

International Workshop on Requirements for Next Generation PMI Test Stands in Fusion Research, 31 August – 2 September, 2010, ORNL

Executive Summary:

An international workshop was held at ORNL to identify opportunities for present and future linear facilities to provide critically needed plasma material interaction (PMI) information for ITER and prospective R&D facilities that develop the PMI basis for a fusion DEMO reactor. Descriptions of knowledge “gaps” in PMI science and technology, recently identified by research needs assessments in the U.S. and E.U., were extended to detail the needed capabilities in research, diagnostics, theory and modeling using such facilities. Their unique research roles and limitations, including how they complement the more complex toroidal PMI research in tokamaks and stellarators, were addressed.

The linear facilities allow many advantageous capabilities, including: *i*) a simplified geometry for a wide range of well-controlled steady-state plasma and target conditions and orientations; *ii*) flexibility in target material choices and mock-up designs; *iii*) access for sophisticated diagnostics at the plasma material interface to reveal details of plasma-induced in-depth surface chemistry and morphology, hydrogen implantation and permeation, sputtering, erosion, redeposition, impurity transport, and the effects of neutron-induced damages; and *iv*) extensive verification of theory and modeling through comparison with these comprehensive measurements.

The present-day portfolio of linear facilities has advanced PMI science in a broad front in concert with the toroidal PMI research. The above-mentioned advantages can be fully exploited if ITER and DEMO reactor-level PMI conditions can be delivered through a combination of development of intense plasma sources including the use of RF heating, upgrades in existing facilities including diagnostics, tests of neutron damaged materials, and improvements in theory and modeling. The workshop participants recommended that the linear PMI research be strengthened in these directions and remain closely coordinated with toroidal PMI research.

See presentations of the meeting at <http://www.ornl.gov/sci/fed/PMTS10/agenda.html>.