



The PPPL Highlights for the week ending February 15, 2020, are as follows:

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

Recovery (J. Galayda):

Vendor Sigmaphi continues manufacture of poloidal field coils. The vendor is setting up equipment in the winding facility to carry out epoxy impregnation of the coils. Delivery of the first coil is expected in April. The review committees for the project Final Design Review (FDR) and CD-3b Director's Review have been recruited. The FDR, Director's Review, and DOE review are scheduled for March 17-19, April 7-9, and May 27-29, respectively. PPPL shops are busy machining inconel parts for slings.

NSTX-U Test Cell - Installation of the NSTX-U radiation monitoring system was completed on Feb. 10. System testing began this week and will be finished by the end of the month. Installation of the NSTX-U test cell wall shielding continues, with completion expected by month's end.

RP Magnet Scope FDR-III - A final design review (FDR) was held Feb. 11 to review the process for in-situ grounding of the shims in the lower G10 ring region. The design would improve lower bundle mechanical load bearing capability to minimize local stress concentration while it is in compression and to protect lower bundle ground wrap insulation while it is in tension. Two earlier FDRs were held Dec. 18, 2019, and Jan. 31, 2020, that covered subjects from the OH ground plane painting to the cooling water system PLC logic change.

Plasma Facing Components - Graphite Tiles - PPPL has completed its evaluation of proposals and is awarding a contract for the fabrication of graphite tiles. Once on the project critical path, the vendor's schedule and price were favorable against our plan, and work will begin on these components immediately.

Construction Phase Planning and Preparation - With the project approach 100% final design, attention is being shifted toward the construction phase of the Recovery Project. Working Groups have been chartered and have begun refining the construction schedule and drawing up plans for preparing D-Site for safe and efficient reassembly and commissioning of NSTX-U.

Weekly

HIGHLIGHTS



Research (S. Kaye):

The U.S. Department of Energy (DOE) Office of Science announced award opportunities to research fusion energy at both U.S. and international facilities, focusing on the use of spherical tokamaks, as a route to the development of fusion as a practical energy source. The initiative will also provide support for research at the National Spherical Tokamak Experiment Upgrade (NSTX-U). These announcements (DOE-FOA-0002259 and DOE-FOA-0002255) can be found at the following link:

<https://www.grants.gov/web/grants/search-grants.html?keywords=tokamak>

S. Shiraiwa has joined the PPPL RF Physics Team effective Feb. 10, 2020. Syunichi was a research scientist and a leader of RF and HTS magnet Computational Development at Plasma Science Fusion Center at MIT. At PPPL, he will be a key member of the US RF SciDAC Project team. He will be supporting the RF SciDAC Project as well as other RF related projects at PPPL through his 3-D full wave code, PETRA-M.

U.S. ITER FABRICATION (H. NEILSON)

A. Basile and H. Neilson, representing the Laboratory's ITER Diagnostics design team, visited collaborators at General Atomics (GA) for planning discussion in regard to manufacture of the Low Field Side Reflectometer (LFSR) antenna assembly. The GA team is preparing to carry out a manufacturing development program aimed at reducing technical risks affecting manufacture and inspection of the assembly. A highlight of the visit was a tour of GA's ITER Central Solenoid coil fabrication facility at their Poway, California site, with a focus on their systems for managing and documenting step-by-step manufacturing processes and outcomes. Discussions with welding and quality assurance specialists focussed on strategies for qualifying welding and weld inspection processes compatible with ITER's strict requirements for in-vacuum equipment. It is expected that the planned manufacturing development tasks will help the PPPL team to finalize design details and will demonstrate the manufacturing feasibility of the design.

ITER & TOKAMAKS (R. NAZIKIAN)

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

R. Maingi presented an online lecture for the Stanford Online High School Astronomy Club: "Principles of Nuclear Fusion." K. Tock from Stanford served as the host. About a



dozen high school students attended the lecture, which featured a number of astrophysical examples and analogies, to explain the underlying physics of nuclear fusion, the challenge of plasma-material interactions, and the prospects for using liquid metals as plasma-facing components.

THEORY (S. HUDSON)

H. Zhu, Y. Zhou, and I. Dodin published a paper titled "Theory of the tertiary instability and the Dimits shift from reduced drift-wave models," [Phys. Rev. Lett. 124, 055002 (2020); <https://doi.org/10.1103/PhysRevLett.124.055002>]. It is shown in this paper that drift-wave turbulence tends to concentrate near extrema of the zonal velocity so the growth rate of the primary modes is modified by the local zonal-flow curvature, i.e., the second derivative of the zonal velocity with respect to the radial coordinate. This leads to a generic explanation of the well-known yet elusive Dimits shift, which is studied in the paper within the modified Hasegawa-Wakatani model and also calculated explicitly in the Terry-Horton limit.

COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER)

Science Education (A. Zwicker):

Communications (L. Bernard):

The Office of Communications published a press release on the PPPL website about research into what triggers fast magnetic reconnection. The research, by physicist Y.-M. Huang et al, produced a formula for tracking the development of "plasmoid-instability Disruptions." The story was also posted to the *EurekaAlert* and *NewsWise* press release distribution services.

DIRECTOR'S OFFICE (S. COWLEY)

On Feb. 12, S. Cowley presented at the Advanced Reactor Summit VII & Showcase, which was held at the University of Tennessee, Knoxville.

This report is also available on the following web site:

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