Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Extended MHD NIMROD Simulations of HIT-SI plasmas CIHAN AKCAY, CHARLSON KIM, TOM JARBOE, BRIAN NELSON, University of Washington — We present results from zero β two-fluid MHD (2fl-MHD) NIMROD calculations of the Helicity Injected Torus with Steady Inductive helicity injection (HIT-SI). HIT-SI uses two semi-toroidal helicity injectors oscillated out of phase to generate and sustain toroidal plasmas via steady inductive helicity injection (SIHI). All the plasma-facing walls of the experiment are coated with an insulating material to guarantee an inductive discharge. The helicity injectors are simulated as oscillating normal magnetic and parallel electric field boundary conditions with odd toroidal symmetry. A highly resistive edge-layer approximates the insulating walls. The Prandtl number ($Pm = 10$), and Lundquist number ($S = 10^3 - 10^4$) closely match the experimental values. 2fl-MHD calculations produce more toroidal current (I_{tor}) and faster growth rates than their resistive MHD (rMHD) counterparts. An energetics analysis indicates 2fl-MHD dynamo channels more energy into the axisymmetric mode than the MHD dynamo. The simulation results show good agreement with internal and surface magnetic measurements. Singular value decomposition indicates the calculations mostly capture the spatial eigenmode structure of the experiment. Simulation output is also comped with chord-averaged ion velocities.

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Date submitted: 20 Aug 2012 Electronic form version 1.4