



The PPPL Highlights for the week ending March 31, 2018, are as follows:

NSTX-U RECOVERY AND RESEARCH (J. MENARD)

Recovery

A successful Preliminary Design Review (PDR) was held on March 27, 2018, for the Polar Region Part 1 which included the PF coil supports.

A successful Final Design Review (FDR) was held on March 30, 2018, for the Inner PF Coil Replacement. This review satisfies a Notable Outcome for the laboratory and completes an important milestone for the Recovery project.

For the Inner PF Coils, the PPPL Winding Shop has completed winding at least the first two layers of the prototype coil.

Research

L. F. Delgado-Aparicio visited the University of Tokyo February 2-28 to work with Prof. Y. Takase and H. Yamazaki on simulations of the response of multi-energy SXR systems for the MST-RFP in Madison, Wisconsin, and tokamaks in general. Two papers will be submitted to Review of Scientific Instruments as proceedings of the 2018 High Temperature Plasma Diagnostic Conference.

J. Menard participated in a discussion meeting with the theme "Fusion energy using tokamaks: can development be accelerated?" held at the The Royal Society, London, on March 26-27, 2018, and gave an invited presentation "Fusion Nuclear Science Facility and Pilot Plant studies at PPPL". J. Menard also visited the Culham Centre for Fusion Energy (CCFE) to discuss collaborations on MAST-U, toured MAST-U and auxiliary areas of JET, and also visited Tokamak Energy in Milton Park.

The paper "TORBEAM 2.0, a paraxial beam tracing code for electron-cyclotron beams in fusion plasmas for extended physics applications," by E. Poli, et al. was published in Computer Physics Communications 225, 36 (2018). PPPL/NSTX-U co-authors are N. Bertelli and F. Poli. This paper describes the significant transformations and extensions of the electron cyclotron beam tracing TORBEAM code, in terms of both the physical model and the spectrum of applications with respect to its original form.



U.S. ITER FABRICATION (H. NEILSON)

Low-field-side reflectometer (LFSR): The LFSR team has drafted a design compliance matrix (DCM) to clearly map the flowdown of ITER Diagnostic system requirements to that subset of requirements that apply to the LFSR. The DCM serves as a tracking tool to ensure that each requirement is addressed in the design and the solution properly documented. The draft DCM is currently in review by the technical responsible officer (TRO) at the ITER Organization Central Team.

An abstract by W. Wang, *et al.*, “Thermal Loads and Cooling Design for ITER in-Port Low-Field-Side Reflectometer Diagnostic System,” has been prepared for submission to the 30th Symposium on Fusion Technology (SOFT 2018), to be held Sept. 16-21 in Sicily. The abstract describes the thermal loading of the front-end LFSR waveguides, the design challenges, and the analysis methods used to develop solutions.

ADVANCED PROJECTS (H. NEILSON)

Stellarators (D. Gates):

D. Gates made a presentation, “Recent Advances in Stellarator Optimization,” at the first Hangzhou International Stellarator Workshop, held March 26-28 in Hangzhou, China and which was hosted by Zhejiang University. The talk covered recent progress that has been made improving the performance of the STELLOPT code along with future plans. Gates also chaired a session at the meeting on Stellarator divertor physics. Very positive conversations were held with members of the Chinese stellarator community.

System Studies (C. Kessel):

A manuscript by A. Rowcliffe (ORNL) and C. Kessel, “Materials-Engineering Challenges for the Fusion Core and Lifetime Components of the Fusion Nuclear Science Facility,” has been accepted for publication in the journal *Nuclear Materials and Energy*. This work was presented at the International Conference on Fusion Reactor Materials and addresses the critical materials development needs as a prerequisite for a FNSF as well as the materials research to be carried out in the FNSF in-service environment. A range of R&D activities that support these needs and can be addressed right now is described and motivated as part of a structured program toward fusion energy. These activities include the identification, using a spallation proton facility (SINQ), of threshold helium concentrations in the structural steel where property degradation begins; development of corrosion-resistant advanced fusion steels with aluminum additives; pursuit of first wall



high-heat-flux advanced monoblock configurations with steel and silicon carbide; and examination of bainitic steel as a vacuum vessel material in fission neutron exposures (HFIR).

THEORY (A. BHATTACHARJEE):

B. Dorland from the University of Maryland gave a Heliophysics seminar on Friday, March 30, 2018. The title of the talk was “Collisionless damping of slow magnetosonic waves (and related compressional fluctuations)”. The abstract and a copy of the presentation may be found on

<https://theory.pppl.gov/news/seminars.php?scid=9&n=heliophysics-seminars>

Bill Tang has won a highly competitive, \$100,000 Global Impact Award from NVIDIA Corp., the leading producer of graphics processing units (GPUs) for carrying out artificial intelligence (AI) computing. This award was one of two presented at the NVIDIA national GPU technology conference held March 26-29 in San Jose, California. Further details are provided in the PPPL weekly:

<https://mail.google.com/mail/u/0/#trash/16285fa6d8fada29?projector=1&messagePartId=0.1>

ENVIRONMENT, SAFETY & HEALTH (J. LEVINE)

Material Services, Environmental Services and Health Physics collaborated to return a depleted California-252 source to Oak Ridge National Laboratory's source recovery program. The return of this accountable source helps to reduce the inventory of radioactive material at PPPL and the associated safety, security and environmental risks.

COMMUNICATIONS AND PUBLIC OUTREACH (A. ZWICKER)

SCIENCE EDUCATION (A. ZWICKER)

A. Zwicker and S. Greco were interviewed March 29 about STEM and science education for Science Forward at Macaulay Honors College, City University of New York. Science Forward is a framework and curriculum for promoting scientific literacy and is an open educational resource. The video, about energy use in the U.S. and how they go about their jobs, will be used in curriculum at the Honors College.



COMMUNICATIONS (L. BERNARD)

The Office of Communications posted two press release to the PPPL website. One focused on S. Lazerson and the PPPL-designed trim coils now being used on the Wendelstein 7-X stellarator in Germany. The other focused on a team of Princeton University inventors who won first place in the 13th Annual Innovation Forum earlier this month. The inventors presented a device known as a flowmeter, which was developed at PPPL. The news stories were also posted on the *EurekAlert!* and *Newswise* press release distribution services.

DIRECTOR'S OFFICE (R. HAWRYLUK)

March 26-27, M. Zarnstorff participated as a Chair of the Royal Society meeting in London, UK, then visited the JET and MAST facilities on March 28-29.

On March 28, D. McComas and R. Hawryluk hosted a visit of two UK government officials Sharon Ellis (Director of International Science & Innovation) and Andrew Price (Head of USA Team and Regional Manager for the Americas, UK Science and Innovation Network). The visitors were provided with an overview of PPPL, and toured NSTX-U, LTX and MRX.

On March 28, Assistant Professor J. Trelewicz of Stony Brook University presented a colloquium entitled, "Combating Instabilities in Nanocrystalline Tungsten through Grain Boundary Doping."

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