



The PPPL Highlights for the week ending August 22, 2020, are as follows:

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

Recovery (J. Galayda):

Coils — Low power testing was completed at PPPL on coils PF1-a Lower and PF1-b Lower this week. PF1-b Lower is in the mold awaiting vacuum pressure impregnation (VPI), which is planned for Aug. 26. Coils PF1-c Lower and PF1-a Upper were delivered to PPPL and inspected on Aug. 7. PF1-c Lower had good electrical testing results and is ready for shipping, which is planned for the week of Aug. 24. Spare PF-1a, PF-1b, and PF1-c coils were in fabrication this week. Spares PF1-a and PF1-c were mounted on mandrels in the clean room this week and G11 parts were prepared for spare coil PF1-b.

Personnel Safety System (PSS) — The technical review of the proposals for the installation of the PSS conduit system has been completed and the qualified subcontractor has been identified. The subcontract award is anticipated prior to Sept. 1.

NSTX Test Cell Oxygen Deficiency Monitoring System — Pre-bid site walkdowns for the installation of the NSTX Test Cell Oxygen Deficiency Monitoring System and the power supply to the DC bakeout system were performed; firm fixed-price quotations are pending.

Research (S. Kaye):

An NSTX-U/ST-40 ECH collaboration Zoom meeting was held on Aug. 20 with ST-40 researchers V. Shevchenko and ST-40 graduate student P. van de Glessen. NSTX-U researcher N. Bertelli gave an overview of the Fokker-Planck CQL3D code and how to run it for EC frequency regime in ST-F1/ST-40 plasmas.

ITER PROJECTS (H. NEILSON)

Project Control (E. Nassar):

The Laboratory's ITER team is developing an updated Estimate at Completion (EAC) for its diagnostics design work, i.e., completion of preliminary and final design of all 11 sub-projects. The PPPL effort, led by Project Control Manager E. Nassar, is part of a U.S. ITER initiative to update the EAC at the project level. Each of the Diagnostics lead engineers has developed and documented task-based cost estimates for their remaining design scope, identifying the key assumptions and risks that qualify the estimates given the current level of design maturity. Reviews by department management and senior members of PPPL Engineering are under way.



Low Field Side Reflectometer — LFSR (S. Shirey):

The Laboratory received a detailed work proposal from subcontractor General Atomics (GA) for completing a manufacturing study design to prepare for fabrication of the in-vessel antenna assembly. The plan centers on construction of a Test Antenna Block Assembly (TABA) which incorporates key features of the final assembly. The proposal encompasses all of the manufacturing studies needed to support preparations for a Manufacturing Readiness Review, a milestone which will be the gateway to approval for production manufacture. While the proposal is currently under review by PPPL, GA is already making progress manufacturing samples in anticipation of welding trials slated to begin the first week of September.

Upper Wide Angle Viewing — UWAV (M. Smith):

The UWAVS team has developed a proposed list of deliverables, basically the contents of the complete documentation package for the system design. The team will work with Central Team responsible officers to agree on this list of deliverables, which will define the design work scope and therefore provides a basis for planning and estimating the work. The UWAVS team also resumed efforts associated with the in-vessel mirror interfaces in Upper Port 17, which differs from the other four UWAV installations.

Toroidal Interferometer Polarimeter — TIP (M.-A. De Loosz):

The TIP and LFSR teams are working with Central Team counterparts on the task of finalizing the design of captive overhead supports for beamlines and waveguides. A recent meeting resulted in feedback and guidance for planning the work. A PPPL engineering team of A. Buahin, M. Mansour, and M.-A. de Loosz, has been assembled in order to expedite the tasks.

ITER & TOKAMAKS (R. NAZIKIAN)

DIII-D (B. Grierson)

Research:

Two SULI students co-mentored by F. Laggner and A. Bortolon completed their summer projects aimed at advancing pedestal structure research. E. Zeger (University of California-Los Angeles) successfully developed a neural network regression model that predicts the structure of H-mode pedestal parameters to a degree of accuracy surpassing previous similar attempts. This was enabled by the implementation of efficient and robust tools to retrieve and preprocess the “training dataset,” as well as by the use of optimized neural network architectures determined through state-of-the-art

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random forest techniques. J. Spendlove (Brigham Young University) developed a parametric model that allows accurate prediction of the common-mode component of the noise in the LLAMA diagnostic measurements. The modeled common-mode noise can be then subtracted from the raw measurements effectively improving the instrument performance in terms of signal-to-noise ratio. When applied to LLAMA measurements from DIII-D plasmas, the modeled-noise subtraction allows the diagnostic to resolve features such as small ELMs or fast post-ELM dynamics, previously indistinguishable from the noise. The completion of the two projects delivers important tools to address the open question of the prediction of H-mode density pedestal, both in terms of enhancing the LLAMA diagnostic capability to assess the role of ionization source, and providing data driven prediction of pedestal behavior in support of existing codes such as EPED and TRANSP.

International JET/EU (Podestà, Poli):

The upgrade of the digitizers for the Faraday Cups lost ion detector at JET has been completed by JET colleagues, in coordination with P. Bonfiglio for PPPL. The new UXD7 digitizers have a maximum sampling frequency of 200 kHz, which represents a substantial improvement from the previous acquisition with limited sampling rate of 5kHz. Tests by P. Bonfiglio confirm a reduction of pickup noise at 10 kHz harmonics that was observed during an initial assessment with a single UXD7 unit. The upgraded system is now acquiring data routinely during JET discharges and clear signatures of coherent losses of energetic ions associated with MHD activity have been already observed.

ADVANCED PROJECTS (D. GATES)

Stellarators (D. Gates):

C. Zhu helped organize the Joint PPPL-Simons Summer School on stellarator optimization and gave a lecture on Aug. 20 entitled, "Introduction to STELLOPT." There are more than 60 international participants this year and the summer school has been awarded 60,000 CPU-Hours to run the computer labs for STELLOPT and other optimization courses funded by XSEDE (<https://portal.xsede.org/>).

THEORY (S. HUDSON)

M. Churchill co-authored a paper recently published in *Nuclear Fusion* titled, "Summary report of the 3rd IAEA technical meeting on fusion data processing validation and analysis (FDPVA)." It describes the research presented in the 3rd IAEA Technical Meeting on Fusion Data Processing Validation and Analysis that took place in Vienna, Austria, last year: <https://doi.org/10.1088/1741-4326/aba8dd>



A paper by M. Tacu, A. Khrabry, and I. Kaganovich titled, “Convenient analytical formula for cluster mean diameter and diameter dispersion after nucleation burst” was published in *Physical Review E*:

<https://journals.aps.org/pre/abstract/10.1103/PhysRevE.102.022116> In this paper, the authors propose an alternative method of estimating the mean diameter and dispersion of clusters of particles formed in a cooling gas, right after the nucleation stage.

COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER)

Communications (L. Bernard):

The Office of Communications posted three press releases to the PPPL website. The first reported on research by J. Dominski and others giving fresh insight into what causes plasma eruptions known as edge-localized modes. The second notes that B. Dorland has been named to the new position of associate director of computational science at PPPL. The third reports that E. Kolemen has won a prestigious 2020 Excellence in Fusion Engineering award presented by Fusion Power Associates. All three stories were also posted to the *Newswise* and *EurekAlert* press release distribution services.

L. Bernard participated virtually in the U.S. Department of Energy headquarters Office of Public Affairs and Laboratory Communications monthly meeting on Aug. 18.

DIRECTOR’S OFFICE (S. COWLEY)

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

C. Ferguson hosted the monthly virtual PPPL supervisors meeting on Aug. 18.

S. Cowley, J. Menard, and M. Zarnstorff participated in the Virtual Workshop-Fusion Energy Sciences Advisory Committee (FESAC) Long-Range Planning Subcommittee meeting on Aug. 20.

D. Graves participated in the virtual workshop, “Competitive Ecosystem — Microelectronics Research and Capabilities across the DOE Laboratory Complex” on Aug. 20.

S. Cowley participated virtually in the National Laboratory Director's Council (NLDC) bi-weekly coordination meeting on Aug. 21.



On August 21, J. Menard participated in the weekly National Virtual Biotechnology Laboratory (NVBL) working group call.

V. Riccardo will be leaving the Laboratory effective Aug. 31 to pursue a new opportunity. Under Riccardo's leadership, Engineering has added new rigor to guide the NSTX-U Recovery Project that has us on the path to returning to operations. Replacing her will not be easy and we are immediately beginning a global search to find the next engineering leader to propel us forward. Please welcome Craig Burkhart who joined the Laboratory as Interim Associate Laboratory Director for Engineering reporting to S. Cowley, on Aug. 17.

This report is also available on the following web site:

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