Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Investigating High Frequency Magnetic Activity During Local Helicity Injection on the Pegasus Toroidal Experiment[1] N.J. RICHNER, M.W. BONGARD, R.J. FONCK, J.L. PACHICANO, J.M. PERRY, J.A. REUSCH, University of Wisconsin-Madison — Understanding the current drive mechanism(s) of Local Helicity Injection (LHI) is needed for confident scaling to next-step devices. 3D resistive MHD NIMROD simulations ascribe large-scale reconnection events of helical injector current streams as a current drive mechanism. The events generate $n = 1$ $\dot{B}$ fluctuations on outboard Mirnov coils, consistent with experiment. New results suggest additional mechanisms are also active during LHI. Reconnection-driven ion heating is better correlated with high frequency activity than the $n = 1$ bursts. Experiments with inboard injectors can exhibit an abrupt ($\sim 250\ \mu s$) transition to a reduced MHD state on outboard Mirnovs where the $n = 1$ feature vanishes, while still maintaining current growth and/or sustainment. A new insertable magnetics probe was developed to investigate these phenomena. It measures $\dot{B}_z$ up to 3.5 MHz at 15 points over a 14 cm radial extent ($\Delta R \sim 1$ cm). Measurements with this probe are consistent with the outboard Mirnovs when positioned far from the plasma boundary. However, measurements near the plasma edge lack the reduction in broadband power (up to 2 MHz) following the transition. The probe shows power is concentrated at higher frequencies during LHI, with mostly flat $\dot{B}$ spectra up to ∼600–800 kHz ($\sim f_{ci}$) at which there is a resonance-like feature; at higher frequencies, the power decreases. These measurements suggest short-wavelength activity may play a significant role in LHI current drive.

[1]Work supported by US DOE grant DE-FG02-96ER54375.

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Date submitted: 13 Jul 2017 Electronic form version 1.4