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Titel:

Uncertainties of Airborne Source Characterization using Matrix Inversion

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Abstract:

Matrix inversion methods are widely used in structure-borne Transfer Path Analysis (TPA) for indirect force determination based on measurements of acceleration signals and inertance matrices. Instead, for airborne TPA, the sound shares are often synthesized using microphone measurements at each side near the source in combination only with airborne sound sensitivities measured with a small loudspeaker. This may be sufficient to estimate the transmission of airborne sound energy from source to receiver, but for a detailed analysis of the contribution of particular structural units of a complex source, a correct definition of source characteristics is a very important step.
Matrix inversion methods also allow evaluating the volume velocity of a complex source as a superposition of assumed monopoles composing this source. Calculations are based on measured sound pressure signals in the near field around the source and measured transfer functions from the locations of assumed monopoles to the measurement points, using a volume velocity source. The choices of the number and locations of the measurement points, as well as the assumed number and distribution of monopoles, influence the final results. Uncertainties caused by these parameters were studied using a simplified model of a complex source consisting of several loudspeakers.