Abstracts

Measurements on a 215-GHz Subharmonically Pumped Waveguide Mixer Using Planar Back-to-Back Air-Bridge Schottky Diodes

P.H. Siegel, R.J. Dengler, I. Mehdi, J.E. Oswald, W.L. Bishop, T.W. Crowe and R.J. Mattauch. "Measurements on a 215-GHz Subharmonically Pumped Waveguide Mixer Using Planar Back-to-Back Air-Bridge Schottky Diodes." 1993 Transactions on Microwave Theory and Techniques 41.10 (Nov. 1993 [T-MTT]): 1913-1921.

This paper presents design and performance data for a 215-GHz subharmonically pumped waveguide mixer using an antiparallel-pair of planar air-bridge-type GaAs Schottky-barrier diodes. The waveguide design is a prototype for a 640-GHz system and uses split-block rectangular waveguide with a 2:1 width-to-height ratio throughout. The measured mixer noise and conversion loss are below that of the best reported whisker contacted or planar-diode mixers using the subharmonic-pump configuration at this frequency. In addition, the required local oscillator power is as low as 3 mW for the unbiased diode pair, and greater than 34 dB of LO noise suppression is observed. Separate sideband calibration, using a Fabry-Perot filter, indicates that the mixer can be tuned for true double sideband response at an intermediate frequency of 1.5 GHz. Microwave scale model measurements of the waveguide mount impedances are combined with a mixer nonlinear analysis computer program to predict the mixer performance as a function of anode diameter, anode finger inductance, and pad-to-pad fringing capacitance. The computed results are in qualitative agreement with measurements, and indicate that careful optimization of all three diode parameters is necessary to significantly improve the mixer performance.

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