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Resonant ELM frequency behavior as a function of q95 with 3D fields

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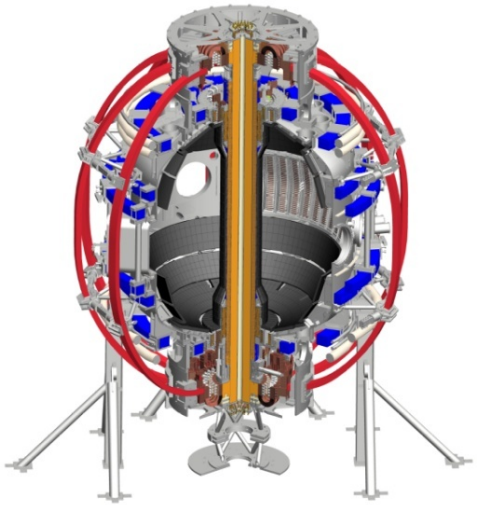

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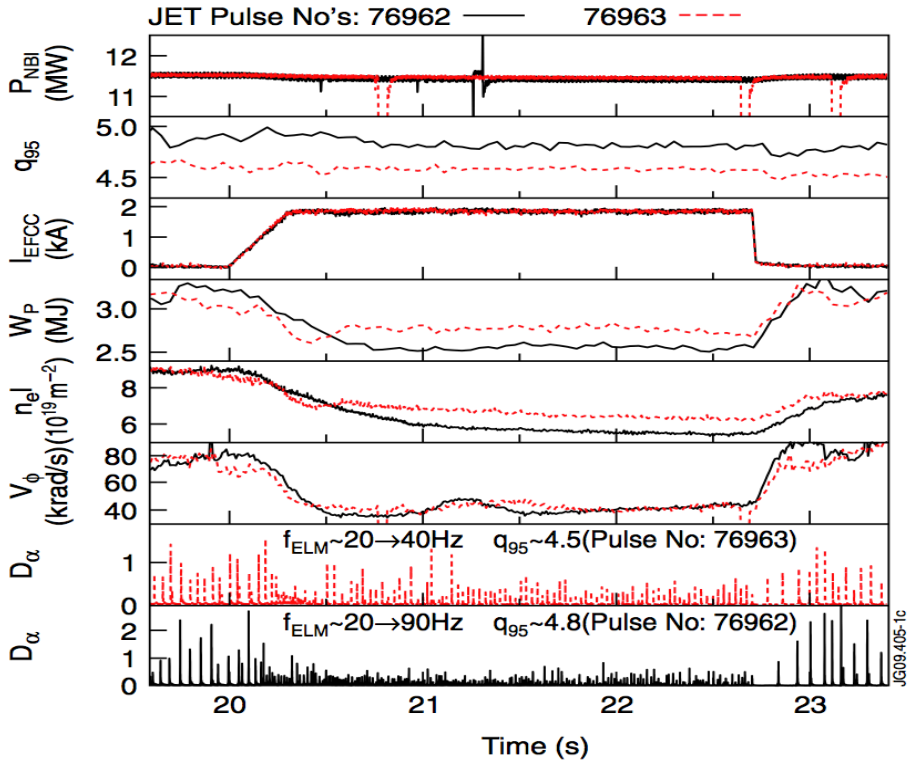
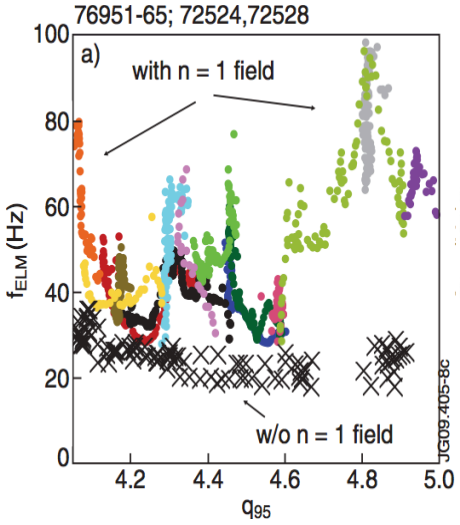
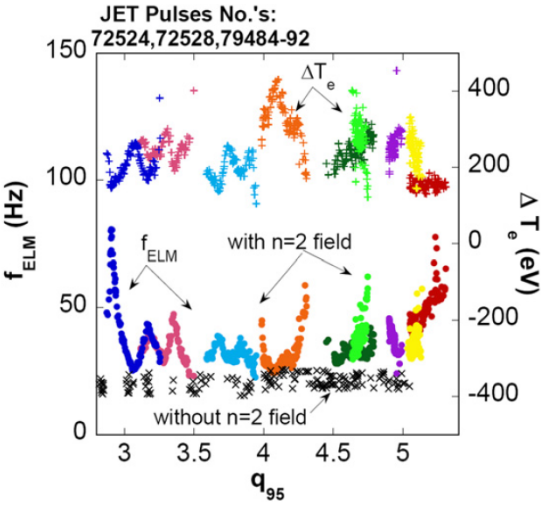
Background

- Experiments on JET show a strong increase in ELM frequency (4-5x) in narrow q_{95} windows during 3D field application
- Structure is very fine, with Δq_{95} peaks ~ 0.2-0.3
- Effect observed for both n=1 and n=2 applied fields
- Resonant behavior qualitatively explained by peeling mode/relaxation model







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Experimental Plan

- Goal: Look for resonant behavior in f_{ELM} vs q_{95} with 3D fields on NSTX-U
- Operate in ELMy H-mode, slowly ramp q_{95}
  - Start with robustly ELMy shot at q_{95}~10, near minimum of ELM triggering threshold
  - Ramp down q_{95} from 10-9; ramp over as long a period as possible
- Apply DC n=3 3D fields to look for resonance effect
  - Want biggest field that plasma tolerates, might need multiple shots at each q_{95}
  - Repeat with q_{95} ramp up from 9-10
- Replace with n=2 or n=2+3 fields
- Repeat with q_{95} ramp from 9-8, then 11-10, follow steps above
- Requires: natural ELMs, either boronization phase or passivated Lithium; 3D field pulses; 1.0-0.5 run days

Backup

- NSTX has seen q_{95} dependence on 3D field ELM triggering threshold (XP1048)
- XP818 showed changes in ELM frequency due to 3D fields at constant q95
  - "Compound" (natural+triggered) ELMs