3 DEVELOPMENT AND RESULTS

By analyzing the chosen topology, the values to be used in the resonance circuit located at the load stage for the mixer to operate at the 2.4GHz frequency. In this way, values of 8nH and 0.5497pF were calculated and adopted for the inductors and capacitors, respectively.

In order to achieve a higher conversion gain for the mixer upconverter it is necessary to establish the polarizing current transistors that allow a higher frequency of transit (ft) and consequently a higher transconductance (gm), since the gain of the mixer is directly proportional to gm.

3.1 MOSFET Mixer

For the development of the upconverter mixer using MOSFETs, the transistors with values of W = 10u and L = 130n were dimensioned, width and length of the channel respectively. These values were chosen in order to maintain a minimum L to achieve maximum frequencies and less parasitic capacitances in the circuit. Carrying out a simulation of the transit frequency according to the Vgs voltage and a simulation of drain current Id in function of the voltage Vgs, a bias current Id = 3mA was obtained and transductance equal to 7.5mS obtained by observing the points of the MOS transistor.

Obtained the value of the bias current that produces greater transconductance, just mount the schematic of the mixer upconverter using the values of W and L previously defined and ensure that in the transconductance stage the transistors are polarized with a current Id = 3mA, therefore the mixer will achieve greater conversion gain for the technology used.

3.1.1 Performance Simulations

For what are done as due performance simulations of the upconverter mixer, the circuit of Figure XX is used. This circuit allows simulations of conversion gain, dissipated power and compression point of 1dB.

Figure XX

This circuit has components that play specific roles in the realization of simulations, such as the PORTs that allow an application of input voltage and source impedance, the BALUN is responsible for performing the unbalanced signal transformation and the VCVS sources that attenuate the voltage generated by the PORT of the local oscillator by 50%, creating positive and negative components.

The simulated result of the gain conversion can be seen in Figure XX, where a value of 15, 77dB was obtained for a local oscillator power of 10dBm, observing a power dissipated by the 8.4mW circuit, which exceeds the specification of the upcoonverter mixer, to achieve the specification the bias current was reduced, thereby reducing the power dissipated to 5mW and the conversion gain to 13.95dB.

In order to reach the values mentioned above, the multiplicity of the transistors was changed. Multiplicity is nothing more than transistors placed in parallel.

3.2 CNTFET Mixer