



The PPPL Highlights for the week ending November 30, 2019, are as follows:

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

### **Recovery (J. Galayda):**

**Metrology** — A post-award meeting was held this week with the new metrology BOA subcontractors.

**NSTX-U Test Cell** — Subcontractor Powers Electric was mobilized to begin installation of the test cell radiation monitoring system enhancement this week. Work continued on construction of rebar and wooden concrete forms for the south high bay labyrinth, as part of the shielding improvement job.

**Private Flux Region Injector FDR** — A final design review (FDR) was held on Nov. 25 to review the mechanical, electrical, and instrumentation and control (I&C) aspects for the two NSTX-U private flux region injectors. The private flux region injectors are used to support operations through deuterium or impurity fueling to mitigate heat flux to the plasma-facing components and to support physics research activities.

**TF Inner Bundle Twist Laser Measurement PDR** — A preliminary design review (PDR) was held on Nov. 26 to review further test results of a toroidal field (TF) inner bundle twist laser measurement design system. Under imposed EM loads, the TF inner bundle will twist during operations. A combination of strain gauges and external laser-based measurements can be used to monitor the twist. A prototype test was conducted for the conceptual design review (CDR) to determine the measurement sensitivity of a mounted laser, reflector, and detector system. The PDR examined the results of additional prototype tests and reviewed the selected equipment and its measurement capabilities and limitations.

**CS Magnet Assembly Lower G10 Ring Resolution Peer Review** — A small working group of recovery project engineers and technicians has been assessing the status and capability of the G10 ring mounted at the base of the OH coil. A peer review was held on Nov. 26 to review the component, including proposed modest modifications. The peer review validated the conclusions of the working group, opening the path to do additional prototyping toward an FDR.

**PF Coil Deliveries** — NSTX-U project personnel are evaluating Sigmaphi's revised schedule for deliveries of poloidal field (PF) coils. The revised schedule is being integrated into the overall project plan and post-delivery activities at PPPL will be adapted to the new schedule.



### **Research (S. Kaye):**

A group of PPPL and NSTX-U researchers participated in the 2019 KSTAR campaign the week of Nov. 11 and led various experimental sessions on RMP ELM control and impurity powder dropper (IPD) with NFRI collaborators. The collaborations yielded (1) RMP ELM suppression in new KSTAR regimes, including high BT or low heating power and giving valuable data to study the parametric dependencies of RMP thresholds (N. Logan, J.-K. Park); (2) validation of quiescent non-resonant 3D fields (S. Yang, J.-K. Park); (3) successful implementation and initial test of real-time RMP ELM controller based on D-alpha and also MHD spectroscopy (E. Kolemen, R. Shousha, O. Neilson); and (4) new evidence for recycling reduction using boron nitride powder injection wherein the injected powder is distributed by each discharge and gradually improves the wall conditions. (A reduction in baseline D-alpha level and a decrease in ELM frequency were both observed.) (E. Gilson, A. Diallo, A. Bortolon) Y. Jeon, a visiting scholar from NFRI, also joined remotely from PPPL to assist physics operation for every session related to 3D physics during the week.

W. Choe (Professor of Engineering at the Korean Advanced Institute of Science and Technology, Korea) visited NSTX-U/PPPL during the week of Nov. 18 to discuss various research collaboration topics on plasma transport, diagnostics, diverter physics, and low-temperature plasmas. He met with NSTX-U/PPPL researchers including M. Ono, S. Sabbagh (Columbia University), L. Delgado-Aparicio, and Y. Raitses.

### **THEORY (S. HUDSON)**

A. Scheinberg attended the Supercomputing 2019 conference and presented a poster titled, "Kokkos and Fortran in the Exascale Computing Project Plasma Physics Code XGC." Authors included A. Scheinberg (PPPL), G. Chen (Los Alamos National Laboratory), S. Ethier (PPPL), S. Slattery (Oak Ridge National Laboratory), R. Bird (Los Alamos National Laboratory), P. Worley (PH Worley Consulting), and C.S. Chang (PPPL).

Also, the paper titled, "ORB5: A global electromagnetic gyrokinetic code using the PIC approach in toroidal geometry," by E. Lanti et al., including A. Scheinberg, was accepted in *Computer Physics Communications*.

M. Churchill attended the APS-DPP community planning meeting in Knoxville, TN.

**This report is also available on the following web site:**

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