

NSTX-U Weekly Report (September 8, 2017)

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

Recovery

A Cost and Schedule Review was held September 6-8. The committee was chaired by Robert Iotti, former Chair of the ITER Council. A de-brief presentation was made by the committee on Friday, and a written report will be delivered in the coming weeks. The final Extent of Condition Report, in response to DOE Notable 2.1, will factor in the latest cost and schedule estimate, along with the findings of the committee, and be delivered to DOE prior to the end of the fiscal year.

Metrology of the center-stack casing tiles and angle tiles has been completed, and the metrology hardware setup has been revised for future in-board diverter measurements. The removal of the CHI gas injectors is in progress.

In the Coil Winding Facility, the test copper bundle is being fitted in the mold enclosure and plumbing connections are being made to the Binks pressure tanks in preparation for the upcoming VPI.

The neutral beam group has completed pre-op testing of the calorimeter for beam-line #2.

Research

Koji Kusumi and Shoki Nakamura, graduate students from Kyoto University, visited Egemen Kolemen's group (PPPL/Princeton University) to work on Liquid Metal eXperiment (LMX) over the summer. They worked on thermal mixing enhancement of localized heated on free-surface of liquid metal film flow under various strength of the transverse magnetic field with using 3 kinds of inline hemispheres arrays configurations and 3 kinds of staggered hemispheres arrays configuration. It was found that the best optimized inline configuration for the thermal mixing efficiently which is the middle length of pitch in flow direction under relatively low magnetic and high magnetic field. Two research papers are in development based on this analysis. The results will be presented at the International Symposium on Fusion Nuclear Technology (ISFNT). Prof. Tomoaki Kunugi of Kyoto University also visited PPPL in August for a week. The main aim of the visit was to exchange ideas on liquid metal flow with Egemen Kolemen and advise his visiting graduate students (K. Kusumi and S. Nakamura). Productive discussion was held on the heat transport for liquid metal flow based fusion divertor concepts. The collaboration will continue in the following year.

The paper "Edge loss of high-harmonic fast-wave heating power in NSTX: a cylindrical model" by R.J. Perkins et al [<https://doi.org/10.1088/1741-4326/aa7860>] has been published in the journal Nuclear Fusion. Previous High-Harmonic Fast Wave heating operation on NSTX exhibited a large loss of fast-wave power to the divertor along scrape-off-layer field lines for edge densities above the fast-wave cutoff. It was postulated that the wave amplitude is enhanced in the scrape-off layer due to cavity-like modes, and that these enhanced fields drive sheath losses through RF rectification. In this work the influence of annulus resonances on wave-field reconstructions is studied and instances have been found in which annulus resonant modes dominate the spectrum and trap over half of the total wave power in the edge. The work is part of an ongoing effort to determine the mechanism underlying these scrape-off layer losses on NSTX, identify optimal conditions for operation on NSTX-U, and predict whether similar losses occur for the ion-cyclotron minority heating scheme both for current experiments and future devices such as ITER.