

## **NSTX Weekly Report (Mar. 5, 2010)**

### **FY 2010 NSTX plasma operations**

**Planned: Total - 15 run weeks (Base - 14 run weeks, ARRA - 1 run week)**

**Completed: 0 run week and 0 plasma shot**

The paper 'Demonstration of Tokamak Ohmic Flux Saving by Transient Coaxial Helicity Injection on NSTX' by R. Raman et al. has been published in the Physical Review Letters **104**, 095003, 5 March (2010). The paper describes the attainment of peak currents up to 300 kA in NSTX using Transient CHI start-up and when these discharges are coupled to induction, it has produced up to 200 kA additional current over inductive-only operation. CHI in NSTX has shown to be energetically quite efficient, producing a plasma current of about 10 A/Joule of capacitor bank energy. In addition, for the first time, the CHI produced toroidal current that couples to induction continues to increase with the energy supplied by the CHI power supply at otherwise similar values of the injector flux, indicating the potential for substantial current generation capability by CHI in NSTX and in future toroidal devices. (R. Raman, University of Washington)

The paper "Advances in high-harmonic fast wave physics in the National Spherical Torus Experiment" by G. Taylor, et al. has been accepted for publication in Physics of Plasmas. The paper presents recent results that show improved core high-harmonic fast wave (HHFW) heating at longer wavelengths and during start-up and plasma current ramp-up that were obtained by lowering the edge density with lithium wall conditioning. Lithium conditioning allowed significant HHFW core electron heating of deuterium neutral beam injection (NBI) fuelled H-mode plasmas to be observed for the first time. Large edge localized modes were observed immediately after the termination of rf power. Visible and infrared camera images show that fast wave interactions can deposit considerable rf energy on the outboard divertor. HHFW-generated parametric decay instabilities were observed to heat ions in the plasma edge and may be the cause for a measured drag on edge toroidal rotation during HHFW heating. Also a significant enhancement in neutron rate and fast-ion profile were measured in NBI-fuelled plasmas when HHFW heating was applied. (G. Taylor)

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

The NSTX start-up activities continued this week with the ongoing bake of the NSTX vacuum vessel. In parallel with the vessel bake, open circuit testing of the field coil power conversion rectifiers was performed, and conditioning of the neutral beam ion sources was started. Also this week, the initial run-up of the motor generator set in preparation for upcoming field coil power testing was successfully completed. Ramp-down from the bake-out is scheduled for this coming week.

Access to the NSTX test cell will be available next week upon the conclusion of the vessel bake.

## **Research Operations (M. Bell)**

### **Boundary Physics Operations (H. Kugel)**

- Liquid Lithium Divertor (LLD) Diagnostics
  - Filters for the Divertor Fast Cameras were received and preparations for camera filter calibrations started.
  - A location for installation of the Enhanced Divertor Spectrometer system was approved, and preparations for its installation started.
- Lithium Evaporators (LITERs)
  - LITER units F1 and K1 were leak checked successfully, and preparations were completed for their delivery to NSTX.
  - Work continued on the assembly of LITER units F2 and K2.