Abstracts

Performance of a Two-Junction Array SIS-Mixer Operating Around 345 GHz

C.E. Honingh, G. de Lange, M.M.T.M. Dierichs, H.H.A. Schaeffer, T. de Graauw and T.M. Klapwijk. "Performance of a Two-Junction Array SIS-Mixer Operating Around 345 GHz." 1993 Transactions on Microwave Theory and Techniques 41.4 (Apr. 1993 [T-MTT]): 616-623.

We have made a detailed study of the gain and noise of a SIS heterodyne receiver at 345 GHz. As mixing element we use an array of two Nb-AI/sub 2/O/ sub 3/-Nb SIS junctions in series. The array is operated in a waveguide mount with a backshort and an E-plane tuner. The best receiver noise temperature achieved is 140 K DSB. The embedding impedances were determined by fitting theory to the measured pumped curves. High-quality fits are obtained which constitute the first detailed test of the Tucker-theory at frequencies above 300 GHz. The impedances found by this method are in very good agreement with impedances measured in a scale model at 3.3 GHz. From these embedding impedances gain and noise of the mixer were calculated over a full bias range using the Tucker theory in the three-port low IF approximation. The calculated values are compared to mixer gain and noise as obtained from receiver measuremerits. The observed dependence of mixer gain and noise on bias voltage, pump power and embedding impedance is in good agreement with theory. However the absolute value of the measured gain is a factor .45 ± 0.05 lower than calculated. The measured mixer noise is approximately two quanta, 38±10 K, higher than calculated. These discrepancies appear to be independent of the bias parameters of the mixer.

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