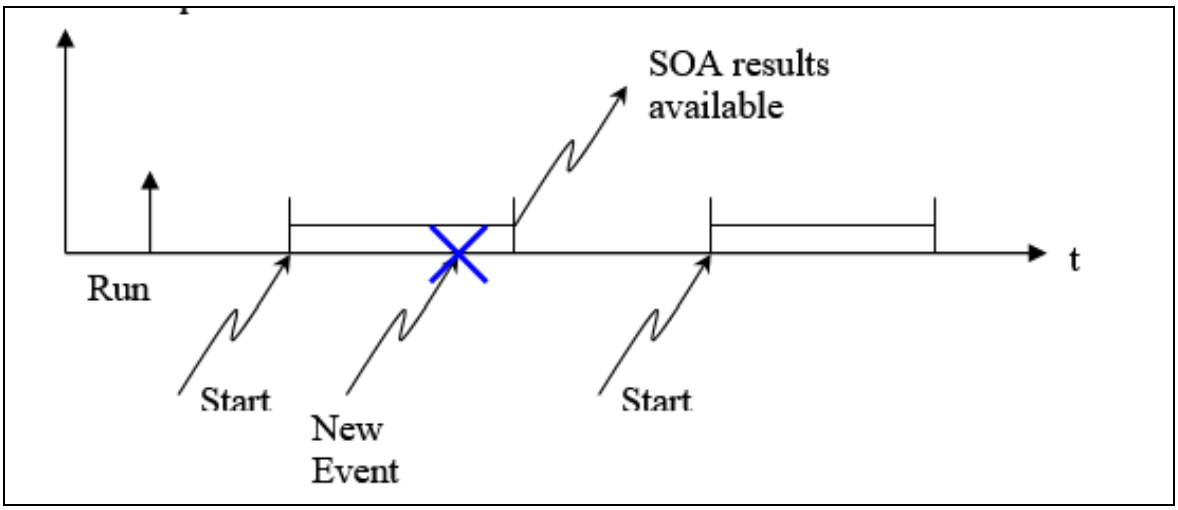

SOA results
available
Repeat on
new start
Triggering
Start
SOA results available
+ Reset
Block Triggering
Repeat on
end of
averaging
Trigger
End of current block
Count = avg number
Running

- 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.

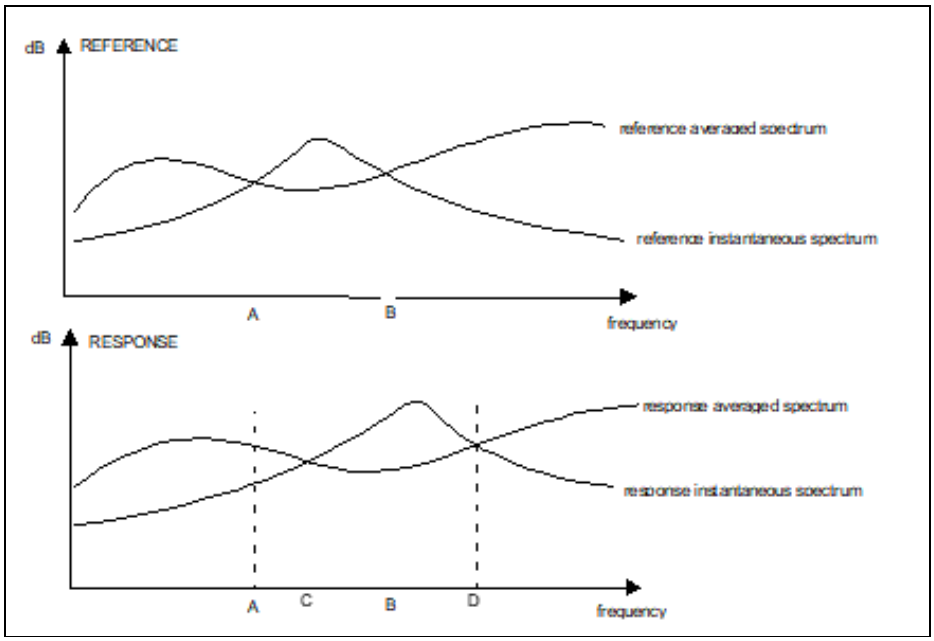
- **Accept mode**: selects the method of rejecting signal blocks.

Mode	**Description**
Normal	All blocks are accepted
Overload rejection	Blocks with an overload are automatically rejected

35.2.3.4 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**.

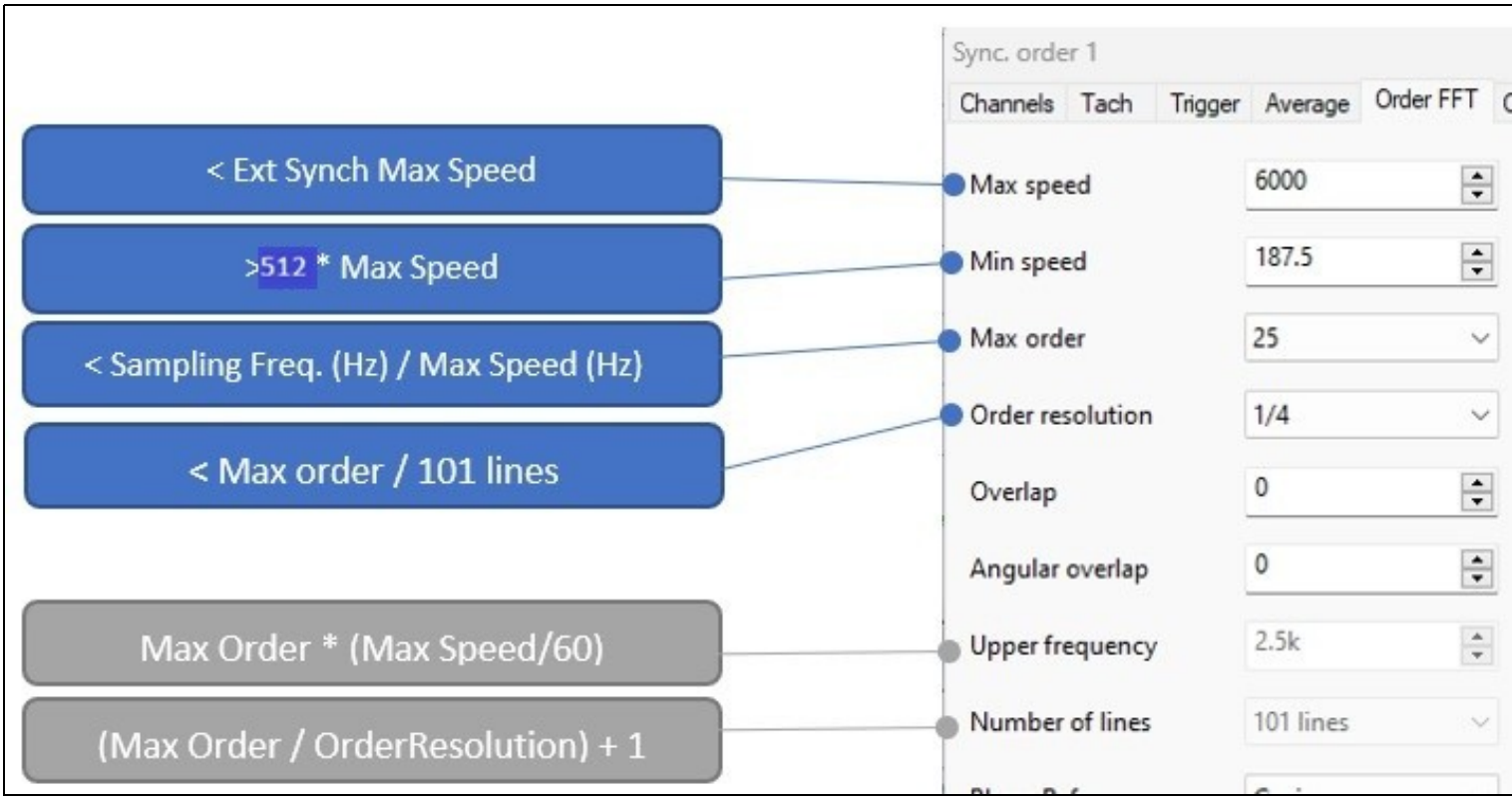
Hidden/fixed: Peak hold and Referenced Peak hold are only available if the Domain setting from the same sub-module is set to Spectral.

- **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.

35.2.3.5 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.

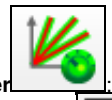
To know more, see § 1.4.2.1 tachometer /tachs.

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.

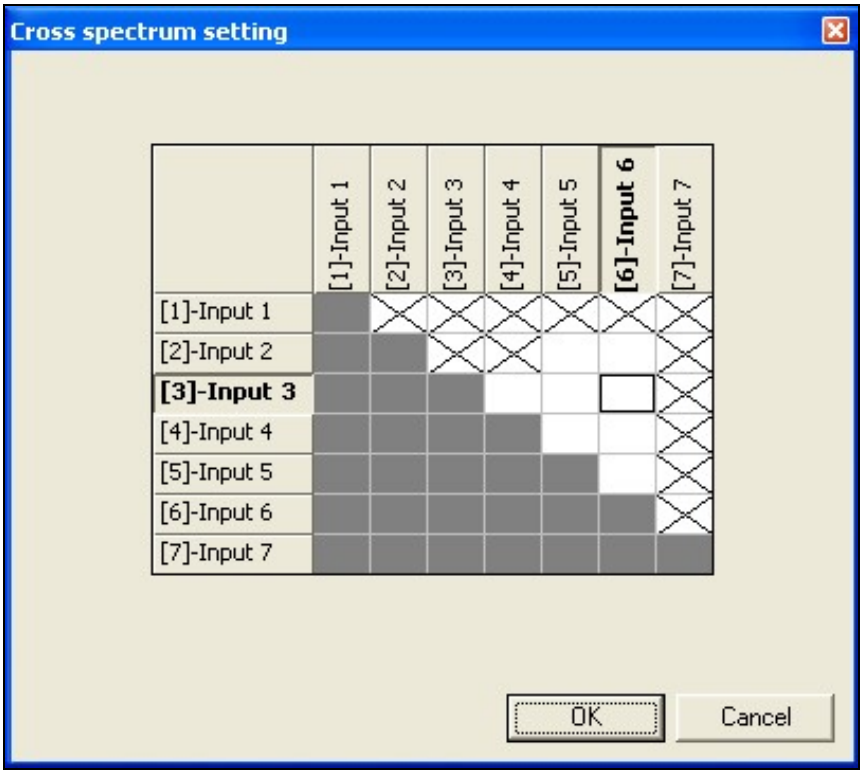
Hidden/fixed: fixed

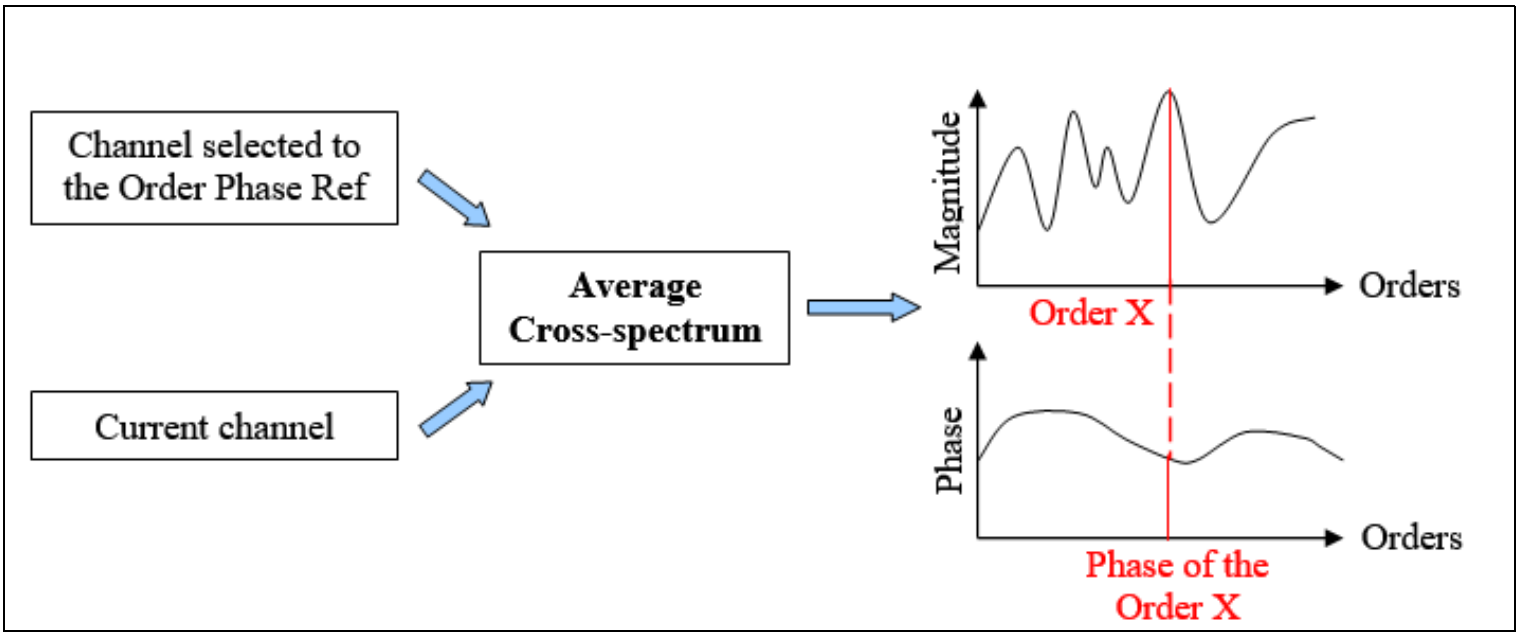
- **Phase Ref**: The phase reference for the computation of the Order FFT

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

35.2.3.6 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

35.2.3.7 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 $x(\tau) = y(\tau)$.

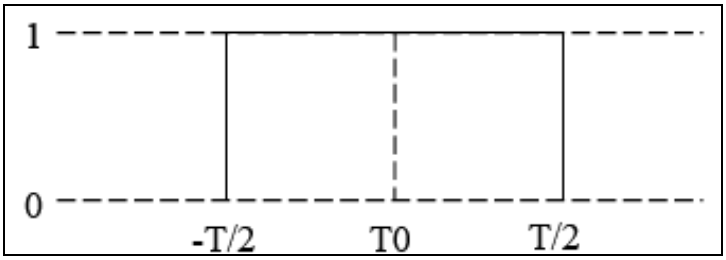
- **Correlation:** Allows to activate or not the calculation of the correlation.

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.

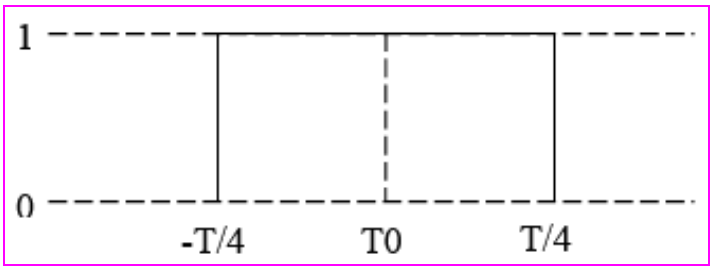
- **Weighting window:** Choose between following values of this setting:

Three types of correlation window are available:

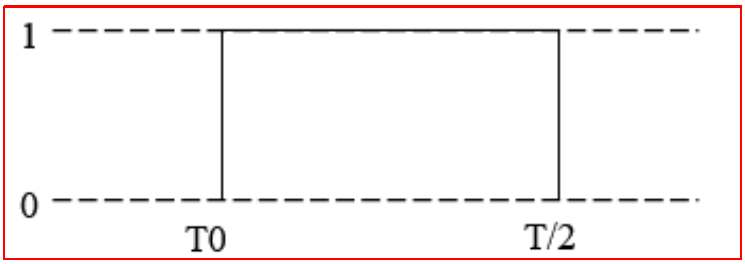
Uniform [-T/2, T/2] (where T is the trigger block length): All the window coefficients are equal to 1. For best results with the Uniform weight window, you should use signal sources that are self-windowing, such as transients, burst, and periodic waveforms (signal period must be a multiple of the weight 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.

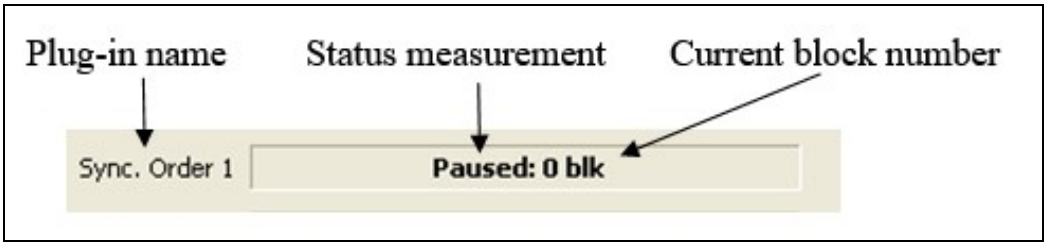
Considerations to obtain good results when making correlation measurement.

- 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.

35.2.4 SOA Status

All statuses are available to add to the control panel

35.2.4.1 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.

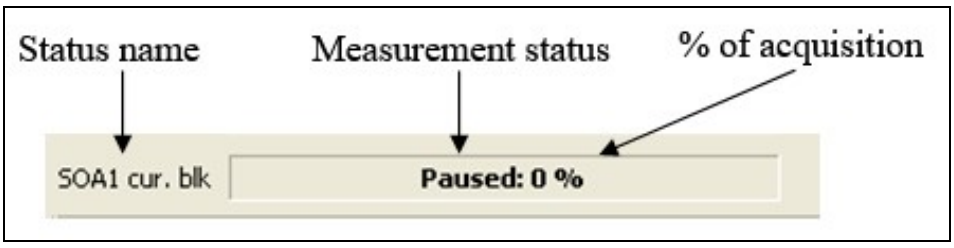
The way the status bar is displayed, depends on the type of averaging selected:

- **?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:

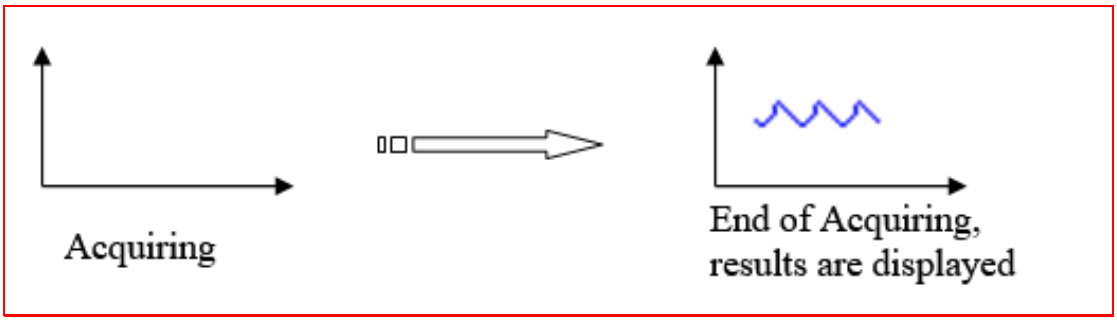
- *Green background and white or black text*: acquisition in real-time.
- *Red background and white or black text*: the current acquisition is not real-time (current block is not analyzed).
- *Green background and red text*: the current acquisition is real-time, but since start not all the blocks were analyzed.

35.2.4.2 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.

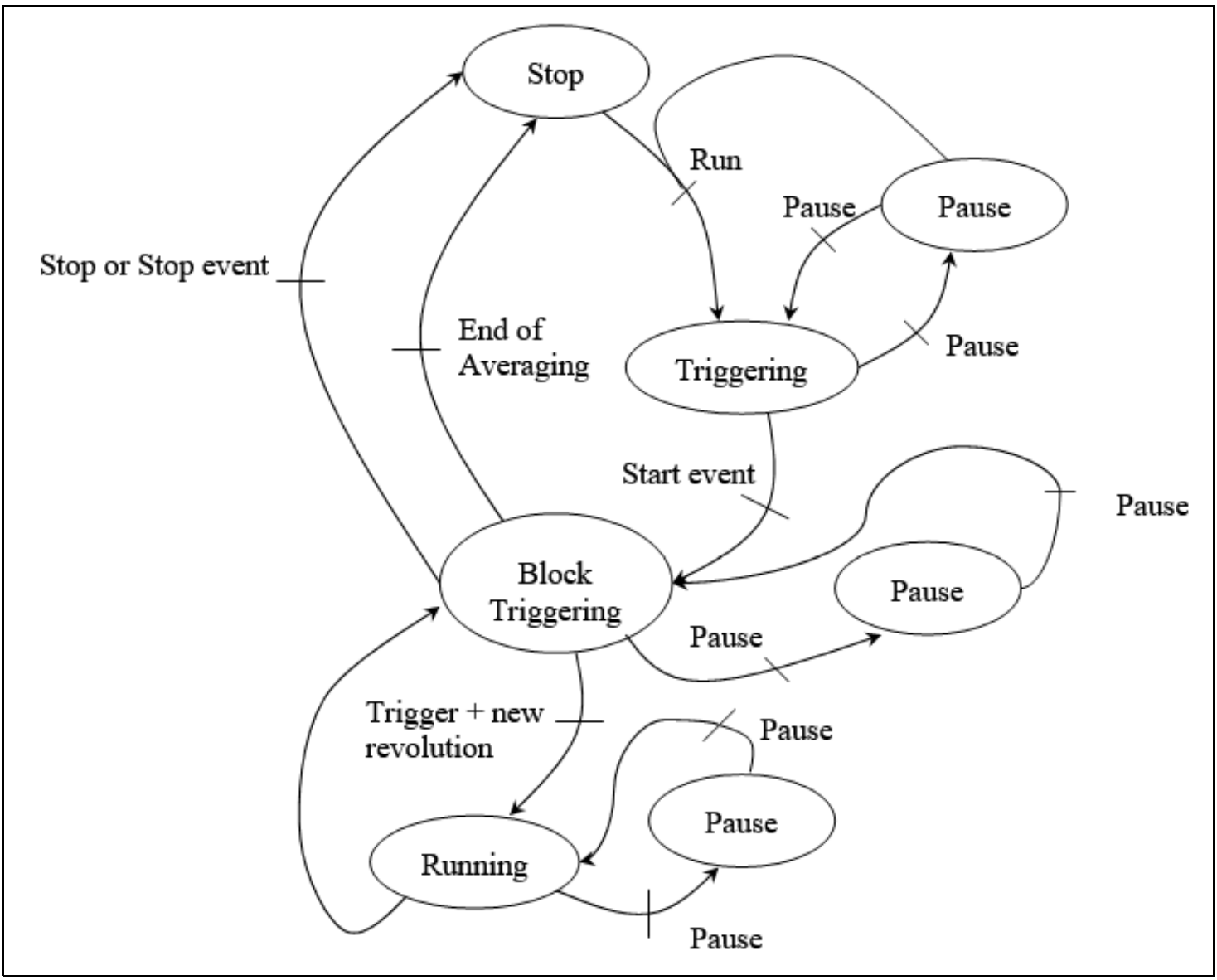
- Triggering:
- Acquiring: displays the evolution of the acquisition in percentage. During the acquiring period, no result is displayed; the result will be display at the end of the acquisition.



- Paused: the acquisition is paused
- Stop: the acquisition is stopped

35.2.4.3 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

35.2.4.4 Count

This status displays the averaging count processed. This status is expressed in analyzed block.

35.2.4.5 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).

35.2.4.6 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).

35.2.4.7 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.

36 NVGate Tachometer

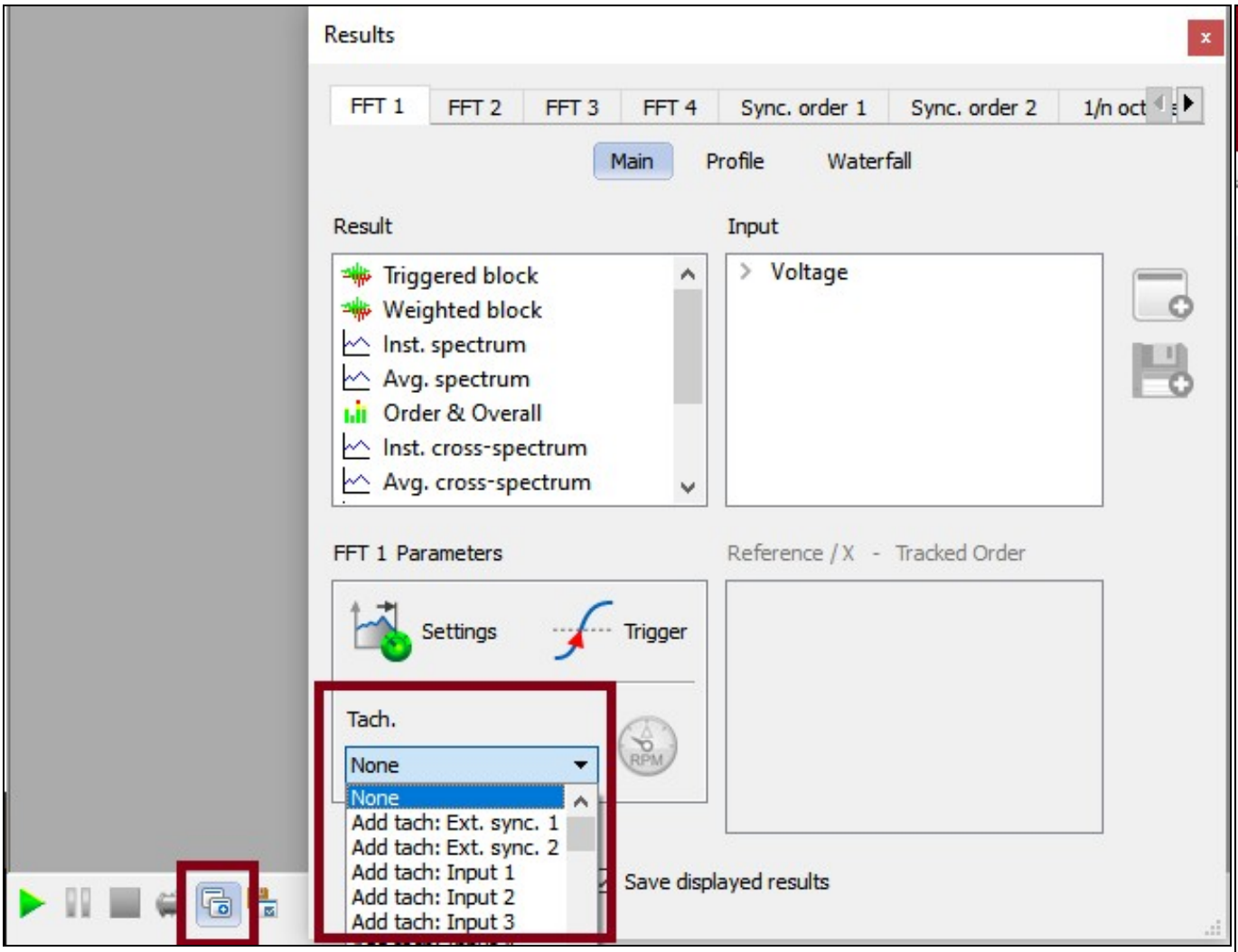
NVGate can set up several tachometer sources, including virtual tachometers in the case of multiple shafts. Tachometers are based on signals that provide pulses/revolution from a CAN bus or from a voltage proportional to the angular velocity.

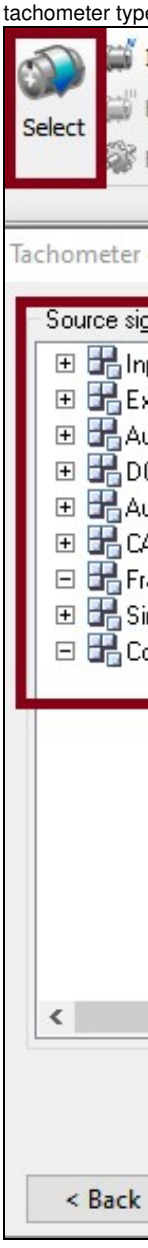
36.1 Connect

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

36.2 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.

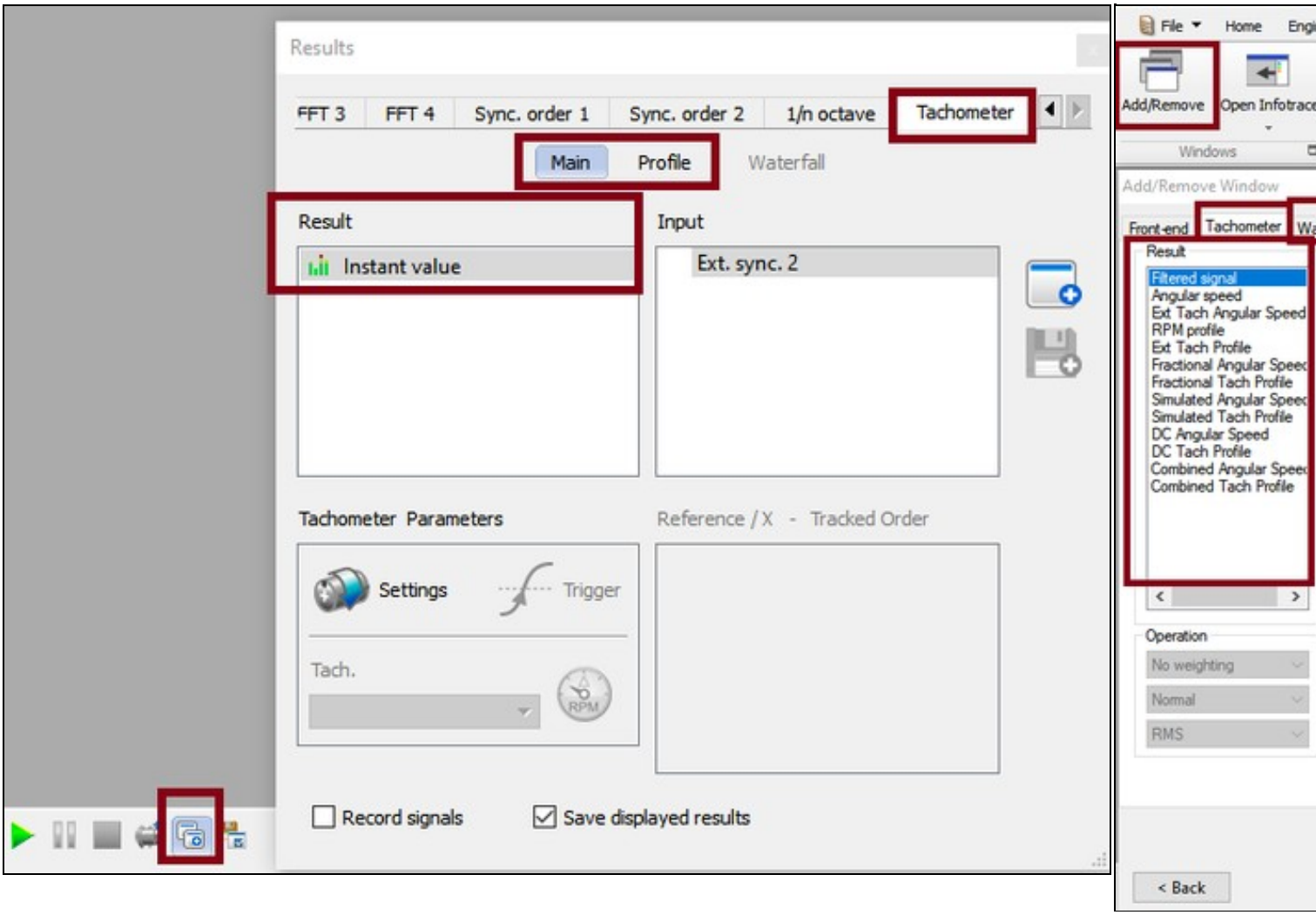
Display

Using GoToResult

You can display scalar values, or profiles using GoToResult windows.

For advanced results, us

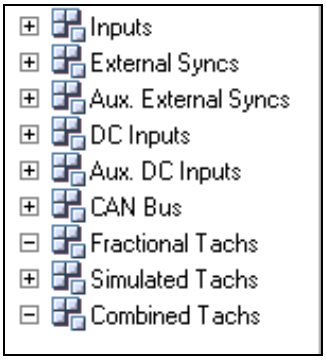
Using GoToResult



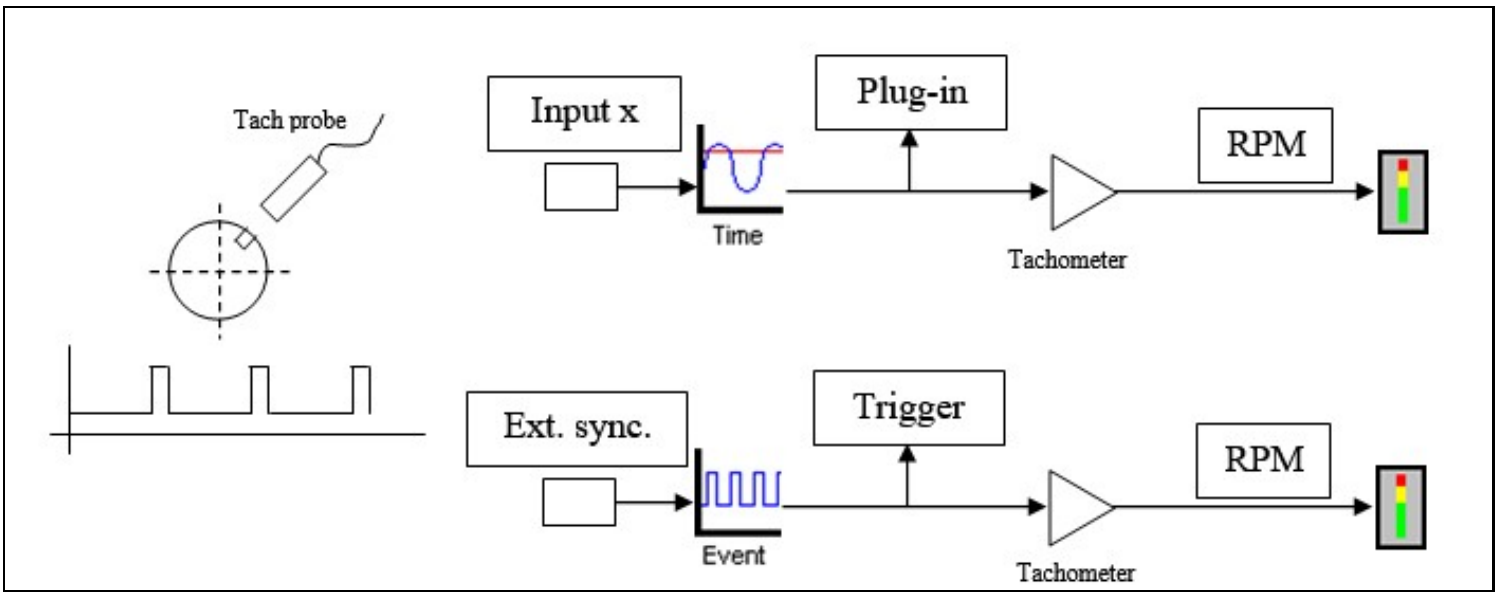
First activate a tachometer in a window plug in. Second, a new tab is created: "tachometer". Select the profile or scalar value Tips : to create Advance

36.3 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.



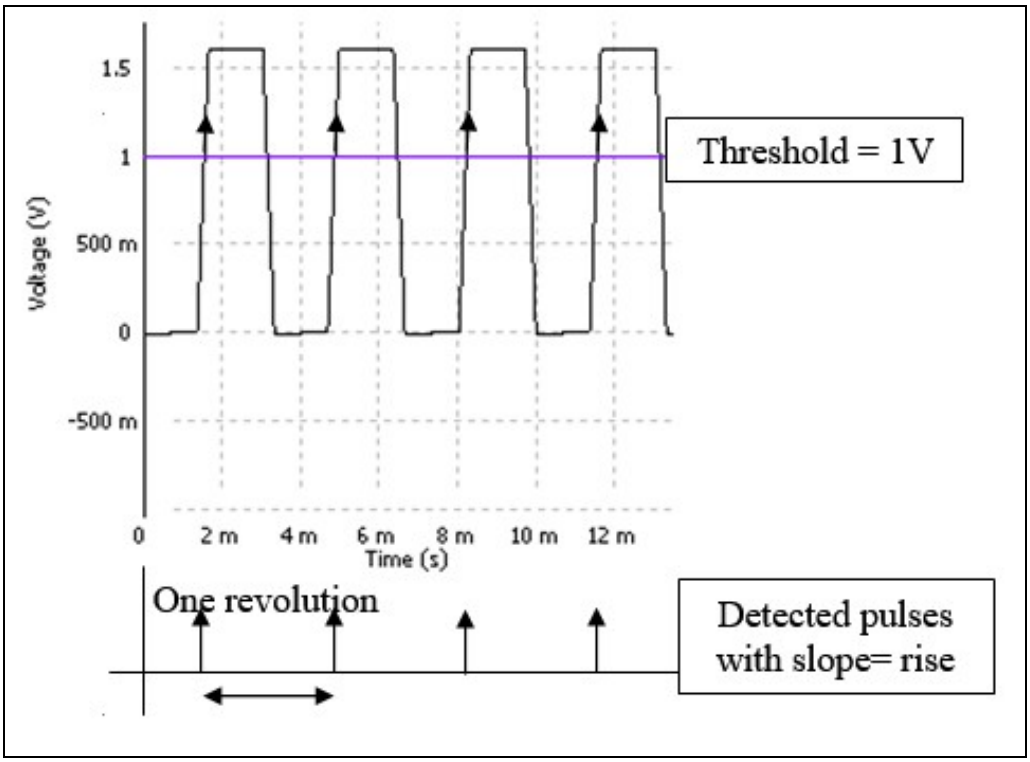
The tach probe that provides the pulse signal can be connected either on an input or on an External sync. The External sync is sampled at 64* the Front-end sampling frequency in order to achieve higher precision in delay or phase measurements.



36.3.1 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).

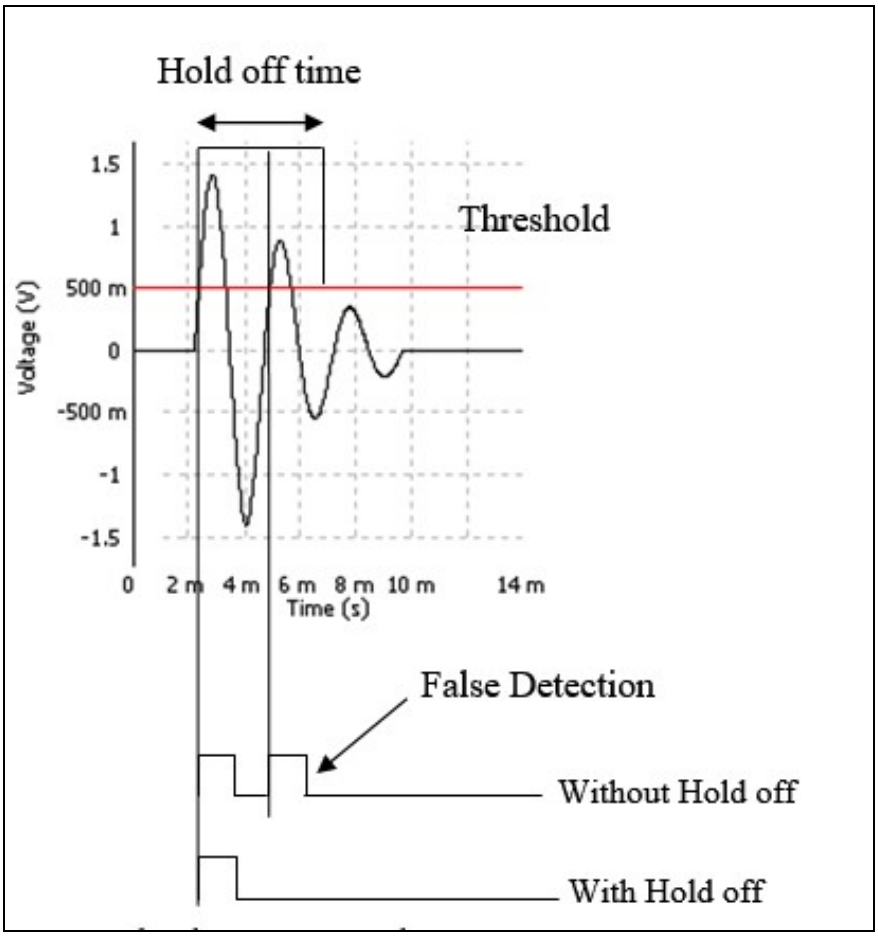
- **Source:**: the tach input signal (NONE by default). The input signal can be any Front-end input in Connected mode, on-line or any Player track in Post-analysis mode (except for the DC input and the Ext. Sync. inputs or tracks). (note : on OR35V1, Input 5 to input 8 are not able to be set as source 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.

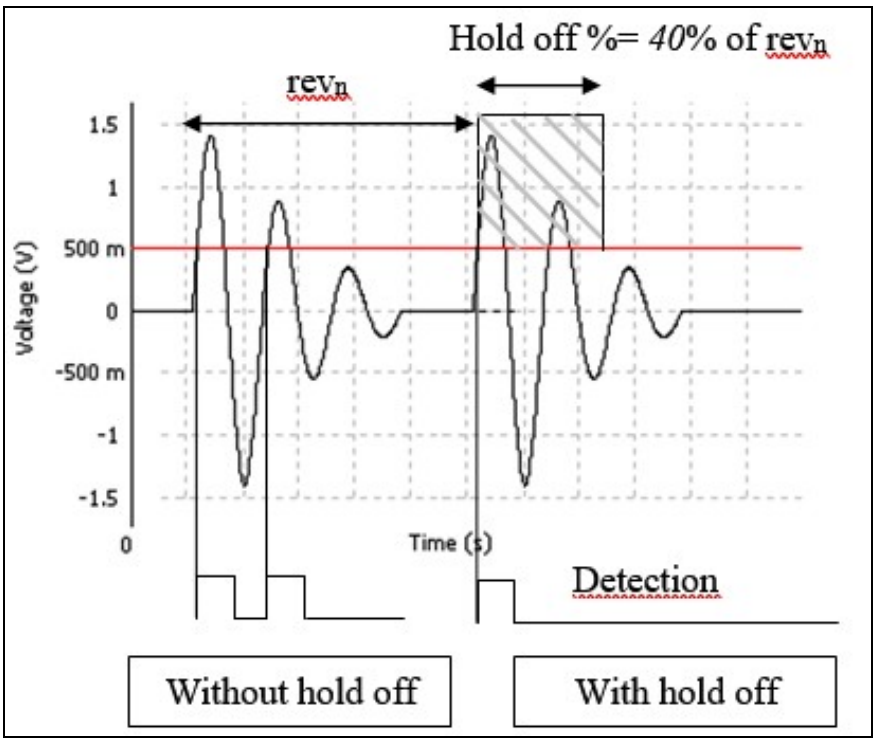
Slope	Description
Rise	Tach pulses are detected on rising edge of the input signal
Fall	Tach pulses are detected on falling edge of the input signal

- **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.



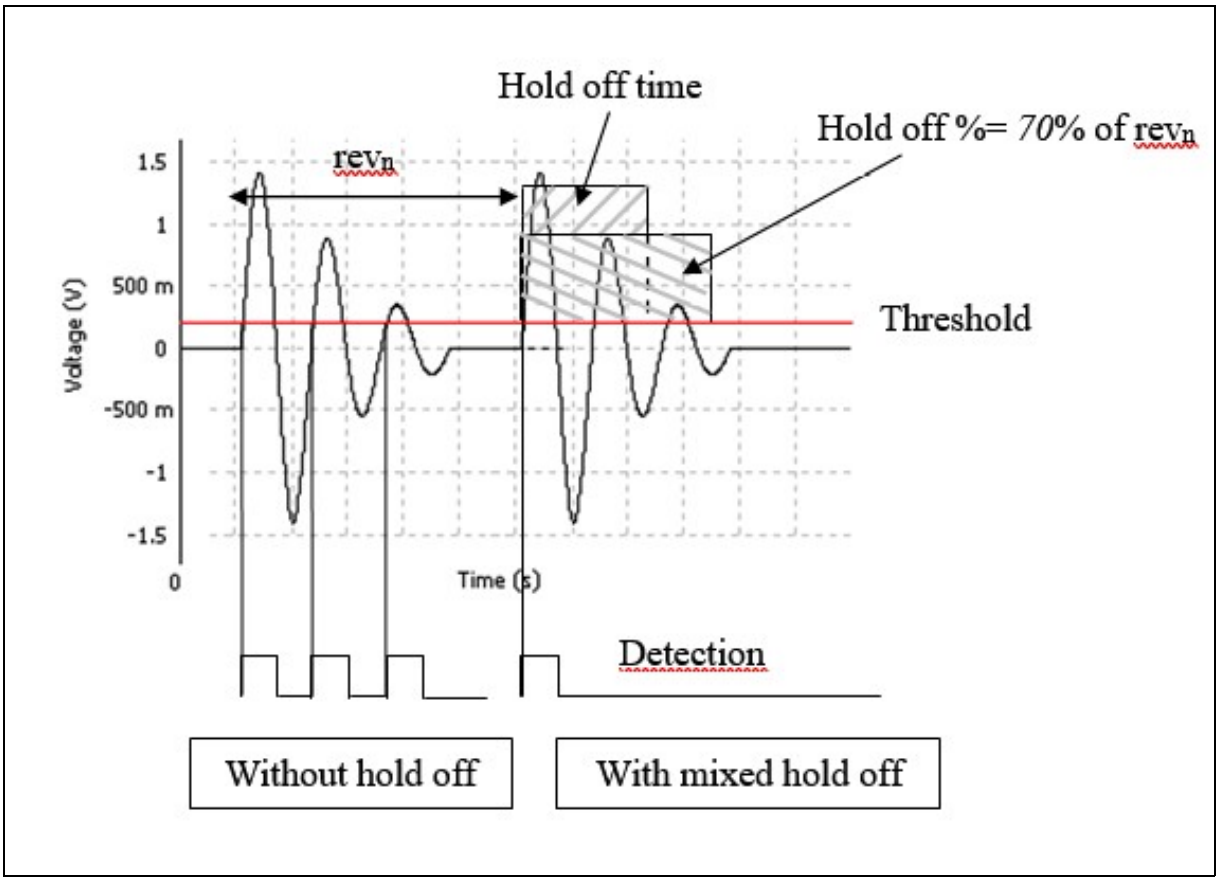
This minimum time is in fact the maximum between the Hold off setting value and the value computed using the last tach period length and the Hold off(% period) setting value. The user can enter any value between 0 and 36000s.

- **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.

36.3.2 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.

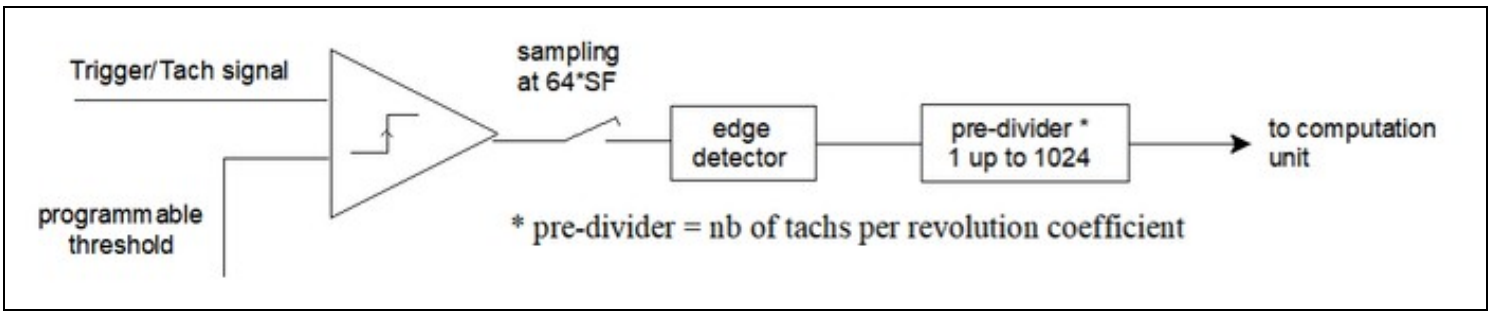
In post analyze, we connect player track on tachometer Ext synch resource.

36.3.2.1 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.

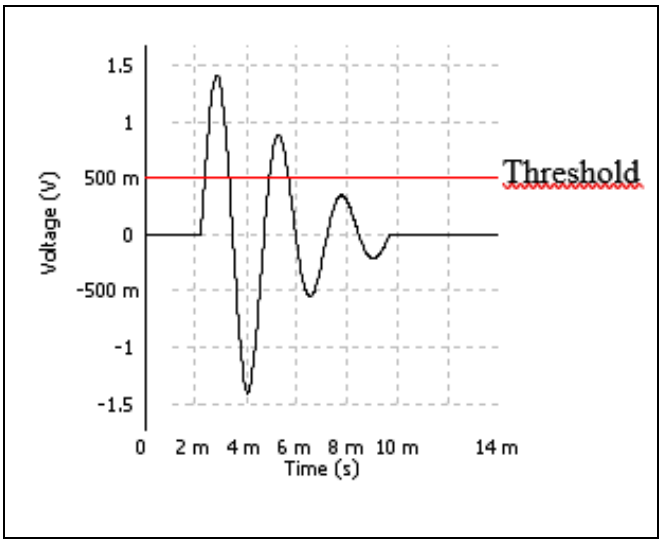
For external sync or tach signals whose frequencies overload the inputs sampling rate, an internal hardware divider is available in order to lower signal frequency. The upper frequency of the external sync must be lower than 64 times the Front-end frequency range. At input frequencies greater than 300 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.

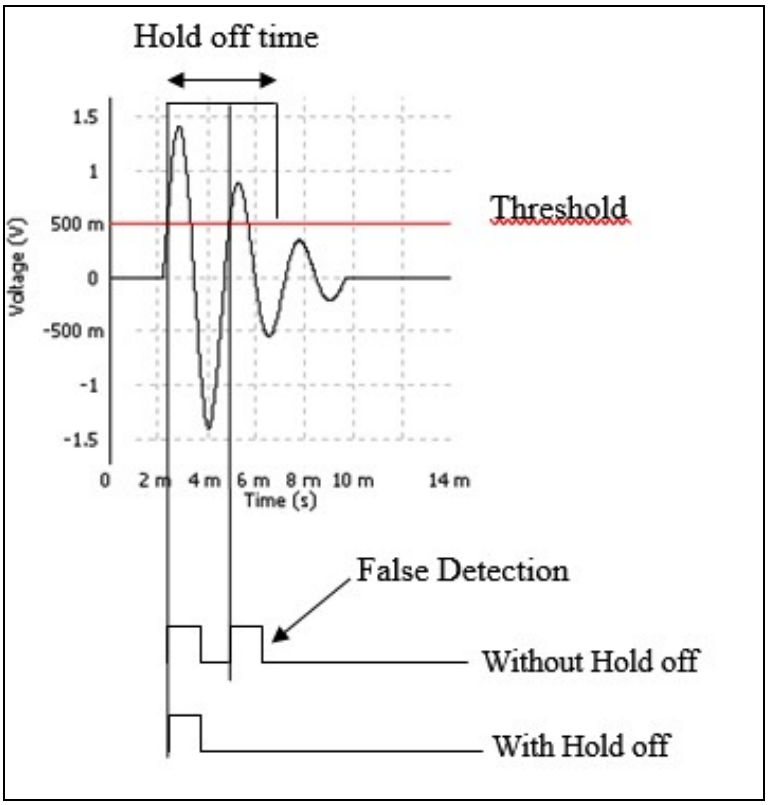
- **Label**: the name of this External Sync. (by default Ext. sync. n, with 1 <= n <= 2). The label of each External Sync is used in the result name and in all connection tools.
- **Threshold**: the detection level.



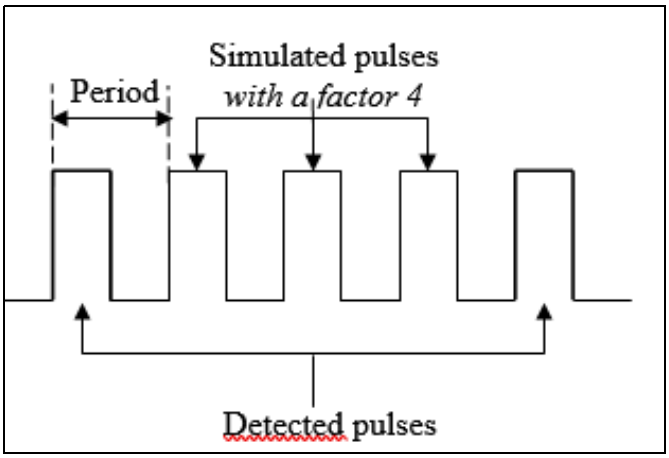
- **Slope**: the slope associated with the threshold that defines the trigger detection.

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

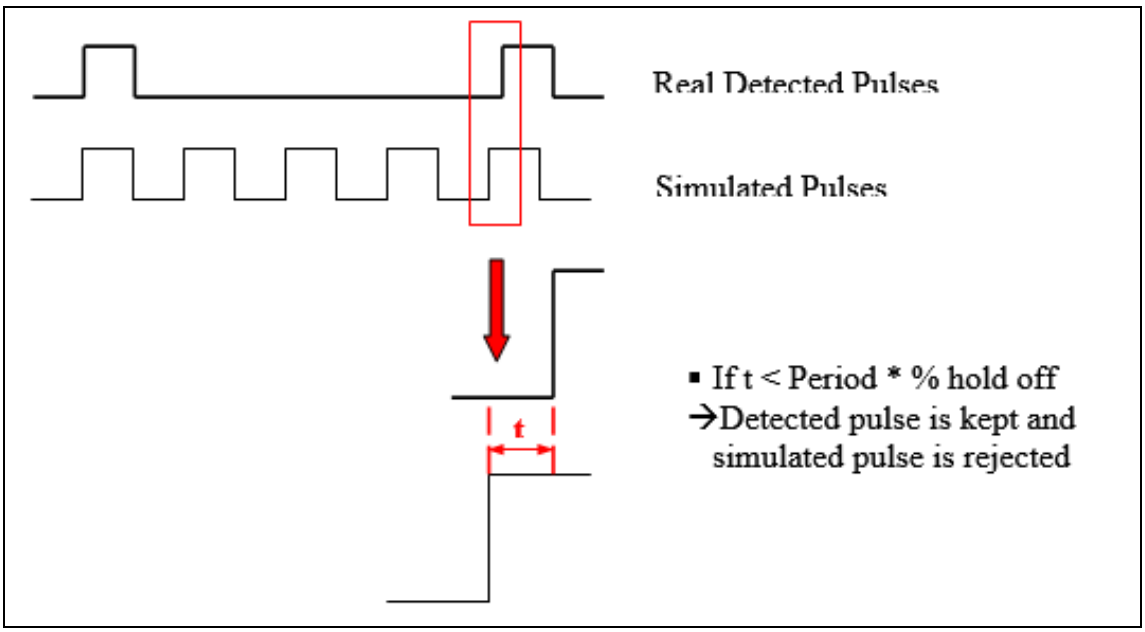
- **Hold off**: defines the minimum time (expressed in seconds) between two pulses. If a pulse is detected before this time has expired since the last valid pulse then the new pulse is rejected. The user can enter any value between 0 and 36000s.



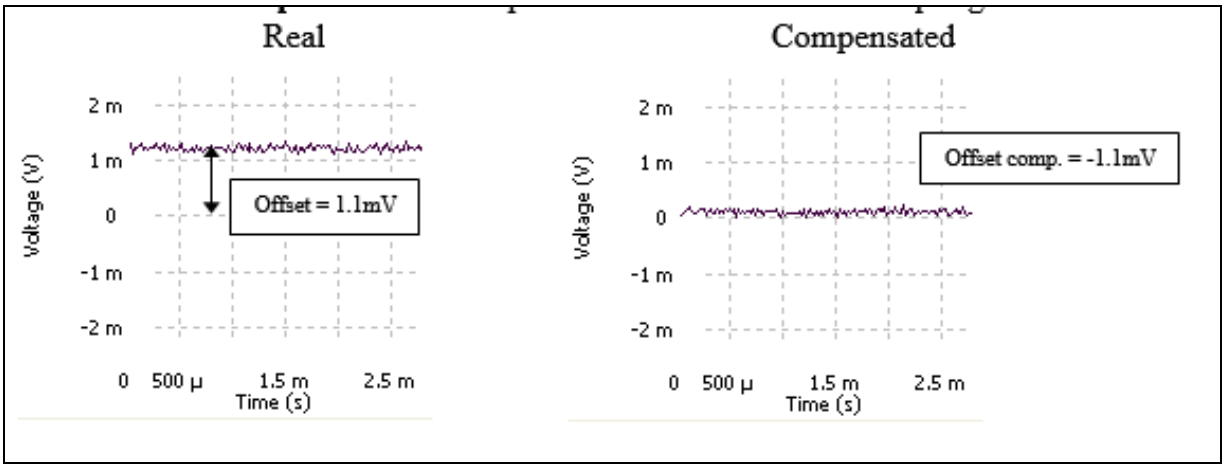
- **Hystersis**: defines the hystersis around the threshold. The value can be adjusted between 0 and the full scale of the input signal (depending on the input range).
- If Slope is set to RISE, the input signal must go below Threshold - Hystersis before a new pulse can be detected.
- If Slope is set 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.

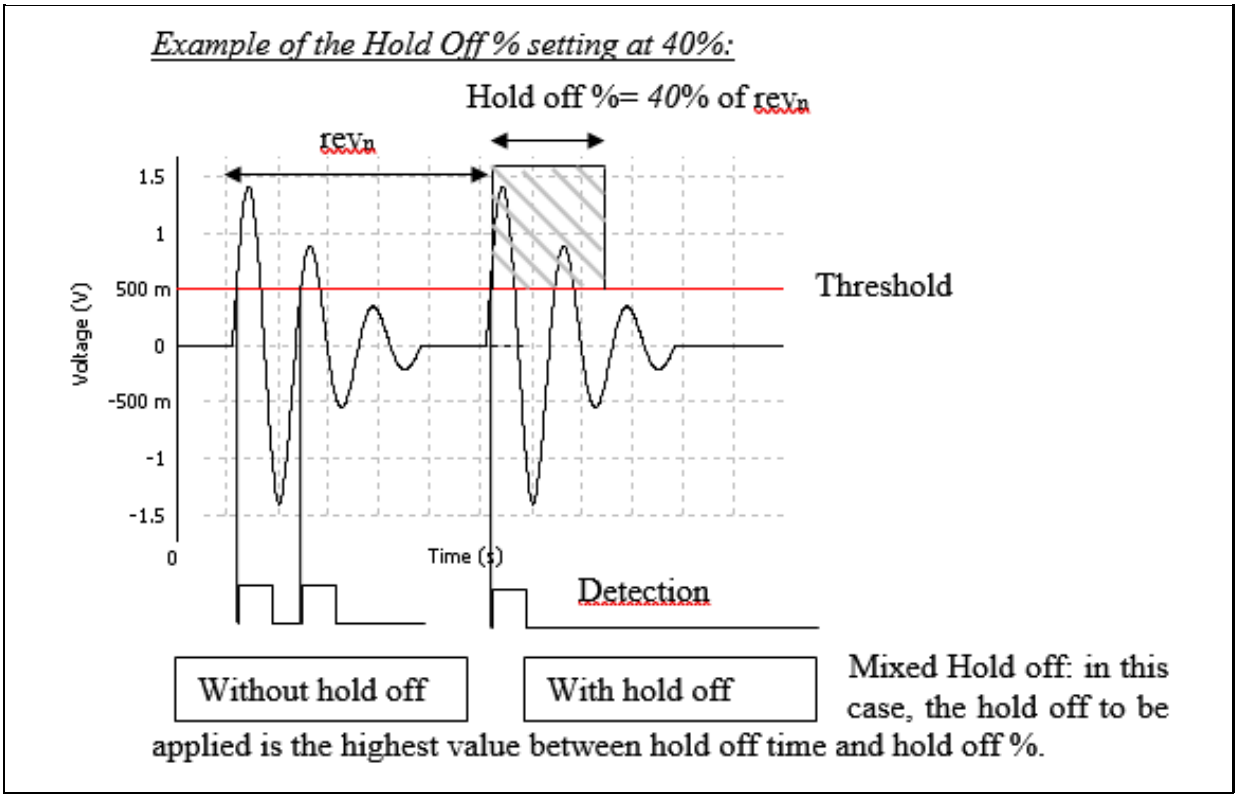
Mode	Description
Trigger	The Input generates events only. It can be used as trigger, start and stop of plug-in analyzers and be recorded. Recorded event occurs as 0/1 V signals. Note that the trigger event remains available on any mode.
Tach	The input generates a tach signal (RPM and revolution phases) 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

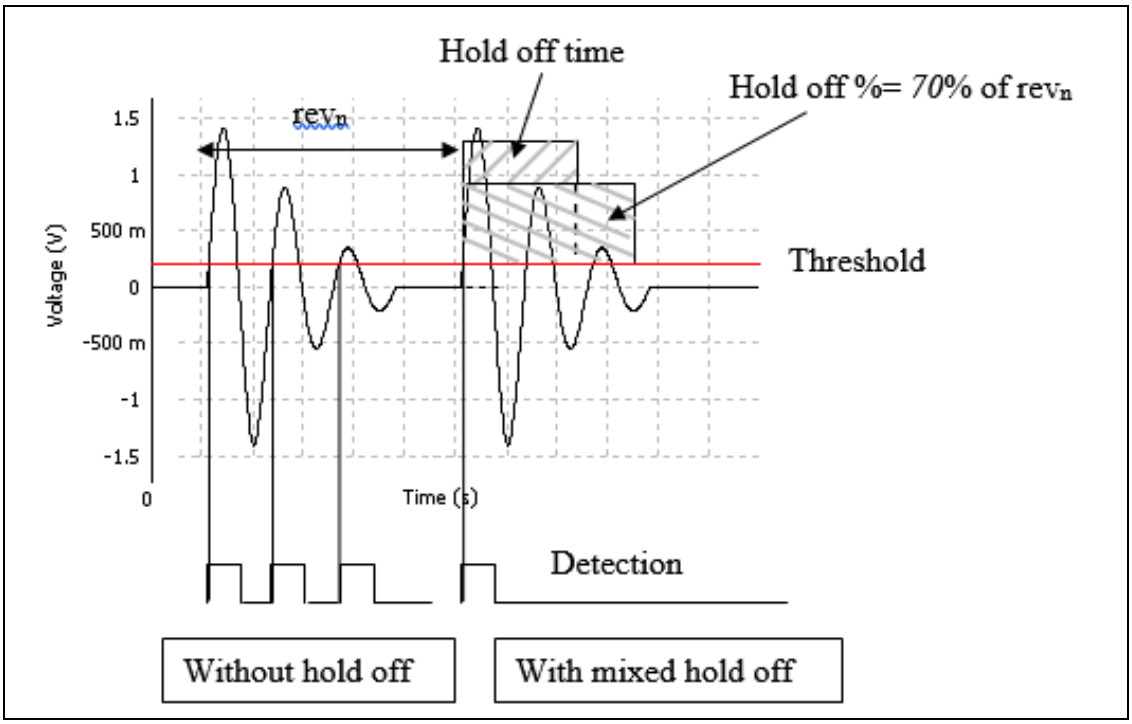
Sampling	The detected pulses on the inputs will be used to synchronize the SOA re-sampling algorithm. The number of pulse/rev is free and may be different from the SAO resolution.
Sampling + Tors	Combine the sampling and the Torsional modes. Both angular re-sampling and instantaneous velocity are provided 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.



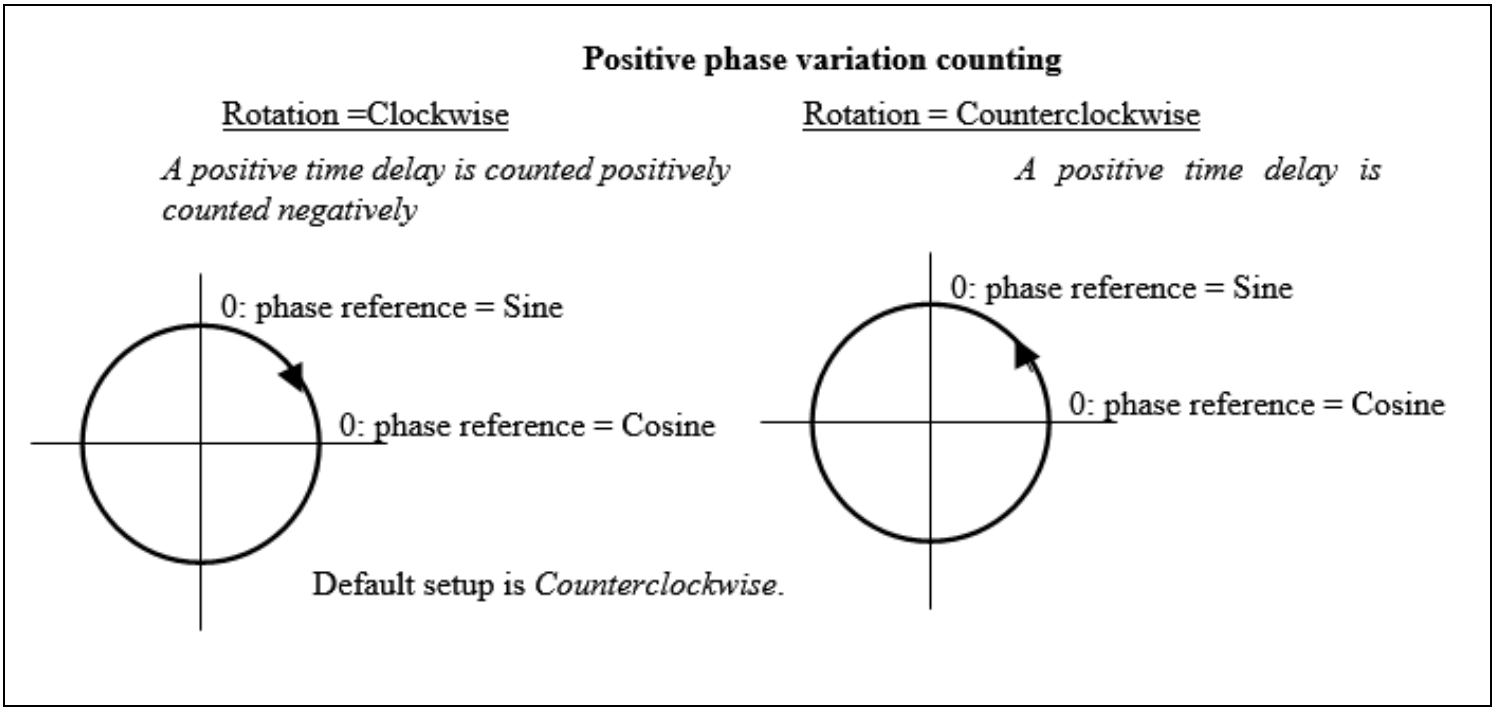


- **Pulse** / **rev**: the number of pulses per revolution. The user can enter an integer value between 1 and 4092. For a non-integer number of pulses per revolution the user must use a virtual tach.

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

36.3.2.2 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.

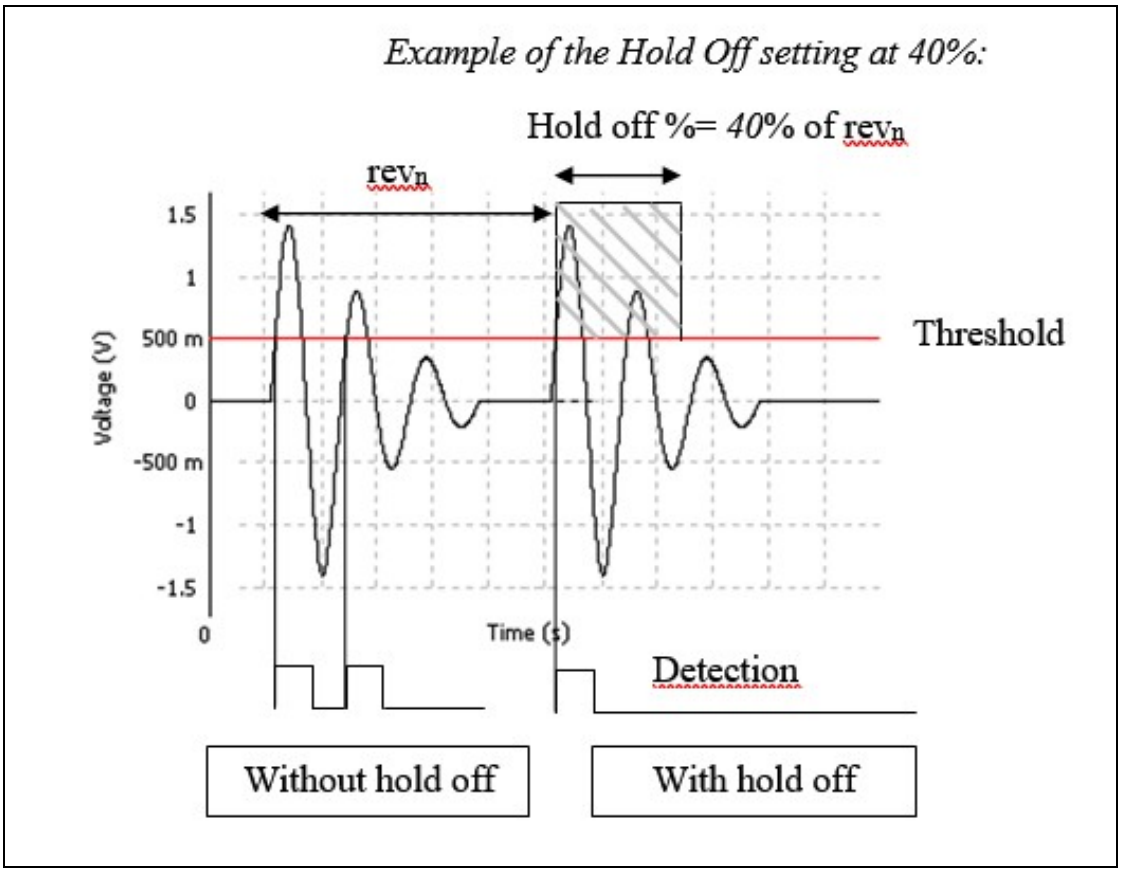
The rotation side is managed independently for each tachometer (Ext. sync, input, D, combined and fractional). Default setup is *Counterclockwise*;

See *Ext Sync §* for details

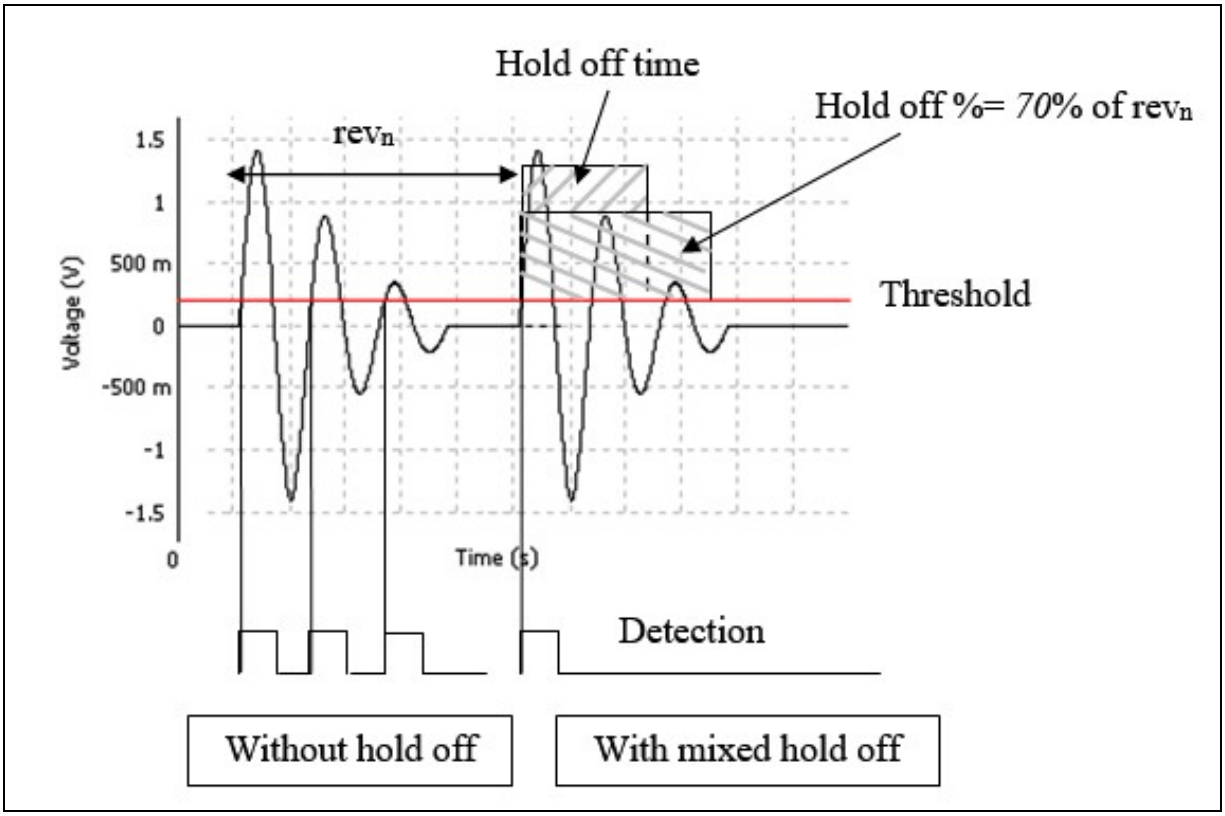
- **Average size**: defines the average number used to compute the average speed. Revolution number n average speed is: avrg_speed[n-1] + (inst_speed[n-1] - avrg_speed[n-1]) / avrg_size.
- **Threshold**: sets the signal threshold for tach pulse detection. The threshold is expressed in the same unit as 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 %.



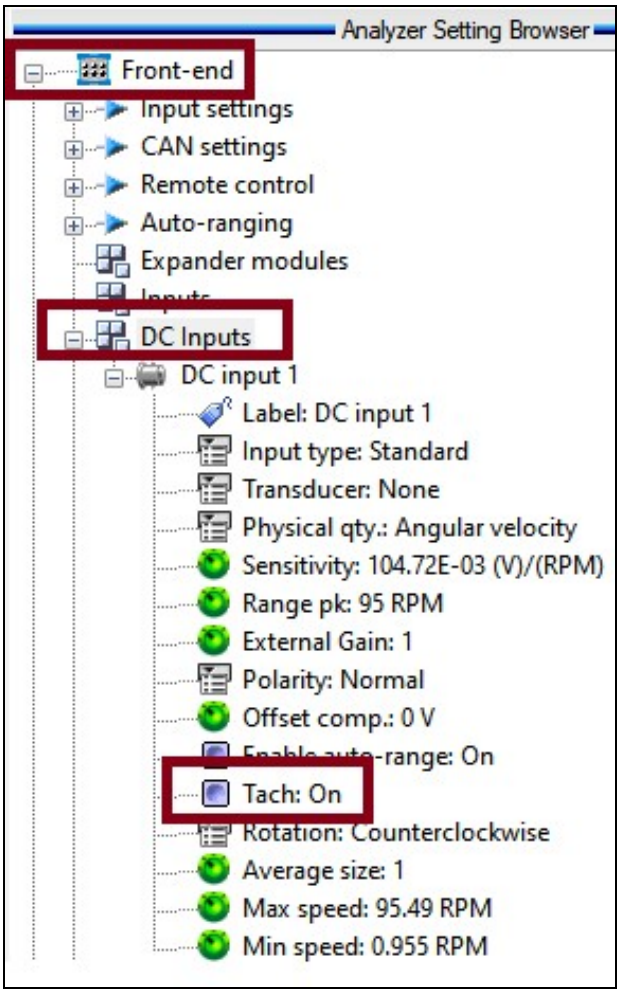
Note: the hold off value in Post-Analysis is added to the time or the percentage already put for the acquisition.

- **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.

36.3.3 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.

36.3.3.1 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.

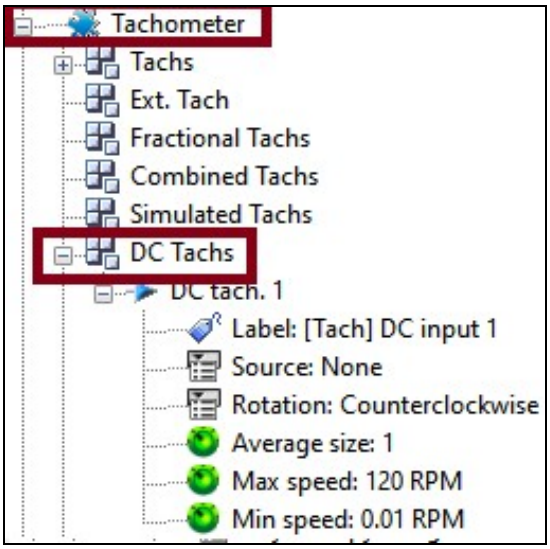
  Notes:

  - 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

36.3.3.2 Post analyse



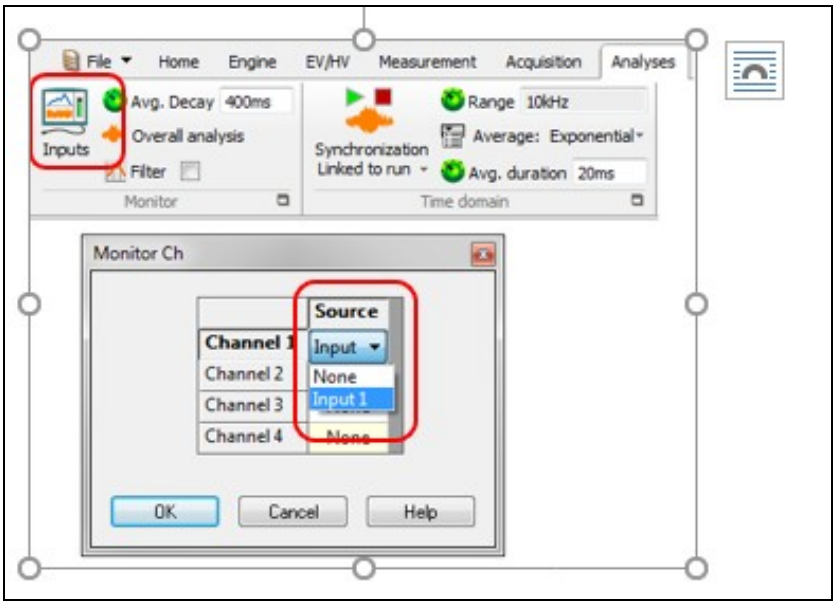
DC Tach in PA
In Post-Analyze, the DC tachs are available.

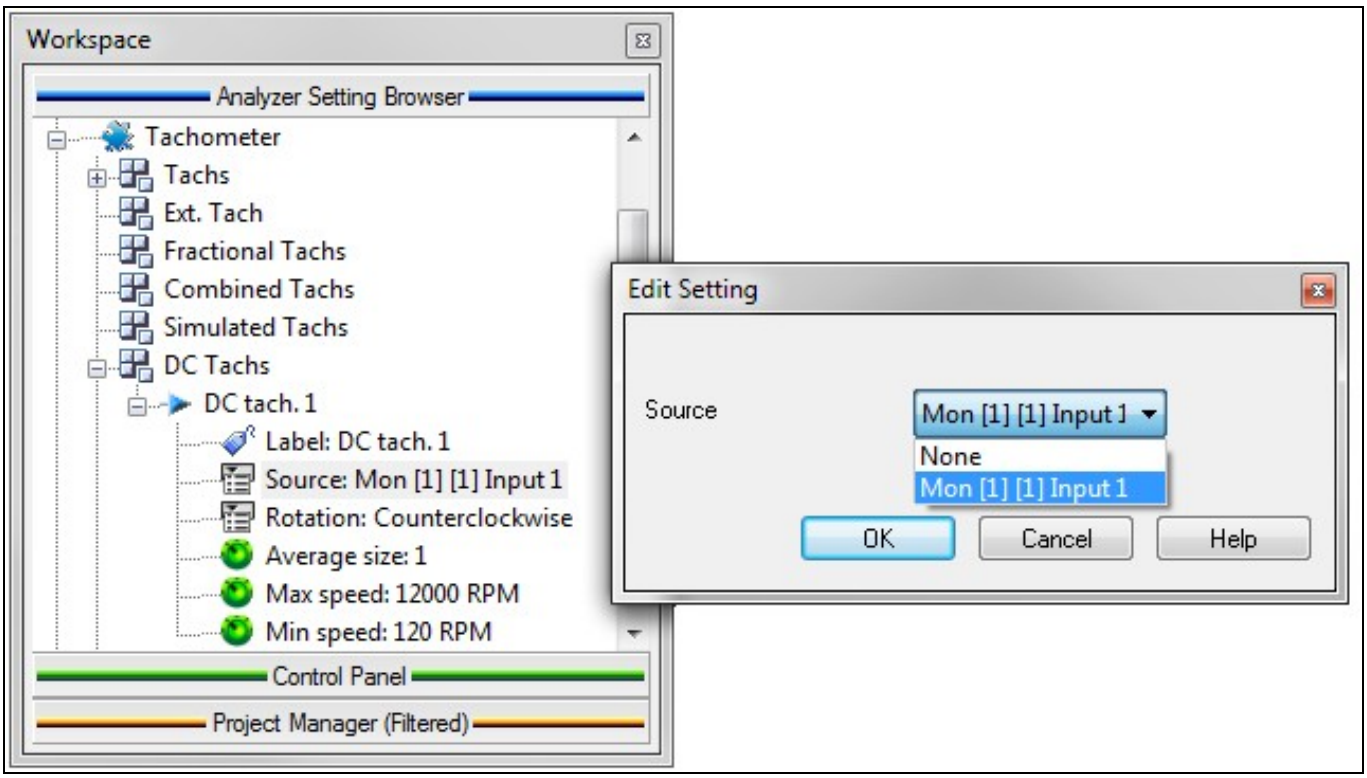
They can be activated and connected to a DC Input available in the signal loaded in the player. Then set up magnitude, sensitivity and offset allow to calibrate the DC Input in post analyze to obtain the correct values of the angular velocity. Settings are the same in acquisition mode.

36.3.3.2.1 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.



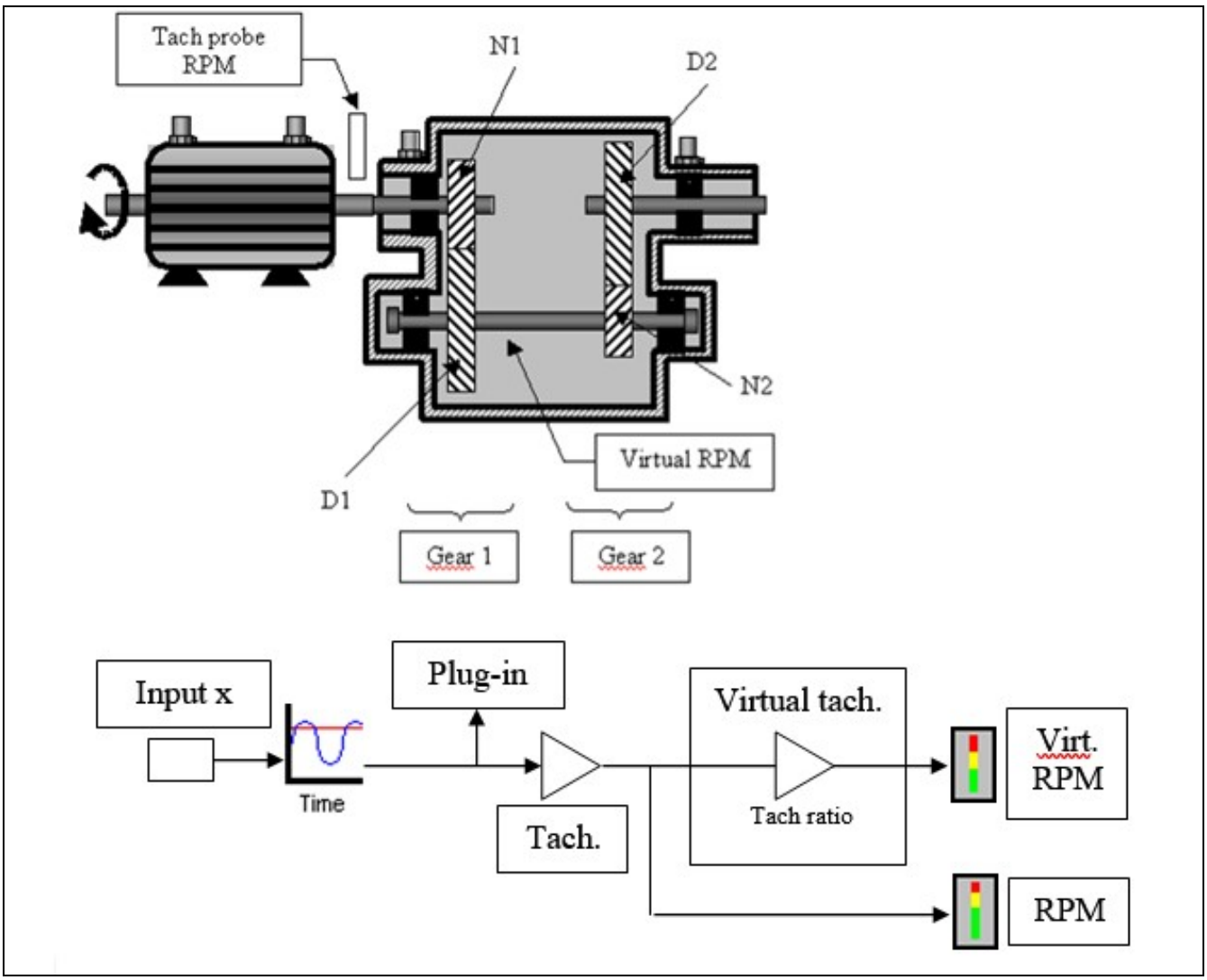


The DC tach is then available for any tachometer usage.

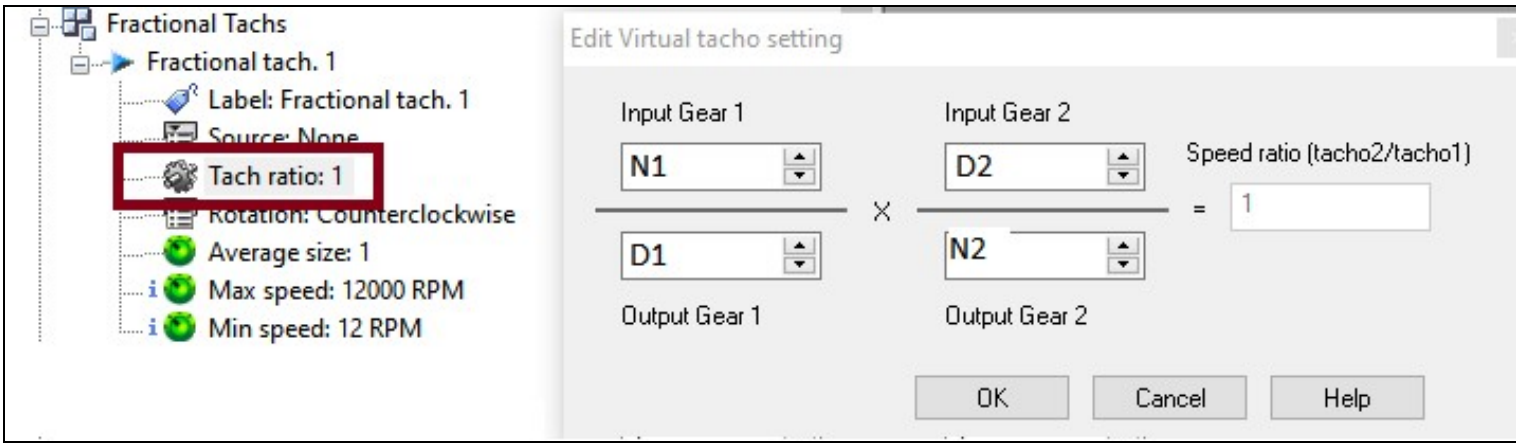
36.3.4 Fractional Tachs

 : *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.

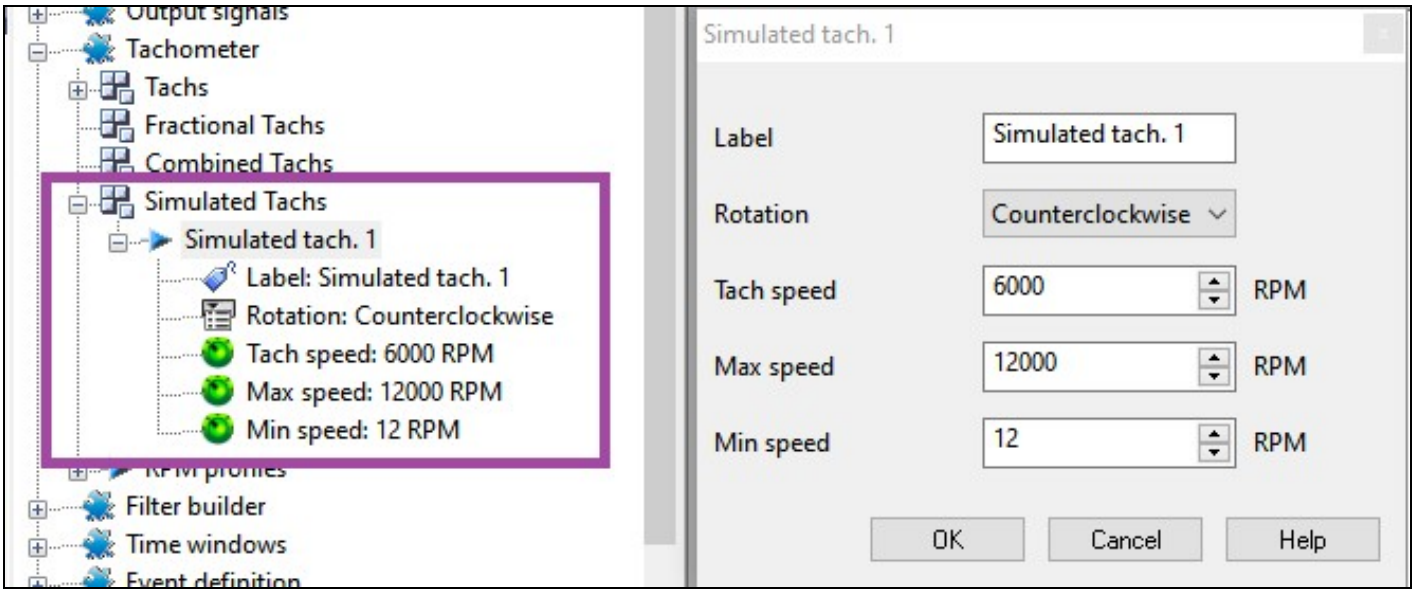
The rotation side is managed independently for each tachometer (Ext. sync, input, D, combined and fractional). Default setup is *Counterclockwise*;

- **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.

36.3.5 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.

36.3.6 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.*

36.3.6.1 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.

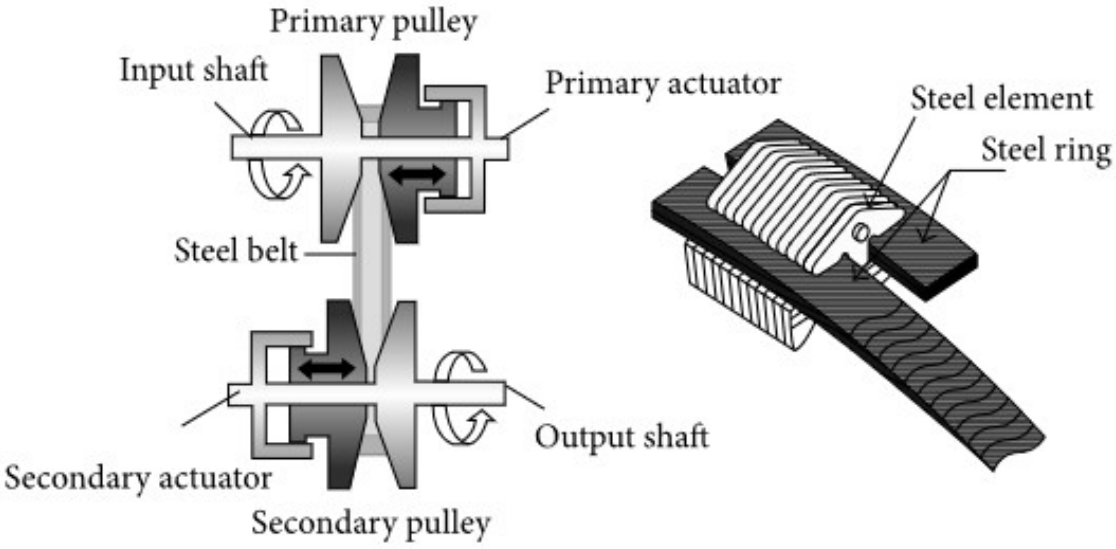


Figure 1

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/

36.3.6.2 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.

36.3.7 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.

36.3.8 Extract tach from FFT waterfall and edit tachometer

Read this page

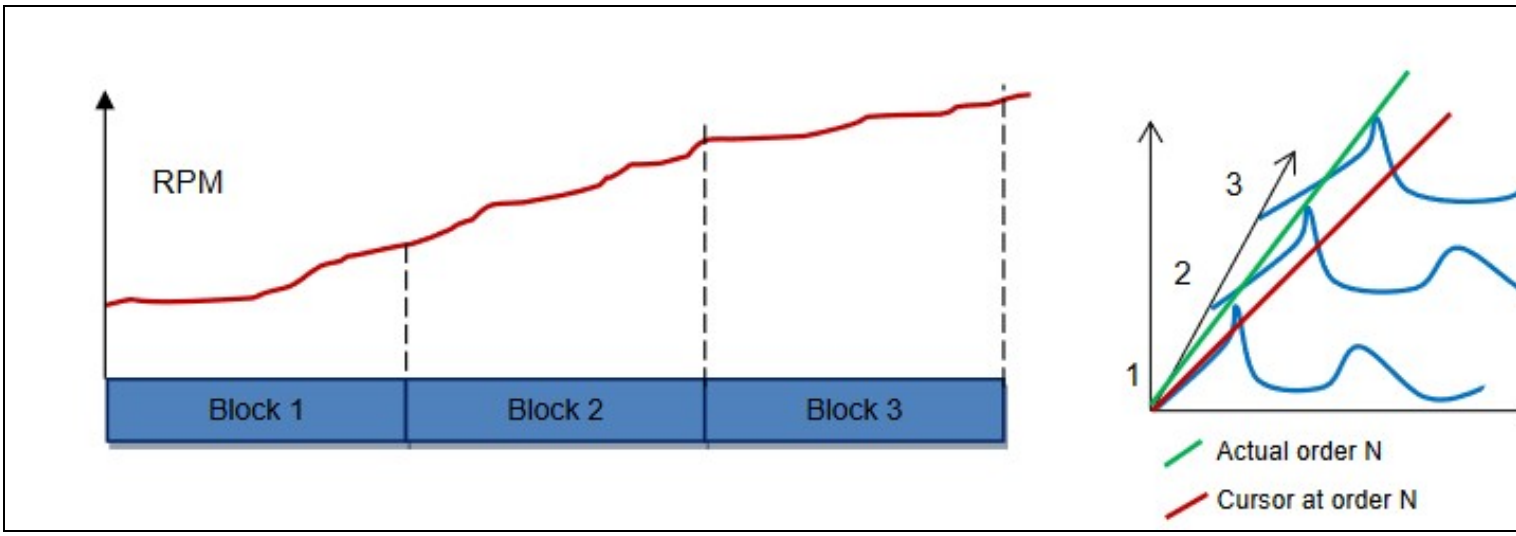
36.4 F.A.Q

36.4.1 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

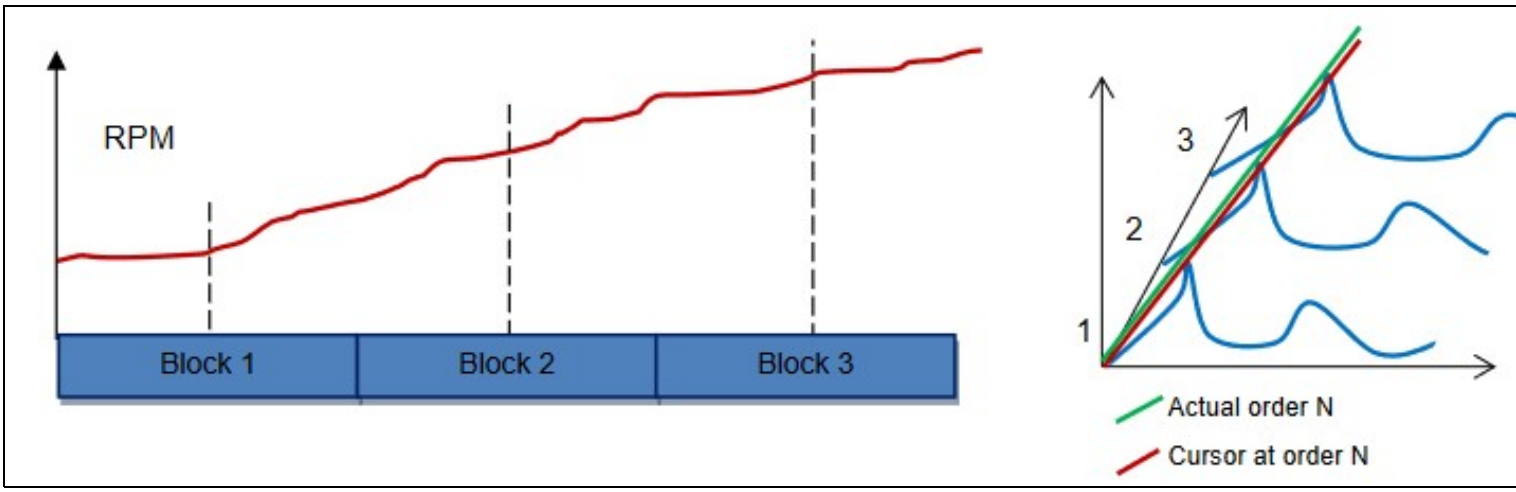
This allows centering tachometer speed at the center of the FFT/SOA trigger block(s). It is useful with long trigger blocks (High resolution analyses) to perfectly match the actual data with the order cursor or section.

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.

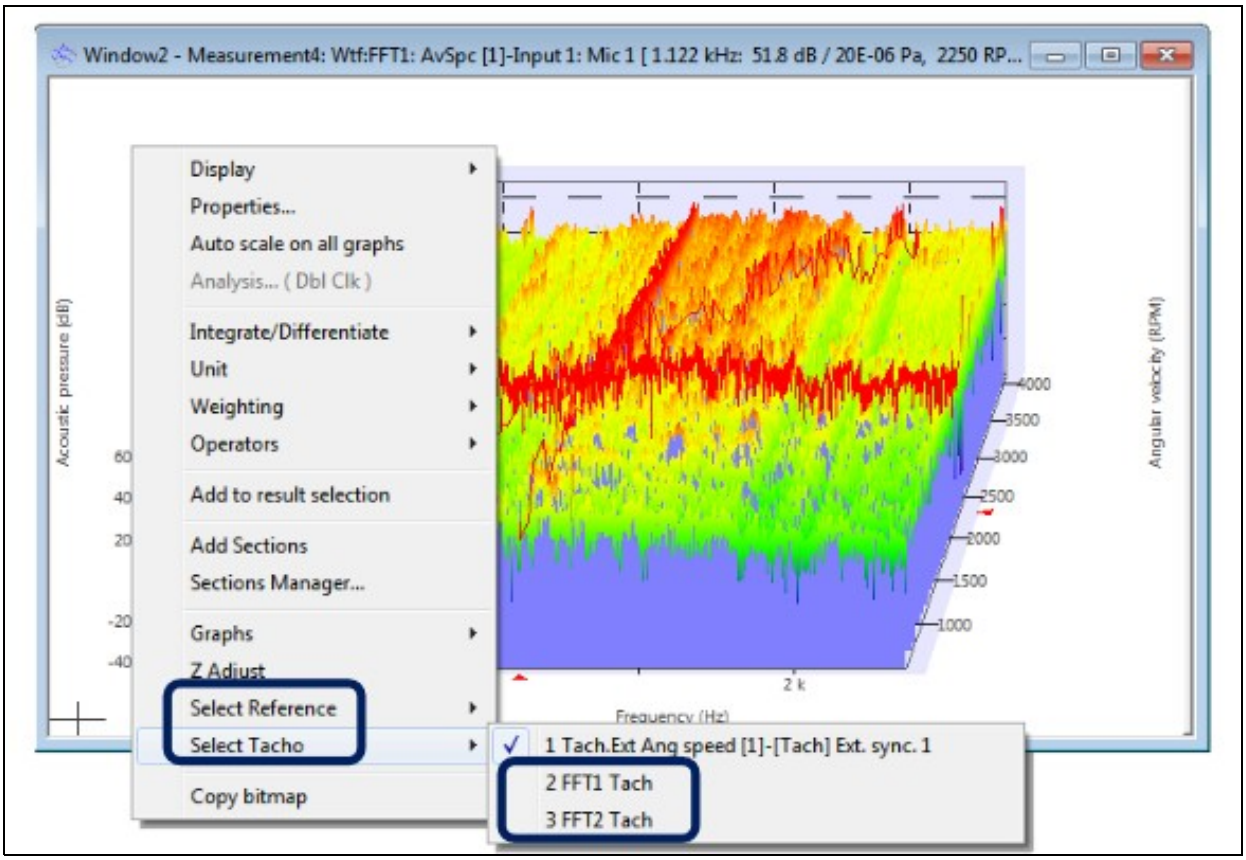


With the centered tachometer, the orders calculations match more accurately the actual orders in waterfall. The computation of the angular speed takes in account the averaging, triggering and overlap used in the plug-in. The centered speed is calculated as:

$$CT = \frac{RPM(End\_of\_analysis) - RPM(Begin\_of\_analysis)}{2}$$

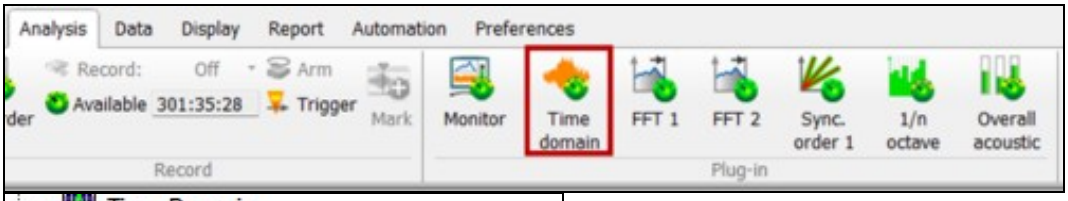
The RPM centering and averaging is done in the analysis plug-in prior to be connected to the waterfall. To use the centered tach simply add the said tachometer to the corresponding plug-in (FFTn or SOAn). These additional tachometers are available in the waterfall as soon as one of the result of the plug-in is added to the waterfall.

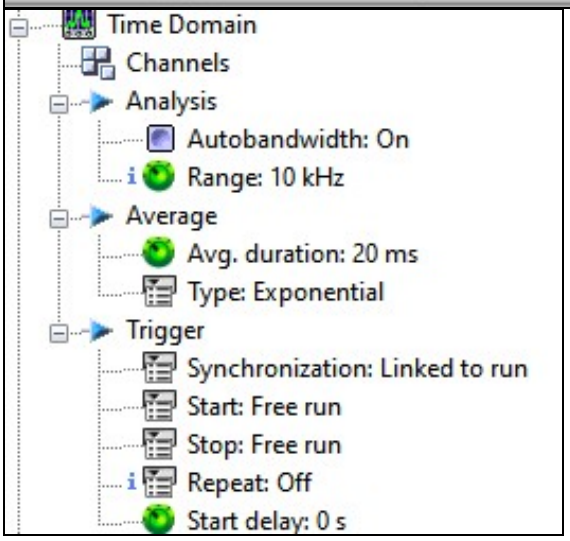
- 1. Add Tach to the Plug-in,
- 2. Add plug-in results (Spectra, orders, etc..) to the waterfall,
- 3. Display the waterfall,
- 4. Select the Plug-in Tach, as a tachometer and reference


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

37 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.



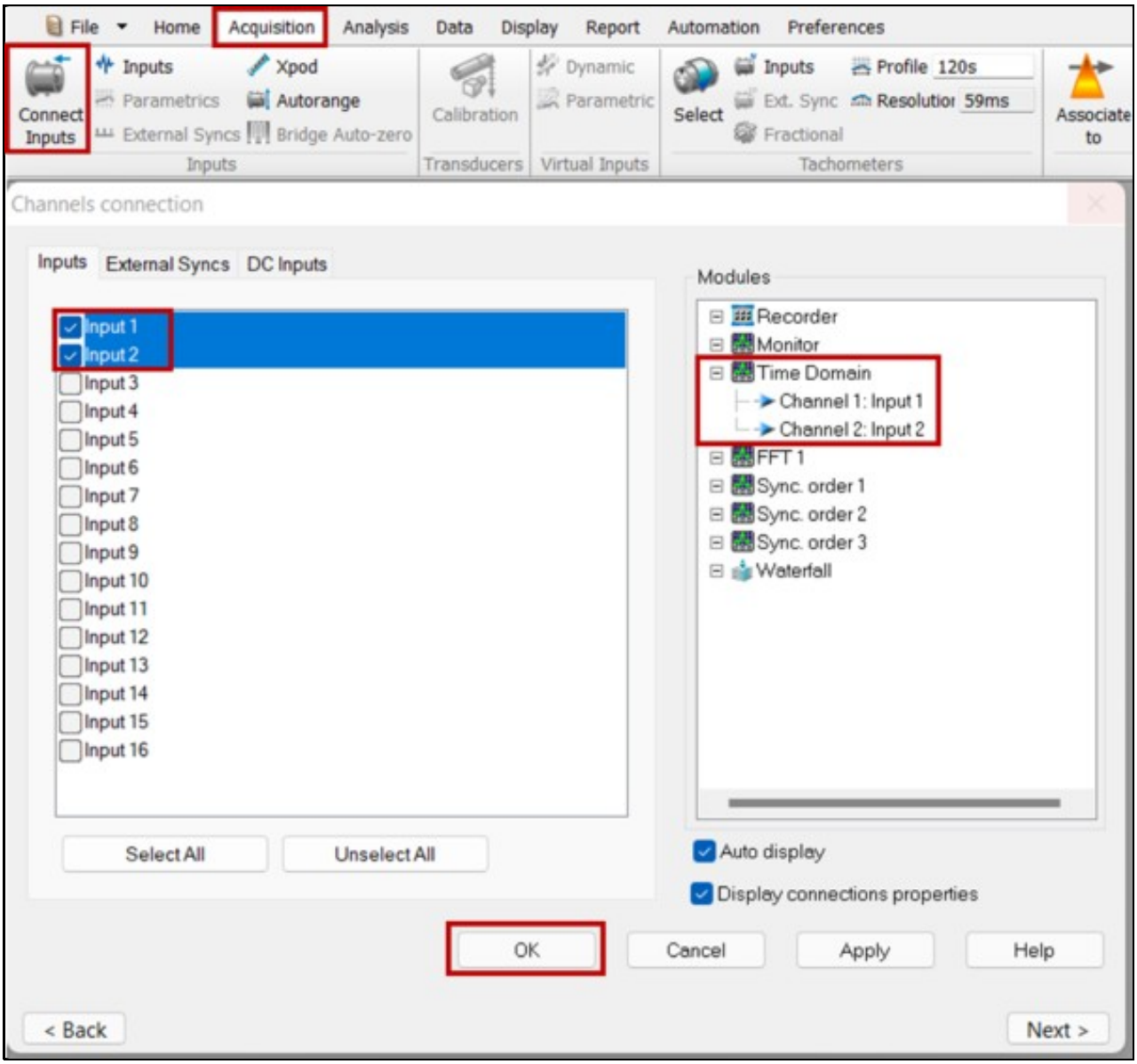


This TDA plug-in provides 2 types of results:

- 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).

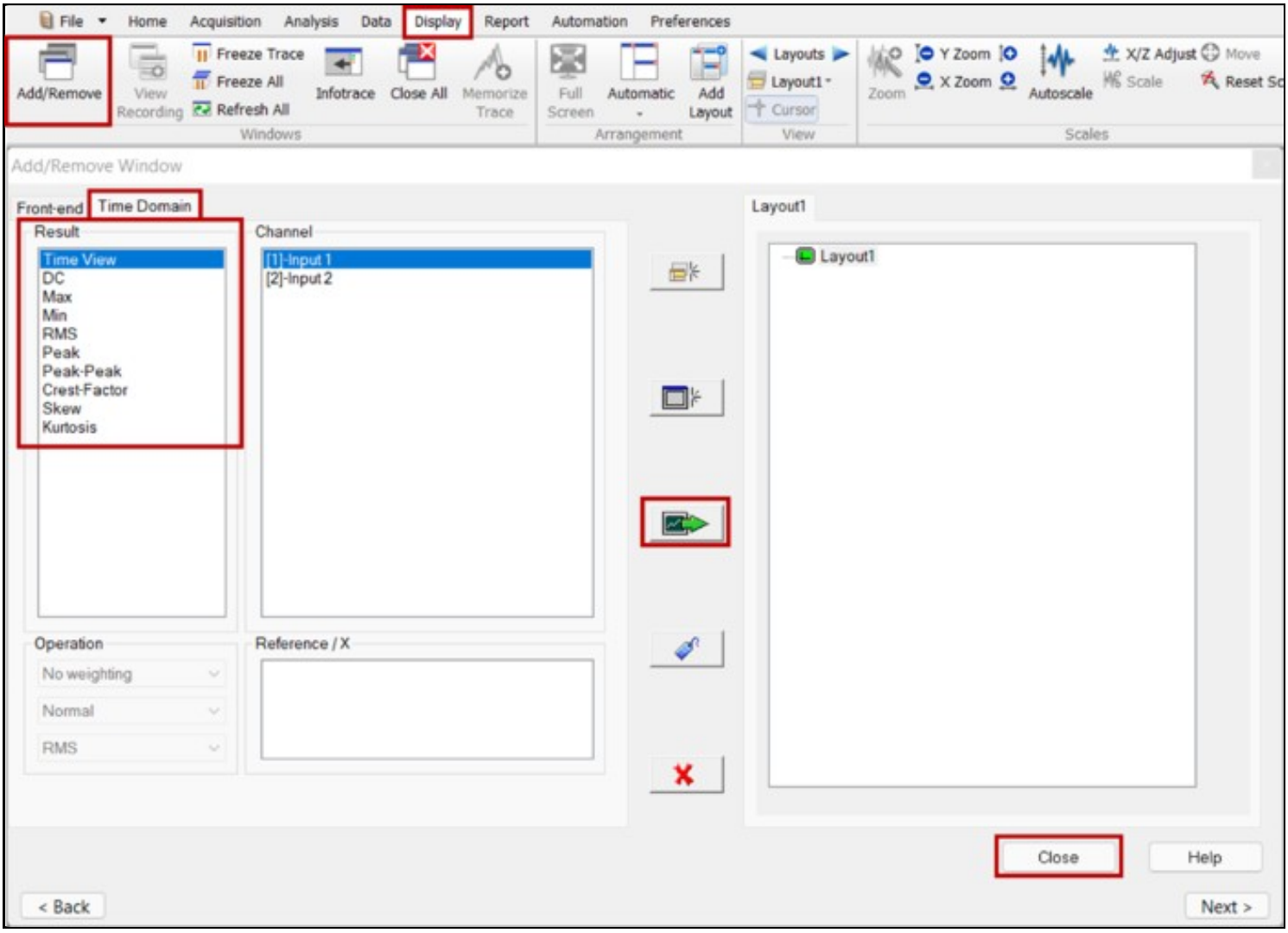
37.1 Connect channels

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 >

37.1.1 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 = $\sqrt{N}$

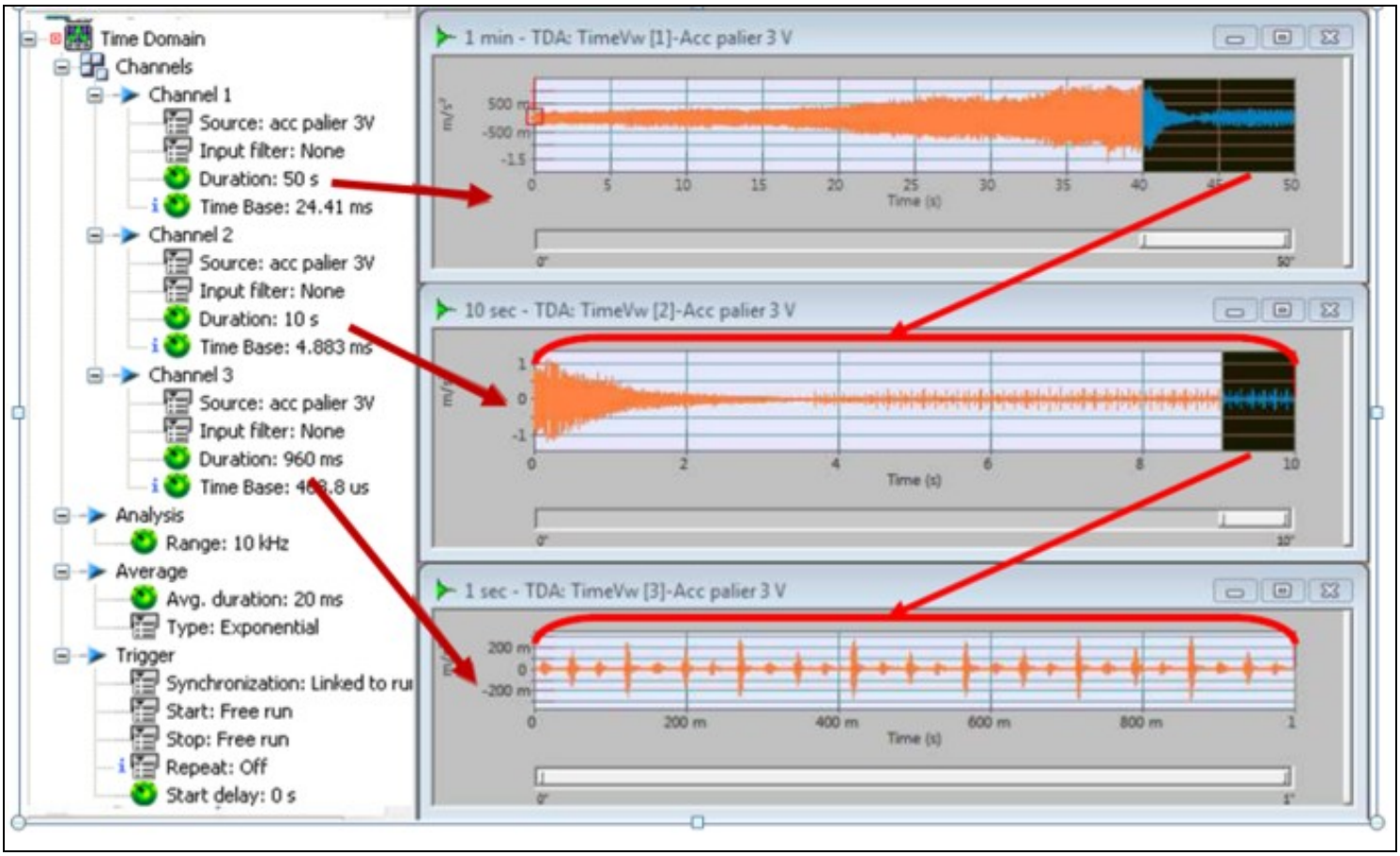
N = number of samples in the triggered block = 2.56*lines number-1

- **Kurtosis**: the kurtosis value (4^{th} order moment) of the time signal
- **Time View**

Profiles of scalar values (Max, Peak-Peak,...) can be displayed using the Waterfall Plug-in.

37.1.1.1 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.

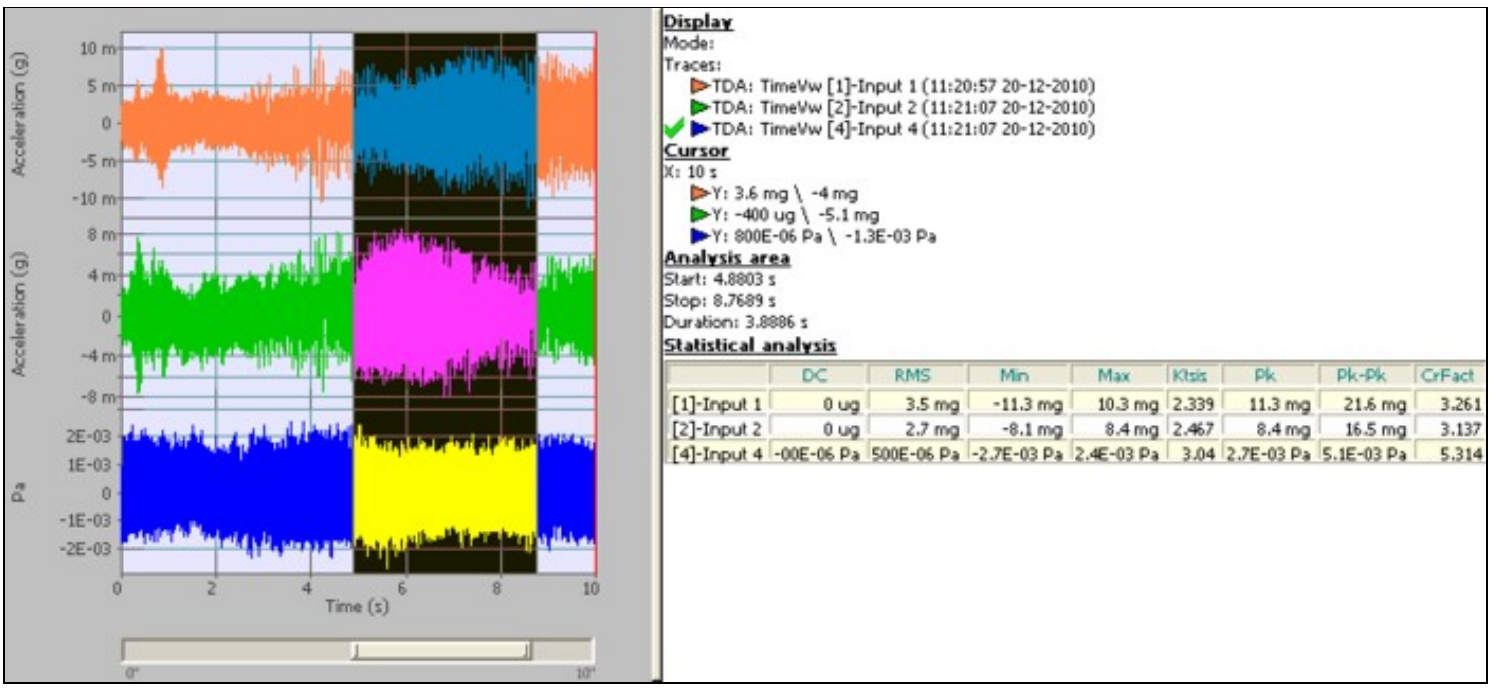


It?s possible to display several TDA channels in same window even if the durations are different. The windows size will be set according to the larger duration.

X zoom is not available at Time View, display is fixed to multi graph.

This window handles 3 cursors:

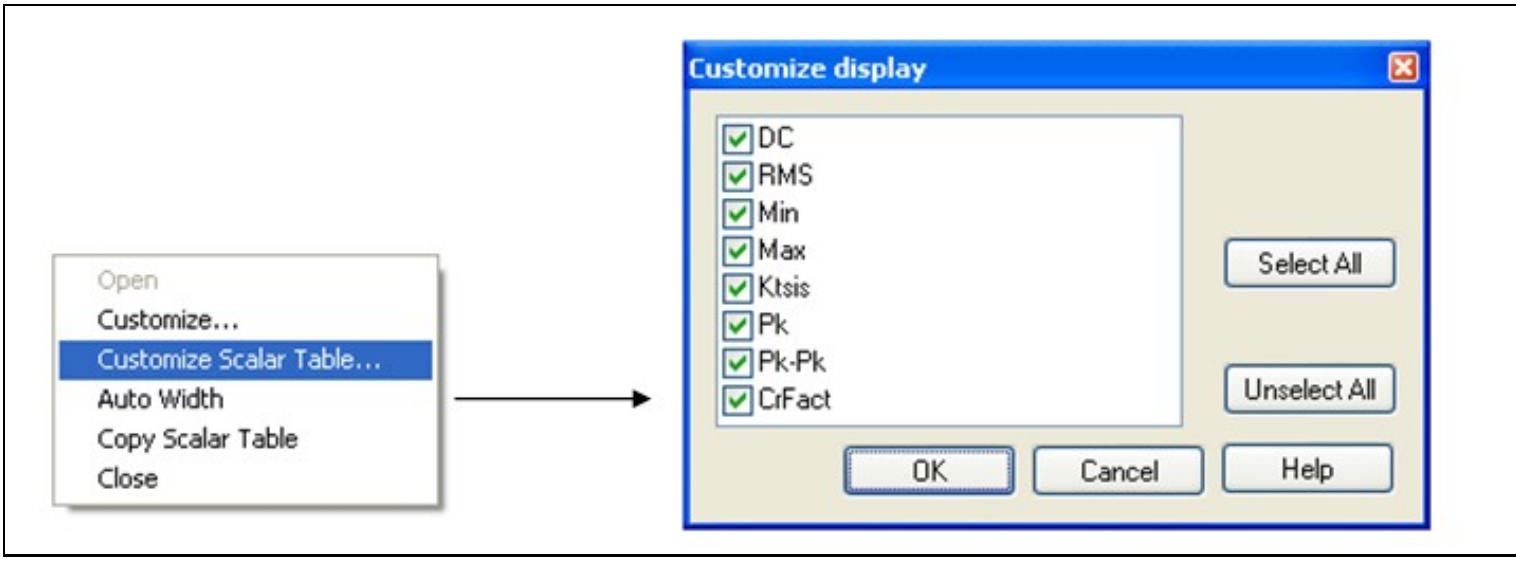
- Main cursor where is retrieved the values displayed at infotrace
- Cursors 1-2 used for selection. The scalar values displayed in the infotrace are computed according to this selection.



	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.



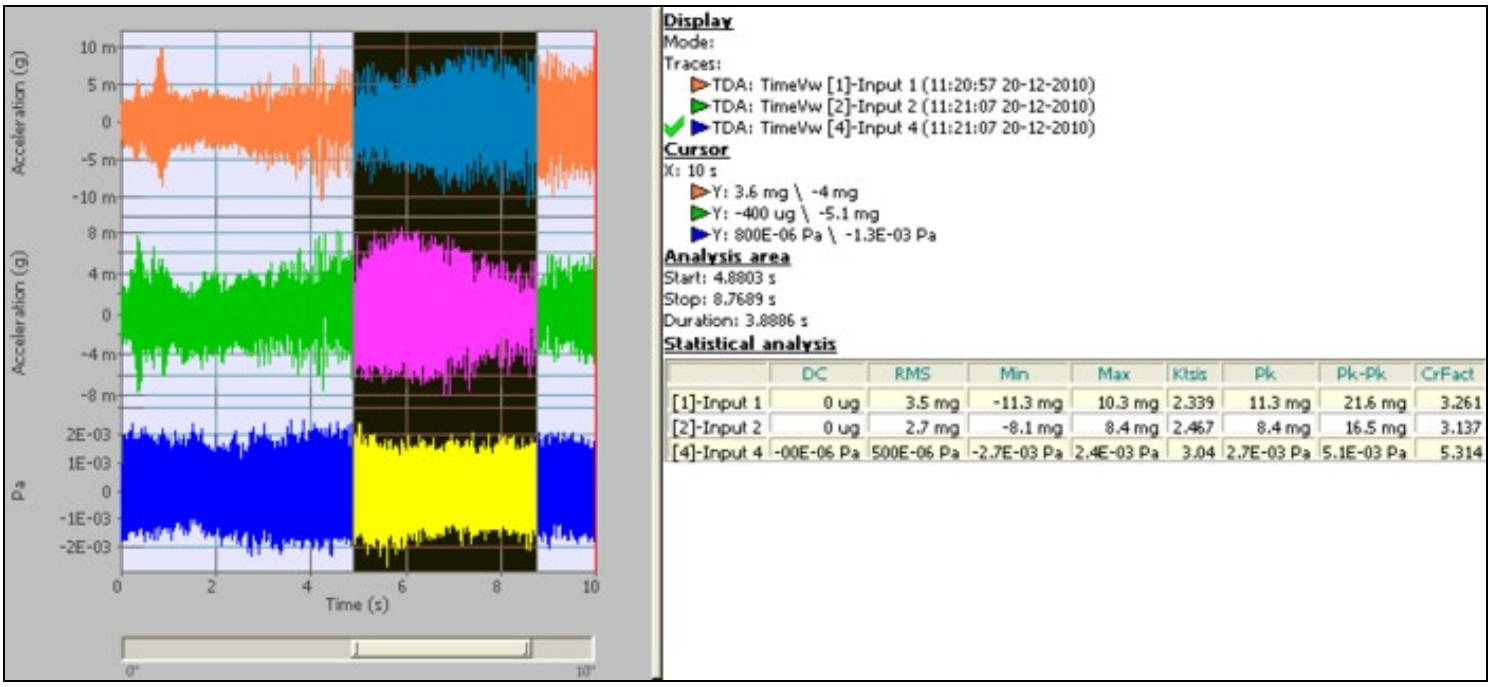
The setup of the monitored duration determines the analysis steps. These steps are indicated in the *Time base* states. The *Time base* is the time interval for each new point in the *Time view* signal. The time view duration is settable from 320 ms to 100 000 s (27 hours) with a 20 kHz bandwidth.

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.

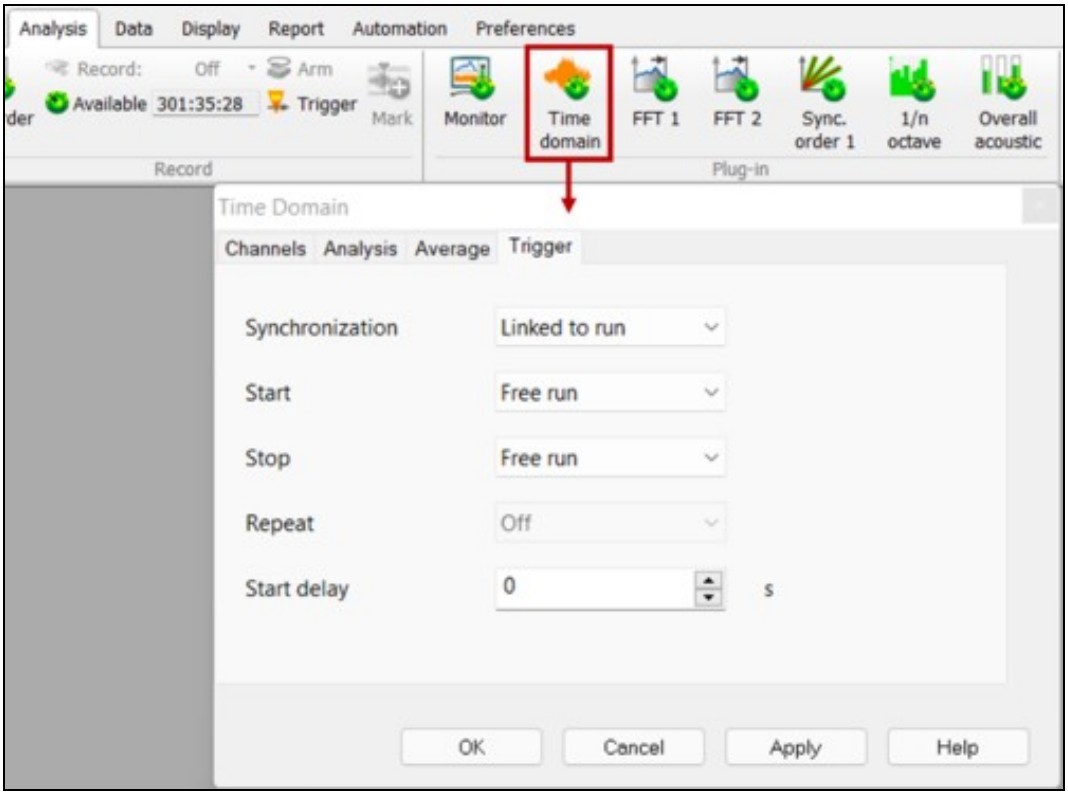
In addition to the signal overview, the *Time view* provides statistic extraction of a part of the displayed signal. The extraction takes into account the signal defined in the selected area (reverse video). The results of this extraction are available in the info trace. The following levels are computed in the selected area:

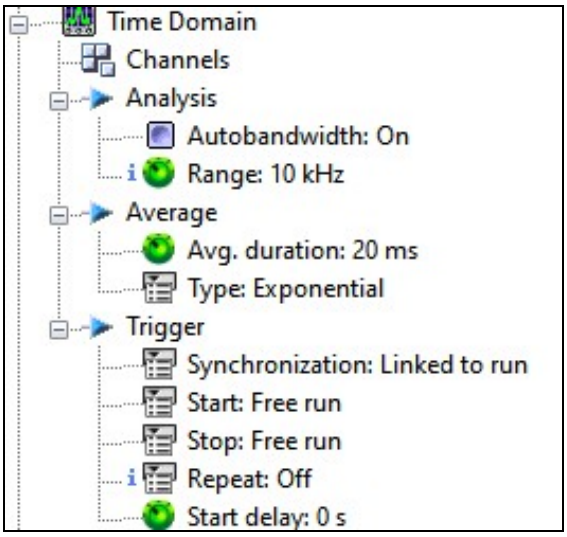
- DC
- RMS (root min square)
- Min. (minimum) lowest amplitude
- Max (maximum) highest amplitude
- Ktsis (kurtosis) 3rd order moment
- Pk (peak) absolute value of the largest amplitude
- Pk-Pk (peak-peak) largest excursion
- CrFact (crest factor) Pk-Pk/RMS
- Kurtosis



	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

37.1.2 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.

37.1.2.1 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.

37.1.2.1.1 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.

37.1.2.1.2 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.

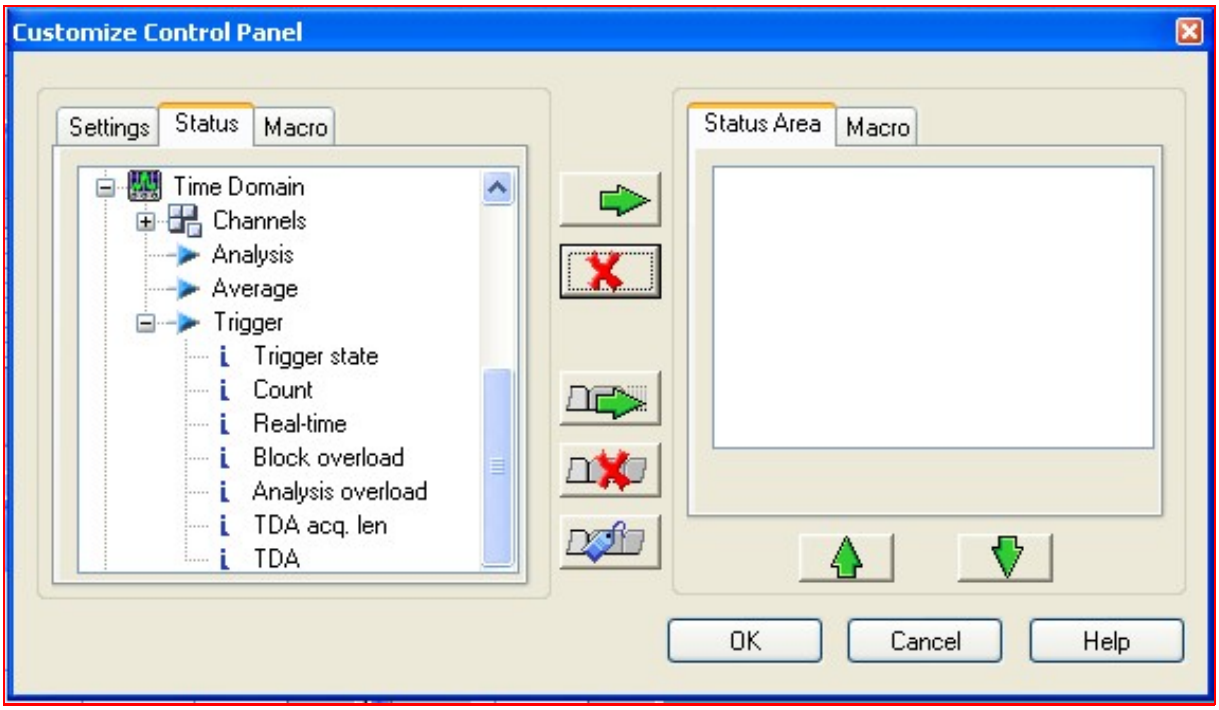
- **Duration**: The duration of the signal used to compute the scalar results available as result. Results are delivered each 256 samples.:This setting affects only the Time View, not the scalar results.

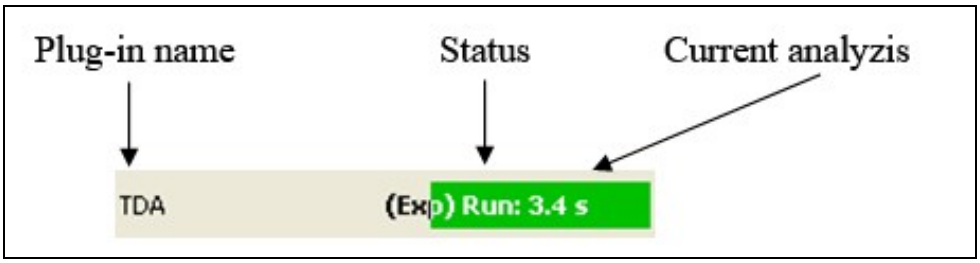
37.1.2.1.3 Trigger

- **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.

37.1.3 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
-

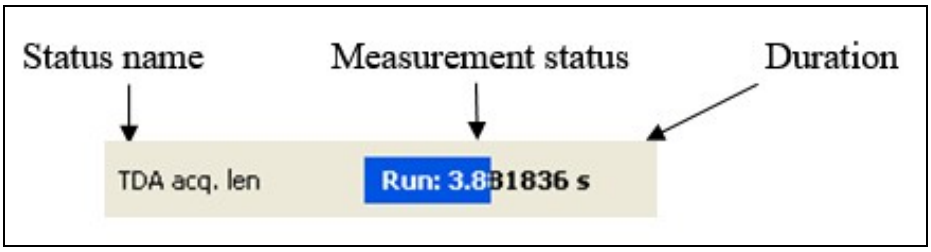
Notes: in exponential averaging mode the average counts stops increasing as soon as the set value is reached.

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:

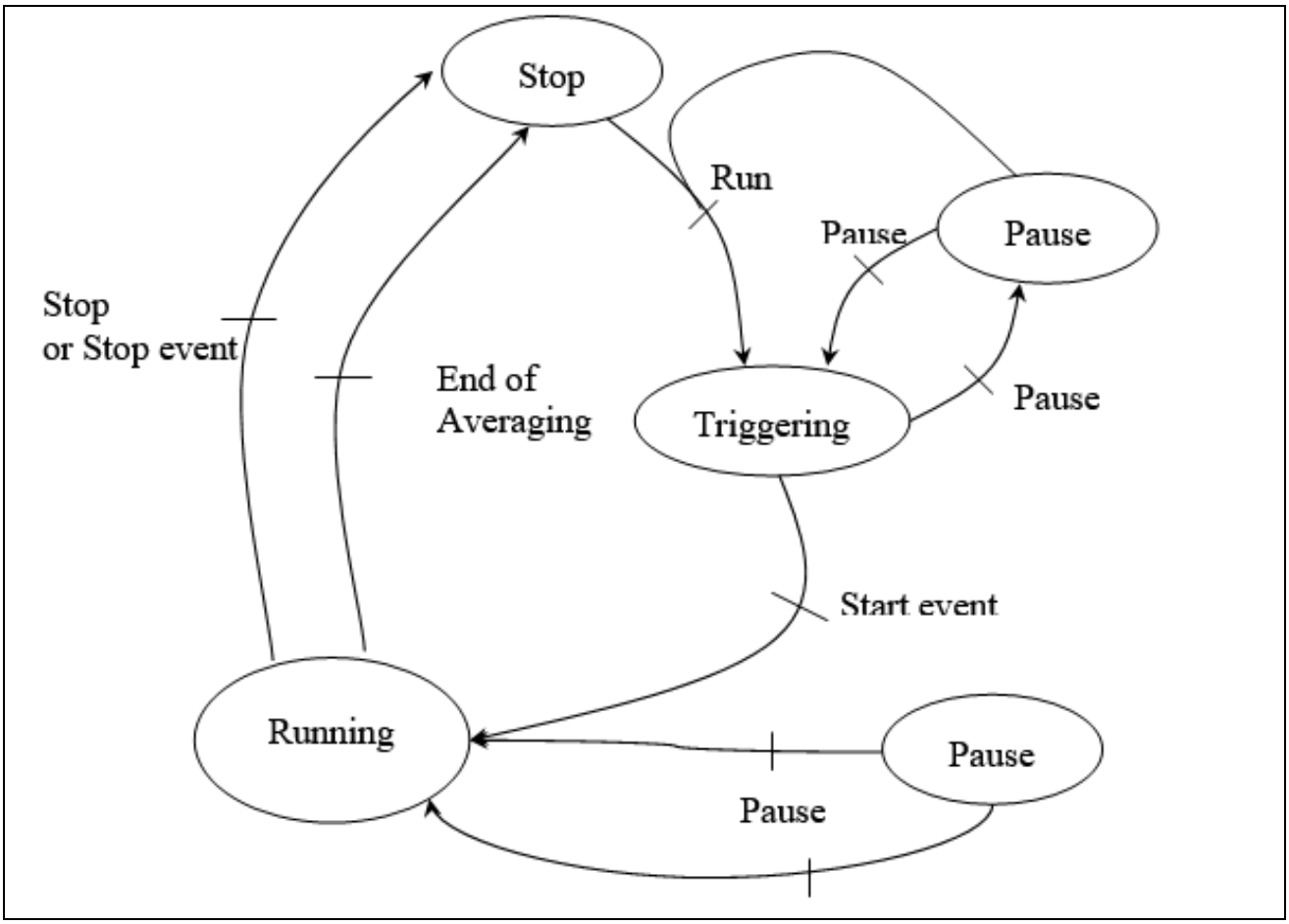
- *Green background and white or black text*: acquisition in real-time.
- *Red background and white or black text*: the current acquisition is not real-time (current block is not analyzed).
- *Green background and red text*: the current acquisition is real-time, but since start not all the blocks were 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.

37.1.3.1 Count

This status displays the averaging duration processed. This status is expressed in seconds.

37.1.3.1.1 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).

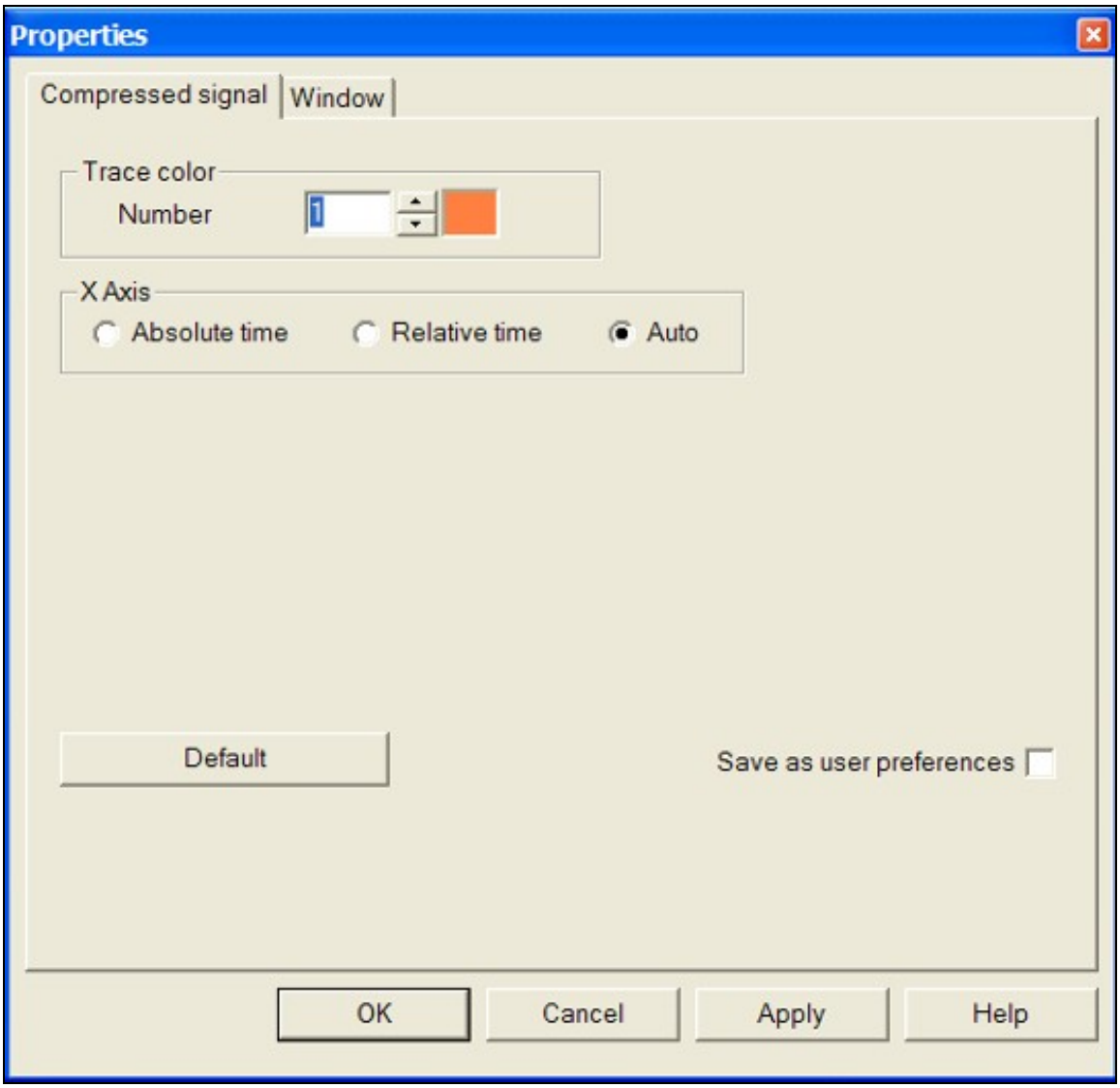
37.1.3.1.1.1 Block overload

This status corresponds to the instantaneous overload indication for TDA plug-in current block, for instance amplitude overload occurred in the current analyzed block.

37.1.3.1.1.2 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.

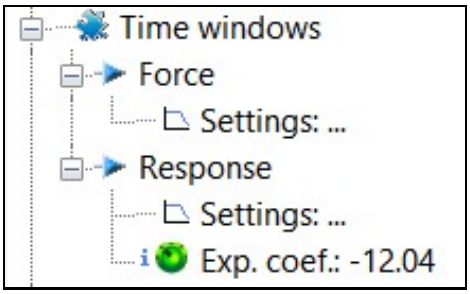
37.1.3.1.2 Properties


Properties
Compressed signal
Window
Trace color
Number
1
X Axis
Absolute time
Relative time
Auto
Default
Save as user preferences
OK
Cancel
Apply
Help

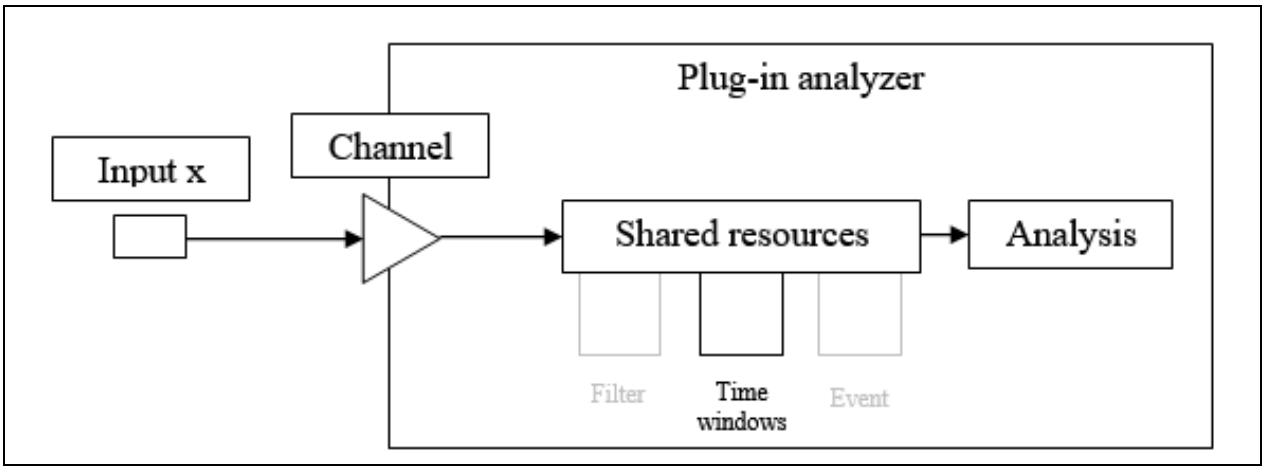
- Trace color
- Number: selects the trace number for color modification.
- Color box: click on this box to modify the color of the selected trace.

- 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.

38 NVGate Time windows



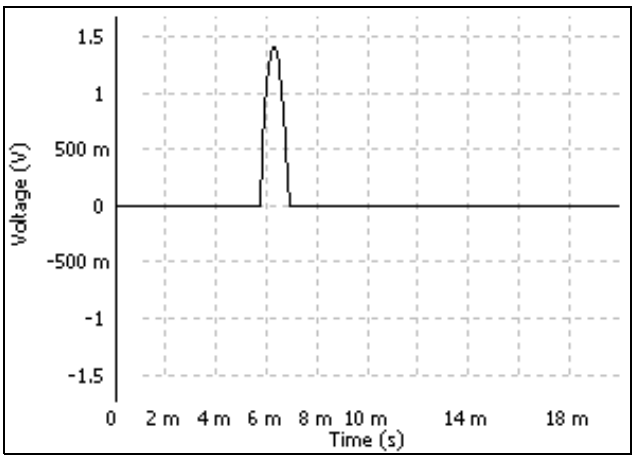
Used to define time weighting windows that can be applied to FFT blocks.



38.1 Video tutorial

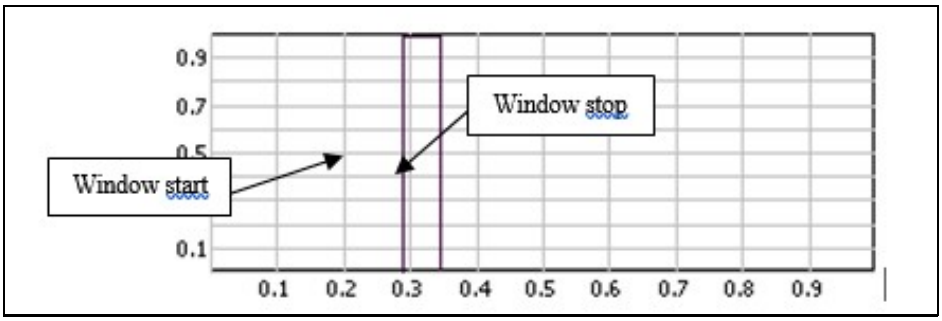
38.1.1 Force

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.



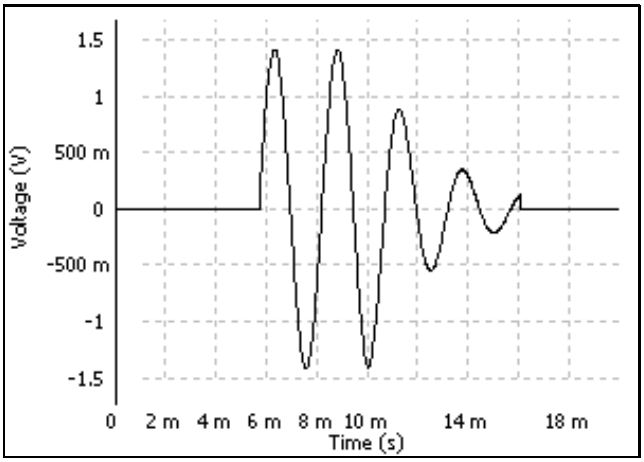
- **Window Start**: Starting point of the window as a percentage of the triggered block size of the plug-in using the window. The block size is the plug-in resolution setting value multiplied by 2.56. ex: for 401 lines resolution the triggered block size is 401*2.56 = 1024 samples.
- **Window Stop**: 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.



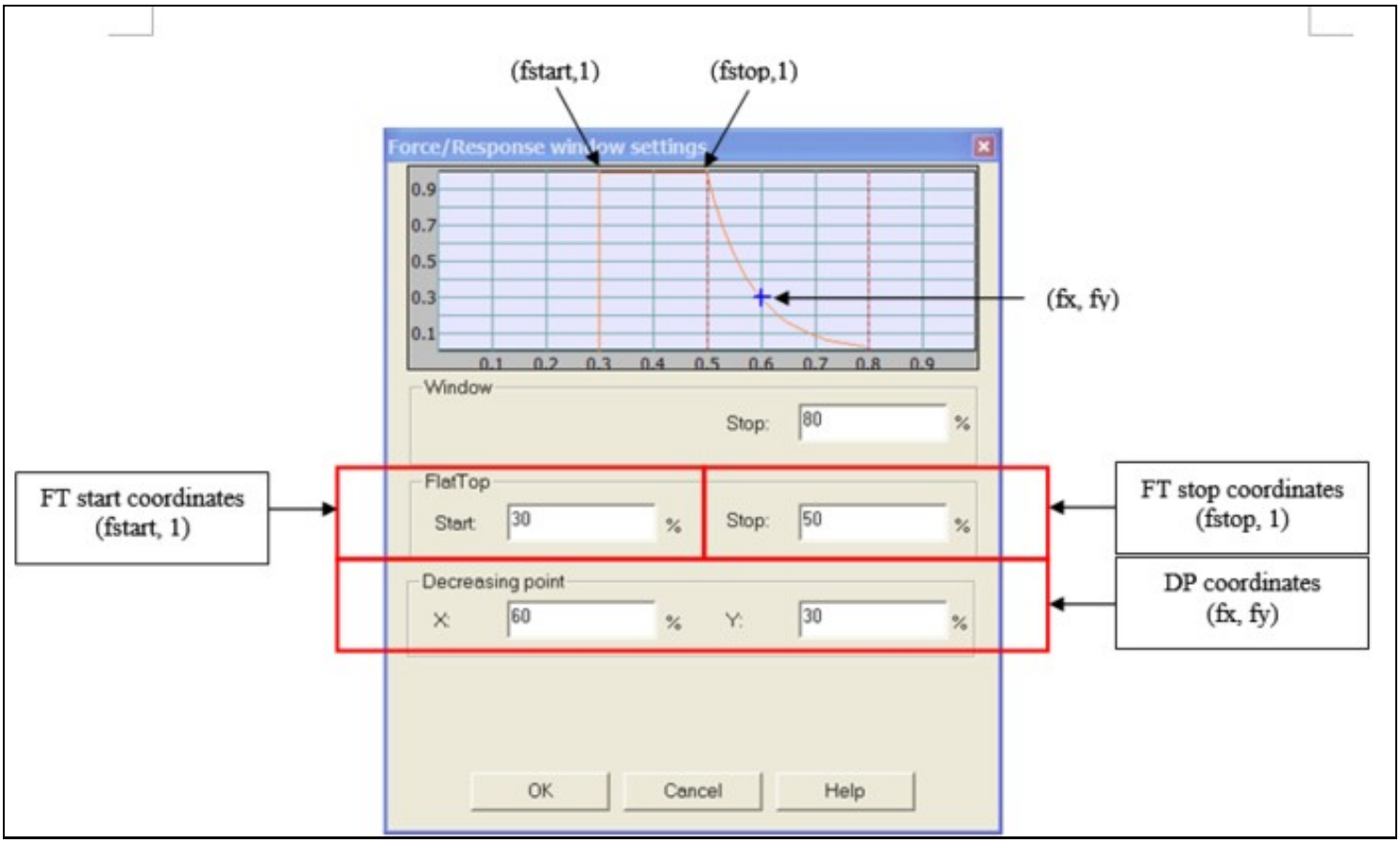
38.1.1.1 Response

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

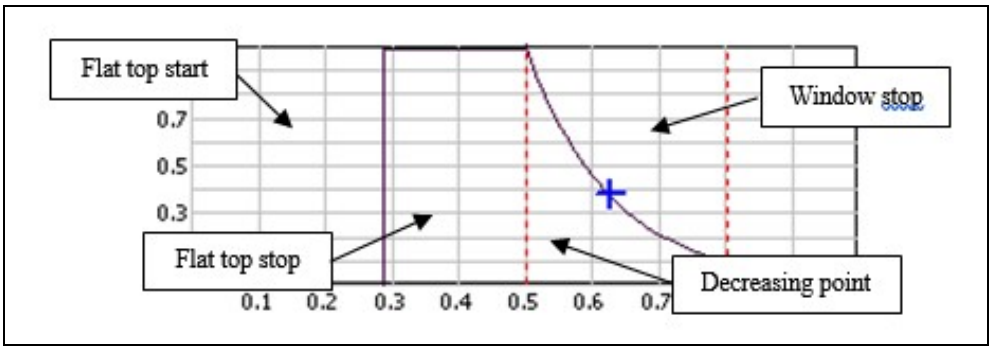


- **Exponential coefficient**: this coefficient is calculated with the coordinates of Decreasing point Y and Decreasing point X.

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.

39 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.

39.1 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.

39.1.1 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:

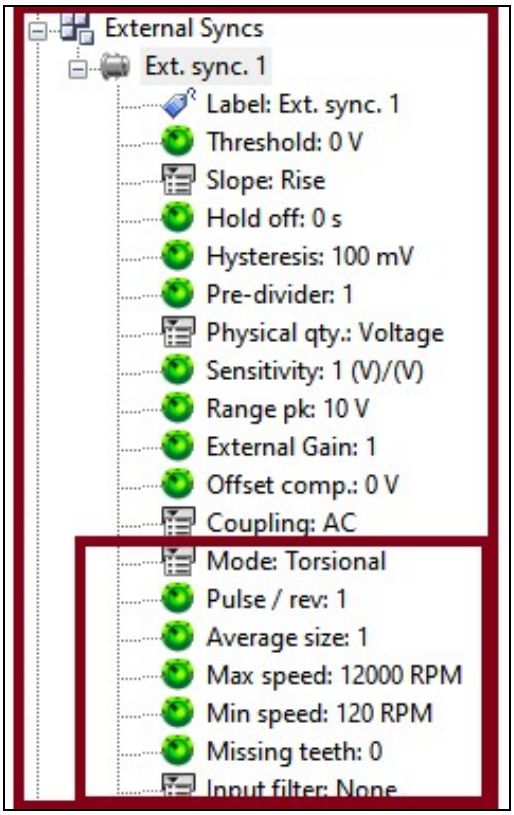
Max RPM = (40 000*64)/pulse per revolution example : 12 800 RPM with 200 Pls/rev

· Missing teeth management: up to 3 consecutive teeth.

· Available filters: HighPass, LowPass; BandPass, StopBand, Integrator (single or double) and differentiator

39.1.2 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 .

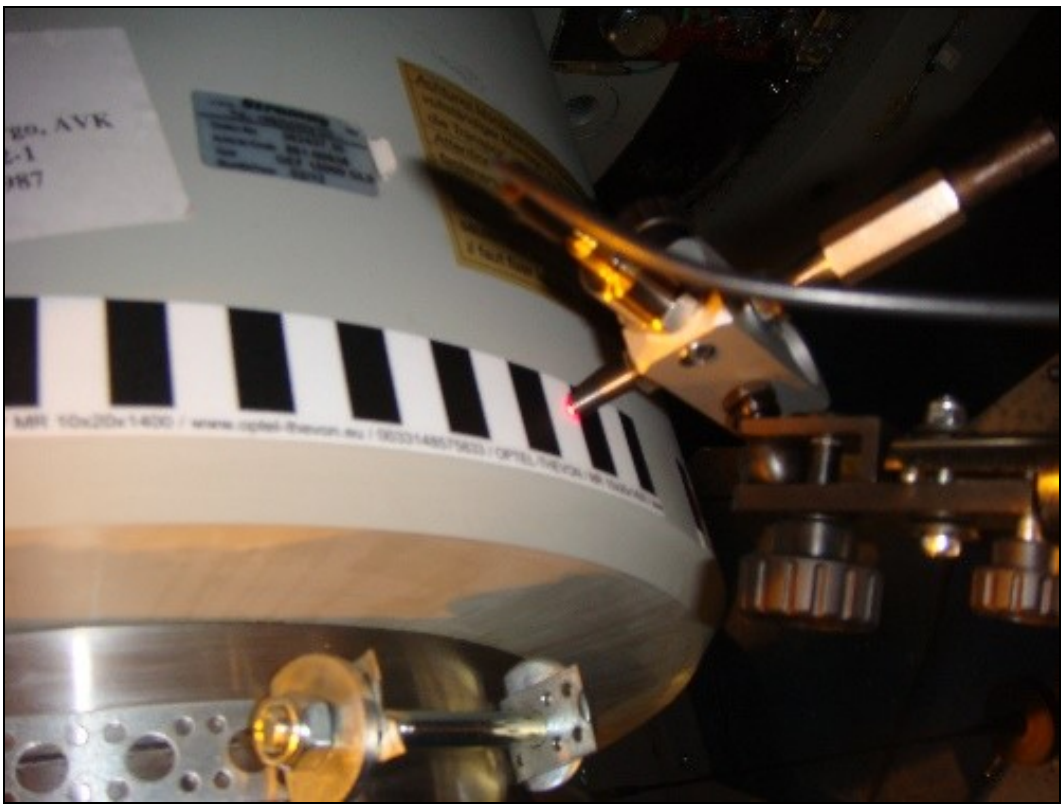
At least the filter which let you integrate or differentiate the RPM speed to get respectively plane angle deviations and angular accelerations for the analyses.

39.1.3 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.

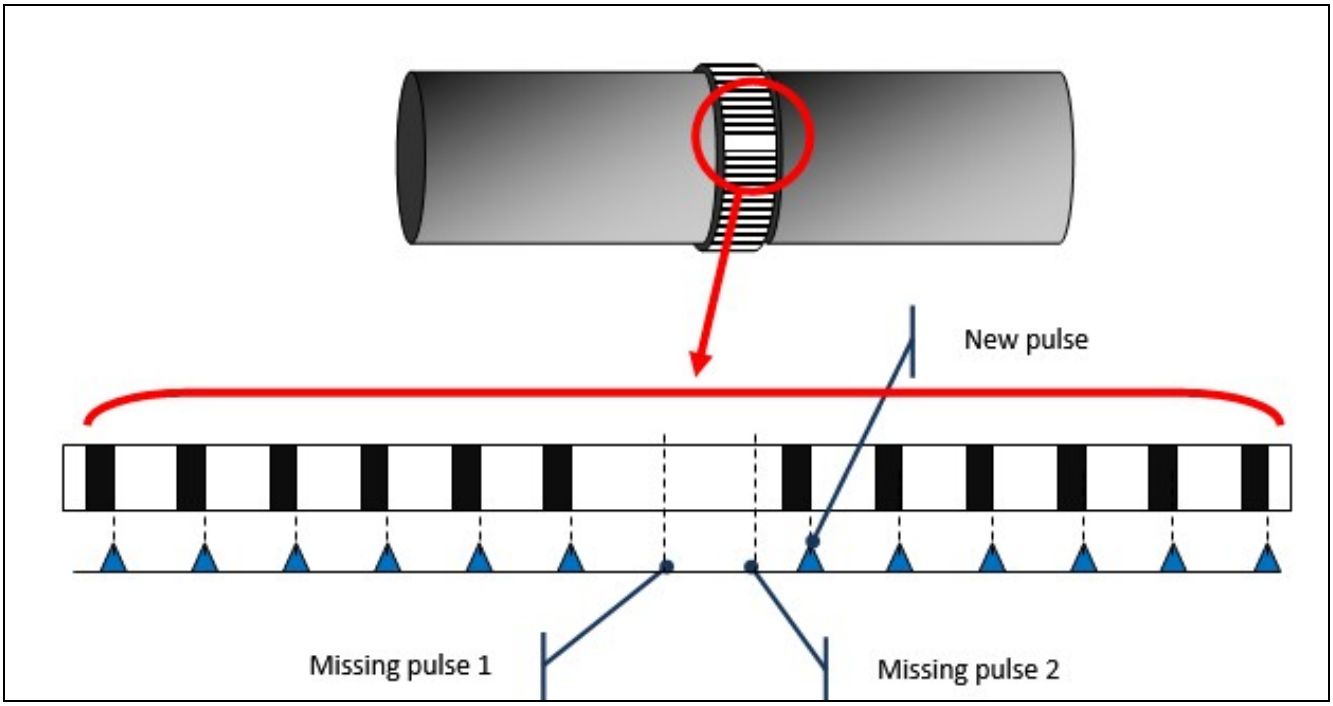


A very useful solution is the piano (or zebra) tape which is glued on the shaft and read by an optical probe: Easy to install and to use.

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.

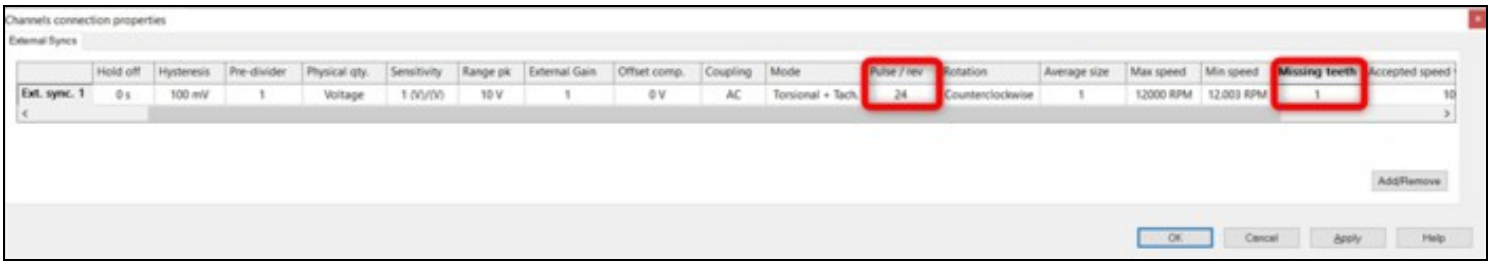
OROS torsional function is able to manage such fractional pulses. It offers to achieve torsional measurement on the field in a simple and easy way.



Piano tape junction for fractional missing pulse management

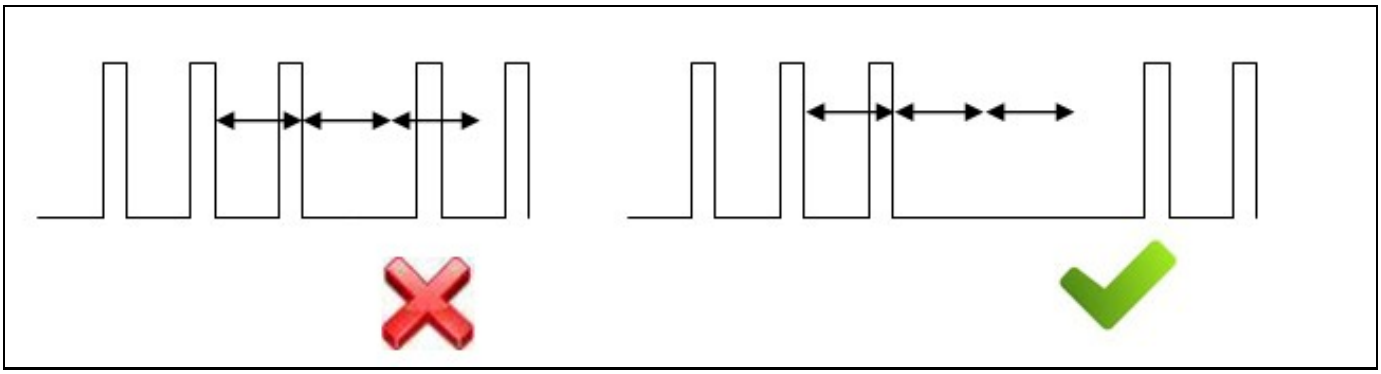
The empty area (missing teeth) length at the piano tape junction must be included between 1 and 3 teeth. The number of missing teeth must be set to the exact number of missing teeth: In this example: 2.

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.

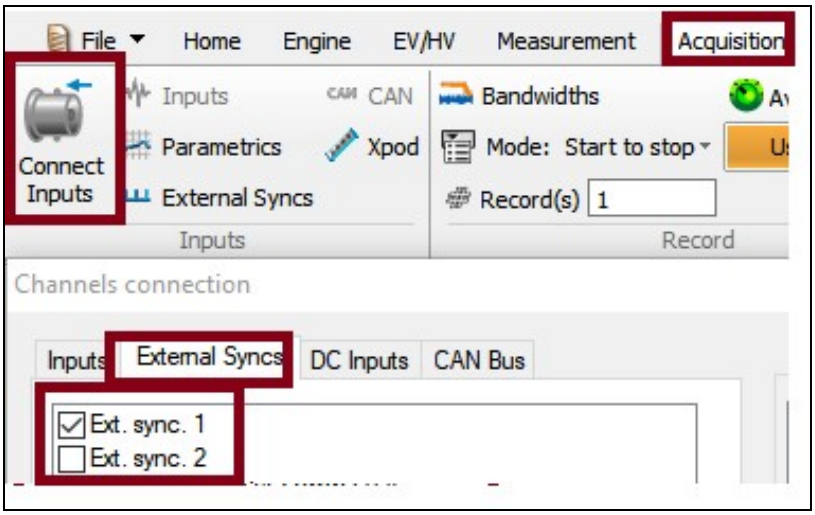
39.1.4 Tutorial

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.

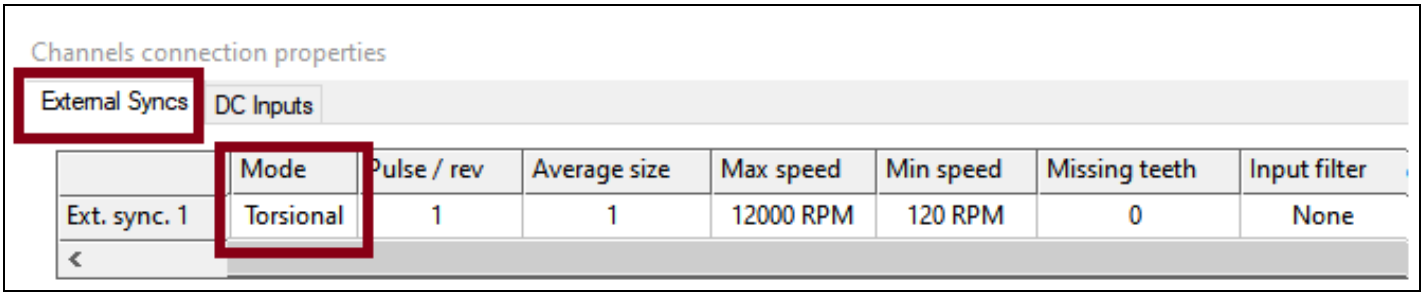
Both instantaneous velocity channel and pulse train can be recorded at the same time.

39.1.4.1 Online mode

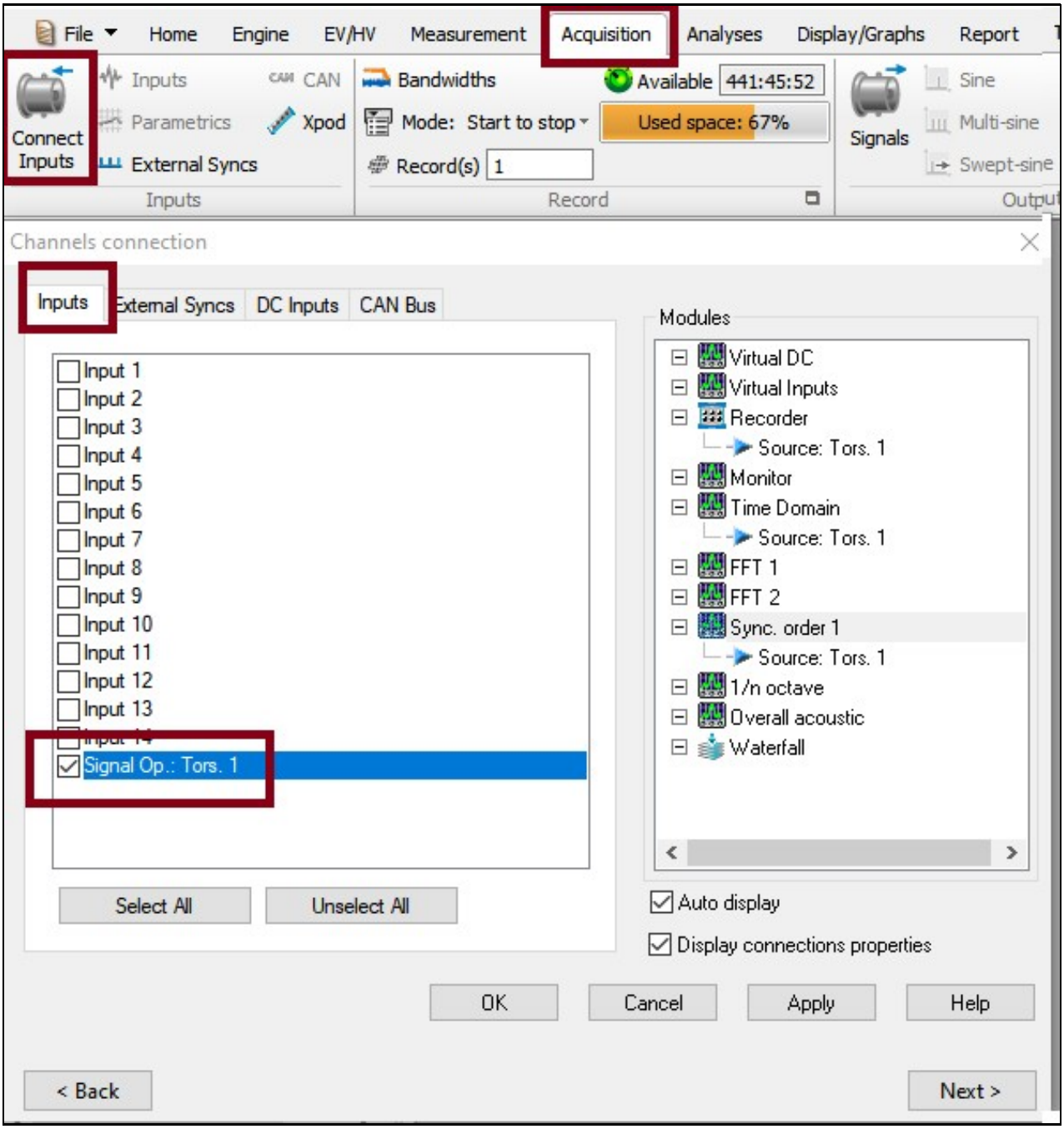
- Plug your tachometer on ext synch channels,
- Activate the Ext-Synch channels and press OK



- 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.

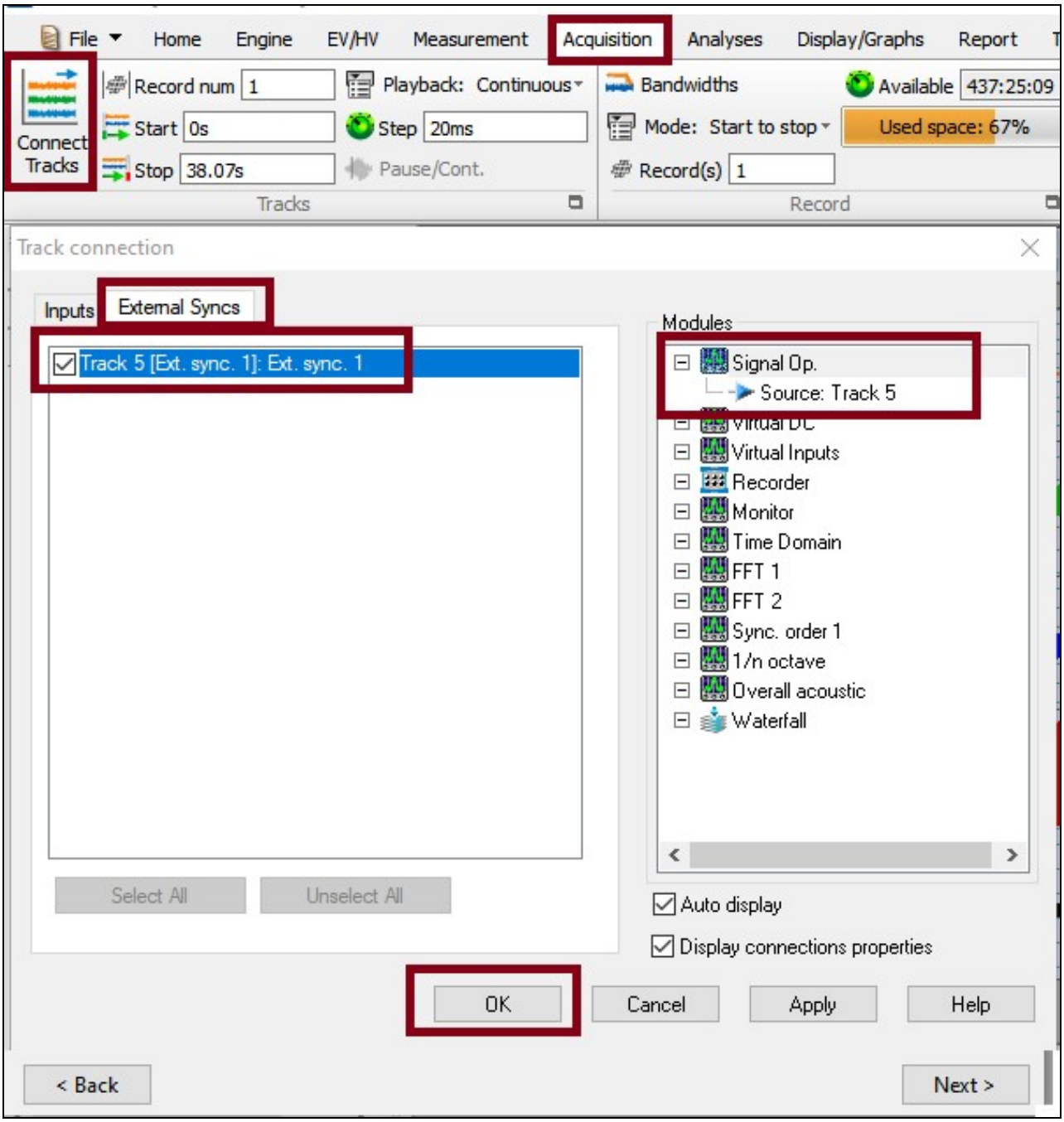
39.1.4.2 Post-processing

For post-analysis purposes, the way to operate depends on the type of recorded signal:

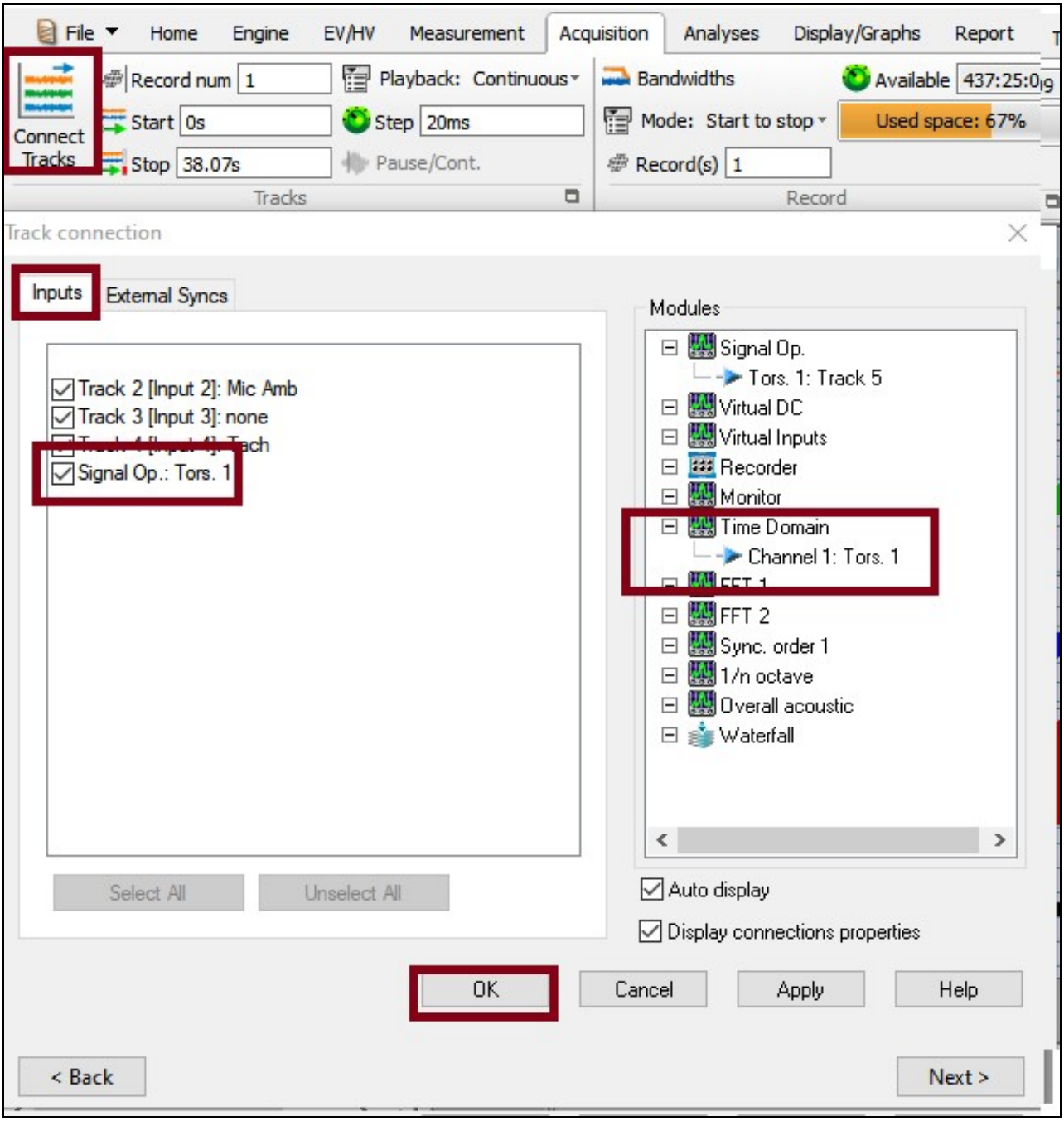
- If the converted signal (Tors x) have been recorded, the post analysis is exactly like for the usual recorded inputs.

- if the pulses have been recorded and not the converted signal, a new resource module called *Signal Operation* is then available for this conversion.

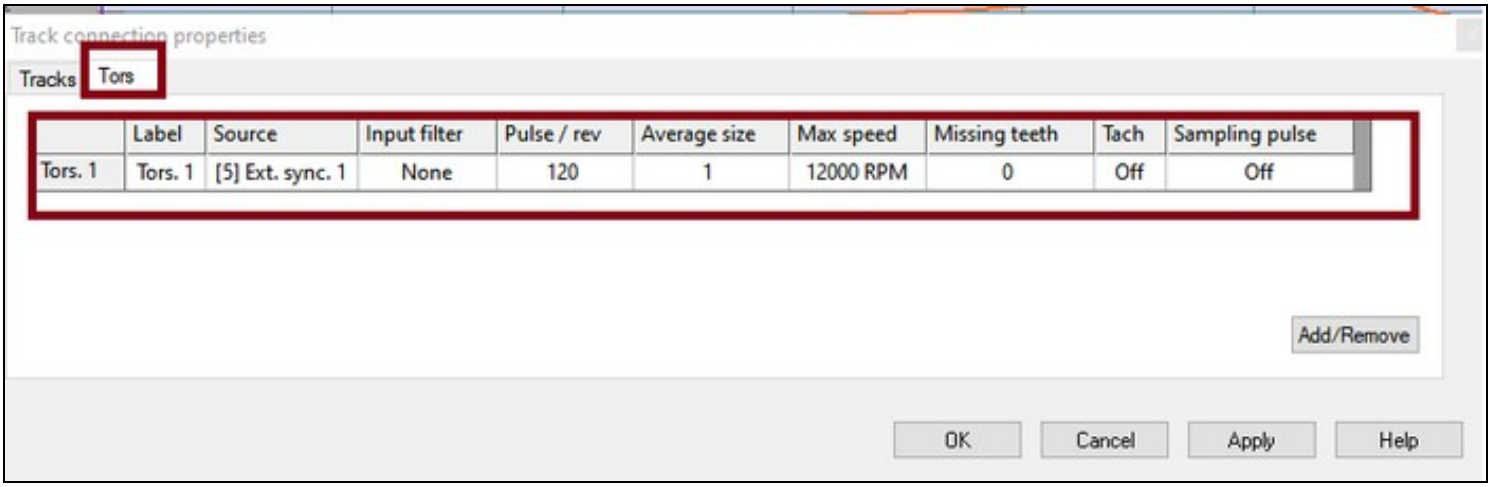
- Do a post analysis on the signal:
    - Click on connect track. Connect the "Ext synch" tracks to "signal op" by a "drag and drop". Press ok.


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
Select All
Unselect All
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
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.

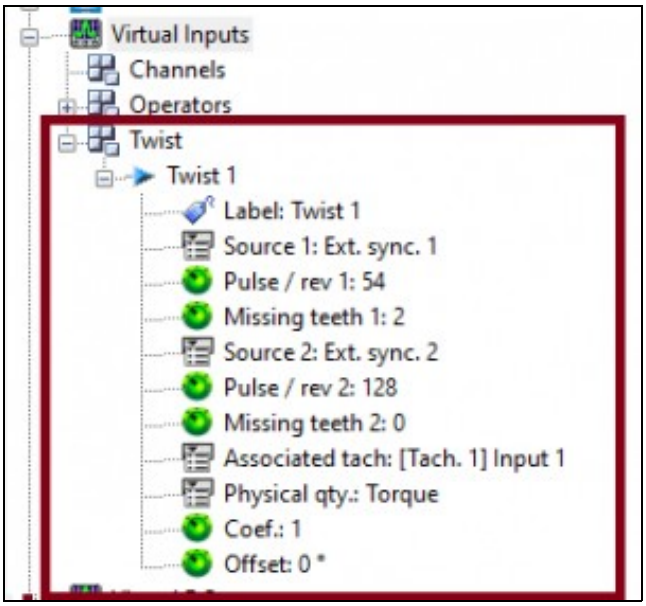


39.2 Twist measurements (static and dynamic)

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.

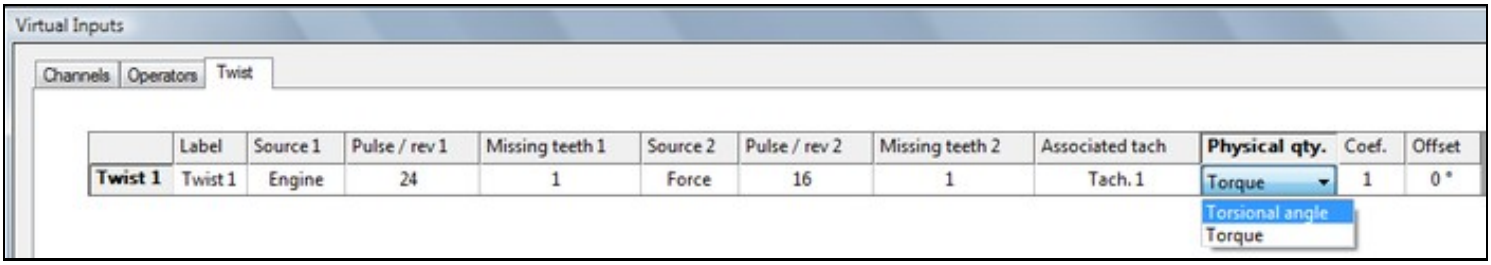


Both signals are calculated simultaneously by the virtual input module.

When the torsional signals are setup, simply connect it to the *Virtual input* plug-in.

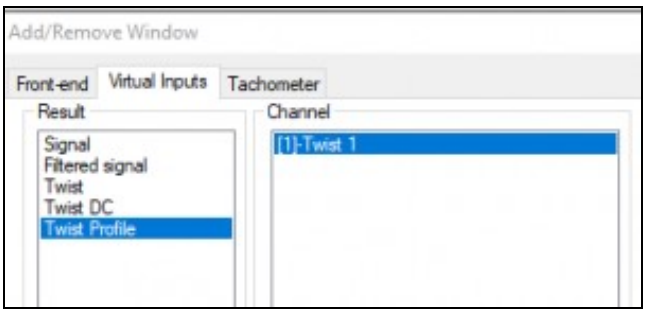
To calculate the phase between the 2 sides of the twist it is necessary having a tachometer. This tachometer can come from any of the inputs or directly from one of the torsional signals using the *Torsional + tach.* mode. Having a missing tooth helps to have better accuracy.

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.



39.2.1 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

39.3 Angular sampling for SOA analysis

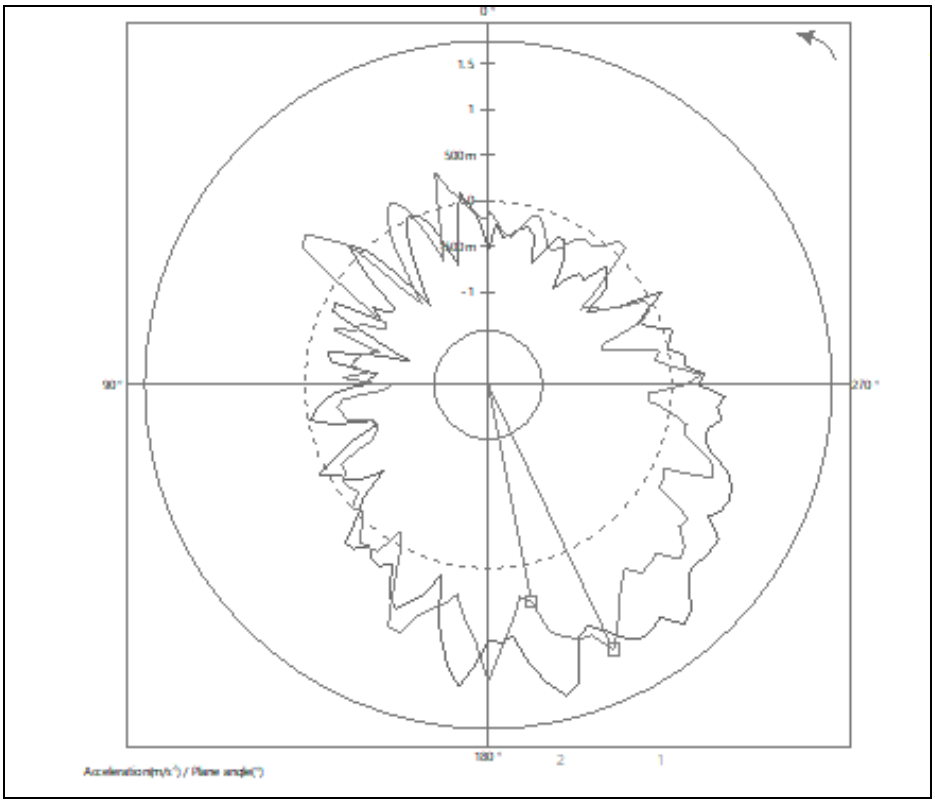
The major improvement comes as a simple setting? with large effects. Indeed the possibility to sample the measured signal with a distributed angle pulses of a rotating shaft provides accurate results.

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

39.3.1 Operations

In order to use the angular sampling function (Optional) it is necessary to have at least:

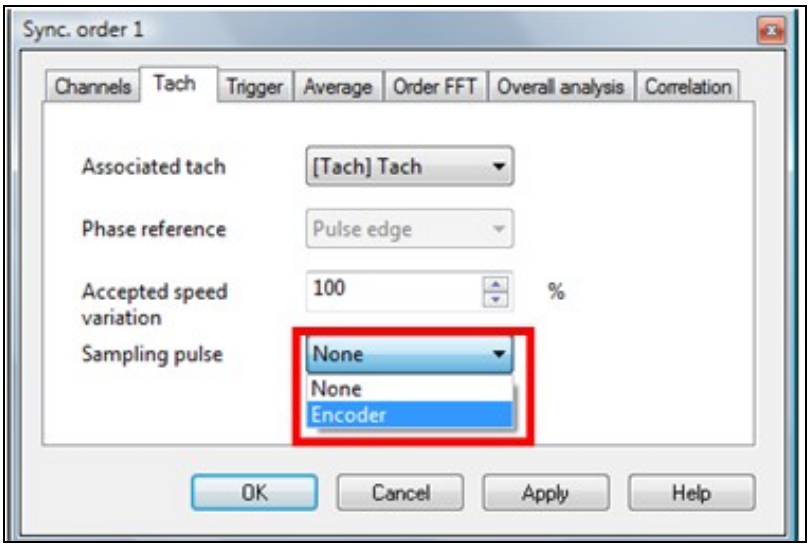
- A pulses train signal with a known number of pulses/rev
- phase reference (usually a 1 pulse/rev signal)

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

39.3.1.1 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.

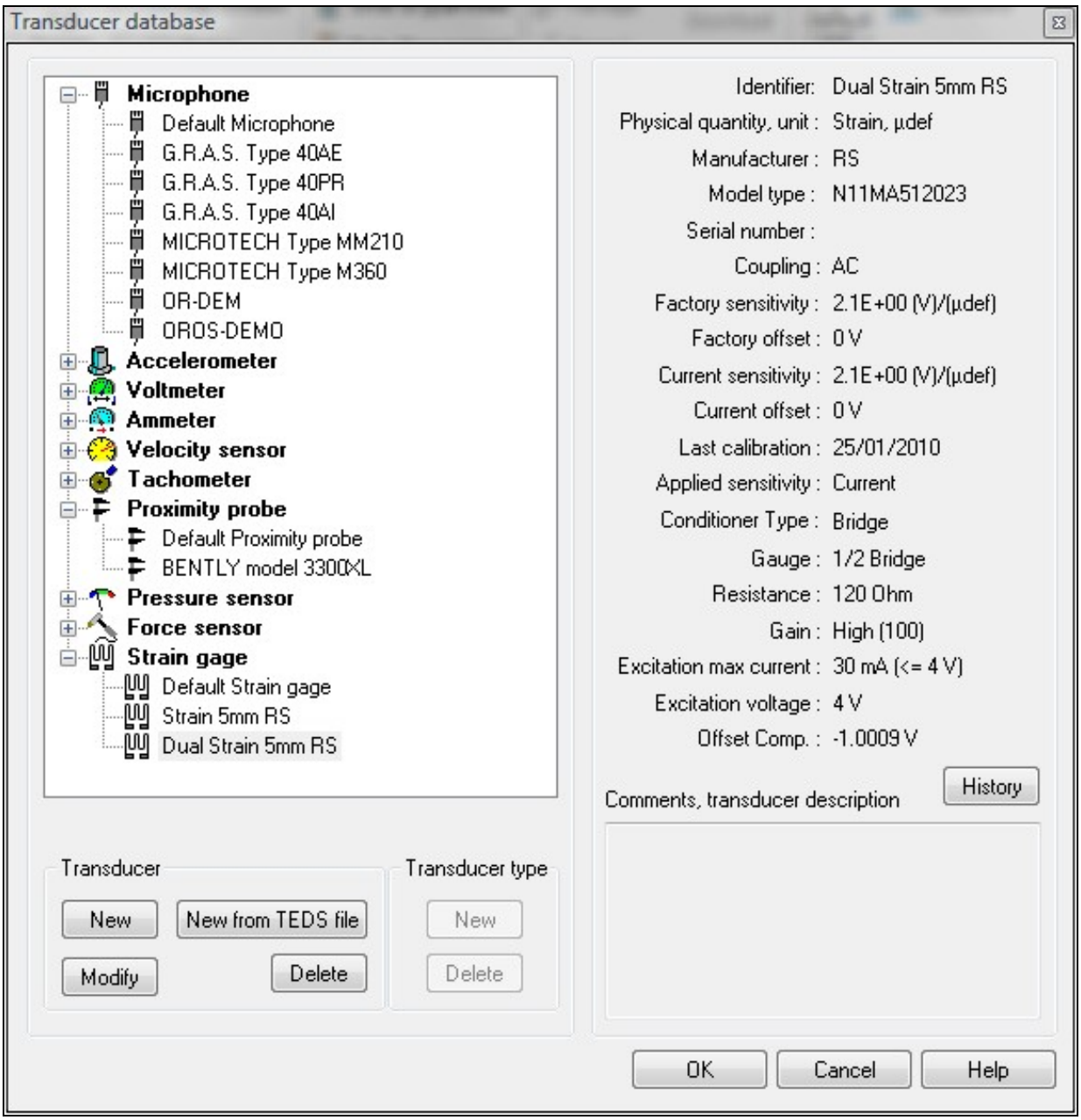
NVGate allows achieving angular sampled analysis avoiding the artefacts introduced by the direct angular sampling.

40 NVGate Transducer and Calibration

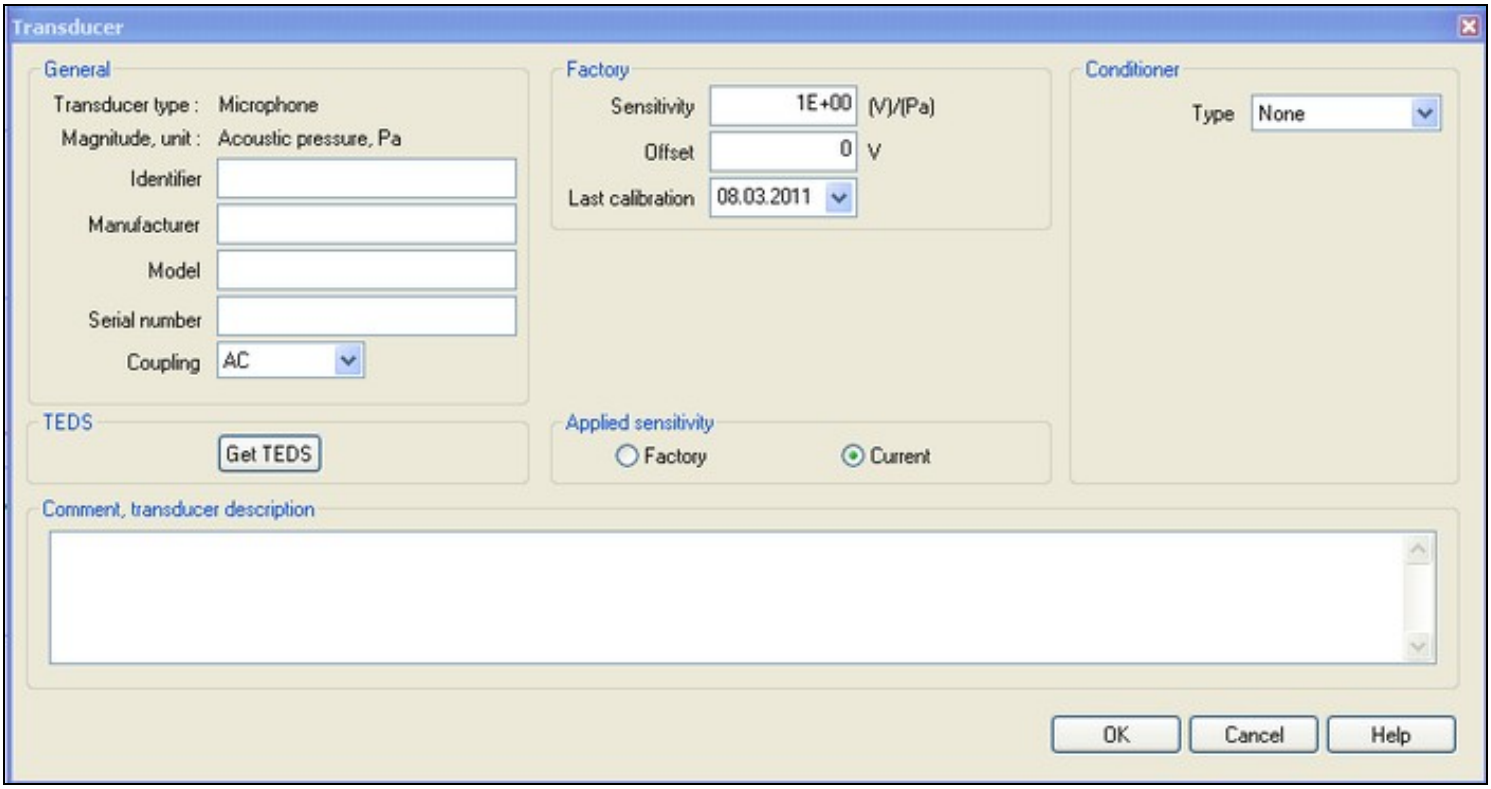
40.1 Transducer Database

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[?].

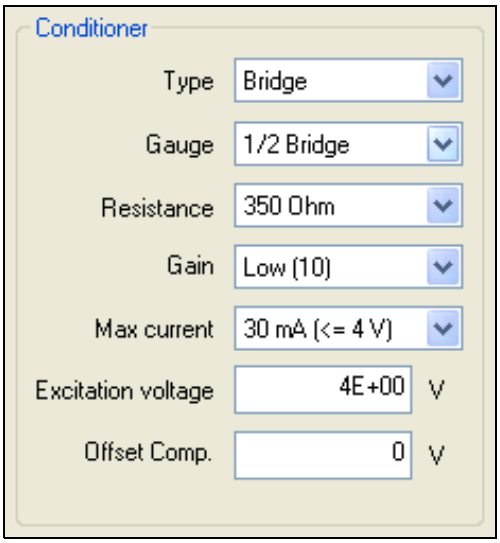
The history button is used to retrieve all calibrations that have been performed on the transducer.

- Applied sensitivity:

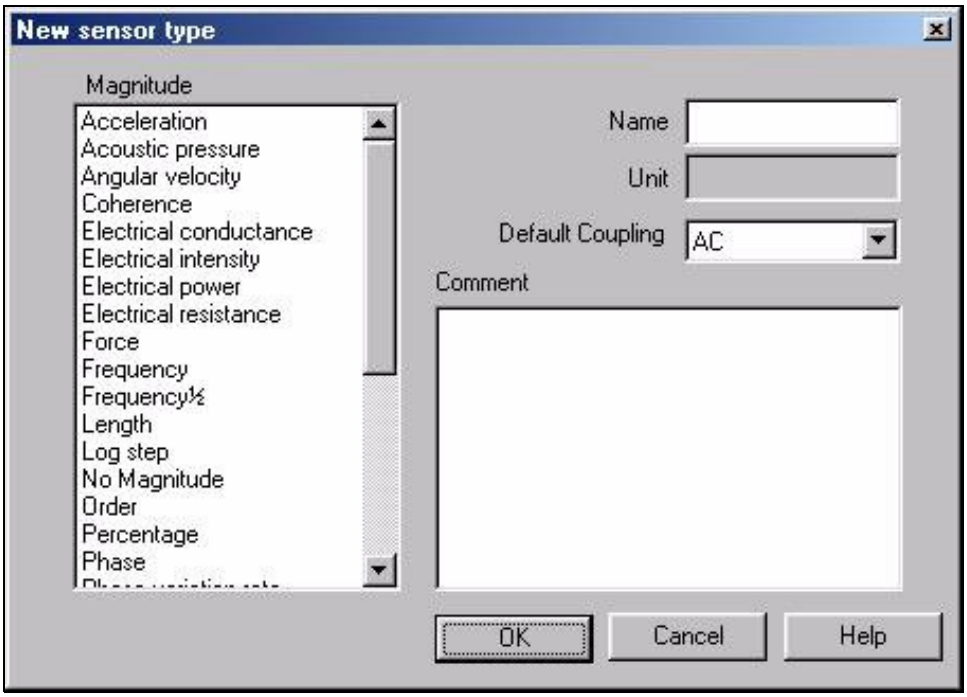
Factory: applies sensitivity of the calibration chart of the transducer.

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.



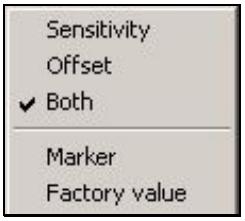
- Type: bridge signal conditioning for strain gauges, dynamic pressure, force and acceleration measurements.
- Gauge type: Full, Half or Quarter bridge mount. The completion resistors are included in the Xpod,
- Resistance: Bridge completion resistor: 120 or 350 Ohms for quarter bridge mount.
- Gain: 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.

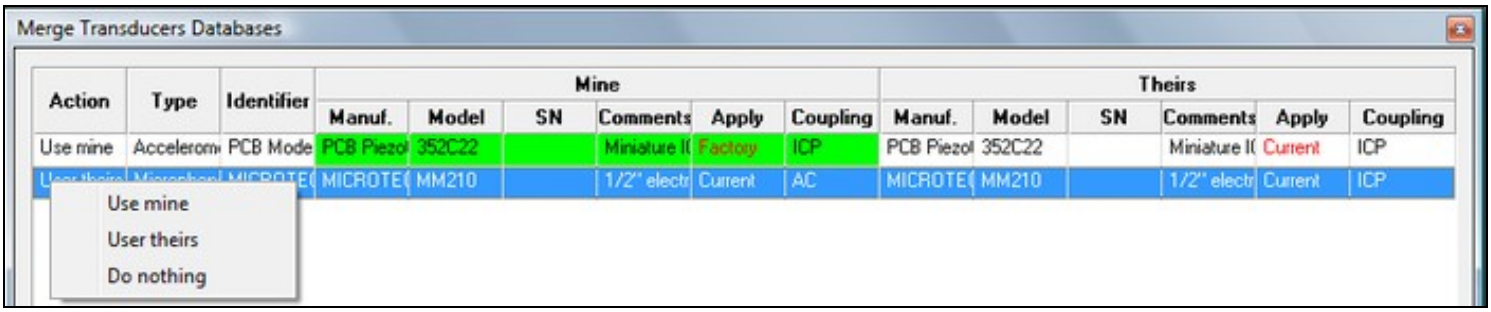


It is used to select the sensitivity graph, the offset graph or both. It is also possible to hide/display the factory values. There is also a marker to highlight the calibration.

-  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

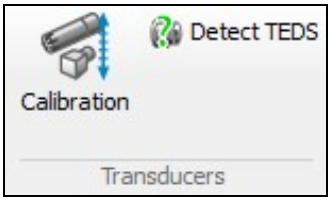
-  Export: Allows exporting the current database (file: *transducers.tdb* located in the *NVGate.exe* directory) in csv format.

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.

40.2 Transducers Calibration



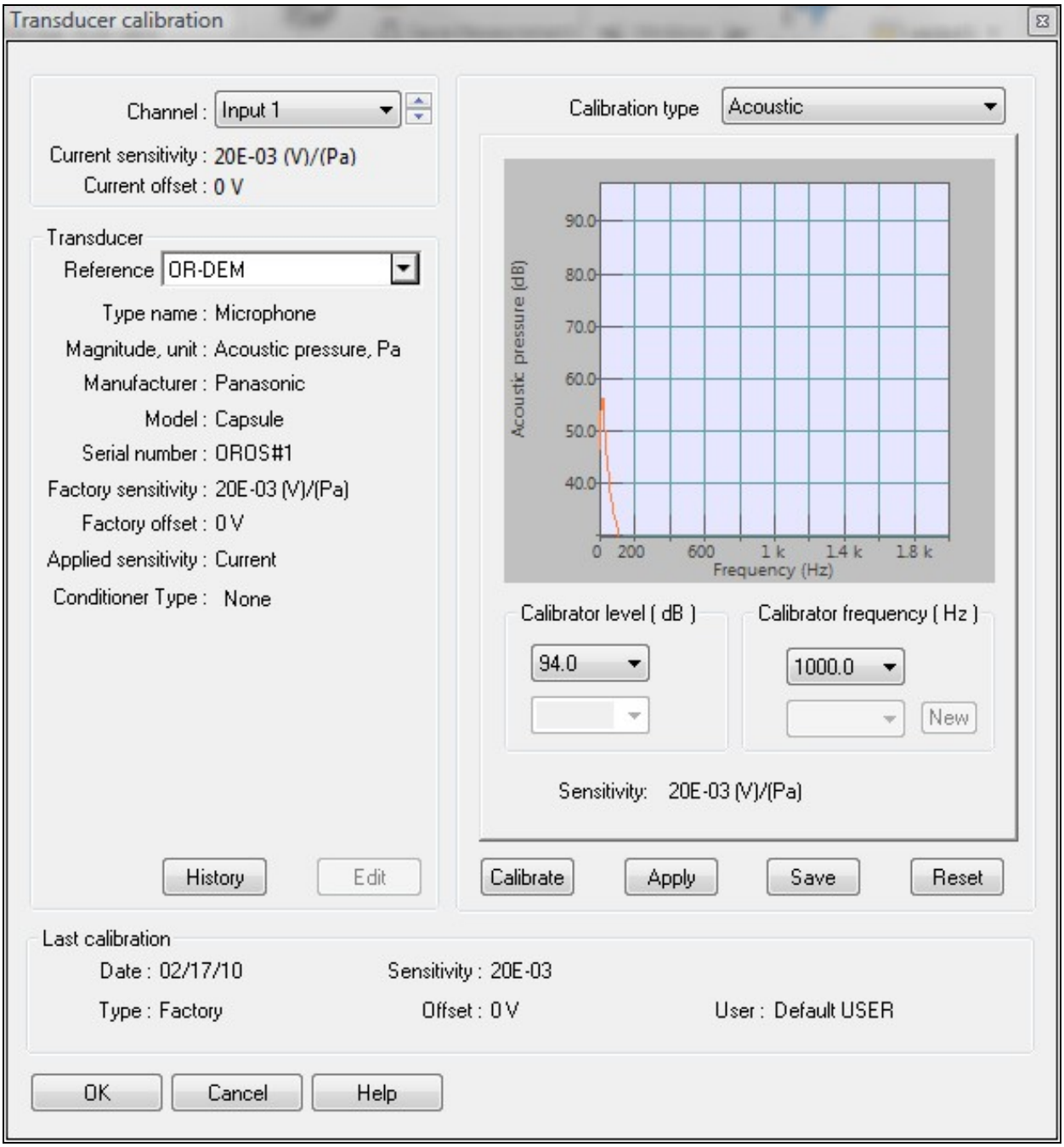
Manage the transducers calibration and automatic recognition prior to measurements:

- 

Calibration: Initiates the calibration procedure tool.

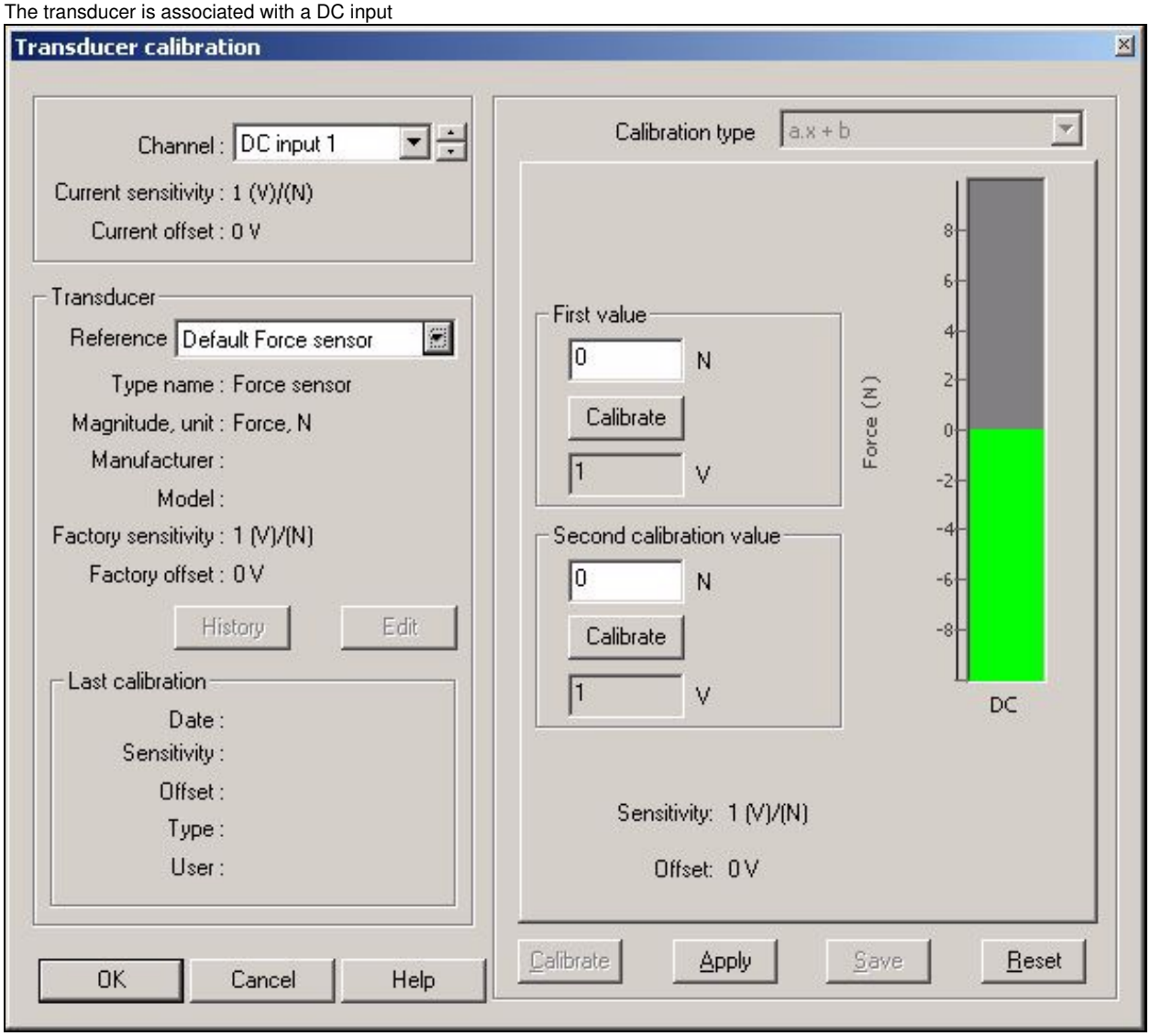
All current analyses and recording must be stopped prior switching to calibration.

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

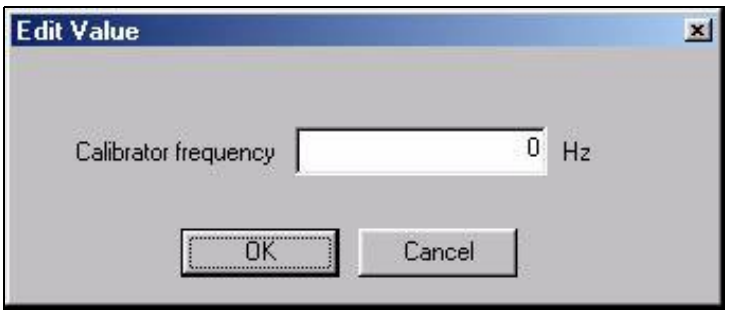
- Channel: This is the channel to be calibrated. It can be selected using the drop-down list or the up and down arrow. It is available for calibration of all dynamic and DC inputs. When a channel is selected, the sensitivity and the offset are immediately updated.
- Reference: This is the transducer 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.



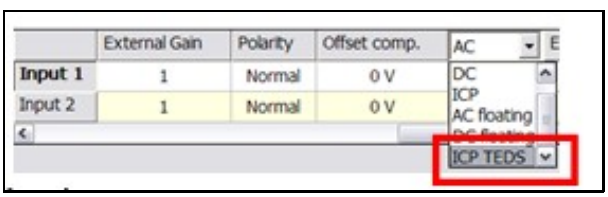
- New: Used to select a user-defined calibrator frequency
- Calibrate: Starts the calibration. The analyzer detects the maximum level, checks that frequency is near the calibrator frequency, and determines the new sensitivity.

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.

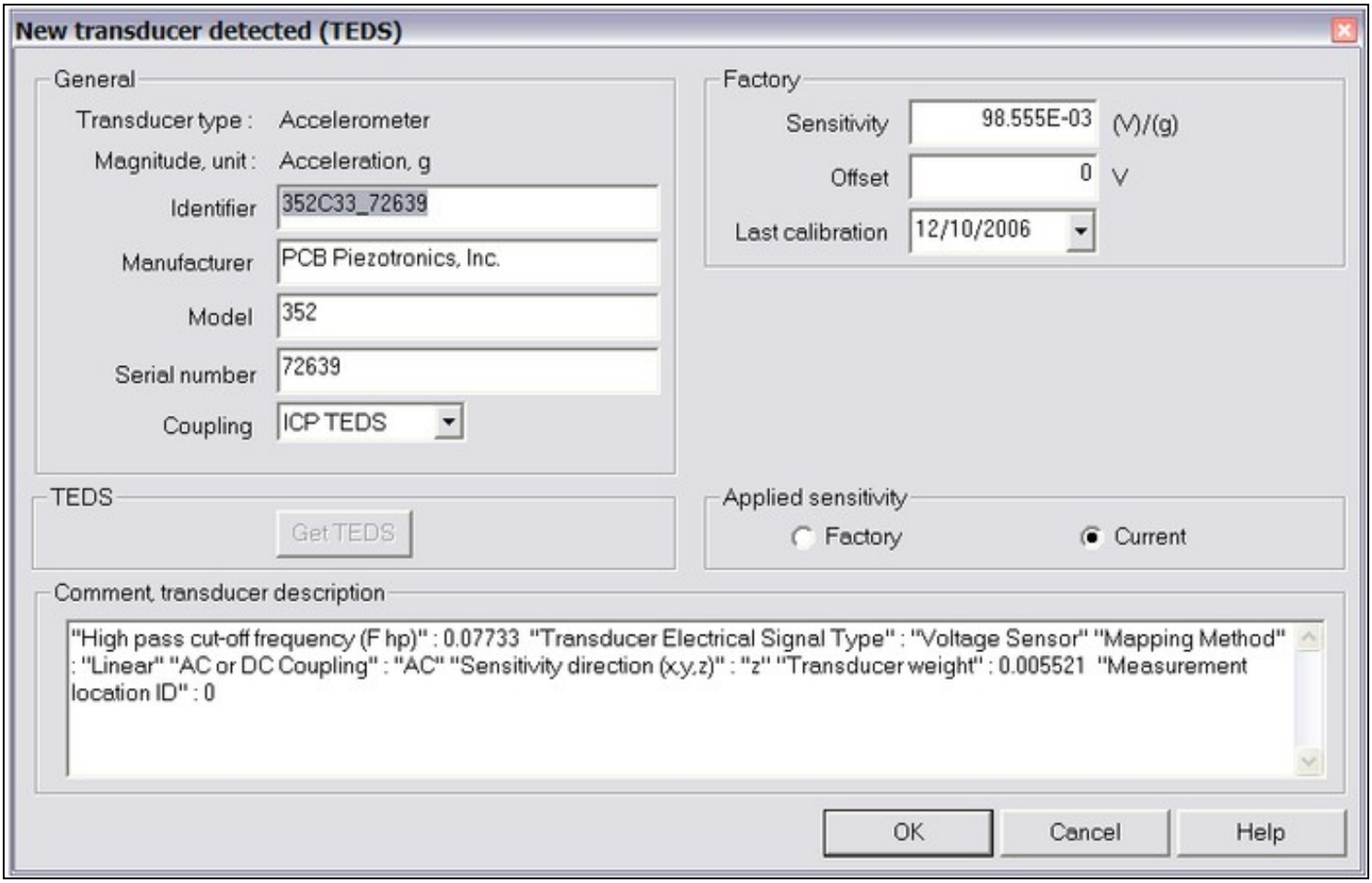
Only the inputs with their coupling set to ICP+TEDS will be checked.



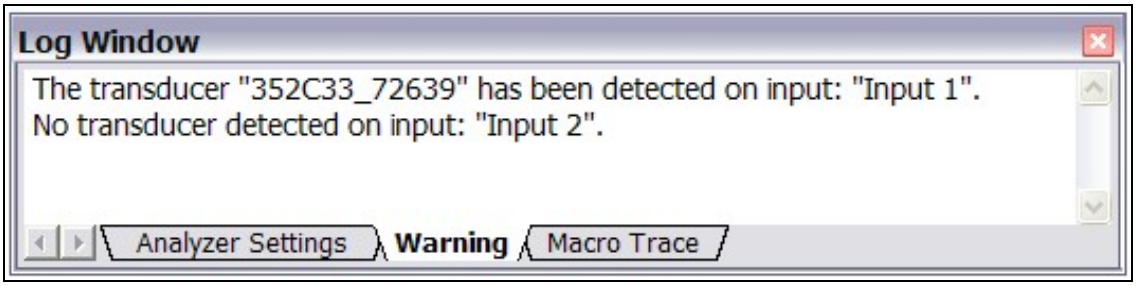
Applying the ICP+TEDS coupling to any (set of) input(s) will activate a recognition sequence on the corresponding input(s). The result can be the following;

- 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:

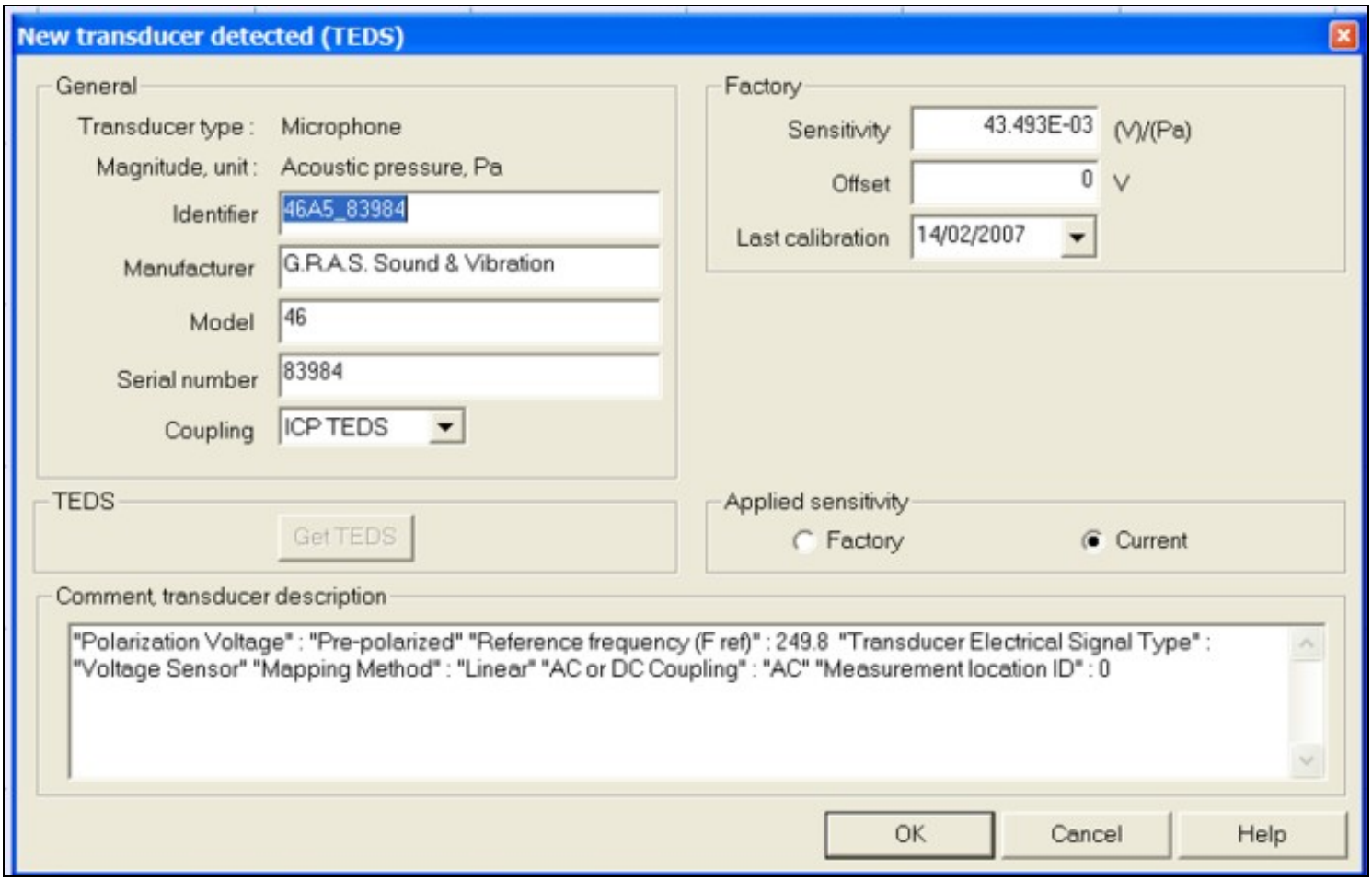
Connect a TEDS transducer on a channel.

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.

41 NVGate User Preferences

41.1 Introduction

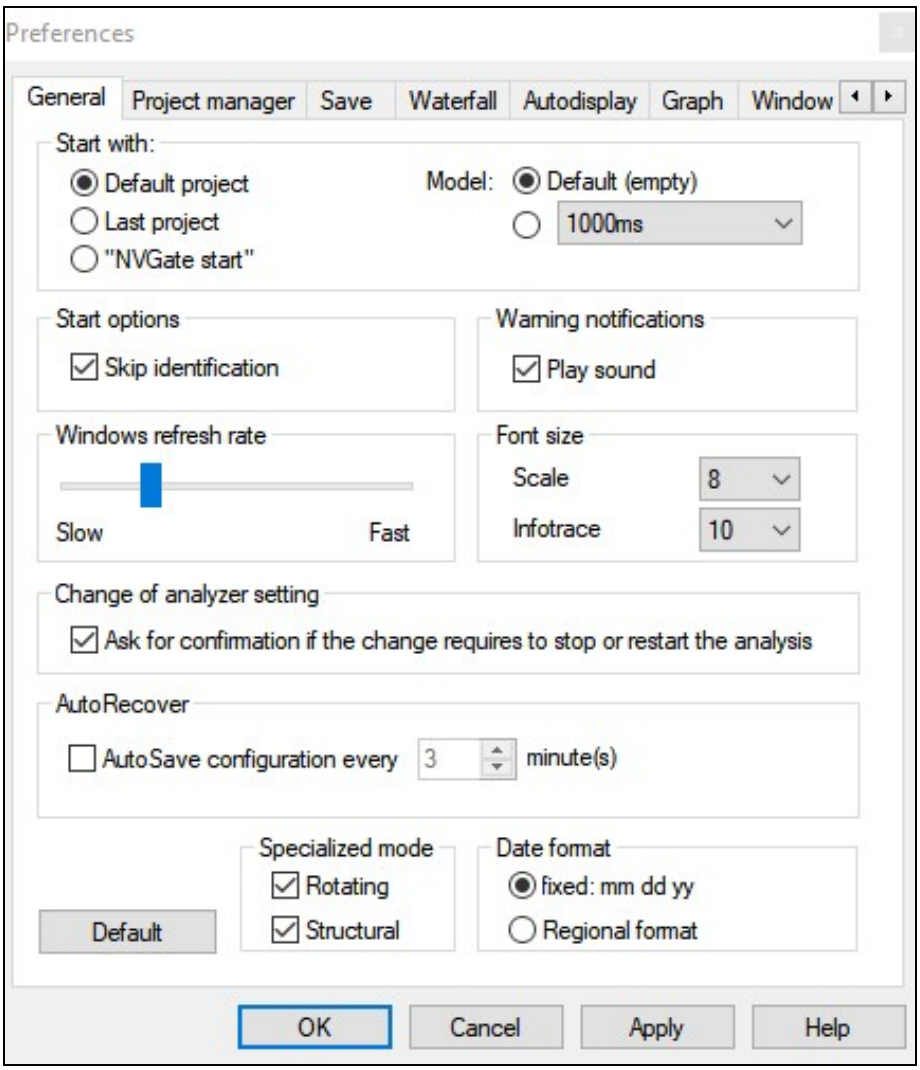
Th user preferences allow modifying and saving your preferred usages for future uses. NVGate propose to share the software use (from a unique PC) between multiple users allowing them to recall their preferences

The user preferences are saved in the user file (.usr).

Users preferences are accessible from the *Home* tab/ *Preferences* group

41.1.1 General

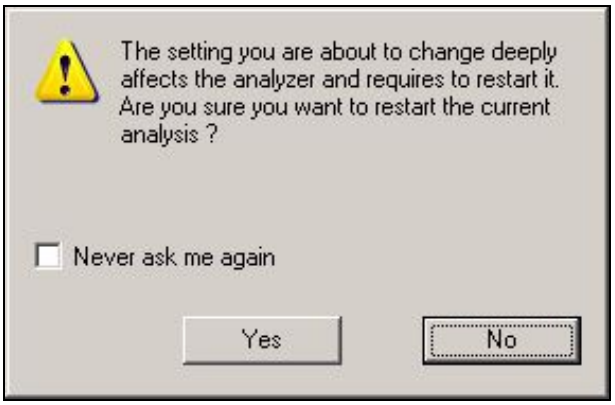
This page is dedicated to general NVGate setting.



- **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.

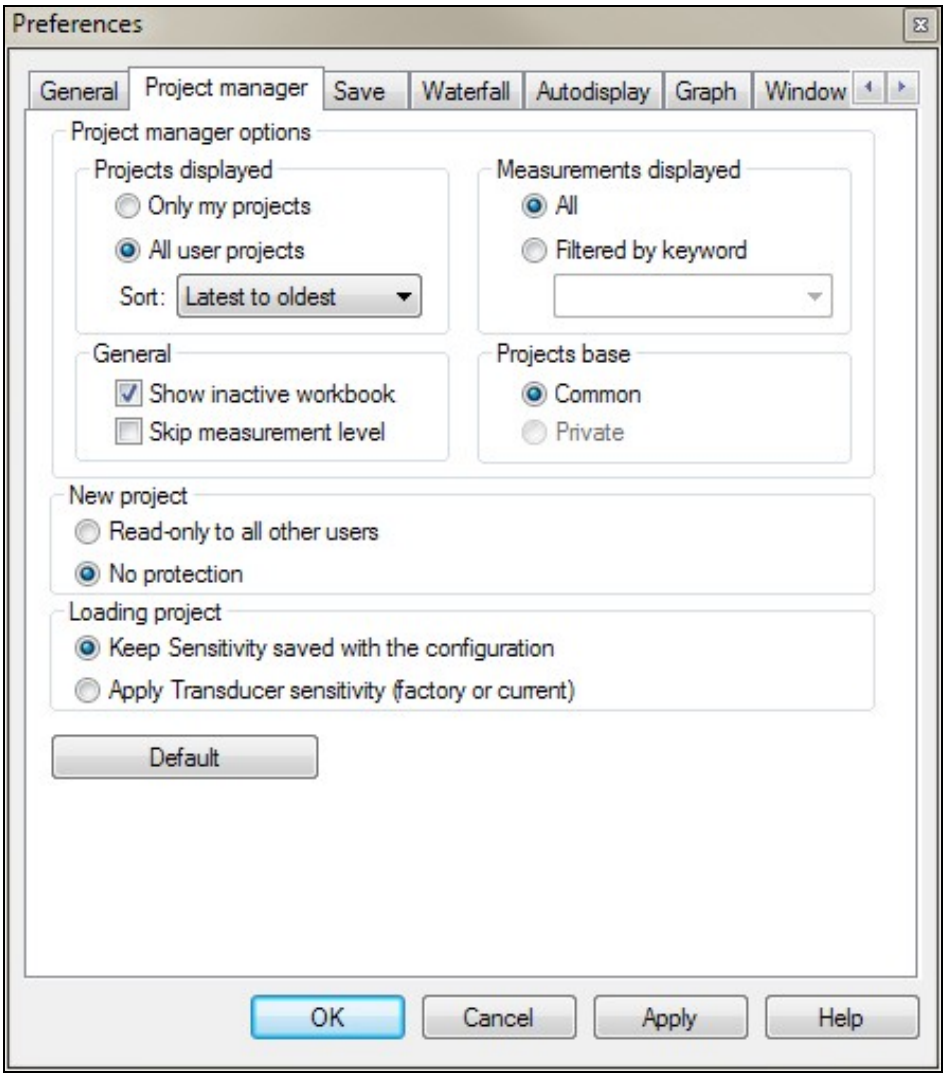


Select this option to block this message.

For users that selected the date as the measurement name auto increment, a choice of date format

41.1.2 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

41.1.2.1 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:

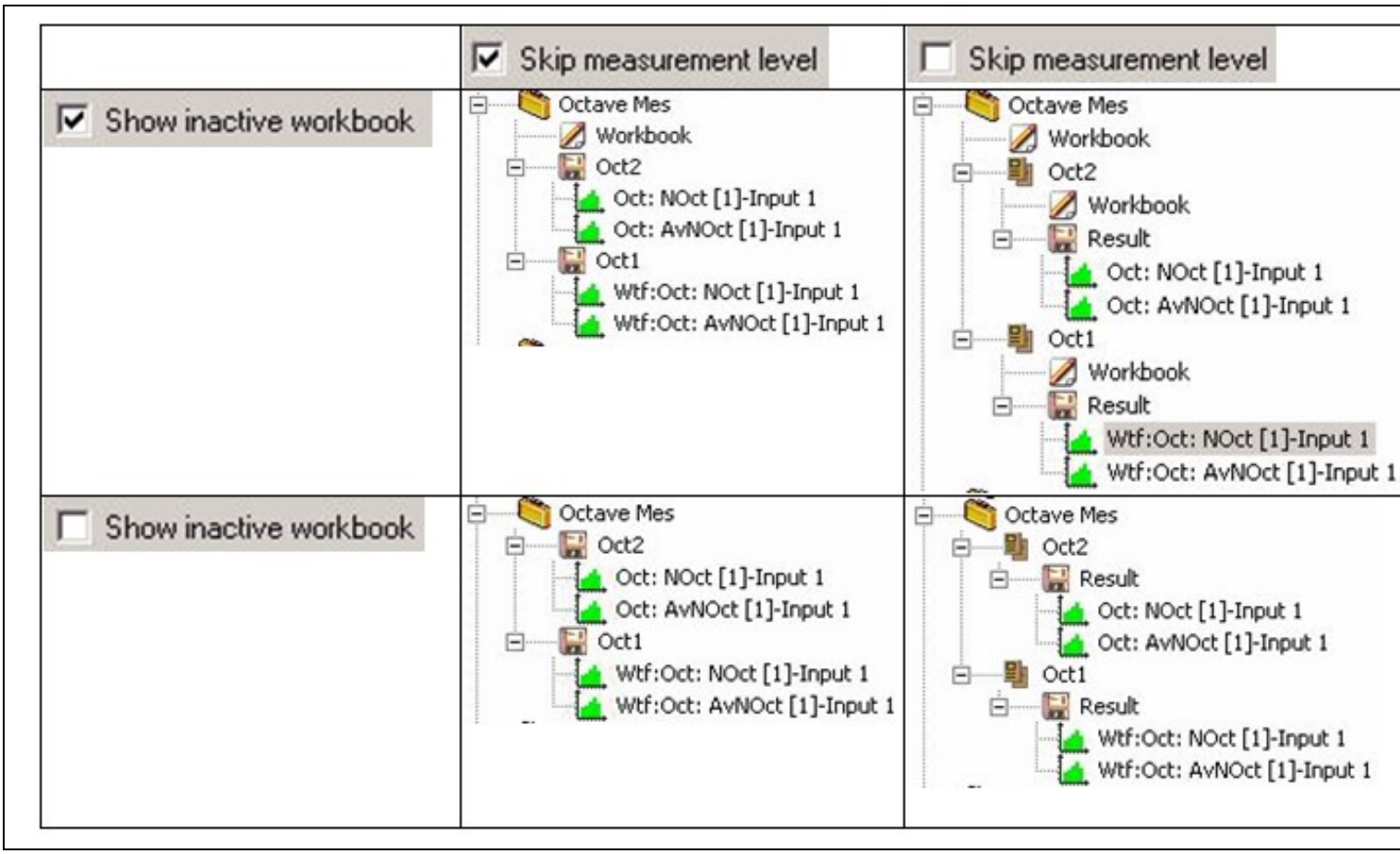
Alphabetical	The projects are classified by their name
Latest to oldest	The projects are classified by date created, with the newest project being at the top of the project manager
Oldest to latest	The projects are classified by date created, with the newest project being at the bottom of the project manager

41.1.2.1.1 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.

41.1.2.1.2 General

It is possible to hide all the inactive workbooks and to delete the measurement level. The table below illustrates the differences

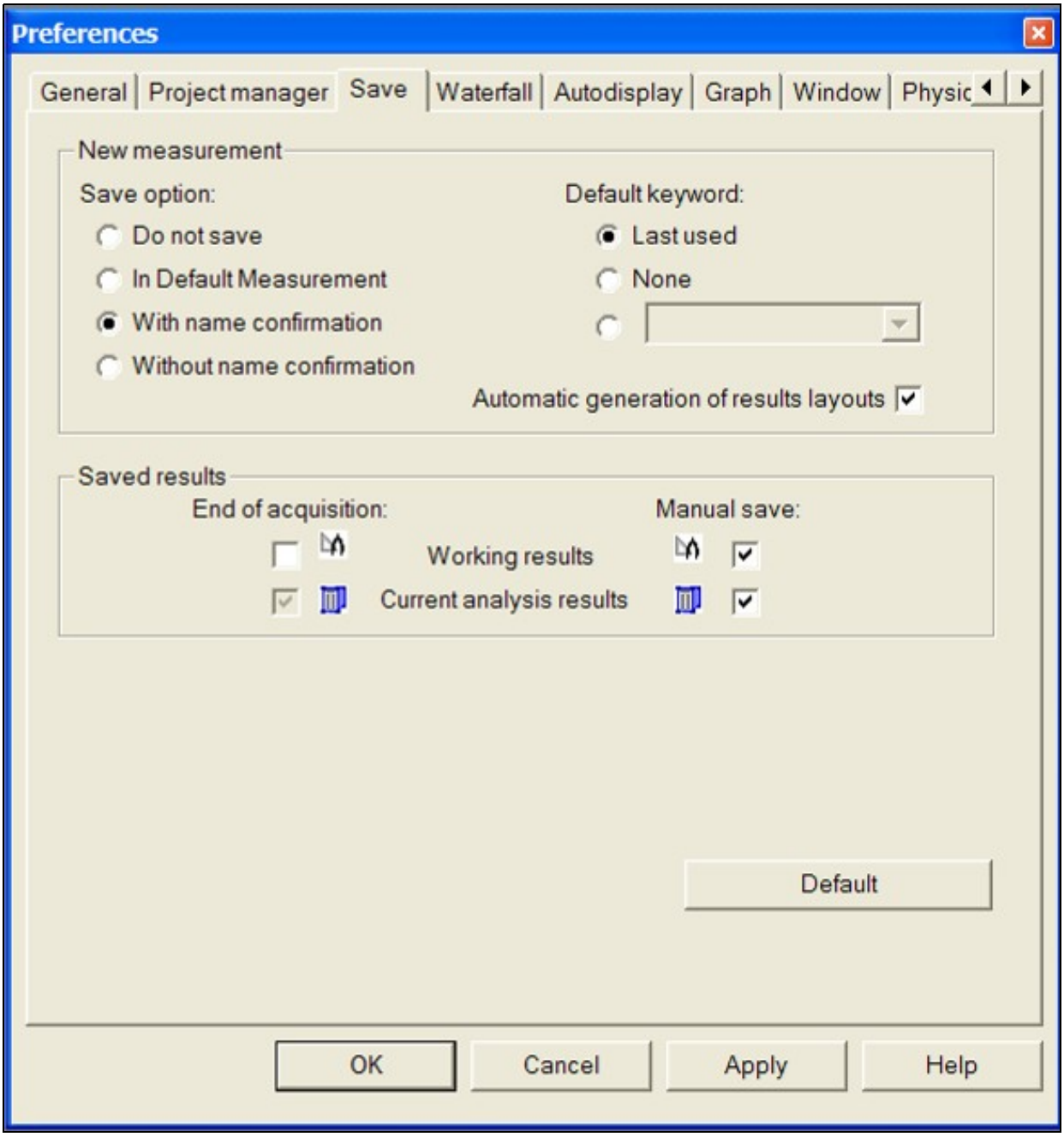


41.1.2.1.3 New project

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.

41.1.3 Save



41.1.3.1 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.

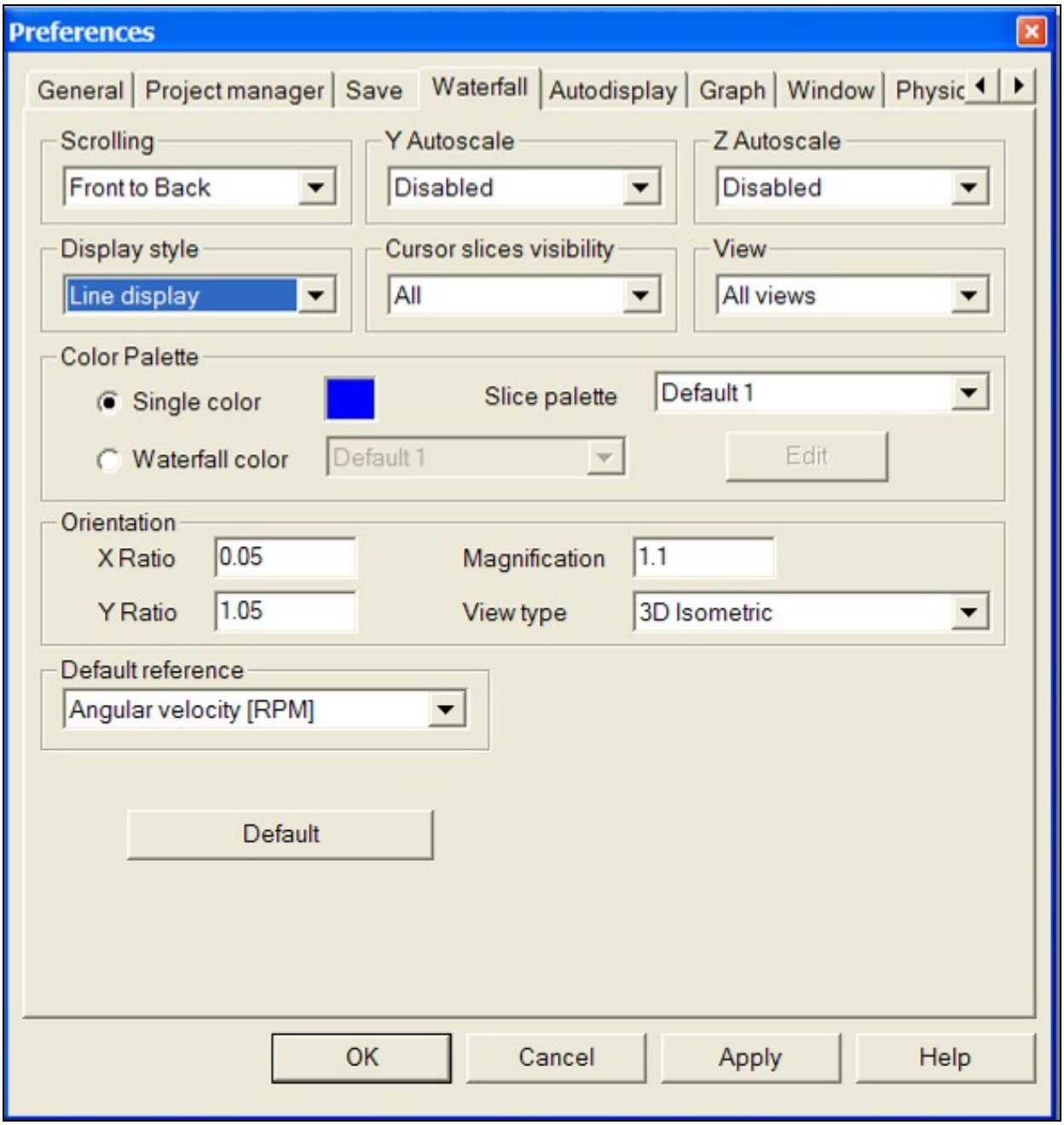
41.1.3.1.1 Saved Results

- **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**.**

41.1.4 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:

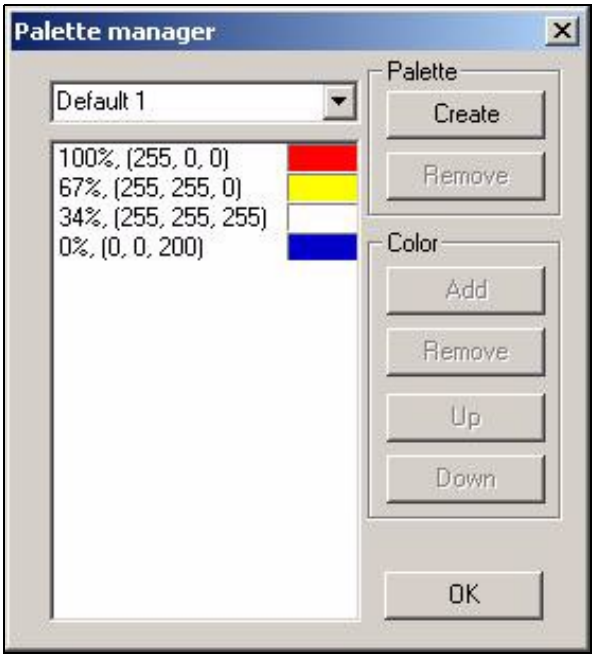
- **Front to back:** the Waterfall is filled from front to back of the displayed box.
- **Back to front**: the Waterfall is filled from back to front of the displayed box.
- **Color palette**

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.

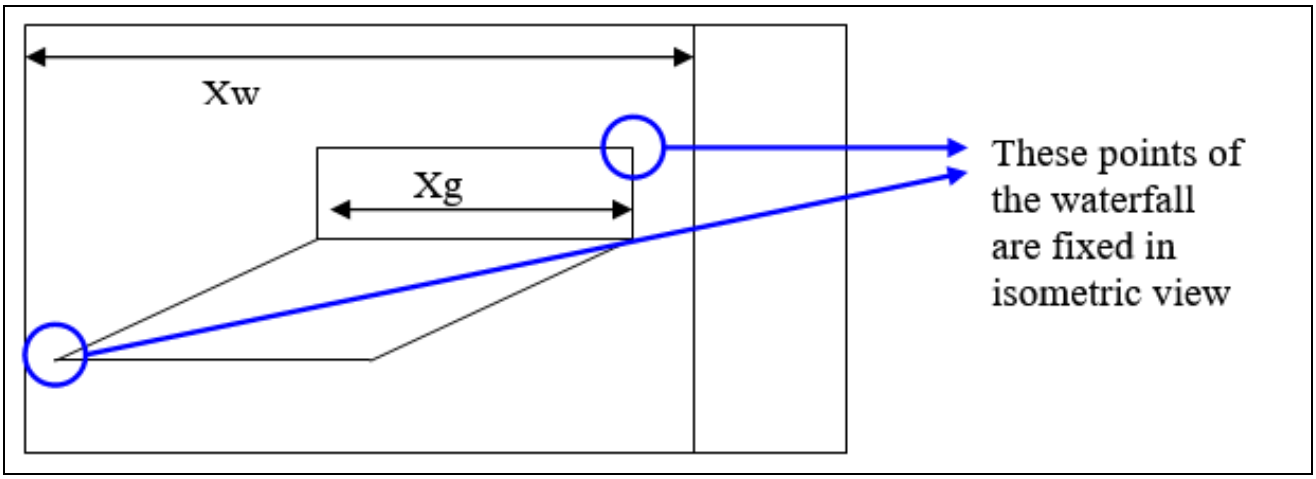
If the Waterfall is displayed, then the reference is the one defined in the user preferences.

- **View**

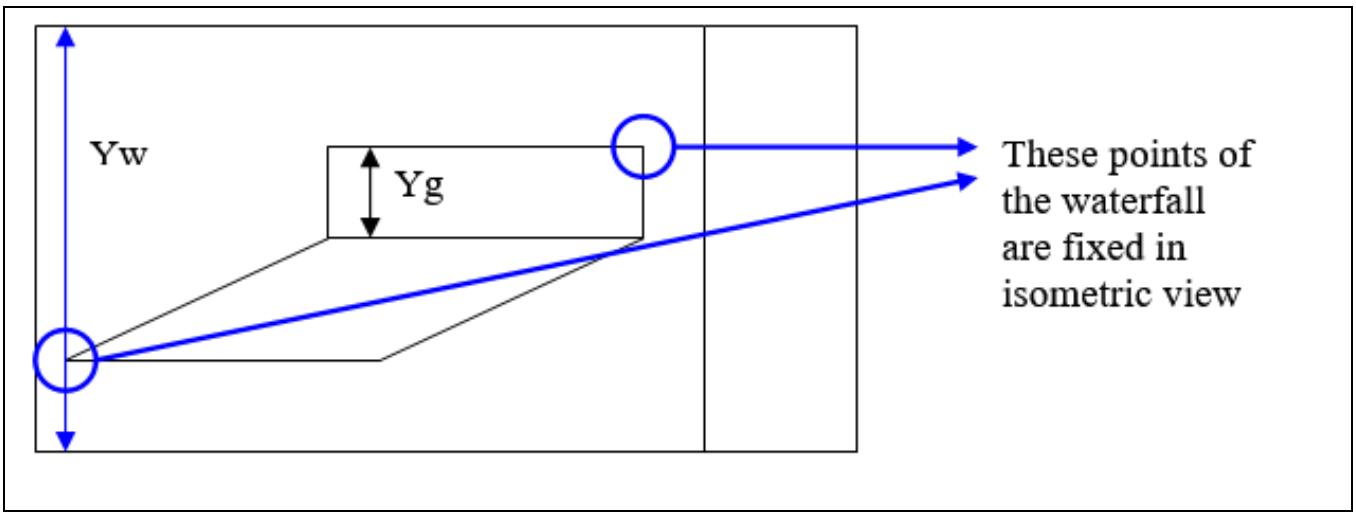
Used to select a view mode in the Waterfall window: two modes are available:

- 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.

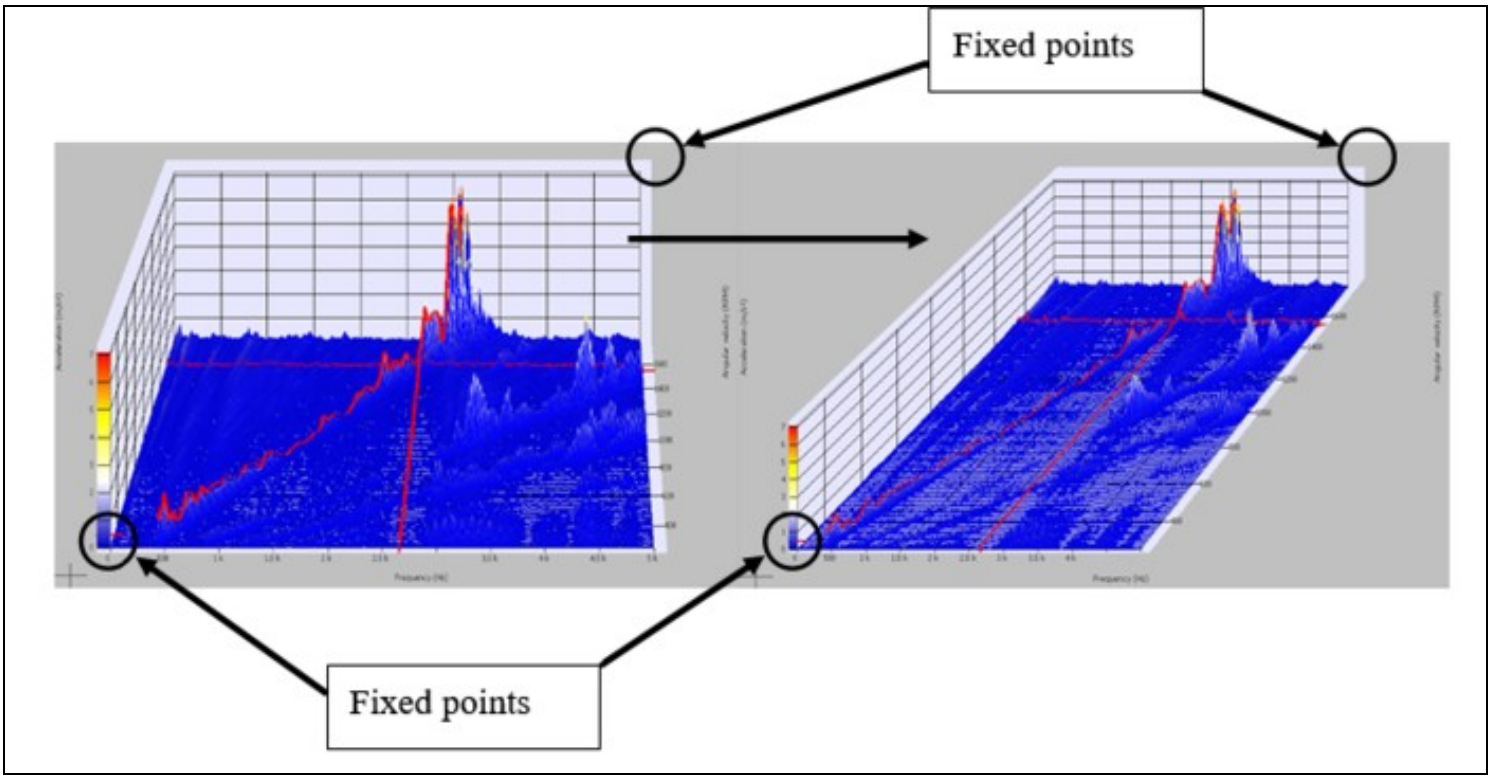


- Magnification: this setting displays the position of the waterfall in the window in term of depth. The waterfall will be far in the window if the cam factor is large.

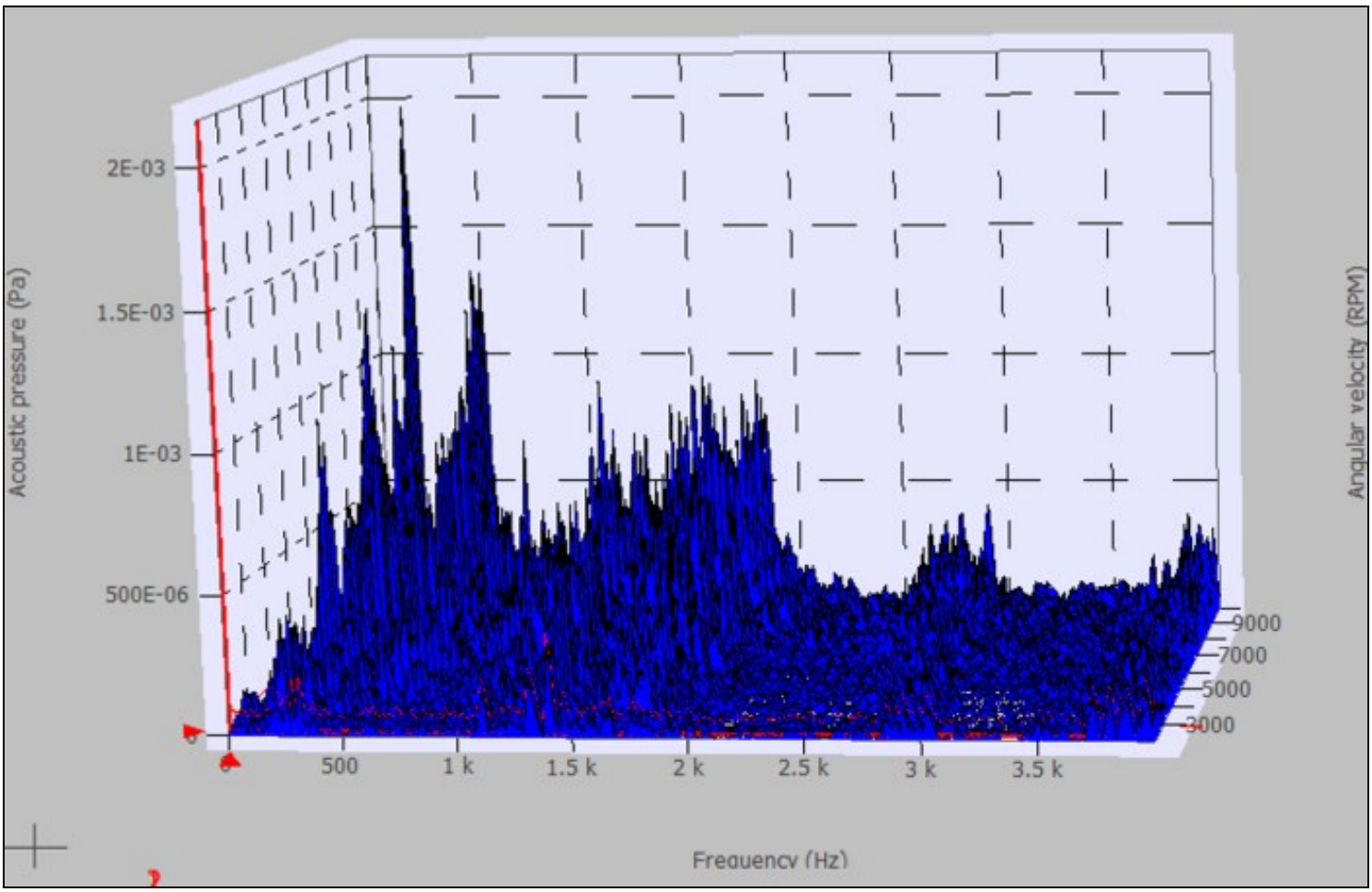
- View type:

- 3D isometric

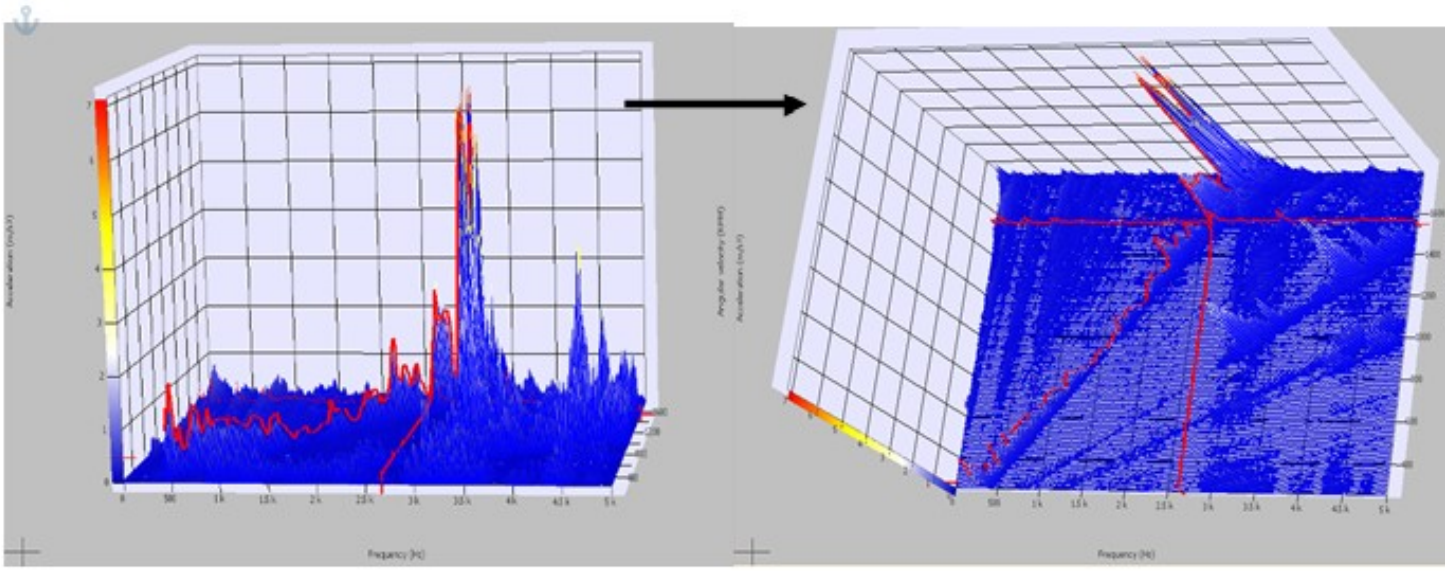
If isometric view is checked: you can change the position and dimension of the waterfall around two fixed points (see above).



• 3D perspective:

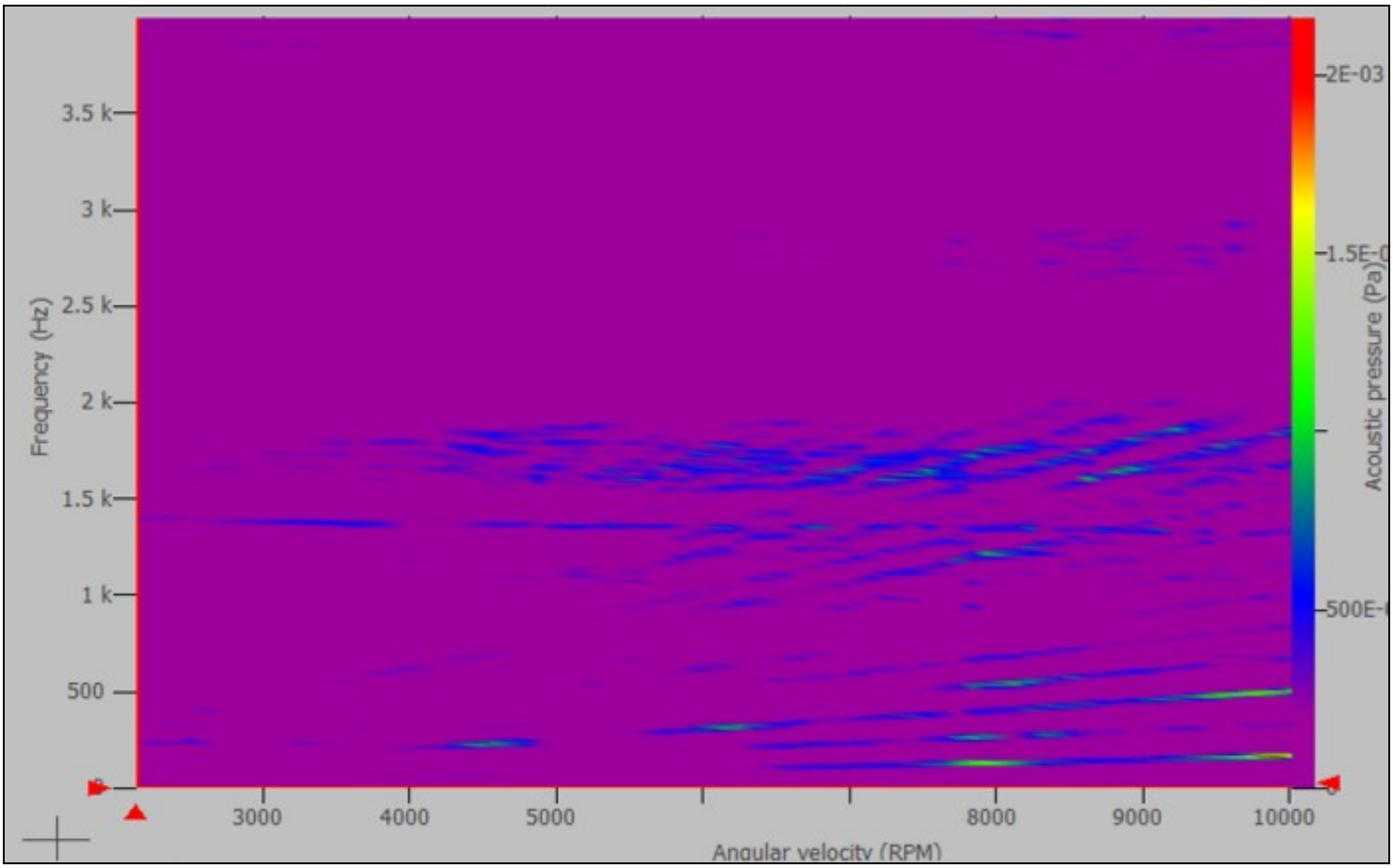


If Perspective is not checked: there is no fixed point, the waterfall can be moved in the 3D space. This view is an orthonormal view.



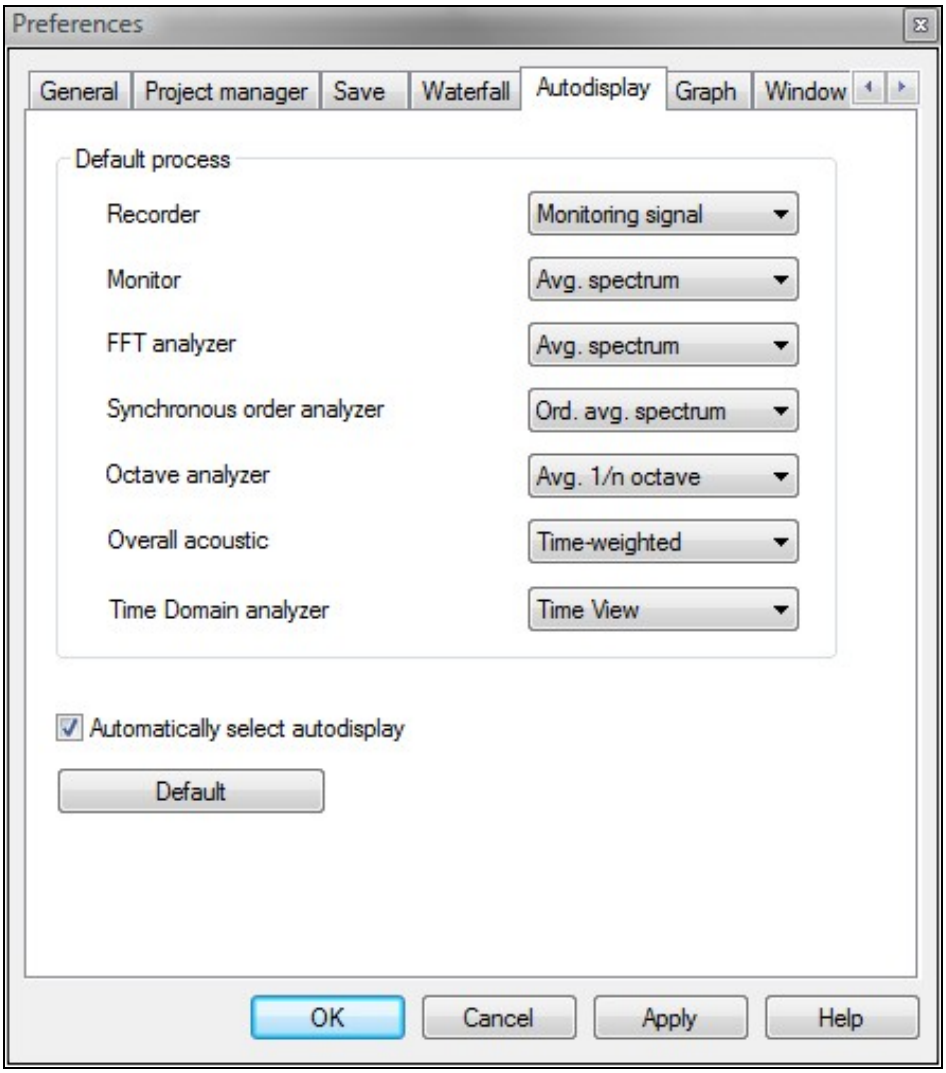
- Freq/Time Colormap:

- Time/Freq Colormap:



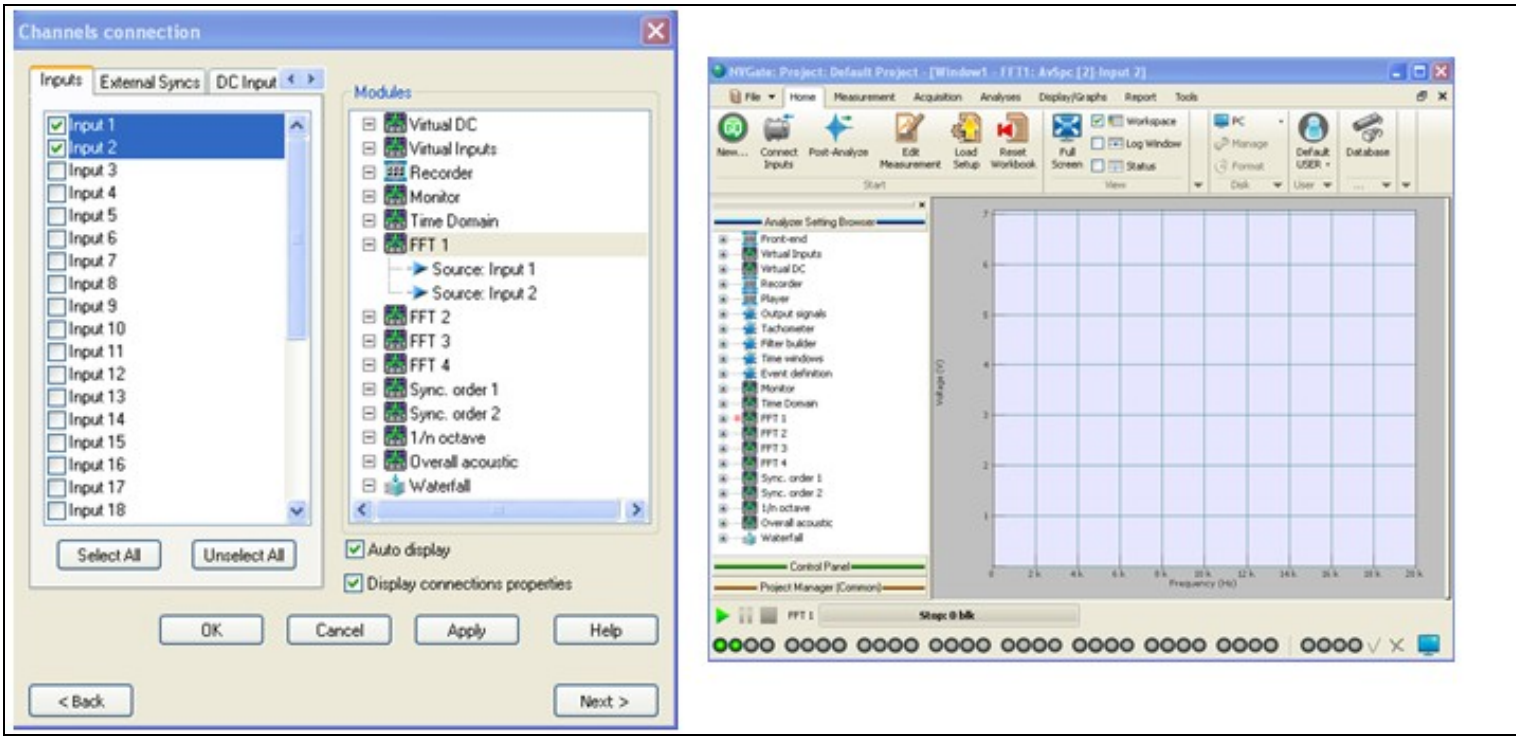
41.1.5 Autodisplay

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:



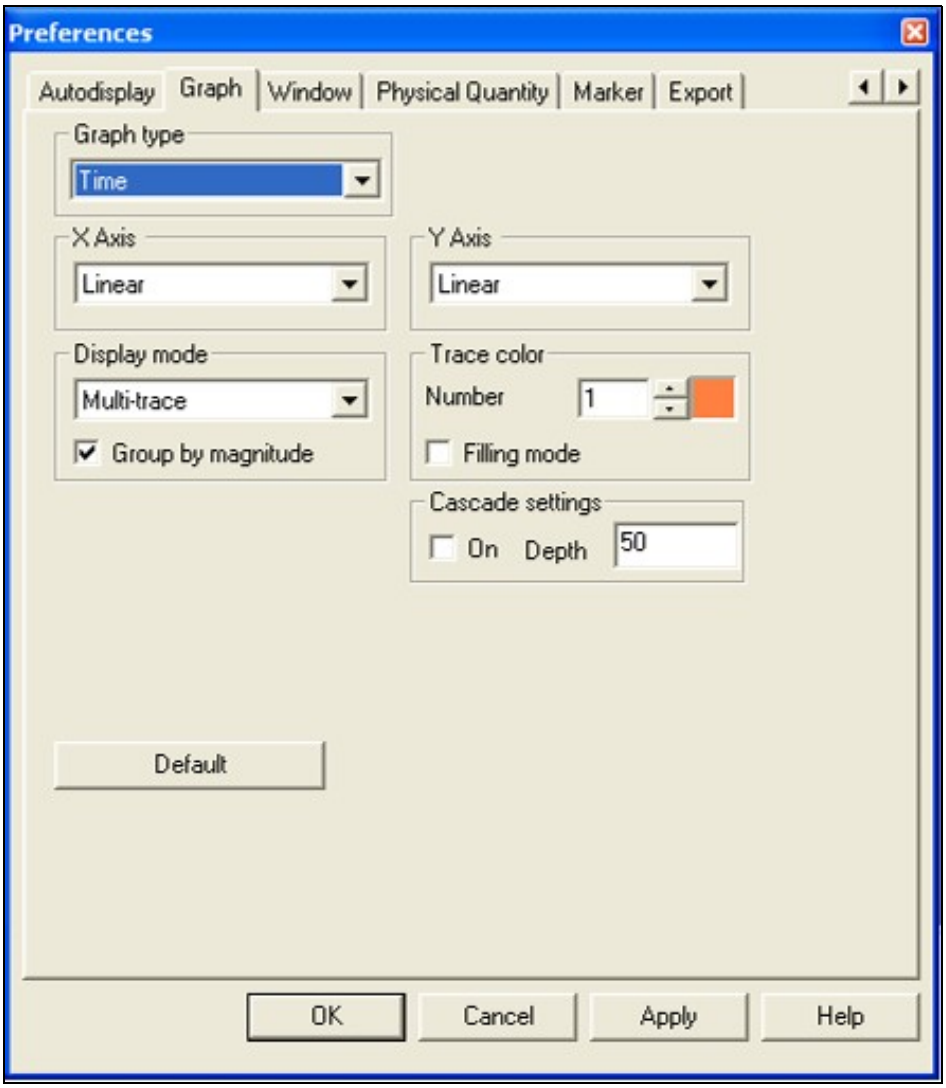
Input connection: The type of result selected in the autodisplay preferences is automatically displayed

41.1.6 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.

41.1.6.1 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.

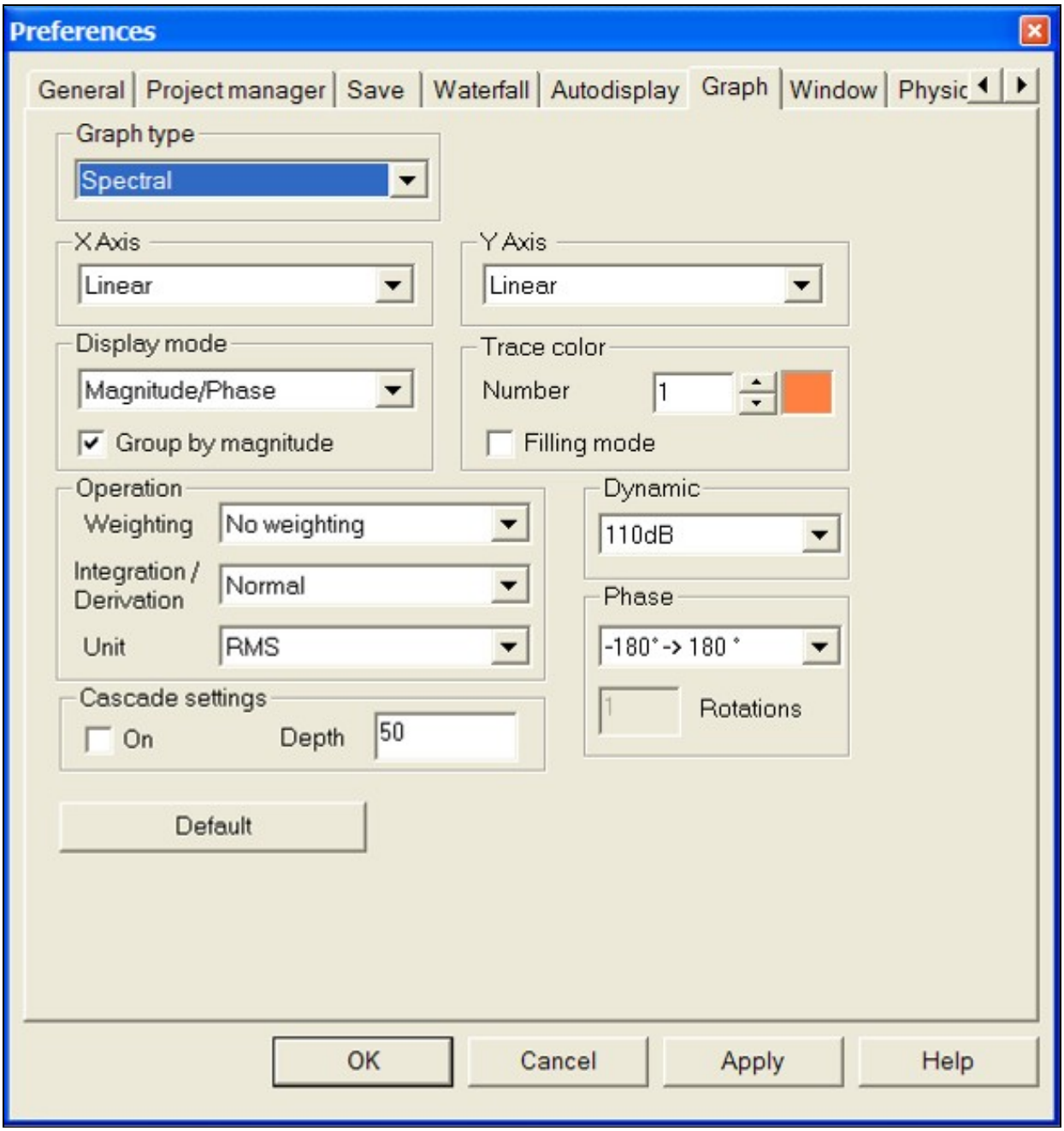
If Magnitude gathering is active, when the window is in a simple multi trace mode (module, phase, real, imaginary... but not in multi trace module/phase, real/imaginary....), one area is created for each different Y magnitude in the window.

- **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.

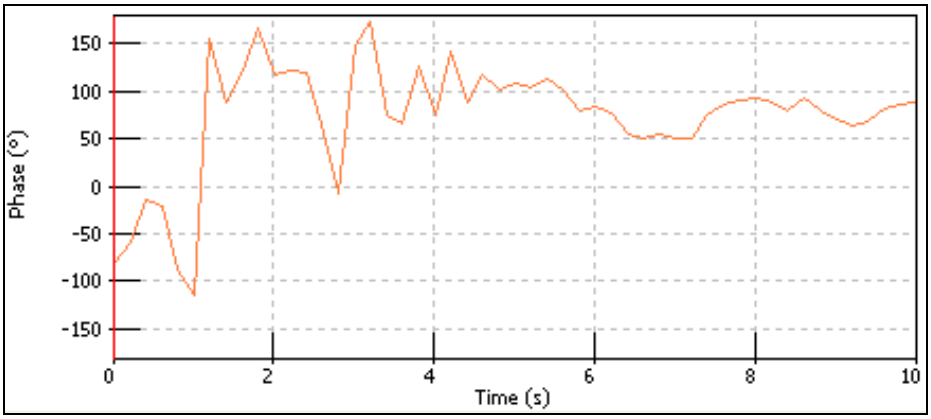
41.1.6.2 Spectral


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

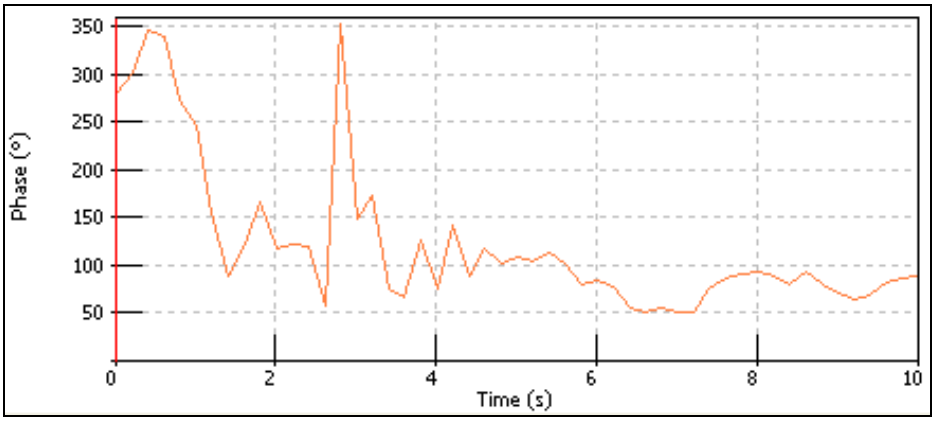
- **X-axis:** Select the X scale type. Two kinds of X scale are available (depending on the kind of window).
- Linear
- Logarithmic

- **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.

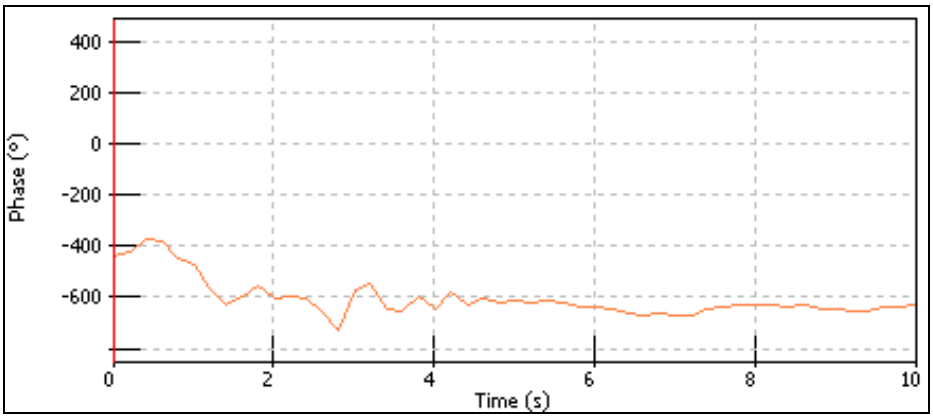
- **Phase**
- **-180° -> 180°**: sets the phase graph Y-axis between ?180° to +180°.



- **0 -> 360°**: sets the phase graph Y-axis between 0 to +360°.

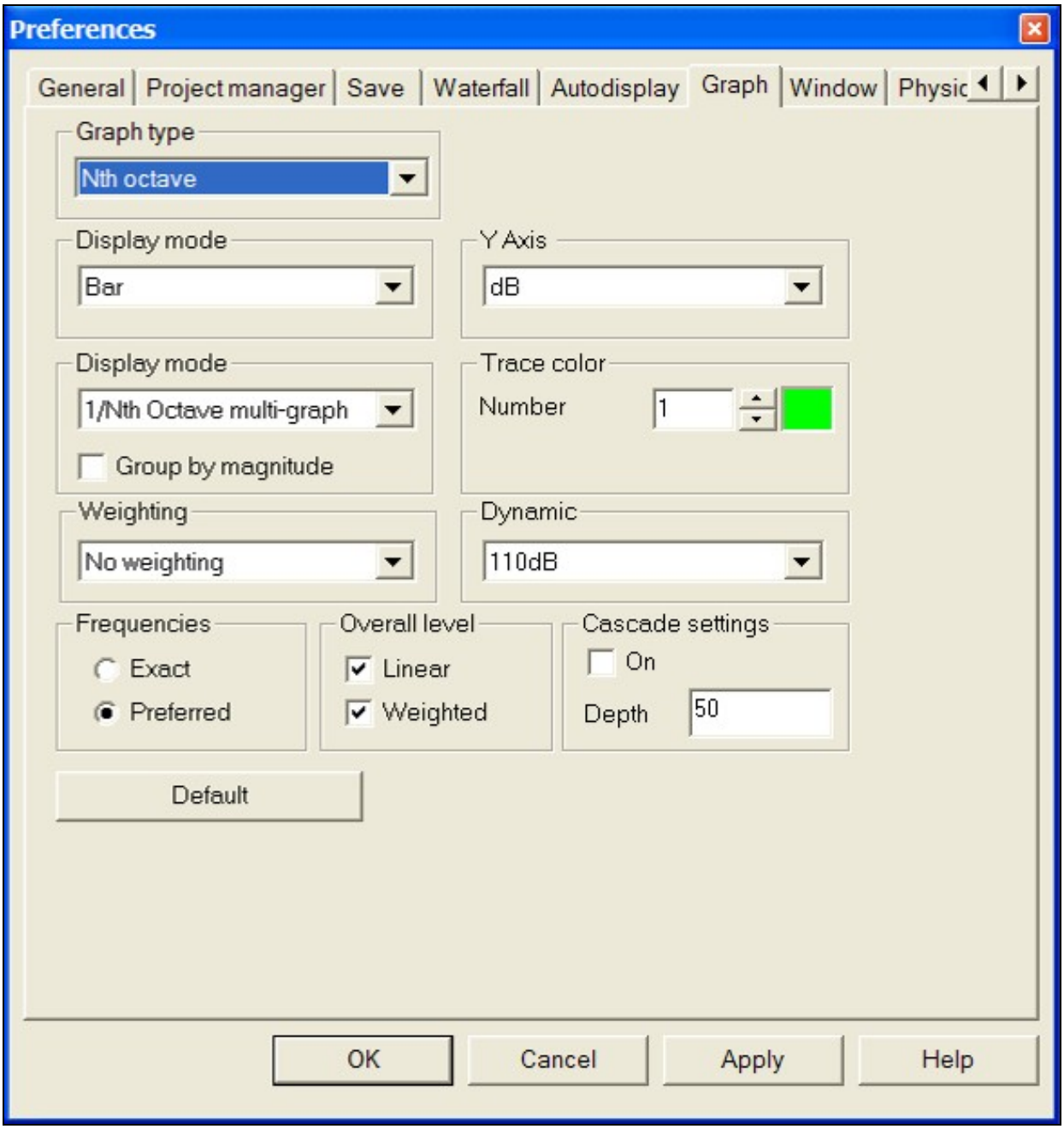


- **Rotations:** sets the number of rotations to be displayed on the Y-axis.



Example for 5 rotations

41.1.6.3 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.

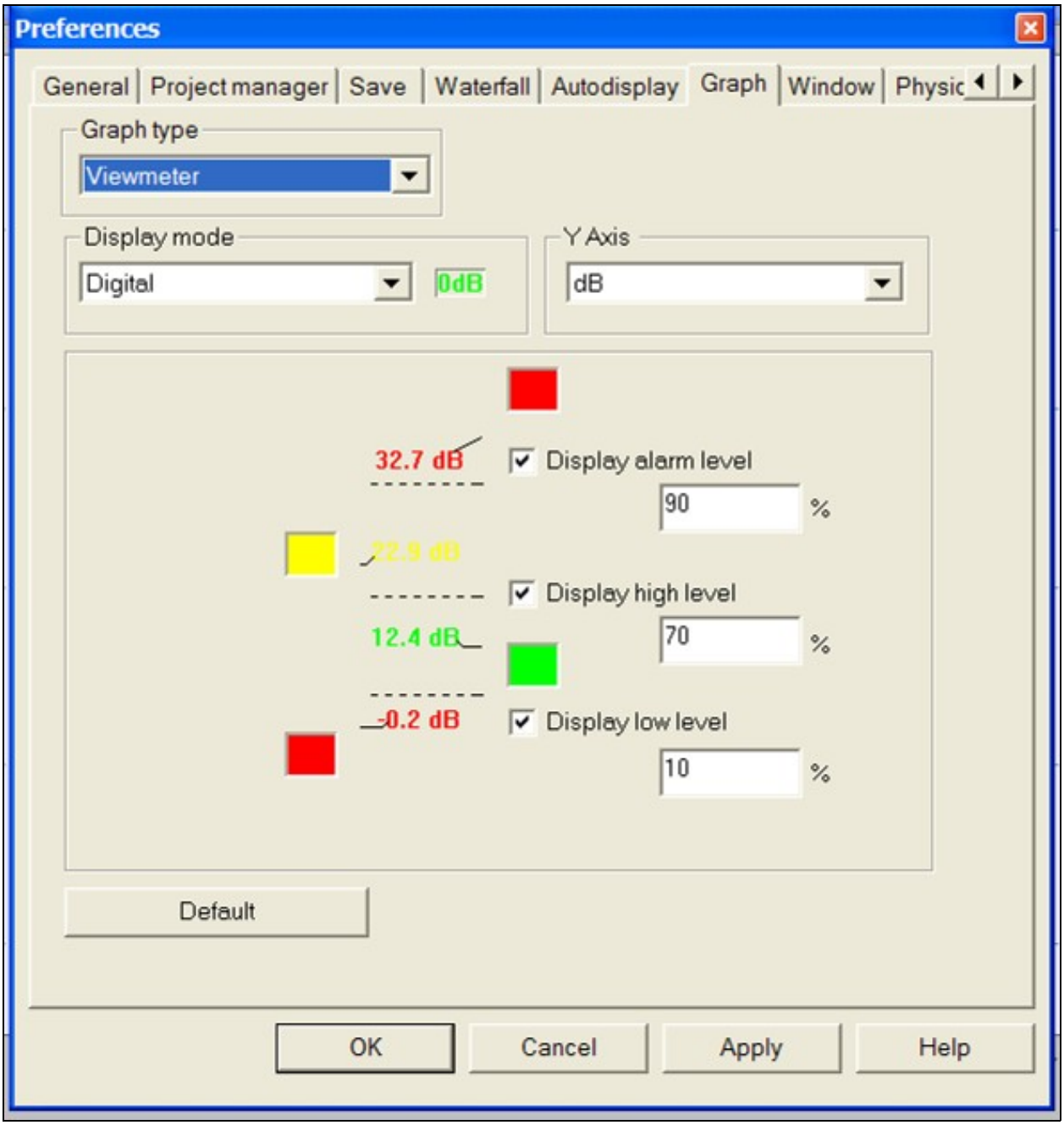
- **Weighting**

Used to select the type of weighting desired.

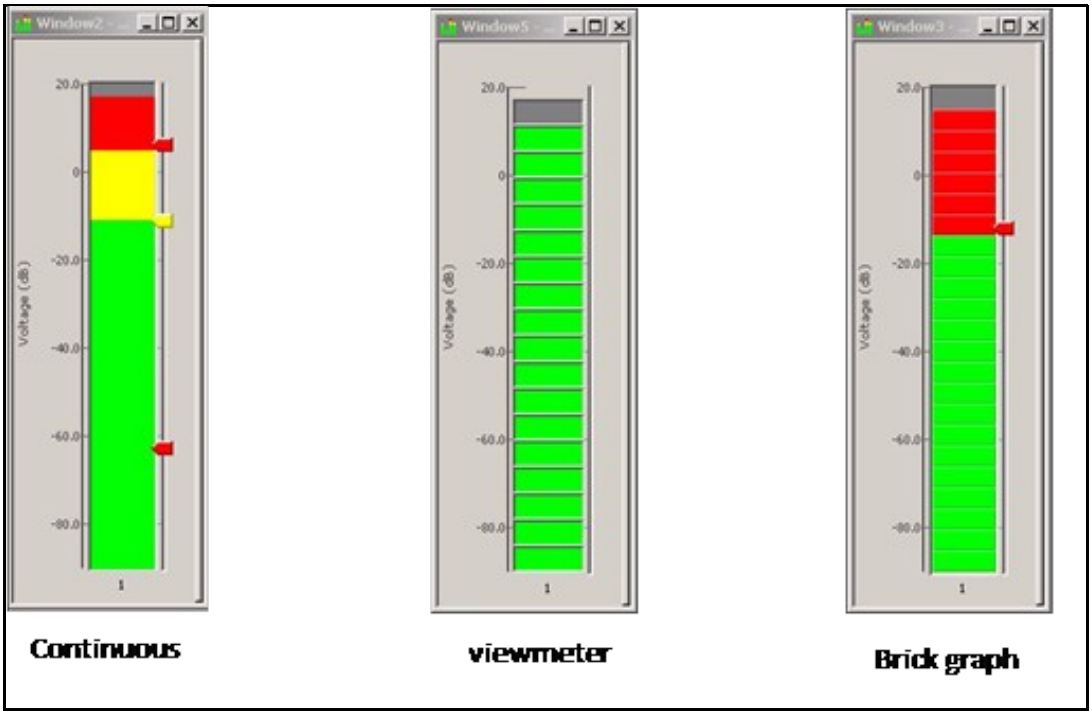
- **Overall level**
- **Linear**: if checked, the linear global level is displayed.
- **Weighted**: if checked and available, the weighted level is displayed.

- **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.

41.1.6.4 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

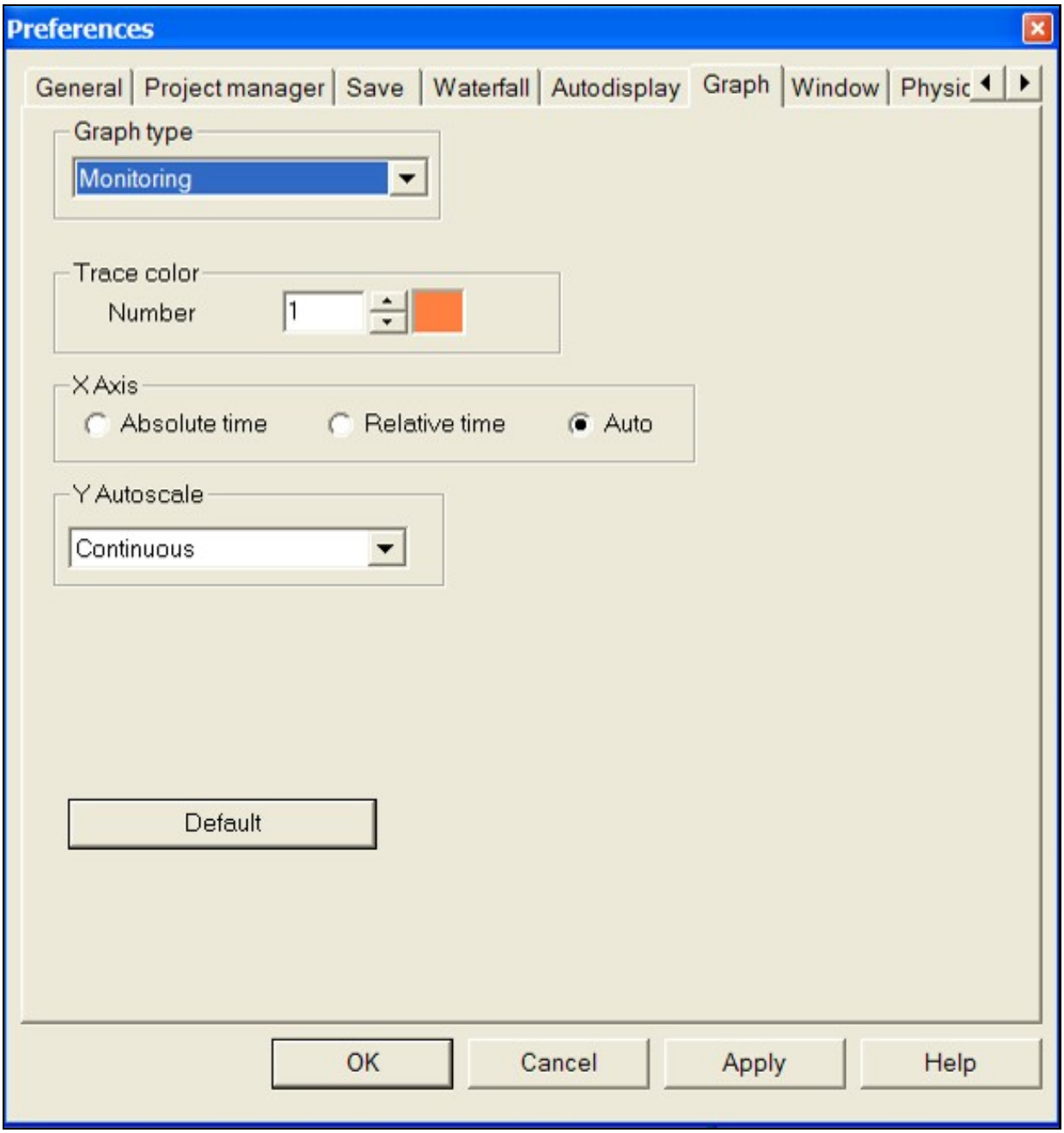
- **Display mode:** There are two types of display:
- Bar graph



- 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.

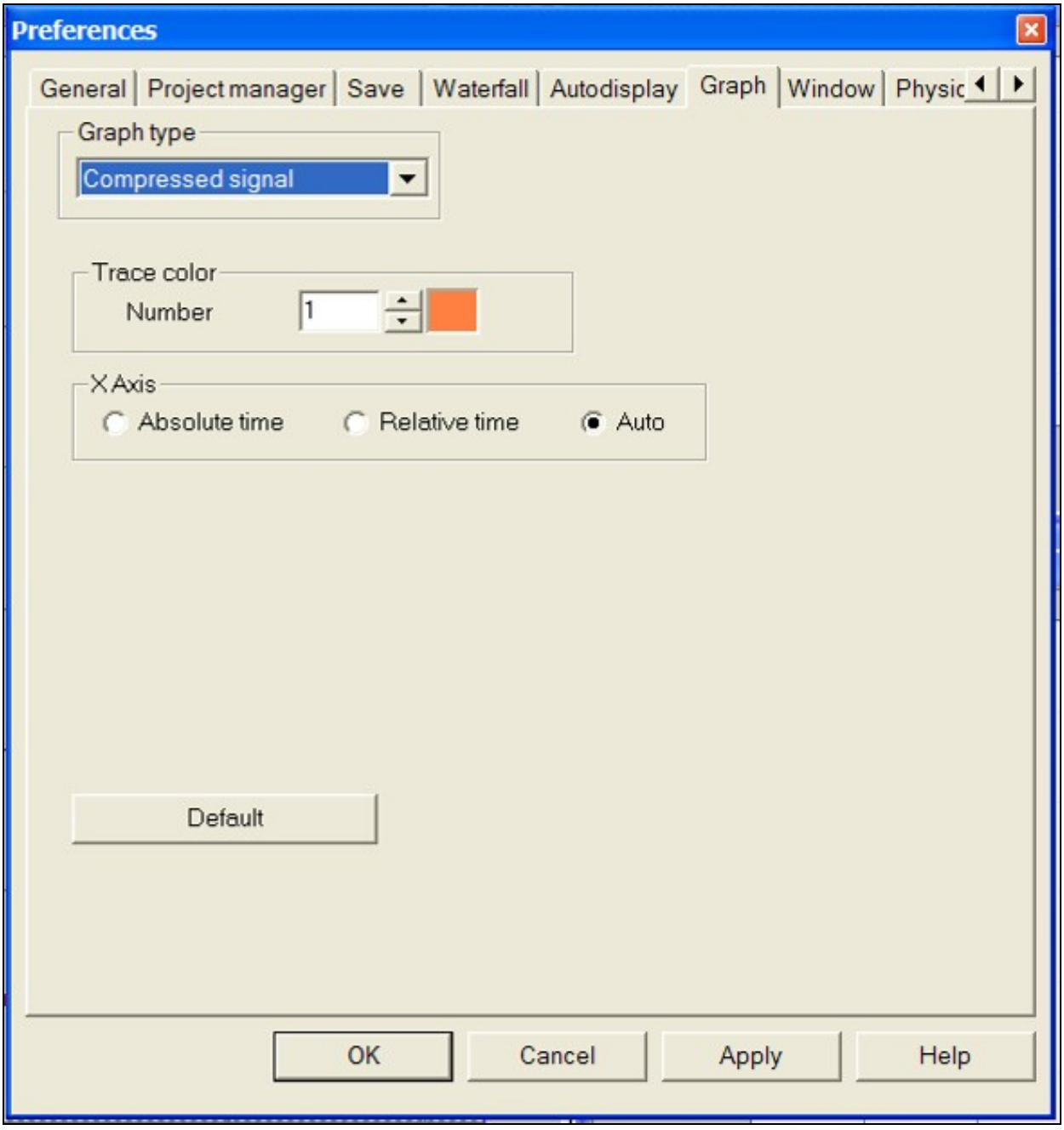
41.1.6.5 Monitoring


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.

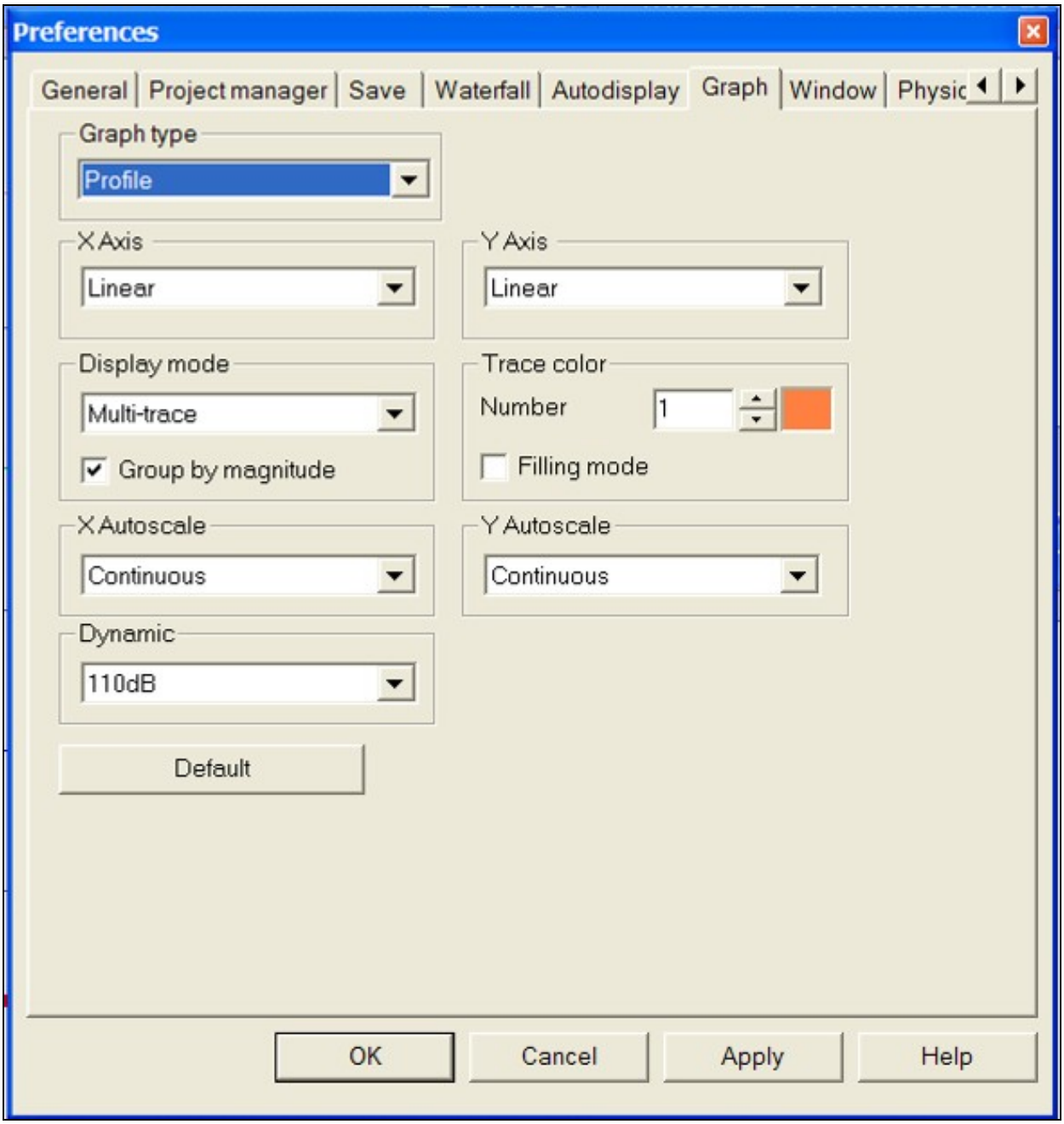
41.1.6.6 Compressed signal



- 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.

41.1.6.7 Profile

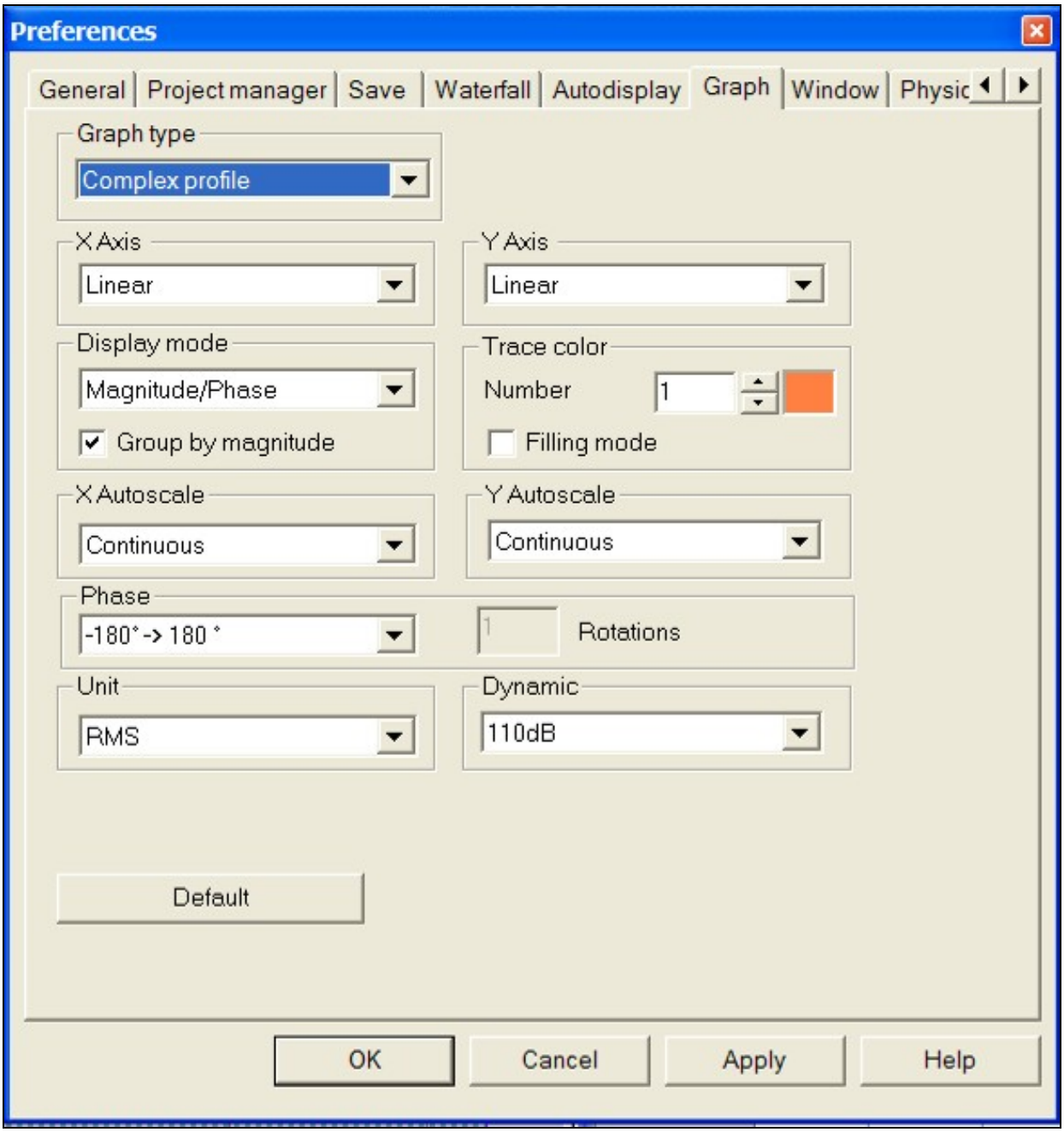


- X Axis
- Linear: uses linear scale for X-axis units.
- Y Axis
- Linear: uses linear scale for Y-axis units.
- Display mode
- Magnitude: overlays all magnitude traces on a single graph.
- Phase: overlays all phase traces on a single graph.
- Magnitude gathering: if this mode is activated and when a 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.

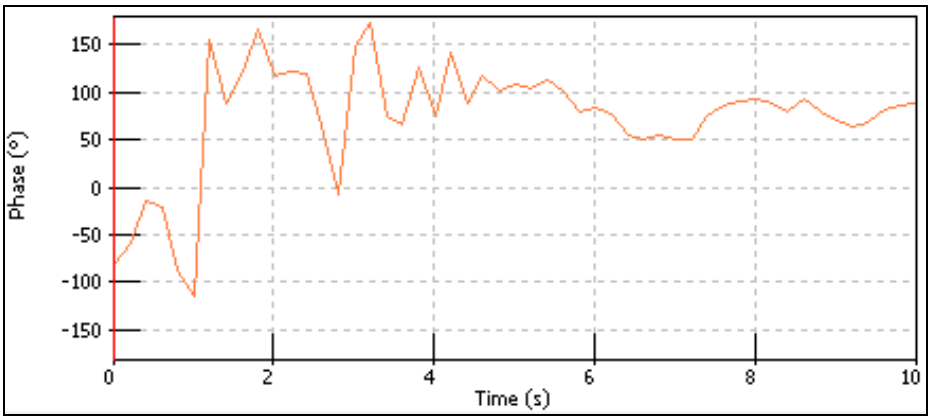
- Y Autoscale
- Continuous: the Y scale is automatically adjusted to the current min and max y values of the window traces with a margin to facilitate visibility.
- Disabled: Y autoscale is not activated.

41.1.6.8 Complex profile

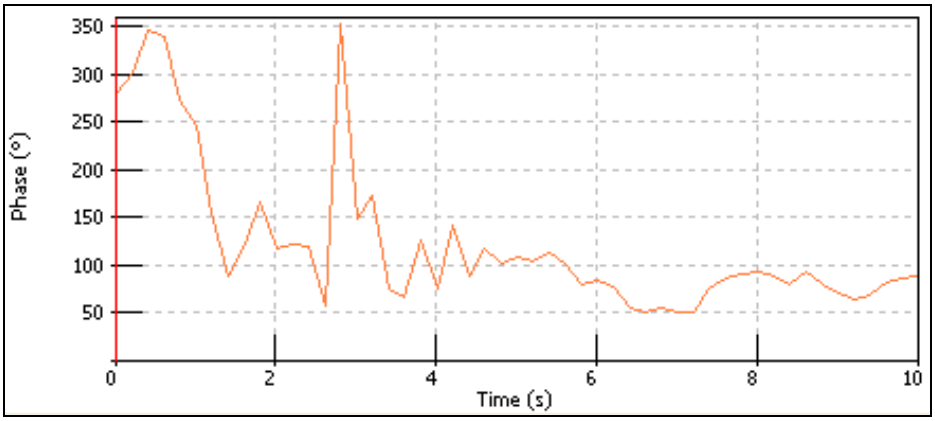

Preferences
General
Project manager
Save
Waterfall
Autodisplay
Graph
Window
Physic
Graph type
Complex profile
X Axis
Linear
Y Axis
Linear
Display mode
Magnitude/Phase
Group by magnitude
Trace color
Number
1
Filling mode
X Autoscale
Continuous
Y Autoscale
Continuous
Phase
-180° -> 180 °
1
Rotations
Unit
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°.

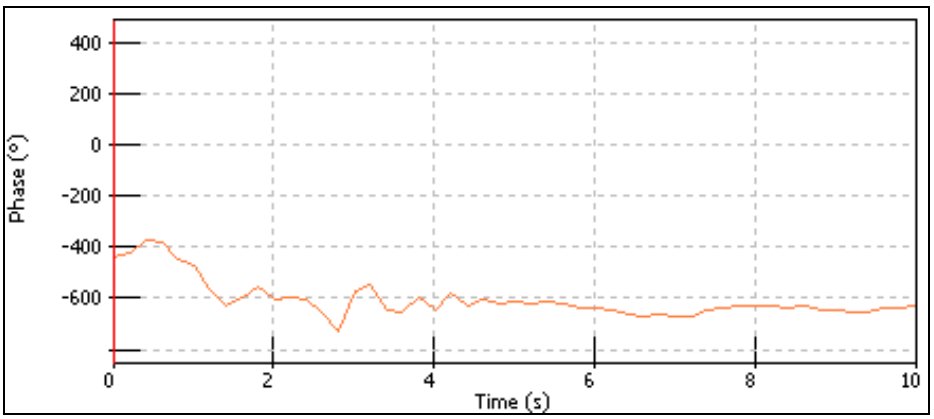


- 0 -> 360°: sets the phase graph Y-axis between 0 to +360°.



-

Rotations: sets the number of rotations to be displayed on the Y-axis.

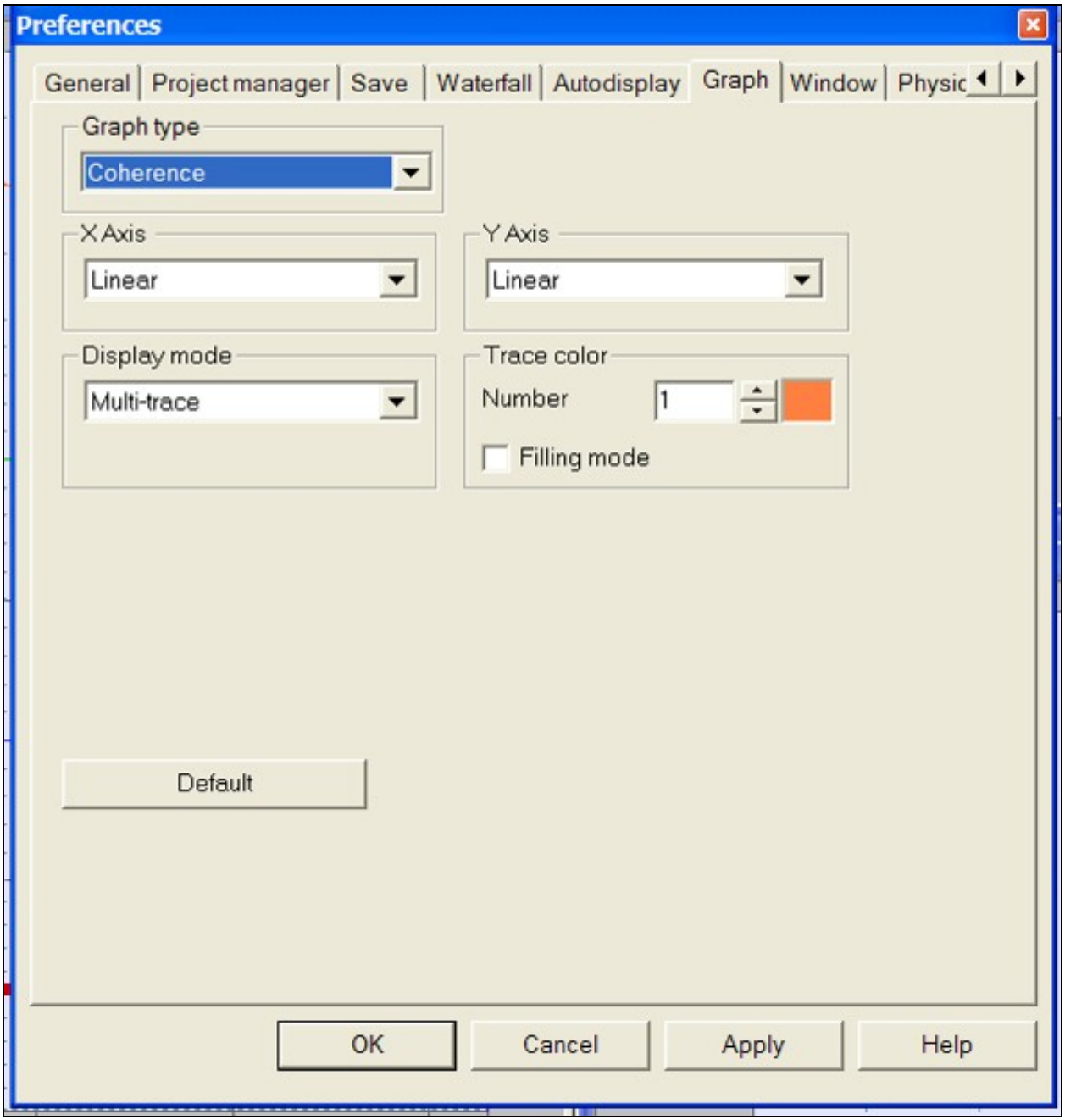


Example for 5 rotations

- 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.

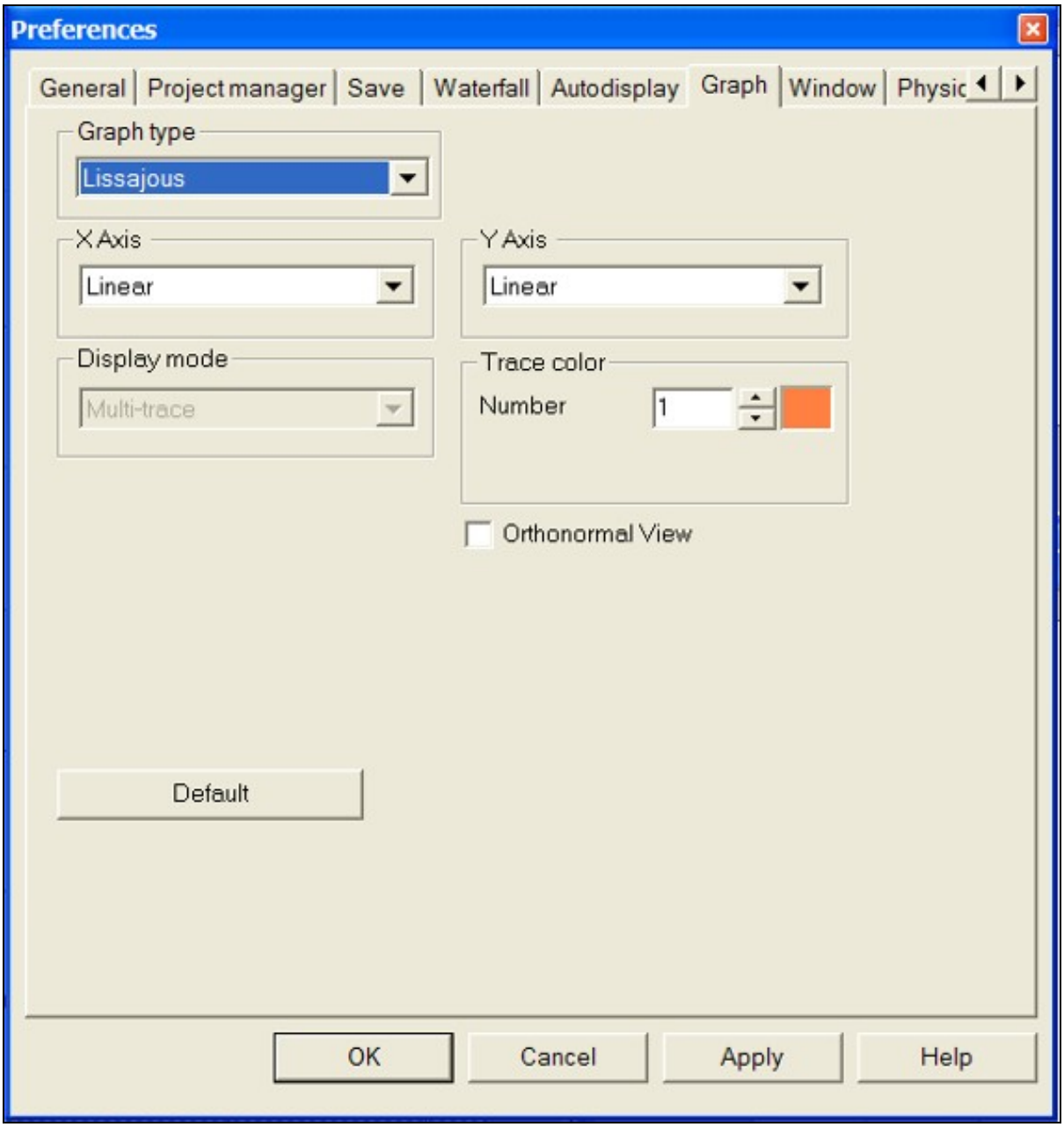
- Y Autoscale
- Continuous: the Y scale is automatically adjusted to the current min and max y values of the window traces with a margin to facilitate visibility.
- Disabled: Y autoscale is not activated.

41.1.6.9 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.

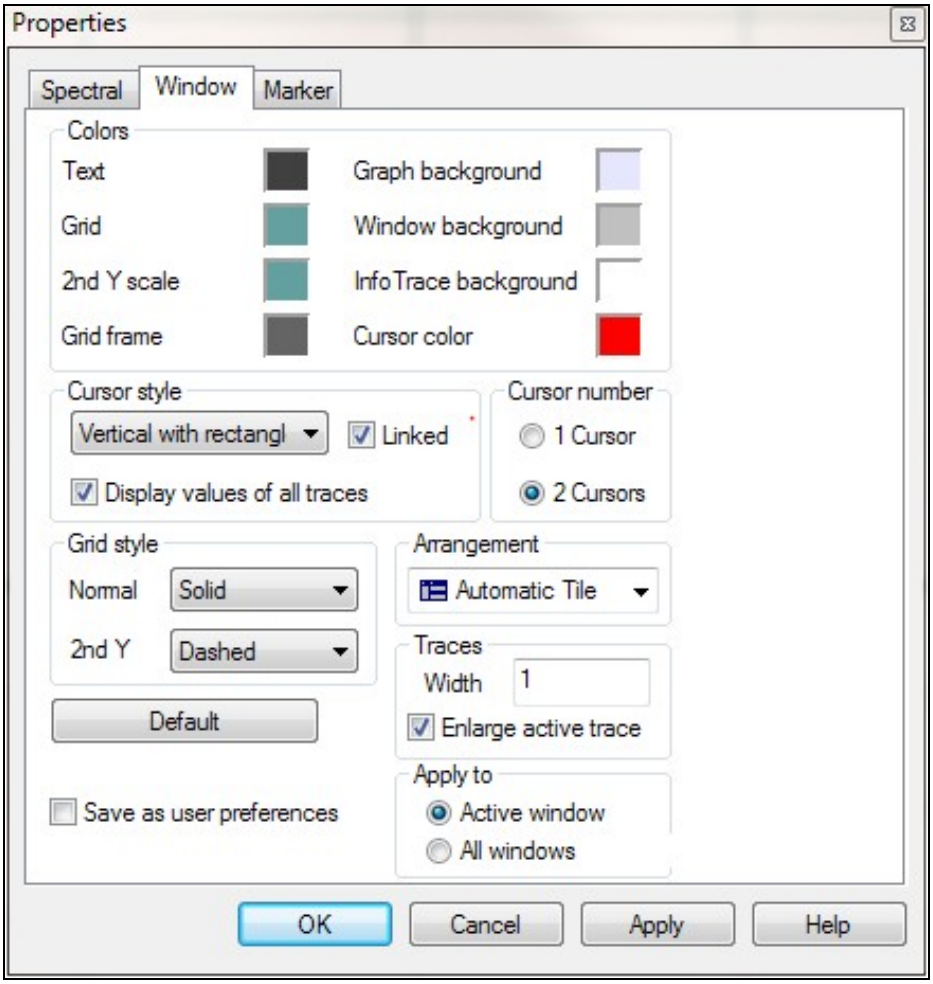
41.1.6.10 Lissajous



- 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.
-

41.1.7 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

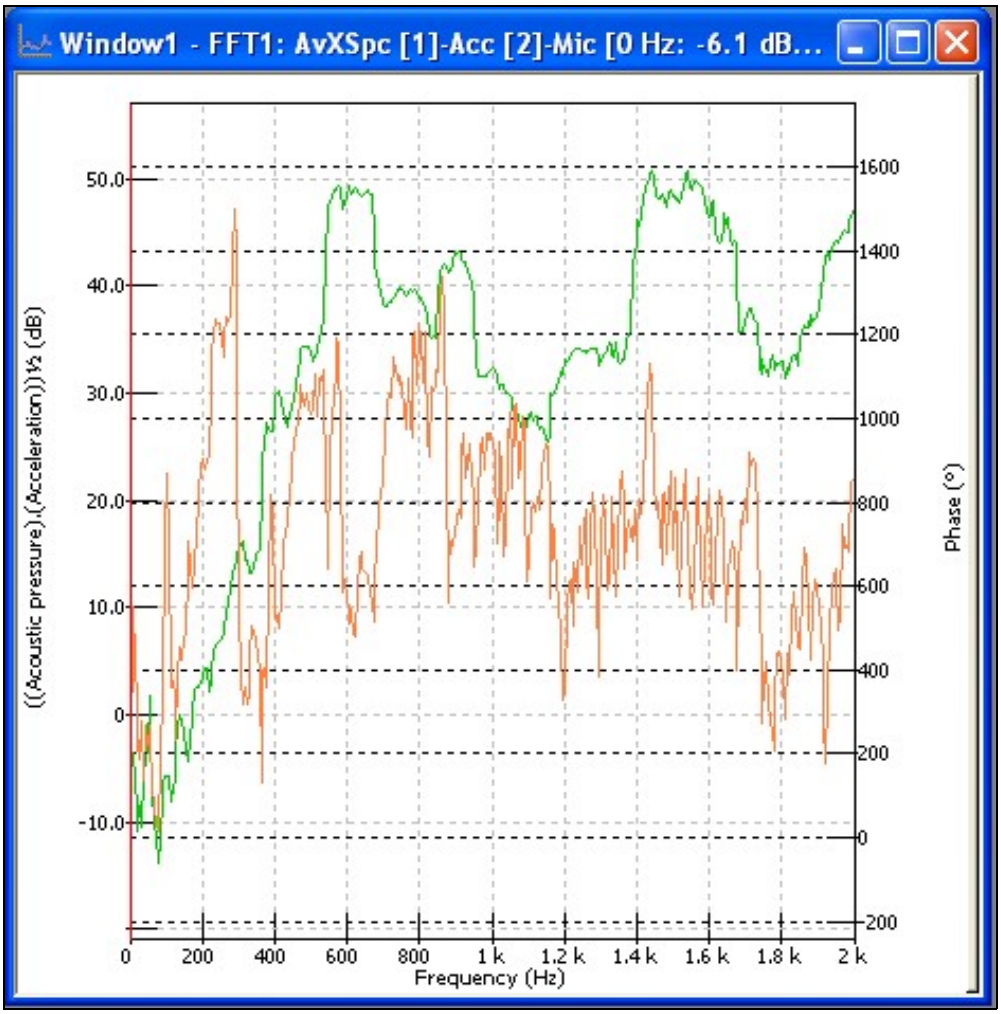
Linked: Enables links between the cursors of several windows: when one cursor moves, the other also moves. See cursor menu section for details.

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:

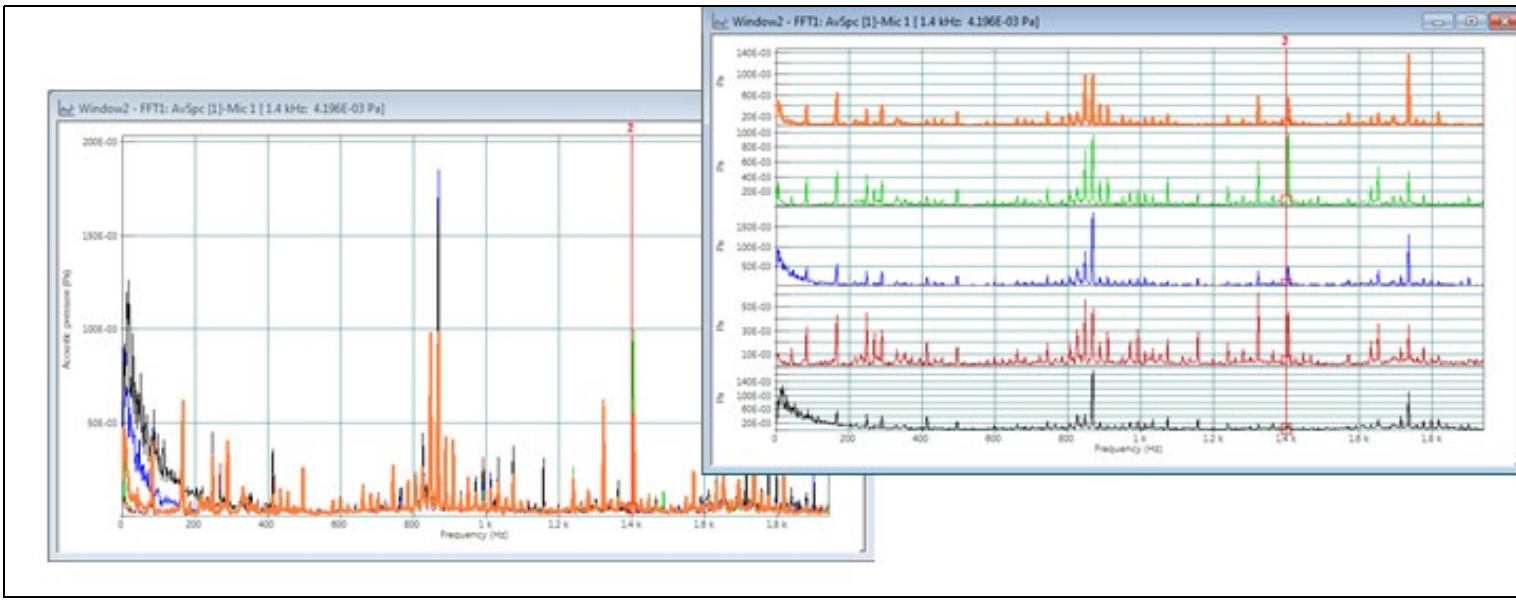
- No grid
- Solid
- Dashed


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).



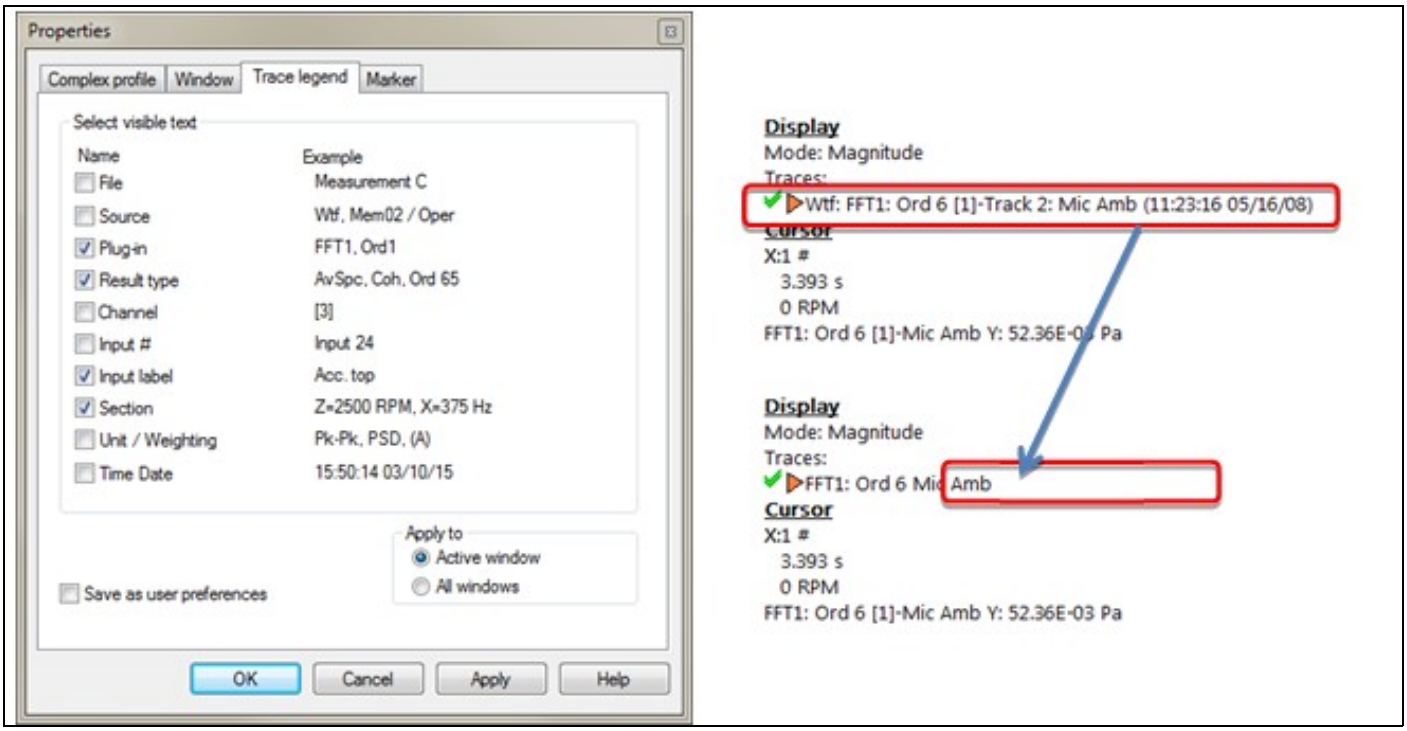
It applies on 2D graphs except the compressed signals view (TDA TimeView, Recorder monitoring, Player signal, zoomed signal and signal preview). Both multi-graphs and multi-trace support this option.

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.

41.1.7.1 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:

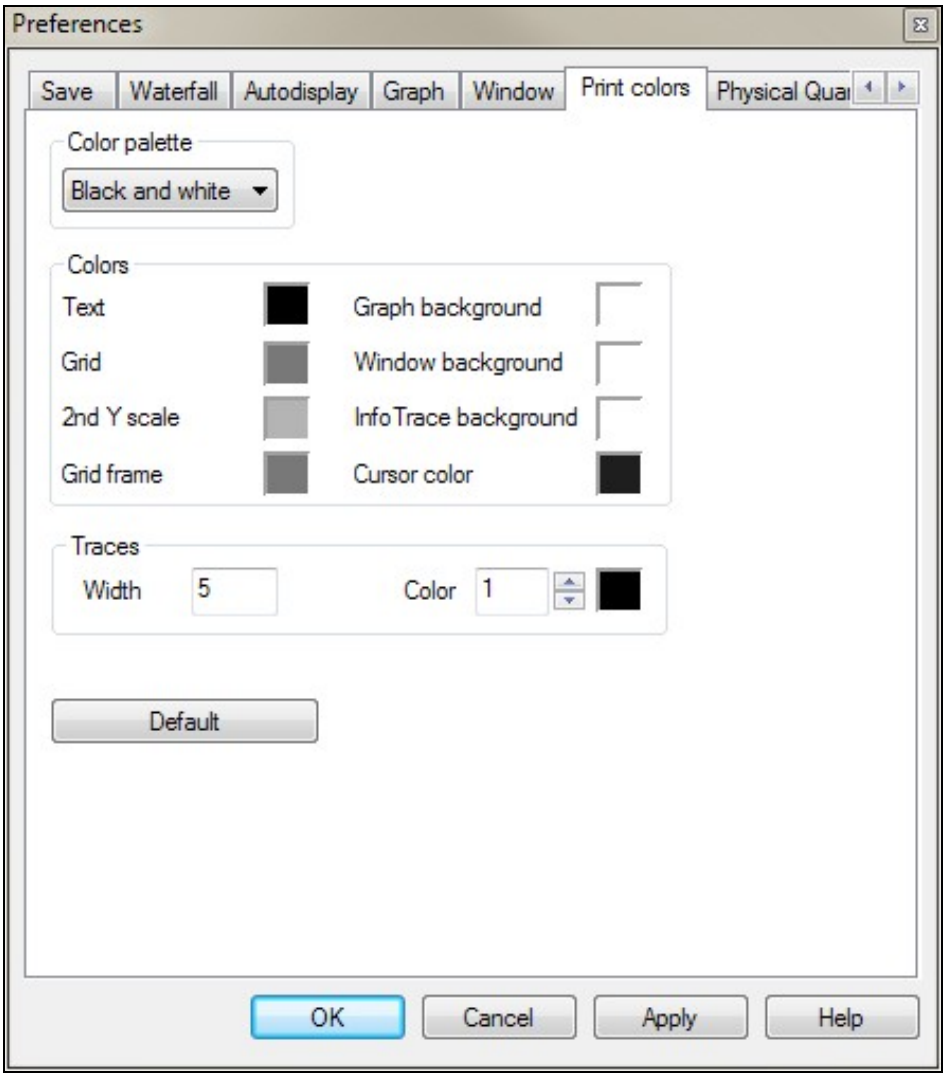


This is accessible from both users' preferences for all new display or locally from the window properties (right click out of the graph) to modify the current window only.

41.1.8 Print colors

This preferences allows setting the way the report or copy/paste out of NVGate are plotted.

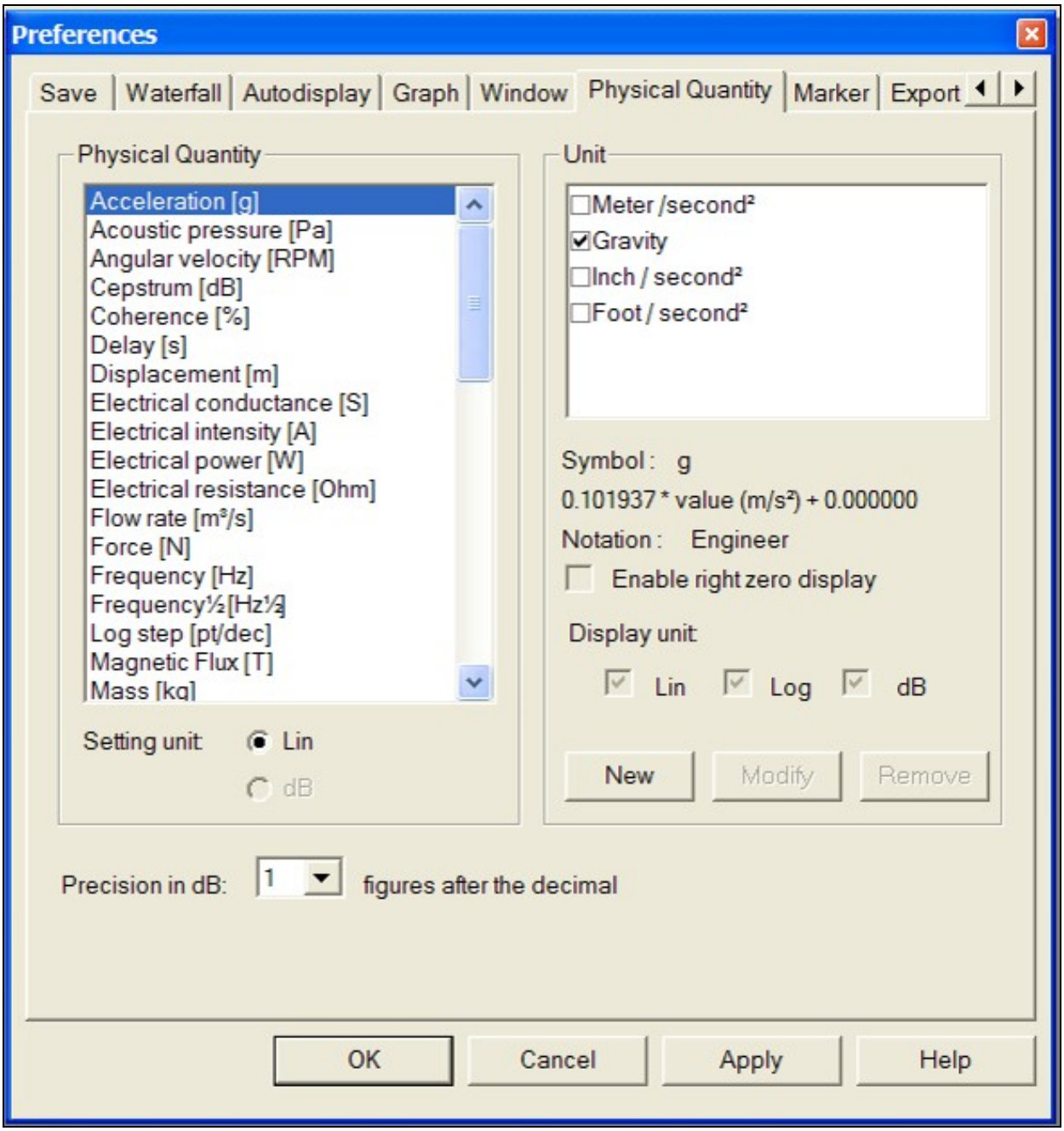
2 palettes are available one for B&W printer the other one for colored export.


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

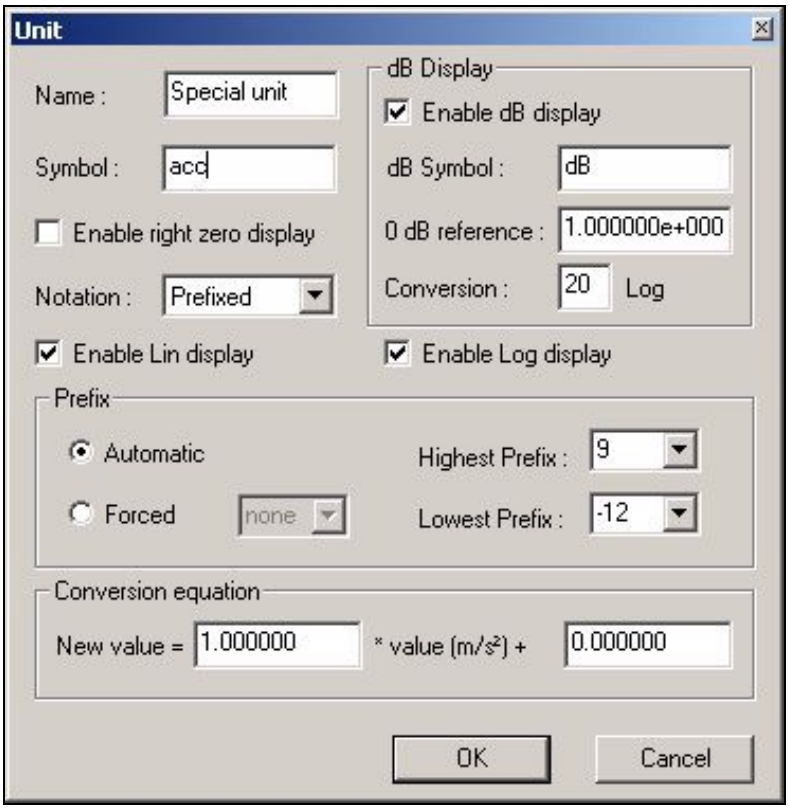
41.1.9 Physical quantity

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/s²

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.

41.1.9.1 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.

41.1.9.1.1 Remove

Use this button to remove the selected unit. Only units created by the user can be removed.

41.1.9.1.2 Precision in dB

General option (applied to every unit) to define the number of figures displayed after the decimal when using dB display.

41.1.9.1.3 FAQ Spare units and physical quantities

41.1.9.1.3.1 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.

41.1.9.1.3.2 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

41.1.9.1.3.3 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.

41.1.9.1.3.4 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

41.1.10 Marker

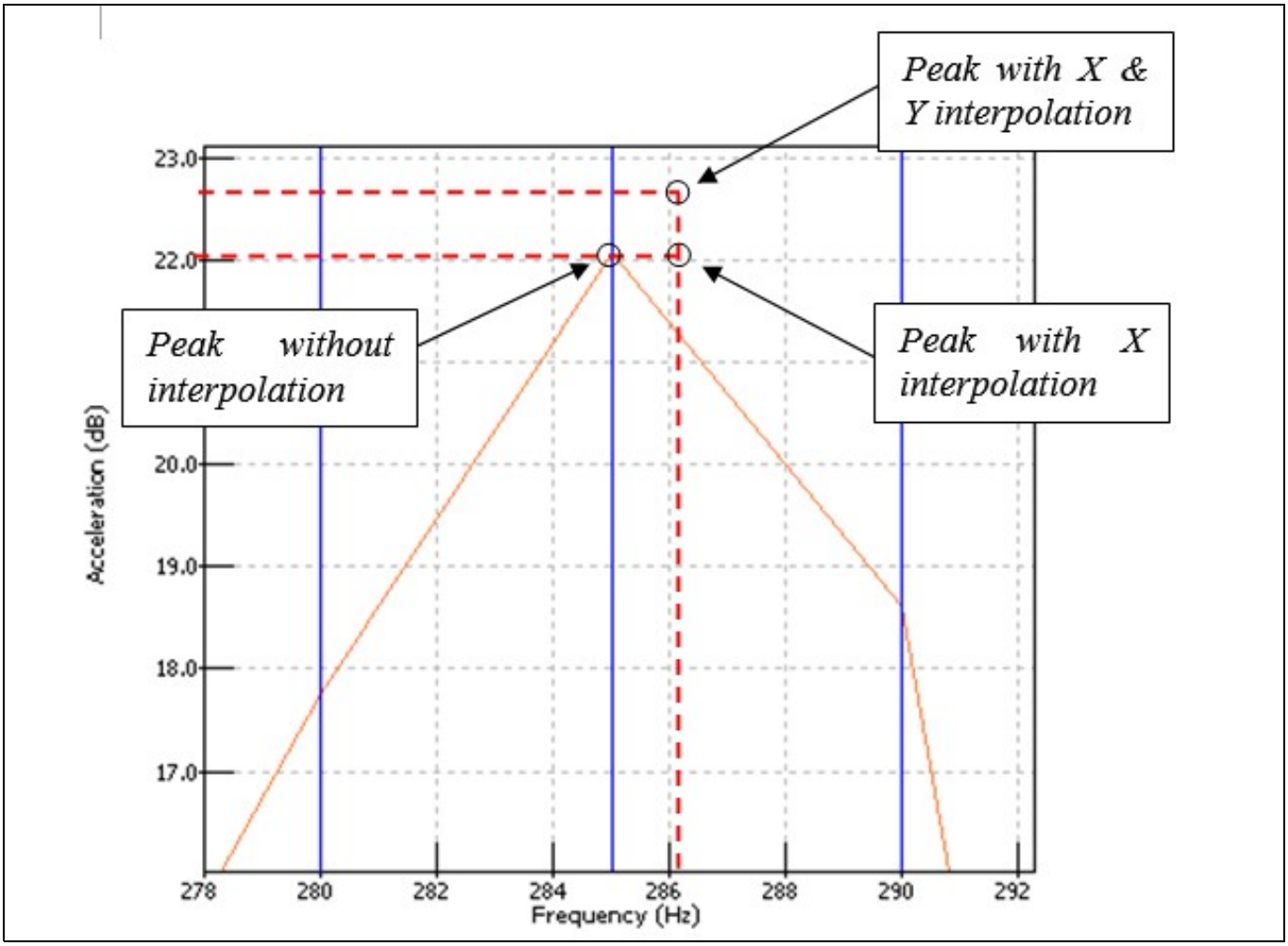
41.1.10.1 Free Marker page

41.1.10.1.1 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.

41.1.10.1.2 Label setup

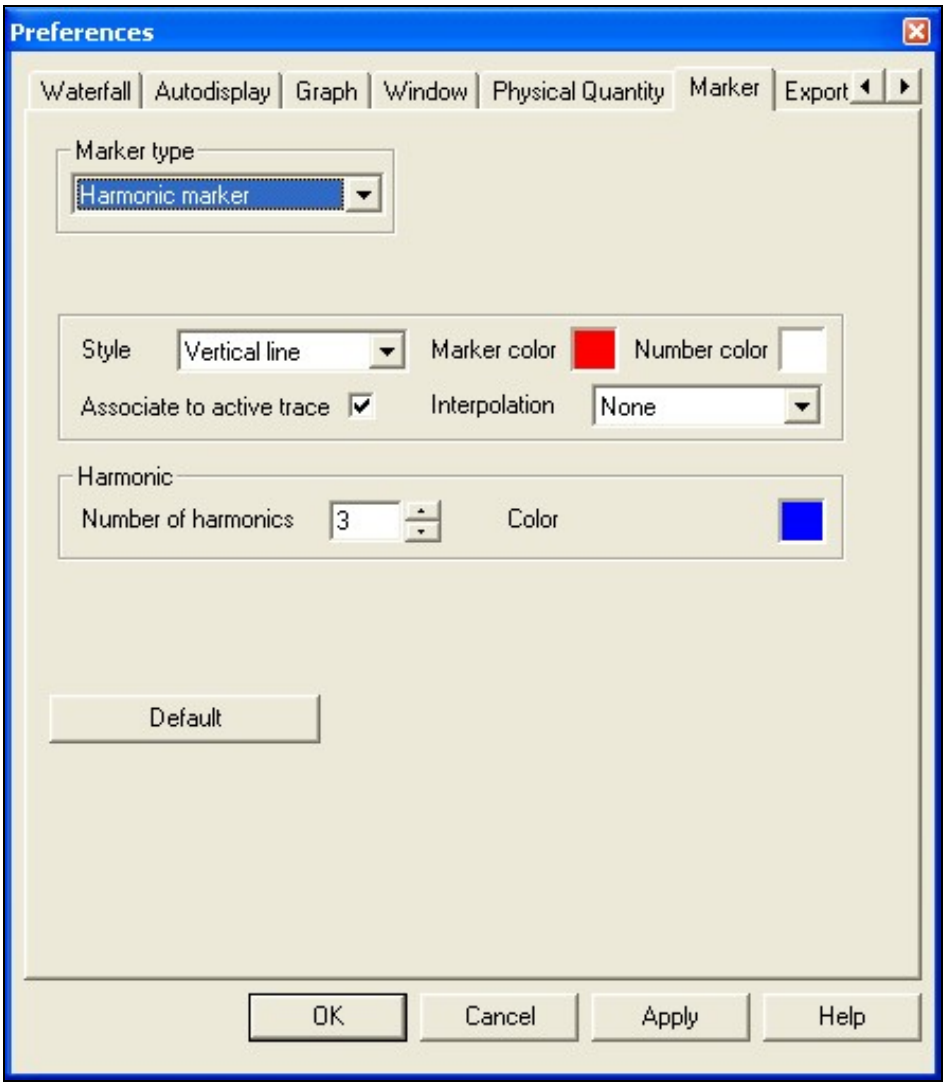
- Text color: Selects label color.
- Background color: Selects label background color.
- Display current position: displays automatically the coordinates of the selected point.

41.1.10.1.3 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".

41.1.10.2 Harmonic marker page

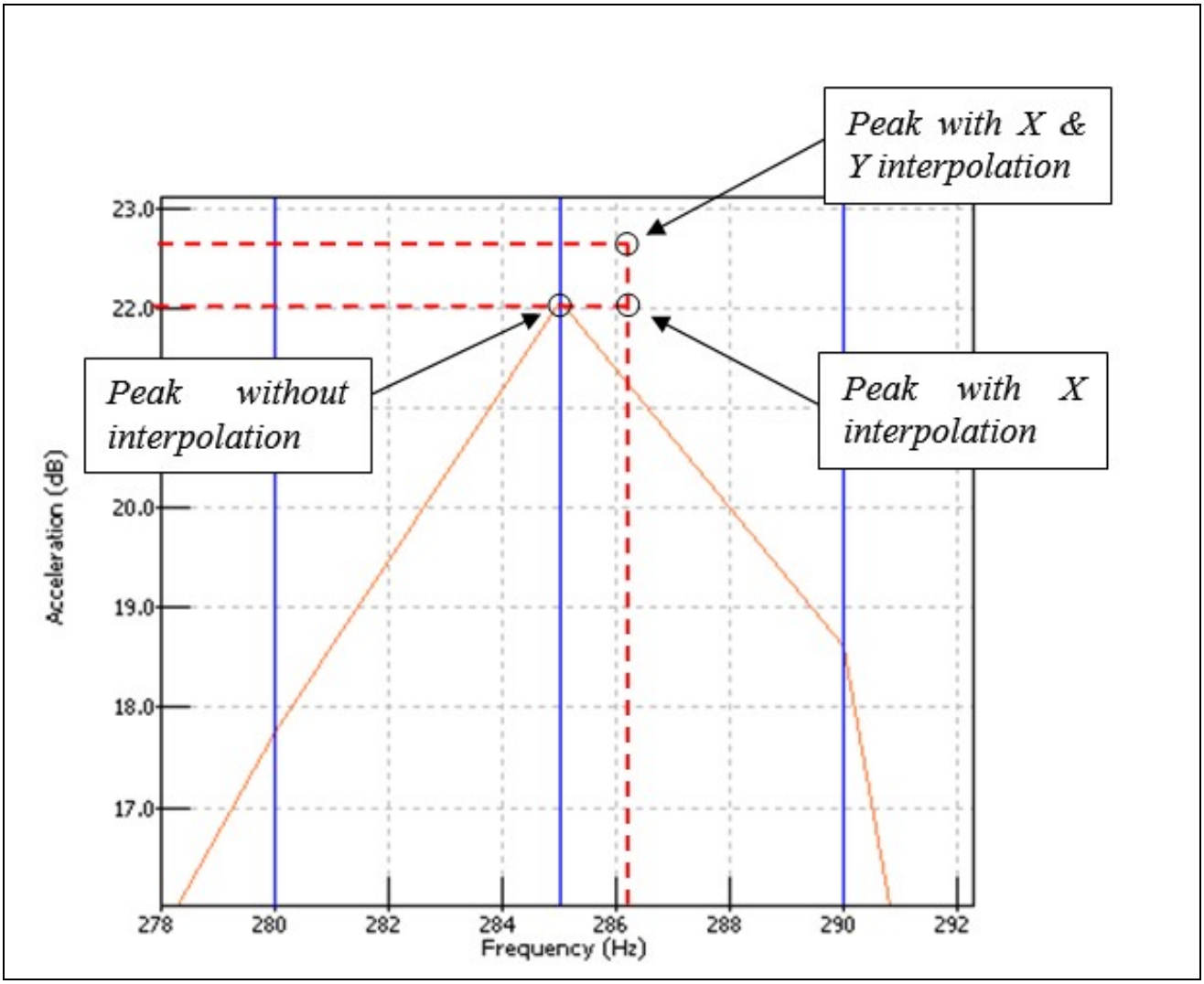


41.1.10.2.1 Style

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.



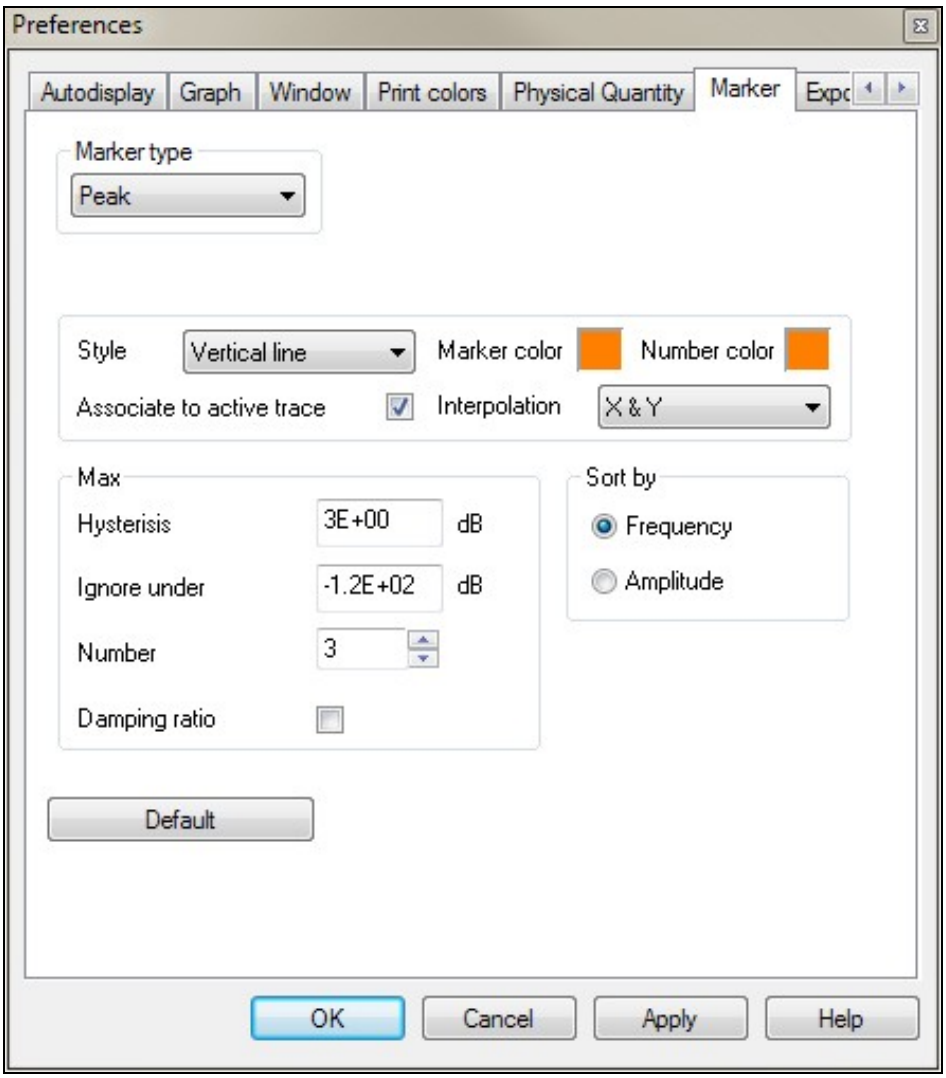
Note: the interpolated values of harmonic markers will be available only if the harmonic marker is placed on a peak. The peak detection criteria are the same as the peak marker adjusted in the User preferences. The marker can be moved by 1/32 step. The x value is computed with the selected weighted window.

41.1.10.2.2 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".

41.1.10.3 Peak marker page

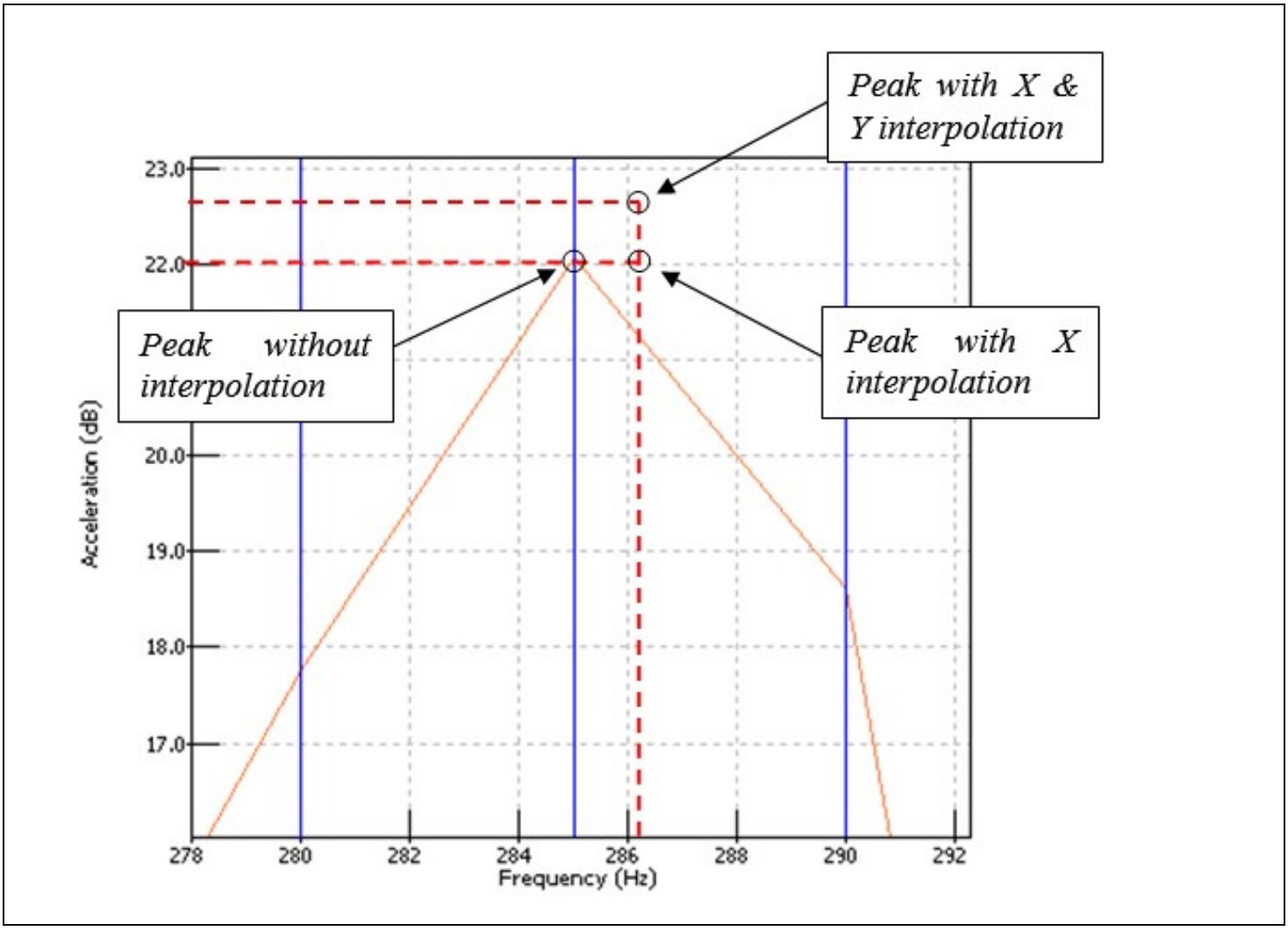


41.1.10.3.1 Style

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.



41.1.10.3.2 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.

41.1.10.3.3 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.

41.1.10.3.4 Find peak algorithm

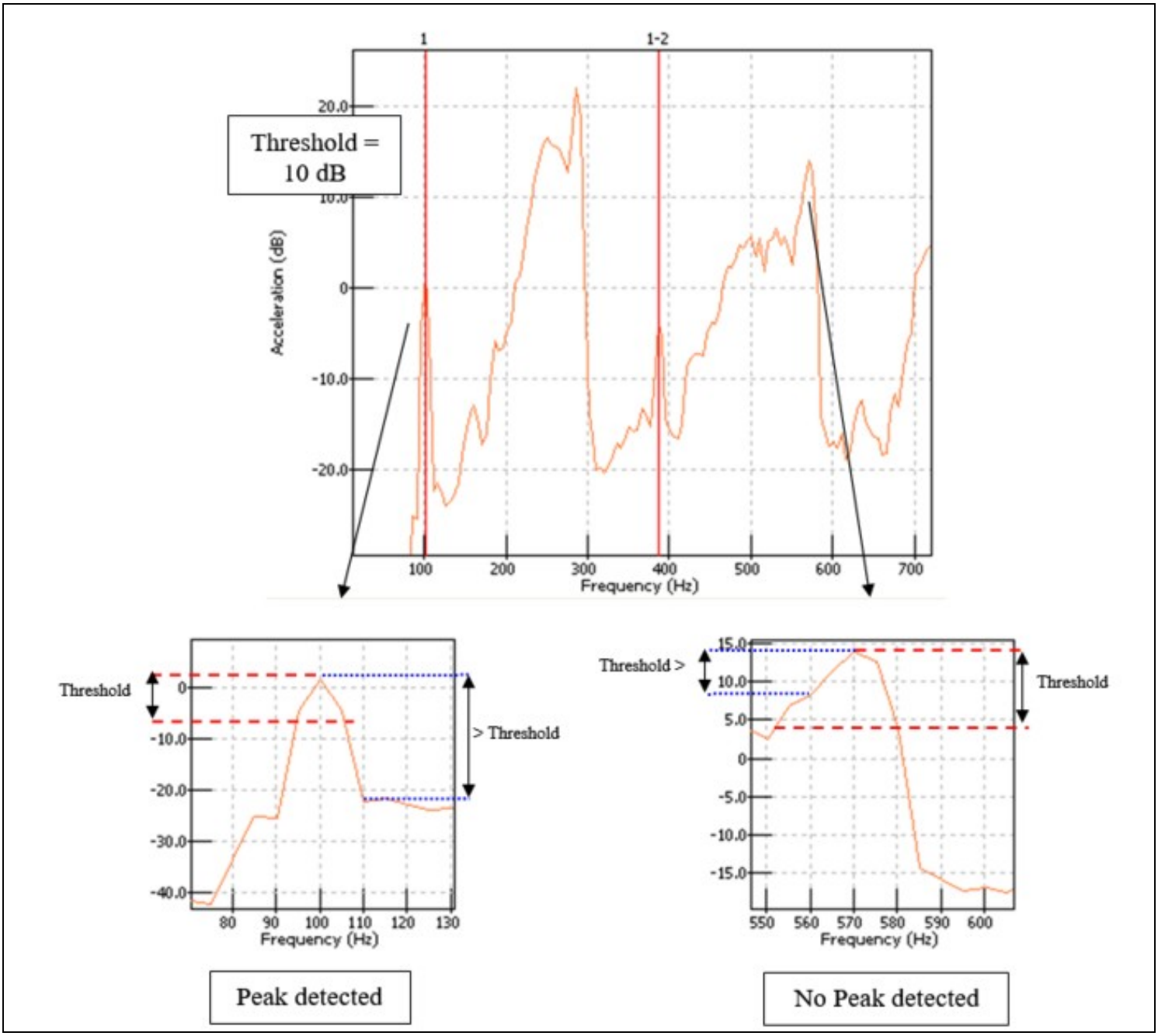
Finding peaks is only available for the Spectrum and Cross Spectrum traces. It looks for the peaks of the selected trace. It can be applied to the current frozen window or to all frozen windows in the workspace.

A spectrum line is detected as a peak if the two following conditions are met:

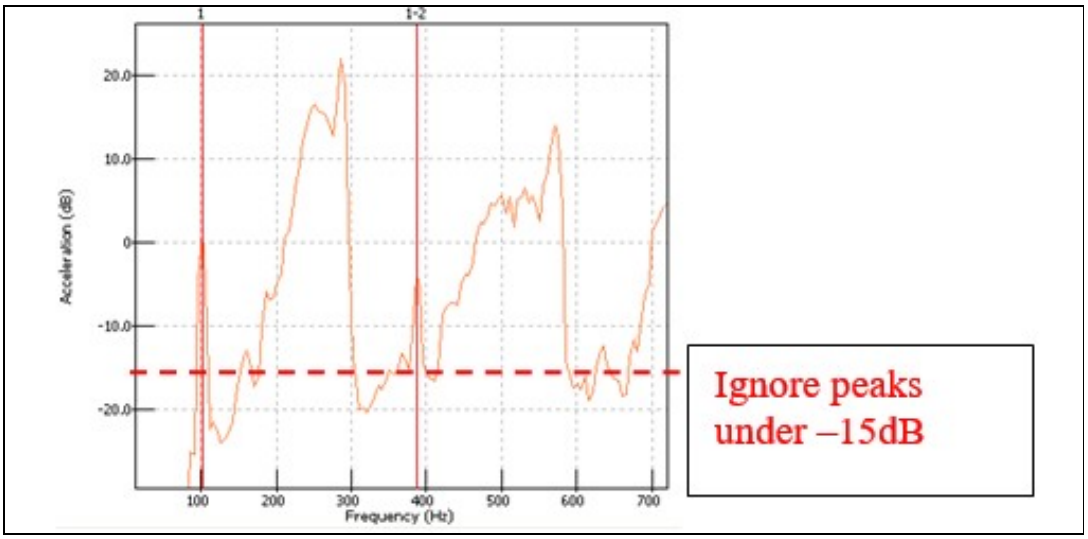
- The two adjacent spectrum line levels are lower than the central spectrum line level.
- The two following spectrum line levels are lower than the central spectrum level minus the peak threshold.

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
10.0
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.



41.1.10.3.5 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:

$$\Delta\omega = bandwitdh\ @(peak\ \_\ amplitude\ -\frac{1}{\sqrt{2}})$$

$$\omega_R = peakfreque\ ncy$$

$$DR = \frac{\Delta\omega}{2\omega_R}$$

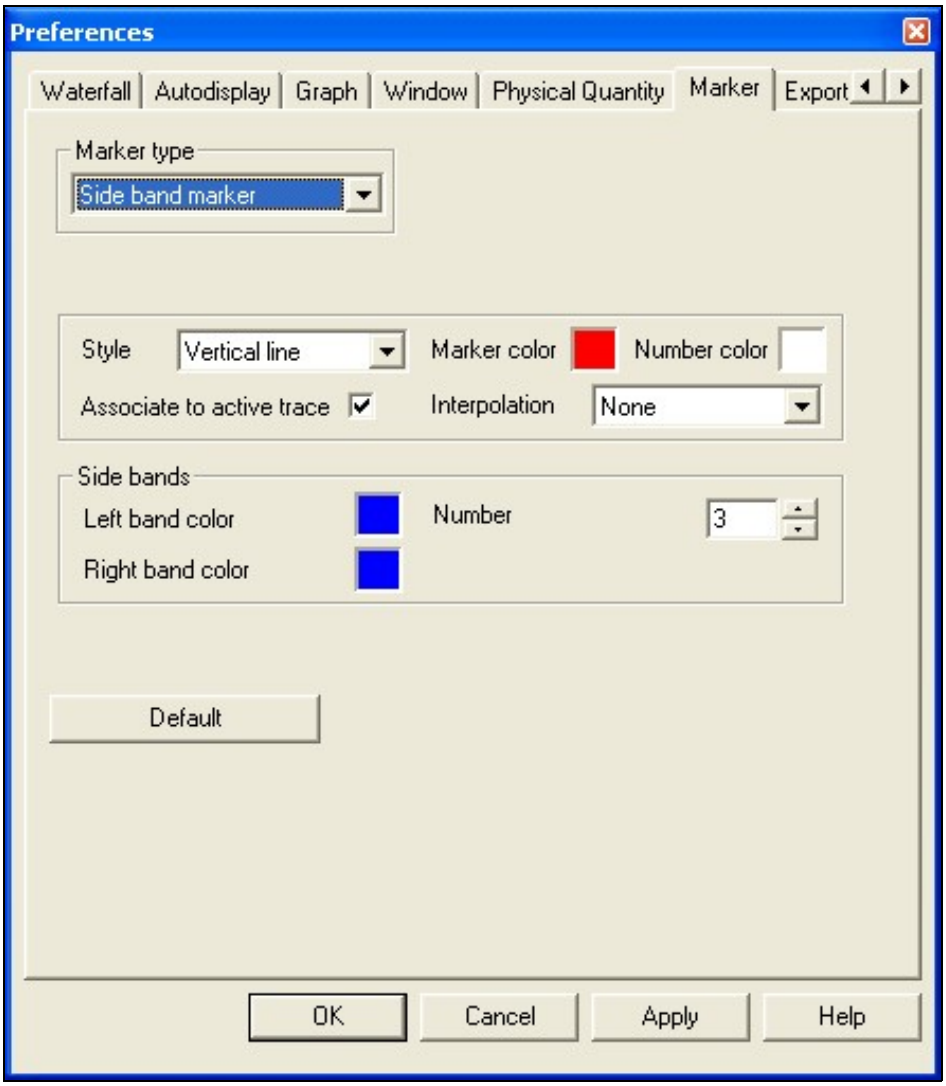
The calculation of the damping factor is activated through the marker properties or preferences.

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".

41.1.10.4 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

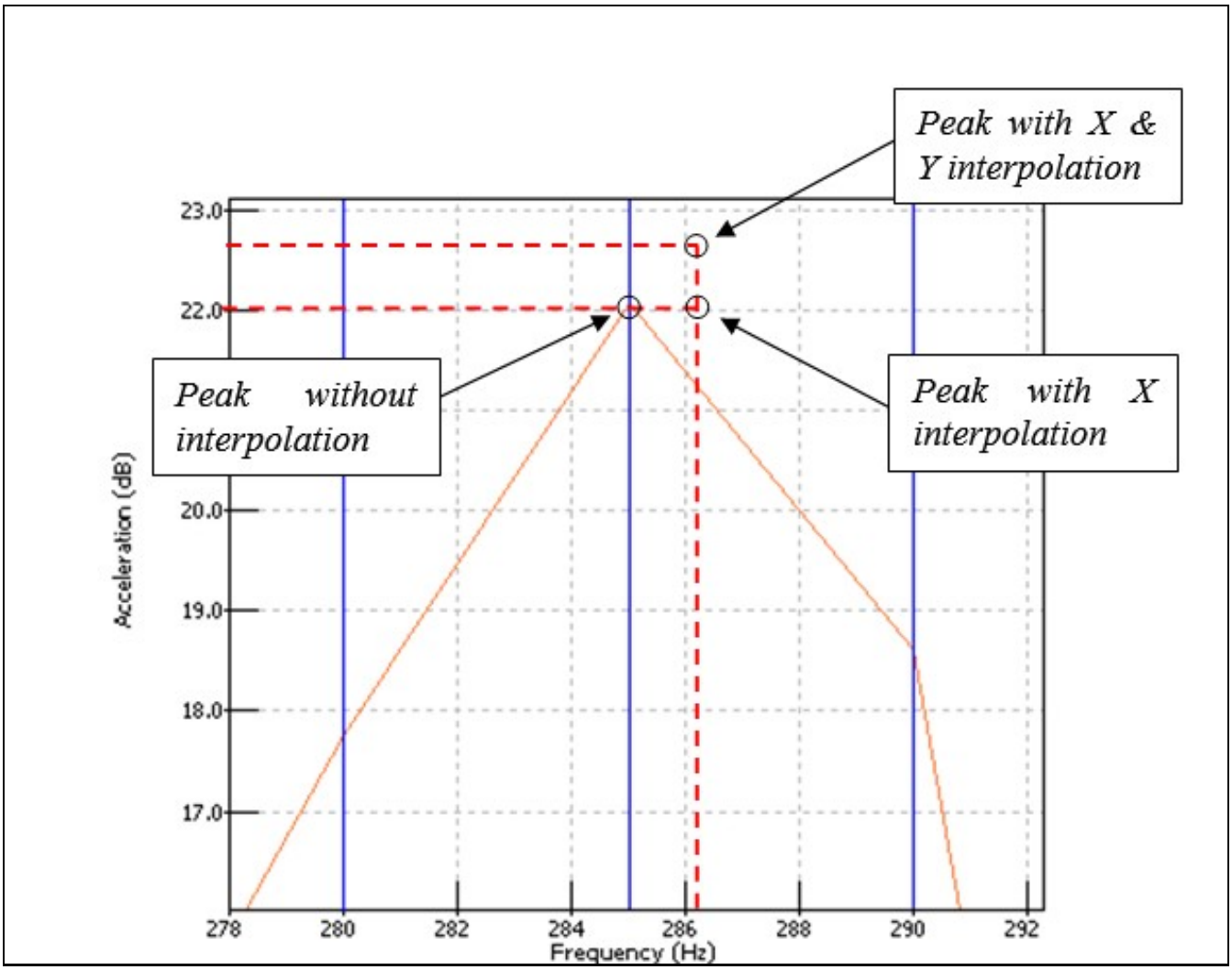
41.1.10.4.1 Style

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

41.1.10.4.2 Marker color

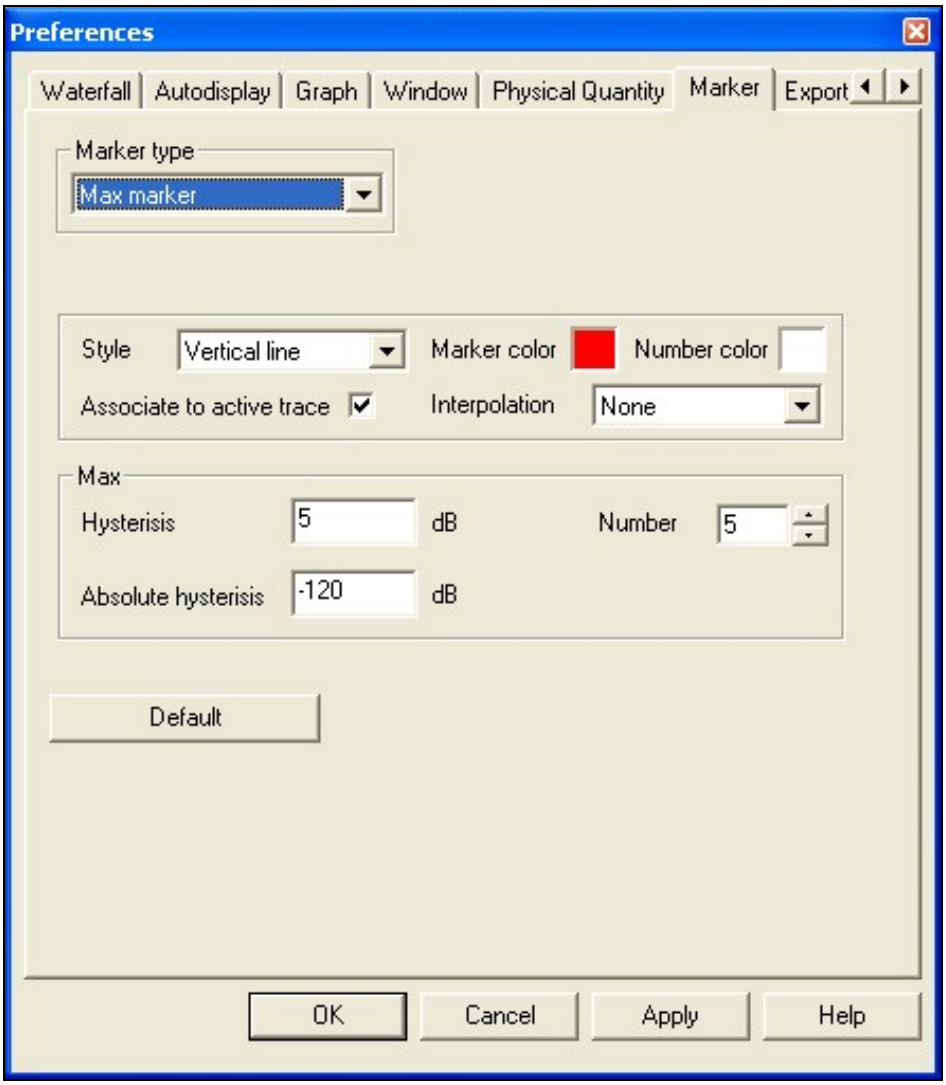
- Number color: Selects the marker color used in the graphical area.
- Associated to active trace: If checked, the marker added will be associated with the active trace: the markers display the values only for the active signal. If not checked, the markers display all the values when not associated with 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.



41.1.10.4.3 Side bands

- Left band color: Selects left band color
- Right band color: Selects right band color
- Number: Selects number of side bands to compute.

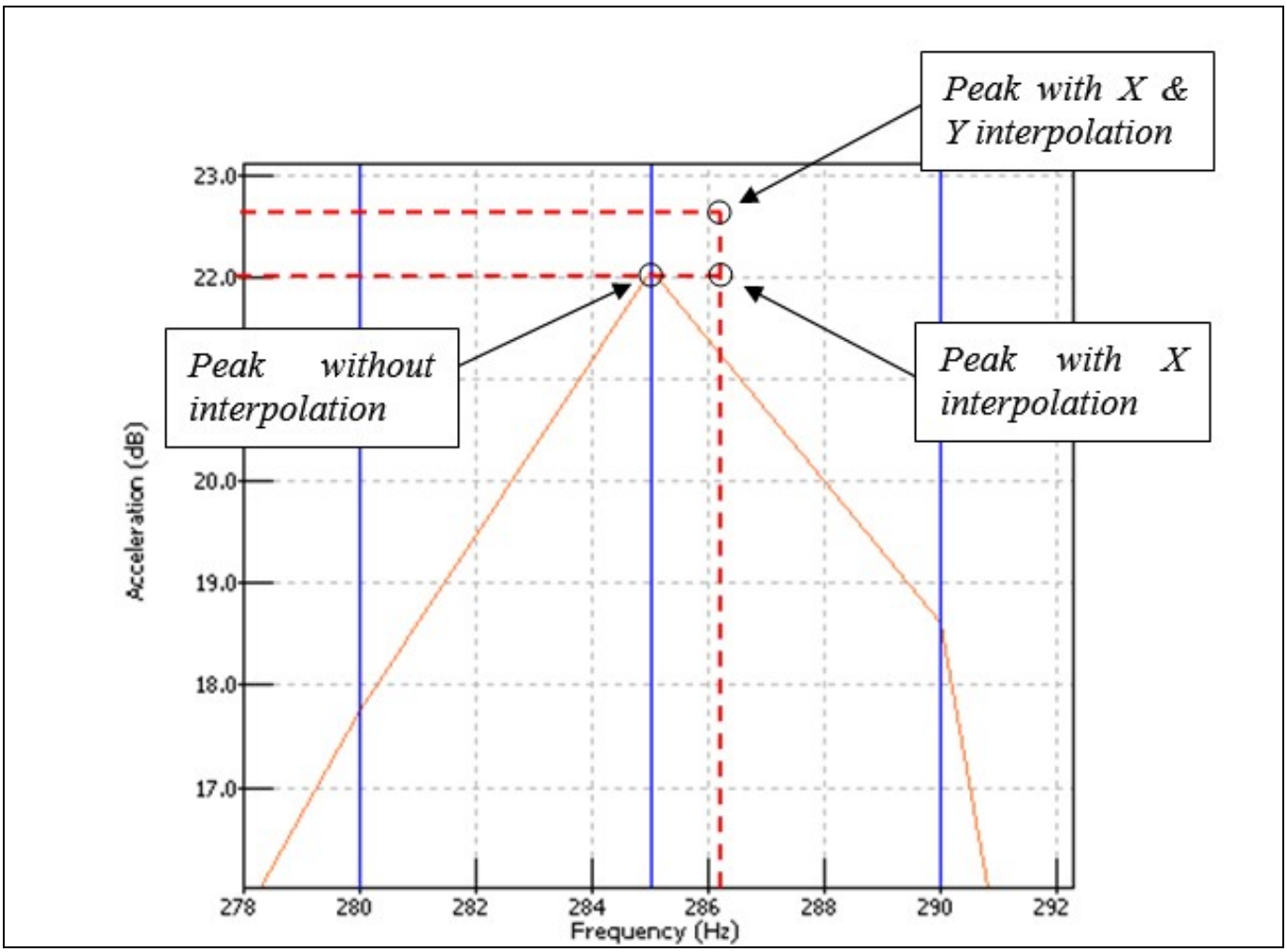
41.1.10.5 Max marker page



41.1.10.5.1 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.



41.1.10.5.2 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.

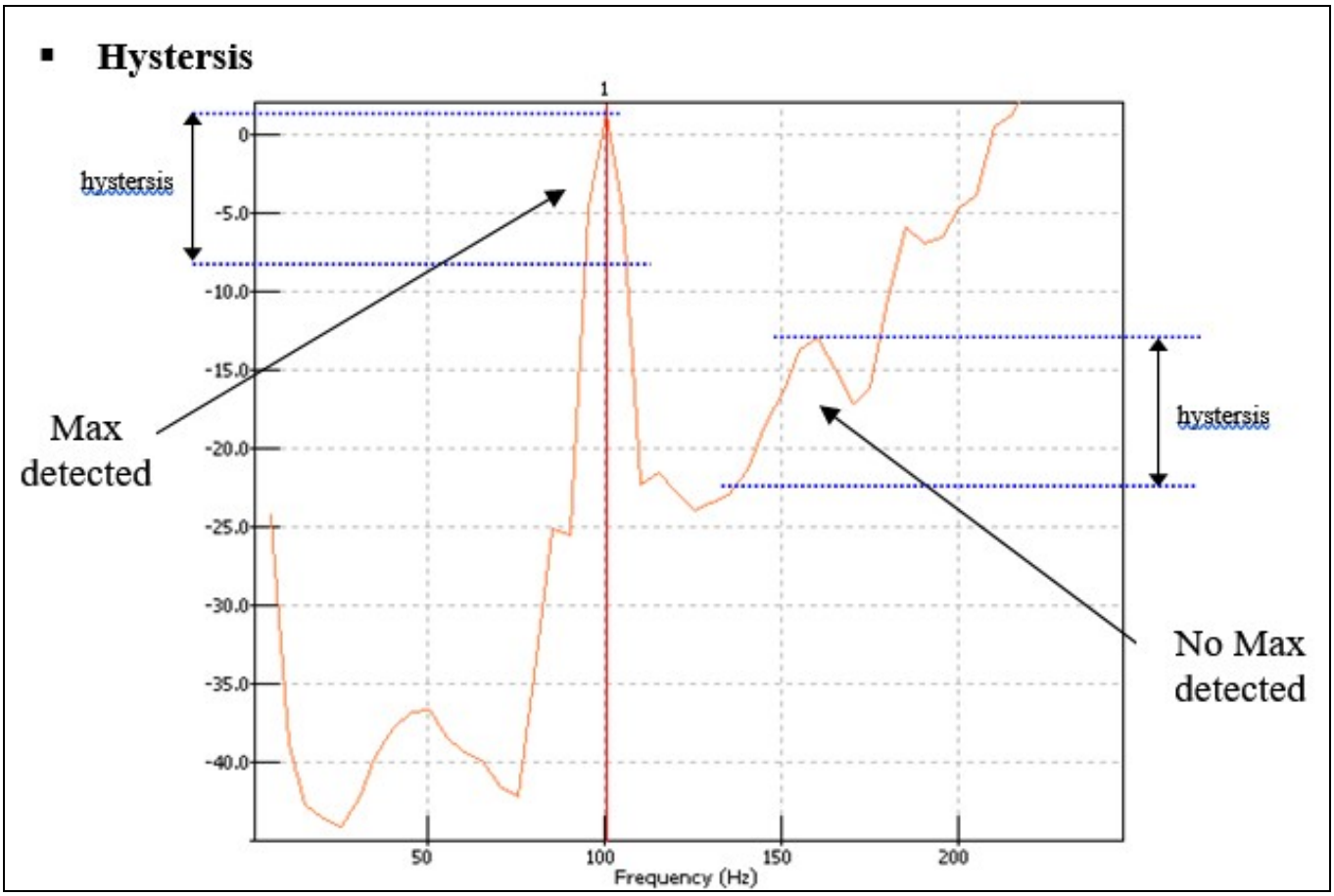
When it is activated an additional column is added in the corresponding marker table.

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".

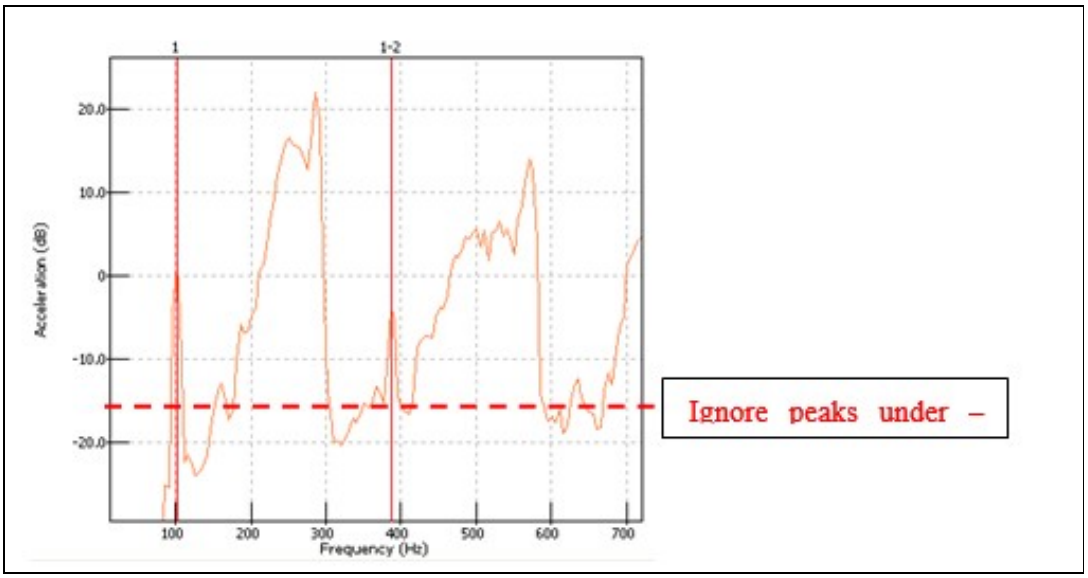
41.1.10.5.3 Find max algorithm

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.

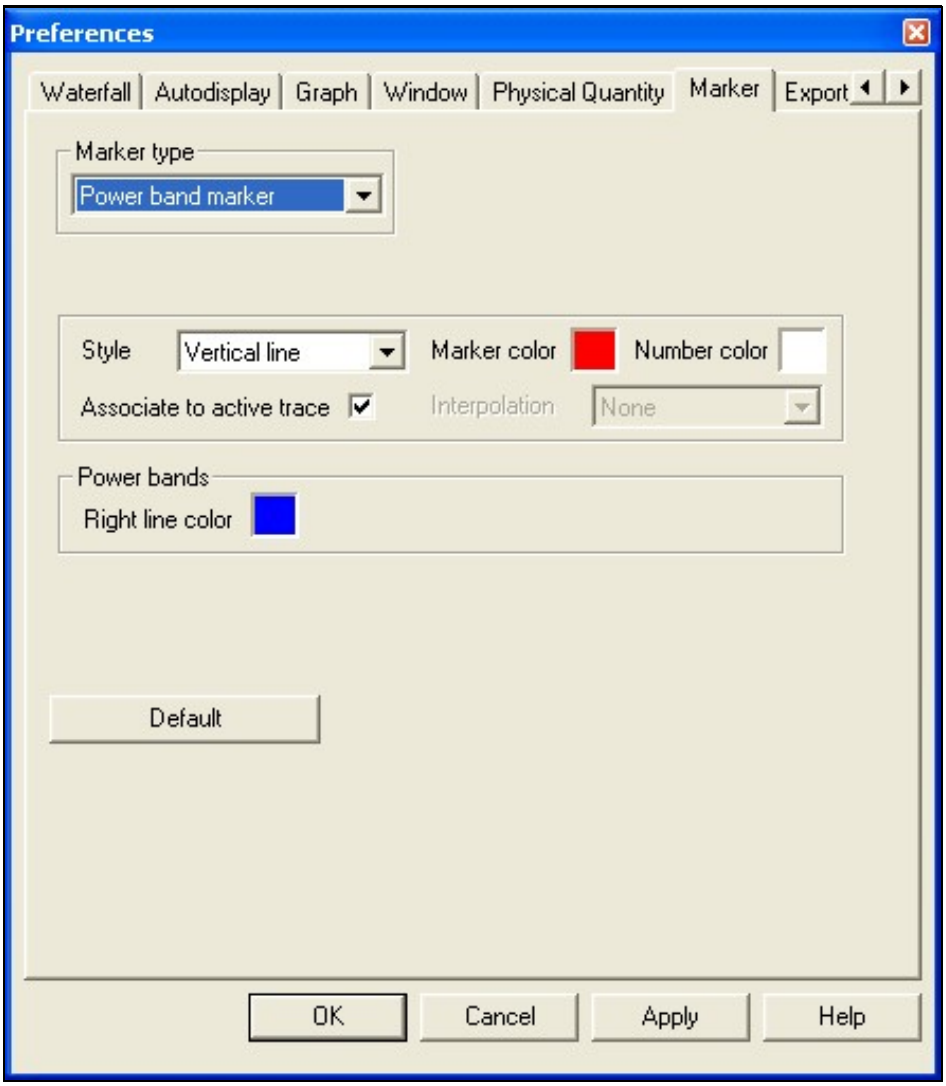


The following diagram shows how the maxima are searched for different maximum threshold values. In the first figure, the maximum threshold allows to find 2 maximum while in the second figure a larger maximum threshold found only one maximum.

- 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



41.1.10.5.4 Style

Selects marker drawing style used in graphical area. The available marker drawing styles are:

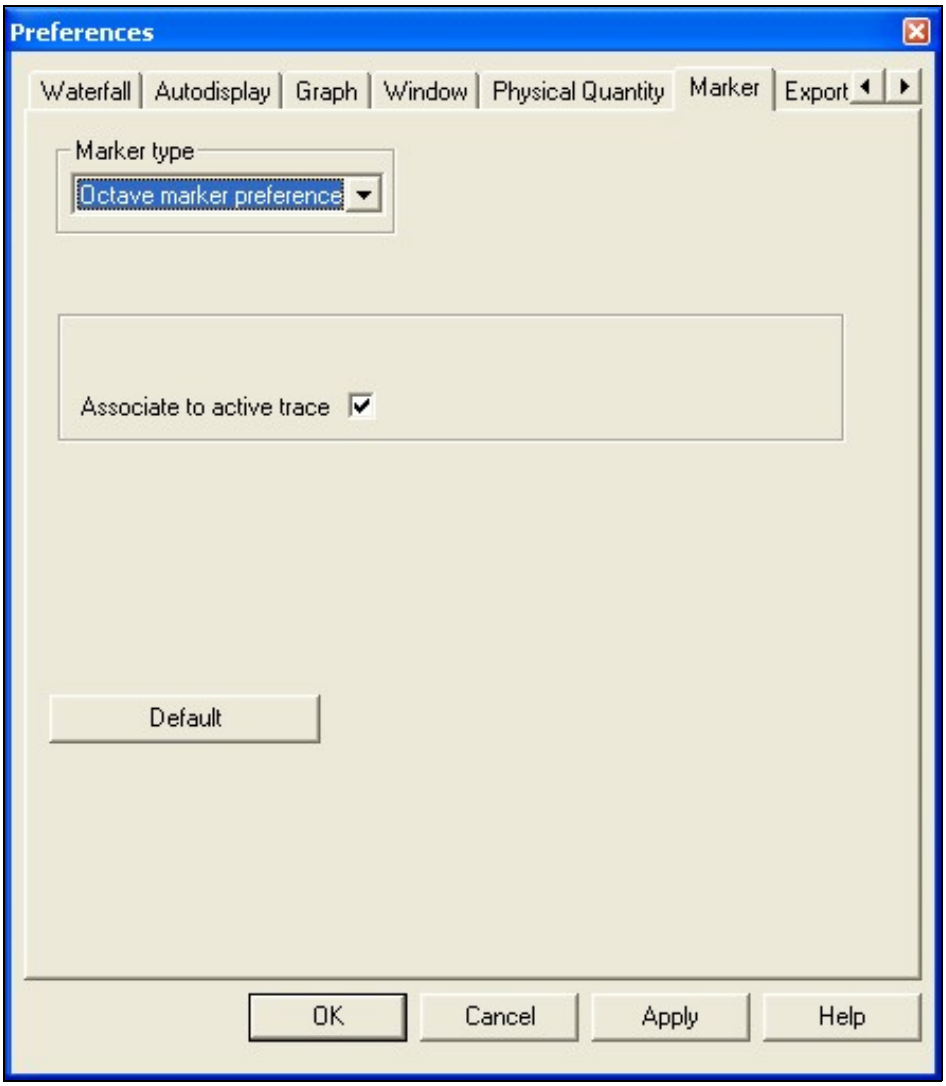
- Vertical line
- Vertical dashed line
- Vertical with rectangle
- Cross-hair
- Vertical + Horizontal

- 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.

41.1.10.5.5 Power bands

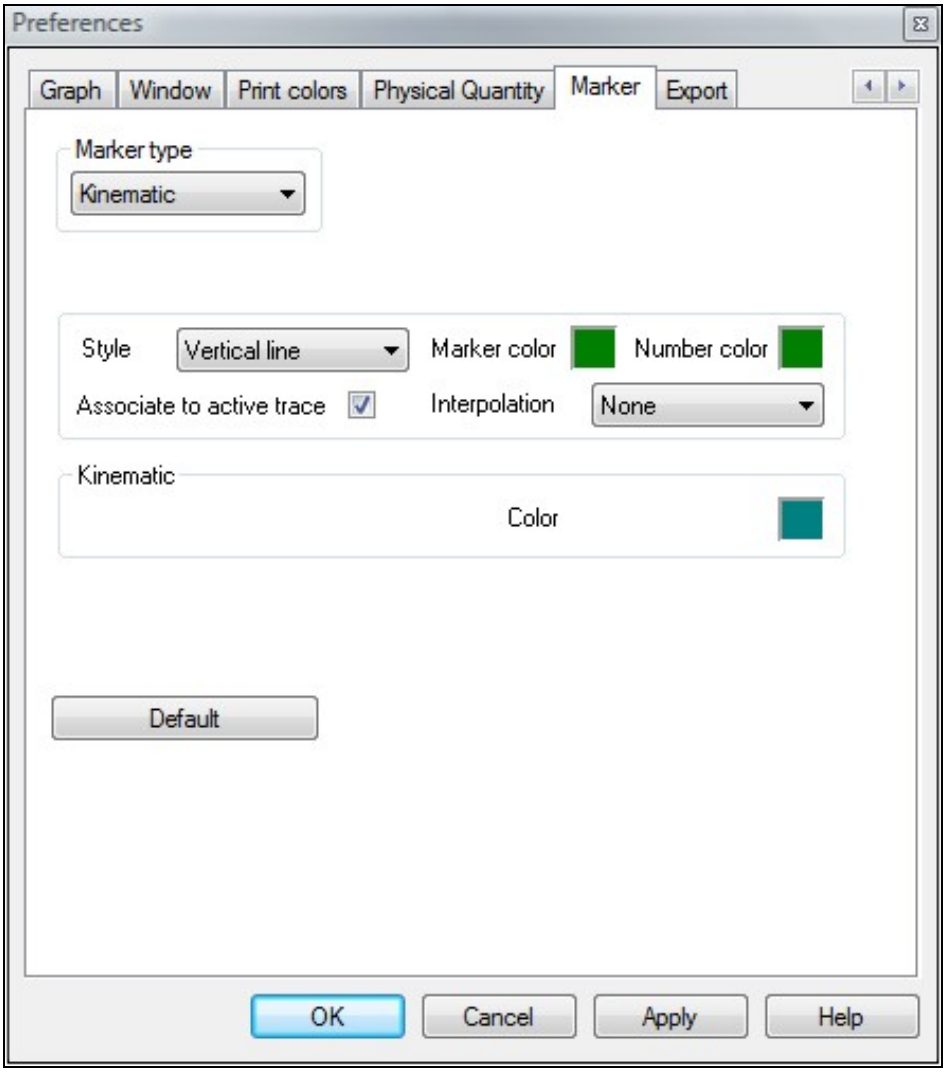
- Right line color: Selects right line color.

41.1.10.5.6 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.

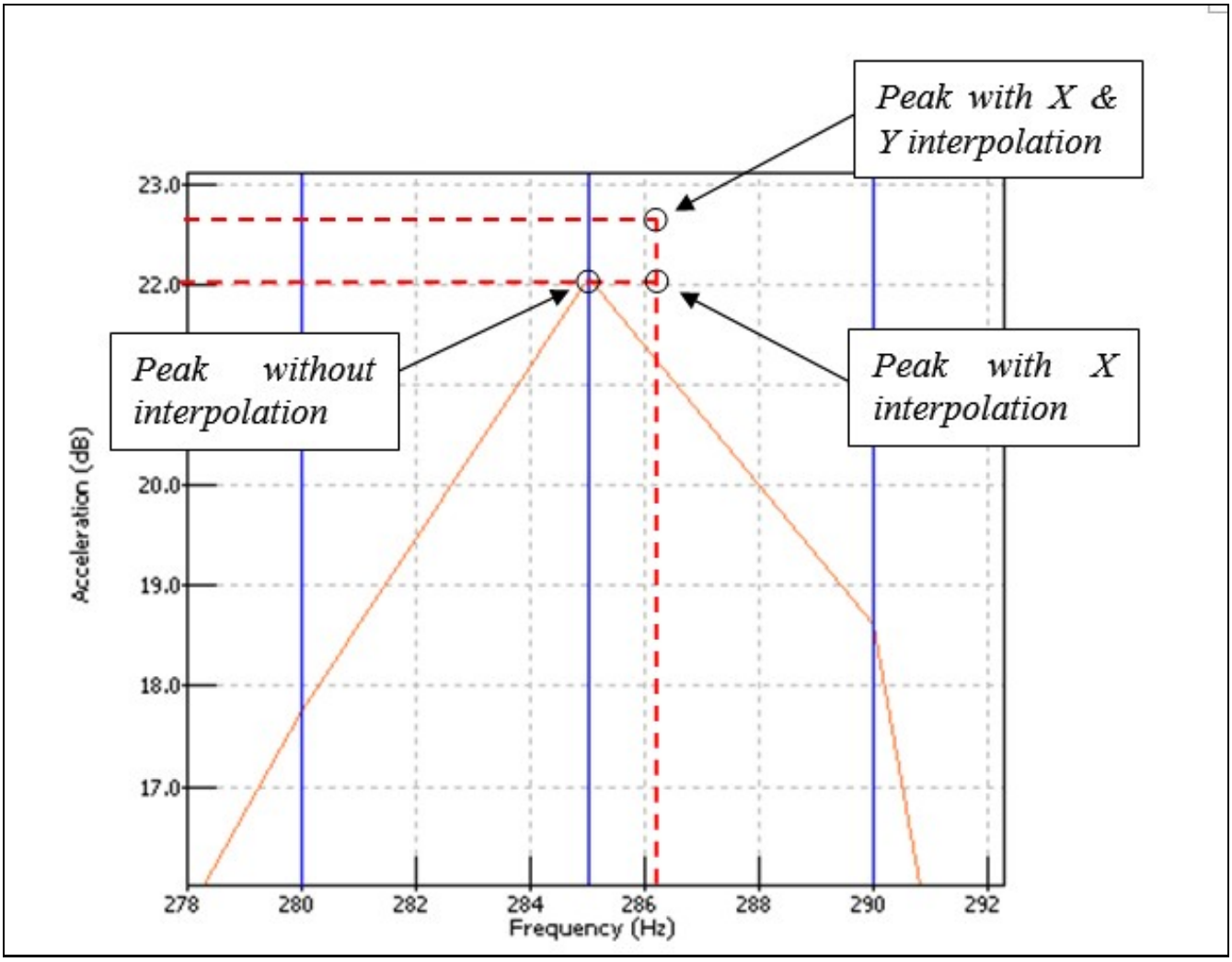
41.1.10.5.7 Kinematic marker page



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.



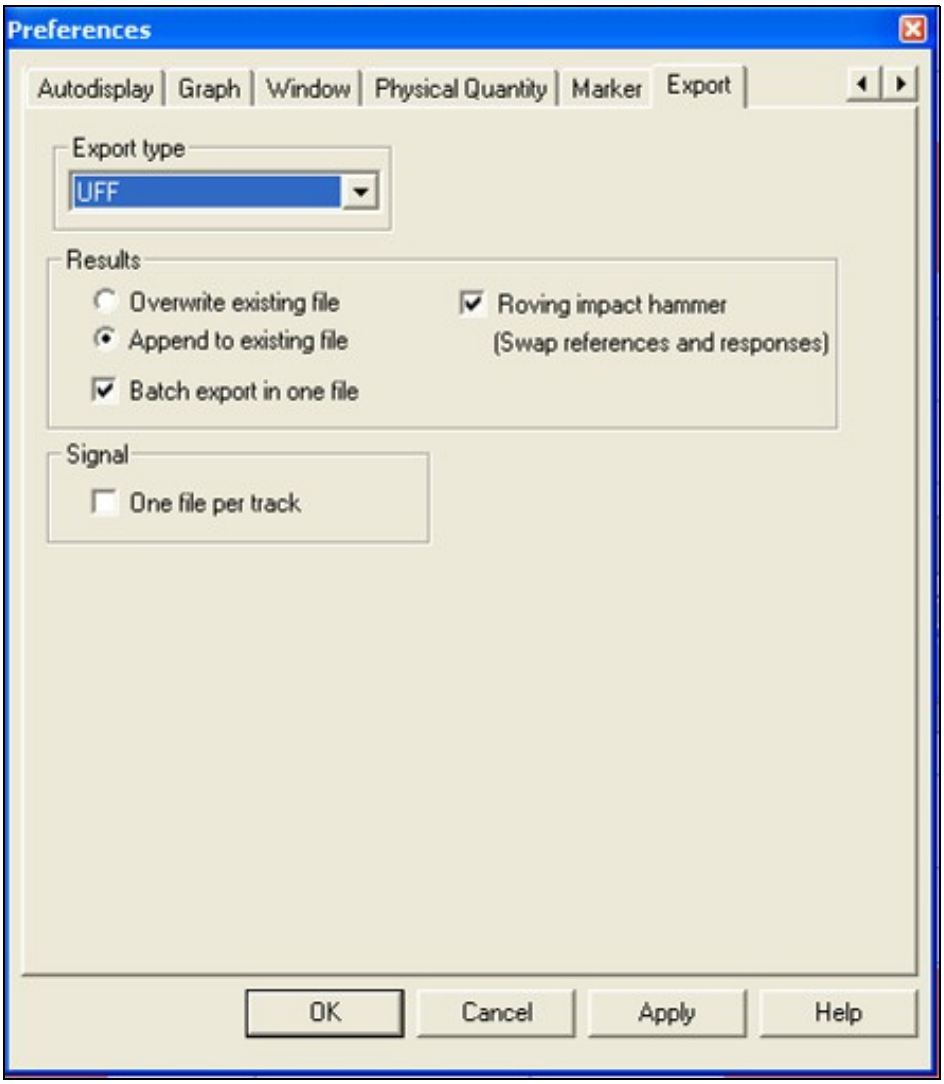
Note: the interpolated values of harmonic markers will be available only if the harmonic marker is placed on a peak. The peak detection criteria are the same as the peak marker adjusted in the User preferences. The marker can be moved by 1/32 step. The x value is computed with the selected weighted window.

41.1.11 Export

This function is used to configure the way data is converted to a specified format.

41.1.11.1 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.

41.1.11.1.1 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.

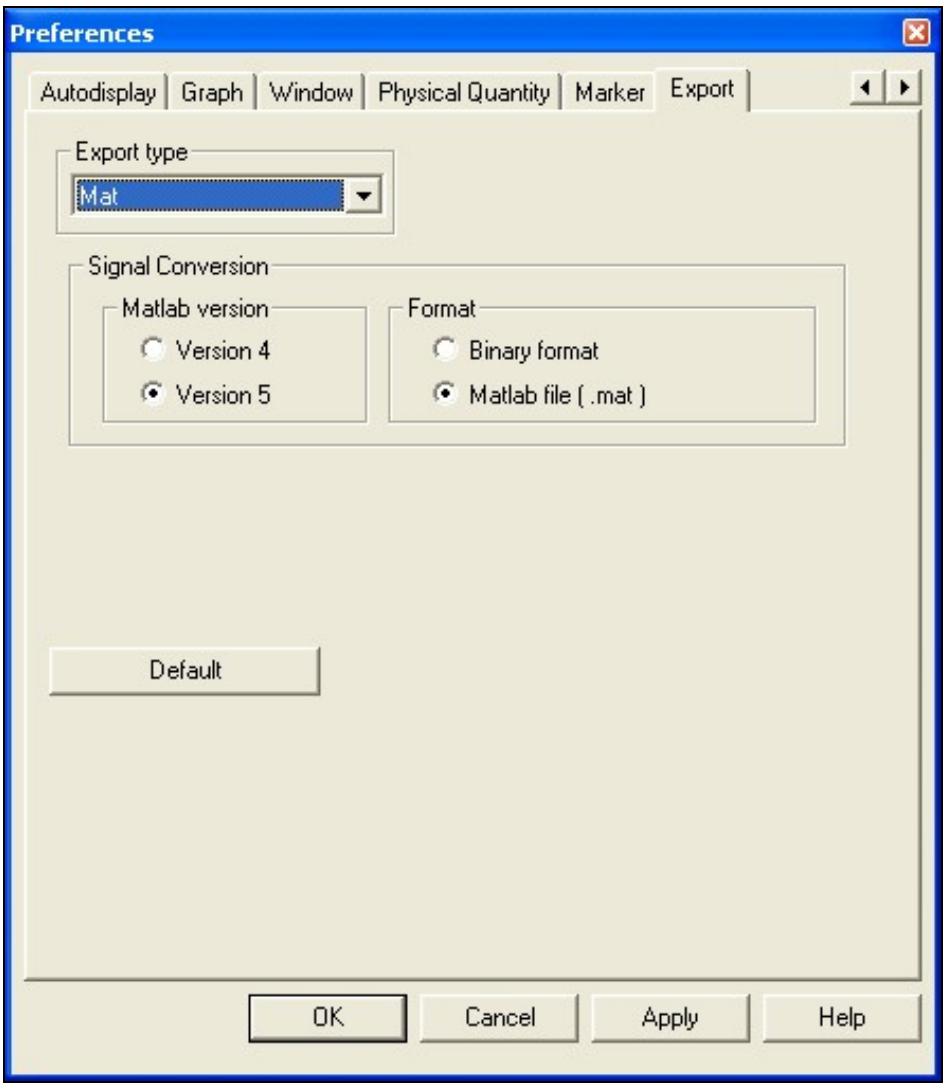
41.1.11.1.2 Signal

- 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".

41.1.11.2 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.



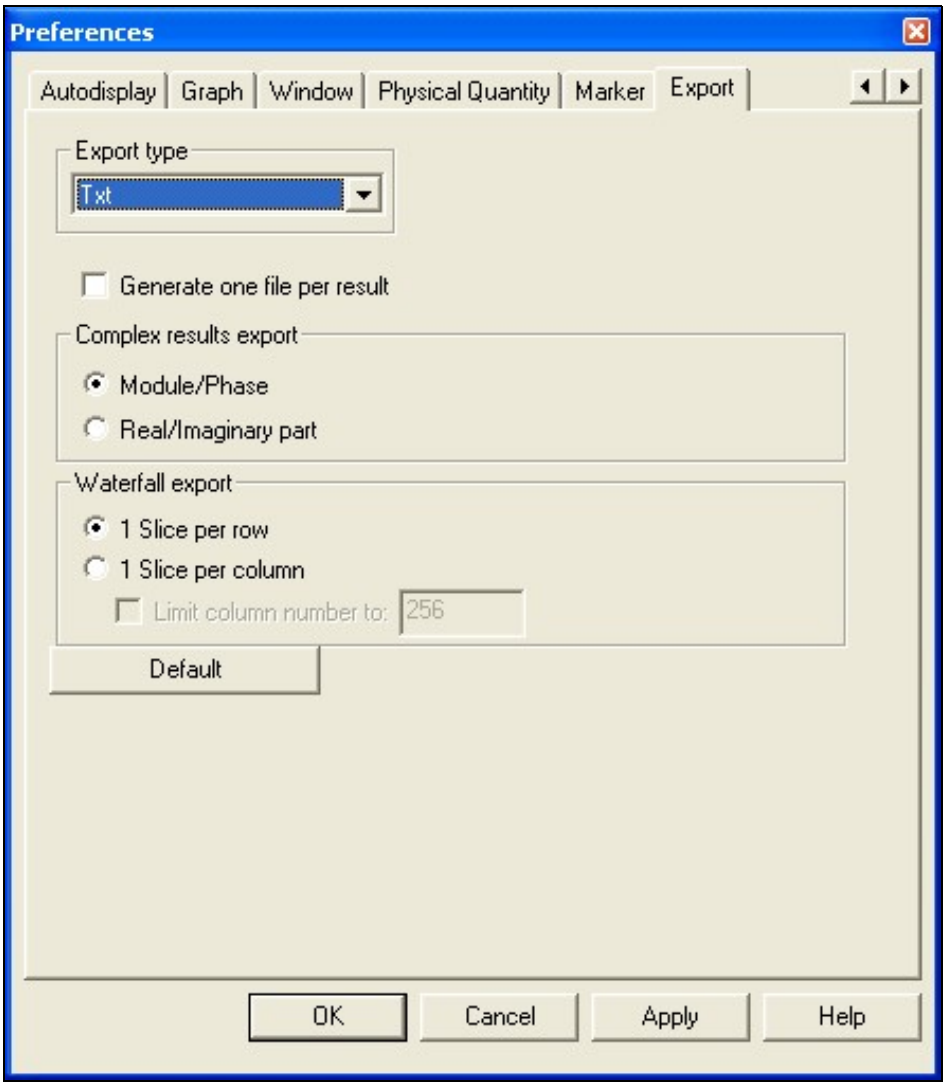
41.1.11.2.1 Matlab version

Used to select the matlab version of the created file. Refer to your installed version to find out which version you should select.

41.1.11.2.2 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.

41.1.11.3 Txt



41.1.11.3.1 Generate one file per track

When a result file is converted to txt, every result is exported to a dedicated file.

41.1.11.3.2 Complex results export

- Module/Phase: Complex result are in the Module / phase format.
- Real/Imaginary part: Complex results are in Real / Imaginary part format.

41.1.11.3.3 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).

41.1.11.3.4 .txt description format

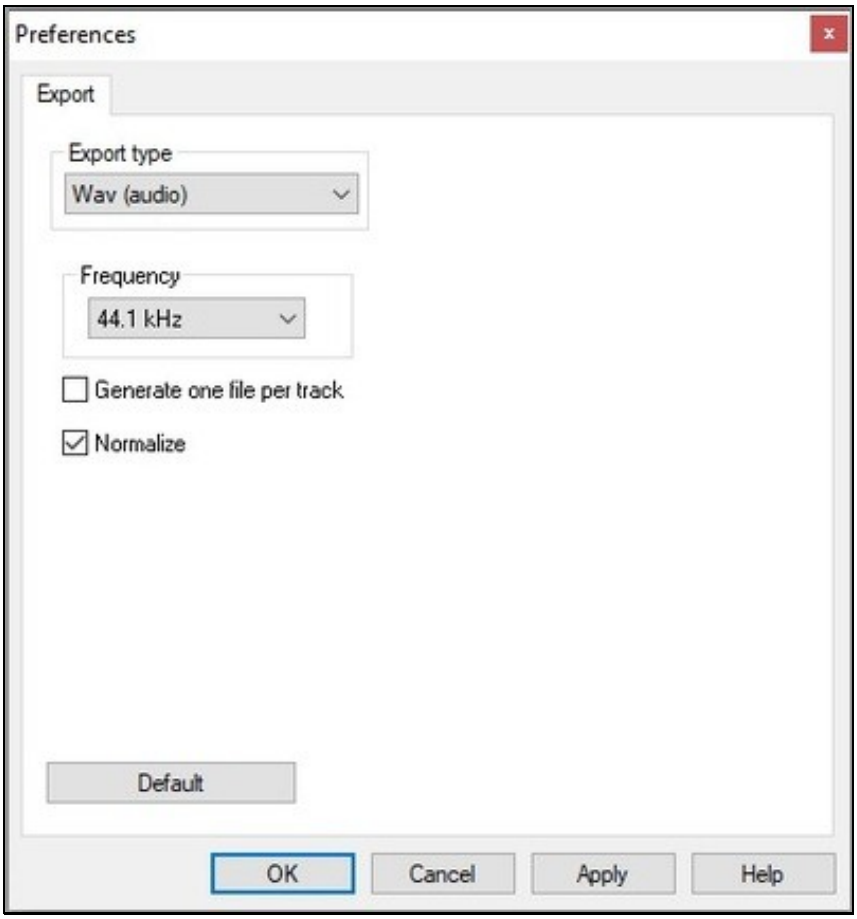
See this page

41.1.11.4 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

41.1.11.4.1 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.

41.1.11.4.2 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.

41.1.11.4.3 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]

42 NVGate Virtual Input

42.1 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…

42.1.1 Channel

Each channel represents an operand for the operators. Each channel applies a polynomial to the input signal and a filter.

$$Channel_c = (Filter(Input) \times A_c + B_c)^{P_c}$$

- **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 :

$(A*i+B)^{\mathbf{P}}$

42.1.2 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 :

$(A*Op+B)^{\mathbf{P}}$

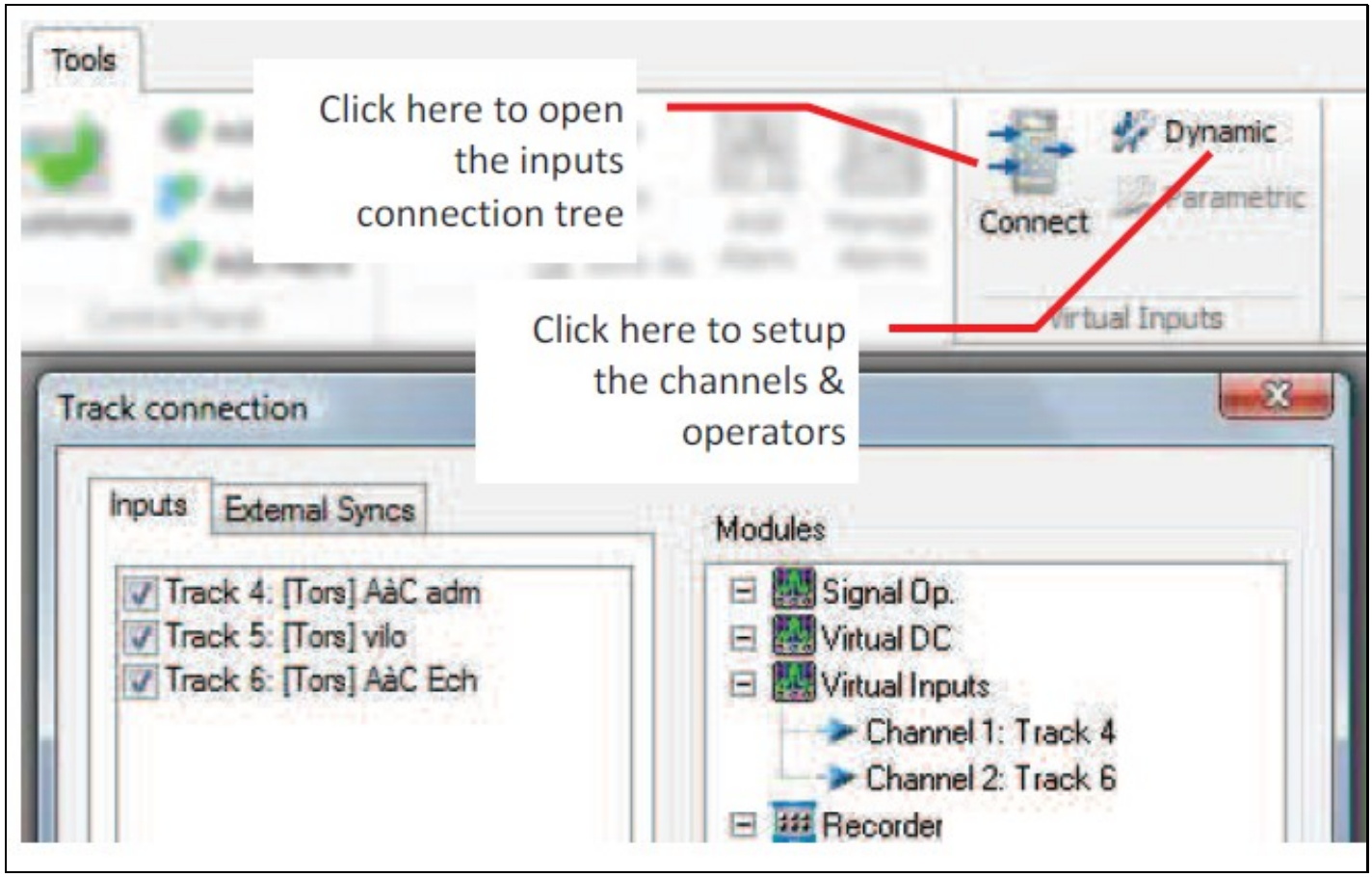
Note: if the software is able to solve the dimension formula between the channels and the operator (including the coef/offset/power), the output magnitude will be automatically applied. If not, the output will be proposed in Volts.

42.1.3 Twist

Read torsional page

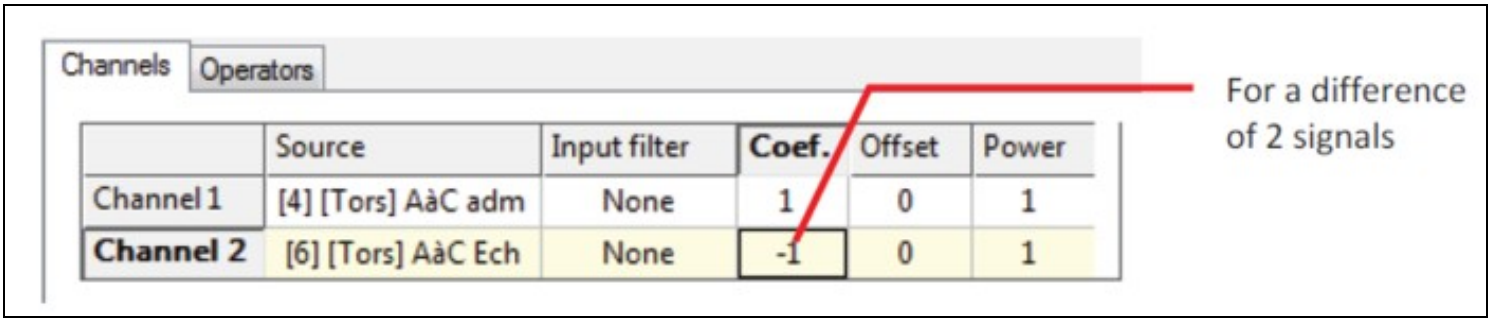
42.1.4 Tutorial

- First connect the tracks on the virtual inputs plug in.



- For each channel, you can apply this equation :

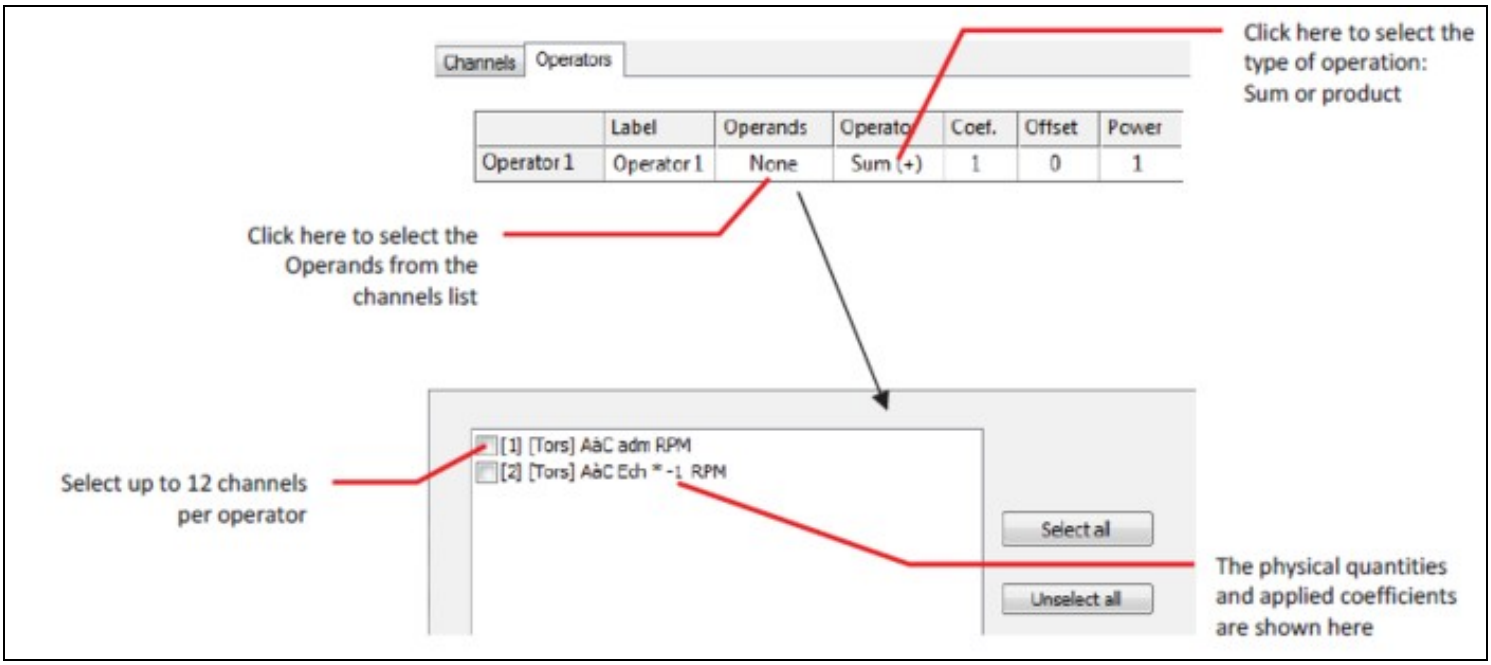
$$Channel_c = (Filter(Input) \times A_c + B_c)^{P_c}$$



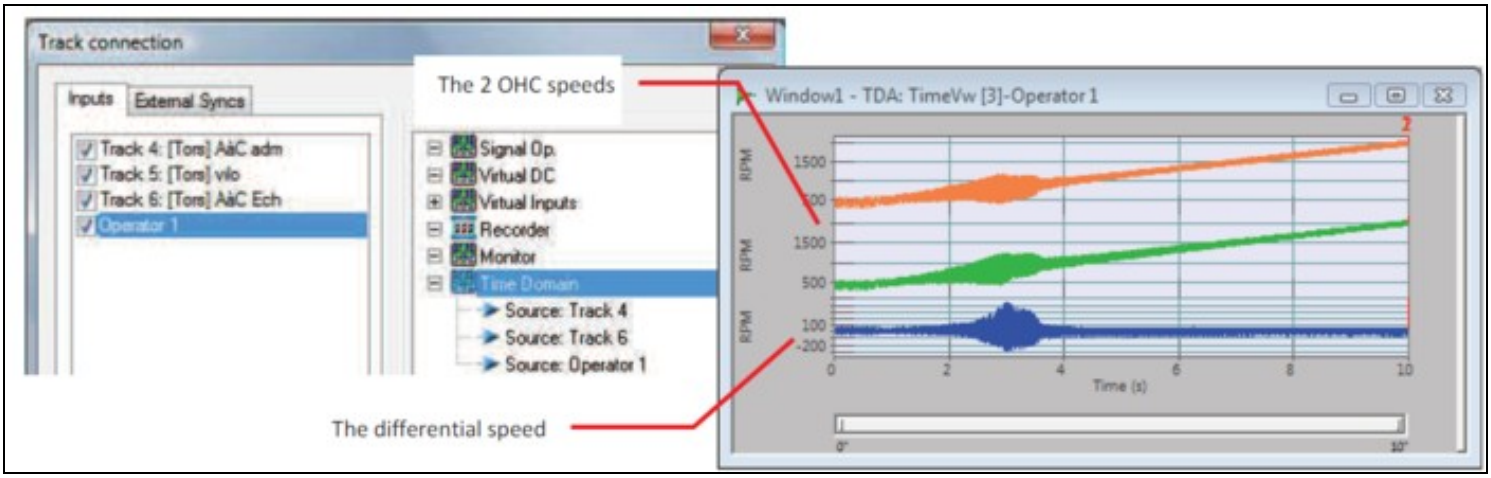
- On operator tab, you can create several operators and sum or multiply the channels selected, and apply a new equation.

$$Operator_n = (\sum_i Channel_i \times A_i + B_i)^{P_n} \text{ For sum operations}$$

$$Operator_n = (\prod_i Channeli \times A_i + B_i)^{P_n} \text{ For product operations}$$



- Then a new channel "operator 1" appears on connect input, then you can use this channel like any other NVGate dynamical input.



42.2 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)

42.2.1 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).

42.2.2 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.

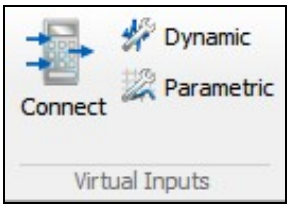
Parameter/constant names must start with a letter and may be ended by a number. The dot (.) is always the decimal separator independently from the OS preferences and the comma (,) is used as parameter separator.

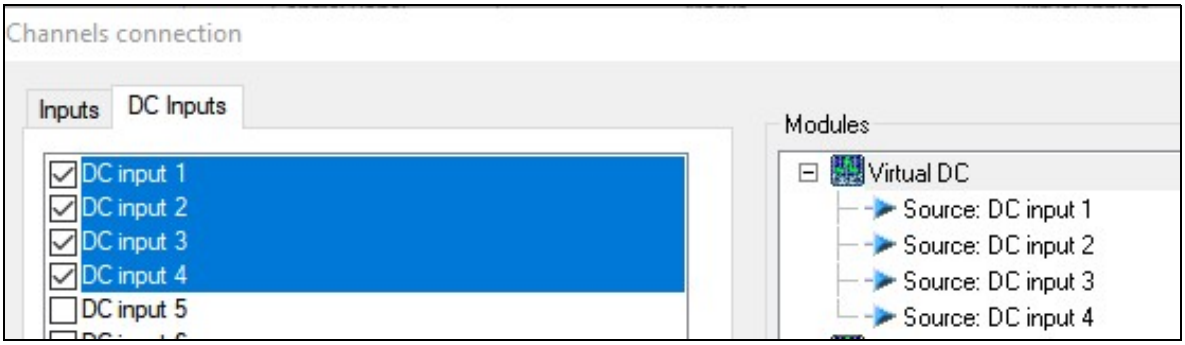
The editor does not check the dimension of this result. The content of the formula can be copy/pasted from any text editor.

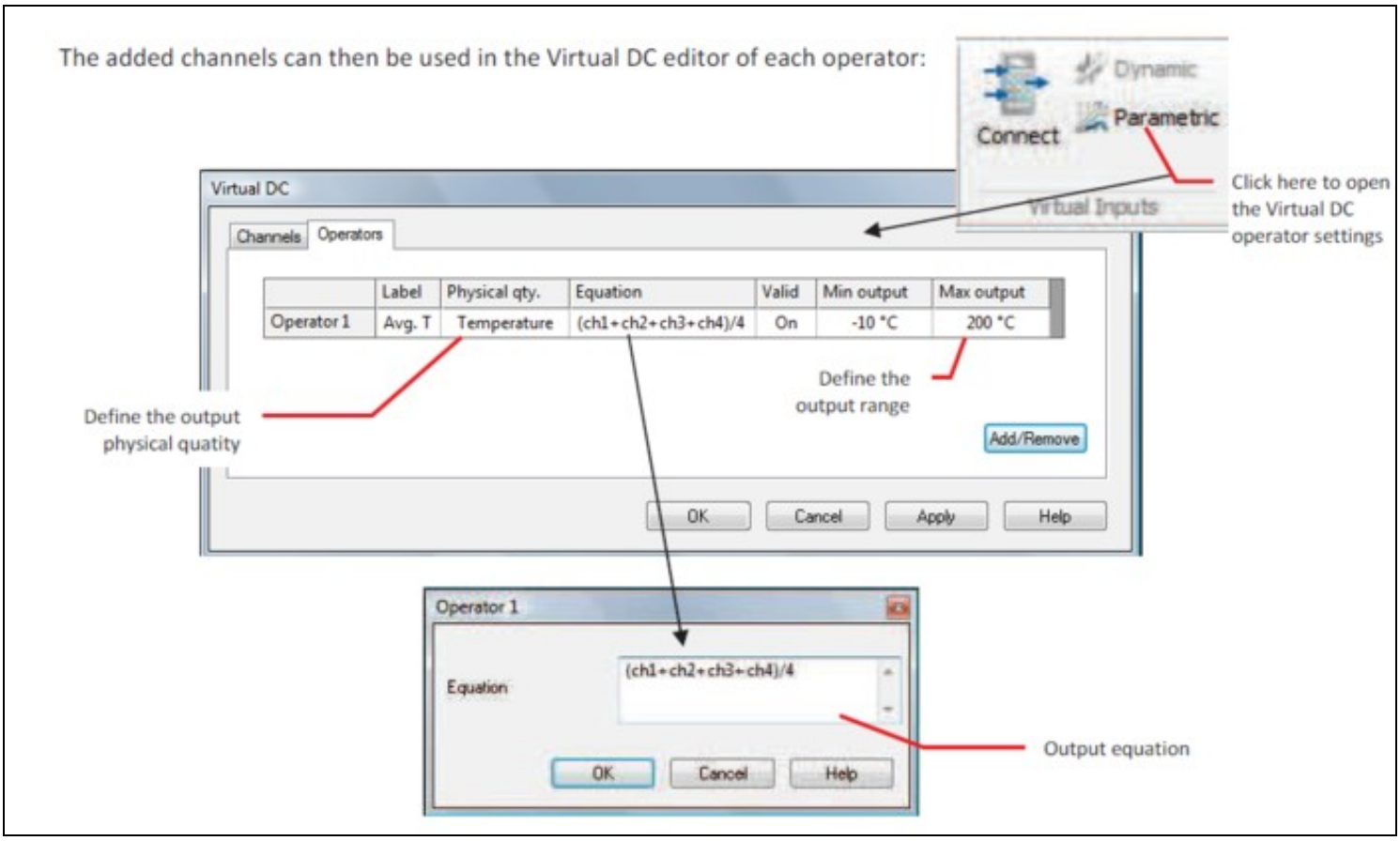
- **Valid**: Indicates if the operator is valid or not. To be valid an operator must process one of the virtual DC channel in its equation
- **Min output** / **Max output**: define the output range. These settings are expressed in the unit of the selected magnitude of the operator.

42.2.3 Tutorial

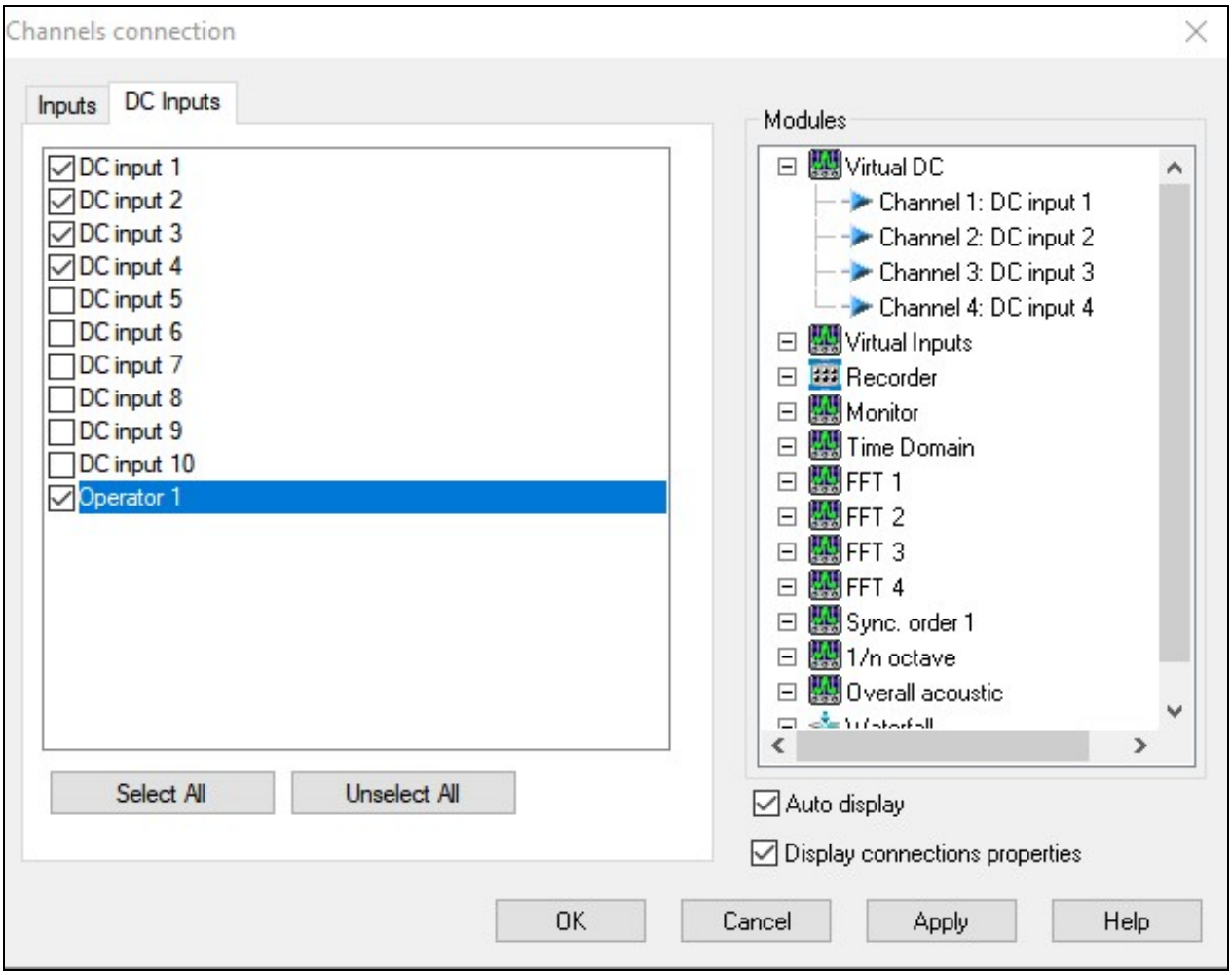
First connect the DC channels to the virtual DC plug in.







A new track "operator 1" is now created and appears on channels connection. You can use it as any other DC input.

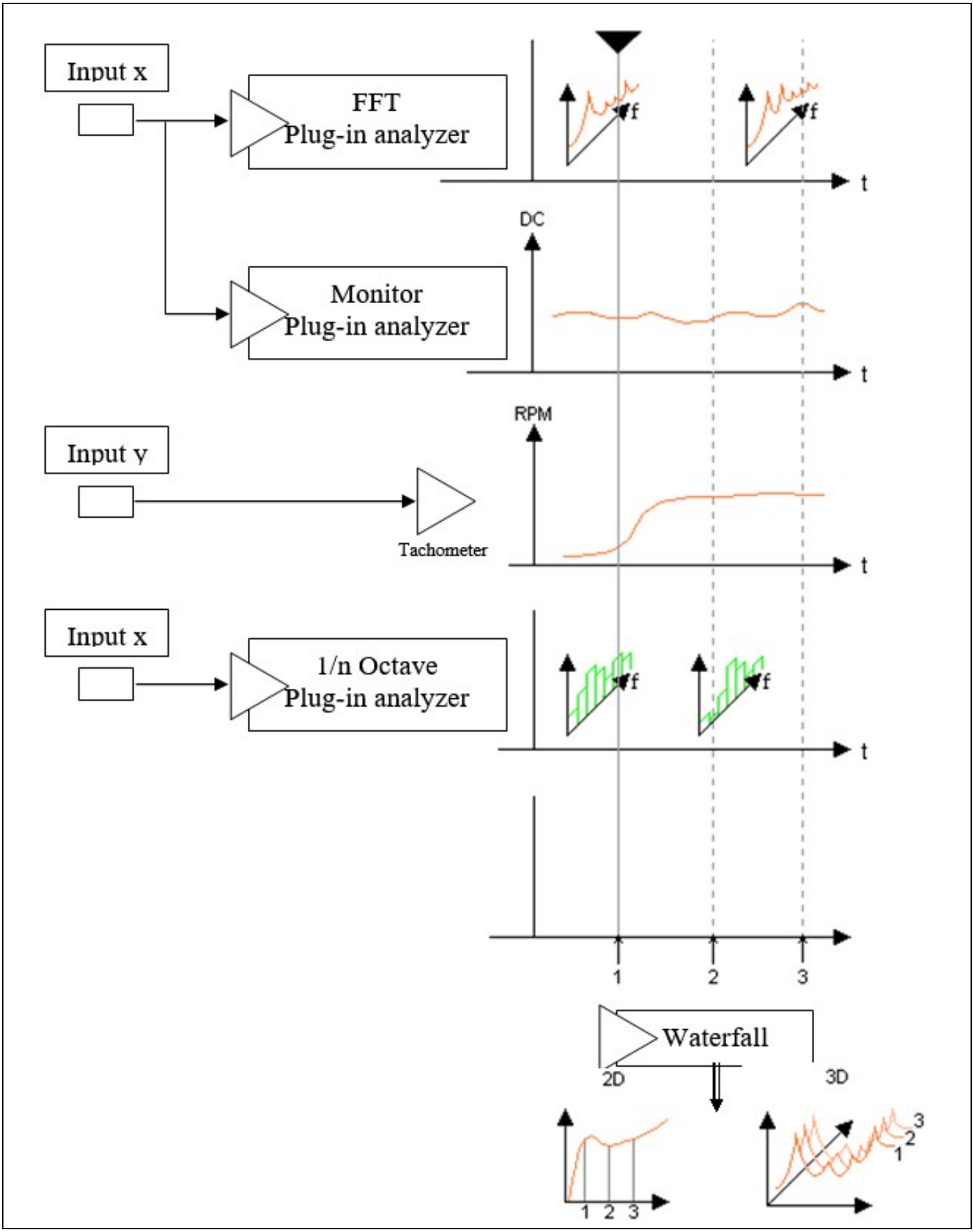

Channels connection
Inputs
DC Inputs
DC input 1
DC input 2
DC input 3
DC input 4
DC input 5
DC input 6
DC input 7
DC input 8
DC input 9
DC input 10
Operator 1
Select All
Unselect All
Modules
Virtual DC
Channel 1: DC input 1
Channel 2: DC input 2
Channel 3: DC input 3
Channel 4: DC input 4
Virtual Inputs
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

43 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).

43.1 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.

43.2 Tutorial

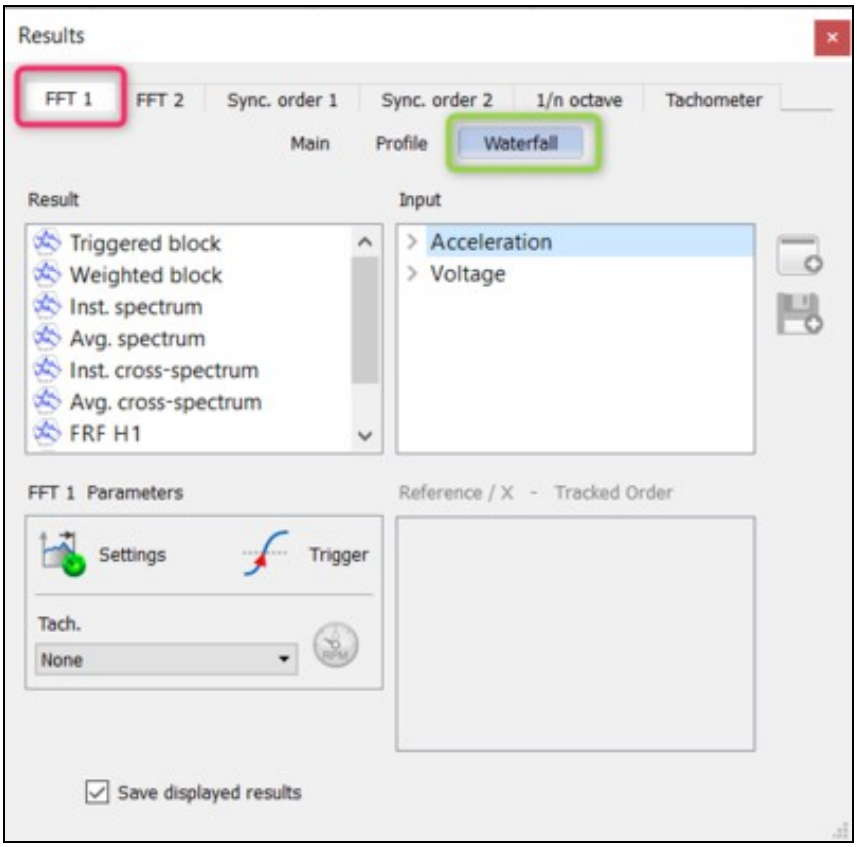
43.2.1 Waterfall connection

This section will show the different ways to add results into the waterfall.

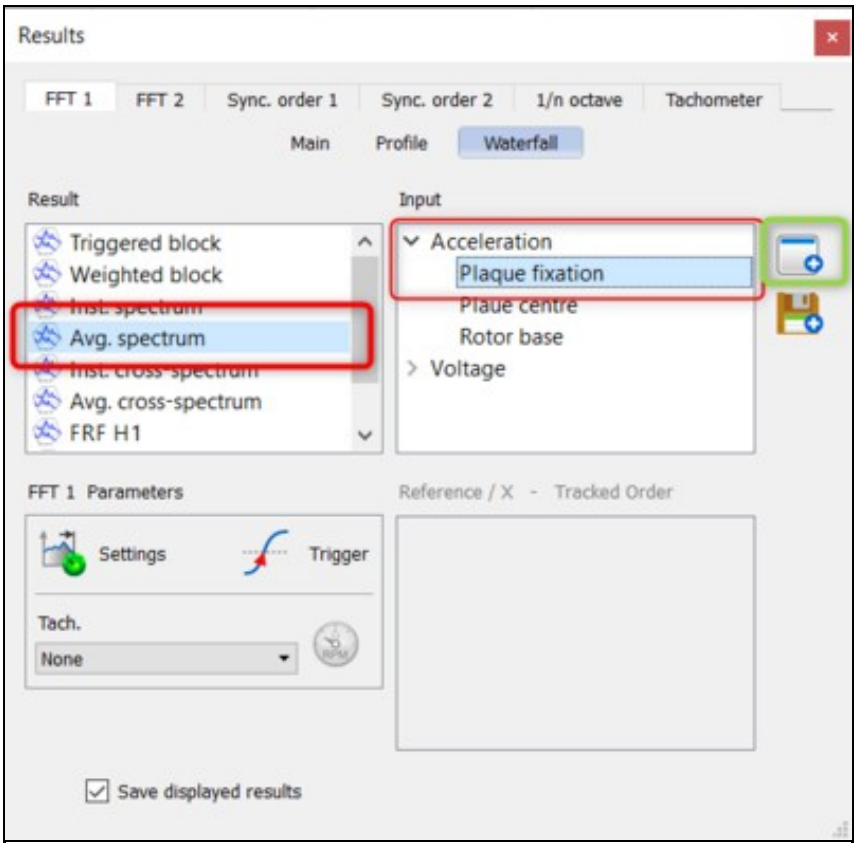
43.2.1.1 From the Show Result window

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.

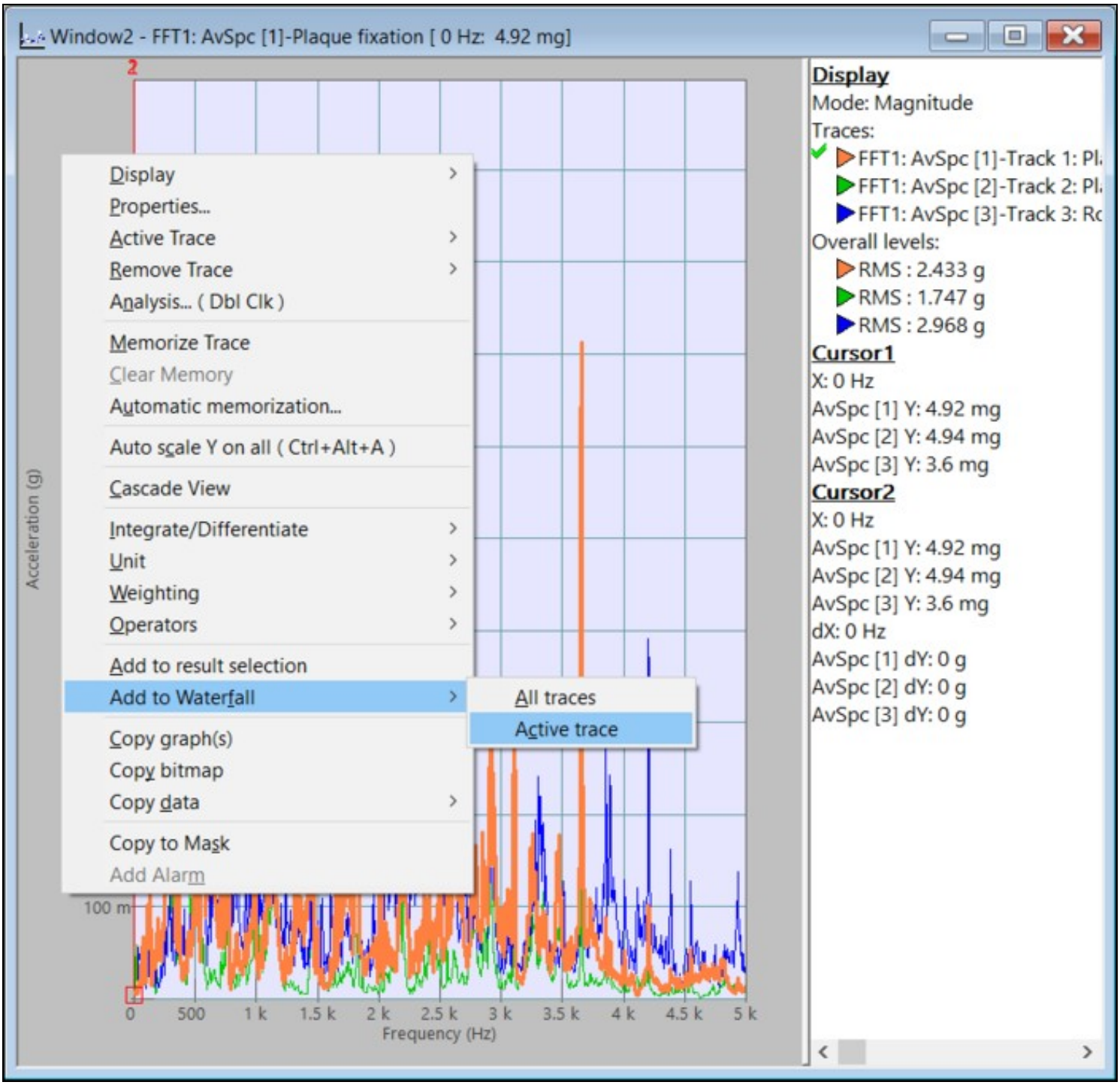
For more detail please see NVGate Software overview.

See also the RT60 with interrupted source tutorial video, where this method is used.

43.2.1.2 From the graph window

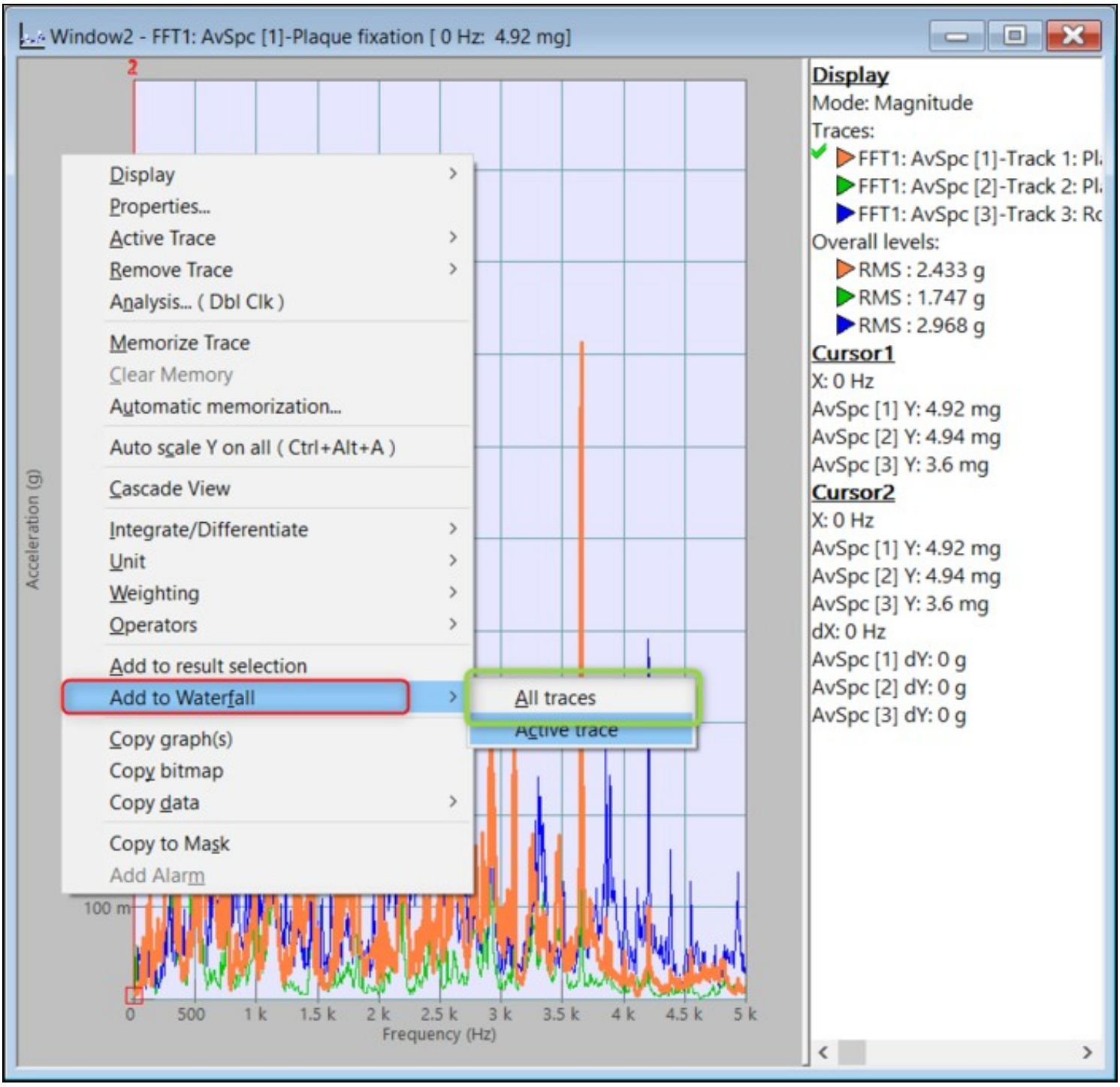
This method will allow you to add the result from a currently displayed graph into the waterfall. This will work with any result of NVGate compatible with the waterfall. As previously, we will add the Average spectrum **of all the channels** into the waterfall.

First of all, right-click on the grey border of the graph and go in the *Add to Waterfall* section :

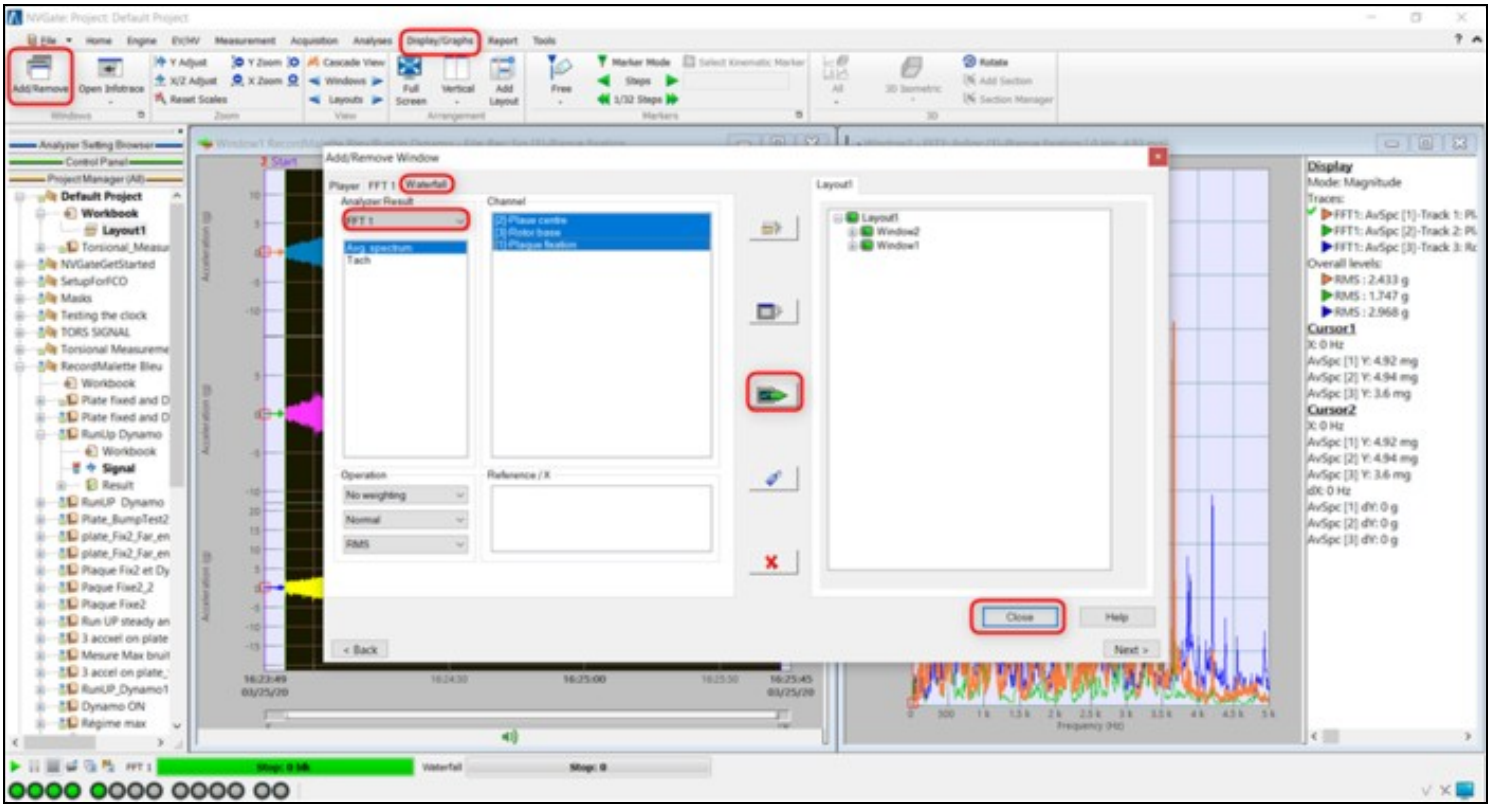

Window2 - FFT1: AvSpc [1]-Plaque fixation [0 Hz: 4.92 mg]
Display
Mode: Magnitude
Traces:
FFT1: AvSpc [1]-Track 1: Pl
FFT1: AvSpc [2]-Track 2: Pl
FFT1: AvSpc [3]-Track 3: Rc
Overall levels:
RMS : 2.433 g
RMS : 1.747 g
RMS : 2.968 g
Cursor1
X: 0 Hz
AvSpc [1] Y: 4.92 mg
AvSpc [2] Y: 4.94 mg
AvSpc [3] Y: 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.

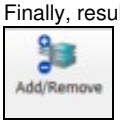


All the traces have been added, and the waterfall can be displayed from the Add/Remove windows menu of theDisplay/Graphs tab of the Ribbon :



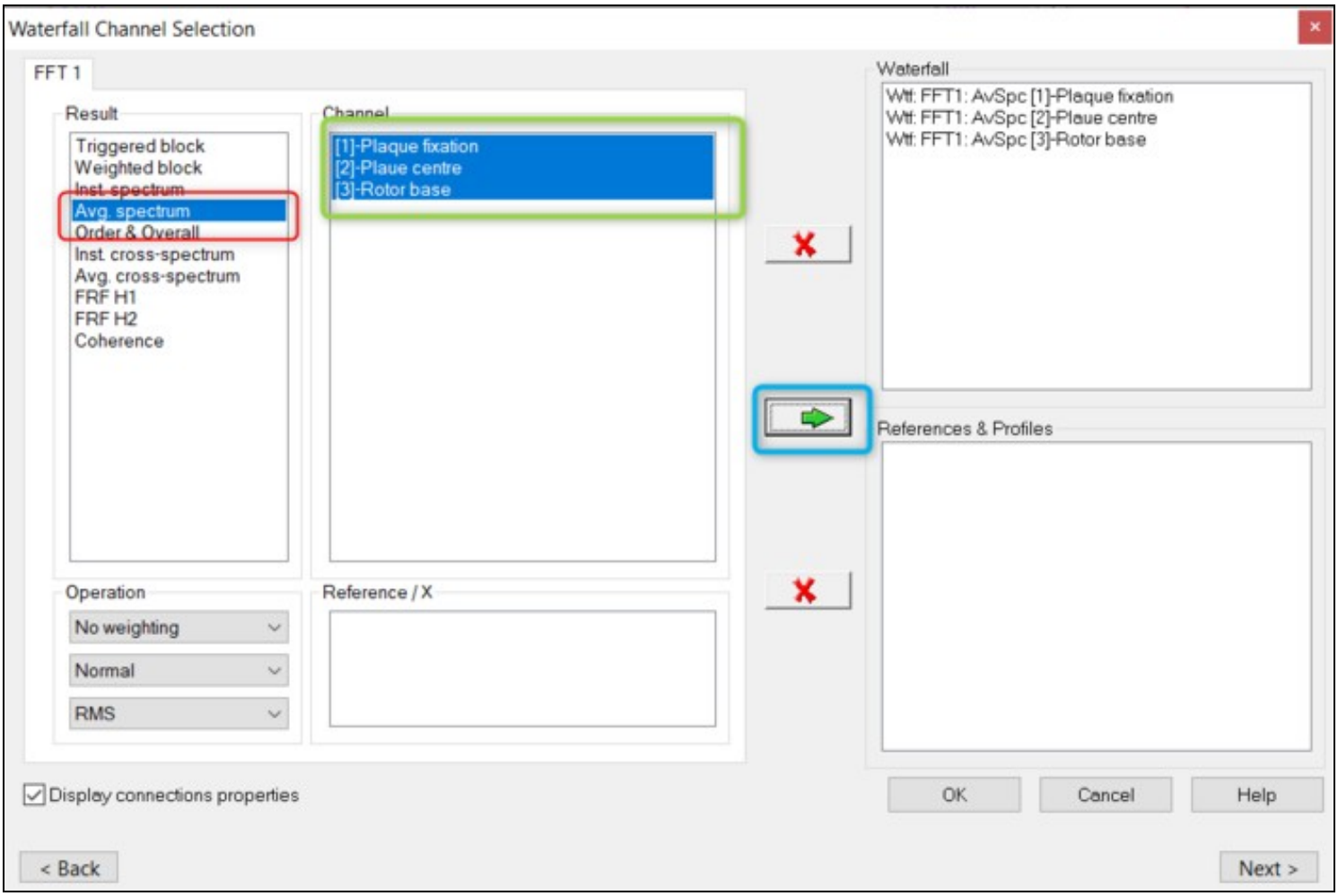
The *3D view* of the waterfall is now displayed in the current layout.

43.2.1.3 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.

43.2.2 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.

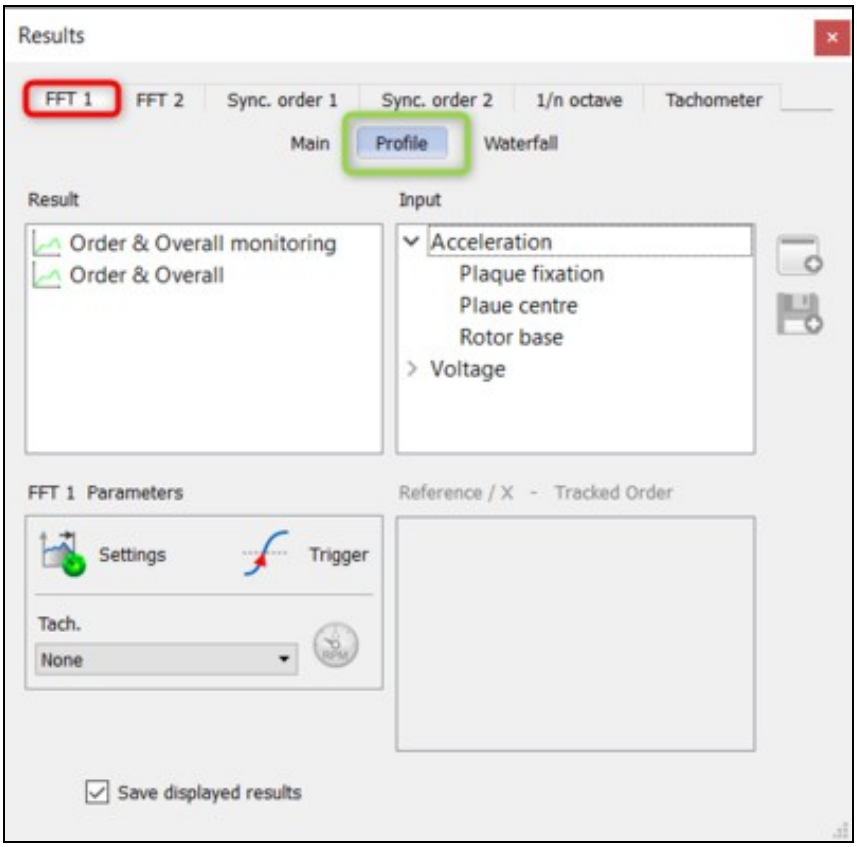
A profile can be used to plot trend over the time for DC inputs, Overall RMS level and Bode plots of Orders over the RPM value of the shaft.

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.

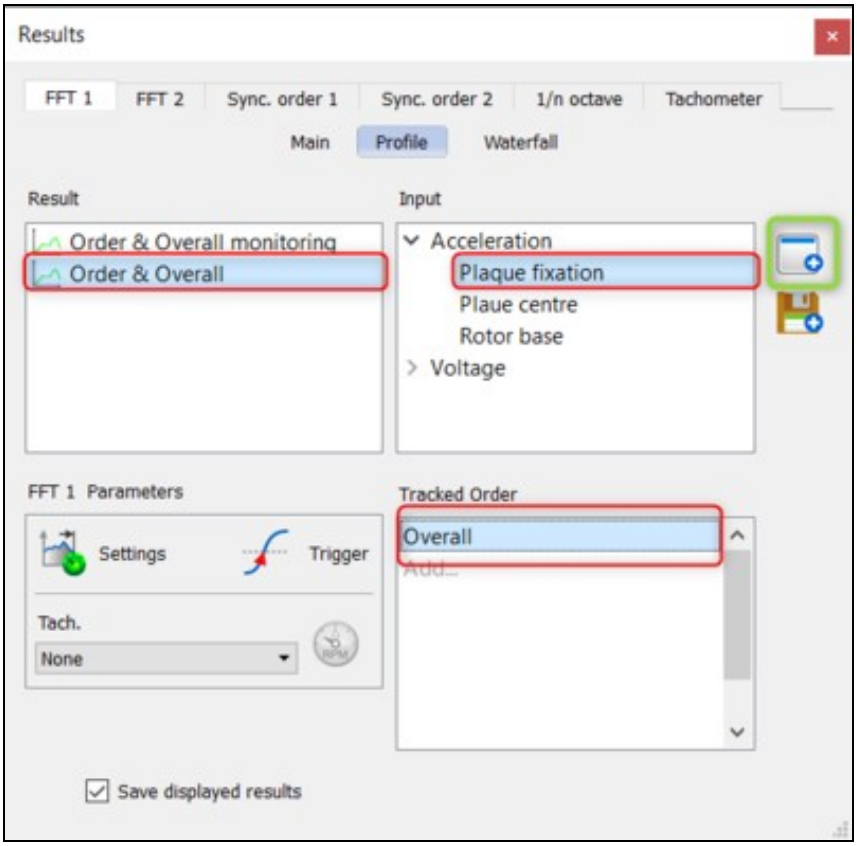
43.2.2.1 From the Show Result window

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.

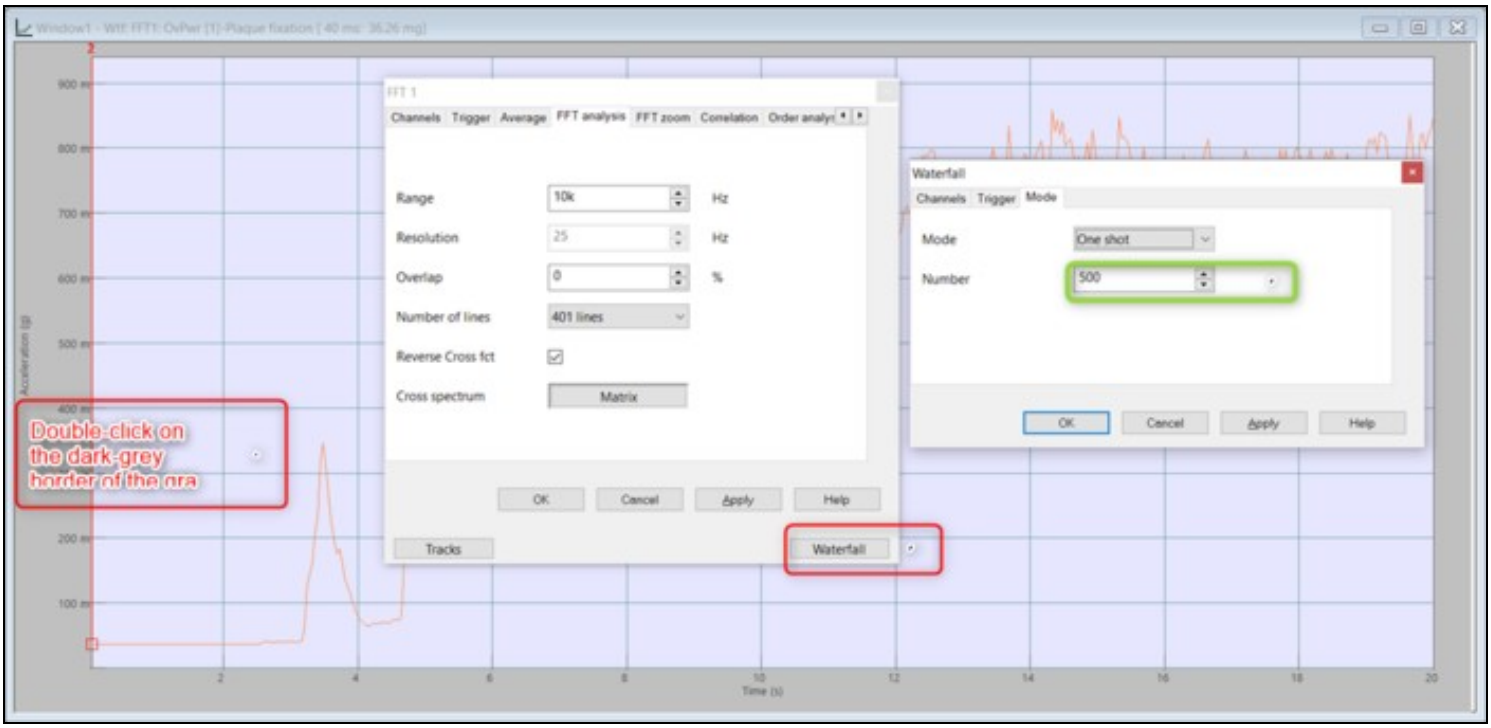
First, open the Show Result window, go in the *FFT 1* tab, and reach the *Profile* section :



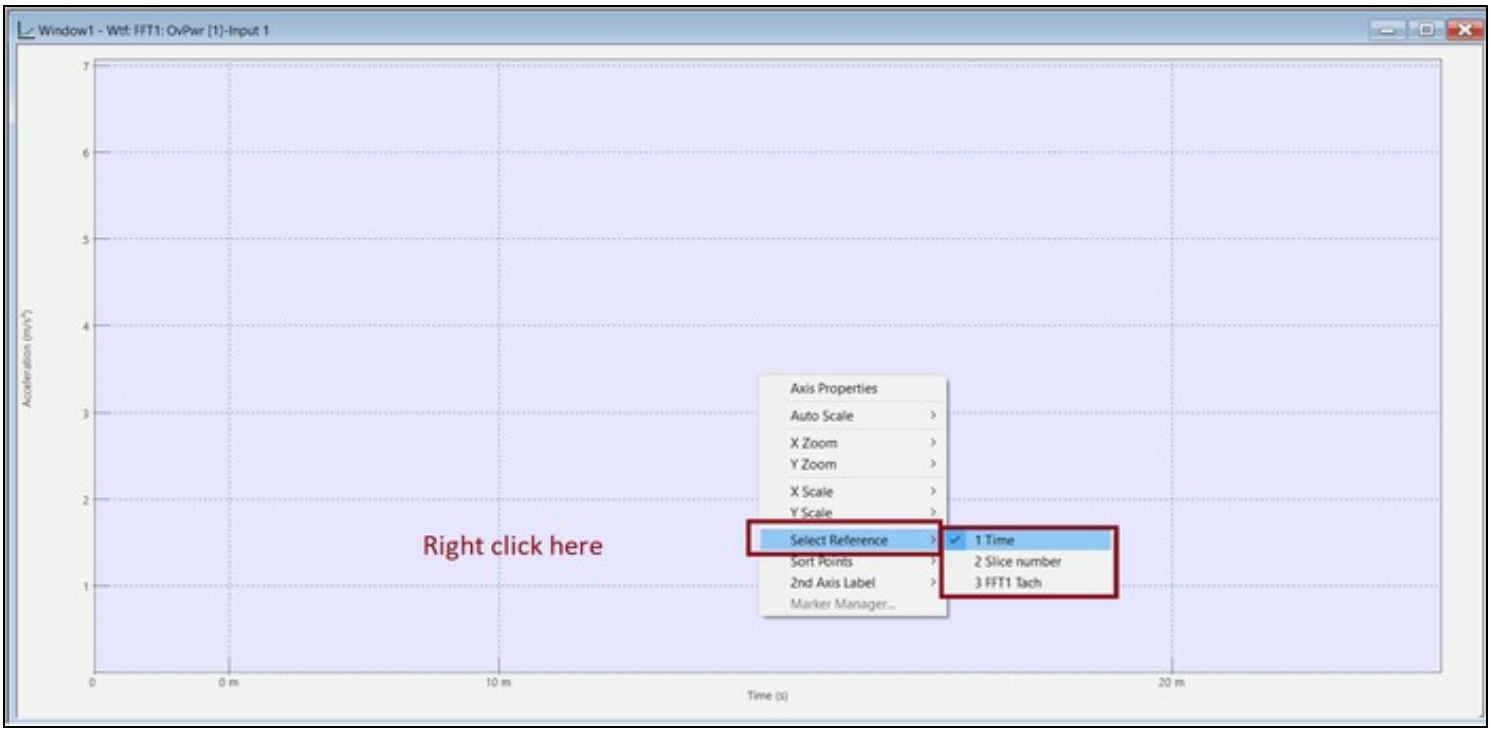
Then, select *Order & Overall* and the fist input. In the *Tracked order* section, select *Overall*. Finally click on  to display the waterfall :



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.



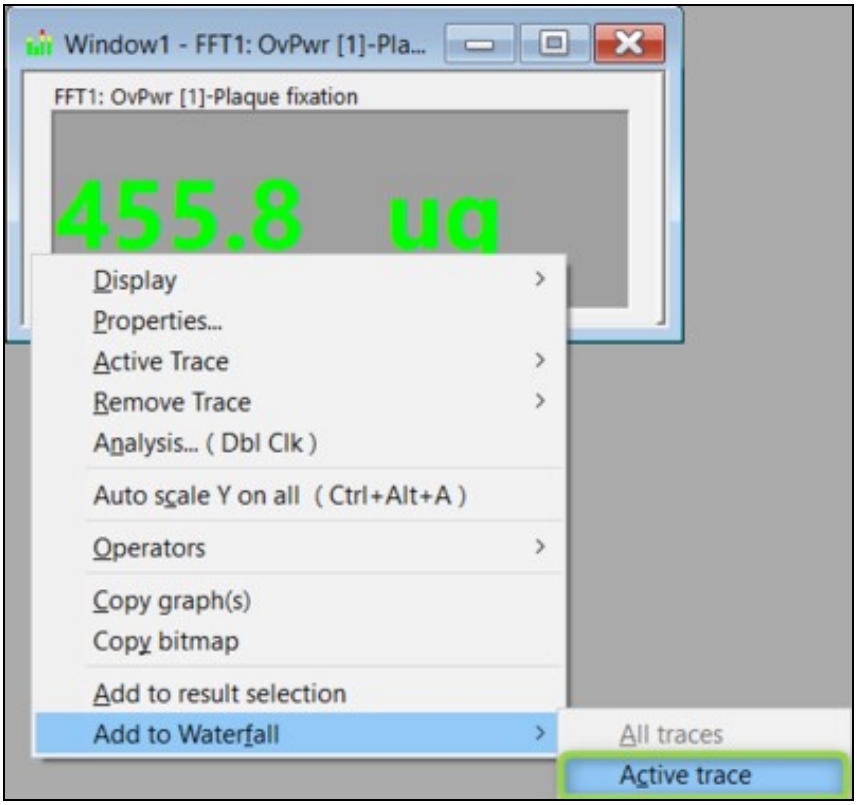
For more detail please see NVGate Software overview, and the following sections.

43.2.2.2 From the graph window

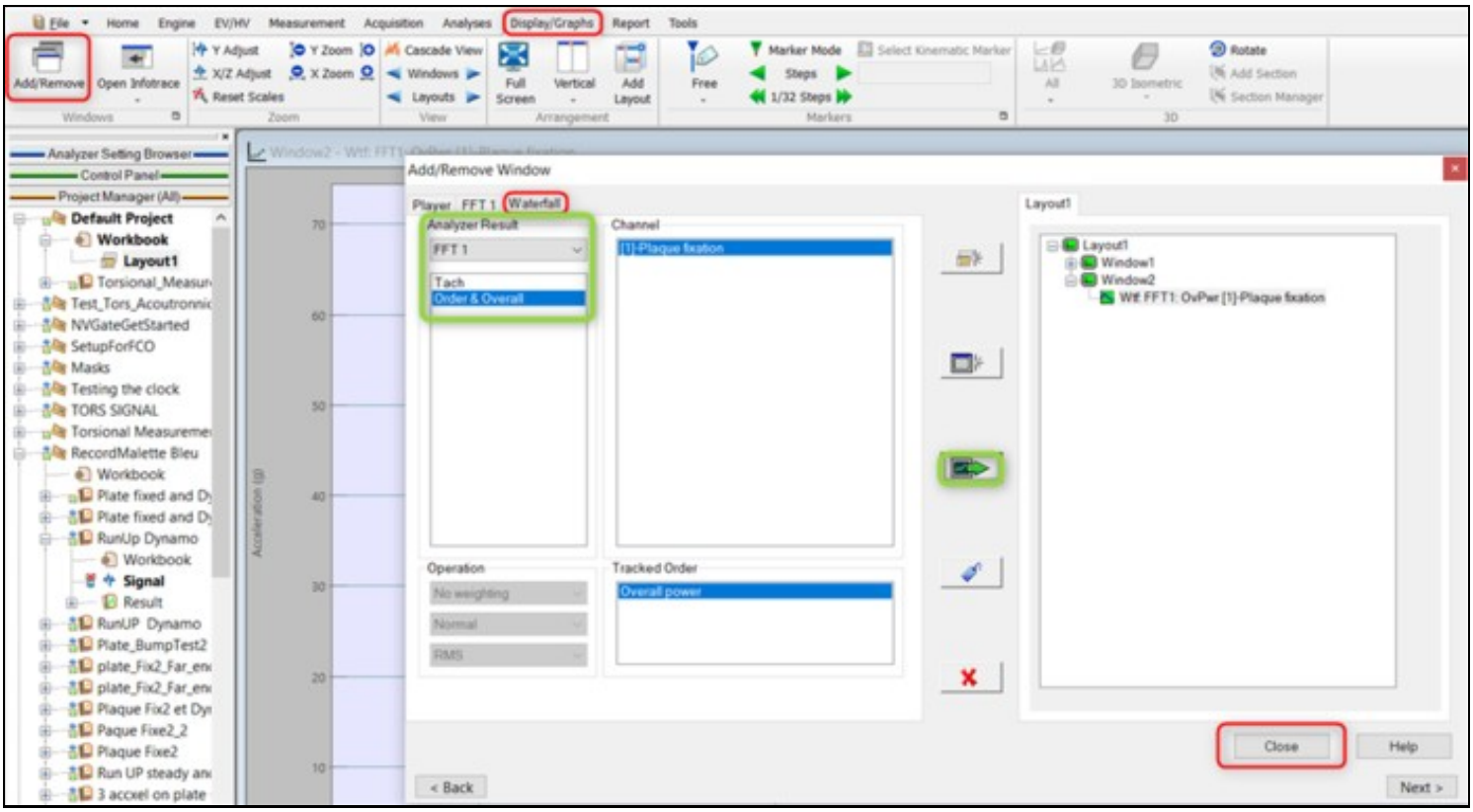
As we did for the standard waterfall, we will now see how to add a scalar value in the waterfall to create a profile directly from the result window.

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. :*

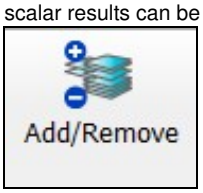


After clicking on *Active Trace*, the *Overall Level is added in the waterfall. We will now use the same method to display the profile. go in the Add/Remove windows menu of theDisplay/Graphs tab of the Ribbon :*

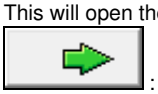


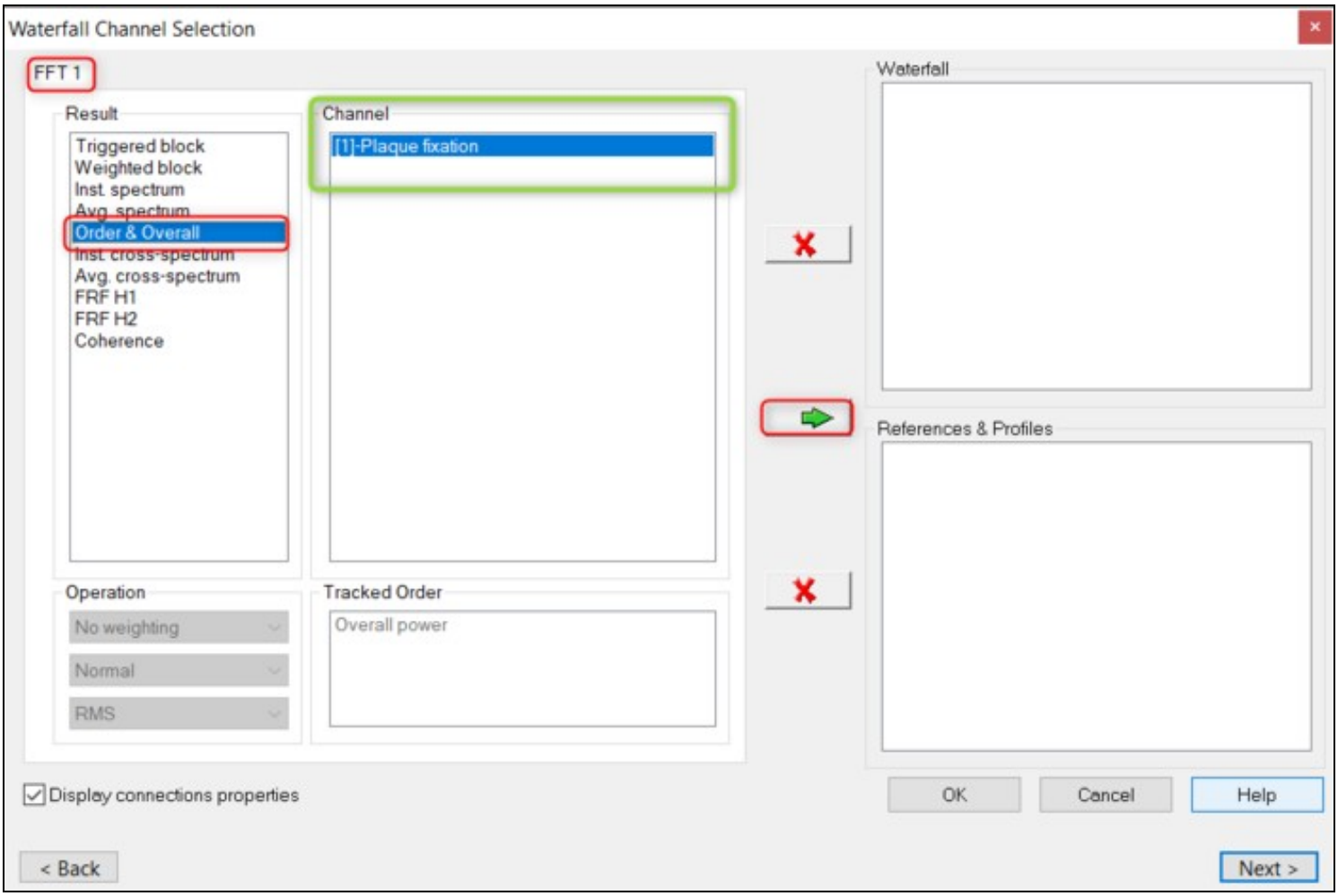
The profile is now displayed in the current layout. As previously, you may need to adapt the depth of the profile.

43.2.2.3 From the waterfall plug-in menu

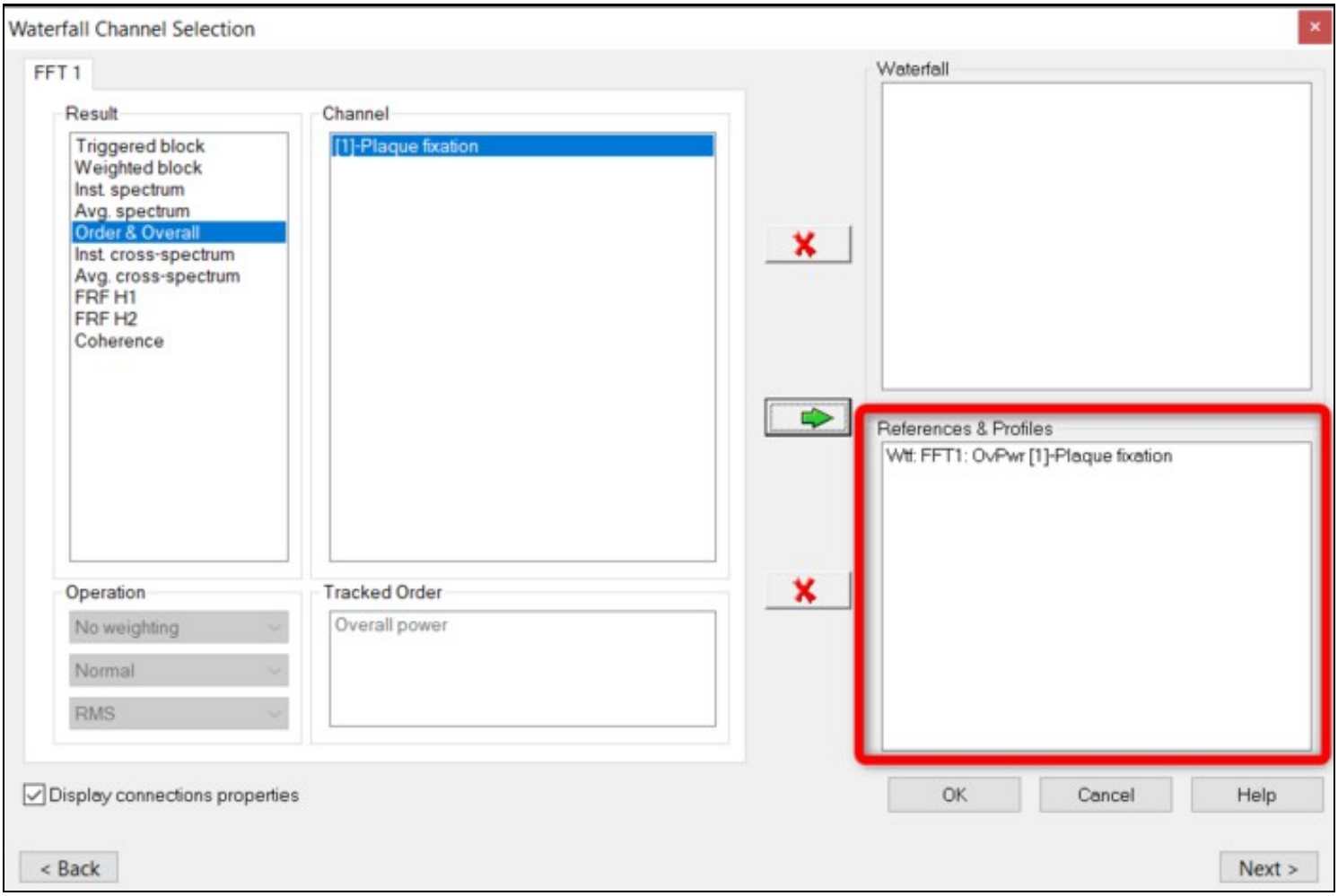
As for other results, scalar results can be added into the waterfall directly from the waterfall menu. To do so, go into the Analyses tab of the NVGate ribbon, and click on 

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 >

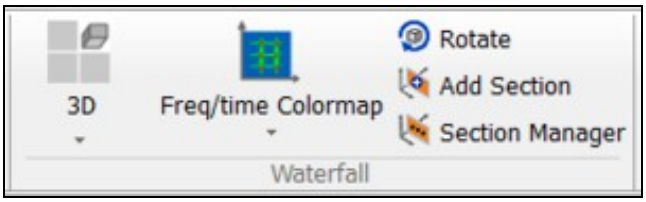
After clicking on  , the trace is added in the *References and Profiles* section :



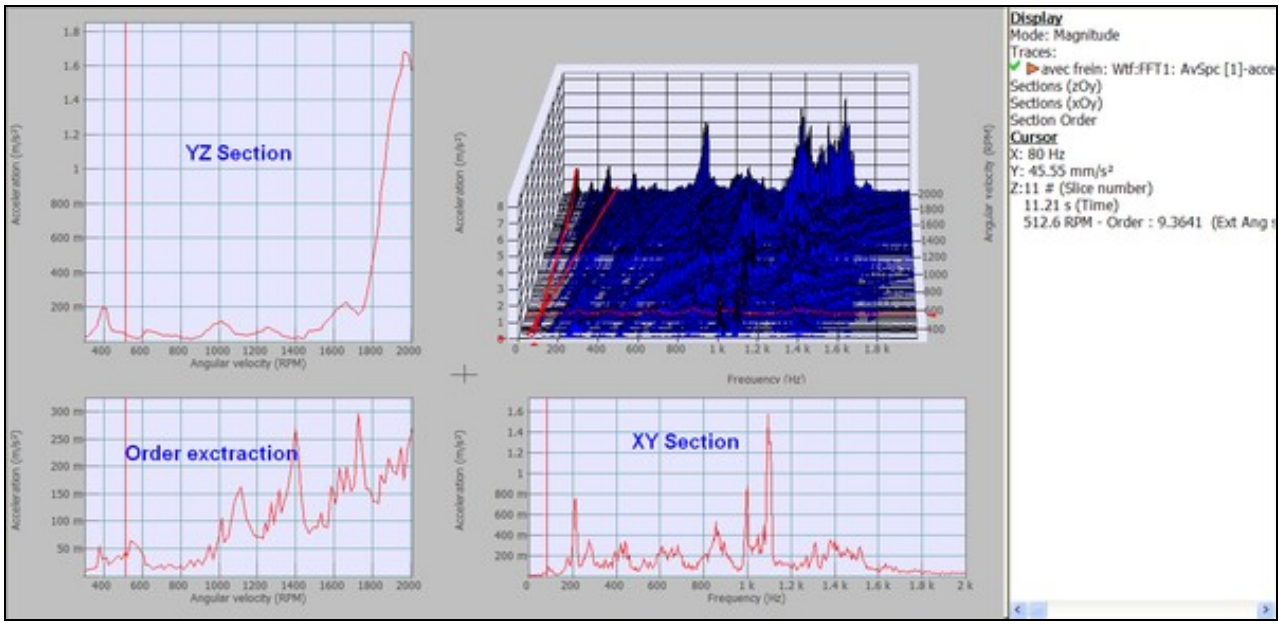
Click on *OK*, the results have been added to the waterfall. You can now display it with the method described in the previous section.

43.3 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:



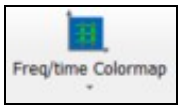
3D only: Shows the 3D graph only. This graph can be a 3D plot or a color map.

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.

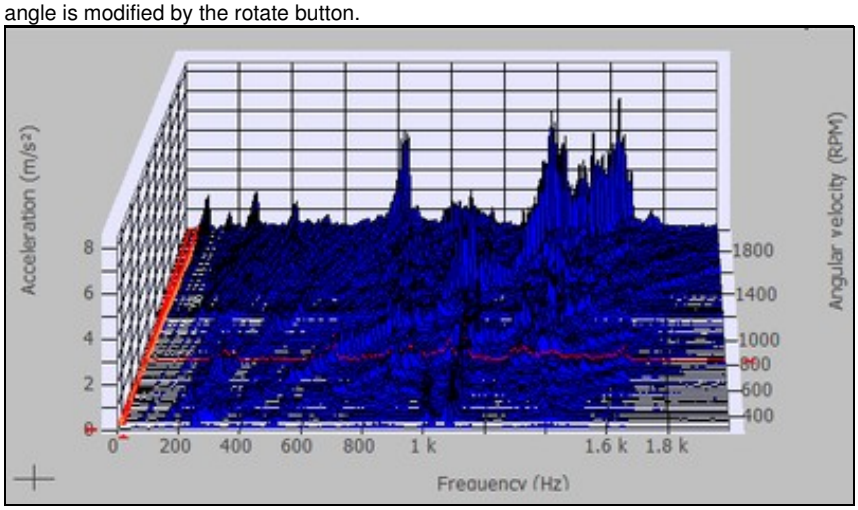
All graphs: Shows all the graphs in a matrix.



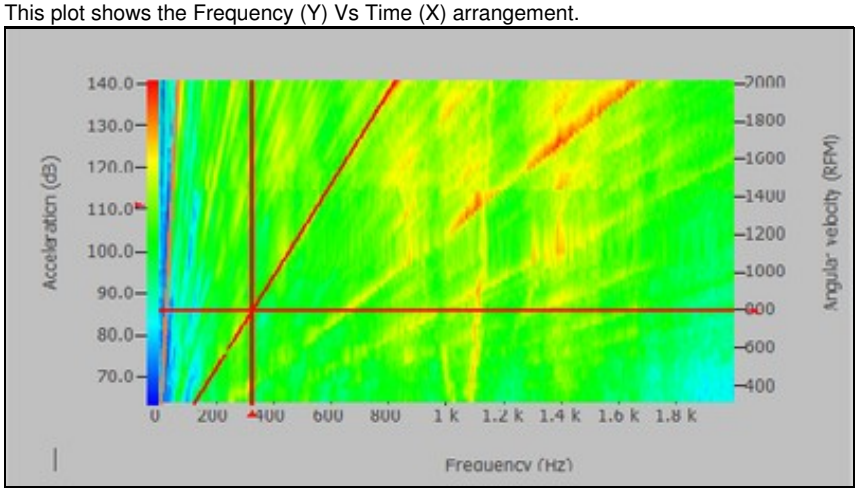
3D waterfall graph or ColorSpectrum view: Enables selecting the type of view for the Waterfall window.

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 

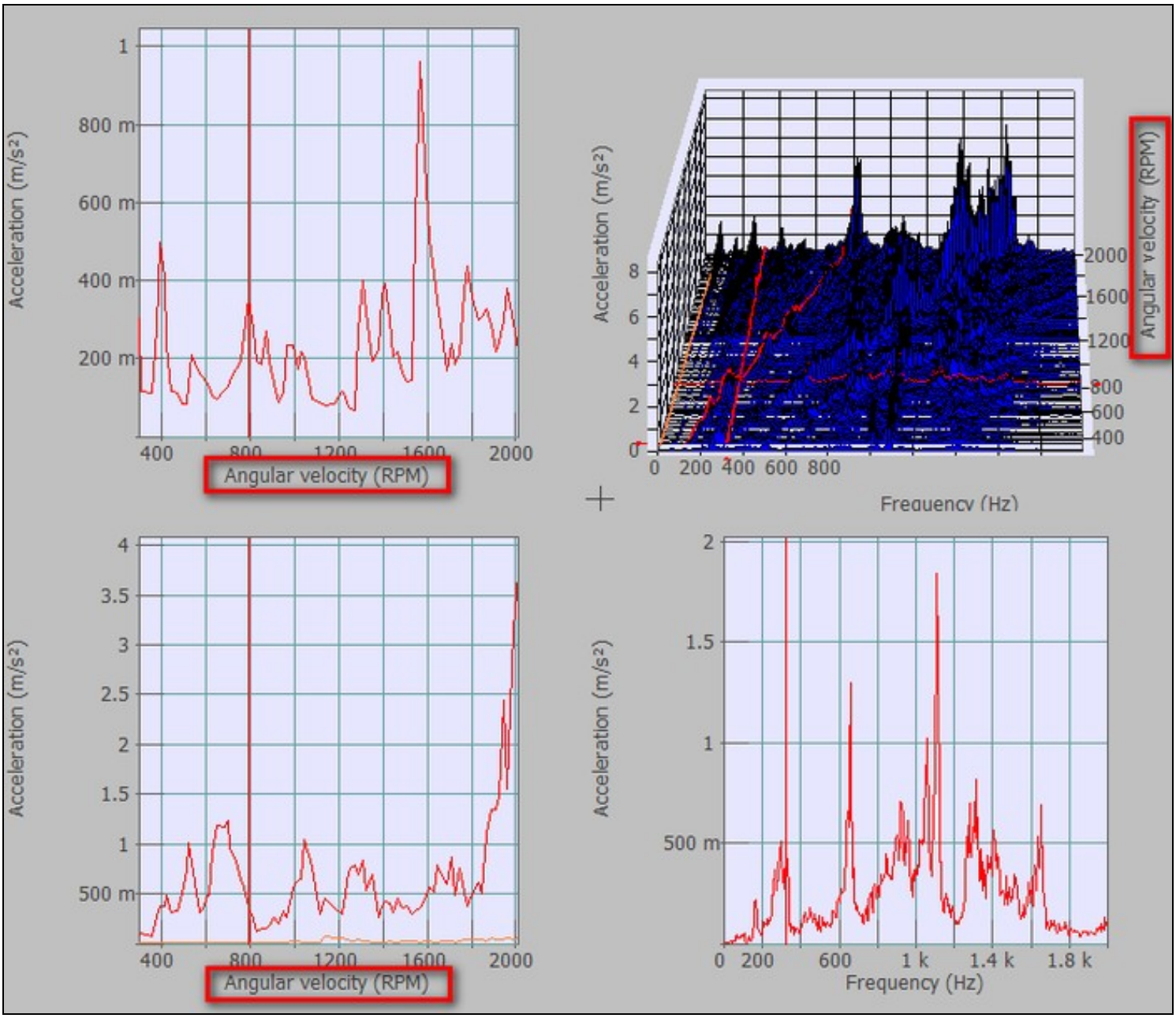
must be selected).

Tip: Move the mouse over the cross in the middle of the window and click in order to resize manually the graph window.

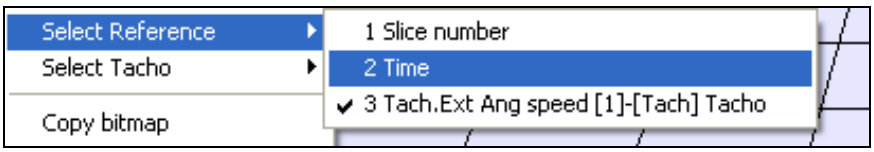
43.3.1 References

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.

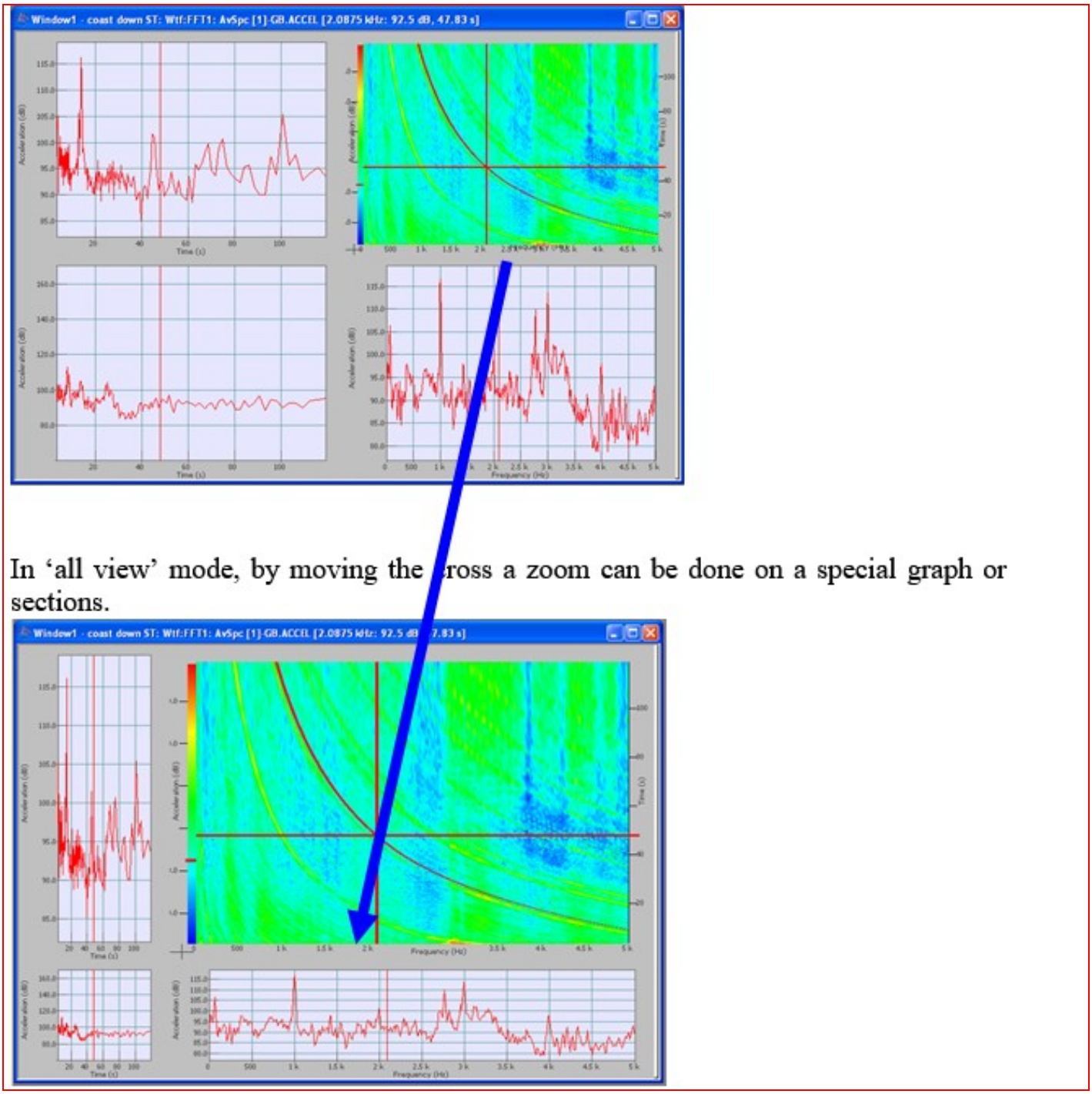
Right click on the grey part of the graph to select the active reference.


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.



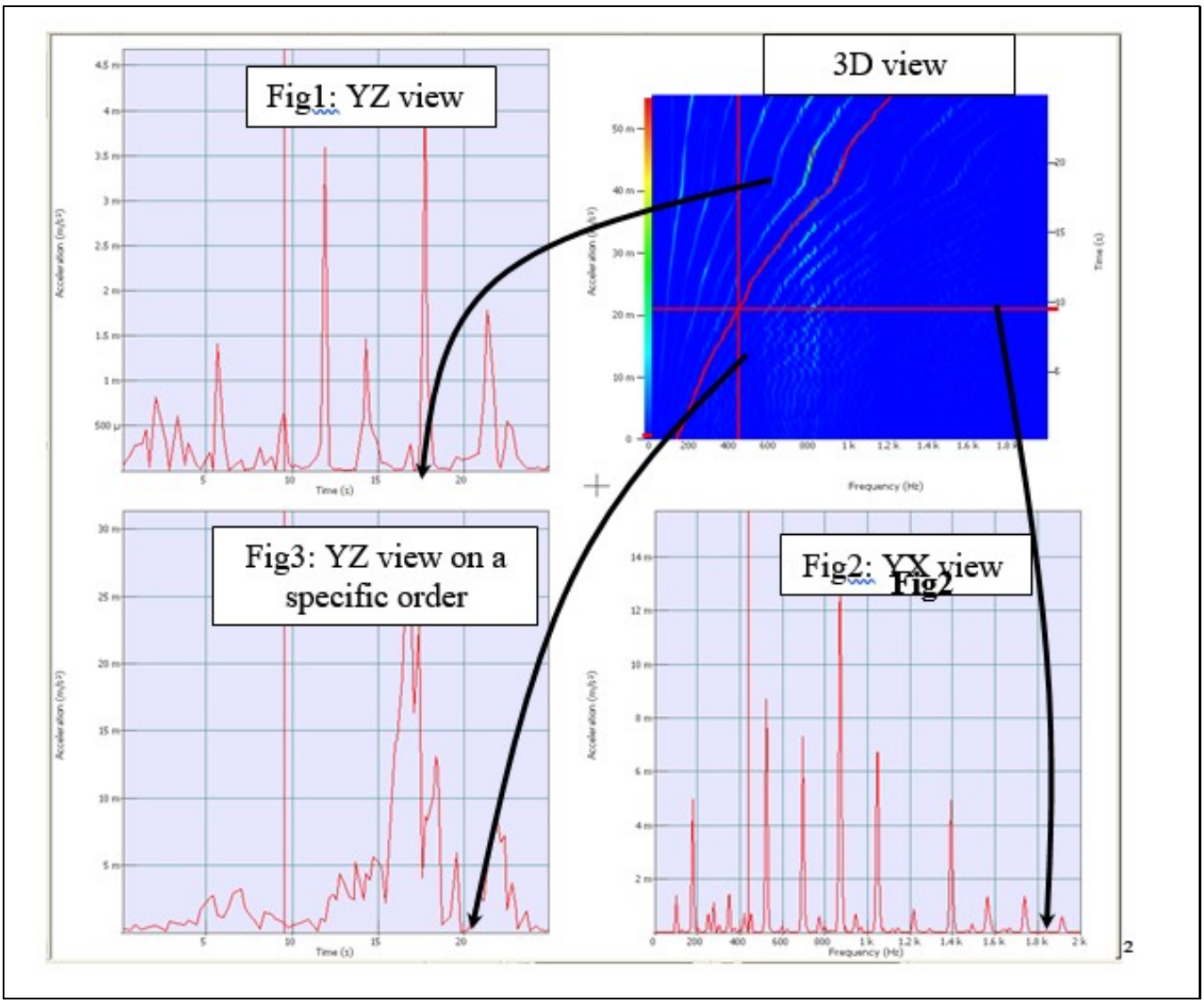
A threshold is available on a waterfall by pressing the ?y? button (or ?ctrl y? for more precision).



43.3.1.1 Sections

-  Add section: Add a copy of the cursor location in each of the 3 extraction graph

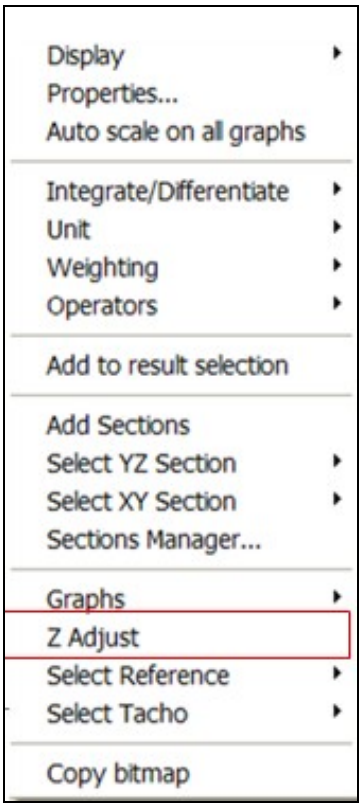
Waterfall display provides extraction of section from the 3D space



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.

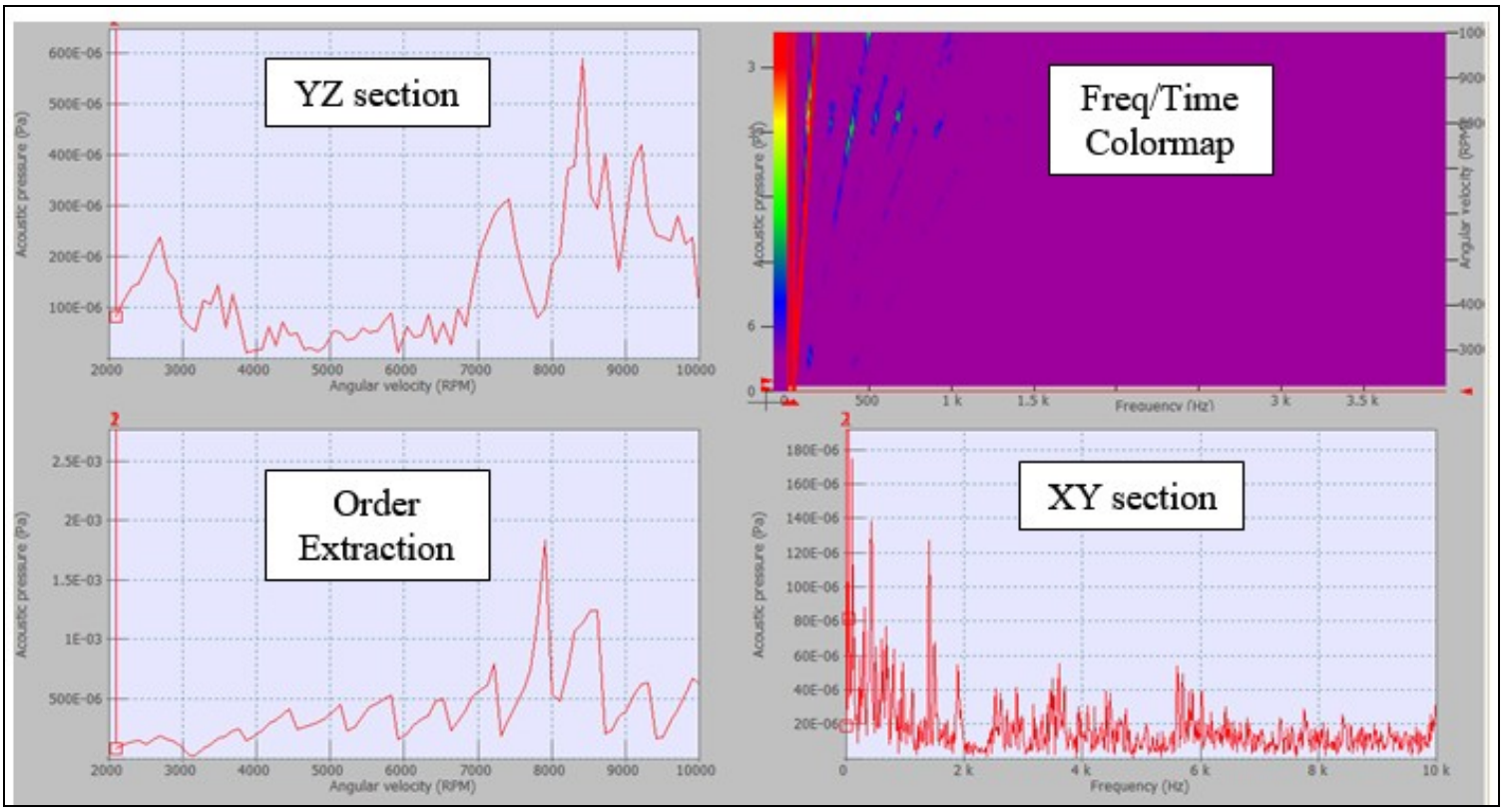
During the acquisition, an autoscale is available on the z-axis (reference) if ?z Adjust? is active.



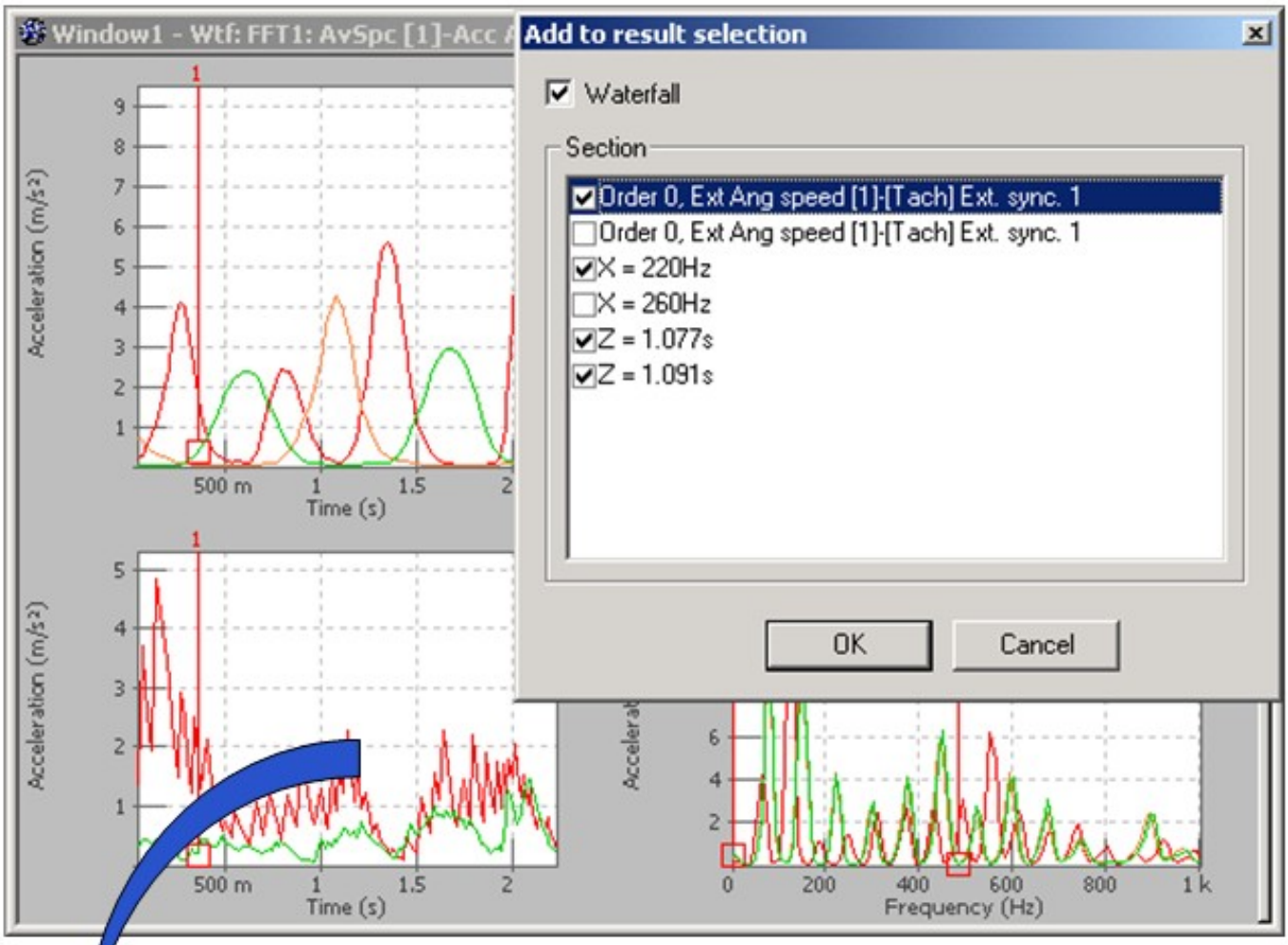
- **Add section:** Creates a new section at the current position of the cursor. The extraction section is created only if a tach has been selected in the Waterfall.
- **Select YZ section:** Selects the active trace in the YZ graph. Useful to get the value of the cursor for this section
- **Select XY 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:

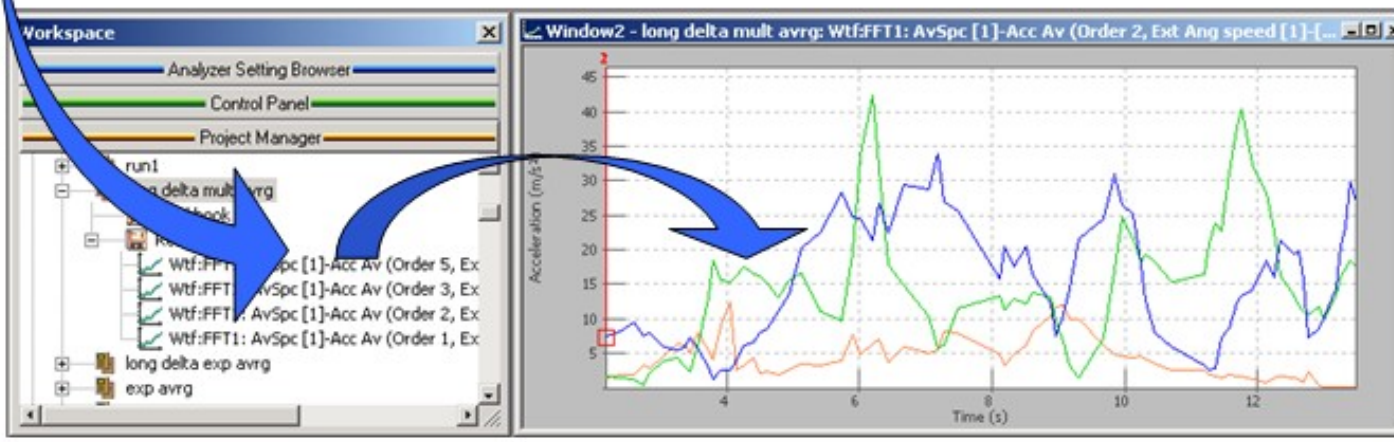
- 3D view: you can select by right-clicking on it an isometric view, a perspective view, a freq/time colormap or a time/freq colormap (useful to track orders). The 3D view is the default view.
- YZ section,
- Order extraction (only available if a tachometer is active).



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.



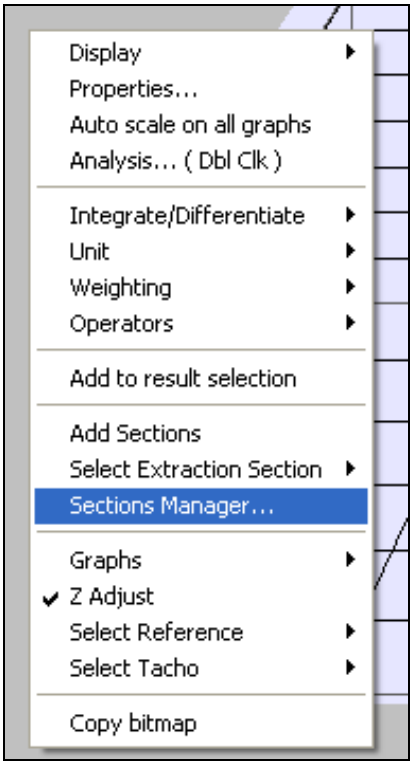
After being saved, the sections became independent results, reducing the amount of saved data when you are focusing only on extracted data.

43.3.1.2 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.

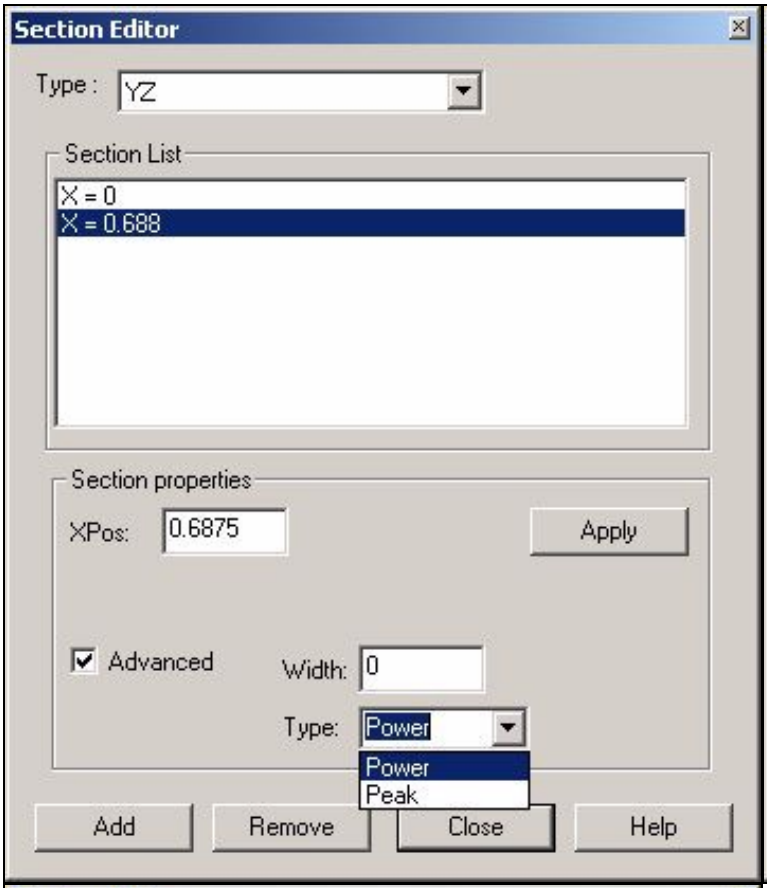
-  Section manager: Open the waterfall section manager.

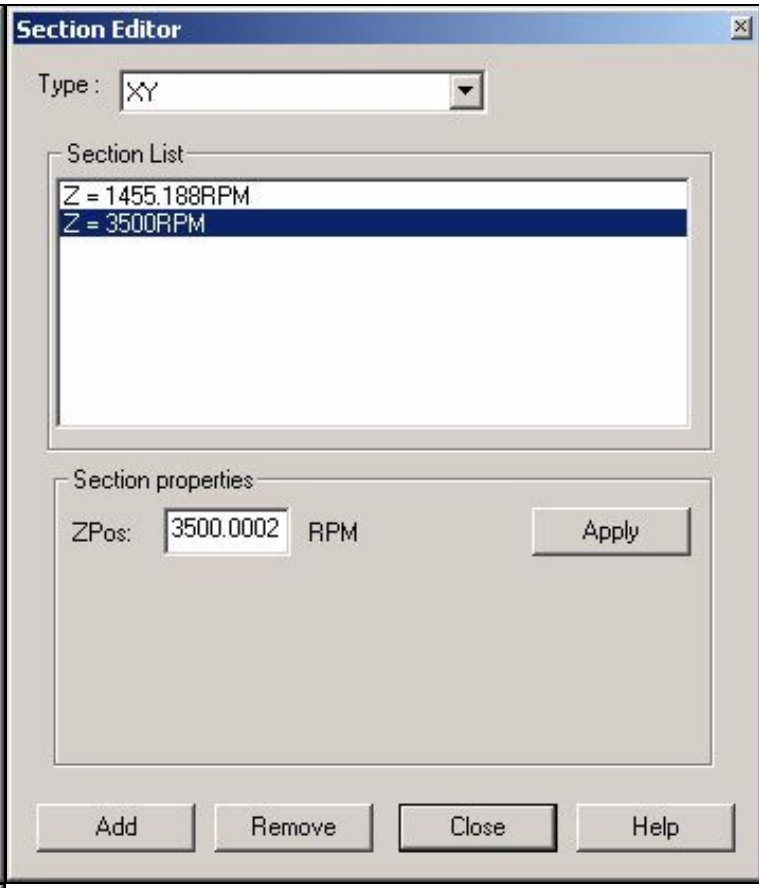
or, right click in the grey part of the graph and select Section manager.

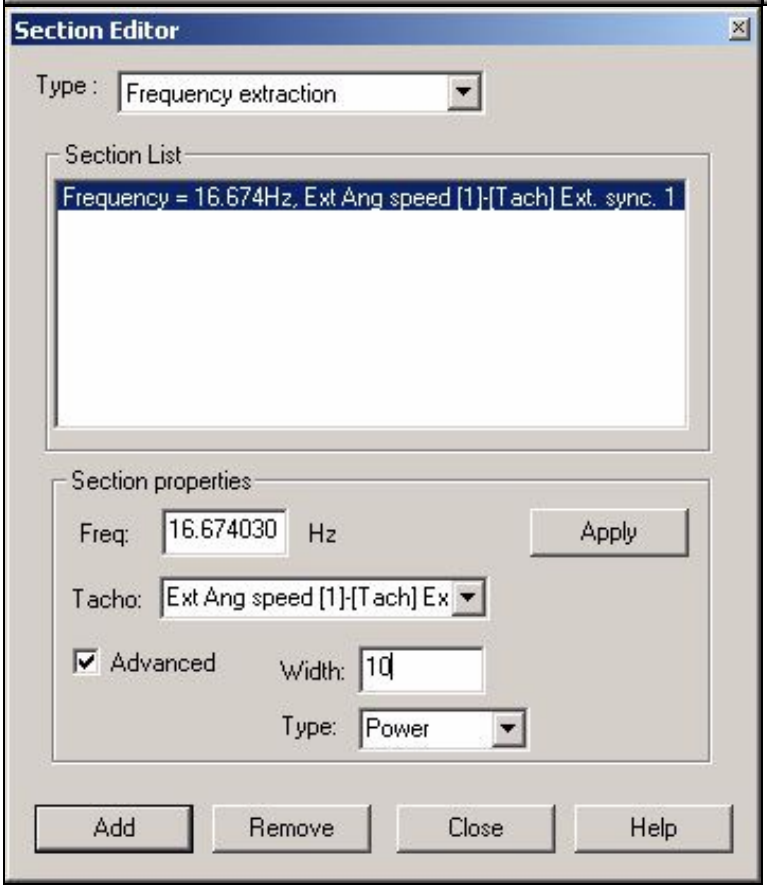


- Section manager: This dialog box is used to create and modify sections.

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

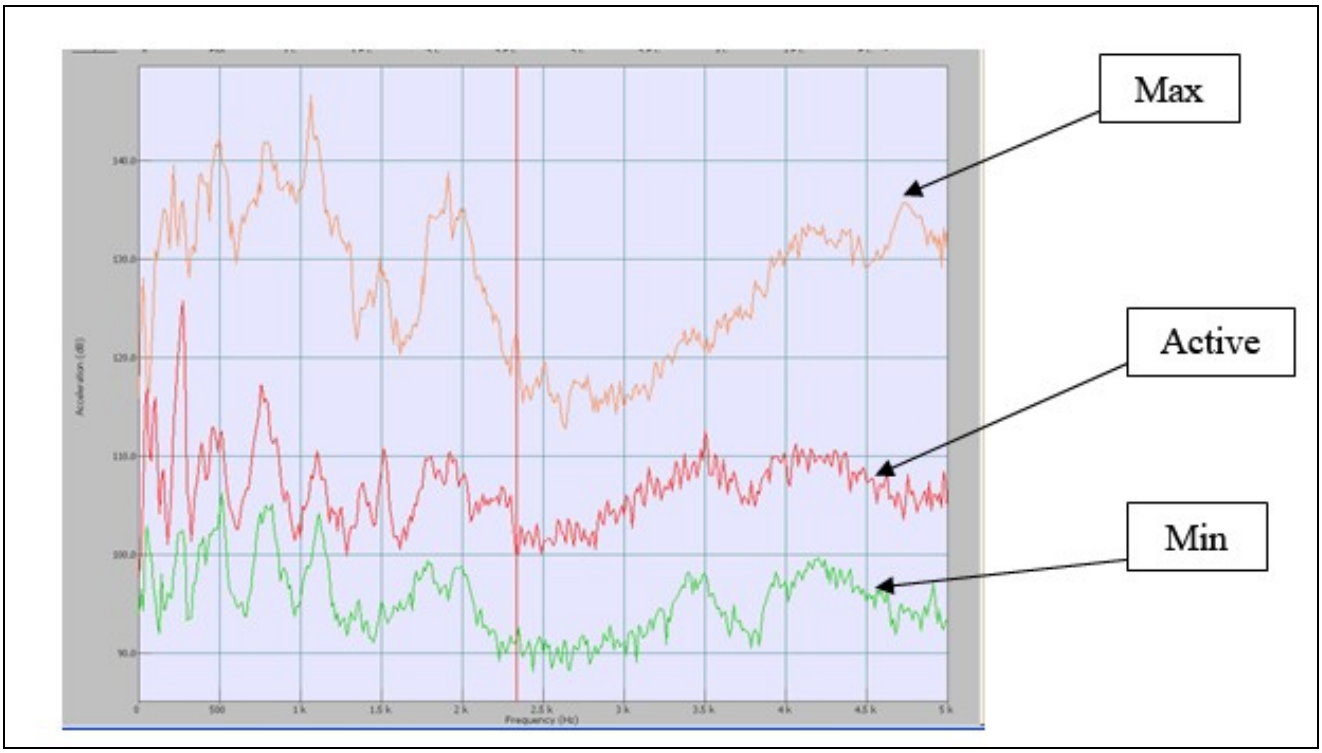
- Section properties: The XPos, ZPos, Freq or Order defines the position of the section in the Waterfall. When the "Advanced" box is checked, it defines the center of the band. The width is used when the "Advanced" box is checked. It defines the bandwidth.

The advanced sections are:

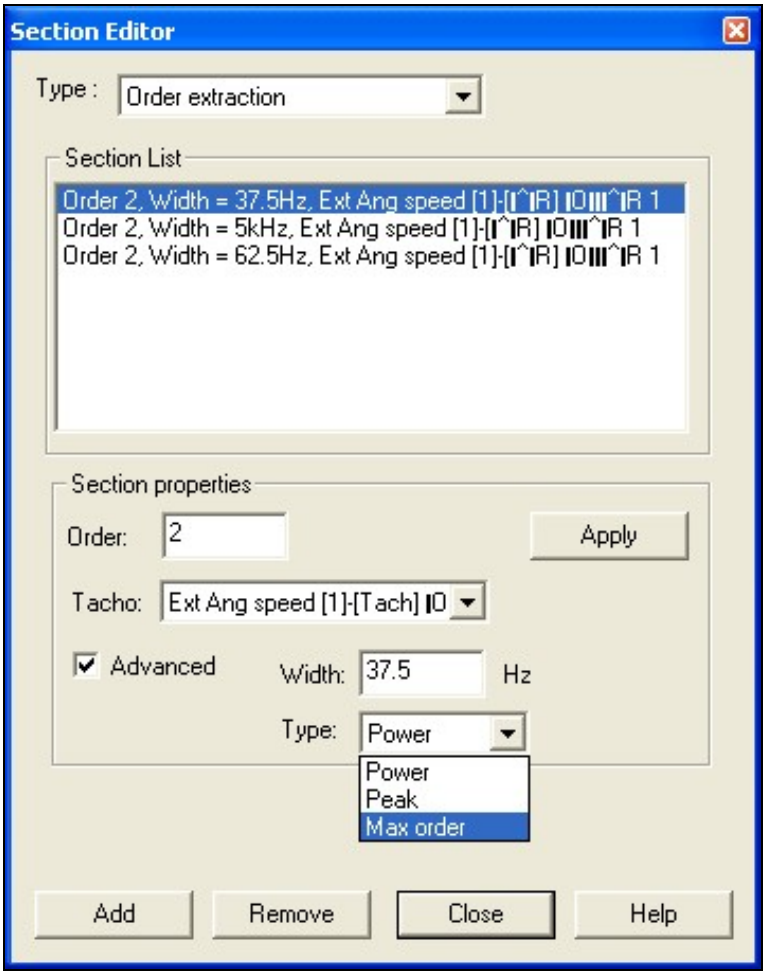
Type	Sections	Type of result	Description
Power	YZ, Order and Frequency extraction sections	Frequency, order and octave spectra	Calculates the power within the band
Peak	YZ, Order and Frequency extraction sections	Frequency, order and octave spectra	Detects the highest value
RMS	YZ sections	Triggered 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

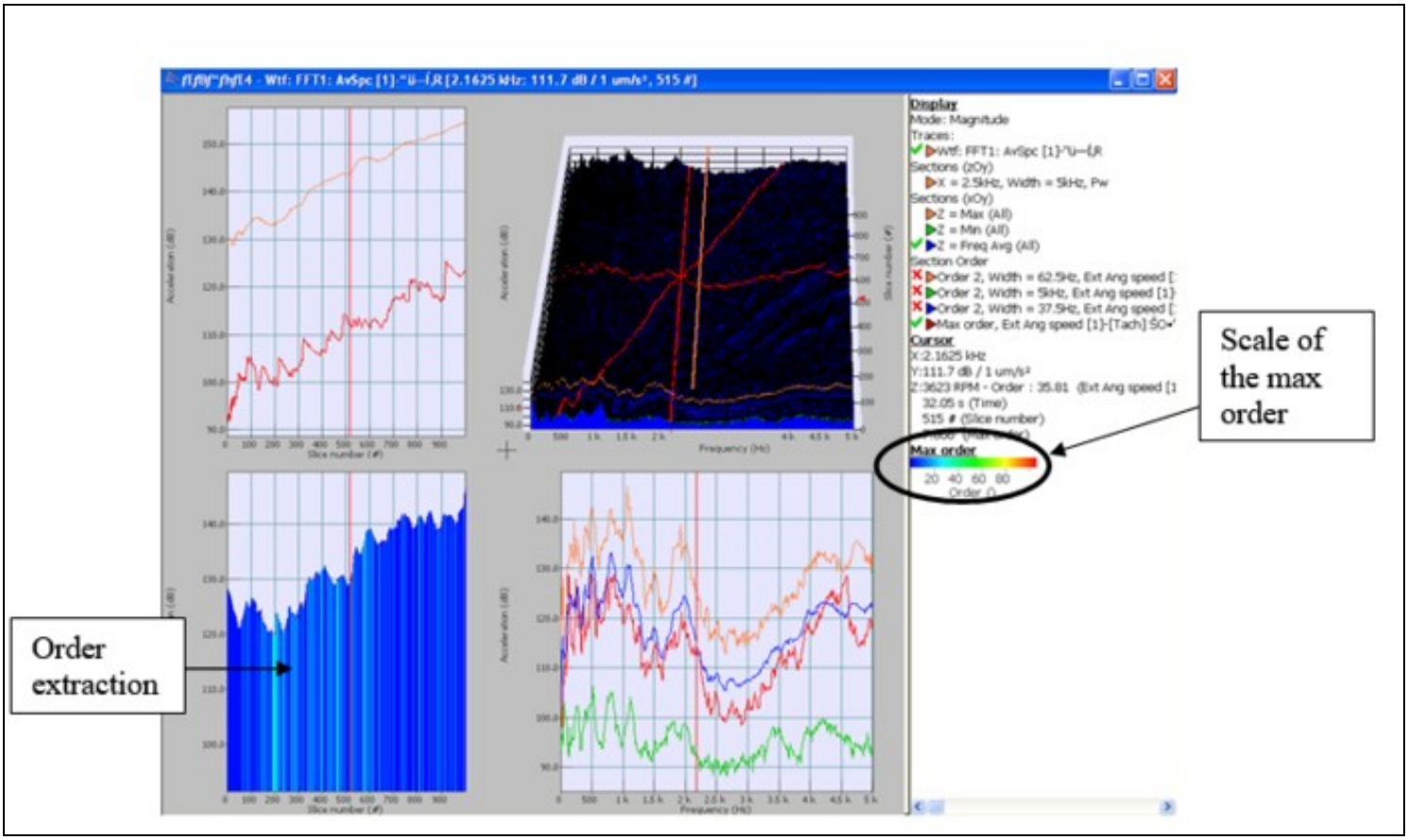
- *Z-Operator*:

This Operator is available on XY extraction view and 3 operators are available: Min, Max and Arithmetic Average.



- *Order Extraction*:





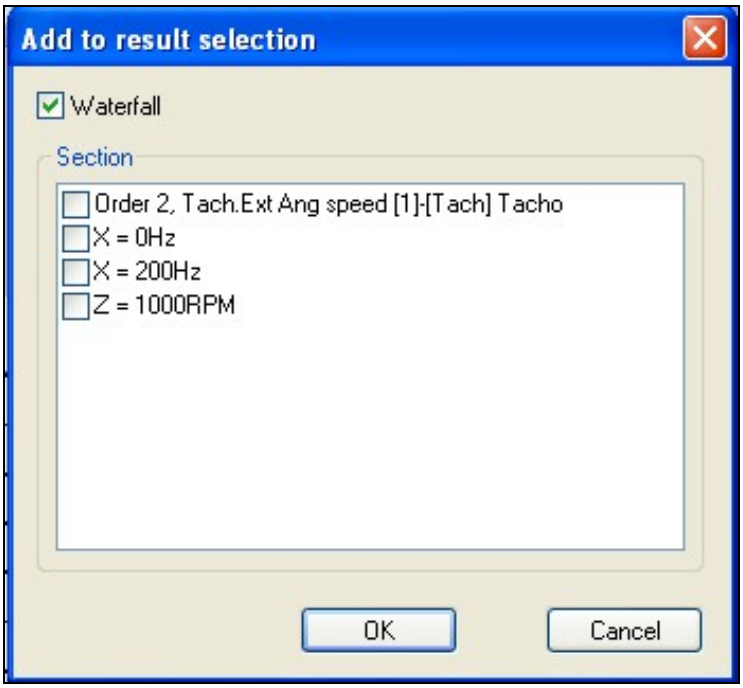
This Operator take data spectrum by spectrum, for each spectrum there is a determination of the max value and of the corresponding order. Using this operator it is possible to detect on which orders it is useful to work. Note: The Max Order cannot be saved in result (not available in the ?Add to result selection?).

43.3.1.3 Save results

This section gets you to select and save the Waterfall results.

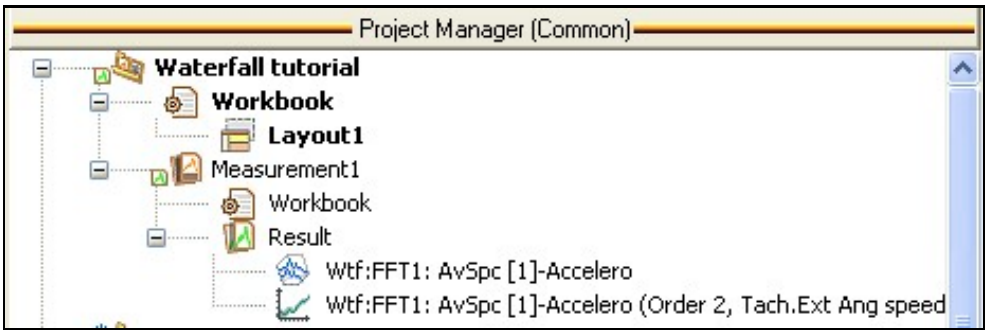
Right click on the Waterfall window and select **Add to result selection**. A window that allows you to select the results to be saved is displayed:

- 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:



43.4 Settings

43.4.1 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

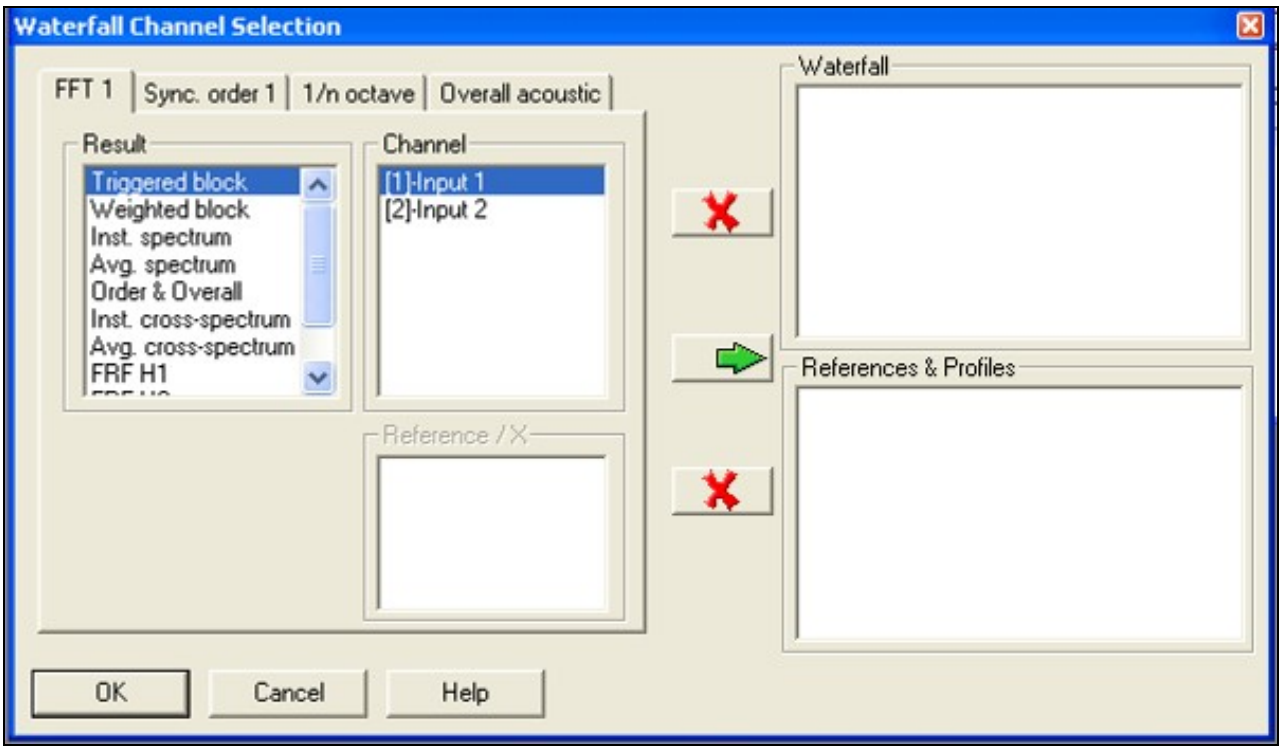
- **Results 3D**: spectra collected by the waterfall acquisition putted in order by a reference. These types of results are displayed in 3D graphs (3D, isometric or color-spectrogram).

43.4.1.1 Channel

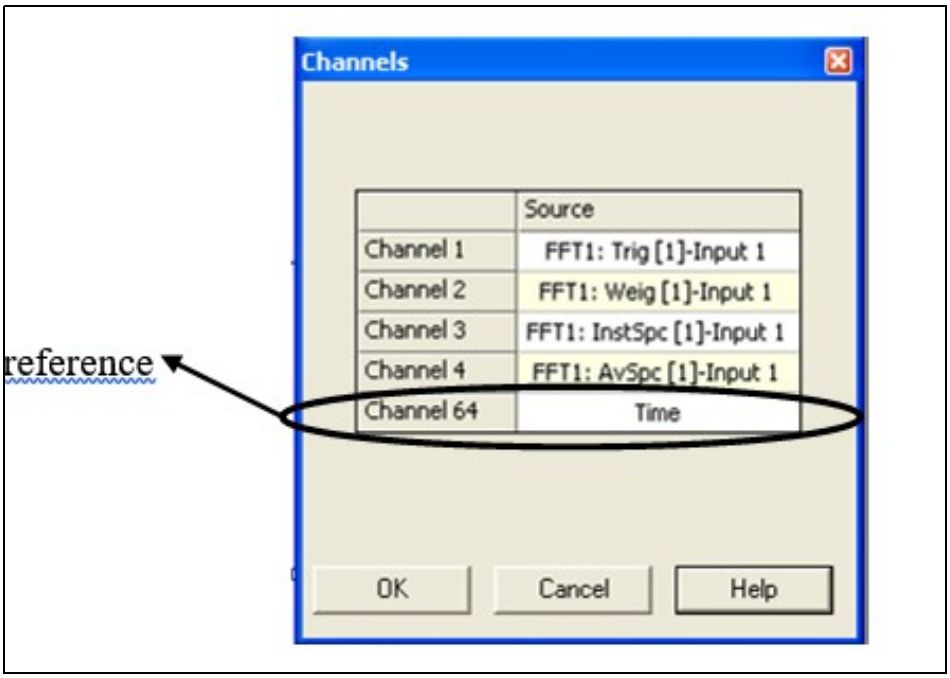
The different channels are available by putting selected inputs in the plug-in.

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.



43.4.1.1.1 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.

43.4.1.1.2 Mode

Contains the settings related to the Waterfall display mode.

- **Mode**:

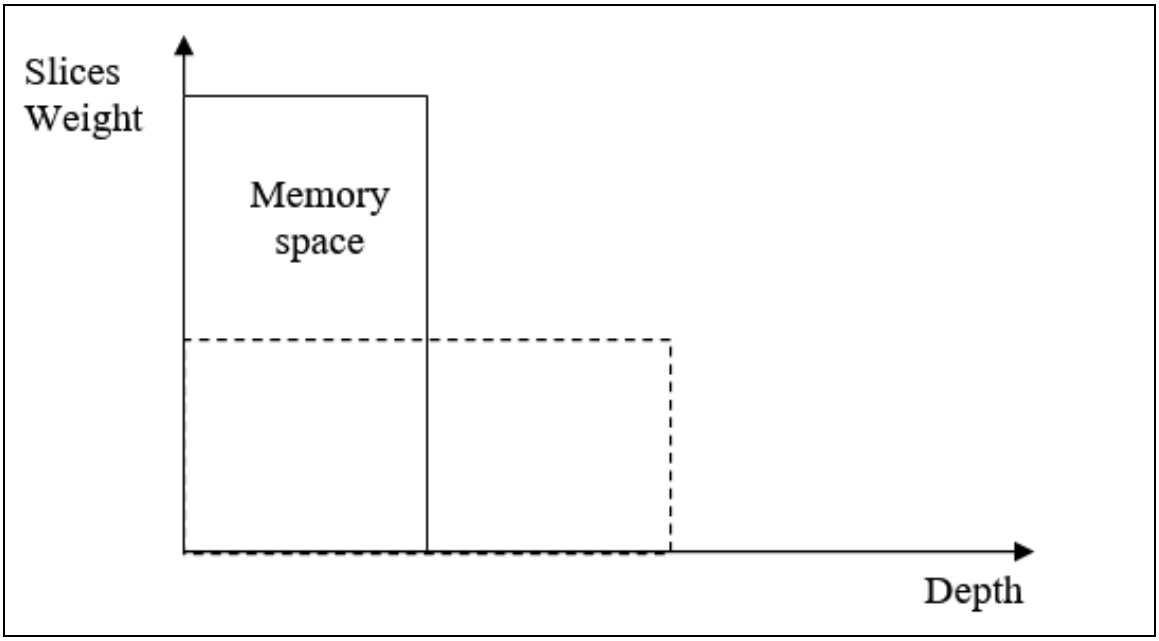
Off: the Waterfall is inactive. This mode is useful to check your signal and your settings before the analysis.

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

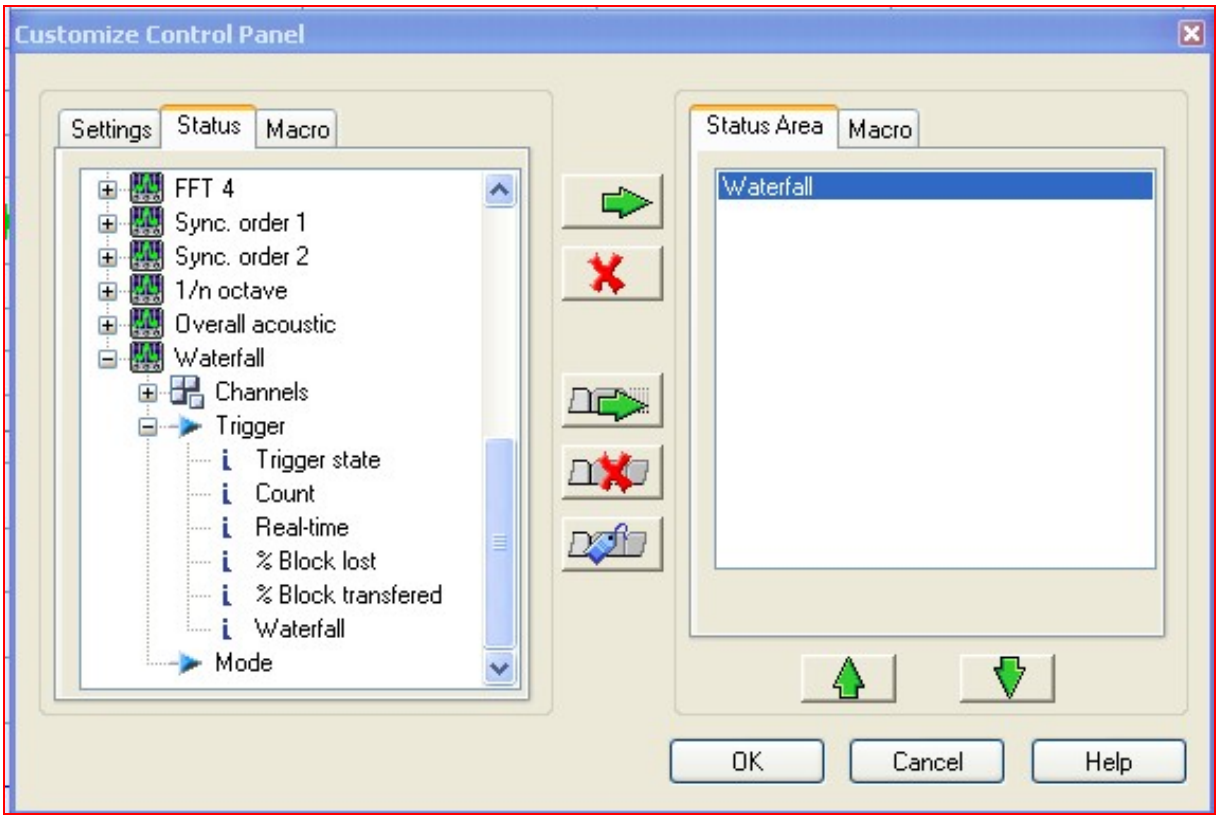
- **1/N Octave**: if the waterfall trigger selected were « Oct result available », the slices number would depend on durations (average duration « T » and short duration « t ») from the sub module Average in 1/N Octave.

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

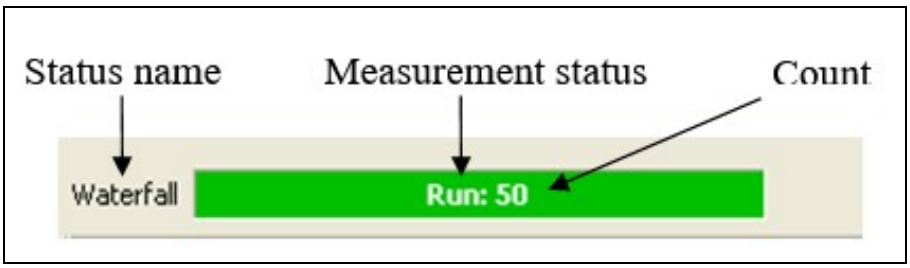
The on line display uses more power and could slow displays but acquisitions and analyses remain real-time.

43.5 Waterfall status

All statuses are available to add to the control panel



43.5.1 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:

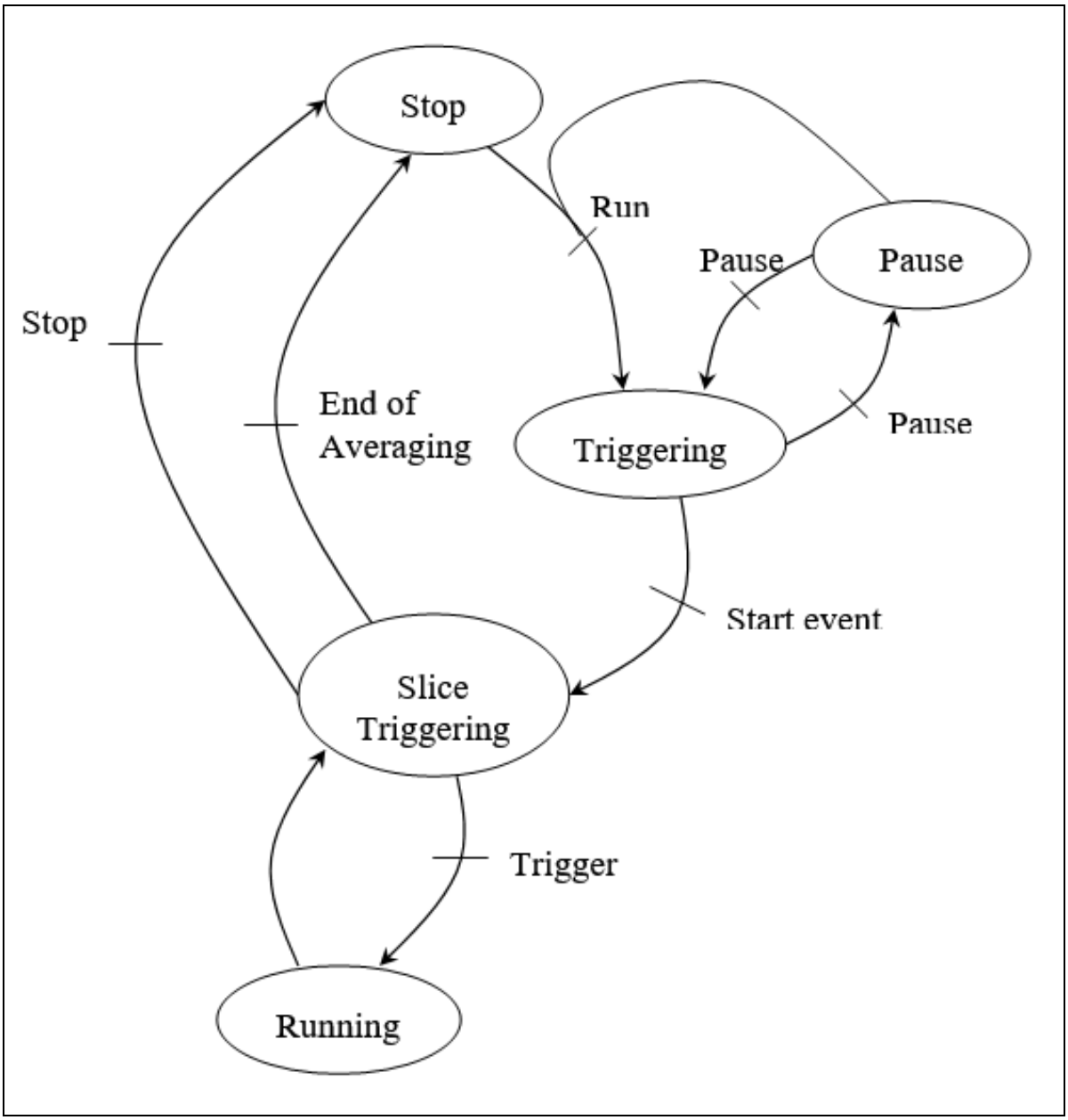
- ?One shot? mode: the progress bar is filled from left to right.
- ?Continuous? mode: the progress bar is filled from right to left with flashing until the end of the acquisition.
- ?Off? mode: the progress bar is empty with the text ?Off? inside.

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.

43.5.1.1 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.

43.5.1.1.1 Count

This status displays the averaging count, that total number of slices already acquired.

43.5.1.1.1.1 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.

43.5.1.1.1.2 % 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.

43.5.1.1.1.3 % 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%.

43.6 FAQ

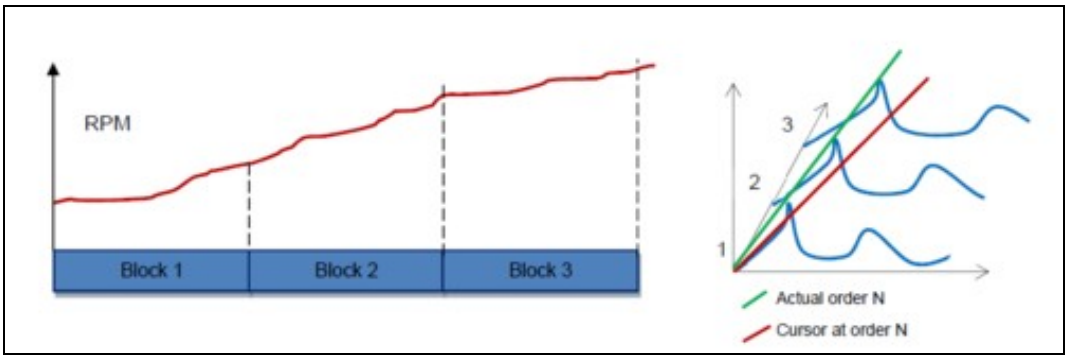
43.6.1 FFT1 Tach vs EXT synch tach

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.

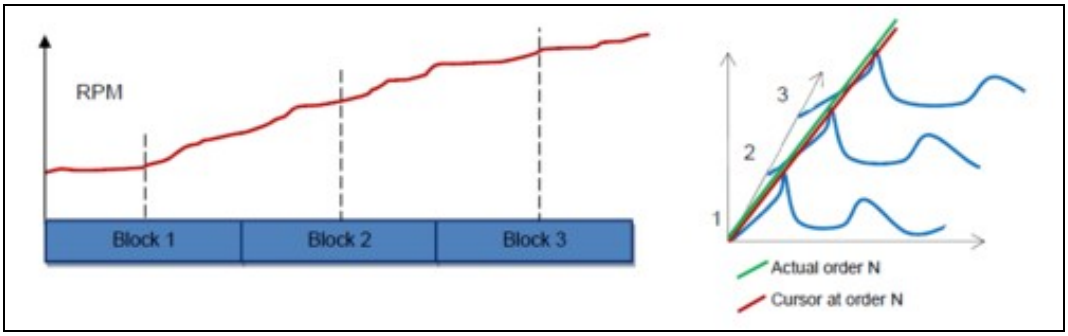
This allows centering tachometer speed at the center of the FFT/SOA trigger block(s). It is useful with long trigger blocks (High resolution analyses) to perfectly match the actual data with the order cursor or section.

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

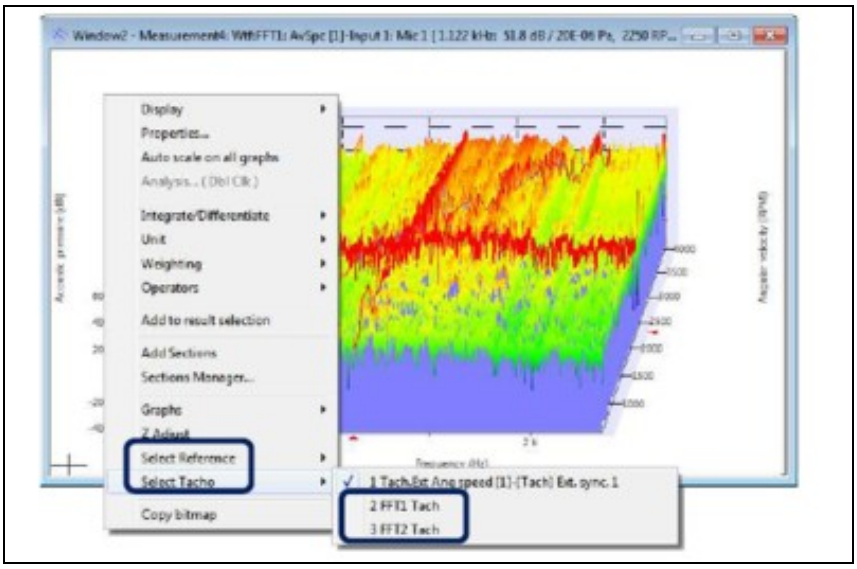
The RPM centering and averaging is done in the analysis plug-in prior to be connected to the waterfall. To use the centered tach simply add the said tachometer to the corresponding plug-in (FFTn or SOAn). These additional tachometers are available in the waterfall as soon as one of the result of the 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

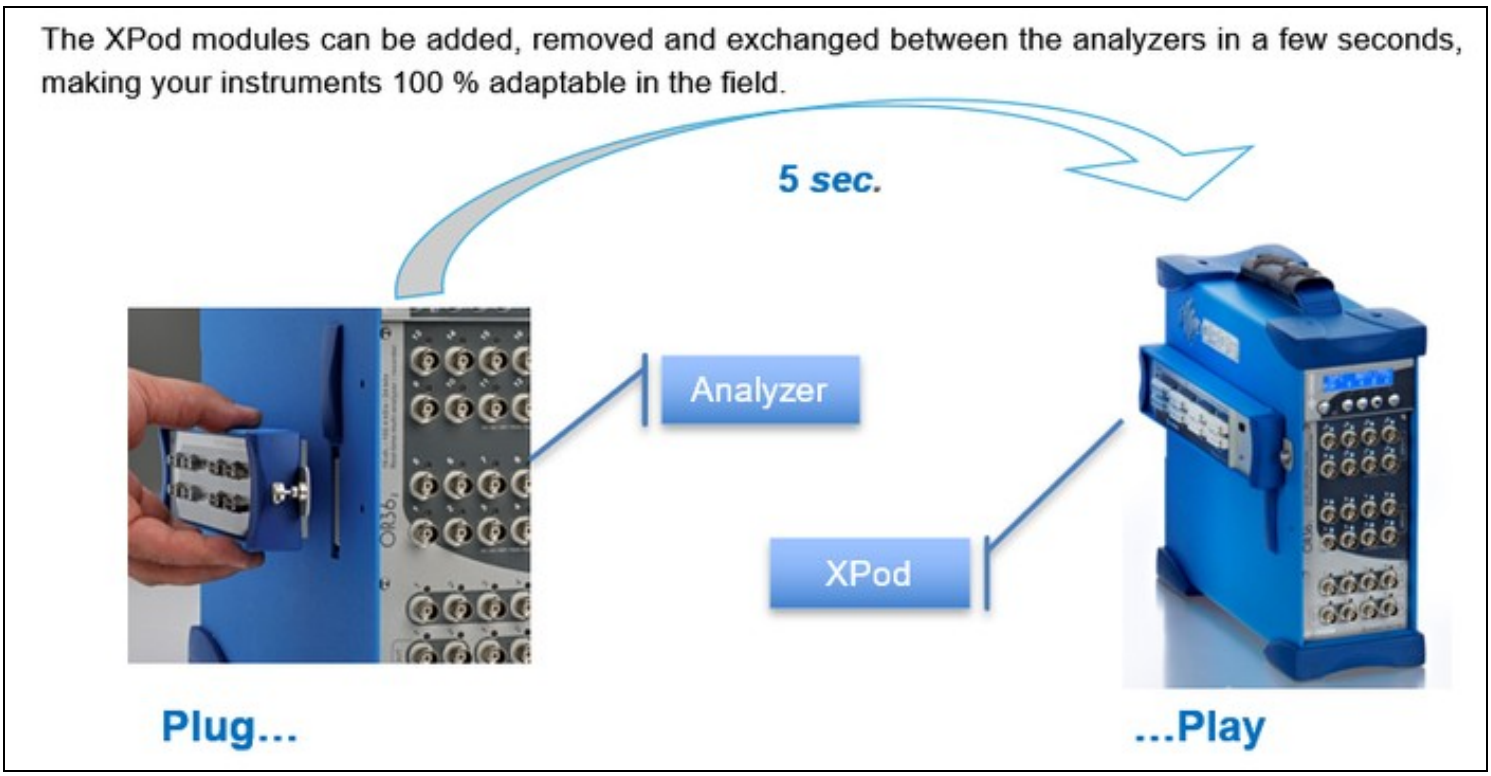
44 NVGate X-Pod: Temperature probe conditioner

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**

44.1 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.



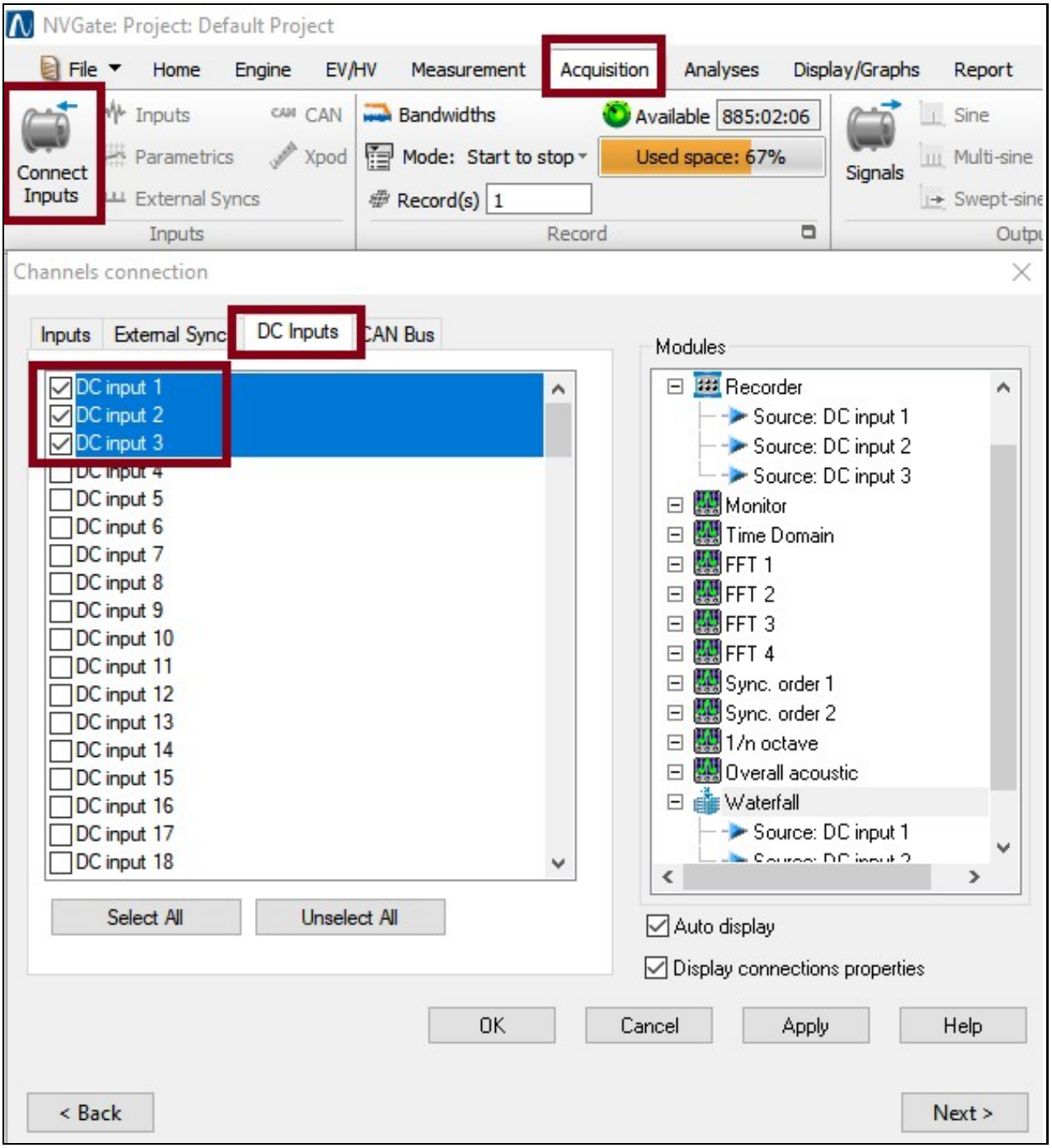
In the connected mode, when an XPod is present each corresponding input can be routed to:

· The BNC input (Standard)

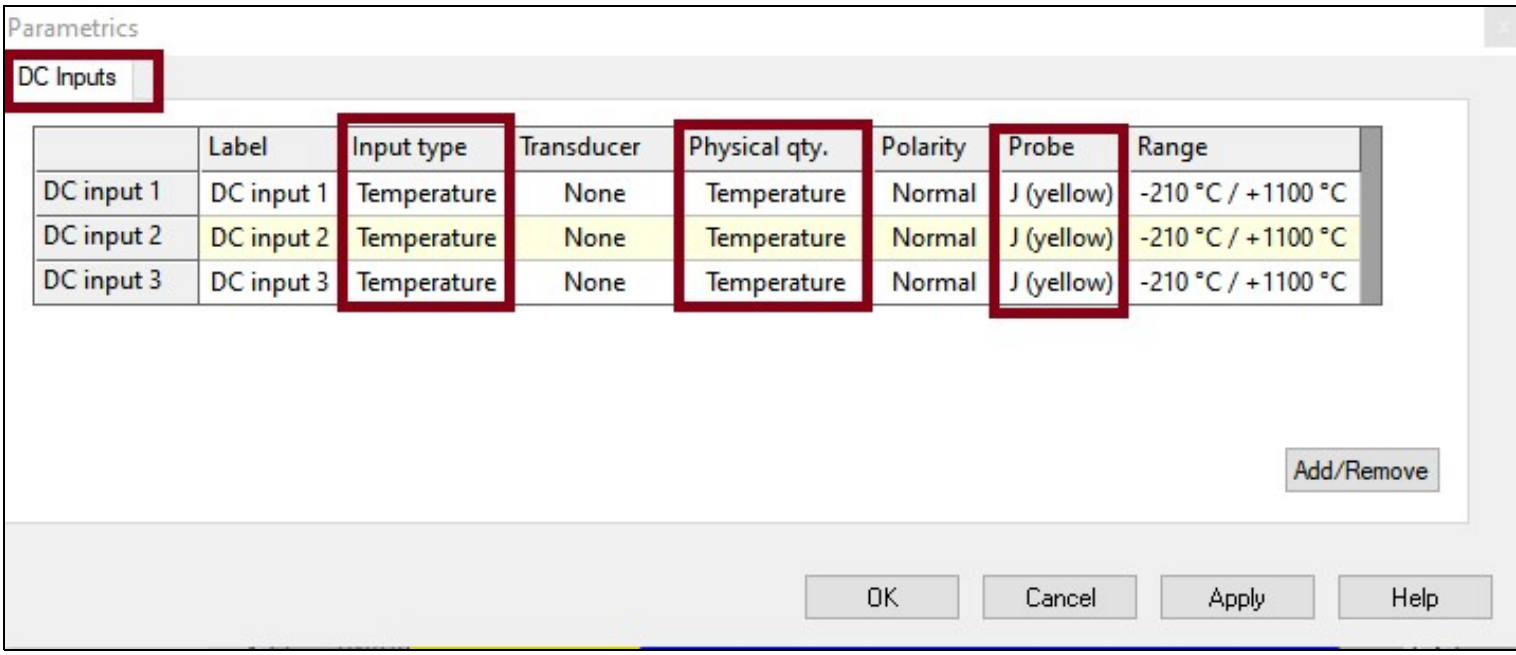
· The XPod connector

44.2 Tutorial

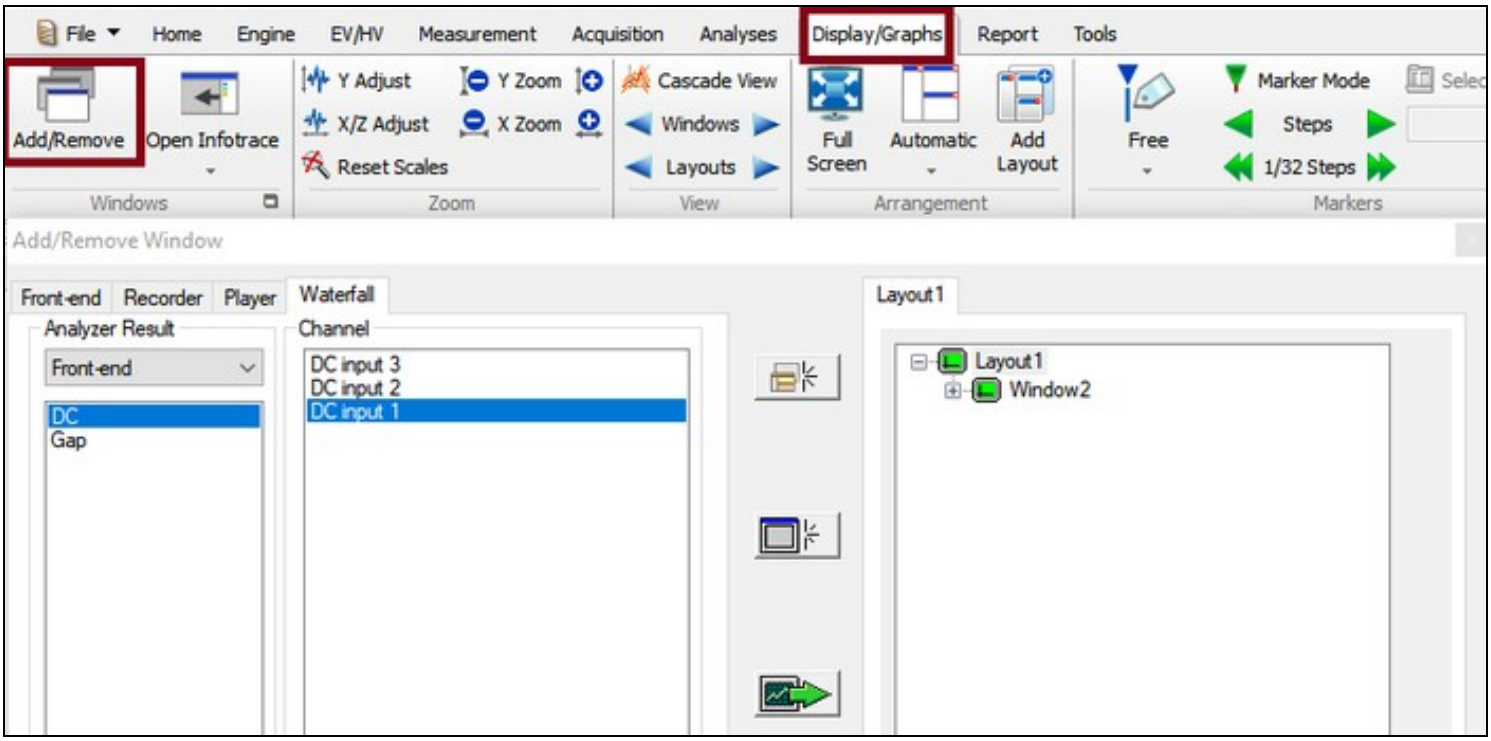
- First connect Xpod to the analyzer and connect your temperature probes.
- Start Analyzer
- Start NVGate
- **Select a DC Input** and put in in a "plug in" (recorder, waterfall (for profile)...)



- 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

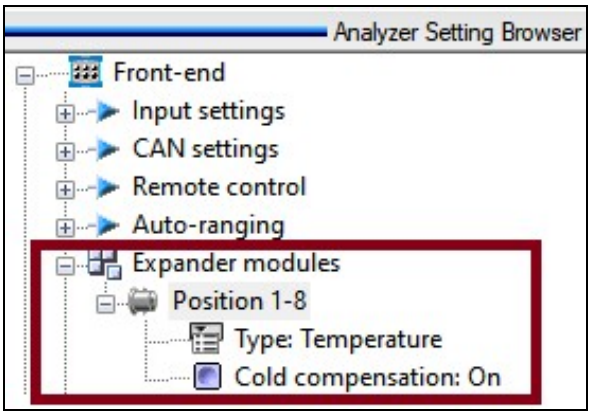


44.3 Settings

44.3.1 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.

44.3.2 Input settings

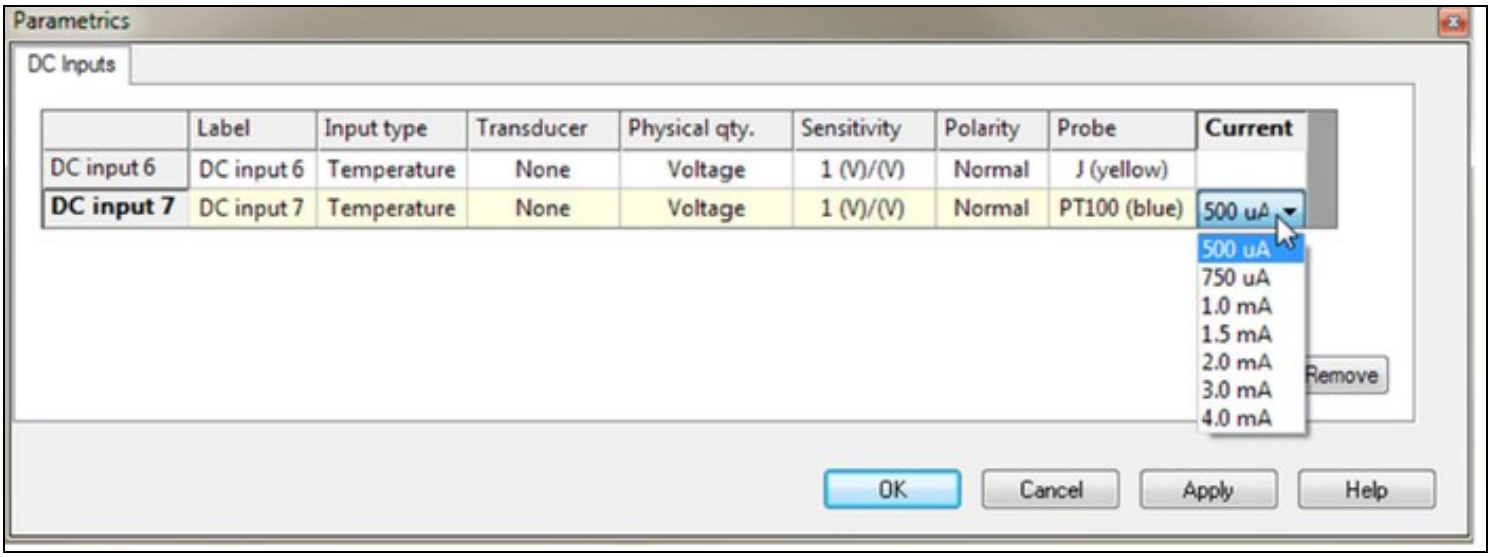
DC Inputs

	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.

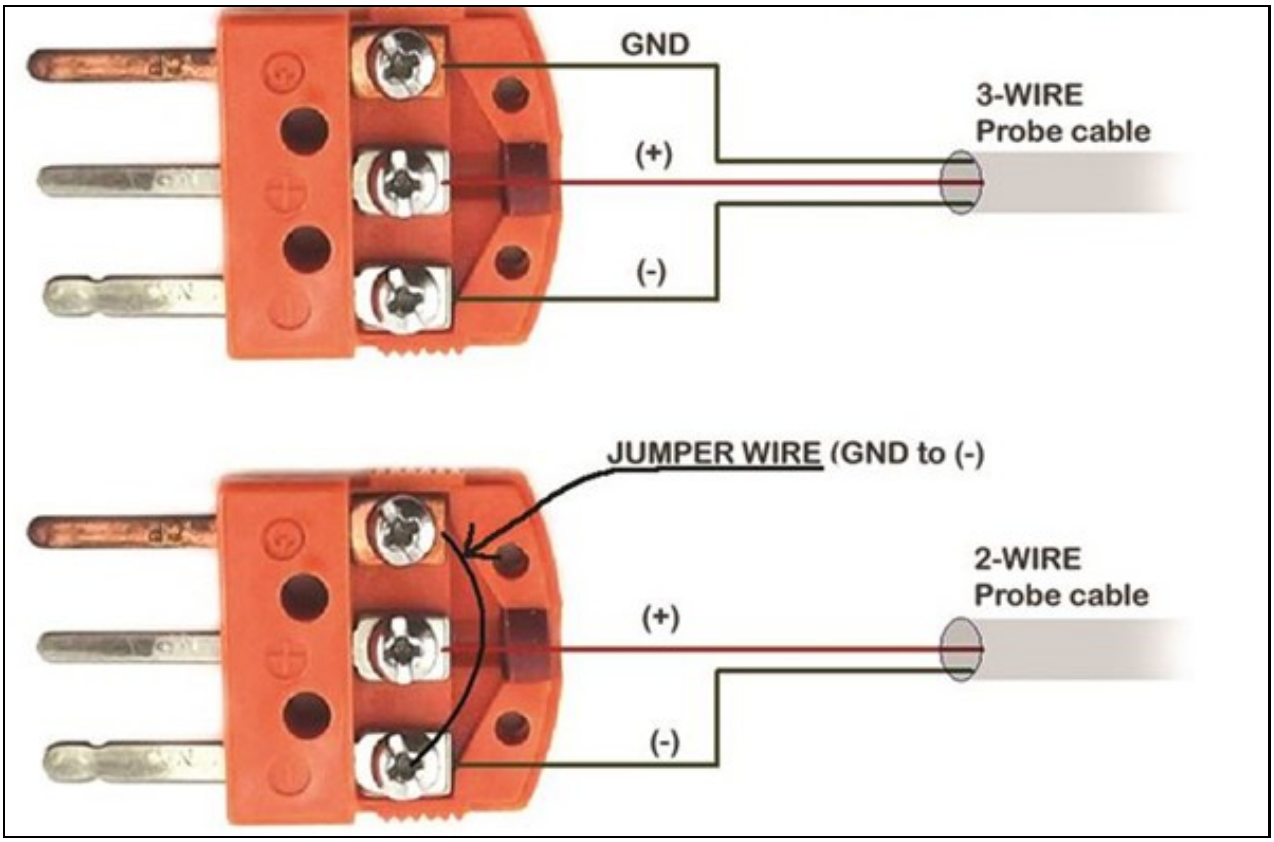
While using RTDs (PT100 PT1000), the applied current can be selected



(the standard is 500 uA)

44.3.3 Sensor Connector

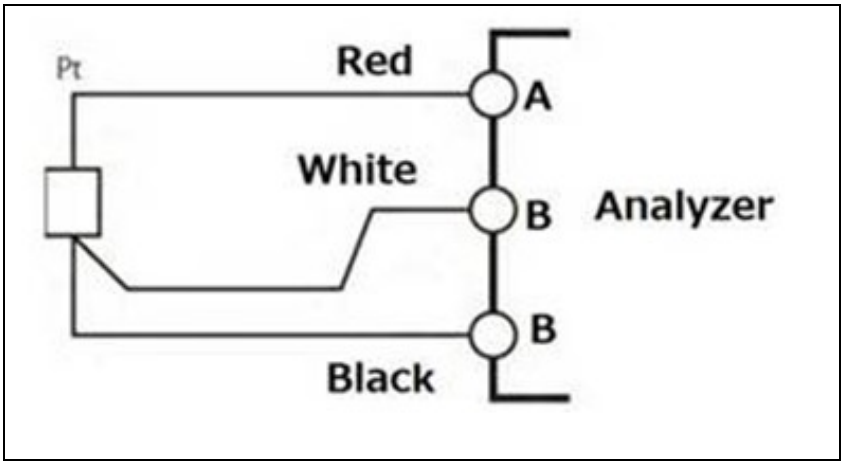
This is a standard connection. If you buy a temperature sensor it is already a cable like this :

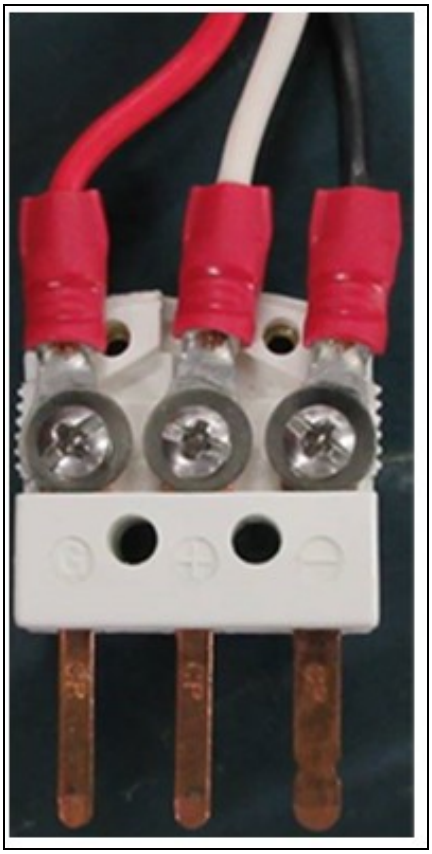


note : for a 2 wire probe the third pin is optional. It is working with a 2 pin connector.

44.3.3.1 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"

45 NVGate: Properties

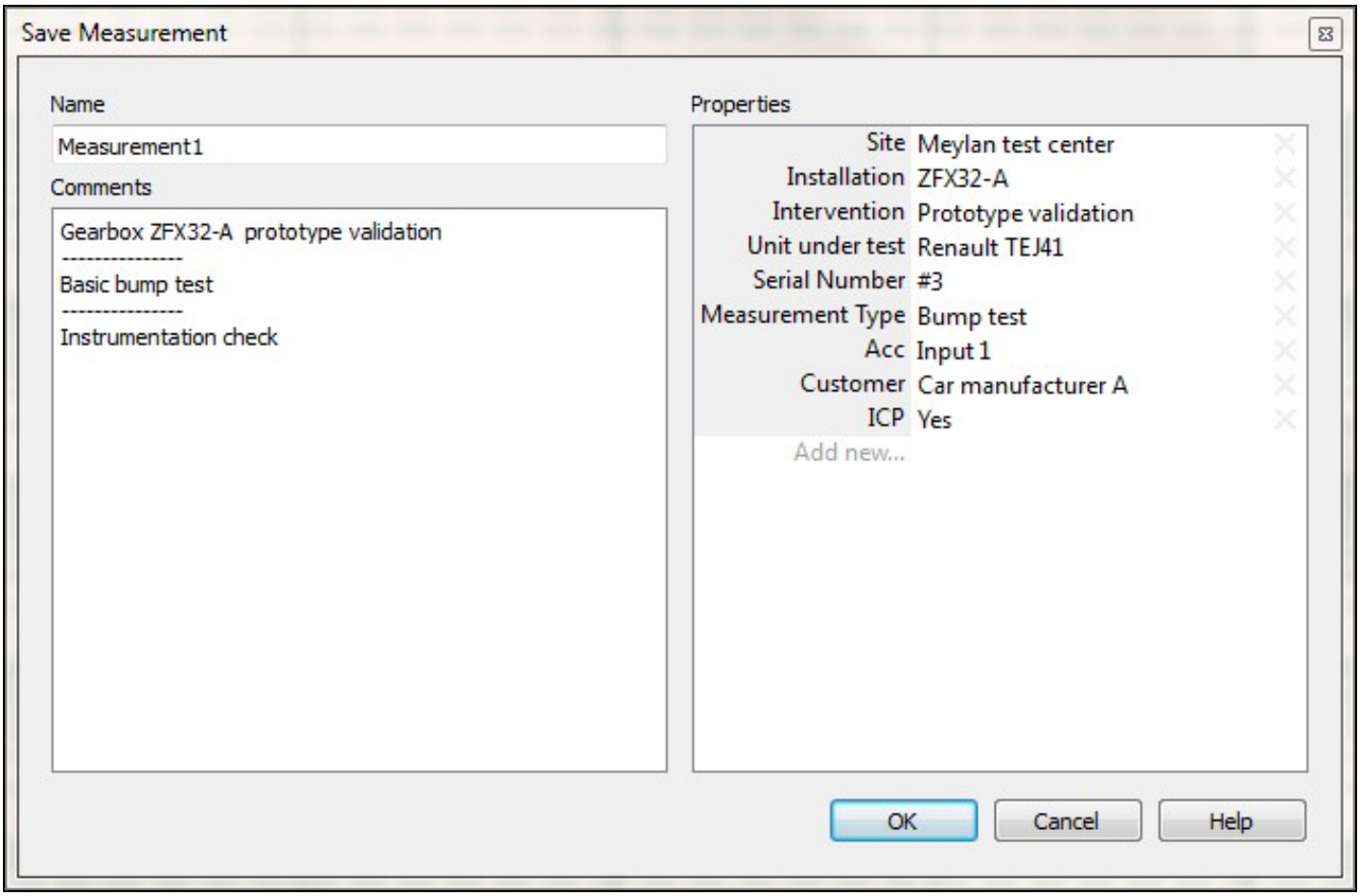
45.1 Properties overview

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):



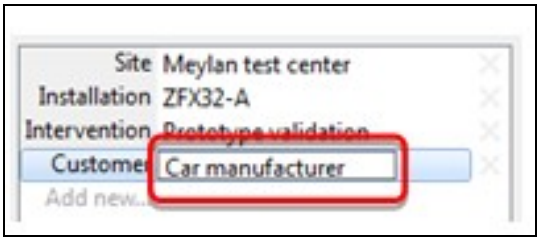
On the left side the Item's name and the comments. Current Project and Model comments will inherit to the Measurements.

On the right side the OROS user and User properties. Current Project and Mode properties will inherit to the Measurements.

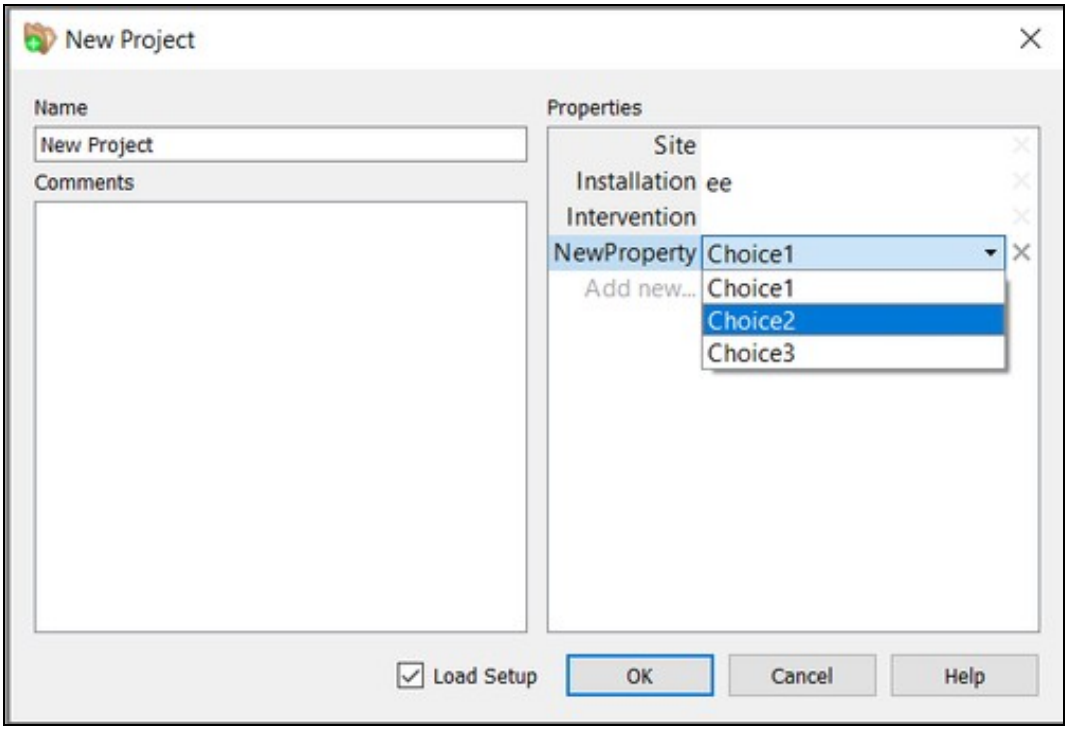
45.1.1 Saving Data

45.1.1.1 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:

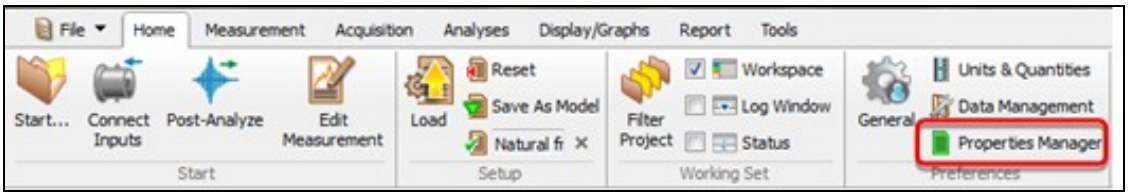


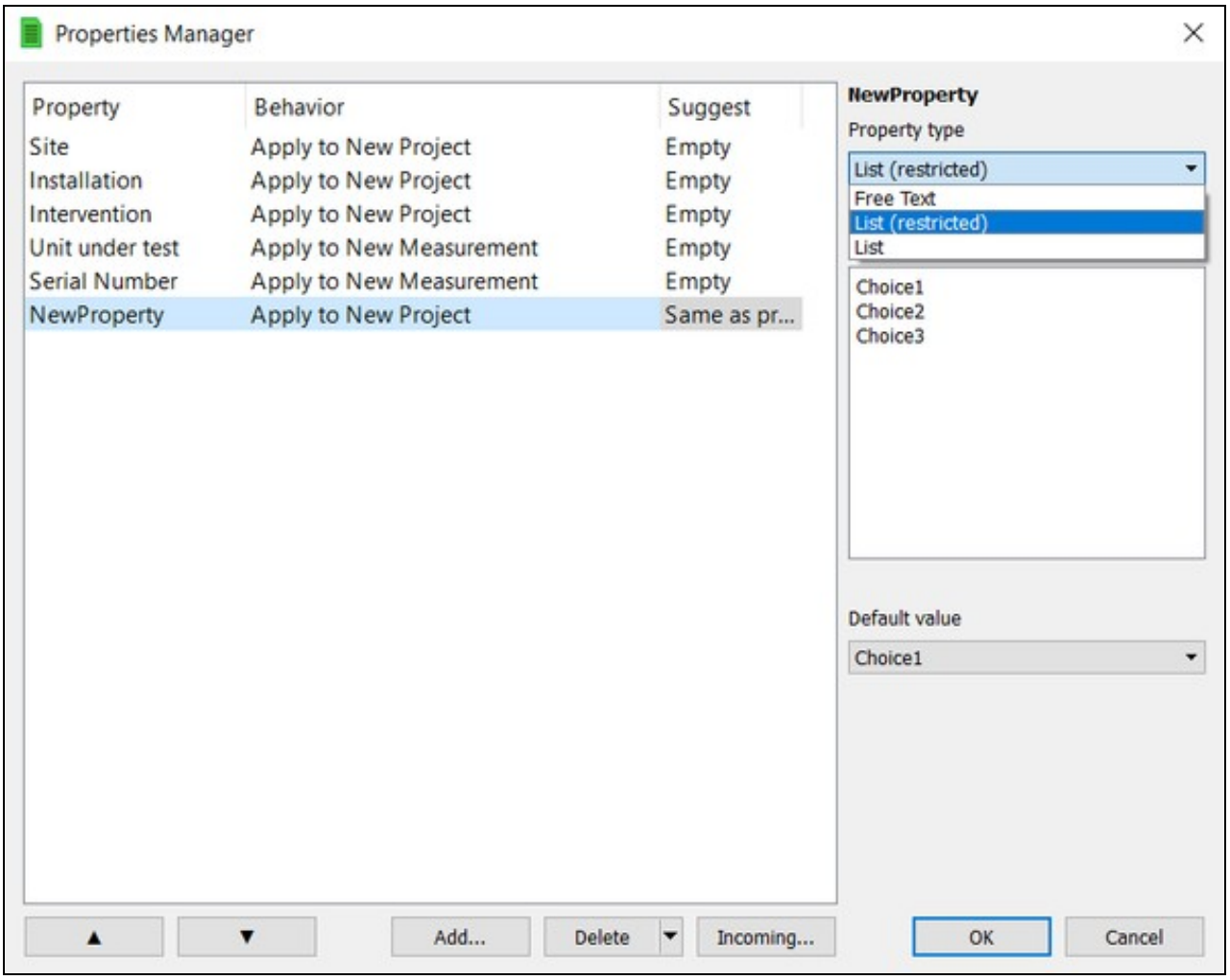
Filling in a predefined choice for a property (when for example creating a new project)

Below, we will explain how to proceed.

45.1.2 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

45.1.2.1 Behaviour

- **Apply to new** "Item": will show the property while saving the corresponding "Item"

45.1.2.1.1 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.

45.1.2.2 Property Type: Free Text/List

After selecting a property, the property type can be selected. Three choices are available:

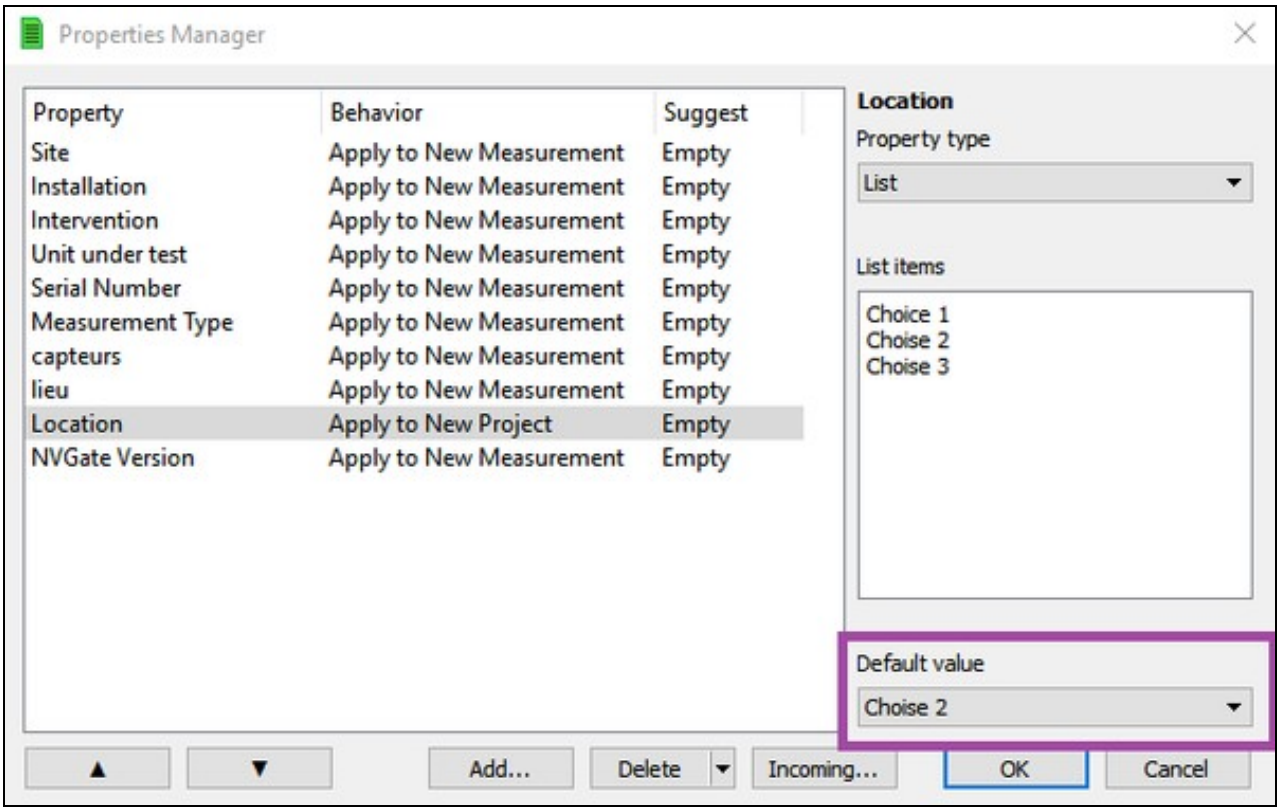
Free text: The user can enter any text freely when filling the property information.

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:

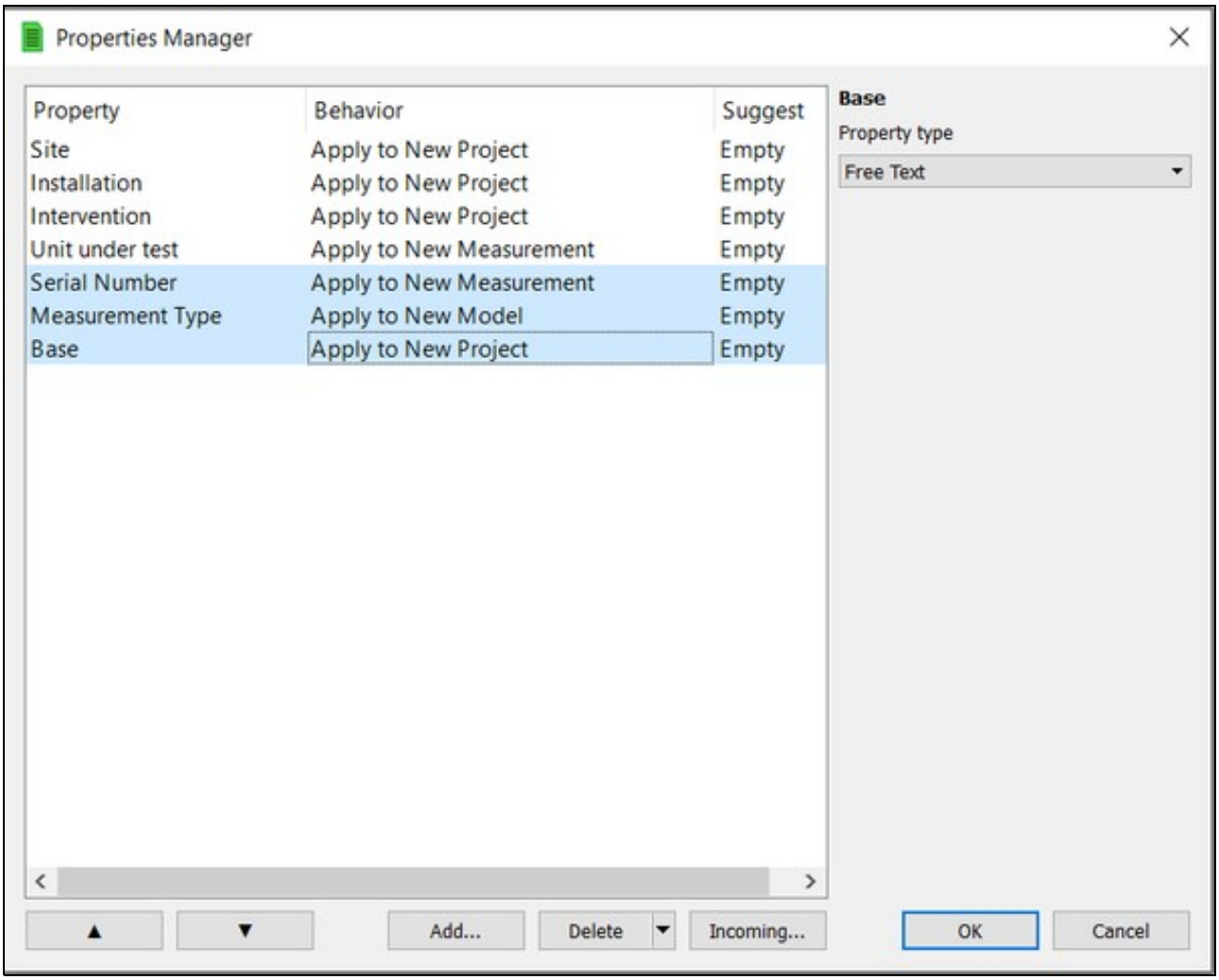


Setting up the default selection from the list

45.1.2.3 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.

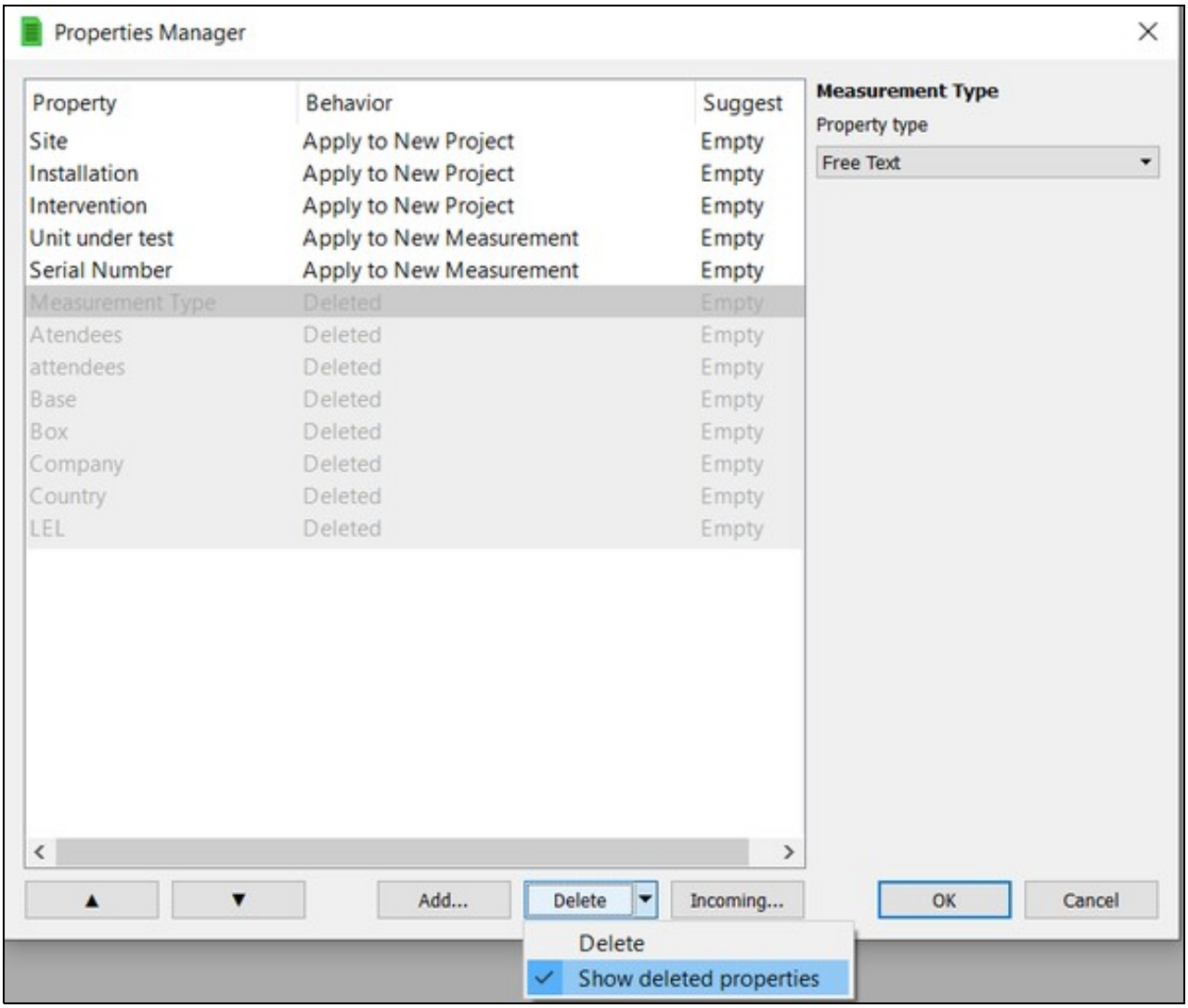
45.1.2.4 Deleting existing properties


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'

45.1.2.5 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).

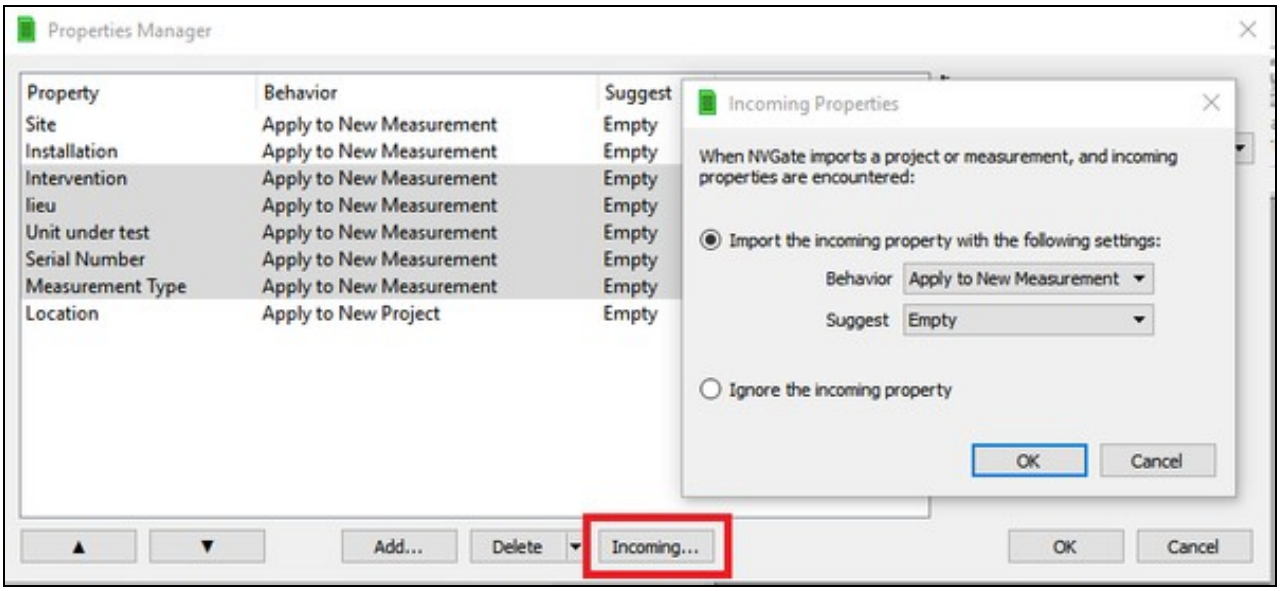
You can select what will happen to a property when the import occurs. The behavior is adjusted after pressing the button "Incoming ?"

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.

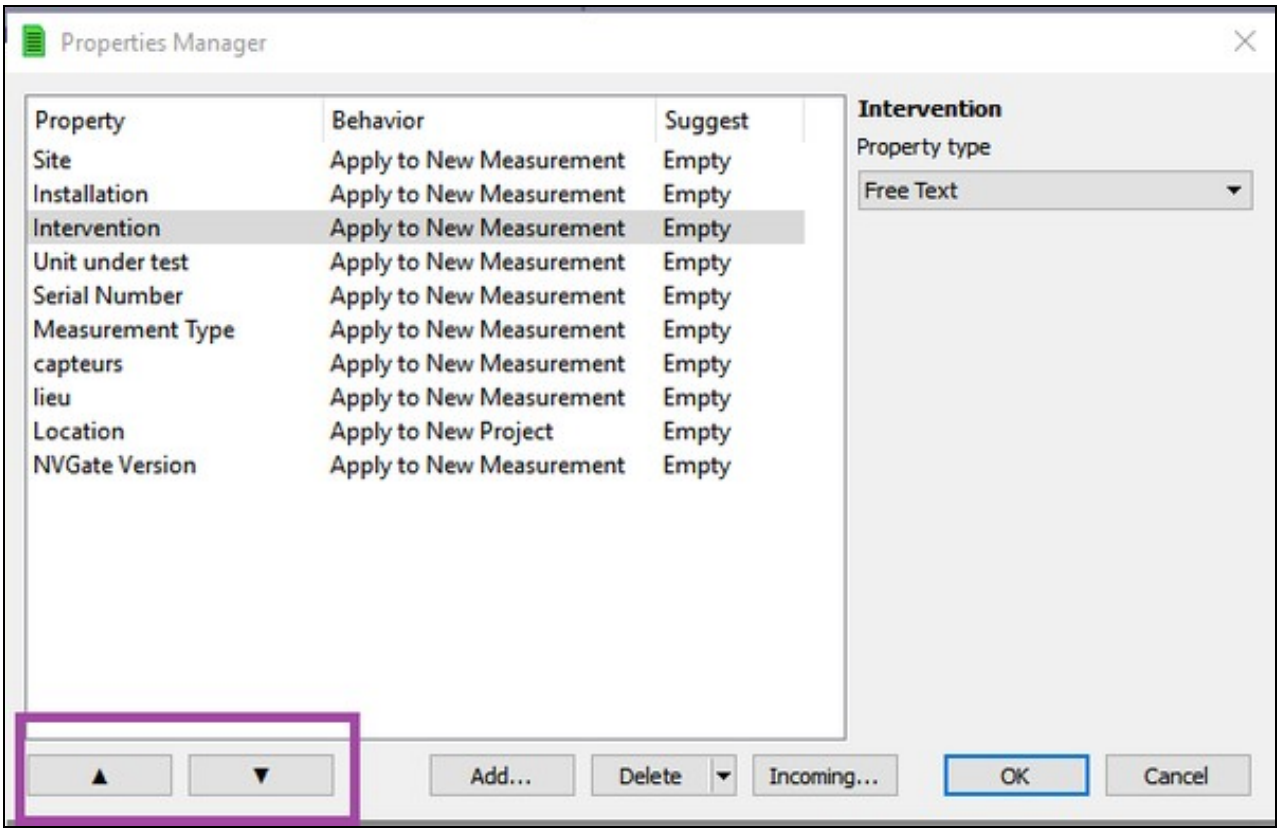
- Ignore: When this behavior is selected, the property will actually take the status deleted right at the import level.



Setting up what will happen to a property during an import

45.1.2.6 Sorting the properties

It is now possible to rank properties (after selecting them) to change their order:



45.1.3 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.

45.1.3.1 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>
```

45.1.3.2 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>
```

46 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!

46.1 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.

46.1.1 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)

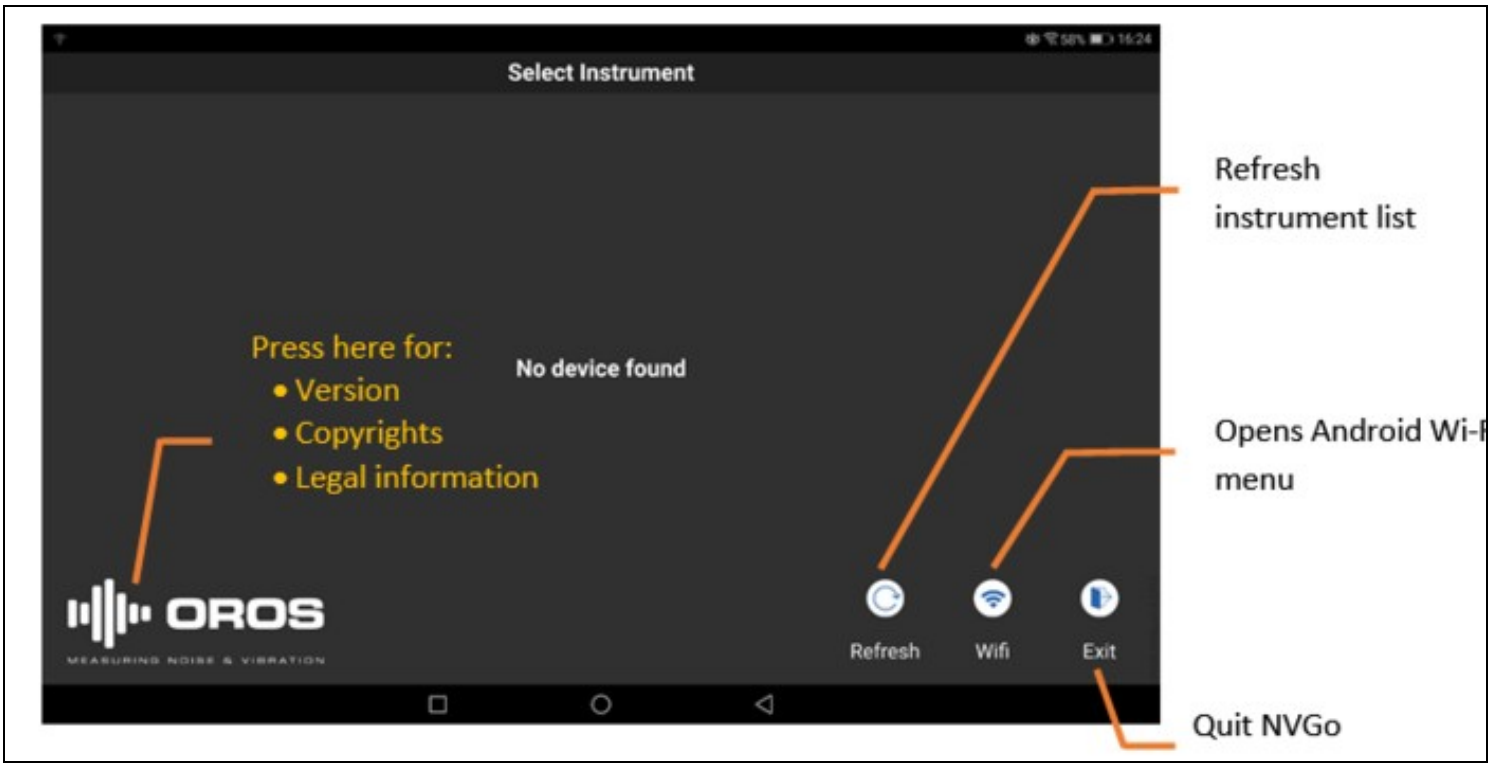
3) Use a file browser and navigate to your download folder.

4) Tap the APK to begin the installation process.

The app should safely install.

46.1.2 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.

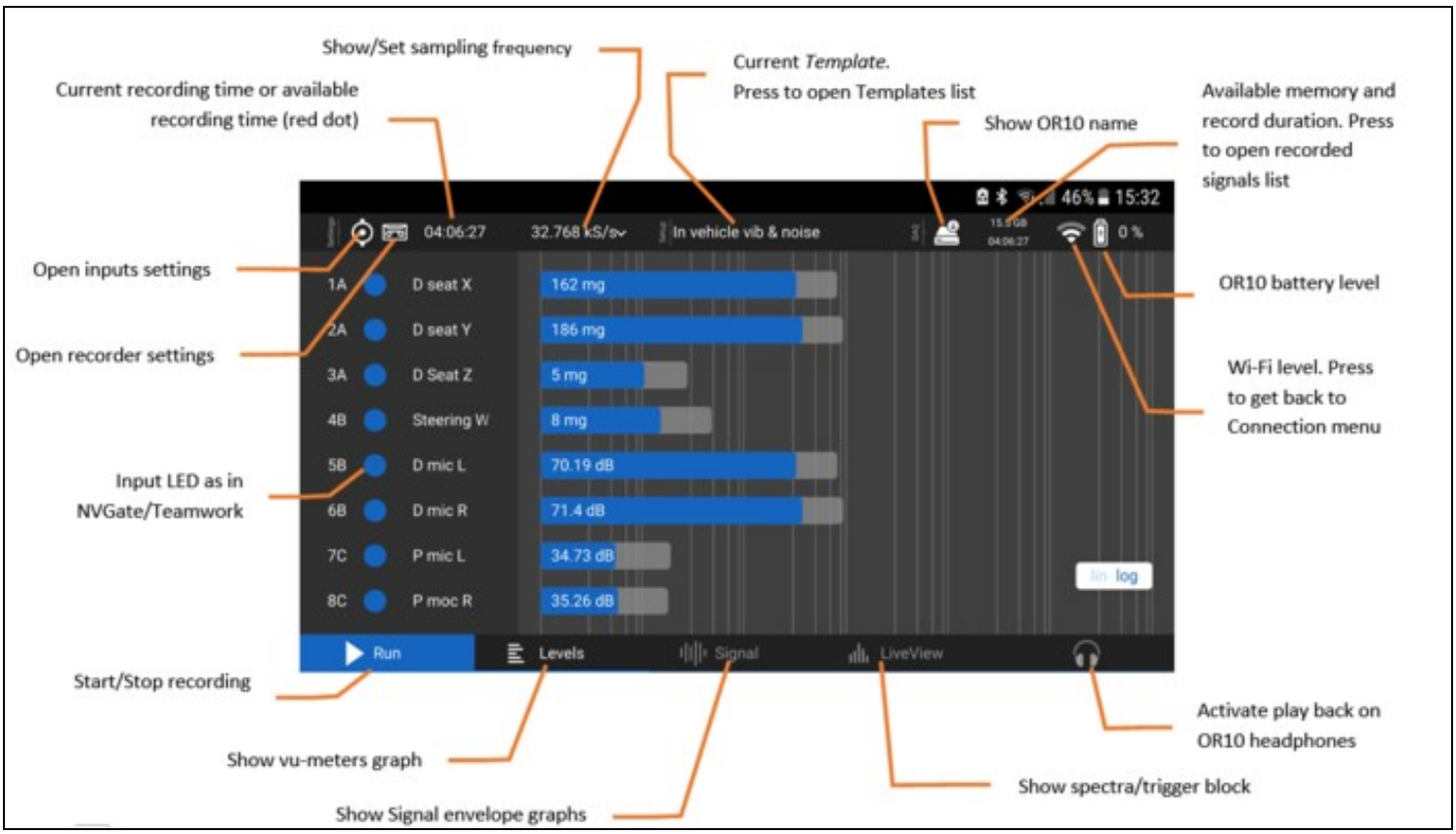
4. Press the "Wi-Fi" button on NVGo. The Android Wi-Fi menu is displayed.

5. Connect to the OR10. (default password is : 12345678)

6. Press Android back (<) button to return to NVGo.

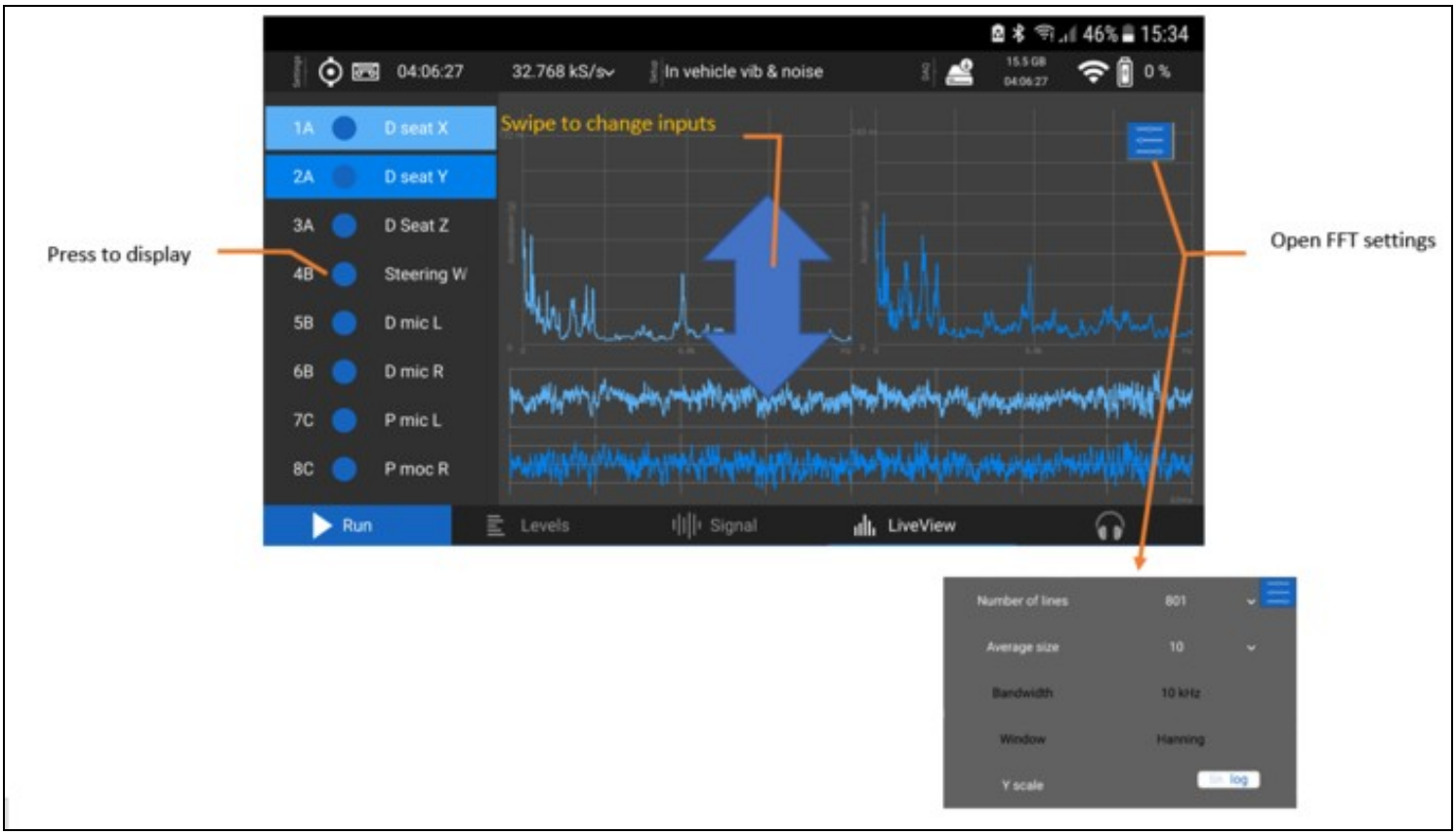
Refresh the instrument list. When your OR10 appears showing "Ready", click on it to start NVGo with this instrument.

Main screen :



46.1.2.1 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.

46.1.2.2 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.

46.1.2.3 Levels

Levels shows the RMS and Peak levels of all dynamic inputs together.

46.1.2.4 Playback

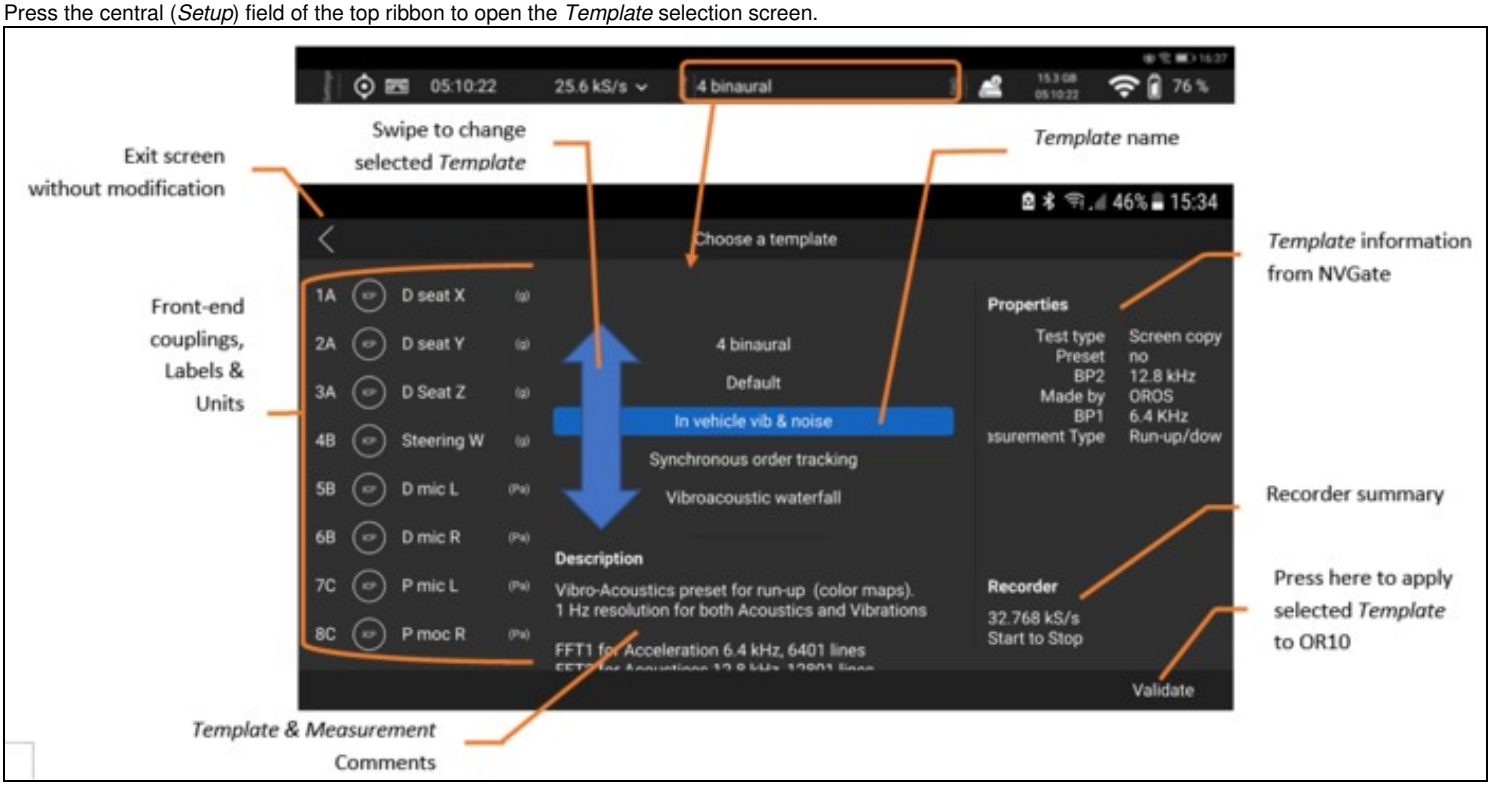
Press the headphone icon on bottom right of the main screen to activate the playback. The 2 active inputs (blue background on the *Signal* and *LiveView* screens) are replayed on the OR10 headphone plug. The volume is automatically adjusted. Caution, the playback volume is dependent on the used headphone 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.

46.1.3 Setting up the OR10

46.1.3.1 Loading a Template

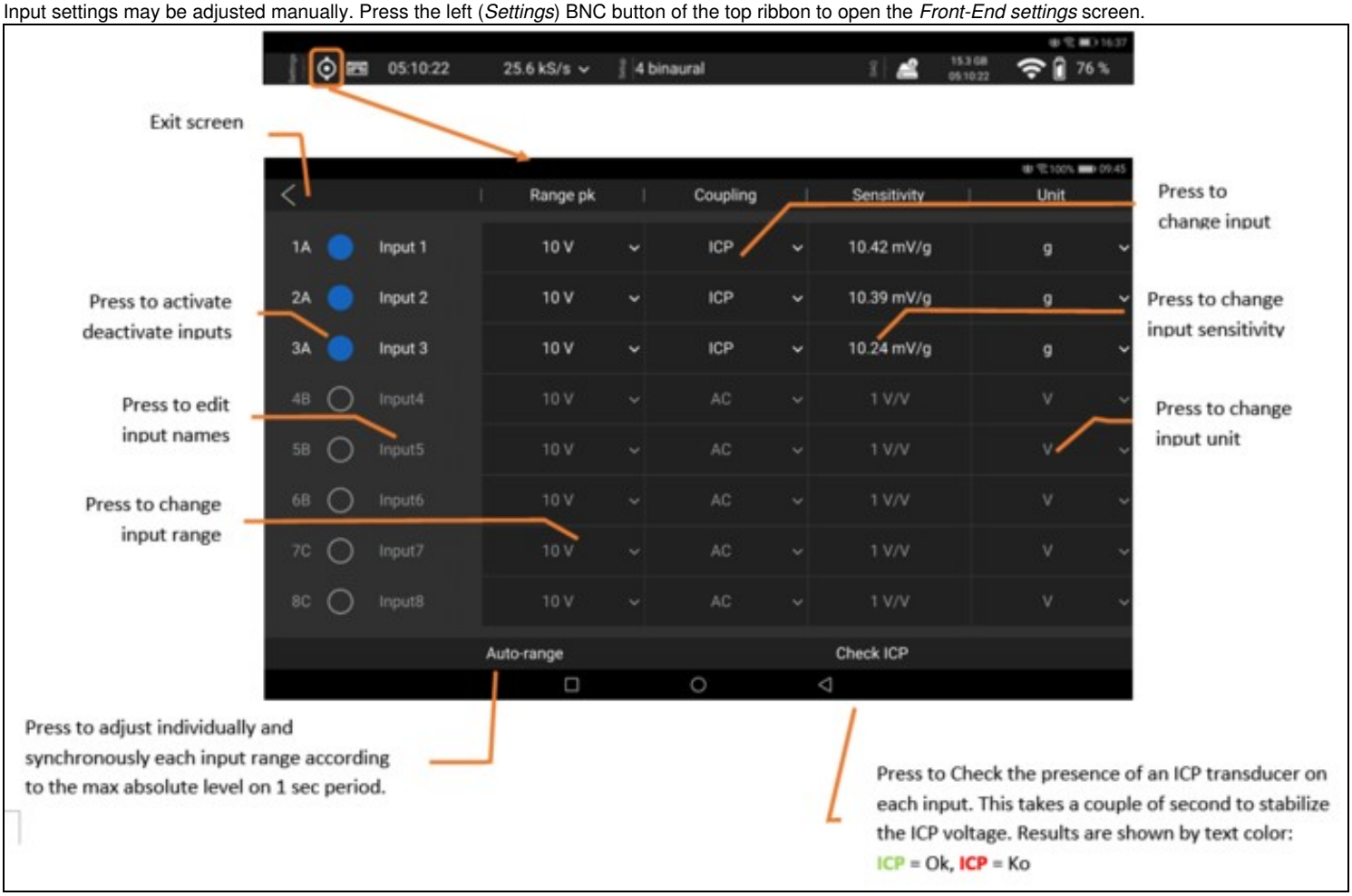
The *Templates* are generated and added to the OR10 memory with NVGate (see NVGate Template generation §). They are used in the same way NVGate *Models* is in order to setup the front-end with predefined settings. The *Template* properties and description will be saved in the *Measurements* made with it.

Press the central (*Setup*) field of the top ribbon to open the *Template* selection screen.



46.1.3.2 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.



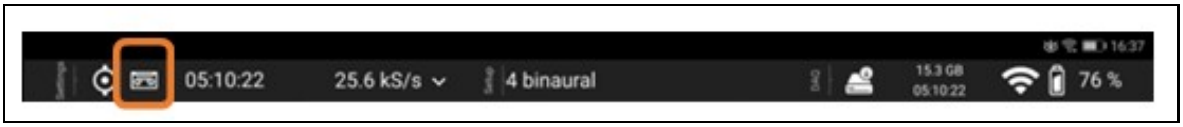
46.1.3.3 Adjust the Sampling Frequency

The sampling frequency is always displayed in the main screen. Simply select the desired sampling rate from the Top Ribbon drop down menu.

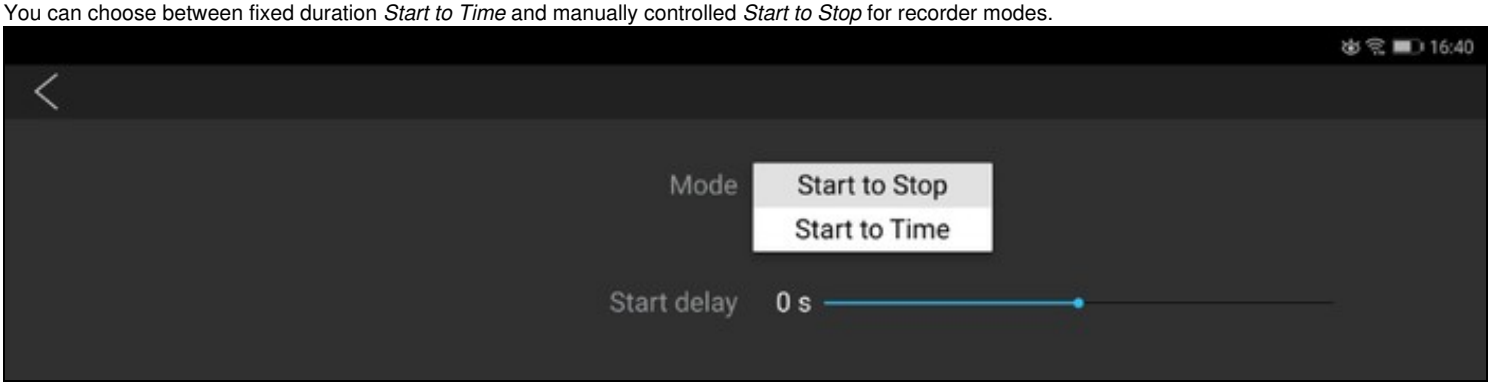
This menu is not available when the OR10 is recording.

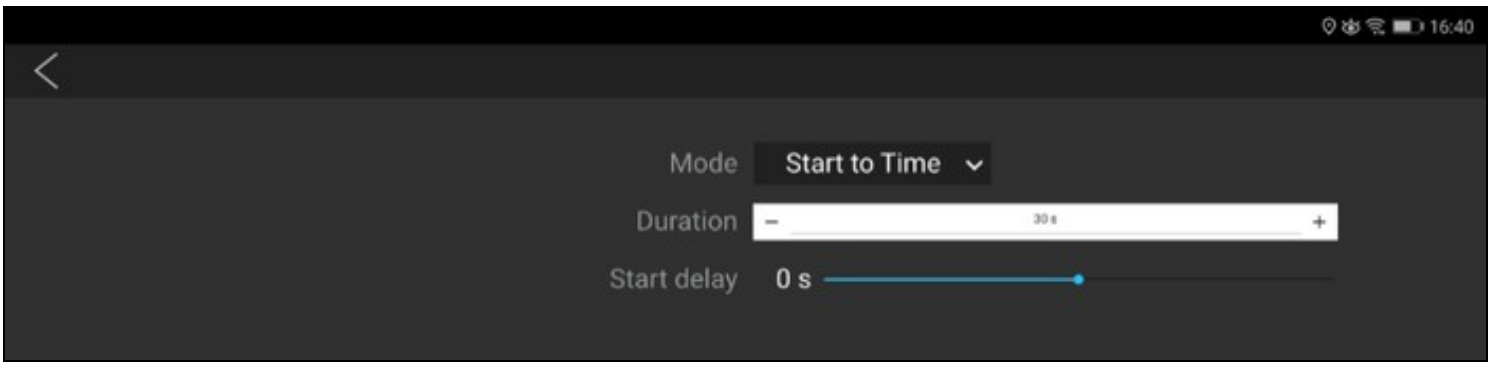
46.1.3.4 Adjust the Recorder

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.



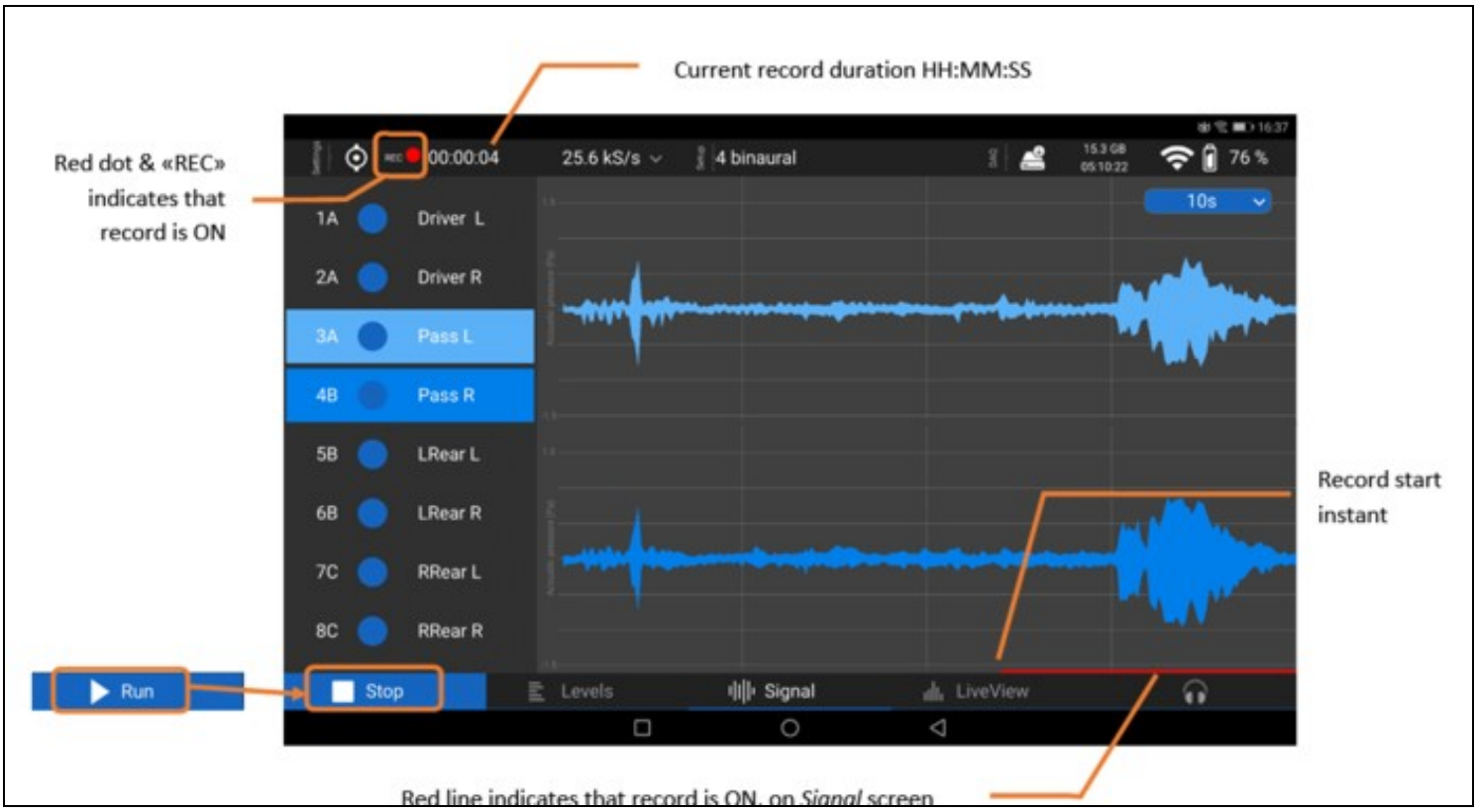


For *Start to Time*, the duration should be updated by editing the field or using the +/- buttons.

46.1.4 Make a Recording

46.1.4.1 Start Recording

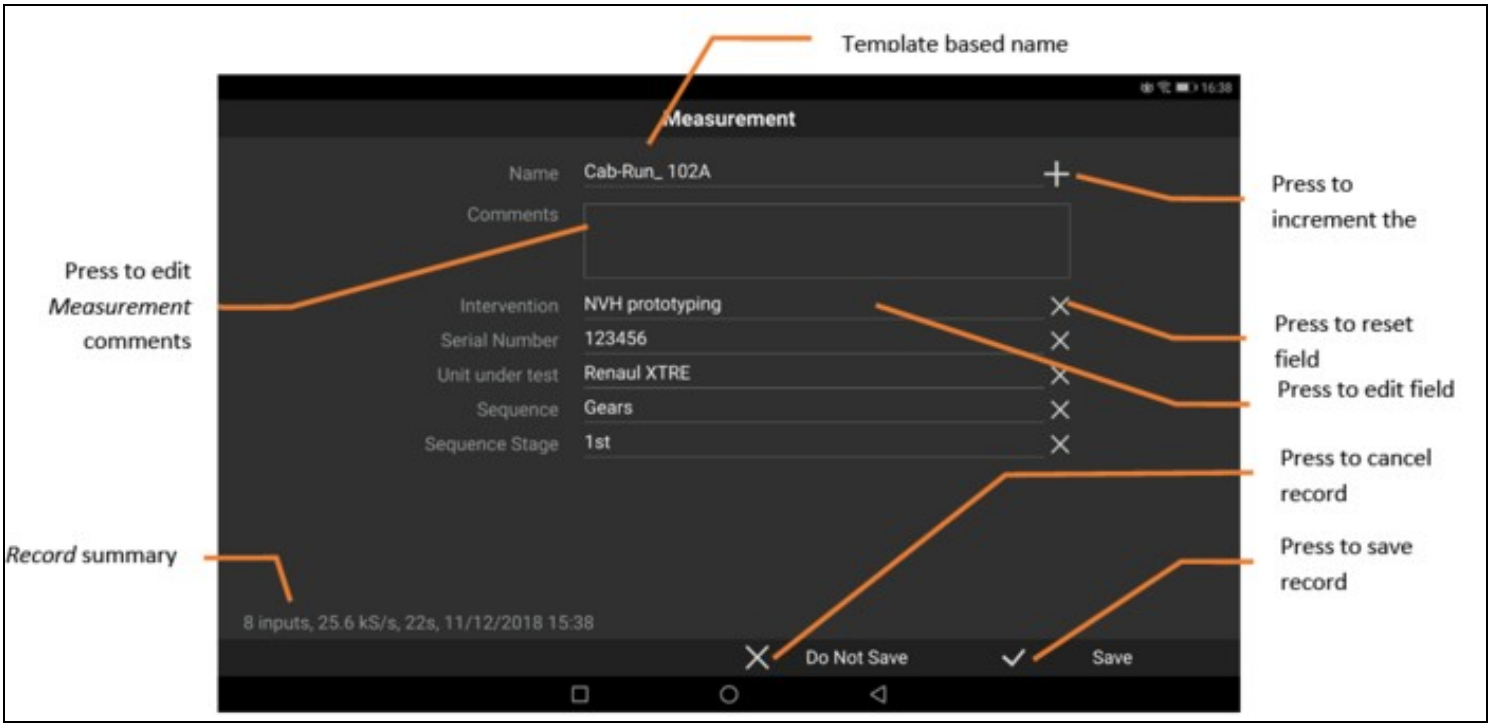
When the OR10 setup is done, the system is ready to start acquiring and saving the input data. To start the recording, press the bottom left *Run* button or press the "REC" button on the OR10.



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.

46.1.4.2 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:

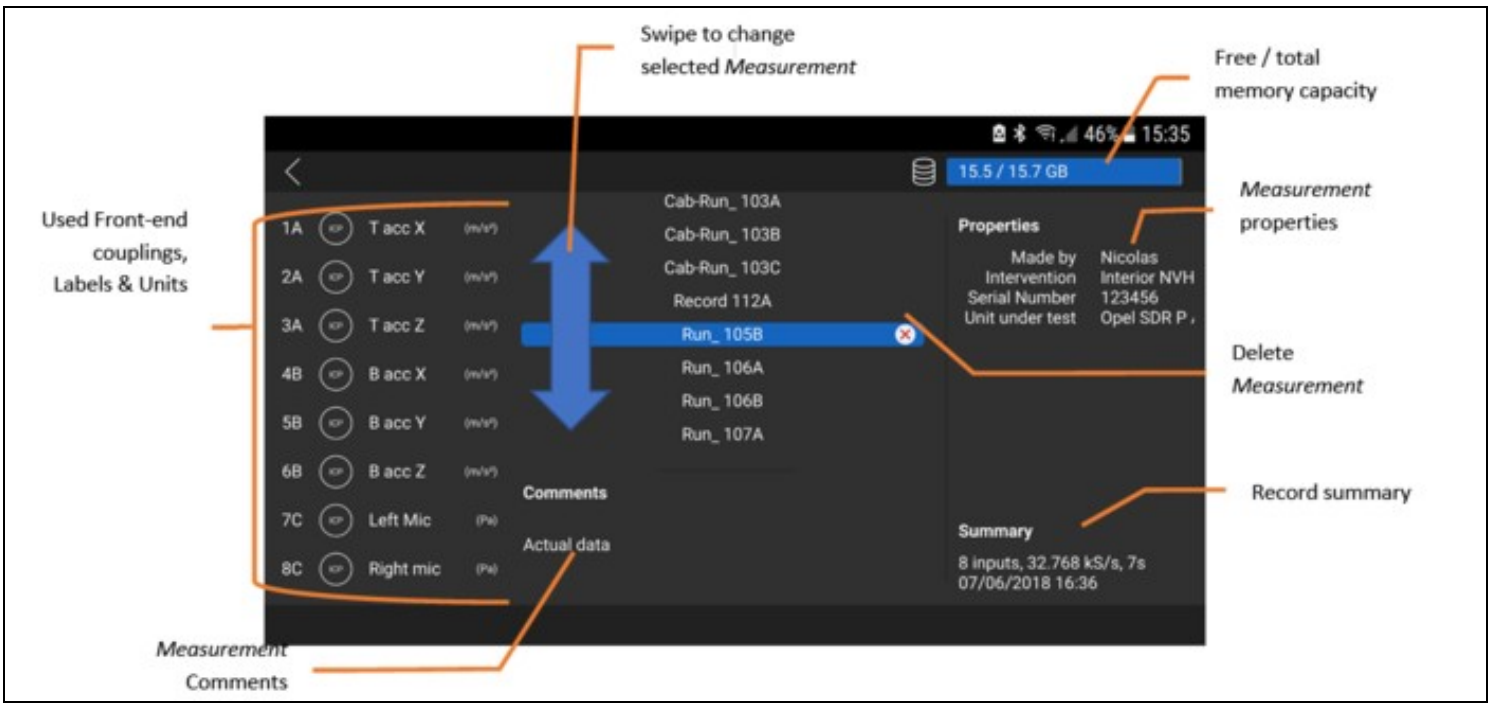
- Letter is incremented while using the same *Template* for multiple acquisitions (called RUNs)
- Number is incremented and letter reset when *Template* is changed.
- Number and letter are automatically incremented to avoid overwriting existing files in the OR10 memory.

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.

46.1.4.3 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.

47 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.

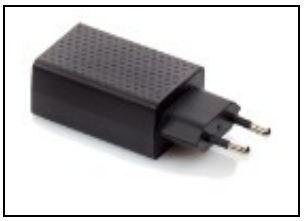
This will help you efficiently handling your new instrument. Please read it carefully before operating your MODS components.

47.1 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

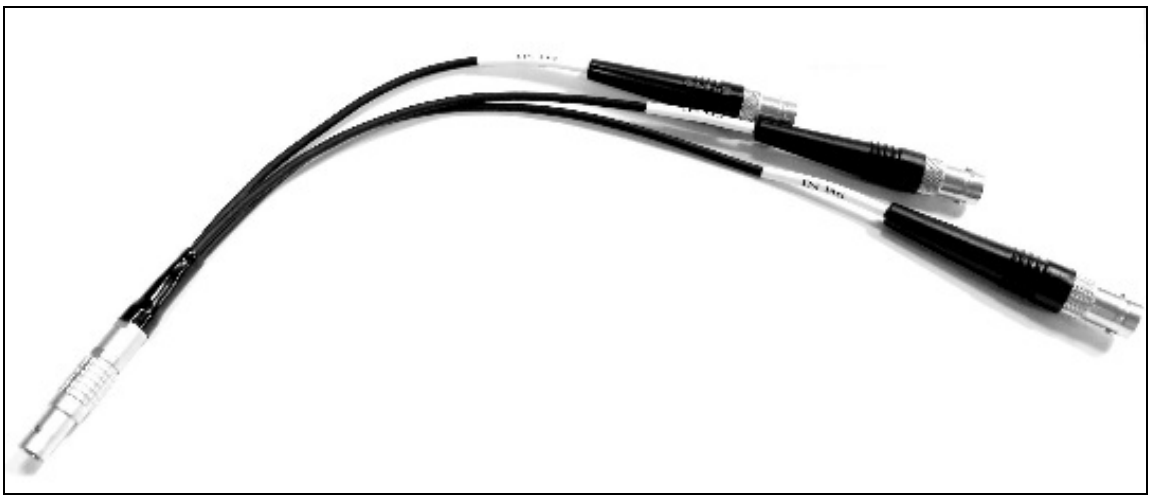
2. USB-C power supply designed to power OR10, and charge internal battery.



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

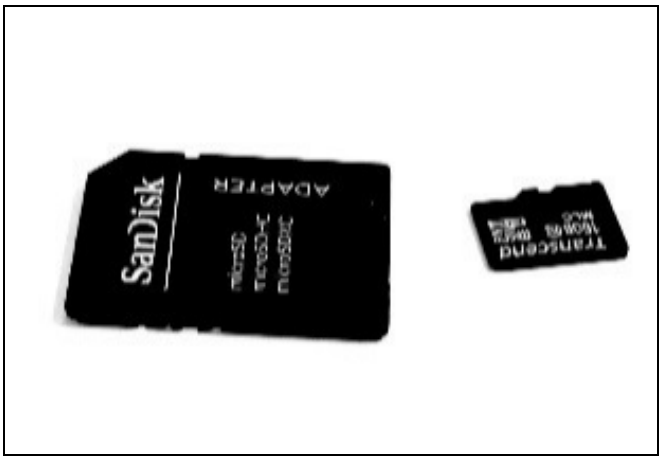
B: Dynamic inputs 4 to 6

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.

47.1.1 Instrument description

47.1.2 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.

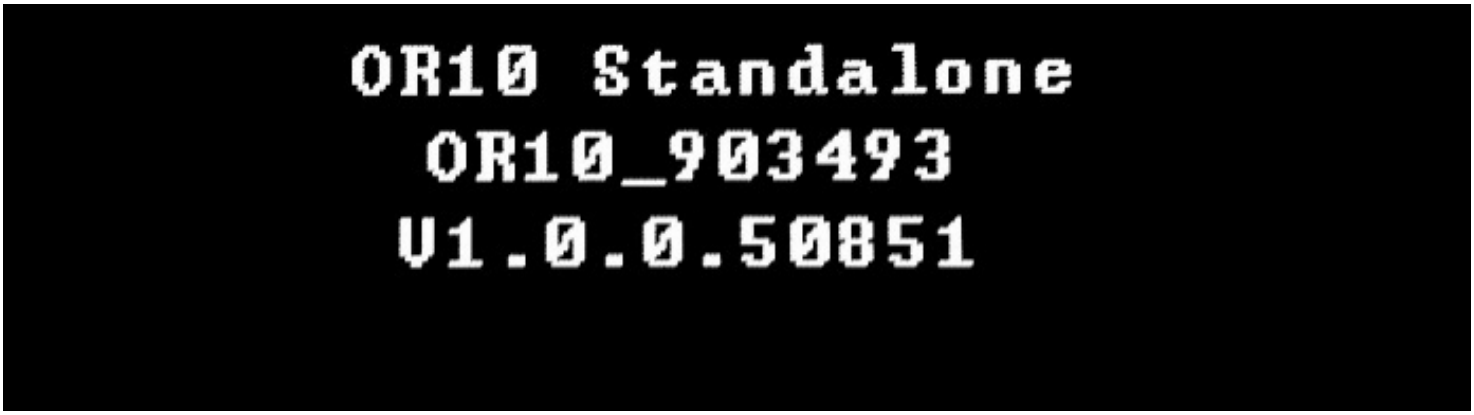
47.1.2.1 How to use the touch screen

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.

47.1.2.2 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.



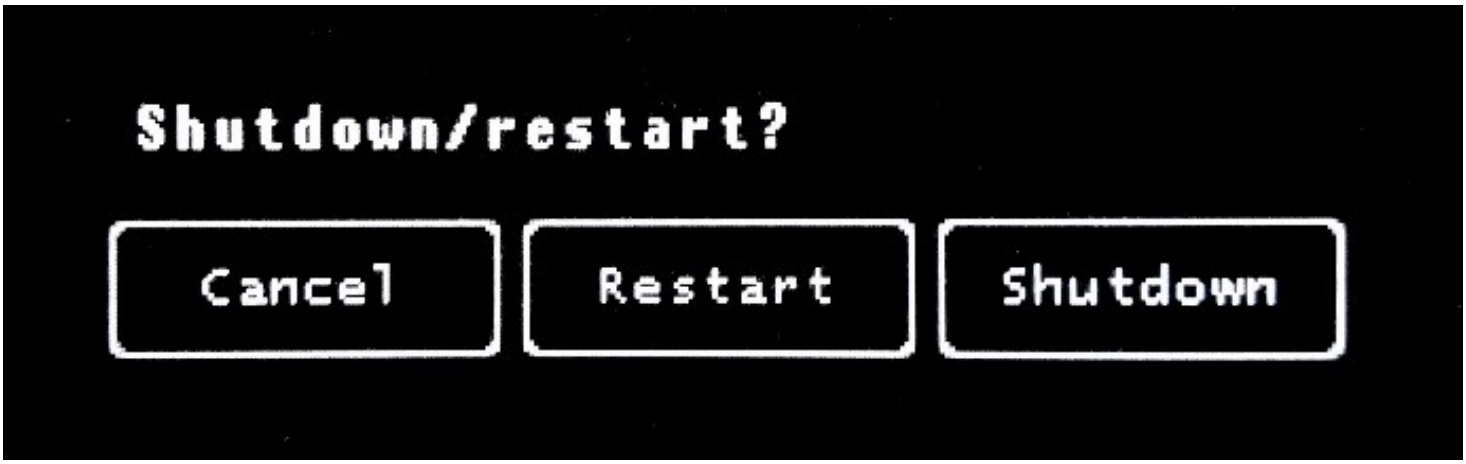
The system shows the serial number and the middleware version.

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.

47.1.3 Connecting to OR10

47.1.3.1 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.

47.1.3.2 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

47.1.3.2.1 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.

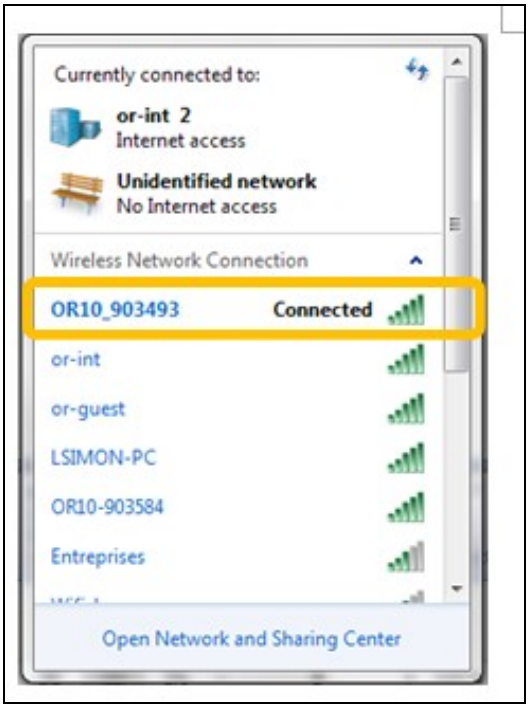
Caution: the 5 GHz bandwidth is not compatible with World location. Selecting this combination from OR10 screen will block the OR10 Wi-Fi.

47.1.3.2.2 Connect to the access point

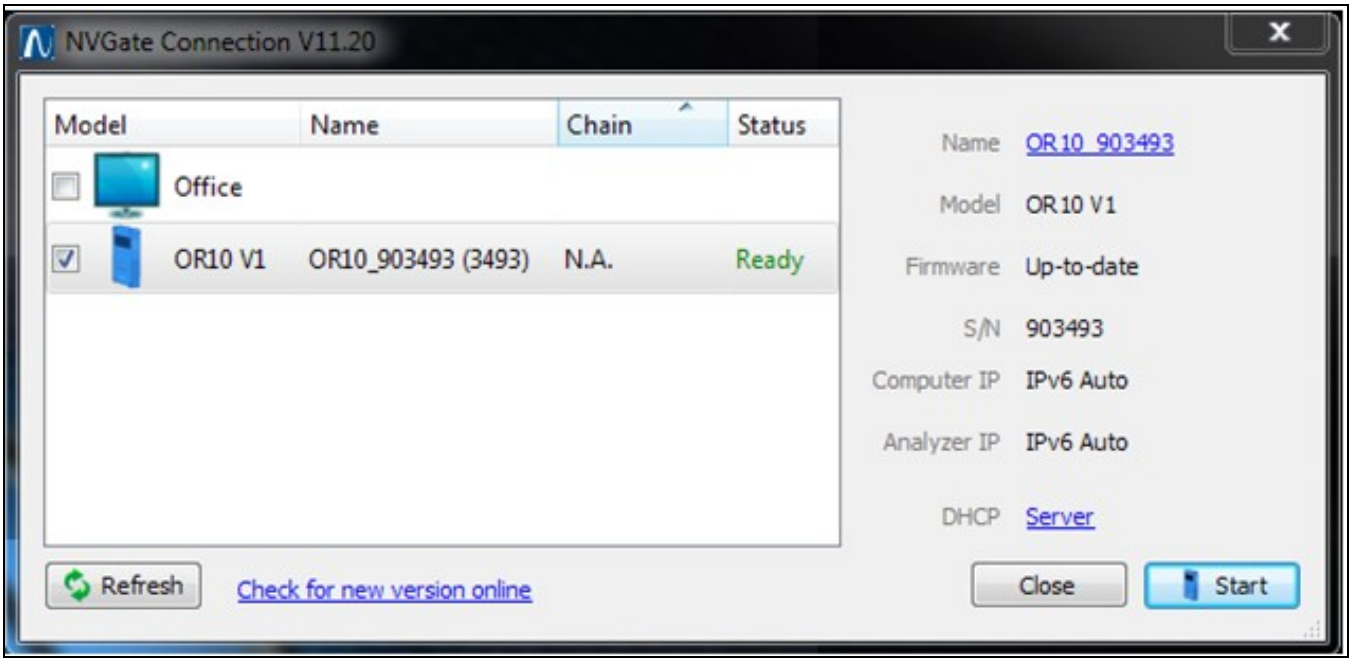
The Ethernet protocol used by OR10 is IP V6. Check that your PC's Ethernet adaptor is properly configured for IPV6 connection. IP addresses are automatically managed.

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.

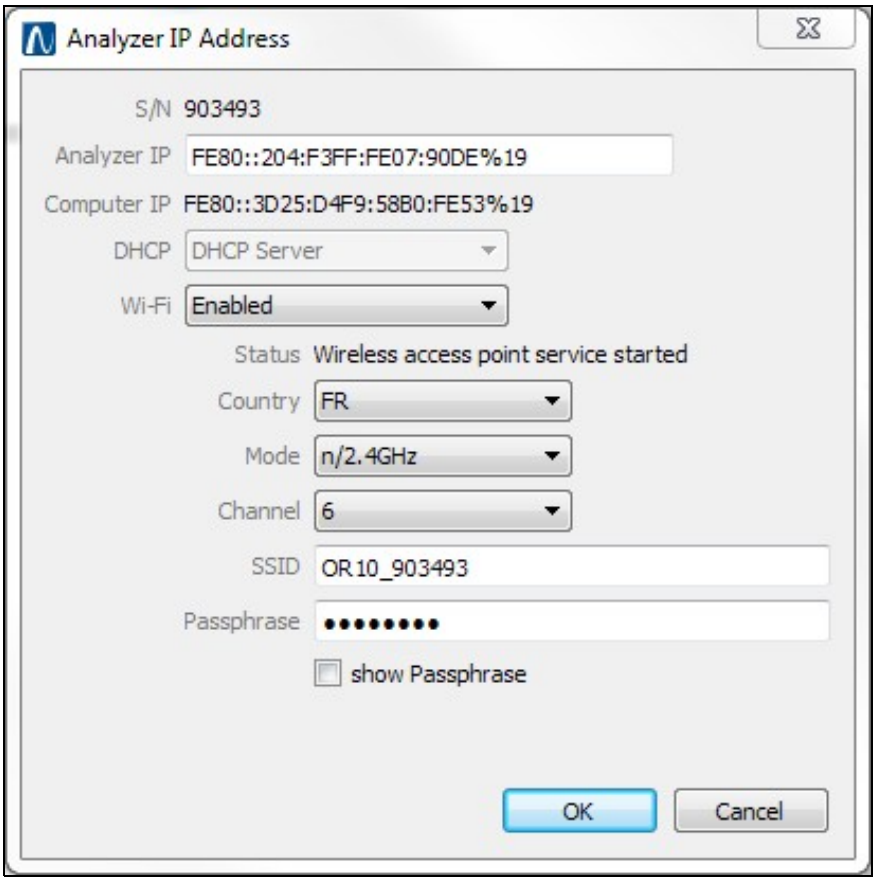
Select the instrument, the right panel will show OR10 information. Hyperlinks allow modifying contents/settings.

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.

47.1.4 Accessing OR10 data

OR10 data consist of *Templates* (setups) *and Measurements* saved in the µSD memory.

47.1.4.1 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.

47.1.5 MODS OR10 Software

47.1.5.1 NVGate

Read NVGate home page

47.1.5.2 Stand alone operation

Read OR10 stand alone operation page

47.1.5.3 NVGo: Android OR10 Aplication

Read NVGo Android Apllication page

48 OR3X Hardware Instruments

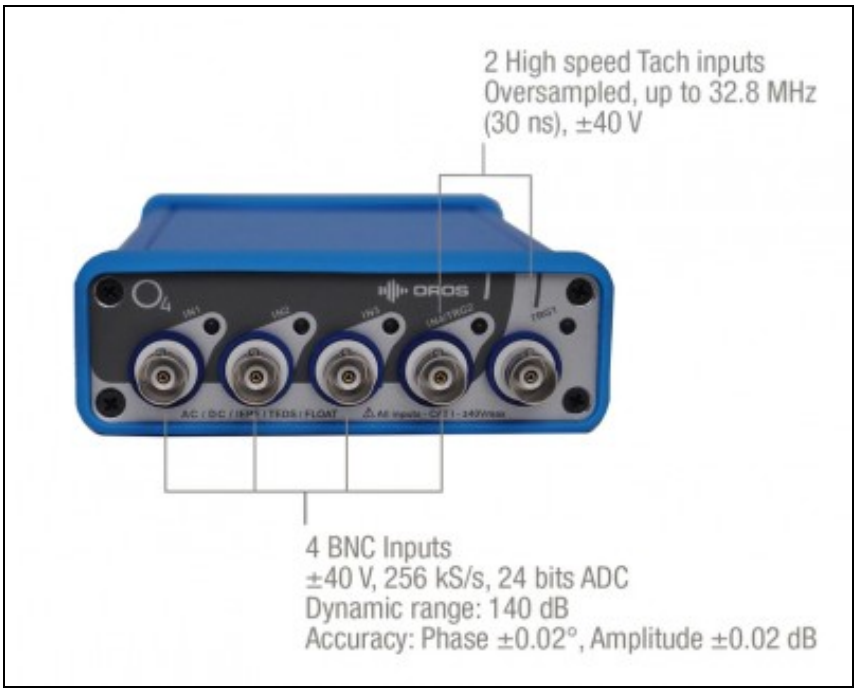
48.1 OROS Teamwork instruments Range

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.

48.1.1 O4 analyzer

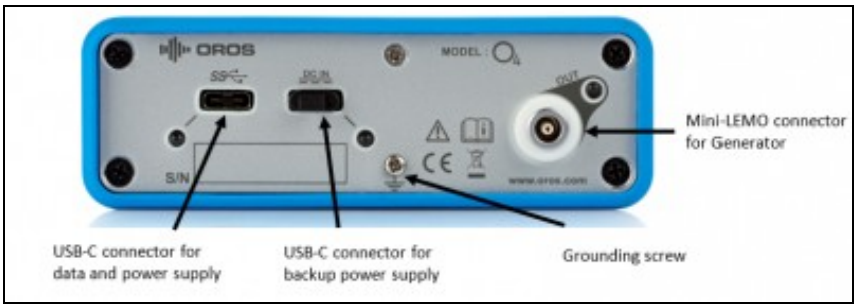
O4 is a compact analyzer. It offers 2 or 4 dynamic inputs with 2 ext. sync.



48.1.1.1 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)



48.1.1.2 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:

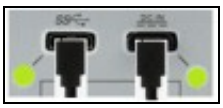
48.1.1.2.1 OLD PC

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.

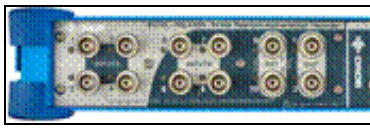


All the connections of O4 instruments comply with SELV (Safety Extra Low Voltage) conditions.

48.1.2 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.

48.1.2.1 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.

48.1.2.1.1 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.

48.1.2.2 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.

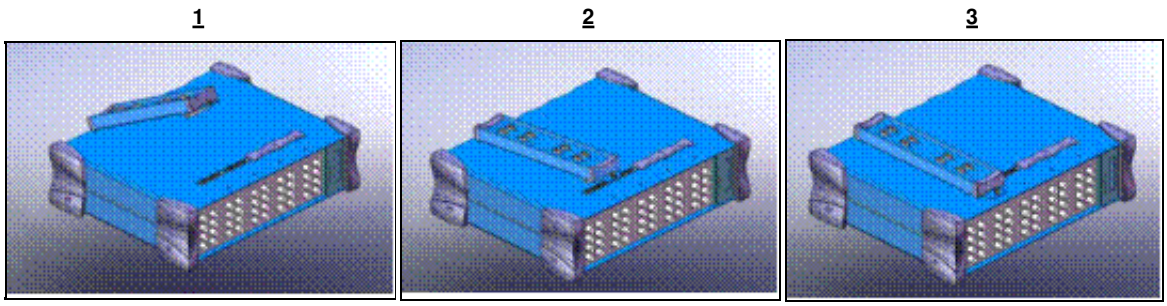
To fix the XPod on the analyzer:

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,

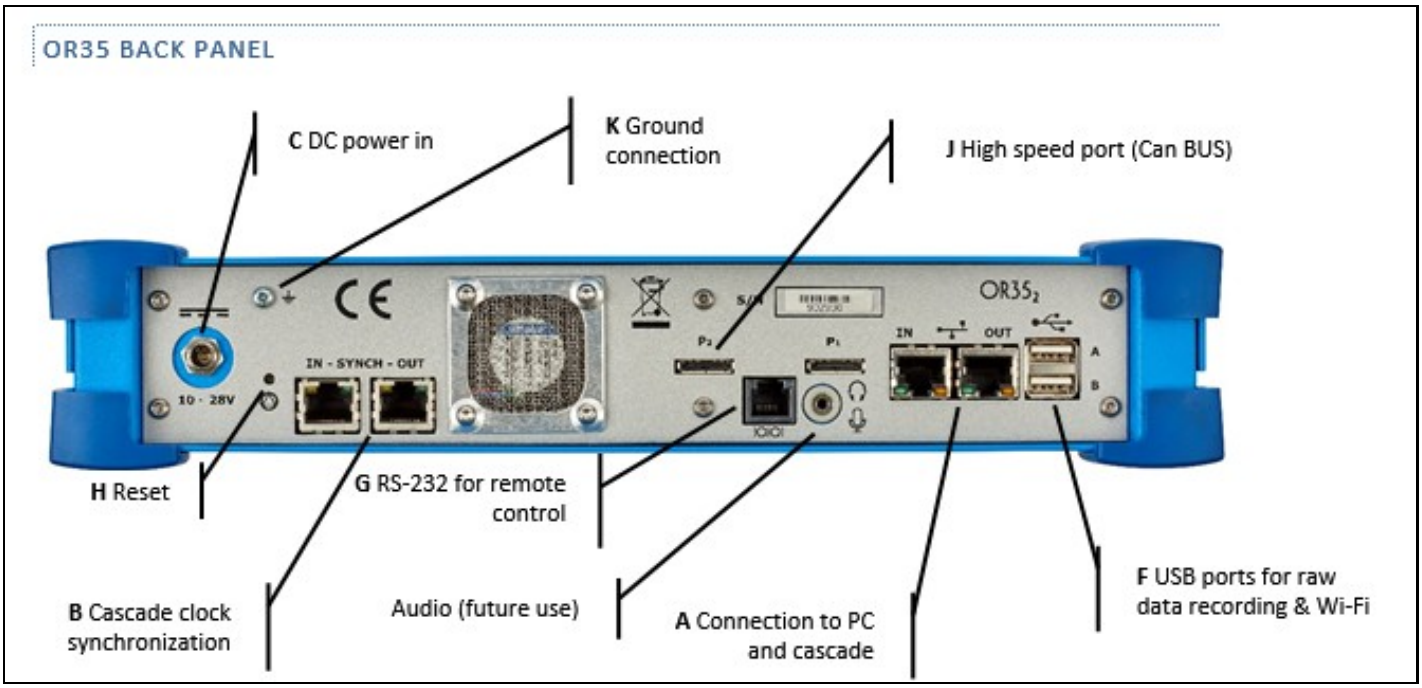
4. Secure the XPod on the analyzer with the screw on the extension key of the XPod



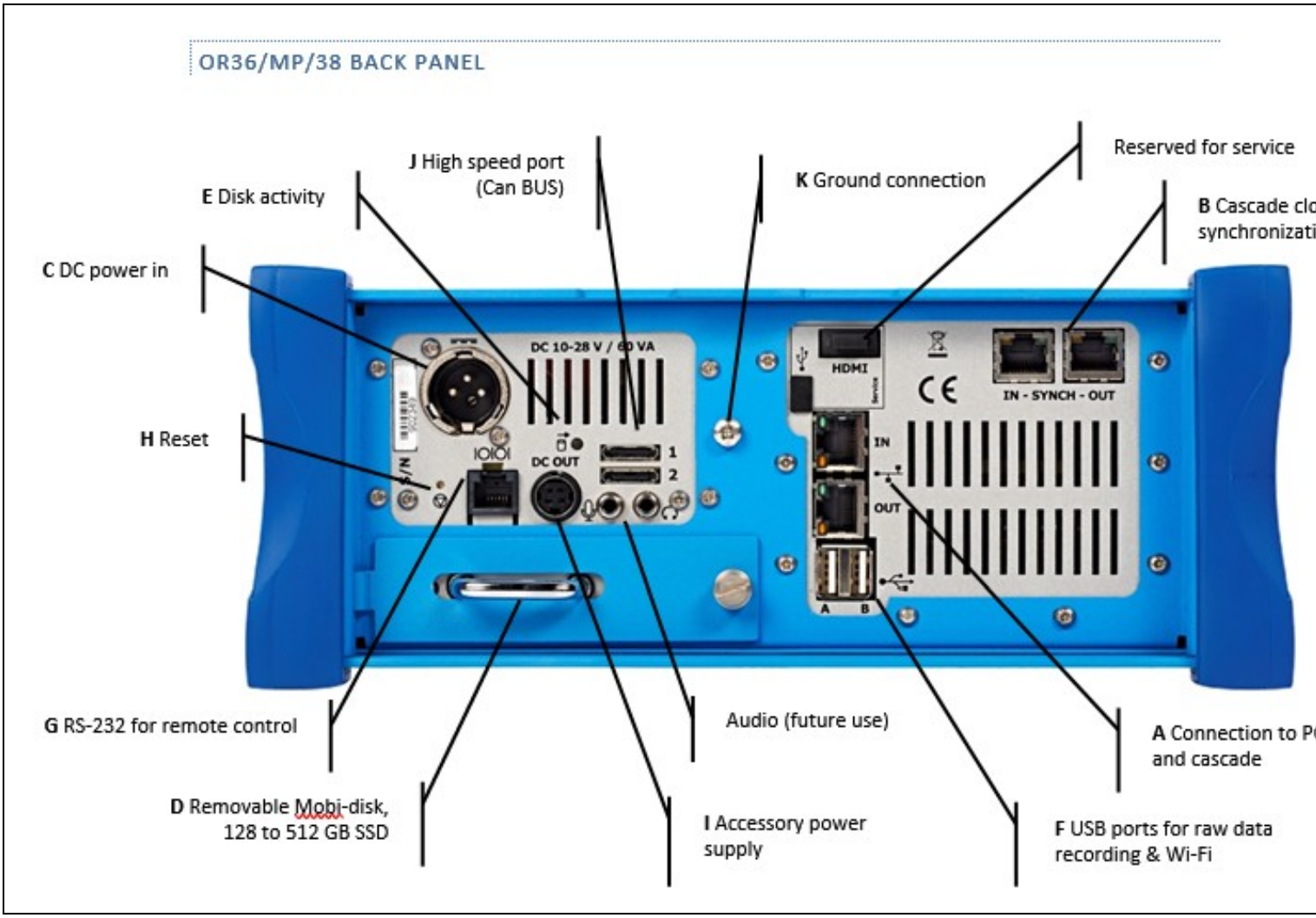
Note: When travelling, fix the XPod to the analyzer to avoid any damage. In the absence of an XPod, secure the rubber cover on the analyzer. There are two rubber covers on the XPod, which allows having a cover left if one is lost.

48.1.2.3 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.

48.1.2.3.1 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:

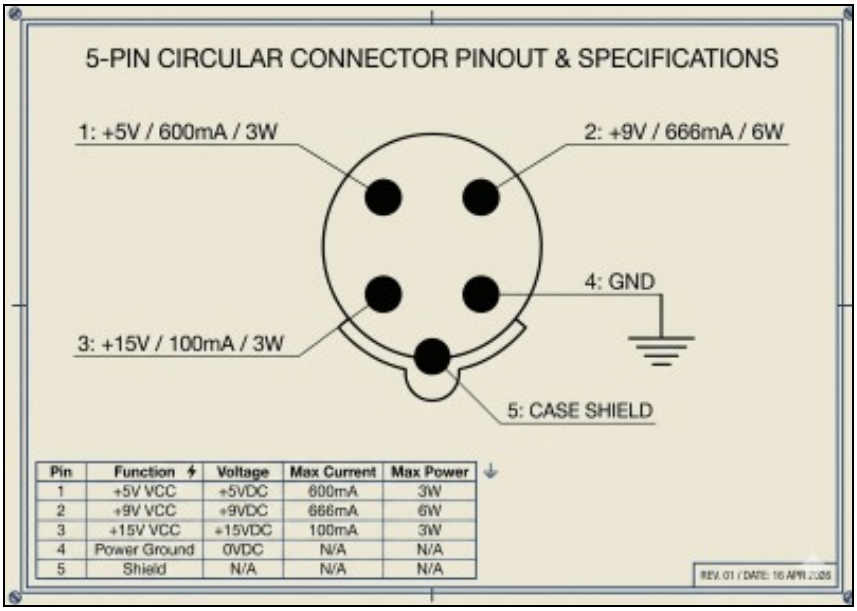
1. +5V, 3W, 1.6 A

-

2. +9V, 6W, 650 mA

-

3. +15V, 6W, 25 mA



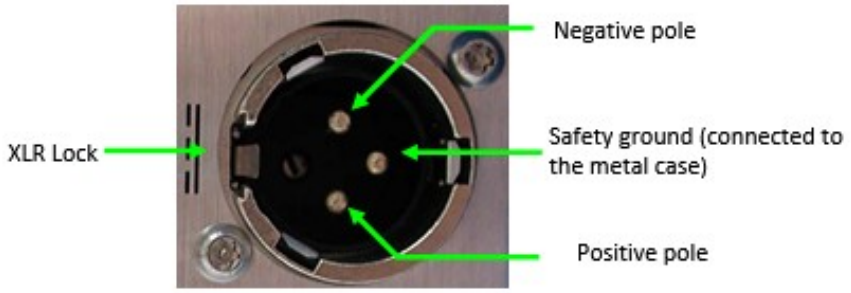
Pin	Function	Voltage	Max Current	Max Power
1	+5V VCC	+5VDC	600mA	3W
2	+9V VCC	+9VDC	666mA	6W
3	+15V VCC	+15VDC	100mA	3W
4	Power Ground	0VDC	N/A	N/A
5	Shield	N/A	N/A	N/A

- **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

48.1.2.4 DC Power supply

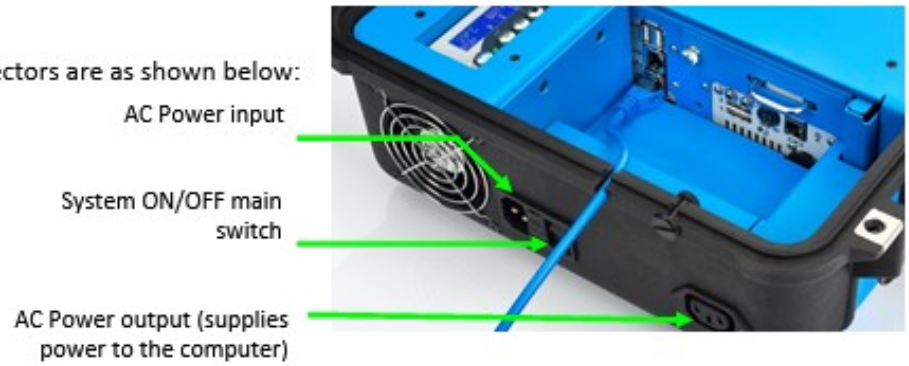
OR36 & OR38 CONNECTOR

These analyzers are powered by an external power supply through the DC power supply connector:

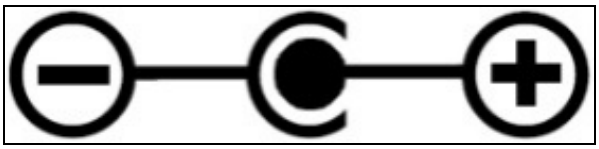


ORMP CONNECTORS

The power supply connectors are as shown below:



48.1.2.4.1 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:

48.1.2.4.2 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

48.1.2.4.3 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

48.1.2.4.4 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)

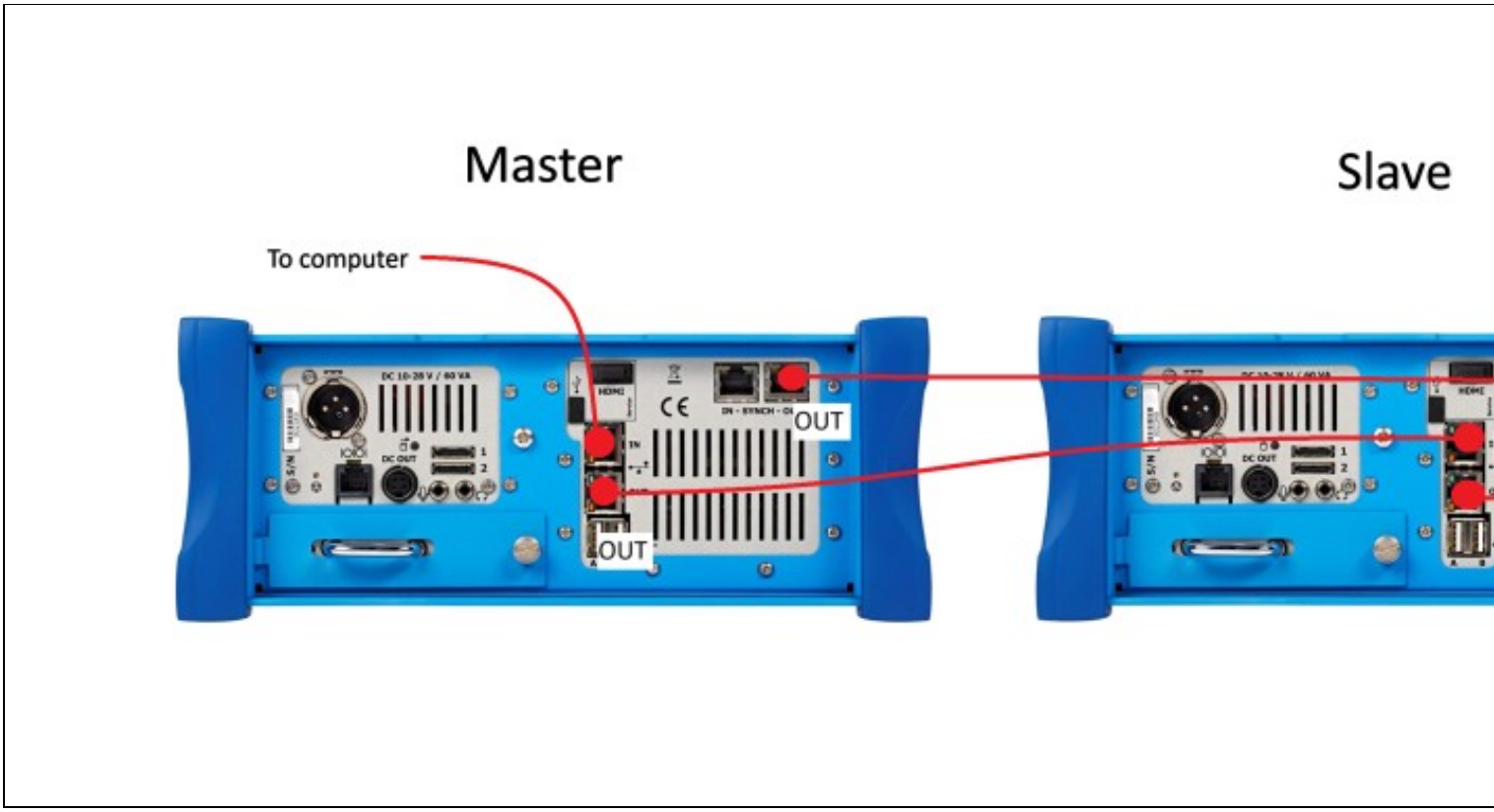
Battery	Type	**NiMh** 17 modules (no memory effect)
	Autonomy	**2 h** (8 ch 1 DSP 12.8 kS/s)
	Charge time	**3 h** (typical)
	Charge conditions	DC power supply > 24 V

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

48.1.2.5 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.

48.1.3 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.

48.1.4 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.

48.1.4.1 Temperature and fan management

<table>
<tr><th>Internal temp</th><th>System status</th><th>Fan</th></tr>
<tr><td>70°C (158 °F)</td><td>Absolute maximum rating</td><td>Off</td></tr>
<tr><td>65°C (149 °F)</td><td>Forced shutdown, do not operate</td><td>Off</td></tr>
<tr><td>60°C (140 °F)</td><td>Normal</td><td>Forced max</td></tr>
<tr><td>50°C (122 °F)</td><td rowspan="2">Normal</td><td rowspan="2">Automatic Fast</td></tr>
<tr><td>45°C (113 °F)</td></tr>
<tr><td>40°C (104 °F)</td><td rowspan="2">Normal</td><td rowspan="2">Automatic Slow</td></tr>
<tr><td>35°C (95 °F)</td></tr>
<tr><td>30°C (86 °F)</td><td rowspan="2">Normal</td><td rowspan="2">Off</td></tr>
<tr><td>0°C (32 °F)</td></tr>
<tr><td>-5°C (23 °F)</td><td rowspan="2">OK with 1 min/°C Warmup</td><td rowspan="2">Off</td></tr>
<tr><td>-20°C (-4 °F)</td></tr>
<tr><td>-25°C (-13 °F)</td><td>Storage, do not operate</td><td>Off</td></tr>
<tr><td>-35°C (-31 °F)</td><td>Absolute minimum rating</td><td>Off</td></tr>
</table>

48.1.4.2 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.

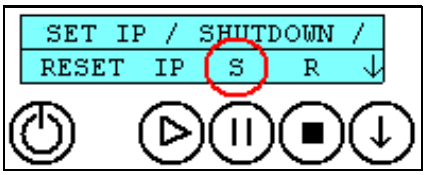
Instrument auto-tests are performed until "System OK ?" appears on the screen or "Ready D-rec" if the D-rec option is available.

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).

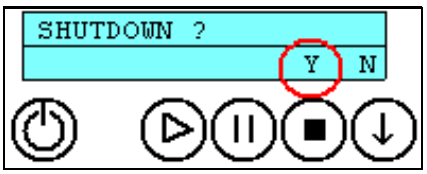
From the LCD screen:

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

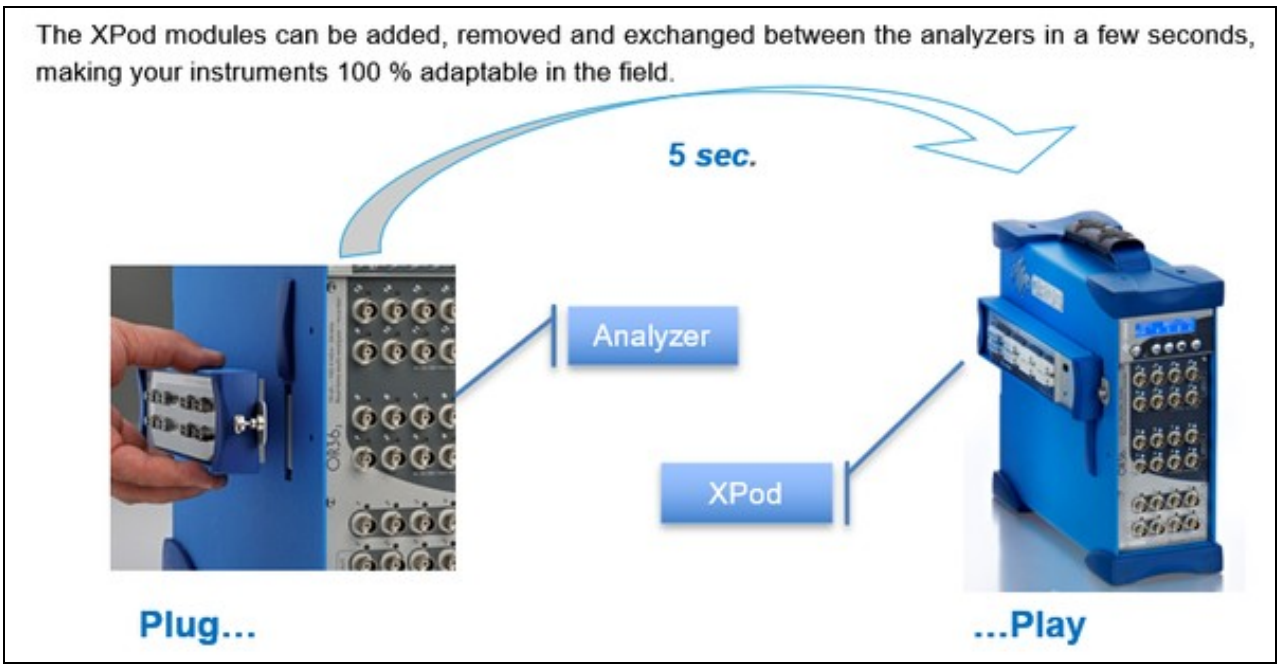
If Instrument does not respond, press the On/Off button until it turns off. Then, power it on again after a few minutes.

49 XPod Bridge - Strain gauge

OROS analyzers feature optional XPod Wheatstone bridge conditioner.

49.1 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:

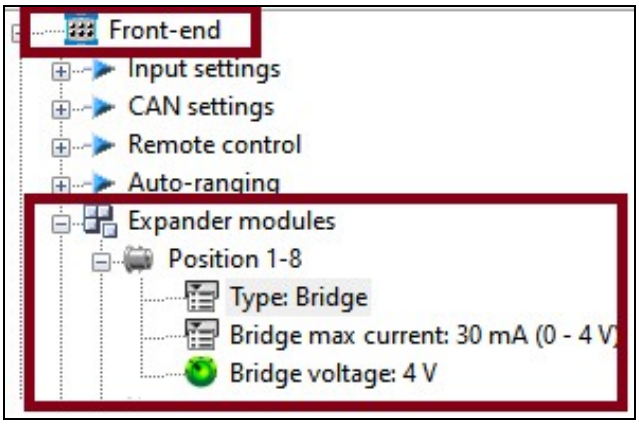
· The BNC input (Standard)

· The XPod connector

49.1.1 General Xpod settings

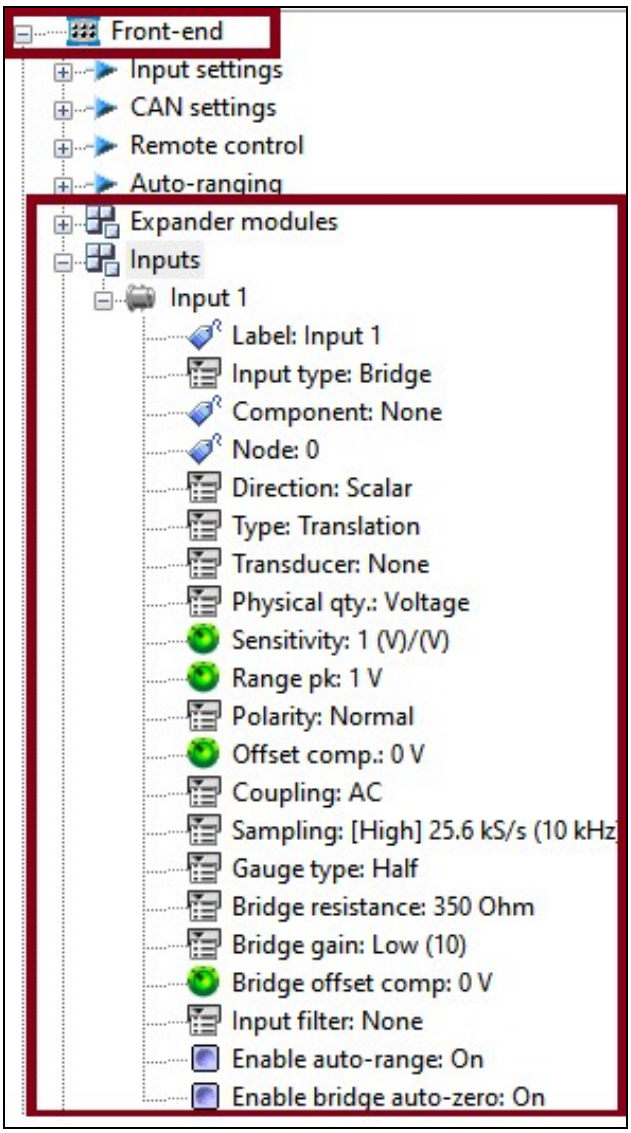
- **Type**: For acquisition setup preparation, the XPod presence can be simulated in the office mode:

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.

49.1.2 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.

49.2 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

49.2.1 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

49.2.2 Cables

We recommend using the following cable characteristics for wiring a strain gauge:

- Twisted pairs

- 6 wires

- Independent ground shields for each pair

49.2.3 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)

49.2.4 Bridge connection

49.2.4.1 Quarter bridge

QUARTER BRIDGE

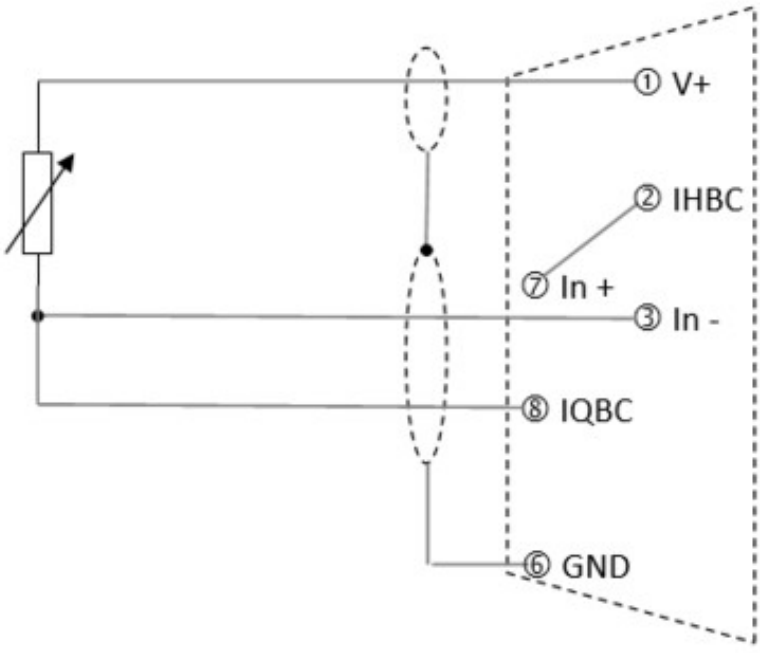
This mounting type is the simplest as only one resistor has to be installed. This simplicity is paid on the Metrologic side.

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)



49.2.4.2 Half bridge

HALF BRIDGE

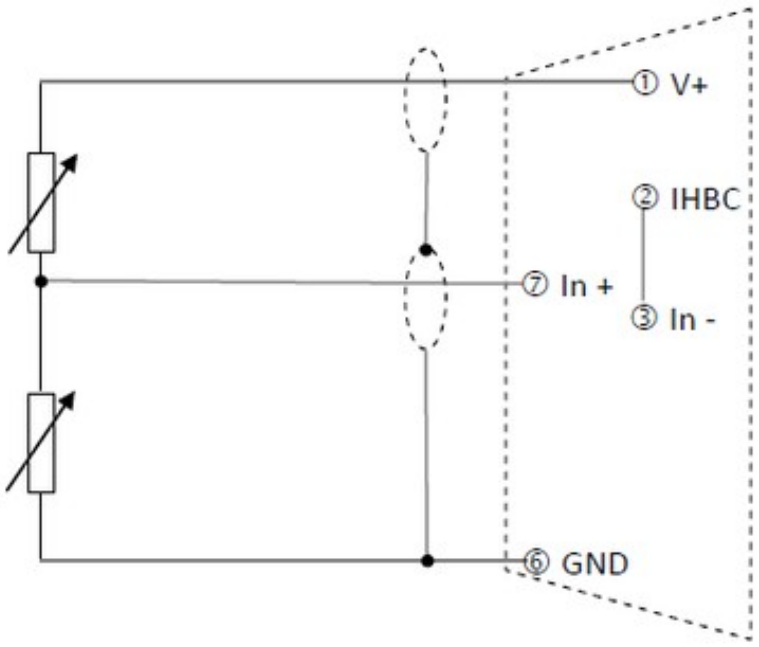
The half bridge mounting presents the compromise with interest from both ¼ and full bridge.

Pros:

- Easy to install (2 gauges),
- Temperature compensated,
- Good sensitivity with opposite resistors mounting,
- Static traction cancellation

Cons

- For short cable only (< few meters)



49.2.4.3 Full bridge

FULL BRIDGE

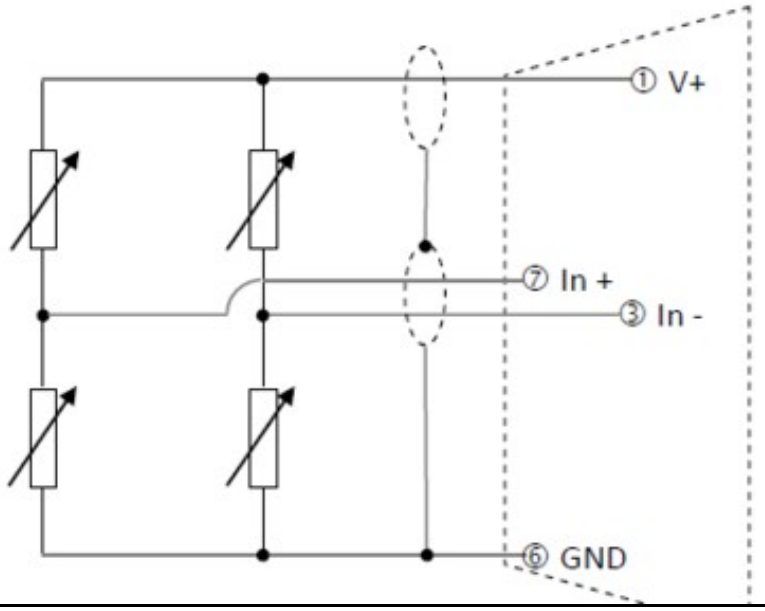
The full bridge mounting provide the most accurate and reliable results. On the other hand it not easy to assemble. Full bridges are almost mounted in pre-assembled force, pressure and torque transducers.

Pros:

- Temperature compensated,
- Very good sensitivity and accuracy

Cons:

- Complicated installation number of gauges, alignment.



49.2.5 download

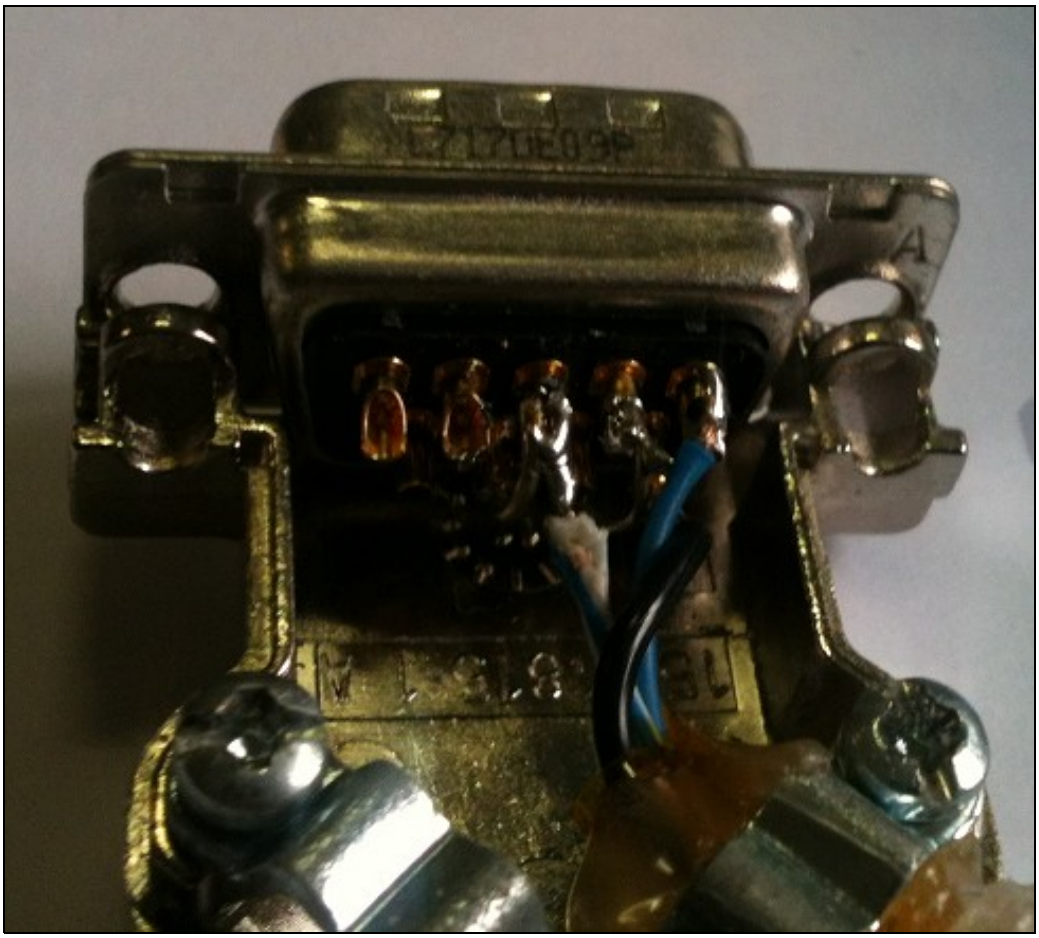
Download : OROS BRIDGE CONDITIONERS XPOD? CONNECTIONS in .pdf

49.3 Tutorial: how to set up XPOD conditioners for strain gage

49.3.1 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

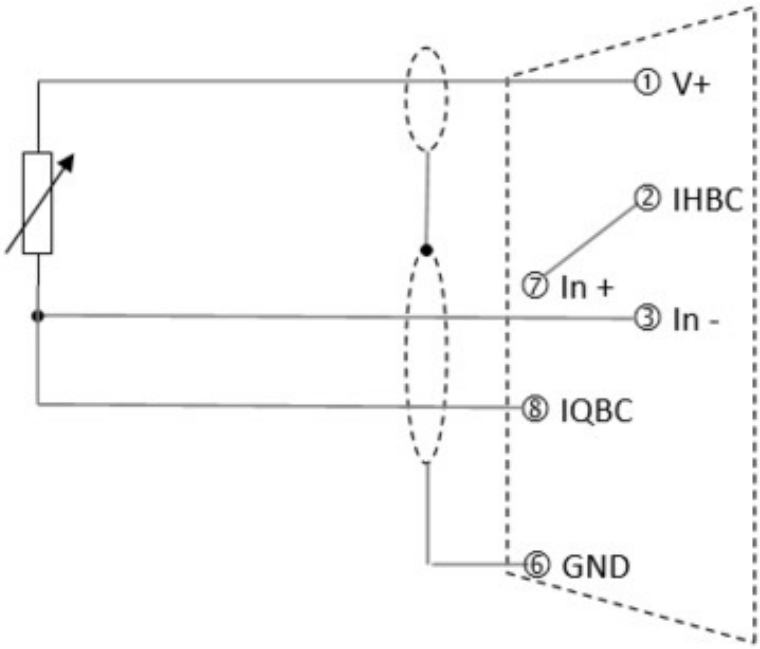
This mounting type is the simplest as only one resistor has to be installed. This simplicity is paid on the Metrologic side.

Pros:

- Easy to install
- Not expensive
- Low price.

Cons:

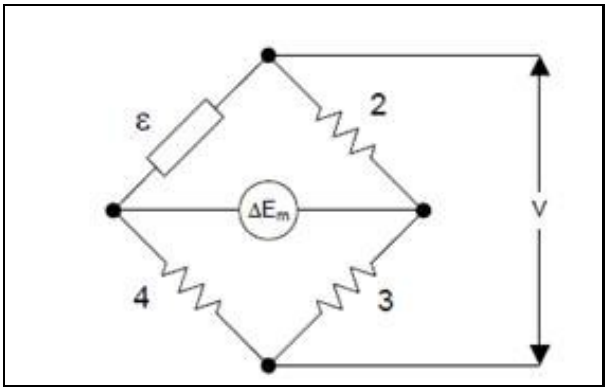
- Sensitive to temperature
- Sensitive to wire length and resistance in 2 wire cabling
- Lower sensitivity
- For short cable only (< few meters)



49.3.2 Set up NVGate

49.3.2.1 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



$$\frac{\Delta E_m}{V} = \frac{S_G \cdot \varepsilon}{4} \frac{2}{\left(2 + S_G \cdot \varepsilon\right)}$$

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

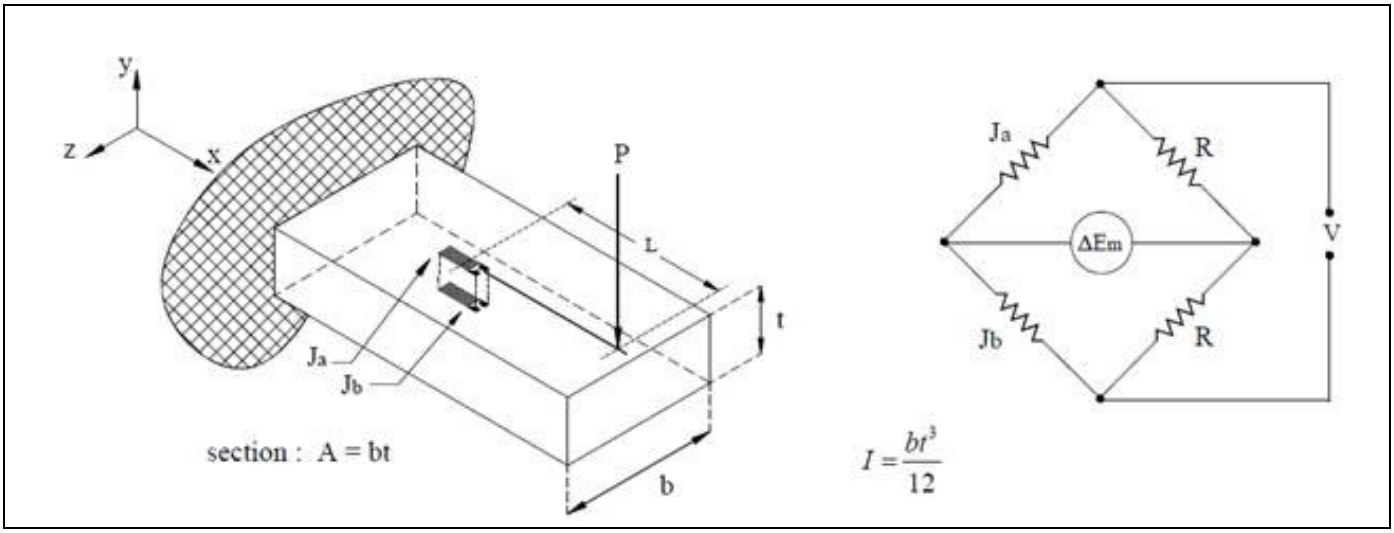
bridge.Here, 2, 3 and 4 are XPOD internal resistors

- 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:

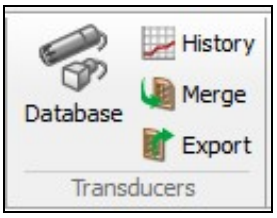
$$\frac{\Delta E_m}{V} = \frac{S_G \cdot \varepsilon}{2}$$

So the fact that 2 gauges are used instead of only one gets the bridge sensitivity twice better.

49.3.2.2 NVGate setup

It is advised to first add a "transducer" in NVGate database in order to register the bridge configuration.

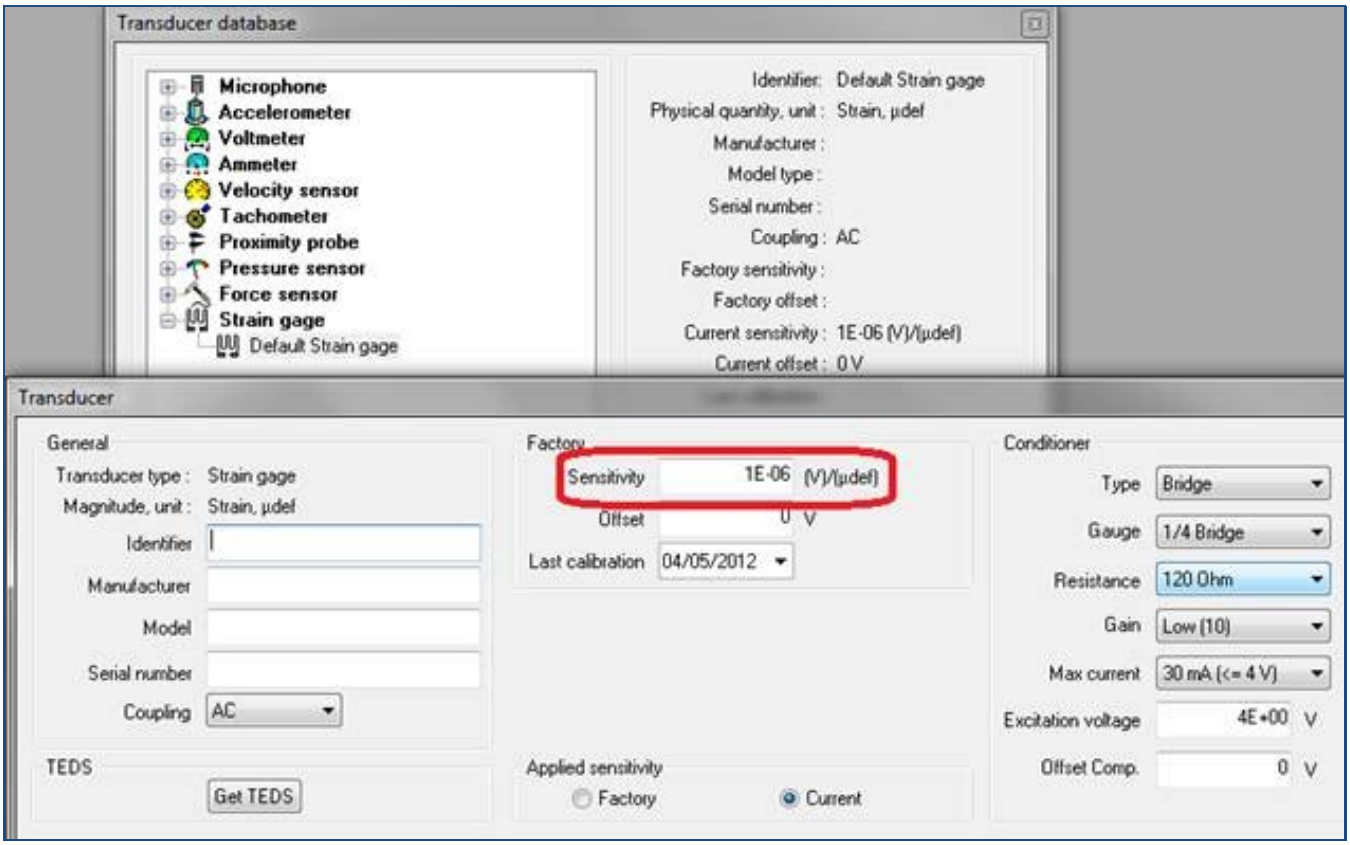
Browse *the Home menu > Transducer tab > Database*



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.

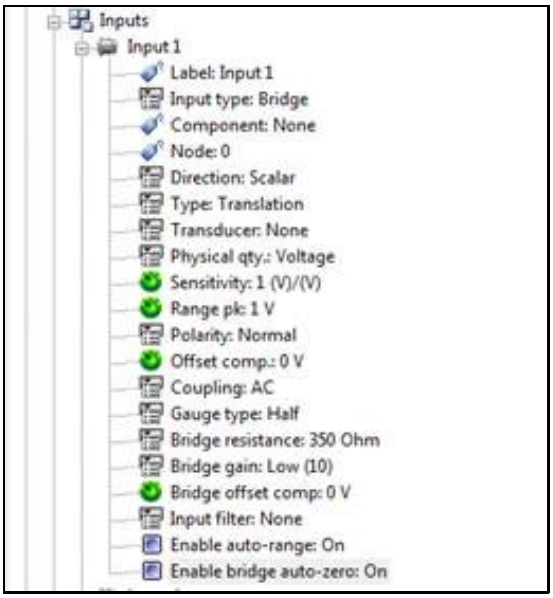


49.3.2.3 Measurement

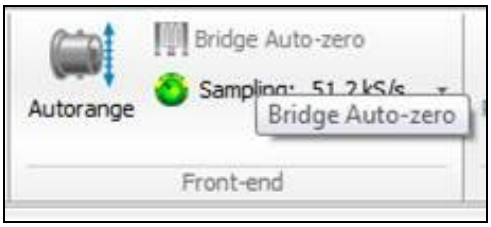
The XPOD contains 8 inputs. In case of XPOD connection, the 8 BNC inputs are disabled for using the XPOD inputs.

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.

49.4 Compute main stress with rosette

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