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Ongoing MHD Simulations of HIT-SI Using NIMROD G.L. SUTPHIN, T.R. JARBOE, V.A. IZZO, B.A. NELSON, A.J. REDD, P.E. SIECK, J.A. ROGERS, University of Washington — The Steady Inductive Helicity Injected Torus (HIT-SI) is a spheromak concept that uses dual injectors to provide constant steady inductive helicity injection (SIHI), which maintains toroidal current by generating poloidal flux with relaxation current drive. Decaying spheromak equilibrium simulations of HIT-SI using Non-Ideal Magnetohydrodynamics (MHD) with Rotation Open Discussion (NIMROD), a finite element, resistive MHD code, demonstrate flux amplification and relaxation current drive. While NIMROD is designed to handle only axisymmetric geometries, time dependent, non-axisymmetric boundary conditions applied to the axisymmetric confinement region of HIT-SI approximate the interaction with the injectors. Previous driven spheromak simulations show poloidal flux amplification at high Lundquist numbers (S = 516, S=897) through the buildup of the magnetic energy in the n = 0 mode relative to the n =1 mode. At low Lundquist numbers (S = 22), where the resistive diffusion time is high relative to the Alfven time, this poloidal flux amplification does not occur. Current research focused on determining the range of S where this build up starts to occur is presented.

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