

## NSTX-U Weekly Report (November 21, 2014)

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

The paper "Dependence of recycling and edge profiles on lithium evaporation in high triangularity, high performance NSTX H-mode discharges" by R. Maingi (PPPL) et. al. was published in the Journal of Nuclear Materials. The paper is available at <http://dx.doi.org/10.1016/j.jnucmat.2014.10.084>. Performance of high triangularity, high elongation discharges was compared with medium triangularity, low elongation plasmas as a function of pre-discharge lithium evaporation. Overall the trends in recycling reduction, ELM elimination, and performance enhancement were very similar between these discharges, while the absolute stored energy/temperature were higher in the highly shaped discharges, owing to higher  $I_p$  and acceptable NBI heating before reaching the global stability limits. These results are favorable for the highly shaped discharges planned in NSTX-U. (R. Maingi)

Joon-Wook Ahn (ORNL) visited KSTAR for November 1 – 11 and performed experiment for the interaction of RMP fields and divertor detachment. Record long ELM suppression (~6 sec) was successfully achieved with mid-plane  $n=2$  configuration. It was found that different plasma shape was necessary to reproduce ELM suppression, depending on the wall condition. Initial attempt of divertor gas puff to produce detachment during the ELM suppression period revealed that confinement degradation was weaker or delayed in the presence of RMP fields compared to the gas puff only reference shot. (J-W. Ahn)

### **Experimental Research Operations (S. Gerhardt, R. Kaita)**

On November 7, the neutron diagnostic system on NSTX-U was calibrated, in preparation for the forthcoming experimental campaign. The calibration was performed with a neutron source mounted on a model train car and run on a set of circular tracks inside the NSTX-U vacuum chamber. This is the same technique that was used previously for calibrations in 2009 and 2011. A new neutron source, obtained through a transfer from ANL earlier this year, was used. The significantly greater intensity of the new source allowed the calibration to be completed within 6 hours, a considerably shorter period than the several days needed in 2009 and 2011 when a substantially-decayed source dating from ~1980 had been used. Dosimetry results indicated radiation exposures below the minimum detectable threshold for all personnel involved in the calibration, in keeping with ALARA principles. Dr. Kunihiro Ogawa from the LHD group (NIFS, Japan) observed the calibration, in anticipation of a similar calibration that is to be done on LHD a few months from now. (D. Darrow, PPPL)

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

NSTX Upgrade activities continued with the completion of all planned in-vessel work. After completion of diagnostic installations, mid-plane in-vessel surfaces were blackened, and surfaces wiped with alcohol. The final neutral beam duct is now being installed, and primary vessel seals are being made up in preparation for pumpdown. NSTX-U Engineering Work Packages are in the process of being closed out.

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. Installation of the DCPS has been completed, and operational testing continues. Using the DCPS autotester to inject data from earlier NSTX shots, the new PSRTC control outputs were found to match archived outputs.

Preparations of non-upgrade equipment for plasma operations in the NSTX-U configuration also continued. Installation of the exit side flight tube for the Multi-pulse Thompson Scattering (MPTS) diagnostic up to the vessel TIV is in progress, and MPTS electrical installations in the test cell continue. Conduit runs for the new Tri-Methyl Boron (TMB) injection system are being installed. Testing of the inner and outer vacuum vessel magnetic sensors has been completed. The neutral beam helium refrigerator compressors have been started, and the cleaning up of process gas is in progress on 12 hour/day shifts.

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