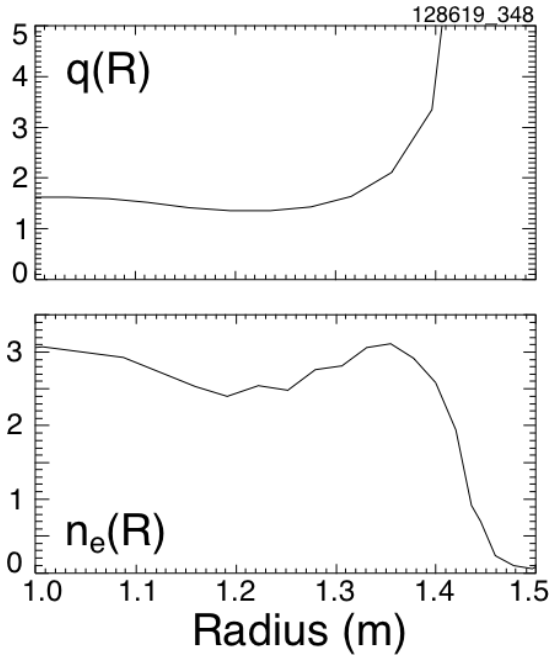
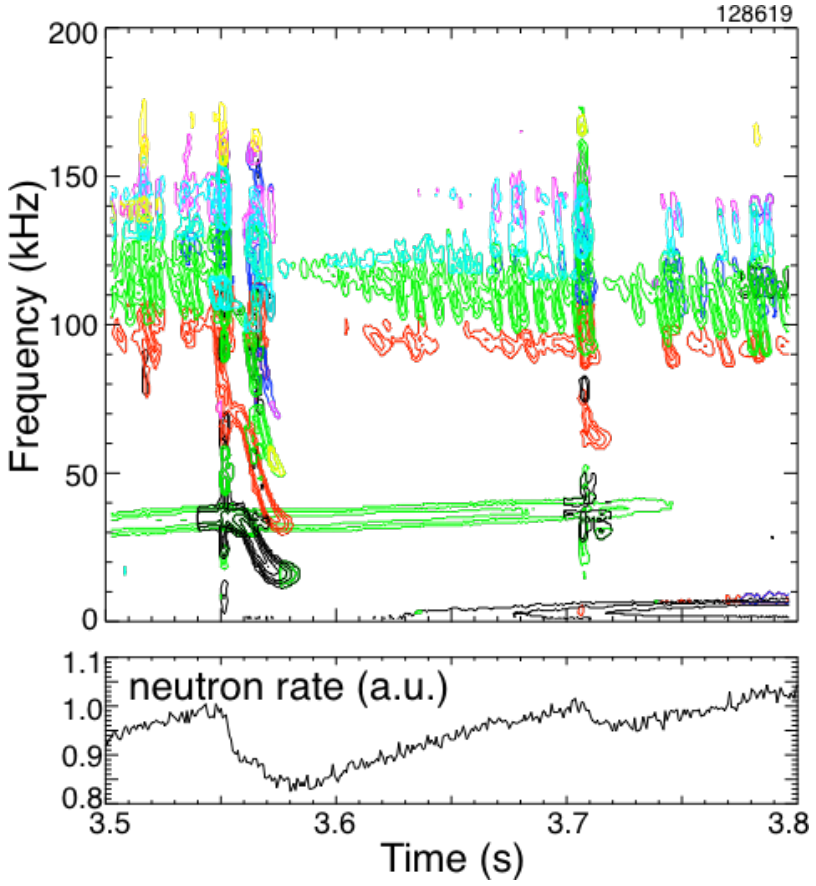
Develop H-mode TAE avalanche target plasma XP-906 (1/2 day)

- Goal is to develop reproducible H-mode plasma with TAE avalanches
- Explore sensitivity to density, source voltage, toroidal field and beam sources.
- Attempt to optimize target to acquire some data with reflectometer, sxi cameras and interferometers (FIReTIP) on mode amplitude

Some H-mode TAE avalanches already identified



- Neutron rate drops at avalanches, as in L-mode plasmas.
- Range of n-numbers is similar to L-modes (2-5).
- Seen with full beam voltage.



- Just as in L-mode cases, q-profile is slightly inverted with $q_{min} \approx 1.2$ - 1.5.
- Need to identify conditions under which Avalanches are seen.

Many options for starting point

- Need to develop target; possible starting points include:
  - Start with current, L-mode target, switch to D and let go into H-mode.
    - 4 kG, 800 kA (124781) or 4.5 kG, 900 kA (128455)
    - Not sure it will work
    - simple extension of work to date.
  - Try to reproduce conditions from 128619.
    - 5 kG, 750 kA, LSN, $K \approx 1.8$, $\delta \approx 0.45$
    - Not sure how to get there.
    - Nice TAE avalanches
  - Use 127117
    - 5.5 kG, 700 kA, LSN, $K \approx 2.2$, $\delta \approx 0.7$
    - $q_{min} > 2$, is this a relevant regime?
    - Nice avalanches, peaked core density (reflectometer data).

Run plan, goals:

- Goals for this half-day:
  - Reproduce TAE avalanches in H-mode shot
  - Explore existence criteria
  - FLIP, FIDA, SXI, FIReTIP, reflectometers(?), MSE
- Experiment plan:

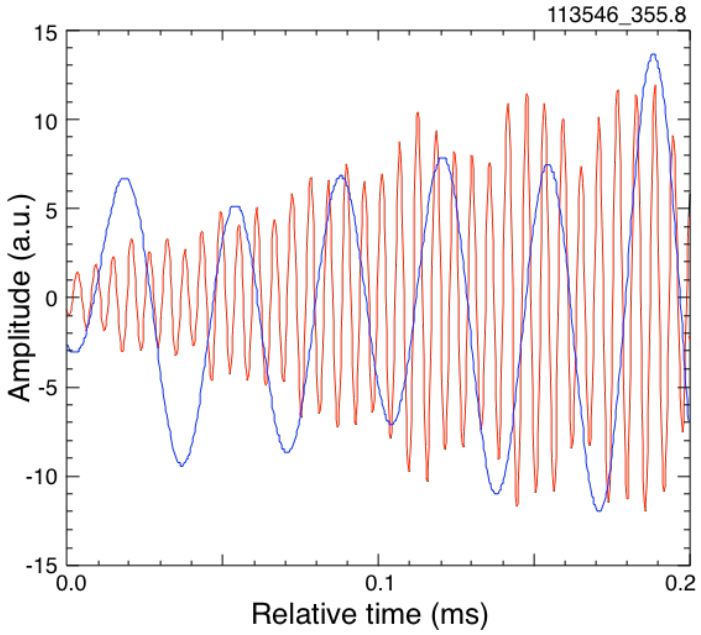
1. Reproduce shot 127117, sources A&B (3 shots)
2. Small density scan; ne(0)≈2.7, 3.5, 4.0. (3 shots)
3. Beam source scan; A&C, B&C (2 shots)
4. Beam power scan; A&?(80kV, 70 kV) (2 shots)
5. Small current scan; 800 kA, 850 or 900 kA. (2 shots)
6. TF scan (at optimum current); 5 kG (1 shot)

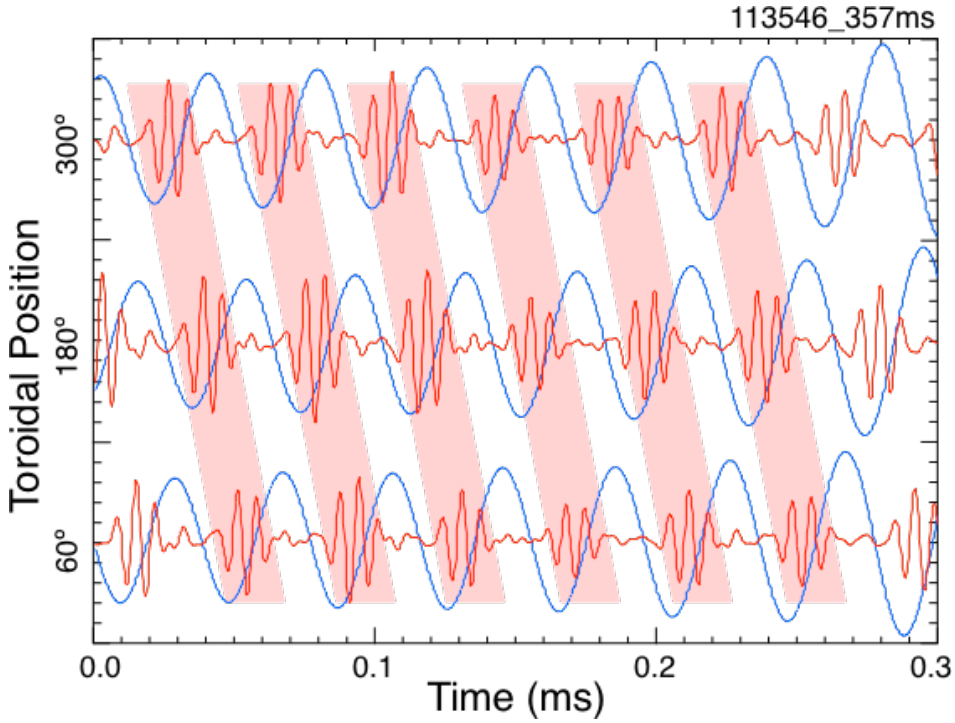
TAE Localization with EFCCs?
(three-wave coupling revisited)

- Goal: Demonstrate that TAE modes can be strongly localized with externally applied error field.
- Motivation: Experimental observation that low frequency kink mode can result in nearly 100% spatial localization.
    - could be relevant to stellarators, design of stellarator diagnostics.
- Observations challenge current theoretical models of TAE; experiments could lead to improved understanding of basic theory.

TAE Localization with EFCCs?
(three-wave coupling revisited)

- Strong localization for kink-like perturbation.
- Could error field have similar effect?
- Could plasma survive required perturbation?





- Amplitude modulation is weaker as mode amplitude decreases, consistent with non-linear 3-wave mixing model.
- Modulation increases strongly after this - as if there were a threshold.