

## **NSTX Weekly Report (May 11, 2007)**

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

**Planned: 10 weeks**

**Completed: 7.16 weeks with 1001 plasma discharges (through May 9, 2007)**

Stanley Kaye, David Mikkelsen and Martin Peng (ORNL) attended the ITPA meetings on Transport and on Confinement Databases and Modeling held in Lausanne, Switzerland on May 7-10, 2007. Stanley Kaye gave an update on the ITPA Physics Issue CDB-6 (Low Aspect Ratio) as well as a talk on Momentum Confinement studies in NSTX. David Mikkelsen gave a talk on the GYRO ETG simulations and initial high-k scattering measurements on NSTX. Martin Peng gave updates on the ITPA Physics Issues TP6.3 and TP9. (S. Kaye)

R. Maingi (ORNL) presented a talk at the ITPA pedestal group meeting in Garching titled: "Status of the PEP-9 Pedestal Scaling Experiment between DIII-D, MAST, and NSTX". (R. Maingi)

On May 9, Roger Raman (University of Washington) gave a seminar at the University of Maryland on solenoid-free plasma startup in STs. Numerous questions from the audience indicated considerable interest in the area of plasma start-up. (R. Raman)

On May 10 and 11, Stan Kaye gave a seminar on "Overview of Physics Results in the National Spherical Torus Experiment (NSTX)" at CRPP in Lausanne, Switzerland and IPP in Garching, Germany. (S. Kaye)

Rob La Haye and Ted Strait (GA) visited NSTX to collaborate with Steve Sabbagh (Columbia) on a two-part experiment to investigate the physics of neoclassical tearing modes. Non-resonant ( $n=3$ ) magnetic braking was applied with the RWM coils, in a discharge where an  $n=1$  tearing mode appeared during the high beta phase. The tearing mode onset occurred earlier and at lower beta as the plasma rotation was reduced, qualitatively consistent with results from DIII-D and JET. The threshold for re-stabilization of the mode with decreasing beta was also determined, supporting the identification as a neoclassical tearing mode and providing data on the marginal island size physics. As plasma rotation was reduced, both tearing modes and resistive wall modes were encountered, again similar to DIII-D experience. (T. Strait)

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

On Thursday May 3<sup>rd</sup> in the morning, XP-740 entitled "NTM threshold at low plasma rotation" was run by T. Strait who was visiting from General Atomics.  $n=3$  braking was applied to measure the effect of plasma rotation on the onset of neoclassical tearing modes. In the afternoon, XP-739 entitled "Marginal island width of NTM's on NSTX" was performed by R. LaHaye who was also visiting from GA. Data was obtained during beta ramp-downs on the marginal NTM island width.

On Friday May 4<sup>th</sup> additional data was taken for XP-739 (see above). In the afternoon, shot development for XP's 701 and 702 entitled "Assessment of intrinsic error fields after TF centering" and "Optimization of RFA and RWM detection algorithms", respectively, was performed.

On Monday May 7<sup>th</sup> XP-742 entitled “H-mode fuelling optimization using supersonic gas injection (SGI)” was performed. H-modes plasmas were obtained for which the high field side gas injector plenum pressure was reduced to 300Torr (down from the usual value of  $\sim 1000$ Torr), with fuelling supplemented by the controlled application of SGI.

On Tuesday May 8<sup>th</sup> XP-727 entitled “Stability limits at high normalized current” was run. High elongation plasmas ( $\kappa \sim 2.6$ ) were obtained with normalized current  $IN = I/aB \sim 6$ . Lithium evaporation was used during this XP.

On Wednesday May 9<sup>th</sup> XP-728 entitled “RWM stabilization and optimization – ITER scenario” was run.  $n=3$  braking was used to slow plasma rotation and induce an RWM. RWM feedback was used to then stabilize the observed mode. A phase scan of the applied feedback signal was performed.

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

NSTX operations continued this past week with the return of three ion source neutral beam injections, and the extensive use of the LITER 1d lithium evaporator. The NSTX switching power amplifier driven error field coils were used in support of experiments on neoclassical tearing mode stability and scaling, and on an experiment on resistive wall mode active stabilization. Lithium evaporation was used in continuing an experiment on breakdown optimization, and in conjunction with three source neutral beam injection for experiments on stability limits and high bootstrap current. The supersonic gas injector (SGI) was used in an experiment on the fueling of h-mode plasmas. Commissioning of the new Biased Electrode and Probe (BEaP) diagnostic during plasma operations also continued this week.

Access to the NSTX test cell will be available during a scheduled maintenance period this coming week.

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

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

- LITER-1d unit-1 was used to apply lithium evaporations to support NSTX XP-701, XP-702, XP-727, XP-728, and XP-710. (H. Schneider)
- LITER-1d unit-2 was installed in the PS&T Lithium Test Facility chamber, and aligned with 2 Quartz Crystal Deposition Monitors in preparation for off-line measurements. Pumpdown was started and is now in progress.
- The SGI was used in support of XP-742. (V. A. Soukhanovskii, LLNL)

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

Power supply repairs for the 35 GHz University of California at Los Angeles (UCLA) microwave reflectometer have been completed, and the system has been reinstalled on NSTX. UCLA personnel will come to PPPL during the upcoming maintenance week to work on implementing the 45 GHz and 65 GHz systems. Diagnostic activities on a Lawrence Livermore National Laboratory X-ray spectrometer and the University of California at San Diego fast reciprocating probe will also occur with visitors from these institutions during this time.