

AUG Monday Morning Meeting 24/07/2017

Magnetic reconnection measurements with the Imaging Motional Stark Effect diagnostic.

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IMSE + Sawteeth: Objective

Objectives:

- 1) Measure q-profile change inside $q=1$ over sawtooth crash
Requires sensitivity in $\delta q < 0.05$.
- 2) Determine if reconnection is complete --> Does current profile change at $\rho=0$?
- 3) Investigate effect of $q=1$ surface elongation on reconnection [M. Yamada]

Requires:

- 1) Shot program to produce large, repetitive, long-period sawteeth.
- 2) At least 1 second of identical sawteeth for good statistics.
- 3) IMSE Calibration shots ($\pm B\phi$, USN, Raxs Scan) on same day.

IMSE + Sawteeth: Attempt #1, #2

Large sawteeth have been difficult with Q8.

Started from existing low-density L-mode sawteeth transport program

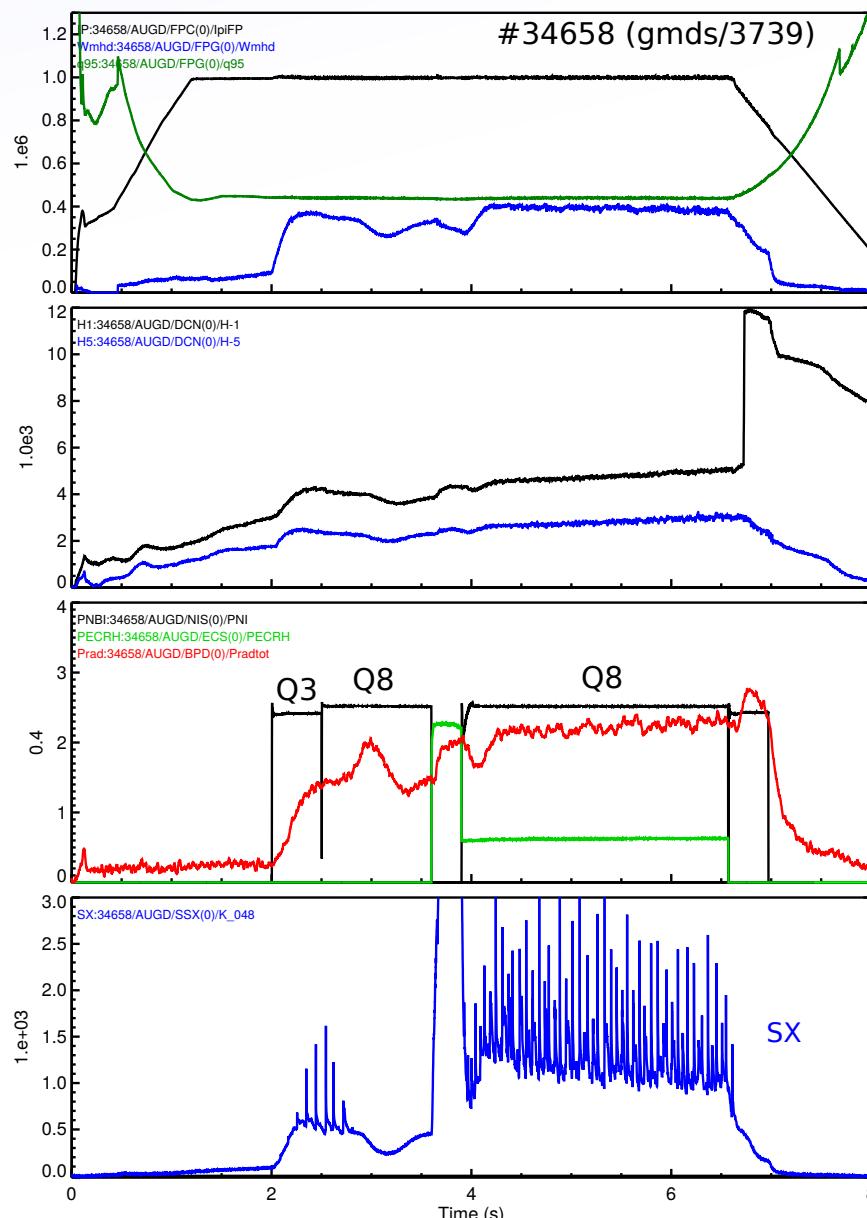
[R. McDermott, B. Geiger]

- Add on-axis ECRH in 2nd phase to increase sawteeth size and period.

34657: Q8 Technical problem.
Q3 HST trip. Needed more gas.

34658:

- Unable to stay in L-mode
- Phase 1: Large but irregular sawteeth, disappeared after 1s.
- Phase 2: ECRH creates fast small sawteeth. ECRH was possibly too far off-axis.

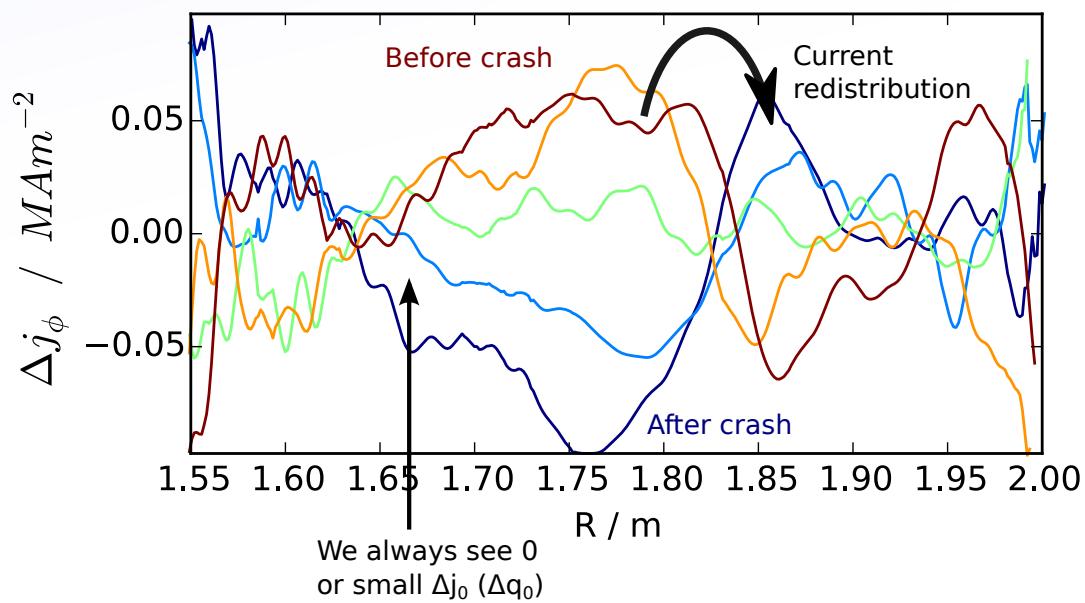


IMSE + Sawteeth: Attempt #3

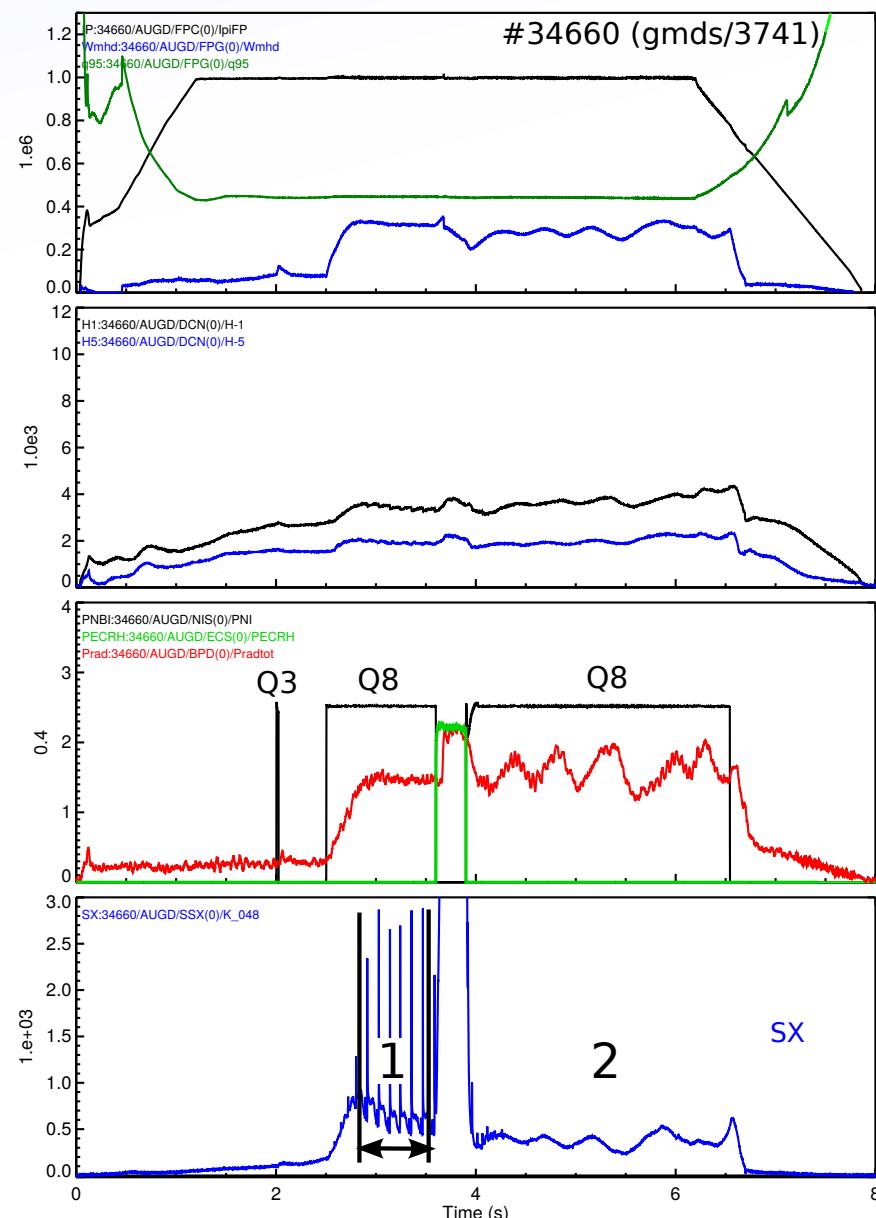
34660:

- Repeat, but remove ECRH in phase 2.
- Q3 tripped after 25ms
- Delay to NBI start seems to help.

Phase 1: Good sawteeth, OK data:



Phase 2: No sawteeth

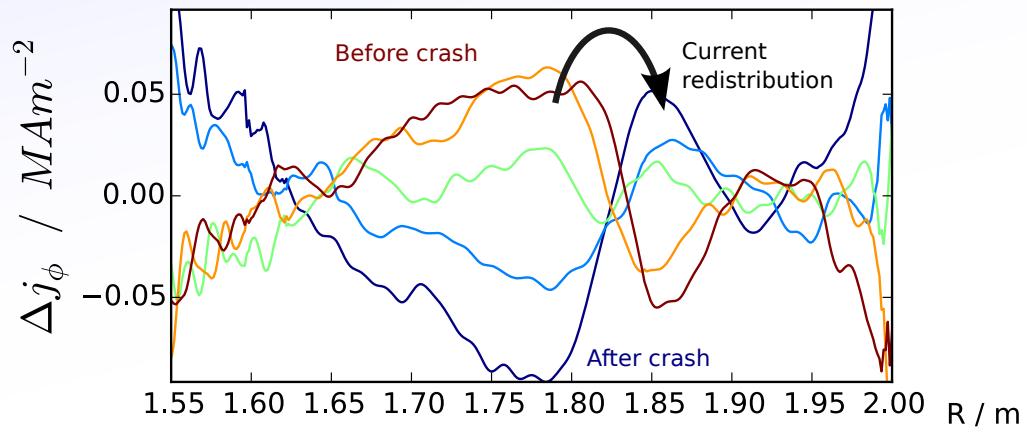


IMSE + Sawteeth: Attempt #4

34664:

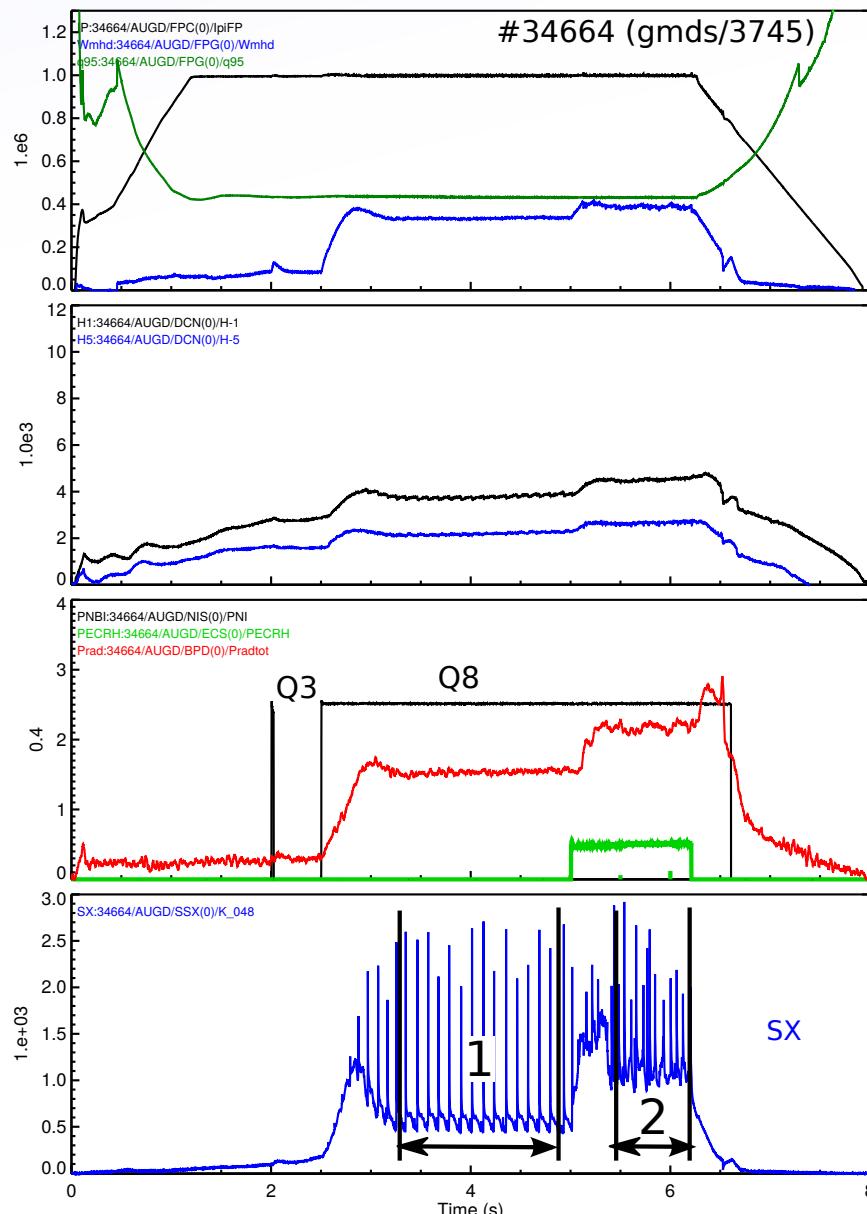
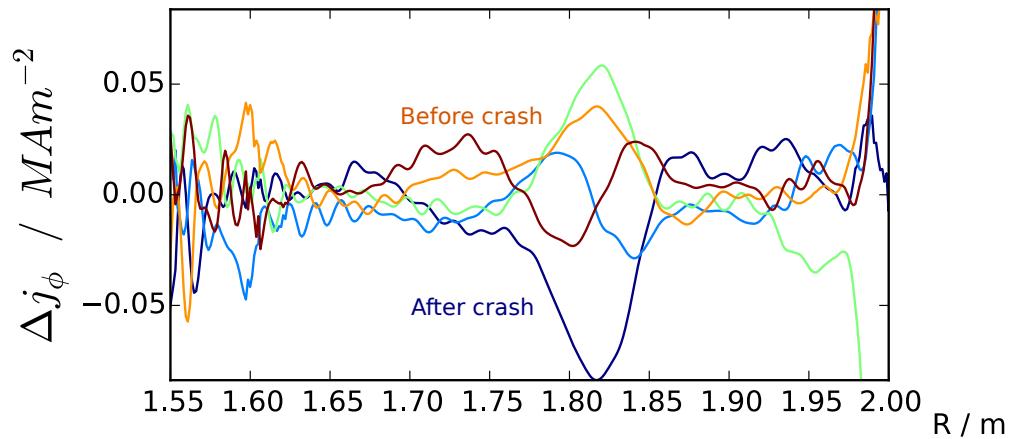
- Repeat without gap in Q8,
try to hold phase 1 sawteeth for 2.5s
- Reintroduce ECRH on axis to see effect.

Phase 1: Large, slow regular sawteeth, Good Statistics.



Phase 2 (ECRH): Fast irregular sawteeth. Not good data.

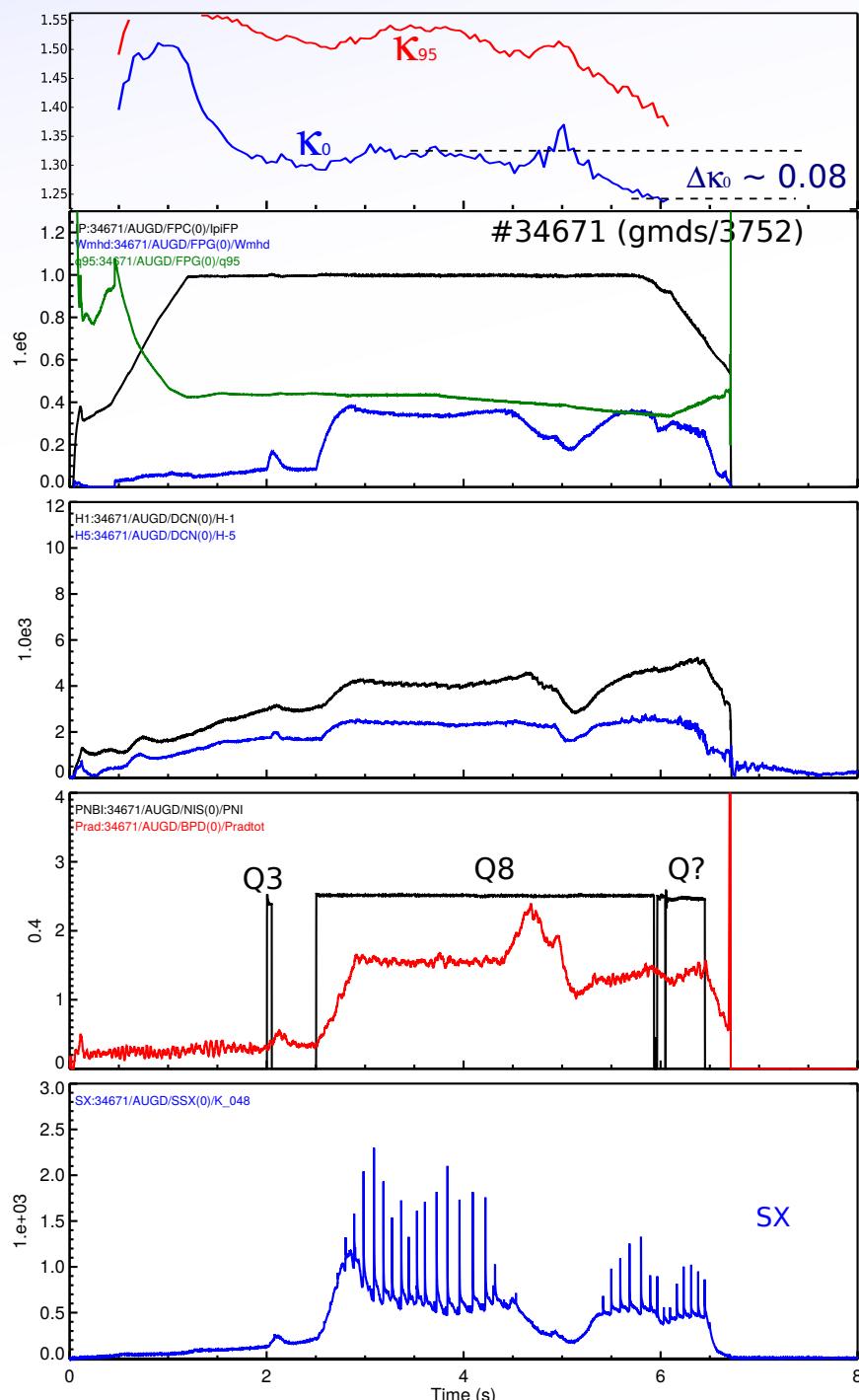
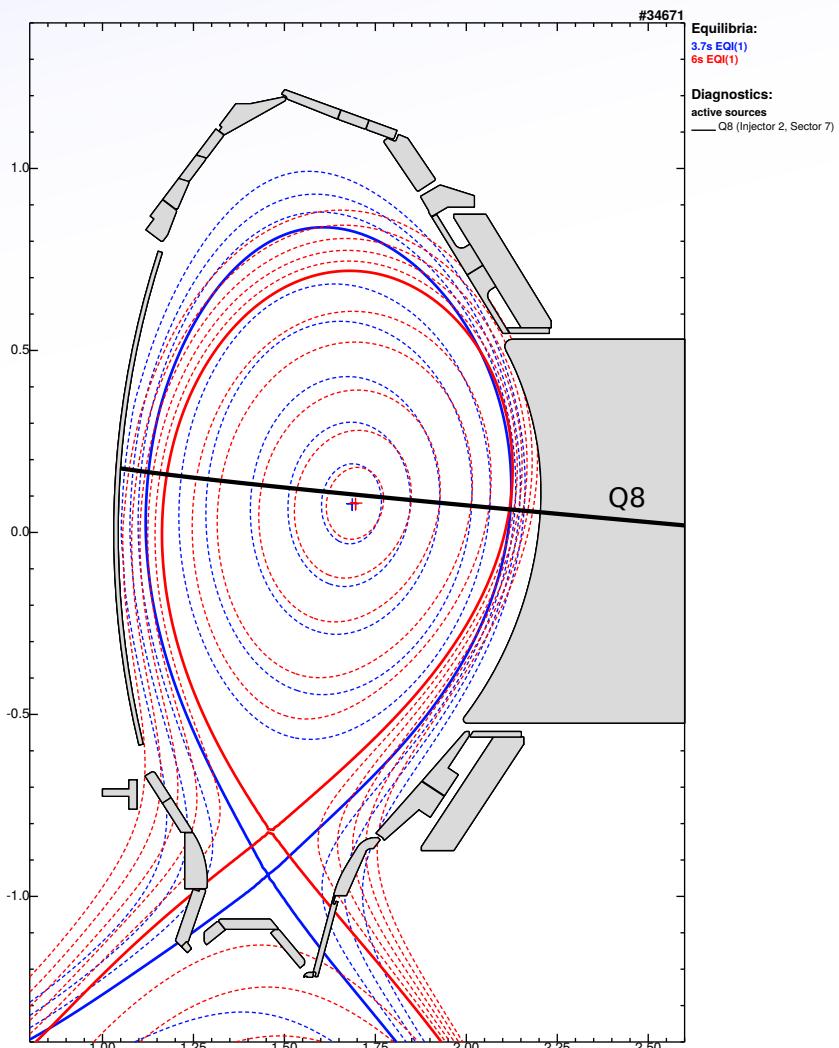
Current change appears to be more localised
near inversion radius:



IMSE + Sawteeth: Elongation

34671:

- Remove ECRH.
- Develop elongation scan:
 - Raise strike points (rather than lowering axis) in order to keep Q8 deposition similar.
 - No compensation for q profile change, may need to add Ip ramp later.

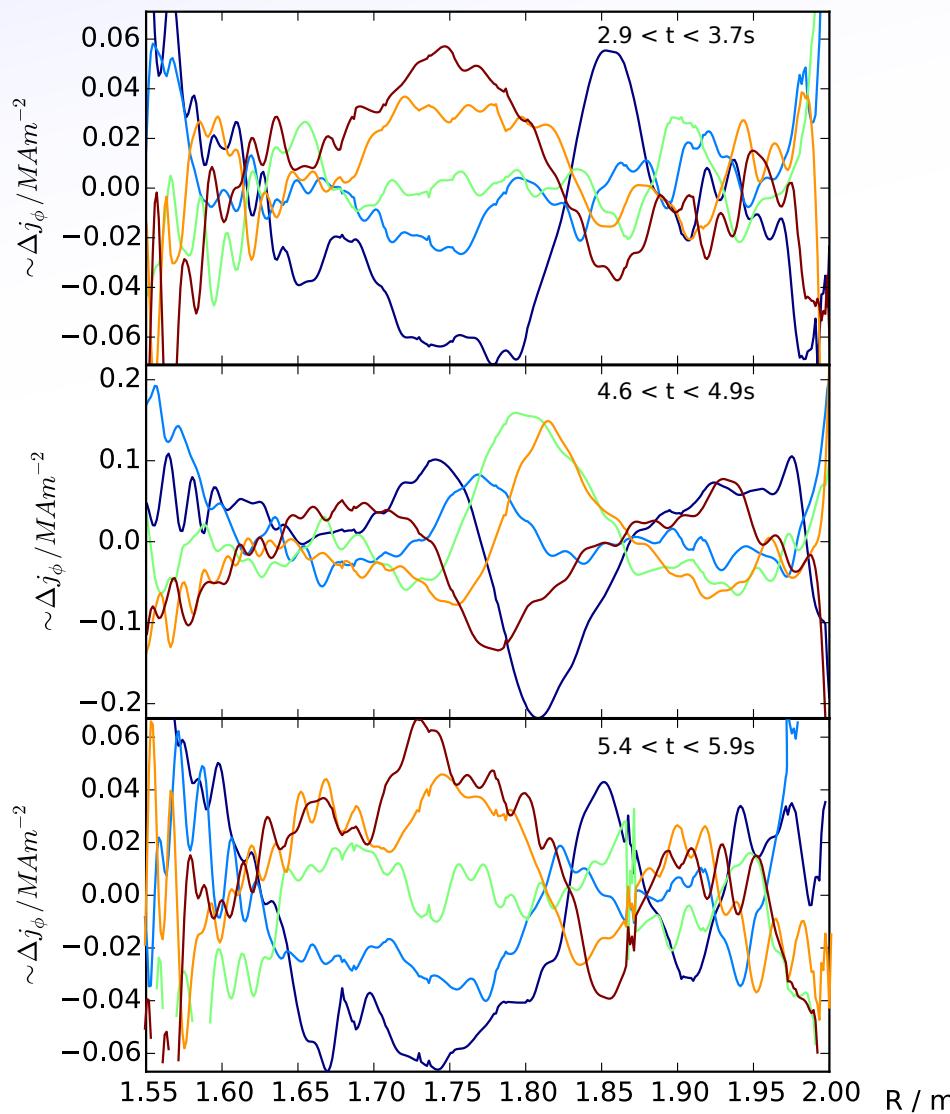


IMSE + Sawteeth: Elongation

34671:

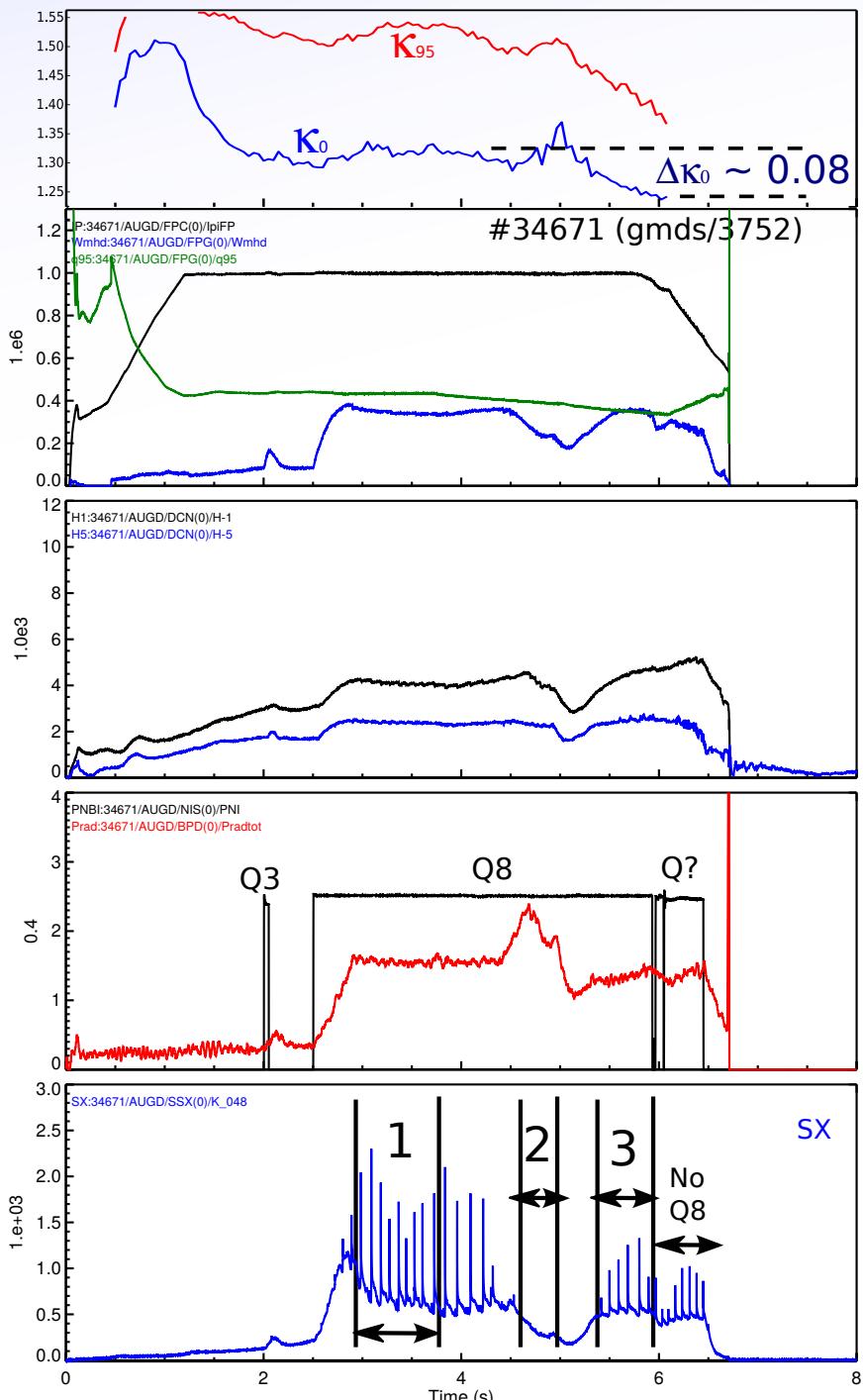
- Dropped to L-mode during scan, sawteeth move.
- Scanned small range of κ_0 (~ 0.08).
- Q8 Tripped before end of scan (so no IMSE)
- Some changes in sawteeth, but need to examine everything else that is changing.

1:



2:

3:



IMSE + Sawteeth: Future

To be done...

- 1) Derive absolute q profiles: IDE + calibration shots.
- 2) Determine if $j_0(q_0)$ is really not changing.

- 3) Development of elongation scan.
 - Need Ip ramp to compensate q-profile change?
 - What else changes? Can it be avoided?
(Suggestions welcome)

- 4) ECRH Behaviour
 - Identify exactly when/how ECRH helps and when it hinders the sawteeth.
 - Scan ECRH across q_0 surface from outside.
 - Stepped scan to see the ECRH effect on the current profile with IMSE.