1) Add header on biniary file with
    1) ID of the digitizer
    2) Data structure (in Setup directory?)
    3) Run number

2) Structure of the data director with separate subdirectory fot tracker, PID, gamma e setup

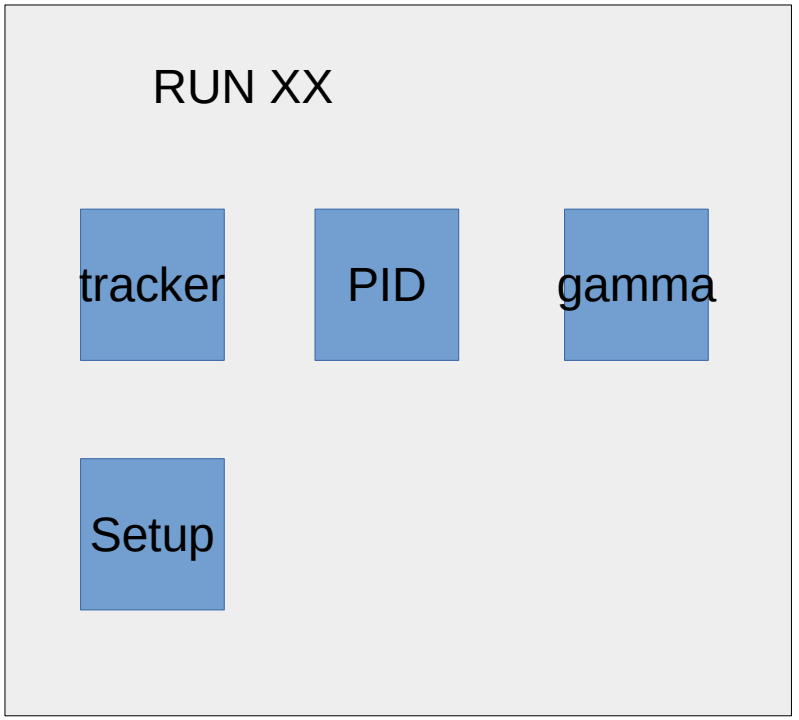
3) The macro that convert binary to root file take the link between digitizer and anode section from separate configuration file. The macro should provide for different level of

    min level all the original data are kept to havemaximum flexibility during test.

    max level only the usefull data are kept and all the other are not copied to save space

4) Separation of the flag variable in two different variable (to be alligned with the digitizers documentation)

5)



Assunto come riferimento il fascio la x cresce da dx verso sx

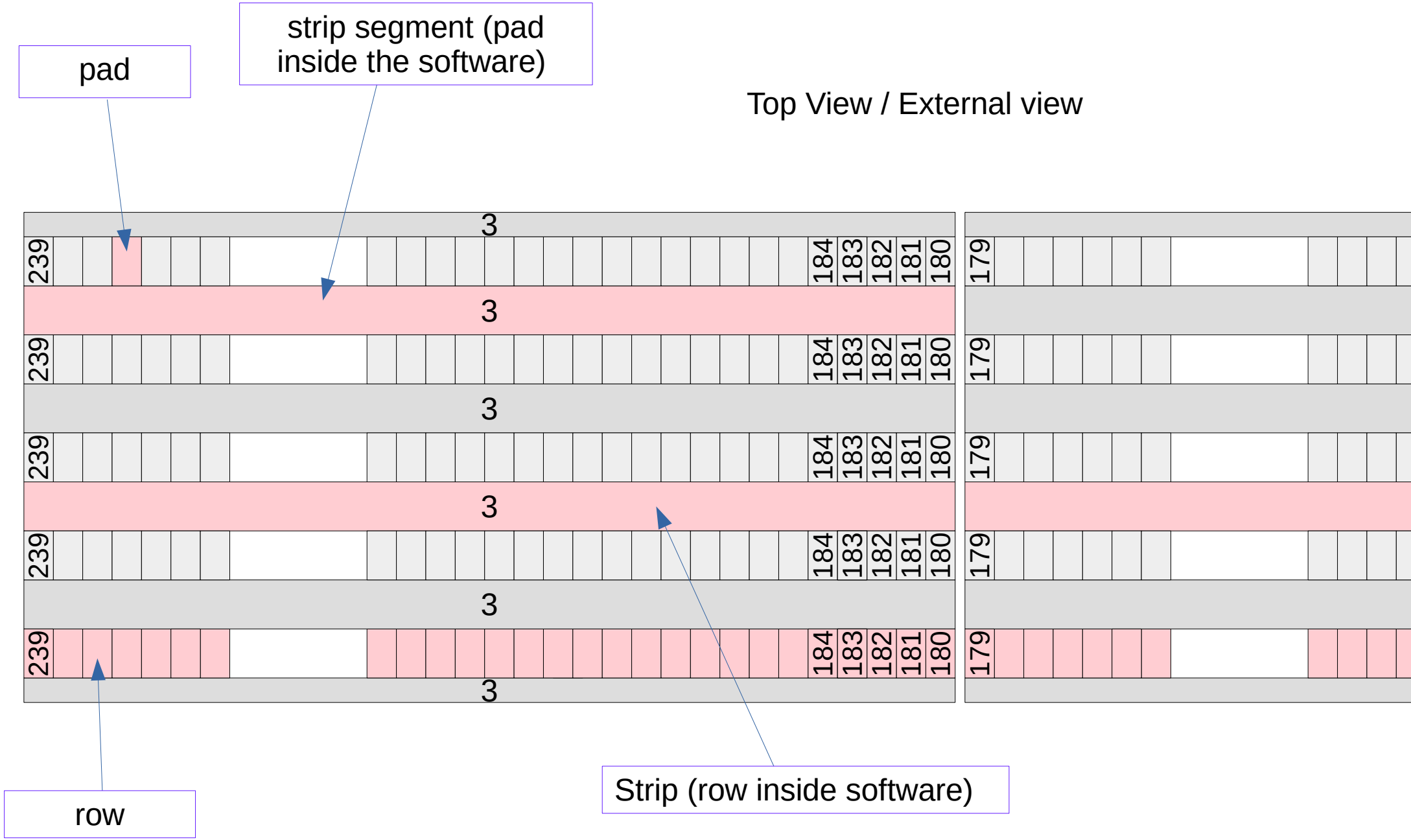
Sistema di riferimento come quello del FPD

Everything start from 0

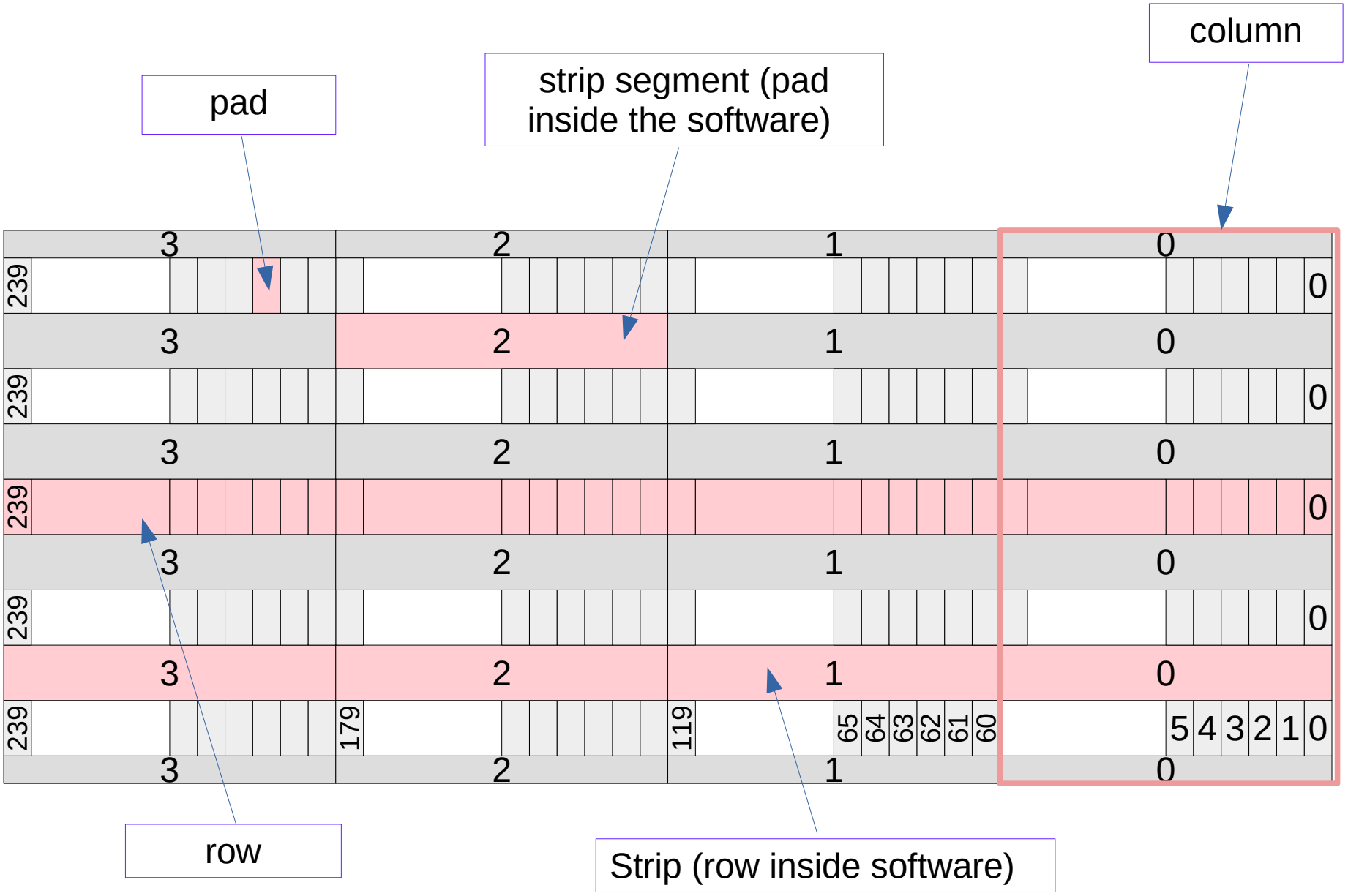
# *DEFINITIONS*

- *Hit:* All the information relate to the signal in a single pad entry is related to the organization of this information on a root or binry file, hit is the corresponding physical phenomenon
- *(Physical) Event:* It is the totality of hit generated by a single physical event (e.g. charged particle crossing the detector)
- *(Software) Event:* Is a group of hit in a given time window where to look for one or more *Physical events.*
- *Cluster:* Group of hit that are close in space and time (not necessarely part of a physical event)
- *Row:* is the totality of pad or strip tha have same z-coordinate (in the final detector a row is made or of 60x4). It is divided in four segments corresponding to the four sections of the anode.
- *Strip:* Is the sensible area of the anode between two rows. Each strip is made of four long segment (300 mm) each one corresponding to a section of the anode.

Inside the code *strip* and *row* are both called *row*. The proper raw have an index that run from 0 to 4 and 60x4 pads, the strips instead have an index between 5 and 10 and just 4 pads.


pad
strip segment (pad inside the software)
Top View / External view
3
239
184
183
182
181
180
179
row
Strip (row inside software)

Top view / External view of the full anode



| | | | |
|---|---|---|---|
| 19 | 18 | 17 | 16 |
| 15 | 14 | 13 | 12 |
| 11 | 10 | 9 | 8 |
| 7 | 6 | 5 | 4 |
| 3 | 2 | 1 | 0 |

Section number

Column 3 Column 2 Column 1 Column 0

beam

Bottom view (internal view).

**Full anode** (group of all 4 anodes)

**Single anode** (single anodic board corresponding to a column)

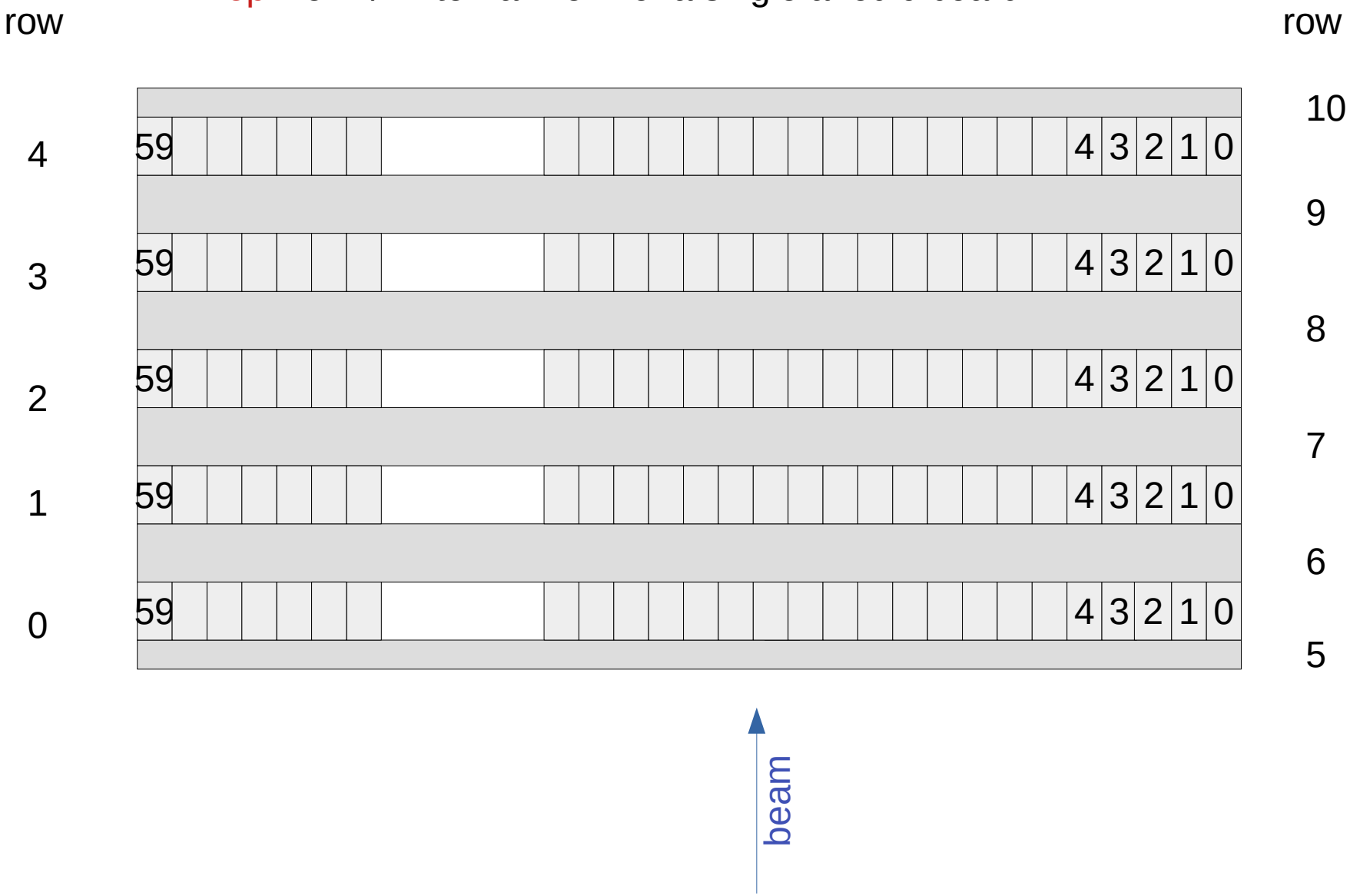
**Anode section** (group of pad and strip linked to a digitizer)
At each anode section is linked one and only one digitizer and a preamplifier

| Anode section | row | column | ID dig | ID preampl |
|---|---|---|---|---|
| 0 | 0 | 0 | xxx | yyyy |
| 1 | 0 | 1 | xxy | yyyx |
| 2 | 0 | 2 | … | ... |
| 3 | 0 | 3 | … | ... |
| 4 | 1 | 0 | … | ... |
| 5 | 1 | 1 | … | ... |
| 6 | 1 | 2 | … | ... |
| ⋮ | ⋮ | ⋮ | | |
| 19 | 4 | 3 | … | … |

Example of template for the anode map file.

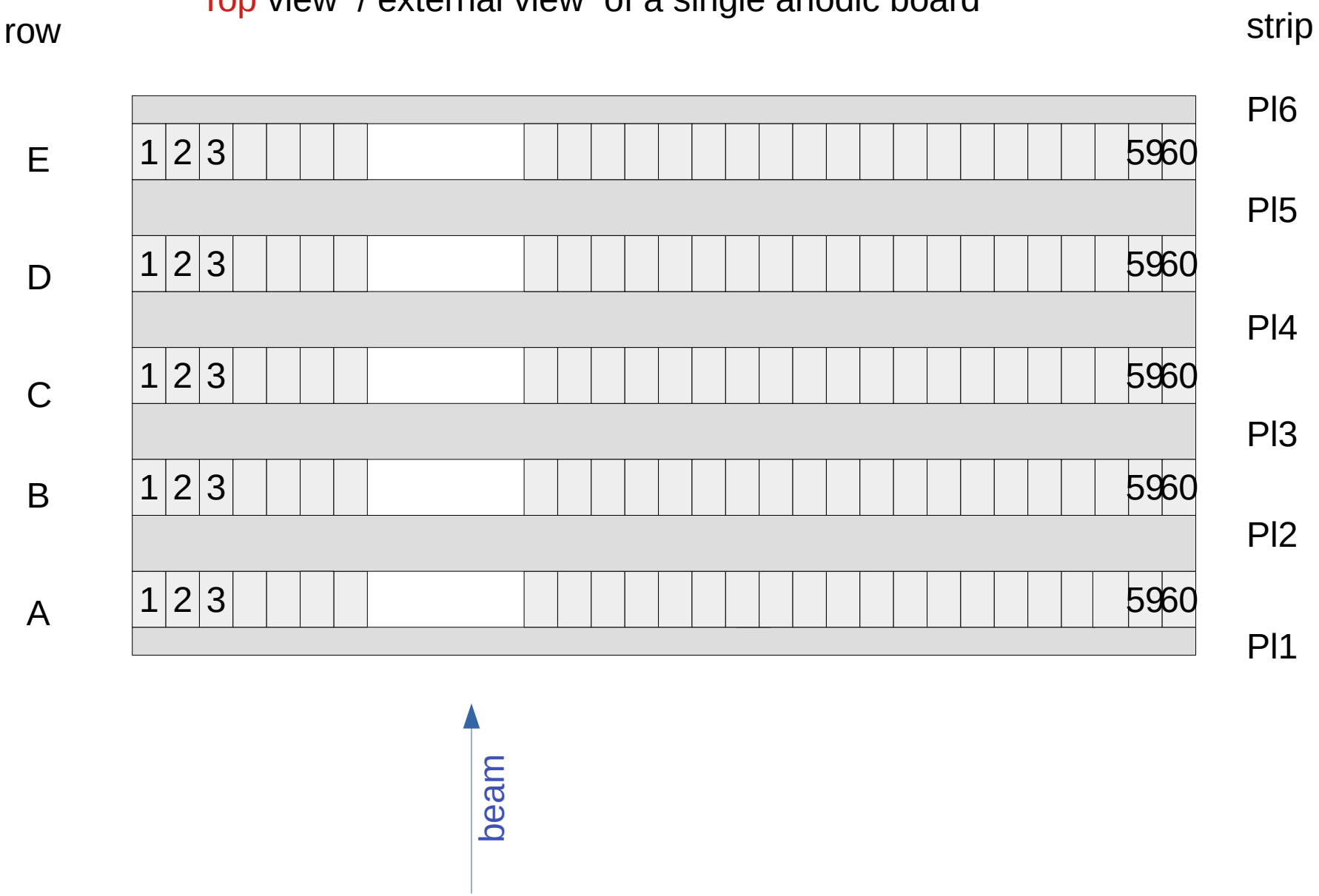
# Software nomenclature

Top view / External view of a single anodic board



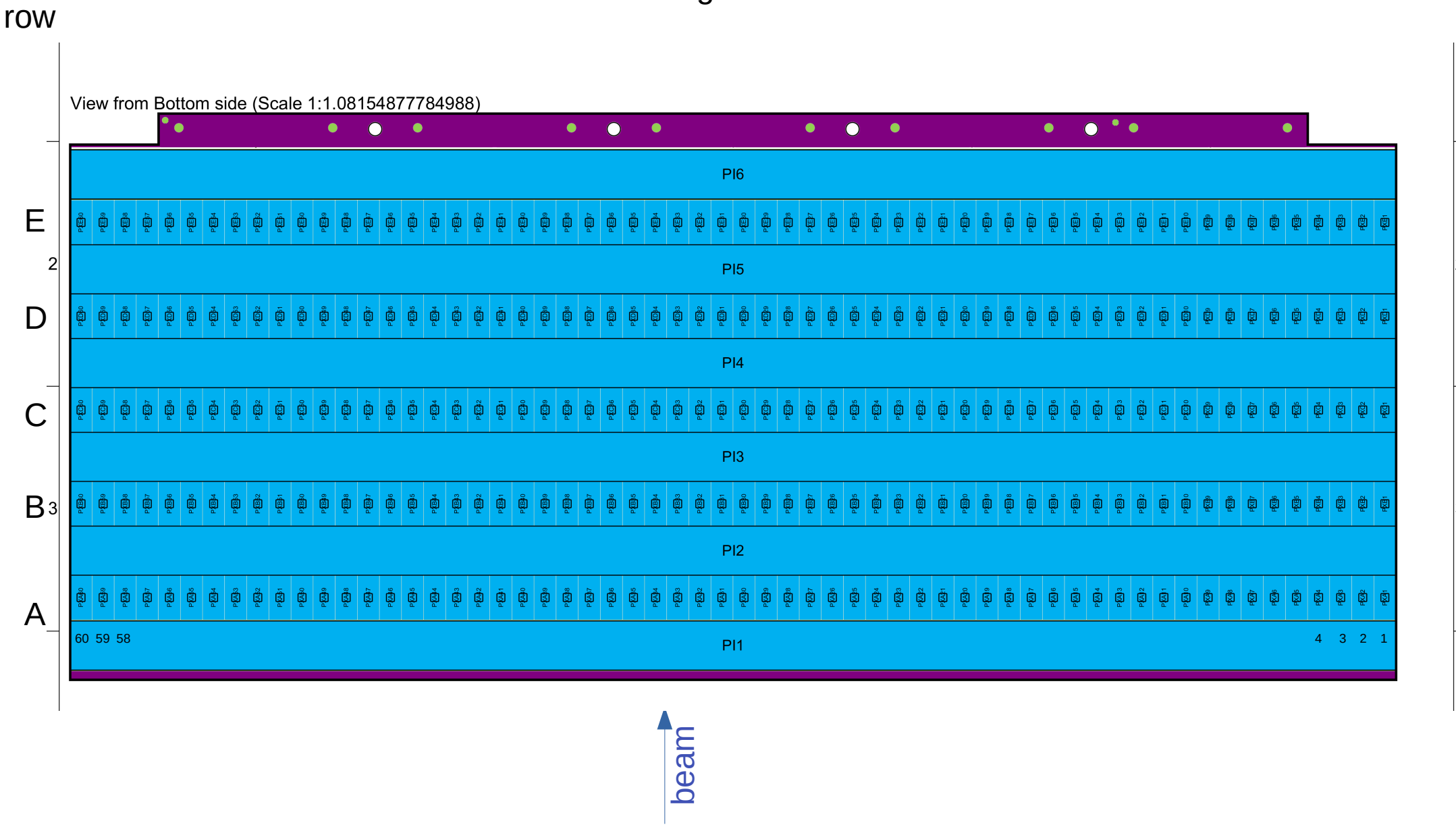
# Electronics nomenclature

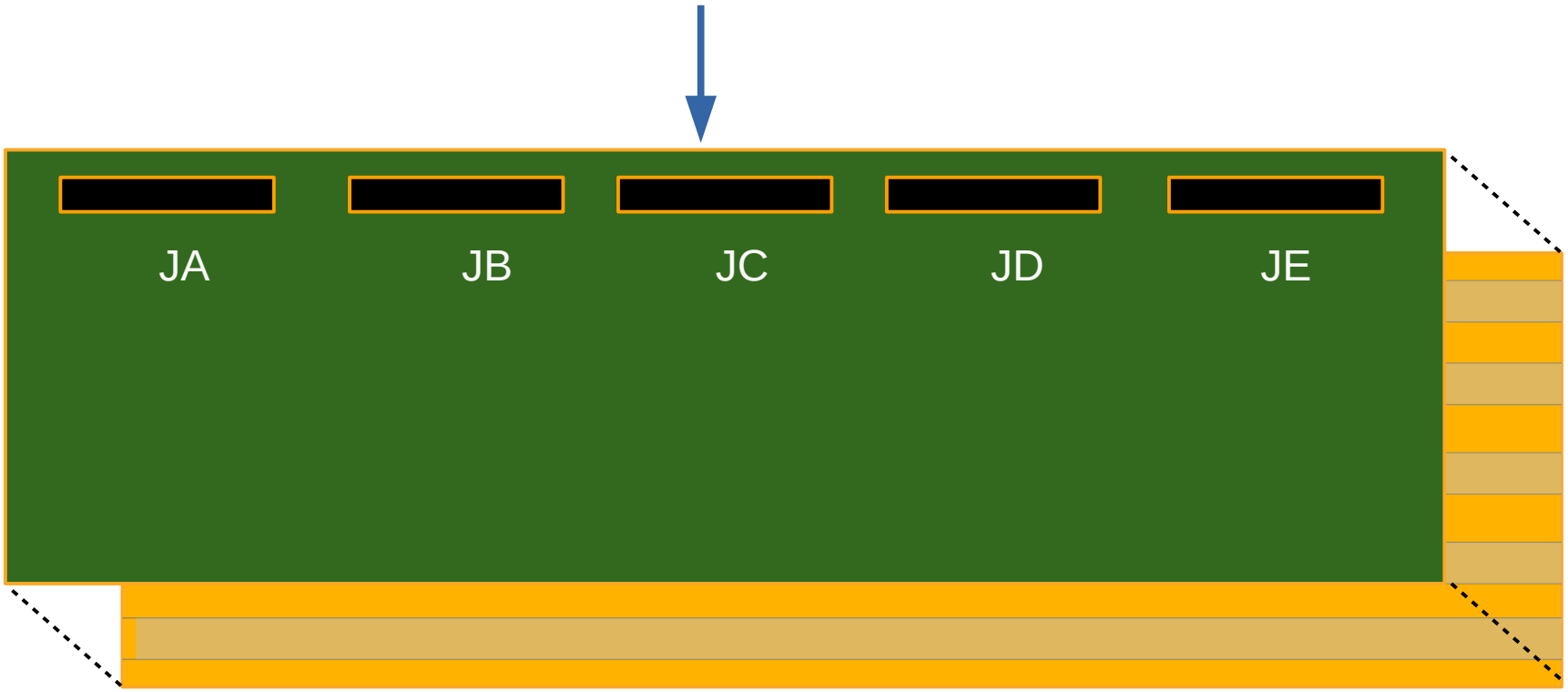
Top view / external view of a single anodic board



# Electronics nomenclature

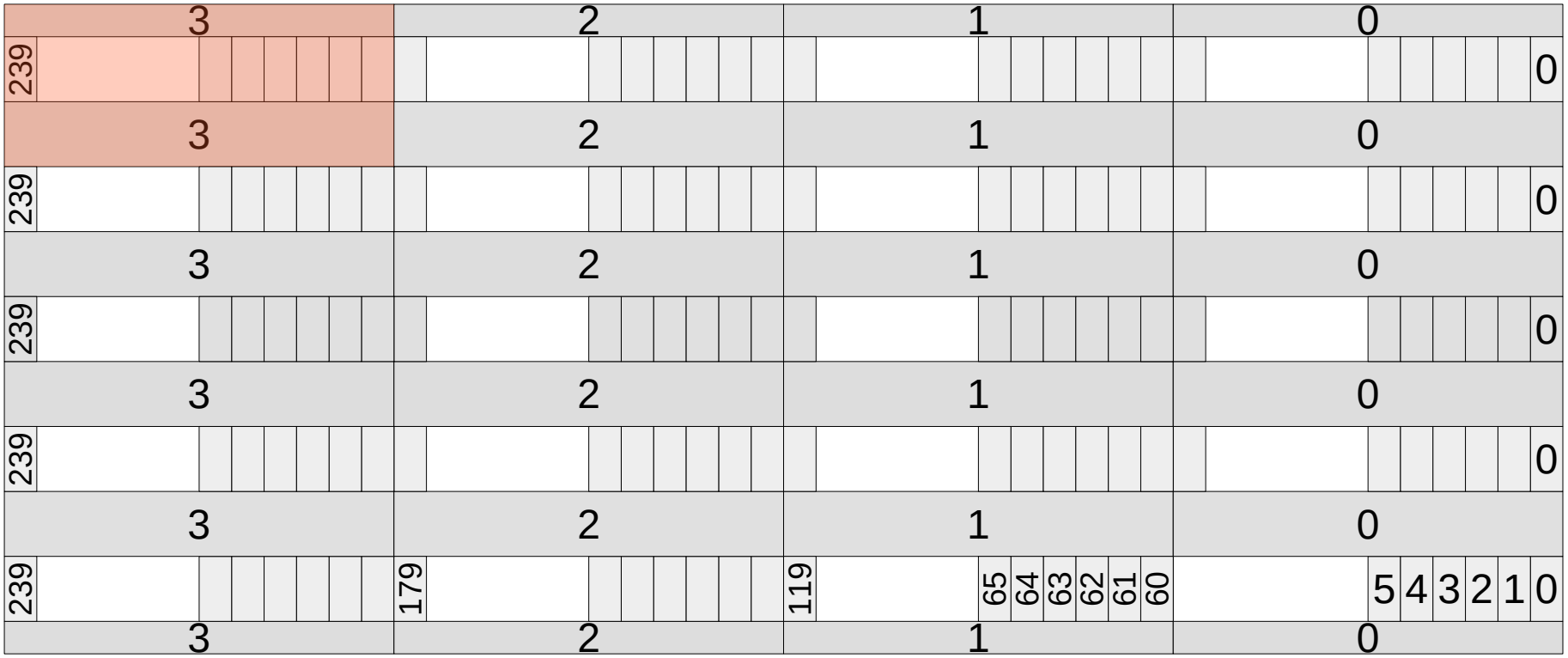
Bottom view / internal view of a single anodic board

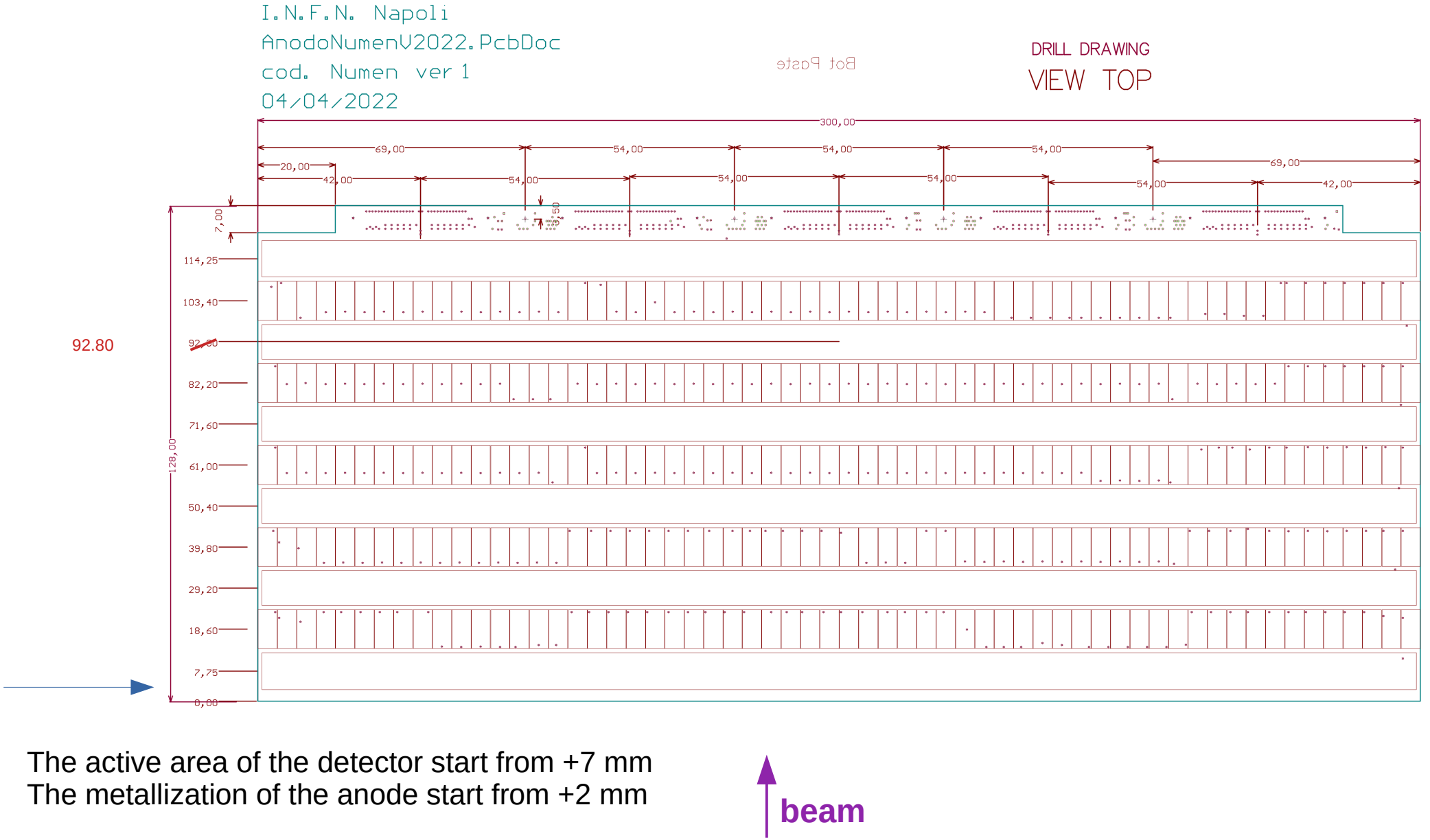





| Connector | channels elec. nom. | Channel software nom. |
|---|---|---|
| **JA** | **row A + Pl1** | **row 0 + row 5** |
| **JB** | **row B + Pl2** | **row 1 + row 6** |
| **JC** | **row C + Pl3** | **row 2 + row 7** |
| **JD** | **row D + Pl4** | **row 3 + row 8** |
| **JE** | **row E + Pl5 + Pl6** | **row 4 + row 9 + row 10** |

Top view / External view of the full anode with an highlight (red) on a single section of the anode






The active area of the detector start from +7 mm
The metallization of the anode start from +2 mm

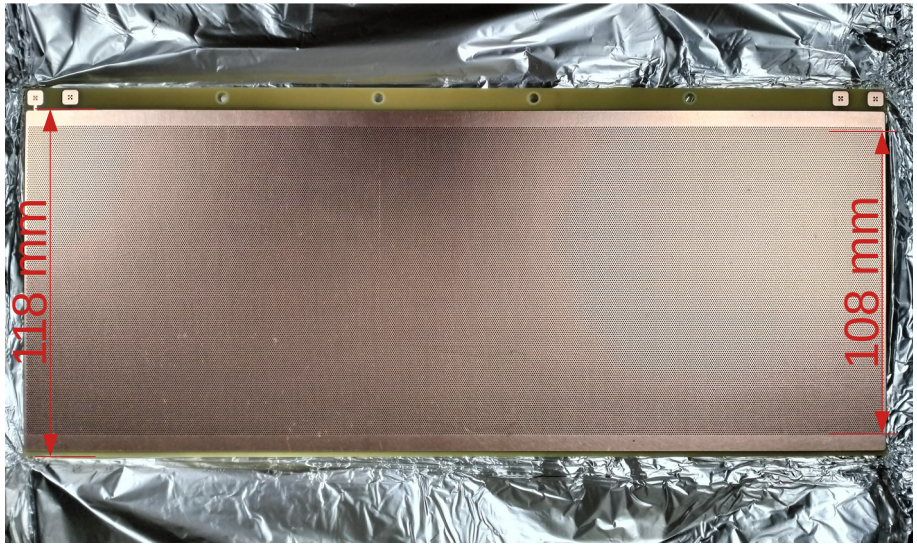
| Raw | centre | Close edge | Far edge | width |
|---|---|---|---|---|
| 5 | 7.75 | 2 | 13.5 | 11.5 |
| 0 | 18.60 | 13.5 | 23.7 | 10.2 |
| 6 | 29.20 | 23.7 | 34.7 | 11 |
| 1 | 39.8 | 34.7 | 44.9 | 10.2 |
| 7 | 50.4 | 44.9 | 55.9 | 11 |
| 2 | 61 | 55.9 | 66.1 | 10.2 |
| 8 | 71.6 | 66.1 | 77.1 | 11 |
| 3 | 82.20 | 77.1 | 87.3 | 10.2 |
| 9 | 92.80 | 87.3 | 98.3 | 11 |
| 4 | 103.4 | 98.3 | 108.5 | 10.2 |
| 10 | 114.25 | 108.5 | 120.0 | 11.5 |

Size of the anode 128 mm
Metal-coated size 118 mm

The insulation layer between the raws has been neglected!

Active area start from 7 to 115
Row 5 and 10 have an effective size of 6.5 mm

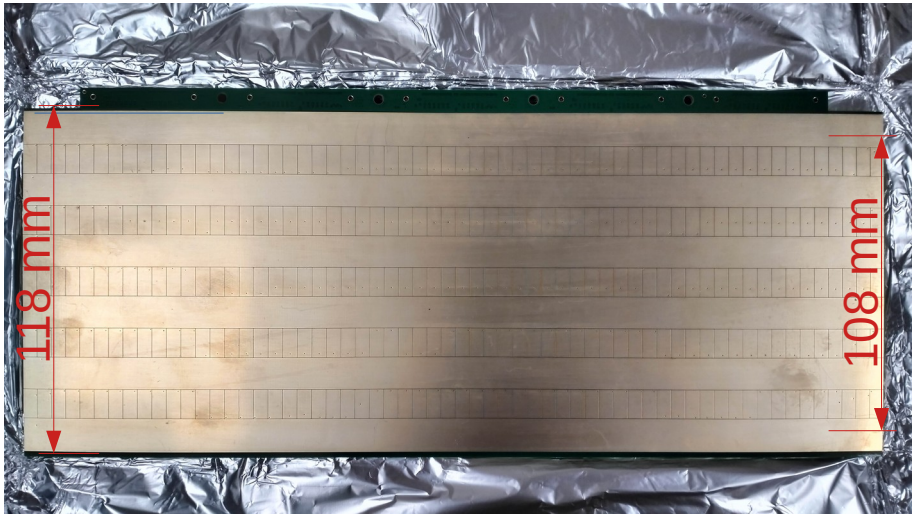
## THGEM




Heigth of the metallized surface  118 mm
Heigth of the drilled surface 108 mm

The active area of the tracher is 108x300 mm therefore the first and last strip of the anode extend below the partition grid.
It must take into account when you determine the tracks and choice the reference sistem

## Anode




Heigth of the metallized surface  118 mm

# Adpater Samtec flat – 64 Ch ERF8

| In adapter | Out preamp |
|---|---|
| 0 | 0 |
| 1 | 16 |
| 2 | 1 |
| 3 | 17 |
| 4 | 2 |
| 5 | 18 |
| 6 | 3 |
| 7 | 19 |
| 8 | 4 |
| 9 | 20 |
| 10 | 5 |
| 11 | 21 |
| 12 | 6 |
| 13 | 22 |
| 14 | 7 |
| 15 | 23 |

| In adpter | Out preamp |
|---|---|
| 16 | 8 |
| 17 | 24 |
| 18 | 9 |
| 19 | 25 |
| 20 | 10 |
| 21 | 26 |
| 22 | 11 |
| 23 | 27 |
| 24 | 12 |
| 25 | 28 |
| 26 | 13 |
| 27 | 29 |
| 28 | 14 |
| 29 | 30 |
| 30 | 15 |
| 31 | 31 |

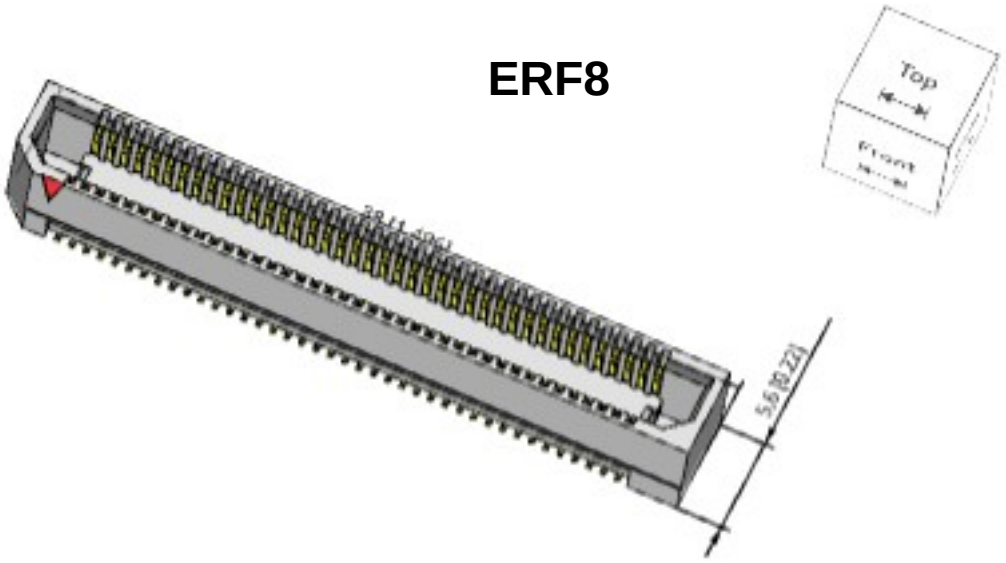
| In adapter | Out preamp |
|---|---|
| 32 | 32 |
| 33 | 48 |
| 34 | 33 |
| 35 | 49 |
| 36 | 34 |
| 37 | 50 |
| 38 | 35 |
| 39 | 51 |
| 40 | 36 |
| 41 | 52 |
| 42 | 37 |
| 43 | 53 |
| 44 | 38 |
| 45 | 54 |
| 46 | 39 |
| 47 | 55 |

| In adapter | Out preamp |
|---|---|
| 48 | 40 |
| 49 | 56 |
| 50 | 41 |
| 51 | 57 |
| 52 | 42 |
| 53 | 58 |
| 54 | 43 |
| 55 | 59 |
| 56 | 44 |
| 57 | 60 |
| 58 | 45 |
| 59 | 61 |
| 60 | 46 |
| 61 | 62 |
| 62 | 47 |
| 63 | 63 |

# Pinout of different elements

| Pad number | output channel PA | |
|---|---|---|
| 0 | 1 | |
| 1 | 2 | |
| 2 | 3 | |
| 3 | 4 | |
| ⋮ | ⋮ | |
| 59 | 60 | |
| | | |
| Strip | 61 | |
| Strip2 | 62 | (if row is 4) |

**ERF8**

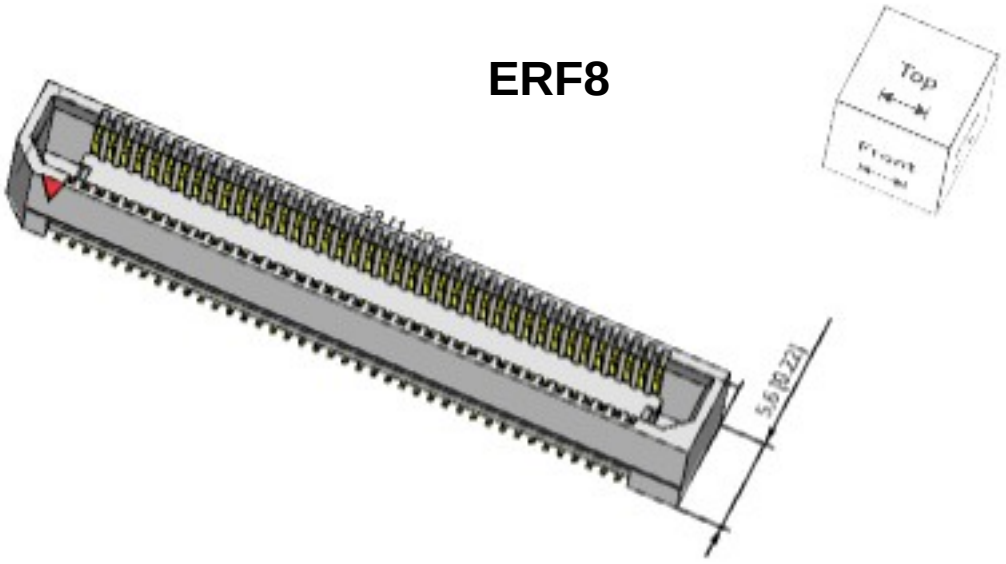



| Pin number SAMTEC ERF8 | channel PA |
|---|---|
| 1 | bias 0:31 |
| 2 | bias 0:31 |
| 3 | N.C |
| 4 | N.C |
| 5 | 16 |
| 6 | 0 |
| 7 | 17 |
| 8 | 1 |
| 9 | 18 |
| 10 | 2 |
| ⋮ | ⋮ |
| 33 | 30 |
| 34 | 14 |
| 35 | 31 |
| 36 | 15 |
| 37 | N.C. |
| 38 | N.C. |
| 39 | GND |
| 40 | GND |
| 41 | GND |
| 42 | GND |
| 43 | N.C. |
| 44 | N.C. |
| 45 | 48 |
| 46 | 32 |
| 47 | 49 |
| 48 | 33 |
| 49 | 50 |
| 50 | 34 |
| ⋮ | ⋮ |
| 71 | 61 |
| 72 | 45 |
| 73 | 62 |
| 74 | 46 |
| 75 | 63 |
| 76 | 47 |
| 77 | N.C. |
| 78 | N.C. |
| 79 | bias 32:63 |
| 80 | bias 32:63 |

# Pinout of different elements

SAMTEC to Flat converter (by Fabio L.)

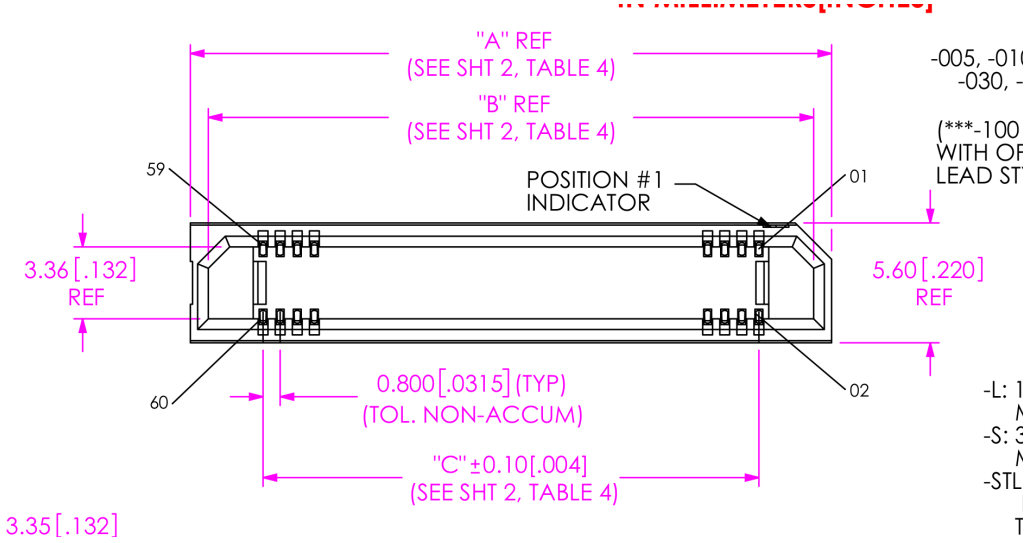
**ERF8**

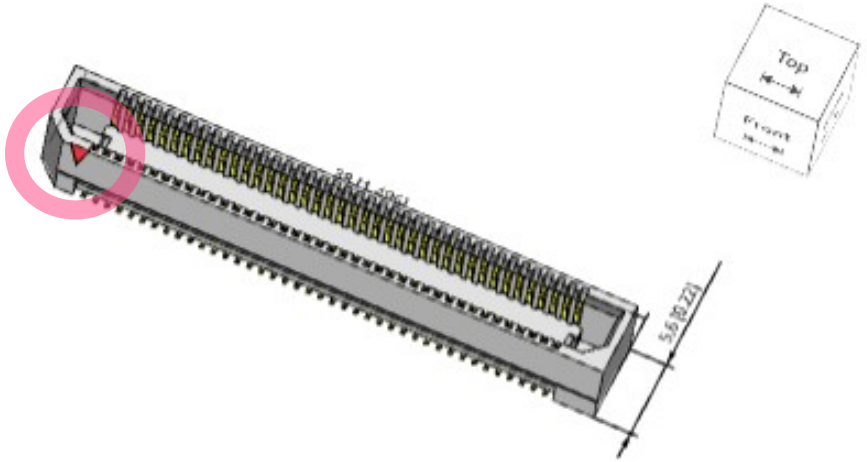



| Pin number SAMTEC ERF8 | out channel in flat cable |
|---|---|
| 1 | N.C. |
| 2 | N.C. |
| 3 | N.C. |
| 4 | N.C. |
| 5 | 16 |
| 6 | 0 |
| 7 | 17 |
| 8 | 1 |
| 9 | 18 |
| 10 | 2 |
| ⋮ | ⋮ |
| 33 | 30 |
| 34 | 14 |
| 35 | 31 |
| 36 | 15 |
| 37 | N.C. |
| 38 | N.C. |
| 39 | N.C. |
| 40 | N.C. |
| 41 | N.C. |
| 42 | N.C. |
| 43 | N.C. |
| 44 | N.C. |
| 45 | 48 |
| 46 | 32 |
| 47 | 49 |
| 48 | 33 |
| 49 | 50 |
| 50 | 34 |
| ⋮ | ⋮ |
| 71 | 61 |
| 72 | 45 |
| 73 | 62 |
| 74 | 46 |
| 75 | 63 |
| 76 | 47 |
| 77 | N.C. |
| 78 | N.C. |
| 79 | N.C. |
| 80 | N.C. |

# First pin in SAMTEC connectors and cables

## ERF8




## ERCD

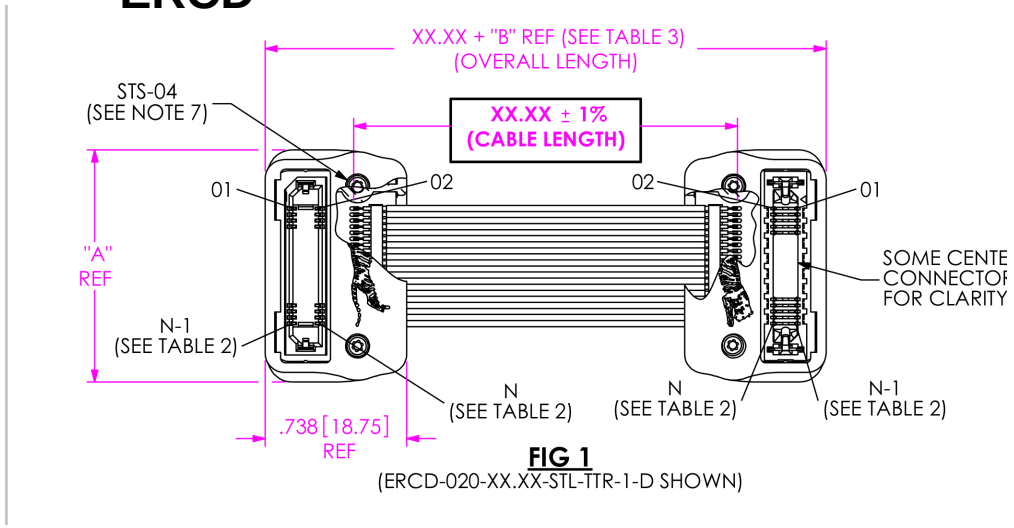
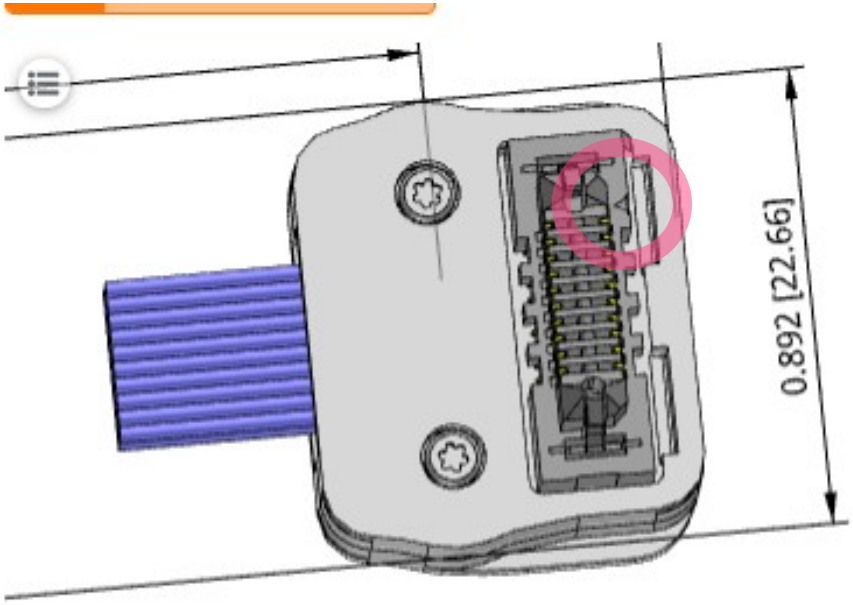
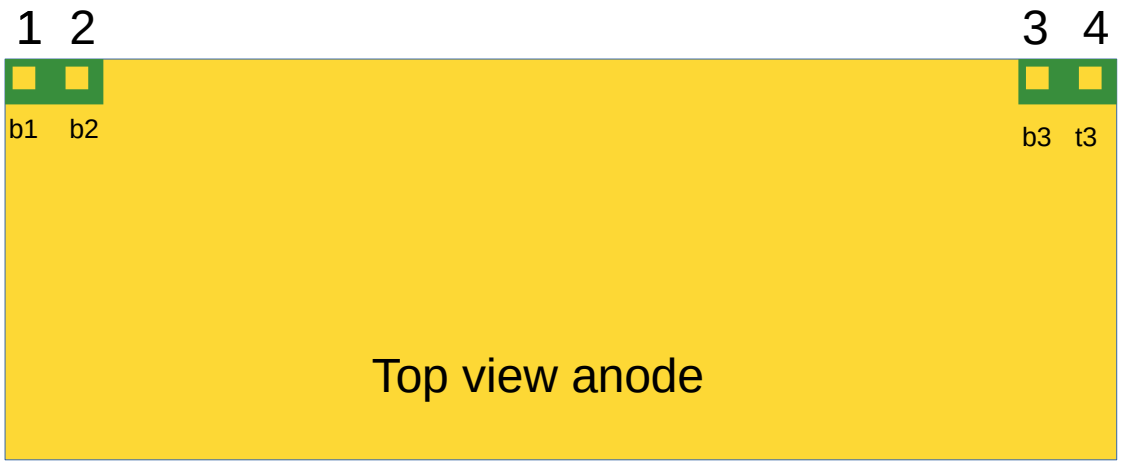
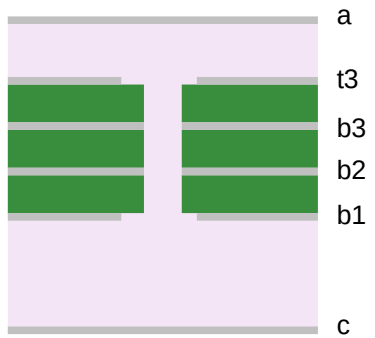


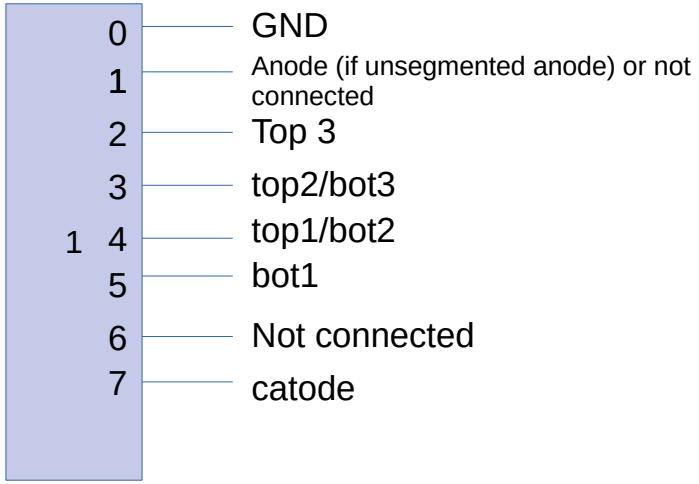

**FIG 1**
(ERCD-020-XX.XX-STL-TTR-1-D SHOWN)

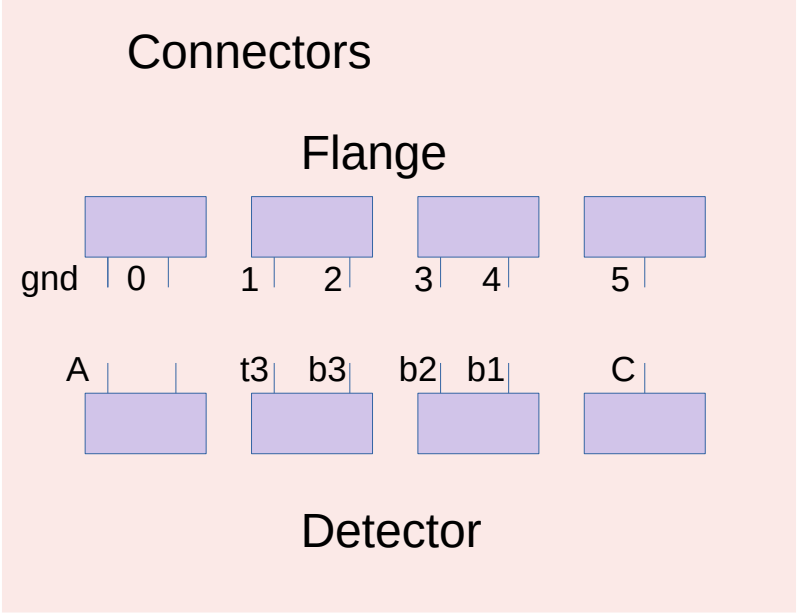



1 2
3 4
b1 b2
b3 t3
Top view anode


a
t3
b3
b2
b1
c

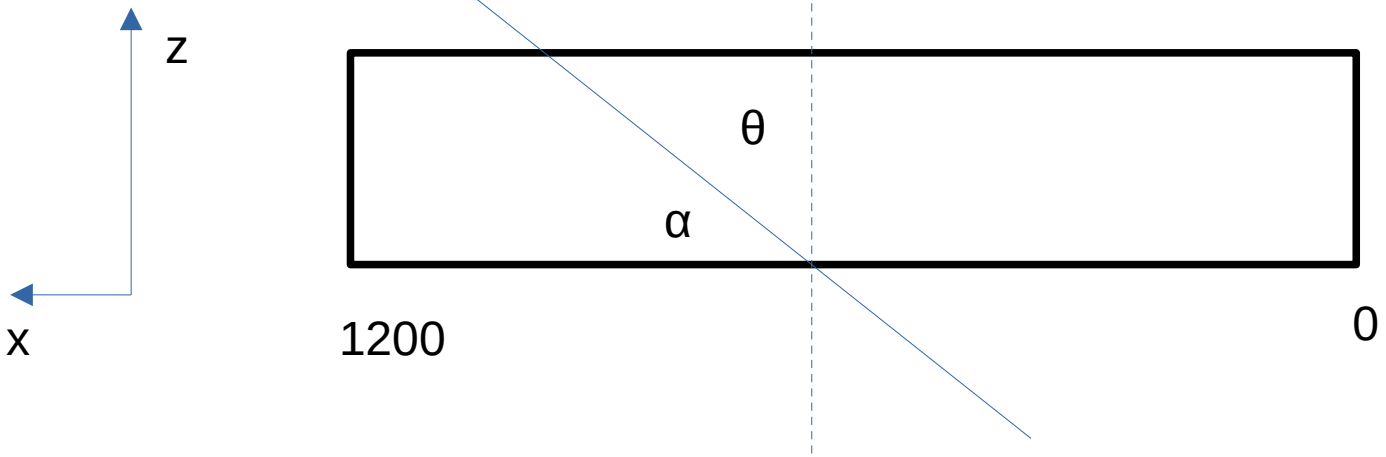
## CAEN A1015G


0
1
2
3
1 4
5
6
7
GND
Anode (if unsegmented anode) or not connected
Top 3
top2/bot3
top1/bot2
bot1
Not connected
catode

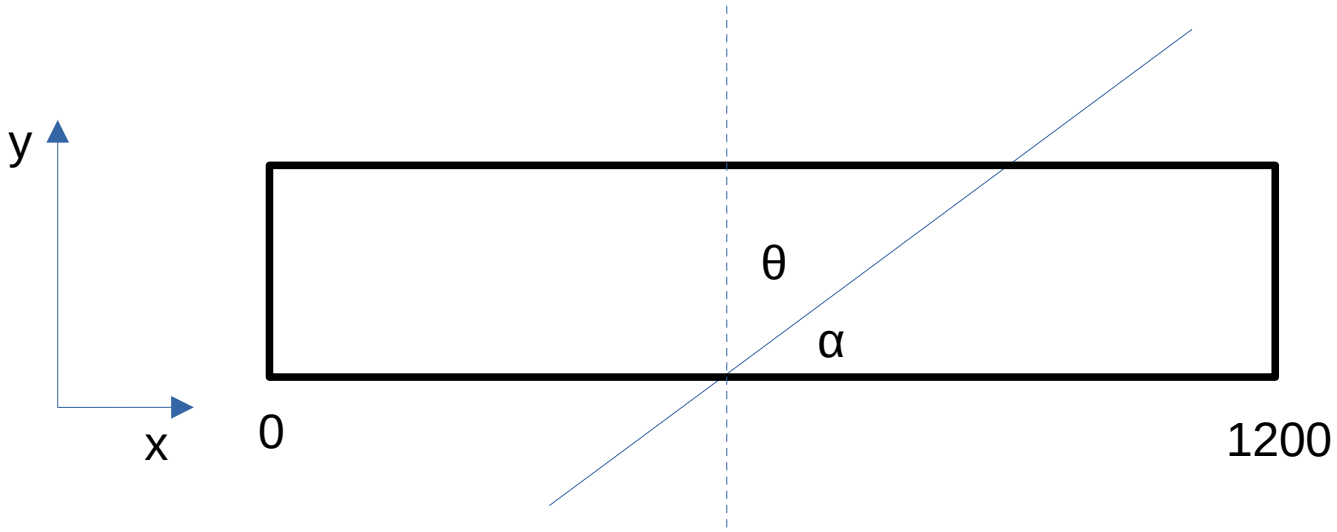

Connectors
Flange
gnd 0 1 2 3 4 5
A t3 b3 b2 b1 C
Detector

# Angles (top view)

Lab frame




Analysis frame

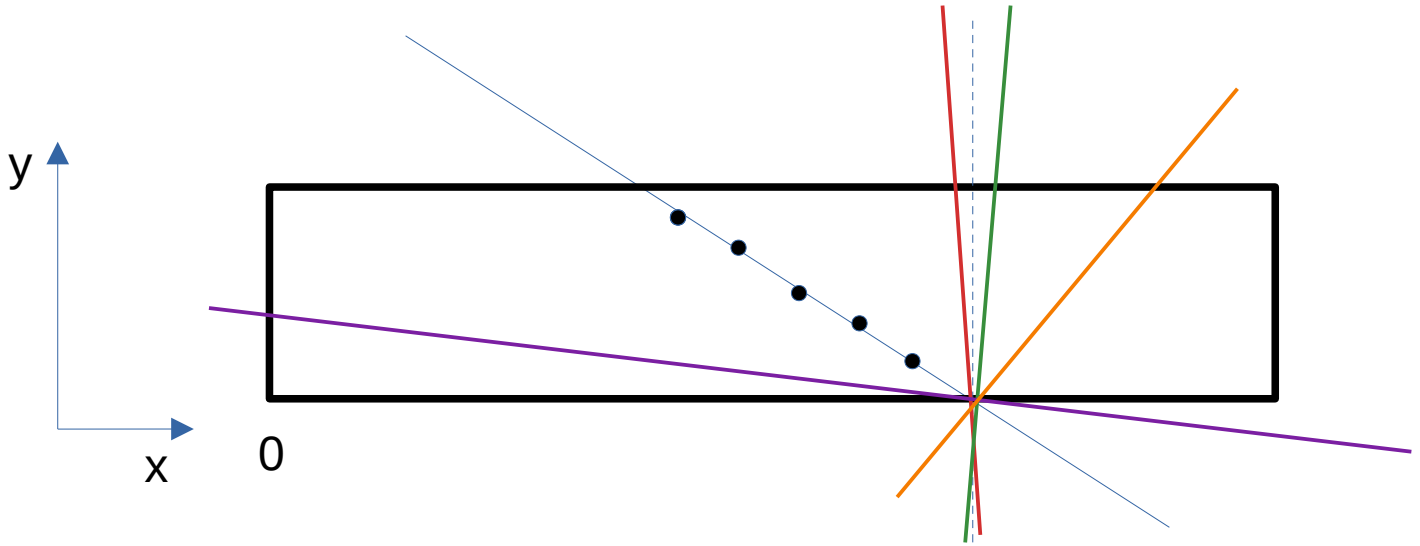



$\alpha_A$ is positive
(coefficiente angoalre retta)

$\theta_A$ is positive
(angolo rispetto alla direzione del fascio)

$\alpha_A+\theta_A=90$

# Angles




theta_deg=-90-alpha_deg;

theta_deg=-90-alpha_deg;
if(theta_deg<-90){theta_deg=-90-alpha_deg+180;}