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THE RESULTS OF THE FIRST EXPERIMENTAL STUDIES OF THE PLASMA OF A MODEL OF A HELICON TRUSTER WITH AN HTS MAGNETIC SYSTEM *)

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Research in support of the creation of a domestic high-power electrodeless plasma rocket truster (EPRT) is being conducted at the Kurchatov Institute Research Center. One of the varieties of such an truster is the helicon plasma rocket truster GPRT). This truster:

- provides the possibility of using a wide range of elements and their compounds as a working fluid, including outboard air;
- in principle, has a simple design and can provide a long service life and high reliability.

GPRT operation requires a magnetic field of a special configuration, which ensures the creation and acceleration of plasma flow. Plasma is created by ionization of the working fluid by helicon waves, and thrust is created by acceleration and formation of a plasma stream in a magnetic nozzle [1].

To create the required magnetic field at the experimental stand PN-3, magnetic coils made on the basis of a high-temperature superconductor (HTS) of the second generation in the form of a tape with a width of 12 mm are used [2]. The maximum field on the axis of the magnetic system is 0.7 T.

The PN-3 stand has a pumped chamber with a volume of 5 m^3 and high-vacuum pumps, cryogenic and turbomolecular, with a total pumping speed of up to 20 m^3/s in argon, allowing for studies of plasma processes in the magnetic nozzle of the GPRT layout with a working gas flow rate of up to 20 cm^3/s. The stand includes a well-developed diagnostic complex, including a variety of optical and corpuscular diagnostics, a microwave interferometer.

This paper presents the results of the first experimental studies conducted on the created model of the GPRT. Argon was used as the working gas. The dependences of the main parameters of the plasma flow flowing out of the engine on the magnitude of the magnetic field induction (current in the coil) and the flow rate of the working gas are shown, and the dependences of the radial distributions of the electron temperature and plasma density on these parameters are presented.

References

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