

NSTX Weekly Report (May 9, 2008)

FY 2008 NSTX plasma operations

Planned: 15 weeks

Completed: 9.78 weeks, 1442 plasmas (through May 7, 2008)

Michael Bell attended the Fourth US-PRC Magnetic Fusion Collaboration Workshop, held at the University of Texas, Austin TX, on May 5-6, 2008 and made a presentation on "National Spherical Torus Experiment and ASIPP/PPPL Collaboration Activities". There were 48 participants in the meeting, 21 from Chinese institutions, including senior researchers from the ASIPP, Hefei and the SWIPP, Chengdu. The workshop included 38 presentations, of which 19 were made by participants from the Chinese institutions. The workshop was also attended by Drs Ken Hill, Janardhan Manickam and Hong Qin from PPPL (M. Bell)

There will be an NSTX Physics Meeting on Monday, 5/12 at 1:30 PM in LSB318. We will have XP and analysis updates by: Skinner - XP824 Li pumping and retention on NSTX (part 1 before Li), and Kugel/Maingi – Results of first LITER application. If anyone else would like to present something, please let me know before the meeting. The talks will be found in http://nstx.pppl.gov/DragNDrop/NSTX_Meetings/Monday_Physics_Meetings/2008/5-12-08/ (S. Kaye)

This years NSTX Results/Theory Review is scheduled for Wed/Thurs, Aug. 6/7. This is coming later than usual this year due to the NSTX Five Year Review, which is scheduled for the last week of July. The Run Assessment will be held on Friday morning, Aug. 8. Please mark your calendars; more information will follow as we get closer to the date. (S. Kaye)

Run Coordination (M. Bell, R. Raman)

Six experiments received run time in the week May 1 - 7.

On Thursday 5/1, in the experiment "Improved error field suppression in long-pulse discharges" [XP-823, J. Menard], scans of the polarity and amplitude of the $n=3$ error correction field were completed at 1.1MA. The scans confirmed the presence of an $n=3$ error field (EF) component, and indicate that the EF is roughly proportional to I_p (or vertical field). $n=1$ feedback gain and low-pass-filter time-constant scans were then performed to optimize RFA and RWM suppression. The proportional gain was increased by up to a factor of 3 with filter time-constants as low as 2ms while maintaining stability. The combined optimized $n=3$ and $n=1$ control was then utilized to increase the pulse duration of otherwise disruptive lower- I_p discharges (0.7-0.8 MA) by up to a factor of 2.

Three experiments were scheduled on Friday 5/2, The experiment "NPA vertical scan" [XP-807, S. Medley] was completed successfully viewing at reduced particle pitch. Combined with last year's results, the data obtained in this scan imply that the observed MHD-induced flattening of the NB ion radial profile is not sensitive to the viewed particle pitch in the range $v_{||}/v \sim 0.6 - 0.9$. At the conclusion of this experiment we continued shot development for the experiment "X-point limiter" [XP-826, M. Bell]. The first part of the experiment "Li pumping and retention on NSTX" [XP-824, C. Skinner] was run on Friday afternoon to measure the retention of deuterium before the introduction of lithium into the vessel. The vessel pressure rise with ohmic and RF

heated plasmas was monitored with the torus interface valves closed. Comparison to gas-only shots showed that most (82% - 99%) of the gas injected was immediately retained in the vessel. Outgassing over the subsequent 21 hours reduced the retention fraction to 36%.

On Monday 5/5, we continued the experiment "High-k turbulent fluctuations in HHFW heated plasmas" [XP-821, E. Mazzucato]. Problems with plasma control caused by a failed data communication module limited the number of shots obtained in the conditions required so the experiment was not completed.

The experiment "LITER Characterization and its Effect on ELMs" [XP-827, H. Kugel] was performed on Tuesday 5/6 and Wednesday 5/7. The dual LITER system evaporated a total of 20.6g of lithium into the vessel. Prior to each discharge, the LITERs were withdrawn behind shutters, where they also remained during the subsequent HeGDC applied for periods up to 9.5 min. After the HeGDC, the shutters were opened and the LITERs were reinserted to deposit lithium on the lower divertor target for 10 min, at rates of 10-70 mg/min, prior to the next discharge. The findings include: 1) plasma density reduction as a result of lithium deposition; 2) suppression of ELMs; 3) improvement of energy confinement in a low-triangularity shape; 4) improvement in plasma performance for standard, high-triangularity discharges; 5) reduction of the required HeGDC time between discharges; 6) increased pedestal electron and ion temperature; 7) reduced SOL density. The discharges also benefited from the application of $n=1$ and $n=3$ mode control which reduced deleterious MHD activity.

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

NSTX plasma operations continues this past week with the use of neutral beam and high harmonic fast wave heating, and the newly commissioned lithium evaporation (LITER) system. LITER control system testing and a high temperature bake of both probes was completed over the weekend. Initial lithium evaporations were performed with the probe shutters closed, and was followed by a period of first deuterium and then helium glow discharge cleaning to provide the needed machine conditions for the subsequent and successful experiment on ELM mitigation.

Access to the NSTX Test Cell will be available during scheduled maintenance this coming week.

Research Operations (M. Bell)

Boundary Physics Operations (H. Kugel)

- Lithium Evaporator (LITER)

The controls for the dual LITER system were integrated and tested. The lithium loaded LITERs were baked to 270 °C behind closed Torus Interface Valves (TIV). The LITERs were inserted into the vessel after plasma operations and the Integrated System Test Procedure (ISTP) was performed to 550°C. Subsequently, DGDC followed by HeGDC restored vacuum conditions. The dual LITER system was then used to support the XP-827.

- Lithium Powder Dropper

The Lithium Powder Dropper was loaded with stabilized 50 micron lithium powder and successfully demonstrated the controlled dropping of lithium powder as measured with a laser diagnostic. Preparations were started for installation of the Lithium Powder Dropper during the maintenance week. (D. Mansfield)

- Liquid Lithium Divertor (LLD)

A teleconference was held between members of the NSTX and SNL LLD design teams to review the draft inquiry for solicitation of interest in the LLD fabrication from vendors. This draft was approved and was subsequently sent to vendors. (R. Ellis,III