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Pre-FY15 forum Meeting #1

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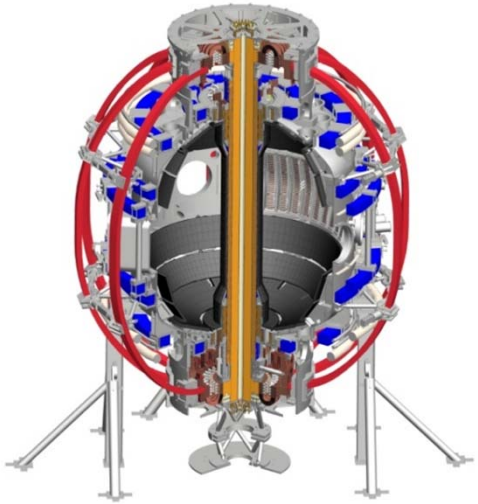
*Walter Guttenfelder, **Yang Ren**, Stan Kaye, and NSTX-U T&T TSG*

NSTX-U T&T TSG
Dec. 16, 2014



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T&T XMP/XPs topics/titles to: (1) recommission T&T systems/diagnostics, (2) run in ~1st month of research ops

- No T&T specific diagnostics require immediate XMPs
- ➢ For profiles: Assess NBI modulation necessary for CHERS measurement

- Almost all T&T XPs will require TRANSP analysis, therefore requiring TS, CHERS, magnetics/EFIT/MSE, neutron detector, bolometers
  - TRANSP can be used to assess self-consistency among diagnostics
  - Between shots TRANSP will be available (BEAST)

- <u>Priority T&T XPs (motivated by Milestones & PAC35 research plans)</u>

1. H-mode confinement & turbulence scaling with higher I_P, B_T (NBI source)
2. Influence of q and Ω_{tor} profiles (with 2nd NBI and 3D coil) on turbulence & transport
3. Measure GAE/CAE mode trends with NBI power, R_{tan}
4. Explore H-mode access & variation with R_{tan} (pedestal physics/Boundary TSG?)

- <u>Other T&T experiments for FY15 – more detailed versions of the above after intial operation</u>

1. H-mode confinement and turbulence scaling with ν_*
   - Requires careful parameter matching (I_P~B_T, n~const, T~B^2 by adjusting P_{NBI})
2. Measure perturbative particle transport
   - Need SGI & TS
3. Measure perturbative momentum transport
   - Uncertainty of simultaneous NBI modulation + CHERS measurement
   - Or possibly use 3D fields
4. Measure GAE/CAE mode structure using reflectometry
5. Measure L-H threshold parametric dependencies (especially on R_{TAN})

FY15-16 milestones relevant to T&T research & T&T Research Plans from PAC35

- **(R15-1)** *Assess H-mode τ_E, pedestal and SOL characteristics at high B_T, I_p, P_{NBI}*
  - Assess confinement scaling at reduced ν_*
- **(R15-2)** *Assess the effects of neutral beam injection parameters on the fast ion distribution function and neutral beam driven current profile*
  - Investigate sensitivity of GAE/CAE induced χ_e to fast ion phase space
- **(Joint Research Target 2015)** *Quantify impact of broadened current and pressure profiles on confinement and stability*
  - Study transport and turbulence response with q, s, $p_0/\langle p \rangle$ using expanded NBI flexibility

STATED RESEARCH PLANS FROM PAC35:

- Characterize H-mode confinement scaling at increased B_T/I_p = 0.8 T/1.6 MA
  - Push to lowest collisionality possible (is $\tau_E \sim 1/\nu_*$ still valid?)
  - Characterize changes in multi-channel transport χ_e, χ_i, χ_φ, D_{imp} (e.g., does $\chi_i \approx \chi_{i,NC}$ & $D_i \approx D_{i,NC}$ remain at lower ν_*), compare with theory
- Explore parametric transport and turbulence dependencies with q and flow profiles using expanded NBI flexibility, 3D coils
  - Characterize changes in low-k turbulence (BES, reflectometry), compare with gyrokinetic simulations
- Measure CAE/GAE mode frequencies and structure (BES, reflectometry)
  - Characterize effect of GAE/CAE on experimental χ_e, sensitivity to NBI tangency radii/pitch angle
  - Compare with theory, HYM simulations