PARAMETERS OF THE PLASMA FLOW OUTFLOW FROM THE NOZZLE OF THE PLM-M MAGNETIC PLASMA INSTALLATION [[1]](#footnote-1)\*)

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Successful space exploration requires the development of space transportation systems. One of the promising directions in the development of traction systems is magnetoplasmodynamic accelerators (MPDA) [1].

The PLM-M installation [2] at NRU MPEI can be used to develop technologies and advanced designs of MPDU. The setup is equipped with three solenoids that can form the configuration of the plasma nozzle. The radii of the solenoids are 90 mm, 82.5 mm and 150 mm. The configuration of magnetic fields was simulated at currents in the main and additional solenoids of 200 A, 85 A, and 120 A, respectively. According to the calculation results, in the center of the main solenoids, the magnetic field reaches 35 mT, and in the zone of plasma flow outflow into the receiver, from 5 to 15 mT. For additional plasma heating, an ICR heating system using a helicon antenna is provided.

The plasma parameters in the receiver region of the PLM-M facility are determined by optical methods. The measurements were carried out with an AvaSpec-ULS2048x16-USB2-RM optical spectrometer (0.5 nm channel resolution). The electron temperature according to the analysis of the intensities of the spectral lines is 2 eV, the electron concentration is ne~1013 cm-3.

The configuration of magnetic fields was simulated in the COMSOL Multiphysics 5.6 program at currents in the main and additional solenoids of 200 A, 85 A, and 120 A, respectively. The radii of the solenoids are 90 mm, 82.5 mm and 150 mm. The cross section of the conductor is assumed to be square with dimensions of 2x2 mm. According to the calculation results, the magnetic field in the center of the main solenoids reaches a value of 35 mT, while at the outlet of the installation, the values ​​lie in the range of 5–15 mT.

Further work will be aimed at measuring the thrust of the outflowing plasma flow into the receiver, implementing an additional plasma heating system, and, ultimately, creating a prototype magnetoplasma accelerator with liquid metal lithium electrodes.

References

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