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Near and Far Field Acoustic Pressure Skewness in a Heated Supersonic Jet[1] EPHRAIM GUTMARK, PABLO MORA, JEFF KASTNER, NICK HEEB, University of Cincinnati, KAILAS KAILASANATH, JUNHUI LIU, Naval Research Laboratory, UNIVERSITY OF CINCINNATI COLLABORATION, NAVAL RESEARCH LABORATORY COLLABORATION — The dominant component of turbulent mixing noise in high speed jets is the Mach wave radiation generated by large turbulent structures in the shear layer The Over-All Sound Pressure Level (OASPL) in the far field peaks in a direction near the Mach wave angle. "Crackle" is another important component of high speed jet noise. Crackle cannot be recognized in the spectrum of the acoustic pressure signal, but it appears in the temporal waveform of the pressure as sharply rising peaks. Skewness levels of the pressure and dP/dt have been used as a measure of crackle in high specific thrust engines and rockets. In this paper, we focus on recognizing a technique that identifies the impact of different test conditions on the near-field and far-field statistics of the pressure and dP/dt signals of a supersonic jet with a design Mach number of Md=1.5 produced by a C-D conical nozzle. Cold and hot jets, T0=300K and 600K, are tested at over, design, and under-expanded conditions, with NPRs=2.5, 3.671, 4.5, respectively. Second, Third and Forth order statistics are examined in the near and far fields. Rms, skewness and kurtosis intensity levels and propagation are better identified in the dP/dt than in the pressure signal. Statistics of the dP/dt demonstrate to be a better measure for crackle.

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