Periphery plasma spectroscopic diagnostic of Globus-M2 tokamak with neutral helium injection [[1]](#footnote-1)\*)

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The injection of helium into the high temperature plasmas of tokamaks and stellarators is actively used as a diagnostic tool at the majority of contemporary devices with magnetic confinement [1]. The detailed information about the electron density and temperature profiles at the periphery and at the divertor region of a plasma discharge is a substantial issue of high temperature plasmas [2]. The main results of the diagnostic tool based on the measurements of the emission intensity ratios of neutral helium (HeI) lines and developed for “Globus-M2” tokamak are presented in the report.

The main component of the diagnostic is a polychromator based on the fast camera Miro M110 [3] with framerate up to 1600 at full spatial resolution 1200×800. The optical system of the polychromator allows to obtain four images of helium line emission simultaneously with size 300×300 pixels each on camera’s sensor. The detailed description of its hardware and positioning is presented in the article [4].

The experimental data has been obtained in a wide range of plasma parameters and helium injection regimes. Discharges #40268 - #40270 have been chosen to be processed for their higher signal-background contrast relative to the other discharges and, therefore, for a higher measurement localization. Measured electron density and temperature values (Te, ne) for the discharge #40269 are within 20-40 eV and (1-2)×1013 cm-3 range accordingly. SOLPS-ITER simulation [5] shows a moderate level of agreement with helium spectroscopy diagnostic measurements at the plasma edge region. A decrease in the electron density and an increase in the electron temperature has experimentally been measured upon approaching the separatrix in the scrape-off layer from the strong magnetic field side.

The polychromator’s optical system has been modified after the first experiments where its sustainable performance has been maintained. The diagnostic’s programming shell of helium beam image processing has also been upgraded so that the image quality and measurements reliability is improved. The detailed analysis of electron density and temperature profiles is presented in the full version of the paper.

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References

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