

## **NSTX Weekly Report (September 23, 2011)**

**FY 2011 NSTX plasma operations started on October 4, 2010**

**FY 2011 NSTX Outage started on October 25, 2010**

**Planned Run Weeks: 14 run weeks**

**Run Weeks Completed: 4.21 run weeks and 839 plasma shots**

An article "The relationships between edge localized modes suppression, pedestal profiles and lithium wall coatings in NSTX" by D.P. Boyle (PPPL), R. Maingi (ORNL), P.B. Snyder (GA), et. al., was published Plasma Phys. Control. Fusion **53** (2011) 105011 and available at <http://stacks.iop.org/0741-3335/53/105011>. This work details profile and stability analysis as ELMs disappeared throughout a lithium deposition scan. While the quantity of lithium deposited between discharges did not uniquely determine the presence of ELMs, profile analysis demonstrated that lithium was correlated with wider density and pressure pedestals with peak gradients farther from the separatrix. Moreover, the ELMy and ELM-free discharges were cleanly separated by their density and pedestal widths and peak gradient locations. Ultimately, ELMs were only suppressed when lithium caused the density pedestal to widen and shift inward. These changes in the density gradient were directly reflected in the pressure gradient and calculated bootstrap current. This supports the theory that ELMs in NSTX are caused by peeling and/or ballooning modes, as kink/peeling modes are stabilized when the edge current and pressure gradient shift away from the separatrix. Edge stability analysis using ELITE corroborated this picture, as reconstructed equilibria from ELM-free discharges were generally farther from their kink/peeling stability boundaries than ELMy discharges. It was concluded that density profile control provided by lithium is the key first step to ELM suppression in NSTX. (R. Maingi)

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

The NSTX Vacuum vessel and neutral beam-line were vented to air this week following the testing of recent Gas Injection System modifications. Following these tests, the plasma real time control system was disabled and configured for software development. Electrical insulation tests of the outer TF windings and PF 4/5 windings were performed and documented before securing these systems for the outage. Also this week, lithium was evaporated from the two new LITER probes in an operation intended to document LITER performance, and prepare the probes for long term storage.

Access to the NSTX test cell is expected to be available throughout most of this coming week.