TEST OF FUSION MATERIALS BY STATIONARY PLASMA LOADS IN PLM device [[1]](#footnote-1)\*)

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Tests of tungsten in modern tokamaks have demonstrated the possibility of a significant change in the surface structure under the influence of powerful plasma loads [1]. For the construction of ITER, as well as the development of projects for thermonuclear reactors FNS and DEMO and tokamak TRT, full-scale testing of divertor materials and the first wall is required. It is extremely important to ensure adequate conditions for plasma testing of fusion materials [1], in which the processes of changing the structure of the surface facing the plasma should be investigated. Such tests are carried out on PLM plasma device [2]. The PLM is a linear magnetic trap with a multi-cusp scheme of magnetic plasma confinement - 8-pole multicusp. A feature of this divice is the stationary regime of plasma confinement for many hours, which is an advantage for testing divertor materials and the first wall of a thermonuclear reactor. The plasma parameters during the tests are relevant to the near-wall plasma in a tokamak - the temperature of the hot electron fraction is up to 50 eV, the cold electron fraction is from 2 to 10 eV, the plasma density is more than 2x1018 m-3, the load on the material test modules of the wall of the thermonuclear reactor is more than 2 MW / m2 . Tungsten, molybdenum, graphite, steel test plates and cooled modules were tested in stationary helium discharges in PLM plasma device. The duration of the discharges during testing reached 200 minutes. The heating temperature of the plates reached 1000 ° C or more. After plasma tests in PLM on tungsten, molybdenum, and steel plates, a change in the surface structure is observed - stochastic highly porous nanostructured layers are formed with a thickness of more than 1.5 micrometers with structural element sizes less than 50 nm. Such layers can retain a large amount of tritium in a fusion reactor and change the plasma-wall interaction conditions [1].

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References

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