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Nimrod Simulations of HIT-SI Plasmas CIHAN AKCAY, CHARLSON KIM, THOMAS JARBOE, BRIAN NELSON, University of Washington — We present NIMROD simulation studies of current-drive, magnetic reconnection and relaxation behavior of the HIT-SI experiment. HIT-SI (Steady Inductive Helicity Injected Torus) is a spheromak that uses two semi-toroidal injectors to provide steady inductive helicity injection (SIHI). SIHI produces and sustains a spheromak by generating poloidal flux using relaxation current drive. Because NIMROD can only model axi-symmetric geometries, the helicity injectors of the experiment are modeled as flux ($\psi_{\rm inj}$) and current ($I_{\rm inj}$) boundary conditions by applying a tangential electric field at the top and bottom of the tank. The tangential electric field provides both the voltage drop needed to drive the injector current and the loop voltage to bring the injector flux in/out of the equilibrium region. A highly resistive thin edge-layer approximates the insulating walls of the experiment and turns the injectors into current sources. Our simulations use a zero β resistive MHD model with uniform density. The Lundquist number S ($\equiv \sqrt{\frac{\mu_0}{\rho}}\frac{B}{2\pi R\eta\lambda_{sp}^2}$) is 22 and injector lambda ($\lambda_{\rm inj} \equiv \mu_0 I_{\rm inj}/\psi_{\rm inj}$) is 30. Here ρ and η are the plasma density and resistivity, R is the magnetic axis. To date, our results show little relaxation and nearly zero plasma current during injector operation whereas current amplification up to a factor of 2 is observed in the experiment.

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