Abstracts

Electronically Tuned Integrated X-Band Superheterodyne Receiver

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This paper describes the development of a unique, integrated, low-noise, X-band, sweeping superheterodyne receiver. The general configuration of the receiver was dictated by the requirements for typical microwave sweeping receivers, which include low noise figure, large dynamic range, high conversion gain, good image rejection, narrow instantaneous IF bandwidth, wide tuning range, and rapid sweep capability. Figure 1 includes a wideband tunnel-diode amplifier (TDA) to provide an acceptably low noise figure, considering the relatively undistinguished noise performance typical of wideband microstrip mixers when driven by solid-state local oscillators and degraded by high-frequency IF amplifiers. The mixer is of the image-rejection type, consisting essentially of two identical balanced mixers with proper phasing at the signal, local oscillator (LO), and IF-output ports to provide image cancellation. A Gunn device was selected for the internal oscillator, as this type provides ample fundamental X-band power, and is sufficiently quiet to permit electronic tuning with a moderate resonator Q. The latter enables the oscillator to be varactor tuned, thereby avoiding the heavy, bulky, power-consuming electromagnets that are associated with YIG-tuned X-band devices.

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