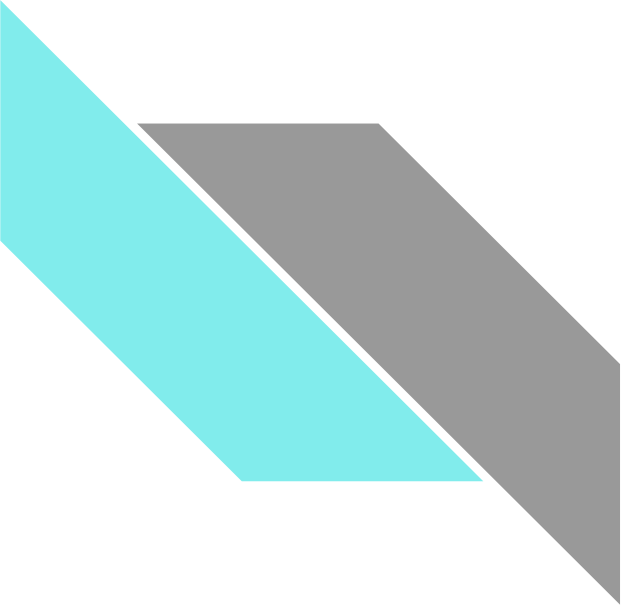




Back-scattering study in TB16: Status report

Bohdan Dudar

20.08.2020

Outline

1

Changes to code & control plots

2

Back-scattering analysis

3

Electron/photon identification study

Changes to Geant4 simulation

Before:

Geant4 simulation

- Electronic noise smearing
- Calorimeter efficiency

Analysis code

- Geometrical selection
- Bad pads
- Clustering

Changes to Geant4 simulation

After:

Geant4 simulation

- Trigger simulation (new)



Analysis code

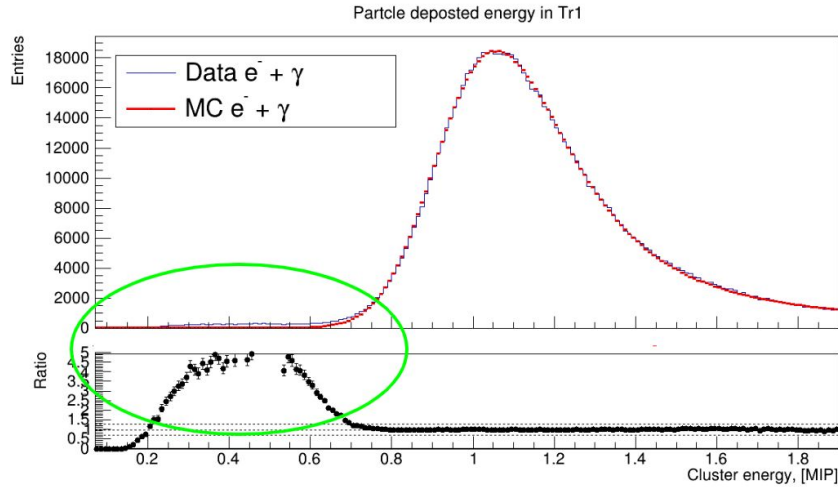
- Electronic noise smearing
- Calorimeter efficiency
- Geometrical selection
- Bad pads
- Clustering

Why to do all of this?

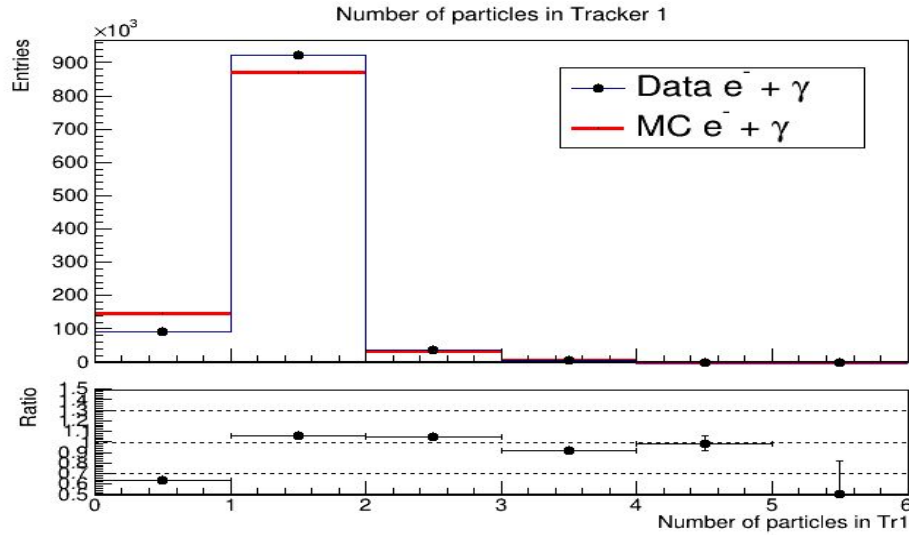


Why to do all of this?

Deposited energy in the trackers is in disagreement

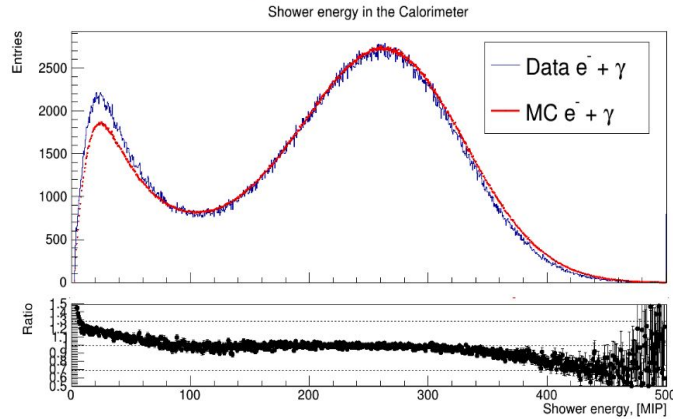


Why to do all of this?



Why to do all of this?

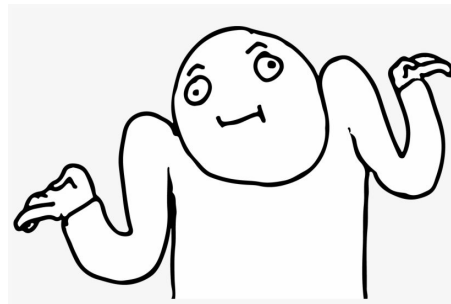
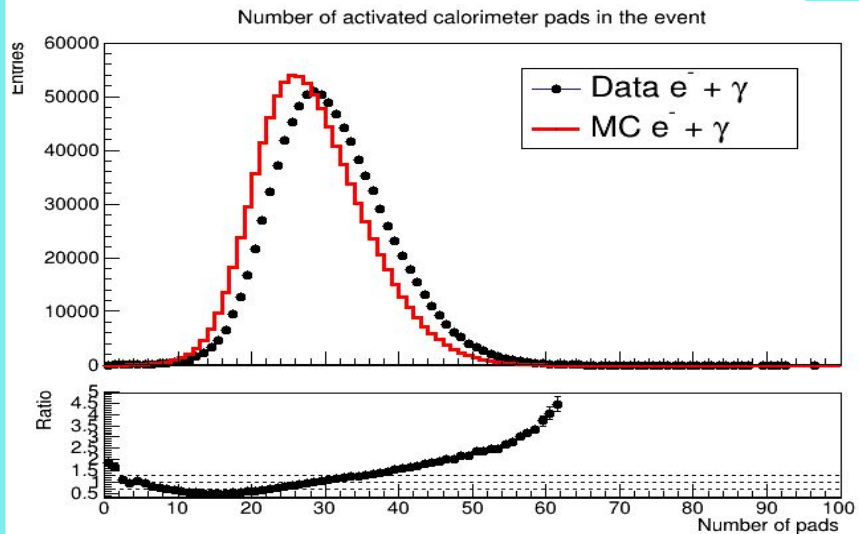
Control plots: Energy of the showers for the calorimeter



Data shows more low energy showers



Why to do all of this?



Changes to Geant4 simulation

After:

Geant4 simulation

- Trigger simulation (new)



Analysis code

- Electronic noise smearing
- Calorimeter efficiency
- Geometrical selection
- Bad pads
- Clustering

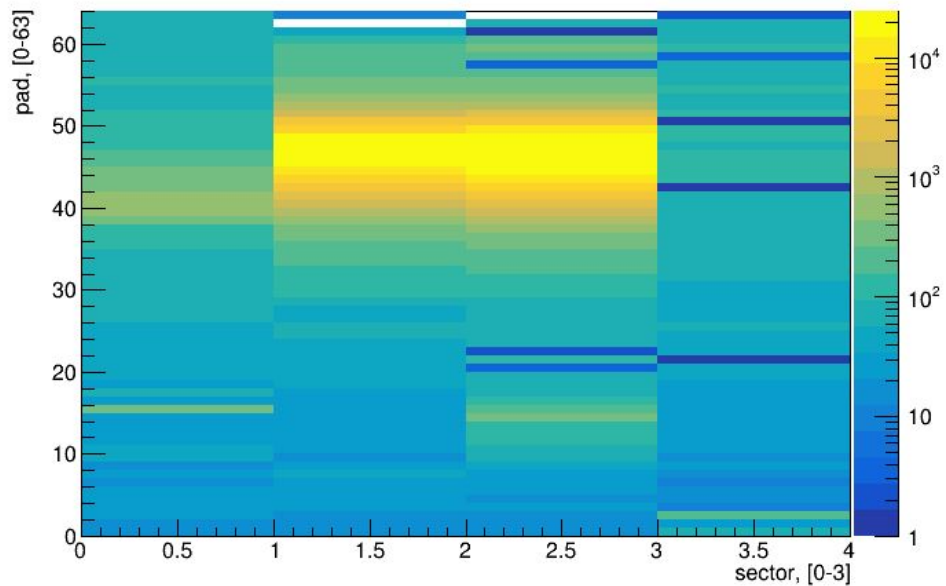
Control plots

Before control plots

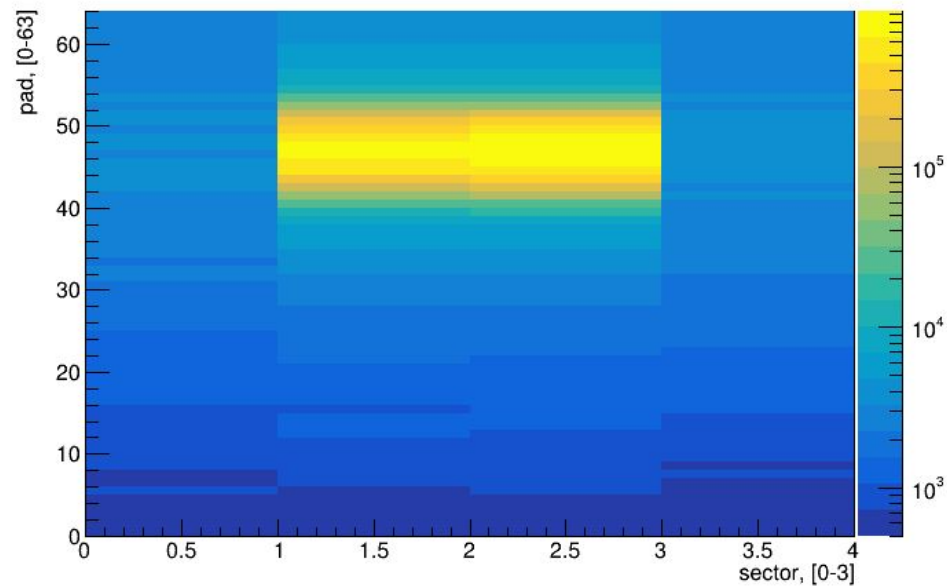
- Apply geometry cuts
- Add noise energy smearing to MC
- Add calorimeter efficiency to MC

And here is why:

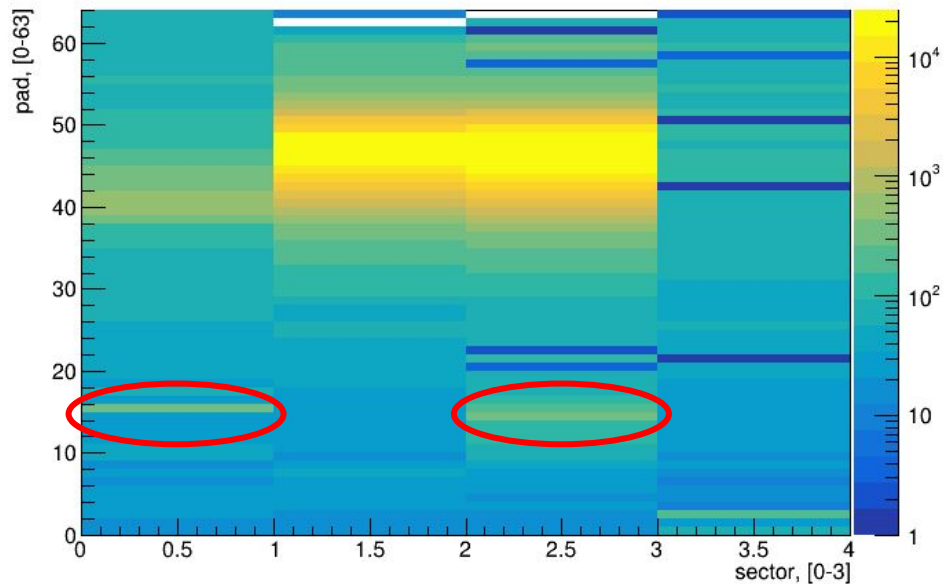
Data: hit map in tracker 1



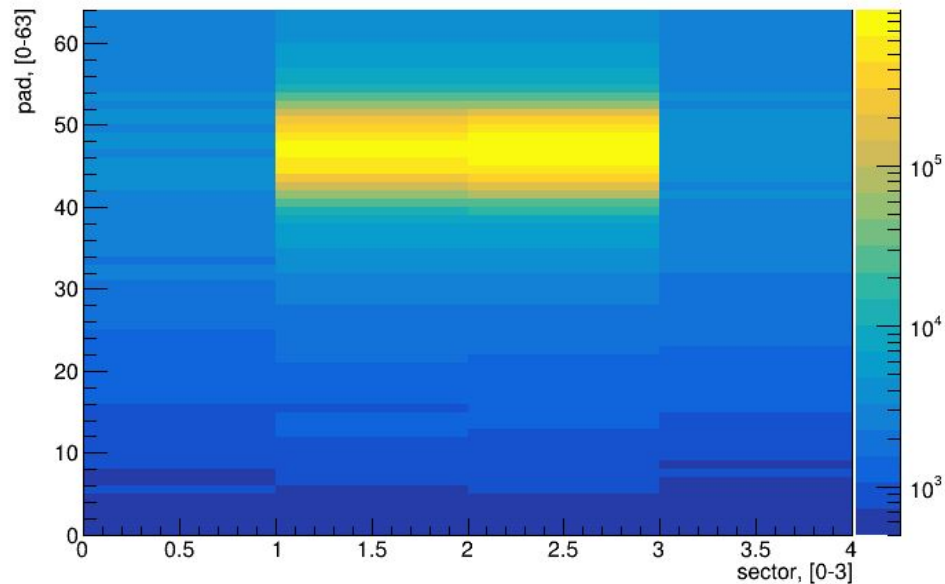
MC: hit map in tracker 1



Data: hit map in tracker 1



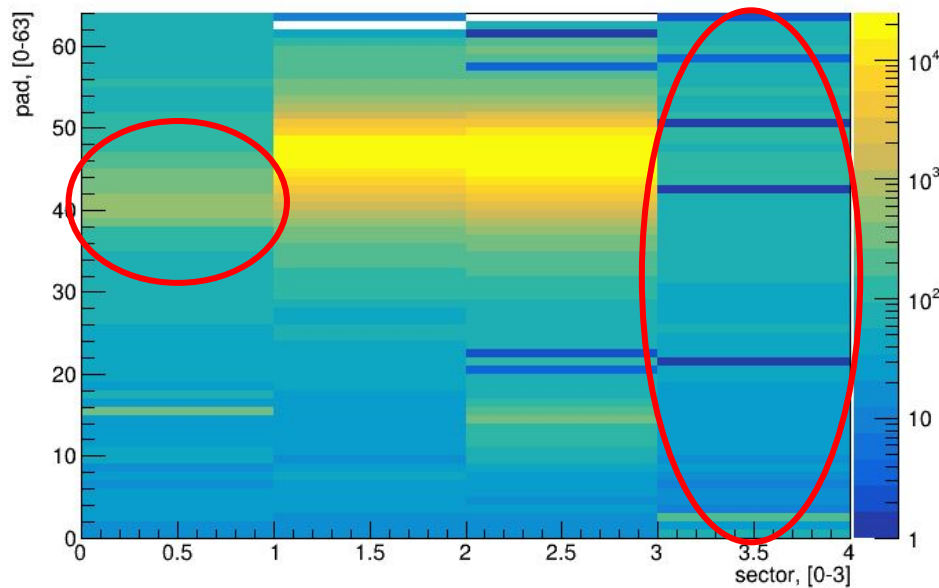
MC: hit map in tracker 1



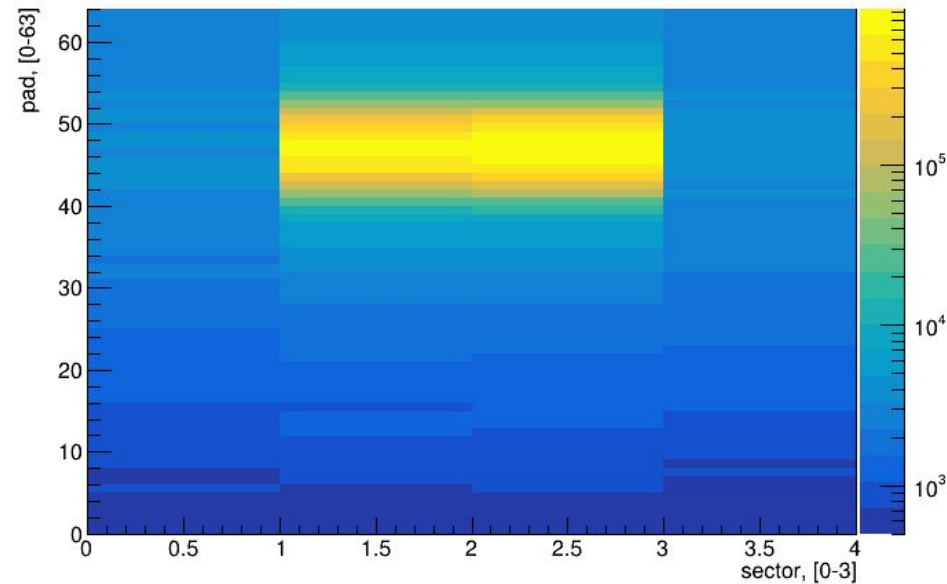
Cross-talk creates fake hits in lower area of a sensor.

MC doesn't reproduce it

Data: hit map in tracker 1



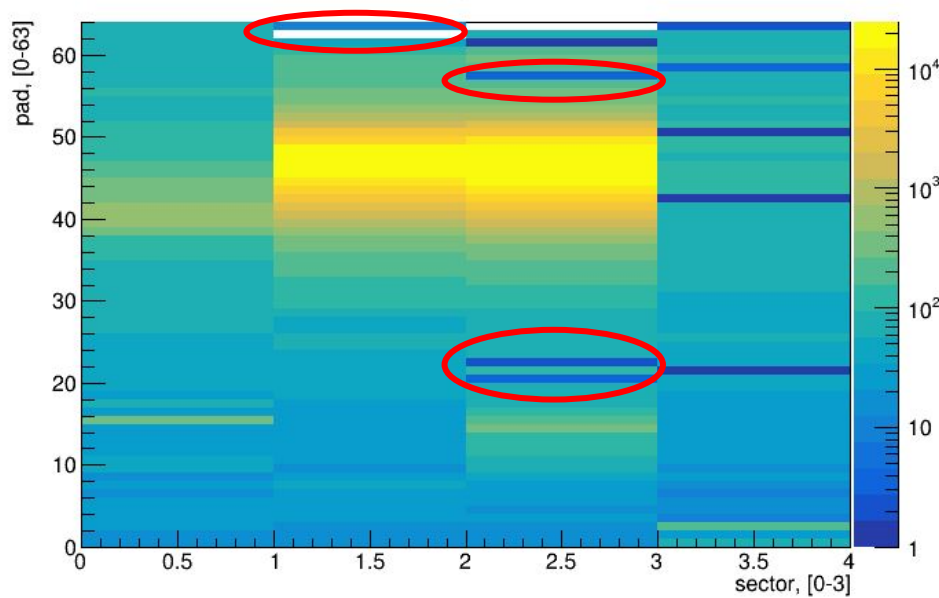
MC: hit map in tracker 1



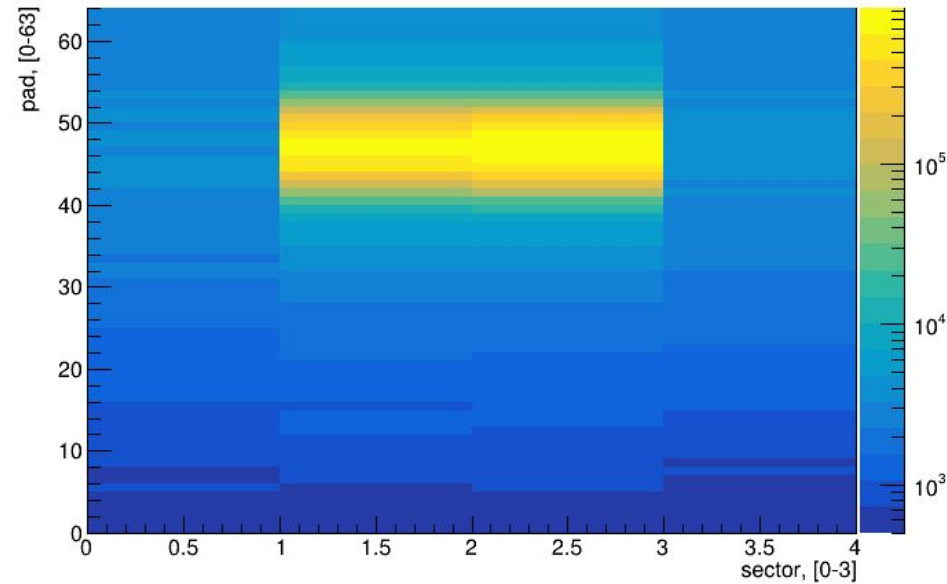
Side sectors have low statistic and aren't regions of interest.

MC agreement is bad, because precise beam shape simulation is needed

Data: hit map in tracker 1



MC: hit map in tracker 1



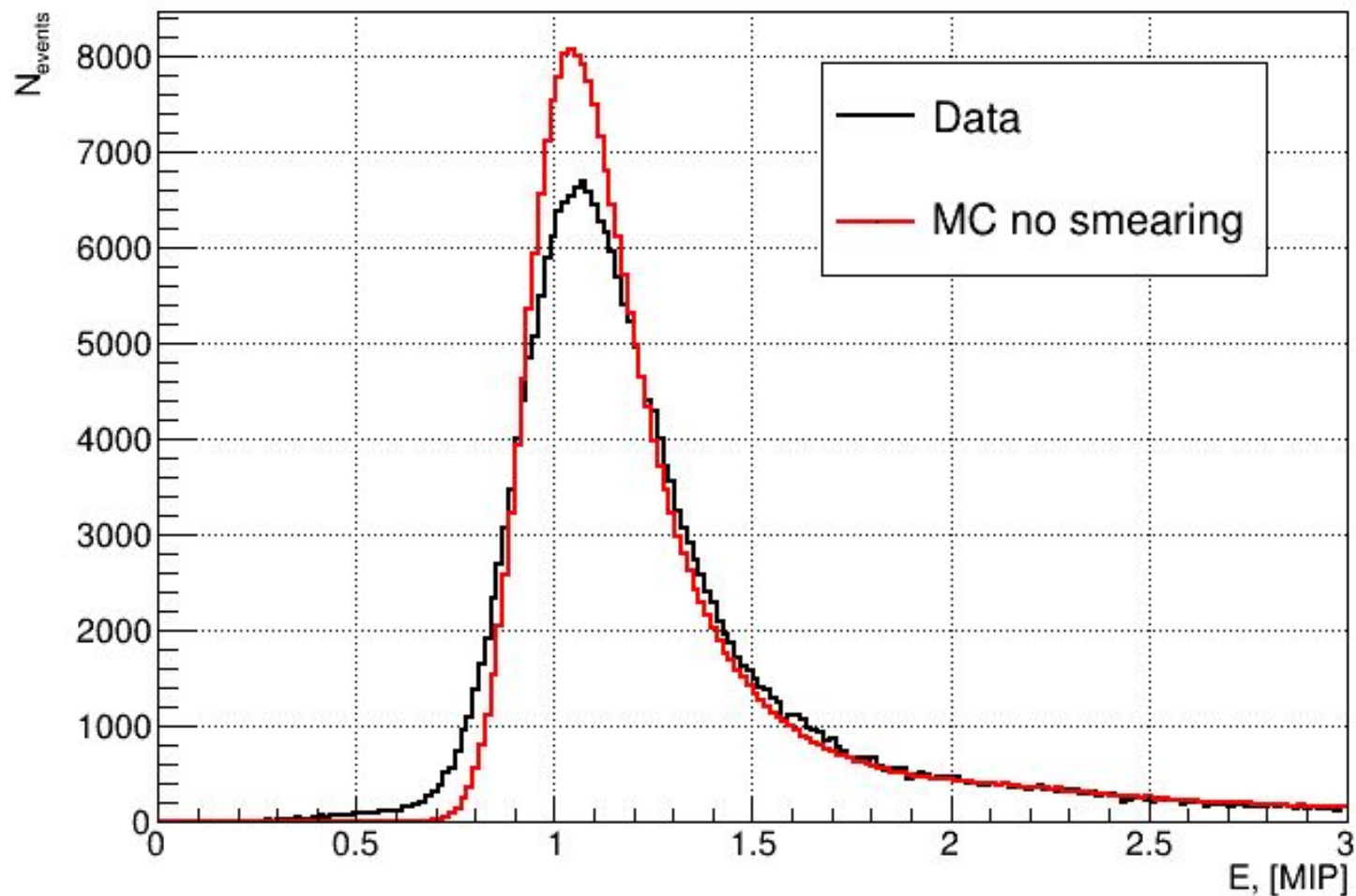
Bad/grounded channels are not simulated in MC.

So they are removed from both data and MC in the analysis for better agreement

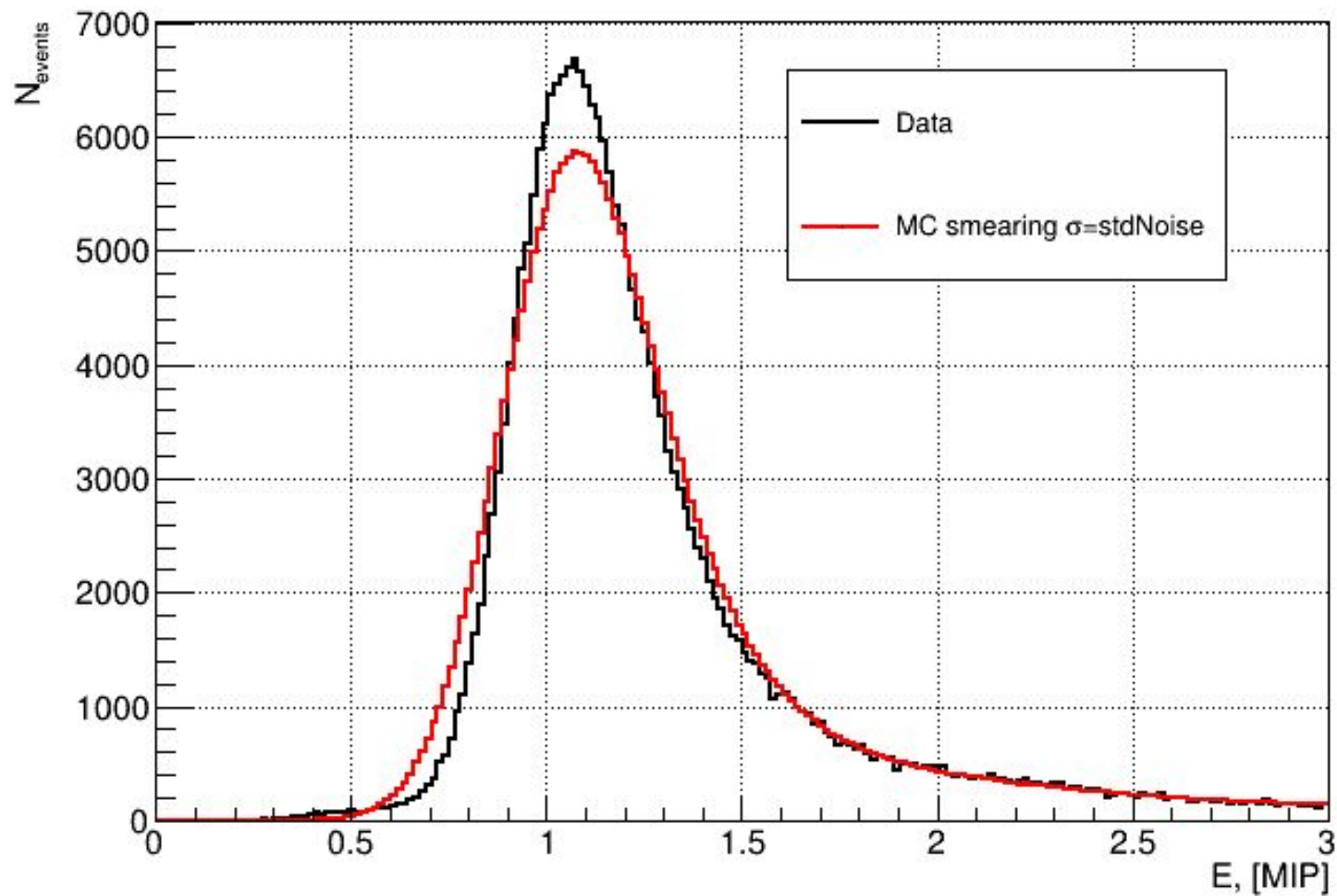
Geometry cuts

- Exclude pads < 20 — to avoid cross-talk
- Exclude side sectors — not region of interest. To properly simulate needs precise beam shape information
- Exclude bad pads

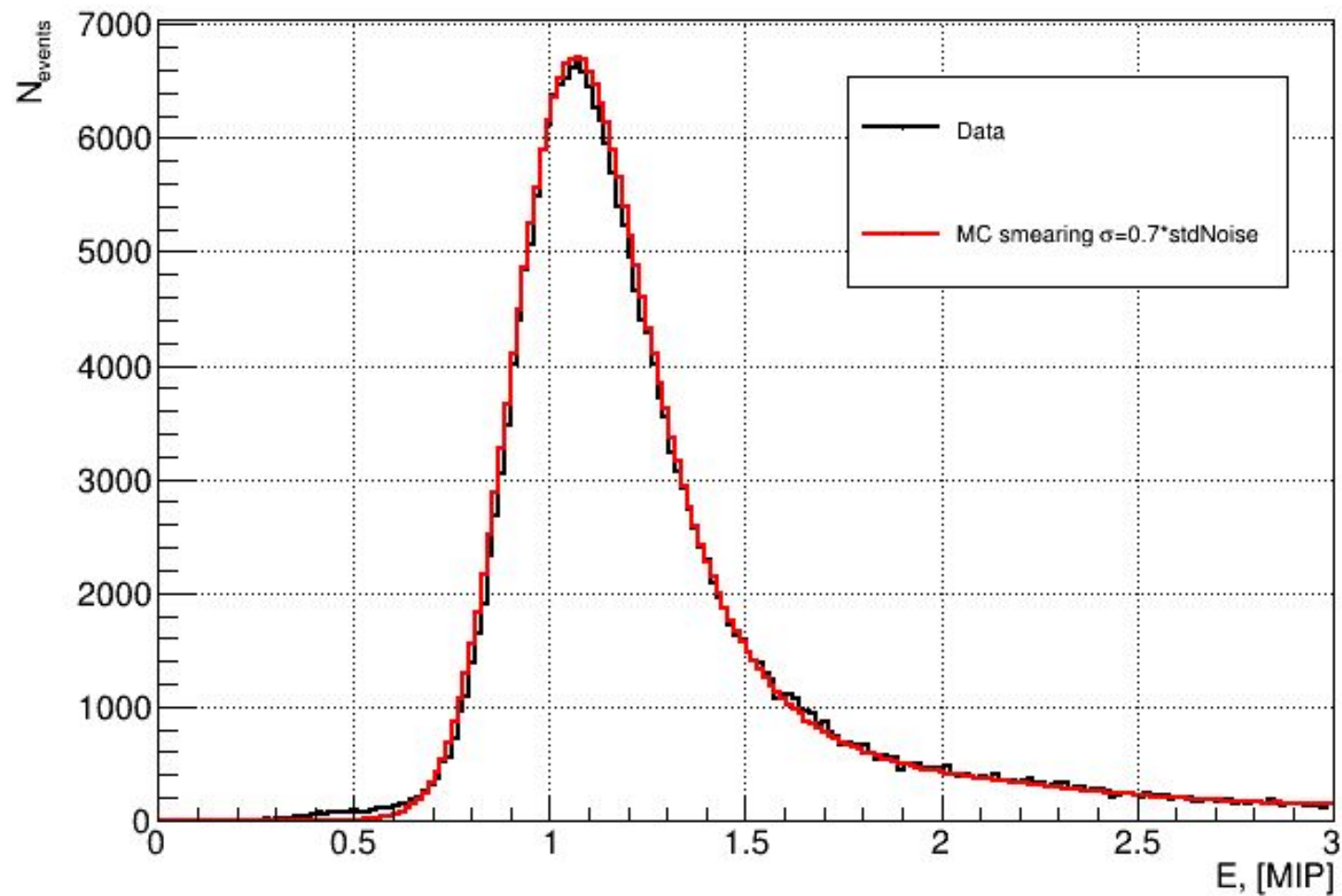
Deposited energy in the 1st tracker



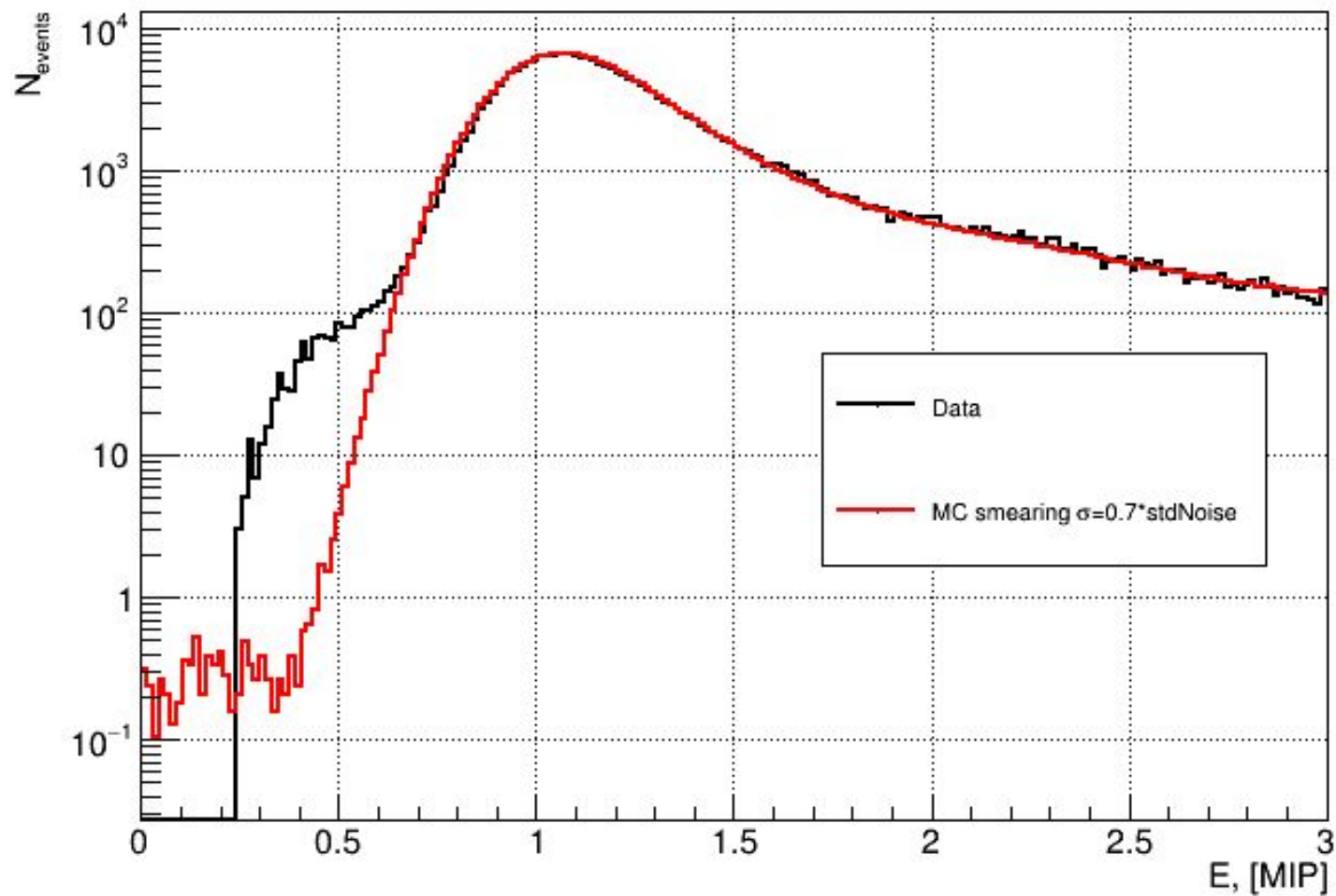
Deposited energy in the 1st tracker



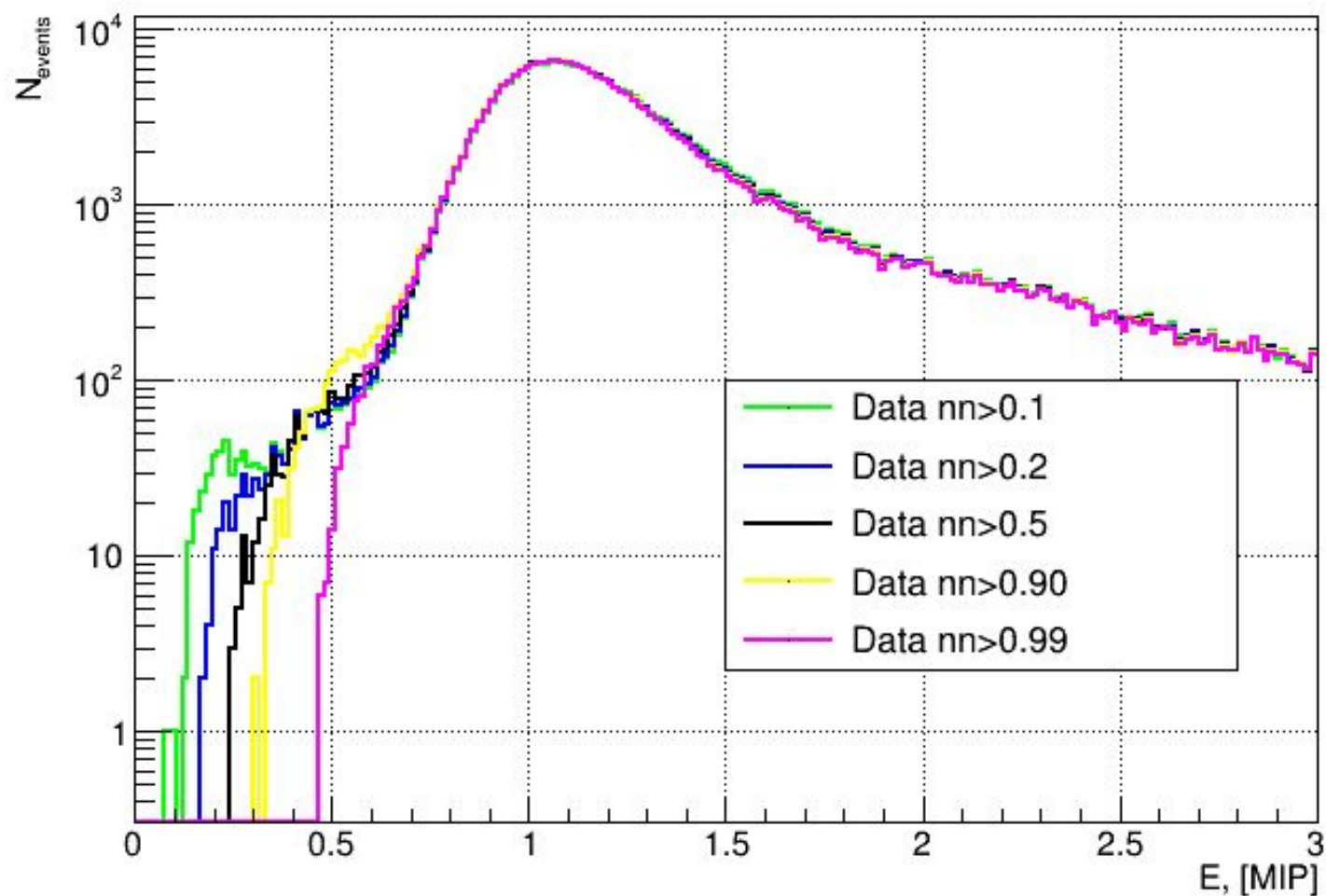
Deposited energy in the 1st tracker



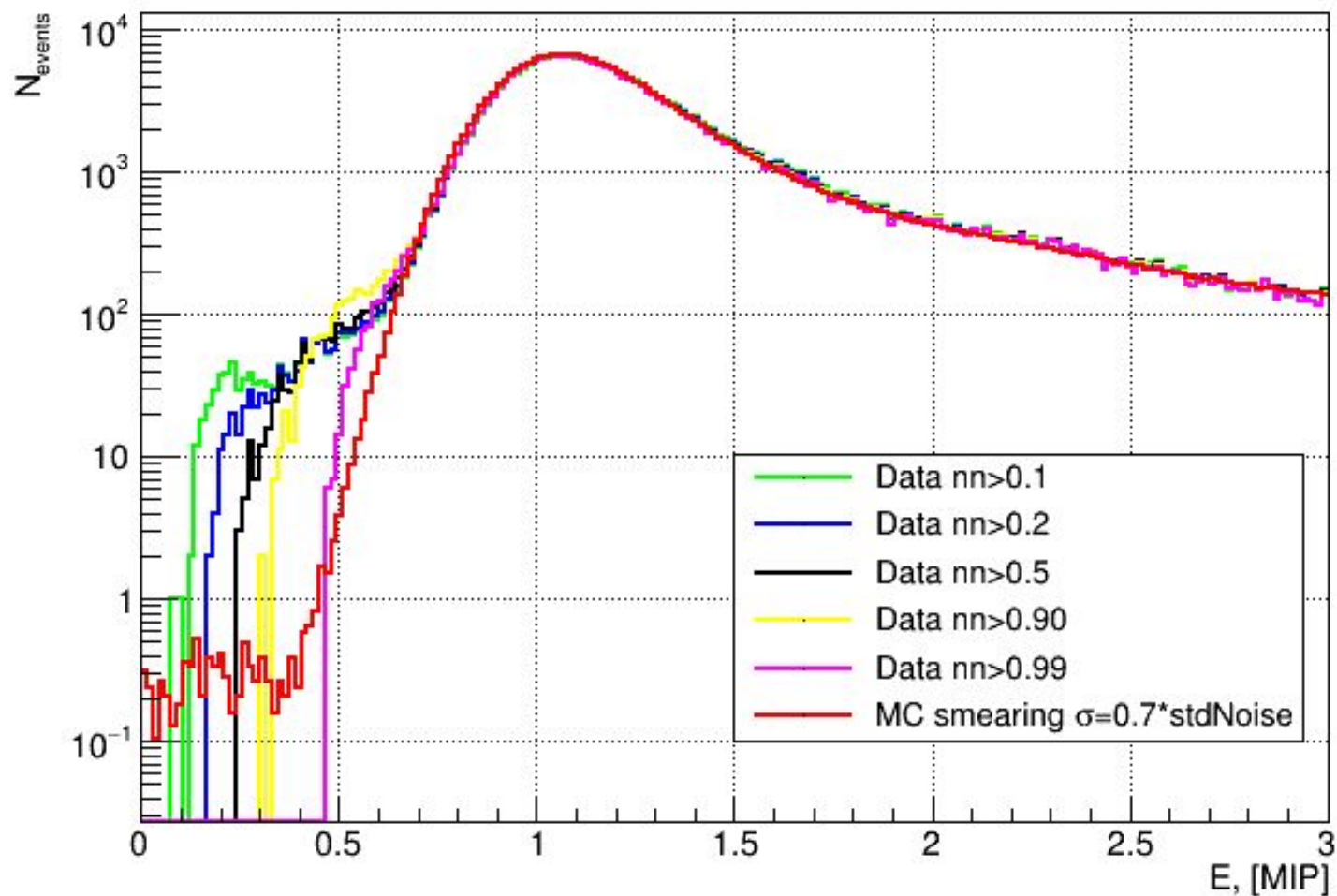
Deposited energy in the 1st tracker



Deposited energy in the 1st tracker



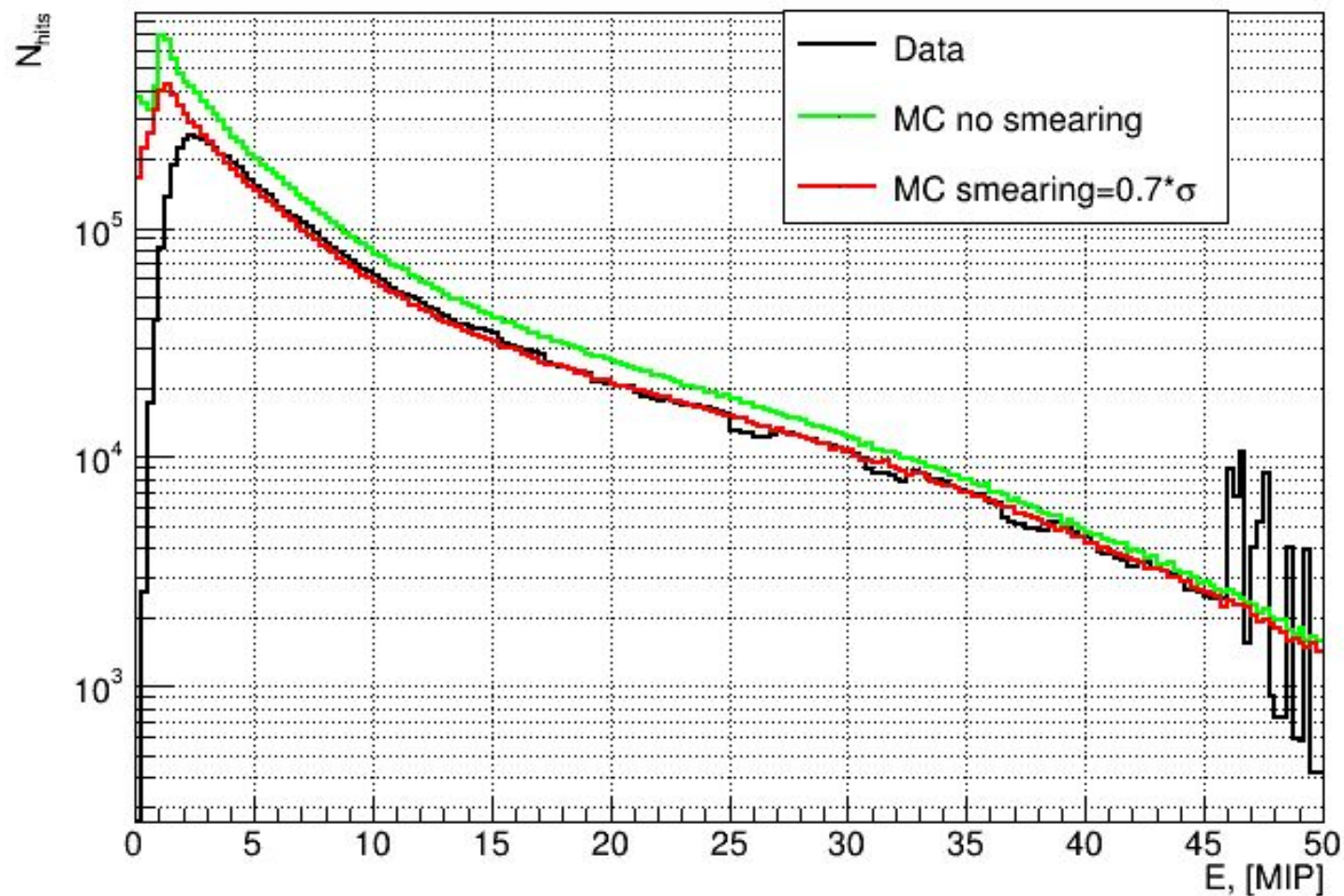
Deposited energy in the 1st tracker



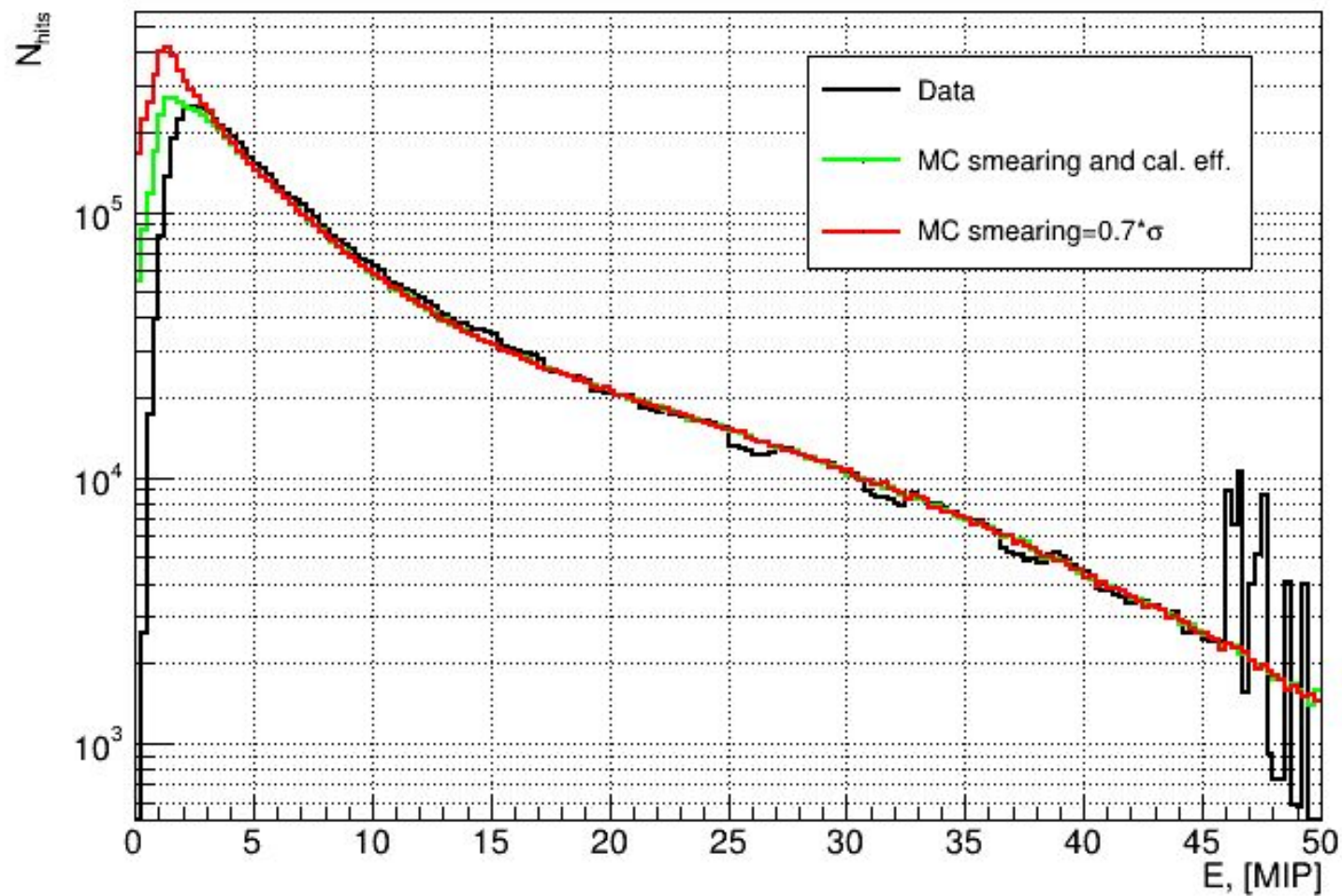
Energy smearing

- Data and MC disagree at energies lower than 0.7 MIP. This is probably problem with APV rather than Geant4. This can be checked with FLAME data.
- 0.7 of recorded APV noise sigma was used. Why 0.7 is the best match — unclear.

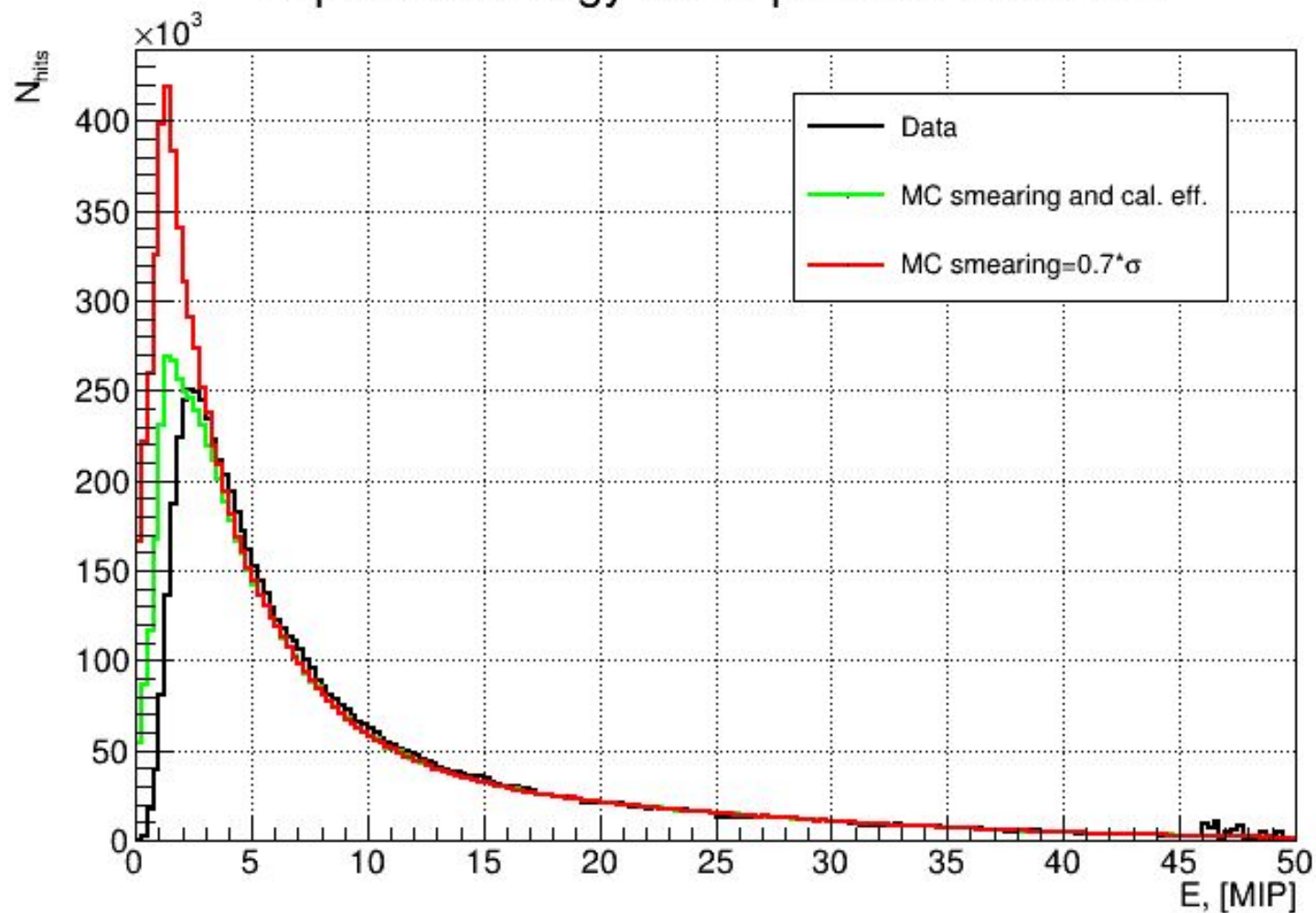
Deposited energy in the pads of calorimeter



Deposited energy in the pads of calorimeter



Deposited energy in the pads of calorimeter



To be continued...

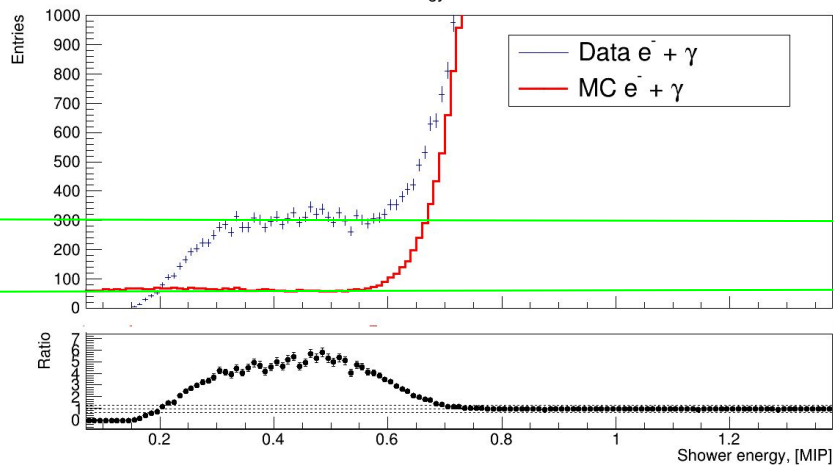
- Improved control plots
- Back-scattering numbers and plots for electron runs
- Identification efficiency without bad pads influence

BACK UP

Plotting only 1st clusters vs all clusters

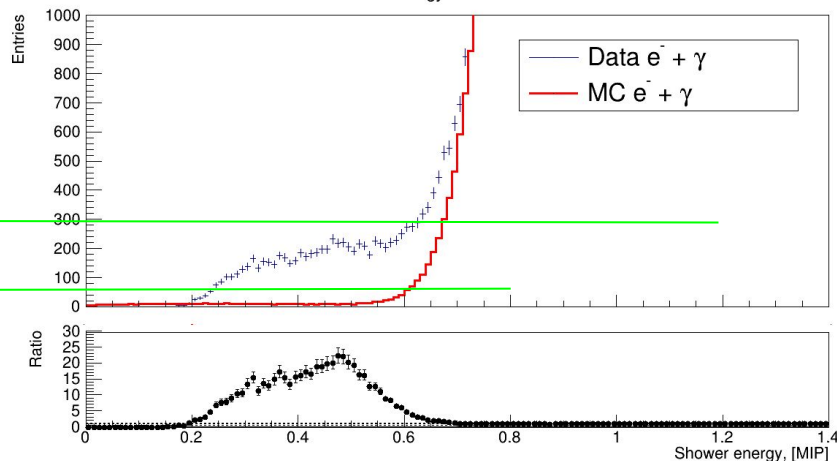
All clusters

Shower energy in the Calorimeter



Only 1st clusters

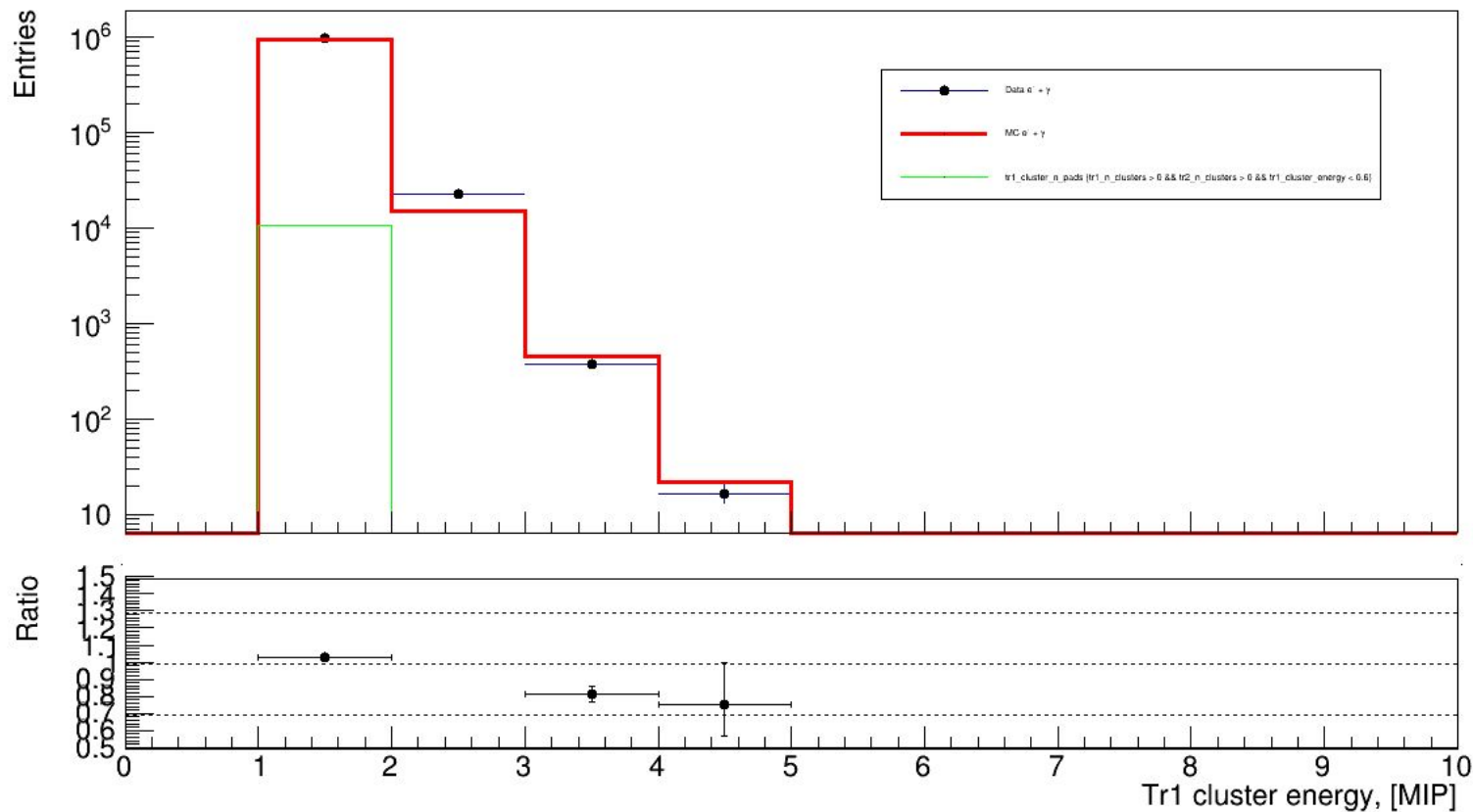
Shower energy in the Calorimeter



Therefore: low-energy hits are primary electrons

Low-energy hits consist only of 1 pad (not energy sharing)

Tr1 cluster energy



Position of the low-energy hits correlated to the shower

Position check of weird clusters in Tracker1

