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High sound pressure models for microperforated panels backed by an air cavity

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When submitted to relatively high sound pressure amplitudes, Micro Perforated Panels (MPP) are influenced by certain effects, which are non negligible (vibration of the panel, end radiation and also proximity of the perforations). A model of the total impedance of the MPP is derived from the sum of the contributions of each effect in the case of relatively high sound pressure. The effect of end radiation is supposed to be independent of the propagation inside the apertures. The model is applicable for low Mach numbers. In order to validate the models, various steel MPP specimens were built with different aperture diameters, interstices (distance between two near apertures) and thickness sizes. The experimental method consists in measuring the acoustical pressure before the specimen and the velocity at the aperture entrance. The experimental setup is based on the use of an impedance circular tube. A loudspeaker capable of delivering high sound pressure is used as a source. The excitation is a white noise in a frequency range between 500 Hz and 5000 Hz and the detection is performed with microphones. The comparison between measurements and simulations for the impedance and absorption coefficient is done and discussed.