

Abstract Submitted  
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**Non-Solenoidal Startup Research Directions on the Pegasus Toroidal Experiment**<sup>1</sup> R.J. FONCK, M.W. BONGARD, B.T. LEWICKI, J.A. REUSCH, G.R. WINZ, University of Wisconsin-Madison — The Pegasus research program has been focused on developing a physical understanding and predictive models for non-solenoidal tokamak plasma startup using Local Helicity Injection (LHI). LHI employs strong localized electron currents injected along magnetic field lines in the plasma edge that relax through magnetic turbulence to form a tokamak-like plasma. Pending approval, the Pegasus program will address a broader, more comprehensive examination of non-solenoidal tokamak startup techniques. New capabilities may include: increasing the toroidal field to 0.6 T to support critical scaling tests to near-NSTX-U field levels; deploying internal plasma diagnostics; installing a coaxial helicity injection (CHI) capability in the upper divertor region; and deploying a modest (200–400 kW) electron cyclotron RF capability. These efforts will address scaling of relevant physics to higher  $B_T$ , separate and comparative studies of helicity injection techniques, efficiency of handoff to consequent current sustainment techniques, and the use of ECH to synergistically improve the target plasma for consequent bootstrap and neutral beam current drive sustainment. This has an ultimate goal of validating techniques to produce a  $\sim 1$  MA target plasma in NSTX-U and beyond.

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