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EX/P6-05: Fast-ion Energy Loss during TAE Avalanches in the National Spherical Torus Experiment

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Strong TAE avalanches on the National Spherical Torus Experiment are typically correlated with drops in the neutron rate in the range of 5% - 15%. In previous studies of avalanches in L-mode plasmas, these neutron drops were shown to be consistent with modeled losses of fast ions due to the strong, multi-mode TAE bursts. In this study, TAE avalanches in an NSTX H-mode plasma were studied. At the measured TAE mode amplitudes, simulations with the ORBIT code found that fast ion losses were negligible. However, the OR-BIT simulations predicted that the TAE would scatter the fast ions in energy, resulting in a significant drop in fast ion beta, even in the absence of fast ion losses. Convolving the fast ion beta was consistent with the measured drop in neutron rate. Further, the estimated change in the fast ion energy is comparable to the estimated energy in the TAE wave-field.

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