Abstract Submitted
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Numerical Modeling of NBI-driven GAE modes[1] E.V. BELOVA, N.N. GORELENKOV, E.D. FREDRICKSON, Princeton University Plasma Physics Laboratory — Hybrid 3D code HYM is used to investigate beam ion effects on MHD modes in NSTX, aiming at simulations of NSTX shots where chirping frequency GAE/CAE modes have been observed. The thermal plasma is modeled using the MHD equations, and full-orbit delta-f kinetic description is used for the beam ions. For large neutral beam injection velocities and strong anisotropy in the pitch-angle distribution, many Alfven modes are excited. The resonant particles satisfy Doppler-shifted cyclotron resonant conditions. Growth rates of global Alfven eigenmodes (GAEs) are sensitive to details of the distribution function, in particular, the pitch angle distribution. Most unstable mode in HYM simulations compares well with experimental results for NSTX. Nonlinear simulations show that GAE instabilities saturate at low amplitudes due to particle trapping. The saturation amplitude is proportional to the square of the linear growth rate, except for the marginally unstable cases. The magnetic perturbations have shear Alfven polarization in the core, however the compressional component dominates at the edge, indicating possible coupling to the edge-localized CAE modes.

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