

$$\pi^0$$

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# Calibration

ilc17\_slc6\_arbor25May15.sh

- 1 energy deposit

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

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

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

- 2 number of hit

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

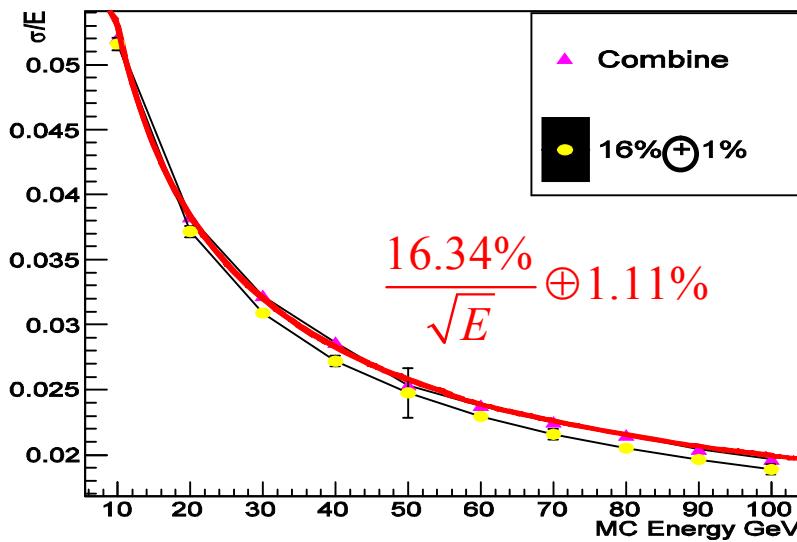
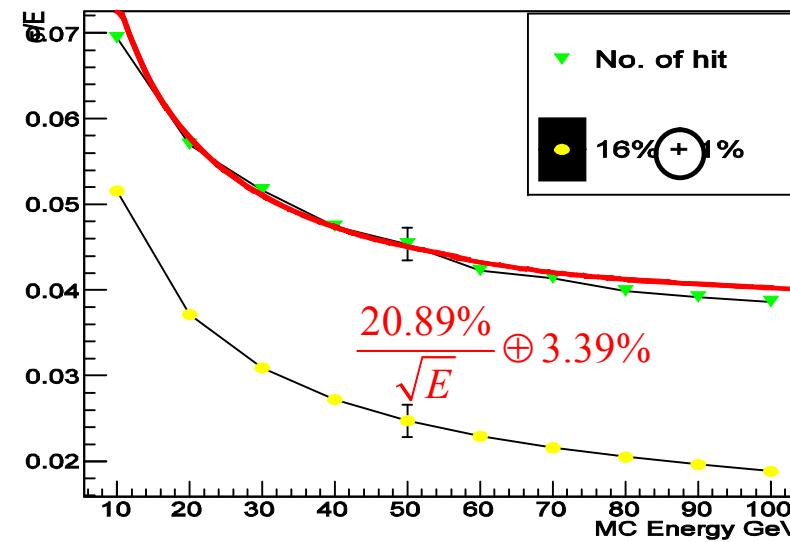
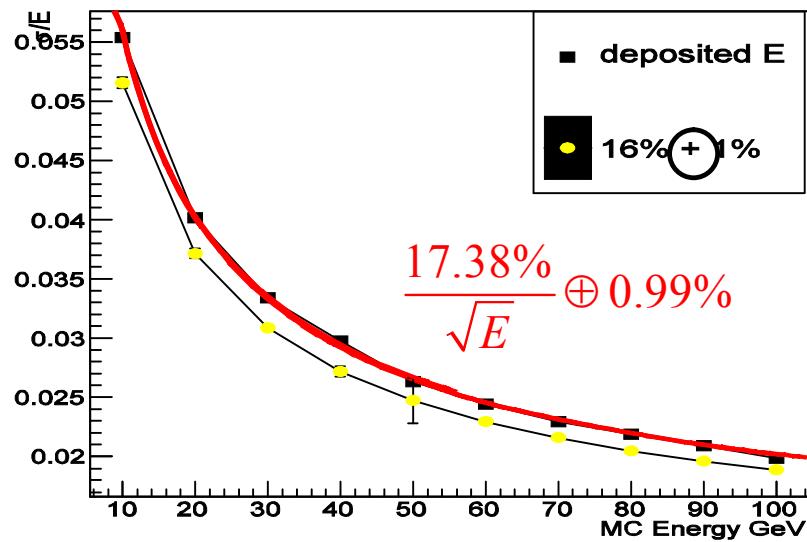
- 3 combining the two measurements

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

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

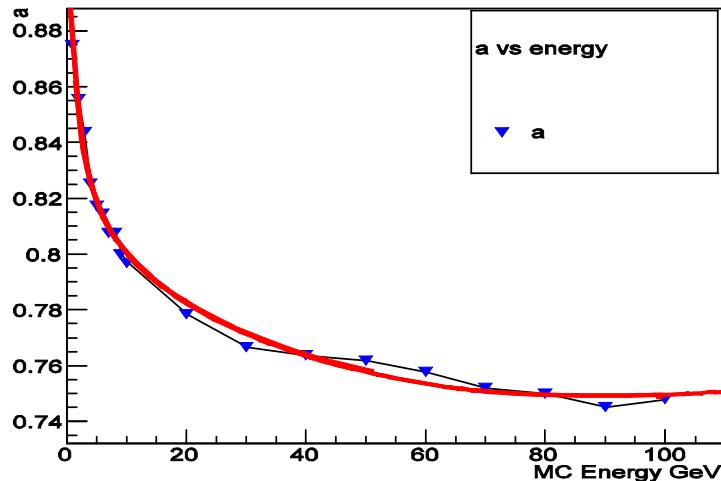
# $E_\gamma$ resolution with calibration

(ArborPFOsCollection without  $\gamma$  conversion)

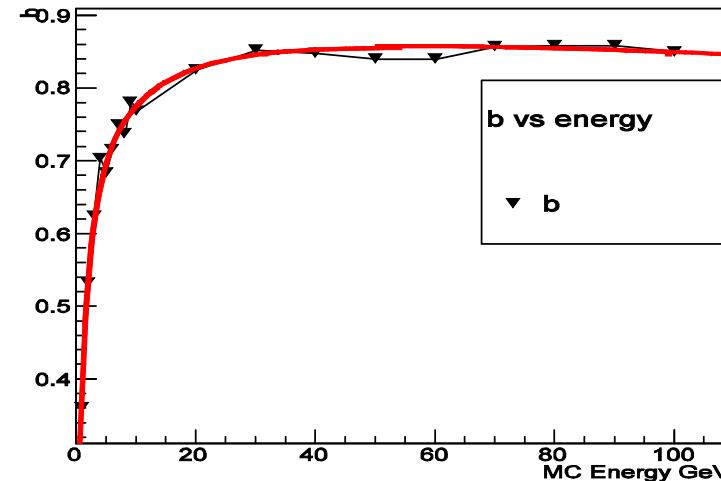


# Parameter fit (without $\gamma$ conversion)

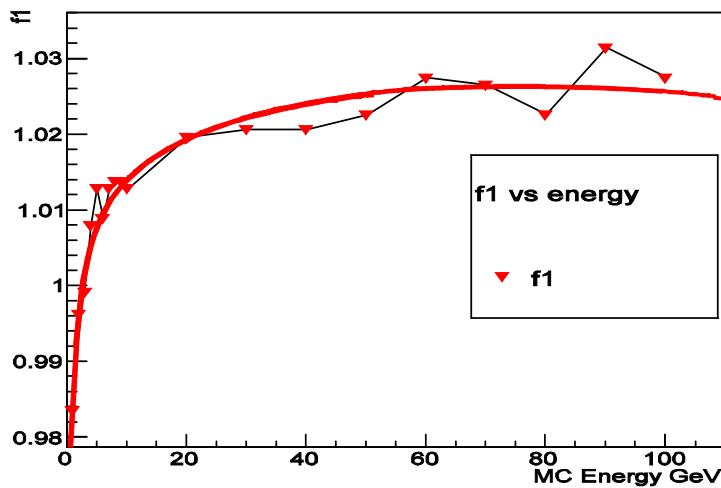
Graph



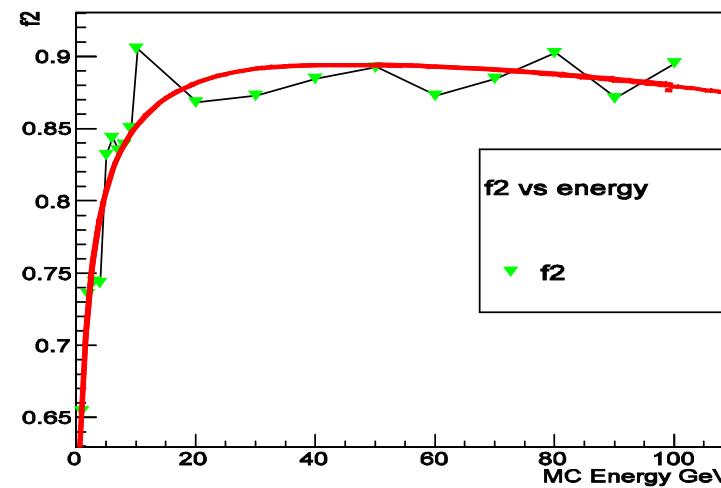
Graph



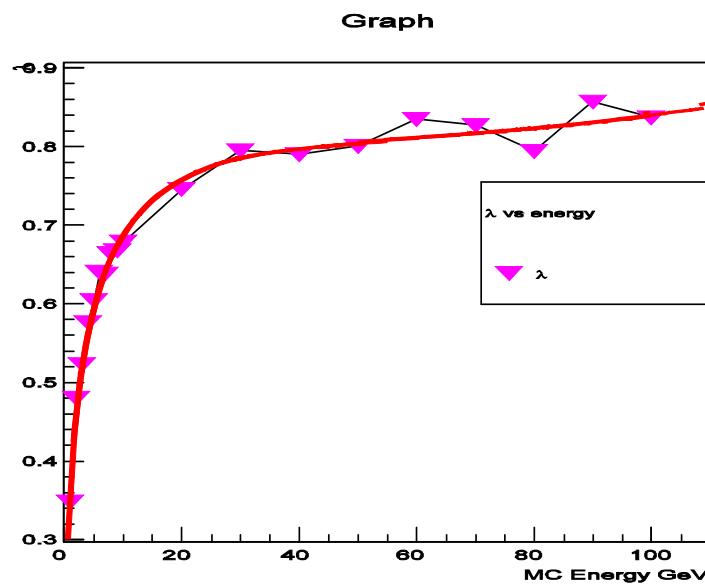
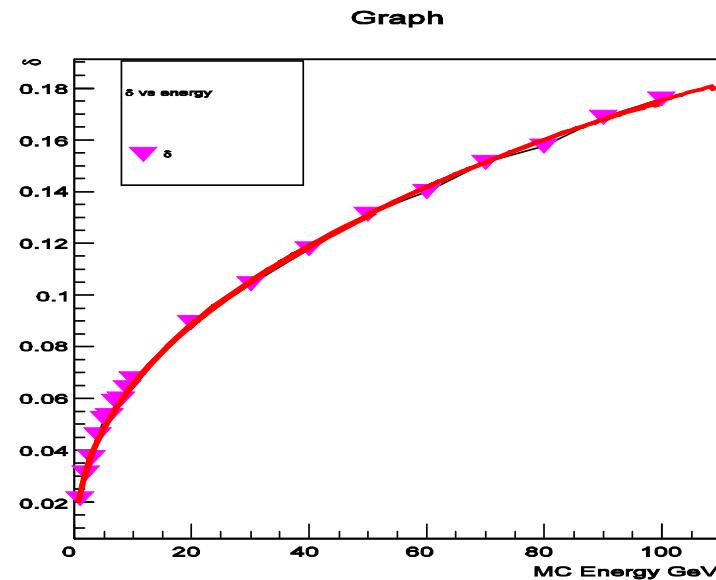
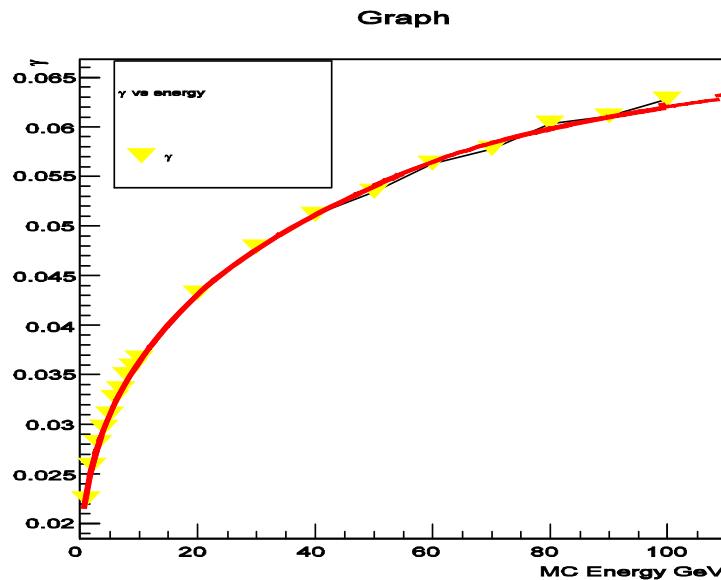
Graph



Graph

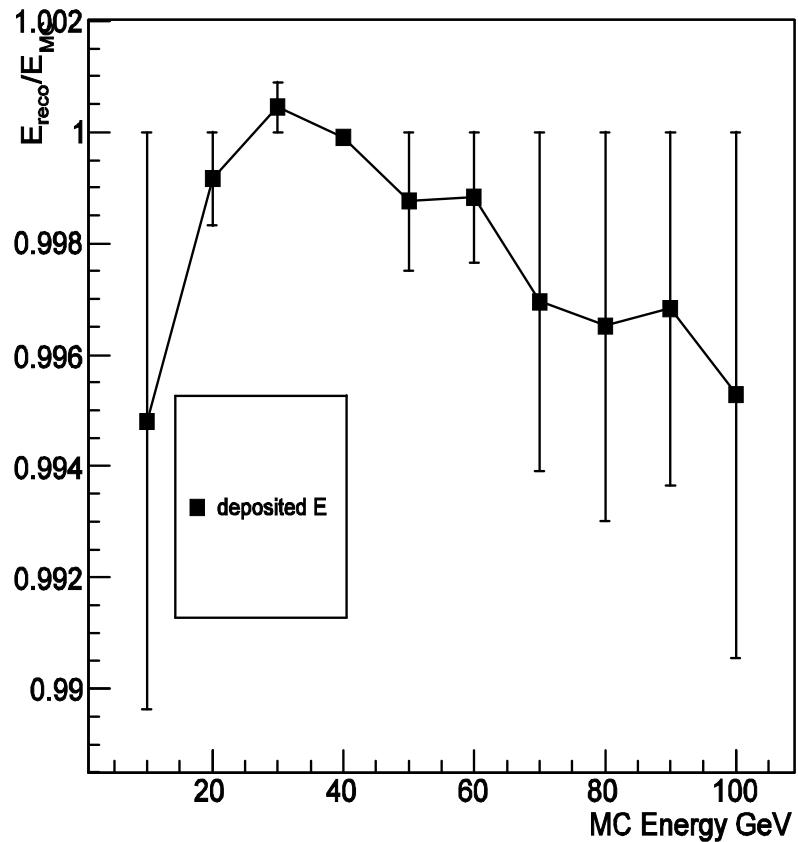


# Parameter fit (without $\gamma$ conversion)

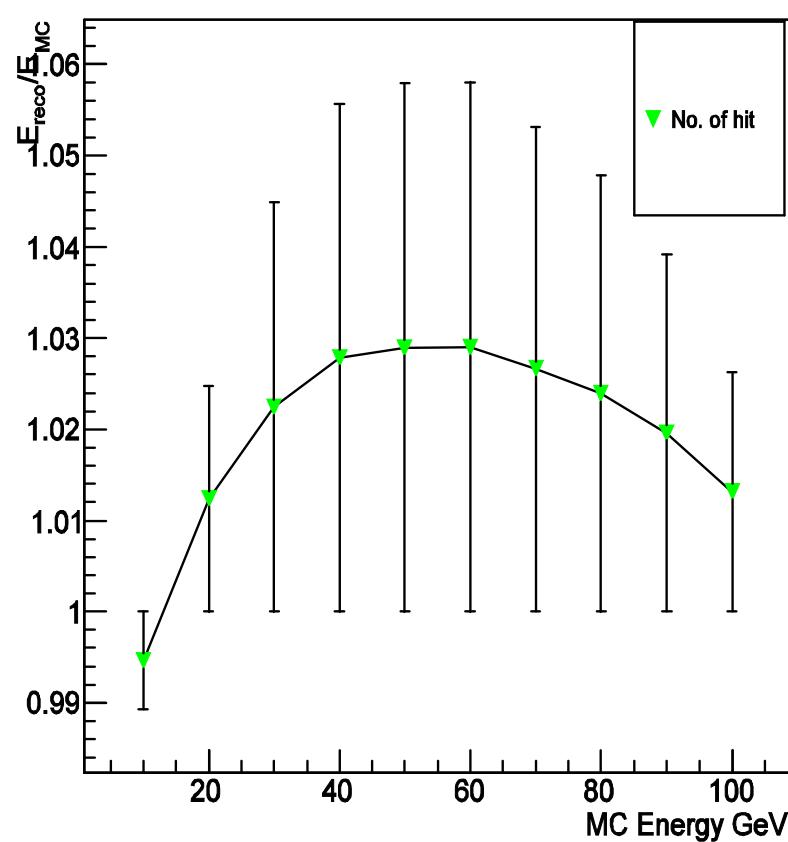


# $E_\gamma$ (without $\gamma$ conversion)

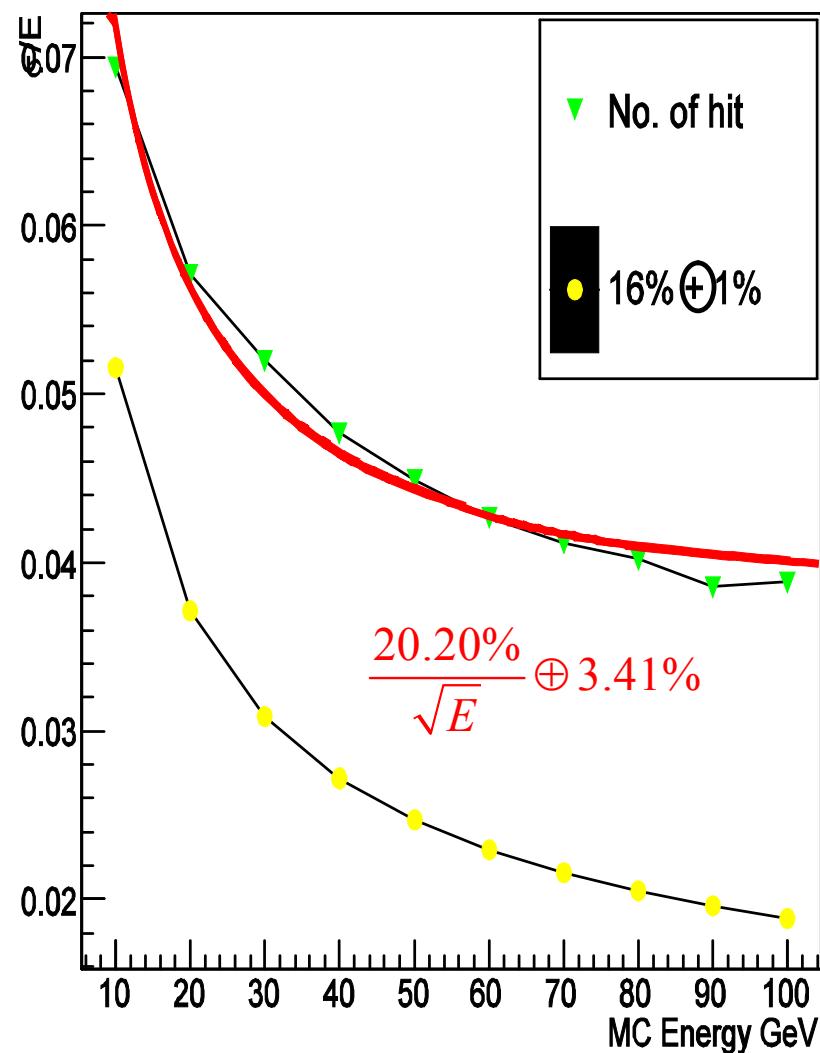
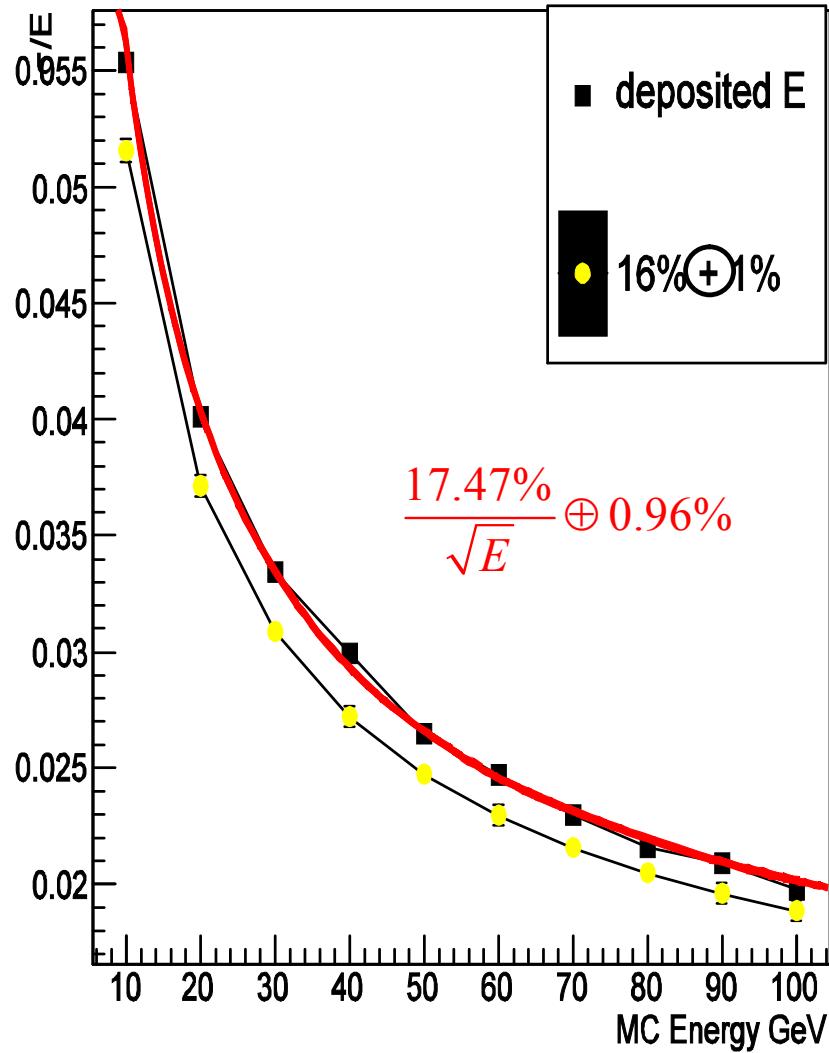
Graph



Graph



# $E_\gamma$ resolution through (without $\gamma$ conversion)



# Information

- 1  $\pi$  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)

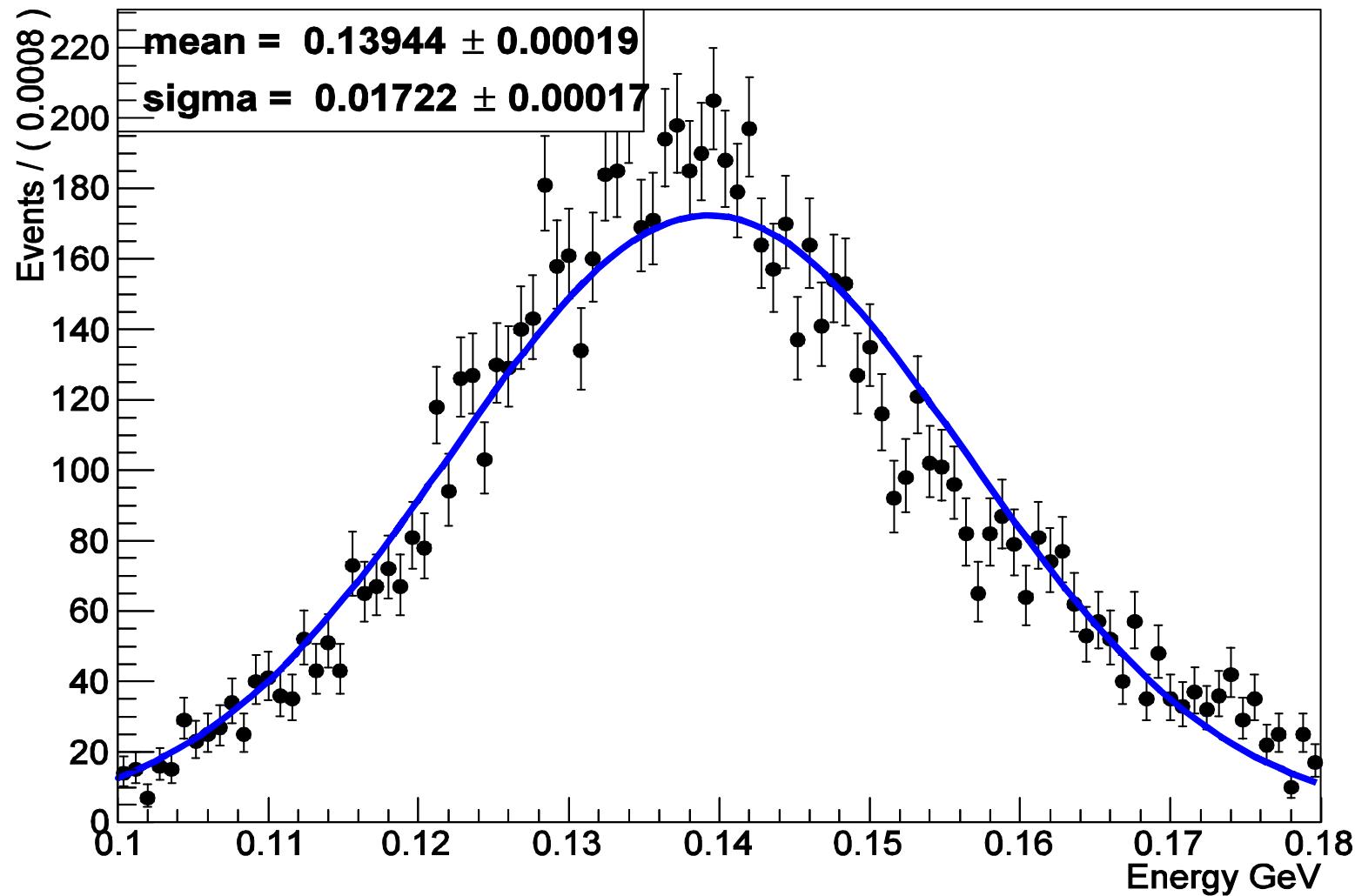
```
↳
/generator/generator particleGun
/gun/position 0 0 0 mm
/gun/direction 0.0 1.0 0.035
/gun/energy 20 GeV
/gun/momentumSmearing 0.0 GeV
/gun/phiSmearing 1 deg
/gun/thetaSmearing 1 deg
/gun/directionSmearingMode uniform
/gun/particle pi0
/run/beamOn 10
```

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# $\pi^0$ mass (5GeV) ArborNeutral

without  $\gamma$  conversion

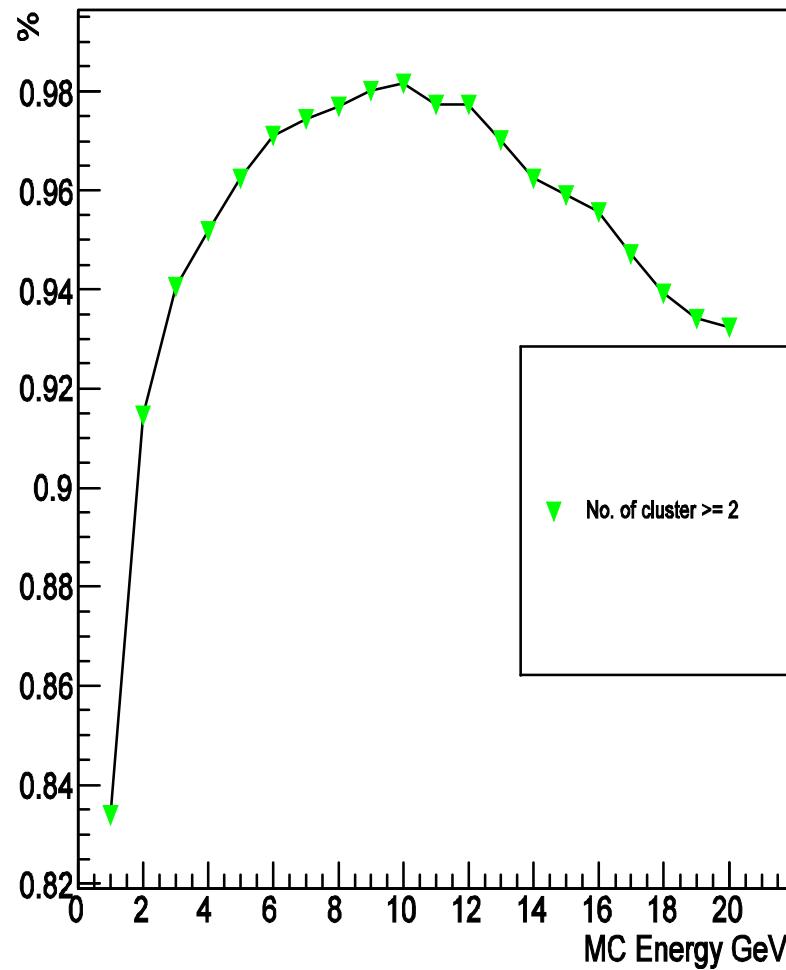
Reconstruction energy (deposit E)



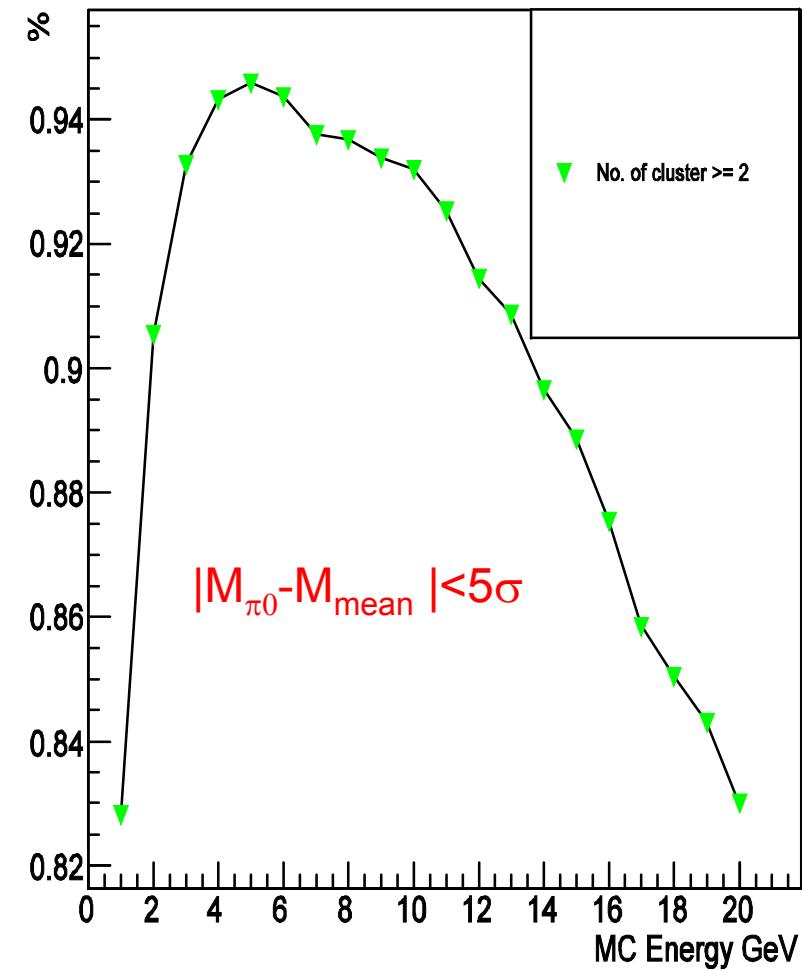
# Efficiency

No. of charge<1 & No.of cluster  $\geq 2$

Graph



Graph

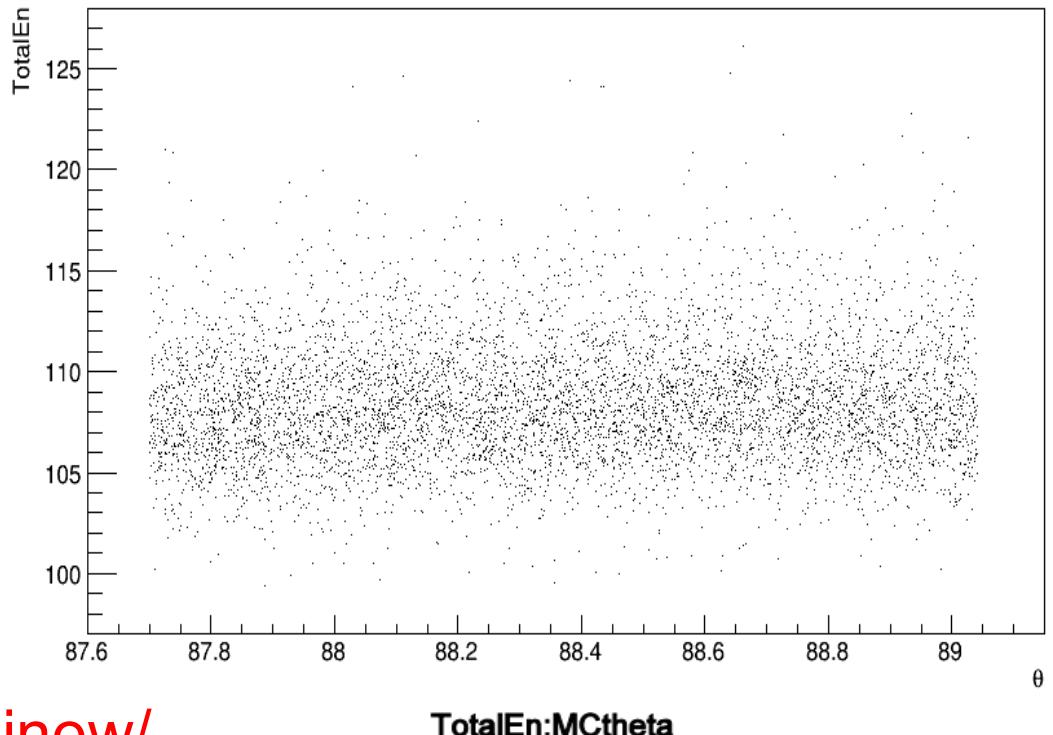


backup

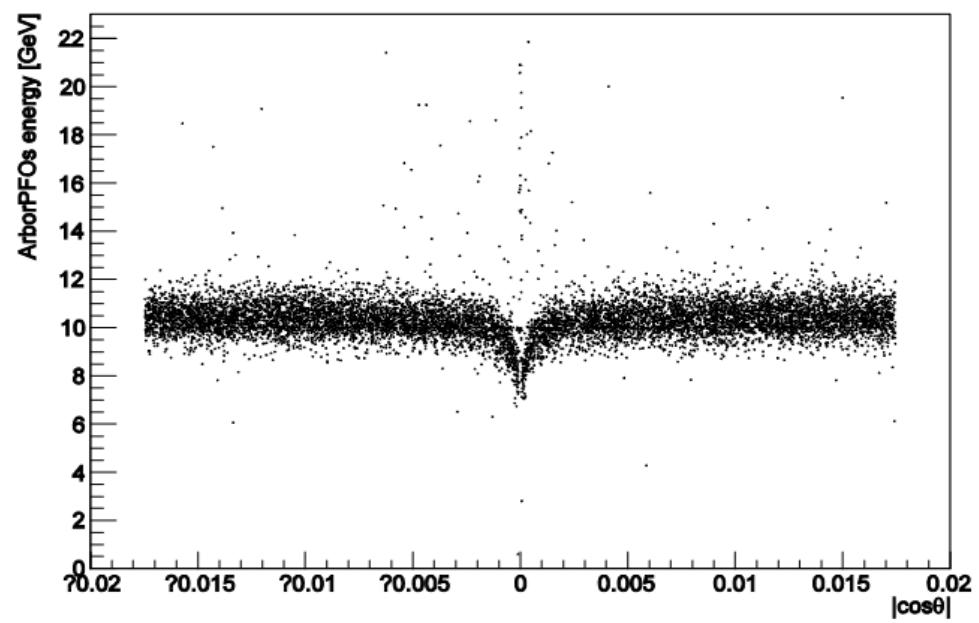
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[~] /generator/generator particleGun  
[~] /gun/position 0 0 0 mm  
[~] /gun/direction 0.0 1.0 0.035  
[~] /gun/energy 10 GeV  
[~] /gun/momentumSmearing 0.0 GeV  
[~] /gun/phiSmearing 1 deg  
[~] /gun/thetaSmearing 1 deg  
[~] /gun/directionSmearingMode 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
```

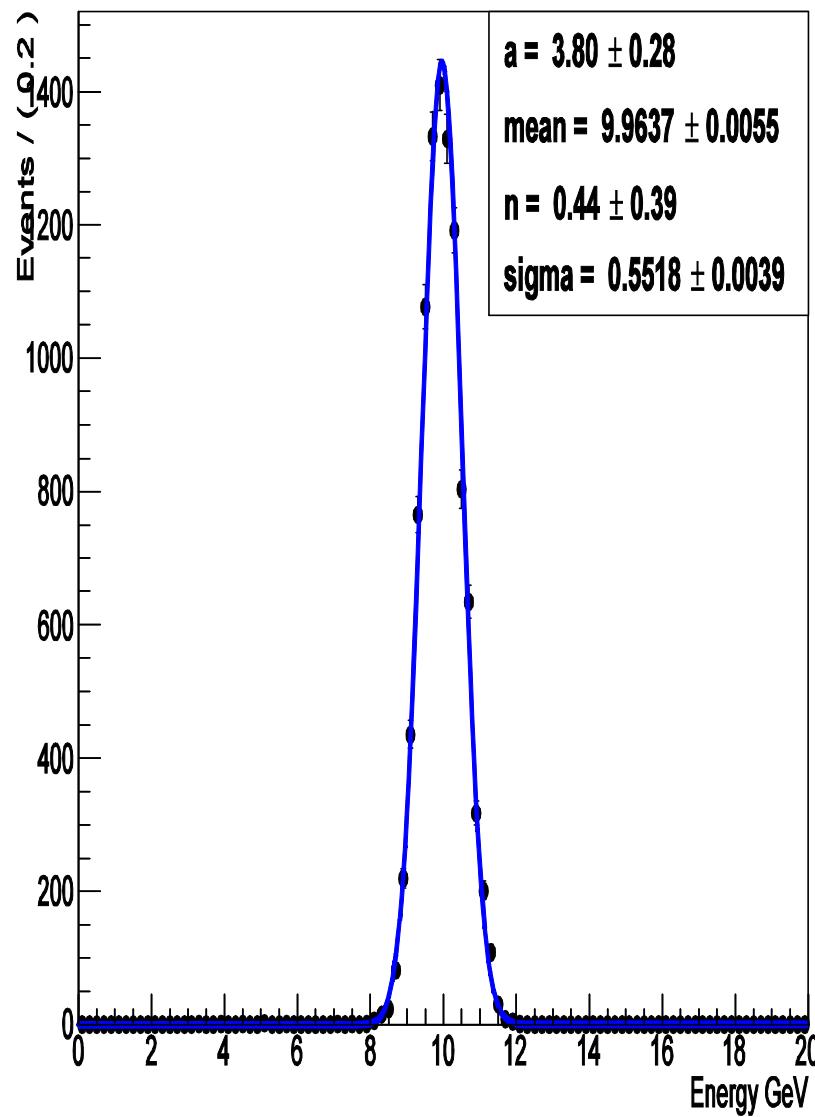


TotalEn:MCtheta

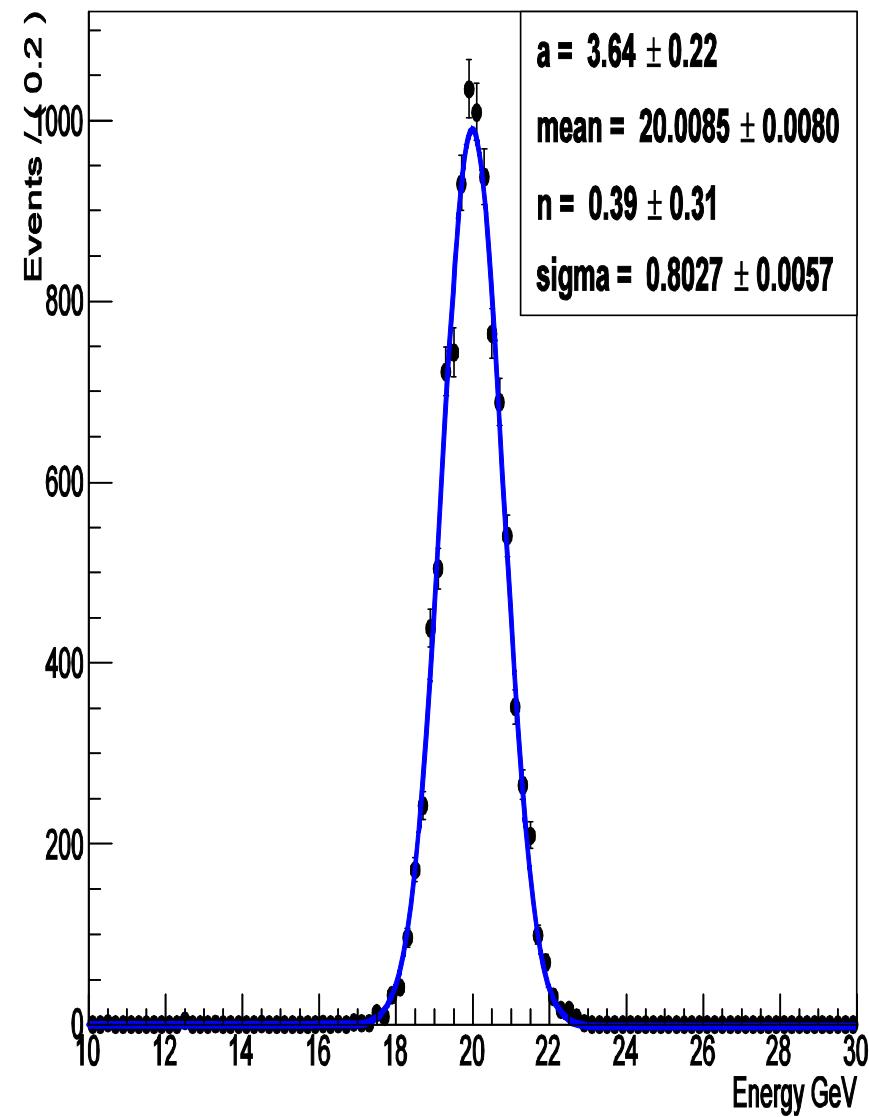


# $E_\gamma$ deposite in Ecal (iterating) No. of charge<1

Reconstruction energy (deposit E)



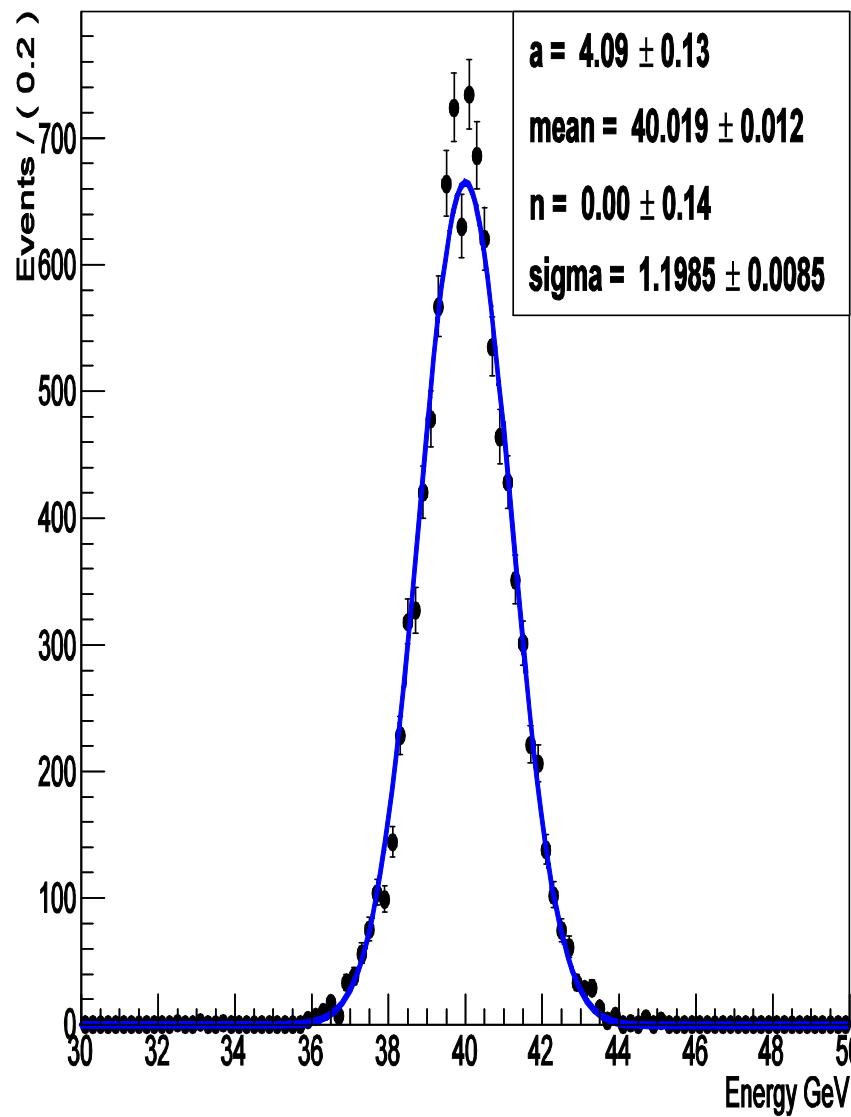
Reconstruction energy (deposit E)



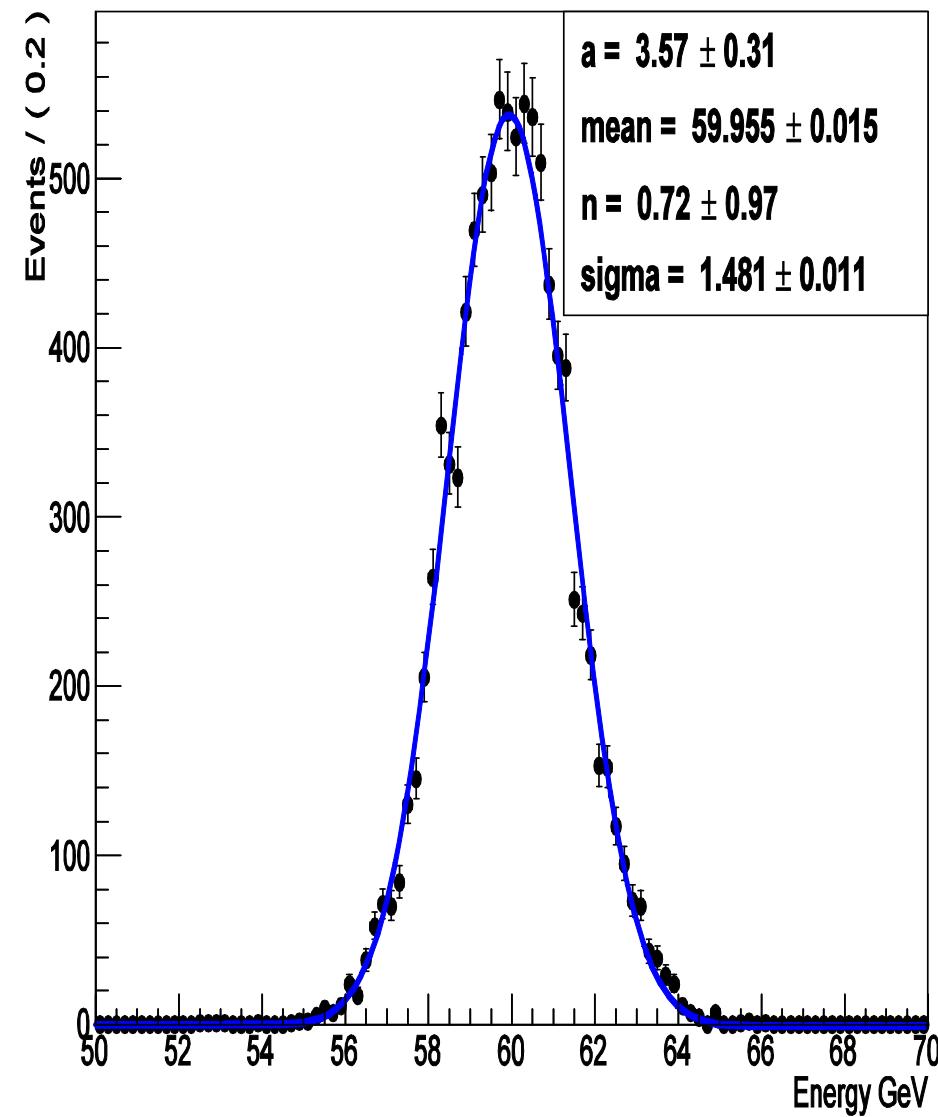
# $E_\gamma$ deposite in Ecal (iterating)

No. of charge<1

Reconstruction energy (deposit E)



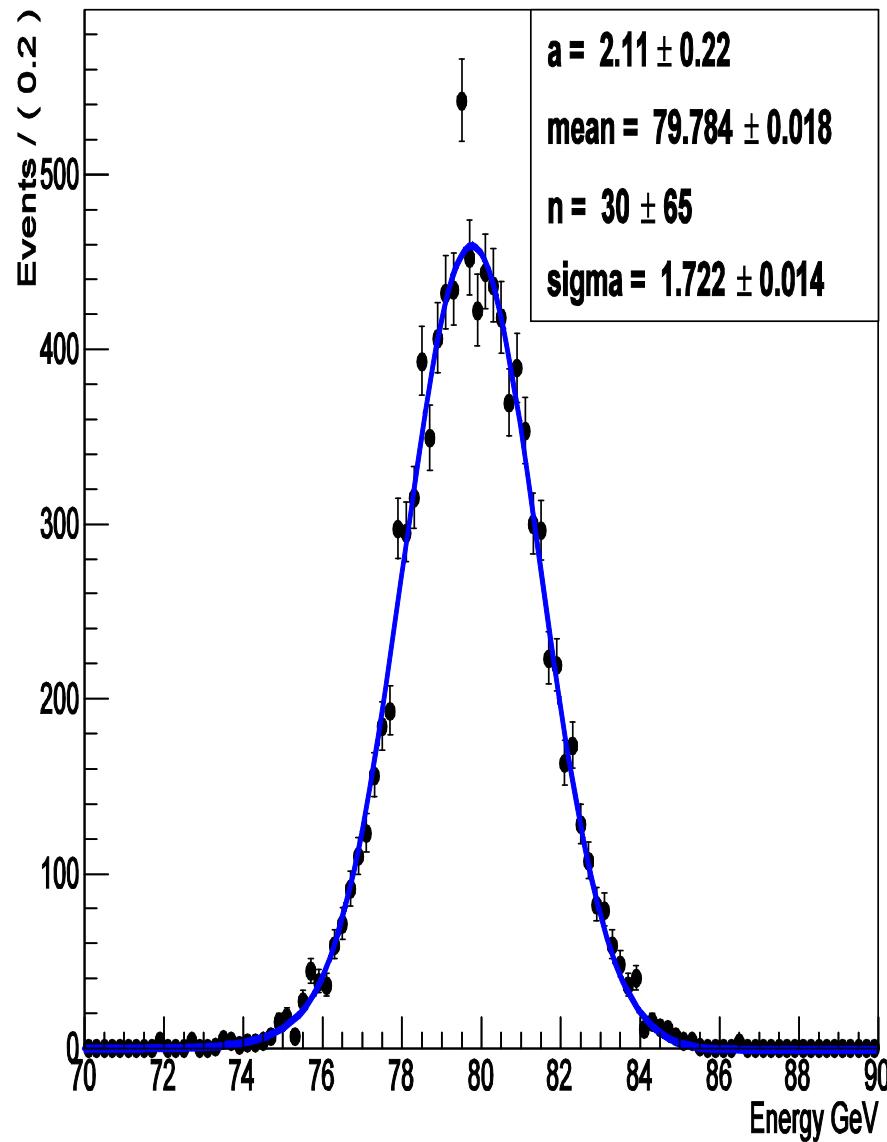
Reconstruction energy (deposit E)



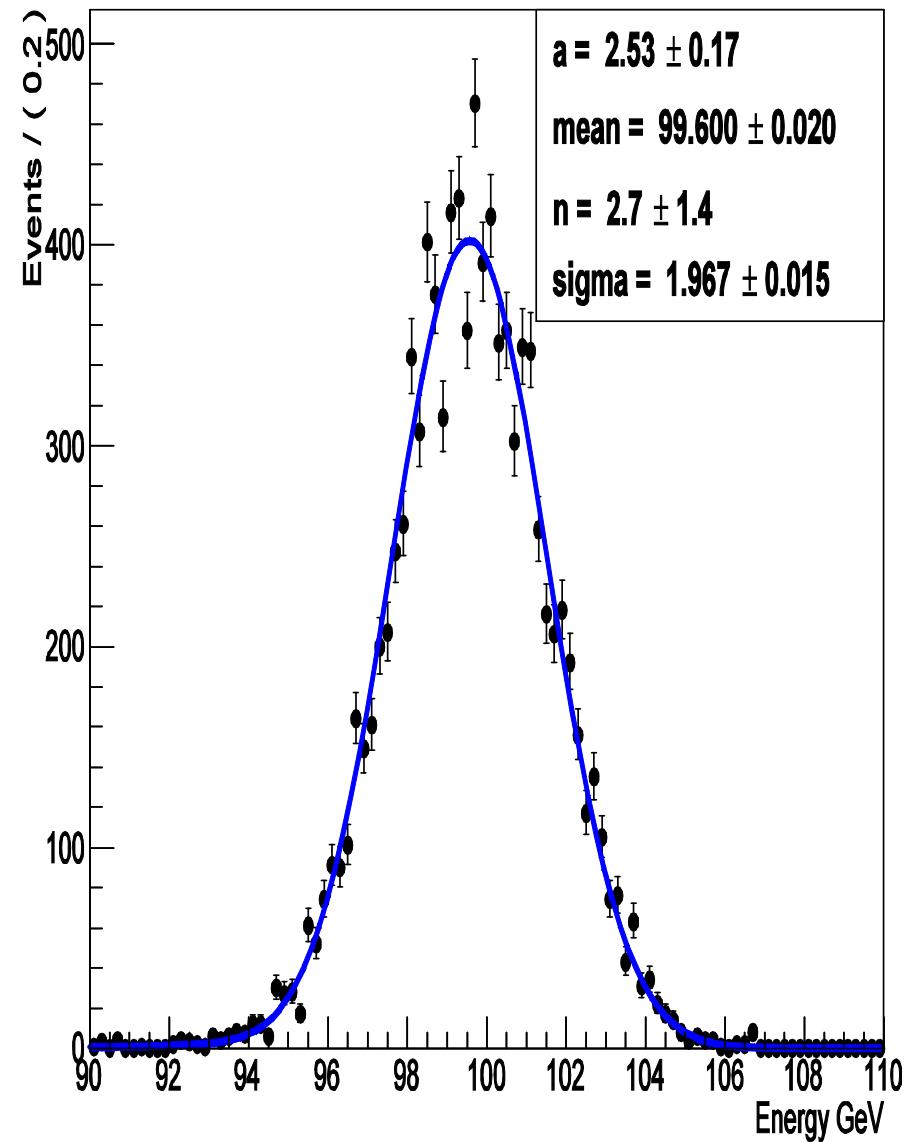
# $E_\gamma$ deposite in Ecal (iterating)

No. of charge<1

Reconstruction energy (deposit E)

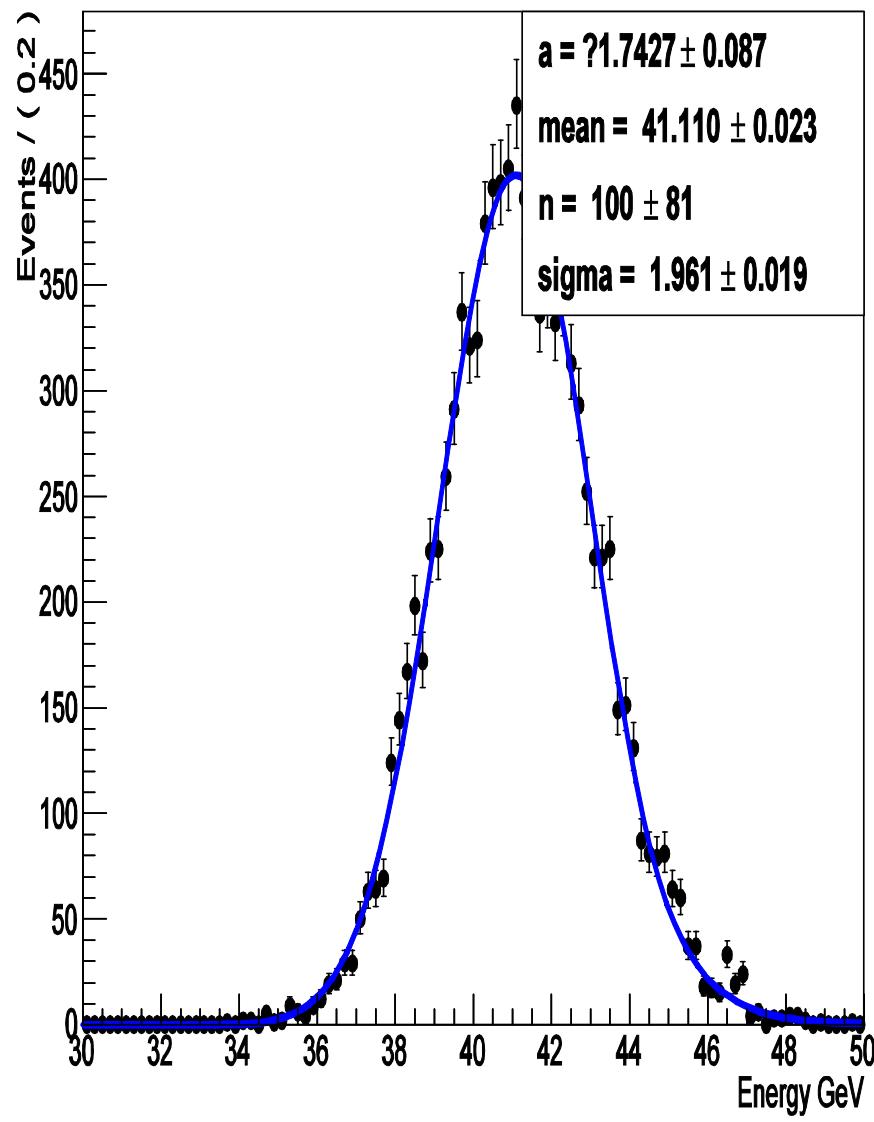


Reconstruction energy (deposit E)

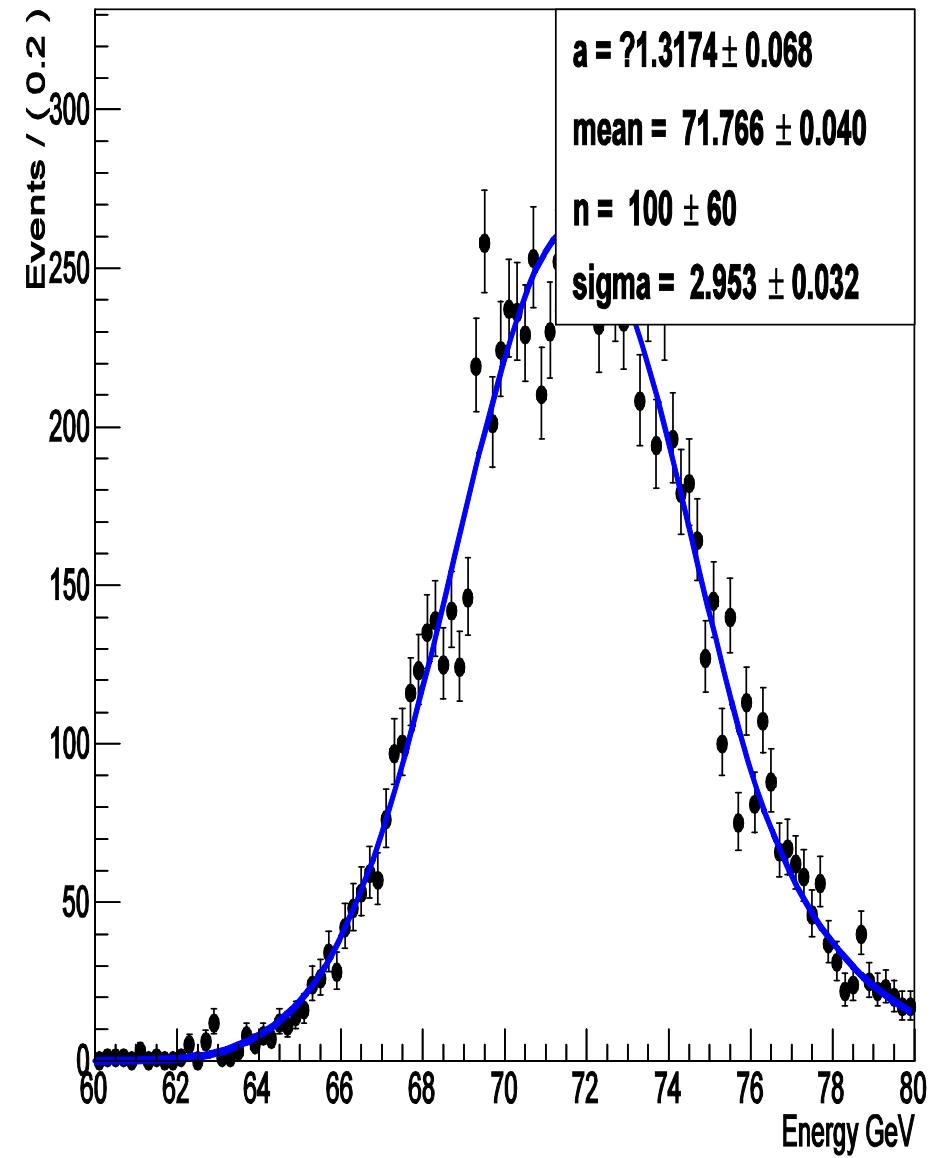


# No. of hit in Ecal (iterating) No. of charge<1

Reconstruction energy (No. of hit)

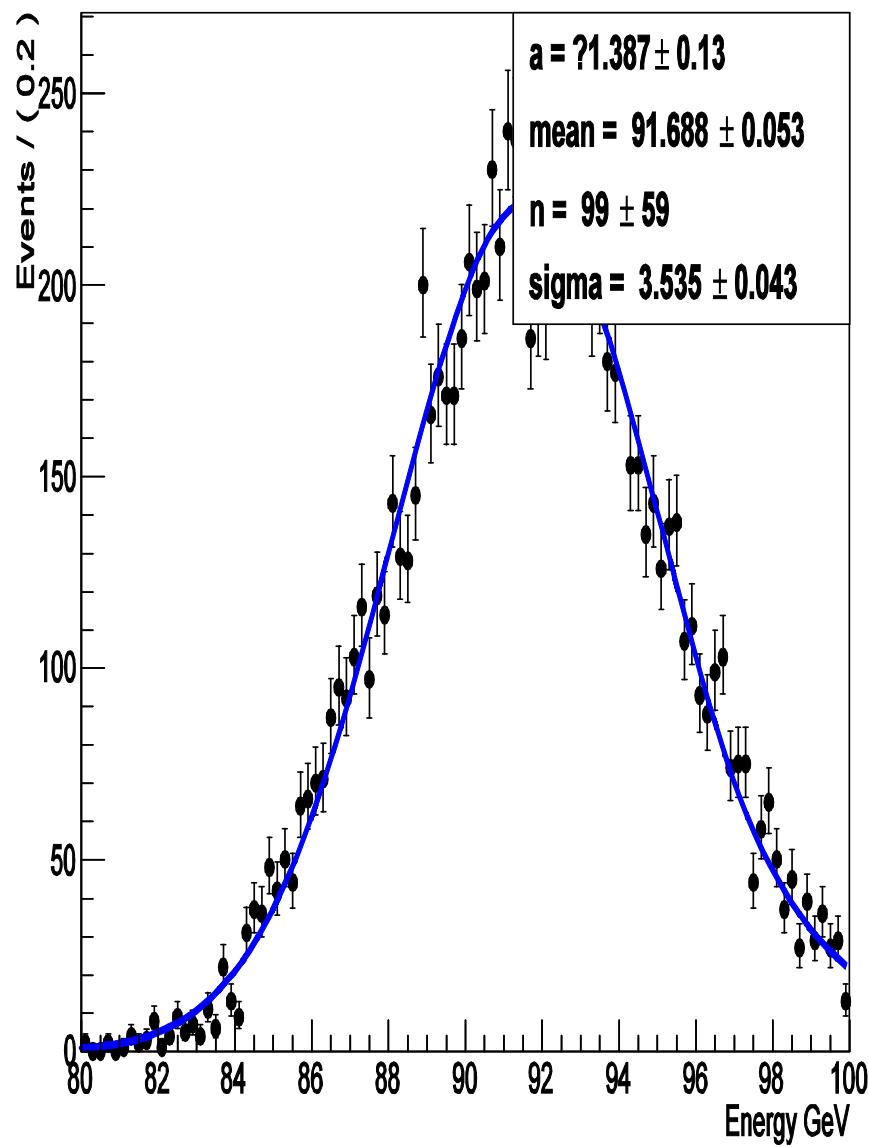


Reconstruction energy (No. of hit)



# No. of hit in Ecal (iterating) No. of charge<1

Reconstruction energy (No. of hit)



Reconstruction energy (No. of hit)

