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Stereo PIV Measurements in the Wall-Normal-Spanwise Plane of Turbulent Channel Flow J.M. BARROS, K.T. CHRISTENSEN, U. Illinois — Stereo PIV measurements are conducted over a $4h \times h$ field of view in the wall-normal–spanwise plane of turbulent channel flow for fully-developed smooth-wall conditions at a friction Reynolds number of 600. These experiments represent a significant challenge to the stereo PIV method as the dominant velocity component is oriented normal to the PIV measurement plane while the in-plane components are much weaker turbulent fluctuations. Validation of the experimental method is achieved via comparison with direct numerical simulation data at a similar Reynolds number. Good agreement is noted both in the mean streamwise velocity as well as the Reynolds normal and shear stresses. Inspection of instantaneous velocity fields in this cross-plane reveals the spatial signatures of low- and high-momentum regions, the former of which have been previously linked to hairpin vortex packets in the outer layer of wall turbulence. These regions can extend to the centerline of the channel and often embody a significant fraction of the Reynolds shear stress. Two-point correlations are used to study the average characteristics of these features on the wall-normal–spanwise plane.

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