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Overview of Non-Solenoidal Startup Studies in the Pegasus ST[1] M.W. BONGARD, J.L. BARR, G.M. BODNER, M.G. BURKE, R.J. FONCK, J.L. PACHICANO, J.M. PERRY, J.A. REUSCH, N.J. RICHNER, C. RODRIGUEZ SANCHEZ, D.J. SCHLOSSBERG, University of Wisconsin-Madison — Local helicity injection (LHI) is a non-solenoidal startup method pursued on Pegasus utilizing compact, high power current sources ($A_{inj} \sim 2-4$ cm^2, $I_{inj} \sim 10$ kA, $V_{inj} \sim 1$ kV) at the plasma edge. Outboard injectors ($N_{inj} = 4$, $A_{inj} = 8$ cm^2) produce $I_p \sim 170$ kA plasmas compatible with Ohmic drive. A 0-D model that treats the plasma as a resistive element with time-varying inductance and enforces I_p limits from Taylor relaxation is used to interpret experimental $I_p(t)$ in several scenarios. Strong inductive drive arises from the plasma shape evolution, in addition to poloidal field induction. A new injector system has recently been installed in the lower divertor region ($N_{inj} = 2$, $A_{inj} = 8$ cm^2) to explore the implications of geometric placement of the helicity injectors on LHI startup. This geometry supports tests of reconnection dynamics seen in NIMROD simulations, high-B_T effects expected in larger devices, and LHI electron confinement with and without inductive assist. Plasmas with $I_p > 130$ kA, $V_{inj} \sim 0.5$ kV, $\Delta t_{pulse} \sim 8$ ms and $B_T/B_{T,max} \leq 50\%$ are produced with the inboard system to date, consistent with performance expectations. Higher I_p is expected with increased B_T, V_{inj}, and Δt_{pulse}. Thomson scattering data in both geometries indicate high $T_e \geq 100$ eV during LHI, suggesting the confinement is not strongly stochastic. Conceptual design work is exploring the feasibility of coaxial helicity injection and ECH heating on Pegasus in addition to LHI.

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[ ] Prefer Oral Session
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