The PPPL Highlights for the week ending September 28, 2012, are as follows:

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

For the Lab's US ITER scope, we submitted revised resource-loaded schedules and FY13,14 Milestones as input to the revised Project Performance Plan following guidance from the Lehman Panel.

D. Johnson and B. DeVan (USIPO) met with IO CODAC personnel to learn about documentation requirements needed for the RGA Preliminary Design Review.

C. Gentile from the PPPL Port Engineering Team met with IO and RF-DA engineers designing the Port Plug Test Facility to discuss interface sheets defining interfaces between this test facility and the former TFTR Test Cell.

D. Johnson submitted an IAEA Invited Paper entitled "ITER Diagnostics - Technology and Integration Challenges."

NSTX (M. ONO):

NSTX-U is in the Upgrade Project outage in FY 2012

High-Resolution Magnetic Footprint Modeling in NSTX and NSTX-U (T. Evans, W. Wu, and R. La Haye, General Atomics) - recently, the trip3d code at General Atomics has been modified to run on a 960 core Tesla GPU computer and is being used to study the open field line properties in NSTX due to 3D fields from an external non-axisymmetric RWM field-error correction coil. The lobes of the upper and lower heteroclinic tangle, as theoretically predicted in double null NSTX plasmas, intersect the low-field side target plates over a relatively narrow region. The Tesla computer is essential for carrying out these studies since reasonably good quality simulations of divertor footprint distributions require calculations of at least 800,000 field lines which would take of order 3,000 cpu hours on a standard Linux workstation with the trip3d code but have been done in 56 gpu hours using the trip3dgpu code on 240 cores (i.e., a single GPU board) on the Tesla computer. As the development of the trip3dgpu code continues over the next few years, simulations of the open field line properties from a proposed internal non-axisymmetirc perturbation coil on NSTX-U will be carried out and field-error models will be tested.

Mike Jaworski (PPPL) attended the Symposium on Fusion Technology (SOFT) meeting held in Liege, Belgium. The talk, "Prospective of Liquid Metals as PFCs: Status and Future Activities in the USA" was presented and well received at the "Liquid Metals Application in Fusion Science" satellite meeting.

NSTX Upgrade construction activities continued this week and are highlighted in the Engineering section below.

Preparations of non-upgrade equipment for plasma operations in the NSTX-U configuration continued with the ongoing assembly of new firing generators for the field coil power conversion (FCPC) system rectifiers. A prototype new fault detector for those FCPC rectifiers has been running well on bench tests, and procedures for installing and testing that system on a rectifier are out for review.

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

ITER & TOKAMAKS (R. WILSON):

DIII-D (R. Nazikian):

Wayne Solomon has been appointed leader of the Dynamics and Control Group at DIII-D. In this role, the focus of the group is to develop advanced scenarios (both inductive and steady state) under reactor relevant conditions and to develop disruption control and MHD stability techniques for application to ITER and future fusion reactors.

Egemen Kolemen presented "Real-time Mirror Steering for Improved Closed Loop Neoclassical Tearing Mode Suppression by Electron Cyclotron Current Drive in DIII-D" at the SOFT 2012 Conference in Liege, Belgium. This presentation explained the engineering design and implementation of the new real-time steerable mirror system on DIII-D.

The ABB1 FPA tube was removed from its socket for inspection. All tube connections appear acceptable, no arc tracks or heavy corrosion is visible. Five year planning and an availability and needs report preparation is in progress.

Alcator C-Mod (R. Ellis III):

The Motional Stark Effect (MSE) group operated the background light subtraction system, on one channel of the diagnostic, during the run. A failed avalanche photodiode (APD) was replaced in time for the run thanks to PPPL procurement and accounting departments. An initial check of the results from the week’s run indicates that the background light subtraction system met its performance objectives. This system will significantly improve the performance of the MSE diagnostic when implemented on all channels.

Bob Ellis visited MIT to work on the Hot Outer Divertor project.

International:

Benjamin Tobias traveled to USTC where he presented an invited lecture on modeling ECE in cases of steep gradients, non-Maxwellian, and anisotropic electron temperatures relevant to tokamak edge plasmas and non-inductive current drive. This evolving collaboration between PPPL, USTC, and UC Davis has provided unique perspective on the efficacy ICRH and LHCD for core electron heating and current drive on EAST. Analysis of 2D ECE-Imaging provides clear evidence of enhanced current inside the q=1 radius and an increase in electron temperature of nearly 40% during ICRH induced H-mode operation. A detailed comparison of these results with simulation is to be reported at the upcoming APS-DPP meeting in October.

KSTAR (H. Neilson):

A U.S.-Korea agreement, or Project Annex, on "Cooperation in the Area of Fusion Energy Research and Related Fields" was signed by officials of both governments this week. The objective of the agreement is to promote scientific and technological cooperation between the U.S. and Korea in fusion energy research and related fields in order to enhance their capabilities to make positive contributions in these fields for their mutual benefit. The technical scope of the agreement encompasses a) tokamak research on KSTAR (Korea), NSTX (U.S.), DIII-D (U.S.) and other fusion research facilities in both countries; b) research on the pathway to fusion energy, including the pre-conceptual design of next-step fusion nuclear facilities such as the First Phase DEMO Plant of Korea (K-DEMO); c) research on fusion science, technology, theory, advanced computation, modeling, and simulation; and d) research on related fields to realize fusion energy. PPPL's Randy Wilson was appointed to be the U.S. Technical Coordinator for work under this agreement.

ADVANCED PROJECTS (H. NEILSON):

The W7-X Trim Coil project accomplished two more milestones this week with the shipment of the third and fourth coils from the supplier's facility. The coils are expected to arrive at IPP in mid-October. Re-tooling for the fifth and final coil, which is of a different shape from the first four, is currently in progress. The fifth coil is expected to be ready for shipment in December.

All components for the upgrade of the U.S. x-ray imaging crystal spectrometer (XICS) have arrived at at Japan's National Institute for Fusion Science and have been installed on the Large Helical Device (LHD) with the participation of PPPL physicist Novimir Pablant. Alignment and calibration activities are in progress in preparation for the 2012 run. From a hardware standpoint the upgrade, which will extend coverage out to the edge of the plasma, is complete. The 2012 campaign is expected to begin in mid-October.

Chuck Kessel attended the ARIES project meeting, presenting an update on physics analysis of temperature and density profiles on the operating point, heating and current drive analysis, and the updated equilibrium for the advanced physics and advanced technology options. Scoping studies of the conservative physics and conservative technology option were also presented showing significant increase of the major radius. Francesca Poli provided some of the heating and current drive analysis with TSC/TRANSP and Katy Ghantous presented analysis to assess

the fast alpha particle losses due to MHD modes, using a quasi-linear treatment, for the advanced physics operating point.

COMPUTATIONAL PLASMA PHYSICS GROUP (S. JARDIN):

Jin Chen visited Institute of Computational Mathematics and Scientific/Engineering Computing, CAS from September 8-24, and gave a series of lectures to graduate students on numerical methods with applications in solving MHD related numerical problems. Jin met two groups of researchers and software developers and had very fruitful discussions with them. One group is working on Adaptive Structured Meshes applications INfrastructure(JASMIN) with applications in ICF; the other group is working on Parallel Hierarchical Grid (PHG), a parallel computing environments and platforms for design and implementation of 3D self-adaptive finite elements on distributive hierarchical unstructured grids. The useful inputs may directly benefit our present work in MHD simulations.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

PPPL presented a talk at SOFT2012 in Liege, Belgium on the status and technical progress of the NSTX Upgrade project.

With the second neutral beam now in the NSTX test cell, the test cell is being cleaned up and prepared for the start of other outage activities in mid-October.

Some insulation is being removed from all of the outer TF flags so their braze joints can be inspected. These inspections will begin next week.

The rework of the vacuum vessel bays JK cap has been completed and it has been sent out for a vacuum bakeout.

In the CS Winding Area eleven (11) bars are now insulated and ready for the Quadrant Mold. The quadrant mold modifications were completed and the mold was leak tested. The mold has been moved over to the CS winding area and is being prepped for the first VPI. The missing quarter rounds filler parts have been delivered and are ready for use in the mold.

Machining of the PFCs T-bars continues in the Tech Shop. The parts are running routinely now, about 2 hours each.

Machining of the Bay L flange continues in the machine shop. Approximately two more weeks of machining remain on the small diagnostic flanges to be welded on the Bay L flange.

The PF 4/5 clamps and sliding parts were delivered from Carolina Fabricators this week.

Facilities and Site Services (M. Viola, R. Carnevale):

GPP: Work on the LSB and C-Site MG Low Roof is complete. The warranty inspection was also performed by Carlisle, the PPLCC, LSB, Auditorium, and the MG Low Roofs to issue the new 30 year warranty. Work on the Commons Deck continues and is expected to be completed in the next two weeks, weather permitting.

Operations: All planned steam and low pressure condensate maintenance are complete. The boilers have been tested on natural gas and are ready for steam start-up for October 18. PSE&G completed repairs to the underground natural gas supply line to the main boilers. Coincidentially, the natural gas line to Mod. 6 was found leaking at the utility pressure regulator and was also repaired by PSEG.

Fire Protection: The semi-annual fire damper testing is complete. Installation of a new card reader for the Drafting Print Room is complete. Several minor problems with ACAMS and Simplex systems were resolved.

HVAC: The D-Site Mockup Building Clean Room was temporarily repaired until a new system can be procured. The installation is planned for December. Pipe insulation repair and replacement work resumed in Shop Wing Mechanical Room this week.

Telecommunications Office: The installation of the revised Avaya firmware software for the phone system Gateways 1 and 2 was completed successfully on September 27. No problems have been reported. Altura plans to install the new revised firmware on the remainder of the Gateways (Gateways 3, 4, 5, & 6) next week. The installation of new firmware is one step in an ongoing effort to resolve the phone system problems associated with intermittent dead analog phone lines.

The Facilities/Maintenance Department Electricians, working under the guidance of AC Power are installing up-to-date ground wiring for all equipment in the Phone Room, A117. The goal is to isolate the phone system equipment and racks therefore eliminating any stray voltage that could cause electrical problems to the phone system and phone lines. The project is part of an effort to resolve and eliminate phone problems that may be attributed to previous wiring installations to equipment in the Phone Room.

Spence Holcombe and Matt Lawson participated in the DOE users FAST training session that covered changes to system reporting for FY12.

Floribeth Chacon was accepted into the Excelling at Princeton 2012-2013 program. This is a program taught by instructors from Mercer County College and sponsored by Princeton University.

Excess Property delivered 2,450 lbs of excess IT and electronic equipment to Unicor for recycling.

BUSINESS OPERATIONS (E. WINKLER):

T. Gillars and S. Drapkin participated in a conference call presented by DOE-HQ. The purpose of the call was to answer questions and discuss concerns regarding the new guidance on Property Plant &Equipment (PP&E) Permanently Removed from Service.

The Business Operation Department's primary objective was to complete work on the FY2012 year-end financial closing. During this week the focus was largely on recording all expenditures for Fiscal Year 2012.

Representatives of Procurement and HR met to discuss plans for a new competitive procurement for the operation of the PPPL Occupational Medicine Office. The current subcontract will expire on January 23.

Representatives of the Procurement Division, the ITER Fabrication Department and DOE-Princeton Site Office participated in a monthly videoconference with representatives of the US ITER Project Office (USIPO) at Oak Ridge National Laboratory. The purpose of the meeting was for PPPL to provide the USIPO with a status report on the steady state electrical supply network (SSEN) design and fabrication effort and diagnostics design efforts, and to discuss the impact of continuing resolution funding constraints on the projected procurement schedule for SSEN components.

Project Data Sheets for those Laboratory Directed R&D (LDRD) projects funded in FY2012 which the Director's Office has approved for continuation in FY2013 were submitted to the DOE Princeton Site Office for concurrence.

Five proposals were submitted to DOE in response to Program Announcement LAB 12-02, "High Energy Density Laboratory Plasma Science for Inertial Fusion Energy". PPPL is the lead on one proposal; LLNL or LBNL is the lead on the other four proposals in which PPPL is included as a collaborator.

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

Representatives from the Environmental Services and Facilities & Site Services Divisions attended the third annual GreenGov Symposium in Washington, DC. GreenGov is sponsored by the White House Council on Environmental Quality (CEQ) and the Association of Climate Change Officers (ACCO). In conjunction with the GreenGov Symposium, Environmental Services personnel attended the EFCOG Environmental Working Group Meeting, the DOE Sustainability Best Practices Workshop, The Federal Electronics Challenge (FEC) Awards Cermony and the DOE Sustainability Awards Ceremony. PPPL received a Federal Electronics Challenge Silver Award, a DOE GreenBuy Program Gold Award, and a DOE Sustainability Award for at these ceremonies.

ESU Ambulance A166 responded to Plainsboro for four mutual aid assignments. Engine 66 responded to Princeton for two mutual Aid assignments.

The Site Protection Division (SPD) completed the 2012 update of the Emergency Readiness Assurance Plan (ERAP) and submitted it for review and approval through the ESH&S Department and Director's Office to the Princeton Site Office.

SPD completed the Corrective Action Plan (CAP) for the recent DOE Safeguards and Security bi-ennial audit through the ESH&S Department and Director's Office to the Princeton Site Office.

SPD has completed an internal Y-12 security "lessons learned" training program/discussion for the Emergency Services Unit platoons.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

On September 24-25, PPPL hosted nine individuals who evaluated the Laboratory against an application it submitted to the Vision for Performance Excellence Award. This application was a commitment the University had made to DOE for the laboratory to file a Baldrige application. Baldrige had changed the rules, so PPPL applied to a State program, as now required. The first step in this process was the development of a 50 page application against the Baldrige Criteria. The external review team had evaluated the application and based on the scoring, PPPL was awarded a site visit. The team has prepared a feedback report that is now being reviewed and the laboratory should receive this document in late November. During their visit, the team has 24 official sessions with ~30 Laboratory supervisors and also met with 219 staff members.

The following PPPL Reports were posted to the web:

ITER Diagnostic First Wall PPPL-4813
Authors: G. Douglas Loesser, et. al.
Submitted to: TOFE Conference, Nashville, TN (August 2012)

Calculation of Eddy Currents In the CTH Vacuum Vessel and Coil Frame PPPL-4814
Authors: A. Zolfaghari, A. Brooks, A. Michaels, J. Hanson, and G. Hartwell
Submitted to: ANS, Fusion Science and Technology. Presented at: Topical Meeting on the Technology of Fusion Energy (August 27-31, 2012)

Gyrokinetic Studies of the Effect of Beta on Drift-wave Stability in NCSX PPPL-4815
Authors: J.A. Baumgaertel, G.W. Hammett, D.R. Mikkelsen, M. Nunami, and P. Xanthopoulos
Submitted to: Physics of Plasmas (September 2012)

The Hamiltonian Structure and Euler-Poincare Formulation of the Valsov-Maxwell and Gyrokinetic System PPPL-4816
Authors: J. Squire, H. Qin and W.M. Tang
Submitted to: Physics of Plasmas (September, 2012) PPPL-4819

Nonlinear Amplification and Decay of Phase-mixed Waves in Compressing Plasma PPPL-4817
Authors: Paul F. Schmit, I.Y. Dodin, J. Rocks, and N.J. Fisch
Submitted to: Physical Review Letters (September, 2012)

Toroidal Precession as a Geometric Phase PPPL-4818
Authors: J.W. Burdy and H. Qin
Submitted to: Physics of Plasmas (September 2012)

Progress in Developing a High-Availability Advanced Tokamak Pilot Plant PPPL-4819
Authors: T. Brown, A.E. Costley, R.J. Goldston, L.El-Guebaly, C. Kessel, G.H. Neilson, S. Malang, J.E. Menard, S. Prager, S. Scott, P. Titus, L. Waganer, and M. Zarnstorff
Submitted to: 24th IAEA Fusion Energy Conference, San Diego, CA, Oct. 8-13, 2012

Disruptions, Disruptivity, and Safer Operating Windows in the High-β Spherical Torus NSTX PPPL-4820
Authors: S.P. Gerhardt, R.E. Bell, A. Diallo, D. Gates, B.P. LeBlanc, J.E. Menard, D. Mueller, S.A. Sabbagh, V. Soukhanovskii, K. Tritz, and H. Yuh
Submitted to: Nuclear Fusion, (October 2012)

Dynamics of the Disruption Halo Current Toroidal Asymmetry in NSTX PPPL-4821
Authors: S.P. Gerhardt
Submitted to: Nuclear Fusion (October 2012)

Use of Polycarbonate Vacuum Vessels in High-Temperature Fusion-Plasma Research PPPL-4822
Authors: B. Berlinger, A. Brooks, H. Feder, J. Gumbas, T. Franckowiak and S.A. Cohen
Submitted to: Trans America Nuclear Soc (Aug.30.2012) Presented at: ANS Fusion Science and Technology and TOFE Conference, Nashville, TN (Aug 27-31, 2012)

DIRECTOR'S OFFICE (B. SOBEL):

On September 26, Professor James Olsen of Princeton University presented a colloquium entitled "Is It The Higgs Boson?"

On September 28, Mike Zarnstorff chaired a meeting of the Research Department Heads.

This report is also available on the following web site:
http://www-local.pppl.gov/director/highlights/2012-highlights.htm