Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Core magnetic shear effects on tearing mode stability in the presence of energetic ions[1] A.J. COLE, Columbia University, D.P. BRENNAN, Princeton University, C. AKCAY, J.M. FINN, Tibbar Plasma Technologies Inc. — Simulations of the onset of resistive MHD instabilities are presented where a slowing down distribution of energetic ions can either stabilize or destabilize disruptive tearing modes depending on the magnetic shear in the core. Two cases are compared, one with monotonic shear throughout the profile ($q_{\min} = 1.1$) and one with reversed shear in the core ($q_{\min} = 1.3$). Outside of the reversal surface the equilibrium profiles are nearly identical between the two cases. The drive from energetic ions is stabilizing in monotonic shear and destabilizing in reversed shear, consistent with previous theory. In the reversed shear case without energetic ions a 3/2 mode is unstable, while with ions both a 2/1 and 3/2 mode are driven unstable. Comparison of the simulated beta limits are made against a reduced MHD model with a tearing layer, resistive wall, and energetic ion pressure included, showing qualitative agreement. Nonlinear simulations with energetic ions are also explored, and analyzed in terms of the linear results and a reduced model of the energetic ion effect on the resistive mode.

[1]Supported by US DOE Grants DE-SC0014005 and DE-SC0014119

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Date submitted: 03 Jul 2019 Electronic form version 1.4