

## NSTX Weekly Report (June 17, 2005)

FY2005 Planned Operations: 17 weeks

Completed: 8.19 weeks producing 869 plasmas

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

- NSTX researchers participated in the FESA Facilities Panel meeting, June 13 – 15, NRL, Washington.
- M. Petrov of Ioffe Institute (RF) is visiting NSTX this month. S. Medley is the host. He will be making corrections for plasma opacity on the measured Neutral Particle Analyzer (NPA) ion temperatures using the recently acquired Ioffe Double code. The resulting profiles will be mapped onto the mid-plane for comparison with the CHERS ion temperature profiles.
- Kazuya Nakayama of CHUBU University is visiting NSTX this month. He is collaborating with the UC Davis Far-infrared Tangential Interferometer-Reflectometer (FIRETIP) system on NSTX. Hyeon Park is the host. Dr. Nakayama will collaborate with NSTX Researchers on FIRE Tip System Research on NSTX.
- Ben Fraenkel of Hebrew University, Israel (retired) is visiting NSTX to collaborate on Spatial Resolved X-ray Crystal Spectroscopy diagnostic on NSTX. M. Bitter is the host.

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

The eighth week of operations was completed successfully with four experimental proposals and one machine proposal conducted.

XP 502 - "High beta at high triangularity"

Toroidal field ramp downs were performed, achieving plasmas with high  $I/aB \sim 7.5$ . These discharges achieved toroidal beta  $\sim 35\%$  the highest value achieved this year. A new record stored energy of 430kJ was achieved during the high TF portion of one of these discharges. The toroidal beta was 29% at the point of peak stored energy.

XP 506 - "Ohmic H-modes"

Following last weekend's boronization, long Ohmic H-mode periods were recovered, and additional core reflectometer and edge data were obtained to complete this experiment.

XP 507 - "Long-pulse discharges in LSN"

Gas fueling modifications were performed to recover early H-mode access during the  $I_p$  pause. The associated reduction in flux consumption, combined with optimization of the beam heating power and timing resulted in record NSTX discharge pulse-lengths of  $> 1.5$ s at  $I_p = 700$  and  $750$ kA. During the highest confinement phase of the discharges,  $\beta_N = 6$ ,  $\beta_P = 1.5$ , and  $\beta_t = 17\%$ .

#### HHFW conditioning XMP

Up to 4MW of HHFW heating power was successfully coupled to 600kA Helium discharges using rtEFIT for precise outer gap control. In piggyback, NB injection both before and after the RF heating phase was used for MSE filter calibration and NPA Ti measurements using NPA vertical scanning capability made possible by temporary absence of the LPI. For the first time on NSTX, the vertical scanning capability of the Neutral Particle Analyzer (NPA) was utilized to measure vertical ion temperature profiles. The data was obtained on a shot-to-shot basis in piggyback mode during a beam only phase of experiments using RF launch into Helium plasmas.

#### XP 521 "HHFW heating during the $I_p$ ramp"

Target discharges from the HHFW conditioning campaign were modified to run in deuterium and at lower plasma current. The rtEFIT control phase and HHFW injection time were moved earlier, and OH current clamps were applied to assess the impact of HHFW heating and current drive on sustaining the plasma current. Current decay was observed during the OH clamp phase which further increased  $I_i$  and lowered  $\kappa$ . However, at still lower  $I_p$  and with  $I_p$  feedback control, phases of low loop voltage were observed, and  $I_i$  stopped increasing when sufficient HHFW power was applied. Interestingly, central  $T_e$  values  $> 1.3$ keV were observed in some low- $I_p = 300$ kA discharges.

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

NSTX operations continued this past week after a vacuum vessel boronization over the weekend. Good machine conditions after the boronization helped achieve record levels of Beta and stored energy in XP-502 "High beta at high  $\kappa$  and  $\delta$ ", and 1.5 second pulse lengths were achieved in XP-507 "Long-pulse LSN discharges". Also, good progress was made on XP-506 "OH H-modes", which was able to achieve reliable H-modes after the boronization. A better portion of the week was devoted to HHFW conditioning/experiments with XMP-26 "Raise HHFW power to 6MW", and XP-521 " $I_p$  ramp with HHFW". In parallel with the HHFW work, a calibration of the MSE diagnostic was performed, and the SPRED diagnostic was used in developing ion temperature profiles.

Plasma operations will resume on Monday morning and there will be no access to the NSTX test cell during the 1st shift. Run days will be extended to 7PM on Tuesday and Thursday this week, and 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. An NSTX maintenance week will begin at the end of the run day on Friday, June 24th. (A. von Halle)

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

#### Physics Operations (D. Mueller)

Operations went very well this week, we made over 160 plasma shots, had a shot with an NSTX record for stored energy (430kJ) and another with an NSTX record pulse length (1.57s 3 to 6 times the current penetration time) at 750 kA. The HHFW was conditioned up to about 3 MW and used to study current drive. RT-EFIT Isoflux control was used for all the HHFW heated discharges.

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

- The LPI maintenance was completed and reassembly is in progress.
- Machining for the MGDC probe was completed. The Installation Procedure was approved. Work is in progress to initiate the mechanical installation.

#### Diagnostic Operations (R. Kaita)

- A defective water pump and valve on the SPRED vacuum ultraviolet survey spectrometer has been replaced, and it is now working properly.
- Brett McGeehan, a Summer Undergraduate Laboratory Intern (SULI) student from Dickinson College who is working with us this summer, has arrived at PPPL to begin work on plasma imaging with fast visible cameras on NSTX.