Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Nonlinear MHD studies of sawtoothing and stationary tokamak states using NIMROD[1] K. J. MCCOLLAM, B. E. CHAPMAN, M. D. PANDYA, J. S. SARFF, C. R. SOVINEC, UW-Madison, D. L. BROWER, J. CHEN, R. YONEDA, UCLA, W. X. DING, USTC — Using the extended-MHD code NIMROD, we simulate tokamak dynamics with the aim of exploring conditional boundaries between sawtoothing and non-sawtoothing states. Our previous single-fluid visco-resistive MHD studies with rectangular tokamak cross sections at Lundquist numbers of $S \approx 10^5$ showed characteristically different $n = 1$ linear mode structures in magnetic field and flow for zero- and finite-beta ($\sim 1\%$) cases. Nonlinear evolution of zero-beta cases exhibited quasi-periodic sawtooth-like events moving the core safety factor q profile above 1 from below. However, spectral pileup prevented successful nonlinear simulations in finite-beta cases, which is ascribed to poor flux surface-spatial grid alignment for the rectangular grids. Thus we are developing elliptically and circularly gridded cases, which will have better flux-grid alignment. Characterizing linear stability for these cases for zero and finite beta will be followed by nonlinear simulations.

[1]This work is supported by the US DOE.

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Date submitted: 29 Jun 2020 Electronic form version 1.4