Simultaneous wall-shear-stress and wide-field PIV measurements in a turbulent boundary layer\textsuperscript{1} GUILLAUME GOMIT, University of Southampton, GREGOIRE FOURRIE, Universite internationale de Rabat, ROELAND DE KAT, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — Simultaneous particle image velocimetry (PIV) and hot-film shear stress sensor measurements were performed to study the large-scale structures associated with shear stress events in a flat plate turbulent boundary layer at a high Reynolds number ($Re_\tau \approx 4000$). The PIV measurement was performed in a streamwise-wall normal plane using an array of six high resolution cameras (4×16MP and 2×29MP). The resulting field of view covers $8\delta$ (where $\delta$ is the boundary layer thickness) in the streamwise direction and captures the entire boundary layer in the wall-normal direction. The spatial resolution of the measurement is approximately 70 wall units (1.8 mm) and sampled each 35 wall units (0.9 mm). In association with the PIV setup, a spanwise array of 10 skin-friction sensors (spanning one $\delta$) was used to capture the footprint of the large-scale structures. This combination of measurements allowed the analysis of the three-dimensional conditional structures in the boundary layer. Particularly, from conditional averages, the 3D organisation of the wall normal and streamwise velocity components ($u$ and $v$) and the Reynolds shear stress ($-u'v'$) related to a low and high shear stress events can be extracted.

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