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Boundary Element Method with Viscous and Thermal Losses: A Calibration Microphone Test Case

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A Boundary Element Method implementation including viscous and thermal losses of sound waves at the boundaries was proposed [1,2] and applied successfully to a number of cases, e.g. acoustic metamaterials and measurement microphones [3,4]. As other implementations employing the Finite Element Method, the BEM with losses is based on the linearized Navier-Stokes equations with no flow. In this presentation, a full three-dimensional BEM model of a one-inch condenser microphone designed for primary calibration, the B&K 4160, will be used for the discussion of the shortcomings of the BEM with losses [5]. This test case is particularly challenging due to its size, internal intricacy and strong coupling of internal, external and membrane domains. This model will be compared with other simpler BEM models of condenser microphones. Based on the results, possible paths for further improvement of the BEM implementation with losses will be suggested.

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