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Category Number and Subject: 5.6.2. DIII-D Tokamak

Theory Experiment

**Measurements of Short Wavelength Plasma Fluctuations
Using the DIII-D Phase Contrast Imaging Diagnostic,*** J.R.
Dorris, J.C. Rost, M. Porkolab, *MIT-PSFC*; K.H. Burrell, *General
Atomics* – The DIII-D Phase Contrast Imaging (PCI) diagnostic has
been upgraded and used to measure turbulence in the outer plasma
region ($0.7 < r/a < 1$) covering an operational range of 10 kHz –
10 MHz and $2\text{--}30\text{ cm}^{-1}$. A novel rotating mask has been used to
measure turbulence as a function of propagation angle about the PCI
chord. This technique provides localized measurements along the
PCI chord for turbulence with $k_{\parallel} \sim 0$, and an estimate of the
turbulence k_{\parallel} value otherwise. Long wavelength ($|k| \lesssim 12\text{ cm}^{-1}$)
turbulence is localized to within the instrumental width of the last
closed flux surface (LCFS) ($r/a \gtrsim 0.9$). Modes with finite (and
theoretically unexpected) *parallel wavenumber* have been seen to
propagate at angles as large as $k_{\parallel}/k \sim 0.1\text{--}0.4$. Due to the finite k_{\parallel} ,
these modes cannot be localized with the present techniques. A
theoretical explanation for these modes is lacking at the present time.

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