# NSTX-U Weekly Report (November 22, 2013)

## NSTX-U is in the Upgrade Project outage in FY 2013

The NSTX-U researchers, Charles Skinner and David Gates of PPPL were elected to the APS-DPP Fellows at the 55th Annual APS-DPP meeting held in Denver, Colorado on Nov. 11-15, 2013. Gates' fellowship award citation reads "For innovation and leadership in the understanding and control of limiting MHD phenomena in toroidal plasmas," and Skinner's "For innovations in magnetic fusion issues including tokamak dust diagnostics and tritium management and seminal contributions to x-ray lasers and applications, non-linear optics, plasma spectroscopy, and plasma-lithium interactions." (M. Ono, PPPL)

Several NSTX-U researchers presented results at the 18th Workshop on MHD Stability Control held in Santa Fe, New Mexico during November 18-20, 2013. Jon Menard (PPPL) presented "Kinetic effects on the ideal-wall limit and the resistive wall mode", Jack Berkery (Columbia University) presented "Resistive Wall Mode Stability in NSTX and Benchmarked Kinetic Physics Calculations with MISK", Steve Sabbagh (Columbia University) presented "Active resistive wall mode and plasma rotation control for disruption avoidance in NSTX-U", Y-S. Park (Columbia University) presented "Resistive Wall Mode Active Control Physics Design for KSTAR", Eric Fredrickson (PPPL) presented "Energetic particle instabilities and their control in steady state plasma", Zhirui Wang (PPPL) presented "The Use of DCON for Computation of Outer Region Matching Data for Singular MHD Modes in Axisymmetric Toroidal Plasmas", and Kimin Kim (PPPL) presented "Study on neoclassical transport and kinetic stability in perturbed tokamaks with particle simulation". Lastly, Luis Delgado (PPPL) presented "Internal kink modes in Ohmic and LHCD plasmas in Alcator C-Mod" (J. Menard / S. Sabbagh).

Walter Guttenfelder (PPPL), Antoine Cerfon (Courant Institute, NYU) and Zach Hartwig (MIT, PSFC) attended the Kavli Frontiers of Science Symposium hosted by the National Academy of Sciences, Nov. 7-9, 2013, Irvine, Califronia (http://www.nasonline.org/programs/kavli-frontiers-of-science/past-symposia/2013-usfos.html). The aim of the symposium is "to bring together young scientists to discuss exciting advances and opportunities in a broad range of disciplines". The three presented a session (proposed by Anne White, MIT and Cerfon) titled "Progress in bringing a star to earth", with the aim of summarizing some of the accomplishments and remaining challenges for magnetic fusion energy. After an introduction (Cerfon), two talks were given: "Understanding and controlling turbulence at 100 million degrees" (Guttenfelder) and "Enclosing a star: The challenges of materials in magnetic fusion energy" (Hartwig). A number of interesting questions and comments were given during the 45 minute discussion session following the talks. (W. Guttenfelder)

Dr. Dmitri Ryutov (Lawrence Livermore National Laboratory) visited PPPL on November 21 – 22, 2013. He gave a talk entitled "Novel divertors based on manipulation of poloidal field structure". The talk summarized recent theoretical progress in developing divertor magnetic field geometries with poloidal field nulls of the first, second and third order, understanding of their magnetic and plasma properties, and comparison with experiments on DIII-D, NSTX and TCV. Dr. Ryutov also met with several NSTX-U and PPPL staff and discussed a variety of fusion, laboratory and astrophysical plasma physics topics. (V. Soukhanovskii, LLNL)

Tom Williams, a graduate student from the University of York in the United Kingdom who is completing his doctoral research, visited PPPL on November 18 and 19. He presented a seminar entitled "Propagation in 3D of microwaves through density perturbations" at the NSTX-U Monday physics meeting on November 18 and visited various members of the PPPL research staff during his visit. He is helping to analyze data obtained with the Synthetic Aperture Microwave Imaging (SAMI) diagnostic on MAST. The SAMI diagnostic will be moved from MAST and installed on NSTX-U next year as part of a collaboration with the University of York and the Culham Centre for Fusion Energy, allowing us to study in detail the electron Bernstein wave mode conversion physics in the edge of NSTX-U. (G. Taylor, PPPL)

Gustavo Canal, a graduate student from EPFL (Swiss Federal Institute of Technology in Lausanne, Switzerland) visited PPPL on Friday, November 22. He presented a seminar entitled "Fast seeding of NTMs by sawteeth and the use of non-continuous ECRH for their preemption," and also met with several NSTX and PPPL researchers. (J. Menard, PPPL)

Bilel Rais, a graduate student from Consorzio RFX, Italy will be visiting PPPL from Nov. 18 – Dec. 21st, 2013. The purpose of this visit is to collaborate with Charles Skinner of PPPL and Bruce E. Koel (Professor of Princeton University) on surface analysis of plasma facing materials to understand the characteristics of boronized and lithiated samples exposed and unexposed to RFX-mod plasma discharges. (C. Skinner)

**Engineering Operations (A. von Halle, C. Neumeyer)**

NSTX Upgrade activities continued with the ongoing preparation of the OH winding system. The OH Coil's fiberglass base on the TF bundle has been laid up to the correct diameter, and sample OH brazes have been completed and sent out for tensile tests. Copper for the OH winding is being loaded onto spools, and the rollers needed to straighten the conductor are being set up. In the NSTX Test Cell, three of the four in-vessel protective plates containing the neutral beam impingement armor are complete and will be installed this coming week. Assembly of the Neutral Beam #2 to NSTX-U vessel transition duct is nearing completion.

Preparations for plasma operations in the NSTX-U configuration also continued with the ongoing commissioning of the ex-vessel systems for the Multi-Pulse Thomson Scattering (MPTS) diagnostic. A new MPTS Optics Collection Box has been manufactured and is being qualified by that vendor's QC group. A repair to the PF5 coil insulation has been successfully completed and tested.

Access to the NSTX test cell will be available only through previous arrangement with the Upgrade Work Control Center.