

NSTX-U Weekly Report (March 4, 2016)

FY 2016 NSTX plasma operations

Operation Targets: Total - TBD

Completed: 4.81 run week and 482 plasma shots

Run Coordination (J. Menard, S. Gerhard)

On Tuesday 3/1/2016, approximately 15 additional shots were taken towards XMP-140 (PF-5 Proportional Error Field Correction Test). These shots sought to determine the optimal error field correction (EFC) proportional to the PF5 coil current at a plasma current of 900 kA. First, a 900 kA ohmic reference plasma was developed using the optimum PF5 proportional EFC previously determined at 700 kA (on 2/25/2016). Then, scans of both the correction phase and the proportional amplitude were conducted about the previous optimum correction point. The results confirmed that the optimum correction at 900 kA was very near to the optimum at 700 kA, further validating the use of these EFC tools in the development of high performance NSTX-U discharges.

On Monday 2/29, Tuesday 3/1, and Wednesday 3/2 an additional 43 shots were taken towards XMP-137 (Increase I_p and κ in L- and H- mode). These discharges extended the parameters of an 800kA ELMy H-mode scenario including κ (increased from 1.95 to 2.2), internal inductance (lowered from 0.9 to 0.8), stored energy (170kJ increased to 220kJ), and H-mode period (200ms increased to 600ms). The best shots from each day were 203624, 203655 and 203679. This success was enabled by up to 4MW neutral beam heating power and improvements in the error-field correction, vertical stability and ISOFLUX shape control

On Thursday 3/3, 12 shots were taken toward XP-1506 (Low-beta, low-density locked mode studies). The goal was to perform a 'compass scan' by applying various phases of $n=1$ error fields during 700 kA ohmic discharges. The $n=1$ field ramp was performed on top of the optimum PF5 proportional error field correction as determined by XMP-140. Locked modes and disruptions were generated due to the applied $n=1$ fields, and analysis is ongoing.

On Friday 3/4, completed both XMP-115, isoflux control (sans X-point/Strikepoint control), by demonstrating feedback control of DRSEP and XMP-138, vertical control, by exercising the Vertical Growth Rate algorithm. These XMPs demonstrated the control algorithms for isoflux and vertical control functioned as expected. Several shots were also taken toward XMP-137 (Increase I_p and κ in L- and H-mode) with the goal of leveraging the new drsep control to maintain a long-pulse L-mode in USN with 1.8MW of NBI heating. The H-mode transition was avoided by using an USN shape, however the resulting plasmas were limited by MHD activity.

Experimental Research Operations (S. Gerhardt, R. Kaita)

A successful Final Design Review (FDR) for the NSTX-U High-Z Divertor facility enhancement was held on Feb. 29th. Kelsey Tresemer and Michael Jaworski of PPPL reviewed the design, initial installation procedure and preliminary operations guidance for the project. The FDR was deemed successful pending resolution of final CHITs allowing the project to enter procurement for machining of the continuous ring of molybdenum plasma-facing components to be installed following the FY16 run campaign this summer. (M. Jaworski)

Engineering Operations (A. von Halle, P. Titus)

NSTX-U plasma operations continued this past week with experiments on ISOFLUX

and vertical plasma control, H-mode development, Low-Beta Error field correction, and MPTS commissioning. Plans and procedures for an argon vent of the NSTX-U vessel to retrieve boron nitride debris from a diagnostic shutter have been reviewed and will be performed during a two week maintenance period that begins this coming week. Installation activities during this maintenance period include the Lowus/Zeus/Mona Lisa diagnostic systems, the Argon Dump system controls needed for future lithium operations, the Lithium Granule Injection system, the fast Voltage measuring system needed for CHI operations, and the new Massive Gas Injector system. The NB2B autotransformer will be replaced with a spare unit, and maintenance/repairs will be performed on the NB2C transmission lines. Weld inspections are planned for Motor Generator #1, and a test run-up of MG#2 is scheduled.

The NSTX-U Test Cell will be in controlled access this coming week for approved work.