# A NUMERICAL STUDY OF THE EFFECTS OF TRAILING EDGE BLUNTNESS ON AIRFOIL TONAL NOISE

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**Abstract.** The aim of this study is to analyze the effects of trailing edge bluntness on airfoil tonal noise generation and propagation at low and moderate Reynolds numbers. Several simulations are conducted for a NACA 0012 airfoil at four different freestream Mach numbers, M=0.1 to 0.5. The angle of incidence is set equal to 3 deg, and the Reynolds number based on the airfoil chord is set at Re=5000, 10000 and 100000. The effects of compressibility on sound generation and propagation are analyzed along with the effects of scattering by blunt trailing edges with four different radii of curvature. Sound generation by vortex shedding is computed by a hybrid method and an accurate two-dimensional direct calculation, and results are compared. The hybrid approach uses direct calculation for near-field source computations and the Ffowcs Williams-Hawkings equation as the acoustic analogy formulation. Numerical results show that the airfoil emits an intense "narrow-band" tone and that a thicker trailing edge emits higher noise levels than a thinner one since the magnitude of quadrupole sources are larger for the thicker configuration. Moreover, the spatial distribution of quadrupole sources shows that the peak quadrupole values are closer to the surface when the trailing edge is thicker, which, again, increases the scattered far field noise.