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An Application of Time-Reversal Acoustics to Sound Insulation
Measurements in Buildings

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This paper considers the possible application of time reversal acoustics (TRA) to airborne sound insulation measurements in buildings. In TRA, an array of transducers is set up to form a time-reversal 'mirror' or 'cavity'. Using this array, the sound radiated from an initial source is collected and refocused spatially and temporally, thereby being reproduced at the initial source position with high signal-to-noise ratio (S/N). Most previous studies of TRA have been conducted underwater with ultrasonic sound sources, with only a few in the audible range in real buildings. The technique is best suited to non-dissipative systems, raising the question of whether any advantage could exist for transmission between rooms. This study applies TRA experimentally in the audible range using maximum length sequence signals for transmission between two rooms. Comparison is made between conventional measurements (with and without impulse response deconvolution) and TRA in terms of effective S/N and apparent level difference between the rooms. Substantially greater S/N is achieved using TRA, but the interpretation of measurements is not straightforward, and the technique is much more demanding than conventional measurements.