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Initial Measurements of Local Electric and Magnetic Field Fluctuations on DIII-D via Beam Emission Spectroscopy M.G. BURKE, R.J. FONCK, B. GEIGER, G.R. MCKEE, University of Wisconsin - Madison — A novel diagnostic for measuring local plasma electric and magnetic field turbulence has been designed and built for DIII-D. It spectrally resolves the Motional Stark Effect (MSE) split neutral beam emission at high frame rates, where fluctuations in the MSE component separation is proportional to local magnetic and electric field fluctuations. Design improvements to the central spatial heterodyne spectrometer (SHS) reduced the leakage of environmental mechanical vibrations and thermal variation into the interferometer. Characterization of the intensified high-speed CMOS detector inform the level of excess noise at the signal gain required for photon noise limited operation. Modeling of the measured photon noise (1% at 500 kHz) and the inherent cross-correlational capabilities of SHS indicate fluctuation detection down to the 0.1% level. Geometric Doppler broadening due to the large plasma collection optic reduces the theoretical fluctuation sensitivity of the diagnostic. Here, a geometric Doppler broadening compensation technique applies an equal but opposite spectral shift via properly offsetting the input aperture of the SHS. Laboratory experiments demonstrate this compensation and agree with theoretical calculations. First measurements and analysis of electric and magnetic fluctuations induced by low and high frequency modes on DIII-D will be presented. Work supported by US DOE under DE-FC02-04ER54698, FG02-89ER53296.

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