

NSTX Weekly Report (March 10, 2006)

FY2006 weeks of research operations

Planned: 11 weeks

Completed: 1.88 weeks

- Martin Peng attended the 35th meeting of the Fusion Power Coordinating Committee of the Committee on Energy Research and Technology of the International Energy Agency in France during February 28 - March 1, 2006. He visited the MAST researchers at the EURATOM Fusion Association at the UKAEA Fusion Science Center at Culham, U.K. on March 2, 2006.
- R. Kaita gave a talk entitled "Lithium in NSTX" at the Plasma Facing Components Meeting in San Diego last week.
- There will be no NSTX Physics meeting today, Monday 3/13. We will have short summaries from last week's run plus a longer presentation next Monday, 3/20. (S. Kaye)

Run Coordination (R. Raman, S. Sabbagh)

Five Experimental Proposals and one machine proposal were run. The machine was partially boronized using 3g of TMB during the evening of March 7.

XMP44: High-k system tests - D. Smith, H. Park: This new diagnostic recorded the first signals during the L-mode and H-mode phases of a plasma discharge.

XP606: Transient CHI, March 6, 7 – R. Raman: Transient CHI experiment were run in the configuration (15mF, 1.5kV) used during 2005 to produce plasma currents that show current persistence after the injector current is reduced to zero. 60kA of closed flux current was produced, and the discharge was diagnosed with the Thomson scattering diagnostic, fast visible camera, soft x-ray, bolometer array and spectroscopy systems. A toroidal field scan was conducted. The magnitude of the current that persisted past 20ms increased from 20kA during 2005 to 35kA in present experiments and persisted for more than 200ms. Results are consistent with observations from the NSTX 2005 run and with results from the HIT-II experiments at the University of Washington, and indicate that higher capacitor bank voltage and good vessel conditions are important requirements for increasing the magnitude of the closed flux current. On many discharges low power HHFW (50 to 150kW) was applied to study antenna loading and coupling of these waves to the CHI target (J. Hosea). About an hour was spent developing suitable targets for future CHI edge current drive experiments (D. Mueller, XP533).

XP603: Long pulse double null development, March 8 – D. Gates: Long pulse double null discharges, with a target plasma elongation of 2.3 (during the flat-top) with lower triangularity ~ 0.8 and upper triangularity ~ 0.5 , and outer gap of 9cm were developed. All shots were run with rtEFIT control, and so during the flattop, plasma boundaries were extremely reproducible. The plasma shape trajectory during the current ramp was improved in order to achieve earlier H-mode. A current scan was completed with currents

of 1MA, 0.95MA, 0.9MA, and 0.8MA. The longest pulse of the year so far was at 950kA, with pulse length of 1.08s. Interesting hot ion mode was observed ($T_i \sim 1.5T_e$ over a large plasma volume).

XP604: on Deposition studies, March 9 - C. Skinner, R. Maingi: Previous studies of film deposition in the upper and lower divertor regions using the quartz crystal oscillators in NSTX have shown that the first discharge of the day produces net deposition equivalent to many times the gas fueling rate, assuming uniform deposition. It was determined that this deposition is independent of the 30 min. glow discharge cleaning used to begin operations at the start of each run day, i.e. a similar level of net deposition is also observed even when the glow is not used. In addition, a controlled discharge duration scan showed that short discharges also result in net deposition, whereas long discharges result in no change of film thickness or net erosion.

XP604: on Edge fluctuation measurements and transient internal Probe – J. Boedo, K. Williams: 800kA LSN discharges with densities of $0.8 n_G$ and greater in H-mode were diagnosed. The transient insertable probe collected data from $n_G \sim 0.4-0.75$. Within that range, the data indicate that the RMS levels of the poloidal electric field (i.e radial velocity) increases significantly with density in the SOL (factors of 5) whereas the RMS levels of ion saturation current (or density) stay roughly the same. Preliminary results suggest that the turbulent radial transport increases at higher density due to higher velocities and not due to higher density fluctuations. By varying the timing of the gas puff edge turbulence measurements ranging in density from $0.8 n_G$ to $1.1 n_G$ were achieved.

XP626: Plasma fueling with supersonic gas jet (SGJ), March 9 – V. Soukhanovskii: The SGI was operated in conjunction with reduced fueling from the center stack gas injector to control the density rise in a high power beam heated, long pulse, 1MA H mode discharge. Good progress was made toward obtaining a steady-state density ($dn/dt=0$). A change in the ELM behavior was also seen.

XP602: Long-pulse development in lower-single-null, March 10 – J. Menard: Shot development was performed for 750kA LSN PF1B discharges. Gas injection timing and duration modifications were performed to recover early H-mode transition at $t=90ms$, and a 1.4s discharge was produced limited by the duration of the TF flat-top. Progress was also made in matching the upper and lower shape parameters of the PF1B LSN utilizing rtEFIT, and the boundary shape was well controlled. Several discharges exhibited beta collapses during the I_p flat-top preceded by edge rotation decay, and such discharges will be used as targets for error field correction studies. The PCS real-time RWM mode-ID algorithm was also tested in preparation for future experiments.

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

The NSTX FY'06 run continued this past week, making progress on several experimental proposals (XP's). The PF power and ECH systems were configured for Coaxial Helicity Injection (CHI) Operations early in the week, supporting work on XP-606 "Transient CHI" and XP-533 "Edge Current Drive with CHI". A vacuum vessel boronization was performed on Tuesday evening before beginning work on XP-603 "Long-pulse Double Null Discharges", XP-604 "Density Scan", XP-626 "Plasma Fuelling with the SGI", and XP-602 "Long-pulse Lower Single Null Discharges". Commissioning of the High K

scattering system (XMP-44) continued throughout the week, and that system is now yielding data. A fault occurred in an inductor in the OH power supply at the end of the run on Friday. This is scheduled to be repaired during the planned maintenance week. During the evenings, work continued on the installation and testing of the steering controls for the EBW antennas at Bay G.

High power operations are scheduled for Monday and Tuesday of this coming week, with a short maintenance break planned for Wednesday through Friday to prepare the Tessel Pellet Injector for experiments the following week. Access to the test cell will be available from 5PM to 9PM on Monday and Tuesday, and throughout the day on Wednesday through Friday. (A. von Halle)

Research Operations (M. Bell)

Diagnostic Operation (R. Kaita)

- The high-k scattering microwave fluctuation diagnostic is operational. Signals were recovered after a faulty amplifier for a power splitter was replaced..

Boundary Physics Operations (H. Kugel)

- Assembly of LITER test fixtures has been in progress to test design upgrades to control lithium flow and to improve the reliability of the heaters.
- Boronization-51 applied 3 gms of deuterated trimethylboron (TMB), and this was followed by HeGDC to remove the co-deposited deuterium. (W. Blanchard)