

## NSTX-U Weekly Report (July 15, 2016)

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

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

**Completed: 10.06 run weeks and 1066 plasma shots**

The NSTX-U Team Meeting was held on July 15, 2016 at PPPL. The NSTX-U team was updated on the on-going PF 1A blockage issue and the restart of plasma operations and the run plan for FY 2016 and beyond. The meeting material is available on the web at: [http://nstx.pppl.gov/DragNDrop/NSTX\\_Meetings/Team\\_Meetings/2016/2016-07/](http://nstx.pppl.gov/DragNDrop/NSTX_Meetings/Team_Meetings/2016/2016-07/). (M. Ono, J. Menard, PPPL)

Francesca Poli (PPPL) has visited the ITER Organization on July 11-13. She has reported on PPPL progress on the HCD analysis within the contract on EC power management. She met with the HCD department and with the Science and Operation Department to discuss the use of RF and NBI as actuators. Focus was on the use of IC and EC for sawtooth control and of EC for NTM control. She presented TRANSP simulations with real time feedback of NTMs and discussed the implications of this analysis on the required precision in the detection of the island, on the accuracy of real-time magnetic equilibrium reconstruction, and priorities in the decisional trees for shared actuator control applications. (F. Poli)

Walter Guttenfelder and Chuck Kessel of PPPL traveled to MIT July 13-15 to lead an experiment on Alcator C-Mod titled “Transport and turbulence validation at high beta and low rotation”. ITER-like H-mode discharges with  $\beta_N=1.8-2.2$  were achieved using 4-4.5 MW of ICRF power at low field (2.7 T). Full profile data was measured using Thomson scattering and crystal imaging x-ray spectroscopy. PCI and polarimeter fluctuation data were also acquired. These discharges will be used to validate the quantitative impact of electromagnetic effects on transport at ITER-like beta values through the use of gyrokinetic simulations coupled with synthetic diagnostic calculations. (W. Guttenfelder)

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

NSTX-U plasma operations remained on hold this past week during recovery from the PF1aU coil water leak. A low temperature ( $< 90^\circ\text{C}$ ) electrical bake of the center stack to dry residual water was completed, and vessel/coil system insulation tests (Hi-Pots) performed. All coils were able to withstand rated Voltages, but the TF system's electrical leakage was higher than seen in earlier tests. This was believed to be due to trapped moisture at the base of the center column. A nitrogen purge was established at the bottom of the center column, and dramatic reductions in the electrical leakage are being recorded. This will continue until former levels of TF electrical insulation are restored. The PF1aU coil will not be used for the remainder of this year's run campaign, and plasma operations will resume with the new XMP-155 (L-mode development w/o PF1aU) to assess the use of PF2 for similar plasma shape control. Arrangements are being made to have the PF1aU coil analyzed and replaced during the upcoming outage. In parallel with the drying work this week, good progress was made on the commissioning of new capabilities. The Material Analysis Particle Probe (MAPP) automated remote position control was tested as a final step in sample exposure and analysis capability for plasma operations. Pre-operational testing of the Lithium Evaporator (LITER) probes has been completed, and all systems are ready to support the lithium fills of the probes. The MGI, the MAPP diagnostic, and the LITER probes

are all ready to support NSTX-U plasma operations. Also this week, conditioning of the six neutral beam ion sources continued, and the vacuum conditioning of the HHFW antennas was completed. The HHFW Antenna/RF systems are now ready to tune into a plasma.

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

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

The mid-plane and the lower divertor MGI valves were successfully commissioned in nitrogen, helium, and neon at the full operating pressure planned for the FY16 experiments. The system is now ready to support plasma operations. (R. Raman, University of Washington)

The first machined high-Z tile was received from the vendor for examination. All of the dimensions of the features were well within specifications, and the surface finish exceeded requirements. The surface hardness was tested, and the absence of any effects due to heating from the electrical discharge machining (EDM) process was verified. The vendor was thus instructed to proceed with the remainder of the tile machining. (R. Kaita, PPPL)