

PRINCETON PLASMA PHYSICS LABORATORY

WEEKLY highlights



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

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

A Sources Sought Notice was posted on FedBizOps for "Physics And Engineering Design Support And Diagnostic Hall Instrumentation Development For ITER Low Field-Side Reflectometry (LFSR) Diagnostic System".

A Preliminary Shut-Down Dose Rate Assessment Report was drafted which describes neutronics analysis results for all of the US equatorial port based diagnostics (ECE, TIP, MSE, RGA, CIXS, and LFS Reflectometer).

R. Feder and D. Johnson spent the week at the ITER site discussing port integration and port plug testing issues with the ITER Organization Diagnostics Staff.

In preparation for a Preliminary Design Review in April for the residual gas analyzer (RGA), several documents were reviewed and placed into final sign-off.

In preparation for a port integration meeting next week for equatorial port 11, the LFS reflectometer waveguide routings were changed to remove the connection between some of the waveguides and the port cell structure.

The proposal submittal period for HV Substation Transformers was extended by 2 weeks as requested by several vendors. This is not surprising since RFP was issued during Christmas/New Years' break, a low productivity time period.

NSTX (M. ONO):

An article "Stochastic Loss of Neutral Beam Ions from NSTX during Toroidal Alfvén Eigenmode Avalanches," by D. S. Darrow (PPPL) et al., was published in Nuclear Fusion in January, Nucl. Fusion 53 ([2013](#)) 013009. This paper compares measurements and guiding center orbit code modeling of neutral beam ion loss during these bursting avalanche events which sometimes occur in NSTX plasmas. Recent developments in the PPPL guiding center orbit code ORBIT have allowed mapping of the stochastic domains in the beam ion phase space induced by MHD modes such as these TAE avalanches. Such mapping, using the measured eigenmode structures in the observed bursts, shows the bursts can affect simultaneously both ranges of

passing and trapped orbits, with fair agreement with the measured losses. This adds a useful technique for analysis of the effects of MHD on fast ion confinement in future devices.

Preparations of plasma operations in the NSTX-U configuration also continued with the ongoing fabrication of the new field coil power conversion (FCPC) system firing generators, and the controls testing of Production unit #1 in a FCPC rectifier.

ITER & TOKAMAKS (R. WILSON):

Alcator C-Mod (R. Ellis):

B. Ellis visited C-MOD to work on the Advanced Outer Divertor upgrade. Details of the electromagnetic analysis, and responses to PDR CHITs were discussed. The additional heat loads on in-vessel surfaces due to radiation from the heated divertor were also discussed.

A. Diallo completed a two-week visit to perform analysis of pedestal fluctuations that have been measured during ELM cycles on C-Mod, and which may be linked to profile-regulating transport in H-mode edge. Preliminary results from this analysis are being prepared for presentation at the US-EU TTF meeting in April.

ADVANCED PROJECTS (H. NEILSON):

A white paper entitled "QUASi-Axisymmetric Research (QUASAR) experiment" was submitted to the Future Facilities sub-panel of the Fusion Energy Sciences Advisory Committee. The paper proposes an experimental facility that uses the substantial capital investment in the NCSX experiment to investigate the viability of the quasi-axisymmetric stellarator as a potential solution for Magnetic Fusion Energy. The QUASAR facility was one of the four suggested facilities that DOE's Fusion Energy Sciences office submitted to the sub-panel for consideration. The department also led a multi-institution white paper, "Toward a Fusion Nuclear Science Facility," proposing the establishment of a national scoping study to evaluate options and develop the Mission Need case for such a facility.

The Wendelstein 7-X collaboration program complete important tasks this week, notably the successful post-impregnation electrical testing on the fifth and final trim coil. Final assembly and inspection tasks are in progress. Staff from PPPL and the Max Planck Institute for Plasma Physics personnel will visit the supplier, Everson Tesla, Inc., next week as the coil is being prepared for final shipment. The specification for the trim coil DC disconnect switch procurement was prepared and issued for approval.

Several presentations on PPPL stellarator research were given at the Exploratory Topics in Plasma and Fusion Research Workshop in Fort Worth, Texas. Novimir Pablant presented a poster titled "The X-Ray Imaging Crystal Spectrometer Diagnostic on LHD: Applicability to Current and Future Fusion Research". Other presentations included a poster by H. Neilson, "Motivations and Opportunities for a Renewed U.S. Domestic Stellarator Program." In addition, PPPL work was highlighted as part of the stellarator overview talk given by David Anderson (University of Wisconsin).

THEORY (A. BHATTACHARJEE):

The Theory Department Plasma Material Interaction (PMI) Working Group met on February 8 to discuss the prospects for using small plasma experiments to advance the development of PMI theory and models. Presentations on pertinent experimental devices at PPPL and elsewhere were made by Y. Raiteses, I. Kaganovich, and T. Abrams.

Visiting research scholar Jinxing Zheng who is being hosted by J. Breslau continued his research on stellarator coil design with a study of the relationship between the radius of curvature and the maximum field produced by the coils. He has also practiced exercising the COILOPT code by re-deriving a set of optimized coils for the reference plasma configuration of the NCSX device.

On February 15, J. Breslau presented an invited talk on "Spline Representations for More Efficient Stellarator Coil Design" at the Workshop on Exploratory Topics in Plasma and Fusion Research (EPR2013) in Fort Worth. The talk described a new software tool developed by Dr. Breslau that computes optimized stellarator coil shapes modeled by spline curves that accurately produce a target plasma configuration while being much easier to construct and maintain than those computed using previous techniques. H. Mynick also attended the Workshop and presented a paper, "Progress in Turbulent Optimization of Toroidal Configurations".

COMPUTATIONAL PLASMA PHYSICS GROUP (S. JARDIN):

During the week of February 4-8, Irena Johnson organized an on-site Python Programming Training, which included nine scientists, eight from the Theory Department. Python, is a popular modern object oriented computing language that has the advantage of being open source, easily readable, efficient, portable and scalable to large projects. Those who attended acquired valuable skills that will facilitate improved code development for data management and visualization.

On February 13, the entire PPPL TRANSP group (with R. Budny and S. Kaye) held a two-hour video conference call with the JET TRANSP team including I. Voisekhovitch, J. Conboy, and M. Romanelli. The JET side discussed their usage patterns for TRANSP and some JET-specific modifications that they have made. The PPPL team discussed the progress during the last year and future plans in the areas of (1) the new PT_SOLVER, (2) new free-boundary equilibrium capabilities, (3) new NUBEAM capabilities including NUBEAM/RF coupling, and (4) new parallelization options. Plans were made regarding incorporating the JET modifications in to the PPPL code version, and working with JET physicists to utilize some of the newly installed capabilities as they are released.

PLASMA SCIENCE AND TECHNOLOGY (P. EFTHIMION):

Scientists from PPPL attended the Workshop on Exploratory Plasma Research at Fort Worth, Texas, February 12 - 15. There were talks by R. Majeski on LTX lithium results, S. Cohen on FRC results, and E. Belova on MHD stability. The meeting has been broadened since it was focused on Innovative Confinement Concepts. There were sessions on boundary physics, verification and validation of physics computer codes, stellarators, HEDLP, FRCs, and RFPs. After the banquet, Sam Barish of DOE made a presentation outlining a new funding solicitation for the area of Exploratory Plasma Research. The solicitation will cover experimental plasma

physics relevant to magnetized reactor plasma. The solicitation should be released within 6 weeks. The solicitation will not include HEDLP or experimental research on DIII-D, NSTX, or CMode.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

Construction: The new bay L nozzle has been fitted-up to the vessel and the nozzle has been trimmed to size and the vessel has been ground out for the necessary weld prep. The nozzle will be welded in place next week. The two TF clevis pads in the lower JK area have been welded.

Only one clevis pad is not yet done. Welding of the SW vessel leg mount is nearly complete. Set-up for the machining of two TF outer legs to remove flags that need to be replaced is complete and machining will start next week in the south high bay area. Umbrella stiffeners are being bolted in place so that re-machining requirements can be finalized and weld prep requirements can be established. The 119' platform extension has been installed. Work continues on the wiring in the gallery as does the installation of the lower tray on the east side of NSTX. Work on the category 3 racks is next.

Center Stack: TF Conductors: One of the conductors in quadrant mold was removed and replaced over concerns that a potential for glycerin to be present in the cooling tube soldered joint. There are four conductors that were soldered using the early lower temperature solder temperature during fabrication. The bars in question will be resoldered using the higher temperature cycle before being used in the TF bundle. The quadrant mold is expected to be closed up for VPI by midweek next week now.

OH preparations: The OH winding tension station fabrication continued in the Tech Shop.

Flex Joints: Nine (9) more flex connectors were received from the supplier bringing the quantity delivered up to 39 pieces, more than 50% ordered. All of the pieces delivered so far have excellent quality and have passed incoming inspections.

PF1C Tiles: A successful FDR for the PF1C tiles was held this week.

Bus Bars: The Bus bars upgrade work has continued this week. The first draft of the bottom-up schedule was prepared.

Facilities and Site Services (M. Viola):

Engineering Services: The Facility Division has developed project list of costs to improve decision making for future spending. An issue with the CS Elevator that has been dormant for some time was raised. We have begun collecting information and making inquiries to develop scope of what needs to be addressed. Approval to Remove the Neutral Beam Equipment in the C-site MG Building as part of the renovation was obtained.

The Fire Protection Engineer continued to gather information and prepare responses to close out items from the Fire Protection Audit.

The Telecommunications Office met with the Federal Government Motorola representative, Marty Killila, who is the direct federal sales rep and technical engineer for Motorola, the manufacturer of the Lab's LTR Narrowband Radio System to address Fire Protection Audit issues that were raised. The Lab's portable radios cannot be changed or programmed to add a 'STOP' feature. The Lab's current LTR (Logic Trunked Radio) Radio System is not compatible with Motorola's portable radios classified as 'Public Safety' radios, or radios to be used in extreme environments. The Lab would need to purchase a new radio system to change to different portable radios. This item was closed with consideration to revisit it when a total upgrade is planned for the system.

The Energy Manager is developing a priority list for Insulation work to be performed. Some of the work is in difficult to reach areas, which drives up costs and reduces payout. A meeting was scheduled meeting to discuss Demand Flow Energy conservation Project for our chiller water system.

Material Services: J. Siminoff attended IATA certification February 13-15 for Radioactive Material Training. Four hundred and twenty-five pounds of Office Equipment/Supplies were delivered to UNICOR for recycling. A new contract was issued for the electronic recycling with UNICOR on February 7. Two loans were approved for shipment of items to University of California - Davis and California State University on February 8.

BUSINESS OPERATIONS (E. WINKLER):

T. Gillars participated in a conference call conducted by the DOE Office of Financial Risk, Policy and Controls. The purpose of this training was to inform Laboratory internal controls points-of-contact of the standard risk assessment frameworks used in internal controls assessments at DOE. This training will also help to ensure compliance with the Federal Managers' Financial Integrity Act (FMFIA) and OMB Circular A-123.

PPPL received first year funding of \$116,550 from NASA for the "Role of Mode Conversion on Solar and Heliospheric Radio Emissions" project. The Principal Investigator is E.H. Kim. The total funding expected is \$368,700 for the three-year period of performance.

R. Templon participated in the monthly Procurement Evaluation and Re-engineering Team (PERT) telephone conference. Topics discussed included the draft agenda for the upcoming annual PERT policy meeting, and the status of upcoming peer reviews at Savannah River; CH2M Hill Plateau; Washington Office of River Protection (led by PPPL); NREL; Berkeley (PPPL participating); Kansas City Plant; Oak Ridge; and PNNL. Also discussed were two procurement strategy white papers under preparation for the DOE and NNSA Senior Procurement Executives.

Procurement submitted Revision 15 of the PPPL PCard System Policies and Procedures Manual for DOE review.

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

A Management Safety Walkthrough of the Lab Bldg and L-Wing 1st Floor was held on February 13. Action items were assigned for follow up to correct a number of issues that were found in these areas.

The Site Protection Division and Human Resources conducted applicant interviews for two vacant ESO positions.

The Site Protection Division is in receipt of the draft Safety and Security Risk Assessment report completed by the DOE Security Team in October 2013, and is starting the internal review process of the observations and recommendations.

Members of the Site Protection Division attended an ESH&S meeting to discuss preliminary findings from a laser safety audit at PPPL and participated in a Management Safety Walkthrough of the first floor Lab Wing.

Captain D. Thompson, Captain H. Caruso, and Captain K. Rhoades completed Module B of the EMT Continuing Education Program over the weekend.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

On February 13, the Science Education Department visited Private Nicholas Minue School in Carteret, New Jersey. Over 100 second graders were present for the demo.

On February 16, Professor Andy Hicks, of Drexel University, spoke to about 360 people from the general public at our Science on Saturday series .

OFFICE OF ACADEMIC AFFAIRS (N. FISCH):

On February 14, N. Fisch gave a colloquium in the Faculty of Physics at the Weizmann Institute of Science on "Wave Compression in Plasma".

DIRECTOR'S OFFICE (B. SOBEL):

On February 11, M. Zarnstorff hosted the monthly PPPL Research Meeting. Agenda items presented and discussed were: FESAC Meeting - (M. Zarnstorff), DIII-D Meeting - (R. Wilson/S. Gerhardt), Princeton-IPP Center (S. Prager), and a new solar flux rope experiment in MRX (C. Myers).

On February 13, Dr. Reinier Beeuwkes PhD, President and Non-Executive Chairman of the Board of Directors of Ischemix, visited the Laboratory. Dr. Beeuwkes toured the facilities and participated in a roundtable discussion (fusion futures, PPPL FNSF/pilot scoping) with A. Cohen, J. Menard, H. Neilson, M. Zarnstorff, D. Gates, S. Prager, K. MacPherson, and S. Smith.

On February 13, Professor Gerta Keller, Princeton University, presented a colloquium entitled "Volcanism, Impacts, and Mass Extinctions".

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