

NSTX Weekly Report (February 4, 2011)

FY 2011 NSTX plasma operations started on October 4, 2010

FY 2011 NSTX Outage started on October 25, 2010

Planned Run Weeks: TBD

Run Weeks Completed: 4.21 run weeks and 839 plasma shots

Steve Sabbagh and Jack Berkery of Columbia University gave presentations at the General Atomics mini-workshop "Theoretical / Experimental Understanding of RWM Physics and Use of In-vessel coils for Error Field Correction in High Beta Plasmas" entitled "RWM Kinetic Stability Advancements for Improved Agreement with Experiments: Collisionality and Anisotropy", "Active RWM Stabilization in NSTX – Update and Considerations", and "ITPA MDC-2 Joint Research: benchmarking RWM stability physics between codes, and experiments". (S. Sabbagh, Columbia University)

Guizhong Zou, a student from the EAST group at ASIPP, China, who is working on lithium conditioning visited PPPL for two weeks. He gave a talk entitled "Lithium Experiments on the HT-7 and EAST Tokamaks". It was reported that large toroidal trays of liquid lithium will be installed on HT-7 in the next year. It was further reported that EAST has attained their first H-modes with the use of lithium conditioning. In particular, conditioning is accomplished with lithium evaporation into pulsed He GDC discharges during the first several hours of plasma operations. The lithium so deposited is then spread around the PFCs for several more hours followed by the use of the PPPL lithium dropper to accomplish H-mode operation. Using this scenario, EAST has produced H-modes lasting up to 6.4 seconds. (D. Mansfield, PPPL)

Summaries of Current Progress of General Atomics Research Participation on NSTX as of January 23, 2011 (Reflecting work since end of September 2010): H-mode Edge Pedestal Character and Stability (Tom Osborne) - The latest version of the profile analysis software was installed at NSTX and NSTX specific enhancements were added. Plasma Control (Dave Humphreys and Anders Welander) - Plasma control topical efforts have included continued validation of nonrigid plasma models for NSTX control design and further development of simserver tools. These efforts continue to support the broader goal of implementing a model-based multivariable decoupling shape controller on NSTX in the current project grant period. Edge Localize Mode (ELM) Stabilization Using Resonant Magnetic Perturbations (Todd Evans) - Current work in this task area has focused on developing advanced computational tools needed for optimizing internal, off-axis, non-axisymmetric coils that can be used for ELM stabilization and divertor heat/particle flux studies in NSTX. Progress has also been made on developing and testing new metrics for quantifying the statistical properties of stochastic magnetic fields in the NSTX pedestal plasma. High Harmonic Fast Wave (Bob Pinsker) - R. Pinsker made a one-week visit to PPPL to participate in HHFW experiments. The week was occupied with attempts to find plasma conditioning procedures to mitigate the macroscopic eruptions of lithium from these hot-spots on the face of the antenna. The localized injection of lithium from the spots was thoroughly documented with the excellent high-speed camera coverage that is facilitated by the low aspect ratio of the device. Studies of Neoclassical Tearing Modes, Rotation and 3-D Field (Richard Buttery) - Analysis of 2009 studies (on $n=1$ vs $n=3$ braking impact on tearing limits) was completed and work has been compiled into a paper, now presented at IAEA and a journal paper also compiled and now being submitted to Nuclear Fusion. 2010 experiments have been

further analysed. Results suggest either a weak or no trend in toroidal field. A significant density dependence appeared to be the main feature of the 2010 data, and was close to the linear scaling seen in other studies. A further effect of lowering of thresholds with beta is present, though ill-constrained, consistent with other studies and theory of ideal plasma response. (R. La Haye, General Atomics)

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

The NSTX outage continued this past week with the completion of structural modifications to the main platform around bay G in preparation for installing the diagnostic neutral beam for the new MSE-LIF diagnostic. Other MSE-LIF work included the installation of new services such as chilled water piping and control system racks/cable trays, and modifications needed to the machine's helium bake-out lines. Successful reviews were held on a redesign of the Liquid Lithium Divertor (LLD) fasteners to allow the plates to be reinstalled in NSTX without external heating or cooling, and on a design to replace the first row of the inboard divertor with molybdenum tiles. Also this week, fiber-optic pulls between the SPA1 & SPA2 supplies were completed, and in-vessel Romer Arm measurements of new penetrations for T-FIDA were performed. Access to the NSTX test cell will be available this coming week.

Research Operations (M. Bell)

Boundary Physics Operations (H. Kugel)

- Liquid Lithium Divertor (LLD)
 - A Final Design Review for the LLD plate reinstallation was conducted and judged to be successful pending resolution of chits.
 - Preparations continued for a Peer Review of the LLD plate and nearby diagnostic sensors.
- Molybdenum Inner Divertor Tiles
 - Preparations continued for a Peer Review of the diagnostics affected by the planned installation of molybdenum tiles on the lower inboard divertor.
- Materials Analysis Particle Probe (MAPP)
 - A requisition was submitted for a 38" stroke bellows motion drive.