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NIMROD Simulations of HIT-SI Plasmas C. AKCAY, C.C. KIM, T.R. JARBOE, B.A. NELSON, University of washington, V.A. IZZO, UCSD — 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. The helicity injectors of the experiment are modeled as flux ($\psi_{\rm inj}$) and current ($I_{\rm inj}$) boundary conditions. Our study uses a zero β resistive MHD model with uniform density. Lundquist number S and injector lambda, $\lambda_{\rm inj}(=\mu_0 I_{\rm inj}/\psi_{\rm inj})$ characterize the parameter space. $S\left(=\sqrt{\frac{\mu_0}{\rho}}\frac{B}{2\pi R_0 \eta \lambda_{sp}^2}\right)$ is the ratio of resistive diffusion to Alfvén transit time, ρ and η are the plasma density and resistivity, R_0 is the magnetic axis and $\lambda_{sp}(=\mu_0 j_{//}/B)$ is the spheromak lambda, 10.3 $\rm m^{-1}$ for HIT-SI. For our current simulations we set $\lambda_{\rm inj}$=30, and perform a scan in S for low values ($\sim 10-100$). Our results to date at $S=22$ and 35 show little relaxation during sustainement but growth of the n=0 magnetic energy and an increase in plasma current during the decay phase. Upon completion of this study at $\lambda_{\rm inj}$=30 we will repeat the resistive MHD simulations at a lower $\lambda_{\rm inj}$ (~ 20) in order to chart the relaxation behavior as a function of $\lambda_{\rm inj}$.

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