Status & future: XP221

Tearing & kink stability of low-li plasmas with reduced EF

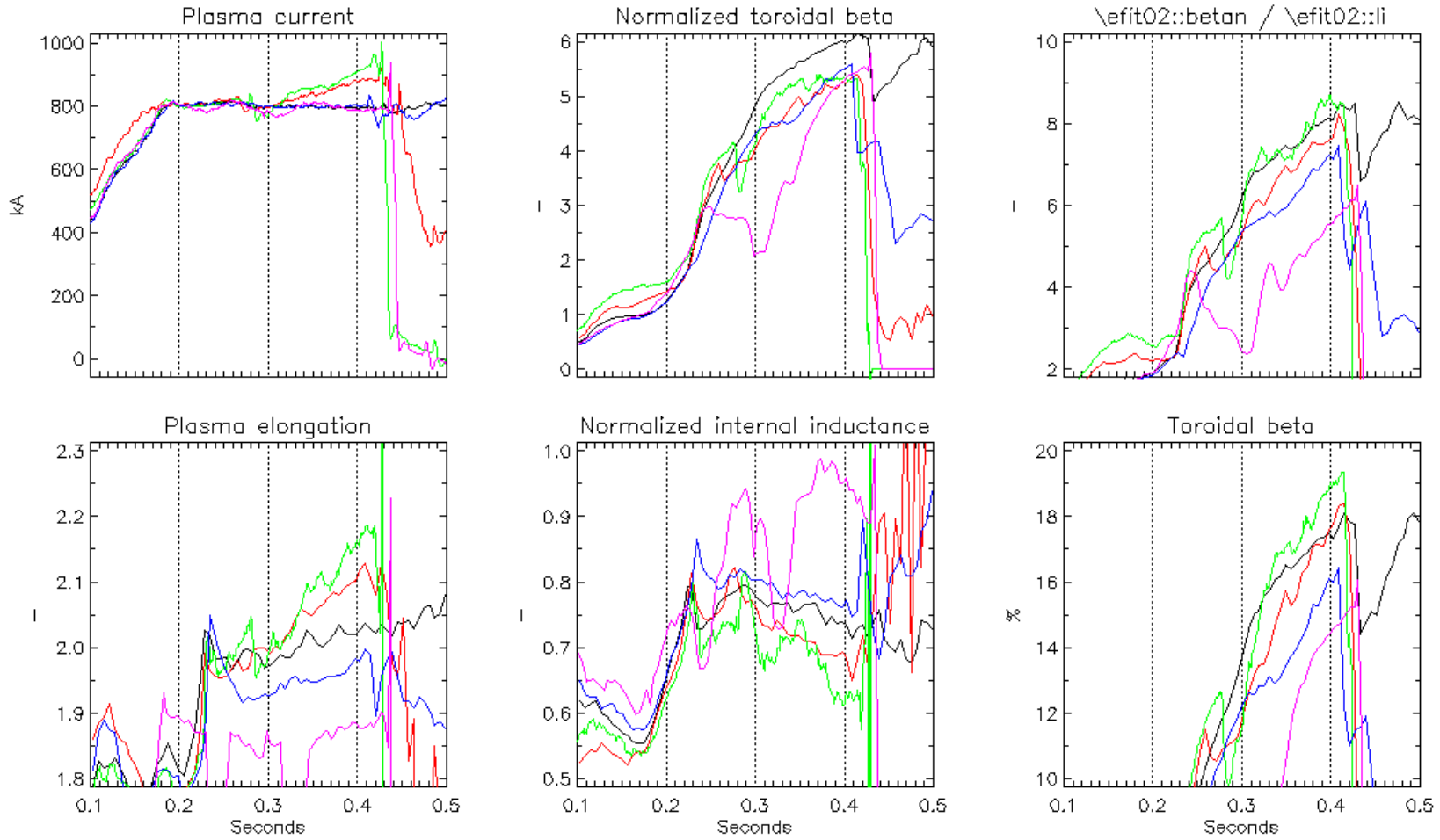
- Used κ, δ changes and I_P ramps to vary l_i
  - Scanned li from 0.6-0.9, κ=1.9-2.2
  - β_N did not drop with increasing κ

- Want to do stability calculations, but need:
  - Post-neon CHERs for TRANSP runs
    - 108420, 108433, 108435, 108721
  - Do kinetics match EFIT stored energies?
  - Assess proximity to no-wall and with-wall limit

Increased $\kappa \Rightarrow$increased β (higher I_P, but fixed q*, β_P)

Shots:
108420
108433
108435
107821
107637

XP221, 202



XP Goal: higher κ in steady-state

- Previous run showed higher κ could lower l_i, with increase in β at higher I_P
- Develop higher-κ 800kA LSN with flat-top
  - Attempt to get to κ=2.2-2.3 (as tall as possible)
  - At fixed I_P ⇒ higher q* ⇒ higher β_P and q(0)
    - Find stability limit, document with kinetics
  - Raise I_P with fixed q*, could possibly get to 1MA at high $\beta_P > 1.2$ and high q also, $\beta_t = 18\text{-}20\%$
    - Find stability limit, document with kinetics
  - Scan triangularity in high κ state
    - Predict higher δ should have higher β_N limit

Status & future: XP207

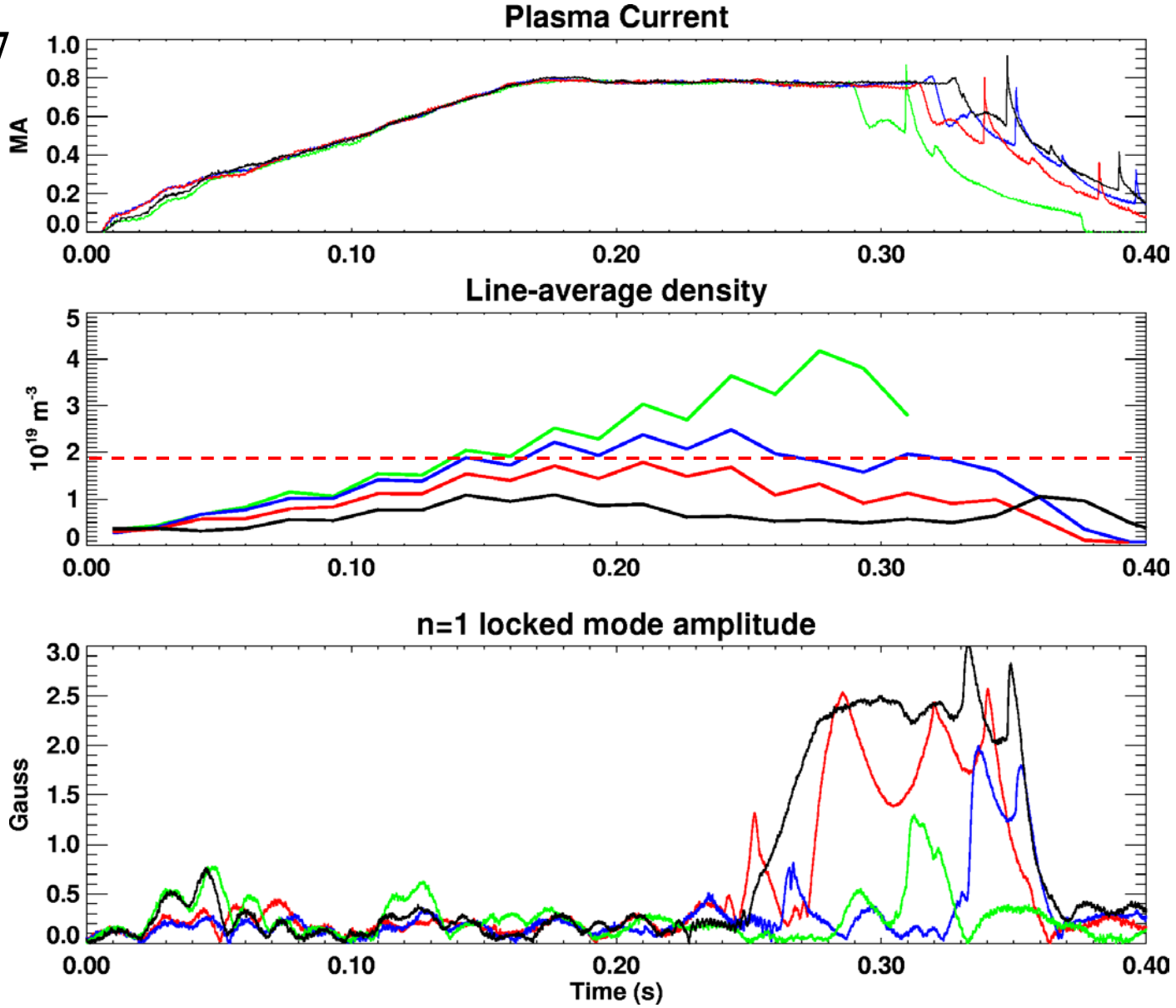
Impact of error-field reduction on NSTX LSN discharges

- Density scan this FY with reduced EF shows clear threshold for locked-mode onset

- Need to compare to Fitzpatrick theory
  - Compute resonant (2/1) component vs. time
  - Compute other time-scales for threshold size
  - Use MPTS for ohmic diamagnetic ω_0 calculation
  - *Should be able to finish this for IAEA paper*

Persistent locking observed only for $\bar{n}_e < 2\times10^{19}m^{-3}$

XP207



Goals of future XP work

- Extend comparison w/ theory to different B, I_P
  - Is there a parameter regime w/o modes at lower n_e?
- Use NBI pulses to increase rotation, turn off mode $\Rightarrow$ change mode natural rotation
- Using single source, wait long enough to approach no-wall limit at low density – does EF amplification happen - locked mode return?
- Will want reproducible locked-mode conditions to compare ex-vessel locked mode sensor signature to new internal RWM/EF sensors