NSTX-U Weekly Report (August 15, 2014)

NSTX-U is in the Upgrade Project outage in FY 2014

A paper entitled "Reduced model prediction of electron temperature profiles in microtearing-dominated NSTX plasmas" by S.M. Kaye (PPPLP) et al. was published online in Physics of Plasmas **21**, 082510 (2014). The paper studies a representative H-mode discharge from the National Spherical Torus Experiment (NSTX) in detail as a basis for a time-evolving prediction of the electron temperature profile using an appropriate reduced transport model. The time evolution of characteristic plasma variables such as electron beta and collisionality, the MHD alpha parameter and the gradient scale lengths of T_e, T_i and n_e were examined as a prelude to performing linear gyrokinetic calculations to determine the fastest growing micro instability at various times and locations througout the discharge. The inferences from the parameter evolutions and the linear stability calculations were consistent. Early in the discharge, when beta and collisionality, were relatively low, ballooning parity modes were dominant. As time progressed and both beta and collisionality increased, microtearing became the dominant low-k_{theta} mode, especially in the outer half of the plasma. Given these results, the Rebut-Lallia-Watkins (RLW) electron thermal diffusivity model, which is based on microtearing-induced transport, was used to predict the time-evolving electron temperature across most of the profile. The results indicate that RLW does a good job of predicting T_e for times and locations where microtearing was determined to be important, but not as well when microtearing was predicted to be stable or subdominant. (S. Kaye)

The NSTX-U Team Meeting was held on August 15, 2014. The presentation slides are available at http://nstx.pppl.gov/DragNDrop/NSTX_Meetings/Team_Meetings/2014/08_15_2014/. (M.Ono, PPPL)

R. Kaita (PPPL) gave two tutorial lectures last week at the Fourth Graduate Summer Institute on Complex Plasmas at Seton Hall University. The first talk was entitled “A Historical Introduction to Magnetic Confinement Fusion,” and included the advantages of the low aspect ratio approach being explored in NSTX-U. The second talk was entitled “The 'Complexity' of the First-Wall Challenge in Magnetic Confinement Fusion,” with examples from lithium plasma-facing component research on NSTX-U. (R. Kaita)

Engineering Operations (A. von Halle, C. Neumeyer)

NSTX Upgrade activities continued with the completion of post VPI (vacuum impregnation with epoxy) clean-up of the completed TF/OH coil assembly, as well as the silver plating of its lead blocks. The lower support and belleville assemblies were installed on the centerstack this week. The assembly of the centerstack casing continues with the welding of the PF1B upper and lower coils in place, and the preparations to start installing the centerstack casing tiles. The lower ceramic break has been assembled for vacuum leak checking. In the NSTX-U Test Cell, all three ion sources have been installed on NB#2,

Development of the new Digital Coil Protection System (DCPS) continued with the preparation of the Field Coil Power Conversion (FCPC) junction area for the installation of the DCPS computer and hardware interfaces. Development of integrated system test procedures is in

progress.

Preparations for plasma operations in the NSTX-U configuration also continued with the ongoing reassembly of the Motor Generator after the successful completion of the rotor weld repairs. Electrical insulation tests (Meggers) of the motor's stator and rotor were successfully performed. Also this week, the final design for a new TF coil turn to turn fault detector system was successfully reviewed.

Access to the NSTX test cell will be available only through previous arrangement with the Upgrade Work Control Center.