

Design of a Novel Nonlinear Curve Coupling Waveguide Coupler for Sheet Beam Travelling Wave Tube

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A new type of input/output coupler for sheet beam travelling wave tube (TWT) is designed in this paper. The coupler adopts a single coupling waveguide with Chebyshev nonlinear curve profile distributed between two paralleled rectangular waveguides in H-plane, to compact dimensions, ease fabrications, possess a high power capacity and be more convenient for periodic cusped magnet-quadruple magnet (PCM-QM) focusing system. Based on the analytical investigation of the electronic field contour plot, a certain sloping angle of the coupling waveguide is obtained to correct the phase shift and extend the operating frequency bandwidth and suppress the reflection to avoid generating oscillation in slow wave structure (SWS). Simulation results based on the numerical calculation and genetic algorithm built-in Ansoft High Frequency Structure Simulation (HFSS), imply that the coupler achieves a broadband bandwidth ($S_{11} < -20$ dB) of 23 GHz and 10 GHz in W-band, with the coupling coefficient above -0.2 dB.