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A Method for Estimating Far-Field Acoustics Generated by a Turbulent Wall Jet ADAM NICKELS, LAWRENCE UKEILEY, University of Florida, ROBERT REGER, LOUIS CATTAFESTA, Florida State University — Noise generated via flow interactions within a turbulent wall jet is investigated using a multi-stage estimation method. Two component Particle Image Velocimetry (PIV) and surface pressure measurements are acquired at a Reynolds number based on nozzle height of 25,500. The PIV snapshots and surface pressure measurements were acquired in a synchronous manner to allow for correlation between the quantities. A Proper Orthogonal Decomposition (POD) and Linear Stochastic Estimation (LSE) based technique is used to estimate a set of time-resolved velocity fields at a higher time resolution than was measured. To improve the estimates, the Kalman filter is employed to leverage measurements against a dynamical model established by employing Dynamic Mode Decomposition (DMD) on an independent set of time resolved PIV data. With the estimated time resolved velocity fields and surface pressure measurements, Poisson's equation for fluctuating pressure is solved to find the pressure acting along the entire surface under the wall jet. The far-field acoustics generated by the wall jet are then estimated by solving Curle's acoustic analogy, using the integrated surface pressure as the source term.

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