NSTX Weekly Report (Oct. 17, 2008)

FY 2008 NSTX plasma operations

Planned: TBD

Completed: 0 run weeks

• At the 22nd IAEA Fusion Energy Conference being held in Geneva, Switzerland, the following twenty NSTX related presentations were made during the conference, October 13-15: "Overview of Results from the National Spherical Torus Experiment (NSTX)", talk by D.A. Gates; "Suppression of Turbulent Transport in NSTX Internal Transport Barriers", poster by H. Yuh (Nova Photonics); "Momentum Transport in Electron-Dominated Spherical Torus Plasmas", talk by S.M. Kaye; "Plasma Performance Improvement with Lithium-Coated Plasma-Facing Components in NSTX", poster by R. Kaita; "Divertor Heat Flux Mitigation in High-Performance H-mode Plasmas in NSTX", poster by V. Soukhanovskii (LLNL); "An Experiment to Tame the Plasma Material Interface", poster by R. Goldston; "Edge Turbulance, Blob Generation, and Interaction with Sheared Flows" poster by D. D'Ippolito (Lodestar Research Corp.); "Spectral Effects on Fast Wave Core Heating and Current Drive", poster by C.K. Phillips; "Advances in Global MHD Mode Stabilization Research on NSTX", talk by S. Sabbagh; "New Understanding of Tokamak Plasma Response to 3D Magnetic Fields", rapporteured talk by J-K. Park; "Investigation of Electron Bernstein Wave (EBW) Coupling and its Critical Dependence on EBW Collisional Loss in High-Beta, H-Mode ST Plasmas", poster by S. Diem; "Interaction between Turbulence and Neoclassical Dynamics and Its Effect on Tokamak Transport: Gyrokinetic Simulations and Theory", poster by W. Wang; "Comparison of Small ELM Characteristics and Regimes in Alcator C-MOD, MAST, and NSTX", poster by R. Maingi (ORNL); "Turbulent Fluctuations with the Electron Gyro-Scale in NSTX Plasmas", talk by E. Mazzucato; "Theory and observations of low frequency eigenmodes due to Alfvén acoustic coupling in toroidal fusion plasmas", talk by N. Gorelenkov;; "Solenoid-free Plasma Start-up in NSTX using Transient CHI", poster by R. Raman (U. Washington); "Toroidal Alfvén Eigenmode Avalanches in NSTX", talk by E. Fredrickson; "Electrostatic Dust Detection and Removal for ITER", poster by C. Skinner; "Energetic Particle-induced Geodesic Acoustic Mode", poster by G-Y. Fu; and "Electron Cyclotron Current Drive in Spherical Tokamaks with Application to ITER", poster by A. Ram (MIT). (M. Bell)

<u>Engineering Operations (A. von Halle, C. Neumeyer)</u>

The NSTX outage continued this week with the fabrication of a machining fixture needed to bore the in-vessel Beam Emission Spectroscopy (BES) vacuum vessel interface. Actual machining of the BES diagnostic port is expected to begin this coming week. Also this week, additional tiles were removed for modifications needed to measure halo currents in those tiles, and tiles that had been sent to Sandia for ion beam analysis have been returned to PPPL. The rebuilt neutral beam helium refrigerator compressor parts are back at PPPL for re-assembly, and the testing of two spare neutral beam ion sources is in progress. The NSTX test cell will be in free (card reader) access this coming week.

Research Operations (M. Bell)

Boundary Physics Operations (H. Kugel)

• Liquid Lithium Divertor (LLD)
- A step-bent LLD sample was heated in vacuum to 500°C and then allowed to cool to determine if a relaxation of the radius of curvature shape would occur due to the possible release of stresses induced by the bending process. Shape measurements were performed after cooldown and compared with similar measurements made before heating. The measurements indicated no change in the bent shape to within experimental uncertainty of about +/- 0.020"-0.030", and hence, the sample does not exhibit the need to be returned to the vendor for correction. This indicates that an LLD segment rendered in a similar manner will retain its curvature. (S. Jurczynski, R.Ellis, M. Viola)
-The port allocation and feedthrough design for the LLD control and diagnostic cables was completed. (L. Roquemore, H. Kugel, R. Kaita)
-The design of the LLD control and diagnostic rack installation was started and is in progress. (F. Jones)
-A report "Preliminary findings of wetting tests on a porous molybdenum substrate using solid lithium", by Josh Kallman and John Timberlake on off-line sample testing for the LLD was completed. Heating and hydrogen glow discharge cleaning appeared to be beneficial for preparing this substrate for lithium wetting. Solid pieces of lithium placed on the hot molybdenum substrate surface melted, and flowed in all directions including upwards opposing gravity on the surface inclined at a 22 degree angle to mimic the orientation of the LLD in NSTX. Accurate temperature measurements of porous molybdenum using a thermocouple proved difficult and this difficulty has been observed on other occasions. (J. Kallman, J. R. Timberlake)

• Edge Sample Probe
--The Purdue collaboration reported progress on the design of a sample holder for exposing 3 different sample materials simultaneously, and then outgassing each sample individually for absolute measurements and comparisons of absorbed plasma efflux in different PFC materials.(C. Taylor, J. P. Allain)
- NSTX completed a backup-design of a sample holder for exposing 1 sample, and then outgassing the sample for similar measurements. In addition, with automation, this system can be used for measuring relative changes in local recycling conditions following repeated exposures and outgassing measurements during a sequence of discharges. (L.Roquemore)
- Preliminary measurements of the Bay J Sample Probe alignment conditions were performed. The results indicate sufficient clearances to allow insertion of several candidate sample holder designs. The measurements will be repeated with improved accuracy after completion of a special alignment jig. (L. Roquemore)

• Graphite Tile Analysis - The FY08 NTSX graphite tiles sent to SNL for ion beam analysis have been returned and received for reinstallation. (W. R. Wampler, SNL)

• Lithium Collaboration - PPPL personnel (J. R. Wilson, R. Majeski, R. Kaita, and M. Bell) met with G. Mazzitelli (FTU) to discuss collaborations between ENEA/Frascati and PPPL on research with lithium plasma-facing components.(R. Kaita)