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Low frequency evaluation of steady-state pressure distribution and reverberation time in two-room coupled system

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A modal expansion method supported by a numerical implementation has been used for studying acoustic properties of coupled room system composed of two connected rectangular enclosures. In a theoretical model a low frequency limit was considered, where modes are lightly damped, thus they were approximated by eigenmodes of a hard-walled room. Eigenfunctions and eigenfrequencies were computed numerically via an application of the forced oscillator method. Calculation results have shown a great influence of absorbing material location and sound source position on the distribution of acoustic pressure and sound decay inside enclosures. As was shown it is the result of a modal localization caused by a generation of modes with eigenfrequencies very close to frequencies of modes in rectangular prisms having the same dimensions as enclosures. When one of enclosures was much more absorbent than the other one, calculation data have demonstrated an interaction of modes during a sound decay that produces reverberant curves with a rapid initial decay and a shallow late decay slope. As was found a "sagging" appearance of decay curves occurs when a late sound decay is dominated by a decay of eigenmodes localized in an enclosure with a weak sound damping.