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Dynamics of straight and curvy long fibers in turbulent channel flow MOBIN ALIPOUR, TU Wien, University of Udine, MARCO DE PAOLI, TU Wien, SINA GHAEMI, University of Alberta, ALFREDO SOLDATI, TU Wien, University of Udine — In this study, we investigate the behavior of long fibers in turbulent channel flow. The experimental facility consists of a closed water channel (aspect ratio 10) and the experiments are performed at the shear Reynolds number $Re_\tau = 350$. The fibers consist of neutrally buoyant rods, both straight and curvy, characterized by a length-to-diameter ratio of 120. Fibers are recorded by four high-speed cameras in a fully developed flow section. We propose a new three-dimensional reconstruction and tracking method based on the light intensity distribution, which is obtained with the multiple algebraic reconstruction technique (MART). The fibers are first discriminated, i.e. the voxels corresponding to the location of the fibers are detected, then the orientation of the fibers is identified and tracked. We show that the tomographic analysis proposed allows an accurate reconstruction of both position and orientation of the fibers. We investigate the behavior of the fibers in two distinct regions of the flow (the channel center and the near-wall region). We analyze the effect of the curvature of the fibers on their orientation and rotation rate, and we observed that in both cases the impact of the curvature is remarkable.

Mobin Alipour
TU Wien, University of Udine

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