Measurements of Broad-k_r Microturbulence Near the L-H Transition in NSTX Using FMCW Reflectometry and Backscattering*

S. Kubota, W. A. Peebles, S. J. Zweben[1], R. J. Maqueda[1]
University of California, Los Angeles, CA 90095
[1] Princeton Plasma Physics Lab, Princeton, NJ 08543

Abstract

In the spherical torus, measurements of the turbulence dynamics relevant to the L-H transition physics remains elusive. Detailed measurements of the turbulence (as well as background plasma) evolution at the ETB location are necessary for comparison with L-H transition theories. Previous measurements with FMCW backscattering on NSTX have shown suppression of turbulence over a broad range of k_r~0-20 cm^{-1} leading up to the L-H transition, and localized to the region around the ETB. Recent upgrades to the FMCW reflectometers have decreased the frequency sweep interval to 3.5 μs, allowing these diagnostics to function as radial correlation reflectometers in the steep density region near the ETB location. Ohmic-, RF-, and NBI-heated H-mode plasmas have been probed. Preliminary measurements show a sharp decrease in the radial correlation length from ~1.5 cm to less than 0.5 cm, just prior to the L-H transition and in a narrow region ~1 cm around the ETB location. The correlation length on either side of the ETB remains unaffected until the background density profile begins to change appreciably. Additional measurements using the poloidal correlation reflectometer coupled with synthetic diagnostic codes will provide estimates of the turbulence poloidal flow. Comparisons with the gas-puff imaging diagnostic, as well as other edge diagnostics, will be presented at the meeting.

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