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Experimental Investigation of Turbulent-driven Sheared Parallel Flows in the CSDX Plasma Device GEORGE TYNAN, RONGJIE HONG, JIACONG LI, SAIKAT THAKUR, PATRICK DIAMOND, UC San Diego — Parallel velocity and its radial shear is a key element for both accessing improved confinement regimes and controlling the impurity transport in tokamak devices. In this study, the development of radially sheared parallel plasma flows in plasmas without magnetic shear is investigated using laser induced fluorescence, multi-tip Langmuir and Mach probes in the CSDX helicon linear plasma device. Results show that a mean parallel velocity shear grows as the radial gradient of plasma density increased. The sheared flow onset corresponds to the onset of a finite parallel Reynolds stress that acts to reinforce the flow. As a result, the mean parallel flow gains energy from the turbulence that, in turn, is driven by the density gradient. This results in a flow away from the plasma source in the central region of the plasma and a reverse flow in far-peripheral region of the plasma column. The results motivate a model of negative viscosity induced by the turbulent stress which may help explain the origin of intrinsic parallel flow in systems without magnetic shear.

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