Design and simulation of an accelerating and focusing system

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Abstract
Electrostatic focusing lenses have a vast field of applications in electrostatic accelerators and particularly in electron guns. In this paper, we first express a parametric mathematical analysis of an electrostatic accelerator and focusing system for an electron beam. Next, we design a system of electron emission slit, accelerating electrodes and focusing lens for an electron beam emitted from a cathode with 4 mm radius and 2 mA current, in a distance less than 10 cm and up to the energy of 30 keV with the beam divergence less than 5°. This is achieved by solving the yielded equations in mathematical analysis using MATLAB. At the end, we simulate the behavior of above electron beam in the designed accelerating and focusing system using CST EM Studio. The results of simulation are in high agreement with required specifications of the electron beam, showing the accuracy of the used method in analysis and design of the accelerating and focusing system.

Keywords: electron gun - electrostatic accelerator - focusing lens - charged particle transportation

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