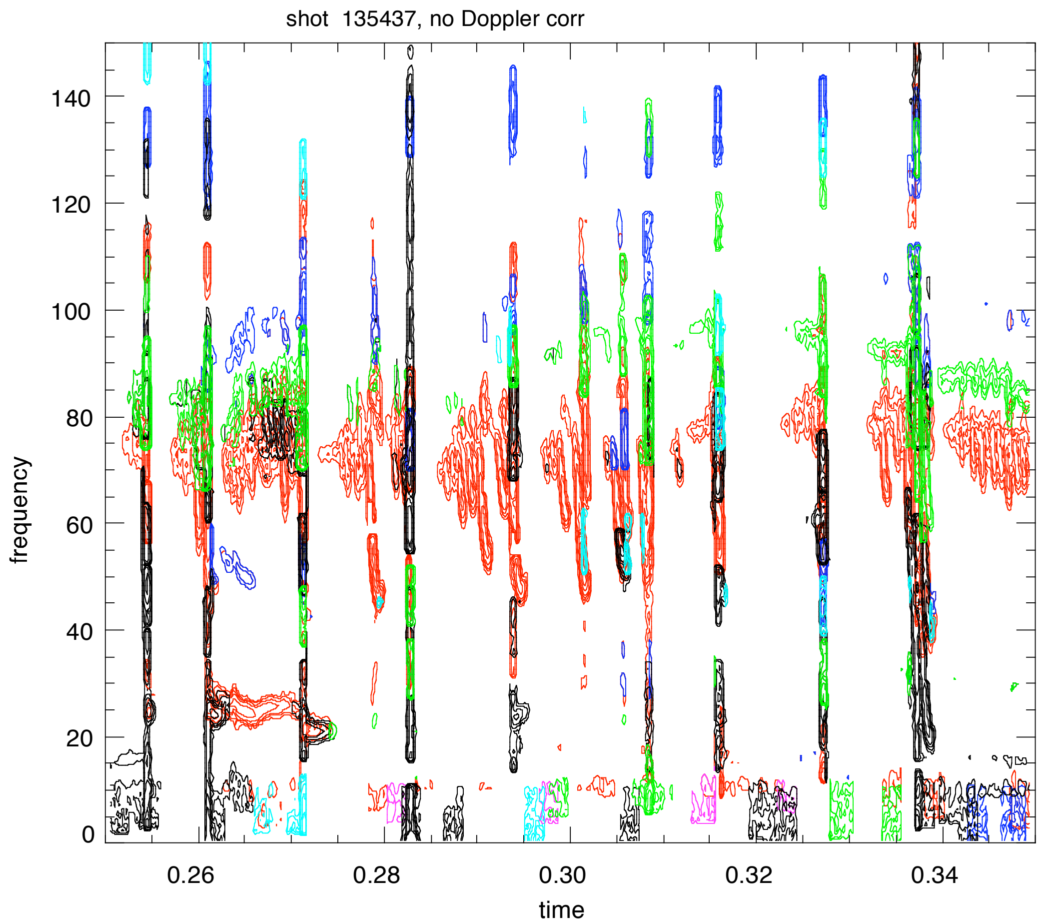
Proposals for 2011 XPs

1. H-mode TAE (GAE) avalanches
2. Document high frequency CAE
3. Documentation of Angelfish
4. Documentation of GAE avalanches
5. TAE antenna XP?

1. H-mode TAE Avalanches w/tFIDA

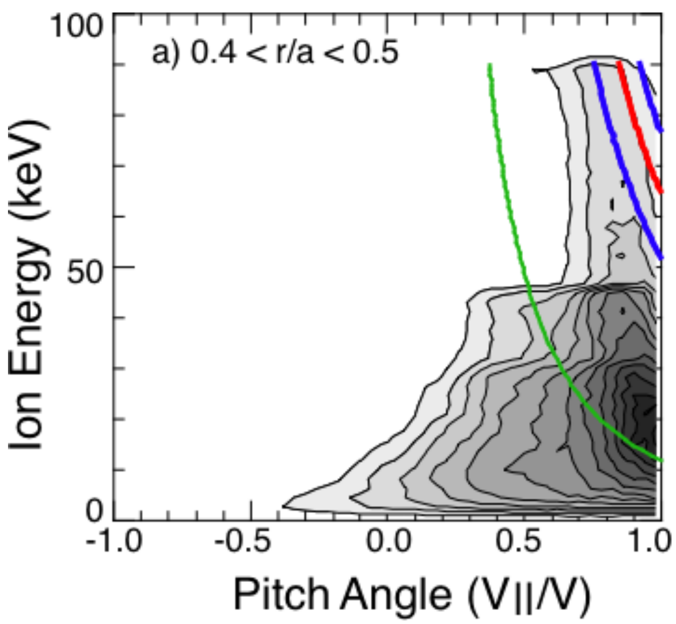
- Need to extend L-mode TAE avalanche studies to H-mode.

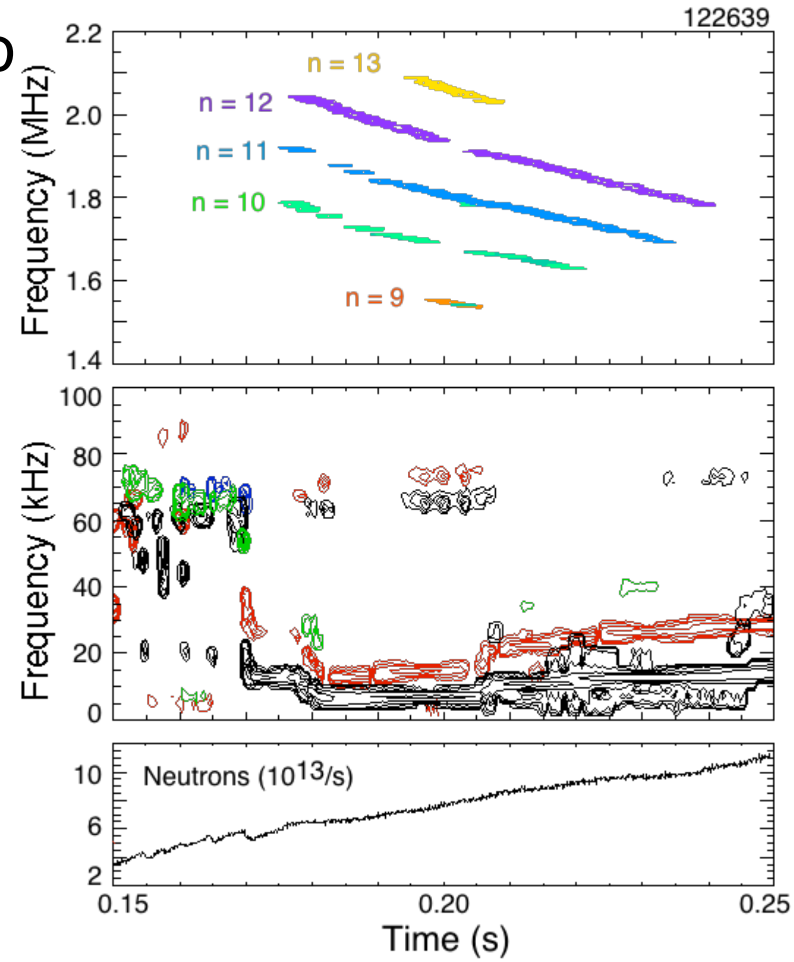
- H-mode avalanches are seen with full voltage beams, no difficulty getting MSE data.
- Measure fast ion redistribution, mode amplitudes, equilibrium parameters (q-evolution).
- Explore parameter boundaries for TAE avalanches.



2. Document early hfCAE with tFIDA, new reflectometers.

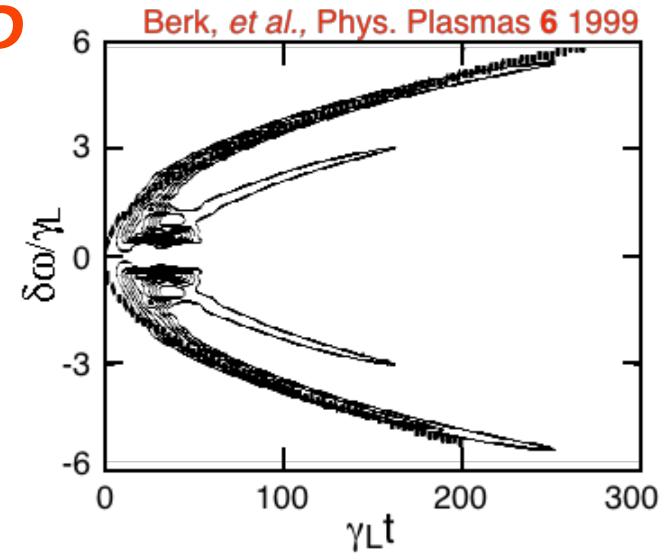
- There is some delay, suggesting diffusion plays a role in fast ion redistribution responsible for mode drive.
- Alfvénic early modes don't seem to have similar effect.
- Fast ions originate from core region?



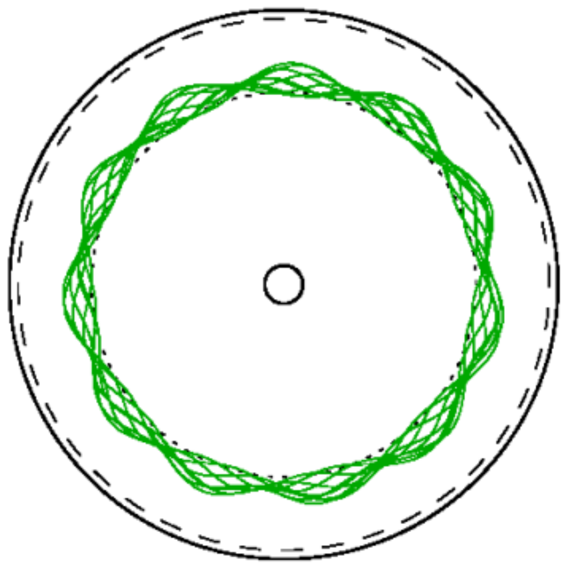


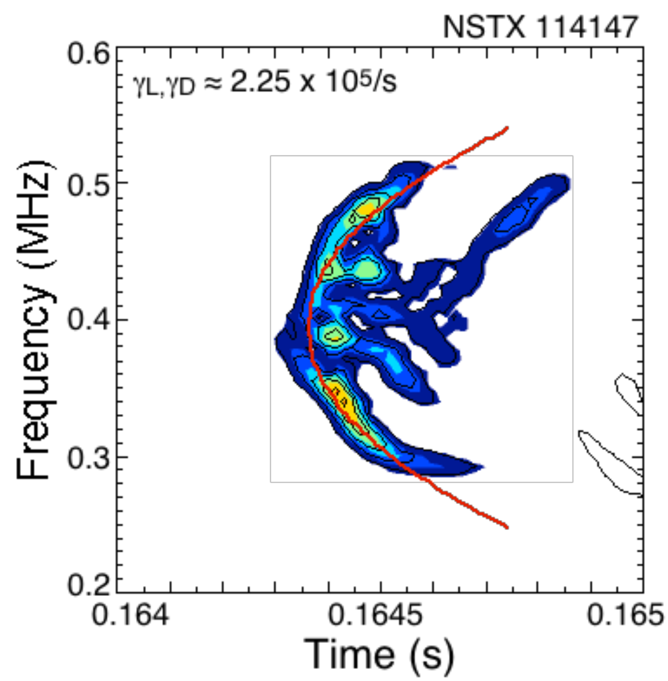
3.Angel fish GAE or CAE?

- Polarization measurements are not definitive.
- Best examples with up-down chirps were at very low TF, 3 kG, high Ip.
- ω_{ci}, $\omega_{transit}$ phase locking?



$$\omega_{ci} - k_{\parallel} V_{b\parallel} + k_{\phi} V_{tor} = \omega_{GAE}$$

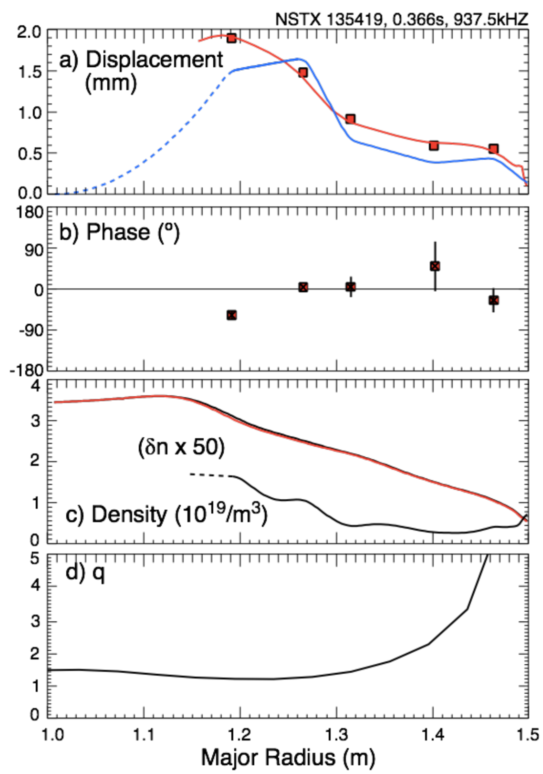




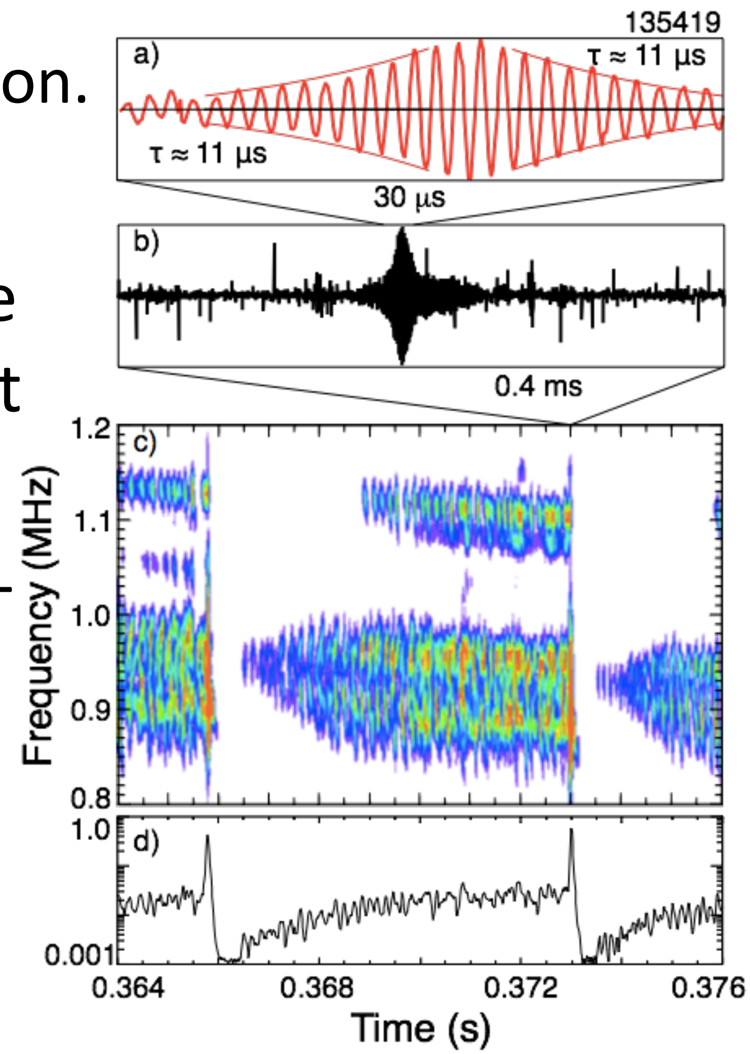
$$\omega_{lab} = \omega_{GAE} - k_{\phi} V_{tor} = k_{\parallel} V_{Alfvén} - k_{\phi} V_{tor}$$

4. GAE avalanches in H/L-mode

- Use BES & new reflectometer diagnostics to measure mode structure and amplitude.
- fFIDA to look for fast ion redistribution.

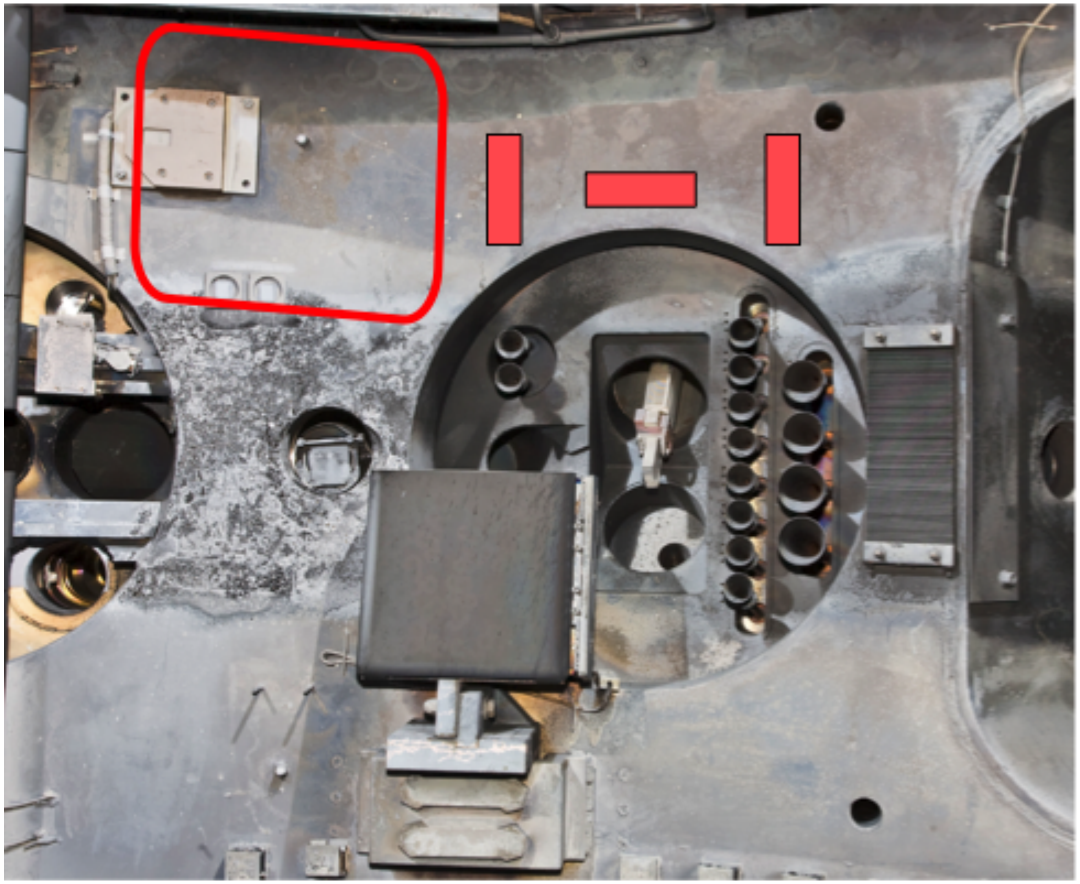


- Peak amplitude lasts ≈10 μs out of 5 ms period.
- Could be piggy-back on TAE avalanche XPs.



5. Add Coil for TAE excitation?

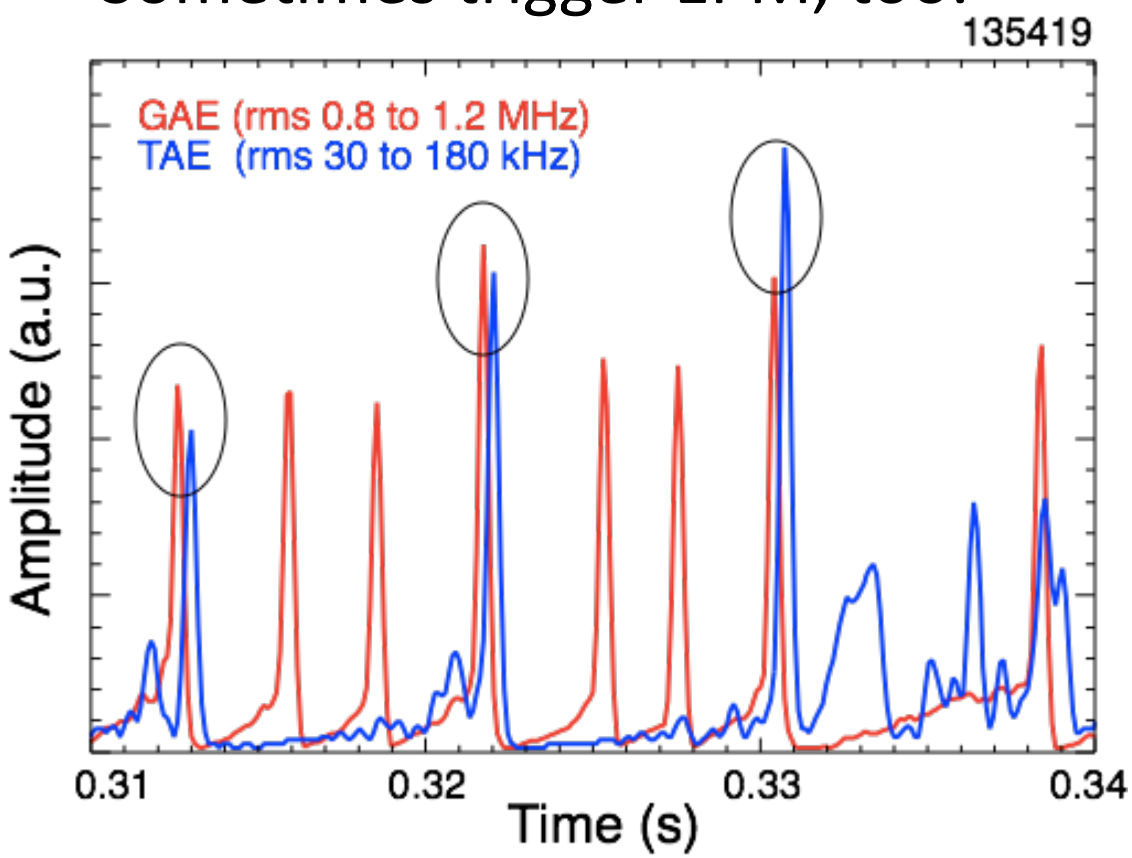
- Add simple ≈5 turn coil as shown – ≈25 cm x ≈30 cm, 5 turns
- Very similar to C-Mod coil (15cm x 25cm, 5 turns, 400 W amplifier)
- Looks promising to add this opening...

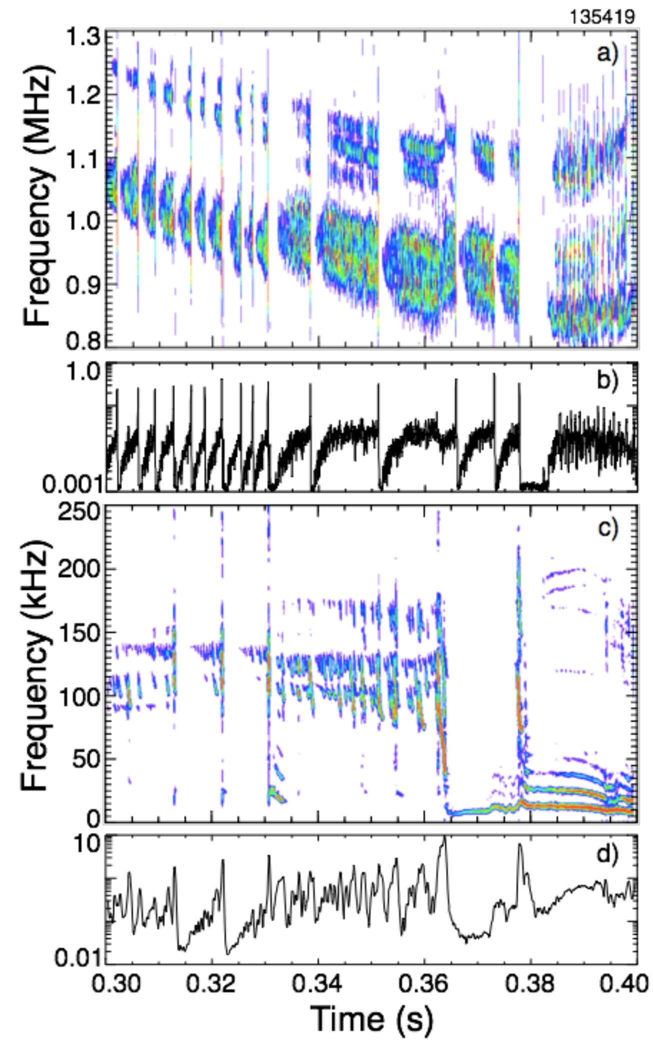


Bay J

GAE avalanches in H/L-mode

- Bursts can trigger TAE avalanches; implies significant redistribution of fast ions
- Sometimes trigger EPM, too.





Measure radial structure of Angelfish

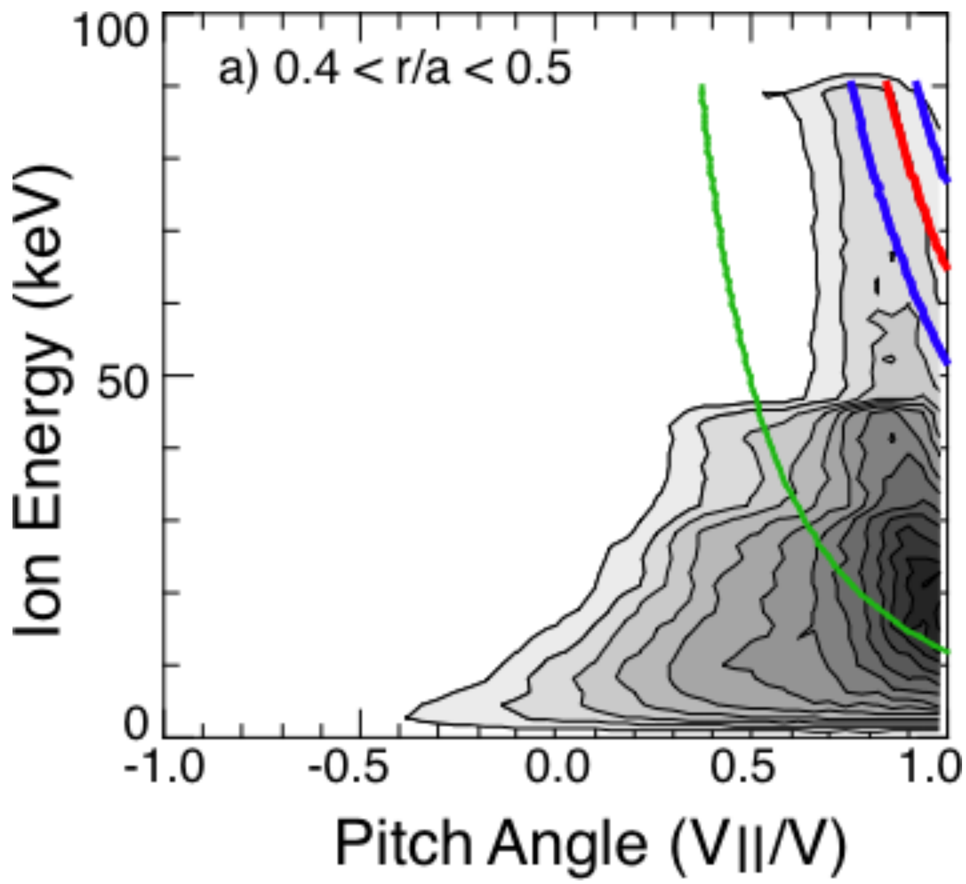
- Dedicated experiment; operation at 32 kA, 2.5 kG where best Angelfish were seen.
- Typically best Angelfish in bat-ear H-modes, so no reflectometer data.
- BES should be able to capture mode, good MSE data would be worth effort.
- Maybe FIDA might see something – if fast enough (0.5ms chirps every couple of ms)

High-frequency CAE

- These modes typically appear with n=1 kink mode, possibly as a result of fast ion redistribution.
  - Frequency spacing, mode numbers consistent with CAE.
  - Propagate co-parallel to beams, $8 \leq n \leq 13$.
  - Few fast ions in unperturbed distribution meet resonance condition.
- Probably pick up in piggy-back, but might need dedicated run-day

hfCAE documentation (tFIDA + BES + refl. array)

- modes driven through simple parallel resonance?
- fast ions don't normally populate resonant region
- Does kink redistribute fast ions?



N=3 Braking

- Some data, *e.g.,* 132758 – 132769, but avalanches and TAE not that good.
- Spend a day developing good avalanche target, incl. small Ip and TF scan.
- Then add braking.
- This XP cannot be done in piggy-back, needs at least one full day.

Proposed XP's

1. 3-wave coupling with n=3 error field (NC)
2. Affect of TAE induced transport on rotation, NBCD (stability scaling)
3. 'High density' TAE in monotonic H-mode plasmas.
4. Search for KAWs
5. Reversed field FIDA validation XP
6. HHFW acceleration of fast ions
7. HHFW on chirping (Sharapov EP?) (see 6).
8. EPM(fishbone) fast ion transport
9. eGAM search (reversed Ip)
10. Code validation TAE experiment
11. EPMs (see 8)
12. Marginal stability conditions for TAE
13. Characterize low frequency modes
14. Effect of HHFW on plasma rotation
15. HHFW interaction with fast ions (see 6&7)
16. HEF

Additional XP's not covered

- Fast ion transport by turbulence
- Document amplitude/structure of high frequency *AE in electron transport studies.

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- Affect of TAE induced transport on rotation, NBCD (stability scaling)
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