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STUDY OF HELIUM BEAM INTERACTION WITH HIGH TEMPERATURE PLASMA OF "GLOBUS-M2" TOKAMAK *)

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Spectroscopic diagnostic of peripheral plasma with neutral helium injection provides data on plasma parameters averaged along lines of sight [1]. The size of emission area along those lines is defined by distribution of neutral helium injected into plasma, optical system properties and plasma parameters within the area. In order to correctly interpret the diagnostic measurements, it is necessary to accurately take into account and analyze contributions of listed above factors, and the first steps towards this objective is made within neutral helium emission model described in this work.

A frame obtained by spectroscopic diagnostics is simulated using the collisional-radiative model. The goal of the work is to improve the interpretation of diagnostic measurements.

The intensity of helium lines emission incident onto the camera matrix is determined by its emissivity. Three-dimensional emission intensity distribution for neutral helium lines is calculated using time-dependent collisional-radiative model (as in [2]), which includes atomic processes of ionization by electron collision, (de)excitation by electron collision, spontaneous transitions of 19 lower energy states of neutral helium and neutral jet parameters (velocity and density distribution). The neutral helium jet density distribution is calculated according the similarity law given in [3] based on gas dynamic modeling. The electron density and temperature are acquired from SOLPS-ITER calculation [4].

The emission incident onto a matrix pixel is calculated as the integral of emissivity along the axis of the observation cone for each of the 260×260 pixels of the camera matrix.

The results of comparison analysis of simulated and acquired images of helium cloud emission are presented. Possible sources of discrepancies and the possibility of taking them into account in calculations are discussed.

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