NSTX Weekly Report (Apr. 16, 2010)

FY 2010 NSTX plasma operations
Planned: Total - 15 run weeks (Base - 14 run weeks, ARRA - 1 run week)
Completed: Base - 0.75 run week and 111 plasma shots
Completed: ARRA -1.01run week and 171 plasma shots

Fifteen NSTX physicists attended the U.S. Transport Task Force Meeting in Annapolis, MD, held April 13-16, 2010. S. Kaye has assumed the Chairmanship of the TTF for the next two years. The following presentations were given by the NSTX physicists. The plenary talks were "ELM suppression through modification of Edge Profiles with Lithium Wall Coatings in NSTX" by J.M. Canik (ORNL) and "Pedestal transport and stability of small-ELM regimes in NSTX" by A. Sontag (ORNL). The oral talks were "Nonlinear Gyrokinetic Simulations of Electron Turbulence in NSTX" by J. L. Peterson, "A synthetic diagnostic for validation of gyrokinetic, nonlinear simulations of Electron Temperature Gradient driven turbulence against measurement of short-scale turbulence in the National Spherical Torus Experiment" by F.M. Poli, "L-H Threshold Studies in NSTX" by S. Kaye, "Reflectometry and Backscattering Measurements of Broad-k_r Microturbulence Near the L-H Transition in NSTX" by S. Kubota (UCLA), "Quiet Periods in Edge Turbulence Preceding the L-H Transition in NSTX" by S. Zweben, "Impact of multi-mode TAE dynamics on fast ion transport in NSTX" by M. Podesta, "Strike point splitting by the effect of 3-D field in NSTX" by J-W. Ahn (ORNL). The poster presentations were "Heat Transport in NSTX Scrape-Off Layer Plasmas with Reduced Collisionality" by T. Gray (ORNL), "Poloidal distribution of intermittent events (blobs) in the scrape-off layer and divertor of the National Spherical Torus Experiment (NSTX)" by R. Maqueda, "Quiet Periods in Edge Turbulence Preceding the L-H Transition in NSTX" by S. Zweben, "Imaging the Pedestal Island Structure during the Application of 3D Magnetic Perturbations" by D. Battaglia (ORNL), and "The NSTX beam emission spectroscopy (BES) diagnostic system: capabilities and research plan" by D. Smith (U. Wisconsin). (S. Kaye, R. Maingi, ORNL)

Members of the NSTX Research Team participated in the Edge Coordinating committee (ECC) meeting that preceded the TTF and had a focus on the FY10-11 Joint Research milestones. The following presentations were given: "Status of Experiments and Analysis Toward the FY2010 Joint Research Target on Scrape-off layer heat transport" by R. Maingi (ORNL), "NSTX experimental contributions for the FY2011 Joint Research Target on pedestal physics" by R. Maingi (ORNL), and "Reduced model simulations of the SOL width and comparison with NSTX data" by J. Myra (Lodestar Research). (R. Maingi)

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

XP1000, "Liquid Lithium Divertor Characterization" continued through Thursday, April 9. Liquid Lithium Divertor (LLD) was heated to 320ºC and the outer strike-point was moved, shot by shot, out to as far as approximately 70cm (as determined with several diagnostics and EFIT). Densities were measurably higher with the strike point on LLD - possibly because LLD acts as a deuterium source. LLD was then cooled to 250°C and densities dropped. SGI was tested on one shot and good results (lower density) were seen. The Lithium Evaporators (LITERs) were emptied towards the end of Thursday or Friday morning, so on Friday the magnetics calibration shots were finished. Shot 137642 was made with 40kV NBI as needed for neutron detector calibration. The final shots needed for MSE filter tuning (small outer gap)

were done next and finished by early afternoon. XP1004 to optimize error field correction during the early current ramp was started, but the earlier operation without benefit of lithium had deconditioned the machine. Helium glow was used between shots to control conditioning, but stable operating conditions were not reached by the end of the day. With the refilled Bay F LITER, the beta feedback XMP065 was completed Tuesday, with successful demonstration of the beta feedback algorithm. The 'new' basis vectors for EFIT reconstructions were also implemented, and much better convergence was achieved. XP1023 was started after 2:30pm, with the goal of exercising RWM feedback algorithms and evaluating machine performance with a single LITER. Fairly good plasmas were made, but not yet with the ultralow l_i from last year, and the flux consumption was higher. Neon glow for CHERS calibration was done Tuesday night. MSE calibrations were finished and a TS window calibration was done Wednesday.

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

NSTX experimental operations continued this past week successfully using beta-feedback control of the neutral beams, lithium evaporation, Liquid Lithium Divertor (LLD) pumping and RWM control in experiments on optimized beta control and RWM stability and control at high beta. Two new lithium evaporator (LITER) probes were filled and installed on the NSTX vacuum vessel last weekend. One of these could not be fully commissioned due to a problem with its torus isolation valve (TIV), and experimental operations was performed this week using the single Bay F unit. The inoperative TIV will be replaced during this coming maintenance week. Also this week, the fiber-optics for the new Beam Emission Spectroscopy (BES) diagnostic were installed, and a calibration of the Motional Stark Effect (MSE) diagnostic was performed. On Friday (April 16), elevated leakage currents were found during the morning center-stack and OH insulation test. This was traced to a small water leak at one of the OH coil leads. Since getting access to the area around the leak would take the better part of the day, operation was suspended and we entered the scheduled maintenance week on Friday.

Access to the NSTX test cell will be available through the coming maintenance week.

Research Operations (M. Bell)

Boundary Physics Operations (H. Kugel)

• Liquid Lithium Divertor (LLD)
- LLD plates were operated in the heated and unheated modes in support of XP1000.

• Lithium Evaporators (LITERs)
- LITER unit F2 was used to support experiments.

• LLD Diagnostics
- The DIMS (Divertor imaging spectrometer) spectrometer has been moved to the D-site diagnostic room and is being set up with controls and input optics. Preparations are in progress for pulling the fibers to the NSTX port.

Diagnostic Operations (R. Kaita)

• Diagnostic calibrations were performed during the past week. They included taking data for

the Nova Photonics Motional Stark Effect (MSE) polarimetry system, and transmission measurements for the Multipoint Thomson Scattering (MPTS) diagnostic.

• The implementation of the Lawrence Livermore National Laboratory Lyman-alpha diode array for edge emission measurements has been completed. The electronics have undergone their first successful tests during NSTX plasmas.