Abstract Submitted
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Numerical investigation of design and operation parameters on CHI spheromak performance[1] J.B. O'BRYAN, Univ of Washington, C.R. ROMERO-TALAMS, Univ of Maryland, Baltimore County, S. WOODRUFF, Woodruff Scientific, Inc. — Nonlinear, numerical computation with the NIMROD code is used to explore magnetic self-organization in spheromaks formed with coaxial helicity injection, particularly with regard to how externally controllable parameters affect the resulting spheromak performance. The overall goal of our study is to inform the design and operational parameters of a future proof-of-principle spheromak experiment. Our calculations start from vacuum magnetic fields and model multiple distinct phases of evolution. Results indicate that modest changes to the design and operation of past experiments, e.g. SSPX [E.B. Hooper et al. PPCF 2012], could have significantly improved the plasma-current injector coupling efficiency and performance, particularly with respect to peak temperature and lifetime. While we frequently characterize performance relative to SSPX, our conclusions extrapolate to fundamentally different experimental designs. We also explore adiabatic magnetic compression of spheromaks, which may allow for a small-scale, high-performance and high-yield pulsed neutron source.

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