Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Urania: A Spherical Tokamak for Developing Non-Solenoidal Plasma Startup Techniques[1] J.D. WEBERSKI, M.W. BONGARD, University of Wisconsin-Madison, S.J. DIEM, ORNL, R.J. FONCK, J.A. GOETZ, B.A. KUJAK-FORD, B.T. LEWICKI, M.D. NORNBERG, A.C. PALMER, University of Wisconsin-Madison, R. RAMAN, University of Washington, J.A. REUSCH, A.T. RHODES, G.R. WINZ, University of Wisconsin-Madison — Development of a routine non-solenoidal startup technique is a critical issue facing the spherical tokamak. A major upgrade to the PEGASUS program is underway to develop and compare leading non-solenoidal startup techniques on a dedicated solenoid-free facility—the Unified Reduced A Non-Inductive Assessment (URANIA) experiment. Facility upgrades for URANIA include: increased B_T to 0.6 T, extended pulse duration (≤ 100 ms), an enhanced poloidal field set for improved shape control, and an expanded diagnostic suite, while retaining an ultra-low aspect ratio ($A \approx 1.2$). Modelling and experiments have informed the design of a new local helicity injection (LHI) system capable of $I_p \leq 0.3$ MA by leveraging the enhanced B_T to increase the Taylor limit early in the discharge. The new LHI system is designed to optimize helicity input and increase Taylor limit via a non-circular current source geometry. A prototype of this new source is in fabrication for testing on PEGASUS. A novel system capable of transient and sustained coaxial helicity injection is in design. A modest power (200–400 kW) electron Bernstein wave radiofrequency heating and current drive system will be deployed.

[1]Work supported by US DOE grants DE-FG02-96ER54375 and DE-SC0019008.

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Date submitted: 28 Jun 2019 Electronic form version 1.4