NSTX-U Weekly Report (July 26, 2013)

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

The paper "Core transport of lithium and carbon in ELM-free discharges with lithium wall conditioning in NSTX" by F. Scotti (Princeton University) et al., has been published in Nuclear Fusion (53 (2013), 083001). The paper presents an analysis of core transport of intrinsic impurities (carbon and lithium) in NBI-heated H-mode discharges in NSTX. In the paper, core transport codes NCLASS, NEO and MIST are used to assess the impact of lithium evaporative coatings on impurity transport. While reasonable agreement is achieved between experimental peaking factors and neoclassical predictions in discharges without lithium conditioning, residual anomalous transport in the pedestal region is needed to explain the experimental carbon density profile shape and evolution in discharges with lithium coatings. The disappearance of ELMs with the application of lithium coatings is the main responsible for carbon accumulation. The enhancement in neoclassical lithium particle diffusivities due to the high carbon concentration is partially responsible for the low lithium core concentration. (F. Scotti)

The paper "Fast-wave power flow along SOL field lines in NSTX and the associated power deposition profile across the SOL in front of the antenna" by R.J. Perkins (PPPL) *et al* was published in *Nucl. Fusion* **53** 083025 (2013) doi:10.1088/0029-5515/53/8/083025. On NSTX from around 25% to more than 60% of the HHFW power can be lost to the SOL regions, and a large part of this lost power flows along SOL magnetic field lines and is deposited in bright spirals on the divertor floor and ceiling. Field-line mapping matches the location of heat deposition on the lower divertor. The field-line mapping is then used to partially reconstruct the profile of lost fast-wave power at the midplane in front of the antenna. The losses peak close to the last closed flux surface as well as the antenna, suggesting that the loss mechanism cannot be localized to the antenna components and providing an important benchmark for RF codes to reproduce. (R. J. Perkins)

Dr. K. Ogawa, of the LHD experimental group (NIFS, Japan), visited D. Darrow (NSTX-U, PPPL) July 15-19. Energetic particle diagnostic issues on both machines were discussed, including measurement of the fusion rate profile by neutron collimators and charged fusion product detector arrays. This included some discussion of diagnostics on TFTR, and was in preparation for a planned deuterium plasma campaign in LHD. Also discussed were neutron diagnostic calibration methods for both experiments, and a concept for an array of beam ion loss detectors in LHD based upon thin foil Faraday cup technology that PPPL is developing for several experiments, including NSTX-U. (D. Darrow)

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

NSTX Upgrade construction activities continued with the ongoing sanding of TF inner quadrants and fit-ups into the full inner TF mold. On the NSTX vacuum vessel, a procedure for aligning the new port plug at bays F-G for the MPTS diagnostic has been developed, and fit-ups of the bay F-G alignment probe are in progress. The welding of the tubes for the five new mid-plane gas injection ports has been completed, and all tubes have been vacuum leak checked. Welding of the new lower umbrella stiffeners has been completed.

Preparations of non-upgrade equipment for plasma operations in the NSTX-U configuration also

continued with the recommissioning and power testing of the RF test stand in order to qualify a new compliant center conductor HHFW center post. The ongoing fabrication and power testing of the new firing generators for the field coil power conversion (FCPC) system rectifiers is nearing completion. To date, 33 of the 34 planned new firing generators have been delivered to FCPC.

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