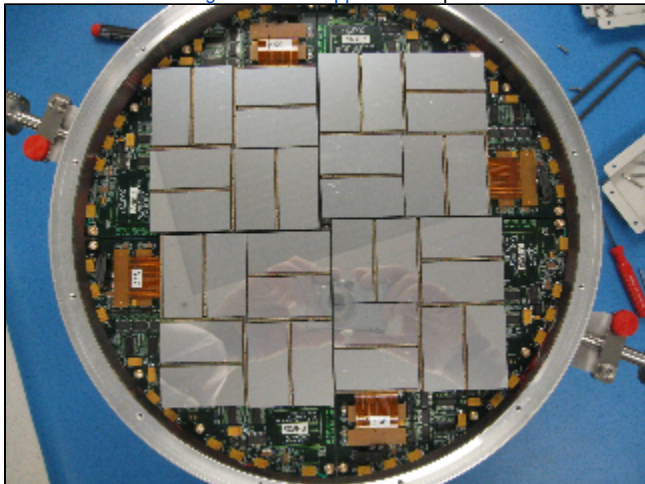


2013-04-19 CSPad CxiDs1 alignment

Optical measurement

Input files

- [2013-04-19-Run7-DS1-Metrology-1700.xlsx](#)- file from Chris Kenney
- [2013-04-19-DS1-Configuration-1700.pptx](#) - description of the detector configuration



Procedure

Create [2013-04-19-Run7-DS1-Metrology-1700.txt](#) from [2013-04-19-Run7-DS1-Metrology-1700.xlsx](#)

Run script: `procOpticalAlignment.py`
which gives large deviation in optical measurement is observed in Q2, pair 0:

pair:	S1	S2	dS1	dS2	L1	L2	dL1	dL2	<dS/L>	angle(deg)	D1
D2	dD	d(dS)	d(dL)								
Quad 2											
pair: 0	20915	20685	31	-199	43544	43309	-17	-252	-0.00194	-0.11124	47993
48308	-315	230	235								

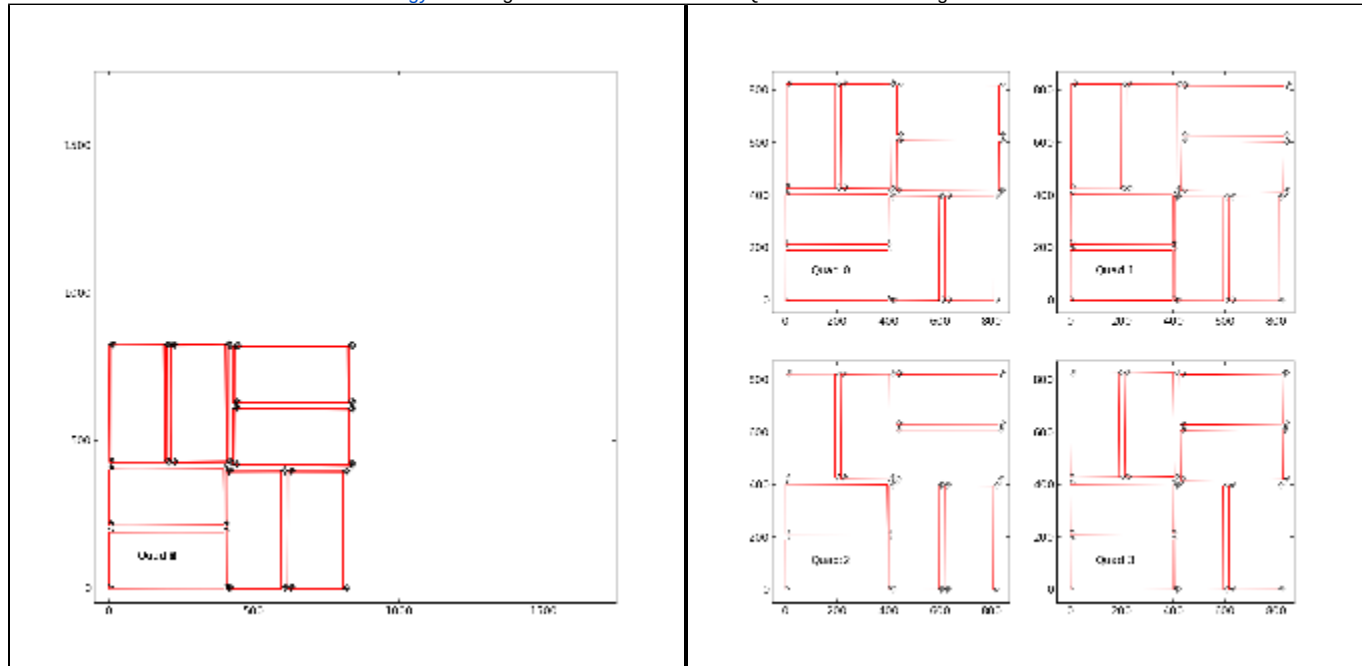
Responsible for this effect is Q2, point 7:

Quad 2				
Sensor	X	Y	Z	
7	43298		44099	-2

Add 200 to both, X and Y and changed to:

7	43498		44299	-2
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Corrected file [2013-04-19-Run7-DS1-Metrology-corr.txt](#) gives a consistent table for QC and is used for alignment.



QC procedure and results

We calculate

S1 - 1st short side length of 2x1

S2 - 2nd short side length of 2x1

L1 - 1st long side length of 2x1

L2 - 2nd long side length of 2x1

D1 - 1st diagonal of 2x1 between corners 1 and 3

D2 - 2nd diagonal of 2x1 between corners 2 and 4

dS and dL are the deviations of the 1st and 2nd corner along the short and long sides, respectively. The sign of all dS are chosen in order to provide correct sign for the tilt angle (the same direction for all 2x1 sensors).

<dS/L> - the tilt angle of 2x1 averaged over two sides in radians.

angle(deg) - the same angle in degrees.

dD = D1 - D2

d(dS) = dS1 - dS2

d(dL) = dL1 - dL2

Quality check parameters for the perfect measurement:

- S1=S2, L1=L2 - the 2x1 sides should have equal length and width,
- D1=D2 - the 2x1 diagonals should be equal,
- dS1 = dS2 = 2*dL1 = 2*dL2 - tilt angle should provide consistent deviation for all corners,
- dD=0, d(dS)=0, and d(dL)=0 - within precision of measurement.

Everything, excluding <dS/L> and angle(deg), are in micrometers.

pair:	S1	S2	dS1	dS2	L1	L2	dL1	dL2	<dS/L>	angle(deg)	D1
D2	dD	d(dS)	d(dL)								
Quad 0											
pair: 0	20909	20913	79	83	43544	43540	-33	-37	0.00186	0.10659	48306
48299	7	-4	4								
pair: 1	20908	20902	40	34	43536	43501	22	-13	0.00085	0.04871	48299
48259	40	6	35								
pair: 2	20905	20911	250	244	43540	43560	94	114	0.00567	0.32496	48296
48322	-26	6	-20								
pair: 3	20903	20919	-7	-23	43539	43558	-11	8	-0.00034	-0.01973	48313
48303	10	16	-19								
pair: 4	20924	20908	-203	-219	43538	43537	102	101	-0.00485	-0.27768	48301
48301	0	16	1								
pair: 5	20910	20900	-118	-128	43536	43538	59	61	-0.00283	-0.16187	48296
48295	1	10	-2								

pair: 6	20907	20906	-64	-63	43547	43553	-37	-31	-0.00146	-0.08354	48305
48311	-6	-1	-6								
pair: 7	20910	20910	203	203	43548	43547	99	98	0.00466	0.26709	48308
48307	1	0	1								
Quad 1											
pair: 0	20914	20918	-99	-95	43537	43544	45	52	-0.00223	-0.12764	48305
48302	3	-4	-7								
pair: 1	20919	20907	-39	-51	43541	43553	14	26	-0.00103	-0.05921	48306
48309	-3	12	-12								
pair: 2	21381	21374	-96	-89	43920	43927	-44	-37	-0.00211	-0.12066	48853
48845	8	-7	-7								
pair: 3	21385	21380	-94	-89	43920	43918	-33	-35	-0.00208	-0.11937	48857
48838	19	-5	2								
pair: 4	20925	20918	-320	-327	43540	43543	155	158	-0.00743	-0.42569	48309
48307	2	7	-3								
pair: 5	20915	20907	-109	-117	43545	43542	53	50	-0.00260	-0.14869	48301
48306	-5	8	3								
pair: 6	20911	20908	-79	-76	43541	43551	-38	-28	-0.00178	-0.10197	48309
48302	7	-3	-10								
pair: 7	20912	20912	-36	-36	43542	43554	-28	-16	-0.00083	-0.04736	48304
48313	-9	0	-12								
Quad 2											
pair: 0	20915	20885	31	1	43544	43509	-17	-52	0.00037	0.02105	48260
48308	-48	30	35								
pair: 1	20909	20916	62	69	43533	43543	-29	-19	0.00150	0.08620	48306
48293	13	-7	-10								
pair: 2	20914	20911	217	220	43541	43552	101	112	0.00502	0.28749	48309
48306	3	-3	-11								
pair: 3	20895	20899	60	56	43543	43547	24	28	0.00133	0.07632	48297
48301	-4	4	-4								
pair: 4	20925	20913	19	7	43544	43535	-2	-11	0.00030	0.01711	48303
48304	-1	12	9								
pair: 5	20904	20906	50	52	43537	43540	-29	-26	0.00117	0.06711	48294
48299	-5	-2	-3								
pair: 6	20921	20909	-150	-138	43547	43548	-63	-62	-0.00331	-0.18946	48315
48303	12	-12	-1								
pair: 7	20905	20908	48	45	43538	43540	19	21	0.00107	0.06119	48296
48300	-4	3	-2								
Quad 3											
pair: 0	20907	20902	186	181	43543	43546	-79	-76	0.00421	0.24145	48312
48293	19	5	-3								
pair: 1	20908	20905	102	99	43542	43550	-53	-45	0.00231	0.13223	48304
48305	-1	3	-8								
pair: 2	20917	20907	406	416	43550	43543	197	190	0.00944	0.54077	48306
48313	-7	-10	7								
pair: 3	20906	20803	259	362	43546	43538	135	127	0.00713	0.40859	48263
48295	-32	-103	8								
pair: 4	20910	20903	303	296	43538	43539	-148	-147	0.00688	0.39414	48295
48302	-7	7	-1								
pair: 5	20985	20983	337	335	43713	43704	-157	-166	0.00769	0.44045	48485
48486	-1	2	9								
pair: 6	20899	20909	91	81	43552	43546	40	34	0.00197	0.11315	48302
48310	-8	10	6								
pair: 7	20907	20903	146	150	43547	43548	67	68	0.00340	0.19472	48302
48308	-6	-4	-1								

- Most measurements are consistent within measurement precision about 10um
- Neglect 100um deviation in

pair:	S1	S2	dS1	dS2	L1	L2	dL1	dL2	<dS/L>	angle(deg)
d1	d2	dD	d(dS)	d(dL)						
Quad 3										
pair: 3	20906	20803	259	362	43546	43538	135	127	0.00713	0.40859
48263	48295	-32	-103	8						

- Angles of 2x1 are in the range from -0.42 to +0.54 degree.

Configuration parameters

✓ center/0-end.data (pixel)

198.02	198.06	310.09	97.62	628.25	629.22	712.11	498.98
198.51	198.15	313.63	100.88	629.51	630.48	711.61	499.01
197.97	197.91	308.90	95.84	625.28	625.63	710.70	497.89
197.67	197.84	306.33	93.85	625.32	623.58	710.74	498.15
307.61	95.27	626.06	626.09	512.10	724.67	195.87	195.97
307.25	94.95	623.07	624.14	510.58	722.79	195.18	195.52
307.94	95.41	624.20	624.92	514.45	726.70	198.17	198.68
307.99	95.56	628.14	626.89	514.66	726.22	199.03	198.64
-0.04	-0.16	0.12	0.22	-0.29	-0.05	-0.34	-0.34
-0.21	0.15	-0.40	-0.72	0.39	0.21	1.15	0.58
0.16	0.00	0.03	0.14	-0.11	-0.20	-0.05	0.03
-0.06	-0.01	-0.45	-0.20	-0.37	-0.49	-0.36	-0.29

✓ tilt/0-end.data (degree)

0.10659	0.04871	0.32496	-0.01973	-0.27768	-0.16187	-0.08354	0.26709
-0.12764	-0.05921	-0.12066	-0.11937	-0.42569	-0.14869	-0.10197	-0.04736
0.02105	0.08620	0.28749	0.07632	0.01711	0.06711	-0.18946	0.06119
0.24145	0.13223	0.54077	0.40859	0.39414	0.44045	0.11315	0.19472

Alignment of quads in the detector

✓ offset/0-end.data

0	0	820	820
0	820	820	0
0	0	0	0

✓ offset_corr/0-end.data
Version from 2013-01-31 !!!

0	0	5	2
0	5	4	4
0	0	0	0

✓ marg_gap_shift/0-end.data
Version from 2013-01-31 !!!

15	40	0	37
15	40	0	37
0	0	0	0

Test plot for CSPad using PyCSPadImage/src/Alignment.py