



The PPPL Highlights for the week ending August 3, 2019, are as follows:

NSTX-U RECOVERY (J. GALAYDA) AND RESEARCH (S. KAYE)

Recovery (J. Galayda):

TF Bundle — For the TF bundle investigation, tests on all weakest-link sample types have been completed. Static tests on all other sample types have been completed and cyclic testing is finishing up. Testing to determine the parameters to assess crack propagation in the laminate samples are well underway. Calculations are being finalized, documented, and submitted for checking, and dry runs have started. A dashboard has been set up for the Stage 2 review on August 7-8.

Machine Core Structures — Preparations continue for the Machine Core Structures Final Design Review on Aug. 5 and 6. Final analysis, calculations, drawings, and report preparations continue with assistance from Oak Ridge National Laboratory (ORNL).

Magnets — Sigma Phi continues with procurements of coil-winding equipment and building preparations. Action items from the result of an on-site visit during the previous week are actively being addressed.

HTT/HTP — Engineering and Quality Assurance visited G. J. Oliver, the fabricator of the HTT/HTP mandrel. The onsite visit was very productive, and PPPL is working with the G. J. Oliver team to approve the manufacturing, inspection and testing (MIT) plan and the manufacturing readiness review.

Research (S. Kaye):

Nothing to report for this week

U.S. ITER FABRICATION (H. NEILSON)

A peer review of design work on the sensors, data acquisition hardware, and software for the ITER Upper Wide Angle Viewing (UWAV) diagnostic was held July 23-24 at the project site in Saint Paul lez Durance, France. The work was performed by Bertin Technologies under subcontract to PPPL and overseen by PPPL's F. Hoffman and B. Stratton, both of whom attended the review. The UWAV diagnostic consists of infrared and visible cameras viewing specific regions of the divertor from five upper ports. The review panel, chaired by A. Winter of Germany's Max Planck Institute for Plasma Physics, found the Bertin work to be at a level of maturity equivalent to preliminary design review (PDR) expectations. Review chits dealt with the need to clarify requirements for the system, including temperature ranges to be measured and required time resolution for the various operational roles of the system. It was also

Weekly

HIGHLIGHTS



found that the interface with the plasma control system needs to be better defined since the system has a machine protection function. Other key issues were the effect of radiation on electronics in the port cell, reliability of the Stirling cooler that is part of the infrared cameras, and how the emissivity of the divertor surface will be determined. There were a number of useful comments on integration with the ITER instrumentation and control system. A report on the findings will be issued.

The Laboratory's fabrication group is supporting the low field side reflectometer design team by investigating fabrication and assembly of so-called weld plugs, which will seal the ends of gun-drilled water cooling channels in the antenna assembly. Design details of the plugs and mating "sockets" (holes) must be optimized for manufacturability and inspectability, as well as long-term reliability through many years of operation in ITER's nuclear environment. The first plugs were fabricated this week. The next steps are to machine a set of holes in a flat plate, and then perform the welds.

ITER & TOKAMAKS (R. NAZIKIAN)

DIII-D (B. Grierson):

Research:

F. Laggner travelled to Madison, Wisconsin, for the first Joint MFE/FM&T Division of Plasma Physics Community Planning Process Workshop. Laggner is the lead author on the initiative proposal titled, "Generation ITER — Exciting opportunities for early career researchers and the US fusion program," and met with the workforce development cross-cutting group at the workshop. B. Grierson, who is on the program committee and co-leads the transport and confinement expert group, participated remotely.

S. Haskey and Grierson led experiments during the first day of a three-day pedestal structure thrust on DIII-D. The experiments on this day developed a baseline target shot for the thrust activities to document turbulence and transport in the H-mode pedestal, and performed a collisionality scan to determine the ion heat flux in the pedestal region. These experiments are designed to optimize main-ion CER for assessing the level of neoclassical and turbulent ion thermal transport in the pedestal.

The article "Verification and application of resonance broadened quasi-linear (RBQ) model with multiple Alfvénic instabilities," by N. Gorelenkov, V. Duarte, C. Collins, M. Podesta, and R. White was published online in *Physics of Plasmas*: <https://doi.org/10.1063/1.5087252>. The RBQ model for the problem of relaxing the hot ion distribution function in constant-of-motion 3D space is presented with the self-consistent evolution of multiple Alfvén eigenmode amplitudes. The model represents



the generalization of the earlier published model by carefully examining the wave particle interaction in the presence of realistic Alfvén eigenmode (AE) structures and pitch angle scattering with the help of the guiding center code ORBIT.

THEORY (S. HUDSON)

On July 16, F. Ebrahimi visited the University of Wisconsin-Madison. She was invited to speak at an event organized by the University of Wisconsin Alumni Association to celebrate the 150th anniversary of the first female graduated at UW-Madison. She was one of three UW alumnae featured in the anniversary issue of [On Wisconsin Magazine](#). She made a public presentation about her research on solar magnetic explosions and fusion energy.

Ebrahimi also attended the APS-DPP community planning workshops in Madison. She presented a talk titled, “The Plasma Universe and Reconnection,” in the Discovery Plasma Science. She also attended some of the MFE sessions.

N. Ferraro delivered the closing address at the community planning workshop in Madison. The goal of the workshop was to gather and generate consensus community input for a strategic plan for the DOE Office of Fusion Energy Sciences. There were more than 200 registrants representing the areas of magnetic fusion energy, fusion materials and technology, and discovery plasma science.

N. Gorelenkov attended the community planning process (CPP) meeting in Madison last week representing PPPL in the energetic particles expert group. All the initiative proposals were considered by the group with the intent to understand how they may close the gaps identified prior to the meeting. Several compact devices proposed within the US fusion community were considered in addition to the US participation in ITER. Recommendations were submitted to clarify the ideas of each proposal. Some of them were not sufficiently worked out. Several private companies that have emerged recently were also considered as alternatives to DOE-sponsored projects.

COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER)

Communications (L. Bernard):

The Office of Communications posted two press releases to the PPPL website. The first explains new research, led by D. Schaeffer, into high-energy shock waves driven by solar flares and coronal mass ejections that complement readings from spacecraft. The second details PPPL’s new apprenticeship program. PPPL has partnered with the New Jersey Department of Labor and Workforce Development to offer young people four years of technical classes and hands-on training as electrical, electronic and mechanical



technicians working on plasma physics and fusion energy research experiments. The stories were also posted to the online *Newswise* and *EurekaAlert* press release distribution services.

DIRECTOR'S OFFICE (S. COWLEY)

On Aug. 1, J. Galayda started work at PPPL as NSTX-U Project Director.

This report is also available on the following web site:

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