

Abstract

The down-conversion mixer is a key component in the design and development of receivers that can cope with 6G communications. The primary function of the down-conversion mixer is to combine the received radio frequency (RF) signal with the local oscillator (LO) signal to generate an intermediate frequency (IF). This study proposes a differential-input Gilbert-cell active mixer to enhance gain and linearity. Furthermore, the project utilizes an indium phosphide heterojunction bipolar transistor (InP HBT) provided by the Ferdinand-Braun-Institute (FBH). It employs microstrip transmission lines from the TRM process and passive components for the circuit's physical layout development. The research process involves the utilization of the ADS software and the design toolkits provided by FBH through the implementation of a simulation. A wideband differential Gilbert cell mixer with a central operating frequency of 145 GHz, a conversion gain of 9.55 dB, high linearity, high stability, and a system bandwidth of up to 40 GHz has been successfully designed.