Weekly HIGHLIGHTS

PPPL PRINCETON PLASMA PHYSICS LABORATORY
U.S. DEPARTMENT OF ENERGY

The PPPL Highlights for the week ending August 11, 2018, are as follows:

NSTX-U RECOVERY AND RESEARCH (J. MENARD)

Recovery:

Magnets - Vacuum Pressure Impregnation (VPI) of the Tesla Engineering PF1A prototype coil was completed. The coil was removed from the VPI mold, passed high-pot testing, and is scheduled to ship from the company next week. The Sigma-Phi coil was shipped and arrived at PPPL on August 10. Coil testing procedures have been updated for the two remaining prototype coils, and resources are in place so that testing can commence. The magnet testing team is also preparing processes and procedures for extended duration electrical testing of representative PF1A prototype coil sections.

NTC Shielding - A successful second preliminary design review (PDR) was held on August 6 to review the revised design plans and improvements for the NSTX-U test cell (NTC) shielding. Basic shielding design, neutronics analysis, and construction plans were reviewed and analyzed during the meeting to ensure all recommendations made during the April PDR were implemented.

Central Instrumentation & Control - Installation of electrical equipment for the Computer Automated Measurement And Control (CAMAC) replacement Phase 2 work began in the D-site pump house. Procurement of cabling for this effort is complete.

Research:

Rajesh Maingi gave a tutorial lecture to the undergraduate and high school interns at PPPL titled "Plasma Exhaust via a Magnetic Divertor." The seminar covered particle, momentum, and power exhaust issues in steady state. Several of the students stayed longer to hear an extra lecture portion on transient power exhaust issues due to edge localized modes in tokamaks, and learned methods to control transients. Several examples from NSTX and NSTX-U were cited in the lecture.

Loic Reymond, Ahmed Diallo, and Vlad Vekselman published a paper entitled "Using Laser-Induced Rydberg Spectroscopy diagnostic for direct measurements of the local electric field in the edge region of NSTX/NSTX-U: Modeling" - Review of Scientific Instrument, vol. 89, 10C106, 2018. This paper proposes a novel, laser-based method for measuring the electric field in the edge of tokamaks.

U.S. ITER FABRICATION (H. NEILSON)

The low-field-side reflectometer (LFSR) team has submitted a summary document, known as the "ESPN report," focused on the hydraulic aspects of the front-end antenna unit (FAU). As

described in the report, the FAU is an assembly consisting of six waveguide antenna horns, a cooled antenna support block, and a water manifold. Both the block and the antennas feature networks of internal water cooling passages, which are designed to remove the heat that is absorbed by these components during plasma operation, and to maintain them at temperature during bakeout operations. The FAU is cooled during plasma operation with water at 70 C at an inlet pressure of 4.0 megapascals. During vacuum bake-out, water, at 240 C at a pressure of 4.4 megapascals, will be used. The report summarizes the various mechanical loads acting, both singly and in combination, on the FAU including electromagnetic loads during disruptions, thermal loads during plasma operation and bakeout, and water pressure. The analyses performed to quantify these loads are summarized. The stresses calculated from the worst-case load combinations are found to be much larger (by a factor of 12.24 to 41.5) than the stress due only to the water internal pressure. This report provides a basis for proper classification of the LFSR water-cooled components under the French order concerning nuclear pressure equipment, or Equipements Sous Pression Nucléaire (ESPN). Preparation of the report was led by PPPL engineer Wenping Wang.

International PMI (R. Maingi):

The run plan for the upcoming flowing liquid lithium limiter experiment on EAST was finalized in conference calls between the US and China. This is the third generation limiter on EAST, made entirely out of molybdenum, and it is expected to have improved technical performance compared with the previous two limiter versions.

ENGINEERING (V. RICCARDO)

C. Gentile attended the 2018 DOE Office of Science LDRD Program Review at Brookhaven National Laboratory where he made a presentation on his PPPL LDRD funded project, “In-Situ Production of Radionuclide Molybdenum-99 (Mo-99) without Uranium.” This LDRD-funded activity resulted in USA patent #9318228, awarded April 19, 2016.

A Document Management System (DMS) Final Design Review (FDR) was held on August 10. This is the final step in designing a Lab-wide system that will be used to facilitate the review, approval archiving, and display of PPPL’s documents and records.

COMMUNICATIONS (L. BERNARD)

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This week, the Office of Communications prepared for the visit by Secretary of Energy Rick Perry.

DIRECTOR'S OFFICE (S. COWLEY)

Brookhaven National Laboratory and Princeton Plasma Physics Laboratory jointly hosted the 2018 Office of Science LDRD Program Review on August 6–7, 2018. The meeting was held at Brookhaven National Laboratory. PPPL meeting participants were: M. Zarnstorff, P. Efthimion, K. Hill. L. Biringer, W. Tang, C. Gentile and Y. Raitses.

On August 9, the PPPL Office of the Vice President and the Director's Office hosted a visit for DOE Secretary Rick Perry. Secretary Perry met with Princeton University President C.L. Eisgruber, VP for PPPL D. McComas and PPPL Lab Director S. Cowley. Secretary Perry also held an All Hands Meeting with PPPL employees, and was provided a tour of various PPPL facilities.

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