TESTS OF COOLED MODELS OF TUNGSTEN MODULES OF THE HEAT-SHIELDING LINING OF THE DIVERTOR BY COMBINED IRRADIATION WITH HIGH-POWER ELECTRON BEAMS AND STATIONARY PLASMA FLOWS [[1]](#footnote-1)\*)

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For the purposes of constructing a thermonuclear tokamak reactor, it is necessary to study erosion and the effects of plasma-wall interaction under stationary high-heat plasma and beam load on the in-vessel components [1]. In this work, combined tests of experimental tungsten mock-ups of the divertor tiles with steady-state plasma under conditions of intensive arcing are carried out. The cooled prototype mock-ups are made of water-cooled tungsten modules with a copper substrate. Combined beam and plasma tests of experimental tungsten mock-ups of the divertor tiles were carried out by high-power electron beams in an electron beam facility and subsequently by steady-state plasma in the PLM plasma device [2]. At the electron beam facility, tungsten mock-ups were irradiated with thermocyclic loads up to 50 MW / m2 relevant to the loads of ELMs in a large-scale tokamak. These mock-ups were subsequently irradiated with steady-state plasma in PLM plasma device with loads up to 1 MW / m2 for several hours. After such combined tests, damage of the surface of tungsten mock-ups was analyzed using optical and electron microscopy, X-ray spectroscopy, and the characteristics of erosion and recrystallization of the tungsten surface were determined. To generate arcs on the surface of tungsten mock-ups, a system based on a powerful laser was developed and tested in PLM device demonstrating the possibility of using it to study the effects of plasma shielding of the surface in conditions of intense arcing. Tests of the cooling system of tungsten mock-ups of the divertor tile for testing in the PLM with steady-state plasma loads were carried out. Plasma and beam tests were supported by Rosatom State Corporation project No. 223 EOTP-UTP 774/158-D, stochastic surface clustering analysis was supported by the RSF grant 17-19-01469, radiation effects were evaluated with the support of the RFBR grant 19-29-02020.

References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVIII/Mu/ru/BW-Budaev.docx) [↑](#footnote-ref-1)