——————————————————————— S1-P-049002 ———————————————————————

# AUXILIARY DISCHARGE OF A WIDE APERTURE ELECTRON ACCELERATOR BASED ON ION-ELECTRON EMISSION*

*A.A. GRISHKOV, M. S. VOROBYOV, S. Y. DOROSHKEVICH, V. A. SHKLYAEV*

*Institute of High Current Electronics SB RAS, Tomsk, Russian Federation*

In this paper, the region of the auxiliary discharge of an electron accelerator based on a non-self-sustained high-voltage glow discharge is investigated. The paper presents the developed analytical model and the results of numerical simulation of an glow discharge, which plays the role of an auxiliary discharge and is used to generate plasma with subsequent extraction of ions into the main high-voltage gap.

In this glow discharge, two tungsten wires are the anode, and the cathode is the inner walls of the chamber. In the model, these discharge regions are considered as separate independent nodes, which are connected by a layer of conducting plasma that matches the boundary conditions. In this case, it is assumed that the Child-Langmuir conditions are satisfied for both the cathode and anode layers. The developed model, based on the representation of the auxiliary glow discharge as matched electron and ion diodes, makes it possible to estimate the range of possible voltages for each of the near-electrode layers and determine the plasma potential. Then this results was used in further simulation aimed at obtaining the maximum coefficient of electron beam extraction into the atmosphere.
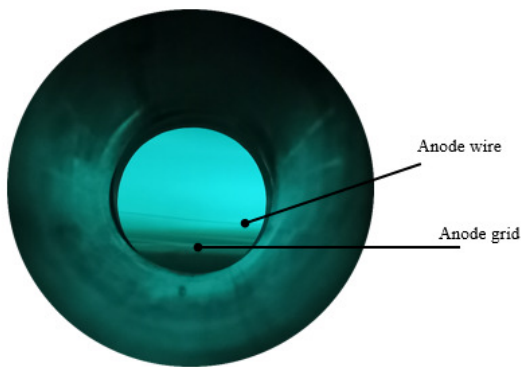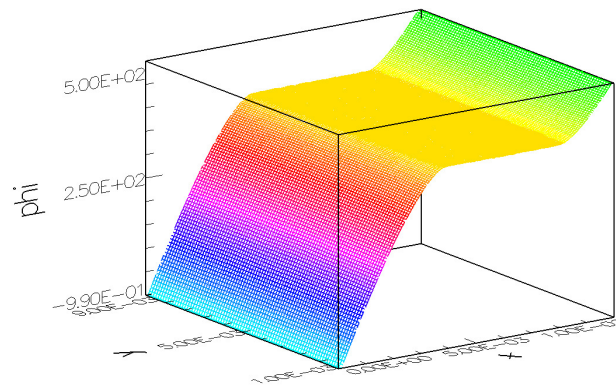


Fig. 1. Helium gas plasma of auxiliary discharge.



Fig. 2. Distribution of potential in the auxiliary discharge in "plane" model. Simulation with xoopic code.

Modeling was carried out using the codes KOBRA3-INP [1] and xoopic [2]. The calculation of the plasma potential and the parameters of the cathode and anode layers agree with the experimental results obtained by the probe method.

## REFERENCES

[1]   KOBRA3-INP, INP Wiesbaden, Junkernstr. 99, 65205 Wiebaden, Germany.

[2]   Verboncoeur J. P., Langdon A. B., and Gladd N. T., An object-oriented electromagnetic PIC code, *Comput. Phys. Commun*. 87, 199 (1995).