

NSTX Weekly Report (May 7, 2007)

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

Planned: 10 weeks

Completed: 6.14 weeks with 856 plasma discharges (through May. 2, 2007)

The paper entitled “Scaling of electron and ion transport in the high-power spherical torus NSTX” by S.M. Kaye, R.E. Bell, D. Gates, B.P. LeBlanc, et al. was published in Physical Review Letters in issue 17 of Volume 98, article 175002 (2007). The paper contains results of dedicated confinement scans conducted in high power low aspect ratio discharges. The results showed that confinement depended on toroidal field almost linearly as $B_T^{0.9}$, which is much stronger than is observed at higher aspect ratio. Furthermore, the scaling of confinement with plasma current is weaker than that at higher aspect ratio, with the confinement in NSTX going as $I_p^{0.4}$. (S. Kaye)

The ITPA-sponsored experiment to determine the dependence of the H-mode pedestal structure on aspect ratio, a joint experiment between DIII-D, MAST and NSTX, was continued on MAST. Discharges with pedestal beta above 6% were obtained in MAST at lower pedestal collisionality than before. In addition, the ITPA-sponsored experiment to compare small ELM regimes between Alcator C-MOD, MAST and NSTX, was also continued on MAST. Here the pedestal beta and collisionality window of a small ELM regime in double-null configuration was documented. R. Maingi (ORNL) participated in these experiments on-site at MAST. (R. Maingi)

Because many of the session leader's for last week's XPs are on travel, we will not have an NSTX Physics meeting on Monday, 5/7. (S. Kaye)

Run Coordination (D. Gates, M. Bell)

On Thursday April 26th XP-734 entitled “Te gradient and shear effects on confinement” was run. This experiment combined neutral beam heating with HHFW at high toroidal field in L-mode to look at the effects of reverse shear on confinement. Very high confinement times were observed (~100ms) in plasmas with clear evidence of an internal transport barrier. Clear evidence of HHFW heating in combination with neutral beam heating was also observed. Data was taken using the high-k scattering system.

On Friday morning April 27th XP-721 entitled was “Small ELM regime comparison” was re-run. Small changes were made to the plasma configuration that enabled H-mode to be obtained for a comparison to a shape that Alcator C-mod and MAST will both produce. In the afternoon XP-703 entitled “B and q scaling of locked mode thresholds” was completed. MSE data was obtained during shots with low density locked modes. In the late afternoon XMP-51 “Commissioning of the Biased electrode and Probe” was run.

On Monday April 30th XP-731 entitled “HHFW non-solenoidal I_p ramp-up” was run. HHFW power was coupled to very low current discharges attempting to ramp the plasma current up with a combination of HHFW driven current and bootstrap current.

On Tuesday May 1st XP-717 entitled “RF current drive at high toroidal field” was run. A phase scan of the HHFW power was performed in plasmas with and without neutral beam injection.

On Wednesday morning May 2nd XP-706 entitled “Beta suppression of the Alfven cascade” was completed. An NBI power scan was looking at the beta dependence of these modes. In the afternoon XP-741 entitled “Beta induced Alfven acoustic modes” was run. Plasmas were obtained that appear to have BAAE mode, pending more detailed analysis.

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

NSTX operations continued this past week with the successful commissioning and operation of the new Biased Electrode and Probe (BEaP) diagnostic, and extensive use of the High Harmonic Fast Wave (HHFW) system to investigate plasma current drive at various RF antenna phasings and machine fields to 5.5kG. Use of the new LITER 1d lithium evaporator also continued this week in support of experiments requesting lithium deposition to improve plasma confinement. Neutral beams were used in support of experiments throughout the period, which reduced the amount of time available during the day to condition the new ion source in the "B" position. Ion source conditioning operations continued in the evening to make up some of this time.

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

Research Operations (M. Bell)

Boundary Physics Operations (H. Kugel)

- LITER-1d was used to apply lithium evaporations in support of XP-739 and X-740. (H. Schneider)
- The following Liquid Lithium Divertor (LLD) design meeting talks were given:
 - "Fast Ion Loss to NSTX Divertor Region and Implications for the LLD", D. Darrow
 - "Recycling and Particle fluxes in NBI-heated H-mode Plasmas", V. A. Soukhanovskii (LLNL)
- The following poster contributions have been accepted for presentation at the 2007 IEEE SOFE:
 - "High Pressure Supersonic Gas Jet Fueling on NSTX", V. A. Soukhanovskii (LLNL)
 - "Design and Performance of NSTX Movable GDC Probe", H. W. Kugel

Diagnostic Operations (R. Kaita)

- The Langmuir probes were checked as part of the integrated system test procedure for the new Biased Electrode and Probe (BEaP) hardware. The bias voltages for them were successfully controlled up to their maximum value of 100 V.