

## NSTX Weekly Report (May 16 2008)

### FY 2008 NSTX plasma operations

**Planned: 15 weeks**

**Completed: 10.24 weeks, 1524 plasmas (through May 9, 2008)**

The following NSTX-related presentations were made at the 17th Topical Conference on High Members of the NSTX team attended the High Temperature Plasma Diagnostics in Albuquerque, New Mexico last week: "Electron Bernstein Wave Emission and Mode Conversion Physics on NSTX", an invited talk by Stephanie J. Diem, "The NSTX fast-ion D-alpha diagnostic " by M. Podesta (UCI), "Thomson scattering density calibration by Rayleigh and Rotational Raman scattering on NSTX" by B. LeBlanc (PPPL), "Diagnostics for the biased electrode experiment on NSTX by L. Roquemore (PPPL), "Power calibration and remote control capability of the high-k scattering system on NSTX" by "W. Lee (POSTECH, Korea), "Simulation of the motional Stark effect diagnostic gas-filled-torus calibration by H. Yuh (Nova Photonics, Inc.), "The Motional Stark Effect (MSE) Diagnostic on the National Spherical Torus Experiment (NSTX)" by F. Levinton (Nova Photonics, Inc.), "Fast soft x-ray camera images of MHD phenomena in NSTX" by C. Bush (ORNL), and "Multicolor soft x-ray detector sensitivities and optimization" K. Tritz (Johns Hopkins University). (R. Kaita)

J. Menard attended the MAST Program Advisory Committee (PAC) this week. Comment was sought from the PAC on the proposed MAST Upgrade plans, and on the ongoing MAST research programme. (J. Menard)

Hank Strauss of NYU visited PPPL to discuss resistive MHD simulations with M3D showing destabilization of small modes. The characteristics of these resistive ballooning modes and Type V ELMs was discussed, and a plan to compare M3D calculations with data is being developed. (R. Maingi, ORNL)

There will be an NSTX Physics Meeting on Monday, 5/19 at 1:30 PM in LSB318. Jon Menard will give a brief summary of the MAST PAC and an update on XP-823. If anyone else would like to present something, please let me know before the meeting.

The talks will be found in

[http://nstx.pppl.gov/DragNDrop/NSTX Meetings/Monday Physics Meetings/2008/5-19-08/](http://nstx.pppl.gov/DragNDrop/NSTX%20Meetings/Monday%20Physics%20Meetings/2008/5-19-08/). (S. Kaye)

### **Run Coordination (M. Bell, R. Raman)**

Four experiments received run time in the two days May 8-9.

On Thursday 5/8, we continued the experiment "LITER Characterization and its Effect on ELMs" [XP-827, H. Kugel]. The lithium evaporators were used to coat the plasma facing components between discharges until their contents were exhausted around 2pm. Thereafter, with an active lithium coating on the surfaces, we continued to run discharges and examined the effects of reducing the period helium glow discharges applied between discharges. Taking advantage of the conditions following LITER evaporation, we then switched to the experiment "Improved error field suppression in long-pulse discharges" [XP-823, J. Menard] and obtained further confirmation of improved low-n mode control at reduced plasma current, 750-800kA.

Using the previously optimized mode control, a record pulse-length of 1.5s for 800kA discharges was obtained. At lower current, 750kA, a record NSTX pulse length of 1.8s was achieved with beta-N sustained at 5 (%m.T/MA) or above for over 3 current redistribution times. For both currents, the discharge pulse length was limited by the TF coil heating limit. Important factors in the improved performance appear to be (a) reduced flux consumption (despite lower NBI power), (b) sustainment of the plasma rotation, and (c) the delay or elimination of core n=1 rotating mode activity late in the plasma discharge.

On Friday 5/9 we performed conditioning of the HHFW antenna in the machine proposal XMP-26 [J. Hosea]. RF power up to 2.3MW was successfully coupled in deuterium plasmas using the current drive phasing of the antenna straps which produces a directed wave spectrum with parallel wavenumber  $k_{\parallel} = 7\text{m}^{-1}$ . We then switched to the experiment "Magnetic Shear and Transport" [XP-829, H. Yuh (Nova Phototonics)] and were able to recreate and improve on conditions for beam and RF heated helium plasmas with deeply shear reversed current profiles. Central electron temperature up to 3.6keV exhibiting steep electron ITBs were produced with 2MW of beam and 1.3MW of HHFW power. In the ITB region at 124cm, where the high-k scattering diagnostic was set to observe, the Te gradients reached 0.5keV/cm.

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

NSTX was off-line for scheduled maintenance this past week, with an emphasis placed on the removal, refilling and reinstallation of the two lithium evaporator (LITER) probes. By the end of the week, both probes were back in place and being baked in preparation for operations this coming week. Also this past week, cabling was installed to continue commissioning new remote control equipment for the high-k scattering diagnostic system. Work continued on the assembly/testing of two potential spare neutral beam ion sources, and computer hardware to provide neutral beam injection feedback to the Plasma Control System (PCS) was installed.

There will be no access to the NSTX test cell during plasma operations this coming week, and plasma operations will be extended to 7PM on Tuesday and Thursday. Access to the test cell will be available from the end of the run day to 10PM each evening.

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

#### **Diagnostic Operations (R. Kaita)**

- Personnel from the Johns Hopkins University installed a new transmission grating spectrometer on NSTX. It is being baked out, and final cable connections will be made next week.
- The eight motors and encoders for remote control of the mirrors on the high-k turbulence diagnostic were successfully tested.
- New amplifiers for the divertor bolometer array were received and installed.

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

- Lithium Evaporator LITER-F was reloaded with 44.0 g of lithium. LITER-K was reloaded with 40.9 g of lithium.

- \* Vendor information on a Liquid Lithium Divertor candidate heater temperature controller was received from the SNL team for NSTX controls review.