PXL Coordinate System
-what I know and what I need

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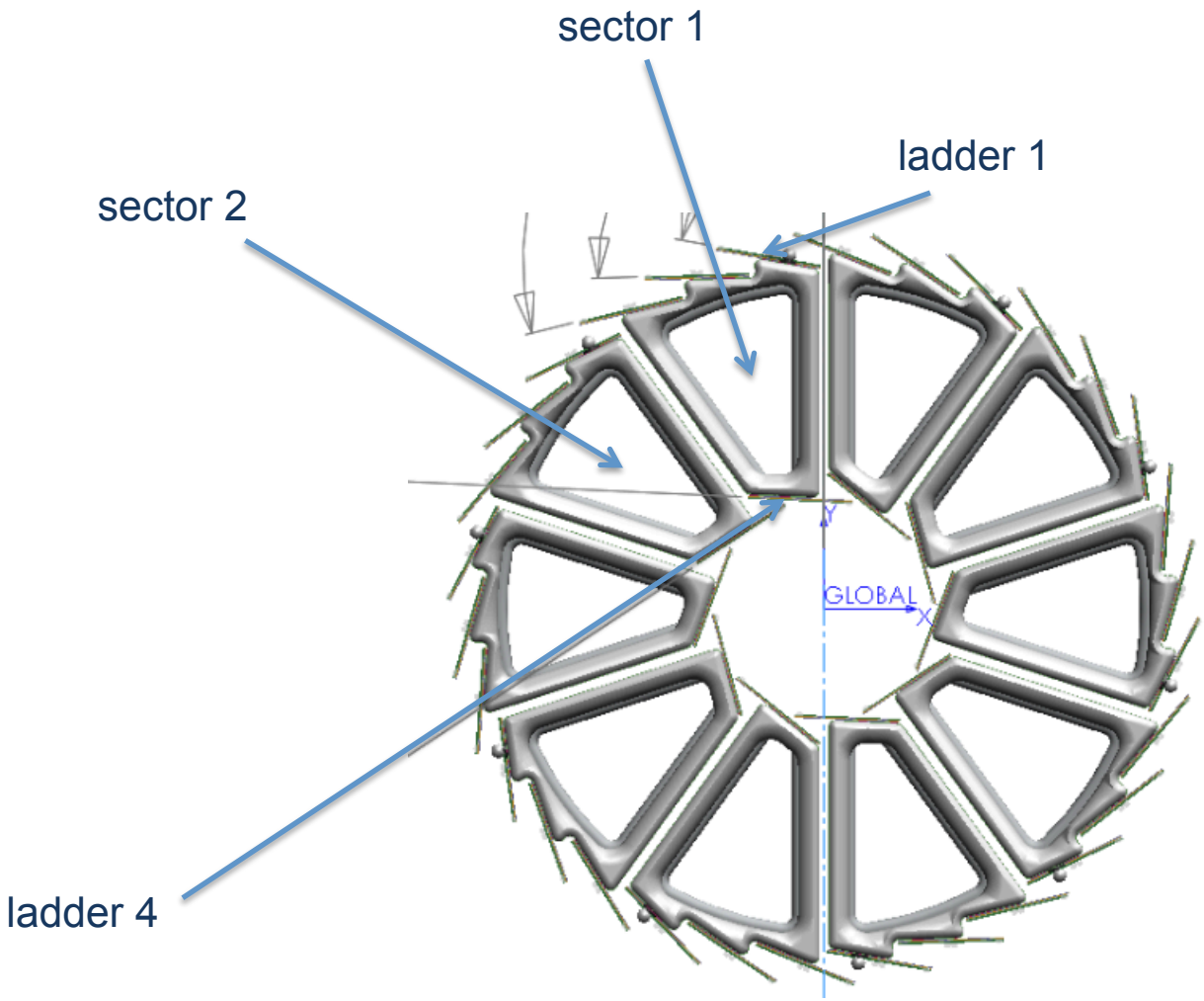
- My understanding of the pxl coordinate system we want
- TGeoHMatrix parameters from the parameters I obtained from Joe, comparing with what is in ROOT geometry, for year 2013

From Global to Pxl Sectors

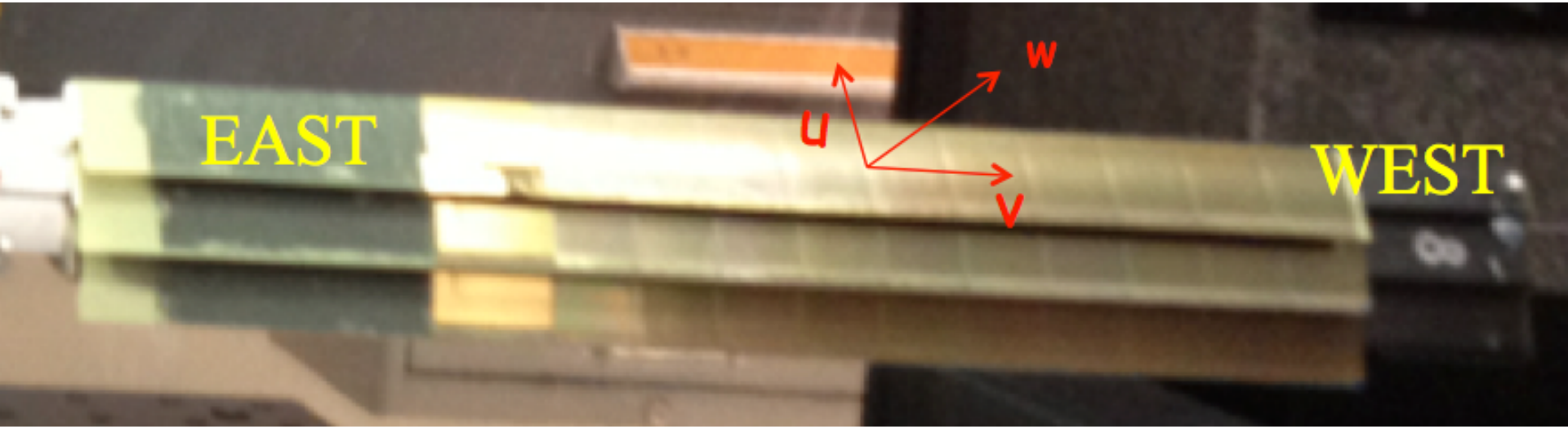
- GlobalXYZ = TpcOnGlobal*IdsOnTpc*PstOnIds*PxlOnPst*HalfOnPxl*SectorOnHalf*sectorLocalXYZ
- no rotation or translation for ideal geometry: sectorLocalXYZ = STAR global xyz
- TGeoHMatrix parameters for TpcOnGlobal, IdsOnTpc, PstOnIds, PxlOnPst, HalfOnPxl, SectorOnHalf:

r00	r01	r02	t0
r10	r11	r12	t1
r20	r21	r22	t2
=			
1	0	0	0
0	1	0	0
0	0	1	0

Sector and Ladder Numbering



Ladder



- u, w, v in the plot are local x, y, z, respectively
  - in the reconstruction codes I will only use x, y, z
  - in alignment calibration codes u, w, v may be used.
- The origin is
  - in u / local x direction, at the center of the sensitive area
  - in w / local y direction, on the surface of the sensor sensitive area
  - in v / local z direction, at the middle point between the sensitive areas of the 5th and the 6th sensor.

LadderOnSector Parameters

- According to the parameters I obtained from Joe, for ladder 1 on sector 1

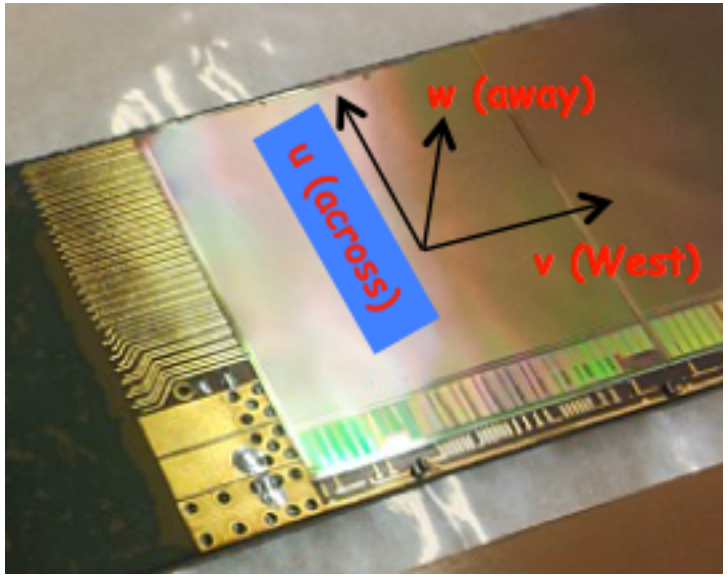
0.984695	0.174284	0	-1.06913
-0.174284	0.984695	0	8.14311
0	0	1	0.0321

- From geometry, the code to read it from Jonathan

-0.9846954	-0.1742841	0.0000000	-1.14906
0.1742841	-0.9846954	0.0000000	8.14414
0.0000000	0.0000000	1.0000000	0.00000

- For rotation, we see a flip of local x and y between the two set of parameters, meaning for the ROOT geometry the ladder local x is pointing to the decreasing pxlRowNumber direction, and local y pointing inside the sensor surface. This is not what we want.
- For shift, the minor differences could be due to different models we obtain from engineers, then at least one source need to be updated. Or the origin is place at a different place from defined in the previous page. That's why I asked for a detailed document.

Sensor



- u, w, v in the plot are local x, y, z, respectively
- The origin is
  - in u / local x direction, at the center of the sensitive area
  - in w / local y direction, on the surface of the sensor sensitive area
  - in v / local z direction, at the center of the sensitive area
- The TGeoHMatrix parameters for sensor 1 on ladder

1	0	0	0
0	1	0	0
0	0	1	-9.1125

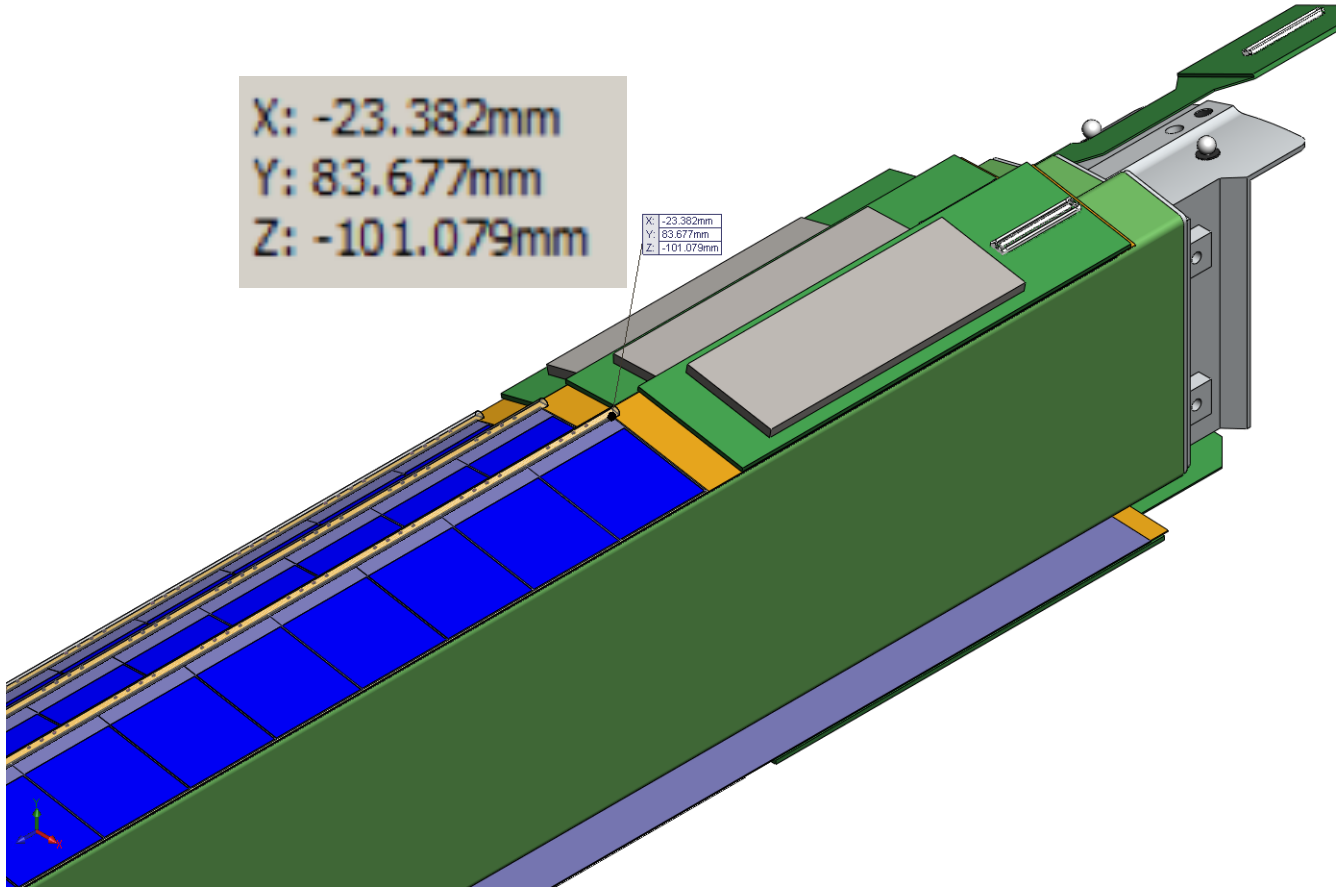
Summary

- A detailed document of the coordinate system we want to my understanding.
- For other transformations than ladderOnSector, I have no received any TGeoHMatrix parameters from geometry. From STAR global to sector, the coordinate is the same for ideal geometry. The TGeoHMatrix transformation is null.
- For sensorOnLadder, no parameters from geometry received yet.
- For ladderOnSector, both rotation and shift are not consistent with the parameters I get from Joe. The detailed plots and parameters I received from Joe are attached following.

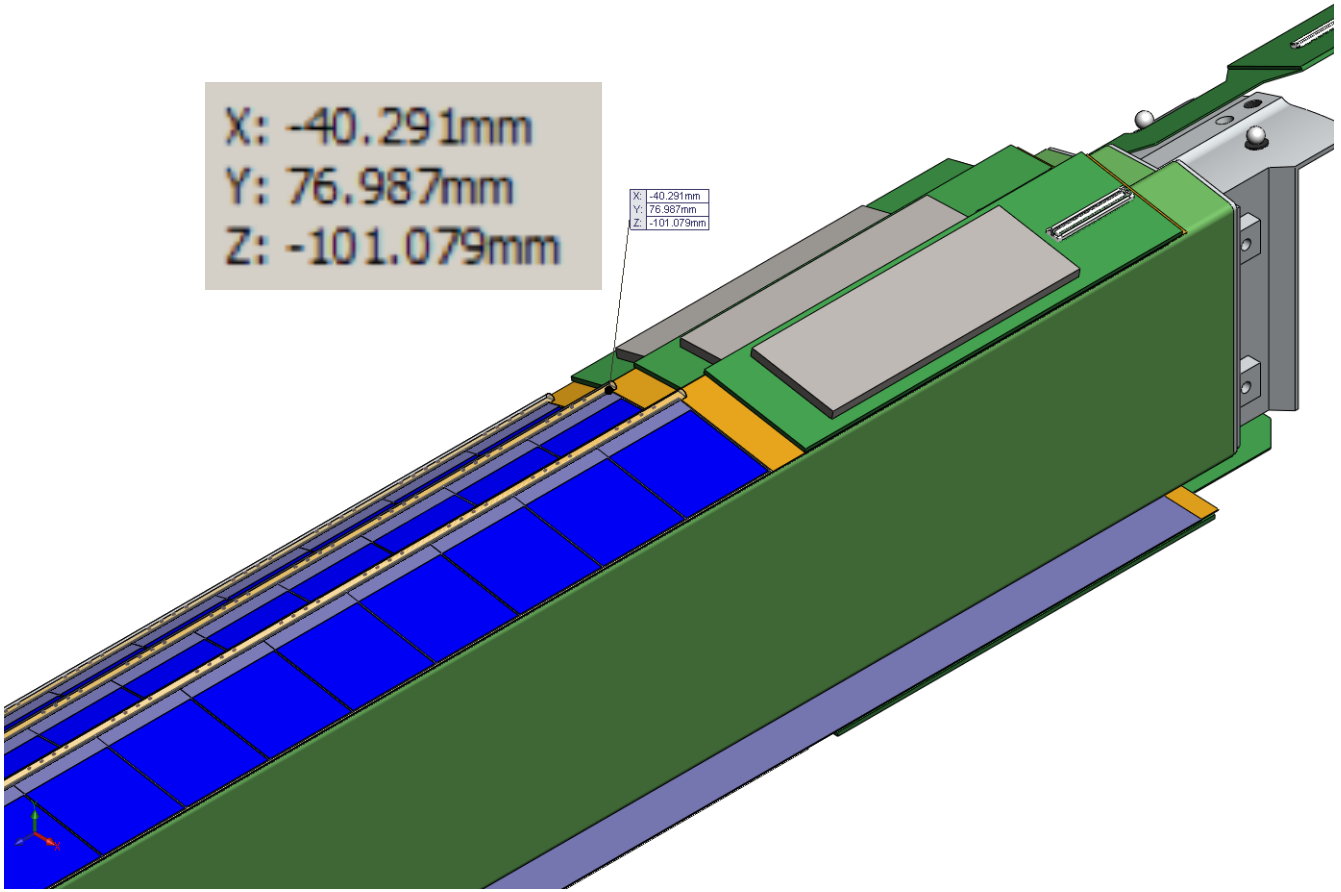
Thank you

☺

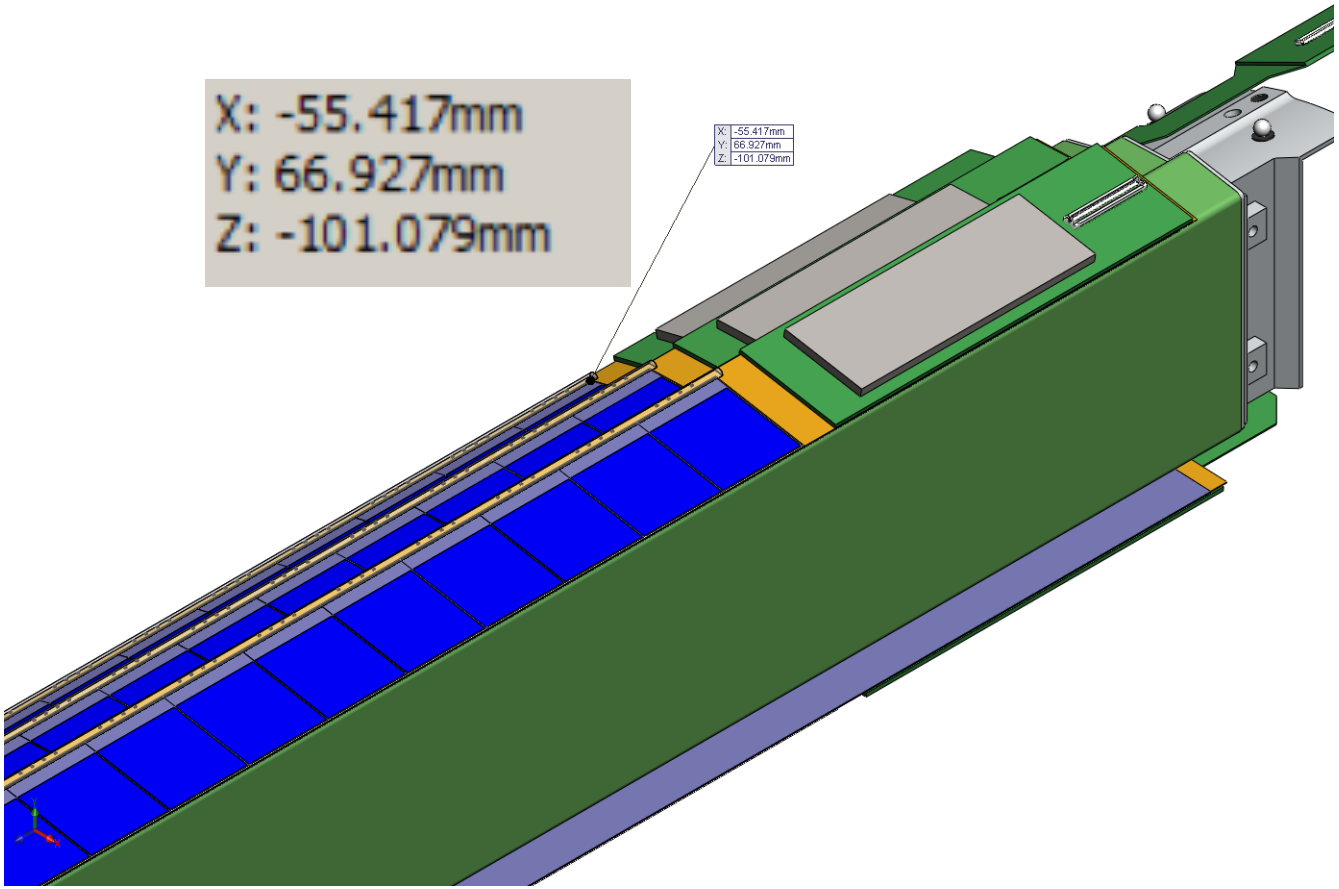
1st Chip Corner



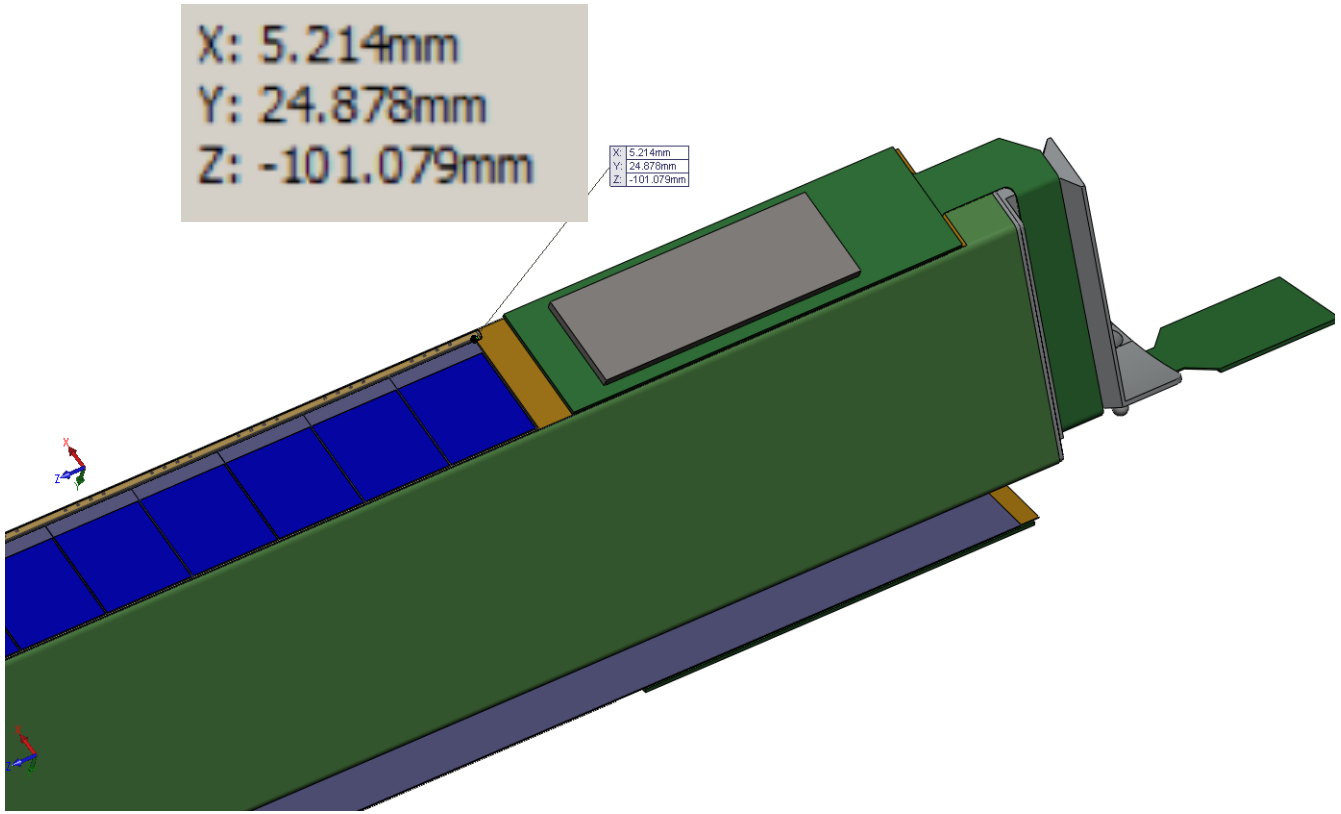
2nd Chip Corner



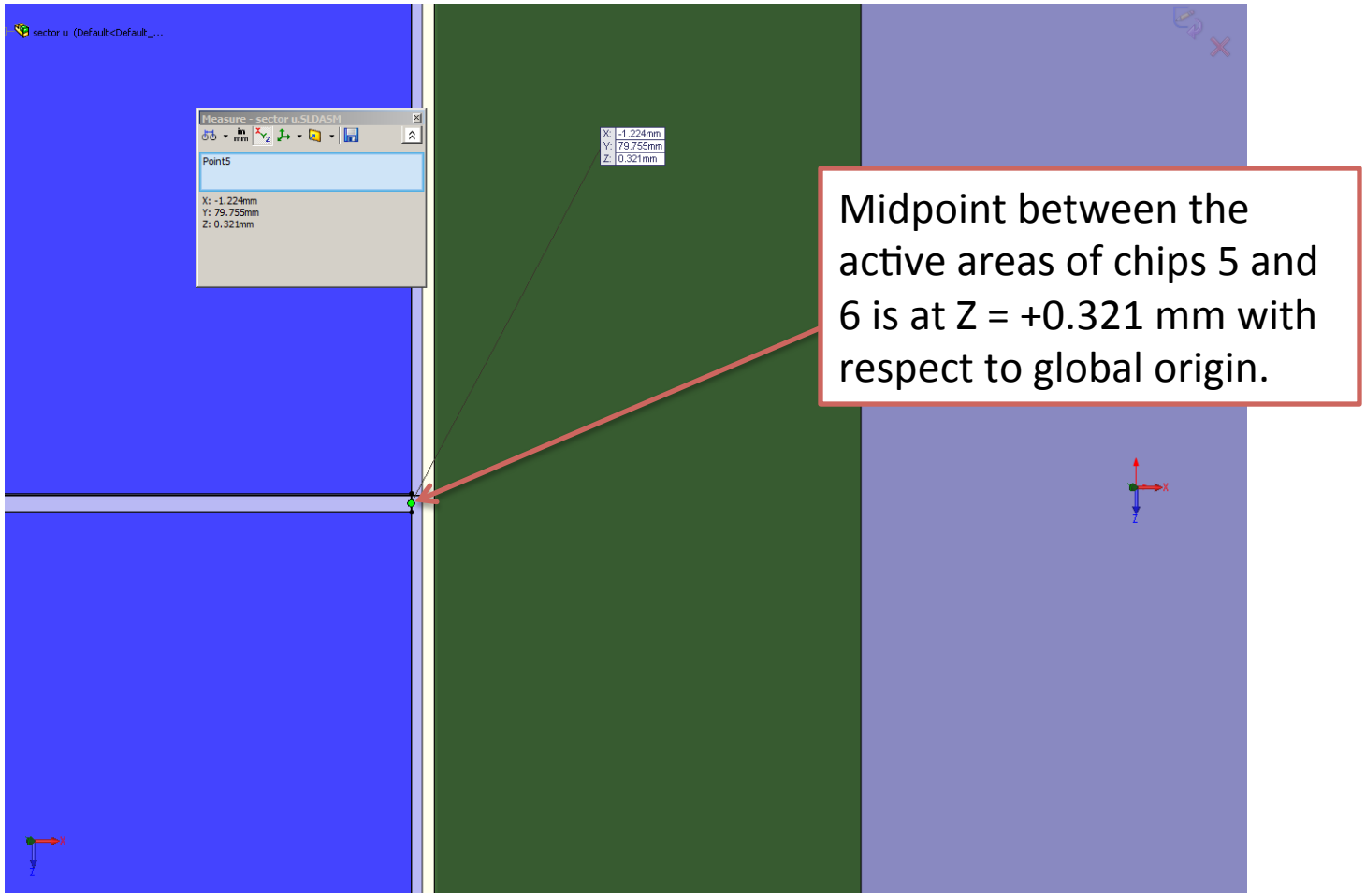
3rd Chip Corner



4th Chip Corner

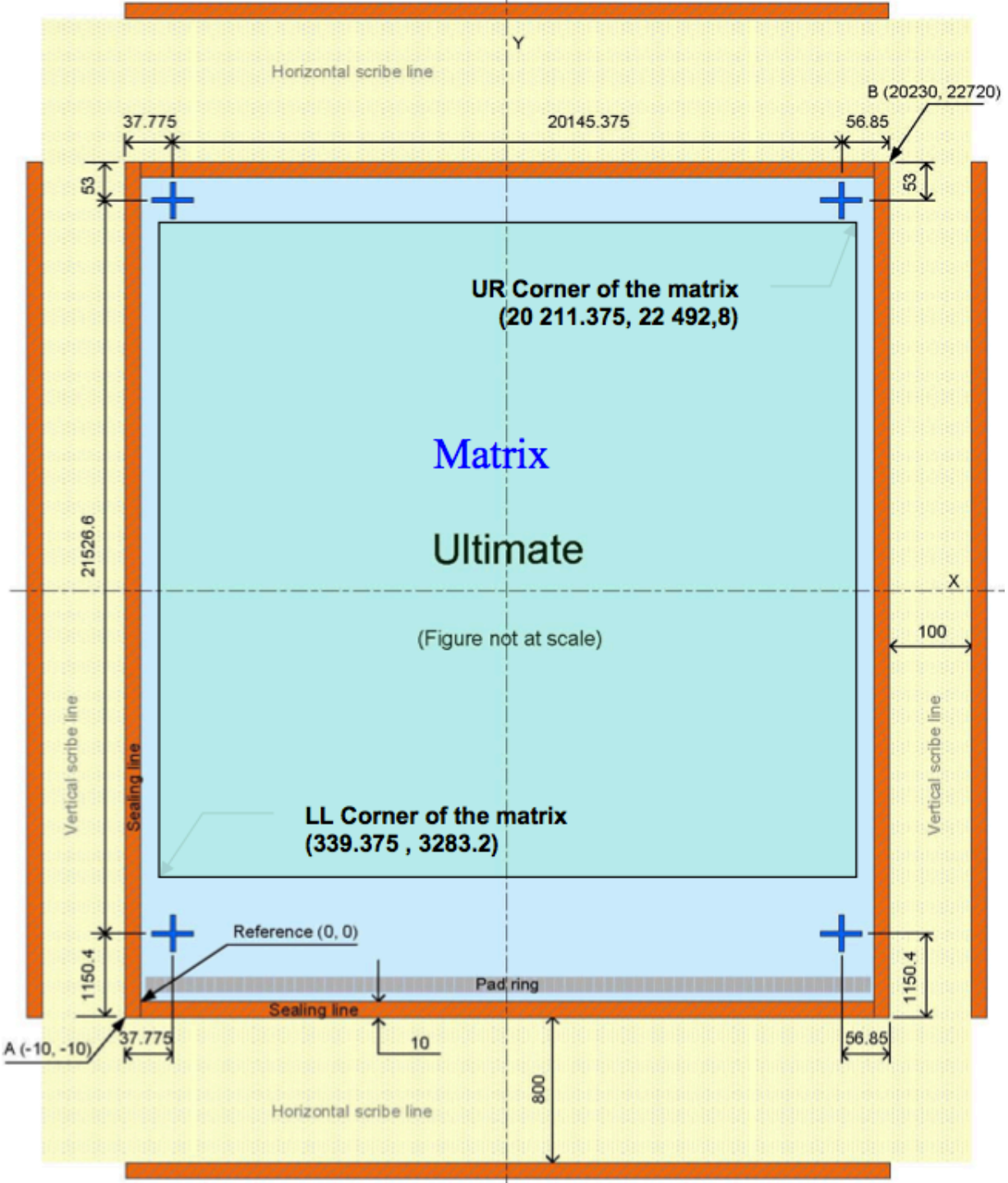


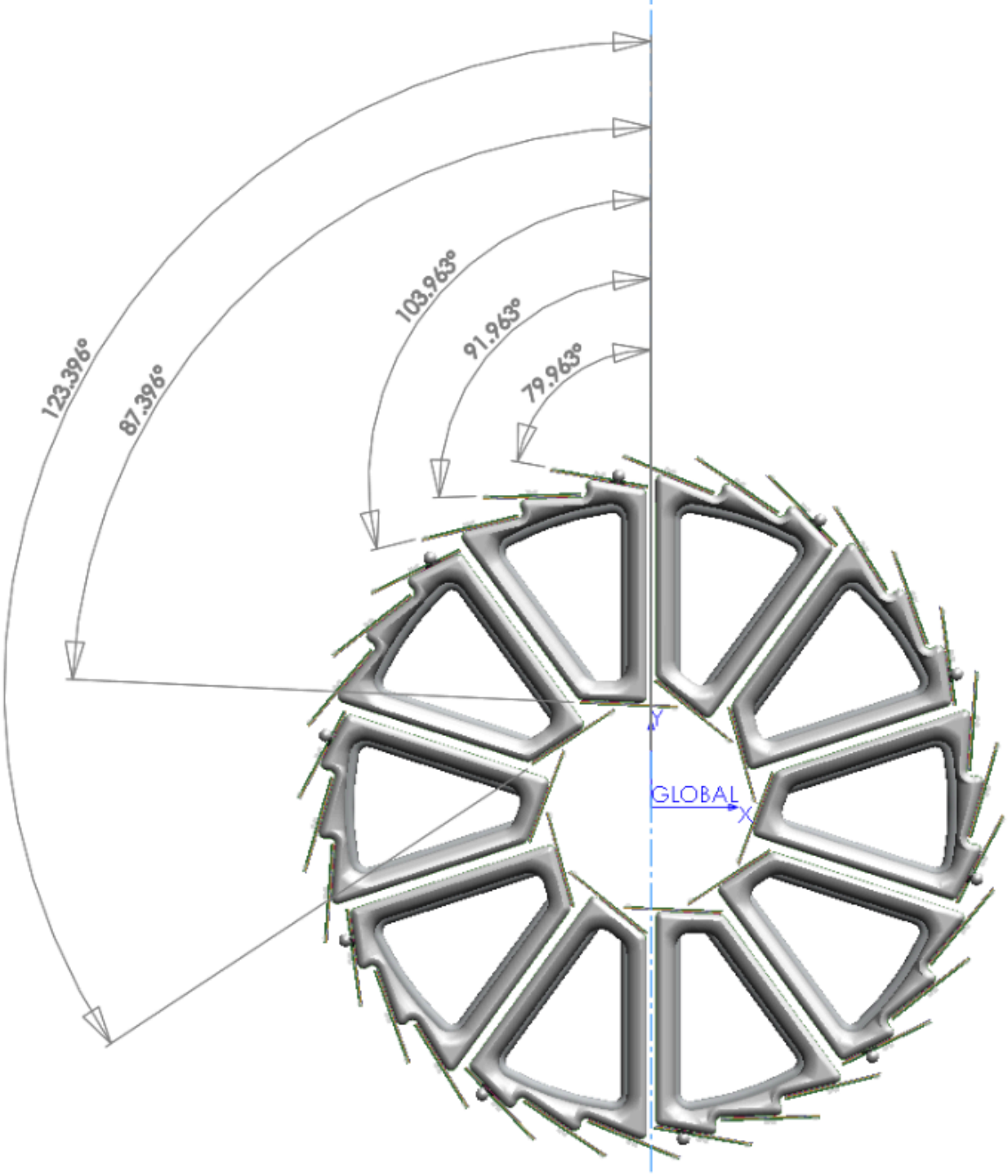
Centering of chips array



- chip step 20.240+0.01 mm

- The sensitive area in the silicon is the epitaxial layer which is approximately 15-20 microns thick and starts approximately 5 microns below the sensor surface. So the sensitive layer average depth 14 µm from chip surface.


Y
Horizontal scribe line
B (20230, 22720)
37.775
20145.375
56.85
53
53
UR Corner of the matrix
(20 211.375, 22 492,8)
Matrix
Ultimate
21526.6
X
(Figure not at scale)
100
Vertical scribe line
Sealing line
LL Corner of the matrix
(339.375 , 3283.2)
Vertical scribe line
Reference (0, 0)
1150.4
Pad ring
Sealing line
1150.4
A (-10, -10)
37.775
10
56.85
800
Horizontal scribe line


123.396°
87.396°
103.963°
91.963°
79.963°
Y
GLOBAL
X