ECAL Energy Resolution

$$\frac{\sigma E}{E} = \frac{p0}{\sqrt{E}} \oplus p1 \oplus \frac{p2}{E}$$

PDG: 34.8.1

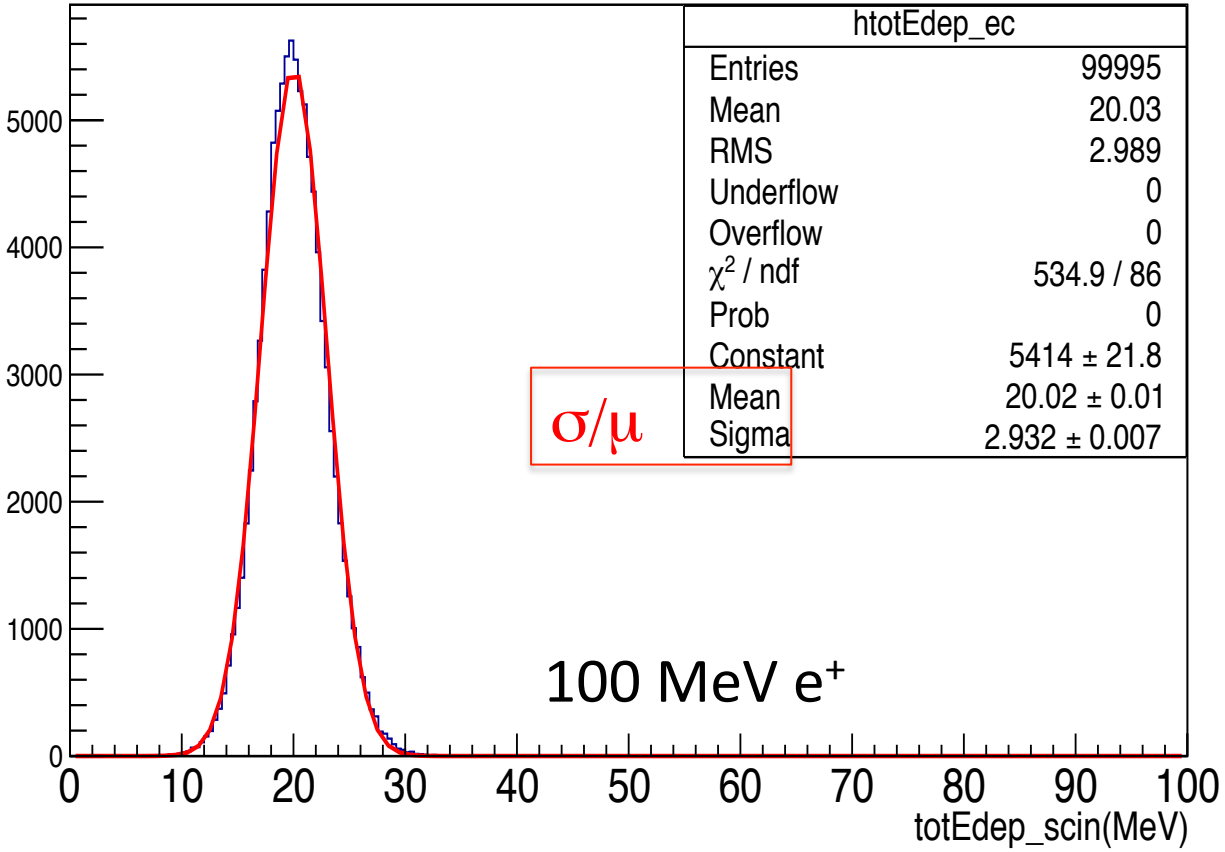
- P0: statistic-related fluctuations: intrinsic shower fluctuations, photoelectron statistics, and sampling fluctuations (4-5% for our shashlik design, which is based on Xiaochao's calculation)
- P1: detector non-uniformity and calibration uncertainty
- P2: noise term

Method

7-module configuration

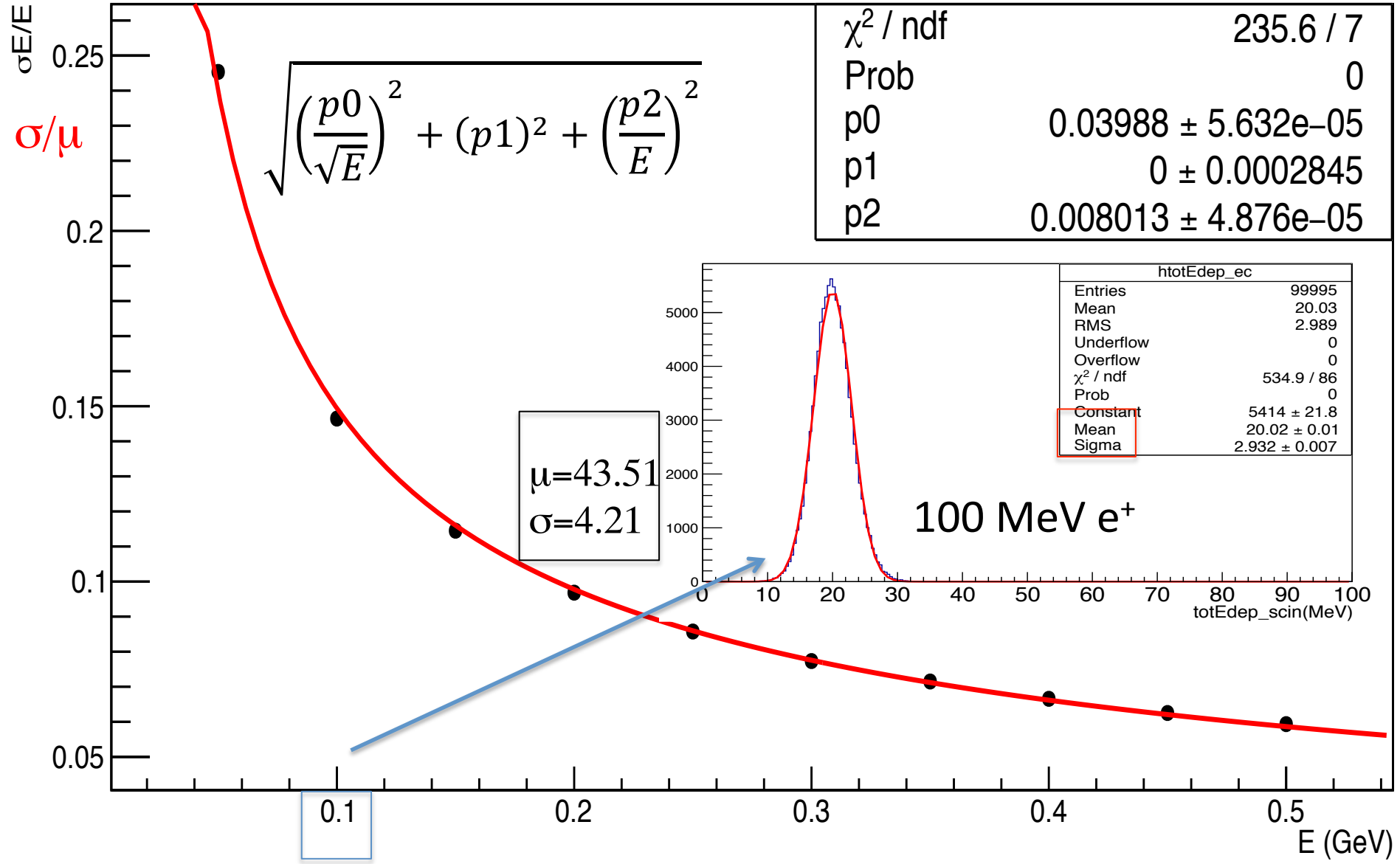
e^+ : E= 0.05 , 0.1 , 0.15, 0.2……., and 7 GeV

Total shower deposit energy: totEdep

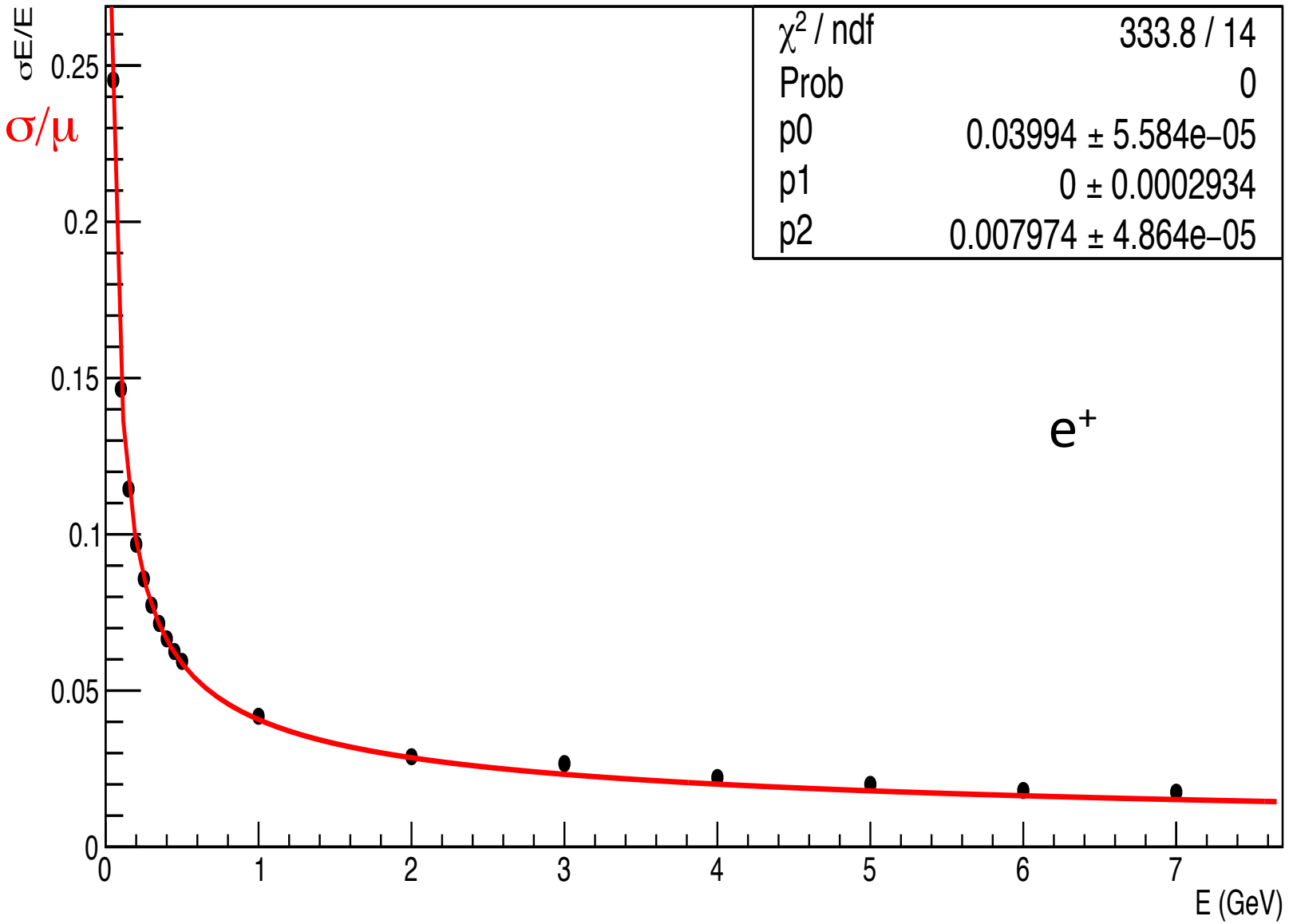


7-module Configuration Simulation Results

EC energy resolution

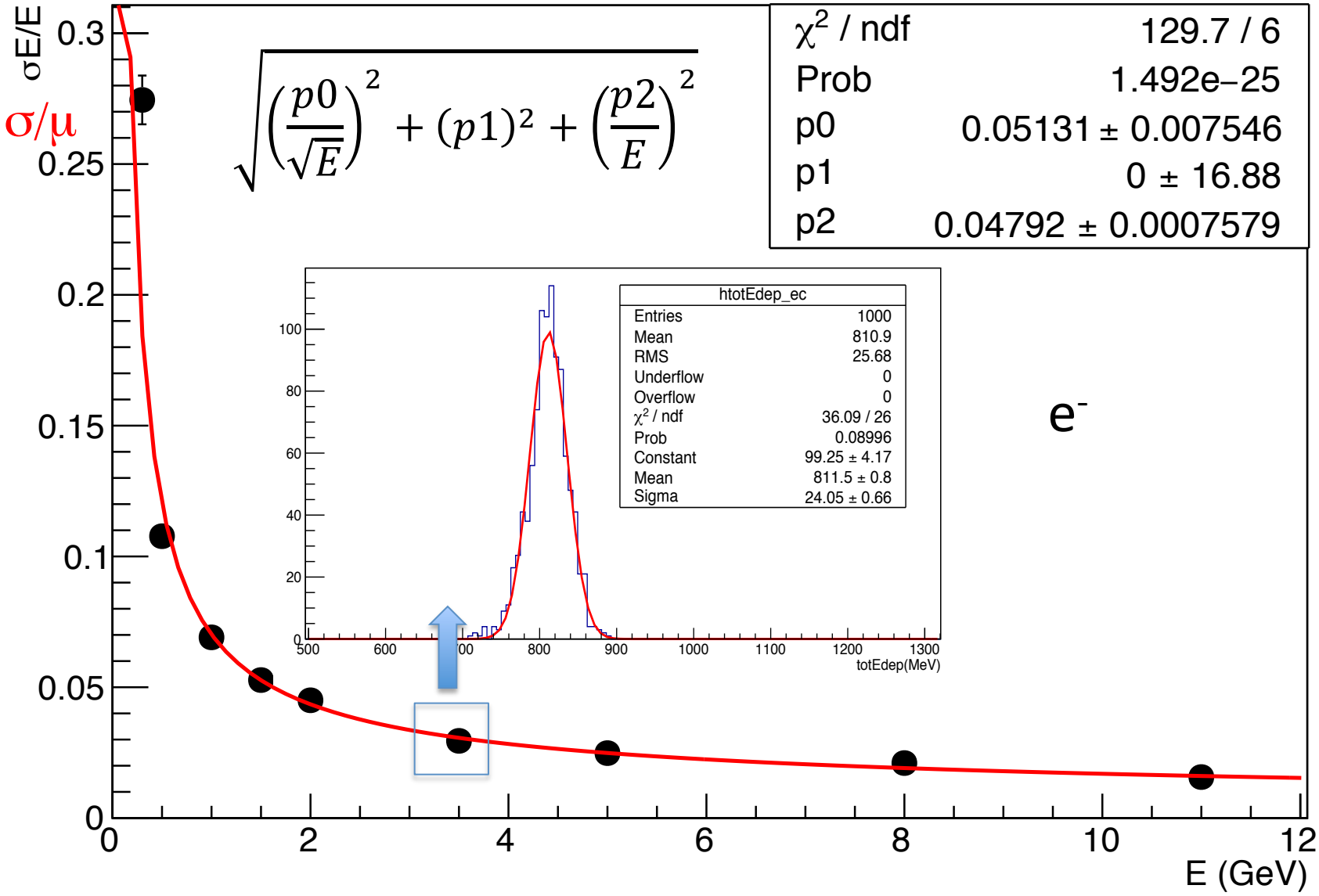


7-module Configuration Simulation Results



PVDIS Configuration and θ_e=25° Simulation Results

EC energy resolution



Summary

- For the 7-module configuration, positrons without any field straightly hit on the front of ECAL.

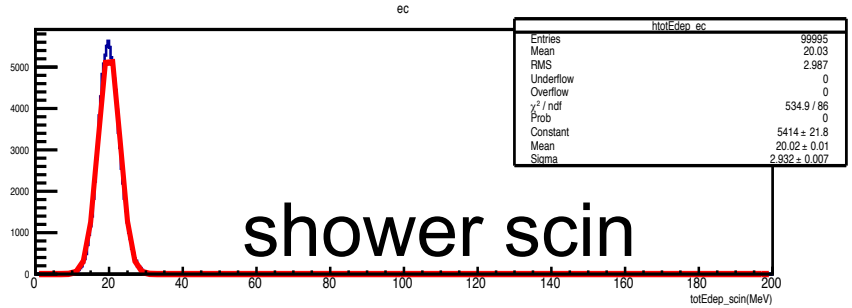
χ^2 / ndf	333.8 / 14
Prob	0
p0	0.03994 ± 5.584e−05
p1	0 ± 0.0002934
p2	0.007974 ± 4.864e−05

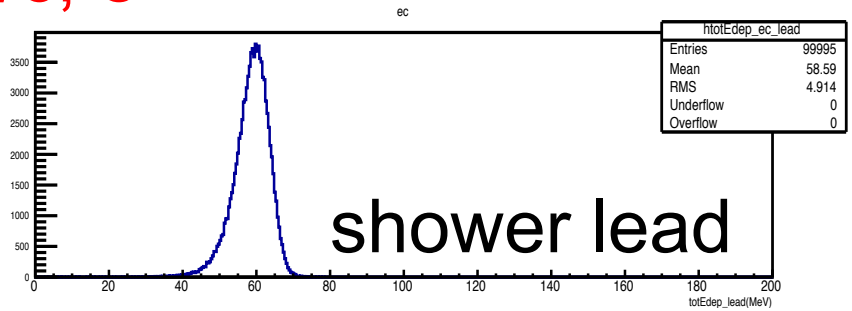
- For the PVDIS configuration, electrons with field with θ=25o hit on the front of ECAL.

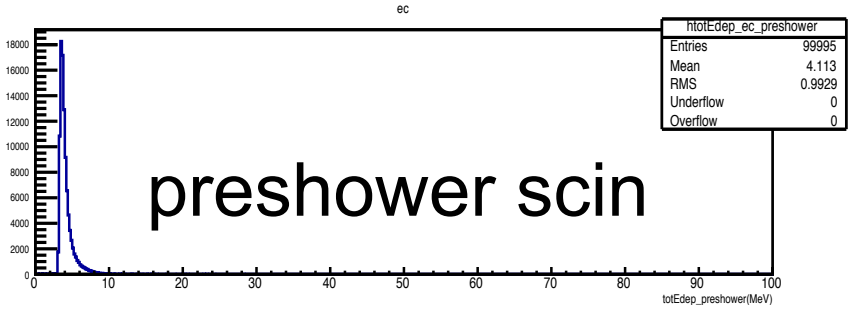
χ^2 / ndf	129.7 / 6
Prob	1.492e−25
p0	0.05131 ± 0.007546
p1	0 ± 16.88
p2	0.04792 ± 0.0007579

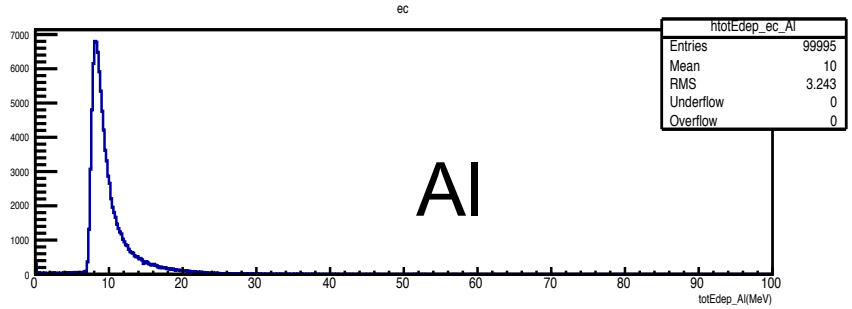
Momentum Fraction Deposit in ECAL

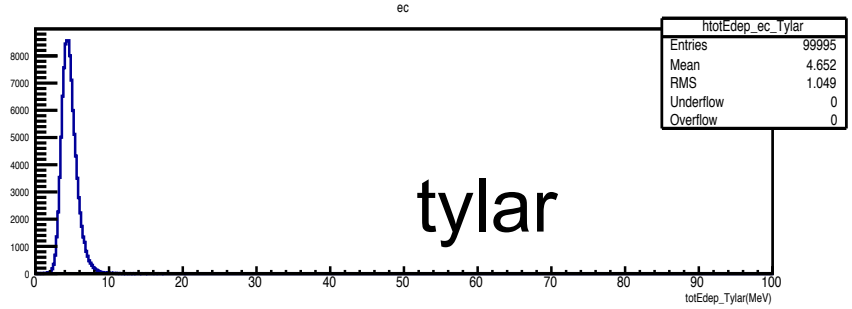
100 MeV/c, e+

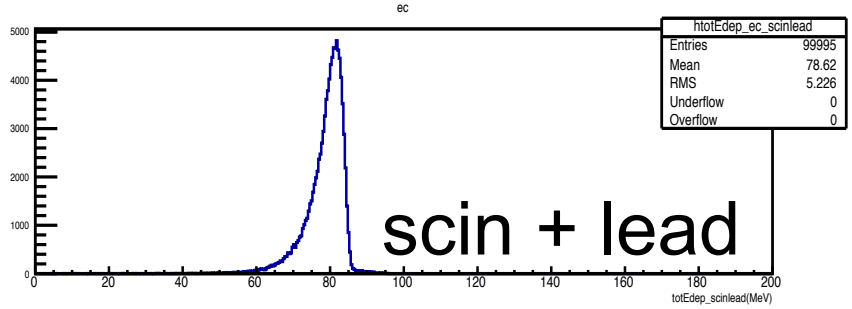

ec
htotEdep_ec
Entries 99995
Mean 20.03
RMS 2.987
Underflow 0
Overflow 0
χ² / ndf 534.9 / 86
Prob 0
Constant 5414 ± 21.8
Mean 20.02 ± 0.01
Sigma 2.932 ± 0.007
totEdep_scin(MeV)
shower scin

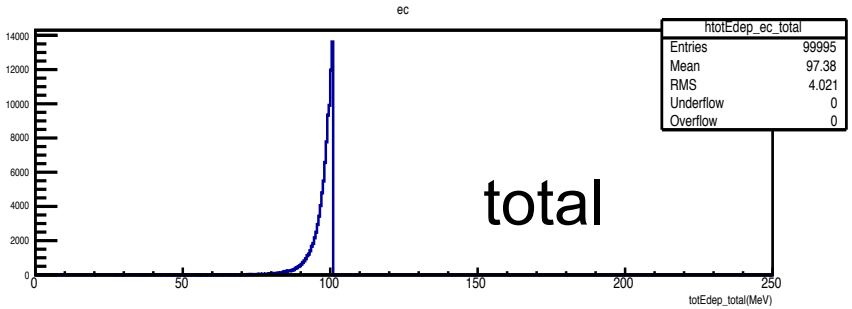

ec
htotEdep_ec_lead
Entries 99995
Mean 58.59
RMS 4.914
Underflow 0
Overflow 0
totEdep_lead(MeV)
shower lead

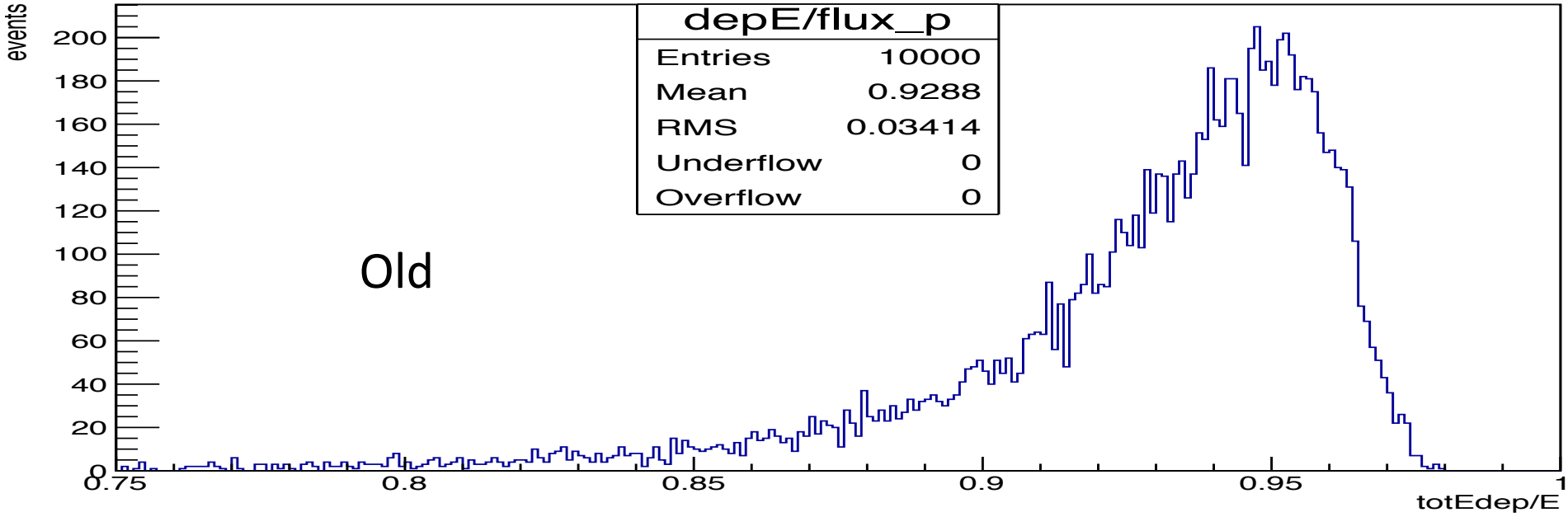

ec
htotEdep_ec_preshower
Entries 99995
Mean 4.113
RMS 0.9929
Underflow 0
Overflow 0
totEdep_preshower(MeV)
preshower scin

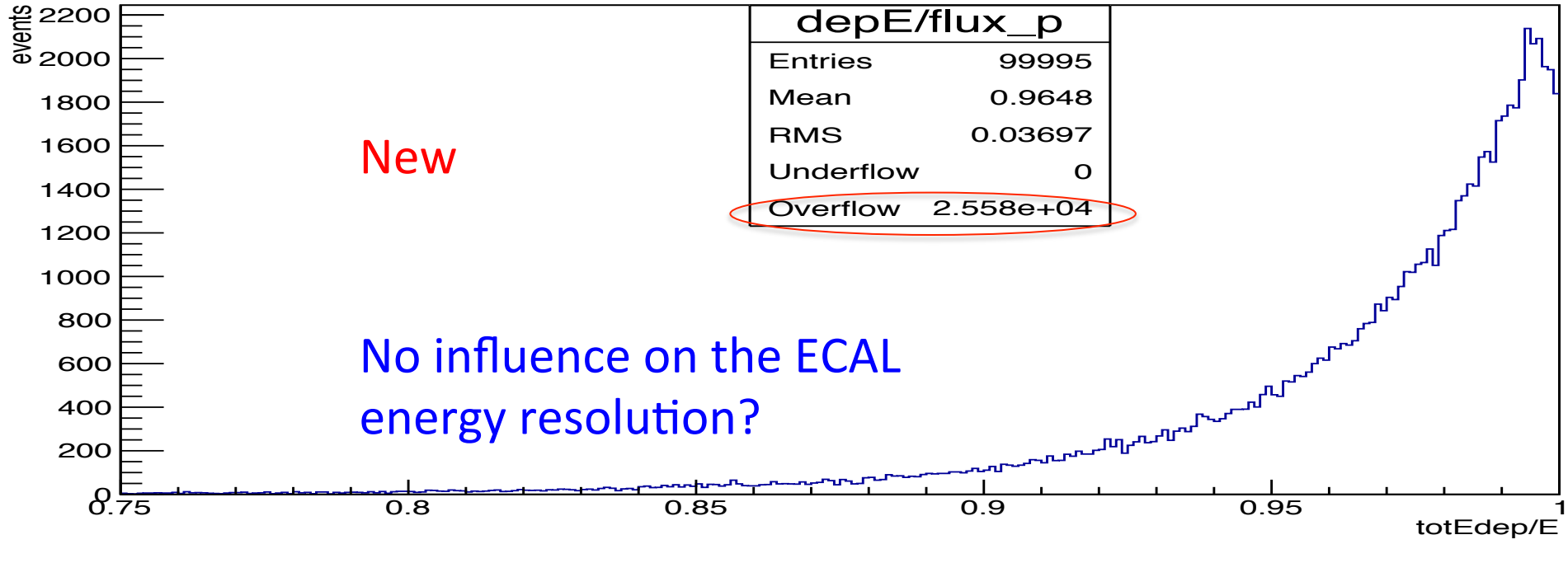

ec
htotEdep_ec_Al
Entries 99995
Mean 10
RMS 3.243
Underflow 0
Overflow 0
totEdep_Al(MeV)
Al


ec
htotEdep_ec_Tylar
Entries 99995
Mean 4.652
RMS 1.049
Underflow 0
Overflow 0
totEdep_Tylar(MeV)
tylar


ec
htotEdep_ec_scinlead
Entries 99995
Mean 78.62
RMS 5.226
Underflow 0
Overflow 0
totEdep_scinlead(MeV)
scin + lead


ec
htotEdep_ec_total
Entries 99995
Mean 97.38
RMS 4.021
Underflow 0
Overflow 0
totEdep_total(MeV)
total


depE/flux_p
Entries 10000
Mean 0.9288
RMS 0.03414
Underflow 0
Overflow 0
Old
events
totEdep/E


depE/flux_p
Entries 99995
Mean 0.9648
RMS 0.03697
Underflow 0
Overflow 2.558e+04
New
No influence on the ECAL energy resolution?
events
totEdep/E

Next Step

- Figure out the over summed ECLA deposit energy in the GEMC simulation package.

  - ❖ Check out the ECAL deposit energy in each scintillator layer.
  - ❖ Figure out how does the GEMC add deposit energy together.

Any comments and suggestions ?