

## **NSTX-U Weekly Report (March 31, 2017)**

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

### **NSTX-U Recovery Project (R. Hawryluk)**

The ninth of the twelve planned Design Verification and Validation Reviews (DVVR's) was held this week, this one reviewing the NSTX-U Vessel Bakeout systems, and observations / suggestions (chits) are now being organized into corrective actions.

Regarding test cell work, trial fit-ups of the Poloidal-CHERS diagnostic in-vessel passive plates were performed, and final machining of mounting structures is in progress. Installation and alignment of waveguides for the FIRETIPS diagnostic continues, as well as adjustments to the Deposition Monitor and Dust Collector. Neutral beam armor plates are being removed from the vessel for vacuum leak checking and leak repairs.

Recommissioning of the coil winding facility also continued with a heat run of the bake-out oven to test the VPI seal on the trial PF1A mandrel. Installation of buswork for the PF1 coil test stand in the Field Coil Power Conversion Building continues, and the fabrication of the pump cart needed to meet PF1 coil cooling water requirements has been completed. Voith Hydro Inc. has completed inspections of the Motor Generator Lower Guide Bearing shaft journal, and results are being reviewed by PPPL and Andritz Engineering. Conditioning of the deionized water to the first spare neutral beam ion source is making good progress, and that source should be ready for electrical insulation tests by next week. A second spare source is being assembled in the Clean Room. Also this week, the final design of the OH water heater Instrumentation and Controls was reviewed.

### **NSTX-U Research (J. Menard)**

The paper titled "Perturbative momentum transport in MAST L-mode plasmas" by W. Guttenfelder et al. was published in Nuclear Fusion [<https://doi.org/10.1088/1741-4326/aa6501>]. The paper is a result of a PPPL-CCFE collaborative experiment run during the NSTX Upgrade outage as part of an ITPA activity. It investigates the measurement and prediction of momentum pinch in MAST L-modes to complement previous experiments and analysis reported for NSTX.

O. Izacard (LLNL, in research assignment at PPPL) published the article entitled "Generalized fluid theory including non-Maxwellian kinetic effects" in the special issue of Journal of Plasma Physics 83 (2017) 595830201 [<https://doi.org/10.1017/S0022377817000150>] for the Nathaniel J. Fisch symposium on Solved and Unsolved Problems in Plasma Physics. The main result of the proposed generalized fluid theory is the discovery of the origin of particle diffusion and heat conduction via the interpreted non-Maxwellian (called INMDF). The diffusion and conduction are due to the competition between a growing INMDF on short time scales due to spatial gradients and the thermalization toward the Maxwellian on longer time scales. The new non-Maxwellian fluid equations could initiate the next generation of fluid codes including kinetic effects and can be expanded to other scientific disciplines such as astrophysics, condensed matter or hydrodynamics.

Steve Sabbagh attended the DIII-D Program Advisory Committee as a committee member.