Effect of n=3 Fields Below the ELM Triggering Threshhold on edge and SOL transport in NSTX

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The pulsed application of n=3 fields above a threshold level in NSTX results in the regular destabilization of edge localized modes (ELMs) [1]. The threshold level is a function of the pulse length and magnitude, as well as the edge safety factor. For n=3 pulses below the threshold level, ELMs are unreliably triggered or not destabilized at all. When the n=3 pulses are above the nominal current amplitude, but below a threshold duration, a distinct, transient ~50% increase in the divertor D_α emission is observed for the duration of the pulse. A perturbation is also measured on several other diagnositcs, such as edge USXR chords and divertor cameras. These responses are much smaller in magnitude than a triggered ELM. When an ELM is triggered, the ELM response appears superimposed over the sub-threshold effects.

The responses are broadly consistent with increased edge and scrape-off layer transport and augmentation of the intrinsic strike point splitting caused by error fields [2]. The pulses also result in modulation of a global Alfven eigenmode (GAE) mode coincident with reductions in the neutron production, consistent with modifications to the fast ion distribution function. Ideally these pulses could be used to provide density control and prevent impurity accumulation without ELMs, however the tested pulses appear to be insufficient for this purpose. A characterization of the responses will be presented, for applied fields of several different pulse lengths and amplitudes. This work is supported by DOE grant numbers DE-AC05-00OR22725, DE-AC02-09CH11466 and by the Magnetic Fusion Energy fellowship from ORISE.

[1] Canik, J.M., *et al.*, Nucl. Fusion **50** (2010) 034012.

[2] J.-W. Ahn, *et al.*, Nucl. Fusion **50** (2010) 045010.