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Validation of M3D-K code for beam-driven TAE modes

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XP -1015

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N. Crocker, D. Smith
et al.

Goal: obtain detailed measurements of structure and dynamics of TAE modes to validate the M3D-K code

Allotted run time:
0.5 day

Culham Sci Ctr
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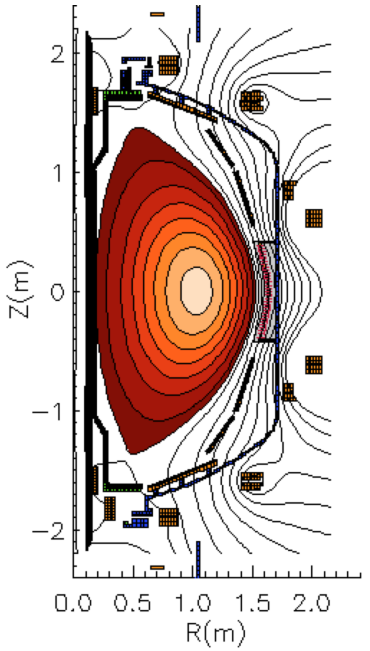
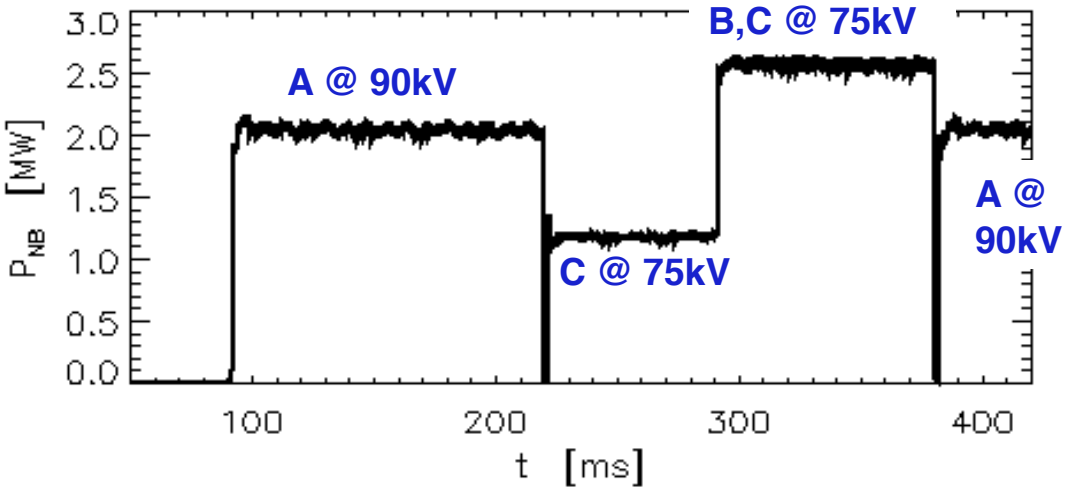
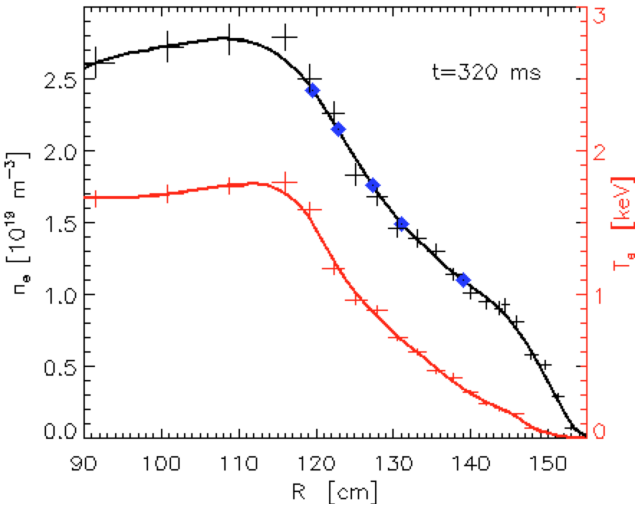
Focus on L-mode, center-stack limited deuterium plasmas (similar to XP-916)

- Starting conditions:
  - Reproduce baseline discharge from 2009 (e.g. sh#135388)
    - L-mode, D plasma, center-stack limited
  - Make sure that plasma remains *limited* from 200 ms up to ~450 ms
  - Need good shot reproducibility
    - LITERs at 10 mg/min total deposition rate

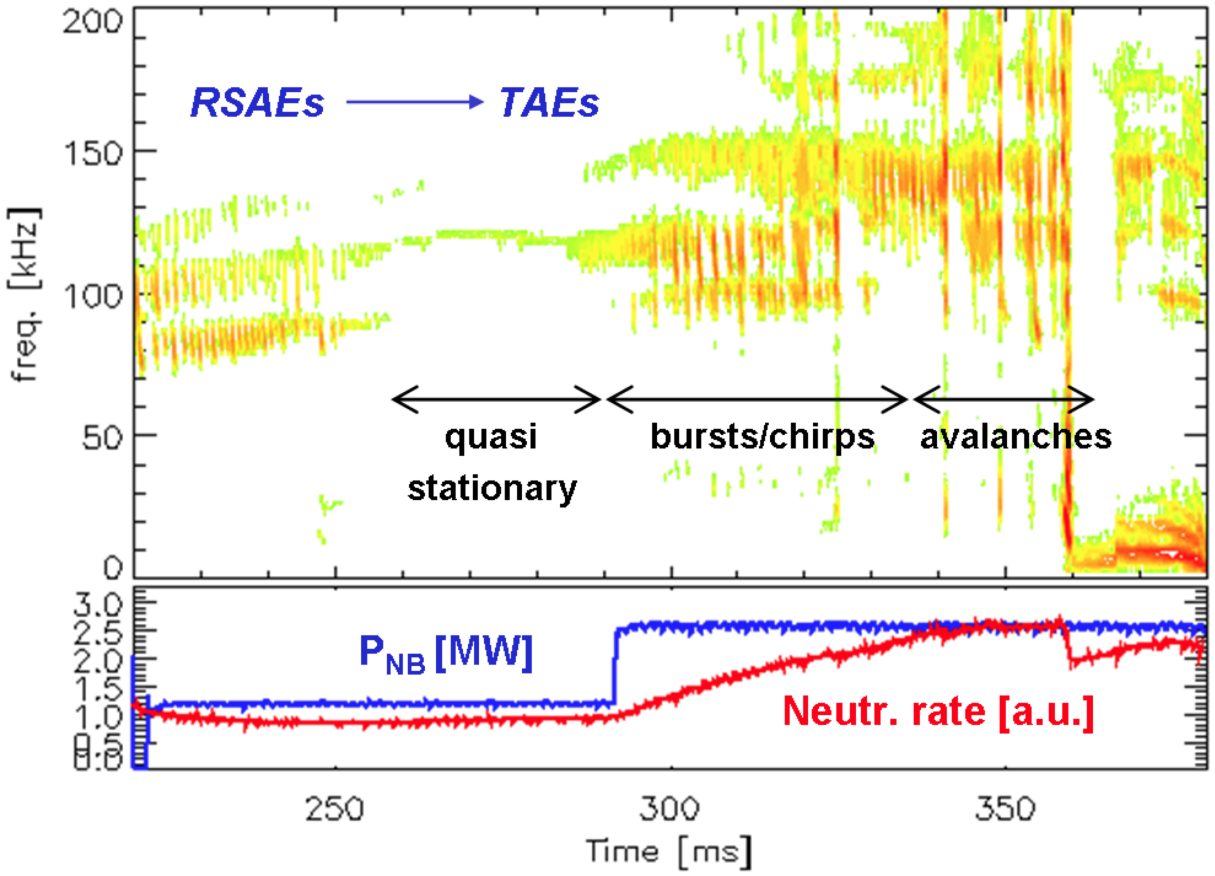






Optimize scenario to have "long" (>>50 ms) phase with weakly turbulent TAEs

- Scan NB voltage to identify "marginally stable" conditions
- Maximize duration of quasi-stationary TAE phase by adjusting NB timing (example: delay source B)



Run plan for ½ day XP (~12 good shots)

- Re-establish baseline scenario from shot 135388 — 2 shots
- Optimize density and NB timing/voltage — 3 shots
- Document mode structure and TAE dynamics — 3 shots *(repeat)*
- Document *q*-profile evolution (anticipate source A) — 4 shots
- Repeat for high density, up to n~8x10^{19} m^{-3} @ t~300 ms — as time permits

Total: ~12 shots

Diagnostics & Machine conditions

- Required diagnostics:
  - BES (at least 8 radial channels), reflectometers
  - All fast ion diagnostics (FIDA, NPA, ssNPA, sFLIP)
  - Plasma profiles (MPTS, CHERS, MSE) & magnetics

- Machine conditions:
  - NB sources B & C used at de-rated voltage, minimum 60 kV
  - Need low impurity level for FIDA; oxygen content must be low
  - Need well reproducible discharges
    - LITERs @ ~10mg/min total