

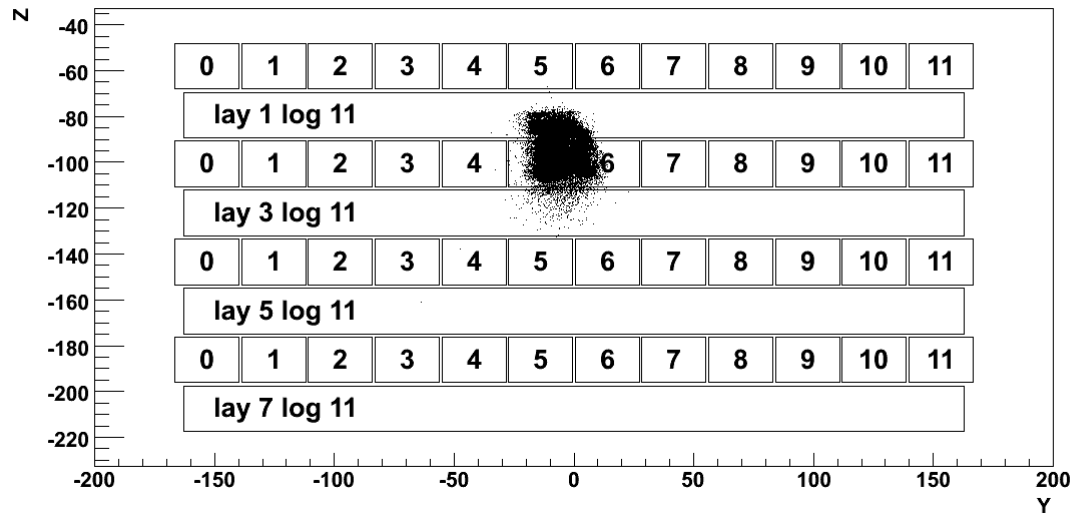
# Analysis of the run 700001951 (cont.)

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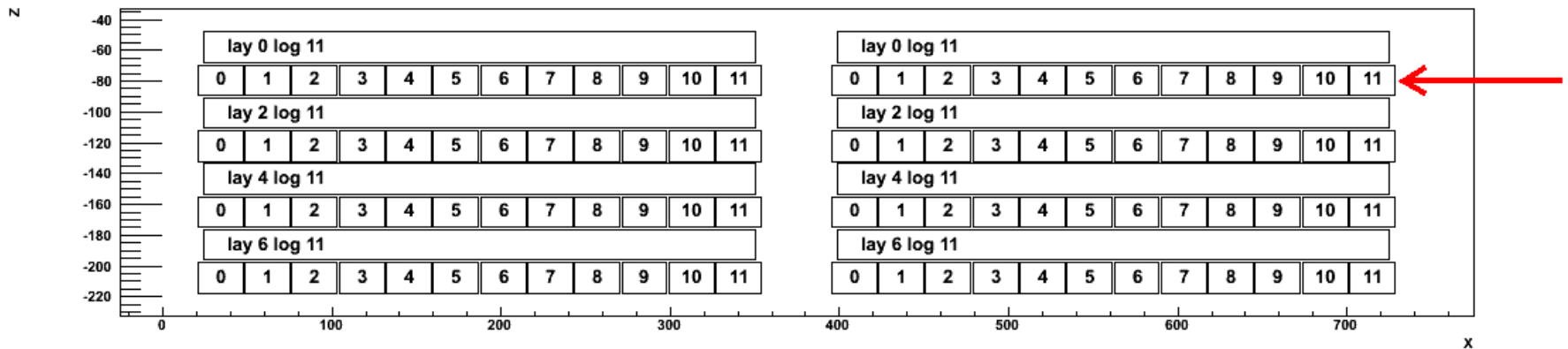
- Use the new simulated run BT-1951
  - Last week the simulation was done without beamtest06
- Looking at the longitudinal development in odd layers

# Run 700001951 : 282 GeV, 90 deg

Tower 3 side view

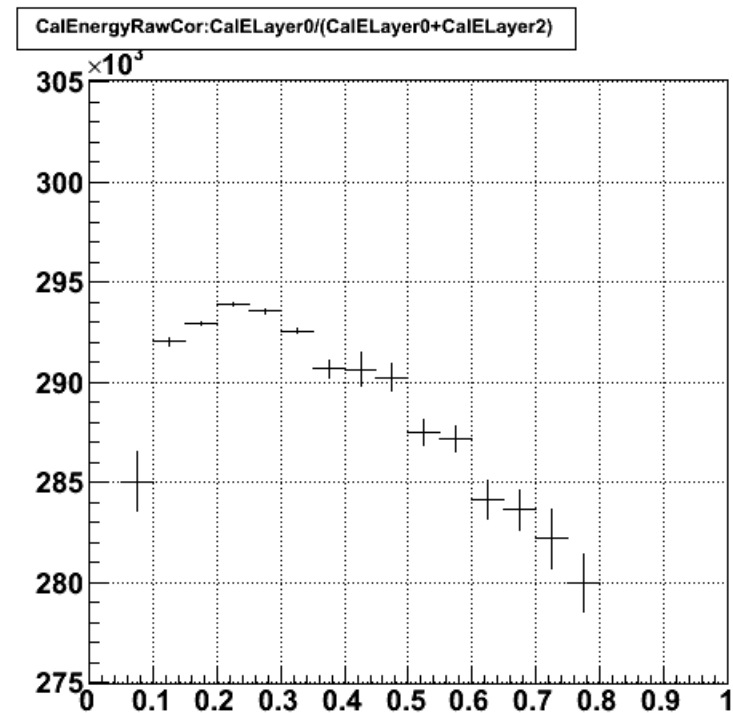
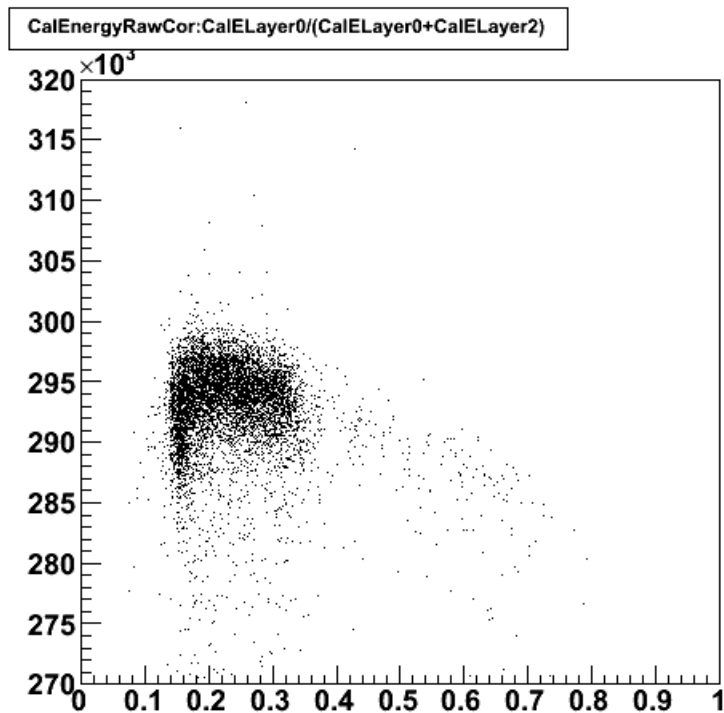


Tower 2 and 3 XZ view



# Corrected CalEnergyRaw (reminder)

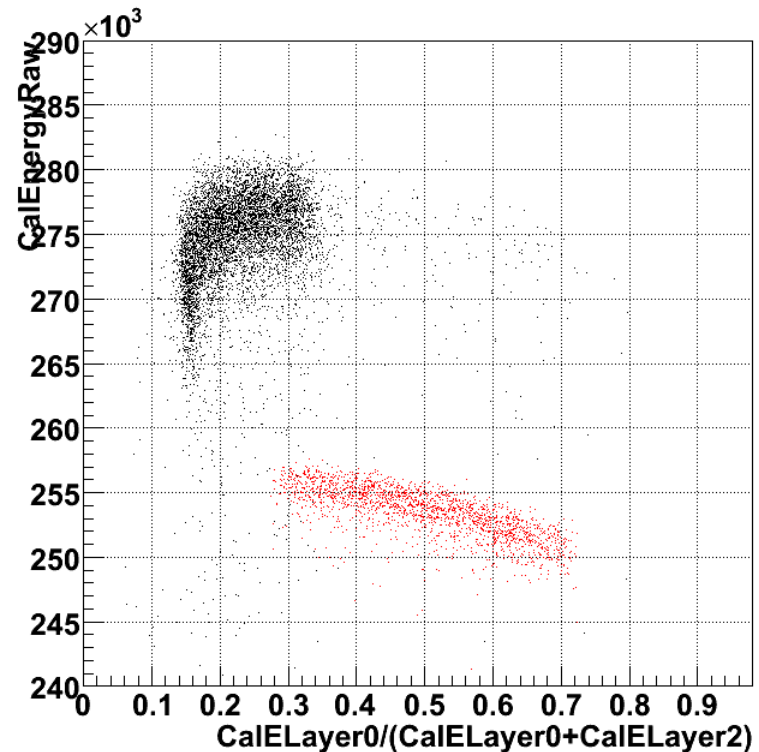
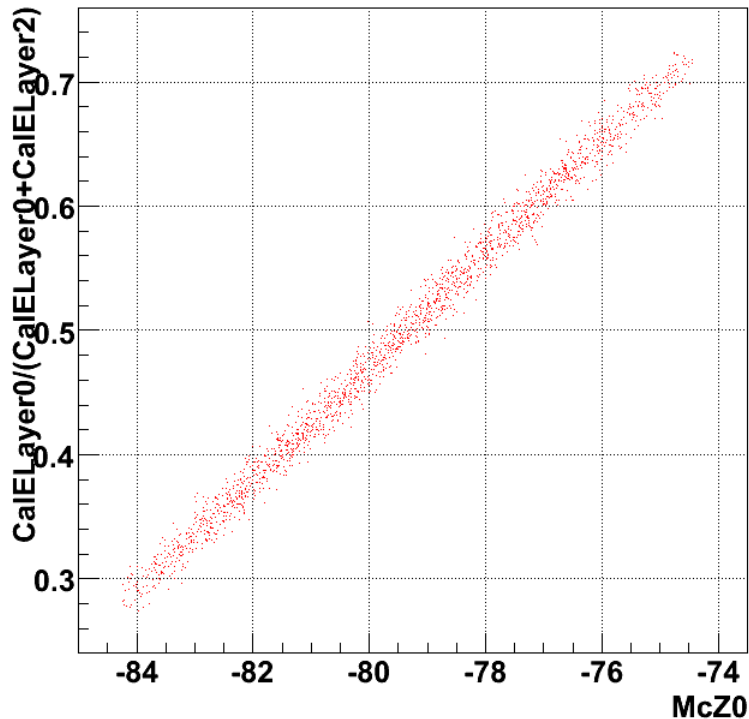
- When  $\text{CalELayer0}/(\text{CalELayer0}+\text{CalELayer2}) = 0.5$  the raw energy is exactly corrected for lateral leakage by using :  $\text{CalEnergyRawCor} = \text{CalEnergyRaw} + \text{CalELayer3} + \text{CalELayer4} + \text{CalELayer5} + \text{CalELayer6} + \text{CalELayer7}$
- 290 GeV / 282 GeV  $\rightarrow$  energy overestimation of (at least) about 3%



# Comparison with Gleam simulation (reminder)

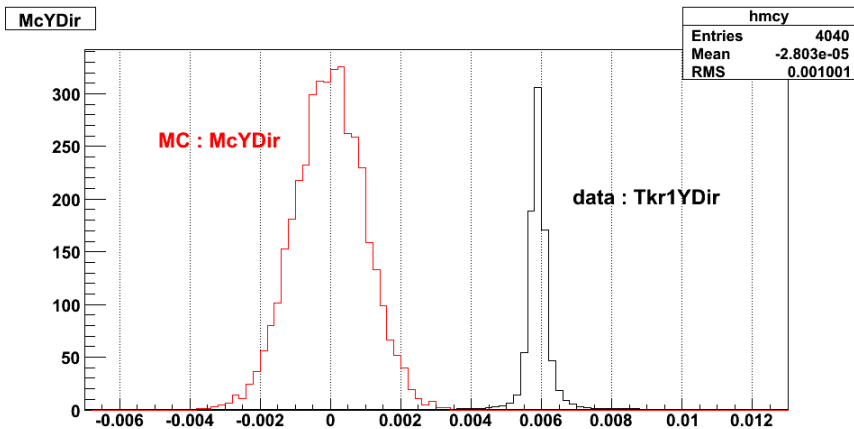
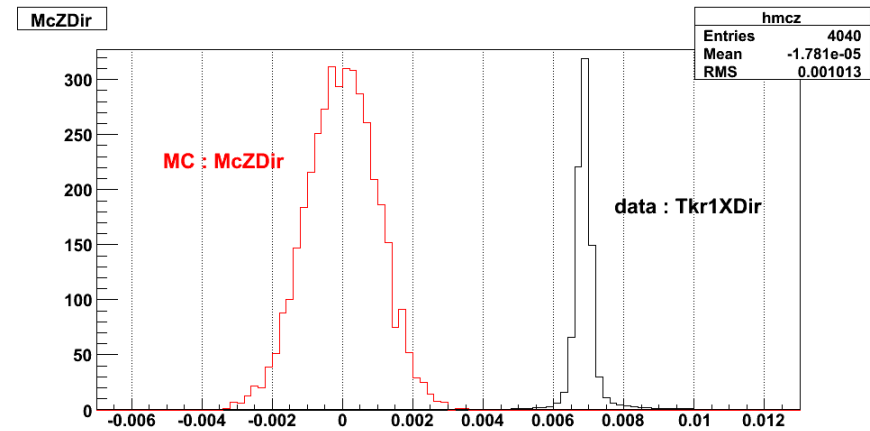
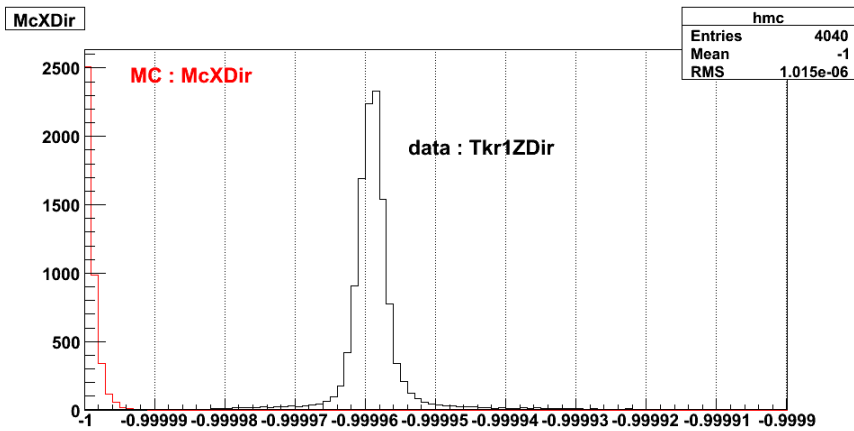
- $\text{CalELayer0}/(\text{CalELayer0}+\text{CalELayer2})$  is a good measurement of the vertical position (if perfect intercalibration)
- *At the center of layer 1 : 275 GeV / 255 GeV  $\rightarrow$  data/MC  $\sim$  8%*

`CalELayer0/(CalELayer0+CalELayer2):McZ0 {CalEnergyRaw<300000 && CalEnergyRaw>2000}`



# New run BT-1951

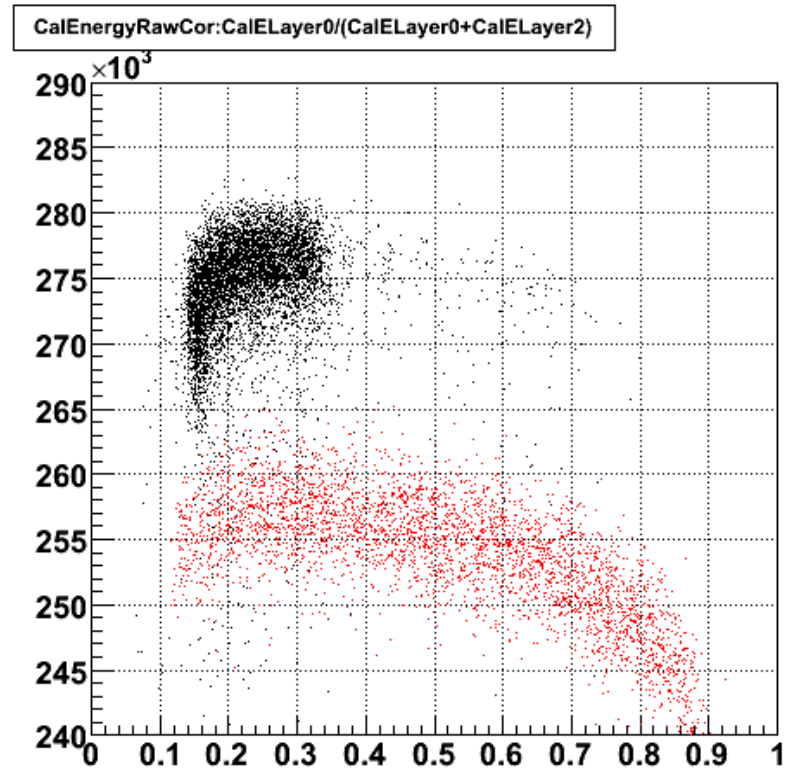
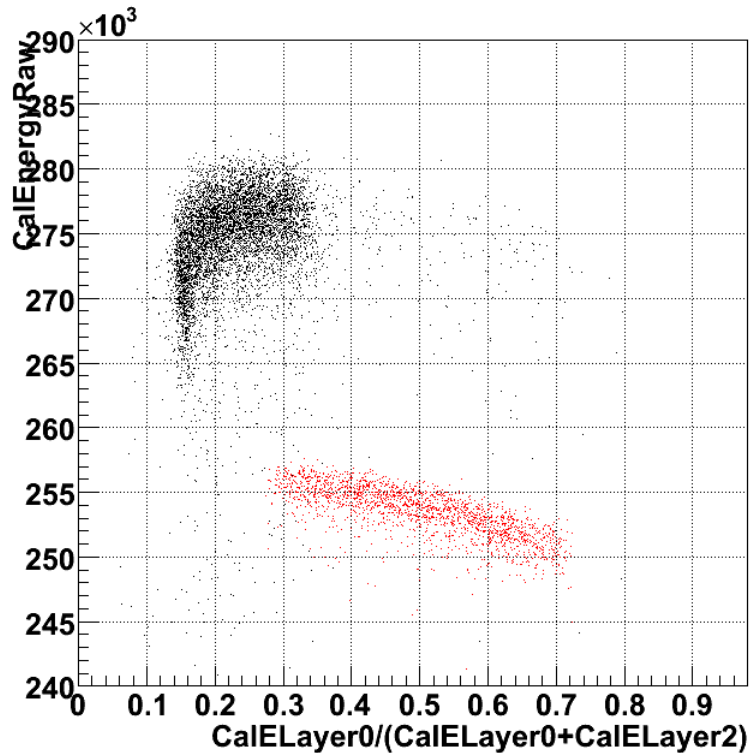
- Use 282 GeV 0deg run 700001922 to compare beams divergence
  - Main axis : BT-1951 McXDir <-> 700001922 Tkr1ZDir
  - Vertical axis : BT-1951 McZDir <-> 700001922 Tkr1XDir
  - Horizontal axis : BT-1951 McYDir <-> 700001922 Tkr1Ydir



- The divergence is larger in MC
- Data : the beam goes down a little along the vertical direction : -2mm through one tower
- Something wrong when Mc variables are filled : McX0 = -2225 ????

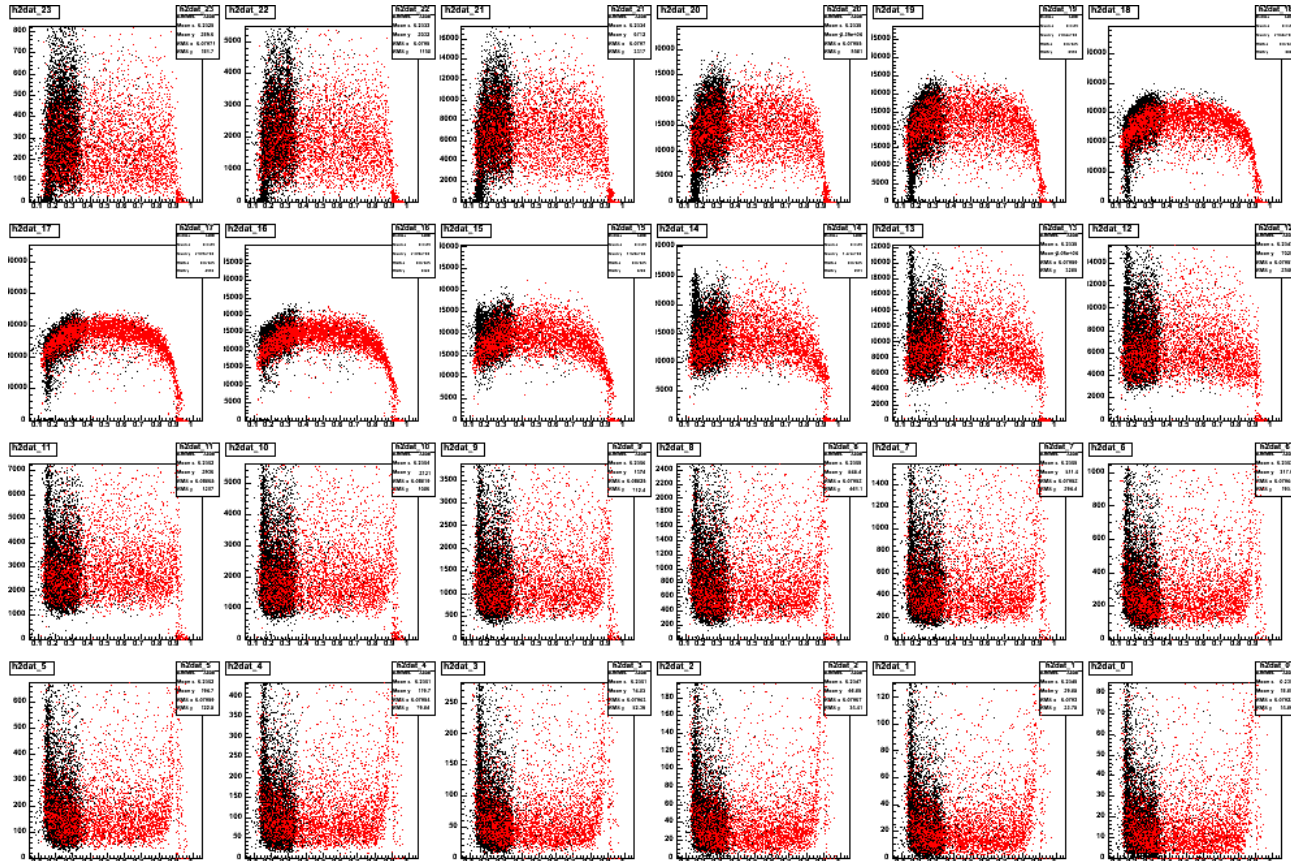
# CalEnergyRaw with BT-1951

- With BT-1951 (right) : no big change compared to Gleam only simulation (right) for the mean energy



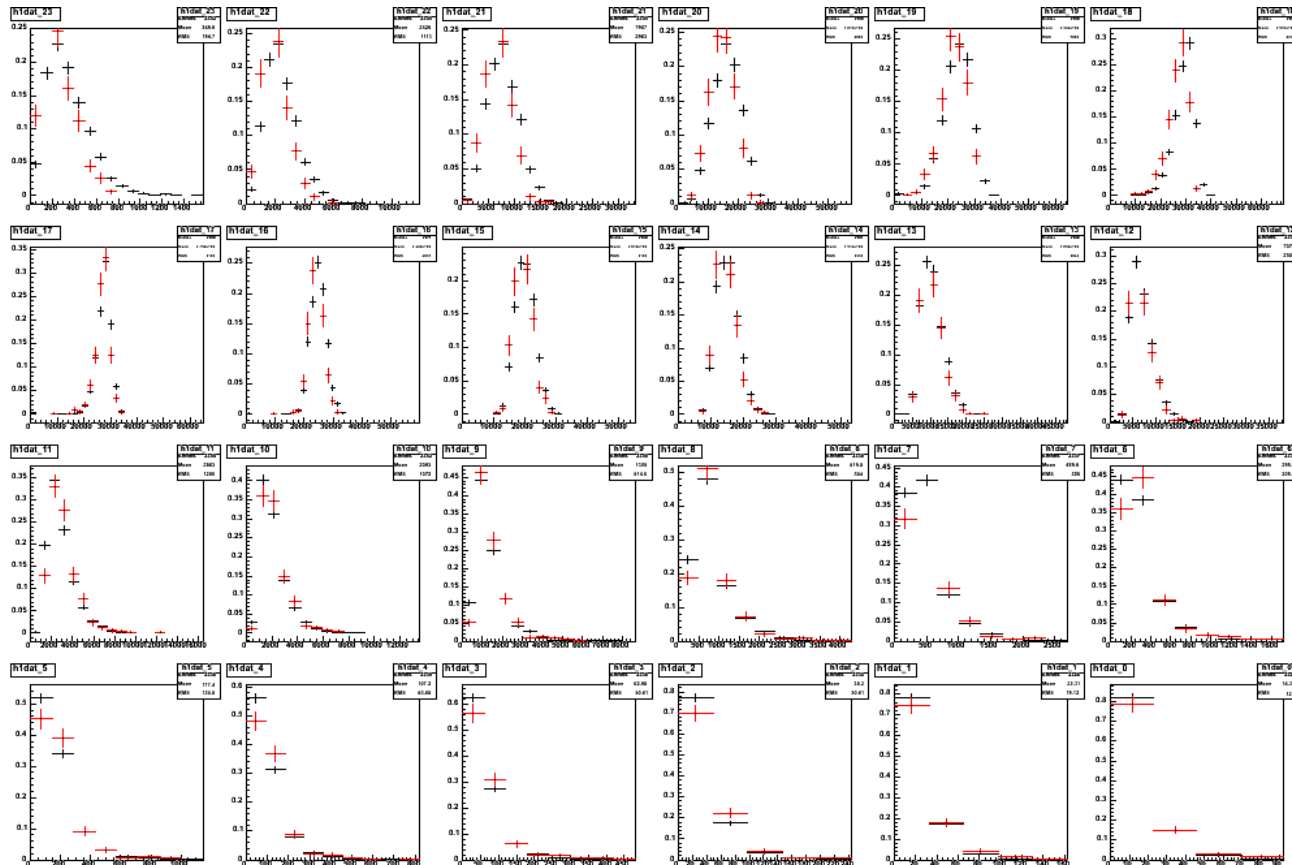
# Longitudinal development

- Looking at layer 1
- From tower3 log11 (start of the shower) to tower2 log0 (end of the shower)
- Looking at energy vs  $CalELayer0/(CalELayer0+CalELayer2)$



# Longitudinal development

- Selection :  $0.25 < \text{CalELayer0}/(\text{CalELayer0}+\text{CalELayer2}) < 0.35$
- Comparing the average energy in data (black) and in MC (red)

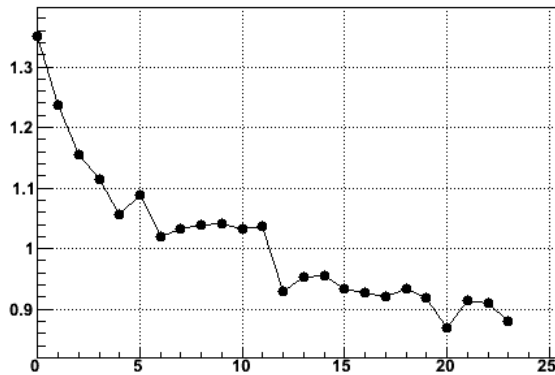




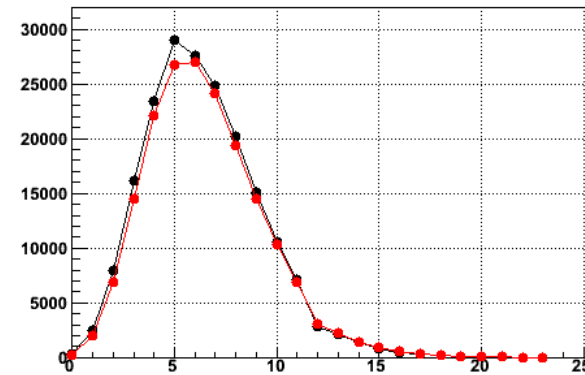
# Data/MC comparison (layer 1)

- Mean energy Data/MC vs log number from start of shower
- Big difference at the start of the shower
- A constant  $\sim 3\%$  difference in second half of tower 3 (along the decreasing edge)
- Drop when switching from tower 3 to tower 2

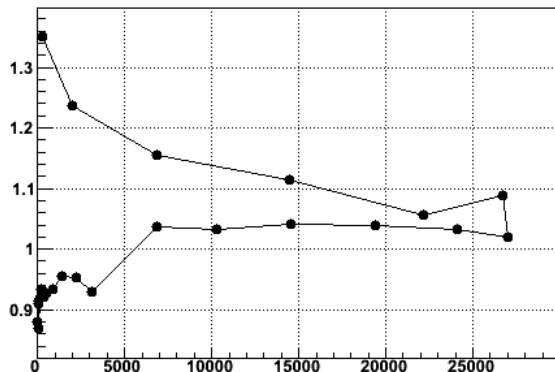
meandat/meanmc vs (11-log\_number)



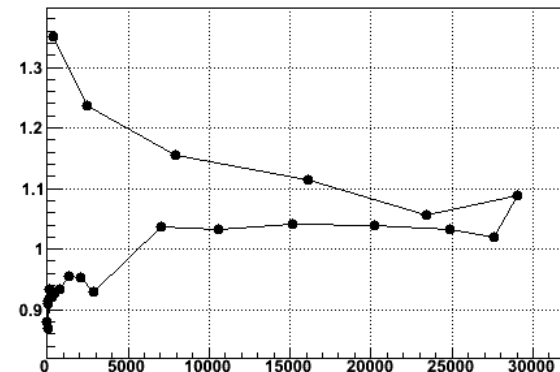
mean energy vs (11-log\_number) (black=data red=mc)



meandat/meanmc vs meanmc



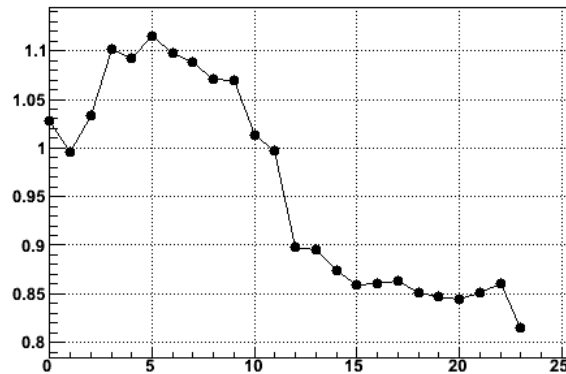
meandat/meanmc vs meandat



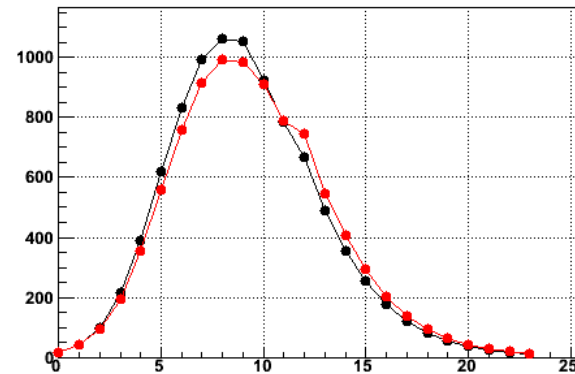
# Data/MC comparison (layer 3)

- Again drop from tower 3 to tower 2

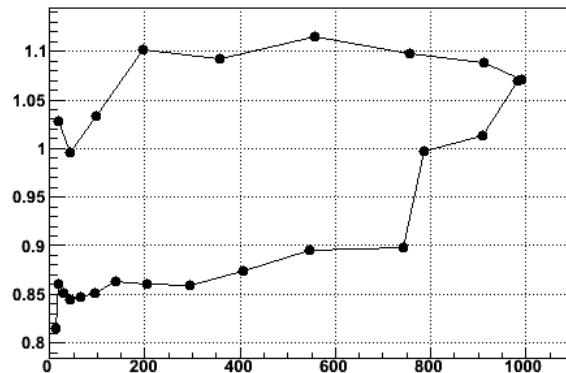
meandat/meanmc vs (11-log\_number)



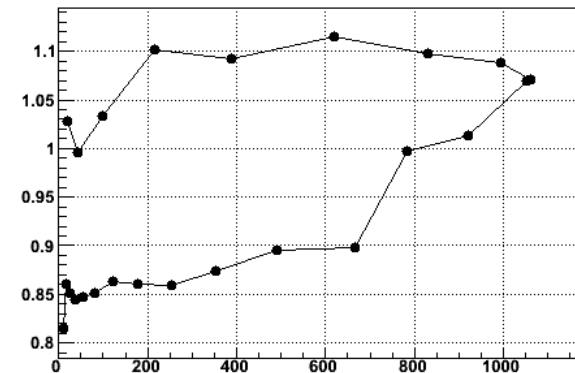
mean energy vs (11-log\_number) (black=data red=mc)



meandat/meanmc vs meanmc



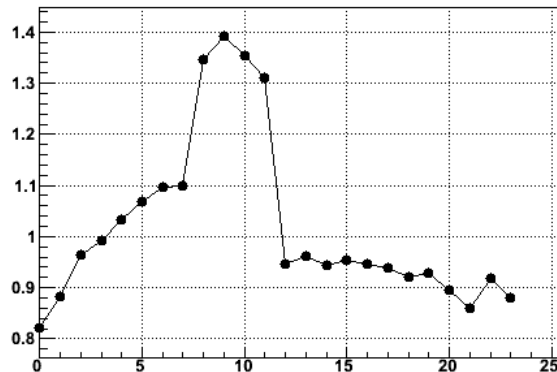
meandat/meanmc vs meandat



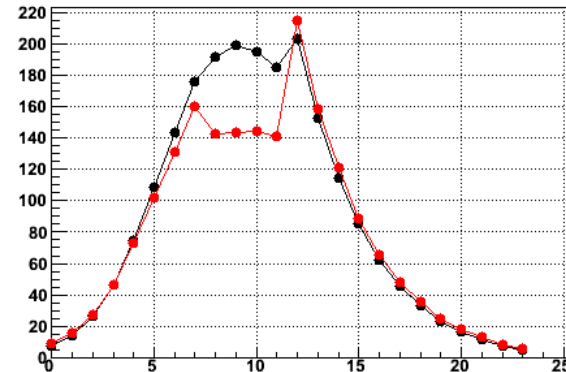
# Data/MC comparison (layer 5)

- MC : something weird is going in the last 4 logs of tower 3 !!!
- Again discontinuity when switching from tower 3 to tower 2

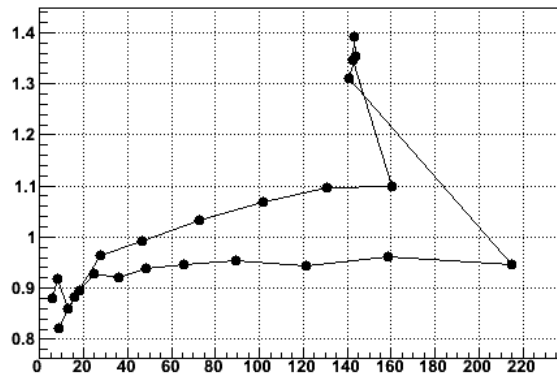
meandat/meanmc vs (11-log\_number)



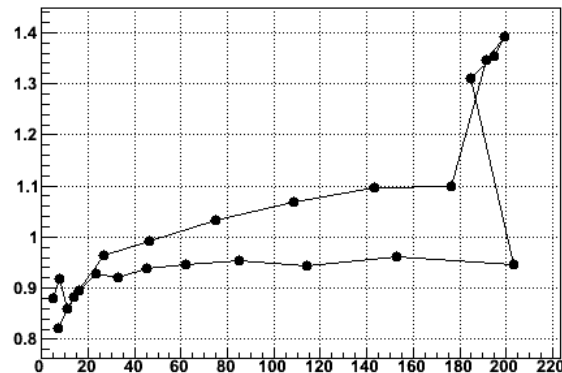
mean energy vs (11-log\_number) (black=data red=mc)



meandat/meanmc vs meanmc

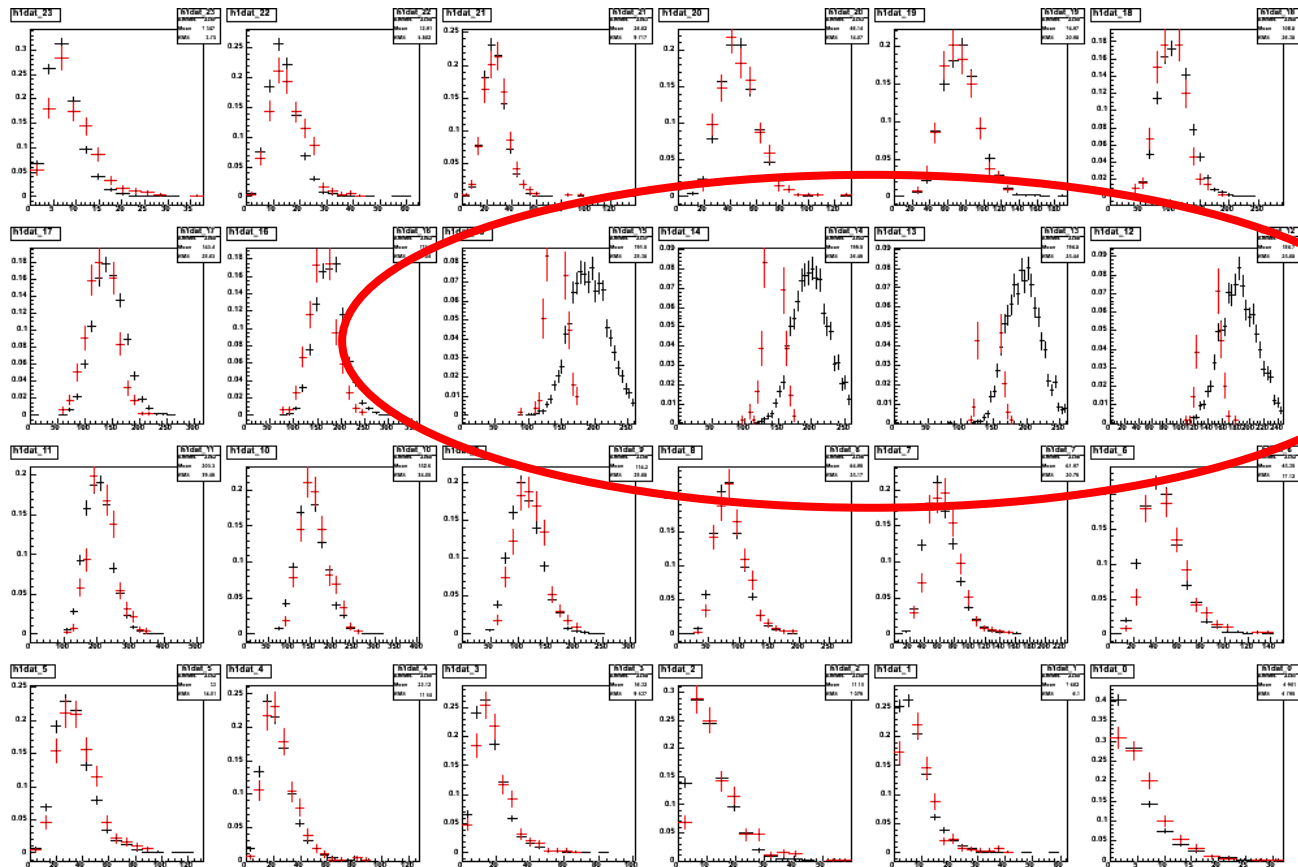


meandat/meanmc vs meandat



# Data/MC comparison (layer 5)

- Problem of digitization ? Calibration ?
  - Data 700001951 : not processed with the last calibration
  - BT-1951 : processed with last calibration



# Conclusions

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- Since we can not integrate perpendicularly to the trajectory, it is not possible to determine the longitudinal profile
- With odd layers we can at least sample the longitudinal development
- When looking at odd layers far away from the trajectory, we are also sensitive to transverse development potential disagreement
- Anyway:
  - Layer 1 : where most of the energy lies, so the closest to the longitudinal profile. We see the same behavior as in Odeg configuration : the largest disagreement is at the start of the shower **THOUGH** the tracker is not involved here !
  - Layer 1,3,5 : discontinuity when switching from tower 3 to tower 2 in MC
  - Layer 5 : there is something weird with logs 3,2,1,0 of tower 3