Results from XP-836
“Parametric scan of high elongation plasmas”

NSTX Physics meeting

D. Gates

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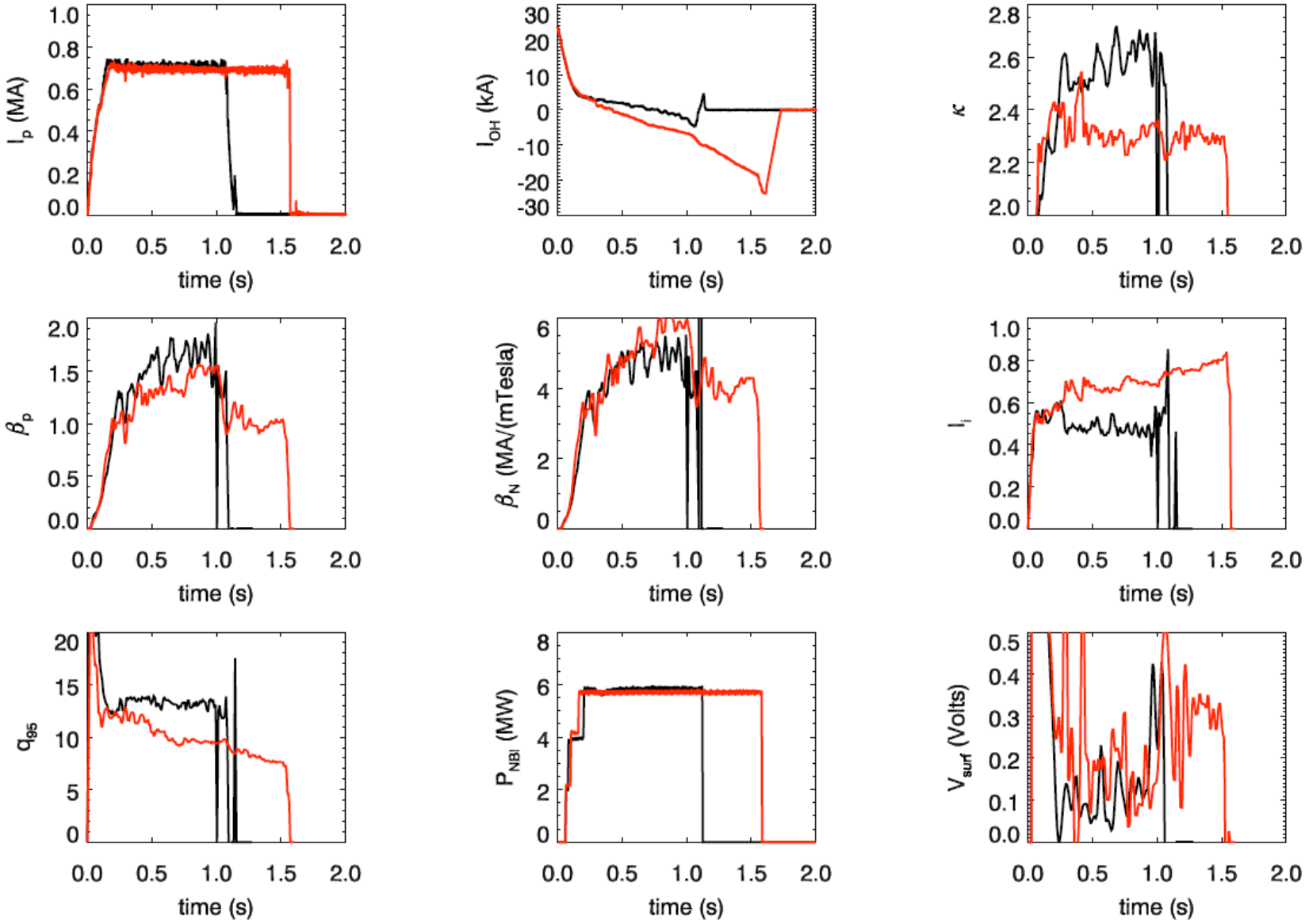
Run plan

- Goal: Improve the operating limits for the high kappa scenario (previously limited to β_N<4)
  - focus on varying B_t and Ip 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)

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 ($\tau_{pulse} > \tau_{CR}$)
- Subject to verification, appear to have set record for sustained β_p during the I_p flattop
  - Also at higher Te than previous high β_p scenarios
  - Pending full analysis, should give higher non-inductive current fraction

Comparison of 129986 to 116318



Observations

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