PLASMA FORMATION IN OPEN MAGNETIC TRAP SMOLA WITH HELICOIDAL FIELD [[1]](#footnote-1)\*)

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The key problem of plasma confinement in linear open systems is the low energy plasma lifetime caused by longitudinal losses of particles and energy. To solve this problem, the concept of helical plasma confinement was proposed, based on multi-mirror confinement with moving magnetic mirrors in the plasma reference frame [1, 2]. The concept theoretically predicts an exponential dependence of the loss suppression efficiency on the length with a helical field [1]. SMOLA device has been designed and developed for experimental verification of this confinement concept at the BINP SB RAS. The SMOLA device consists of input expander with discharge forming system (plasma source), transport section with helical and straight solenoids for decelerating or accelerating the plasma flow depending on direction of plasma rotation and exit expander with radial segmented endplate. [2]. In experiments on this device, the principal operability of the confinement method was shown [3].

An important issue, which solution determines the experimental confirmation of the efficiency of the idea of helical confinement, is the choice of the optimal regime of plasma formation in the device. Generation of a plasma flow in the SMOLA device is carried out by the axially symmetric plasma source with a thermionic LaB6 cathode and a hollow copper anode. In connection with the question posed, it is necessary to investigate the dependences of the parameters of the formed plasma (plasma discharge current, plasma density, temperature, potential, as well as the gas balance in the plasma) on the external experimental conditions (anode - cathode voltage, the amount of gas consumed and the value of the cathodic magnetic insulation).

A series of experiments were carried out to study the stable regime of plasma formation in the SMOLA device. The diagnostic complex used in the experiments includes probe and optical diagnostic methods. Using the probes system (Langmuir probes, Mach probe, magnetic probes), parameters such as density, temperature and plasma electrical potential are measured. Optical diagnostic (spectrometer with high spatial resolution) provides information on plasma rotation.

In the report, the dependences of the plasma flow, its density, electrical potential, discharge current, and other parameters of the discharge system on the initial experimental values of the plasma source are described.

References

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