Double Balanced Mixer (DBM) Lab

Utilizing the notes from the DBM lecture, conversion loss, 1 dB compression, isolation, phase detector, and current controlled attenuator will be measured. Due to limited availability of equipment, the network analyzer (NA) will be used as one signal source; the arbitrary function generator can be used as a second signal source. We will also make use of spectrum analyzers, scopes, and power supplies. Choose and note frequencies of the test that are within the DBM range. With the NA, verify that all terminations, pads, and other components are functioning as expected as this will be necessary for all parts of this experiment. Measure everything, assume nothing!

1. **Measuring Conversion Loss**. The DBM used in the lab will require +7 dBm LO drive level. If the NA does not provide this level, an amplifier will be used to get this level. The attenuator in the NA can used to obtain precise power levels. Use the spectrum analyzer to measure the power levels. The pads used are to provide a good match. (Nominally 10 dB pad will provide 20 dB return loss, as the signal must pass through the attenuator twice.) Look up the data sheet on line for the mixer used in the experiment. Measure conversion loss for LO drive of +7 and 0 dBm and compare the results. The RF level should be the nominal listed for the part.

2. **Measure 1 dB compression point**. This setup is the same as for the conversion loss above. The difference here is to vary the level of the RF input over a wide dynamic range, plotting the results and noting the 1 dB compression point for both +7 and 0 dBm LO drive.

3. **Isolation**. Measure the isolation between all ports at a drive level of +7 dBm, i.e. LO to RF, LO to IF, RF to IF. If time permits, repeat at 0 dBm and at different frequencies.

4. **Phase detector**. At 100 MHz, measure the phase detector transfer function, i.e. degrees per volt, plot the results at a power level of +7 dBm. In lieu of a variable delay line, use BNC cables in 1-nanosecond increments until a full 360 degrees is measured. With the RF port terminated, what is the DC offset voltage measured at the IF port? If time permits, repeat for a power level of 0 dBm.

5. **Current controlled attenuator**. At a mid frequency for the DBM, and +7 dBm input to the LO port, measure output RF power as a function of drive current. Either put power supply in current limit mode or measure voltage across a series resistor. Do not overdrive the IF. Max current is available from the data sheet. What happens if the polarity of the current is reversed?