

NSTX-U Weekly Report (September 29, 2017)

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

Recovery

In the Coil Winding Facility, preparations of the test bundle and VPI mold continues with the documentation and labeling of manifold valving and lines. Overall system vacuum leak checking is in progress, and adjustments were made to the system overflow tank this week. The test VPI is planned for mid-October.

Engineering has reviewed bus work and support installations needed for inner PF Coil power testing on the Field Coil Power Conversion (FCPC) Test Stand, and is working on additional bus clamps and insulation details for the coil flag area.

Inspections and cleaning of Neutral Beam #1 internals has started. Also this week, Preliminary Design Reviews (PDRs) were held for the low heat flux plasma facing components and for the replacement of the Torus Vacuum Pumping System (TVPS) backing pump and the pump cooling system.

Research

Z.R. Wang attended to 1st Asia-Pacific Conference on Plasma Physics (Sep 18-23, 2017) and gave an invited talk entitled "Full toroidal computation of resistive MHD instabilities based on asymptotic matching approach". The singular Galerkin method developed in resistive DCON to solve the outer and inner region delta prime was described. A successful benchmark between resistive DCON and PEST-3, which are the two only existing codes solving delta prime in full toroidal geometry, has been carried out. Resistive DCON exhibits more robust convergence than PEST-3 code when beta approaches the ideal wall limit. Recent progress in resistive plasma response using resistive DCON was also described.

Devon Battaglia gave an NSTX-U Physics Meeting talk entitled "Startup Development for MAST-U". Devon discussed the details of his two month stay at MAST-U, helping them to define null field and plasma startup scenarios once they commence operating. Devon brought tools, such as LRDFIT, to bear on this study, making these tools available for MAST-U researchers, and teaching them how to use them.

The paper "Two-dimensional turbulence cross-correlation functions in the edge of NSTX" by S. J. Zweben, D. P. Stotler, F. Scotti, and J. R. Myra, has been published in Physics of Plasmas 24, 102509 (2017); doi: 10.1063/1.5002695. This paper described the radial vs. poloidal cross-correlation functions of edge plasma turbulence as measured near the outer midplane using a gas puff imaging (GPI) diagnostic on NSTX. The ellipticity and tilt angle of the positive cross-correlation regions and the minimum negative cross-correlation and total negative over positive values were evaluated for 15 locations in the images for 20 shots. There was a significant variation in these correlation results within this database, and possible causes for this variation are discussed.

R. Kaita gave a seminar entitled "Challenges in Modeling of Plasma-Material Interactions for Fusion Applications" at the Institute for Advanced Computational Science at Stony Brook University in New York on September 28. The talk described how modeling has been successful in explaining many of the features of controlled thermonuclear plasmas. The realistic modeling of the complex physical and chemical processes involved in plasma-material interactions (PMI), however, has been extremely difficult. Recent computational advances have not only enabled detailed comparisons between experiment and theory, but have explained phenomena that were unexpected from simple pictures of PMI. Molecular dynamics simulations, for example, had an important role in understanding the suppression of gross erosion of lithium under deuterium bombardment, but many challenges remain in PMI modeling.