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NSTX

Effect of Resonant Magnetic Perturbations on ELM Stability in NSTX

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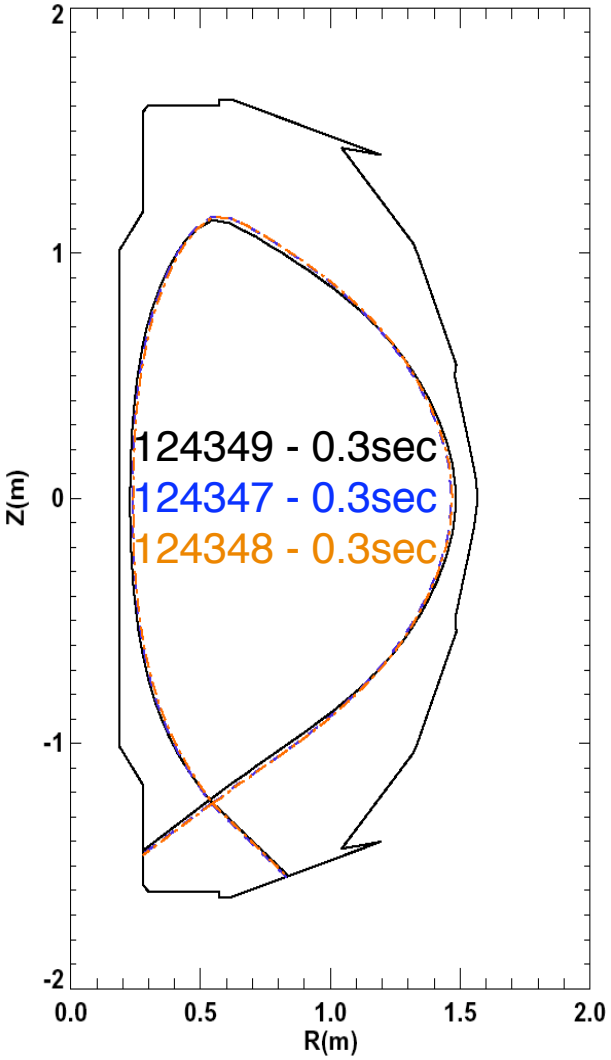
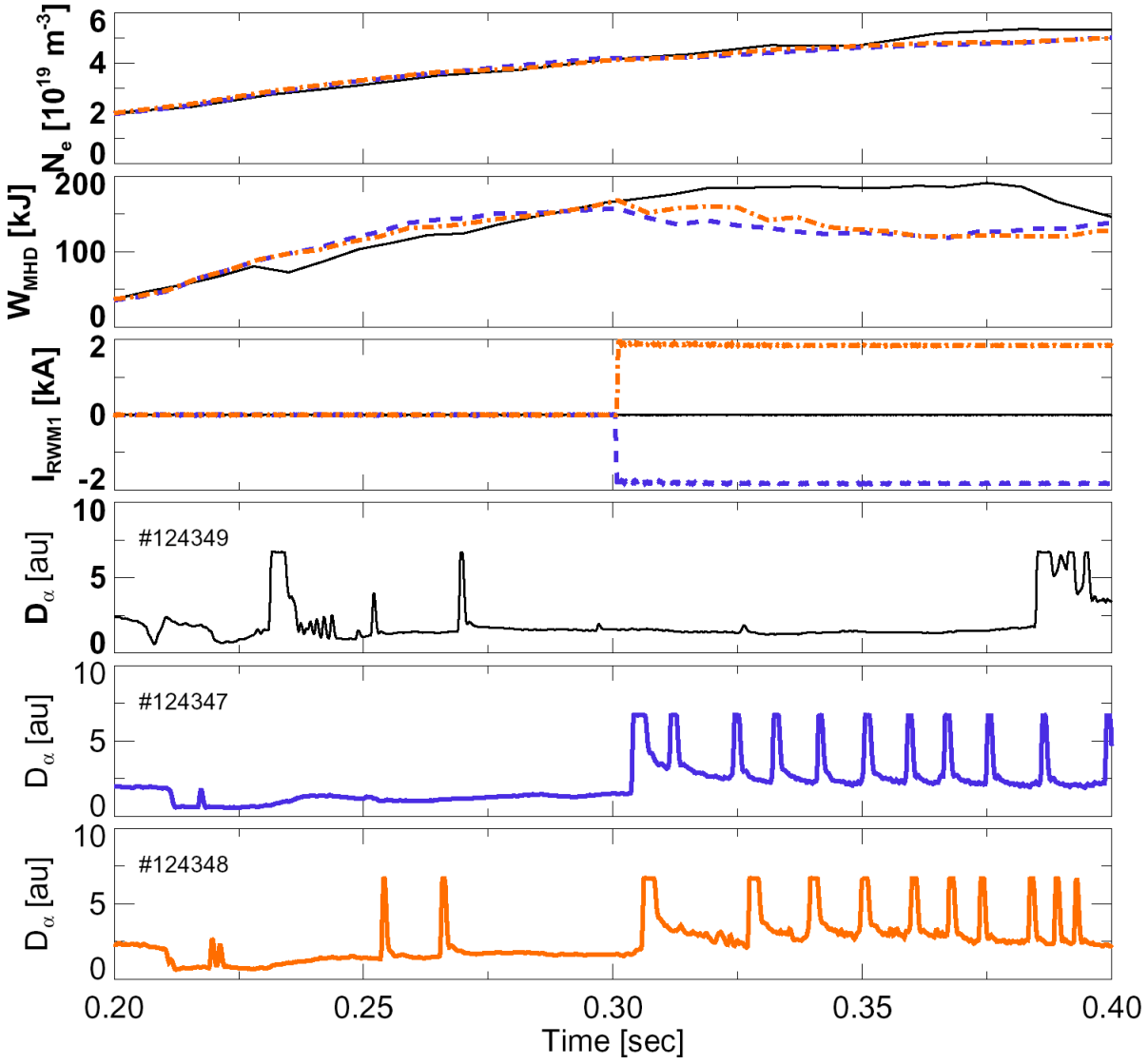
Motivation and Background

- Large ELM mitigation and/or suppression required to prevent excessive PFC damage in ITER
- DIII-D very successful at suppressing Type I ELMs with n=3 Resonant Magnetic Perturbations (RMP), using internal coils
- Limited success in affecting edge stability with external C-coils
- Recent success in JET: ELM mitigation with n=1 RMP, external coils

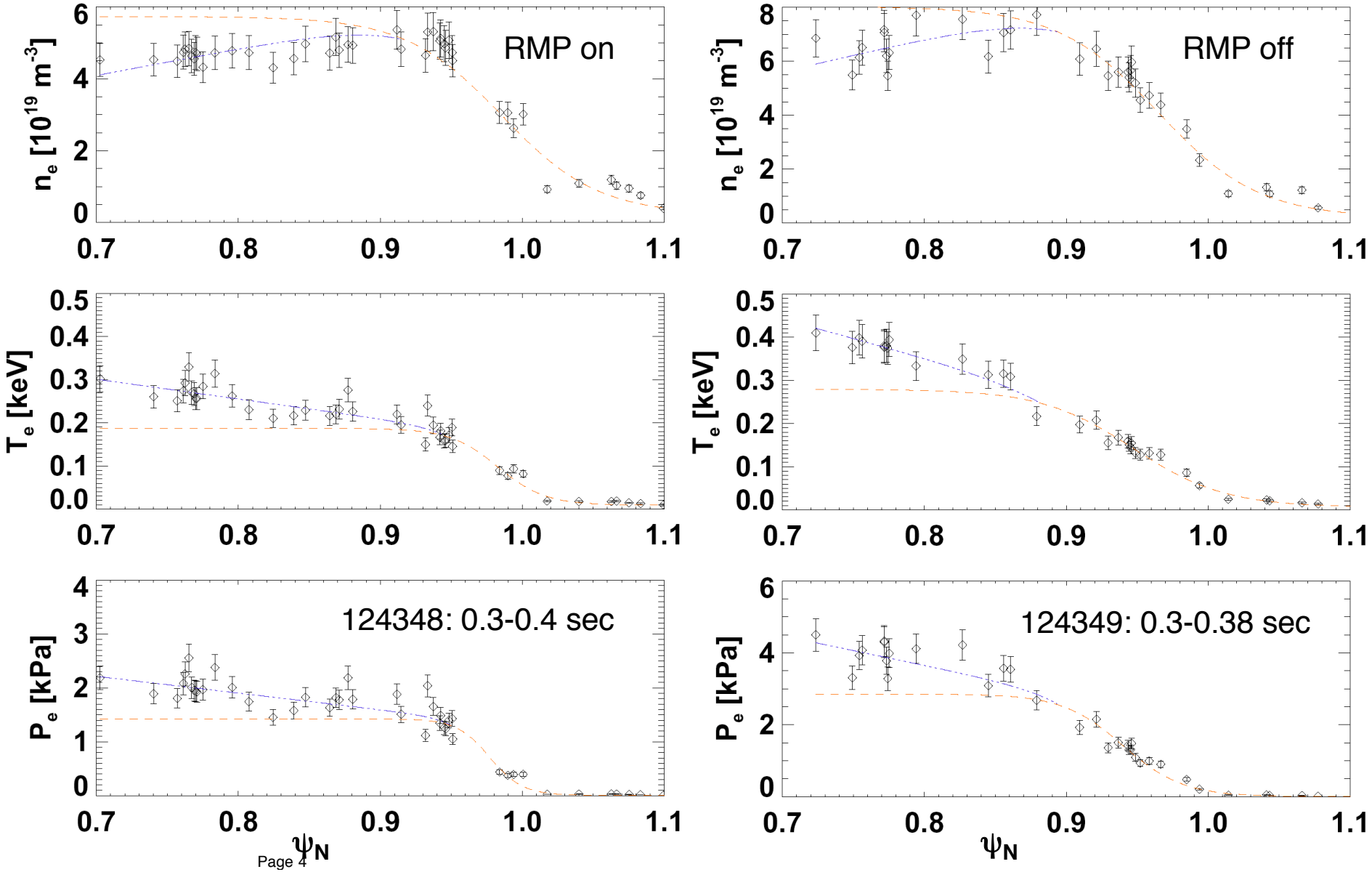
- NSTX error-field correction and resistive wall mode coils are external to vacuum vessel, but closer to plasma boundary than DIII-D's C-coil
  - Previous NSTX XP in 2005 showed brief periods of affecting ELMs, but the RMP effect could not be separated from recycling changes
  - Subsequent XP in 2007 showed ELM-triggering, rather than suppression

RMP can de-stabilize ELMs in low δ_l discharges

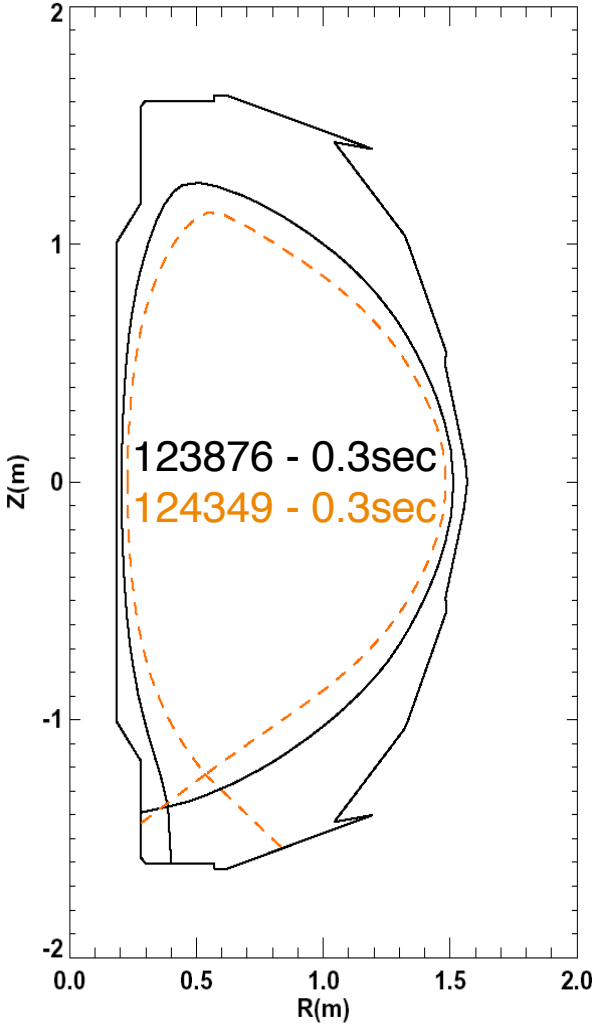


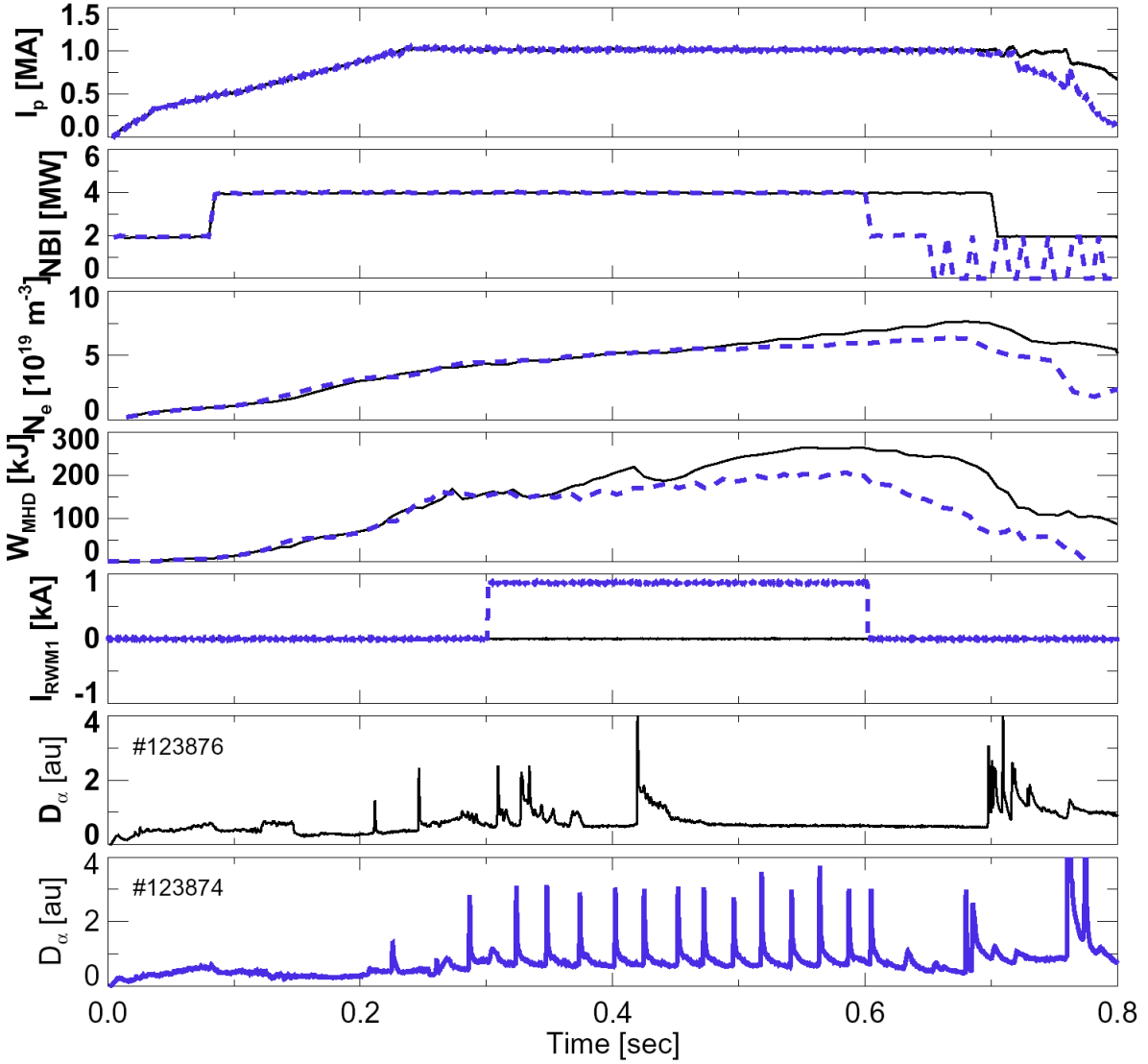


Preliminary tanhfits show peak pressure gradient comparable with and without RMP



RMP can also de-stabilize ELMs in high δ_l discharges





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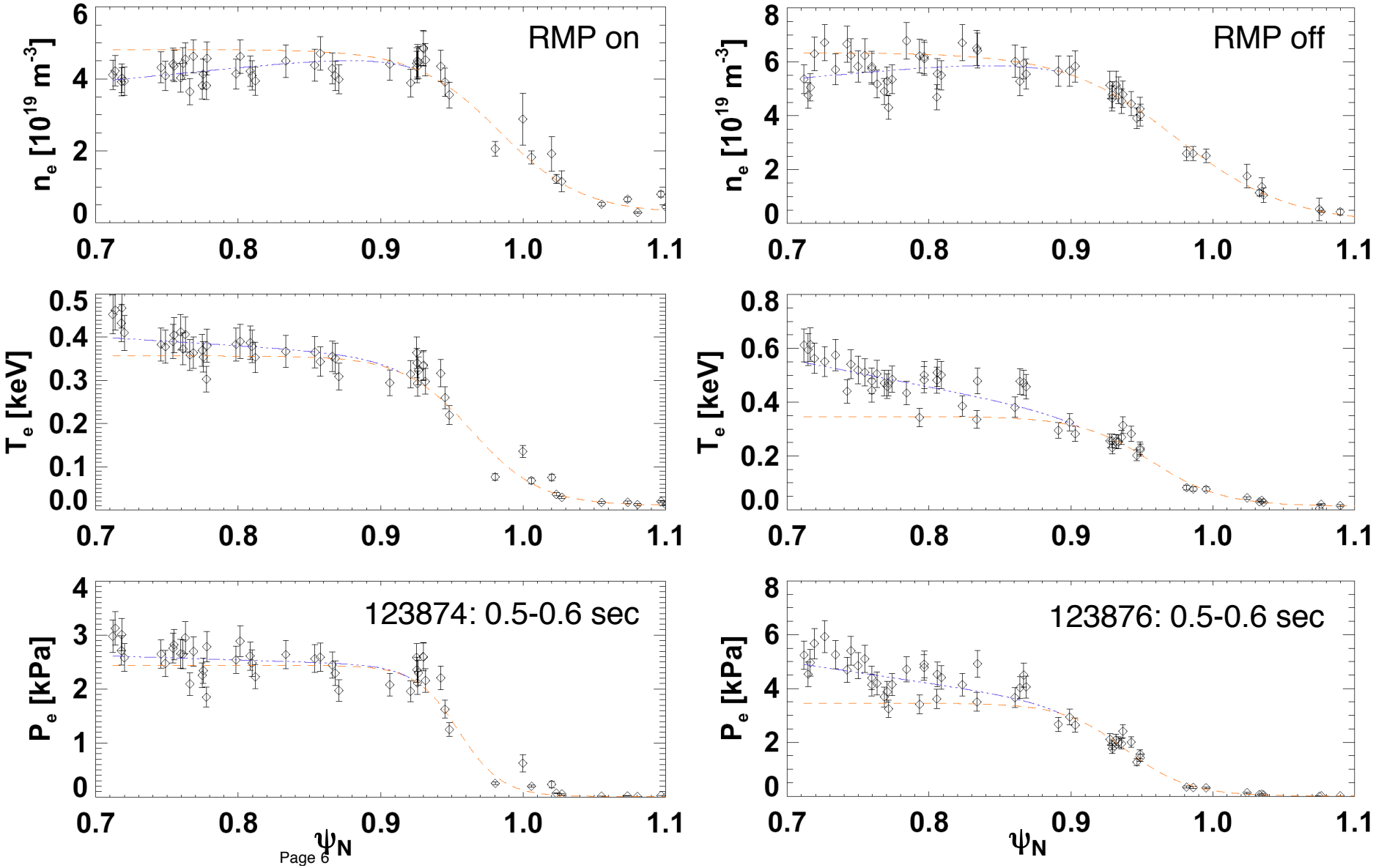

Proposed Experimental Plan: Exploring ELM-Triggering by RMP (_ or 1 day)

- Determine threshold RMP level for ELM-triggering (5/10 shots)
  - Reproduce low δ_l quiescent discharge (ref 124349)
  - Vary current in EF/RWM coils
- Eliminate effects of changing recycling patterns (4)
  - Alternate discharges with RMP on, RMP off
- Get good, high resolution edge profiles for stability analysis (with e.g. ELITE) by varying outer gap (4)

- Investigate resonant nature of ELM-triggering by changing q_{95} (5)
- Repeat (profile) measurements in high-δ_l discharges (5)