NSTX Weekly Report (June 12, 2009)

FY 2009 NSTX plasma operations
Planned: Base - 11 run weeks, ARRA - 5 run weeks (pending funding approval)
Completed: Base -10.00 run weeks with 1,549 plasma shots, ARRA - 0 run weeks

On Wednesday June 17, the NSTX Mid Run Assessment will beheld in LSB 252 at PPPL. For this assessment, the Leader or the Co-Leader would provide a brief summary of accomplishments from that group and provide a list of high-priority experiments that could be run during the reminder of the NSTX Run. The meeting would start at 9AM and each group would have about 25 to 35 minutes for their presentation. (R. Raman, University of Washington)

Run Coordination (R. Raman , University of Washington, Deputy: E. Fredrickson)

NSTX Plasma Experimental Highlights for June 5-10: The supersonic gas injector was used to fuel a high performance H-mode discharge without relying on the standard high field side gas injection system. Experiments in support of the FY09 Research milestone on current profile modification due to fast ion driven modes, plasma current dependence of L-H threshold and experiments to understand neoclassical tearing mode (NTM) physics were also run.

On the afternoon of June 4 and for part of June 5, XP918, "The dependence of the 2/1 NTM on plasma impurities and wall conditions" – F. Volpe, was studied by using lithium evaporation and/or puffing Neon. Scans were successfully completed and clear trends were identified: The mode onset time is delayed with increased Li whereas it strikes earlier in time with increased amounts of Ne . Ne was visible in the CHERS background view, in SPRED and USXR data. USXR data indicated that Ne penetrated deep enough to affect the island. SPRED and CHERS documented how rapidly Ne penetrated the plasma and for how long it survived in it. Turning off the n=3 EFC and/or n=1 magnetic feedback had little effect on the mode onset time. After stopping Lithium evaporation and using HeGDC, to prevent early disruptions, the 2/1 NTM came back earlier in the discharge, as expected. Analysis of the data is underway.

On the afternoon of June 5, XP-912, "Comparison of H-mode fueling with supersonic gas injector and conventional gas injector" – V. Soukhanovskii, was run. Much progress was made in optimization of fueling for a long-pulse H-mode scenario. Several reproducible long-pulse (1.2 s) H-mode discharges were developed using the shoulder high-field-side injector and the supersonic gas injector (SGI). In SGI-only fueled H-mode discharges, the amount of injected gas was reduced five-fold in comparison with a commonly used center-stack fueled NSTX H-mode scenario. Particle balance analysis showed that the total deuteron inventory remained constant in the SGI-fueled ELM-free discharges, although the electron inventory was rising at a rate 1E21 particles/s due to carbon accumulation in the core plasma.

For part of June 8 and on June 9, XP-905, "Current Profile Modifications and Fast Ion Loss from BAAEs / EPMs energetic particle modes" – D. Darrow, was run. After considerable searching, these bursting modes were obtained in a regime with heavy lithium deposition. The conditions used had low enough plasma density to allow good Fast-ion D-alpha (FIDA) measurements of the fast ion density throughout the plasma. Good fast ion loss data was also recorded and the reflectometers clearly showed the modes, which should allow fitting of the internal amplitude.

Motional Stark Effect (MSE) data showed some changes in field line pitch angle coincident with the mode bursts. However, these changes are comparable in magnitude to variations that occur frequently in NSTX plasmas, indicating that these particular modes do not have any greater effect on the plasma current profile than do regularly occurring MHD modes in NSTX.

On June 10, XP-922, "Ip scaling of the L-H threshold" – S.M. Kaye, was run and completed. Two current levels were compared, 0.7 and 1.0 MA. A significant difference in threshold power was found for sustained, high performance H-modes (Pabs+Poh ~ 2.1 vs 4.1 MW for 0.7 MA and 1.0 MA respectively). Although some slow decreases in D-alpha were observed at the ~2 MW level even in 1.0 MA discharges, these plasmas did not exhibit standard H-mode features. Thirty-nine shots were obtained during this run day.

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

NSTX operations continued this past week with extended run days on Tuesday and Thursday. Lithium evaporation (LITER), neutral beam injection and error field correction were used in experiments on the effects of fast ion loss on plasma current profiles, on the evaluation of metallic impurity accumulation when using lithium to suppress elms, and on diffusive techniques to increase lithium coverage via the LITER probes. Various levels of neutral beam injection and lithium evaporation were used in an experiment to measure the dependence of the L-H threshold on plasma current and confinement quality, and in an experiment utilizing strike point control to study impurity, temperature, and density profiles at different stages of lithium coatings. Time was spent on Monday June 8 to repair some damaged areas of insulation on two of the Error Field Correction Coils, and operations resumed after a full set of insulation checks (HiPots). An experiment on the formation and study of ELMs introduced via a manipulation of the plasma vertical position was revisited this week. Also this week, evaluation of the heaters for the new Liquid Lithium Divertor (LLD) system continued in the test lab.

The NSTX Test cell will be in free (card reader) access during scheduled maintenance this coming week.

Boundary Physics Operations (H. Kugel)

• Liquid Lithium Divertor (LLD)
- A teleconference was held with the molybdenum coating vendor to discuss LLD progress and planning.
- Modifications to the Control Rack to facilitate testing were completed.
- Vacuum testing of the heaters to determine software control parameters is in progress.

• Lithium Evaporator (LITER09)
- Preparations were started for reloading both LITERs during the next maintenance period.

• Lithium Powder Dropper
- Unit-1 was loaded with lithium powder and calibrated. It has been vented with argon, and is awaiting installation on NSTX during the first week of the next maintenance period.
- Unit-2 is being prepared for loading, calibration, and installation on NSTX during the 2nd week of the next maintenance period.

Diagnostic Operations (R. Kaita)

• The digitizer and detector amplifiers for the new Lyman-alpha array have been received at PPPL. This diagnostic is a collaboration with the Lawrence Livermore National Laboratory, and

will be used for edge measurements in the vicinity of the NSTX liquid lithium divertor.