FIRST RESULTS OF ion cyclotron heating of hydrogen plasma [[1]](#footnote-1)\*)

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The PN-3 facility is designed to study the processes in the electrodeless plasma thruster. The working mass (hydrogen, argon, neon, etc.) is fed into a quartz glass tube, where it is ionized using a helicon plasma source. To study the detachment of the plasma flow from the field lines in the magnetic nozzle, it is necessary to accelerate the plasma produced in the source. For this purpose, it is proposed to put energy into the transverse motion of ions by the method of ion-cyclotron resonant heating (ICRH). The transverse component of the kinetic energy of the ions, which is further converted into a longitudinal component in the volume of the magnetic nozzle. Thus, the ICRH system will make it possible to intensify plasma detachment in the region under study.

In experiments, hydrogen acts as a working gas, which is determined by the magnetic configuration of the setup and the frequency of the high-frequency (HF) generator.

It should be noted that ICRH occurs when the known relation [1] is fulfilled. This condition forms a set of technical requirements necessary for the implementation of this heating method.

The paper demonstrates the results of designing and modernization the PN-3 to create conditions for the ICRH for heating hydrogen plasma. In particular, the modification of the vacuum system of the hydrogen pumping stand, and the implementation of the RF source system at a frequency of 1.7 MHz with a power of up to 10 kW.

Also, the report presents the first results of experiments in which the energy spectra of ions were measured by the grid analyzer, the electron density by a heterodyne microwave interferometer, as well as measurements with a traction meter.

References

1. Timofeev A. V. On RF heating of inhomogeneous collisional plasma under ion-cyclotron resonance conditions //Plasma Physics Reports. – 2015. – Т. 41. – №. 11. – С. 873-881
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/Lt/ru/FM-Sukhov.docx) [↑](#footnote-ref-1)