OPTIMIZATION OF THE IOS FOR FORMATION OF A POWERFUL ATOMIC BEAM WITH TUNABLE ENERGY [[1]](#footnote-1)\*)

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Injectors of powerful beams of fast hydrogen atoms are widely used for plasma heating and stabilizing in installations with magnetic confinement [1]; the review [2] shows the long-term experience of the Budker Institute in creating powerful atomic injectors based on positive and negative ions. This report is devoted to the study of the problems of the powerful ion beams formation in ion-optical systems (IOS) with tunable energy. Previously, atomic beam injectors were developed for the C-2W installation of TAE (USA), in which the energy of particles during a pulse can vary according to an arbitrary time scenario from 15 to 40 keV with a constant extracted current of the IOS [3].

To implement such a scenario, a four-electrode IOS was used in which a 15 keV beam with a required current of 150 A is formed in the first gap, and then increases to 40 keV by accelerating in the second gap (acceleration-additional acceleration scheme). Although such a scheme allows keeping constant the value of the extracted current, however, for some range of the accelerating voltage the optimal conditions of the beam formation are violated and the angular divergence increases markedly, which is confirmed by modeling calculations [3]. With a further increase in the beam energy, the angular divergence monotonically decreases and becomes equal to or less than the initial one.

In order to avoid this phenomenon of an increase in angular divergence in the area of non-optimal values of the accelerating voltage, the optimization of the IOS operation scenario was carried out by modeling the formation of a beam in various acceleration modes. In the calculations, it was found possible to redistribute the voltage at the gaps of the IOS in such a way as to avoid deterioration of the angular characteristics of the beam. Such acceleration modes were experimentally confirmed.

References

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