

Abstract Submitted  
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**Energetic Particle Instabilities Simulated in GYRO**<sup>1</sup> E.M. BASS, GA-ORISE, M.S. CHU, R.E. WALTZ, General Atomics — The Eulerian gyrokinetic code GYRO [1] has been used to study instabilities driven by a sparse, hot species (such as fusion-produced  $\alpha$ -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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