

The Methods to Improve the Wide Dynamic Range using InGaP/GaAs HBT MMIC Double Balanced Mixer for ICS System

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Abstract

This paper describes the MMIC double balanced mixer (DBM) which is designed for the adaptive feedback interference cancellation system (AF-ICS). It is optimized for the dual band operation for PCS and IMT-2000 applications. By using a pre-distortion stage precedes the LO port. To improve the linearity of the mixer, A Gilbert cell multiplier, and an emitter-follower buffer at the RF output feeding into a single amplifier. The results improved by using them are shown in Table 1. The mixer shows a conversion gain of 1.2 dB, a third-order intermodulation distortion (IMD3) of 93.5 dBc, a third order input intercept point (IIP3) of 16.7 dBm, a third order output intercept point (OIP3) of 17.9 dBm, and a 1 dB compression point (P_{1dB}) of 0.15 dBm.

1. Introduction

Modern digital communication systems require the high linearity of the device and no interference. AF-ICS is the system that cancels the unwanted feedback signal which is come back from Transmitter(Tx) antenna to the Receiver(Rx) antenna at the wireless repeater system. The block diagram of ICS in wireless repeater system is shown in Fig.1 Interference canceller generates the signal with the same amplitude and anti-phase as the feedback signal. Each signal is cancelled by combining out of phase and the same amplitude. However this cancelling system can not control all of the feedback signals because of the time-varying factors which they have. So, one feedback signal which has the same variable factors as the signal set in the cancelling system is cancelled out. Thus, the adaptive cancelling system for the time-varying factors is required to cancel the all feedback interference signals [1]. In such AF-ICS, the linearity of the system is very important factor. Especially the distortion caused during the process to mix the signals affect the whole AF-ICS. So, this paper describes the high linearity mixer using some methods to improve it. Actually there are various methods of

designing MMIC mixer to enhance the linearity. Among them the suggested method is the minimize the IMD.

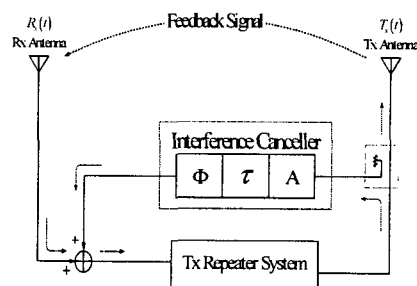


Fig. 1. The general block diagram of ICS in wireless repeater system

2. Design of Double Balanced Mixer

For AF-ICS, high linearity and good isolation between each port are very important issues in mixer up-conversion. The basic topology of the up-conversion mixer is shown in Fig. 2. It is composed of a double balanced mixer that consists of transconductance stages Q1 and Q2 and differential switching pairs Q3 and Q4, Q5 and Q6.