DOI: 10.34854/ICPAF.52.2025.1.1.062

TEMPERATURE MEASUREMENTS WITH THE INFRARED THERMOGRAPHY FOR THE DIVERTOR TARGET PLATES IN THE GLBOUS-M2 TOKAMAK *)

Tokarev V.A., Gusev V.K., Khromov N.A., Voronin A.V., Petrov Yu.V., Sakharov N.V., Novokhatsky A.N., Mukhin E.E., Zhiltsov N.S., Tolstyakov S.Yu., Minaev V.B., Telnova A.Yu., Shchegolev P.B., Ermakov N.V., Kiselev E.O.

Ioffe Institute, St. Petersburg, Russia, Valentin.Tokarev@mail.ioffe.ru

The main task of the divertor configuration is to reduce the flow of impurities into the main plasma. In a diverted tokamak, the power crossing the separatrix enters a region called the Scrape-Off Layer (SOL). It is enriched with impurities that enter from the walls of the plasma chamber. Impurities from the central plasma also accumulate there. Area where separatrix crossing divertor targets (strike point) is one of the most thermal loaded element of the first wall. For tokamak reactors that will operate in a quasi-stationary mode, thermal loads in this region may exceed the capabilities of modern materials, what is one of the main limitations in achieving regimes with high power gain.

Infrared (IR) thermography has now become one of main instrument for the divertor heat flux profile measurement [1]. This type of diagnostic is useful tools for measurement the evolution of the divertor's plates surface temperature, which makes it possible to calculate the heat flux by solving heat conduction problem. As well as to determine such an important parameter: exponential power decay length in the SOL (λ_q), that is the characteristic distance at which the heat flux density decreases by *e* times.

Globus-M2 is compact spherical tokamak with open divertor [2], a major radius R=0.36 m, a minor radius a=0.24 m, plasma current $I_p \leq 0{,}5$ MA and toroidal magnetic field $B_T \leq 1$ T. Infrared camera is installed at the upper dome of the vacuum vessel at a distance of 1.45 m from the lower divertor. The MCT (mercury cadmium telluride) detector of the IR camera is operated in the 3.5-4.7 μm wave range with 320×256 pixels for the full frame with 220 Hz in standard temperature range 5–150 ºC. The work presents results of temperature measurements of divertor targets surface, heat flux calculation solving 2D inverse heat conduction problem.

The work was performed at the Spherical Tokamak Globus-M research facility, which is part of the Federal Center for Collective Use "Materials Science and Diagnostics in Advanced Technologies" with the financial support of the Russian Science Foundation, project No. 23-79-00033.

References

[1]. Lee H.H. et al Nuc. Mat. and E. 12 (2017) 541-547
[2]. V.B. Minaev et al J. Phys.: Conf. Ser. 1094 012001

*) abstracts of this report in Russian