Multi-energy SXR measurements of Resistive Wall Mode behavior in NSTX

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Abstract

A multi-energy soft X-ray (ME-SXR) array [1] has been used for the determination of time and space-resolved emissivity profiles during resistive wall mode (RWM) experiments in NSTX. High β_N~5-6 plasmas have been found to exhibit low frequency activity (~20-30 Hz) in both the magnetic and SXR diagnostics [2], with the latter being sensitive to peripheral and core $n_{e,Z}$ and T_e (kinetic) fluctuations (see Figure 1). Since the active control of the RWM instability is expected to significantly improve the performance of future burning plasmas, the main purpose of this study is to understand if the activity observed in both the kinetic and magnetic data is a stable RWM; studying the correlations between plasma diagnostics with good spatial localization and '*wall*' magnetic measurements is therefore of great importance. Kinetic measurements of the Resonant Field Amplification (RFA) effect were done using a single frequency *n=1* traveling waveform; neon injection was also used to increase the signal-to-noise ratio of the ME-SXR diagnostic. Reconstructions of H-mode plasmas showing these 20-30 Hz fluctuations, and others with a combination of the peripheral low frequency activity and fast core MHD phenomena – that can change the energetic particle population and contribute to destabilize RWMs - will also be presented. This work was supported by the US DoE grant No. DE-FG02-99ER5452 at JHU and DoE-PPPL Contract No. DE-AC02-09CH11466.

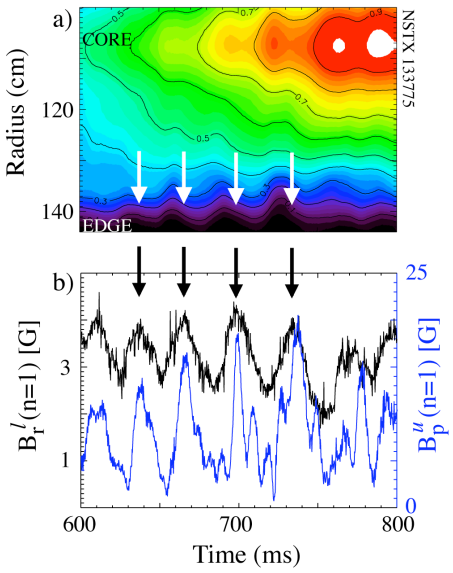

Fig. 1. a) Low-energy SXR emissivity and b) *n=1* radial and poloidal fields measured by the RWM coils.

[1] L. Delgado-Aparicio, *et al.*, PPCF, **49**, 1245 (2007).

[2] L. Delgado-Aparicio, *et al.*, 35th EPS, Sofia, ECA Vol. **33E**, P-2.173, (2009).