



The PPPL Highlights for the week ending December 29, 2018, are as follows:

NSTX-U RECOVERY AND RESEARCH (J. MENARD)

Recovery:

Center Stack Casing — The center stack casing (CSC) final design review (FDR) was held on Dec. 28. The FDR was held to review the development of the NSTX-U center stack casing design, determine the impact to all related system interfaces that have taken place since the presentations at the preliminary design review, and confirm the final design leading to the procurement and manufacturing of a new center stack casing. The CSC includes the regions and components between the center stack bellows flanges and includes those flanges, the divertor flanges, bellows, organ pipes and collars, and the main body of the casing. Completion of this FDR is a PEMP notable for FY2019 and the FDR was deemed successful pending resolution of chits.

Research:

Publications — The paper, “Electromagnetic article injector for fast time response disruption mitigation in tokamaks,” by R. Raman, et al., was published online in *Nuclear Fusion*: <https://dx.doi.org/10.1088/1741-4326/aaf192>. The paper describes an electromagnetic particle injector (EPI), a novel, rapid-time-response disruption-mitigation system that can accurately deliver a radiative payload to the plasma center on a <10 ms time scale, which is much faster and deeper than what can be achieved using conventional methods. The primary advantage of the EPI concept over gas-propelled systems is its potential to meet short-warning time scales while accurately delivering the required particle size and materials at the velocities needed to achieve the required penetration depth in high-power, ITER-scale discharges for thermal and runaway current disruption mitigation.

U.S. ITER FABRICATION (H. NEILSON)

A key task for the Low Field Side Reflectometer (LFSR) project in 2019 will be the fabrication of one or more manufacturing test articles to support the final design of the system’s in-vessel components. In preparation, the LFSR team has held meetings with the Laboratory’s Fabrication and Quality Assurance organizations to inform the planning. A preliminary concept for a manufacturing test article has emerged from the discussions; the concept includes a wave launcher, waveguide, and a microwave periscope formed by back-to-back waveguide bends for one of the six channels. These components will be installed in a steel support block that is prototypical in key aspects of the actual design. The planning group has begun to converge on key decisions

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regarding, for example, geometric dimensioning and tolerancing (GD&T), welding methodology, and applicable quality assurance procedures. Preparation of technical specifications and statements of work is planned to start in January.

ITER & TOKAMAKS (R. NAZIKIAN)

DIII-D Research (B. Grierson):

Research:

PPPL researchers participated in the Strategic Planning Workshop (SPW) for DIII-D's FY19 and FY20 experimental campaigns. This year is unique since the workshop was intended to identify research priorities and "thrust" elements for two years of experiments. Presentations were given by all PPPL onsite research staff, including two overview presentations: one by N. Logan titled, "3D Stability Physics and Control," and another by B. Grierson titled, "Core-Edge Integration." Research priority presentations were given by Q. Hu on the scaling of ELM suppression and density pump-out/in by 3D fields, A. Ashourvan on classification of pedestal instabilities, S. Haskey on ion thermal and particle transport in the H-mode pedestal, B. Grierson on verification/validation of the new 210 co/counter off-axis neutral beam, and A. Bortolon on reducing the carbon content of DIII-D plasmas by active wall conditioning through low-Z impurity injection. These research priorities will be reviewed and presented to the DIII-D Research Council on Jan. 10 and used to assign the runtime guidance for each research area and topical group.

Operations:

International PMI (R. Maingi):

PPPL staff and WEST researchers conducted a videoconference to discuss an impurity powder dropper collaboration on WEST. PPPL staff presented research highlights and implementation experience from the use of impurity droppers in other tokamaks. While a principal collaboration theme would be wall conditioning and high-Z impurity control with low-Z impurity injection, the use of impurity injection to optimize pedestal performance, impurity transport, and power exhaust are additional areas of interest. WEST is scheduled to shut down in the summer of 2019, so a likely target for experiments would be the spring of 2020. The next set of discussions will happen during the ITPA coordinating committee meeting in Jan. 2019, followed by a site visit in Feb. 2019.



THEORY (S. HUDSON)

M. Churchill participated in the 26th ITPA TG Divertor and SOL meeting in Madison, Wisconsin. He presented, "Gyrokinetic findings of the ITER heat-flux width and momentum balance in the scrape-off layer," covering results from the XGC code on divertor heat load width on ITER and a gyrofluid formulation to interpret momentum balance.

The paper, "Direct observation of nonlinear coupling between pedestal modes leading to the onset of edge-localized modes," by A. Diallo, et al., was accepted for publication by *Physical Review Letters*.

COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER)

Communications (L. Bernard):

The Communications Department posted three stories to the web site www.pppl.gov. One described the research of the winners of the Kaul Foundation Prize, D. Mansfield and R. Maingi, and the Distinguished Research Fellow award, R. Majeski. Another story described that major computer time on three supercomputers was won by C.S. Chang and his team to investigate issues that will impact ITER. The third focused on research by C. Dong into turbulence, plasmoids, and the heating of the solar corona. All stories were posted on the *Newswise* and *EurekAlert!* press release distribution services.

DIRECTOR'S OFFICE (S. COWLEY)

On Dec. 19, S. Cowley presented the annual PPPL State of the Laboratory to staff. Some of the topics Cowley discussed were DOE funding for PPPL, the National Academy of Sciences report on burning plasmas, and PPPL awards and patents.

The 2018 Kaul Foundation Prize was awarded to D. Mansfield and R. Maingi. The 2018 Distinguished Research Fellow was awarded to R. Majeski.

On Dec. 21, the annual PPPL Holiday Luncheon was held. PPPL's world-famous skit took place after the meal.

This report is also available on the following web site:

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