Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Simulation of MST tokamak discharges with resonant magnetic perturbations[1] B.S. CORNILLE, C.R. SOVINEC, B.E. CHAPMAN, A. DUBOIS, K.J. MCCOLLAM, S. MUNARETTO, University of Wisconsin-Madison — Nonlinear MHD modeling of MST tokamak plasmas with an applied resonant magnetic perturbation (RMP) reveals degradation of flux surfaces that may account for the experimentally observed suppression of runaway electrons with the RMP. Runaway electrons are routinely generated in MST tokamak discharges with low plasma density. When an $m = 3$ RMP is applied these electrons are strongly suppressed, while an $m = 1$ RMP of comparable amplitude has little effect. The computations are performed using the NIMROD code and use reconstructed equilibrium states of MST tokamak plasmas with $q(0) < 1$ and $q(a) = 2.2$. Linear computations show that the $(1, 1)$-kink and $(2, 2)$-tearing modes are unstable, and nonlinear simulations produce sawtoothing with a period of approximately 0.5 ms, which is comparable to the period of MHD activity observed experimentally. Adding an $m = 3$ RMP in the computation degrades flux surfaces in the outer region of the plasma, while no degradation occurs with an $m = 1$ RMP. The outer flux surface degradation with the $m = 3$ RMP, combined with the sawtooth-induced distortion of flux surfaces in the core, may account for the observed suppression of runaway electrons.

[1]Work supported by DOE grant DE-FC02-08ER54975

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Date submitted: 15 Jul 2016 Electronic form version 1.4