Investigation of transport in the Globus-M2 tokamak plasma using an integrated approach based on data of optical diagnostics

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Plasma confinement time and ignition conditions of the fusion reaction are determined by the energy and particles transport. The transport of impurities in a tokamak plasma is one of the most important issues in the physics of fusion devices. The input power is resulted not only in fuel heating, but also in the radiation losses from the plasma, which are mainly associated with the impurities. In the course of this work aimed at studying the transfer processes, the diagnostics of radiation losses, the effective ion charge and impurity spectroscopic diagnostics will be upgraded, and a multi-chord diagnostics of the two-dimensional electron temperature distribution T_e will be developed. At the Globus-M2 tokamak, radiation losses are measured using a system based on SPD photodiodes, which consists of a 16x16 photodiode array, a 1x24 array and the discrete photodiodes, and 2D distribution of the radiation losses in the poloidal cross section is reconstructed using the tomography methods. To upgrade the P_{rad} diagnostics, it is supposed to change the geometry of lines-of-sight of the photodiode systems: it will increase the accuracy of the reconstruction of the P_{rad} profile in the central plasma volume, and will allow us to get the distribution of radiation losses from the divertor region. Z_{eff} is determined on the Globus-M2 tokamak using the system based on measurement of bremsstrahlung intensity along one viewing chord. It will be possible to obtain profile of Z_{eff} with the additional lines-of-sight for Z_{eff} diagnostics. A multi-chord system for determining the profiles of T_e will allow to obtain $<Z_{eff}>$ in the monitoring mode. Spectroscopic diagnostics will be modernized to cover all the main impurities in the plasma of the Globus-M2 tokamak. Experiments on the Globus-M2 spherical tokamak with a high toroidal magnetic field up to 1 T will be carried out using the upgraded diagnostic complex that should provide important information on plasma confinement in toroidal magnetic devices.

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