

Goal: Characterize double balanced mixer large signal performance.

* **Absolute Maximum Ratings for Mini-Circuits ZAD-1 Mixer**

* LO Power: +10 dBm

* RF Input Power: +13 dBm

* Be very careful about synthesizer power adjustment so that these maximum levels are not exceeded. The mixer is expensive!

* **Frequency Range:**

* RF/LO 0.5 to 500 MHz

* IF DC to 500 MHz

Mixer Evaluation. Apply a 100 MHz, +7dBm sine wave to the local oscillator input of the Mini-Circuits ZAD-1 mixer. Measure this signal on the spectrum analyzer first to account for cable loss and verify its power level and spectral content. Connect the spectrum analyzer to the IF output of the mixer.

a. Connect the second generator to the RF input of the mixer. Set the mixer input RF signal amplitude to -20 dBm. Select an RF input frequency that will produce a downconversion output at 20 MHz.

Determine the conversion loss at both down and upconversion output frequencies.

b. Change the RF input to the image frequency. Record frequencies and show that the conversion losses are essentially the same.

c. Measure the 1 dB gain compression point for the mixer.

d. Measure the conversion loss of the mixer as a function of LO input power starting from 7 dBm and reducing the LO power in 3 dBm increments. Explain why the loss increases when the LO drive is reduced.

e. Restore the LO power to +7 dBm. Measure the LO to IF and RF to IF isolation. Then, connect the spectrum analyzer to the RF port and measure LO to RF isolation.

f. Reconnect the spectrum analyzer to the IF port. With the RF input power close to the 1 dB compression point, set the reference level of the spectrum analyzer so that the largest output from the mixer is close to the top of the screen. Reduce the resolution bandwidth so that the noise level is less than -70 dBm. Record the frequency and amplitude of all IF output frequencies up to the 5th order. Explain how each frequency was generated (for example, a 4th order product would be $3f_{LO} + f_{RF}$).

Report. Summarize your measurement results. Describe the measurement conditions used for each part above. The report should be short – not a design report. Address each of the steps a.-f. above in the report.