Tunable Flat-Plate Absorber Design for Active Sound Absorption

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Abstract

Noise reduction at low frequencies is a major issue in many workspaces and indoor public places. Unlike mid- and high-frequency noise, low frequency noise is less attenuated by using conventional sound absorbing materials. This communication proposes an electro-mechano-acoustic absorber model that couples three physical domains using plate vibration and sound radiation theories. The mechanical system is an elastically suspended plate specifically developed to favor the piston-like movement thereof. An electromechanical transducer is attached to the plate in order to tailor its dynamic response to incident pressure waves, thereby improving the sound absorption capacity of the system. Structural Mechanics module and Acoustics module are used in this study. We present the design and modeling of this electro-mechano-acoustic system, including the feedback control law which allows to turn it into a tunable electroacoustic absorber. The acoustic performance experimentally achieved from a prototype absorber are then compared to the simulation results.

Figures used in the abstract

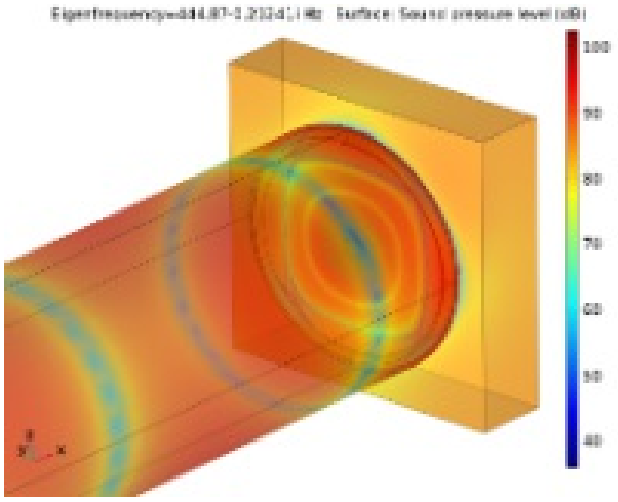

Figure 1: Sound pressure distribution in a duct controlled by a flat-plate electroacoustic absorber.