The PPPL Highlights for the week ending March 29, 2013, are as follows:

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

A package of over 20 preliminary design documents was uploaded to the ITER Document Management System in preparation for the Preliminary Design Review for the Residual Gas Analyzer. This Review will take place in Cadarache, France on April 9-10.

Retroreflectors for some of the Toroidal Interferometer/Polarimeter sampling chords will be housed in the blankets lining the duct of the ITER Heating Neutral Beams. In preparation for the Final Design Review for these blankets, redefinition of the retroreflector interfaces are needed. This week options for integration of the retroreflector housings were discussed with diagnostic experts at General Atomics.

UCLA submitted plans for a transmission line layout for testing characteristics of waveguide components being fabricated by ORNL, with a corrugation design chosen to be suitable for the ITER LFS Reflectometer.

A Procurement Package for "Physics and Engineering Design Support and Diagnostic Hall Instrumentation Development for ITER Low-Field-Side Reflectometry (LFSR) Diagnostic System" was submitted to DOE for approval.

Vendor bids were received for the ITER High Voltage Circuit Breakers and High Voltage Switches.

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.

C. Skinner and R. Goldston of PPPL travelled to Hefei, China for the DivSOL ITPA meeting March 19-22. The focus of the meeting was to assess the main issues and potential showstoppers for the implementation of a single tungsten divertor from the ITER startup phase through the Q=10 milestone. A report on the implications for divertor heat flux, fuel retention, material issues and operations is due by May and will be of interest for the proposed move of NSTX-U from C to metal PFCs. Skinner gave presentations on behalf of Joon-Wook Ahn (ORNL) on 'ELM heat flux widths and toroidal asymmetry' that triggered interest and follow up action on the implications for ITER's ELM strategy. He also gave a presentation on behalf of Vlad

Soukhanovskii (LLNL) on 'Divertor Detachment Studies in NSTX'. Goldston has been working with Peter Stangeby and the JET and COMPASS groups on interpreting measurements relevant to the ITER Be start-up limiters, in light of the melting seen on the Be start-up limiters at JET. He gave a presentation on 'Theoretical explanations for narrow heat flux layers near a LCFS'.

Recent General Atomic studies for NSTX plasma control have been focused on developing a new TokSys model for the NSTX-U configuration, analyzing equilibria from the LRDFIT code, producing TokSys GSEQ equilibria for the new system, and analyzing the new configuration for relative vertical stability. The TokSys designeq and convergeq codes were used to produce a well-converged lower single null equilibrium with the NSTX-U coil-set for a 2 MA plasma current. In the next step the code gspert was applied to this NSTX-U equilibrium. It gave a vertical growth rate of about 4 rad s-1 with the new TokSys conductor configuration. The predicted mode in this case is not purely vertical. Although it is common for axisymmetric instabilities to have significant non-vertical, nonrigid components, it is possible that a better solution can be found. Further studies will address the form of such modes in NSTX data, and produce calculations using appropriate constraints. (Dave Humphreys, Matt Lanctot and Anders Welander, General Atomics).

ITER & TOKAMAKS (R. WILSON):

DIII-D (R. Nazikian)

A. Nagy participated in the team diagnosing the I-coil high resistance short to ground determined to be inside the vessel. Several techniques were attempted to locate this connection between the I-coil conductor and its jacket, discovered a couple weeks ago during ops check out. If this short was a low resistance short the location would have been relatively simple, however given the high resistance it was more difficult. A scheme measuring the current differences in each coil leg was developed and used successfully to locate this connection. Coil operation limitations are in discussion.

D. Mansfield and L. Roquemore travelled to G.A. to assist in installation of the PPPL supplied lithium dropper onto the DIII-D tokamak.

ADVANCED PROJECTS (H. NEILSON):

The Wendelstein 7-X (W7-X) Trim Coil Project achieved a major milestone this week with the shipment of the five trim coil instrumentation interface modules, or "I/O boxes," for short. These units, which will transfer instrumentation signals from the coils to the W7X central computing system, were designed by PPPL's X. Zhao and were fabricated by PPPL's A. Falcon. Upon arrival of the I/O boxes and the trim coil #5 at the W7-X site in Greifswald, Germany later this month, all coil-related hardware delivery milestones will be completed, leaving only power supply-related deliveries which will be completed by the end of the fiscal year.

H. Neilson and M. Zarnstorff attended an organizational meeting of the Collaborative Innovation Center for Advanced Fusion Energy and Plasma Science at the University of Science and Technology of China (USTC) in Hefei, China. The Center is a partnership of six institutions, five

Chinese institutions and PPPL, established to contribute to the advancement of fusion and plasma science and to develop an educated workforce that will enable China to contribute strongly to ITER and build a China Fusion Engineering Test Reactor (CFETR) in the near future. Participants in the meeting reviewed and approved the Charter for the center, the work plan for 2013-2014, the organizational structure, and recruiting strategy. The main focus for the first year will be the submission of an application to the Chinese government to become a National Collaborative Innovation Center under a new program established by the Ministries of Education and Finance; if successful this designation would bring opportunities for significant new fusion funding to the center. M. Zarnstorff also presented two talks at the meeting.

THEORY (A. BHATTACHARJEE):

The Theory Department Plasma Material Interaction (PMI) Working Group met on March 27 at PPPL. T. Abrams gave a presentation on experiments performed with M. Jaworski on the Magnum-PSI linear plasma device in the Netherlands. Abrams also discussed semi-analytic modeling of the erosion-redeposition process observed in those experiments. D. Stotler followed with an overview of the state of PMI models used in edge plasma transport codes.

Version 4.6 of the DEGAS 2 Monte Carlo neutral transport code (http://w3.pppl.gov/degas2) was released by D. Stotler to external users. The primary improvements to the code are: 1) a more efficient scheme for transmitting data from the "worker" processors to the central processor on massively parallel computers and, 2) a generalized approach to specifying atomic species and reactions when coupling to the XGC0 guiding center neoclassical particle transport code being developed within the Edge Physics Simulation SciDAC 3 project.

J. Johnson and P. Damiano participated in the AGU Chapman Conference on Fundamental Properties and Processes of Magnetotails in Reykjavik, Iceland from March 10-15 that brought together researchers studying both the terrestrial magnetotail and those at other planets. Johnson presented an invited review talk on “Alfvenic Magnetotail-Ionosphere Coupling at Earth and other Planets” while Peter gave an oral presentation entitled “2D Global Gyrofluid-kinetic Electron Simulations of Magnetotail Alfven Wave Propagation”.

COMPUTATIONAL PLASMA PHYSICS GROUP (S. JARDIN):

E. Feibush presented "Scientific Visualization with VisIt" as a mini-course sponsored by the Princeton Institute for Computational Science and Engineering on March 27. Researchers from twelve different departments attended. Representing users' data in the visualization toolkit software was emphasized. This workshop provided hands-on training in using the VisIt visualization software, assembling JPEG images into QuickTime movies, and selecting data from f(x,y,z) data sets. CPPG interns M. Knyszek, J. Miller, and M. Lotocki served as teaching assistants.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

Construction: The umbrella arch reinforcements have been modified, positioned and tack welded into place. Full welding is now in progress with the upper east side being done first to clear the area for electrical installations to start. The bay L nozzle passed its leak check. TF4 passed its electrical test and was re-installed on the south side of the machine. The 109' and 118' platforms can now be re-established in this area. The repair machining of TF12 continues in the south high bay. The termination of category 3 cables continued this week, as did the installation of brackets around the top of the machine for the new upper cable tray which has been fully pre-assembled in the shop. The installation of shims for the umbrella legs has been completed. Positions for the six new gas injection ports have been laid out on/in the vessel to verify that there are no significant interferences .

CS Upgrade: The mold was closed up on March 18, but vacuum tests revealed some leaks which required the mold to be reopened and the leaks repaired. After repairs were completed the mold was closed up and successfully retested on Thursday and transported to the oven for the VPI procedure. The plumbing is being installed now and the second quadrant is scheduled to being the VPI process early next week. Insulation wrapping of two bars was completed in the winding area this week. Only two more bars remain to be wrapped to complete the insulation for the third quadrant. The OH Winding station fabrication continued throughout the week in RESA. The main frame was painted and work continued on the spool station. The CS stud welding fixture drawing was sent out to BPA vendors to determine interest in fabricating it. A meeting was held this week to review the critical path activities on the centerstack assemblies and to identify areas that could be accelerated. A peer review of the DCPS design activities was held on Tuesday of this week.

NBI Upgrade: The Decon and removal of BL component stands, equipment, and floor areas continues in the TTC. Lift equipment is on order to remove the TTC floor plug for HVE lifts. Fabrication and leak checking of LHe cryo line continues in the NB shop. LHe cryogenics line installation and welding on the TFTR Test Cell South wall continues. Fabrication continues on the NB/TVPS duct components in the Tech Shop. The TVPS ducts have been fit in place tack welded to the central spool piece. Work continues on the Armor backing plates in the Braze Shop. Procurement held a pre-bid conference for the DI Water procurement. Decon of the BL2 lid has continued. Decon of the BL2 surround and tools continued to make way for HVEs. The BL2 Calorimeter support structure was installed on top of the BL and the calorimeter was cycled. Limit switch alignment is complete.

Office of Project Management (T. Stevenson):

The Lessons Learned Library was added to the Project Management web page. Work Planning system 6.1 was moved to the development area for testing. Move to the production area is imminent. Requirements gathering for a Work Planning system upgrade continued. ENG procedure and Engineering Standard reviews are ongoing.

Facilities and Site Services (M. Viola):

Maintenance Services: HVAC and Operations staff replaced chilled water supply/return isolation valves in the 138' Level MER. Additionally, repairs were made the chilled water piping on the 4th floor of the RF building.

Engineering Services: A copy of the PPPL 2012 Business Plan was distributed and a meeting held with department contributors to discuss input for updates for 2013. Revision is in progress. Work progresses on obtaining feedback and developing required documentation for the TFTR Duct Restoration Project. A meeting was held with AC Power to discuss C-Site MG Building Cable Tray and Electrical work Demolition/Relocation cost options. A Chilled water Shut-off valve was replaced and during the maintenance opportunity, the Neutral Beam Chilled Water bypass valve was re-configured to reduce failure points and improve reliability.

Fire Protection: Training for Personnel who occupy FM200 areas was completed and the presentation forwarded on to use for on-line training. The punch list item for the smoke detector in HP HVAC was completed.

Energy: PPPL will begin using Integrys as the vendor for Natural Gas beginning in April.

Telecom: The Telecommunications Office is installing an antenna on the LSB Penthouse roof as the first step of the installation of radio communications equipment, which will enable the PPPL's SPD personnel to communicate with Princeton University's Public Safety personnel. The Telecommunications Office has enabled the 'tethering' feature on iPhone 5 users. The tethering feature will allow users to remotely connect to the Internet for data communications for laptop computers, printers, etc. The tethering feature on the iPhone 5 smartphones will eliminate the need for wireless USB modems, thus saving the Lab $50 per month for all USB modem users.

Material Services: Material Services questioned PSO and Chicago operations in regards to the rational for requiring an export control review for Personal Property on Domestic Loans. Currently awaiting clarification from HQ which may aid in the minimum requirements for Domestic Loans.

BUSINESS OPERATIONS (E. WINKLER):

PPPL received $121,900 of third-year funding from NASA for continued work on the "Effects of ULF on Newly Created Heavy Ion at Mercury" project. The Principal Investigator is E.H. Kim and the period of performance is through February 2014.

DOE approved an amendment to the Work-for-Others agreement between the ITER Organization and PPPL for the "3D MHD Simulation of VDEs for Detailed Evaluation of Toroidal Peaking Factor (TPF) and Associated Electro-Magnetic Load" project. The amendment increases the budget from $267,000 to $333,750 and revises the scope of work to include using the GRIN code to model ITER's blanket and wall structure. The Principal Investigator is S. Jardin.

A new Laboratory Directed R&D (LDRD) project titled "Development of a Plasma Data Management Program" was submitted to the DOE Princeton Site Office for review and concurrence.

E. Winkler participated in a meeting of the NLDC CFO Working Group.

The Laboratory procedure for travel planning and approval for conference attendance was revised to incorporate the current guidelines issued by DOE.

Members of the Procurement Division staff, the Head of Accounting and the Subcontracts Audit Representative participated in a 4-hour virtual conference hosted by the National Contract Management Association. The conference topic was understanding, surviving and responding to the results of the Government audit process. Each participant earned four hours of continuous learning credits.

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

A management safety walkthrough of the cafeteria was performed on March 28. Safety conditions in this area were found to be good to very good.

Emergency Services Engine 66 responded to Princeton Township for one mutual aid assignment.

SPD provided comments to DOE/PSO and the DOE Office of Health, Safety and Security on the DOE draft report, "PPPL Physical Protection System Risk Assessment." This draft report summarizes the results of a DOE Office of Science led effort to conduct a physical protection system assessment of PPPL. The assessment was held in November 2012.

Dr. Earl D. Hicks, Director of the Safeguards and Security Division of the DOE Office of Science, visited PPPL March 27-28. J. DeLooper provided an overview of the Laboratory, while SPD Head F. White provided an overview of the Site Protection Division and the Emergency Services Unit Multi-Tasked Responder. Captain K. Rhoades and J. Dunnigan (Alkhateeb) provided a tour of the site, concentrating on the emergency services facilities, the Rad Waste Building and the CASL. A. von Halle provided a tour of the experimental facilities, including the NSTX test cell, TFTR test cell, D-Site MG, LTX, NCSX and the VPI facilities. Dr. Hicks also toured the site of the future alternate Emergency Operations Center in the High Performance Computing Research Center on B-Site and met with Princeton University Public Safety on main campus. Dr. Hicks spent significant time with SPD and PSO staff discussing the thirteen recommendations from the DOE Draft Risk Assessment Report.

Platoons A, B and C completed their Bloodborne Pathogens annual refresher training.

Platoon A completed their annual Self-Contained Breathing Apparatus (SCBA) training.

Emergency Services Officer J. Bain received his Fire Services Instructor Level II certification from the State of New Jersey.

Emergency Services Officer R. Walker received his Fire Inspector certification from the State of New Jersey.

INFORMATION TECHNOLOGY (S. BAUMGARTNER):

J. Dong developed and sent out for review an interconnection spreadsheet for the NSTX-U Digital Coil Protection System. This shows the routing of about 1,500 wires for both protection and simulation/testing instrumentation.

A chit from a DCPS project peer review of workscope, status, and forecast highlighted a critical need for software engineering (resources). This is already in the project's budget and a job posting for a software developer has been on the street since January.

H. Towner, K. Silber, M. Cohen and S. Baumgartner met with J. Graham to discuss a project to use source code provided by SLAC to implement an Action Tracking System (ATS) at PPPL. The challenges are that the code is written for an Oracle database and integrates to SLAC's PeopleSoft system neither of which is in use at PPPL. The code/design must be translated to Microsoft SQL Server and data mapped to PPPL's equivalent data resources in Active Directory and Business Systems. The ATS would be used as part of PPPL's Contractor Assurance program in reporting to DOE.

J. Hirsch, C Minervini and S. Baumgartner presented an Information Security Continuous Monitoring update to the Princeton Site Office as part of PPPL's Cyber Security accreditation requirements.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

The following PPPL Reports were posted to the web:

Guiding Center Equations of High Accuracy PPPL-4862
Authors: R.B. White, G. Spizzo and M. Gobbin
Submitted to: Plasma Physics and Controlled Fusion (March 2013

Computation of Multi-region Relaxed Magnetohydrodynamic Equilibria PPPL-4863
Authors: S.R. Hudson, R.L. Dewar, G. Dennis, M.J. Hole, M. McGann, G. von Nessi and S. Lazerson
Submitted to: Physics of Plasmas (December 2012)

Comparison of Edge Turbulence Imaging at Two Different Poloidal Locations in the Scrape-off Layer of Alcator C-Mod PPPL-4864
Authors: S.J. Zweben, et. al.
Submitted to: Physics of Plasmas (March 2013)

DIRECTOR'S OFFICE (B. SOBEL):

March 27-29, M. Zarnstorff visited both EAST and LHD, and met with their research staffs for collaboration planning.

On March 27-28, A. Cohen attended a meeting on Operations held at the Brookhaven National Laboratory in Brookhaven, NY

On March 27, Dr. Masaaki Yamada, Princeton University's Plasma Physics Laboratory presented a colloquium entitled "Study of Magnetic Reconnection: Recent Discoveries on MRX".

This report is also available on the following web site:
http://www.pppl.gov/publication-type/weekly-highlights