Memorandum

To: File

From: John Effland

Date: 2005-05-02

Revisions:

2005-05-02	jee	Initial
2005-05-16	jee	Corrected label on Figs 6 and 7, Updated Block Diagram

Subject: Comparison of Band 6 Cartridge Measurements in RAL Dewar and Cartridge Test Systems

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Noise temperature, image rejection, and gain of the Band 6 Cartridge SN001 are compared when it's installed in the RAL Dewar and in the Cartridge Test System (CTS). The data are taken from Koller's graphs[1] measured by Dan, Ralph Groves, and Dave Schmitt. There appears to be an error with those graphs because the 6-10 GHz data, annotated as "Polarization 1," is most likely "Polarization 0" because those points are nearly identical to the 4-12 GHz Polarization 0 data.

The equipment configuration for the Cartridge Test System is shown in Figure 1 and is similar to the configuration used for the RAL Dewar measurements.

Cartridge noise temperatures (Figure 2 and Figure 3) are about 20% lower (~8K at the lowest noise temperature) when measured in the RAL Dewar, probably because the mixers operate at lower physical temperatures in the RAL Dewar. Mixer temperatures are controlled to ~4.2K in the CTS but are ~3.5K in the RAL Dewar.

A troubling discrepancy exists in the image rejection for the LSB, shown in Figure 4, where it degrades to about 6 dB in the RAL Dewar compared to 9.8 dB when measured in the CTS. Image rejection for USB, shown in Figure 5, is nearly the same when measured in both systems.

A problem is clearly evident in the cartridge gain data, which includes the warm IF amplifiers, graphed in Figure 6 and Figure 7. LSB gain in the RAL Dewar measured at the three lowest intermediate frequencies and at the three highest USB IFs fall more than 10 dB below cartridge gains measured in the CTS.

[1] http://almaedm.tuc.nrao.edu/forums/alma/dispatch.cgi/iptfedocs/showFolder/101230/def/def/6649324

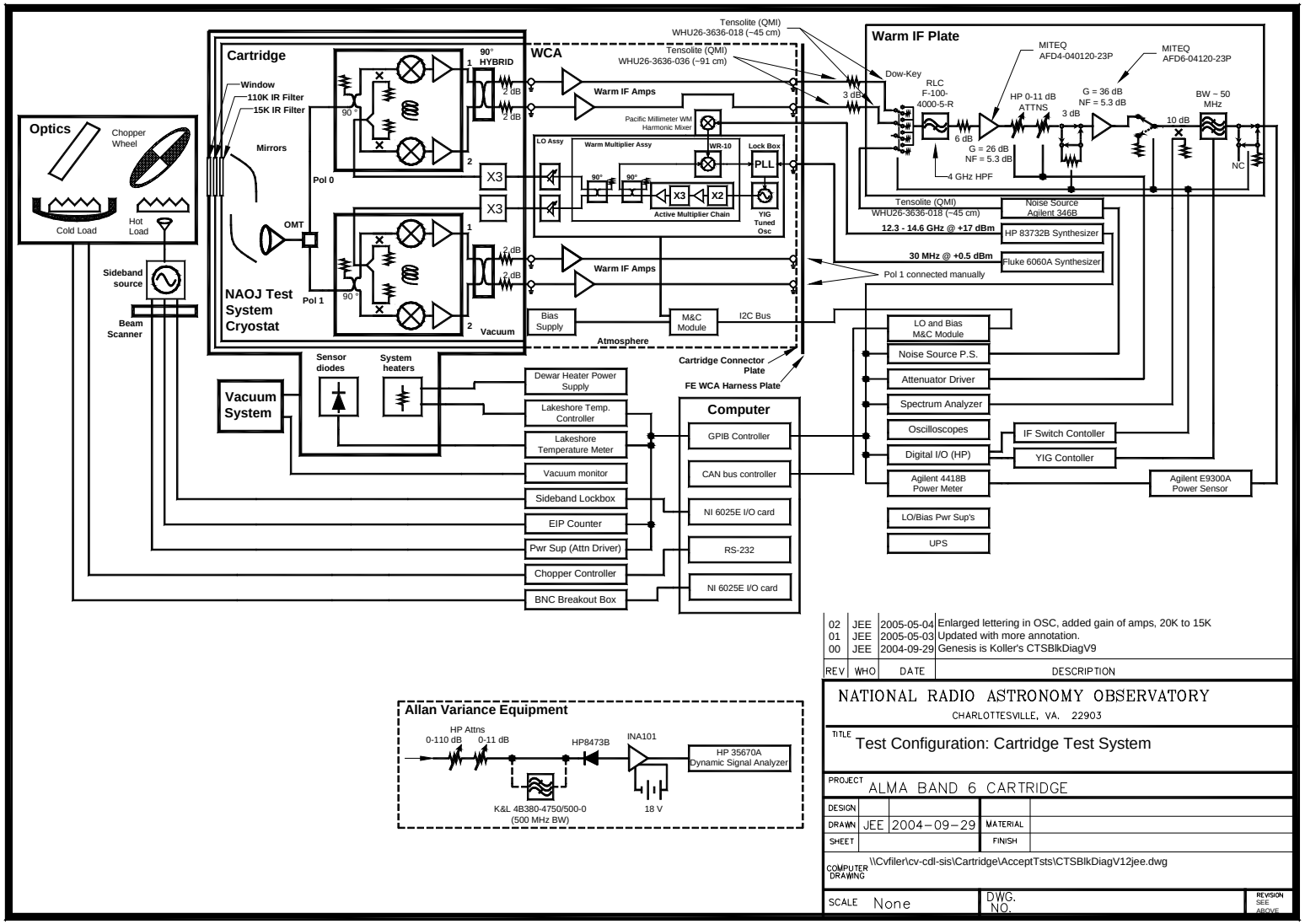

Figure 1: Measurement Equipment for Cartridge Test System

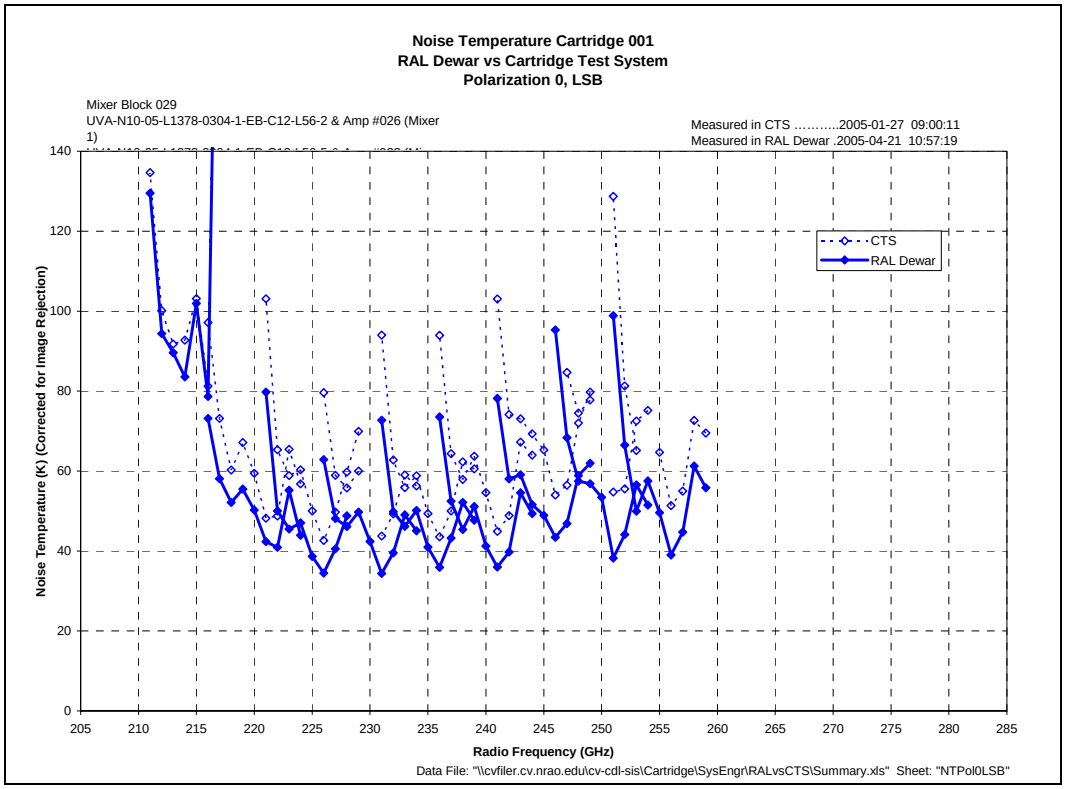

Figure 2: Noise Temps, Pol 0 LSB

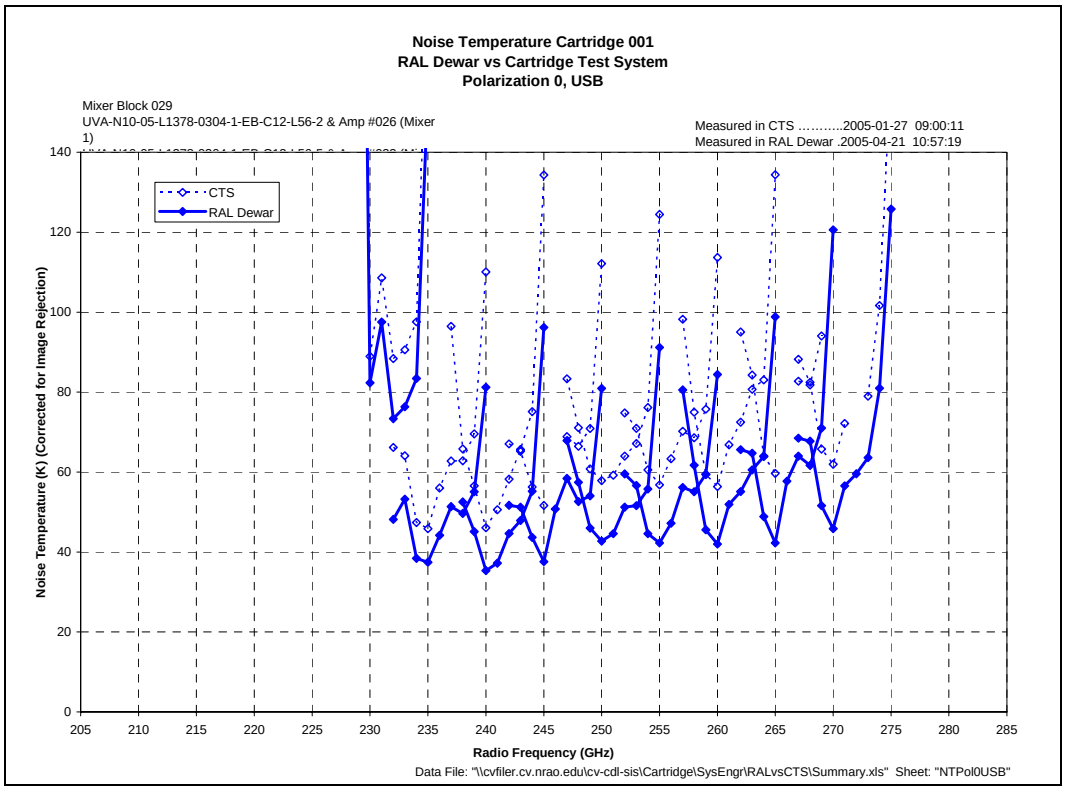

Figure 3: Noise Temps, Pol 0 USB

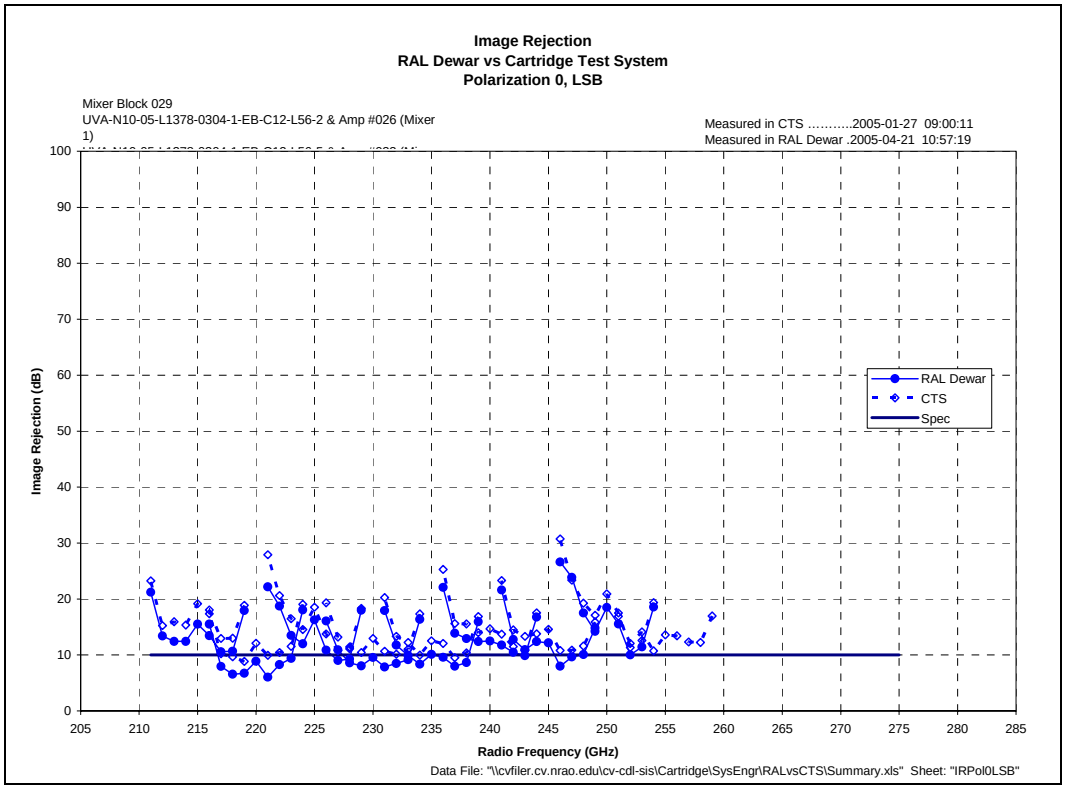

Figure 4: Image Rejection, Pol 0 LSB

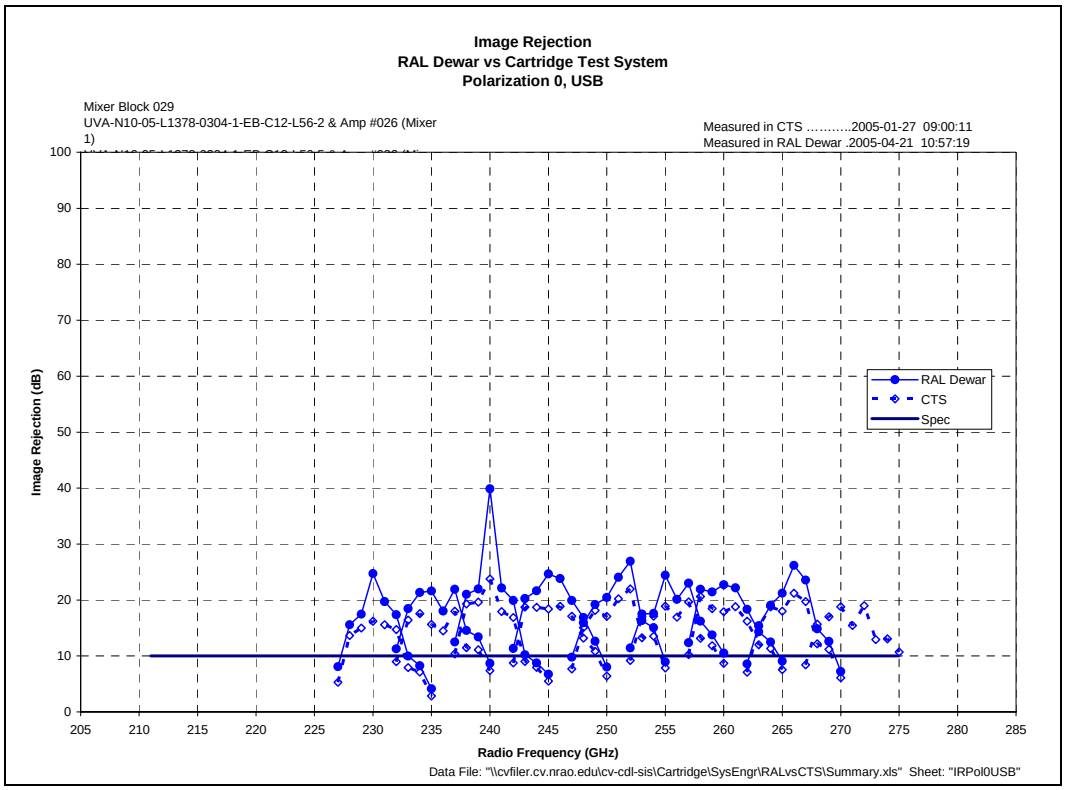

Figure 5: Image Rejection, Pol 0 USB

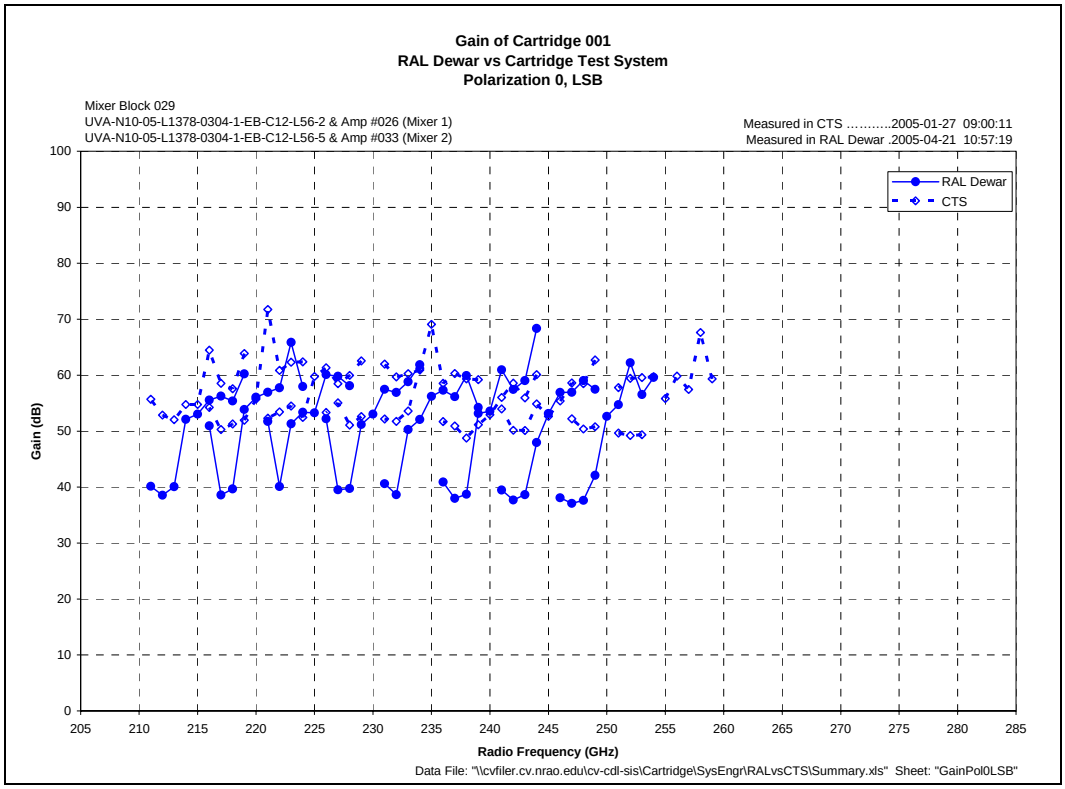

Figure 6: Cartridge Gain (Including Warm IF Amps), Pol 0 LSB

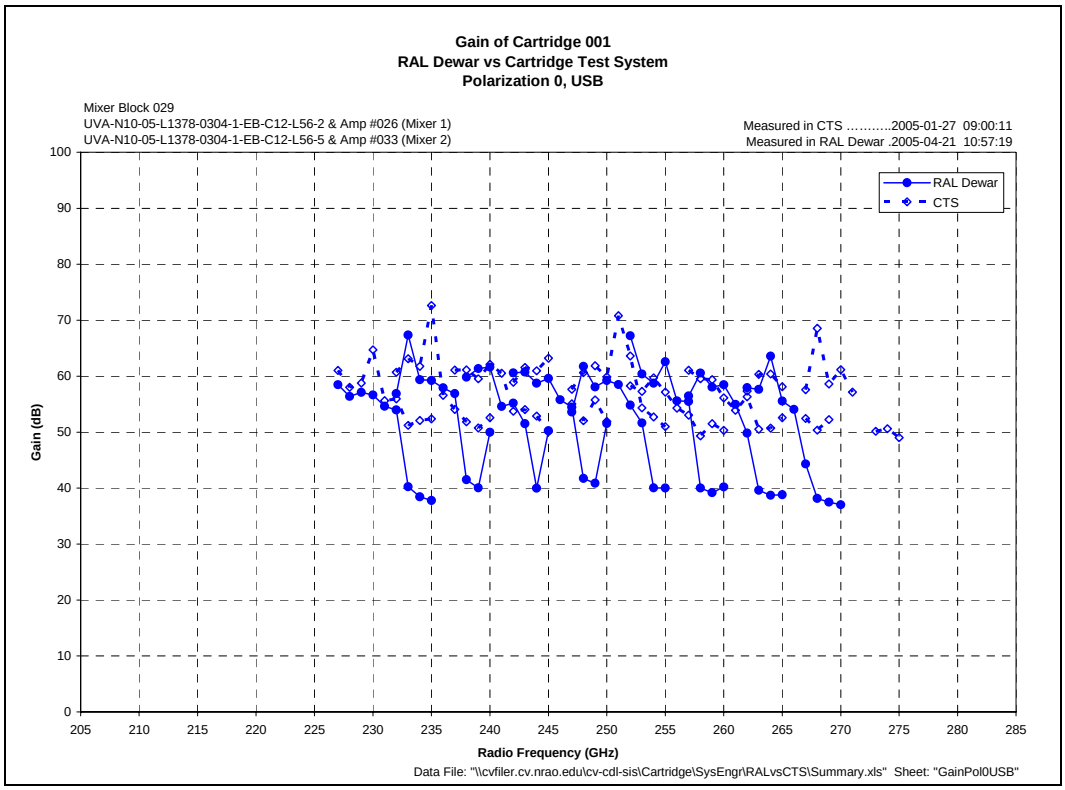

Figure 7: Cartridge Gain (Including Warm IF Amps), Pol 0 USB