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Titel:

Characterization of airborne sound sources using matrix inversion

Authors: Serafima Velizhanina, Roland Sottek

Abstract:

The matrix inversion method is an approach used in transfer path analysis for determining source characteristics (e.g., volume velocity Q in the case of airborne sound sources). The method allows for representing a complex airborne sound source by a superposition of monopoles. The calculation of Q-values is based on measured sound pressure signals in the near field of the radiating structure, and measured transfer functions (TFs) from the locations of assumed monopoles to the measurement points, using a calibrated Q-source.

Ideally, for TF measurements the Q-source is placed exactly at the positions of the assumed radiating components of the structure, e.g., inside the housing. This is often not realizable: only for case studies, but not without changing the object of interest. Therefore, the measurements are typically performed by placing the Q-source close to the supposed radiating component. This approach causes uncertainties in the determination of the TFs between sources and receiver. Consequently, this leads to errors of the predicted Q-values. Alternatively, the matrix of TFs can be measured reciprocally, reducing errors caused by the external Q-source at the cost of using additional microphones at the housing. In this paper, the different approaches are compared using an application example.