LASER-AIDED DIAGNOSTICS of HYDROGEN ISOTOPES RETENTION On THE WALLS for GLOBUS-M2 TOKAMAK [[1]](#footnote-1)\*)

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1Gasparyan Yu., 1Bulgadaryan D., 1Efimov N., 1Efimov V., 1Krat S., 1Popova M., 1Sinelnikov D., 1Vovchenko E., 2Dmitriev A., 2Elets D., 2Mukhin E., 2Razdobarin A., 2Minaev V., 2Novokhatsky A., 2Sakharov N. and 2Varfolomeev V.

1National Research Nuclear University MEPhI, [YMGasparyan@mephi.ru](mailto:YMGasparyan@mephi.ru)  
2Ioffe Institute, [e.mukhin@mail.ioffe.ru](mailto:e.mukhin@mail.ioffe.ru)

In modern fusion devices, the amount of fuel (hydrogen isotopes) captured by the walls is determined from measurements of the gas balance or post mortem analysis of the plasma-facing components. Methods for remote diagnostics of local fuel accumulation in the walls have been developed for many years [1] and are included in the list of high-priority tasks for the ITER reactor [2]; however, the problem of quantitative analysis of hydrogen isotopes retention remains unsolved. This work presents the results of experiments and computer modeling of the yield of hydrogen isotopes from hydrogen-containing samples under laser irradiation, as well as the concept of laser diagnostics of fuel accumulation in the Globus-M2 tokamak [3].

Laboratory experiments were carried out on the MEPhI Large Mass Monochromator, equipped with Nd: YAG laser with a wavelength of 1064 nm, a pulse duration of 20 ns, and maximum energy of 70 mJ per pulse. Deuterium-saturated titanium and tungsten films and tungsten tile exposed in Globus-M2 tokamak divertor in 2015 were studied. Using a pre-calibrated quadrupole mass spectrometer, the dependences of the amount of outgoing deuterium on the power density of the laser pulse in the range 5 – 200 MW/cm2 were obtained for all samples. Computer simulation of the release of deuterium from a tungsten sample was carried out in the TMAP7 code intended to solve gas diffusion and heat transfer problems. The simulation results make it possible to determine the required laser pulse parameters for gas desorption and surface ablation modes.

Based on obtained results, a system for laser diagnostics of the distribution of trapped deuterium in the first wall and divertor of the Globus-M2 tokamak was designed.

References

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