

The PPPL Highlights for the week ending May 12, 2017 are as follows:

NSTX-U RECOVERY PROJECT (R. HAWRYLUK):

The second of the two planned Extent of Condition (EoC) reviews is being held the week of May 15.

Recommissioning of the coil winding facility continued this week with the installation of insulation on the oven extension as needed for the VPI of a PF-1A prototype, and on the sealing of the PF1A Lead Box mold.

TF, OH and CHI bus from NSTX to the bus tower continues to be removed for inspection and silver plating as required.

A peer review of procedures for the fabrication of a PF-1 prototype coils was held last week.

PPPL staff were on-site at Everson Tesla to witness the priming of PF1 conductor.

The first entry into neutral beam #2 after last year's full three source operation at 90keV was made. The inspection indicated that all beam impinged copper surfaces and alignments look good.

Planning is underway to use the neutron generator in the NSTX Test Cell and Gallery to test penetration shielding during the week of May 22.

NSTX-U RESEARCH (J. MENARD):

M. Jaworski remotely participated in the EUROfusion Liquid Metal Strategy Meeting on May 10 and 11. Jaworski presented the talk "Experience and development of lithium and liquid metal experiments on the NSTX and NSTX-U devices" to provide international context for EU researchers who are developing a long-range plan for addressing the European DEMO Roadmap activity evaluating liquid metals as a possible power exhaust option for fusion.

A simulation of the equilibrium evolution in NSTX-U has been developed. The simulation is built in Simulink around a block named GSEVOLVE. This code is fully nonlinear and can be run for an entire discharge. The simulation comes with a model-predictive controller (MPC) that can use any conceivable equilibrium quantities as targets. One example of application with the MPC is to control the simulation so that it reproduces the diagnostic signals from a real shot.

Using this approach, the simulation matches the evolution of the plasma boundary reasonably well. It is also possible to replace the MPC with an interface that connects the simulation to the actual NSTX-U plasma control system (PCS). This can facilitate development of new PCS codes and preparation for experiments. (Anders Welander, General Atomics).

ADVANCED PROJECTS (H. NEILSON):

Stellarators (D. Gates):

S. Lazerson has been part of an ongoing series of meetings regarding the next experimental campaign at W7-X (OP1.2a). As the Scenario and Integration Task Force Leader, his participation has been instrumental in identifying the pertinent operational constraints in this upcoming campaign. In particular, emphasis has been placed on gathering the necessary edge and divertor data so that a baseline comparison before and after scraper element installation can be made. Additionally, the role of the U.S. supplied trim coil system has also been a strong motivator in experimental planning. Dr. Lazerson is currently visiting IPP-HGW in preparation for the next experimental campaign.

The stellarator optimization code (STELLOPT) has recently undergone a number of upgrades to improve reliability, portability, and collaborative development. Key to these upgrades in the creation of a Git repository for the source code. This revision control system allows users/developers to download the software, create use-case based installation files, modify the code, and publish those changes to the larger user base. The Git system is currently under multi-institutional testing with PPPL, the University of Wisconsin, and IPP-HGW. Lazerson is the lead developer on the STELLOPT code.

Lazerson and N. Pablant completed development and testing of a new library to allow the conversion between the flux-space and real-space coordinates from a VMEC output file. This library also allows the extraction of real space magnetic quantities from the VMEC Fourier mode representation. The library, written in FORTRAN, is called `mir_tools` and is now available as part of the STELLTOOLS/LIBSTELL library. A set of python wrappers has also been developed to allow the library to be used within python programs. These tools are meant to be an alternative to the AJAX module which is distributed as part of LIBSTELL. The new `mir_tools` module provides better reliability, accuracy and speed along with a simple standardized interface.

On May 8, a kickoff meeting was held to organize the research activities of accepted Princeton University graduate student Alexandra LeViness. Ms. LeViness is a recipient of a prestigious Fulbright scholarship to perform research on W7-X over a 10 month period starting in September of 2017. She will defer attendance at Princeton until 2018 while she performs this research in Greifswald. The meeting was attended by a large group of scientists and engineers that will form the team with which LeViness will work. It was agreed that she would work on the Langmuir probes and Halpha measurements for the TDU scraper elements that were recently sent to W7-X by PPPL. D. Gates and T. Sunn Pedersen will act as the academic advisors for the project.

DIRECTOR'S OFFICE (S. ZELICK):

On May 10, Professor Uri Shumlak from University of Washington, presented a colloquium entitled, "Compact Approach to Plasma Confinement using Sheared Flow Stabilization of a Z-Pinch".

May 10-11 the PPPL Advisory Board met at the PPPL to learn about the progress regarding various projects.

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