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Title

Low perveance confined-flow Pierce gun for a 0.14 THz broadband folded waveguide traveling wave tube

Source

VACUUM, vol.86, no.3, OCT 8 2011, 335-339.

Abstract

An approach for designing an electron gun for a high efficiency, high linearity 0.14 THz traveling wave tube (TWT), has been presented. A Pierce electron gun of beam perveance 0.0047 mu P has been designed for a high gain, high linearity and high efficiency 014 THz TWT using CST STUDIO SUITE Charged Particle Simulation soft and electronic optical software TAU. The initial gun geometry, as obtained from the Vaughan iterative synthesis method, has been used as input for simulation of the electron gun. An M-type dispenser cathode of diameter 0.8 mm has been used for cathode loading of 2.75 A/cm(2). The magnetic focusing with integral-pole-piece barrel assembly and periodic-permanent magnets (PPM) have been designed using CST and TAU. The practical problem of linking requisite cathode flux to the cathode for confined flow of the electron beam with low convergence factor has been sorted out by gradually increasing the PPM magnetic field. The magnetic field has been increased in steps from the gun and over the first five magnets varying from Brillouin field (B(B)) value to twice B(B) for achieving the electron beam with scalloping less than 10%. Simulation results show that the design method is reasonable for obtaining a 0.14 THz TWT electron gun and periodic-permanent magnets (PPM). 