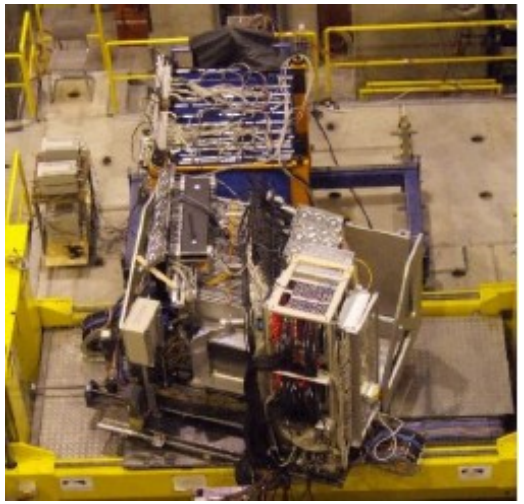
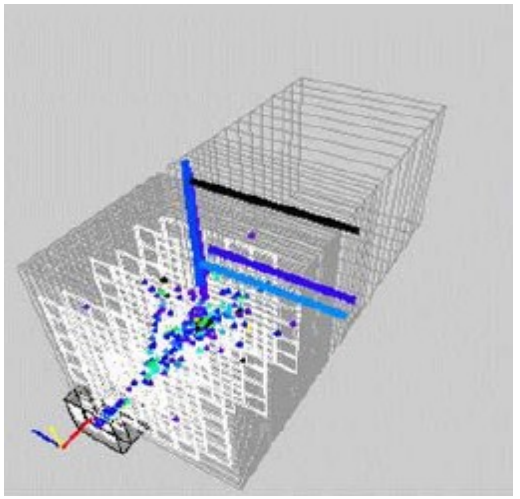
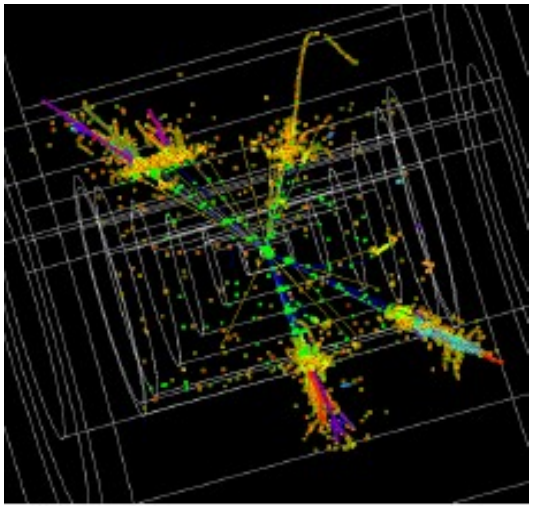
# Electromagnetic showers in AHCAL. An absorber thickness study





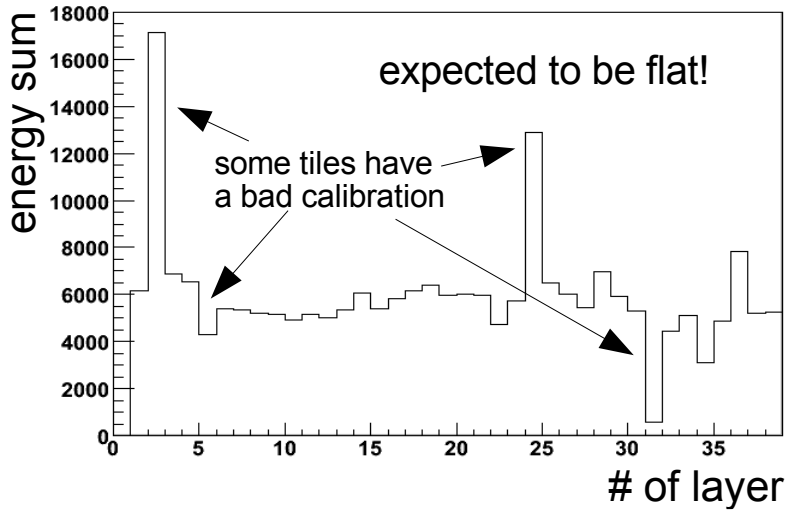


# Electromagnetic showers in AHCAL. An absorber thickness study.

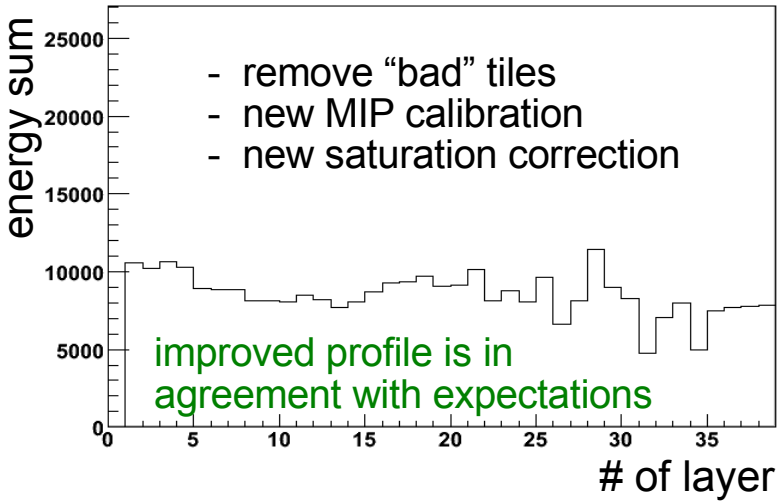
## ..improvement of the energy reconstruction..

### Improvement of calibration

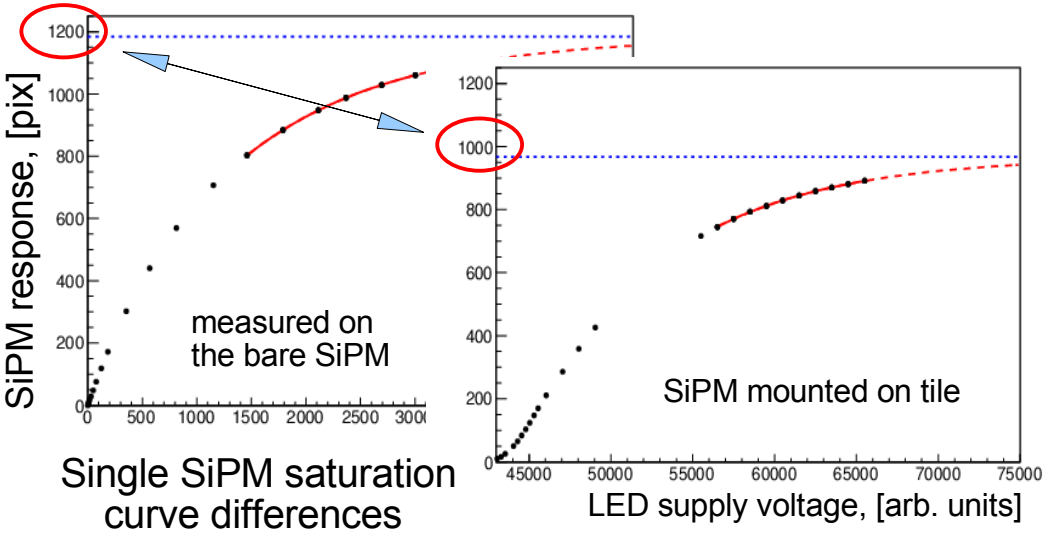
Longitudinal energy profile of muons



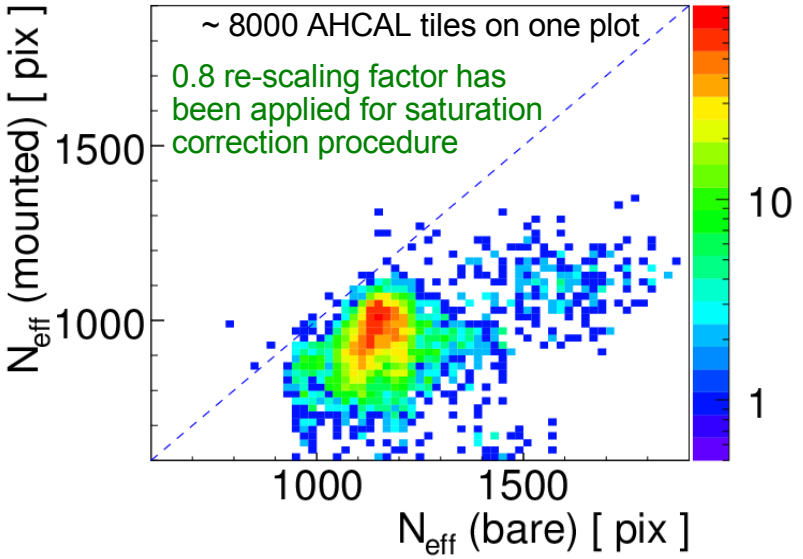

Longitudinal energy profile of muons




### re-scaling of SiPM saturation correction curves




Single SiPM saturation curve differences



# Electromagnetic showers in AHCAL. An absorber thickness study.

## Longitudinal profile study..

An electromagnetic shower's energy profile:

$$dE/dt = p_1 \cdot t^{p_2} \cdot e^{-p_3 \cdot t}$$

where E – energy deposited, t – depth in calorimeter

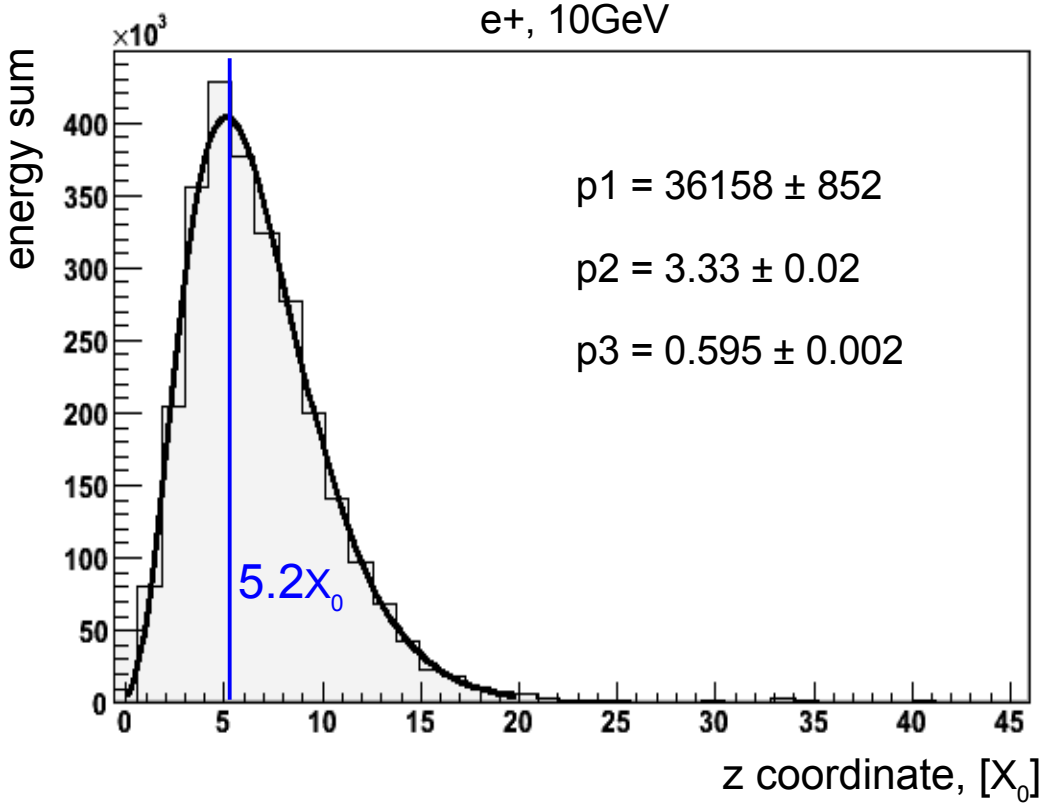
The maximum depth of an e/m shower in calorimeter for e+(e-):

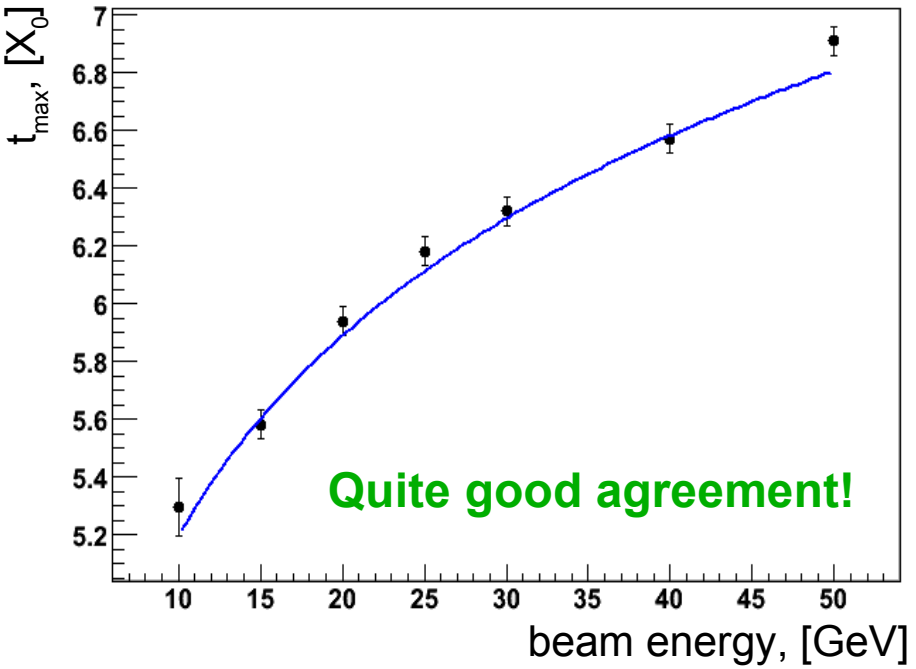
$t_{max} = [\ \ln(E/e_c) - 0.5\ ]\ [X_0]$

E – particle energy
$e_c$ – critical energy (≈ 33.6 MeV)

Calculated: $t_{max} \approx 5.2\ X_0$

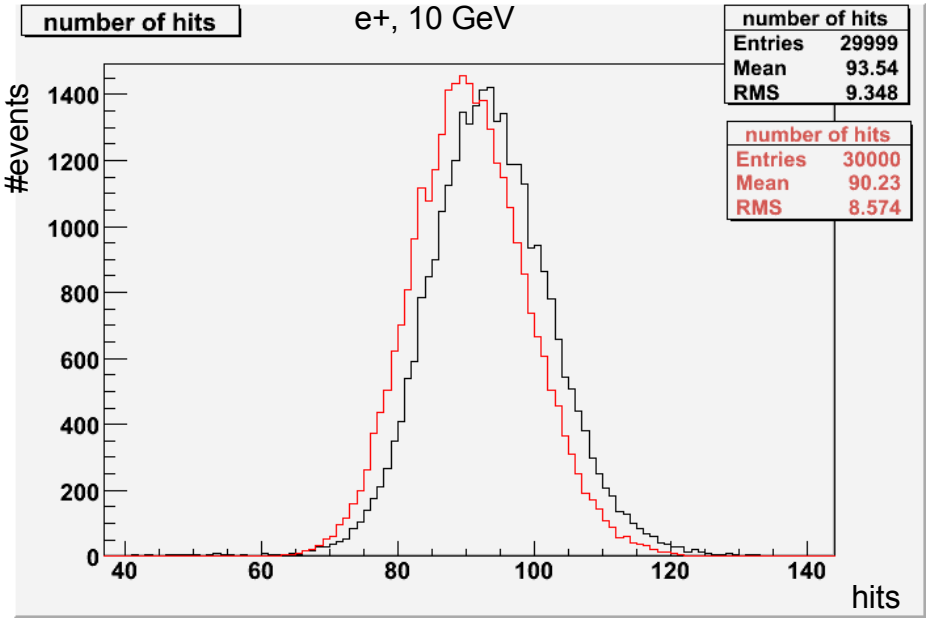
From data: $t_{max} \approx 5.3\ X_0$

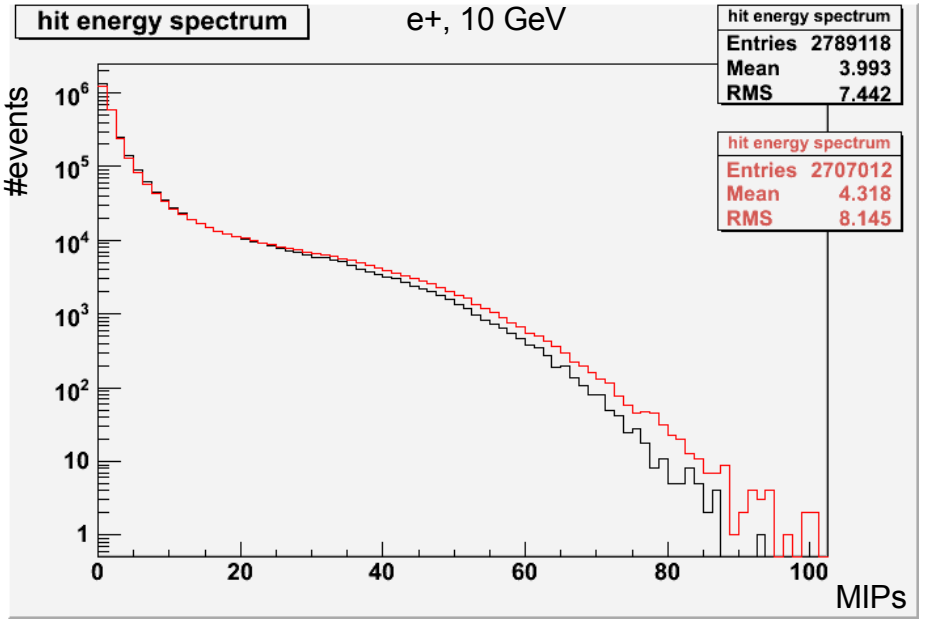


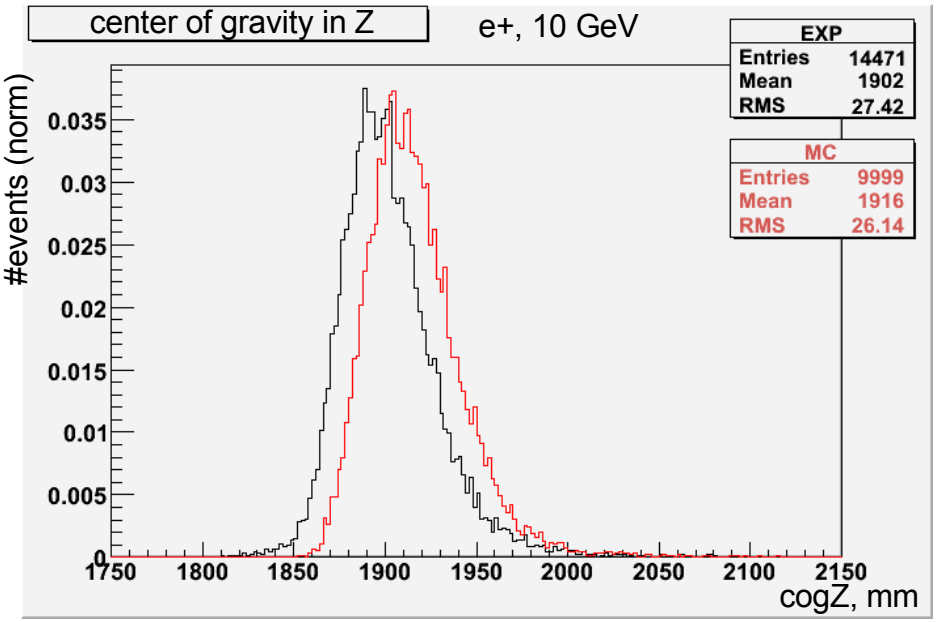



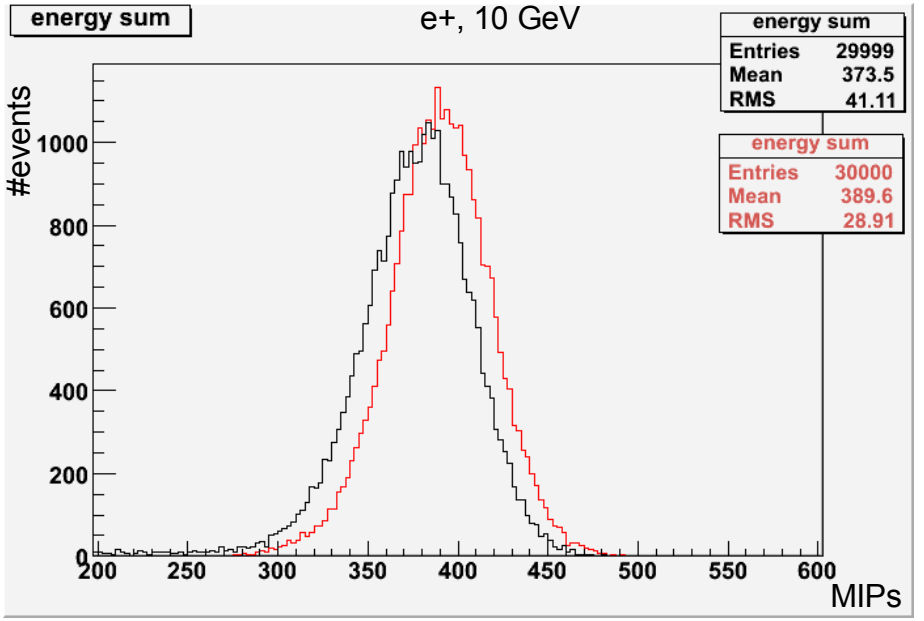
# Electromagnetic showers in AHCAL. An absorber thickness study.

exp (black) and MC (red) with re-scaled saturation and temperature effect simulation



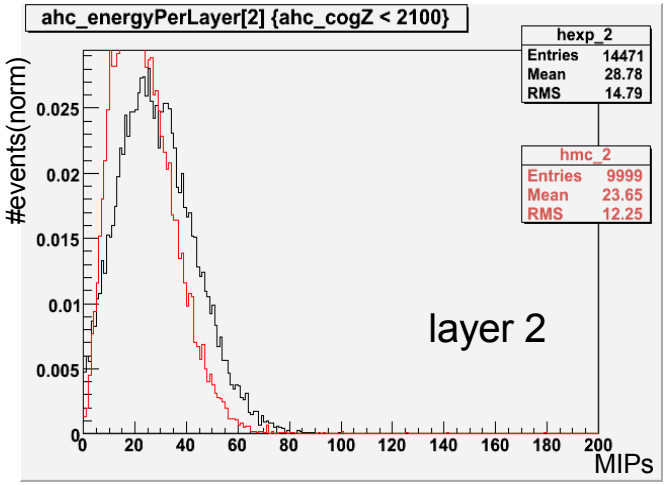



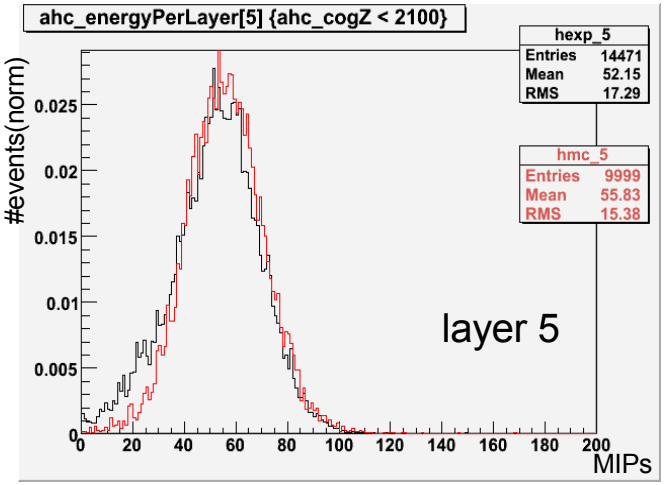



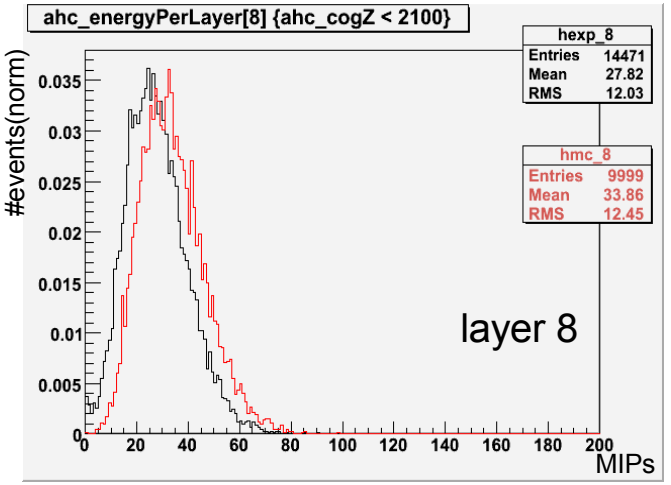



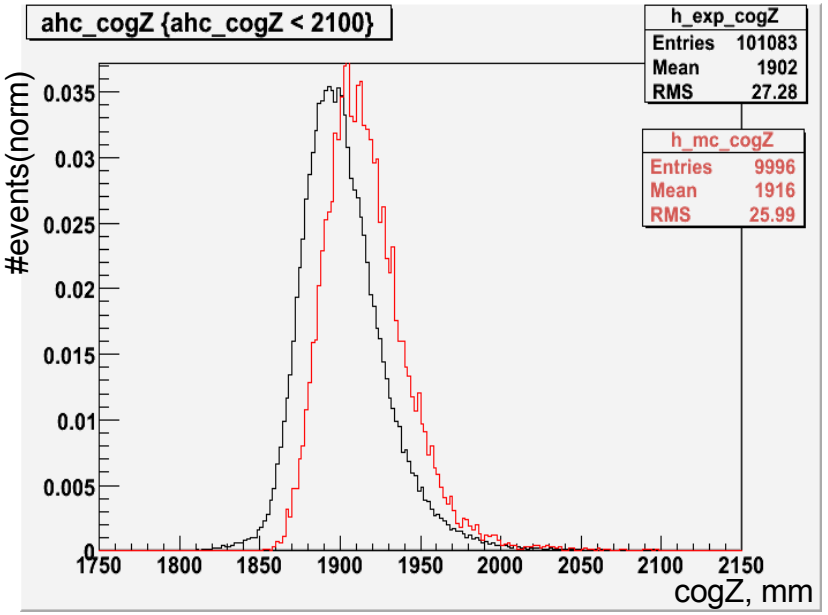
# Electromagnetic showers in AHCAL. An absorber thickness study.

exp (black) and MC (red) all effects included

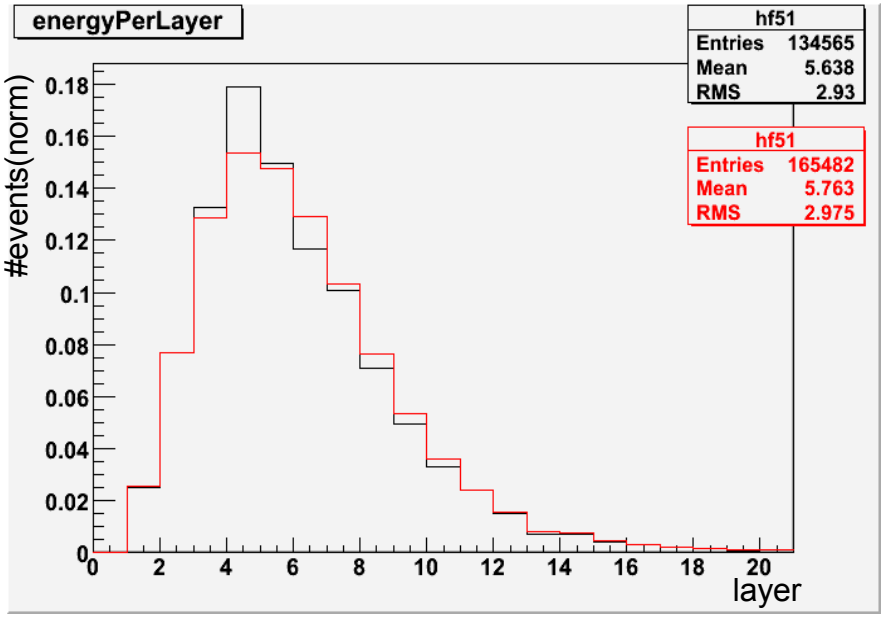


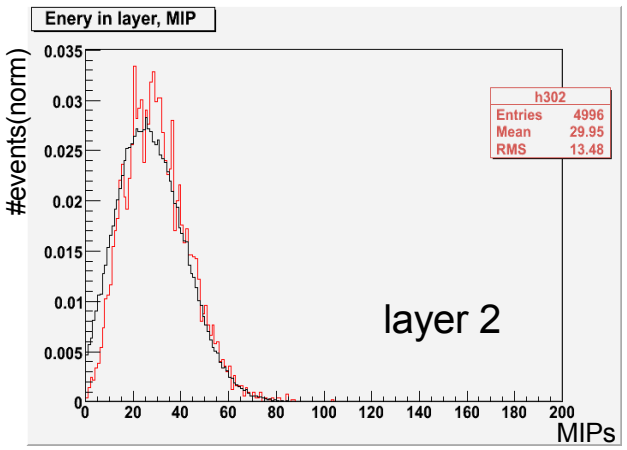

shower center of gravity in Z direction

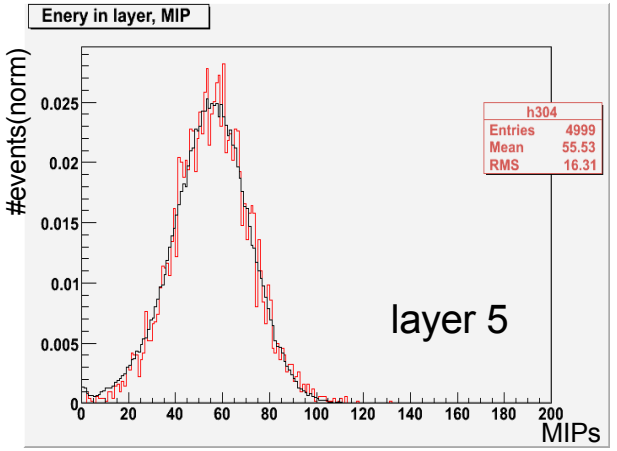


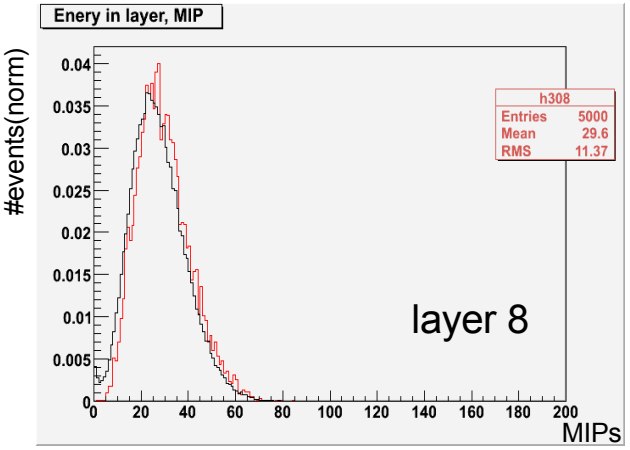

energy profile of a shower

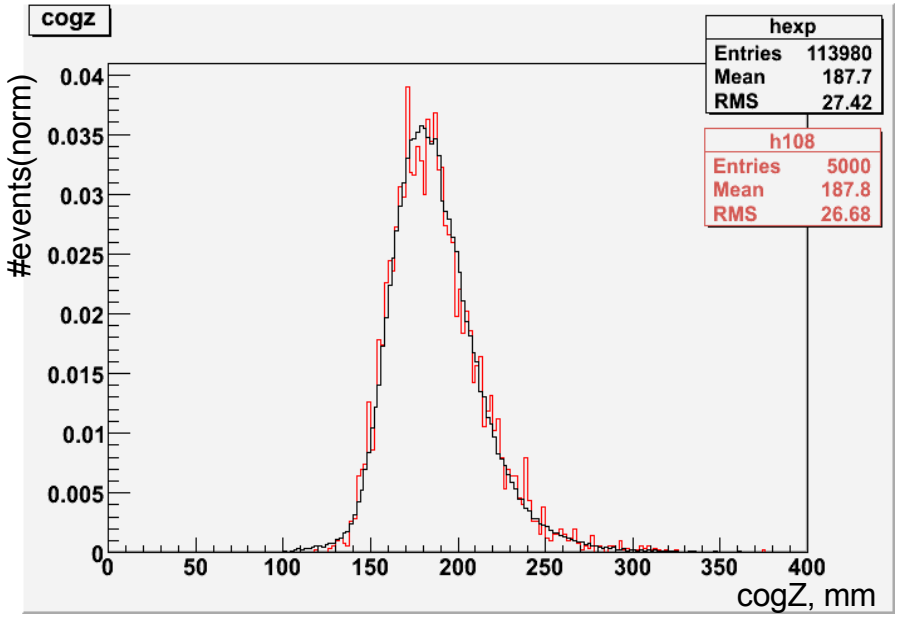
# Electromagnetic showers in AHCAL. An absorber thickness study.

exp (black) and MC (red) + 5mm of Fe just before 1st layer of AHCAL

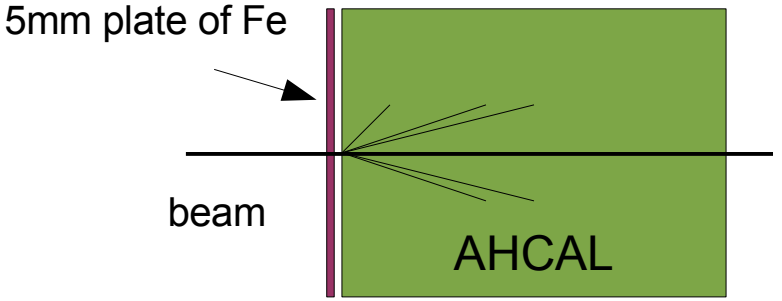



shower center of gravity in Z direction

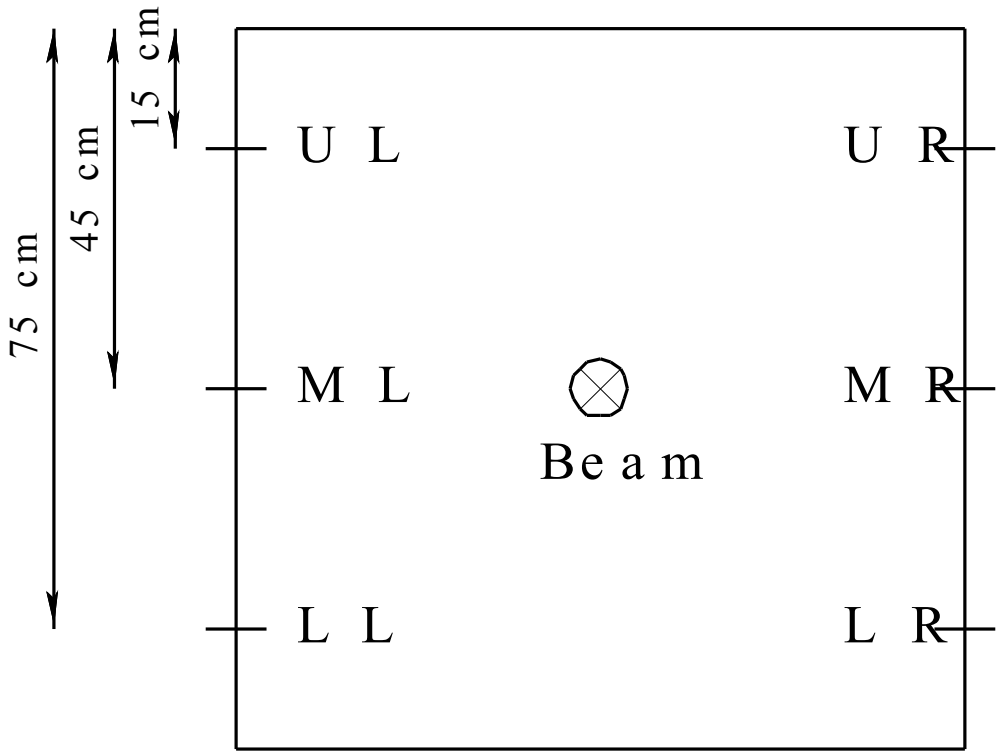



..need more material along the test beam line in Monte Carlo simulation (?)

# Electromagnetic showers in AHCAL. An absorber thickness study.

A precision measurements of the absorber's thickness.

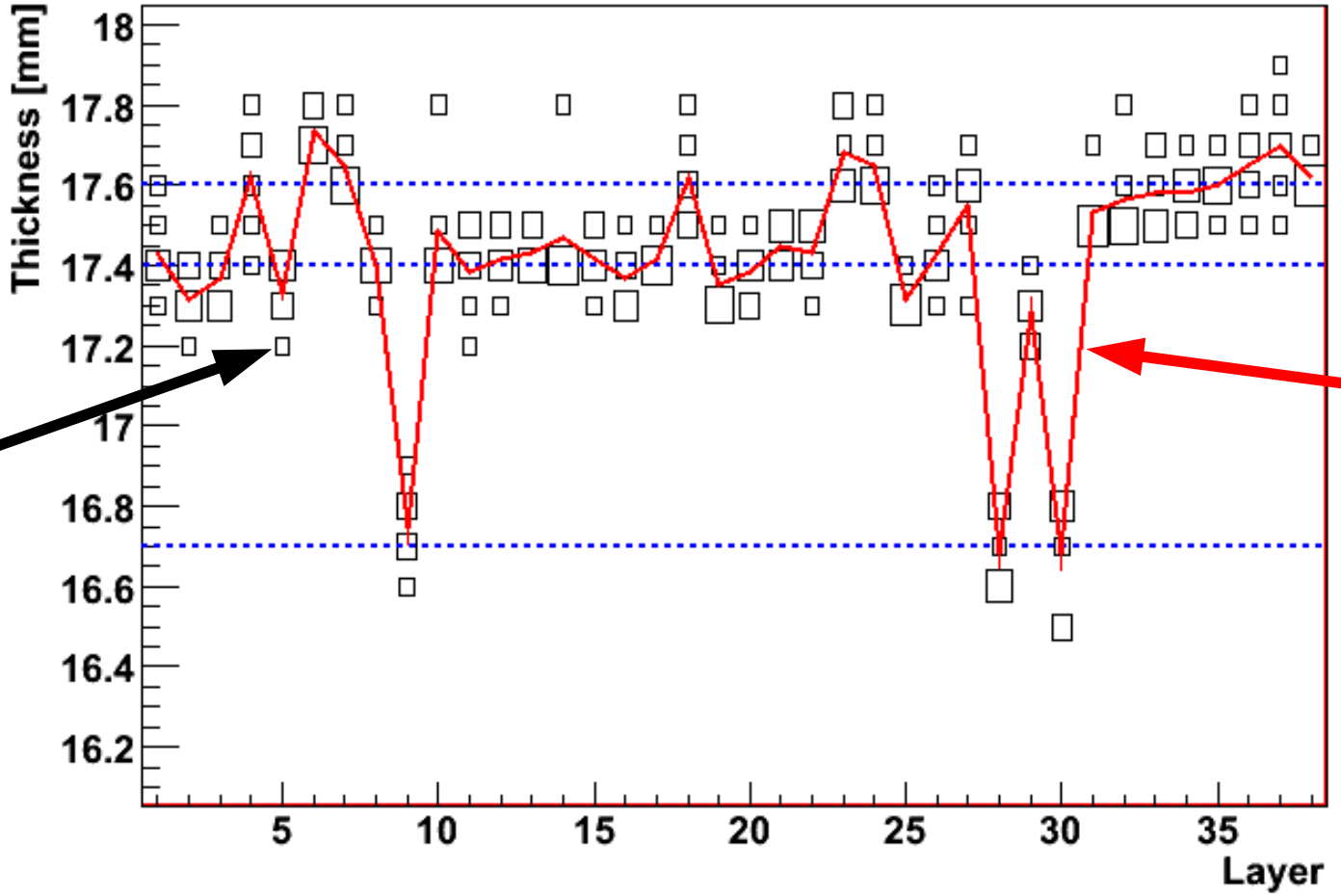
- a stack is still assembled, only edges accessible
- measurement of six points at each plate with an accuracy of ~ 100μm



# Electromagnetic showers in AHCAL. An absorber thickness study.

The thickness in the GEANT4 Mokka model by default: 16mm of steel

..and now we have more complicated picture:

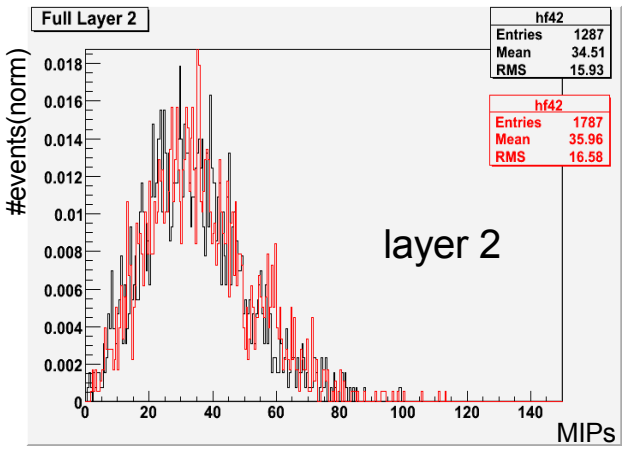


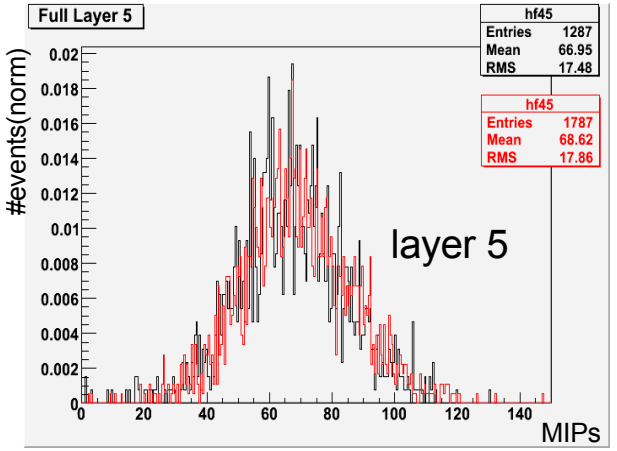

six values per layer

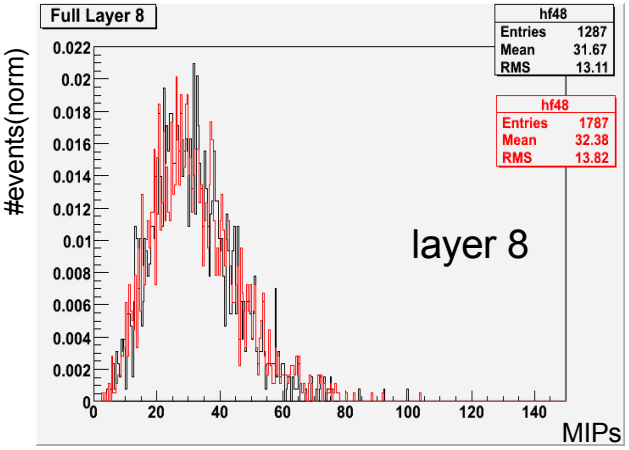
layer-wise average

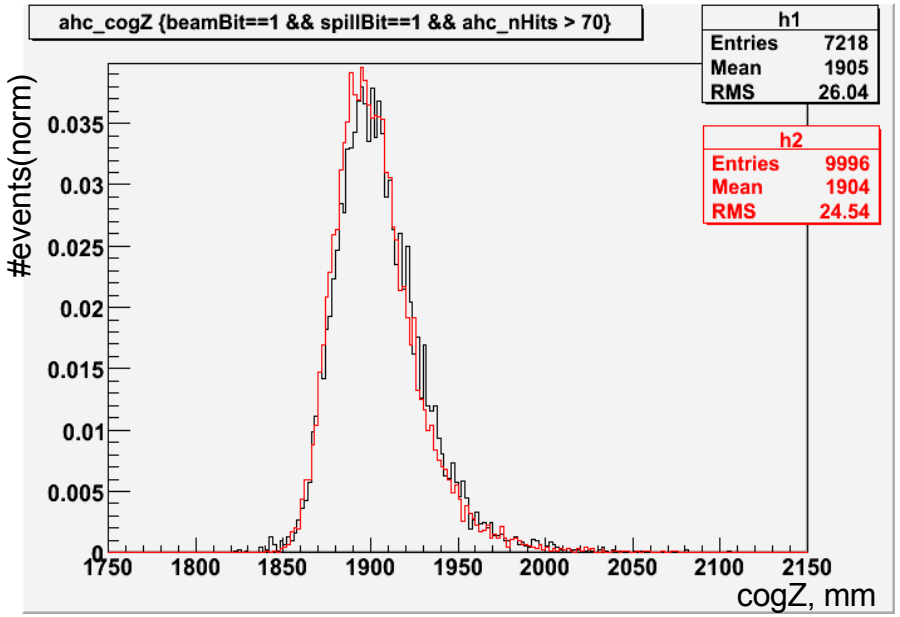
# Electromagnetic showers in AHCAL. An absorber thickness study.

exp (black) and MC (red) + measured thickness of each Layer

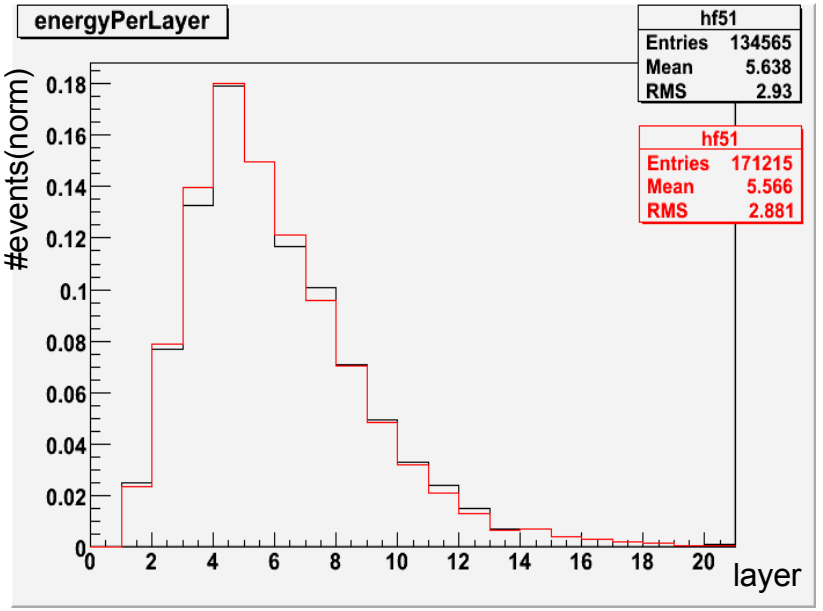


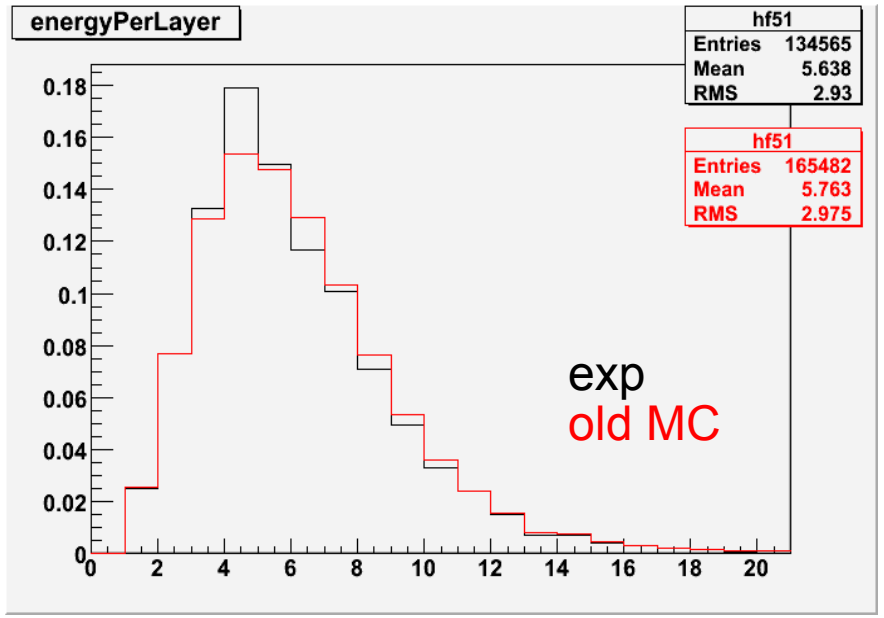



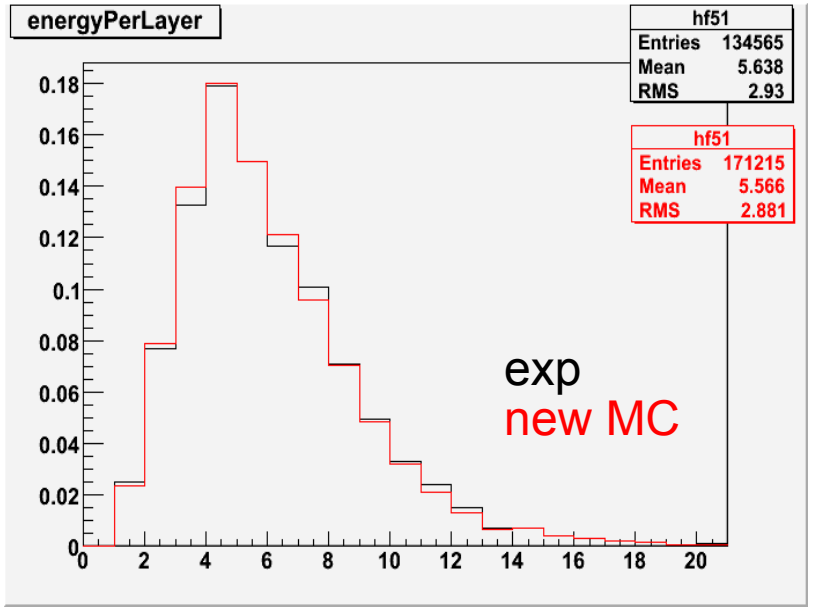

shower center of gravity in Z direction

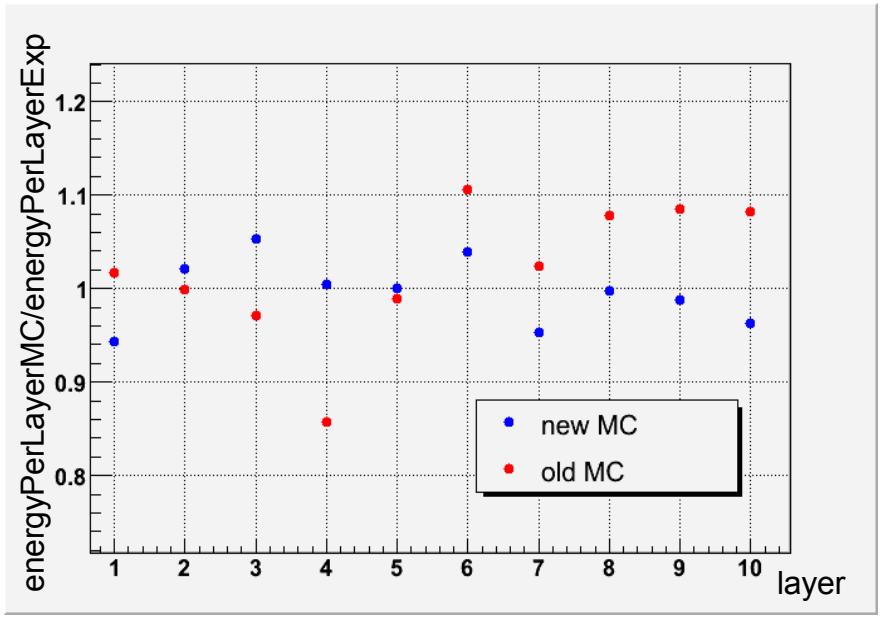



energy profile of a shower

# Electromagnetic showers in AHCAL. An absorber thickness study.




to be continued..