



中央研究院物理研究所
INSTITUTE OF PHYSICS, ACADEMIA SINICA

Status report

2025/03/20

ZDC Internal

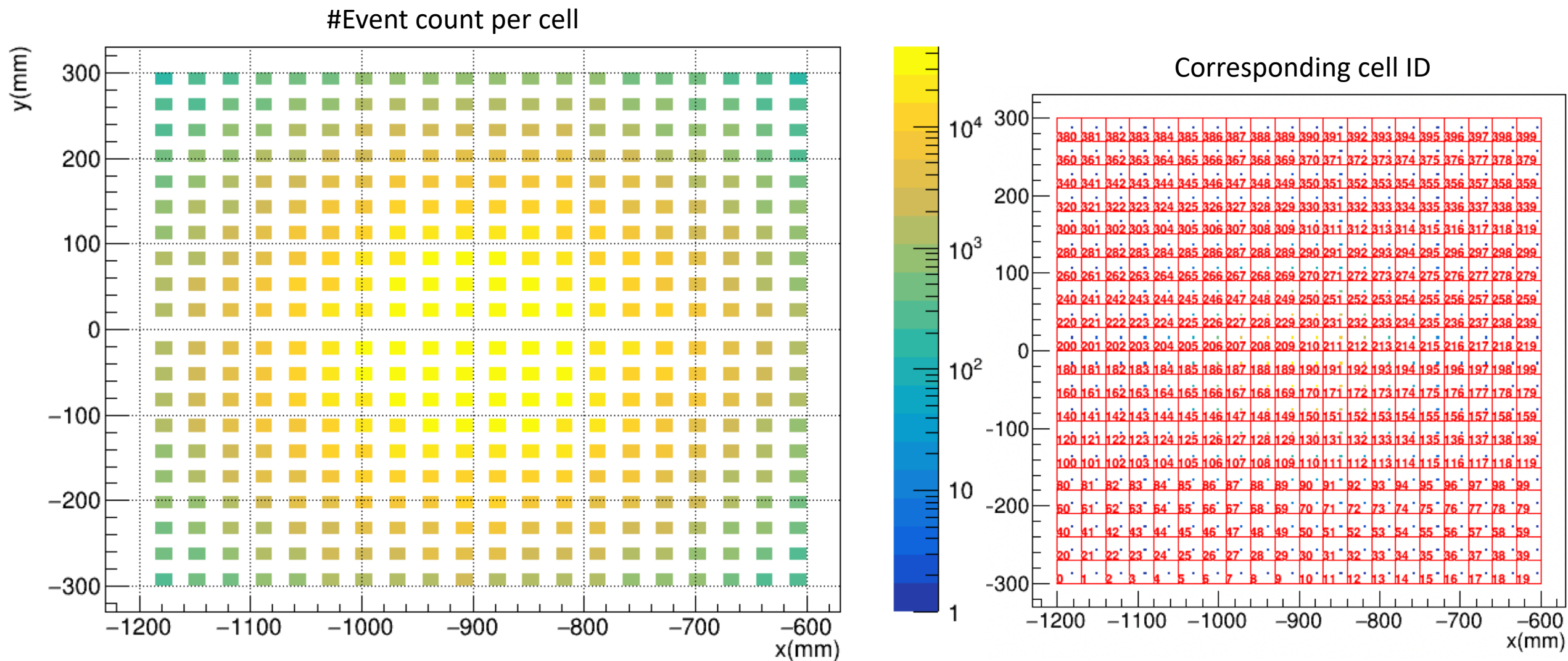
WAI YUEN CHAN

- Get down to the workshop, install the beam test setup
- Make a plotter to plot the histogram for ML sample
 - Tried to use ROOT, but didn't work well.
 - Eventually use matplotlib to build a prototype.
- Today/Tomorrow: Job submission pipeline test

ML Sample: Histogram

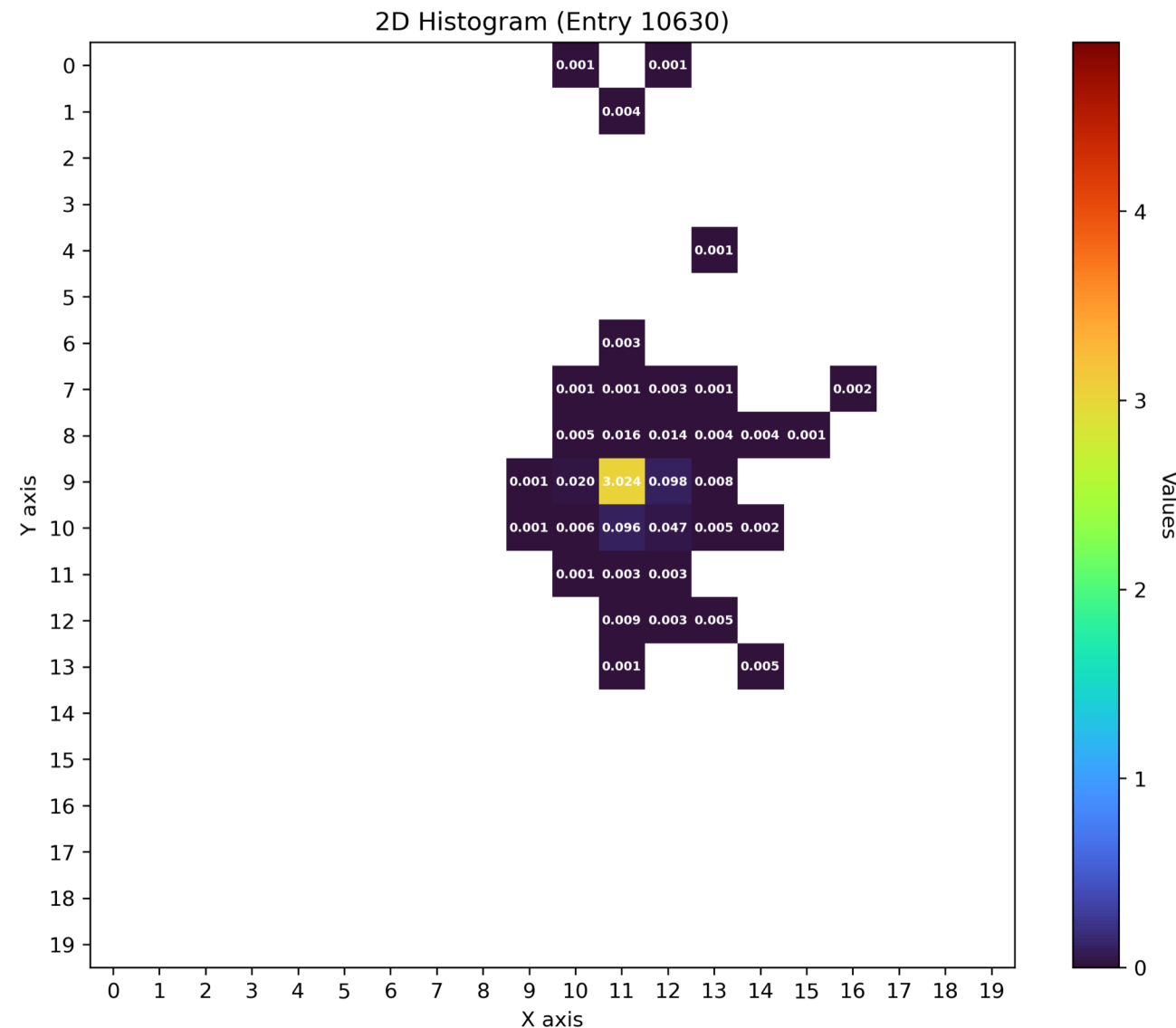
- We make use of the ROOT file structure (looping over entries), we can make a 20x20 2D array to store the energy per cell.
- A print out with energy per cell (**amplified by 10000 times** for visual purpose) in 1 example event has been shown as a 2D array:

```
[[ 0 0 0 0 0 0 0 0 0 0 10 3 12 0 0 0 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 7 37 4 0 0 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0]
 [ 0 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 5 0 0 14 2 0 0 0]
 [ 0 0 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 8 25 0 0 5 0 0 6]
 [ 0 0 0 0 0 0 0 0 0 0 12 13 33 14 4 3 18 0]
 [ 0 0 0 0 0 0 0 0 5 1 47 163 141 39 36 12 3 0]
 [ 0 0 0 0 0 0 0 2 0 13 196 33 210 81 8 7 3 0]
 [ 0 0 0 0 0 0 0 2 0 13 60 196 217 47 22 0 0 0]
 [ 0 0 0 0 0 0 0 0 5 2 12 34 29 6 9 7 0 0]
 [ 0 0 0 0 0 0 0 0 0 4 0 89 28 51 6 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 1 11 0 5 50 0 0 0]
 [ 0 0 0 0 0 0 0 0 1 0 0 3 0 0 0 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 0 0 0]
 [ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0]]
```



- We can transfer the array into 2D Histogram for each single event.

[	0	0	0	0	0	0	0	0	0	0	10	3	12	0	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	7	37	4	0	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0]
[	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	5	0	0	14	2	0	0	0	0]
[	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	8	25	0	0	5	0	0	6	0]
[	0	0	0	0	0	0	0	0	0	0	12	13	33	14	4	3	18	0	0]
[	0	0	0	0	0	0	0	0	5	1	47	163	141	39	36	12	3	0	0]
[	0	0	0	0	0	0	0	2	0	13	196	33	210	81	8	7	3	0	0]
[	0	0	0	0	0	0	0	2	0	13	60	196	217	47	22	0	0	0	0]
[	0	0	0	0	0	0	0	5	2	12	34	29	6	9	7	0	0	0	0]
[	0	0	0	0	0	0	0	0	4	0	89	28	51	6	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	1	11	0	5	50	0	0	0	0	0]
[	0	0	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0]
[	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0]

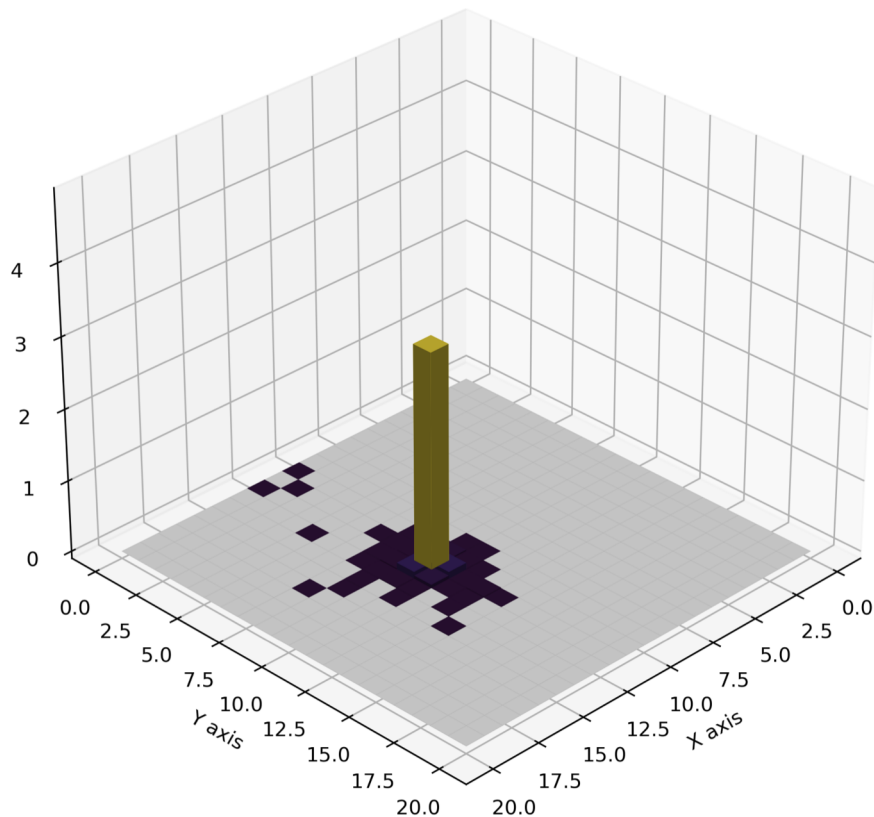


- For each event we have also record the sum of energy and the number of cell which have energy ≥ 0.001 GeV

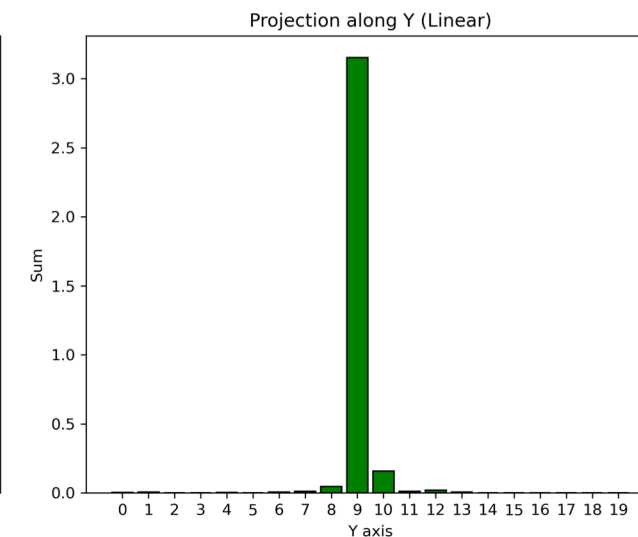
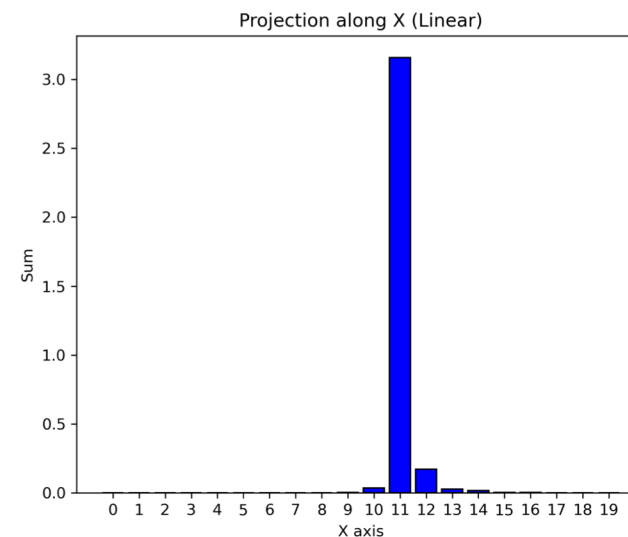
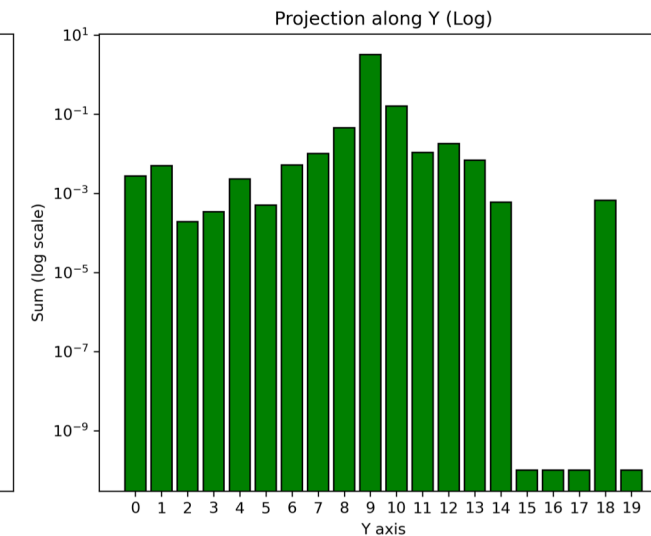
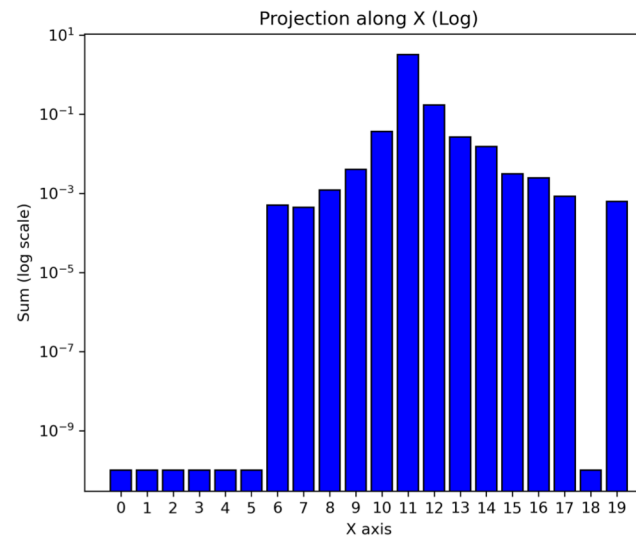
```

Entry 10630 2D array:
[[0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 3. 0.1 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.1 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. ]
Total sum of all elements: 3.4
Number of elements  $\geq 0.001$ : 35
    
```

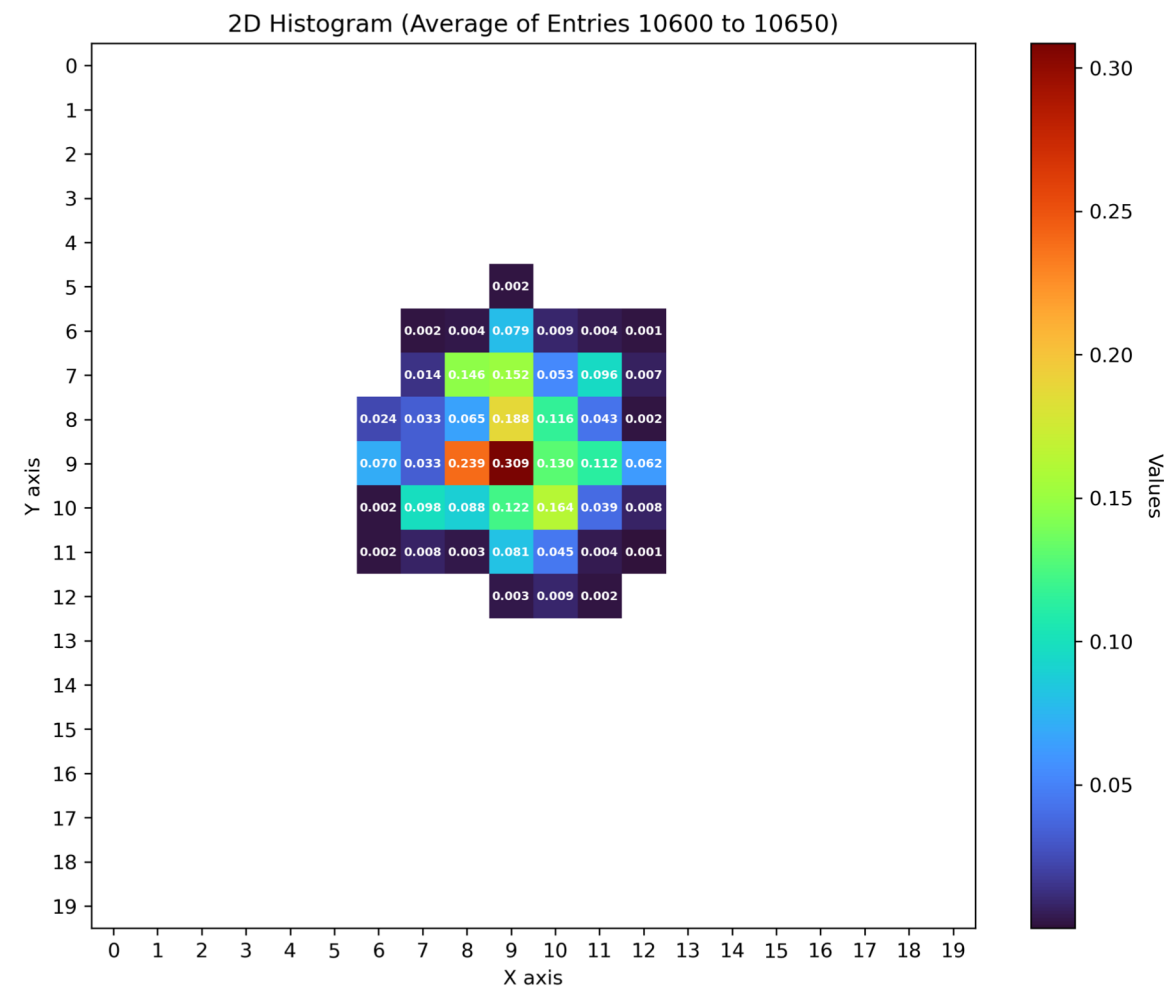
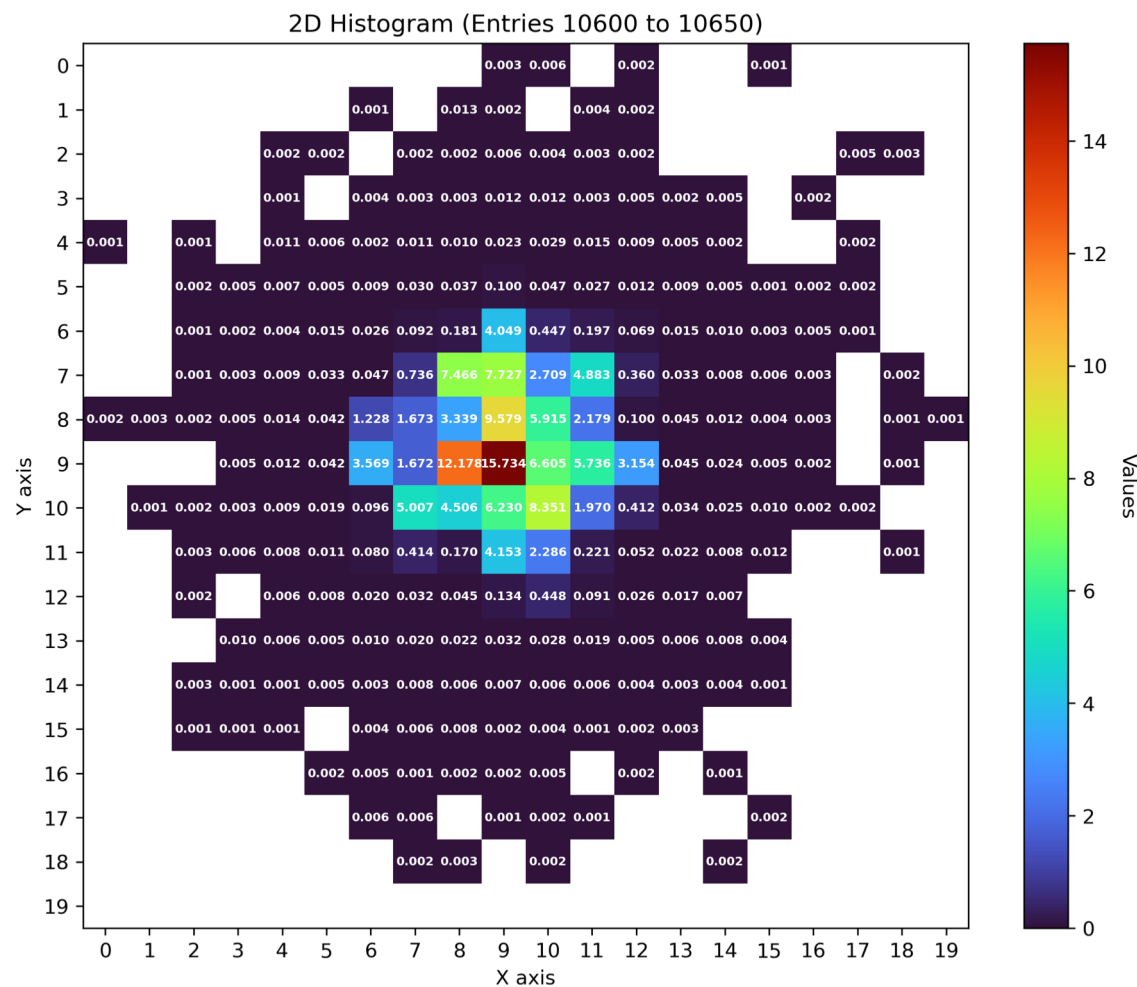
3D Histogram (Entry 10630)



- 1D and 3D histogram will help us to identify any decay product hit the ECAL



- 2D histogram for multiple events are also available.



- We made a prototype plotter which can read the array and plot 1D, 2D and 3D histograms. However, we should also plot the histogram from different energy range (e.g. 0-5 GeV, 5.1-10 GeV ...) in order to have more useful information
- Minor: change the naming in the code
- Job submission pipeline test (try 1k sample should be fine)