

NSTX-U Weekly Report (August 26, 2016)

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

Several NSTX-U and ST researchers and engineers gave oral and poster presentations at the 22nd Topical Meeting on the Technology of Fusion Energy (<http://tofe2016.ans.org/>) held August 21-25, 2016 in Philadelphia, PA at the Sheraton Philadelphia Society Hill. NSTX-U/ST-related invited talks included: “Overview of Initial Operation on NSTX-U” by Devon Battaglia, “Studies of Next-Step Spherical Tokamaks Using High-Temperature Superconductors” by Jonathan Menard, “ST-Based Fusion Nuclear Science Facility: Breeding Issues and Challenges of Protecting HTS Magnets” by Laila A. El-Guebaly (University of Wisconsin), and “Boronization System for the NSTX-Upgrade Fusion Device” by Dang Cai. Poster presentations included “Thermal and structural performance evaluation of the NSTX-U high-Z divertor” by Art Brooks, “NSTX-U 2nd Neutral Beam Relocation” by Neway Atnafu, “NSTX-U Bake-Out Simulations and Evaluations” by Peter Titus, and “Design and operation of the electrical noise suppression system for CHI on NSTX and NSTX-U” by Zhi Gao. (J. Menard)

Steve Sabbagh and Young-Seok Park of Columbia University ran two experiments on the KSTAR superconducting tokamak in Daejeon, Korea entitled “Stability Limits in Maximum Normalized Beta Plasmas with Steady-state Profiles, Moving Toward Lower q95 Operation”, and “Variation of NTV torque: Distinct torque profiles and NTV offset rotation”. Earlier high betaN operation that was curtailed by rotating MHD activity was extended to 3 seconds by a delayed onset of the mode. Higher ion temperature (near 4 keV) was run in the NTV experiment compared to 2015, which demonstrated significantly stronger $n = 2$ non-resonant plasma rotation damping, and braking by using the $n = 1$ “non-pitch-aligned” configuration now eventually yielded resonant braking, and locking. Therefore, use of this $n = 1$ configuration to produce stronger non-resonant core NTV is susceptible to locking. (S. Sabbagh)

NSTX-U researchers attended and presented invited talks at the US-Japan Compact Toroid Workshop (<http://www.physics.uci.edu/US-JAPAN-CT2016>) in Irvine, CA (Aug. 22-24). Walter Guttenfelder presented “Transport at high beta in spherical tokamaks” which provided an overview of the unique stability characteristics of the ST configuration, NSTX transport and turbulence observations & validation efforts, and a brief summary of initial NSTX-U operations. Roger Raman (University of Washington) presented “Overview of transient CHI plasma start-up research in NSTX-U” which provided an overview of coaxial helicity injection in NSTX, best results achieved, as well as upgrades that will enhance CHI capabilities in NSTX-U. (W. Guttenfelder, R. Raman)

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

Disassembly and removal of equipment from the NSTX-U upper umbrella was completed, and the failed PF1aU coil has been removed from the test cell. Another round of PF1aU electrical insulation, resistance, and inductance measurements have been taken as a baseline, and the coil is being prepared for off-site radiography. Setup of the coil winding facility continues. On the vessel, a contaminated through-bolt on the upper ceramic break was found to be the cause of a variable inner to outer vacuum vessel electrical leakage path. Trimethylboron inventory has been removed from the TMB system, and sulfur hexafluoride is being reclaimed from the neutral

beam power systems. Lockout/Tagout of NSTX-U vessel hazardous energy sources is underway per procedure in preparation for a vessel entry next month. The neutral beam-lines are being pumped, purged, and vented in preparation for the removal of the calorimeter assemblies for maintenance. Also this week, on-site training on the application of Micro-Optics Fiber Bragg Grating systems for shear stress measurement was held.

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