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Nonlinear MHD simulation of DC helicity injection in the Pegasus spherical tokamak ADAM BAYLISS, CARL SOVINEC, University of Wisconsin - Madison — DC helicity injection has been successfully employed in spherical tokamaks (ST's) to produce a tokamak-like plasma with either a poloidal-gap voltage known as coaxial helicity injection [HIT-II, NSTX] or a biased cathode gun configuration [CDX, PEGASUS]. In PEGASUS, the tokamak-like plasma which is subsequently ohmically driven is the product of a reversal of vacuum poloidal flux and a merger of gun-injected current filaments. A 3D nonlinear MHD computation using the NIMROD code [Sovinec et al. JCP **195**, 355 (2004)] simulates the formation, merger, and relaxation of the gun-injected current filaments to the tokamak-like plasma. The reversal of poloidal flux due to the field induced by the helicity drive is reproduced and the MHD processes leading to the merger and relaxation of the current filaments are described. Over the lifetime of a helically-driven experimental shot (approximately 10ms), the extent to which the merged plasma exhibits amplication of poloidal flux and the injected current in the relaxed state, reported in PEGASUS, is explored. The results are compared with simulations of current drive in NSTX via coaxial helicity injection which exhibit an n=1 open field-line kink [Tang and Boozer, Phys. Plasmas **11**, 2679 (2004)].

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