

$\text{Br}(\text{H} \rightarrow \gamma\gamma)$ measurement

WANG Feng ¹ RUAN Manqi ² LI Gang ²

ZHANG Zhenyu ¹ ZHOU Xiang ¹

¹ Wuhan University

² Institute of High Energy Physics Chinese Academy of Science



25/05/2015

E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

ilc17_slc6_arbor25May15.sh

CalibrECAL:

48.19

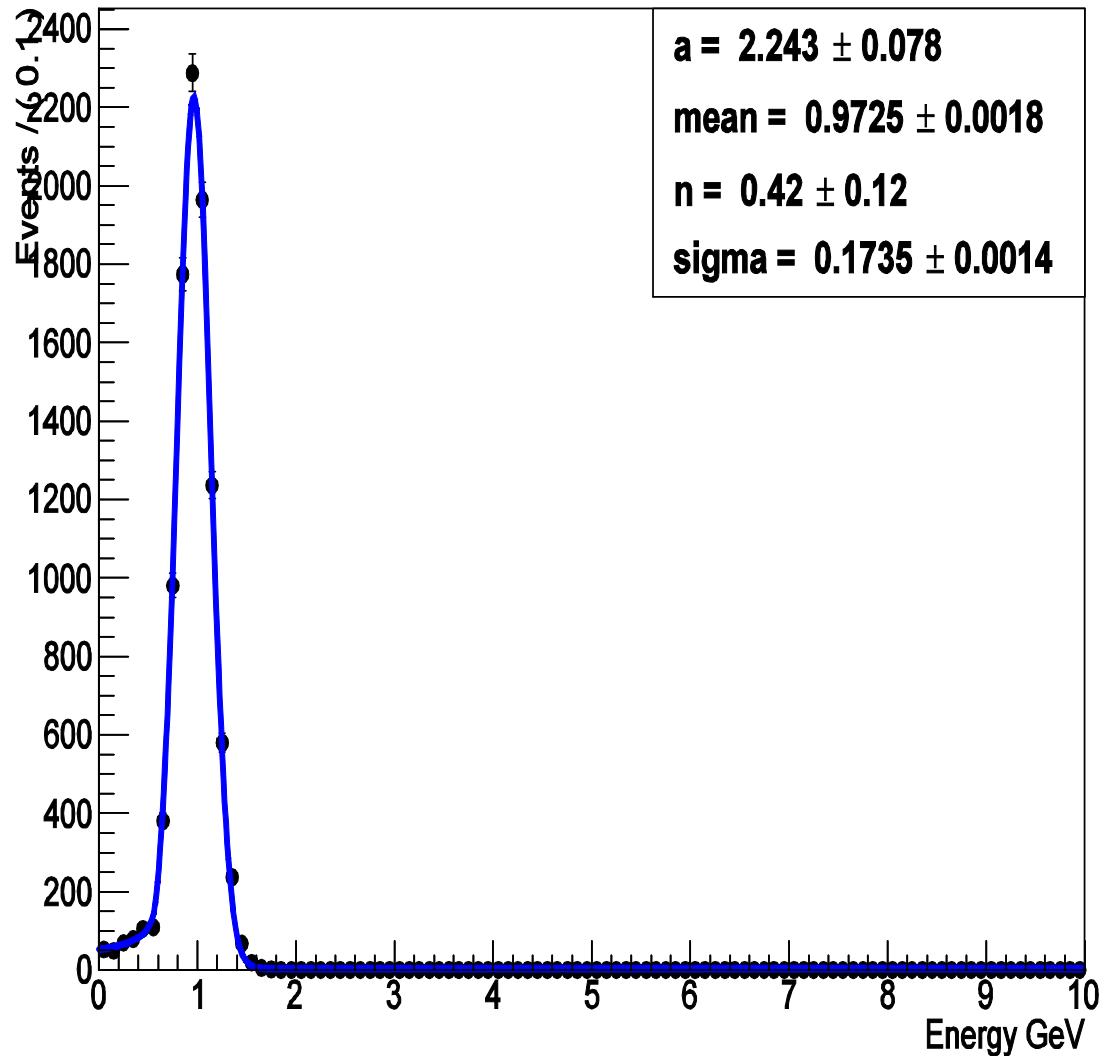
98.38

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{en} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.1784 \approx \frac{17.84\%}{\sqrt{E}}$$



E_γ deposite in Ecal (ArborPFOsCollection)

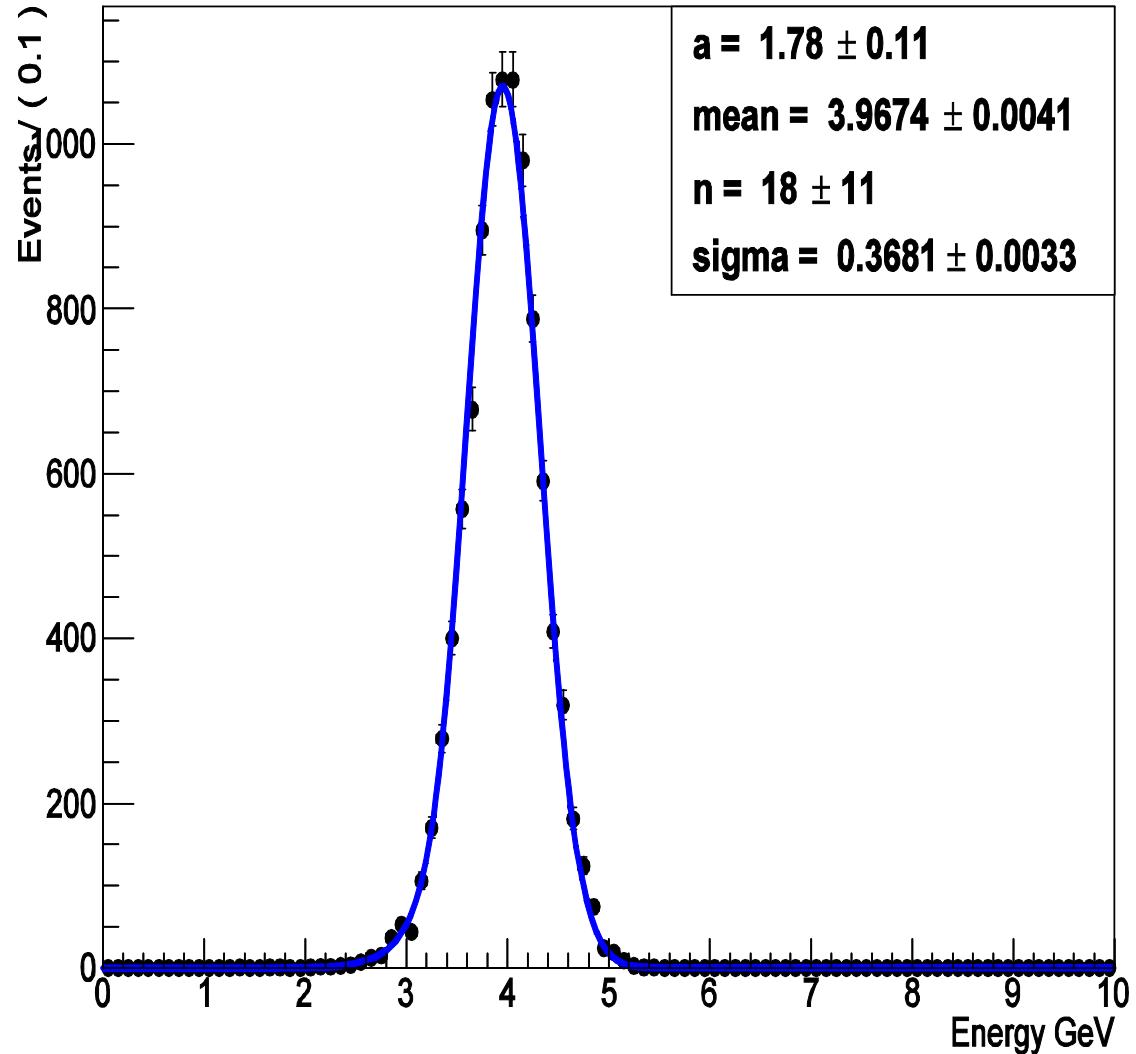
Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.0928 \approx \frac{18.56\%}{\sqrt{E}}$$



E_γ deposite in Ecal (ArborPFOsCollection)

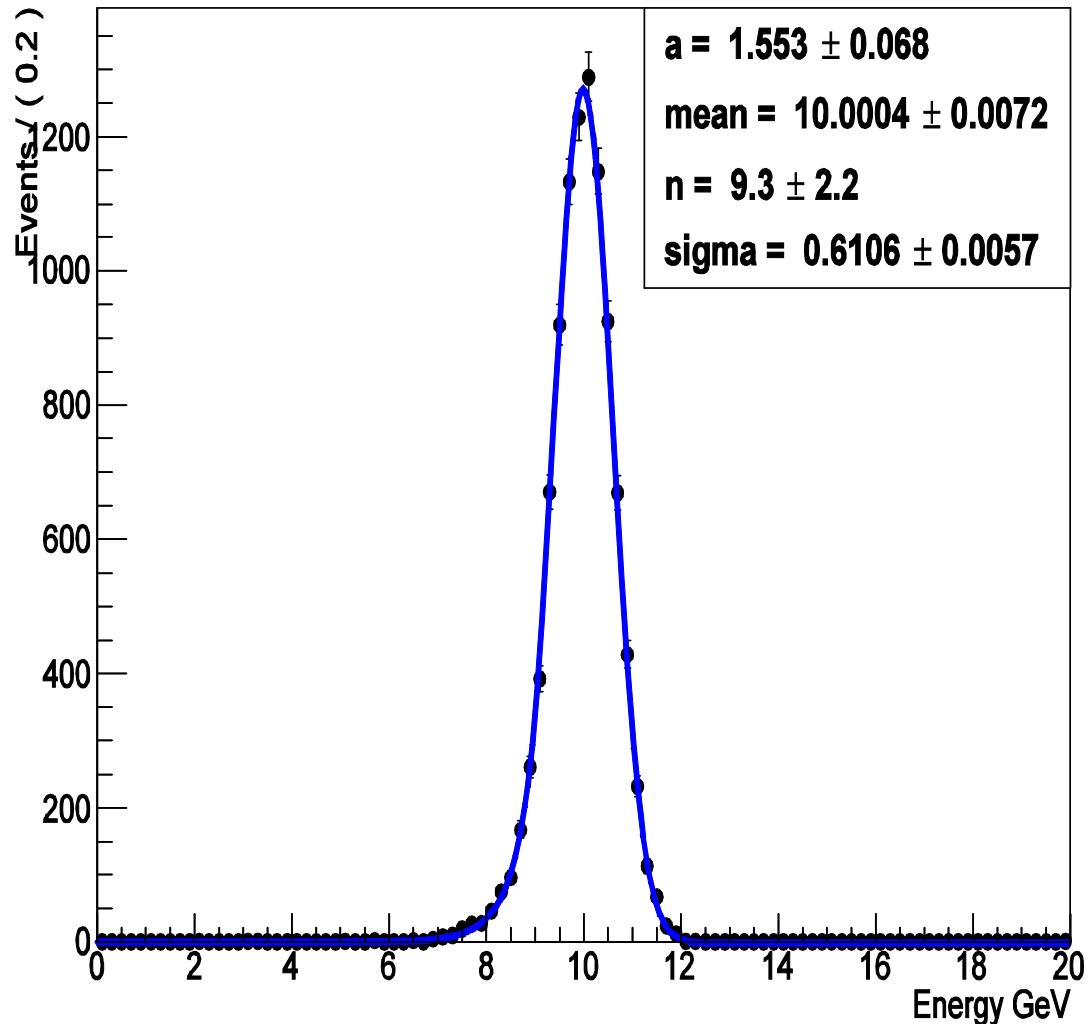
Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{en} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.0611 \approx \frac{19.31\%}{\sqrt{E}}$$



E_γ deposite in Ecal (ArborPFOsCollection)

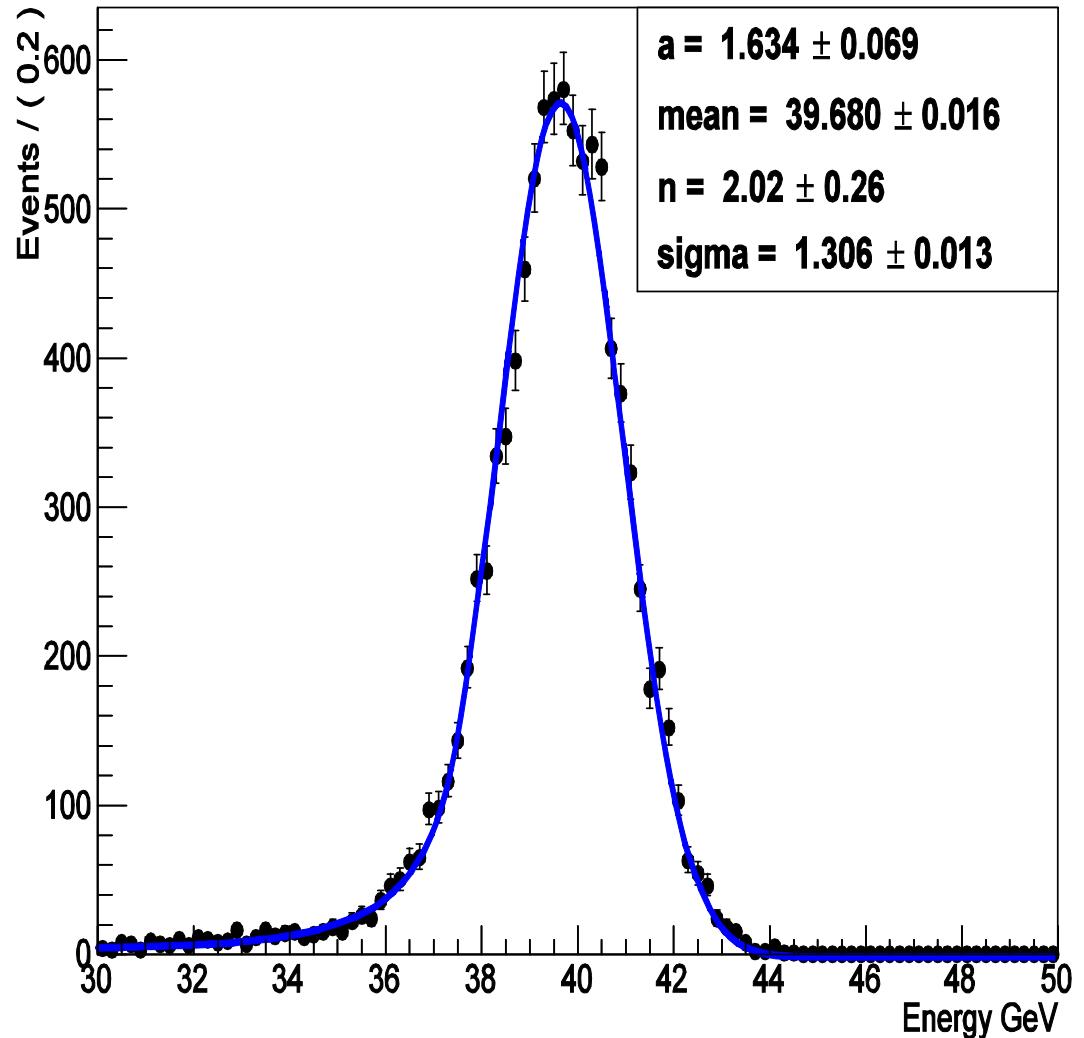
Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{en} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.03291 \approx \frac{20.82\%}{\sqrt{E}}$$



E_γ deposite in Ecal (ArborPFOsCollection)

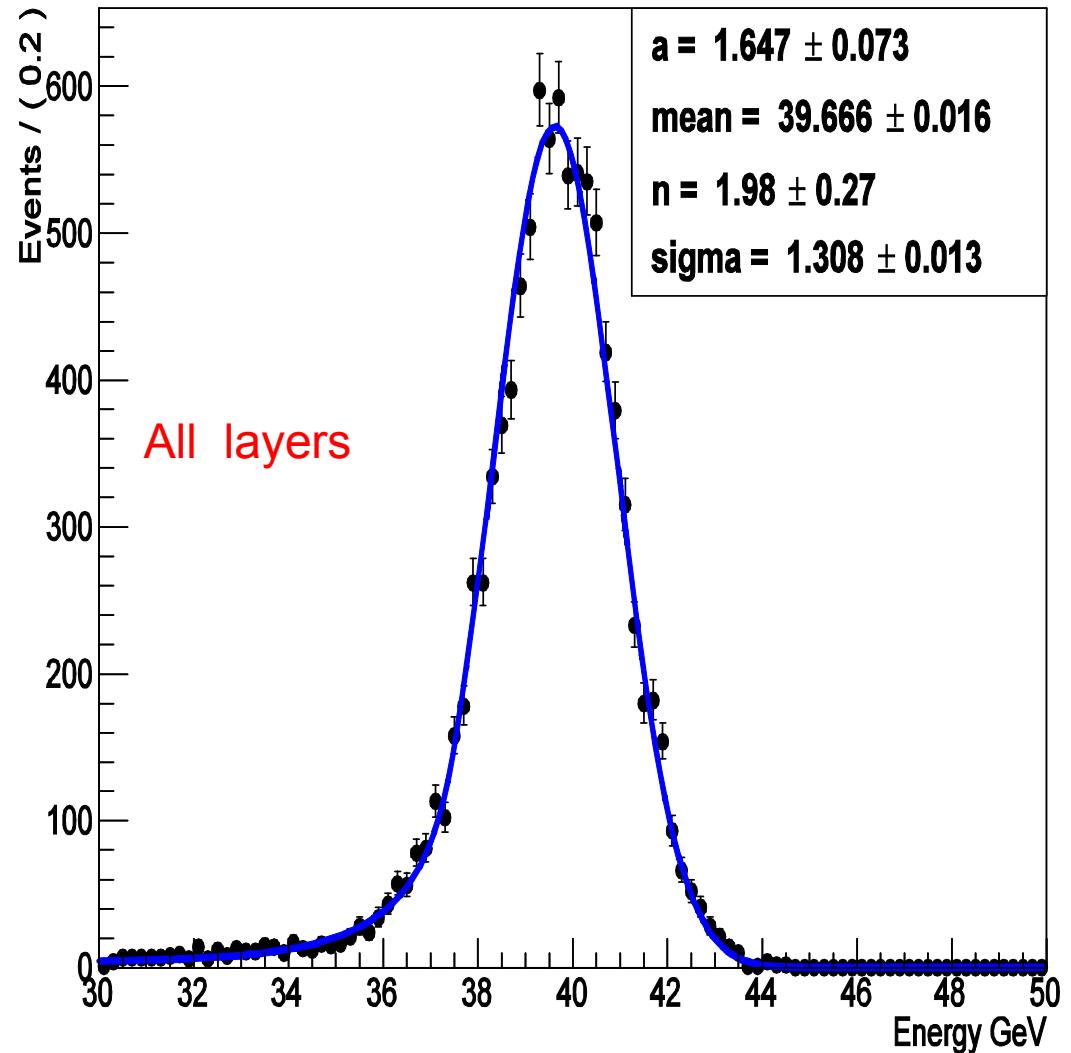
Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.03298 \approx \frac{20.86\%}{\sqrt{E}}$$



E_γ deposite in Ecal (ArborPFOsCollection)

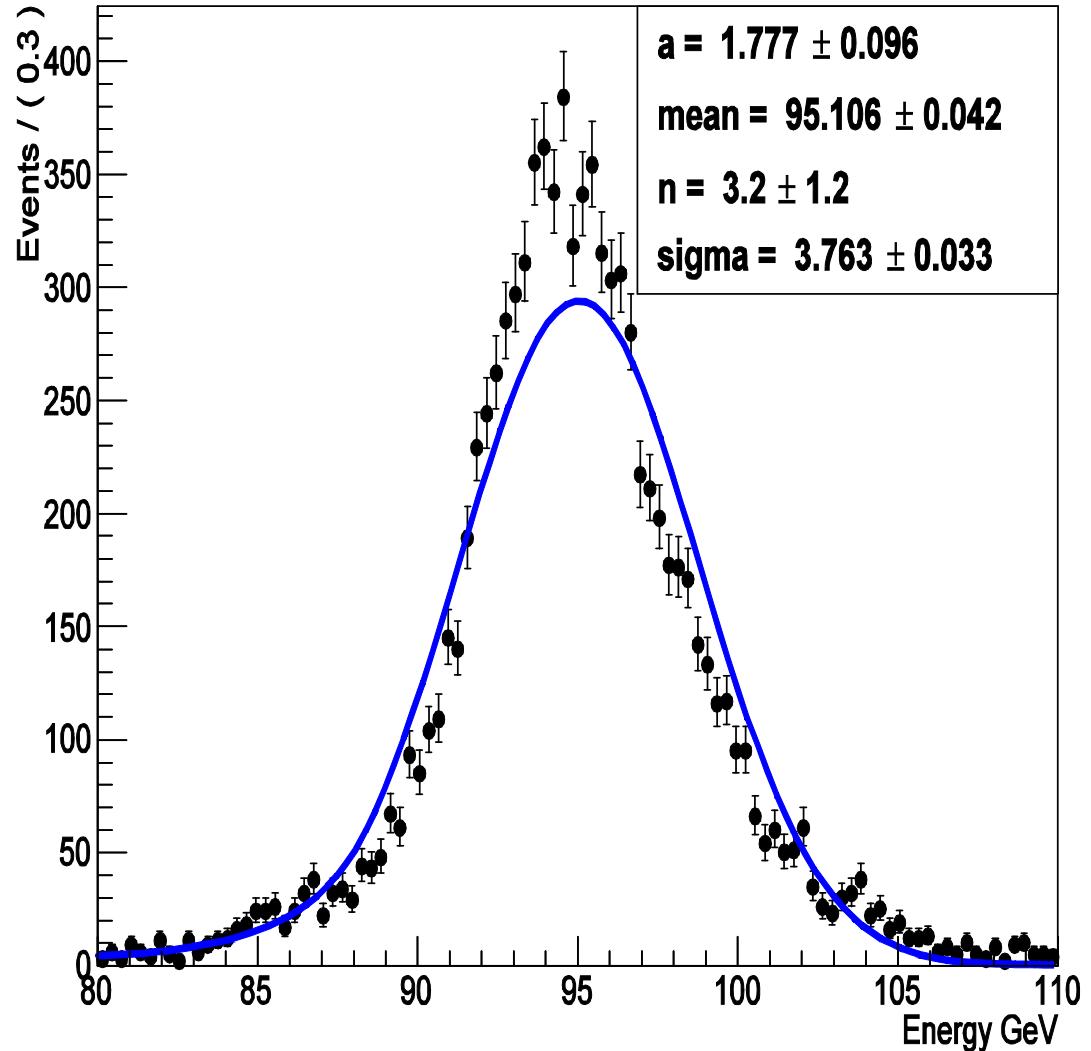
Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.03957 \approx \frac{39.57\%}{\sqrt{E}}$$



E_γ deposite in Ecal (ArborPFOsCollection)

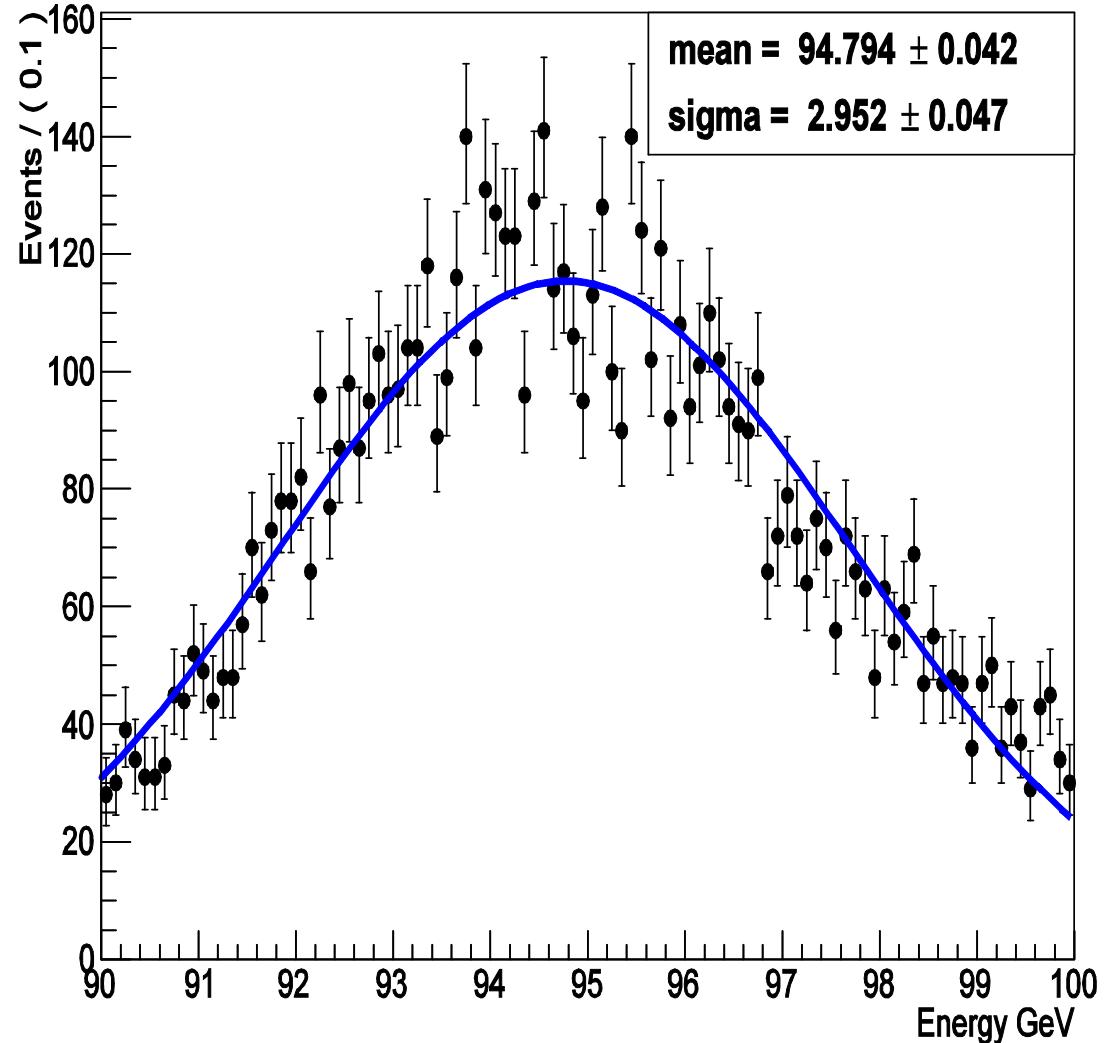
Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.03114 \approx \frac{31.14\%}{\sqrt{E}}$$



E_γ deposite in Ecal (EcalSiliconCollection)

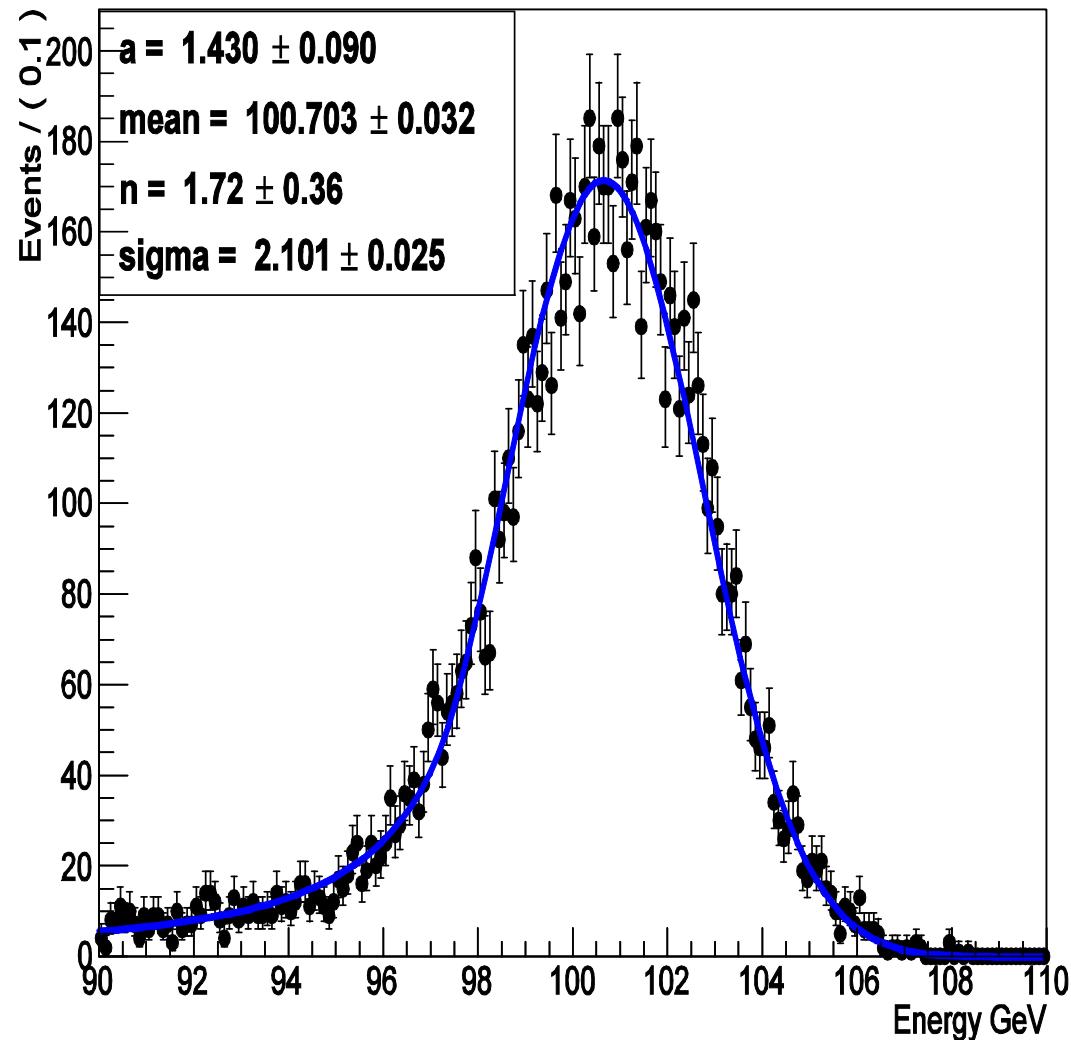
Reconstruction energy (deposit E)

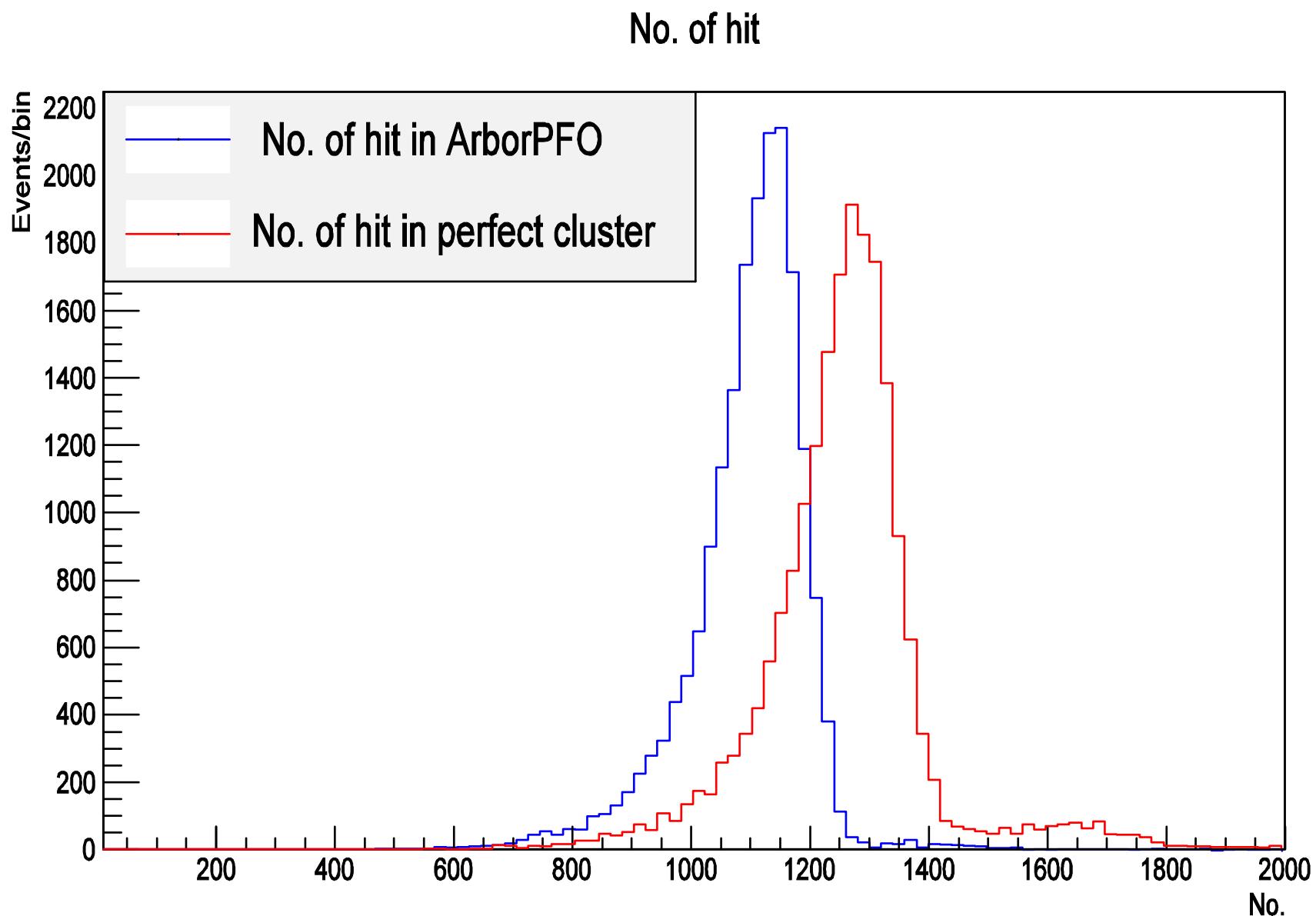
$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

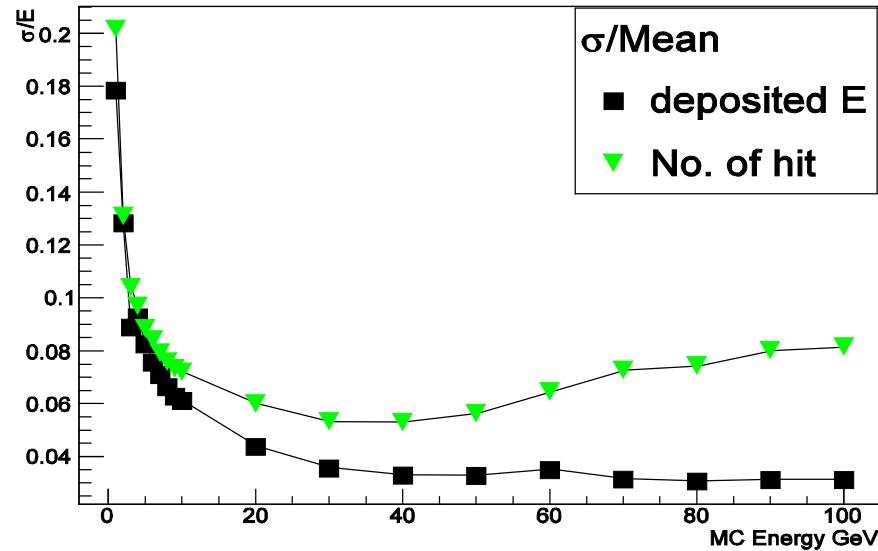
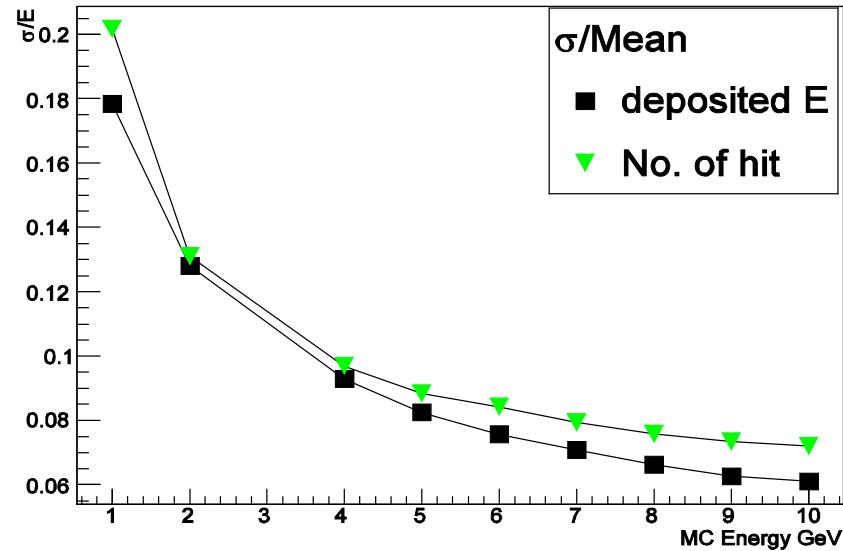
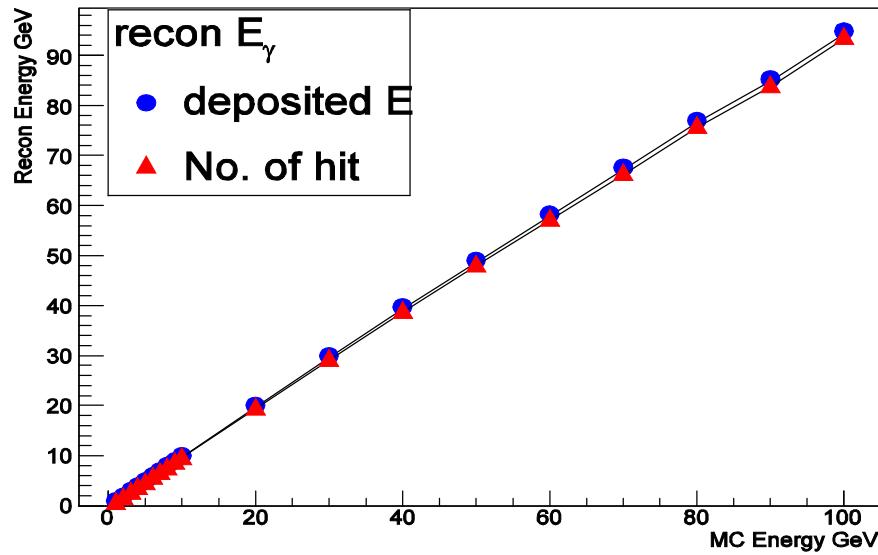
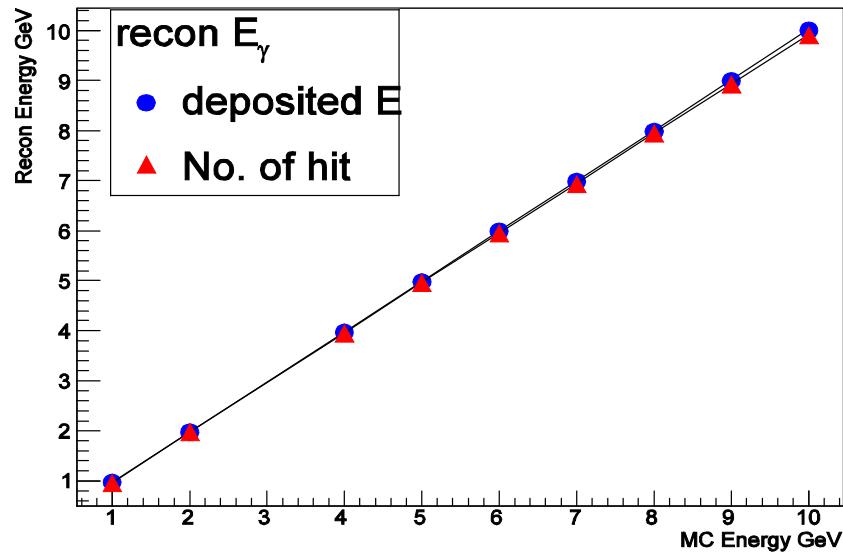
$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.02086 \approx \frac{20.86\%}{\sqrt{E}}$$





E_γ deposite in Ecal (ArborPFOsCollection)



back up

init_ilcsoft_ArborDHCAL_6_ILD.sh

Optimization

- 1 energy deposit

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{en} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2 \quad \chi^2\text{-minimized}$$

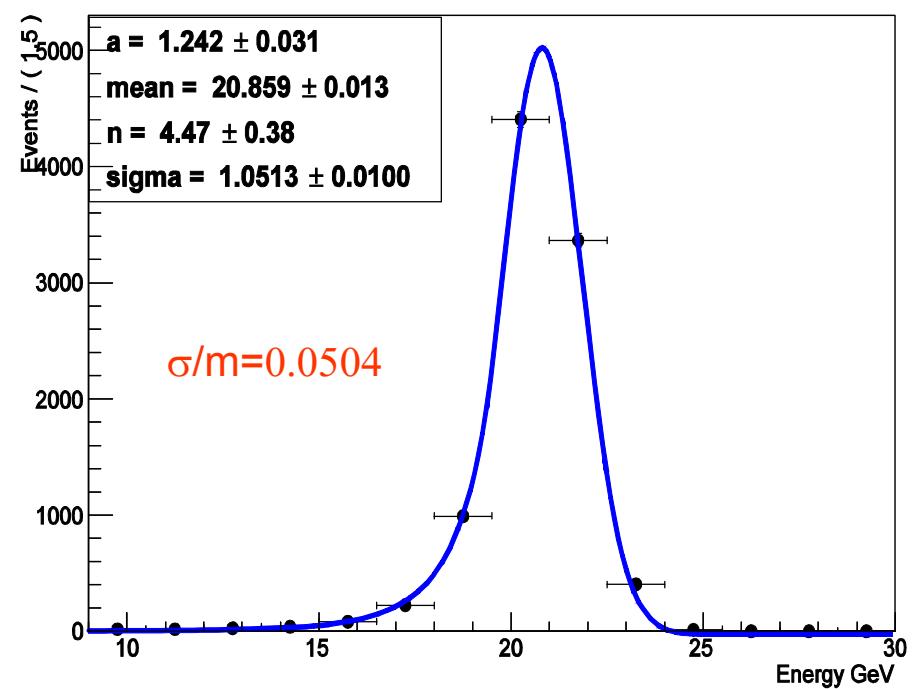
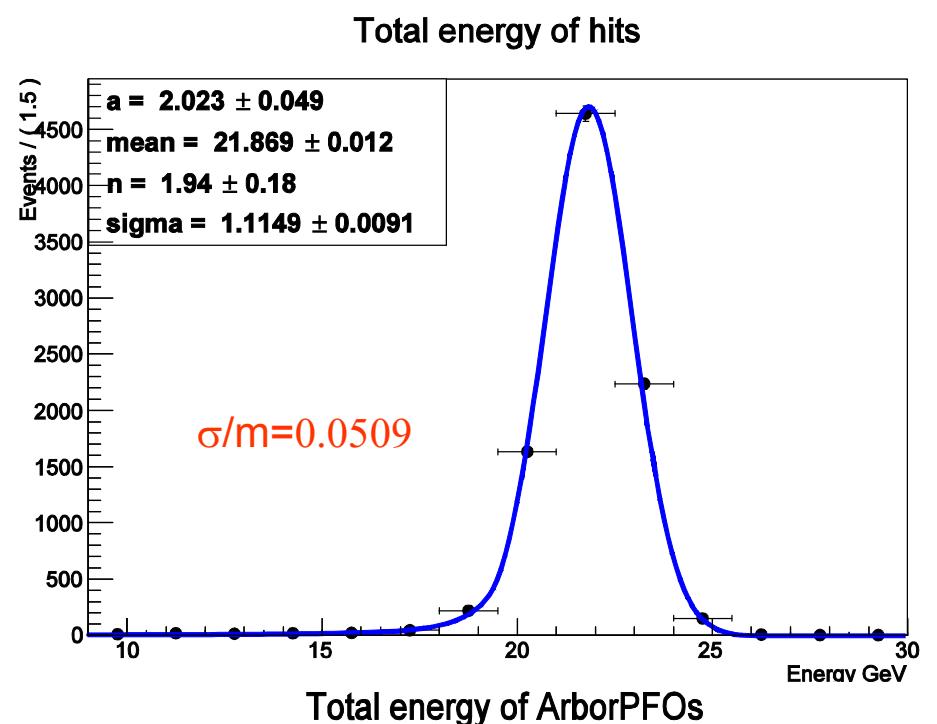
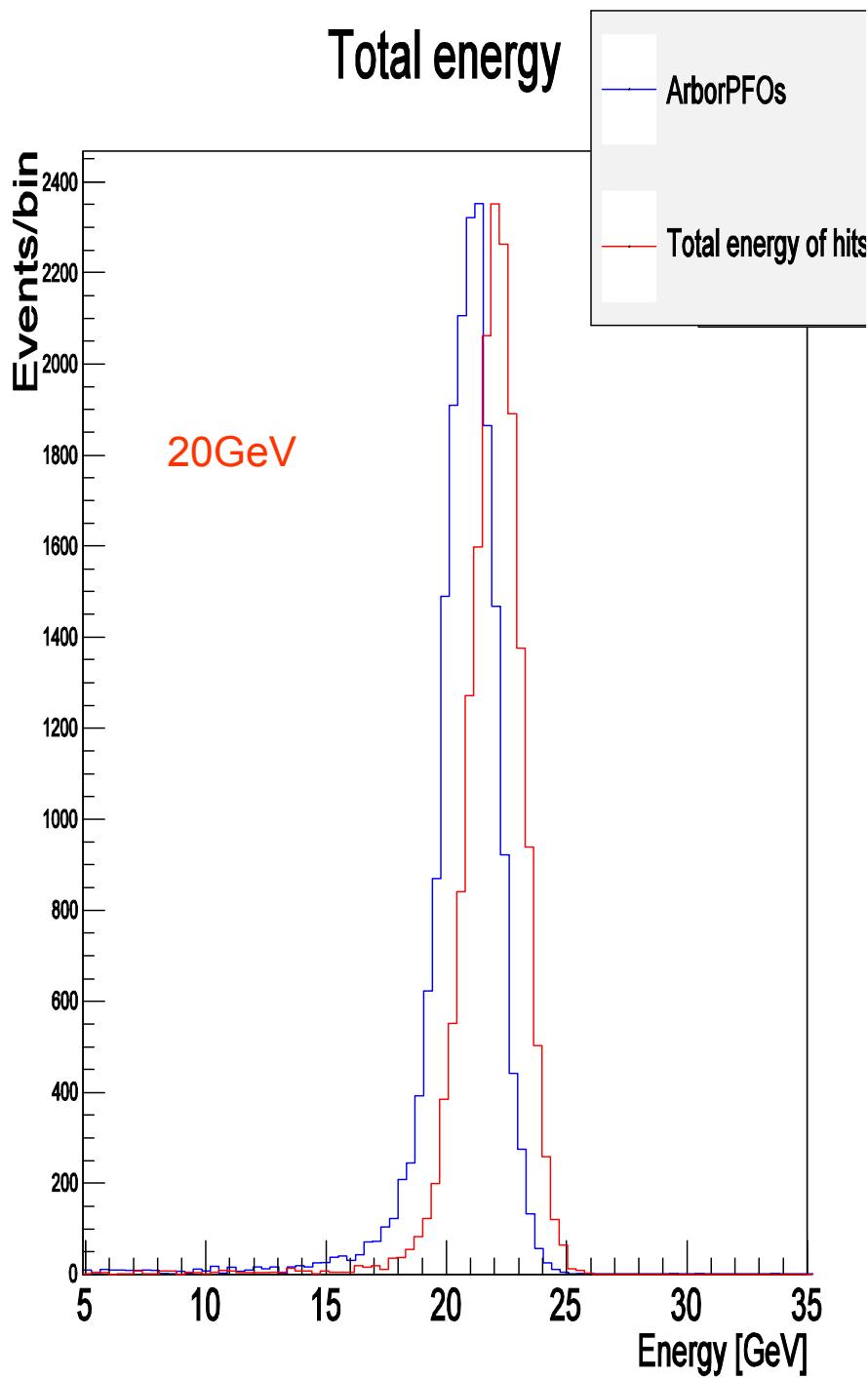
- 2 number of hit

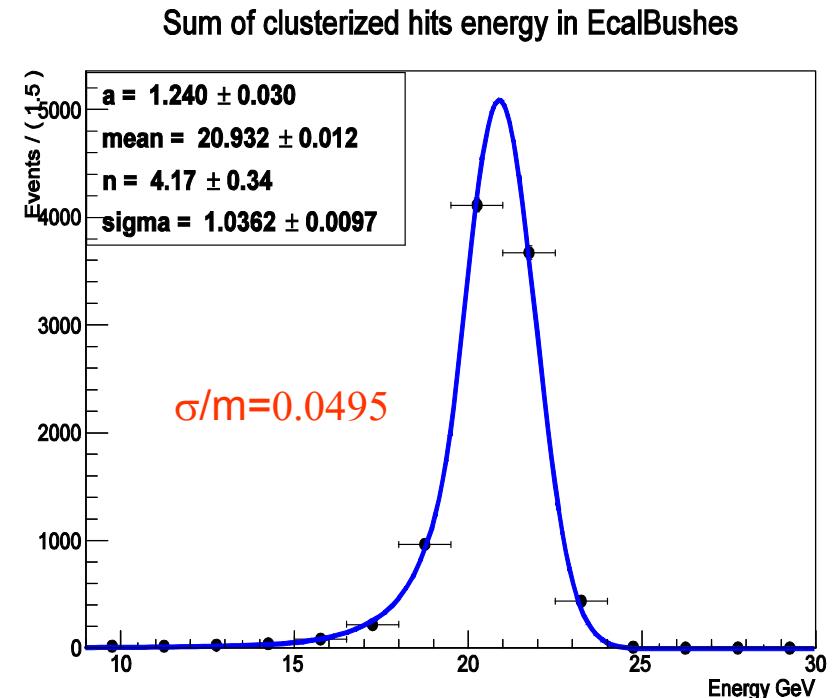
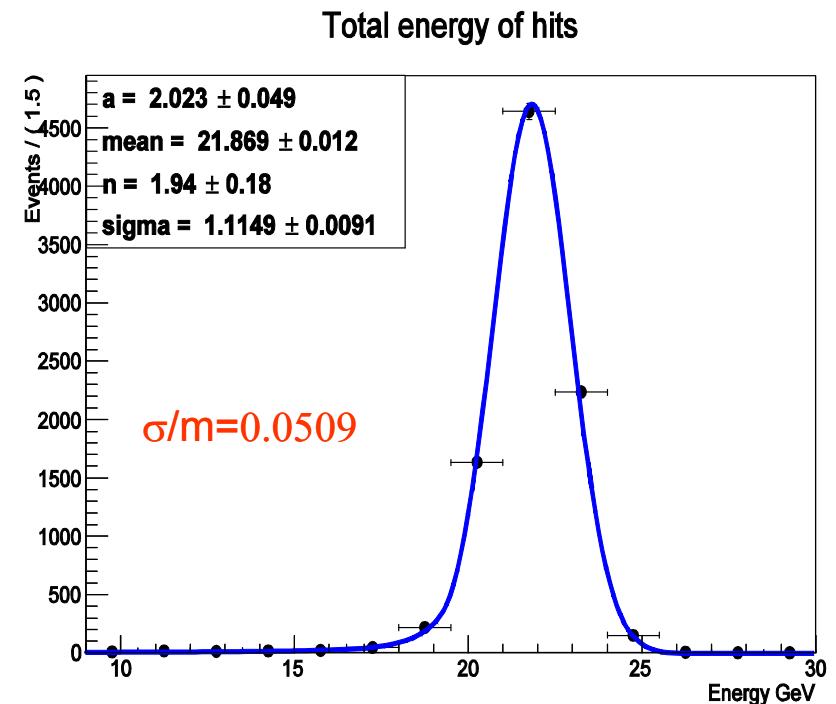
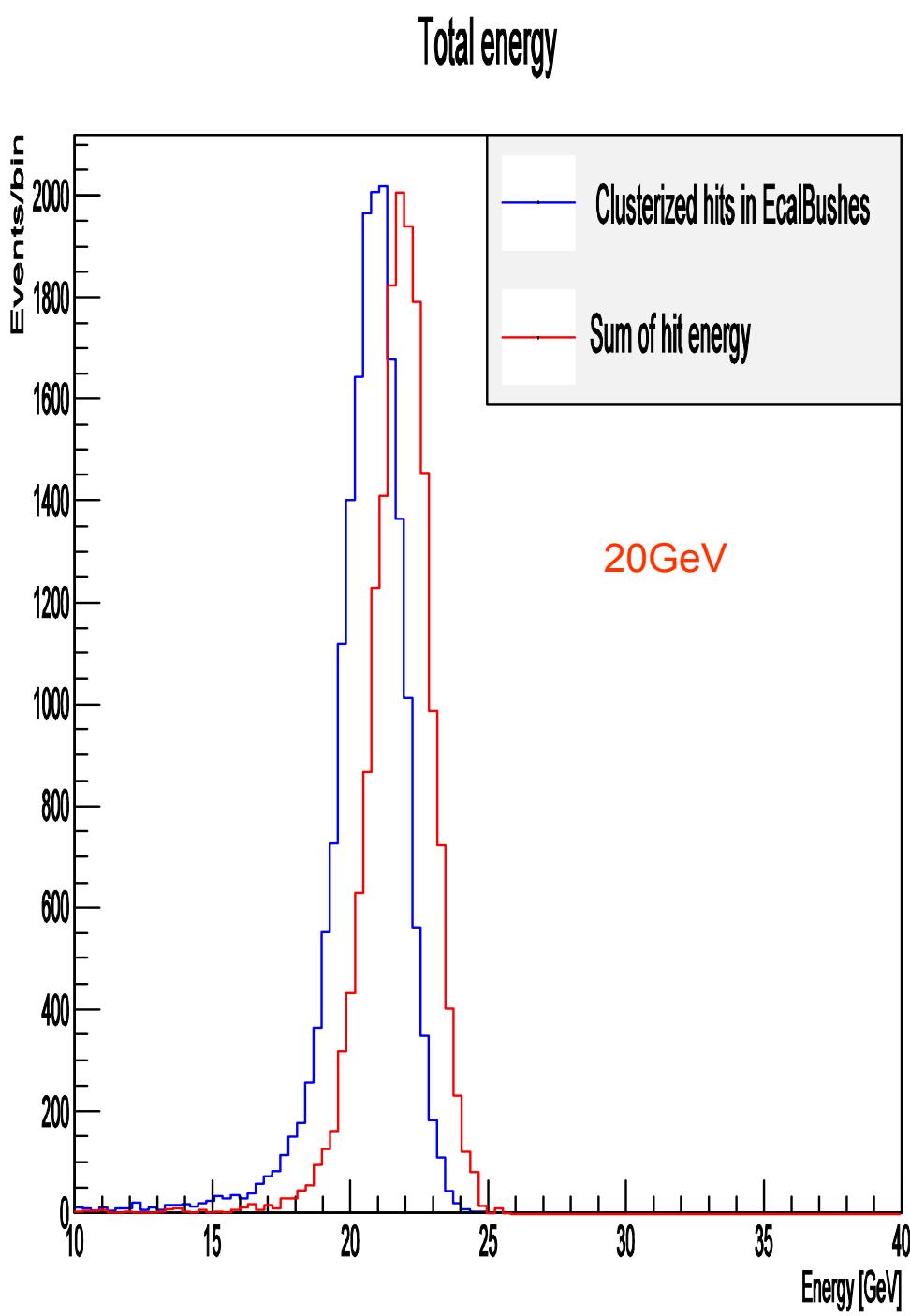
$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) + \delta(N_{odd10} + N_{even10})$$

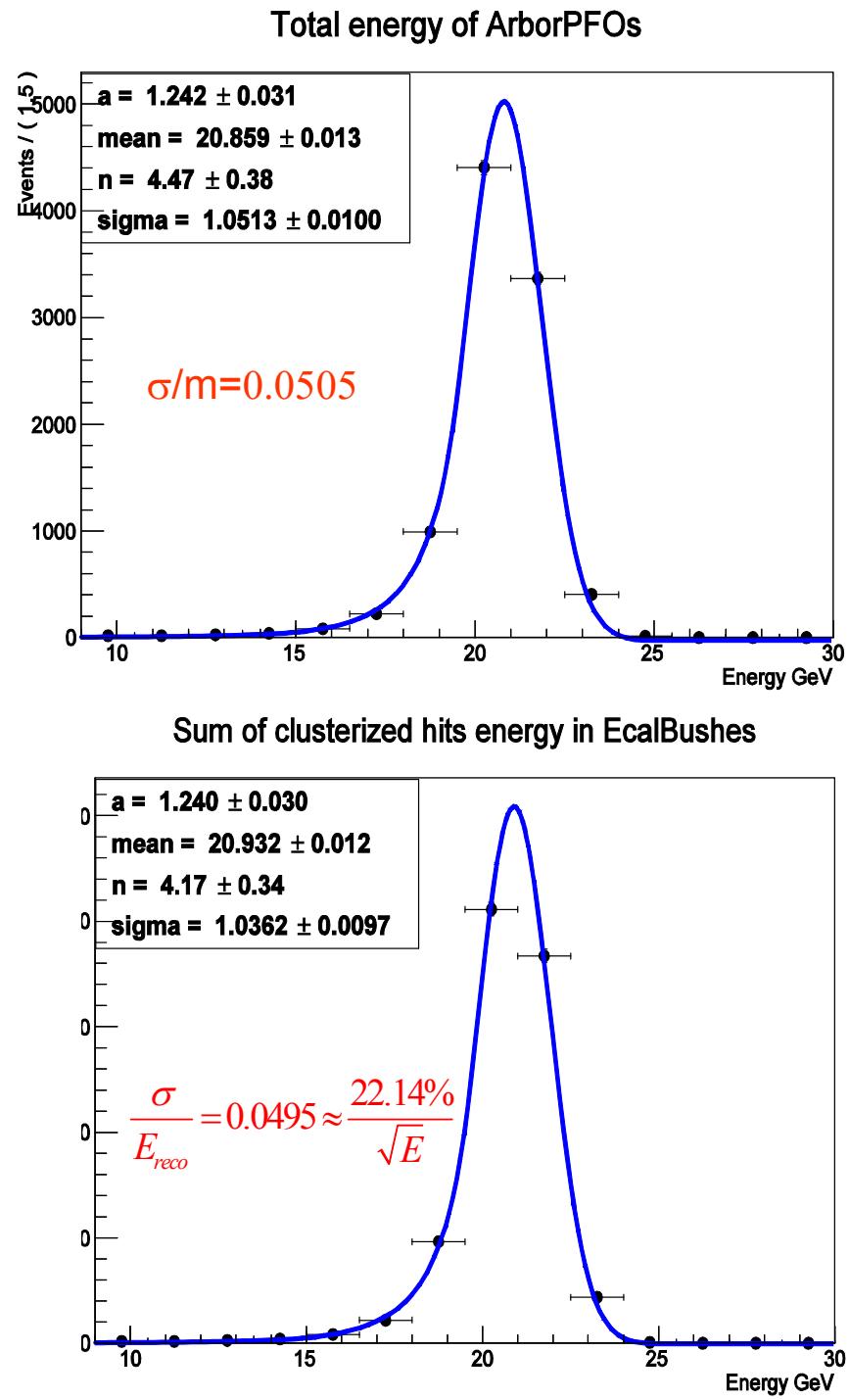
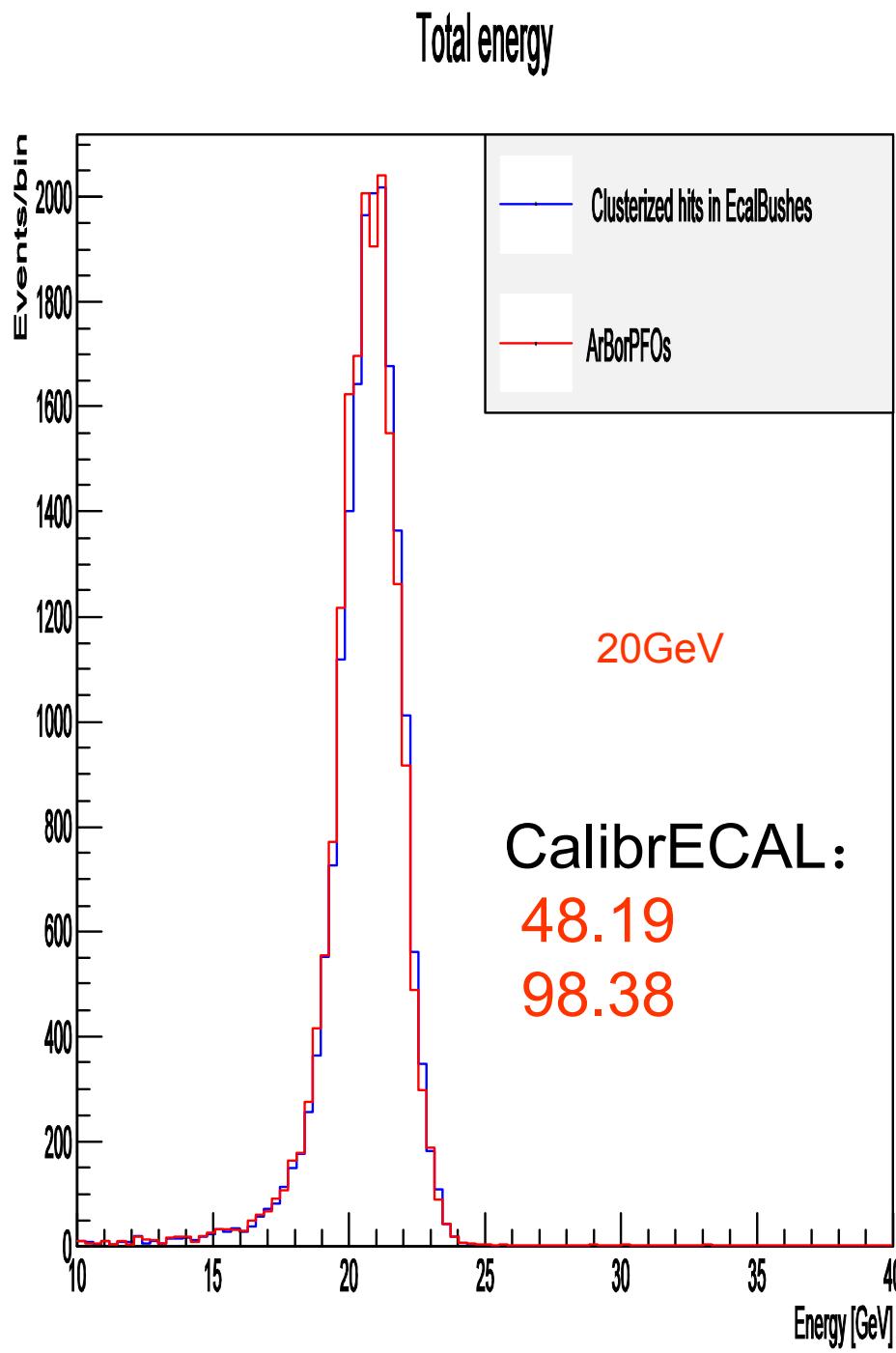
- 3 combining the two measurements

$$E = \lambda E_{meas}^{en} + (1-\lambda) E_{meas}^{hit}$$

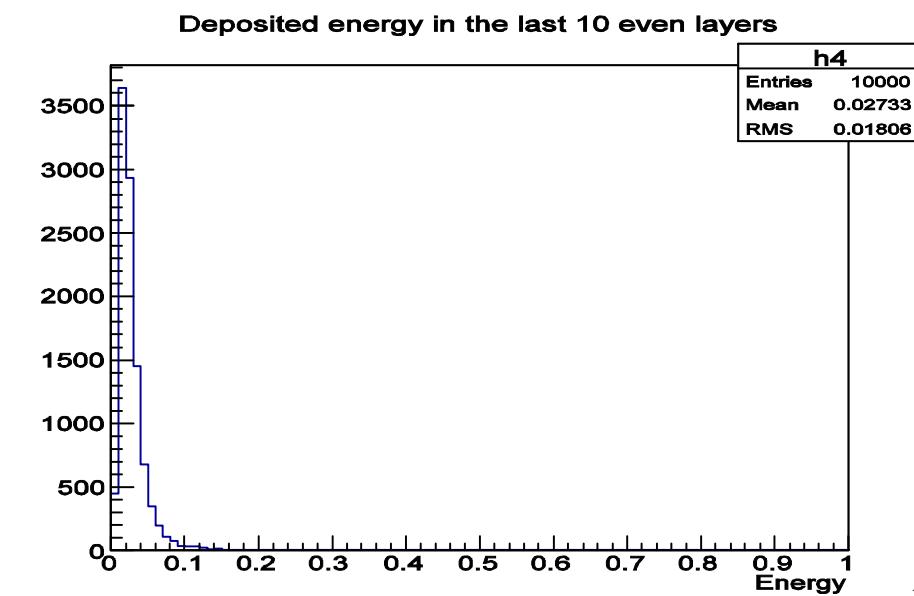
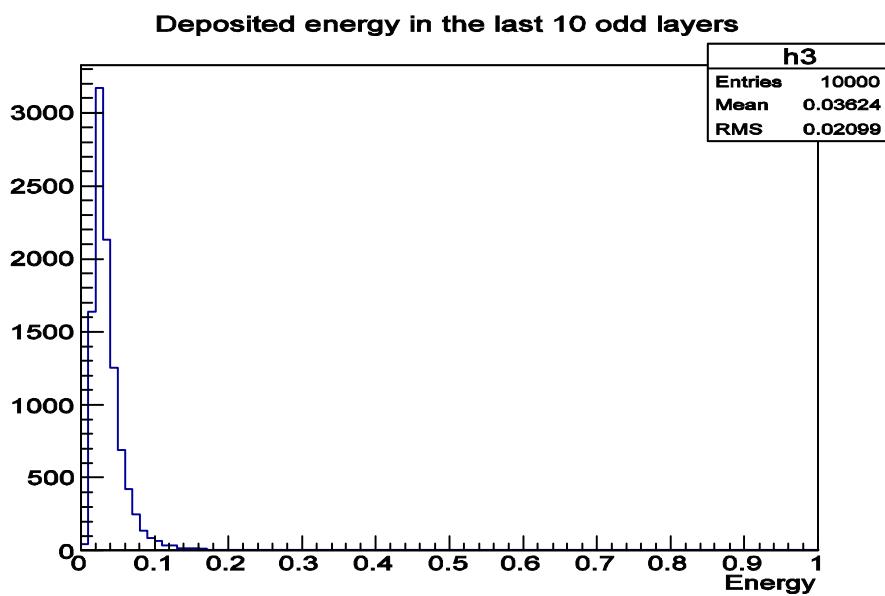
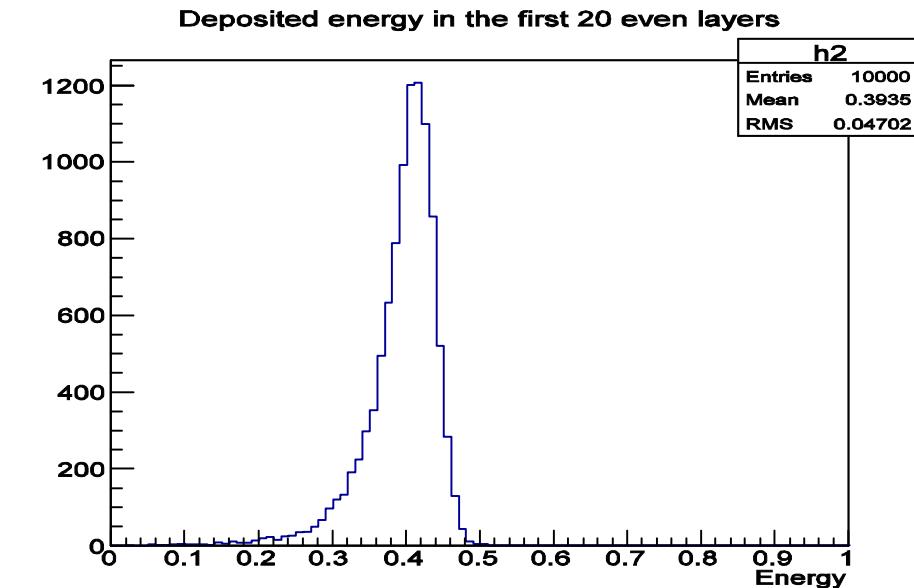
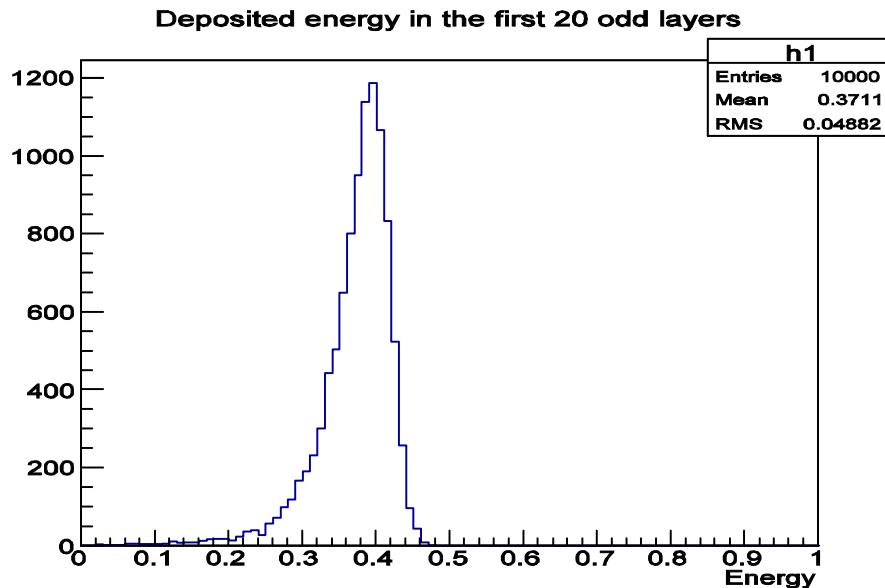
$$\chi^2 = \sum_{events} \left(\left\{ \lambda (\textcolor{red}{E}_{mean}^{en} - E_{meas}^{en}) + (1-\lambda) (\textcolor{red}{E}_{mean}^{hit} - E_{meas}^{hit}) \right\} / \frac{16\%}{\sqrt{E_{MC}}} \right)^2 \quad \chi^2\text{-minimized}$$







E_γ deposite in Ecal (EcalSiliconCollection)



E_γ deposite in Ecal (EcalSiliconCollection)

Reconstruction energy

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{en} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

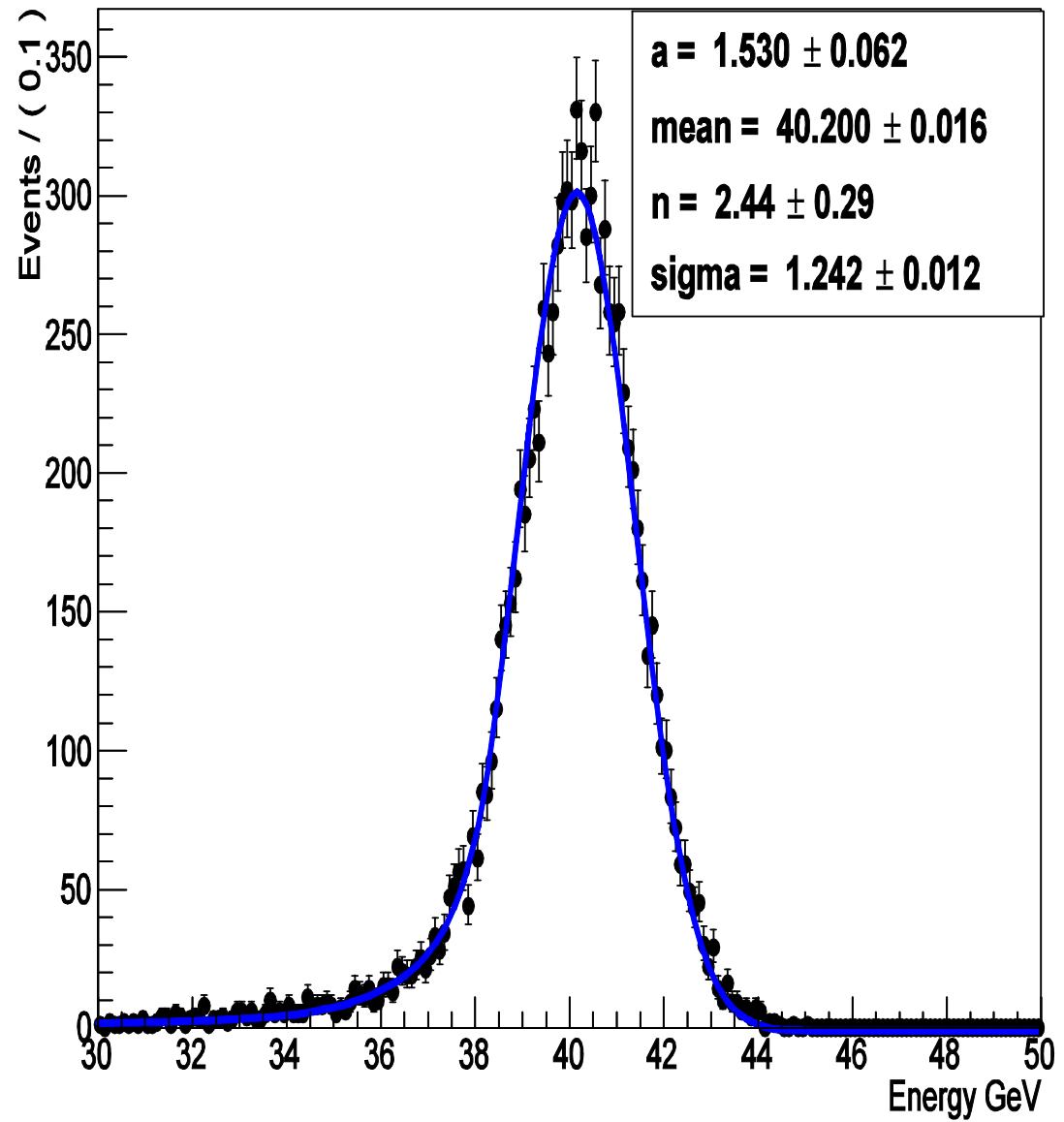
$$a = 88.0481$$

$$f_1 = 0.5434$$

$$b = 198.438$$

$$f_2 = 0.5192$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.0309 \approx \frac{19.54\%}{\sqrt{E}}$$



E_γ deposite in Ecal (EcalCollection)

Reconstruction energy

CalibrECAL:

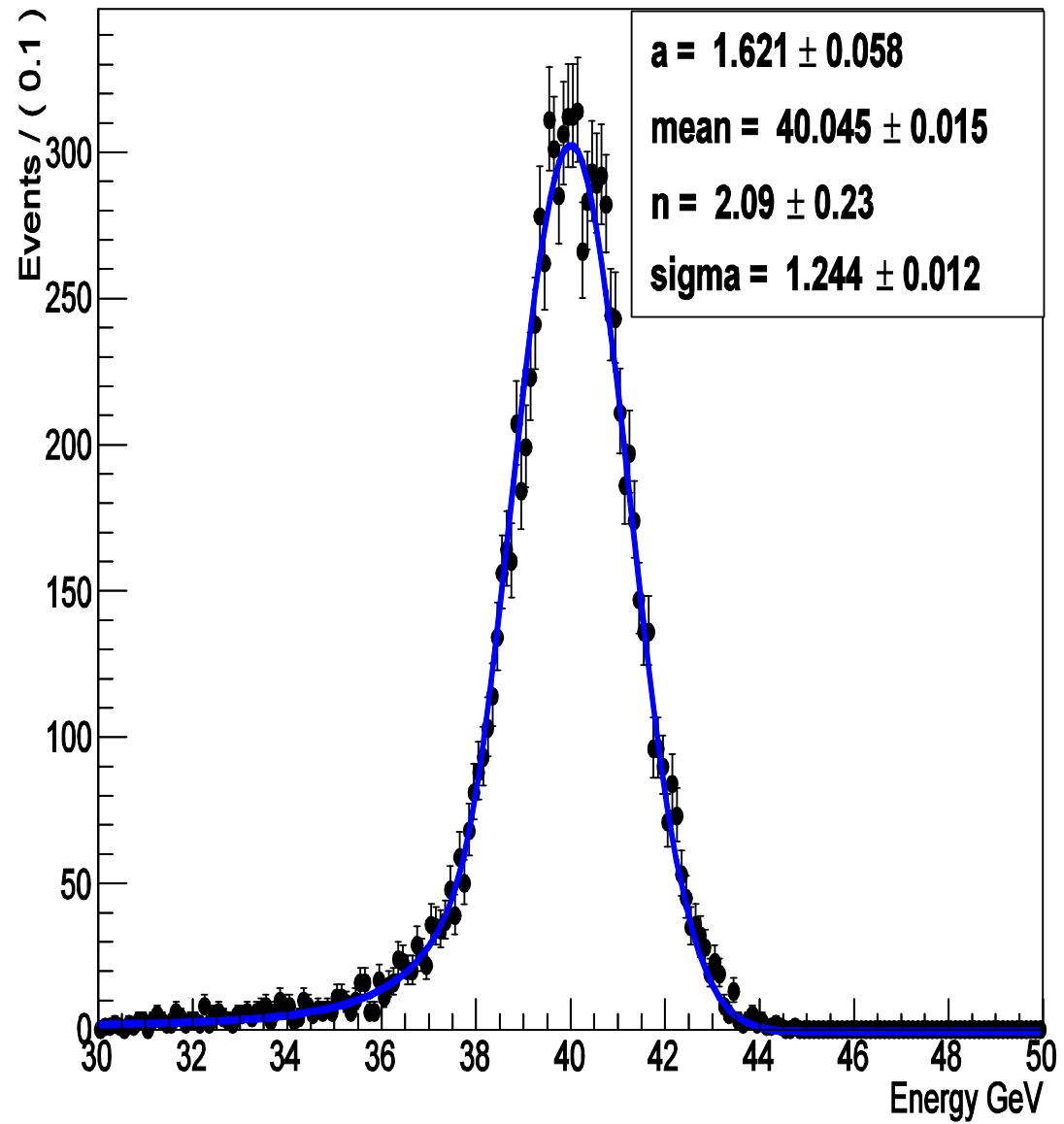
48.19
98.38

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

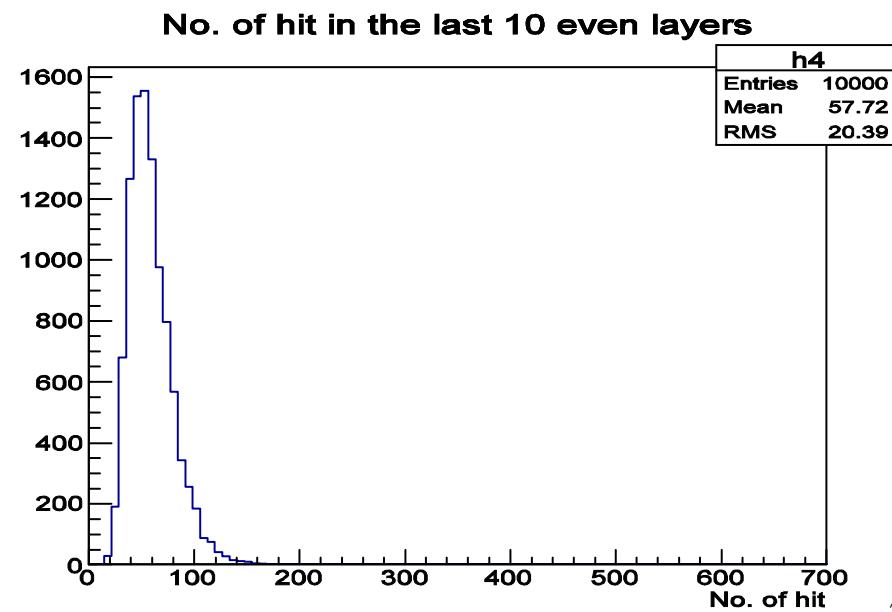
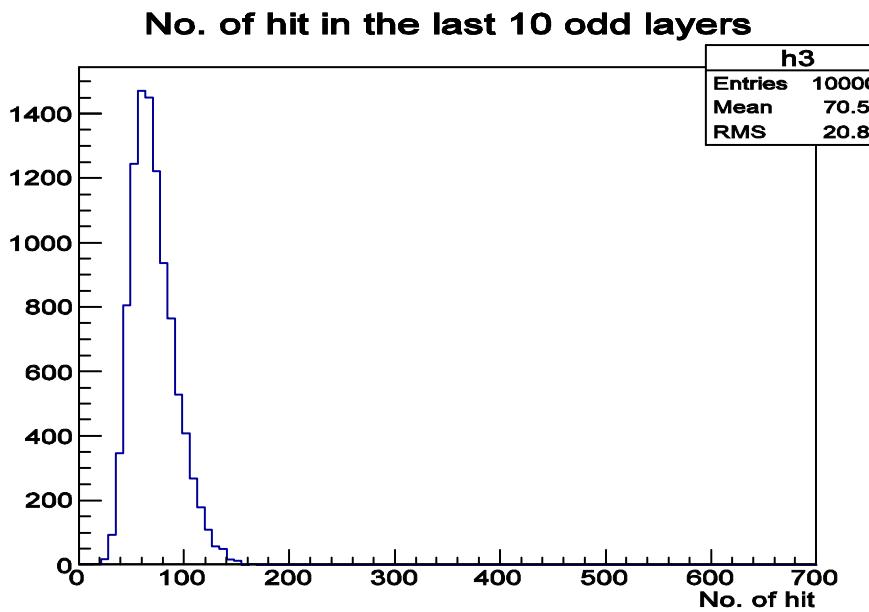
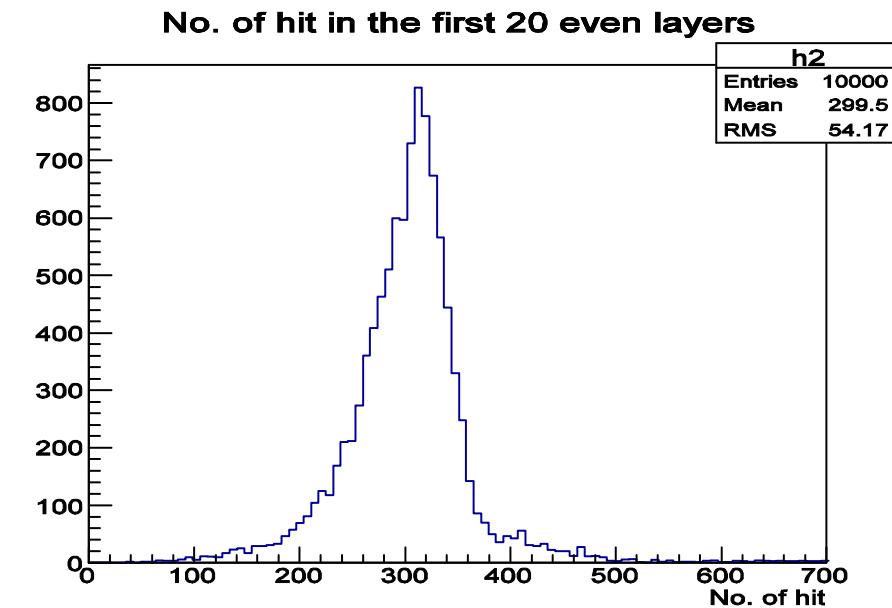
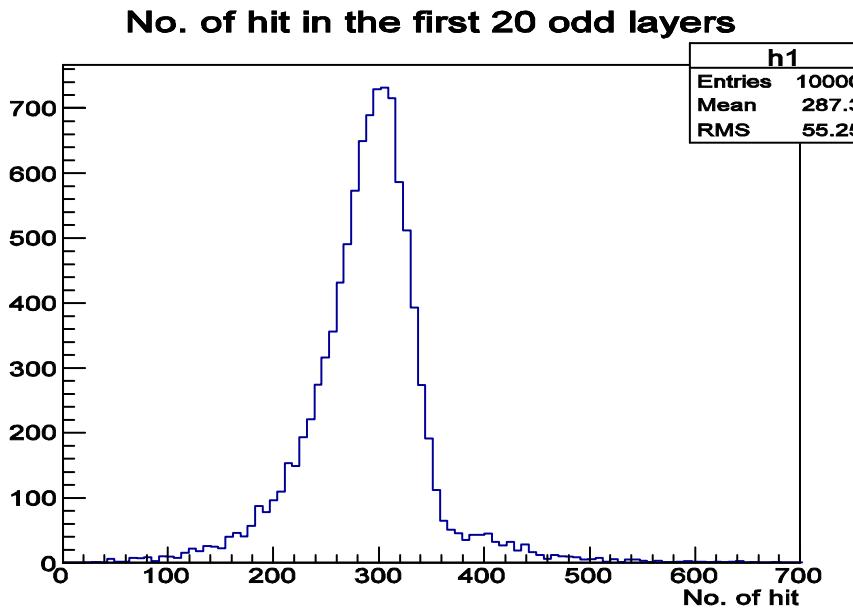
$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{reco}} = 0.0311 \approx \frac{19.64\%}{\sqrt{E}}$$



No. of hit in Ecal

(EcalSiliconCollection)



No. of hit in Ecal (EcalSiliconCollection)

Reconstruction energy

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

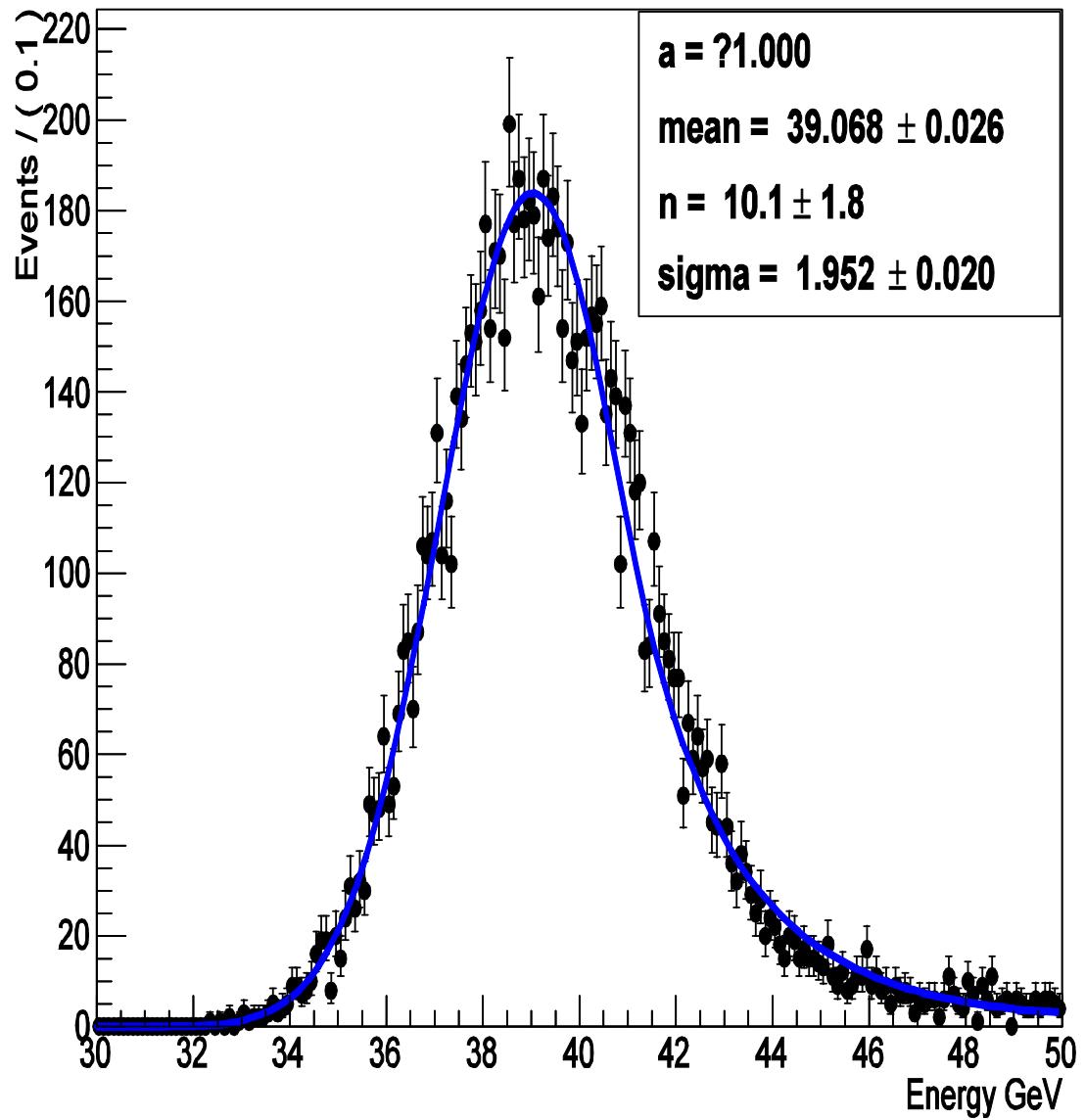
χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\gamma = 0.0423$$

$$\delta = 0.1166$$

$$\frac{\sigma}{E_{reco}} = 0.03998 \approx \frac{31.61\%}{\sqrt{E}}$$



No. of hit in Ecal (EcalCollection)

Reconstruction energy

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) + \delta(N_{odd10} + N_{even10})$$

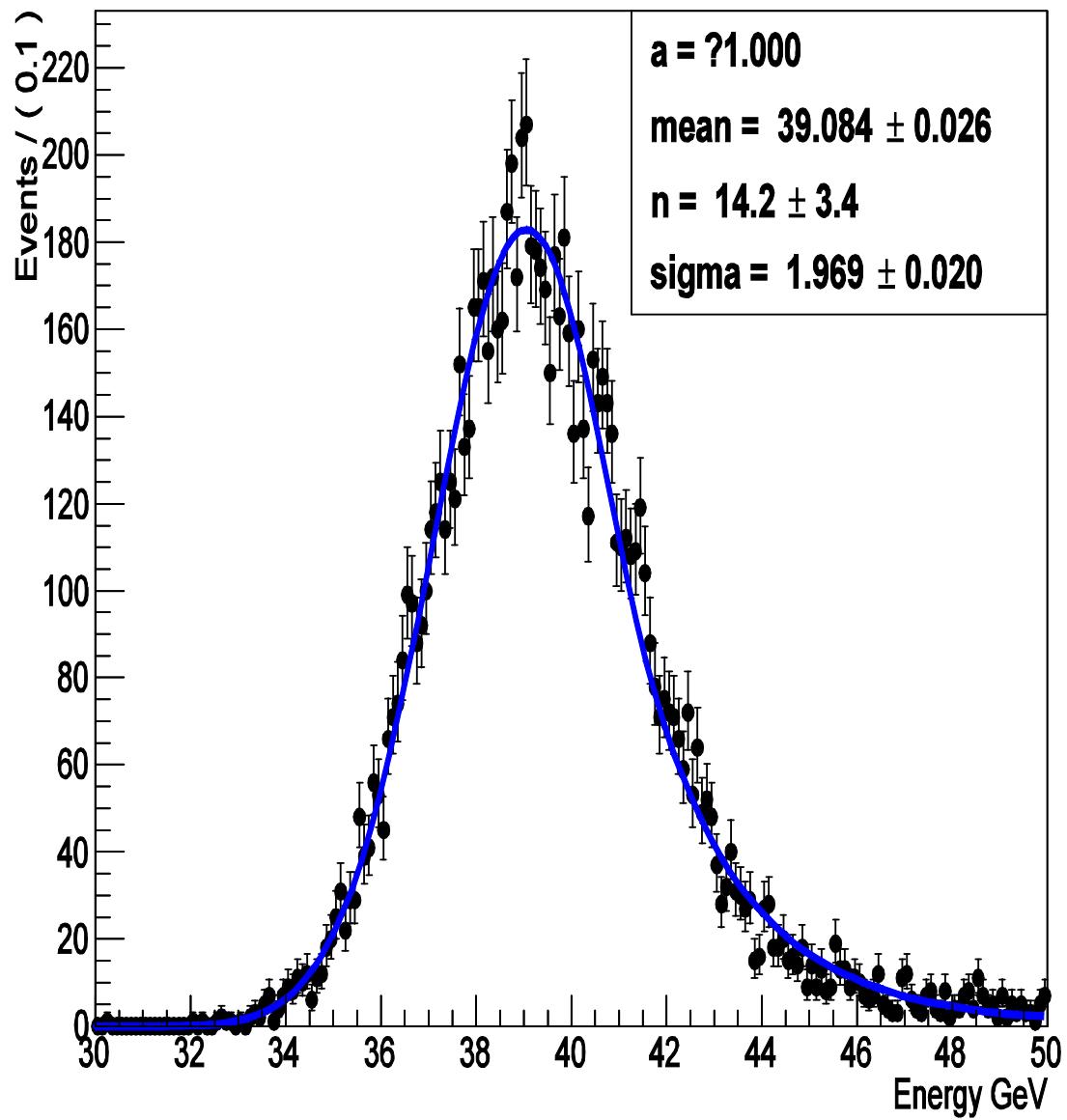
χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\gamma = 0.0466$$

$$\delta = 0.1285$$

$$\frac{\sigma}{E_{meas}^{hit}} = 0.05038 \approx \frac{31.86\%}{\sqrt{E}}$$



ilc17_slc6_arbor25May15.sh

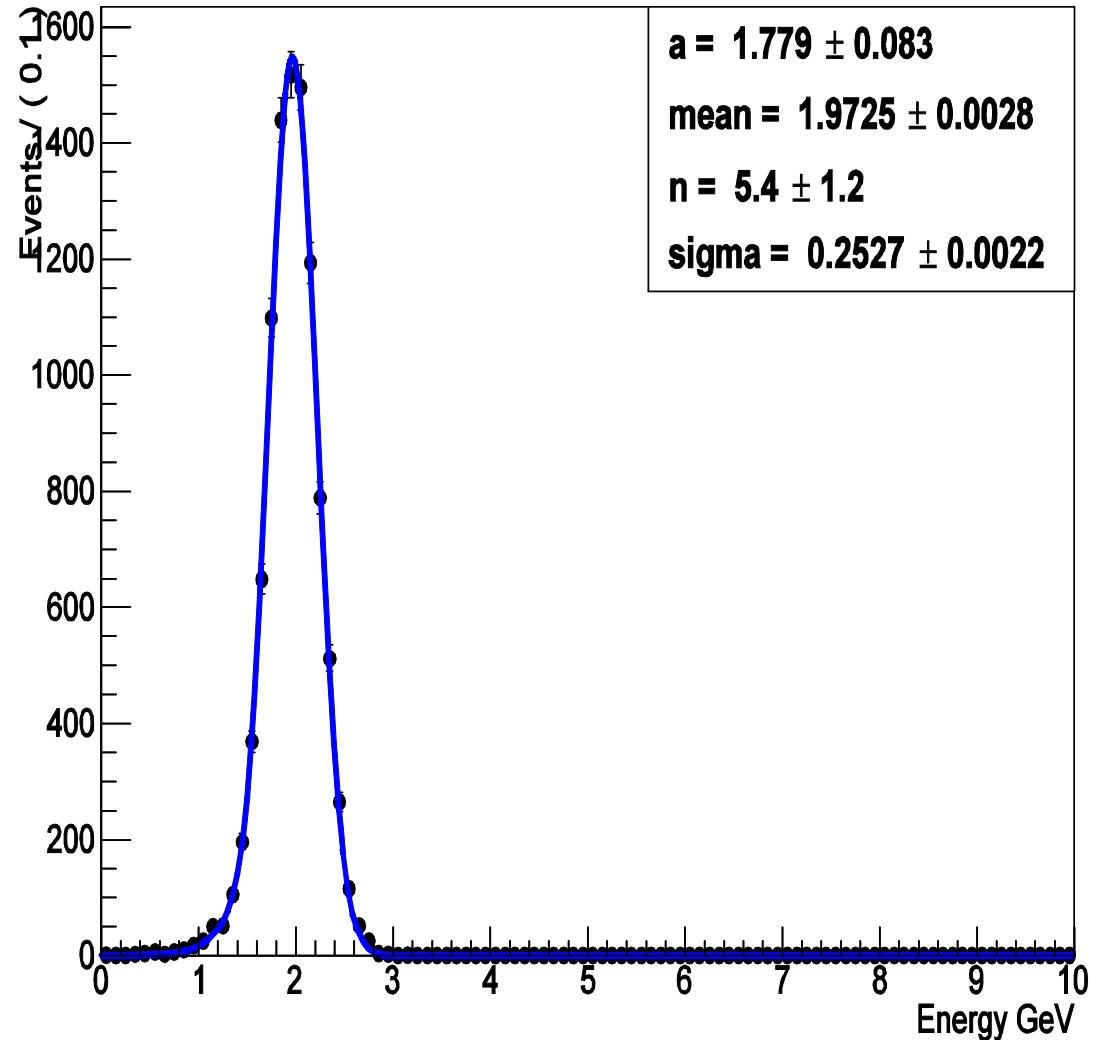
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



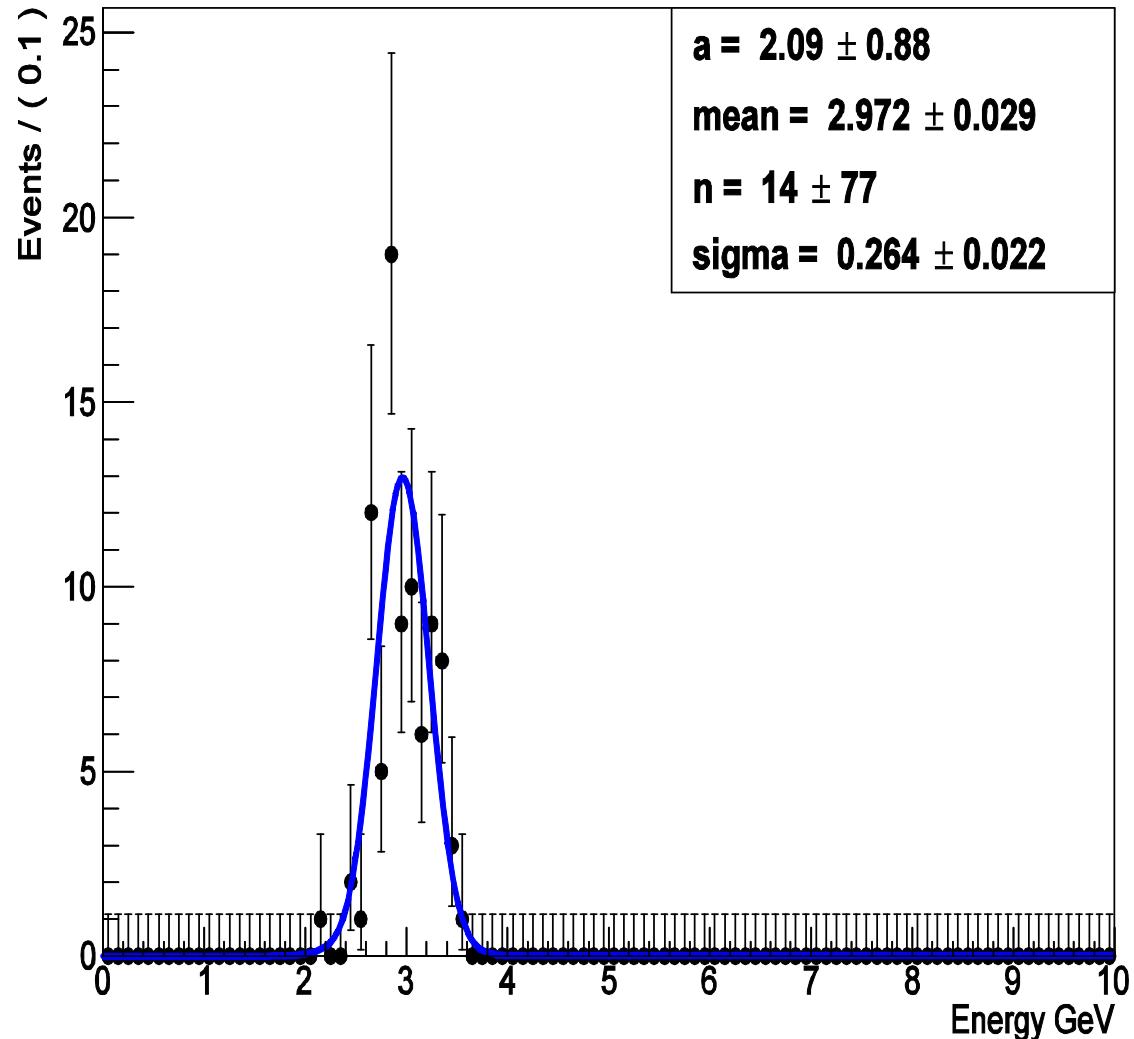
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



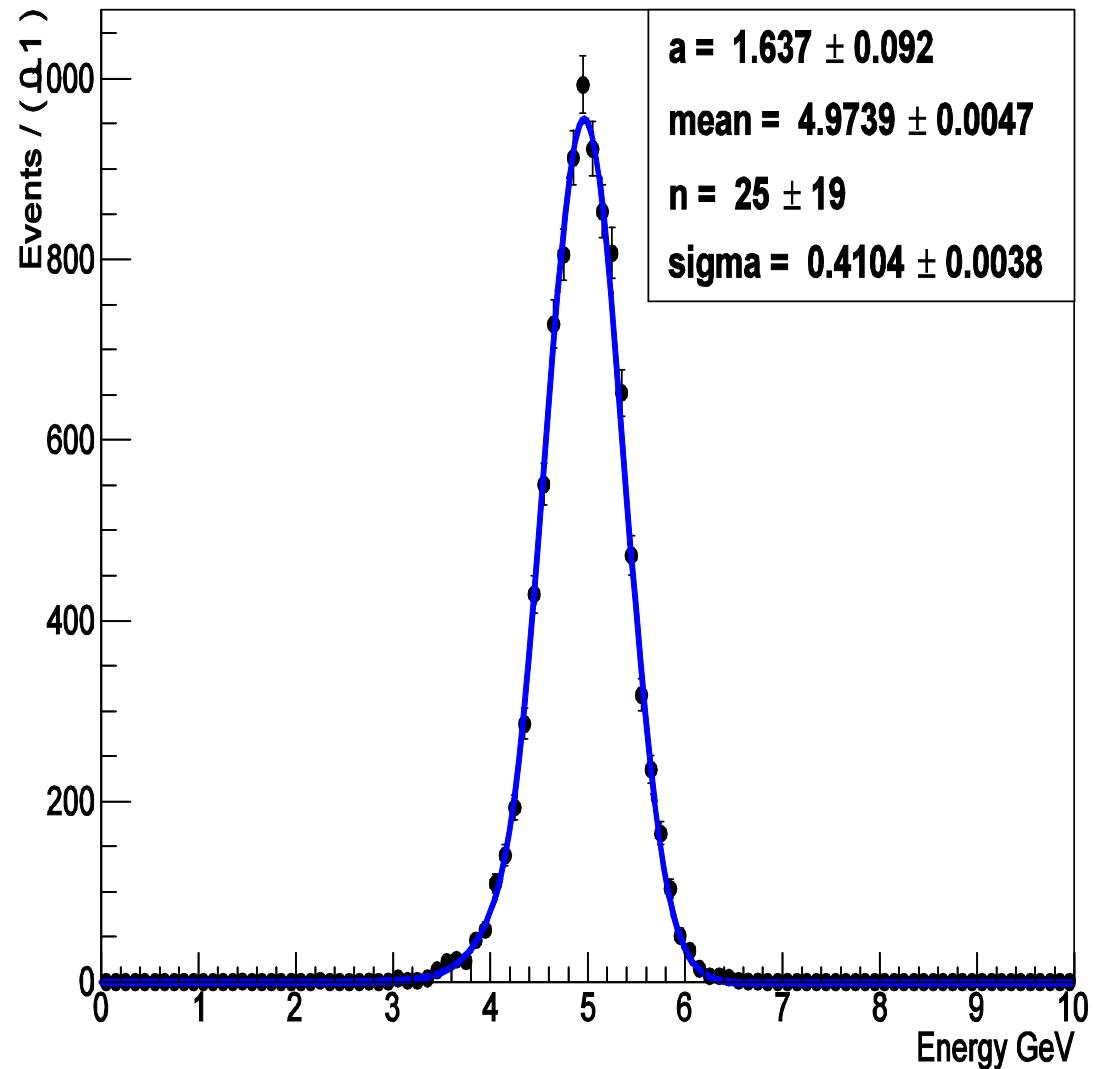
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{en} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



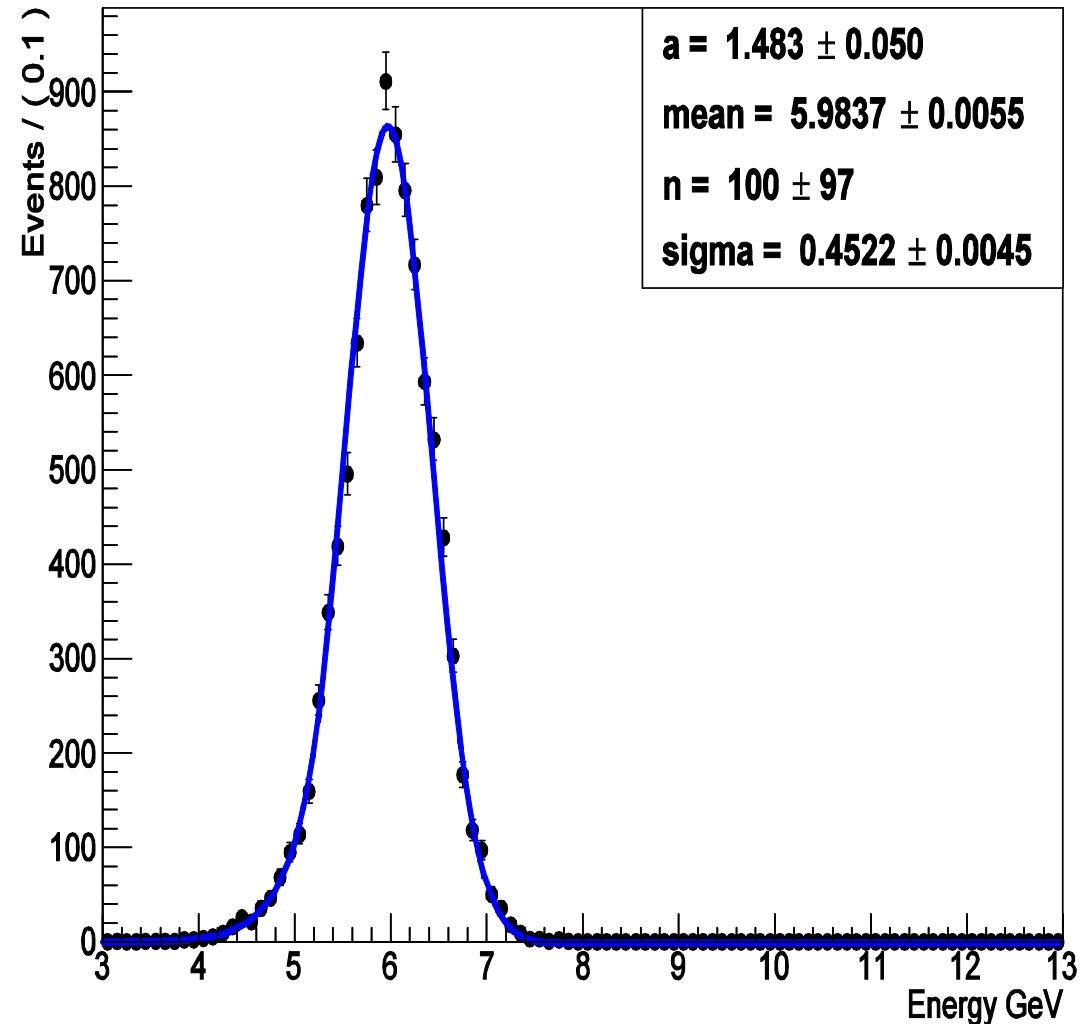
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



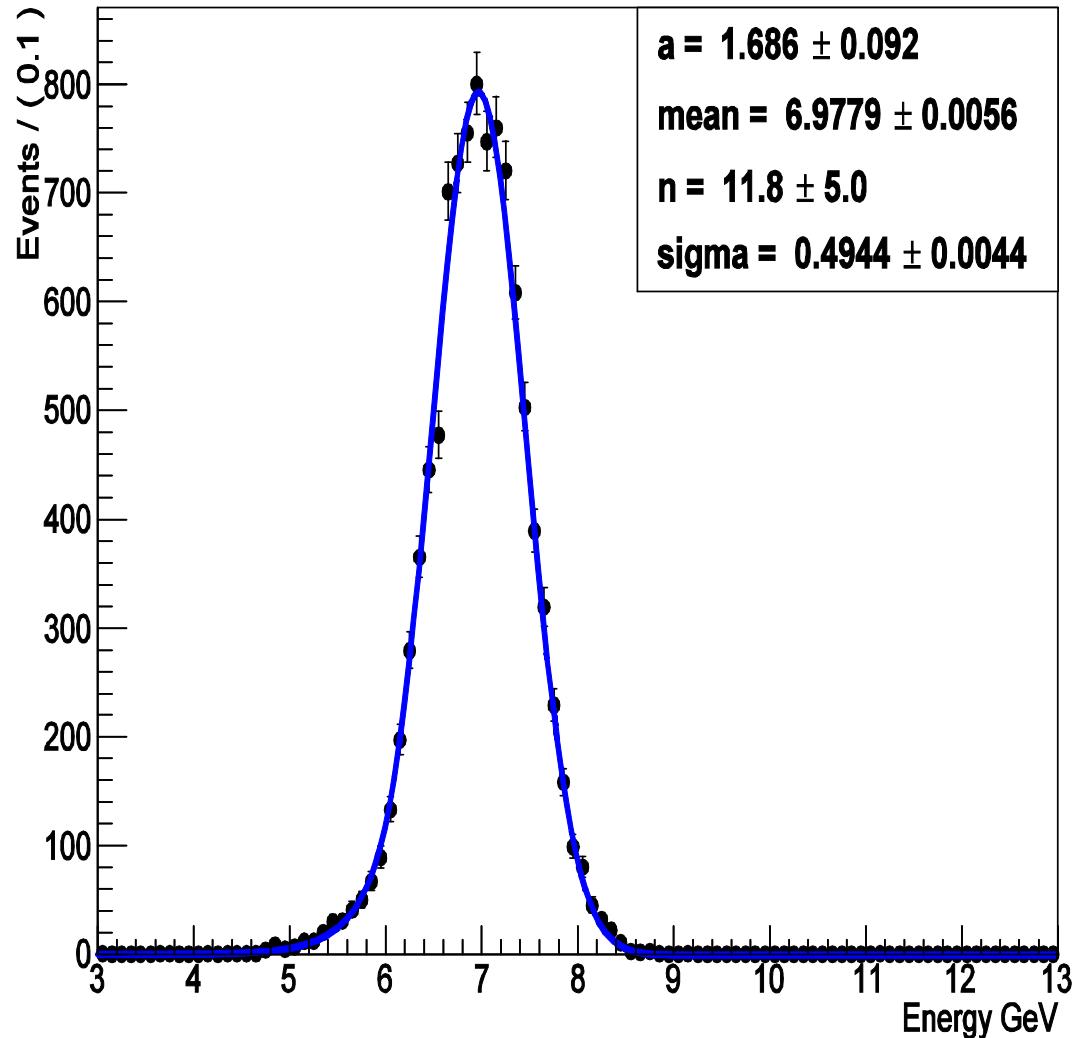
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



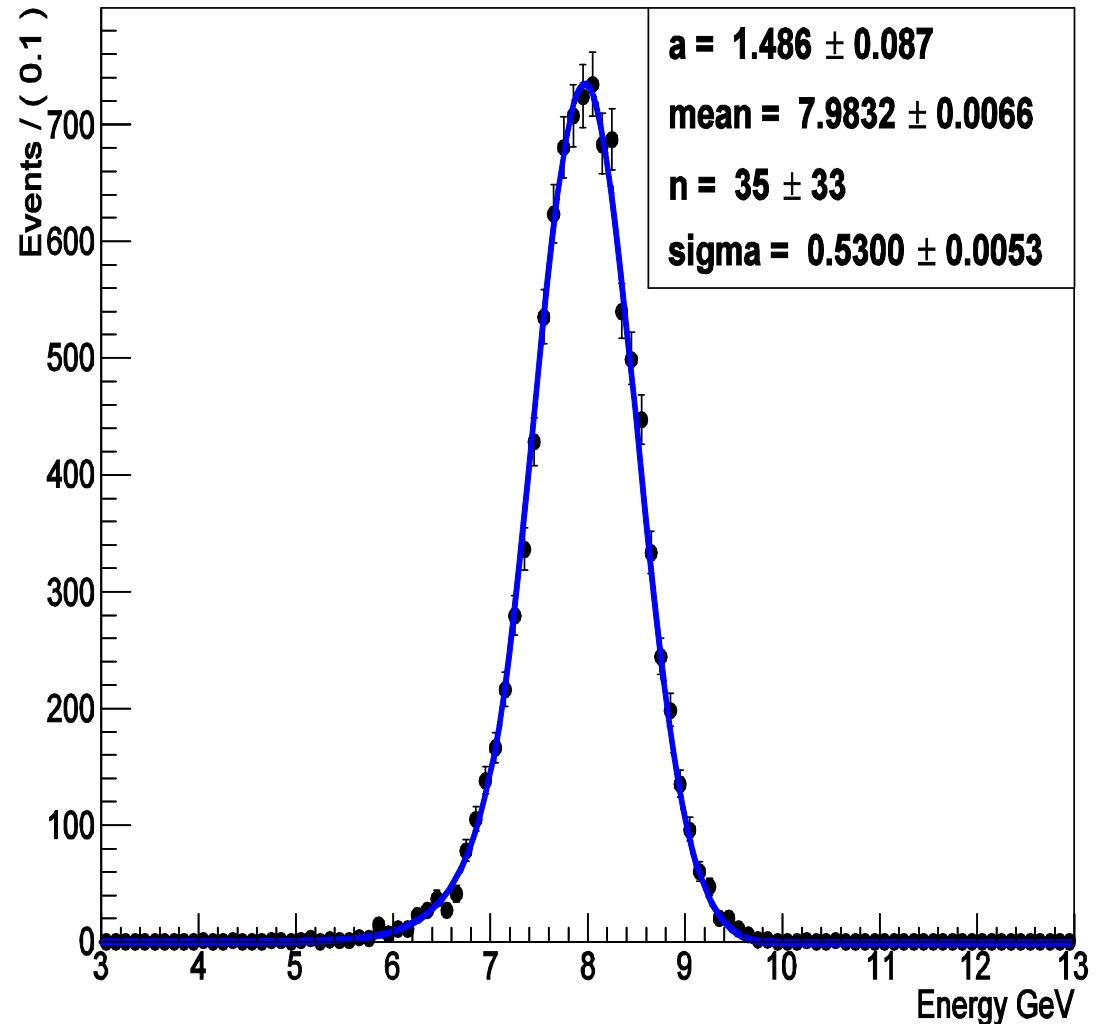
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

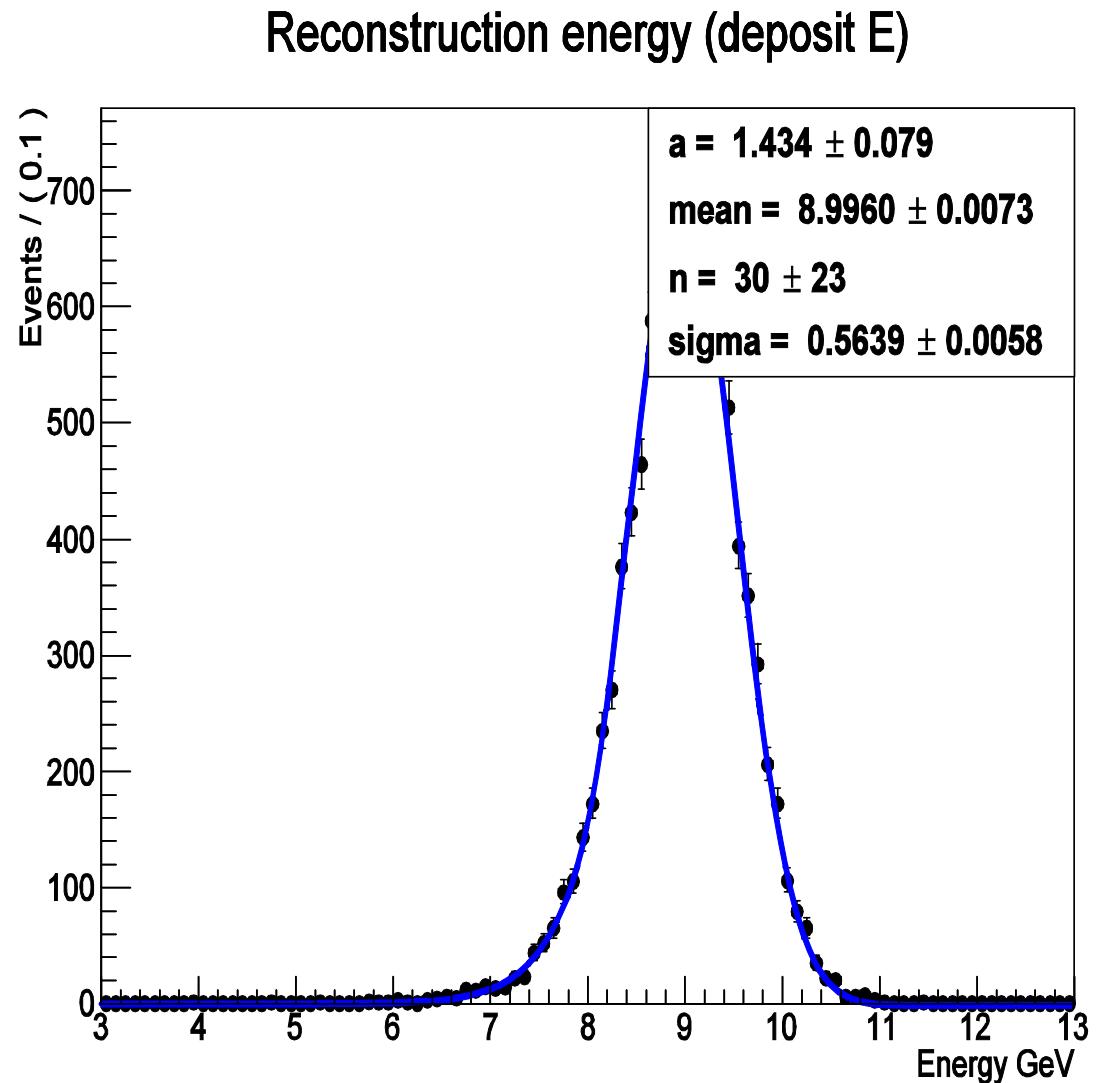


E_γ deposite in Ecal (ArborPFOsCollection)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{en} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



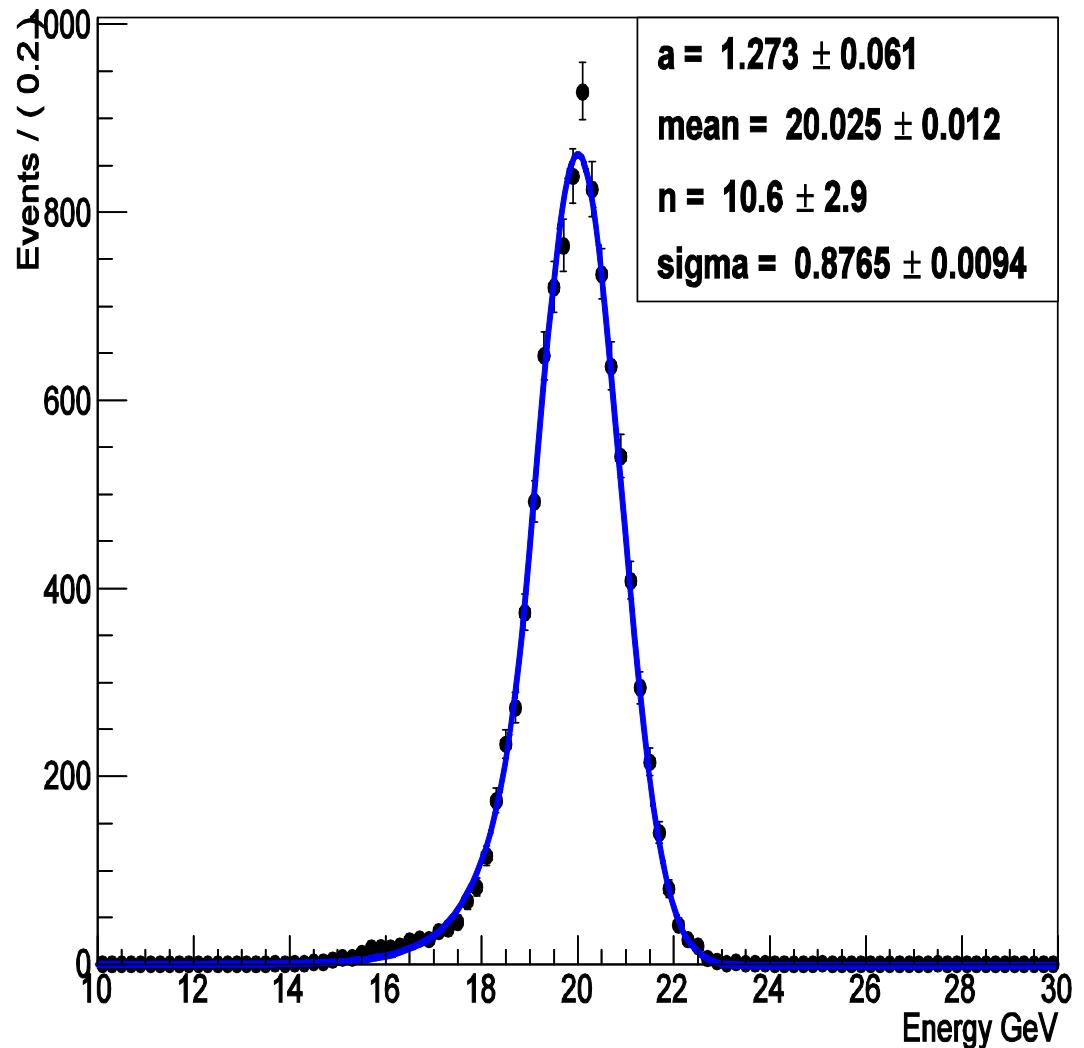
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



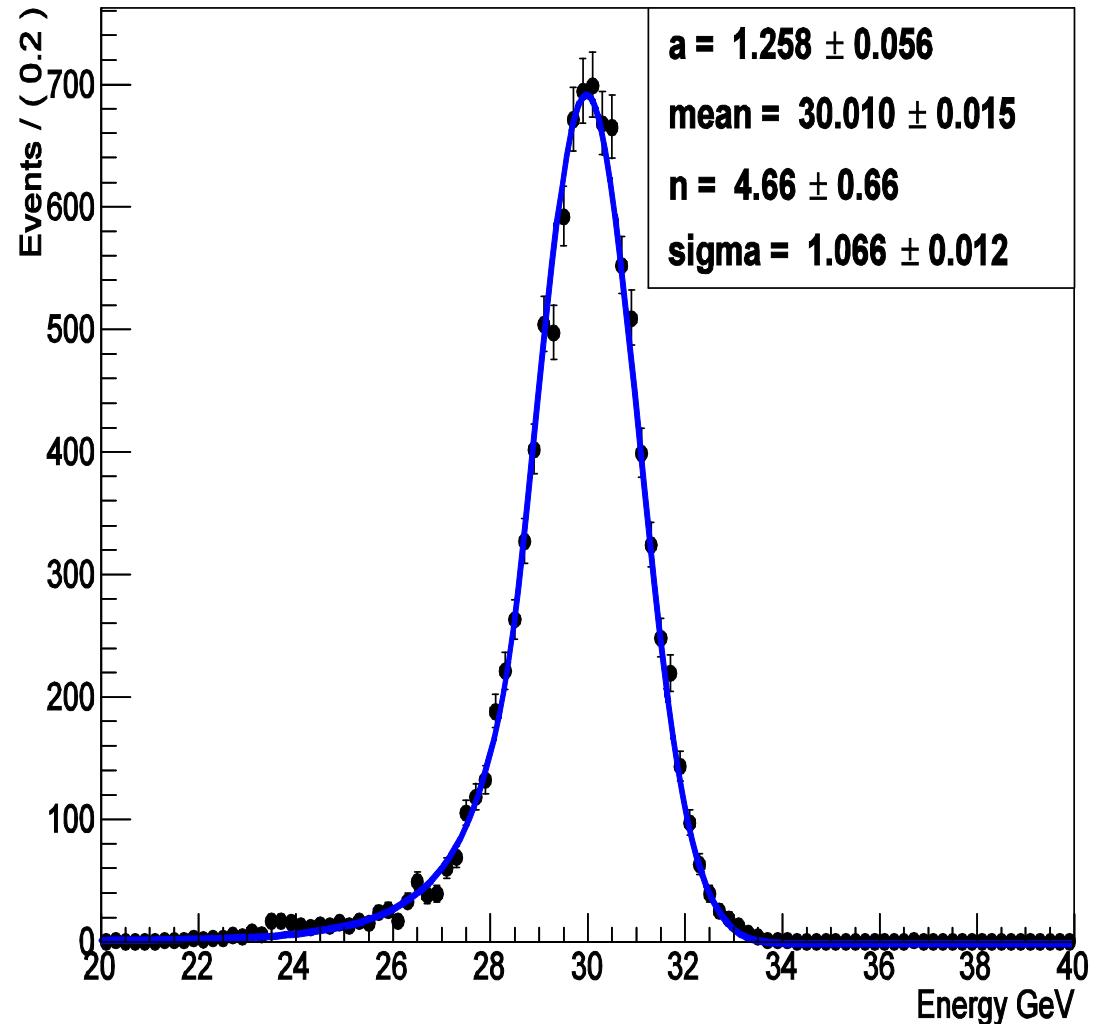
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



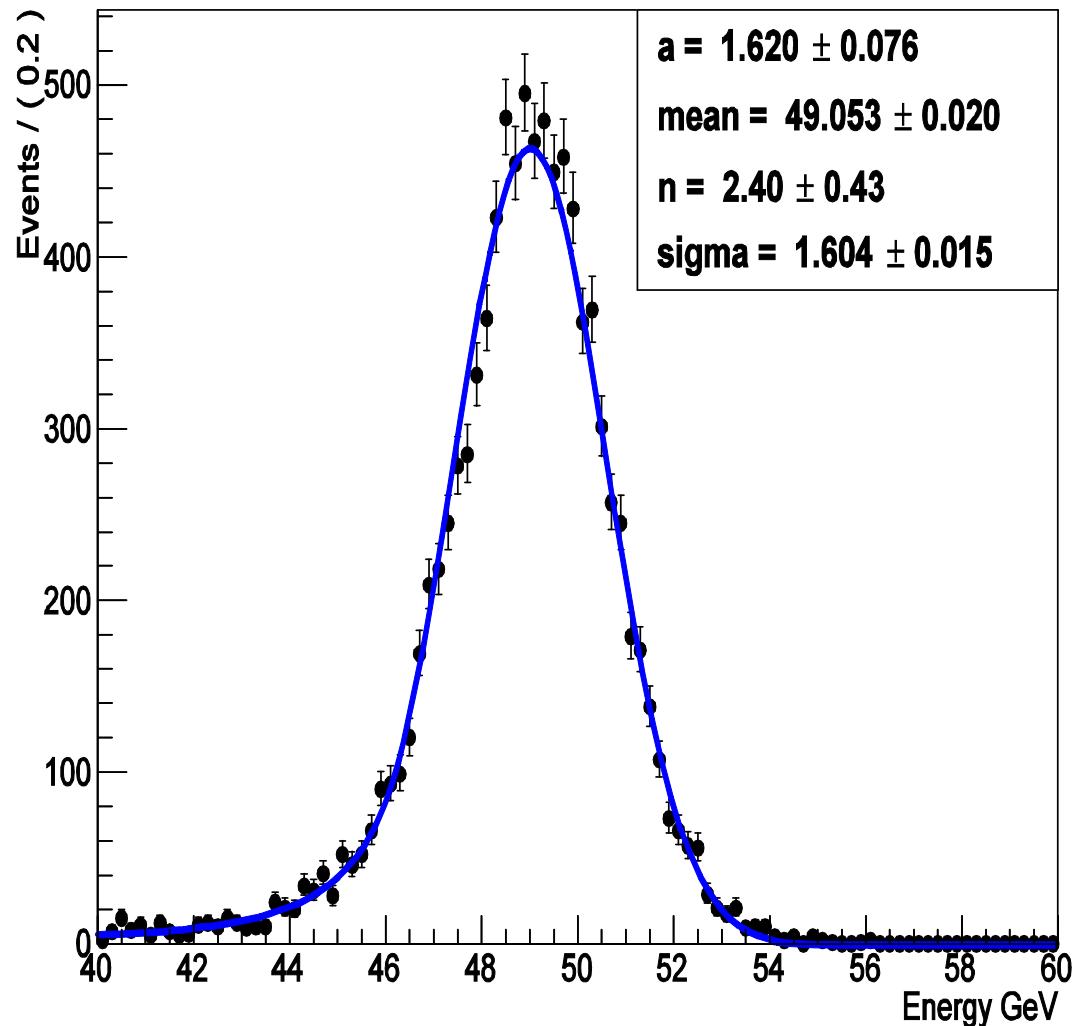
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



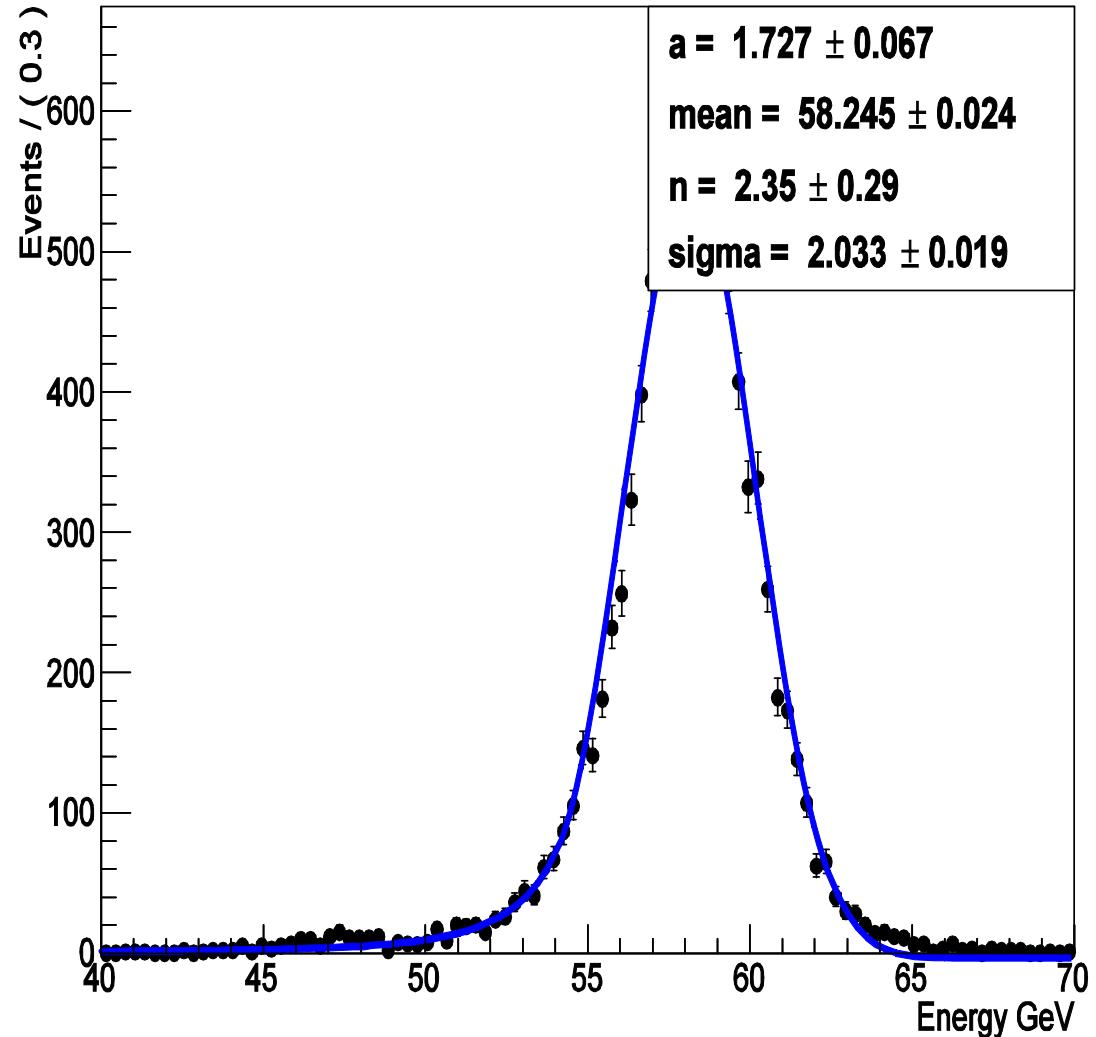
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



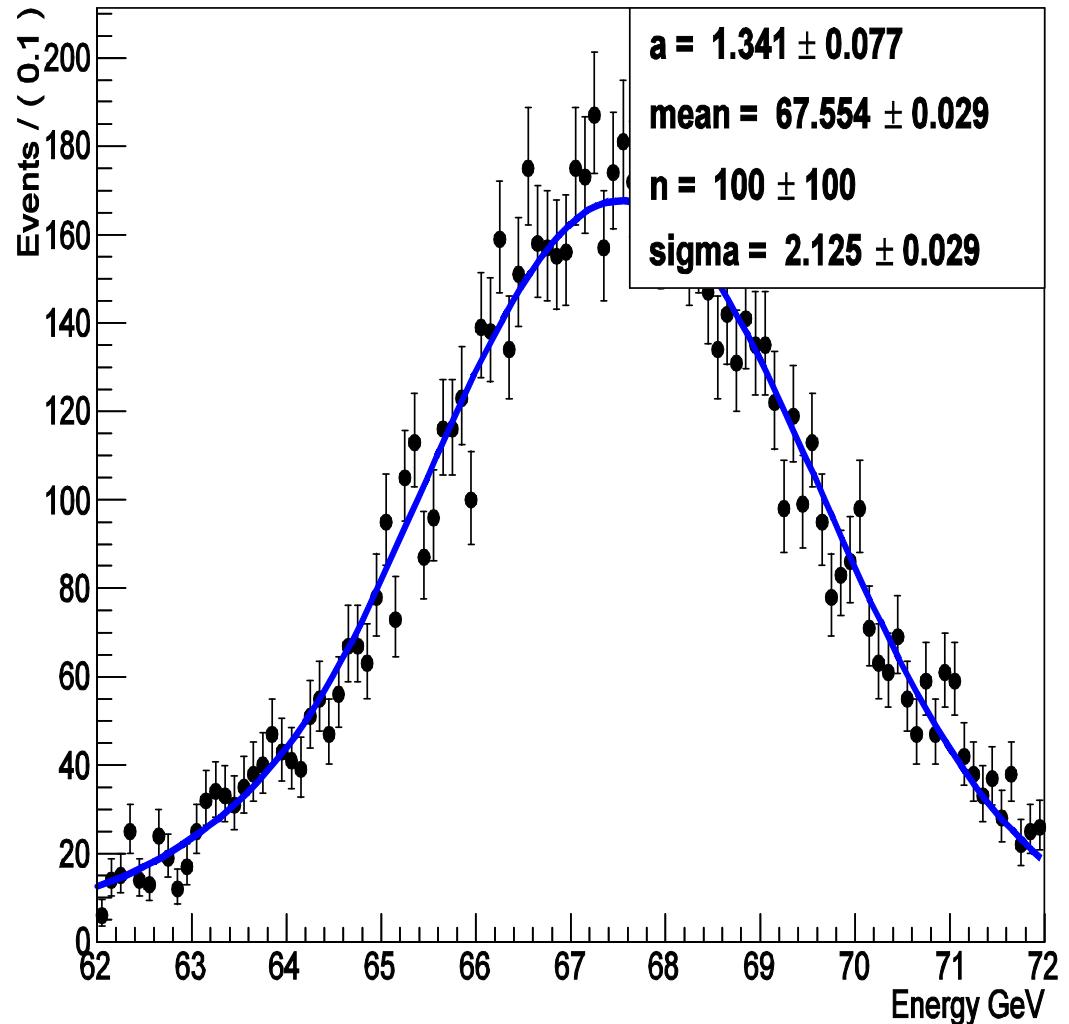
E_γ deposite in Ecal (ArborPFOsCollection)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

Reconstruction energy (deposit E)



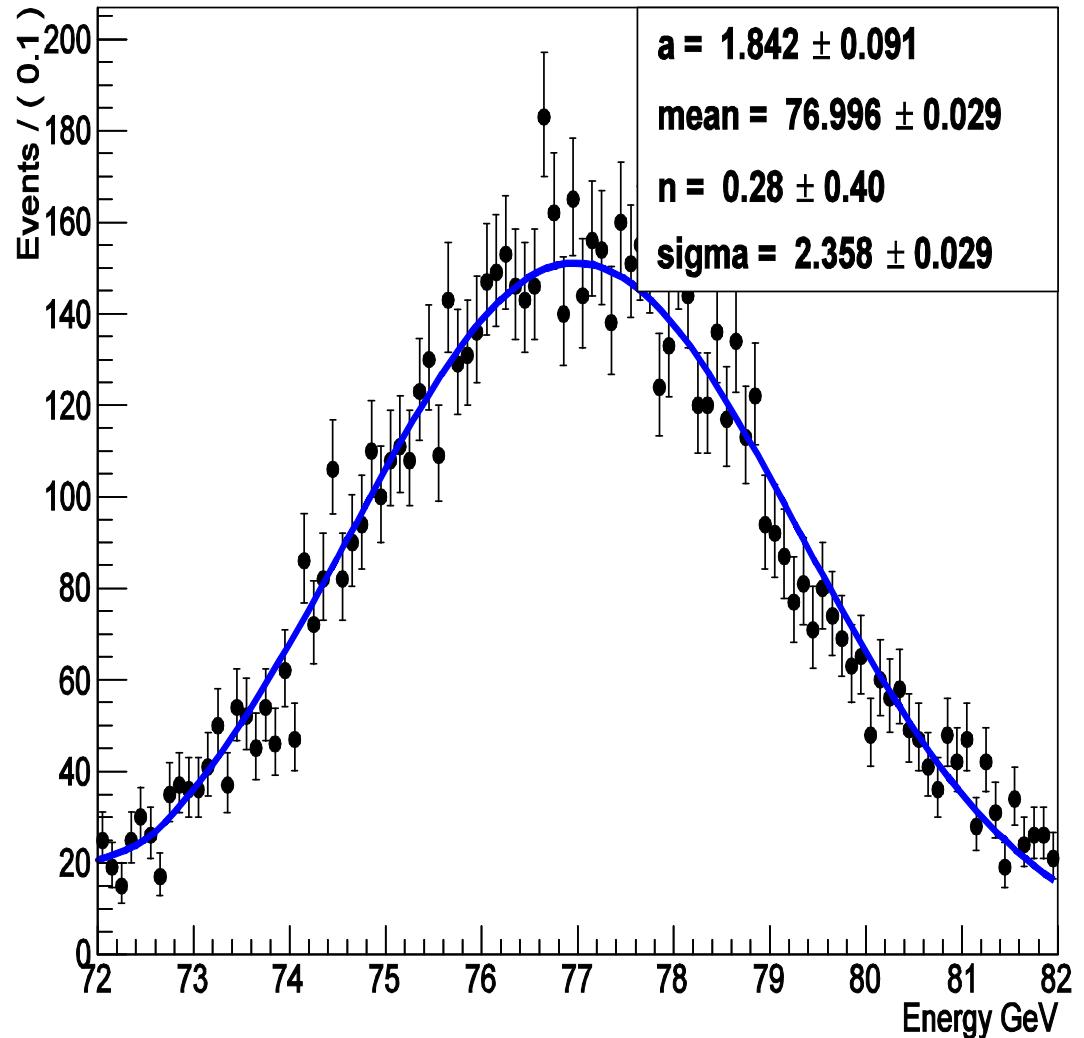
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



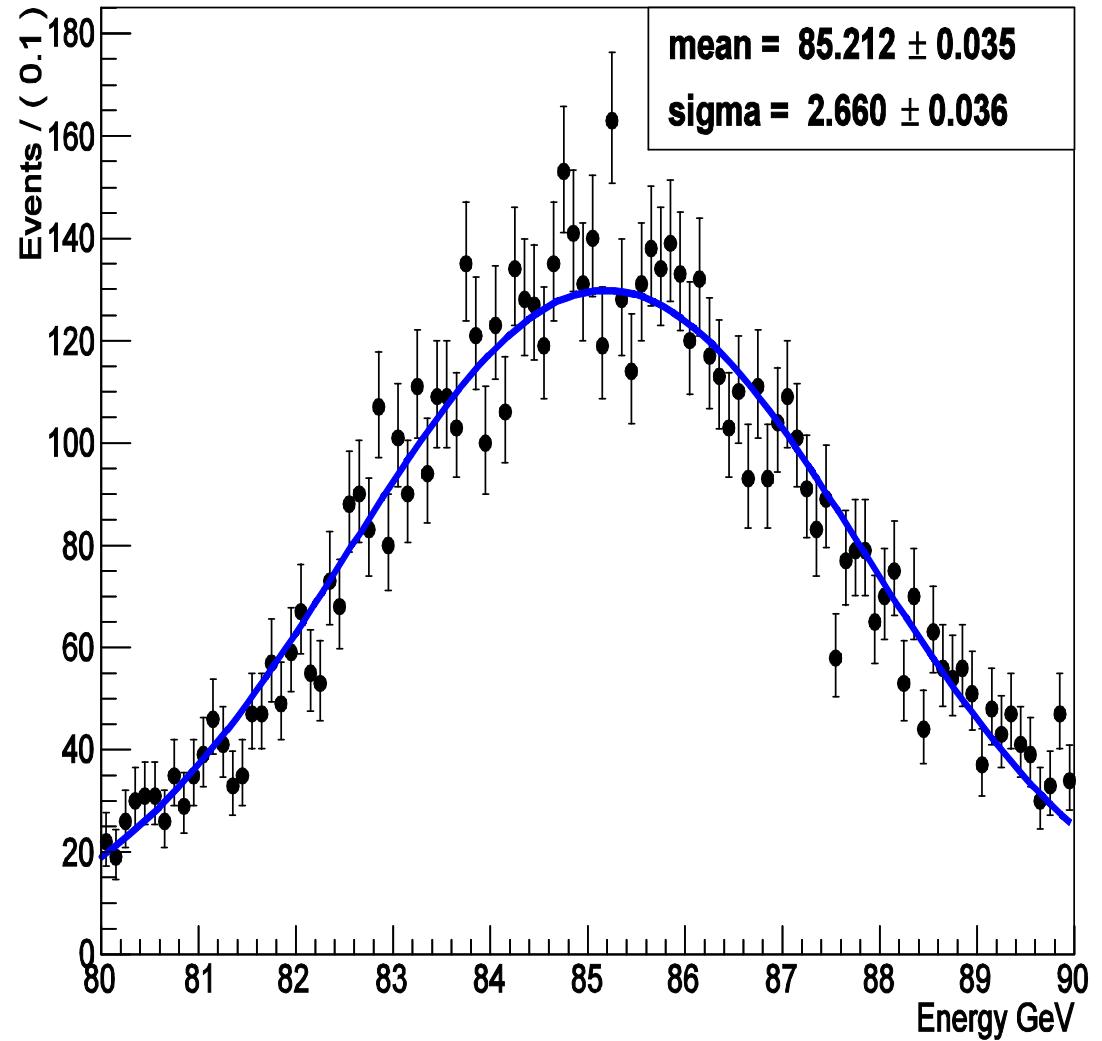
E_γ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$E_{meas}^{en} = a(f_1 E_{odd20} + (1-f_1) E_{even20}) \\ + b(f_2 E_{odd10} + (1-f_2) E_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{en} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



No. of hit in Ecal (ArborPFOsCollection)

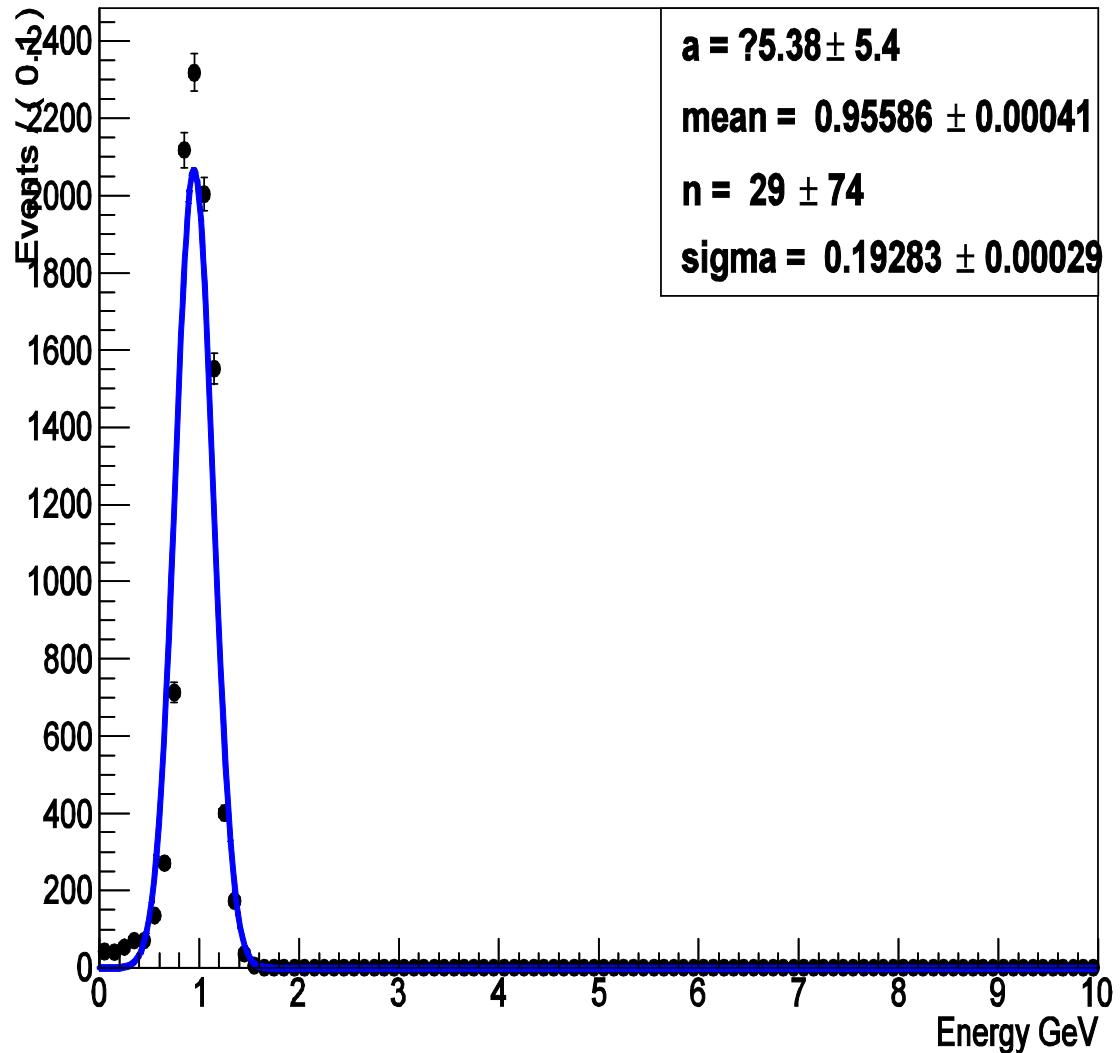
Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.02017 \approx \frac{20.17\%}{\sqrt{E}}$$



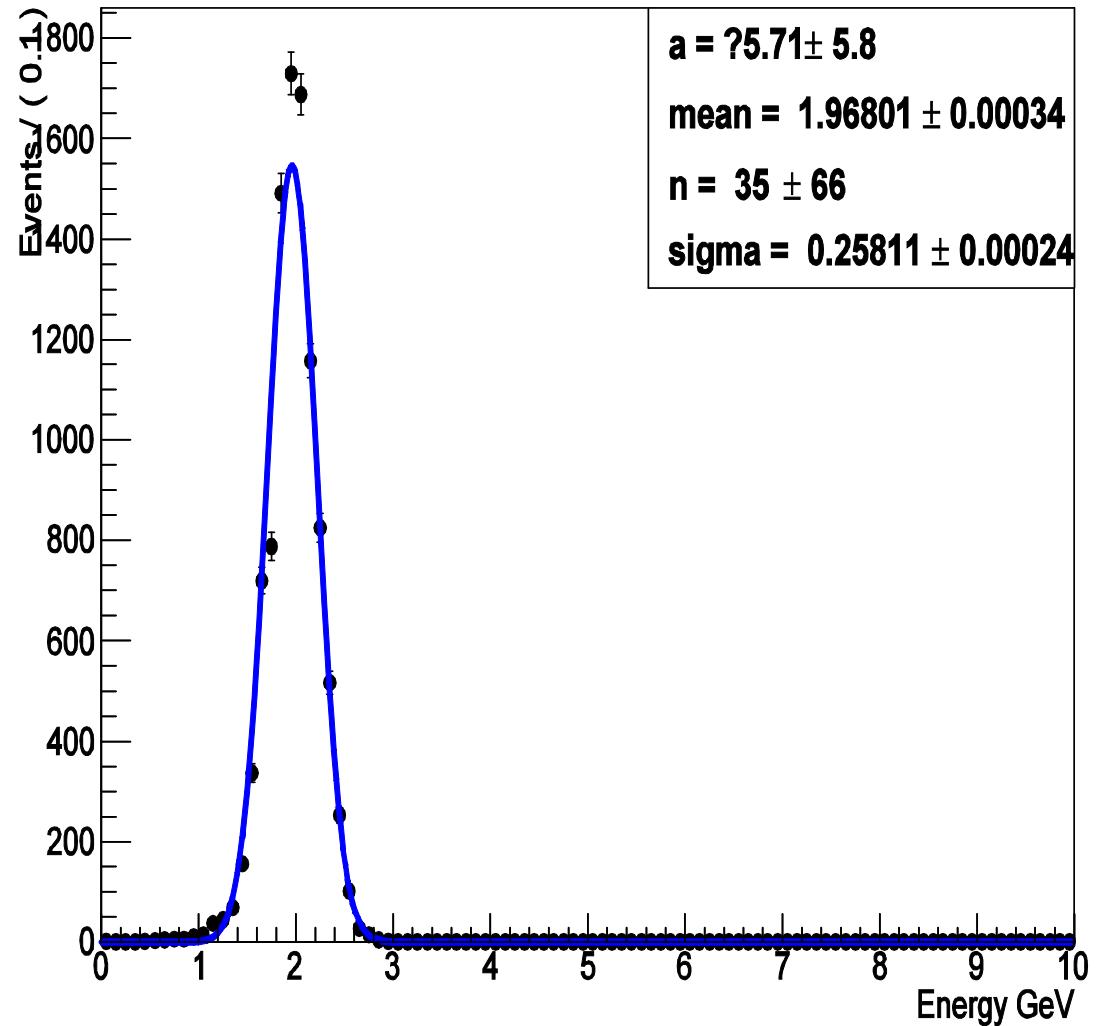
No. of hit in Ecal (ArborPFOsCollection)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

Reconstruction energy (No. of hit)

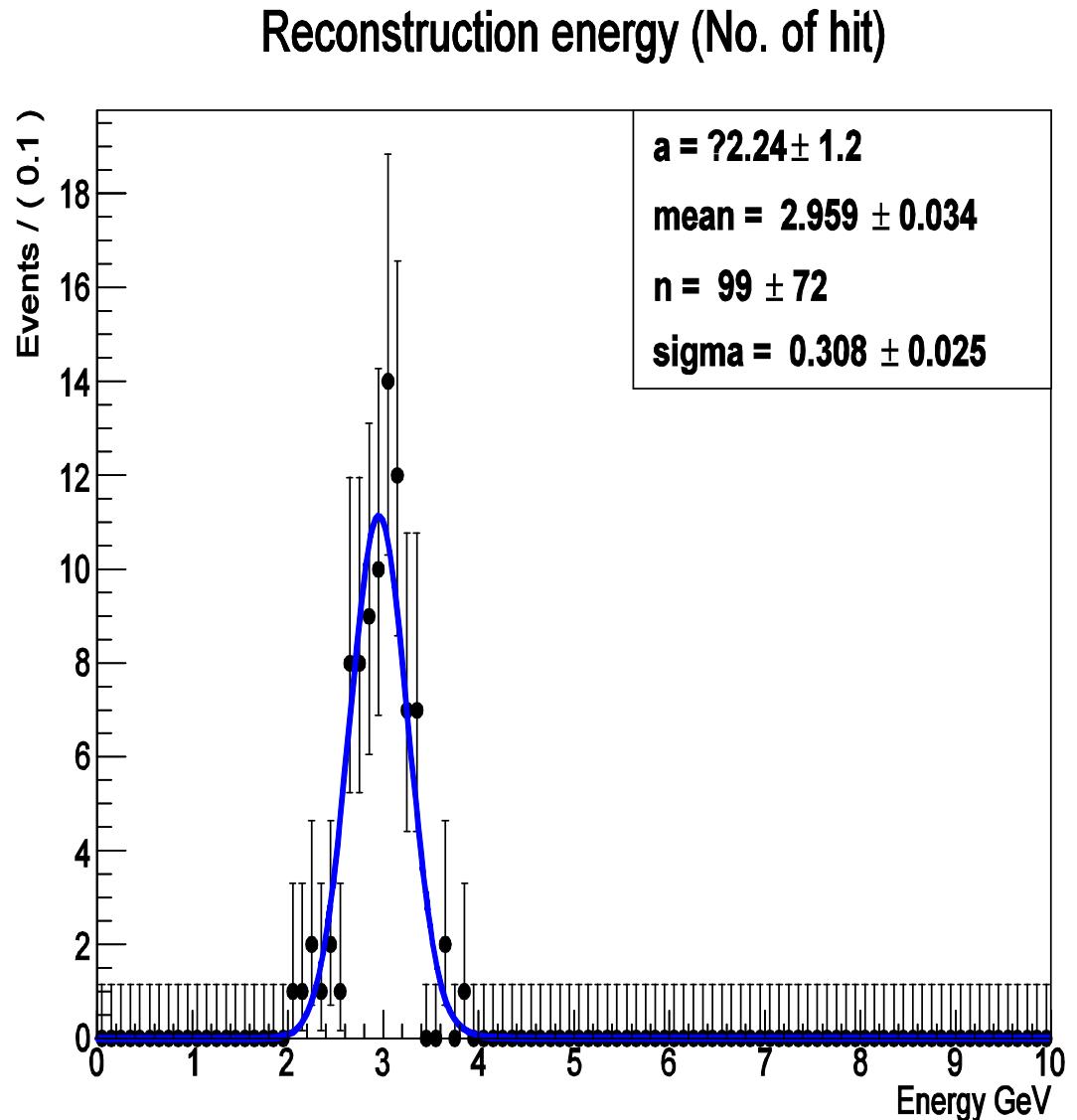


No. of hit in Ecal (ArborPFOsCollection)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



No. of hit in Ecal (ArborPFOsCollection)

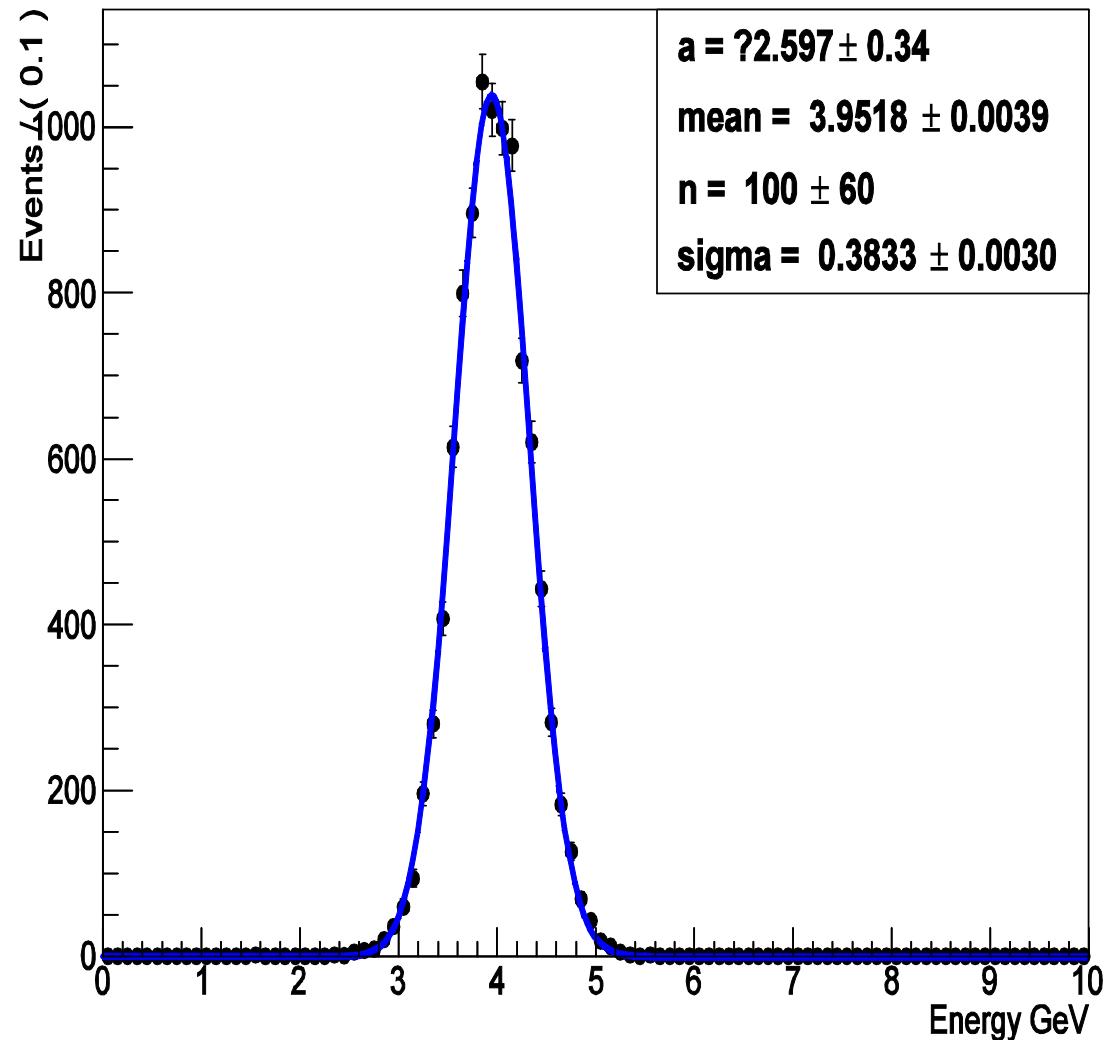
Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.09699 \approx \frac{19.39\%}{\sqrt{E}}$$



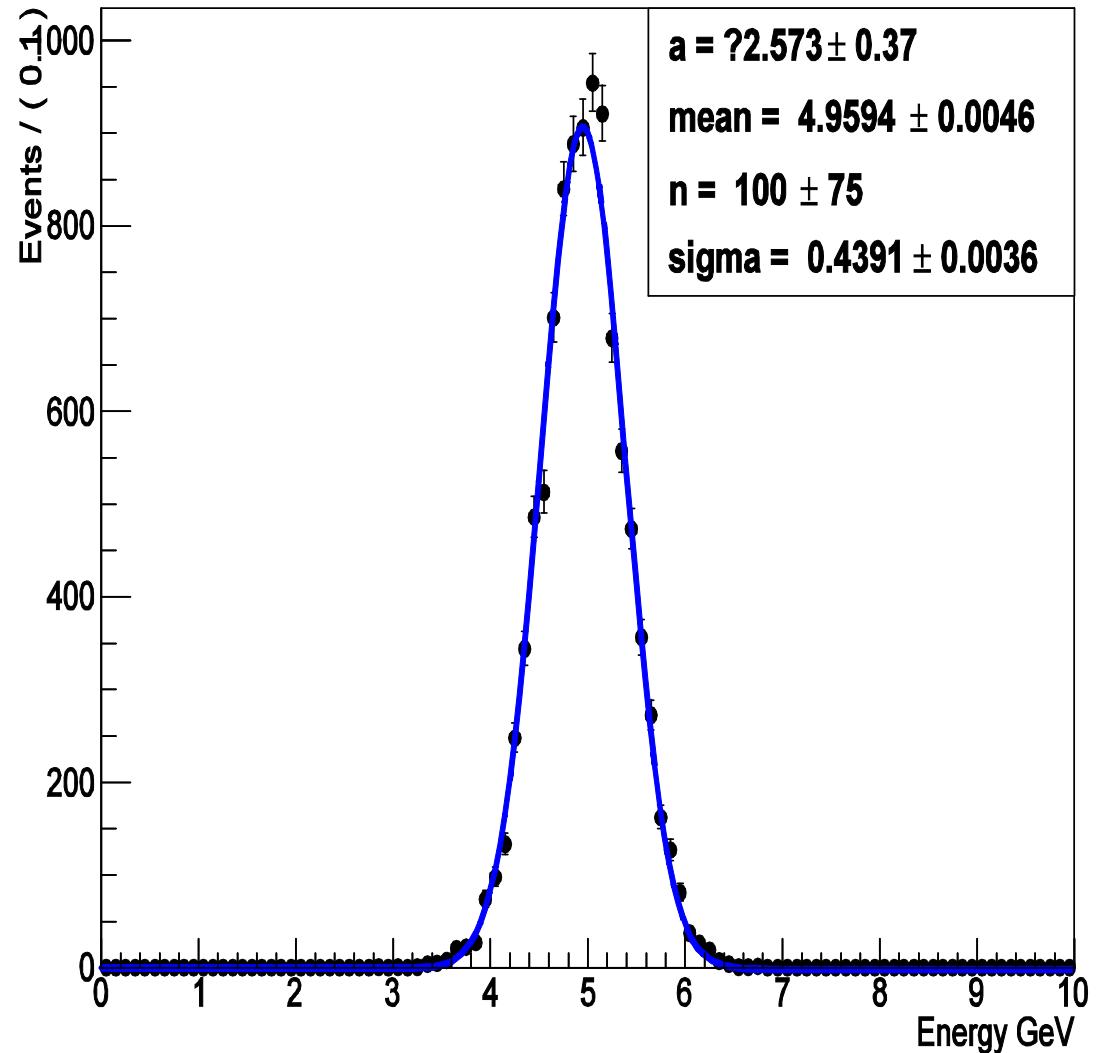
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



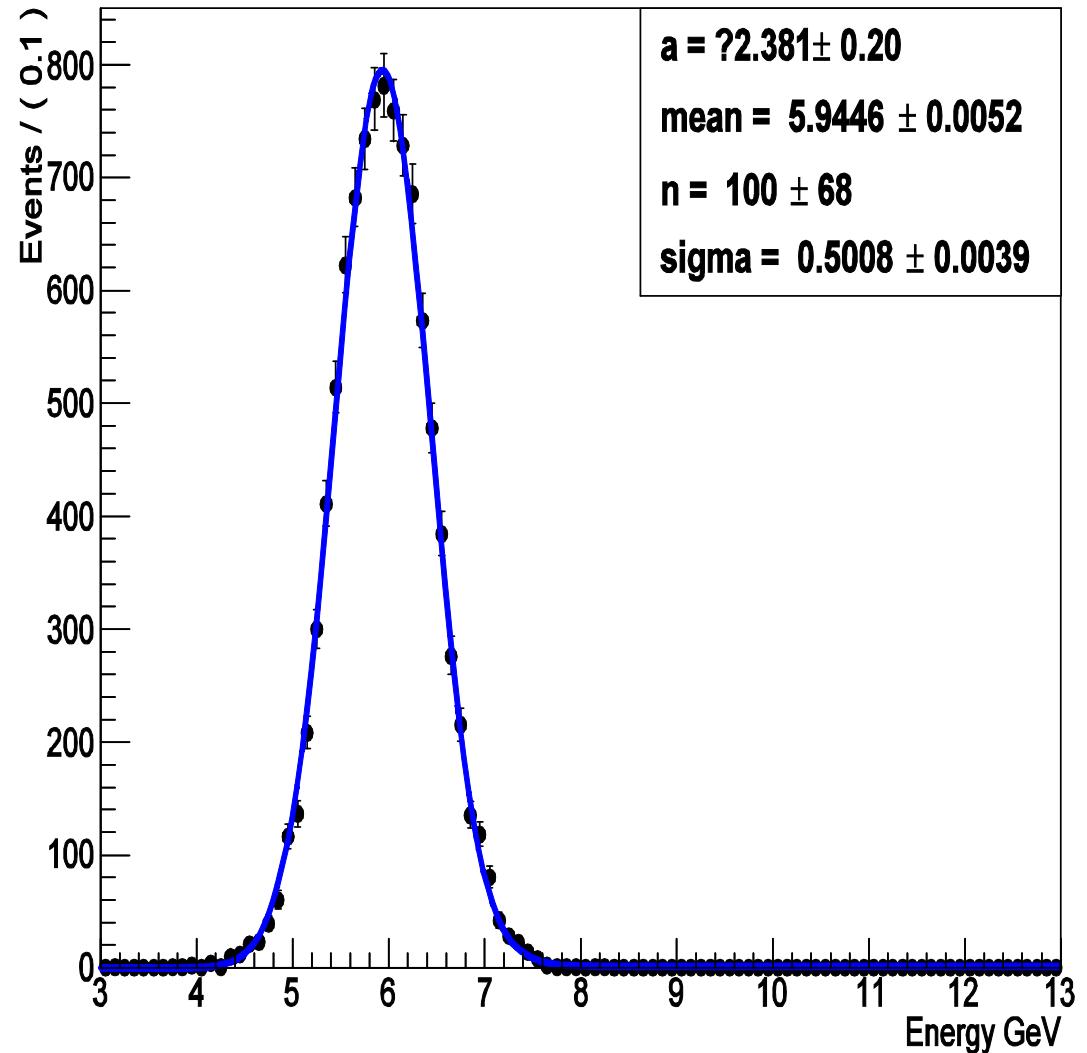
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



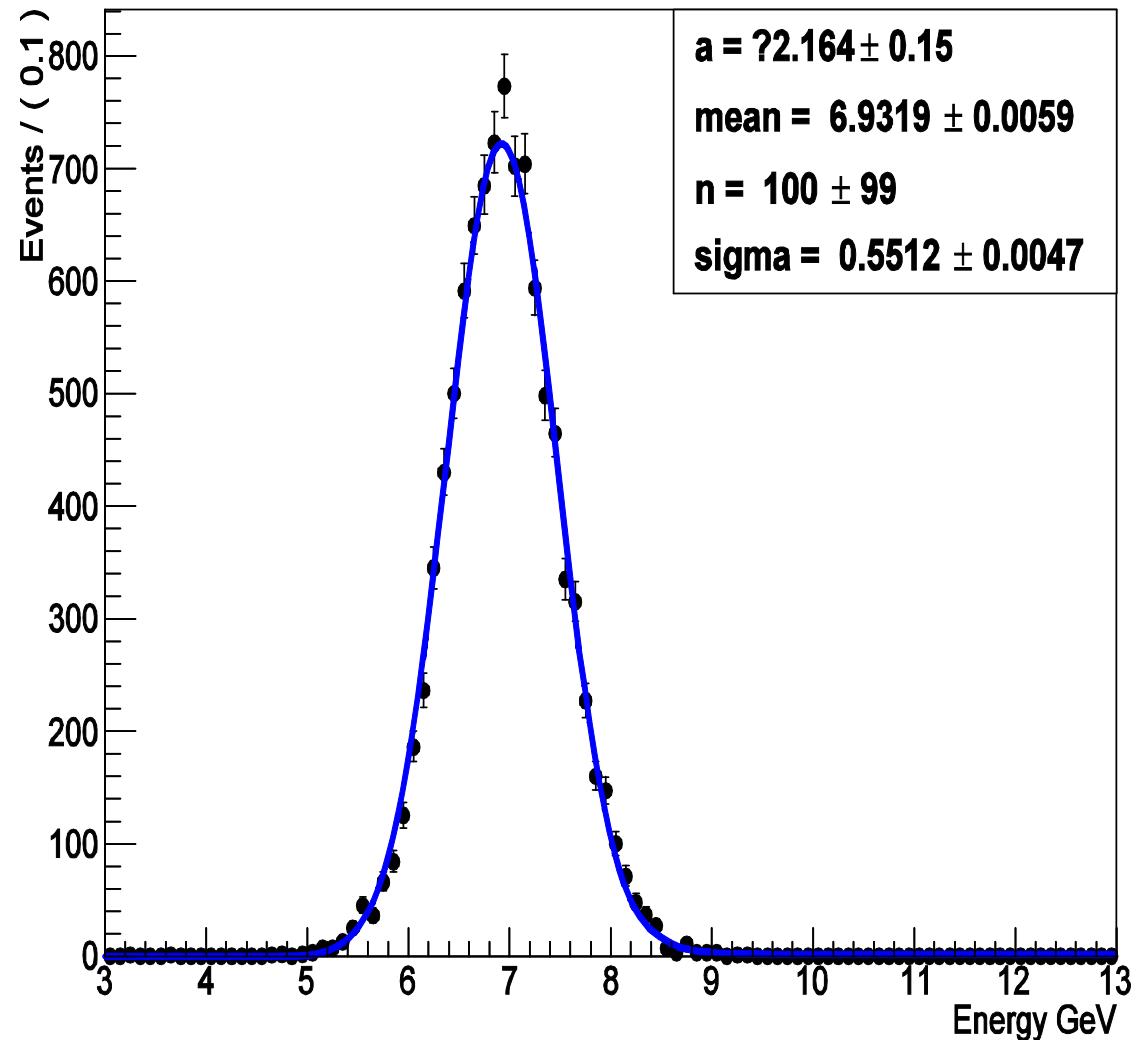
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{hit} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



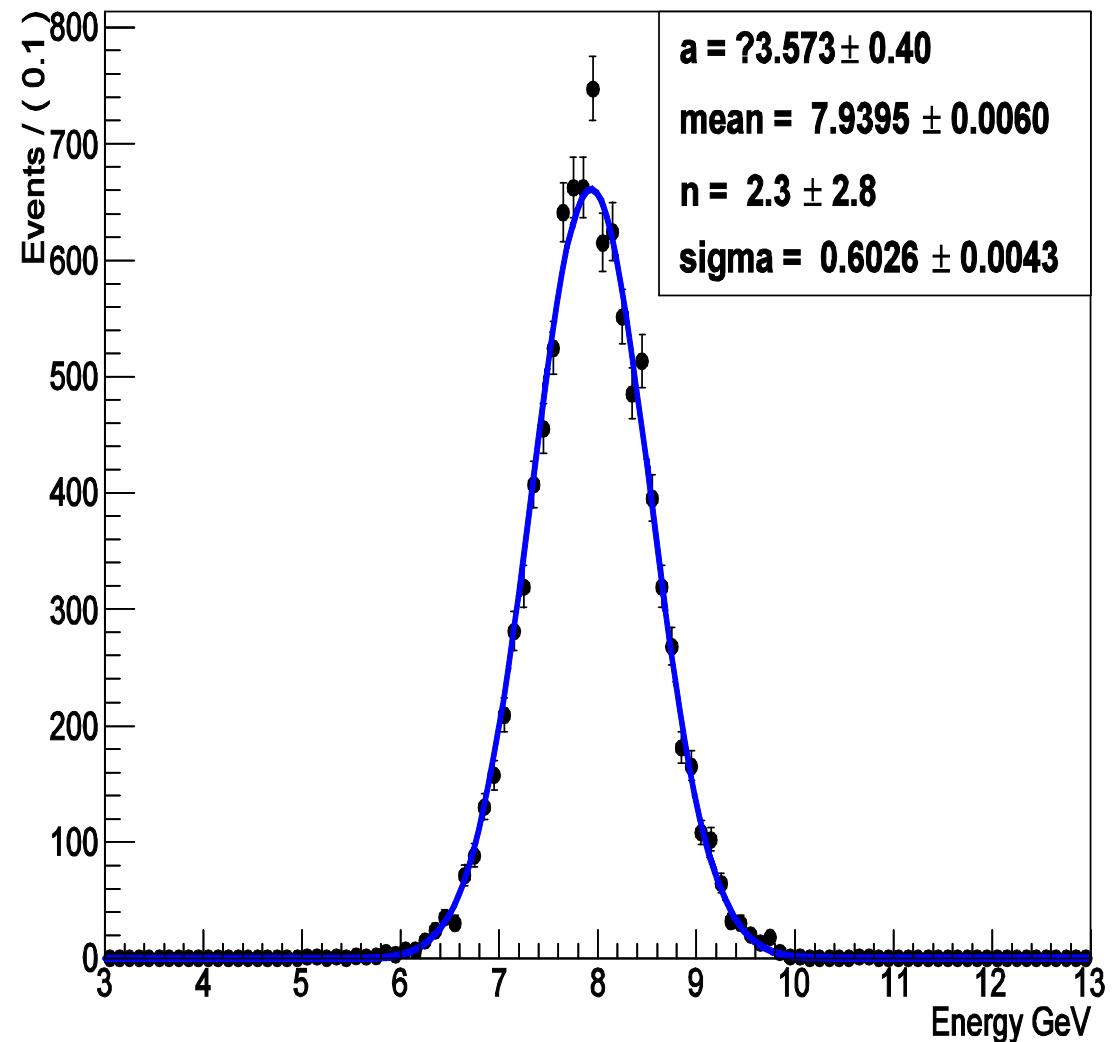
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



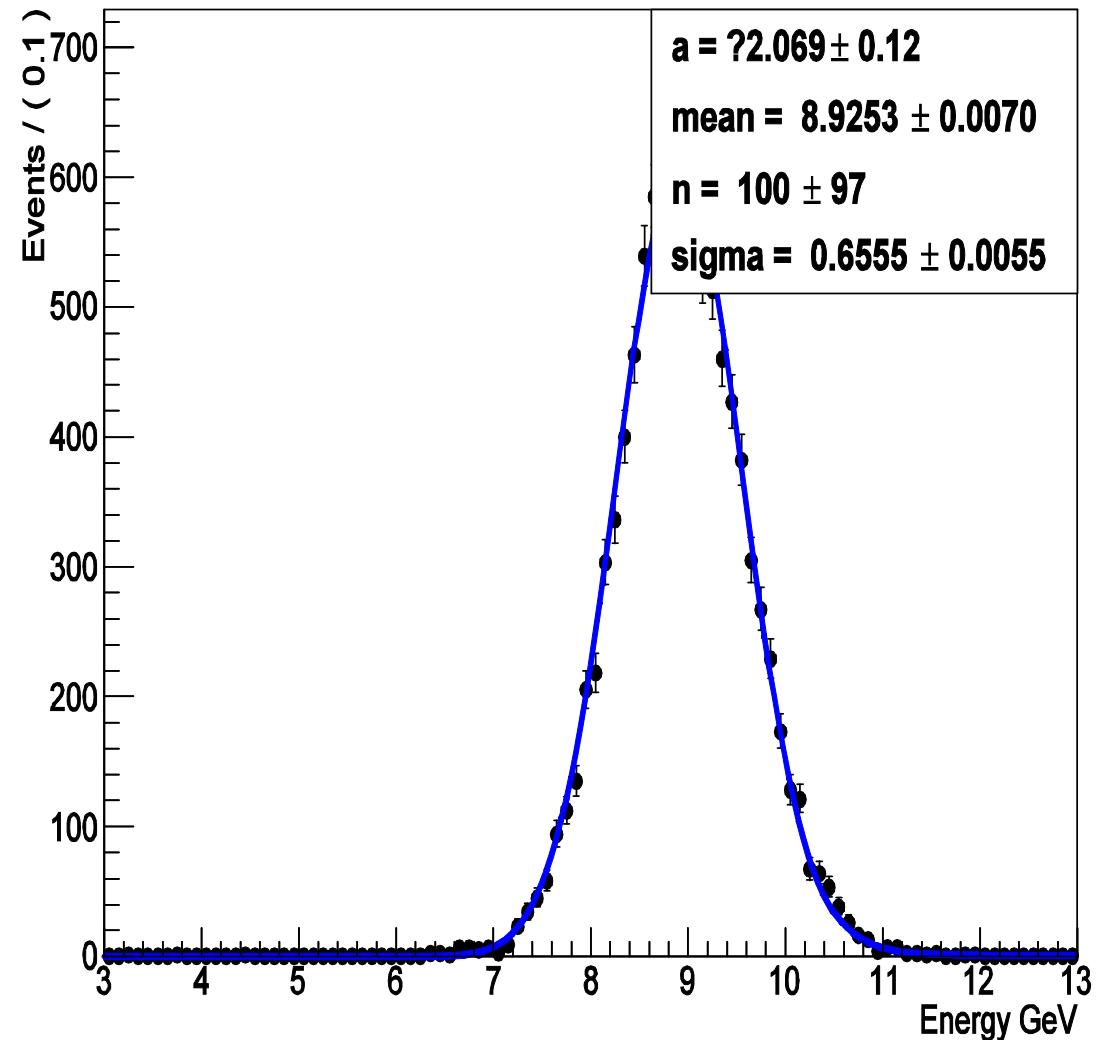
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



No. of hit in Ecal (ArborPFOsCollection)

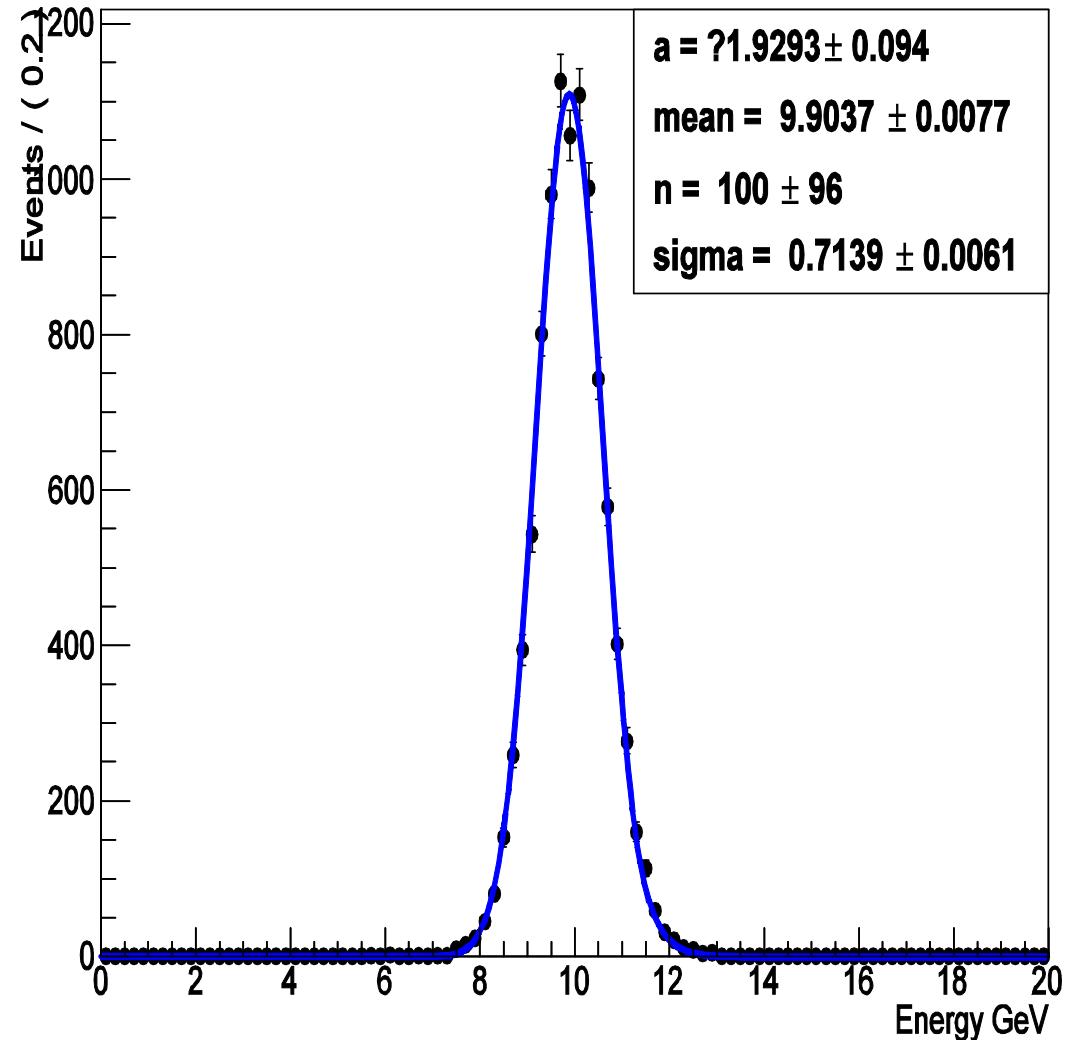
Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.07208 \approx \frac{22.79\%}{\sqrt{E}}$$



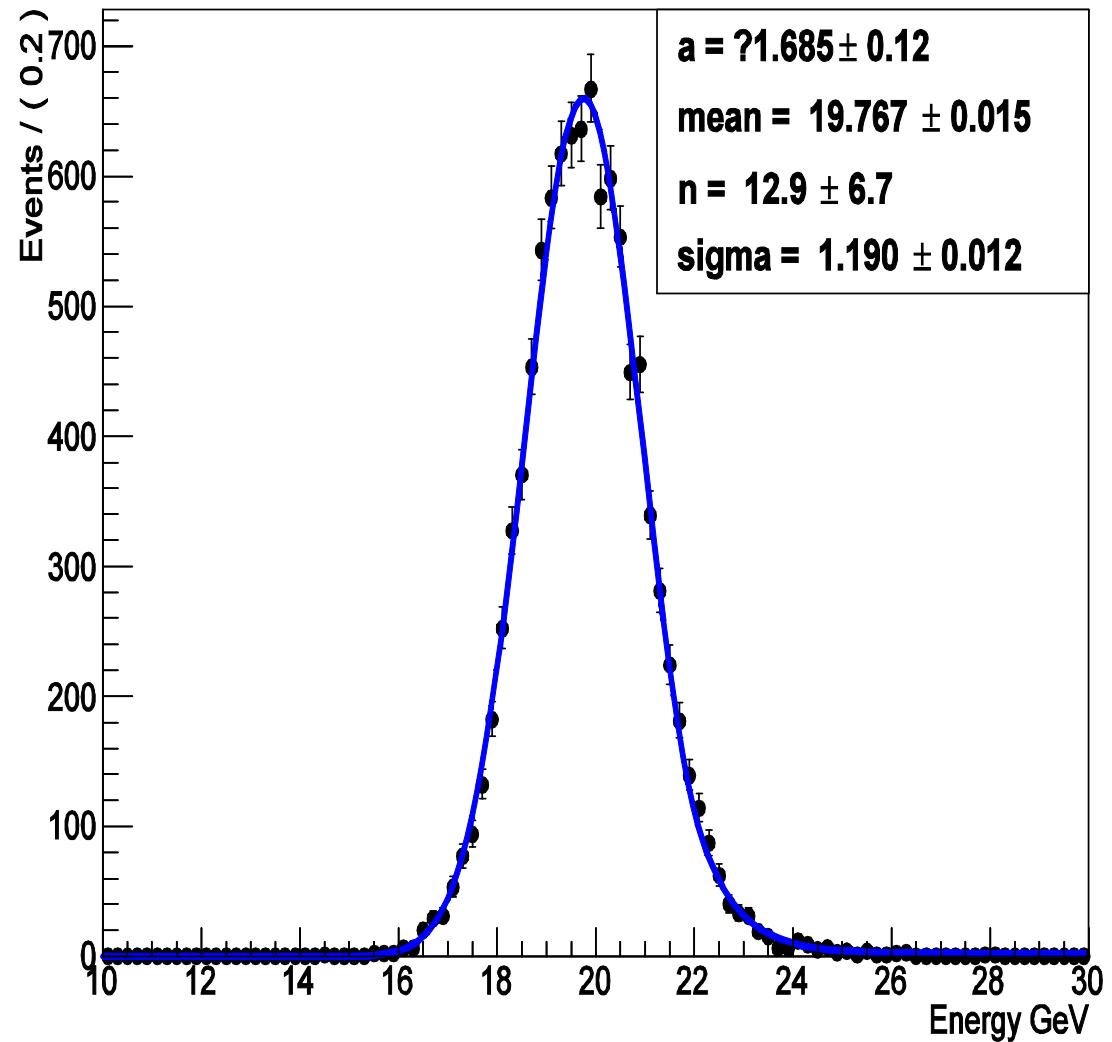
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



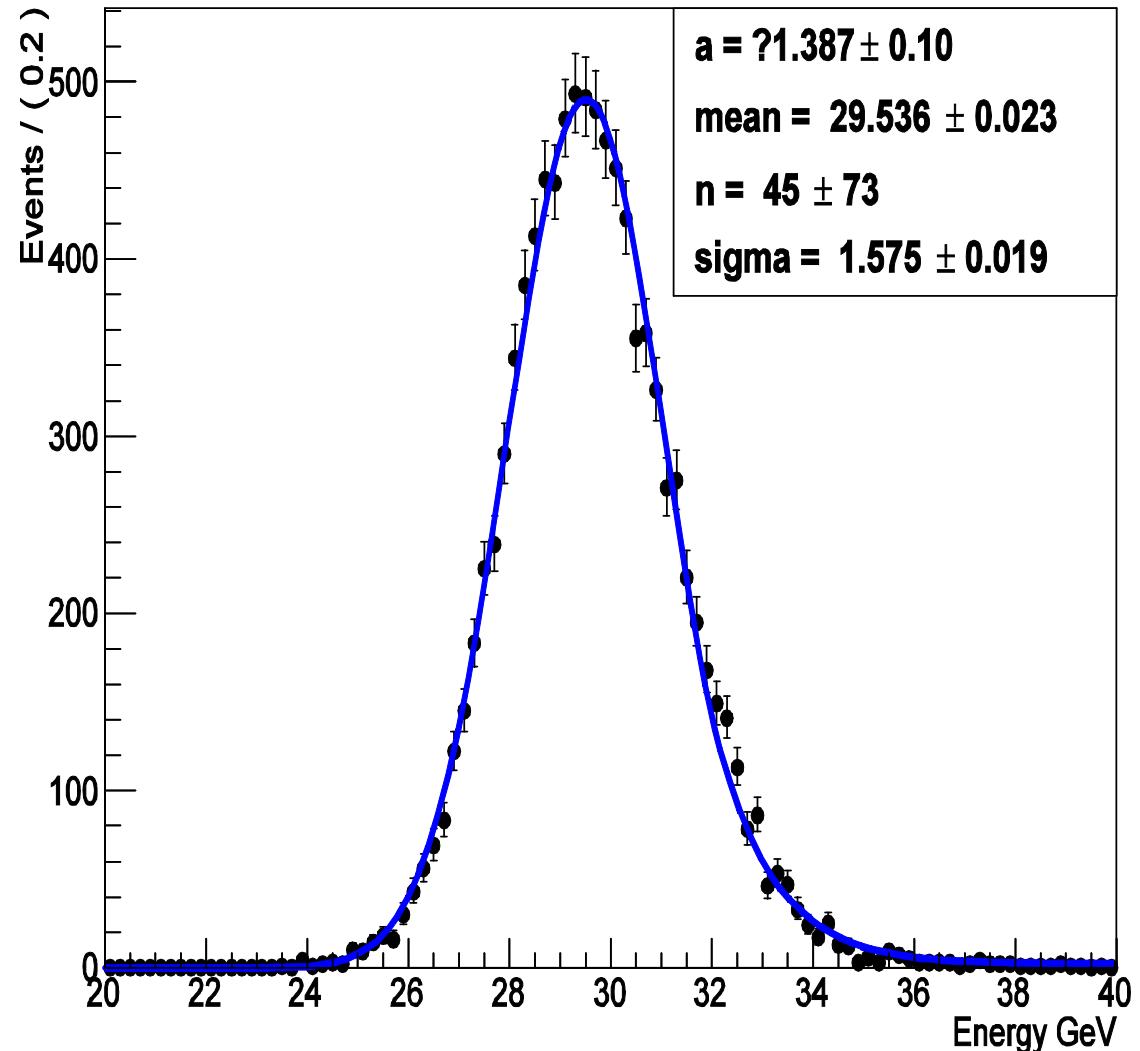
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



No. of hit in Ecal (ArborPFOsCollection)

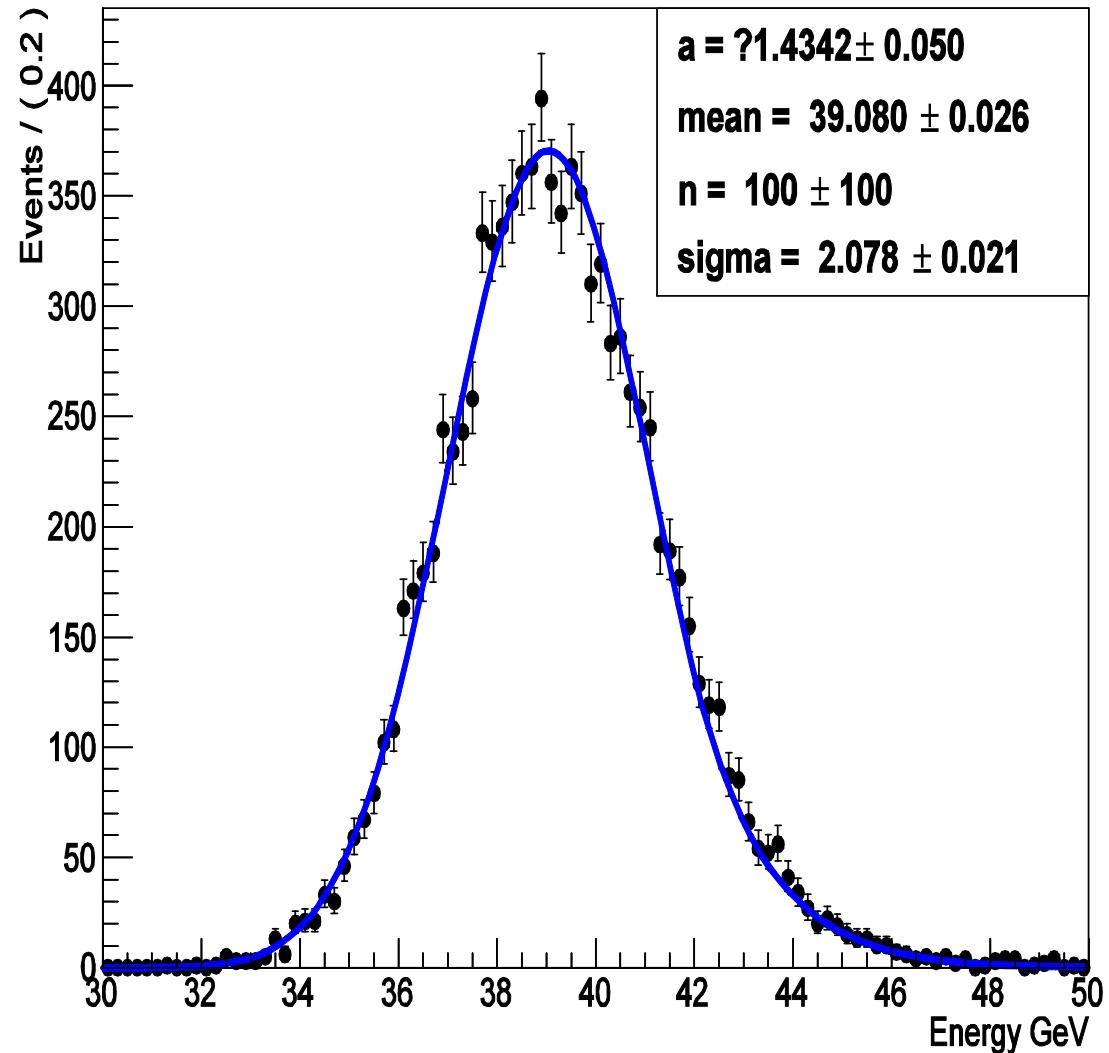
Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.05317 \approx \frac{33.63\%}{\sqrt{E}}$$



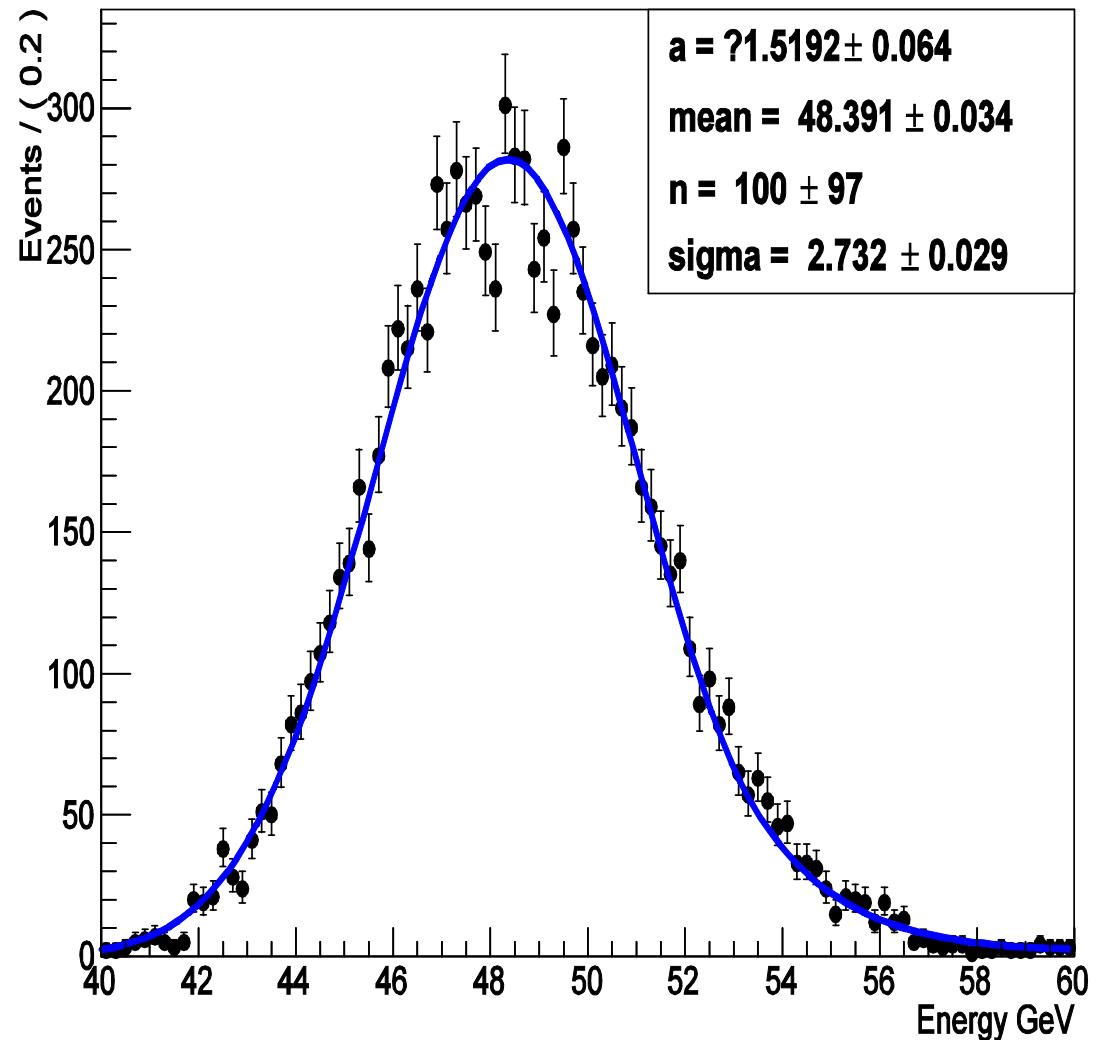
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

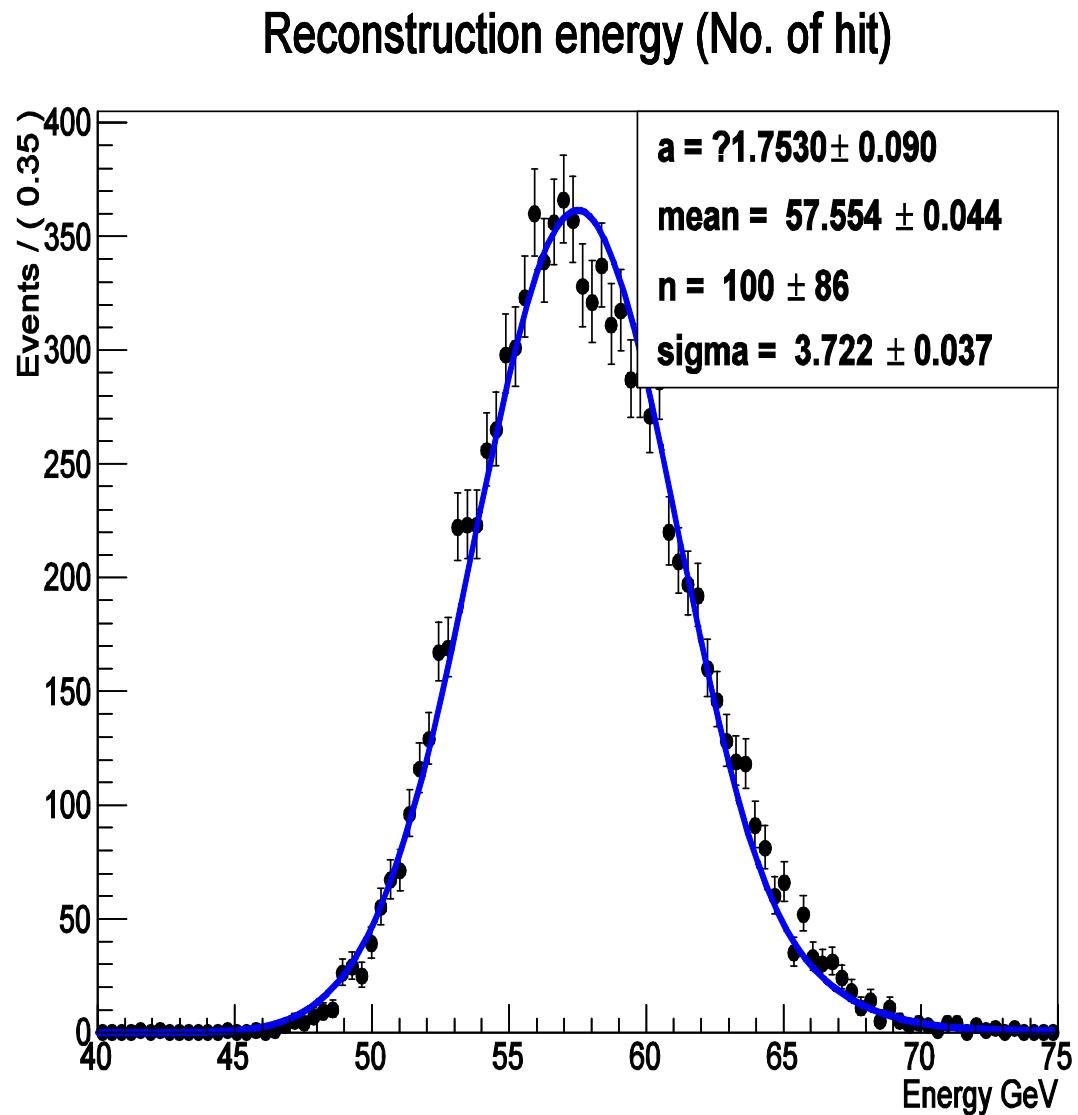


No. of hit in Ecal (ArborPFOsCollection)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



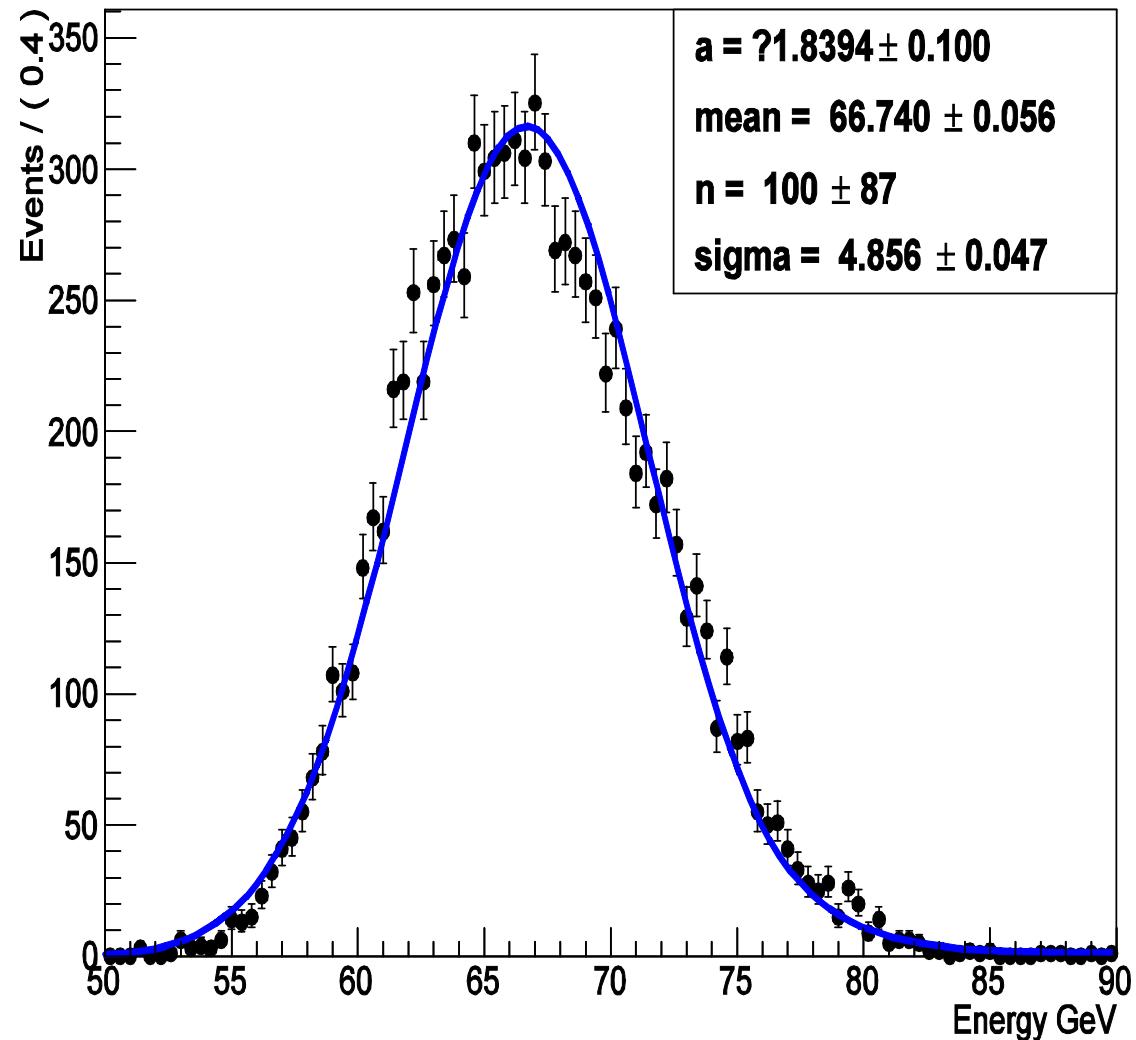
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left((E_{meas}^{hit} - E_{MC}) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



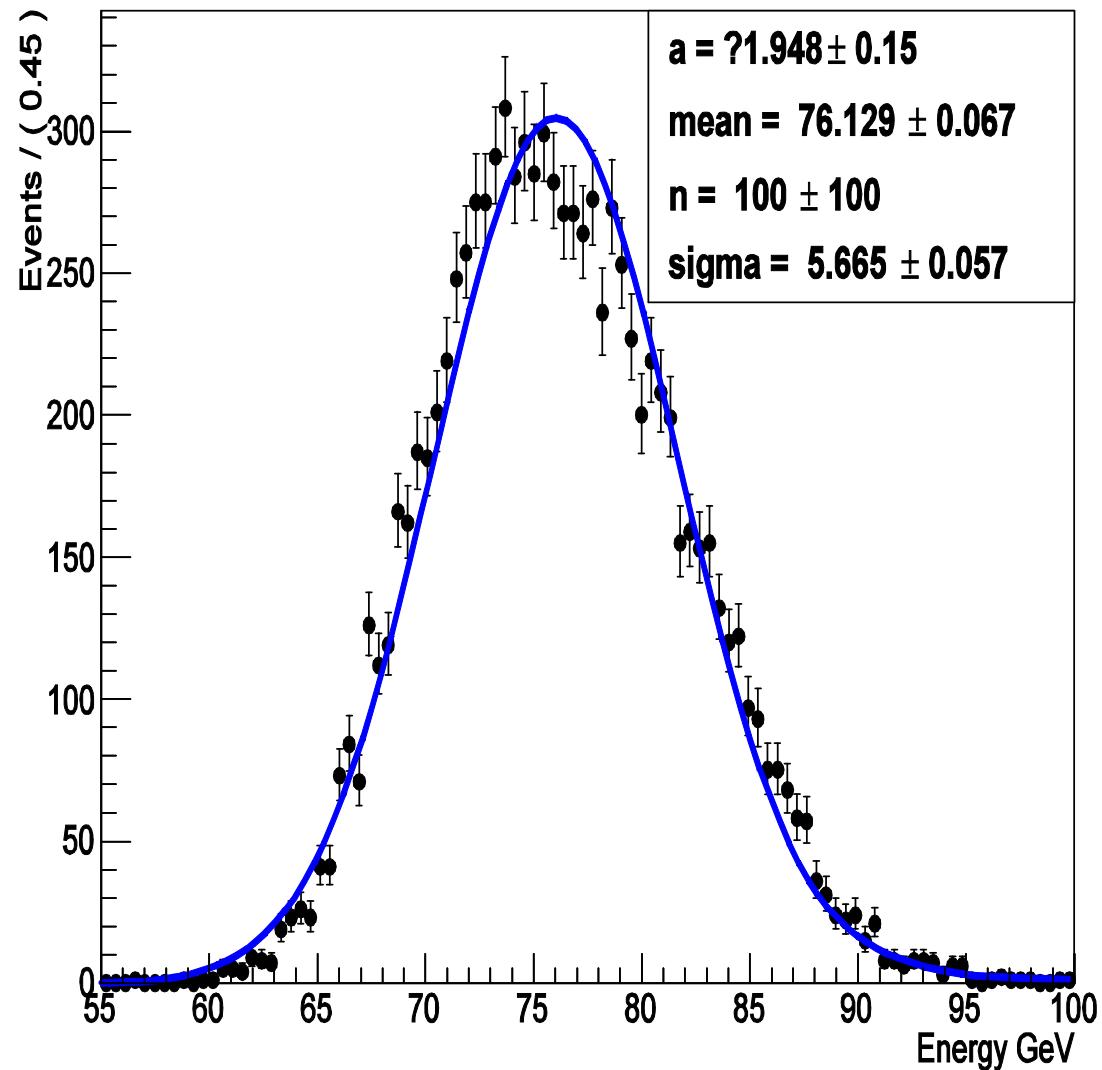
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



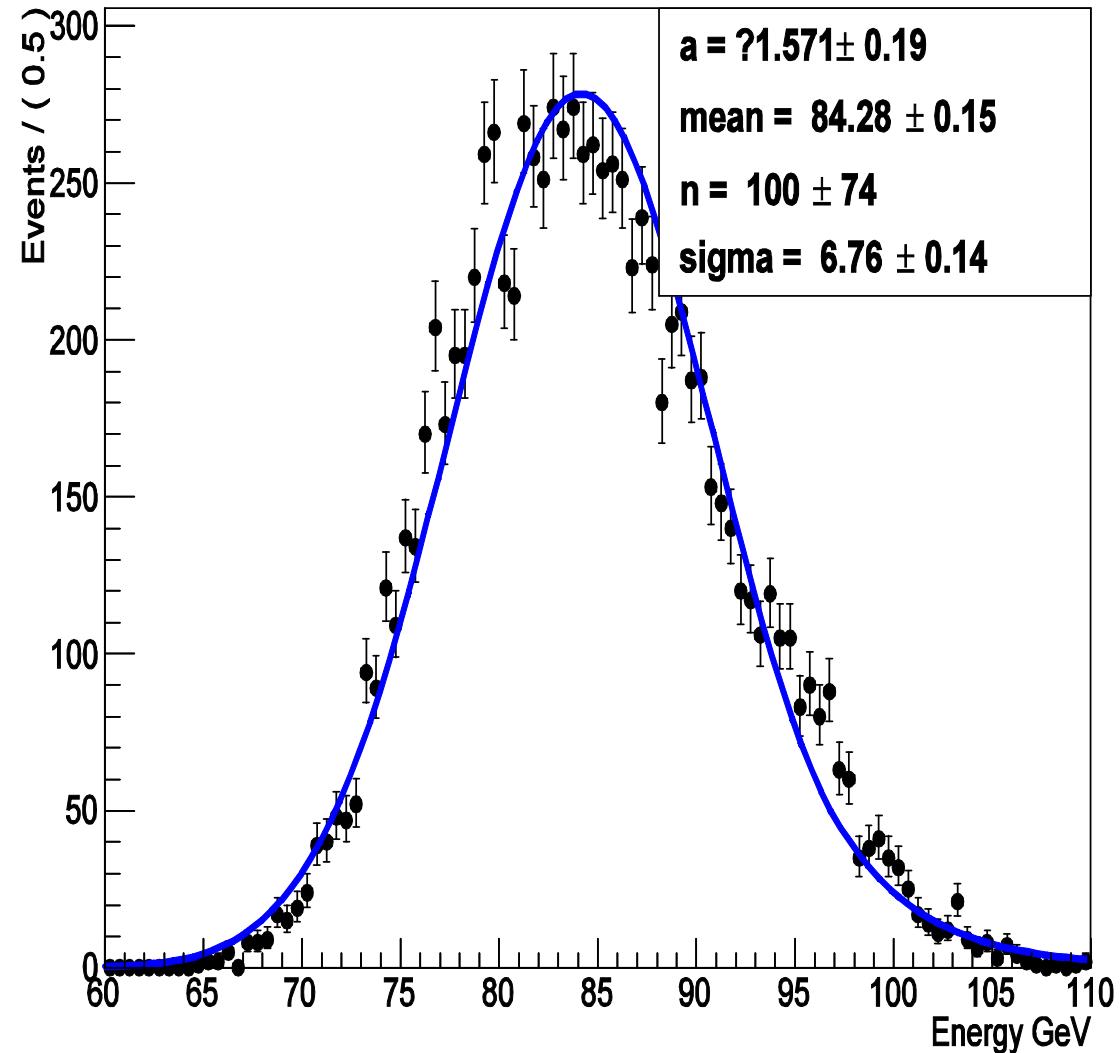
No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$



No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$E_{meas}^{hit} = \gamma(N_{odd20} + N_{even20}) \\ + \delta(N_{odd10} + N_{even10})$$

χ^2 -minimized

$$\chi^2 = \sum_{events} \left(\left(E_{meas}^{hit} - E_{MC} \right) / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

$$\frac{\sigma}{E_{meas}^{en}} = 0.08167 \approx \frac{81.67\%}{\sqrt{E}}$$

