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NSTX

NSTX Program Update:

Collaboration status
A few TSG updates
PAC meeting summary

College W&M
Colorado Sch Mines
Columbia U
Comp-X
General Atomics
INEL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Nova Photonics
New York U
Old Dominion U
ORNL
PPPL
PSI
Princeton U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Maryland
U Rochester
U Washington
U Wisconsin

J. Menard, PPPL

February 12, 2008
NSTX Team Meeting
Princeton Plasma Physics Laboratory

Culham Sci Ctr
U St. Andrews
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAERI
Hebrew U
Ioffe Inst
RRC Kurchatov Inst
TRINITI
KBSI
KAIST
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep
U Quebec

NSTX Collaboration Opportunities for 2008-2010

- Peer review of proposals completed
- Several collaborators already informed of renewals
- DoE and NSTX announcements expected shortly
- Expect approx. 10-12 proposals will be funded
- Expect increased emphasis on boundary/LLD

NSTX Macroscopic Stability TSG – Update 2/12/08

- 2008 Run
  - Macro Stability XPs
    - Top-priority XPs from Forum on schedule for next week (NTM XPs 801 and 810)
    - 6 XPs through group review; 2 through full team review
    - ELM mitigation XP through two meetings, strawman shot list developed, written XP in progress
    - Joint NSTX/MAST XP on NTV physics submitted to MAST Forum (SAS)
- Physics
  - RWM stabilization physics
    - Hu-Betti-Manickam kinetic δW code ported, initial testing on NSTX plasma with zero rotation at q = 2 surface (124010)
  - RWM multi-mode physics
    - Multi-mode VALEN code completed – testing now on NSTX, HBT-EP, and DIII-D equilibria
    - NSTX plasma is only case where second mode should become dominant

Boundary Physics TSG update

- Coordinated submission of 18 abstracts to PSI-21 conference
  - Abstract by D. Mansfield et al. on ELM suppression by lithium in NSTX was accepted as an oral contribution
  - NHTX has poster (w/o paper)
- Conducted 3 meetings to discussed a revised run plan and review high priority XPs.
  - All high-priority XPs have now been reviewed.
- Conducted impurity assessment meeting and generated recommendations for planning of FY 2008 measurements and analysis
- Conducted discussions and meetings on ELM control with RMP XPs together with MHD TSG

General PAC comments (1)

- The PAC endorses prioritization:
  - both research goals and key hardware upgrades
- Research goals:
  1. Increase & understand NBI current at lower n_e, ν^*
  2. Increase and understand H-mode confinement at low ν^*
  3. Demonstrate & understand NI start-up and ramp-up
  4. Sustain β_N & understand MHD near & above no-wall limit
- Upgrades
  - LLD, BES, HHFW

General PAC comments (2)

- PAC encourages the NSTX Team to **fully embrace these priorities and focused research plan**.
  - Consider allocating “cross-cutting” and “reserve” run-time to high-priority tasks, especially Li and efforts to maximize effectiveness of NBICD
  - Include 2008 & 09 explicit milestones for Li/LLD to insure progress in this key area, PAC recommends a 2008 milestone to highlight new results from the dual LITER.
  - Include a 2009 explicit milestone for higher-power HHFW using dual-feed antenna
  - Consider ways to better organize scientific team-work/leadership on the program priorities.
- ITER support:
  - Suggestion to enhance NSTX relevance: VDE control noise floor
  - RWM coil/port-plug contributes a relevant ITER design point.

Select TSG-specific PAC comments (1)

- T&T
  - Opportunity to enhance particle transport studies involving Li with other things affecting density, e.g., RMP
- BP
  - Understand the physics behind plasma effects correlating with Li usage SOONER rather than later
  - Div. detachment & high heat-flux research should remain high priority.
- HHFW & EBW
  - extend experiments to higher NBI power - runtime allocated rather low
  - ensure adequate resources (incl. run time) to prepare for and take advantage of this upgrade
- EP
  - Synthetic diagnostic in the NOVA code:
    - unclear whether modes were EP multi modes, avalanche, other
    - results of ORBIT sims not presented – compare with DIII-D where a large discrepancy between the ORBIT & expt. result was found

Select TSG-specific PAC comments (2)

- MS
  - The experiments in support of ITER critical design issues are a high 2008 priority: RMP for ELM mitigation, neo. class. viscosity, ITER-like RWM
  - The high-n control coil set, proposed for 2011, is well motivated. Design work should continue if operation beyond FY10 is clarified.
- SFSU
  - Outer-PF start-up could be more aggressively pursued
    - increase preparation in 2008 for more aggressive 2009 experiments, since pre-ionization is probably already good enough from CHI to initiate the outer-PF ramp-up.
- Integrated Scenarios:
  - Integrated Modeling: Concerned that the progress in 2007 appears to have been limited.
  - PAC encourages increasing the emphasis on this activity in order to:
    - Inform the upgrade and research development path on NSTX
    - Provide confidence that these models can be used to design next-step ST devices.
  - While the PAC believes some level of integration may be possible in 2010, NSTX operation beyond 2010 will be indispensable in demonstrating this important capability.

“5 year plan” completion schedule

- PAC believes long-term “target” compelling → should write 5yr plan
- DoE default position is that FY10 is likely final year of NSTX operation due to budgetary limitations
  - But, decision to accept NCSX rebaselining not until June 2008
- Suggests best approach is for NSTX to prepare 5yr plan
  - Provide clear/clean separation of FY09-10 and FY11-13 plans
  - Provide strong scientific justification for FY11-13 upgrades/operation
    - Focus on *new understanding* gained from additional capabilities/run-time
- Cannot guarantee team will be asked to submit 5yr plan, or that if submitted and reviewed, the plan will be executed
  - Given present uncertainty, should be prepared for all possibilities

We are here

- **February 2008** — **Revise/write draft plan with above format**
- **April 1, 2008** — **Complete draft plan due**
- **April 15, 2008** — **Final plan (document) ready**

- **3 wks before review** — **Draft presentation material ready**
- **2 wks before review** — **Dry run of the presentation**
- **1 wk before review** — **Final presentation material ready**
- **~ May 2008 (TBD)** — **New 5 Year Plan Review meeting?**