

NSTX-U Weekly Report (March 10, 2017)

FY 2017 status: NSTX-U is in a maintenance and repair outage.

NSTX-U Recovery Project (R. Hawryluk)

The four day NSTX-U Extent of Condition review was held this past week, and the review committee focused on the proposed corrective actions that were the result of the first five DVVRs. The review panel debriefed the Project debrief on Thursday afternoon and is in the process of writing their report. Tom Todd, the head of the Extent of Condition (EOC) Committee and former chief of technology at the Culham Centre for Fusion in England chaired the meeting. Members of the committee were: Richard Callis, of General Atomics National Laboratory; John Smith, project manager at General Atomics; Martin Cox, of the Culham Centre for Fusion Energy; Rem Haange, former ITER technical director; Michel Huguet, former head of ITER EDA site in Naka; Brian LaBombard, of MIT's Plasma Science and Fusion Center; Ronald Parker, emeritus professor at MIT's Plasma Science and Fusion Center; and Dennis Youchison, of Oak Ridge National Laboratory. In addition, some of the EOC members, F. Cassella and Graeme Murdoch from the US ITER Project Office and Ursel Fantz from IPP, Garching, participated remotely. Also attending was Josh King, program manager for Spherical Tokamak at the DOE's Fusion Energy Sciences (FES) program along with Mark Foster and Matthew Lanctot who participated remotely. The next Design Verification and Validation Review (DVVR) will review the NSTX-U Test Cell, and will be held this coming Thursday.

Regarding test cell work, the Poloidal-CHERS diagnostic passive plate tiles have been removed from the vessel in preparation for upgrades to the passive plates and mounting structures. Installation and alignment of waveguides for the FIRETIPS diagnostic continues. Recommissioning of the coil winding facility also continued with the mounting of a PF1a Lower mandrel on the winding table and the completion of testing of recent adjustments to the conductor tensioning skid. The procedure for the flow testing of the spools of copper conductor is in final approval. Installation of power components for the PF1 coil test stand in the Field Coil Power Conversion Building has started.

Maintenance of the motor generator (MG#1) continues to make good progress with the reinstallation and successful testing of the thrust bearing heat exchangers. Team Industrial reps were brought on site this week to re-inspect MG#1 rotor welds, with no issues found. An inspection of the MG#1 lower guide bearing revealed more wear than expected after 576 hours of run time, and Voith Hydro and PPPL Engineering will meet this coming week to further evaluate.

NSTX-U Research (J. Menard)

Members of the LLNL-NSTX-U Collaboration travelled to General Atomics to work with the DIII-D Team on divertor diagnostics and divertor research topics from 27 February to 3 March. Vlad Soukhanovskii (LLNL Group Leader) worked with LLNL staff on the divertor vacuum ultraviolet spectrometer SPRED scheduled for installation later this year. He also discussed with DIII-D physicists divertor detachment and snowflake divertor experiments planned for the NSTX-U Experimental Campaign on DIII-D. Filippo Scotti (LLNL Research Staff) worked on data acquisition and software upgrades for the divertor tangential cameras operated by LLNL. The radiation hardened cameras, originally developed by LLNL on DIII-D, were installed and operated by LLNL on NSTX-U in 2016. Filippo Scotti also discussed planning of lithium transport and divertor experiments with DIII-D researchers.

The article "Exploration of magnetic perturbation effects on advanced divertor configurations in NSTX-U" by H. Frerichs, O. Schmitz, I. Waters, G. P. Canal, et al. in *Physics of Plasmas* 23, 062517 (2016) has been selected as one of 2016's Most Read Articles in *Physics of Plasmas*.

Matthew Reinke visited the WEST facility at CEA-Cadarache from 3/5 through 3/10. This visit developed a plan to deploy and adapt the THACO software for x-ray crystal spectroscopy analysis on WEST, looking forward to eventual use NSTX-U, in collaboration with MIT. Additionally, he met with a variety of diagnosticians and engineers responsible for IR thermography, calorimetry, bolometry and fiber Bragg grating diagnostics and discussed the design and plans for the WEST wall monitoring system to help protect the plasma facing components.

C. Myers traveled to General Atomics to participate in DIII-D magnetics calibration efforts. The purpose of this trip was to apply broadband AC chirp waveforms to the DIII-D poloidal field and ohmic coils (the F and E coils, respectively) with the aim of improving real-time 3D magnetic sensor calibrations on both DIII-D and NSTX-U. In collaboration with E. Strait (GA), A. Hyatt (GA), S. Munaretto (GA), and J. Hanson (Columbia U), all 19 of the required AC vacuum field shots were obtained. Data analysis is underway.

R. Raman remotely participated in the ITER Disruption Mitigation Workshop (March 8 to 10) held at ITER headquarters. The meeting reviewed the physics basis for the ITER disruption system (DMS), reviewed the current baseline design for the DMS, and discussed alternate mitigation concepts. The Electromagnetic Particle Injection Concept (EPI) was discussed as one of the alternate injection concepts considered at the meeting.