

PRINCETON PLASMA PHYSICS LABORATORY

WEEKLY highlights



The PPPL Highlights for the week ending November 2, 2012, are as follows:

U.S. ITER FABRICATION (D. JOHNSON):

Diagnostic Procurement Arrangements 5.5.P3.US.01 (U11, U14, Upper Cameras) and 5.5.P4.US.01 (E9, ECE, TIP) are now ready for signoff, pending DOE approval.

After discussions with the IO, a task agreement is being drafted for preparatory work in support of the Conceptual Design Review for the Motional Stark Effect diagnostic, tentatively scheduled for April 2013.

NSTX (M. ONO):

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

Members of the NSTX-U Team participated in the Annual Meeting of the Division of Plasma Physics of the American Physical Society in Providence, Rhode Island, October 29–November 2, and presented four invited/tutorial talks, eleven contributed talks and 48 contributed posters. The invited/tutorial talks were: “Modifications of Impurity Transport and Divertor Sources with Lithium Wall Conditioning in NSTX” by F. Scotti (PPPL), “Interplay Between Coexisting MHD Instabilities Mediated by Energetic Ions in NSTX H-mode Plasmas” by A. Bortolon (UCI), “Physics of Tokamak Plasma Start-up” by D. Mueller (PPPL), and “Assessing Low Wavenumber Pedestal Turbulence in NSTX with Measurements and Simulations” by D. Smith (University of Wisconsin).

A new paper "Spherical Torus Equilibria Reconstructed by a Two-fluid, Low-collisionality Model" by A. Ishida (Niigata University, Japan) and L. C. Steinhauer (Bothell, Washington) has been published in *Physics of Plasmas* 19, 102512 (2012). The paper describes reconstruction of the high-performance National Spherical Torus eXperiment (NSTX) [Bell et al., *Phys. Plasmas* 17, 082507 (2010)] using the two-fluid, low-collisionality equilibrium model [Ishida et al., *Phys. Plasmas* 17, 122507 (2010)]. Profiles of the electron and ion temperatures, the toroidal flow, the density, and the magnetic field pitch angle of the reconstructed equilibrium fit well the measured profiles of NSTX shot 132484 at 0.7 s. The reconstructed equilibrium shows that the global two-fluid effect is fairly large; the perpendicular flow of both species differs significantly from the ExB drift; local gradient scale lengths can be smaller than the ion inertial length especially on the outboard side; and the electrostatic potential varies along a given magnetic flux by as much as several percent of the electron temperature in the core region.

Following the preparation for and the recovery from Hurricane Sandy, NSTX Upgrade construction activities resumed this week and are highlighted in the Engineering section below.

Preparations of non-upgrade equipment for plasma operations in the NSTX-U configuration also continued with the ongoing testing of the prototype fault detector in conjunction with the new firing generator in a field coil power conversion rectifier. Efforts this week centered around the testing of the power conversion control link.

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

ADVANCED PROJECTS (H. NEILSON):

Tom Brown completed a one-week visit to the Chinese Academy of Sciences' Institute for Plasma Physics (ASIPP) in Hefei, discussing design approaches for next-step fusion nuclear facilities. In working meetings with the ASIPP design integration team headed by Yuntao Song, Brown presented details of the Advanced Tokamak and Compact Stellarator pilot plant designs developed at PPPL, while Song's team explained their plans and design options for a Chinese Fusion Engineering Test Reactor (CFETR). It became clear that there is much potential for mutual benefit in a U.S.-China collaboration on next-step fusion nuclear facility design and planning. With the encouragement of ASIPP Director Jiangang Li and National CFETR Team Leader Yuanxi Wan, PPPL and ASIPP will work together to draft a collaborative work plan for consideration.

COMPUTATIONAL PLASMA PHYSICS GROUP (S. JARDIN):

A TRANSP Users Group meeting was held in Providence on October 31 in conjunction with the annual APS-DPP meeting. Material was prepared by each of the TRANSP developers to inform users of new and planned capabilities. Highlights of these presentations were:

Robert Andre: The free boundary equilibrium package ISOLVER has now been released and can be used with TRANSP in either interpretive or predictive mode. In the latter, the equilibrium is evolved self consistently coupled with the flux diffusion equation. It works both in a "least squares mode" where boundary shape points are specified, and in a "coil currents mode" where the plasma shape is determined self-consistently from plasma, conductor, and coil currents.

Marina Gorelenkova: Several new capabilities have been added to NUBEAM. It is now coupled to TORIC with the addition of a RF kick operator. A new 3D Halo model has been added to more accurately track the halo neutrals generated by charge exchange. A new energy and pitch angle dependent anomalous diffusion of the beam ions as computed by the TGLF/DEP codes has been implemented.

Xingqiu Yuan: The new solver package PT-SOLVER is now operational. It was demonstrated that it is capable of solving temperature evolution equations when TGLF is used as the transport model. The capability is being released first to beta-test users, but is expected to be generally released in the next six months. Users wishing to learn more about any of these capabilities should contact the appropriate developer.

A SciDAC Center for Extended MHD Modeling (CEMM) meeting was held October 28 in Providence in conjunction with the APS-DPP meeting. The project progress towards milestones was reviewed. Technical talks were given in the areas of improved numerical algorithms, modeling of RMPs and EHO and associated transport, sawteeth, helical states, and snakes, coupling neoclassical kinetic effects into MHD, and plasma disruption modeling. Copies of all the presentations can be found on the CEMM web site: w3.pppl.gov/CEMM on the "workshops" link.

PLASMA SCIENCE AND TECHNOLOGY (P. EFTHIMION):

MRX:

Recently MRX has shown, for the first time in a laboratory plasma, how the presence of an external guide field affects the rate of magnetic reconnection - one of the most common but least understood phenomena in the universe, and one that gives rise to such events as auroras, solar flares and geomagnetic storms. The studies found that guide fields can sharply reduce the reconnection rate in plasmas. This result helps to explain the observation in the earth's magnetosphere plasma where reconnection with a strong guide field takes place more slowly than antiparallel reconnection. The result also shed a light into solar and astrophysical plasmas and could lead to better predictions of disruptive geomagnetic storms and solar flares. The work was published by Tharp et al in Phys. Rev. Letts. 109, 165002 (2012) recently, and was highlighted through a press release in the last week's APS-DPP meeting in Providence, Rhode Island.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

NSTX Upgrade (R. Strykowski, E. Perry, L. Dudek, T. Stevenson):

Installation of new umbrella legs continued this week as did the straightening of the outer TF flags.

A second pre-job briefing for the cutting of the vacuum vessel for the NB2 JK cap installation was held and this cutting will begin soon.

At Major Tool eight bars have completed machining; of those, two completed inspection and the remaining six are in inspection. These eight bars are expected to ship to PPPL next week. Major tool has six bars in the cue ready to be machined. At EWI, there are three bars welded and in NT inspection.

In the coil winding area another bar was sandblasted. The quadrant mold indexing and alignment hardware is now being installed to place the conductors in final position prior to the covers being installed.

The OTF weldment completed incoming inspection. A few nonconformance's were discovered however they are believed to be inconsequential. The mating parts are being test fit just to ensure there are no issues.

NBI Upgrade: Work resumed this week after Laboratory closure for the weather event but coverage has been reduced during the recovery effort. Alignment of the BL in the NTC progressed well. Jacking screws for fine adjustment of the BL aim have been installed for finalizing location. A pre-job brief took place for the Bay JK VV plasma cut in preparation for the installation of the new weldment.

Office of Project Management (T. Stevenson):

Development of the Work Planning online system revision 6.0 continues. On page format changes are in progress.

ENG-006 Statements of Work and Specification procedure was approved and posted by Best Practices.

An in-house EVMS surveillance self-assessment required by the PMSD has been scheduled next week. Primary focus will be on the NSTX Upgrade capital project.

Facilities and Site Services (M. Viola):

Hurricane Sandy: There was damage to external insulation on the RF building large ventilation ducts as well as several air intake louvers on the building roofs. A tree fell across the rear corner overhang of the Hazmat building and has been cut and removed. A tree in the upper lot is cracked and dangerous, and has been roped off. A tree limb damaged some street lighting and a lighting pole in the parking lot fell down. These situations have been addressed or made safe. PPPL fared well compared to the devastation in the surrounding area.

Operations: Central Plant and HVAC Systems have been restored from Sandy related electric outages. Construction work has commenced for the HP Office and Conference Room renovations. Please observe safety postings in the area.

Fire Protection: R. Camp provided guidance to Site Protection from home during storm and outages to support ACAMS issues. Fermi Lab called to discuss the recent HALON discharge and wanted to compare notes though there was little in common. Evaluated the damaged hazmat building sprinkler system that was damaged by hurricane Sandy to recommend action to restore the fire protection system.

Telecommunications: We lost our outside Verizon lines due to hurricane Sandy and are using our six backup lines (was eventually restored).

Steam Plant: We switched from boiler #2 to our 350 HP Boiler #4 in preparation for the cooler days. We began inspecting our new steam traps to assure all are functioning properly.

Management: Federal Information Management System (FIMS) data entry continues.

Cafeteria: Please welcome our new Cafe Chef Manager Mark Gazo and sample his culinary creations.

BUSINESS OPERATIONS (E. WINKLER):

The heads of Procurement and Accounting conducted their monthly safety walkthrough of the LSB EWA first floor area. No new safety related issues were observed.

Ed Winkler participated in a telephone conference with other Laboratory CFO's and staff from the DOE CFO's Office. Topics discussed included, among other things, Institutional Cost Reporting, LDRD cost charging method, conference management reporting requirements, analysis of travel costs, and FY2013 budget outlooks.

Arlene White attended the 2012 National Minority Supplier Development Council Conference and Business Opportunity Fair in Denver, Colorado. This annual event is one of the largest small disadvantaged business expositions in the United States. The Laboratory participates as part of the outreach commitment in its small business subcontracting plan.

The Budget Office submitted PPPL's LDRD project data for FY2012 into the DOE LDRD database. This data will be included in the agency's FY2012 Report to Congress on Laboratory Directed Research and Development (LDRD) at the DOE Laboratories.

ENVIRONMENT, SAFETY, HEALTH & SECURITY (J. LEVINE):

ESU Ambulance A-166 responded to Plainsboro for two mutual aid assignments. ESU Engine 66 responded to Princeton for two mutual aid assignments, to Plainsboro for six mutual aid assignments and to C-Site for four assignments.

The DOE Office of Science and Office of Health, Safety and Security postponed their visit to PPPL for a DOE Peer Review Risk Assessment of PPPL. The reviewers were to tour the Laboratory and assess the risk to Departmental assets and the physical protection of those assets. A new date for the Risk Assessment has not been determined.

Hurricane Sandy passed through New Jersey on October 29. PPPL took the following actions before, during and after the Hurricane. In preparation - SPD distributed information and an action plan that may be used in the event of a catastrophic weather event. As per EPIP-06, Natural Emergencies, a storm preparatory meeting was held with laboratory departments and subject matter experts to discuss situational awareness and plans to deal with any physical impacts to the Laboratory. SPD distributed several all staff messages concerning typical actions and preparations for the upcoming Hurricane. ESU Officers increased their surveillance patrols at B-Site and throughout the Laboratory, especially at D-Site and the Hazardous Waste Storage Facility. ESU Officers responded to several downed trees and wires, broken glass, insulation damage, etc., during the storm. The ESU Communications Officer provided informational messages throughout the hurricane to PPPL and PSO senior managers denoting conditions at the Laboratory. The Laboratory was closed on October 29-30 due to the hurricane and had a delayed opening at 10:00am on October 31. Laboratory staff were notified of the closings by the PTENS System (Princeton Telephone and E-Mail Notification System). The Laboratory Telephone Hotline and the Laboratory Status Web Page were also updated with closing information.

The Laboratory hosted a "Reception Area" for responders and people in the community who were without power due to Hurricane Sandy. The cafeteria was available as a "warming" area and had several charging stations for cellphones, laptops, and other electronic devices. The men's and women's locker rooms were made available for shower usage.

DOE/PSO approved a Specific Site Security Plan for an Iranian Foreign National to be assigned to PPPL.

ESU trained eleven members of Plainsboro's Community Emergency Response Team (CERT) on the proper use of fire extinguishers. The training was held at the PPPL Firehouse on October 20 and was led by Driver/Operator Sean Galie with assistance from ESU Platoon B members.

Captain Darren Thompson participated in the Plainsboro Township Fire Prevention Open House on October 21. Captain Thompson provided fire extinguisher training to the community participants at Station 49 in Plainsboro.

The new ORPS Duty Facility Manager schedule for the period October 26-January 31 was distributed.

Captain Kevin Rhoades attended Multi-Hazard Emergency Planning for Higher Education provided by Rutgers University.

ESU Officer Ani Malool completed her EMT Refresher training this week at the Bergen County EMS Training Center.

ESU Platoon A completed the Annual Physical Agility Test. This test is completed by all ESU Operations personnel while wearing full turn-out gear and self-contained breathing apparatus (SCBA). The test is a ten-station test consisting of various Fire, EMT and Security components.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

PPPL's science education department traveled to APS-DPP in Rhode Island. Many of the students that were to present their posters were unable to attend due to the weather, but at least two were able to travel and present. Christopher Pieronek, a 2012 NUF program intern who did his research at General Atomics and mentored by Ben Tobias, was able to travel and presented his poster. Stephanie Guang, a high school intern at PPPL mentored by Charlie Genitle, now a freshman at Brown University, was also able to present her poster at the student poster session.

John DeLooper led a workshop at Science Teacher's Day on Plasma 101 for Middle School teachers on October 30.

Andrew Zwicker presented his poster on "Novel Methods for Communicating Plasma Science to the General Public". Aiya Merali presented her poster titled: Increasing Science Interest among Underprivileged Students. Arturo Dominguez presented his poster titled: "Particle transport across the LCFS and the Weakly Coherent Mode during I-Mode plasmas in Alcator C-Mod"

Science Education represented PPPL at the Plasma Science Expo on November 1-2. Many thanks to the following PPPL volunteers at our booth) who were present to help demonstrate plasma to over 2000 kids at the expo.

This report is also available on the following web site:

<http://www-local.pppl.gov/director/highlights/2012-highlights.htm>