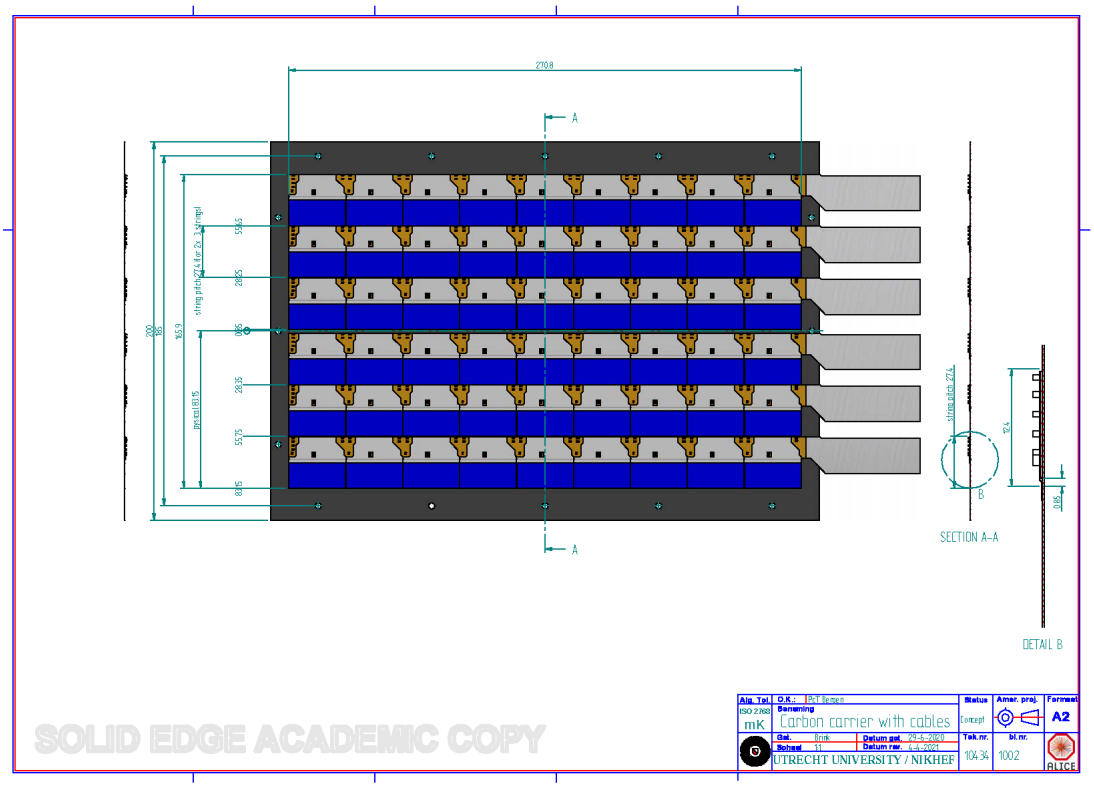
MLPCT_Pres_04122021

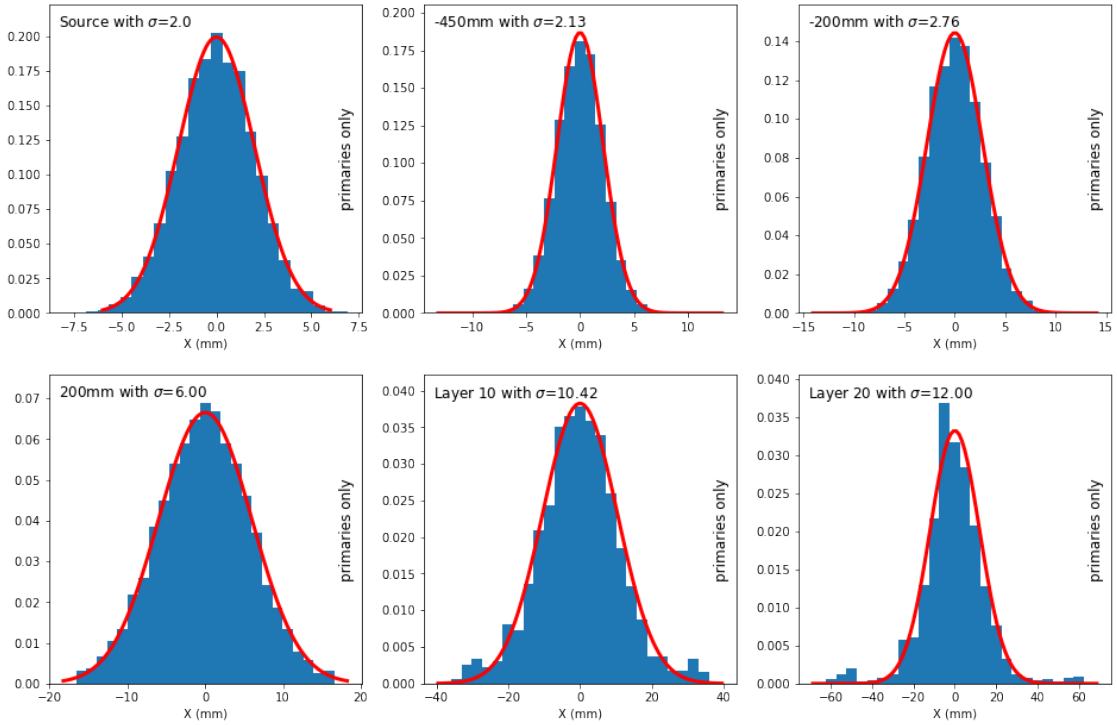
April 18, 2021

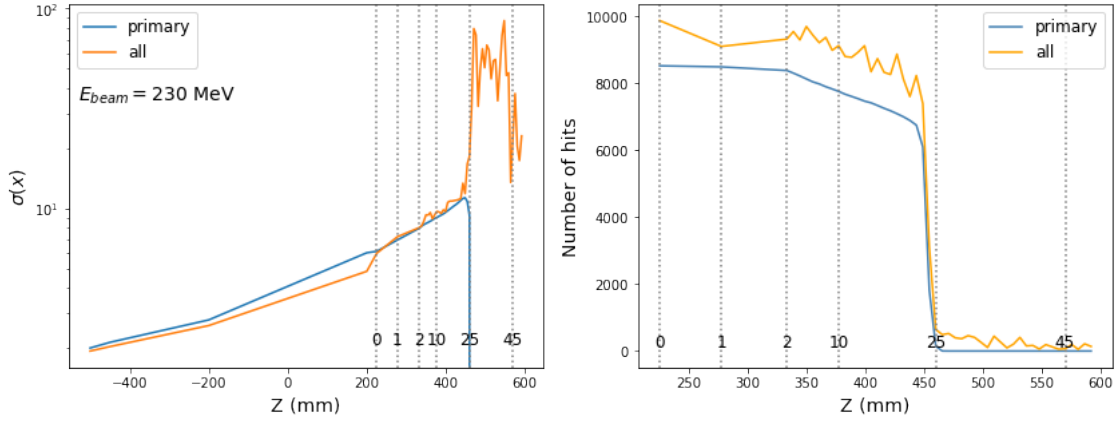
- Goal: get "realistic" detector readout for NN training
- MC just tells us, "there is a particle in the sensitive layer of the detector depositing there E_{dep} energy"
- in the detector the charge diffusion activates multiple pixels (cluster) depending on E_{dep}
- detector geometry has dead zones, overlaps, chip boundaries



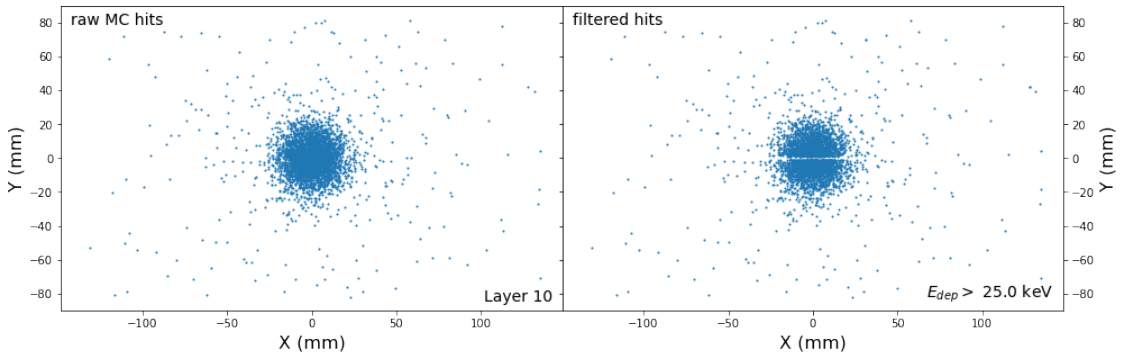

```
( 45.02,-14.60) =>  [[[5.0, 4.0, 1022.259917920657, 510.43750000000034], [5.0,
5.0, 1022.259917920657, 0.76488095238137 03]]]
(213.60, 34.70) =>  [[]]
( 37.40, 23.50) =>  [[[5.0, 7.0, 761.6580027359784, 331.8660714285721]]]
( 37.40,186.30) =>  [[]]
```

0.0.1 Pencil beam ?

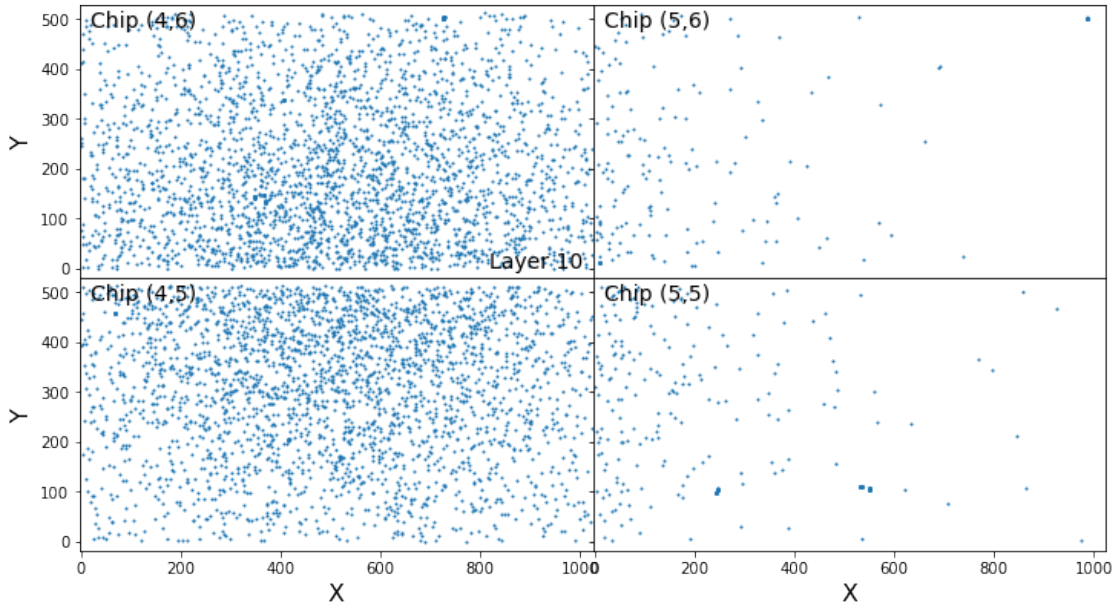


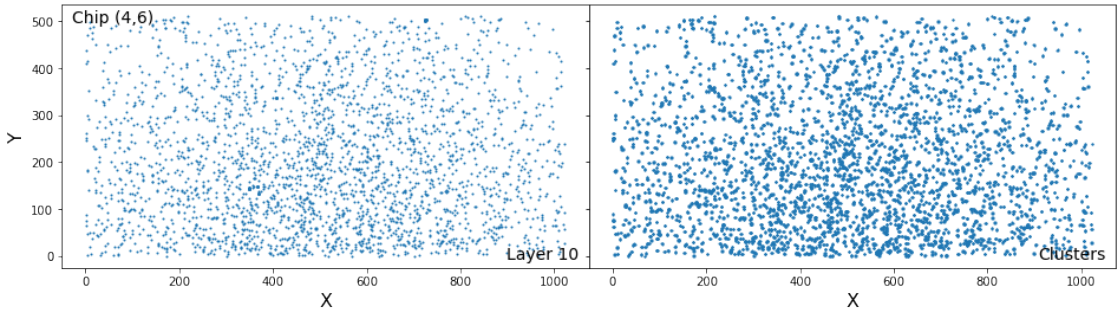


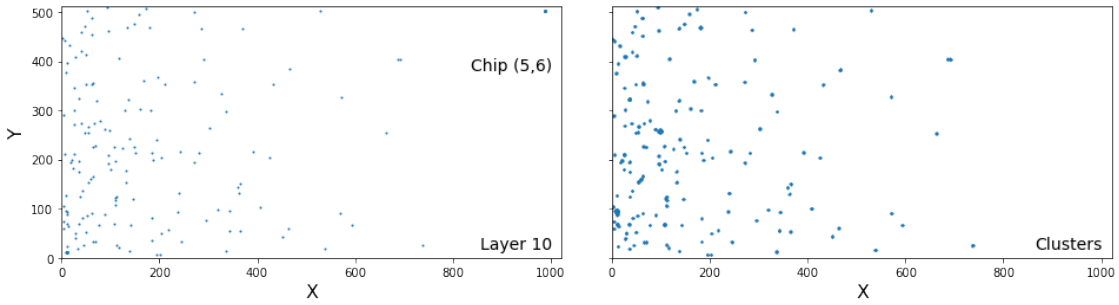
So in calorimetric layers the spread is already considerable ($\sigma \approx 10$ mm means that we are covering already $\approx$ two chips in y extension and one chip in x extension), and in the "secondaries" region the spread is quite high ($\approx$ 60mm), covering 6x12 chips (however, usually do not survive the clusterization)!



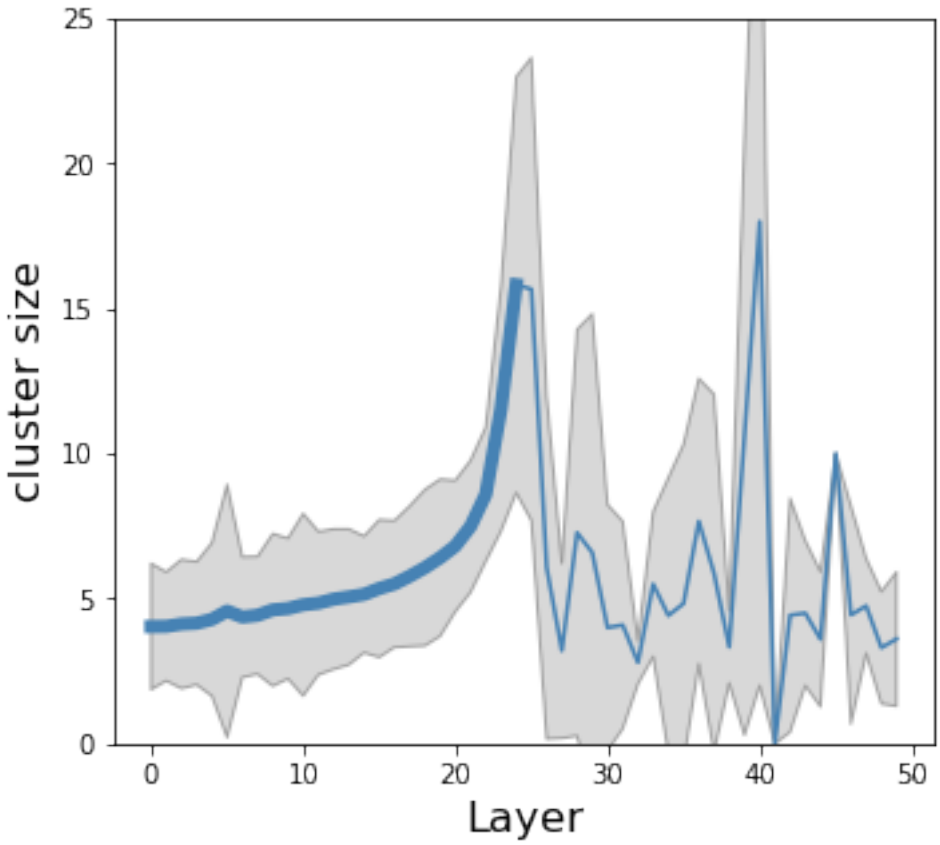
"Visual widht" is +- 30 mm, covering 4 chips in y and 2 (3) chips in x direction in Layer 10 Single hit: 99.06% (8461), No hit: 7.66% (654), Double hit: 0.16% (14)








```
Cluster loss in chip (4,6): 0.46%, in chip (5,6): 0.73%
```




```
Average number of cluster pixels to MC Hits: 4.71 (all Layers), 4.85 (first 25
Layers)
Average cluster size (first 25 Layers): 5.90
```

So using cluster reduces the data by a factor of ≈ 5 (6-clustersize_information). There is some discrepancy between the numbers I heard - uses 50-100 k primaries for one "screenshot" - There

are on average 200 track for one "screenshot"

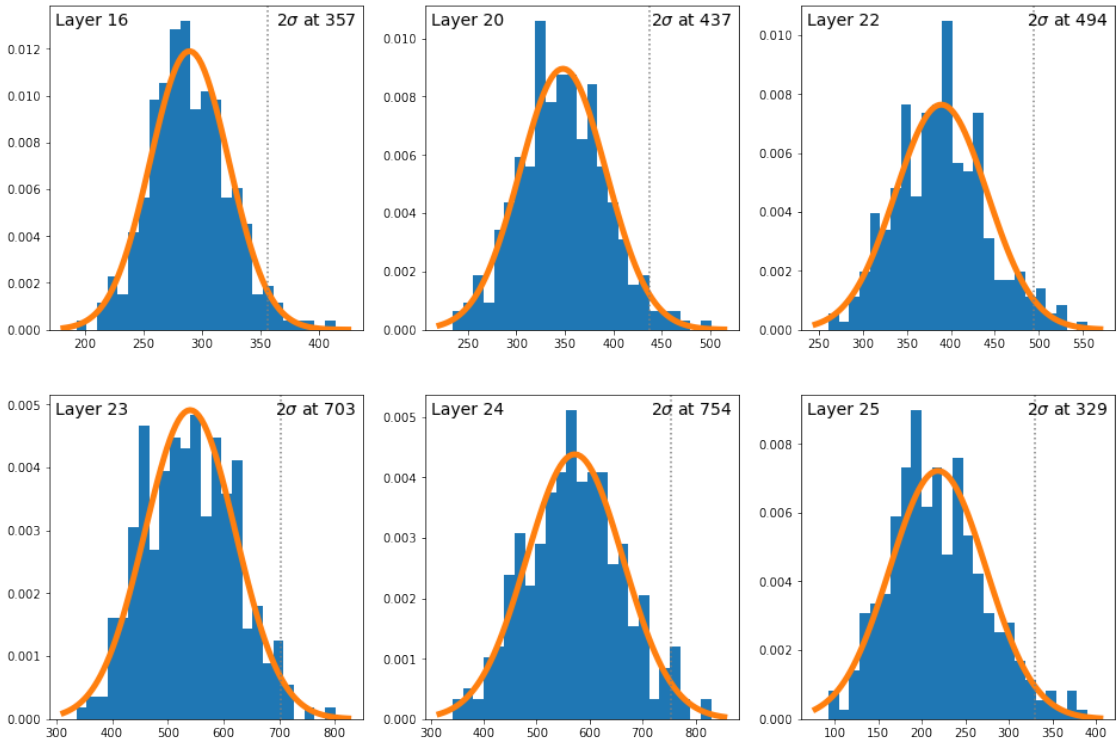
There are $10^4 - 10^5$ primaries per beamspot (duration 10 ms) and we may have 1000 frames of duration 10μs, providing 10-100 primaries per frame.

```
   col  row            X           Y  edep
0  5.0  4.0  1022.259918  510.437500  0.03
1  5.0  5.0  1022.259918    0.764881  0.03
[45.02, -14.600000000000001]
[45.02, -14.600000000000001]
```

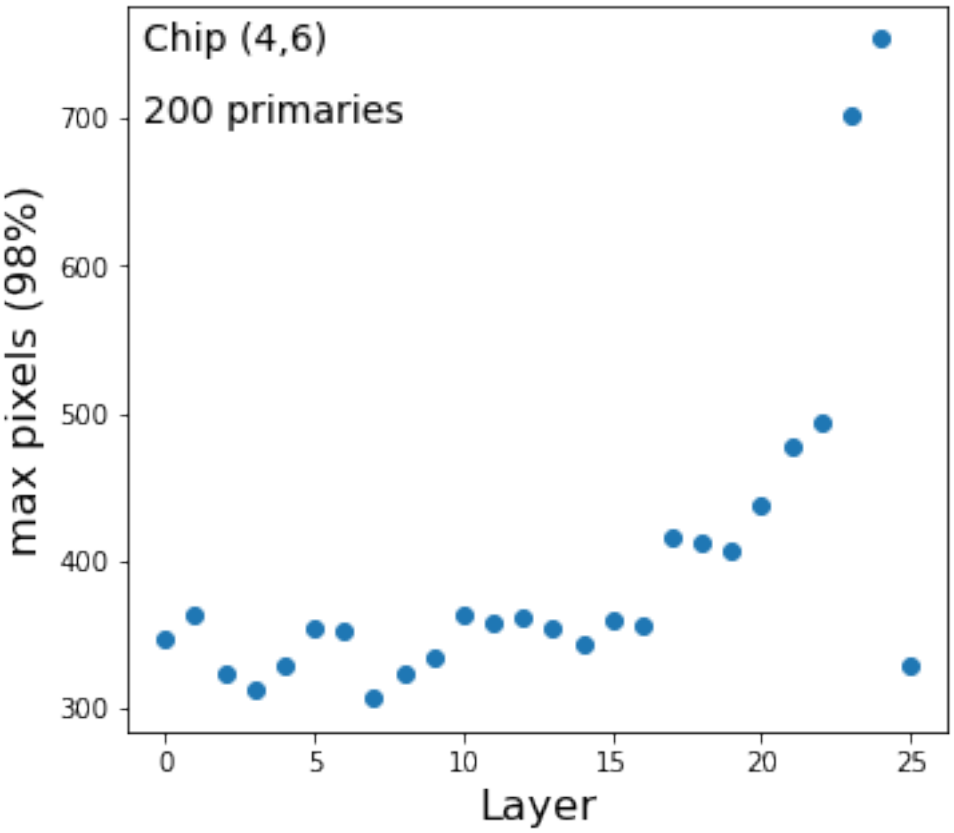
0.1 End of the 04/12, 2021 presentation, new part comes

lets have a statistics of how many readouts do we have for randomly choosen 200 tracks

[26]: `[414.0, 501.0, 555.0, 801.0, 830.0, 390.0]`



Number of activated pixels in one chip at different layers. The 2 σ line corresponds to include $\approx$ 98% of the events and gives the maximum number of pixels to be considered for reconstruction.



Maximum number of activated pixels on **one** chip vs layer, for which $\approx 98\%$ of events fits. With 800 activated pixels we are safe to work with, for most of the layers and input size of 400 (both for X and Y) is enough.