CONCEPTUAL DESIGN OF FUSION REACTOR MATERIALS PLASMA IRRADIATION MOCKUP BY HELICON SOURCE [[1]](#footnote-1)\*)

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Sources of low-temperature plasma are currently widely used in a wide variety of fields of science and technology. Plasma sources are used both for domestic and technological applications (light sources, microelectronics production, plasma processing of materials), and in scientific research, in particular, for the experimental study of wall processes and plasma effects on materials that are supposed to be used for the inner lining of fusion facilities. The principle of plasma sources action is based on various gas ionization methods: ionization of molecules in a glow gas discharge, gas ionization by electron impact, excitation by high-frequency (HF) and ultra-high-frequency (microwave) current sources, etc.

One of the most common plasma sources for linear plasma generators (LPG) is an arc source with a glowing cathode, the operating life of which is very limited by sputtering processes. In addition, the atomized cathode material introduces an impurity into the plasma and can contaminate the surface of the irradiated samples. The transition to a high-frequency helicon plasma source, which is one of the most promising plasma sources for a linear plasma trap [1, 2], avoids the problems described above. High discharge efficiency of this type will allow the creation of a plasma with a high density. An important feature of the discharge — plasma generation near the axis of the plasma chamber — will make it possible to minimize plasma losses to the chamber walls, and therefore, reduce thermal loads and switch to a quasistationary mode [3].

The paper presents the conceptual design results of the laboratory experimental setup (HPS-2) based on a 13.56 MHz helicon plasma source with a power of 2 kW. Several magnetic coils will provide magnetic fields up to 0.2 T. The working gas of a plasma source is hydrogen isotopes with the possibility of adding helium, neon or argon. The facility is designed to study the interaction of plasma with promising materials of fusion reactors. The technical solutions used in the design will make it possible to obtain the flux density of deuterium ions in the interaction chamber in the range of 1020 - 1022 ions/s·m2 (up to 100 А/m2).

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References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Pt/ru/GP-Ananyev.docx) [↑](#footnote-ref-1)