HAViewer

User guide

Table of Contents

HAViewer

HAViewer is the vibration analysis software, which is part of the Vib@Work hand-arm vibration dosimeter product range.

The main HAViewer features include:

- The display of vibration time histories
- Tool use simulations over different periods for comparison with actual measurement periods
- The management of several sensors
- Reporting tools
- The export of measurements into various formats (viewer, spreadsheet and text formats)
- The creation of annotations
- The creation of exclusion tools
- Peak searches
- The import of voice messages recorded during vibration measurements
- The import of videos recorded during vibration measurements

The display of vibration time histories
The vibration measurements measured by your hand-arm sensor(s) and saved using the HASensor software in Viewer format (i.e. .vif files) can be opened using HAViewer.
HAViewer then displays the sensors' vibration measurement time histories for your further analysis and handling.

Different periods of use simulations
You can amend the periods of use of the worker's tools easily and immediately view the impact of the different periods of use on the partial A(8) and total A(8) vibration exposures.

The management of several sensors
HAViewer automatically takes into account the configuration you entered in HASensor at measurement time (i.e. one or more sensors on the same tool or on different tools).

Reporting tools
The 'Copy to Clipboard' buttons allow you to send HAViewer data (i.e. graphs and exposure results) to the Windows' clipboard and then paste them into other applications (for example, into a word processor). Thanks to this extremely flexible approach, you can - for example - build up a report using your own template in parallel to your analyses in HAViewer by copying graphs and results into your document and annotating them as required.

Measurement exports
You can select one or more sensors and the relative measurement periods and export them to files in a variety of formats (i.e. new .vif files containing the selected elements, spreadsheets, or text files).

Annotations
You can select measurement ranges on the graph, colour highlight them and enter captions.

Exclusions
You can select measurement ranges on the graph, colour highlight them and enter captions. Unlike annotations that only have a visual effect, measurements linked to an exclusion are excluded from exposure calculations. Once defined, an exclusion can easily be made 'active' or 'inactive', or grouped.'
What-if' scenarios can then be easily implemented.

Peaks
Peaks for given sensor(s), within a given range and above a given threshold can be found and highlighted.

Voice records
You can import voice messages recorded during vibration measurements into HAViewer, where you can play them and thus determine – for example - the impact of particular working conditions or events on the vibration measurement results.

Videos
You can import videos recorded during vibration measurements into HAViewer, where you can play them and thus determine – for example - the impact of particular working conditions or events on the vibration measurement results. A synchronised cursor moves across the vibration graph while the video is playing. You can also manually move the cursor on the vibration graph to an area of interest; the video will then show you what happened at that point in time.

HAViewer - Main Window

Menu Bar   Tool Bar   Plot Area

②   **③**   **①**

Action Panel   **④**   **⑤** Result Panel
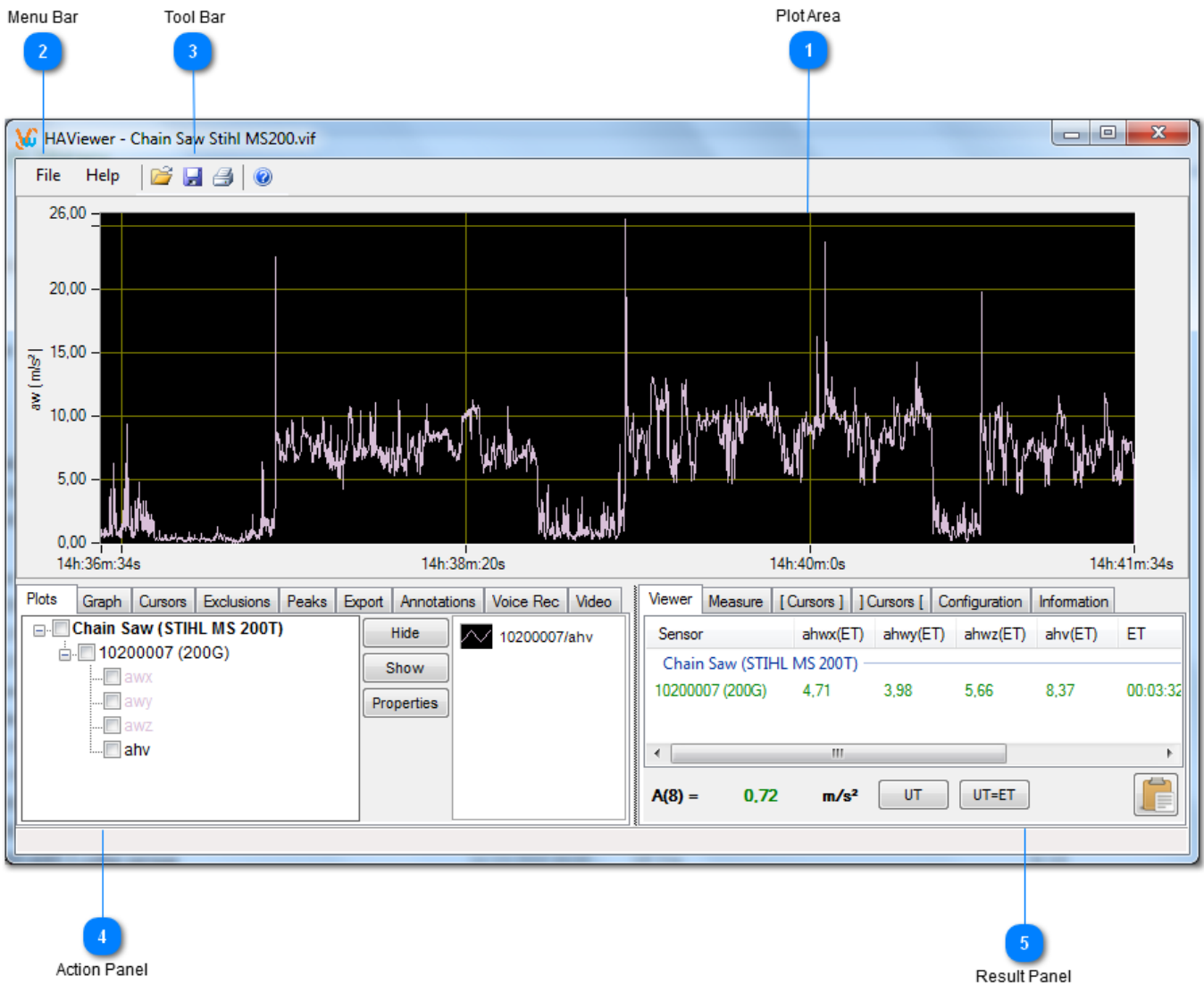
The HAViewer main window is basically divided into 3 panels:

1. The plot area on the top. This is the graphical area where vibration time histories are plotted.
2. The action panel located on the left at the bottom. This is where you select operations to be performed
3. The result panel located on the right at the bottom. This is where vibration partial and total exposures are displayed under various conditions and/or depending on the operations that have been performed on vibration measures.

The HAViewer main window is divided into 3 areas:

- The plot area at the top. This is the graphic area where the vibration time histories are plotted.
- The action panel located to the bottom left of the screen. Here you can select operations to be performed.
- The results panel located to the bottom right of the screen. This is where the partial and total vibration exposure values are displayed according to the context and the conditions that you have defined for their calculation.

Note:
You can adjust the size of the plot area in relation to the panel areas (see how to adjust the workspace).

Note:
You can adjust the size of the action panel in relation to the results panel (see how to adjust the workspace).
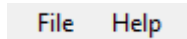
1 ### Plot Area
Plot of vibration time histories.
You can interact with the graph (i.e. zoom, pan) using key sequences (refer to Graph Interactions for further details).
The plot properties (i.e. colour, line type, etc.) can be changed in the Graph tab.

2 ### Menu Bar

File   Help

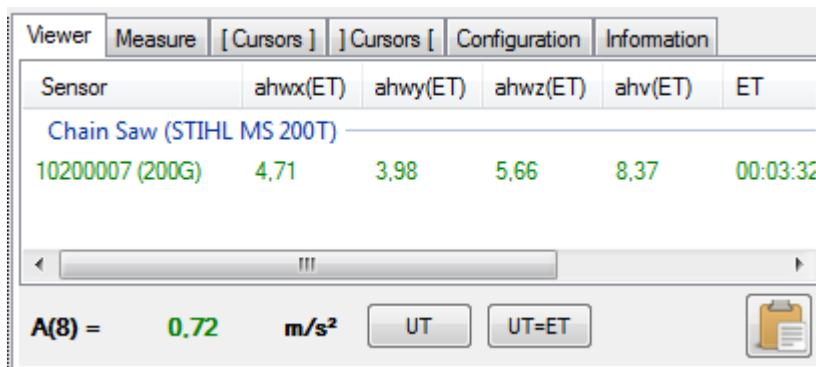This is the usual Windows Menu Bar for commands relating to Files and Help.

3 ### Tool Bar

Quick access to open, save, print file and help functions.

4 ### Action Panel

| Plots | Graph | Cursors | Exclusions | Peaks | Export | Annotations | Voice Rec | Video |

Chain Saw (STIHL MS 200T)
  10200007 (200G)
    awx
    awy
    awz
    ahv

Hide
Show
Properties

10200007/ahv
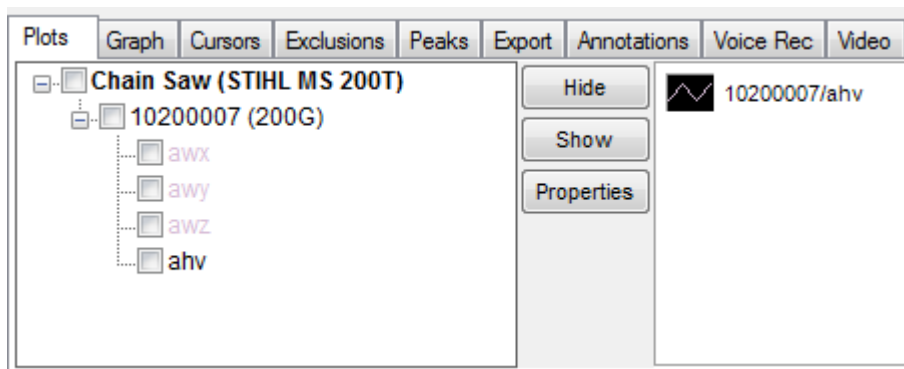
This panel allows you to access the different calculation and analysis features of HAViewer.

5 ### Result Panel

| Viewer | Measure | [Cursors] |] Cursors [| Configuration | Information |

Sensor	ahwx(ET)	ahwy(ET)	ahwz(ET)	ahv(ET)	ET
Chain Saw (STIHL MS 200T)					
10200007 (200G)	4,71	3,98	5,66	8,37	00:03:32

A(8) =   0,72   m/s²   UT   UT=ET

Measurement results are displayed in this panel as well as information you entered when performing measurements (configuration, worker, comments).
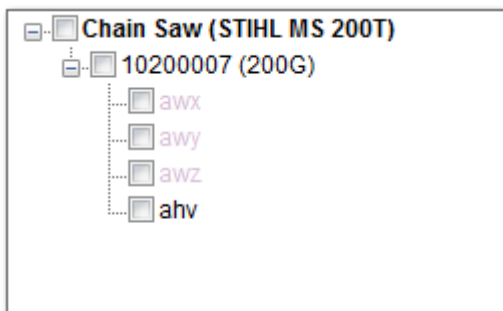
Plots Tab
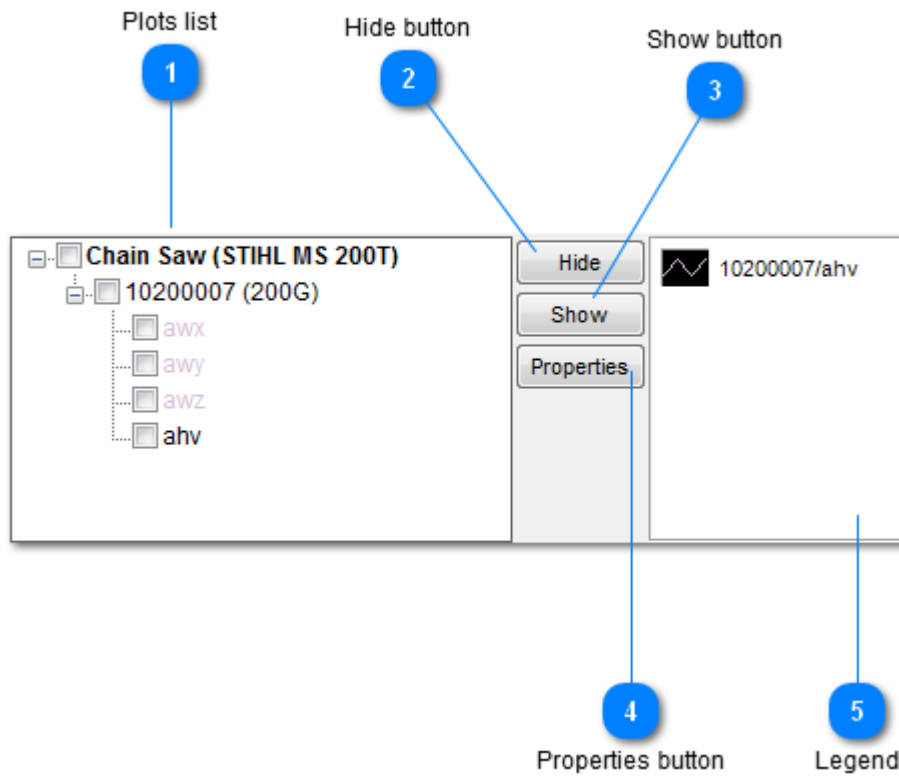
There are 4 plots associated with each sensor measurement. They all show weighted acceleration vs. time.

- awx, awy and awz are the weighted accelerations in the x, y and z axis of the sensor, respectively.
- ahv is the weighted acceleration total value, i.e. the square root of the three axes ($awx^2 + awy^2 + awz^2$).

Plots list

This is the list of available plots shown in tree structure format.
The plots shown in the graph are shown in black font.
The hidden plots are shown in greyed-out font.

Hide button
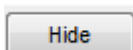
You can use this button to hide one or more plots in the graph.
First check the plot(s) that you wish to hide in the list and then click this button.
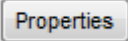
3 **Show button**

Show

Using this button you can display one or more plots in the graph.
First check the plot(s) that you wish to show in the list and then click this button.

4 **Properties button**

Properties

Using this button you can change the graphic properties of plot(s) (i.e. colour, line style, point style, etc.).
First check the plot(s) in the list for which you wish to change the graphic properties and then click this button.
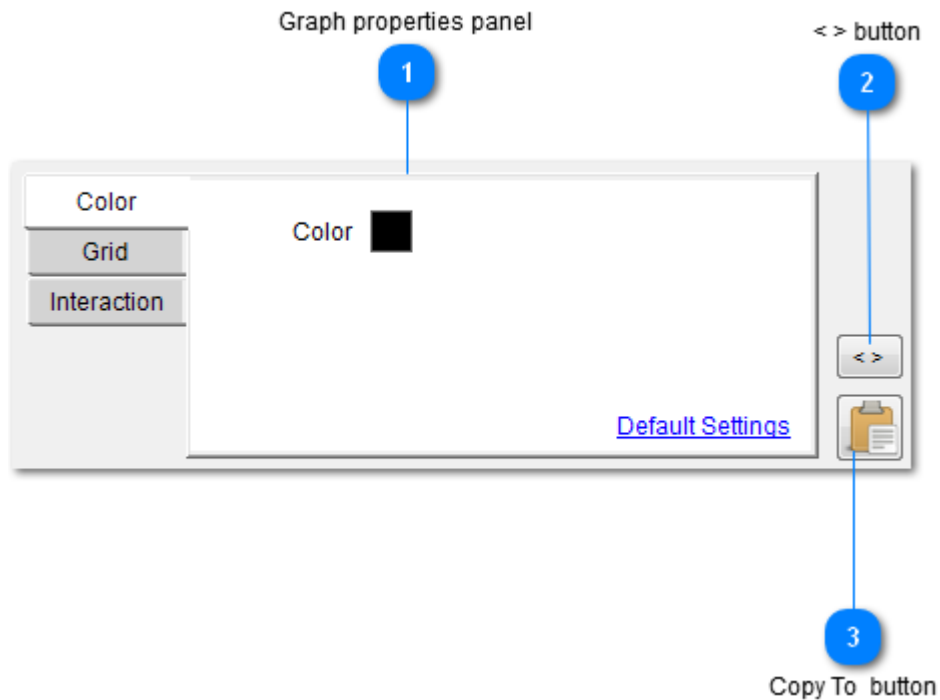
5 **Legend**

10200007/ahv

This is the legend of plots that are displayed on the graph.

Graph Tab

Graph properties panel   < > button

1

2

| Color |
| Grid |
| Interaction |

Color ■

< >

Default Settings

3

Copy To button

---

1 **Graph properties panel**

| Color |
| Grid |
| Interaction |

Color ■

Default Settings

Select a tab to change the graph properties (background colour, grid properties or configuration of the possible interactions with the graph).
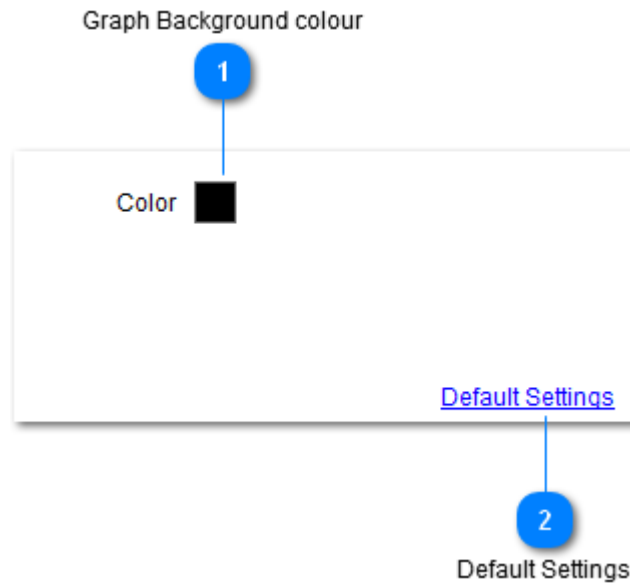
2 **< > button**

< >

Click on this button to cancel any previous zoom or pan operation you have performed on the graph.

3 **Copy To button**

Click on this button to send a copy of the graph to the Windows clipboard.
You can then paste this copy of the graph into any other application (i.e. word processor) for reporting purposes.
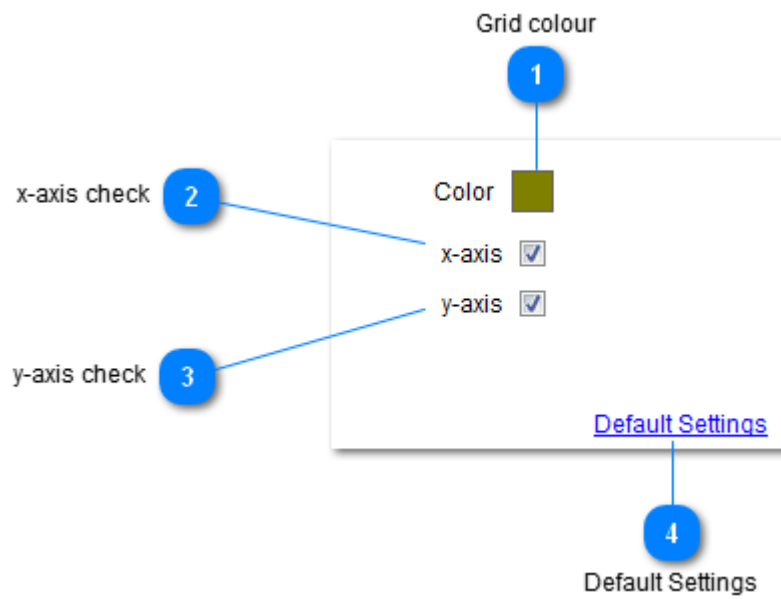
colour Tab

Graph Background colour

Graph Background colour

Click in the coloured area to open the colour selection window.

Default Settings

Default Settings

Click on default settings to go back to the original graph background colour (i.e. black).

Grid Tab

Grid colour

x-axis check

Color

x-axis ☑

y-axis ☑

y-axis check

Default Settings

Default Settings

Grid colour

Click in the coloured area to open the colour selection window.

x-axis check

x-axis ☑

Check/uncheck this box to show/hide the vertical x-axis grid.

y-axis check

y-axis ☑

Check/uncheck this box to show/hide the horizontal y-axis grid.
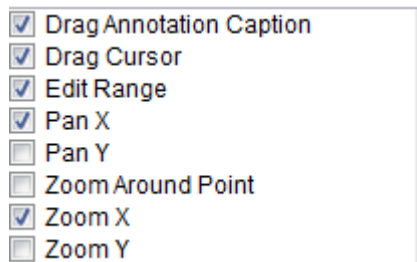
Default Settings

Default Settings

Click on 'default settings' to go back to the original grid colour.

Interactions Tab

Interactions with graph

①

| ☑ Drag Annotation Caption |
| ☑ Drag Cursor |
| ☑ Edit Range |
| ☑ Pan X |
| ☐ Pan Y |
| ☐ Zoom Around Point |
| ☑ Zoom X |
| ☐ Zoom Y |

Default Settings

②

Defaults Settings

① Interactions with graph

| ☑ Drag Annotation Caption |
| ☑ Drag Cursor |
| ☑ Edit Range |
| ☑ Pan X |
| ☐ Pan Y |
| ☐ Zoom Around Point |
| ☑ Zoom X |
| ☐ Zoom Y |
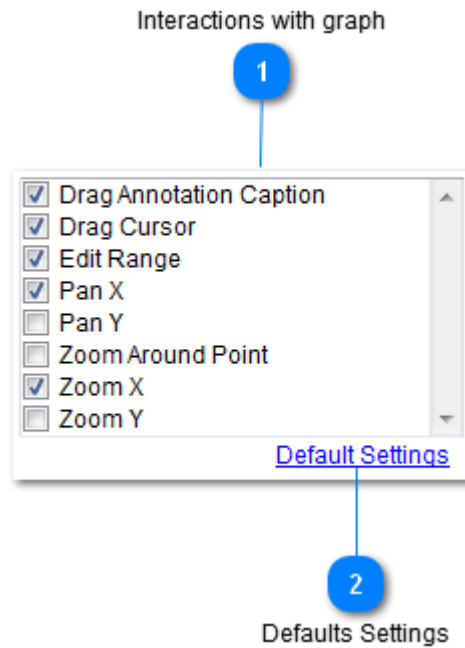
This is the list of possible user interactions with the graph that can be enabled (checked) or disabled (unchecked).
The related key sequences will operate according to their enabled/disabled status (checked or unchecked), (see the Graph Interactions section for a complete list of interaction key sequences).

② Defaults Settings

Default Settings

Click on 'default settings' to go back to the original default interactions.

Cursors Tab
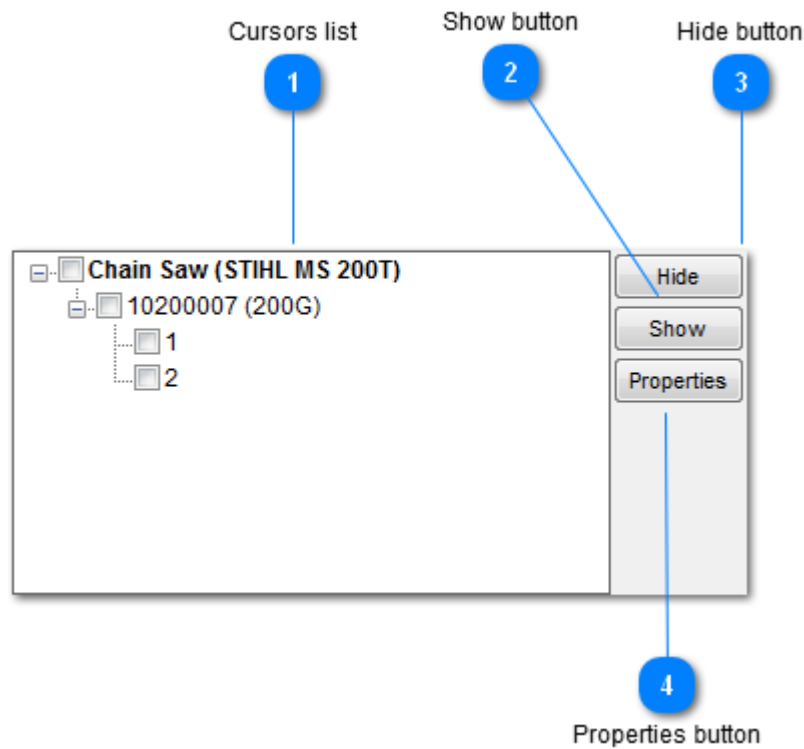
Cursors are mainly used to allow users to select measurement ranges for which operations need to be performed

- To define exclusions (exclusions tab)
- To define measurement ranges to be exported (export tab)
- To define annotations (annotations tab)
- To define the ranges where exposure values are calculated (the corresponding results are displayed in both the [Cursors] and] Cursors [Tabs for measurements between cursors and outside cursors respectively).

Note:
There is a pair of cursors linked to each sensor and listed as '1' and '2'.
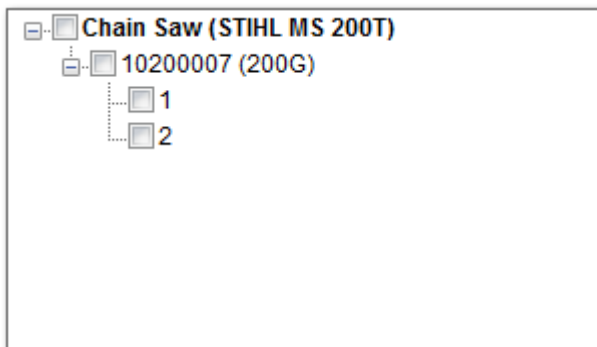
Cursors list

This is the list of available cursors in tree structure format.
The cursors listed in the graph are shown in black font.
The hidden cursors are shown in greyed-out font.

2 **Show button**

Show

Using this button you can show one or more cursors on the graph.
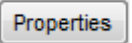First check the cursors(s) you want to show in the list of cursors and then click this button.

3 **Hide button**

Hide

Using this button you can hide one or more cursors on the graph.
First check the cursors(s) you want to hide in the list of cursors and then click this button.
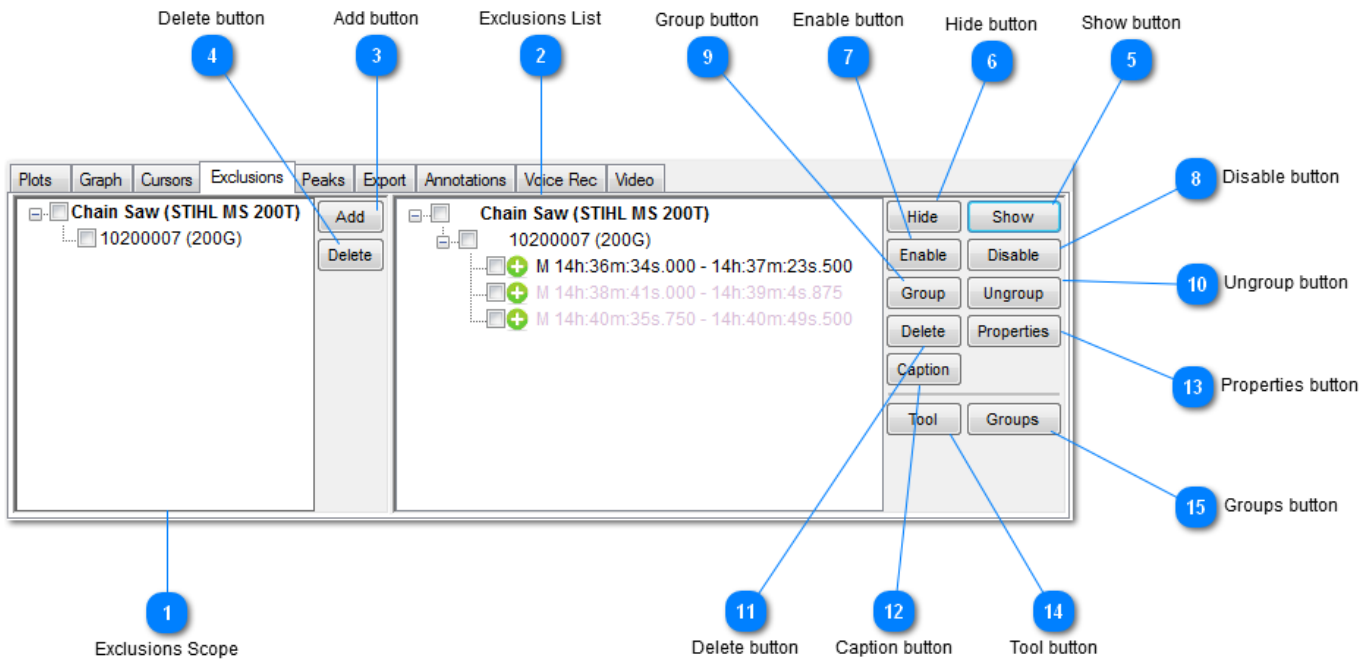
4 **Properties button**

Properties

Using this button you can change the properties of cursors(s) on the graph (i.e. colour).
First check the cursor(s) for which you wish to change the graphic properties in the list of cursors and then click this button.

Exclusions Tab

An exclusion is a range of measures - for a given sensor - that is not taken into account in exposure computations.
Exclusions can be easily be made active (i.e. excluded from exposure computations) or inactive (included in exposure computations) using the "Enable" and "Disable" buttons, respectively.

An exclusion is a range of measurements - for a given sensor - that is not taken into account in exposure calculations.
Exclusions can be easily activated (i.e. corresponding measurements excluded from exposure calculations) or deactivated (corresponding measurements included in exposure calculations) using the "Enable" and "Disable" buttons.

There are two types of exclusions:

1. **'Measurement' exclusions** that are generated by the HASensor software during vibration measurements.
2. **'Viewer' exclusions** that you can create with HAViewer to easily implement 'What-if' scenarios for example.
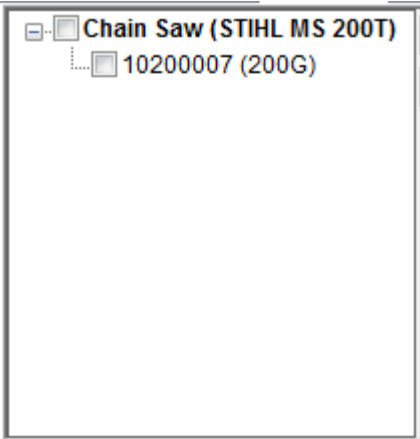
Note:
Viewer exclusions are marked as 'V', while Measurement exclusions are marked as 'M'.
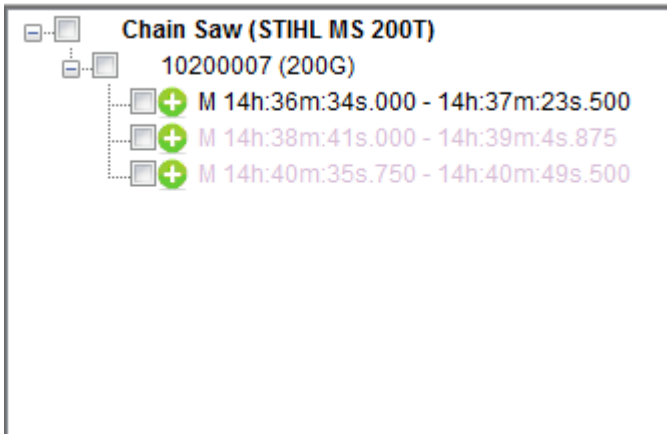
Note:
An exclusion is linked to a sensor. Hence, it operates on each measurement axis of the sensor.

1 **Exclusions Scope**

Exclusions are linked to a sensor. When you wish to 'Add' or 'Delete' exclusion(s), you must first check the sensor(s) in this list to which the added or deleted exclusion(s) are to be allocated.

2 **Exclusions List**

The exclusions are presented in tree structure format.

Their format is as follows: [M or V] start time - stop time [group]

where

 or denotes whether the exclusion is active or not.

M or V denotes a 'Measurement' or 'Viewer' exclusion.

[group] is the exclusions group to which the exclusion is allocated (it is left blank if the exclusion is not allocated to an exclusions group).

Exclusions shown in the graph are shown in black font.
Hidden exclusions are shown in greyed-out font.

Add button

3

Add

Using this button you can create exclusions.
In the exclusion scope, check the sensor(s) you wish to create exclusions for.
For each of the checked sensor(s), select the measurement range you wish to exclude in the graph using the sensor-linked pair of cursors.
Click the "Add" button.

Delete button

4

Delete

Using this button you can delete exclusions.
In the exclusion scope, check the sensor(s) you wish to remove exclusions from.
For each of the checked sensor(s), select the measurement range in the graph containing the existing exclusions you wish to remove using the sensor-linked pair of cursors.
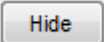Click the "Delete" button.

Show button

5

Show

Using this button you can show exclusion(s) in the graph.
First check the exclusion(s) you wish to show in the exclusions list and then click this button.

Hide button

6

Hide

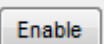Using this button you can hide exclusion(s) in the graph.
First check the exclusion(s) you wish to hide in the exclusions list and then click this button.

Note:
Hiding exclusions only has a visual impact. Measurements corresponding to hidden (and still active) exclusions are still excluded from exposures calculations.
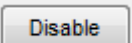
Enable button

7

Enable

Using this button you can activate exclusion(s) (i.e. the corresponding measurements are not taken into account in exposure calculations).
First check the exclusion(s) you wish to enable in the exclusions list and then click this button.

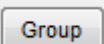### Disable button

8

Disable

Using this button you can deactivate exclusion(s) without deleting them (i.e. the corresponding measurements are taken into account in exposure calculations).
First check the exclusion(s) you wish to disable in the exclusions list and then click this button.

Group button

9

Group

Using this button you can allocate exclusion(s) to a group.
First check the exclusion(s) you wish to allocate to a group from the exclusions list and then click this button.

A dialogue box will then open asking you for the exclusions group name to which you wish to allocate exclusion(s).

Note:
Group(s) must first be created in order to be able to allocate exclusion(s) to them- see the 'Groups' button below.

10 **Ungroup button**

Ungroup

Using this button you can remove exclusion(s) from a group.
First check the exclusion(s) you wish to remove in the exclusions list and then click this button.

11 **Delete button**

Delete

Using this button you can delete exclusion(s).
First check the exclusion(s) you wish to delete in the exclusions list and then click this button.

Note:
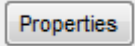'Measurement' exclusions cannot be deleted. They can however be disabled.

12 **Caption button**

Caption

Using this button you can enter a caption for exclusion(s).
First check the exclusion(s) you wish to enter a caption for in the exclusions list and then click this button.
A dialogue box will then open asking you to enter the caption text.

13 **Properties button**

Properties

Using this button you can change the properties of exclusion(s) in the graph (i.e. colour).
First check the exclusion(s) for which you wish to change the graphical properties in the exclusions list and then click this button.
The exclusion properties dialogue box will then open.

14 **Tool button**

Tool

Using this button you can generate exclusions for measurements above/below a given threshold for a given duration.
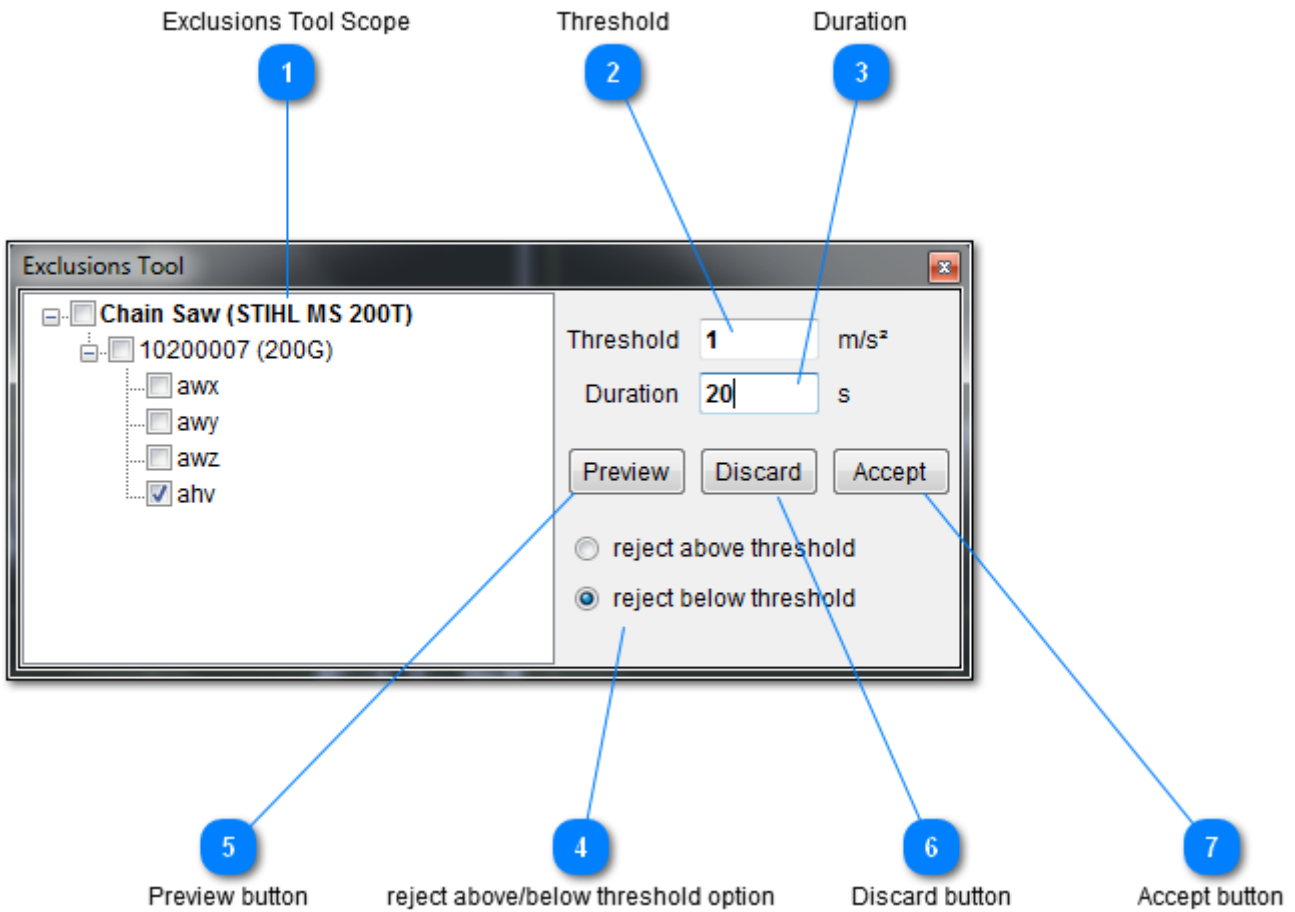When you click this button the exclusions tool dialogue box will open.
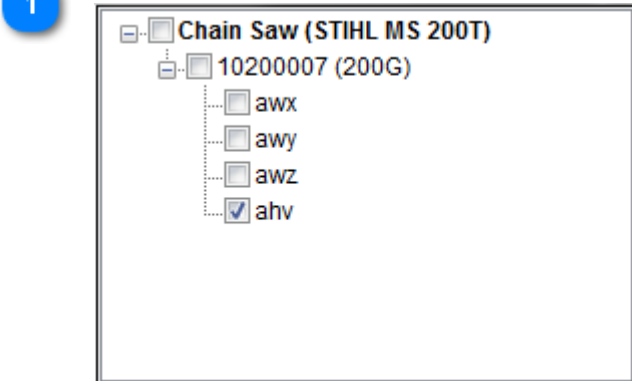
15 **Groups button**

Groups

This button allows you to access the dialogue box for defining and managing the exclusion groups.
When you click this button the exclusions groups dialogue box will open.

Exclusions Tool Dialogue box

Exclusions Tool Scope

Check the waveforms on which the exclusions tool will operate.

Threshold

Measurements above/below this acceleration threshold for at least the given duration will be rejected.

3 **Duration**

Duration 20 s

Measurements above/below the acceleration threshold for at least this duration will be rejected.

4 **reject above/below threshold option**

○ reject above threshold

◉ reject below threshold

Select whether the exclusions tool should reject measurements above or below the given threshold.

5 **Preview button**

Preview

Click this button to preview in the graph exclusions that have been generated by the exclusions tool.
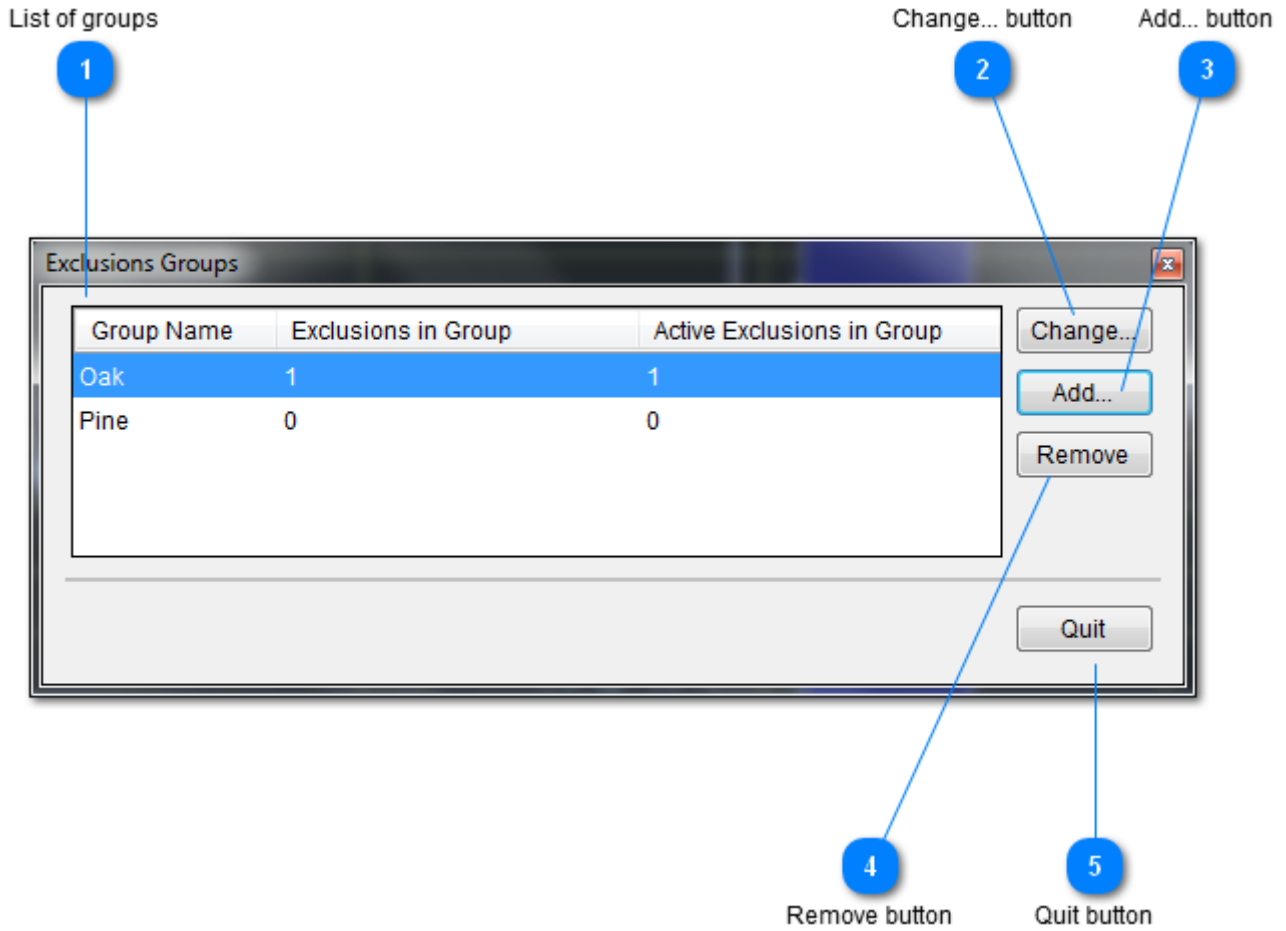
6 **Discard button**

Discard

Click this button to reject exclusions that have been generated by the exclusions tool.

7 **Accept button**

Accept

Click this button to accept exclusions that have been generated by the exclusions tool.

Exclusions Groups Dialogue box

1 List of groups
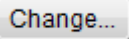

This is the list of defined groups.

Column Header	Description
Group Name	The name of the group
Exclusions in Group	The number of exclusions that are allocated to the Group
Active Exclusions in Group	The number of active (enabled) exclusions that are allocated to the Group

2 **Change... button**
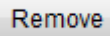
Change...

First select a group name in the list and click this button to change its name.

3 **Add... button**

Add...

Click this button to add a new exclusions group name to the list.

4 **Remove button**

Remove

First select a group name in the list and click this button to remove it.

5 **Quit button**

Quit

Click this button to close the exclusions group dialogue box.

Peaks Tab
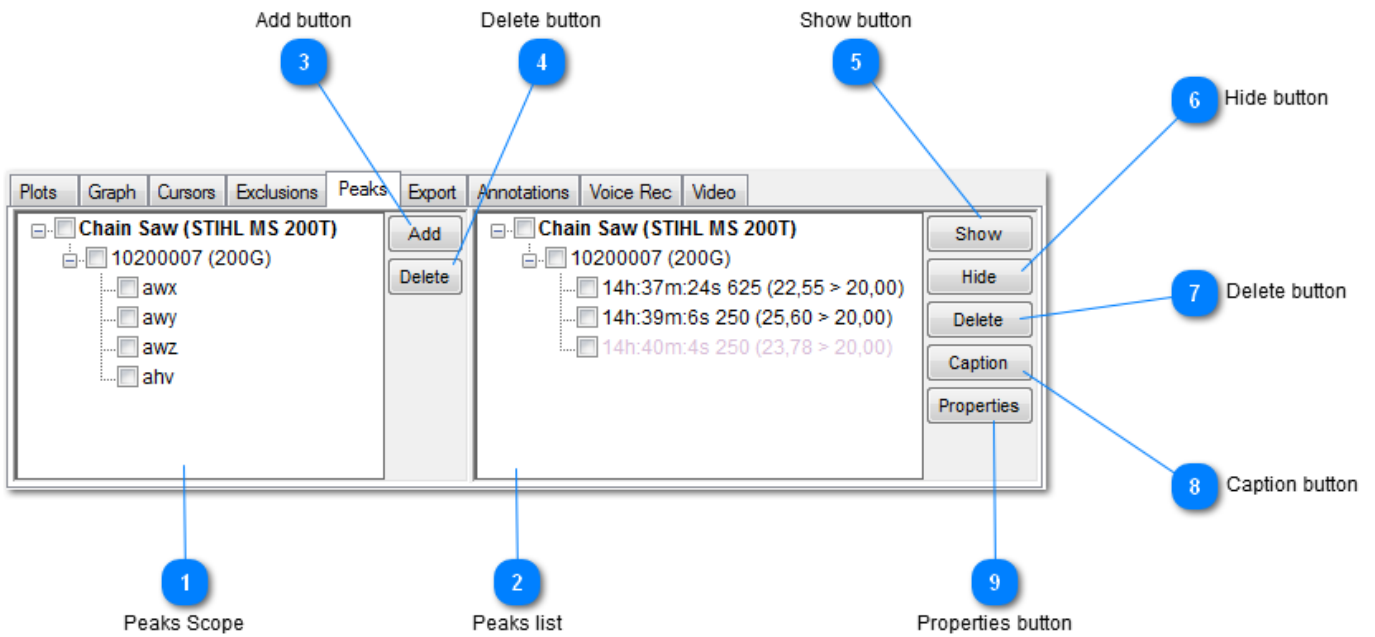
You can search for peaks above a certain vibration level on one or more waveforms.

Peaks Scope

Peaks are linked to a waveform. When you want to 'Add' or 'Delete' peak(s), you must first check the waveform(s) in which you wish to search for peaks.

Peaks list

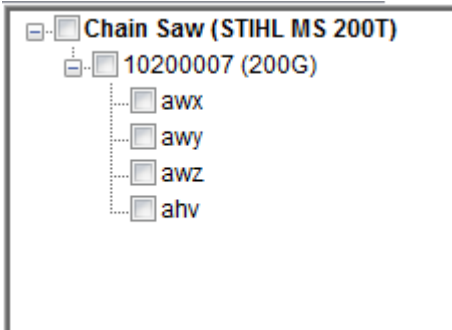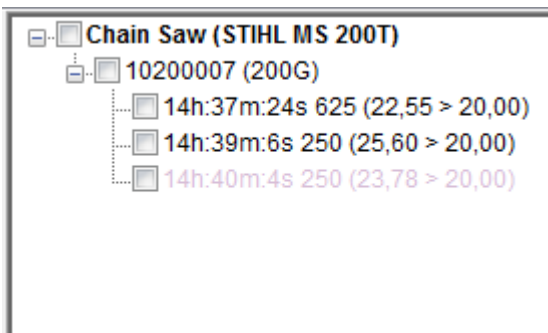Peaks are listed as: location (value > threshold)

where

location is the position of the peak in time
value is the acceleration value of the peak
threshold is the acceleration level that was used when searching for peaks

Peaks shown in the graph are listed in black font.
Hidden peaks are listed in greyed-out font.

Add button

Using this button, you can access the dialogue box allowing you to define a detection threshold.
In the peaks scope, check the waveform(s) in which you wish to search for peaks.
Click the "Add" button.

Delete button

Using this button you can delete previously identified peaks.
In the peaks scope, check the waveform(s) from which you wish to remove peaks and then click this button.

Show button

Using this button you can show one or more peaks in the graph.
First check the peak(s) you wish to show in the peaks list and then click this button.

Hide button

Using this button you can hide one or more peaks in the graph.
First check the peak(s) you wish to hide in the peaks list and then click this button.

Delete button

Using this button you can delete previously identified peak(s).
First check the peak(s) you wish to delete in the peaks list and then click this button.

Caption button

Using this button you can enter a caption for one or a more peaks.
First check the peak(s) you wish to enter a caption for in the peaks list and then click this button.
A dialogue box will then open asking you to enter the caption text.

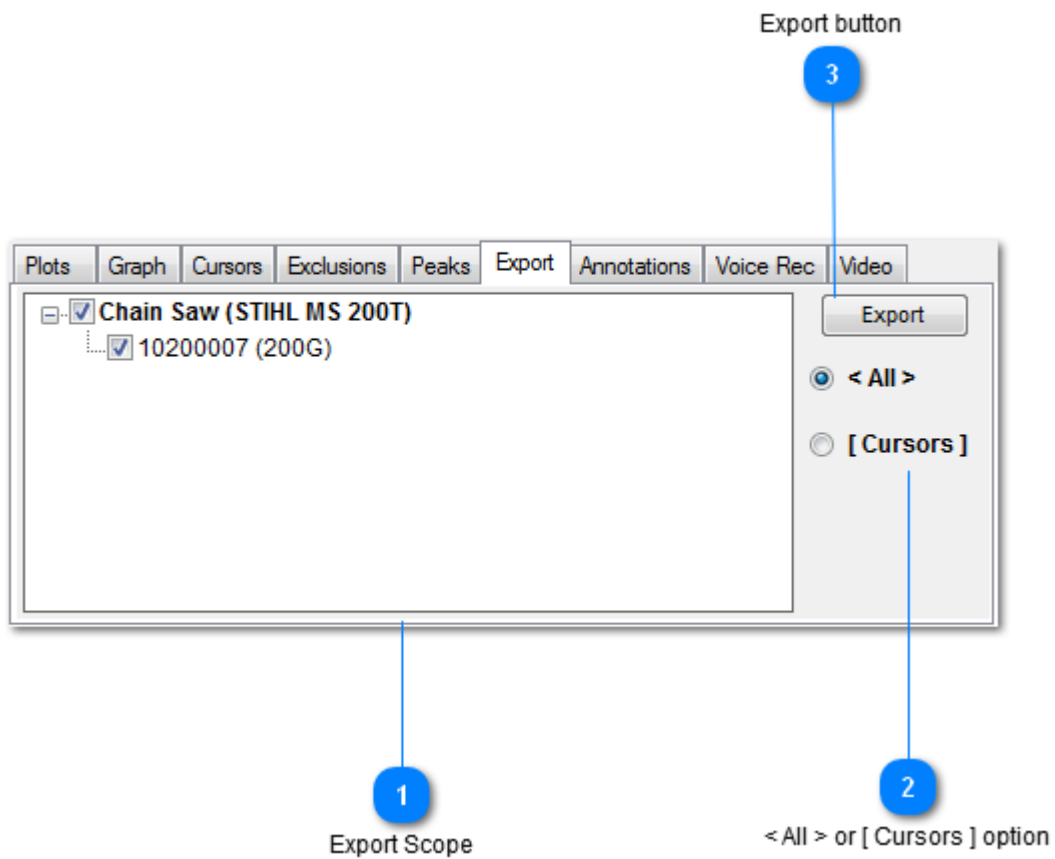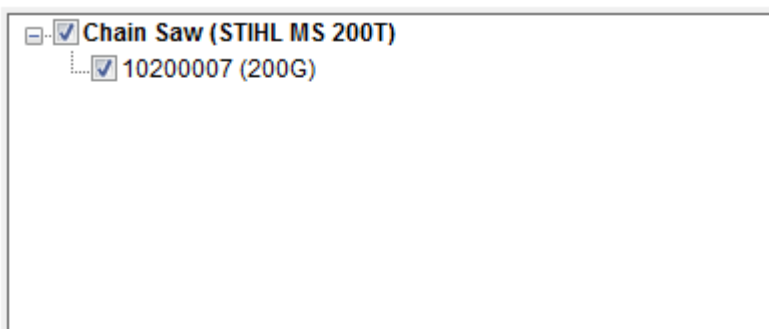## Properties button

Using this button you can change the properties of one or more peaks on the graph (i.e. colour).

First check the peak(s) for which you wish to change the graphic properties in the peaks list and then click this button.
A "Peak properties" dialogue box will then open.

Export Tab

Export button

3

| Plots | Graph | Cursors | Exclusions | Peaks | Export | Annotations | Voice Rec | Video |

☐ ☑ **Chain Saw (STIHL MS 200T)**
　　☑ 10200007 (200G)

Export

◉ **< All >**

○ **[Cursors]**

1

Export Scope

2

< All > or [Cursors] option

Export Scope

1

☐ ☑ **Chain Saw (STIHL MS 200T)**
　　☑ 10200007 (200G)

Here you can check the sensor(s) from which you wish to export measurements.

< All > or [Cursors] option

2
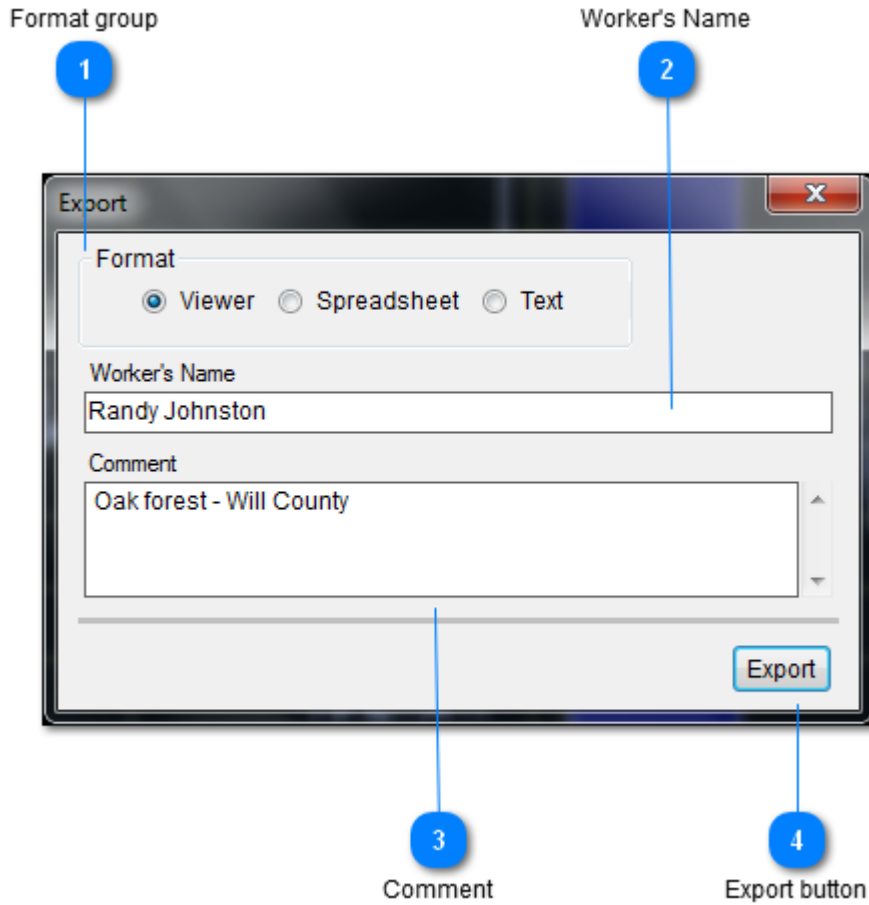
◉ **< All >**
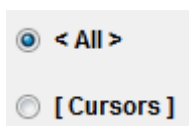
○ **[Cursors]**

You can choose the measurements for export: either all measurements or restricted to those between cursors.

3 **Export button**
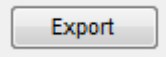
Export

When you click the Export button the export dialogue box will open.

Export dialogue box

① Format group
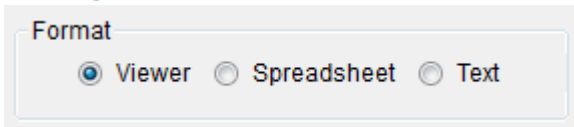
The selected sensor(s) and related measurement range(s) can be exported in 3 different formats:

Format	Description of exported data
Viewer	Data is exported in a new viewer file (.vif file) that can be opened in HAViewer.
Spreadsheet	Data is exported in an .asc file that can be imported into a spreadsheet. The field separator is ; (a semi-colon)
Text	Data is exported into a .txt file that can be opened with any text editor.

② Worker's Name

You will be able to update the worker's name.

3 **Comment**

Comment

Oak forest - Will County

You will be able to update the comment.

4 **Export button**

Export
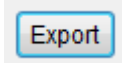
Click this button to open the usual Windows Save File dialogue box.

Annotations Tab
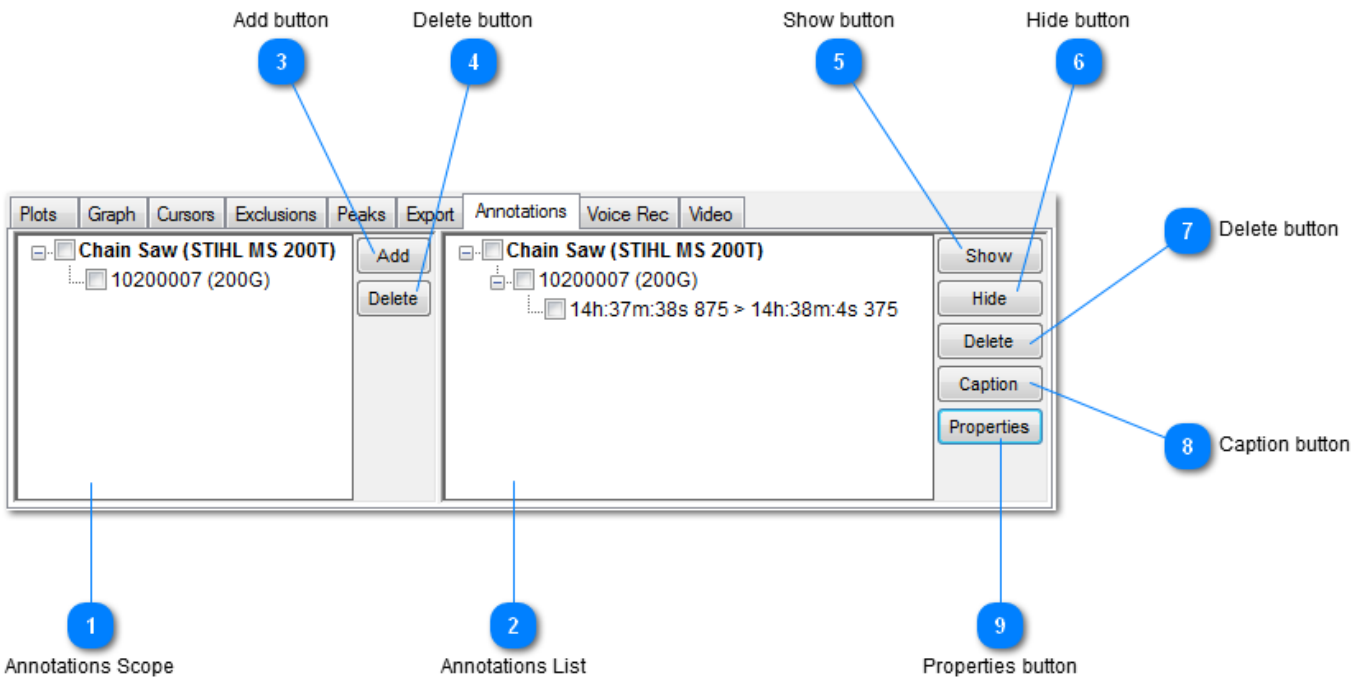
You can highlight and annotate the measurement ranges corresponding to one or more sensors.

Note:
Unlike exclusions, annotations have no effect on exposure calculations.

1 Annotations Scope

Annotations are linked to a sensor. When you want to 'Add' or 'Delete' annotation(s), you must first check the sensor(s) to which the annotation(s) will be added or deleted.

2 Annotations List

Annotations are displayed in tree structure format.

Their format is the following: start time - stop time [group]

The annotations displayed in the graph are shown in black font.
The hidden annotations are shown in greyed-out font.

3 **Add button**

Add

Using this button you can create annotations.
In the annotations scope, check the sensor(s) for which you wish to create annotations.
For each of the checked sensor(s), select the measurement period you wish to highlight in the graph using the sensor-linked pair of cursors.
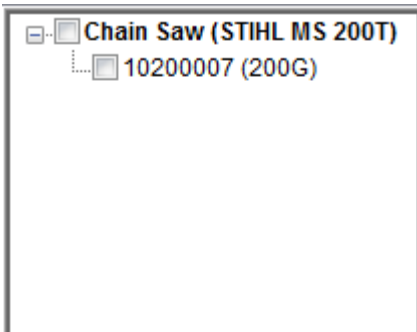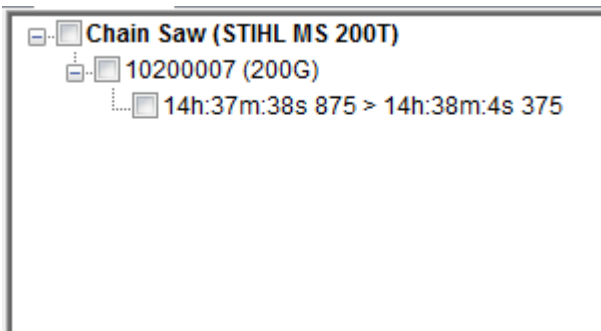Click the "Add" button.

4 **Delete button**

Delete
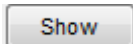
Using this button you can delete annotations.
In the annotations scope, check the sensor(s) you wish to remove annotations from.
For each of the checked sensor(s), select the measurement range in the graph enclosing the existing annotations you wish to remove using the sensor-linked pair of cursors.
Click the "Delete" button.

5 **Show button**

Show

Using this button you can show one or more annotations in the graph.
First check the annotation(s) you wish to show in the annotations list and then click this button.

6 **Hide button**
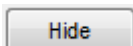
Hide

Using this button you can hide annotation(s) in the graph.
First check the annotation(s) you wish to hide in the annotations list and then click this button.

7 **Delete button**

Delete

Using this button you can delete annotation(s).
First check the annotation(s) you wish to delete in the annotations list and then click this button.

8 **Caption button**
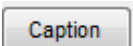
Caption

Using this button you can enter a caption for annotation(s).
First check the annotation(s) you wish to enter a caption for in the annotations list and then click this button.
A dialogue box will then open asking you to enter the caption text.

9 **Properties button**
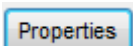
Properties

Using this button you can change the properties of annotation(s) in the graph (i.e. colour).
First check the annotation(s) for which you wish to change the graphic properties in the annotations list and then click this button.

The annotation properties dialogue box will then open.

Voice Records Tab
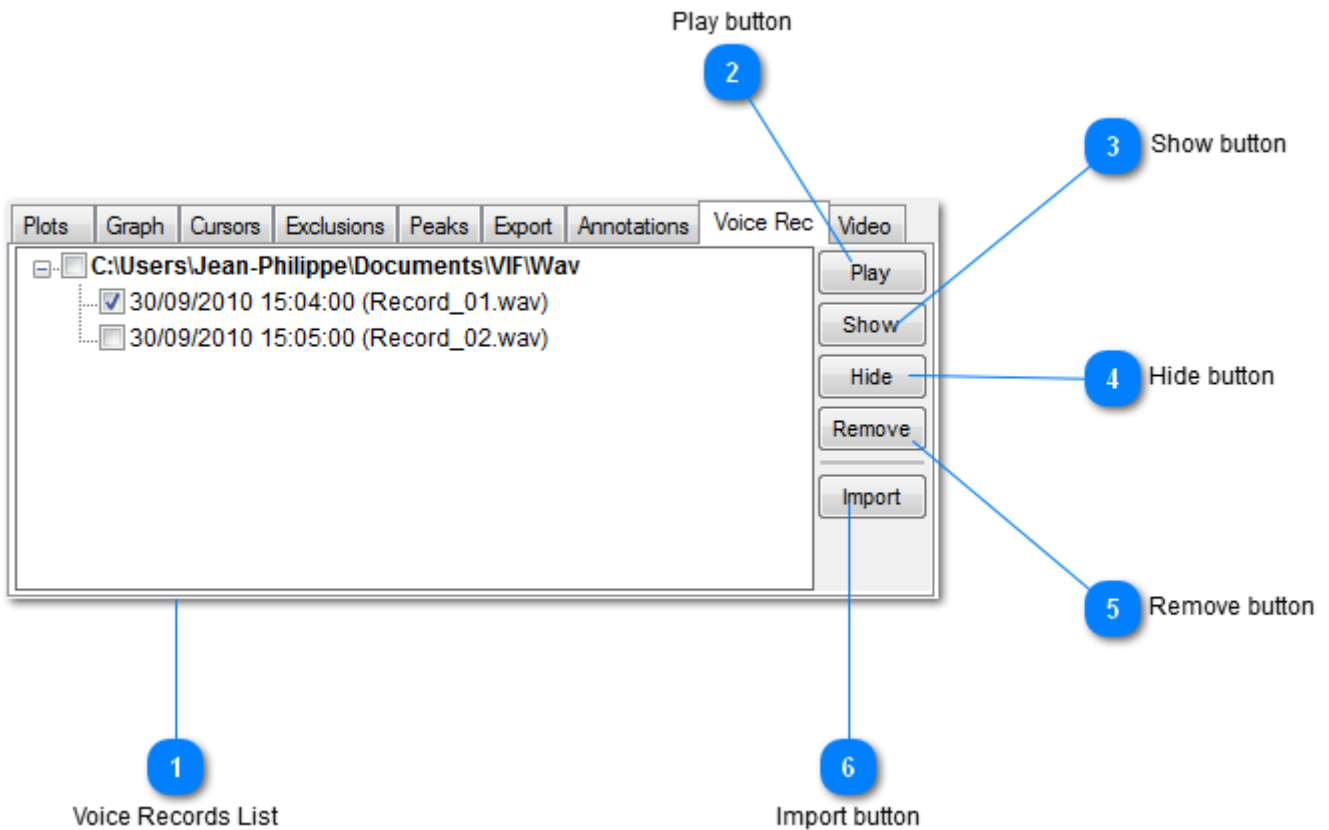
You can record voice messages during vibration measurements and replay them in HAViewer.
A marker is linked to each voice record and appears on the X axis of the vibration time histories in the location corresponding to the time when the record was taken.

	Prior to taking vibration measurements and voice records, make sure that the system date and time of your PC (the one running HASensor) and your voice recording device are the same. This will ensure that voice records will be correctly imported in HAViewer and that they will be synchronised with the vibration measurements.

1 **Voice Records List**

☐ C:\Users\Jean-Philippe\Documents\VIF\Wav
  ☑ 30/09/2010 15:04:00 (Record_01.wav)
  ☐ 30/09/2010 15:05:00 (Record_02.wav)
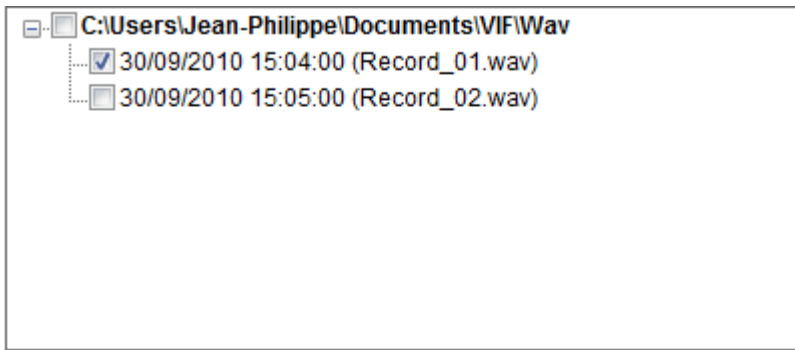
This is the list of records that have been imported into HAViewer.

2 **Play button**

[Play]

First check the voice messages that you wish to play in the voice records list and click this button.

Note:
Please make sure that your speakers are not muted ant that the volume level is sufficient.

3 **Show button**

[Show]
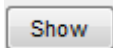
Using this button you can display the voice record markers on the X axis of the graph.
First check the record(s) for which you wish to display the corresponding markers in the graph and then click this button.
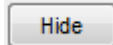
4 **Hide button**

[Hide]

Using this button you can hide the voice record markers on the X axis of the graph.
First check the record(s) for which you wish to hide the corresponding markers in the graph and then click this button.

5 **Remove button**

[Remove]

Using this button you can remove voice records from the list.
First check the record(s) that you wish to remove from the voice record list and click this button.

Note:
This only removes the related voice record from the list. The corresponding wav files are not deleted and remain in the directory in which they were saved.

6 **Import button**

[Import]

Click this button to open the voice record directory selection dialogue box to select the directory where the wav files corresponding to the voice messages are saved.

	Please note that only voice records taken during the vibration measurements will be imported. HAViewer checks that the .wav file 'modified' date-time is within the vibration measurement start and end time range. The 'modified' date-time of the file is the date-time at the end of the voice message recording.

Video Tab
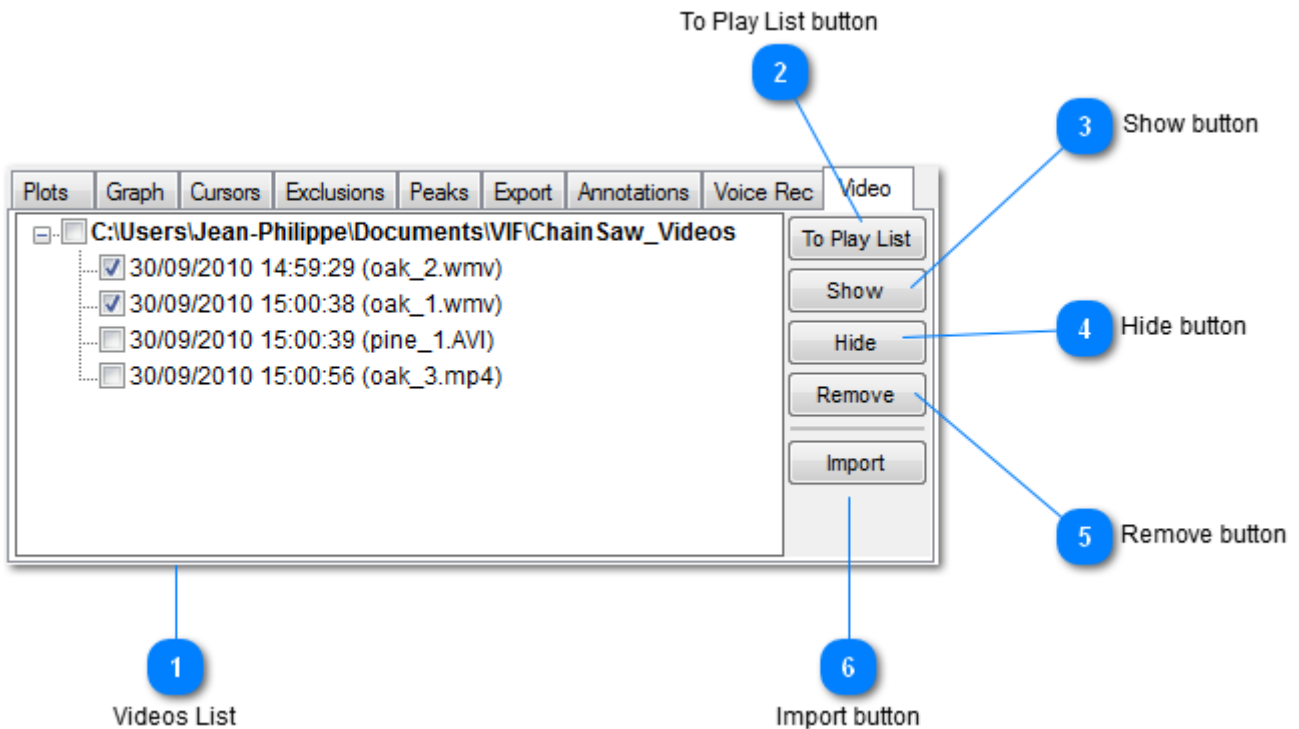
You can record videos with any appropriate devices (i.e. cameras, smartphones, etc.) during vibration measurements and replay them in HAViewer.
A graphical marker is linked to each video and appears on the X axis of vibration time histories corresponding to the video's time range.

👆	Prior to taking vibration measurements and videos, make sure that the system date and time of your PC (the one running HASensor) and your video device are the same. This will ensure that videos will be correctly imported into HAViewer and that they will be synchronised with the vibration measurements.

The video must be started after the first sensor starts to measure and must be stopped before the last sensor stops. |

1 **Videos List**

C:\Users\Jean-Philippe\Documents\VIF\ChainSaw_Videos
☑ 30/09/2010 14:59:29 (oak_2.wmv)
☑ 30/09/2010 15:00:38 (oak_1.wmv)
☐ 30/09/2010 15:00:39 (pine_1.AVI)
☐ 30/09/2010 15:00:56 (oak_3.mp4)
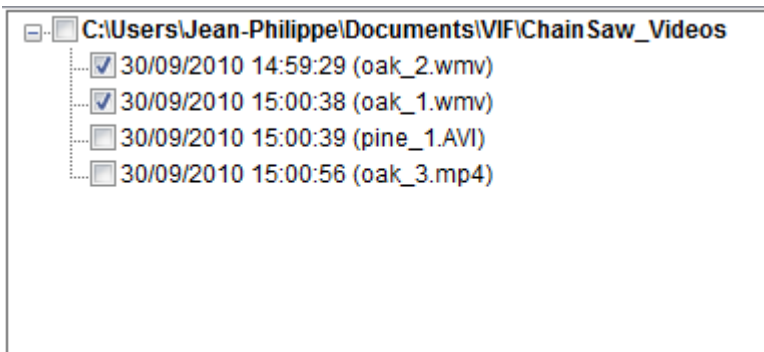
This is the list of videos that have been imported into HAViewer.

2 **To Play List button**

To Play List

First check the videos that you wish to play in the videos list and click this button.
A Play List will be created and Windows Media Player will open.
Click the Windows Media Player "Play" button to view videos in the play list.

A synchronised cursor will move across the vibration graph while the video is playing.
Alternatively, using the mouse, you can also manually move this cursor on the vibration graph to a specific vibration measurement point.
Click the "Play" button on the video player to start viewing the images at this particular vibration area of interest.

3 **Show button**

Show

Using this button you can display the video markers on the X axis of the graph.
First check the video(s) for which the corresponding markers should appear in the graph and then click this button.

4 **Hide button**

Hide

Using this button you can hide video markers on the X axis of the graph.
First check the video(s) for which the corresponding markers should be hidden in the graph and then click this button.

5 **Remove button**

Remove

Using this button you can remove videos from the list.
First check the video(s) that you wish to remove from the videos list and click this button.

Note:
This only removes the related videos from the list. The corresponding files are not deleted and remain in the directory in which they were saved.

6 **Import button**

Import

Click this button to open the videos directory selection dialogue box to select the directory where the video files are saved.

	Please note that only videos recorded during vibration measurements will be imported. HAViewer checks that both video start and stop times are within the vibration measurement start and end time range. Only videos matching those requirements will be imported. The video stop time corresponds to the 'modified' date-time windows properties of the corresponding file. The video start time is calculated as video stop time - video duration. Those file properties (i.e. 'modified' date time and 'duration') can be accessed by clicking the file name with the right-mouse button in Windows explorer and then selecting properties. Please note that the 'duration' property is not accessible in Windows XP. You can access this property in Windows Vista and Windows 7.

Results Tabs
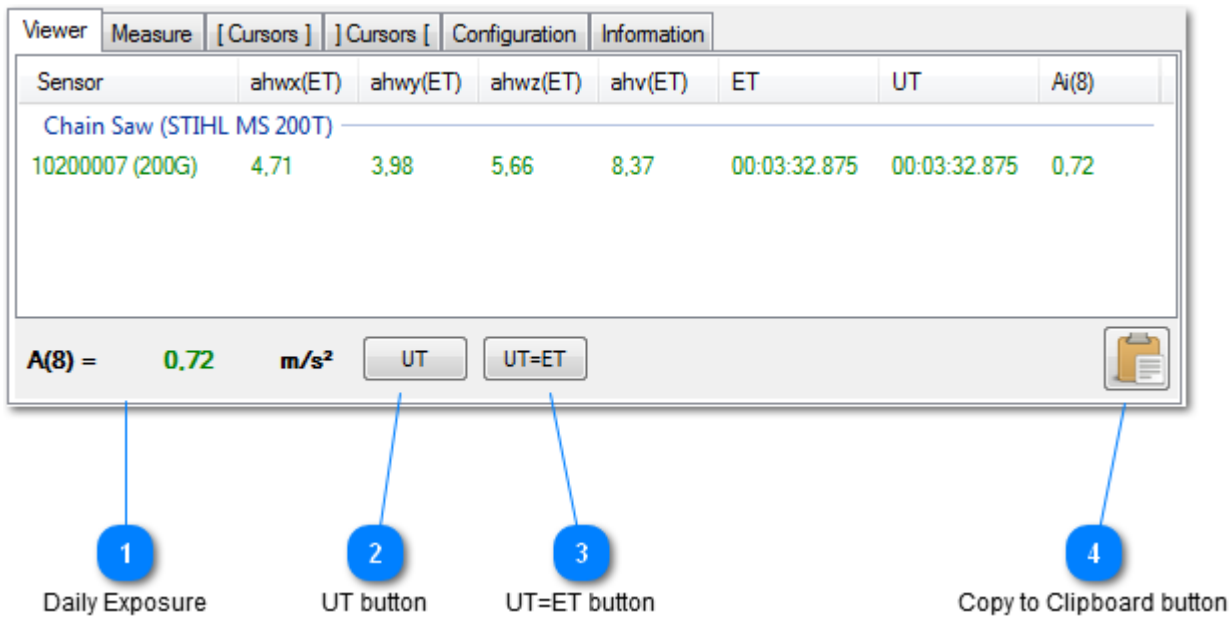
There are four results tabs - Viewer, Measurement, [Cursors], and] Cursors [- each showing results from a different perspective depending on the operations you perform. The table below summarises how HAViewer features impact the results displayed in a given tab.

	Cursors	Viewer Exclusions	Measure Exclusions
Viewer	Not impacted	Impacted by active 'Viewer' exclusions	Impacted by active 'Measure' exclusions
Measure	Not impacted	Not impacted	Impacted by active 'Measure' exclusions
[Cursors]	Impacted	Impacted by active 'Viewer' exclusions between cursors	Impacted by active 'Measure' exclusion between cursors
] Cursors [	Impacted	Impacted by active 'Viewer' exclusions outside cursors	Impacted by active 'Measure' exclusions outside cursors

Listed Results:

a$_{\text{hwx}}$(ET), a$_{\text{hwy}}$(ET), a$_{\text{hwz}}$(ET)
These are the RMS weighted acceleration values according to the X, Y and Z axis that have been measured during the exposure period ET.

a$_{\text{hv}}$(ET)
This is the value that combines the three values of ahw for the X, Y and Z axis according to:

$$a_{hv} = \sqrt{a_{hwx}^2 + a_{hwy}^2 + a_{hwz}^2}$$

Exposure Time (ET)

The exposure time is the time range during which the operator is actually subjected to the vibrations of a tool. This time range corresponds to the measurement time MT, minus the periods during which the tool isn't being used. As a result, the times during which the tool has been set down or held in the hand without being in operation, must not be taken into account in the exposure period. The "HASensor" software determines this period for each sensor used based on the levels measured and their duration.

Usage Time (UT)

This is the normal usage duration of a tool by the operator during his/her working day.

If you perform the measurement during the entire usage duration of the tool by the operator during his/her working day, the usage period is considered as being equal to the exposure time (ET); this is measured automatically by the sensor.

If you perform the measurement for just a proportion of the usage duration of the tool by the operator, you have the option to modify the UT value to reflect the estimation that you have made of the time during which the operator is exposed to the vibration of the tool .

Measurement Time (MT)

The measurement time is the interval of time during which the sensor measured.

A$_i$ (8)

This is the partial daily vibration exposure. It is described as partial as it only takes into account the impact of one of the tools used by the operator, the tooli. It is calculated using the formula:

$$A_i(8) = a_{hvi}\sqrt{\frac{ETi}{8h}}$$

☝	If several sensors have been attached to the same tool, the highest value of ahv is taken into account in the calculation of the partial daily vibration exposure Ai(8) relating to this tool.

👍	Daily exposure is compared to the exposure action value (2.5 m/s²) and to the exposure limit value (5.0 m/s²) as defined in European Directive 2002/44/EC ("vibration" directive) and are presented in accordance with the following colour code: Green indicates an exposure level below the action value Orange indicates an exposure level above the action value but below the limit value. Red indicates an exposure level above the limit value. Grey indicates an exposure level that is not taken into account in the total daily exposure calculation A(8).

A(8)

The total daily vibration exposure A(8) of the operator, which takes into account all of the machines used by the operator is then calculated on the basis of the partial exposure values according to the formula:
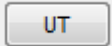
$$A(8) = \sqrt{A_1(8)^2 + A_2(8)^2 + A_3(8)^2 + \ldots}$$

where $A_1(8)$, $A_2(8)$, $A_3(8)$, etc. are the partial exposure values associated with the various vibration sources.

① Daily Exposure

$$A(8) = \quad 0.72 \quad m/s^2$$

② UT button

[UT]

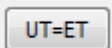Click this button if you wish to set a different Usage Time for the selected sensor.

Note:
First select the sensor in the list for which the Usage Time needs to be adjusted.

Note:
The 'Measurement' tab does not have a 'UT' button as it shows original measurements saved with HASensor.

③ UT=ET button

[UT=ET]

Click this button if you wish to set UT equal to ET for the selected sensor.

Note:
First select the sensor in the list for which the Usage Time will be set to its Exposure Time.

Note:
The 'Measurement' tab does not have a 'UT=ET' button as it shows original measurements saved with HASensor.

④ Copy to Clipboard button

Click on this button to send a copy of the results array to the Windows clipboard.
You can then paste this copy of the results array in any other application (i.e. word processor) for reporting purposes.

Configuration Tab

The measurement configuration is detailed in this tab.

① Sensors List

List of sensors grouped by tool.

List of sensors used grouped by tool.

The information contained in this list is that originally entered in HASensor when configuring the measurement:

Column Header	Description
Sensor	Sensor Serial Number (Sensor Type: 200G or 5000G)
Location	Where the sensor was attached to the tool
Orientation	How the sensor was oriented as compared to the tool
Start Time	When the measurement was started
Stop Time	When the measurement was stopped

Information Tab
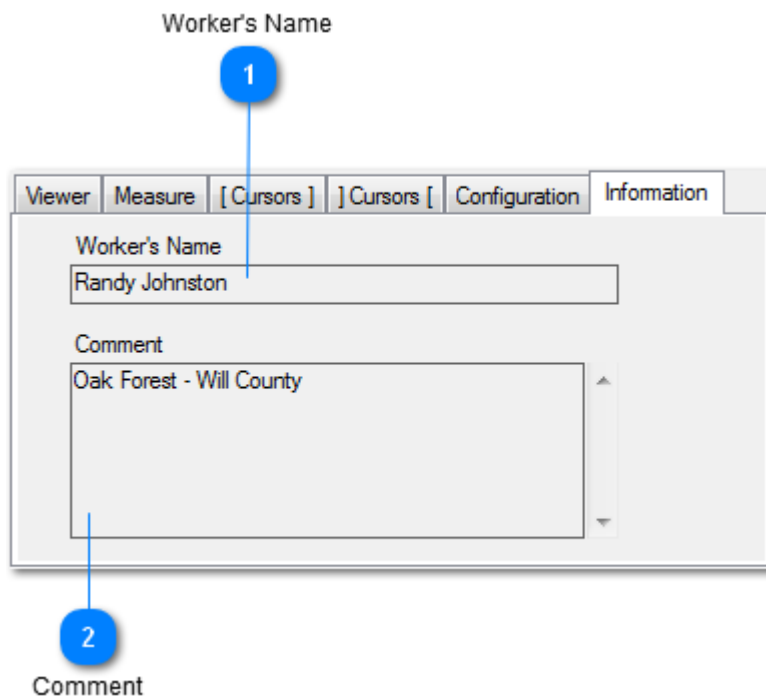
Worker's Name

This is the worker name as initially entered in HASensor, or entered upon exporting if relating to an exported file.

Comment

This is the comment initially entered in HASensor, or entered upon exporting if relating to an exported file.

Graph Interactions

You can interact with the graph through the sequences of keys described hereunder.

You can interact with the graph through the key sequences described below.

Note:
Some of the listed features may be disabled (i.e. unchecked) in the Graph tab/Interactions tab.
To enable a particular interaction, simply check it in the list.

Note:
To ensure that the key sequences operate, the graph area must first be selected (click on the graph prior to performing any of the key sequences mentioned below).

|	
Shift+Click	To zoom in around a point: hold down the Shift key and left click the mouse in the plot area that you wish to enlarge.
Shift+Mouse Wheel	To zoom in or out around a point: hold down the Shift key, position the mouse cursor in the plot area that you wish to enlarge (or shrink) and then move the mouse wheel forward (or back).
Shift+Drag	To perform a zoom operation on an axis: hold down the Shift key, left-click the mouse in the plot area that you wish to enlarge and drag the mouse keeping the button pressed until the area you wish to be enlarged has been selected.
Shift+Alt+Drag	To perform a proportional zoom operation (the same amplification of both the x and y axis): hold down the Shift and Alt keys and left-click the mouse in a corner of the area to be enlarged, select the area by dragging the mouse while keeping the left button pressed until the desired amplification has been reached.
Shift+Right-Click	Hold down the Shift key and right-click the mouse in the plot area to undo a zoom operation
Cltr+Drag	To perform a pan operation: hold down the Ctrl key, left-click the mouse and drag it over the plot area, keeping the button pressed. Release the mouse button once you have reached the desired location.
Ctrl+Right-Click	Hold down the Ctrl key and right-click the mouse in the plot area to undo the pan.
Drag Cursor	To move a cursor to a different point: click on a cursor and drag it keeping the left mouse button pressed. Release the left mouse button once the cursor is in the desired location.
Mouse Cursor	Position the mouse cursor over a data point to display a tooltip for the plot data value.
Edit the graphic scale	Click on the first or last value of the scale on the X or Y axis of the graph to select and then edit it manually.

How To

This section provides a list of How-to's which are step-by-step procedures on how to perform typical operations.

How To

How to adjust the workspace

You can adjust the size of the plot area in relation to both the action/result panels. Just position the mouse in the transition area between the two panels until the mouse cursor changes to the up/down arrow shape. Then left click the mouse and drag it while keeping the button pressed. Release the button once you have resized the workspace as desired.
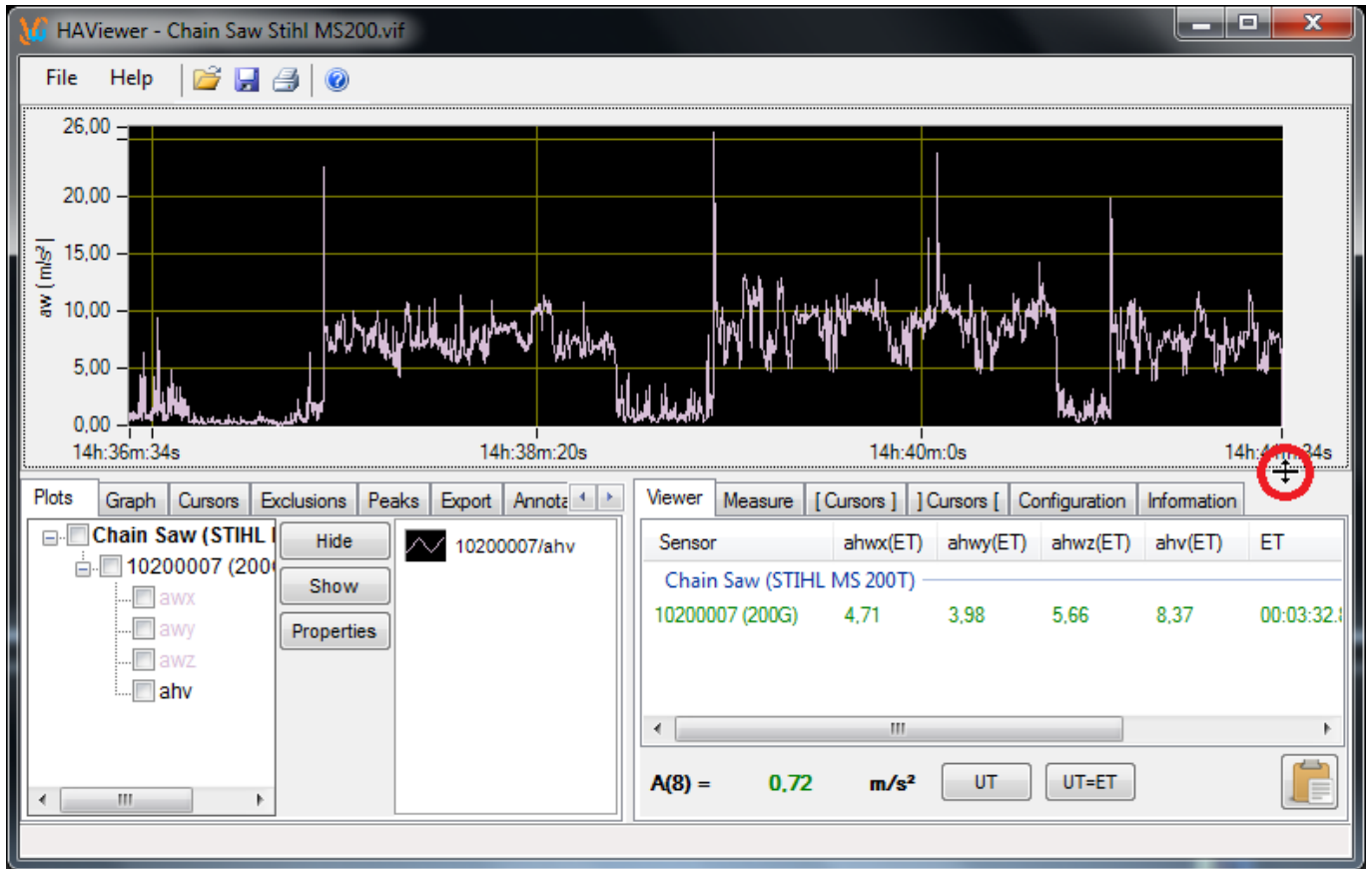
You can adjust the size of the action panel in relation to the results panel. Just position the mouse over the transition area between the two panels until the mouse cursor changes to the left/right arrow shape. Then left click the mouse and drag it keeping the button pressed. Release the button once you have resized the workspace as desired.
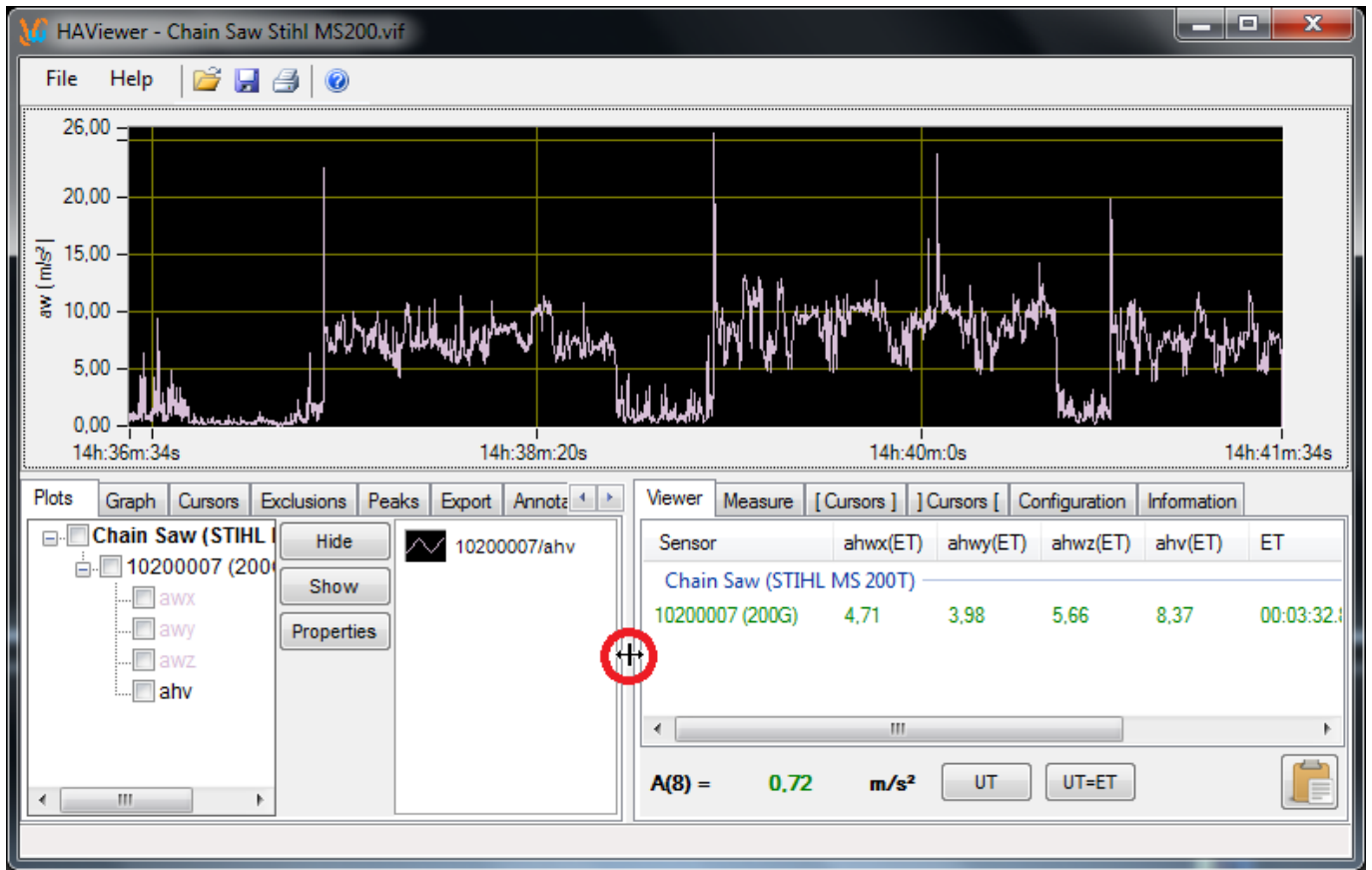
Some sub-panels can also be resized the same way.