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[] Theory [x] Experiment

Initial UF-CHERS Measurements of Ion Temperature Fluctuations as a Function of Electron Temperature Gradient,*

D. Truong, R.J. Fonck, G.R. McKee, Z. Yan, *U. Wisc-Madison*; S.P. Smith, *GA* – The Ultra Fast CHarge Exchange Recombination Spectroscopy (UF-CHERS) diagnostic on DIII-D measures local, long-wavelength ion temperature and toroidal velocity fluctuations at turbulence-relevant spatiotemporal scales. The optical system consists of 2 spatial channels, with 8 spectral channels each, set 1 cm apart radially (within a turbulence correlation length). UF-CHERS measures photons emitted from the $n=8-7$ transition of C VI at 529.05 nm during the charge exchange recombination reaction between injected neutral beam deuterium atoms and intrinsic carbon ions. Unique features include high optical throughput, low-noise, high-gain, high efficiency APD detectors, and a 1 MHz sampling rate; all designed to measure turbulent ion thermal fluctuations. In an experiment exploring the calculated shortfall of transport and turbulence at high gyroBohm normalized flux in L-mode plasmas, varying ECH power was applied between $\rho=0.6$ and $\rho=0.8$ to change the gradient scale length and local heat flux to examine transport behavior near $\rho=0.7$. This experiment provided a suitable test case for UF-CHERS and measurements were obtained as a function of electron temperature gradient; initial results will be presented.

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