

PRINCETON PLASMA PHYSICS LABORATORY

WEEKLY highlights



The PPPL Highlights for the week ending November 28, 2014, are as follows:

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

PPPL engineer A. Basile and designer N. Allen spent the week in Cadarache, France attending a System Integration Review for Equatorial Port Plug 17, and meeting with ITER organization experts on the core imaging X-ray system.

Experts from India, the US, and the ITER organization met again to discuss alternate designs for the relay of electron cyclotron emission between the port plug and the transmission line guiding the radiation to the instrumentation in the diagnostic hall. IO experts took the action to provide detailed concerns about the India proposal to use a quasi-optical relay system.

NSTX (M. ONO):

On November 13-14, R. Raman (University of Washington) visited GA to participate in the DIII-D National Campaign XP "Disruption mitigation in the presence of MHD instability", which was lead by D. Shiraki (ORNL). The massive gas injection (MGI) valve was triggered based on real time MHD signals for the first time on DIII-D. The low torque ITER baseline scenario was used as the target plasma, with rotating $m/n=3/2$ tearing modes and 2/1 locked modes used to trigger neon massive gas injection. A systematic scan of the MGI timing relative to MHD locking was carried out, and the resulting data should enable a better understanding of the effectiveness of disruption mitigation strategies in the presence of growing or fully developed MHD instabilities. In addition, robust operation of the target scenario with repeated MGI was demonstrated, with no negative impacts on neutral beam operation or subsequent plasma breakdown observed.

Preparations for plasma operations in the NSTX-U configuration also continued. Cleanup of the process gas for the neutral beam helium refrigerator is making good progress on round-the clock refrigerator compressor operation. Motor Generator #1 maintenance is nearing completion with the cleaning of the lower guide bearing cooling paths scheduled for the week of December 1. The Plasma Current (IP) Calculator system checkout is in progress.

ITER & TOKAMAKS (R. HAWRYLUK):

Nuclear Fusion published the review article, "Energetic particle physics in fusion research in preparation for burning plasma experiments" by N.N. Gorelenkov, S.D. Pinches and K. Toi. 2014 Nucl. Fusion 54 125001 doi:10.1088/0029-5515/54/12/125001. The abstract of the review

states: The area of energetic particle (EP) physics in fusion research has been actively and extensively researched in recent decades. The progress achieved in advancing and understanding EP physics has been substantial since the last comprehensive review on this topic by Heidbrink and Sadler (1994 Nucl. Fusion 34 535). That review coincided with the start of deuterium–tritium (DT) experiments on the Tokamak Fusion Test Reactor (TFTR) and full scale fusion alphas physics studies. Fusion research in recent years has been influenced by EP physics in many ways including the limitations imposed by the ‘sea’ of Alfvén eigenmodes (AEs), in particular by the toroidicity-induced AE (TAE) modes and reversed shear AEs (RSAEs). In the present paper we attempt a broad review of the progress that has been made in EP physics in tokamaks and spherical tori since the first DT experiments on TFTR and JET (Joint European Torus), including stellarator/helical devices. Introductory discussions on the basic ingredients of EP physics, i.e., particle orbits in STs, fundamental diagnostic techniques of EPs and instabilities, wave particle resonances and others, are given to help understanding of the advanced topics of EP physics. At the end, we cover important and interesting physics issues related to the burning plasma experiments such as ITER (International Thermonuclear Experimental Reactor).

DIII-D (R. Nazikian):

The LGI team worked successfully to inject lithium granules of 0.3, 0.5, and 0.7 mm size into DIII-D H-mode plasmas. All granules sizes successfully triggered ELMs. In addition, ELMs were successfully paced using the 0.3 and 0.5 mm granules, increasing the ELM frequency by a factor of 5-10 with the peak ELM heat flux reduced by at least a factor of 2-3. Side-by-side comparisons were also made with the ORNL D2 pellet injector, which also paced ELMs. This successfully meets the PPPL notable outcome to operate and commission the LGI on DIII-D. The unit is currently being reviewed and refurbished in preparation for the next set of experiments in December.

The neutral beam pole shield copper plates and two sets of TZM moly tiles are being delivered to GA on November 26.

C-Mod (S. Scott):

The ten individual units of the MSE background polychrometer were moved from the assembly hall and mounted in the system rack. Cabling of the polychrometers in the rack is about 50% complete. Fabrication of the control system is about 90% complete. Fabrication of the fifty filter heater assemblies has begun.

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

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

Construction: Alignment and tack welding of the exit side flight tube for MPTS has been completed. PF and CHI bus fit-ups and installations in the upper and lower umbrellas continue. Installation of TF bus to the centerstack has been completed. Airside cabling inside the umbrellas continues. Category 3 cables continue to be terminated at the racks on the 119-foot platform. Primary seals are being finalized on the vessel in preparation for pump down.

OFFICE OF COMMUNICATIONS (K. MACPHERSON):

R. Borchelt, Director of Communications for DOE SC, J. Carter, Director of Communications for the Brookhaven DOE Site Office, and B. Quirke, Director of Communications for the DOE Chicago Field Office visited PPPL on November 24-25. They visited with Directors S. Prager, A. Cohen, M. Zarnstorff, and the Office of Communications. J. DeLooper gave them a tour of NSTX-U and QUASAR.

DIRECTOR'S OFFICE (C. AUSTIN):

The Directorate and HR Director hosted an FY14 Employee Promotion Luncheon on November 24. The purpose of the luncheon was to recognize employees who were promoted during FY 14 (October 1, 2013 - September 30, 2014) - by thanking them for their continued contributions and achievements at the Laboratory.

PUBLICATIONS:

Gorelenkov, N.N.; Pinches, S.D.; and Toi, K., "Energetic Particle Physics In Fusion Research In Preparation For Burning Plasma Experiments," Nuclear Fusion 54 125001 doi:10.1088/0029-5515/54/12/125001

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