Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Magnetic structure and activity during local helicity injection[1]
N.J. RICHNER, M.W. BONGARD, R.J. FONCK, J.A. REUSCH, C.E. SCHAEFER, University of Wisconsin-Madison — Local helicity injection (LHI) is a non-solenoidal startup technique that uses biased plasma sources to inject DC magnetic helicity and drive current. For confident scaling to future devices, better understanding of the properties of LHI-generated plasmas and the mechanism(s) through which current is driven could prove crucial. Comparisons of Thomson scattering and radially scanning magnetic probe measurements find the magnetic boundary is shifted up to 8 cm outward relative to the kinetic edge during LHI. This suggests a two-region structure is present: an edge force-free region dominated by the current stream(s); and an inner confined region with a tokamak-like plasma. LHI-driven plasmas have greater magnetic activity than comparable Ohmic discharges, with the activity asymmetrically distributed and localized to the injector stream region. Following shutoff of the injectors, this power rapidly ($\approx$ 0.5 ms) decays and symmetrizes, and the remaining activity resembles that of an Ohmic-driven discharge. Broadband activity during LHI has power law behavior resembling that of Alfvénic turbulence which is expected to cascade helicity to large scales and has been observed in other reconnecting systems. The role of this activity in helicity transport and current drive, along with high frequency activity $f \approx 2$ MHz ($\approx$ 2–4 f_{ci}) that increases with LHI drive, is being investigated.

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

Michael Bongard
University of Wisconsin-Madison

Date submitted: 28 Jun 2019 Electronic form version 1.4