

In situ measurements of the oblique incidence sound absorption coefficient for finite sized absorbers - DTU Orbit (08/11/2017)

In situ measurements of the oblique incidence sound absorption coefficient for finite sized absorbers

Absorption coefficients are mostly measured in reverberation rooms or with impedance tubes. Since these methods are only suitable for measuring the random incidence and the normal incidence absorption coefficient, there exists an increasing need for absorption coefficient measurement of finite absorbers at oblique incidence in situ. Due to the edge diffraction effect, oblique incidence methods considering an infinite sample fail to measure the absorption coefficient at large incidence angles of finite samples. This paper aims for the development of a measurement method that accounts for the finiteness of the absorber. A sound field model, which accounts for scattering from the finite absorber edges, assuming plane wave incidence is derived. A significant influence of the finiteness on the radiation impedance and the corresponding absorption coefficient is found. A finite surface method, which combines microphone array measurements over a finite sample with the sound field model in an inverse manner, is proposed. Besides, a temporal subtraction method, a microphone array method, impedance tube measurements, and an equivalent fluid model are used for validation. The finite surface method gives promising agreement with theory, especially at near grazing incidence. Thus, the finite surface method is proposed for further measurements at large incidence angles.

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