Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Nonlinear simulations of NBI driven GAE modes in NSTX[1] E.V. BELOVA, N.N. GORELENKOV, PPPL — Hybrid 3D code HYM is used to investigate beam ion effects on MHD modes in a NSTX, aiming at simulations of NSTX shots where chirping frequency GAE/CAE modes have been observed. Thermal plasma is modeled using the MHD equations, and full-orbit delta-f kinetic description is used for the beam ions. Simulations show that for large neutral beam injection velocities and strong anisotropy in the pitch-angle distribution, many Alfven modes are excited. Unstable GAEs modes for $2 < n < 7$ and weakly unstable CAE for $n > 7$ are observed. Scaling of the growth rate of GAE mode with beam ion density is stronger than linear due to significant modification of plasma equilibrium profiles. Profile modification is due to self-consistent beam ion effects, and it has indirect effect on the stability. It was demonstrated that phase velocity of the unstable GAE mode has opposite sign compared to the beam injection velocity, and the resonant particles satisfy Doppler-shifted cyclotron resonant conditions. Dependence of the growth rate on dissipation parameters is studied. Nonlinear simulations show that the GAE instability saturates at low amplitude.

[1]This work supported by U.S. DOE Contract # DE-AC02-76CH03073.

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Date submitted: 24 Jul 2007 Electronic form version 1.4