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XP for the characterization of 2nd NBI line

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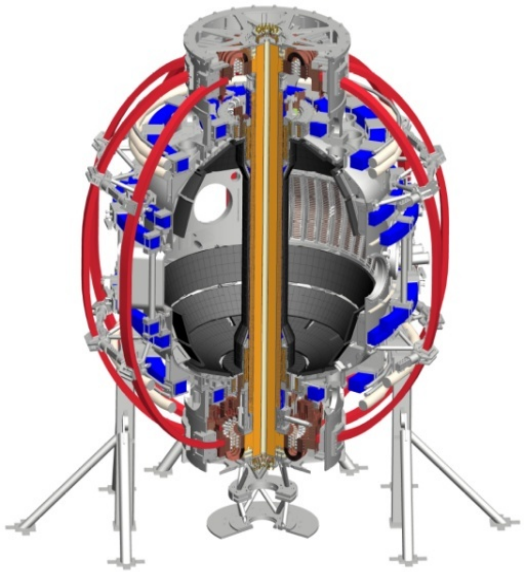
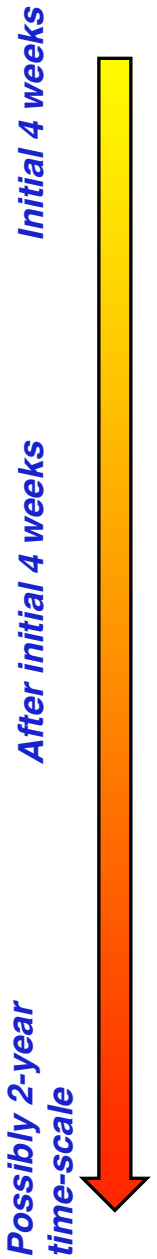
NSTX-U Research Forum
EP-TSG parallel session
02/24/2015



XP goals expected to shift from initial "basic" characterization/checkout to NB-CD, confinement physics



NB checkout:

Are different NB lines behaving "as expected"? Are results consistent with "classical" expectations (NUBEAM)?

Milestone R15-2:

Assess effects of NBI parameters on fast ion distribution function, NB driven current profile.

FY15 FES Joint Research Milestone:

Quantify impact of broadened current and pressure profiles on confinement and stability.

ITPA-EP Joint Experiment on NB-CD

NSTX-U/PPPL to lead the task (details to be discussed at March ITPA-EP meeting).

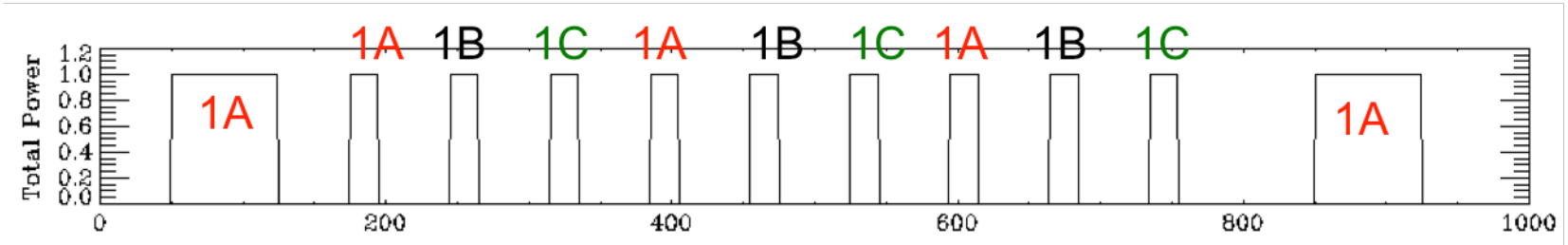
Initial NB checkout: compare NB performance (neutron rate, prompt losses, etc.) to *classical* predictions from NUBEAM

- **Goal: To verify consistency between exp't and NUBEAM modeling in quiescent plasmas (where classical fast ion physics is expected) with on-axis and off-axis neutral beams**

i. Compare neutron build-up/decay rates from beam blip experiments with TRANSP calculation

ii. Compare prompt losses (sFLIP) with predictions through I_p scan

Ex: beam blips for **on-axis beams** (NSTX-like plasma 0.5T, 0.8MA)



1A: 20ms pulses
1B: 20ms pulses
1C: 20ms pulses
50ms between blips

- Shots w/ 1A(90kV)-1B(90kV)-1C(90kV), unlikely a quiescent discharge
- Shots w/ 1A(65kV)-1B(65kV)-1C(65kV), weak CHERS signal, no MSE data

Target for first ~8 weeks of EP research: establish baseline for JRT-15 & R15-2; 2 run days requested

Proposed topics for initial XPs:

- On- vs. off-axis NB for "fiducial-like" H-mode
  - Use "standard" H-mode target(s) with P_{NB}=4-8MW
  - Perform initial assessment of J_{NB} vs NBI source mix
  - Perform initial assessment of pressure/stability vs NBI source mix

Possible spin-offs from main (cross-TSG/SG) XPs:

- Power scan, explore P_{NB}>6-8MW (beta limit)
- Dependence of fast ion distribution on NBI parameters
  - Systematic scans of tangency radii, *NBI energy*
  - Assess resulting F_{NB}; initial characterization of *AEs vs. F_{NB}
- *Others …*

Proposed matrix for J_{NB} vs. NBI mix XP

	4MW	6MW	8MW*
On-axis	70, 110	70, 60, 110	50, 60, 70, 110
Balanced	70, 120	70, 110, 120	50, 60, 110, 120
Off-axis	70, 130	70, 120, 130	50, 60, 120, 130

- In fiducial H-mode condition
  - to limit discharge development & have reliable target
- Target single I_p, B_t setting
  - Favor low-I_p ~700kA for high non-inductive fraction; high B_t~0.7T for f.i. confinement
  - To be coordinated with I_p/B_t scan XPs
- Keep total NB power ~6MW or less
  - (Arguably) easier to characterize J_{nb} contribution from different source at lower P_{NB}

Proposed matrix for pressure/stability vs. NBI mix XP

	4MW	6MW	8MW*
Least peaked	70, 130	70, 60, 130	50, 60, 70, 130
Mix	70, 110	60, 70, 110 or 70, 110, 120	70, 110, 120, 130
Most peaked	110, 120	70, 110, 120	60, 70, 110, 120

- Fiducial H-mode condition
  - to limit discharge development & have reliable target
- More than one I_p, B_t setting
  - Requires I_p/B_t scans; extend previous table to high I_p
  - To be coordinated with I_p/B_t scan XPs
- *May be repeated after transition to Li-PFCs (broader profiles)*