Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Theory and simulation of the magnetic island-induced TAE mode[1] CARSON COOK, CHRIS HEGNA, University of Wisconsin, DON SPONG, STEVE HIRSHMAN, Oak Ridge National Lab — In this work, we develop the theory of the shear Alfven continuum in the presence of a magnetic island in a toroidal equilibrium. The shear Alfven spectrum of a magnetically confined plasma influences the stability properties of the system. Discrete Alfven eigenmodes are of particular interest to fusion plasmas. The frequencies of these modes lie in the gaps of the Alfven continuum, and thus the modes do not experience continuum damping and can be driven unstable by energetic particles. The effects of magnetic islands on the ellipticity-induced Alfven eigenmode and the beta-induced Alfven eigenmode have been studied in some detail (see e.g. Biancalani et al, *Plasma Phys. Control. Fusion* 53, 025009 (2011)). However, the effects of islands on the toroidicity-induced Alfven eigenmode (TAE) has not been investigated. The magnetic island-induced TAE (MiTAE) gap will be discussed along with the discrete MiTAE mode. Numerical simulation results using the SIESTA equilibrium code will be presented and compared to theory. Using the Hessian matrix from a SIESTA equilibrium, the Alfven eigenmodes and frequencies can be computed. A simple toroidal equilibrium with an island will be studied and the computed MiTAE structure and frequency will be compared to the analytical prediction.

[1]Research supported by the U. S. DOE under grants DE-FG02-99ER54546 and DE-SC0006103.

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Date submitted: 12 Jul 2013 Electronic form version 1.4