NSTX-U Weekly Report (December 22, 2017)

FY 2018 status: NSTX-U is in a maintenance and repair outage.

Recovery

On Tuesday December 19, 2017 a Core Engineering Peer Review was held to look at several integrated electro-mechanical engineering and plasma performance constraints on final design optimization of the Inner PF Coils, Plasma Facing Components (PFCs) and TF/OH bundle re-assembly.

A Preliminary Design Review (PDR) was held on December 20, 2017 for the Interspace Pumping System. The system will be used to pump the space between a set of O-rings on the NSTX-U vessel flange.

A Peer Review was held on December 21, 2017 to present an evaluation of two methods of turn-to-turn factory acceptance testing that have been evaluated for the NSTX-U Inner PF Coils. Since a turn-to-turn fault was the failure mode of the original PF1AU coil, turn-to-turn factory acceptance testing is a high priority and high visibility task.

Electrical testing was performed on the Straight Bundle prototype (shown in the Figure to the right) which was fabricated as a test prior to the PPPL PF prototype fabrication. A megger test was performed, and the turn insulation resistivity was ~1500 Giga-ohms. Additionally a hi-pot test was performed. Electrical breakdown occurred at ~40 kV (outside the bundle at the test leads). Both tests have been deemed satisfactory.

Research

Members of the Univ. of Washington (R. Raman, B.A. Nelson, and J.A. Rogers) and PPPL (M. Ono) Coaxial Helicity Injection (CHI) team traveled to Kyushu University to conduct transient CHI experiments on QUEST from Dec. 4 – 15, 2017. A primary objective for this run campaign was to observe toroidal current persistence after the CHI injector current was reduced to zero. Based on results from the previous run campaign, it was determined that to achieve this goal it was necessary to more rapidly reduce the injector current after the CHI plasma was initiated. Modifications used to improve discharge conditions included changing the current limiting resistors, limiting the maximum operating voltage, reducing the gas injection plenum volume, and reconfiguring the poloidal field coil power supplies. A PPPL fast color camera was used to obtain full coverage of the CHI plasma growth into the vessel. With these several changes, the total amount of injected gas was reduced by a factor two. Initiation of CHI discharges as sufficient low levels of injected gas is quite important, and necessary, as described in a recent NSTX CHI paper (K.C. Hammond, et al., 2018 Nuclear Fusion 58 016013). Toroidal currents up to 50 kA were generated and exhibited current persistence after injector current was reduced to zero, and absorber-arc-free discharges were obtained more reliably. Members of the QUEST Team, including a number of students, and members from the University of Hyogo and Tokyo participated in and supported the experiments.