

## NSTX-U Weekly Report (January 22, 2016)

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

**Operation Targets: Total - TBD**

**Completed: 2.33 run week and 241 plasma shots**

### **Run Coordination (J. Menard, S. Gerhardt)**

A full bottle boronization was performed on 1/17/2016.

Magnetics calibration shots under XMP-106 [Magnetics Calibrations, Myers] were conducted for approximately 1.5 hours on 1/18/2016. These were followed by operations under XMP-116 [Initial H-mode Development, Battaglia et al] for the remainder of 1/18/2016. Routine H-mode access was achieved with beam powers ranging from 1 - 3 MW and the H-mode period was extended up to 700ms (202930). Operations on 1/19/2016 continued with XMP-116 where the LH transition was moved earlier to the start of flattop. This effort resulted in achieving the first discharges to exceed 150 kJ of stored energy (202946) and the internal inductance remaining below one for the length of the H-mode flattop (202951).

1/20/2016 and much of 1/21/2016 were dedicated to troubleshooting an increased leakage resistance during inner vessel high-pots. The cause was found to be a reduction of the electrical isolation between the inner vessel and the PF-1cU coil. This coil was not needed for operations during the rest of the week, and so it was put in a safe state and will be inspected during the upcoming maintenance period. The remainder of 1/21/2016 was dedicated to running step 3.1 of XMP-121 [6 SPA Checkout, Gerhardt]. The goal of this step was to run the Resistive Wall Mode (RWM) coils via the dedicated Switching Power Amplifiers (SPAs) during plasma shots. After some debugging of related PCS code, this was successfully accomplished.

In the evening of 1/21/2016, a short Ne GDC was performed for CHERS calibration under XMP-134. The Ne glow was followed by an hour of He GDC.

The morning of 1/22/2016 was dedicated to running additional shots towards XMP-116 with the continued goal of diverting earlier in the discharge in order to enter H-mode at lower values of  $l_i$  and larger elongation. While H-mode was achieved, diverting earlier in a double null (DN) shape made the discharges prone to vertical instabilities. In response, diverting in a lower single null (LSN) shape was pursued, however H-mode access was found to be more difficult in this configuration. This effort will benefit from improvements to the vertical feedback control (see XP-1506 summary below), larger heating power and ISOFLUX shape control, which is ready for deployment when operations resume.

The afternoon was dedicated to running steps from XP-1506 [L-Mode Error Field Studies, Myers]. The objective was to perform a 'compass scan' to identify the mode locking threshold as a function of the applied  $n=1$  error field. An ohmic L-mode scenario was chosen to eliminate the effect of beam-driven rotation on the locking threshold. Numerous discharges were taken, each using the RWM coils to apply a ramping  $n=1$  error field at a particular phase. Mode locking was observed, and the data are now being analyzed to determine if any gross error fields can be detected. During this XP, some adjustments were made to the vertical position control

configuration, and these modifications appear to have been beneficial. These will be utilized in future NSTX-U operations, including the H-mode XMP where they may prove quite beneficial.

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

NSTX-U plasma operations continued this week after completing another vacuum vessel boronization over the weekend. Operations this week utilized neutral beam injection, and added the Switching Power Amplifier (SPA) driven Resistive Wall Mode (RWM) coils for the first NSTX-U experiments on error field correction. Also this week, the Gas Injection System (GIS) was configured for a period of neon glow for an off-hours diagnostic calibration. Our daily electrical insulation tests (Hi-Pots) identified a degradation of the PFIC upper coil insulation (not currently being used for NSTX-U experiments), and that coil has been drained and the power supply disabled to continue experimental operations. Troubleshooting will continue during the 2 week maintenance period starting this coming week. Other activities in addition to planned maintenance for this period include lithium system preparations such as the installation of the argon dump system and LITER controls, commissioning of new diagnostics, and GIS upgrades.

The NSTX-U Test Cell will be in controlled access this coming week for approved work.