

CHAPTER 5

CONCLUSION

Although many methods have been proposed to improve the input return loss and noise figure of mixer, they usually need the hybrid and use active mixer structure; but that will increase the noise figure and degrade conversion gain. In this thesis we refer to several types of mixer (diode mixer, balance diode mixer, double balance mixer, active gate mixer, active drain mixer, dual gate FET mixer, FET based switching mixer) to create a new structure mixer named “active balanced switching mixer”.

Though there are so many researches devoting to design X-band mixer circuit in the recent years, some issues still left unsolved. There are three major problems in the academic researches: First, the x-band device nonlinear model is not very well especially at FET pinch off region. Second, device manufactory doesn't provide enough small signal s-parameter at variable bias condition. Third, the simulation tool can't fully support noise parameter design.

We had spent much time developing the small signal S-parameter measurement system using HP8510 VNA at X-band and designed TRL calibration-kit for S-parameter measurement. From the experimental works we got good accuracy and reliable results.

We had done the S-parameter measurement of active devices (HJFET) at several bias conditions to design the mixer. In the design procedure we use the Microwave office software to simulate the prototype “active balanced switching mixer “, and the measured result shows good agreement with our requirement and simulation. The main features of the active balanced switching mixer are:

1. Low noise figure → 4.3dB.
2. High conversion gain → 6.5dB.
3. Low cost → Using RO4003 20mil PCB, and package HJ-FET.

4. Small size→Total test PCB size included the circuit Mixer, RF couple, LO couple, and IF Low pass filter is 30 x 18.4mm.
5. Low input return loss→ < -20dB.

Based on the features stated above, we can conclude that the active balanced switching mixers we proposed here could be serve as a very competitive component in satellite and X-band communication system.

