

CZT IMAGER : GEOMETRICAL DETAILS

Material properties:

PROPERTY	VALUE
Composition	Cd _{0.9} Zn _{0.1} Te
Growth method	MHB (Modified horizontal Bridgman)
Conductivity type	N-Type
Density	5.85 g/cm ³
Bulk resistivity	3x10 ⁹ to 8x10 ⁹ Ω cm
Pair creation energy (eV)	4.43 eV
Electrode type	Ohmic
Electrode material	Indium
μ _e (Electron mobility x lifetime product)	3~5x10 ⁻³ cm ² /V
Theoretical absorption	> 88% (5mm CZT thick @122Kev)

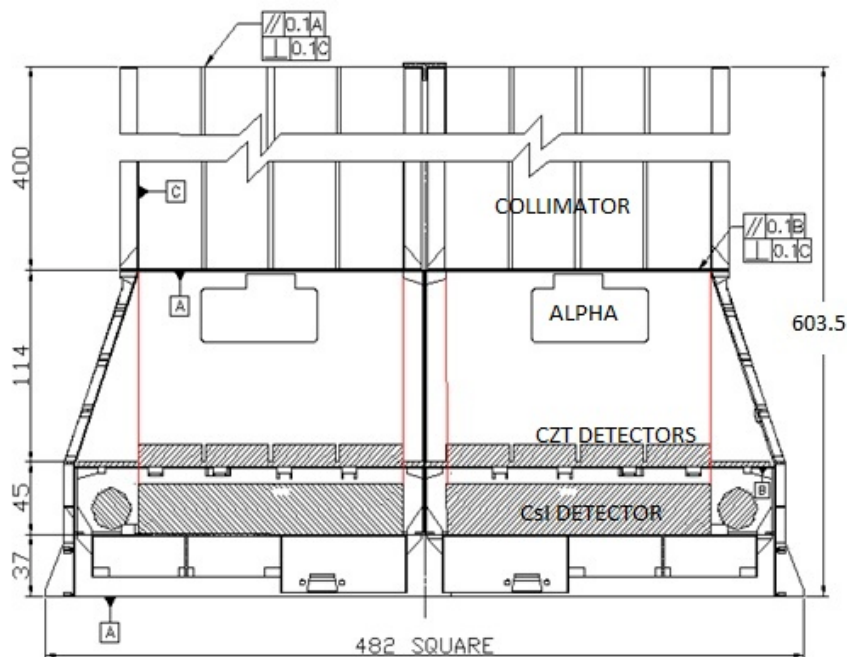
Detector Geometry:

PROPERTY	VALUE
Length	39.06mm ± 0.05
Width	39.06mm ± 0.05
Thickness	5.0mm ± 0.1
Pixels matrix	16 x 16
Pixel pitch	2.46 mm
Pixel anode pad size	1.86 x 1.86 mm

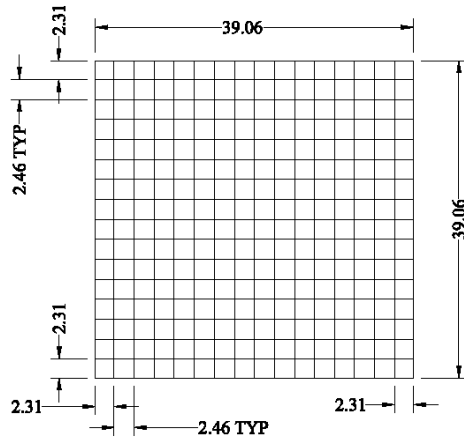
Alignment philosophy:

The CZT-Imager is configured in a way that the design itself will take care of most of the alignment issues mechanically. The important aspects are listed below.

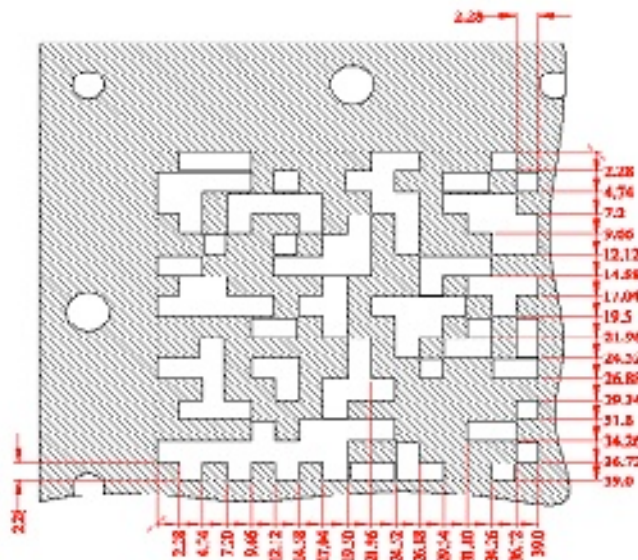
- The detector board consists of CZT detectors are mounted in the housing which geometrically matches the collimator opening. The space between detectors are maintained as 2.5 mm.



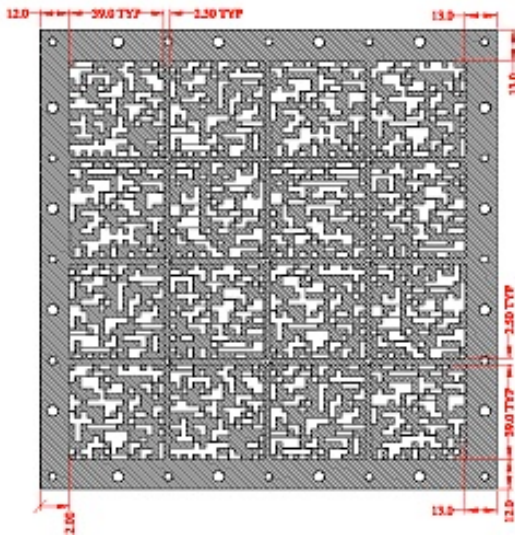
- The size of each CZT detector is 39.06 mm x 39.06 mm with a tolerance ± 0.05 mm. For the designing purpose the tolerance is not taken into consideration. The total area is pixellated in 16 x 16 matrixes where each pixel is having a size of 2.46 mm x 2.46 mm except the edge pixels. The edge pixels measures 2.31 mm x 2.31 mm.



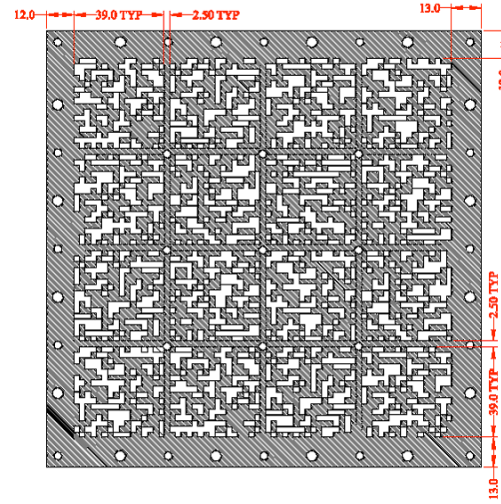
- The Coded Aperture Mask (CAM) is designed to geometrically match the total area of CZT detectors. To ease the design purpose each pattern in the CAM considered 39.00 mm instead of 39.06 mm. The difference of 60 microns (between CZT detector area and CAM pattern area) is adjusted in the end pixels of CAM. The end pixels of CAM measures 2.28 mm instead of 2.31 mm.



- The CAM is provided an offset of 1 mm from the edge to the start of first mask pattern in perpendicular directions to align the CZT detector plane with the mask patterns. Due to this offset the CAM is made in two types (CAM type-1 & 2) considering the orientation of CAM in each quadrant.

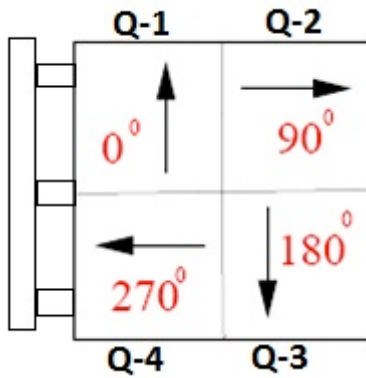


CAM-type1

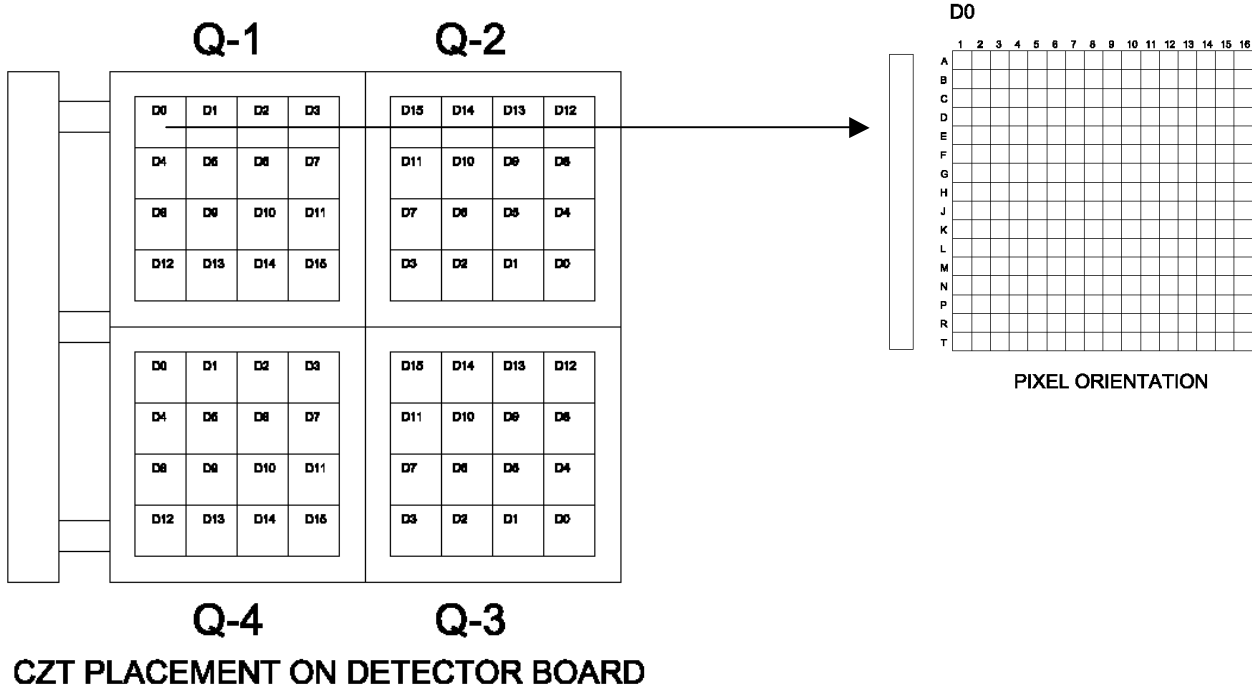


CAM type-2

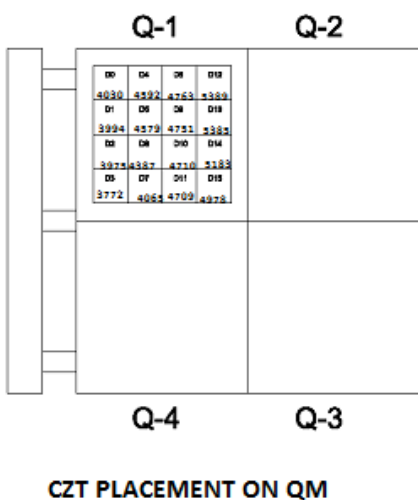
- CAM type -1 is used in quadrant 1 & 3 and CAM type-2 is used in quadrant 2 & 4. The orientation of CAM on CZT –imager payload is shown below.



- CZT detector placement & orientation on detector board is shown below.



- CZT placement on qualification model is shown in the figure below with detector ID.



Pixel Map:

Each Channel is physically connected to one of the 256 device pixels. The OMS40G256 though the internal implementation may have different physical mapping of the channels, the detector has a built-in conversation system providing a linear mapping for the pixels.

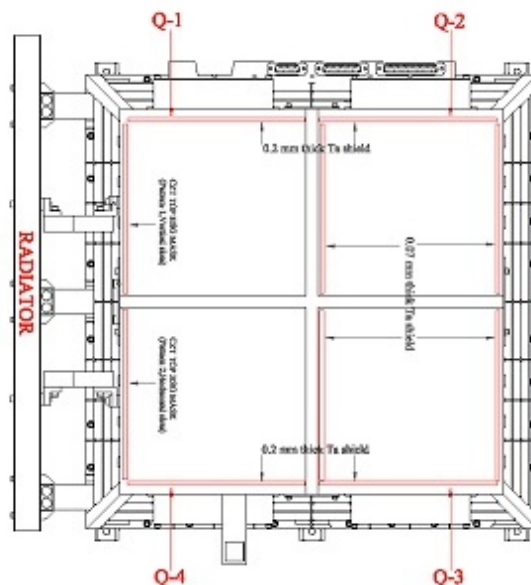
All pixels mapping viewed from the device CZT side. The device is oriented in such a way that the HV pin located at the upper left corner (pixel A1).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	000	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015
B	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031
C	032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047
D	048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063
E	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079
F	080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095
G	096	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111
H	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
J	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
K	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
L	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
M	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
N	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
P	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
R	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
T	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

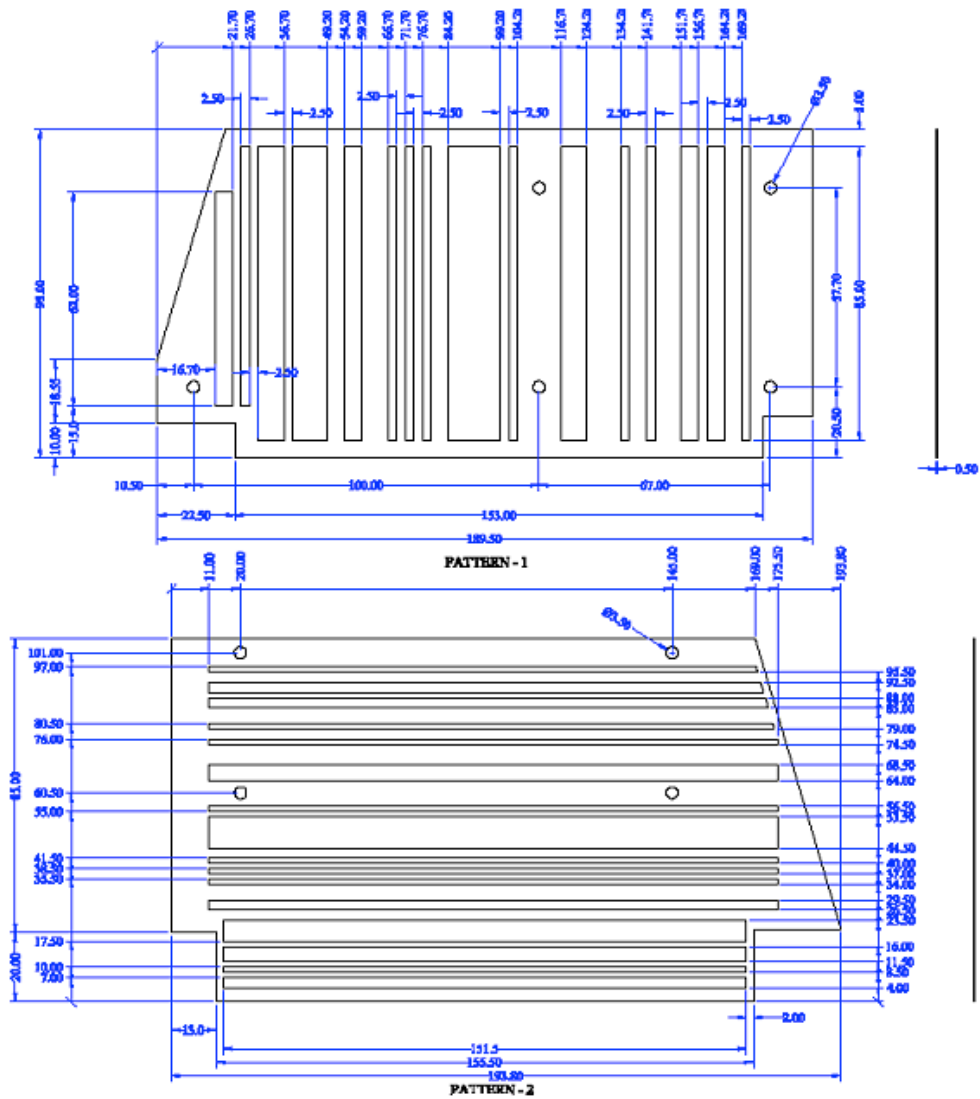
Lateral Mask:

The CZT-Imager payload has masks and shields fixed on the inner side of CZT TOP HSG., whereas the masks are bonded along the radiator side of CZT TOP HSG. The lateral masks are made in two types namely pattern-1 & 2. Pattern-1&2 fixed on the sides of quadrant no.1 & 4 respectively. The details of mask pattern, orientation of masks and shielding are shown below.

Diagram showing the orientation of mask & shield of CZT TOP HOUSING



Lateral Mask Patterns



Dimension details:

The overall dimension of the payload is 482 mm x 458 mm x 603.5mm in height (without radiator assy.), whereas the effective distance between CZT detectors surface to the CAM surface is 481 mm.

