DPP07-2007-000742

Abstract for an Invited Paper
for the DPP07 Meeting of
the American Physical Society

Electron Temperature Fluctuations in the Core of High-Performance DIII-D Plasmas[1]

A.E. WHITE, UCLA

Electron temperature fluctuations have been measured for the first time in the core of high-performance, neutral-beam-heated DIII-D plasmas. Simultaneous local characterization of temperature and density fluctuations presents an opportunity to challenge theoretical/simulation predictions. Data from long-duration quiescent H-mode plasmas indicate that, at r/a=0.75, normalized fluctuation levels are reduced by a factor of 5 below L-mode levels, with a detectability limit of $\leq$0.25%. In these QH-mode plasmas, the absolute temperature fluctuation amplitude is observed to decrease by a factor of 2, correlating with increasing electron temperatures and improved electron thermal confinement. Temperature fluctuation levels and frequency spectra, $k_\theta \rho_s \leq$0.5, are determined via correlation electron cyclotron emission radiometry [1]. In L-mode, temperature fluctuations (20< f <250 kHz) increase with radius from ~0.5% at r/a=0.5 to ~2% at r/a=0.8, similar to local ñ measurements performed simultaneously with the beam emission spectroscopy diagnostic. The evolving frequency spectra reflect a Doppler-shift caused by E×B plasma rotation that dominates the intrinsic dispersion of the underlying instabilities. Linear gyrokinetic calculations at low-k for these L-mode plasmas indicate increasing growth rate with radius consistent with the observed profile of temperature fluctuations. These initial calculations will be extended to include nonlinear gyrokinetic simulations to provide a more critical comparison between experiment and theory. In particular, variations in the temperature and density fluctuation levels during neutral beam heated L-mode plasmas, with and without electron cyclotron heating, will be compared to code predictions.

[1] G. Cima, et al., Phys. Plasmas **2**, 720 (1995).

[1]Supported by US DOE under DE-FG03-01ER54615, JP333701, and a DOE-ORISE fellowship.