Br(H →γγ) measurement

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Optimization ilc17_slc6_arbor25May15.sh

- 1 energy deposit

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

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

- 2 number of hit

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

- 3 combining the two measurements

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

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

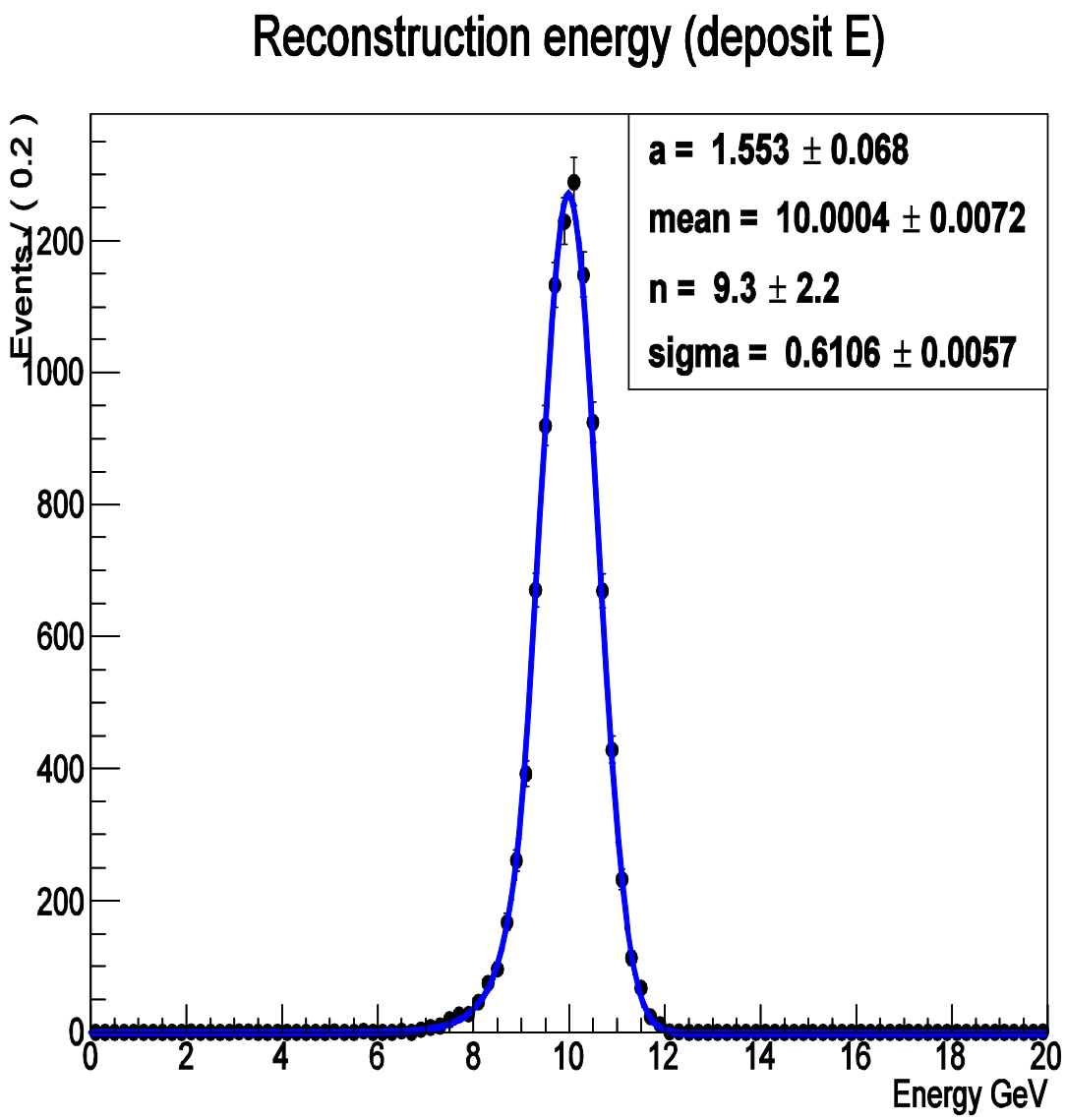
E_γ deposite in Ecal (ArborPFOsCollection)

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

χ^2-minimized

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

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



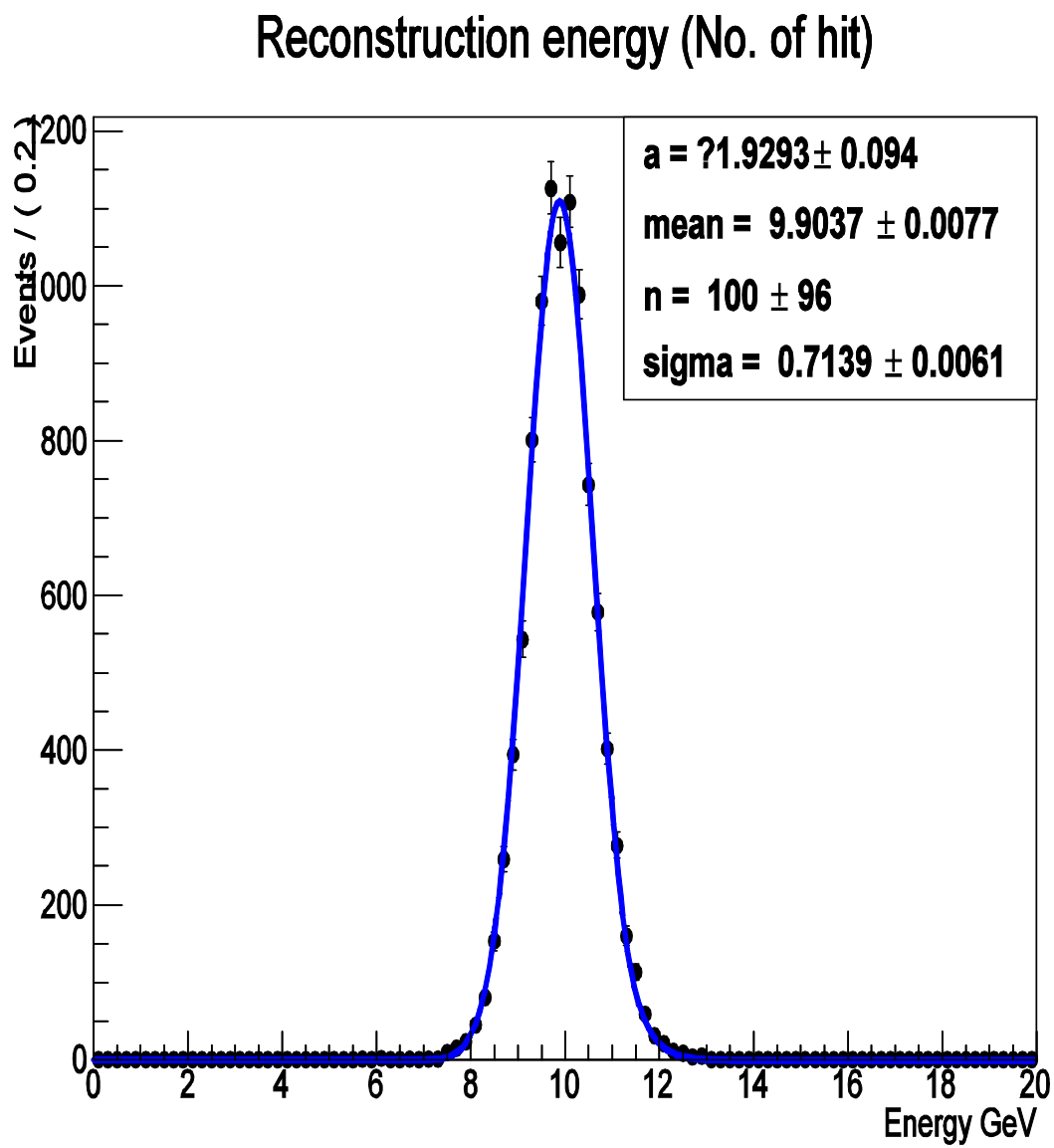
No. of hit in Ecal (ArborPFOsCollection)

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

χ^2-minimized

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

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



Combining result in Ecal

(ArborPFOsCollection)

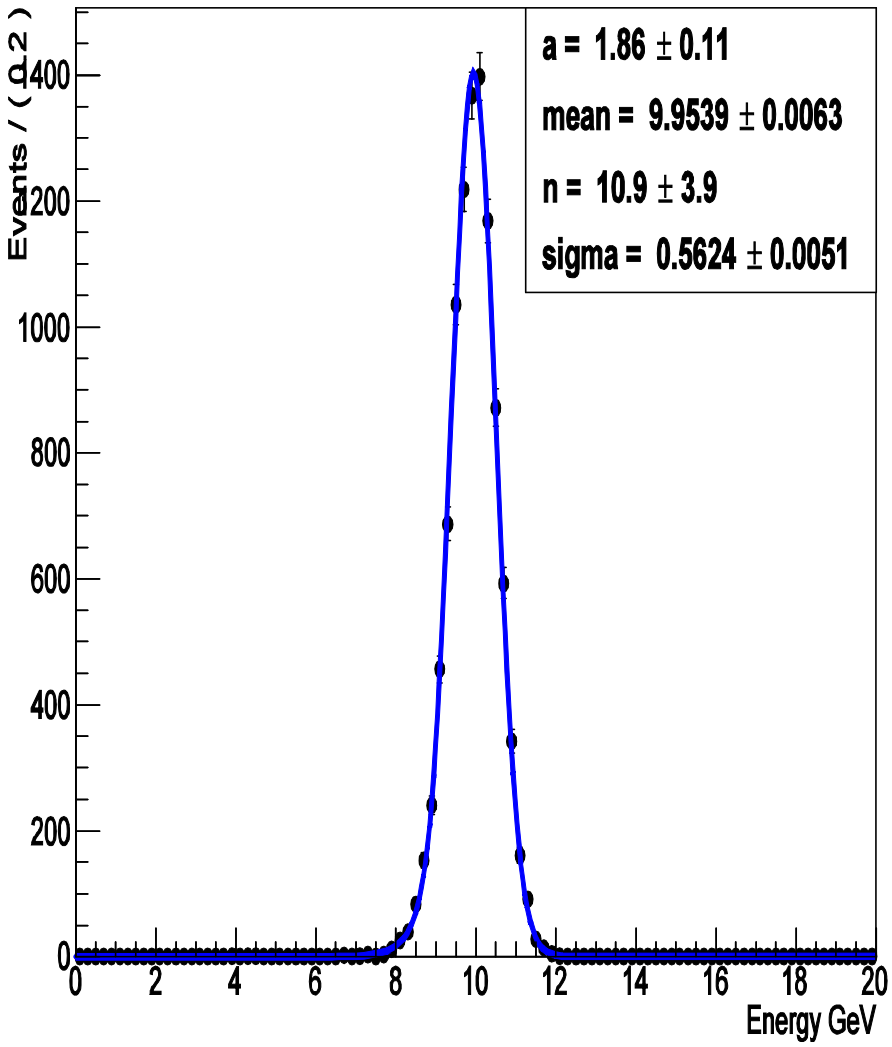
$$E = \lambda E_{meas}^{en} + (1-\lambda) E_{meas}^{hit}$$

χ^2-minimized

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

$$\frac{\sigma}{E} = 0.05625 \approx \frac{17.79\%}{\sqrt{E}}$$

Reconstruction energy (combining E & hits)



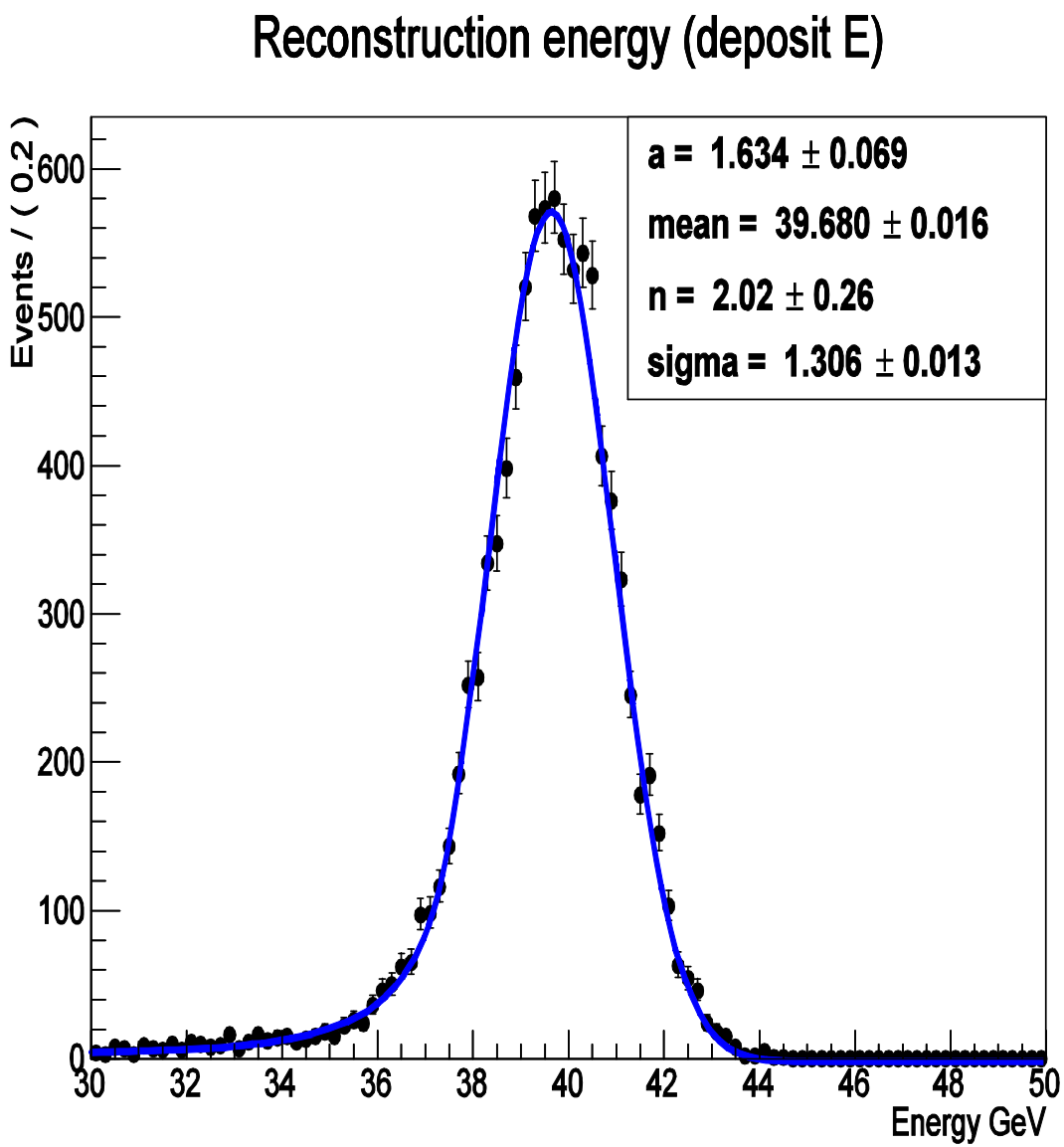
E_γ deposite in Ecal (ArborPFOsCollection)

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

χ^2-minimized

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

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



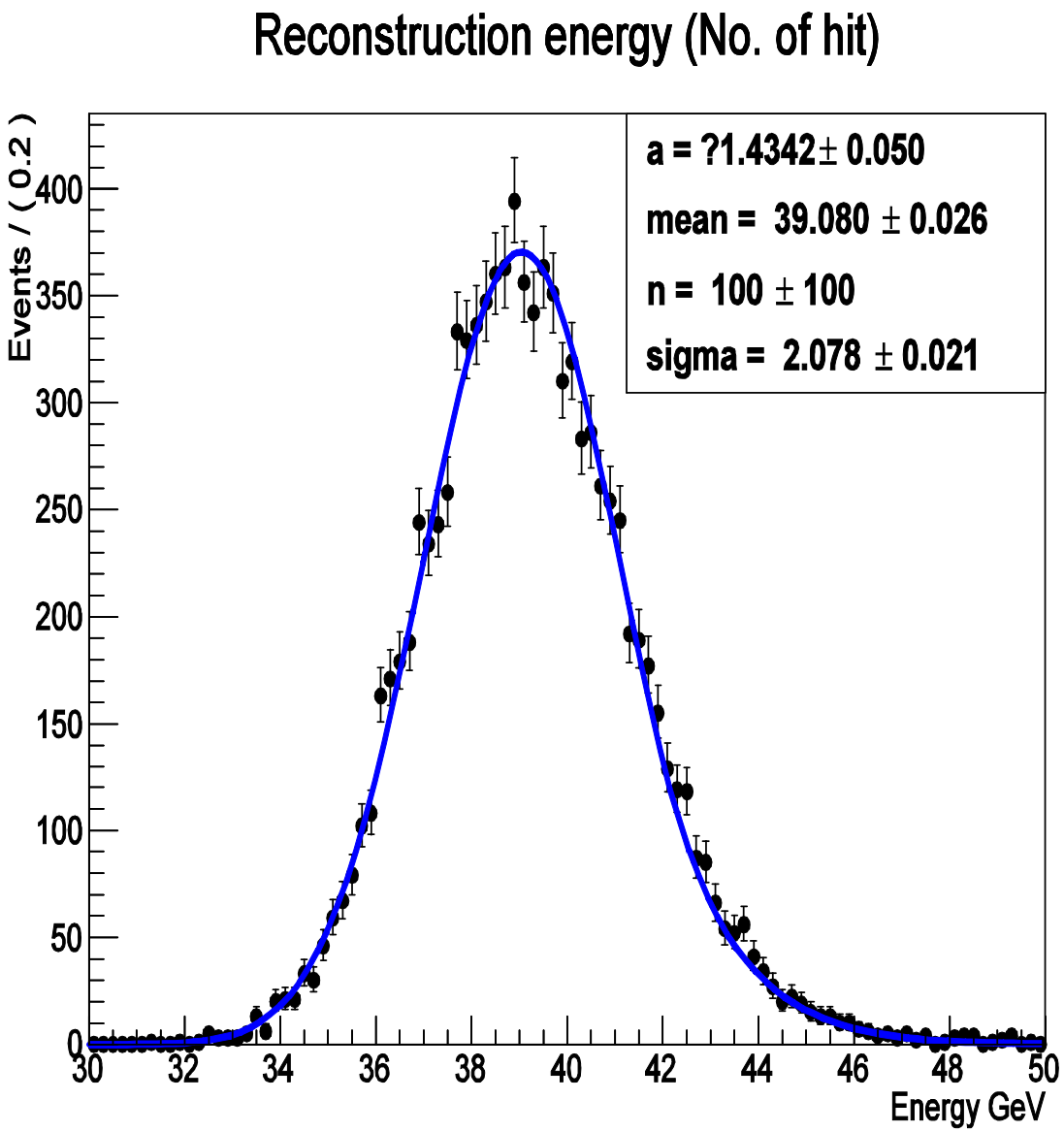
No. of hit in Ecal (ArborPFOsCollection)

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

χ^2-minimized

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

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



Combining result in Ecal

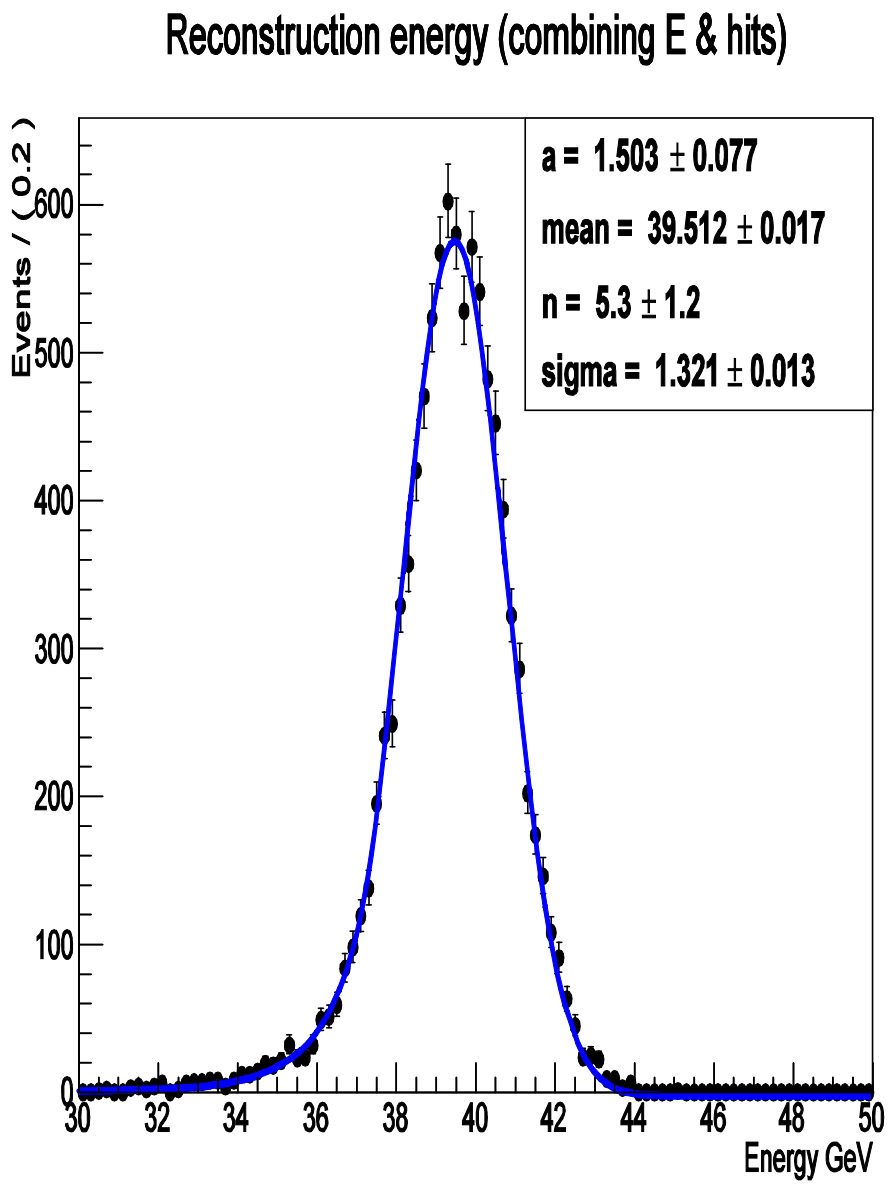
(ArborPFOsCollection)

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

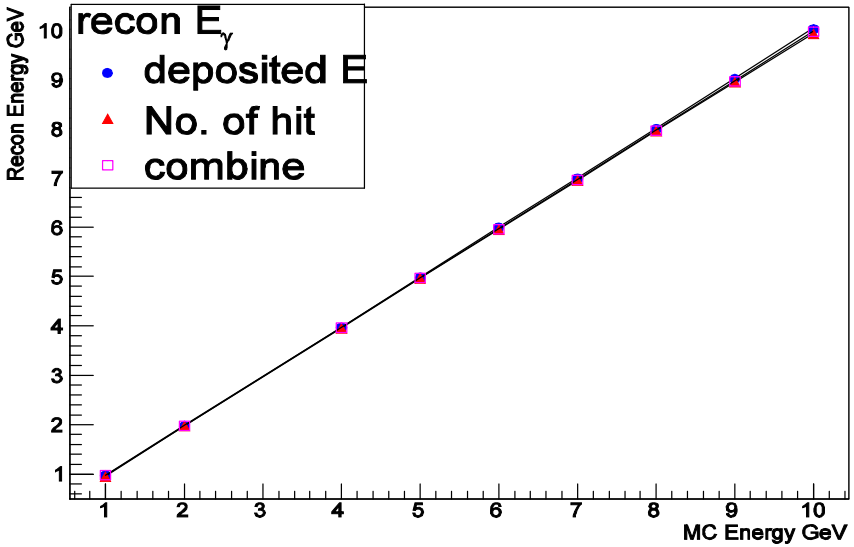
χ^2-minimized

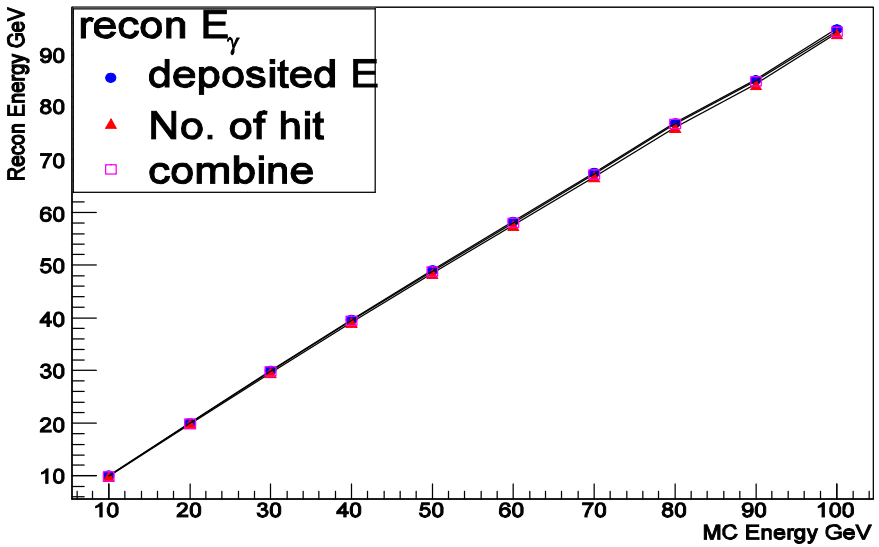
$$\chi^2 = \sum_{events} \left(\left\{ \lambda \left(E_{mean}^{en} - E_{meas}^{en} \right) + (1-\lambda) \left(E_{mean}^{hit} - E_{meas}^{hit} \right) \right\} / \frac{16\%}{\sqrt{E_{MC}}} \right)^2$$

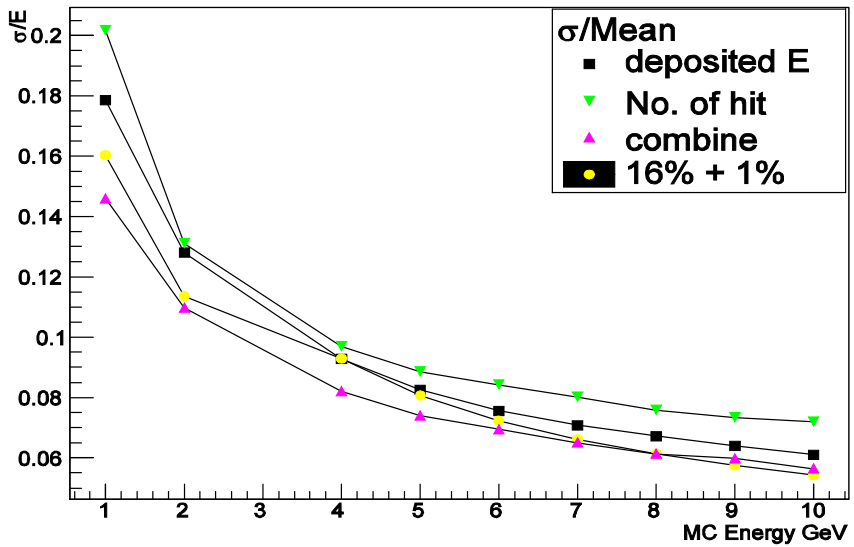
$$\frac{\sigma}{E} = 0.03343 \approx \frac{21.14\%}{\sqrt{E}}$$

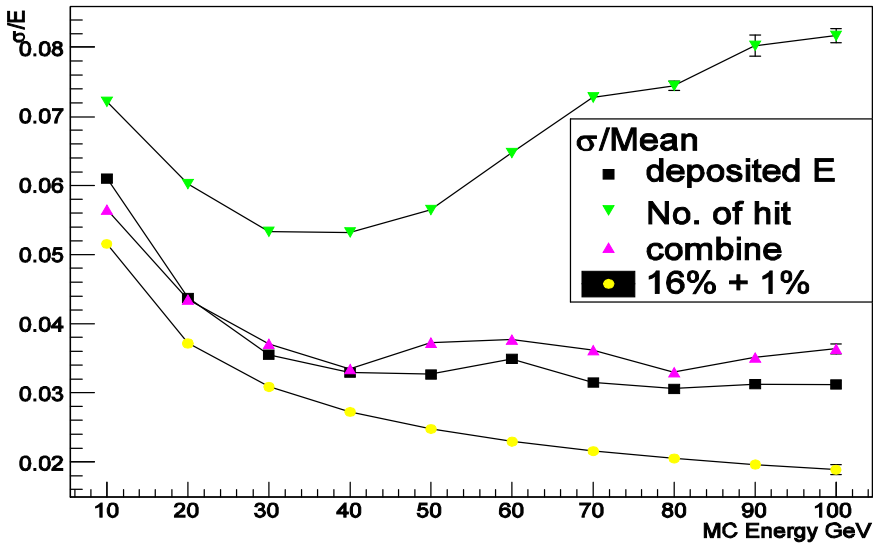


E_γ resolution with calibration (ArborPFOsCollection)

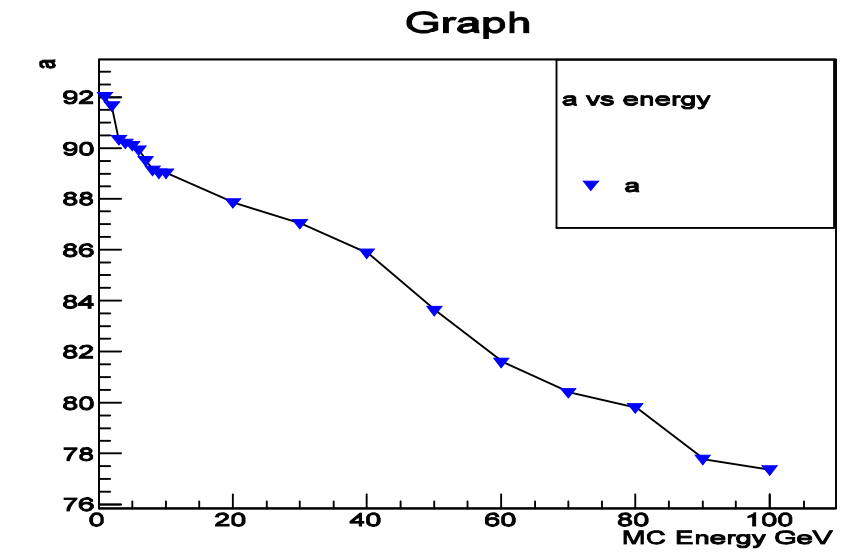


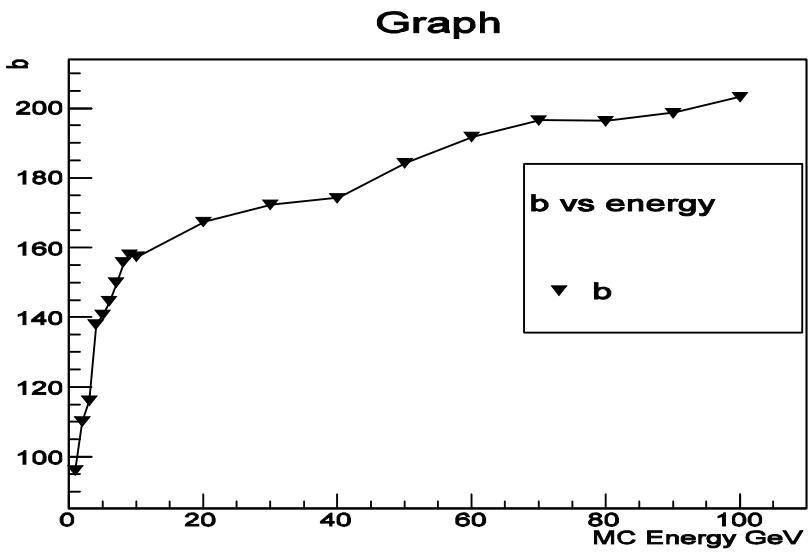


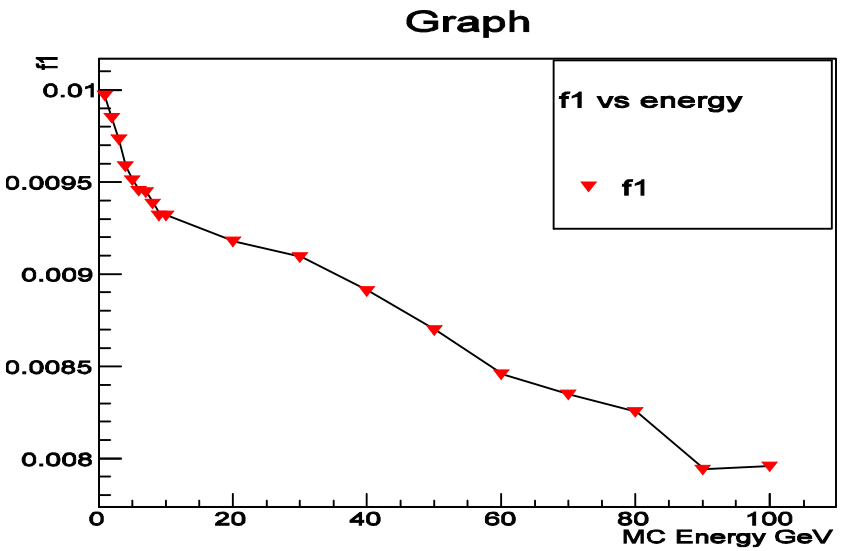


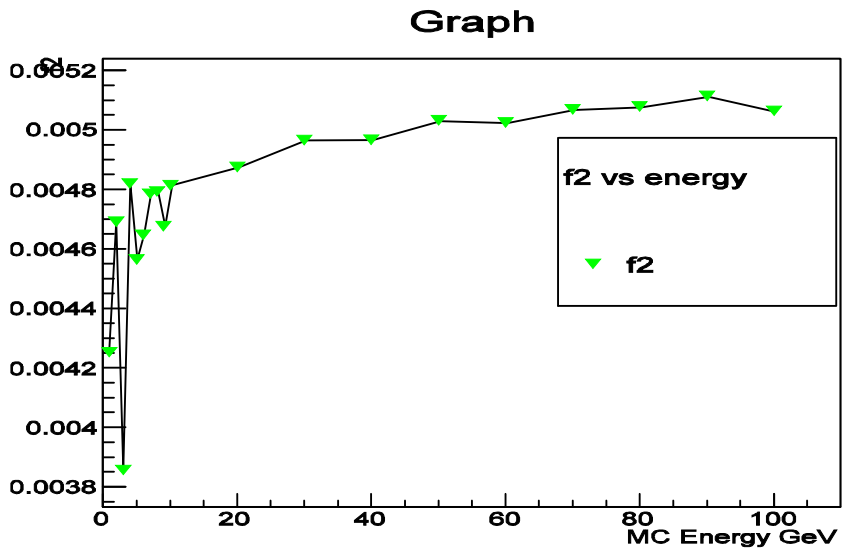


Parameter vs E (ArborPFOsCollection)









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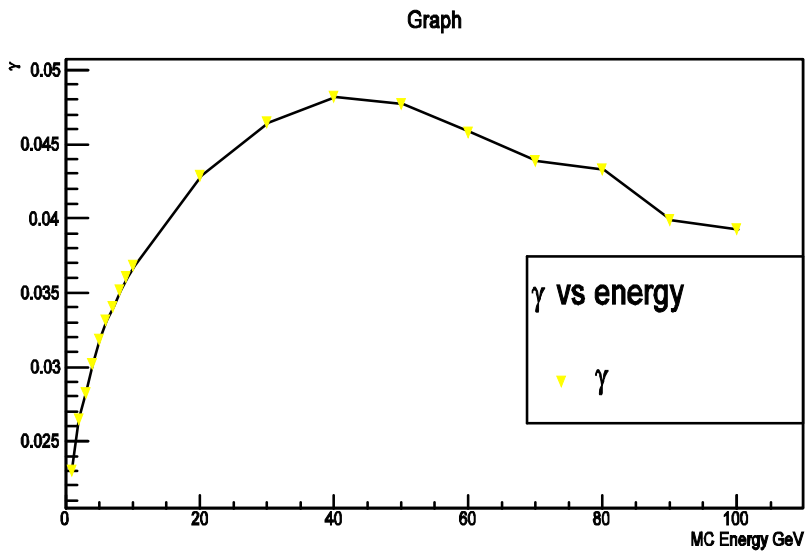
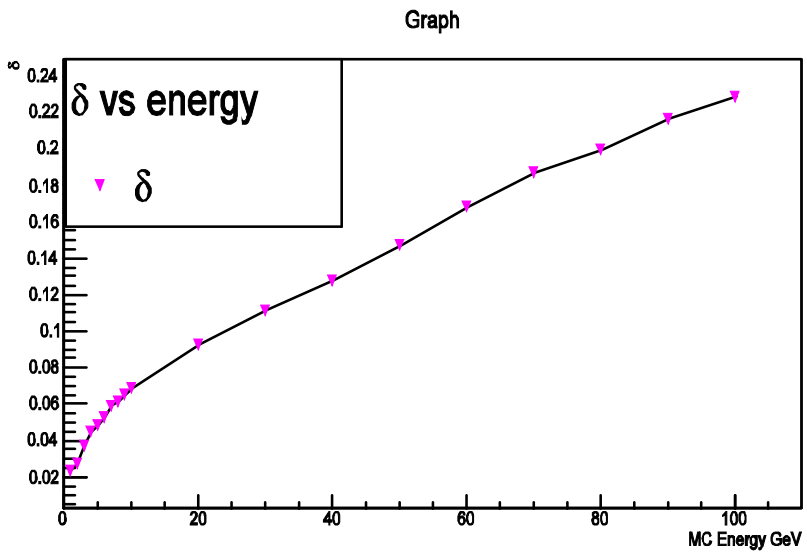
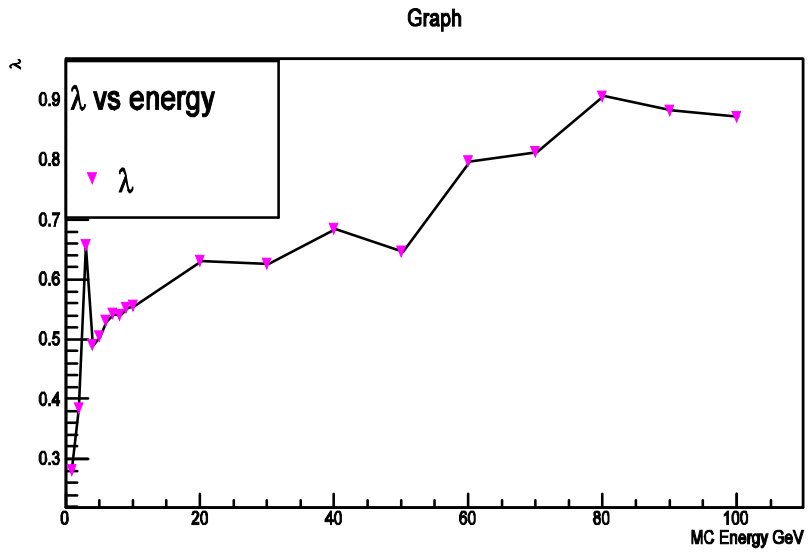
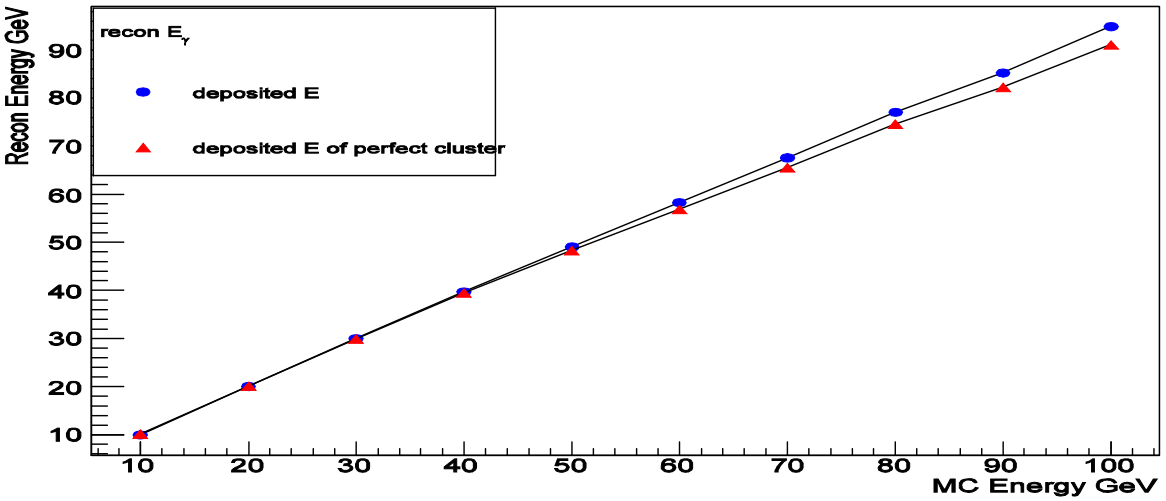
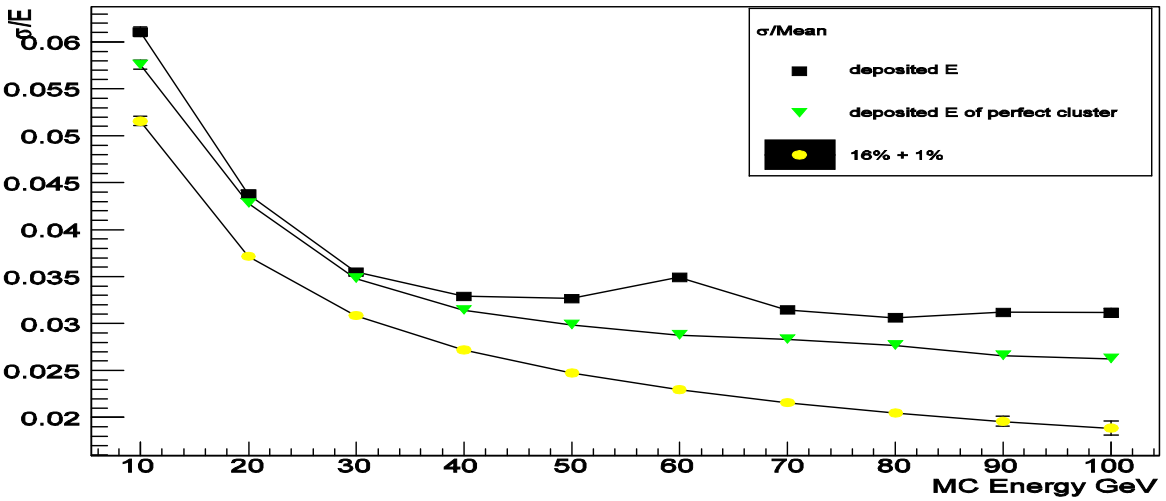




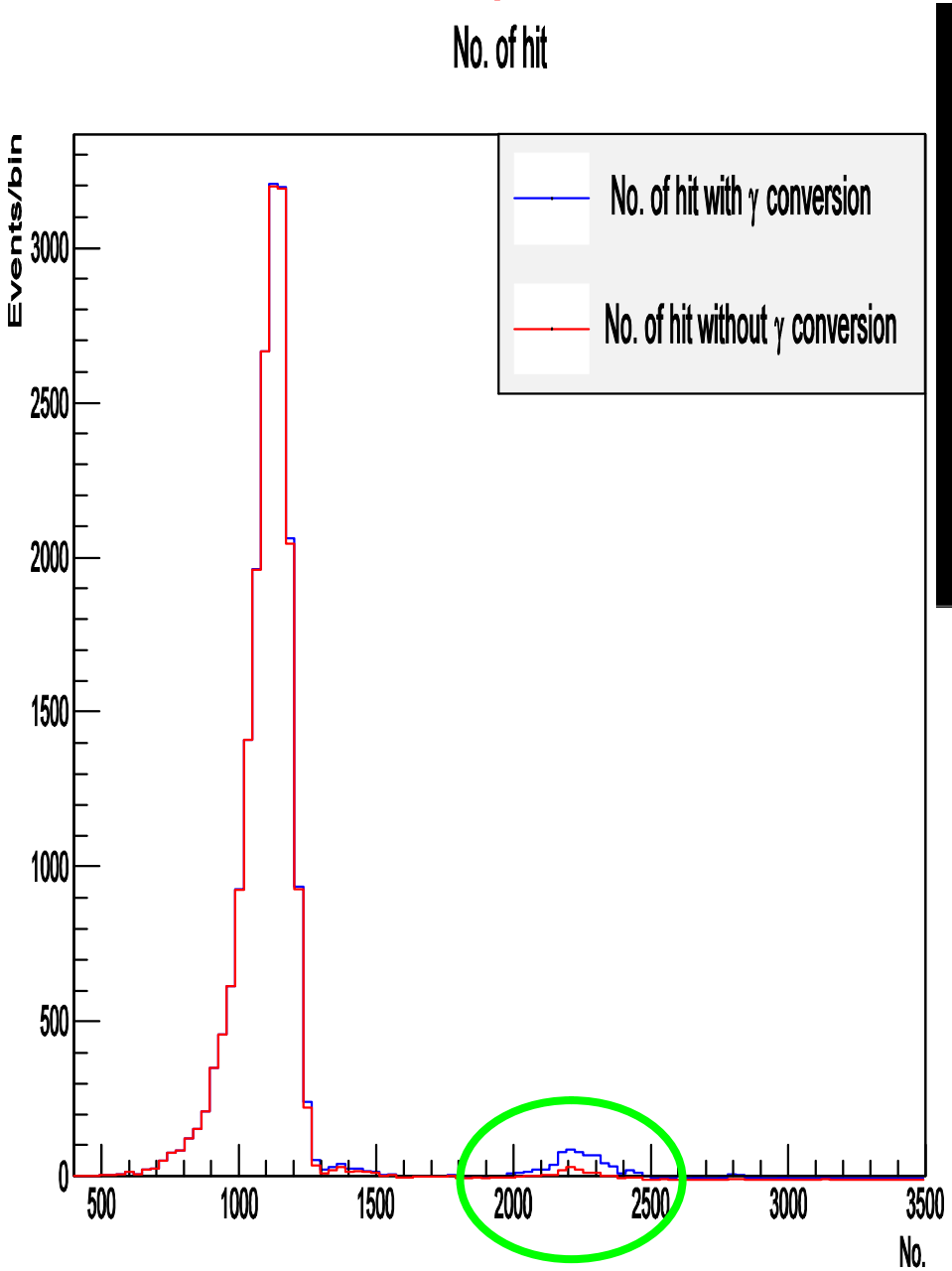


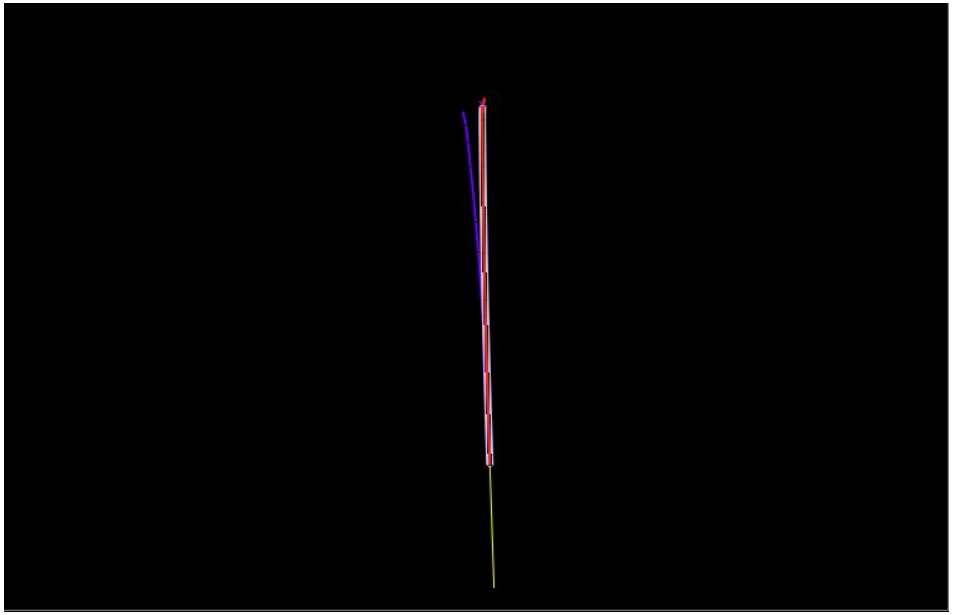
E_γ resolution with calibration (perfect cluster)

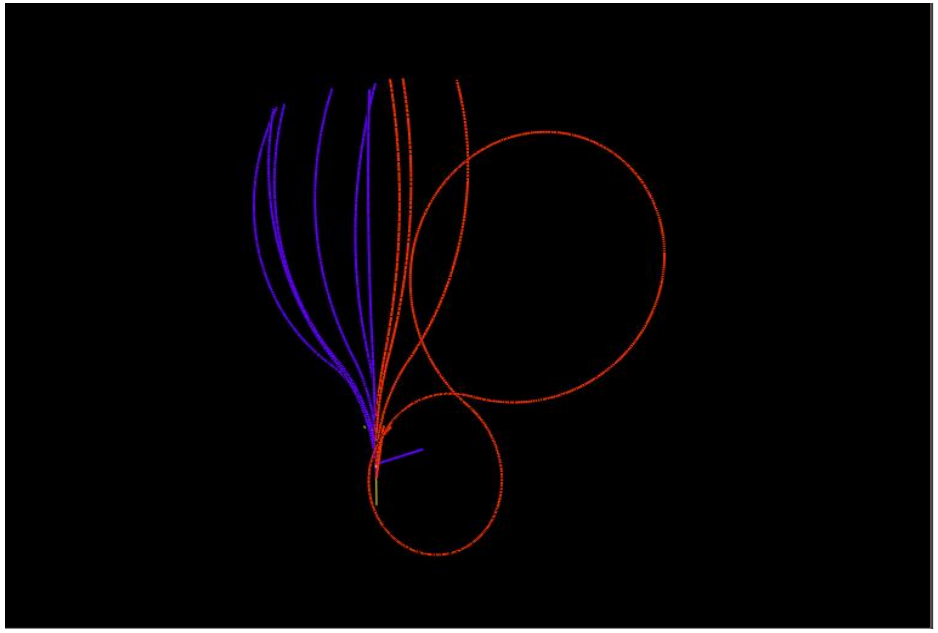




No. of hit (perfect cluster)



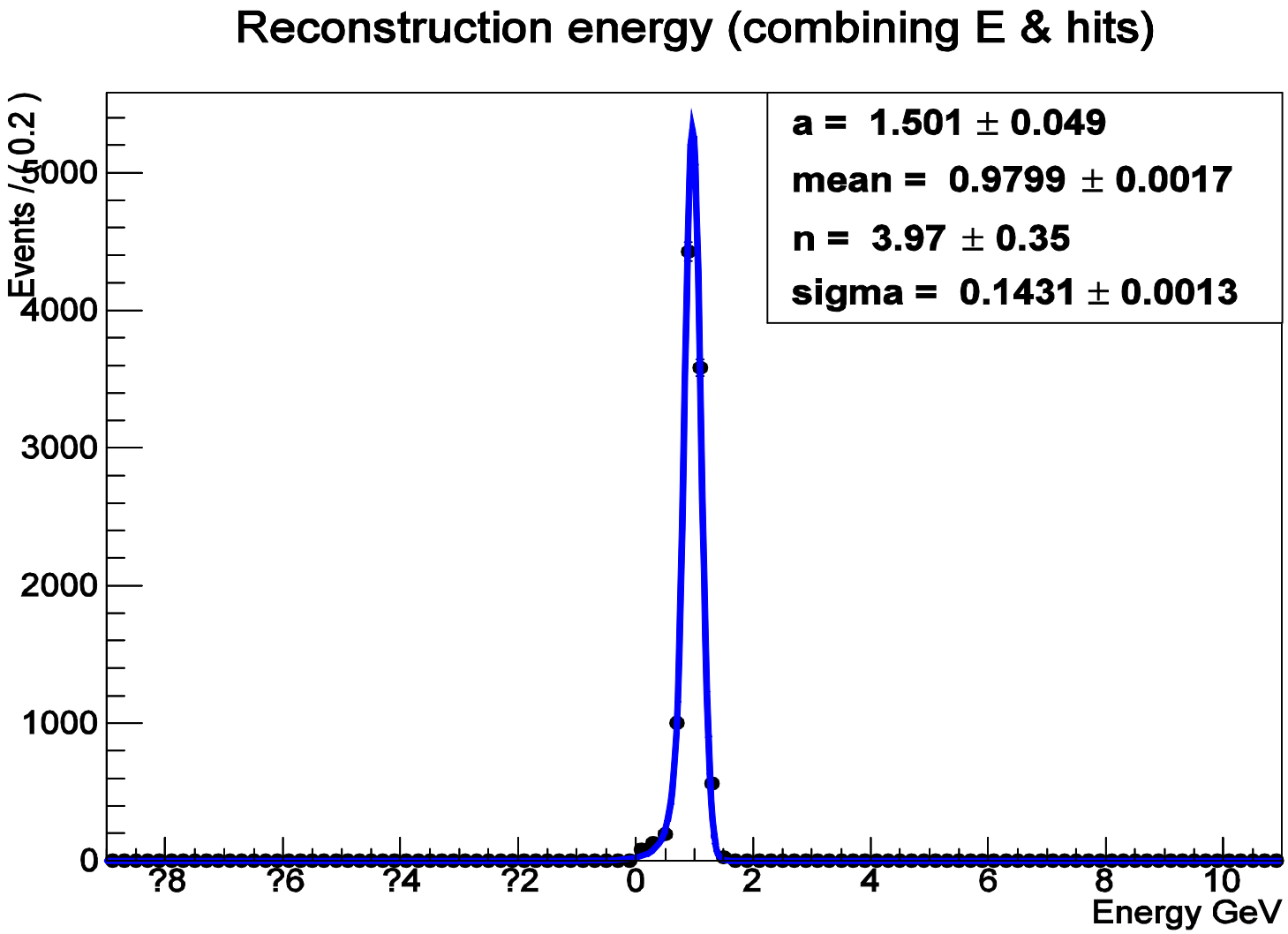




back up

Combining result in Ecal

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



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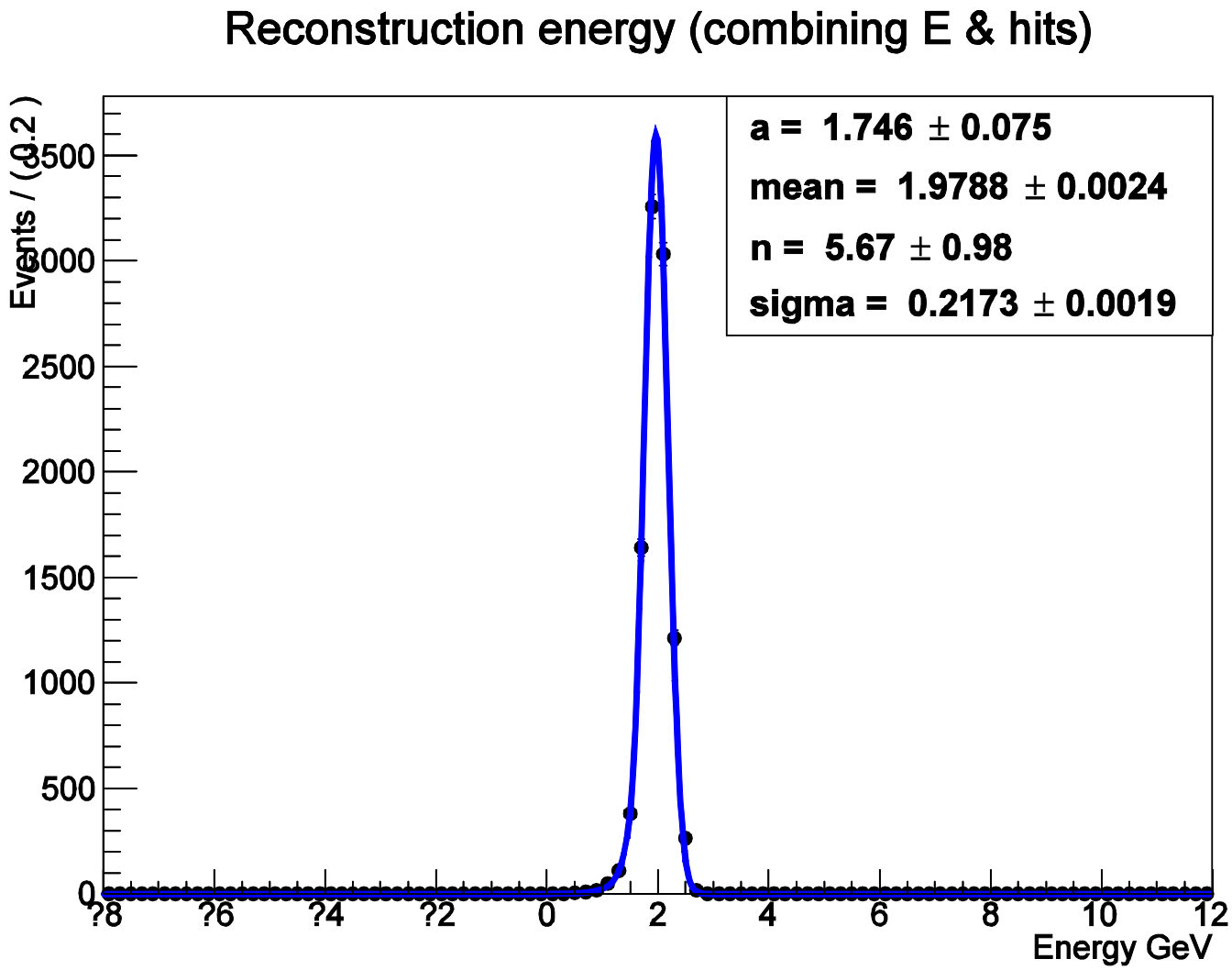

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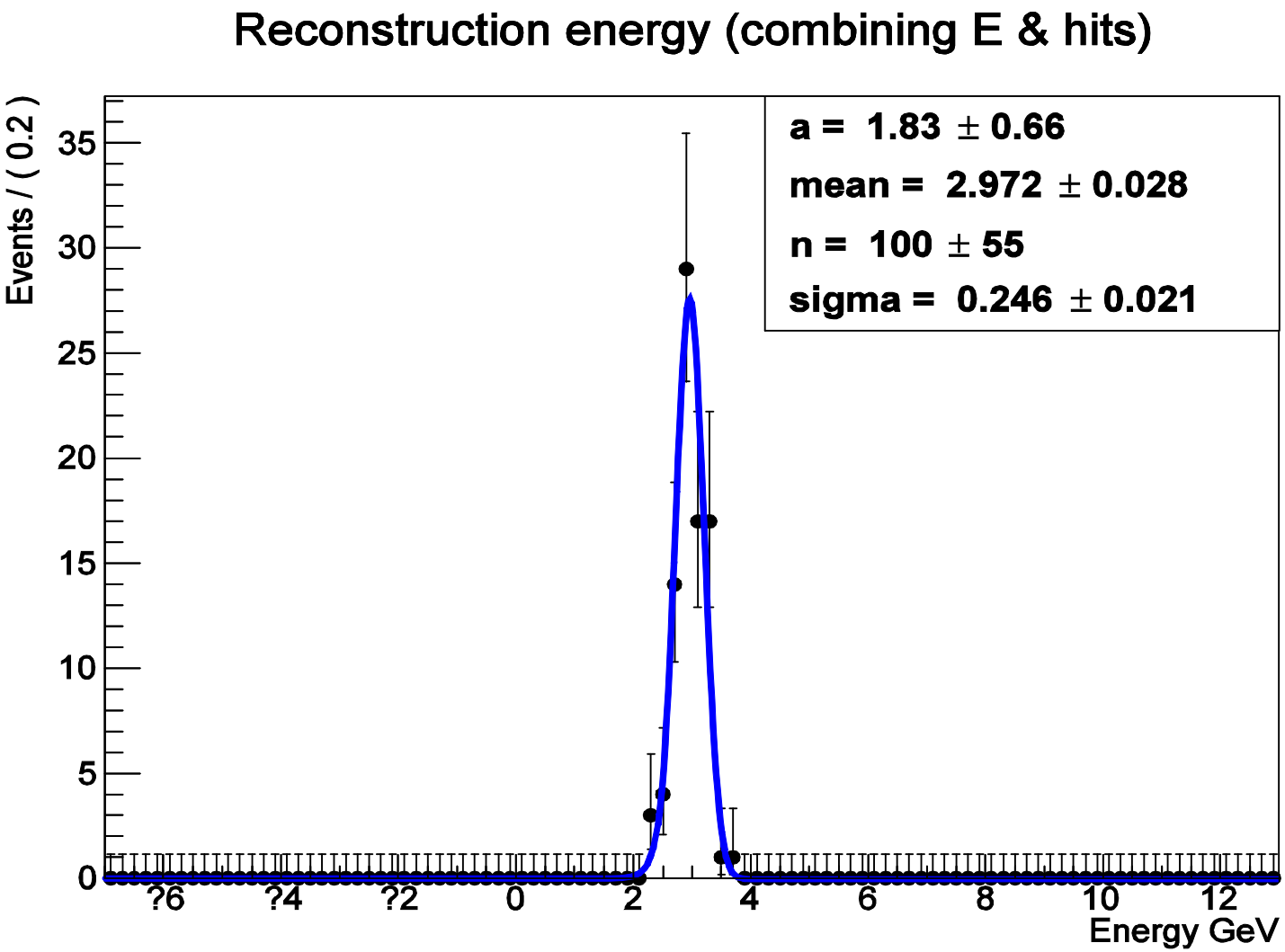

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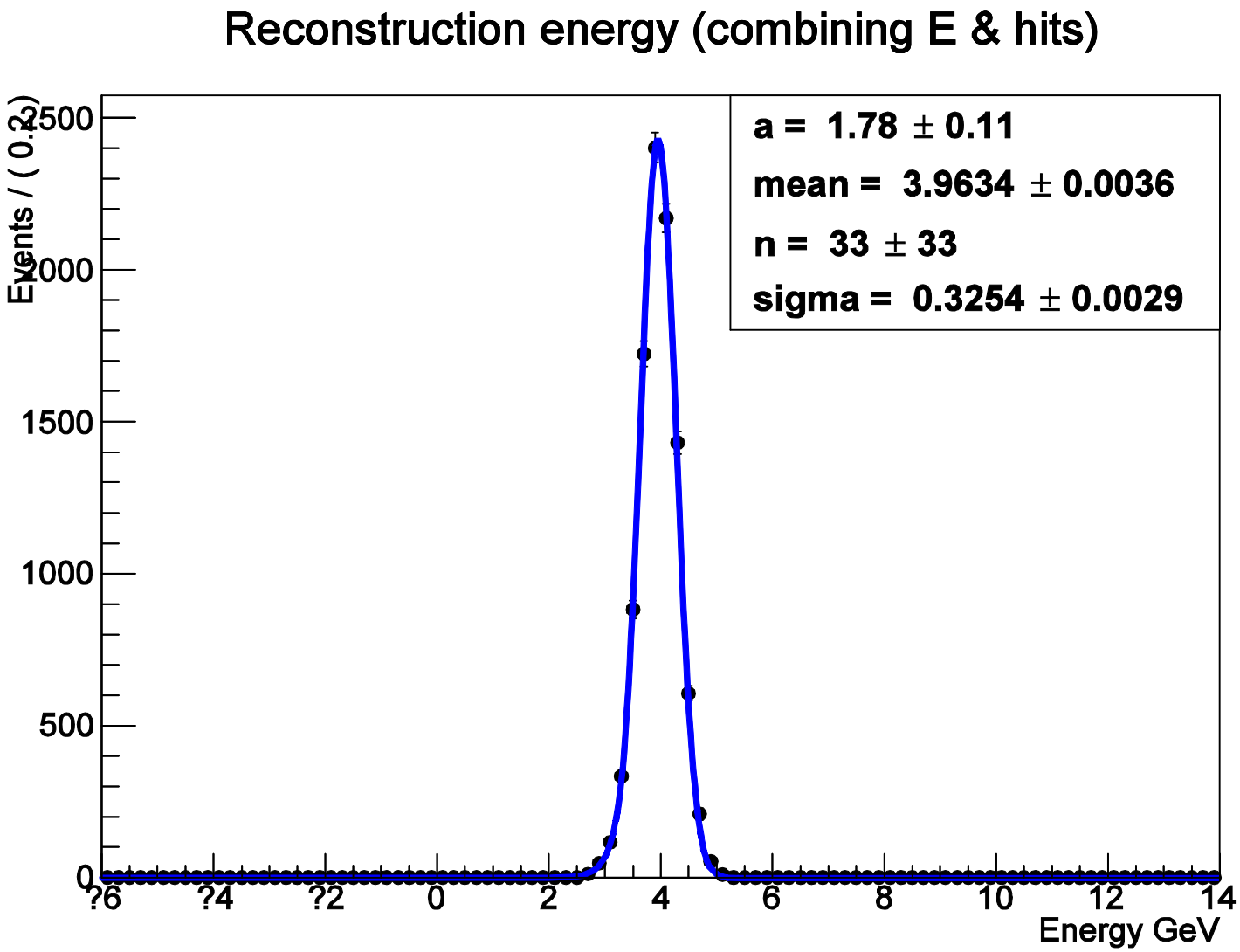

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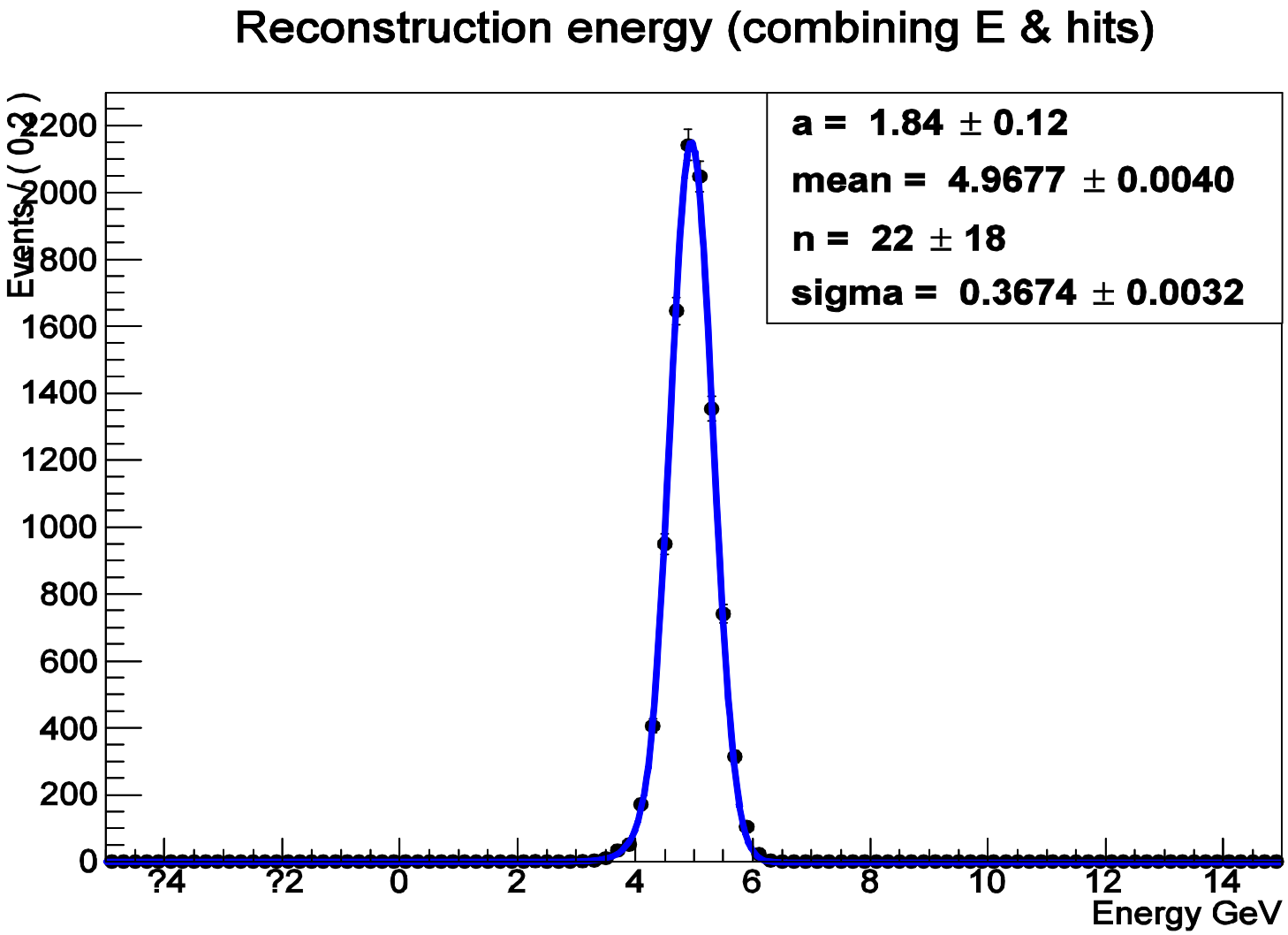

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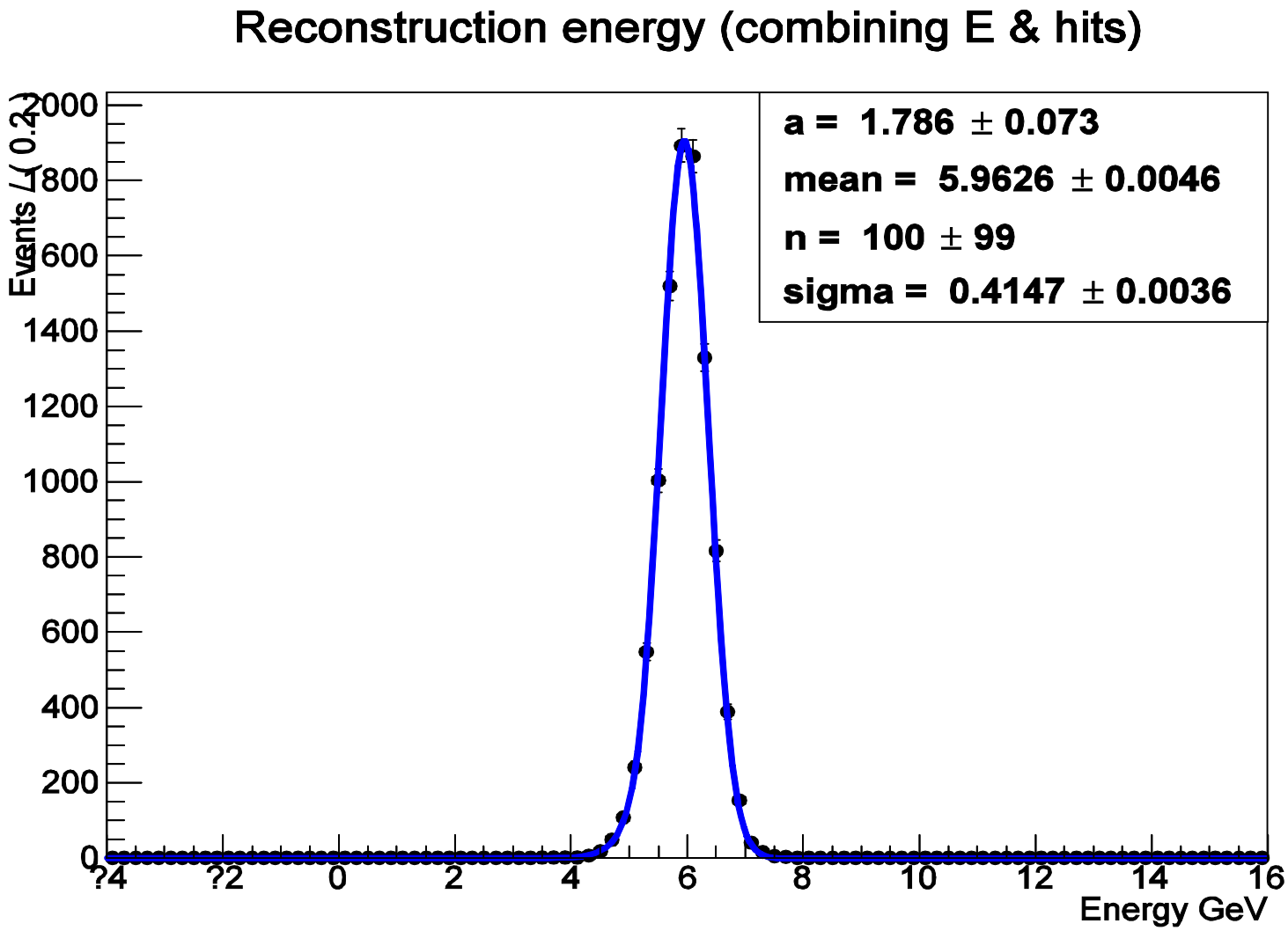

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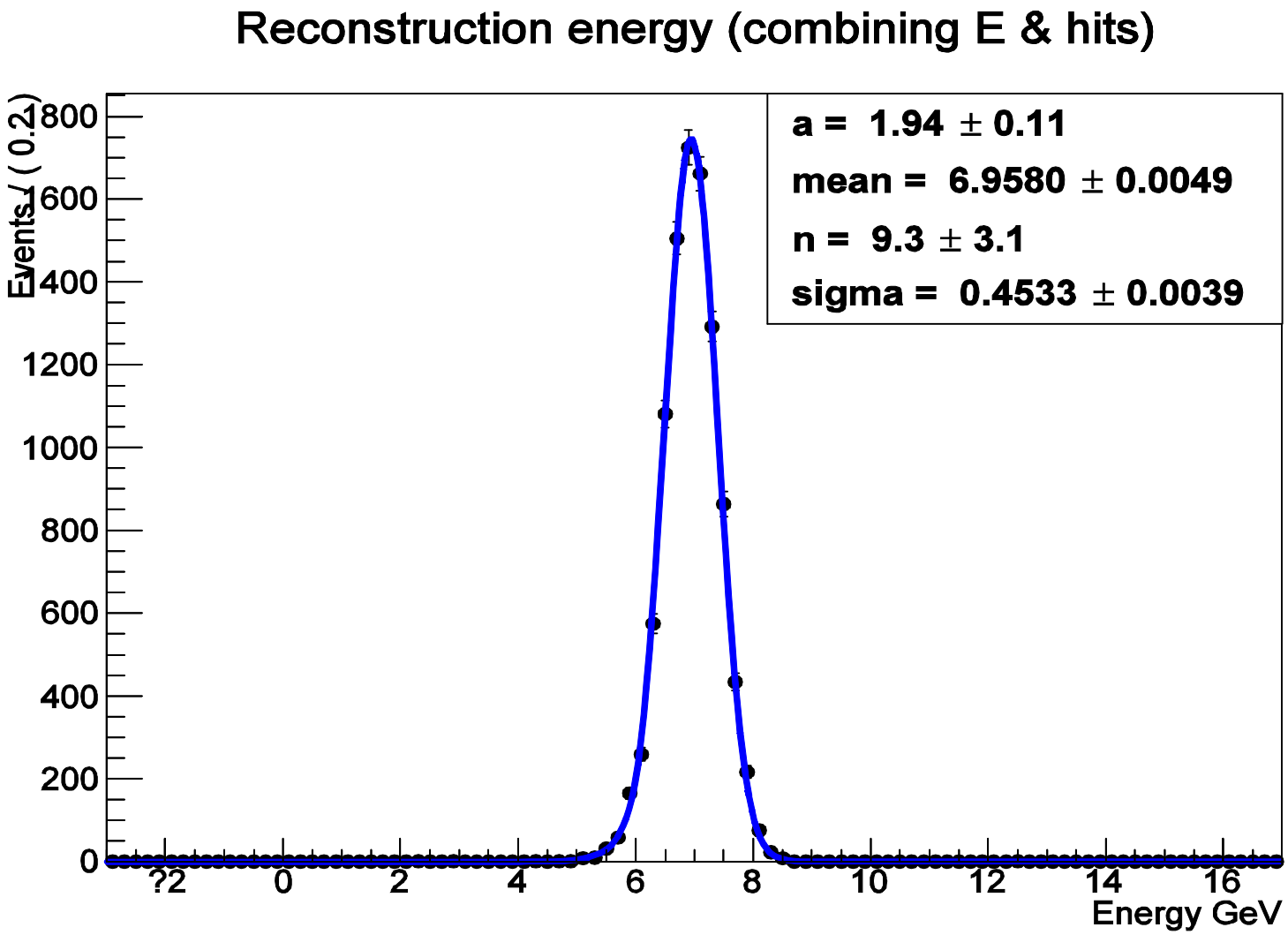

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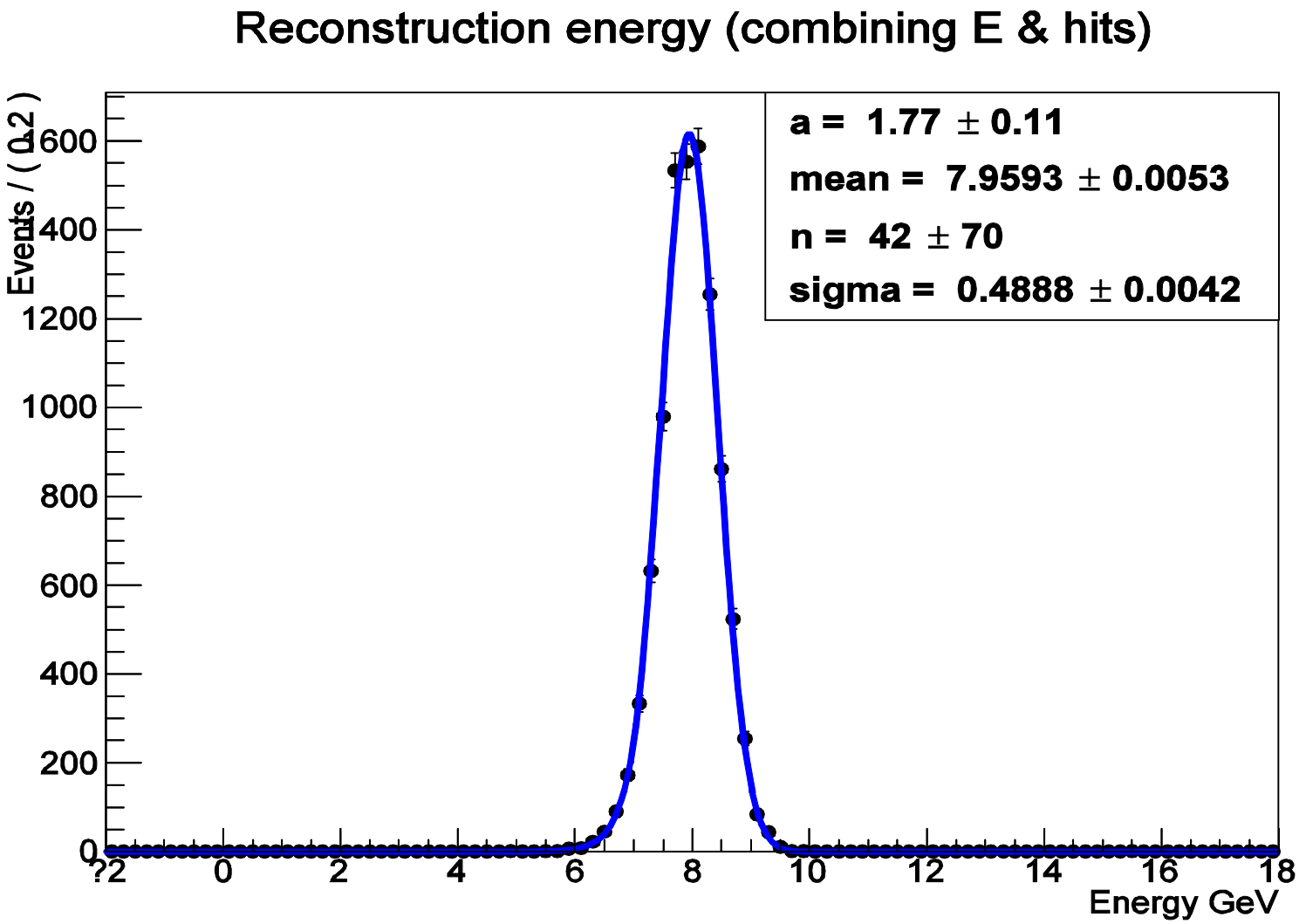

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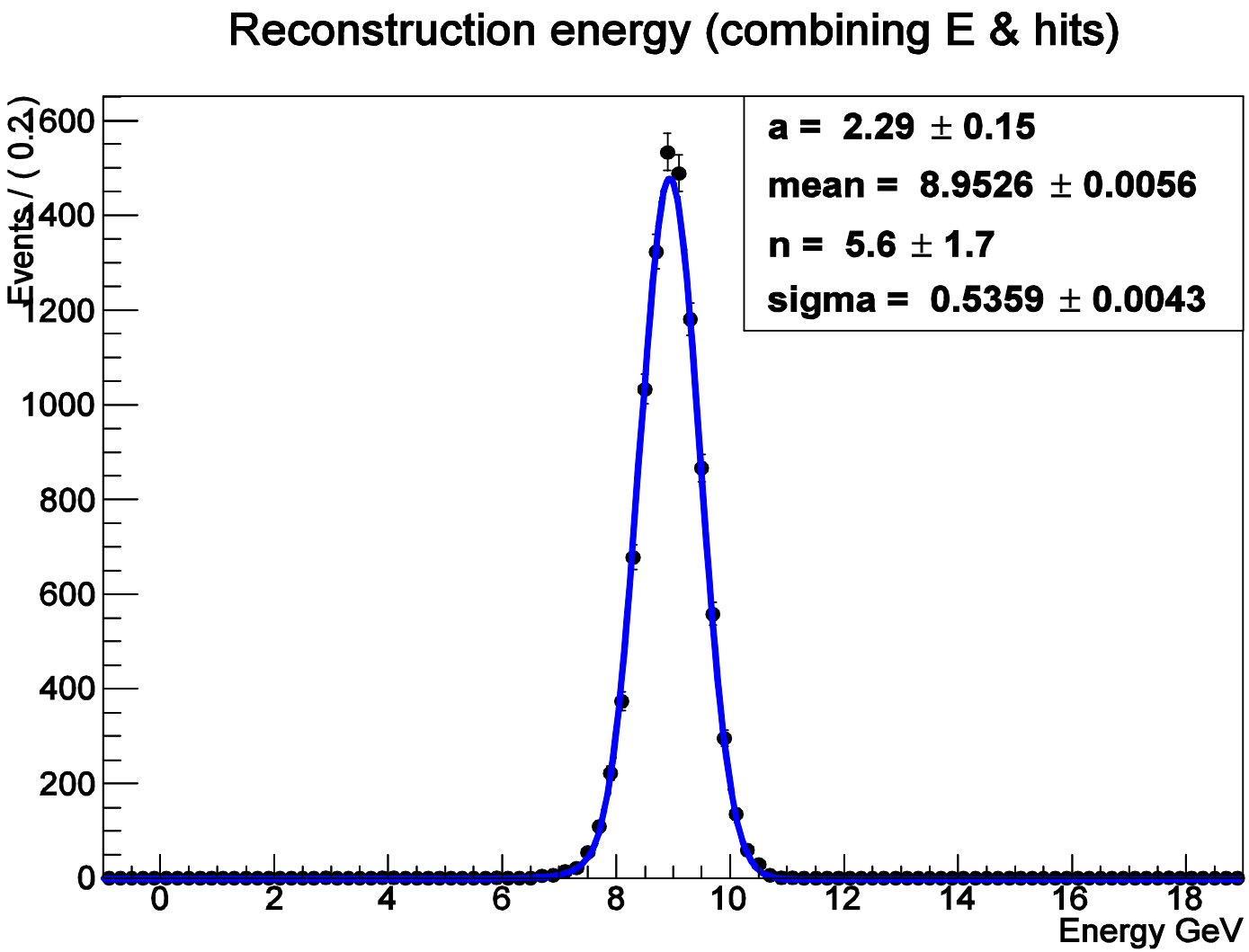

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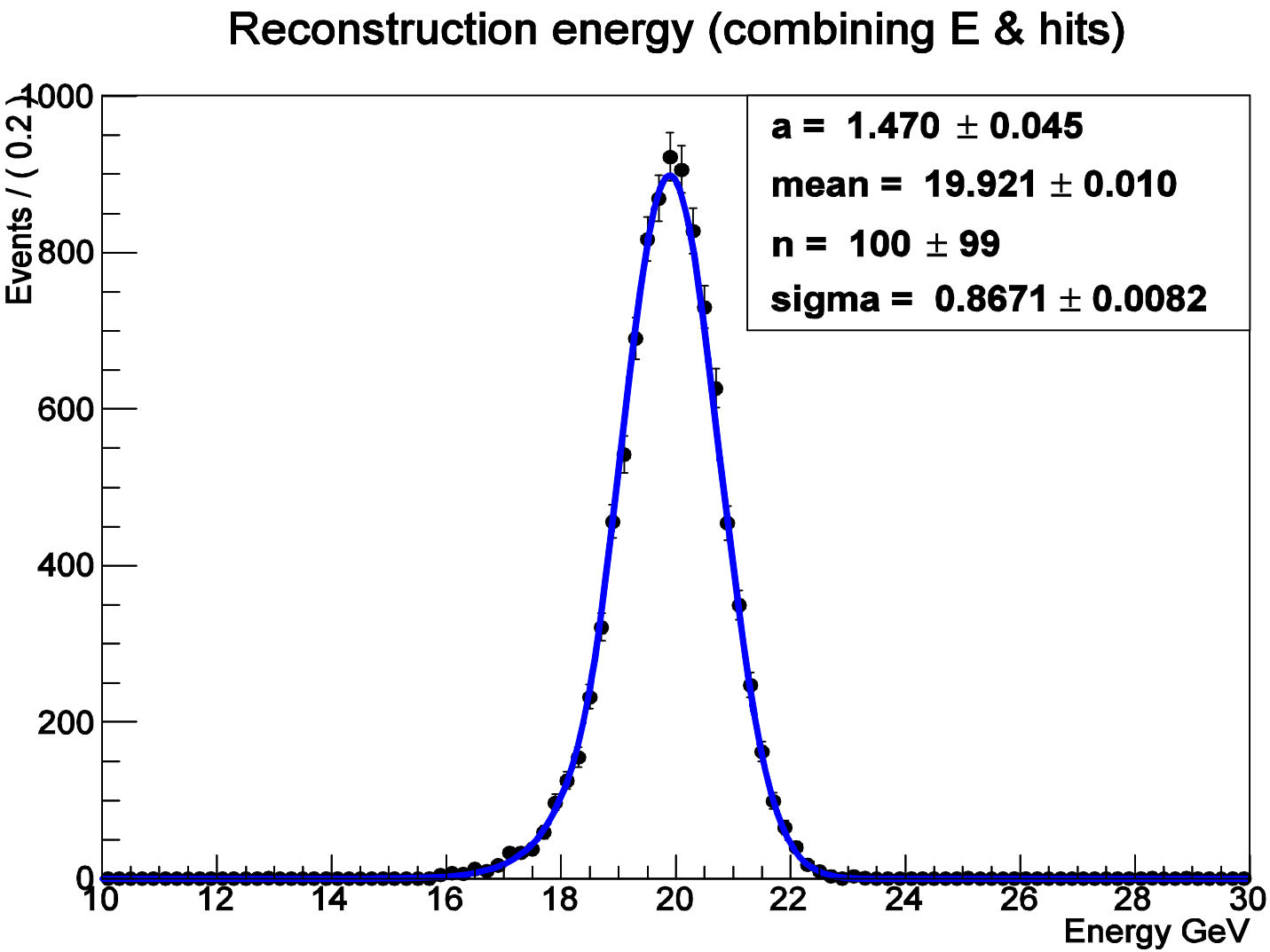

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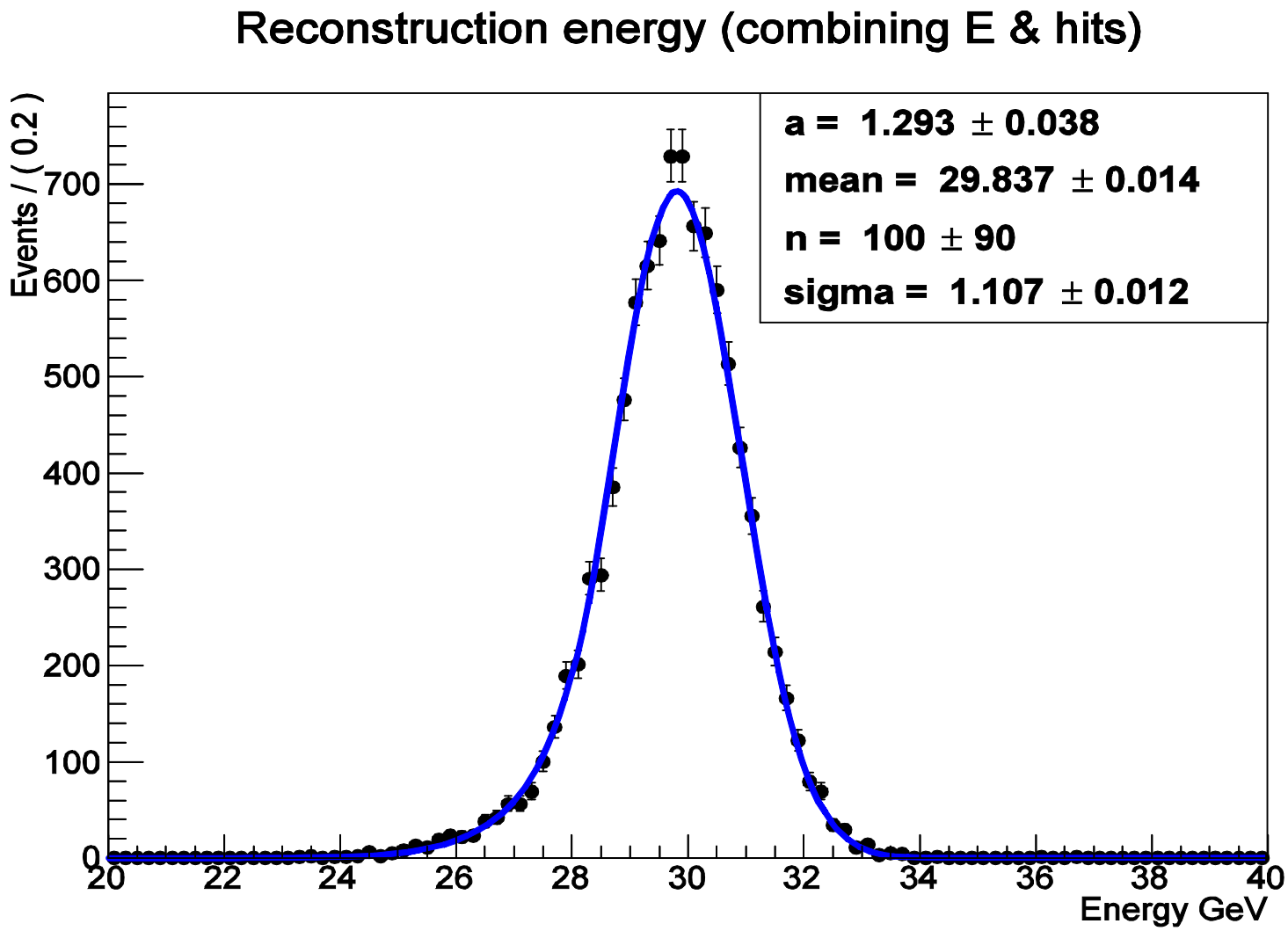

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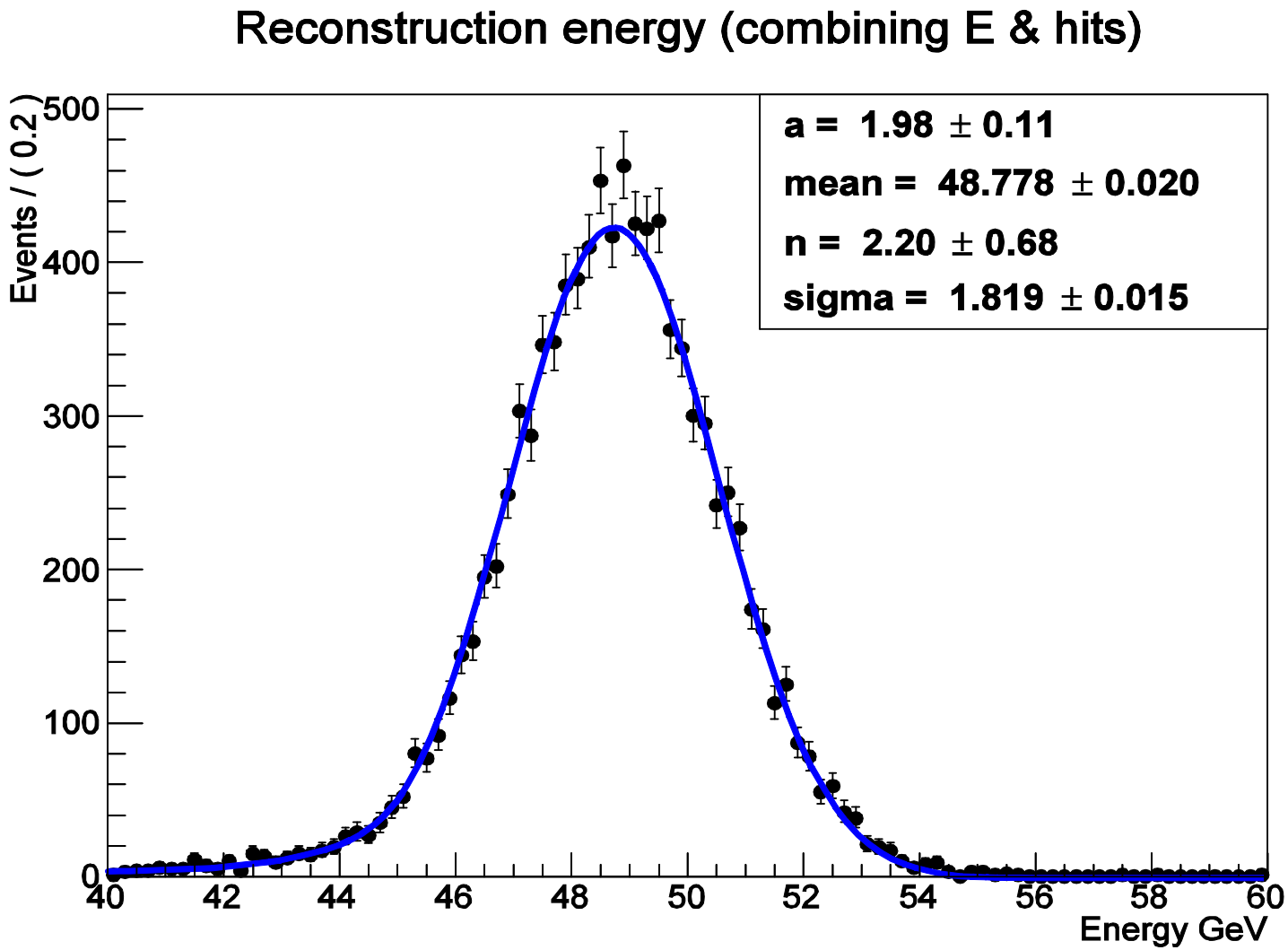

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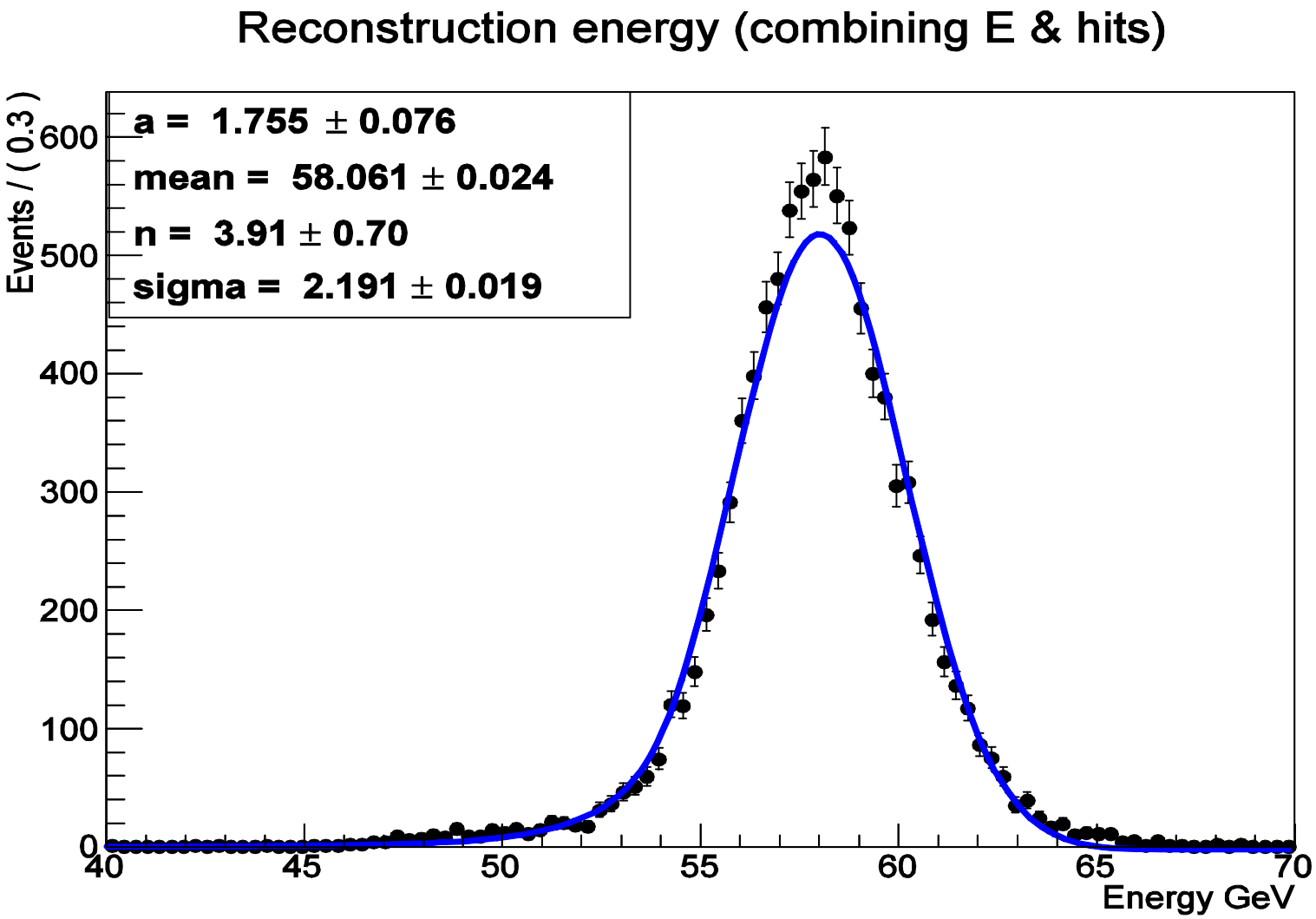

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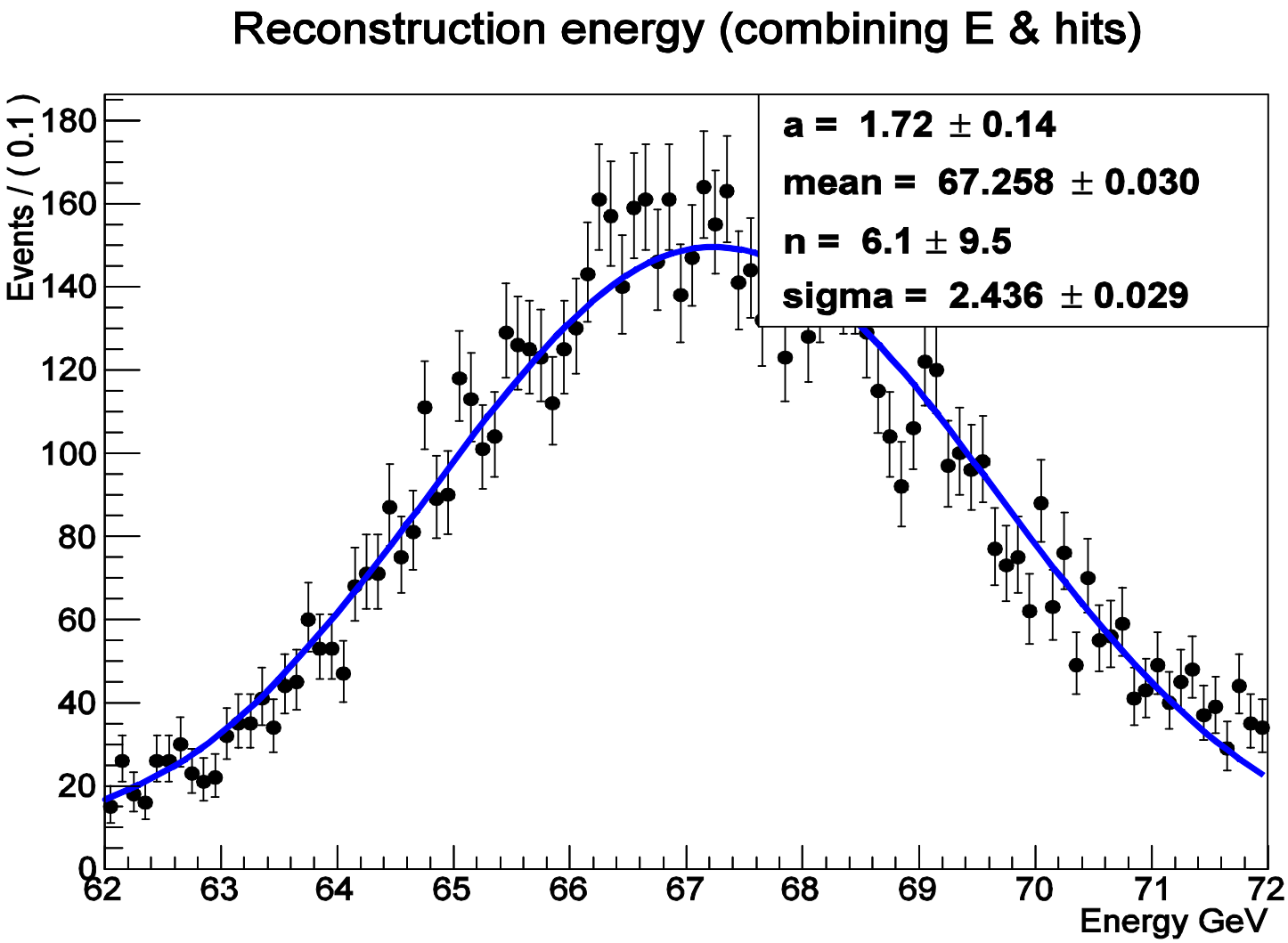

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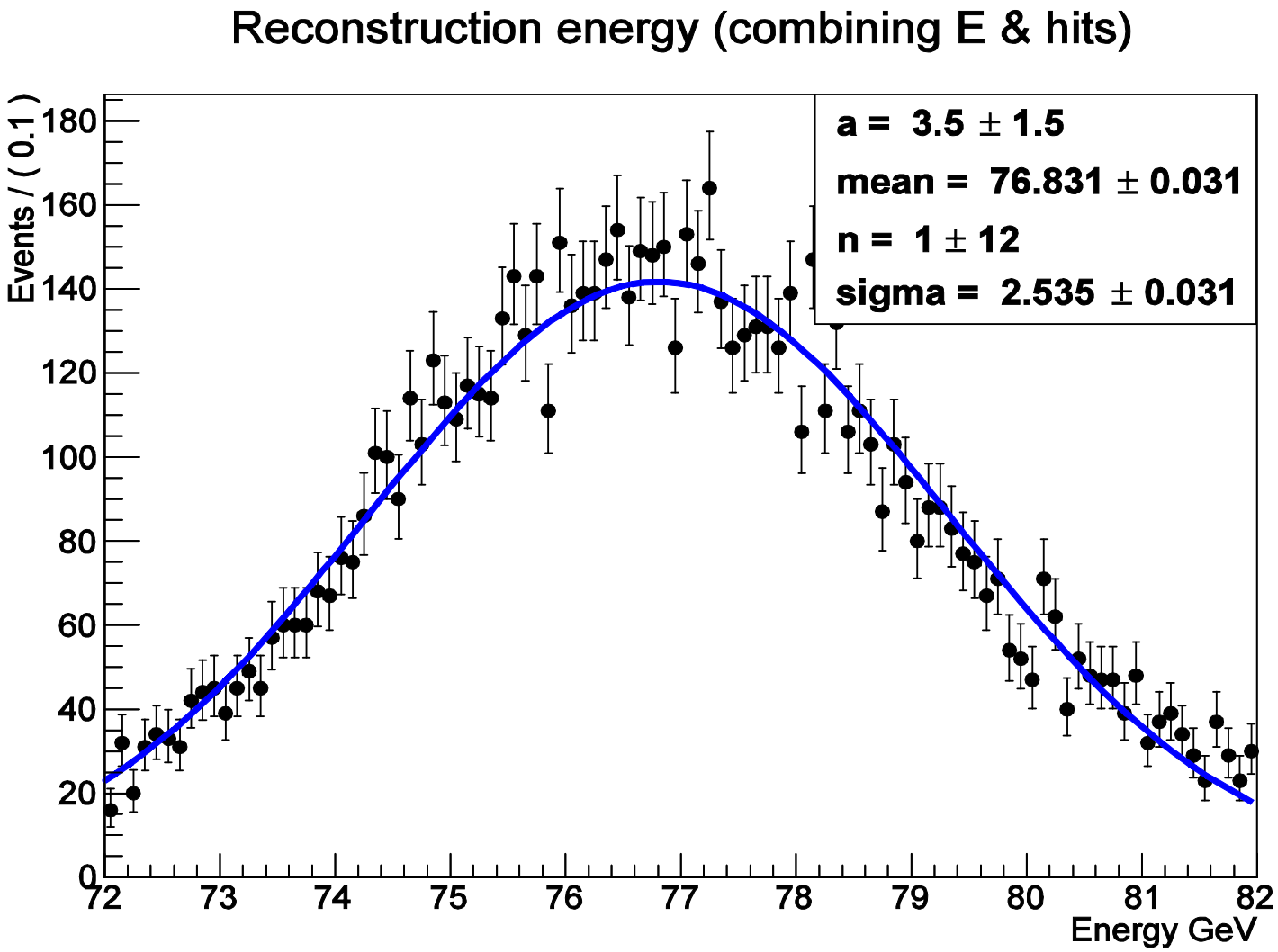

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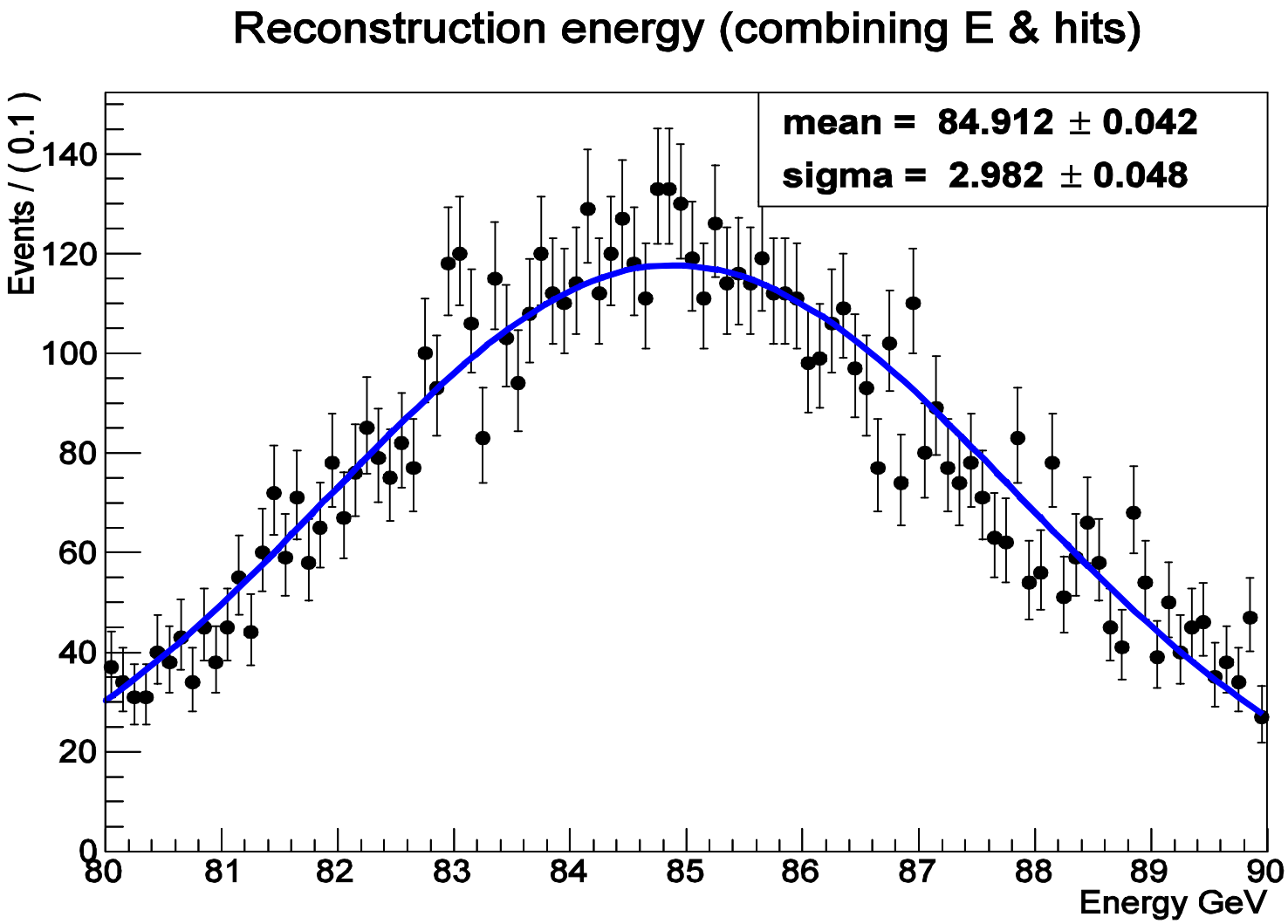

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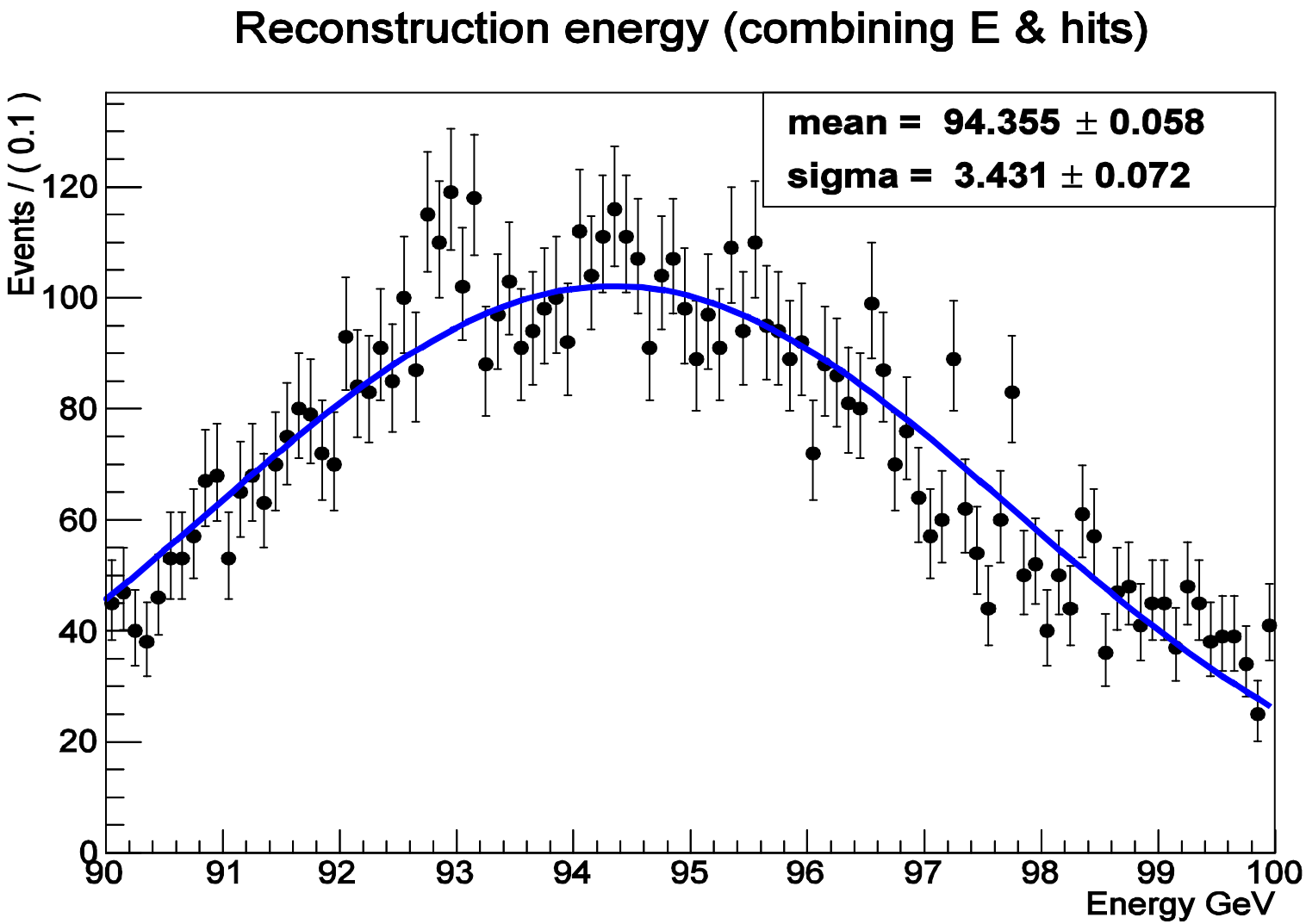
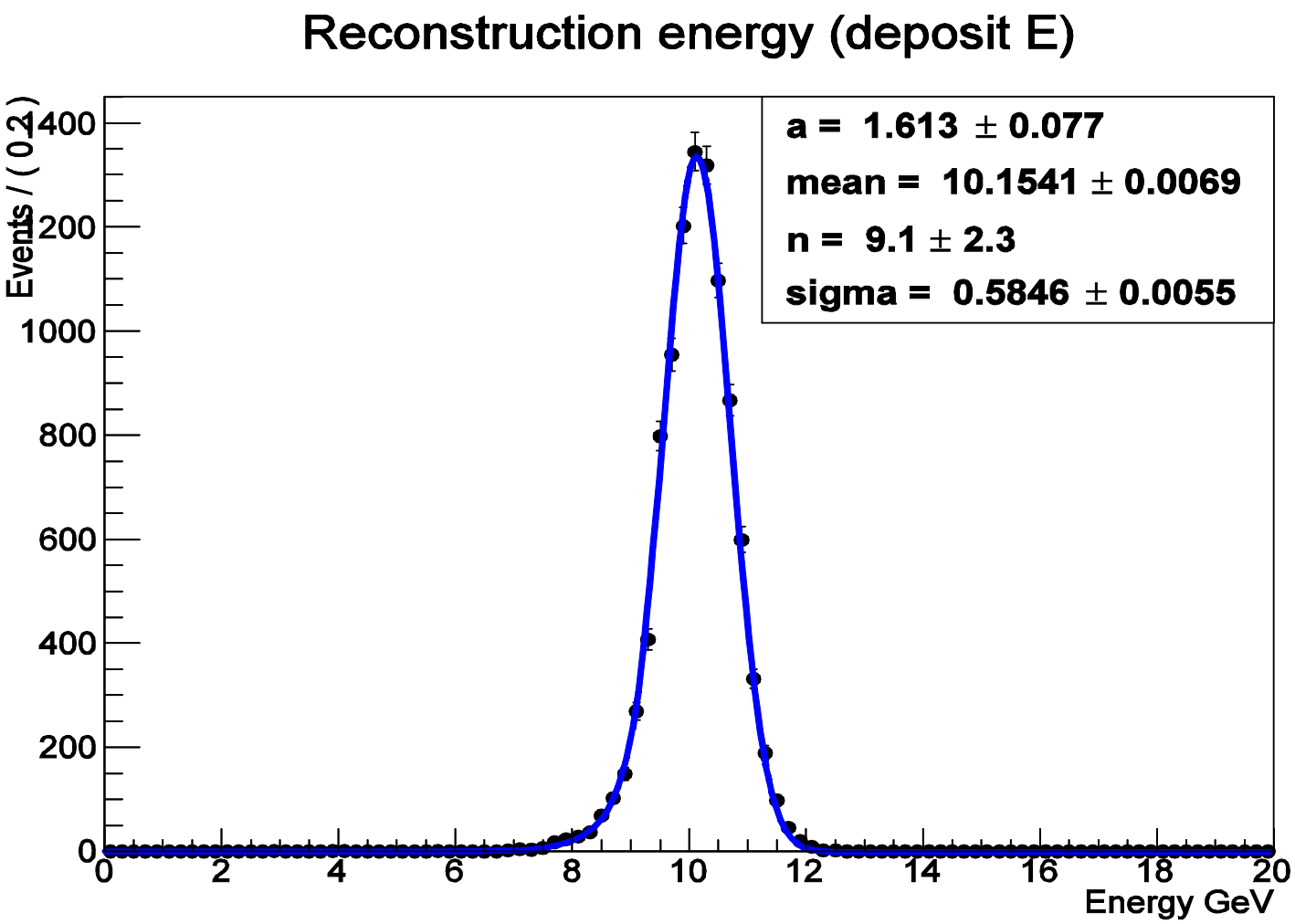


E_γ deposited (perfect cluster)

$$E_{meas}^{en} = a\left(f_1 E_{odd\,20} + \left(1-f_1\right)E_{even\,20}\right) + b\left(f_2 E_{odd\,10} + \left(1-f_2\right)E_{even\,10}\right)$$



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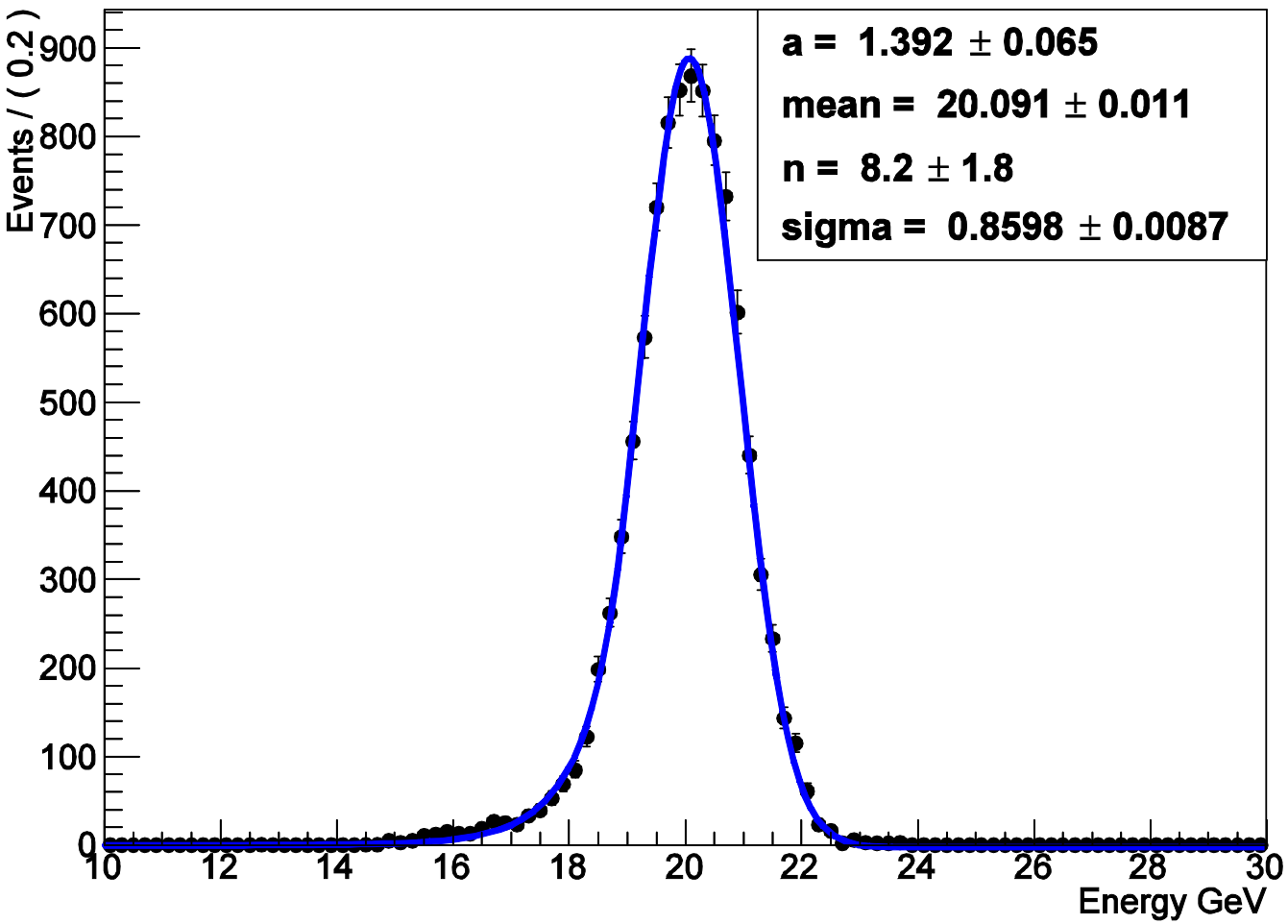
Reconstruction energy (deposit E)



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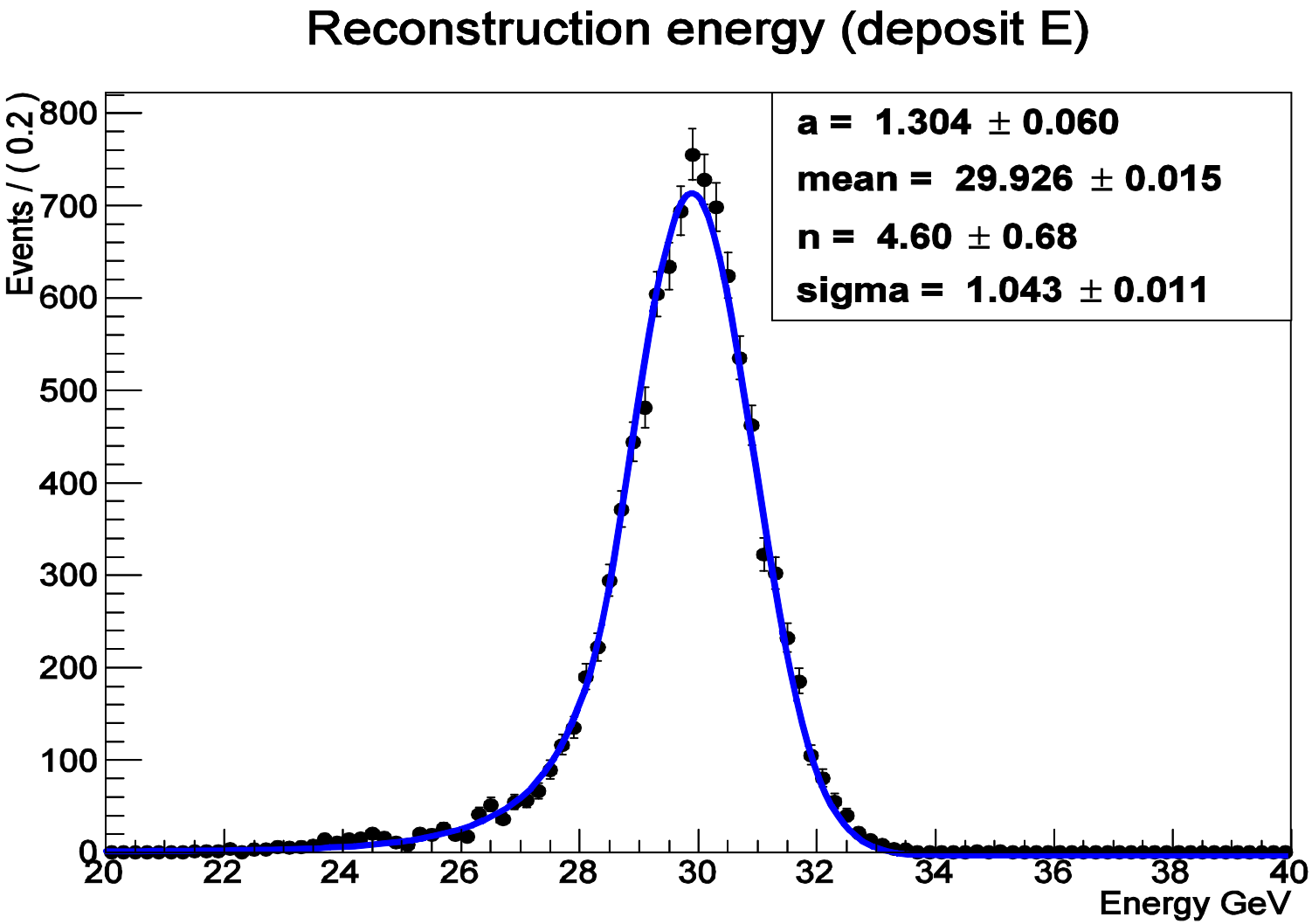

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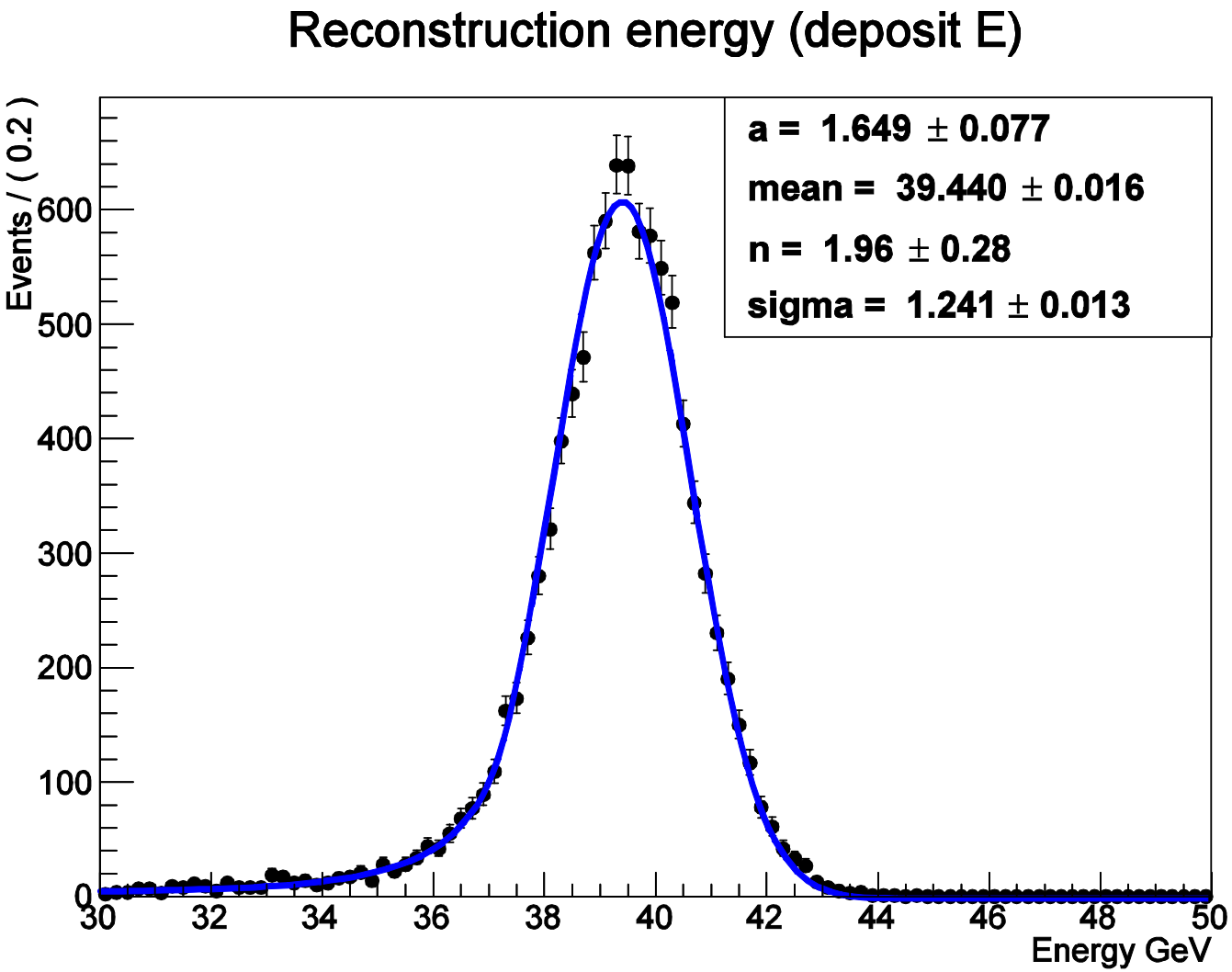
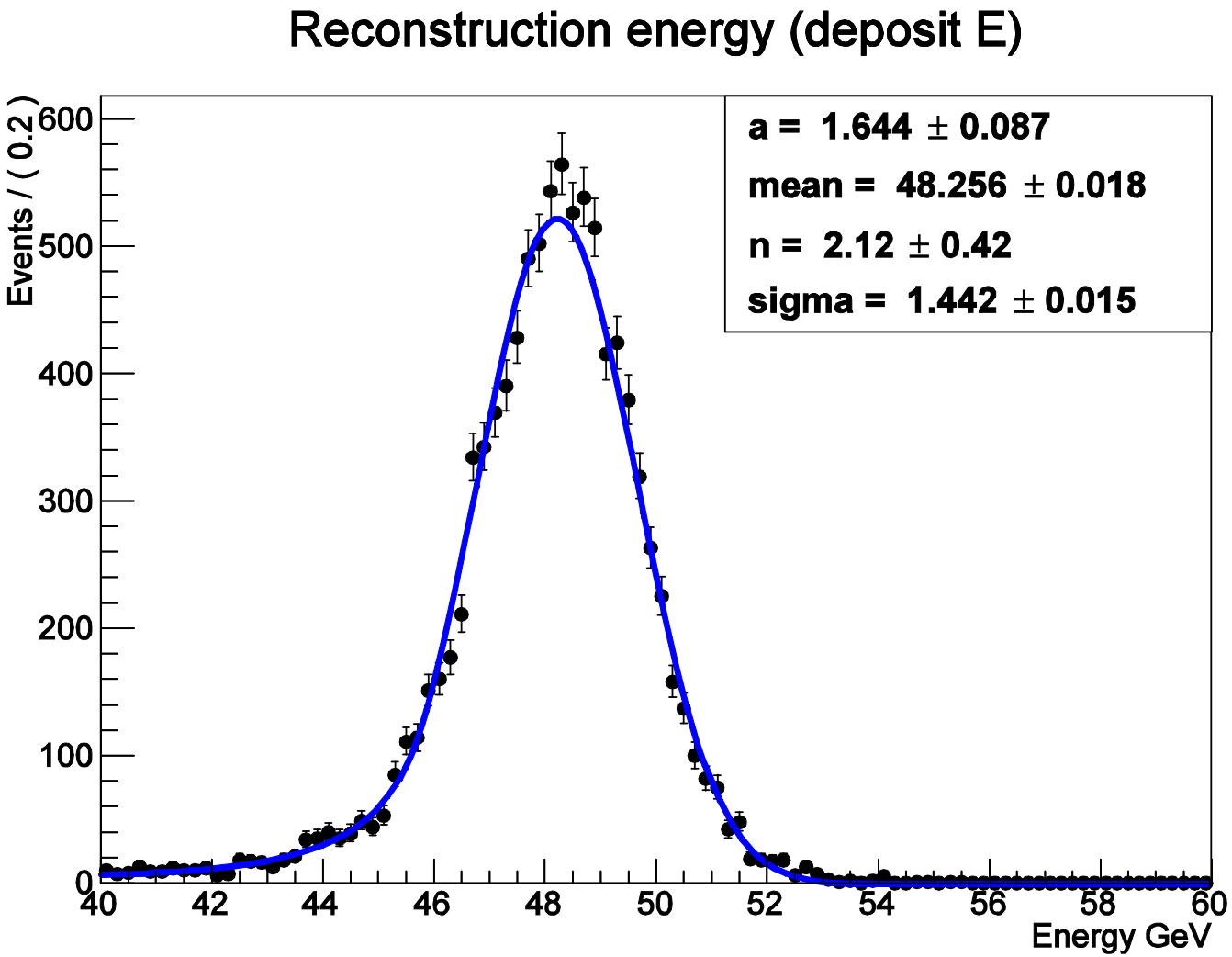


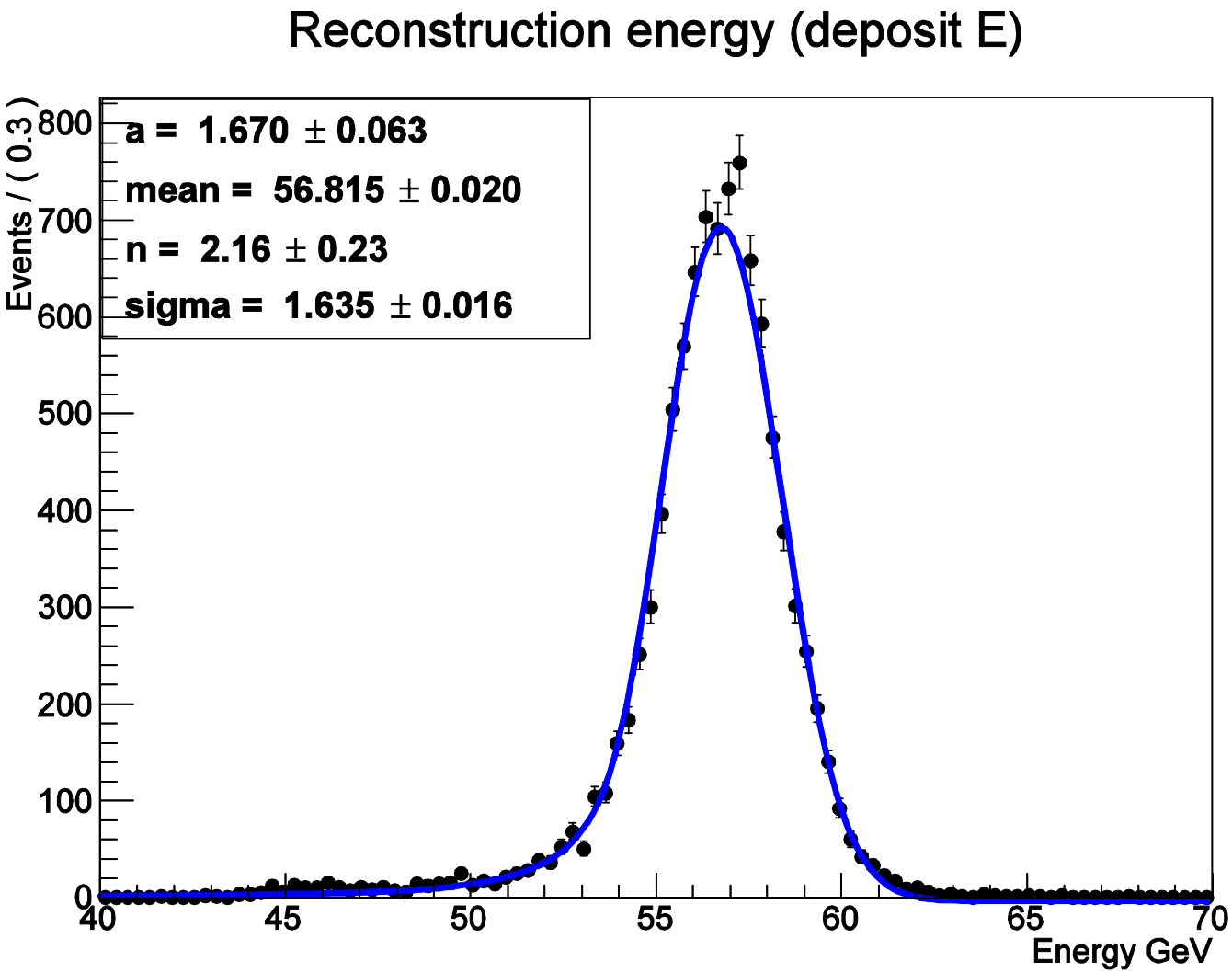
E_γ deposited (perfect cluster)

$$E_{meas}^{en} = a\left(f_1 E_{odd\,20} + \left(1-f_1\right)E_{even\,20}\right) + b\left(f_2 E_{odd\,10} + \left(1-f_2\right)E_{even\,10}\right)$$



E_γ deposited (perfect cluster)

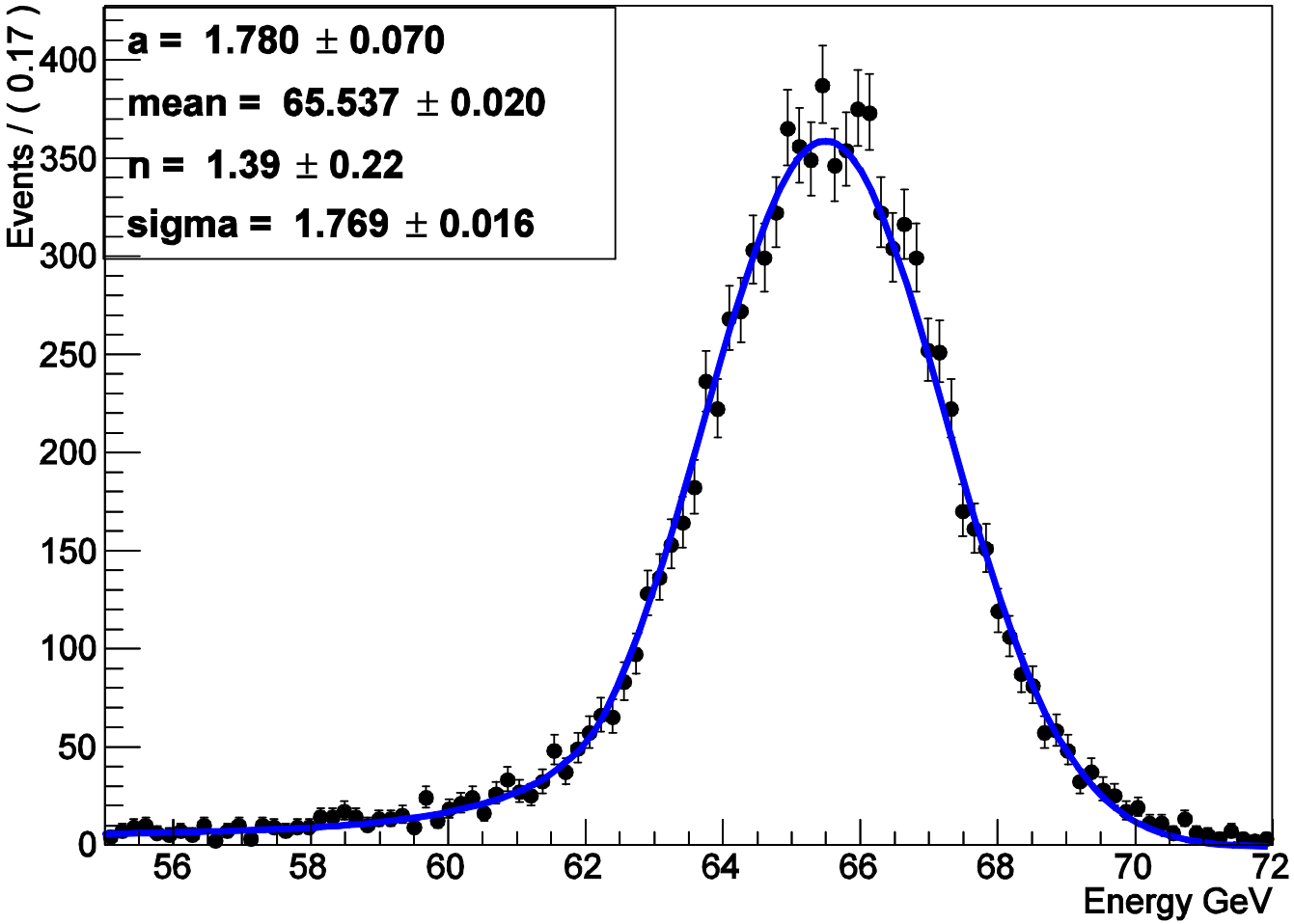
$$E_{meas}^{en} = a\left(f_1 E_{odd20} + (1-f_1) E_{even20}\right) + b\left(f_2 E_{odd10} + (1-f_2) E_{even10}\right)$$



E_γ deposited (perfect cluster)

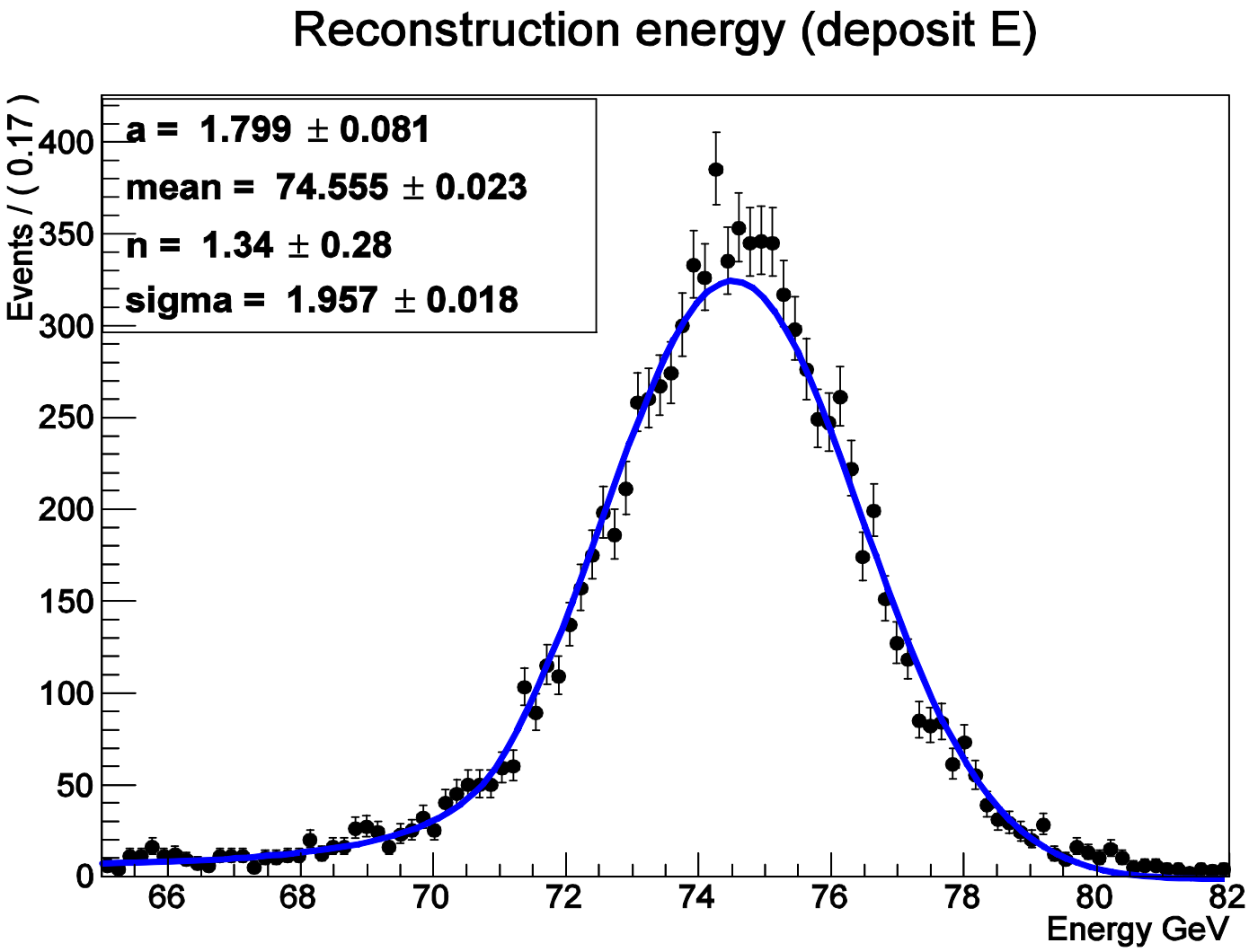
$$E_{meas}^{en} = a\left(f_1 E_{odd\,20} + \left(1-f_1\right)E_{even\,20}\right) + b\left(f_2 E_{odd\,10} + \left(1-f_2\right)E_{even\,10}\right)$$

Reconstruction energy (deposit E)



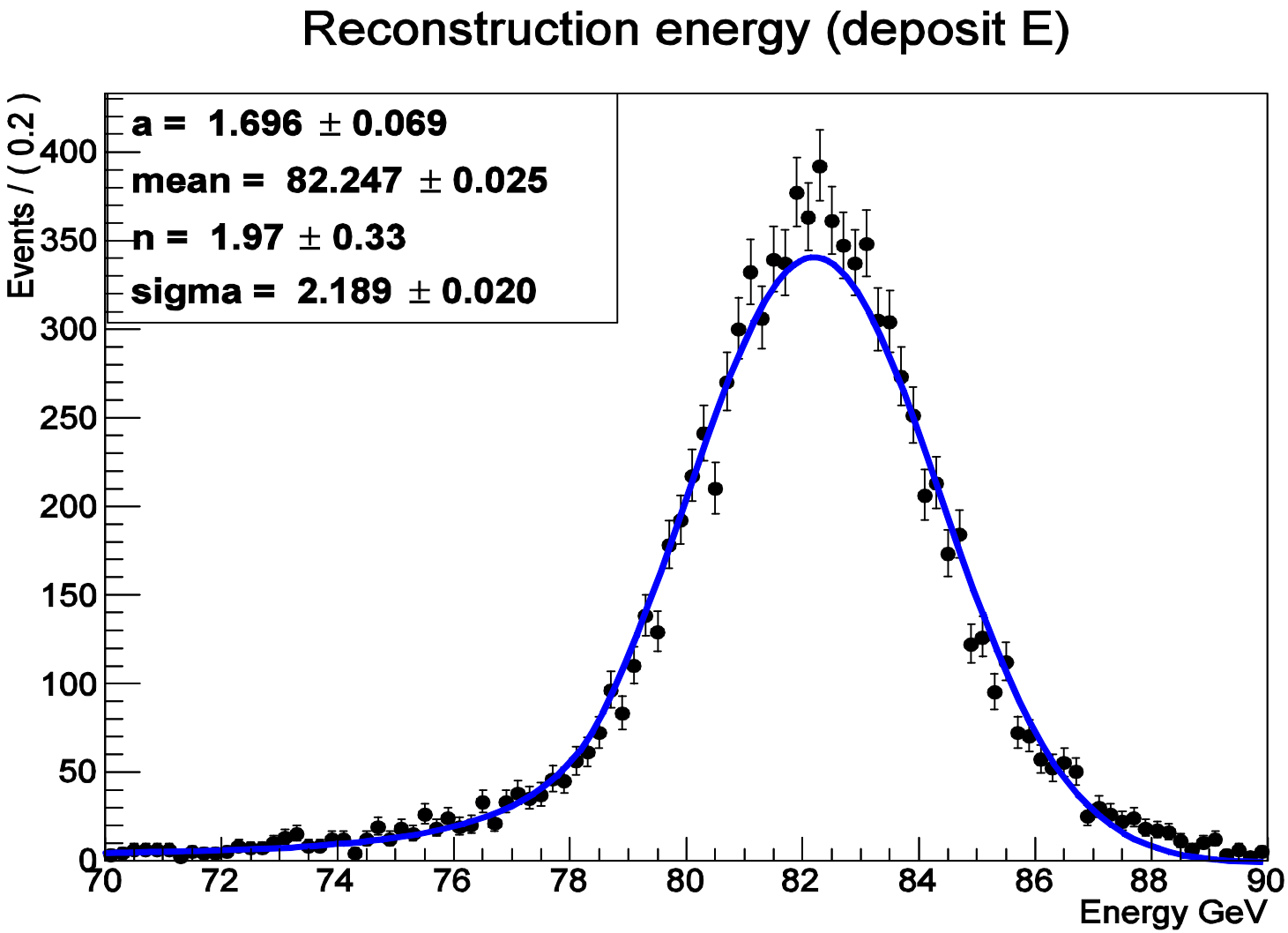
E_γ deposited (perfect cluster)

$$E_{meas}^{en} = a\left(f_1 E_{odd\,20} + \left(1-f_1\right)E_{even\,20}\right) + b\left(f_2 E_{odd\,10} + \left(1-f_2\right)E_{even\,10}\right)$$



E_γ deposited (perfect cluster)

$$E_{meas}^{en} = a\left(f_1 E_{odd\,20} + \left(1-f_1\right)E_{even\,20}\right) + b\left(f_2 E_{odd\,10} + \left(1-f_2\right)E_{even\,10}\right)$$



E_γ deposited (perfect cluster)

$$E_{meas}^{en} = a\left(f_1 E_{odd\,20} + \left(1-f_1\right)E_{even\,20}\right) + b\left(f_2 E_{odd\,10} + \left(1-f_2\right)E_{even\,10}\right)$$