Weekly HIGHLIGHTS

PPPL PRINCETON PLASMA PHYSICS LABORATORY

U.S. DEPARTMENT OF ENERGY

The PPPL Highlights for the week ending April 14, 2017 are as follows:

U.S. ITER FABRICATION (H. NEILSON):

Steady State Electrical Network (J. Dellas):

The Laboratory continues to make progress toward completion of U.S. equipment deliveries for the Steady-State Electrical Network (SSEN). The Uninterruptible Power Supply (UPS) supplier, Schneider Electric, recently received "Released for Manufacturing" (RFM) approval, the last RFM to be issued for SSEN procurements. All outstanding equipment items are now in or beyond the manufacturing stage. The UPS supplier submitted a revised schedule based upon plans to perform all testing at their manufacturing facility Switzerland. This plan offers a significant reduction in schedule risk compared to the previous plan, which required shipping the equipment to a facility in France for testing. The SSEN project is currently on track to complete all deliveries by this October.

Diagnostics (R. Feder):

D. Johnson and N. Atnafu visited General Atomics on April 11 and 12 to meet with the subcontract project team for the TIP diagnostics design. The TIP prototype was installed on the DIII-D experiment and initial tests completed. As part of the prototype an impressive and very complex optical system was developed with temperature control enclosure. The team reviewed the prototype test plans and communicated the progress with the diagnostics instrumentations and controls. The team also discussed the re-plan activity that's under progress and suggestions were made for resource leveling, activity prioritization and hold points.

NSTX-U RECOVERY PROJECT (R. HAWRYLUK):

The final Design Verification and Validation Review (DVVR), this one on Real Time Control and Protection, is being held on April 19 and 20.

The PF1AU Coil Failure Root Cause Analysis team of L. Hill, F. Malinowski, I. Zatz, and experts from the firm of McCallum-Turner conducted interviews with members of the NSTX-U Project Team throughout the week.

Regarding test cell work, machining and fit-ups of the Poloidal-CHERS diagnostic in-vessel passive plates has been completed, and materials have been moved to the Vacuum Prep Lab to be prepped and baked before installation.

Two of the in-vessel neutral beam armor panels have been removed from the vessel for pressure testing, and the other two successfully completed vacuum leak checking in-situ. The first post-operations entry into Neutral Beam #1 for inspections indicated no problems with any of the beam-impinged surfaces. An entry into NB #2 is planned for next week. Work continues in the Neutral Beam Clean Room on the assembly of a second spare ion source. Pre-op testing of the first spare ion source is nearing completion after successful electrical insulation testing this past week.

Recommissioning of the coil winding facility also continued with vacuum leak checking of the VPI vacuum mold and the PF1A mandrel at ambient and epoxy curing temperatures. A Management Safety Walkthrough of the coil winding facility was conducted on Friday afternoon.

Voith Hydro engineers will be on site next week to discuss plans for completing the D-Site MG lower guide bearing maintenance.

NSTX-U RESEARCH (J. MENARD):

Four graphite tiles that were retrieved from NSTX-U after the last campaign. Cores samples have been obtained from these tiles under the supervision of PPPL Health Physics personnel. A total of forty-seven samples were removed in such a way that the plasma facing surface of the tiles were not contaminated by debris from the coring process. Twenty-two samples were provided to collaborators J.P. Allain and F. Bedoya from the University of Illinois at Urbana-Champaign for surface analysis. The remainder of the samples will be analyzed at PPPL and at the Imaging and Analysis Center (IAC) of the Princeton Institute for the Science and Technology of Materials (PRISM) housed in the Andlinger Center for Energy and Environment (ACEE) on campus.

Professor W. Boeglin and grad student A. Netepenko from FIU visited PPPL during the week of April 10 to assess the status of the NSTX-U Fusion Product diagnostic. W. Boeglin presented results from initial tests of the diagnostic on MAST and plans for the NSTX-U system at a NSTX-U EP-TSG meeting on April 12. During the visit, plans have been discussed to use TRANSP modeling to compute expected signal levels of the Fusion Product system for NSTX-U plasmas up to full-field, full-current scenarios. Short-term plans for re-deploying the system to MAST-U in FY-18 (during the NSTX-U outage) have also been discussed, including potential areas of collaboration for physics studies on fast ion redistribution by MHD instabilities and validation of fast ion transport models in TRANSP.

The paper “Unusual emission lines of carbon in the 170-190Å region on NSTX” has been published by J. K. Lepson, et al. in AIP Conference Proceedings 1811, 190008 (2017). The abstract reads: “We measured the spectral emission of plasmas from the National Spherical Tokamak Experiment in the extreme ultraviolet region, typically dominated by M-shell iron lines. Although we found that most of the significant emission in the 170–270Å region emanates from iron, there are also some strong lines of carbon present. We show that the carbon lines are not produced by electron-impact excitation, and we speculate that they are formed instead by charge exchange.”

ITER & TOKAMAKS (R. NAZIKIAN):

KSTAR:

The MSE background polychromator and computer arrived safely at NFRI and has been unpacked and moved to the KSTAR MSE laboratory. The system will be assembled and aligned the week of April 24 during a visit by Bob Mumgaard (PSFC).

DIII-D:

N. Logan, B. Grierson, S. Haskey, and L. Cui led an experiment on DIII-D to validate the GPEC 3D MHD and NTV torque model. The new torque matrix formalism of the Generalized Perturbed Equilibrium Coder (GPEC) was used to optimize edge and core localized NTV. These fields were first predicted with GPEC and then applied to plasmas with high and low toroidal rotation in ELMing counter-Ip discharges. The new ASIPP power supplies were used to power the 3D field coils. Analysis using TRANSP is now under way to infer the torques from the time rate of change of the angular momentum profiles for direct comparison to the GPEC predictions.

Luis F. Delgado-Aparicio gathered information on impurity concentrations in several DIII-D discharges to make signal-to-noise estimates for a new spectrally resolved x-ray imaging camera in preparation for a physics review of a proposed new diagnostic. The imaging detector will be able to perform spatially resolved measurements of medium- to high-Z impurities such as Si, Ar, Ca to Mo and W.

A. Nagy led the NB High Voltage transmission line Hi-pot test this week. The results surpassed all expectations with 160kV stand off across a 5.5" distance.

The pole shields for two neutral beam lines are currently being fabricated with delivery to GA expected in mid-June.

A successful PDR held on April 5 for the new calorimeter. Minor design changes are being re-analyzed to verify that the design meets updated requirements. Design/drafting has begun for the fabrication drawings required for the FDR, tentatively scheduled for early May.

THEORY (A. BHATTACHARJEE):

M. Churchill participated in the “Future Online Analysis Platform” workshop held in Arlington, Virginia. The workshop was organized to discuss the research challenges that need to be addressed for a computational facility for online data analysis of data from large-scale science experiments. He presented a brief presentation on “Streaming analytics to enable interactive, data-intensive scientific research”, in collaboration with researchers from Oak Ridge National Laboratory.

BUSINESS OPERATIONS (K. FISCHER):

PPPL won a national award for ensuring that 99 percent of eligible electronic equipment purchased last year met rigorous standards for recyclability and energy efficiency. The three-star EPEAT award is the highest award the Green Electronics Council gives.

DIRECTOR'S OFFICE (S. ZELICK):

On April 12, Dr. Kenneth Ford presented a colloquium entitled, "PPPL at t = 0".

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