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Spectral analysis of "homogenized" PIV data of axisymmetric jet turbulence MAJA WÄNSTRÖM, Chalmers University of Technology, WILLIAM K. GEORGE, CNRS, LML, Lille, France, KNUD ERIK MEYER, Technical University of Denmark — This paper concerns the estimation of one-dimensional spatial spectra from a set of 10,580 two-component velocity fields in a plane cut along the centerline axis of a turbulent air jet. The jet nozzle diameter $d = 1cm$ and the field-of-view extends from $30d$ to $100d$ and covers at least four jet half-widths. The Reynolds number based on nozzle diameter is $Re = 20,000$. Following [1], PIV data of the growing flow was mapped and re-sampled into streamwise homogeneous similarity coordinates, $\eta = r/\delta_{1/2}(x)$ and $\xi = \ln[(x - x_o)/D]$. Inevitable spatial variation in attainable dynamic range was overcome by the extensive number of statistically independent samples. Studies of the effects of window length and type, filtering, sampling noise and data re-sampling on the spectral energy distribution are performed and discussed. Finally, the spectral estimates are compared to the temporal estimates of [2], which are obtained by hotwire using Taylor's Hypothesis.

[1] Ewing, D. et al. J. Fluid Mech., 577, 309-330, 2007.
[2] Frohnapfel, B. Multi-Point Similarity of the Axisymmetric Turbulent Far Jet and Its Implication for the POD. Master Thesis, U. Erlangen 2003.

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