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**Spatially resolved measurements of fine-scale structure in a turbulent flow between two counter-rotating disks using scanning PIV** JOHN LAWSON, University of Cambridge, JAMES DAWSON, Norwegian University of Science and Technology — The smallest lengthscales of turbulent motion contain important features of its character: they are strongly intermittent and are responsible for the dissipation of kinetic energy and micro-scale mixing. Until recently, access to space- and time-resolved, 3D measurements of turbulent velocity fields has largely been the purview of numerical simulation. The capabilities of existing experimental techniques, such as tomographic PIV and stereo PIV, have limited their application to laboratory investigation of the fine scale motion. We have developed a variant upon scanning PIV using two high speed cameras, combining aspects of tomographic reconstruction and 3D cross-correlation techniques to yield time resolved, 3D-3C measurements in a turbulent flow between two counter-rotating disks at $R_\lambda \simeq 219$. The measurement is low noise, exhibits a variety of fine-scale phenomena and captures the turbulent dissipation to within 3%. Statistics of velocity gradients are consistent with homogeneous, axisymmetric turbulence but not isotropy. This new capability permits us to present a handful of results concerning the fine-scale structure of the velocity field and its derivatives, from the perspective of an observer travelling with the flow and aligned with the strain eigenframe.

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