Characterization of chirping TAE modes on NSTX

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The interaction of multiple TAE modes with a background population of fast ions can lead to large losses of fast ions from the core plasma. For future reactors such as ITER, this may result in a decreased fusion efficiency and potential damage to in-vessel components. A deeper understanding of the physics of TAEs can be gathered from NB-driven plasmas of NSTX, where large (up to 30%) fast ion losses are associated with bursting, chirping TAE activity. This work investigates the main features of the bursting/chirping TAE regime on NSTX. On a time scale greater than the inverse rate of bursts (0.5-1ms), TAEs behave as a set of modes characterized by a similar frequency in the plasma frame and similar spatial localization. The detailed dynamics on shorter time scales can be different for each mode. Chirps are usually not synchronized among all the modes, except for the larger bursts. Typical frequency excursion during a chirp is O(10%) of the mode frequency. In general, the modes exhibit increasing amplitude and frequency excursions when the drive for TAEs, e.g. parametrized through the injected NB power, is increased. Higher plasma densities for a fixed injected NB power lead to a reduction of mode activity for all the modes. Recent results from the 2010 NSTX Run will be presented. The consistency of the experimental data with recent theories aimed at explaining the causes underlying the observed bursty TAE mode regime will be also discussed.
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