



The PPPL Highlights for the week ending December 7, 2012, are as follows:

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

Quality Plans and Risk Management Plans are being drafted to satisfy the initial deliverable requirements for the two diagnostic PAs signed off at the recent ITER Council meeting.

ITER Task Agreement C55TD37FU covering support for MSE conceptual design was approved by the US and sent back to the IO for final sign-off. Once the TA is approved, a quality plan will be submitted.

A statement of work was drafted to investigate changes in the ECE optical design aimed at reducing the size of the shutter and hot calibration source to provide space for associated mounting hardware.

At a monthly Progress Meeting, progress towards the Preliminary Design Review scheduled for April was reported, and final authorship assignments were made for the full set of documents needed to support this Review.

A draft Document Deliverable Checklist for the LFS Reflectometer was sent to the IO RO for comment before formal submission as a PA deliverable.

Possible dates for a Peer Review in Cadarache of a proposed reconfiguration of the LFS Reflectometer front-end from bistatic to monostatic launch/receive are March 18 or March 21. Agreement was reached as well on a list of Panel members for this Review.

For the LFS Reflectometer, a proposal for revised waveguide routing in the interspace and port cell was discussed which reduces the number of miter bends (and thus improves performance). This proposal will next be discussed with the IO and the RF-DA, who will soon be responsible for integrating this system, once the PA for integration of equatorial port 11 is signed between the IO and the RF-DA.

NSTX (M. ONO):

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

D. Darrow (PPPL) and Y. Ren (PPPL) attended the International Toki Conference on "Cross-Validation of Experiment and Modeling for Fusion and Astrophysical Plasmas," held in Toki

City, Japan, November 19-22. Darrow gave a talk entitled "Comparison of Measurement and Modeling of Stochastic Loss of Neutral Beam Ions during TAE Avalanches in NSTX." Y. Ren presented a poster entitled "Experimental Observation of ExB Shear Induced Reduction in Electron-scale Turbulence and Thermal Transport in NSTX".

Joon-Wook Ahn (ORNL) visited KSTAR to run experiment on small ELMs. Several small ELM regimes have been identified previously on other machines but they typically occur in narrow operating window, e.g. strict DN configuration and high density (Greenwald fraction higher than 0.7) for type-II ELMs. However, small ELMs at KSTAR occurred in significantly wider operating window; various magnetic configurations (DN, USN, LSN, and limited) and much lower density (Greenwald fraction less than 0.4). Three shape parameters are at the moment under investigation; inner separatrix shape, squareness, and drsep. Straight (or even concave) inner separatrix and higher squareness are thought to be beneficial for accessing small ELM regime and experimental data showed a consistent behavior at KSTAR. This has a potential of the access to the small ELM regime with good confinement and wide operating window.

On December 5, J. Menard (PPPL) visited the MIT Plasma Science and Fusion Center (PSFC) and presented a seminar entitled "Progress and Plans for NSTX Upgrade". J. Menard also participated in discussions with PSFC leaders regarding possible opportunities for collaboration between the PSFC and NSTX/PPPL groups.

On December 3, M. Ono (PPPL) visited the Gamma-10 group at Tsukuba University. M. Ono and Professor Imai discussed a joint cooperative agreement between PPPL and the GAMMA-10 group. He also talked about the 28 GHz MW-class gyrotron development. He then visited National Institute for Fusion Science, Gifu, Japan on December 4-5 and participated in the long-pulse RF experiment being conducted on Large Helical Device (LHD) and he discussed the collaboration plan for the liquid lithium divertor R&D with Professor Hirooka.

NSTX Upgrade construction activities continued 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 fabrication of the new field coil power conversion system firing generators.

ITER & TOKAMAKS (R. WILSON):

DIII-D (R. Nazikian):

B. Tobias participated in a Physics Validation Review for the Microwave Imaging Reflectometer (MIR) diagnostic upgrade for 2-D electron density fluctuation measurements on DIII-D. This system will use the same port access and optical system for the ECE Imaging diagnostic. The goal is to image density perturbations in the pedestal region of H-mode plasmas. This project is a collaboration between PPPL and UC Davis.

PPPL researchers participated via remote connection to the DIII-D Research Opportunities forum on December 3-4. A total of 43 proposals were submitted by offsite and onsite PPPL researchers.

B. Grierson presented research on main-ion toroidal and poloidal rotation at the JIFT Workshop in Uji, Kyoto, Japan. An experimental scaling of main-ion rotation with ion collisionality was presented, and speculations of turbulent generation of poloidal flow at low collisionality was discussed with members of the theoretical community.

B. Grierson also visited ASIPP-EAST in Hefei, China and presented research on quantitative spectroscopy at DIII-D. EAST is currently preparing neutral beam injection, and Grierson, M.G. von Hellermann and W.W. Heidbrink are participating in design and analysis considerations for charge-exchange and fast-ion D-alpha systems.

Wayne Solomon chaired a physics validation review for a survey spectrometer to be installed on DIII-D for the FY13 campaign, to allow more quantitative interpretation of fast camera data for disruption studies.

ADVANCED PROJECTS (H. NEILSON):

The Wendelstein 7-X (W7-X) Trim Coil project conducted a supplier's final design review for the coil power supplies on November 28. The review was conducted at the supplier's facility, Applied Power Systems (APS) of Hicksville, New York, and was chaired by PPPL Electrical Engineering Division Head Al von Halle. The APS team presented their detailed plans for completing the manufacture of the supplies and conducted a tour of the facility. The review and was deemed satisfactory pending the resolution of eleven chits dealing with details of the design. Completion of this review allows APS to begin procurements to support the fabrication of the power supplies. In spite of delays caused by the recent hurricane, acceptance testing for the first power supply unit remains on schedule for the third week in February.

Physicist N. Pablant, who has participated on-site throughout the 2012 Large Helical Device (LHD) experimental campaign, reported completion of a successful run this week. He was able to acquire excellent data with the recently upgraded U.S. x-ray imaging crystal (XICS) system, with the expectation that the results will support some excellent physics studies. As a step toward the physics analysis, integration of the inverted XICS measurement data into the National Institute for Fusion Science (NIFS, Japan) TASK3D transport analysis suite was completed.

A manuscript reporting work performed under the Laboratory's LDRD Pilot Plant study, "Mission And Readiness Assessment for Fusion Nuclear Facilities," by G. H. Neilson, *et al.*, was accepted for publication in a special issue of *Fusion Science and Technology* containing the Proceedings of the ANS Topical Meeting on the Technology of Fusion Energy (TOFE-2012).

Hutch Neilson attended the Fusion Power Annual Symposium in Washington, D.C., presenting a talk, "Summary of the 1st IAEA DEMO Programme Workshop, UCLA, 15-18 October 2012."

The Laboratory submitted four abstracts for stellarator papers to be presented at the Workshop on exploratory topics in Plasma and Fusion Research (EPR2013), February 12-15, in Fort Worth, Texas. The titles and lead authors are: "The X-Ray Imaging Crystal Spectrometer Diagnostic on LHD: Applicability to Current and Future Fusion Research," by N. A. Pablant; "Progress in Turbulent Optimization of Toroidal Configurations," by H. E. Mynick; "Spline Representations

for More Efficient Stellarator Coil Design," by J. A. Breslau; and "Motivations and Opportunities for a Renewed U.S. Domestic Stellarator Program," by G. H. Neilson.

THEORY (A. BHATTACHARJEE):

The second meeting of the Theory Department Plasma Material Interaction (PMI) working group was held on December 6 at PPPL. The objective of the group, led by D. Stotler, is to identify one or more PMI or materials related problems that can be solved by small teams within the theory department in conjunction with PPPL experimentalists. This second meeting consisted of presentations by A. Hakim, E. Granstedt, G. Hammett, T. Abrams, I. Kaganovich, and L. Zakharov in which each briefly described their current research interests.

COMPUTATIONAL PLASMA PHYSICS GROUP (S. JARDIN):

The TRANSP/NUBEAM output now contains data for the shielded and the unshielded beam driven current for each neutral beam line. This feature was requested by the group from Lehigh University. It is essential for the discharge control work that they are doing that there be a capability to determine the current driven and the power deposition associated with each beam line.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

The final vacuum vessel cut for NB2 has been completed at bays J and K. Installation of the JK cap will be next.

All new umbrella legs have been installed on the upper umbrella and just five legs remain to be done on the lower umbrella.

Modifications have been completed to one of the four vacuum vessel leg mounts.

Re-installation of bakeout piping on the upper dome continues.

Modifications to the turnbuckles for the outer TF support structure continue.

Fabrication of parts for new covers and clamps for the quadrant mold continues in the shops.

Two more bars were insulated this week. Eight conductors are now wrapped for Quadrant 2. In addition the Aquapour "wash out" test was successfully conducted. The test demonstrated that the Aquapour could be easily cleaned from between the TF bundle and OH coil after the winding operations. Another bar was soldered in CAS building.

The prototype quadrant mold cover was completed in house and will be test fit to the coil and mold on December 10. The fabrication of the in-house cover is underway in the Tech Shop.

Four OTF weldments completed incoming inspection and 4 more were shipped. The second lot of TF Flex connectors was released for shipment bringing the total released to 13 pieces.

NBI Upgrade: Management performed the monthly status of all active jobs this week. The exit spool piece and the NB TIV were installed on BL2 in the NTC. Fit up of armor backing plates was performed in the VV and discrepancies were noted. Adjustments will be made to supports. Ion dump and 90 inch flange brazing and welding is complete. Leakchecking is in progress. Final assembly of the calorimeter awaits the replacement drive units en route from the vendor. Cryo line fabrication continues in the NB shop. The LHe manifold was taken to the TTC and lifted on to the South wall catwalk for trial fit. Preparations are underway to make the cut into the existing system. A discussion regarding support brackets on the TTC East wall resulted in simplified plans for the cryo line installation. The power cable for the decel supplies was received and hipotted this week. All power cabling for the NBI 4ABC systems is on site. Progress continues on duct and its flanges in the Tech Shop and at vendors. The JK lift fixture was load tested this week.

Office of Project Management (T. Stevenson):

Action items from the Work Planning review Board have been completed.

The work planning system email notifications to RLMs were noted as having been deactivated and this problem was investigated by ITD. The WP system notification emails were sent but domain problems caused the emails to stop working. This is being corrected by ITD with changes incorporated in WP 6.0.

Additional requirements were added to the Work Planning online system revision 6.0 per discussions at the WPRB. These items have been added. Rollout is expected this month.

The System Engineer list changes are in progress. The System Engineer online training module is being developed.

Facilities and Site Services Division (M. Viola):

Construction Management: The commons deck is complete pending final inspection. Work is nearly complete on replacing the D-Site Mock-up Clean Room HVAC System. HP Office and Conference Room Renovations continue. Steam and condensate piping insulation work on Engineering Building roof is completed. Insulation work at D-Site areas will commence December 10. Carpenter Shop dust collector FDR has been scheduled for December 13.

Telecommunications: Altura is still working on the intermittent problem of voicemail message waiting lights staying on after the user has checked voicemail messages. Telecommunications has begun tracing, identifying and labeling all telecom cables that exit the phone room, A117, particularly to the PPLCC. Any identified unused cable will be deinstalled.

In an effort to accurately charge back cost centers for telecommunications expenses, the telecommunications office is working with the accounting department and cost center managers providing data relating to phone numbers, locations, users names and cost center numbers. The telecommunications office, as requested by the cost center managers, will update the

telecommunications expenses database in Great Plains. This database is used by the accounting department to allocate telecommunications costs back to the Lab's cost centers based on a percentage of phones in each cost center.

Office Support and Cafeteria: Ed Jenkins is scheduling the installation of the HP furniture once the renovations are complete; it should be around December 19.

BUSINESS OPERATIONS (E. WINKLER):

The procurement division and the travel office have entered into discussions with the NNSA Supply Chain Management Center (SCMC) concerning the possible use of auto rental agreements negotiated by the SCMC and the University of California. The agreements appear to offer substantial savings opportunities, and also feature volume-driven rebates.

A Work for Others Agreement was executed with Lockheed Martin (LM) Corporation Space Systems Company. PPPL will participate in LM's study of the effects of a Hall Effect Thruster or Hall Current Thruster on an operating spacecraft solar array. The PPPL Principal Investigator for this effort is Y. Raitses; the funding to be provided by LM is \$75,000 for the ten-month period of performance.

The budget office submitted PPPL's "Tracking of Technology Transfer Third-Party Receipts" data for FY 2012 to the DOE.

The budget office responded to call from the DOE regarding the status of uncosted balances remaining from FY2010 or earlier.

PPPL responded to a request from the DOE for possible research topics that may be funded, such as Work for Others projects, by the Department of Defense.

All documentation requested by the DOE Chicago Office for its review of PPPL's FY2012 LDRD program has been submitted. Following the close of each fiscal year, DOE-CH must review and certify the LDRD data submitted by PPPL into the DOE LDRD reporting system. This data will be included in the DOE's FY2012 Report to Congress on Laboratory Directed Research and Development (LDRD) at the DOE Laboratories.

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

The Safety Division participated in several safety meetings with Plasma Science & Technology (PS&T) staff and students to review ISM concepts and safety specifics for individual labs and experiments. The discussions were led by PS&T Department Head, P. Efthimion.

Revision 7 to the ES&H Manual chapter on isolation of electrical hazards was reviewed and approved by the Safety Review Committee (SRC).

A meeting of the Environmental Review Committee (ERC) was held on December 5.

ESU Engine 66 responded to C-Site RF Building for an activated fire alarm and to the LSB for an odor of smoke caused by a discarded cigarette in leaves near the exterior of the building. Ambulance A166 responded to Plainsboro for five mutual aid assignments.

ESU Officers attended Live Burn Training at Mercer County Fire Academy on December 1-2. The training consisted of group briefings, discussions, practical training evolutions, and lessons learned, while observed by MCFA Fire Instructors. The practical training included hydrant hook-up, FDC hook-up, standpipe connection, extinguish fire techniques and ventilation techniques. Full fire turn-out gear, PPE and SCBA (Self-Contained Breathing Apparatus) were in use.

The HP CASL approved access list has been updated. The new access list is posted at the CASL door.

SPD distributed an all-staff message on December 6 regarding holiday and Christmas tree fire safety provided by the U.S. Fire Administration and FEMA.

ESU Officer J. Bain successfully completed training and is now qualified as a Driver/Operator.

The US flag was lowered to half-staff on December 6. New Jersey Governor Christie ordered the flag flown at half-staff to honor the service and sacrifice of United States Marine Corporal Christopher M. Monahan, Jr. Monahan, 25, a resident of Island Heights, New Jersey, tragically lost his life while supporting Operation Enduring Freedom in Helmand Province, Afghanistan on November 26.

The U.S. flag was lowered to half-staff on December 7. President Obama urged that all flags of the United States of America be lowered to half-staff to honor those American patriots who died as a result of their service at Pearl Harbor. Please visit <http://www.whitehouse.gov/the-press-office/2012/12/06/presidential-proclamation-national-pearl-harbor-remembrance-day-2012> to view the Presidential Proclamation.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

A. Dominguez visited TCNJ on December 4 and December 7. They were identical classes: Methods of Teaching Science class for undergrads studying to be elementary and special education teachers. They were two classes of ~25 students each and on December 4, A. Merali attended and assisted with the first class. The title of the talks were: "Plasma, Fusion and PPPL".

The Science Education Department went to the Liberty Science Center to perform maintenance of the plasma display that is part of the "Energy Quest" exhibit on fusion energy. They met with staff of LSC to discuss future upgrades to the exhibit including a new information kiosk.

A. Zwicker met with science supervisors from local-area schools at Rider University's Center for Teaching and Learning. The meeting was hosted by the Center's Director, Professor Kathy Browne. Topics included the next generation of national science standards that will be released next year and the PPPL-NASA partnership for K-12 teachers.

On December 7, J. DeLooper participated in "Science Night Live" in Allentown, New Jersey. PPPL exhibited various plasmas for the public who attended.

OFFICE OF ACADEMIC AFFAIRS (N. FISCH):

On November 29, N. Fisch gave the ASET Colloquium at the Tata Institute of Fundamental Research, in Mumbai, India, on the topic of "What is a Plasma?"

On December 2, N. Fisch gave a lecture at the ITER International School, in Ahmedabad, India, on the topic of "Methods of rf Current Drive."

On December 4, N. Fisch gave a lecture at the ITER School on the topic of "Some Unsolved Challenges in RF Current Drive." The theme of the 2012 ITER International School was "RF Heating and Current Drive."

On December 2, Ilya Dodin delivered a lecture at the ITER International School on the topic of "Lagrangian and Geometrical Methods in the Fundamental Physics of Waves and their Application to Plasma Dynamics."

DIRECTOR'S OFFICE (B. SOBEL):

On December 4, S. Prager and A. Cohen attended a meeting of the Princeton University Research Board on main campus.

On December 5, Drs. R. Lucas and F. Spedalieri, University of Southern California, presented a colloquium entitled "Adiabatic Quantum Computing with the D-Wave One".

On December 5-6, S. Prager attended the Annual Fusion Power Associates (FPA) meeting in Washington, DC.

On December 7, S. Prager and M. Zarnstorff and J. Menard attended a meeting at MIT to discuss a collaboration between the two facilities.

This report is also available on the following web site:
<http://www.pppl.gov/polWeeklyHightsExternal.cfm>