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Final Results from the SSPX Spheromak Program H.S. MCLEAN, B.I. COHEN, D.N. HILL, E.B. HOOPER, B. HUDSON, R.J. JAYAKUMAR, L.L. LODESTRO, J.D. KING, J.M. MOLLER, C.A. ROMERO-TALAMAS, T.L. STEWART, R.D. WOOD, LLNL, E.C. MORSE, UC Berkeley, J.A. JOHNSON III, E.D. MEZONLIN, J. TITUS, Florida A&M Univ., C.R. SOVINEC, UW-Madison —
In its last year of operation, SSPX achieved significant performance including peak electron temperature T_e ~500eV, toroidal magnetic field on axis B>1T, plasma current I_p ~1MA, and core electron thermal diffusivity $\chi_e < 10$ m^2/sec. We investigated helicity injection with longer pulse lengths (>10 msec), and with multiple current pulses. The latter demonstrated quasi-steady-state operation with intervals of improving confinement between field-building pulses. We also explored the relationship of field buildup to kinking of the central plasma column by extending the length of the flux conserver and observed improved field generation. In ongoing numerical work, new visualization tools aid interpretation of NIMROD 3D resistive MHD simulations and comparisons to SSPX data continue to help validate predictive capability. Goals identified for next-generation spheromaks include even longer pulses, auxiliary heating with NBI, higher flux amplification through variable bias flux operation, and thinner walls with active feedback control of external tilt/shift modes. This work performed under the auspices of the U.S. DoE by LLNL under Contract DE-AC52-07NA27344.

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