GLOBUS-M2: FiRST RESULTS OF RESEARCH WORK AND PLANS OF SCIENTIFIC INVESTGATIONS

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The report presents the results of pilot campaigns from the previous three years of operation. The experiments were carried out in deuterium plasma with injection of a 28 keV deuterium beam. With an increase in the magnetic field up to 0.8 T and the plasma current up to 0.4 MA, an increase in the plasma stored energy and the energy confinement time up to 3 times was recorded. The experimental data extend the scaling obtained earlier on the NSTX (USA), MAST (UK), and Globus-M (Russia) tokamaks to the region of higher magnetic fields of spherical tokamaks. With an increase in the plasma current and magnetic field, a noticeable increase in the neutron yield was recorded. In experiments at the maximum values of the magnetic field and current, an increase in the triple product *nTτ*Е by an order of magnitude was observed in comparison with discharges at low fields and the transition of the plasma to a collisionless regime with the collisionality parameter ν \* << 1. Reasons plasma thermal insulation improving are discussed and data simulations of heat and particles transport in base discharges are presented.

The results of studying the structure of Alfvén modes and their influence on the confinement of fast particles are presented. The established dependence of fast ion losses on the amplitude of toroidal Alfvén modes demonstrates a decrease in losses with increasing field and current. The diagnostic application of the analysis of Alfvén instabilities spectra is described.

The paper presents the results of a scrape–off–layer studying of plasma with a divertor configuration using Langmuir probes. Predictive modeling of the wall plasma with the SOLPS-ITER code has been carried out, which demonstrated the presence of radial currents in the boundary layer, which are of a neoclassical nature.

For the first time in a spherical tokamak, it was possible to replace a part of the inductive discharge current with a current dragged by RF waves of the intermediate frequency range (2.45 GHz), slowed down in the toroidal direction.

Plans for further research are discussed. Increasing the field and current up to the design values (1.0 T and 0.5 MA) and the neutral injection power up to 2 MW is scheduled. Increasing the power of the lower hybrid current injection system is planned. The use of new diagnostic equipment, including multi-frequency Doppler reflectometer, scanning system of neutral analyzers, repetitively pulsed laser and Thomson scattering spectrometers, dispersive interferometer, multichannel active charge exchange spectroscopy, etc. is designated.

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