

Transmit composite noise tests on Icom IC-9700 on 2m and 70cm

I ran transmit composite noise measurements on the IC-9700 with a Mini-Circuits +17 dBm ZFM-4H mixer to down-convert the 2m and 70cm transmissions to 14.2 MHz, as measured with Perseus FFT direct sampling receiver / spectrum analyzer.

Here is my setup to be critiqued. The LO is an HP 8642A synthesizer fed into the mixer at +17 dBm. I used high-side injection, but there was no difference whether high-side or low-side injection was used. The conversion loss of the mixer is about 2 dB higher at 2m than 70cm, which is also indicated by the data sheet.

Signal into Perseus can be as high at -2.5 dBm before it over-ranges, when adjusted in 1 dB steps. The on-channel level into Perseus was between -3.5 dBm and -4.0 dBm. I used a 6-dB Mini-Circuits BNC in-line attenuator at the input of Perseus to provide a reasonable termination for the mixer.

Readings of composite noise were taken to the closest 1 dB using the dBm S meter in RMS mode with maximum averaging. For example, if the reading which racks around approximately 0.5 dB read -105.5 dBm, I would record -105 dBm. Similarly, if the on-channel dBm reading was -3.5 dBm, I would subtract 4 dB from the rounded-off reading, and then add 20 dB for the 100 Hz receive bandwidth.

The measurements taken with the +17 dBm mixer, which allowed driving the mixer harder and thus driving Perseus near full scale resulted in virtually identical results as previously with a +7 dBm mixer and a 10 dB in-line pad. (Maximum deviation from previous data was 1 dB.)

On-channel testing demonstrated the mixer was not even in 0.1 dB gain compression. Noise floor of Perseus with a 100 Hz bandwidth is -133.5 dBm. The lowest level of composite noise measured was on 2m at 100 watts and 100 kHz offset at -113 dBm, or 20 dB above Perseus noise floor.

The specified phase noise of the HP 8642A is as follows when used on the following bands:

2m -141 dBc/Hz @ 20 kHz & -144 dBc/Hz @ 200 kHz offsets

70cm -137 dBc/Hz @ 20 kHz & -144 dBc/Hz @ 200 kHz offsets

The effect of the mixer LO noise should cause minimal degradation of the measurements. Performance of HP products are typically better than the specifications.

Rev A