

Design and analytical modeling of folded waveguide traveling wave tube

Abstract

We are developing a simple analytical model for the design of the folded waveguide traveling wave tube (FWTWT). Numerical software does exist for the design of FWTWT but requires large computer run time, is costly and does not provide the physical view for rapid design optimization of the FWTWT. In this paper, the design and analysis of the FWTWT using the spatial harmonics method of the TE_{10} mode of the EM wave are presented. An X-band FWTWT is used to verify this method. The normalized dispersion and beam line equations are used to simplify the design process so that the FWTWT can be designed to operate at any desired frequency. Both the S parameter-ABCD-S parameter conversion method and the equivalent circuit model method using Marcuvitz theorem are used for deriving the S parameters and for the analysis of dispersion curve of the 90° sharp-cornered bend of the FWTWT. The analysis is developed by considering the straight and curved portions of the structure supporting the TE_{10} mode of the EM wave..

Language of Original Document

English

Author Keywords

Folded waveguide traveling wave tube; Normalized dispersion; Spatial harmonic; X-band

Index Keywords

Analytical model; Analytical modeling; Beam lines; Conversion methods; Design and analysis; Design process; Dispersion curves; E-M waves; Equivalent circuit model; Folded waveguide traveling wave tubes; Large computers; Normalized dispersion; Numerical software; Rapid design; S parameters; Spatial harmonic

Engineering controlled terms: Design; Dispersions; Electromagnetic waves; Harmonic analysis; Optimization; Traveling wave tubes; Tubes (components); Vacuum technology; Waveguides

Engineering main heading: Dispersion (waves)