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NIMROD Simulations of Spheromak Formation, Magnetic Reconnection and Energy Confinement in SSPX E.B. HOOPER, B.I. COHEN, U.C. LLNL, C.R. SOVINEC, U. Wisc-Madison — The SSPX spheromak is formed and driven by a coaxial electrostatic gun that injects current and magnetic flux. Magnetic fluctuations are associated with the conversion of toroidal to poloidal magnetic flux during formation. After formation, fluctuations that break axisymmetry degrade magnetic surfaces, and are anti-correlated with the core temperature and energy confinement time. We report NIMROD simulations extending earlier work[1] supporting the SSPX experiment through predictions of performance and providing insight. The simulations are in fairly good agreement with features observed in SSPX and underscore the importance of current profile control in mitigating magnetic fluctuation amplitudes and improving confinement. The simulations yield insight into magnetic reconnection and the relationship of fluctuations to field line stochasticity. We have added external circuit equations for the new 32 module capacitor bank in SSPX that will add flexibility in shaping the injector current pulses and substantially increase the injected currents and the magnetic energy. New NIMROD simulations of SSPX lead to higher temperature plasmas than in previous simulations. *Work supported by U.S. DOE, under Contr. No. W-7405-ENG-48 at U. Cal. LLNL and under grant FG02-01ER54661 at U. Wisc Madison. [1]C. R. Sovinec, B. I. Cohen, *et al.*, Phys. Rev. Lett. **94**, 035003 (2005); B. I. Cohen, E. B. Hooper, *et al.*, Phys. Plasmas **12**, 056106 (2005).

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