Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

**Jet Crackle: Near-field Nonlinear Acoustic Interactions Due to High-Speed Turbulent Sources** DAVID BUCHTA, JONATHAN FREUND, University of Illinois — It is thought that supersonically advecting eddies in high-speed turbulent jets can radiate Mach-wave-like sound, which corresponds with the perception of a rasping or crackling character in their radiated sound. This perception is thought to be in part due to weak shocks in the sound field, but there is another feature of the sound which suggests that more than simple one-dimensional wave steepening occurs: the pressure signals at a point are skewed, with $S_k \geq 0.4$ also correlating to the perception of crackle. This is peculiar because simple nonlinear steepening will not of itself generate skewed pressure signals. We use direct numerical simulations of temporally developing turbulent free shear flows ($Re = 1530$ up to $Re = 2810$ based on momentum thickness) of crackling and non-crackling temporal planar shear layers to study their near-field acoustics and turbulent sound source. Space–time correlations of the turbulence, statistical measures of near-field wave density and propagation directions, and observations of wave-wave interactions suggest that very near-field nonlinear acoustics are potentially important for the generation of these observed peculiar sound-field characteristics.

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Date submitted: 01 Aug 2013 Electronic form version 1.4