Abstracts

Analysis and Optimization of Millimeter- and Submillimeter-Wavelength Mixer Diodes

T.W. Crowe and R.J. Mattauch. "Analysis and Optimization of Millimeter- and Submillimeter-Wavelength Mixer Diodes." 1987 Transactions on Microwave Theory and Techniques 35.2 (Feb. 1987 [T-MTT]): 159-168.

An analysis of the noise of millimeter- and submillimeter-wavelength mixers with GaAs Schottky diodes is presented. This analysis accounts for the correlation of the downconverted components of the time-varying hot-electron noise in the series resistance, and is thus accurate even for cryogenically cooled mixers operated at submillimeter wavelengths. This paper shows that the terms of the series-resistance noise correlation matrix are functions of the Fourier coefficients of the squared diode current $F(I^2)$ rather than the square of the Fourier coefficients of the diode current $[F(I)]^2$, as has been previously presented in the literature. The analysis is used to evaluate the optimization of cryogenic mixer diodes. It is shown that minimization of the diode's I-V slope parameter V/sub 0/ is more critical than reduction of the parasitic elements for millimeter-wavelength operation, while at frequencies above 600 GHz (Lambda<0.5 mm), the junction capacitance is the most crucial parameter. Experimental results from several research groups working with a variety of mixers are presented to substantiate these results.

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