

## NSTX Weekly Report (June 2, 2006)

FY2006 weeks of research operations

Planned: 11 weeks

Completed: 10.18 weeks

The paper "Bispectral Analysis of low- to high-confinement mode transitions in the National Spherical Torus Experiment", by A. White, S.J. Zweben, M.J. Burin, T.A. Carter, T.S. Hahm, J. Krommes, and R.J. Maqueda was accepted for publication in Physics of Plasmas. This analysis found that there was no significant increase in the amount of nonlinear coupling between low frequency fluctuations and high frequency fluctuations during the 10 msec before the L-H transition in NSTX, based on data from the gas puff imaging diagnostic. This work was done by Anne White of UCLA during her graduate student 'practicum' at PPPL during the summer of 2005. (S. Zweben)

Two additional NSTX contributed papers were presented at the 14th Joint Workshop on Electron Cyclotron Emission and Electron Cyclotron Resonance Heating held in Santorini Island, Greece (May 9-12, 2006). Bob Harvey gave a talk entitled "Electron Bernstein Emission due to Non-thermal Distributions in NSTX", in which Bob used GENRAY/CQL3D to show EBW emission via BXO coupling is sensitive to non-thermal deviations for typical NSTX plasmas and Joan Decker presented a talk entitled "Current Drive by Electron Bernstein Waves" in which Joan summarized his modeling of EBWCD in NSTX. (G. Taylor)

There will be an NSTX Physics meeting on Monday, June 5 at 1:30 pm in LSB18. The agenda is: **XP Summaries:** F. Levinton – Reversed Shear, A. Sontag – RWM Passive Stability Boundary, J. Menard – LSN H-mode, D. Stutman – Perturbed Electron Transport, and Delgado-Aparicio – Impurity Transport (S. Kaye)

The NSTX Team Meeting was held on Wednesday, May 31, 2006. The presentation material is available on the NSTX web site. The Safety Forum breakout group report summary presentations are also available on the web.

### **Run Coordination (R. Raman, S. Sabbagh)**

Good progress was made with all three experiments conducted during this week.

**XP532  $B_T$  and Beta scaling on confinement (May 25-26) – S.M. Kaye:** An experiment to study the scaling of confinement with toroidal field, plasma current, beta and collisionality was completed. Preliminary analysis of data at near-fixed density confirms a strong scaling of global confinement with both toroidal field and plasma current. TRANSP analysis of these discharges will be performed to study the scaling of the thermal confinement. There is enough range in beta and collisionality (at otherwise fixed dimensionless parameters) to study the scaling of normalized confinement ( $B^*\tau$ ) with these parameters.

**XMP44: High-k system commissioning – (May 26, 30) - D. Smith:** In addition to the launching positions previously explored, further progress was made in realigning the high-k scattering system to measure at intermediate radii.

**XP610 Study of Transport with Reversed Shear in NSTX (May 30) - F. Levinton:** This was a continuation of the experiment conducted on March 27-28. During this half-day run, a monotonic q-profile at 900 kA was developed using the growth scenario developed for the 800 kA case. Preliminary LRDFIT analysis confirms the shear in the core is very low. As the shear was reduced from a negative value and approached zero the MHD activity seemed to increase. The data is being analyzed to determine if this is having any effect on the electron temperature profile. The reversed shear case at 900 kA was easily produced by lowering the current of the IMA discharge used on March 27. The peak electron temperature for the reversed shear case was 1.8-1.9 keV. As the magnetic shear in the core was reduced the peak electron temperature dropped to about 1.5-1.6 keV.

**XP619 The physics of passive RWM stabilization (May 31) – A. Sontag:** Scans of the Alfvén frequency and ion collisionality at constant q were performed in discharges with beta above the no-wall stability limit in order to determine the relation of these parameters to passive RWM stability. The RWM/EFC coil set was used to apply n=3 fields which slowed plasma toroidal rotation until the RWM became unstable. Alfvén speed scans were performed at two q values, and nearly a factor of two variation in Alfvén speed was achieved. A wide range of ion collisionality was also generated, which is another important variable in some theories of RWM stabilization. Piggyback testing of the Br sensors for real-time active RWM feedback input was also performed.

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

NSTX plasma operations continued this week after the Memorial Day holiday. Commissioning of the high-k scattering system continued (XMP-44), and that diagnostic was used to take measurements in support of XP-610 "Study of Transport with Reversed Shear in NSTX". After a vacuum vessel boronization, XP-619 "Physics of Passive RWM Stabilization" was completed on an extended run day. Progress was also made this week on XP-602 "Long Pulse development at reduced density using EF Correction" and XP-612 "Scaling of Perturbed Electron Transport with Collisionality, Heat Flux, and Current". The capability of injecting deuterated methane via the bay B mid-plane gas injector was used in support of XP-613 "Impurity transport in H-Modes" late in the week. Also this week, Alignments and testing of the LITER probe, fitted with a new cartridge and fresh supply of lithium, were performed in preparation for a lithium deposition experiment scheduled for next week.

Plasma operations will continue this coming week. Access to the test cell will be available from the end of the run day to approximately 9PM each evening.

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

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

- The assembly and leak check of LITER 1C was completed. It was reloaded with about 35 g of lithium and installed on NSTX Bay-F Upper. The probe assembly was mildly baked and the system achieved

the procedural pressure. The TIV was then opened, and the probe inserted to the operating position. The probe was measured to be isolated from all ground connections and the alignment was found to be good.

- NSTX TMB Boronization-56 (~5g) was performed. (W. Blanchard)

#### Diagnostic Operations (R. Kaita)

- A fast visible camera has been moved to a viewing window on a Bay I flange in preparation for new two-dimensional edge neutral density measurements.
- The Johns Hopkins University “optical” X-ray (OSXR) array is operational and was used for an experimental proposal (XP) entitled “Z-scaling of impurity transport in beam heated NSTX Hmode discharges” this past week. The XP is part of doctoral thesis research using the OSXR diagnostic.