

Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Two-Dimensional Characterization of ELM Precursors in NSTX

Y. SECHREST, T. MUNSAT, CU-Boulder, D.J. BATTAGLIA, S.J. ZWEBEN, PPPL — Gas Puff Imaging (GPI) has been used to capture the two-dimensional evolution of Edge Localized Mode (ELM) precursors. Precursor events were observed preceding ELMs and ELM-induced H-L back transitions in radio frequency (RF) heated H-mode plasmas, and the growth of the precursor mode through the ELM filamentation was imaged in the plane perpendicular to the local B-field. Strong edge intensity modulations appeared to propagate in the electron diamagnetic direction while steadily drifting radially outward. Intensity fluctuations were observed at frequencies around 20 kHz and wavenumbers of $0.05\text{-}0.2\text{ cm}^{-1}$. Edge intensity fluctuations are strongly correlated with magnetic signals from Mirnov coils, and toroidally distributed coils estimated toroidal mode numbers of $n=5\text{-}10$. Upon growing to a trigger point, precursor fluctuations were seen to form filamentary structures and move into the Scrape-Off Layer (SOL) explosively with radial velocities peaking at 8 km/s. Quantitatively similar precursors have been observed in Ohmic H-mode plasmas as well, though significantly fewer events are seen in the Ohmic cases and none were observed in similar near-threshold NBI shots studied.

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Date submitted: 20 Jul 2012

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