



The PPPL Highlights for the week ending March 22, 2013, are as follows:

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

A Physics Risk Mitigation Review was held in Cadarache, to consider a US proposal to modify the Low Field Side Reflectometer front-end design from a bistatic to a monostatic configuration. The proposal would replace six pairs of antennas, each pair with separate launch and receive functions, with seven antennas each of which functions in both launch and receive modes. The results in a much simpler design, relieving severe space constraints, particularly close to the plasma. This monostatic approach was recently demonstrated by UCLA researchers on the DIII-D tokamak, and UCLA led the effort in preparing the proposed change.

Good progress was reported in meetings held this week for the two US ITER diagnostics (Motional Stark Effect - MSE, and Core Imaging X-Ray Spectrometer - CIXS) that remain in the conceptual design phase. Conceptual Design Reviews for these two diagnostics are scheduled for May 28-29 - MSE, and for June 4-5 - CIXS.

Three of the five retroreflectors planned for the ITER Toroidal Interferometer/Polarimeter (TIP) diagnostic are located in blanket modules lining the heating beam ducts. The ITER Organization duct blanket designers proposed an implementation of the retroreflector housings in a cutaway in the duct blanket. The U.S. design team proposed a modification in this concept to improve diagnostic performance.

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.

The following several enhancements and updates were added to the H-mode pedestal analysis software for NSTX-U by Tom Osborne (General Atomics): The rotation profiles were more accurately extrapolated beyond the separatrix to allow better determination of the zero crossing for the radial electric field. A provision was added to allow reconstruction of the impurity density profile from the carbon density rather than the Zeff profile. An overall scale factor for the bootstrap current was added to the kinetic EFIT tool.

D. Darrow (PPPL) from the NSTX-U group visited MAST over the period March 11-19. During this interval, he and collaborators from Florida International University were able to test the susceptibility of a fast proton detector to electromagnetic noise from the MAST magnetic field

coils and neutral beam injectors. These tests were made in preparation for planned use of the diagnostic in MAST experiments in July. Although no plasmas were made during this visit, data acquired during the operation of individual magnetic field coils and beam injectors showed noise levels well below the signals produced by alpha particles from an americium source, which mimic the fast protons from the plasma. This gives confidence that good measurements can be made during the experiments in July, in which measurements of the fusion source rate spatial profile from this diagnostic can be compared with those taken by MAST's neutron camera. Favorable results from those experiments would allow design of a compact fusion source rate profile diagnostic for NSTX-U.

Preparations for plasma operations in the NSTX-U configuration also continued with a successful conceptual design review of the proposed compliant center conductor for the High Harmonic Fast Wave (HHFW) system vacuum feed-throughs. The assembly and testing of the new firing generators for the field coil power conversion (FCPC) system rectifiers continues.

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

ITER & TOKAMAKS (R. WILSON):

DIII-D (R. Nazikian):

B. Grierson and X. Yuan recently completed a verification exercise to compare using TGLF transport fluxes using PT_SOLVER and TGYRO. Differences in the definitions of the normalized inverse gradient scale-length between TGYRO and PT_SOLVER (adopted from XPTOR) were previously being input to TGLF, resulting in differences in the prediction of the transport fluxes. The new version of PT_SOLVER maintains a consistent definition of (a/LT) and (a/Ln) with the general geometry definitions of the GACODE suite of tools (GYRO/NEO/TGYRO/TGLF). The next steps in this comparison exercise towards a predictive modeling goal is to contrast the final transport solution profiles after PT_SOLVER and TGYRO have matched target transport fluxes from TRANSP power balance calculations.

International (J. R. Wilson):

J. R. Wilson travelled to KOREA to take part in the KSTAR PAC meeting, March 20-22 in Daejeon, Republic of Korea. Results of the 2012 campaign, plans for 2013 and the future were reviewed and recommendations made. KSTAR continues to exhibit progress in its research results and offers a valuable research opportunity for the world program.

ADVANCED PROJECTS (H. NEILSON):

PPPL is playing key roles in the technical planning for the 2013 Symposium on Fusion Engineering (SOFE), to be held June 10-14 in San Francisco, California. The PPPL-led Technical Program Committee this week issued a draft program consisting of over 360 papers from the international community, including 56 plenary and invited papers from leading fusion experts on topics at the forefront of fusion engineering. Contributed papers span the full scope of

fusion engineering, with an emphasis on current leading-edge projects such as ITER and NIF, but also of next-step programs and facilities on the roadmap to the realization of fusion. PPPL engineers N. Desai, M. Viola, and I. Zatz are leading the preparation of conference publications including the proceedings and a special issue of "Transactions on Plasma Science", while C. Gentile leads fundraising effort for the conference. The conference is being organized by Lawrence Livermore National Laboratory under the leadership of General Chair W. Meier, with strong administrative contributions from PPPL's P. Hampton, L. Lauria, and K. Lukazik.

COMPUTATIONAL PLASMA PHYSICS GROUP (S. JARDIN):

S. Ethier and S. Jardin (along with C.S. Chang, PPPL Theory) participated in the NERSC Program Requirements Review "Large Scale Production Computing and Storage Requirements for Fusion Energy Sciences: Target 2017" in Rockville MD March 19-20. The review brought together the leaders in the FES computational physics community to discuss what computing capabilities would be needed in 2017 in order to conduct their research. More details regarding the review, including the presentations, can be found at:

<http://www.nersc.gov/science/hpc-requirements-reviews/FES/>

B. H. Park, visiting researcher from KSTAR, made a presentation at the weekly CPPG group meeting on "Monte Carlo RF Kick Operator in NUBEAM". The presentation covered the theory and implementation of the RF Kick operator now in a production mode in TRANSP that allows calculation of the effect of the RF fields as calculated by TORIC on the fast ions as calculated by NUBEAM. The talk was broadcast by ReadyTalk to collaborators at ORNL and MIT.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

Construction: The JK cap passed its leak check this week. Leak check of the new bay L cap is next. The re-machining of the TF outer leg that will go on the south side of the machine has been completed. Modification and positioning of the umbrella arch stiffeners is in progress and welding will begin in a few days. Terminations of category 3 cables is in progress.

CS Upgrade: The installation of quadrant 2 conductors into the mold was completed. The end indexing blocks were installed and the installation of side shims was started. Four OH insulators, wound last week were cured early this week and are ready for machining. The last of 3 TF conductors was successfully resoldered. Cleanup and filing of the solder joints is planned for next week. The OH Winding station fabrication continued throughout the week in RESA. The main frame is 90% complete and work began on the spool station. The passive plate straps reinforcements were roughed out in the C-site machine shop. The remaining operations will be completed once the passive plates are removed from the machine and available for fit up. A telecon was conducted with the bidders for the upper umbrella lid to understand their fabrication plans for the part. The fabrication of the lower umbrella lid at Carolina was halted when a drawing error was discovered. A minor drawing change is being implemented to correct the error.

NBI Upgrade: The Decon and removal of BL component stands, equipment, and floor areas continues in the TTC including the notable removal of the calorimeter high contamination area. Low contamination areas remain posted; however, floor areas required for HVE relocation is progressing very well. Preparation of parts for lifting HVE segments continues. Parts are on order to remove the TTC floor plug for HVE lifts. Fabrication and leakchecking of LHe cryo line continues in the NB shop. LHe cryogenics line installation and welding on the TFTR Test Cell South wall continues. Fabrication continues on the NB/TVPS duct components in the Tech Shop. 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 119 level to the BL2 lid area was installed. Brackets and supports for handrails around the BL2 lid were welded. Decon of the BL2 lid has started. Decon of the BL2 surround and tools has started to make way for HVEs. A layout of the NTC vacuum lines for BL2 and TVPS has been completed and reviewed including field walkdowns. Power supply work includes continuing preparation of the procurement package and reactivation work on N4ABC Modulator/Regulator Gradient Grid assemblies.

Office of Project Management (T. Stevenson):

Changes for Work Planning system 6.1 are in progress to address judgments of need and corrective actions. These changes will be included in upcoming COG/RLM training. Modifications to add a Lessons Learned Library to the Project Management web page are in progress. A procedure review for ENG-008 Failure Mode and Effect Analysis has started.

Facilities and Site Services (M. Viola):

Engineering: Drawings and the installation plan have been prepared for TFTR HVAC Duct Relocation Project. Preparations continue for modifying the CS elevator to address safety concerns. The heat exchanger heads have been removed from Chiller 701 as work proceeds on the chiller rebuild project.

Fire Protection: FPE working with procurement to obtain bids on Fire sprinkler system internal inspections as required by the Fire Protection Audit action items. The planned resource for estimating the FHA Project has changed employers, so additional effort is required to utilize his services.

Energy: The Energy Manager communicated a Green Machine Award effort to the Environmental department. The description is as follows: The water tower on site is filled with canal water. A potable water backup system is in place to feed the tower in case canal water cannot be delivered. Maintenance to the valve controlling potable water requires regular testing. During each test about 35,000 gallons of potable water are used. This procedure used to be done once a month. Testing methodology was revised to testing once per quarter. This action saves the laboratory about 300,000 gallons of potable water and over \$4,000.00 per year, as well as maintenance time. R. Jeanes, T. Ward, and B. Clayton worked on the project. The site natural gas supply was interrupted March 20 but gas was sourced at a reasonable price and the site continued to use gas for the boilers.

Telecom: The Telecommunications Officer wrote a short article, which will be published in the PPPL Weekly News Letter on Cell Phone Safety to remind Lab 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.

Material Services: Material Services and IT met with Communications to plan roll-out of new Property Pass System and outreached this week to a small group of users to get started.

BUSINESS OPERATIONS (E. WINKLER):

The Accounting Division completed the annual Report of Contractor Expenditures for Supplementary Compensation covering CY2012. This report is used by the Department of Energy for reviewing employee compensation for wages and salaries and for the various programs, which contribute to employees' health and welfare.

L. Lauria, H. Wojtenko, and T. Bleach participated in a conference call conducted by the SC Conference Management Team from the DOE Office of Laboratory Policy and Evaluation. The purpose of the call was to provide guidance and updates on several topics related to conference management. The primary topics discussed were in the areas of conference exclusions, food exemptions and conference reporting.

The PCard System Administrator issued Revision 15 of the PCard Policies and Procedures Manual. This manual revision brings PPPL's rules into alignment with the DOE PCard policies and procedures that govern all cards issued under the DOE task order agreement with GSA. This revision also implements recent changes to Laboratory rules for purchase of sensitive property, "green" electronic equipment, and wireless device accessories, and includes a revised disciplinary process for violation of PCard system rules or late submission of monthly account reconciliations.

R. Templon hosted a telephone conference with the members of the team that will peer-review the purchasing system at Washington River Protection Solutions (Tank Cleanup), Hanford, Washington in April. The team includes senior procurement personnel from Argonne National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Idaho National Laboratory and Pacific Northwest National Laboratory.

PPPL submitted a proposal titled "Laboratory Study of Magnetohydrodynamic and Hydrodynamic Instabilities in Rotating Flows of Astrophysical Interest" to NASA. The Principal Investigator is H. Ji. The total budget request is \$434,800 for the three-year period of performance.

DOE approved Amendment 1 to the Work for Others Agreement with Lockheed Martin Corporation Space Systems Company. The amendment increases the work scope and increases the funding to be provided from Lockheed Martin by \$40,000. The Principal Investigator for this effort is Y. Raitses.

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

Environmental Services Division (ESD):

Waste management personnel shipped 1,846 pounds of hazardous and non-hazardous chemical waste for off-site treatment and transferred air filter units from the D-Site Mechanical Equipment Room (MER) to the Radioactive Waste Handling Facility (RWHF) for packaging.

Environmental compliance personnel completed the Non-Compliance Report addressing elevated total suspended solids (TSS) in the detention basin outfall (DSN001) and sent it to DOE-PSO for transmittal to NJDEP.

J.M. Sorge personnel completed quarterly ground water monitoring in support of PPPL's ground water remediation program.

Safety Division:

A management safety walkthrough of the C-Site LSB East Basement, NSTX Control Room and Computer Room was conducted on March 20. Safety conditions in these areas were found to be very good.

Site Protection Division (SPD):

Emergency Services Ambulance A166 responded to Plainsboro for one mutual aid assignment and to PPPL C-Site for one assignment.

The Site Protection Division Head and Deputy Head attended Root Cause Analysis Training provided by J. Malsbury, Head of Quality Assurance.

On March 23, J. Dunnigan attended the third in a series of classes for NJ Fire and Emergency Services Instructor Level I Certification at the Mercer County Fire Academy.

ESU and SPD administration received Detention Basin Alarm Training provided by K. Rule of Environmental Services.

Captain K. Rhoades participated in FM200 training.

Several members of ESU attended a lecture on "Fire Ground Death & Injury....Not Everyone Goes Home - Survival Program" given by Chief Billy Goldfeder at Princeton University on March 23.

Platoon B Driver/Operator S. Galie instructed a group of Burlington County Girl Scouts on basic first aid as well as treating common wilderness injuries as part of their First Aid Badge program. Galie also discussed his career at PPPL as a Firefighter/EMT and as a volunteer in the community, and answered questions about being a first responder.

INFORMATION TECHNOLOGY (S. BAUMGARTNER):

G. Tchilinguirian participated in a web meeting with the DOE Control System Security working group. The topic was a summary of this year's ICS and SCADA summit (conference).

A PDR for the NSTX-U Digital Coil Protection System software was conducted. The design of overall software architecture was reviewed. Additional PDR's on lower-level software components are planned.

M. Cohen, H. Towner and S. Baumgartner met with representatives from Google for a presentation on Google's development roadmap for the next 12 months. A primary focus will be improving the fidelity in Google docs when importing Microsoft Office documents and presentations, primarily to display embedded graphs and formatting properly. In addition, improvements will be made to attach Google Drive documents in calendar events. We also reviewed issues documented by PPPL employees in last year's Google survey conducted in June.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

On March 22, Science Education hosted 360 students and 50 chaperones from over 40 different schools across the New Jersey and Pennsylvania area at the annual Young Women's Conference in Science Mathematics, Technology, and Engineering. Over 40 PPPL volunteers assisted in the program, which was held on the Princeton University main campus. The event included talks by PPPL's N. Desai, The Franklin Institute's Jayatri Das, and NASA's Heather Paul. Over 40 female exhibitors from various STEM fields joined us for a hands-on exhibit session, and 10 laboratories on campus provided tours to the young women in attendance. The conference highlights women in STEM and hopes to encourage its attendees to pursue education and careers in STEM fields. Science Education would like to express their most heartfelt gratitude to all of their amazing volunteers! Thank You: E. Tokuoglu, T. Greenburg (and daughter), A. Castano, P. Zapata, S. Zapata, K. Lukazik, M. Tyrrell, L. Ramirez, D. Strauss, J. Jackson-Devoe, M. Kevin-King, M. Pueyo, A. Carpe, R. Camp, A. Zwicker, E. Meier, F. Cargill, J. DeLooper, A. Pinto, M. Schaefer, A. Dominguez, B. Lyons, J. Malsbury, D. McBride, A. Borkar, D. Andruczyk, S. Burrows, S. DePasquale, R. Hatcher, M. Kalish, E. Fredrickson, K. Roberts, J. Jones, S. Theil, M. Ovalles, G. Zimmer, A. Moten, C. Austin.

A. Zwicker gave a TEDx talk at St. Peter's College in Jersey City, New Jersey. (<http://www.ted.com/tedx/events/5959>). The theme of the event was "Future Utopias" and his talk was titled, "Creating a Star on Earth: The Path to Fusion Energy."

The Department of Energy has a new website, Women @ Energy, that showcases 75 of the talented and dedicated DOE employees who are helping change the world, ensuring America's security and prosperity through transformative science and technology solutions. PPPL's A. Merali is highlighted: (<http://energy.gov/diversity/articles/women-energy-alyiya-merali>) and for more info (<http://pinterest.com/energy/women-energy/>).

The following PPPL Reports were posted to the web:

A Magnetic Diagnostic Code for 3D Fusion Equilibria PPPL-4859

Authors: Samuel A. Lazerson, S. Sakakibara and Y. Suzuki

Submitted to: Plasma Physics and Controlled Fusion (November 30, 2012)

FEMCAM Analysis of SULTAN Test Results for ITER Nb3SN Cable-conduit Conductors
PPPL-4860

Authors: Yuhu Zhai, Pierluigi Bruzzone, Ciro Calzolaio

Presented at: 7th Mechanical and Electromagnetic Effects in Superconductors (MEM13)
workshop, hosted by ITER in Aix-em-provence, France (Mar 12-13, 2013) Submitted to:
Superconductor Science and Technology (March 2013)

Automation of The Guiding Center Expansion PPPL-4861

Authors: J.W. Burby, J. Squire and H. Qin

Submitted to: Physics of Plasmas (March 2013)

DIRECTOR'S OFFICE (B. SOBEL):

A. Cohen attended the ITER MAC meeting held in Barcelona, Spain March 18-20.

On March 20, Dr. Gavin McIntyre, Ecovative Design LLC, presented a colloquium entitled "Are Mushrooms the Next Polymers? Growing Plastic Replacements With Fungi".

This report is also available on the following web site:

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