Reversed Bt operation proposals

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Combined T & T and BP Meeting
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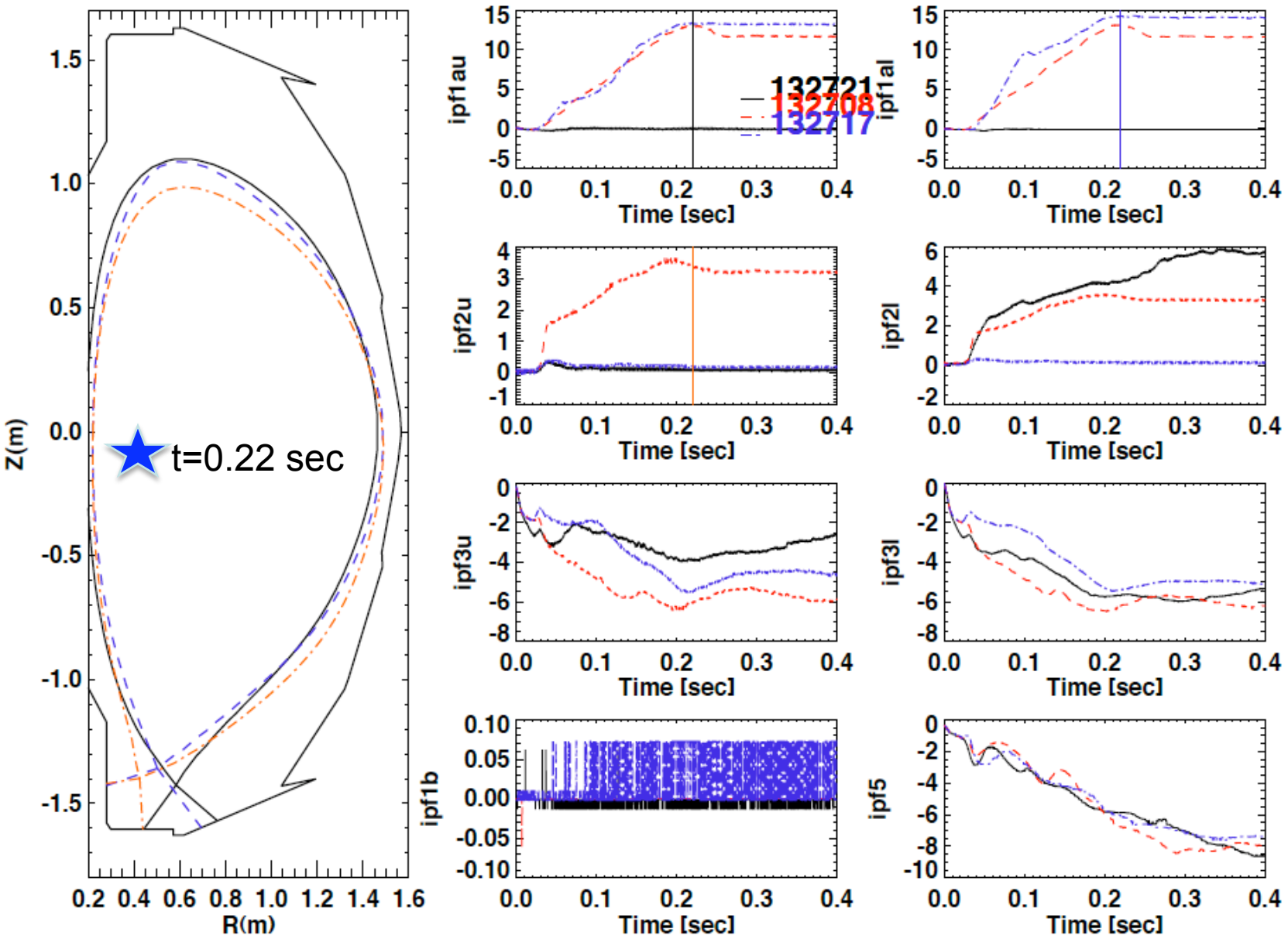
Proposal: measure effect of grad-B drift on P_{LH}

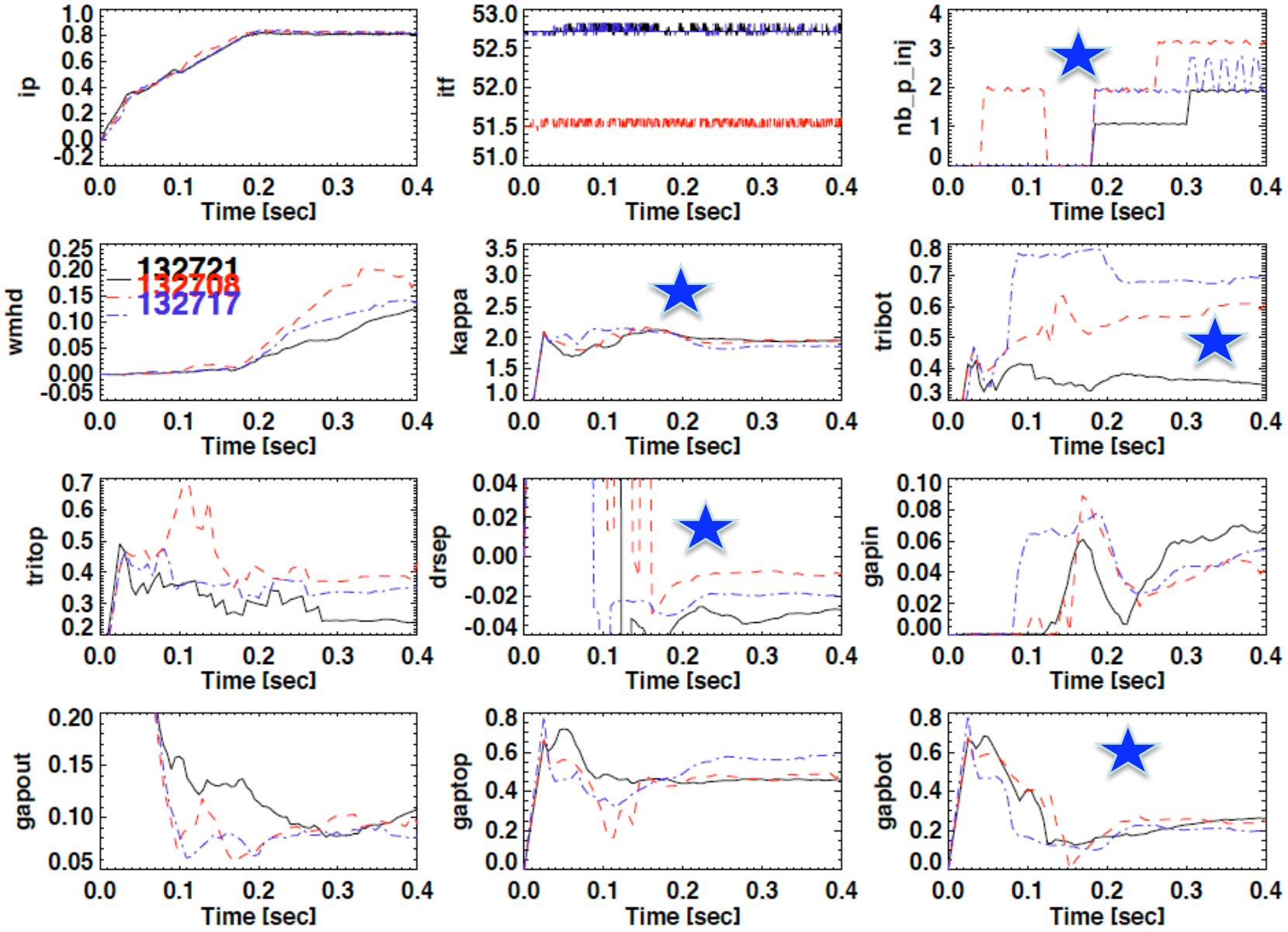
- Unfavorable grad-B drift direction usually increases P_{LH} by ~ 100%, so measuring P_{LH} along with edge gradients and turbulence will augment power threshold studies

- Proposal: measure P_{LH} in LSN H-modes at low and high delta to complement results from XP 909
  - Target δ=0.4, 0.8 (in LSN configuration)
  - Consider also a DN comparison to verify P_{LH} doesn't change?
  - Interpret results in collaboration with CS Chang and XGC runs
- Alternate execution idea: use RF to measure P_{LH} with power ramps as in XP941 today, instead of P_{NBI}

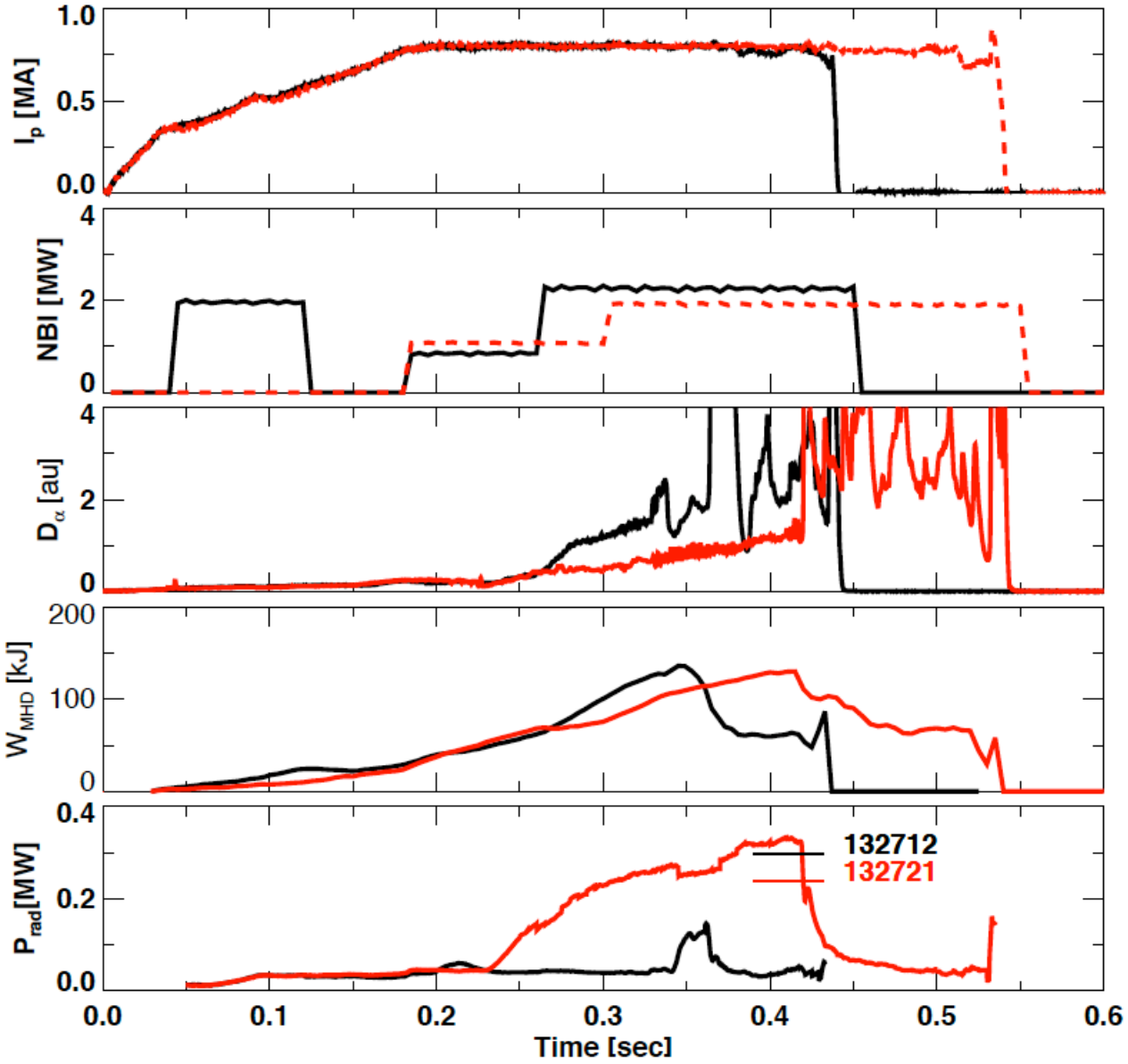
Three X-point radii and triangularities achieved



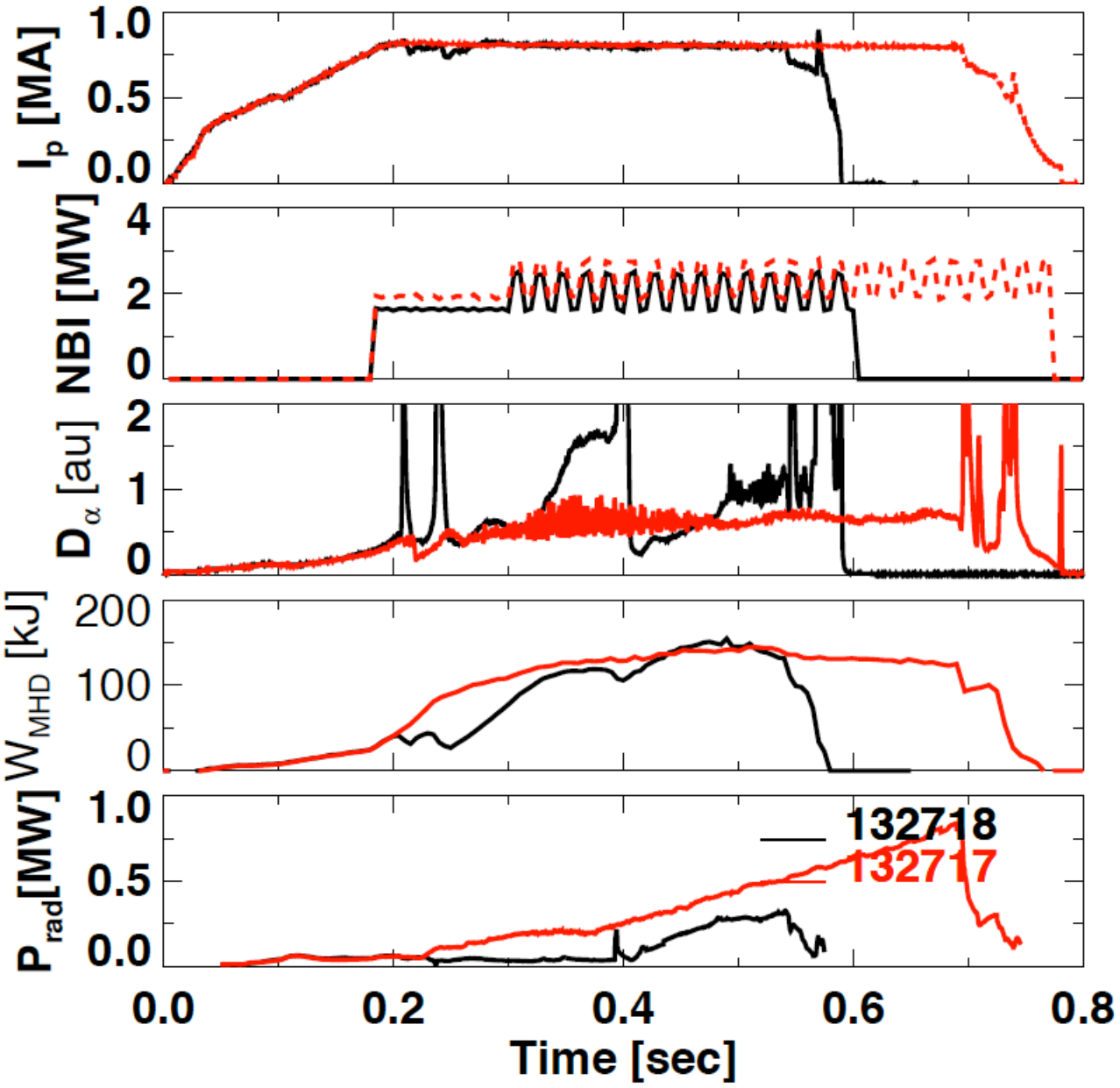
κ, bottom gap relatively well matched at 0.2 s, but δ_r^{sep} different
P_{LH}^{NBI} lowest for $\delta_L \sim 0.4$ and comparable for higher δ_L



Low δ_L~ 0.4 has P_{LH}^{NBI} < 1.1 MW



High δ_L~ 0.7 has $P_{LH}^{NBI} \leq 2$ MW



Proposal: Characterize high power L-modes with Rev. B_t

- Unfavorable grad-B drift direction usually increases P_{LH} by ~ 100%, so this should increase operating space available for L-mode operation
- Recent C-Mod data shows rather good performance in rev. Bt L-modes, but they don't have enough power to see impact on ELMs and β limits
  - C-Mod shows formation of H-mode pedestal-like Te but without high density edge
- Proposal: characterize L-mode operational window, edge characteristics with an NBI and IP scan
  - Target δ=0.8 fiducial-like configuration with strong downward bias
  - High Bt important for β limit headroom?
  - Add RMP to look for density pumpout signs?

Improved L-modes in C-Mod have pedestal-like profiles

McDermott, PoP 2009

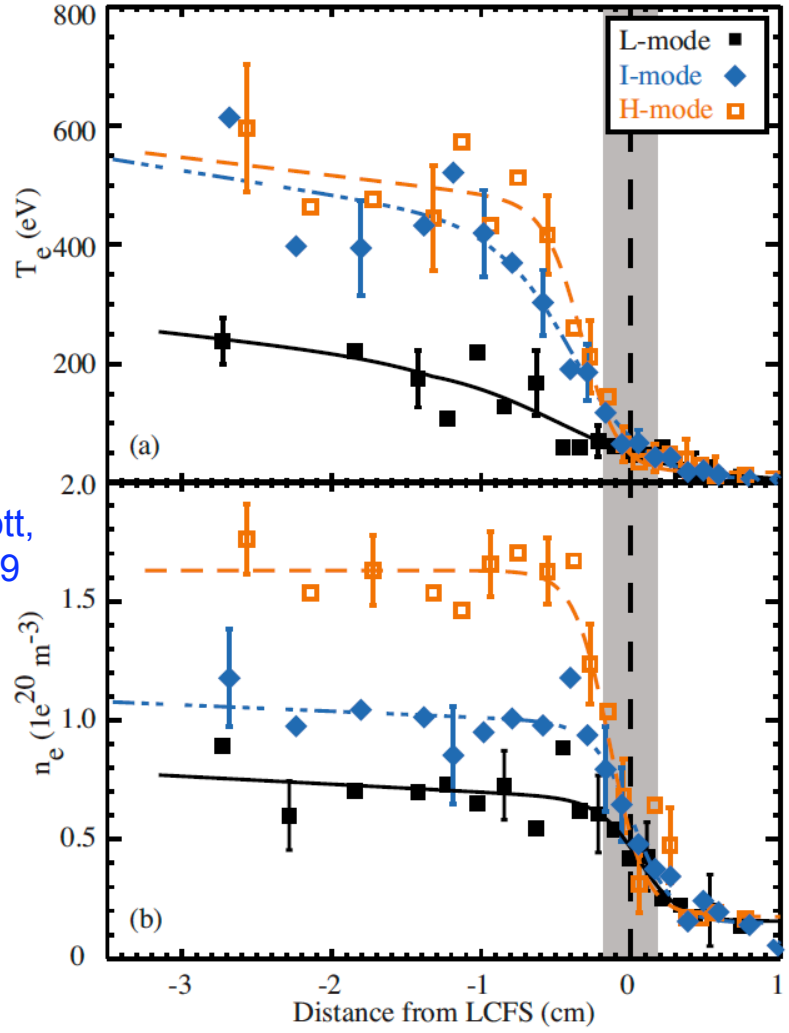


FIG. 14. (Color online) Comparison of (a) edge electron temperature and (b) electron density profiles between *L*-mode, *I*-mode, and *H*-mode plasmas. The *I*-mode temperature profile approaches *H*-mode values, while the *I*-mode density profile remains closer to *L*-mode levels.

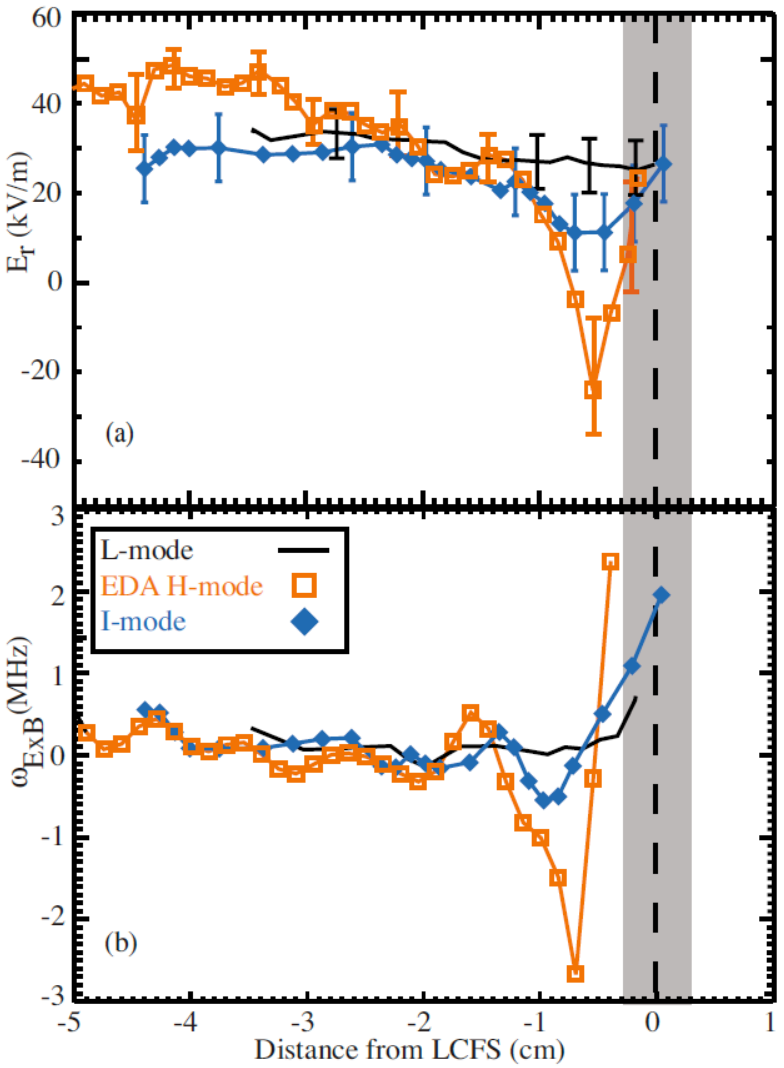
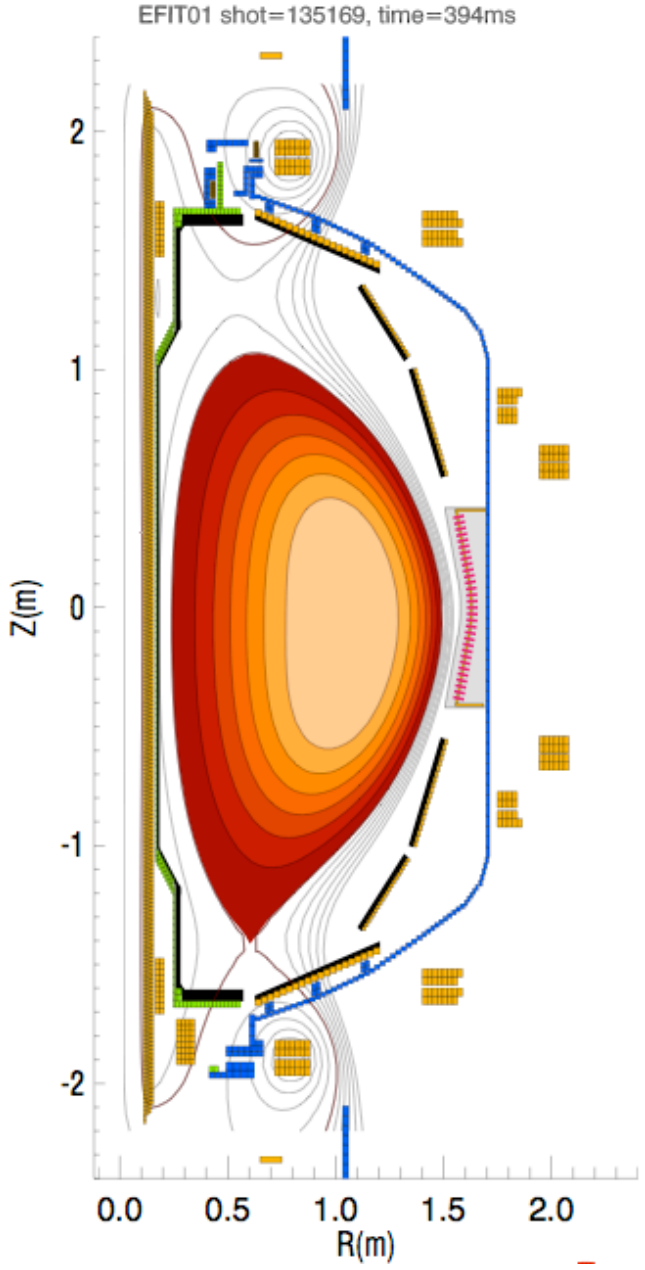


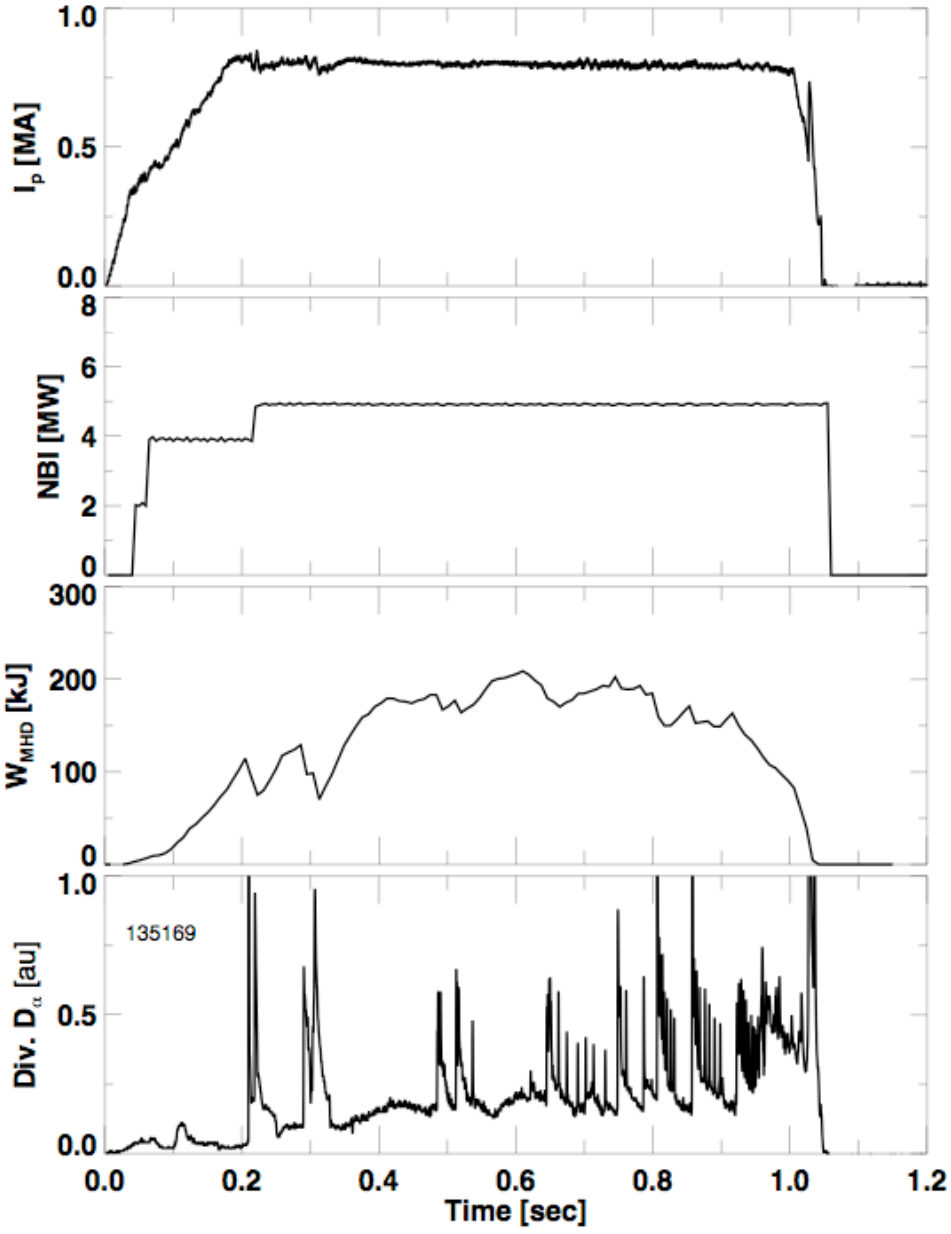
FIG. 15. (Color online) Comparison of (a) the radial electric field and (b) the $\mathbf{E}\times\mathbf{B}$ shear profiles between an *L*-mode, *I*-mode, and EDA *H*-mode. *I*-mode radial electric field well depths and $\mathbf{E}\times\mathbf{B}$ shear rates are lower than their *H*-mode counterparts.

Proposal: Thermal transport in H-mode boundary with rev. Bt

- Power flow to outer and inner divertor observed to become more balanced with rev. Bt operation in tokamaks
- Proposal: complete scans of several quantities known to affect the divertor heat flux profile: P_{NBI}, I_P, gas puffing (as in FY2010 Joule milestone XP923) in low delta PF2L shapes run in XP942 (e.g. 135169)
  - Low δ needed to see both inner and outer strike points
  - Some high δ shots desired as well (only assess OSP)
  - Need to add some radiative divertor tries as well
- Basic modeling: simulation of data with 2-D codes (e.g. b2 /EIRENE, UEDGE, DEGAS-2) to assess how heat is transported between midplane -> X-point -> divertor
- Detailed modeling: prediction of SOL heat flux widths from turbulence models, e.g. SOLT code

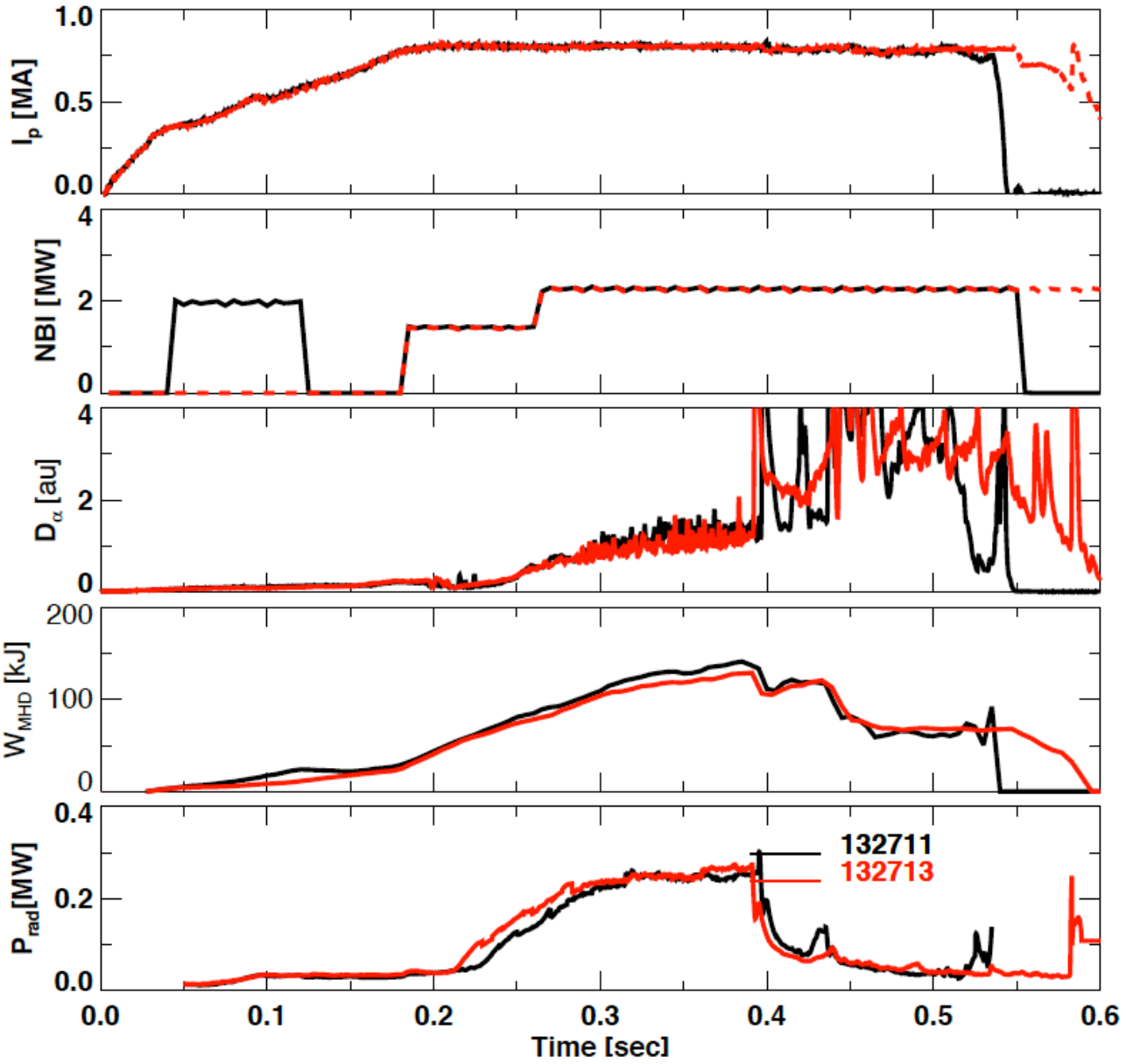
PF2L diverted shapes allow spectroscopic access to both strike points





Backup

Early P_{NBI} does not affect P_{LH}^{NBI} (Low $\delta_L \sim 0.4$)



Medium $\delta_L \sim 0.55$ has $P_{LH}^{NBI} \leq 2$ MW