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Towards High Speed Jet Noise Reduction Using Time-Resolved PIV[1] ZACHARY BERGER, Syracuse University, MATTHEW BERRY, Syracusye University, PATRICK SHEA, Syracuse University, BARRY KIEL[2], Air Force Research Laboratory, NAIBO JIANG, Spectral Energies, LLC., BERND NOACK, Institute PPRIME/CNRS, SIVARAM GOGINENI, Spectral Energies, LLC., MARK GLAUSER, Syracuse University — In this investigation, the flow field of a Mach 0.6 turbulent, compressible jet is studied using time-resolved particle image velocimetry (TRPIV). The hydrodynamics and acoustics are simultaneously sampled using pressure sensors in the near-field and microphones in the far-field, respectively. Two-component velocity measurements are taken in the streamwise plane of the jet, just before the collapse of the potential core. Several planes are obtained off of the jet's centerline, providing information across the entire nozzle and beyond the expanding shear layer. These measurements will provide a three-dimensional view of the flow field in the spanwise direction of the jet. Low-dimensional modeling tools are implemented to extract the energetic modes in the flow. In addition, correlations between the near-field velocity and the far-field acoustics are computed using similar techniques. These results will assist in identifying the structures and events in the near-field responsible for the far-field noise. The goal is to use the time-evolution of the flow field to identify these events both spatially as well as temporally. Ultimately, active flow control schemes will then be developed based on these findings.

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