INVESTIGATION OF PLASMA PROCESSES IN HIGH-POWER ELECTRODELESS PLASMA ROCKET ENGINES [[1]](#footnote-1)\*)

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The electrodeless plasma rocket engine (EPRE) is one of the most promising candidates for replacing chemical engines for interplanetary flights. Such an engine basically consists of three blocks: a helicon cold plasma source (HCPS), a plasma flow heating unit based on ion cyclotron resonance (ICR) and a magnetic nozzle in which the outflow jet is formed, as well as thrust and specific impulse are created. All three blocks are interconnected by a single magnetic field configuration. Currently, the task is to study the processes of creating and accelerating the plasma flow, as well as its disruption from the magnetic field lines in powerful EPRE.

As a model of the EPRE, the PN-3 stand is considered, which not only has all the components inherent in the EPRE, but also the ability to change external parameters such as the grade and flow rate of the working gas, as well as the method of its supply, the amount of input power, the magnitude and configuration of the magnetic field in a wide range. A diverse diagnostic complex allows you to take spatial and temporal distributions of the main plasma parameters, as well as to make cross-measurements with several different diagnostics simultaneously.

Using Langmuir probes, spatial distributions of plasma density and electron temperature in the plasma flow flowing out in the magnetic nozzle were obtained, as well as the dependences of these values on the configuration of magnetic fields, the flow rate of the working gas, and the value of the RF power input. The obtained dependences were confirmed by parallel measurements using other diagnostics - laser-induced fluorescence, optical emission spectroscopy and interferometry.

The obtained dependences allow us to give recommendations on the method of supplying the working gas, as well as the magnitude and configuration of the magnetic field for high-power EPRE.

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