# First Results in Data-MC comparison

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# Comparison Between…

| | | | |
|---|---|---|---|
| 5801 | 400 | 50 | Xray source Cu 8.04/8.91 keV - 24cm distance from beginning of window |
| 5806 | 400 | 50 | Xray source Rb 13.4/15 keV - 24cm distance from beginning of window |
| 5813 | 400 | 50 | Xray source Mo 17.4/19.6 keV - 24cm distance from beginning of window |
| 5825 | 400 | 50 | Xray source Ag 22.1/25 keV - 24cm distance from beginning of window |
| 5832 | 400 | 50 | Xray source Ba 32.1/36.6 keV - 24cm distance from beginning of window |

Reconstructed with Autumn21 (Winter 2022)

and…

- Data digitized with the digitization code with saturation
- 500 tracks per energy

- Variables compared:
  - Integral
  - Lenght
  - Width
  - Slimness

- Energies at: 8, 15, 18, 24, 35 keV

- Reconstructed with Autumn21

- Density (light/npixels)
- dEdx (light/lenght)
- TGaussMean
- TGaussSigma

- Diffusion uniform within 5- 45 cm

- Same parameters of the data

- Cluster nhits
- Cluster size

- First Strategy: Cut over lenght<400. Background subtraction. Normalization data-simulation. Comparison
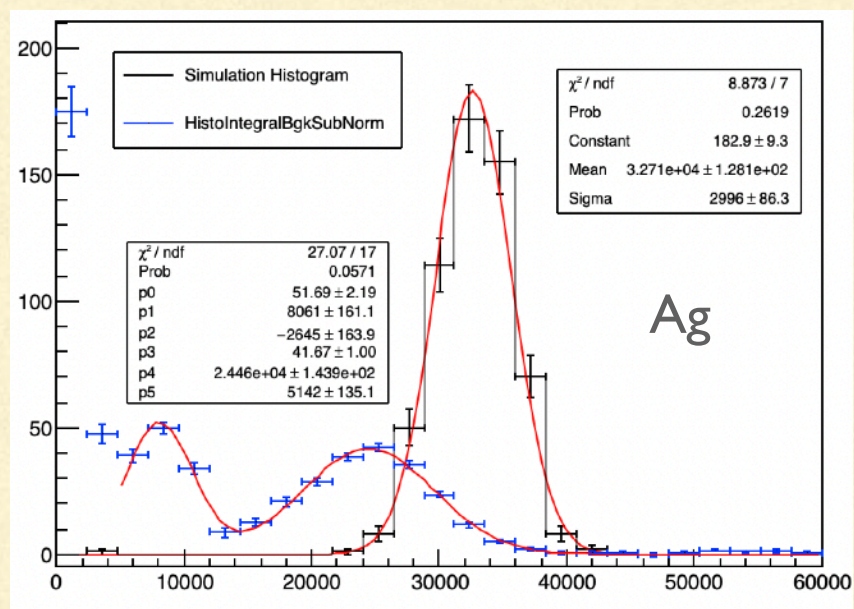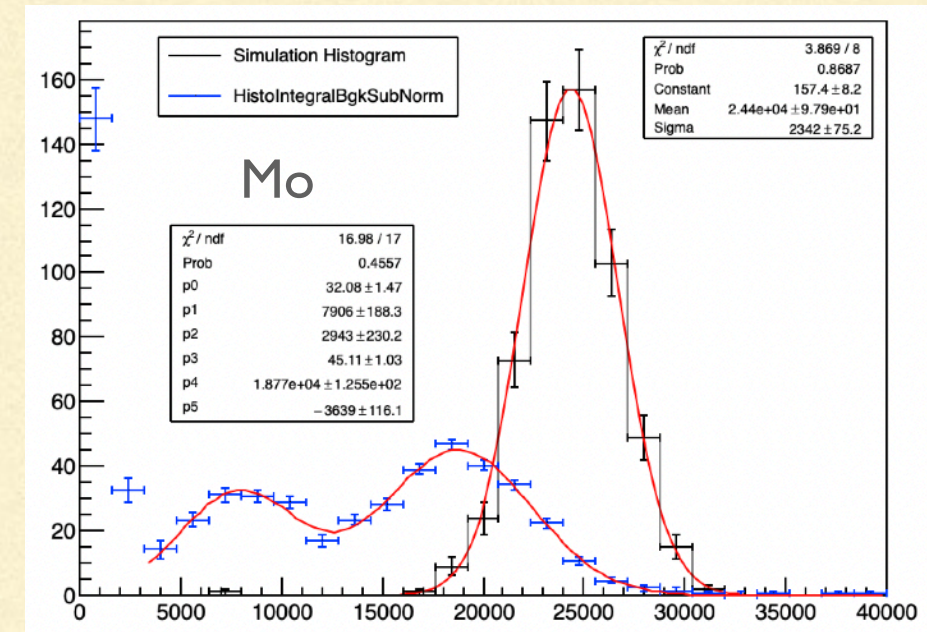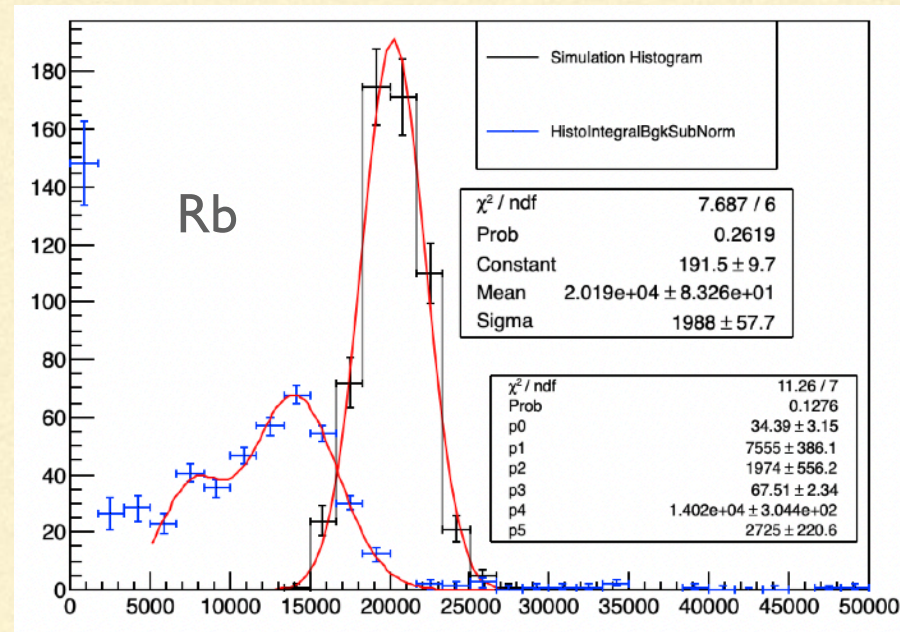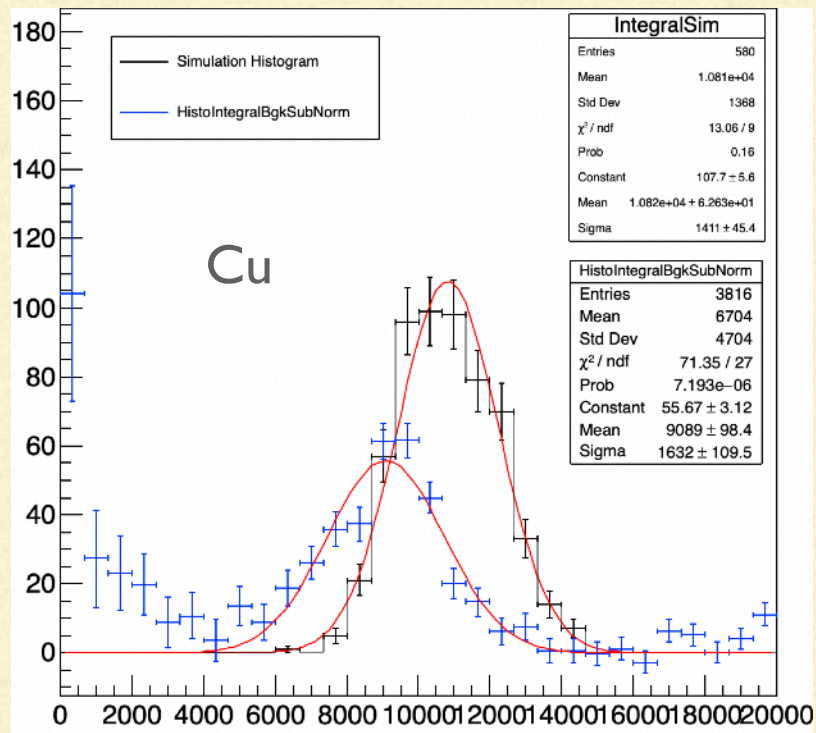
# Issue in background normalization
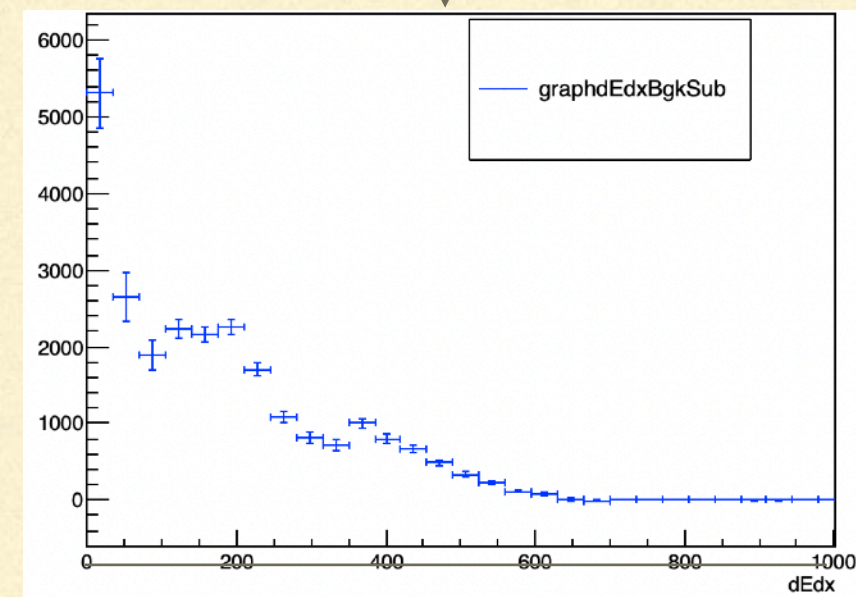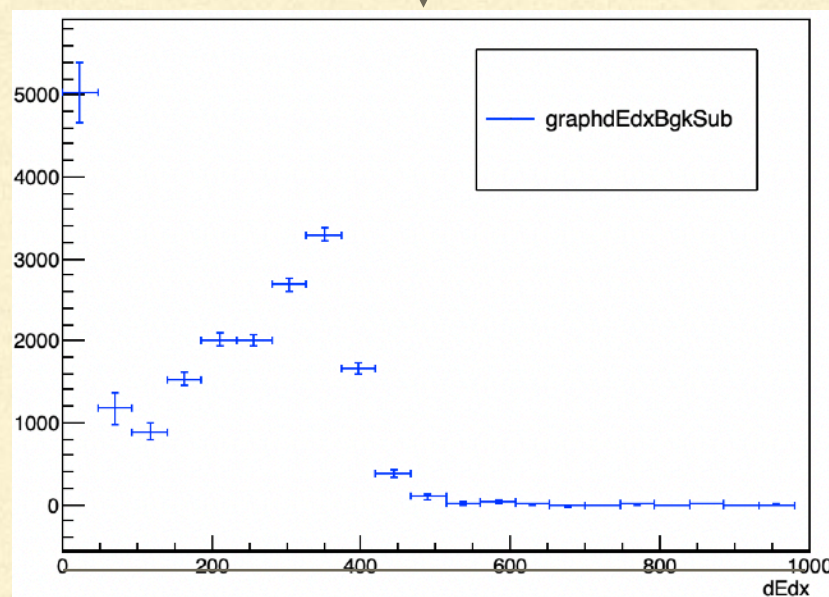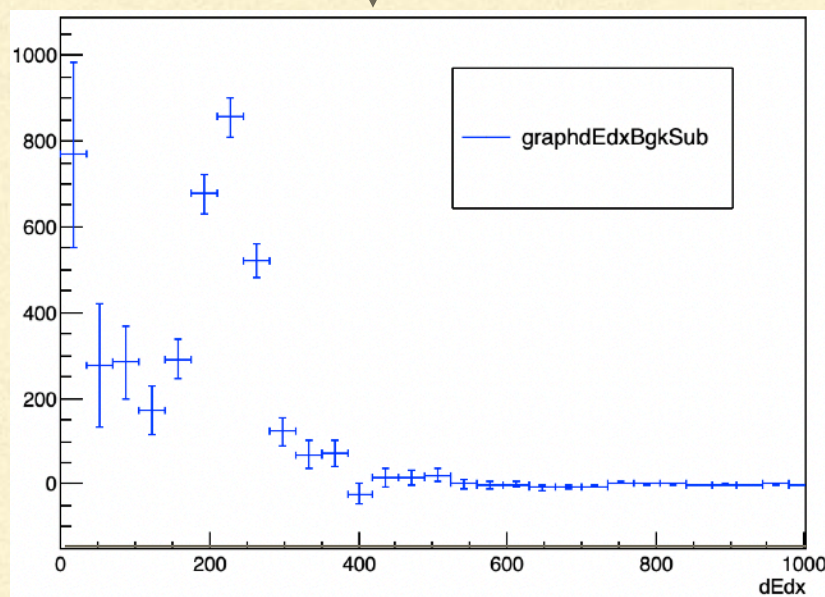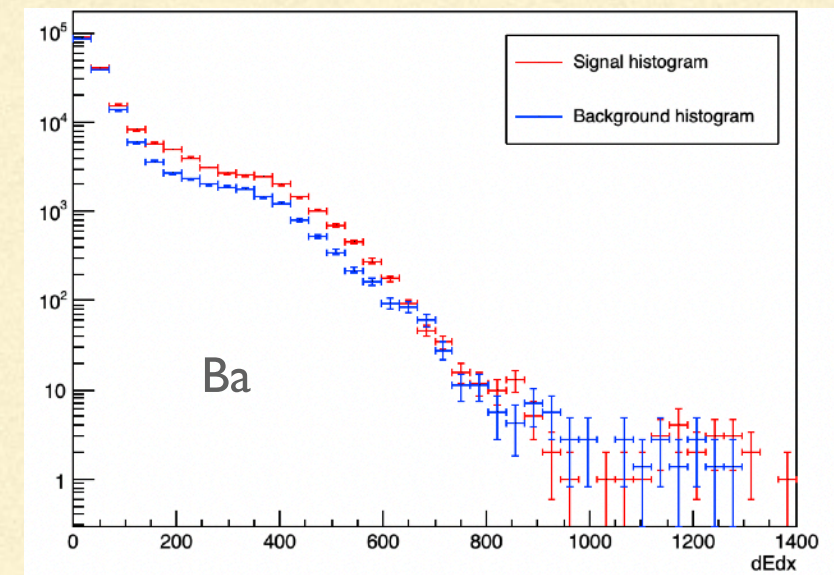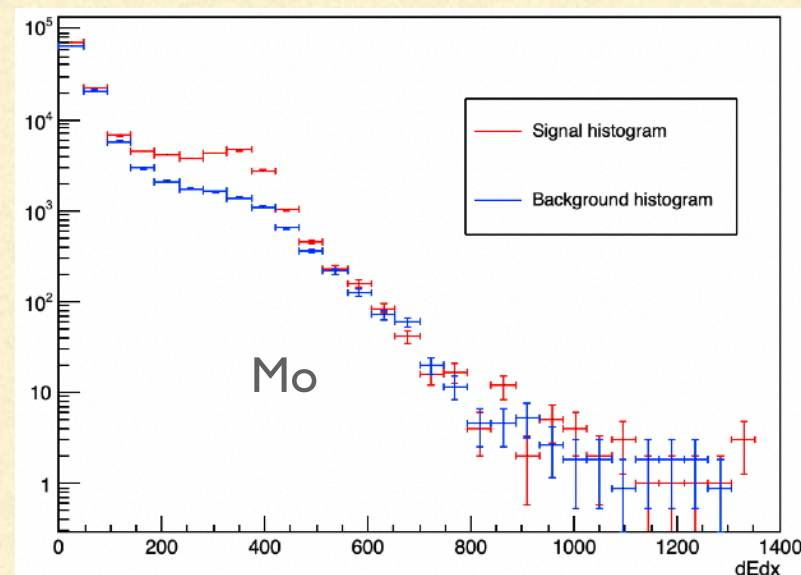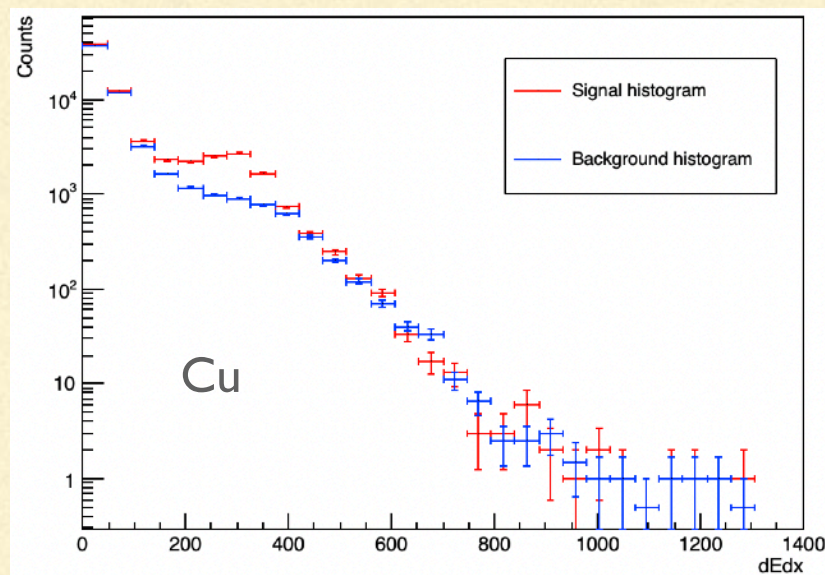


- Data and bakground are not in agree at very low energies; excess of events in source data:
  - Higher light production → higher probability of a fake cluster
  - Higher # of tracks → higher probability of a small piece of track cut out from the main track
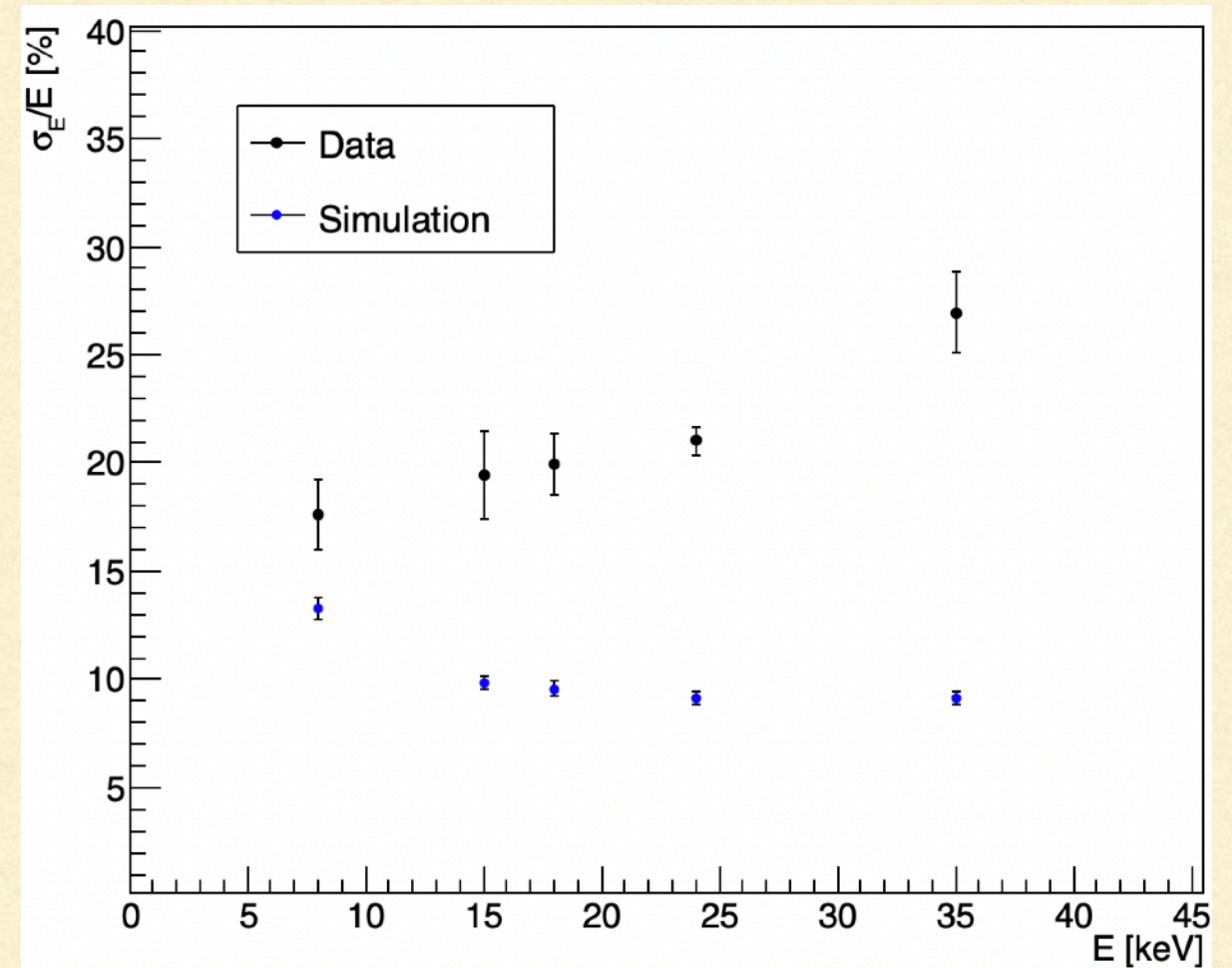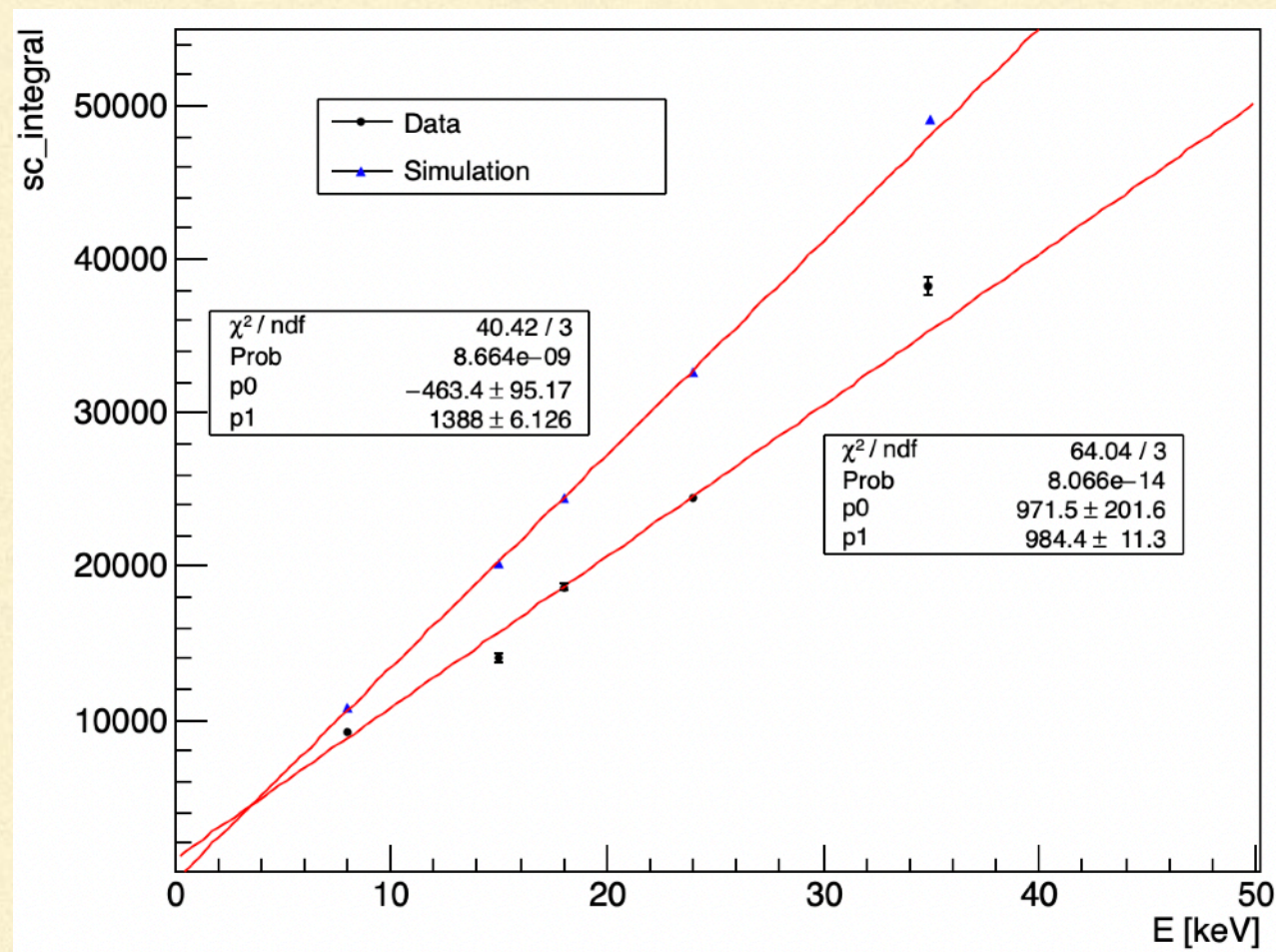
- Thinking about how to solve it

# Integral comparison
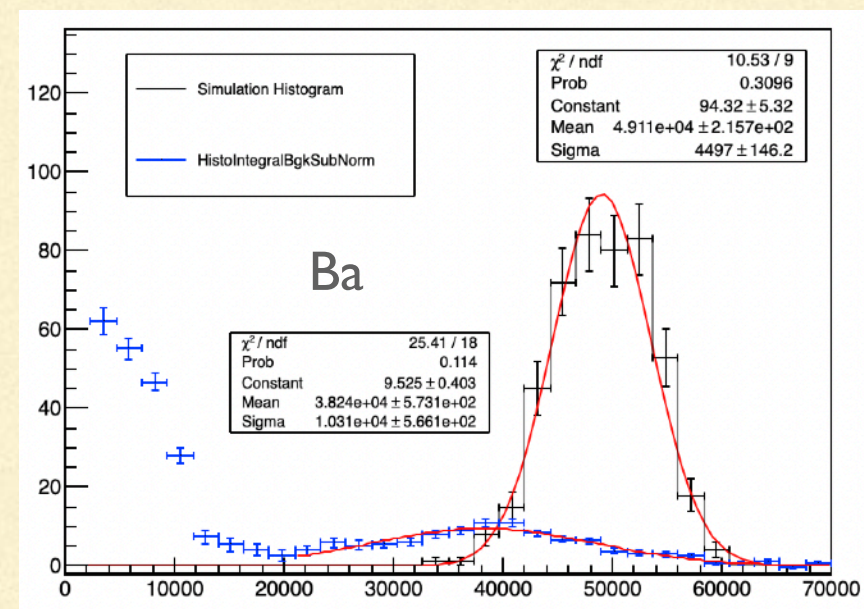


- Problem of fake cluster clould be solved with an cut on the integral (e.g. >1000)
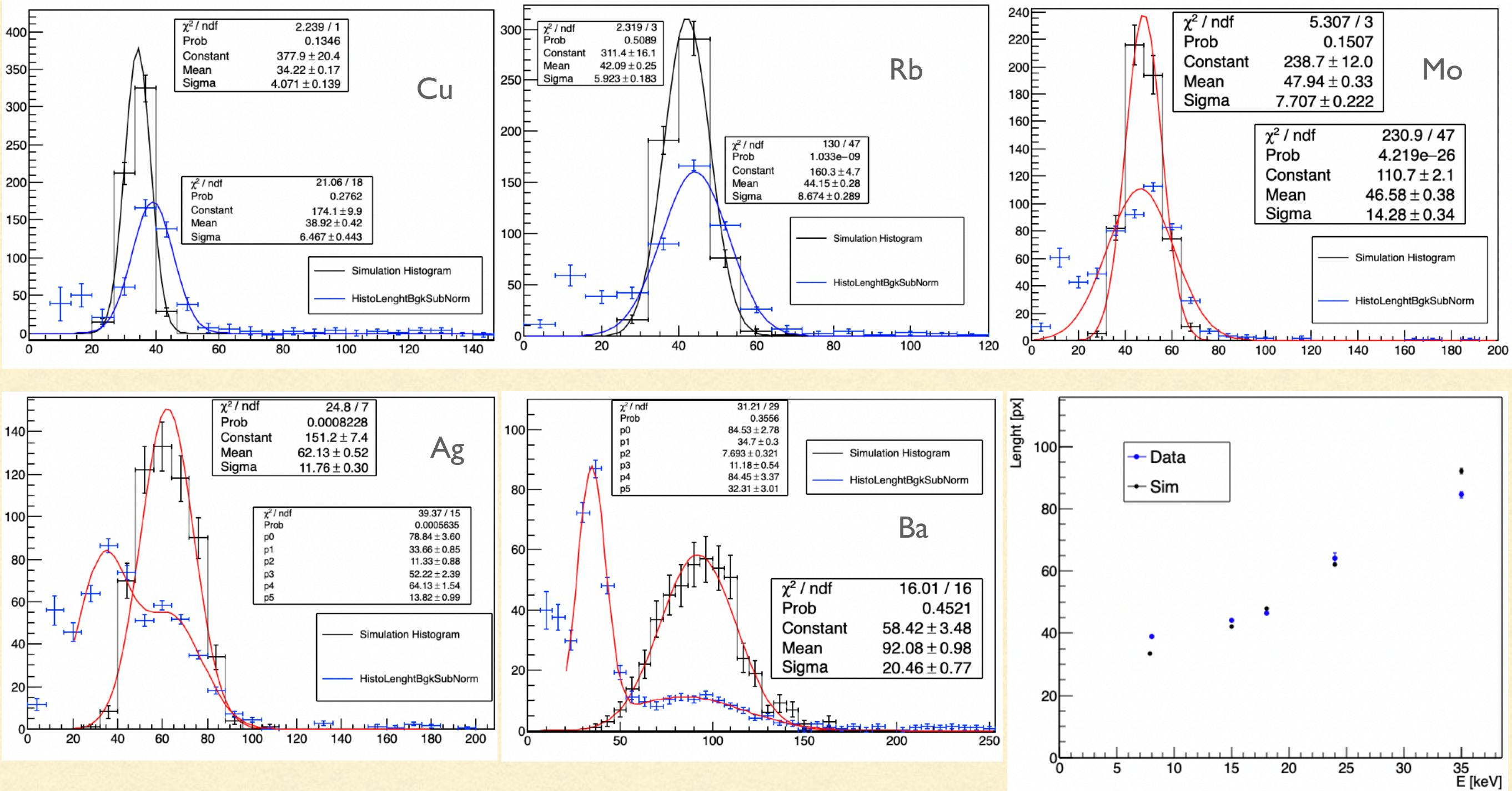
# Linearity and energy resolution



- Too much light in the simulation with respect to data

- Energy resolution can be improved with a further analysis (e.g. NonUniform binning, Bkg modeling)
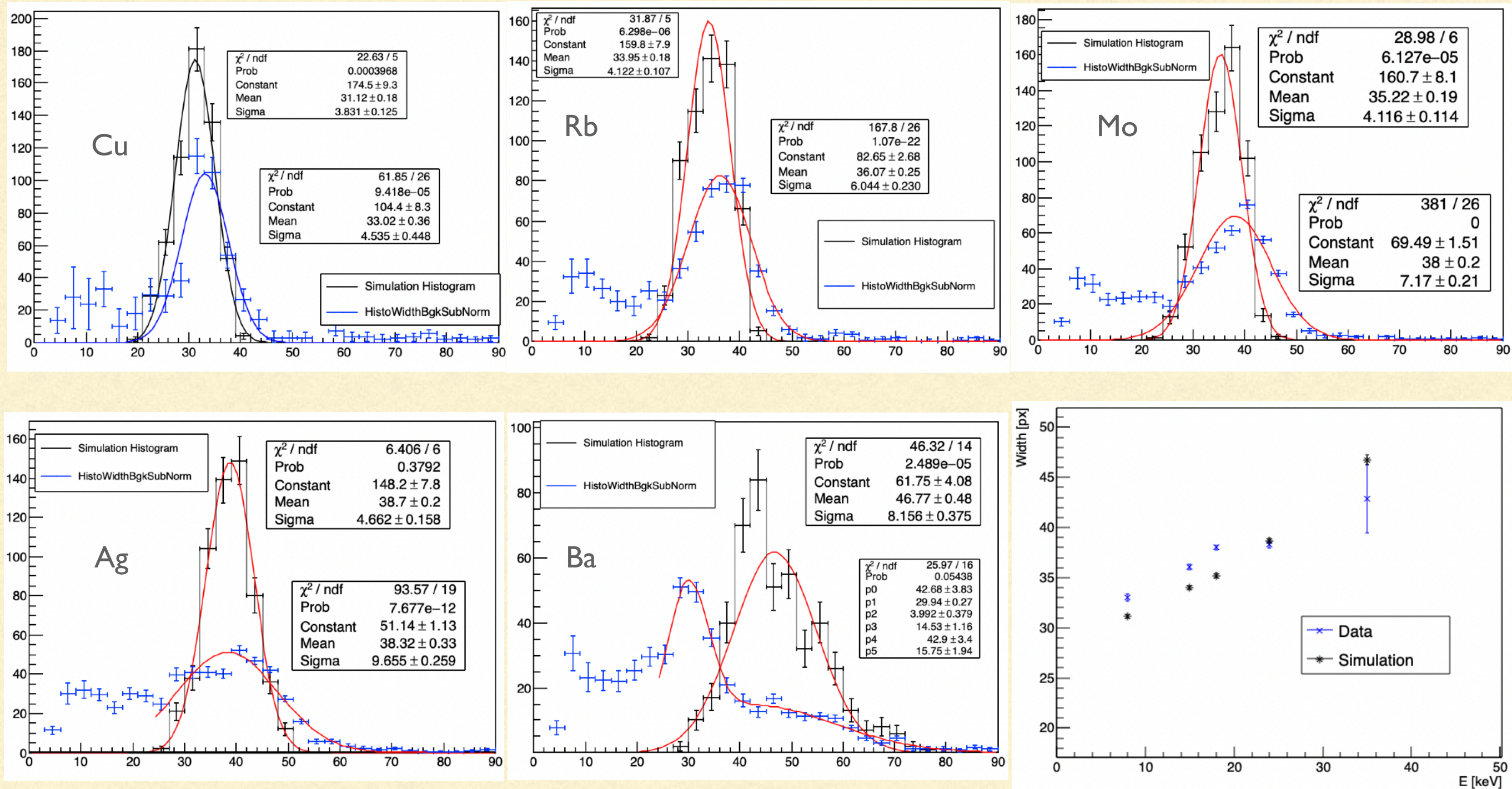
# Track lenght



- Copper contamination more present at higher energies
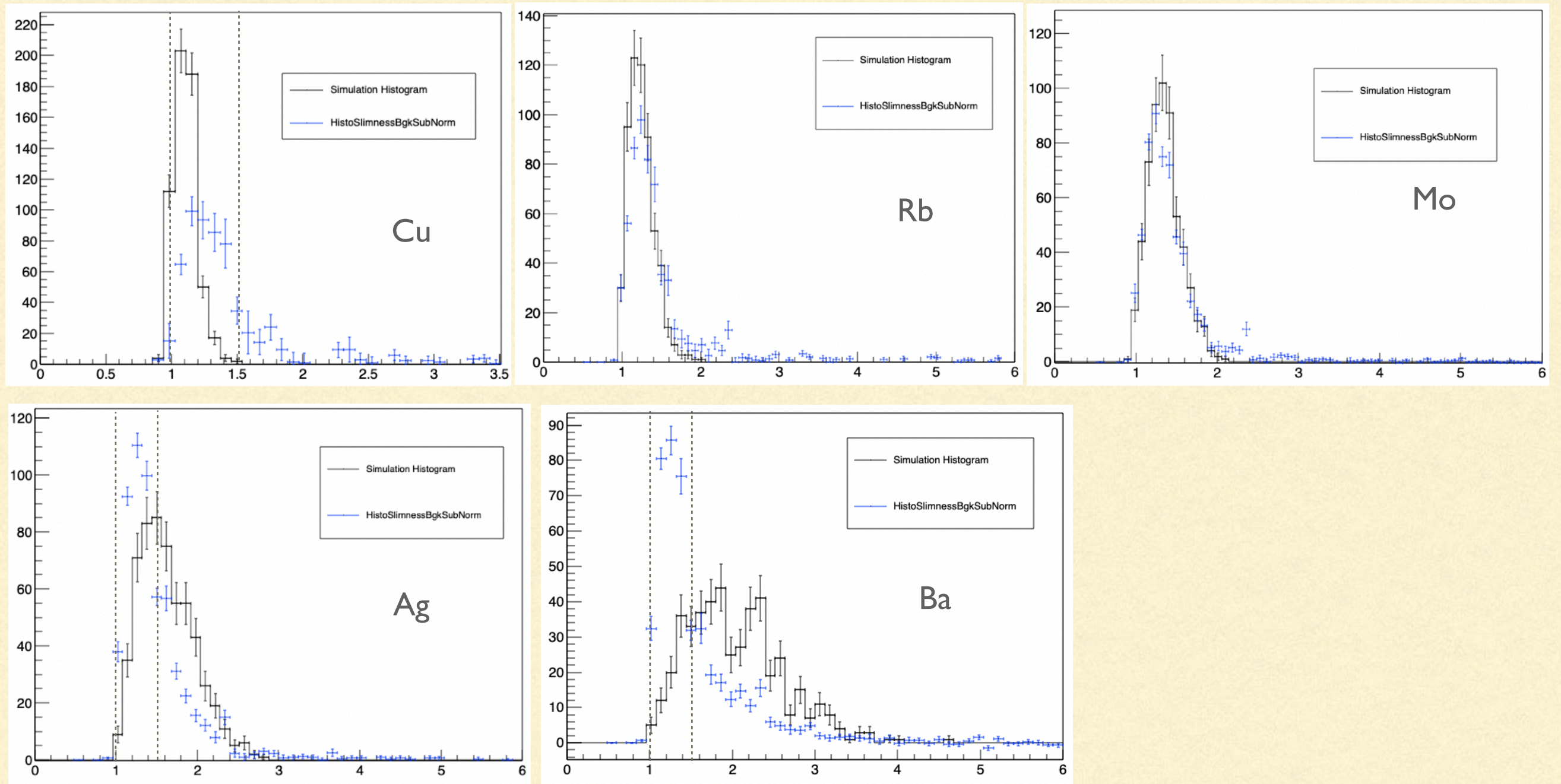  - Since peaks are separated an energy selection could help in the analysis

# Track width

- Width increase with energy but less than lenght as expected
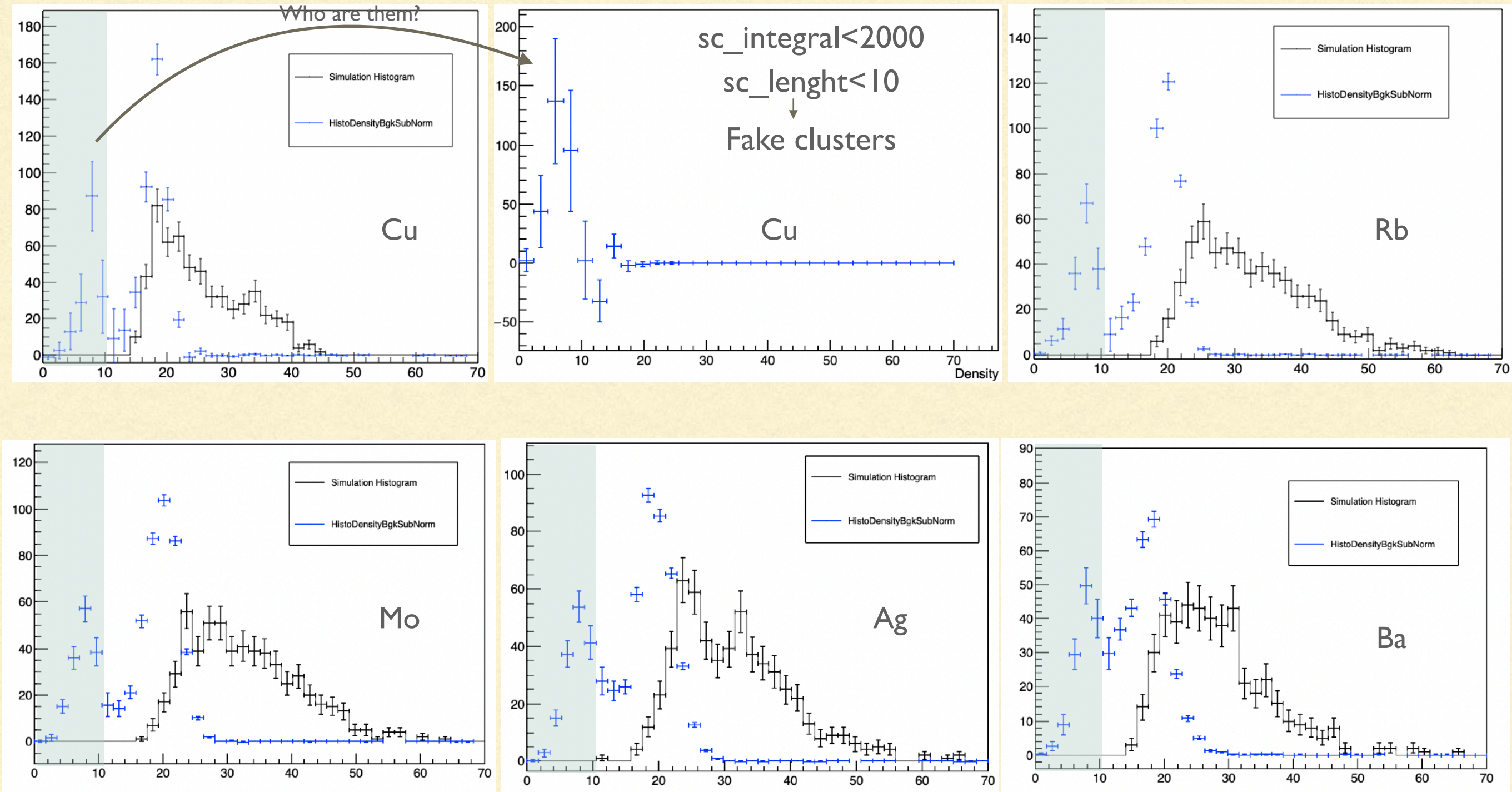- Differences due to non uniform z in the data?

# Slimness



- Copper contamination modifies the distribution shape
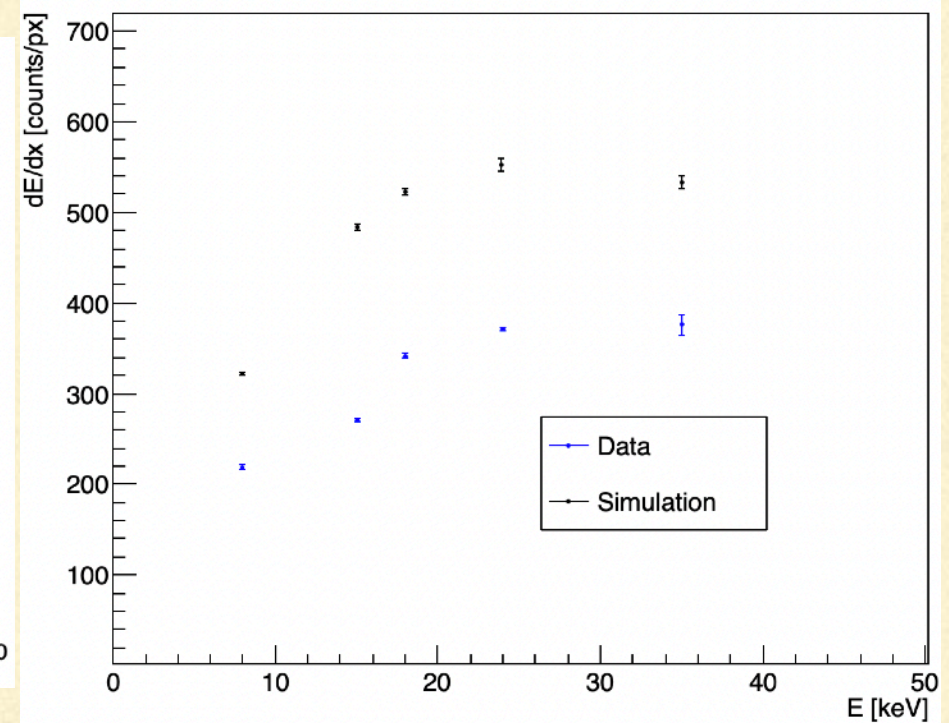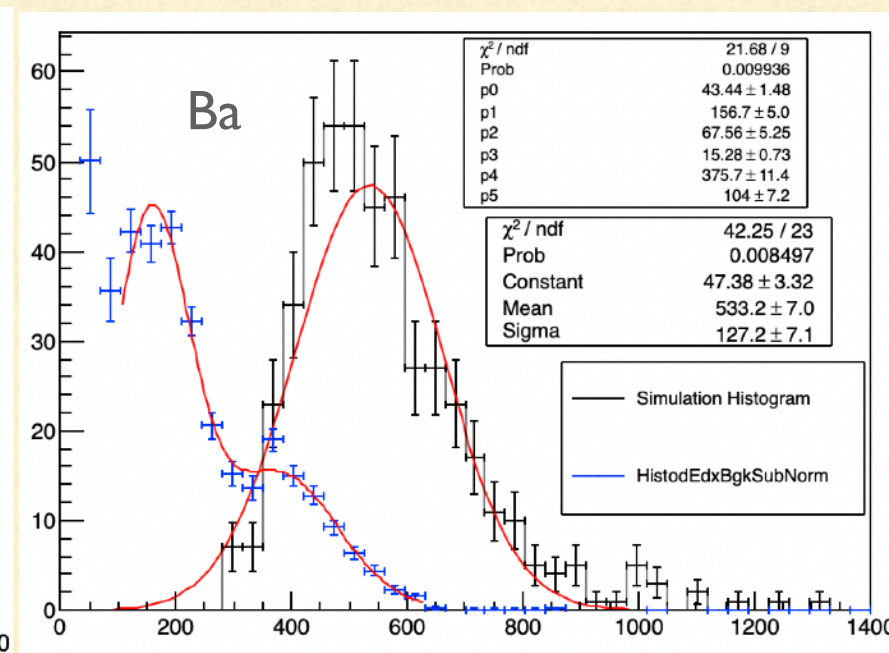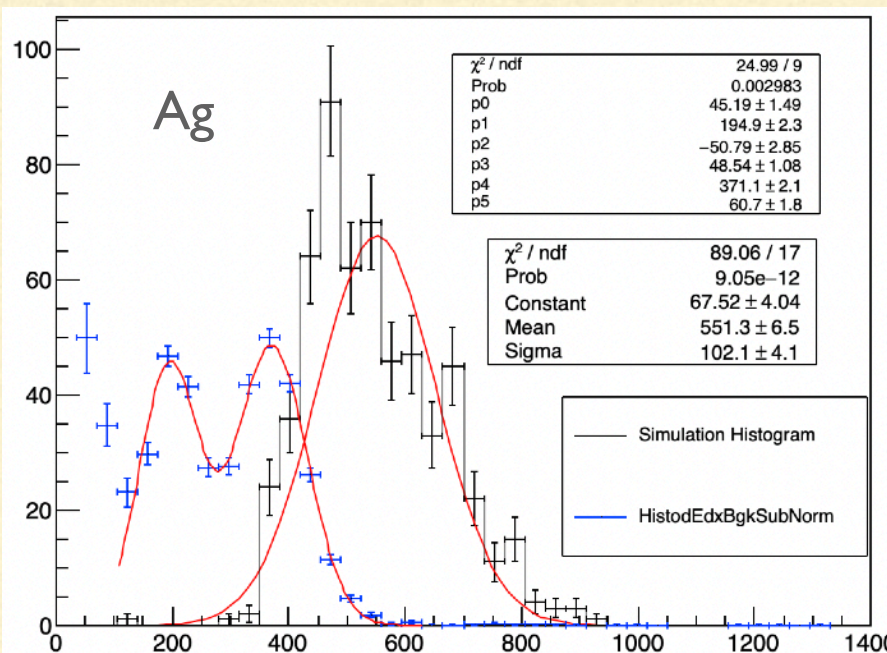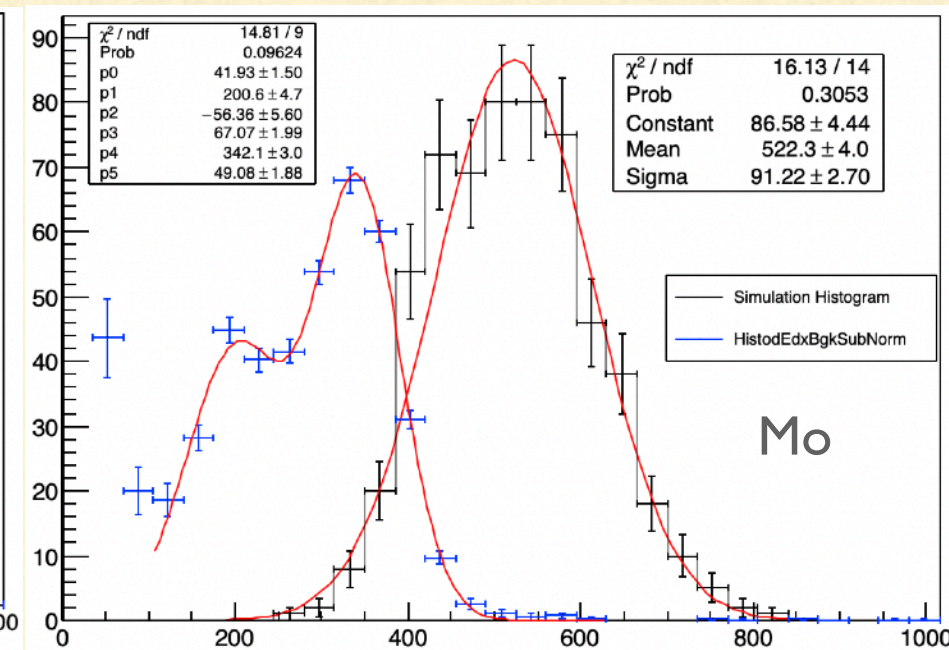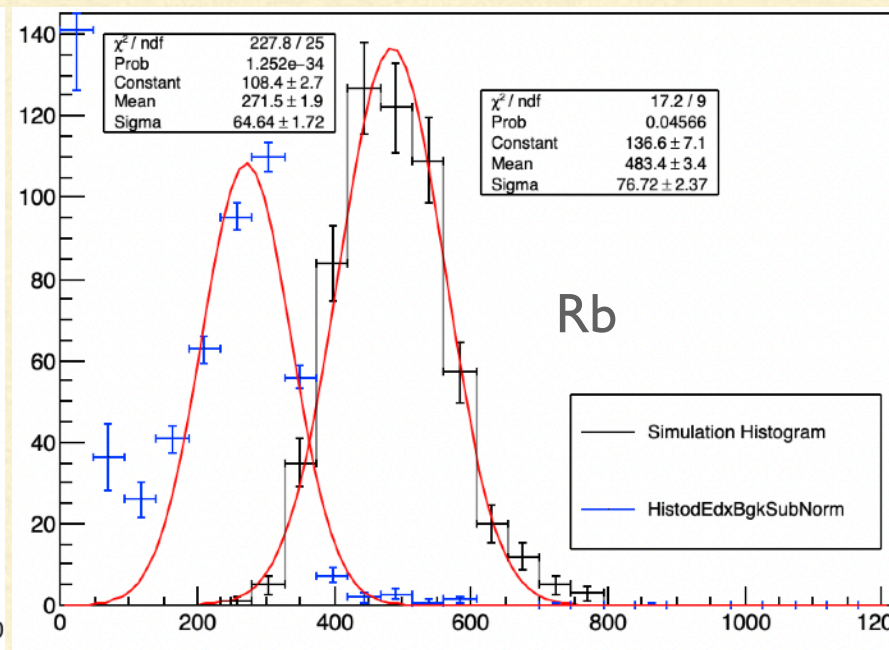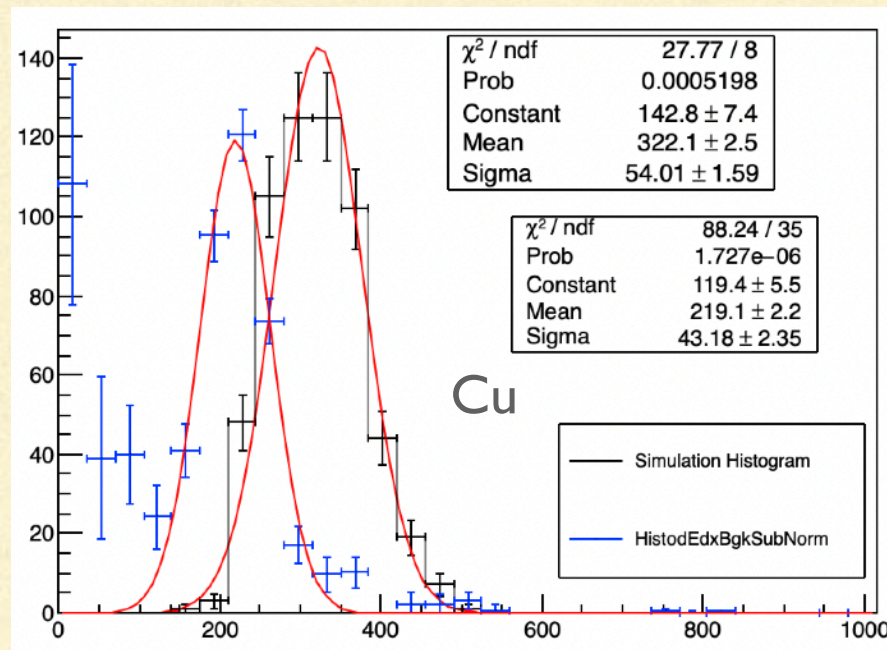- With the normalization: less copper→more signal in slimness>1.5

# Density



- Spoiler: Nhits Data-Sim in agreement.
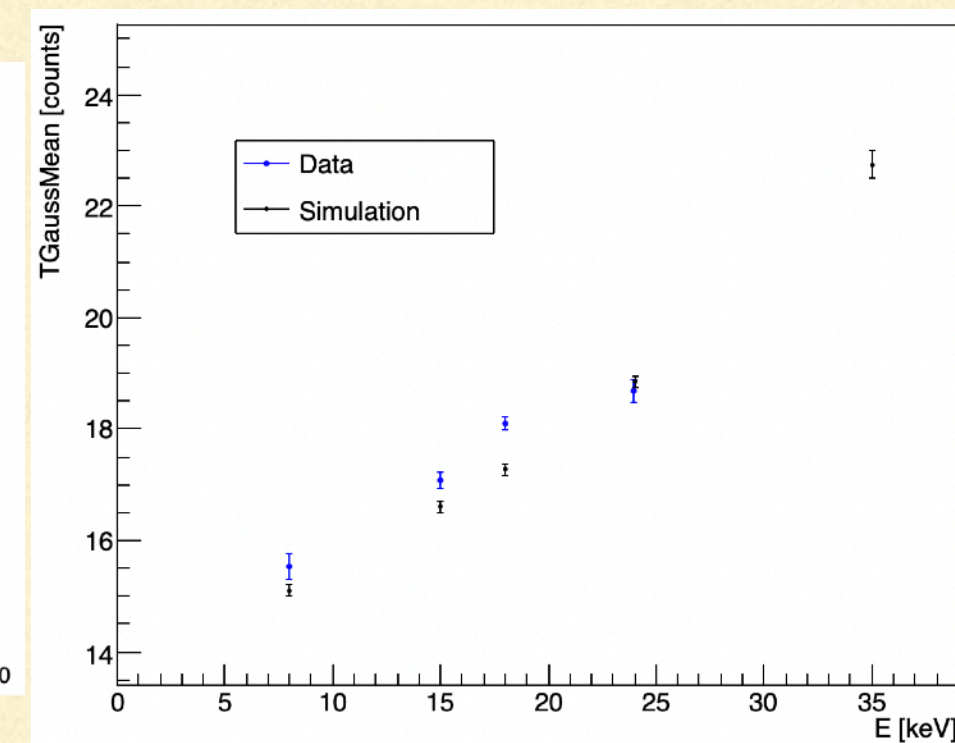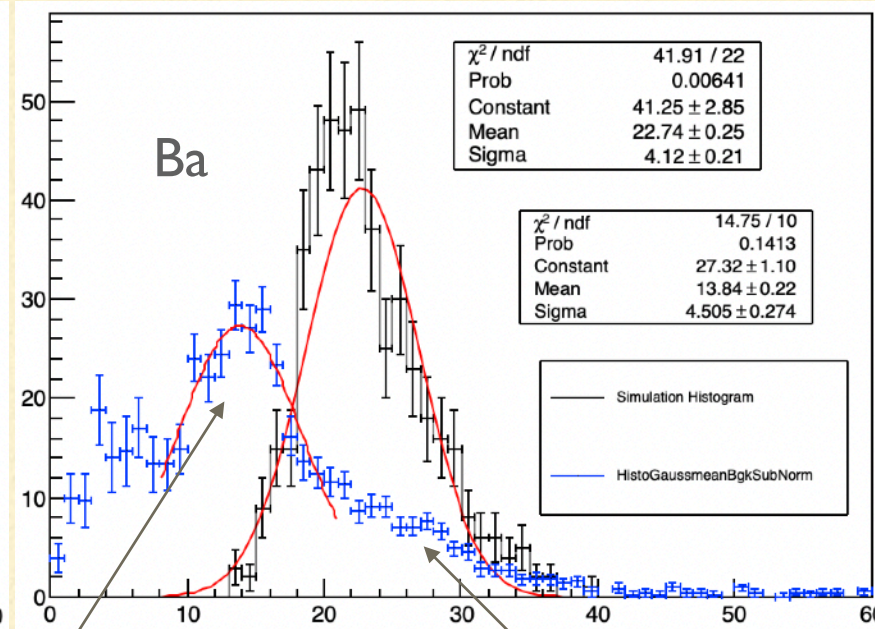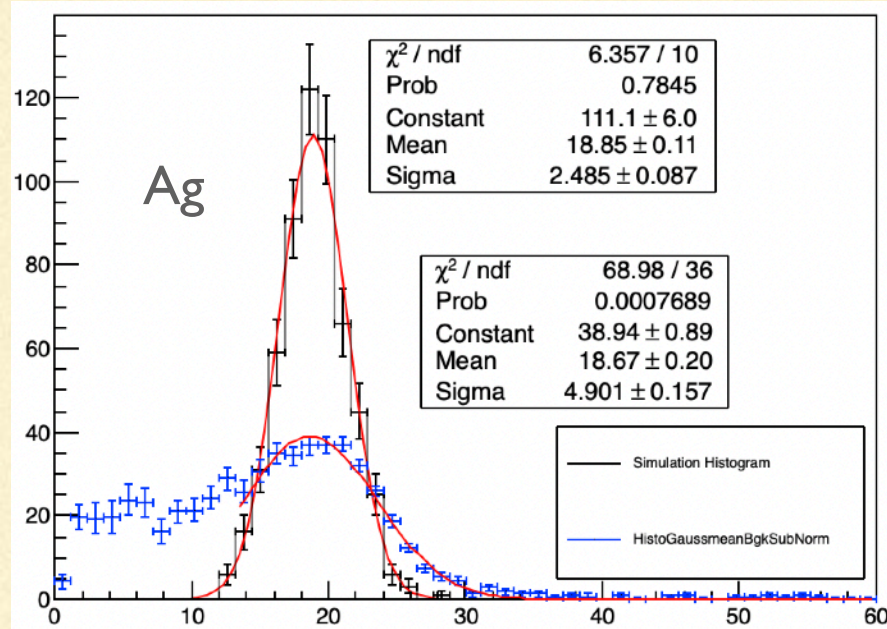- Excess of light in simulation compatible with higher density (not in a trivial way)
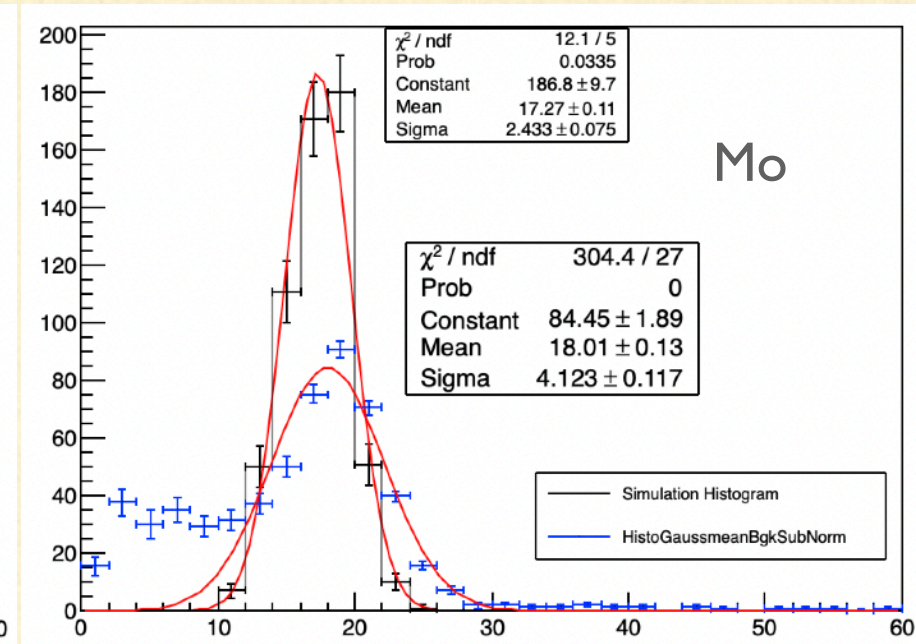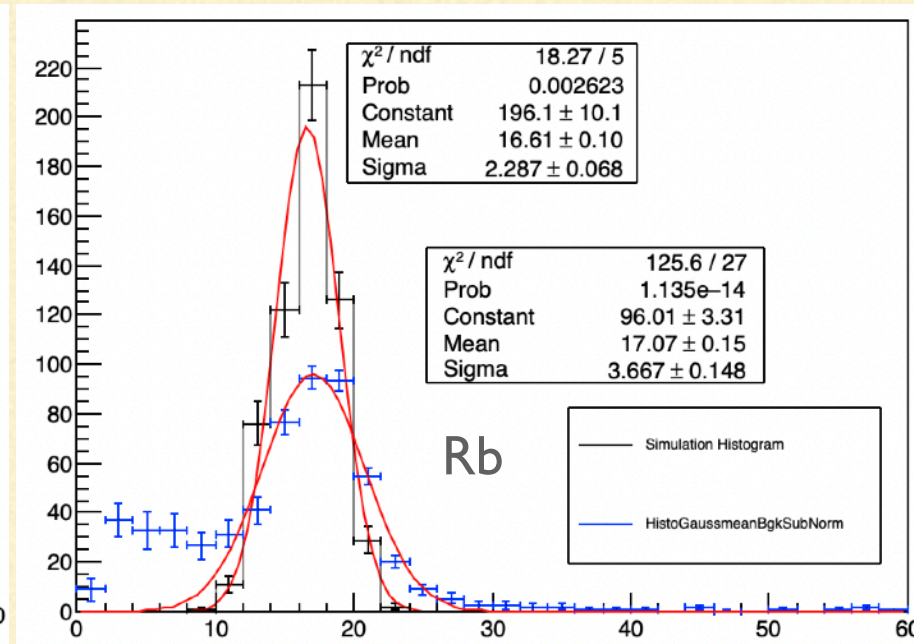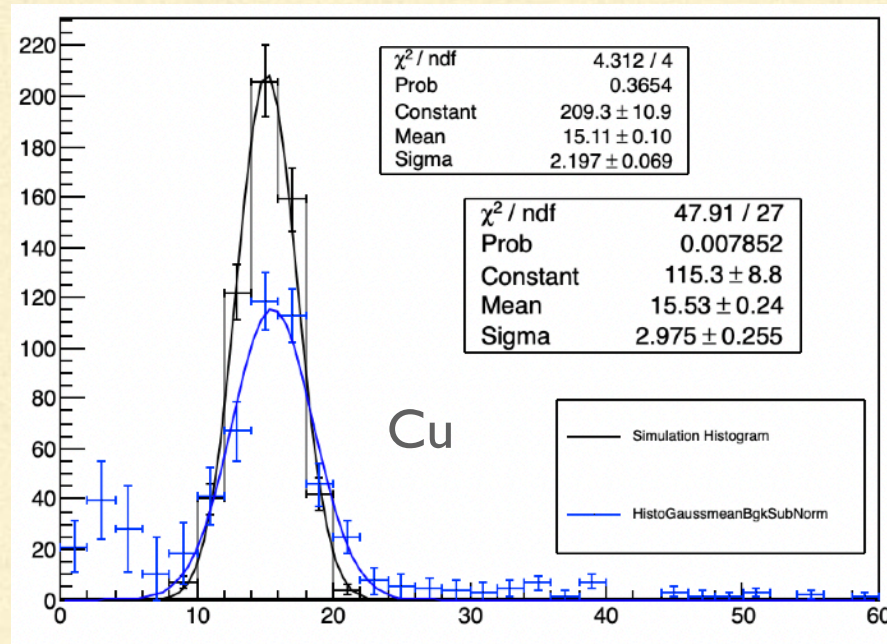
# dE/dx



- Lenght in agreement in data and MC
- Excess of light→ Excess in specific ionization

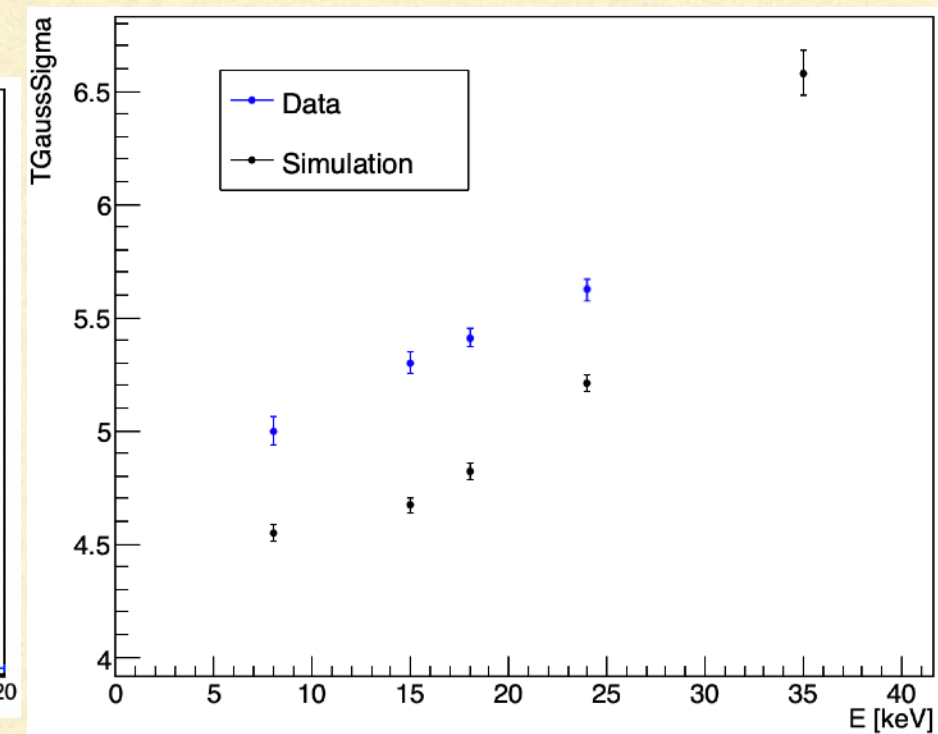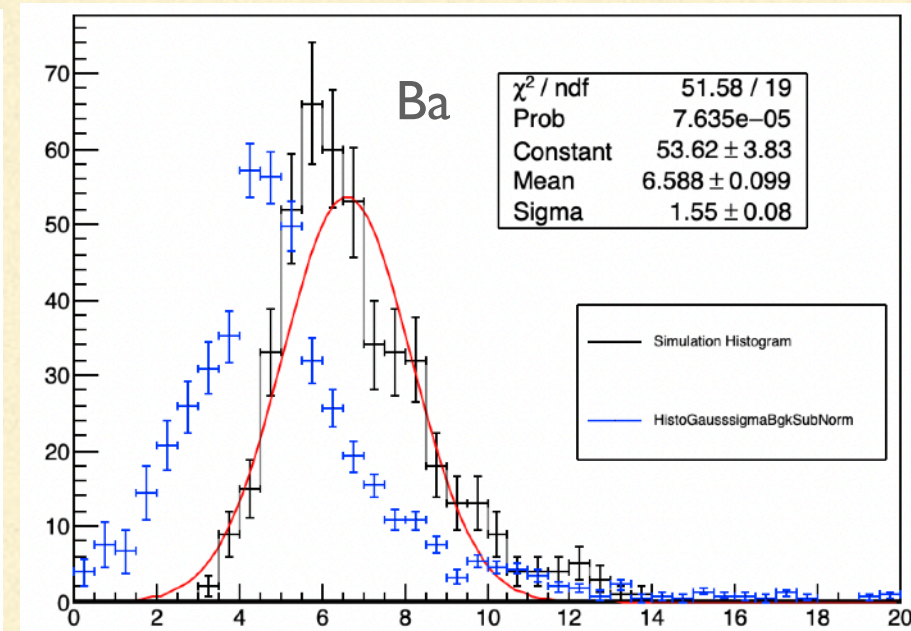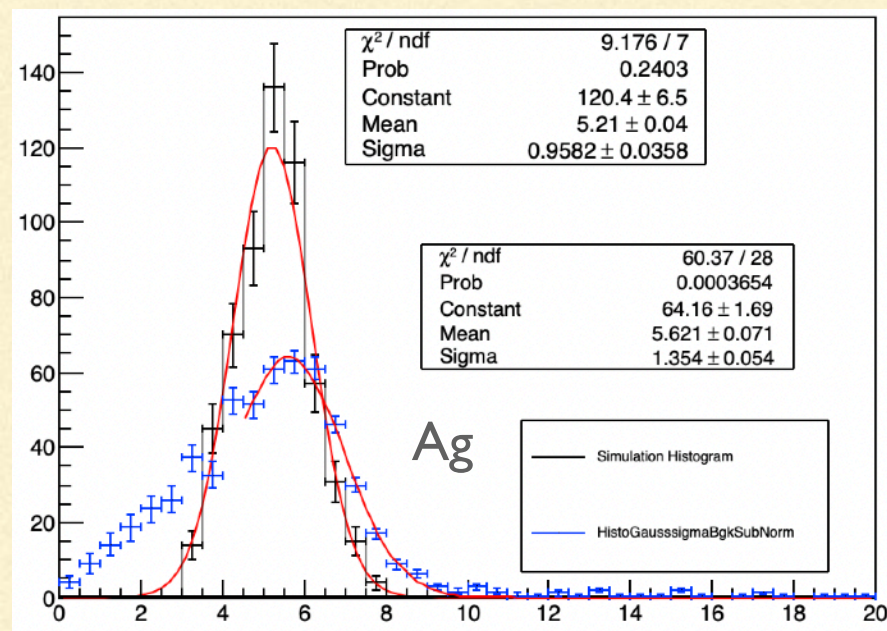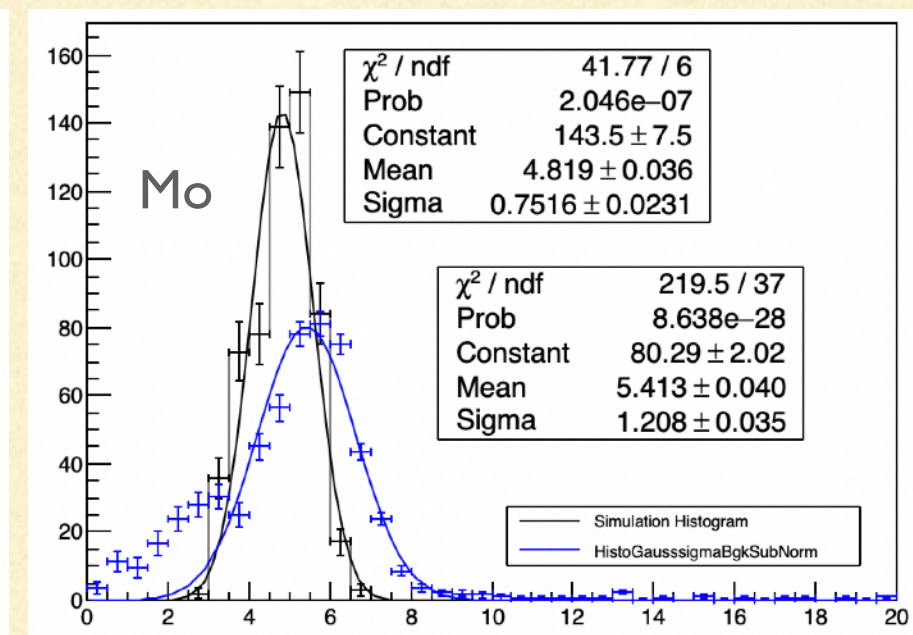Not constant: dx is 2D and rising Side of Bethe-Block

# TGaussMean



Cu

| χ² / ndf | 4.312 / 4 |
|---|---|
| Prob | 0.3654 |
| Constant | 209.3 ± 10.9 |
| Mean | 15.11 ± 0.10 |
| Sigma | 2.197 ± 0.069 |

| χ² / ndf | 47.91 / 27 |
|---|---|
| Prob | 0.007852 |
| Constant | 115.3 ± 8.8 |
| Mean | 15.53 ± 0.24 |
| Sigma | 2.975 ± 0.255 |

Rb

| χ² / ndf | 18.27 / 5 |
|---|---|
| Prob | 0.002623 |
| Constant | 196.1 ± 10.1 |
| Mean | 16.61 ± 0.10 |
| Sigma | 2.287 ± 0.068 |

| χ² / ndf | 125.6 / 27 |
|---|---|
| Prob | 1.135e-14 |
| Constant | 96.01 ± 3.31 |
| Mean | 17.07 ± 0.15 |
| Sigma | 3.667 ± 0.148 |

Mo

| χ² / ndf | 12.1 / 5 |
|---|---|
| Prob | 0.0335 |
| Constant | 186.8 ± 9.7 |
| Mean | 17.27 ± 0.11 |
| Sigma | 2.433 ± 0.075 |

| χ² / ndf | 304.4 / 27 |
|---|---|
| Prob | 0 |
| Constant | 84.45 ± 1.89 |
| Mean | 18.01 ± 0.13 |
| Sigma | 4.123 ± 0.117 |

Ag

| χ² / ndf | 6.357 / 10 |
|---|---|
| Prob | 0.7845 |
| Constant | 111.1 ± 6.0 |
| Mean | 18.85 ± 0.11 |
| Sigma | 2.485 ± 0.087 |

| χ² / ndf | 68.98 / 36 |
|---|---|
| Prob | 0.0007689 |
| Constant | 38.94 ± 0.89 |
| Mean | 18.67 ± 0.20 |
| Sigma | 4.901 ± 0.157 |

Ba

| χ² / ndf | 41.91 / 22 |
|---|---|
| Prob | 0.00641 |
| Constant | 41.25 ± 2.85 |
| Mean | 22.74 ± 0.25 |
| Sigma | 4.12 ± 0.21 |

| χ² / ndf | 14.75 / 10 |
|---|---|
| Prob | 0.1413 |
| Constant | 27.32 ± 1.10 |
| Mean | 13.84 ± 0.22 |
| Sigma | 4.505 ± 0.274 |

Cu Peak

Barium here?

# TGaussSigma
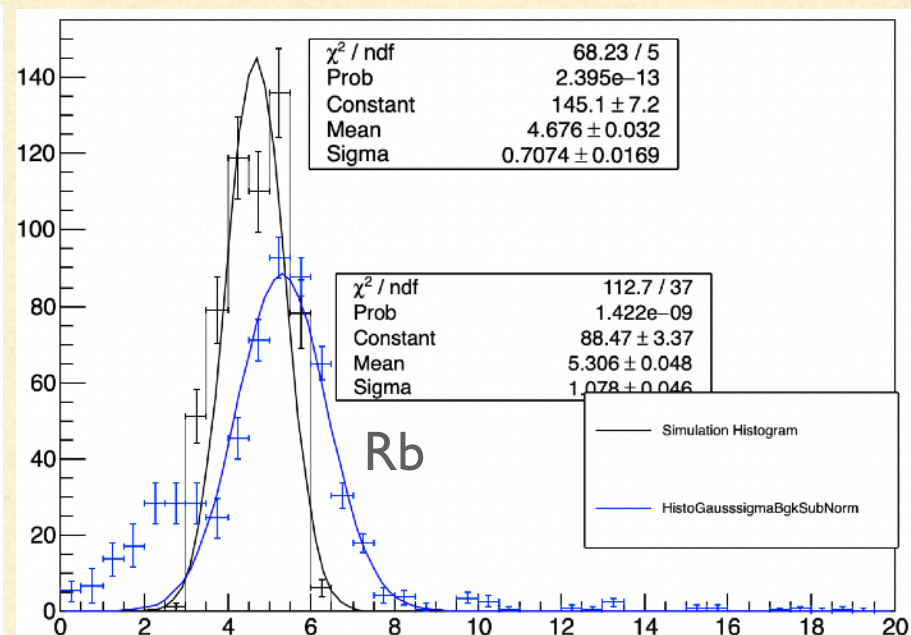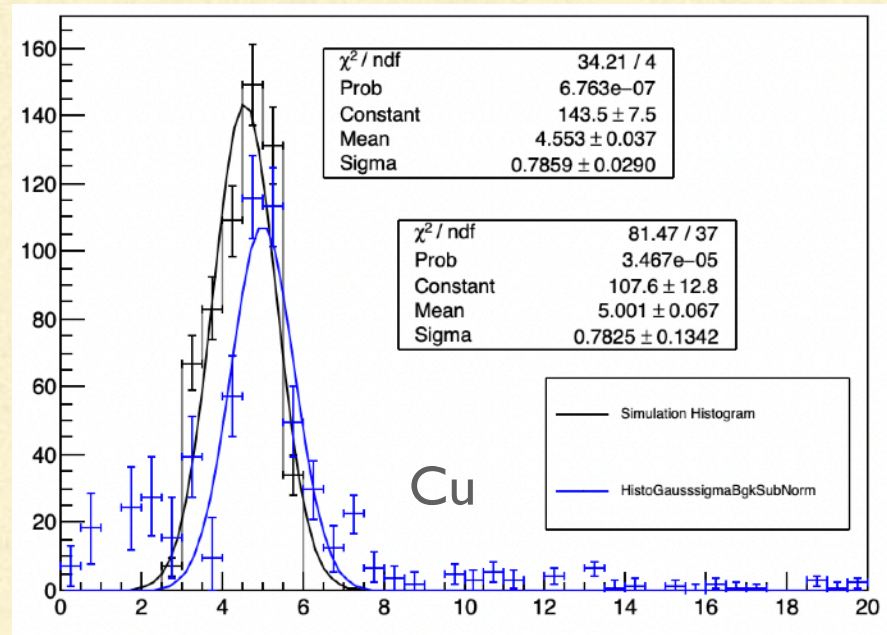
# Nhits
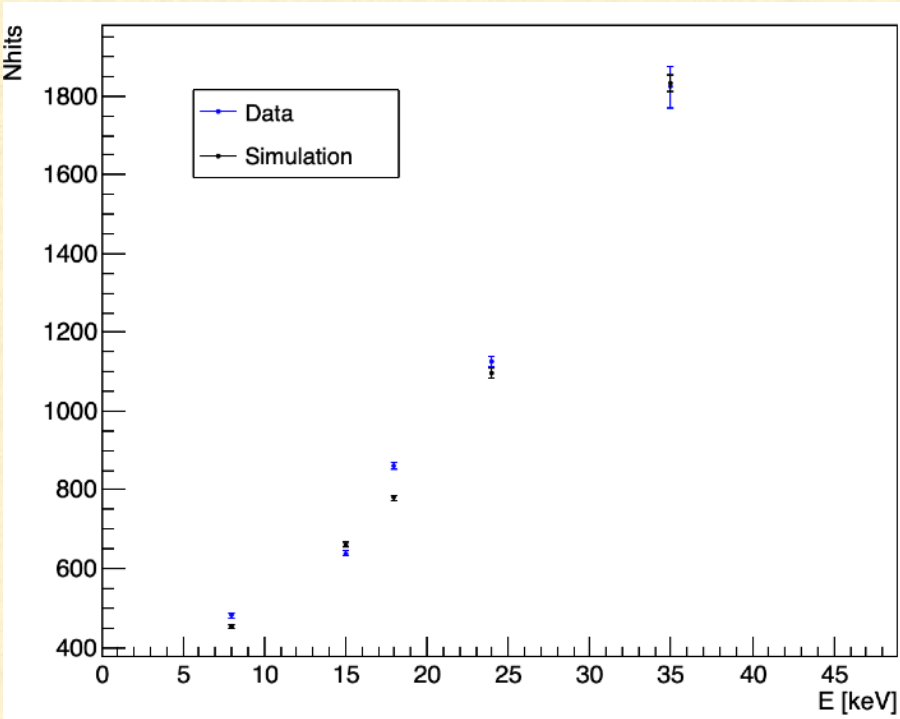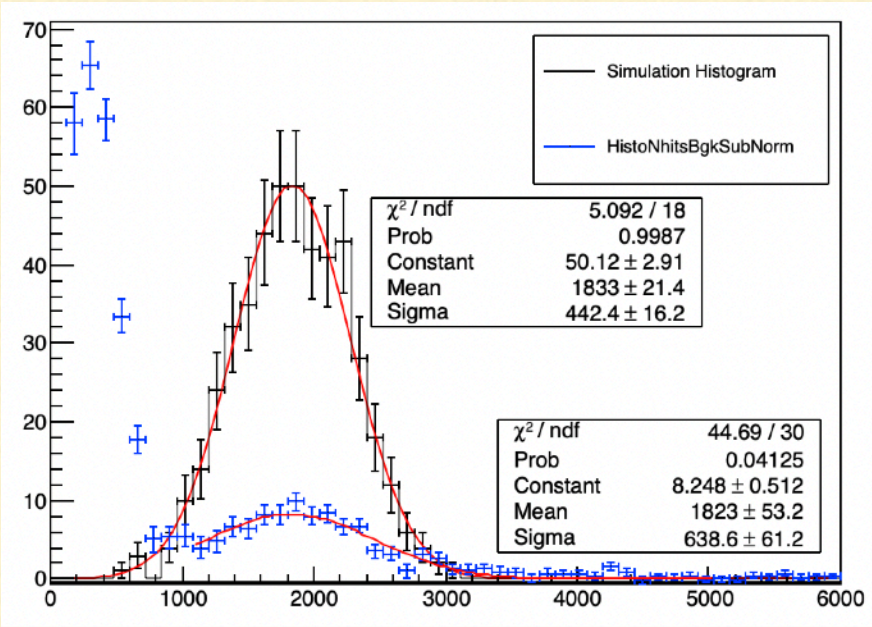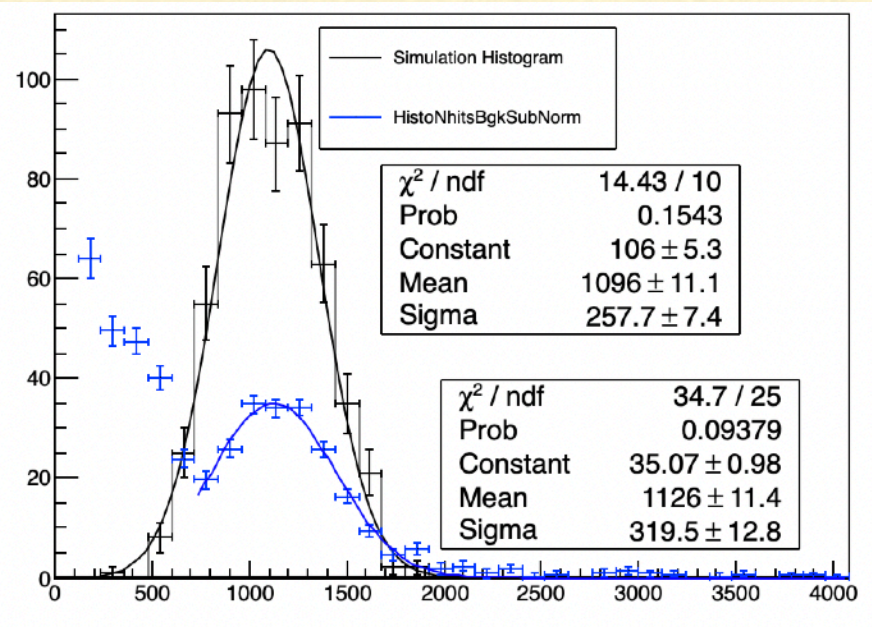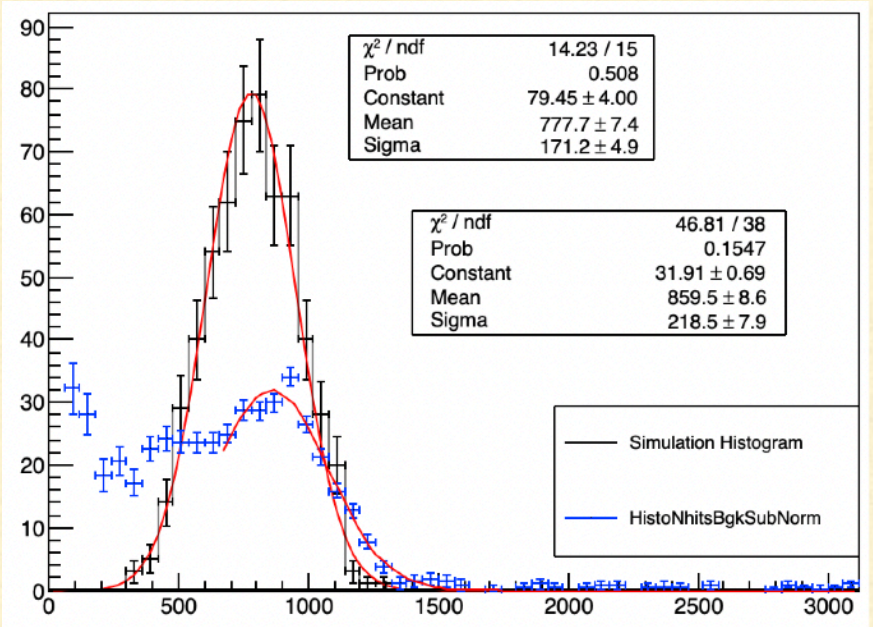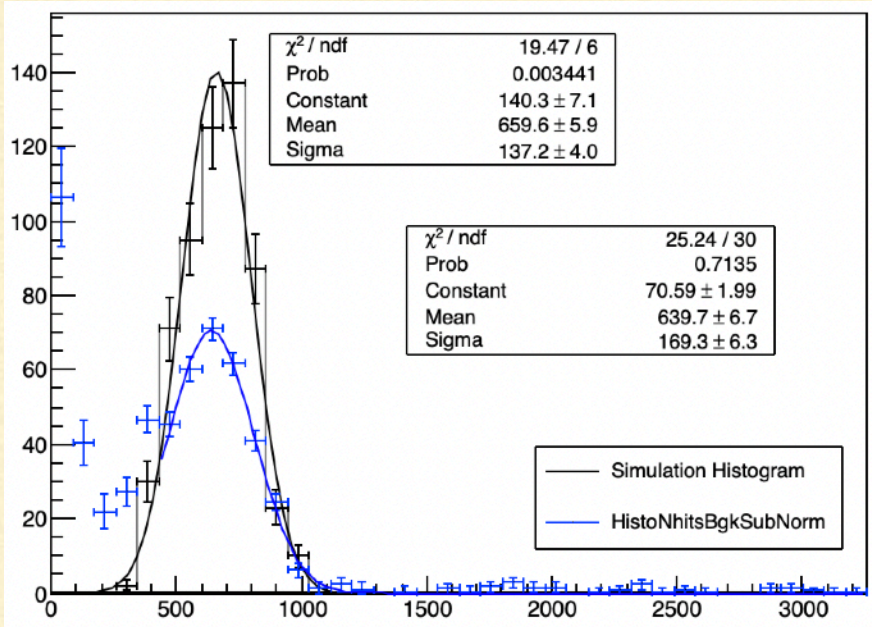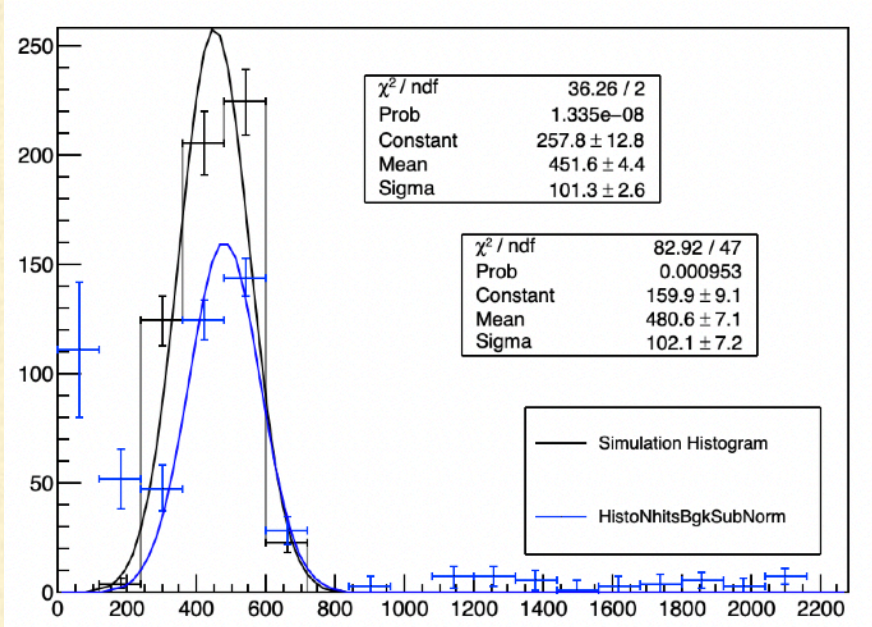
# Size
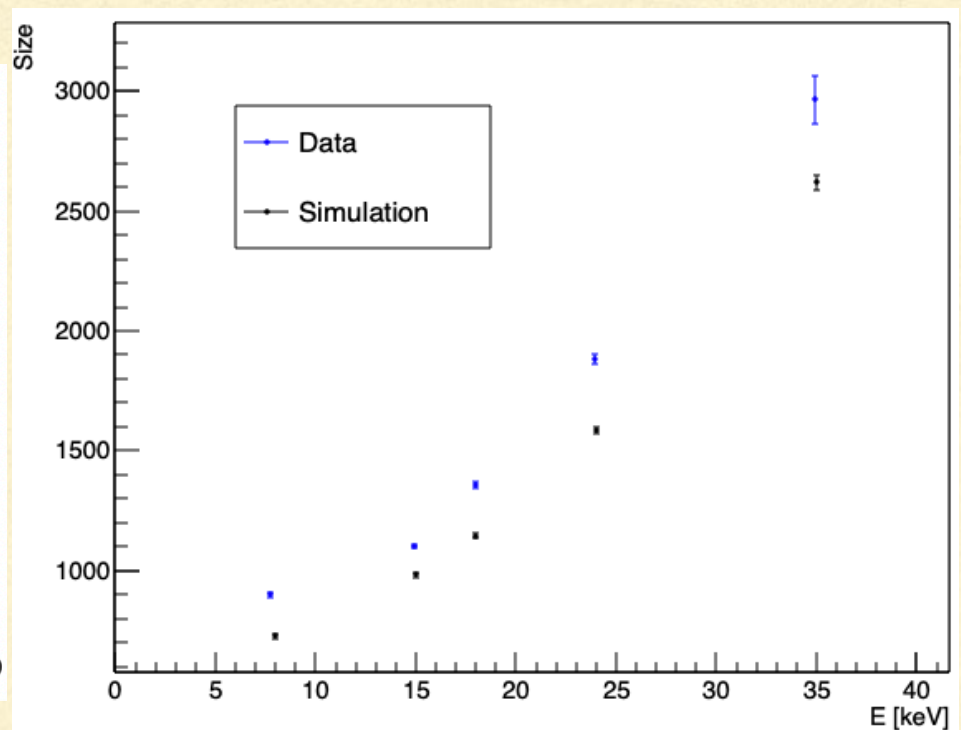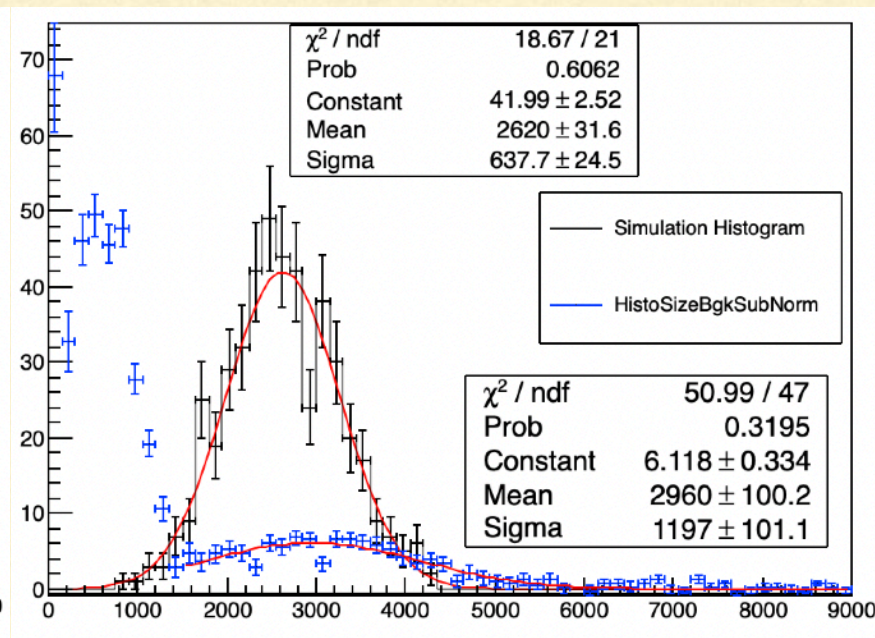


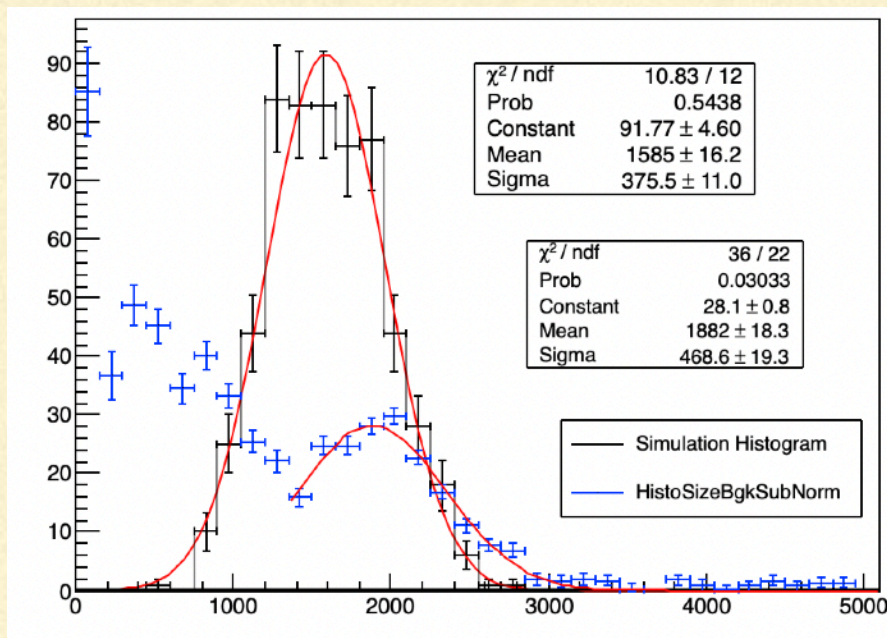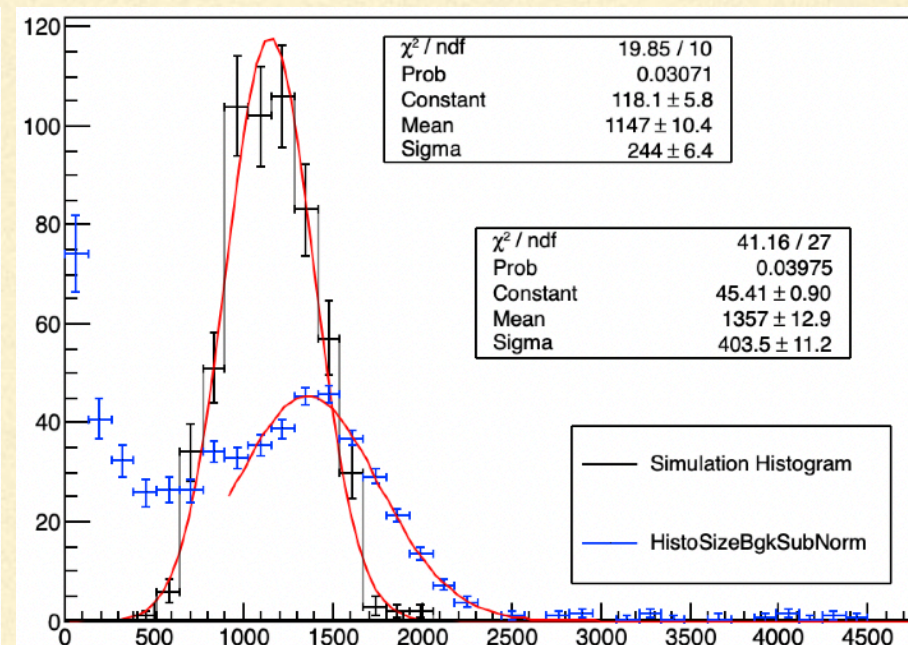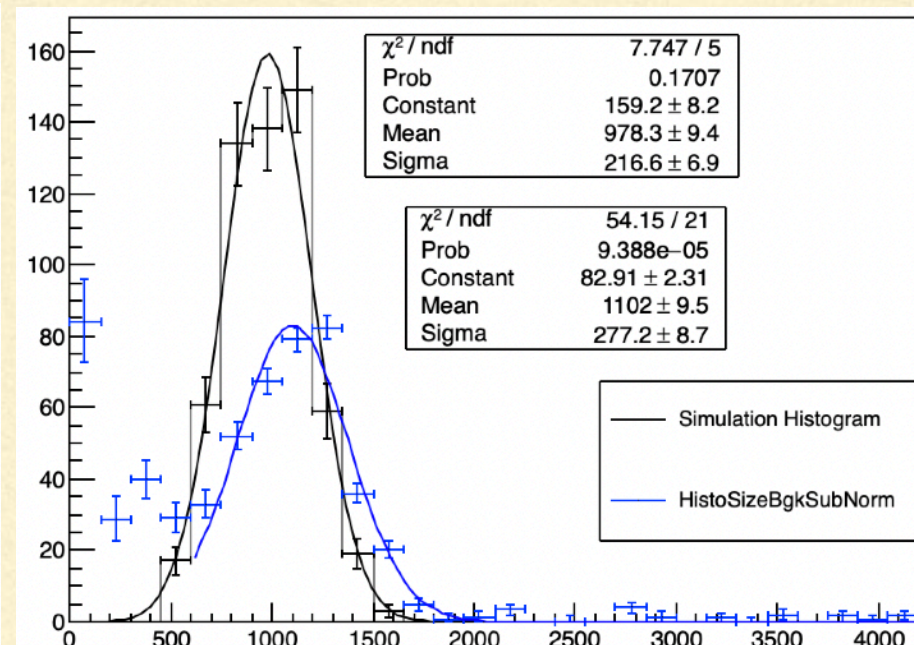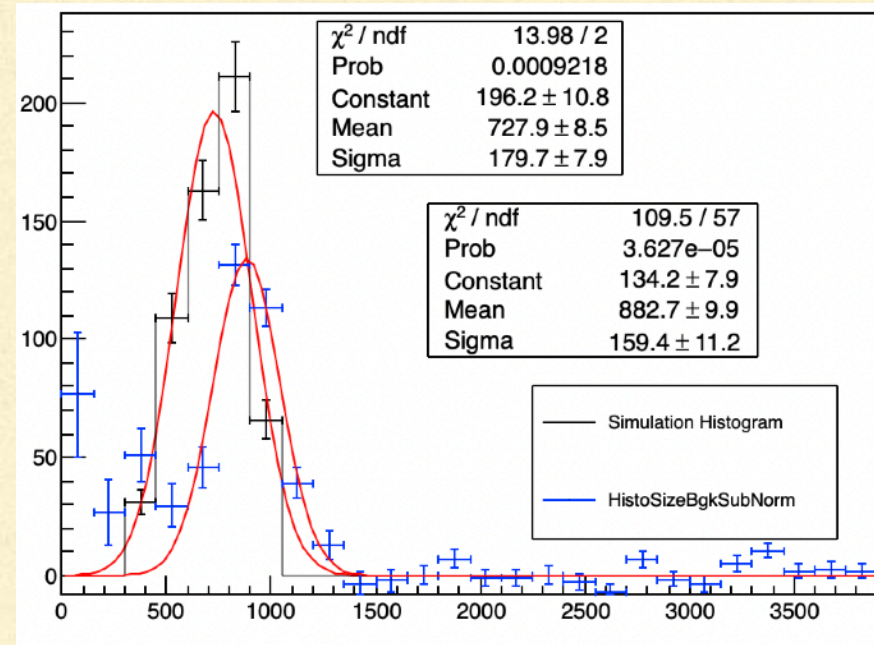Differente noise tra dati e simulazione?

# Recap. and conclusions

- Data and MC comparison shows:

<table>
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<td>

- Agreement in:
    - Nhits
    - TGausMean

Diffusion is well simulated?

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- Fine-tune needed in:
    - Lenght
    - Width
    - TGaussSigma
    - Size

Possible relation with a different pedestal in simulation?

Non uniform z distribution?

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- To improve:
    - Linearity
    - EResolution (to be confermed)
    - Light density
    - Specific ionization

Connected with the saturation?

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