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**Near-field acoustic radiation by high-speed turbulence: amplitude, structure, gas-stiffness, and dilatational dissipation** DAVID BUCHTA, JONATHAN FREUND, University of Illinois at Urbana-Champaign — High-speed (supersonic) turbulent shear flows are well-known to radiate pressure-wave patterns that have higher positive peaks than negative valleys, which yields a notable skewness, usually with $S_k > 0.4$. Direct numerical simulations (DNS) of planar turbulent mixing layers at different Mach numbers ($M$) are used to examine this. The baseline simulations, of an air-like gas at speeds up to $M = 3.5$, reproduced the observed behavior of jets. Simulations initialized with corresponding instability modes show that $S_k$ increases linearly with the velocity amplitude ($M_t = \sqrt{\overline{u_i'u_i'}}/c_o$), reflecting the $M$ dependence of the DNS, which can be related to simpler gas dynamic flows. Simulations with a stiffened-gas equation of state (often used to model liquids) show essentially the same Mach-number dependence, despite the nominally greater resistance to compressibility. Turbulence simulations with an artificial energy reallocation mechanism, imposed to alter its structure, show little change in $S_k$. Finally, we also consider significantly increased bulk viscosity to suppress dilatation. In this case, $S_k$ diminishes along with the sound-field intensity, though the turbulence stresses themselves are nearly unchanged.

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