

NSTX Weekly Report (January 23, 2004)

FY 2004 weeks of operation planned: - 18 weeks, Completed: - 0.2 weeks

Draft Featured PPPL Highlight Contribution from NSTX:

NSTX returned to plasma operation on Tuesday, January 20, 2004 after successfully commissioning the new NSTX TF system to 4.5 kG. All work for the TF repair effort as defined in the Project Execution Plan dated July, 2003 is now complete within cost & schedule baselines. The first week of the plasma operation focused on the upgraded real time control system commissioning, diagnostic calibrations, and the NBI (neural beam injector) conditioning in preparation for physics runs starting the week of January 26, 2004.

Department, Project, Program (M. Ono, M. Peng, M. Williams, E. Synakowski)

- Martin Peng attended during January 20-21 a meeting of the International Energy Agency (IEA) Fusion Power Coordinating Committee (FPCC) chairs and the Implementing Agreement (IA) chairs on the future directions and working arrangements of the IA activities, and the FPCC meeting of 2004. He also attended during January 22-23 the MAST Research Forum to discuss enhanced opportunities of collaboration in fusion energy sciences research. (M. Peng)
- C. H. Skinner presented an informal summary of the recent ITPA Divertor / SOL Meeting in Naka, Japan, January 13-16, 2004. A number of issues crucial to the success of ITER were discussed.

Run Coordination (S. Kaye)

NSTX returned to successful operation on Tues, 1/20 with ohmic plasmas at 600 kA and 4.5 kG. Four main tasks were accomplished during this first week of operation in preparation for physics runs starting next week. The new control system was commissioned and work on maximizing the control system gains was performed. Plasmas with elongations of two with gains at least a factor of two greater than those used last year were produced. The control system is still not yet near an overdrive limit, and it is believed the gains can be increased further. This reflects the reduced latency in the new control system. Thomson scattering laser alignment and calibration were performed, as was a Neon glow for calibration of the CHERS and ERD diagnostics. Finally, neutral beams conditioned as much as possible in preparation for NBI operation towards the end of next run week.

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

- The NSTX operations resumed on Tuesday, January 20th, with the completion of integrated system testing and the start of the 1st series of plasma shots of the year. The remainder of operating time for the week was devoted to diagnostic calibrations and the set-up of the plasma control system. Upgrades to reduce the latency of the plasma controls were tested, and the feedback gains of that system were increased. The alignment of the detection optics for the Multi-Pulse Thomson Scattering (MPTS) diagnostic were completed, and a Rayleigh scattering calibration was performed on Friday. A neon glow was performed to calibrate the CHERS and ER diagnostics.
- Neutral beam conditioning is in progress with all three ion sources now accelerating beams into the calorimeter. The six RF sources used to power the HHFW antennas have completed heat runs at 1MW each. The power tetrode in RF source #3 will be replaced with a spare before starting the vacuum conditioning of the antenna.
- In the coming week, the test cell will be in restricted access during 1st shift, with test cell access available from approximately 5:00PM to 10:00PM each evening. A maintenance week is scheduled for February 9th - 13th. (A. von Halle)

Research Operations (M. Bell)

USXR arrays – (D. Stutman, Johns Hopkins University)

Three USXR arrays at Bay G are operational. A few vertical array channels which have higher noise are presently being worked upon. The new toroidally displaced vertical array at Bay J is also ready for installation. This array is meant for internal displacement measurements during RWM and for 'two-color' measurements of temperature perturbations. However, the Bay J gate valve on which the array was supposed to be installed is leaking. A solution needs to be found to enable its installation during this run.

Physics Operations (D. Mueller)

- NSTX has resumed plasma operation. After completion of the TF testing, the first plasma of 2004 in was produced on Tuesday, Jan. 20. The first plasma was a purposefully short duration plasma designed to test the many changes in the plasma control system. After a short period of He GDC, a 600 kA, LSN plasma in deuterium was produced with a current flattop out to about 400 ms (shot 110812). Operation continued on Wednesday and Thursday with the aim of commissioning the plasma control system and implementing some planned improvements.
- The control system has undergone many improvements during the shutdown. Among these is a reduction in the latency in the control system response from about 4 ms to about 1 ms, involving both hardware and software modifications.
- A loop voltage difference signal has replaced the digital derivative of the flux loops in the PCS to provide the derivative term in the feedback loop for vertical position control. This reduced the noise in the derivative term in the vertical control by a factor 5 and also removed the latency inherent in taking the derivative digitally. Although used in only one shot (110843) so far, this clearly improved the vertical control compared to the preceding shot. It appears that we will be able to increase the derivative gain further, which bodes well for improving our ability to control vertical position at high kappa.
- The fully calibrated magnetics data were available for the first shot. EFIT analysis was available soon after each plasma shot. Many improvements to the EFIT analysis had also been made during the shutdown aimed at both speeding up the between-shots analysis and making it more robust.

Boundary Physics Operations (H. Kugel)

- The Supersonic Gas Injector and Edge Magnetic Sensor Team met to review a promising vendor probe system, and to complete plans for a Peer Review.
- A trial fit up of the installation fixtures for the Lithium Pellet Injector (LPI) was successful. The Test Cell installation procedure and the off line final testing of the unit are in progress as paced by emergent events.
- C. H. Skinner presented an informal summary of the recent ITPA Divertor / SOL Meeting in Naka, Japan, January 13-16, 2004. A number of issues crucial to the success of ITER were discussed.
- The following abstracts were submitted to the 15th Topical Conference on High Temperature Plasma Diagnostics, April 19-22, San Diego, CA, "NSTX Low-Z Pellet Injector", H.W. Kugel et al., and "Supersonic Gas Injector for Fueling and Diagnostic Applications on NSTX, V. A. Soukhanovskii, et al.

Diagnostic Operations (R. Kaita)

- The tangential bolometer detector resistances have decreased after glow discharge cleaning (GDC), even though the shutter has been kept closed. They will continue to be monitored during future GDC operations to help determine the cause of the problem. It may be due to carbon deposited on the detectors from surfaces that were blackened during the last outage to reduce stray light.
- The fabrication of parts for the fast two-dimensional soft X-ray camera has been completed.
- The diagnostics presently on NSTX are operational except for the X-ray crystal spectrometer on the horizontal midplane. Its detector has to be reinstalled.
- Calibrations with a neon glow discharge were completed for the CHERS ion temperature and PRD poloidal rotation diagnostics.
- A new conductance-limiting barrier has been installed to limit the gas flow into the vertical X-ray crystal spectrometer during plasma operations.