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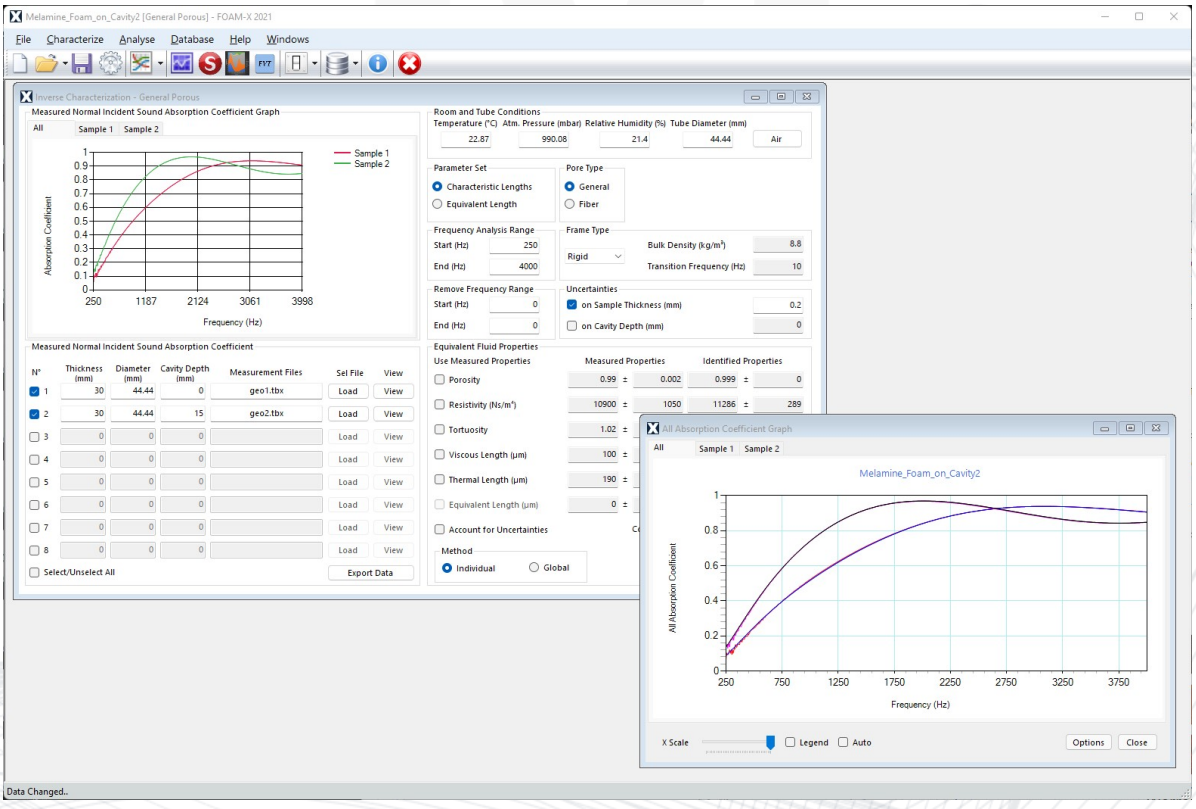
# FOAM-X Software

***Identification of the non-acoustic properties of porous open-cell materials***

From the absorption coefficient or dynamic compressibility modulus and dynamic density, FOAM-X extracts the main non-acoustic properties of poroelastic materials with open cells: open porosity, static airflow resistivity, tortuosity, viscous and thermal characteristic lengths, thermal permeability, Young's modulus, Poisson's ratio and damping factor.

FOAM-X's identification algorithms use acoustic measurements obtained by ASTM-E1050, ISO 10534-2 or ASTM-E2611 using impedance and transmission tubes.

FOAM-X includes also a simulation and sensitivity index module and a database to store identified materials.




*** Please note that the technical aspects of our equipment may be subject to change without notice.**

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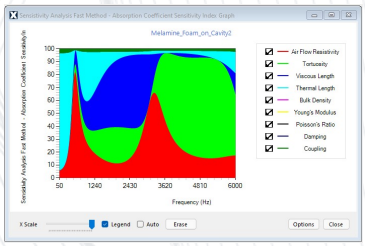
# Identification Module

**Advantages**

- Obtain quickly Biot's theory parameters of poroelastic material with only an impedance and transmission tube.
- Works with all impedance and transmission tubes related to ASTM E1050, ISO 10534-2 and ASTM E2611 standards.
- Complement of standard test equipment (airflow resistivity meter, porosimeter and quasi-static mechanical analyzer).

**Software FOAM-X**

- Methods available:
  - Inverse and indirect methods for equivalent fluid
  - Inverse method for poroelastic material (Biot's theory)
- Tab-delimited columns text file as input data to be the most compatible with ASTM E1050, ISO 10534-2, ASTM E2611 tube software. The text files must contain absorption coefficient or dynamic bulk modulus and dynamic bulk density.
- Computes uncertainties on identified parameters and sensitivity index on acoustic indicators.
- Takes into account of atmospheric condition and tube geometry.
- Identified properties (user can fixe one or more):
  - Open porosity
  - Static airflow resistivity
  - Tortuosity
  - Viscous and thermal characteristic lengths
  - Static thermal permeability
  - Young's modulus
  - Poisson's ratio
  - Damping loss factor



# Types of materials

**Open cell poroelastic material**

- Foam (metallic, polymer, chipped, etc.)
- Fibrous (glass wool, shoddy, felt, PET, etc.)
- Perforated plates and resistive screen
- Woven and non-woven fabrics

**Frame**

- Rigid (reinforced fiberglass, metal foam, etc.)
- Limp (glass wool, felt, etc.)
- Elastic (polymer foam, etc.)

# Simulation, Sensitivity and Database modules

- Prediction of acoustic indicators under normal incidence plane wave:
  - Absorption coefficient
  - Transmission loss
  - Surface impedance
  - Characteristic impedance
  - Complex wavenumber
  - Dynamic bulk density and dynamic bulk modulus.
- Includes a tools to compare simulations with experimental data (input).
- Takes into account of:
  - Air cavity, rigid or anechoic endings
  - Lateral boundary conditions (sliding or bounded) and air leaks
  - Rigid, limp and elastic material frame type
  - Material thickness and tube diameter
  - Atmospheric conditions
- Includes a sensitivity module to identify the impact of identified parameters uncertainties on acoustic indicators.
- Includes a database module to store, retrieve and compare tested materials.
- All simulated data and database can be exported.
- Identified parameters can be exported to NOVA, VA One.

# Warranty and Support

The software includes one year of technical support. Check with Mecanum for more information about the software exclusion policy.

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# NOVA Software

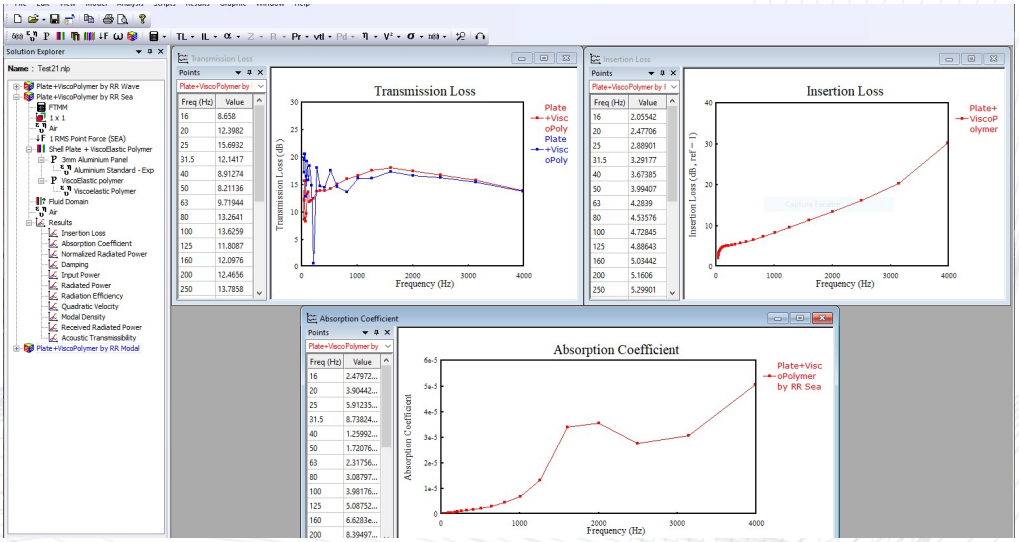
***Acoustic simulation software for multilayer materials***

Nova is a user-friendly, flexible and powerful solution used to predict and optimize vibro-acoustics indicators (e.g. sound absorption, transmission loss, insertion loss, etc.) of acoustics materials and their integration into multilayer structures.

Apply to:

- Foam (e.g. metallic, polymeric, chipped foam, etc.)
- Fiber (e.g. glass wool, rock wool, felt, shoddy, plastic fiber, fabrics, etc.)
- Viscoelastic and solid structures (e.g. thin or thick plate, septum, perforated panel, resistive or impervious screen, etc.)
- As well as other acoustic materials.

By modeling these materials, concept proposals can be made in order to increase their performance according to various fields of application such as automobiles (e.g. carpet, headliner, hood, trunk, dash), aircraft (e.g. panel treatments), buildings (e.g. insulation walls, doors, carpets, single/double windows) and materials industry (e.g. rank and optimizes acoustic performance)

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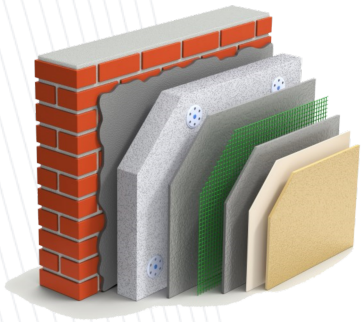
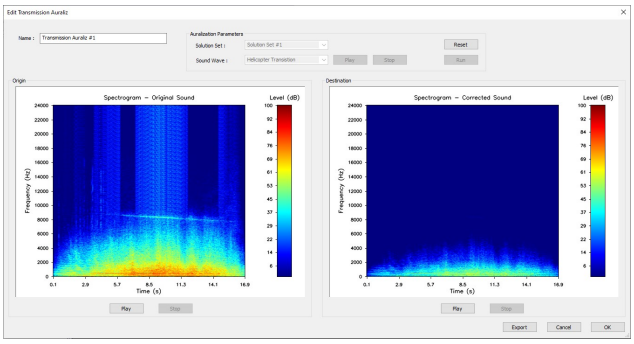
## NOVA Software

- User-friendly interface
- Provides advanced models of porous materials (rigid, flexible, felt, elastic, screens and perforated panels)
- Allows an unlimited combination of materials in order to simulate concrete acoustic problems
- Based on proven technology validated by the University of Sherbrooke (establishment recognized for its research in acoustics)
- Ideal application for acoustics consultants, architects, and manufacturers of noise control materials
- Optimize the acoustic performance of materials without having to model a complete acoustic structure system
- Ability to manually add materials to the existing database
- Possibility of defining materials whose properties are frequency dependent
- Ease of imposing different types of sources such as: plane wave, diffuse field, piston motion, rain on the roof monopole and turbulent boundary layer.
- Frequency analysis in narrow, octave, and 1/3 octave bands
- Calculates all vibroacoustic parameters (absorption, transmission loss, insertion loss, quadradic velocity, radiated power, damping, radiation efficiency, etc.) and classic indicators (STC, RW, NRC, SAA)
- Compatible with FOAM-X software measurement files and other software from ESI Group. Automated export functions to multiple commercial software.



## Features

- Nova includes two modules:
  - medium and high frequencies based on the transfer matrix method considering the finite lateral dimensions of the multilayers;
  - low frequencies based on FEM / BEM method.
- Considers orthotropic, sandwich and composite panels
- Includes automatic detection and joining of different domains (elastic, porous and fluid)
- Studies the effects of different boundary conditions
- Ability to import experimental data such as transfer matrix, wavenumber, absorption coefficient and transmission loss.
- Ability to define target curves and compare them with simulation results.
- Additional script for specific studies (e.g. ring frequency, curved panel, equivalent damping, compression effect and sensitivity analysis on porous material)
- Micro macro scripts for Shoddy, PU foam, fiber and granular based materials
- Auralization prediction tool to compute sound rendering of a simulated transmission loss (predefined bank of experimental, industrial and environmental sounds such as an air extractor or a truck engine)

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