

# 2023-02-22 CSPAD CXI SC3 Alignment

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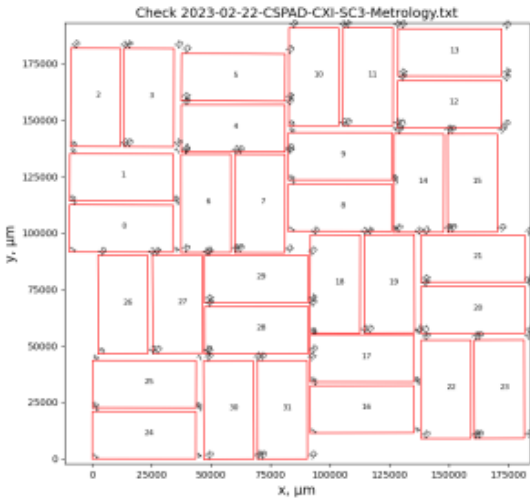
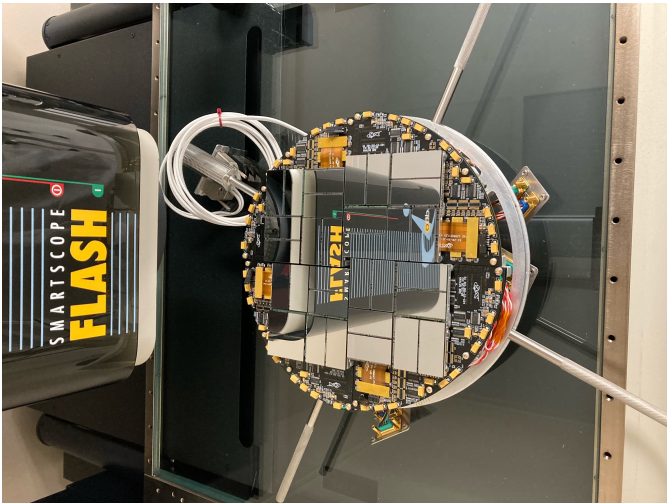
## Optical measurements

Comments from Chris Kenney:

It is in the standard ePix 2M format,  
except with each sensor "split" in to two halves.  
Origin is outermost corner of Quad 3  
Top of detector - where the coolant lines are - is at the top

Metrology files:

- [2023-02-22-CSPAD-CXI-SC3-Metrology.xlsx](#)
- [2023-02-22-CSPAD-CXI-SC3-Metrology-orig.txt](#)
- [2023-02-22-CSPAD-CXI-SC3-Metrology-corr.txt](#)
- [2023-02-22-CSPAD-CXI-SC3-geometry-v2.txt](#)



## Quality check

> optical\_metrology\_check -i 2023-02-22-CSPAD-CXI-SC3-Metrology.txt

### Quality check in X-Y plane

| Quality check in X-Y plane                           |    |    |     |     |    |    |     |     |            |    |    |    |   |
|------------------------------------------------------|----|----|-----|-----|----|----|-----|-----|------------|----|----|----|---|
| X-Y quality check for optical metrology measurements |    |    |     |     |    |    |     |     |            |    |    |    |   |
| -----                                                |    |    |     |     |    |    |     |     |            |    |    |    |   |
| segm:                                                | S1 | S2 | dS1 | dS2 | L1 | L2 | dL1 | dL2 | angle(deg) | D1 | D2 | dD | d |

(dS) d(dL)

```
-----
segm: 0 20902 20906 -187 -183 43537 43539 85 87 -0.24346 48294 48299
-5 -4 -2
segm: 1 20904 20905 -136 -135 43541 43541 61 61 -0.17830 48295 48303
-7 -1 0
segm: 2 20905 20903 125 123 43539 43536 -60 -63 -0.16318 48294 48297
-3 2 3
segm: 3 20913 20903 126 116 43541 43536 -54 -59 -0.15923 48300 48297
2 10 5
segm: 4 20904 20902 3 1 43544 43544 0 0 0.00263 48302 48300
1 2 0
segm: 5 20908 21003 -386 -291 43542 43537 144 139 -0.44544 48302 48340
-38 -95 5 <<<<
segm: 6 20906 20899 -24 -31 43538 43536 16 14 0.03619 48296 48293
3 7 2
segm: 7 20903 20900 111 108 43543 43536 -53 -60 -0.14410 48293 48300
-7 3 7
segm: 8 20910 20909 -89 -90 43543 43541 45 43 -0.11777 48303 48301
1 1 2
segm: 9 20908 20907 -19 -20 43550 43552 3 5 -0.02565 48304 48314
-9 1 -2
segm:10 20903 20907 0 4 43537 43536 2 1 -0.00263 48298 48293
4 -4 1
segm:11 20914 20912 76 74 43548 43545 -35 -38 -0.09868 48307 48308
0 2 3
segm:12 20905 20911 -144 -138 43551 43549 60 58 -0.18550 48301 48316
-15 -6 2
segm:13 20899 20894 -57 -62 43545 43544 35 34 -0.07829 48304 48293
10 5 1
segm:14 20876 20901 93 118 43540 43536 -61 -65 -0.13884 48278 48300
-22 -25 4
segm:15 20909 20903 -48 -54 43539 43538 27 26 0.06711 48299 48295
3 6 1
segm:16 20905 20903 87 85 43546 43545 -40 -41 0.11316 48303 48302
1 2 1
segm:17 20903 20906 -31 -28 43481 43486 6 11 -0.03887 48242 48252
-10 -3 -5
segm:18 20909 20910 90 91 43538 43541 -49 -46 -0.11909 48296 48303
-7 -1 -3
segm:19 20911 20924 -118 -105 43542 43547 46 51 0.14671 48303 48313
-9 -13 -5
segm:20 20907 20910 29 32 43550 43544 -9 -15 0.04013 48308 48304
4 -3 6
segm:21 20906 20909 -33 -30 43544 43545 13 14 -0.04145 48302 48305
-2 -3 -1
segm:22 20908 20908 2 2 43538 43541 -4 -1 -0.00263 48298 48300
-2 0 -3
segm:23 20912 20910 -110 -112 43542 43541 54 53 0.14606 48302 48302
0 2 1
segm:24 20912 20909 -36 -39 43545 43551 19 25 -0.04934 48311 48304
7 3 -6
segm:25 20905 20906 -108 -107 43545 43545 52 52 -0.14145 48303 48303
0 -1 0
segm:26 20890 20901 -215 -204 43531 43530 99 98 0.27575 48284 48288
-3 -11 1
segm:27 20910 20905 -253 -258 43539 43536 124 121 0.33624 48298 48298
0 5 3
segm:28 20905 20904 94 93 43540 43536 -43 -47 0.12305 48296 48296
0 1 4
segm:29 20897 20910 3 16 43542 43542 -1 -1 0.01250 48302 48296
6 -13 0
segm:30 20916 20908 -285 -293 43540 43537 143 140 0.38031 48303 48298
4 8 3
segm:31 20907 20911 -92 -88 43736 43538 46 -152 0.11817 48301 48474
-173 -4 198 <<<<
-----
-----
```

## Deviations

| Deviations |                          |
|------------|--------------------------|
| WARNING    | segm 5:   -95   > 60.0   |
| WARNING    | segm 31:   -173   > 60.0 |
| WARNING    | segm 31:   198   > 60.0  |

## Quality check in Z

| Quality check in Z                                 |            |         |       |       |      |      |      |      |      |      |      |      |     |      |
|----------------------------------------------------|------------|---------|-------|-------|------|------|------|------|------|------|------|------|-----|------|
| Z quality check for optical metrology measurements |            |         |       |       |      |      |      |      |      |      |      |      |     |      |
| -----                                              |            |         |       |       |      |      |      |      |      |      |      |      |     |      |
| -----                                              |            |         |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:                                              | SA         | LA      | XSize | YSize | dZS1 | dZS2 | dZL1 | dZL2 | dZSA | dZLA | ddZS | ddZL | dZX | dZY  |
| angXZ(deg)                                         | angYZ(deg) | dz3(um) |       |       |      |      |      |      |      |      |      |      |     |      |
| -----                                              |            |         |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 0                                            | 20904      | 43538   | 43538 | 20904 | -40  | -42  | 74   | 72   | -41  | 73   | 2    | 2    | 73  | -41  |
| 0.09607                                            | -0.11238   | -1.996  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 1                                            | 20904      | 43541   | 43541 | 20904 | -30  | -29  | 109  | 110  | -29  | 109  | -1   | -1   | 109 | -29  |
| 0.14409                                            | -0.08085   | 1.001   |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 2                                            | 20904      | 43537   | 20904 | 43537 | -2   | -2   | -89  | -89  | -2   | -89  | 0    | 0    | -2  | -89  |
| -0.00548                                           | -0.11712   | 0.006   |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 3                                            | 20908      | 43538   | 20908 | 43538 | -1   | 10   | -60  | -49  | 4    | -54  | -11  | -11  | 4   | -54  |
| 0.01233                                            | -0.07172   | -10.993 |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 4                                            | 20903      | 43544   | 43544 | 20903 | -60  | -75  | 27   | 12   | -67  | 19   | 15   | 15   | 19  | -67  |
| 0.02566                                            | -0.18502   | -15.006 |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 5                                            | 20955      | 43539   | 43539 | 20955 | -21  | -33  | -14  | -26  | -27  | -20  | 12   | 12   | -20 | -27  |
| -0.02632                                           | -0.07382   | -11.906 |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 6                                            | 20902      | 43537   | 20902 | 43537 | -10  | -26  | -158 | -174 | -18  | -166 | 16   | 16   | -18 | -166 |
| -0.04934                                           | -0.21846   | 16.010  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 7                                            | 20901      | 43539   | 20901 | 43539 | 13   | -21  | -86  | -120 | -4   | -103 | 34   | 34   | -4  | -103 |
| -0.01096                                           | -0.13554   | 34.012  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 8                                            | 20909      | 43542   | 43542 | 20909 | -16  | -20  | -1   | -5   | -18  | -3   | 4    | 4    | -3  | -18  |
| -0.00395                                           | -0.04932   | -4.001  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm: 9                                            | 20907      | 43551   | 43551 | 20907 | -25  | -10  | -9   | 6    | -17  | -1   | -15  | -15  | -1  | -17  |
| -0.00197                                           | -0.04796   | 14.999  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:10                                            | 20905      | 43536   | 20905 | 43536 | -36  | -38  | -220 | -222 | -37  | -221 | 2    | 2    | -37 | -221 |
| -0.10141                                           | -0.29084   | 1.998   |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:11                                            | 20913      | 43546   | 20913 | 43546 | -37  | -26  | -185 | -174 | -31  | -179 | -11  | -11  | -31 | -179 |
| -0.08630                                           | -0.23617   | -10.984 |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:12                                            | 20908      | 43550   | 43550 | 20908 | -56  | -54  | -22  | -20  | -55  | -21  | -2   | -2   | -21 | -55  |
| -0.02763                                           | -0.15072   | 2.015   |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:13                                            | 20896      | 43544   | 43544 | 20896 | -164 | -71  | 5    | 98   | -117 | 51   | -93  | -93  | 51  | -117 |
| 0.06776                                            | -0.32217   | 92.958  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:14                                            | 20888      | 43538   | 20888 | 43538 | -9   | 9    | -44  | -26  | 0    | -35  | -18  | -18  | 0   | -35  |
| 0.00000                                            | -0.04606   | -18.007 |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:15                                            | 20906      | 43538   | 20906 | 43538 | -16  | -13  | -20  | -17  | -14  | -18  | -3   | -3   | -14 | -18  |
| -0.03974                                           | -0.02435   | -2.995  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:16                                            | 20904      | 43545   | 43545 | 20904 | -4   | -9   | 3    | -2   | -6   | 0    | 5    | 5    | 0   | -6   |
| 0.00066                                            | -0.01782   | -5.000  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:17                                            | 20904      | 43483   | 43483 | 20904 | -9   | -31  | 22   | 0    | -20  | 11   | 22   | 22   | 11  | -20  |
| 0.01449                                            | -0.05482   | -22.001 |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:18                                            | 20909      | 43539   | 20909 | 43539 | 23   | 43   | -78  | -58  | 33   | -68  | -20  | -20  | 33  | -68  |
| 0.09043                                            | -0.08948   | -20.004 |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:19                                            | 20917      | 43544   | 20917 | 43544 | 11   | 13   | -149 | -147 | 12   | -148 | -2   | -2   | 12  | -148 |
| 0.03287                                            | -0.19474   | -2.010  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:20                                            | 20908      | 43547   | 43547 | 20908 | -22  | -32  | 29   | 19   | -27  | 24   | 10   | 10   | 24  | -27  |
| 0.03158                                            | -0.07399   | -9.993  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:21                                            | 20907      | 43544   | 43544 | 20907 | -32  | -35  | 52   | 49   | -33  | 50   | 3    | 3    | 50  | -33  |
| 0.06645                                            | -0.09180   | -2.997  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:22                                            | 20908      | 43539   | 20908 | 43539 | 9    | 12   | -24  | -21  | 10   | -22  | -3   | -3   | 10  | -22  |
| 0.02877                                            | -0.02961   | -3.002  |       |       |      |      |      |      |      |      |      |      |     |      |
| segm:23                                            | 20911      | 43541   | 20911 | 43541 | -49  | -40  | -73  | -64  | -44  | -68  | -9   | -9   | -44 | -68  |
| -0.12193                                           | -0.09014   | -8.994  |       |       |      |      |      |      |      |      |      |      |     |      |

[illegible]

## Correction

### Quality check in X-Y plane after correction

|         |       |       |      |      |       |       |     |     |          |       |       |
|---------|-------|-------|------|------|-------|-------|-----|-----|----------|-------|-------|
| segm:12 | 20905 | 20911 | -144 | -138 | 43551 | 43549 | 60  | 58  | -0.18550 | 48301 | 48316 |
| -15     | -6    | 2     |      |      |       |       |     |     |          |       |       |
| segm:13 | 20899 | 20894 | -57  | -62  | 43545 | 43544 | 35  | 34  | -0.07829 | 48304 | 48293 |
| 10      | 5     | 1     |      |      |       |       |     |     |          |       |       |
| segm:14 | 20876 | 20901 | 93   | 118  | 43540 | 43536 | -61 | -65 | -0.13884 | 48278 | 48300 |
| -22     | -25   | 4     |      |      |       |       |     |     |          |       |       |
| segm:15 | 20909 | 20903 | -48  | -54  | 43539 | 43538 | 27  | 26  | 0.06711  | 48299 | 48295 |
| 3       | 6     | 1     |      |      |       |       |     |     |          |       |       |
| segm:16 | 20905 | 20903 | 87   | 85   | 43546 | 43545 | -40 | -41 | 0.11316  | 48303 | 48302 |
| 1       | 2     | 1     |      |      |       |       |     |     |          |       |       |
| segm:17 | 20903 | 20906 | -31  | -28  | 43481 | 43486 | 6   | 11  | -0.03887 | 48242 | 48252 |
| -10     | -3    | -5    |      |      |       |       |     |     |          |       |       |
| segm:18 | 20909 | 20910 | 90   | 91   | 43538 | 43541 | -49 | -46 | -0.11909 | 48296 | 48303 |
| -7      | -1    | -3    |      |      |       |       |     |     |          |       |       |
| segm:19 | 20911 | 20924 | -118 | -105 | 43542 | 43547 | 46  | 51  | 0.14671  | 48303 | 48313 |
| -9      | -13   | -5    |      |      |       |       |     |     |          |       |       |
| segm:20 | 20907 | 20910 | 29   | 32   | 43550 | 43544 | -9  | -15 | 0.04013  | 48308 | 48304 |
| 4       | -3    | 6     |      |      |       |       |     |     |          |       |       |
| segm:21 | 20906 | 20909 | -33  | -30  | 43544 | 43545 | 13  | 14  | -0.04145 | 48302 | 48305 |
| -2      | -3    | -1    |      |      |       |       |     |     |          |       |       |
| segm:22 | 20908 | 20908 | 2    | 2    | 43538 | 43541 | -4  | -1  | -0.00263 | 48298 | 48300 |
| -2      | 0     | -3    |      |      |       |       |     |     |          |       |       |
| segm:23 | 20912 | 20910 | -110 | -112 | 43542 | 43541 | 54  | 53  | 0.14606  | 48302 | 48302 |
| 0       | 2     | 1     |      |      |       |       |     |     |          |       |       |
| segm:24 | 20912 | 20909 | -36  | -39  | 43545 | 43551 | 19  | 25  | -0.04934 | 48311 | 48304 |
| 7       | 3     | -6    |      |      |       |       |     |     |          |       |       |
| segm:25 | 20905 | 20906 | -108 | -107 | 43545 | 43545 | 52  | 52  | -0.14145 | 48303 | 48303 |
| 0       | -1    | 0     |      |      |       |       |     |     |          |       |       |
| segm:26 | 20890 | 20901 | -215 | -204 | 43531 | 43530 | 99  | 98  | 0.27575  | 48284 | 48288 |
| -3      | -11   | 1     |      |      |       |       |     |     |          |       |       |
| segm:27 | 20910 | 20905 | -253 | -258 | 43539 | 43536 | 124 | 121 | 0.33624  | 48298 | 48298 |
| 0       | 5     | 3     |      |      |       |       |     |     |          |       |       |
| segm:28 | 20905 | 20904 | 94   | 93   | 43540 | 43536 | -43 | -47 | 0.12305  | 48296 | 48296 |
| 0       | 1     | 4     |      |      |       |       |     |     |          |       |       |
| segm:29 | 20897 | 20910 | 3    | 16   | 43542 | 43542 | -1  | -1  | 0.01250  | 48302 | 48296 |
| 6       | -13   | 0     |      |      |       |       |     |     |          |       |       |
| segm:30 | 20916 | 20908 | -285 | -293 | 43540 | 43537 | 143 | 140 | 0.38031  | 48303 | 48298 |
| 4       | 8     | 3     |      |      |       |       |     |     |          |       |       |
| segm:31 | 20907 | 20911 | -92  | -88  | 43538 | 43538 | 46  | 46  | 0.11844  | 48301 | 48296 |
| 5       | -4    | 0     |      |      |       |       |     |     |          |       |       |

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## Constants

metrology processing command

> optical\_metrology\_cspad\_v2\_xpp -f 2023-02-22-CSPAD-CXI-SC3-Metrology.txt

🟢 Archive: /reg/g/psdm/detector/alignment/cspad/calib-cxi-SC3-2023-02-22/2023-02-22-CSPAD-CXI-SC3-geometry-v2.txt

## References

- [CSPAD Alignment](#)