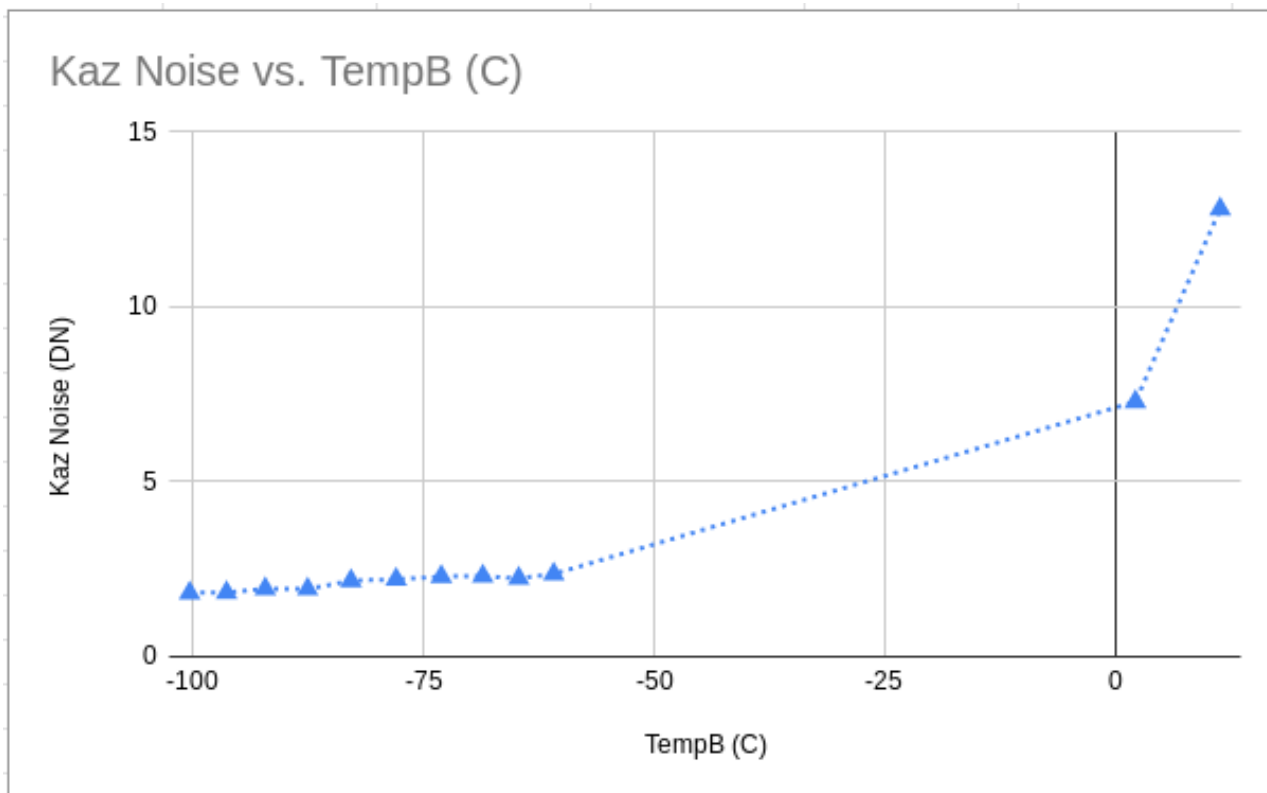


RIXS-CCD Noise v. Temperature

Setup: RIXS-CCD in test chamber. Turbopump on, Pirani reads 2.7e-8 with Polycold running. Foil covering window to block room light. Archon configured for binning mode, external trigger. Frame rate set by burst period setting of Silent Waveform generator. Configured according to RIXS-CCD procedure at https://drive.google.com/file/d/18SGIGRSk_v71dKv3i-ESIEPfAwkLIDiv/view?usp=sharing

Method: Define noise stats box to include a block of pixels avoiding the non-pixel gaps in the display. Since the block contains sequential reads of the binned pixels, the standard deviation over the block is a ~proxy for noise. Record std. dev and absolute signal at 50 Hz, 100Hz, and 200Hz to measure leakage. Gradually increase temp from -120C, pausing 15min at each temp to stabilize before recording. Save 10 frames at each setting for later analysis.

TempA (C)	TempB (C)	Rate (Hz)	Abs DN	Noise (DN)	Kaz Noise (DN)	Data
-120.0	-100.4	200	1568.7	1.52	1.82	/home/detopr/archon/data/20201105/1d_200Hz_120C
	-100.4	100	1569.6	1.58	1.93	/home/detopr/archon/data/20201105/1d_100Hz_120C
	-100.4	50	1570.7	1.68	2.04	/home/detopr/archon/data/20201105/1d_50Hz_120C
-115.0	-96.4	200	1569.0	1.54	1.83	/home/detopr/archon/data/20201105/1d_200Hz_115C
	-96.4	100	1570.1	1.60	1.93	/home/detopr/archon/data/20201105/1d_100Hz_115C
	-96.4	50	1571.9	1.77	2.16	/home/detopr/archon/data/20201105/1d_50Hz_115C
-110.0	-92.2	200	1570.3	1.56	1.94	/home/detopr/archon/data/20201105/1d_200Hz_110C
	-92.2	100	1571.9	1.68	2.22	/home/detopr/archon/data/20201105/1d_100Hz_110C
	-92.1	50	1574.1	1.85	2.34	/home/detopr/archon/data/20201105/1d_50Hz_110C
-105.0	-87.6	200	1572.4	1.56	1.93	/home/detopr/archon/data/20201105/1d_200Hz_105C
	-87.6	100	1574.2	1.67	2.17	/home/detopr/archon/data/20201105/1d_100Hz_105C
	-87.6	50	1576.9	1.95	2.74	/home/detopr/archon/data/20201105/1d_50Hz_105C
-100.0	-82.9	200	1578.5	1.78	2.17	/home/detopr/archon/data/20201105/1d_200Hz_100C
	-82.9	100	1581.5	2.03	2.48	/home/detopr/archon/data/20201105/1d_100Hz_100C
	-82.9	50	1588.2	2.52	2.96	/home/detopr/archon/data/20201105/1d_50Hz_100C
-95.0	-78.0	200	1577.5	2.11	2.21	/home/detopr/archon/data/20201105/1d_200Hz_95C
	-78.0	100	1581.5	2.39	2.53	/home/detopr/archon/data/20201105/1d_100Hz_95C
	-78.0	50	1587.7	2.81	3.01	/home/detopr/archon/data/20201105/1d_50Hz_95C
-90.0	-73.1	200	1553.6	2.66	2.29	/home/detopr/archon/data/20201105/1d_200Hz_90C
	-73.1	100	1556.7	2.86	2.62	/home/detopr/archon/data/20201105/1d_100Hz_90C
	-73.1	50	1562.8	3.18	2.92	/home/detopr/archon/data/20201105/1d_50Hz_90C
-85.0	-68.6	200	1502.8	2.77	2.30	/home/detopr/archon/data/20201105/1d_200Hz_85C
	-68.7	100	1505.1	2.91	2.54	/home/detopr/archon/data/20201105/1d_100Hz_85C
	-68.7	50	1510.0	3.22	2.58	/home/detopr/archon/data/20201105/1d_50Hz_85C
-80.0	-64.7	200	1433.0	2.34	2.24	/home/detopr/archon/data/20201105/1d_200Hz_80C
	-64.7	100	1435.4	2.50	2.45	/home/detopr/archon/data/20201105/1d_100Hz_80C
	-64.7	50	1441.5	2.83	2.90	/home/detopr/archon/data/20201105/1d_50Hz_80C
-75.0	-60.9	200	1372.1	1.93	2.36	/home/detopr/archon/data/20201105/1d_200Hz_75C
	-61.0	100	1374.5	1.98	2.37	/home/detopr/archon/data/20201105/1d_100Hz_75C
	-61.0	50	1382.2	2.40	2.71	/home/detopr/archon/data/20201105/1d_50Hz_75C
0.0	2.2	200	1258.7	8.17	7.29	/home/detopr/archon/data/20201105/1d_200Hz_0C
	2.2	100	1366.3	18.5	9.88	/home/detopr/archon/data/20201105/1d_100Hz_0C
	2.1	50	1614.6	47.5	13.51	/home/detopr/archon/data/20201105/1d_50Hz_0C
10.0	11.4	200	1500.4	12.7	12.8	/home/detopr/archon/data/20201105/1d_200Hz_plus10C
	11.4	100	1931.0	21.9	16.8	/home/detopr/archon/data/20201105/1d_100Hz_plus10C
	11.4	50	2895.4	41.9	24.3	/home/detopr/archon/data/20201105/1d_50Hz_plus10C



Surprising to me that the noise and leakage never really seemed to take off until well above -75C....expected to see it increase by x2 per 7K or some such, but I guess that's only around room T. Will need to look at the data to understand how I'm confusing myself.

Wondering whether something had just railed, I poked a small hole in the foil over the window, and found the detector was still working more or less as expected even at -50C. Decided to take it all the way to 0C, expecting it to become unusable at some point. Not sure that ever happened, but at least the noise started to go up 😊

Went back through the data using a script written by Kaz that actually calculates the noise for the entire device. I believe it includes unit cells that don't have active pixels and may thus underestimate the noise. The results differ in detail but the general trend is similar to the 'box' proxy noise estimate. The noise from the script is plotted against the TempB reading.

Using $3.3e-/DN$, the noise at -61C (TempB) is still below $9e-$. Can't assume that the device temperature tracks TempA or TempB well.