Abstracts

Intermodulation analysis of dual-gate FET mixers

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A detailed intermodulation analysis of dual-gate FET (DG-FET) mixers is presented. The analysis method is based on a large-signal/small-signal analysis using time-varying Volterra-series methods. The analysis program allows one to probe the internal nodes of DG-FETs to evaluate the nonlinear current components. Therefore, it helps physical understanding of intermodulation distortion (IMD) mechanisms in DG-FET mixers. The program was used to identify the major sources of IMD generation. It was found from the analysis that the nonlinearities due to the output conductance (G/sub d3/ and G/sub d2/) of the lower common-source FET were most responsible for IMD generation. The impact of the upper common-gate FET on IMD generation was also found to be nonnegligible, especially at high local oscillator (LO) power levels. The analysis also predicted the presence of MM "sweet spots" using bias optimization, which was experimentally proved by the fabricated mixers at X- and Ka-bands. The optimized X-band hybrid mixer showed measured intermodulation characteristics (OIP/sub 3/ /spl sim/13.6 dBm) comparable to those of the resistive mixers (OIP/sub 3/ /spl sim/15.3 dBm) with low LO and dc power conditions.

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