2013-12-20 Qaud MEC Alignment

Content

Optical measurements

- 2013-12-20-Quad-MEC-Metrology.xlsx - file with optical measurements from Gabriel
- 2013-12-20-Quad-MEC-Metrology.txt - text version of the same file
- 2013-12-20-Quad-MEC-Metrology-corr.txt - corrected file (see next section for details)

This time metrology file has all coordinates in mm (milimeters with rounding up to 10 um...

Quality check

Quality check table for original metrology file

```
pair:        S1      S2     dS1     dS2        L1      L2     dL1     dL2    <dS/L>  angle(deg)      D1
D2      dD   d(dS)   d(dL)    dz3(um)

Quad  0
pair: 0   20910   20910    -180    -180     43550   43540      90      80   -0.00413   -0.23684   48304
48306      -2       0      10     99.997
pair: 1   20920   20920    -200    -200     43560   43630      10      80   -0.00459   -0.26285   48309
48401     -92       0     -70    100.033
pair: 2   20910   20100      10     820     43550   43540      10       0    0.00011    0.00658   47960
48305    -345    -810      10   1724.336
pair: 3   20910   20900    -140    -130     43540   43530     -60     -70   -0.00310   -0.17767   48294
48294       0     -10      10      9.995
pair: 4   20900   20910    -220    -210     43540   43550      90     100   -0.00494   -0.28289   48296
48311     -15     -10     -10    -69.579
pair: 5   20920   20900      40      20     43200   43550     -20     330    0.00069    0.03968   48304
47999     305      20    -350     34.059
pair: 6   20910   20910    -130    -130     43530   43540     -70     -60   -0.00299   -0.17109   48294
48298      -4       0     -10      0.002
pair: 7   20910   20909    -130    -129     43540   43540     -60     -60   -0.00297   -0.17041   48302
48298       4      -1       0    -30.000
```

Applied corrections

- pair 1: Correction to point 2: x+0.07mm; 0.01 0.08
- pair 2: Correction to point 16: x0.8mm; 44.63 43.83
- pair 5: Correction to point 24: x+0.35mm; 90.62 90.97

Gabriel Blaj reported that "Z deviations larger than ~150 micron are typos, or the metrology microscope focussing on the wrong surface. Please use the other 3 and assume a
flat surface to extrapolate the real Z". So, we apply Z correction:

- point 13 Z=1.76 0
- point 17 Z=1.75 0
- point 18 Z=1.80 0
- point 21 Z=1.76 0
- point 22 Z=1.75 0

Quality check table for corrected metrology file in X-Y

```
segm:        S1      S2     dS1     dS2        L1      L2     dL1     dL2    angle(deg)   D1      D2      dD   d
(dS)   d(dL)
Quad  0
segm: 0  -20910  -20910    -180    -180     43540   43550     -90     -80   -0.23684   48306   48304
2       0     -10
segm: 1  -20920  -20920    -200    -200     43560   43560     -80     -80   -0.26306   48338   48309
29       0       0
segm: 2  -20100  -20110      20      10    -43540  -43550       0     -10    0.01974   47960   47964
-4      10      10
segm: 3  -20900  -20910    -130    -140    -43530  -43540      70      60   -0.17767   48294   48294
0      10      10
segm: 4   20910   20900     220     210    -43540  -43550     100      90   -0.28289   48311   48296
15      10      10
segm: 5   20900   20920     -40     -20    -43550  -43550     -20     -20    0.03947   48314   48304
10     -20       0
segm: 6  -20910  -20910    -130    -130    -43540  -43530      60      70   -0.17109   48294   48298
-4       0     -10
segm: 7  -20909  -20910    -129    -130    -43540  -43540      60      60   -0.17041   48302   48298
4       1       0
```

Quality check table for corrected metrology file in Z

```
2015-03-05 14:32:33 (info) CalibManager.GUIMetrology: Quality check in Z:
segm:        SA      LA   XSize   YSize    dZS1  dZS2  dZL1  dZL2    dZSA  dZLA  ddZS  ddZL     dZX   dZY
angXZ(deg) angYZ(deg) dz3(um)
Quad  0
segm: 0  -20910   43545   43545   20910     -90    10   -90    10     -40   -40  -100  -100     -40   -40
-0.05263   -0.10960     99.997
segm: 1  -20920   43560   43560   20920     -40    60   -80    20      10   -30  -100  -100     -30    10
-0.03946    0.02739    100.000
segm: 2  -20105  -43545   20105   43545      50    10    10   -30      30   -10    40    40      30   -10
0.08549   -0.01316     39.998
segm: 3  -20905  -43535   20905   43535       0   -10    10     0      -5     5    10    10      -5     5
-0.01370    0.00658      9.995
segm: 4   20905  -43545   43545   20905      20     0    40    20      10    30    20    20      30    10
0.03947    0.02741    -20.009
segm: 5   20910  -43550   43550   20910     -10     0    20    30      -5    25   -10   -10      25    -5
0.03289   -0.01370     10.000
segm: 6  -20910  -43535   20910   43535      10    10   -10   -10      10   -10     0     0      10   -10
0.02740   -0.01316      0.002
segm: 7  -20909  -43540   20909   43540     -20    10   -30     0      -5   -15   -30   -30      -5   -15
-0.01370   -0.01974    -30.000
```

Constants

```
2015-03-05 14:32:33 (info) CalibManager.GUIMetrology: parameters of type "center":
```

```
 199.76   198.51   307.20    98.55   628.98   629.41   711.43   498.54
 199.76   198.51   307.20    98.55   628.98   629.41   711.43   498.54
 199.76   198.51   307.20    98.55   628.98   629.41   711.43   498.54
 199.76   198.51   307.20    98.55   628.98   629.41   711.43   498.54
 306.45    94.25   623.52   624.25   513.94   726.85   198.35   199.14
 306.45    94.25   623.52   624.25   513.94   726.85   198.35   199.14
 306.45    94.25   623.52   624.25   513.94   726.85   198.35   199.14
 306.45    94.25   623.52   624.25   513.94   726.85   198.35   199.14
  -0.05    -0.14     0.00    -0.07    -0.14    -0.11    -0.09    -0.16
  -0.05    -0.14     0.00    -0.07    -0.14    -0.11    -0.09    -0.16
  -0.05    -0.14     0.00    -0.07    -0.14    -0.11    -0.09    -0.16
  -0.05    -0.14     0.00    -0.07    -0.14    -0.11    -0.09    -0.16
```

2015-03-05 14:32:33 (info) CalibManager.GUIMetrology: parameters of type "tilt":

```
-0.23684  -0.26306   0.01974  -0.17767  -0.28289   0.03947  -0.17109  -0.17041
-0.23684  -0.26306   0.01974  -0.17767  -0.28289   0.03947  -0.17109  -0.17041
-0.23684  -0.26306   0.01974  -0.17767  -0.28289   0.03947  -0.17109  -0.17041
-0.23684  -0.26306   0.01974  -0.17767  -0.28289   0.03947  -0.17109  -0.17041
```

2015-03-05 14:32:33 (info) CalibManager.GUIMetrology: parameters of type "geometry":

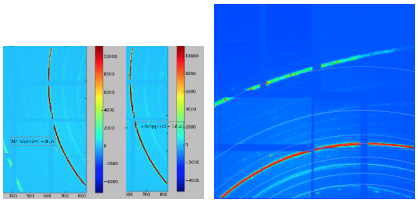
```
# TITLE      Geometry parameters of CSPAD
# DATE_TIME  2015-03-05 14:32:33 PST
# METROLOGY  /reg/g/psdm/detector/alignment/cspad/calib-mec-2013-12-20/2013-12-20-Quad-MEC-Metrology-corr.txt
# AUTHOR     dubrovin
# EXPERIMENT MEC
# DETECTOR   CSPAD
# CALIB_TYPE geometry
# COMMENT:01 Table contains 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      21957    33685       -5       0     0     0   -0.23684 -0.05263
-0.10960
QUAD:V1        0  SENS2X1:V1     1      21820    10360      -15       0     0     0   -0.26306 -0.03946
0.02739
QUAD:V1        0  SENS2X1:V1     2      33767    68537        0     270     0     0    0.01974  0.08549
-0.01316
QUAD:V1        0  SENS2X1:V1     3      10832    68617       -7     270     0     0   -0.17767 -0.01370
0.00658
QUAD:V1        0  SENS2X1:V1     4      69137    56492      -15     180     0     0   -0.28289  0.03947
0.02741
QUAD:V1        0  SENS2X1:V1     5      69185    79895      -12     180     0     0    0.03947  0.03289
-0.01370
QUAD:V1        0  SENS2X1:V1     6      78200    21802      -10     270     0     0   -0.17109  0.02740
-0.01316
QUAD:V1        0  SENS2X1:V1     7      54799    21890      -17     270     0     0   -0.17041 -0.01370
-0.01974
QUAD:V1        1  SENS2X1:V1     0      21957    33685       -5       0     0     0   -0.23684 -0.05263
-0.10960
QUAD:V1        1  SENS2X1:V1     1      21820    10360      -15       0     0     0   -0.26306 -0.03946
0.02739
QUAD:V1        1  SENS2X1:V1     2      33767    68537        0     270     0     0    0.01974  0.08549
-0.01316
QUAD:V1        1  SENS2X1:V1     3      10832    68617       -7     270     0     0   -0.17767 -0.01370
0.00658
QUAD:V1        1  SENS2X1:V1     4      69137    56492      -15     180     0     0   -0.28289  0.03947
0.02741
QUAD:V1        1  SENS2X1:V1     5      69185    79895      -12     180     0     0    0.03947  0.03289
-0.01370
QUAD:V1        1  SENS2X1:V1     6      78200    21802      -10     270     0     0   -0.17109  0.02740
-0.01316
QUAD:V1        1  SENS2X1:V1     7      54799    21890      -17     270     0     0   -0.17041 -0.01370
-0.01974
QUAD:V1        2  SENS2X1:V1     0      21957    33685       -5       0     0     0   -0.23684 -0.05263
-0.10960
QUAD:V1        2  SENS2X1:V1     1      21820    10360      -15       0     0     0   -0.26306 -0.03946
```

```
0.02739
QUAD:V1         2   SENS2X1:V1      2       33767     68537        0      270      0      0     0.01974   0.08549
-0.01316
QUAD:V1         2   SENS2X1:V1      3       10832     68617       -7      270      0      0    -0.17767  -0.01370
0.00658
QUAD:V1         2   SENS2X1:V1      4       69137     56492      -15      180      0      0    -0.28289   0.03947
0.02741
QUAD:V1         2   SENS2X1:V1      5       69185     79895      -12      180      0      0     0.03947   0.03289
-0.01370
QUAD:V1         2   SENS2X1:V1      6       78200     21802      -10      270      0      0    -0.17109   0.02740
-0.01316
QUAD:V1         2   SENS2X1:V1      7       54799     21890      -17      270      0      0    -0.17041  -0.01370
-0.01974
QUAD:V1         3   SENS2X1:V1      0       21957     33685       -5        0      0      0    -0.23684  -0.05263
-0.10960
QUAD:V1         3   SENS2X1:V1      1       21820     10360      -15        0      0      0    -0.26306  -0.03946
0.02739
QUAD:V1         3   SENS2X1:V1      2       33767     68537        0      270      0      0     0.01974   0.08549
-0.01316
QUAD:V1         3   SENS2X1:V1      3       10832     68617       -7      270      0      0    -0.17767  -0.01370
0.00658
QUAD:V1         3   SENS2X1:V1      4       69137     56492      -15      180      0      0    -0.28289   0.03947
0.02741
QUAD:V1         3   SENS2X1:V1      5       69185     79895      -12      180      0      0     0.03947   0.03289
-0.01370
QUAD:V1         3   SENS2X1:V1      6       78200     21802      -10      270      0      0    -0.17109   0.02740
-0.01316
QUAD:V1         3   SENS2X1:V1      7       54799     21890      -17      270      0      0    -0.17041  -0.01370
-0.01974
CSPAD:V1        0   QUAD:V1         0       -4500     -4500        0       90      0      0     0.00000   0.00000
0.00000
CSPAD:V1        0   QUAD:V1         1       -4500      4500        0        0      0      0     0.00000   0.00000
0.00000
CSPAD:V1        0   QUAD:V1         2        4500      4500        0      270      0      0     0.00000   0.00000
0.00000
CSPAD:V1        0   QUAD:V1         3        4500     -4500        0      180      0      0     0.00000   0.00000
0.00000
```

Alignment check with rings

Left plot is from Zhou e-mail obtained with constants for MecTargetChamber.0:Cspad.0 from 2013-12-10

Right plot is generated with latest available optical measurement for MecTargetChamber.0:Cspad.0 from 2013-12-20 (different date and corrections to measurements were applied).



Geometry parameters

Parameters for center, tilt, and geometry are available in

Archive: `/reg/g/psdm/detector/alignment/cspad/calib-mec-2013-12-20/calib/`

Deployment: /reg/d/psdm/mec/mecf9615/calib/?

Summary

- X coordinates are corrected for points 2, 16, 24
- Z coordinate is corrected for points 13, 17, 18, 21, 22
- After that all deviations are ~10um.

References

- CSPAD Alignment
- CSPAD Geometry and Alignment
- CSPAD Geometry Software
- CSPAD2x2 Alignment