Abstracts

A DC-20-GHz InP HBT balanced analog multiplier for high-data-rate direct-digital modulation and fiber-optic receiver applications

K.W. Kobayashi, R.M. Desrosiers, A. Gutierrez-Aitken, J.C. Cowles, B. Tang, L.T. Tran, T.R. Block, A.K. Oki and D.C. Streit. "A DC-20-GHz InP HBT balanced analog multiplier for high-data-rate direct-digital modulation and fiber-optic receiver applications." 2000 Transactions on Microwave Theory and Techniques 48.2 (Feb. 2000 [T-MTT] (Mini-Special Issue on Research Reported at the 1999 Radio Frequency Integrated Circuits (RFIC) Symposium)): 194-202.

This paper reports on a dc-20-GHz InP heterojunction bipolar transistor (HBT) active mixer, which obtains the highest gain-bandwidth product (GBP) thus far reported for a direct-coupled analog mixer integrated circuit (IC). The InP HBT active mixer is based on the Gilbert transconductance multiplier cell and integrates RF, local oscillator, and IF amplifiers, High-speed 70-GHz f/sub T/ and 160-GHz f/sub max/ InP HBT devices along with microwave matching accounts for its record performance. Operated as a down-converter mixer, the monolithic microwave integrated circuit achieves an RF bandwidth (BW) from dc-20 GHz with 15.3-dB gain and benchmarks a factor of two improvement in GBP over state-of-the-art analog mixer ICs. Operated as an up-converter, direct-digital modulation of a 2.4-Gb/s 2/sup 31/ -1 pseudorandom bit sequence (PRBS) onto a 20-GHz carrier frequency resulted in a carrier rejection of a 28 dB, clock suppression of 35 dBc, and less than a 50-ps demodulated eye phase jitter. The analog multiplier was also operated as a variable gain amplifier, which obtained 20-dB gain with a BW from dc-18 GHz, an third-order intercept of 12 dBm, and over 25 dB of dynamic range. A single-ended peak-to-peak output voltage of 600 mV was obtained with a /spl plusmn/35-mV 15 Gb/s 2/sup 5/-1 PRES input demonstrating feasibility for OC-192 fiber-telecommunication data rates. The InP-based analog multiplier IC is an attractive building block for several wideband communications such as those employed in satellites, local multipoint distribution systems, high-speed local area networks, and fiber-optic links.

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