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GLOBUS-M2 PLASMA HEATING ANALYSIS *)

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The report presents an analysis of plasma heating by high-energy atomic beams at the Globus-M2 [1, 2] spherical tokamak with a major radius R=0.36 m, a minor radius a=0.24 m and plasma elongation $\kappa \sim 1.8$. Two injectors [3] were used, with the particle energies $E_{NBI^1} \leq 28$ keV and $E_{NBI^2} \leq 45$ keV and the total output power $P_{NBI} = 1.25\,MW$ in atomic beams. Discharges with the toroidal magnetic field up to 0.9 T and the plasma current up to 0.4 MA were studied in a wide range of plasma density from $2 \cdot 10^{19}$ to 10^{20} m^{-3}.

The spatial distribution of electron temperature and density was measured by Thomson scattering diagnostics of laser radiation. The spatial distribution of ion temperature was measured by charge exchange spectroscopy diagnostics. Neutral particle analyzer provided information on the plasma isotopic composition. The effective charge was measured by bremsstrahlung diagnostics. The additional heating power assimilated by the plasma particles was determined using the NUBEAM [4] code. The ASTRA [5] code was used to calculate the transport coefficients from the experiment data.

The highest electron (1.7 keV) and ion (4 keV) temperatures were achieved [6], when deuterium was injected into a deuterium plasma with a moderate density of $\langle n_e \rangle \sim 4 \cdot 10^{19}$ m^{-3}. In higher density, the ion and electron temperatures are compared to 1.0-1.5 keV. Analysis of the plasma energy balance at different absorbed heating power, plasma density, and isotopic composition of the injected beams was performed. A comparison of the energy confinement time τ_E, electron χ_e and ion χ_i heat diffusivity coefficients at different values of operating parameters is presented.

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