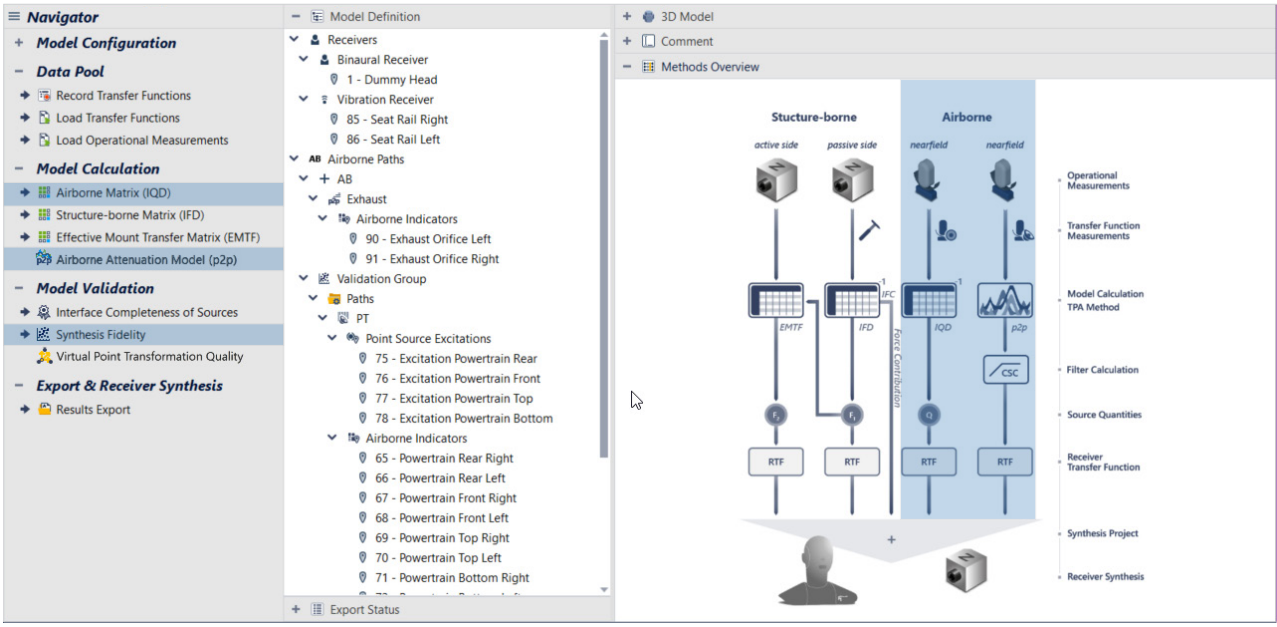
HEAD acoustics

DATA SHEET



ArtemiS SUITE
Signal Processing

Code 51603

ASP 603
TPA – Airborne Analysis

TPA – Airborne Analysis forms part of the TPA package of ArtemiS SUITE and enables the calculation of the IQD matrix and the airborne sound attenuation model (p2p) for the measured airborne sound components.

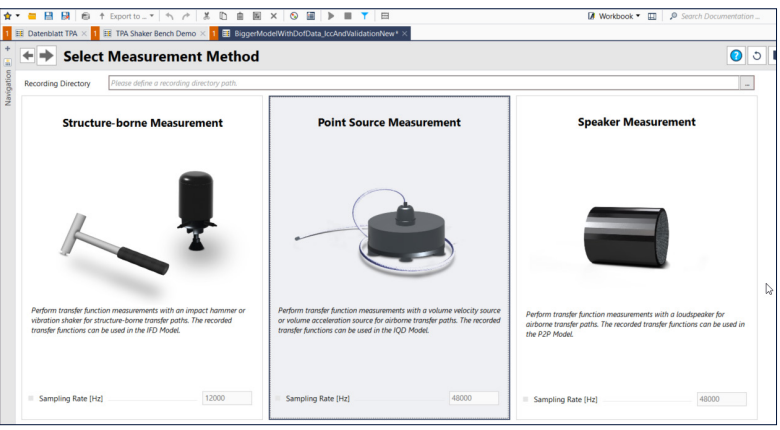
OVERVIEW

ASP 603 TPA – Airborne Analysis

Code 51603

TPA – Airborne Analysis is an optional extension of the TPA Project, enabling the application of the IQD method (Indirect Q-Source Determination) to determine operational volume velocities by inverting the acoustic impedance transfer function matrix. In addition, the p2p method (Pressure to Pressure) is available for determining the noise contributions induced by airborne sound.

Furthermore, TPA – Airborne Analysis enables sound-pressure and volume-velocity measurements to evaluate the quality of the TPA model and to perform validation measurements intended to optimize the mapping accuracy of the synthesis.



KEY FEATURES

Extension to the TPA Project (APR 600 is required) for model creation and model validation of airborne sound components

Supported methods for model calculation:

- Indirect volume velocity determination (Indirect Q-Source Determination, IQD)
- Airborne sound attenuation determination (Pressure to Pressure, p2p)

Model Validation

- Execution of sound pressure and volume velocity measurements for model validation

APPLICATIONS

- Precise, path-selective characterization and analysis of airborne sound sources in the overall system
- Reconstruction of acoustic source strengths (inversion)
- Investigation of airborne sound transmission paths from the source to the receiver
- Identification of dominant sound components
- Quantification of frequency-dependent contributions
- Reliable evaluation of TPA model quality

DETAILS

Model Calculation

IQD Method

The IQD method is used to determine the operational volume velocities by inversion of the acoustic impedance transfer function matrix. To this end, the required input quantities comprise the measured transfer functions from the resultant sound pressure to the applied volume velocity as well as the sound pressures emitted by the source during operation.

Within TPA, the airborne sound matrix is used to clearly delineate airborne-sound-induced contributions from other transfer paths—in particular from structure-borne paths and structural vibrations.

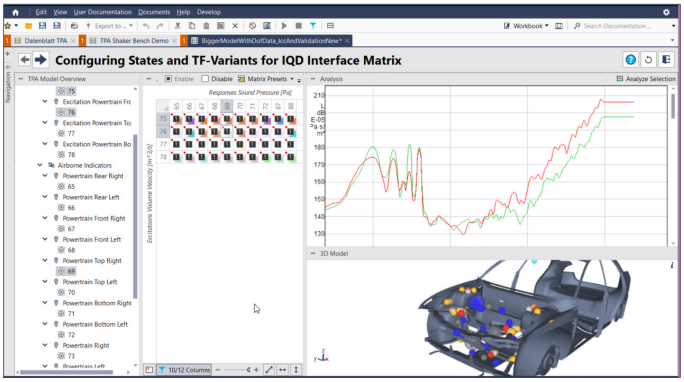
p2p Method

As an alternative to the IQD method, the p2p method can be used to calculate airborne-sound-induced sound contributions. This method is particularly appropriate when the aim of the TPA is to analyze the transfer paths and the sound generation at the receiver position without explicitly determining the acoustic source characteristics.

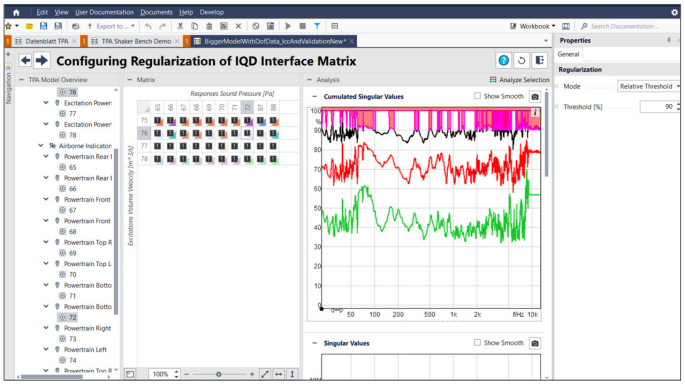
The calculation requires the transfer functions between the applied and the resultant sound pressure. Analogous to the IQD method, the sound pressures emitted by the source during operation must also be available.

When determining the airborne sound attenuation for a source measured with multiple microphones, the individual contributions must be adjusted using a Coherent Source Correction (CSC).

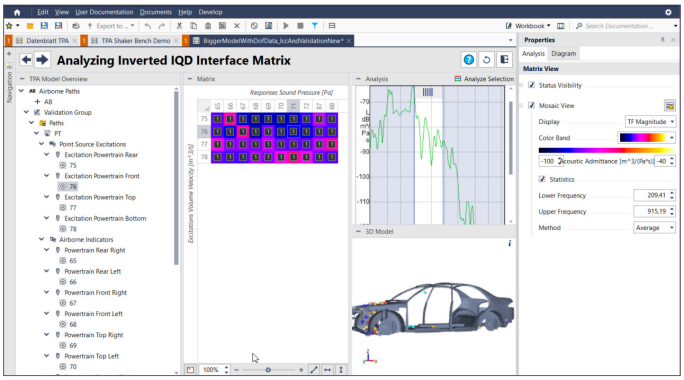
The p2p method thus enables a precise analysis of the airborne transfer paths and provides valuable information on the frequency ranges and mechanisms of noise generation at the receiver—even without directly determining the source quantities.



IQD method: Matrix configuration



IQD method: Regularization of the matrix configuration

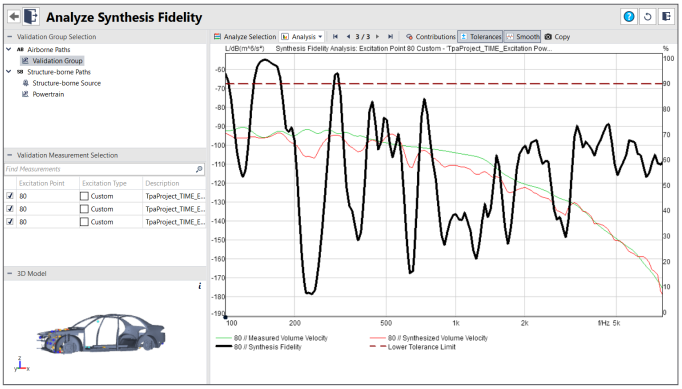


IQD method: Matrix analysis

Model Validation

In this step, validation measurements are used to verify whether the TPA model responds correctly to unknown excitations at the source interface. The mapping quality is evaluated by comparing a measured excitation (sound pressure and volume velocity) with the synthesized excitation calculated on the basis of the defined model structure. The analysis thus provides a frequency-dependent quality criterion that describes the reproduction accuracy of the TPA model for previously unknown excitations.

If the mapping quality does not comply with the requirements of the TPA model, refining the interface matrix, optimizing the applied transfer functions, and modifying the matrix regularizations may all help improve the synthesis accuracy.



Analysis of the synthesis accuracy of the airborne sound paths

LICENSES

Required

Code	Product Name	Description
50000	APR 000 APR Framework	Basis of ArtemiS SUITE
51603	ASP 603 TPA - Airborne Analysis	Indirect determination of the volume velocity via matrix inversion (IQD) and calculation of the airborne sound attenuation model (p2p)
50600	APR 600 TPA Project	Performing transfer path analyses

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