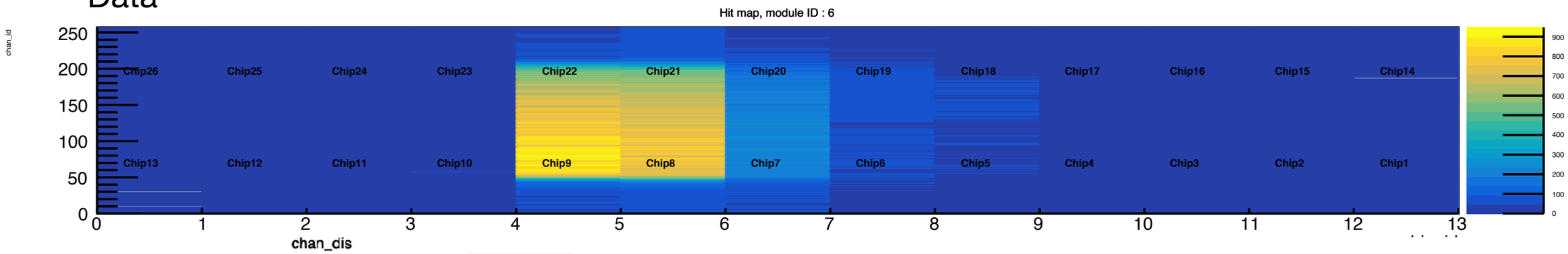
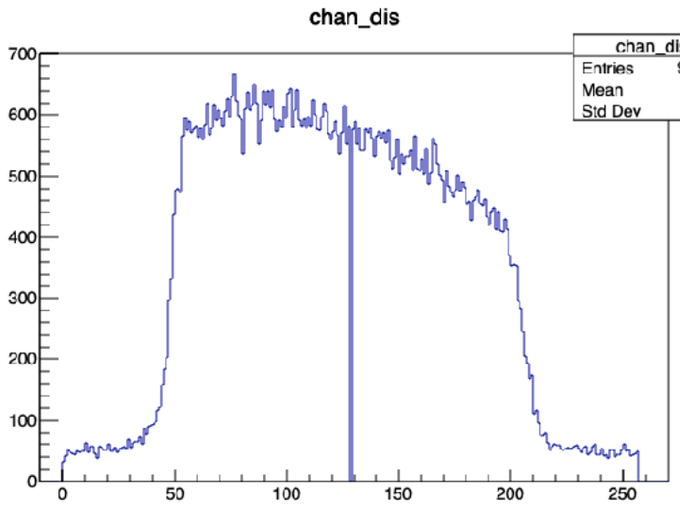
# INTT Beam Test Results and other topics

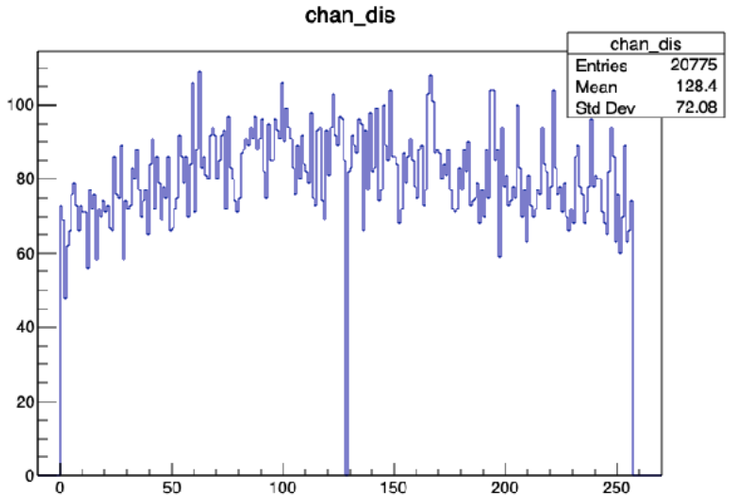
C. W. Shih (NCU) & G. Nukazuka (RBRC)

# Hit map comparison

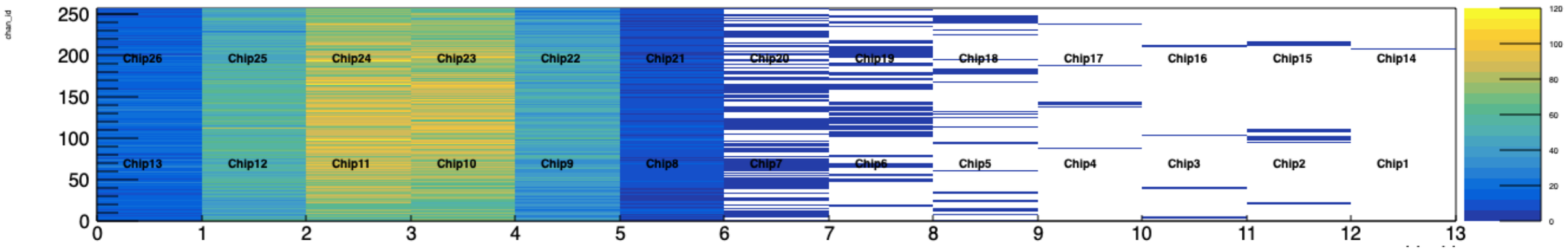
## Data



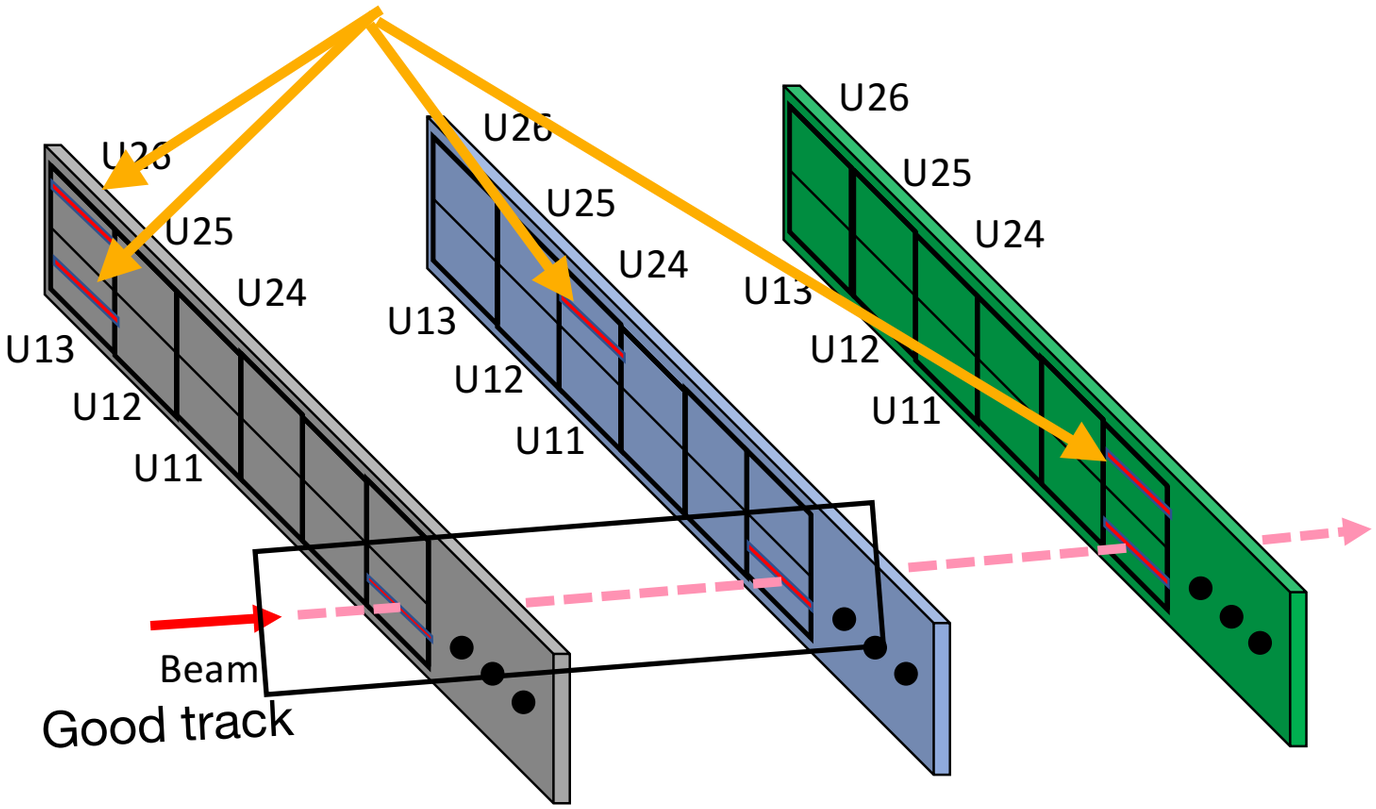

## MC



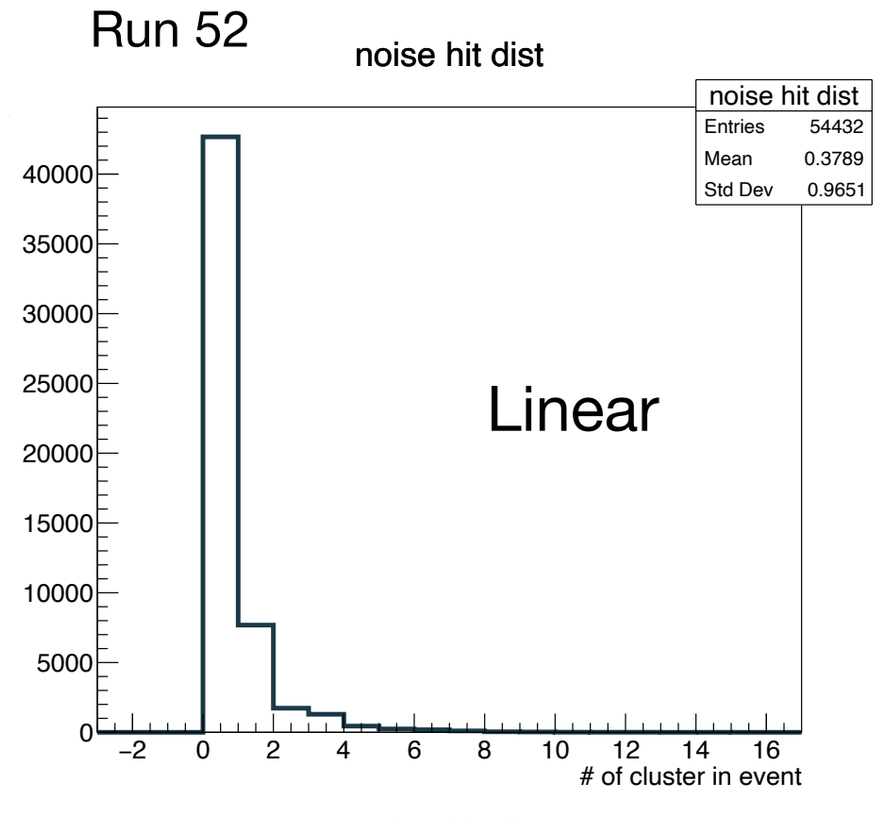

The Beam spot of MC is wider, hard to tune. (Beam information is from ELPH directly)

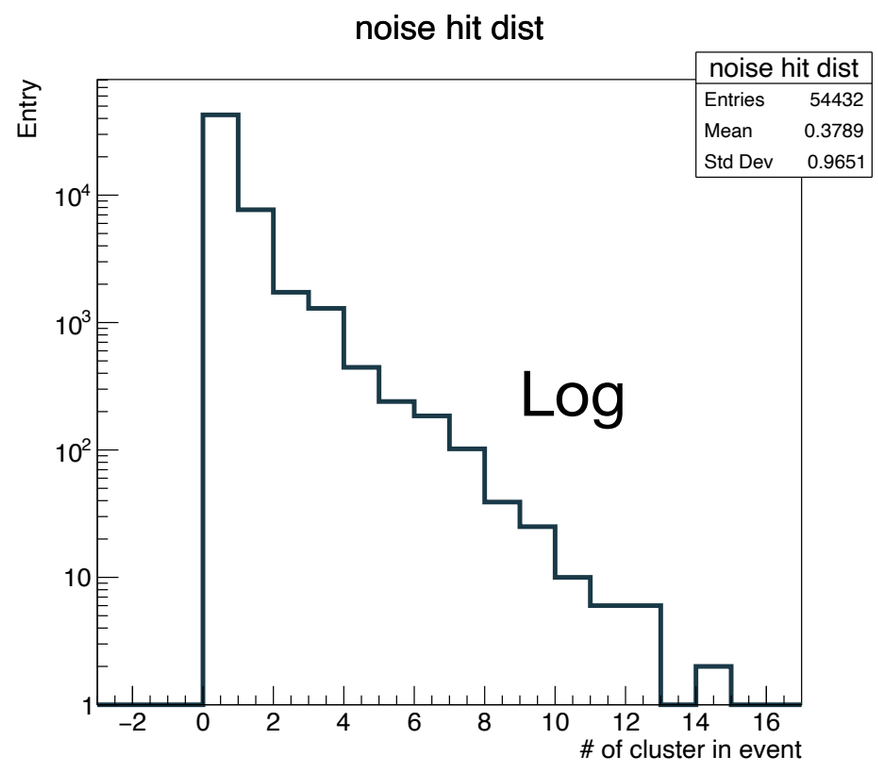
# Noise distribution estimation

Try estimate the noise dist. by data



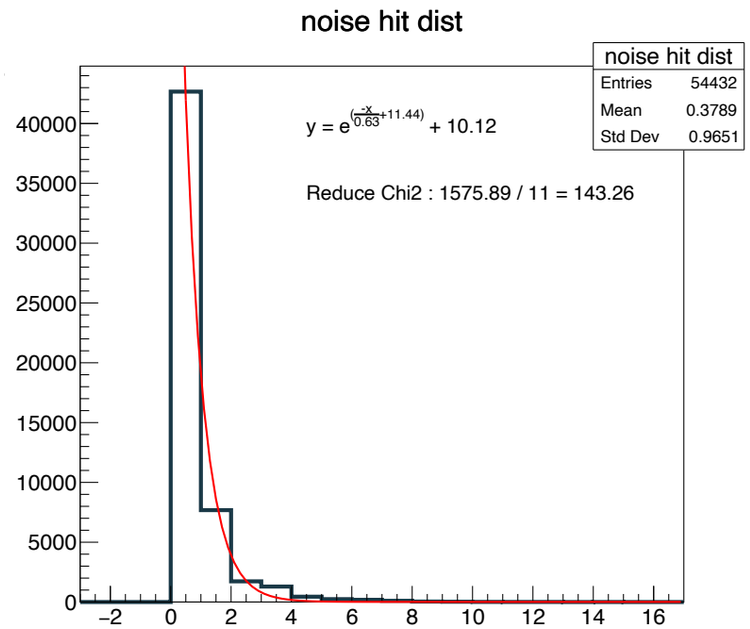

Only check the good track events
In the example, total cluster : 7

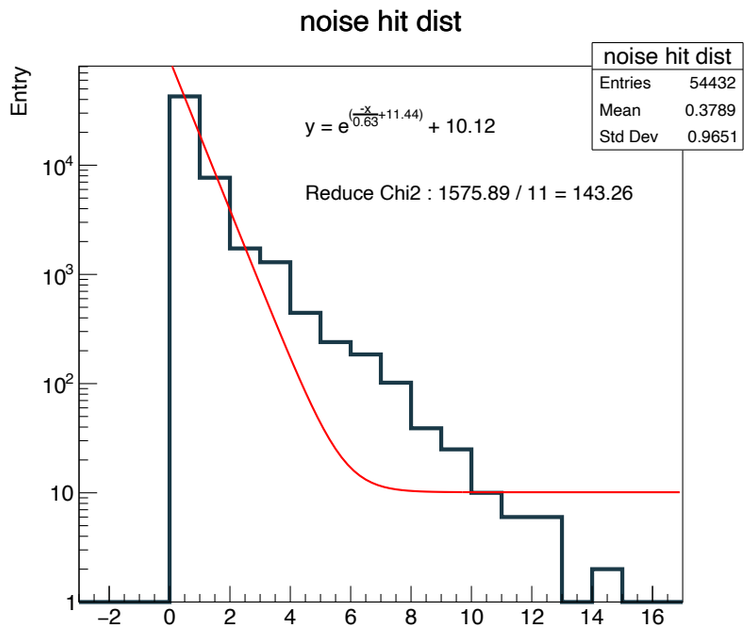


# Noise distribution fitting

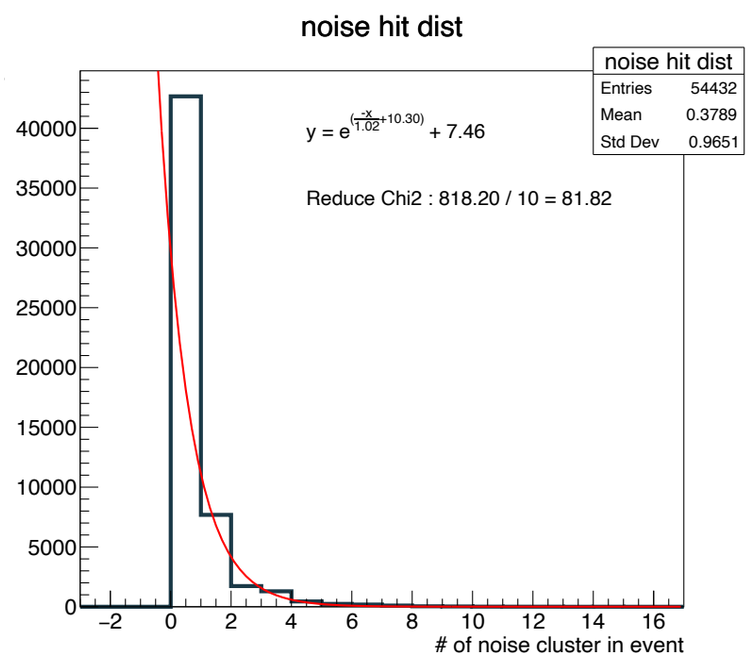
## Full range

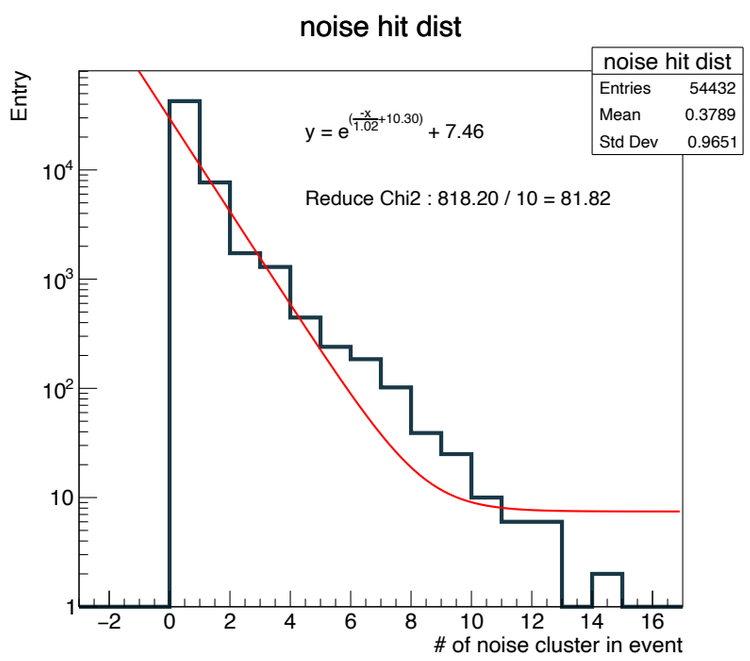



Entry of the “0 bin” : 42668 -> 78.3%

## Without “0 bin” (being used)

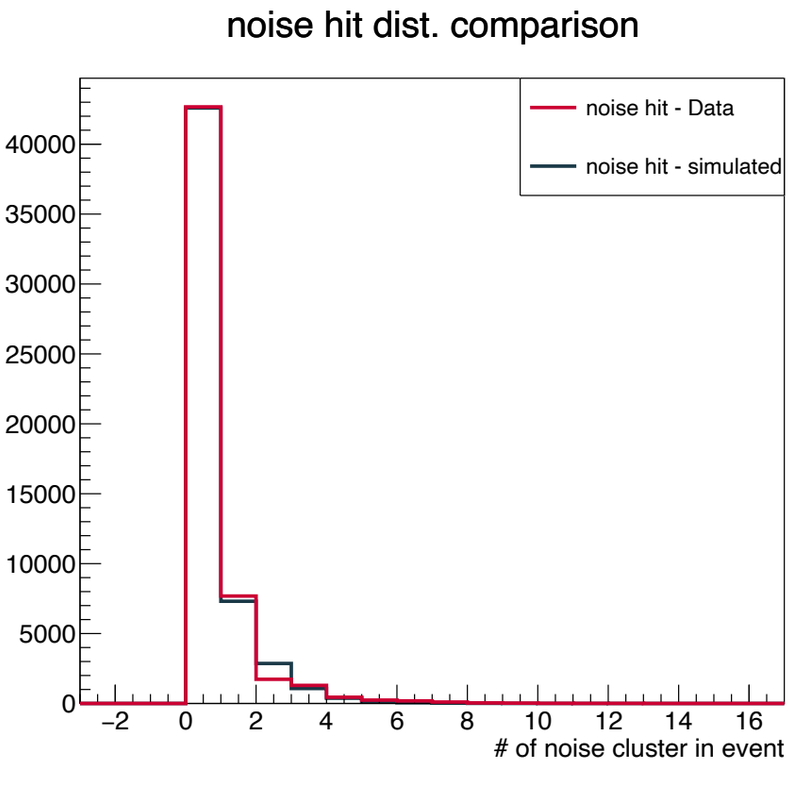


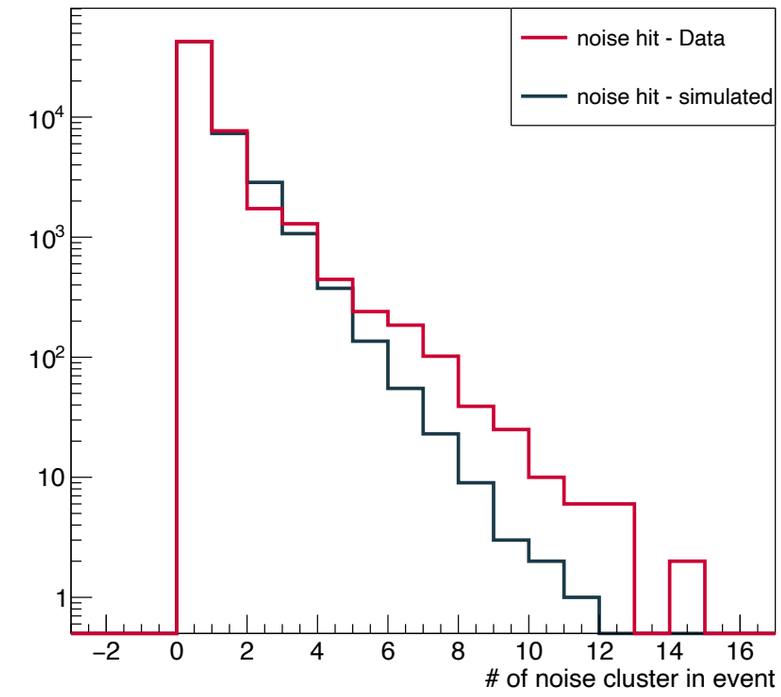




Current method :

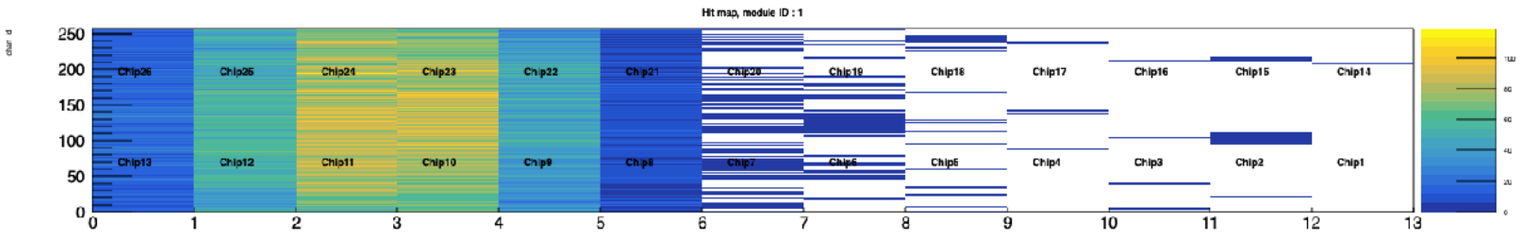
1. 78.5% of event → no noise hit added
2. Rest →
   follows the “Without 0 bin” dist..

# Distribution comparison (noise only)

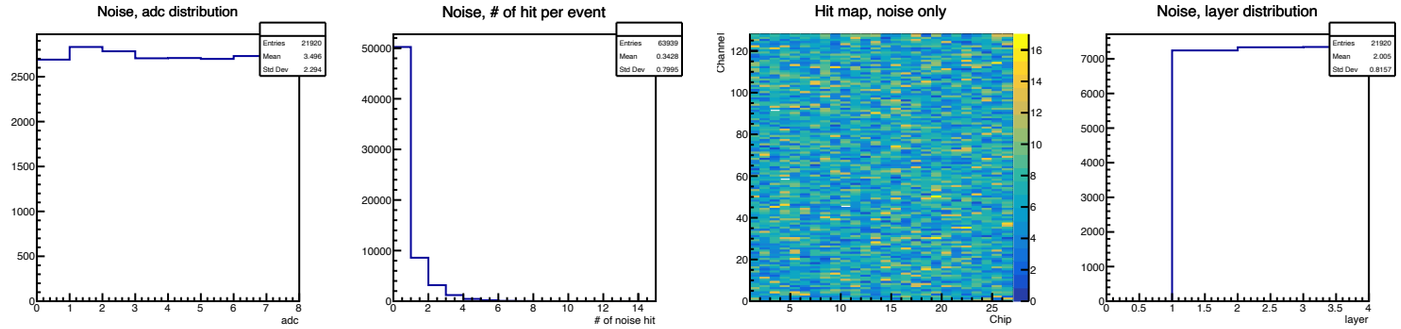


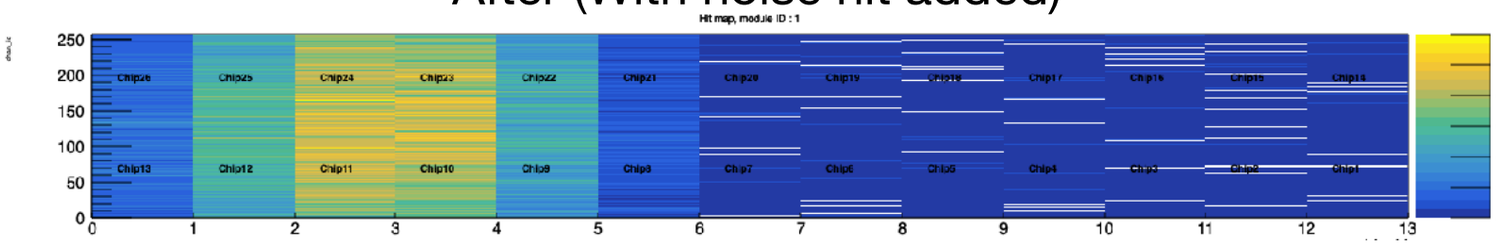

Before (no noise hit added)




Noise hit distributions.




After (With noise hit added)

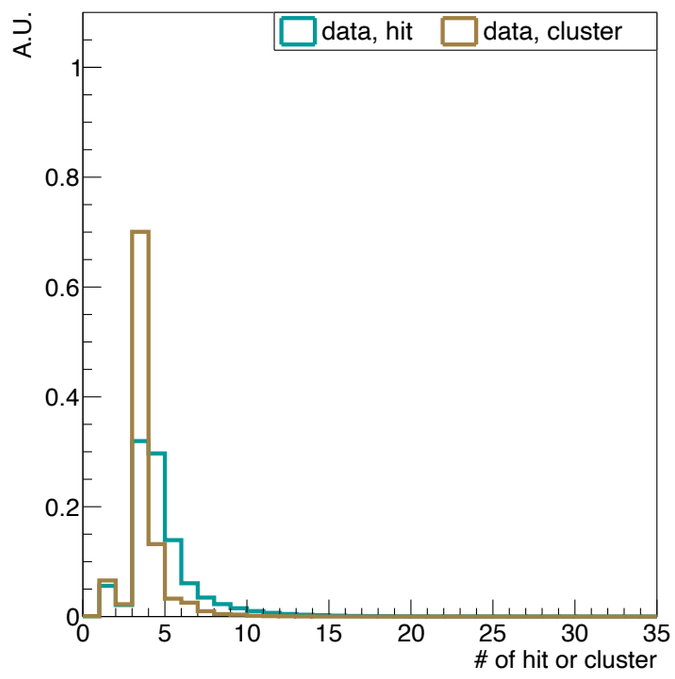


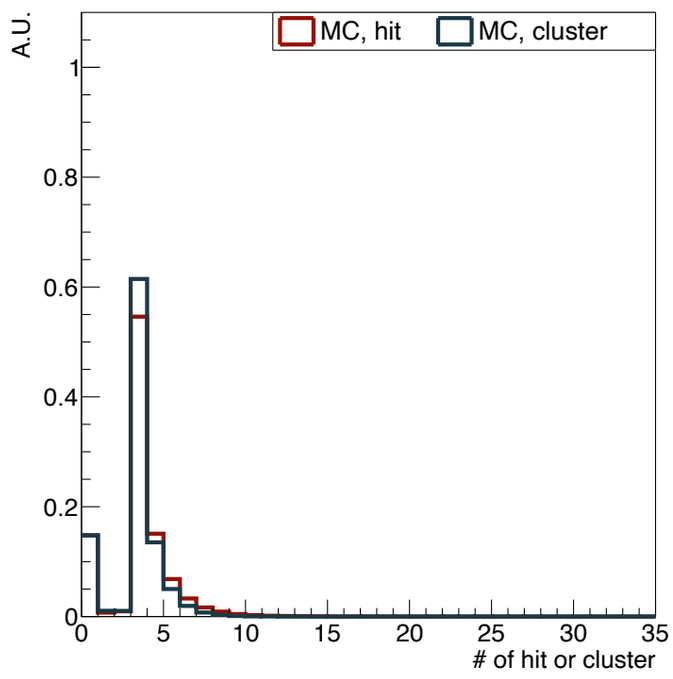
# Distribution comparison (combine)

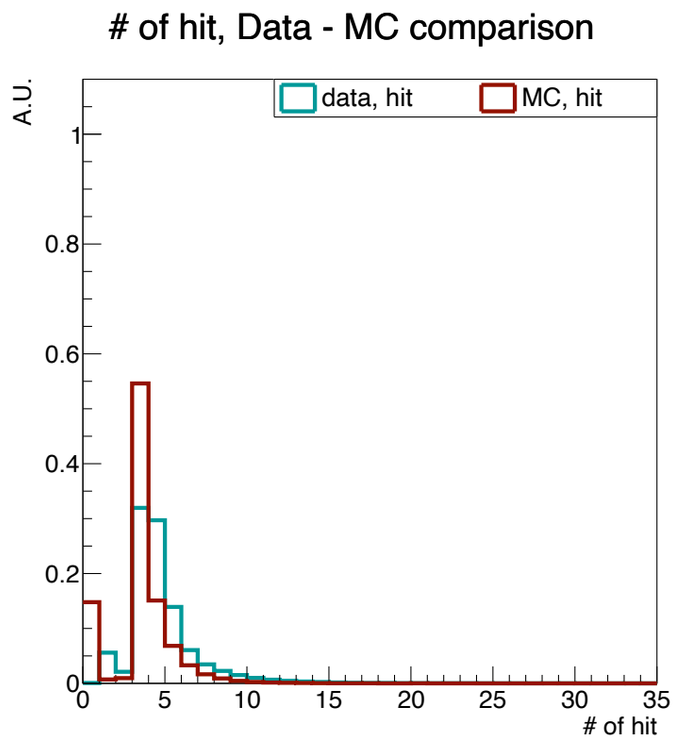
Comparison :

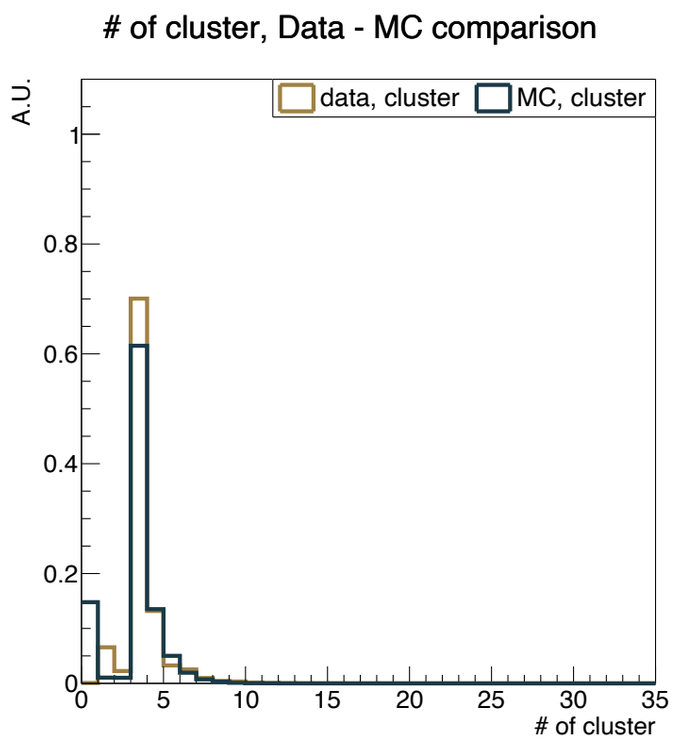
Run52 vs MC no noise hit

Linear



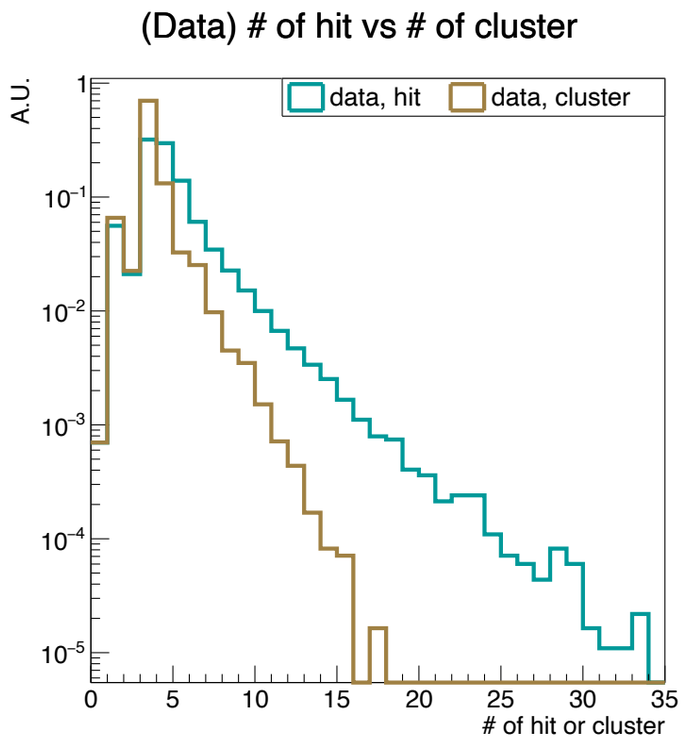



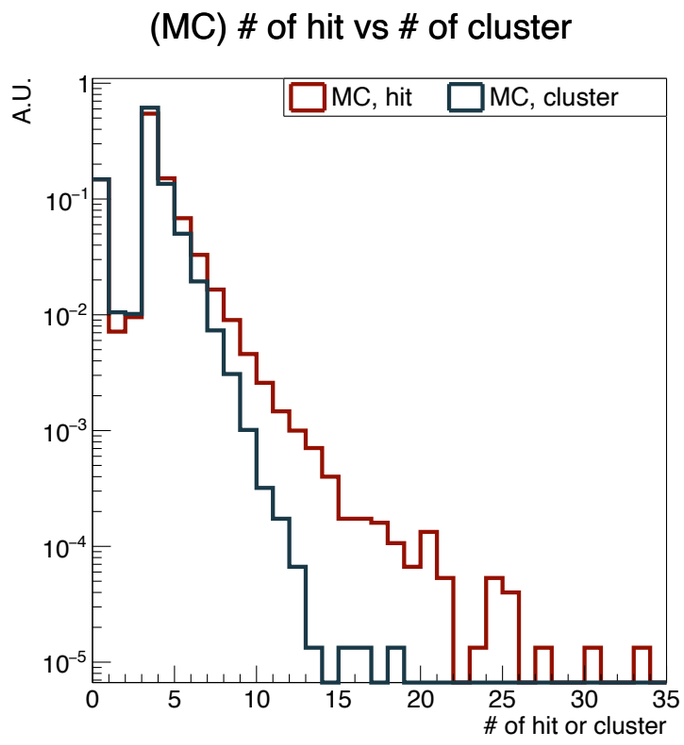
# Distribution comparison (combine)

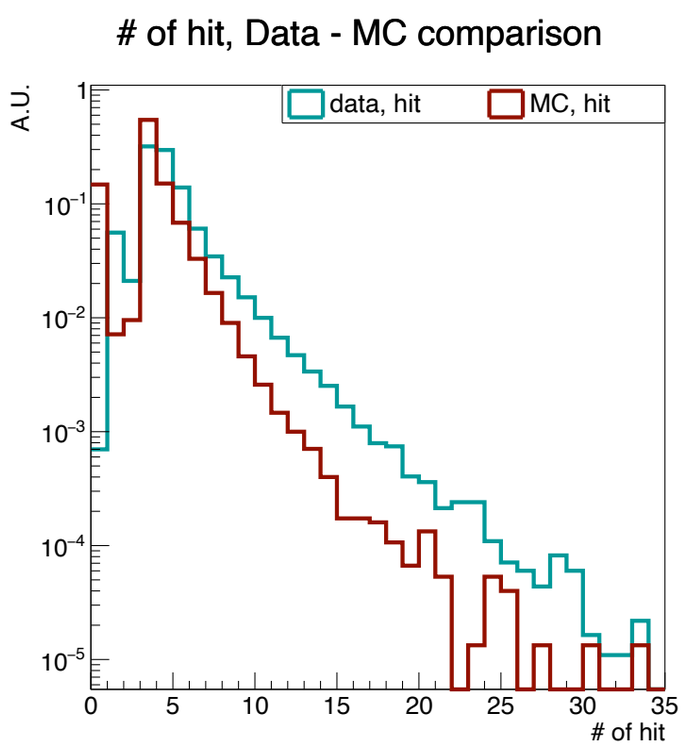
Comparison :

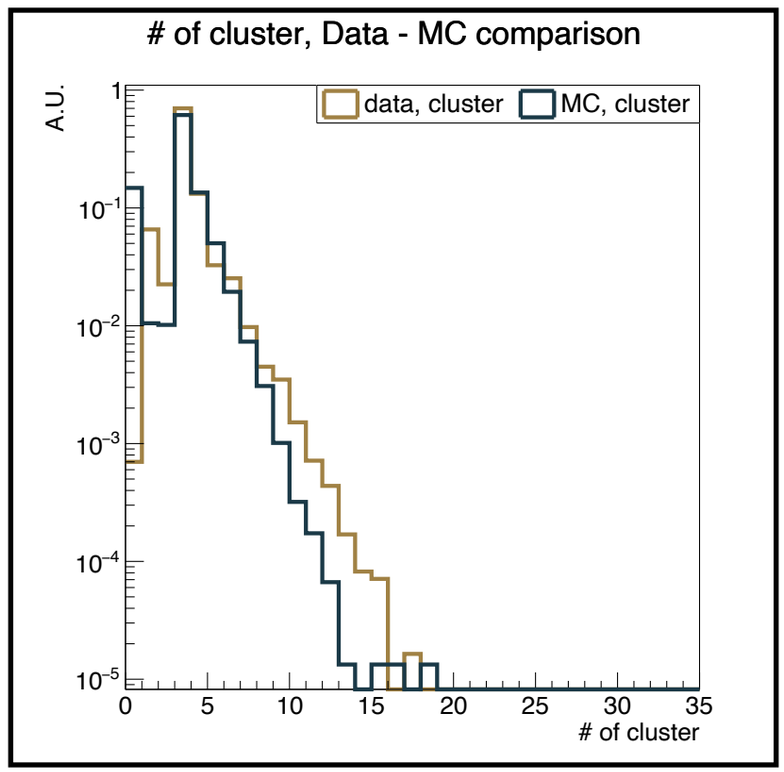
Run52 vs MC noise hit

Log scale



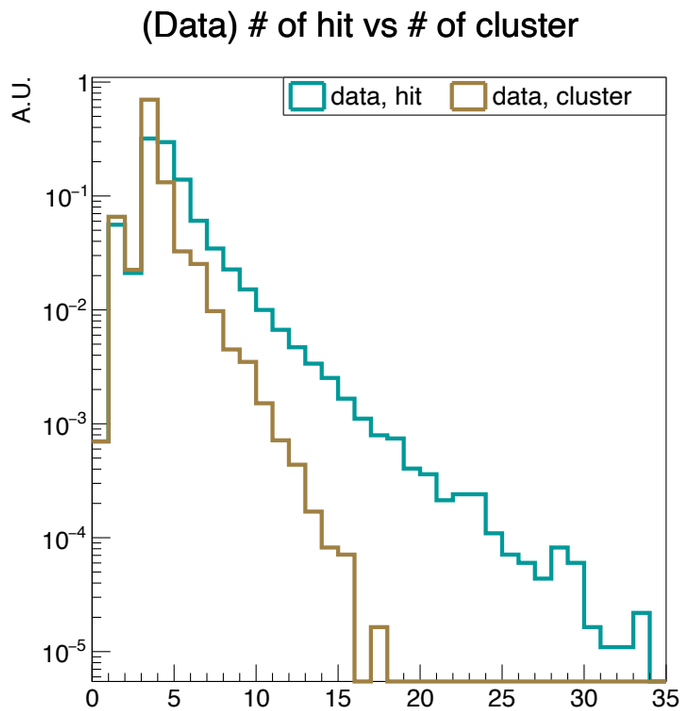



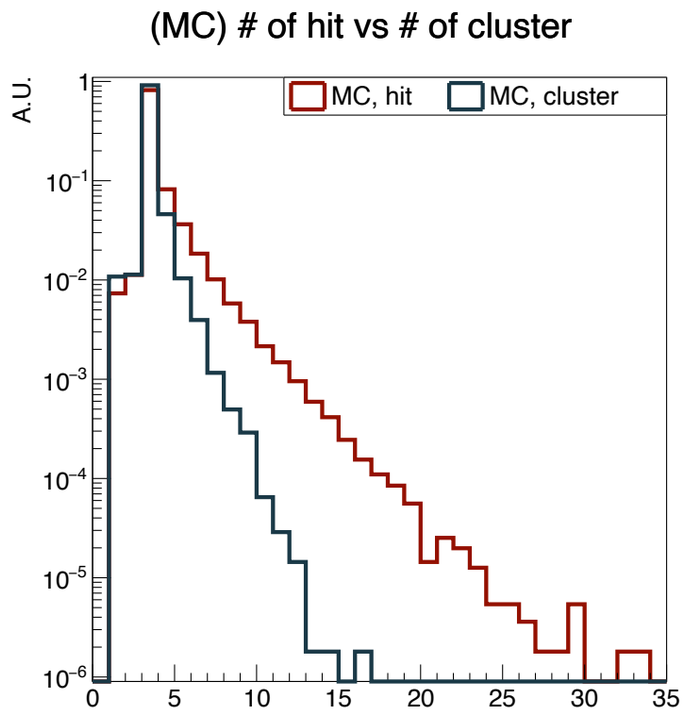
# Distribution comparison (combine)

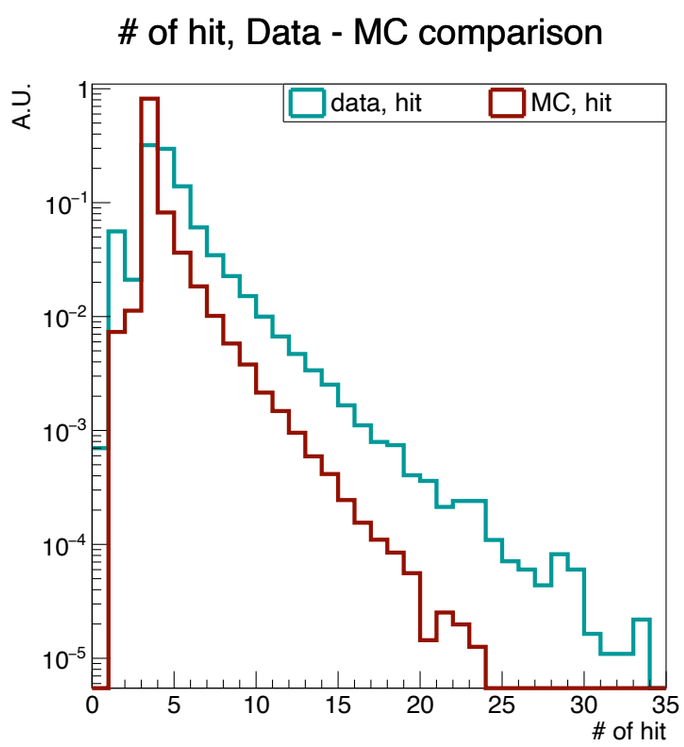
Comparison :

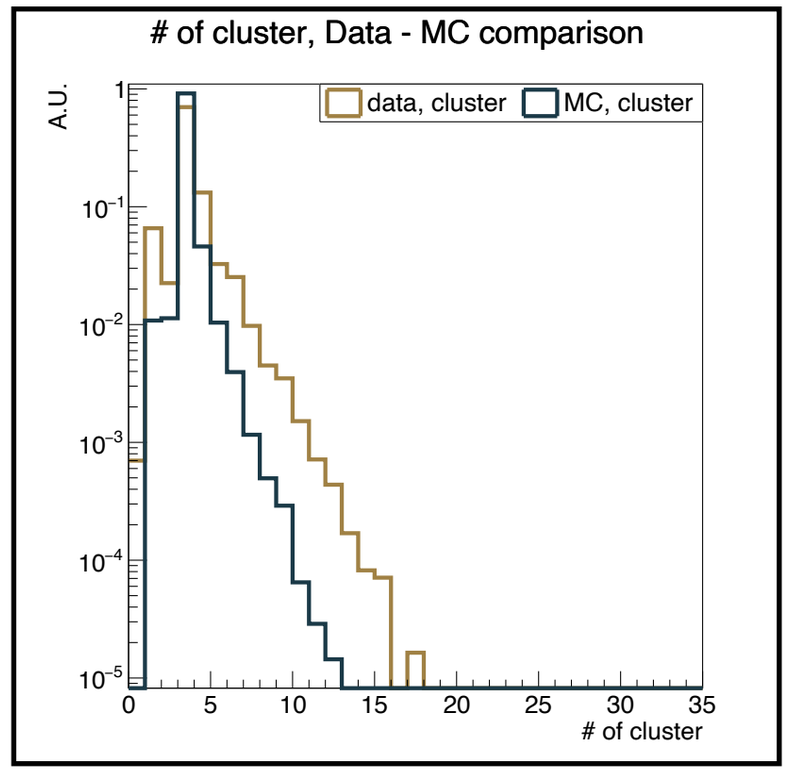
Run52 vs MC no noise hit

Log scale



# Scattering angle (MC)

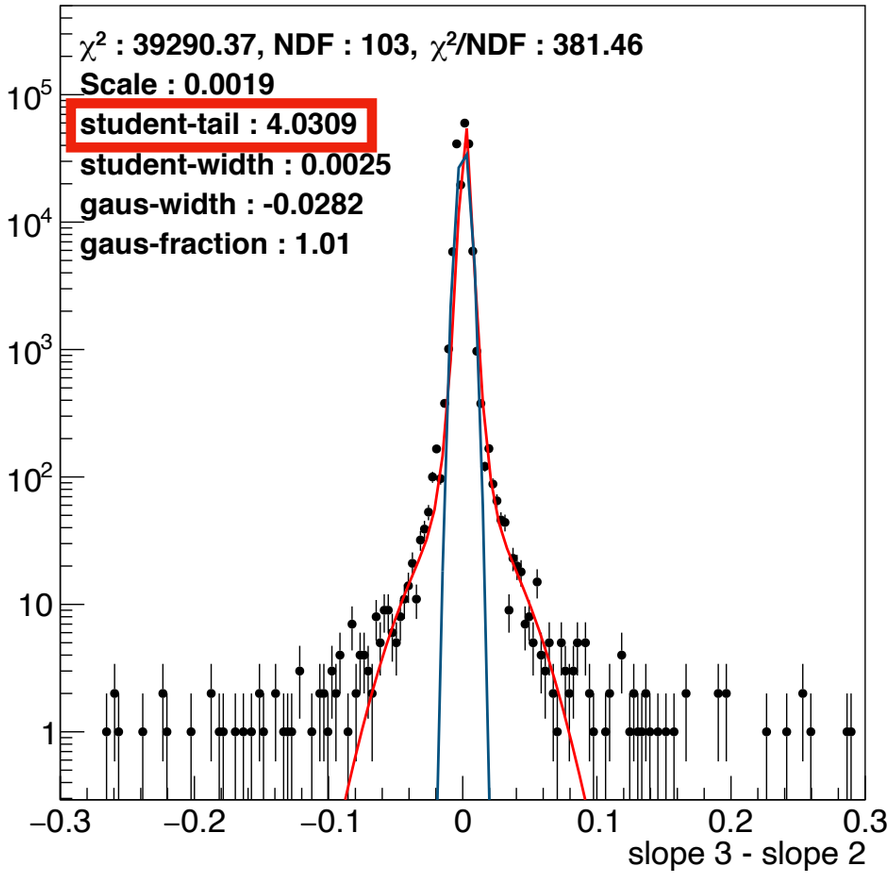
Without noise

```
=====3-layers=====efficiency results==========
99.97480        +0.00383        -0.00446
99.94434        +0.00570        -0.00631
99.83847        +0.00971        -0.01031
=====3-layers=====efficiency results==========
```

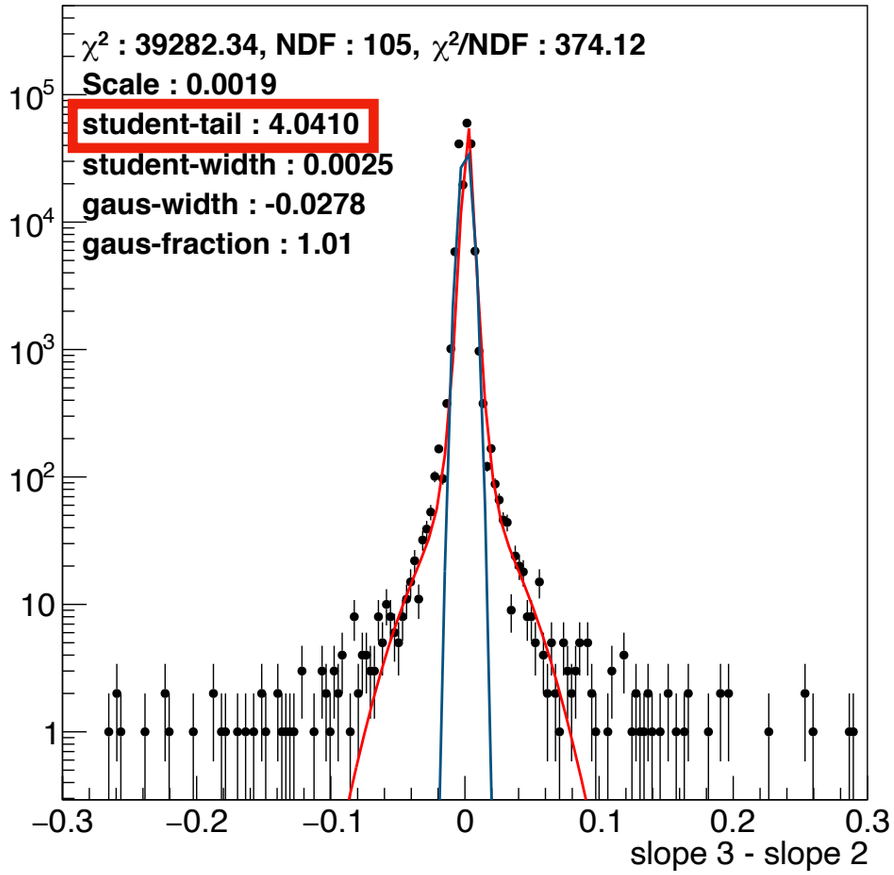
With noise added

```
=====3-layers=====efficiency results==========
99.96894        +0.00425        -0.00488
99.94200        +0.00582        -0.00643
99.83204        +0.00990        -0.01050
=====3-layers=====efficiency results==========
```

slope 3 - slope 2



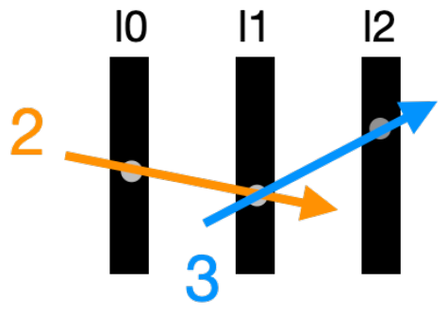

slope 3 - slope 2




Noise hits seem to be no contribution

Fit parameters need to be fine tuned

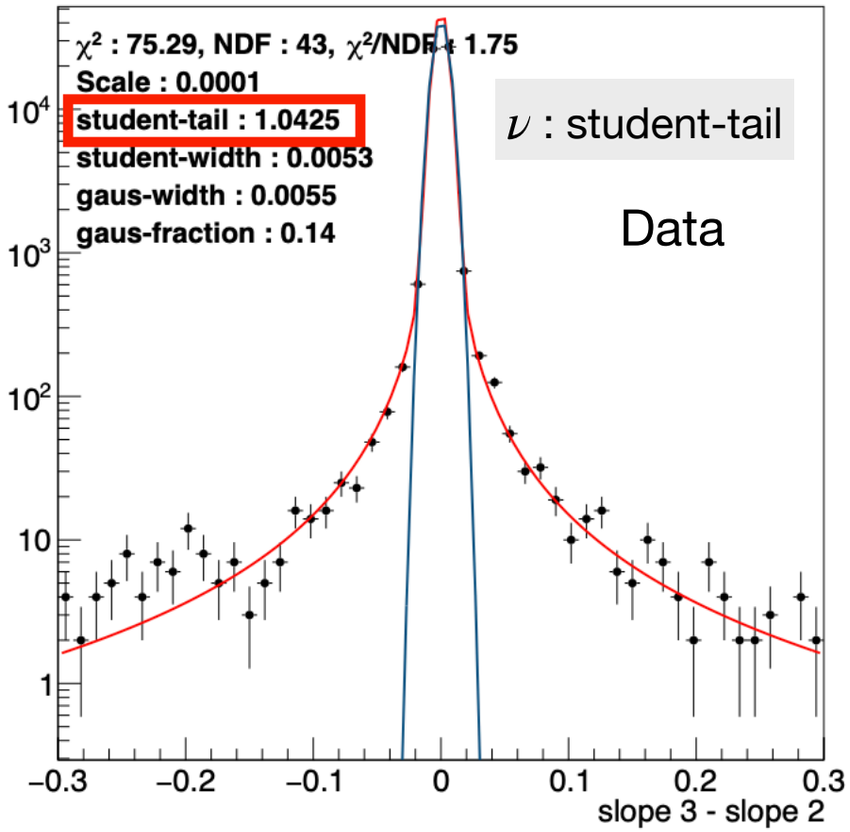
# Scattering angle (Data)



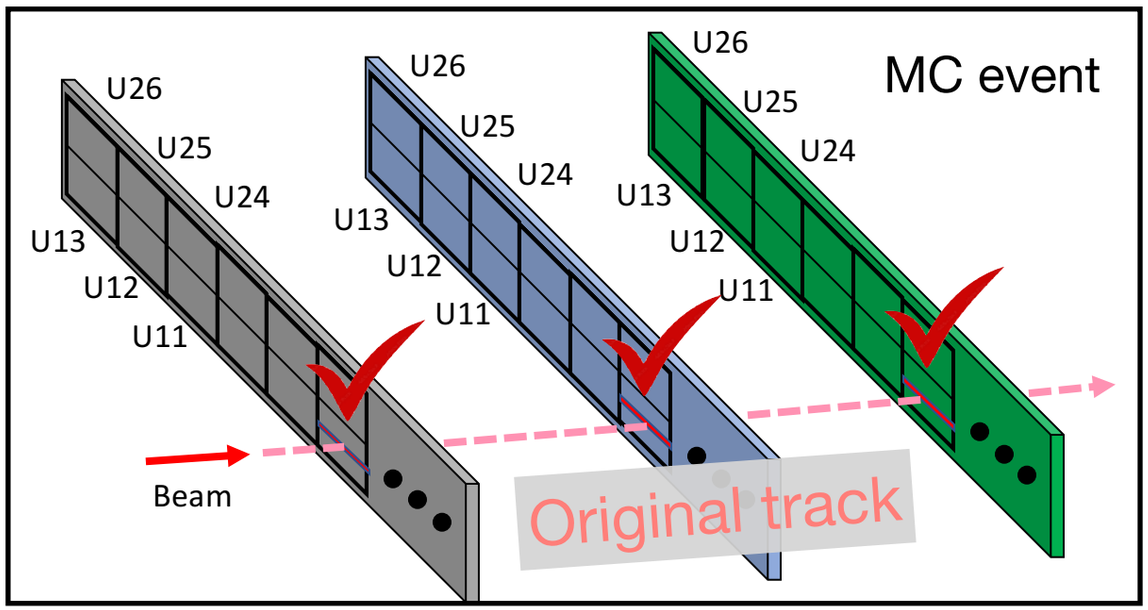

2 : slope of I1-I0
3 : slope of I2-I1

Fitting function : Gaussian + student's t

$$f(\theta) = N \cdot \left( (1-a) \cdot \frac{1}{\sigma_G \sqrt{2\pi}} e^{-\frac{(\theta-\mu)^2}{2\sigma_G^2}} + a \cdot \frac{\Gamma(\frac{\nu+1}{2})}{\sqrt{\nu\pi}\sigma\Gamma(\frac{\nu}{2})} (1 + \frac{(\theta-\mu)^2}{\nu\sigma^2})^{-\frac{\nu+1}{2}} \right).$$



# The reason



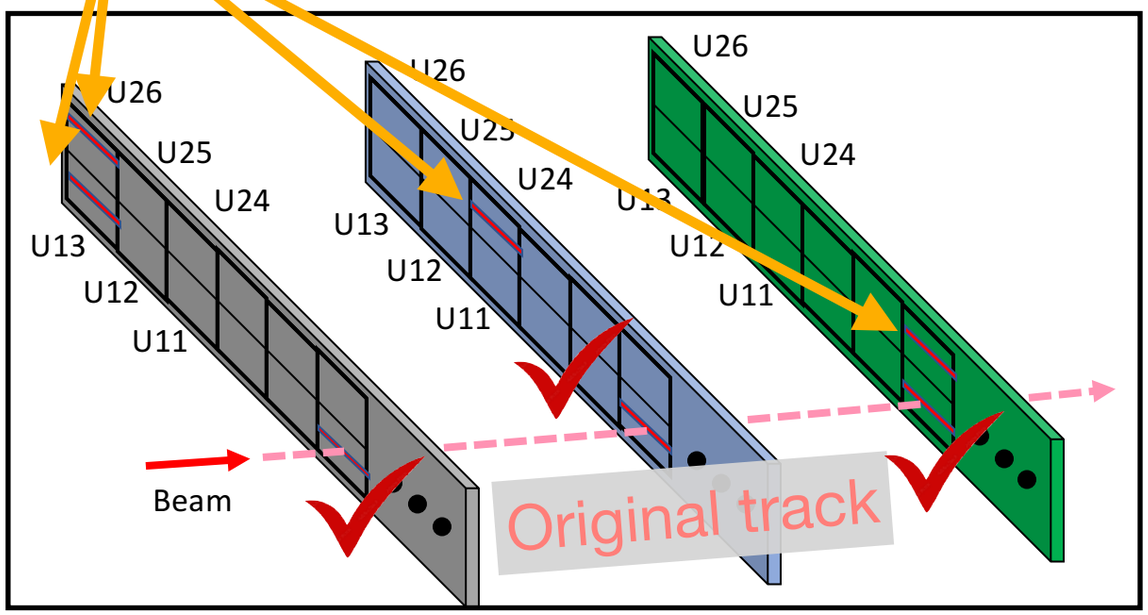

Based on current scattering macro, only the best track is selected (The original track) for scattering angle calculation.

Event-profile : 111

Noise hits added
(What I did)

Noise hits

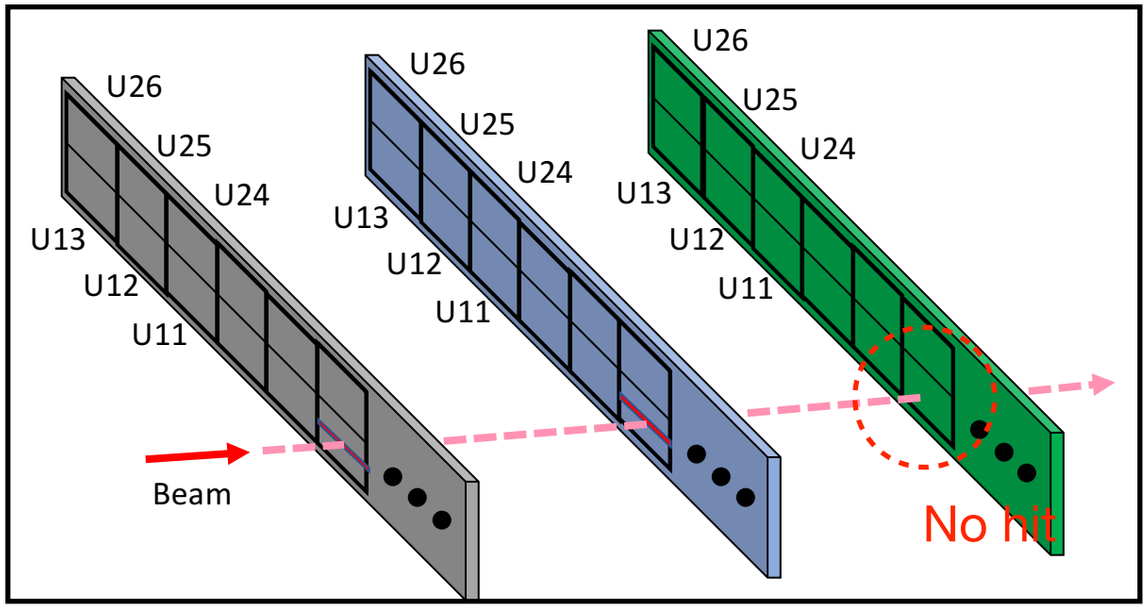
The selected clusters for scattering calculation




If the original event has a good track. Then the macro would still select the same track for calculation

Event-profile : 111 (still)

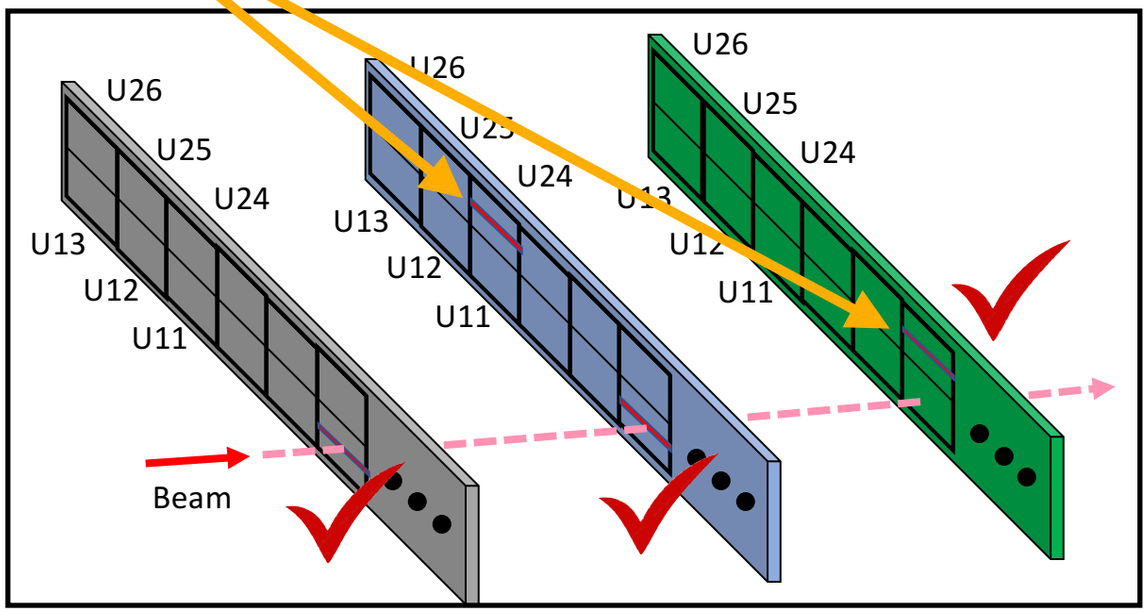
# The reason




Event-profile : 110

Noise hits added
(What I did)

Noise hits




Event-profile : 111 (original : 110)

Based on current scattering macro, only the best track is selected (The original track) for scattering angle calculation.

The selected clusters for scattering calculation

The way noise hit contribute to the scattering calculation is by the left-hand side example.

Event-profile 011/101/110 is very rare in MC
Which leads to almost zero contribution for noise.

# TW ladders

8 TW ladders were arrived at BNL yesterday, 6 ladders are on the way here.
There will be 8+6+4 = 18 TW ladders in BNL (all barrel-2).

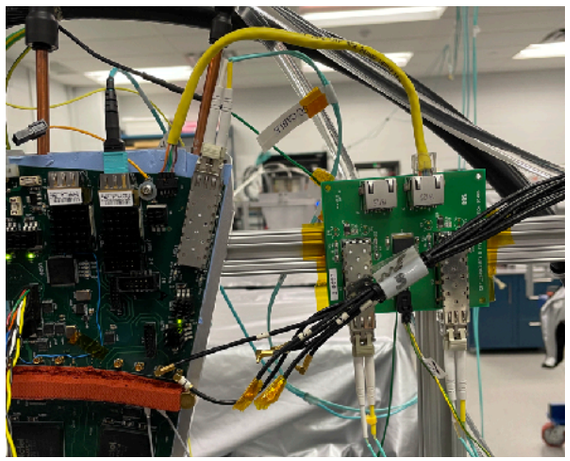

25 G impact indicator is white 👍

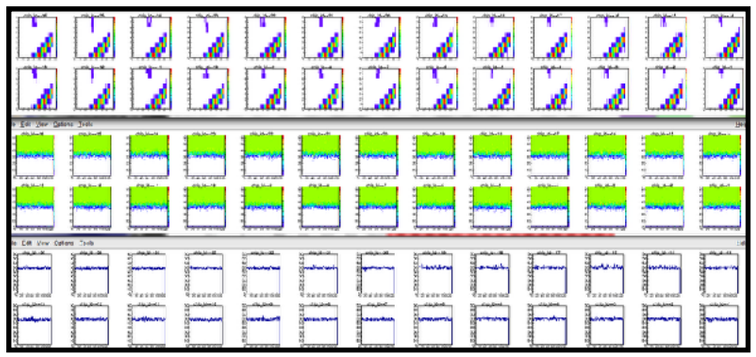
All 8 ladders were labeled and the box were opened for survey → all ladders seem to be good (in one piece)


Two 15 G impact indicator are red…

# 2nd Testbench

We tested the clock board and the new handmade cables on barrelIt works. We can get the correct calibration data with this set.





Ladder ✓
FEM ✓
FEM_IB ✓
Clock board ✓
Clock board handmade cables ✓
Clock board optical fibers (same length) → prepared
ROC on the table Seems to be un-functional :
- 3 ports x 2 columns (A and C) were tested
  - → no FEM response and c
  - → FEM chip lights off

# Back up