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Title:Study of the influence of transverse velocity on the design of cold cathode-based electron guns for terahertz devices
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Abstract:This paper presents the design of an electron gun for terahertz vacuum tubes realized with a nanowire or nanotube cold cathode. This technology is particularly interesting in this field since it allows the reduction of gun dimensions and of power consumption with respect to the thermionic guns. We found that focusing is a rather critical aspect since cold cathodes show a relevant transverse velocity, which increases the divergence of the beam and typically induces high current losses on the anode. An analysis of the parameters that influence the transverse velocity has been performed together with the identification of a proper design procedure that reduces the transverse velocity effects. Different electron guns have been designed that deliver a circular beam in the range of 1-4 mA with a radius in the range of 30 μm.
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