

NSTX Weekly Report (August 27, 2010)

FY 2010 NSTX plasma operations

Planned: Total - 15 run weeks (Base - 14 run weeks, ARRA - 1 run week)

Total completed – 10.80 run weeks and 2038 plasma shots

Completed: Base – 9.79 run weeks and 1867 plasma shots

Completed: ARRA -1.01run week and 171 plasma shots

The following six NSTX papers have been accepted for publication Journal of Nuclear Materials. The manuscripts were prepared for the 19th International Conference on Plasma Surface Interactions that was held in San Diego, CA on May 24-28, 2010: "Deuterium Retention in NSTX with Lithium Conditioning" by C.H. Skinner, et al., "Snowflake" divertor configuration in NSTX" by V. A. Soukhanovskii (LLNL) , "Macroscopic Motion of Liquid Metal Plasma Facing Components in a Diverted Plasma" by M. Jaworski , "Poloidal Distribution of Intermittent Events (Blobs) in the Scrape-off Layer and Divertor of the National Spherical Torus Experiment (NSTX)" by R. Maqueda , "Observation and modeling of inner divertor re-attachment in discharges with lithium coatings in NSTX " by F. Scotti , and "Turbulent Transport and the Scrape-off-Layer Width " by J. R. Myra (Lodestar). (V.A. Soukhanovskii)

The paper "The role of kinetic effects, including plasma rotation and energetic particles, in resistive wall mode stability" by Jack Berkery (Columbia U.), et al., at NSTX was recently published online in Phys. Plasmas. The paper shows how the RWM can become unstable at intermediate levels of plasma rotation, and the role of energetic particles in RWM stabilization. The paper can be found at <http://link.aip.org/link/?PHP/17/082504>. (S. Sabbagh, Columbia U.)

Jeehyun Kim recently completed a two-year visit to PPPL as a graduate student from Pohang University for Science and Technology (POSTECH) in South Korea. On NSTX, she first worked on implementing remote control of the microwave launching and collection mirrors for the high- k turbulence diagnostic. Kim then focused on using the FIRETIP multichannel density diagnostic to measure density fluctuations driven by RF fields. Her studies, which also included simulations using the full-wave TORIC code, are summarized in a paper to be published in the Review of Scientific Instruments. (R. Kaita)

Run Coordination (E. Fredrickson, S. Sabbagh - Columbia University)

On Thursday, August 19, two XPs were run. XP1020 (Berkery) examined resistive wall mode passive stability physics vs. rotation and energetic particle fraction in low li, high betaN plasmas. The experiment emphasized gradual approaches to RWM marginal stability, with MHD spectroscopy used in all discharges. Clear ranges / profiles for plasma rotation yielding passive RWM stabilization were found, with instability found at high and intermediate rotation levels. In addition, the most favorable conditions for passive stabilization yielded record values of the stability parameter betaN/li, with two plasmas reaching values between 13.5 and 14 at Ip = 0.8MA. XP1023 (Sabbagh) demonstrated optimal feedback phase and suitable gain settings for the RWM active control system in these low li target plasmas, with clear demonstration of successful feedback using RWM radial field sensors in addition to poloidal field sensors. RWM n = 1 amplitudes for both sensor sets were very low, and discharges terminating before the programmed pulse length appear to be due to slow edge instabilities leading to edge cooling and loss of the low li state."

On August 20, we began with Vlad Soukhanovskii's XP1045 to develop and document the "Snowflake" divertor configuration to reduce peak divertor heat flux. The XP began with some shots to document the effect of Lithium on edge profiles with the fast, plunging probe (Jose Boedo). Then good progress was made in developing stable, reproducible Snowflake divertor configurations. In the afternoon we switched back to Rajesh Maingi's XP1029 to study the dependence of the H-mode threshold on plasma triangularity where progress was made in the power scans.

On August 23-24, plasma conditioning was performed on the HHFW antennas to power levels needed to support experiments. On August 25, we moved on to Gary Taylor's XP1019 to study HHFW heating of low current, low temperature plasmas. This supports plans to use HHFW to assist in current ramp-up.

On Thursday, August 26, we completed Joon-Wook Ahns's XP1046 on ELM heat fluxes. A collisionality scan was completed by applying 3D fields at different times in the discharge evolution. The NBI power scan and $n = 1$ applied field (static) phase scan was completed. In conjunction, XP1048 RMP/ELMs vs. q_{95} (J. Park) was completed in piggyback with XP1046. In the afternoon we nearly completed Vlad Soukhanovskii's XP1045 to develop and document the Snowflake divertor configuration. A potential issue for analysis is that the plasma were ELMing (large, Type I ELMs), but the ELMs were avoided later in the day by reducing the beam power.

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

NSTX plasma operations continued on extended shifts this past week with experiments utilizing lithium evaporation, HHFW and neutral beam heating, and Resistive Wall Mode (RWM) feedback via the Switching Power Amplifier (SPA) driven error field coils. Integrated system testing to increase the PF4 operating level was successfully completed in preparation for an experiment to further influence plasma shape in developing strike point control. One of the two lithium evaporator (LITER) probes was replaced with a fresh spare during the week utilizing a new baking system and minimizing lost run time. The second LITER probe will be replaced over the weekend

Access to the NSTX test cell will be restricted during plasma operations this coming week. Access is expected to be available each evening.

Research Operations (M. Bell)

Boundary Physics Operations (H. Kugel)

- Liquid Lithium Divertor (LLD)
 - The materials and supplies for a 4-plate air heating system were ordered and deliveries have started. Planning for installation is in progress.
- Lithium Evaporators (LITER)
 - LITER units K1 and F2 were used each day as required to support Experimental Proposals

(XPs)

- LITER unit K1 was emptied and replaced with unit K2.
- Lithium Powder R&D
 - The torus interface valves for the 2 installed Lithium Powder Droppers were opened to the vessel. Test injections into the late end of discharges used for other work were started.
- Molybdenum Inner Divertor Tiles
 - An engineering teleconference was held to discuss project planning.