

Abstract Submitted
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Investigating the Interactions between Intrinsic Rotation and Turbulence through Multifield Fluctuation Correlation Analysis¹ XIJIE QIN, GEORGE MCKEE, ZHENG YAN, MATT KRIETE, DINH TRUONG, BENEDIKT GEIGER, University of Wisconsin-Madison, UNIVERSITY OF WISCONSIN-MADISON TEAM — Intrinsic rotation is predicted to be driven by long-wavelength turbulence, $k \sim \rho_i$, while $E \times B$ shear that results from intrinsic and externally driven rotation can suppress turbulence and enhance turbulence decorrelation. To investigate those two competing mechanisms, experiments were performed to measure turbulence and the phase relationships between various fluctuating fields: density fluctuations (\tilde{n}) from Beam Emission Spectroscopy (BES), ion temperature fluctuation (\tilde{T}_i) and toroidal velocity fluctuations (\tilde{v}_ϕ) from Ultra-Fast Charge Exchange Recombination Spectroscopy (UF-CHERS). In plasmas heated by NBI or NBI+ECH on DIII-D, toroidal rotation, $E \times B$ shear, and momentum transport changed significantly as T_e/T_i increased with ECH injection. The correlation and phase relationship between \tilde{v}_ϕ and \tilde{n} are examined and compared at varying T_e/T_i . The effects of $E \times B$ shear on turbulence are investigated by obtaining a 2D $E \times B$ flow-field through velocimetry analysis and calculating turbulence correlation length and decorrelation times through inter-channels correlation analysis. These results will elucidate the role of turbulence in driving intrinsic rotation.

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