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An improved low frequency radiation model for finite sound reflectors

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Geometric computer models for room acoustics, such as ODEON, predict sound fields most reliably at high frequencies. At low frequencies, algorithms must be modified to account for deviations from geometrical acoustics caused by wave phenomena. For finite reflectors, a common low frequency model is based on the Kirchhoff-Fresnel Diffraction Approximation, which predicts a uniform 6 dB per octave slope below a reflector's geometrical limiting frequency. As discussed in this paper, highly accurate Boundary Element Method simulations, not subject to the Kirchhoff Approximation, suggest the use of an additional, lower limiting frequency and slope of 12 dB per octave to represent the reflector's response at the lowest frequencies. This second limiting frequency and 12 dB per octave slope, referred to as the dipole limiting frequency, are presented in a form suitable for insertion into a geometric computer model. [Work supported by the National Science Foundation.]