

## NSTX Weekly Report (Apr. 27, 2007)

**FY 2007 NSTX plasma operations started on Feb. 19, 2007.**

**Planned: 10 weeks**

**Completed: 5.06 weeks (through Apr. 25, 2007)**

- R. Maingi (ORNL) presented a talk at ORNL's Fusion Energy Division titled: "Global Pumping Projections and Sensitivities for the NSTX liquid lithium divertor project" R. Maingi also presented a seminar at Georgia Tech titled "Characteristics of small ELMs in NSTX". (R. Maingi)
- Jon Menard gave a seminar on NSTX results entitled "Recent Results and Research Opportunities on the National Spherical Torus Experiment (NSTX)" at New York University on April 11th. The seminar sparked many insightful questions and discussions. (J. Menard)
- The 12th US-EU Transport Task Force Workshop was held at the Bahia Resort Hotel in San Diego, Cal from April 17-20, 2007. 6 NSTX researchers attended the workshop and gave 12 NSTX contributed posters and talks: "Experimental tests of turbulent transport near marginal stability" by J.A.Boedo (UCSD), "MHD-induced neutral beam ion loss from NSTX by D. Darrow. "Global beta-induced Alfvén-Acoustic modes in JET and NSTX by N. Gorelenkov, "Investigation of fast ion mode nonlinear dynamics and spatial structure in NSTX" by N. Crocker (UCLA), "Confinement, transport and turbulence properties of NSTX plasmas" by S. Kaye, "Gyrokinetic simulation studies of plasma transport in the NSTX experiment by W. Wang, "Microtearing instabilities and electron transport in NSTX" by K.L. Wong, "NSTX high-k scattering system on NSTX: status and plan by H. Park, and "Progress in BOUT modeling of NSTX edge plasma" by M. Umansky (LLNL). (S. Kaye)
- There will be an NSTX Physics meeting on Monday, April 30 at 1:30 pm in LSB318. We will have summaries of last week's XPs from "High kappa and bootstrap fraction discharge development" by D. Gates, "High-k scattering" by E. Mazzucato, "Reversed shear plasmas" by H. Yuh, "Small ELM regime similarity experiment" by R. Maingi, and "LITER results (longer presentation)" by H. Kugel. The presentations will be placed in the usual Monday Physics Meeting folder in the Drag and Drop area. (S. Kaye)

### **Run Coordination (D. Gates, M. Bell)**

Five Experimental Proposals were carried out this week.

On Thursday April 19<sup>th</sup> XP-712 entitled "HHFW Power balance optimization at high B field" was run. Very nice results were obtained in several different phasings. Electron temperatures up to ~4keV were observed.

On Friday April 20<sup>th</sup> and again on Monday April 23<sup>rd</sup> XP-719 entitled "Investigate effect of lithium coated divertor on plasma performance with LITER-1d" was run. 11.64 grams of LITER was deposited over 2 days. Reduced divertor Halpha was observed along with a noticeable increase in energy confinement time.

On Tuesday April 24<sup>th</sup> in the morning XP-706 entitled “beta suppression of Alfvén Cascade” was run. A few shots were obtained that repeated earlier conditions. In addition  $n=3$  magnetic breaking was applied and very low rotation plasmas were obtained. In the afternoon XP-710 entitled “High bootstrap fraction plasmas at high elongation” was run. Plasmas with elongation of up to 2.6 were obtained with poloidal beta of 1.4 in H-mode using LITER-1d. These discharges exhibited very low ohmic flux consumption.

On Wednesday April 25<sup>th</sup> XP-735 entitled “high-k scattering measurements in RF heated plasmas” was run. Data was obtained using the high-k scattering system in plasmas initially developed during XP-712. Scans of scattering position and RF power were obtained. Neutral beam heating was used as a profile modification tool and also to measure the q-profile using MSE.

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

NSTX operations continued this past week with extensive use of the new LITER 1d lithium evaporator on an experiment measuring the effects of lithium deposition on confinement and ELM behavior in H-mode plasmas, and on another which used both the evaporator and neutral beams to develop high elongation discharges with high bootstrap fraction. Also this week, central electron temperatures of up to 4.4keV were achieved through HHFW heating in an experiment measuring high-K scattering, and both HHFW and neutral beams were used to heat helium discharges in an experiment to diagnose core transport in reversed shear plasmas. A second LITER 1d canister has been fabricated and mounted on a vacuum chamber in the lithium test lab. The freshly refurbished spare ion source installed in the neutral beam "B" position is being conditioned in parallel with the operation of the other two ion sources in support of NSTX experiments.

The NSTX test cell will be in restricted access during plasma operations this coming week. Access will be available from 5 to 10PM each evening.

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

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

- LITER-1d/Unit1 reliably evaporated lithium on NSTX PFC's in support of XPs -719 and -710. On April 20, 2.21 g, and on April 23, 9.43 g were evaporated for XP-719. On April 24, 3.07 g were evaporated for XP-710. Total estimated evaporation to date is 15.55g and 61.05 g of lithium remain.
- Main chamber and divertor lithiumization was demonstrated by evaporating lithium directly into a HeGDC.
- The fabrication and subsequent mounting of LITER-1d/Unit2 to its feedthrough assembly was completed, and it was moved to the Lithium Test Facility. Preparations for calibration measurements were started. (S. Jurczynski, T. Provost, J. Taylor, J. Timberlake).
- The LPI was used off-line to perform velocity measurements with candidate 304-SS sabots for powder injection experiments. An optimum style was adopted and planning for fabrication was started. (T.

Czeizinger, D. Mansfield, G. Gettelfinger)

- The following Liquid Lithium Divertor design meeting talks were given on 4/24/07: “Near Term Plans” by H. Kugel, “Particle Flux and Recycling Analysis in NSTX” by V. Soukhanovskii (LLNL), and “Lithium Chemistry in NSTX” by J. R. Timberlake. The presentation material is on the NSTX web page.

#### Diagnostic Operations (R. Kaita)

- Recent activities that involved new diagnostic capabilities included the installation of hardware for the University of California at Los Angeles 35 GHz reflectometer for density fluctuation measurements, and the optics and camera for the SWIFT plasma flow diagnostic.
- Time-resolved data are being obtained routinely with the Lawrence Livermore National Laboratory XEUS X-ray spectrometer. The high spectral resolution has been useful in measuring metallic impurity levels that have been difficult to determine with other spectroscopic means on NSTX.