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Title:Formation of Laminar Electron Flow for a High-Power Sub-THz Gyrotron

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Abstract:This paper describes the design of a magnetron-injection gun for a 100kW, 300 GHz gyrotron. With an increase in power and frequency, performance of the gyrotron becomes quite sensitive to the quality of the electron beam. Formation of a laminar electron flow is essential for the realization of a high quality beam with small velocity spread. In this study, a new method is proposed for the evaluation of the laminarity, and applied to the design optimization of the electrodes. It is found that the laminarity depends not only on the conventional design parameter of the cathode slant angle, but also on the spatial distribution of the electric field inside the beam.

Number of references:7

Inspec controlled terms:electrochemical electrodes - electron beams - gyrotrons - laminar flow - magnetrons - millimetre wave tubes - submillimetre wave tubes

Uncontrolled terms:laminar electron flow formation - high-power subTHz gyrotron - magnetron-injection gun - electron beam - electrode optimization - cathode slant angle - electric field - power 100 kW - frequency 300 GHz

Inspec classification codes:A4785 Applied fluid mechanics - A4715 Laminar flows - B2350 Microwave tubes - E2130 Fluid mechanics and aerodynamics (mechanical engineering)

Numerical data indexing:power 1.0E+05 W;frequency 3.0E+11 Hz

Treatment:Practical (PRA)

Discipline:Physics (A); Electrical/Electronic engineering (B); Manufacturing and production engineering (E)

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