

## NSTX Weekly Report (September 10, 2010)

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

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

**Total completed – 12.78 run weeks and 2423 plasma shots**

**Completed: Base – 11.77 run weeks and 2252 plasma shots**

**Completed: ARRA -1.01run week and 171 plasma shots**

A joint meeting of Alcator C-Mod and NSTX staff was held Sept. 7-8 at PPPL to help plan the activities for the FY11 Joint Research Target on H-mode pedestal physics, with an emphasis on testable models of the pedestal structure. This workshop built on the earlier DIII-D pedestal planning workshop in Feb. 2010. Twenty-four technical talks were presented, comprised of theoretical predictions and/or experimental capabilities, results and analysis. The discussion involved substantial off-site participation via a complement of remote connection techniques. The next step is to generate experimental proposals to be run in the three domestic facilities for FY11; in C-Mod and NSTX, those experiment runs will begin in Oct. 2010. The workshop was co-organized by Jerry Hughes (MIT) and Rajesh Maingi (ORNL). (R. Maingi)

A manuscript entitled "A simple apparatus for the injection of a lithium aerosol into the scrape-off layer of fusion research devices" by D. K. Mansfield, et al., has been accepted for publication in the journal Fusion Engineering and Design. This paper is a thorough technical description of the dropper apparatus with some preliminary description of the results of aerosol injection on NSTX. (D. Mansfield)

Jon Menard attended the MAST Program Advisory Committee meeting held September 6-8 at the Culham Centre for Fusion Energy (CCFE) in the UK. The PAC reviewed the near-term plans for the MAST program and the longer-term status and plans for MAST Upgrade. Discussions were also held with members of the MAST team on possible opportunities for future MAST and NSTX collaboration. (J. Menard)

### **Run Coordination (E. Fredrickson, S. Sabbagh - Columbia University)**

On Thursday, Sept 2, 2010 we ran Bill Heidbrink's XP1014 "Study of Angelfish instability & effect of HHFW" in the morning to study the energetic particle induced "Angelfish" instabilities. Plasmas with good, reproducible Angelfish were found and small scans of beam power and toroidal field were done to find scaling of stability. However, amplitude was too low for Beam Emission Spectroscopy measurement of the mode structure. The afternoon continued with XP058 "Impact of Outer Squareness on High-Kappa" to investigate squareness scaling in high performance plasmas. Good control of squareness was achieved with use of PF4 and PF5 in combination by handing off the outer gap control from PF5 to PF4. The PF4 current was successfully increased to 15 kA (the maximum allowable current on this coil) while reducing the PF5 current to 2-3 kA, whereas the a comparable normal plasma without PF4 needed ~10 kA of PF5. This result is consistent with previous experiments where we saw a roughly two to one PF4 current compensation for PF5.

On Friday Sept. 3, 2010 we ran Stefan Gerhardt's XP1006 "High-kappa Neutral Beam Heated Scenarios with Improved Control and Liquid Lithium Divertor" to investigate high non-inductive fraction plasmas. Machine performance was good, although a reduction in kappa

was used to improve plasma reproducibility. High beta-poloidal plasmas were achieved, comparable to those from previous years. Initial estimates of Zeff showed little reduction in impurity content, however.

There was no operation on Monday which was the Labor Day holiday.

On Sept 7 and 8, we began the Coaxial Helicity Injection (CHI) experiment, XP 1034 “Flux saving and improved coupling to Ohmic Heating”. Very good results have been obtained so far with coupling of CHI to Ohmic plasmas reaching 1MA of current with significant flux savings over purely inductive plasmas. Plasma current enhancements of up to 400kA were achieved with CHI compared to cases without CHI.

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

NSTX plasma operations continued on extended shifts this past week after configuring the vacuum vessel, coil and power systems for Coaxial Helicity Injection (CHI) operations. CHI discharges were developed at various capacitor bank energies, then optimized through the use of lithium and the Switching Power Amplifier (SPA) driven PF Absorber coils. Preparation are underway to replace one of the two lithium evaporation (LITER) probes with a freshly refilled spare this coming weekend.

Access to the NSTX test cell will be restricted during plasma operations this coming week. Access is expected to be available each evening.

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

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

- Liquid Lithium Divertor (LLD)
  - Assembly of the gas manifold for air heating of the LLD plates was started.
  - Planning started for the installation of a high capacity air compressor to support air heating of 4 LLD plates
  
- Lithium Evaporators (LITER)
  - LITER-K and -F units on the vessel were used to support experimental operations; LITER-K was emptied and LITER-F requires maintenance.
  - LITER-K and -F units on the fill stands were outgassed.
  - Preparations started for installing a loaded LITER on Bay-K and performing maintenance on the Bay-F unit
  
- Lithium Powder R&D
  - Both dropper units were used to support CHI experiments.