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Frequency-Wavenumber Spectrum of Surface Pressure Fluctuations Induced by High-Speed Turbulent Boundary Layers JUNJI HUANG, YUCHEN LIU, LIAN DUAN, The Ohio State University — Spatio-temporal structure of the fluctuating pressure field induced from high-speed turbulent boundary layers is analyzed by using a database of direct numerical simulations (DNS). Specifically, DNS are used to examine and compare the frequency-wavenumber spectrum of wall pressure generated by Mach 8 turbulent boundary layers developing spatially over several canonical geometries including a 2-D flat wall, the inner wall of an axisymmetric nozzle, and a sharp slender circular cone. The study provides insights into the scaling of pressure disturbance spectrum with respect to the boundary-layer parameters and the flow configuration. Such information is important to developing physics-based models that could adequately predict the magnitude, frequency content, location, and spatial extent of boundary-layer-induced pressure fluctuations at high speeds for the structural design of high-speed vehicles.

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