

NSTX Weekly Report (July 9, 2004)

For FY2004 Joule milestone: 18 weeks; programmatic goal: 20 weeks.
Completed: 17 weeks producing 1937 plasmas.

Department, Project, Program (M. Ono, M. Peng, M. Williams, E. Synakowski)

- Five members of the NSTX Research Team, M.Bell, T.Biewer, R.Maingi, D.Mueller, and M.Redi, attended the 31st Meeting of the European Physical Society on Plasma Physics, held at Imperial College, London June 28 - July 2, 2004. They presented eight posters on NSTX research. Accompanying papers have also been submitted for publication in the conference proceedings. In addition, an oral presentation at the conference by B. Nelson on coaxial helicity injection included results from both the HIT-II device at the University of Washington, and NSTX. The NSTX presentations at the conference are being posted at http://nstx.pppl.gov/DragNDrop/EPS-04_London/.

- In January, an integrated system test was conducted to qualify the machine. The results of the tests indicated that the resistance of the joints was below the engineering specification of $700\text{ n}\Omega$ at 4.5kG and the temperature rise was in accord with expectations. Over time, the joint resistance values if any drifted down and stayed at the low level for a period of about two months. However, during the past recent month, a small gradual upward drift in the joint resistance has been observed though the joint resistance has stayed well below $700\text{ n}\Omega$. Temperature and strain gauge measurement also revealed apparent reduction over time. Recent, TF-flag displacement measurements show larger movements compared to the design values. In parallel, we have been performing new simulations and bench test which indicate the resistance measurement is consistent with larger than expected joint "lift-off". This indicates that we still need to improve our understand of the joint behavior and if needed make appropriate improvements. For this reason, to assure safe device operation, we limited the TF to 3 kG. At 3 kG, all joint resistance values are less than $150\text{ n}\Omega$ during the pulse. The experimental proposals are being modified to reflect this new operating limit for the remaining 3 weeks of operations.

- An NSTX Physics meeting will be held on Monday, July 12, starting at 1:30 pm in B-318. Stan Luckhardt, from UCSD, will present a talk entitled "Plasma-Facing Component Research in the UCSD PISCES Program" discussing his group's recent work on plasma-facing components and plasma-surface interactions on the UCSD PISCES-B device. The studies at this facility include erosion, co-deposition, and hydrogen retention of solid beryllium and carbon-beryllium for ITER.

Run Coordination (S. Kaye, J. Menard)

In a holiday shortened week, operational time was spent developing both DND and LSN discharges for 3.5 kG and 3 kG toroidal field operation. Initial experiments with Lithium pellet injection were performed. A documentation of fluctuations through clean and dithering L-H transitions were done, and an investigation of the dependence of Type V ELMs on fueling location and amount was completed. The MSE diagnostic was taking data with four channels during this week.

- Target plasmas at both 3.5 and 3 kG in both DND and LSN plasmas were developed. At 3.5 kG, DND discharges that had 500 msec of current flattop at 800 kA were developed. 1 MA discharges in this configuration had current flattops of approximately 200 msec. LSN discharges at elongations of 2.4 to 2.5 lasted for 750 msec (with a 550 msec current flattop) at 800 kA. Early H-modes were established in these plasmas. At 3 kG, discharges in both configurations were developed that lasted to over 400 msec,

with 250 msec current flattops. These shots appeared to be terminated by tearing modes that locked. (D. Gates/J. Menard)

- An initial experiment to demonstrate injection of lithium pellets into NSTX OH and NBI heated discharges was performed. During H-mode plasmas, the pellets were seen to be injected into the plasma, but broke up at the edge before significant penetration. A cumulative buildup of Lithium in the upper and lower divertors was, however, observed. In Ohmic and NBI pre-heated plasmas, the pellet was seen to penetrate into and through the core of the plasma. Some control of the pellet penetration depth was accomplished through adjustments to the beam turn off time. These experiments were performed at both 3.5 and 3 kG. (H. Kugel).
- DND discharges were run in order to document the change in fluctuations through the L-H transition using the GPI and reflectometer diagnostics. The GPI captured one good L-H transition, and several dithering ones. (S. Zweben).
- The experiment to assess the dependence of Type V ELMs on fueling location and amount was completed. The Type V ELMs appear to be associated with fueling from the center-stack injector only; no ELMs of this type were observed when the plasma was fueled by the shoulder injector. Furthermore, these ELMs were associated with higher fueling amounts. At low gas fill pressures, no Type V ELMs were observed. (R. Maingi).

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

A vacuum vessel boronization was performed at the beginning of the week before the start of two experiments on long pulse plasmas. At lower fields, long pulse double-null plasmas, XP-402, and lower single-null (LSN) plasmas, XP-432, were generated, with high toroidal beta of 25-30% sustained at 1MA in the LSN plasmas for approximately .4 seconds. The machine proposal to commission the Lithium Pellet Injector (LPI) was interrupted to address a water leak in the OH bus work, but was later completed successfully injecting lithium pellets into 1MA, neutral beam heated, H-mode plasmas. The week concluded with continuations of experiments on OH driven H-modes, XP-442, L to H mode transitions, XP-454, and ELM physics, XP-450. Calibrations and polarity checks of the new Resistive Wall Mode (RWM) coils were completed in the evenings this past week, and integrated system power testing of the RWM coils are scheduled for this coming week

NSTX will be operating extended shifts until 7:00pm on Tuesday, Wednesday, and Thursday this week. The NTC will be open after the run until 10:00pm each evening. (A. von Halle)

Research Operations (M. Bell)

Boundary Physics Operations (H. Kugel)

- Commissioning of the Lithium Pellet Injector was completed. 16 lithium pellets, about 2 mg each were injected into LSN and DND, NBI-heated, H-mode plasmas, and into L-mode LSN Ohmic plasmas. Lithium pellets injected into NBI-heated LSN and DND plasmas as viewed with the Li I filtered Plasma TV appeared to ablate in the scrape-off layer or in the outer boundary. The pellets injected into OH plasmas exhibited good penetration to the HFS region. Finally, a NB preheat was added prior to pellet arrival, and a controlled experiment was performed to vary the penetration depth, which was found to be very sensitive to the NBI turn-off time relative to pellet arrival. As this work progressed, Li luminosity started to be observed from the very initiation of discharges, due to depositions from preceding discharges.