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Numerical Simulations of Current Channel Relaxation For Non-Inductive Startup T.M. BIRD, C.R. SOVINEC, D.J. BATTAGLIA, J.B. O'BRYAN, Univ. of Wisconsin - Madison — Nonlinear resistive MHD computation with anisotropic thermal conduction is used to investigate the relaxation of helical current filaments into tokamak-like plasmas for non-inductive startup of spherical tokamaks. A localized, volumetric current source has been added to the NIMROD code (nimrodteam.org) to model miniature washer-gun current sources in the lower divertor region of the Pegasus Toroidal Experiment at the Univ. of Wisconsin. When the induced magnetic field is smaller than the vacuum field, a helical filamentary current channel forms on open field lines, comparable to experimental results in similar conditions. Relaxation into tokamak-like plasmas has been demonstrated in experiment with induced fields that exceed the vacuum field [N. W. Eidietis, et al., J. Fusion Energy 26, 43 (2007)]. Simulation results show that current channels begin to collect near the injector when reversing the poloidal flux between the injector and inboard wall. Both zero-beta simulations and temperature dependent simulations with anisotropic thermal conduction are presented along with comparison to experiment.

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