

NSTX-U Weekly Report (Dec. 21, 2012)

NSTX-U is in the Upgrade Project outage in FY 2013

Yang Ren (PPPL) attended the US-Japan Joint Institute for Fusion Theory Workshop on Neoclassical and Turbulent Flow Generation and Associated Transport held at Uji, Kyoto, Japan from Nov. 25-26 and gave a talk entitled “Response of Electron-scale Turbulence and Thermal Transport to Continuous ExB Shear Ramping-up in NSTX”. In the talk, experimental observation of reduction in electron-scale turbulence and thermal transport in the NSTX NBI-heated L-mode plasmas is presented together with comparisons with linear and nonlinear gyrokinetic simulations. ExB shear induced by NBI-driven toroidal flow is found to be temporally and spatially correlated with reductions in electron-scale turbulence and thermal transport. Linear and nonlinear gyrokinetic simulations have shown that stabilization of Ion Temperature Gradient (ITG) turbulence due to ExB shear can be responsible for the observed reductions although there are qualitative discrepancies between experimental and predicted heat fluxes. Future work to address the discrepancies is also discussed. Ren had discussion with Prof. T.S. Hahm of Seoul National University on what flow should be used for calculating Doppler shift frequency (ExB flow vs. impurity toroidal flow), the definition of ExB shear quenching and the difference in ion thermal and momentum transport in the NSTX H- and L-mode plasmas. Ren also held discussion with Dr. Tanaka from NIFS (National Institute for Fusion Science), Japan on the 2-D Phase Contrast Imaging diagnostic and its measurements on LHD (Large Helical Device). (Y. Ren)

Yang Ren (PPPL) visited ASIPP (Academy of Sciences Institute of Plasma Physics) in Hefei, China on Nov. 28-29 and SWIP (Southwestern Institute of Physics) in Chengdu, China on Dec. 3-4. A seminar entitled “Recent Progress in Understanding Anomalous Electron Thermal Transport in NSTX” was presented at both institutes. In the presentation, recent findings of electron thermal transport on NSTX were reviewed: the first nonlinear gyrokinetic simulation of microtearing turbulence which predicts experimentally relevant level of electron thermal transport; studies of parametric dependence of high-k turbulence measured with a microwave scattering diagnostic and the implications on electron thermal transport; and mechanisms underlying the flattening of central T_e profile in NSTX high-power NBI-heated H-mode plasmas. Y. Ren was given the tours of EAST and HL-2A tokamaks and their major diagnostics. Discussions on interpretation of CO₂ laser scattering results on EAST were held with Dr. Li Yadong and his students. Ren discussed near term collaboration on the CO₂ diagnostic and future data analysis and experiments on EAST. Ren also held discussions with Mr. Wulu Zhong of SWIP on profile reflectometry and Doppler backscattering measurements in a variety of experimental conditions and their interpretations. He also referred Shige Kubota’s 2012 IAEA paper on k-r backscattering measurements on NSTX using UCLA FMCW (frequency-modulated continuous-wave) reflectometry which can be applied to their FMCW reflectometer. The possibility of conducting experiments on HL-2A in the future was also discussed. (Y. Ren)

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

NSTX Upgrade construction activities continued this week with the welding in place of the last lower umbrella leg, and re-installation of the lower dome bake-out tubing is now in progress. The welding of the upper umbrella legs and re-installation of the upper dome bake-out

tubing has already been completed. Several fit-ups of the new Bay J-K Cap were performed to achieve the precise proper location, and weld prep is now in progress for tacking it in that final location. Also this week, upgrades to the PF2/PF3 coil mounts were completed.

Preparations of non-upgrade equipment for plasma operations in the NSTX-U configuration also continued with the ongoing fabrication of the new field coil power conversion system firing generators. Over half the printed circuit boards for all the production units are now on site and undergoing bench testing.

No NSTX Test Cell activities are planned for the Holiday week. Access to the NSTX test cell will be available only through previous arrangement with the Upgrade Work Control Center.

