Comparison of Edge Fluctuation Measurements from PCI, BES, and Reflectometry on DIII–D*

J.C. Rost,[1] M. Porkolab,[1] T.L. Rhodes,[2] G.R. McKee,[3] and K.H. Burrell[4]

[1]*Plasma Science and Fusion Center, MIT, Cambridge, Massachusetts 02139-4307, USA*
[2]*University of Los Angeles, California, USA*
[3]*University of Wisconsin, Madison, Wisconsin, USA*
[4]*General Atomics, PO Box 85608, San Diego, California, 92186-5608, USA*

Phase Contrast Imaging, Beam Emission Spectroscopy, and reflectometry provide three different but complementary measurements of the density fluctuations in the edge of the DIII–D tokamak plasma. In particular, the PCI is sensitive to modes with $k_\theta << k_r$, while the BES and reflectometry response depend less on the angle of $k_\perp$. On plasma discharges in which the three diagnostics collect data from the same location at the same time, comparison of the signals gives more information about the turbulence than a single measurement. We found that the L–mode frequency spectra (10–250 kHz) from the three diagnostics have identical shapes. However, the H–mode spectra differ significantly, and the drop in fluctuation amplitude from L–mode is not identical, with the $k_\theta << k_r$ modes suppressed the most. This suggests that the edge fluctuations are nearly isotropic in L–mode but highly anisotropic in H–mode. The relationship between the diagnostic measurements and the pure $S(k_\theta,k_r)$ spectrum is explored by comparisons with the results of the BOUT edge turbulence and transport calculation.

*Work supported by U.S. Department of Energy under Contract DE-AC03-99ER54463 and Grants DE-FG03-96ER54373 and DE-FG03-86ER53225.