

## **NSTX-U Weekly Report (May 18, 2012)**

### **NSTX-U is in the Upgrade Project outage in FY 2012**

NSTX-U was well-represented at the 19th High Temperature Plasma Diagnostics Conference, held May 6-10 in Monterey, California. NSTX-U collaborator Chase Taylor of Purdue University gave an invited talk entitled "Materials Analysis and Particle Probe (MAPP): A Compact Diagnostic System for In-Situ Analysis of Plasma-Facing Components". There were 13 poster presentations on Diagnostics for NSTX-U presented by NSTX-U collaborators and PPPL staff. (B. Stratton, PPPL)

The article "Suppressing electron turbulence and triggering internal transport barriers with reversed magnetic shear in the National Spherical Torus Experiment" by J. L. Peterson (LLNL) et al. has been published online in [Phys. Plasmas](https://doi.org/10.1063/1.4718456) 19, 056120 (2012). The article contains the first nonlinear gyro-kinetic simulations of electron temperature gradient (ETG) driven turbulence in NSTX electron internal transport barriers. Local simulations identify a strongly up-shifted nonlinear critical gradient for thermal transport that depends on magnetic shear. Global simulations show e-ITB formation can occur when the magnetic shear becomes strongly negative. While the ETG-driven thermal flux at the outer edge of the barrier is large enough to be experimentally relevant, the turbulence cannot propagate past the barrier into the plasma interior. [<http://dx.doi.org/10.1063/1.4718456>] (J. L. Peterson)

M. Ono (PPPL) visited the National Institute of Fusion Science (NIFS), Gifu, Japan on May 17 – 18, 2012 under the US-Japan collaboration agreement to discuss the US-Japan NSTX-U collaboration plan. He discussed various collaboration topics including ECH/EBW, liquid lithium, and superconducting ST design with a number of NIFS researchers including T. Mutoh, Y. Nagayama, H. Kasahara, S. Kubo, H. Hirooka, T. Seki, and T. Tanaka. He gave a seminar entitled "NSTX-U Program Plan and the NSTX Upgrade Project Status." (M. Ono)

B. Heim, a graduate student from Purdue University, just completed a three-week visit to PPPL. As part of his masters thesis research, he was able get diagnostics for the Purdue Materials Analysis and Particle Probe (MAPP) operational in one of the NSTX technology development laboratories. With the X-ray photoelectron spectroscopy (XPS) system, he was able to obtain data with and without lithium coatings on carbon samples. The MAPP is intended to allow analysis of such samples immediately after exposure to tokamak plasmas. The plan is operate MAPP on LTX prior its installation on NSTX after the upgrade. (R. Kaita, PPPL)

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

NSTX Upgrade construction activities continued this week with the completion of preparations for the removal of outer TF #11. The actual removal of TF #11, which is required for upcoming vacuum vessel modifications, is scheduled to occur next week. Most of the old-style TF clevis pads have been removed from the vacuum vessel, and the clevis pads for the Upgrade configuration are ready to be welded in place. Sand-blasting of the first of the inner TF coil conductors, complete with cooling tube, has been completed, and that conductor has been moved to the priming station. Additional inner TF conductors are on site and being prepared for the soldering-in of cooling tubes, and the first TF quadrant mold has been moved to its station in the coil fabrication facility. On the neutral beams, leak checking of components for the 2nd neutral

beam-line continued, and good progress was made on the fabrication and test cell installation of cryogenic lines for two beam operation. The final design of the new firing generator for the field coil power conversion was successfully reviewed, and peer reviews were held on a proposal to improve the CHI gap armor and on NSTX-U magnetic diagnostic needs.

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