

NSTX Weekly Report (February 6, 2004)

FY 2004 weeks of operation planned: - 18 weeks, Completed: - 2.2 weeks

Draft Featured Highlights:

The first full week of neutral beam operation saw records set for both toroidal and normalized beta, with plasma discharges achieving toroidal betas of up to 37% and normalized betas of up to 7. High beta toroidal values were achieved with the plasma current being ramped to 1.3 MA, and the high normalized beta of 7 was obtained through current ramp down experiments. Over 6 MW of beam power was available reliably for the experiments during the week.

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

- Yasuyuki Yagi, the head of fusion group at the National Institute of Advanced Industrial Science & Technology- AIST, Tsukuba, Ibaraki, Japan visited NSTX on Monday, February 2, 2004 to discuss on the MHD instability related issues. He gave a PS & T Seminar on "Magnetic confinement of the thermonuclear fusion plasmas, particularly reverse-field pinch type".
- Mikhail Grazynevich of the MAST at Culham Lab, EURATOM/UKAEA, UK visited NSTX for one week to participate in the high beta experiments on NSTX.
- There will be an NSTX Physics meeting on Monday, 2/9/04, beginning at 1:30 pm in B-318. Information for remote participation is given below. In addition to any updates on the Experimental run (results, issues, etc.), there will be two presentations: Martin Peng will give a brief reprise of his recent trip to MAST and Stewart Zweben will report on "First Results from the 300 frame GPI camera". (C. K. Phillips)
- The February NSTX Team Meeting will be held on Thursday, February 12, 2004, at 1:30 P.M., in LSB318. Remote participation will be available for our off site team members. (J. Savino)

Run Coordination (S. Kaye)

The first full week of neutral beam operation saw records set for both toroidal and normalized beta, with plasma discharges achieving toroidal betas of up to 37% and normalized betas of up to 7. Over 6 MW of beam power was available reliably for the experiments during the week. Machine performance was aided by boronization during the first part of the week, during which time the neutral beams to condition further. The effects of the boronization were monitored from which the O/C ratio measured by SPRED. Continued running throughout the week led to a general decrease in this ratio to levels for which the machine condition is considered to be good. High beta toroidal values were achieved with the plasma current being ramped to 1.3 MA, and the high normalized beta was obtained through current ramp down experiments, in which beta-poloidal reached 1.5. H-mode plasmas were obtained throughout the week, with a special note that transitions were observed in double null plasmas using only one beam source for the first time. Global confinement times were calculated to be approximately twice the L-mode scaling value for both L- and H-mode plasmas. It was found that the Thomson Scattering window has been coated, causing a reduction in transmission. Mikhail Grazynevich from MAST visited during the week and aided in the experiments. (S. Kaye)

An experiment to analyze rotation and aspect ratio effects in high poloidal beta plasmas was begun this week and yielded a record normalized beta value of 7. The experiment is aimed to reach the equilibrium limit, and these initial positive results were obtained in the most conservative of three planned plasma current time histories. Only the first condition was attempted today. The results attained so far ($\epsilon \cdot \beta_{\text{poloidal}} = 1.07$) are encouraging indicators that target equilibrium with the most extreme values of poloidal and normalized beta can be produced to allow study of the effect of rotation on ST equilibria under these conditions. (S. Sabbagh, Columbia University)

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

- NSTX operations continued this past week completing work to implement rEFIT shape control and moving on to high-beta experiments, reaching a new high toroidal beta for NSTX of 37%. The neutral beam systems were able to support these experiments with all three sources operating at 90keV for a total neutral power of over 6 MW. Density measurements are now available with FIRETIP, as well as the MPTS diagnostic.

A one week maintenance period began this weekend and the NSTX test cell will be in free (card reader) access during this time. The test cell is expected to remain in free access around the clock until the machine scrubs at the end of the week. (A. von Halle)

Research Operations (M. Bell)

Boundary Physics Operations (H. Kugel)

- A Requisition was submitted for a Bellows Motion System for the Supersonic Gas Injector.
- A Requisition was submitted for 6 cylinders of deuterated trimethyl boron.
- Work was in progress for the installation of the Lithium Pellet Injector gas lines, and vacuum interface signals.
- The results of the SRC Review of proposed revisions to the NSTX SAD/FMEA addressing Low-Z Pellet Injection were received and the response was completed.
- TMB room temperature Boronization-20 and -21 were completed.

Diagnostic Operations (R. Kaita)

- The Princeton Scientific Instruments fast camera was re-installed for the gas puff imaging system.
- The data acquisition difficulties with the FIRE TIP diagnostic, including a bad digitizer and link problems, were corrected. Plasma density data are now being obtained.

Diagnostic Upgrades (D. Johnson)

- Initial data was obtained with the solid state neutral particle analyzer array. New viewing apertures, additional borated poly shielding and enhanced EMI shielding will be installed in the upcoming maintenance week to enhance the signal-to-noise ratio.
- The first camera images of divertor H-alpha were obtained with a recently installed tangential view of the lower x-point region.
- The scintillator-based, fast lost ion probe was commissioned successfully, yielding the first pitch angle- and energy-resolved measurements of lost fast ions on NSTX.

Physics Analysis (C. K. Phillips, S. Kaye)

- On 2/4/04, a Wave-Plasma Interactions Science Focus Group meeting was held to review plans for implementing electron Bernstein wave heating & current drive (EBW H&CD) on NSTX. A copy of the viewgraphs presented by Gary Taylor at the meeting can be found in the NSTX DragNDrop area in a folder called "NSTX EBW Meeting". Martin Peng and Dave Rasmussen participated remotely from ORNL. The discussions focused on the choice of frequency for the system, hardware availability and acquisition, development of models for EBW coupling calculations in collaboration with Mark Carter and Fred Jaeger from ORNL, and further modeling of the NSTX scenarios with the GENRAY/CQL3D code and benchmarking against models used at MAST.