

NSTX-U Weekly Report (September 23, 2016)

FY 2016 NSTX plasma operations completed **Completed: 10.06 run weeks and 1066 plasma shots**

The NSTX/ NSTX-U Results Review was held on Wed. and Thurs, Sept. 21 and 22, 2016, in which members of the Research Team (both on- and off-site) gave short summaries of research accomplishments and ongoing studies over the last year. These summaries included analysis of NSTX data as well as research and Experiment summaries from the initial operational period on NSTX-U. In all, 54 presentations were made, with the following breakdown: Materials and PFC (6 presentations), Energetic Particles (8 presentations), Waves (3 presentations), Advanced Scenario Control (9 presentations), Pedestal and Divertor (6 presentations), Macroscopic Stability and Solenoid-Free Start Up (10 presentations), and Transport and Turbulence (12 presentations). (S. Kaye, PPPL)

Felipe Bedoya successfully completed his preliminary examination for the doctoral program in the Department of Nuclear, Plasma, and Radiological Engineering at the University of Illinois at Urbana-Champaign (UIUC). Bedoya presented the proposal for his thesis research, which included the examination of samples exposed during boronization and NSTX-U plasma operations. He was able to analyze them without exposure to air with the Materials Analysis and Particle Probe (MAPP) while at PPPL. Bedoya will continue studying the MAPP samples at UIUC, where he can do a comparison with samples from NSTX-U divertor tiles. (R. Kaita, PPPL)

R. Michael Churchill, Alexandre Fil, Robert Lunsford, and Rajesh Maingi of PPPL visited DIII-D from Sept 12–16 to discuss enhancing and expanding collaboration opportunities during the ongoing NSTX-U outage. Michael Churchill presented a talk entitled “Kinetic simulations of scrape-off layer physics in the DIII-D tokamak” to the Boundary and Plasma Materials Interaction Center. In addition Alexandre Fil presented “Modeling of lithium granule injection with M3D-C1” and Robert Lunsford presented “Multi-species granule injection on DIII-D and NSTX-U” to the PedELM group. Productive discussions were had with both DIII-D researchers and PPPL scientists stationed at GA about the most beneficial way to utilize the contributions of PPPL scientists during the upcoming year. They also examined the operational prototype of a new method of regular frequency granule delivery developed by PPPL engineer Alex Nagy and discussed the possibility of its implementation in upcoming DIII-D experiments. (R. Lunsford)

Rob La Haye of General Atomics visited PPPL for the NSTX-U results review and to work with Lucas Morton (ORAU) on preliminary analysis of $n=1$ tearing modes in NSTX-U (for comparison to NSTX). (R. LaHaye)

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

NSTX-U in-vessel diagnostic calibrations will continue first and second shift six days a week into the first week of October. CHERS/FIDA and BES spatial calibrations have been completed, and electrical installations for the S-Flip and I-Flip diagnostics continue. IR camera calibrations have been completed. The rack for the RF Langmuir diagnostic has been installed and electrically tested. The procedure for the dissection and borescope inspections of the damaged

PF1aU coil is being developed, and a procedure review will be scheduled. Set-up of the coil winding facility continues. The neutral Beam helium refrigerator compressors have been removed for scheduled maintenance. A cost/schedule review of the design/installation plans of the new Cryopump Divertor (CPD) was held this week. Also this week, the NSTX-U FY16 Results Review was held. The FY-16 technical run assessment is planned for next week.

Access to the NSTX-U Test Cell is expected to be available for approved work this coming week.

On September 19, 2016, a Peer Review was held to review the status of the forensic investigation of the failed NSTX-U PF1A-U coil. The Peer Review served two purposes. First, it reviewed all of the non-destructive evidence obtained to date, including a summary of anomalies uncovered by extensive radiography. Second, based on these results, it was proposed to initiate the destructive part of the investigation by cutting the coil into three distinct sections that would preserve all of the potential evidence in the coil. Cutting methods were reviewed and end mill cutting at PPPL was agreed as the best approach. During the cutting process, care will be taken to capture any coolant and/or residue released by the coil. Following coil sectioning, a series of initial tests will be performed including individual turn borescoping, electrical and pressure/vacuum tests. These tests will hopefully indicate compromised locations within the coil that may have either caused or led to the coil's failure. Braze joints and joggles will be examined as part of this investigation. Presently, procedures and documents (NEPA, JHA, etc.) are being prepared for review that will outline the sectioning and initial testing processes. A Package Review is planned to assure that a consensus is reached by all stakeholders. Depending on the results, initial testing may be followed by additional testing, including CT scanning of coil sections. The investigation is fluid depending on the evidence found, however, additional steps will not be taken without being reviewed by a peer group first. (I. Zatz, PPPL)

Plans are being developed to organize activities and provide resources to accomplish multiple tasks to improve NSTX-U facilities. The NSTX-U outage will include the replacement of both upper & lower PF1A coils as well a number of ex & in-vessel tasks. The design of the newly improved PF1A coils will eliminate multiple features, which in the past, complicated the fabrication process. The PF1A coils will likely be fabricated in parallel at both PPPL & a qualified external vendor to meet schedule goals. Machine disassembly is going well and design efforts are in process to make the noted improvements. (D. Loesser, PPPL)

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

In vessel diagnostic calibrations started on Monday 9/19, with the completion of the BES (beam emission spectroscopy) spatial calibration (D. Smith, UW). On Tuesday early AM, photos were taken to support the spatial alignments of the University of Tennessee spectroscopy system (K. Gan, UT). The bulk of time on Tuesday, Wednesday, and Thursday was dedicated to spatial calibration of the vertical FIDA (fast ion D-Alpha), ERD (edge rotation diagnostic), rtV (real time velocity), poloidal CHERS (charge exchange recombination spectroscopy), and toroidal CHERS systems (M. Pedesta, PPPL, R. Bell, PPPL, D. Liu, UI). Time was also spent on Thursday early AM on the ORNL IR (Infrared) camera calibrations (T. Gray, J-W. Ahn, ORNL), and on Friday AM on the ORNL reflectometer (C. Lau). Time was also spent on Thursday and Friday to complete the spatial calibration of the two T-FIDA (tangential-) system. Finally, Friday ended with the start of spatial and photometric calibrations for the various LLNL spectroscopic

imaging systems which will continue over the weekend and into next week (F. Scotti, LLNL).