The PPPL Highlights for the week ending September 30, 2017, are as follows:

**NSTX-U RECOVERY AND RESEARCH (J. Menard)**

Recovery

In the Coil Winding Facility, preparations of the test bundle and VPI mold continues with the documentation and labeling of manifold valving and lines. Overall system vacuum leak checking is in progress, and adjustments were made to the system overflow tank this week. The test VPI is planned for mid-October.

Preliminary Design Reviews (PDRs) were held for the low-heat-flux plasma-facing components and for the replacement of the Torus Vacuum Pumping System (TVPS) backing pump and the pump cooling system.

Research

Z.R. Wang attended the 1st Asia-Pacific Conference on Plasma Physics (Sep 18-23, 2017) and gave an invited talk entitled, “Full toroidal computation of resistive MHD instabilities based on asymptotic matching approach.”

Devon Battaglia gave an NSTX-U Physics Meeting talk entitled "Startup Development for MAST-U.” Devon discussed the details of his two-month stay at MAST-U, helping them to define null field and plasma startup scenarios once they commence operating. Devon brought tools, such as LRDFIT, to bear on this study, making these tools available for MAST-U researchers, and teaching them how to use them.

The paper "Two-dimensional turbulence cross-correlation functions in the edge of NSTX,” by S. J. Zweben, D. P. Stotler, F. Scotti, and J. R. Myra, has been published in *Physics of Plasmas* 24, 102509 (2017); doi: 10.1063/1.5002695. This paper described the radial vs. poloidal cross-correlation functions of edge plasma turbulence as measured near the outer midplane using a gas puff imaging (GPI) diagnostic on NSTX.

R. Kaita gave a seminar entitled “Challenges in Modeling of Plasma-Material Interactions for Fusion Applications” at the Institute for Advanced Computational Science at Stony Brook University in New York on Sept. 28.

**U.S. ITER FABRICATION (H. Neilson)**

Steady State Electrical Network (J. Delias)

On Sept. 29, the final shipment of U.S. ITER Steady State Electrical Network (SSEN) equipment left the supplier’s facility, en route to the project site. The complete SSEN system will serve ITER’s steady-state power requirements, providing electricity for systems such as pumps, computers, HVAC, lighting, etc. Earlier this year, following the
delivery of the main power transformers, the system was energized for the first time and is now operational. This week’s shipment is a culmination of a five-year, $34 million project managed by PPPL, involving 16 procurements of electrical power equipment from suppliers all over the world. The Laboratory’s project team of engineers, procurement, and quality assurance specialists is led by senior engineer J. Dellas.

**Diagnostics (R. Feder)**

The PPPL team is taking measures to ensure that the status of suspended projects is well documented for U.S. ITER diagnostics projects. The status is captured in detailed “Project Restart” packages, in which design documentation, R&D results, open issues, etc. are compiled. Another important step is the archiving of the numerous technical and administrative project documents that go along with each diagnostic system. The restart reports and documents will be stored on a central easily accessible file system for efficient future access.

Low Field Side Reflectometer (LFSR): The LFSR team has started preparing several important documents for the June 2018 Preliminary Design Review (PDR). ITER design reviews require a wide array of documents ranging from design and load descriptions to remote handling and maintenance procedures as well as all of the physics-based documentation. The many stakeholders in the document review process at PPPL, U.S. ITER and the Central Team mandate an early start. Team member J. Teodoro is managing several of these documents as well as tracking the interface documents. A. Zolfaghari is managing the compilation of load specifications and mechanical analysis documents. Also, the LFSR team and the Central Team’s Equatorial Port 11 (EP11) integration team came to agreement on the general configuration of the LFSR in-vacuum components that will be used for the EP11 PDR and analysis set.

**ITER & TOKAMAKS (R. NAZIKIAN)**

**DIII-D (B. Grierson)**

**Research:**

A. Ashourvan (PPPL) gave a presentation in the NSTX-U/I&T Physics Meeting on intrinsic rotation measurements in DIII-D. In this study, pedestal top velocity predictions by T. Stoltzfus-Dueck (Princeton) are tested on DIII-D for a database of low-torque discharges comprised of both L- and H-mode plasmas. For moderate NBI powers (PNBI< 4 MW), model prediction agrees well with the experiments for both L- and H-mode. At higher NBI power, the experimental rotation is observed to saturate and even degrade compared to theory. However, when the edge neutral beam torque is accounted for, the measurements again come into line with predictions.
**Operations:**

PPPL is providing 3 major components for the 210 off-axis beam on DIII-D and also leads the overall project. The three components are the pole shields, delivered in June 2017, a calorimeter with delivery scheduled for Sept. 30, and an absolute collimator, due to be delivered in January 2018. A successful FDR was held this week on the collimator. Each of these components has PPPL engineering design features that reduce cost while increasing performance. The pole shields use molybdenum plates in the high heat affected zone and can be replaced without beam line disassembly. The calorimeter uses gun-drilled coolant channels to prevent water channel cracking, and an expanded array of thermocouples for beam thermal imaging. The absolute collimator has two "diving boards" on each lower corner to spread the beam heat load and are removable, again without requiring beam line disassembly.

A successful final design review was held on the off-axis neutral beam 210 high voltage transmission line. This two-port transmission line connects the high-voltage power supplies to the neutral beam sources in both the co and counter positions. High-voltage testing up to 180kV across a 7.5" gap were successful and the prototype components have now been qualified.

**ASDEX-Upgrade (R. Maingi)**

A. Nagy and A. Bortolon visited ASDEX-Upgrade in Garching, Germany, to install a new four-chamber impurity powder dropper, in collaboration with the Max-Planck Institute of Plasma Physics (IPP). The powder dropper was received from customs and bench tested in a laboratory at the IPP. The dropper will be deployed on ASDEX-Upgrade in the next two weeks in preparation for boron-injection experiments for wall conditioning. The goal of the experiment is to determine if boron powder injection from the top of the machine can be used to boronize tungsten surfaces during plasma operations. If successful, the method has important implications for extending the operational performance of existing experiments.

**ADVANCED PROJECTS (H. Neilson)**

**Stellarators (D. Gates)**

In a recent visit to the Wendelstein 7-X project site in Greifswald, Germany, physicists D. Gates and R. Lunsford had several productive discussions regarding implementation of a “powder dropper” for the upcoming OP1.2b campaign. A likely path forward was identified. Gates also met with a Fulbright scholar who has been accepted into the Princeton University plasma physics graduate program housed at PPPL. The student will be working on measuring the plasma properties on the surface of the “scraper element,” a plasma facing component fabricated by PPPL and which is scheduled to be installed for OP1.2b.
While on site at Wendelstein 7-X, Gates organized a meeting of the U.S. collaborators on site. Fourteen on-site collaborators and two remote viewers attended the meeting and discussed diverse topics associated with best practices in our collaborative efforts.

ENGINEERING & INFRASTRUCTURE (V. RICCARDO)

Tritium Storage

The Tritium Storage Delivery Glove Box (TSDGB) depleted uranium beds have been successfully removed from the primary tritium lines. The three u-beds have been packaged in Type A containers awaiting imminent disposal off-site.

BUSINESS OPERATIONS (K. FISCHER)

Procurement (P. Schurott)

PPPL Procurement participated in the Independent Review of Post-Award Contract Administration at Brookhaven National Laboratory (BNL). The review team consisted of Procurement managers from PPPL, Argonne, and Fermi national laboratories. The independent review team was charged with the task of functionally assessing the effectiveness of contract administration with an emphasis on invoice review and approval process. The purpose of the review was to assist the Procurement & Property Management division at BNL to identify any gaps between their Standard Work Instructions, and their actual post-award administration effectiveness, in advance of their 2018 PERT review. This exercise is partly the result of PPPL having shared its 2016 “Mini-PERT” pre-review exercise concepts with other laboratories in the lab complex. The activity had been cited as a best practice.

COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER)

COMMUNICATIONS (L. BERNARD)

The Office of Communications posted on the website a story about PPPL research providing reassurance that the heat flux in the ITER tokamak will be manageable. Research led by C.S. Chang over two years shows that the width of the heat flux could be well within the capacity of the ITER divertor plates to tolerate. The news release was posted on EurekAlert! and Newswise distribution services as well.

SITE PROTECTION (F. WHITE)

On Thursday, Sept. 28, PPPL held its annual Emergency Exercise. This year's scenario, a health and safety emergency, allowed PPPL to test several important facets of the Emergency Operations Systems. The exercise also allowed us to activate the Emergency
Response Organization in concert with the Occupational Medical Office (OMO) to help manage a simulated health emergency, complicated by a rapidly developing social media response. We assessed several new emergency procedures, including public information; the PPPL Pandemic Plan; and programs developed for two new DOE orders. We also beta-tested an emergency exercise software program developed by the DOE.

The simulation was an outbreak of Legionnaire’s Disease that sickened four employees and four students that had been on tour. The OMO team partnered with Princeton Medical Center at Plainsboro in responding to and effectively managing this simulated emergency. The exercise was very successful – the Emergency Operations Systems worked as designed, and we identified a number of areas that we can develop as part of our continuous improvement efforts. The PPPL Emergency Preparedness Review Committee deserves credit for its extensive work behind the scenes in planning and executing the exercise.

This report is also available on the following web site:

http://www.pppl.gov/publication-type/weekly-highlights