

## **NSTX-U Weekly Report (April 27, 2012)**

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

The paper "Simulation of microtearing turbulence in NSTX" by W. Guttenfelder (PPPL), J. Candy (GA), S.M. Kaye (PPPL) et al. was published online in Physics of Plasmas 19, 056119 (2012). This paper presents non-linear microtearing turbulence simulations based on an NSTX discharge showing that the predicted electron thermal transport is dominated by magnetic flutter and is comparable to experimental values. While a stochastic model based on the calculated perturbed field lines can recover the approximate magnitude of transport, it can not reproduce the scaling. Most notably, microtearing transport is predicted to increase with collisionality, consistent with observed NSTX confinement scaling. The predicted transport is also very stiff with electron temperature gradient (and beta to a lesser extent), and can be reduced significantly with experimental levels of ExB shear. Using a synthetic diagnostic approach, calculations suggest that a proposed polarimetry diagnostic may be sensitive to the unique structure of magnetic perturbations from microtearing turbulence. (W. Guttenfelder)

A diagnostic collaboration between the NSTX LLNL group (Alex Tronchin-James and Vlad Soukhanovskii) and the PPPL low temperature plasma (LTP) laboratory (Yevgeny Raitses) has been completed. This work was focused on commissioning the LLNL SPRED vacuum ultraviolet (VUV) spectrometer for NSTX-U divertor measurements. The SPRED spectrometer was mounted on the Penning plasma source in the LTP laboratory. The plasma source operated with argon and xenon gases and provided divertor-like plasma radiation. Excellent VUV sensitivity and spectral resolution properties of the SPRED spectrometer were confirmed. The recorded argon and xenon spectra are being analyzed for plasma diagnostic applications, including plasma temperature, ion charge state distribution, and deviation of plasma electron energy distribution function from the Maxwellian (thermal) distribution, for use in NSTX-U divertor experiments. (V. Soukhanovskii)

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

NSTX Upgrade construction activities continued this week with installation of the new upper primary flux loops, and the ongoing reinstallation of the upper passive plates. The outer TF coil clevis pads are being removed from the vessel, and a new lift fixture needed for outer TF leg removals has been fabricated and load tested. The first four of the new inner TF conductors are now on site, and the soldering of cooling tubes into these conductors is scheduled to start next week. Leak checking of components for the 2nd NSTX neutral beam-line is in progress, along with the refurbishment of the calorimeter for that beam-line. New cryogenic lines for that beam-line are being fabricated and installed in the test cell. Also this week, a successful conceptual design review of the software systems for the new Digital Coil Protection System was held.

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