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Abstract:A 220 GHz folded waveguide slow-wave structure is designed and its dispersion relation, interaction impedance and circuit attenuation are analyzed. The simulation results show good agreement with the theoretical formula analysis. The folded waveguide slow-wave structure has broad cold bandwidth about 119 GHz, flat dispersion relation, fairly high interaction impedance about 3 Ω and low circuit attenuation for a 220 GHz central frequency. The large signal performance of 27 mm (50 periods) folded waveguide circuit is predicted. Simulations show that the nonlinear gain is 14.5 dB at 220 GHz where beam voltage and current are 20 kV and 10 mA, respectively. A saturated 3 dB bandwidth is 16.3 GHz (211.9 GHz to 228.2 GHz).