XP818: Exploratory approach to finding ELM mitigation solution with midplane non-axisymmetric coils

- Goal
  - Demonstration of ELM mitigation with NSTX midplane RWM coil set
- Approach (March 24th, 2008): n > 1 field amplitude scans emphasized
  - Target development
    - (i) low $q_{95} < 6$; (ii) swept q_{95} to insure mitigation not missed due to resonance
  - Application of DC fields (broader *n* spectrum, new 2008 capabilities)
    - New combined odd/even parity (present favorite $n = 2 + 3$)
    - New even parity field (dominant $n = 2$) created with new RWM coil patch panel
    - Complete scan of $n = 3$ field
  - Application of AC fields
- General result
  - ELMs not fully mitigated; PHAT ELMs created in some cases
  - n = 2 + 3 configuration was not particularly favorable
    - PHAT ELMs produced in other field configurations
  - (aside) Good non-resonant and resonant magnetic braking detail shown

XP818 ELM Mitigation completed most of original plan

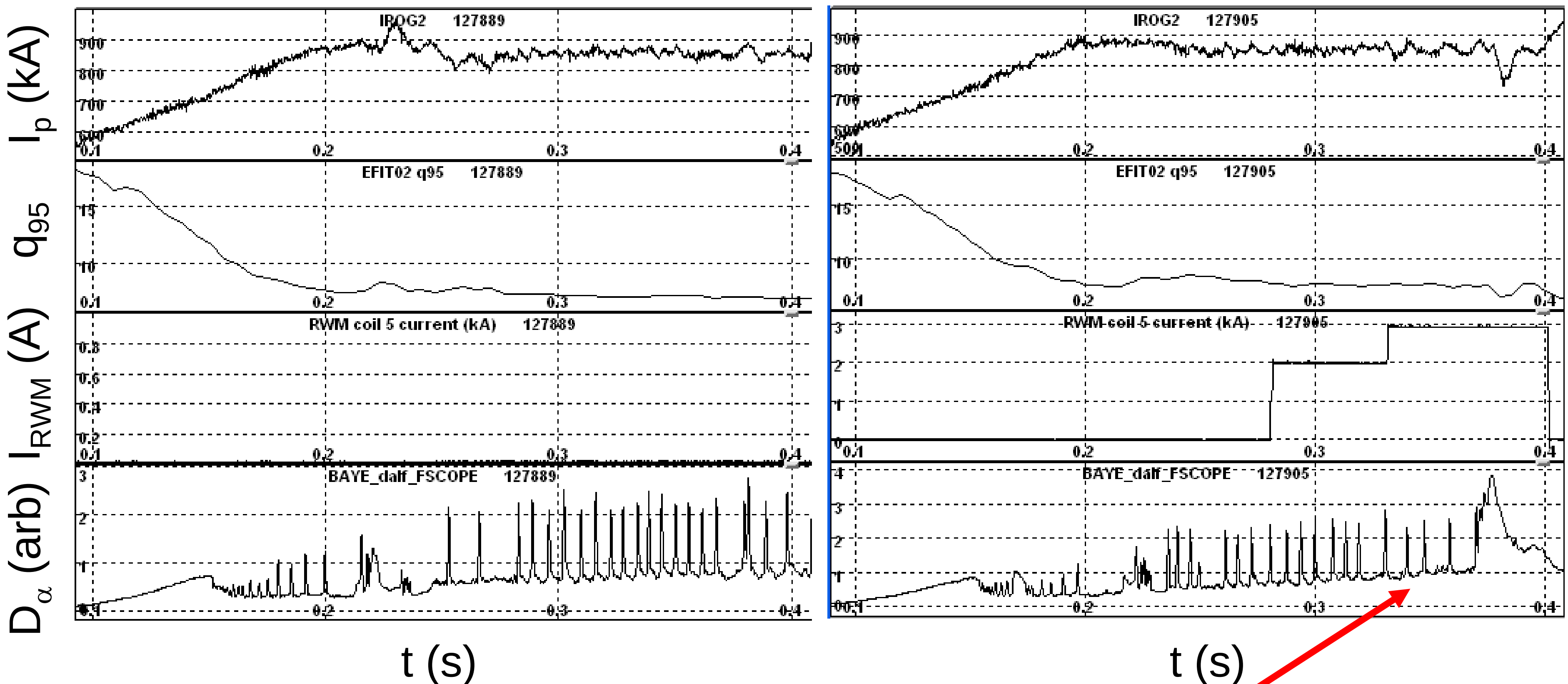
Shots taken (3/3 + 3/7)

Task	Number of Shots
1) Create target plasmas	
A) Create *q95* < 6 target: (generate at least 10 ELMs with approximately even spacing) (*q95* ~ 5.5 is adequate)	
- Use shot 124349 as setup shot, (*Ip* = 0.8 MA, *Bt* = 0.5 T), change NBI source C to 1 MW unmodulated	2
- Raise *Ip* to 0.9 MA; change *Bt* to 0.45T, then 0.40T	3
- If *q95* > 6 and insufficient ELMs, perform startup optimizations as per J. Menard to raise *qmin*.	(8)
B) Create *q95* ramp target	
- Start from low *q95* target created in step (1A), *Ip* flat-top to 0.7 MA, ramping up to 1.0 MA; adjust eventual *Ip* flat-top if needed to create steady ELMs.	4
- if plasma drops out of H-mode, start *Ip* ramp from 1.0 MA ramping to 0.7 MA	(2)
- vary *Bt* to change range of *q* ramp (optional)	(2)
C) Create *q95* > 8 target	
- Use shot 124349 as setup shot, (*Ip* = 0.8 MA, *Bt* = 0.5 T), change NBI source C to 1 MW unmodulated	
- Drop *Ip* to 0.7 MA; tweak to 0.75 MA if desired	2
2) Attempt ELM mitigation with non-axisymmetric fields under normal recycling conditions	
- DC fields:	
A) Apply *n* = 3 field configuration; vary amplitude from 1.5 kA	4
B) Apply *n* = 3 + 1 field configuration; vary amplitude from 1.0 kA, 0.5 kA	4
C) Apply *n* = 2 + 3 field configuration (start from RWM (1-4) 0.5kA, RWM (2,6) 0.5kA, RWM (3,5) 1.5 kA)	4
D) Apply *n* = 2 field configuration; vary amplitude from 1.5 kA	4
E) Apply *n* = 6 field configuration (primary field is *n* = 0); vary amplitude from 2.5 kA	3
- AC fields (pre-programmed):	
F) Apply *n* = 3; vary *f* above/below ELM frequency; vary amplitude from 2.0 kA	4
G) Apply *n* = 1 (co-propagating); vary *f* above/below ELM frequency; vary amplitude	4
H) Apply *n* = 1 (ctr-propagating); vary *f* above/below ELM frequency; vary amplitude	4
- AC fields (*n* = 1 feedback):	
I) *n* = 1 *Br* feedback: giant ELM target (e.g. 125271), vary (i) gain (ii) phase	6
3) Attempt ELM mitigation with non-axisymmetric fields under reduced recycling conditions	16
Total (optional):	64 (12)

Shots taken (3/3 + 3/7)

ELMs not mitigated with n = 2 + 3 configuration

ELM target control shot (no n > 1 field,) n = 2+3 field, 2.0 – 3.0kA peak RWM current



- Decrease in ELM frequency at maximum applied field
- Continue to investigate physical cause for changes in ELM behavior
  - Results consistent with Chirikov parameter > 1 being necessary, not sufficient condition for ELM mitigation; but could be due to different physics