Studies of Density Fluctuation Dynamics in L-H Transitions and Pedestal Formation in DIII-D Using Beam Emission Spectroscopy*

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Edge plasma transport barriers play a critical role in global plasma performance and are expected to determine core plasma conditions in ITER. It is therefore particularly important to understand the mechanism(s) that govern the width and height of the edge pedestal. One such mechanism is believed to be sheared ExB decorrelation of turbulence, which is observed during the L-H transition, and may also continue during subsequent development of edge barriers and lead to a reduction in the cross-field transport rates during pedestal formation. In this presentation, we report on studies of density fluctuation dynamics across the edge and pedestal region in DIII-D, during and beyond the L-H transition, measured with a newly upgraded beam emission spectroscopy diagnostic [1]. It is found that in the pedestal region, the turbulence is rapidly suppressed at the transition, but then begins to grow in amplitude as the pedestal height increases and the E_r well deepens, such that it has returned to (or even exceeds) L-mode intensity levels when ELMs begin. The dynamics of power spectra, coherences, cross phases, and correlation lengths are also presented, along with initial measurements of poloidal velocities obtained via time-delay estimation [2]. Comparisons to models of edge barrier formation are also discussed.

[1] D.K. Gupta, *et al.,* Rev. Sci. Instru. **75**, 3493 (2004).

[2] M. Jakubowski, R.J. Fonck, and G.R. McKee, Phys. Rev. Lett. **89**, 265003-1/4 (2002).

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