



The PPPL Highlights for the week ending March 15, 2013, are as follows:

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

A Readiness Review for the Residual Gas Analyzer Diagnostic was held in preparation for the Preliminary Design Review scheduled for April 9-10.

The Subcontract Proposal Review Panel (SPEB) met to discuss draft Source Selection Plan (SSP) and Request for Proposal (RFP) documents associated with the "Physics and Engineering Design Support and Diagnostic Hall Instrumentation Development for ITER Low-Field-Side Reflectometry (LFSR) Diagnostic System". Several Expressions of Interest were received in response to a Sourced Sought Notice for the above procurement.

A draft RFP to the SPEB that will be evaluating bids for the ITER 22kV switchgear procurement.

SPEB evaluation continues for the ITER High Voltage Transformer procurement.

A meeting, to discuss progress towards the Conceptual Design Review for the Motional Stark Effect Diagnostic, considered numerical modeling of expected signals when viewing the diagnostic neutral beam, performed by Nova Photonics. This CDR is scheduled for the week of May 27.

NSTX (M. ONO):

NSTX-U is in the Upgrade Project outage in FY 2013. NSTX Upgrade construction activities continued this week and are highlighted in the Engineering section below.

David Ruzic, Professor of Nuclear, Plasma, and Radiological Engineering and Director of the Center for Plasma-Material Interactions at the University of Illinois at Urbana-Champaign (UIUC) visited PPPL on March 15. He gave a seminar entitled "Recent Lithium Experiments at Illinois." He described the latest UIUC work using thermoelectric magnetohydrodynamics (TEMHD) for flowing liquid lithium with tokamak magnetic fields. The TEMHD-driven flows enable convective heat dissipation without external pumps, so they provide an attractive approach to high-power plasma-facing components (PFCs). The UIUC group uses TEMHD to direct the lithium through channels in PFCs in a design called Liquid-Metal Infused Trenches, or LIMIT. A LIMIT module has been successfully tested on the HT-7 tokamak in China, and could be a possibility for future high-power PFCs on NSTX-U.

Preparations for plasma operations in the NSTX-U configuration also continued with the ongoing assembly and testing of the new firing generators for the field coil power conversion (FCPC) system rectifiers. The third and fourth production firing generators successfully completed bench tests in the Electronics Shop.

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

ADVANCED PROJECTS (H. NEILSON):

In the Wendelstein 7-X collaboration program, the fifth and final trim coil was shipped this week. Typical shipping time to Greifswald, Germany is about three-four weeks. In addition, the fabrication and bench testing by PPPL of the five input-output interface modules, which will be used to transfer instrumentation signals from the coils to the W7X central computing system, was completed. These units are being prepared for shipment.

The Coordinated Working Group Meeting (CWGM) for Stellarator/Heliotron Studies was held in Madrid, Spain last week. N. Pablant participated (via remote connection) and presented a talk entitled "Transport analysis of ECH heated plasmas using TASK3D in the LHD" as a way to introduce a discussion on ongoing PPPL collaborative projects. This presentation covered the current status of the TASK3D collaboration, as well as recent progress on the XICS diagnostic system and the STELLOPT equilibrium reconstruction tool. The PPPL-NIFS collaboration was also highlighted in the talk on TASK3D development given by the LHD group.

THEORY (A. BHATTACHARJEE):

On March 12, D. Stotler, B. Davis and G. Tchilinguirian ran the Robot Arm competition at the New Jersey Science Olympiad State Tournament. Each of the 20 high school teams participating in Robot Arm designed and built a stationary robot capable of picking up various objects and placing them in one of four "goal" boxes.

On March 14, X. Li and L. Zakharov visited the Institute of Computational Mathematics and Scientific/Engineering Computing in Beijing. Li gave a talk on "Hiro Currents in Vertical Disruption Events (VDE) and their Simulations". Direct measurements of axisymmetrical Hiro currents during VDE on EAST in May 2012 made it clear that existing disruption simulation codes miss the important effect of Hiro currents and misrepresent the physics of even 2-D vertical instability. New numerical schemes, based on adaptive coordinates, aligned with the magnetic field, should be used to reproduce the Hiro currents. Li presented the steps for development of the VDE simulation code system, which includes the interfacing of the existing core equilibrium code ESC, new plasma edge equilibrium code PEC, and existing conducting shell simulation code SHL. The recently developed PEC is now interfaced with ESC as parallel processes. The details of numerical scheme of PEC, based on Hermite finite elements, were discussed. The special software, CodeBuilder (Cb), which maintains the documentation, communications and the source code consistent with each other, was used for the code development.

On March 14, L. Zakharov gave a talk on "Stationary Flowing Liquid Lithium (FLiLi) System for Tokamaks" to the Professor M.J. Ni group in the College of Physical Sciences, Graduate University of Chinese Academy of Sciences. He explained that unique property of liquid lithium to pump hydrogen isotopes is a key to the plasma regimes relevant to magnetic fusion. Utilization of this property should return magnetic fusion to its original idea of insulation of the high temperature plasma from the wall. The major challenge for using liquid lithium is related to its high chemical activity and interaction with residual outgassing from the wall in the tokamak devices. The talk described how the stationary FLiLi system addresses this technology challenge and make the use of liquid lithium practical and consistent with the safety requirements.

COMPUTATIONAL PLASMA PHYSICS GROUP (S. JARDIN):

Dr. J. Lang, Computational Plasma Physics Group (PPPL), presented a CPPG seminar titled "XGC1 Performance on GPU-CPU Hybrid Architecture". XGC1 is a particle-in-cell code including gyrokinetic ions and drift kinetic electrons, which typically uses 5000 particles per cell and the total number of particles exceeds 20 billion. An electron sub-cycling method was developed to push electrons multiple steps for each ion push, and this takes up most of the computing time (>90%). These computationally heavy pushing subroutines are good fits to the recently developed General Purpose Graphics Processing Unit (GPGPU) technologies. The XGC1 code was recently ported to the GPU based TITAN supercomputer using CUDA FORTRAN. In her talk, she presented the CUDA FORTRAN implementation and optimization in XGC1 and demonstrated its performance improvement in the GPU-CPU hybrid architecture.

A new visualization interface has been developed for exploring three-dimensional data, $f(x,y,z)$ or $f(x,y,t)$. Written in Python and using the Tkinter package, the graphical user interface provides an intuitive approach for positioning and animating slice planes through the data and animating the view of the data volume. The rendering is computed in the VisIt software and animations are saved in QuickTime movie files. These techniques are useful for visualizing density data computed by Nubeam and the full wave solution in reflectometry simulations. The visualization interface was developed by M. Lotocki, M. Knyszek, and J. Miller under the direction of E. Feibush.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

Construction: The upper and lower umbrellas have been prepped for the welding of the umbrella stiffeners. The arch stiffeners for the umbrellas are being trial fitted. The modifications to the mount for the last vessel leg are underway. The temporary in-vessel stiffeners at Bays J and K have been removed and the leak check fixture is being installed for use starting next week. The repair machining to the first TF outer leg has been completed. The new flags will now be insulated and tested prior to re-installation. PF5 mounts are being removed for upgrade. Clips are being welded to the vessel for the bakeout tubing.

CS Upgrade: The first TF bundle quadrant insulation passed its 1000 volt meggar test with a

resistance of 20 k Meg between conductors and conductors to ground. The quadrant is now being readied for laser tracker metrology. The quadrant mold was cleaned and painted with mold release. Loading of conductors into the mold will begin on March 18 for the second quadrant VPI. Telecons with the four bidding vendors for the OH coil mold were conducted. A vendor will be selected by early next week. Major Tool reported that the next TF conductor is expected to be up and running about April 22 ahead of their last date commitment. This would allow the next conductor to be delivered by the PPPL requested date of May 1. The wet layup of the OH insulation fillers was started March 9. The first four have been wound and are ready for oven curing. The oven cycle is scheduled to begin on March 18. Resoldering of three (3) conductors began this week. The first piece was resoldered and set aside. The resoldering of the second piece started on March 15. Work continued on the OH winding stand in the CAS RESA building.

NBI Upgrade: The Calorimeter was moved into the NTC and installed in BL2. The Decon and removal of BL component stands, equipment, and floor areas continues in the TTC paving the way for HVE relocations and Power cable tray installations. Preparation of parts for lifting HVE segments continues and preparations in the TCB will resume. Fabrication and leak checking of LHe cryo line continues in the NB shop. LHe cryogenics line installation and welding on the TFTR Test Cell South wall continues. A calculation was performed looking at wall loading for the cable and tray installation on the TTC East wall and shield blocks. Fabrication continues on the NB/TVPS duct components in the Tech Shop. The final TVPS flange deliveries are imminent so final assembly and welding of the central spool section can proceed. Support brackets for the rectangular bellows are complete allowing final assembly and welding of the rectangular portion of the NBI duct. Work continues on the Armor backing plates in the Braze Shop. Procurement is working on the DI Water procurement. A new NTC platform bridge from 109 level to the labyrinth was installed and inspected. The old stairway was removed to make way for NBI source platforms in that corner. Installation of the bridge from 119 level platform to the BL2 lid has started.

Office of Project Management (T. Stevenson):

The monthly Project Status Review Board meeting was held this week with active jobs reporting status and plans. A Work Planning Review Board meeting was held this week reviewing new Work Plans WP 1836 through WP 1559. A WAF Review Board meeting was held this week on a portion of NSTXU scope an schedule. Changes for Work Planning system 6.1 are in progress to address judgments of need and corrective actions. Several more changes were identified and will be incorporated in WP 6.1. Analysis of several noted problems with approval strings are being investigated. Planning continues for a larger upgrade and expansion of the Work Planning online system later this year. Development of the COG/RLM training was completed and production of the online package is set to begin with the Training Office in approximately two weeks.

Facilities and Site Services (M. Viola):

Material Services: Material Services met with G. Tchilinguirian and A. Massry (IT) and reviewed a new property pass system with property control. The roll out of a new electronic "Property Pass System" will be implemented in the near future by the IT Department. A few changes/additions were addressed in the meeting, prior to rolling out the new system for PPPL use. Material Services recently received a link to the "CMF Stationary On-line System" for PPPL employees to browse. This link can be accessed at the top of the Material Services Web Page by

using the "user ID" and "password" supplied. Please note that by accessing this system using the User ID and Password supplied, will not give you access to purchasing rights.

Engineering: DOE confirmed which Life Cycle Cost tool is to be used for the Strategic Lab Initiative analysis. A meeting was held with the outside structural engineer to float ideas on C-Site MG Building deck renovation. Work has commenced on overhauling the Central Plant Chiller C-701. This involves a complete mechanical tear down and inspection of the chiller unit including but not limited to replacing the internal bearings as well as cleaning and eddy current testing of all the condenser and evaporator tubes, all OEM required maintenance and any miscellaneous repairs. The Central Plant Cooling Tower chemical feed controller was repaired and the automatic chemical injection system is now back in service. The FIMS Validation data collection is in progress and is scheduled for completion this week.

Fire Protection: Department representative met to discuss the costs to comply with DOE Order 420.1C Candidate Interviews for the Fire Protections Engineer position continue.

Energy: Our energy manager attended the Gobacon conference and the National Facilities, Maintenance and Technologies conference. She noted that were several special lighting systems demonstrated that might have application at PPPL.

Telecommunications: The Telecommunications Office met with Sue Murphy-LaMarche regarding cell phone safety at the Laboratory. Two initial actions will be done immediately. The Telecommunications Officer had approval to change the telephone policy in the Personnel Practices Manual to include the statement, "Cell phone safety: Do not use a cell phone or any wireless device while driving your vehicle or operating machinery. If necessary to use your cell phone, stop your vehicle in a safe location so that you can safely use your cell phone." Second, the Telecommunications Officer created an article to be published in the PPPL Weekly Newsletter on cell phone safety to remind Laboratory staff that cell phone usage is not permitted in government vehicles and it is a primary law violation in New Jersey. The article will also contain cell phone safety tips.

BUSINESS OPERATIONS (E. WINKLER):

Members of the Business Operations Department divisions and members of the Business Computing Division met with an Oracle Insight team to describe and discuss current Laboratory business computing operations, including web-based applications and the Great Plains ERP system.

Members of the Accounting Division met with representatives from the Baker Tilly, LLC accounting firm, to discuss the purchase orders, subcontract, travel, miscellaneous payment processes and any changes in internal controls since the last audits were conducted.

A. White attended the Annual National Reservation Economic Summit in Las Vegas, Nevada as part of PPPL's contractual obligation to provide outreach to socially and economically disadvantaged small businesses. The summit is sponsored by the National Center for American Indian Enterprise Development, and is the largest Native American procurement exposition held in the U.S.

N. Gnyp attended the Aerospace and Defense Contract Management Training Forum 2013 in San Diego, California. Attendance at this training forum, sponsored by the National Contract Management Association (NCMA), is a requirement for completion of a one-year NCMA Contract Leadership Development Program.

The Business Operations Subcontract Audit Representative has initiated a cost-incurred/rate/accounting system review of Nova Photonics.

A Work for Others agreement was executed for engineering analysis and design support for Pohang University of Science and Technology. The Principal Investigator is B. Ellis. The budget is \$30,000 for the six-month period of performance.

Third year funding of \$199,900 was received from NASA for the work for others project titled "Collaborative Research on the Electron Diffusion Region Supporting the Magnetospheric Multi-Scale Mission." The Principal Investigator for this effort is M. Yamada.

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

Emergency Services Ambulance A166 responded to Plainsboro for one mutual aid assignment.

A conference call was held with the DOE Office of Health, Safety and Security to discuss the DOE draft report, "PPPL Physical Protection System Risk Assessment," resulting from the assessment held in November 2012.

The total suspended solid result for surface water outfall DSN001 exceeded the permit limit, resulting in submission of an ORPS Report (SC--PSO-PPPL-PPPL-2013-0001). The exceeded conditions associated with this are under investigation.

New Jersey Governor Christie ordered the US flag to be flown at half-staff on March 11 in honor of the passing of former Speaker of the New Jersey General Assembly and former Attorney General of New Jersey, William F. Hyland. Please visit <http://nj.gov/infobank/circular/eocc127.pdf> to view the governor's executive order.

The Radiation Waste Facility Approved Access List has been updated following a recommendation in the recent DOE draft Risk Assessment report to reduce the number of individuals who have access to this area. Questions regarding access to this area may be directed to Keith Rule (Ext. 2329).

SPD staff met with a Communications Office team to review the design for a new ESU identity and patch. When finalized, the new identity will be used on uniforms, vehicles, bicycles, etc.

On March 16, J. Alkhateeb attended the second in a series of classes for NJ Fire and Emergency Services Instructor Level I Certification at the Mercer County Fire Academy.

INFORMATION TECHNOLOGY (S. BAUMGARTNER):

Members of the Information Technology Department attended three days of Oracle Insight Discovery sessions for the purposes of evaluating potential Oracle solutions for a new business system. The evaluation will provide PPPL with a high-level fit gap analysis and report as part of the first steps in determining direction for a business system replacement.

NSTX-U Digital Coil Protection System: computer I/O signal lists and preliminary cabling design has started.

The NSTX COE Logbook web pages and back-end database software are being worked on to correct problems identified during testing.

OFFICE OF COMMUNICATIONS: (K. MACPHERSON):

On March 14, C. Cane completed all of the required coursework for Princeton University's Management Development Certificate program, part of Princeton's Core Learning Curriculum through the Office of Human Resources.

J. Jackson DeVoe worked with Princeton University art students in Professor Halvorson's class on getting remaining badges. On March 12, Jackson DeVoe hosted a tour of 11 students from the University of Tokyo who were given a tour by J. DeLooper. The students were visiting Princeton University for two days and being hosted by the Dean for Research S. Smith. The tour included the NSTX control room and annex, the tunnel to the D site, a view of the NSTX upgrade from the window, the NCSX site and the Science Education laboratory. Jackson DeVoe also helped host a tour, led by A. Zwicker, of nine Lewis School students, and three adults (March 15). The tour stopped at the NSTX control room and the PPPL Science Education Laboratory. Jackson DeVoe also assisted John Offredo, a reporter from the Times of Trenton, on PPPL's receiving the EPA 'WasteWise Partner of the Year' award.

J. Greenwald served as press contact for S. Prager's March 13 presentation at a briefing sponsored by the American Security Project in Washington, D.C.

E. Starkman photographed the VPI group, Princeton art students, K. Tafe, A. Borkar, T. Rothman, C.S. Chang and S. Galie for the Weekly and slide show. Starkman set up a photo gallery of the Epoxy work and the lift of the completed quadrant to folks, in addition to providing prints and digital files as requested. Starkman also worked on updating the NSTX CAD drawing with new people images.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

On March 15, A. Zwicker was the after-dinner keynote speaker at the spring meeting of the New Jersey American Association of Physics Teachers, held at Princeton University. His talk was titled: "Fusion 2013: How Close are We to Creating a Star on Earth?"

The last Science on Saturday program concluded on March 16 with more than 360 individuals attending. Assistant Professor Josh Kohut of Rutgers University presented “ A Robot’s View of Our Ocean Planet.”

DIRECTOR’S OFFICE (B. SOBEL):

On March 11, the monthly PPPL Research Meeting was held. The purpose of the monthly meetings are to communicate across the departments and projects about significant results and developments. This meeting was coordinated by the Research Meeting Committee: E. Fredrickson, S. Kaye, F. Ebrahimi and R. Wilson. J. Schmitt has recently been added as a new committee member. They can be contacted at ResearchMeeting@pppl.gov . The agenda for the March 11 meeting was: Updates (M. Zarnstorff), Summary of Workshop on Exploratory Topics in Plasma and Fusion Research (EPR2013) - (R. Majeski), Reducing turbulent transport in toroidal configurations via shaping - (H. Mynick), A possible technical solution for a liquid divertor in DEMO (M. Jaworski).

On March 13, S. Prager was one of the speakers at the American Security Project Meeting "Fusion Power: A 10-year Plan to Energy Security". The meeting was held in Washington, DC.

On March 13, Professor Chris Johnson, University of Utah, presented a colloquium entitled "Modern Visualization Successes and Challenges".

On March 14, S. Prager, A. Cohen, and M. Zarnstorff attended the Fusion Day activities in Washington, D.C. Graduate students J. Parker and D. Boyle also attended. The Directorate met with congressional staffers while in Washington D.C.

On March 15, S. Prager and M. Zarnstorff attended the Fusion Energy Sciences Advisory Committee Meeting (FESAC) held in Potomac, Maryland.

On March 15-16, S. Prager attended a meeting of the Magnetic Fusion Program Leaders group. The meeting was held in Potomac, Maryland.

This report is also available on the following web site:

<http://www-local.pppl.gov/director/highlights/2013/2013-highlights.htm>