

PRINCETON PLASMA PHYSICS LABORATORY

WEEKLY **highlights**



**The PPPL Highlights for the week ending August 1, 2014, are as follows:**

**U.S. ITER FABRICATION (D. JOHNSON):**

Request For Shipment documentation for the ITER HV Circuit Breakers is in the review/approve cycle with shipment to ITER now planned for late August.

Factory Acceptance Testing of HV Transformer #1 was completed.

The divertor diagnostic residual gas analyser (RGA) sampling tube was reviewed in a two day Final Design Review in Cadarache, France on July 29-30. There was one class one chit pointing out that some of the documents required for the FDR had not been approved prior to the review.

A meeting with ITER diagnostic CAMs resulted in a list of potential FY15 and FY16 milestones to submit for consideration to the Project.

At a weekly meeting for the Core Imaging X-Ray Spectrometer, L. Delgao-Apricio reported on discussions with the Swiss company Dectris concerning the availability and cost of imaging X-ray detectors with the detector head connected via a one-meter cable to the readout electronics.

PPPL received, from Reade Advanced Materials, six pounds of boron carbide pellets, in the form of 5x10mm cylinders. Planned are measurements of the close-packed density and the outgassing (after cleaning and baking) from collections of these pellets. These pellets are being considered as low mass shielding material for the ITER diagnostic shield modules.

**NSTX (M. ONO):**

Preparations for plasma operations in the NSTX-U configuration also continued with the ongoing reassembly of the Motor Generator after the successful completion of the rotor weld repairs. The generation and exercise of pre-operational test procedures for the Neutral Beam (NBPC) and Field Coil (FCPC) power conversion systems continues. Pre-operational testing of the neutral beam arc and filament power supplies for NB#2 has been completed, and testing of the NB#2 suppressor grid power supplies is in progress. Preparations are underway for open circuit testing of the field coil power conversion system rectifiers.

## **ITER & TOKAMAKS (R. HAWRYLUK):**

### **DIII-D (R. Nazikian):**

E. Kolemen led experiments with the DIII-D team to test radiation control using impurity seeding. High radiation levels were obtained and adequately controlled using neon. The ultimate goal is to achieve well-controlled high performance plasmas with high edge radiation.

The Neutral Beam Pole Shield job has been awarded to a vendor. The scheduled delivery date of the two pairs of pole shields is early November. The lead-time to procure TZM Molybdenum is the critical path item in the job schedule.

A paper titled "Phase-locking of magnetic islands diagnosed by ECE-Imaging Authors" by B. Tobias, et al., was accepted for publication in Review of Scientific Instruments and will appear in the special issue of the proceedings of the High Temperature Plasma Diagnostics conference.

The machining of remaining parts for the Lithium Granule Injector has been completed at PPPL and work is commencing on final assembly.

### **International (G. Taylor):**

G. Taylor and R. Perkins visited the EAST long-pulse, superconducting tokamak at ASIPP in Hefei, China, July 18-23 to prepare for ICRF experiments to investigate RF losses in the plasma scrape off layer. During their visit to ASIPP they met with operations, diagnostic and RF physicists, as well as computer network technical staff. Their visit is part of a long-term collaboration between U.S. researchers and EAST that has the goal of developing RF actuators for long-pulse tokamaks. EAST is in the middle of a plasma and systems commissioning campaign following a 20-month long major upgrade. During the previous EAST campaign in 2012 only 2 MW of RF power was coupled into plasma, even though there were 6 MW of RF source power available at the time. Previous ICRF experiments on NSTX had identified significant RF loss mechanisms in the scrape off layer that were directing RF power to flow to the diverter, instead of heating the plasma. While the poor plasma coupling to the plasma on EAST in 2012 may have been in part due to the low plasma density in those plasmas, it is possible that RF loss mechanisms similar to those observed in NSTX may be occurring in EAST. There are now 12 MW of RF power available on EAST and there is a long-term goal of coupling at least 70% of this RF source power into plasma. A team of PPPL RF physicists plans to return to EAST to conduct experiments that may help EAST researchers achieve this long term goal.

## **ADVANCED PROJECTS (D. GATES):**

A Final Design Review (FDR) for the W7-X X-Ray Imaging Crystal Spectrometer (XICS) Project was satisfactorily completed this week. With the successful completion of this review, the project will now shift into fabrications. The diagnostic support structure will be the first item sent out for fabrication. Several long lead-time items have already gone out for bid, including the crystal and the beryllium window. IPP colleagues reported that that the mounting points have already been welded to the W7-X cryostat and an installation plan had been approved. The XICS project remains on schedule to be delivered in time for installation prior to initial W7-X

operations. Project risk analysis was presented and cost schedule risks were identified.

S. Lazerson traveled to Columbia University to give a tutorial on the STELLOPT family of codes to a group of researchers led by Professor Francesco Volpe. Dr. Lazerson assisted researchers with the installation of STELLOPT on a 12-processor Ubuntu machine. The tutorial spanned three days and included the topics of installation of software, running VMEC, visualization of equilibrium in Matlab, and running STELLOPT. Additionally, a coils file for the CNT device was developed and free boundary simulations were performed. This work provides the group with the necessary tools to begin stability analysis of the CNT experiment and is supported by the DOE Off-Site University Research Program (OSUR).

## **ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):**

### **NSTX Upgrade (R. Strykowski, E. Perry, L. Dudek, T. Stevenson):**

Construction: The feedthroughs for the RF Langmuir Probes have been completed. The centerstack casing was placed in a vertical position so the PF1B lower coil could be trial fit. It was then lowered so the pockets for the PF1Bs could be enlarged and the PF1Bs themselves are being adjusted so the mounting ears are all flat and the studs are being replaced with longer ones. The upper ceramic break and PF1C coil trial fit on the vessel was completed once the PF2 clamps were re-made so the ceramic break would fit. The upper ceramic break and PF1C coil will be removed so the temporary floor can be established in the upper umbrella and the trial fit-ups of the TF flex, lead extensions and finger supports can begin. The electricians continue working on the fibers and fiber jumpers for the vacuum/RGA/gas injection systems. Powers Electric is silverplating and installing the TF bus.

CS Upgrade: A second magnet power supply was connected to the OH coil to increase the power into the coil and reduce the heat up time to about an hour. In addition, chilled water was piped to the TF bundle to allow cooling during the OH coil heat up to increase the shear force on the Aquapore. More dial indicators were also added to record the movement of both coils during heat up and cool down modes. An attempt to reheat and debond the OH will be performed the afternoon of August 1. The PF1C coil passed its hipot test successfully this week. The welding mandrel completed water jetting and is being setup for machining. The first pair of lead extensions at Martinez and Turek were E-Beam welded. They reported the welds look significantly better than the first batch. A demonstration of the hotwire cutting technique for the Aquapore was held and may prove to be a method to remove wires if needed. Both PCHERS passive plates were shipped from Major Tool and are expected to arrive August 1.

NBI Upgrade: TVPS Fore line and Exhaust line installation continues. TVPS turbopump table installation is in progress. The armor manifold installation was completed. NB Controls fabrication and installation cabling work on rack connections, cable runs, and BL wiring continued in NTC and gallery. Telemetry fiber optics end-to-end testing and rework continues in NTC. PTP-NB-212 Arc and Filament power testing was completed on NB2 ABC. Decel power supply reactivation and dummy load tests were completed on NB2C. In parallel with power testing, the LCCs are receiving attention in support of PTP-NB-212 testing. Additional NB installation procedures are in development and review. The NBI Cryogenics effort has started to pump down cryogenic lines for upcoming operations. Preparations are underway for installing

ion sources on BL2 starting the week of August 4. Management attended the monthly IPT meeting this week.

Digital Coil Protection System: DCPS PTP testing and compilation of testing documentation continues and the documentation covers PTP-DCPS-001 by sections with graphs showing successful tests and trips. Progress continues on hardware interface layout, drawings, orders, and fabrication of digital and analog boards. Component installation and bench testing continues. Water PLC testing continues in parallel with water system operations in support of FCPC rectifier testing. Evaluation of the DCPS chit log continues.

#### **BUSINESS OPERATIONS (K. FISCHER):**

PPPL received first year funding from NASA for a Work for Others to collaborate with the University of Alaska Fairbanks on the research titled "Large-Scale Radial Plasma Transport and Heating in Planetary Magnetospheres". The PPPL Principal Investigator for this effort is J. Johnson and the funding to be provided by NASA is \$109,884 for the three-year period of performance.

#### **DIRECTOR'S OFFICE (C. AUSTIN):**

July 29-31, A. Cohen participated in an infrastructure workshop at Brookhaven National Laboratory (Upton, New York).

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