

NSTX-U Weekly Report (Sept. 7, 2012)

NSTX-U is in the Upgrade Project outage in FY 2012

The paper "Study of chirping toroidicity-induced Alfvén eigenmodes in NSTX" by M. Podestà (PPPL) et al. has been published in Nuclear Fusion **52**, 094001, 2012 (<http://stacks.iop.org/0029-5515/52/094001>). The paper summarizes recent results on chirping TAE modes commonly observed in NSTX plasmas. The modes are characterized in terms of frequency and amplitude evolution under different plasma conditions. It is shown that the broad radial mode structure remains largely unaffected even during strong avalanches, in spite of the strongly non-linear mode dynamics. Mode-mode coupling between TAE modes and lower frequency, kink-like modes is also investigated. (M. Podestà)

A new NSTX paper "Local effects of biased electrodes in the divertor of NSTX" by S.J. Zweben (PPPL) et al., has been published in Plasma Phys. Control. Fusion **54** 105012 (2012) and can be found at: <http://iopscience.iop.org/0741-3335/54/10/105012/>. The goal of this paper was to characterize the effects of small non-axisymmetric divertor plate electrodes on the local scrape-off layer plasma. When these electrodes were biased positively near the outer strike point they caused changes in the local plasma which were qualitatively consistent with the expected upward and downward vertical motion due to a convective cell generated by the electrodes. (S.J. Zweben)

Steve Sabbagh and Jack Berkery of Columbia University participated in a joint experiment MP2012-83-02 on DIII-D on August 29th to further validate kinetic RWM stabilization effects. As in past experiments, target plasmas were produced with a normalized beta of 2.4. The value was further increased to 3.5 to verify and expand results produced in July. The higher normalized beta values exceed the nominal $n = 1$ no-wall stability limit. Low frequency MHD spectroscopy demonstrated increased plasma response at increased normalized beta, and mode activity at reduced $B_t < 1.5T$. S. Sabbagh delivered a DIII-D Science Meeting presentation the week prior to illustrate and discuss RWM dynamics in NSTX, and make comparisons to an initial analysis of the first half day run of MP2012-83-02 from July. (S. Sabbagh)

A more detailed study of scrape-off layer heat transport, divertor radiation, and pedestal profiles in the snowflake divertor configuration was performed on 24 August 2012 in a half-day experiment at the DIII-D National Fusion Facility. The experiment session leaders were NSTX-U researchers Vlad Soukhanovskii (LLNL, participated off-site from PPPL) and Egemen Kolemen (PPPL, participated on-site at DIII-D), while LLNL and GA staff assisted with experimental and diagnostic arrangements at DIII-D. Divertor heat fluxes between and during Type I ELMs were documented using fast infrared thermography in both the snowflake minus and plus configurations. As previously observed in the initial snowflake divertor experiment at DIII-D, a significant reduction of between-ELM peak divertor heat fluxes in the snowflake-minus configuration was measured at core density of $\sim 50\%$ of the Greenwald density under attached divertor conditions. A density scan was performed to compare divertor radiation distribution and the outer strike point detachment threshold between the standard and snowflake-minus configurations. The snowflake-plus and an ideal snowflake configurations were also obtained for hundreds of milliseconds, enabling a more systematic assessment of divertor and pedestal properties. Finally, pedestal profiles were documented in both the snowflake-minus and

snowflake-plus configurations. Preliminary analysis suggests there is a reduction of the ELM energy in the snowflake phases. (V. Soukhanovskii)

M. Ono (PPPL) visited Tokyo University's UTST and TST-2 groups on Sept 3-4, 2012. He discussed the recent UTST results with Prof. Y. Ono, Dr. Yamada, and four students who presented their respective research summaries. The USTS group has been successful in starting up the ST discharges with a technique called double null merging where two spherical torus plasmas are created. The TST-2 group has recently started a lower hybrid current drive experiment using a ceramic waveguide launcher system with the 200 kW system. The group has done a very nice job in building the ceramic waveguide system. He discussed various rf related topics with the TST-2 staff including Prof. Y. Takase, Dr. Ohwasa, and the TST-2 graduate students. He then gave a seminar on NSTX-U summarizing the recent progress on the NSTX upgrade project and the NSTX-U research activities. (M. Ono)

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

NSTX Upgrade construction activities continued this week with the removal of the machine platform at machine bays J, K and L in preparation for moving the second neutral beam-line into the test cell. External decontamination of NB2 equipment continues to make good progress, and we are on track to install NB2 in the test cell by late September. The installation of PF2/3 coil support hardware on NSTX continued this week, along with the trail fit-ups of the lower umbrella stiffener pieces. In-vessel metrology of mip-plane port locations was performed to help finalize the new bay L penetration for the MPTS diagnostic.

Preparations of non-upgrade equipment for plasma operations in the NSTX-U configuration also continued. The IT group continued on the development of Plasma Control System Algorithms and Data Acquisition System protocols for the proposed power, gas, and magnetic diagnostic system configurations. Painting and general maintenance of outdoor equipment also continued.

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