

Study of Transport with Reversed Shear in NSTX

Fred M. Levinton



D. Stutman (Johns Hopkins U.)

S. Kaye (PPPL)

J. Menard (PPPL)

E. Synakowski (PPPL)

Goals for Proposed XP on Reversed Magnetic Shear

1. Reproduce and document with MSE-CIF discharges from XP411 that appeared to have improved electron confinement with reversed shear.
2. Development of a robust high $q(0)$, reversed shear startup using MSE-CIF for guidance.
 - Need high T_e early in discharge without MHD. Use early NBI, H-mode/L-mode, fast current ramp...
 - Useful for other XP's requiring high $q(0)$ or reversed shear scenario.

Goals... continued

3. Investigate thermal and particle transport of ions and electrons.
 - Macro and micro stability in RS region.
 - Power threshold, shear dependence,...

Run Plan Overview

Conditions: ~1 MA plasma current, ≥ 4.5 kG

1. Documentation of low density L-mode conditions from XP411 with MSE-CIF. (15 shots)

- Shots 112996, 112988, 112989 have different ramp rates with very different electron temperature profiles.
- Replace NBI source B with source A for MSE documentation.

Run Plan Overview

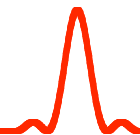
2. Develop high Te early in H-mode discharge, without MHD to slow down current penetration. Full size plasma with high kappa and DND. Monitor q-profile between shots with MSE-CIF and EFIT. (30 shots)

- Vary current ramp rate(4-6 MA/s)...add pause to avoid MHD.
- Start NBI injection as early as possible.
- Utilize lithium or helium conditioning if necessary.

Run Plan Overview

3. Develop high T_e early in L-mode discharge, without MHD. Full size plasma with high κ and DND. (20 shots)

- Strategy to prevent H-mode formation: gap adjustment, limiter operation, reduced NBI power.



Run Plan Overview

Section 2 & 3 of this XP could benefit from;

- Wall conditioning using lithium pellet injection (XP-515).
- RWM coil to develop low density startup without locked modes (XP-501)?
- Use HHFW is successfully coupled into startup phase to produce high Te, (XMP-030 & XP-510).