



The PPPL Highlights for the week ending June 2, 2018, are as follows:

NSTX-U RECOVERY AND RESEARCH (J. MENARD)

Recovery:

For the inner poloidal field (PF) coils, one vendor has completed the vacuum pressure impregnation (VPI) process, post-VPI electrical tests, and dimensional checks. That coil will ship to PPPL next week. PPPL has completed the VPI and is in the curing process. The other two external vendors have completed winding. The copper conductor extrusions for all three of the production coils — PF1A, B, and C (5 spools for each coil type) — was completed last week. Ultrasonic testing of the extrusions has been successfully completed. Review of the dimensional inspection results of the extrusions is in progress.

U.S. ITER FABRICATION (H. NEILSON)

The Laboratory hosted a visit by U.S. ITER Systems Engineering Head H. Bailey to discuss design review preparations for the Low Field Side Reflectometer (LFSR) project. The meeting focused on the criteria for demonstrating readiness of an ITER subsystem design project like LFSR to move to final design. The topics discussed included design documents, interfaces, change management, and review procedures. The meeting was attended by LFSR team members from the Laboratory and from subcontractor General Atomics. The information from this meeting provides clear targets that the team will use in its planning for upcoming preliminary design reviews of U.S. ITER diagnostics.

ADVANCED PROJECTS (H. NEILSON)

Stellarators (D. Gates):

J. Swerdlow, an undergraduate student in his senior year at Yale University, has begun a three-month summer internship working on Wendelstein 7-X (W7-X) with PPPL physicist N. Pablant. Swerdlow received the International Student Award (ISA) fellowship, enabling him to travel to Greifswald, Germany, and participate in research on-site at W7-X over the summer. During the internship, he will characterize the uncertainties in determining of impurity transport diffusion and convection profiles given the available set of diagnostics at W7-X. Impurity transport simulations at W7-X are typically performed using the 1D transport code STRAHL. By comparing the output of the STRAHL simulations to measured emissivity profiles from XICS and spectral evolution from HEXOS, it is possible to constrain the impurity transport coefficients. Swerdlow's work will look at the set of diffusion and convection profiles that are consistent with the diagnostic measurements, study the uniqueness of these solutions, and



determine the spatial resolution achievable under ideal conditions. The results of this study can help determine what additional experiments or diagnostics may be necessary to further characterize impurity transport.

THEORY (A. BHATTACHARJEE):

A figure from the paper titled, “A fast low-to-high confinement mode bifurcation dynamics in the boundary-plasma gyrokinetic code XGC1,” by S. Ku, C. S. Chang *et al.* *Phys. Plasmas* **25**, 056107 (2018), has been featured on the cover for the APS-2017 special issue of *Physics of Plasmas* **25**(5) Part 2.

A paper titled, “Wave kinetics of drift-wave turbulence and zonal flows beyond the ray approximation,” by H. Zhu, Y. Zhou, D. Ruiz (Sandia), and I. Dodin was published in *Physical Review E* [Phys. Rev. E **97**, 053210 (2018)]. The abstract and a link to the online article can be found on the Theory website:

<https://theory.pppl.gov/news/seminars.php?scid=4&n=publications>

D. Schaeffer presented a talk titled, “Generation of Laser-Driven, High-Mach-Number Magnetized Collisionless Shocks,” at the 12th High Energy Density Laboratory Astrophysics (HEDLA) conference. The talk covered recent experiments on the Omega laser facility that created for the first time high-Mach-number magnetized collisionless shocks in the laboratory. The abstract and a copy of the presentation are available on the Theory website:

<https://theory.pppl.gov/news/seminars.php?scid=3&n=invited-talks>

J. Cheng from the University of Colorado-Boulder visited the Theory Department to work with J. Dominski and others. Junyi is working in the group of S. Parker on GEM, an electromagnetic gyrokinetic PIC code. Work on benchmarking GEM together with XGC, as well as other ECP related topics, was performed.

COMMUNICATIONS AND PUBLIC OUTREACH (A. ZWICKER)

Members of both the Communications and Public Outreach departments helped host two tour groups of Princeton University alumni.

SCIENCE EDUCATION (A. ZWICKER)

On May 8 and 9 as chair of the APS-DPP Education and Outreach (E&O) committee, A. Dominguez went to Portland, Oregon, to meet with local school administrators and teachers in preparation for the E&O activities in the 2018 APS DPP meeting.



On May 16 and 17, A. Dominguez gave a series of seminars at the University of Puerto Rico Rio Piedras, Mayaguez, and Humacao campuses to advertise the work done at PPPL and recruit for internships, graduate school and summer workshops.

On May 31, D. Ortiz participated in the STEM Academies College and Career Panel Discussion, hosted by the Hunterdon County Vocational School District (HCVSD).

COMMUNICATIONS (L. BERNARD)

The Office of Communications posted a press release about research indicating that the sheath of electric charge surrounding objects within plasma can sometimes be positive. This finding, in research by B. Kraus and Y. Raitses, could improve the accuracy of measurements of electrical charge around these objects. The article was also posted to the *NewsWise* and *EurekAlert!* press release distribution services, and led the U.S. Department of Energy Office of Science “Science Headlines.”

DIRECTOR’S OFFICE (R. HAWRYLUK)

On May 30, Professor P. Falkowski, Rutgers University, presented a colloquium entitled, "Life's Engines."

Princeton University had a team of experts visit PPPL last week to assess our tritium systems. These systems were used on the Tokamak Fusion Test Reactor (TFTR), which operated with deuterium and tritium plasmas from 1993 to 1997 before TFTR was decontaminated and demolished. The team conducted an extensive review that not only assessed the current condition of PPPL’s tritium systems, but also explored the path forward.

This report is also available on the following web site:
<http://www.pppl.gov/publication-type/weekly-highlights>