

## NSTX Weekly Report (July 10, 2009)

### **FY 2009 NSTX plasma operations**

**Planned: Base - 11 run weeks, ARRA - 5 run weeks**

**Completed: Base - 10.95 run weeks with 1,705 plasma shots  
ARRA - 0.22 run weeks with 40 plasma shots**

Five papers describing results from NSTX research were presented at the 18th Topical Conference on RF Power in Plasmas that was held in Ghent, Belgium, June 24-26. Joel Hosea presented an invited talk titled "Recent Fast Wave Coupling and Heating Studies on NSTX, with Possible Implications for ITER", and Mario Podesta (U.C. Irvine) presented an invited talk titled "Use of Fast Ion D-Alpha Diagnostics for Understanding ICRF Effects". Stephanie Diem (ORNL) presented a poster paper titled "Investigation of EBW Physics in H-Mode Plasmas in NSTX", Benoit LeBlanc presented a poster paper titled "Analysis of High-Te Plasmas Heated by HHFW (High Harmonic Fast Wave) in NSTX" and Gary Taylor presented a poster titled "Recent Improvements in Fast Wave Heating in NSTX". (G. Taylor)

Members of the NSTX Team attended the 36th European Conference on Plasma Physics in Sofia, Bulgaria from Monday June 29 through Friday July 3, 2009. Michael Bell presented an invited talk on "Plasma Response to Lithium-Coated Plasma-Facing Components in the National Spherical Torus Experiment". There were five contributed posters on NSTX results: "Dependence of divertor heat flux profiles on triangularity and  $dr_{sep}$  in NSTX H-mode plasmas" by J-W. Ahn (ORNL) et al., "Multi-energy SXR characterization of stabilized resistive wall modes in NSTX" by L. Delgado-Aparicio (Johns Hopkins University) et al., "Modeling Fast Ion Transport in Toroidal Alfvén Eigenmode Avalanches in NSTX" by E. Fredrickson et al., "Modification of edge plasma profiles in ELM-suppressed discharges with lithium coatings in NSTX" by R. Maingi (ORNL) et al., "Coaxial Helicity Injection Non-inductive Startup on NSTX" by B. Nelson (University of Washington) et al., "Fast ion transport by toroidicity induced Alfvén eigenmodes on NSTX" by M. Podesta (UC Irvine) et al., and "High flux expansion divertor studies in NSTX" by V. Soukhanovskii (LLNL) et al. (M. Bell)

The following NSTX related talks were given at the DOE Plasma Facing Components Community Meeting, MIT, Cambridge, MA, July 08-10, 2009: "Effect of Lithium Wall Coatings on Edge Profiles and Stability", R. Maingi (ORNL), "Use of 3-D Fields for ELM Pace-Making in NSTX Lithium, Enhanced H-modes", J. Canik (ORNL), "Erosion /Redeposition of CMOD Molybdenum and NSTX Lithium Divertors", J. Brooks (Purdue), "NSTX Sample Probe", C. Taylor/J.P. Allain (Purdue), "Complex Chemical Interactions of Lithium, Deuterium, and Oxygen on Lithium-Coated Graphite PFC Surfaces", C. Taylor (Purdue), "2D Divertor Calculations for NSTX Upgrade", J. Canik, and "NSTX Liquid Lithium Divertor Status", H. Kugel. (R. Maingi / H. Kugel)

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

NSTX Plasma Experimental Highlights for July 11-12: The High Harmonic Fast Wave (HHFW) system with the new double-feed upgrade was successfully commissioned.

On July 6 and 7, XMP26 "Bring HHFW online and condition the antenna – J. Hosea" was run. Plasma operation of the newly configured double-feed antenna into L-mode discharges

commenced this week. Multi-megawatt HHFW plasma operation was achieved relatively quickly with the double-feed antenna, as compared to earlier HHFW campaigns with the single-feed antenna. However, considerably more conditioning of the antenna will be required in order to establish the operational capability of the double-feed antenna. On July 6 the antenna was conditioned into helium plasmas. Helium operation began with 180 degree heating phasing, and up to 1.5 MW was successfully coupled for 200 ms before we decided to change to -90 degree current drive phasing. Up to 3.4 MW was coupled using -90 degree phasing, with some trips, and good 250 ms, 2 MW pulses without trips, were also obtained. On July 7 the antenna was conditioned into deuterium plasmas. With -90 phasing up to 3.5 MW was coupled with some trips and up to 2.8 MW was coupled for over 200 ms without trips. With -150 degree phasing 2 MW was coupled for over 200ms without trips. Some operation with +90 degree phasing was also attempted, with up to 1.6 MW coupled with some trips.

On the morning of July 8, XP944 “HHFW heating of L-mode deuterium plasmas – J. Hosea” was run. A current scan with 2 MW of -90 phasing heating was completed but the run ended prematurely due to a high voltage crowbar on RF source 3.

On the afternoon of July 8, reference discharges in support of XP908 “Dependence of momentum and particle pinch on collisionality – W. Solomon (General Atomics)” were produced. Work for this XP will continue on July 9.

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

The NSTX maintenance period concluded this week with some limited plasma operations in helium to verify system readiness to support experiments on Monday. All three neutral beam ion sources have been re-conditioned to 90keV operation after the calorimeter bellows replacements, and the vacuum conditioning of the upgraded HHFW antennas is making good progress. The recharged LITER probes are ready to support operations, as well as the first of the two lithium powder droppers. Also this past week, coil protection systems to allow the SPA's to be used to drive the Coaxial Helicity Injection absorber coils were implemented and tested, and power testing of the machine's error field coils was completed.

The NSTX Test cell will be in restricted access this coming week during plasma operations, with extended run days (to 7PM) planned for Tuesday and Thursday. Test cell access will be available each evening at the end of the run day.

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

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

- Lithium Powder Dropper
- Two Lithium Powder Droppers were used to support XP-913, "Injection of Lithium Powder in NSTX" (D. Mansfield)