Tests of prototypes of the heat-shielding of the ITER divertor dome by plasma flows in the QSPA-T: results and extrapolation to the ITER conditions [[1]](#footnote-1)\*)

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To determine the resource of the ITER heat-shielding and study the processes of their erosion, it is necessary to test samples of shielding materials under intense plasma-thermal load [1]. In this work, tests of samples of protective coatings were carried out on a quasi-stationary plasma accelerator QSPA-T. The QSPA-T installation allows creating plasma flows with a pulse duration of ≈ 1 ms and with a thermal load on the irradiated samples of 0.2–5 MJ / m2, which is comparable to the conditions of transient processes in ITER [2]. In this regard, QSPA-T is used for tests of protective coatings and the study of erosion mechanisms [3]. In order to get as close as possible to the conditions of transient plasma processes in the ITER during testing of protective coatings, a magnetic field should be created in the region of plasma-material interaction, as well as the plasma flow itself should be magnetized. It is of interest to compare the process of irradiation of materials with plasma in the presence of a magnetic field and without it, which will reveal new physical laws. In addition to varying the magnitude of the field, various configurations of the magnetic field and the position of the surface of the protective coating with respect to the incident plasma flow should be investigated, since these conditions can significantly affect the intensity of erosion.

In order to carry out tests in the presence of a magnetic field, a special system of Helmholtz coils was developed to be placed inside the testing chamber of the QSPA-T. Two series of experiments were carried out on the irradiation of samples of tungsten coatings (flat targets) without a magnetic field and with a magnetic field of ≈ 0.6 T. In each series, two targets were tested, one of which was irradiated at a normal incidence of the plasma flow, and the other at an angle of 45 ° to the direction of the flow. The tests were carried out under the same conditions of plasma exposure, the duration of which was 0.75 ms, and the thermal load in the center of the target was 1.5 MJ / m2. The profiles and optical images of the surface of the irradiated samples were measured, the experimental results were analyzed, and the data were extrapolated to the ITER conditions.

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