3-D Reconstruction of Edge Filamentary Structures in NSTX via Reflectometry*

S. Kubota, N. A. Crocker, A. Diallo[1], S. M. Kaye[1], R. Maingi[1],
W. A. Peebles, T. L. Rhodes

University of California, Los Angeles, CA 90095
[1] Princeton Plasma Physics Lab, Princeton, NJ 08540

Abstract

Long-lived coherent structures resembling filaments and elongated along the direction of the magnetic field, have recently been observed in the plasma edge of a number of devices including the spherical torus. On NSTX, edge density fluctuations can be measured with high spatial resolution using two arrays of fixed frequency reflectometers (16 channels total, 30-50 GHz and 55-75 GHz). Measurements were made during the inter-ELM (Type I) phase of the discharge, where the density profile coverage extends from the steep-gradient region to the top of the edge pedestal. The poloidal and toroidal separation of these arrays allows one to determine that these filamentary structures are long-lived (several hundred μs) and propagate in the co-current direction with an apparent toroidal speed of 1-2 km/s. Their influence on the evolution of the edge density gradient is still under investigation. Physical optics calculations indicate that the largest structures have a perpendicular width of ~3 cm and a density perturbation that is dipole-shaped, with fluctuation levels up to ~20%. The motion of these structures is mostly poloidal/toroidal with some indication of radial propagation. Their relationship to blobs is still unclear, however the observations above seem consistent with some results from theories involving interchange-driven instabilities, in connection with blob formation and cross-field transport in the SOL. Further details and comparisons will be presented at the meeting.

* Supported by U.S. DoE Contracts DE-FG02-99ER54527 and DE-AC02-09CH11466.