Characterization of Electromagnetic Showers using the Tragaldabas detector

LabCAF-IGFAE / USC

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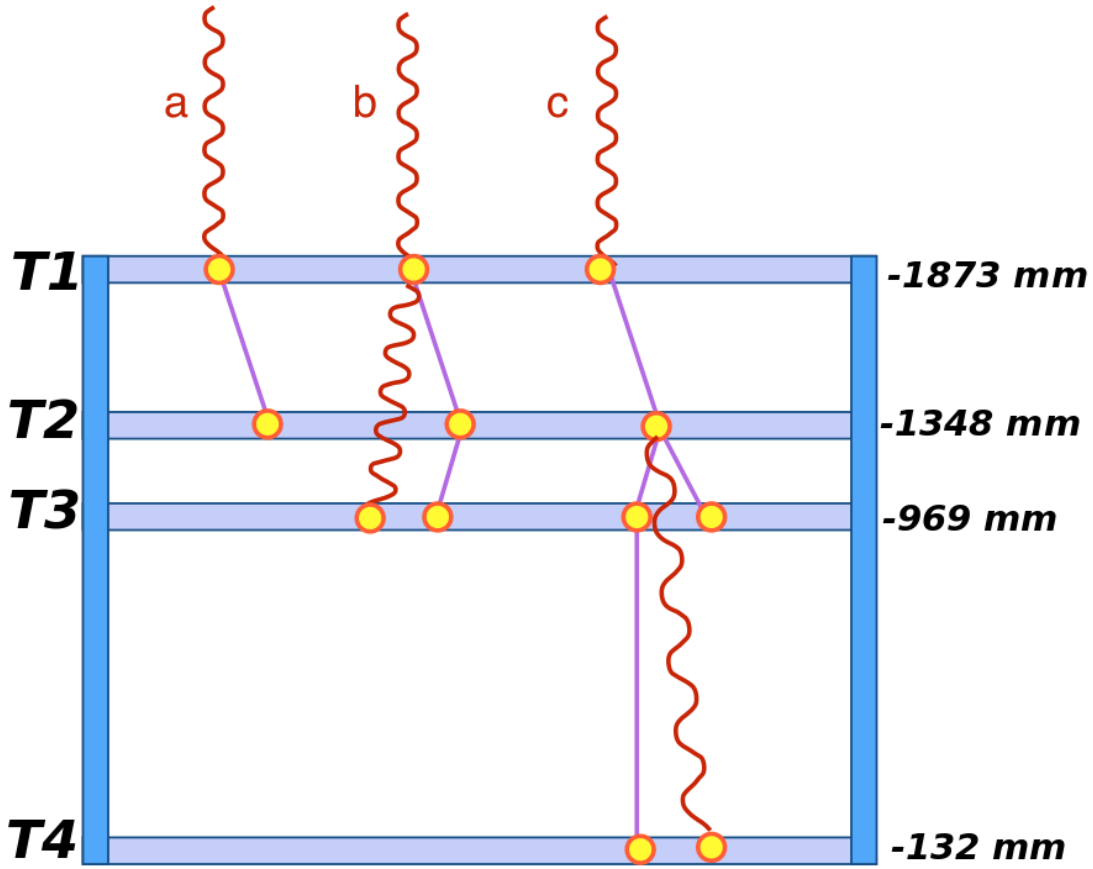
Introduction and Motivation

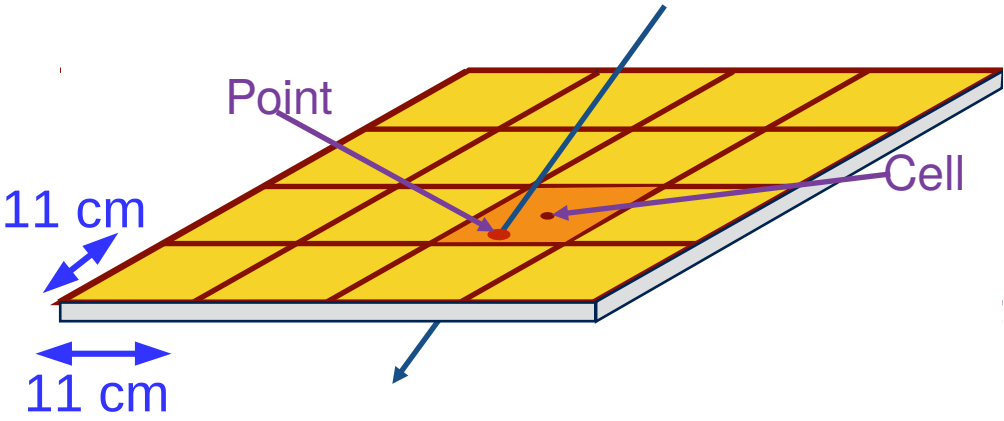
- Analyzing the PDI capability of Tragaldabas for (γ, e, μ) .
- We always assume a Hit in the 1st (top) layer .
- We use vertical particles (γ, e, μ) and the number events is 100K.
- Main goal to look for discriminatory variables that help us to identify and detected particles .

Flux of Cosmic rays at sea level ($I / m^{-2} s^{-1} sr^{-1}$)

E/GeV	Muons		Electrons	Photons	Protons	Neutrons
	Flux	IntFlux [%]	Flux	Flux	Flux	Flux
0.01	100	<< 1	28	60	2.1	30*
0.1	99	0	6.0	8	1.9	10*
0.2	97	3	3.0	3.5	1.5	-
0.5	86	14	1.0	1.1	0.9	1.5
1	69	31	0.4	0.4	0.5	0.7
2	46	54	0.1	0.1	0.25	-
5	20	80	0.02	0.02	0.1	-

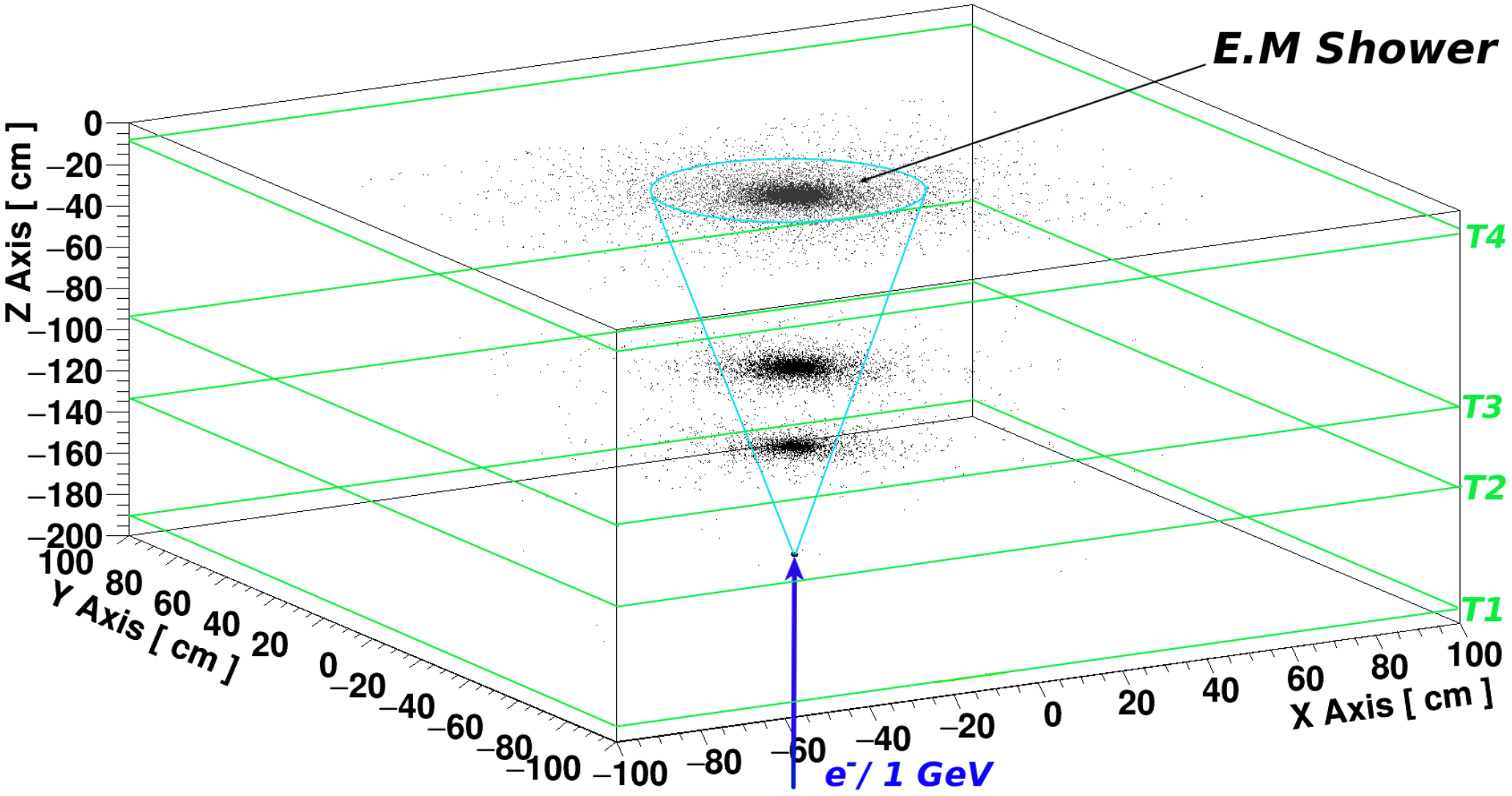
Tragaldabas Geometry



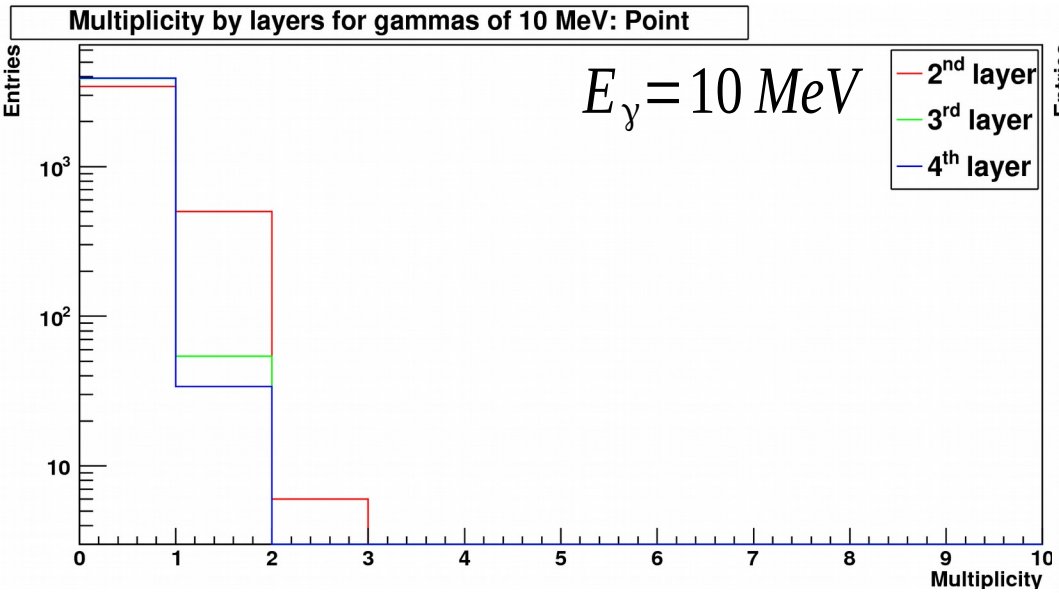


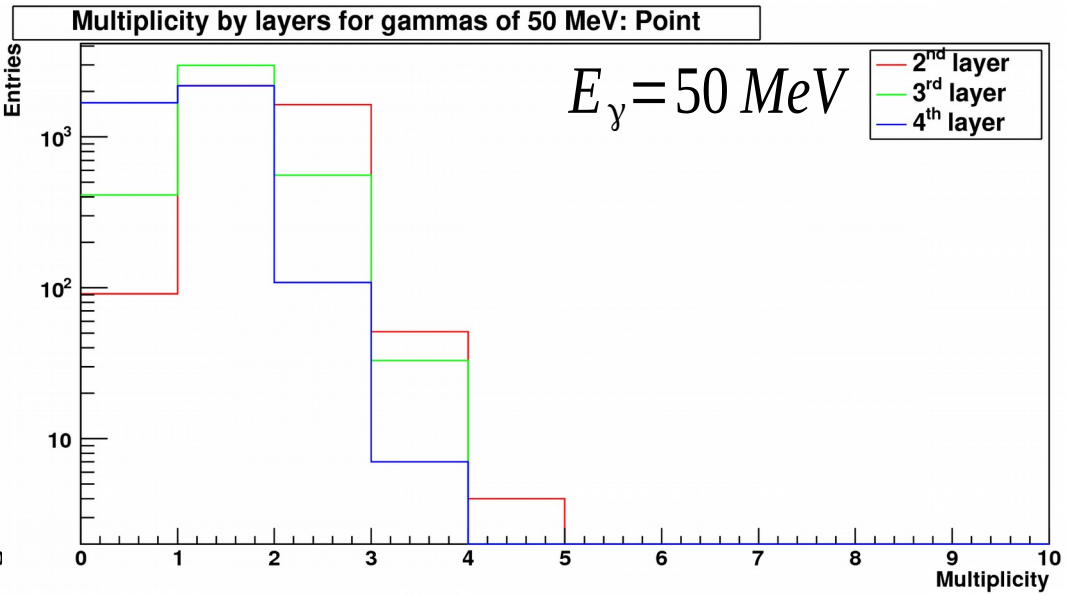
Example EM shower sample (100K events)

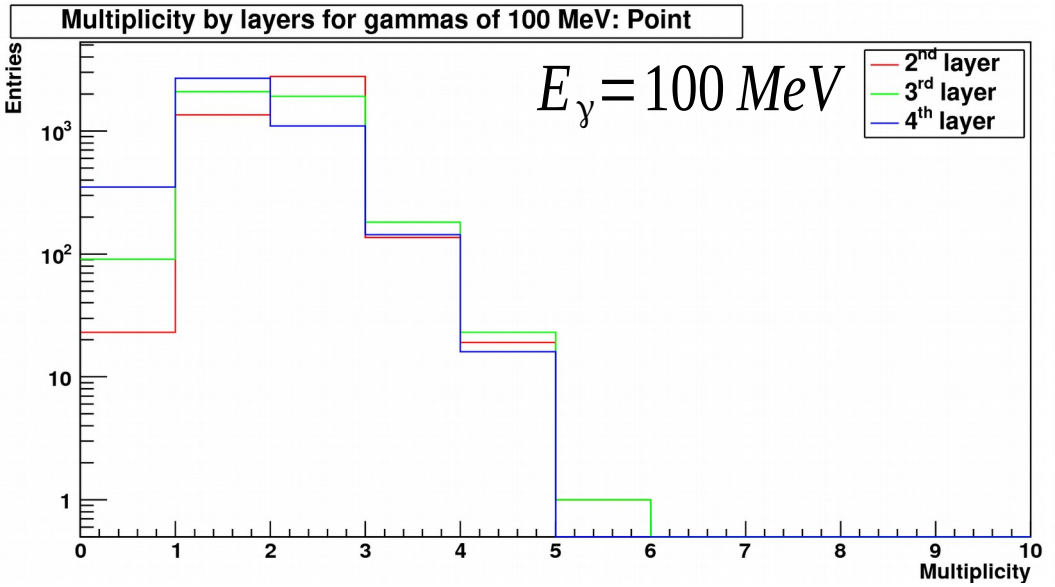
E(e-) = 1 GeV .

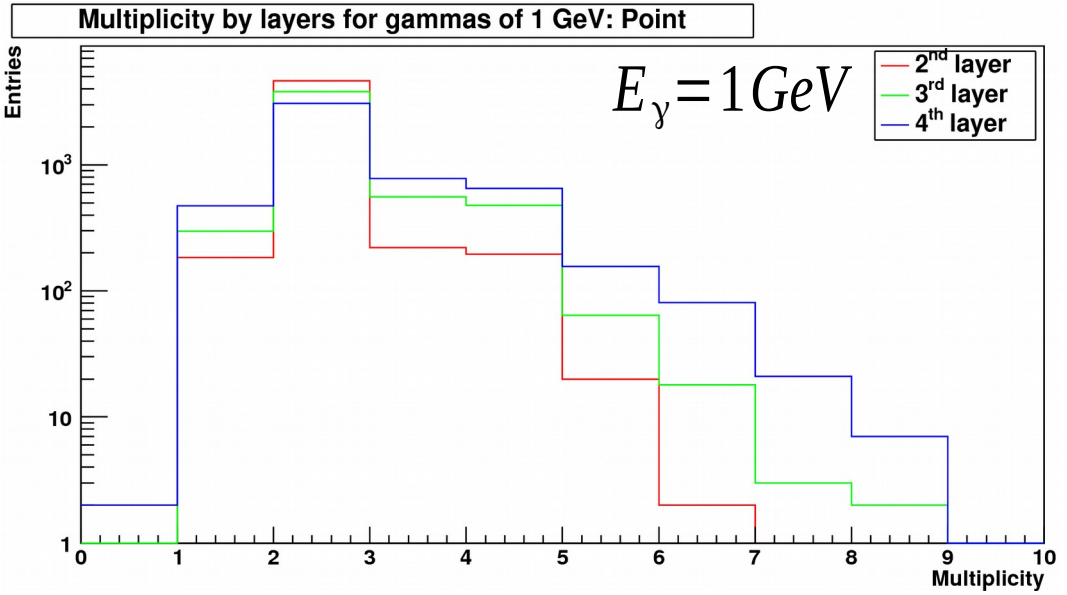


Gammas : multiplicity in different layers



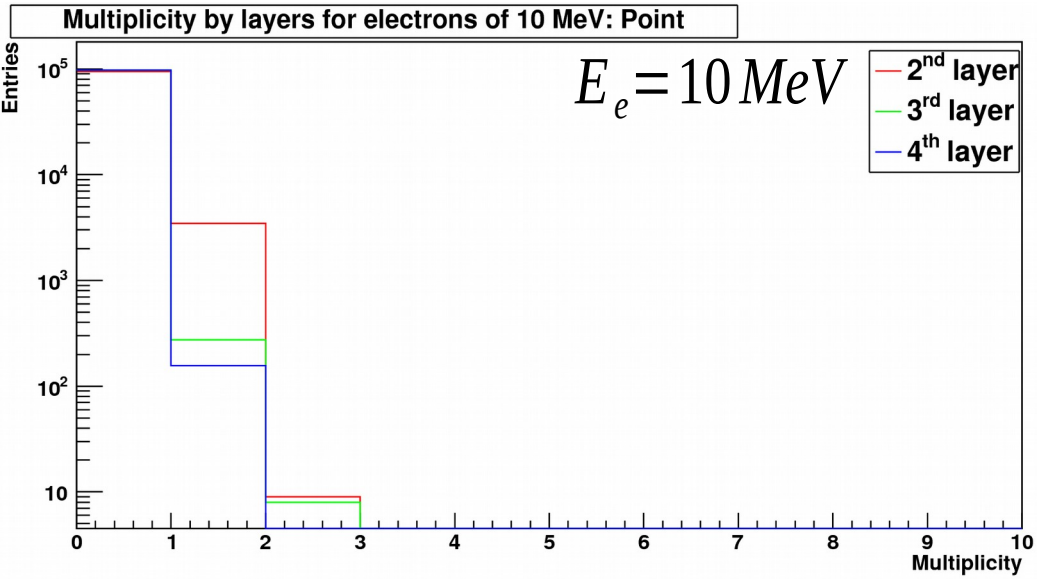


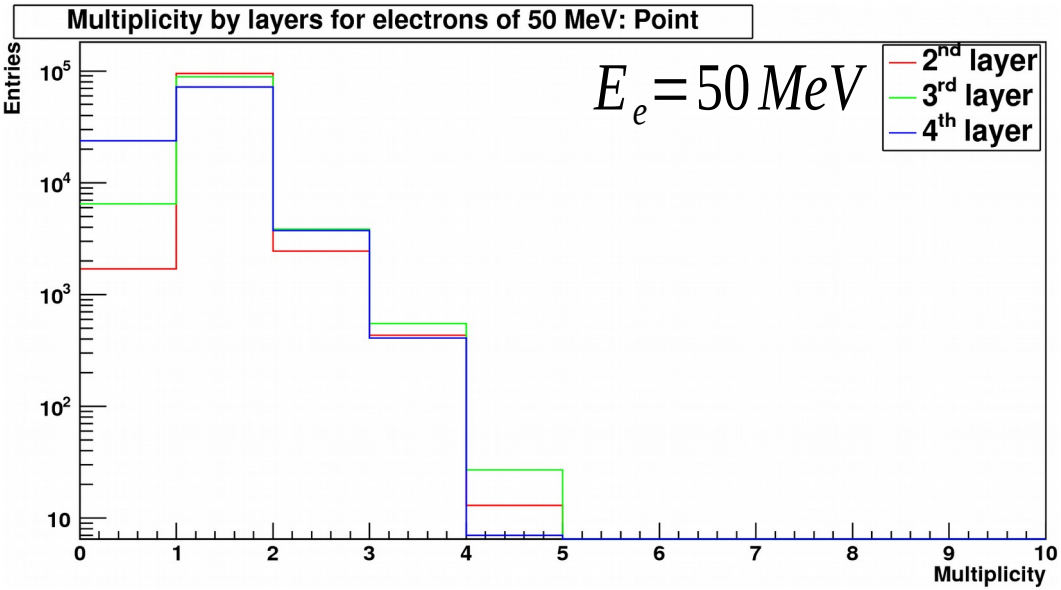


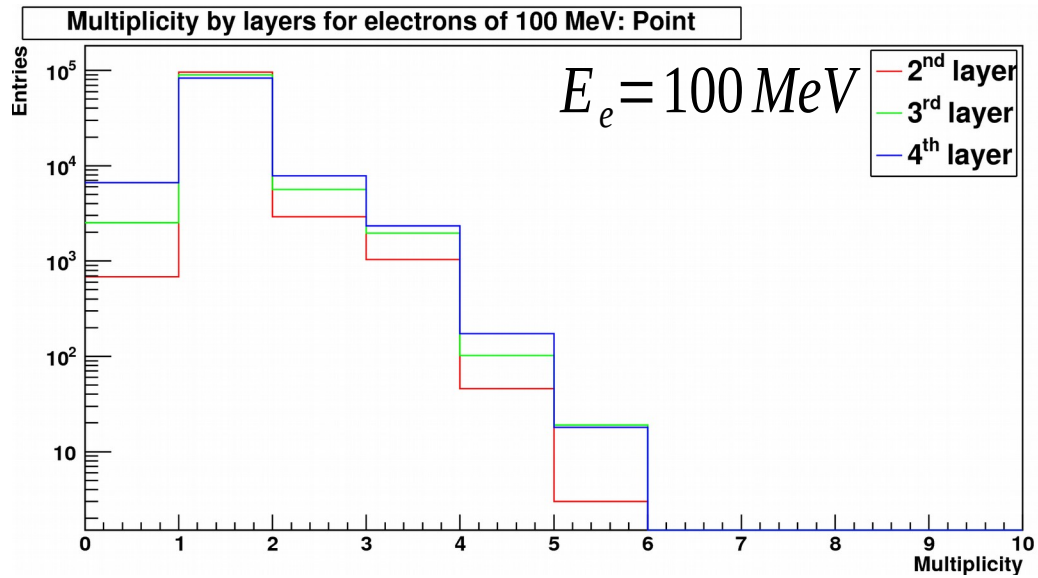


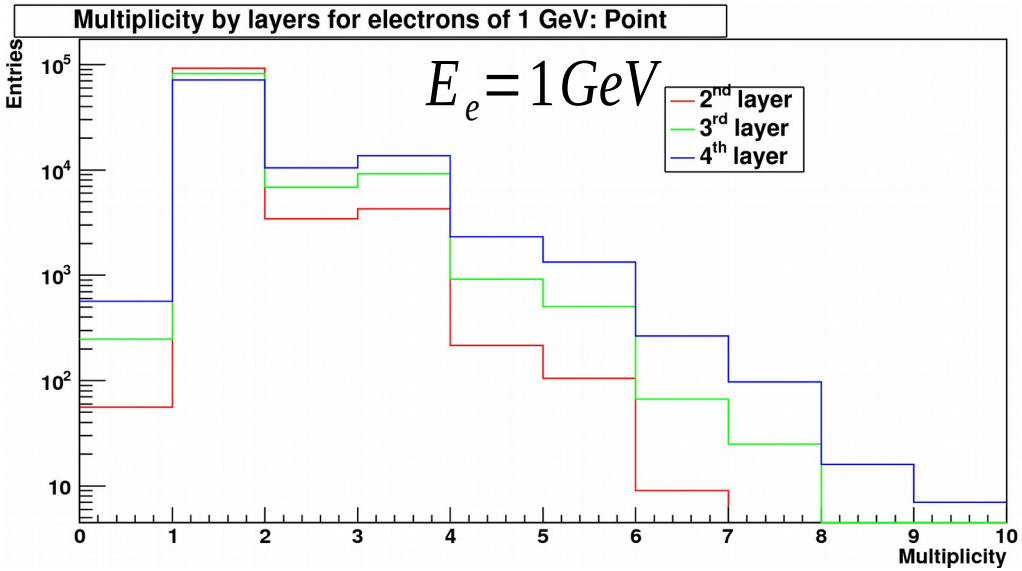
The Multiplicity grows with the energy in all the layers

Electrons : multiplicity in different layers



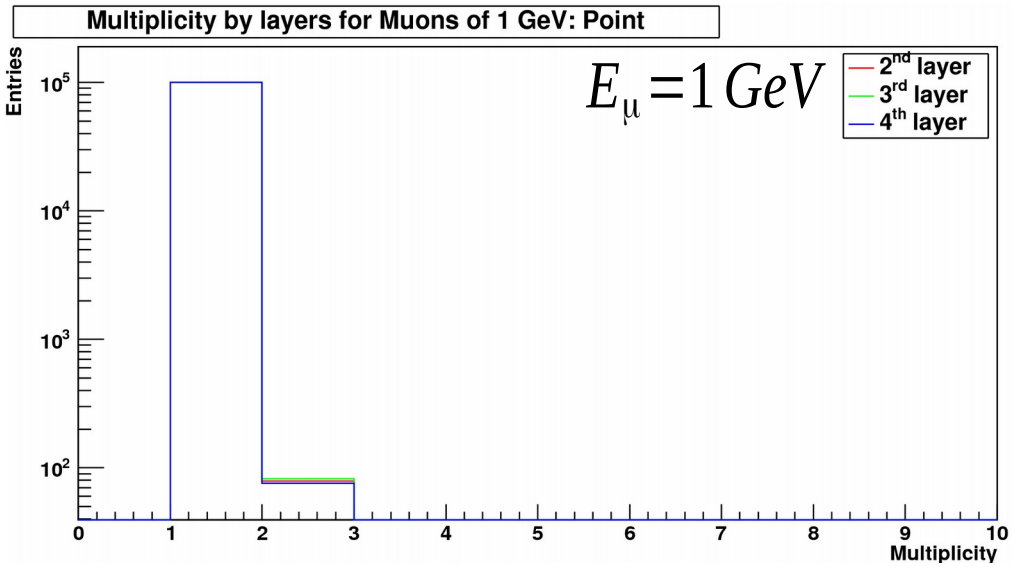


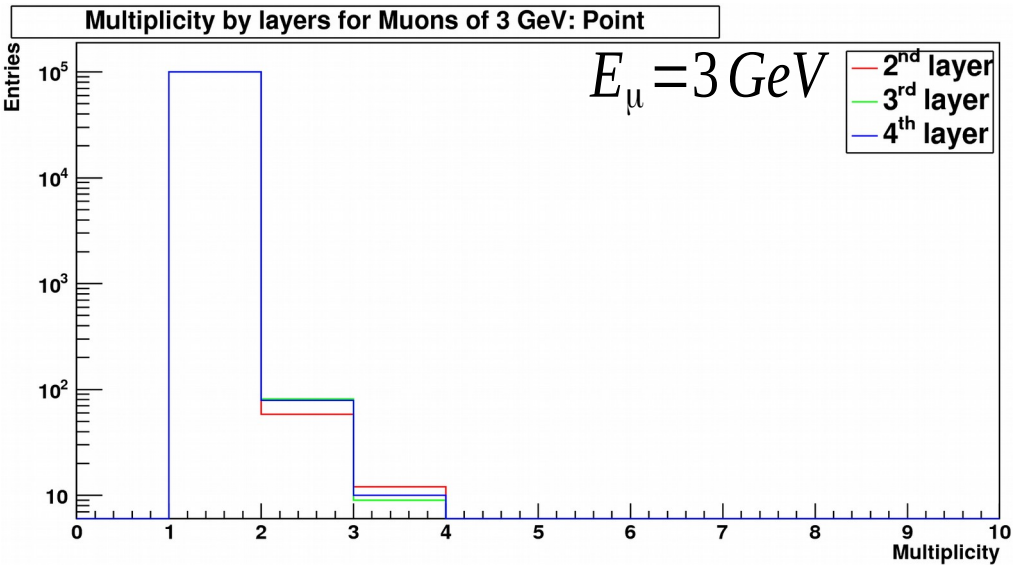


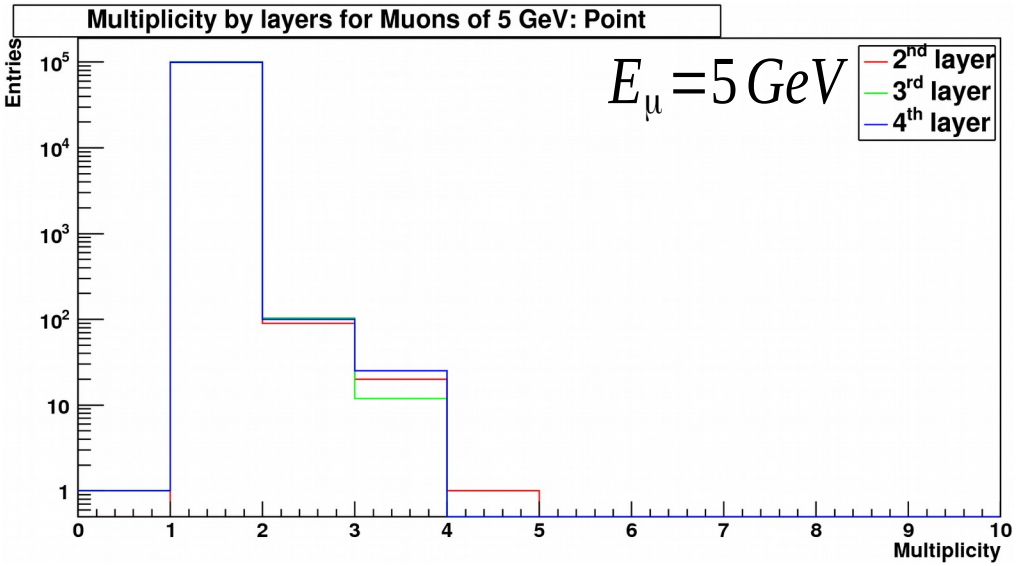


The Multiplicity is sligthly higher than for gammas

Muons : multiplicity in different layers

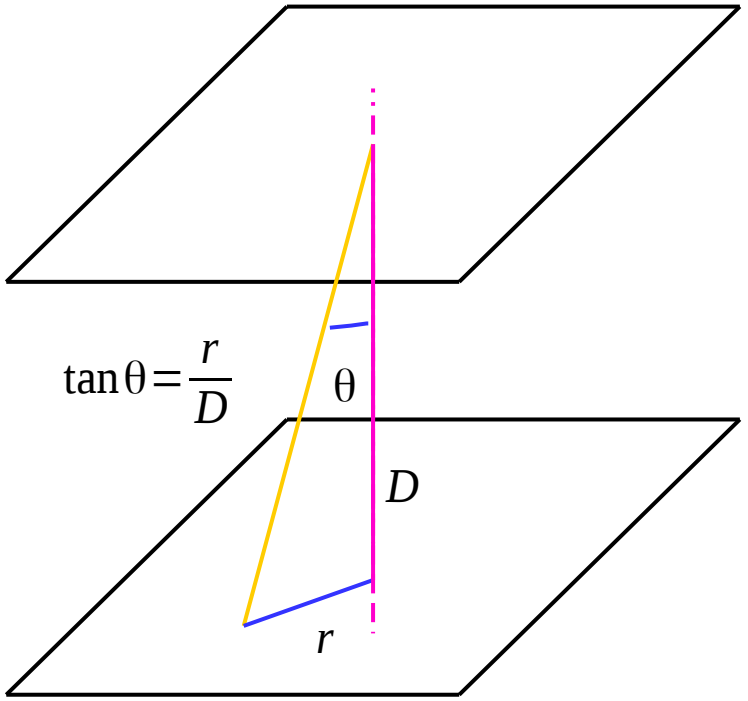


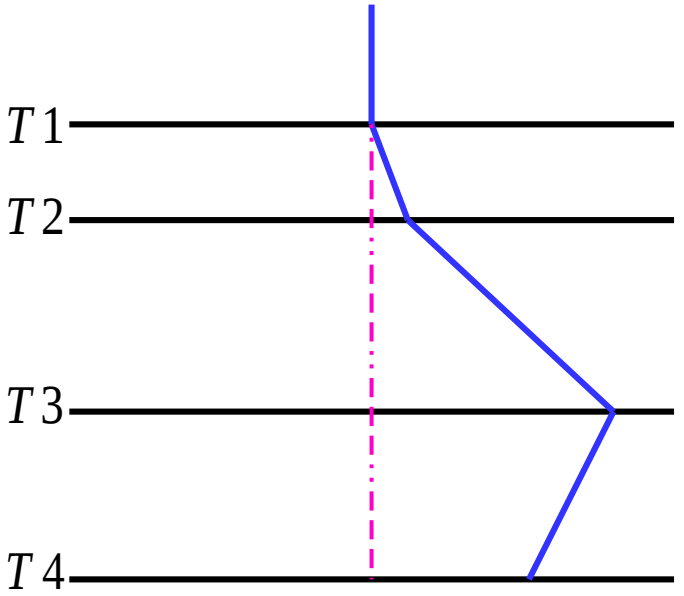


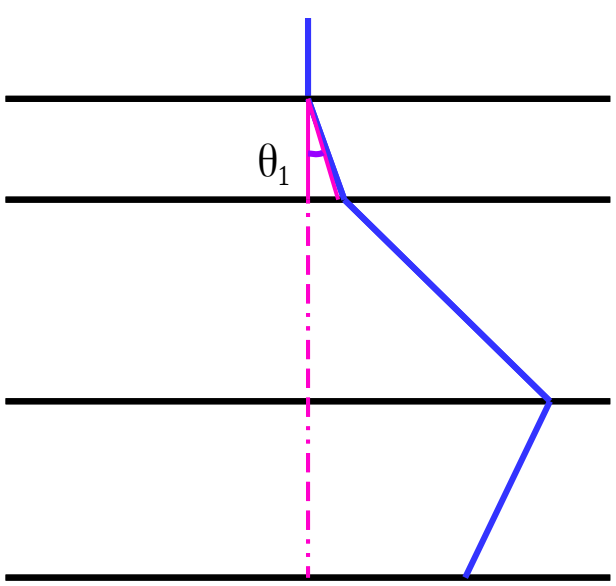


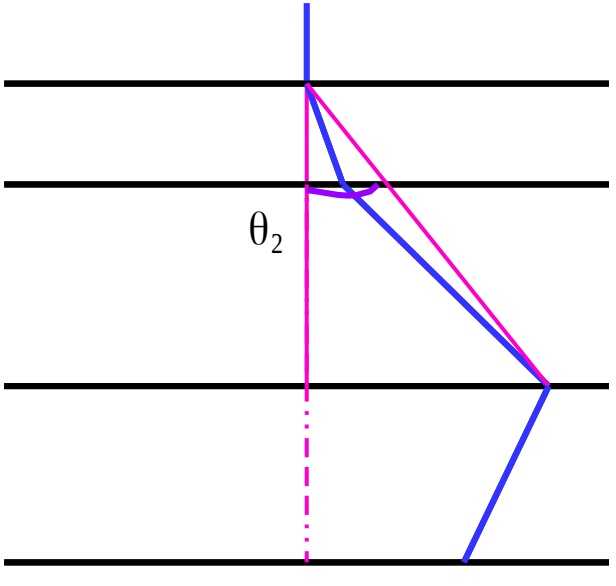
The Multiplicity for muons is smaller than for electrons and gammas.

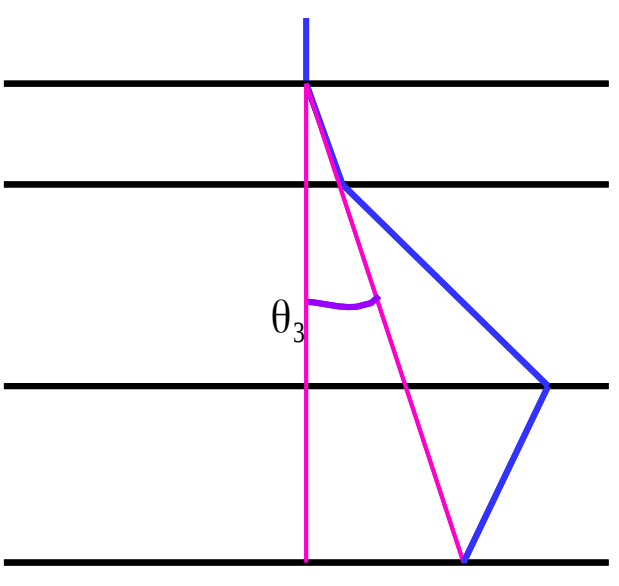
Analysis of the EM shower broadening



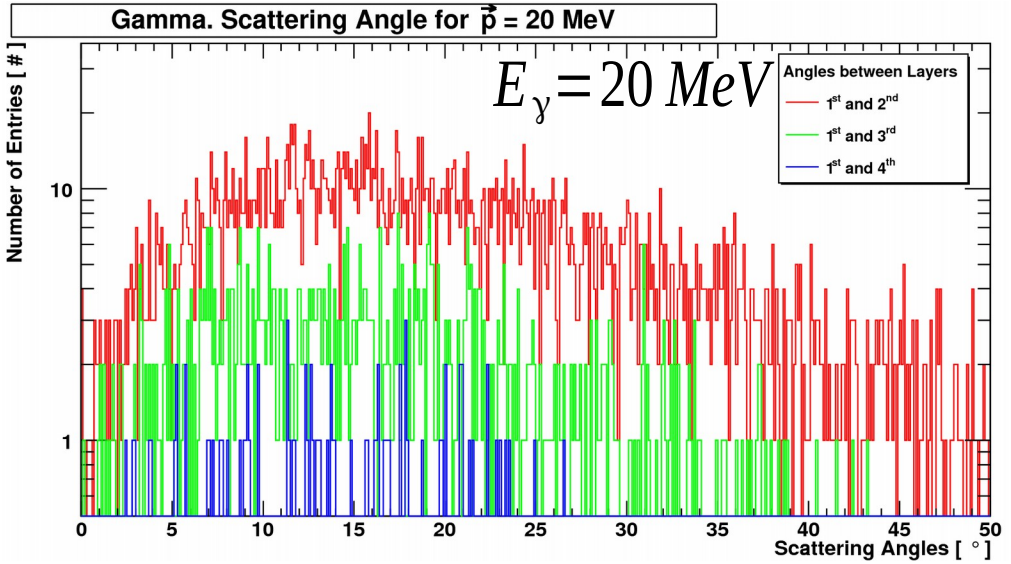


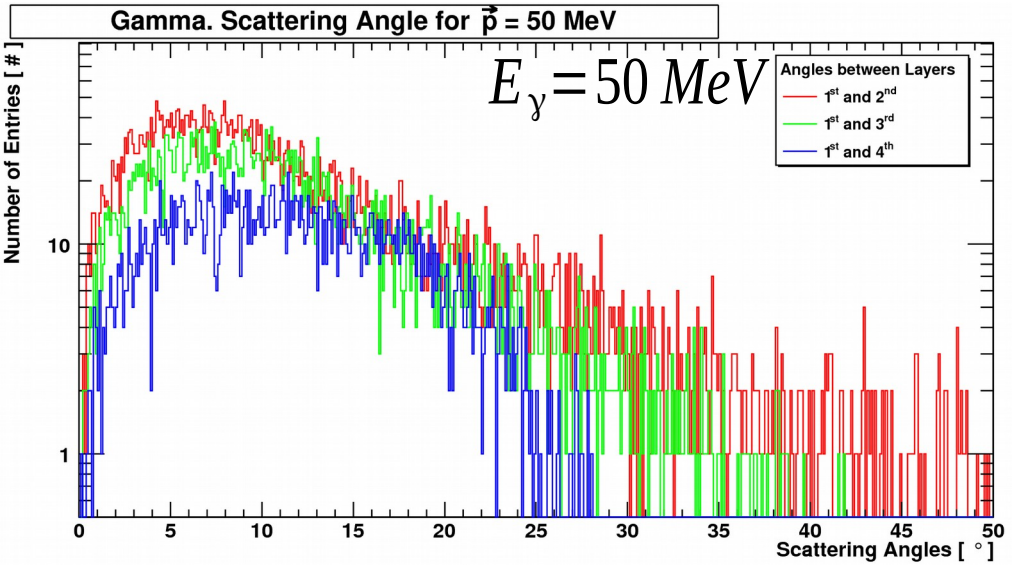


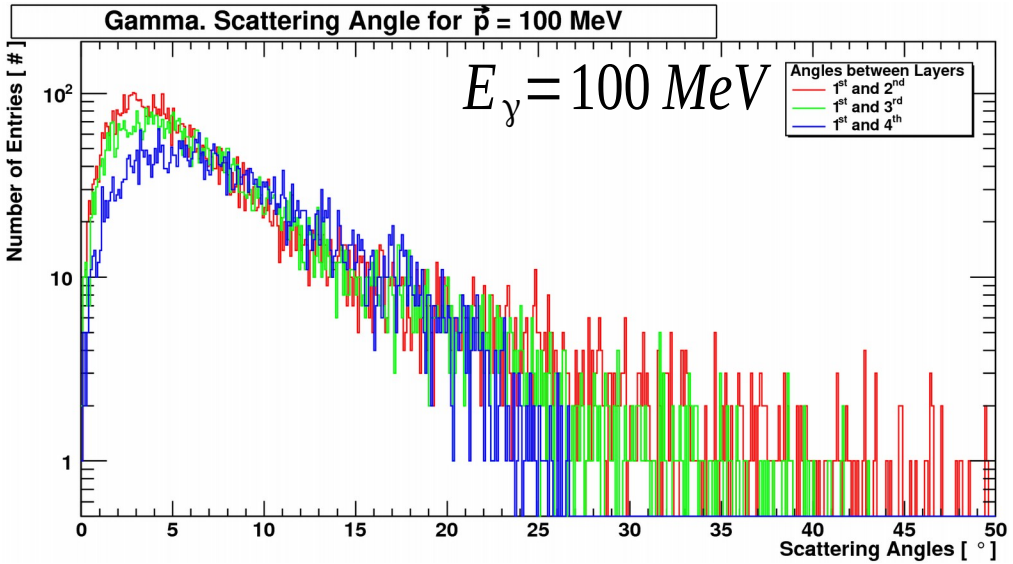


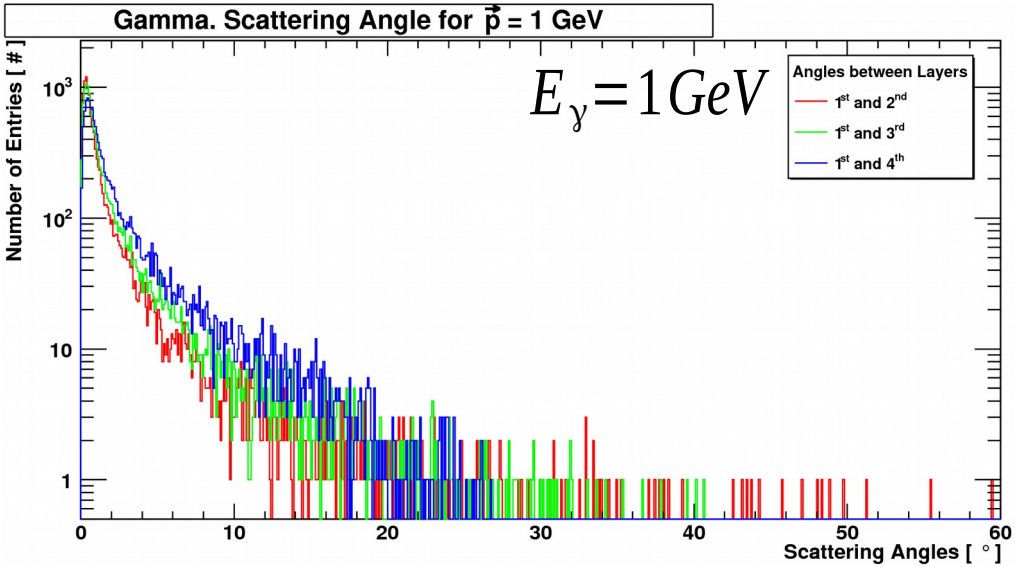


Gammas : scattering angle broadening



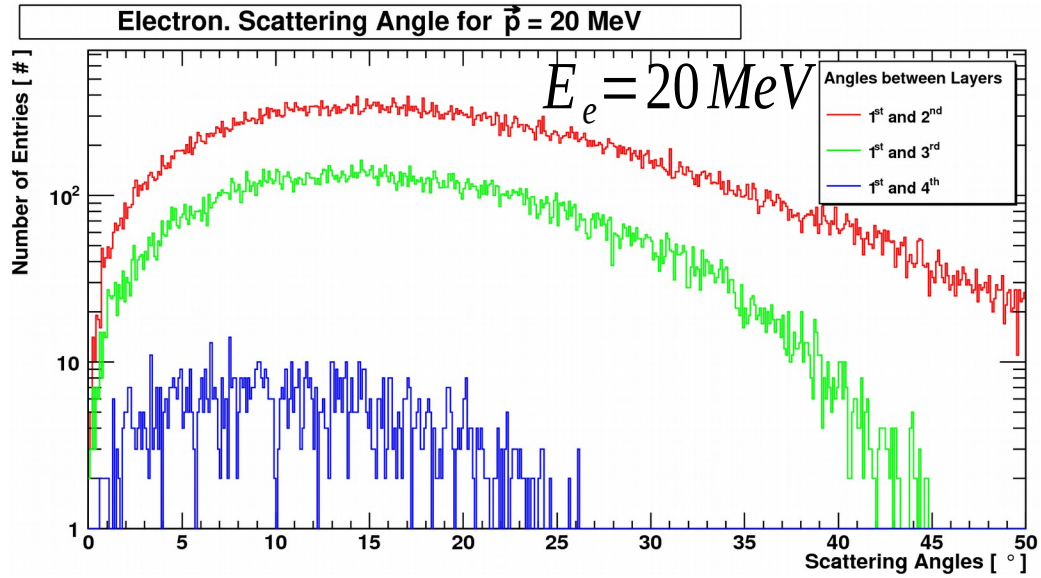


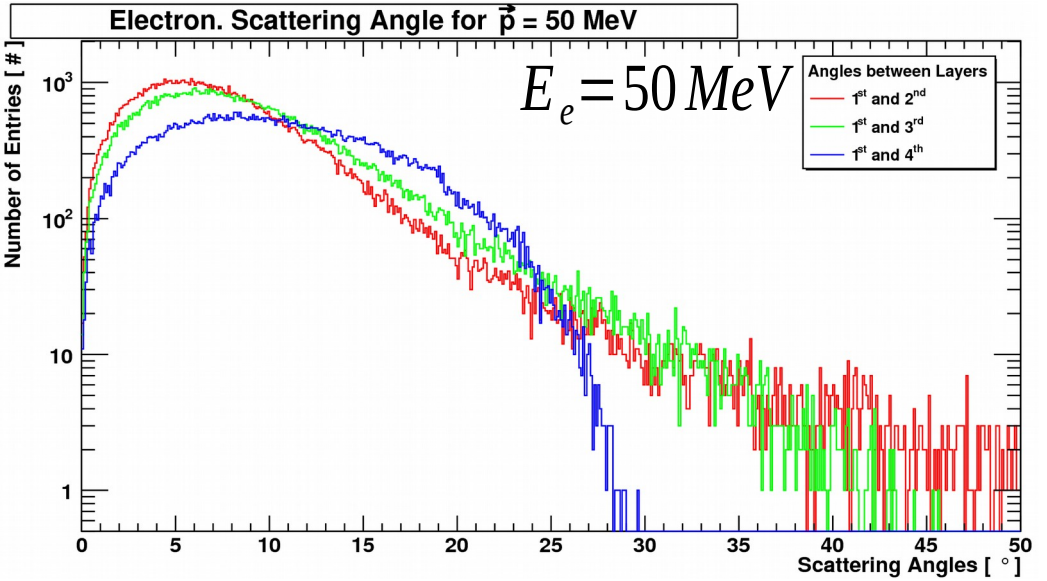


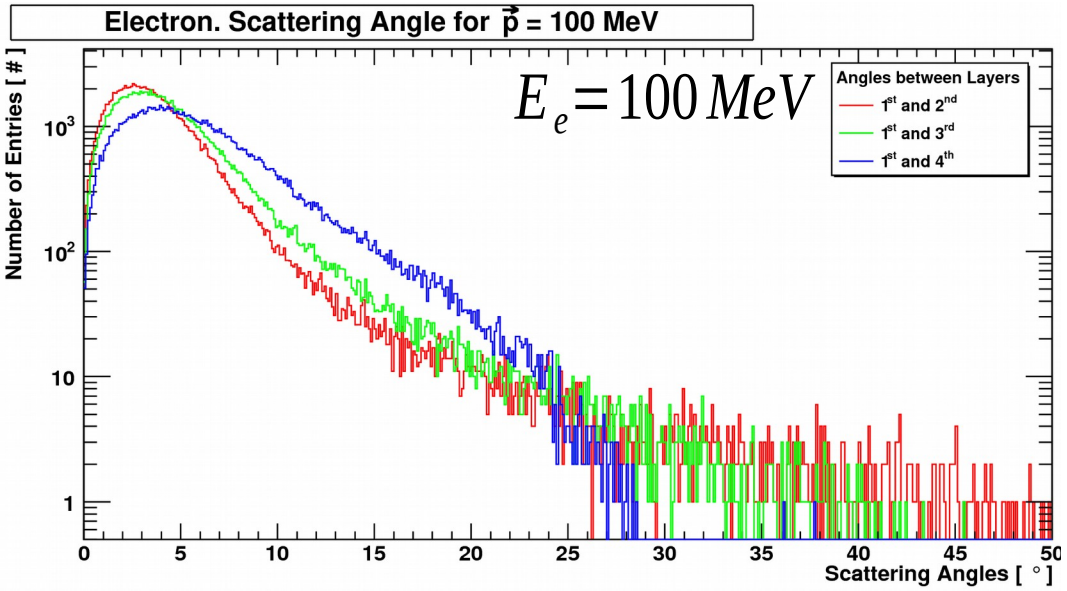


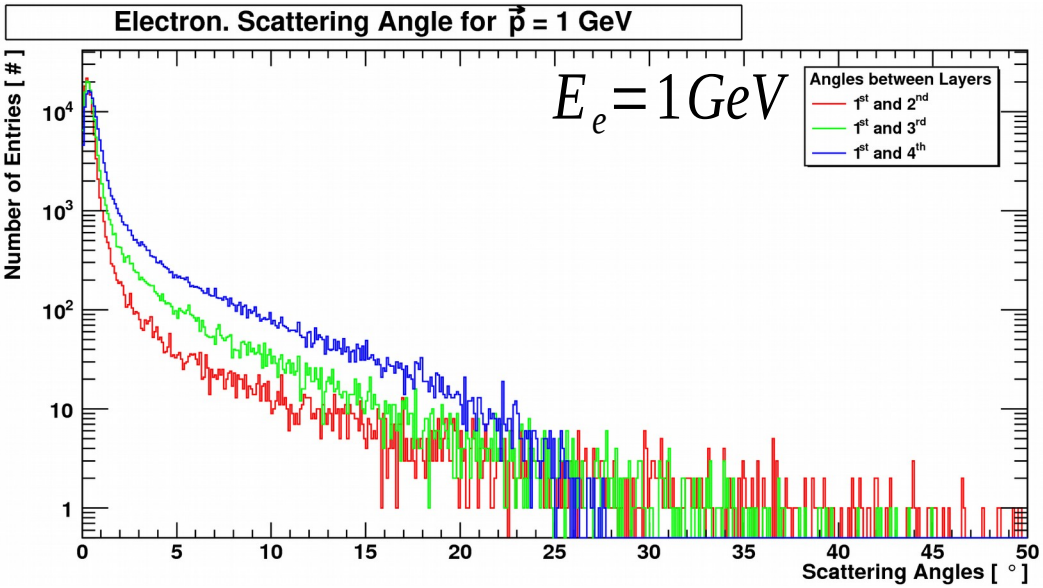
- Scatter angle decrease with the energy

Electron : scattering angle broadening



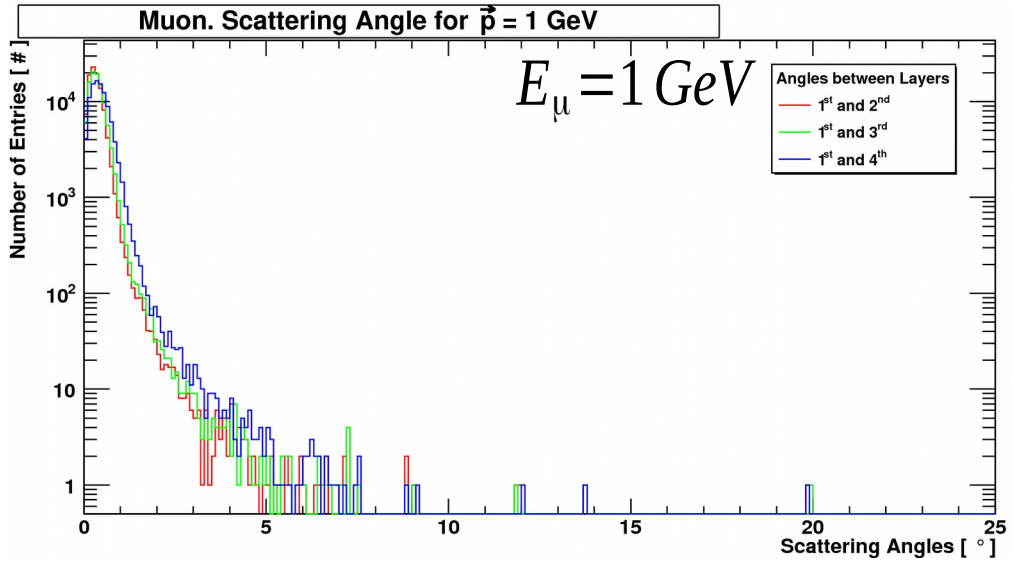


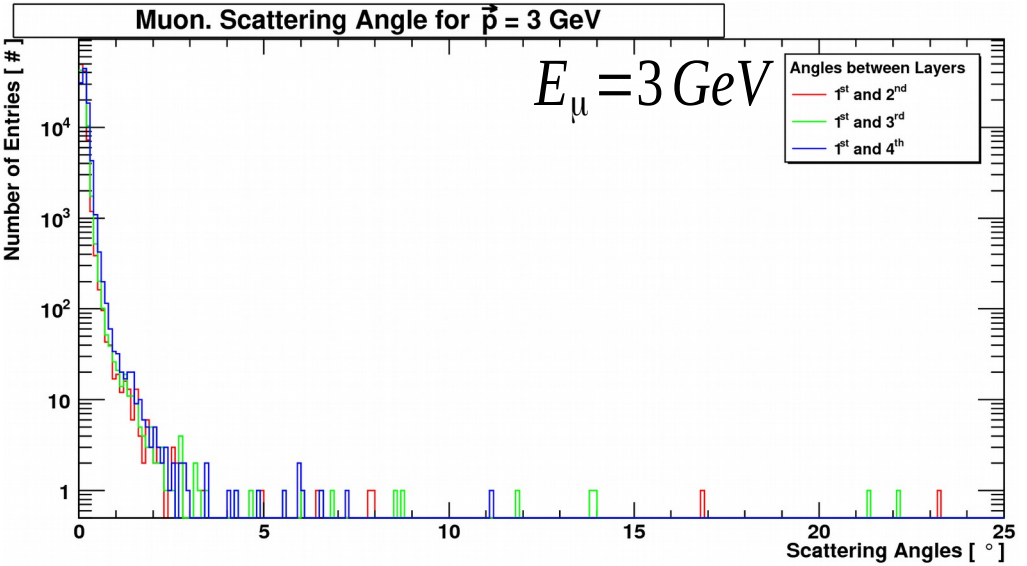


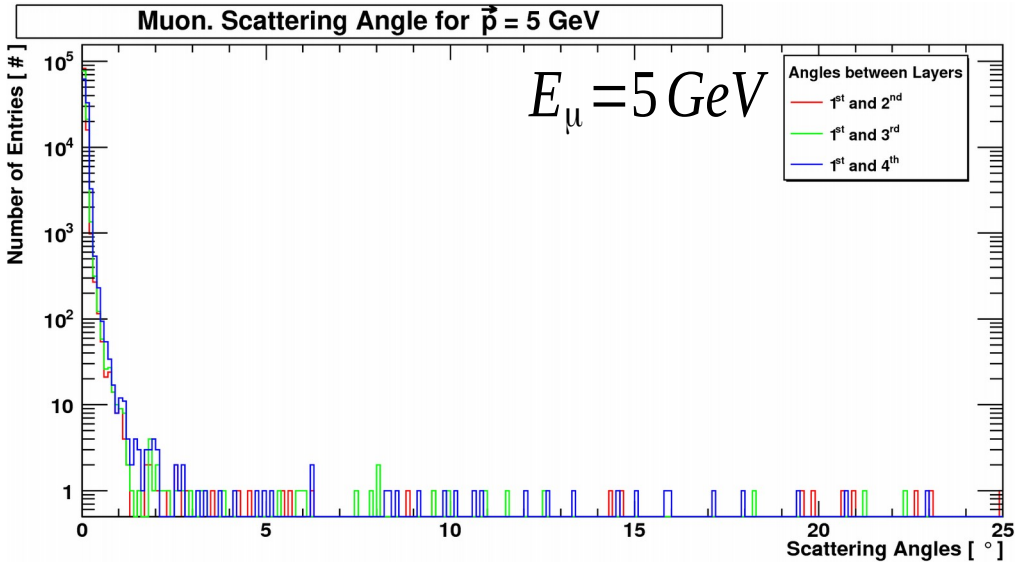


- Mean scatter angle decreases with energy

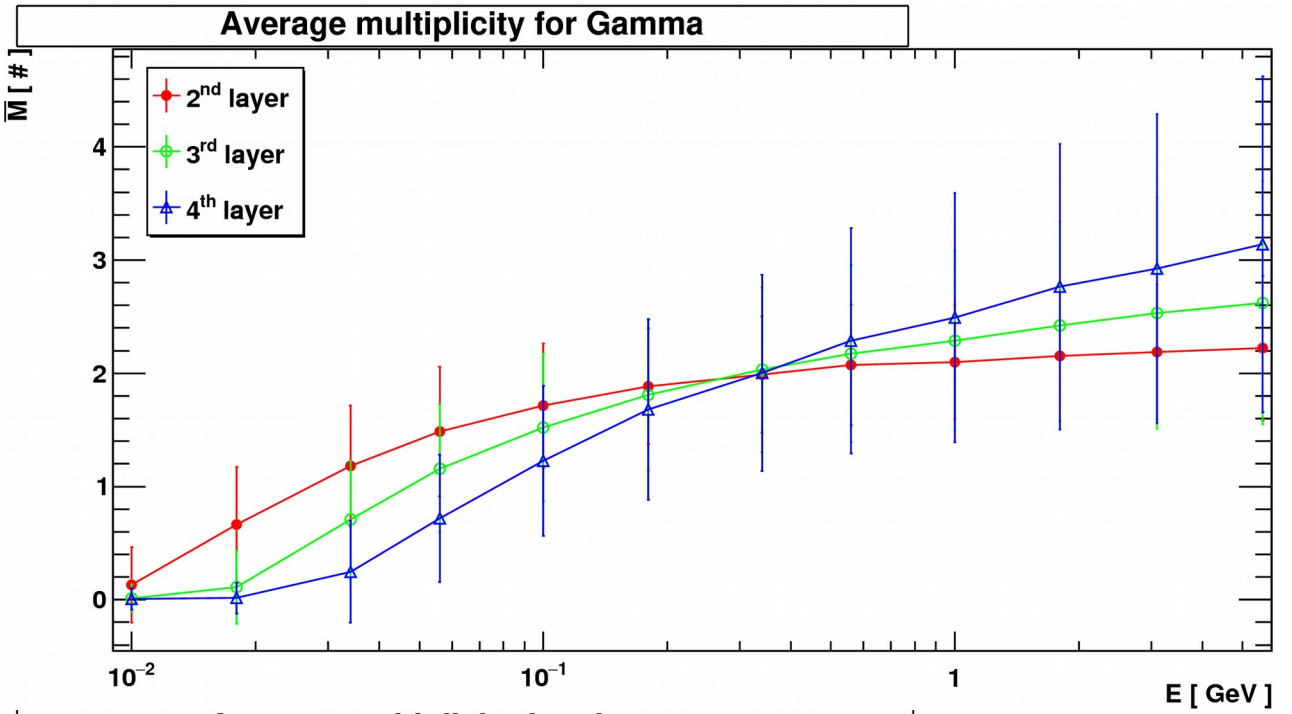
Muon : scattering angles broadening

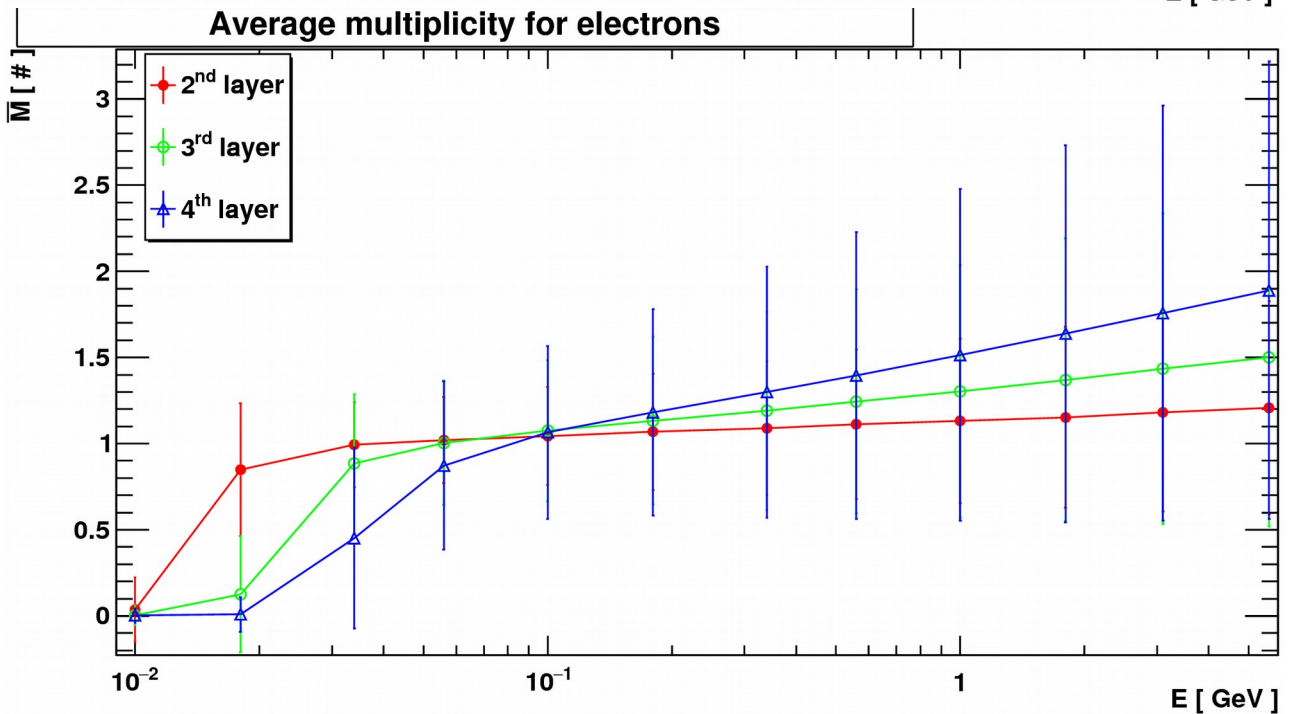






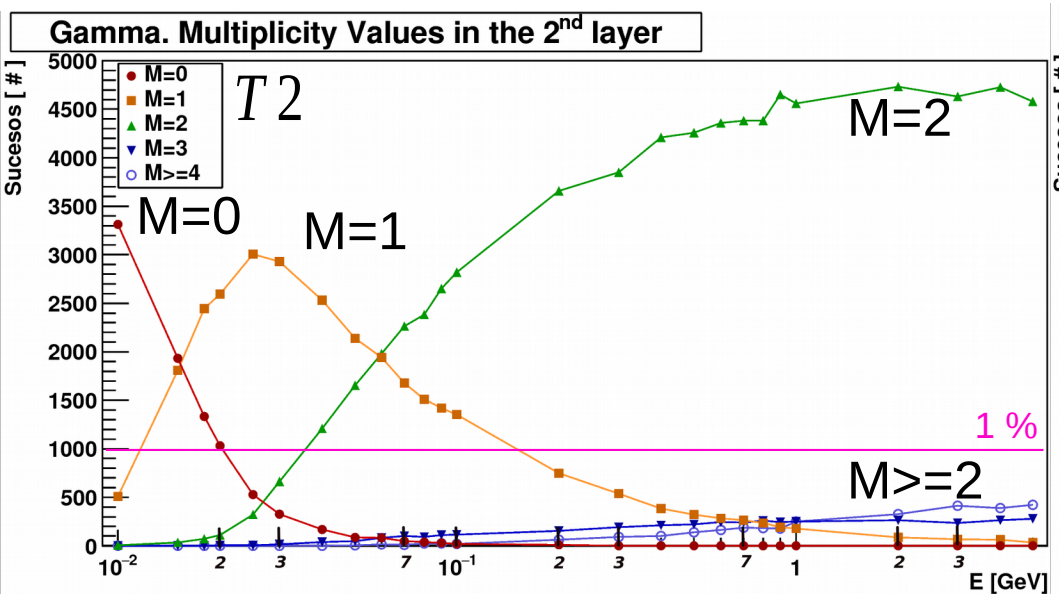
Multiplicity behavior as a function of energy

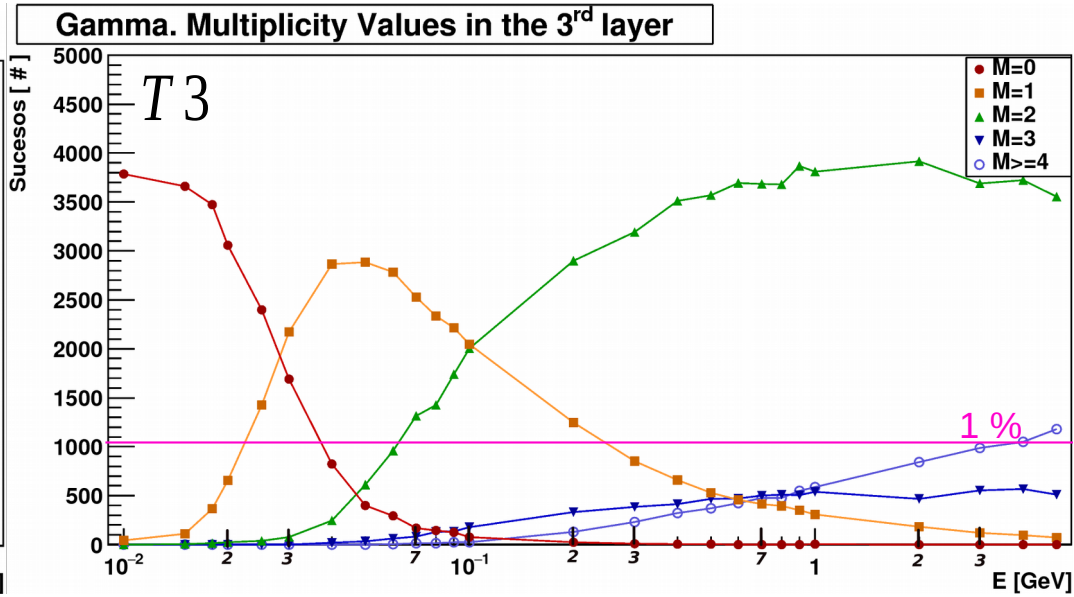


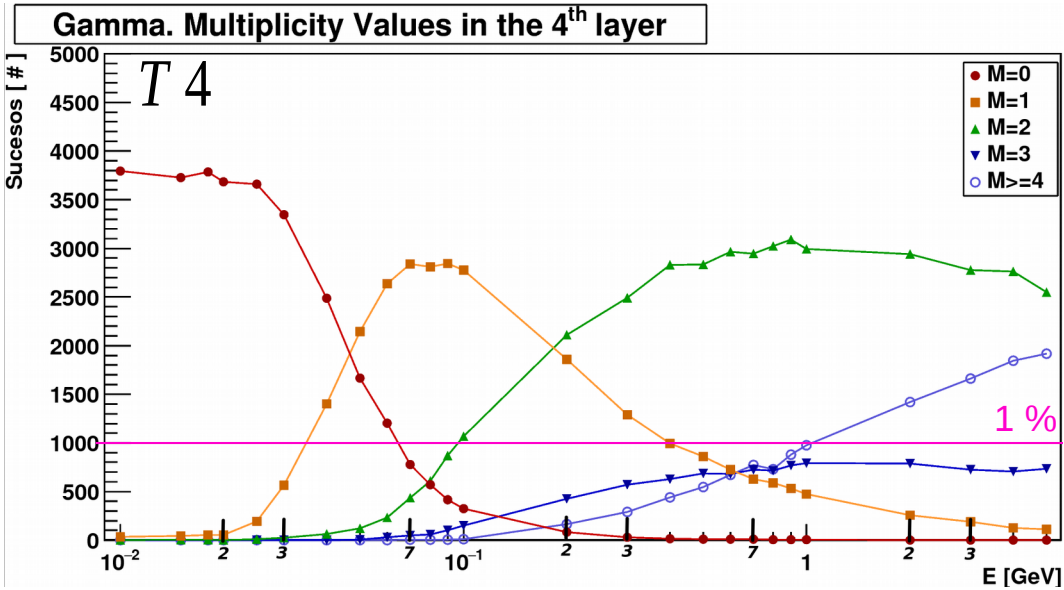


Gammas : shower Multiplicity in different layers

N.º Events : 100K .

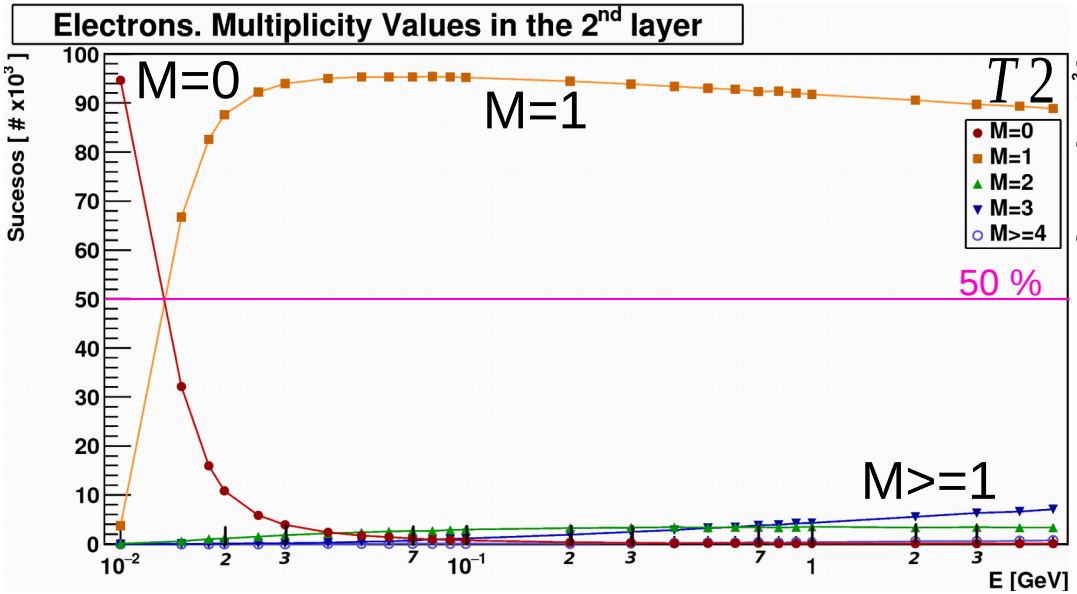


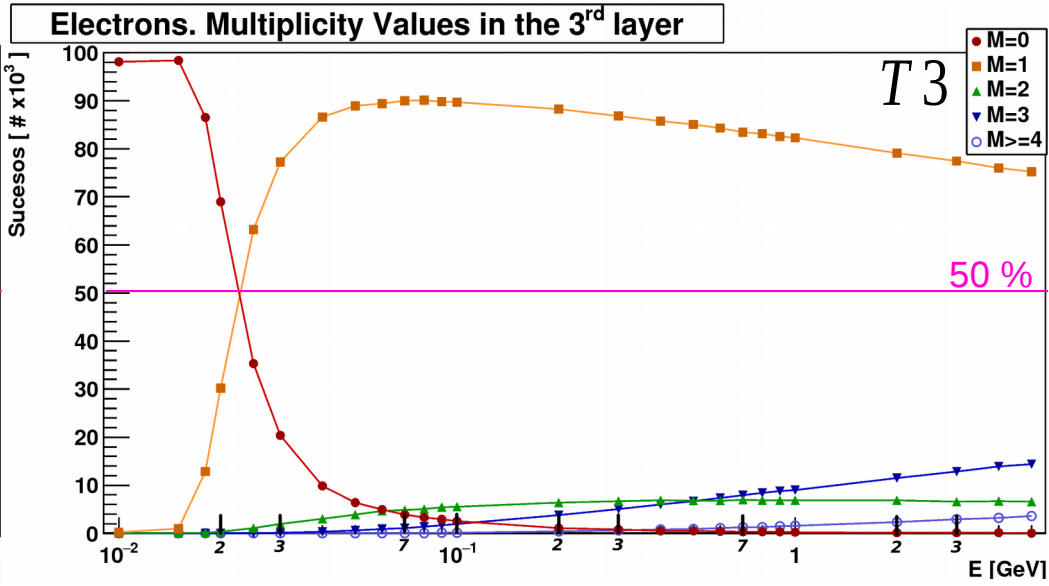


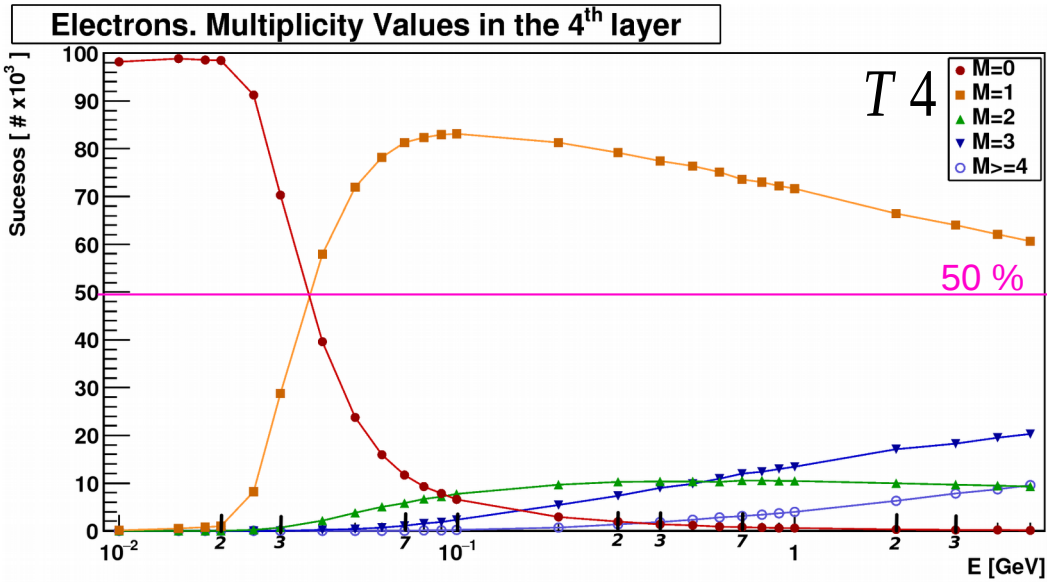


Electrons : shower Multiplicity in different layers

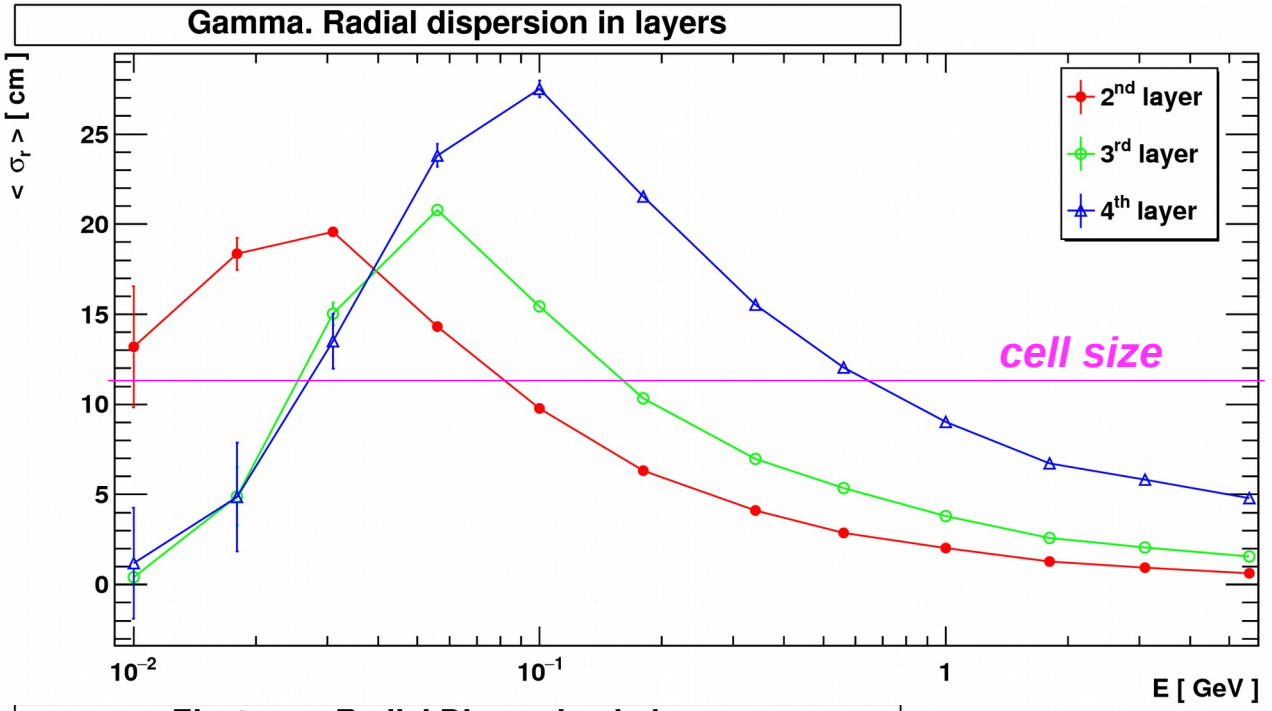
N.º Events : 100K .

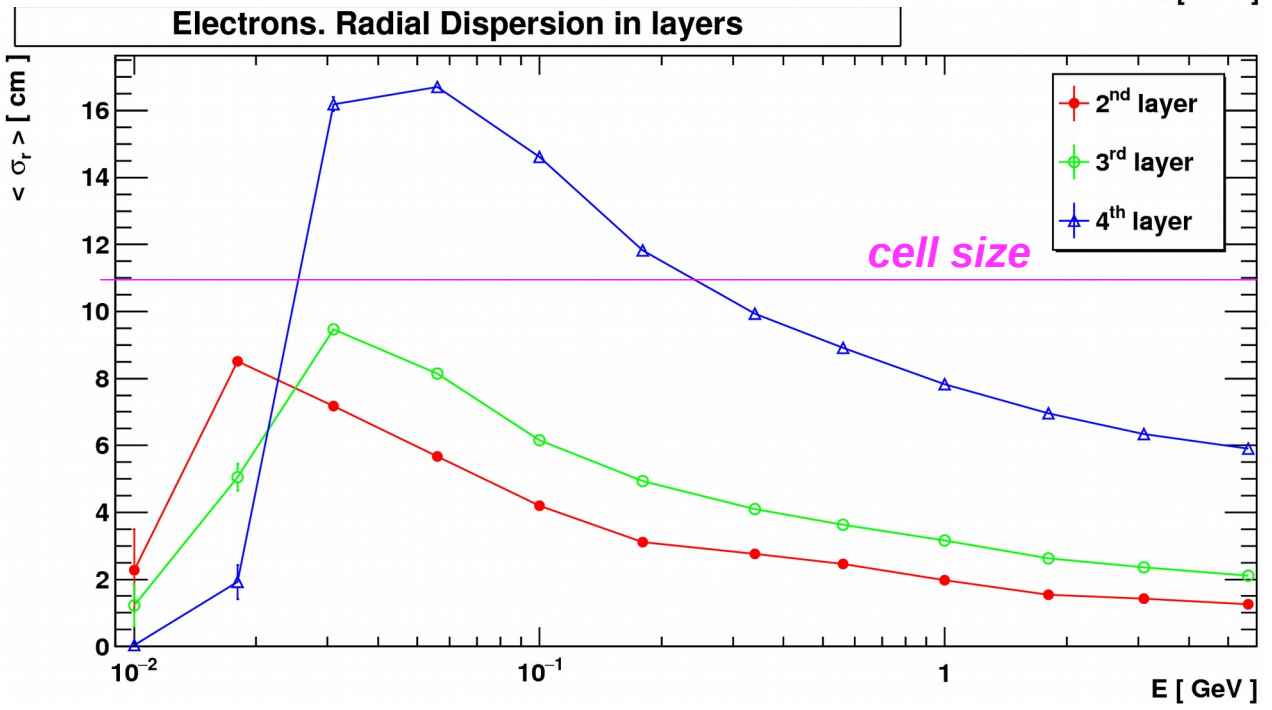




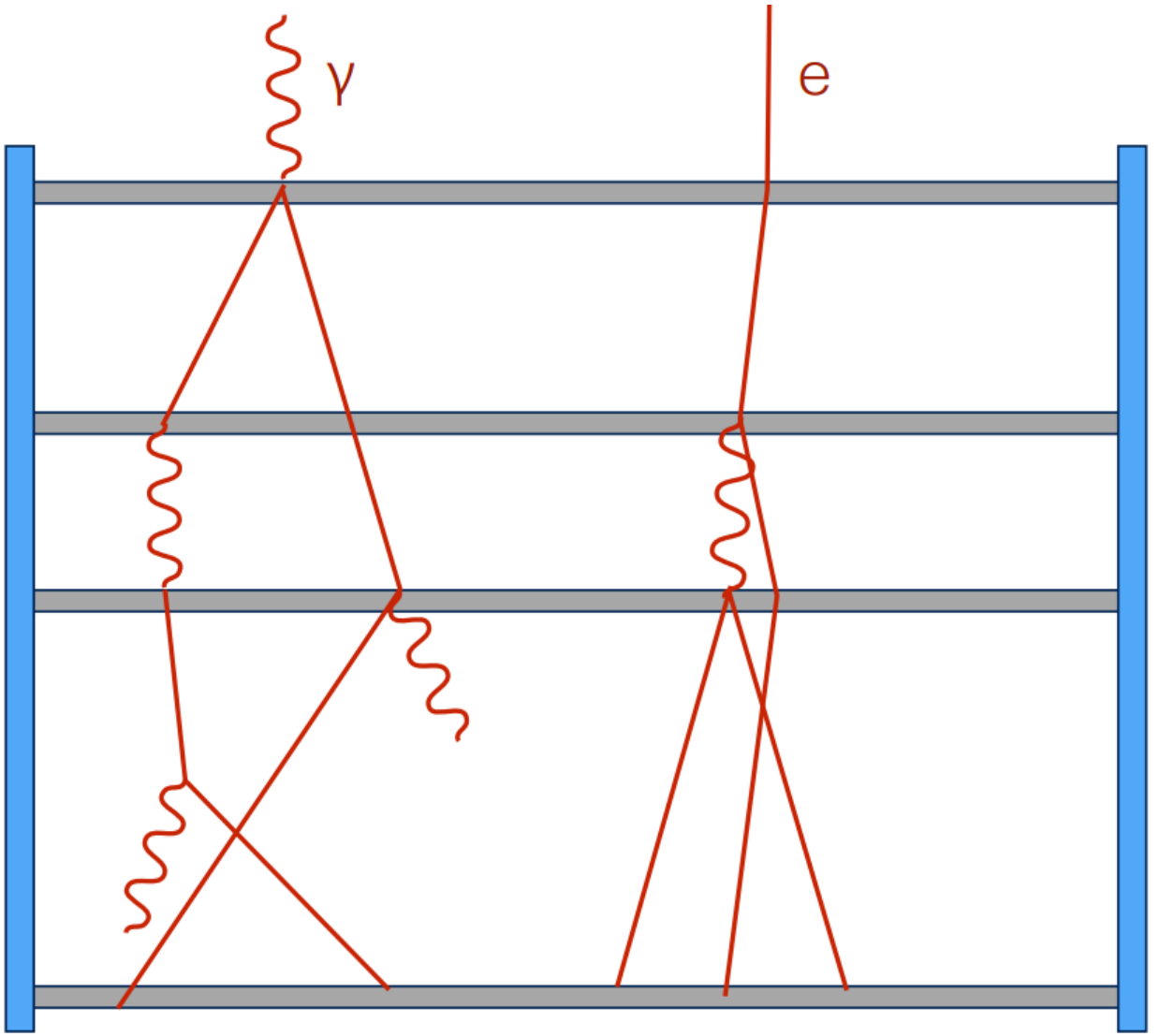


Radial analysis (σ_r)





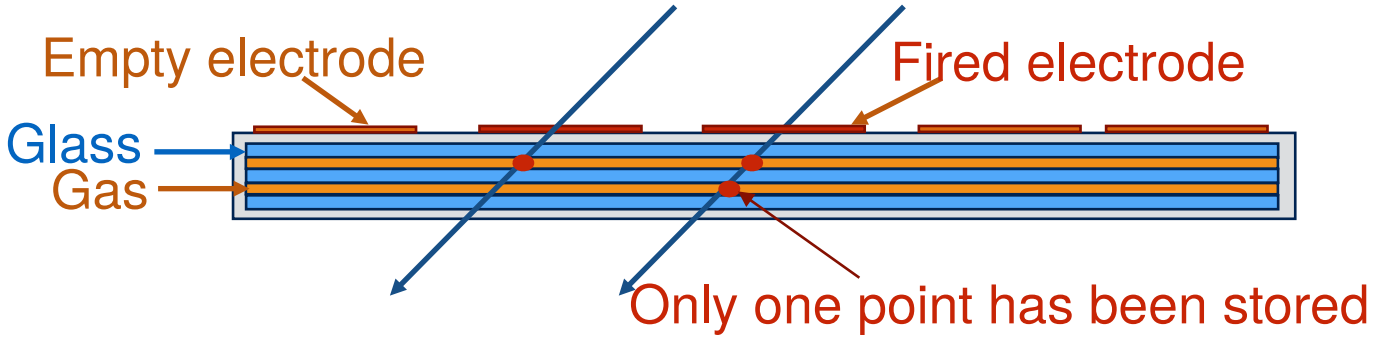
Radial Dispersion : Conclusions



Usually, γ showers are broader than e-showers

Conclusions

- We have analyze the response of the Tragaldabas to electron and gammas of cosmic ray interest .
- Shower multiplicity in all layer growth with the energy both for electrons and gamma .
- The Multiplicity for muons is smaller then for electrons and gammas .
- The shower of the gamma open more than the shower of electrons.


Empty electrode
Fired electrode
Glass
Gas
Only one point has been stored