

PRINCETON PLASMA PHYSICS LABORATORY

**WEEKLY** highlights



**The PPPL Highlights for the week ending February 8, 2013, are as follows:**

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

D. Johnson and R. Feder attended the third annual "IO-DA Diagnostics Meeting" at the ITER site. The focus of this meeting was port plug integration. While at this meeting D. Johnson began discussions with managers of the diagnostic efforts in the Russian and European Domestic Agencies concerning the possibility for mutually beneficial cooperation in the development of diagnostic port plugs.

In another in a series of conceptual design development meetings for the Core Imaging X-ray Spectrometer, an IO design team presented a concept with potential to meet the shielding requirements while being more maintainable than the US concept with the same capability.

C. Gentile participated remotely as a panel member in the Preliminary Design Review for the ITER Port Plug Test Facility. It is planned that such a facility would be operated at PPPL to qualify US diagnostic port plugs.

A final draft of the Statement of Work for "Physics and Engineering Design Support and Diagnostic Hall Instrumentation Development for ITER Low Field Side Reflectometer Diagnostic System" was completed and circulated for broader review.

**NSTX (M. ONO):**

S. Gerhardt (PPPL) participated in the DIII-D PAC meeting from January 29-30. The committee was charged with assessing both technical and presentation aspects of the DIII-D five year research plan, covering FY14-FY18; an independent review of the plan will be done by a different committee later this year. Presentations covering both the DIII-D physics and hardware upgrade plans were given, and the PAC report is being finalized.

Preparations of plasma operations in the NSTX-U configuration also continued with fabrication of the new field coil power conversion (FCPC) system firing generators. Production unit #1 is now complete and being installed in a FCPC rectifier for pre-operational testing.

## **ADVANCED PROJECTS (H. NEILSON):**

The Wendelstein 7-X (W7-X) trim coil supplier, Everson Tesla, Inc., having completed the resin impregnation of the fifth and last W7X Trim Coil last week, removed it from the mold this week. The coil is being prepared for final electrical testing and metrology which will be completed next week and will be witnessed by PPPL personnel. The coil is expected to be shipped by the end of the month. Assembly of the first I/O interface module was completed by Laboratory staff this week. Assembly of the final four modules is expected to be completed by the end of the month.

Hutch Neilson visited Oak Ridge National Laboratory on 5 February for discussions with fusion program staff. During the visit Neilson presented a seminar, "Fusion Nuclear Facilities, Stellarators, and Roadmaps to Fusion Energy."

## **THEORY (A. BHATTACHARJEE):**

Recently, a series of innovative research on the theoretical foundation of modern gyrokinetic theory has been carried out by J. Burby, a third year Ph.D. student at Princeton University's Graduate Program in Plasma Physics and PPPL's Theory Department. Using the methods and techniques of differential geometry, Burby proved that in general the gyrocenter phase space coordinates do not exist globally [Phys. Plasmas 19, 052106 (2012)]. However, this does not imply that gyrokinetic theory is invalid in general. He showed that the fundamental justification of the gyrokinetic theory is due to the existence of asymptotic gyro-symmetry, which is a global and coordinate independent fact when the space-time scalelength of the magnetic field is larger than that of the gyromotion of a charged particle. To a more practical side, the application of the methods of differential geometry reveals that the toroidal precession of a charged particle in a toroidal confinement device is a geometric phase [Phys. Plasmas 20, 012511 (2013)], similar to the well-known Berry's phase in quantum system. Such a revelation enables a general coordinate independent expression of the toroidal precession in tokamaks and quasisymmetric stellarators alike, which can be implemented as an accurate and efficient algorithm for numerical simulations.

On February 5, Dr. Seung-Hoe Ku gave a theory seminar entitled "Introduction to XGC." The presentation focused on basic properties and capabilities of the XGC ( X-point Gyrokinetic Code) code such as the model equations, geometry, collision operators, logical wall-sheath, and the full/delta/total-f numerical techniques. Physical results of global simulations of ITG turbulence, neutral atomic physics, and intrinsic rotation were also discussed. Some of the mentioned future work included simulations of electrostatic turbulence in L-mode, and L-H transition and comparisons with experiments; and enhancement of electromagnetic capability to include low-m/n tearing modes.

## **ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):**

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

Construction: Several umbrella stiffeners have been trial fit so that installation issues can be identified. Set-up for the machining of two outer TF coils to repair their flags has been

completed and the repairs are about to begin. Rack to rack wiring in the north gallery has been completed. Installation of category 3 racks will be next. Installation of the Bay L nozzle will occur in the coming week. Measurements continue for the upper umbrella leg shims. In the technical shops the fabrication of NB2 duct components continues, as does the OH winding fixture and the NB armor backing plates.

TF Conductors: Five more conductors were primed and prepared for wrapping in the winding area. The quadrant mold continues to be fit with conductors, both end blocks have been installed to the conductors. The side shims have been adjusted and installed in the mold. Work is in progress on the end flanges to improve the fitup to the cooling water tube feed-thrus.

Ceramic Break: The ceramic break procurement was awarded to Kyocera this week, promised delivery is 15 weeks ARO.

OH preparations: The OH winding tension station fabrication continued in the Tech Shop. PF 4/5 Supports: The PF 4/5 support sliding blocks were received back from Magnaplate and are ready for installation.

Outer TF Coils: A vendor visit was made this week to Everson to observe progress on the new OTF legs. The soldering of the OTF coils are almost complete. Five of the six conductors are soldered. They are in process of modifying the groove in conductor 6. The first four conductors were picked up by the roller this week. The last two, are scheduled for rolling early next week.

NBI Upgrade: Changes to the Bay JK VV corner reinforcements are in progress to make manufacturing less difficult. The small port between Bay J-I will need additional engineering to reinforce the area so an estimate for ECP is in progress. The magnet and ion dump were installed in BL2. Calorimeter drives were delivered this week so calorimeter final refurbishment will resume. Lifting fixtures and preparations for HVE relocations are in progress. Procurement packages for power system cable and tray and for deionized water piping are in development and drawings for these packages are nearing completion. Installation of NTC platform 109 and 119 bridges is planned. Fabrication and leak checking of LHe cryo line continues in the NB shop. LHe cryogenics line installation on the TFTR Test Cell South wall continues. Fabrication continues on the central spool section for the NBI duct in the Tech Shop. Cable tray installation for BL controls and instrumentation is in progress in the NTC; BL1 cable removals for required changes are in progress.

#### **Office of Project Management (T. Stevenson):**

Additional requests for minor additions for version 6.1 are being evaluated by IT. A more macroscopic change to the WP system to address JONs has been outlined for further planning. The EVMS self assessment report has been approved. System Engineer training with the online package is in progress. Development of the COG/RLM online supplemental training package continues.

#### **Facilities and Site Services (M. Viola):**

Engineering Services: The team for SLI continues to gather documentation of available data on the lab wing to office conversion and the CAS RESA to MG Conversion. Our architect is

building the model of the MG building for the CDR. A General requirements document was reviewed for the CAS RESA to MG aspect and clarified many issues. A Peer review was held for ESU Building Exterior Wall Upgrade. We conducted a pre-bid conference with several potential subcontractors for Central Plant Chiller overhaul and maintenance planned for this Calendar Year. A meeting was held to review Carpenter Shop Dust Collector project to review the PDR Chits for new Carpenter Shop dust collector for next week's FDR.

Fire Protection: We requested a cost from Simplex for the equipment and programming necessary to implement redundant network EVES. We completed a draft of a brief description of the EVES and the benefits of a redundant network station and distributed for review. A Statement of Work (SOW) was completed for a hydraulic design calculation and evaluation of the warehouse sprinkler system to adequately protect the existing load. Our sprinkler designer/installer visited the site on Wednesday to discuss what is needed and examine the warehouse. BNL agreed to a telephone conversation Friday to discuss follow up to various Fire Protection Audit Review items.

Telecommunications: The installation of the new electrical power transformer and new electrical power outlets in the Telephone Equipment Room is complete and power was transferred successfully. The Telecommunications Office met with the Federal Government Motorola representative to discuss options regarding the Radio and Communications finding from the recent DOE Fire Protection Review regarding recommendations, which could make ESU's portable radios easier to use in an emergency situation. The Telecommunications Office renewed the annual maintenance agreement to provide service and support for the Lab's UHF Narrowband Radio System.

Energy Management: Natural Gas was interrupted but site was able to obtain natural gas on the open market.

### **BUSINESS OPERATIONS (E. WINKLER):**

Members of the Business Operation Department met with representatives from Princeton University's Office of Audit and Compliance and Baker Tilly, PLLC accounting firm, to kick-off the cost allowability audits for fiscal years 2011 and 2012.

The PCard System Administrator released the results of her annual audit to cardholders and approving officials. The period covered by the audit was FY 2012. One statement from every cardholder active in the period was included in the audit sample. A summary report of audit findings was prepared and submitted to Laboratory management and the DOE.

As of January 31, PPPL is exceeding only 1 of its 5 proposed small business subcontracting goals. Performance to date is as follows: overall small business, 50.5% (goal 50.2%); disadvantaged business, 2.71% (goal 5.0%); women-owned business, 5.94% (goal 7%); HUBZone business, 1.45% (goal 3.5%); and service disabled veteran owned business, 2.52% (goal 3%). Procurement will continue to closely monitor small business awards through the months of February and March, and may determine that it is appropriate to request a goal adjustment from DOE, based on the Laboratory's final FY 2013 budget.

The Procurement Division responded to a request from the DOE Princeton Site Office to provide the Office of Small and Disadvantaged Business Utilization (OSDBU) with updated information on the PPPL Small Business Program, including point of contact information, FY 2012 goal achievements as reported to SBA via eSRS, a copy of the approved FY 2013 subcontracting plan, and a separate table of F2012 goals versus actual achievements.

The Procurement Division responded to a request from the DOE Princeton Site Office to provide the DOE Office of Management with its FY 2012 spend for the top ten North American Industrial Classification System (NAICS) codes.

The Procurement Division provided the Associate Director for Best Practices and Outreach with PPPL's total FY 2012 spend in the state of New Jersey. In the last fiscal year PPPL awarded more than \$10.4 million in subcontracts, purchase orders, BPA releases and pcard transactions to in-state suppliers.

E. Winkler, J. Pursell, M. Iseicz along with M. Dikeakos and K. Tafe from the DOE Princeton Site Office participated in a conference call with two GAO staffers in support of the GAO's review of Work for Others (WFO) at the DOE national laboratories. The key objectives of the review are to understand: (1) the work being done under DOE's WFO program; (2) the goals of the WFO program and how DOE measures performance against those goals; and (3) DOE efforts to ensure that WFO projects meet cost recovery requirements. The conference call involved the GAO staffers asking questions of PPPL and PSO to understand the management of PPPL's WFO program by the Laboratory and the DOE.

A proposal entitled "Fundamental Studies of Synthesis of Nanomaterials: A Joint Challenge for Plasma and Materials Sciences" was submitted to the DOE Basic Energy Sciences program. The requested budget for PPPL and its collaborators for this three-year proposal is \$2,770,000 per year. The Principal Investigator is Y. Raitses.

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

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

The PPPL Pandemic Response Plan, Rev. 2, dated January 2013 was approved and posted to the PPPL Home Page.

SPD issued all-staff e-mail messages regarding (1) suspicious persons nearby in Plainsboro (2) Weather Emergency Notifications and (3) Winter Weather Expected on Friday.

The FY 2013 PPPL Department Call Trees (Rev. 2) were updated and provided to the Emergency Services Communication Center (ESCC). The Department Call Trees will be used only in the event of a PTENS failure (Princeton Telephone and E-Mail Notification System).

SPD staff participated in a peer review meeting with Facilities & Site Services staff to discuss the upgrade to the Emergency Services Building that is planned.

## **OFFICE OF COMMUNICATIONS: (K. MACPHERSON):**

C. Cane continued to train Laboratory colleagues on the Drupal system and updated the Director's webpage.

J. Jackson DeVoe and G. Czechowicz edited, designed and produced the PPPL Weekly, including stories on the Laboratory's new Safety Champions Committee and other important announcements.

J. Greenwald wrote a research brief on PPPL research that appeared on Princeton University's Journal Watch page:

<http://blogs.princeton.edu/research/2013/02/08/new-light-shed-on-pesky-snakes-that-cool-fusion-reactions-physical-review-letters/>

K. MacPherson hosted a teleconference on February 6, with Princeton University and MIT to discuss how communications initiatives can support government relations.

E. Starkman, with the assistance of J. Greenwald, prepared a one-minute video about the Centrifuge project with H. Ji, C. Gentile and E. Gilson.

## **BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):**

A. Zwicker gave a talk called, "Reinventing Learning: The Art of Science at Princeton University" to the faculty of the John Witherspoon school in Princeton.

A. Zwicker was interviewed by NJTV for the show "State of the Arts" about the Princeton Art of Science Competition retrospective show that is at the Liberty Science Center. The interview will be broadcast March 10 on PBS.

A. Zwicker attended the kick-off meeting for Science Action, a Princeton University video competition for students and post-docs. PPPL is a co-sponsor of the competition, which includes fusion energy as one of the focus topics for 3-5 minute videos that will be produced during the semester.

## **OFFICE OF ACADEMIC AFFAIRS (N. FISCH):**

N. Fisch is visiting the Department of Particle Physics and Astrophysics at the Weizmann Institute of Science as a Weston Visiting Professor for the spring semester. During this time, G. Hammett will act as Director of Graduate Studies in the Princeton University Program in Plasma Physics.

On January 28, N. Fisch attended a reception in Tel Aviv sponsored by the Israeli Ministry of Science and Technology to commemorate the Tenth Anniversary of the Columbia Shuttle disaster in which Israeli astronaut Ilan Ramon perished together with American astronauts.

On February 4, Nat Fisch gave an invited talk at the Israeli Conference on Plasma Science and Applications (IPSTA), in Holon, Israel. The talk was titled, "Wave Compression in Plasma."

**DIRECTOR'S OFFICE (B. SOBEL):**

On February 5, M. Zarnstorff chaired a meeting of the Research Council to discuss Field Work Proposals for FY14-15.

On February 5, Joe McBrearty, Deputy Director for Field Operations for the Office of Science visited the Laboratory.

On February 6, S. Prager met with the Administrative Support Staff as part of his Working Group Meetings program.

On February 6, Professor Jeroen Tromp, Princeton University, presented a colloquium entitled "Seismic Imaging and Inversion Based on Spectral-Element and Adjoint Methods".

This report is also available on the following web site:

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