Variation of intermittency with flow shear in the Large Plasma Device

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The Large Plasma Device (LAPD) is a 17 m long, 60 cm diameter magnetized plasma column with typical plasma parameters $n_e \sim 1 \times 10^{12}\text{cm}^{-3}$, $T_e \sim 10\text{eV}$, and $B \sim 1\text{kG}$. Broadband, fully-developed turbulence is observed in the edge of the LAPD plasma along with spontaneously driven azimuthal flows. The capability to continuously vary the edge flow and flow shear has been developed in LAPD using biasing of an annular limiter; this control has been used to document the response of turbulent transport to flow shear in LAPD [1]. Turbulent transport is reduced monotonically with increasing shear, regardless of the sign of the flow (or flow shear). More recently, changes in the intermittency of edge turbulence with changing edge flow has been investigated. The intermittency of the turbulence (as measured by, e.g., the skewness of the amplitude PDF) is *minimized* at low flow and increases with increasing flow in either direction; opposite of the trend observed in the turbulent transport. At low/moderate flow, the intermittent structures are consistent with "blobs," and a clear dipolar potential structure is observed. At high flow and flow shear, the turbulence is strongly intermittent and this intermittence seems to be connected to a coherent mode which is likely driven by the rotational interchange instability. In the high-flow limit, intermittent structures are observed, but they appear to be entrained in the strong azimuthal flow and do not propagate radially.

[1] D.A. Schaffner, et al., Phys. Rev. Lett. 109, 135002 (2012)