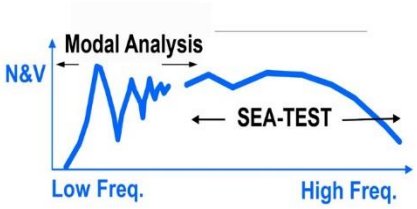
SEA-TEST Overview

Experimental Solutions for Noise and Vibration Design in medium and high frequencies domain

SEA-TEST is post-processing software, analyzing imported data in universal file format from any external data acquisition system supporting both modal analysis test protocol and this export format.

SEA-TEST Software allows engineers to more effectively apply laboratory testing to the **N**oise and **V**ibration (**N&V**) design process. **E**xperimental **SEA** (**ESEA**) gets benefit of highly optimized data acquisition and signal processing of Modal Analysis Systems to extract parameters used in the Energy Flow N&V design process based on the **S**tatistical **E**nergy **A**nalysis method (**SEA**).



Wide-ranging applications include:

- Automobile interior acoustic design
- Air-& rotor-craft interior noise control
- Rocket & spacecraft vibroacoustics
- Railcar interior & railway structure noise
- Shipboard and underwater noise
- Architectural acoustics
- Consumer appliance noise control

Acquiring with external Modal Analysis System, Analyzing with SEA-TEST

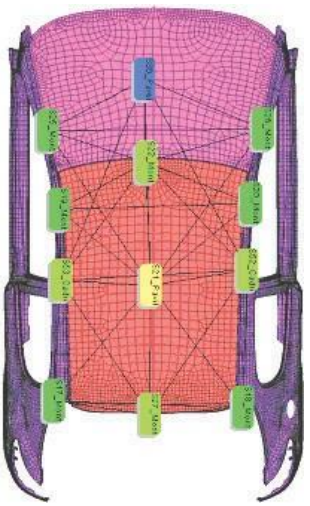
SEA-TEST linked to a Modal Analysis System, drastically changes the approach of an ESEA problem.

How can divide my structure into subsystems? Am I sure I did not miss some measurements? How long will take my measurement session?

All these questions can be easily answered with the measurement wizard integrated into a Modal Analysis System. Using geometry management capabilities of a Modal Analysis System, the user simply acquires FRF like in modal analysis.

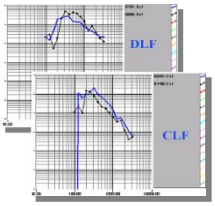
SEA-TEST checks the data acquisition progress and an SEA model can be generated at any time on the current data set. SEA-TEST provides a wide variety of possible solutions.

- Automation process
- 3D-progress bar for global check
- Permanent control of the model



Extract N&V Parameters

Multiple noise and vibration measurements can be grouped for different structural and acoustic regions-corresponding to the 'subsystems' of SEA design method.



SEA-TEST reduces the subsystem FRF data and time decay data to a set of SEA parameters that completely describe how N&V energy will distribute itself in the test specimen. These parameters are effective mass (or acoustic volume), **D**amping **L**oss **F**actor (**DLF**), **C**oupling **L**oss **F**actor (**CLF**), modal density and power level of applied excitation.

- Avoid errors in reducing large datasets
- No custom coding required for processing
- FAST, automatic processing

Experimental SEA Modeling

The reduced data defines a mathematically complete SEA model of a test specimen - or even just a part of the specimen. With this 'experimental SEA' model you can predict subsystem N&V levels due to synthesized load cases, conduct 'noise path analysis' diagnostics and determine optimum damping for noise control. Other applications include the identification of a load or environment as an SEA power source - directly from operating N&V (energy) level measurements. ESEA models are also an excellent way to conduct quantitative assessment of competitors' products.

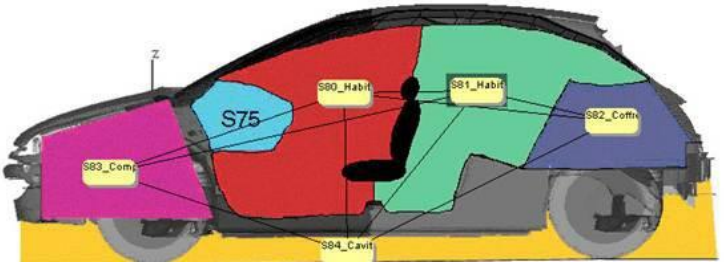
- Better understanding of physics
- Answer N&V design questions

Interface to SEA+ Software

Your ESEA data can also be imported in SEA+ analytical SEA design code by InterAC or in other theoretical SEA software.

The data can be used in three powerful ways in theoretical SEA software:

- 3D fully-experimental SEA modeling
- HYBRID SEA modeling-where selected SEA parameters can be used to replace or enhance the analytical SEA estimates
- MODEL REFINEMENT-where comparison with experimental SEA parameters is used as a rational basis for refining assumptions made in SEA analytical modeling parameters



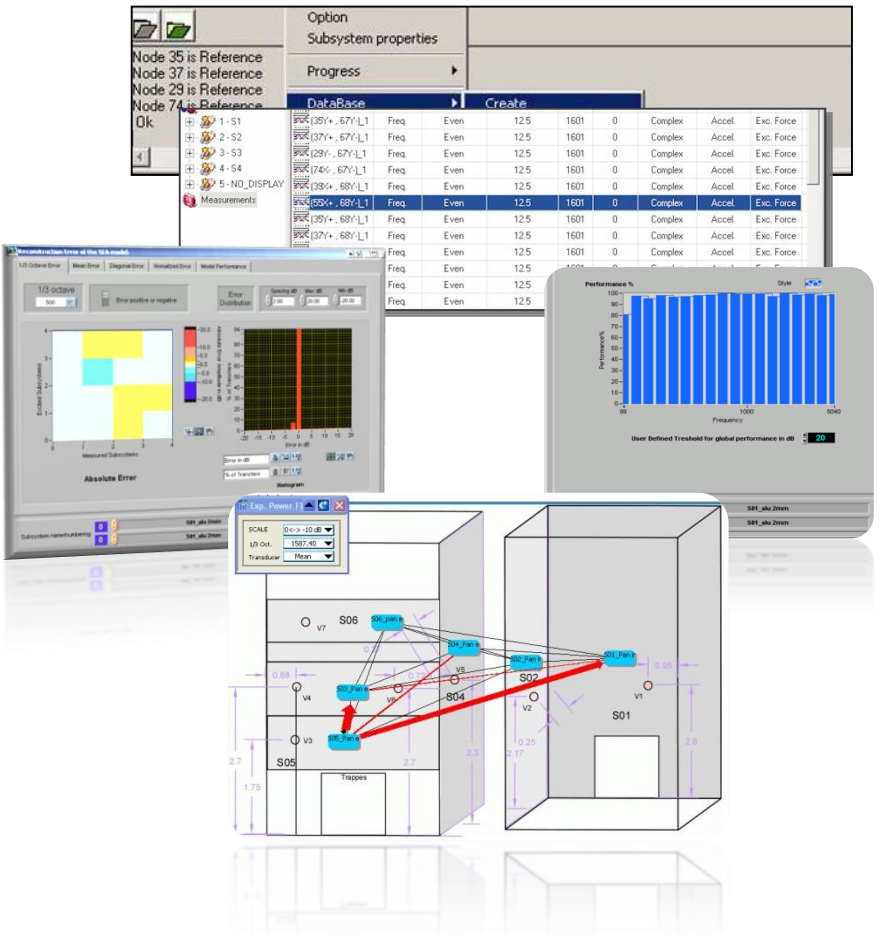
SEA-TEST Specifications

Interactive Post-processing of Data Acquisition for Experimental SEA

Pre-requisite:

Any data acquisition system with at least two channels for **F**requency **R**esponse **F**unction (**FRF**) analysis and able to export data in MTS-IDEAS TEST format (AFU, UNV-Dataset 58).

SEA-TEST post-processes data acquired following a modal analysis protocol into **E**xperimental **SEA** (**ESEA**) model.

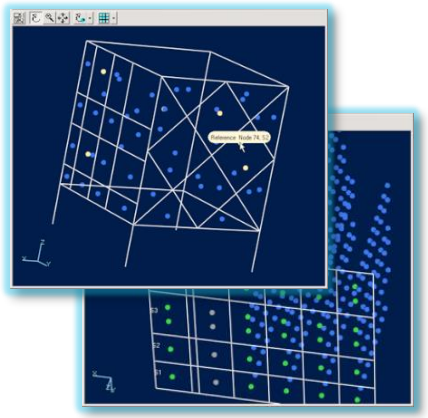


ESEA - Data Reduction

SEA-TEST performs data reduction of modal analysis to derive the statistical input required to identify SEA parameters of the analyzed subsystem.

The data reduction process provides:

- Input power:
  - Sign change & neg. value filtering - 1/3 octave & narrow band power
  - Mean & standard deviation Quadratic (energy) response
  - Subsystem-averaged, 1/3 octave quadratic (energy) response
  - Auto compacting per subsystem
  - Mean & standard deviation
- Decay rate parameter estimation:
  - From multiple FRFs
  - Selectable Butterworth filtering
  - Hilbert envelope & Schroeder smoothing options
  - Selectable 1/N th octave bands



  - Mean & standard deviation
  - Automatic & interactive modes
  - Provide reverberation time (T60), apparent **D**amping **L**oss **F**actor **(DLF)** and absorption coefficient
  - Subsystem Equivalent mass, volume
- Subsystem modal density & modal overlap
- Quadratic Band Averaged FRF:
  - Mean values
  - Standard deviation
- 3D-Progress view:
  - 3D-Progress bar to check Recording progress with the Modal Analysis System
  - 3D-Model view: visualization of model geometry and transducers in SEA-TEST

Experimental SEA - Modeling

- Build SEA model as 2D network:
  - Graphical icons define subsystems
  - Coupling via network or matrix
  - Subsystem suppression, union, auto renumbering & connect-all
  - Store/Open SEA model & results file
- **C**oupling and **D**amping **L**oss **F**actors (**CLF** & **DLF**):
  - Equivalent or user-defined mass
  - Lalor's simplified CLF method
  - Matrix estimation of CLF, DLF with random Monte Carlo inverse or SVD pseudo-inversion methods
  - Mean and standard deviation
  - Auto detection of connections between subsystems
  - SEA model optimizer for best fitted solution
- SEA model solution & diagnostics:
  - Apply multiple power inputs
  - Solve for subsystem energy, velocity or **S**ound **P**ressure **L**evel (**SPL**)
  - Subsystem power inputs, outputs
  - Network energy flow diagram
  - Model performance index for data reconstruction
- Source power identification

External Interfaces

- Read data in Universal #58 and tab delimited ASCII text file formats
- Export 1/3rd octave files to SEA+ or other analytical SEA software
- Export in UNV format experimental SEA parameters
- Input of NASTRAN geometry to create measurement points

Minimum Hardware Requirements

- PC with Windows 7 to 10
- XGA monitor resolution (1024x748)
- 2 Gb memory

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