Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

**Correlation of Large-scale Structures and Far-field Radiated Noise in High-speed and High Reynolds Number Jets**[1] JEFF KASTNER, JIN-HWA KIM, MO SAMIMY, The Ohio State University — The importance of dynamic processes involving large coherent structures in entrainment, mixing, and noise generation in free jets and shear layers is well established. The present research attempts to further the understanding of the relationship between the large coherent structure dynamics and the far-field sound of high-speed and high Reynolds number jets. This was achieved by exploring the flow field and the far field of two axisymmetric jets with a Mach number of 0.9 ($Re_D$ of 7.6 x $10^5$) and 1.3 ($Re_D$ of 1.1 x $10^6$). The jets were controlled by eight localized arc filament plasma actuators distributed around the nozzle exit. The actuators operate over a frequency range of 0 to 200 kHz, and the phase between the eight actuators can be varied to allow excitation of azimuthal modes 0, 1, 2, 3, $\pm1$, $\pm2$ and $\pm4$. The far field of the jets was probed with a three-dimensional microphone array at 30 $^\circ$ to the downstream jet axis. The array estimates the origin of sound waves in space and time and also provides the sound pressure level. The flow field of the jets was investigated using flow visualization and particle image velocimetry. Both techniques are non-intrusive planar measurements that provide mean and fluctuating quantities of the flow field. Detailed results from the far-field and flow field diagnostics and their correlation will be presented and discussed.

[1]Supported by NASA Glenn Research Center and OCAPP

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Date submitted: 01 Aug 2006 Electronic form version 1.4