

2015-01-20 CSPAD Camera2 Alignment

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Optical measurements

Comments from Gabriel Blaj:

The new CSPAD CXI Camera2 metrology is attached. This is the former CXI DS2 camera, with previous metrology file in DS2-Metrology-Aug-27-2014.xlsx (sent previously). As discussed previously, the camera is now named the CXI Camera2_V16_20150120, with new metrology in the attached file. The only quad that is changed is quad 3 (counting from 0 to 3). I will forward the new naming formula once again.

Metrology files:

[2015-01-20-CSPAD-CXI-Camera2-Metrology.xlsx](#)

- Q3 is re-measured only relative to [2014-08-27-CSPAD-CXI-Camera2-Metrology.xlsx](#)
- **Z coordinates for Q0, Q2 were not measured**
- **Q1 Z values: measured incorrectly - discard**

No correction for X-Y, Z-data for Q1 is discarded

Quality check in X-Y plane

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	S1	S2	dS1	dS2	L1	L2	dL1	dL2	angle(deg)	D1	D2	dD	d
segm: (dS)	d(dL)												
Quad 0													
segm: 0	-20937	-20905	101	133	43556	43544	59	47	0.15393	48311	48317		
-6	-32	12											
segm: 1	-20911	-20905	65	71	43571	43551	31	11	0.08944	48308	48329		
-21	-6	20											
segm: 2	-20927	-20910	51	68	-43542	-43548	-17	-23	0.07829	48301	48316		
-15	-17	6											
segm: 3	-20931	-20916	31	46	-43587	-43591	3	-1	0.05061	48333	48368		
-35	-15	4											
segm: 4	20943	20946	55	58	-43546	-43544	27	29	-0.07434	48319	48320		
-1	-3	-2											
segm: 5	20916	20903	138	125	-43558	-43543	58	73	-0.17300	48308	48312		
-4	13	-15											
segm: 6	-20948	-20942	-58	-52	-43574	-43510	-34	30	-0.07237	48343	48292		
51	-6	-64											
segm: 7	-20915	-20941	2	-24	-43571	-43550	6	27	-0.01447	48316	48337		
-21	26	-21											
Quad 1													
segm: 0	-20932	-20954	-138	-160	43566	43569	-61	-58	-0.19595	48351	48329		
22	22	-3											
segm: 1	-20948	-20950	46	44	43558	43548	26	16	0.05920	48328	48330		
-2	2	10											
segm: 2	-20930	-20927	64	67	-43572	-43542	-54	-24	0.08616	48332	48317		
15	-3	-30											
segm: 3	-20951	-20912	95	134	-43592	-43547	-97	-52	0.15057	48354	48319		
35	-39	-45											
segm: 4	20882	20956	-74	0	-43558	-43549	-46	-37	0.04867	48338	48296		
42	-74	-9											
segm: 5	20926	20925	-51	-52	-43552	-43577	-2	-27	0.06773	48320	48339		
-19	1	25											
segm: 6	-20924	-20921	91	94	-43563	-43566	-42	-45	0.12166	48327	48329		
-2	-3	3											
segm: 7	-20940	-20912	-95	-67	-43563	-43547	29	45	-0.10655	48323	48319		
4	-28	-16											
Quad 2													
segm: 0	-20944	-20953	91	82	43586	43585	40	39	0.11371	48356	48360		
-4	9	1											
segm: 1	-20973	-20937	-121	-85	43574	43547	-53	-80	-0.13548	48323	48354		
-31	-36	27											
segm: 2	-20911	-20953	10	-32	-43566	-43572	-7	-13	-0.01447	48350	48322		
28	42	6											
segm: 3	-20908	-20909	-52	-53	-43544	-43546	27	25	-0.06908	48303	48305		
-2	1	2											
segm: 4	20947	20911	58	22	-43547	-43547	9	9	-0.05263	48324	48306		
18	36	0											
segm: 5	20917	20911	-86	-92	-43548	-43554	-38	-44	0.11709	48310	48314		
-4	6	6											
segm: 6	-20908	-20907	66	67	-43545	-43572	-26	-53	0.08747	48323	48309		
14	-1	27											
segm: 7	-20913	-20909	-46	-42	-43483	-43480	23	26	-0.05798	48245	48251		
-6	-4	-3											
Quad 3													
segm: 0	-21001	-20956	83	128	43541	43568	63	90	0.13878	48366	48320		
46	-45	-27											
segm: 1	-20906	-20904	0	2	43562	43543	19	0	0.00132	48318	48301		
17	-2	19											
segm: 2	-20932	-20909	-38	-15	-43544	-43576	22	-10	-0.03486	48329	48317		
12	-23	32											
segm: 3	-20934	-20904	-158	-128	-43550	-43552	63	61	-0.18813	48320	48308		
12	-30	2											
segm: 4	20912	20949	-69	-32	-43545	-43549	-44	-48	0.06644	48335	48297		
38	-37	4											
segm: 5	20938	20934	-157	-161	-43558	-43544	-87	-73	0.20918	48325	48319		
6	4	-14											
segm: 6	-20913	-20911	-150	-148	-43544	-43546	72	70	-0.19605	48306	48305		
1	-2	2											
segm: 7	-20921	-20918	-78	-75	-43541	-43552	39	28	-0.10065	48313	48307		
6	-3	11											

Quality check in Z

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[illegible]

Constants

✓ geometry/0-end.data

```
# TITLE      Geometry parameters of CSPAD
# DATE_TIME  2015-02-03 13:57:08 PST
# METROLOGY  ./work/metrology.txt
# AUTHOR     dubrovin
# EXPERIMENT CXI
# DETECTOR   CSPAD
# CALIB_TYPE geometry
# COMMENT:01 Table contains the list of geometry parameters for alignment of 2x1 sensors, quads, CSPAD, etc
# COMMENT:02 All translation and rotation pars of the object are defined w.r.t. parent object Cartesian frame
# PARAM:01 PARENT      - name and version of the parent object
# PARAM:02 PARENT_IND  - index of the parent object
# PARAM:03 OBJECT      - name and version of the object
# PARAM:04 OBJECT_IND  - index of the new object
# PARAM:05 X0          - x-coordinate [um] of the object origin in the parent frame
# PARAM:06 Y0          - y-coordinate [um] of the object origin in the parent frame
# PARAM:07 Z0          - z-coordinate [um] of the object origin in the parent frame
# PARAM:08 ROT_Z       - object design rotation angle [deg] around Z axis of the parent frame
# PARAM:09 ROT_Y       - object design rotation angle [deg] around Y axis of the parent frame
# PARAM:10 ROT_X       - object design rotation angle [deg] around X axis of the parent frame
# PARAM:11 TILT_Z      - object tilt angle [deg] around Z axis of the parent frame
# PARAM:12 TILT_Y      - object tilt angle [deg] around Y axis of the parent frame
# PARAM:13 TILT_X      - object tilt angle [deg] around X axis of the parent frame

# HDR PARENT IND      OBJECT IND      X0[um]  Y0[um]  Z0[um]  ROT-Z  ROT-Y  ROT-X      TILT-Z  TILT-Y  TILT-X

QUAD:V1      0  SENS2X1:V1  0      21736  32910      0      0      0      0      0.15393  0.00000
0.00000
QUAD:V1      0  SENS2X1:V1  1      21764  10525      0      0      0      0      0.08944  0.00000
0.00000
QUAD:V1      0  SENS2X1:V1  2      33135  68357      0      270     0      0      0.07829  0.00000
0.00000
QUAD:V1      0  SENS2X1:V1  3      10548  68345      0      270     0      0      0.05061  0.00000
0.00000
QUAD:V1      0  SENS2X1:V1  4      68567  56864      0      180     0      0     -0.07434  0.00000
0.00000
QUAD:V1      0  SENS2X1:V1  5      68641  79593      0      180     0      0     -0.17300  0.00000
0.00000
QUAD:V1      0  SENS2X1:V1  6      77801  21584      0      270     0      0     -0.07237  0.00000
0.00000
QUAD:V1      0  SENS2X1:V1  7      54887  21619      0      270     0      0     -0.01447  0.00000
0.00000

QUAD:V1      1  SENS2X1:V1  0      21796  33393      69      0      0      0     -0.19595  0.29458
-0.12311
QUAD:V1      1  SENS2X1:V1  1      21763  10496     -53      0      0      0      0.05920  0.13813
-0.11487
QUAD:V1      1  SENS2X1:V1  2      33311  68498     -35      270     0      0      0.08616  0.49826
0.29991
QUAD:V1      1  SENS2X1:V1  3      10488  68326      12      270     0      0      0.15057 -0.02190
0.07101
QUAD:V1      1  SENS2X1:V1  4      68577  56906      30      180     0      0      0.04867 -0.21575
0.30402
QUAD:V1      1  SENS2X1:V1  5      68533  79420      54      180     0      0      0.06773 -0.18939
0.08214
QUAD:V1      1  SENS2X1:V1  6      77306  21384     -179      270     0      0      0.12166  0.36970
0.09601
QUAD:V1      1  SENS2X1:V1  7      54801  21366      33      270     0      0     -0.10655 -0.11226
-0.14602

QUAD:V1      2  SENS2X1:V1  0      21762  33294      0      0      0      0      0.11371  0.00000
0.00000
QUAD:V1      2  SENS2X1:V1  1      21805  10433      0      0      0      0     -0.13548  0.00000
0.00000
```

QUAD:V1 0.00000	2	SENS2X1:V1	2	33267	68360	0	270	0	0	-0.01447	0.00000
QUAD:V1 0.00000	2	SENS2X1:V1	3	10584	68343	0	270	0	0	-0.06908	0.00000
QUAD:V1 0.00000	2	SENS2X1:V1	4	68488	57005	0	180	0	0	-0.05263	0.00000
QUAD:V1 0.00000	2	SENS2X1:V1	5	68432	79403	0	180	0	0	0.11709	0.00000
QUAD:V1 0.00000	2	SENS2X1:V1	6	77293	21711	0	270	0	0	0.08747	0.00000
QUAD:V1 0.00000	2	SENS2X1:V1	7	54717	21678	0	270	0	0	-0.05798	0.00000
QUAD:V1 0.10106	3	SENS2X1:V1	0	21671	32898	80	0	0	0	0.13878	-0.11313
QUAD:V1 -0.06578	3	SENS2X1:V1	1	21763	10453	-46	0	0	0	0.00132	-0.05920
QUAD:V1 -0.03683	3	SENS2X1:V1	2	33039	68572	16	270	0	0	-0.03486	0.06299
QUAD:V1 -0.05394	3	SENS2X1:V1	3	10418	68557	12	270	0	0	-0.18813	0.04108
QUAD:V1 0.41335	3	SENS2X1:V1	4	68343	57213	-10	180	0	0	0.06644	-0.23288
QUAD:V1 0.15599	3	SENS2X1:V1	5	68304	79806	80	180	0	0	0.20918	-0.07762
QUAD:V1 -0.09474	3	SENS2X1:V1	6	77911	21808	44	270	0	0	-0.19605	0.05206
QUAD:V1 -0.07105	3	SENS2X1:V1	7	54550	21911	41	270	0	0	-0.10065	0.00274
CSPAD:V1 0.00000	0	QUAD:V1	0	-4500	-4500	0	90	0	0	0.00000	0.00000
CSPAD:V1 0.00000	0	QUAD:V1	1	-4500	4500	0	0	0	0	0.00000	0.00000
CSPAD:V1 0.00000	0	QUAD:V1	2	4500	4500	0	270	0	0	0.00000	0.00000
CSPAD:V1 0.00000	0	QUAD:V1	3	4500	-4500	0	180	0	0	0.00000	0.00000
RAIL 0.00000	0	CSPAD:V1	0	0	0	1000000	0	0	0	0.00000	0.00000
IP 0.00000	0	RAIL	0	0	0	0	0	0	0	0.00000	0.00000

✓ geometry/1-end.data - with aligned quads:

CSPAD:V1 0.00000	0	QUAD:V1	0	-4800	-3200	0	90.0	0.0	0.0	0.00000	0.00000
CSPAD:V1 0.00000	0	QUAD:V1	1	-3800	6200	0	0.0	0.0	0.0	0.00000	0.00000
CSPAD:V1 0.00000	0	QUAD:V1	2	5800	4900	0	270.0	0.0	0.0	0.00000	0.00000
CSPAD:V1 0.00000	0	QUAD:V1	3	3800	-4800	0	180.0	0.0	0.0	0.00000	0.00000

⚠ /reg/g/psdm/detector/alignment/cspad/calib-cxi-ds2-2015-01-20/calib/CsPad::CalibV1/CxiDs2.0:Cspad.0/geometry/geo-cxi86415-r0002-swap-cabels.data - geometry file with swapped quad indexes for swapped cables for cxi86415, as requested by Jason

CSPAD:V1 0.00000	0	QUAD:V1	0	-3800	6200	0	0.0	0.0	0.0	0.00000	0.00000
CSPAD:V1 0.00000	0	QUAD:V1	1	-4800	-3200	0	90.0	0.0	0.0	0.00000	0.00000
CSPAD:V1 0.00000	0	QUAD:V1	2	3800	-4800	0	180.0	0.0	0.0	0.00000	0.00000
CSPAD:V1 0.00000	0	QUAD:V1	3	5800	4900	0	270.0	0.0	0.0	0.00000	0.00000

Quads alignment

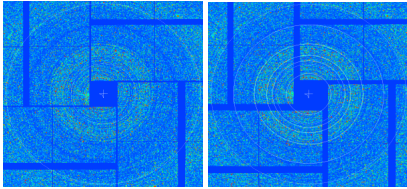
2015-03-04 quad alignment for exp=cxig0715:run=23

Quads alignment is done on 2015-03-04 using new alignment tool with development name geo.

Chris/Sebastien Boutet: there should be lysozyme rings in cxig0715 runs 8,10,11,12,13,14,15.

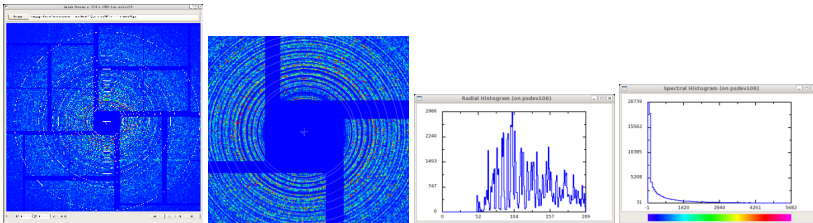
Data from runs 13 and 23 (exp=cxig0715:run=23) is used to get cspad ndarray with maximal intensity values over 20K-40K events.

Images below show default and aligned version of the geometry file:



2015-05-01 quad alignment for exp=cxii2415:run=8

Chris supplied file /reg/g/psdm/detector/alignment/cspad/calib-cxi-camera2-2015-01-20/cspad-ndarr-max-cxii2415-r0008-lysozyme-rings.npy



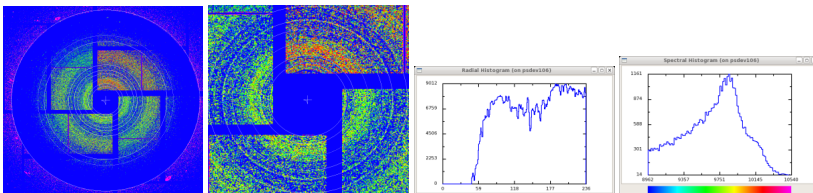
Archived: /reg/g/psdm/detector/alignment/cspad/calib-cxi-camera2-2015-01-20/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/geometry/geo-cxii2415-r0008-v1.data

Deployed: /reg/d/psdm/CXI/cxii2415/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/geometry/1-end.data

2015-05-01 quad alignment for exp=cxii5615:run=24-36,38-42

ndarray with image: /reg/g/psdm/detector/alignment/cspad/calib-cxi-camera2-2015-01-20/cspad-ndarr-max-cxii5615-r24-42-protein.txt

starting version of geometry geo-cxii2415-r0008-v1.data

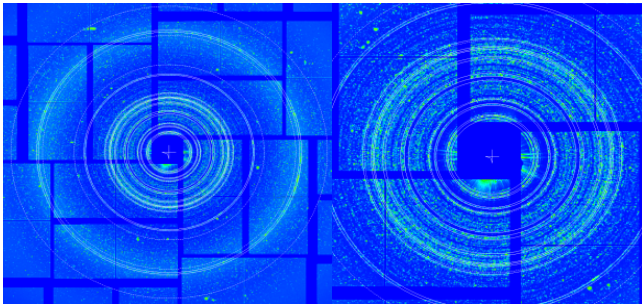


Archived: /reg/g/psdm/detector/alignment/cspad/calib-cxi-camera2-2015-01-20/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/geometry/geo-cxii5615-r24-42-v1.data

Deployed: /reg/d/psdm/CXI/cxii5615/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/geometry/1-end.data

2016-03-21 quad alignment for exp=cxih9615:run=48, 51, 65

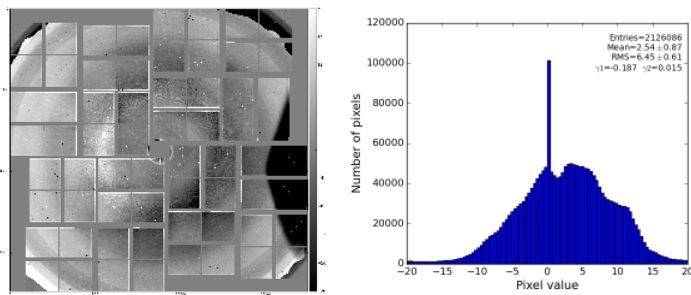
- Data: /reg/d/psdm/cxi/cxih9615/xtc/ exp=cxih9615:run=48 collected on 2016-06-26 13:13 - 19:18
- Restore xtc data files from tape runs 39, 48, 51, 65
- Optical metrology: [2015-01-20 CSPAD Camera2 Alignment](#)
- Initial geometry: calib-cxi-camera2-2015-01-20/geo-cxii5615-r24-42-v1.data
- Geometry file saved: /reg/g/psdm/detector/alignment/cspad/calib-cxi-camera2-2015-01-20/geo-cxih9615-r48-51-65-v1.data
- Plots:



2016-03-21 quad alignment for exp=cxij4915:run=25, 26

- Data: exp=cxij4915:run=25, 26 collected on 2015-10-29 19:07 - water ring
- Using [Radial Background Subtraction Algorithm](#) with initial geometry calib-cxi-camera2-2015-01-20/geo-cxii5615-r24-42-v1.data

apply correction of the detector position `geo.move_geo( 'CSPAD:V1', 0, -2200, -600, 0)` we get



- Geometry file saved: /reg/g/psdm/detector/alignment/cspad/calib-cxi-camera2-2015-01-20/geo-cxij4915-r25-v1.data

Command for further tuning

```
geo -g geo-cxii5615-r24-42-v1.data -i cspad-ndarr-max-cxii5615-r24-42-protein.txt
OR:
geo -g geo-cxii2415-r0008-v1.data -i cspad-ndarr-max-cxii2415-r0008-lysozyme-rings.txt
OR for alignment cross-check:
geo -g geo-cxii2415-r0008-v1.data -i cspad-ndarr-max-cxii5615-r24-42-protein.txt
```



In commands above it is assumed that geometry and image files reside in local directory.

References

- [Detector alignment tool](#)
- [Cross check of correction to optical metrology](#)
- [CSPAD Alignment](#)