

## **NSTX Weekly Report (May 1, 2009)**

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

**Planned: Base - 11 run weeks, ARRA - 5 run weeks (pending funding approval)**

**Completed: Base - 5.2 run weeks, ARRA - 0 run weeks**

S. Sabbagh (Columbia U.) attended the US-KSTAR Bilateral Collaboration Meeting on April 15 in San Diego, CA and presented a talk entitled “Equilibrium, Stability, and RWM control in KSTAR”. He then attended the ITPA MHD Stability Group meeting on April 21-22 in Daejeon, Korea and delivered three talks: “Update on instrumentation and measurement of halo currents in NSTX”, “Role of kinetic effects/plasma rotation on RWM stabilization and comparison to experiment”, and “Update on power calculations for RWM control in ITER”. He also gave a joint experiment MDC-2 summary for H. Reimerdes (Columbia U.). Finally, he presented an invited talk at the Korean Physical Society meeting on April 23 in Daejeon entitled “Resistive Wall Mode Stabilization Research on NSTX and implications for KSTAR”. (*S. Sabbagh*)

J. Menard visited the Plasma Science and Fusion Center at MIT on April 24 to meet with researchers, tour the Alcator C-Mod facility, and give a seminar entitled “Progress and Plans for the National Spherical Torus Experiment”. (*J. Menard*)

M. Bell participated in a meeting on April 15-17 at the ITER Cadarache Joint Work Site of an expert group convened to prepare a revised version of the ITER Research Plan for consideration by the ITER STAC at its meeting in May. (*M. Bell*)

S. Kaye, D. Darrow, E. Fredrickson and D. Smith from NSTX attended the Joint US-EU TTF meeting in San Diego, CA, April 28 - May 1. Dr. Kaye gave a talk entitled “Momentum Transport Studies in NSTX”, Dr. Darrow gave a talk and poster entitled “Neutral Beam Ion Loss During TAE Avalanches in NSTX Plasmas”, Dr. Fredrickson gave a poster entitled “Modeling Fast Ion Transport in TAE Avalanches in NSTX”, and Dr. Smith gave a plenary talk entitled “Observations of electron gyro-scale fluctuations near ETG marginal stability in NSTX plasmas with large ExB flow shear”. (*S. Kaye*)

R. Kaita gave a seminar on Tuesday, April 28, at the new Michigan Institute for Plasma Science and Engineering at the University of Michigan. He described research on lithium as a plasma facing component in fusion applications. (*R. Kaita*)

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

On April 22 and 24, the second part of XP-911 “Li pumping and retention in NSTX” [C. Skinner] was run in support of the FY09 Joule Milestone. Gas retention measurements were conducted after coating the lower portion of the NSTX vessel with lithium. Experiments were done with ohmic plasmas with all the pumps closed off, and with neutral beam heated plasmas, where the deuterium pumped by the neutral beam cryopanel was separately tracked. Gas balance measurements showed high (>90%) prompt retention, that decreased due to post-shot outgassing. The post-plasma vacuum vessel outgassing was tracked for 12-48 hours. In collaboration with Purdue University, ATJ graphite, Si and Pd samples were exposed to the plasmas on a probe. After exposure, thermal desorption spectroscopy was performed on an ATJ sample. Twelve samples have been shipped to Purdue University for further surface analysis.

On the morning of April 23, XP-922 “Ip dependence of L-H threshold, Hysteresis and Confinement quality” [S. Kaye] was continued to obtain additional data in higher current discharges. After not pumping on the vessel overnight as part of the preceding gas retention

experiment, an L-H transition could be obtained at powers up to 2.5 MW in 0.9 MA discharges. The sensitivity of the L-H transition to vessel condition will be reassessed and the experiment will be attempted later in the run.

On the afternoon of April 23, XP-836 “Parametric Study of Highly elongated plasmas” [D. Gates] was run to investigate improvements in plasma control by varying the polynomial basis functions within rtEFIT. However, it was initially difficult to obtain the desired plasma conditions because of the elevated H-mode threshold that day. Heavy application of lithium eventually restored plasma conditions with high values of beta-poloidal.

On the afternoon of April 23, XP-912, “Comparison of H-mode fueling with supersonic gas injector (SGI) and conventional gas injector” [V. Soukhanovskii] was continued using LITER to improve H-mode discharge reproducibility. Several comparison discharges with matched densities, fueled by the SGI and the low-field side conventional injector were obtained. The preliminary conclusions are that the SGI fueling efficiency is higher than the low field side conventional gas injector. Other benefits of the SGI injection included reduced divertor and edge neutral pressures, and a fast response of divertor recycling.

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

NSTX completed the first of a two week scheduled maintenance period, with efforts focusing on the installation of the HHFW transmission lines. Both LITER probes are being removed from the machine to be refilled with lithium, and will be ready to support plasma operations when it resumes on May 11. Testing of the proposed Liquid Lithium Divertor (LLD) system heaters continued this week, as well as the installation of the LLD AC power systems in the NSTX Test Cell. Work on NSTX was suspended on Tuesday for all staff to attend the PPPL Safety Forum.

Access to the NSTX Test cell will be available during scheduled maintenance this coming week.

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

##### **Diagnostic Operations** (*R. Kaita*)

Dr. Yang Ren from the University of Wisconsin continued a two-week visit to NSTX to work on the high-k scattering diagnostic in the areas of microwave source operation, ray tracing to configure the system for measurements, and testing the remote control hardware for the mirrors that determine the launch geometry of the probe beam and detection of the scattered signal.

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

#### **• Liquid Lithium Divertor (LLD)** (*M. Viola*)

- A teleconference was held with SNL to discuss progress and planning.
- Repairs will be completed next week to the molybdenum spray-coating equipment at the vendor plant. The revised schedule is: spray samples by May 11, ship samples to PPPL May 12, PPPL evaluate samples May 13-19, vendor install special tooling and spray first plate May 13-19, finish spraying plates on or about May 19, ship plates to PPPL about May 20.
- measurements of the vacuum out-gassing of a candidate heater are in progress.

#### **• Lithium Evaporator (LITER)** (*J. Timberlake*)

- preparation of lithium for reloading LITERs during the maintenance are in progress.