

## NSTX-U Weekly Report (June 17, 2016)

### **FY 2016 NSTX plasma operations**

**Operation Targets: Total – 18 run weeks**

**Completed: 8.95 run weeks and 940 plasma shots**

M. Podestà (PPPL) presented a summary of results from the initial operation of the NSTX-U Real-Time Velocity (RTV) diagnostic at the NSTX-U Monday meeting on 06/13. The RTV system, based on active charge-exchange recombination spectroscopy, provides toroidal plasma velocity data from four radial locations at a maximum sampling rate of 5kHz. Analysis is performed in real-time during a discharge and velocity data are provided to the NSTX-U Plasma Control System, as required for future implementation of rotation feedback. Post-discharge analysis tools have also been developed to complement regular CHERS results with velocity, carbon temperature and carbon density at high sampling rate. Initial data from the FY16 Run confirm that the design goals have been met or exceeded, with rotation data routinely dispatched to PCS and the possibility of supplying ion temperature data in real-time under consideration. Examples from post-discharge analysis illustrate the capabilities of the RTV system to capture fast dynamic of events such as sawteeth and plasma response to instabilities. (M. Podestà)

Jack Lovell (Durham University/CCFE) visited PPPL from 6/10-6/20 to work with Matthew Reinke (ORNL) and Greg Tchilinguirian (PPPL) on getting the new D-tAcq FPGA-based bolometer analyzer hardware integrated into MDSPlus and demonstrate its capabilities relative to existing analog solutions. (M. Reinke)

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

A dry run for lithium loading of the NSTX-U lithium evaporators (LITERs) with the "lithium filler for LITER" (LIFTER) was successfully conducted in the South High Bay. The LIFTER system is used to pump liquid lithium into the LITER reservoir using argon gas. The hardware for controlling the argon flow and the lithium reservoir heaters was determined to be operational. The two LITERs used in the LIFTER dry run have been exchanged with the two that have already been checked with the remote insertion system on NSTX-U. Once remote insertion control is tested for the second two LITERs, all four of them will be ready for lithium evaporation. (R. Kaita, PPPL)

The Johns Hopkins University Transmission Grating Imaging Spectrometer (TGIS) has been installed on the machine at Bay I and under vacuum for several weeks. The TGIS is designed to measure spatially resolved spectral lines in the XUV-VUV range, 50-700Å with frame rates up to 50Hz. Using these measurements, the TGIS will provide important information with regard to impurity concentration profiles and transport,  $Z_{\text{eff}}$ , as well as support the fast Te profile measurements with the ME-SXR neural network analysis. This past week the electrical installation of the TGIS was completed, including an extension of the camera power cable and routing of an active USB cable and USB-fiber media converter, with installations at racks 435 and 400. The diagnostic gate valve was opened to the vessel. Diagnostic checkout with a local laptop system was completed successfully. (K. Tritz, Johns Hopkins)

Work on the electrical and mechanical installations for the Bay-J Upper Infrared Video Bolometer (IRVB) are nearing completion, with final tests of remote operation of the IR camera

during NSTX-U operations to be completed early next week. The IRVB is ready to open to NSTX-U vacuum and take data following demonstrations that show camera triggering and data collection are robust. (M. Reinke, ORNL)

On HHFW #5 - 6, their newly-rebuilt AC power systems were successfully run last week into NSTX-U for antenna conditioning. Antenna voltages reached 20kV similar to the values reached for HHFW #1 - 4 earlier. HHFW #4 RF power feedback controller was extensively bench-tested. The system operated correctly up to at least a megawatt in subsequent testing. The new protective relays have been installed on the RF power yard feeder breakers Q6B5 and Q6B3. "Transfer-trip" testing of Q6B3/Q6B5 from the RF Power Yard relays will start on Monday. This involves extensive timing tests using GPS-synchronized clocks at each end. On NSTX-U, HHFW antenna conditioning and operations using all six sources will resume next Wednesday. (N. Greenough, PPPL)

### **Engineering Operations (A. von Halle, P. Titus)**

All new NSTX-U PF1A support installations have been completed. Analysis of the as-built configuration has been reviewed, and calculation checks are nearing completion. Test Cell area scrubs have been completed, and a full set of field coil electrical insulation tests (high pots) have been performed. Coil power testing will now utilize four new cameras at the top and bottom of the vessel and a fifth at the mid-plane, all with archiving ability. The mounting of the strain gauges on the outer TF coils, as needed to confirm design criteria for increasing our TF Field strength, has been completed. Neutral beam ion source conditioning continued this past week, and the HHFW antennas have been vacuum conditioned to 20kV. Integrated system control testing of the F2 & K2 lithium evaporator (LITER) probes currently installed on the NSTX-U vessel has been completed, as well as pre-operational testing of the F1 & K1 LITER probes installed on the fill stand. Making preparations to swap the FI/K1 and F2/K2 LITER probes to complete fill and cycling pre-operational testing on all probes. Also this week, electrical Installation activities associated with the Bay J IR Video Bolometer (IRVB), the Trans Grating Spectrometer, and the FIRETIPS diagnostic were completed, and final design reviews for the planned High Z tile installation and the OH Coil Preheater system were held.

The NSTX-U Test cell will be in restricted access this coming week during plasma operations. Limited access is expected to be available for approved work on second shift.