

NSTX-U Weekly Report (December 12, 2014)

NSTX-U is in the Upgrade Project outage in FY 2014

The paper "Erosion of lithium coatings on TZM molybdenum and graphite during high-flux plasma bombardment" by T. Abrams (formerly Princeton U., currently General Atomics) et al., was published in Fusion Engineering and Design 89 (2014) 2857–2863. This paper is based on experiments conducted at the Magnum-PSI linear plasma device at FOM-DIFFER in the Netherlands. One key finding of the work was that under the divertor-like plasma conditions in the Magnum-PSI device, the total erosion yields derived from optical emission spectroscopy and Thomson scattering measurements were found to be much lower than might be calculated from Langmuir-law evaporation into vacuum. These latter evaporation rates have long been used as a baseline for estimating temperature limits of liquid lithium PFCs and these new measurements indicate those temperature limits may require revision. (T. Abrams)

On Dec. 8 - 10, 2014, Stan Kaye and Rajesh Maingi of PPPL participated in the ITPA Coordinating Committee Meeting at ITER Headquarters in Cadarache, France. The purpose of the meeting was multi-fold, and it included updates to the ITER Research Plan and system development, Annual Reports and Plans by each ITPA Topical Group, reports by each ITER Partner on their programs to address ITPA needs, a discussion among Program representatives to indicate the level of their commitment to each ITPA Joint Experiment and Activity, and finally a discussion of other items. Rajesh Maingi, Chair of the Pedestal Physics ITPA Topical Group gave a summary of past year work and next year plans, and Stan Kaye gave an overview of the new U.S. DOE data sharing guidelines that will impact collaborations between U.S. and non-U.S. scientists. (S. Kaye)

Joon-Wook Ahn (ORNL) visited Prof. Masahiro Kobayashi, NIFS, Japan, Dec. 8 – 12, 2014, and led an experiment on LHD for the effect of RMP on divertor footprints and divertor plasma characteristics. Measurements of divertor strike line heat flux were made using the IR camera for the first time in LHD, and a systematic variation of density, NBI power, and RMP phase was performed. Initial data showed that applied $m/n=1/1$ RMP fields significantly altered footprints pattern mainly in the helical direction, and no strike line splitting in the poloidal direction was observed unlike the case in tokamaks. High collisionality condition produced plasma response leading to penetration of RMP fields and the growth of islands, for which enhanced asymmetry of heat flux footprints in the helical direction was observed. This data is consistent with the present understanding of the role of plasma response in island formation and edge stochasticization. (J-W. Ahn)

Peter Beiersdorfer of the Lawrence Livermore National Laboratory (LLNL) visited NSTX-U for discussions with PPPL personnel and onsite LLNL collaborators. Spectrometers that cover three spectral ranges at extreme ultraviolet (EUV) wavelengths have arrived from LLNL for NSTX-U, and details of installing them were reviewed. There was also a discussion of the layout of a laser blowoff system from LLNL for impurity transport studies. The laser will be located in an enclosure outside of the NSTX-U Test Cell (NTC) for convenient access when NTC entry is not permitted. The laser will be directed to a compact chamber on NSTX-U with a target array that enables impurity injection at multiple times during a single discharge. (R. Kaita)

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

NSTX Upgrade activities continued with the ongoing installation of the primary vessel seals in preparation for an initial pumpdown. An initial rough pumpdown of the vessel is now scheduled for next week. Bus installation inside the umbrellas continues, and connections to the centerstack Rogowski coils has started. Installation of the new Massive Gas Injector System is in progress.

The Digital Coil Protection System (DCPS) and the Power Supply Real Time Control (PSRTC) development efforts are working towards the start of Field Coil Power Conversion System dummy load testing. DCPS pre-operational testing is nearing completion, and the operation procedure to exercise, set, and verify fault protection algorithms is being developed. PSRTC software testing continued, and procedures for I/O testing, and to simulate and verify the real-time outputs against recorded shots are being exercised.

Preparations for plasma operations in the NSTX-U configuration also continued. Installation of the exit side Torus Isolation Valve for the Multi-Pulse Thompson Scattering (MPTS) diagnostic has been completed, and installation of the bay G flight tube support for MPTS continues. Electricians continue MPTS electrical and safety interlock installations. For the energy conversion systems, power supply open circuit testing continues, and the TF supplies have been completed. Neutral Beam (NB) Power Supply recommissioning also continued with the ongoing dummy load testing of the Modulator Regulators, and the NB Helium refrigerator operations continues round the clock to circulate/clean-up process gas. Cool-down of the refrigerator is scheduled for next week. In the NSTX test cell, vessel gas injectors are being reinstalled, as well as the power systems for the new deuterated trimethylboron (dTMB) injection system.

Access to the NSTX test cell will be available only through previous arrangement with the Upgrade Work Control Center.