NSTX-U Weekly Report (November 17, 2017)

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

Recovery

For the Plasma Facing Components (PFCs), a Preliminary Design Review (PDR) was held on November 15th to address the high-heat-flux PFCs.

For the new poloidal field coils, the Vacuum Pressure Impregnation (VPI) for the straight copper log bundle commenced in the PPPL Winding Shop on November 13, and the bundle was impregnated with CTD-425 resin on November 15. Fabrication of the winding form mounting beam has progressed ahead of schedule. The mounting beam is needed to start winding PPPL's prototype poloidal field coil.

Research

R. Maingi presented the annual update on activities and proposals for the ITPA Pedestal and Edge Physics (PEP) topical group at the ITPA Coordinating Committee at the ITER Organization HQ, Nov. 7-9 in Cadarache, France. He also served as a member on the ITPA Coordinating Committee, representing NSTX-U, and presented the annual collection of international exchanges between the US and other countries on behalf of John Mandrekas at the IEA-CTP meeting.

On Tuesday, 11/14, Nikolai Gorelenkov (PPPL) gave an NSTX-U/I&T Physics meeting talk on his work on developing a reduced code to determine the effect of Alfven Eigenmodes (AEs) on Energetic Particles, work which is within the SciDAC center on energetic particles. The effect of AEs on fast ions within RBQ is evaluated using the quasi-linear approach generalized for this problem recently (V.N. Duarte, PhD thesis, 2017). The generalization involves the resonance line broadened interaction with the diffusion coefficients prescribed by the QL theory to find the evolution of the velocity distribution function. The baseline eigenmode structures are found using the NOVA-K code perturbatively. The interaction of fast ions and AEs is captured for the cases where there are either isolated or overlapping modes. A new RBQ code allowing the diffusion in radial, P_phi direction (1D) is being developed. The wave particle interaction can be reduced to one-dimensional dynamics where for the Alfvénic modes, typically the particle kinetic energy is nearly constant. Hence to a good approximation the Quasi-Linear (QL) diffusion equation only contains derivatives in angular momentum. The diffusion equation is then one dimensional that is efficiently solved simultaneously for all particles with the equation for the evolution of the wave angular momentum. Obtained EP diffusion is then transferred to the TRANSP code for long time simulations of the plasma discharge. Initial applications of the RBQ to DIII-D plasma with elevated q-profile lead to good agreement between measured and calculated neutrons and fast ion profiles.