COMPARATIVE ANALYSIS OF HIGH-FREQUENCY PLASMA DRIVERS WITH DIFFERENT FARADAY SCREENS FOR MULTISECOND OPERATION [[1]](#footnote-1)\*)

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Gavrisenko D., Shikhovtsev I., Belchenko Yu., Gorbovsky A., Kondakov A., Sotnikov O., Vointsev V., Finashin R.

Budker Institute of Nuclear Physics, Novosibirsk, Russia, [d.gavrisenko@g.nsu.ru](mailto:d.gavrisenko@g.nsu.ru)

Atomic beam injection is one of the main methods of plasma heating in thermonuclear installations. As part of the implementation of the federal project "Development of technologies for controlled thermonuclear fusion and innovative plasma technologies", at the Budker Institute of Nuclear Physics of the Siberian Branch of the RAS, an atomic injector of the megaelectronvolt energy range for heating is being developed, based on the acceleration and neutralization of a negative hydrogen ions beam [1]. To obtain the beam, a high-frequency surface-plasma source is used. The inductive RF discharge is maintained inside the cylindrical volume of the RF driver when an RF voltage is applied to an external three-turn antenna [2]. To prevent overheating and erosion of the ceramic wall of the driver, a protective cylindrical Faraday screen with longitudinal slots is installed inside. The shield reduces the efficiency of transferring RF power into the discharge. The purpose of this work is to analyze and compare RF drivers with various protective shields and RF antennas in multisecond pulses.

The experiment was carried out at a test stand, which is a vacuum volume with an RF driver installed on it. The stand is equipped with a grid probe on a vacuum movable input. The stand cooling system has flow and water temperature meters. A thermal imaging camera was used to measure the surface temperature of the RF driver elements.

Three different protective screens were analyzed in the experiments. The dependence of the ion current density at the driver output on the input power is obtained for different screens and different antenna configurations. The removed power by water cooling from the protective screen was measured in pulses with a duration of 30 seconds. Screen and driver temperatures are measured.

As a result of the experiments, protective screens with different designs were tested. An analysis of the thermal loads distribution on the RF driver elements was conducted. Limitations on the duration of the RF driver operation when using various protective screens are determined.

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References

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