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Extended MHD Simulations of the Formation, Merging, and Heating of Compact Tori ANGUS MACNAB, SIMON WOODRUFF, Woodruff Scientific, LLC — We examine the formation, compression, merging, and stability of compact tori (CT) for magnetic field generation and heating by use of the 3D extended MHD code, NIMROD [C.R. Sovinec et al. J. Comp. Phys. 355, 195, (2004)]. Recent advances in the NIMROD code allow us to study plasmas, including the effects of Hall physics and highly anisotropic and field dependent transport. The physics of CT formation and acceleration requires numerical models that can effectively treat plasma flows in systems that are often far from equilibrium. The formation of plasmas with strong magnetic fields by use of a low power source still remains a critical issue. Recently, a novel means for generating strong B from a low current source was developed, and relies on the repetitive injection of plasma from a coaxial gun, leading to the step-wise increase in both total circulating current and core plasma temperature. A natural limit is encountered much as in CT injection for fueling into tokamaks, namely the injected plasma must penetrate the target plasma. To reach high fields, this then will require compression before injection. Stability of the configuration to fluid (e.g. Rayleigh-Taylor) and ideal modes (e.g. tilt/shift) are examined.

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