

APEX Meeting Summary

Talk by Alice Ying: Status of MHD and Heat Transfer Analyses for NSTX Flowing Lithium Surfaces, and M-Tor Status and Plan

Previous MHD and heat transfer analyses to determine the operating conditions of the flowing liquid walls along the NSTX center stack and divertor areas were reported. It has been shown that of all MHD effects, the one caused by the surface normal field is the most important. The flow over the center stack area is not affected by MHD interaction significantly, whereas flow over the inboard divertor undergoes strong MHD drag resulting in flow thickening by several times. The flow over the outboard divertor is essentially stopped. The analysis shows that a flow with an inlet velocity of 2 m/s and film thickness of about 4 mm can be established to provide surface temperature less than 400° C for the center stack under a projected NSTX total heating power of 10 MW operation. The plan for FY01 was presented. The analyses will focus on defining options for a flowing limiter module in NSTX, exploring options that may assist NSTX long pulse operations, and defining flowing liquid options for other operating plasma devices (C-MOD, DIIID).

In the subtask area of construction of a laboratory magnetic field facility, the magnetic torus, LM-MHD facility constructed of 24 TARA water-cooled coils is nearly completed. The plan for FY01 is to examine the effects of surface normal fields and toroidal field gradients on LM MHD, to investigate the effects of magnetic field time varying perturbation, to study schemes for propulsion from applied external currents, and to obtain data code validation.

Talk by Mike Ulrickson: NSTX R&D Possibilities

R&D needs for a removable liquid surface module as well as the needs for possible alternates such as divertor and center stack were presented. In addition, Mike suggested that the soaker hose concept should be seriously evaluated to see if it is indeed a strong candidate for the module.

Talk by Brad Nelson: Engineering Configuration Options for Flowing Lithium in NSTX P. Fogarty, B. Nelson

B. Nelson presented the status of flowing liquid wall configuration options in NSTX. The options discussed were all toroidally continuous and included flow over the center stack, flow over the lower outboard divertor, flow over both the center stack and lower divertors and flow over the passive plates. Two variations of flow over the lower divertor included changing from round streams to flat streams, and changing the flow direction from radially inward to radially outward. The radially outward flow should be more consistent with MHD calculations by Smolentsev. It appears very difficult to provide flowing walls that are consistent with the coaxial helicity injection system at the bottom of the torus, but a system may be possible if the CHS were relocated to the top of the machine. In addition to the CHI problem, the primary issues associated with the flowing

liquid walls are 1) the need, location and material type for insulators and insulating coatings and 2) the need for and implementation of applied currents in the flow. The next step will shift the focus of work from toroidally continuous flow schemes to a single, midplane module.