

NSTX Weekly Report (July 23, 2004)

For FY2004 Joule milestone: 18 weeks; programmatic goal: 20 weeks.
Completed: 19.1 weeks producing 2221 plasmas.

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

- No NSTX Physics meeting on Monday, July 26. (C. K. Phillips)

Run Coordination (S. Kaye, J. Menard)

During this week, experiments were performed which took advantage of the availability of the MSE diagnostic for assessing changes in the current profile. These experiments studied HHFW CD, high beta, EF/RWM active control, electron ITBs, and “long pulse” LSN. In addition, the new CHI cap bank was commissioned and power tested into a dummy load:

- The HHFW was used in an attempt to drive current. Various discharges, with RF, without RF, with and without NBI, etc were run in order to isolate the RF driven current for assessment by the MSE diagnostic. While some electron heating was observed with counter-RF current drive, co-current drive discharges encountered locked modes and other MHDs. (R. Wilson)
- The experiment “Resistive wall mode physics using the initial global mode stabilization coil” continued last week. The initial global mode stabilization coil pair was used to generate both preprogrammed DC and AC field perturbations in plasmas with varying beta-N, both above and below the $n=1$ no-wall beta limit. The polarity of the applied perturbation was switched as compared to the prior week’s run. RWM growth was again shown to be sensitive at high bet-N to the magnitude of the applied current at a toroidal field of 3 KG. A 300A variation was enough to alter the plasma rotation to cause RWM growth. MHD “spectroscopy” was performed using pulses and modulation, scanning the applied perturbation current in ~10Hz increments up to 60Hz. (S. Sabbagh)
- Attempts at high beta were met with success in reducing the MHD that previously inhibited access to higher current. However, PF3 trips, caused by a hardware limit on the PF3 current, and subsequent disruptions prevented actual access to these higher values. This PF current limit will be lifted for the next attempt at high beta conditions. (D. Gates)
- During the electron ITB experiment at 3 kG, the MSE diagnostic did indicate high central q, and these discharges will serve as good candidates for analysis. (D. Stutman, E. Synakowski)
- Good MSE data was acquired for several discharge conditions with differing central safety factor evolution. First, low-density and high-Te (1.4keV) plasmas from the low-density locked mode experiment were reproduced at reduced injected power using source C followed by source A. Initial MSE

data indicates elevated $q(0) > 1$ prior to the reconnection event in these discharges, so these discharges are good candidates for testing the hypothesis that shear-reversal plays a role in obtaining high T_e . Second, MSE data was obtained for early H-mode discharges with flat-top current targets of 0.8, 1.0, and 1.2MA. Flat-top discharges were obtained at 0.8 and 1.0MA, but a few additional shots are needed to develop the 1.2MA target. If completed, this scan in current and poloidal beta combined with MSE data should be useful for documenting the impact of lowering the fraction of non-inductive current drive on the q profile evolution. (J. Menard)

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

NSTX plasma operations continued this past week, continuing work on XP-403, HHFW current drive with MSE, and completing XP-455, on rotational braking with the RWM coil. XP-421 on high-beta in high-current double null plasmas resumed after a vacuum vessel boronization. Experiments were also performed on measuring transport barriers with MSE (XP-411) and on long pulse single null plasmas with MSE measurements (XP-432). Friday was devoted to the integrated system testing of the new capacitor bank to be used for transient CHI start-up experiments scheduled for next week. NSTX will be operating extended shifts until 7:00pm on Monday, Tuesday, and Thursday this week. The NTC will be open after the run until 10:00pm each evening. (A. von Halle)

Research Operations (M. Bell)

Diagnostic Upgrades (D. Johnson)

The MSE diagnostic provided preliminary $q(0)$ time histories between shots this week, facilitating startup optimization for various experiments aimed at reversed shear configurations.