

$\text{Br}(\text{H} \rightarrow \gamma\gamma)$ measurement & π^0

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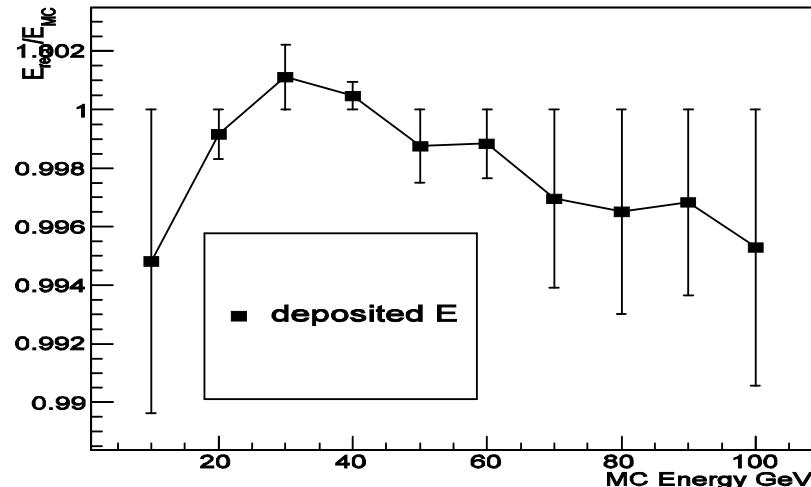
² Institute of High Energy Physics Chinese Academy of Science



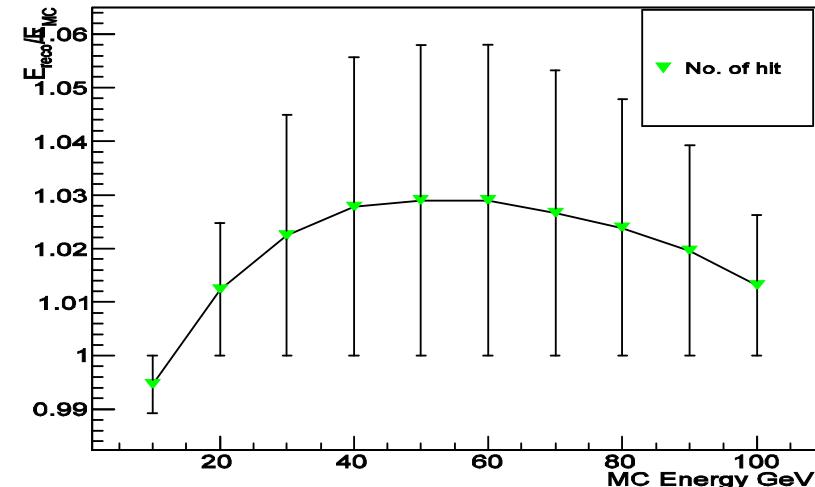
21/07/2015

E_γ estimator (without γ conversion)

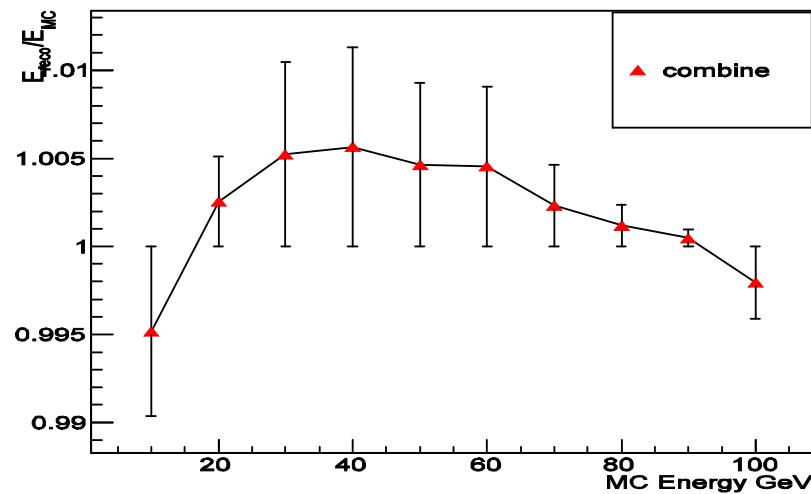
Graph



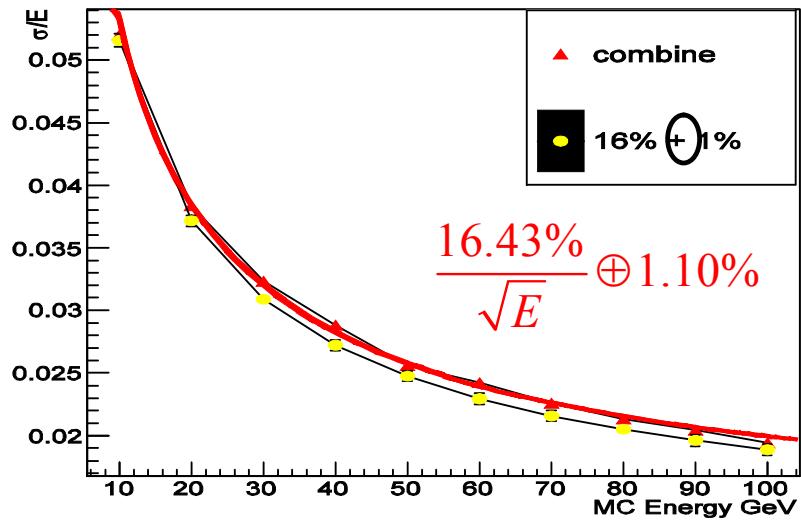
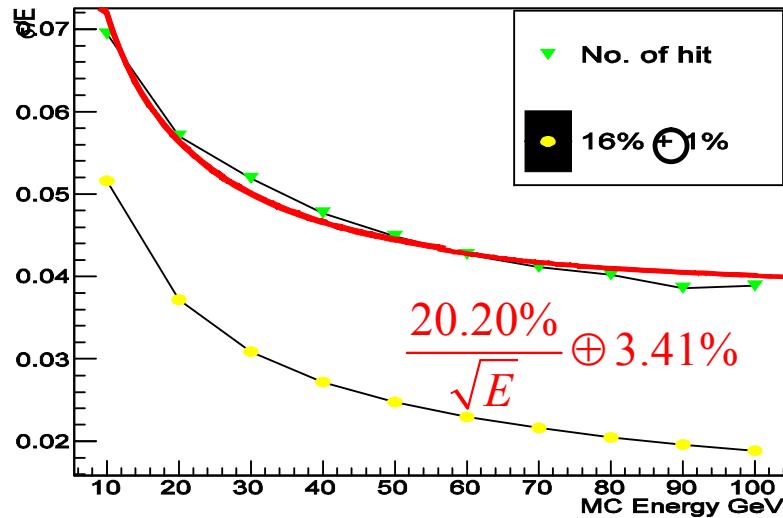
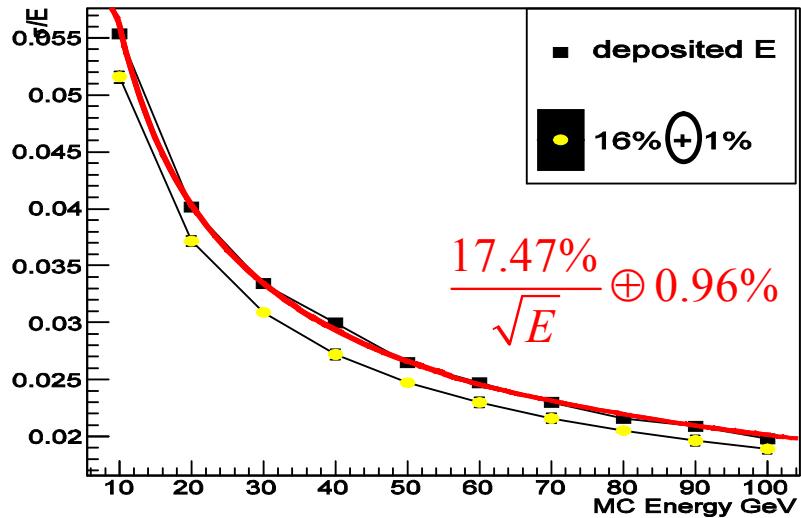
Graph



Graph



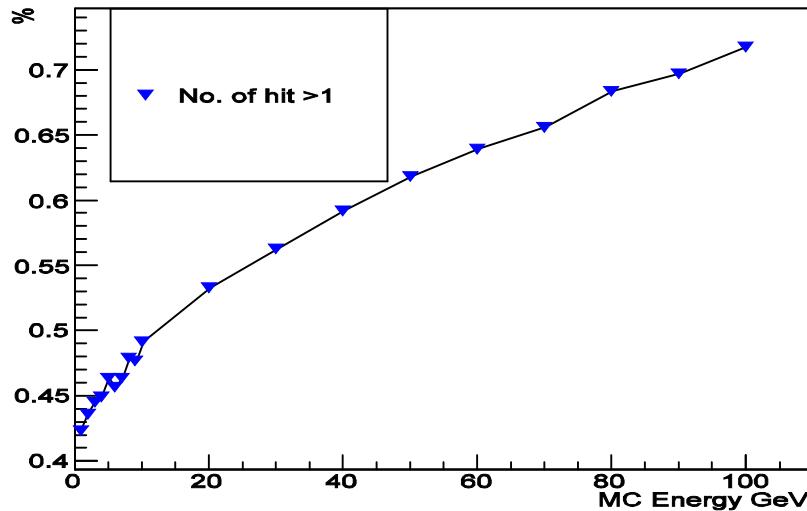
E_γ resolution (without γ conversion)



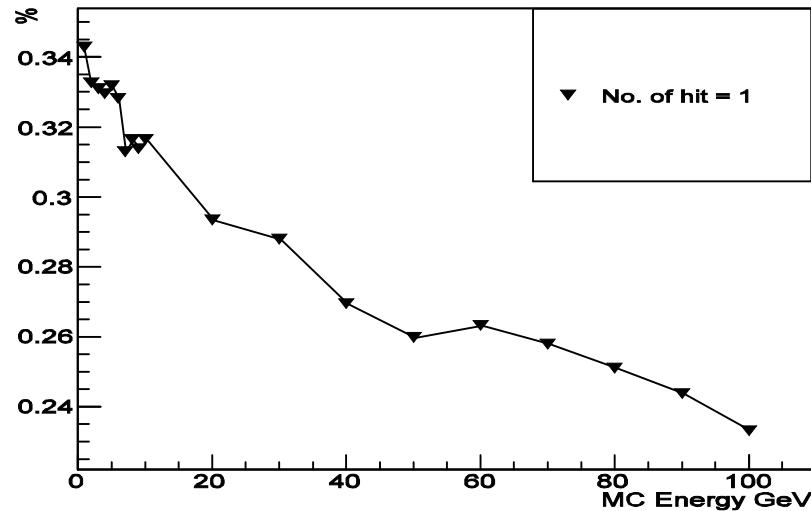
No. of hit in the first layer of ECAL

No. of charge<1

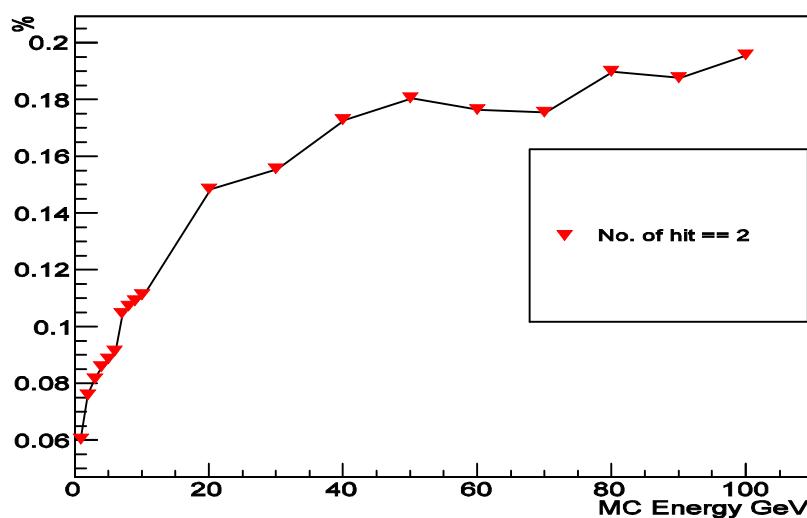
Graph



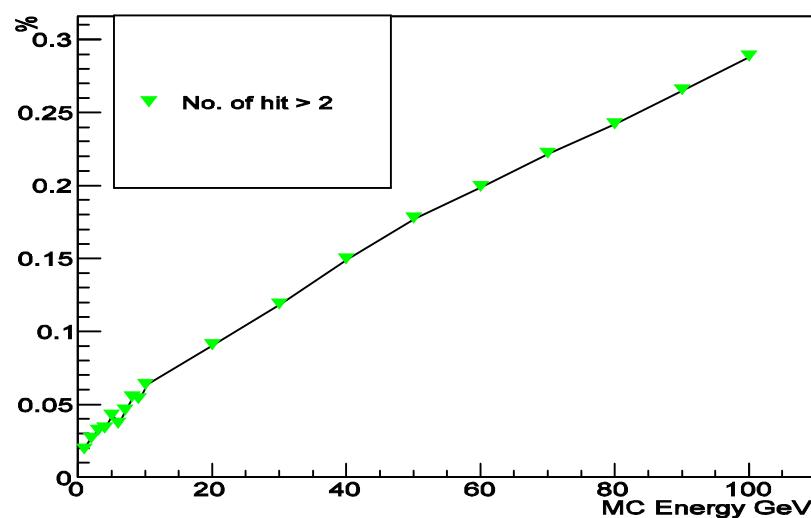
Graph



Graph



Graph



Information

- 1 π decay

$$\pi^0 \rightarrow \gamma\gamma$$

- 2 Invariant mass closest to the 0.135 GeV
- 3 reconstruction

$$M_{\pi^0} = \sqrt{2E_{\gamma_1}E_{\gamma_2}(1-\cos\theta)}$$

- 4 sample [/cefs/tmp_storage/wangf/Pi](http://cefs/tmp_storage/wangf/Pi)

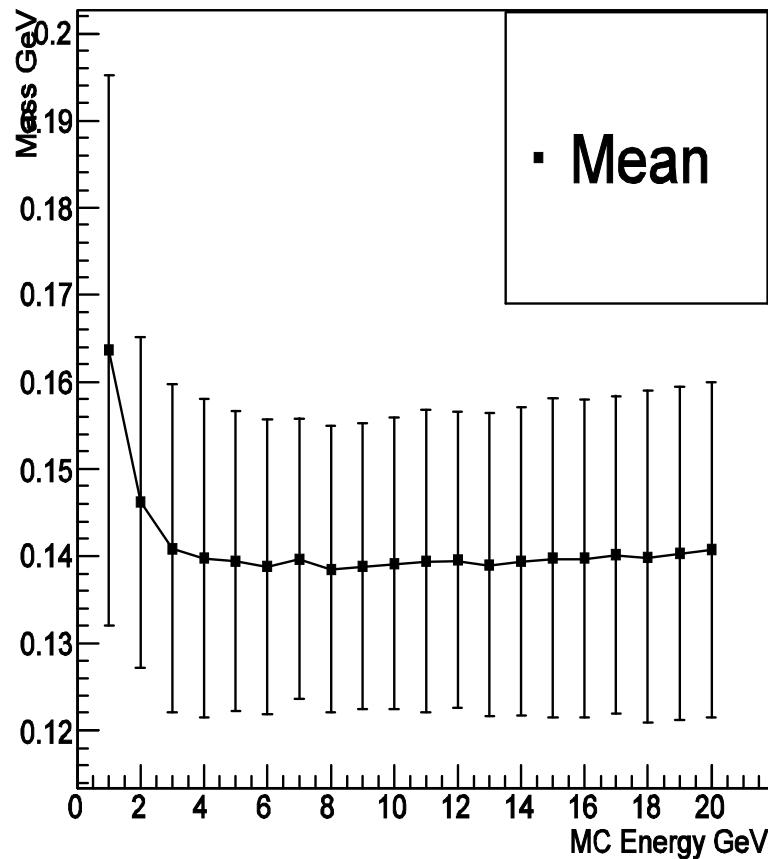
```
↳
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/gun/position 0 0 0 mm
/gun/direction 0.0 1.0 0.035
/gun/energy 20 GeV
/gun/momentumSmearing 0.0 GeV
/gun/phiSmearing 1 deg
/gun/thetaSmearing 1 deg
/gun/directionSmearingMode uniform
/gun/particle pi0
/run/beamOn 10
```

[ilc17_slc6_arbor25May15.sh](#)

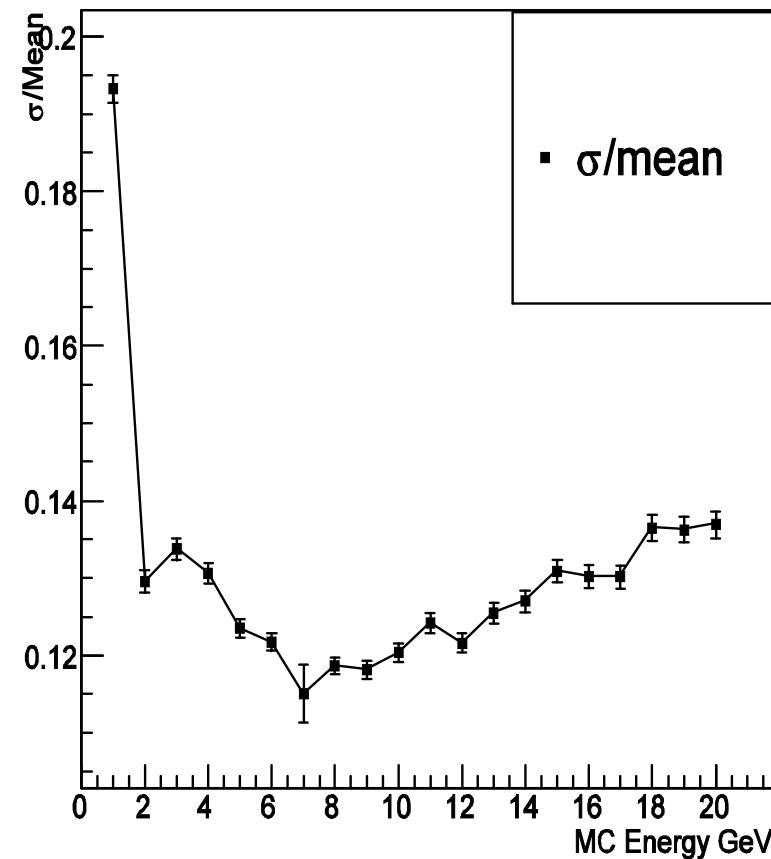
Invariance mass of π^0

No. of charge<1

Graph



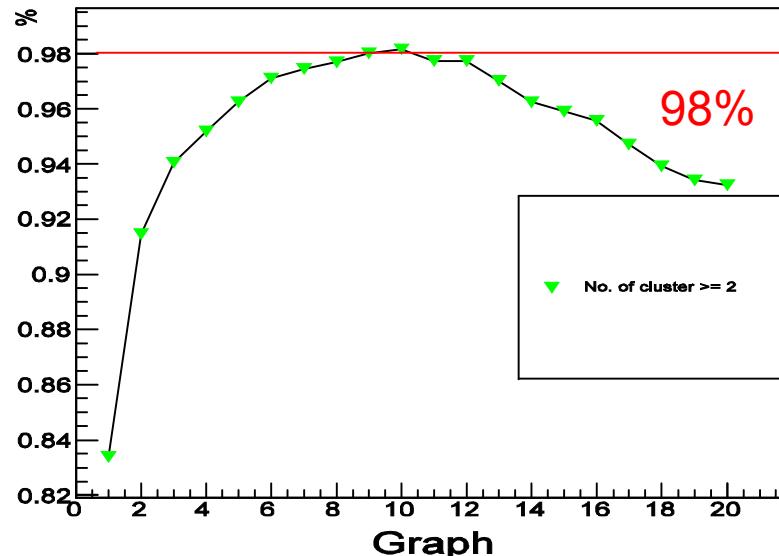
Graph



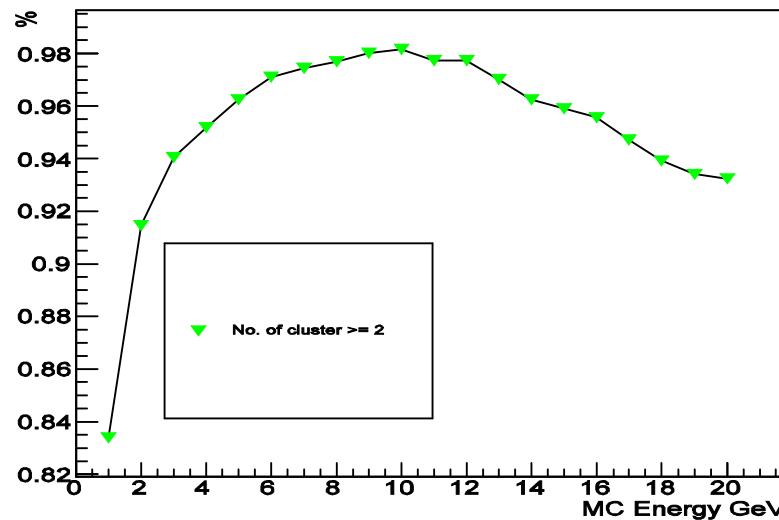
Efficiency

No. of charge<1 & No.of cluster ≥ 2

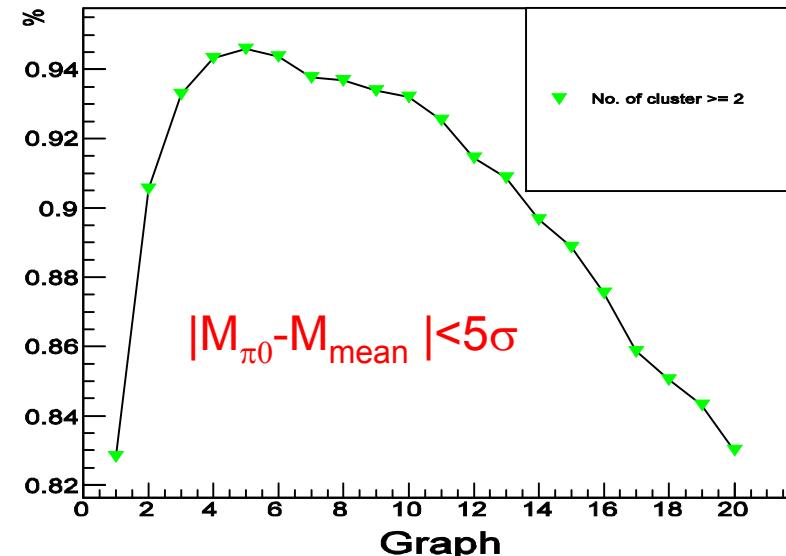
Graph



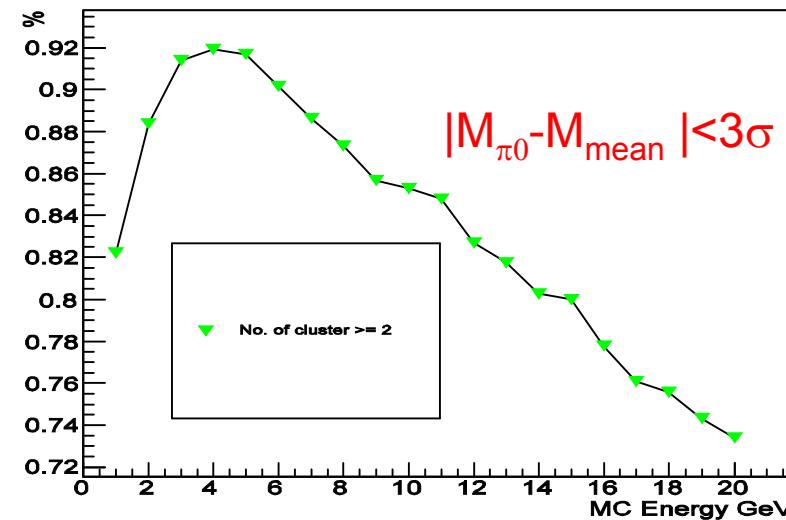
Graph



Graph



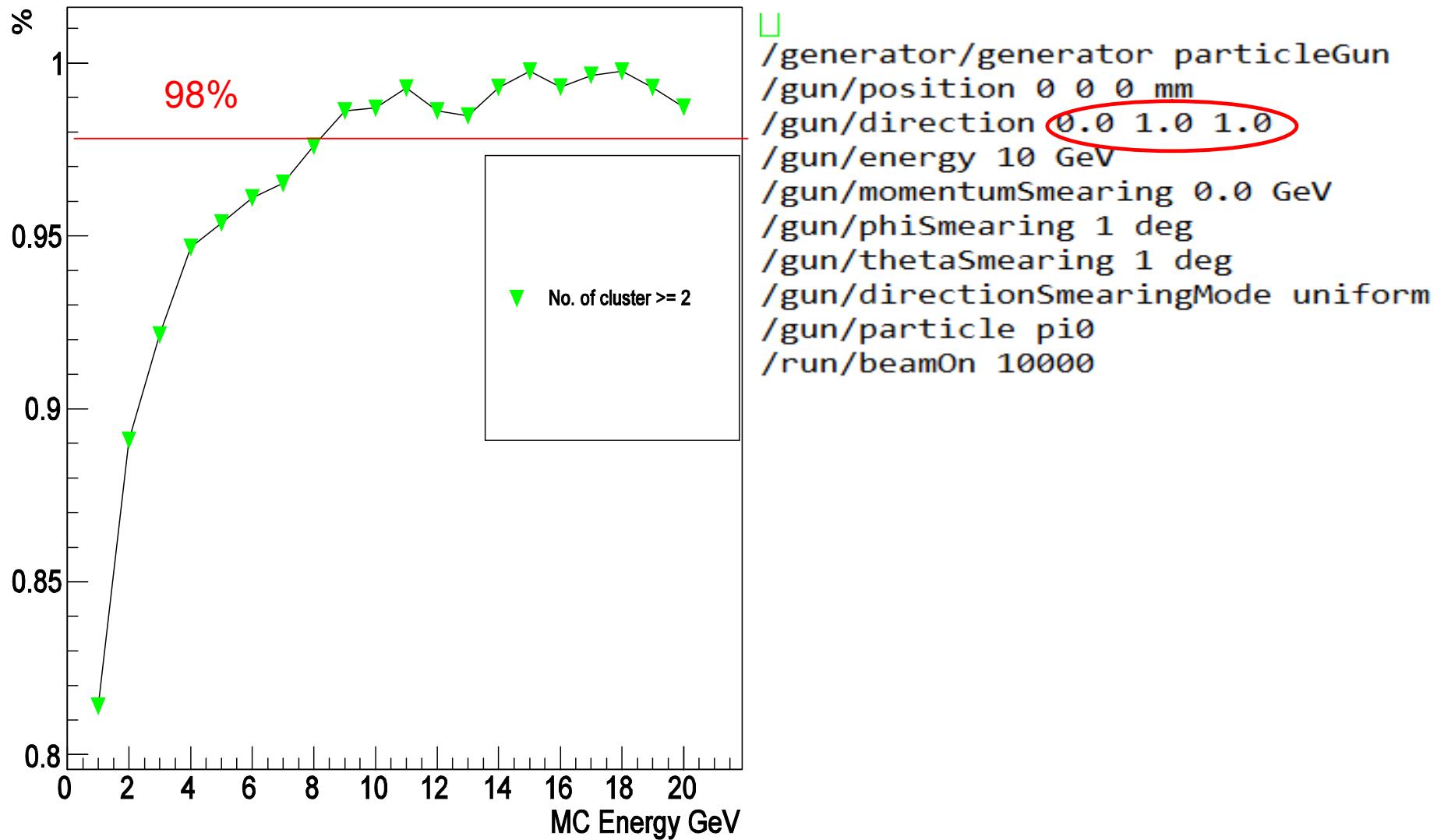
Graph



Efficiency

No. of charge<1 & No.of cluster ≥ 2

Graph

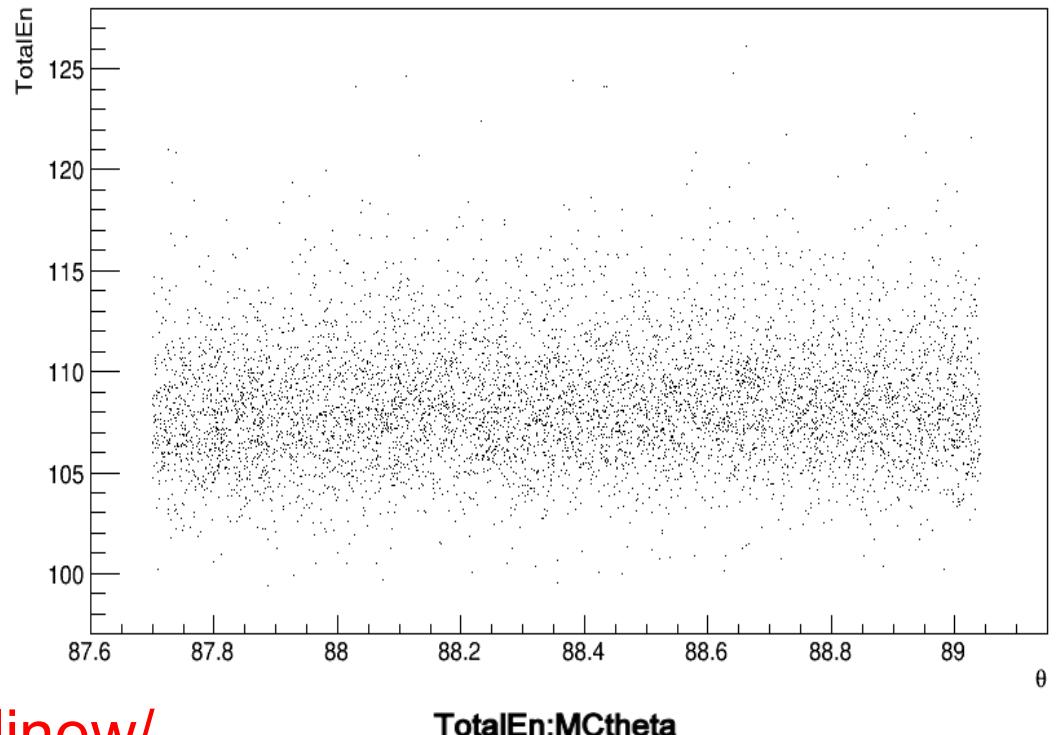


backup

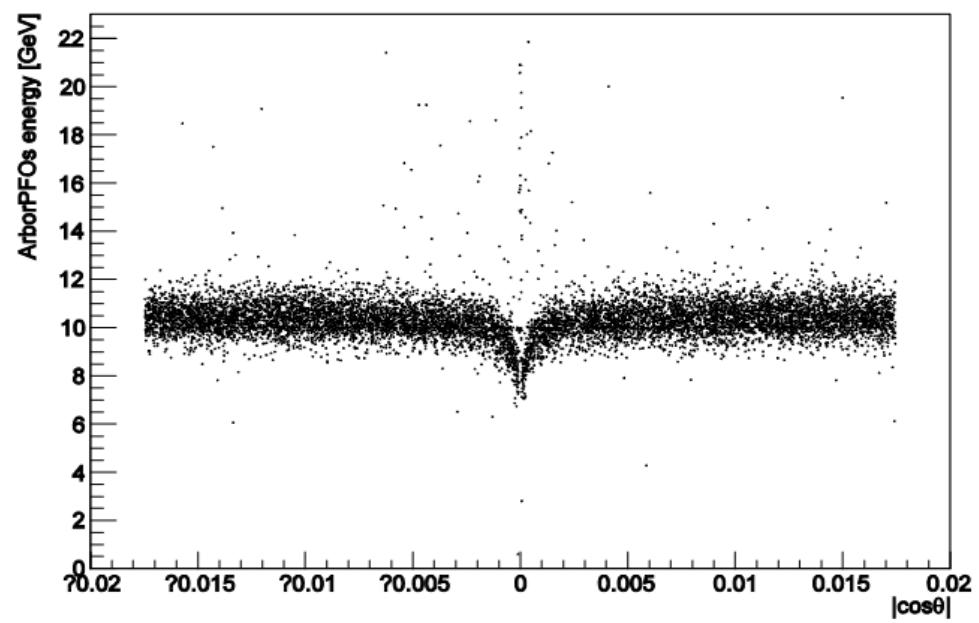
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[ ] /gun/position 0 0 0 mm  
[ ] /gun/direction 0.0 1.0 0.035  
[ ] /gun/energy 10 GeV  
[ ] /gun/momentumSmearing 0.0 GeV  
[ ] /gun/phiSmearing 1 deg  
[ ] /gun/thetaSmearing 1 deg  
[ ] /gun/directionSmearingMode uniform  
[ ] /gun/particle gamma  
[ ] /run/beamOn 10000
```

[/cefs/tmp_storage/wangf/calinew/](https://cefs/tmp_storage/wangf/calinew/)

```
[ ] /generator/generator particleGun  
[ ] /gun/position 0 0 0 mm  
[ ] /gun/direction 0.0 1.0 0.0  
[ ] /gun/energy 10 GeV  
[ ] /gun/momentumSmearing 0.0 GeV  
[ ] /gun/phiSmearing 1 deg  
[ ] /gun/thetaSmearing 1 deg  
[ ] /gun/directionSmearingMode uniform  
[ ] /gun/particle gamma  
[ ] /run/beamOn 10000
```



TotalEn:MCtheta



Calibration

ilc17_slc6_arbor25May15.sh

- 1 energy deposit

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

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

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

- 2 number of hit

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

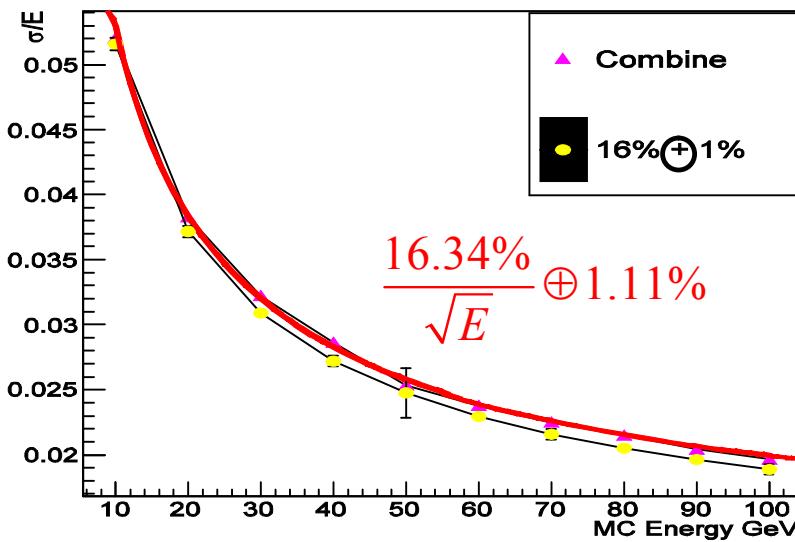
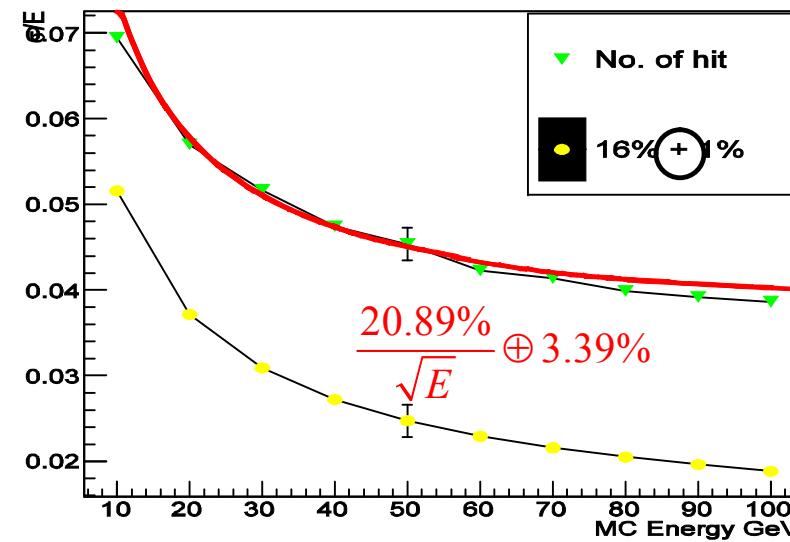
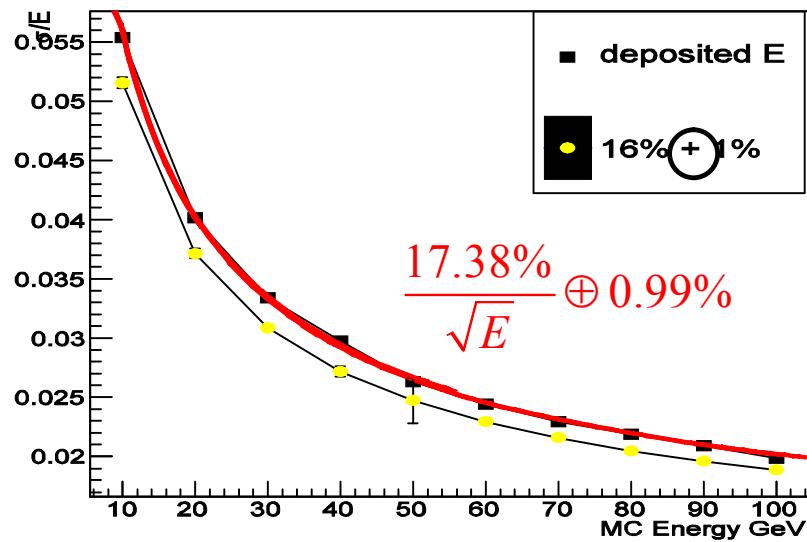
- 3 combining the two measurements

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

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

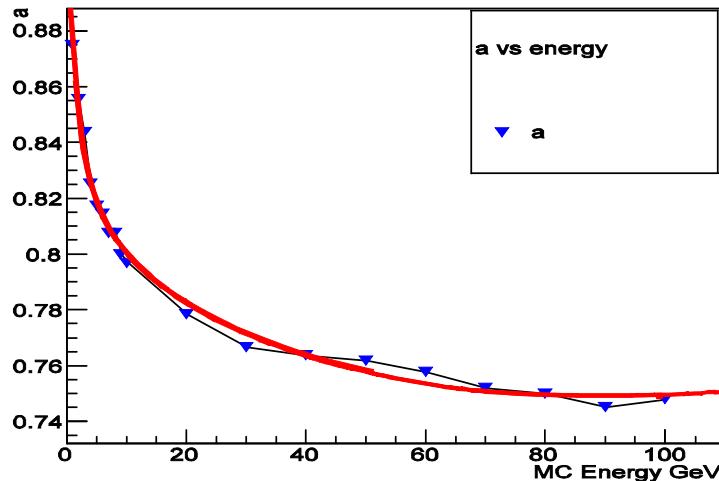
E_γ resolution with calibration

(ArborPFOsCollection without γ conversion)

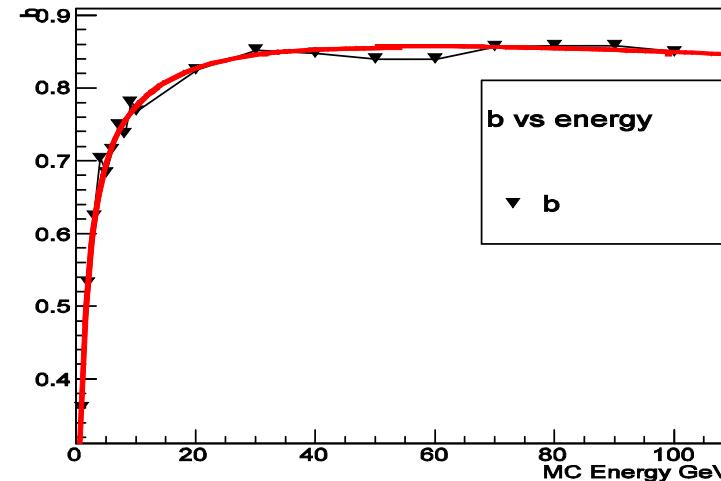


Parameter fit (without γ conversion)

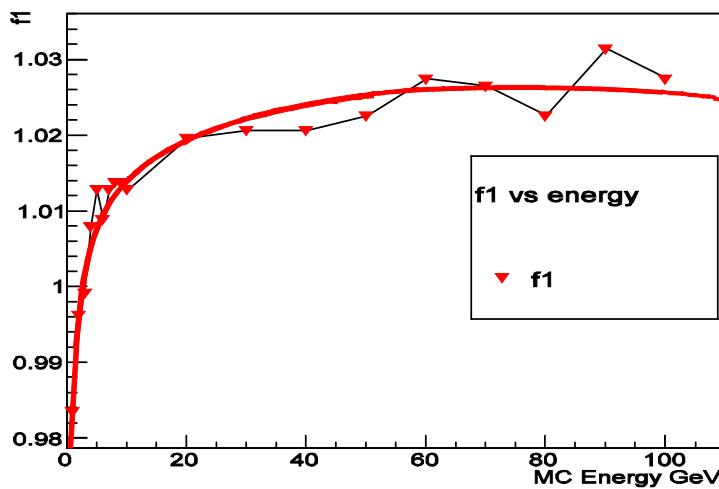
Graph



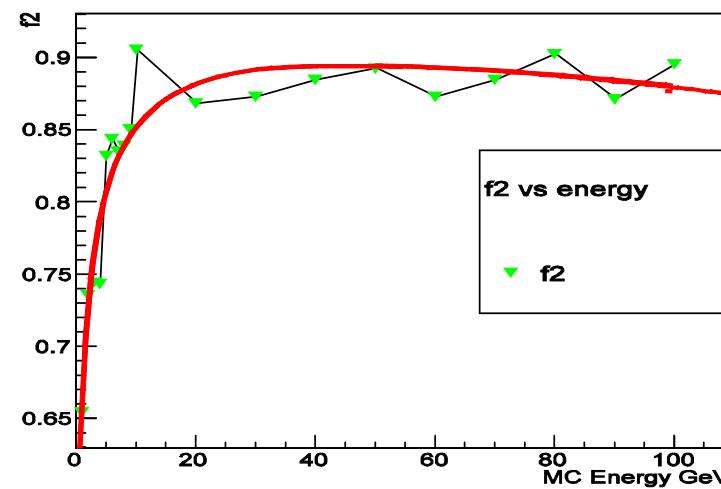
Graph



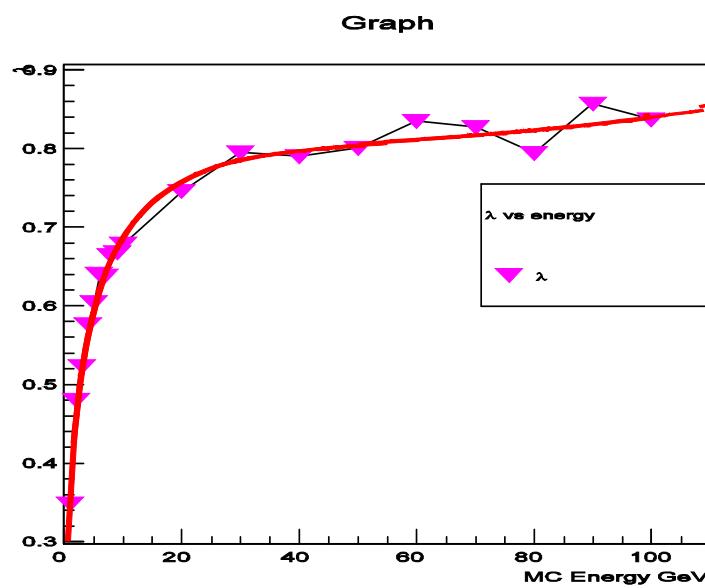
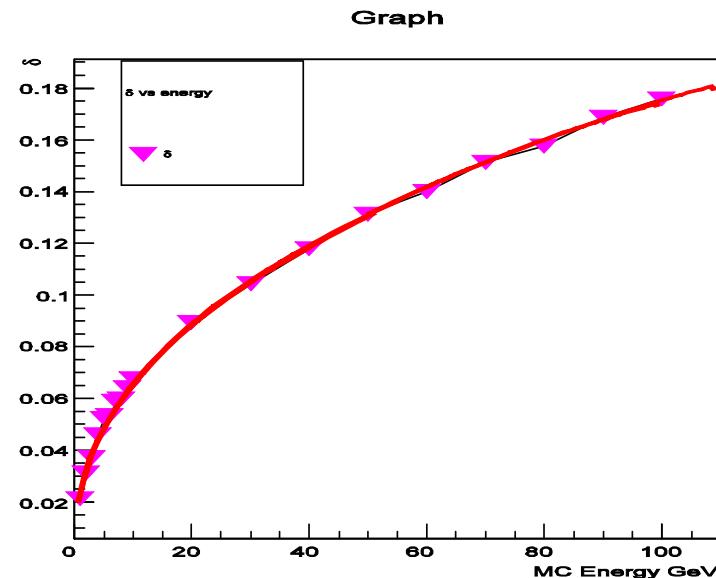
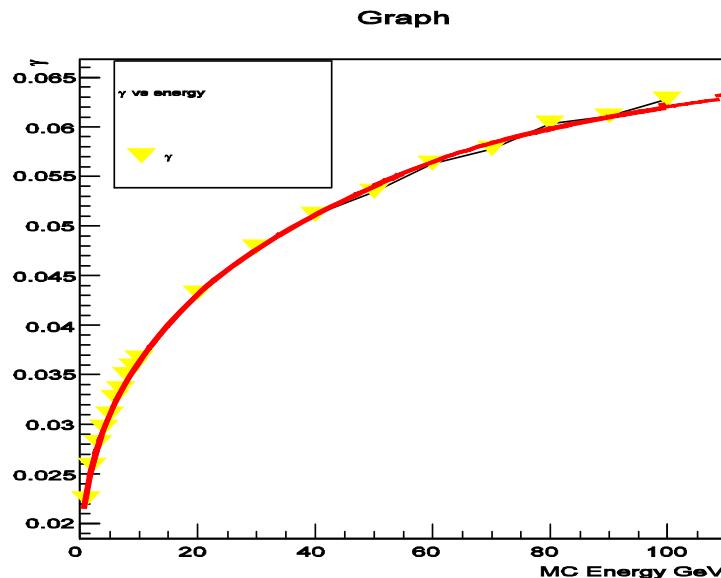
Graph



Graph



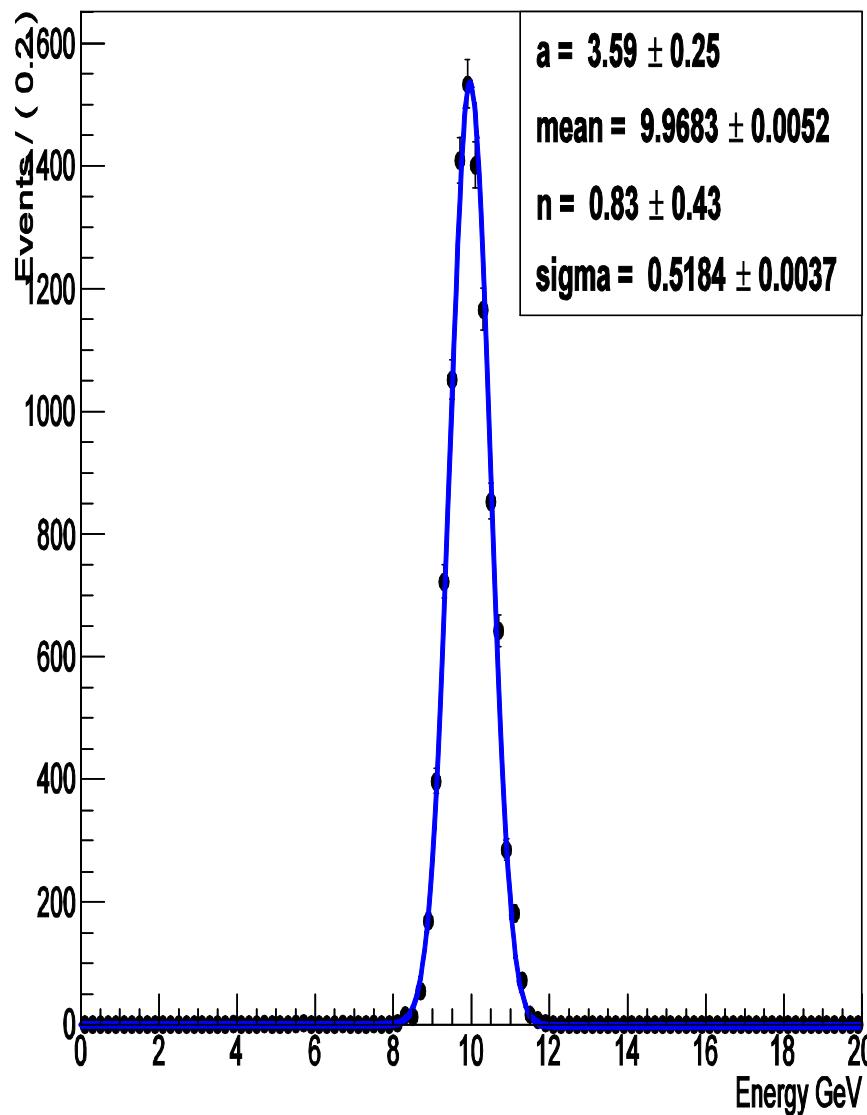
Parameter fit (without γ conversion)



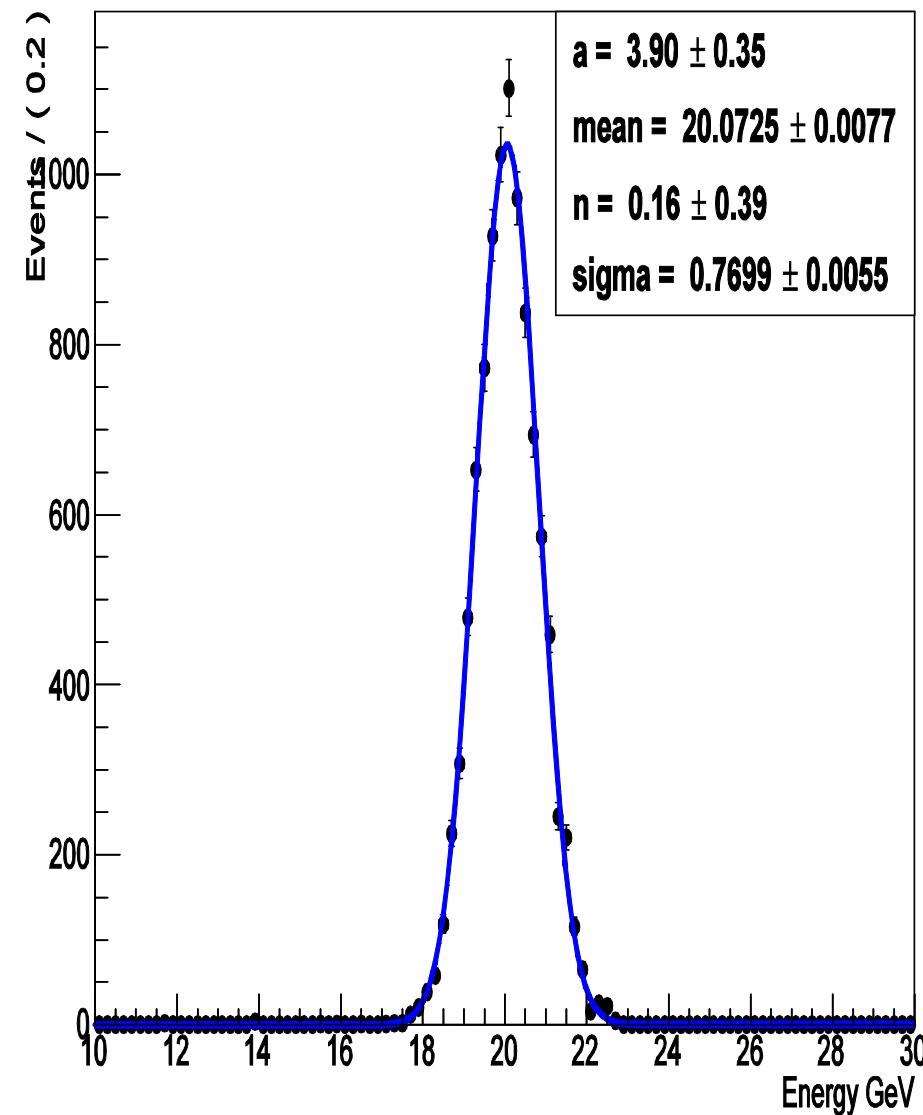
Combining result in Ecal (energy estimator)

No. of charge<1

Reconstruction energy (combining E & hits)

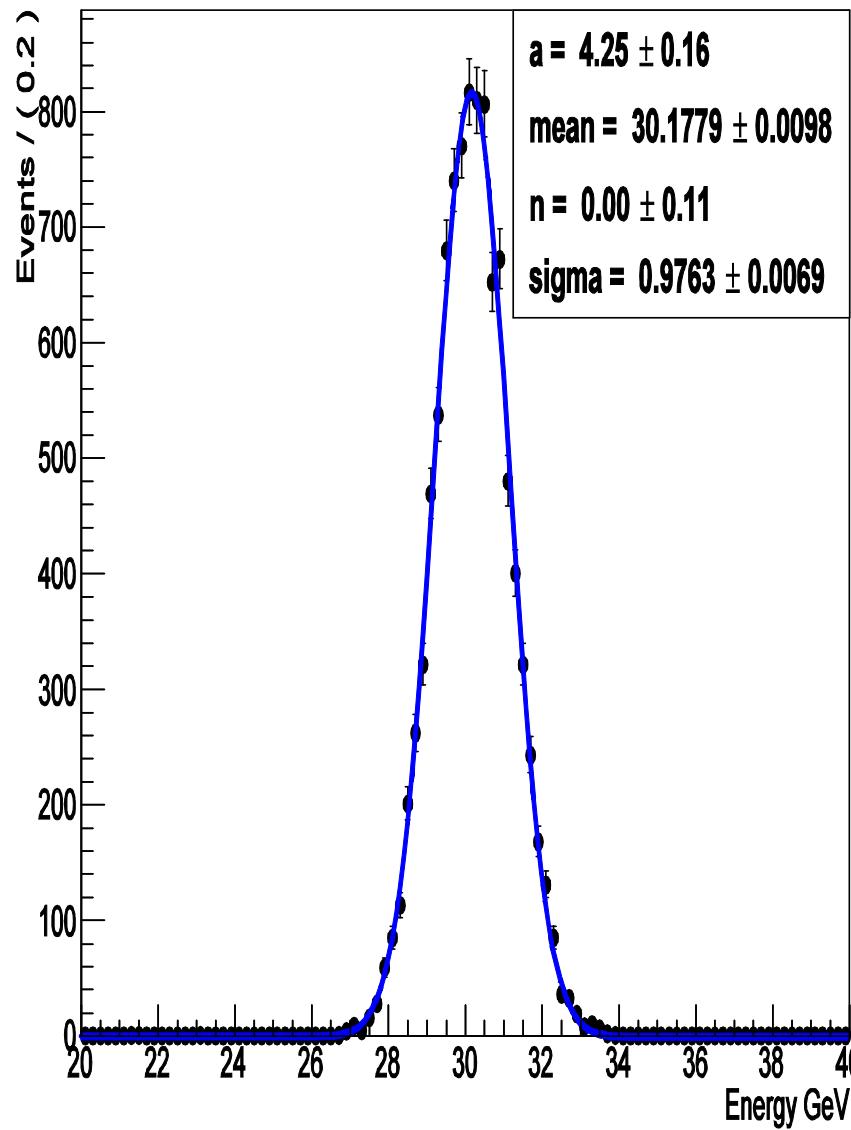


Reconstruction energy (combining E & hits)

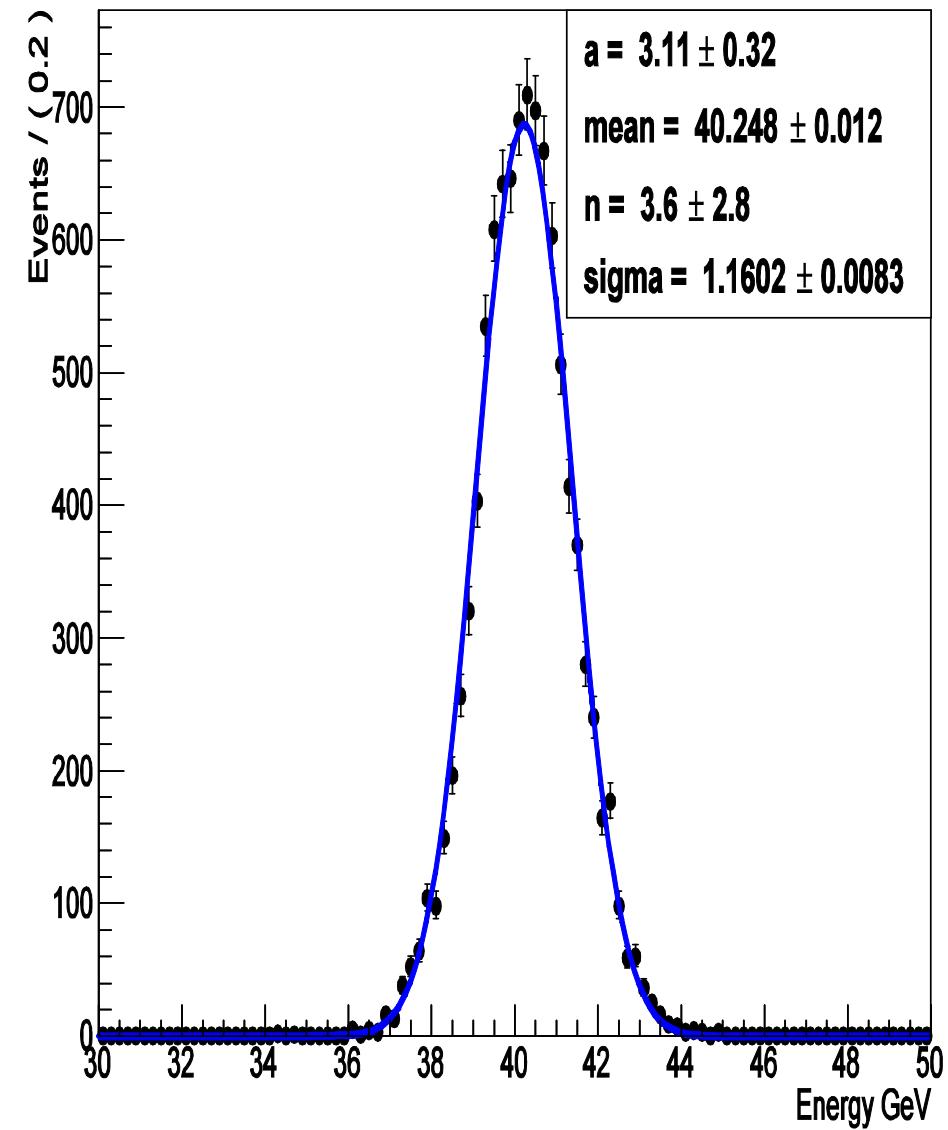


Combining result in Ecal (energy estimator) No. of charge<1

Reconstruction energy (combining E & hits)

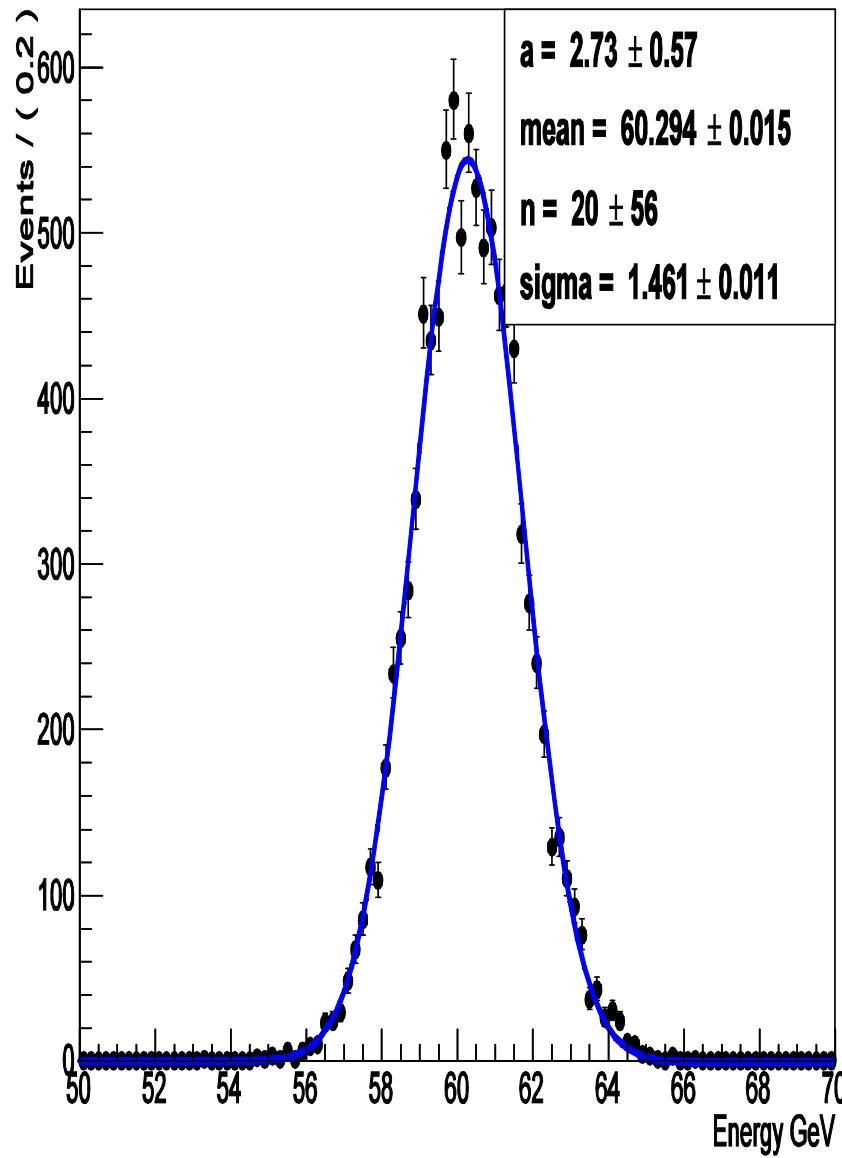


Reconstruction energy (combining E & hits)

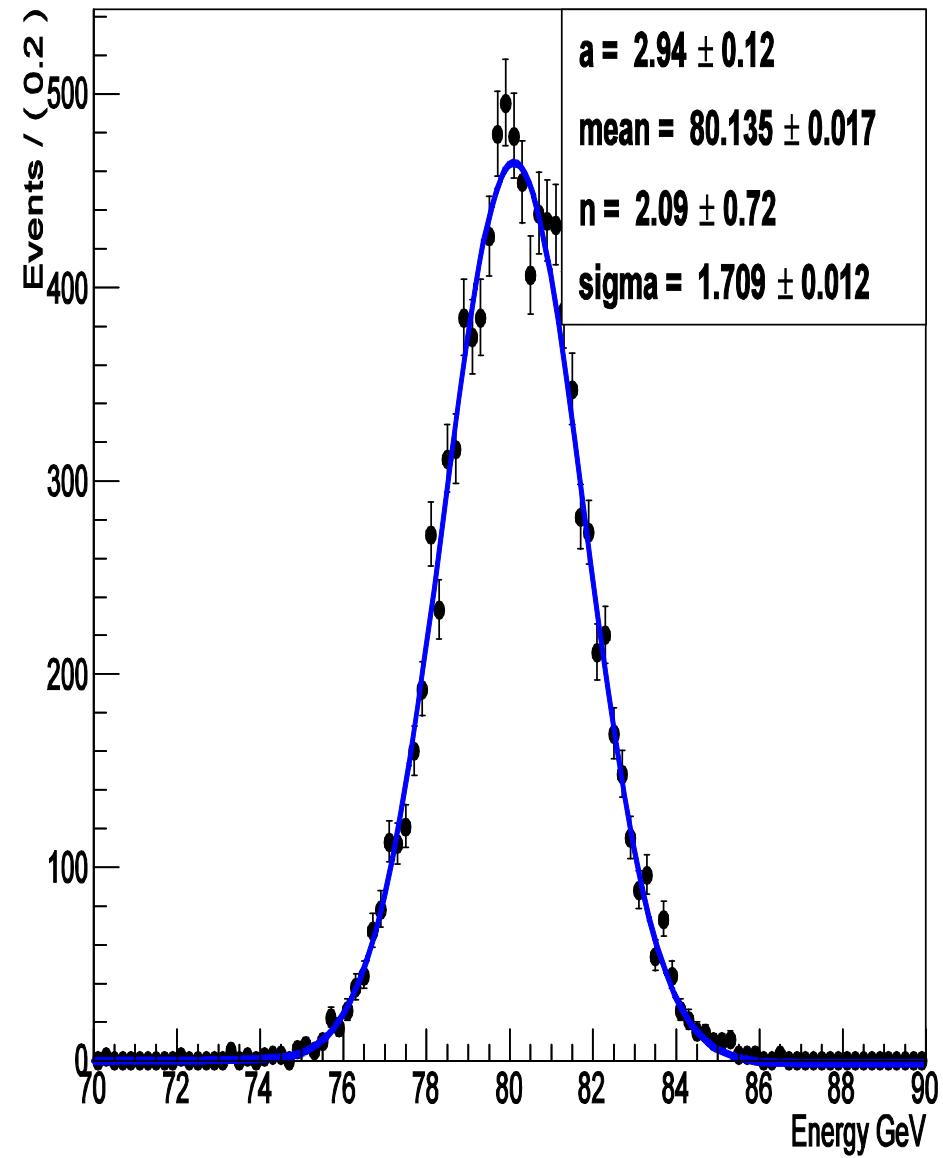


Combining result in Ecal (energy estimator) No. of charge<1

Reconstruction energy (combining E & hits)

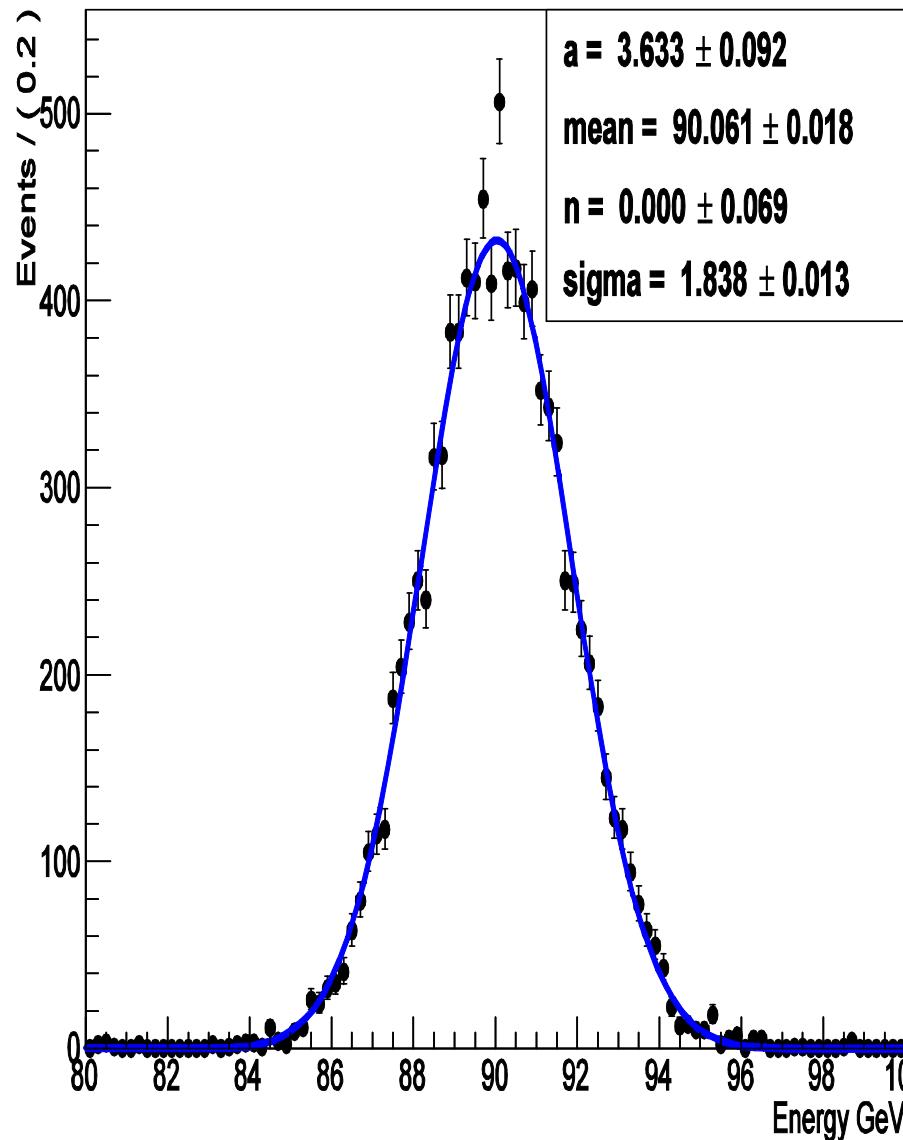


Reconstruction energy (combining E & hits)

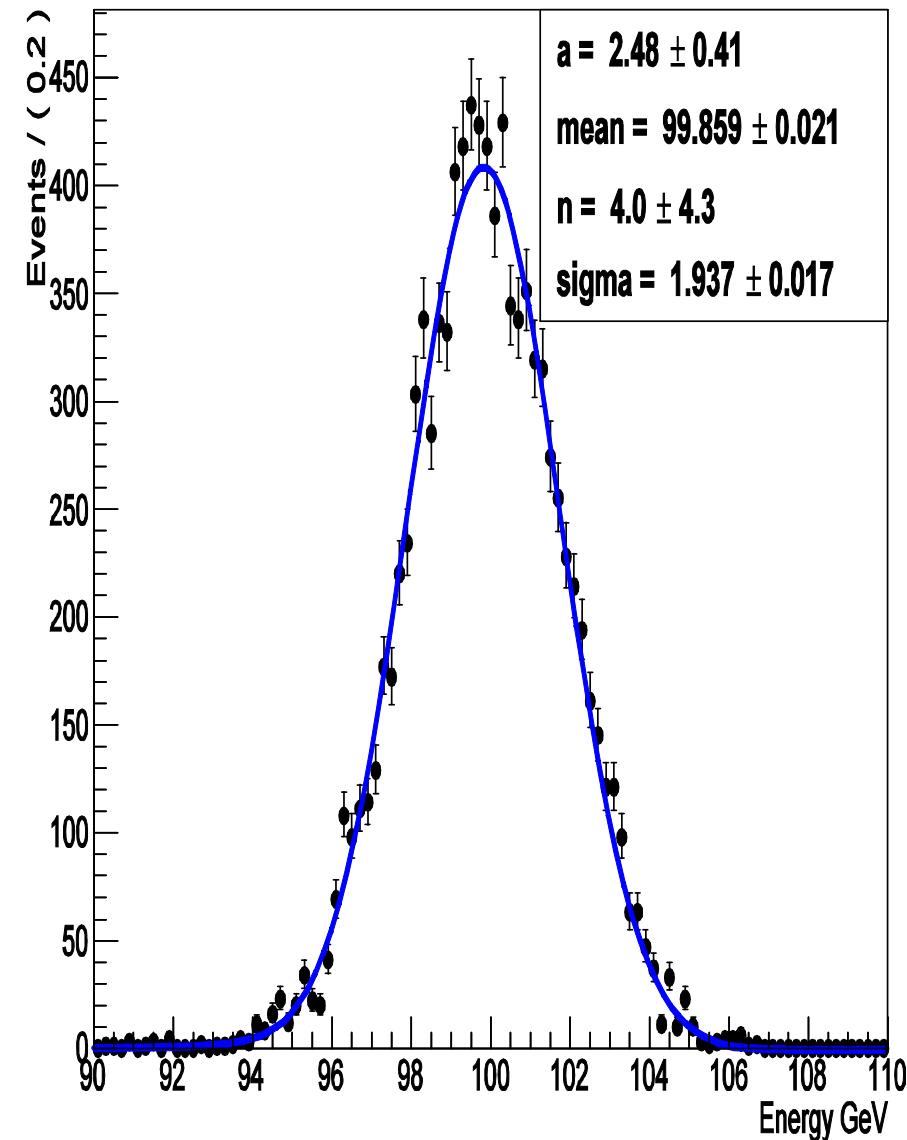


Combining result in Ecal (energy estimator) No. of charge<1

Reconstruction energy (combining E & hits)



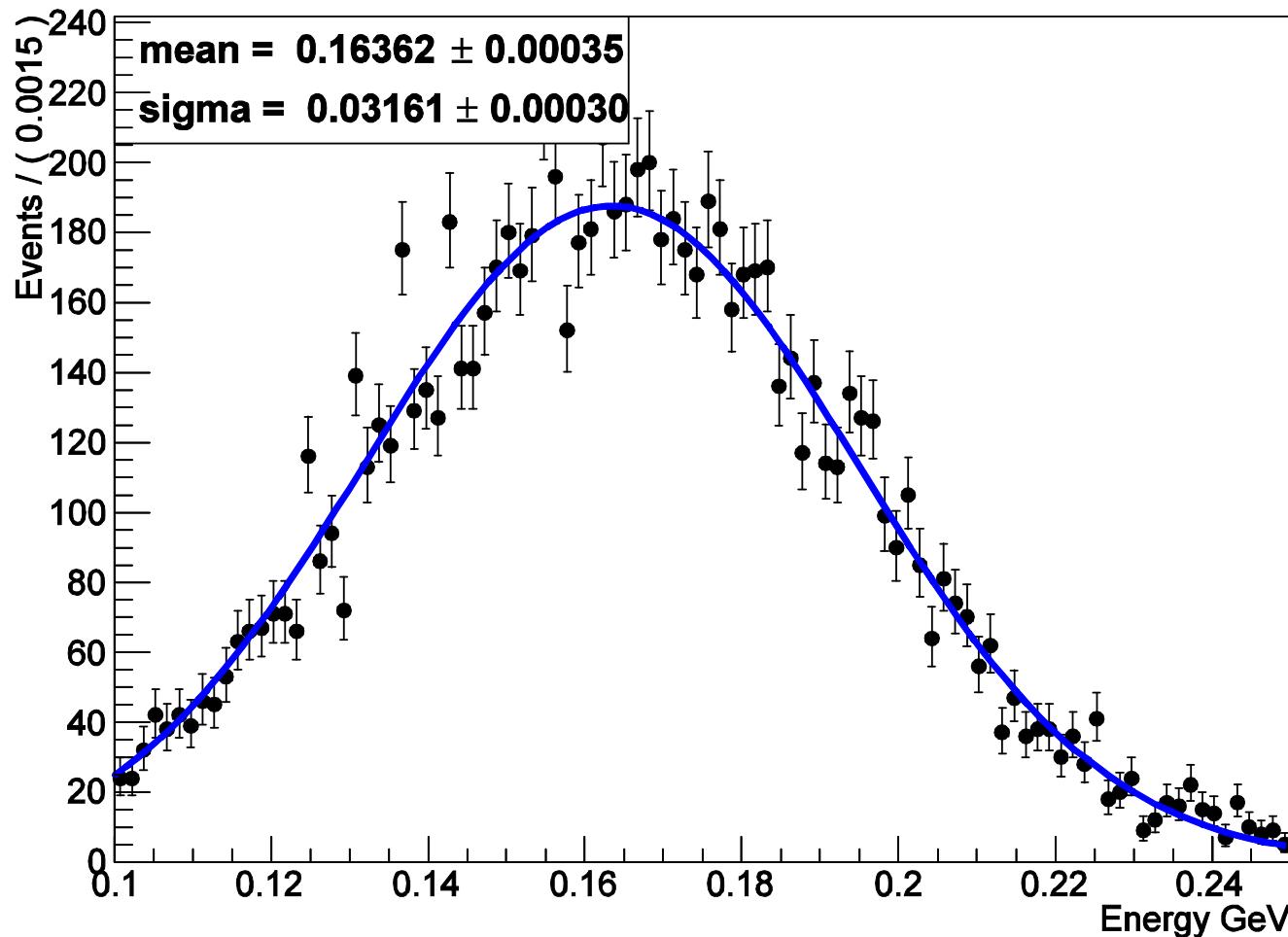
Reconstruction energy (combining E & hits)



π^0 mass (1GeV) ArborNeutral

without γ conversion

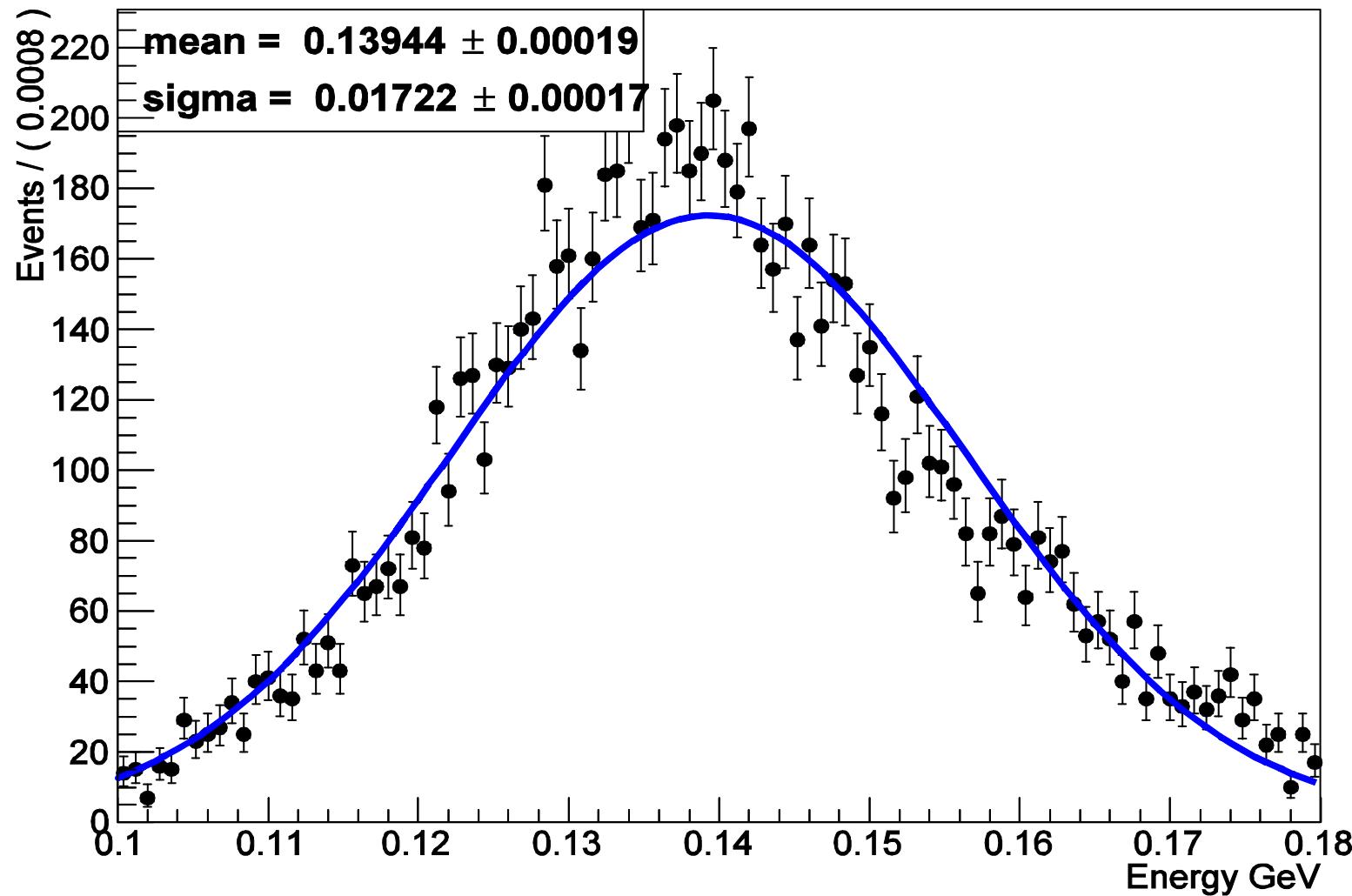
Reconstruction energy (deposit E)



π^0 mass (5GeV) ArborNeutral

without γ conversion

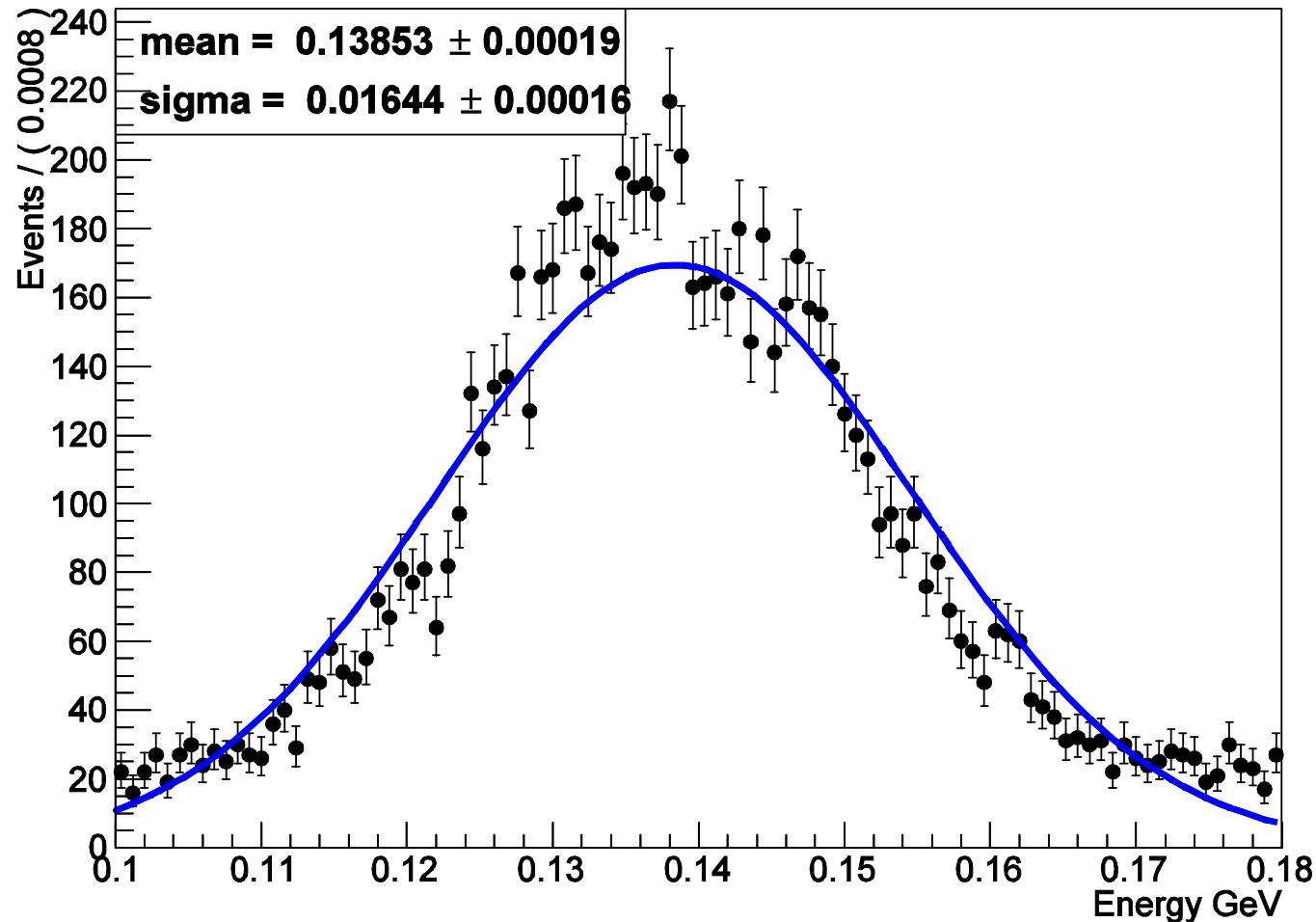
Reconstruction energy (deposit E)



π^0 mass (8GeV) ArborNeutral

without γ conversion

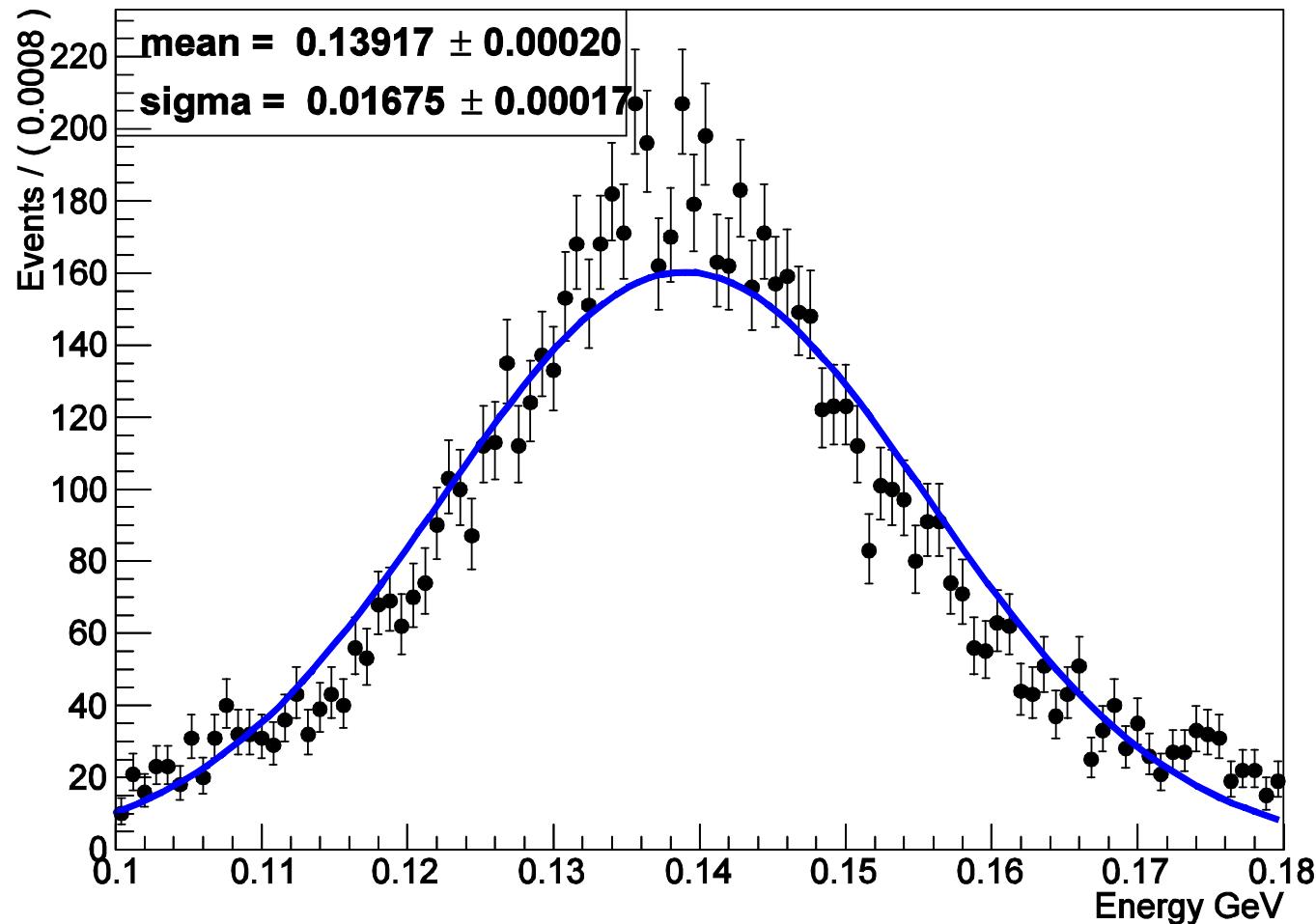
Reconstruction energy (deposit E)



π^0 mass (10GeV) ArborNeutral

without ν conversion

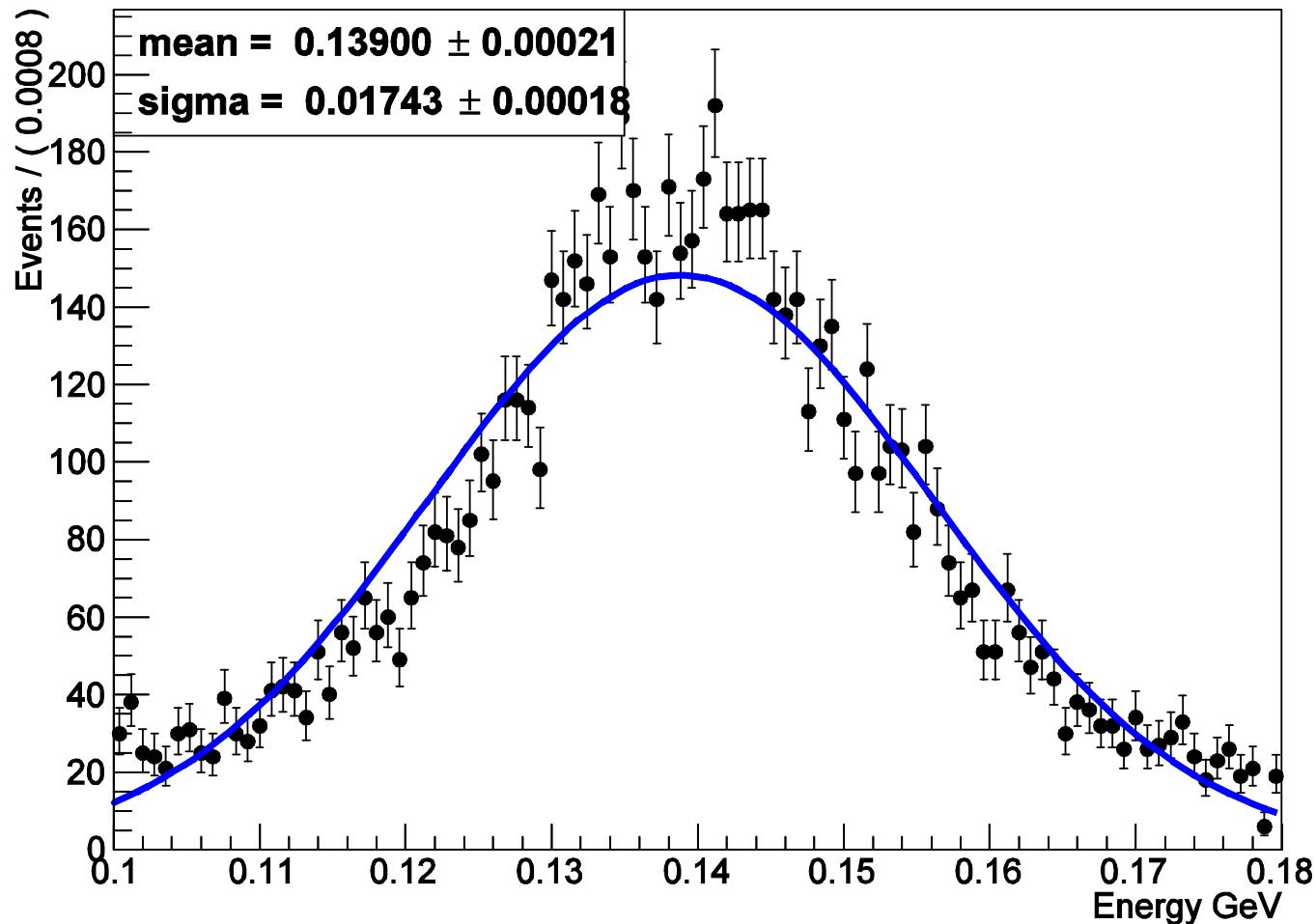
Reconstruction energy (deposit E)



π^0 mass (13GeV) ArborNeutral

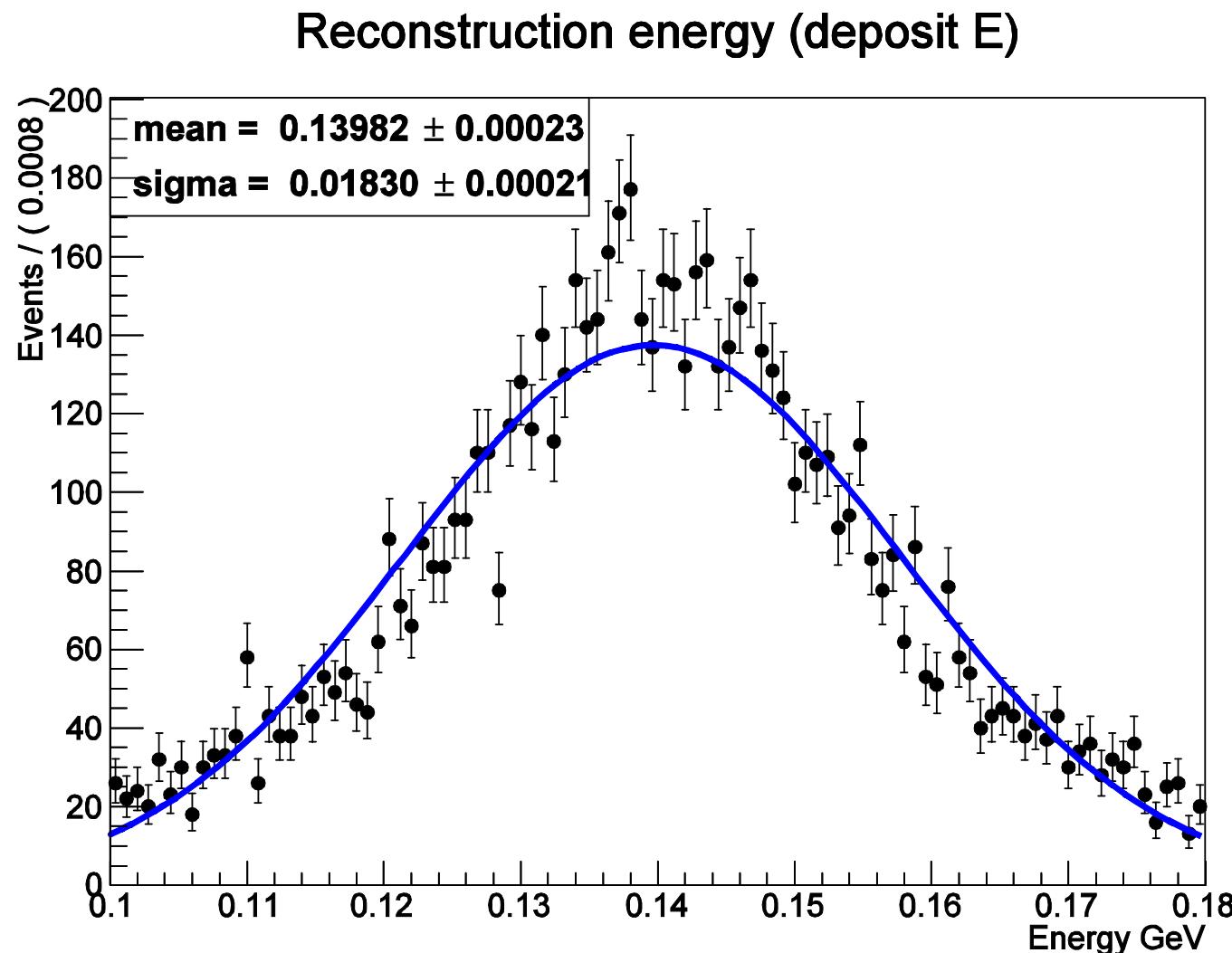
without γ conversion

Reconstruction energy (deposit E)



π^0 mass (15GeV) ArborNeutral

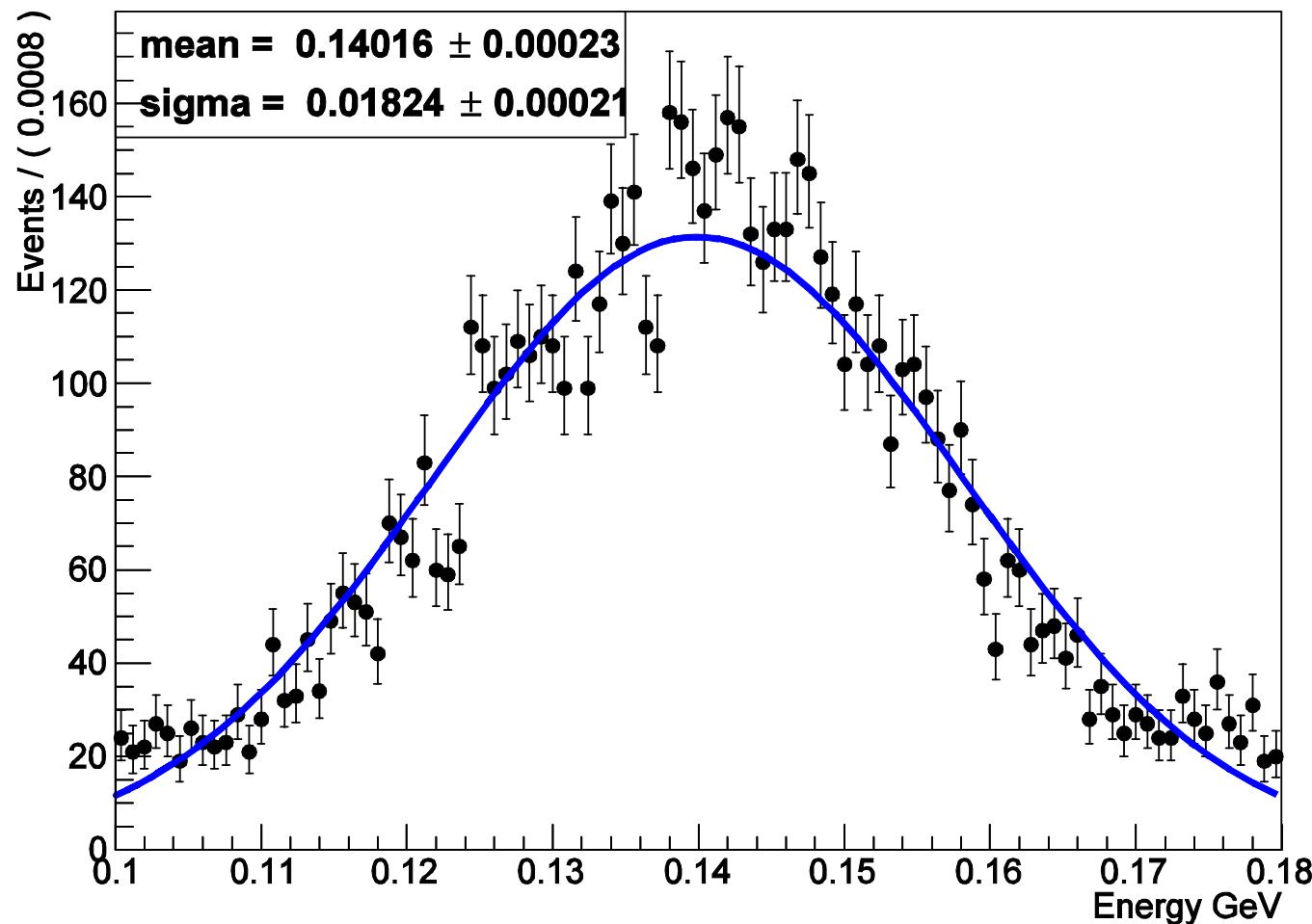
without γ conversion



π^0 mass (17GeV) ArborNeutral

without γ conversion

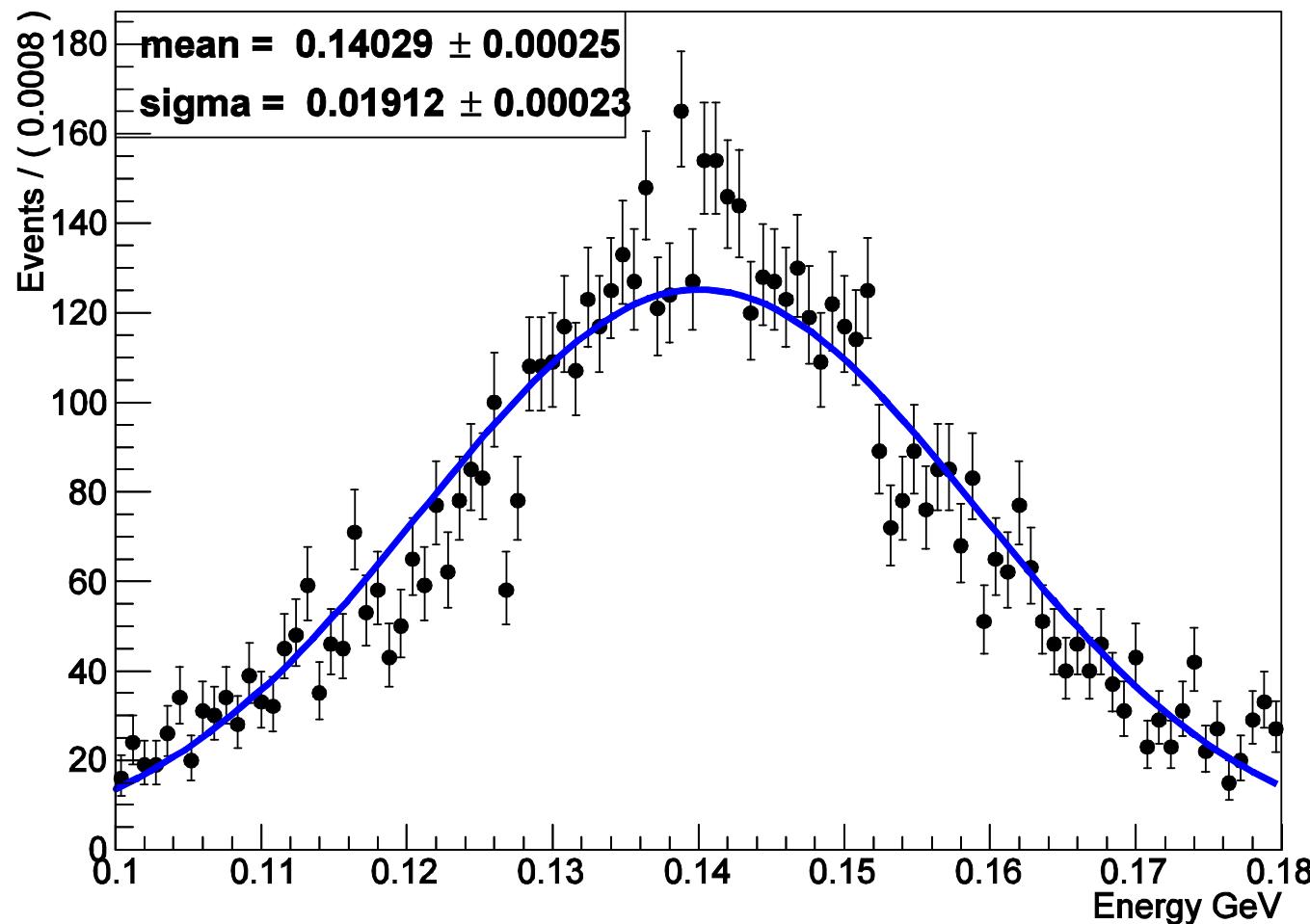
Reconstruction energy (deposit E)



π^0 mass (19GeV) ArborNeutral

without γ conversion

Reconstruction energy (deposit E)



π^0 mass (20GeV) ArborNeutral

without γ conversion

