The PPPL Highlights for the week ending April 14, 2018, are as follows:

**NSTX-U RECOVERY AND RESEARCH (J. MENARD)**

*Recovery:*

A successful preliminary design review (PDR) was held on April 10 for NSTX-U shielding modifications.

Recovery project management worked with DOE-FES management to develop a set of deliverables and an associated timeline for a director’s review to be held later this fiscal year in preparation for a subsequent baselining review.

*Research:*


Y. Ren visited ASIPP in Hefei, China, during the week of April 2 to continue his collaboration with EAST CO2 scattering diagnostic group. He gave a seminar titled, “Overview of high-k scattering diagnostics on NSTX and NSTX-U.” NSTX high-k scattering diagnostic and its key physics results were reviewed in the talk, and the motivation, physics and engineering designs of a FIR high-k scattering for NSTX-U were also presented. In particular, key physics underlying the achievement of localized scattering measurement in magnetized plasmas was discussed.

F. Poli attended the ITPA Integrated Operating Scenarios (IOS) meeting in Daejeon, Korea. She gave an update on two joint activities: one on the core-pedestal coupling and recommendations for boundary conditions for ITER simulations, the second on the modeling of a safe plasma current ramp-down phase for ITER. The IOS group and the Transport and Confinement (T&C) group had a joint session in which Poli gave an overview of the issues with the modeling of ITER scenarios and proposed areas of synergy between the two topical groups.

The paper, “AORSA full wave calculations of helicon waves in DIII-D and ITER,” by C. Lau, et al. was published in *Nuclear Fusion* 58 (2018) 066004 with PPPL/NSTX-U co-author N. Bertelli. This paper shows AORSA full-wave simulations of helicon waves in
DIII-D and ITER, including a comparison with the ray-tracing technique in the core plasma and an estimate of the possible power losses of helicon waves in the SOL plasma.

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

Several members of the Laboratory’s ITER diagnostics team attended a training session on U.S. ITER management procedures for satisfying applicable provisions of the French nuclear safety order. The training, conducted by U.S. ITER’s F. Casella, addressed the U.S. ITER approach to implementing protection-important activities, quality-related activities, and defined requirements.

**ADVANCED PROJECTS (H. NEILSON)**

**Stellarators (D. Gates):**

Department staff organized and chaired the 18th Coordinated Working Group Meeting (CWGM), held April 10-12 at PPPL. The CWGM meets every six months and serves the function of exchanging contemporary physics information from stellarator and heliotron experiments around the world. It also coordinates future experiments to better answer key scientific questions. It is organized as part of the Stellarator-Heliotron Technology Collaboration Programs (SH TCP) under the auspices of the International Energy Agency (IEA). The SH TCP aims to advance applications of physics for fusion power, in particular magnetic fusion devices, by developing the stellarator-heliotron concept of fusion reactors. D. Gates was the local organizer for the meeting, which welcomed 35 scientists from 11 different institutions representing the US, Germany, Spain, the Netherlands, Poland, and Ukraine. Gates is also a member of the international program committee along with A. Dinklage (Max Planck Institute for Plasma Physics, Germany), M. Yokoyama (National Institute for Fusion Science, Japan), and E. Ascasibar (Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, Spain). A total of 59 scientific presentations was given with 14 talks presented from remote locations (including Germany, Japan, France, and Spain).

A conceptual design review (CDR) of the design and project plans for a continuous pellet fueling system for W7-X was held at the Laboratory on April 6. Documentation and presentations for the review were delivered by the joint project team, representing Oak Ridge National Laboratory, Princeton Plasma Physics Laboratory, Max Planck Institute for Plasma Physics (Germany), and National Institute for Fusion Science (Japan). The aim of the project is to build, install, and operate a continuous hydrogen/deuterium high-speed frozen pellet fueling system to provide fueling for quasi-steady state (~30 min) plasma experiments on the superconducting W7-X stellarator in Greifswald, Germany, beginning in 2021. This capability will be used to optimize the performance of 30-minute W7-X discharges and to support a range of fundamental toroidal confinement physics
studies in transport, turbulence and heat/particle control in which U.S. researchers play leading roles. About 15 chits were submitted, providing recommendations for improving various aspects of the plan. The 10-member multi-institutional review board judged the review to be a successful CDR pending resolution of those chits.

THEORY (A. BHATTACHARJEE):

W. W. Lee gave a Research and Review seminar titled, “From Gyrokinetics to MHD,” and Y. Shi gave a Research & Review seminar titled, “Plasma simulations using real-time lattice scalar-quantum electrodynamics.” The abstracts and slides for both are available here:

On April 4, Oxford University’s A. Schekochihin gave a seminar titled, “Two etudes on unexpected behaviour of drift-wave turbulence near stability threshold.” The abstract and slides are available here:

D. Schaeffer presented an invited seminar talk on April 14 titled, “Laboratory Studies of Magnetized Collisionless Shocks” at the NASA Goddard Space Flight Center. The talk covered recent experiments on the Omega laser facility that created for the first time high-Mach-number magnetized collisionless shocks in the laboratory. Measurements of shock scales and significant particle heating through the shock are also presented and compared to simulations and spacecraft observations of the Earth’s bow shock. The presentation is available here:

From March 26 to April 13, M. Gorelenkova hosted M. Vallar, a Ph.D. student from Consorzio RFX (Padova, Italy). Vallar developed a better understanding of the usage and analysis of TRANSP, in particular with the NUBEAM energetic particle studies on advanced tokamak scenarios, and he was able to understand how to correctly analyze the NUBEAM output and how to correctly use the TRANSP tools.

COMMUNICATIONS (L. BERNARD)

The PPPL Office of Communications launched a new format of the staff newsletter on April 9. PPPL Today, an internal communications tool, includes news, events, and interesting happenings around the Lab and is available online for staff only. This replaces the PPPL Weekly, and give staff more timely access to news and information. for staff only, it is available at https://pppl-intranet.princeton.edu/pppl-today.
DIRECTOR’S OFFICE (R. HAWRYLUK)

From April 11-13, the National Academy of Sciences (NAS) held a meeting at PPPL to discuss the future of burning plasma research. Several of our colleagues presented their work to NAS.

On April 12, T. Klinger, from the Max-Planck-Institute of Physics, presented a colloquium titled, “First results from the superconducting stellarator Wendelstein 7-X.”

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