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HEATING OF ELECTRONS OF THE GLOBUS-M2 TOKAMAK PLASMA DURING THE INJECTION OF HIGH-ENERGY ATOMS *)

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The report is devoted to the study of the high-energy atom injection influence on the electrons at Globus-M2 [1]. Globus-M2 is a compact spherical tokamak with a major radius R=0.36 m, a minor radius a=0.24 m and a characteristic elongation of the plasma $\kappa \sim 1.8$. The spatial distributions of temperature and electron density measured by the Thomson scattering [2] were analyzed for a wide range of operating parameters of the tokamak. The toroidal magnetic field and plasma current varied in the range of 0.5 - 0.9 T and 0.2 - 0.4 MA, respectively, at an average plasma density of 10^{19} - 10^{20} m^{-3}. A deuterium beam with a particle energy of 30-50 keV was injected into the deuterium plasma, with the power changing proportionally to the injection energy in the range of 0.3–1.0 MW.

Time intervals at the quasi-stationary stage of the discharge were selected for analysis. 4885 profiles for 306 discharges were processed. The electron temperature in the plasma center exceeded 1.6 keV at a central plasma density of $5 \cdot 10^{19}$ to $1.2 \cdot 10^{20}$ m^{-3}. The electron energy content obtained by integrating the electron pressure profile over the plasma volume reached 6 kJ, and was usually less than half the total plasma energy determined using magnetic measurements. The electron temperature has a strong dependence on the magnetic field and plasma current, and is virtually independent of the density and power injected into the plasma. In this case, the dependence on the plasma current is more pronounced than the dependence on the magnetic field. Analysis of the temperature and electron density profiles showed that for the data set under consideration, the peaking of the density profile depends mainly on the safety factor, and the temperature profile depends on the density profile as $T_e = const * n_e^{1.57}$.

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