Abstracts

Investigations of the Noise Spectra of Avalanche Oscillators

E.F. Scherer. "Investigations of the Noise Spectra of Avalanche Oscillators." 1968 Transactions on Microwave Theory and Techniques 16.9 (Sep. 1968 [T-MTT] (Special Issue on Noise)): 781-788.

Measured amplitude noise spectra of X-band microwave oscillators rising silicon avalanche diodes are presented and compared with theoretical calculations. It was found that for the investigated diodes, the up-converted low-frequency noise (modulation noise) is the main contribution to the spectrum. In a frequency range extending from 1 kHz to several hundred MHz, the spectral noise power distribution is a sensitive function of the bias network impedance. Improvements in the noise-to-carrier power ratio of 5 to 15 dB were obtained by optimizing the bias network impedance. The dc current dependence of the amplitude noise spectrum is a complicated function of diode and circuit parameters. In general, the noise-to-signal ratio improves with increasing current. At high current densities, a reversal of this behavior may occor due to excess noise generation in the breakdown region and saturation effects of the signal power output. The equivalent rms deviation of the frequency modulation noise spectrum is typically one order of magnitude below that of the RF phase noise contribution due to RF noise sources, The phase noise spectrum of the oscillator is, therefore, not affected by the bias network impedance. Measurements on recent diodes indicate that the noise characteristics can be improved by careful control of the semiconductor device processing.

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