

## NSTX-U Weekly Report (Feb. 22, 2013)

### **NSTX-U is in the Upgrade Project outage in FY 2013**

The NSTX-U Program Advisory Committee (PAC) Meeting was held February 19-21 at PPPL. The PAC was charged with assessing the NSTX-U draft 5 year plan for 2014-2018. In particular, the PAC was charged with assessing plans with respect to how well it addresses the key physics issues needed to evaluate the potential of the ST to provide high-performance plasmas for use in a future fusion research facility, plans to investigate key tokamak physics issues for ITER, and plans to contribute to model validation and the development of predictive capability. Additional emphasis was placed on assessing the strength of planned NSTX-U contributions to boundary physics and plasma-material-interaction research, and comments on the plan presentations including logic and format were also requested. The PAC provided very valuable feedback on the 5 year plan content and presentations. The PAC-33 presentations and other info are available at: <http://nstx-u.pppl.gov/program/program-advisory-committee/pac-33> (J. Menard, PPPL)

The paper "Plasma facing surface composition during NSTX Li experiments" by C.H. Skinner (PPPL), et al., was published on-line by Journal of Nuclear Materials, and can be found at <http://dx.doi.org/10.1016/j.jnucmat.2013.01.136>. The article describes laboratory studies of the chemical composition of lithium surfaces exposed to typical residual gases found in tokamaks. Solid lithium and a molybdenum alloy (TZM) coated with lithium were examined using X-ray photoelectron spectroscopy, temperature programmed desorption, and Auger electron spectroscopy both in ultrahigh vacuum conditions and after exposure to trace gases. It was found that lithium surfaces near room temperature were oxidized after exposure to 1–2 Langmuirs of oxygen or water vapor. The oxidation rate by carbon monoxide was four times less. Lithiated PFC surfaces in tokamaks will be oxidized in about 100 s depending on the tokamak vacuum conditions. (C.H. Skinner)

A paper, "2D divertor heat flux distribution using a 3D heat conduction solver in National Spherical Torus Experiment" by Kaifu Gan (ASIPP, China), et al, was published at Rev. Sci. Instrum. **84**, 023505 (2013); doi: 10.1063/1.4792595 (<http://link.aip.org/link/?RSI/84/023505>). Kaifu was an exchange student to PPPL. This paper describes the recent implementation and improvement of a 3D heat conduction code (TACO), incorporating the effect of thin surface layer on divertor tiles, and its application to obtain the 2D heat flux profiles in NSTX. Results are found to be in good agreement with those from a standard 2D heat flux code (THEODOR). An example of toroidal asymmetry in heat flux during ELMs using the 2D data is also provided. Details of inversion techniques to obtain 2D heat flux profiles from the measured surface temperature including the treatment of surface layer effect are given in the appendices. (J-W. Ahn, ORNL)

A paper, "Characterization of the spatial structure of turbulence fluctuations during the edge localized mode cycle in the pedestal region" by Ahmed Diallo (PPPL) et al., has been published in Physics of Plasmas **20**, 012505 (2013). The focus of this work is to investigate the fluctuations limiting the pedestal width growth between ELMs. Using the beam emission spectroscopy and the correlation reflectometry systems, we show that fluctuations are of ion scale propagating in the ion diamagnetic drift direction at the pedestal top. These propagating spatial scales are found to be anisotropic and consistent with ion-scale microturbulence of the type ion temperature

gradient and/or kinetic ballooning modes. This results represent a step toward testing the EPED hypothesis where KBM is postulated to limit the pedestal width. (A. Diallo)

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

NSTX Upgrade construction activities continued this week with the alignments of the new Bay L Nozzle for the MPTS diagnostic. The lid has been installed on the first inner TF quadrant mold, and has been vacuum leak checked. The mold is in the oven and will undergo initial heat tests for additional leak checking and outgassing on Monday (See the attached pictures). The epoxy vacuum impregnation (VPI) is planned for Tuesday and Wednesday.

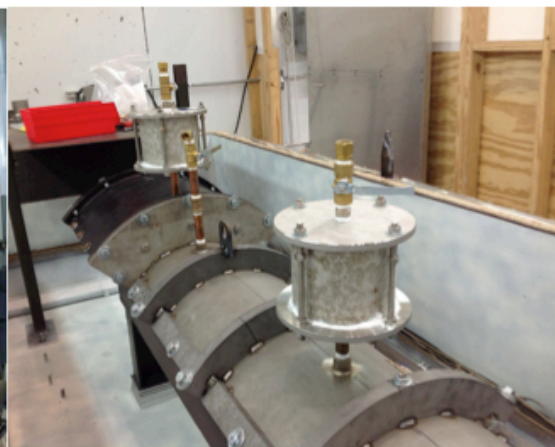
Preparations of non-upgrade equipment for plasma operations in the NSTX-U configuration with the engineering of the locations and cabling for the reinstallation of the machine's center column magnetic sensors.

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

### **TF Quadrant is readied for vacuum pressure impregnation (VPI)**



TF Quadrant VPI mold lowered into the oven.



TF Quadrant VPI mold readied for VPI.