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INVESTIGATION OF PERIPHERAL PLASMA IN GLOBUS-M2 TOKAMAK VIA HELIUM SPECTROSCOPY *)

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Spectroscopic diagnostics of the peripheral plasma of a tokamak using neutral helium injection can provide valuable information about electron temperature and density distribution in the lower X-point region of the plasma cord from via spectral line-ratio technique [1]. Understanding the physical processes involved in the interaction between neutral helium and high-temperature plasma in tokamaks will improve the accuracy of the results obtained and their interpretation.

The report presents the results of diagnostics developed for the Globus-M2 tokamak. The main part of diagnostic is polychromator based on a fast camera Miro M110, with a shooting speed of up to 1,600 frames per second. This optical system allows for simultaneous acquisition of three images of radiative cloud at spectral lines of helium: 668 nm ($1s3d(^1D)$-$1s2p(^1P^0)$), 728 nm ($1s3s(^1S)$-$1s2p(^1P^0)$), and 706 nm ($1s3s(^3S)$-$1s2p(^3P^0)$). These images occupy an area of approximately 300x300 pixels on the camera's sensor each. The details of the device and its location are described in [1]. This report presents the results of measurements taken during discharges in spring and summer of 2024. A comparison of the measured electron density and temperature profiles with the results of the SOLPS-ITER code simulation [3] and the measurement data from the Thomson diagnostics in the divertor region shows a good agreement in the area covered by the helium injection radiation zone, as well as in the region where plasma parameters can be measured using an imaging spectrometer.

The report also presents the results of a comparison between the measured helium distributions and the calculated distributions, taking into account the actual geometry of the diagnostics using the SOLPS-ITER code. Based on this analysis, we conclude that the interaction between a jet of injected neutral helium and the plasma may be the key factor that determines the difference between the measured and calculated distributions.

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