Review scientific adviser

in the graduate qualification work of the SPbSU postgraduate student

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Mathematical modeling of the emission systems based on the field electron cathodes

Field emission plays an important role as a source of electrons in many physical processes. The field emitters range of applications are diverse, including electronic vacuum devices, light sources, electron microscopy, and lithography. The electron source is a field cathode made of various materials. The shape of the cathode can be arbitrary, but the emitting surface must have a small radius of curvature. High current density for a small value of the potential in the system is provided due to the small radius of curvature of the emitter's tip.

In this postgraduate qualification work the diode electron-optical systems based on the field emitters is simulated. The field emitters are located on a flat substrate; the anode is a plane parallel to the substrate. Doronin G.G. presented mathematical models of two-dimensional axisymmetric and planar emission systems.

The formulated boundary problems are solved in a cylindrical coordinate system for axisymmetric systems. In addition, the diode system can take into account materials with different dielectric constants. To calculate the electrostatic potential distribution the influence of the field cathode was replaced by the influence of circular charged filaments. As a result, the electrostatic potential distribution was found in an analytical form - in the form of Fourier-Bessel series with known coefficients in the entire area of the system under study.

For plane systems, boundary value problems are solved in the Cartesian coordinate system both for single emitters and for field emitters array with allowance for dielectric interlayers. In simulating, the influence of the field cathode on the potential distribution was replaced by the influence of charged

filaments and planes, which also made it possible to find a solution in an analytical form.

Doronin G.G. writed the programs in C ++ and presented the results of numerical calculations of the electrostatic potential distribution for specific diode systems. The calculations of the field strength are presented too, and dependence of dielectrics characteristics is shown.

The postgraduate qualification work of Doronin G.G. is a complete self-facilitated research and shows a high degree of preparation of the author of the investigation material and certainly deserves an "excellent".

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