DEVELOPMENT OF ATOMIC INJECTORS AT BINP SB RAS [[1]](#footnote-1)\*)

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The report presents the work on atomic injectors and ion sources carried out at the Budker Institute of Nuclear Physics of the Siberian Branch of the RAS within the framework of the federal project "Development of technologies for controlled thermonuclear fusion and innovative plasma technologies".

At present, a prototype of an atomic injector for the GDT installation is being assembled. The beam power of fast hydrogen atoms is 1.7 MW at an atomic energy of 15 keV. The beam duration is 30 ms in the basic version and 300 ms for the version of the ion source with cooled electrodes of the ion-optical system. A distinctive feature of the injector is a record ion beam current of 150 A. The ion source is based on four plasma arc generators and a three-electrode ion-optical system. The design of arc-discharge plasma generators has been improved, the operating pulse duration has been increased to 1 sec, and the service life of the generators is 1 year.

An ion source with an ion energy of 100 keV and a beam current of 75 A is being developed. After the neutralizer, the atomic beam will have a power of 3.5 MW when operating on deuterium. The radio-frequency plasma source has two drivers mounted on a plasma chamber with a multipole magnetic wall attached to a three-electrode ion-optical system. The initial beam size is ~220 mm x 430 mm, the emission current density is 190 mA/cm2. The electrodes have a slot structure, completely water-cooled, designed for stationary operation.

A project of an atomic injector based on negative hydrogen ions with an energy of 500 keV is being developed [1]. The experimental basis for this work is the accelerator bench of a high-voltage injector, created at the BINP SB RAS. According to the technical task, BINP is to manufacture and test an accelerating tube for an energy of 400 keV and a stripping plasma target, which can be prototypes for a heating injector for the developed TRT tokamak [2].

Two ion sources are being developed based on negative hydrogen ions with an energy of 120 keV and a current of 1.5 A and 9 A. The first one has one RF driver with a power of up to 60 kW at a frequency of 4 MHz, an expansion plasma chamber with a multipole magnetic -optical system with 25 holes. Experiments with the ion source are carried out on the bench of the high-voltage injector. The 9A ion source has four RF drivers, an expansion plasma chamber, and a three-electrode IOS with 145 apertures. The ion source is currently being assembled.

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References

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