Diagnostics of the near-wall plasma in the PLM-M device at testing of the heat-protective components of the tokamak-reactor [[1]](#footnote-1)\*)

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During plasma tests of the plasma-facing in-chamber components of the ITER divertor and the future thermonuclear tokamak reactor (FNS, DEMO), the interaction of plasma with materials causes surface erosion [1] and the entry of eroded materials into the near-surface plasma. As a result, there are plasma screening effects and changes in the plasma-wall interaction. The task is to create diagnostic systems for measuring plasma parameters in such a modified near-surface layer, which can be from several centimeters to millimeters thick. The transport of particles and heat through such a layer depends both on the average values ​​of the concentration and temperature of electrons and ions, and on the properties of plasma turbulence. Measurement of plasma and heat fluxes onto a material surface should be carried out to assess the contribution of erosion effects, arc effects to the processes of plasma-wall interaction and, as a result, to the level of thermal load on the in-vessel components of the reactors. Such measurements should be carried out in conjunction with recording the temperature of the material surface and heat exchange between the surface and the cooling system of the components.

At modified PLM installation (plasma linear multicusp - PLM [2]) at the MPEI it was developed and manufactured a probe diagnostics system for measuring the plasma concentration, electron temperature, characteristics of plasma turbulence and heat fluxes in the near-surface zone above the tested components of the first wall and divertor of large-scale tokamak. The system consists of measuring Langmuir probes, an electromechanical manipulator for reciprocated Langmuir probes, an autonomous power supply system for probes, measuring thermocouples, and a system for recording signals of probes and thermocouples. Measurements of the characteristics of the near-surface plasma over a tungsten module with a surface structure of the "fuzz" type have been carried out. The characteristics of the spectra of the near-surface turbulent plasma have been estimated; they are typical for the near-wall plasma of large-scale tokamaks and plasma thermonuclear devices. Turbulent signals indicate strong turbulence of the near-surface plasma in the frequency range from 1 to 1000 kHz, which indicates a drift-dissipative type of turbulence.

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Pt/ru/GT-Rogozin.docx) [↑](#footnote-ref-1)