Insight+

Traditionally, CAE NVH data and results have been presented as plots, graphs and numbers. But, noise and vibration must be experienced to fully comprehend its effects on vehicle occupants. And in today's competitive automotive industry, it is crucial to quickly and accurately evaluate this data.

Insight+ enables the total experience of NVH data - creating sounds directly from CAE models that NVH engineers can listen to and experience. The CAE model data can be combined with test data to create an immersive, realistic environment.

By enabling NVH engineers to calculate, listen to, and modify individual contributions (both airborne and structure-borne), Insight+ also assists with design and validation of program NVH targets.

Contour Plot
Eigen Mode(Mag)
Analysis system
1.000
0.889
0.778
0.667
0.556
0.444
0.333
0.222
0.111
0.000
No result

150360

The result: vastly superior understanding of NVH CAE results; effortless communication of the meaning of the results to decision makers; and faster decisions with more confidence than ever before possible.
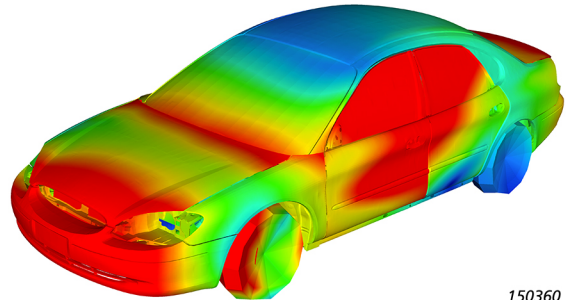
Uses and Features

Uses
- Evaluation of CAE analysis results (transfer functions and operating conditions) for airborne or structure-borne paths, calculated by any source path contribution method
- Listen to and modify contributions, sources, paths
- Evaluation of design alternatives and their effects
- Efficient use of test and CAE data together
- Understand NVH contributions early in the design process
- Auralization of proposed engineering changes in the correct context
- Sharing and developing ideas between NVH test and CAE engineers

Features
- Listen to contributions synchronized for time, speed or RPM
- Perform A/B comparisons
- Record and store modified sounds
- Perform spectral analysis of sources and contributions – view spectra of source level, path sensitivity and contribution off-line or in real-time during playback
- Full suite of filters
- Easy interface for all task operations with cascading tree structure for easy viewing and organisation
- Evaluate any set of time files

- Easy management of sources, paths and receivers in a structured model
- Easy comparisons for target setting
- Combine data from multiple sources, including experimental and analytical result sets
- Quickly convert standard CAE response data to ready-to-run NVH Simulator models
- Support of common CAE program data file formats (including files directly from HyperWorks® and NVH Director)
- Quickly incorporate predicted source strengths and transfer functions into test-based models
- Calculate change filters as the ratio of two (CAE-based) models and apply them to (test-based) models
- Export data for further post-analysis, such as order extraction with PULSE Reflex™
- Full integration with PULSE NVH Simulator's interactive play and display tools for understanding, evaluating and communicating the results
- Easy upgrade to the full PULSE NVH Vehicle Simulator

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Benefits of Using Insight+

Insight+ provides all the tools necessary to playback and analyse the results of a time SPC calculation. It embodies an interactive, intuitive approach to understand and evaluate SPC results. Through highly advanced playback and modification methods, engineers can easily analyse and comprehend SPC results, and make modifications to simulate engineering changes.

With Insight+, the following features are included:
- Contributions can be played simultaneously, in groups or individually
- Contributions or groups of contributions can be toggled on and off during playback
- Multiple sets of contributions can be used for back-to-back comparison, for example, different vehicles, or different design alternatives. These datasets can be synchronised to various parameters, including time, RPM and speed
- A range of data can be selected for playback, and can be looped to play continuously. This range can be selected using time, RPM, vehicle speed or other parameters
- A comprehensive set of filters including high-pass, low-pass, notch, user-defined FIR and others, make editing and modification easy and intuitive
- Filters can be saved/loaded, applied in real-time or off-line, and mixed together
- Real-time and off-line displays of source level, path sensitivity and contribution spectra
- Easy upgrade to the full PULSE NVH Desktop Simulator Type 8601 program
- Can be used in the full Desktop Simulator program, with the same functionality

Insight+ User Interface

Models are typically generated automatically or manually from within Insight+ itself. The model is organized in a tree structure with sound objects containing both time domain data for sources and contributions, and frequency domain data for path sensitivity functions. You simply select contributions in the model for playback and analysis.

Models can easily be modified, combined, organised and stored.
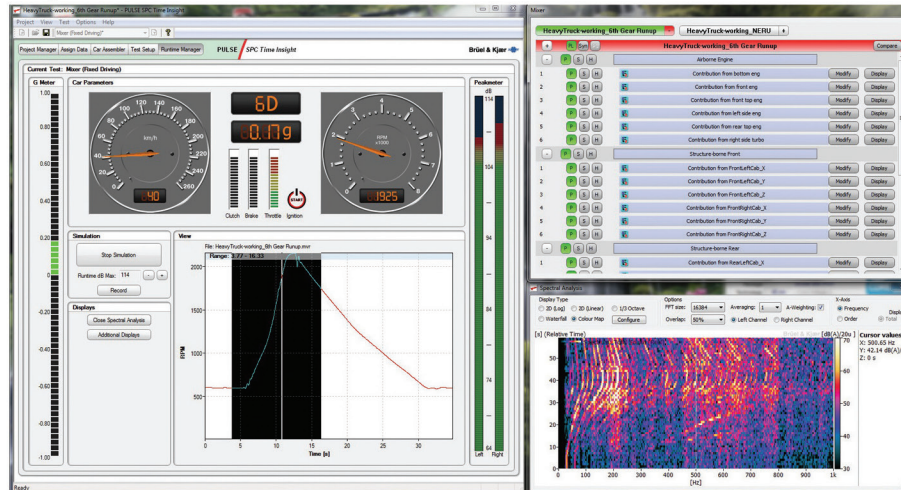
Fig. 1
Model structure in Insight+
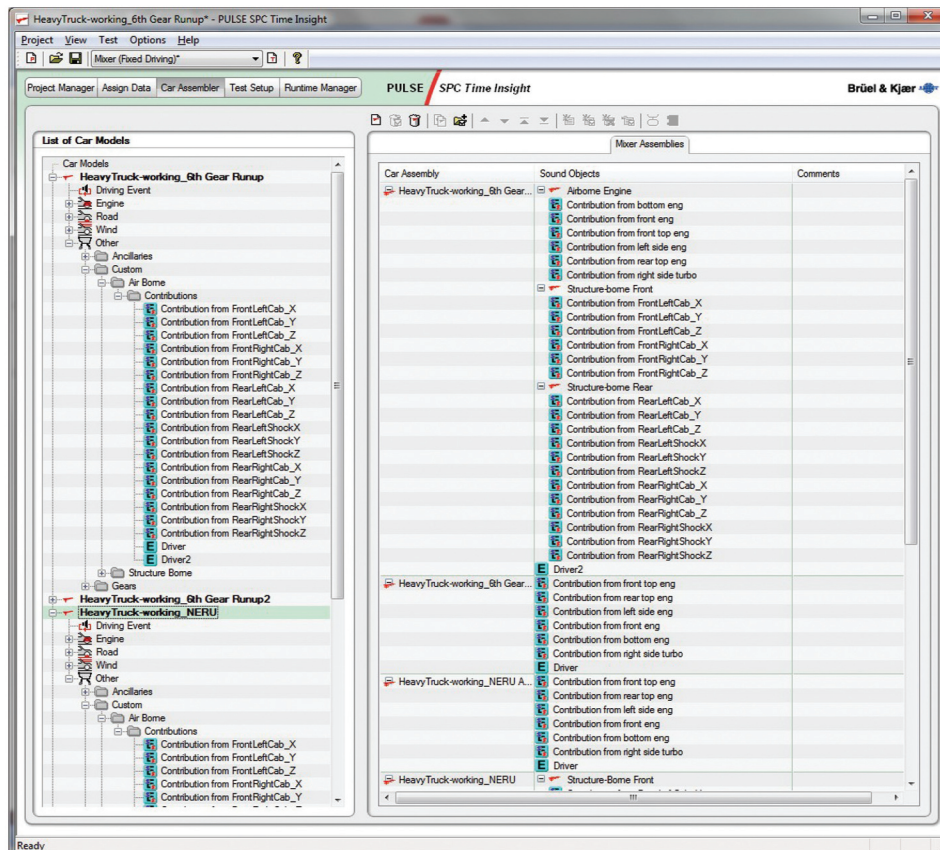
Alternatively, you can manually create and modify models in Insight+. This opens the possibility of adding data from any source (PULSE Time Domain SPC or another program).

Multiple assembly models can be used for playback at one time, facilitating back-to-back playback of different models and different sets of data.

Playback

Playback is simple and intuitive. Load individual or multiple assemblies into the interface's Mixer for back-to-back comparison. Select from the Mixer list the contributions and sound objects you wish to listen to. There are various options for selecting, grouping, playing sound objects/contributions individually and turning sound objects on and off. You can also select a specific range for playback, toggle continuous looping and set up sound synchronisation with another dataset based on a specific parameter (such as engine RPM).

Analysis

Fig. 3
*Real-time spectra for source, path and contribution during playback*
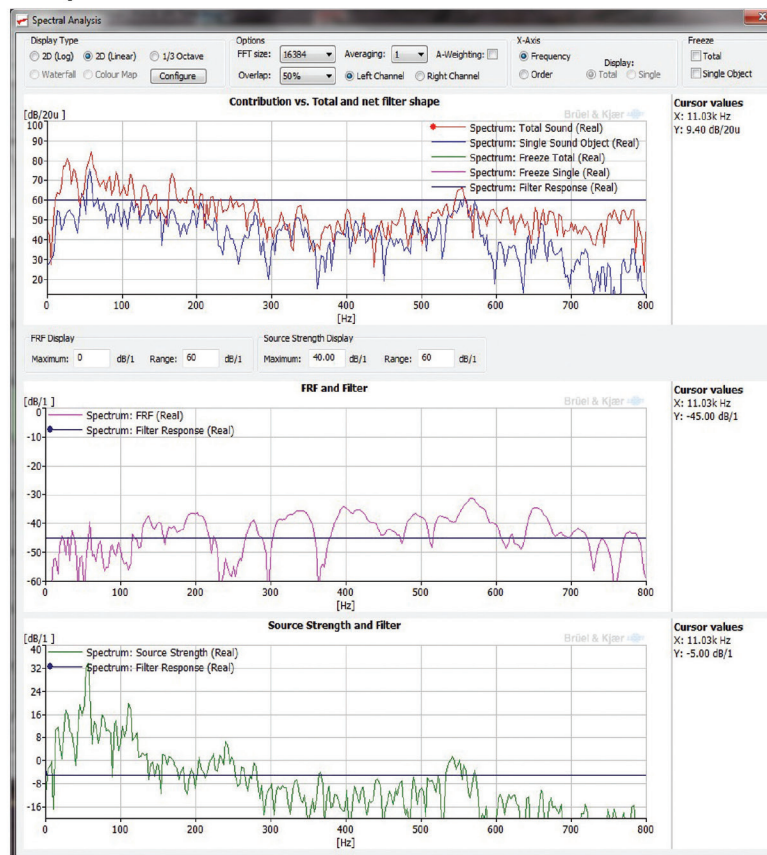
For vehicle models, engine RPM and vehicle speed are shown on large dials. These and other vehicle parameters can be displayed as quantity vs. time plots at the top of the Mixer display. A spectral display can be configured to display 2D frequency spectra in linear, log and 1/3-octave formats, and can be configured for 3D waterfall and contour displays.

Various setup parameters for the spectra displays are conveniently located right at the top of the display, including A-weighting, frequency resolution, averaging, etc. Spectra can be "frozen" to compare to other datasets, other sets of contributions, or other points in time of the playback. Individual contributions can be overlaid with the overall spectrum in the spectra display, making it easy to see exactly how much a single contribution is affecting the total sound level. In addition, a triple spectra display is employed to show levels of source, path and contribution simultaneously during playback. These are in real-time, updating as the sound is played.

Modifications

Fig. 4

*Applying a Notch Filter to the source level of a single contribution*
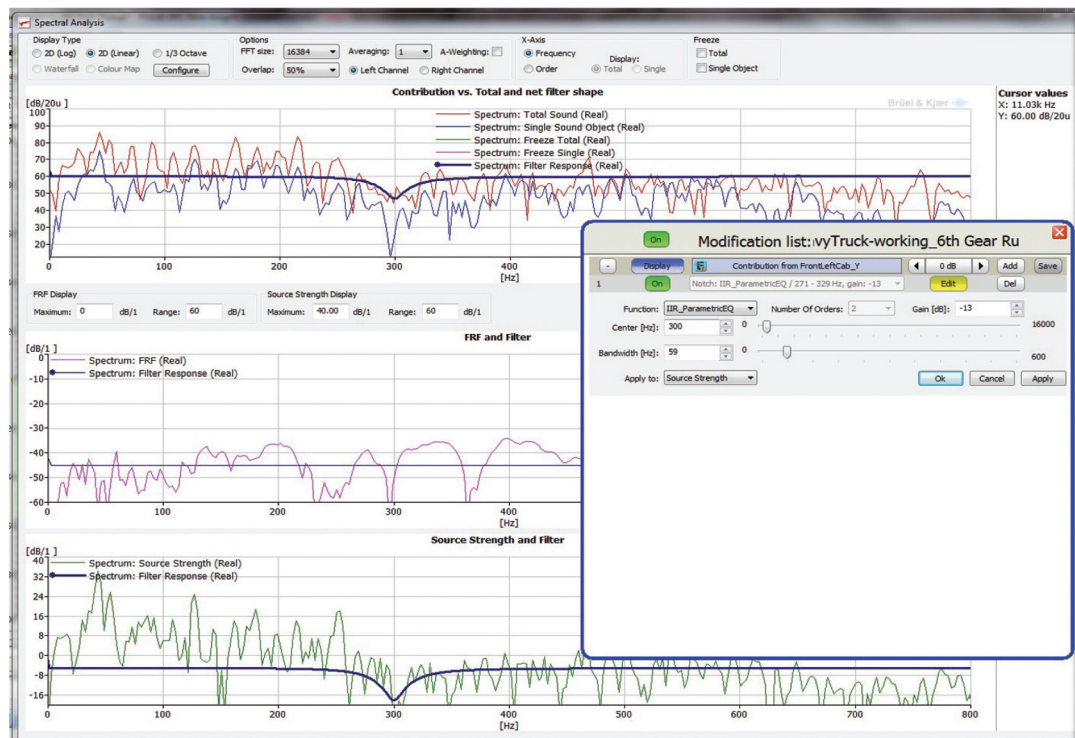
Modifications can be performed on the individual contributions (not the overall sound) through the application of any of the available filter types in the Modification List panel, including high-pass, low-pass, band-pass, band-stop, notch (cut or boost), or user-definable FIR filter. The user-definable FIR filter can use a profile imported from another application. Additionally, simple level adjustments are also easily accomplished through the Modification List panel.

Modifications can also be applied to either the source level or the path. These features enable the simulation of engineering changes in a realistic manner and in a way paralleling the actual physical changes to the physical system.

Off-line Data Display and Analysis

Fig. 5
Off-line display and spectral analysis of source strengths, paths, contributions and summed contributions
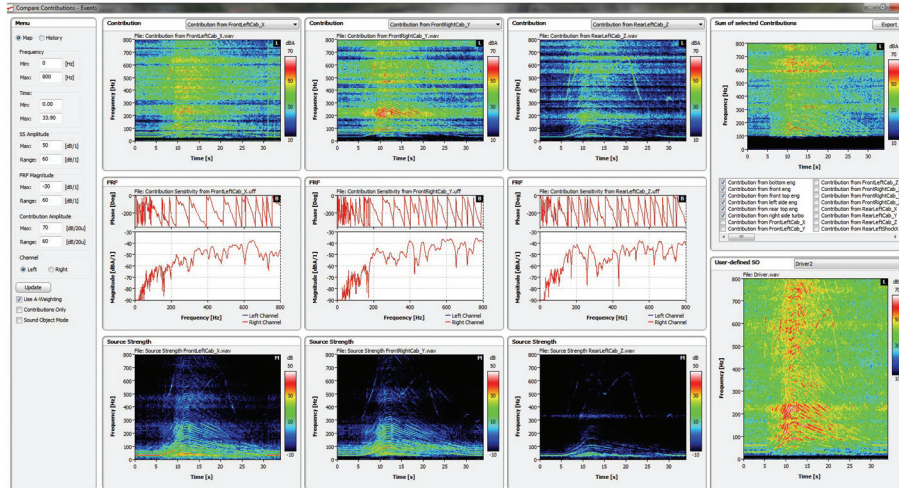
Data can also be viewed either in the time domain or frequency domain using the off-line data display tools. Source, path and contribution levels can be plotted and analysed, with synchronised cursors between contribution, source and path sensitivity FRF. Contributions can be added together and displayed and compared to measured response data. The sum of the paths can be exported as a new time history.

Fig. 6
Change modelling, visualization and modification
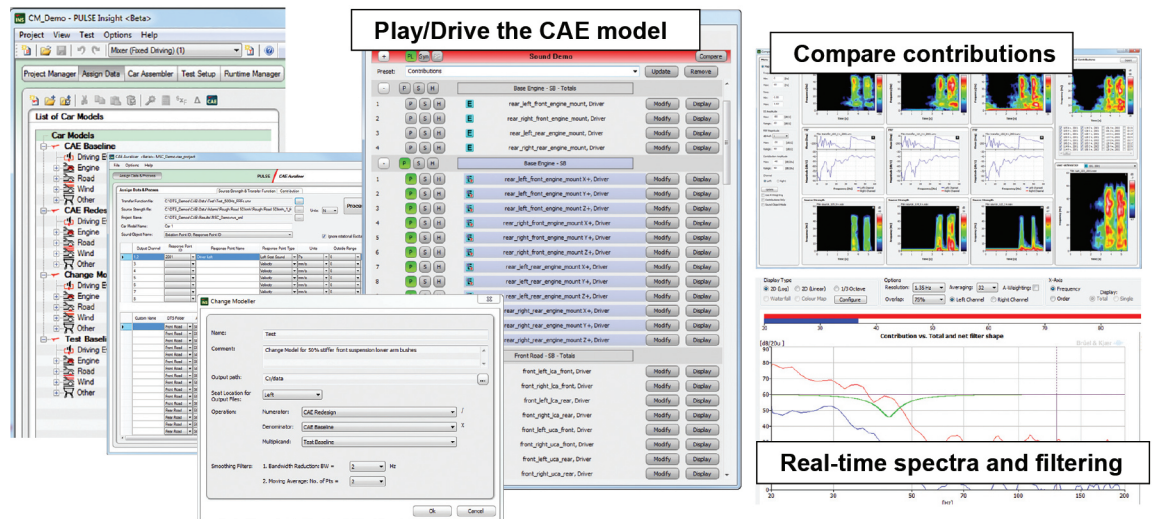
Insight+ automatically converts standard CAE response data from common CAE programs into ready-to-run NVH Simulator models. Source strengths and transfer functions can be quickly incorporated into the interactive NVH simulations.

CAE predictions are often only valid over a limited frequency range or for a restricted set of components. To deal with this, the NVH Simulator and Insight+ allow the engineer to combine CAE and test components in order to generate a more complete 'hybrid' model.

In situations where CAE models are unable to predict the absolute sound energy levels resulting from a design change but instead quantify the changes in the response, the Change Modeller in Insight+ can calculate a set of change filters as the ratio of two CAE-based models and apply them to test-based models.

The whole process occurs in just seconds, even with large CAE models, making Insight+ an effective tool in the iterative design process. Every new design alteration can be quickly incorporated into and experienced in Insight+, where the consequences of proposed design changes can be evaluated by anyone.

Source Path Contribution solutions, including Time Domain SPC Type 7798-E and Insight+, are NVH analysis software tools based on Brüel & Kjær's PULSE Multi-analyzer System.

DTS CAE Auditioner is an optional module for PULSE NVH Vehicle Simulator Type 3644 or Insight+. DTS CAE Auditioner creates DTS or Insight projects, car models, car assemblies and sound objects directly from CAE predicted source strengths, frequency response functions or contribution data files.

Contributions from the various sources can be determined experimentally using source path contribution tools.

PC Configuration

RECOMMENDED PC CONFIGURATION
- 2.5 GHz Intel® Core™ 2 Duo processor, or faster
- 8 GB RAM
- 160 GB Solid State Drive with 20 GB of free space
- Sound Board: 16-bit SB Pro-compatible 3D
- TFT 14.1² display, 1280x1024, 16 000 colours or better
- Windows® 7 (SP 1) 32- or 64-bit
- Web browser
- Adobe® Reader® 10.1

Software

USER INTERFACE
- Task-driven user interface
- Data-centric architecture

Display Functionality: Advanced graphic tools

Ordering Information

Contact your local Altair sales representative to order Insight+

Other related software available directly from Brüel & Kjær

SOURCE PATH CONTRIBUTION SOFTWARE

Type 7798-A-X*	PULSE SPC Viewer
Type 7798-E-X*	PULSE Time Domain SPC

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* Where 'X' indicates the license model, either N: Node-locked or F: Floating

Type 7798-B-X*	PULSE SPC Mount Stiffness and Matrix Methods
Type 7798-C-X*	PULSE SPC Matrix Method with PCD
Type 7798-D-X*	PULSE SPC Multiple Coherence Method

NVH SIMULATOR SOFTWARE

Type 3644-A	PULSE Desktop NVH Simulator
Type 8601-K-X*	PULSE DTS Vehicle Level Data Preparation

NVH ANALYSIS SOFTWARE

Type 8700-X*	PULSE Reflex Base

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