Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

A Model of Energetic Ion Effects on Pressure Driven Tearing Modes in Tokamaks[1] M.R. HALFMOON, Univ of Tulsa, D.P. BRENNAN, Princeton University, A.J. COLE, Columbia University, J.M. FINN, Tibbar Plasma Technologies — An analytic, reduced cylindrical model of linear resistive tearing modes, taking into account the effect of a high-energy, non-Maxwellian ion population as a perturbation in pressure, is applied to study the stability of high aspect ratio tokamak equilibria. The model captures the essential physics driving or damping the modes through variations in the magnetic shear. We focus on the stability of the $m/n = 2/1$ tearing mode. The drift-kinetic motion of high-energy ions is modeled after a method discussed by Hu and Betti (B. Hu and R. Betti, Phys. Rev. Lett. **93**, 105002 (2004)), and entered into an asymptotic matching formalism for the resistive MHD dispersion relation. Toroidal magnetic field line curvature is included to model trapping in the particle distribution, in an otherwise cylindrical model. The results show that the energetic ions damp and stabilize the mode when orbiting in significant positive shear, and drive the mode unstable in reversed shear regions (M.R. Halfmoon and D.P. Brennan, Phys. of Plasmas **24**, 062501 (2017)). These result explain δf - MHD simulations of tokamak experiments with varying shear, and are also found to be consistent with related experimental observations of the 2/1 stability limit.

[1]This work is funded in part by the Department of Energy, grant DE-SC0014005

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Date submitted: 14 Jul 2017 Electronic form version 1.4