



# Bongard *et al.*, EX/P6-34: Advancing Local Helicity Injection for Non-Solenoidal Tokamak Startup

- Scientific Quality: Recent Achievements

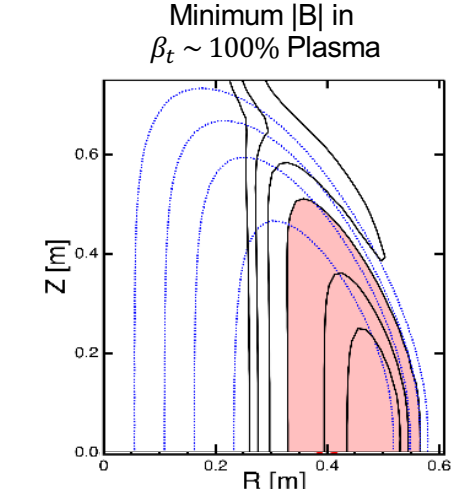
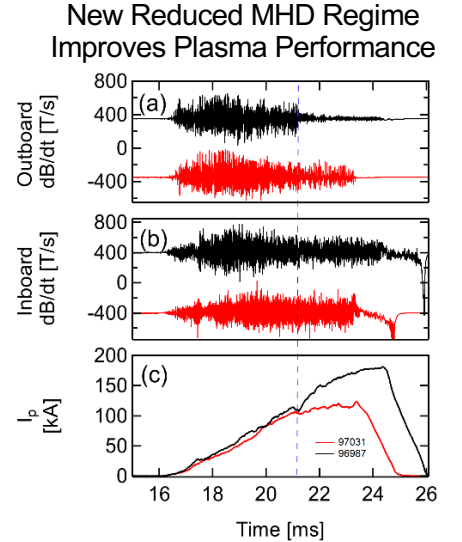
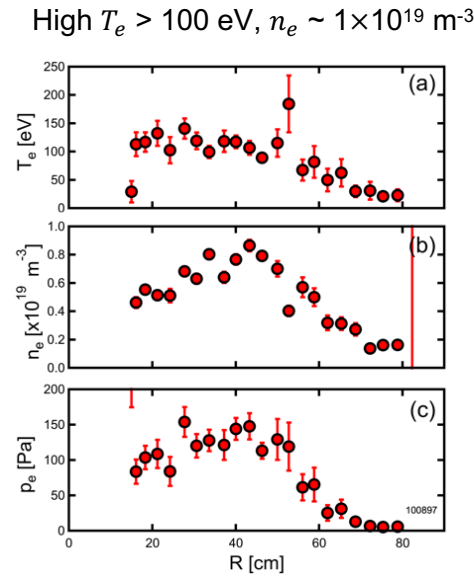
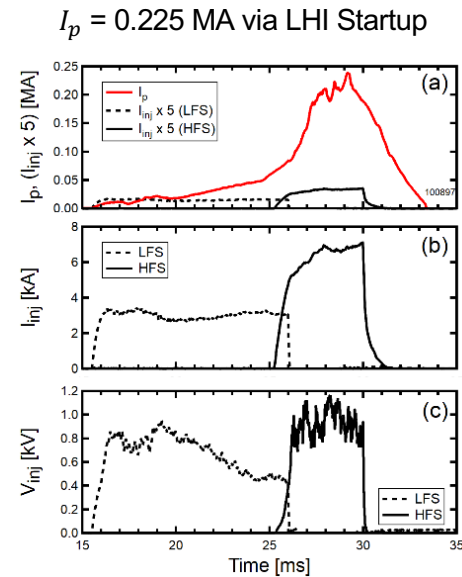
- Record non-solenoidal  $I_p = 0.225$  MA via Local Helicity Injection (LHI) in Pegasus ST
- LHI plasmas compatible with Ohmic sustainment and H-mode access
- Correlation of anomalous ion heating with continuous reconnection activity during LHI
- High  $T_e > 100$  eV at tokamak density ( $n_e \sim 1 \times 10^{19} \text{ m}^{-3}$ )
  - Record for helicity injection startup
- New reduced MHD regime discovered, leading to improved LHI  $I_p(t)$
- Experimental realization of large minimum-|B| well in world-record  $\beta_t = 100\%$  plasmas

- Relevance to Fusion Energy: Critical Issues Addressed

- Non-solenoidal startup capability eliminates need for central solenoid
  - Startup hardware removable before nuclear phase
- First demonstration of LHI  $I_p$  growth via handoff between separate HI systems
  - Proof-of-concept for future high  $B_T$  injectors specializing in early, late phases of sustainment
- Predictive 0D model suggests scenarios for NSTX-U, beyond

- Supporting Comments: Next Steps

- Major facility upgrades to Pegasus planned to support comparative studies of LHI, coaxial helicity injection, with EBW RF heating/CD



Schlossberg *et al.*, Phys. Rev. Lett. **119**, 035001 (2017)  
 Burke *et al.*, Nucl. Fusion **57**, 076010 (2017)  
 Barr *et al.*, Nucl. Fusion **58**, 076011 (2018)

Reusch *et al.*, Phys. Plasmas **25**, 056101 (2018)  
 Perry *et al.*, Nucl. Fusion **58**, 096002 (2018)

