

## NSTX-U Weekly Report (June 29, 2012)

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

Kevin Tritz (Johns Hopkins University) visited EAST June 10th-17th to discuss and review a preliminary design for a multi-energy soft X-ray (ME-SXR) edge system scheduled to be installed for the EAST 2013 run campaign. Meetings were held with Dr. Guosheng Xu and Dr. Wei Zhang to discuss the design and allocation of construction and procurement responsibilities. The system is based off a variable gain, multiple diode array system that operated on NSTX during the last few weeks of the 2010 run campaign. The primary purpose of the diagnostic is to provide fast ( $>10\text{kHz}$ ), multi-energy SXR profile information with high spatial resolution ( $\sim 1\text{cm}$ ) that can be used to extract electron temperature and density profiles from the filtered X-ray signals. In addition to contributing to the physics understanding of edge phenomena on EAST (ELMs, NTMs, impurity transport, disruption quenches), implementing this initial edge ME-SXR system on EAST will provide valuable operational information for design optimization of a core/edge system funded for the NSTX upgrade experiment, as well as an expanded core/edge system at multiple toroidal locations proposed for EAST through the recent International Collaboration solicitation from DoE. The preliminary EAST ME-SXR design was accepted, and a rough timetable was laid out proposing that the system be ready for testing at EAST late spring/early summer of 2013 with machine installation to follow later that year, with the exact schedule contingent on the details of the EAST outage timetable. (K. Tritz)

Gary Taylor (PPPL) visited ASIPP in China from June 15-21 to collaborate on ion cyclotron resonance heating (ICRH) experiments in EAST. During the first two days of his visit he finalized plans for ICRH experiments with Drs. Xinjun Zhang and Chengming Qin of the ICRH group. He presented two experimental proposals at the EAST morning physics meeting on June 18 on behalf of the ICRH group. One experiment had the goal of developing and studying H-modes generated by ICRH alone (that is without additional lower hybrid heating (LHH)), and the other had the goal of studying the transition from the He-3 minority regime to the D(He-3) mode conversion regime. Several sustained ICRH-only H-modes were successfully generated for the first time in EAST. The best H-mode plasmas lasted for over 3 s and were only terminated when the ICRH power was turned off. These long-duration ICRH-generated H-mode plasmas were characterized by a 200 ms ELM-free period immediately following the L-H transition, followed by a "grassy" ELMing phase that lasted until the H-L back transition. The ELM frequency was in the range 150 - 500 Hz during this ELMing phase and there was no sign of plasma performance degradation. There was a 30% increase in stored energy at the L-H transition and  $T_e(0)$  and  $T_i(0)$  increased by 300 eV during the H-mode phase. The L-H transition power was not lowered after a 2-hour lithium deposition on the morning of June 20, so access to the H-mode regime was probably achieved as a result of long-term wall conditioning. L-H transitions were only observed for a narrow range of axial toroidal magnetic field around 2 T, and for a narrow range of target  $n_e L$  between  $1.6 \times 10^{19} \text{ m}^{-2}$  and  $2.8 \times 10^{19} \text{ m}^{-2}$ . H-modes were generated for plasma currents between 400 and 600 kA, but most of the experiment was performed with 500 kA discharges. At least 1.5 MW was needed to generate an L-H transition. During Gary's visit he also discussed progress on the new ECE imaging system with Chen Luo, who is a graduate student working on the diagnostic. (G. Taylor)

The NSTX Team Meeting was held on June 26, 2012. The meeting presentation material is

available on the NSTX web page. (M. Ono)

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

NSTX Upgrade construction activities continued this week with the clean-up of the vessel after the cutting and removal of the bay J-K nozzles, and the preparation for the cutting of the vessel in that area to add the new bay J-K cap and neutral beam port. The vessel cutting and subsequent welding in place of the bay J-K cap is scheduled to start on July 10th. New TF clevis pads are being welded into place on the vessel as they come out of our shops. Plasma cutting trials have been completed to determine the size of containment needed for the umbrella leg cutting. Containment for the lower umbrella has now been fabricated, and protective covers are being installed over the PF coils. In the coil fabrication facility, four of the eight inner TF inner conductors with cooling tubes soldered in place have been cleaned and primed, and the taping of insulation is in progress on the first. The TF quadrant mold is being reworked in the shops. On neutral beams, a new drive mechanism has been installed on the neutral beam (NB) #2 calorimeter, and calorimeter water lines are being trimmed and welded. Assembly of the NB#2 ion dump also continued. Both NB torus isolation valves have been set up for cycle tests and vacuum leak checking.

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