OPTIMIZATION OF TARGET PLASMA PARAMETERS IN THE EXPERIMENT AT THE CAT INSTALLATION [[1]](#footnote-1)\*)

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Kolesnichenko K.S., Voskoboynikov R.V., Ivanov R.St., Korobeynikova O.A., Murakhtin S.V., Savkin V.Ya.

Budker Institute of Nuclear Physics of SB RAS, Novosibirsk, Russia, k.kolesnichenko@g.nsu.ru

At the Budker Institute of Nuclear Physics of SB RAS, the new installation CAT (Compact Axisymmetric Toroid) was put into operation, which is an axially symmetric mirror cell with powerful atomic injection. The purpose of the planned experiment at this facility is to create and study the confinement of a population of hot ions with an extremely high β→1. The possibility of passing to a field-reversed configuration is also considered. It is assumed that neutral beams of hydrogen or deuterium with a particle energy of 15 keV and a total power of more than 2 MW will be injected into the target plasma previously created in the magnetic mirror. According to earlier calculations [1], for efficient accumulation of hot ions resulting from the capture of atomic beams, it is necessary that the electron temperature of the target plasma be in the range of several tens of electron volts, and the linear density should be sufficient for effective capture of beams. To generate a target plasma with the required parameters, the previously developed technique of plasma injection into an ambipolar trap is used [2]. The essence of the technique is to use a gas-discharge source, which has a discharge channel with an annular configuration and operates in a magnetic field. The differential plasma rotation arising due to the E×B drift leads to the development of the Kelvin-Helmholtz instability, which in turn causes the ions of the generated plasma jet to heat up to 200-300 eV. Due to Coulomb collisions, ions transfer energy to plasma electrons. To suppress the electron thermal conductivity between the mirror cell and the plasma generator, a thermal barrier is formed using a special magnetic coil.

The report will present the results of detailed studies of the parameters of the target plasma generated in this way and describe the results of the search for the optimal ratio for the capture and confinement of hot ions between its linear density and electron temperature.

References

1. Yu.A. Tsidulko, I.S. Chernoshtanov, AIP Conference Proceedings, 1771, 040005, (2016), 10.1063/1.4964190/
2. Kabantsev A.A. Neustojchivosti strui mishennoj plazmy. Diss. cand. fiz.-mat. nauk. [Instability of the target plasma stream. Dr. phys. and math. sci. diss.], Novosibirsk, 1991
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Mu/ru/AV-Kolesnichenko.docx) [↑](#footnote-ref-1)