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Detailed comparison of simulations, experiments, and theory of sub-cyclotron Alfven eigenmodes in NSTX[1] JEFF LESTZ, Princeton University, ELENA BELOVA, NIKOLAI GORELENKOV, PPPL, SHAWN TANG, NEAL CROCKER, UCLA — High frequency compressional (CAE) and global (GAE) Alfvén eigenmodes are often driven unstable by super-Alfvénic beam ions in NSTX, and have been linked to anomalous electron temperature profile flattening at high beam power [D. Stutman, PRL 2009]. A large set of 3D MHD-δf hybrid simulations show that GAE are ubiquitous at beam energies $V_b/V_A > 2.5$, while CAE are not excited until $V_b/V_A > 4$. The frequency of the most unstable GAE changes significantly with the normalized beam energy, consistent with trends described by its dispersion and resonance condition. These simulation results are analyzed and compared with a new, extensive experimental survey of NSTX discharges, as well as analytic studies. Interestingly, simulations find no case where counter-propagating CAE are more unstable than co-CAE, whereas experiments routinely observe both co- and counter-CAE. Moreover, simulations find co-GAE to be very unstable for beams peaked around $\lambda \leq 0.5$, yet these modes have not yet been thoroughly investigated experimentally. Preliminary predictions are also made for the CAE/GAE instability in ITER-like plasmas, which are expected to operate near similar values of V_b/V_A as those studied for NSTX.

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