

## NSTX Weekly Report (Feb. 23, 2007)

**FY 2007 NSTX plasma operations started on Feb. 19, 2007.**

**Planned: 10 weeks**

**Completed: 0.54 weeks (through Feb. 21, 2007)**

- A brainstorming session on Transport and Turbulence issues for the 2009-2013 Five Year Plan was held on Monday, 2/19. Thirteen presentations were made, and these covered experimental thrusts, theory-experiment collaboration, including testing of theory through experiment, and diagnostics. Physics topics covered included energy transport of both electrons and ions, momentum and particle transport through steady-state and perturbative studies. Discussion of diagnostics covered upgrades of existing ones, most notably the high-k scattering to measure k-theta, and low-k reflectometry. New diagnostic ideas focused on developing the capability to measure low-k fluctuations routinely, especially during the H-mode phase. Ideas on Beam Emission Spectroscopy and Microwave Imaging Reflectometry were presented. (S. Kaye)

- A meeting was held to begin formulation of the NSTX 5 Year Plan (2009-20013) in the area of MHD research. Eight presentations were made that led to extensive discussion on areas spanning research topics, diagnostics, machine hardware changes and upgrades, theoretical analysis supporting the research plan, and the synergistic integration of these topics. MHD subtopics discussed at the meeting included RWM research, operation with increased shaping (especially elongation), mode stabilization, NTMs, effects of modes on fast particle population, measurement and alteration of scrape-off layer currents, disruption studies, and many other key topics. Improved diagnostics and future analysis plans and capabilities were also discussed. All presentations can be found at [http://nstx.pppl.gov/DragNDrop/Five%20Year%20Plan%20\(FY09-13\)/MHD/Feb-23-07-mtg/](http://nstx.pppl.gov/DragNDrop/Five%20Year%20Plan%20(FY09-13)/MHD/Feb-23-07-mtg/). A summary of the discussion will be made available this week. (S. Sabbagh, Columbia University)

- Roger Raman (U-Wash.) attended the 2007 Innovative Confinements Concepts Workshop held at the University of Maryland (Feb 12-14) and presented a poster describing recent results from NSTX that produced up to 160kA of closed flux current using the method of Transient CHI and without the use of the central solenoid. At the same Workshop, Xianzhu Tang (LANL) gave a talk on the application of CHI to a ST Component Test Facility and described how a Relaxed Transient CHI start-up method could be used to produce most of the start-up current needed in a ST-CTF device" (R. Raman)

- There will be an NSTX Physics Meeting on Monday, 2/26 at 1:30 PM in LSB318. We will have short presentations from those who ran XPs during the week of 2/19: J. Menard – XP711: Breakdown optimization, J. Menard – XP703: Assessment of error fields, and V. Soukhanovskii – XP708: Radiative divertor. R. Maingi will be running an XP on the day of the meeting, so he will report results from his SOL width scaling XP the following week. (S. Kaye)

- The updated schedule for the remaining mini-workshops is as follows:

- Advanced Diagnostics: Tuesday Feb. 27, 1:00 – 5:00 in LSB 318, [BStratton@pppl.gov](mailto:BStratton@pppl.gov).

In addition, there will be a mini-workshop on "Fusion Energy Sciences Development using ST" during March-April with details to be announced, [MPeng@pppl.gov](mailto:MPeng@pppl.gov).

Please send your ideas for a presentation or any questions to the respective meeting organizers. The remote connection will be available for the meetings. For more information, please visit our NSTX

website: [http://nstx.pppl.gov/DragNDrop/Five%20Year%20Plan%20\(FY09-13\)/](http://nstx.pppl.gov/DragNDrop/Five%20Year%20Plan%20(FY09-13)/)

### **Rub Coordination (D. Gates, M. Bell)**

On Monday February 12th and Tuesday February 13th ISTEP-001 was run. The NSTX coil system is now verified up to 5.5kGauss on the TF and maximum current on poloidal field systems. On Wednesday February 14th, plasma control system check out was performed accompanied by the first helium ohmic plasmas as the final check of the control system function. Also on Wednesday, 2 of 6 HHFW antenna straps were vacuum conditioned. All antenna straps were vacuum conditioned up to 20 kV in the evening of February 22<sup>nd</sup>. Neutral beams conditioned into the calorimeter Monday through Wednesday and on performed the NBI aiming procedure, completing the conditioning process. All three sources are available at up to 90kV beam energy. On Thursday February 15th neutral beam conditioning shots were performed. These shots were also used for the MSE beam-into-plasma filter tuning procedure. In addition, VIPS and SPREAD data were taken as part of a machine impurity assessment included in XMP-48 "NSTX startup commissioning and evaluation". On Friday February 16th, XMP-33 the MSE beam-into-gas-with-fields calibration was performed in the morning. XMP-48 will be continued in the afternoon.

On Monday February 19<sup>th</sup> the first experimental proposal of FY07 campaign, XP711 entitled "Improved break-down for higher q during the current ramp", was performed. Plasmas which divert as early as  $t=40\text{ms}$  were made. On Tuesday February 20<sup>th</sup> XP 708 entitled "Divertor heat flux reduction in highly shaped plasmas" was performed. IR camera data was obtained measuring the divertor temperature during deuterium gas puffs from the lower dome. On Wednesday February 21<sup>st</sup> XP 703 entitled "B and q scaling of low density locked mode threshold at low-A" was performed. Several scans were performed investigating the locked mode threshold to determine the effect of the modified TF supports on the TF error field.

### **Engineering Operations (A. von Halle, C. Neumeyer)**

The FY07 NSTX run began this week after the completion of machine proposals (MP's) for "Start-up Commissioning and Evaluation" (MP-48) and an MSE calibration (MP-33), and then a vacuum vessel boronization over the weekend. Progress was made on several experimental proposals (XP's), starting with an assessment of machine conditions in XP-701 "Breakdown optimization", followed by XP-708 "Divertor heat flux reduction and detachment in highly shaped plasmas" and XP-703 "B and q scaling of low-density locked mode threshold at low-A". Plasma operations will continue this week at 5.5kGauss for XP-708 "Divertor heat flux reduction and detachment in highly shaped plasmas", and for initial operation and conditioning of the HHFW antennas.

The NSTX test cell will be in restricted access during the 1st shift this coming week. Test cell access will be available from 5PM to 10PM.

### **Research Operations (M. Bell)**

Mike Walker from General Atomics visited NSTX this week. He installed a version of the NSTX control system modeling tools that have been developed at GA over the last few years on the PPPL Unix Cluster. He also met with control system personnel to gather information on the NSTX control system to further refine the models. Professor Eugenio Schuster of LeHigh University Department of Mechanical

Engineering and Mechanics has been awarded an NSF CAREER grant to do research on plasma control. He and his student, Majed Alsarheed, visited NSTX this week and discussed the tools that Mike Walker installed. Opportunities for performing plasma control research on NSTX were discussed. Professor Clarence Rowley of Princeton University Department of Mechanical and Aerospace Engineering also visited on Wednesday and met with Mike Walker. (D. Gates)

#### Boundary Physics Operations (H. Kugel)

- LITER-1d Units-1, -2, and -3 were welding-stress relieved by vacuum firing, and passed the subsequent leak test and weld inspection. The heater ceramics for Unit-1 were milled with small longitudinal channels for the heater and TC leads. The thermocouples and heaters have been installed on Unit-1, and installation of the final outer insulation and metal radiation shields on Unit-1 is in progress. In the Lithium Test Facility, the vacuum chamber passed the leak test and the final configuration of the pumping system is being secured.
- XEUS (X-ray and Extreme Ultraviolet Spectrometer) data was received for analysis of conditions during XP 601, Effect of Evaporated Lithium PFC Coatings on Density Control. (P. Beiersdorfer, LLNL)
- NSTX TMB Boronization-59 (~5g) was performed. (W. Blanchard)

#### Diagnostic Operations (R. Kaita)

- Recent calibration activities included neutral beam shots for the motional Stark effect (MSE) diagnostic and test shots for magnetics, specifically the resistive wall mode sensors that needed to have their integrators repaired. The equilibrium magnetic sensors and the new segmented Rogowski coil on the center stack are operational.
- Recent installations included new detectors for the solid-state neutral particle analyzer (SSNPA) and refurbished amplifiers for the ultrasoft X-ray (USXR) arrays.
- The alignment of the multipoint Thomson scattering (MPTS) diagnostic appears to be good. This will be confirmed with subsequent laser “burn” measurements.
- All of the known ground loops associated with diagnostics have been cleared.