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Numerical Simulations of NBI-driven GAE modes in L-mode and H-mode Discharges in NSTX

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Hybrid 3D code HYM has been used to investigate properties of beam ion driven GAE modes in NSTX. The HYM code is a nonlinear, global stability code in toroidal geometry, which includes fully kinetic ion description. Excitation of GAE modes have been studied for L-mode and H-mode NSTX discharges. Equilibrium profiles and plasma parameters have been chosen to match several of the NSTX discharge numbers profiles, and the HYM equilibrium solver has been modified to improve the equilibrium fit to the TRANSP and EFIT profiles. Numerical simulations for H-mode have been performed for the NSTX shots, where a GAE activity and related High-Energy Feature (HEF) have been observed. HYM simulations comparison with experimental results for NSTX L-mode shots, show good agreement in terms of the most unstable toroidal mode numbers, frequency, amplitude and the mode structure. It has been shown that most resonant particles have stagnant orbits, and poloidal structure of the unstable mode is relatively coincident with location of the resonant orbits. Linearized and nonlinear simulations have been performed in order to study in detail resonant wave-particle interaction in order to understand the nonlinear evolution of the instability.