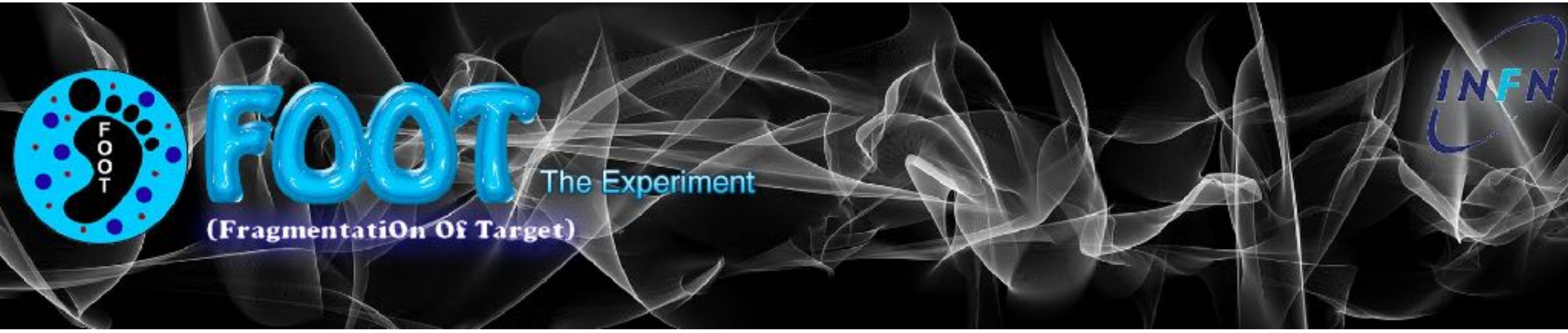


Specificare run che stiamo analizzando

Peverini Francesca, Gianluigi Silvestre

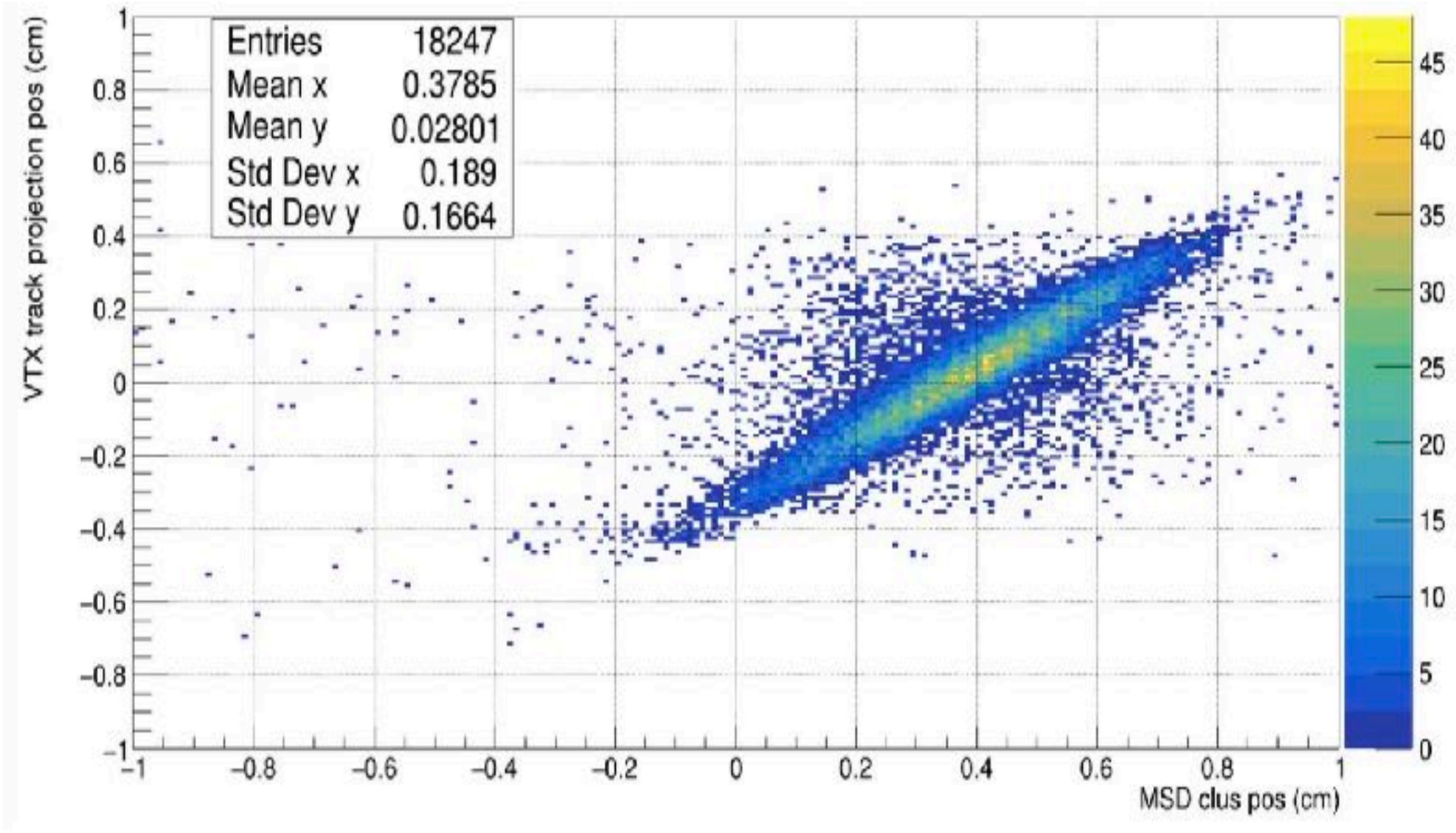
06/10/2021

UPDATE MSD GSI ANALYSIS

CHARGE LOSS CORRECTION

Data from GSI 2021 → Beam energy = 400 MeV with minimum bias trigger

We are measuring mostly particles (oxygen) that did not interact.

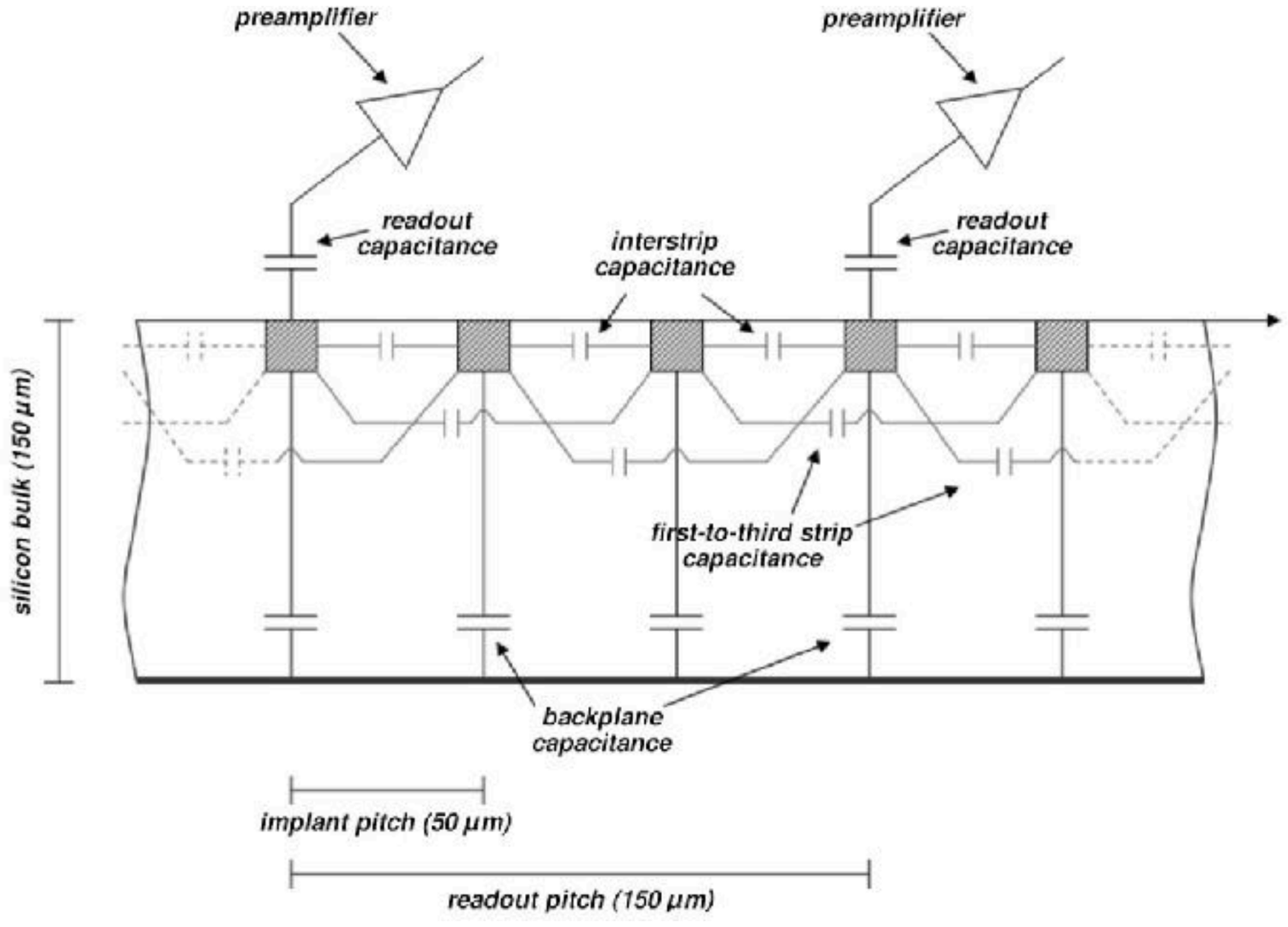


cluster center of gravity

CHARGE LOSS CORRECTION

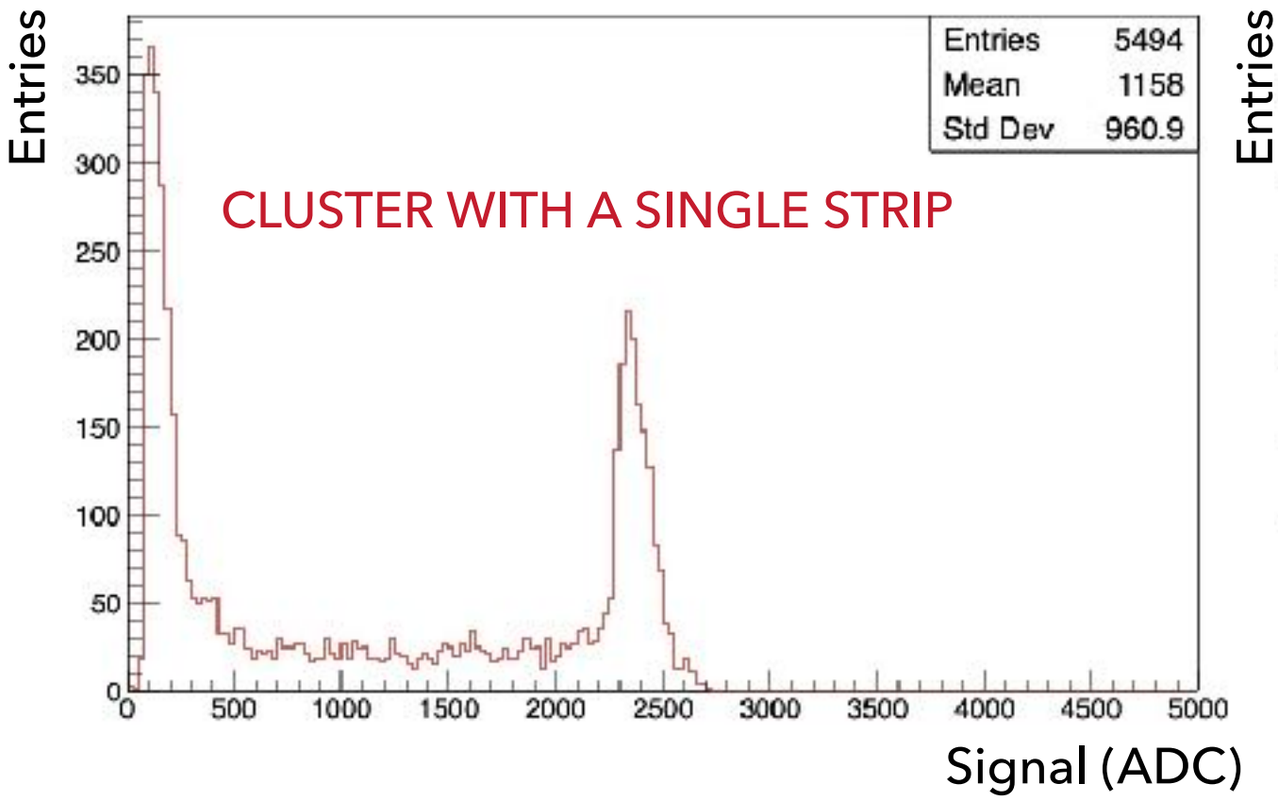
GSI 2021 MSD Readout strategy → Readout pitch: 150μm, with 2 floating strips

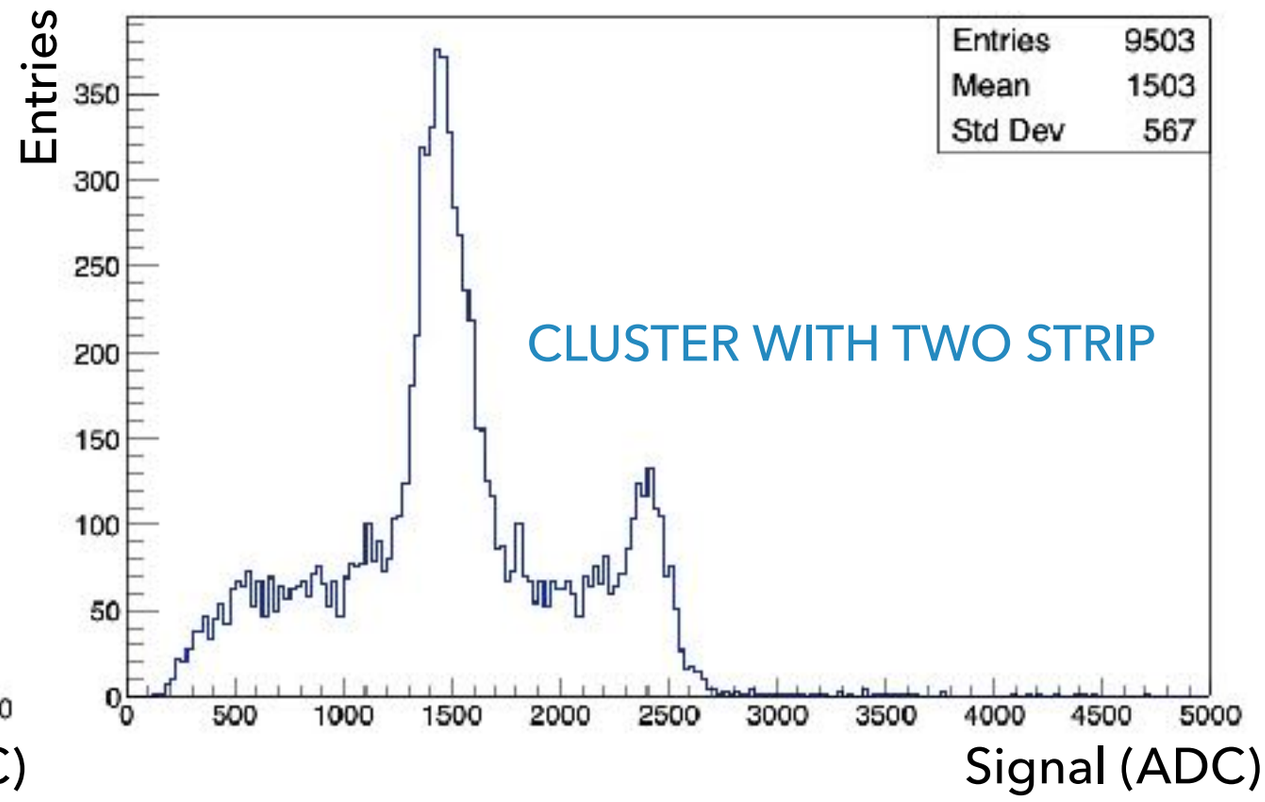
Floating strips help with charge collection between readout strips, charge collection efficiency expected to be non linear between two readout strips.



CHARGE LOSS CORRECTION

The collected charge can spread between the strips which results in some fractional signal loss.





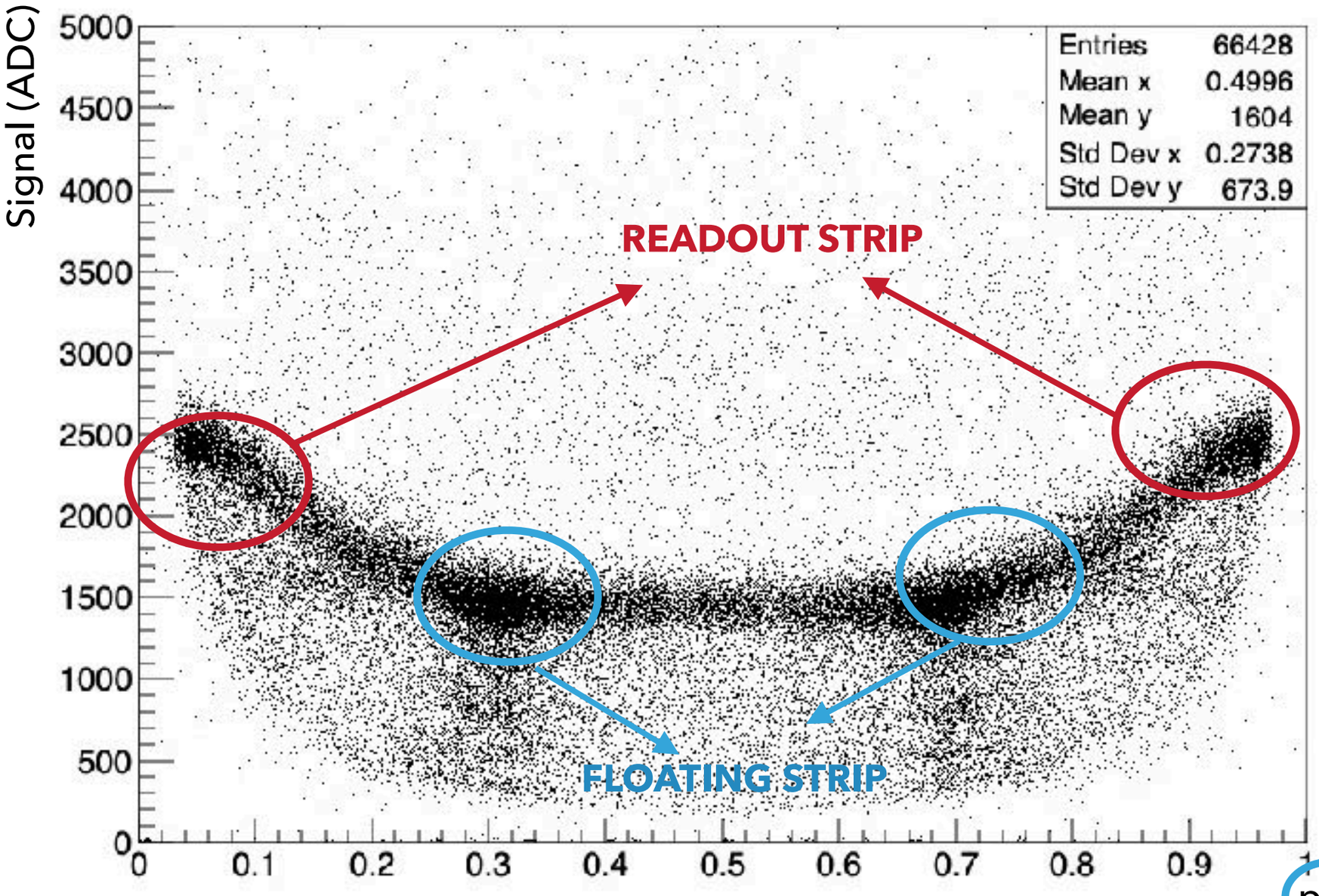
Higher signal peak mostly from single strip cluster

Lower peak mostly from larger clusters

We need a variable to identify this spread of charge across the strips and correct for the associated charge loss.

CHARGE LOSS CORRECTION

Charge collection efficiency depends on the impact position with respect to the readout strip.



In order to distinguish between signals generated by particles impinging on the read-out and floating strips, a variable is introduced and defined as:

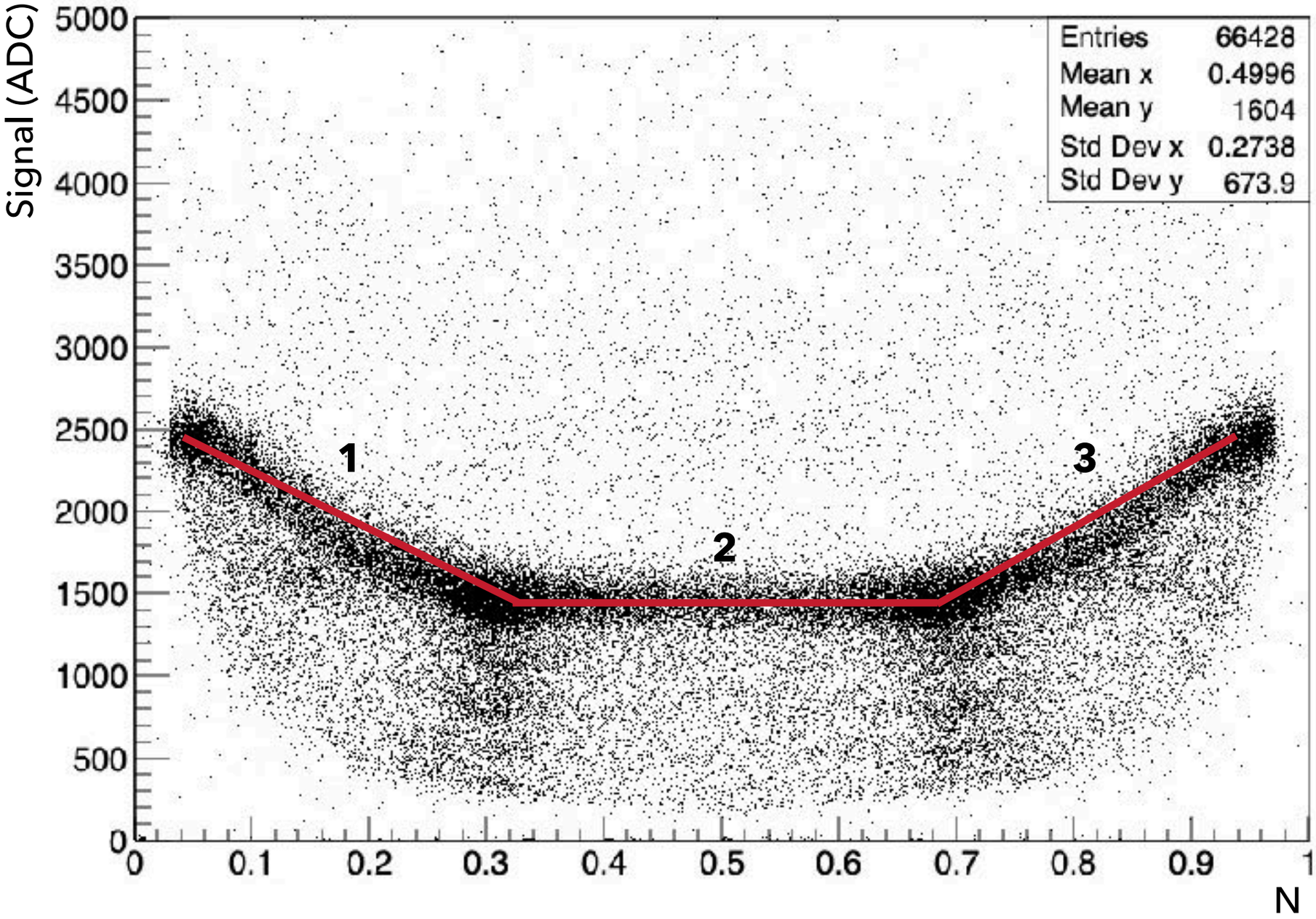
$$pos = \frac{ADC_1 * Strip_1 + ADC_2 * Strip_2}{ADC_1 + ADC_2}$$

Fractional part of the cluster center of gravity as an indicator of impact position

The loss of charge is evident as the impact position varies

CHARGE LOSS CORRECTION

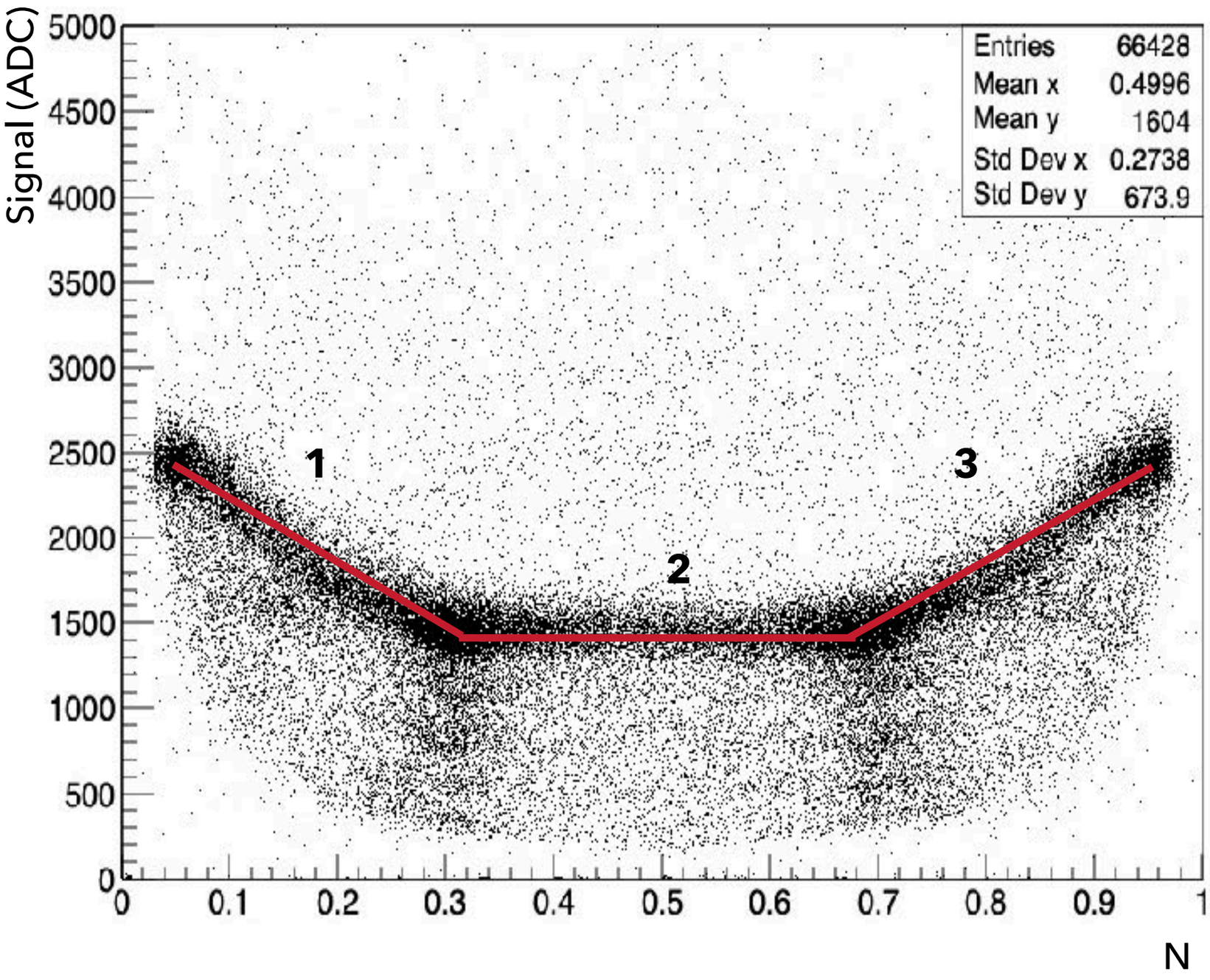
To improve charge measurement we applying different correction factors to varying impact positions. To do this we have identified three different areas, in each of which a linear fit has been implemented.



Sensore	p0
0	1360±8.6
1	1329±8.2
2	1335±77
3	1344±8.3
4	1354±8.0
5	1356±8.0
TOT	**1346.3±19.7**

2

CHARGE LOSS CORRECTION



Sensore	p0	p1
0	-2001±77.9	4577±89.8
1	-1895±76.8	4421±89.1
2	-1928±77.2	4458±91.3
3	-2103±81.1	4680±93.0
4	-1848±76.1	4423±86.6
5	-1743±71.1	4271±82.1
TOT	**-1919.7±76**	**4471.7±88.7**

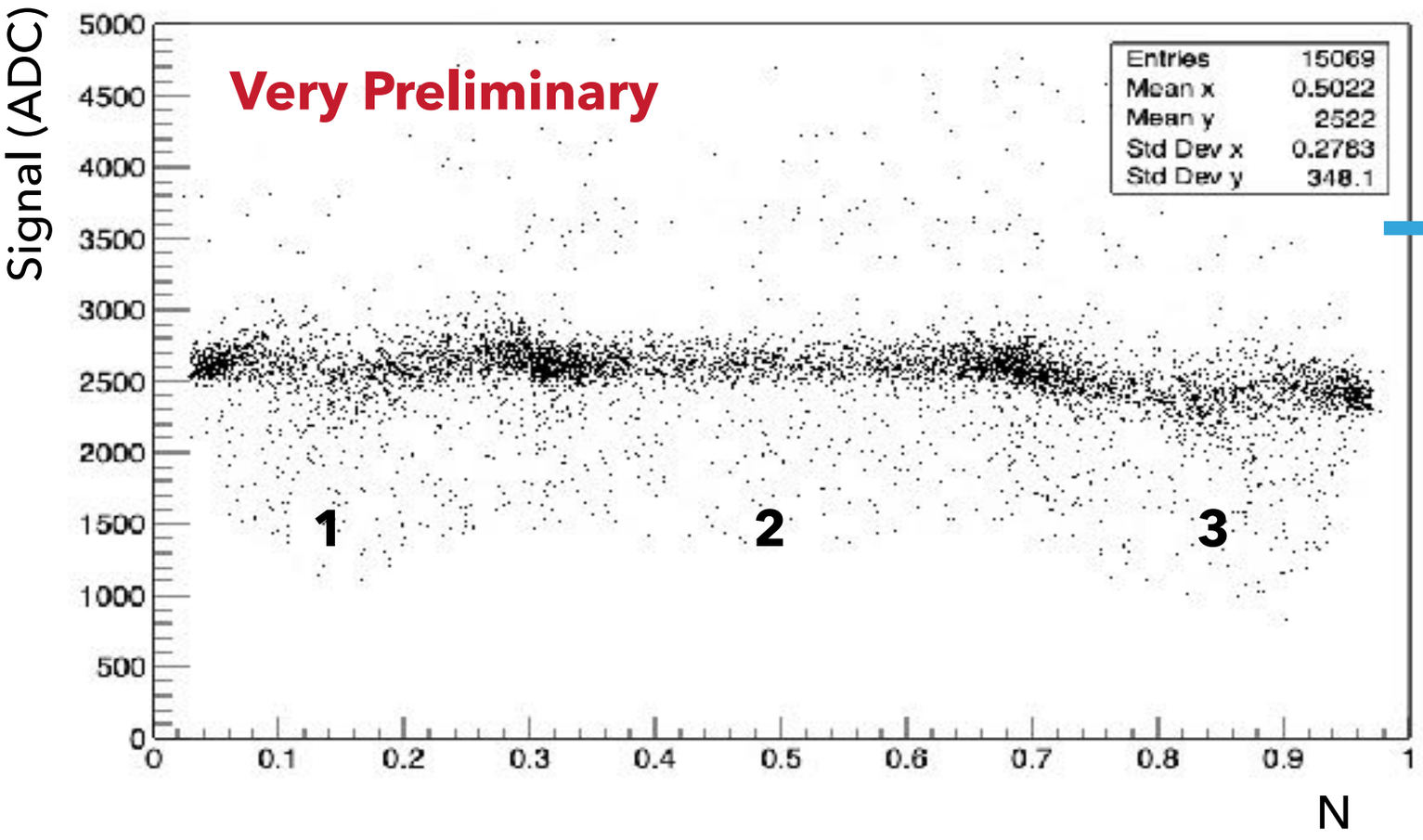
3

Sensore	p0	p1
0	2525±17.9	-4311±90.7
1	2527±15.2	-4361±81.8
2	2533±14.6	-4189±78.3
3	2486±21.3	-4056±101.1
4	2565±13.5	-4367±75.9
5	2547±13.3	-4356±76.5
TOT	**2530.5±16**	**-4273.5±84**

1

CHARGE LOSS CORRECTION

After defining the fit parameters, we can try to implement a first charge loss correction even if we don't have eta function yet.



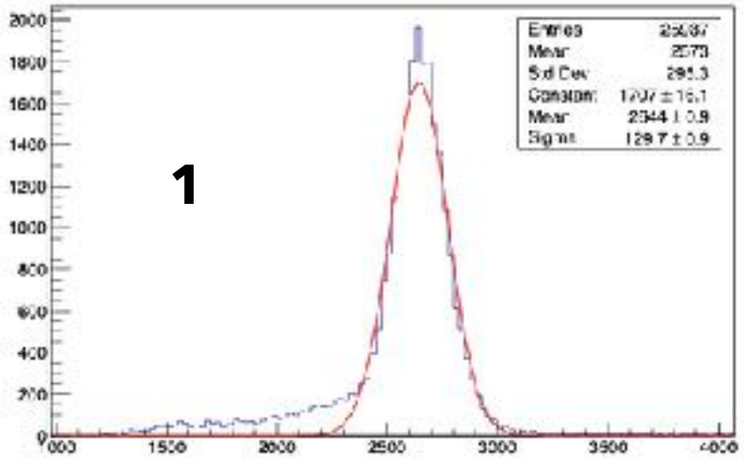
Distributions of the cluster charge after correction.

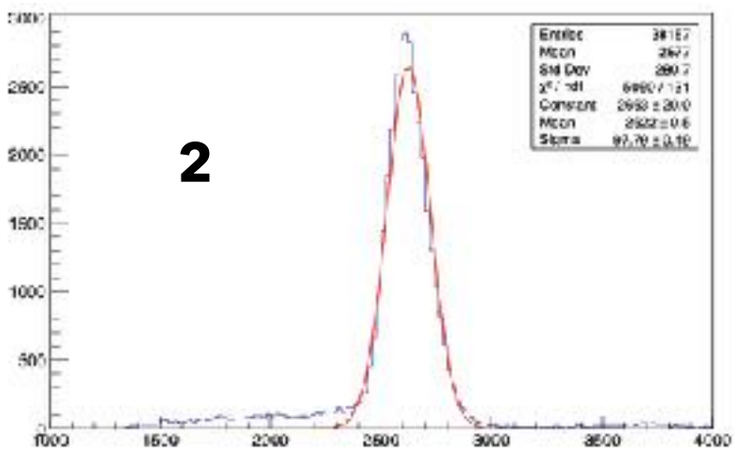
The reduction in charge loss is evident when compared with previous figure.

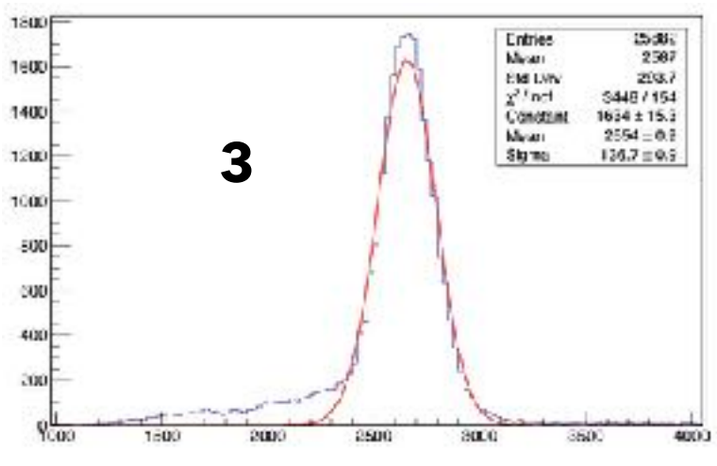
1 $\mu = 2644 \pm 130$ ADC

2 $\mu = 2622 \pm 98$ ADC

3 $\mu = 2654 \pm 137$ ADC

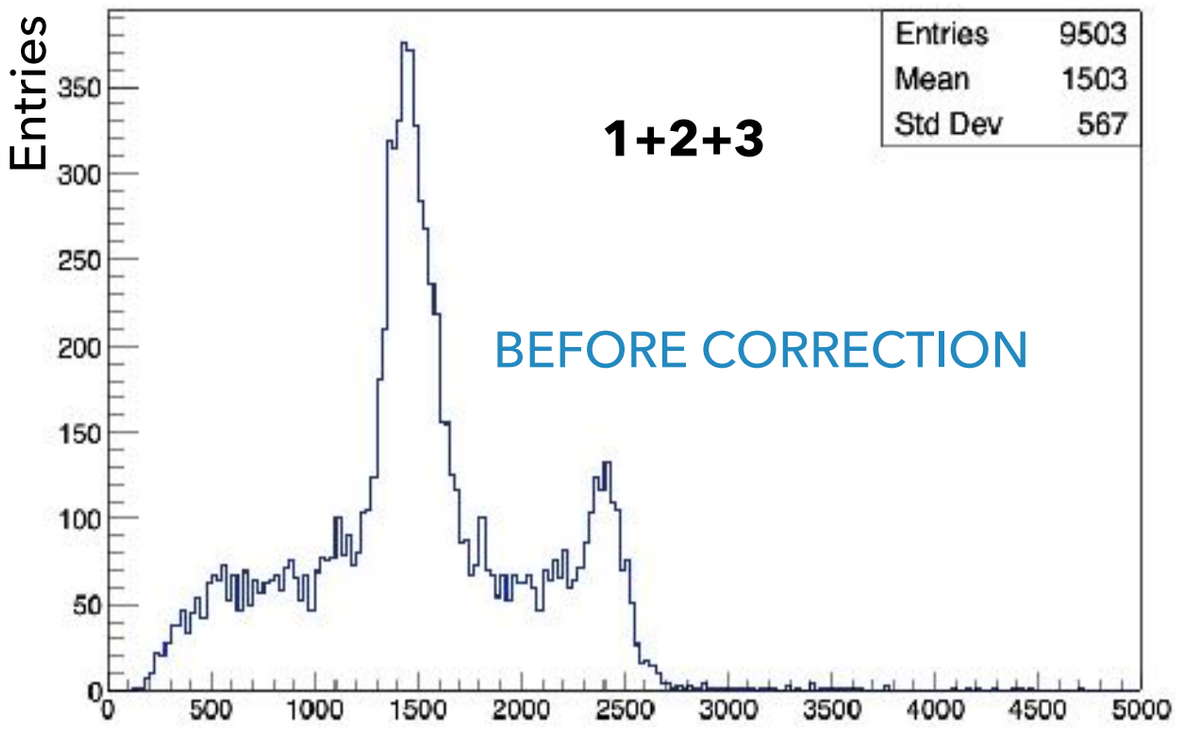


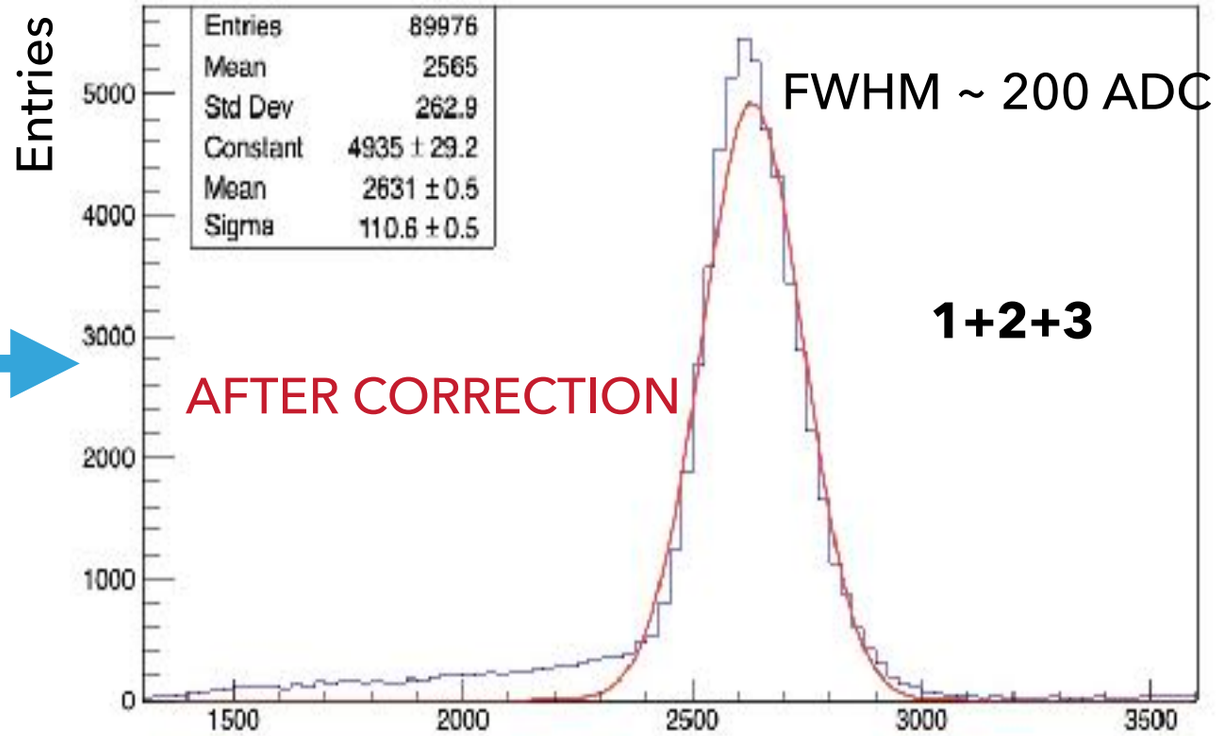




CHARGE LOSS CORRECTION

Very Preliminary





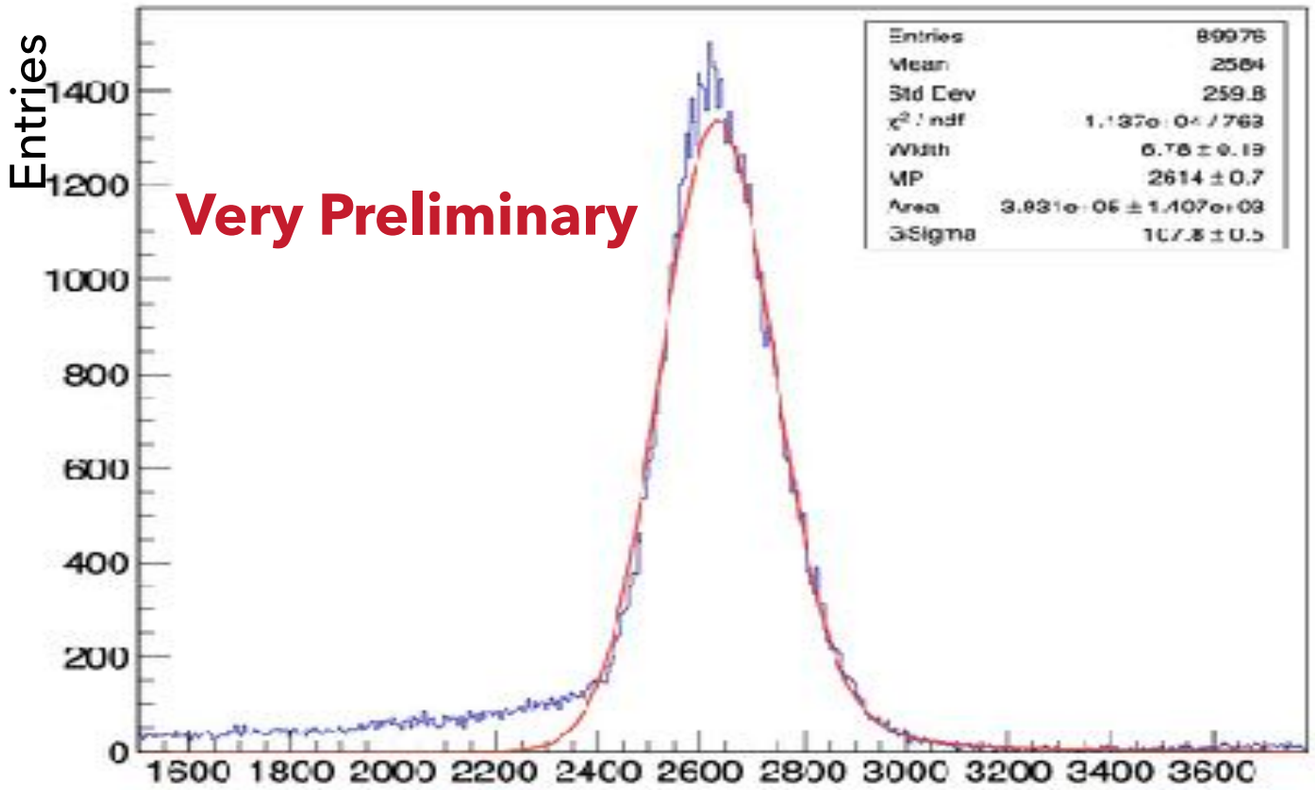
There is no longer a double peak structure for cluster ADC distribution, so now charge collection efficiency do not depends on the impact position with respect to readout strips.

The new peak matches (with 10% difference) the one found in the case of single strip cluster signal.

$\mu = 2365 \pm 73$ ADC SIGNAL FROM SINGLE STRIP CLUSTER

$\mu = 2631 \pm 111$ ADC SIGNAL BEFORE CORRECTION 4.2 % Resolution

CHARGE LOSS CORRECTION



We also implemented a fit with Langaus function and we have achieved very similar results.

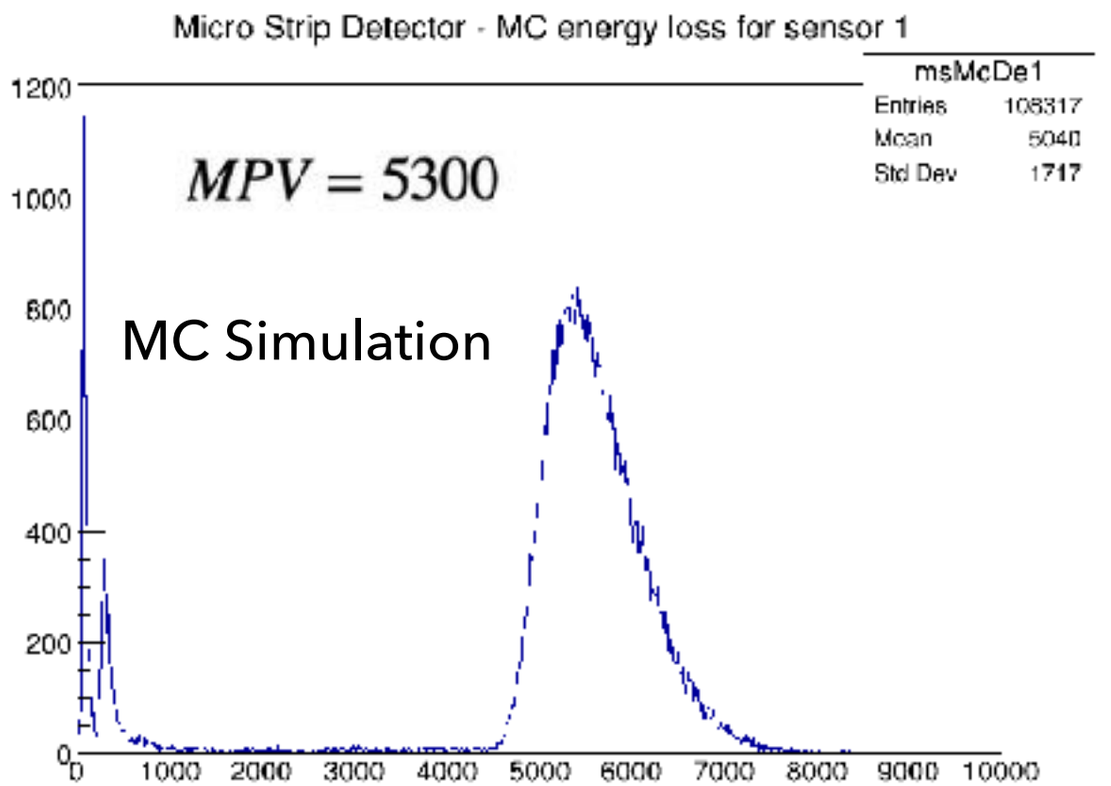
$$MPV = 2614 \pm 108 \text{ ADC}$$

→ Gaussian Sigma

If we use the calibration coefficient obtained from the photon analysis:

$$K_\gamma = 2.1 \pm 0.1 \frac{keV}{ADC}$$

$$\mu = 5525 \pm 233 \text{ keV}$$



CONCLUSION

- We found a first charge loss correction even if we don't have eta function yet, for the run with 400 MeV beam energy.

- The signal peak after correction matches (with 10% difference) the one found in the case of single strip cluster signal.

- We obtain 4.2% resolution.

- We use the calibration coefficient from the photon analysis to obtained the energy released in keV, so we were able to compare the result with MC simulation.

TO DO LIST

- Verify that the found method also works for all the different configs at GSI 2021 (beam energy 200 MeV).

- Verify that the found method also works for the data taking at Trento.

- Eta function measurement at CERN.