

## NSTX Weekly Report (Nov. 20, 2009)

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

**Planned: TBD run weeks**

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

• Nuclear Fusion and IOP Publishing recently announced that the winner of the 2009 Nuclear Fusion award is Steven A Sabbagh et al for the paper Resistive wall stabilized operation in rotating high beta NSTX plasmas (Nucl. Fusion 46 635-644). The award citation states that *"The authors, working on the National Spherical Torus Experiment (NSTX), have demonstrated the advantages of low aspect ratio geometry in accessing high toroidal and normalized plasma beta. This is a landmark paper, which not only reports record parameters of beta in a large spherical torus plasma, but also presents a thorough investigation of the physics of resistive wall mode (RWM) instability beyond the no-wall limit. Sabbagh et al observed the RWM instability with toroidal mode number up to 3, determined that Bondeson-Chu theory on kinetic damping of RWM described the experimental observation, tested the observed rotation damping against neoclassical theory, and documented resonant field amplification at high beta. The paper addresses an issue of critical importance, using a spherical torus, with direct relevance to conventional tokamaks. The fusion power in the technology phase of ITER will depend on the degree of RWM stabilization that can be achieved, which underlines the importance of the authors' contribution."* As a service to the nuclear fusion research community, the winning paper is available at <http://herald.iop.org/nfaward/m25/ljc/202338/link/3080> until the end of May 2010.

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

The NSTX outage continued this week with the completion of the Liquid Lithium Divertor (LLD) plate installations, and the fit-ups of associated diagnostic, edge bias, Mirnov, and Langmuir probe tiles. The feed-throughs for the LLD cooling lines have been installed, LLD heater cables installed and tested, and all ex-vessel electrical control cabinets and tray-work are in place. Welding of the vacuum interfaces for the new Beam Emission Spectroscopy (BES) diagnostic have been completed and leak checked. Modifications of the RWM error field coil at bay G in support of preparations for the new MSE-LIF diagnostic are nearing completion, and the Bay G port cover will be installed over the weekend. All in-vessel construction activities will be complete, and in-vessel diagnostic calibrations will begin on Monday, November 23rd.

The NSTX test cell will be in free (card reader) access this coming week.

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

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

- Liquid Lithium Divertor (LLD)
  - The installation of all 4 LLD plates was completed.
  - The installation of the control rack, diagnostic rack, power, and associated trays was completed.
  - The fabrication, assembly, and cleaning of the diagnostic tiles was completed.
  - The cooling tube installation (welding), the diagnostic (LLD Gap) tile installation are in

progress.

- In vessel diagnostic tile cabling and connectorization at the feedthroughs are in progress.

- LLD Diagnostics

- A lens for the divertor spectrometer optical system was received.

- Lithium Evaporator (LITER2009)

- Oven dissection samples were sent to Purdue University for elemental analysis ( J.P. Allain, C. Taylor).

- Results from the SNL, Ion Beam Analysis (IBA) of the NSTX 2009 tiles were received ( W. R. Wampler)

- Lithium Evaporator (LITER2010)

- The leak test of the bellows motion drives for two addition LITERs was successful.

- Preparations for testing the motor controls of the bellows motion drives started.

- Material for fabricating ceramic connectors to facilitate oven installation was received.