



The PPPL Highlights for the week ending May 17, 2013, are as follows:

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

A dry run for the ITER Motional Stark Effect (MSE) Conceptual Design Review was convened to review recent optical designs, performance simulations, and presentations for the MSE Conceptual Design Review, scheduled for May 28-29 in Cadarache, France.

A Task Agreement (C55TD36FU) deliverable entitled "Diagnostic First Wall Deliverable 1[1] - EM & Neutronics Analysis Status Report" was submitted to the USIPO for sign-off.

A report "Survey of Interspace Dose Rates for USITER Equatorial Port Diagnostics" was submitted to the ITER IDM, fulfilling two Performance Plan Milestones regarding neutronics assessments for the ECE and TIP diagnostics, and confirming that the present shielding labyrinths for these systems are close to meeting the dose rate requirements for hands-on maintenance in the interspace region.

NSTX (M. ONO):

Preparations for plasma operations in the NSTX-U configuration also continued with the power testing of the new firing generators for the field coil power conversion (FCPC) system rectifiers. Ten of the planned thirty four firing generators have now been delivered to FCPC, seven of which have successfully completed power testing. The AC Power group is processing oil and maintaining the three autotransformer and transformer rectifier sets that will provide the primary power for the NB2 ion sources. A problem with an autotransformer winding was detected during internal inspections, and that unit will be pulled from the line-up for replacement/repair.

ITER & TOKAMAKS (R. WILSON):

DIII-D (R. Nazikian):

A meeting was held to discuss the physics requirements for the I-coil cross over network. The objective is to combine audio amplifier and SPA outputs. PPPL engineers presented a summary of the design status to date, using 200 Hz as the cross over frequency between the SPA and audio amplifier sources. More circuit analysis will be performed in preparation for a follow up meeting.

A. Nagy was designated the Significant Event Review Chair for the recent DIII-D TF coil bus joint overheating. The review is scheduled for next Thursday.

R. Nazikian presented a seminar at MIT titled "RMP ELM Suppression in DIII-D".

ADVANCED PROJECTS (H. NEILSON):

D. Gates participated in a preliminary design review on ITER magnetic diagnostics, held May 13-15 at the ITER site in Cadarache, France. A total of 27 presentations were made to the committee and chits were generated. The review was a success, pending resolution of the chits. In general the committee felt that the planned flux loop diagnostic set on ITER was well designed and would achieve the required mission elements.

In the Wendelstein 7-X collaboration, PPPL staff held a teleconference meeting with the trim coil power supply vendor, Applied Power Systems (APS), Inc. The supplier reported, with accompanying photographs, significant progress in fabrication of the five units. All components are in house except for some control circuit boards. All of the high voltage components have been installed and all hydraulic connections have been completed. All five units are being built in parallel so they are all at the same level of fabrication. Delays in the program, attributed to design issues, were satisfactorily explained. Acceptance testing of the first unit is scheduled for June 24, and it is currently forecast that all five units will be delivered by the end of August.

THEORY (A. BHATTACHARJEE):

The theory seminar was presented by Dr. Wenjun Deng from PPPL on "Marker Particle Optimization for Delta-f PIC Simulation". The technique of marker removal and its implementation in the kinetic/MHD hybrid M3D-K code were shown. So far, this method is mostly applicable for study of instabilities with phase space localized structure in delta-f PIC codes. A detailed convergence study of this method for 2-D simulations of bump-on-tail and $n=1$ TAE simulations was presented.

B. Tang gave a presentation at Argonne National Laboratory (ANL) on "Global Simulations of Plasma Turbulence at the Petascale and Beyond" - the project for which he is the principal investigator at the Early Science Projects (ESP) PI Meeting on May 15-16. In addition, Bill participated in the Symposium on "30 Years of Parallel Computing at Argonne" on May 14-15.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

Construction: The NB armor plates have been adjusted at the vessel. Some adjustments are still required. Three centerstack quadrants have been completed and tested. Cable tray reconstruction for category 1, 2, 3, and 4 systems are 90% complete. This work will be completed when the TF coils are installed. The OH coil winding fixture fabrication and electrical support continue. PF4/5 support modifications continue first and second shift. The welding of lower umbrella supports will be completed on May 18. The welder will move to the upper supports. A TF coil will be

delivered to the high bay area on Monday. Preparations are underway for the upcoming June 1st open house at PPPL where the NSTX Upgrade will be show cased. Welding work continues on the lower umbrella structure. The NB armor plates are tacked, the location is being verified. PF4/5 support modifications continue first and second shift. OH coil winding fixture and tape machine fabrication continues. Prep work for the MPTS platform continues. Welding of Bay-L stiffeners has been completed.

CS Upgrade: The third inner TF quadrant successfully passed the electrical and hydro test. 33 of 36 inner TF conductors bars have been taped with the last of four quadrants to be assembled starting the week of May 20. The first of two new outer TF coils will be delivered to PPPL the week of May 20. Good progress is being made on the in-house fabrication and assembly of the OH winding apparatus. The Inner TF bundle full mold is nearing completion with leak testing schedule for next week.

NBI Upgrade: A post award meeting was held with the NB piping service contractor with work scheduled to begin in two weeks. Modifications to the NB armor to resolve interferences with the VV wall monuments is underway. Fabrication and leakchecking of the LHe cryo line continues.

Facilities and Site Services (M. Viola):

Fire Protection: DOE requires facilities such as PPPL to prepare a formal, detailed fire hazard analysis, known as an FHA, in certain cases. PPPL's FHAs were prepared by a fire protection consultant during the preparation for TFTR tritium work. We are currently preparing to update our FHAs and the consultant has spent this week with us determining the scope of work required.

BUSINESS OPERATIONS (R. TEMPLON):

An amendment to the Work for Others Agreement with the ITER Organization on 3D MHD simulation of vertical displacement events (VDEs) was executed to increase the current scope of work to include expanding the GRIN code to calculate wall currents and associated forces more accurately. The total budget for this project increased from \$267,000 to \$333,750.

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

ESH&S participated in a DOE-lead review of the PPPL and Princeton Site Office processes for complying with the National Environmental Policy Act (NEPA).

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

On May 17, Ed Rao, Program Manager, Department of Homeland Security, Washington DC, and James Remer, Department of Homeland Security, TSA Center, Atlantic City, NJ visited the Laboratory to discuss PPPL technologies which may have application in increasing the effectiveness of certain DHS diagnostic tools. Follow up interactions are planned.

On May 15, A. Merali gave a talk on informal science teaching to 15 pre-service teachers at The College of New Jersey, highlighting the programs run by Science Education.

DIRECTOR'S OFFICE (B. SOBEL):

On May 13, the monthly PPPL Research Meeting was held. The agenda for the May 13 meeting was: FESAC update - (M. Zarnstorff), and TTF & ITPA meeting summaries (S. Kaye, N. Gorelenkov, A. Diallo, W. Guttenfelder, C.S. Chang, Y. Ren).

Dr. Jeffrey Griffin, Associate Laboratory Director for Environmental Stewardship Directorate, Savannah Rive National Laboratory visited PPPL on May 15, and presented a colloquium, titled "Savannah River National Laboratory: Underpinning Critical National Missions". During his one day visit, Dr. Griffin met with Drs., Zarnstorff, Cohen, Prager, and others for discussion germane to areas of common interest for future collaborations between PPPL and SRNL.

On May 16-17, Adam Cohen attended the Annual Meeting of the Plasma Science Center on Control of Plasma Kinetics held in Washington, DC.

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AWARDS:

The Department of Energy's Office of Science presented PPPL with a plaque which acknowledged 20 years of hosting middle and high school science bowls.

COLLOQUIA:

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PUBLICATIONS:

An article by D. Mueller (PPPL) "The Physics of Tokamak Start-up" has been published online, May 10 in Physics of Plasmas (Vol.20, Issue 5): URL: <http://link.aip.org/link/?PHP/20/058101&aemail=author> DOI: 10.1063/1.4804416. The paper describes tokamak start-up on present-day devices using inductive start-up, sometimes assisted with auxiliary power from electron cyclotron radio frequency heating. The design of a spherical tokamak (ST) with DT capability for nuclear component testing would require an alternative to a central solenoid because the small central column in an ST has insufficient space to provide

shielding for the insulators in the solenoid. Alternative start-up techniques for the ST such as induction using outer poloidal field coils, electron Bernstein wave start-up, coaxial helicity injection and point source helicity injection are described. The paper is based on D/ Mueller's tutorial talk at the 2012 APS-DPP meeting.

The following PPPL Reports were posted to the web:

PPPL-4877

Fast 2-D Camera Control, Data Acquisition, and Database Techniques for Edge Studies on NSTX PPPL-4877

Authors: W.M. Davis, M. K. Ko, R.J. Maqueda, A.L. Roquemore, F. Scotti, S.J. Zweben
Submitted to: Fusion Engineering and Design (May 2013) Presented at: 9th IAEA Technical Meeting (IAEA-TM) on "Control, Data Acquisition, and Remote Participation for Fusion Research" in Hefei, China, (May 6-10, 2013)

PPPL-4878

Rotational Resonance of Non-axisymmetric Magnetic Braking in the KSTAR Tokamak PPPL-4878

Authors: J.-K. Park, et. al.
Submitted to: Physical Review Letters (April 2013)

PPPL-4879

Boundary Perturbations Coupled to Core $3/2$ Tearing Modes on the DIII-D Tokamak PPPL-4879

Authors: B. Tobias L. Yu, C.W. Domier, N.C. Luhmann, Jr., M.E. Austin, C. Paz-Soldan, A.D. Turnbull, I.G.J. Classen and the DIII-D team
Submitted to: Plasma Physics and Controlled Fusion (March 2013)

This report is also available on the following web site:

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