

**Abstract Submitted for the 51st Annual Meeting  
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**Advanced Ion Temperature and Velocity Fluctuation Diagnostic Design and Preliminary Measurements,\*** I.U. Uzun-Kaymak, R.J. Fonck, G.R. McKee, D.J. Schlossberg, M.W. Shafer, G. Winz, Z. Yan, *U. Wisc.* — A high-efficiency, high-throughput custom spectroscopic system is being designed and implemented at DIII-D to measure localized, long-wavelength ion thermal fluctuations associated with drift wave turbulence. A high-transmission grism (prism-coupled transmission grating) and high-throughput collection optics are employed to observe Doppler-shifted emission from the  $n=8-7$  transition of C VI centered near  $\lambda=529$  nm. The diagnostic achieves 0.25 nm resolution for 2.0 nm spectral band using eight discrete spectral channels. A turbulence-relevant temporal resolution of 1  $\mu$ s will be achieved using high-speed photodiodes and low-noise preamplifiers. The system sensitivity should allow for measurements of normalized ion temperature fluctuations on the order of  $\tilde{T}_I/T_I \leq 1\%$ . These measurements will be combined with 2D BES measurements to determine the local multi-field turbulence dynamics. Predicted signal-to-noise for turbulence measurements, signal analysis techniques, and preliminary data will be presented.

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