



The PPPL Highlights for the week ending November 4, 2017, are as follows:

NSTX-U (J. Menard)

Recovery

For the magnets, all three PF coil prototype vendors are moving rapidly in this early phase, providing concepts for items such as the winding tooling and clean room design. For the passive plates, work has continued on the assessment of the plastic response of the clamping block with an off-center and oversized hole. For the inboard divertor cooling plate, the design has been updated including the analysis model to match the PFC (tile) design. Lastly, a new TF coil outer leg locking mechanism design was presented. The new design would save substantial implementation labor.

Research

D. Boyer attended the 22nd Annual Workshop on MHD Stability Control at the University of Wisconsin-Madison, and gave an invited talk describing profile control development on DIII-D and NSTX-U, as well as the results of an experiment on DIII-D that demonstrated active control of stored energy and rotation using the new capability of varying the neutral beam voltage and perveance as actuators.

U.S. ITER FABRICATION (H. NEILSON)

Steady-State Electrical Network (J. Dellas)

With all equipment deliveries now completed and accepted by the ITER organization, work at PPPL focuses on transfer of ownership and warranty documentation, and closeout of the Procurement Arrangement.

Diagnostics (R. Feder)

N. Sauthoff, US ITER Program Manager, visited PPPL and met with the Diagnostics and Port Plug management and engineering team. R. Feder provided an update for the ongoing work on the low-field-side reflectometer (LFSR) diagnostic and the status of suspended diagnostic and port plug projects. The group discussed ideas for continued support of ITER first plasma system engineering needs in the current funding environment. Sauthoff also discussed the general state of ITER project funding at the federal level.



THEORY (A. Bhattacharjee)

Ozy.com posted an original article on PPPL physicist F. Ebrahimi and her research into coaxial helicity injection and fusion. The article may be found here:

<http://www.ozy.com/rising-stars/could-this-young-physicist-finally-crack-the-code-to-nuclear-fusion/81595>

B. Tang presented a well-received invited talk at NVIDIA's GPU Technology Conference (GTC-DC-2017) in Washington, D.C., titled, "Accelerated Deep Learning Advances," in which fusion energy science was featured as an excellent exemplar application domain.

The article "Plasmoid Instability in Evolving Current Sheets and Onset of Fast Reconnection," by Y.-M. Huang, L. Comisso and A. Bhattacharjee was published in *The Astrophysical Journal* **849**, 75 (2017). The abstract and a link to the article may be found on the Theory Department website:

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

ADVANCED PROJECTS (H. NEILSON)

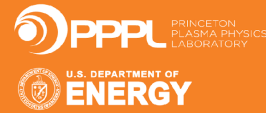
Stellarators (D. Gates)

Recently a successful conceptual design review (CDR) was completed for a novel X-ray wavelength calibration system for the X-ray imaging crystal spectrometer (XICS) diagnostic on the Wendelstein 7-X stellarator. The development and design of this system has been a collaboration between PPPL, Auburn University, and MIT. When completed, the system will allow for an absolute wavelength calibration for the XICS system, which in turn allows for absolute plasma flow measurements to be made. This ability to make absolute flow measurement provides two advantages: 1) perpendicular velocity profiles will be made with higher accuracy, and 2) parallel flow velocity profiles will be available for the first time at W7-X. These measurements allow the radial electric field in W7-X to be inferred, which in turn plays a critical role in the investigation of core transport and neoclassical optimization on W7-X.

The Laboratory hosted a team from China's Southwest Jiaotong University (SWJTU) and Japan's National Institute for Fusion Science (NIFS) to discuss joint plans to construct a quasi-axisymmetric (QA) stellarator experiment at SWJTU. Laboratory staff made presentations on the physics and engineering of stellarators, with an emphasis on design choices and lessons learned in the National Compact Stellarator Experiment (NCSX) project a decade ago. In physics, plans for collaboration in stellarator physics optimization were formulated. In engineering, it was agreed to stay in

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contact through informal meetings and PPPL participation in design reviews. The new experiment, known as China First Quasi-axisymmetric Stellarator (CFQS), will, once constructed, be the world's first of that type.

Fusion Energy System Studies (C. Kessel)

The FESS Liquid Metal Plasma Facing Component (PFC) study team held a video conference featuring a presentation by T. Rognlien (LLNL) on 2D scrape-off layer/neutral simulations of a divertor with lithium being introduced near the target and being pumped out along side walls. Rognlien used the full detachment divertor geometry derived for the FNSF (with solid PFCs) and was able to produce stable fully radiating solutions with lithium as the radiator. These resulted in about 1.5-2.0 MW/m² peak heat fluxes on the target, private flux and side walls, which is low and leads to much simpler design engineering. These solutions generally have both detached (low heat flux) and attached (high heat flux) solutions for a given lithium injection rate. This work is being performed in order to explore the lithium vapor box, or similar, type divertors that take advantage of the low Z material with a high evaporative flux, and high radiative emissivity at low electron temperature and non-equilibrium.

ENGINEERING & INFRASTRUCTURE (V. RICCARDO)

I&C Group

Following several weeks of updating old drawings and procedures, the P=EI power supply in the ESAT pit was resurrected this week with a successful open circuit test. The effort included testing internal circuits, hi potting and servicing disconnect switches. The supply developed a peak voltage of 500 VDC, which meets the LTX requirements.

COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER)

COMMUNICATIONS (L. BERNARD)

The Office of Communications posted a press release to the PPPL website about three PPPL physicists — K. Hill, P. Efthimion, and M. Bitter — who won an Edison Patent Award from the Research and Development Council of New Jersey for their invention of an imaging apparatus that could be used to produce the next generation of integrated circuits. The story was also posted on the *Newswise* and *EurekAlert!* press release distribution services and on the Princeton University website.



DIRECTOR'S OFFICE (R. HAWRYLUK)

On October 24 and 25, R. Hawryluk attended the National Laboratory Directors Committee meeting at Ames Laboratory in Iowa. The meeting focused on diversity and inclusion issues. In addition to the DOE laboratory directors, human resources directors and staff working on diversity and inclusion from the other national laboratories were present. A. Moten, PPPL's interim human resources director, participated in this meeting. A major theme was the importance of making inclusion the ultimate goal of diversity programs to ensure that all individuals are well integrated into the workplace and ensuring that the right conditions exist for each person to reach their full potential.

This report is also available on the following web site:

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