NSTX

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Discussion of NSTX contributions to FY2013 Joint Research Target (JRT)

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For the NSTX Research Team

NSTX Physics Meeting
B318 - PPPL
July 5, 2011

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General Atomics
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JAEA
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TRINITI
NFRI
KAIST
POSTECH
ASIPP
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
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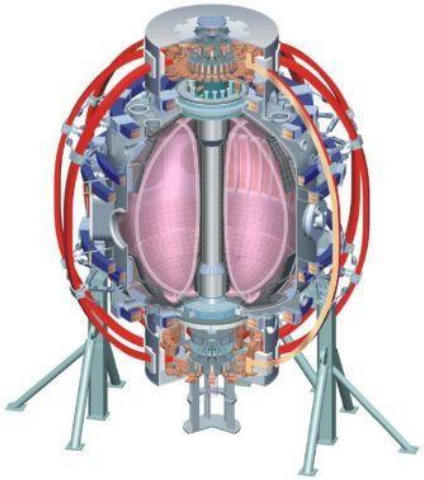
ASCR, Czech Rep



Overview

- Joint Research Targets (JRTs) are discussed and chosen through Fusion Facilities Coordinating Committee (FFCC) consisting of directors of 3 facilities and FES
- Goal of the JRT is to address high-priority research topics for ITER/fusion development using (if possible) all 3 US facilities
  - Exploit unique capabilities of each facility to gain understanding of topic not otherwise accessible
- NSTX will not be operating in 2013, but can contribute to this effort if sufficient data are obtained in the upcoming run
- Top 2 candidate topics for FY2013 discussed were:
  1. Disruptions
  2. ELM control

Overview (2)

- Based on importance to ITER, the ability of the 3 facilities to contribute, and the focused nature of the topic, the 2013 JRT research area/title will be something like (not finalized):
  - "Development of small/no-ELMs regimes with stationary conditions"
- Purpose of this meeting is to begin team discussion of how NSTX can best contribute, including:
  - Lithium ELM-free scenarios (w/ improved density/impurity control)
  - Small ELM regimes (type V?)
  - Rapid/small ELM triggering (Li granules?)
  - ELM suppression with 3D fields
  - Development of I-mode
- Are we missing anything in the list above?

Run-time considerations

- We will likely need to re-direct some run-time to get results in the FY2011-12 run period to support the JRT in 2013
  - 2-4 run-days of “redirection” expected
- There are several/many experiments already planned for 2011-12 that support the FY2013 JRT
- Request that each TSG identify existing/planned experiments from research forum that can contribute strongly to the JRT
  - Should explicitly identify how XP contributes to the JRT research
  - Experiments that are already Priority 1 may get a bit more run-time
  - Experiments that are Priority 2 could get bumped up to Priority 1
  - Other Priority 2 experiments may have even lower chance of getting run-time due to run-time constraints and addition of this milestone

Example/incomplete mapping of XPs supporting 2013 JRT
TSG leaders need to send more complete/accurate info!

- Lithium ELM-free scenarios (w/ improved density/impurity control)
  - XP1125 (Clayton, Park) Effects of 3D Fields on Impurity Transport in the NSTX Plasma Edge
  - WPI and ASC XPs (Taylor, Bell) Core RF heating, HHFW for high H-mode NBICD
  - XP1131 (J. Menard) – early impurity flushing + snowflake for impurity/density control
- Small ELM regimes (type V?)
  - XP1122 (Gerhardt/Gray) Passive impurity control techniques in NSTX-U scenarios / Development of small ELM regime with minimal lithiumization for edge particle control
- Rapid/small ELM triggering (Li granules?)
  - XP1132 (J. Canik) ELM pacing + core RF heating RF and/or n=3 + vertical jogs
  - LRTSG XP?? (D. Mansfield) Midplane injection of Li granules
- ELM suppression with 3D fields
  - XP 1127 (J. Lore) Search for q95 resonant effects on ELM frequency during 3D field application
  - XP 1031 (S. Sabbagh) - ELM stability dependence on edge current, q, and collisionality
  - XP1128 (J.-K. Park) - ELM triggering test using the n=1 or n=2 field
  - Priority 2 (R. Goldston, J. Hosea) - Using Modulated ICRF to Drive EHOs and Modify Edge Transport
  - Priority 2 (Battaglia) – Shifted plasma shape for improving RMP resonance condition
- Development of I-mode
  - BPTSG XP?? – T. Gray - Achieving I-mode on NSTX
  - XP1130 (A. Hubbard) - Access and characterization of I-mode regime on NSTX

Theory support, JRT leadership

- What theory capabilities do we have and/or need to support:
  - Lithium ELM-free scenarios (w/ improved density/impurity control)
    - XGC0, STRAHL, ….
  - Small ELM regimes (type V?)
  - Rapid/small ELM triggering (Li granules?)
  - ELM suppression with 3D fields
    - IPEC, ELITE, EPED, ….
  - Development of I-mode

- Leadership…
  - Need expertise in ELMs, scenarios