NSTX

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Summary of XP 836
Parametric scan of high elongation plasmas

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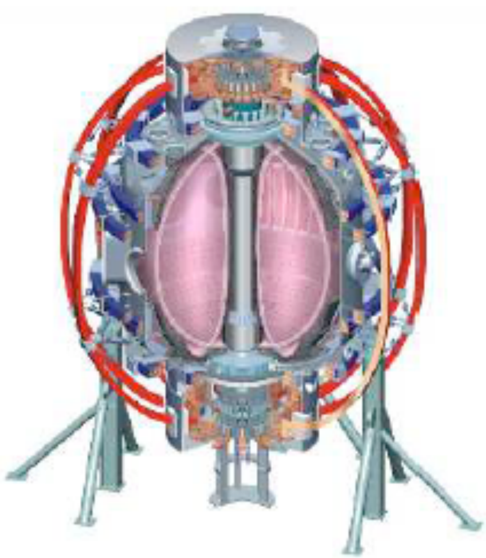
NSTX 2008 Results Review
Conference Room LSB-B318, PPPL
August 5-6, 2008



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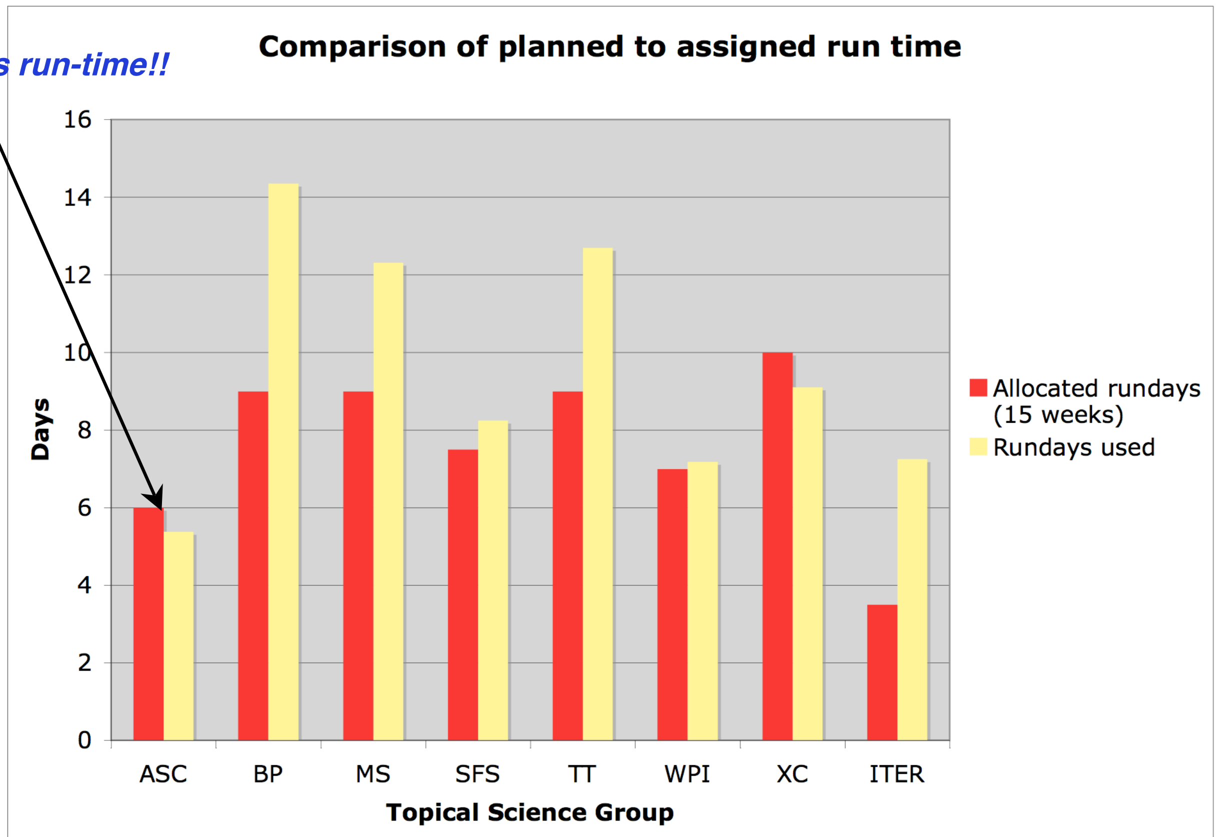
Not much time for ASC this year

- ASC only group not to receive planned allocation
- Long pulse experiments suffered from lack of run time
- Face serious issues meeting FY09 milestone
  - LLD may hamper machine conditioning

- *Less than 6 days run-time!!*



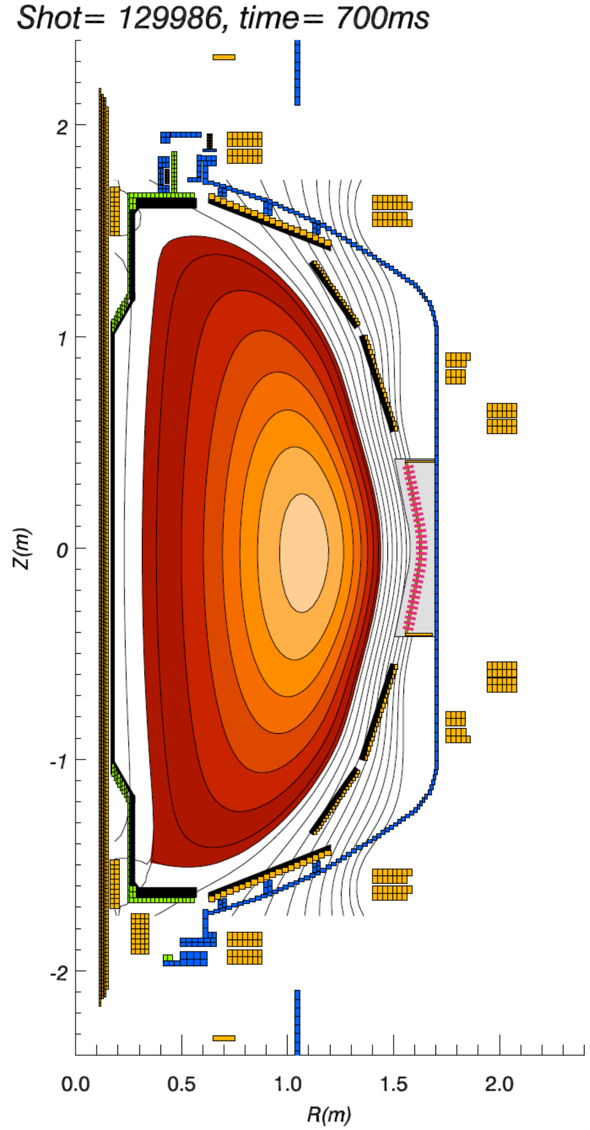
Run plan

- Goal: Improve the operating limits for the high kappa scenario (previously limited to β_N<4)
  - focus on varying B_t and I_p but also investigate the effect of lithium and error field suppression
- 1. Use Liter at 40mg/min, (use no glow scenario if this is effective). Start with shot 129121 (long pulse post-lithium from Jon's error field XP-). (1 shot)
- 2. Increase plasma elongation in increments of 0.1 (3 -5 shots)
- 3. Using elongation with optimum non-inductive current, increase toroidal field in 0.25kGauss increments up to 5.5 kGauss. Adjust pulse to avoid trips. (12 shots)
- 4. Do current scan at select toroidal fields. Use optimum toroidal field, .25kGauss higher and .25 kGauss lower. Current scan from 700-900kA in 50kA steps. (12 shots)
- 5. Repeat 3 and 4 with lithium recently applied, but with evaporator off. (20 shots)

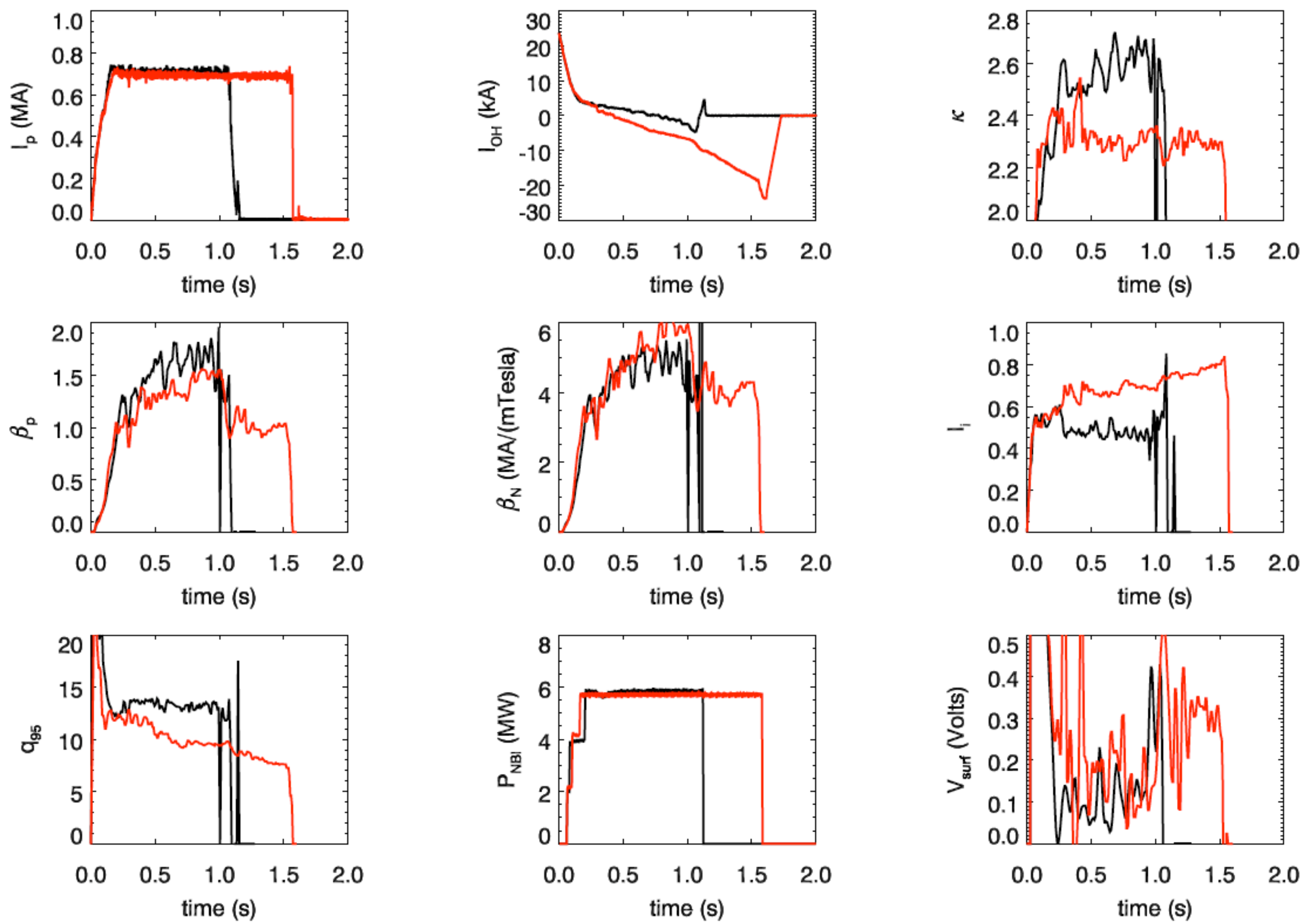
- ***XP was run over the course three different run days - did not receive full allocation of run time***

Summary of results

- Successfully developed high elongation scenarios, with lithiumization, and non-axisymmetric control
  - Benefits appear to add
- Have successfully attained high κ (~ 2.7) and high β_p simultaneously
- These values were sustained for long pulse ($\tau_{pulse} > \tau_{CR}$)
- Have set record for sustained β_p ~ 1.8 during the I_p flattop



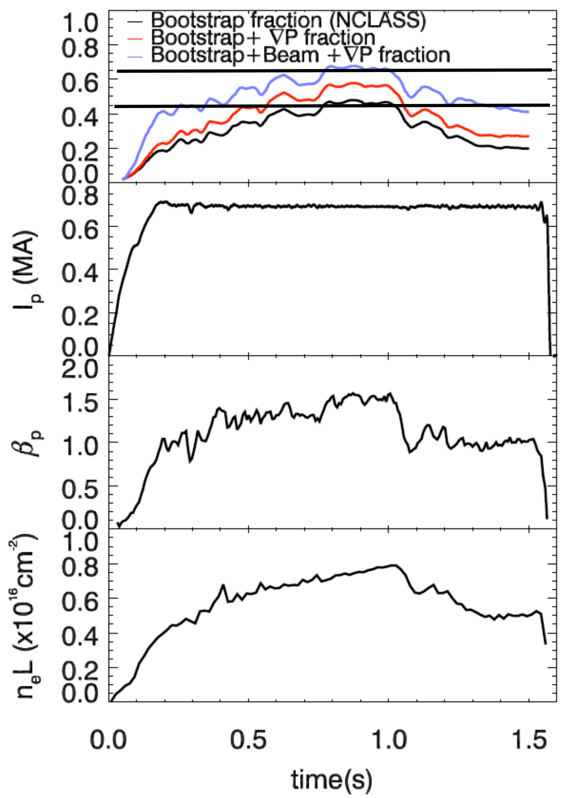
Comparison of 129986 to 116318



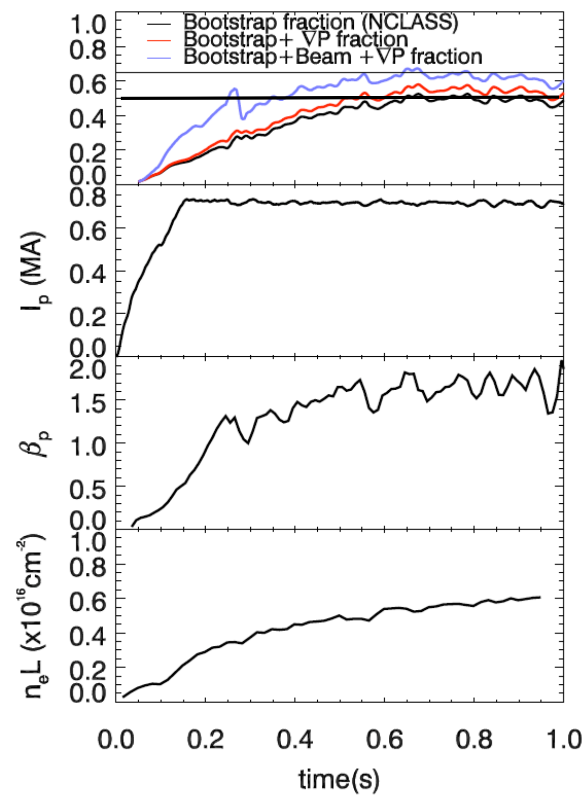
TRANSP indicates 65% non-inductive current fraction

- Same as levels achieved in previous "best discharges"
  - High non-inductive current fraction maintained longer
  - TRANSP indicates Pfirsch-Schluter+diamagnetic currents lower
- Analysis of current profile constituents shows 25% deficit of current relative to total from MSE
  - Issues with Z_{eff}, reconstructions?
- Density ramp rate is reduced with LITER

- ***Results of TRANSP analysis for shot 116318***



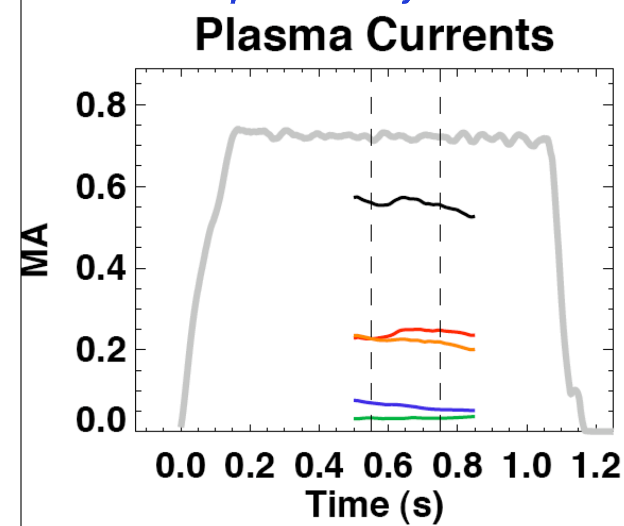
- ***Results of TRANSP analysis for shot 129986***

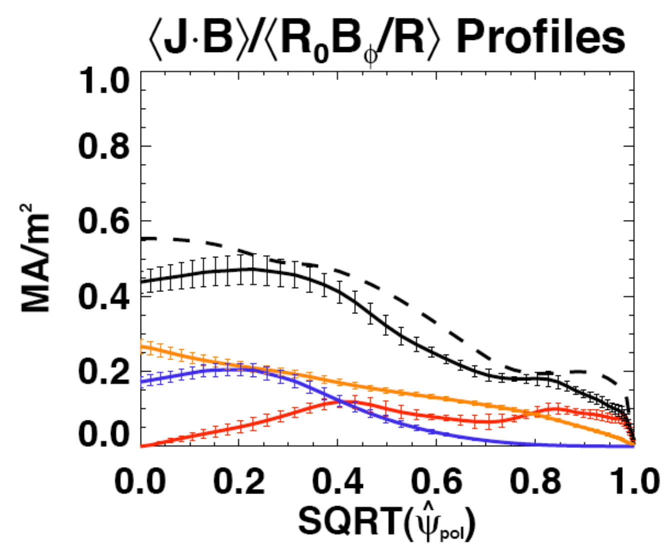


Current profile analysis shows ~20% discrepancy

- Historically current profile analysis gives good agreement
- Most easily explained by a problem with the electron density
- Correction of ~20% to n_e would raise non-inductive current fraction to record value
  - Z_{eff} high, also indicative of density anomaly

- *Current profile analysis for 129968*





Observations

- Reproducibility much better than last year (dual LITERs, long bakeout, n=1 feedback)
- Initial results indicated lower I_p had substantial loss of confinement
- Second run day reversed this trend
  - Dependent on multiple days of lithium operation in a row?
- Substantial difficulty reconstructing these equilibria