Contents

Noesis 14.0 - New Features

1. New Edition – Noesis Essential for ModalAE

ModalAE is a Special Edition of Noesis with support for Modal AE Analysis. The software offers all the basic features, USB protection key, 1D Location options, Advanced waveform and features capabilities and special calculations for analysis for Composite Vessels, intended to support ISO-19106/DOT-May, 2018/ASME X-section 8. The Advanced Edition also supports Supervised and Unsupervised Pattern Recognition algorithms and functions.

The main **advantages** of the product are:

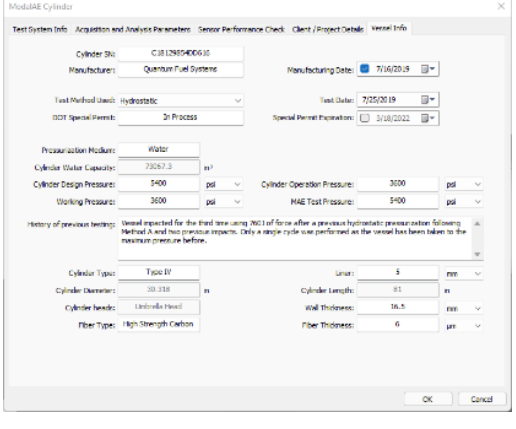
- Complete Analysis using only one application
- Greatly Improve Analysis Speed
- Minimize Human Errors
- Full Audit
- Complete Automated Reports based on Templates
- Archiving

The main **steps** of the analysis are:

Easy and Complete Setup

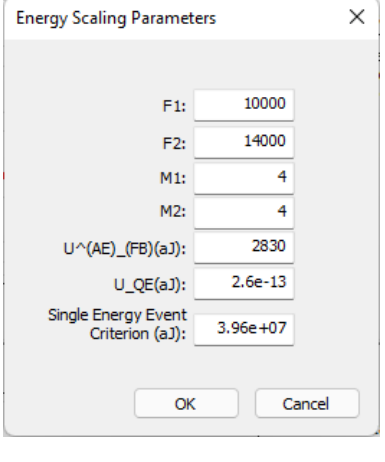
The first step in the analysis is the entry of the background and other information of the Test and the Asset on which the test has been contacted. This includes:

- Test System Info
- Acquisition and Analysis Parameters
- Sensor Performance Check
- Client / Project Details
- Vessel Info



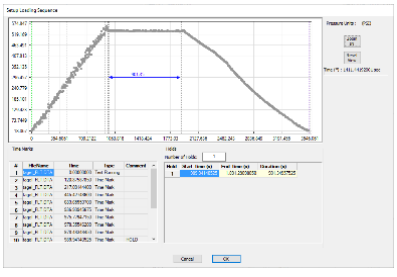
Setup Energy and Calculation of Scaling Parameters

- M1: BE (Background Energy) multiplication factor
- M2: BEO (Background Energy Oscillation) multiplication factor
- U_{FBB}^{AE}: Fiber Bundle Breakage Energy
- (U_{QE}) Quiescent Background Energy
- Single Energy Event Criterion (SEEC)



Easy Definition of Loading Sequence

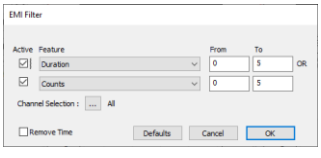
Dedicated interface for easy and fast definition of Loading Sequence including the number of holds (starting and ending times).

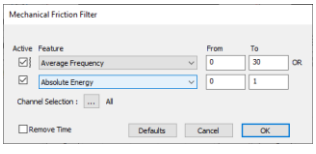


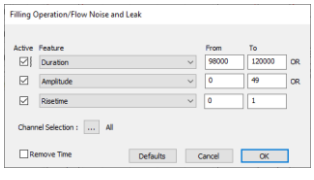
Complete Filtering

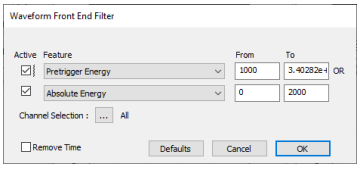
Tools for filtering non relevant data that is associated to:

- EMI
- Mechanical rubbing
- Flow noise
- Leakage and flow noise.



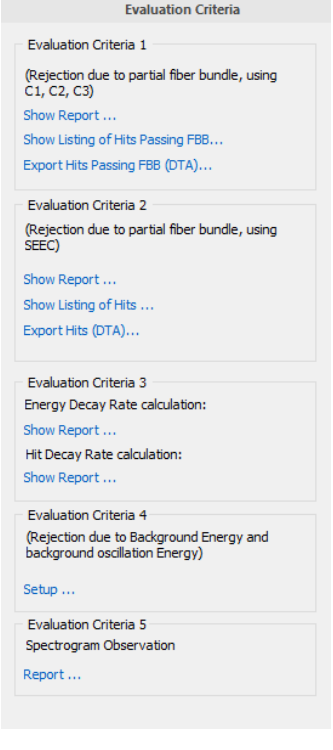






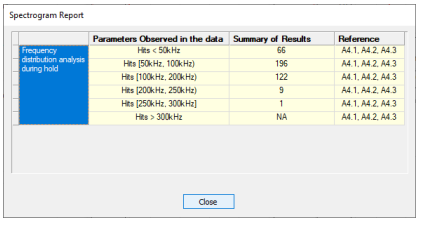
Evaluation Criteria

Various evaluation criteria exist to determine if a vessel is a PASS or a FAIL. ModalAE analysis automated process is available but also present the evaluation criteria so an experienced engineer can validate the results.

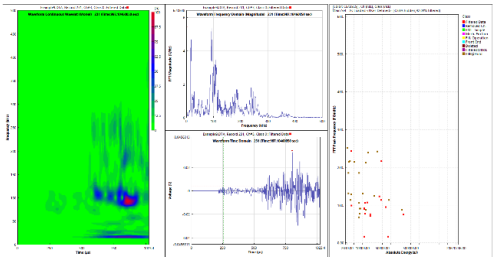


Setup Background Energy Oscillation

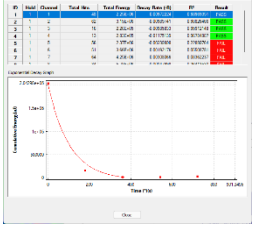
Spectrogram Report



Waveform Analysis



Energy Decay Rate Evaluation

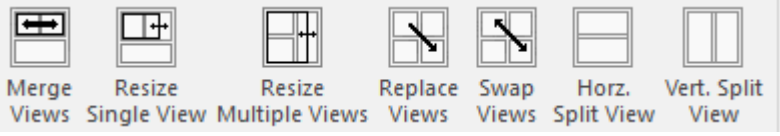


Automated Report and Audit

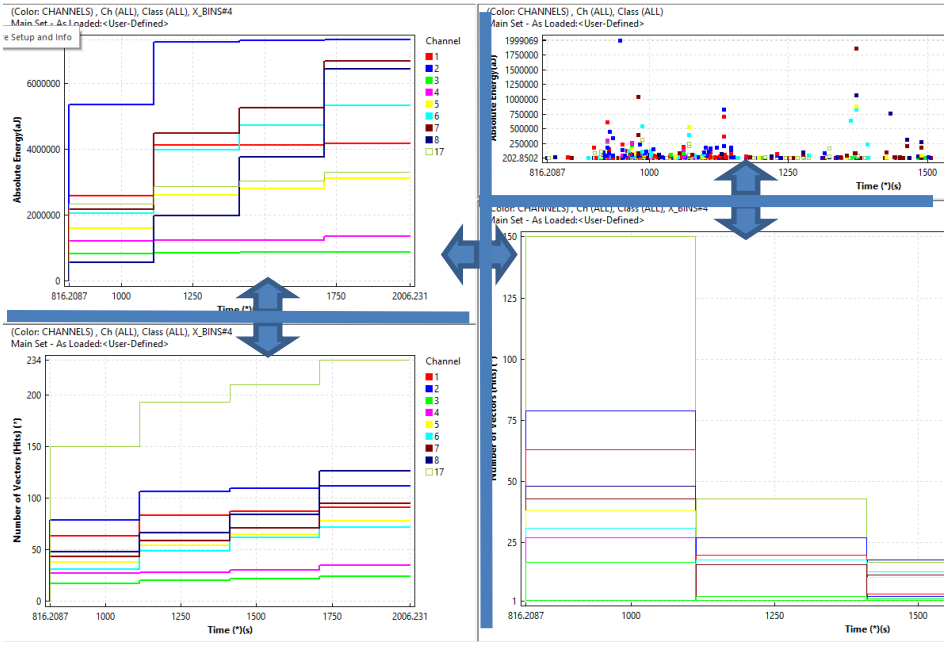
Complete Automated Reports based on Templates and Full Audit of all Analysis steps.

2. Dynamic Splitters inside any Noesis Page

Added dynamic splitters inside any Noesis page. The user has now the option to merge, split, swap, replace or resize any view(s) using the mouse.



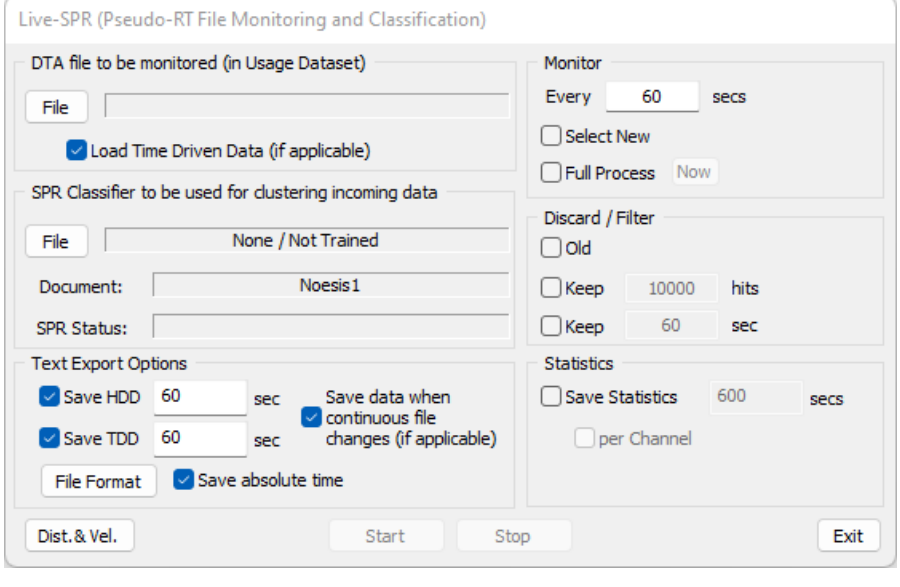
- **Merge Views**: Allows extension of a view area horizontally or vertically, removing any other views under this area. Start by pressing the left mouse button inside the view that is going to be extended. While pressing the left mouse button, move the mouse anywhere inside page. The extended area is designated by a red square. Release left mouse button to accept selection or press simultaneously the right mouse button to cancel operation.
- **Resize Single View:** Allows resizing a single view and its neighboring. Start by pressing the left mouse button inside the view that is going to be resized. While pressing the left mouse button, move the mouse anywhere inside page. The resized area is designated by a red square. Resized neighboring views are designated by purple squares. Release left mouse button to accept selection or press simultaneously the right mouse button to cancel operation. Note that resizing a single view is not always possible. It this situation you should consider use the Resize Multiple Views command.
- **Resize Multiple Views:** Allows resizing multiple views simultaneously by moving the split line between them (see arrows in the following image for possible mouse moves). To move a split line, position mouse cursor over it and while pressing left mouse button, move the mouse accordingly. Release left mouse button to accept selection or press simultaneously the right mouse button to cancel operation.



- **Replace Views**: Allows replacing a view by another view. Start by pressing the left mouse on the view that is going to replace the destination view. While pressing the left mouse button, move the mouse to the destination view. Release left mouse button to accept selection or press simultaneously the right mouse button to cancel operation.
- **Swap Views**: Allows swapping between two views. The source view becomes the destination view, and the destination view becomes the source view. Start by pressing the left mouse on the view that is going to replace the destination view. While pressing the left mouse button, move the mouse to the destination view. Release left mouse button to accept selection or press simultaneously the right mouse button to cancel operation.
- **Horz**. **Split View:** Allows the splitting of a view horizontally to two other equal width and half height views with the same characteristics and properties. Start by pressing the left mouse button inside the view that is going to be split. Release left mouse button to accept selection or press simultaneously the right mouse button to cancel operation.
- **Vert**. **Split View**: Allows the splitting of a view vertically to two other equal height and half width views with the same characteristics and properties. Start by pressing the left mouse button inside the view that is going to be split. Release left mouse button to accept selection or press simultaneously the right mouse button to cancel operation.

3. Noesis Live-SPR

- Added the option to export HDD and/or TDD at specific time intervals in text format. This function is very useful in the case you need to feed another system with data at explicit rate.

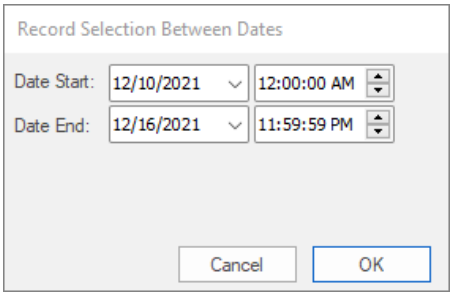


4. Changes/Enhancements in structures functionality

- Sensor coverage page appear in Asset properties now.
- The default for Coverage Area fill is true now.
- Added a "reset to default button" in the sensor setup page of the structures.
- Sensor info check boxes in the Ribbon (AE Info) rearranged.
- Added Sensor Zone Radius to the Structure Wizard

5. Tools to Support Continuous Monitoring

- New command that support Date Time segment selection/delete
- Fixes in date time format for Table views



6. Optimization

- The Feature Extraction implementation is parallel now and thus the execution speed accelerated significant.
- The Feature Extraction optimization for WFS files.
- Parametric Data handling optimization.
- Optimization of the code for the determination of onset waveform parameters (especially when waveforms are kept on disk). This affects significant the Moment Tensor calculation for large datasets.
- General Optimization in various code section resulting better performance.

7. I/O and Data support

- Update of I/O support for all AE data files for all PAC products (DTA and WFS).
- Added support for the new parametric format from microSHM
- Export All Waveforms as txt

8. UT Data Support

- For UT data plots (C-scan mainly) the drawing implementation was optimized. The result is important for large datasets.
- Feature extraction for UT data: Added the capability to have in the same analysis both traditional UT features and advanced features.

9. Data Export to Word

- Added the option to transfer all Noesis Pages to Word

10. General Updates

- Added absolute time option in data grid
- Revised the Intensity setting in cluster tab of plot properties, to produce the same results as AEWin.
- Manuals update
- Examples update
- Setup optimization
- Enhanced Theme support

11. Issues Fixed

General

- Revised Supervised Settings dialog
- Various typo fixes in PR interface
- The settings dialogs for various Pattern recognition do not center on the active mainframe position
- Fixes in k-nnc method in supervised learning
- Fixes in data storage, when loading wfs file in memory
- Fixes in feature extraction issues
- Fixes in Event Hit Linking -> Show All Events
- Protect the execution of Noesis 32-bit for Large Data Files.
- Fix in Intensity dialog
- Fix the behavior of loading a noe document created with incompatible USB key.
- Fix: Vertical and Horizontal distance annotations deactivate when units of axes differ
- Fix: Export data to dta asks for waveforms even if we choose to exclude them
- Fix: User interaction issue when waveforms not embedded to noe are missing
- Fix: Loading of exported dta files (by Noesis)
- Fix: Relative time in WFS files
- Fix: Import parametrics dialog does not work well if user chooses to remove old parametrics
- Fix: Feature name dialog does not update feature names in plots
- Fix: Add time diff between wfs files in Live-WFS
- Fix in LPG mode: Advanced file loading
- Fix: Save location settings and restore - structure info missing
- Fix: When LPG mode, the LPG command does not appear in the classic menu
- Fix in batch export WFS: Dialog clips help text
- Fix in Waveform Export Options Dialog - The usec text is not printed
- Fix in LPG Dialog: The usec text is not printed
- Fix an issue in batch filtering progress dialog
- Remove WAV support from LPG silence.
- Fix in feature extraction for tda when not loaded in memory
- Fix support of HDD data from AEwin SH3 5.92
- Fix an issue when sorting by feature a dta file containing virtual parametrics
- Fixes in Datatable views
- Fix: When loading continued files (not the first), acquisition setup is empty and waveforms are not fully loaded
- Fix: Waveform not invalidating if changing classes, channels, filters outside properties dialog
- Fix: Select all visible records does not work correctly in data table, because it does not consider filtered columns
- Fix: Export data to dta assumes that data is sorted by time
- Fix: Widen patch time dialog to give space to controls
- Fix: Statistics view is empty after selecting Features, Channels and other options

- Fix: Loading of Text Features (TXT) (from New Analysis) in time driven does not allow importing of Channel feature
- Fix: Performance issues when loading tda in memory
- Fix: Live WFS does not apply classifier correctly to working copy of usage set
- Fix: Incorrect drawing of waveforms on multiple waveform plots when waveforms are left to disk (in TDA files case)
- Fix: Batch data filtering: When downsampling TDD parametric using average method, exported dta and exported txt may have different parametric values (approximately 2% relative error)

Structures

- Fixes in Simple Cylinder setup dialog: validation, volume calculation, change of volume unit
- Fix: Changing head type in simple cylinder setup does not update volume calculation
- Simple Template Setup dialogs titles updated.
- Fix: Box structure with none default dimensions had incorrectly calculated sensor positions
- Fix: In the Coverage -Sensor Calibration property page the 'Sensor Average ' edit boxes was not populated
- Fix: Box structure with dimensions of less than 1 has incorrect default sensors setup
- Fix: Flat head of cylinder has no default sensors
- Fix: Cylinder default sensor positions are on the head-to-body weld
- Fix: Cone default sensor positions are on the base or the head weld
- Fix: Sensor property page in the Asset properties is empty for the flat heads
- Typo fixes in Structure section in Ribbon

UT Corrections

- Fix: loading certain UT csc file
- Fix serialization issues
- Fix: Feature Correlation
- Fix: Invalid output in correlation matrix
- Fix: Working copy plots are not designed properly for UT data
- Fix: Sort by feature
- Fix: when removing a feature existing in a table
- Fix: Add user defined feature function
- Fix: Grid in UT Settings of fx setup is empty
- Replace "First Pulse" with "First Echo"; Replace Pulser Rate with Pulser Width in UT settings
- Replace amp "First Threshold" with "First Peak"; all amp " Threshold " with " Peak "; copy gate settings of utwin file to gates 5 to 8
- Fix: Incorrect value of velocity used
- Fix: when removing "color by feature" feature and moving mouse cursor over plot

Noesis 12.0 - New Features

12. New Edition – Noesis Essential for Micro-SHM

Noesis Essential for Micro-SHM is a special low-price edition of Noesis. This edition offers all the functionality of Noesis for AE data only from micro-SHM PAC systems.

The packages includes the following features:

- Full support for PAC (DTA) acoustic emission data files from micro-SHM systems, with save and export capabilities.
- All the standard Noesis Functions

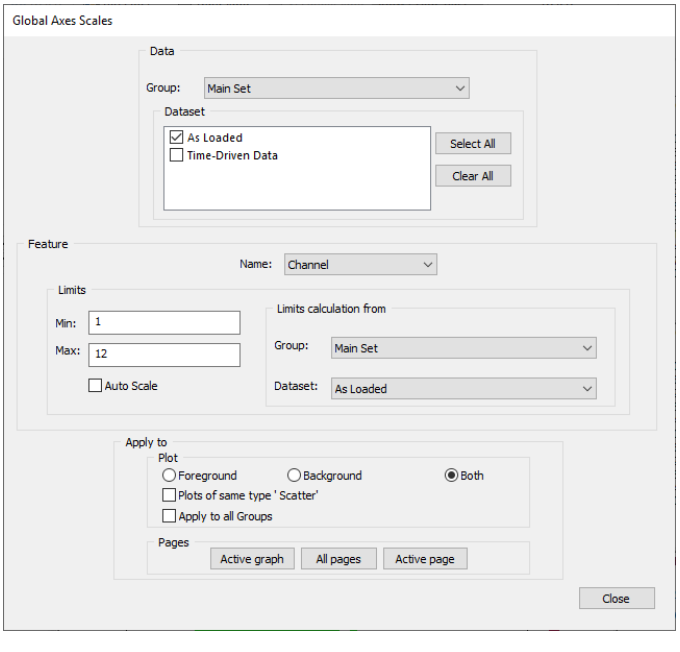
The functions of the modules:

- Advanced Waveform and Features Module
- Supervised and Unsupervised Pattern Recognition Module
- Unsupervised Pattern Recognition (UPR) and the Supervised Pattern Recognition (SPR)

13. Global Axes Scale – Revised functionality

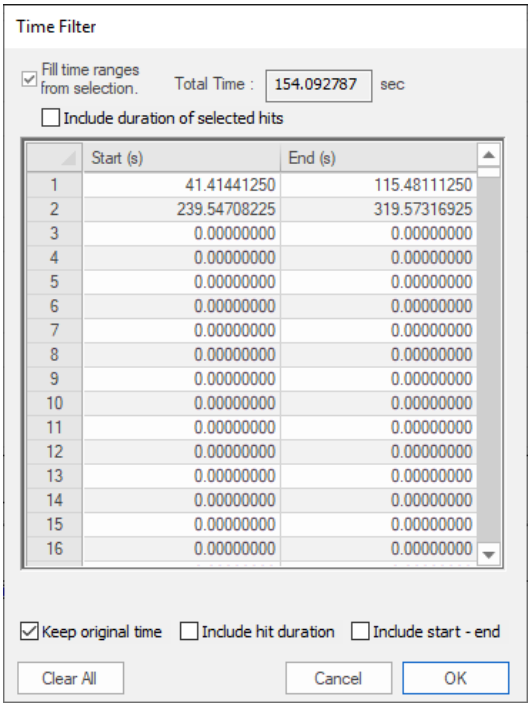
Revised functionality of Global Axes Scale that offer more options.

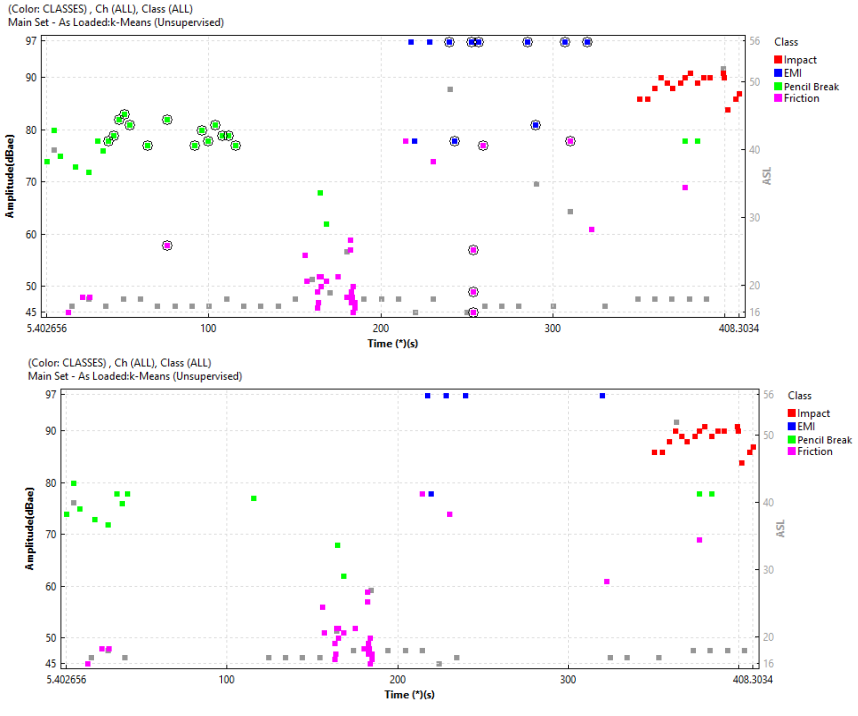
- Selection of feature from any DataGroup and Dataset.
- Application of global limits:
  - to Foreground or Background or both plots
  - to active graph or active page or all pages
  - to current or all DataGroups.



14. Time Filter – Update

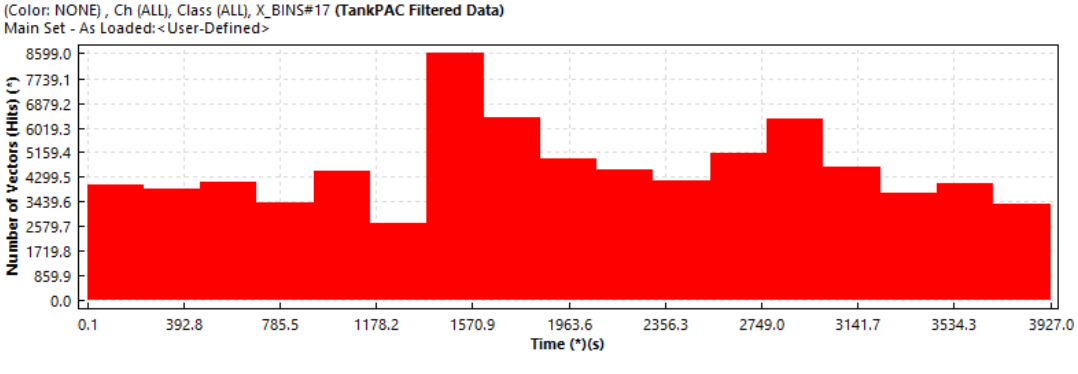
The function Time Filter updated by adding validations and revising the deletion of parametric dataset.

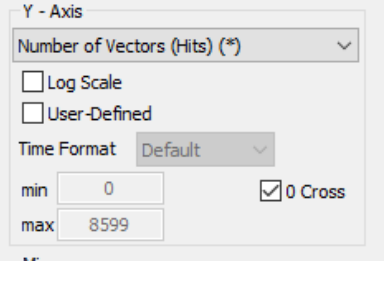




15. Plots

- New option: Force Bar Plots y Axis to start at Zero





- Parallel coordinates graph update with speed up

16. Location

- Added ability to apply velocity to all location groups

17. Delete Channel

- Added ability to delete channel from data and properly update Structure and Location

18. Clustering

- When Clustering Results table is in auto mode, we eliminate the presence scrollbars

- Revised the Intensity setting in cluster tab of plot properties, to produce the same results as AEWin.

19. Live DTA mode

In Live DTA mode, the views are now updated when needed only and we have better performance

20. Data Export

- In data export, we fix the number of digits (accuracy in milliseconds by design and one more digit for rounding purposes).

21. Structures

- Enable AE Coverage for all cases without restriction of the active part
- Draw AE coverage respects structure visibility

22. Issues Fixed

- Scaled fft value in specific frequency when data cursor in active shows old value
- WFS Batch export - Error message in certain cases
- Spherical clustering grid shows incorrect columns when loading document
- Zero width and zero height clusters are not drawn
- Delete time segment does not work for multiple time periods
- Filtered Percentage is incorrect for TDD parametric feature
- Fix drawing issues when printing 3d plot
- Printing issue in 3d waveforms
- Range selection in segment waveforms changes y range in the time domain section
- In Segment waveform, time domain section waveform disappears when using left or right arrow
- Up and down arrows not always work in segment waveform
- Using up and down arrows when selection is on in waveform does not scroll y axis
- Error in time while exporting to text
- Crash while zooming-in too much inside continuous wavelet
- Select channel dialog shows inconsistent information in the case of Channel data deletion and Channel removal
- Select All and Clear Selection not working in TDD Data table
- Color mode value incorrectly set to zero when copying data to clipboard from any graph

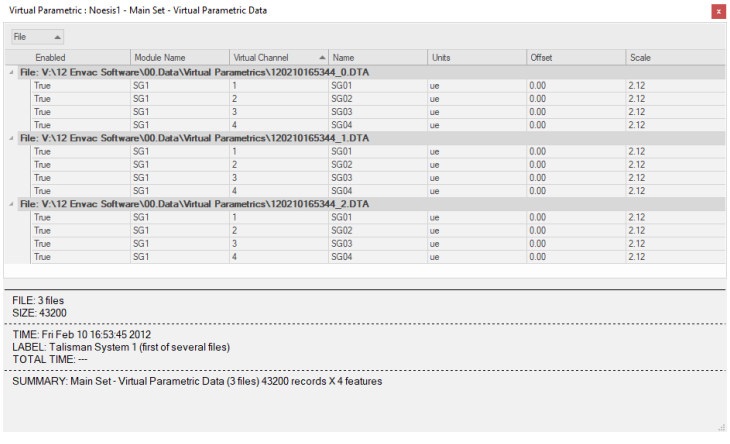
Noesis 11.0 - New Features

23. New Types of Data

Virtual Parametrics

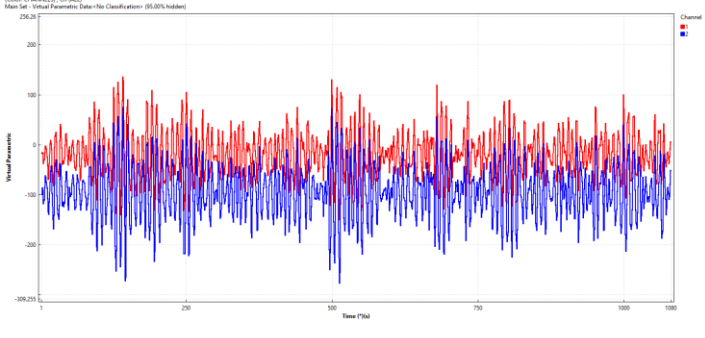
Noesis 11 offer support for Virtual Parametrics. The support is complete as Noesis offer read data from DTA files and present in all views (plots, data tables, etc.). There is an appropriate selector for Virtual Parametrics. The Virtual Parametrics are treated as normal TDD but additional, Noesis offer some dedicated dialogs and views for Virtual Parametrics as you can see below.

Virtual Parametrics Overview Interface



Specific Tables and Plots for Virtual Parametrics

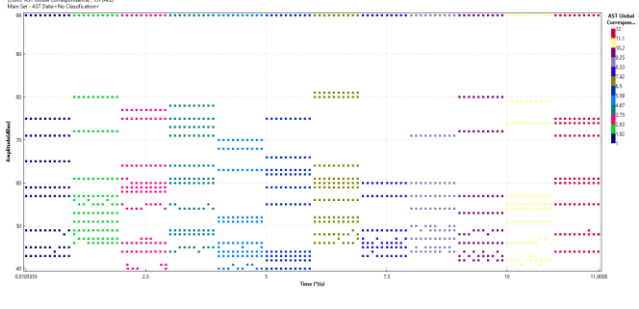
Number	Time	File (*)	Time (*)	Virtual Channel	Virtual Parametric
1	0.99990000	0	0.9999	1	-17.5683
2	0.99990000	0	0.9999	2	-109.275
3	0.99990000	0	0.9999	3	25.6792
4	0.99990000	0	0.9999	4	-51.9812
5	1.99990000	0	1.9999	1	-16.358
6	1.99990000	0	1.9999	2	-98.8315
7	1.99990000	0	1.9999	3	46.457
8	1.99990000	0	1.9999	4	-46.5402
9	2.99990000	0	2.9999	1	-15.6571
10	2.99990000	0	2.9999	2	-86.6235
11	2.99990000	0	2.9999	3	41.6238
12	2.99990000	0	2.9999	4	-55.4
13	3.99990000	0	3.9999	1	-17.422



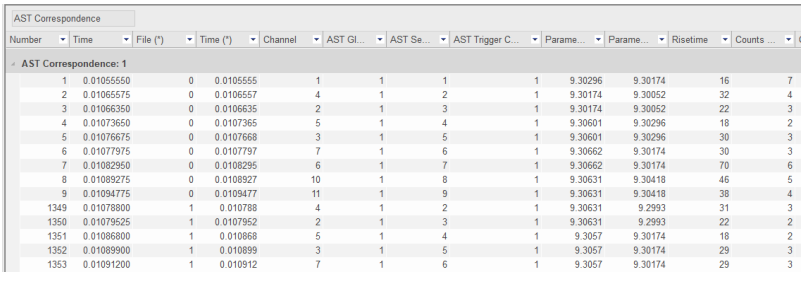
AST files

Noesis 11 offer support for AST hits and waveforms. The support is complete as Noesis read data from DTA files and present in all views (plots, data tables, etc.). There is an appropriate selector for AST Hits and Waveforms. Furthermore, Noesis offer a collection of additional features that allow user to distinguish AST records: AST Trigger Channel, AST Sequence, AST Correspondence and AST Global Correspondence.

AST Hits Plot



AST Data Table



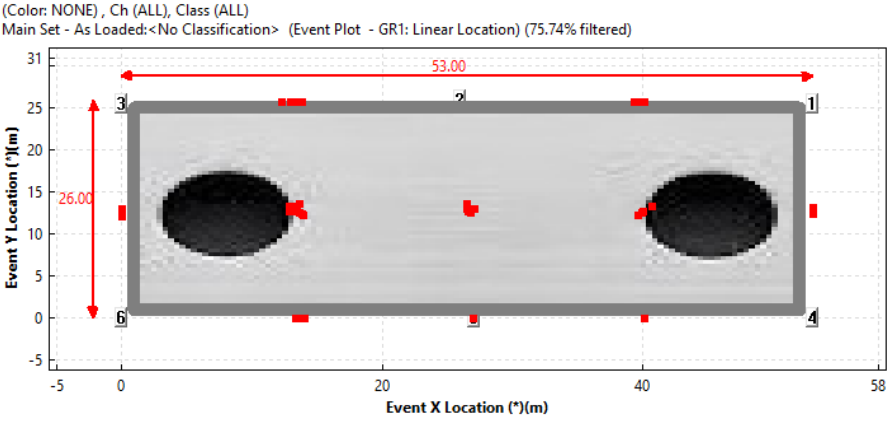
Also, Noesis offer AST Trigger and Stop messages as Timemarks, allow selection to AST dataset and synchronize selection with AST waveform view where applicable. The selection is available in plots, data tables and functions (e.g. Data Filter). Finally, Noesis allow users to perform Location based on AST hits.

24. Plots

Annotations

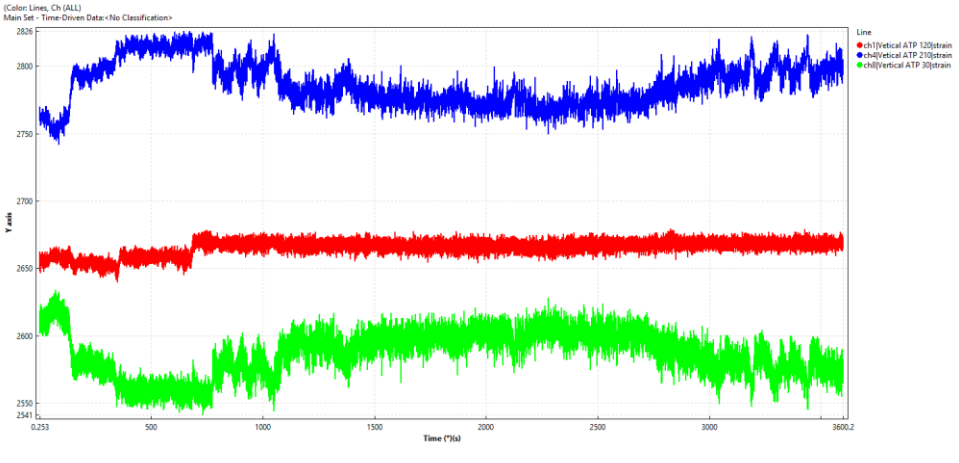
In Noesis 11.0, we enhance the plot annotations with the following features

- Vertical and horizontal line and distance annotations
- Option to add image in Rectangle annotation
- Option to draw annotations front / back of plot.



New Plot Type – Multi Line

In Noesis 11.0, we introduce a new type of plot for TDD data: Multi Line. This plot is very useful for Time Driven Data when you need to plot different features.



Other features

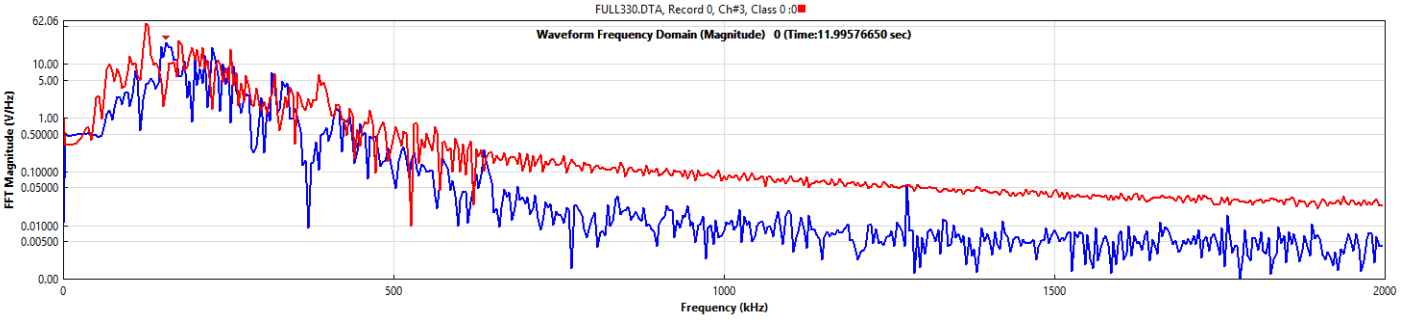
- Global axes scale for cumulative plots
- Optimize speed showing plot properties dialog

25. Waveform Plots

In Noesis 11.0, we have the following enhancements for waveform plots:

- Band Stop filter

- Log Y-axis to FFT
- FTT scale options: Standard and Log option
- Units options in waveform Y axis: V, % and dB.
- Option to add offset value at specific frequency in FFT overlap waveforms



26. Data Tables

In Noesis 11.0, we have the following enhancements for data tables:

- Significant speed optimization especially for very large datasets
- Option to display for Intensity related features

27. Feature Extraction

The following new features are available in Feature Extraction:

- Two New FX features: Peak-to-Peak Time and Peak-to-Peak Amplitude
- Option to copy Original Setup in the Custom Setup. So, it is easier to start from the original setup and modify only the parameters you need.

28. Source Location

The following changes made in Source Location:

- When a location group is added the default units are now from the 1st structure available (if any)
- Source Amplitude and Source Energy location features are not created any more if there are no attenuation data
- Option to perform Location based on AST data

29. Structures

Several improvements and corrections made in the area of structures. For example, option to display label for stair, option to show/hide stairs, color and font option for components, better update of structure view, etc.

30. I/O for DTA and WFS Files

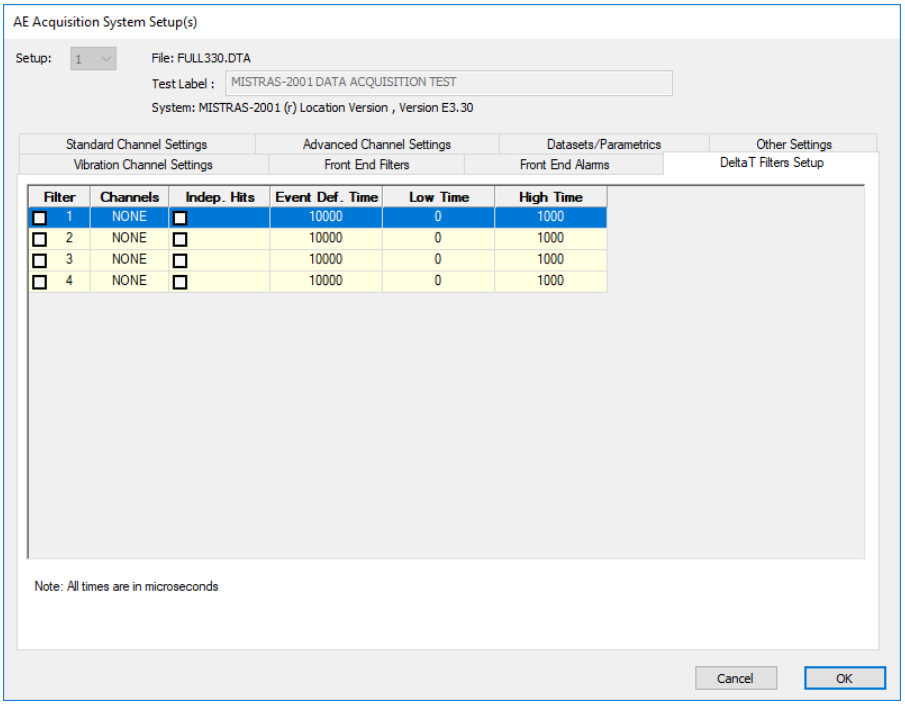
In Noesis 11.0, we have the following enhancements in the files I/O:

- Update of several DTA messages
- New more accurate code for the determination of waveform length in WFS files

31. Various Tools

In Noesis 11.0, we have also the following enhancements for various tools:

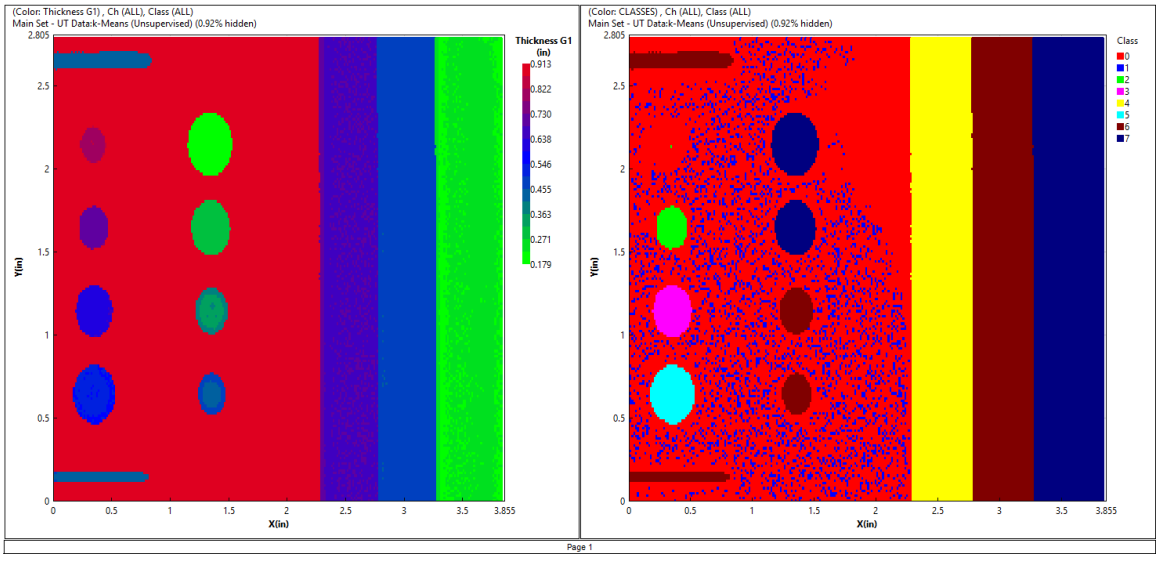
- Parametric Scale – Option to import /export settings
- System Setup – Report of Front End Filter, Front End Alarms and DeltaT Filters in system setup



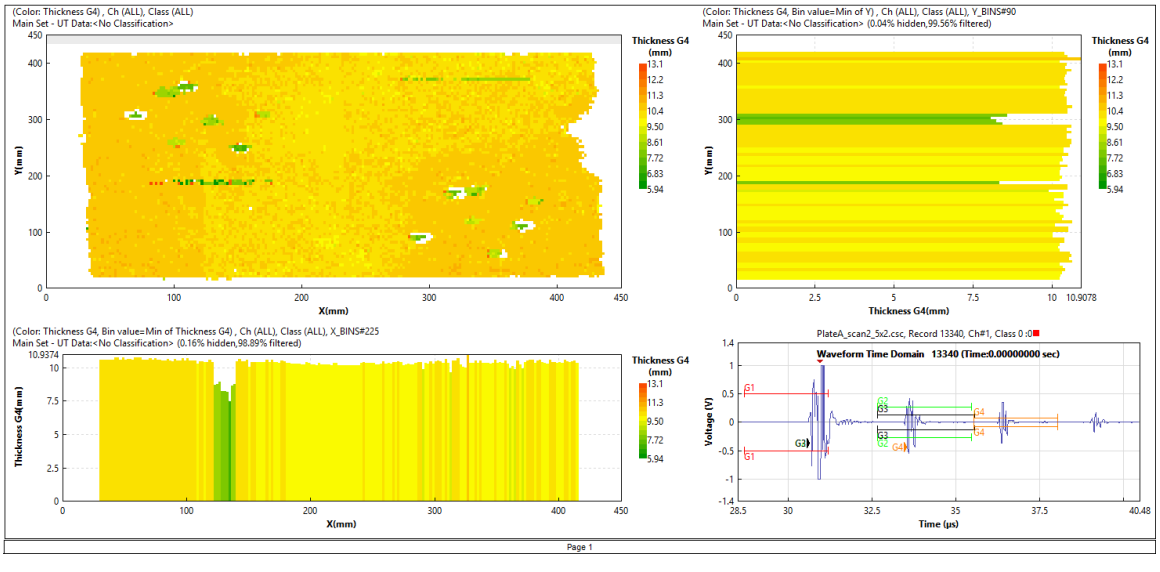
32. UT Data

In Noesis 11.0, we have also the following enhancements in the area of UT data:

- I/O update – Up to UTWwin version 4.01
- Added support for unicode UTWIN Files
- Update of Waveforms with Envelope compression
- Implement loading of text waveform under UT Analysis. Two different formats for easier import from various UT products
- Improvements in Pattern Recognition for UT data



- Implement A/B/C Scan plot



33. General

In Noesis 11.0, we have also the following general enhancements:

- Update of Noesis Examples
- Update of Noesis Setup
- Update of Noesis Manuals
- Update of Ribbon interface
- Improved support for High DPI Display and Multiple Monitors

34. Bug Fixing

In Noesis 11.0, the following bugs were fixed:

- In Wavelets plot, on some size of the window banding appears
- Setting a Scatter view to TDD table and then back to scatter, leave the TDD datable Checked
- Analysis Info command in Backstage trigger the Exit command
- When Save As a document the frame title does not update
- Intensity Analysis features are not shown properly in the data table
- Cannot change values with keyboard in color setup (custom mode) after windows 10 creator's update

- Color popup of color picker control does not show in the correct position in multiple display (show only on the main display)
- Export data as DTA saves more waveform samples than original waveform
- There are some missing messages when exporting data as DTA
- TDD Waveform title shows record number but not filename and feature name
- Incorrect time duration for TDD waveforms
- Data set groups with empty as loaded but with non-empty time-driven data are not shown in analysis info

- Standard Feature FX does not allow selection of frequency domain features
- Incomplete support for old lsf (location configuration files)
- Move Up and Down buttons in advanced load dialog do not work
- Structure Preferences are not applied on creation of a new Structure
- Some graphical resources are not drawn correctly in high dpi
- Drawing problems in STFFT, CWD and Continuous Wavelet
- In live-spr when working dataset is empty an error message is shown that method cannot be applied

- Automatic restart of Noesis after a crash (application must be running for at least 60 seconds) shows one more page
- FFT Magnitude button in event hit linking dialog show FFT Real
- Location results must be not shown if there are no active groups
- Data cursor in waveforms does not show transformed y values
- Add, removing and moving a component in structure view does not update other graph view showing the structure
- Color picker not scaled accordingly to screen dpi
- Loading external parametrics does not take into account durations of constant loading (e.g. pressure)

- Same Name External Parametrics are allowed
- When creating only structure (and not loading data) there are enabled commands that should not be

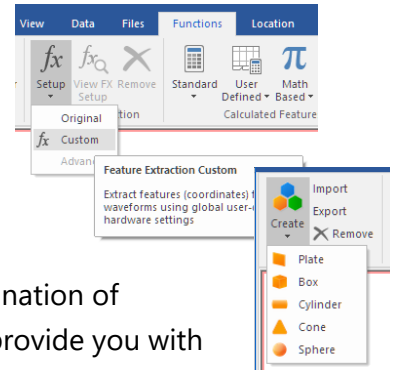
- Attenuation dialog does not show data until a new feature is added
- Adding empty Attenuation feature, changing tab and exec location leads to crash
- Attenuation allows Absolute Energy feature, but it is not added if it exists

- In attenuation grid selecting from menu copy selected, the selection is extended to the top of the grid
- During mouse move when tracking is on, coordinates are not updated in status bar

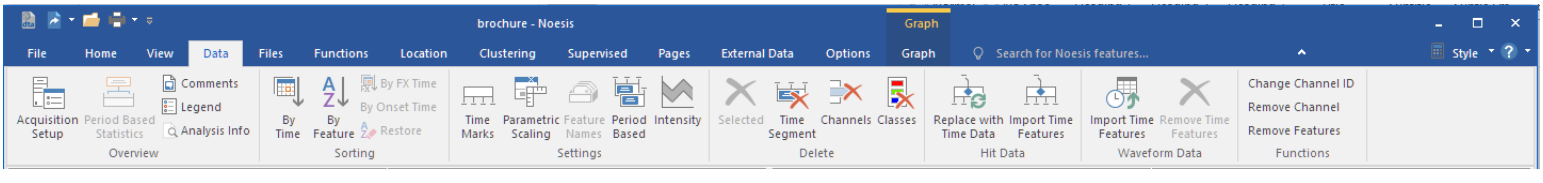
Noesis 9.0 - New Features

35. User Interface

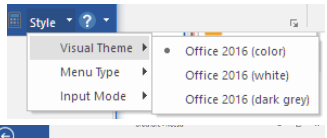
Ribbon Interface



In Noesis 9.0, the old-style Menu and Toolbars replaced by a Modern UI (Ribbon). Ribbon control replaces traditional toolbars and menus with tabbed groups (Categories). Each tab is logically split into Panels and each panel contains various controls and command buttons. In addition, Ribbon control provides smart layout maximally utilizing the available space. For example, if a Panel has been stretched and has no place to display all available controls, it becomes a menu button which can display sub-items on a popup menu. Ribbon also presents visual tooltip for better explanation of functions. Also, the Ribbon offer options like hide/show/auto-hide the ribbon that will provide you with the best experience in work space.

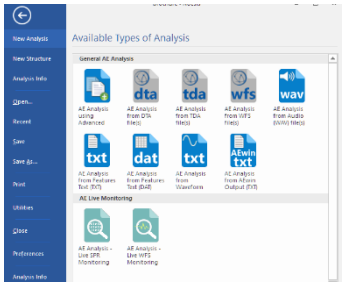


MS Office 2016 Color Schemes



Noesis 9.0 provides several Microsoft Office 2016 look and feel with color scheme selection option.

Support alterative input methods



Noesis 9.0 supports classic menu and backstage panels. Also, it offers support for mouse and touch screen input.

Quick Find of actions by pressing Alt+Q

The "Tell what you want to do" saves you time is by allowing you to use intuitive language to find the commands you need. When you start typing in the "Tell Me box", you don't have to stop and try to remember what something is called officially in the app. If you type "group" Tell Me has your back and will display the relative commands.

Quick Access Calculator

With copy and paste functionality

Resizable Dialogs

Several dialogs are now resizable, so automatically adjusts controls position and/or size as dialog is sized.

Updated all Standard Windows Dialogs to latest editions.

For example, the standard system dialogs File select, Folder select, etc.

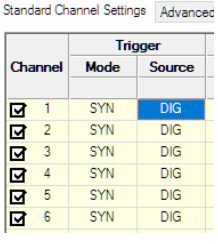
Support of High DPI monitors

Windows 8.1 and 10 automatically chooses the correct display scaling settings for each display based on its pixel density and resolution (for example HD and 4K). You can also have independent scaling settings for each display — so if you plug in an external monitor, Windows will automatically choose the correct scaling level. Noesis supports any scaling.

36. File Support and I/O

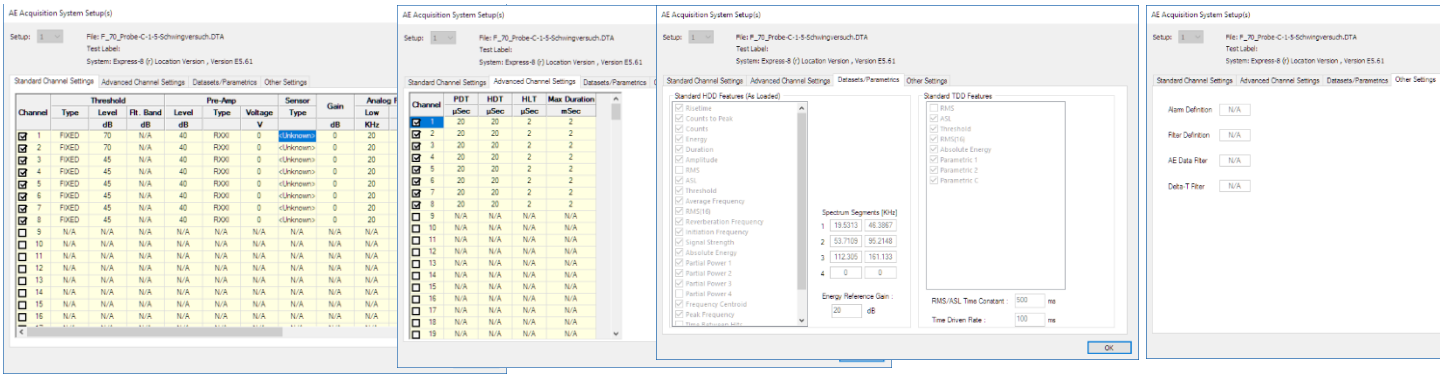
Update of I/O

Noesis 9.0 has updated I/O to support the latest PAC products with the details like A/D AND the synchronization mode and source.



Update of the Acquisition System Setup

The Acquisition Setup dialog have been updated to report all the details of original hardware parameters.

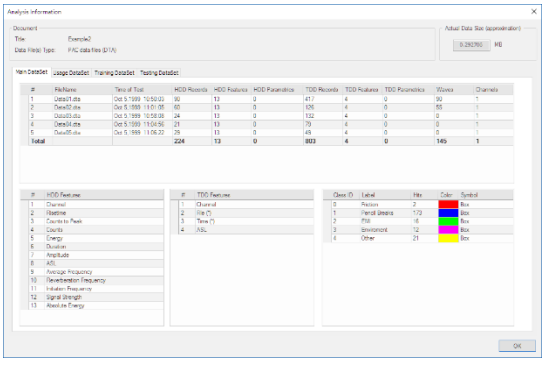


Import AEwin Text files.

Noesis now load AE text file created from AEWin.

New Analysis Information Dialog

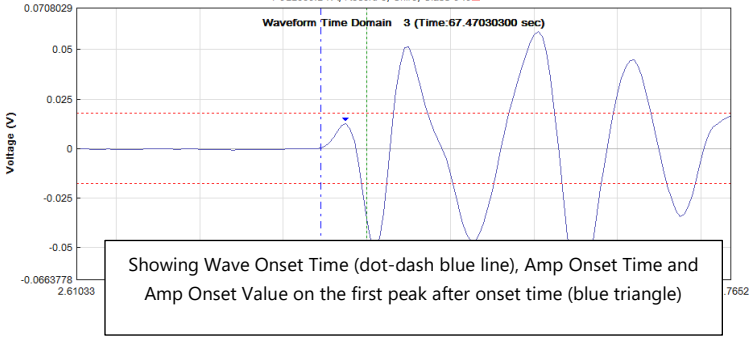
An information dialog is available. The dialog reports all the details of the analysis: Files, Time of Test, HDD records and parametrics, TDD records and parametrics, number of Waves, number of Channels, HDD and TDD features and classification information. The report is available for all datasets.



37. Waveforms

Wave Onset Time

Waveform onset time is computed using the Akaike Information Criterion (AIC). A time window of the time domain signal is selected that contains the onset time. Then using an autoregressive process this window is divided at some point and a method denoted as AIC-



Showing Wave Onset Time (dot-dash blue line), Amp Onset Time and Amp Onset Value on the first peak after onset time (blue triangle)

picker is applied. The point where AIC is minimized is chosen as the onset time.

Amp Onset Time

Amp Onset Time is the time of the first peak (positive or negative) after the Wave Onset Time.

Amp Onset Value

Amp Onset Value is the amplitude of the first peak (positive or negative) after the Wave Onset Time.

New Windowing option: Flattop

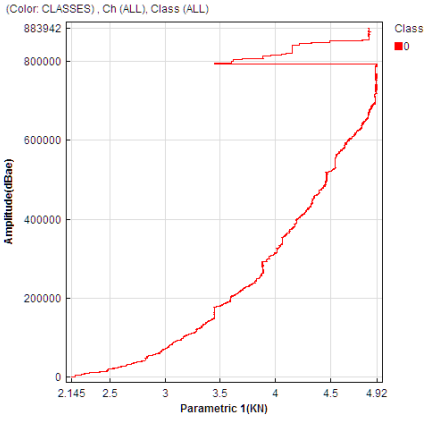
New DSP function: Remove DC offset

Added tracker in waveforms to change P Onset Time after feature extraction

Added option to show values not in percentage in plots of DWT and CWT

38. Plots

New plot: Felicity



In Noesis 9.0, we introduce the Felicity plot for investigation of the Felicity Effect. This effect is defined as the appearance of significant acoustic emission at a load level below the previous maximum applied level.

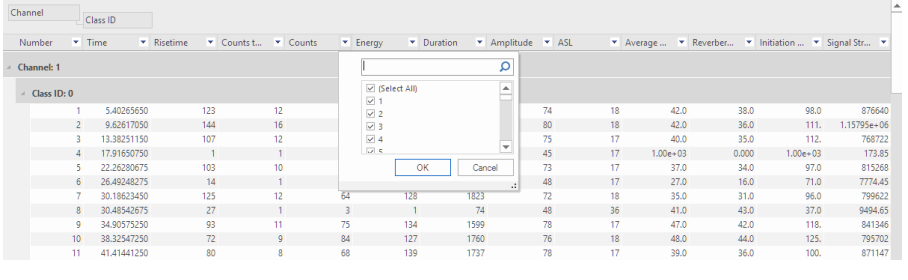
Added more options in Plot properties

For example:

- In Waveforms - show/hide Pretrigger, Threshold, FX Time and OnSet time.
- In 3D plot – show/hide axes, grid and walls
- Added selection for title type in waveform properties (none, single, double)

Speed optimization for Feature and Waveform plots

39. Data Table

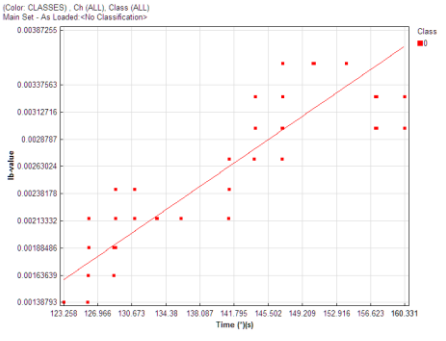


New data table that support both TDD and HDD data. The new tables support collapsible regions. Using this option, the user can collapse or restore info that are showed in the grid (for example per Channel or Class). The benefit of this option is that the grid displays only the info the user needs. The table also allows filtering in any column, column grouping and multiple sorting.

40. Functions

Improved b-value

We introduce the calculation of Improved b-value (Ib-Value) of acoustic emissions (AE). Improved b-value is a new approach of computing b-value. B-value is defined as the "log-linear slope of the frequency-magnitude distribution of AE". Improvisations have been attempted to fine-tune the amplitude distribution graph and use the mean amplitude and standard deviation of the amplitude distribution for computing the Improved b-value and use it for the evaluation of slope failure and fracture process



41. Feature Extraction

This function allows the user to extract features for records with waveforms in the data file(s). The user can either use the original settings, as these apply to each file and channel, or use a custom, global, setup for all files and channels having control over certain extraction parameters. New features have been added (see in the table below highlighted as blue). In total, the user could extract up to 51 features. Also, the number of Partial Powers increased from 4 to 8. A new page is available to define STFFT, DWT and CWT parameters in feature extraction custom setup. Added the capability for FX setup to remember last settings

Feature Name	***Description***	***Feature Name***	***Description***
Amplitude (dBae)	Signal Max Amplitude in dBae	**Frequency Centroid**	Measures the average frequency weighted by amplitude
Amplitude (mV)	Signal Max Amplitude in mV	**Partial Powers**	There are up to 8 Partial Powers. Any number of which can be used. They represent the percentage of energy contained in a certain frequency range.
Duration (µsec)	Signal Duration	**Peak Frequency**	Maximum frequency determined from FFT Power Spectrum
Rise Time (µsec)	Time from signal start to max amplitude	**Peak Power**	Maximum power determined from FFT Power Spectrum
Counts to Peak (#)	Cycles from start to max ampl.	**Threshold**	Fixed or dynamic threshold determined from peak amplitude.
Counts (#)	Cycles from start to end	**RA Value**	The ratio between Rise Time and Amplitude
Rise Angle (rad)	Angle from start to max ampl.	**STFFT Max**	Max. magnitude of Short Time FFT
Decay Angle (rad)	Angle from end to max ampl.	**STFFT Max Time (µsec)**	Time of max. magnitude of Short Time FFT
Energy (EC#)	Energy Counts	**STFFT Max Frequency (kHz)**	Frequency of max. magnitude of Short Time FFT
Signal Strength (pVsec)	Area under signal envelope	**DWT Max**	Max. magnitude of Discrete Wavelet
Absolute Energy (aJ)	Signal Energy	**DWT Max Time (µsec)**	Time of max. magnitude of Discrete Wavelet
Average Frequency (kHz)	Average Frequency	**DWT Max Wavelet Scale**	Scale (base 2) of max. magnitude of Discrete Wavelet
Initiation Frequency (kHz)	Average frequency from start to max ampl.	**CWT Max**	Max. magnitude of Continuous Wavelet
Reverberation Frequency (kHz)	Average frequency from max ampl. to end	**CWT Max Time (µsec)**	Time of max. magnitude of Continuous Wavelet.
Non-Dimensional Amplitude (-)	Ratio of Max to Mean signal amplitude	**Second Peak Frequency (kHz)**	The frequency of the second peak value of the FFT Magnitude
Zero Crossings (#)	Zero crossings from start to end	**Third Peak Frequency (kHz)**	The frequency of the third peak value of the FFT Magnitude
Zero Crossings Frequency (kHz)	Av. Freq. Based on Zero Crossings	**Wave Onset Time (µsec)**	The onset time of the waveform
FFT Amplitude (V/Hz or Vrms)	Max. amplitude of the Amplitude Spectrum magnitude	**Amp Onset Time (µsec)**	The time of the first peak value after the onset time
FFT Width at 10% max ampl. (kHz)	Band width over 10% max amplitude	**Amp Onset Value (V)**	The amplitude of the first peak value after the onset time
FFT Width at 30% max ampl. (kHz)	Band width over 30% max amplitude		
FFT Crossings at 30% max ampl. (kHz)	FFT magnitude 30% max ampl. crossings		

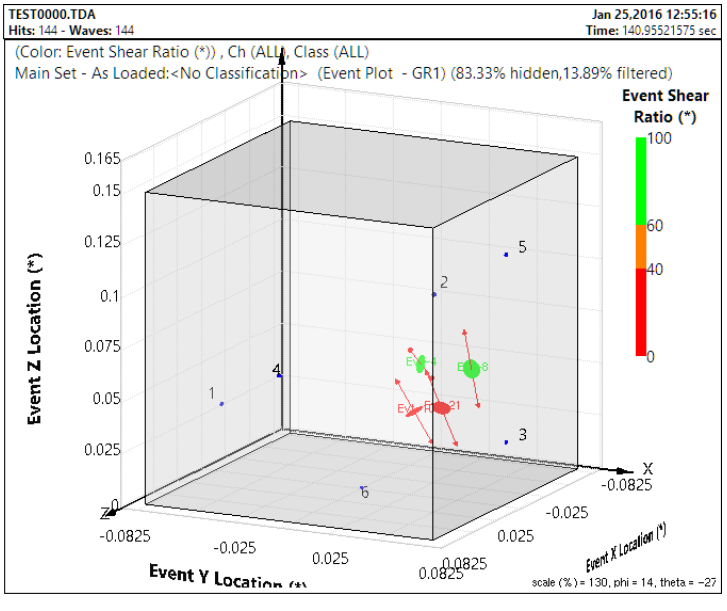
42. Moment Tensor

Selection of Analysis Method

In this version, there are two available methods: PT Files and TDA Files. The first method (PT Files) allows the loading of a set of PT files. The PT file set will contain all the 'waveforms events' created from AEWin or Noesis. The first file is configuration text files that contain all waveform events have an event sequence number followed by the modified TOA (Time Of Arrival) of the first hit. All other files are binary format files that contain onset offsets and amplitudes of channels. The second method (TDA Files) allows the loading and post-processing of TDA files. A TDA file contains waveforms recorded from the active channels of the acquisition system used, either in SYNC (synchronized) or IND (independent) trigger mode.

Automation in Moment Tensor Analysis

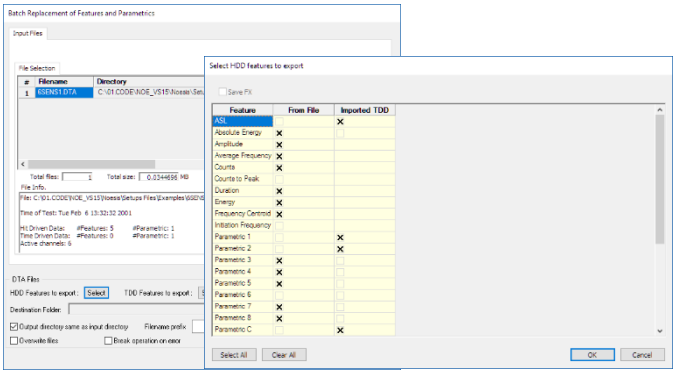
After loading files, the onset times and amplitudes of the signals contributing to the waveform events will be available automatically. The MT dialog consists of two sections which are synchronized together in order to show the active waveform event. The left section controls which subset of the waveform events will be used as the set of user events. The right section of the dialog shows the waveforms that are part of the active waveform event.



43. Tools

Batch Data Replacement

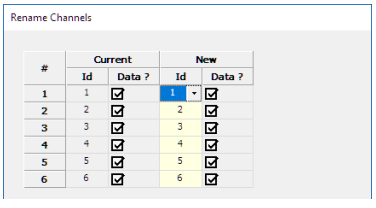
A new utility is available, offering to replace HDD Features and Parametrics with calculated equivalent TDD (or vice versa) and export as DTA file in a batch mode.



Auto Save and Restart Manager

If system fails, then the Noesis attempts to restore the Analysis that was being run prior to the failure.

New dialog for easy channel/sensor rename



Add "Match Files" option in Import TDD Features function

Clustering and Intensity plots – Option for auto table size and custom fonts

Added units next to feature name when exporting to txt

Added 'use default' font option to data table

Added font selection and 'use default font' option in feature hierarchy view

Added font selection and 'use default font' option in parallel coordinates view

Added "Use System Font" and "Apply to all views" button option in preferences dialog

Update Examples

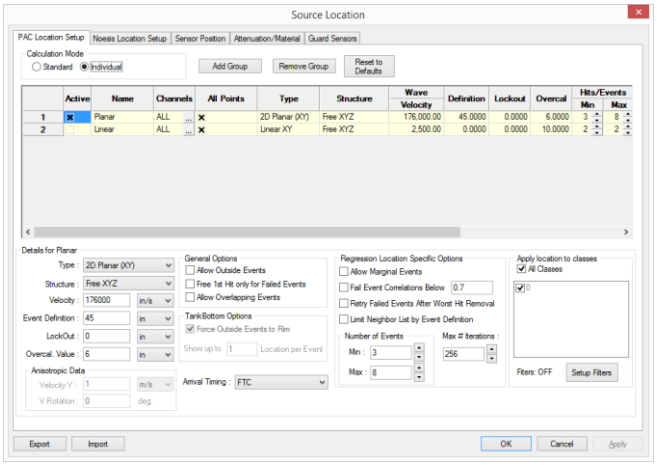
Noesis 8.1 - New Features

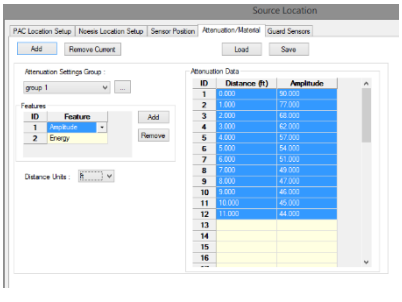
44. File Support and I/O

- Update of I/O to support the latest PAC products like Express-8. Includes support for higher waveform streaming throughput (up to 50MSPS per Express-8 card).
- Update of the Acquisition System Setup report to include newer information like sensor, voltage, filter, etc.
- Support for import and export of Waveform in Audio File Format (WAV)

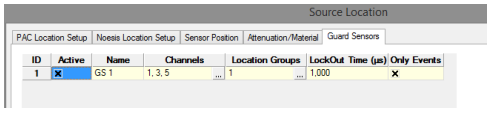
45. Location

- In the existing location options (Zonal, Linear, Wrapped Linear, Linear XY, Conical, Cylindrical, 2D Planar (XY, YZ, XZ), 3D and Spherical Location), new modes were added: 2D Anisotropic and Anisotropic Cylindrical. Also for all location modes, new options are supported (general and regression specific)



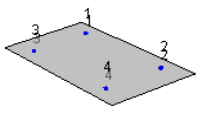


- New Tab: Attenuation/Material, where the user may define the groups of Attenuation curves for all the supported Features (Amplitude, Energy, Absolute Energy)
- New Tab: Guard Sensors, where the user can define groups of guard sensors and apply them to specific location groups.

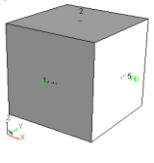


46. Structures for Location

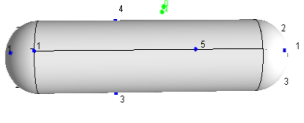
- Creates a structure such as a Plate, Box, Cylinder, Cone etc. to be used in AE Source location operations and visualization. Plate:



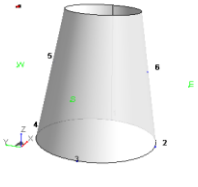
Box:



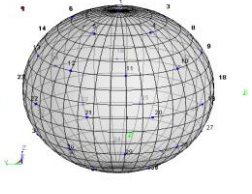
Cylinder:



Cone:

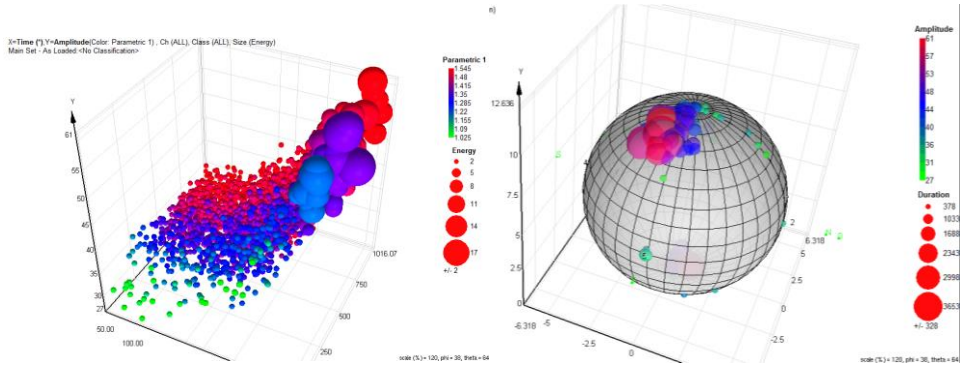


Sphere:



47. New Plot Types

2D and 3D Bubble plots



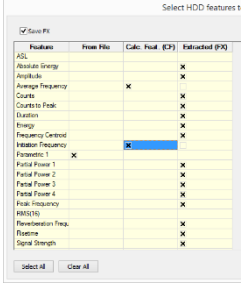
48. Waveform

- New representation – Hilbert transformation
- Signal denoising using Wavelet threshold
- Faster frequency domain representation using lower FFT samples and averaging (user selection)

49. Import TDD Features as Waveforms

- This function allows the user to import specific TDD features as waveforms and perform signal analysis to them (Fourier analysis, RMS, Discrete Wavelet Transformation, Short Time FFT, apply filters and other functionality available to standard waveforms). The user can apply normalization, set maximum voltage input and remove DC offset during import.

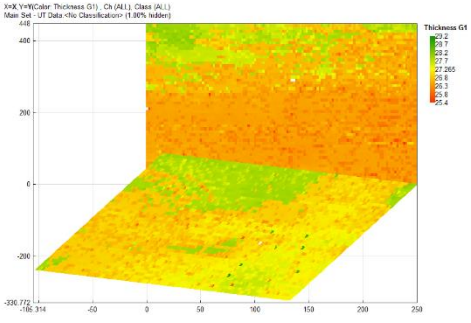
50. Tools



- Export data as DTA: Mixing of original data, extracted and calculated
- Time filter: new more flexible options
- Patch Time: more options available allow data synchronization from different systems.
- Data Filters Using Linear Equations – Define any combination of linear equations to get complex data selection / filtering.
- Add Feature (Math Based) - Calculate quantities for the available HDD or TDD features. Options available are:
- Difference between a record and its previous, 1st derivative of a feature, as a function of Time, using Finite Difference Scheme, the integral of a feature as a local continuous function of Time and Cumulative Sum of the selected Feature.

51. UT Data

- Advanced Import: Create a composite analysis with Ultrasonic B-Scan and C-Scan files in any stitching.



Noesis 7.0 - New Features

All Noesis products are available now in 32-bit and 64-bit versions.

52. New Commands

- Batch WFS Export – Exporting of WFS files in WFS and text format as a whole or partially.
- Report – Transfers active graph or page to a new or existing Word document.
- Event Hit Linking – Shows how selected hits and events are related.

53. Plot Commands

- Copy Interpolated Data – Copies interpolation data to clipboard
- Copy Trend Line Coefficients – Copies trend line coefficients to clipboard.
- Show Selection Statistics – Shows a dialog with statistics like min, max, avg, sum of selected data.

54. Annotations

:

- Add Rectangular annotation.
- Add Ellipsoidal annotation.
- Add Distance Type annotation.
- Add Straight Line annotation.
- Remove annotation.
- Show active plot's annotations.

55. Plots

- Added Fast Plot Drawing mode – Plot area is divided in such a way that each pixel corresponds to a bin. Following specific overlapping strategies certain values are inserted to each bin. This mode is good for large data.
- Gray out non selected data (in density plots) – If this option is set, non-selected data in density plots are shown grayed.
- Overlap strategy – Enabled only in Fast Plot Drawing mode, it allows to specify which values will occupy a certain bin: Last, Min, Max, First.
- Add Interpolation – It allows the addition of linear or cubic spline interpolation, and / or the addition of trend lines: Polynomial, Exponential, Logarithmic, Power Law, Moving Average. User can specify start – end range, show or not the coefficients of a trend line, change polynomial order or number of points for Moving Average, change the color, width and style of the drawing line.
- Option to auto calculate max number of bins
- Copy – Paste graph settings including any background plot

56. Page Commands

- Add Sequential – Creates a template page (marked with a leading asterisk in its name) and adds pages according to specified channels. Graphs shown in each generated page are filtered based on a specific channel.
- Go to Page – Shows a list from which user can select and show a specific page.

- Copy Page Image – Copies page in clipboard as a bitmap image consisting of a header containing file header, the page itself and a footer containing page title.
- Copy Page as WMF – Copies page in clipboard as an EMF (enhanced metafile) consisting of a header containing file header, the page itself and a footer containing page title.

Noesis 6.1 - New Features

57. Integration of PAC's Location Algorithms.

Noesis offers now most of the PAC Location and Clustering options. Noesis support now Zonal, Linear, Wrapped Linear, Linear XY, Conical, Cylindrical, 2D Planar (XY, YZ, XZ), 3D Location, Spherical location options.

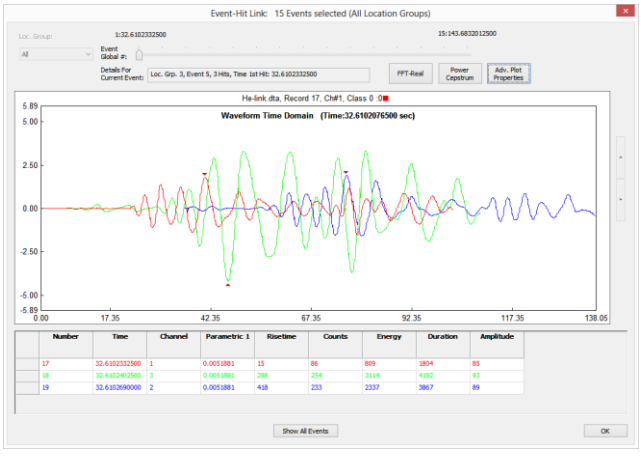
The sensor information could be transferred immediately for AEwin information (Copy – Paste) or by simple data input.

Furthermore, the location could be applied per class or in a portion of the class (sub clustering).

The results could be presented per location group.

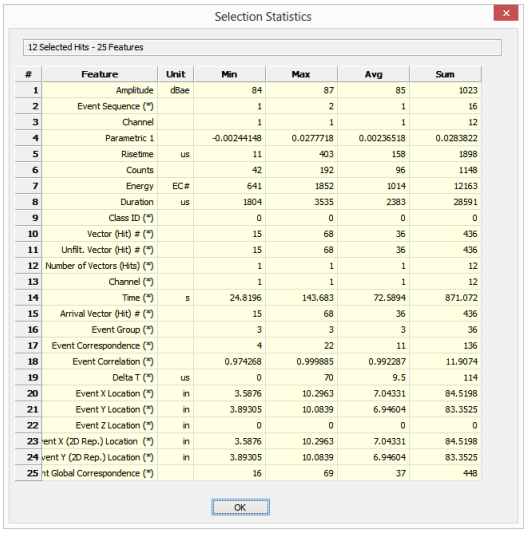
58. Event – Hit Linking

Noesis offers now Event Hit Linking in selected data. Combine this feature with flexible and complex data selection of Noesis can be a very powerful tool. Note the option for view waveforms in any desired transformation.



59. Graphics

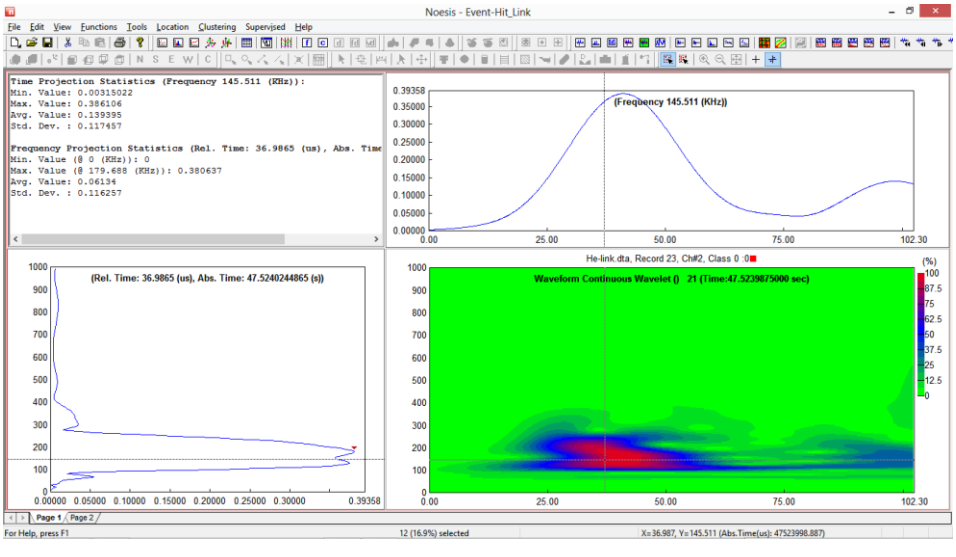
- New binning method – Count.
- Option to auto calculate the max number of bins
- Event Plot – Filter per Location Group and Hit Sequence.
- Copy – Paste Graph Settings including any Background Plot
- Show Selection Statistics



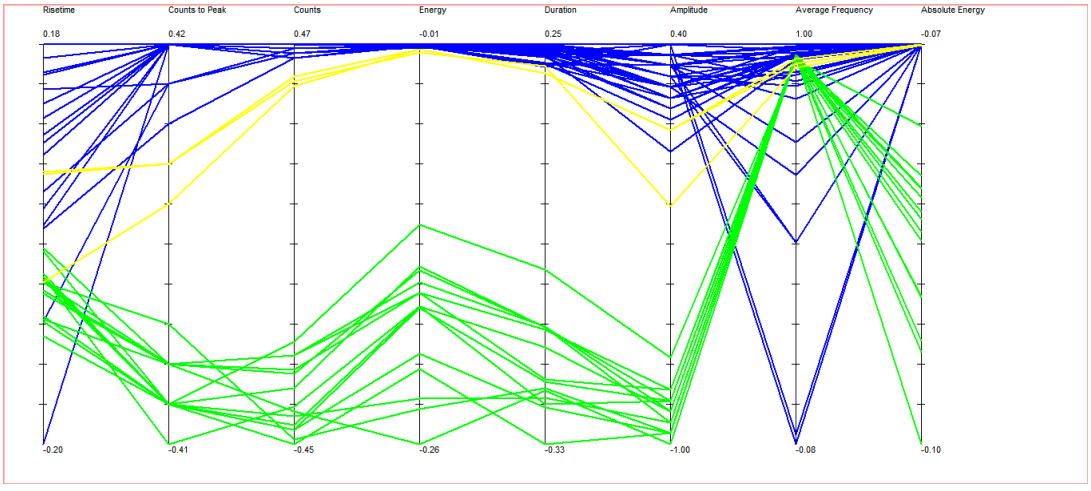
#	Feature	Unit	Min	Max	Avg	Sum
1	Amplitude	dBae	84	87	85	1023
2	Event Sequence (*)		1	2	1	16
3	Channel		1	1	1	12
4	Parametric 1		-0.00244148	0.0277718	0.00236518	0.0283822
5	Risetime	us	11	403	158	1898
6	Counts		42	192	96	1148
7	Energy	EC#	641	1852	1014	12163
8	Duration	us	1804	3535	2383	28591
9	Class ID (*)		0	0	0	0
10	Vector (Ht) # (*)		15	68	36	436
11	Unfilt. Vector (Ht) # (*)		15	68	36	436
12	Number of Vectors (Hits) (*)		1	1	1	12
13	Channel (*)		1	1	1	12
14	Time (*)	s	24.8196	143.683	72.5894	871.072
15	Arrival Vector (Ht) # (*)		15	68	36	436
16	Event Group (*)		3	3	3	36
17	Event Correspondence (*)		4	22	11	136
18	Event Correlation (*)		0.974268	0.999885	0.992287	11.9074
19	Delta T (*)	us	0	70	9.5	114
20	Event X Location (*)	in	3.5876	10.2963	7.04331	84.5198
21	Event Y Location (*)	in	3.89305	10.0839	6.94604	83.3525
22	Event Z Location (*)	in	0	0	0	0
23	ent X (2D Rep.) Location (*)	in	3.5876	10.2963	7.04331	84.5198
24	vent Y (2D Rep.) Location (*)	in	3.89305	10.0839	6.94604	83.3525
25	ht Global Correspondence (*)		16	69	37	448

60. Waveforms Plots

New Continuous Wavelet Plot including Time and Frequency projection plots and Statistics

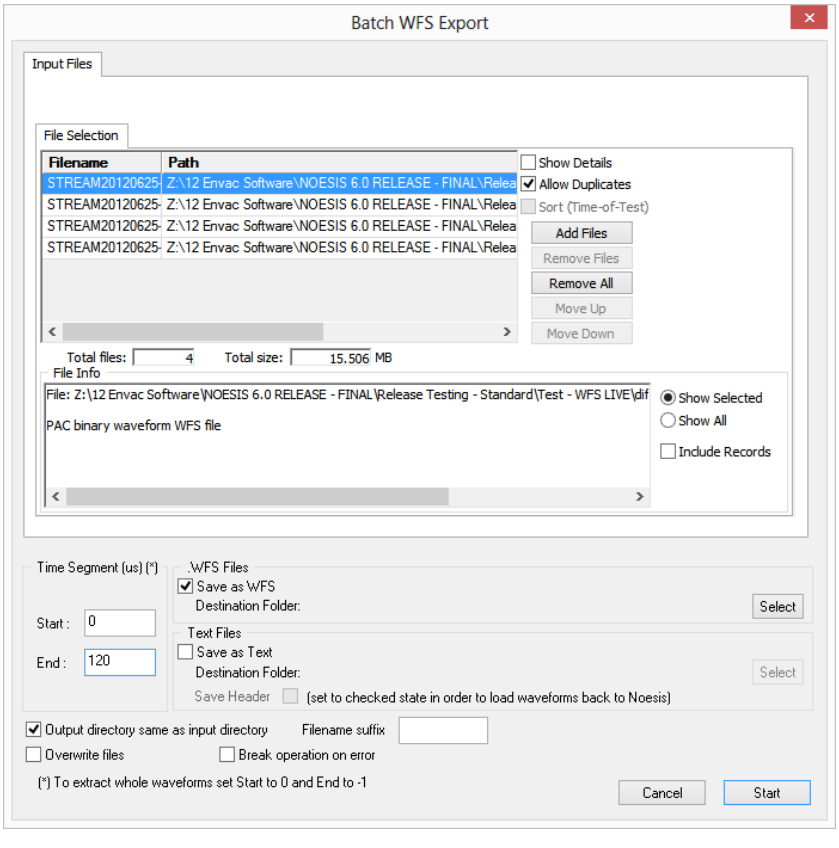


61. New Type of Plot – Parallel Coordinates (must in PR)



62. WFS

63. Export Part of the Waveform either as Text or as WFS using a Batch process.



64. Internal memory rearrangement for faster operation with smaller footprint.

Noesis now uses smarter memory assignment and faster algorithms, so the total behavior is much better.

65. New operation mode using Address Windowing Extensions

The use of available physical memory option allows the use of all available physical memory exceeding 32-bit application constraints under 32-bit/64-bit modern Microsoft operating systems (supported in Microsoft XP and later versions using Address Windowing Extensions (AWE)). Noesis is using Address Windowing Extensions (AWE) that allows an application to quickly manipulate physical memory greater than 4GB. Noesis can load data sets of up to 100 million records with 32767 features.

66. Faster and unlimited WFS Live Operation

Noesis is using now a combination of the File system and SQLite database, so it is capable to process live and fast a very large number of WFS file with a very small memory requirement.

Noesis 5.8 - New Features

67. Functions

- Arrange files in Time (Patch Time): Added a new mode "Preserve Starting Times", that arrange files in time based of the actual Time of Test.
- Advanced Data Loading and Batch Filtering: Added the option to load or not the HDD data
- Advanced Data Loading: Added the option to Sort by Time-of-Test for correct loading of files without worry about the file selection order.
- Advanced Data Loading: Added the option to load TDD only files directly in primary sets (As Loaded, Working Set).
- Advanced Data Loading: Removed the file loading limit of 200 files.
- Export Text Data: Added option to export Time in date format
- Export Waveform as Text: Added waveform segment selection either in time or in number of points.
- Import Text Data: Added support to import Text files with time in date format
- Import External parametric: Added date format support.
- Import External parametric: Added the ability to change parametric names during import.

68. Graphics

- Plot properties: Added separate channel filter lists for HDD and TDD data.
- Plot properties: Added the option to show time in date format, in minutes, hours, days in all 2D and 3D graphs.
- Waveforms Plots: Added Time relative overlapping feature in waveforms.

69. Other (General)

- Export and copy parametric values now do not repeated for every channel (e.g. Parametric vs. Time, Parametric vs. Parametric).
- Added option to horizontal scrolling in scaled waveforms using mouse wheel.
- Optimized speed for Remove Channel command.
- Changed the order of Time column when exporting TDD data (Time column is now exported first).
- Added available parametric names in acquisition setup dialog.
- Added channels with no hits in channel statistics report.
- Fixed a problem in RA (CF) calculation.
- Fixed a problem concerning TDD down sampling: No records were created, if duration of file was less than requested difference of time between sequential TDD records.

Noesis 5.7 - New Features

70. Noesis Live

- Added TDD support in Live
- Added periodic statistics export functionality in Live DTA. When this option is used, statistics in specific time intervals are saved in text files. This includes statistics list of all TDD and HDD features (min, max, average, standard deviation)
- Revised Periodic Statistics plots
- Removed unnecessary messages during Live-SPR execution

71. Graphics

- New option to define background color in all Noesis plots (Feature and Waveform plots). The implementation uses a high contract mode for better visibility in difficult environment.
- Font Selection and Axis format in waveform plot.
- Change the default plot to waveform plot when loading waveform file (WFS, TDA or Text Waveform).
- Change the default plot to Scatter Plot Amplitude vs. Time.
- The background plot properties now are accessible from the plot context menu.
- The time feature is now available in both seconds and date format in all plots.

72. Feature Extraction and Calculated Features

- 'RA Value' in Feature Extraction and Calculated Features (Rise Time over Amplitude)
- Added adaptive threshold in feature extraction (Threshold based on Peak Amplitude)
- Added Threshold (FX) feature in feature extraction
- Correction and improvements in feature extraction (e.g. even HDT is not defined Noesis uses now the complete wave length).

73. Waveforms

- New waveform loading method that uses much less memory (very effective for large datafiles, used for WFS files of 2GB size)
- DTA waveforms to disk option now works for TDA files as well.
- Internal improvements that makes loading and display of waveforms to be faster and less demanding in memory.
- Added support to non-power of 2 waveform text files.
- Fixed DSP filtering for band pass filters when Low Pass Frequency is 0.
- Added support for decimals in low and high pass frequencies in DSP filters.

74. UT data

- Support of newer UTwin files (up to 2.60) and Pocket UT files
- Add support for multi-channels UT data files
- Feature extraction of frequency domain features for UT data

75. AE I/O

- Update of the latest messages for all PAC systems (DiSP, Samos, Pocket AE)
- Read and report TOT, Test and System labels of TDA and WFS files.
- Fixed problem with continuous files
- Fixed problem with Partial Power segments in Acquisition Setup.
- Fixed problems while reading and saving Cycle Parametric.

76. Speed improvements

- Multi-processing extended to more functions.
- Optimized performance while drawing graphs for windows vista and 7.
- Several internal improvements that increase the general Noesis performance

77. Utilities

- In About box of Noesis there are now detailed information about the number of Processors used and the how much memory is occupied by loaded data (HDD, TDD, waveforms).

78. Other (General)

- Added printing capabilities for all types of graphs and waveforms.
- The Examples manual has two more examples (with focus in location)
- Added to select which classes to save while exporting to dta (split to classes mode).
- Added functionality to apply same common settings to all kind of graphs (scatter, waveform, etc) from preferences plot settings dialog.
- Fixed large gaps while drawing y values in graphs.
- Fixed a problem with channel reconfiguration in graphs after changing channel id.

Noesis 5.6.50 - New Features

79. Import External Parametrics

Noesis now offers an advanced function for Importing External Parametrics. This option allows users to import a parametric file created in any software (e.g. MSExcel). This file must be an ASCII file with column headers, first column time and the rest of the columns can be any parametric value. The user may preview the data to be imported into Noesis into a grid (for reviewing purposes), select the dataset in which the data will be imported (HDD, TDD or both), select which of the columns (additional parametrics) to import and select the time matching strategy that better suits the analysis needs (Linear interpolation, Min, Max, Average or Median). Using the strategy selected, Noesis will interpolate and assign the appropriate parametric(s) values (one for each parametric column in the parametric file) to all hits, or TDD records, or both in the Data Set according to their Time.

80. Optimizing WFS loading and processing

Noesis allows the user to choose the way to load information from **WFS files** (in Preferences command). Two options are available: To load waveforms data in memory or leave all data in hard disk. For small and medium size WFS files (up to 300-400MB) in modern computers it is recommended to select to load the Waveforms in memory for faster operations. For larger WFS files (500Mb – 2GB or more) it is recommended to leave the waveforms in disk. This feature permits users to load, view and process data without any limitation. It is worth to mention the very small footprint in memory in the case of leaving WFS data in disk (e.g. for 2GB WFS – 10 minutes of waveform streaming, Noesis uses only 50MB of memory).

81. UT Data Support

Although NOESIS is a software package, specially designed and optimized for the analysis of Acoustic Emission data, the UT module allows the analysis of **Ultrasonic data** in a similar fashion. Thus, using the general advanced tools of Noesis (from plotting, statistics and DSP up to pattern recognition); the user can now perform innovative investigation of Ultrasonic data. Two new editions of the application are available: Light UT and Professional UT

Noesis 5.6 - New Features

82. General framework

Noesis is now a multiprocessing application. Noesis is using from this version the OpenMP API (Open Multi-Processing), so the application is using all the available processors that can be found in modern computers (e.g. Core 2 Duo, Core i3, Core i7, etc.). This has as result the speed up of the execution time in demanding applications. The specific feature is currently used in waveform related functions (e.g. FFT, Feature extraction, etc.), but in the next versions will be used in other demanding functions also.

83. Plots

2D Colored Scatter plot is available. This new kind of plot is similar to density plot of Noesis but here we present only one value in the center of bin area.

Color Setup. Easy editing of color level. Further to mouse adjust of color level, now user could edit direct - just click on the value - the color level. Therefore, the color setup could be made in any desired accuracy. Logarithmic scale in any color palette.

Time resolution in plots. Due to high resolution of time in AE application, the Noesis graphs have been modified to use time in enhanced accuracy so any time plot present accurately the data.

84. Functions

Feature Extraction - Revised version: The Custom Feature Extraction dialog is revised to allow more user actions in multiple hits extraction. The first change is the option to keep original waveform, so the user have a more clear idea of the data processed and be able to apply several different extractions without reload the data. The second change is the option to split waveform to any desired length. Note the picture below the result and very good matching of Noesis Feature Extraction of a very large WFS.

New Calculator for Calculated Features. A new mathematical parser is available now with many predefined functions and operators. The new calculator allows users to create new features using very complex expression and even make programming inside Noesis.

Calculated Features for HDD, TDD or both

85. Pattern Recognition

No need to create Working copy of data. The working copy of data will be created by Noesis automatically when a user action needs this copy of data. There is no need any more to make working copy plots just to initiate the working copy.

86. Waveforms

Speed up of Waveform plots

Absolute time in Waveform graphs. In any Waveform plot, Noesis presents now the relative time (from waveform start) and the absolute time.

Continuous Wavelet Transformation

The Power Cepstrum plot is revised to match better with the literature and other applications graphs.

87. I/O

Enhanced Txt files support. The Noesis support of text files is enhanced to cover cases of text files created from Excel. In some circumstances the cell format or multiple empty cells entries leads to problematic text files. These cases are supported any more.

Noesis 5.5 - New Features

88. General Interface

Advanced Data Loading dialog: In continuation of the previous versions enhancements, this dialog is a complete tool that gives to the user full control of the data to be loaded in Noesis. Particular, the user could navigate to different tabs of the interface and select which features want to load into Noesis. For Hit Driven data the user could select which features to load and further to apply any complex filter (Front End filters). For Waveforms, the user could select to load them or not and to apply any filter based to HDD data. For Time Driven data, TDD features and Parametrics selection is available. Also TDD data rate filter could be applied. Besides that the user is informed in details before the actual loading of the data about the size and characteristics of his data. Note the added feature for loading of all continued files

Batch Data Filtering dialog: This dialog lets the user to select multiple dta files, apply data filters and/or downsampling TDD rate and then to save the filtered data under different names or locations without load the complete data into Noesis, thus reducing data and file sizes very fast. Note the new Tab "TDD Filtering", the user could make complete filtering and rate down-sampling of TDD data. Using the button Select Features/Parametrics, the user could select which features wants to keep. Also the file(s) TDD rate is presented. Then user could select the desired TDD rate and down-sampling method. The available methods are first reading, last reading, min reading, max reading, average reading and median

Data Filter dialog: Now post data filtering (deletion or classification) can be applied to specific classes only. This feature gives the users the ability to post processing data not only in a global level but also per class. Furthermore this lead to cub-clusters.

Delete Time Segment dialog: Now the user has the ability to define multiple time segments for deletion. The time segments could be defined either manual or from selected data (mouse operation). Moreover, the option to keep original time after deletion of data is present. This enhancement together with data deletion speed up (see below) helps the user to complete the data filtering task very fast.

Time Marks Management dialog: In this dialog, the column File is appended. Also more explanatory comments is present about threshold changes (which channel the change is made for), gain changes (which channel the change is made for) and about waveform transmission turning in on / off. This change is very useful in several applications for fast review.

Colors and Labels dialog enhancement: A 'Reset' button is added for reset all colors to the default and clear the particular values in the system registry for the next application usage. For complex pattern recognition analysis this addition could help user.

Preview graphs: More time is given to preview graphs and waveforms when clicking on 'Update' button (this button replaced 'Preview' button in graph and waveform property dialogs), compared to 'Automatic' mode ('Automatic' label

replaced 'Lock' label in old version). 'Automatic' preview (see above) is by default off when loading long waveform .WFS files to speed-up interface handling.

Copy Waveform values: In graphs showing multiple waveforms users can now copy data from individual waveforms by opening context menu (right-click) on the desired waveform. Values are copied only for the portion of the waveform visible on screen (taking into account any zoom-in operations made by the user).

89. File operations – I/O

Export Time Driven data as ASCII file: This tool presents a dialog for TDD selection and then TDD data is exported as text. This feature with the existing features for export HDD and waveforms as text files gives to the user all the necessary tools for data export.

Data loading (TDD only files): Noesis allows user to load and analyze files with only Time Driven data.

Load and saving of continued files: Noesis supports loading and saving of continued files. Automatic loading or saving of continued files is supported.

90. Functions

Calculated Features for Time Driven Data: The user now can switch between HDD and TDD list of features and then to create any new TDD or HDD feature using a great calculator. Note that in this list are included all Non-Feature data like "Time".

Import TDD features: This tool presents a dialog for TDD selection and then TDD data will be imported into Noesis into the Main and Usage Sets as a feature. The function is activated if Time Driven Data exist in the original data file and refers to the Main and Usage Sets.

New standard calculated feature "Time between Channels": The feature "Time between Channels" is added in the collection of the available standard calculated features.

Speed optimization of "Delete Time Segment" function: The delete time segment is a frequently used function especially for F/T application. Since the last years the data sizes were increased significant the function was very slow. In this version, the function was optimized in terms of speed and the user gets the results instantly.

Added a **'Remove Channel'** function under Tools menu.

91. Data management

Internal TDD data restructure – Less memory demand, Faster operations: For the same reasons mentioned above (increase of the data sizes), an internal data restructure of Noesis has as result for the users to load data with less memory requirements and faster operations for Time Driven Data.

92. Graphics

Image export as Vector graphics: Added the "Copy Image as WMF" command in graph context menu to support screen resolution independent graphics to other applications such as Microsoft Word.

93. Waveforms

Fast Waveform Drawing Mode: A "Fast waveform drawing" mode is added in the in Preferences Dialog to speed up waveform drawing. This mode is suitable for very large waveforms (e.g. WFS).

Waveform plotting enhancements: In waveform plots, Noesis offers background grid lines for better visibility. Also two new cursors modes: Free cursor (a line tracker moving everywhere in the plot area and reports values in the status bar) and data cursor (that his movement is restricted to actual values only).

New Waveform plot type Discrete Wavelets: Noesis offers Discrete Wavelet processing and plotting of any waveform or part of the waveform.

New Waveform plot type STFFT: Noesis offers Short Time FFT processing and plotting of any waveform or part of the waveform. Also STFFT Spectrogram is available.

New Waveform plot type Cepstrum: Noesis offers Cepstrum processing and plotting of any waveform or part of the waveform.

New Waveform plot type Cross Correlation: Noesis offers Cross Correlation processing and plotting between any two waveforms.

New waveform plot types Moving Average, Standard Deviation, Skewness and Kurtosis: For every waveform and for all time plot type, Noesis offers processing of wave data using the Moving Average, Standard Deviation, Skewness and Kurtosis calculations. The respective plots are available.

Noesis 5.4 - New Features

94. General Interface

Implementation of the **request for transfer Noesis graphs data to other applications** (e.g. Excel). In the context menu of any Noesis graph, there a Copy Data command that allow user to transfer the graph data through the clipboard. Details like type of graph, number of bins etc. are available.

Enhancements in save/restore workspace. All graphical details of Noesis graphs could be saved and restored later (this includes details like Header, etc.).

Noesis 5.3 - New Features

95. General Interface

New Advanced Data Loading Dialog. Easy definition of the file order (sort by name, time, size or manual sort). Front End Filtering. Immediately arrange of files in time

96. Graphics Enhancements

Vertical alignment for graphs on same columns.

Selection in Density Plots (not selected points don't have color)

Improvement in **TDD plots down-sampling**: Down-sampling now is per channel

Faster rendering of plots (especially for datasets with larger number of features)

Double click in any hit, bring up the corresponding waveform.

Faster waveforms plots

97. Other enhancements

In **Preferences dialog**, user could specify which **workspace** to apply automatically after data loading.

Coloring in **waveform plots** per channel

Improvements in **Import External parametric**: Loading the features names from the file header. More flexible time restrictions (start and end time)

Noesis 5.2 - New Features

98. General Interface

High quality 2D plots. A significant number of improvements have been applied to 2D plot engine of Noesis with the intention to produce high quality plots. A brief analysis of the new features of the 2D plots is following: The appearance of 2D plots is now completely configurable by the user using the Plot Properties. The plot properties in this version include the next new options: Axis format: Labels format (Decimal and Scientific with user selectable number of digits), number of divisions and margin. In all cases an Auto option is available, where Noesis decides the appropriate format based on type of plot, selected features and plot size. Grid format: Option to show/hide grid per axis and type of grid (solid, dash, dot) Font format: The fonts used in plots are now fixed. Labels format: Option to show/hide General Legend, Class Legend, Units of features and selection to show features names on top of Plot or next to axes. The 2D plot engine makes in this version some "smart" adjustments (e.g. compression of divisions during resizing) in order to offer the best possible quality of plots. Background plot improvements like axis label in the right. Current plot appearance can be applied to all plots - for easy and uniform construction of plots.

Enhancements of 2D plots. The following enhancements have been made in existing 2D plots types: Scatter plot - New color modes: by Feature values (any feature available) or by Height (coloring by Y axis feature values). Density plot - Independent X and Y axis number of Bins. New color mode: by Feature values (any feature available).Also for any plot where the color mode is based on Feature values a color palette setup option is available.

Addition of 3D Scatter and Distribution plots. A powerful 3D engine is now available in Noesis. The engine could produce 3D Scatter and Distribution plots. The 3D engine offer complete mouse interaction (rotation, pan and zoom). Also a 3D toolbar is available giving the user the facility to select between orthographic and prospective projections, side, front and top or bottom views. Note that all the options of the 2D plots (except background plot) are available also in 3D plots. The 3D plot types 3D Scatter plots (Note that with the flexible color schemes available (based on classes, feature values, channels) 4D plot could be plotted) 3D Distribution plots.

Complete TDD plots support. All Noesis plots (2D and 3D) are now available in for all TDD data (even when the corresponding HDD feature is missing).

Update of PAC file formats support A complete update of PAC file formats support was made. Particularly, Noesis offer complete support (input and output) of DTA, TRA, WFS and DTA for PocketAE data files.

Batch Data Filter. A new command is available that lets the user to select multiple DTA files, apply data filters and then to save the filtered data under different names or locations, thus reducing file sizes. The user can specify input files using the standard file select dialogs, change the order they will be processed, sort them by their name, path, size or modification date, select output folder where they will be stored (or keep filtered data files in same folders as the original), specify a filename suffix of the filtered files, select to overwrite existing files, select and load filters, remove waveforms and / or time-driven data from them.

99. Other changes

Faster drawing of Waveforms.

New Preferences dialog including default plot settings.

New color definition dialog including **default colors for channels and TDD plots**.

Noesis 5.1 - New Features

100. Graphics

Data coloring in all plot types: None (behaves as single class), Class (colors according to class), Channel (colors according to channel).

Horizontal bins for bar and cumulative plot types.

Secondary y-axis labels and scales on plots.

New graph titles with class, channel filtering info.

Export graph and pages in various formats (BMP, JPEG, TIFF, EPS)

Grid lines in all plots

Page re-ordering function to re-arrange page sequence at any time.

Full TDD drawing in plots.

101. Data

Complete File Time Management. New dialog to rearrange files sequence and time gaps at any point.

Import TDD features. Imports any TDD features found (ASL, RMS, Abs Energy etc) as feature data.

Noesis 5.0 - New Features

102. Graphics

New Pages function. Page setup dialog. After setting up the basic layout the user can use the mouse to merge views in order to achieve custom layouts without complicated tools. Screens like this are easily arranged without having to move floating windows about or stretch them to fit. Everything is done automatically to get a page layout that fits the screen size available. The new pages also feature headers with typical file information. These are exported or copied along with the rest of the page as bitmaps in order to have data traceability. Headers are shown or hidden on demand.

103. Live

Live-SPR with WFS files (real time extraction from Noesis) Noesis can use WFS files in semi-real-time (Live) mode. Noesis will load, show, extract features and classify the data as they are acquired. This has proven very useful in condition monitoring applications.

104. Data

ASCII Waveform data import. Noesis can load and use any waveform in ASCII format. The user has to convert any waveform to a simple ASCII format and then load and use them in Noesis. This means that the waveforms can be viewed normally, get FFT, PS, apply Filters etc and do feature extraction. Even location is possible using the extracted time of arrival.

105. Functions

Extraction of multiple hits from saved waveforms Noesis can extract multiple hits from saved waveforms and split the waveform to match the new hits. This can happen when changing the threshold or HDT, HLT in feature extraction for DTA, WFS, TDA, and ASCII files. This is effectively as re-acquiring the data, especially for WFS files where a large amount of data are stored in each wave for a significant period of time. Entire 2sec streamed waveform at 2MHz.

106. Waveforms

Waveform Filters (Butterworth, Bessel etc) Filters can be applied to any waveform (DTA, TDA, WFS, ASCII) and the user can choose out of a number of filter types and set freely the range, order etc. This can be used from a waveform view properties dialog for viewing only or be applied to **waveforms for feature** extraction. The new feature extraction dialog. The waveform setup page is shown with filter parameters. Note the Multiple Hit Extraction controls at the bottom.

Windowing Noesis can apply windowing to any waveform for viewing or for feature extraction. If location exists in a dataset the user can go into Event Select Mode so any time some hits are selected Noesis will automatically find the rest of the hits in the same event and select them as well. This provides a unique way of looking at location data.

107. Interface/Operation

Faster drawing: New drawing functions have improved speed in Noesis graphics. All plots are now at least 50% than in previous versions. The speed of other graphics such as waveforms has also been improved.

New data input format Several dialogs have been upgraded to use grid inputs. This helps the user have a better overview of input parameters and makes the s/w easier to use.

Better memory usage Unlike other s/w that use similar data Noesis has all the data in memory to make using them for filtering, feature extraction etc more interactive. As data files are getting larger it is important to efficiently use computer memory. Although memory of 1GB or greater is easily found on computers it is also important that a s/w uses it efficiently.

File conversion Noesis can export any data to DTA file format. This includes WFS, TDA and even ASCII waveforms. Waveforms files must have features so a feature extraction is required in order to export to DTA format.

Export graphs All Noesis graphs and pages can be exported to bitmap and JPG files. This can be done by copying the graph or page to another application or by saving the graph, page or all pages to the disk

Menus Following comments by users we have reduced the complexity of menus and make all functions more context driven. This means that the user can right-click on any item to get its properties and see all the functions that can be applied to the item. General s/w functions are better distributed in easier to understand and get used to menus. These have drastically improved usability.

Event Select mouse mode If location exists in a dataset the user can go into Event Select Mode so any time some hits are selected Noesis will automatically find the rest of the hits in the same event and select them as well. This provides a unique way of looking at location data.

Noesis 4.1 - New Features

108. Major Changes

Linear 3D Location (X-Y-Z) including location plot data selection, waveform correspondence etc.

User Defined Features using a feature calculator with function ranging from simple addition to trigonometric and exponential functions.

Support PCI2 waveform streaming files (WFS) with full Noesis functions support (e.g. feature extraction, filtering, UPR, SPR).

Autocorrelation and RMS from waveforms.

Segment FFT views (FFT of waveform sections).

Time Mark Management (Edit, Delete, Insert).

Large DTA file handling with special optimization dialog.

Faster feature extraction and enhanced feature set.

109. Minor Changes

Bin mode additions (min, max, ave, min-max) and bin zooming in all distribution plots.

Faster Line plots.

New Waveform plot.

New feature selection dialogs.

Remove TDD and WF read confirm dialogs.

Cycle counter cumulation between files in multiple file loading.

Split files support.

Save and arrange all pause, run, stop messages