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Time resolved, near wall PIV measurements in a high Reynolds number turbulent pipe flow C. WILLERT, German Aerospace Center (DLR), Germany, J. SORIA, Monash University, Australia, M. STANISLAS, Ecole Centrale de Lille, France, O. AMILI, Monash University, G. BELLANI, University of Bologna, Italy, C. CUVIER, Ecole Centrale de Lille, M. EISFELDER, Monash University, T. FIORINI, University of Bologna, N. GRAF, Innolas GmbH, Germany, J. KLINNER, German Aerospace Center (DLR) — We report on near wall measurements of a turbulent pipe flow at shear Reynolds numbers up to $Re_\tau = 40000$ acquired in the CICLoPE facility near Bologna, Italy. With 900 mm diameter and 110 m length the facility offers a well-established turbulent flow with viscous length scales ranging from $y^+ = 85\mu$m at $Re_\tau = 5000$ to $y^+ = 11\mu$m at $Re_\tau = 40000$. These length scales can be resolved with a high-speed PIV camera at image magnification near unity. For the measurement the light of a high-speed, double-pulse laser is focused into a $\approx 300\mu$m thin light sheet that is introduced radially into the pipe. The light scattered by 1μm water-glycerol droplet seeding is observed from the side by the camera via a thin high-aspect ratio mirror with a field of view covering 20mm in wall-normal and 5mm in stream-wise direction. Statistically converged velocity profiles could be achieved using 70000 samples per sequence acquired at low laser repetition rates (100Hz). Higher sampling rates of 10 kHz provide temporally coherent data from which frequency spectra can be derived. Preliminary analysis of the data shows a well resolved inner peak that grows with increasing Reynolds number. (Project funding through EuHIT - www.euhit.org)

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