Abstract

Wireless applications create special demand for high performance and cost-effective RF front- end receivers. Initial considerations assume 6G targets such as Gbps data rates and more than tens of gigahertz bandwidth. For this purpose, Sub-terahertz region is part of the active research, and this operation involves extreme modulation bandwidths in sub-terahertz (100-300 GHz) spectrum. Aiming to Design and develop a receiver that demonstrates reasonable noise and gain performance in the mentioned spectrum, mixer is considered as one of the key building blocks which needs to be well engineered. A mixer in a receiver chain has the title role to combine the received Radio Frequency signal with a Local Oscillator signal to generate the Intermediate Frequency. This frequency conversion can be done by passive devices and Lumped elements in the circuits, however not effective when it comes to such high frequencies.

The objective of this project is Active Downconverter Mixer design using InP HBT technology of the Ferdinand Braun Institute (FBH). To realize high-speed and efficient connectivity for the 6th Generation of mobile devices with up to 30 GHz bandwidth, 2 novel Single-Ended Mixers have been investigated. The procedure involves linear and non-linear analysis utilizing ADS software built-in features and FBH's provided design kit. Physical layout of the proposed circuits has been developed using Microstrip Transmission Lines in TRM process to verify the results from the schematic. Fabrication and measurement are to be planned as of next step. Mixers exhibit up to 5 dB conversion gain and less than 10 dB noise figure using Y-factor method measurement, more than 40 dB isolation between the three ports and achieving more than 30 GHz bandwidth with high stability based on corresponding parameters.

Keywords: *Broadband, Active, Mixer, 6G, RF-Frontend*