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**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 ($\leq$ 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.

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[X] Prefer Oral Session
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Special instructions: Please place as talk 2/2 from the Pegasus group.

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