

Abstracts

Low-Noise Millimeter-Wave Receivers

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Over the past several years, significant improvements have been made in solid-state devices (that is, avalanche diodes, Gunn diodes, varactors, mixer diodes, etc.) that have enhanced the overall capability and low-noise performance of millimeter-wave receivers. With these improved devices, it is now possible to configure completely solid-state low-noise millimeter-wave receivers. As is similar in the microwave region, low-noise parametric amplifiers, broad-band low-conversion-loss mixers, and solid-state local oscillators are now available. Furthermore, cryogenically cooled parametric amplifiers and mixers are also being developed that will result in achieving the ultimate in system sensitivity. With the flexibility offered by these completely solid-state millimeter-wave components, it is now possible to design the optimum system configuration for the intended application whether it be an advanced communication system, a sophisticated EW application, a radar system, a radiometric system, or satisfying any of the numerous receiver requirements that are being evolved. This paper explores the trends that are being developed in the millimeter-wave region and their application to system design. The performance criterion of various receiver systems and their sensitivity requirements are presented. A review of the system operating noise temperature concept and the method by which it can be determined and its applicability to low-noise components is demonstrated. A review of the state-of-the-art of low-noise systems and experimental data obtained in the millimeter-wave region is also presented.

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