

NSTX-U Weekly Report (August 4, 2017)

FY 2017 status: NSTX-U is in a maintenance and repair outage.

NSTX-U Research (J. Menard)

The paper “Suppression of Alfvén Modes on the National Spherical Torus Experiment Upgrade with Outboard Beam Injection” by E.D. Fredrickson, et al. has been published in Physical Review Letters [<https://doi.org/10.1103/PhysRevLett.118.265001>]. In this Letter data from experiments on the National Spherical Torus Experiment Upgrade is shown for the first time indicating that small amounts of high pitch-angle beam ions can strongly suppress the counter-propagating global Alfvén eigenmodes (GAE). GAE have been implicated in the redistribution of fast ions and modification of the electron power balance in previous experiments on NSTX. The ability to predict the stability of Alfvén modes, and developing methods to control them, is important for fusion reactors like the International Tokamak Experimental Reactor, which are heated by a large population of non-thermal, super-Alfvénic ions consisting of fusion generated α 's and beam ions injected for current profile control.

R. Raman (U-Washington) visited the DIII-D facility from July 24 to 26 to conduct an experiment as part of the NSTX-U experimental campaign on DIII-D. R. Sweeney (ITER Organization) was also on site to participate in these experiments. The primary goal of the experiment was to study the penetration depth of Shattered Pellet Injection (SPI) fragments into two discharges with significantly different parameters. For this experiment, a recently developed Super H-Mode target was used. SPI was carried out into the same discharge at times corresponding to 0.2 and 2MJ of plasma stored energy. Clear penetration differences were observed during 400 Torr-liter pure neon SPI injection in these two configurations. The second part of the experiment studied the minimum required quantities of neon for full radiation saturation. For these studies, compound pellets composed of varying fractions of neon and deuterium were injected into the high-energy portion of the discharge.

Graduate student Ryota Yoneda from Kyushu University completed his three weeks visit to PPPL as part of the collaboration between NSTX-U and QUEST. The main purpose of his visit was to continue to work on EC/EBW modelling for QUEST plasmas employing ray tracing and Fokker-Planck codes. This work was done in collaboration with the PPPL hosts, N. Bertelli and M. Ono.

Dr. Kengoh Kuroda, who is a post-doctoral fellow at QUEST, Kyushu University visited NSTX-U from July 10 to August 4, and worked with R. Raman (U. Washington) and S.C. Jardin (PPPL) to develop a TSC model of CHI start-up on QUEST. Dr. Kuroda built TSC models that ranged from a simple vessel configuration to one that contained more detailed elements of the QUEST vessel. The code was successfully run with the simplified geometry in which the insulator positions were arranged to be like on NSTX and like the ones on QUEST. Comparative studies in both these configuration are in progress and will be reported in upcoming conferences, and in a NSTX-U FY18 milestone document. With the help of Mike Jaworski (PPPL), Dr. Kuroda also learnt to operate the fast color camera, which will be used during the next CHI run campaign on QUEST. Dr. Kuroda's primary research activity is to develop CHI start-up on QUEST.

NSTX-U Recovery Project (R. Hawryluk)

Following the successful completion of a Conceptual Design Review last week, the process of planning for the Cost & Schedule Review, scheduled for September 6-8, has commenced. A preparatory meeting was held with the team of Responsible Engineers to settle on the review agenda and to explain the use of templates for overview presentations and inputs to the risk register. An external review committee, consisting of 16 persons with appropriate project management and engineering experience, was identified and an invitation sent to confirm availability and initiate arrangements.

Activities of the Subcontract Proposal Evaluation Board (SPEB) for the Inner PF Coil Prototypes are underway, with four meetings convened thus far. Two rounds of questions and answers have been completed, and feedback from prior customers has been received. The board plans to converge on its final recommendation next week.