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NSTX

XP 809: ELM Destabilization by RMP

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XP Review
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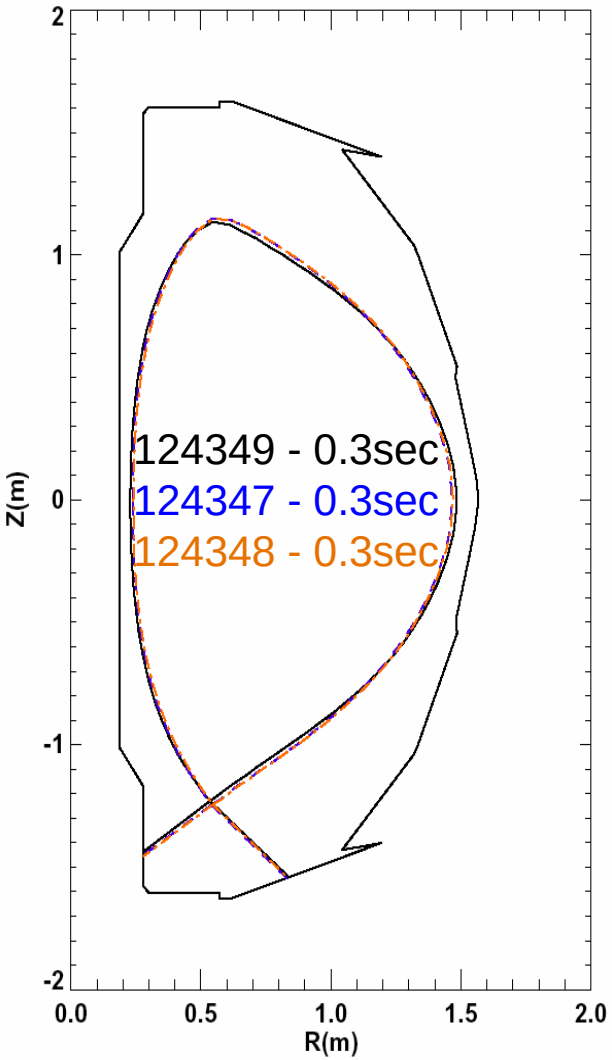
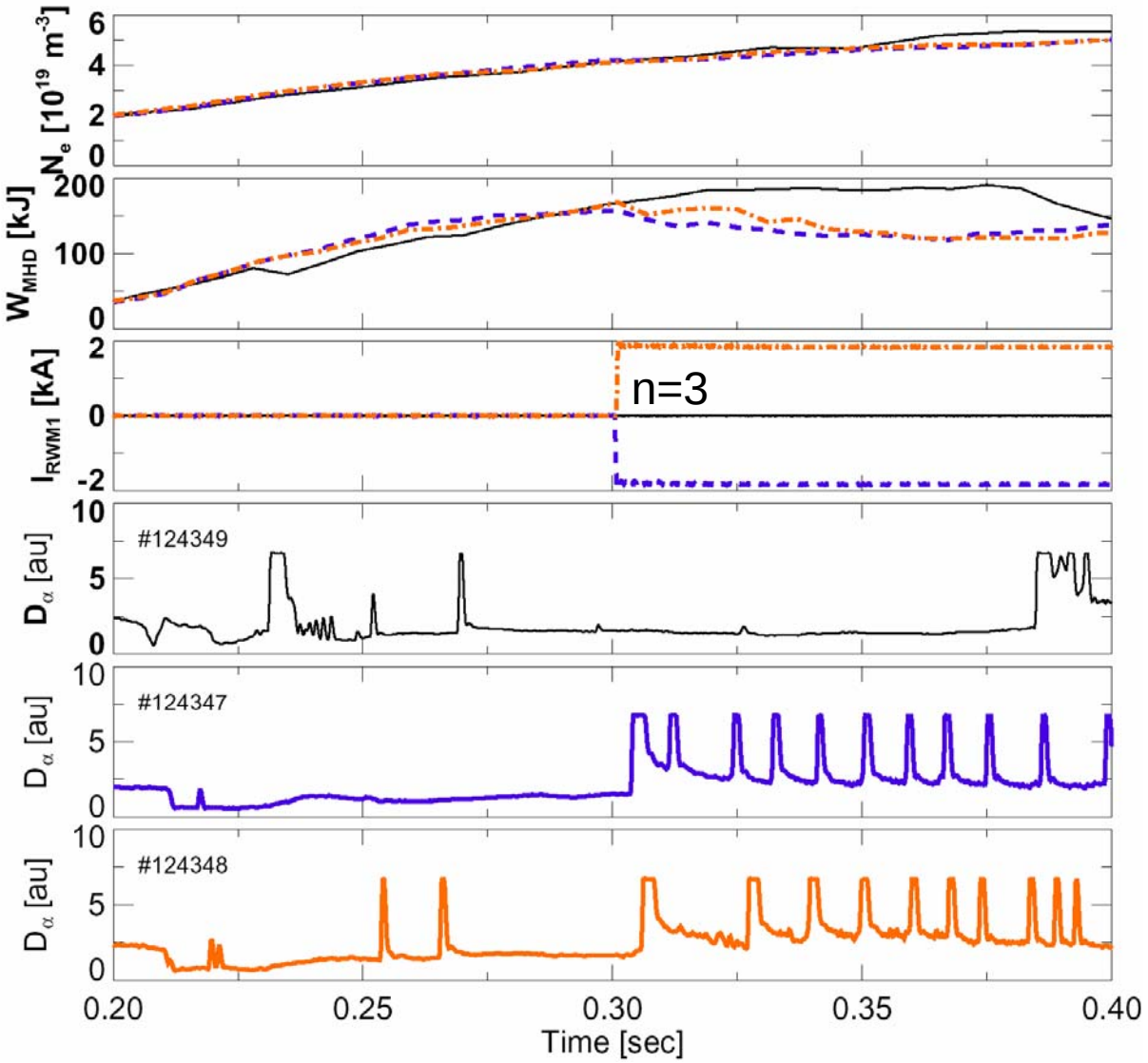
Motivation and Background

- 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 (2 rows)
- Limited success in affecting edge stability with external C-coils (single row)

- 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



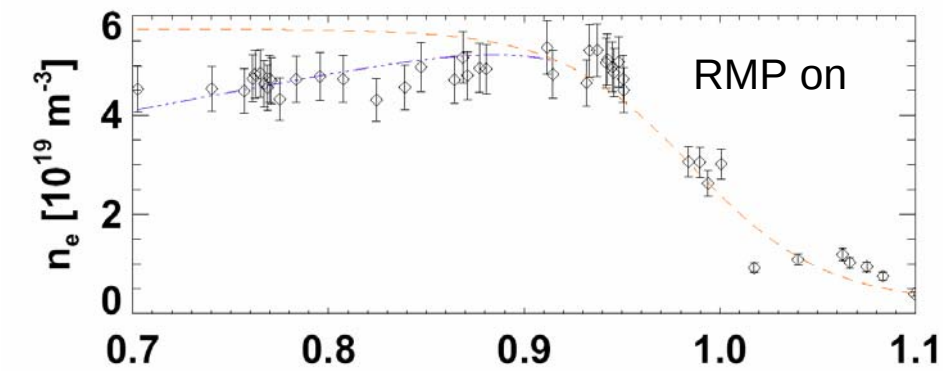


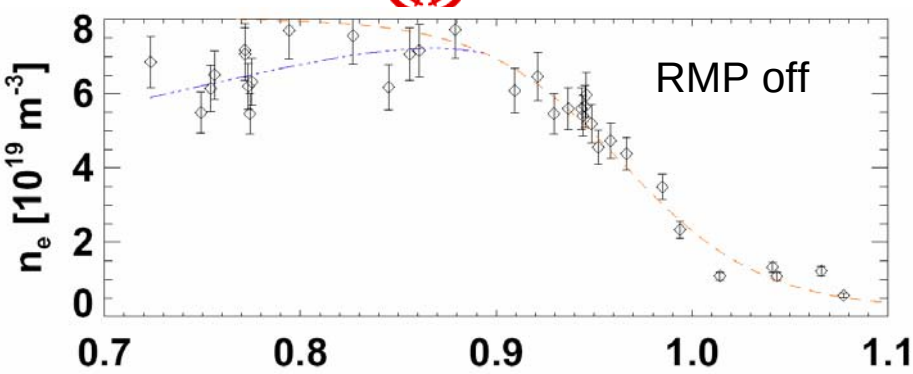
Proposed Run Plan: Exploring ELM-Triggering by RMP (½ day)

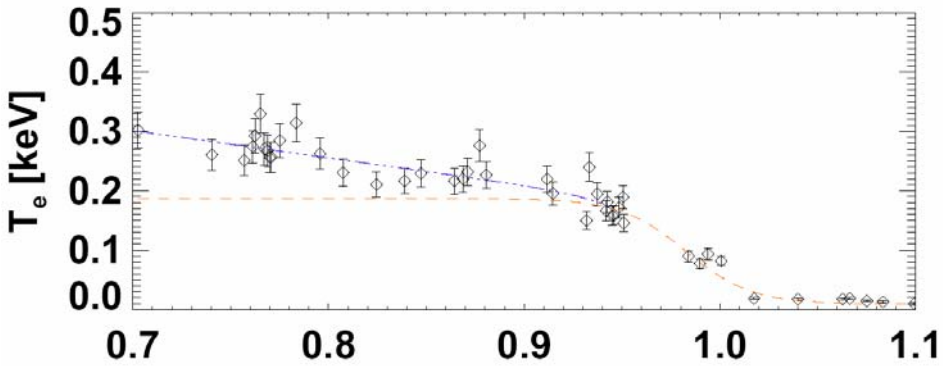
- Reproduce reference discharge 124349 – long (~100ms) ELM-free phase
  - B=0.5 T, Ip=800 kA, P_{NBI} = 5MW, κ=1.8, δ=0.5, gapout=10cm
- EF/RWM current scan to determine threshold current for destabilization (6 shots)
  - 1,1.5, 2kA (triggering previously seen at 1.8 kA) with n=3
  - RMP off/on to check reproducibility
  - Additional shot near threshold current to improve resolution
- Alternate discharges with RMP off, then on (4 shots)
  - RMP on cases at near-threshold from above
  - Separate effects of changing recycling and wall conditions from RMP
- Outer gap scan for high resolution edge profiles (4 shots)
  - 9-11 cm in increments of 0.5cm

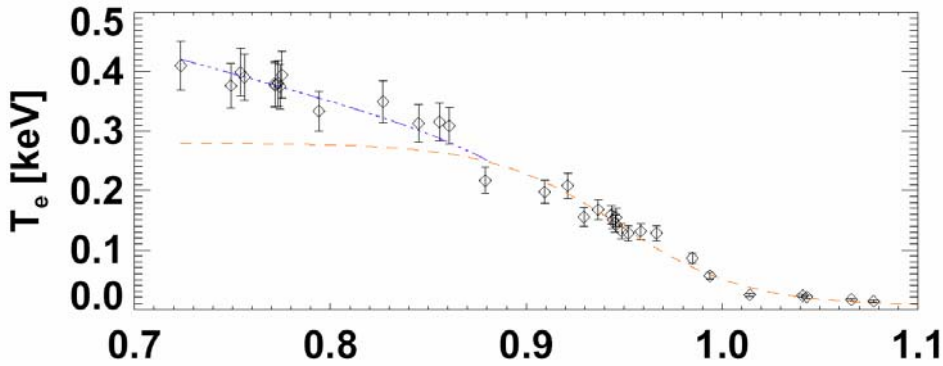
Extra

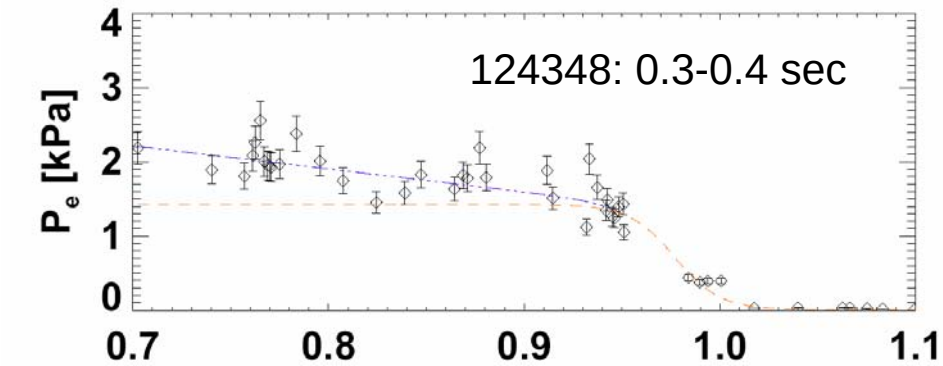
Preliminary tanhfits show peak pressure gradient comparable with and without RMP

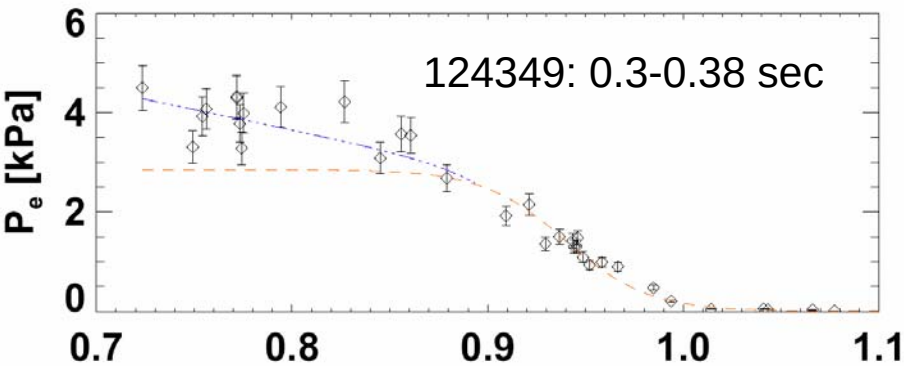




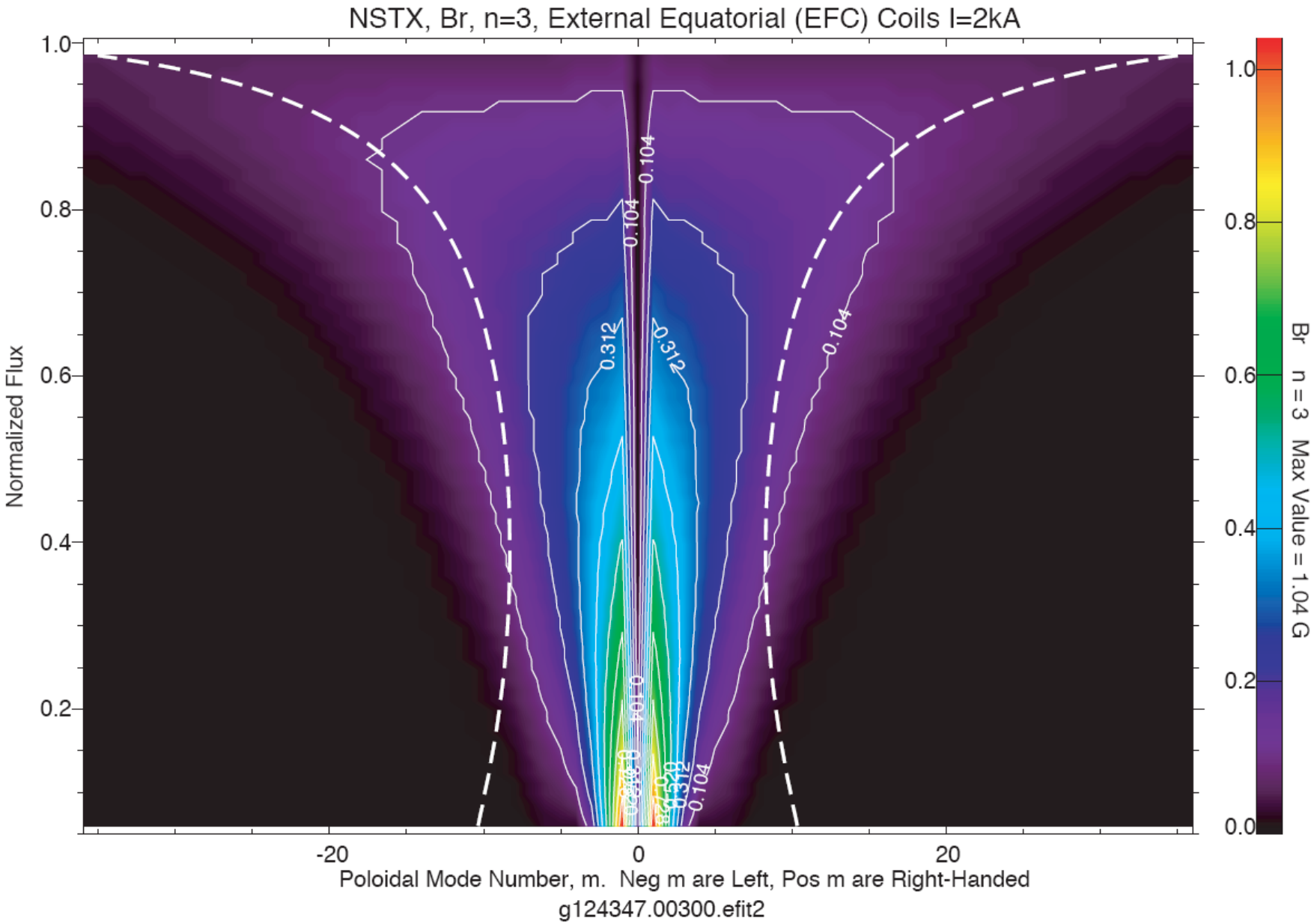




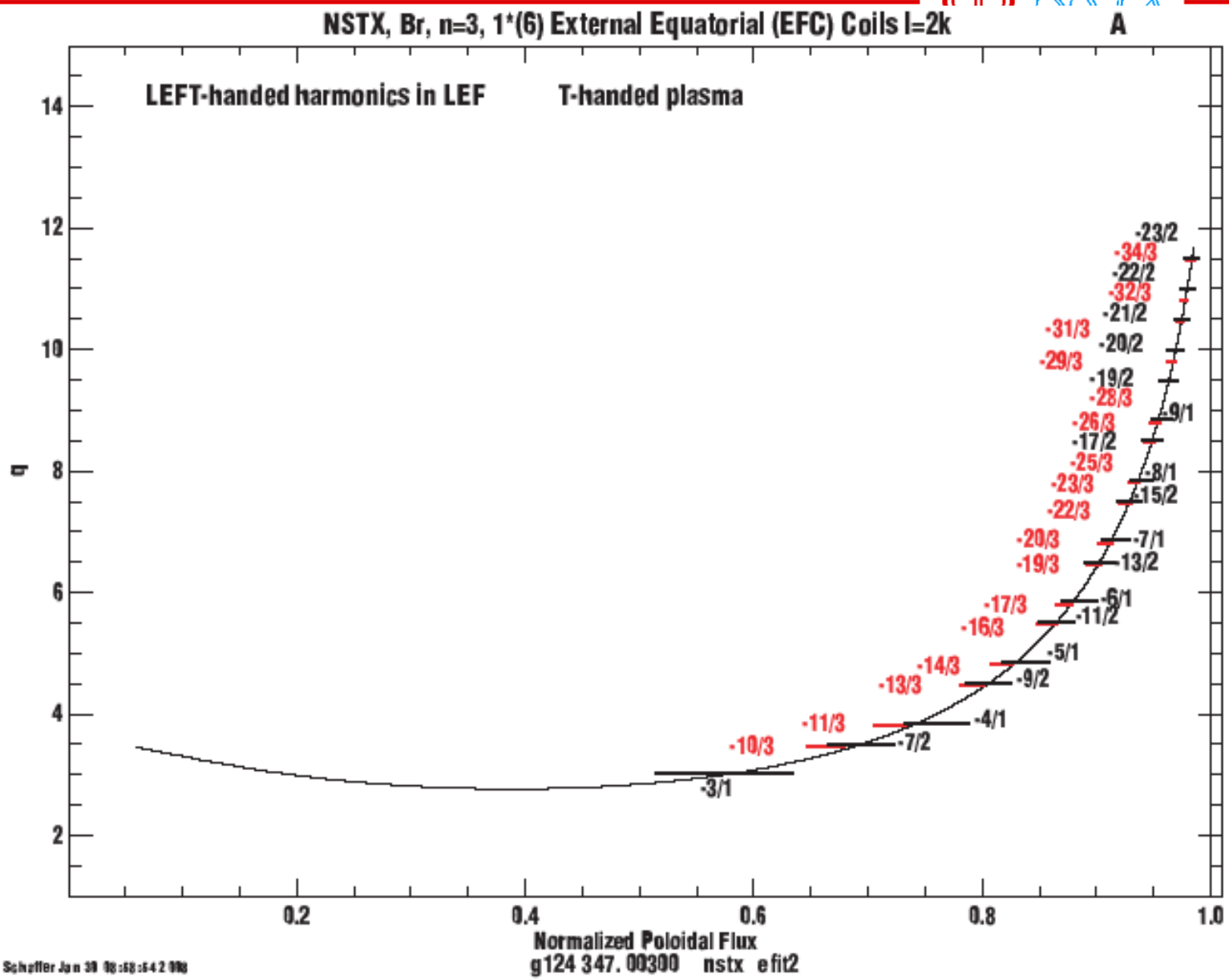




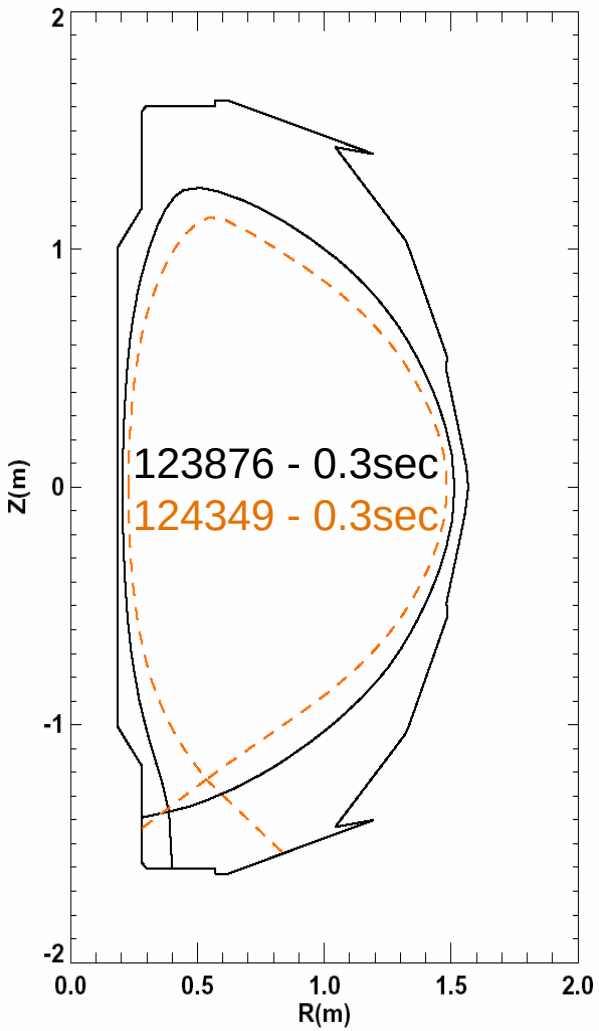
Br spectrum for 124347

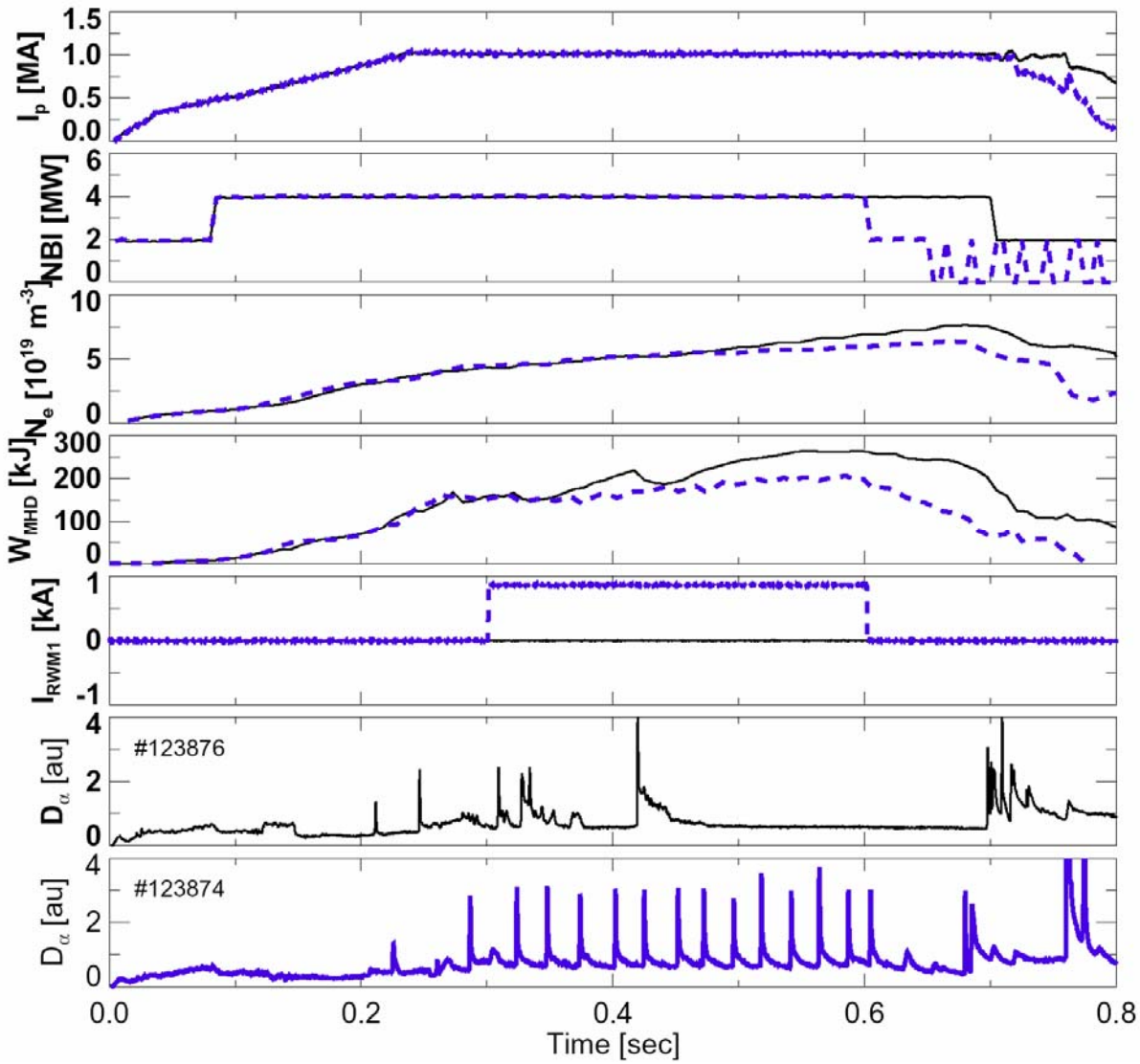


Island widths for 124347



RMP can also de-stabilize ELMs in high δ_l discharges





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