



**The PPPL Highlights for the week ending May 2, 2020, are as follows:**

**NSTX-U RECOVERY (J. GALAYDA) AND RESEARCH (S. KAYE)**

**Recovery (J. Galayda):**

**Coils** — Sigmaphi began preparations to reopen the fabrication facility next week. PPPL has hired a local French engineer to provide fabrication oversight; he has been in training this week with Cognizant Individual M. Kalish and R. Burke to ensure he understands the fabrication and PPPL standards and procedures. In addition, our longstanding QA representative is ready to start when the facility reopens. In parallel, the PPPL team has made great progress in procedures required for testing the coils upon arrival and just prior to installation. Several meetings are being held to work through the particulars for coil receipt, inspection, testing, assembly into slings, and full power testing.

**Center Stack Casing** — Machining of the center stack continues at the Holtec facility in Camden. The quality achieved has been extremely good, and the Holtec team has continued to keep PPPL informed by submitting progress pictures. Due to Covid-19, progress has been limited to a single shift, and a reforecast by the ORT/Holtec team has changed the receipt date to Sept. 30. The impact of this significant delay is being evaluated by the PPPL project team.

**PF1A Sling Bottom Plate & Belt PSA Material Virtual Peer Review** — A virtual peer review was held on April 28 to close all remaining chits for the machine core structure and the recovery project by reviewing design modifications of the PF1A sling assembly. A final design review (FDR) was held March 17-19.

**Hot Water Line Tooling Virtual Peer Review** — A virtual peer review was held April 29 to review the design modification and custom fixturing to bend and move the hot water lines away from the fixed support sliding blocks to add 3/8" additional clearance.

**Neutron Diagnostics I & C Virtual Final Design Review** — A virtual final design review (FDR) was held April 30 to review the final I&C design to upgrade the existing fission chamber neutron diagnostics.

**Research (S. Kaye):**

D. Battaglia, Head of Physics Operations at NSTX-U, presented "The National Spherical Torus Experiment-Upgrade (NSTX-U): Toward a Future Compact Fusion Reactor," and answered questions about NSTX-U and its place in the worldwide quest for fusion energy. This event took place at an informational session on NSTX-U for about one

Weekly

# HIGHLIGHTS



dozen PPPL facility project managers and engineers. The session was organized by D. Pryor, Lead Engineer for Facilities Project Management and Construction. The session was targeted to new employees to describe the history and scientific mission of NSTX-U. Battaglia had attended the “Storytelling for Scientists” workshop in February that was organized by Head of Technology Transfer L. Bagley and felt the experience helped him prepare and deliver his presentation.

## **U.S. ITER FABRICATION (H. NEILSON)**

The Upper Wide Angle Viewing (UWAV) diagnostic is a system of visible and infrared cameras designed to image the ITER divertor surfaces during plasma operation. Since work on this project resumed earlier this year, the design team has reviewed the status of the design as well as the impact of changes in interfacing systems. Design documentation for the Equatorial WAV system, developed by Europe’s ITER team, is also being reviewed. Finally, the procurement package for re-engagement with the UWAV design partner is nearing completion.

The Motional Stark Effect (MSE) design team is conducting a scoping analysis of mirror cooling requirements to determine whether radiation cooling will be sufficient or if active water cooling will be required. As a first step, available neutronics analyses and surface heating guidelines are being used to estimate the heat loads to the mirrors. As with other projects, the procurement package for re-engagement with the MSE design partner is in preparation.

The Low Field Side Reflector (LFSR) continues to submit design documentation for a June final design review of its in-vacuum antenna assembly. A formal deviation request, proposing the use of alternative standards for welding qualification and non-destructive evaluation (NDE) of production welds, was approved by U.S. ITER. The design compliance matrix (DCM), documenting compliance of the antenna assembly design with more than 250 system requirements, was submitted for approval. The DCM provides the mapping between each requirement and the documents that justify compliance. Finally, a memo documenting a reliability, availability, maintainability, and inspectability assessment of the equipment was submitted.

## **ADVANCED PROJECTS (D. GATES)**

### **Stellarators (D. Gates)**

On April 29, D. Gates and P. Titus met with the director of the Institute for Plasma Physics of the Czech Academy of Science (IPP-CAS), R. Panek and P. Vondracek, as well as M. Lanctot of FES. During the meeting a work plan was presented to continue



collaborative efforts between PPPL and IPP-CAS on the design of a new tokamak called COMPASS-U (COMPact ASSEMBLY - Upgrade). The work plan was approved leading to additional funding from the FES for this activity. This enhanced collaboration will support the COMPASS-U final design review currently planned for December 2020.

### **THEORY (S. HUDSON)**

A paper by V. Tsiolis (PU Astrophysical Sciences), Y. Zhou (PPPL), and I. Dodin (PPPL) titled, "Structure formation in turbulence as instability of effective quantum plasma," was published in *Physics Letters A*: <https://doi.org/10.1016/j.physleta.2020.126377>. The paper describes modulational instabilities of Navier-Stokes turbulence as linear instabilities of effective plasma formed by fluctuations as quantum particles with finite de Broglie wavelength. Since Navier-Stokes turbulence is described by vector equations, these "particles," in a way, also have spin. The structures that form serve as collective fields through which the fluctuations interact. This work serves as a stepping stone toward improving the understanding of magnetohydrodynamic turbulence, which can be approached using similar methods.

### **COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER)**

#### **Communications (L. Bernard):**

The Office of Communications posted two news stories to the PPPL website this week. The first reports findings from graduate student E. Rodriguez and others into finding the optimal way to use radio waves to shrink magnetic islands that can cool plasmas and cause disruptions that could harm fusion facilities. The second reports on ways PPPL staff celebrated the 50th anniversary of Earth Day. Both stories were posted to the *Newswise* and *EurekaAlert* press release distribution services.

#### **DIRECTOR'S OFFICE (S. COWLEY)**

Laboratory leadership has been communicating ongoing updates to staff regarding the COVID-19 virus and PPPL.

On April 29, M. Terrones from Pennsylvania State University presented a virtual colloquium titled, "The Past and Future of Carbon Science and Technology."

**This report is also available on the following web site:**

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