

The PPPL Highlights for the week ending January 6, 2017 are as follows:

NSTX-U RECOVERY PROJECT (R. HAWRYLUK):

Progress continues on the development of NSTX-U System Design Descriptions (SDD's), and drafts are being reviewed and updated.

Design Validation and Verification Reviews (DVVR's) are being scheduled, and a DVVR on Instrumentation and Control Systems is now planned for January 18.

Metrology of the OH/TF bundle was completed this week, and the removal of the PF1AL coil supports has started. Engineering plans are being developed for the removal of the PF1B coil and the lower ceramic break.

Recommissioning of the coil winding facility continued with fit-ups of the PF1A mold and mandrel. The final clean-up machining of the PF1AL mandrel continues in the shop, and a PF1AU mandrel has been delivered to the lab.

Work in the Neutral Beam clean room / decon facility continued on the disassembly of the spare ion source with an internal water leak, and on the decontamination and evaluation of an ion source last used on TFTR.

NSTX-U RESEARCH (J. MENARD):

The NSTX-U Integrated Scenarios Science Group met to discuss revised proposals for FY2017 and FY2018 Research Milestones to take into account absent/reduced runtime in FY17/FY18. The NSTX-U Core Science Group also met to discuss FY17-18 Research Milestone proposals. An NSTX-U Program Advisory Committee (PAC-38) videoconference was held on January 6. The videoconference provided the PAC with an informational update on the recent history, status, and plans for the NSTX-U program and facility. The PAC was also charged with providing feedback and ideas on how best to solicit and include input from US University PIs/leaders in the scientific goal and strategic planning of the research program for the next NSTX-U 5 year plan (FY2019-FY2023).

ITER & TOKAMAKS (R. NAZIKIAN):

International:

A single Avalanche Photodiode assembly sent to KSTAR (to evaluate background signal levels) has cleared Korean Customs and will arrive at NFRI this week. Machining has begun on fiber ferrules to mate the existing KSTAR fiber bundles to the MSE background polychrometer.

DIII-D:

The article "Mitigation of divertor heat flux by high-frequency ELM pacing with non-fuel pellet injection in DIII-D", by A. Bortolon et al. has been accepted for publication in Nuclear Materials and Energy. The article reports analysis of ELM pacing events by injection of Li granules in DIII-D, including plasmas in the ITER-baseline scenario. The results show that in some cases paced ELMs show a broad distribution of ELM peak flux, which limits the effectiveness of ELM mitigation. A key question to explore in future experiments is whether a more regular frequency of granule injection can improve the degree of ELM mitigation.

A new workflow for preparing, executing and visualizing XGC0 simulations has been developed and publicly released through the OMFIT framework by Shaun Haskey, Devon Battaglia, and Brian Grierson. This XGC0 module will be used to interpret changes in edge main-ion rotation for existing analyzed data and to support upcoming experiments in the DIII-D rotation research thrust that focus on a predictive understanding of intrinsic rotation. The XGC0 module leverages existing workflows for kinetic equilibrium reconstruction, plasma profile analysis and TRANSP transport calculations for the geometry, background plasma profiles, and heat, particle and momentum sources. Simulations are submitted to NERSC Edison and steered through a graphical interface, enabling rapid and streamlined workflow for interpretive transport and model validation.

The Lithium Powder Dropper has been cleaned of Lithium by operating it continually in mineral oil. The Dropper ran for 5 minutes at maximum excitation, releasing ~50 mg of lithium before running low. The dropper unit has been reassembled with a tapered rod used as a throttle inside the drop hole. This will be bench tested using 200 micron boron carbide spheres and another powder (TBD) to calibrate the flow response. The goal is to use this configuration later in the DIII-D run this summer.

Impurity Granular Injector Version 3 is in fabrication with completion expected next week. Bench testing will commence on this unit to assess the new adjustable filter capability and its maximum delivery rate using carbon and boron carbide spheres (~700 microns diameter). The cartridge that will hold up to four different granule types is in the design phase.

ADVANCED PROJECTS (H. NEILSON):

Stellarators (D. Gates):

In the Laboratory's collaboration with the Wendelstein 7-X stellarator project at the Max Planck Institute for Plasma Physics (IPP), two instrumented scraper units, which were finished and

shipped in December, arrived at the Greifswald, Germany project site the week of 1 January. An accompanying documentation package, consisting of design and quality data, has also been finalized and delivered electronically to IPP. These last two deliveries, once confirmed by IPP, will satisfy a FY17 Notable Outcome. Two spare tiles remain to be fabricated and will be shipped in a few weeks, together with leftover material that was supplied by IPP but not used in the scraper fabrication.

ENGINEERING & INFRASTRUCTURE (V. RICCARDO):

Fabrication and Operations Division (E. Perry, L. Dudek, Y. Zhai):

Yuhu Zhai has completed the FY16 Annual Report on the LDRD project on superconducting magnet studies. Here are the main achievements: A number of new solenoid Nb₃Sn coils with direct winding of high performance s/c wires and novel insulation were fabricated and heat treated at PPPL with in-house furnace/vacuum chamber. Results of low temperature and high field critical current measurement of small PPPL coils tested at the National High Magnetic Field Lab indicate the wire performance meets ITER specifications. Three Journal papers published in FY16 and 2 conference talks were given at the Applied Superconductivity and Magnet technology conferences. I was also invited to give a key-note talk at the Low Temperature / High Field Superconductor Workshop at Santa Fe, New Mexico, February 27 – March 1.

COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER):

Communications (L. Bernard):

R. Rosen distributed a news release about PPPL physicists, led by H. Ji, for the first time directly observing a phenomenon that had previously only been hypothesized to exist. The phenomenon, plasmoid instabilities that occur during collisional magnetic reconnection, had until this year only been observed indirectly using remote-sensing technology.

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