Status, summary and plans for Analysis of data from XP819; fast ion transport during TAE avalanches

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Summary of runtime:

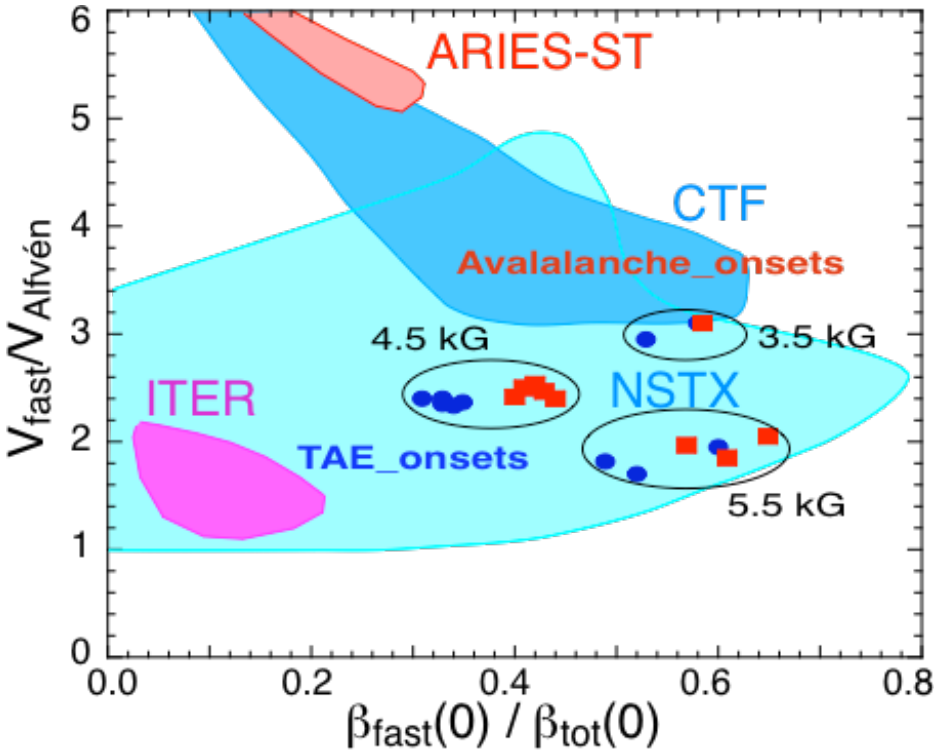
- First day, April 4: 3 shots, establish plasma
- Second day, April 10:
  - 128424-128431 attempt Avalanches with Deuterium
  - 128432-128438 power scan with B up to 95 kV, no TAE.
  - 128439-128444 power scan with C up to 95 kV, no TAE
  - 128445-128448 Scan with B&C up to 75/70 kV, Avalanche
  - 128451-128455 NPA scan with early RF power scan
  - 128456 More Source A coverage for q-profile evolution
- Third day, June 24 - slow start w/rebuilt source C
  - 130089-130096 TF scan with source A, waiting for C
  - 130097-130111 Search for avalanches
  - 130122-130135 Still no avalanches
- Fourth day, July 14 - 2 hours for TF scan
  - 130703-130704 4.5 kG, avalanches restored
  - 130705-130707 5.5 kG, avalanche threshold found
  - 130709-130712 Power scan to 3.4MW, no avalanches!

Analysis Status for TF scan:

- LRDFIT09/TRANSP analysis has been done for:
  - 5.5 kG power scan shots, with good match to neutron rate:
    - 130705a04 2.4 MW, TAE/avalanches
    - 130706a02 2.2 MW, TAE/avalanches
    - 130707a03 2.0 MW, TAE/weak avalanches
  - 3.5 kG power scan shots, with good match to neutron rate:
    - 130709a01 2.0 MW, no TAE
    - 130710a03 2.4 MW, no TAE
    - 130711a01 2.8 MW, TAE modes after 240 ms
    - 130712a01 3.2 MW, possibly weak TAE avalanche at 239 ms.
  - 4.5 kG shots
    - 130703, 130704 still to be analyzed
- Shots 130089 - 130096 will provide q-evolution with only source A, at 3.5, 4.5 and 5.5 kG

Toroidal field ($V_{Alfvén}$) scaling of avalanche threshold is complex

- More beam power needed to reach TAE avalanche threshold at low field, but didn't translate to β_{fast}/β_{tot} scaling of threshold.
- Implies other parameters are important (q profile evolution, β_{fast} profile, etc.).
- Additional analysis of this data, and earlier Beam voltage scan data will be done.
- Also necessary to move beyond cartoon characterization of stability thresholds.



Good data collected on scaling of TAE/Avalanche thresholds with $V_{fast}/V_{Alfvén}$

- Scaling is not as simple as previous (2007) data suggested.
- Extensive NOVA and M3D-K analysis needed to understand scaling.
- New FIDA (and NPA) data showing the impact of Avalanches on fast ion transport will be analyzed in parallel (M Podesta) for APS invited talk.
- Next year avalanche studies will be extended to higher/lower density and H-modes utilizing upgrades to reflectometers and new BES diagnostic