upgrade OF THE NEUTRON DIAGNOSTICS COMPLEX GLOBUS-M2 TOKAMAK [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2022.49.1.018

Skrekel O.M., Bakharev N.N., Varfolomeev V.I., Gusev V.K., Zhiltsov N.S., Ilyasova M.V., Kiselev E.O., Kurskiev G.S., Minaev V.B., Miroshnikov I.V., Patrov M.I., Petrov Yu.V., Sakharov N.V., Telnova A.Yu., Tolstyakov S.Yu., Tukhmeneva E.A., Khilkevich E.M., Shevelev A.E., Shchegolev P.B.

Ioffe Institute, St.-Petersburg, Russia, [fosa97@gmail.com](mailto:fosa97@gmail.com)

The modernization of the Globus-M2 compact spherical tokamak, completed in 2018 [1, 2] made it possible to significantly increase the neutron yield from the plasma [3] by reducing the loss of fast particles arising during injection heating of the plasma. In addition, a second injector of neutral particles with a larger duration and injection energy was put into operation. Thus, it became necessary to reconstruct the neutron diagnostics complex installed at the Globus-M2 tokamak, which includes two corona counters (SNM-11 using the 10B isotope) and two neutron spectrometers (BC-501A based on a liquid scintillator), under new operating conditions and tasks.

In 2021, as part of the development of neutron diagnostics complex of the Globus-M2 facility, an algorithm was implemented for calculating the spatial function of a neutron source, which made it possible to calculate the neutron yield from a tokamak plasma during its injection heating. The *in situ* calibration of the neutron diagnostics complex carried out using an AmBe source determined the relationship between the simulation results and the experimental results [4]. Evaluation of the influence of the field of neutrons scattered on the elements of the installation and the experimental hall on the magnitude of the measured signal proved the need for collimation of neutron counters and spectrometers. Thus, polyethylene shielding was developed and installed for the main elements of the neutron diagnostics complex of the Globus-M2 tokamak, and the detectors were recalibrated.

On small and medium-sized tokamaks, the production of neutrons is mainly due to the reactions of nuclear DD fusion during the interactions of fast particles with particles of the main plasma (beam-target) and with each other (beam-beam). Consequently, the most interesting from the point of view of studying the neutron yield at the Globus-M2 facility are discharges with D-beam injection into D-plasma. However, to obtain reliable information about the fraction of the beam-beam component in the total neutron yield, a series of plasma discharges with the injection of a D-beam into H-plasma was carried out. The obtained experimental results were compared with the calculated values.

This work was financially supported by the Russian Science Foundation (project № 21–72–20007).

References

1. Gusev V.K. et al. Nucl. Fusion 53 (2013) 093013
2. Minaev V.B. et al. Nucl. Fusion 57 (2017) 066047
3. Bakharev N.N. et al. Plasma Phys. 2020. Rep., V.46, 7 P: 675-682
4. Skrekel O.M. et al. Tech. Phys. 2021 (accepted for publication)

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