

## **NSTX Weekly Report (August 10, 2007)**

**FY 2007 NSTX plasma operations completed on June 22, 2007.**

**Planned: 12 weeks**

**Completed: 12.63 weeks with 1,879 plasma discharges**

A paper entitled "Investigation of resistive wall mode stabilization physics in high-beta plasmas using applied non-axisymmetric fields in NSTX" by A.C. Sontag, S.A. Sabbagh, W. Zhu, et al., was recently published in Nucl. Fusion 47 (2007) 1005. The paper reports on characteristics of resonant field amplification (RFA) and Resistive Wall Mode (RWM) stabilization physics in NSTX. The dependence of RFA on the frequency and rotation direction of an applied  $n = 1$  field is shown. Critical rotation for RWM stabilization is examined by reducing the toroidal rotation profile below its steady-state value by  $n = 3$  non-resonant magnetic braking. Modification of plasma rotation profiles shows that rotation outside and including the  $q=2.5$  flux surface is not required for passive RWM stability and there is large variation in the RWM critical rotation at  $q=2$  surface, both of which are consistent with the hypothesis of a distributed dissipation model, rather than the importance of a single rational surface. The critical rotation profile for RWM stabilization is shown to depend on ion collisionality. Understanding of the plasma parameter dependences of RWM stabilization will give greater confidence for extrapolation of RWM stabilization techniques to ITER and other next step devices. (S. Sabbagh, Columbia University))

David N. Ruzic, Director/Professor, Center for Plasma-Material Interactions, University of Illinois at Urbana-Champaign, gave the seminar talk "SLIP -- Study of Lithium Infusion in Porous Media" on August 6, 2007.

No NSTX Physics Meeting this Monday, August 13, 2007. (S. Kaye)

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

NSTX In-vessel work continued this week with the completion of spatial calibrations of CHERS/PCHERS and spectroscopic diagnostics, as well as boroscopic inspections of the HHFW antennas. Twenty three plasma-facing machine tiles removed from the NSTX vacuum vessel were sent to Sandia National Lab for analysis of the surface composition. Additional TF coil bus-work was removed this week to inspect the OH coil leads, and work continued on upgrades to the diagnostic grounding system. An outgassing test of the LITER lithium evaporator was completed on a test vacuum chamber, and a lithium wetting test of a flame-sprayed molybdenum surface was successful. Collaborators from UCLA and UIUC visited PPPL this week and gave presentations regarding the development of a Liquid Lithium Divertor for NSTX.

The NSTX test cell will be in unrestricted (card reader) access this coming week.

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

Boundary Physics Operations (H. Kugel)

- The following presentations were given at meeting to discuss "NSTX Metallic Impurity Accumulation, Helium Retention, and Operation Issues":

"Introduction" - H. Kugel

"Recent SEM K-Xray Analysis of Lithium Coupon and Sample" - H. Kugel

"Photos of Candidate In-vessel Metallic Sources", - L. Roquemore

"Accumulation of Metallic Impurities" - S. Paul and J. Robinson

"Lithium Effects on Edge Neutral Density" - P. W. Ross

"Fast Ion Loss" - D. Darrow

"Helium Retention" - V. Soukhanovskii (LLNL)

"Operation Issues" - D. Mueller

From discussions of these presentations, Action Items were derived in the following areas:

1. Add appropriate shielding to candidate near-edge metal sources,
2. Measure impurity concentrations in the tiles, and if necessary, proceed to the clean tiles,
3. Investigate additional diagnostics to help machine operations to monitor and reduce metallic impurity flux during discharges,
4. Investigate methods to minimize helium retention during lithium deposition.

Work planning is in progress to determine the cost and schedule for completing these Action Items. The meeting material is available on the NSTX Web Page.

- Additional wetting tests in argon of an LLD candidate substrate consisting of molybdenum plasma sprayed on stainless steel were completed on Sample PPI\_1. (J. Timberlake)