

A TE₁₃ Mode Input Converter for 0.1THz High Order Mode Gyrotron Travelling Wave Amplifiers

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A technique to launch a circular TE₁₃ mode to interact with the helical electron beam of a 0.1THz gyrotron travelling wave amplifier is proposed and verified by simulation in this paper. The converter consists of a Y-type power divider, a cutoff waveguide, an output cylinder waveguide, grooves and convex strips to suppress the unwanted modes. The high order TE₁₃ mode is excited by a broadband Y-type power divider with the aid of a cylindrical waveguide system. Using grooves and convex strips loaded at the lateral planes of the output cylindrical waveguide, the electric fields of the potential competing TE₃₂ and TE₇₁ modes are suppressed to allow the transmission of the dominant TE₁₃ mode. The converter performance with and without grooves and convex strips are studied and compared, and excellent results have been achieved. The converter without grooves and convex strips has an average transmission \sim -3 dB to TE₁₃ mode, and the conversion to the TE₃₂ and TE₇₁ modes are respectively at -8dB and -10 dB level. After introduced grooves and convex strips, the simulation predicts that the average transmission is \sim -1.8 dB with a 3 dB bandwidth of 7.3 GHz (96.3-103.6 GHz) and port reflection is less than -15 dB. The conversion to the TE₃₂ and TE₇₁ modes are respectively under -15dB and -24dB in the operating frequency band. It shows the loading grooves and convex strips work well to suppress the spurious modes and improve the conversion efficiency of the TE₁₃ mode.