The PPPL Highlights for the week ending May 10, 2013, are as follows:

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

Persuaded by arguments from the US, the ITER Organization dropped a request to include an option for short-circuit testing in the pending contract for the high voltage transformers.

Two progress meetings this week focused on the interfaces between the ITER Toroidal Interferometer/Polarimeter retroreflectors and the blanket modules in the Heating Neutral Beam ducts. In the three HNB ducts, the plan is to bolt in housings containing an optical periscope, with a plane mirror facing the plasma and directing the laser beam to a corner-cube-reflector which sends the beam back on itself. The next step is to determine whether active cooling is needed to keep thermally-induced distortion of these mirrors within acceptable limits.

For the Electron Cyclotron Emission diagnostic integration into the interspace region of E9, an exchange of CATIA models was discussed with the IN-DA, which is responsible for polarization splitter boxes and transmission lines in this region.

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.

NSTX-U team meeting was held on May 7. In the Research Operation Update, S. Gerhardt noted that the available time window for the diagnostic installation is from August 1-November 29. If you are planning to install hardware for the FY 2015 operation, please contact Gerhardt, B. Stratton, or B. Kaita. The team meeting presentation materials are available on the web: http://nstx.pppl.gov/DragNDrop/NSTX_Meetings/Team_Meetings/2013/2013_05_07%EF%80%A8/

D. Gates, K. Erickson, and B. Davis of PPPL attended the IAEA Technical Meeting (IAEA-TM) on “Control, Data Acquisition, and Remote Participation for Fusion Research” in Hefei, China from May 6-10. On May 6, D. Gates presented a talk entitled "Overview of the Plasma Control System on NSTX-U" immediately followed by a talk by K. Erickson entitled "NSTX-U Control System Upgrades". There was substantial interest in many of the technical solutions chosen for the NSTX control system. On May 8, B. Davis presented a poster entitled "Fast 2-D Camera Control, Data Acquisition, and Database Techniques for Edge Studies on NSTX".

Richard Nygren and Dennis Youchison from the Sandia National Laboratories visited PPPL last week. Among the topics discussed were future plans for high-Z and liquid lithium PFCs on NSTX-U. Youchison also gave a seminar entitled "Helium-Cooled PFCs for Fusion and Other Applications: A History of Analysis and Testing at Sandia."

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. Nine of the planned thirty four firing generators have now been delivered to FCPC, four of which have successfully completed power testing. The AC Power group is processing oil and maintaining the autotransformers and transformer rectifiers that will provide the primary power for the NB2 ion sources.

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

ITER & TOKAMAKS (R. WILSON):

A. Nagy held a design review on a ground fault detection system for use on the I-coils. The gyrotron 8 water cooling manifold purchase process was launched last week and is proceeding rapidly. This job is on schedule and is aiming for completion by the end of August.

A. Nagy participated in the Padre's Science Day at Petco Park with associate Rick Lee (GA). Their demonstration included experiments liquid nitrogen, magnetic fields, eddy currents and their resultant interactions. Approximately 3000 students and parents were in attendance, all had a great time.

ADVANCED PROJECTS (H. NEILSON):

A teleconference project meeting for the K-DEMO collaboration with South Korea's National Fusion Research Institute (NFRI) was held on May 6. The team is currently focused on configuration development and evaluation of the K-DEMO reference design point adopted in February. At the meeting, the PPPL team presented a preliminary poloidal field coil configuration with coil currents for three fiducial equilibrium states, pre-charge, low beta, and high beta. Also, a segmented blanket concept based on vertical removal of modules for maintenance was presented. The team reported system code analyses of the operating space, examining sensitivity to certain assumptions, i.e. thermal conversion efficiency, radiated power fraction in the divertor, and divertor heat flux limit. Design parameters for the various superconductors assumed in the design were reviewed. A detailed summary of conductor analysis results was presented, with comparisons with ITER where appropriate.

THEORY (A. BHATTACHARJEE):

Professor Mike Mauel from Columbia University gave a theory seminar on "Turbulent Pinch, Laboratory Magnetospheres, and the Economic Viability of Fusion". He first reviewed the physics of turbulent pinch in a magnetized plasma. Turbulent pinch due to low-frequency

interchange fluctuations and the new results from the superconducting levitated dipole experiment were also presented. In the second part of his talk, he raised the question of economic viability of fusion compared to other energy alternatives, which created a good discussion. We had a large mixed audience from different groups at the lab in attendance at the seminar.

COMPUTATIONAL PLASMA PHYSICS GROUP (S. JARDIN):

The PPPL M3D-C1 group received news this week that they are to be awarded an additional 20,000,000 NERSC hours spread over CY13-14 for their successful Advanced Leadership Computing Challenge (ALCC) proposal "Study of the Internal Dynamics of ITER". Through this highly competitive awards program, the M3D-C1 team will have resources to greatly increase the spatial resolution of their 3D two-fluid MHD simulations, allowing them to use parameters approaching those of existing and planned fusion devices. Besides the PPPL team, Co-PIs in this activity are Nate Ferraro of General Atomics and Mark Shephard of RPI.

S. Ethier was recently granted special access to Sequoia -- NNSA's most powerful supercomputer (https://asc.llnl.gov/computing_resources/sequoia/), before it was designated entirely for classified work. Housed at LLNL, Sequoia is the largest Blue Gene/Q system in the world and at 16.3 Pflop/s, currently the second most powerful. Dr. Ethier ran benchmark cases with the recently optimized version of GTCP-C, which was developed in collaboration with members of the Future Technologies group at LBL (L. Oliker, S. Williams, K. Ibrahim), K. Madduri at U. Penn., and Princeton U. G8 postdoc Bei Wang. The code, which already scaled extremely well on the large Blue Gene/Q system at ANL (Mira), continued to scale almost perfectly to all 1,572,864 processor cores on Sequoia. GTCP-C uses a hybrid MPI+OpenMP parallel approach to take full advantage of the BG/Q highly multi-threaded nodes and large scalable interconnect. Sequoia is dedicated to NNSA's Advanced Simulation and Computing (ASC) program for stewardship of the nation's nuclear weapons stockpile, a joint effort by LLNL, Los Alamos National Laboratory and Sandia National Laboratories. ASC advances high performance computing for national security, related science and engineering, and other national challenges.

Arnold Kritz and two associates from Lehigh University visited PPPL on May 8 to receive instruction from X. Yuan on the use of PTSOLVER within the TRANSP code. They are the first beta-users of PTSOLVER outside of PPPL. PTSOLVER replaces the normal TRANSP algorithm for predicting the temperatures by a parallel multivariate Newton-based solver that works with highly nonlinear and stiff transport modules such as GLF23 and TGLF. It is normally able to find smooth solutions for the profiles without imposing additional time or space smoothing.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

Construction: Installation of the in-vessel stiffeners at bay L has been started. The upgrades to the PF4/5 supports continues. Welding of the lower umbrella stiffeners continues. The relocation of the MPTS rack has been completed. Re-enforcement of the 109' platform for MPTS will be

next. Category 4 tray work continues on top of the machine. Fabrication of the OH winding fixtures and the NB2 duct components continues in the Tech Shop.

CS Upgrade: The third quadrant successfully completed the epoxy VPI and is being removed from the mold. The modifications made to the cooling tube feedthrus on the mold eliminated the mold stripping issues experienced with VPIs on quadrants 1 and 2. The first two quadrants were readied for the full bundle VPI and moved to crates to temporarily make space for quadrants 3 and 4 in the priming room. Two more conductors were insulated in the winding area. The CS casing was lifted to the upright position and mounted to the stand. It is now ready for CS tile stud installation. The fixture to locate the weld studs on the CS casing is scheduled to ship the end of next week. A leak was discovered in one of the cooling tubes on the first OTF at Everson-Tesla during the leak test. PPPL personnel were at Everson on May 10 to see the leak and discuss the planned repair procedure. Machining of OH insulation filler pieces continued in the RESA building.

NBI Upgrade: Installation of supports for the BL2 source platform continues in NTC. Internal connections have been remade in the three HVEs. Brackets and hardware are being fabricated and assembled for transmission line supports. Fabrication and leakchecking of LHe cryo line continues in the NB shop. LHe cryogenics line installation, welding, and leakchecking on the TFTR Test Cell South and East wall continues. Fabrication continues on the NB/TVPS duct components in the Tech Shop. Procurement activity for the water system piping subcontract continues. Work continued on the SOW and drawings for the power supply cable and tray subcontract requisition package. Tray support bracket installation was analyzed. NBI Armor fitup indicates minor interferences with VV wall monuments so adjustments are being evaluated. Another fitup is planned after monuments are relocated. VV reinforcements were revised and requests for quotes are in progress for a simplified version.

Office of Project Management (T. Stevenson):

The COG/RLM online training for 2013 is in progress. The requirements document for WP 7.0 is in technical review with IT prior to circulation. Additional items have been identified and will be included for this version. Evaluation of outstanding action items with Best Practices provided paths forward and TCRs and revisions are planned. The monthly PSRB meeting has been scheduled.

Facilities and Site Services (M. Viola):

Engineering Services: A final design review was held on May 10 for the Carpenter Shop Dust Collector Project. The FIMS Validation meeting held with PSO. We are finalizing the information provided to DOE.

Fire Protection: Many of our fire extinguishers are no longer serviceable for a variety of reasons. As a result Site Protection and Fire Protection personnel are working together on a review of current extinguisher deployment with a goal of assuring required protection is provided while, at the same time, minimizing the additional costs. As a result of this work you will likely notice that some extinguishers are added, removed or relocated. Employees are encouraged to be cognizant of where extinguishers are located and to express any concerns to H. Caruso or R. Jeanes.

Telecom: A kickoff meeting was held to discuss the possible applications and features of using portable communications devices over the Lab's WiFi network. The goals of this project are to improve remote communications, increasing staff efficiency and productivity, reduce our reliance on cell phones and their recurring monthly fees, and have an alternate means of onsite communications that could replace the aging pocket pager system. The desired features would be phone calls, email, texts, photos, real-time video and 4-digit dialing. In an effort to reduce costs, the Telecommunications Office has requested that all PPPL Skytel pager users review the use of their Skytel pager in their work operations. Our goal is to eliminate Skytel pagers that can now be replaced with cell phones or portable radios. The Telecommunications Officer met with PSO to review and discuss the formal letter to approve the operational use and functions of the VHF radio assignment for the Lab's onsite Motorola paging system. The Telecommunications Office and Facilities maintenance personnel removed the old antenna, cables, repeater and UPS system associated with the old wide-band UHF radio system located in A/B-Site, Sayre Hall.

Material Services: DOE approved two GSA vehicles for Facility and Site Services. Both vehicles (one cargo van and one pick-up truck) were picked-up from GSA on May 8, and are fueled with Ethanol 85. The new property pass system is available to all employees and can be accessed at the following link https://proppass.gov/ or by going to the "Material Services Home Page" under Property Management Information. Temporary Export Forms (TMP forms) are available in property pass system. This form is needed in conjunction with international property passes when hand carrying personal property to a foreign country.

BUSINESS OPERATIONS (R. TEMPLON):

L. Lauria, T. Bleach, B. Bozarth (PSO) and M. Dikeakos (PSO) participated in a conference call with a member of the DOE Office of Inspector General (OIG). The purpose of the call was to discuss the review of PPPL's conference activity that will be conducted by the DOE-OIG.

R. Templon participated in the monthly Procurement Evaluation and Reengineering Team (PERT) conference call. Agenda topics included results of purchasing system peer reviews at CH2M Hill (Plateau) and Washington River Protection Solutions (both in Richland, WA) and Lawrence Berkeley National Laboratory, and plans for upcoming reviews.

R. Templon and T. Bleach met with representatives of the Princeton University Office of Audit and Compliance and the PPPL audit services subcontractor to discuss an upcoming review of Procurement's sole source action file documentation.

U. Patel and N. Gnyp participated in a National Education Seminar sponsored by the National Contract Management Association (NCMA). The seminar topic was "Contract Negotiations: Skills, Tools and Best Practices."

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

The Environmental Services Division shipped 1,197 pounds of hazardous and non-hazardous waste off-site for treatment.

A management safety walkthrough of the Lab Building & L-Wing 2nd Floor was held on May 8. Safety conditions in the area were found to be good to very good.

Emergency Services Engine 66 responded to C-Site for an odor of smoke. Emergency Services Ambulance A-166 responded to Plainsboro for two mutual aid assignments and to PPPL C-Site for one assignment.

DOE Counterintelligence Officer P. Moskal visited the Laboratory May 7-9.

SPD issued an all staff e-mail message regarding Arson Awareness Week (May 5-11) and President Obama's executive order to fly the flag at half-staff. The U.S. flag was lowered to half-staff on May 10. New Jersey Governor Christie ordered the flag flown at half-staff to honor the service and sacrifice of United States Marine Staff Sergeant Eric Christian. Staff Sergeant Christian, 39, a resident of Ramsey, New Jersey tragically lost his life while supporting Operation Enduring Freedom in Farah Province in Afghanistan on Saturday, May 4.

SPD provided two sessions of Building Evacuation Monitor (BEM) training. The purpose of the BEM Program is to assist with the evacuation and accountability of building occupants. Monitors received training to familiarize them with emergency procedures and designated assembly areas. In addition, monitors may have critical responsibilities in times of emergency at the Laboratory. Therefore, BEMs received training on the PPPL Emergency Response Organization and the Emergency Operations Center. Information on the Building Evacuation Program may be found at: https://int-sweb.pppl.gov/siteprotection/buildingevacuation.html . Please be familiar with your evacuation assembly area and post the assembly area map in your work areas, in all conference rooms and provide copies to any visitors.

OFFICE OF COMMUNICATIONS: (K. MACPHERSON):

J. DeVoe and G. Czechowicz edited and produced the PPPL Weekly, including stories on PPPL's work with ITER, the upcoming Open House, and an Early Career grant awarded to A. Diallo.

K. MacPherson visited OFES in Germantown, Maryland, on May 9 and met with E. Synakowski, J. Van Dam, P. Glynn and several program managers including Steve Eckstrand, Sean Finnegan, John Mandrekas, and Ann Satsangi.

J. DeVoe met with and gave a tour to two educators from Busan High School in South Korea, and two representatives from Isys Education tour company on 5-7-13 to discuss our tours.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

A. Zwicker and A. Dominguez attended the Science Action video screening which presented the video shorts produced by Princeton students on fusion energy, climate change and engineering. (http://www.princeton.edu/scienceaction/). The first place price was awarded for, "How is Bacterial Quorum Sensing Influenced by Microfluidics?" The second place prize was awarded for: "How does a plasma contribute to a fusion reaction?" Zwicker was one of the organizers of

the competition and Dominguez was the science judge for the entry on fusion that won second place.

A. Zwicker attended a meeting with representatives of Lockheed Martin, Computer Associates, and Enterra Solutions to plan a new collaboration with the PPPL Science Education Department and local schools on project-based learning modules on energy production and efficiency.

A. Zwicker attended the opening of the 2013 Art of Science competition at Princeton University where he is one of the organizers and spoke briefly at the reception. Third place was awarded to C. Cane and his colleague for their entry, "The Web of Art and Science." This is the sixth Art of Science competition, and a PPPL-entry has won third place in a fourth competition out of six.

On May 11, Science Education hosted a poster session for the participants of the Pathways to Science mentoring program. Five students presented the results of research done in collaboration with a mentor over the last six months. A Best Poster award was presented to Varna Kodoth, who presented her poster: The Effects of Ultraviolet Light on E.Coli. Other topics of study included holography, botany, taxonomy, and fluid dynamics. Twenty-five people were in attendance at the poster session.

DIRECTOR'S OFFICE (B. SOBEL):

On May 8, Dr. Scott McIntosh from the High Altitude Observatory of the National Center for Atmospheric Research, presented a colloquium entitled, "The Alfvénic Motions of the Sun's Outer Atmosphere".

AWARDS:

A. Diallo has received an Early Career Research Program award for a proposal entitled, "Edge Pedestal Structure Control for Maximum Core Fusion Performance".

PUBLICATIONS:

An article entitled "Physics of Radiation-driven Islands Near the Tokamak Density Limit" by D. Gates, L. Delgado-Aparicio, and R. B. White has now been published online, and is available at http://stacks.iop.org/0029-5515/53/063008 . The content of this paper was originally presented at the IAEA Fusion Energy Conference (FEC) held in San Diego, California, October 2012. The paper investigates the behavior of radiation driven islands, which have previously been associated with the tokamak density limit [D. A. Gates and L. Delgado-Aparicio, Phys. Rev. Lett. 108, 165004 (2012)], in the vicinity of this limit.

The following PPPL Reports were posted to the web:

Alcator C-Mod Experiments in Support of the ITER Baseline 15 MA Scenario PPPL-4874
Authors: C. E. Kessel, S. M. Wolfe, I. H. Hutchinson, J. W. Hughes, Y. Lin, Y. Ma, D. R. Mikkelsen, F. Poli, M. L. Reinke, S. J. Wukitch, and the C-Mod Team
Submitted to: Nuclear Fusion (May 2013)

STELLOPT Modeling of the 3D Diagnostic Response in ITER PPPL-4875
Authors: S. A. Lazerson and I.T. Chapman
Submitted to: Plasma Physics and Controlled Fusion (May 2013)

Collisionality Scaling of Main-ion Toroidal and Poloidal Rotation in Low Torque DIII-D Plasmas PPPL-4876
Authors: B.A. Grierson,. K.H. Burrell, W.M. Solomon, R.V. Budny and J. Candy
Submitted to: Nuclear Fusion (March, 2013)

LEADERSHIP POSITIONS:

A. Zwicker began his three-year term as Editor of the newsletter "Physics and Society," a publication of the APS Forum on Physics and Society.

This report is also available on the following web site:
http://www-local.pppl.gov/director/highlights/2013/2013-highlights.htm