

NSTX Weekly Report (July 15, 2005)

FY2005 Planned Operations: 17 weeks

Completed: 11.42 weeks producing 1306 plasmas

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

- N. Tamura and H. Funaba from National Institute for Fusion Science, Japan visited NSTX as part of the US- Japan Exchange Program to discuss planned impurity transport measurements in collaboration with NSTX and Johns Hopkins University.

- There will be an NSTX Physics Meeting on Monday, July 18 at 1:30 pm in LSB318. We will start a series of meetings of XP status reports. (S. Kaye)
 - XP521 Non-solenoidal Ip Rampup with HHFW (Kessel)
 - XP524 Active rotation Control (Zhu, Columbia U)

Run Coordination (J. Menard, S. Sabbagh)

The eleventh week of operation was completed successfully with three experimental proposals.

XP-515, "Recycling Measurements Following Repeated Lithium Pellet Injection"

Helium ohmic discharges were used to condition the Center Stack (CS). Then, lithium pellet injection into CSL ohmic Helium discharges was used to deposit about 30 mg on the CS inner toroidal limiter. A 2 NBI deuterium CSL fiducial discharge was applied, and exhibited a density reduction of about x4 and a peaked density profile. The effect reverted to the pre-lithium discharge fiducial in about 3 discharges. Then, Helium ohmic discharges were used to condition the lower divertor, and similarly, lithium pellet into Ohmic Helium LSN discharges were used to deposit 25 mg of lithium to the lower divertor. As this deposition progressed, the lower divertor increased in neutral Li luminosity. Finally, a 2 NBI deuterium LSN fiducial was applied, and the density exhibited a factor of about 5 reduction from that of the beginning of the day and a peaked density profile. The CSL results made contact with the TFTR lithium database. The LSN results extended the TFTR lithium database to a diverted configuration. This demonstrates that lithium pumps diverted plasmas and increases the peaking of the density profile. This experiment is now complete.

XP-522 "Electron transport vs. q shear"

The conditions were re-established that had high electron temperatures of 2 keV with reversed shear. With a fine-scale beam timing scan, the experiment achieved sustained high $T_e=2\text{keV}$ phase for ~ 100 ms with a confinement time of

80 ms. The ion temperature was $\sim 2\text{-}2.5\text{keV}$, and plasma current and electron density scans were performed to vary the q-profile and measure the effect on electron transport. At first glance, the maximum T_e appears to have a positive correlation with I_p . The final phase of the XP - adding H-mode to the L-mode target - was also begun. Control of the inner gap through elongation and high-field-side gas puffing were demonstrated to allow control of the H-mode initiation time in the high- T_e L-mode phase. Transient confinement times above 120ms were achieved by coupling H-mode to the high- T_e L-mode.

XP525 – "ELM mitigation with RWM/EF coils"

Two days of attempting ELM mitigation through the use of the EF/RWM coils were run. Plasmas of two shapes were primarily used as baseline shots. The first had a JET-like elongation and triangularity, while the other had higher elongation and triangularity. The former discharge had a series of isolated ELMs, while the ELMs in the latter were much higher frequency. EF/RWM coil currents were applied at different levels, from 200 A to 1 kA, with $n=3$ phasing in two different orientations. While there were some hints of amelioration of ELMs with application of these coil currents, the effects were not reproducible. A q-scan was performed to determine the best resonance conditions for the applied fields. The results from the different discharges will be studied to plan for additional run time.

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

NSTX operations continued this past week with two extended run days. The Lithium Pellet Injector was used to fire into several sequences of helium discharges in XP-515, "Lithium Pellet Injection", to establish a Li deposition and assess pumping at the centerstack and divertor. Also, density and temperature scans were completed in support of XP-522, "Electron Transport w/Reverse Shear", and the Error Field/ Resistive Wall Mode coils were used in both polarities to complete a plasma current scan in support of XP-525, "ELM Mitigation". Work continued over the weekend on the new high K scattering diagnostic, aligning mirrors and wave guides at bay K, and on the installation and commissioning of the Moveable Glow Discharge Cleaning Probe.

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. The next NSTX maintenance week is scheduled for the 1st week in August. (A. von Halle)

Research Operations (M. Bell)

Boundary Physics Operations (H. Kugel)

- XP515, “Recycling Measurements Following Repeated Lithium Pellet Injection” was completed. A total of about 86mg of lithium was injected into CSL and LSN Helium Ohmic discharges to coat either the Center Stack inner toroidal limiter, or the lower divertor. Then, CSL and LSN deuterium NBI fiducial discharges were applied, and the observed densities exhibited significant reductions in recycling and peaked density profiles.
- Moveable Glow Probe off-line tests to resolve bellows support issues were completed in preparation for a design review of a candidate support method.