

NSTX-U Weekly Report (April 7, 2017)

FY2017 status: NSTX-U is in a maintenance and repair outage.

NSTX-U Research (J. Menard)

The paper titled "Full-wave simulations of ICRF heating regimes in toroidal plasma with non-Maxwellian distribution functions" by N. Bertelli et al. was published in Nuclear Fusion [<http://iopscience.iop.org/article/10.1088/1741-4326/aa66db/pdf>]. The paper describes the full wave TORIC extension to include the non-Maxwellian ion effects for both ICRF minority and HHFW heating regimes. The evaluation of the wave-field and power absorption, through the full wave solver, with the ion distribution function provided by either a Fokker–Planck (CQL3D) and a Monte-Carlo particle (NUBEAM) codes was examined for Alcator C-Mod and NSTX plasmas. Non-Maxwellian effects generally tend to increase the absorption with respect to the equivalent Maxwellian distribution.

A second quarter NSTX-U progress report has been submitted to DOE FES for the FES Joint Research Target 2017 “Conduct research to examine the effect of configuration on operating space for dissipative divertors”. The NSTX-U contribution includes a summary of NSTX divertor operating space based on previous experimental and modeling work and a new analysis of NSTX experiments. The new analysis focuses on the dependence of detachment characteristics on divertor poloidal magnetic flux expansion, and the dependence of the radial extent of the partially detached region on divertor scrape-off layer width, divertor geometry (flux expansion), and gas seeding. Two-dimensional multi-fluid modeling using the UEDGE code with experimental constraints on transport and boundary conditions is used in the study.

Jon Menard and Matt Reinke (ORNL) traveled to the University of Oxford, in Oxford, UK the week of April 3 to attend the 44th Institute of Physics (IOP) Plasma Physics Conference and the MAST Upgrade Research Forum both held at Worcester College. At the IOP conference, M. Reinke presented a poster entitled “Experimental paths to improve the physics basis for high q-parallel exhaust strategies” and J. Menard presented an invited talk entitled “Physics and technology innovations for compact tokamak fusion pilot plants”. At the MAST-U Research Forum J. Menard gave an invited talk entitled “Progress and plans for research on NSTX Upgrade”. Both travelers had collaboration discussions with MAST-U researchers and leadership in preparation for future MAST-U operation.

NSTX-U Recovery Project (R. Hawryluk)

The eleventh of the twelve planned Design Verification and Validation Reviews was held this week reviewing NSTX-U Diagnostics systems, and observation/suggestions (chits) are now being organized into corrective actions. The diagnostics DVVR was chaired by Valeria Riccardo. External committee members were David Brower, UCLA and Dan Den Hartog, University of Wisconsin-Madison who came to PPPL and Réjean Bolvin, General Atomics and Brian LaBombard, of MIT’S Plasma Science and Fusion Center who attended remotely.

Regarding test cell work, machining and fit-ups of the Poloidal-CHERS diagnostic in-vessel passive plates continued, as well as installation and alignment of waveguides for the FIRETIPS

diagnostic. Removal and vacuum leak checking of the in-vessel neutral beam is in progress, and preparations for the reassembly and reinstallation of the bay H port cover have started.

Recommissioning of the coil winding facility also continued with vacuum leak checking of the trial PF1A mandrel after heat cycling and preparations of copper conductor for sand blasting and priming. The vendor has begun the priming process for the first spool of PF1 coil conductor. PPPL representatives witnessed the transfer of the copper to the handling fixture. Installation of buswork for the PF1 coil test stand in the Field Coil Power Conversion Building is nearing completion.

Conditioning of the deionized water to the first spare neutral beam ion source is making good progress, and insulating gas enclosures have been installed in preparation for electrical testing. A second spare source is being assembled in the Clean Room.