



The PPPL Highlights for the week ending January 11, 2013, are as follows:

ITER FABRICATION - D. Johnson

Final drafts of the quality plans, the document deliverables checklists, and the procurement descriptions were completed for the electron cyclotron emission diagnostic, the toroidal interferometer/polarimeter, and the upper port plugs.

The Control Account Managers for the diagnostic systems included in the recently signed ITER Diagnostic Procurement Arrangements entered draft event risks associated with their systems into the US ITER Risk Management Information System.

Two meetings were held to discuss space issues in the port cell of equatorial port plug 11, both involving clashes between US and RF diagnostics that must share this space.

NSTX (M. ONO):

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. Firing generator chassis are being assembled, and five should be ready to install on FCPC rectifiers by the end of February.

ITER & TOKAMAKS (R. WILSON):

DIII-D (R. Nazikian):

R. Budny visited DIII-D this week to work with B. Grierson in selecting a sequence of DIII-D discharges for validating the TGLF implementation in PTRANSP. The study will commence with the investigation of stationary L- and H-mode discharges and perform TRANSP and ONETWO power balance calculations. Time-independent runs of PTRANSP and TGYRO-TGLF will be performed to validate the TGLF implementation in PT-SOLVER.

The eighth gyrotron socket upper water tank was removed and replaced with a six hole water tank needed for the new gyrotron. The oil catch basin was removed for enlargement consistent

with the need for additional volume. The NASA tube socket was reviewed for conversion back to a depressed collector configuration, and a task list was prepared for review. The NASA tube is due around April '13. Additional ECH work included troubleshooting an insulating oil flow switch, sizing of oil catch basins, and assessment of water manifolds for future design work.

Alcator C-Mod (R. Ellis):

Han Zhang completed thermal calculations showing the radiation to the C-MOD plasma facing components from the divertor in its steady-state, 600 degrees Celsius operating mode. This information will be used to evaluate modifications to diagnostics and cabling that will be required for operation with the divertor.

ADVANCED PROJECTS (H. NEILSON):

Data from the U.S. x-ray imaging crystal spectrometer (XICS) on LHD were utilized in a paper by A. Dinklage, et al., "Inter-Machine Validation Study of Neoclassical Transport Modeling in Medium- to High-Density Stellarator-Heliotron Plasmas." The international author list of this paper includes PPPL's N. Pablant. The paper reports a comparative study of energy transport for medium- to high-density discharges in the TJ-II, Wendelstein 7-AS, and LHD stellarator experiments. The XICS data were used as a verification of LHD's charge exchange recombination spectroscopy (CXRS) profile measurements.

At the January stellarator team meeting, S. Lazerson reported on improvements to the optimization algorithm in the STELLOPT code. In moving from an initial guess to an optimum solution, the optimizer moves along a trajectory in parameter space, defined by the independent variables of the equilibrium configuration, to an optimum solution. If the path leads to a region of parameter space where the calculation fails, the process fails before a solution is found. Lazerson's improvement modifies the search trajectory when that occurs, so that the iterative process can continue toward a solution. These code improvements are currently in the debugging and validation stage. When developed it will be a significant improvement in robustness, to the benefit of all STELLOPT applications, which include reconstruction from experimental measurements as well configuration design optimization.

PPPL hosted the quarterly U.S. Wendelstein 7-X (W7-X) management teleconference, also attended by DOE-Fusion Energy Sciences, Los Alamos National Laboratory, and Oak Ridge National Laboratory. The discussion included status reports on ongoing U.S. projects for W7-X as well as planning for the next phase of the collaboration, which will encompass the transition from construction to experimental research in the W7-X program. A formal agreement is currently being negotiated between DOE and Germany's Max Planck Institute for Plasma Physics, covering U.S. partnership in the W7-X research program. A first draft of the agreement is currently under discussion between the two parties.

FUSION SIMULATION PROGRAM (W. TANG):

B. Tang visited Germantown on January 10 for discussions at ASCR hosted by W. Harrod, Research Division Director, and at FES hosted by J. Mandrekas and J. Van Dam. On January 11

he visited Irene Qualters, Program Director of Office of Cyberinfrastructure at NSF, for discussions on the G8 exascale projects that she oversees on behalf of the U.S. participation.

THEORY (A. BHATTACHARJEE):

On January 11, Dr. Will Fox gave a theory seminar entitled "Magnetic Reconnection and Laboratory Astrophysics Experiments with Laser-produced Plasmas." Magnetic reconnection experiments using magnetized high-energy-density plasma bubbles produced by ablating a target with a high intensity lasers were described along with the underlying theory. Results obtained from recent experiments on the OMEGA EP facility were discussed and compared with 2D collisional PIC (particle-in-cell) simulations.

A. Bhattacharjee gave an invited talk on the "Physics of Explosive Events Within the Heliosphere" in the Conference on Space Weather at the Annual Meeting of the American Meteorological Society, Austin, Texas, January 6-10.

PLASMA SCIENCE AND TECHNOLOGY (P. EFTHIMION):

Hall Thruster Experiment: The article, "Ion acceleration in supersonically rotating magnetized-electron plasma," by N. J. Fisch, Y. Raitses and A. Fruchtman, was included in a special collection of articles from Plasma Physics and Controlled Fusion (PPCF), comprising 15 of the most notable articles published by the journal in 2011. The articles were selected because they were particularly well rated by the referees or were among the most frequently downloaded. The PPPL article included in the collection identifies a long-standing and very striking puzzle in the fortuitously narrow plume reported on the PPPL Hall Thruster Experiment (HTX). A very simple mechanism was put forth to solve this puzzle, namely that the supersonically rotating electron plasma causes the equipotential surfaces to deviate from the magnetic surfaces exactly in such a way as to cause sharp focusing of the ions. The deviation is caused both by centrifugal forces and the Hall effect, such that the plasma self-organizes to produce the large focusing effect.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

Construction: The internal weld of the JK cap to the vacuum vessel has been completed and the external weld is in progress. The vessel cutting at Bay L mid-plane will be done next week. The upgrades to the aluminum castings at the TF/Umbrella interfaces are in progress. Modifications to the Bay H mid-plane flange have been completed and the flange is being cleaned. Rack to rack wiring continues in the north gallery. Welding of the bakeout piping hold down clips to the vessel has been completed for the top of the machine.

Center Stack: Ajax, the induction brazer vendor, was in this week to set up the induction braze unit to be used for OH coil brazes and to train technicians in its operation. After the initial setup the unit is producing very nice looking braze joints. The next step is to finish the tooling to drill counterbores in the conductor ends and to produce joints with the cooling passage ferrules

installed. The quadrant mold cover fabrication is proceeding nicely in the RESA building and CS winding area. The first half is nearly complete with most of the ribs and the end flange tack welded into position. Some temporary clamps were fabricated and welded to the cover to straighten the cover which twisted slightly when it was cut from a length of pipe. The technician crew will work over the weekend to finish the cover as soon as possible. The last of the OTF Weldments were shipped from Carolina Fabricators. The three rejected parts shipped previously were reworked in house to repair the undersized welds. MTM has now agreed to machine and ship the fifth quadrant of conductors when originally agreed to, by the end of February, and the last quadrant in May. The Inconel centerstack casing was received early this week from Martinez and is being prepped for incoming dimensional checks in the CS winding area. Another TF bar was soldered on Friday, only 3 more remain to be soldered to complete the bundle soldering.

NBI: The BL supports were bolted to the floor. Final hydrostatic testing of water lines on BL 90 inch flange and the ion dump are complete. The BL source platform was relocated to the NTC and attached to the BL. Relocation of the 90 inch flange to NTC BL2 has started. The Armor installation procedure is out for review. Another armor backing plate in-vessel fit-up is planned to resolve support mount dimensions. Procurement packages for cable and tray and for water piping are in development. Water system drawings are in progress. Fabrication in the Tech Shop continues on the central spool section for the NBI duct. LHe cryogenics line installation on the TFTR Test Cell South wall continues. Planning for fabrication and installation of the JK RLM coil has started.

Office of Project Management (T. Stevenson):

The monthly Project Status Review Board meeting has been schedule for next week. Work continues on the Work Planning online system version 6.0. The EVMS self assessment report draft is in review for comments, accuracy, and completeness. System Engineer training with the online package continues.

Facilities and Site Services (M. Viola):

Construction Management: We have hired a new Engineering Services Branch Head, Martin Donohue. Charlie Kircher is preparing Statement of Work for the ESU Building waterproofing project. Ray Jeanes prepared for the fire protection review occurring during the week of January 14. Henry Carnevale conducted reviews for replacing the cooling tower filtration system. The failed fire hydrant at the Northeast corner of the LSB was replaced.

Telecommunications: The Telecommunications Office can report over 60 days without downtime for the Lab's analog office phones. This ongoing problem seems to be resolved by reconfiguring the electrical ground wire in the phone room, which eliminated stray electrical voltage from striking the phone system equipment. The Telecommunications Office is exploring the possibility of bringing text messaging into the Lab's 3333 emergency call system. This could be another option for employees to report emergencies to SPD if there are limitations to making a voice call. This Office is working with Fran White and Jim Hirsch in researching this technology. The Telecommunications Office was successful in negotiating a lower cost for a recent proposal from Quality Communications for radio communications equipment. The new equipment will allow PPPL's SPD to have radio communications with Princeton University's Department of Public Safety personnel.

Cafeteria: The new cafeteria pricing is in effect.

BUSINESS OPERATIONS (E. WINKLER):

S. Prager, E. Winkler, and A. Bleach met with Tracey Robertson, the Princeton University (PU) Director of Sponsored Research Accounting, and a representative from PricewaterhouseCoopers (PwC). PwC is responsible for conducting the annual audit of the University's Financial Statements and an ancillary audit focusing on government sponsored research projects. The purpose of the meeting was to discuss the financial practices of the Laboratory to determine if there is compliance with applicable federal regulations and if adequate internal controls exist .

PPPL, through the Budget Office, submitted the required reporting data on its one remaining ARRA-funded project for the quarter ending December 31 into the Federal Reporting web site. In addition, the quarterly Office of Science ARRA project report summarizing progress against milestones was submitted to the DOE.

R. Templon participated in the monthly DOE/NNSA Procurement Evaluation and Re-engineering Team teleconference. Topics discussed included an official policy change which increases the interval between independent peer reviews from three years to five years. The DOE memorandum on the new policy, which will be in effect starting with the FY 2014 review cycle, may be viewed on the PERT web site at <http://www.hanford.gov/tocpert/files.cfm/PERT%20Cycle%20Memo%20Signed%201-3-13.pdf>. The policy allows Contracting Officers to request reviews at shorter intervals, if high risk factors are present.

The PCard Administrator filed PPPL's quarterly card activity report. The report shows that PPPL had 46 card accounts active in the first quarter, and placed 1,176 transactions. These transactions had aggregate value slightly in excess of \$509,000.

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

The Environment Services Division (ESD) shipped 4,160 pounds of hazardous and universal waste off-site for treatment or recycling.

Monthly surface water discharge monitoring reports and annual chronic toxicity testing results were submitted to NJDEP.

Emergency Services Engine 66 responded to one mutual aid assignment in Princeton and one in Plainsboro. Ambulance A166 responded to two mutual aid assignments in Plainsboro.

Emergency Services Driver/Operators R. Lamb and S. Galie attended N.J. College and Public Safety Association Advanced Public safety training this week at The College of New Jersey. This three-day program included content to improve the requisite knowledge of a campus public safety officer and/or supervisor.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

On January 12, (the second lecture in the 2013 Science on Saturday lecture series), PPPL hosted 510 guests from the general public. Professor Udo Schwarz, of Yale University, was present to give his talk titled: "Visualizing The Atomic World".

The following PPPL Reports were posted to the web:

Physics of Radiation-driven Islands Near the Tokamak Density Limit PPPL-4841

Authors: D.A. Gates, L. Delgado-Apricio and R.B. White

Submitted to: Nuclear Fusion Proceedings (January 2013)

Negative Compressibility and Inverse Problem for Spinning Gas PPPL-4842

Authors: Vasily Geyko and Nathaniel J. Fisch

Submitted to: Physical Review Letters (December 2012)

DIRECTOR'S OFFICE (B. SOBEL):

On January 8, the Laboratory was visited by President Hou, University of Science & Technology of China (USTC). President Hou was accompanied by Dr. Zhu, Secretary General of USTC Alumni Association, and Dr. Li, Vice President of USTC. The visitors were in Princeton to sign a Memorandum of Understanding (MOU) with Princeton University. After lunch they visited the Laboratory for an overview and tour of the facilities.

On January 9, there was a Budget and Human Resources meeting.

On January 9, Professor Robert B. Jackson, Duke University, presented a colloquium entitled "The Environmental Footprint of Shale Gas Extraction and Hydraulic fracturing".

On January 10, Stewart Prager held two working group meetings with staff from the engineering department. Stewart's goal is to meet with all staff in identical settings by the spring.

On January 11, there was a Laboratory Management Review (LMR) meeting.

This report is also available on the following web site:

<http://www.pppl.gov/polWeeklyHightsExternal.cfm>