Investigation of a RF-discharge by Langmuir Probe Diagnostics and Optical Emission Spectrometry (OES) [[1]](#footnote-1)\*)

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The helicon-type RF-discharge is widely used for the development of a space plasma engine, testing of materials for thermonuclear installations, in mechanical engineering, medicine, due to its greater efficiency. We note the technical simplicity of this plasma source; for their operation, RF generators at industrial frequency (13.56 MHz and 27.12 MHz) are used, operating on simple antennas in the presence of a weak magnetic field (from 0.01 to 0.2 T) , low operating pressure 0.1 to 50 Pa, the plasma has an electron temperature about 10 eV and a electron density up to 1020 m–3.

In this work, using an RF-compensated Langmuir probe, the electron energy distribution function (EEDF) is constructed, the electron density and electron temperature are determined as a function of pressure [1]. The measurements were carried out in the pressure range of 10–500 mTorr. On fig. 1 shows a schematic diagram of the experimental stand. Energy with a power of 2 kW from the RF generator is transferred to the antenna through a matching system. The magnetic field has values ​​from 1 mT to 72 mT, which will satisfy the condition for excitation of electromagnetic helicon waves at a frequency of 27.12 MHz. Working gas: argon and helium. A cooled antenna has been developed that will allow a stationary mode of operation.

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| Fig. 1. Schematic diagram of the experimental stand |

Optical spectroscopic measurements of the intensity of the spectral lines of the atomic and ion plasma-forming gas have been carried out. The density and temperature of electrons are estimated using the collisional-radiative model for describing the state of plasma [2].

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References

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