Finite Element Modeling of Sound Radiation at the Open End of a Conic Frustum

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ABSTRACT

The linear acoustic response of wind music instruments can be modeled by approximating their air column geometries with piece-wise combinations of cylindrical and conical sections. For sections that couple to a radiating domain (toneholes and open ends), theoretical load impedance or reflection coefficient characterizations must be used. While theoretical approximations for the open end of flanged and unflanged cylinders are well documented, none exist for flanged or unflanged cones. In this study, we make use of the finite element method to evaluate the reflection coefficient at the open end of a flanged and unflanged conic frustum of varying taper angle and radius, with the goal of providing approximate formulas for the corresponding reflection coefficient magnitudes and length corrections.