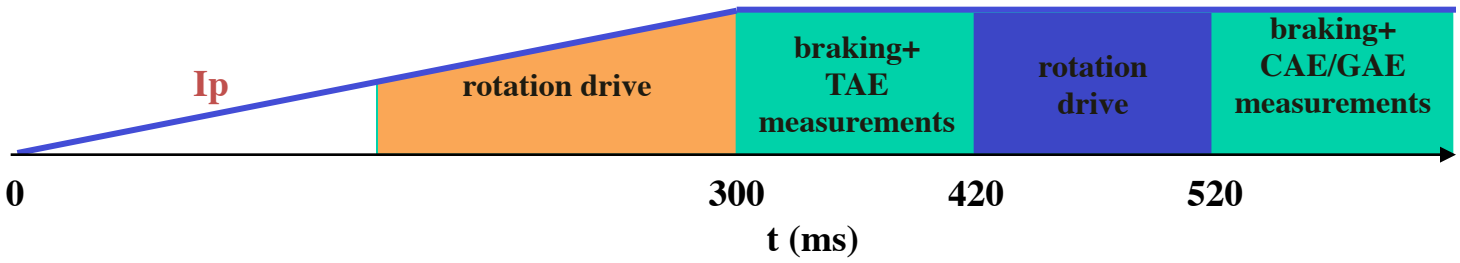
Overview of XP 1525 – Rotation effects on AEs

- AEs potentially significant to core energy & fast-ion transport
  - Predictive capability ultimately necessary
- Structure, frequency & stability sensitive to rotation
- Experiment: beam mix scan (to vary unstable modes) w/ n=3 braking
  - Stability: effect of rotation on composition of spectrum
  - Measure structure & frequency vs. rotation
- Two main goals:
  - Explore potential control tool for modes
  - Data to challenge theories on AE stability and mode structure

Required plasma/machine conditions

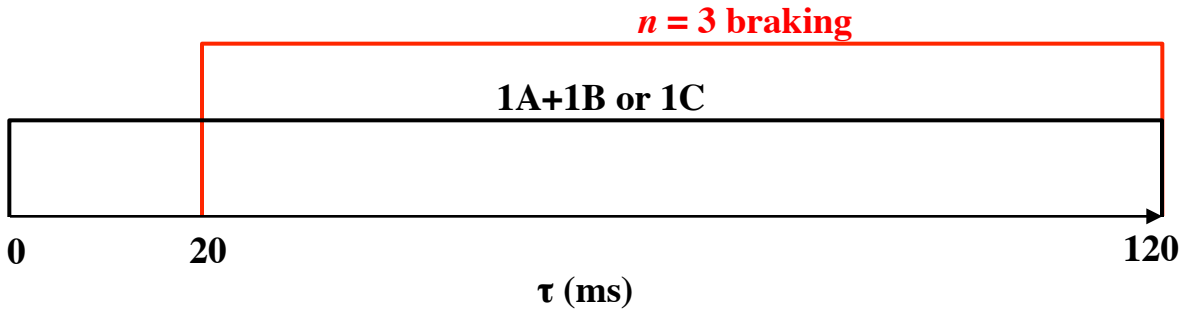
- 4 MW NBI H-mode (various mixes of 1st and 2nd beamlines with sources at 2 MW)
- High rotation (e.g. . $f_{ROT0}/f_{Alfvén0} > 0.2$ if possible), which may require low B_T (e.g. $B_T = 0.45$ T)
- Substantial $n = 3$ braking (e.g. $\Delta f_{ROT0}/f_{ROT0} \sim ½$ if possible)
- Low density:
  - $n_0 <\sim 4 \times 10^{-13}$ during flattop for TAE instability
  - $n_0 < \sim 7 \times 10^{-13}$ and monotonic $n(r)$ until t = 640 ms for reflectometer measurements
  - Lithium
- Possible moderation of density and density "ears"
  - dRsep jogs, n=3 RMP
  - Strategic "reset" with H-L-H transition via jogs or NB reductions

Run Plan



- Basic pattern repeated 6 times: vary beam mix each time
  A. rotation drive followed by TAE measurement period w/ breaking
  B. rotation drive followed by CAE/GAE measurement period w/ breaking
- Rotation drive: 6 MW 2nd beamline (maximum drive)

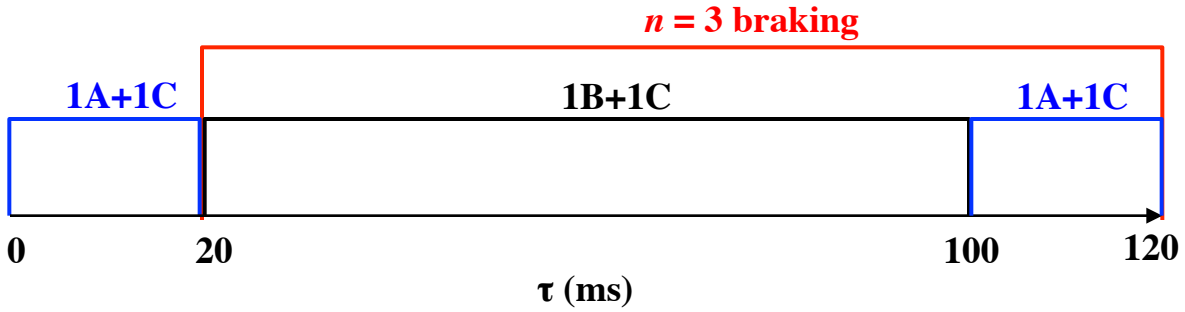
Measurement period NB mixes: 1st beamline stability scan



Mixes

1.1A (2 MW) + 1B (2 MW) – most unstable to TAEs ?

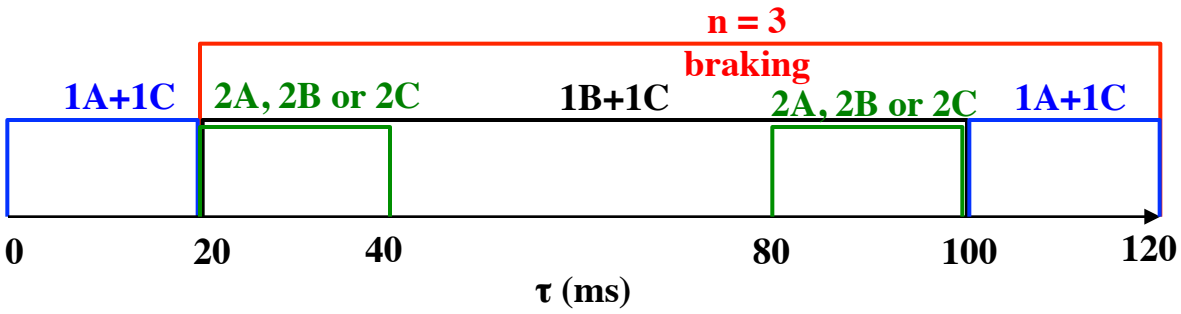
2.1A (2 MW) + 1C (2 MW)



3.1B (2 MW) + 1C (2 MW) – least unstable TAEs ?

– 1B notches synced w/1A blips for MSE + CHERS measurements

Measurement period mixes: 2nd beamline stability scan



All: 1B (2 MW) + 1C (2 MW) – minimally destabilizing to TAEs

- 1B notches synced w/1A blips for MSE + CHERS measurements

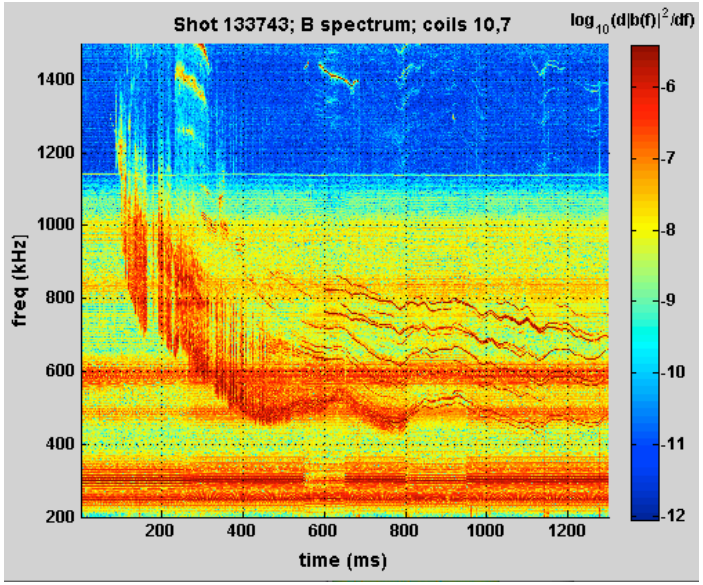
Mixes

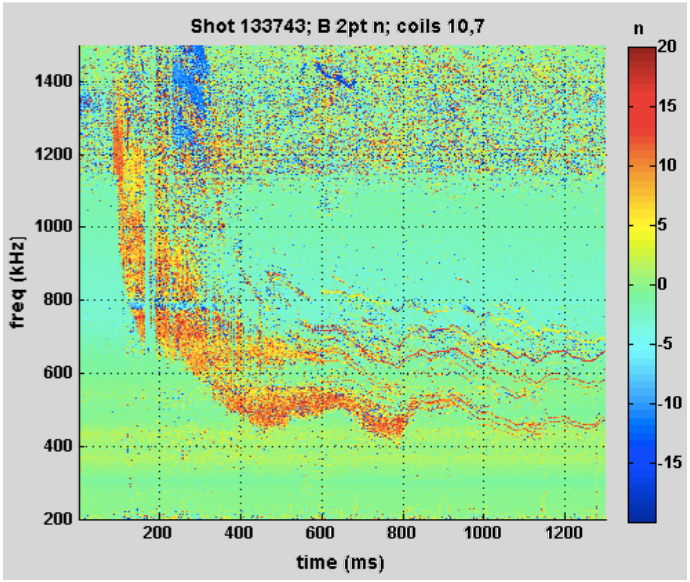
4.2A blips (2MW) – most unstable to TAEs?

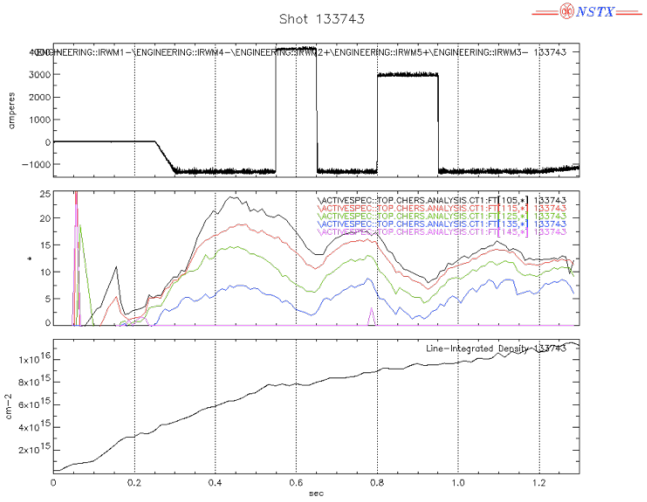
5.2B blips (2MW)

6.2C blips (2MW) – least unstable to TAEs?

Backup


Shot 133743; B spectrum; coils 10,7
log10(d|b(f)|2/df)
freq (kHz)
time (ms)


Shot 133743; B 2pt n; coils 10,7
n
freq (kHz)
time (ms)


Shot 133743
NSTX
amperes
Line-Integrated Density 133743
cm-2
sec