Preliminary Noise and Xtalk Testing of the 14-BIT ADC Board Rev.B

Populated 1 pc ADC Board, and performed some preliminary noise and xtalk testing.

The analog channels have some minor component value changes from Rev.A.
Note: The optional resistor A50 was replaced with a 100pF cap – no functional change.
Schematic located at: http://edg.uchicago.edu/~bogdan/14_BIT_ADC_Board/docB/sch_pdf_filesB/2605B_6.pdf

Typical Noise recorded: STDEV ~ 1.6 LSB (full scale = 16,000):

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2	Noise Test of 14-BIT ADC Board Rev.B - No input.															
3	Row 5 shows the STDEV noise on every channel. (unit=LSB, full scale=16,000.)															
4																
5	1.603691	1.609318	1.504817	1.491117	1.603257	1.559303	1.428029	1.505149	1.448642	1.483073	1.528566	1.53883	1.593342	1.612972	1.73049	1.868775
6																
7	715	745	659	715	676	629	689	689	756	727	762	782	821	768	798	674
8	711	742	658	716	676	628	689	689	755	724	760	779	822	770	799	678
9	712	746	659	716	677	626	688	688	752	725	757	778	820	770	792	677
10	710	743	660	715	674	627	690	687	754	724	760	778	821	767	795	674
11	714	745	659	717	676	629	690	689	753	725	760	780	819	770	794	677
12	712	742	660	716	679	630	691	689	753	727	759	779	819	770	795	677
13	711	742	659	715	674	626	687	688	755	721	758	778	816	769	792	674
14	711	743	658	717	678	628	689	689	755	725	760	777	819	766	796	674
15	714	746	659	718	677	629	689	690	756	727	761	779	820	769	796	674
16	712	743	659	714	676	627	690	689	755	726	761	777	823	772	800	676
17	709	743	659	715	675	629	689	687	755	726	760	779	819	771	795	678
18	713	743	660	715	676	627	689	690	754	726	760	781	821	771	797	677
19	711	743	660	716	678	628	690	690	754	725	760	780	821	770	793	676

For Xtalk testing used a differential input pulse of 2.2Vpp – Full Scale Aggressor.

Pulse applied successively on every channel, with an 18-ft, 8-pair diff cable.

Pulse repeats every 512ns, to simulate one full scale aggressor for each recording.

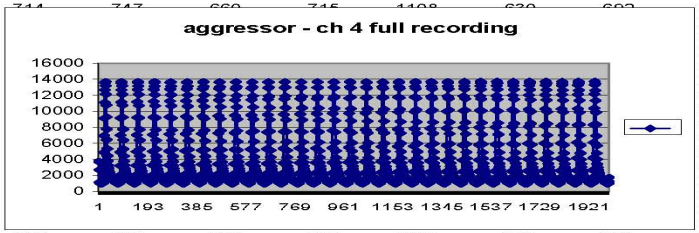
In Example below, aggressor applied on channel E.

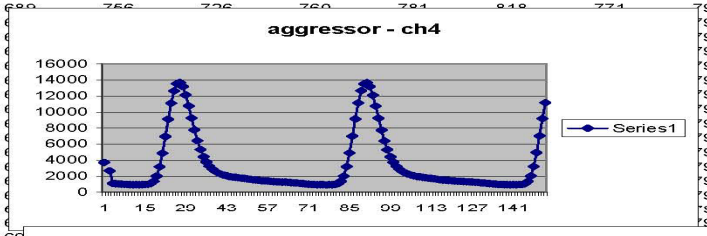
Note the increase in the Noise RMS on the adjacent channels: D, F.

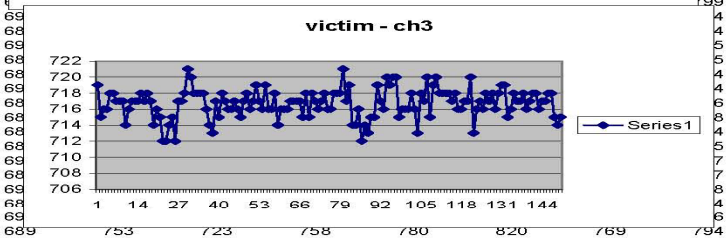
aggr_2.2Vpp_512ns_period_ch4.xls

Xtalk test - aggressor signal on ch 4 (E) - One full scale aggressor pulse (2.2Vpp) every 64 samples (512ns).
Row 6 shows the recorded STDEV noise in every channel, including xtalk (unit=LSB, full scale=16,000).
Signal transmited with an 8-pair, 18ft long cable.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1.800837	1.82387	1.773219	2.112127	3697.66	2.011416	2.269712	1.666553	1.613895	1.579264	1.628877	1.625897	1.680539	1.679142	1.740429	1.996601
713	745	660	719	2669	627	689	687	755	726	757	780	821	770	795	675
712	746	660	717	3165	625	691	689	753	726	758	780	820	769	794	677
709	745	658	714	4864	626	687	688	757	726	764	782	821	770	795	676
712	744	661	716	6942	627	690	691	754	726	763	782	821	772	796	673
712	745	659	715	9103	627	691	688	753	725	760	779	820	772	792	674
712	746	659	712	11098	627	691	687	754	725	760	780	820	771	795	675
713	746	662	712	12644	628	693	687	754	726	760	782	823	772	794	677
711	745	661	714	13530	627	691									
714	747	659	715	13687	631	693									
713	746	660	712	13173	630	694									
713	745	661	717	12130	630	694									
713	747	659	717	10763	633	694									
712	746	661	718	9254	632	694									
712	743	661	721	7770	633	697									
714	748	662	720	6427	631	694									
710	745	662	718	5311	632	695									
711	743	659	718	4424	627	693									
711	746	656	718	3746	627	692									
712	746	661	718	3240	629	693									
714	746	660	716	2873	627	692									
711	743	660	714	2603	627	689									
711	742	660	713	2403	629	689									







Conclusions:

- Typical Xtalk recorded for 2.2Vpp aggressor (full scale) ~ 2.2 LSB;
  - Max Xtalk recorded for 2.2Vpp aggressor ~ 2.4 LSB;
- Typical Xtalk recorded for 1.1Vpp aggressor (half scale) ~ 1.7 LSB;
- Typical noise recorded ~1.6LSB.

Notes:

- All values are given in STDEV for a max scale of 16,000;
- Xtalk may be reduced by increasing filtering –pulses get shorter and wider;
- Files are placed here for reference:
  http://edg.uchicago.edu/~bogdan/14_BIT_ADC_Board/Xtalk_Test_on_RevB_board/Xtalk_RevB.zip

Observations:

- More noise testing can be performed, using a crate with linear power supplies;
- More power supply filtering can be attempted to further reduce noise levels.