

## NSTX Weekly Report (July 8, 2005)

FY2005 Planned Operations: 17 weeks

Completed: 10.14 weeks producing 1129 plasmas

### **NSTX Department, Project, Program (M. Ono, M. Peng, E. Synakowski)**

- M. Peng (ORNL) and R. Raman (U. Washington) attended the IEA Large Tokamak Workshop (W60) on Burning Plasma Physics and Simulation at Tarragona, Spain during July 4-5, 2005. M. Peng presented a talk on "NSTX Contributions to Burning Plasma Studies" and R. Raman presented a talk on "Advanced Fuelling System for use a Burn Control Tool." Jon Menard attended the MHD task group meeting of the ITPA at Tarragona, and presented two talks on behalf of the NSTX team: "NSTX Resistive Wall Mode Experiments" and "NSTX Error Fields & Locked Modes". V. A. Soukhanovskii (LLNL) and R. Maingi (ORNL) attended the ITPA meeting on the SOL (Scrape-Off-Layer). R. Maingi also gave a presentation entitled "Dust Detection on Remote Surfaces in NSTX" on behalf on C. Sinner.

- We will have an NSTX Physics Meeting on Monday, 7/11 at 1:30 pm in LSB318. The talk will be "Resolution of the NSTX Neutron Conundrum - *Circa 2005*" by S. S. Medley, D. S. Darrow and A. L. Roquemore.

### **Run Coordination (J. Menard, S. Sabbagh)**

The tenth week of operation was completed successfully with three experimental proposals and one machine proposal conducted.

#### XMP-24 "rtEFIT development"

Modifications to the real-time data acquisition code were tested, but more time is needed to fully implement the modifications because of unexpected interactions between the PSRTC code and the acquisition code.

#### XP-508 "Long pulse DND discharge development"

The longest 1MA discharge so far this year was obtained, achieving a 920ms end of flat-top time. This is very close to the longest 1MA pulse ever obtained on NSTX. In addition, scenarios with very high confinement were identified. These scenarios reproducibly achieved  $\beta_N \sim 6.1$ , producing what was tentatively identified as a resistive wall mode.

#### XP-517 "Study of TAE stability vs. $q$ and $q$ -shear"

The magnetic safety factor and shear profiles (measured using MSE-constrained reconstructions) were systematically modified in an attempt to change the characteristics of TAE instabilities. The TAE mode was observed to respond to changes in the  $q$  profile as expected from theory. TAE-induced density

fluctuations were also measured using the reflectometer.

#### XP-524 "Active control of rotation damping in RWM plasmas"

The braking effect due to applied helical fields on plasma rotation and the ability to alter the rotation of RWM using the RWM coils were tested. The non-resonant plasma rotation damping by  $n=1$  and 3 applied fields in a controlled way was demonstrated. Rotation recovery was observed after the applied field was shut down before RWM destabilization. Rotation damping/control was examined as a function of normalized beta - plasmas with normalized beta  $> 6$  were generated, and computed to be up to 53% over the  $n=1$  no-wall beta limit (using DCON on NSTX EFIT equilibria with MSE data) - a new record for NSTX. When an  $n=1$  traveling wave were phased to propagate in the direction of plasma flow with frequency near the RWM "natural frequency" expected in these conditions ( $\sim 25\text{Hz}$ ), rotating RWM growth was observed, however, the mode triggered an NTM and the plasma survived. When the applied field was phased to propagate against the plasma flow, the RWM grew unabated and quenched the plasma. NTV and other applicable theories are under investigation to explain the observed rotation evolution.

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

After the maintenance period, which concluded with a mini-boronization of the vacuum vessel on Tuesday morning, NSTX operations resumed this holiday shortened week with one extended run day. A 1MA plasma lasting almost 1 second was achieved while continuing an experiment on long-pulse double null plasmas (XP-508), and progress was made on XP-517 "TAE behavior vs  $q$  and  $q'$ ", and XP-524 "Rotation damping in RWM". The Lithium pellet Injector is under vacuum and ready for operation, with work planned this weekend to install a new high-speed visible camera at Bay B to view the pellet trajectory. Work continues on the installation and commissioning of the Moveable Glow Discharge Cleaning Probe, as well as the new high K scattering diagnostic. A new software algorithm has been implemented to calculate the NB power and should be more accurate for modulated power waveforms.

Plasma operations will resume on Monday morning and there will be no access to the NSTX test cell during the 1st shift. Run days will be extended to 7PM on Tuesday and Thursday this week, and the test cell will be in controlled access each evening from the end of run day until 10PM. A machine area scrub will be performed from 10-11PM each evening in preparation for the following day's run. The next NSTX maintenance week is scheduled for the 1st week in August. (A. von Halle)

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

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

- The connection of the LPI controls was completed and the unit is pumping down in preparation for opening the TIV.
- A Peer Review for the MPG cabling and controls was successful pending resolution of chits. A method to stabilize the bellows of the MGP has been devised and is under review.