



The PPPL Highlights for the week ending May 23, 2020, are as follows:

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

Recovery (J. Galayda):

Project Planning — NSTX-U personnel met with U.S. Department of Energy review chair H. Lee and the management subcommittee to prepare for next week's review. The committee has provided their list of requests for additional information, to which the project will respond in writing by the start of the review.

Coils — Sigmaphi coil fabrication continued this week, and low-power testing of the PF1B#1 coil is complete. Winding continued on PF1A#2 with layer 3 of 4 which was completed this week. PF1A#1 was prepped for vacuum pressure impregnation (VPI), and preparations for winding PF1C#1 began. At PPPL, remote working continued as power testing procedures were developed, reviewed, and approved.

Center Stack Casing (CSC) — The center stack fabrication had a delay this week due to a human error during machining that resulted in a shallow gouge in the angled section. Holtec conducted a thorough review of the issue and developed corrective actions that were reviewed by the PPPL staff. After review of corrective actions to prevent recurrence and discussions with executive management at Holtec, permission was given to resume machining other areas while the NCR for the damaged area was evaluated. The NCR concluded no significant impact to the center stack and permission to fully continue machining is expected to be given this week.

Personnel Safety System (PSS) — The request for proposals (RFP) for the installation of the PSS conduit system was issued on May 20.

Umbrella Lid Connection Modification Conceptual Design Review — A successful conceptual design review (CDR) was held May 21 for the modification of the umbrella lid connection. The CDR covered functional and technical modifications, as well as the pro and cons of those modifications.

U.S. ITER FABRICATION (H. NEILSON)

The Motional Stark Effect (MSE) diagnostic team reported further progress on its analysis to determine cooling requirements for its front-end mirrors. An initial model, consisting of a thin mirror, an insulating layer, and a structural backing were presented. All of these elements are required, but the exact configuration depends on the interrelated requirements for active cooling, mirror cleaning, structural integrity, and

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mirror performance. The cooling requirements are driven by the necessity to limit mirror deformations that would adversely affect its optical properties.

The Laboratory's ITER Diagnostics team has begun the task of estimating the cost of completing all design work for its seven diagnostic systems and four port integration projects. Most of the projects are at relatively low design maturity, having not yet completed preliminary designs. Procurement packages for design partner subcontracts are being prepared as a first step toward engaging teams most familiar with the designs and as a priority for accelerating progress on not only the design work but also cost estimates. In the process, the PPPL team has developed the work breakdown for several projects to a level needed to support planning and preliminary cost estimation.

ITER & TOKAMAKS (R. NAZIKIAN)

Machine Learning (W. Tang):

DIII-D (B. Grierson):

Research:

This week, *Nuclear Fusion* accepted the paper entitled, "Empirical scaling of the $n=2$ error field penetration threshold in tokamaks," written by PPPL authors N. Logan, J.-K. Park, Q. Hu, and C. Myers (now at Sandia National Laboratory). The paper consolidates over three years of PPPL-led error field penetration parametric scaling experiments on the DIII-D tokamak as well as data from the ITPA MHD joint experiment MDC-19 database. It reports individual parameter scans as well as a larger multi-parameter, multi-machine power law scaling for the error field penetration threshold. These scalings predict ITER will be able to tolerate error fields on the order of 10,000 times smaller than the axisymmetric field, which is similar to the sensitivity dealt with on many existing experiments.

Operations:

Relative calibration of the DIII-D charge-exchange recombination (CER) spectroscopy diagnostic systems via beam-into-gas was performed by D. Kaplan, C. Collins (General Atomics), S. Haskey, and B. Grierson (PPPL) in preparation for plasma experiments. Onsite support by GA provided startup and shutdown of the diagnostics, operation of the tokamak, and neutral beam systems. The execution of the shot plan was performed remotely through Discord and Zoom. Ten calibration shots were performed with xenon, helium, and deuterium to establish the instrumental response, wavelength corrections, and relative intensity calibration to prepare the diagnostic for physics experiments.



International PMI and FES LM PFC Development Program (R. Maingi):

A. Khodak presented a new idea for a flowing liquid lithium plasma-facing component (PFC) in a periodic meeting of the liquid-metal PFC development project. The presentation sparked several discussions and follow-on directions. The meeting finished on a round-table status update of project participants.

THEORY (S. HUDSON)

S. Jardin made a presentation entitled, "The NIMROD/M3D-C1 3D VDE Benchmark," at the virtual CTTs Spring Meeting on May 13. The talk is posted here:

<https://ctts.pppl.gov/Sherwood2020/Jardin.pdf>

COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER)

Communications (L. Bernard):

L. Bernard participated in the U.S. Department of Energy Office of Public Affairs and National Laboratories communications offices' teleconference on May 19.

L. Bernard participated in the National Laboratories Chief Communications Officers (NLCCO) meeting via teleconference on May 21.

The Office of Communications posted two news stories to the PPPL website. The first reported on M. Bonkalski starting as the new head of the Environmental, Safety, and Health department. The second reports on new findings by PPPL physicist A. Hakim, PPPL graduate student N. Mandell, and others that increase understanding of the edge of tokamak plasmas. The stories were also posted to the *Newswise* and *EurekAlert* 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 May 19, C. Ferguson hosted a virtual PPPL supervisor's meeting.

A virtual colloquium was presented on May 20 by R. Kaita titled, "Mysteries and Challenges of Lithium as a Plasma-Facing Surface."

This report is also available on the following web site:

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