

## NSTX Weekly Report (May 13, 2005)

FY2005 Planned Operations: 17 weeks

Completed: 3.48 weeks producing 345 plasmas

### **NSTX Department, Project, Program (M. Ono, M. Peng, E. Synakowski)**

- Martin Peng (ORNL) represented NSTX at the IEA Executive Committee meetings for IEA Implementing Agreements on Large Tokamak facilities (LT) and on Tokamaks with Poloidal Field Divertors (PD) on May 9-11, 2005 at PPPL. He presented and discussed the status and plans of the FY 2005 NSTX campaign and its contributions to the 2005 ITPA joint experiments. The presentation is available in the NSTX meetings webpage. (M. Peng)

- There will be no physics meeting, Monday, May 16. (S. Kaye)

### **Run Coordination (J. Menard, S. Sabbagh)**

The third full week of operations was completed successfully with four experimental proposals conducted.

XP-502: "Stability limits at high delta" - The first day of this experiment focused on optimizing the plasma shape evolution during the current ramp using the new PF1A coils. At  $B_t = 3.5\text{kG}$  and  $I_p = 1.2\text{MA}$ , the highest toroidal beta achieved was 29%, and 24% beta-t was reached at 4kG and 1.3MA.

XP-507: "Early divertor and H-mode development for long pulse" - Development continued in producing long-pulse LSN discharges with enhanced shaping using the PF1A coil and earlier diverting and H-mode. Several 800kA discharges were produced with beta-poloidal  $> 1.2$  that were diamagnetic for up to 200ms. Increased  $I_p$  ramp-rate prior to early H-mode transition was found to be beneficial for reducing flux consumption, and several 800kA discharges lasted past  $t=1\text{s}$  and were limited by the TF coil pulse-length limit.

XP-508: "Long pulse DN development with PF1A" - Long-pulse discharges were developed at 0.8, 0.9, and 1.0MA and work continued investigating the effect of magnetic balance (DRSEP) on plasma stability. Long-pulse 900kA discharges were developed with small ELMs in double null (DRSEP  $< 4\text{mm}$ ) with betaN = 5.5 sustained for many energy confinement times.

XP-522: "Study of Transport with Reversed Shear in NSTX" - The goal of this experiment was to document with the MSE diagnostic the q-profiles using various plasma current ramp rates in L-mode plasmas at relatively low electron density. The highest ramp rate discharges that could be obtained without early locked tearing modes produced the highest electron and ion temperatures. The best case had a central electron temperature of 2 keV and confinement time of about 100 ms.

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

NSTX Operations continued this past week with two extended run days. The development of high performance lower single-null plasmas (XP-507) and double-null plasmas using the new PF1A coil (XP-508) continued. Integrated system testing to raise the operating level of the PF1A coil to its rated 24kA was completed in support of XP-502 "Stability limits vs. normalized current at high delta with new PF1A", obtaining beta toroidal up to 29% at 3.5kG. The MSE diagnostic was used in the "Study of Electron Transport with Reversed Shear" (XP-522). Preparations will be made over the weekend for CHI experiments scheduled for the end of this coming week.

Plasma operations will resume on Monday morning and there will be no access to the NSTX test cell during the 1st shift. The run day will be extended to 7PM on Tuesday and Thursday this week. The test cell will be in controlled access each evening from the end of run day until 10PM. A machine area scrub will be performed from 10-11PM each evening in preparation for the following day's run. (A. von Halle)

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

The UCSD probe was upgraded with a lighter/faster shaft and new electronics -the new shaft features connectors and cables with better signal to noise ratio -A Mach diagnostic is now operational and was used in the last dedicated experiments.

- Data was obtained in: 1.2 MW NBI L-mode LSN (maintained by outboard puffing), 1.2 MW NBI H-mode LSN, 1.2 MW NBI L-mode DN, 1.2 MW NBI H-mode DN, 2.2 MW NBI H-mode. No 3 MW H-mode data was obtained for lack of time.

-The probe penetrated past the separatrix often.

-The data is of high quality and will be processed in the upcoming weeks. (Jose A. Boedo, UCSD)

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

The spring semi-annual project meeting to review and discuss DOE sponsored research in plasma-facing component (PFC) technology for fusion energy systems was held on May 9-11, 2005, at PPPL. The following presentations related to NSTX were presented at the meeting: H. Kugel: Lithium pellet injection for surface conditioning in NSTX, J. Timberlake: Evaporator development for PFC coatings in NSTX, and R. Kaita: Update on ALIST (lithium divertor module) plans for NSTX.

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

- NSTX Boronization-41 (10g, TMB) was performed.
- Preparations are being made to analyze the line emission from a Penning

Gauge installed on the pump duct to determine the isotopic composition of the exhaust gas following plasma discharges in NSTX. (R. Raman, U. Washington; R. Gernhardt, PPPL; V. Soukhanovskii, LLNL)

- Information on operating ion gauges in the NSTX fringe magnetic field to measure edge neutral pressures was provided to MAST (R. Raman, U Washington).