

NSTX Weekly Report (June 4, 2004)

FY 2004 weeks of operation planned: - 18 weeks, Completed: - 14.7 weeks

Department, Project, Program (M. Ono, M. Peng, M. Williams, E. Synakowski)

- The next NSTX Physics Meeting will be held on Monday, June 7, starting at 1:30 pm in the Director's conference room. Bret Stratton will discuss the work that he and Schweick Von Goeler have been doing on the new fast, soft x-ray pinhole camera diagnostic for NSTX. Rumor has it that some interesting movies will be featured. (C. K. Phillips)

Run Coordination (S. Kaye, J Menard)

Several XPs and one XMP were run during this week, which was shortened due to Memorial Day. The Troyon Scaling XP attempted high beta discharges through high normalized current, and beta values of 38% with plasma currents of 1.3 MA were achieved. The ELM Mitigation XP continued, looking at the dependence of ELM severity on triangularity and squareness. An XP to study the effect of configuration on plasma rotation was run in collaboration with MIT, and the low density Locked Mode XP was continued. Finally, a gas-filled torus XMP was run for MSE calibration.

- The Troyon scaling XP was run with the objective of attaining high toroidal beta values at high values of the normalized current. The early H-mode scenario, successful in LSN discharges, was attempted in these DND discharges, although the early H-phase could not be sustained at these low toroidal fields (3 kG). Nevertheless, plasma currents of up to 1.3 MA were achieved, with toroidal beta values of up to 38% (EFIT02), with normalized beta values of 5.5 and Troyon normalized beta values of 2.6 to 2.8, consistent with previous results. The q_{95} was approximately 5 (it was ~ 4 in previous attempts), indicating that there is headroom for attaining even higher currents (D. Gates).

- The ELM mitigation experiment continued, with an attempt to study the dependence and mitigation of ELMs on triangularity and squareness. Attempts were made to use rEFIT to change these higher order moments of the shape at relatively high elongation. At these elongations (2.3), the rEFIT vertical control was challenged, and only short pulses (up to 300 msec) could be produced. Triangularity in these pulses varied from 0.5 to 0.75, and a more detailed look at the ELMs in these short duration discharges is underway. The plasmas fared no better without rEFIT control, as mode locking occurred at the lower triangularities and higher kappas limiting the discharge duration as well. rEFIT was reintroduced at lower kappa (2.2), and produced a long-pulse (600 msec) discharge at lower triangularity (0.55). Because of time limitations, only one or two attempts to change the squareness of these plasmas was made, with little success (S. Kaye).

- An XP to study the dependence of the direction of rotation magnitude and direction, both at the edge and in the core, on plasma configuration was motivated by results seen on the Alcator C-Mod tokamak, and was run in collaboration with MIT. The goal of the XP was two fold: 1) to measure the rotation induced in the edge and core of RF heated plasmas in different magnetic configurations (USN, DND, LSN), and 2) to measure the L-H power threshold difference, presumably due to flow differences, in these configurations. Regarding the first goal: rEFIT was used to provide fine control of the magnetic configuration (dRsep scanned through the values of +2, +1, +0.5, 0, -0.5, -1, and -2 cm). Rotation measurements in the edge and core of the plasma generally confirm the flow velocity trends seen in the SOL and core of Alcator C-Mod, pending further analysis. Regarding the second goal: in the DND balanced configuration (dRsep=0) the plasma transitioned reliably into H-mode, dithering at an RF power of ~ 1.5 MW. However, when varying dRsep away from 0, i.e. in USN or LSN, the plasmas did not transition into H-mode for RF powers up to 3.2 MW. More analysis is necessary to understand this failure to go into H-mode in these configurations (T. Biewer).

- The magnetic field and density dependence of locked-modes was studied in early H-mode PF1B-LSN 1MA plasmas. Good rotation profile data was obtained for this experiment for the first time. Static locked modes were not easily obtained in the high density condition during a toroidal field scan from 4.5kG to 3kG. As the density was lowered at the lowest field (3kG), locked modes were again obtained during the Ip ramp and flat-top phases. Interestingly, the local carbon rotation near the plasma edge was measured to be strongly negative in some shots (~ 50 km/s) at the lowest TF, but not at 3.5kG and above. Future studies will reduce the beam momentum input in the low density target and complete the B-field scan at low density. (J. Menard).

- An gas-filled torus XMP was run for MSE calibration, although this was cut short due to heating of the NBI bellows (F. Levinton).

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

NSTX plasma operations continued this past week with an experiment on the Troyon scaling of the beta limit (XP-432) with plasma currents to 1.3MA for a toroidal beta of 38% at 3kG. rEFIT control was used to investigate ELM phenomenology in high elongation, medium triangularity plasma shapes (XP-446). HHFW heating was used to study the dependence of scrape-off layer flows on magnetic configuration (XP-447). A few neutral beam injections into a gas filled torus with TF and PF applied were performed and provided the first data points for the MSE diagnostic calibration. The Lithium Pellet Injector has been installed and is under vacuum.

By the end of this past run week, NSTX had completed 14.7 run weeks this year, producing 1618 plasmas.

NSTX began a two week maintenance period this past Friday in order to install the first two RWM coils. The test cell will be open around the clock until Friday, June 18th, when machine area "scrubs" will begin. Maintenance and construction activities will be suspended during the day on Saturday, June 12th, while the NSTX test cell is open to the public as part of the PPPL open house. Plasma operations will resume on Monday, June 21st. (A. von Halle)

Research Operations (M. Bell)

Boundary Physics (H. Kugel)

- A 17 minute Morning Boronization was performed. (J. Winston, W. Blanchard)
- The control cabling was connected to the Lithium Pellet Injector (LPI), and testing of the controls is in progress. (P. Sichta, R. Gernhardt)
- Off-line flow tests of a partial mockup of the NSTX Supersonic Gas Injector (SGI) were completed. Preparations were started for measuring the output pressure profiles. (T. Provost, V. Soukhanovskii, LLNL)
- Dust collected on a glass slide at Bay C bottom was retrieved, and the dust was analyzed by Raman scattering with a helium neon laser. Particles ranging in size from 2 to 30 microns were predominantly found to be disordered graphitic (sp²) carbon, easily recognized by the presence of the typical D-band (~1330 cm⁻¹) and G-band (1585cm⁻¹). Also found on the slide was a linear fiber 30 micron diameter with a -C≡N- stretching band at 2244cm⁻¹, probably a nitrile rubber, and an irregular fiber with an amide band at 1669 cm⁻¹. (C. H. Skinner)