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Energetic Particle Instabilities Simulated in GYRO,* E.M. Bass, *GA-ORISE*, M.S. Chu, and R.E. Waltz, *GA*— The Eulerian gyrokinetic code GYRO [1] has been used to study instabilities driven by a sparse, hot species (such as fusion-produced α-particles) superimposed on the equilibrium profile in different geometries. The energetic particles are distributed according to a high temperature Maxwellian. Unstable Toroidal Alfvén Eigenmodes (TAEs) have been identified in gaps in the Alfvén continuum at the degenerate frequency of two toroidally-coupled modes with the same toroidal mode number n and adjacent poloidal mode numbers m. Frequency and growth rate have been mapped out as functions of n, background plasma pressure gradients (starting from zero), safety factor, magnetic shear, and density gradient of the hot species in flux-tube geometry. Global geometry simulations using measured profiles from DIII-D are compared to TAEs and other Alfvén modes observed in that machine [2]. To monitor the gap Alfvén modes (and possibly subdominant modes outside the gap) in the presence of background plasma density gradients (and possibly dominant ITG/TEM modes), GYRO will be modified to find frequency and growth rate of sub-dominant modes.

[1] J. Candy and R.E. Waltz, J. Comput. Phys. **186**, 545 (2003).
[2] M.A. Van Zeeland, et al., Nucl. Fusion **46**, S880 (2006).

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