October 1999-2

The XRD9814 is a fully integrated, high-performance analog signal processor/digitizer. It is designed for use in 3-channel linear CCD and CIS imaging applications. Each channel of the XRD9814 is fully differential. Therefore, common mode noises can be effectively rejected from the input signal. Lamp noise is a major source of common mode noise injected onto the cable connecting the CCD and the XRD9814.

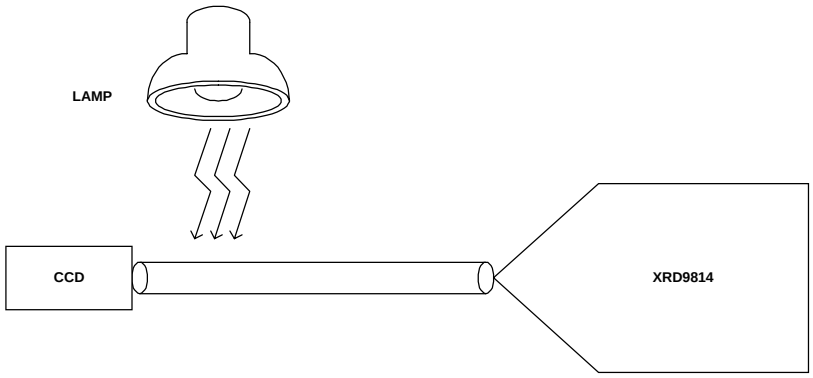

Figure 1. Lamp Noise Injected onto the Cable Connecting the CCD and the XRD9814

To determine the Common Mode Noise Rejection Ratio (CMRR) of the XRD9814, we use sinusoidal signal of 3Vpp magnitude as the noise source. First, the sinusoidal signal with a particular frequency is connected to the positive input pin, IN(+), of the XRD9814 as shown below:

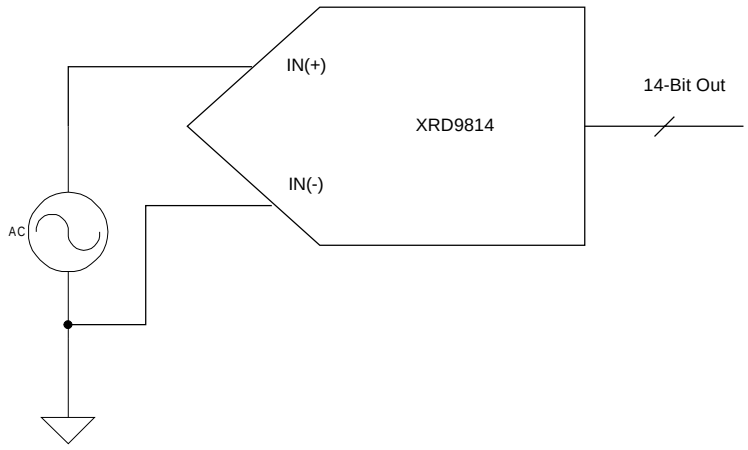

Figure 2. Sinusoidal Input Connected to IN(+) pin of the XRD9814

After digitizing the signal, we compute FFT of the sinusoidal signal. The peak sinusoidal signal amplitude is set to 0 dB.

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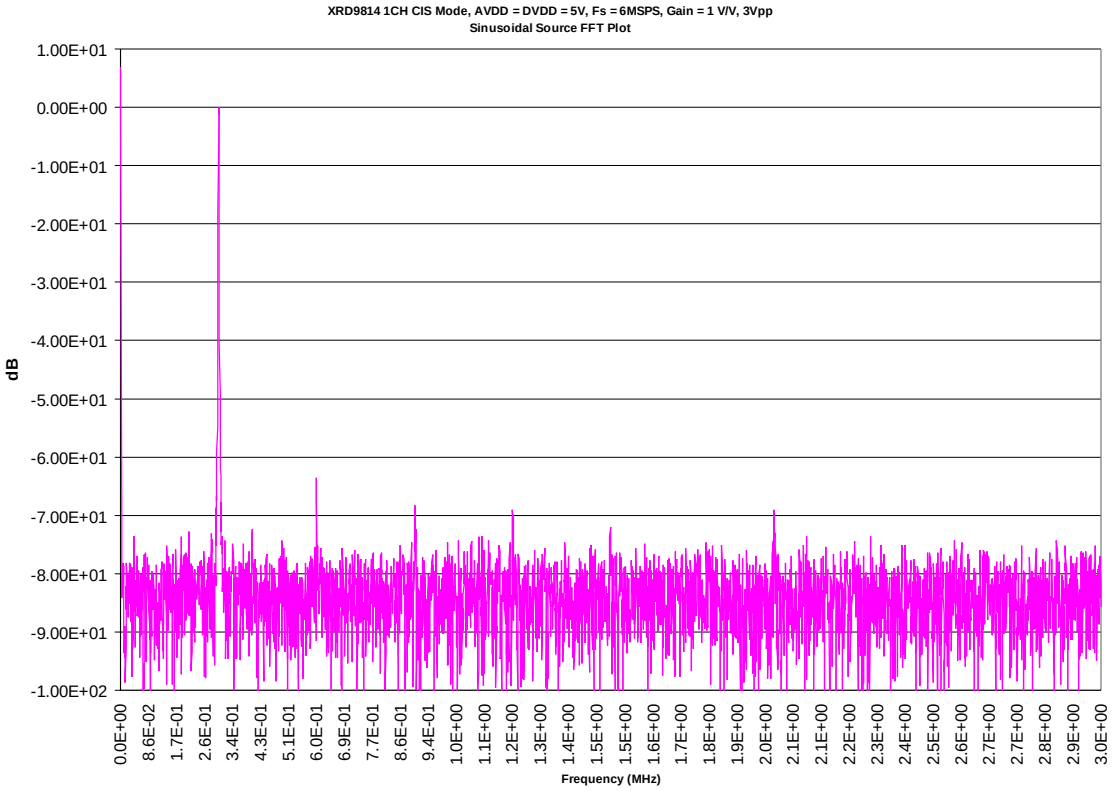

Figure 3. FFT Plot of Sinusoidal Signal with Frequency of 300kHz as Input to the XRD9814

Afterwards, we connect the sinusoidal signal to both IN(+) and IN(-) pins of the XRD9814, take data and compute the FFT plot again:

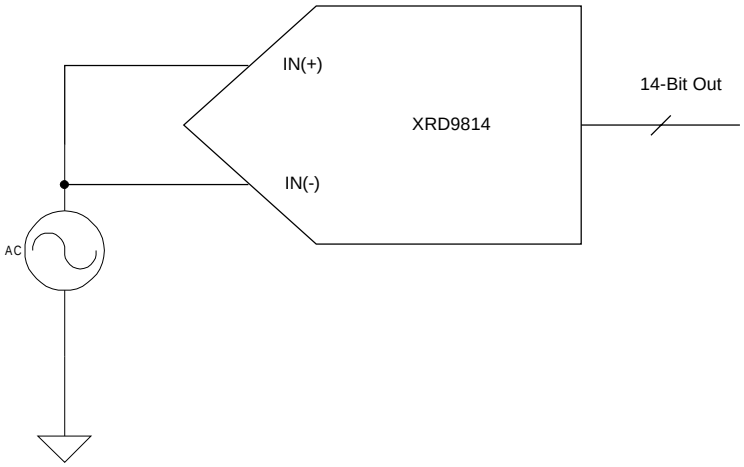

Figure 4. Sinusoidal Input Connected to IN(+) and IN(-) pins of the XRD9814

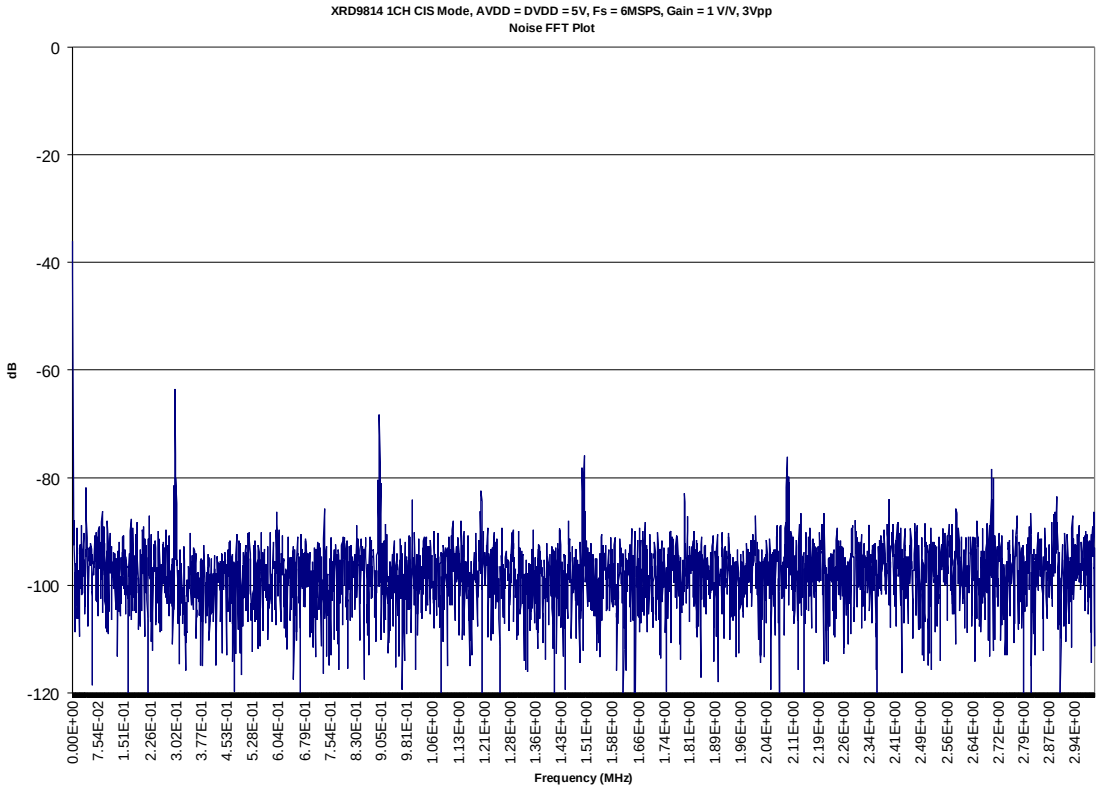

Figure 5. FFT Plot of Sinusoidal Signal with Frequency of 300kHz as Common Input to IN(+) and IN(-) pins of the XRD9814

On the plot above, peak amplitude of the highest harmonic is about –63.57dB. It shows that when noise is common to IN(+) and IN(-) pins of the XRD9814, the rejection ratio is 63.57 dB at 300kHz.

The following graph shows noise rejection ratio of the XRD9814 for noise frequency of 100kHz to 500kHz.

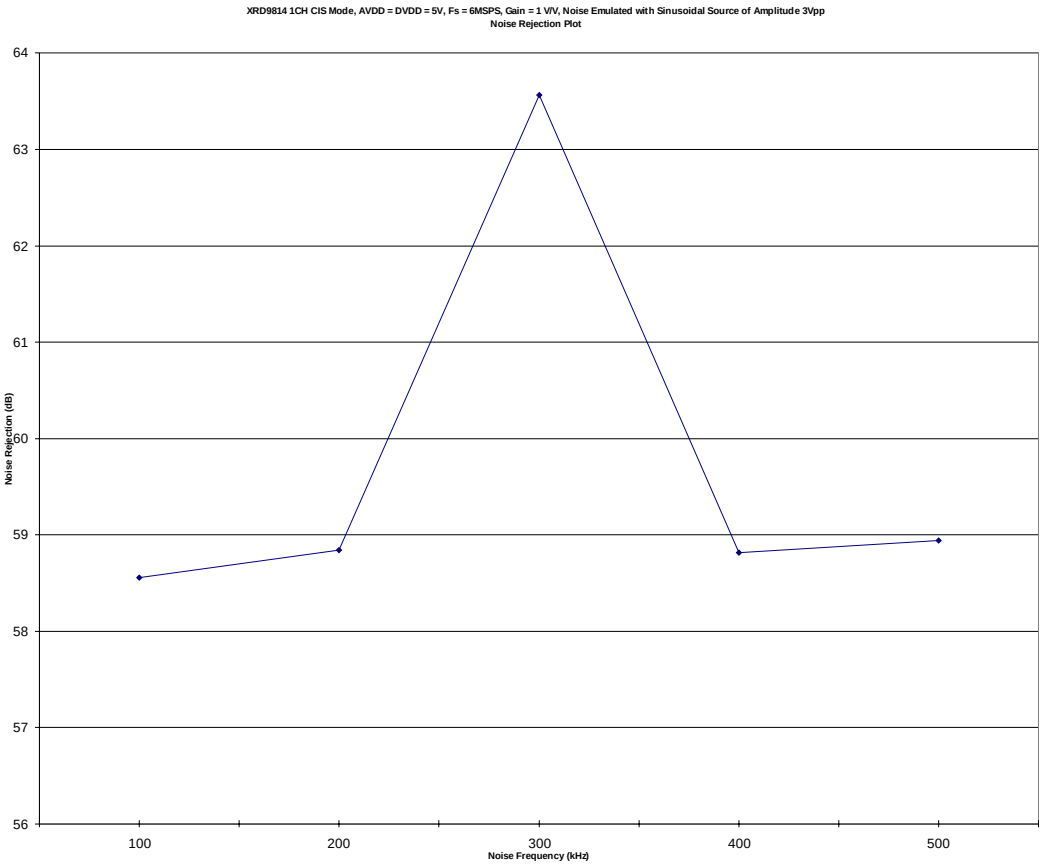

Figure 6. Noise Rejection of the XRD9814

Conclusion

The use of a 3Vpp sinusoidal signal as a common mode noise source is the worst case scenario. Actual CCD systems will typically have 100mV of lamp noise. With noise rejection of approximately 60dB, the lamp noise will drop to 100uV into the XRD9814 and become an insignificant source of noise. It will be buried into the noise floor of the system and impose no adverse effect to accuracy of the XRD9814.

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