NSTX

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ELM stability modification using 3D fields from a single row off-midplane coils on NSTX

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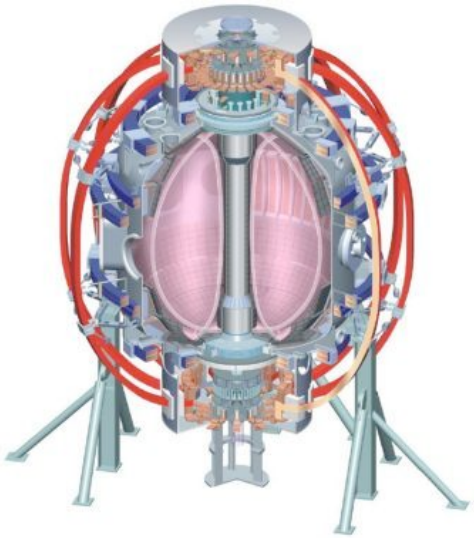

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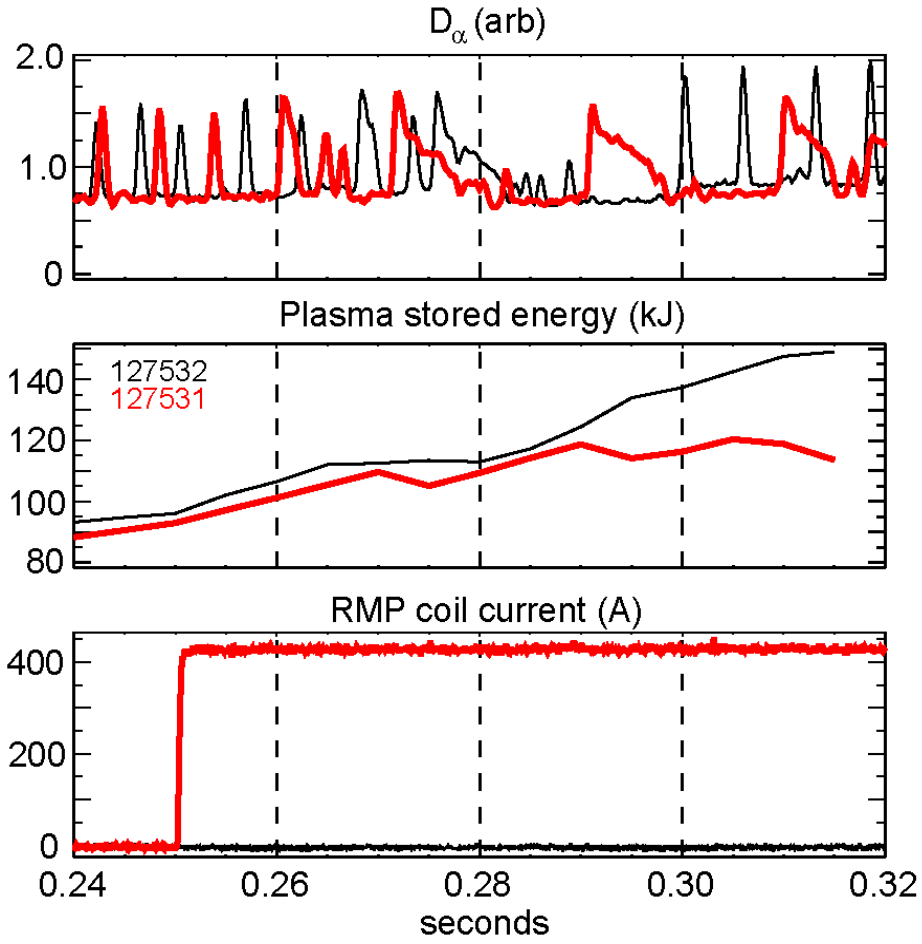
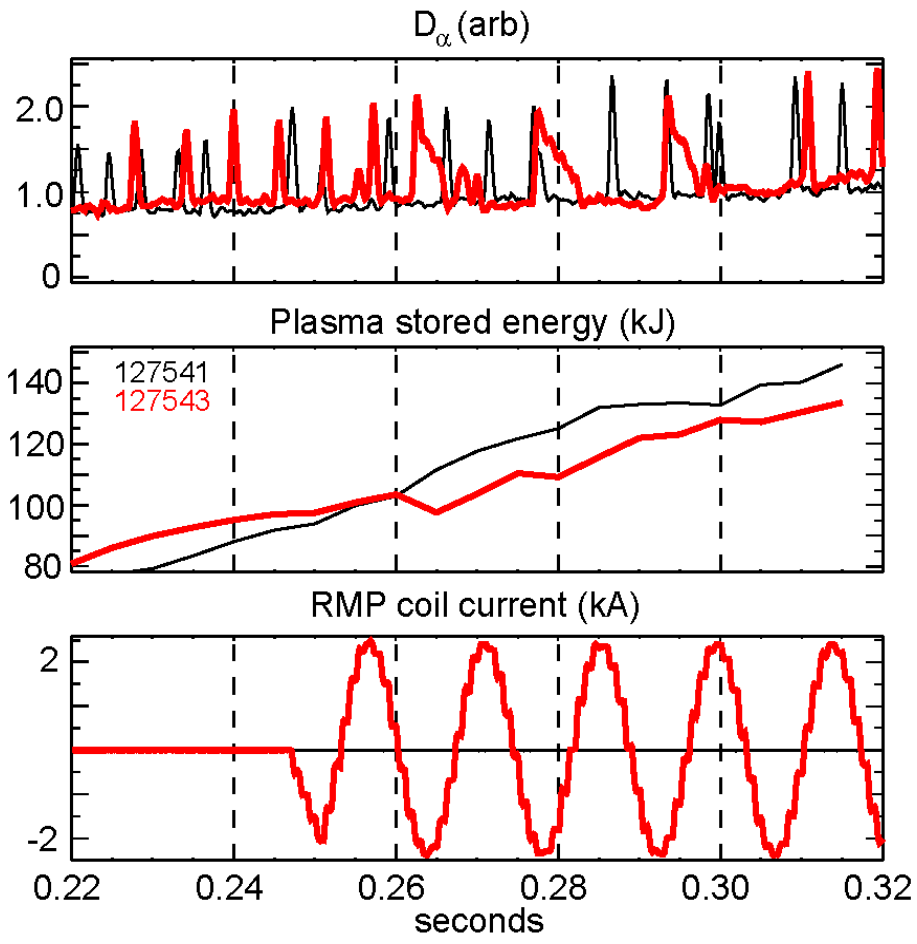
Experiments on NSTX showed a modification, but not suppression, of ELMs using 3D perturbations

n = 2 DC field vs. no field

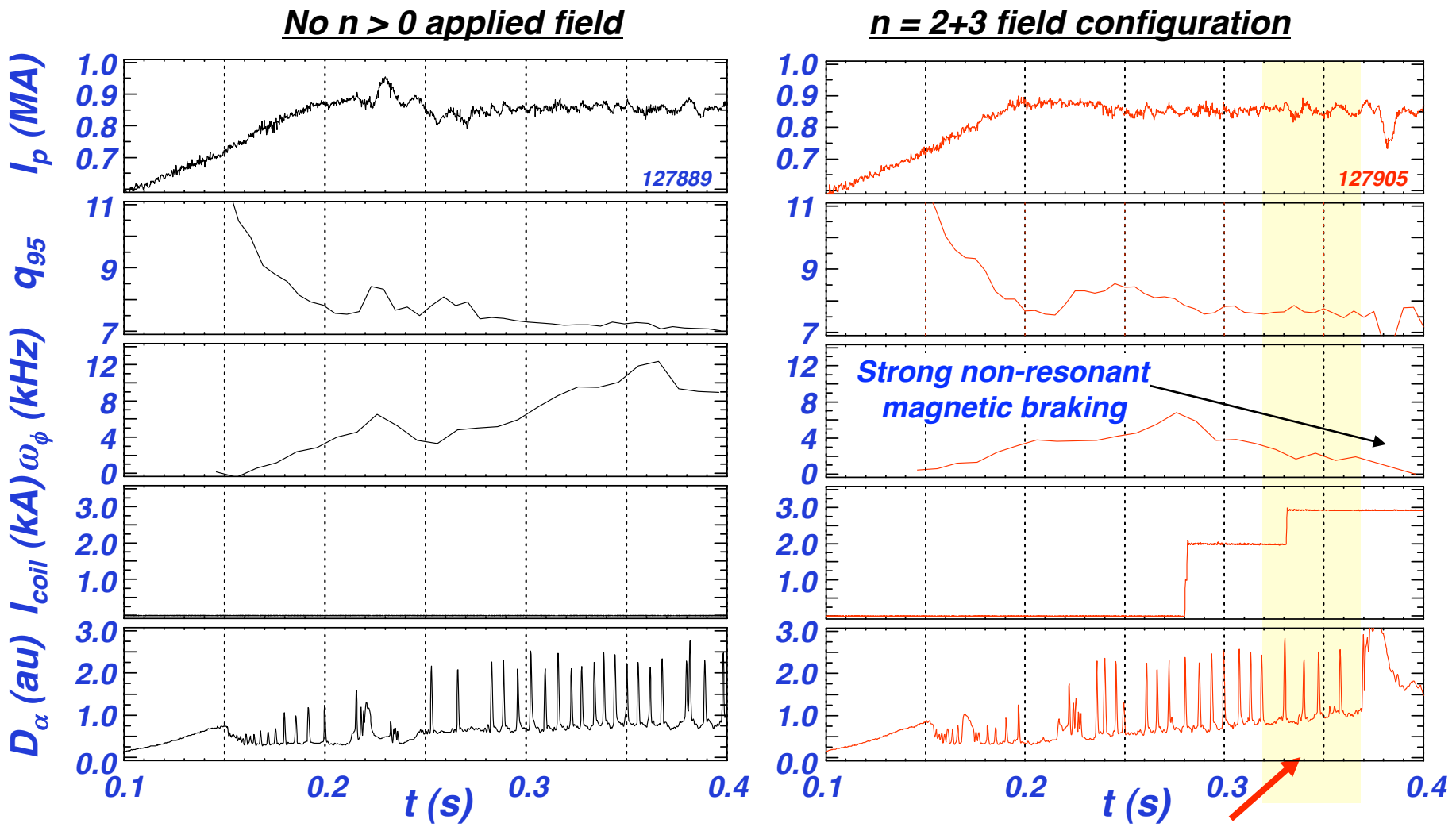


n = 2 AC field, 70 Hz vs. no field



S.A. Sabbagh et. al., *Workshop: Modeling of plasma effects of applied resonant magnetic perturbations*, San Diego, CA Aug, 2008

Strong non-resonant braking at maximum of applied field perturbation



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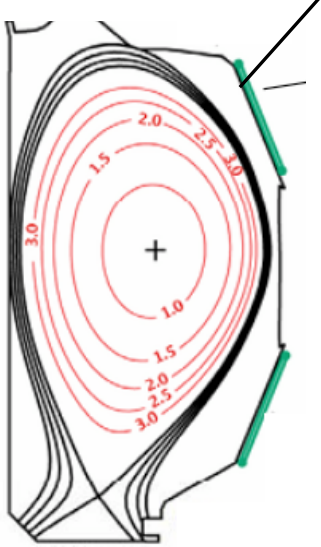
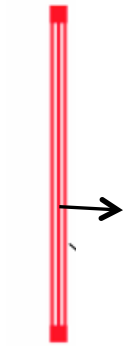
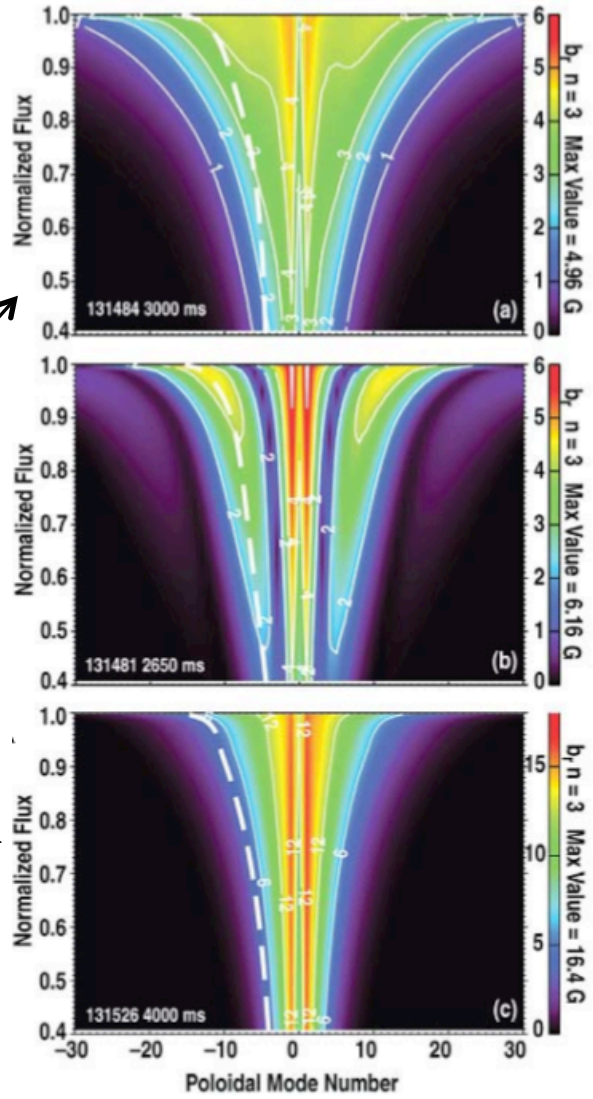
Decrease in ELM frequency at maximum allowed field

DIII-D experiments demonstrated ELM suppression using a single row of off-midplane coils

- ELM suppression using internal, off-midplane coils
  - Successful with both single row and two rows
  - Not successful with external midplane coil
    - Amplitude of perturbation chosen so resonant amplitude similar
- Attributed to a wider island overlap region
  - Large aperture → increased low-m coupling

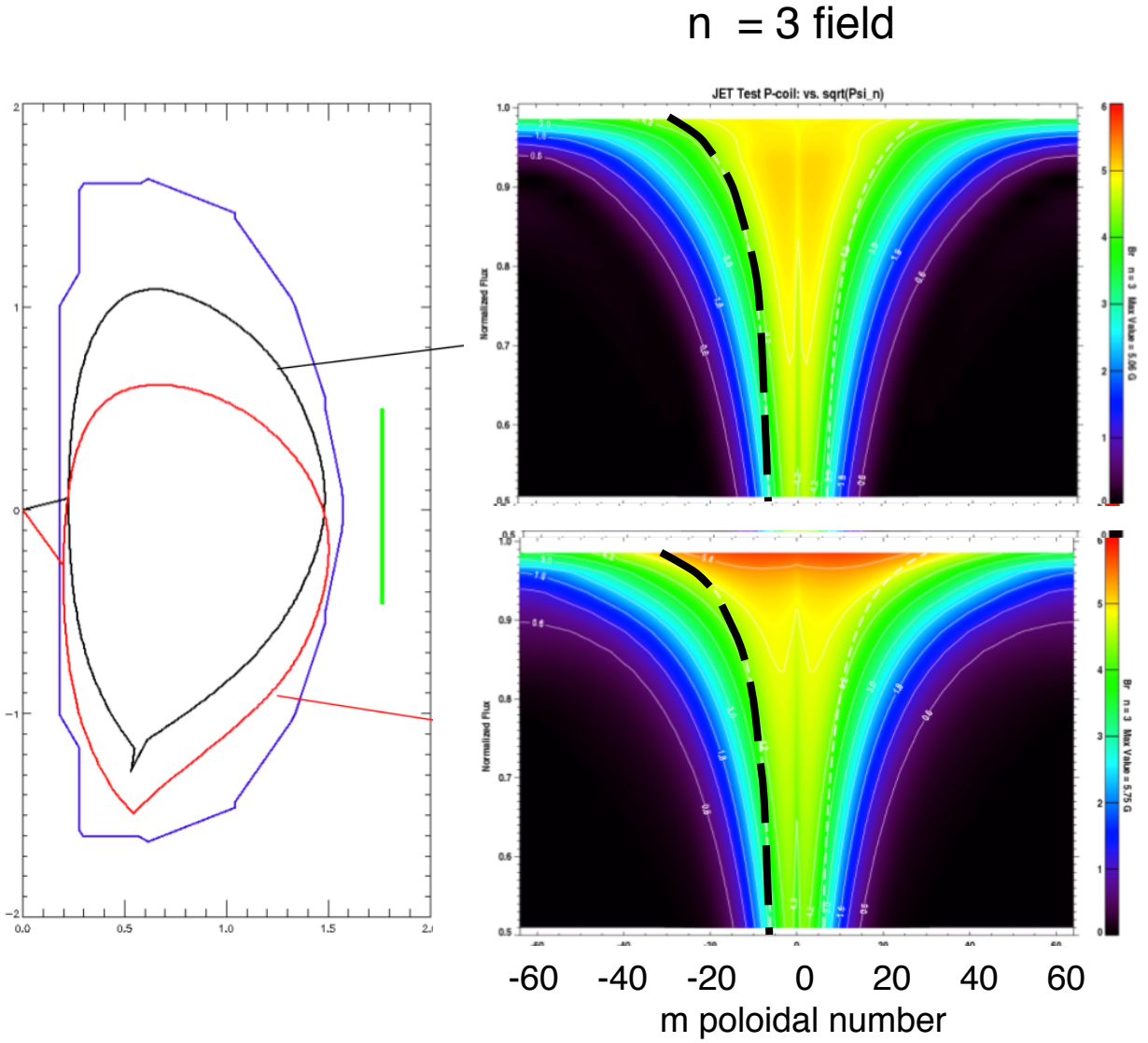






Off-midplane fields reduce non-resonant components in the core

- Shift plasma down 10 cm or more
  - Gives off-midplane perturbation
- Improves resonant coupling
  - Also reduces non-resonant amplitude inside core (reduced braking)



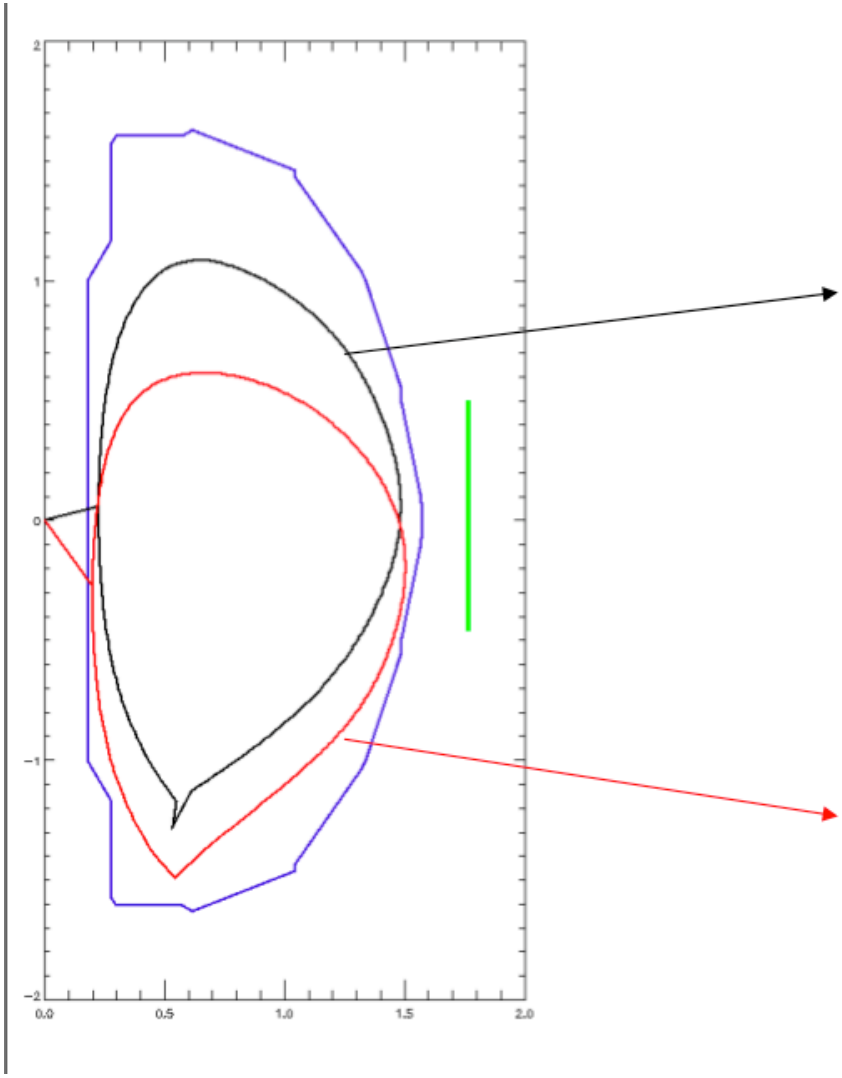
Propose experiment to test ELM suppression using 3D off-midplane fields

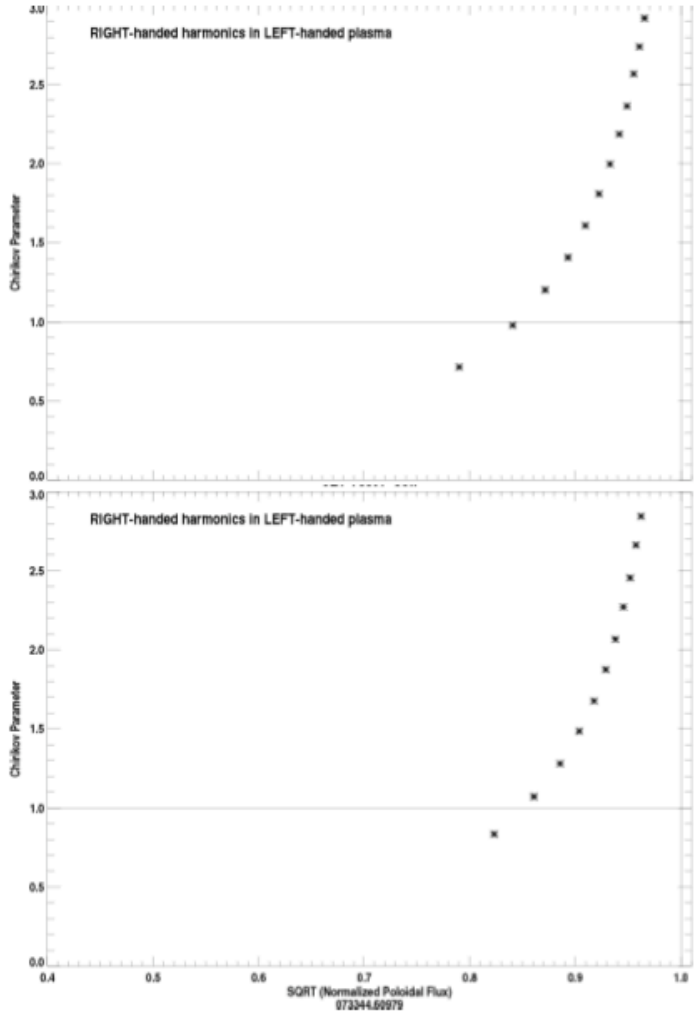
- Propose 1 day experiment
  - Use ISOLVER to plan possible shapes
  - Develop ELMing discharge with $-\Delta z > 10$ cm
  - Apply n = 3 perturbation and increase amplitude until ELMs or suppressed or plasma quickly disrupts due to braking
  - If successful at ELM suppression, try similar shape with $\Delta z = 0$ or scan Δz back to zero to provide reference

- Interest in experiment
  - Demonstrate ELM suppression using external coils
  - First comparison of midplane and off-midplane perturbations using the same coil set – does outboard location matter?
  - Different rotation braking profile
  - Discharges explore off-midplane NBI current drive

Backup

Chirikov profile





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