



The PPPL Highlights for the week ending February 13, 2015, are as follows:

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

Several Project Change Requests were submitted to the USIPO, reflecting re-planning for the Core Imaging X-ray Diagnostic, the Upper Visible/IR Cameras, the Upper Port Plugs, and for Diagnostic Management.

The Second Mirror Cleaning Workshop was held this week in Cadarache, France, with several from PPPL participating remotely. Much work in Europe has been toward qualifying use of an RF plasma to remove coatings on diagnostic mirrors that may arise during ITER plasma operation. With this technique, the mirror itself is driven with RF in the presence of D, He, or Ar gas. The trick is to sputter away the coating without damaging the mirror surface. Many types of coating have been successfully removed with practical removal rates, even in the presence of ITER-relevant magnetic fields. However, cleaned mirrors suffer some damage, in the form of increased surface roughness and associated increased diffuse reflectivity. More work is planned to study the effects of repeated cleaning cycles, re-deposition during cleaning on adjacent mirrors, and more combinations of coatings and substrates.

F4E has contracted with the Spanish company, IDOM to be their diagnostic port integration contractor in Europe. A meeting was held this week and the IDOM team will be coming to PPPL for a port plug engineering workshop in late June.

NSTX (M. ONO):

The Digital Coil Protection System (DCPS) and the Power Supply Real Time Control (PSRTC) development efforts are working towards the start of Field Coil Power Conversion (FCPC) System dummy load testing. All pre-operational tests of the DCPS and the PSRTC have been exercised, and the cause of an intermittent control signal interruption between the RTC output and rectifier firing generator input has been identified and corrected. The PSRTC I/O tests will be repeated as one last step before moving to power supply dummy load testing.

Preparations of non-upgrade equipment for plasma operations in the NSTX-U configuration continued. Preparations to start the dummy load testing of the FCPC rectifiers are in progress. Test cell wiring and fiber-optic connections to commission the new Plasma Current (I_p) calculator have started, and the DCPS Autotester will be used to generate the waveforms that will be used to test and calibrate the I_p calculator functions. Recommissioning of Test Cell

CAMAC systems continues. A Run Copy of OP-NSTX-02 (Start-Up of NSTX-U) has been issued, and sign-offs continue.

Work continues on the OH cooling water preheater system. Preliminary results of the CTD insulation array tests have been received and are favorable. Both misaligned and aligned samples have been tested, and no electrical failures have been reported after 30,000 controlled strain cycles. Based on these results, the preheater system does not have to be fully operational for CD-4. Mechanical behavior of the samples shows some progressive reduction in the moduli of the samples indicating some degradation to the inter-laminar bonds. (This was to be expected.) The conductors are wrapped with Kapton inter-leaved with glass with the expectation that some mechanical strains would have to be accommodated. Completion and operation of the preheater system is still planned to simplify operation and reduce mechanical strains in the insulation system over time, and to support OH coil temperature adjustments to minimize the OH interaction with the TF due to the Aquapor remaining in the interface gap.

ITER & TOKAMAKS (R. HAWRYLUK):

DIII-D (R. Nazikian):

C.S. Chang, R. Hawryluk and R. Maingi participated in the DIII-D BPMIC planning workshop. Chang and Maingi gave presentations on the validation of XGC for pedestal and divertor physics, and participated in the breakout sessions.

B. Ellis visited DIII-D to assess the condition of all four ECH launchers in preparation for maintenance in April. The left hand side of the damaged 285 launcher was disassembled. Damage to it, and the other three launchers, was much less severe than feared. Maintenance plans were discussed with the DIII-D ECH team.

The LGI has been vented with Argon in preparation for removal this week where it will be relocating to the LGI laboratory in the Diagnostics Building. The lithium will then be recovered, sifted, and stored in argon atmosphere for future use. The next step in the technical development of the LGI is to improve reliability and provide a predictable and precise period between granule injections. The LGI is scheduled to be reinstalled on DIII-D in FY16. The lithium powder dropper has been removed from the vessel. Inspections will commence once the vessel is open to identify areas of lithium deposition.

A. Nagy has been made the lead engineer for the new high powered helicon antenna project scheduled to be operational by the end of FY16. This work involves the removal of the mothballed FMIT Fast Wave system, installation of a SLAC Klystron, antenna vessel interface design, removal of the ABB2 transmission line tuners, and removal of the 180-degree antenna.

ADVANCED PROJECTS (D. GATES):

R. Goldston had an article published this week in the Bulletin of the Atomic Scientists: “Negotiating with Iran: Breakout and Sneakout”. The article discusses issues related to negotiations between the P5+1 (the United States, Britain, China, France, Russia, and Germany) and Iran.

Laboratory staff submitted deliverables for a preliminary design review (PDR) of the Wendelstein 7-X TDU Scraper Element (TDU-SE) project, which is currently led by Oak Ridge National Laboratory. The TDU-SE, a specially instrumented plasma facing component, will support U.S. research aimed at advancing the understanding of 3D divertors and edge physics as part of the U.S. collaboration on Germany's Wendelstein 7-X stellarator. The international design review, scheduled for February 18, is expected to establish the readiness of the design to move into detailed engineering. The Laboratory's P. Titus has led the engineering analysis on the project, while R. Strykowski has led the planning for project execution phases from final design through component deliveries. An engineering analysis report, project execution plan, and resource-loaded schedule are among the deliverables contributed by PPPL to the design review package.

THEORY (A. BHATTACHARJEE):

A new publication now online at the Physics of Plasmas website: Wang, L., Hakim, A. H., Bhattacharjee, A., & Germaschewski, K. (2015). Comparison of multi-fluid moment models with particle-in-cell simulations of collisionless magnetic reconnection. *Physics of Plasmas*, 22(1), 012108. doi:10.1063/1.4906063. This paper compares multi-fluid models with kinetic (PIC) models to study the process of fast magnetic reconnection in Harris current sheets. The fluid model retains evolution equations for the full anisotropic pressure tensor, and uses a simple local collisionless closure for the heat flux. Excellent agreement are obtained between the multi-fluid and PIC simulations, specially for the structure (width and extension) of the current sheet, the outflow velocities and decomposition of the generalized Ohm's law, showing the utility of these extended fluid models to simulation of complex problems in plasma physics.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

Construction: Poloidal Field, Ohmic Heating and Coaxial Helical Injection bus inside the umbrellas has passed megger testing. Final installation of the toroidal field bus inside the umbrellas has been started. OH cooling water hoses have been tested and installed - hydro testing of the installations is in progress. Hi-pots of the inner vacuum vessel and bus inside the umbrellas have all passed. Electricians have reinstalled the fiber optics that were pulled back from the machine at the start of the outage. They are now reinstalling the snubber under bays I/J as well as the cabling for the torus interface valves (TIVs). Gas delivery system piping installation continues.

CS Upgrade: Preparation for the OH Heater FDR continued. Calculation for the OH heater design was completed. Fitup of the OTF lead extensions continued this week. Silver plating of TF lead parts continued in preparation for final assembly. The possibility of performing a temperature cycle fatigue test on the selected high-pressure, high-temperature hose was investigated. The water system hose connections and hydro-testing continued throughout the week.

NBI Upgrade: The DI water system repairs continued on MER mezzanine. The strainer installation for the NTC is in progress with completion imminent. The water treatment and fill and flush is planned for the week of February 16. The stack duct installation is imminent in the NTC, parts have arrived, and the IP is nearing approval. Control cabling terminations continue and near completion. Troubleshooting of all cabling in support of various stages of PTP testing is in progress. Gas system fiber optics terminations are in progress in NBPC 138L and are near completion. The M/R power supply testing and tuning continues. Software efforts continue on PLC pages. Pretesting is in progress. Consideration of an IR camera for Bay L 7:30 port to view the armor is in progress. The NTC North door gate installation is scheduled for the end of February due to limited resources. The operating procedure revision and approvals are in progress. In addition, operator training records are being brought up to date.

Digital Coil Protection System: Pretesting and troubleshooting continued in preparation for support of dummy load testing. Further testing of PTP-ECS-035 was completed. Work continues on the DCPS extension and summing chassis implementation. Parameter tree development to support dummy load testing was completed. Development of OP-DCPS-779 set up and startup continues. Preparation for DCPS FCC local pretesting with the Autotester is in progress.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

Dr. Clayton Meyers, PPPL, gave the Science on Saturday lecture titled, Honey, I Shrunk the Plasma: Studying Astrophysical Processes in Laboratory Experiments.

DIRECTOR'S OFFICE (C. AUSTIN):

On February 13, John Sethian, from the U.S. Naval Research Laboratory, presented a seminar entitled, "The Frozen Fiber Z-Pinch".

PUBLICATIONS:

Goldston, R., "Negotiating with Iran: Breakout and Sneakout," Bulletin of the Atomic Scientists

Wang, L.; Hakim, A. H.; Bhattacharjee, A.; & Germaschewski, K., "Comparison of Multi-fluid Moment Models with Particle-in-cell Simulations of Collisionless Magnetic Reconnection," Physics of Plasmas 22(1), 012108. doi:10.1063/1.4906063

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