

NSTX Weekly Report (November 11, 2011)

NSTX is in the Upgrade Project outage in FY 2012

The paper “Dynamical evolution of pedestal parameters in ELMy H-mode in the National Spherical Torus Experiment” by A. Diallo A (PPPL), R. Maingi (ORNL), S. Kubota (UCLA), et al. has been published in Nucl. Fusion 51 (10) 103031 (October 2011). It describes the characterization of the pressure pedestal height and width evolutions during the inter-ELM phase. The pedestal height late in ELM cycle is found to strongly scale with plasma current. Scaling of the pedestal width with square-root of poloidal beta shows that NSTX pedestal width is larger than in conventional aspect ratio tokamaks. Finally, the evolution of the pedestal height and width during the ELM cycle, as well as the scaling of the pedestal pressure with plasma current prior to the onset ELM, are found to be qualitatively consistent with the peeling–ballooning theory. (A. Diallo)

The paper "High spatial sampling global mode structure measurements via multichannel reflectometry in NSTX," by N.A. Crocker (UCLA) et al., has been published in Plasma Physics and Control Fusion **53** (10) 105001 (October 2011). One highlight of the new results is the identification of CAEs as a candidate for causing enhanced thermal electron transport that has been previously hypothesized to be caused by GAEs [D Stutman, PRL 102 115002 (2009)]. Taking advantage of the new capacity of the NSTX reflectometers to detect fluctuations in the core of high density, beam-heated H-mode plasmas, CAE and GAE mode structure were measured across a broad radial region extending from edge to core. The measurements reveal that the CAEs, which have frequencies similar to the GAEs, are core-localized like the GAEs, but more strongly so. The core-localization of GAEs and their potential for resonance with electron orbits are key elements in the hypothesis that they cause the transport. The paper also includes detailed measurements of TAE structure, including amplitude and phase. Interestingly, the phase varies strongly with radius, which is inconsistent with ideal MHD theory, indicating that non-ideal effects such as, perhaps, coupling to fast-ions, are important in determining the mode structure. (N. Crocker)

The paper "Techniques for the measurement of disruption halo currents in the National Spherical Torus Experiment" by S. P. Gerhardt (PPPL) et al., was published in Review of Scientific Instruments **82**, 103502 (2011). This paper describes the mechanical and electrical design of sensors used to detect disruption halo currents in NSTX. It also covers data analysis techniques used to process data from those sensors. (S. Gerhardt)

Dr. Tokihiko Tokuzawa (the National Institute for Fusion Science, Japan) visited PPPL during the last two weeks. While at the laboratory, he collaborated with Shigeyuki Kubota (NSTX/UCLA) on modeling in support of microwave diagnostics on the Large Helical Device (LHD) at NIFS. He gave an Experimental Seminar entitled “Recent Progress of Microwave Diagnostics in LHD.” (R. Kaita, PPPL)

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

NSTX Upgrade construction activities continued this week with the ongoing removal of cables and trays on the top of the vessel, and the installation of the new platform on the west side of the

machine. Removal of diagnostics from the vacuum vessel and the relocation of electronic control racks also continues. An air purge of the vacuum vessel in preparation for the removal of the neutral beam to torus transition duct is in progress, and lift beams were load tested in preparation for the removal of the vessel center column.

Access to the NSTX test cell will be available only through previous arrangement with the Upgrade Work Control Center.