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COMPUTATIONAL STRATEGIES FOR ACOUSTIC TRANSMISSION STUDIES

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The paper addresses the evaluation of acoustic transmission characteristics of sound insulation components using numerical methods. The related problem is solved in the frequency domain using elasto-acoustic approximations [1]. A particular attention is devoted to the handling of semi-infinite acoustic media and the related Sommerfeld radiation condition. Particular implementations of conjugated infinite element [3] and PML (Perfectly Matched Layer) formulations are discussed and compared. The so-called pollution error is handled using modified integration schemes. Diffuse field and turbulent boundary layer excitations (TBL) are considered. Such excitations are modeled as distributed, homogeneous, random processes characterized by reference power spectra and particular spatial correlation functions [2]. For the diffuse field case, the form retained for the spatial correlation accounts for the elimination of grazing incidences [4]. Various semi-empirical TBL models are considered. An algebraic strategy [5]is selected for sampling the related multi-correlated processes along the grid of the loaded surface. The procedure relies on Cholesky decomposition of the matrix of auto- and cross-power spectra and the generation of random phase factors. Mesh requirements related to such a sampling are highlighted. Acoustic transmission examples are presented. Comparisons with analytical solutions are provided for simple geometries. The computational efficiency of proposed strategies is assessed.

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