

## NSTX Weekly Report (March 3, 2006)

FY2006 weeks of research operations

Planned: 11 weeks

Completed: 0.93 weeks

- There will be an NSTX Physics meeting on Monday, 3/6 at 1:30 pm in LSB318. Agenda: Kugel - Status of LITER; Smith - Status of tangential scattering; Hosea - RF conditioning; Soukhanovskii - Divertor detachment/heating results; Extended Presentation; Maingi (for Kugel) - Movable Glow Probe results. (S. Kaye)

### **Run Coordination (R. Raman, S. Sabbagh)**

The first full week of plasma operations proceeded well. A complete set of magnetics calibration was carried out. The NSTX vessel was boronized on the morning of March 1. One XMP and three XPs were run.

**XMP026 (HHFW conditioning - J. Hosea, February 28):** The HHFW system was conditioning using LSN discharges, which were run prior to vessel boronization. The RF power was increased to  $\sim 1.2$  MW, electron temperatures of up to 1.6 keV were observed. With increasing RF power, RF leakage at the CHI gaps was seen to increase as square root of RF power. At its new location, the plasma control computer was immune to RF noise pick-up.

**XP616 (Comparison of HEGDC with fixed and movable probe – H. Kugel, R. Maingi, March 1,2):** An experiment was completed to compare the effects of HeGDC with the fixed GDC probe and the insertable GDC probe. It was found: 1) that the fixed and insertable glow probes each gave comparable performance, allowing 1sec 1 MA pulses; 2) the insertable probe (and probably the fixed one) and present machine conditions allow a 6.5 min. HeGDC and a 12.5 min shot cycle provided not too much gas is puffed into the discharge; and 3) variation of the pressure during the HeGDC (between 2 and 4 mTorr) does not affect discharge performance or duration.

**XP605 (Divertor detachment - V. Soukhanovskii, March 3):** The XP studied divertor heat flux reduction and detachment in 4 MW H- and L-mode LSN plasmas at low triangularity and elongation. Steady-state and pulsed deuterium injections in the divertor region were used to induce the outer strike point detachment. Steady-state injection at a rate of 75 Torr.Liter/s produced the spectroscopic signs of volume recombination and peak heat flux reduction characteristic of the onset of the partial outer strike point (OSP) detachment. Pulsed deuterium injection at a rate of 180 Torr.Liter/s resulted in a higher degree of OSP detachment and further heat flux reduction, however it proved to be more perturbing to the plasma. Divertor heat flux profiles and peak values were measured in relative units (counts) using an infra-red camera.

**XP 626 (Plasma fueling with supersonic gas jet (SGJ) - V. Soukhanovskii, March 3):** The goal was to study H-mode access, in 6 MW NBI-heated double-null ELMy H-mode plasmas, using low field side steady-state SGJ deuterium injection at a rate of 60 Torr.Liter/s in place of the high-field side gas fueling typically used in this plasma scenario. Encouraging results were obtained which will be used to further optimize fueling in long pulse high-performance discharges.

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

The NSTX FY'06 run began this past week with magnetic calibration shots and plasma shots with neutral beam injection to assess the effects of the recent vessel bake-out, before making progress on experiments to enhance machine capability (XMP's) and to gather new experimental data (XP's). Ohmic helium shots for the commissioning of the High K scattering system (XMP-44) were performed, in parallel with shots for the vacuum conditioning of the HHFW antennas (XMP-26). After a vacuum vessel boronization, 1 MA plasmas lasting almost 1 second were obtained with as little 6 minutes of between-shot helium glow discharge cleaning during the "Movable Glow Probe Evaluation"" experiment (XP-616). Progress was also made on experiments on "Plasma Fueling with the Supersonic Gas Injector" (XP-626) and "Divertor Detachment" using lower dome gas injection with two different Lower Single Null diveror plasma shapes (XP-605). John Caughman of ORNL visited PPPL this past week for the installation of the EBW antennas were installed at Bay G.

The NSTX power supplies will be configured to support Coaxial Helicity Injection operations on Monday. Plasma operations are scheduled for the entire week, and the test cell will be locked-up until 5 PM each day. Access to the test cell will be available from 5PM to 9PM each evening this week. (A. von Halle)

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

### **Physics Operations (D. Mueller)**

The first full week of operations proceeded well. One notable result is that the recycling in the machine appears to be lower than in past runs.

Evidence: After the second bake and after a few beam-heated deuterium shots, an attempt at a He discharge failed when the He valve did not open (breakdown was in D2) and the discharge pumped out to become a runaway dominated discharge. The resulting X-rays damaged some electronics and took about 3 hours to recover from. The only time in the past we have seen this was after many He discharges with no, or little, D2 fueling. Certainly this never occurred so early in the run before.

Another related item is that for the first time NSTX was able to repeat discharges of about 1 s duration on consecutive shots at the end of the run day. Previously long discharges were inevitably followed by short discharges and long discharges could not be produced at all except for early in the run day.

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

- The LITER interface panel installation in the test cell has been completed. All field cables and air/He lines are installed and terminated at the Interface Panel. The LITER FDR was declared a success pending resolution of CHITS from the PDR. LITER thermal testing without lithium was completed. LITER thermal testing with lithium was started and some issues were encountered which are presently being resolved.

- Boronization-50 applied 10 gms of deuterated trimethylboron (TMB) and this was followed by HeGDC to remove the co-deposited deuterium. (W. Blanchard)
- XP-616 was completed to compare the effects of HeGDC with the fixed GDC probe and the insertable GDC probe. (R. MAINI, ORNL)