

Holographic reconstruction of sound fields based on the acousto-optic effect - DTU Orbit (09/11/2017)

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Recent studies have shown that it is possible to measure a sound field using acousto-optic tomography. The acousto-optic effect, i.e., the interaction between sound and light, can be used to measure an arbitrary soundfield by scanning it with a laser Doppler vibrometer (LDV) over an aperture; This can be described mathematically by means of the Radon transform of the acoustic field. An interesting feature of this Measurement technique is that the spatial characteristics of the sound field are captured in the measurement. Therefore, the technique has an inherent holographic potential, implicitly yielding a full characterization of the sound field. In this study, a direct projection of the Radon transform from one plane to another and into the space domain, based on an elementary wave expansion is proposed. The relationship between the Radon and the wavenumber domains is examined, and the reconstruction potential of the method analyzed. The study includes both numerical and experimental results.

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