

2011-08-DD DSD CSPad alignment parameters

Optical measurement

We use 2011-08-10 optical measurements from Chris:

[2011-08-DD-Run4-DSD-Metrology.xlsx](#),

[2011-08-DD-Run4-DSD-Metrology.txt](#).

Procedure and table of results

We calculate

S1 - 1st short side of 2x1

S2 - 2nd short side of 2x1

L1 - 1st long side of 2x1

L2 - 2nd long side of 2x1

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).

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

pair:	S1	S2	dS1	dS2	L1	L2	dL1	dL2	<dS/L>	angle(deg)
Quad 0										
pair: 0	20908	20904	38	34	43541	43533	-6	-14	0.00083	0.04738
pair: 1	20911	20913	61	63	43542	43482	29	-31	0.00142	0.08164
pair: 2	20906	20900	-33	-27	43534	43537	-14	-11	-0.00069	-0.03948
pair: 3	20904	20906	-5	-7	43547	43537	6	-4	-0.00014	-0.00790
pair: 4	20977	20980	-148	-145	43700	43703	72	75	-0.00335	-0.19207
pair: 5	20976	20974	-92	-94	43700	43699	48	47	-0.00213	-0.12194
pair: 6	20907	20902	-27	-22	43536	43536	-11	-11	-0.00056	-0.03224
pair: 7	20907	20907	201	201	43499	43499	58	58	0.00462	0.26475
Quad 1										
pair: 0	20902	20900	110	108	43433	43333	53	-47	0.00251	0.14395
pair: 1	20899	20896	140	137	43532	43402	68	-62	0.00319	0.18256
pair: 2	20978	20981	298	295	43700	43701	136	137	0.00678	0.38874
pair: 3	20596	20568	139	167	43698	43708	79	89	0.00350	0.20058
pair: 4	21374	21374	66	66	43909	43911	-29	-27	0.00150	0.08612
pair: 5	21376	21272	135	31	43817	43910	-16	77	0.00189	0.10849
pair: 6	20903	20899	123	127	43537	43542	63	68	0.00287	0.16449
pair: 7	20897	20901	379	375	43537	43540	179	182	0.00866	0.49612
Quad 2										
pair: 0	20903	20904	55	56	43533	43541	-29	-21	0.00127	0.07304
pair: 1	20898	20907	85	94	43535	43530	-39	-44	0.00206	0.11780
pair: 2	21374	21375	38	37	43912	43915	15	18	0.00085	0.04893
pair: 3	21372	21412	270	230	43917	43903	134	120	0.00569	0.32621
pair: 4	20900	20898	-16	-18	43543	43538	20	15	-0.00039	-0.02237
pair: 5	20911	20904	218	211	43536	43541	-106	-101	0.00493	0.28228
pair: 6	20901	20902	-37	-38	43541	43537	-14	-18	-0.00086	-0.04935
pair: 7	20905	20904	-5	-4	43540	43539	4	3	-0.00010	-0.00592
Quad 3										
pair: 0	20903	20907	-5	-1	43541	43536	6	1	-0.00007	-0.00395
pair: 1	20905	20898	11	4	43541	43537	-1	-5	0.00017	0.00987
pair: 2	21377	21369	169	177	43916	43905	87	76	0.00394	0.22574
pair: 3	21380	21374	53	59	43913	43911	33	31	0.00128	0.07307
pair: 4	20904	20904	66	66	43537	43536	-28	-29	0.00152	0.08686
pair: 5	20903	20891	70	58	43540	43551	-39	-28	0.00147	0.08421
pair: 6	20901	20907	-33	-39	43537	43541	-18	-14	-0.00083	-0.04737
pair: 7	20905	20909	-2	-6	43539	43539	-1	-1	-0.00009	-0.00526

- Problematic measurements are:
In quad0, row 27: 64480 42354 -> 65202 43578 (pair 7)
In quad1, row 9: X: 44 -> 344 (pair 3)
These corrections were applied in order to get expected sizes of the sensor.
- All other measurements are consistent with each other within +/- 10um.
- Angles of 2x1 are in the range from -0.05 to +0.32 degree.

Configuration parameters

Configuration parameters are shown in number of pixels.

For 2x1 pairs in each quad

Coordinates of the 2x1 centers

- Use the same orientation as in optical measurement, center is calculated as an average of 4 corner coordinates
- All coordinates in pixels

```
self.pairXInQaud, self.pairYInQaud, self.pairZInQaud =
198.10, 198.06, 307.81, 95.27, 624.40, 625.31, 711.16, 498.99,
198.03, 198.03, 307.35, 96.12, 621.81, 621.61, 710.31, 497.46,
197.64, 197.84, 311.11, 98.69, 626.06, 625.67, 711.18, 498.64,
198.26, 198.04, 312.45, 100.09, 628.56, 628.45, 711.89, 499.62,
Y(pixel):
307.82, 95.40, 626.56, 627.17, 514.02, 726.59, 198.44, 198.32,
308.06, 95.69, 626.35, 625.72, 513.56, 726.50, 198.83, 197.64,
308.07, 95.47, 624.04, 623.36, 515.80, 728.55, 199.09, 199.57,
307.42, 95.13, 625.23, 625.09, 513.67, 726.28, 198.01, 198.49,
Z(pixel):
-0.85, -0.81, -1.18, -0.75, -1.64, -3.26, -2.44, -1.67,
0.43, 0.46, 0.87, 1.45, 0.51, 0.54, 0.68, 1.53,
-0.64, -0.41, -1.13, -0.93, -1.05, -1.31, -0.98, -0.87,
-0.35, -0.29, -0.60, -0.28, -0.92, -0.87, -1.18, -0.76,
```

Hand-made coordinate correction for 2x1 in quads (in pixel)

```
self.dXInQaud = [
# 0 1 2 3 4 5 6 7
[ 0, 0, 0, 0, 0, 0, 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0]]

self.dYInQaud = [
[ 0, 0, 0, 0, 0, 0, 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0]]
```

2x1-pair orientation angle (degree) in quads

```
self.pairInQaudOrient = [ [ 270, 270, 180, 180, 90, 90, 180, 180],
[ 270, 270, 180, 180, 90, 90, 180, 180],
[ 270, 270, 180, 180, 90, 90, 180, 180],
[ 270, 270, 180, 180, 90, 90, 180, 180] ]
```

Sensor tilt angle (degree) from optical measurement

```
self.dPhi =
0.04738, 0.08164, -0.03948, -0.00790, -0.19207, -0.12194, -0.03224, 0.26475,
0.14395, 0.18256, 0.38874, 0.20058, 0.08612, 0.10849, 0.16449, 0.49612,
0.07304, 0.11780, 0.04893, 0.32621, -0.02237, 0.28228, -0.04935, -0.00592,
```

```
-0.00395, 0.00987, 0.22574, 0.07307, 0.08686, 0.08421, -0.04737, -0.00526,
```

Quad coordinates in the detector

```
offX   = 40  
offY   = 40  
gapX   = 0  
gapY   = 0  
shiftX = 38  
shiftY = 38
```

```
self.quadXOffset = [ off+0-gapX+shiftX, off+ 0+0-gapX-shiftX, off+834-0+gapX-shiftX, off+834+0+gapX+shiftX]  
self.quadYOffset = [ off+0-gapY-shiftY, off+834-0+gapY-shiftY, off+834-0+gapY+shiftY, off+ 0+0-gapY+shiftY]
```