

# 2011-06-20 CSPad alignment parameters

Go back to [CSPAD Alignment](#)

## Content

- [Content](#)
- [Optical measurement](#)
- [History of DS1 quads alignment](#)
- [2016-03-16 Geometry re-alignment](#)
  - [Quality check](#)
    - [Raw metrology](#)
    - [Corrected metrology](#)
  - [Alignment of quads](#)
  - [Deployment](#)
- [References](#)

## Optical measurement

We use before-run4 optical measurements from Chris K.:

- [2011-06-20-CSPAD2-Alignment-Before-Run4.xlsx](#) - original metrology
- [2011-06-20-CSPAD2-Alignment-Before-Run4.txt](#) - text version of metrology data
- [2011-06-20-CSPAD2-Alignment-Before-Run4-corr.txt](#) - corrected for 3 points on 2016-03-16

## History of DS1 quads alignment

- 2011-10-18 CxiDs1.0:Cspad.0 cxi37411 alignment - copy of cxi35711, test runs 39, 80.
- Deployed: /reg/d/psdm/CXI/cxi37411/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/
- [2012-01-18 CSPad CxiDs1 alignment](#) for cxi80410-r1150, cxi43312, cxi39912, etc.  
Local: ~dubrovinn/LCLS/CSPadAlignment-v01/calib-cxi80410-r1150-Ds1/  
Deployed: /reg/d/psdm/CXI/cxi80410/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/ Files added as 1142-end.data
- [2012-02-17 CSPad CxiDs1 alignment](#) for cxi39112-r0009, cxi39112  
Local: ~dubrovinn/LCLS/CSPadAlignment-v01/calib-cxi39112-r0009-Ds1/  
Deployed: /reg/d/psdm/CXI/cxi39112/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/
- [2012-03-08 CSPad CxiDs1 alignment](#) for cxi49812-r0073 - copy of cxi37411, test runs 72(dark) 73(water ring) from 2011-12-03.  
Local: ~dubrovinn/LCLS/CSPadAlignment-v01/calib-cxi49812-r0073-Ds1/  
Deployed: /reg/d/psdm/CXI/cxi49812/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/
- [2012-03-14 CSPad CxiDs1 alignment](#) for cxi49012-r0020  
Local: ~dubrovinn/LCLS/CSPadAlignment-v01/calib-cxi49012-r0020-Ds1/\*0-end.data  
Deployed: /reg/d/psdm/CXI/cxi49012/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/\*0-end.data
- [2013-01-31 CSPad CxiDs1 alignment](#)  
Local: ~dubrovinn/LCLS/CSPadAlignment-v01/calib-cxi64813-r0058-Ds1/\*0-end.data  
Deployed: /reg/d/psdm/CXI/cxi64813/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/\*0-end.data

## 2016-03-16 Geometry re-alignment

- Chuck requested geometry file for old experiment cxi40112, run 23 - dark, run 32-35 - images.

## Quality check

### Raw metrology

Original metrology file has problems in 3 points.

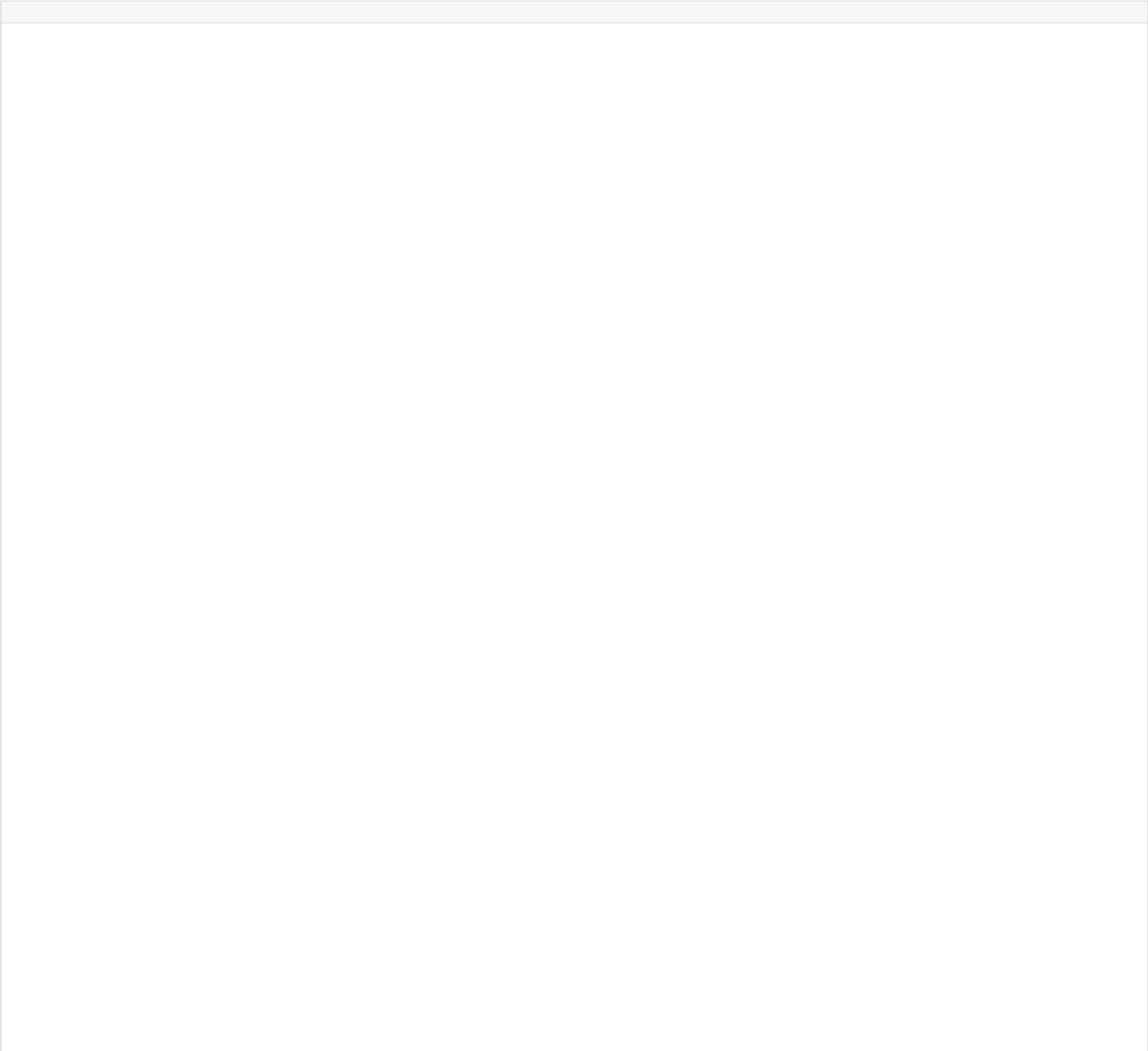
CalibManager.GUIMetrology: Quality check in X-Y plane:

| segm:   | S1     | S2     | dS1  | dS2  | L1     | L2     | dL1 | dL2 | angle(deg) | D1    | D2    | dD   | d |
|---------|--------|--------|------|------|--------|--------|-----|-----|------------|-------|-------|------|---|
| (dS)    | d(dL)  |        |      |      |        |        |     |     |            |       |       |      |   |
| Quad    | 2      |        |      |      |        |        |     |     |            |       |       |      |   |
| segm: 6 | -20901 | -20905 | -123 | -127 | -43278 | -43388 | 54  | -56 | -0.16528   | 48166 | 48056 |      |   |
| 110     | 4      | 110    |      |      |        |        |     |     |            |       |       |      |   |
| segm: 7 | -20893 | -20902 | 75   | 66   | -43465 | -44415 | 984 | 34  | 0.09193    | 48166 | 49146 |      |   |
| -980    | 9      | 950    |      |      |        |        |     |     |            |       |       |      |   |
| Quad    | 3      |        |      |      |        |        |     |     |            |       |       |      |   |
| segm: 5 | 20768  | 20906  | -68  | 70   | -43404 | -43542 | 166 | 28  | -0.00132   | 48121 | 48295 | -174 |   |
| -138    | 138    |        |      |      |        |        |     |     |            |       |       |      |   |

- Problematic measurements are
  - Quad 2, segm 6. Correction for point 32 Y=130->20
  - Quad 2, segm 7. Correction for point 26 Y=44485->43535
  - Quad 3, segm 5. Correction for point 23 X=90854->90716 and Y=90729->90867

Corrected metrology

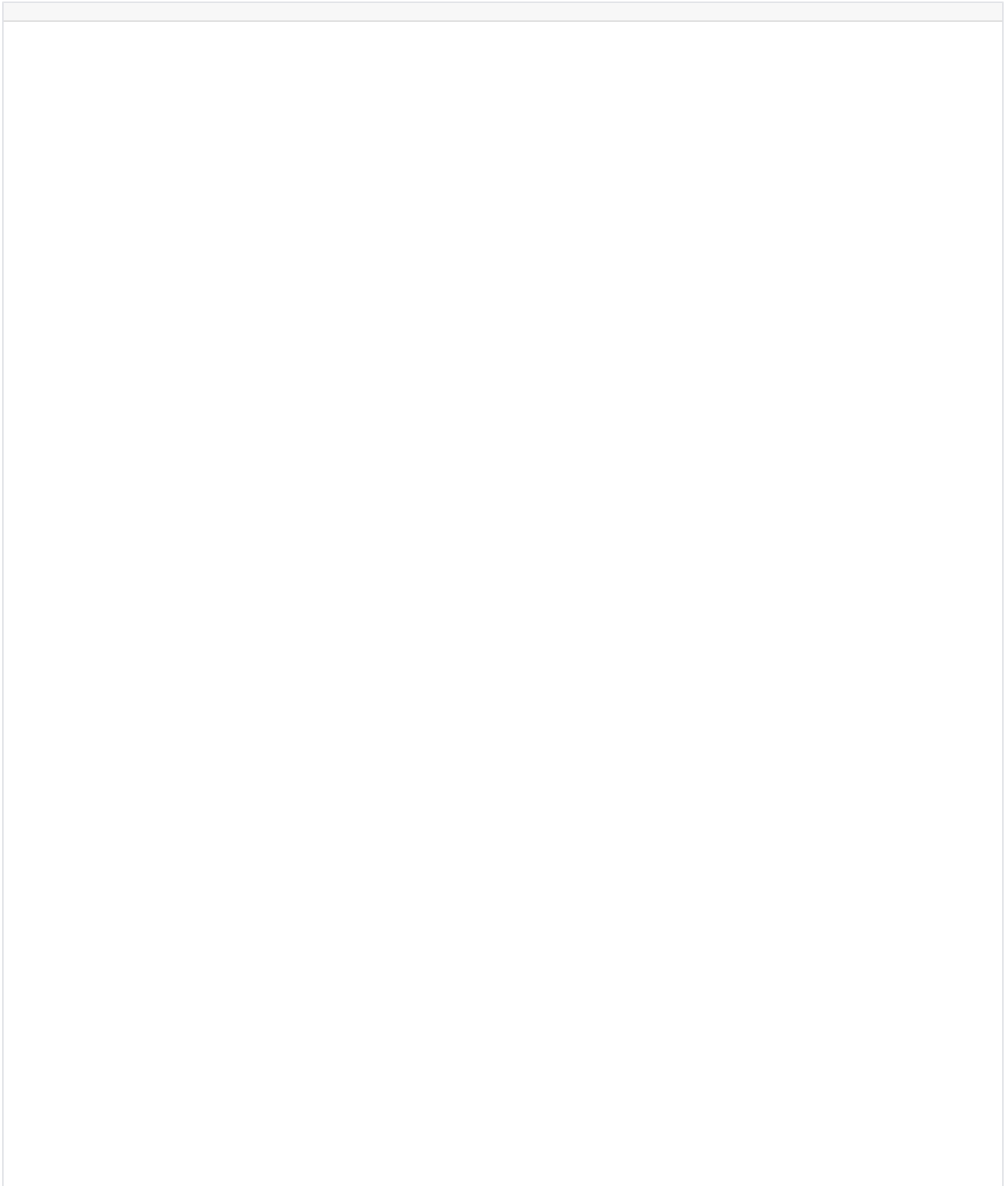
2016-03-16 17:09:06 (info) CalibManager.GUIMetrology: Quality check in X-Y plane:



| segm: | (dS) | S1     | S2     | dS1  | dS2  | L1     | L2     | dL1  | dL2  | angle(deg) | D1    | D2    | dD | d |
|-------|------|--------|--------|------|------|--------|--------|------|------|------------|-------|-------|----|---|
| Quad  | 0    |        |        |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 0    | -20911 | -20907 | -259 | -255 | 43539  | 43543  | -130 | -126 | -0.33818   | 48297 | 48306 |    |   |
| -9    |      | -4     | -4     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 1    | -20907 | -20905 | 0    | 2    | 43535  | 43536  | -4   | -3   | 0.00132    | 48291 | 48298 |    |   |
| -7    |      | -2     | -1     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 2    | -20909 | -20905 | 237  | 241  | -43539 | -43537 | -114 | -112 | 0.31452    | 48296 | 48299 |    |   |
| -3    |      | -4     | -2     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 3    | -20903 | -20894 | -31  | -22  | -43542 | -43540 | 8    | 10   | -0.03487   | 48300 | 48293 |    |   |
| 7     |      | -9     | -2     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 4    | 20908  | 20906  | -111 | -113 | -43539 | -43543 | -51  | -55  | 0.14738    | 48299 | 48301 |    |   |
| -2    |      | 2      | 4      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 5    | 20911  | 20899  | -54  | -66  | -43545 | -43533 | -35  | -23  | 0.07896    | 48297 | 48297 |    |   |
| 0     |      | 12     | -12    |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 6    | -20911 | -20908 | -167 | -164 | -43538 | -43544 | 80   | 74   | -0.21778   | 48303 | 48299 |    |   |
| 4     |      | -3     | 6      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 7    | -20897 | -20905 | -75  | -83  | -43539 | -43541 | 40   | 38   | -0.10396   | 48295 | 48297 |    |   |
| -2    |      | 8      | 2      |      |      |        |        |      |      |            |       |       |    |   |
| Quad  | 1    |        |        |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 0    | -20907 | -20911 | -205 | -209 | 43544  | 43542  | -100 | -102 | -0.27238   | 48302 | 48305 |    |   |
| -3    |      | 4      | 2      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 1    | -20904 | -20892 | -8   | 4    | 43544  | 43550  | 0    | 6    | -0.00263   | 48305 | 48298 |    |   |
| 7     |      | -12    | -6     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 2    | -21379 | -21372 | 16   | 23   | -43909 | -43903 | -7   | -1   | 0.02545    | 48827 | 48837 |    |   |
| -10   |      | -7     | -6     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 3    | -21382 | -21379 | 22   | 25   | -43909 | -43908 | -12  | -11  | 0.03066    | 48837 | 48837 |    |   |
| 0     |      | -3     | -1     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 4    | 20906  | 20915  | 23   | 32   | -43535 | -43543 | 15   | 7    | -0.03619   | 48302 | 48298 |    |   |
| 4     |      | -9     | 8      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 5    | 20911  | 20908  | -17  | -20  | -43540 | -43541 | -11  | -12  | 0.02434    | 48303 | 48298 |    |   |
| 5     |      | 3      | 1      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 6    | -20900 | -20904 | 63   | 59   | -43540 | -43538 | -30  | -28  | 0.08027    | 48296 | 48296 |    |   |
| 0     |      | 4      | -2     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 7    | -20900 | -20901 | 115  | 114  | -43537 | -43543 | -47  | -53  | 0.15067    | 48292 | 48301 |    |   |
| -9    |      | 1      | 6      |      |      |        |        |      |      |            |       |       |    |   |
| Quad  | 2    |        |        |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 0    | -20910 | -20905 | -39  | -34  | 43548  | 43540  | -12  | -20  | -0.04803   | 48304 | 48301 |    |   |
| 3     |      | -5     | 8      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 1    | -20908 | -20896 | -9   | 3    | 43537  | 43539  | 0    | 2    | -0.00395   | 48297 | 48293 |    |   |
| 4     |      | -12    | -2     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 2    | -20900 | -20912 | 92   | 80   | -43536 | -43536 | -43  | -43  | 0.11318    | 48297 | 48293 |    |   |
| 4     |      | 12     | 0      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 3    | -20908 | -20906 | -61  | -59  | -43542 | -43539 | 28   | 31   | -0.07896   | 48299 | 48300 |    |   |
| -1    |      | -2     | -3     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 4    | 20903  | 20900  | 276  | 273  | -43538 | -43536 | 137  | 139  | -0.36124   | 48289 | 48300 |    |   |
| -11   |      | 3      | -2     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 5    | 20899  | 20895  | 244  | 240  | -43538 | -43540 | 116  | 114  | -0.31846   | 48295 | 48293 |    |   |
| 2     |      | 4      | 2      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 6    | -20901 | -20905 | -123 | -127 | -43388 | -43388 | 54   | 54   | -0.16507   | 48166 | 48155 |    |   |
| 11    |      | 4      | 0      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 7    | -20893 | -20902 | 75   | 66   | -43465 | -43465 | 34   | 34   | 0.09293    | 48166 | 48288 |    |   |
| -122  |      | 9      | 0      |      |      |        |        |      |      |            |       |       |    |   |
| Quad  | 3    |        |        |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 0    | -20904 | -20897 | 91   | 98   | 43536  | 43538  | 42   | 44   | 0.12436    | 48291 | 48296 |    |   |
| -5    |      | -7     | -2     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 1    | -20909 | -20904 | -1   | 4    | 43529  | 43534  | -5   | 0    | 0.00197    | 48288 | 48294 |    |   |
| -6    |      | -5     | -5     |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 2    | -20907 | -20902 | 338  | 343  | -43537 | -43540 | -159 | -162 | 0.44808    | 48295 | 48301 |    |   |
| -6    |      | -5     | 3      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 3    | -20896 | -20904 | 200  | 192  | -43537 | -43539 | -95  | -97  | 0.25793    | 48296 | 48293 |    |   |
| 3     |      | 8      | 2      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 4    | 20908  | 20906  | 138  | 136  | -43533 | -43542 | 70   | 61   | -0.18029   | 48297 | 48297 |    |   |
| 0     |      | 2      | 9      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 5    | 20906  | 20906  | -68  | -68  | -43404 | -43404 | 28   | 28   | 0.08976    | 48121 | 48231 |    |   |
| -110  |      | 0      | 0      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 6    | -20900 | -20905 | 251  | 246  | -43540 | -43541 | -118 | -119 | 0.32700    | 48297 | 48299 |    |   |
| -2    |      | 5      | 1      |      |      |        |        |      |      |            |       |       |    |   |
| segm: | 7    | -20905 | -20908 | 248  | 245  | -43536 | -43540 | -117 | -121 | 0.32439    | 48298 | 48297 |    |   |
| 1     |      | 3      | 4      |      |      |        |        |      |      |            |       |       |    |   |

- Corrected metrology have consistent size of 2x1 sides, but still in 2 of corrected points the difference in diagonal is about 1 pixel size (122, 110um)...
- All other measurements are consistent with each other within about 10um.
- Angles of 2x1 are in the range from -0.36 to +0.44 degree.

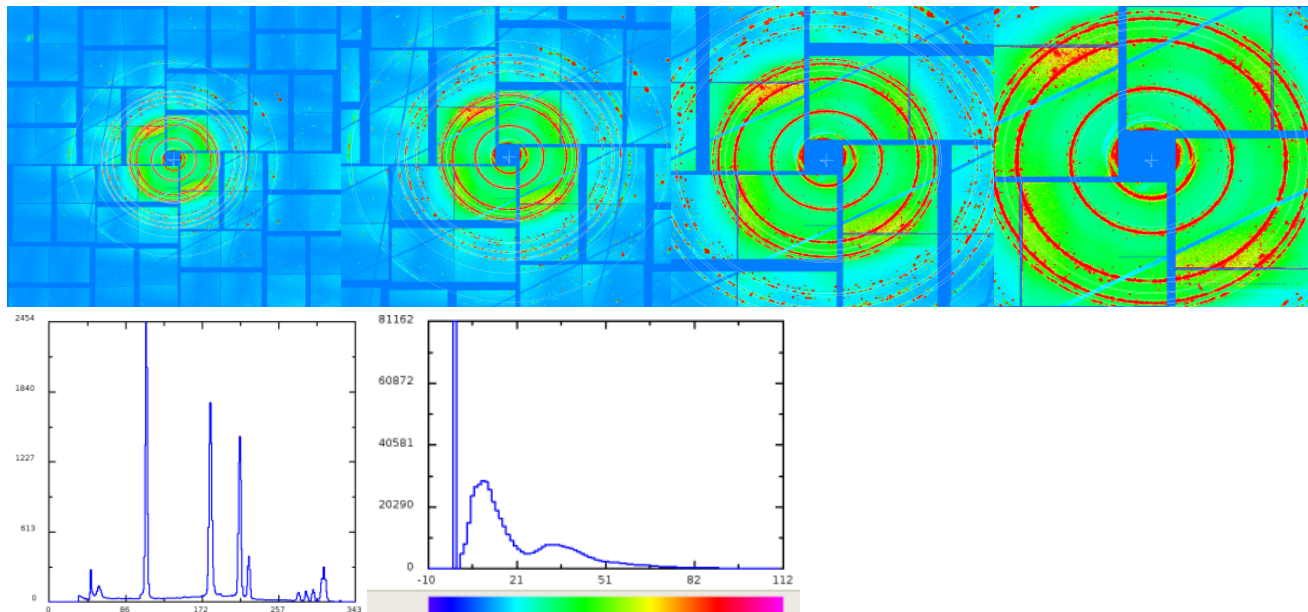
2016-03-16 17:09:06 (info) CalibManager.GUIMetrology: Quality check in Z:



|            | SA         | LA      | XSize | YSize | dZS1 | dZS2 | dZL1 | dZL2 | dZSA | dZLA | ddZS | ddZL | dZX | dZY |
|------------|------------|---------|-------|-------|------|------|------|------|------|------|------|------|-----|-----|
| angXZ(deg) | angYZ(deg) | dz3(um) |       |       |      |      |      |      |      |      |      |      |     |     |
| Quad 0     |            |         |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 0    | -20909     | 43541   | 43541 | 20909 | 3    | -13  | -41  | -57  | -5   | -49  | 16   | 16   | -49 | -5  |
| -0.06448   | -0.01370   | -15.994 |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 1    | -20906     | 43535   | 43535 | 20906 | -19  | 22   | -14  | 27   | 1    | 6    | -41  | -41  | 6   | 1   |
| 0.00790    | 0.00274    | 40.998  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 2    | -20907     | -43538  | 20907 | 43538 | -8   | -7   | 2    | 3    | -7   | 2    | -1   | -1   | -7  | 2   |
| -0.01918   | 0.00263    | -0.999  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 3    | -20898     | -43541  | 20898 | 43541 | 22   | 0    | 9    | -13  | 11   | -2   | 22   | 22   | 11  | -2  |
| 0.03016    | -0.00263   | 22.001  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 4    | 20907      | -43541  | 43541 | 20907 | -23  | 0    | -31  | -8   | -11  | -19  | -23  | -23  | -19 | -11 |
| -0.02500   | -0.03015   | 23.003  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 5    | 20905      | -43539  | 43539 | 20905 | 10   | 19   | -34  | -25  | 14   | -29  | -9   | -9   | -29 | 14  |
| -0.03816   | 0.03837    | 9.002   |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 6    | -20909     | -43541  | 20909 | 43541 | -24  | -25  | 16   | 15   | -24  | 15   | 1    | 1    | -24 | 15  |
| -0.06577   | 0.01974    | 1.006   |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 7    | -20901     | -43540  | 20901 | 43540 | 4    | -5   | 14   | 5    | 0    | 9    | 9    | 9    | 0   | 9   |
| 0.00000    | 0.01184    | 8.998   |       |       |      |      |      |      |      |      |      |      |     |     |
| Quad 1     |            |         |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 0    | -20909     | 43543   | 43543 | 20909 | -24  | -6   | 56   | 74   | -15  | 65   | -18  | -18  | 65  | -15 |
| 0.08553    | -0.04110   | 18.008  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 1    | -20898     | 43547   | 43547 | 20898 | -16  | 31   | 39   | 86   | 7    | 62   | -47  | -47  | 62  | 7   |
| 0.08157    | 0.01919    | 46.979  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 2    | -21375     | -43906  | 21375 | 43906 | -46  | -50  | 9    | 5    | -48  | 7    | 4    | 4    | -48 | 7   |
| -0.12866   | 0.00913    | 4.016   |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 3    | -21380     | -43908  | 21380 | 43908 | -26  | -10  | -16  | 0    | -18  | -8   | -16  | -16  | -18 | -8  |
| -0.04824   | -0.01044   | -15.999 |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 4    | 20910      | -43539  | 43539 | 20910 | -7   | -18  | -53  | -64  | -12  | -58  | 11   | 11   | -58 | -12 |
| -0.07633   | -0.03288   | -10.983 |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 5    | 20909      | -43540  | 43540 | 20909 | 4    | 10   | -73  | -67  | 7    | -70  | -6   | -6   | -70 | 7   |
| -0.09212   | 0.01918    | 6.003   |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 6    | -20902     | -43539  | 20902 | 43539 | -30  | -27  | 21   | 24   | -28  | 22   | -3   | -3   | -28 | 22  |
| -0.07675   | 0.02895    | -3.006  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 7    | -20900     | -43540  | 20900 | 43540 | -36  | -14  | 13   | 35   | -25  | 24   | -22  | -22  | -25 | 24  |
| -0.06854   | 0.03158    | -21.996 |       |       |      |      |      |      |      |      |      |      |     |     |
| Quad 2     |            |         |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 0    | -20907     | 43544   | 43544 | 20907 | -9   | 1    | 6    | 16   | -4   | 11   | -10  | -10  | 11  | -4  |
| 0.01447    | -0.01096   | 10.001  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 1    | -20902     | 43538   | 43538 | 20902 | -15  | 22   | 14   | 51   | 3    | 32   | -37  | -37  | 32  | 3   |
| 0.04211    | 0.00822    | 36.989  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 2    | -20906     | -43536  | 20906 | 43536 | 5    | -19  | 15   | -9   | -7   | 3    | 24   | 24   | -7  | 3   |
| -0.01918   | 0.00395    | 23.989  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 3    | -20907     | -43540  | 20907 | 43540 | 17   | 14   | 4    | 1    | 15   | 2    | 3    | 3    | 15  | 2   |
| 0.04111    | 0.00263    | 2.999   |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 4    | 20901      | -43537  | 43537 | 20901 | -23  | -25  | -27  | -29  | -24  | -28  | 2    | 2    | -28 | -24 |
| -0.03685   | -0.06579   | -2.005  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 5    | 20897      | -43539  | 43539 | 20897 | -2   | 6    | -37  | -29  | 2    | -33  | -8   | -8   | -33 | 2   |
| -0.04343   | 0.00548    | 8.003   |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 6    | -20903     | -43388  | 20903 | 43388 | -31  | -10  | 51   | 72   | -20  | 61   | -21  | -21  | -20 | 61  |
| -0.05482   | 0.08055    | -21.002 |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 7    | -20897     | -43465  | 20897 | 43465 | -10  | -12  | 52   | 50   | -11  | 51   | 2    | 2    | -11 | 51  |
| -0.03016   | 0.06723    | 1.995   |       |       |      |      |      |      |      |      |      |      |     |     |
| Quad 3     |            |         |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 0    | -20900     | 43537   | 43537 | 20900 | 2    | -13  | 17   | 2    | -5   | 9    | 15   | 15   | 9   | -5  |
| 0.01184    | -0.01371   | -14.999 |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 1    | -20906     | 43531   | 43531 | 20906 | -7   | 32   | 20   | 59   | 12   | 39   | -39  | -39  | 39  | 12  |
| 0.05133    | 0.03289    | 38.992  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 2    | -20904     | -43538  | 20904 | 43538 | -6   | -22  | 14   | -2   | -14  | 6    | 16   | 16   | -14 | 6   |
| -0.03837   | 0.00790    | 16.005  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 3    | -20900     | -43538  | 20900 | 43538 | 2    | 4    | 16   | 18   | 3    | 17   | -2   | -2   | 3   | 17  |
| 0.00822    | 0.02237    | -1.998  |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 4    | 20907      | -43537  | 43537 | 20907 | -28  | -24  | -36  | -32  | -26  | -34  | -4   | -4   | -34 | -26 |
| -0.04474   | -0.07125   | 4.005   |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 5    | 20906      | -43404  | 43404 | 20906 | 13   | 3    | -26  | -36  | 8    | -31  | 10   | 10   | -31 | 8   |
| -0.04092   | 0.02193    | -10.000 |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 6    | -20902     | -43540  | 20902 | 43540 | -44  | -17  | 27   | 54   | -30  | 40   | -27  | -27  | -30 | 40  |
| -0.08223   | 0.05264    | -27.003 |       |       |      |      |      |      |      |      |      |      |     |     |
| segm: 7    | -20906     | -43538  | 20906 | 43538 | 2    | -11  | 30   | 17   | -4   | 23   | 13   | 13   | -4  | 23  |
| -0.01096   | 0.03027    | 13.000  |       |       |      |      |      |      |      |      |      |      |     |     |

## Alignment of quads

cxix40112, run 23 - dark, run 32,35,53 - images of rings with wires



## Deployment

in archive:

/reg/g/psdm/detector/alignment/cspad/calib-cxi-ds1-2011-06-20/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/geometry/0-end.data

and in experimental calib directory:

/reg/d/psdm/cxi/cxi40112/calib/CsPad::CalibV1/CxiDs1.0:Cspad.0/geometry/0-end.data

## References

- [CSPAD Alignment](#)