NSTX NOVA PHOTONICS *Supported by* U.S. DEPARTMENT OF ENERGY Office of Science

XP 1040 : Extending Reversed Shear ITBs and H-mode ITBs

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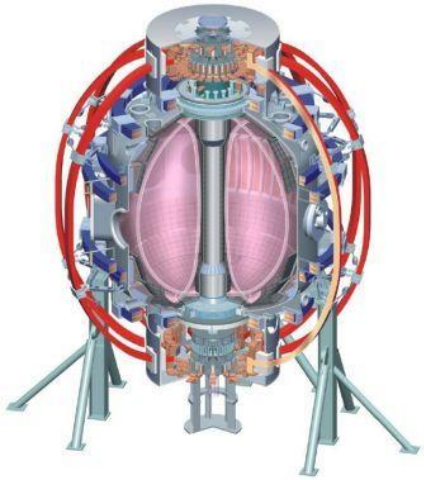
NSTX Results Review
November 30th, 2010

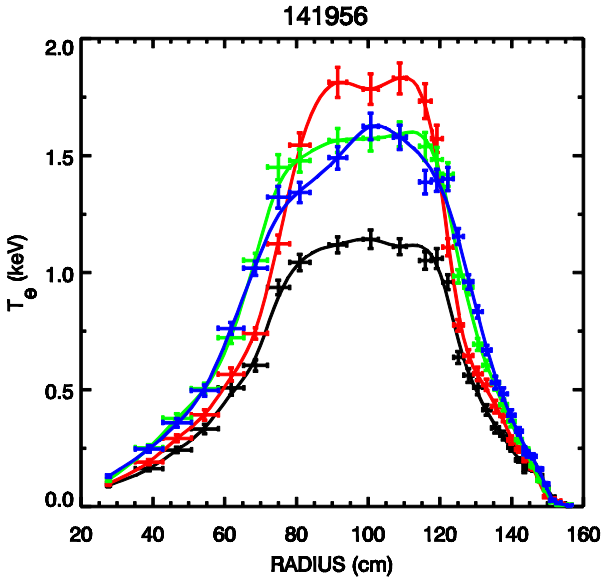


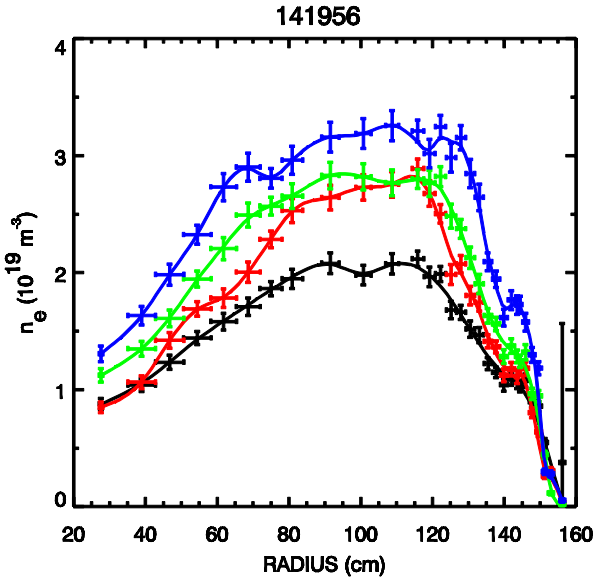
XP 1040 extended reversed shear and attempted to combine H-mode to ITB discharges

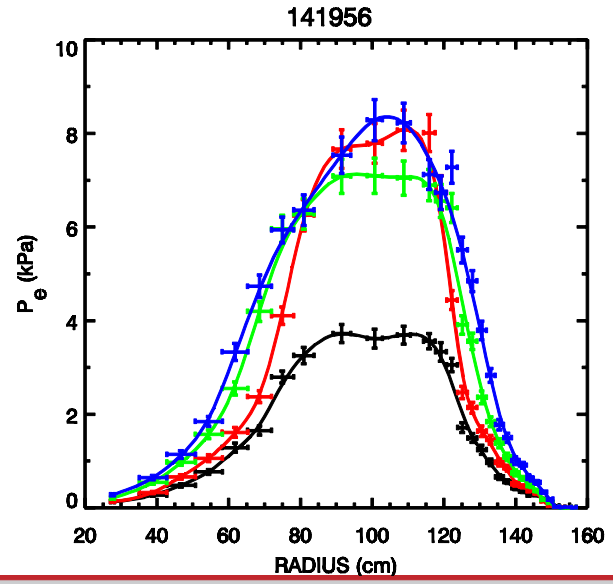
- Optimized reversed shear at 5.5kG
  - I_p scan (1MA)
  - Phase I current ramp point (-50 kA)
  - Flattop time (+40ms)
  - Beam power (Preheat with 2MW Src A, switch to 1MB Src B just before flattop, combined with 0.7 - 1.5 MW RF)
  - RF power at 1.5 insufficient to maintain RS discharge
- Could not completely eliminate internal reconnection
  - but minimized effect to continue with broadened ITB
  - Needed more power for wider ITB
- Extended reversed shear for ~250ms (relaxation time)
  - Sacrificed MSE and T_i, ITBs not impressive with low RF power
- Density ramp affected current distribution
  - Single LITER early morning evap
  - Delayed shutters / abort problems

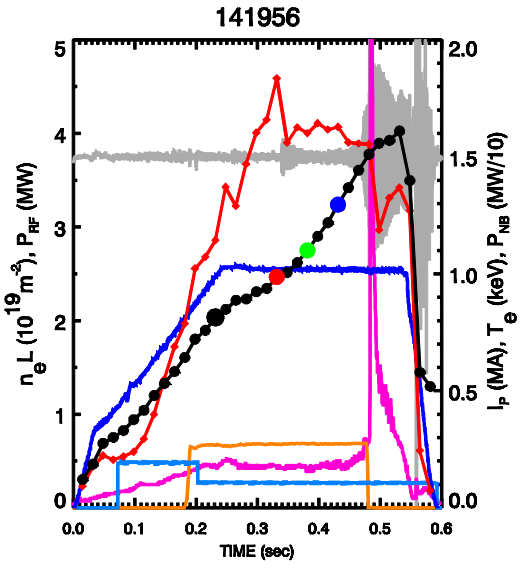
Sustained RS ITB for ~250ms

- With optimized conditions, the RS phase is maintained with only a small recon.
  - 1MW beams, no MSE until MSE-LIF
- ITB is broadened but we did not have enough RF to push gradients in wider
- Density



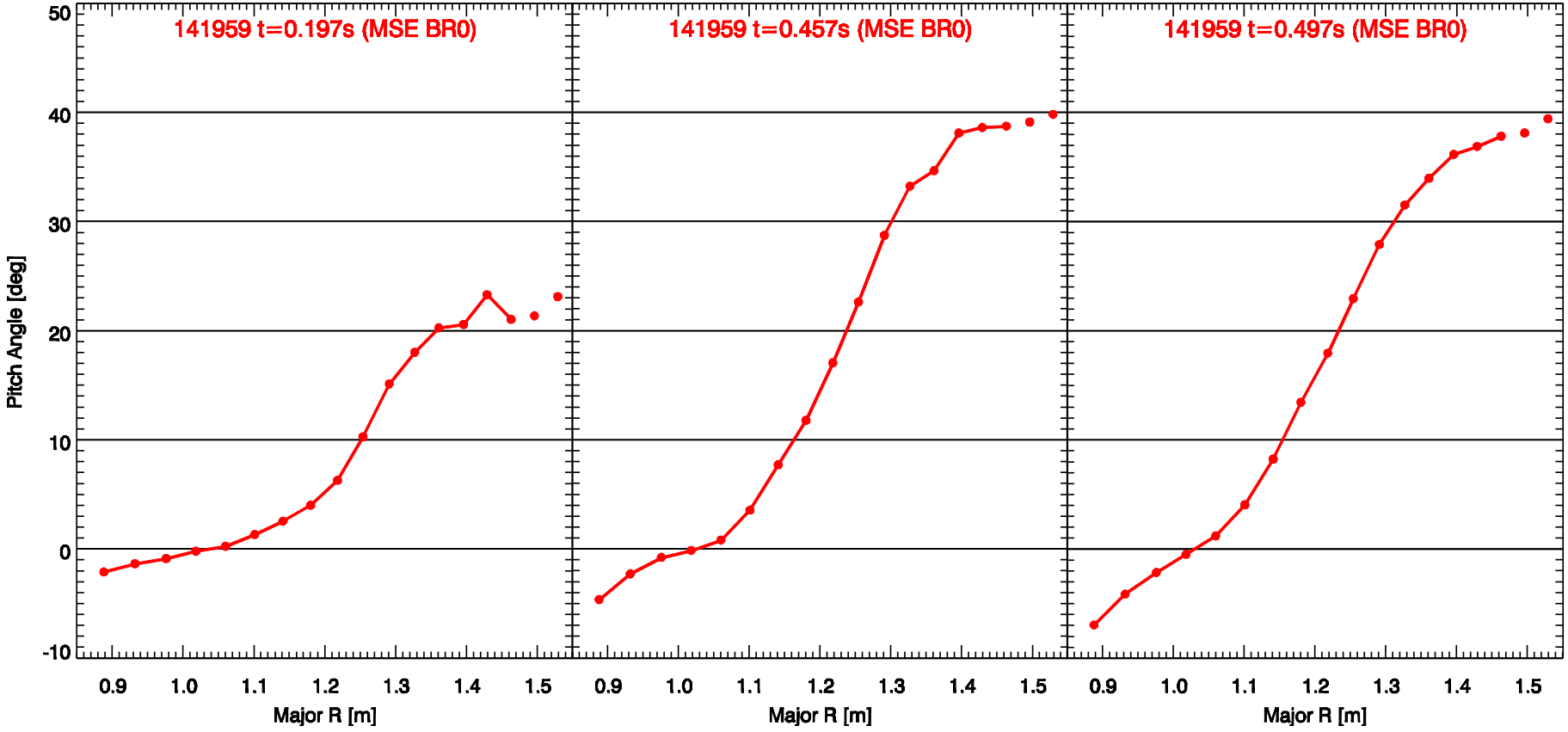






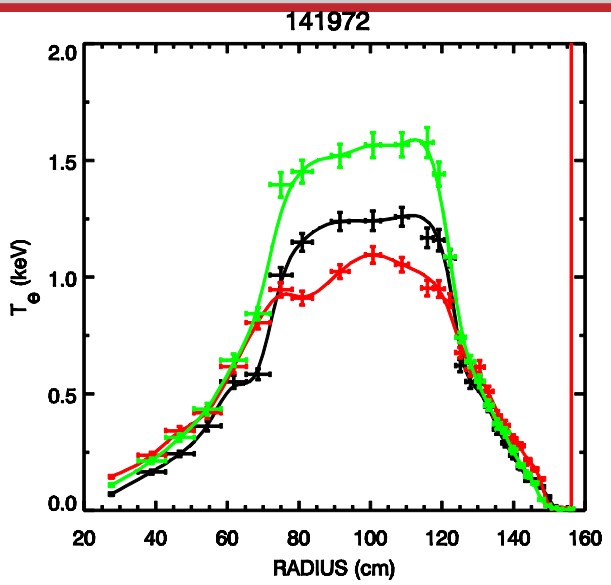
Pitch angle profile measured by turning Src A back on

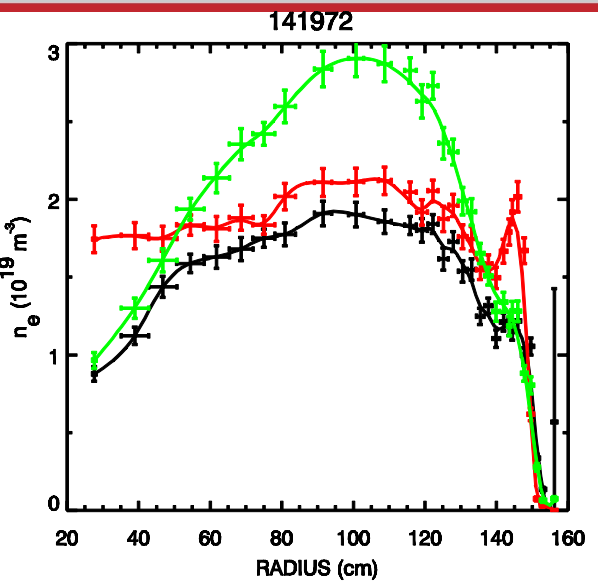
- "Restriking" Src A was surprisingly tricky
- MSE data shows RS profiles until very late in shot

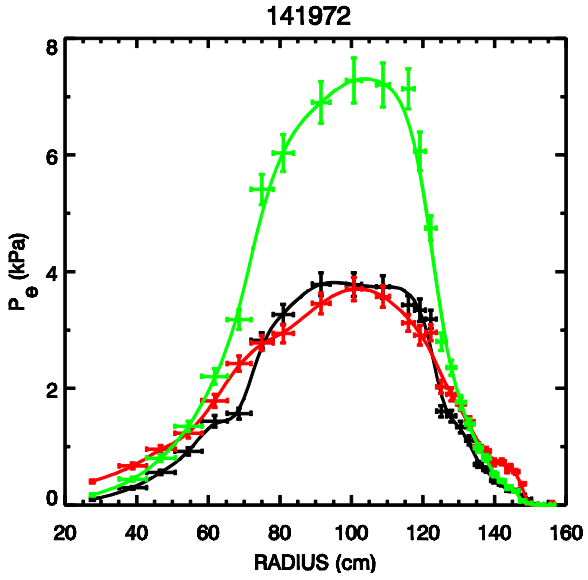


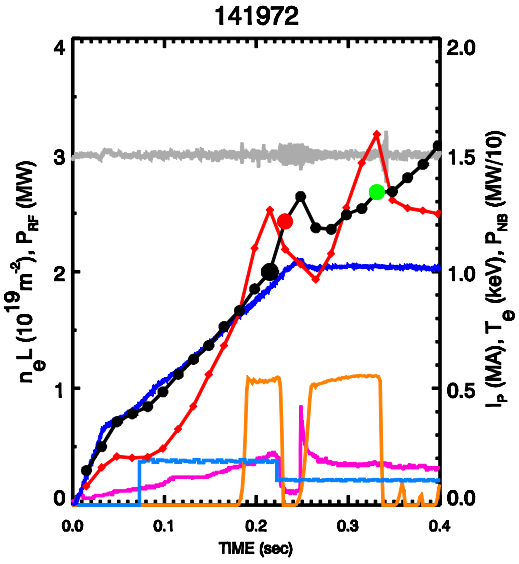
Triggered H-modes with RF, but could not sustain

- RF tripped consistently with L-H transition
- Short (25ms) H-modes did NOT cause current profile to collapse
- ITBs reheated after H-L back transition
- Beam triggered H-modes caused current collapse









XP 1040 Results

- Optimized L-mode discharge for extended RS
  - Successfully extended reversed shear current profile to ~500
  - Can only tolerate ~1MW of NBI (what causes reconnection?)
- Successful L-H transitions with RF power
  - RF trips on transition for these discharges
  - L-H transition (and H-L back transition) allows ITB to persist
- RF has successfully stayed on for other discharges

- Developed a good target for off-axis NBI

- Good hope for double barrier discharges
- MSE-LIF will help greatly