

Abstract for APS '05 invited talk

Structure and Motion of Edge Turbulence in NSTX and Alcator C-Mod

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and the NSTX and Alcator C-Mod Teams

This talk will describe recent 2-D imaging measurements of edge turbulence in NSTX and present some comparisons with Alcator C-Mod and with theory and simulation. The measurements were made using the visible line emission from localized neutral deuterium or helium gas puffs [1-3]. Ultra-high speed movies of the turbulent structure and motion of this light emission were made in both NSTX and C-Mod with a spatial resolution of 64 pixels (poloidally) x 64 pixels (radially), with 300 time frames at 250,000 frames/sec. In Ohmic and L-mode plasmas the edge is always highly turbulent and often contains localized coherent structures ("blobs") which move at about 1 km/sec both radially and poloidally. A model has been developed to convert the measured light emission to density and temperature for comparisons between the observed blob motion in NSTX and analytic scalings [4] and 2D simulations. Movies of the L-H transition in NSTX will be presented and analyzed; the transition appears as a smooth evolution from a turbulent state to a quiescent state without much change in the local turbulent structure or flows. Additional NSTX phenomena will be shown if time allows (e.g. ELMs, MHD, etc.). A comparison between the imaging results in NSTX and in C-Mod will be made and compared to turbulence simulations [5] where possible. Opportunities for additional comparisons between experiment and theory will be discussed.

[1] S.J. Zweben et al, Nucl. Fus. 134, 2004

[2] R.J. Maqueda et al, Rev. Sci. Inst., 2020, 2003

[3] J.L. Terry et al, Phys. Plasmas, 1739, 2003

[4] J.R. Myra and D.A. D'Ippolito, Lodestar Report #LRC-05-105 (2005).

[5] X. Xu et al, Phys. Plasmas 1773, 2003