

## NSTX-U Weekly Report (Nov. 16, 2012)

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

Members of NSTX-U research team participated in the 17<sup>th</sup> Workshop on MHD Stability Control at Columbia University on Nov. 5 - 7, 2012 and gave the following invited presentations: "Avoiding RWMs in ITER" "RWM Stabilization and Control in NSTX (and DIII-D) – Implications for ITER" by Steve Sabbagh (Columbia University) and "Characteristics of disruptions in NSTX: disruptivity, precursors, detection, and halo currents" by Stefan Gerhardt (PPPL). The following contributed talks were also given: "Global Mode Control and Stabilization for Disruption Avoidance in High- $\beta$  NSTX Plasmas" by Jack Berkery (Columbia University), "NTV calculation with particle simulation and its validation in NSTX and DIII-D" by Kimin Kim (PPPL), and "Electromagnetic Particle Injector for NSTX-U" by Roger Raman (University of Washington). (S. Sabbagh)

NSTX-U Research Team members Steve Sabbagh and Jack Berkery of Columbia University submitted an APS DPP Press release entitled "Fusion Plasma Works Best Just Where You Least Expect It", which demonstrates using low frequency MHD spectroscopy in dedicated experiments, the very positive result that NSTX plasmas at very high stability parameters (e.g.  $\beta_{N/li} > 10$ ) are measured to be **\*more\*** stable than plasmas below this value. This result directly and independently supports a similar conclusion made two years ago in dedicated experiments focussed on RWM active control. The press release can be found here: (<http://www.aps.org/units/dpp/meetings/vpr/2012/upload/fusionplasma.pdf>) (S. Sabbagh)

Stefan Gerhardt (PPPL) authored an APS-DPP press release titled: "Halo-Current Effects in Tokamak Reactors: Hardly Heavenly". This paper described measurements of disruption halo currents in NSTX, focussing on the spatial structure and dynamics of the currents. It was shown that the dominant structure of the halo current is a toroidally localized lobe, which can rotate up to 8 times around the torus. The press release can be found at: (<http://www.aps.org/units/dpp/meetings/vpr/2012/upload/halocurrents.pdf>) (S. Gerhardt)

Princeton University graduate student Filippo Scotti and his advisors V. A. Soukhanovskii (LLNL) and R. Kaita (PPPL) submitted an APS DPP Press release "Elements duke it out to penetrate hot plasma". The press release followed an Invited talk GI2.00005 "Modifications of impurity transport and divertor sources with lithium wall conditioning in NSTX" that was presented by F. Scotti at the APS DPP meeting in Providence, RI. This work focused on the changes of carbon and lithium divertor sources, and impurity scrape-off layer and core transport due to lithium wall conditioning in NSTX H-mode discharges. Moderate reduction in divertor carbon influx and the disappearance of ELMs resulted in core carbon accumulation. In contrast, better divertor retention and the higher core lithium neoclassical particle diffusivity prevented lithium accumulation in the core. The analysis employed divertor and core plasma diagnostic data and modeling using neoclassical codes NEO, NCLASS, as well as TRANSP and impurity transport code MIST. The press release can be found at: (<http://www.aps.org/units/dpp/meetings/vpr/2012/upload/hotplasma.pdf>) (F. Scotti)

Jon Menard (PPPL) participated in the Conceptual Design Review (CDR) of the ITER Plasma Control System (PCS) held at the Chateau de Cadarache on 13-15 November, 2012. He served as an external reviewer of the identification of requirements and interfaces in the areas of

non-axisymmetric MHD control, disruptions and runaway electron control, and associated interfaces to the ITER Central Interlock System. (J. Menard)

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

NSTX Upgrade construction activities continued with the ongoing fit-up and welding of new umbrella legs. Ultrasonic testing was performed this week to verify the integrity of braze joints on uninstalled umbrella legs and recently aligned TF flags. Metrology of the new bay J-K cap, which will provide the NB2 injector port, has been completed, and specified weld details of the cap to vessel interface are being reviewed. The new Triax power cable, which when installed will deliver the NB2 ion source accelerating voltages from the neutral beam power conversion building to the NSTX Test Cell, has been delivered to PPPL and tested.

Preparations of non-upgrade equipment for plasma operations in the NSTX-U configuration also continued with the ongoing testing of the prototype fault detector in conjunction with the new firing generator in a field coil power conversion rectifier. Individual faults and breaker trips have been generated, and the rectifier power tested into a local dummy load. Also this week, a final design review of the proposed PF1 coil system feed changes was held.

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