Edge plasma studies on the Globus-M2 tokamak using a movable Langmuir probe

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Langmuir probes can provide high temporal and spatial resolution and are therefore widely used in studies of the peripheral plasma in tokamaks. On the Globus-M2 tokamak a nine-pin Langmuir probe was installed to measure simultaneously the ion saturation current, floating potential, electron temperature and Mach number [1]. When determining the electron temperature, both the triple-probe technique and the recording of the probe current–voltage characteristic were implemented. The Mach number was calculated from the ratio of ion saturation currents of the electrodes located on opposite sides of the protrusion on the probe head [2]. In this work, edge plasma parameters and their fluctuations were measured. In the scrape-off layer, turbulent transport dominates over collisional transport [3]. Obtained Langmuir probe data demonstrate that radial turbulence-induced particle flux significantly decreases at the transition from the low to the high mode of confinement. A designed probe circuit made it possible to measure the time evolution of the electron temperature during ELM events. Also, it was found that with a normal orientation of the toroidal magnetic field, i.e. if the ion $\boldsymbol{B}\times\nabla\boldsymbol{B}$ drift is directed toward the active X-point, a plasma flow in the direction from the outer to inner divertor targets is observed. The experiments were performed at the unique scientific facility “The Globus-M Spherical Tokamak”, which is a part of the Federal Multiple-Access Center “Material Science and Diagnostics in Advanced Technologies”.

References

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