ANTENNA SIMULATION AND THE EXPERIMENT PLANNING ON ION HEATING ACCORDING TO THE “MAGNETIC beach” SCHEME IN THE CENTRAL TRAP OF THE GOL-NB FACILITY [[1]](#footnote-1)\*)

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The heating of ions with the help of electromagnetic radiation is a good method for expanding the range of operating parameters for the experiment on multiple-mirror confinement at the GOL-NB facility [1]. To test the feasibility of such heating, a scheme based on the “magnetic beach” method was proposed [2,3]. In such scheme, the Alfvén wave is launched from a region with a stronger field. The transfer of energy to ions occurs when the wave reaches the conditions of ion-cyclotron resonance in the working zone.

The magnetic fields in the GOL-NB facility [4] are 0.3 T in the central part and 4.5 T in the multiple-mirror sections. The corresponding cyclotron frequencies of hydrogen ions lie in the range of 4.56-68.4 MHz. Based on the configuration of the magnetic field in the central part, a frequency of 13.56 MHz, which has a resonance in a field of 0.89 T, was chosen to excite the wave. The antenna that launch the wave is located in a field of 1.1 T. Calculations carried out for the GAMMA-10 facility, which has similar parameters, show that at an operating plasma density in the trap of 3∙1019 m−3, the energy transfer will occur predominantly in the peripheral region [5], which will make it possible to observe the energy transfer to the plasma by changing its glow profile.

An antenna consisting of two half-turns is proposed for excitation of a wave in the plasma. The antenna was modeled using a 3D modeling package. The fields created by the antenna were calculated, and the parameters were optimized. In addition, the parameters of the incoming RF radiation path were also calculated.

The power supply system to the antenna consists of an RF generator with a power up to 25 kW, a matching device and connecting coaxial cable.

In experiments on energy transfer from the Alfven wave to ions in the central trap of the GOL-NB facility, it is planned to use the diagnostics available at the facility. Cameras and fast video cameras for visual control of the absence of failures in the antenna operation and changes in the plasma glow profile. Spectrographic diagnostics for detecting changes in plasma temperature along the width of the H-alpha line profile. In addition, to detect wave propagation in plasma, it is planned to create movable RF probes.

References

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