

NSTX-U Weekly Report (July 14, 2017)

FY 2017 status: NSTX-U is in a maintenance and repair outage.

NSTX-U Research (J. Menard)

During an NSTX-U/DIII-D National Campaign experiment led by Dan Boyer, a new algorithm in the DIII-D PCS that uses the variable beam voltage and perveance capabilities of the neutral beam injectors for power, torque, energy, and rotation control was successfully tested. The algorithm determines the optimal combination of voltage, perveance, and duty cycle for each of the beams, constrained to the reliable operating range, to achieve requested total torque or power waveforms. Fast adjustments in perveance and/or duty cycle are used to compensate for the slow response of beam voltage to requested changes. The power and torque control capabilities were used for simultaneous feedback control of the stored energy and rotation from a real-time CER channel in the core as well as with a channel from the edge. The algorithm was able to track requested values while compensating for changes in confinement and the effect of pre-programmed ramps in the voltage of selected beams.

Yang Ren visited General Atomics from July 6th to July 14th to carry out a proposed NSTX-U/DIII-D national campaign experiment and to work with UC-Davis ECEI group. The experiment entitled “study of collisionality dependence of ion- and electron-scale turbulence in advanced inductive hybrid scenario with ST-relevant q95 on DIII-D” was successfully executed on July 11th and 12th with two half-day operations. A four-point collisionality scan with collisionality varied by a factor about 7 has been achieved by varying the toroidal magnetic field and plasma current simultaneously. Reasonable plasma profile matching was also achieved in order to keep other dimensionless quantities approximately constant while collisionality was varied. Turbulence measurements with a variety of diagnostics were documented at each collisionality value. Data analysis is being carried out.

Devon Battaglia is spending eleven weeks this summer at CCFE to assist in defining the startup and rampup scenarios for initial operations on MAST-U. An important objective is to use the LRDFIT code to develop methods for optimizing the inductive breakdown and initial current channel formation for MAST-U and compare to the calculations and experiments performed for NSTX-U. In the first weeks of this collaboration, Devon has worked with the MAST-U team to define the axisymmetric conducting structures of the vacuum vessel and supporting structures, and translate this information into the necessary input for the LRDFIT calculations. He has also provided input for the plans currently being drafted for initial MAST-U plasma operations.

Nicola Bertelli visited MIT the week of July 10-14 to work with S. Shiraiwa, J. Wright, and P. Bonoli on the RF core + edge plasma numerical tool developed in MIT.

NSTX-U Recovery Project (R. Hawryluk)

Calibration standards for both the laser tracker and romer arm were received, and spatial measurements of the passive plates and outboard divertor have been completed.

The Neutral Beam 1A source isolation valve was successfully removed for evaluation and repair. All six neutral beam ion source steering systems have been tested and found to be fully functional, addressing one of the DVVR Chits.

Vendor questions have been answered for the Inner PF Coil Prototype procurement. Bids are due by July 21, 2017.

A Draft Notable Report was submitted to FES.