J. Effland 22 Feb 2008

1. Summary

Oscillation problems in Cartridge B6-007 (link) have caused a delay in the ALMA schedule, and consequently, a careful search for spurious signals is underway for Cartridge B6-003 which will replace that cartridge in FE-001. The following checks are planned:

1. Explain all spikes found in noise temperature and gain measurements with 4K stage heated to 4K
2. Remeasure cartridge noise temps with 4K stage cooled to minimum temperature.
3. Examine output powers with spectrum analyzer

This note reports on Item 1, but just for Pol 0. Results for Pol 1 and Items 2 and 3 will be available later today.

Spikes have been found in noise temperature and gain for Pol 0, but this report shows that they are unrelated to spikes in output power. We intend to remeasure those frequencies (LO = 221 and 229 GHz) for the PAI Report, but given the problems with B6-007, it's important to explain all spikes found in our measurements.

2. Spikes in 4K Noise Temperature and Gain Measurements

Figure 1 shows cartridge gain with spikes for LO = 221 GHz in both upper and lower sidebands. Figure 2 is the same data plotted *vs*. IF for all LO frequencies.

Figure 3 shows that the spikes resulted from an anomaly in the measurement system at this frequency because they are even observed in the physical temperature of the RF hot load, as well as the total receiver power measured when looking into the cold load. The physical temperatures are measured with the LakeShore Temperature Monitor.

The power in 100 MHz bandwidth for each sideband while the receiver is looking at the cold load is shown in Figure 4 and shows no spikes.

Spikes in cartridge noise temperature are evident in Pol 0, IF = 4.8 GHz for LO = 221 and 229 GHz as seen in Figure 5. An examination of the parameters used to calculate receiver noise temperature, Figure 6 and Figure 7, shows no spikes are evident in the noise powers for this receiver. Note that Figure 6 and Figure 7 show receiver temperatures, in contrast to cartridge temperatures, so that warm IF corrections don't account for the spikes. Since the spikes remain in the receiver temperature plots, the warm IF is not the cause of the spikes.

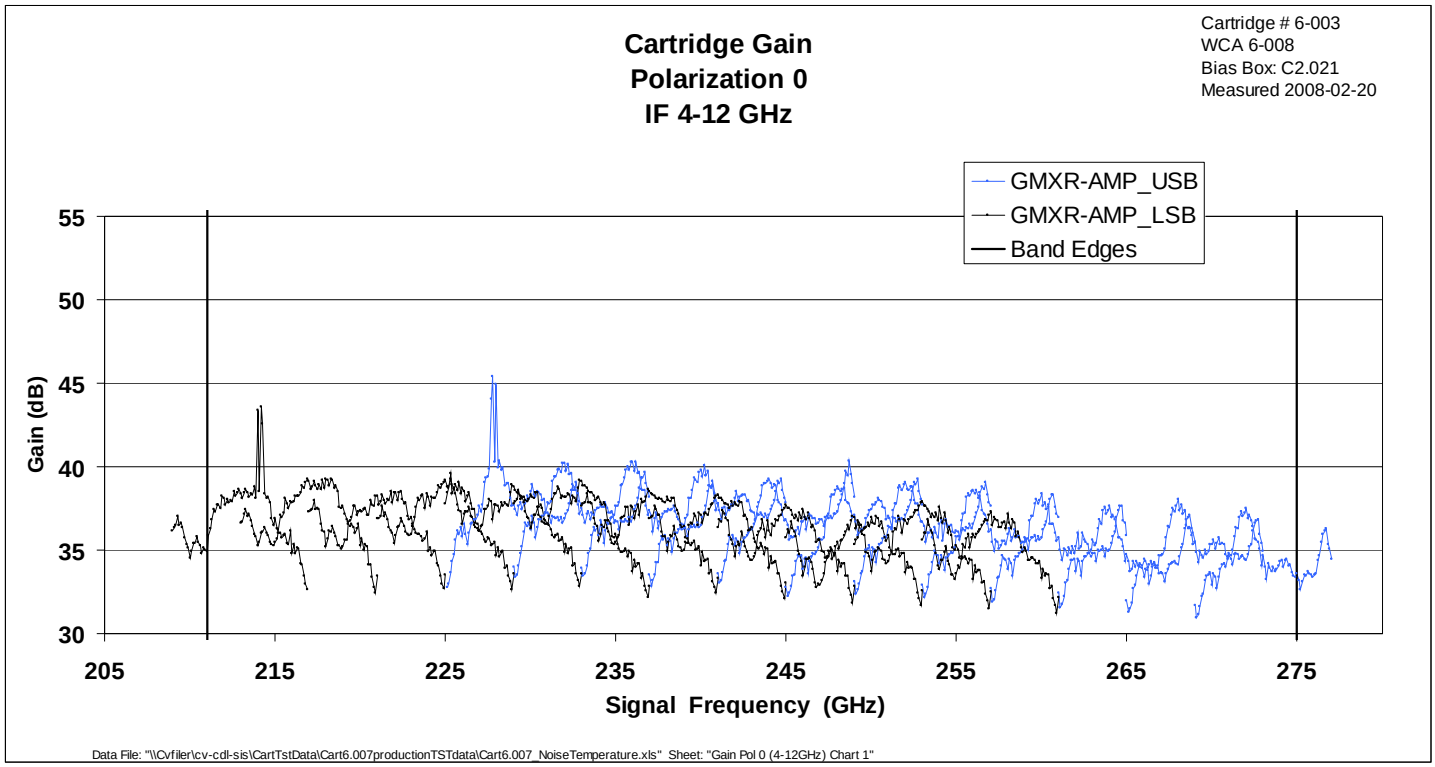

Figure 1: (Source)

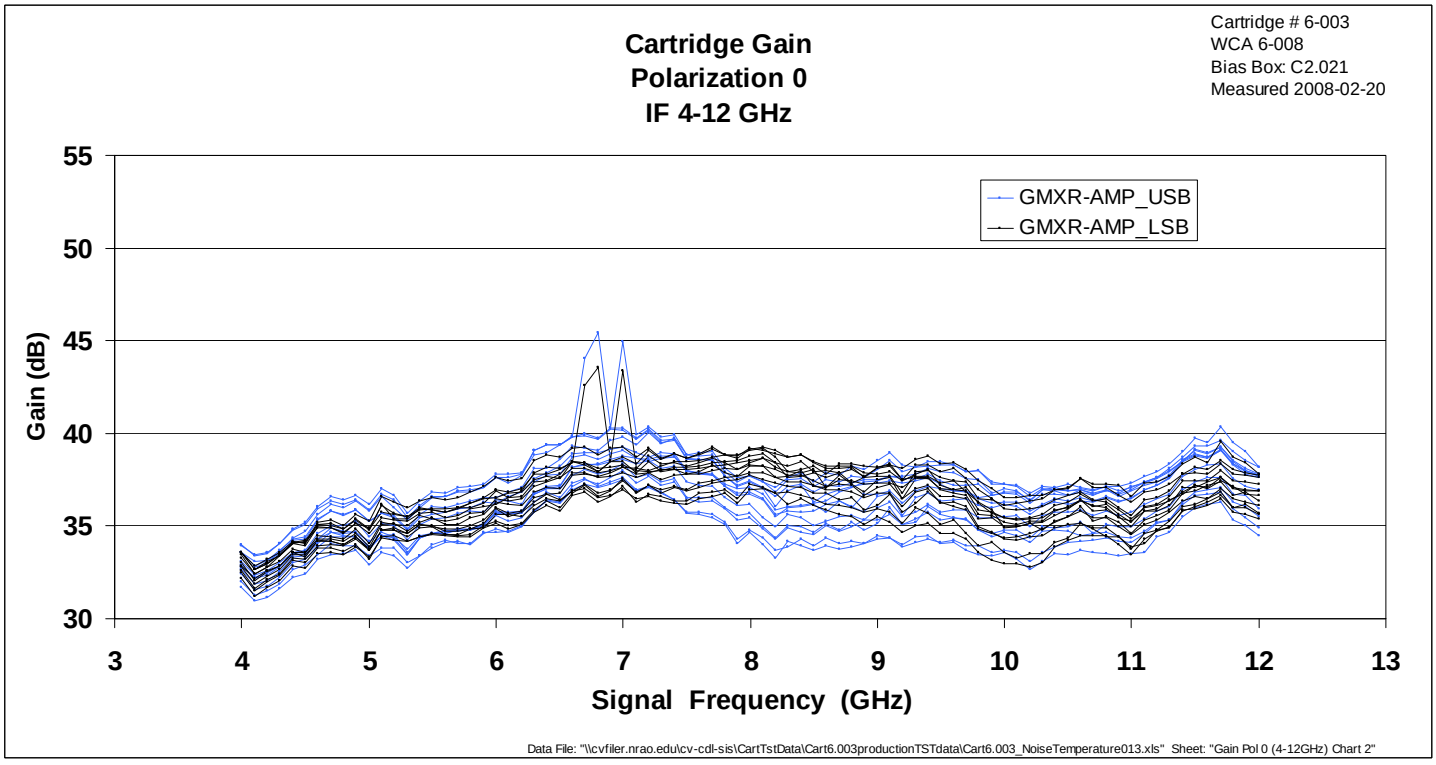

Figure 2: (Source)

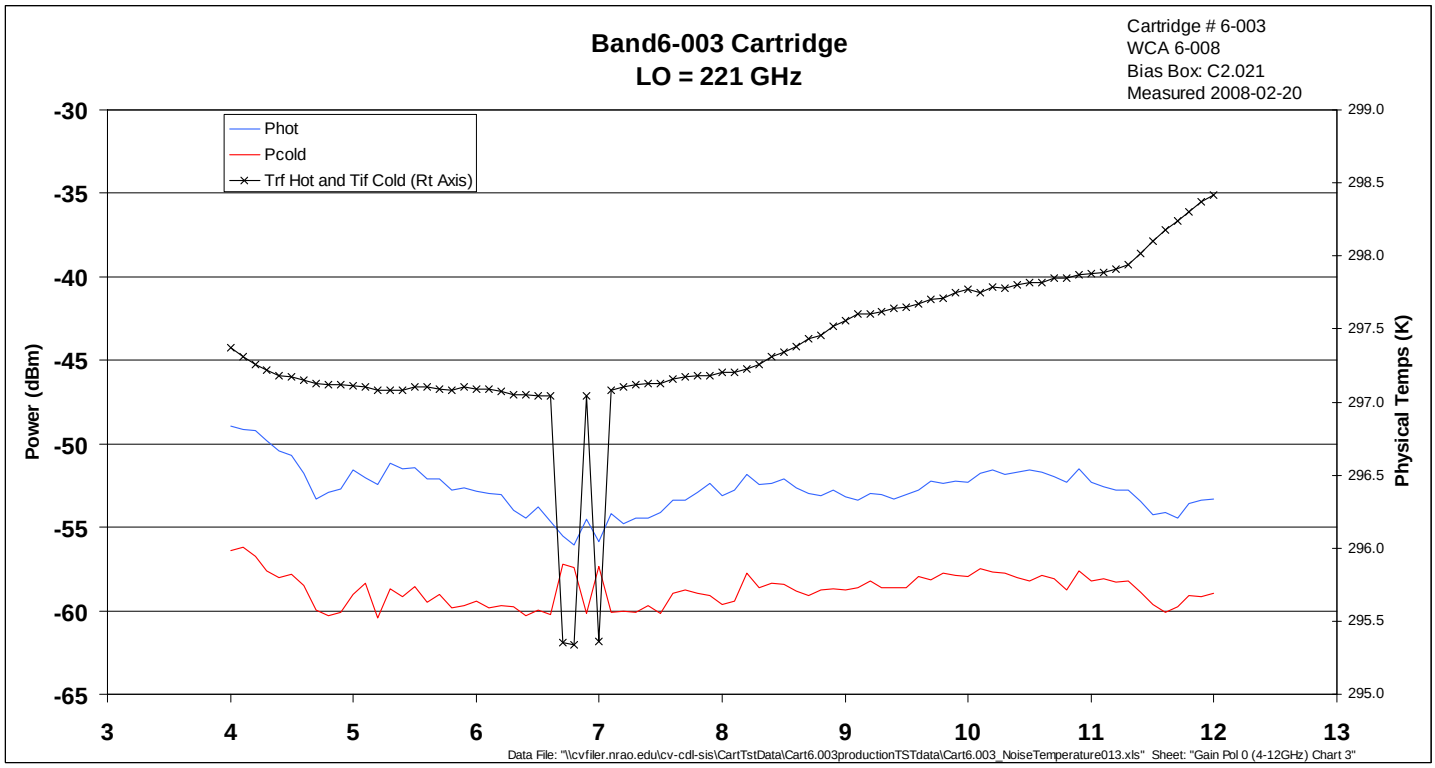

Figure 3: (Source)

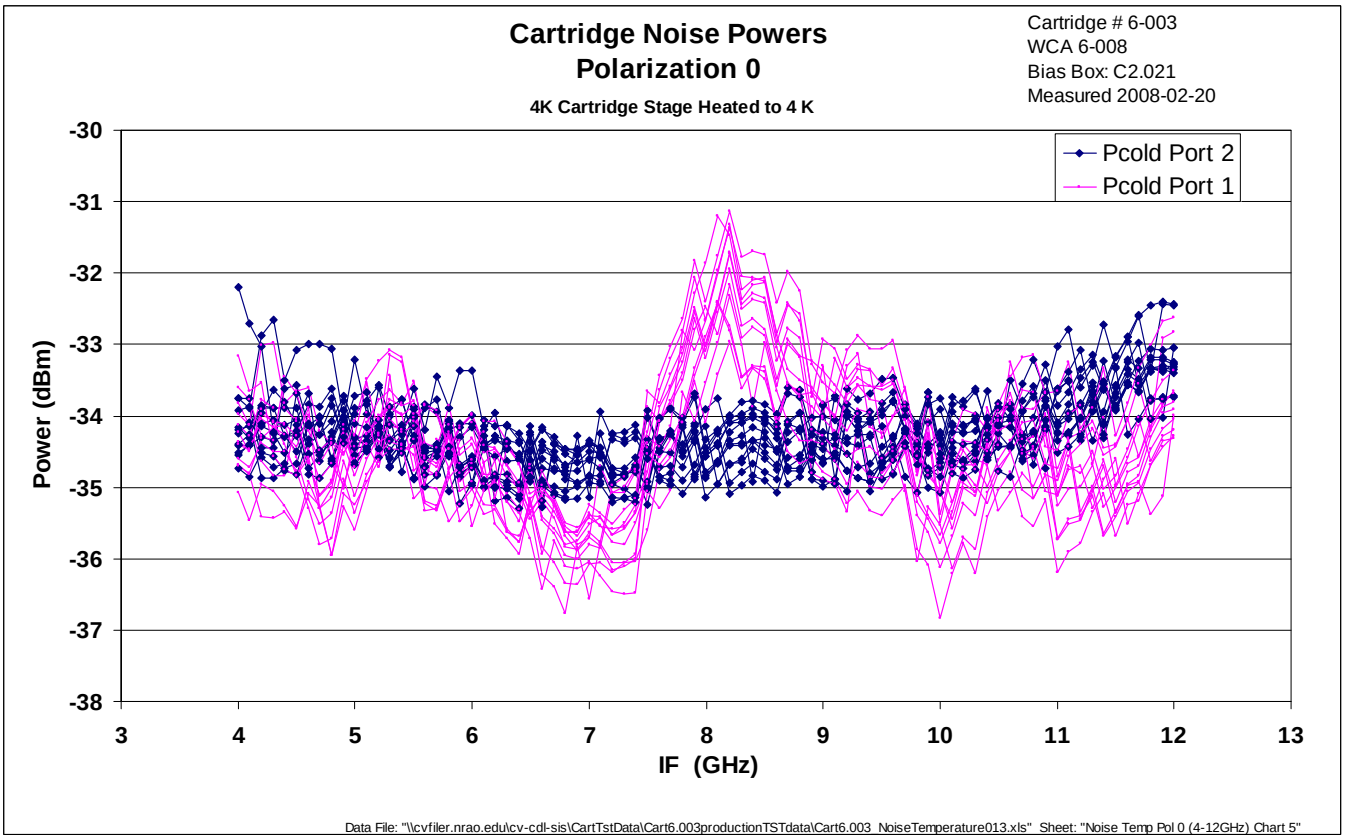

Figure 4:

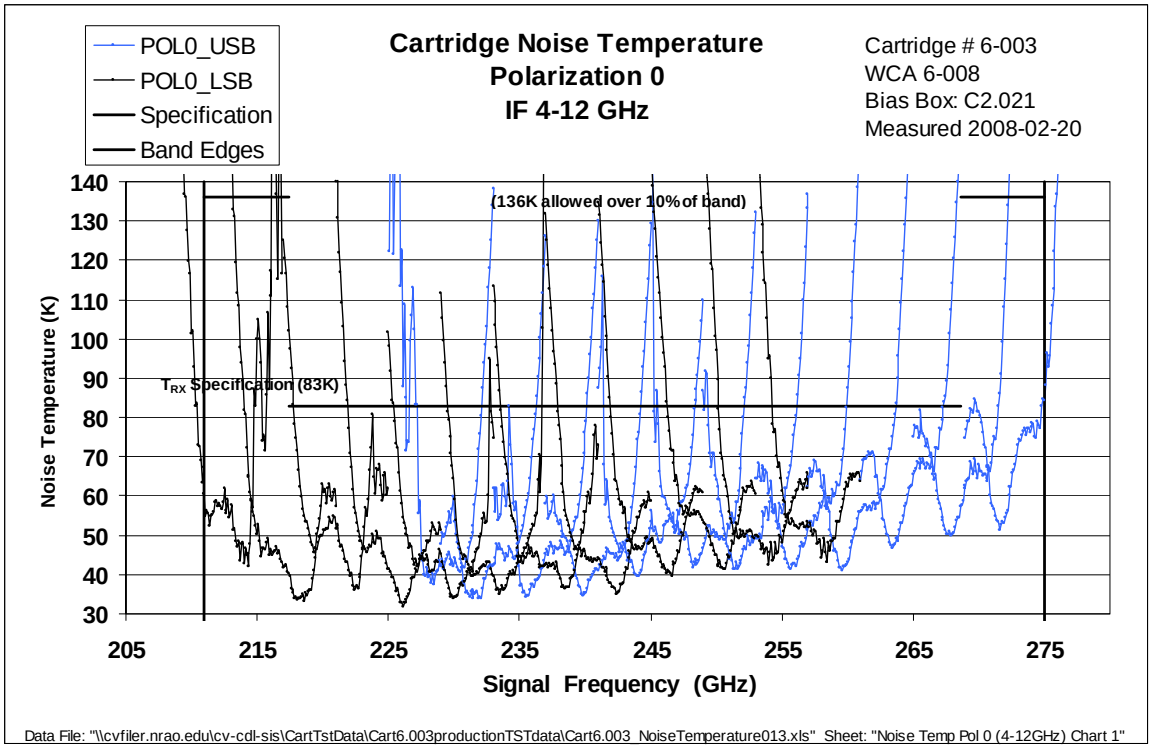

Figure 5: (Source)

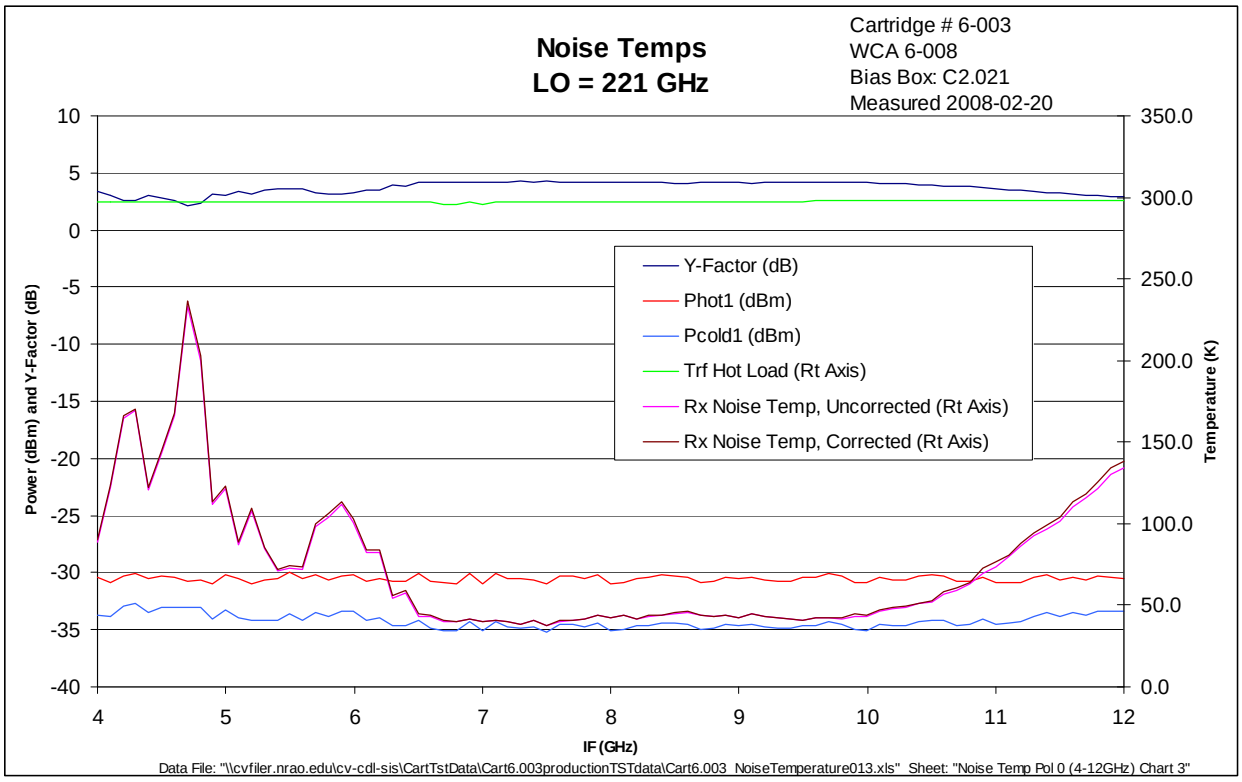

Figure 6:

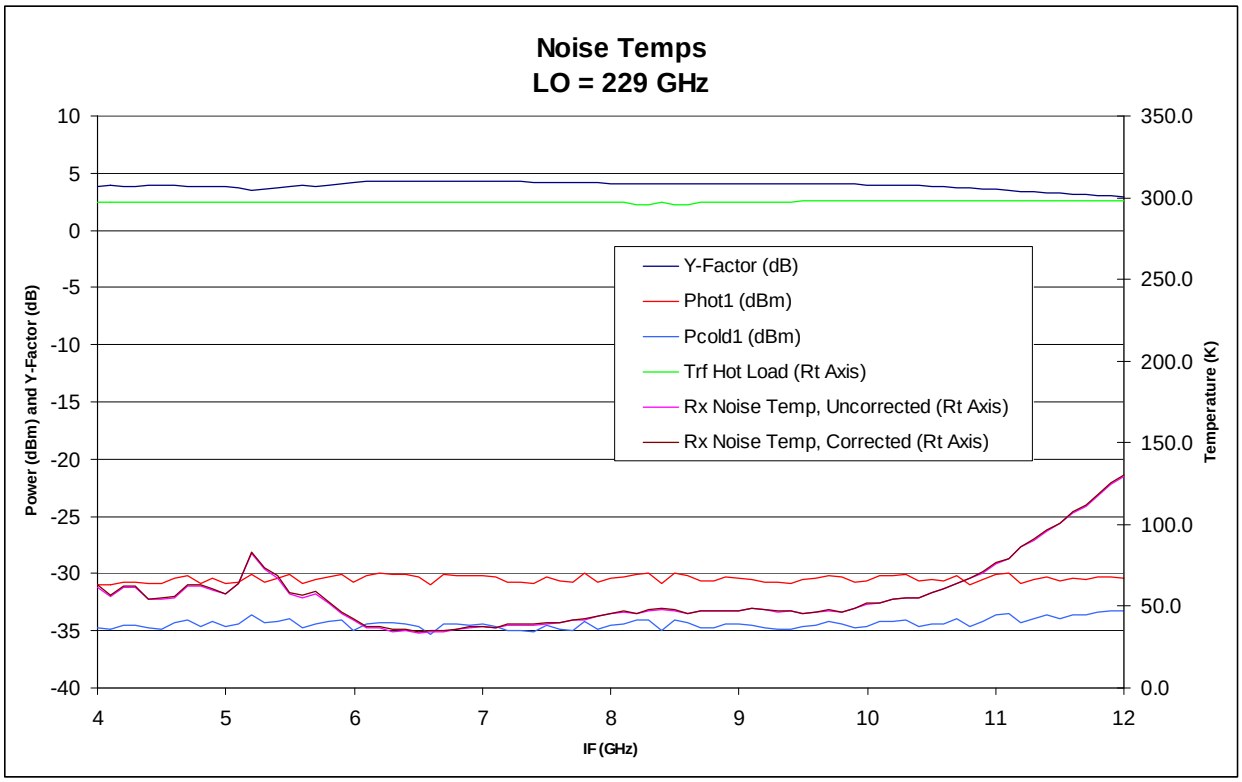

Figure 7: