Abstracts

Experimental Evaluation of Noise Parameters in Gunn and Avalanche Oscillators

M. Ohtomo. "Experimental Evaluation of Noise Parameters in Gunn and Avalanche Oscillators." 1972 Transactions on Microwave Theory and Techniques 20.7 (Jul. 1972 [T-MTT]): 425-437.

Equations are presented that express noise-to-carrier ratio and rms frequency deviation of a negative-resistance oscillator with a multiple-resonant circuit in terms of effective available noise power densities of both 1/f and white-noise sources, an effective saturation factor, and an appropriate Q/sub L/ of the oscillator. Experimental evaluation of the noise parameters in Gunn and avalanche oscillators by use of these equations is described. AM and FM noise measurements have been made on X-band Gunn oscillators and Si and GaAs avalanche oscillators for frequency off carriers extending from 1 kHz to 10 MHz. Both 1/f and white noise have been observed in these oscillators. The validity of the above equations has been verified for Gunn oscillators from the dependence of the noise spectra on Q/sub L/. For Gunn oscillators and Si and GaAs avalanche oscillators, the effective noise-temperature ratio for white noise, N/kT/sub 0/, has been found to be 23~29, 41~51, and 38~44 dB, and the effective saturation factor to be 2~2.9, 0.5~2.4, and 2, respectively. An increase of N/kT/sub 0/ with the RF voltage across the diode has been observed in Si avalanche oscillators. Parameters for 1/f noise have also been evaluated approximately.

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