

548. Title:Theoretical and experimental investigation of a Ka-band gyro-TWT with lossy interaction structure

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Abstract:The stability analysis of a Ka-band gyrotron traveling-wave tube amplifier (gyro-TWT) operating in the circular TE₀₁ mode at the fundamental cyclotron harmonic is presented. The small signal linear theory is used to analyze the amplification of operation mode and oscillation of parasitic modes. The optimum dielectric parameters including loss layer thickness and permittivity are given. Propagation loss of operation mode is 3 dB/cm with the thickness of loss layer $d=0.7$ mm and relative permittivity $\epsilon''=11-6j$, and propagation loss per unit length of parasitic modes TE₁₁, TE₂₁, TE₀₂ at each oscillation frequency (24.85 GHz, 27.85 GHz, 61.2 GHz) is 2.5 dB/cm, 6 dB/cm, 7.5 dB/cm, respectively, sufficient to suppress oscillations of operation and parasitic modes. Taking advantage of the optimized parameters of loaded dielectric, a high gain scheme has been demonstrated in a 34-GHz, TE₀₁-mode gyro-TWT, producing 160 kW saturated output power at 40 dB stable gain and 22.8% efficiency with a 3-dB bandwidth of 5%.