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Sound-turbulence interaction in transonic boundary layers LUDOVIC LELOSTEC, Department of Aeronautics and Astronautics, Stanford, CA, 94305, CARLO SCALO, Department of Mechanical Engineering, Purdue University, IN 47907-2045, SANJIVA LELE, Department of Aeronautics and Astronautics, Stanford, CA, 94305 — Acoustic wave scattering in a transonic boundary layer is investigated through a novel approach. Instead of simulating directly the interaction of an incoming oblique acoustic wave with a turbulent boundary layer, suitable Dirichlet conditions are imposed at the wall to reproduce only the reflected wave resulting from the interaction of the incident wave with the boundary layer. The method is first validated using the laminar boundary layer profiles in a parallel flow approximation. For this scattering problem an exact inviscid solution can be found in the frequency domain which requires numerical solution of an ODE. The Dirichlet conditions are imposed in a high-fidelity unstructured compressible flow solver for Large Eddy Simulation (LES), CharLES^{x}. The acoustic field of the reflected wave is then solved and the interaction between the boundary layer and sound scattering can be studied.

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