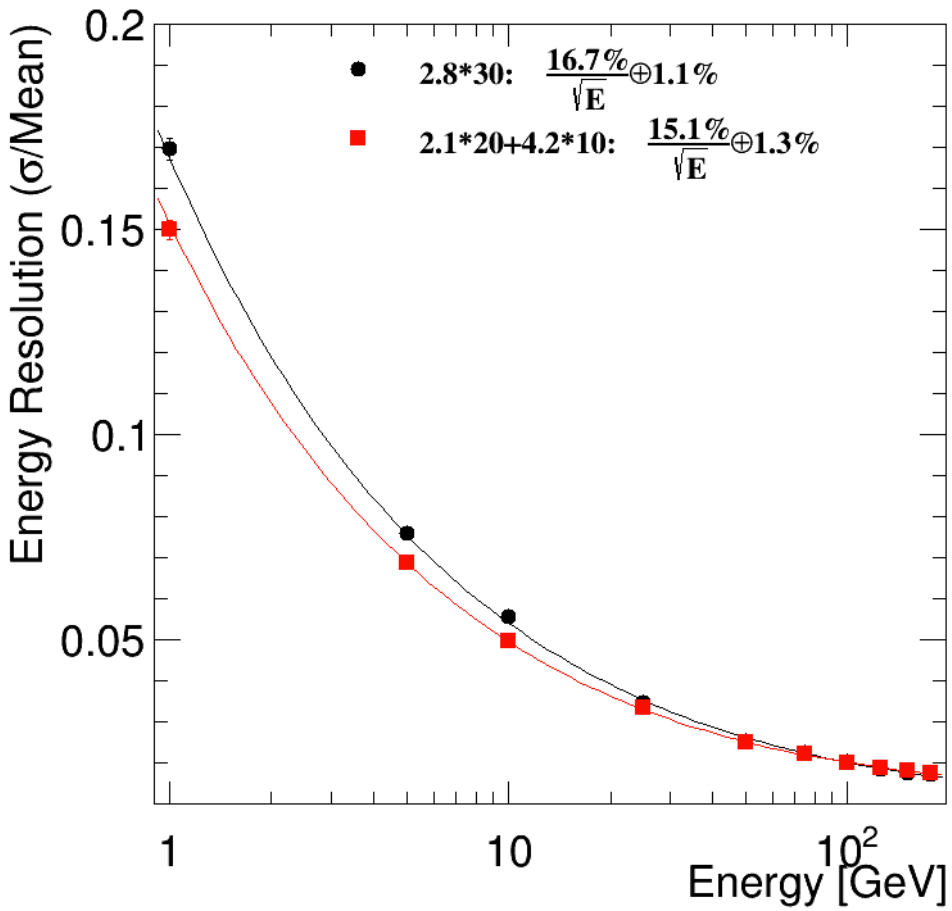
Work progress

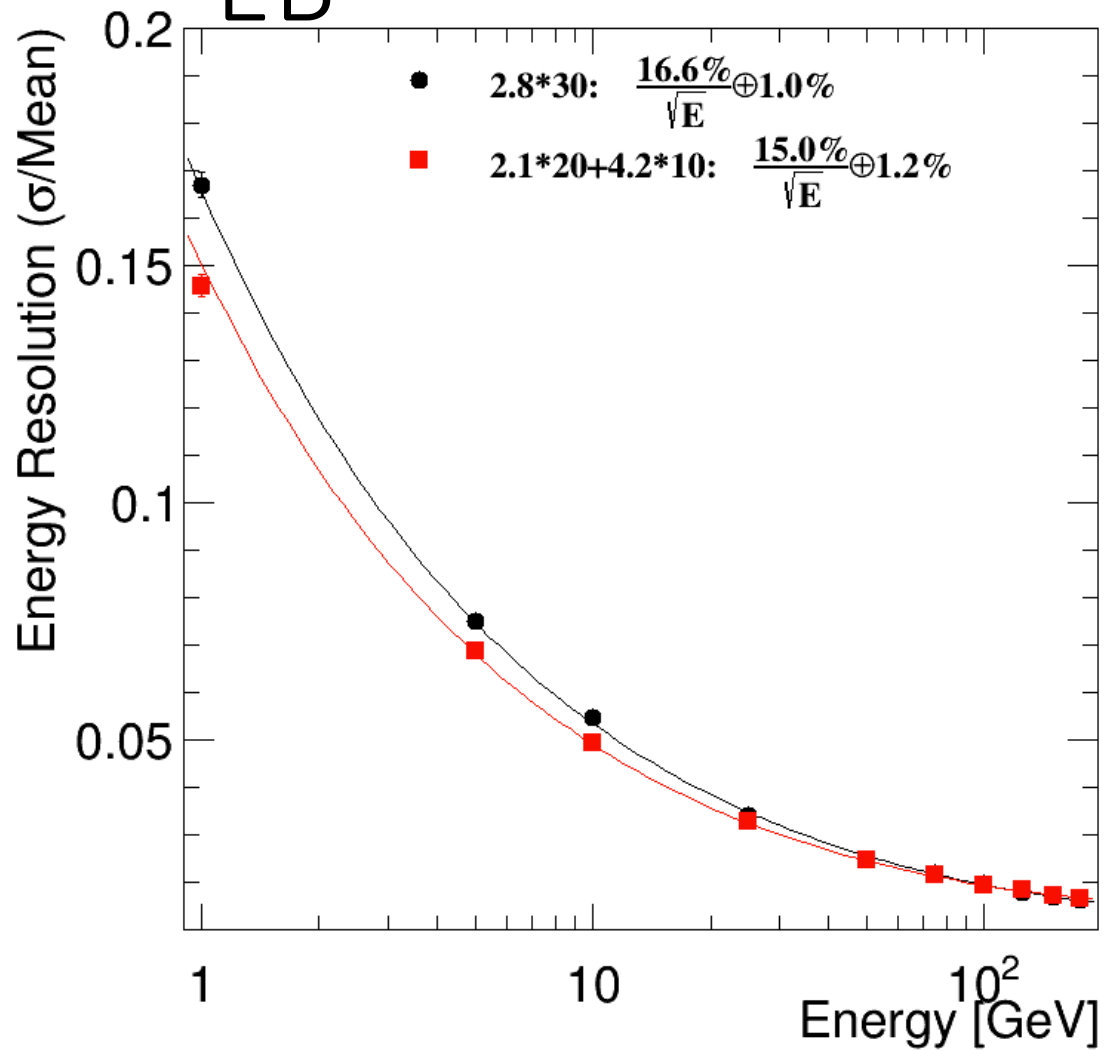
Photon energy correction

Resolution and Linearity at simplified Geometry

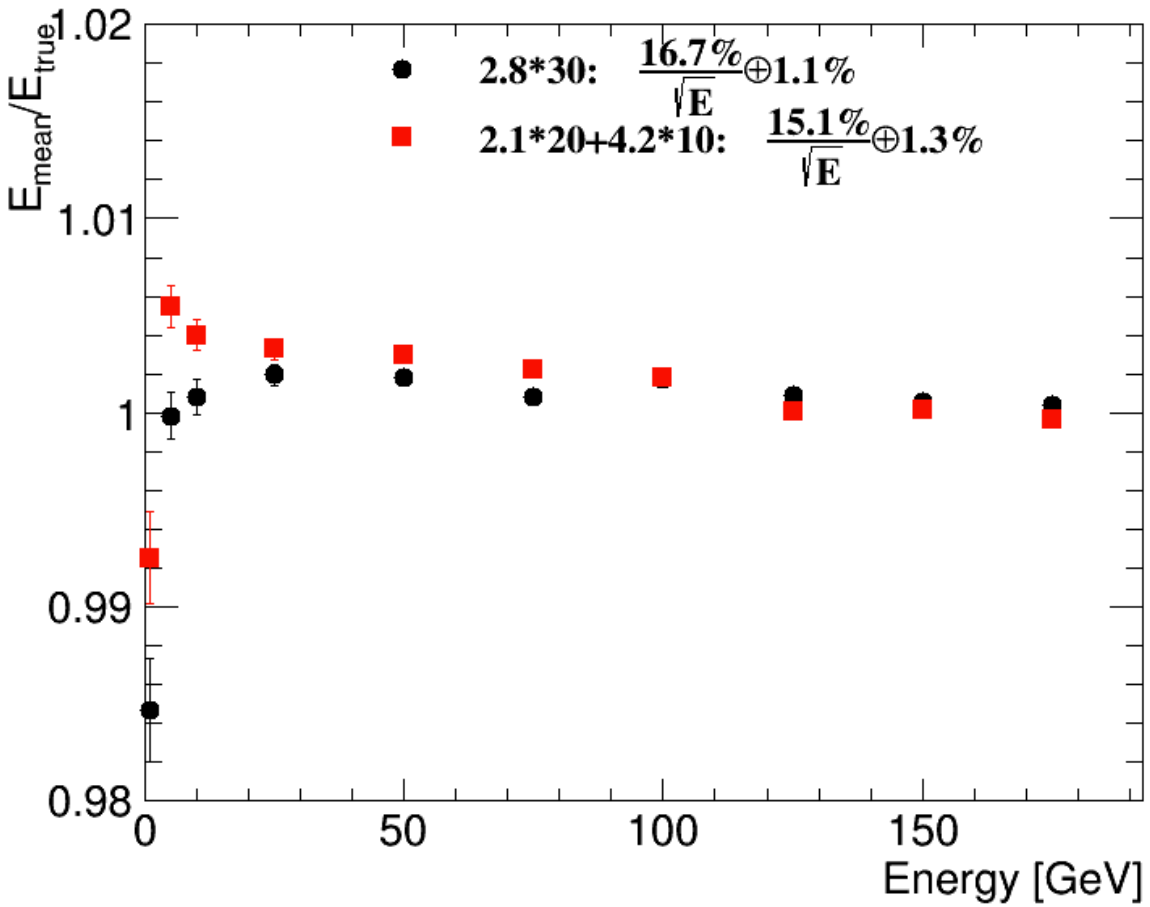
EB+EE


Energy Resolution (σ/Mean)
0.2
0.15
0.1
0.05
1
10
10^2
Energy [GeV]
2.8*30: $\frac{16.7\%}{\sqrt{E}} \oplus 1.1\%$
2.1*20+4.2*10: $\frac{15.1\%}{\sqrt{E}} \oplus 1.3\%$

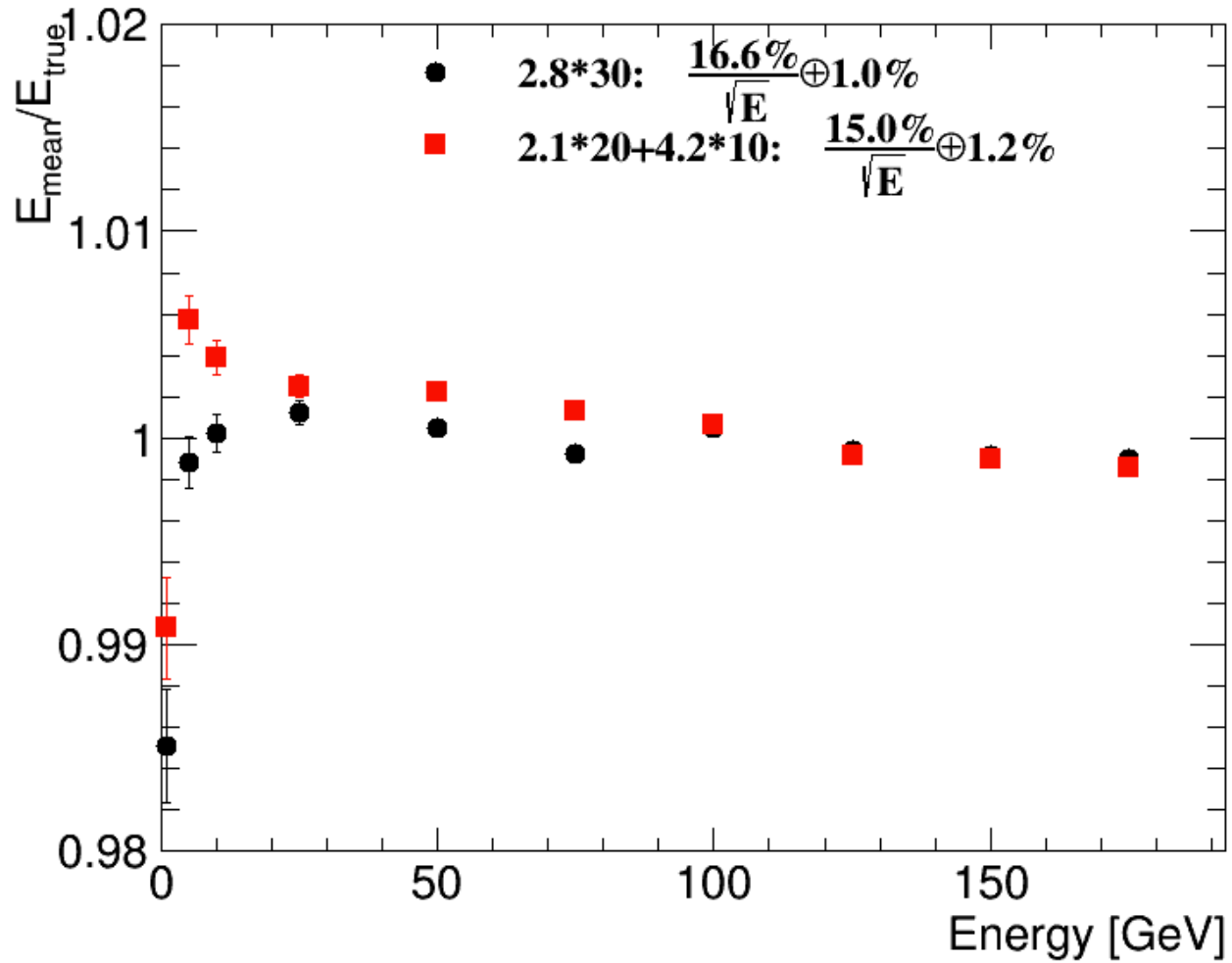
EB


Energy Resolution (σ/Mean)
0.2
0.15
0.1
0.05
1
10
10^2
Energy [GeV]
2.8*30: $\frac{16.6\%}{\sqrt{E}} \oplus 1.0\%$
2.1*20+4.2*10: $\frac{15.0\%}{\sqrt{E}} \oplus 1.2\%$

EB+EE

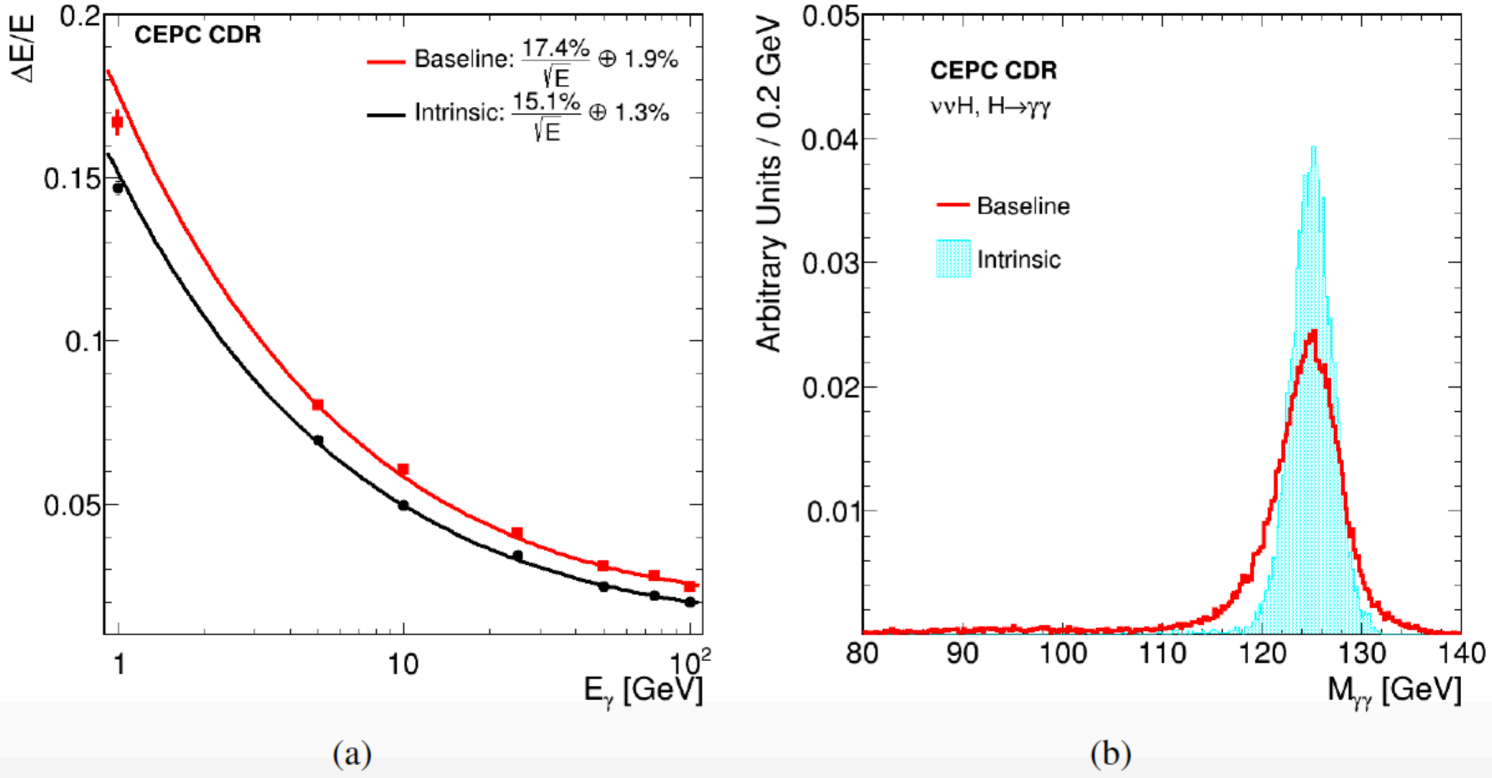

E_{mean}/E_{true}
1.02
1.01
1
0.99
0.98
0
50
100
150
Energy [GeV]
2.8*30: $\frac{16.7\%}{\sqrt{E}}\oplus 1.1\%$
2.1*20+4.2*10: $\frac{15.1\%}{\sqrt{E}}\oplus 1.3\%$

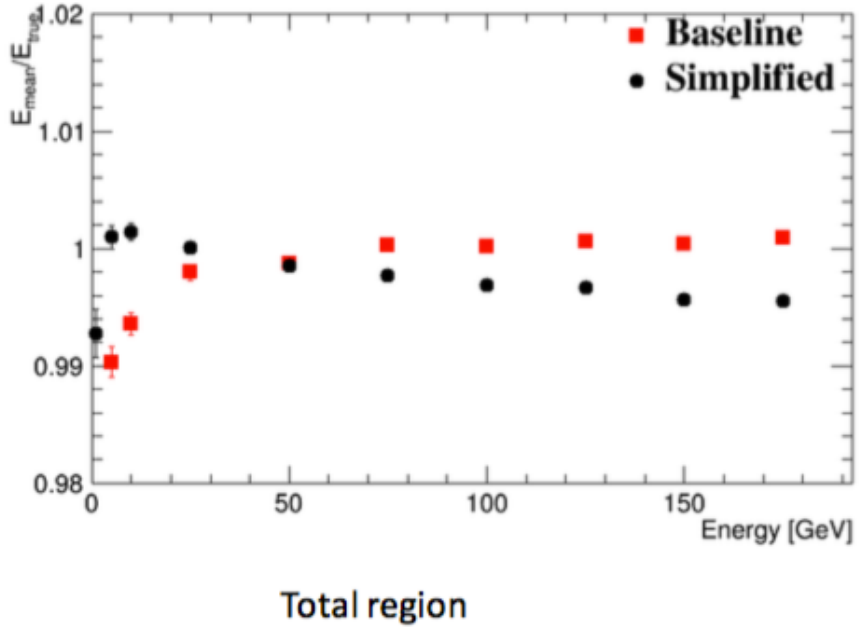
EB


E_{mean}/E_{true}
1.02
1.01
1
0.99
0.98
0
50
100
150
Energy [GeV]
2.8*30: $\frac{16.6\%}{\sqrt{E}}\oplus 1.0\%$
2.1*20+4.2*10: $\frac{15.0\%}{\sqrt{E}}\oplus 1.2\%$

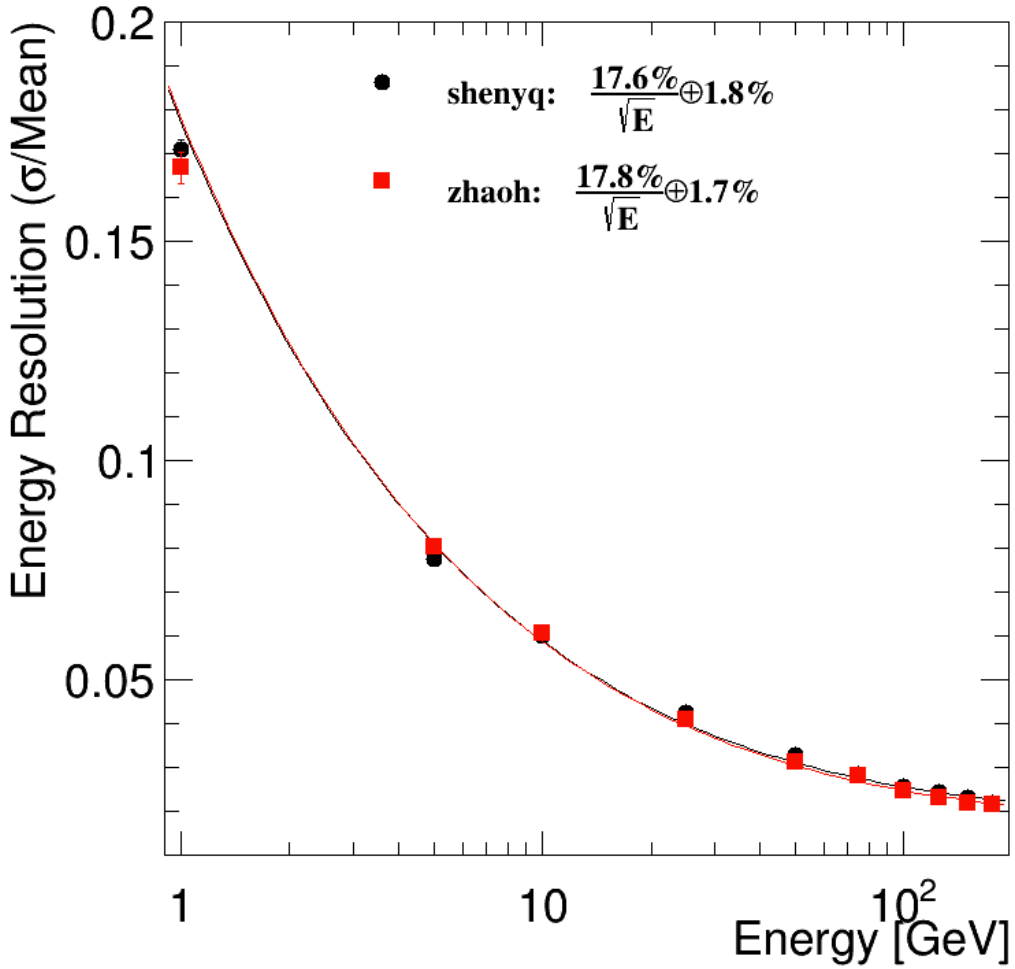
Energy Correction

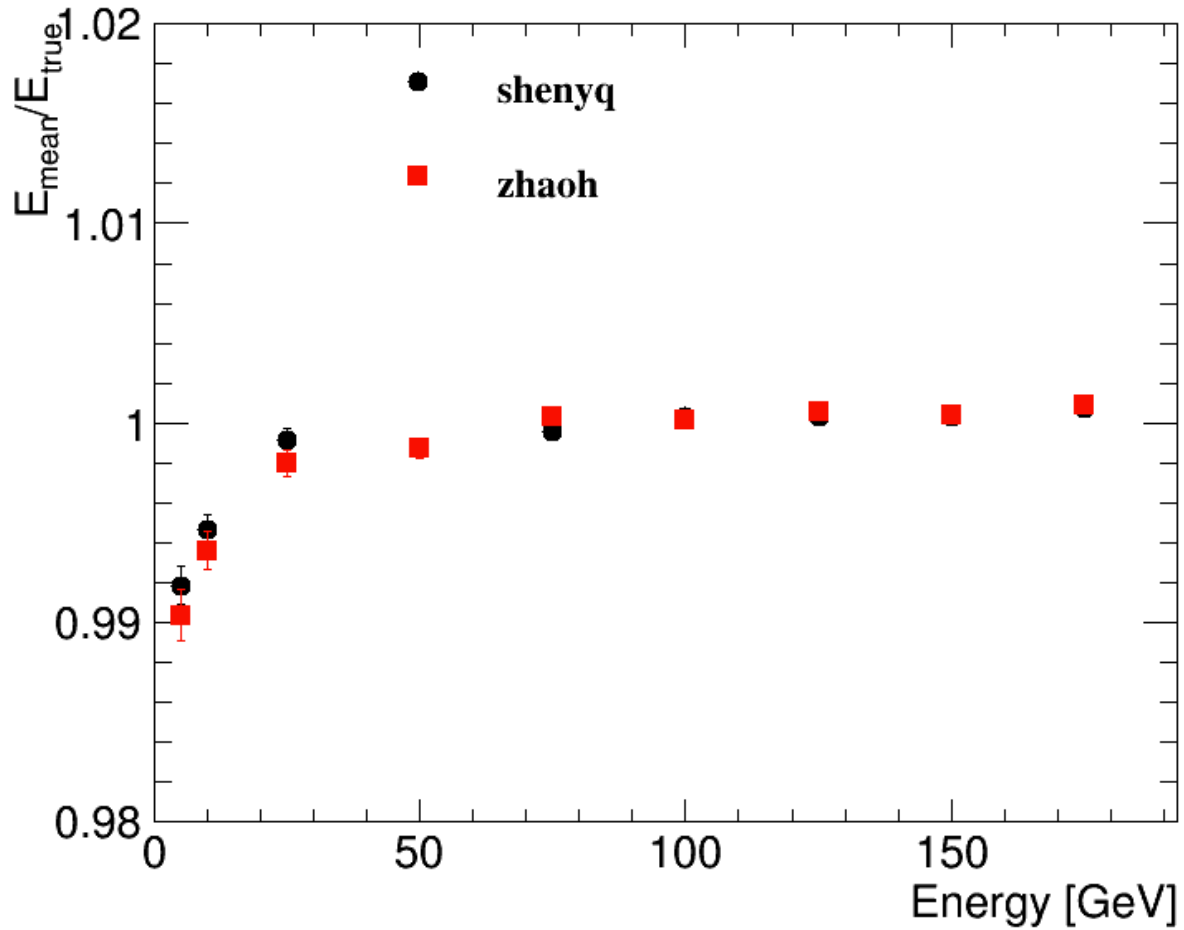
- Motivation (CDR)

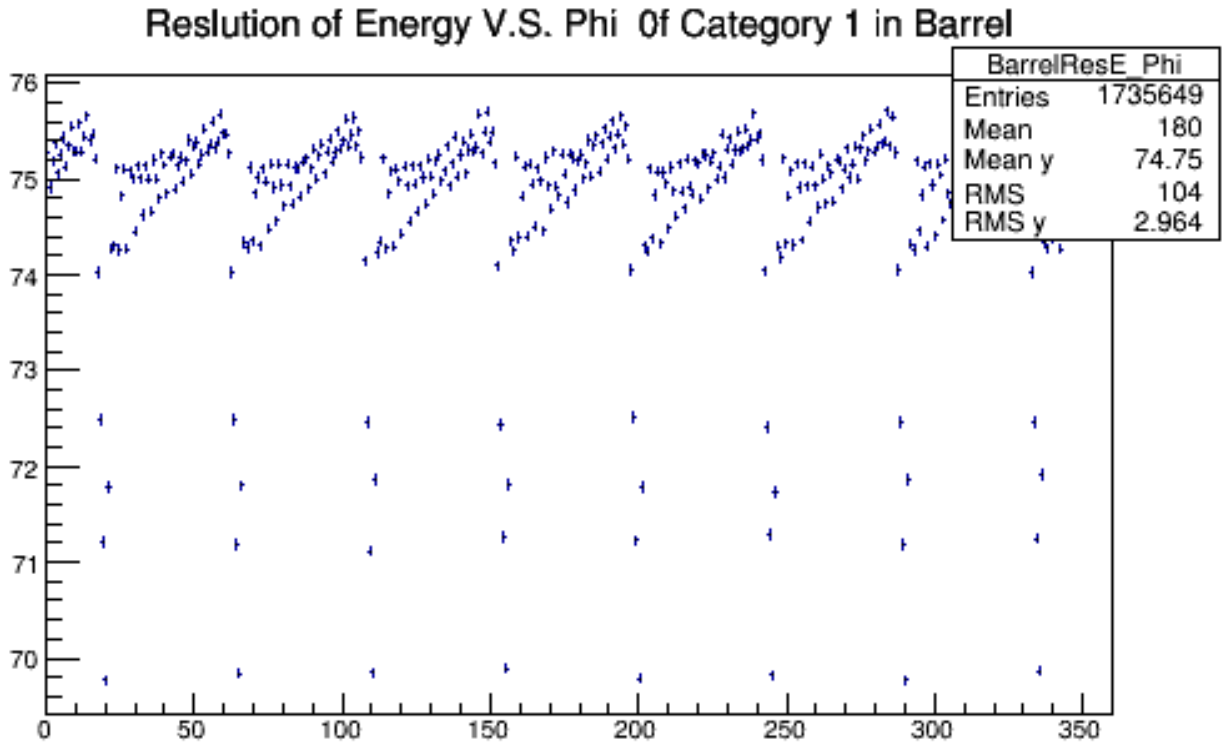


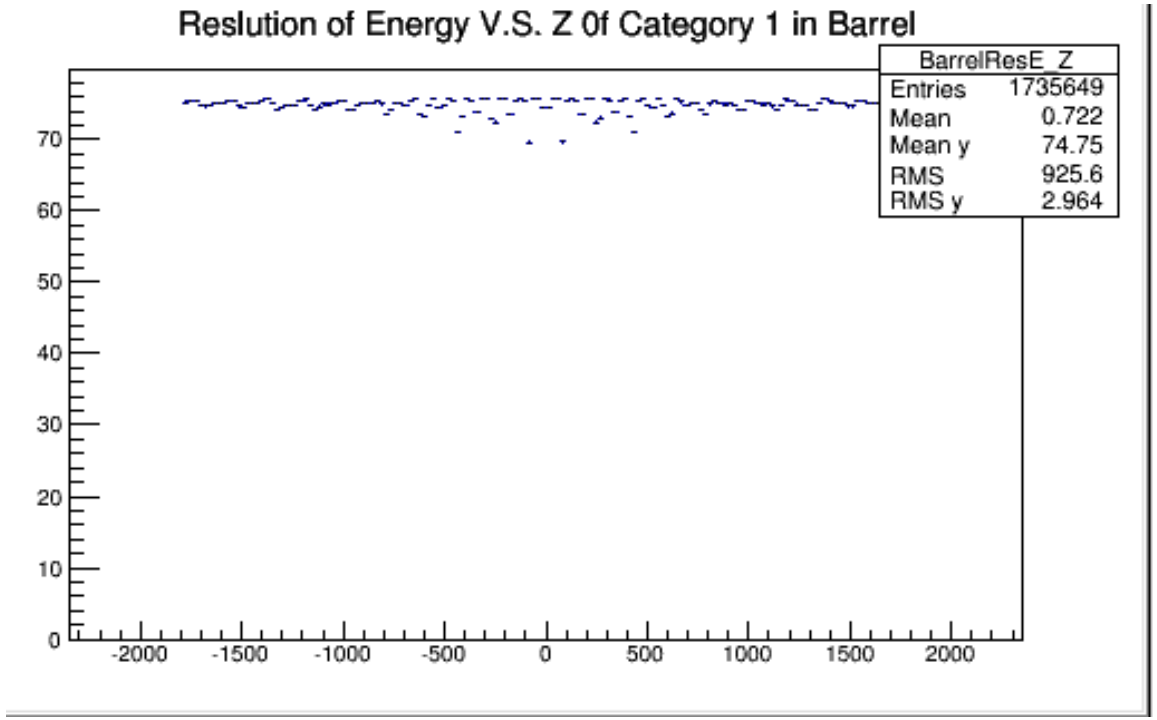


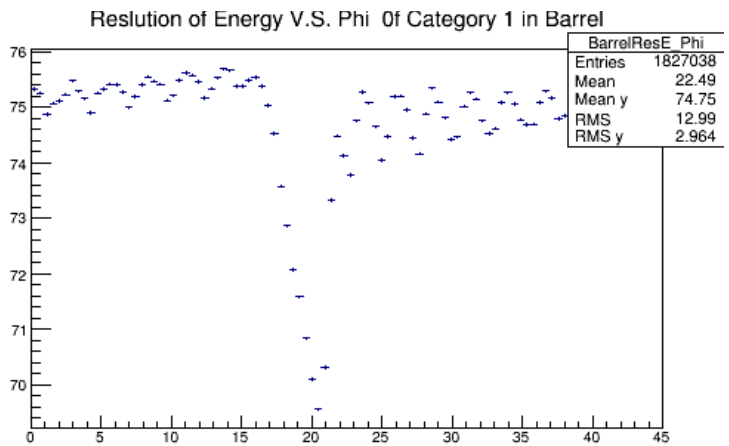
Total Region (compare with CDR)





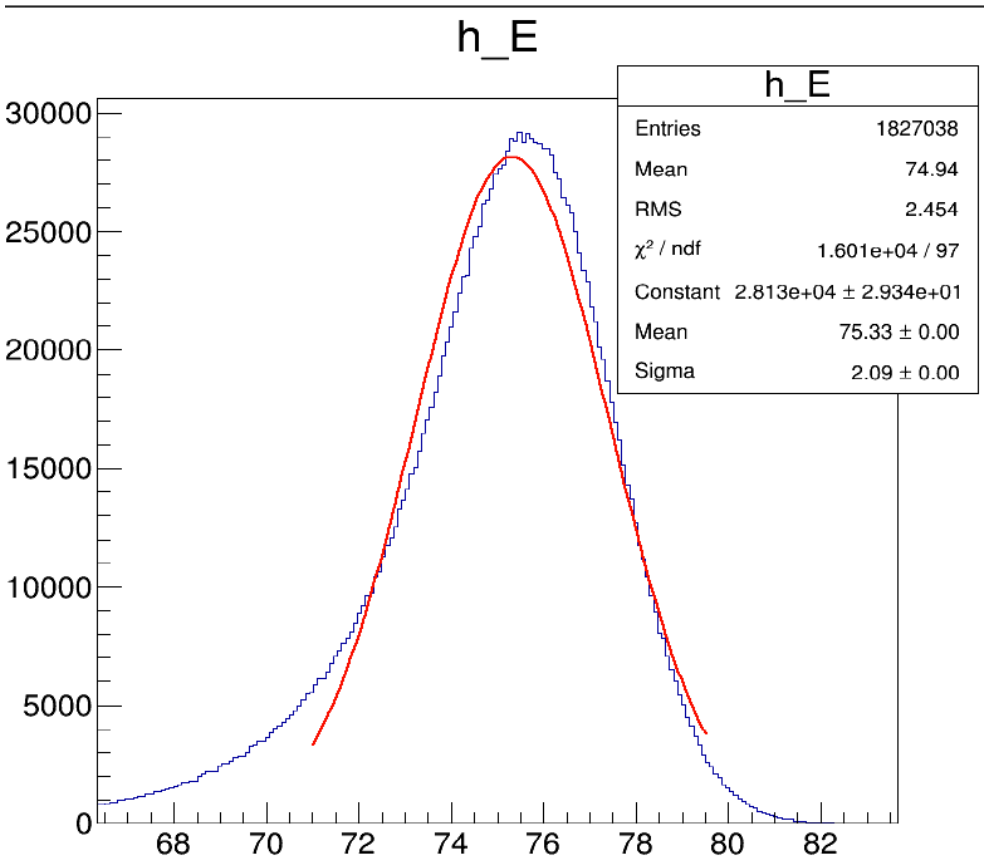

Reslution of Energy V.S. Phi 0f Category 1 in Barrel
BarrelResE_Phi
Entries 1735649
Mean 180
Mean y 74.75
RMS 104
RMS y 2.964

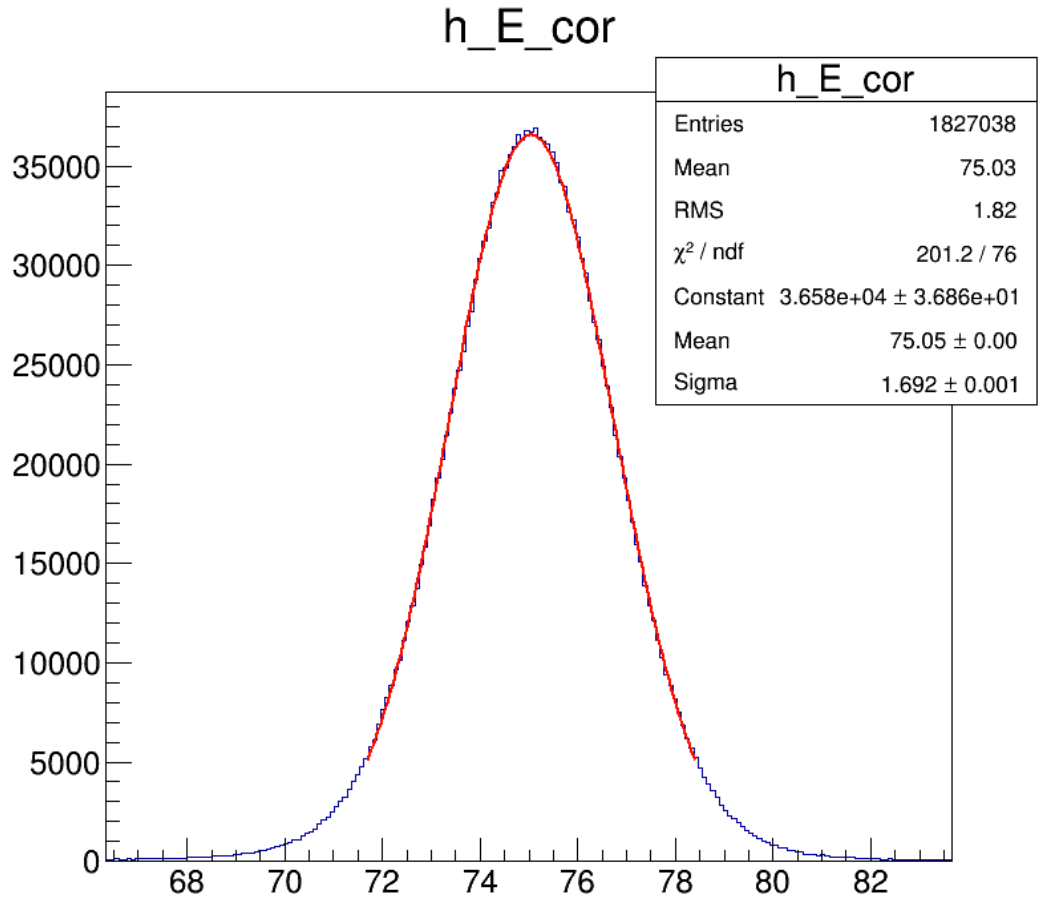

Reslution of Energy V.S. Z 0f Category 1 in Barrel
BarrelResE_Z
Entries 1735649
Mean 0.722
Mean y 74.75
RMS 925.6
RMS y 2.964


Reslution of Energy V.S. Phi 0f Category 1 in Barrel
BarrelResE_Phi
Entries 1827038
Mean 22.49
Mean y 74.75
RMS 12.99
RMS y 2.964

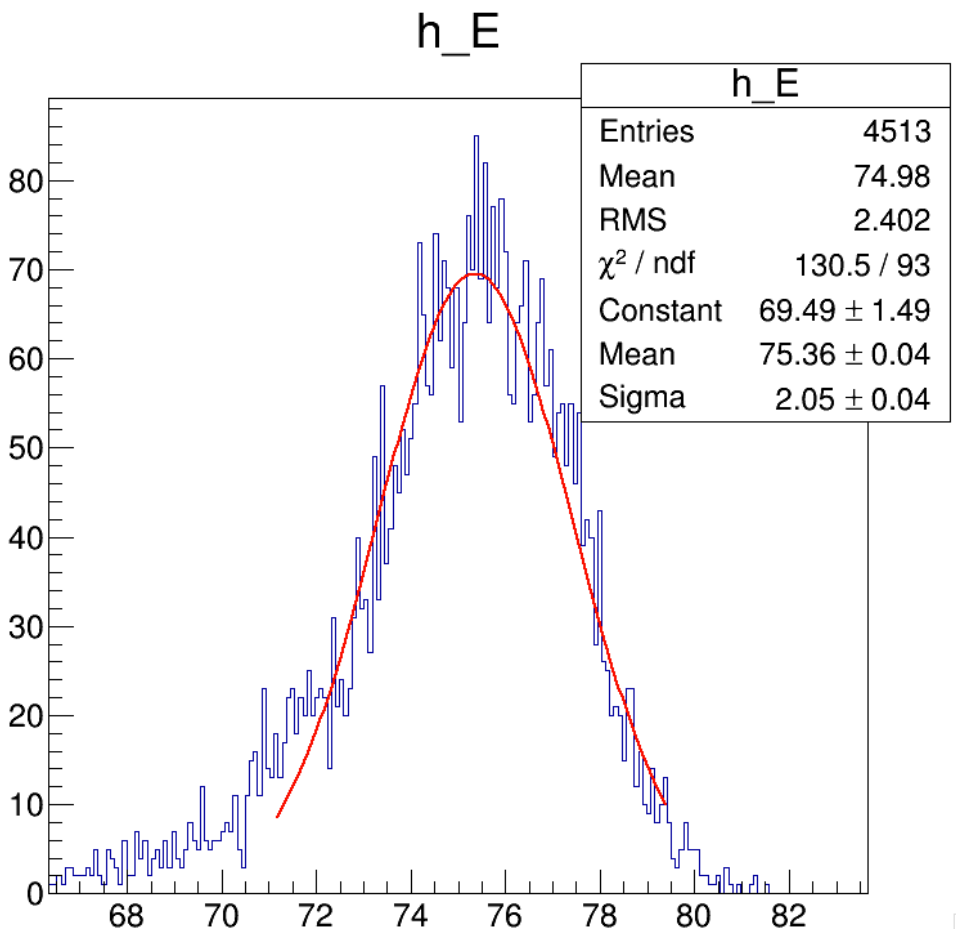
EB case unconvert photon

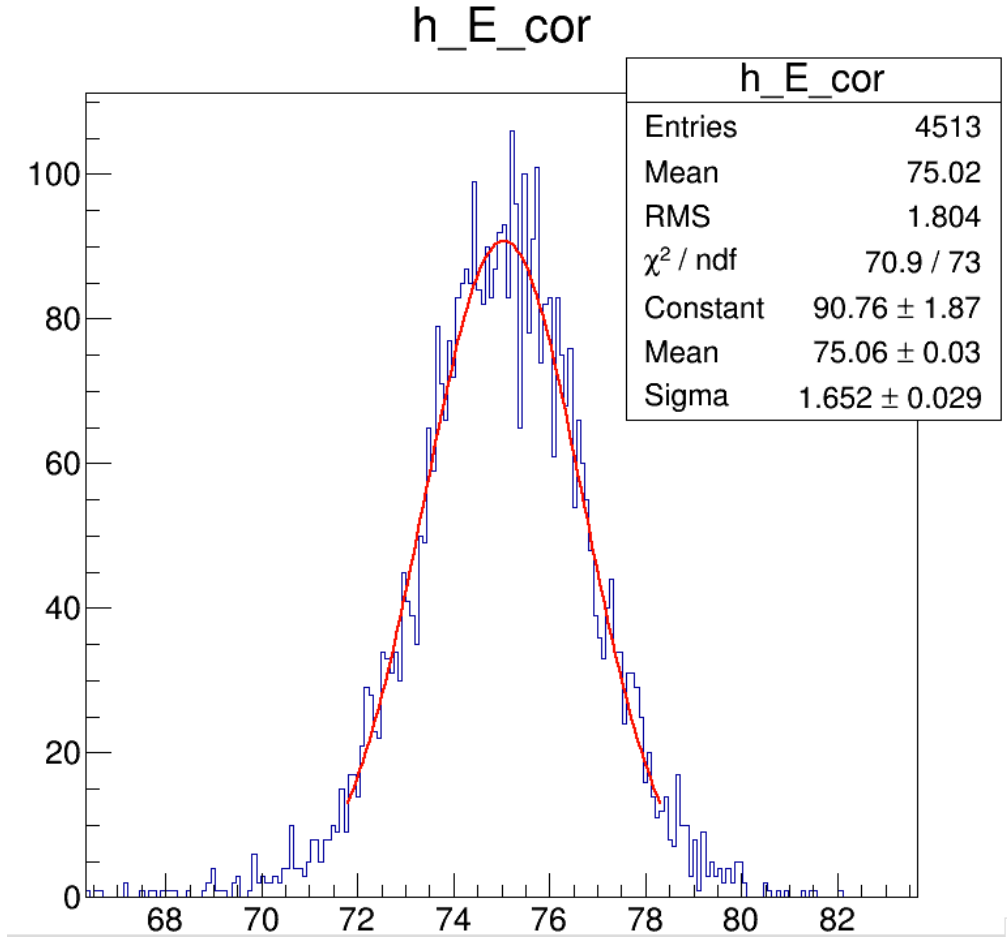
- 75GeV Photon



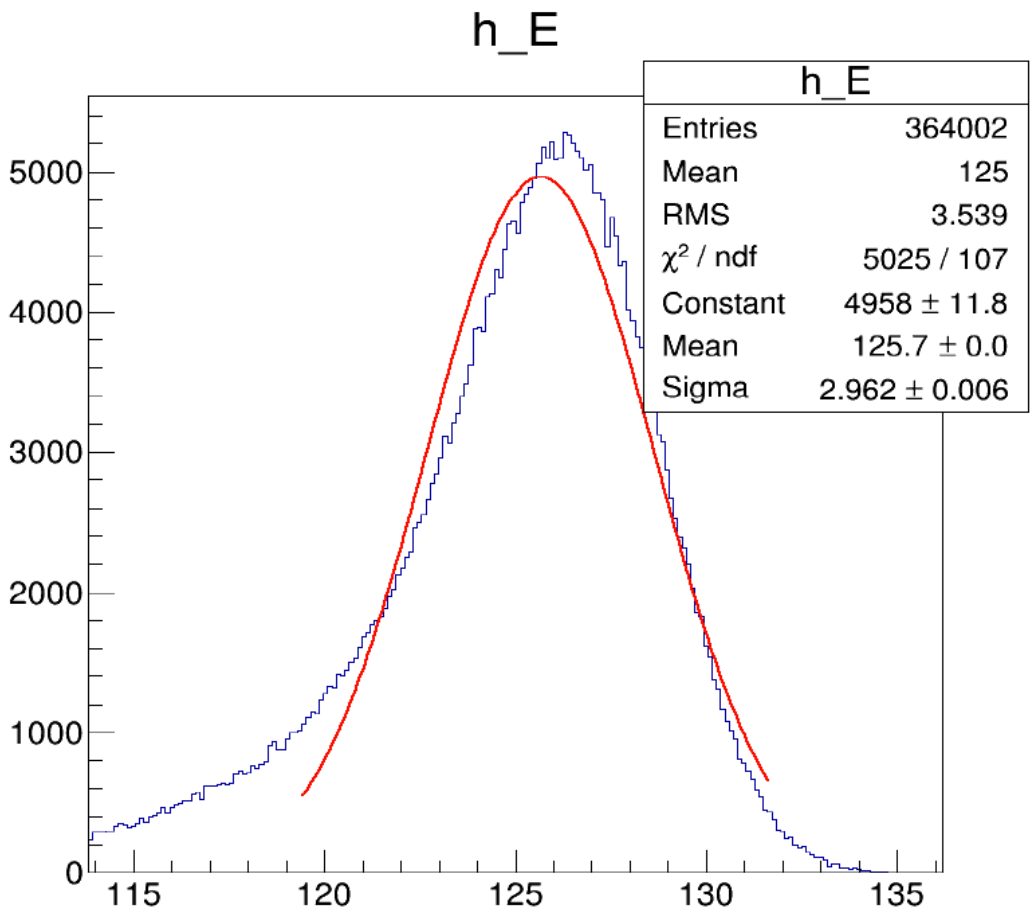


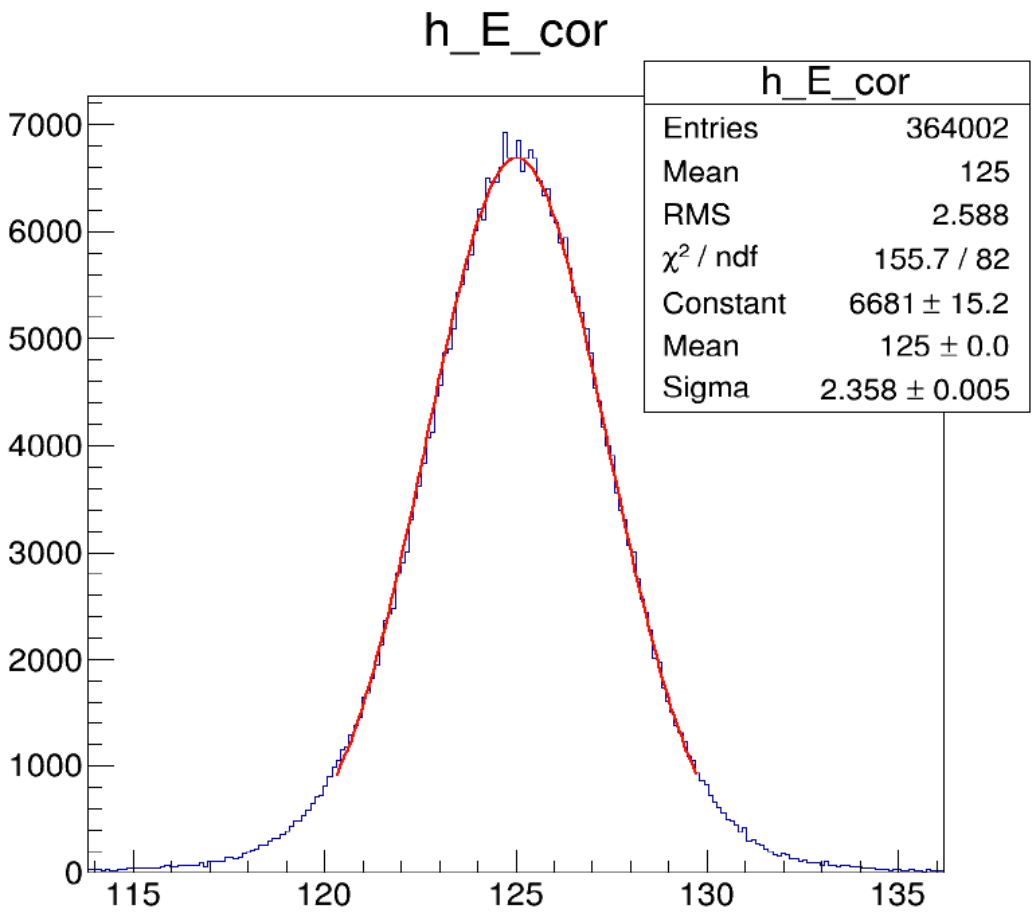
75GeV less events



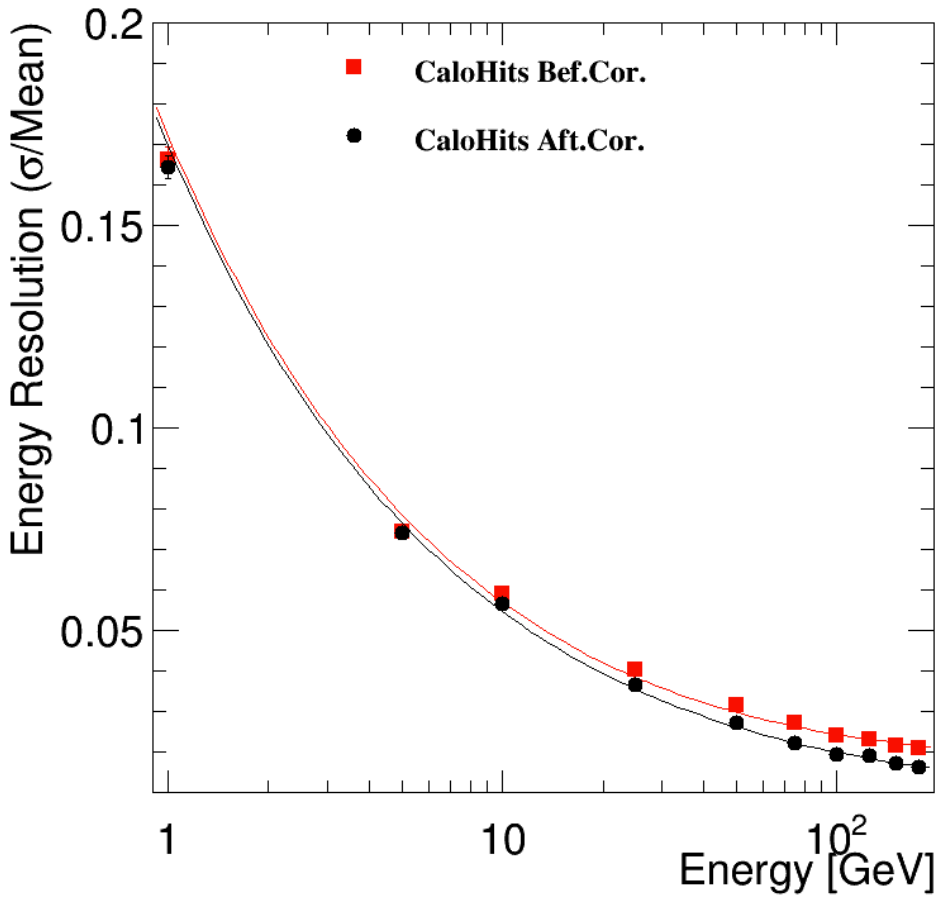


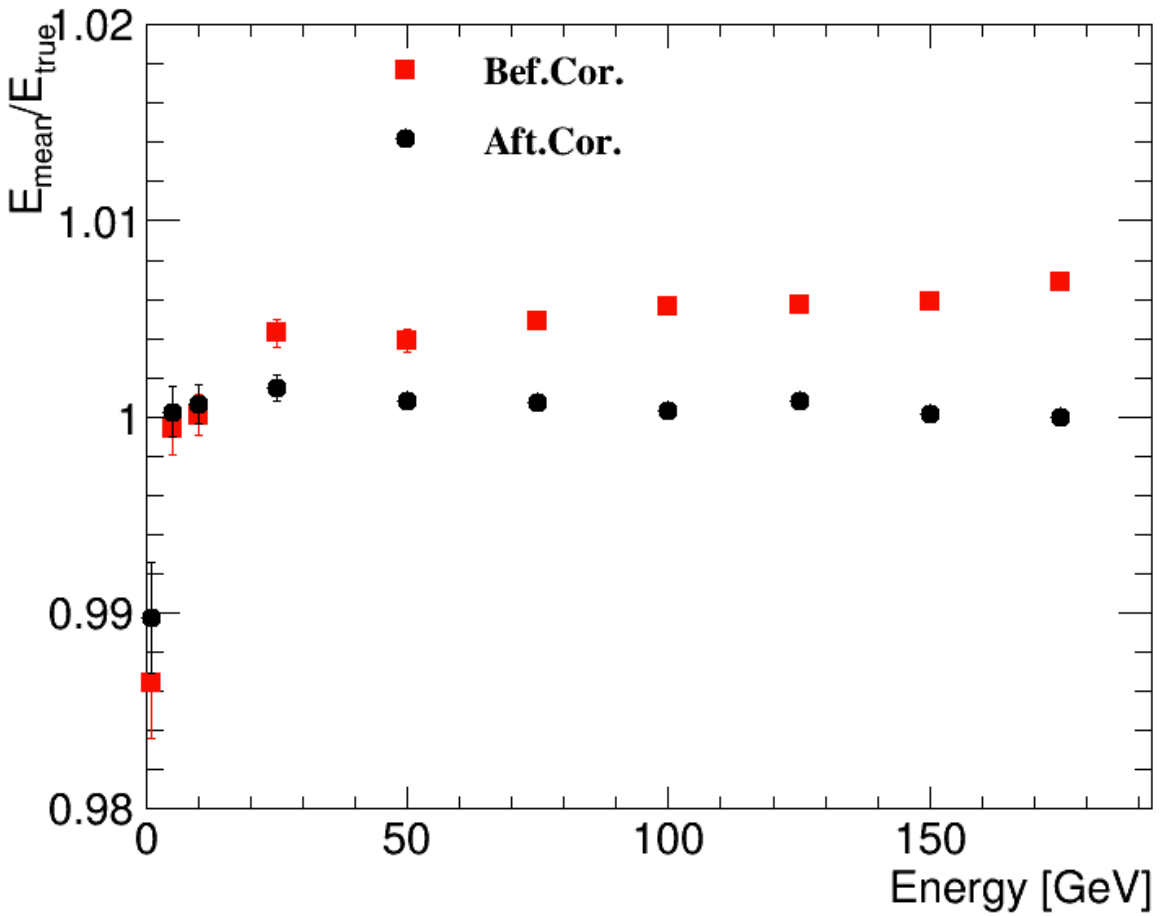
125GeV more events



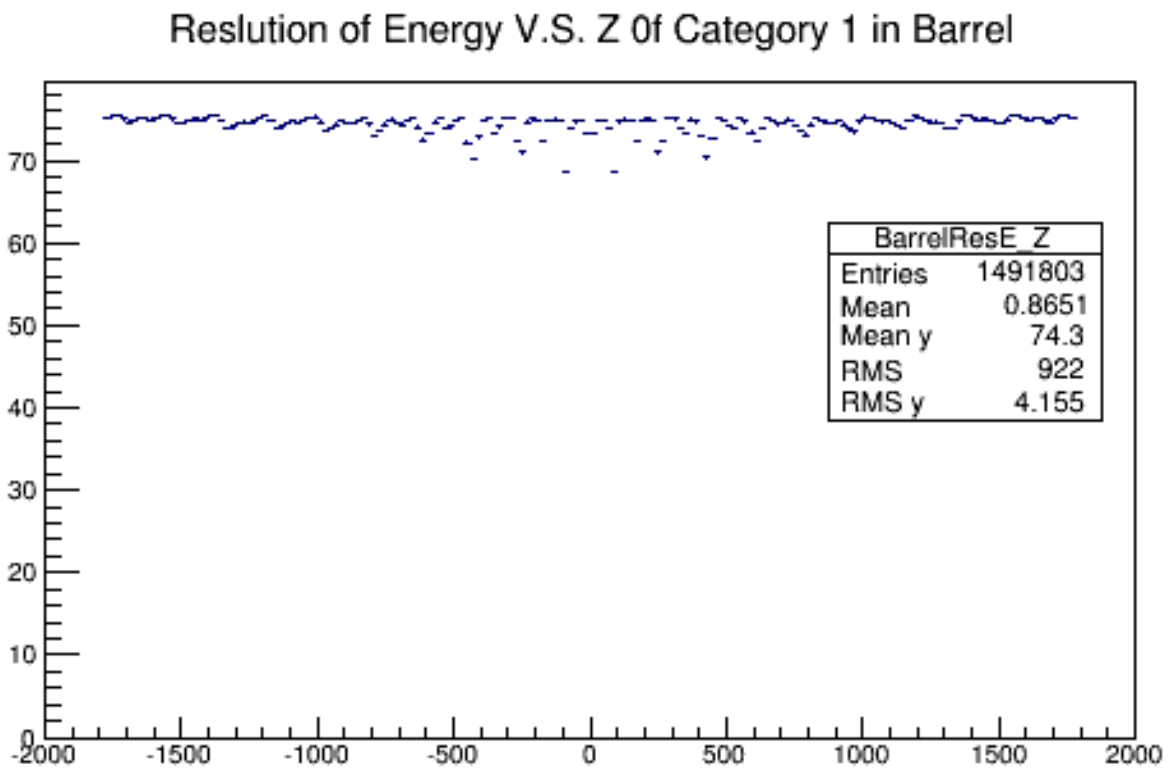


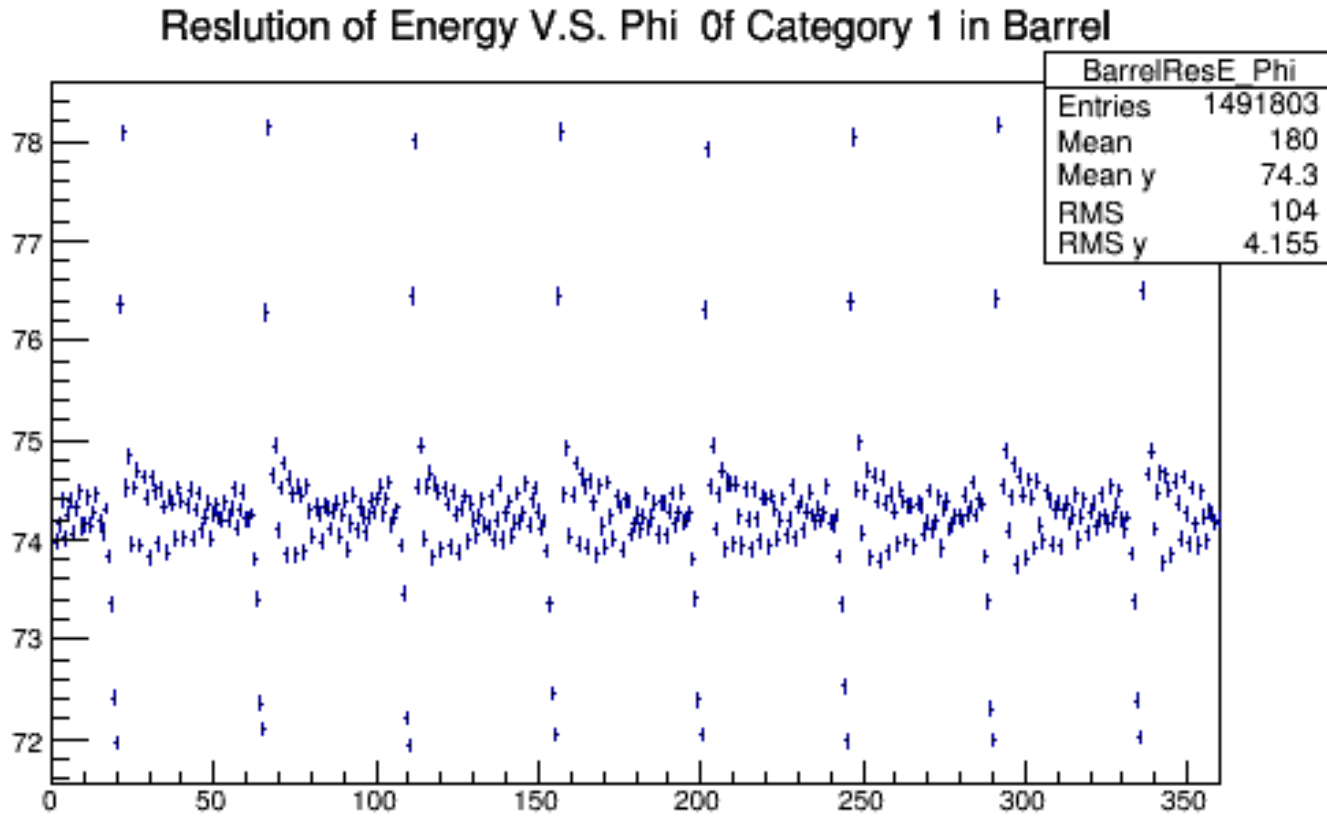
Less events


Energy Resolution (σ/Mean)
0.2
0.15
0.1
0.05
CaloHits Bef.Cor.
CaloHits Aft.Cor.
1
10
10^2
Energy [GeV]


E_{mean}/E_{true}
1.02
1.01
1
0.99
0.98
Bef.Cor.
Aft.Cor.
0
50
100
150
Energy [GeV]

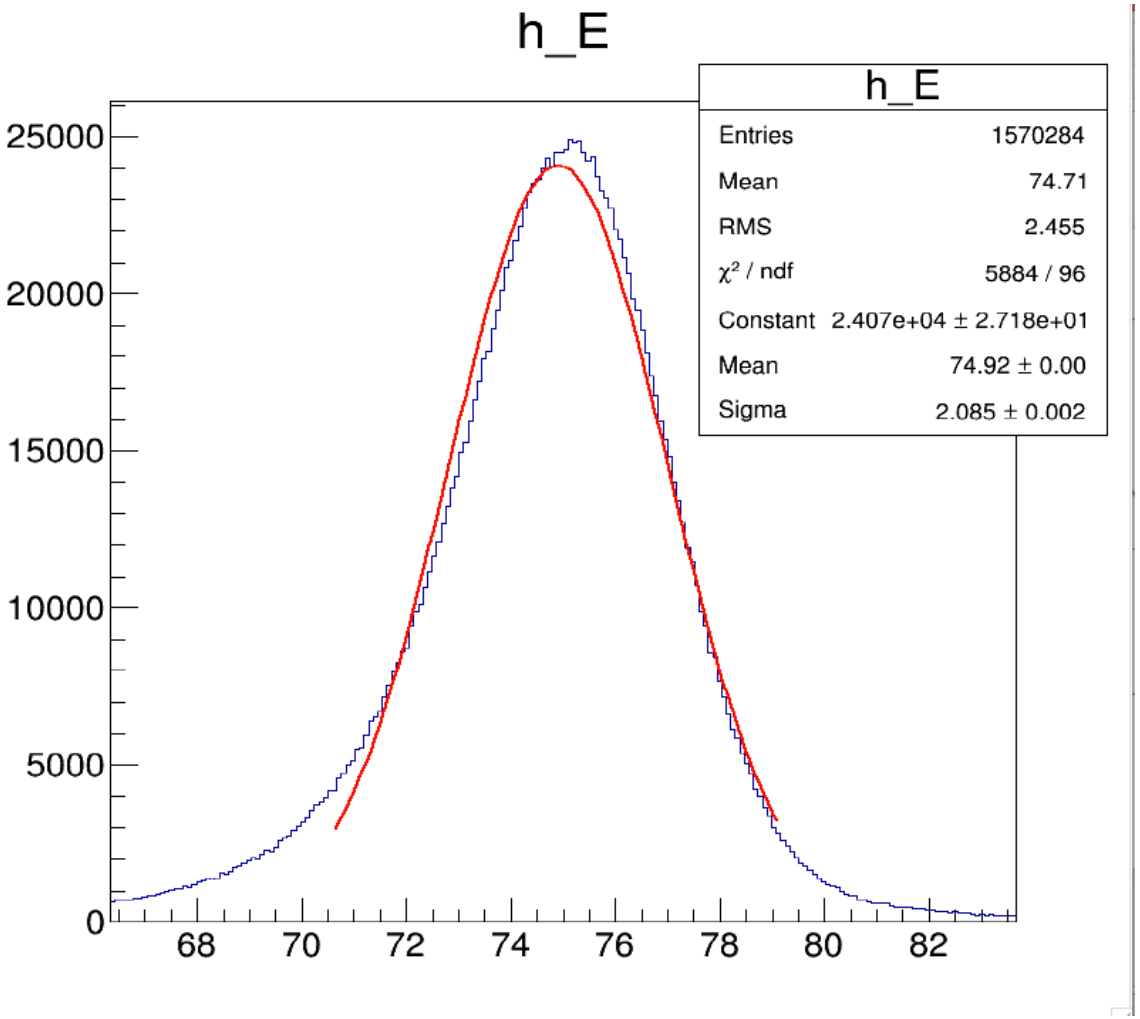
ArborPFO

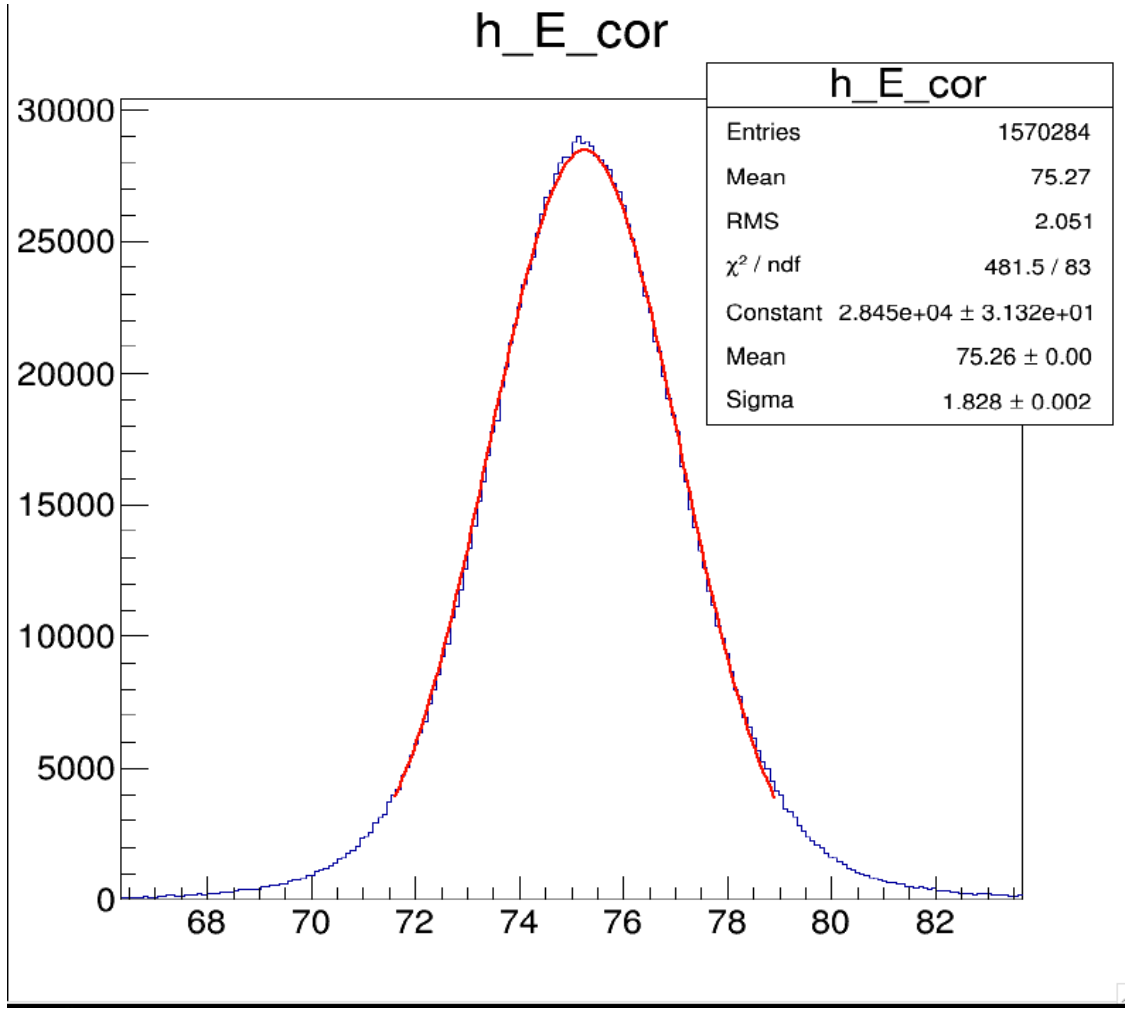




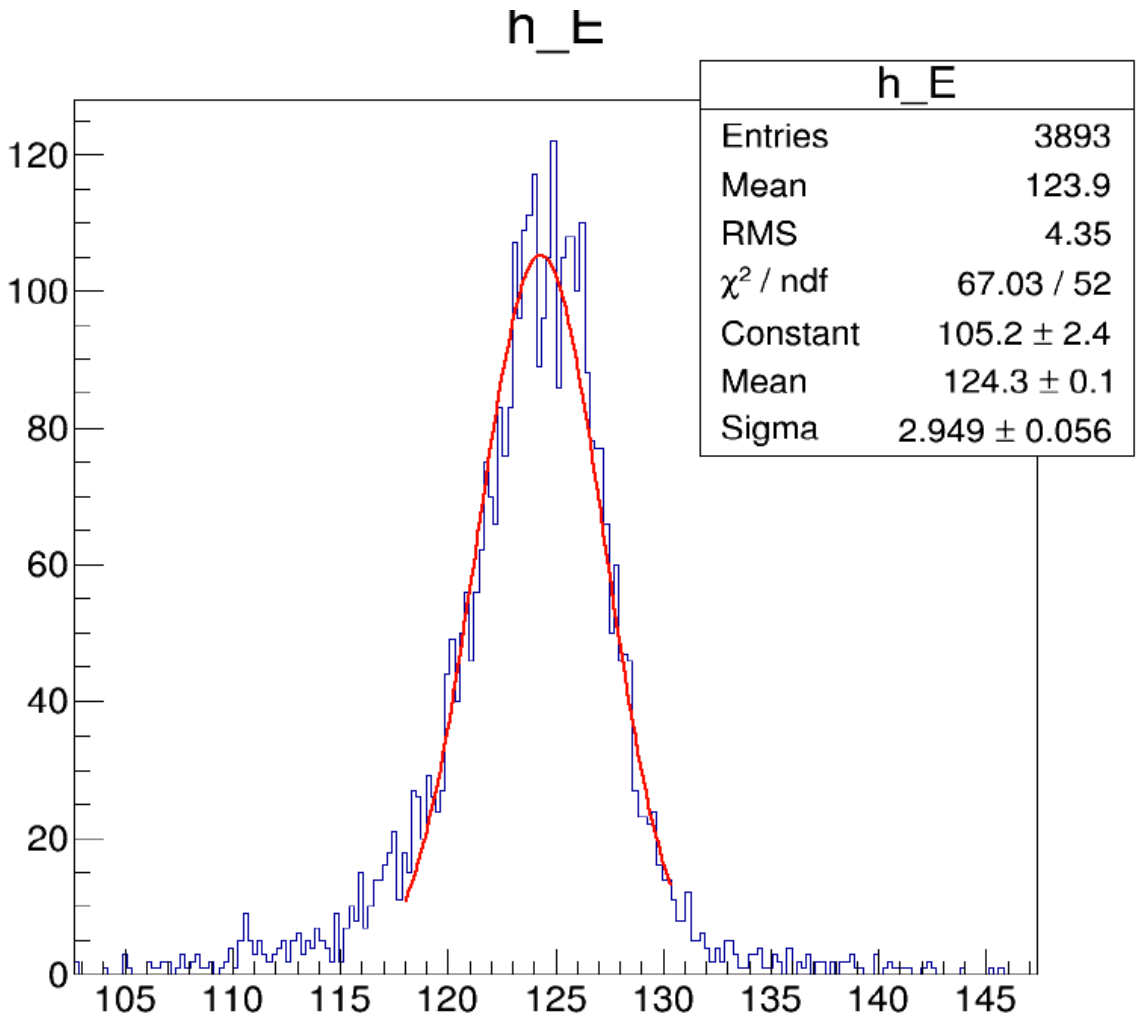
(只重建出一个光子的事例)
并且重建光子的theta,phi与true level的theta, Phi一致) (1574160 ~5.2%)

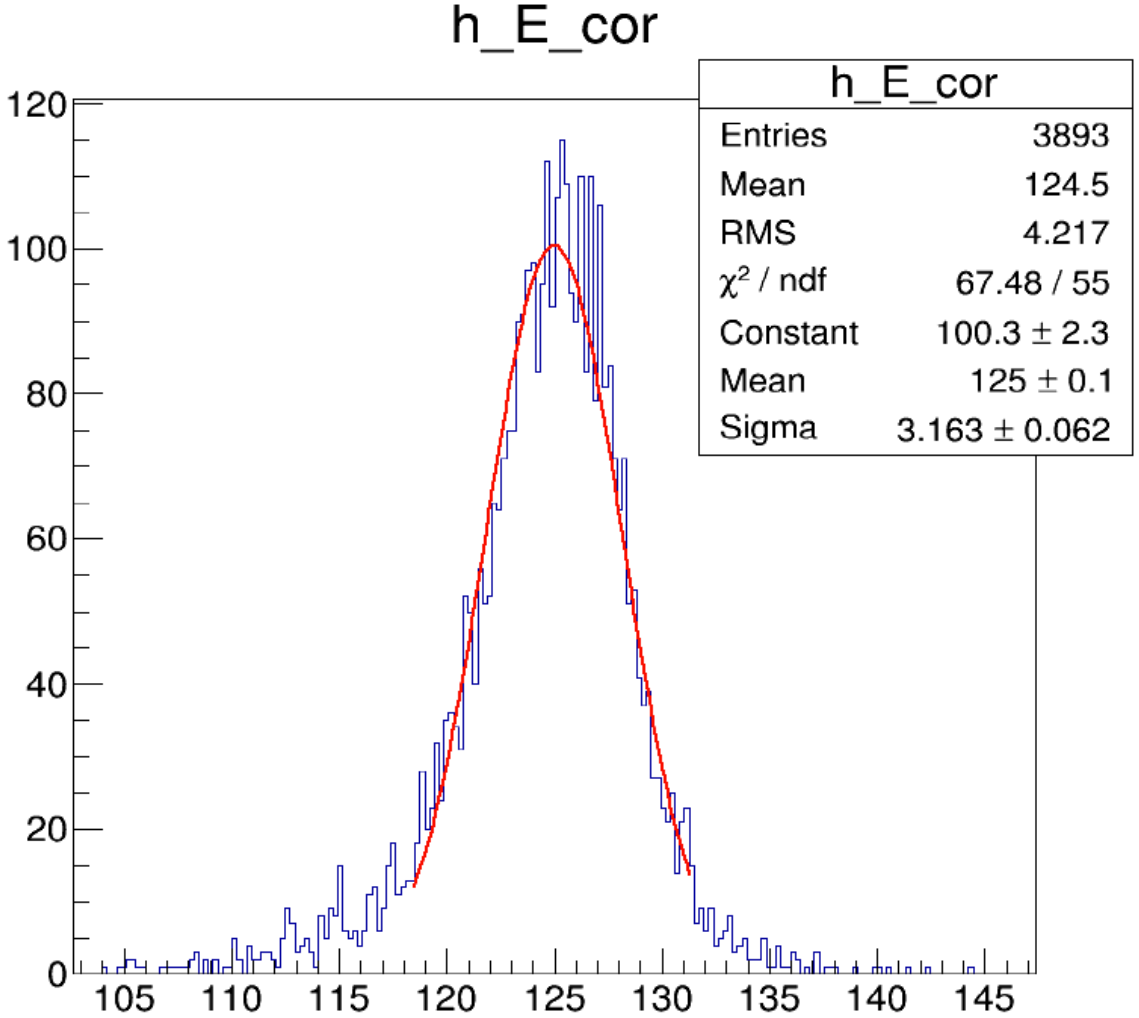
75GeV


h_E
h_E
Entries 1570284
Mean 74.71
RMS 2.455
χ² / ndf 5884 / 96
Constant 2.407e+04 ± 2.718e+01
Mean 74.92 ± 0.00
Sigma 2.085 ± 0.002
25000
20000
15000
10000
5000
0
68
70
72
74
76
78
80
82

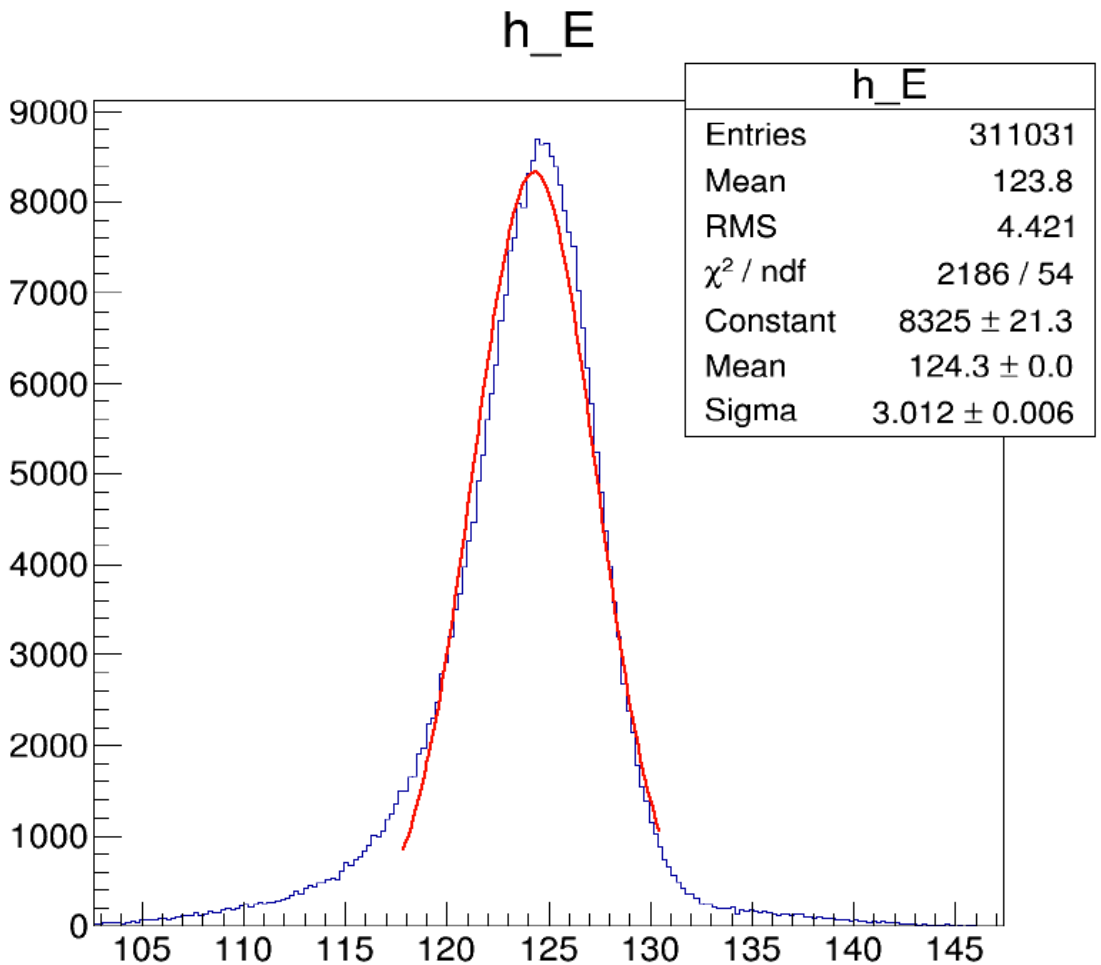

h_E_cor
h_E_cor
Entries 1570284
Mean 75.27
RMS 2.051
χ² / ndf 481.5 / 83
Constant 2.845e+04 ± 3.132e+01
Mean 75.26 ± 0.00
Sigma 1.828 ± 0.002
30000
25000
20000
15000
10000
5000
0
68
70
72
74
76
78
80
82

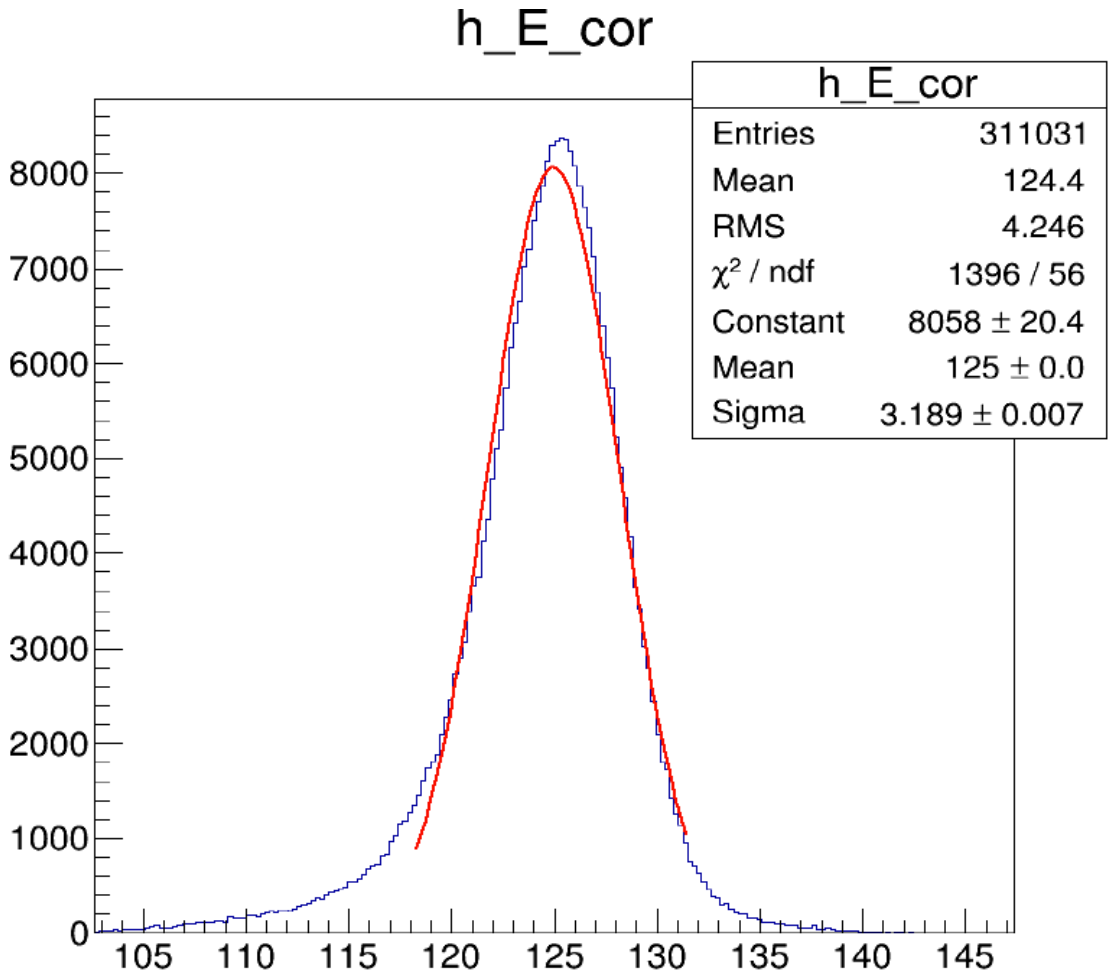
125GeV less events

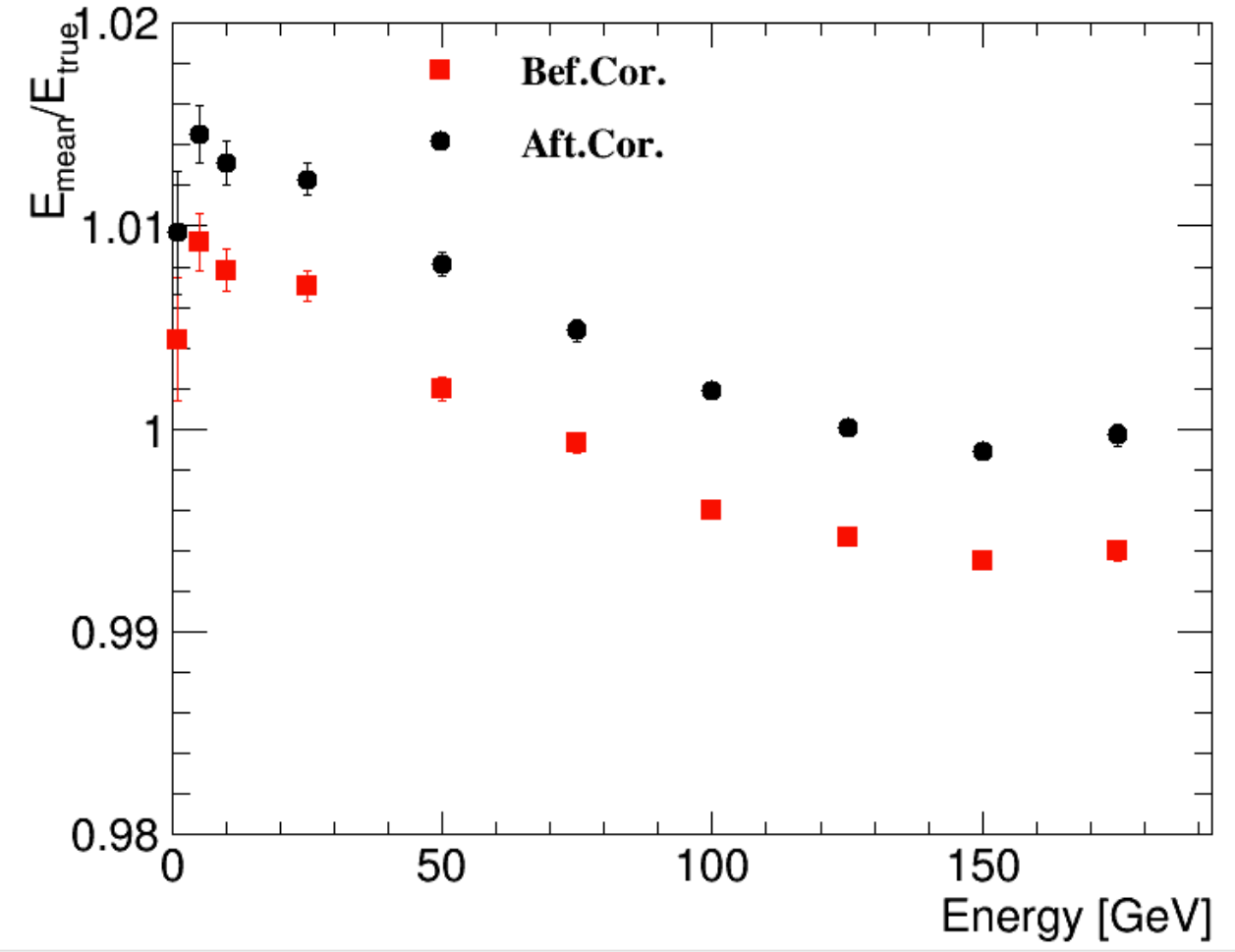


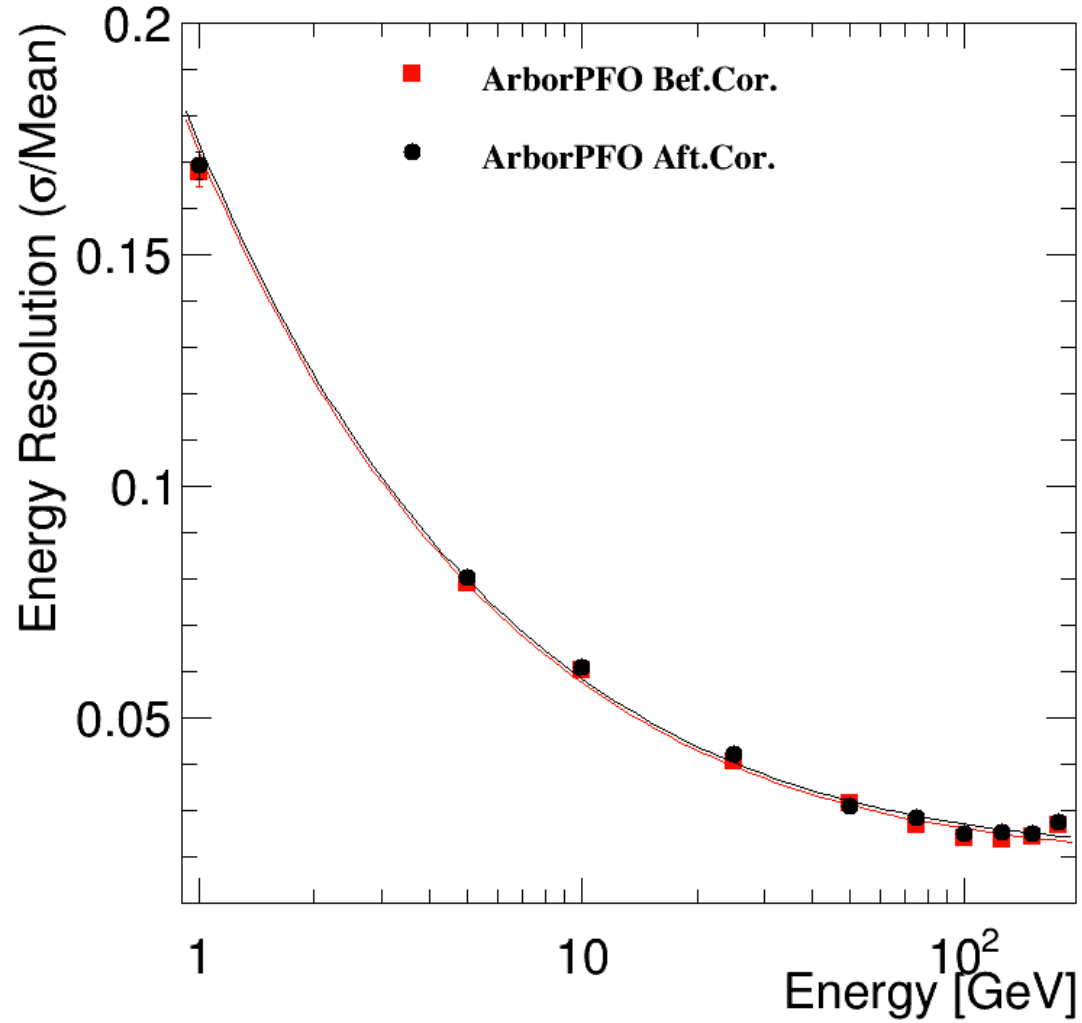


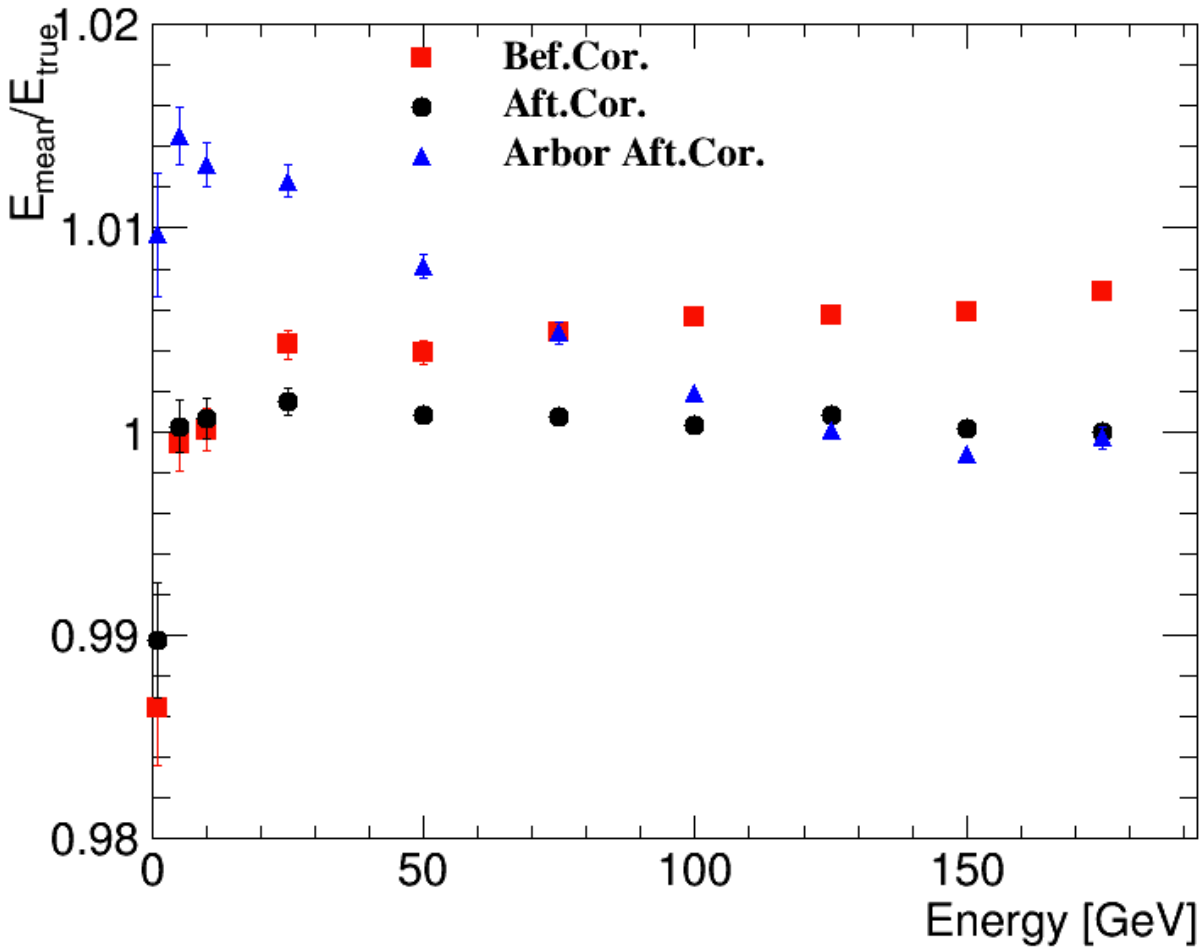
125GeV more events

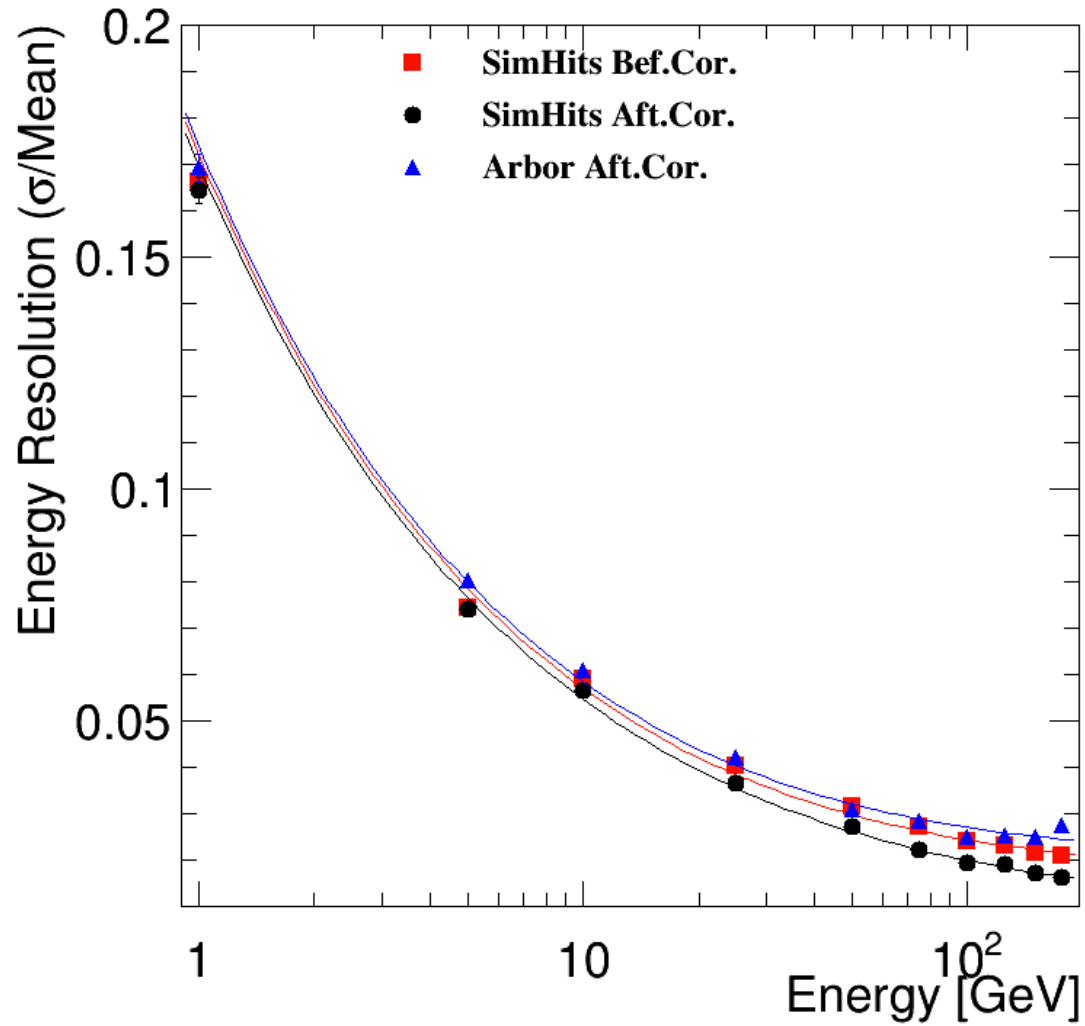




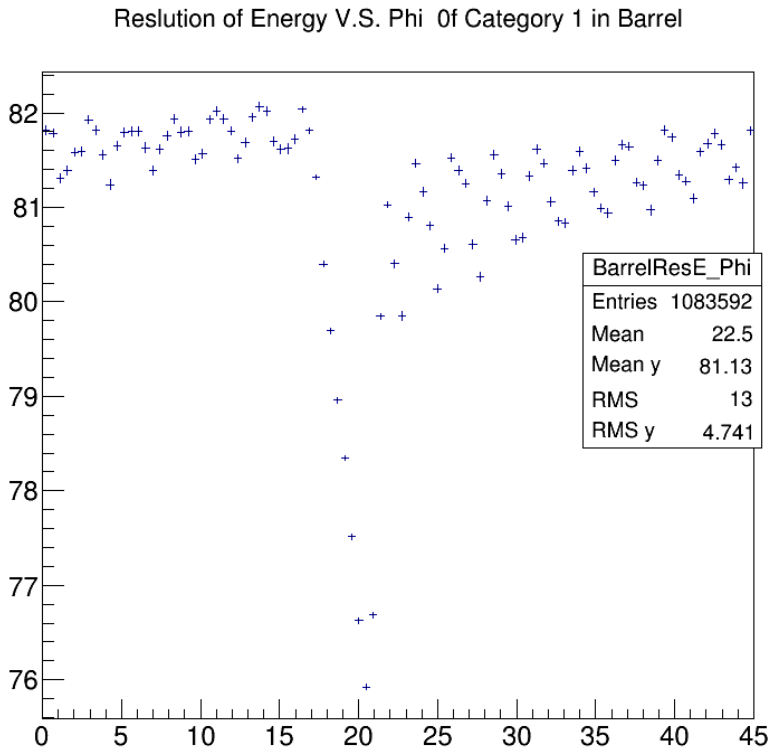

E_{mean}/E_{true}
1.02
1.01
1
0.99
0.98
0
50
100
150
Energy [GeV]
Bef.Cor.
Aft.Cor.


Energy Resolution (σ/Mean)
0.2
0.15
0.1
0.05
1
10
10^2
Energy [GeV]
ArborPFO Bef.Cor.
ArborPFO Aft.Cor.

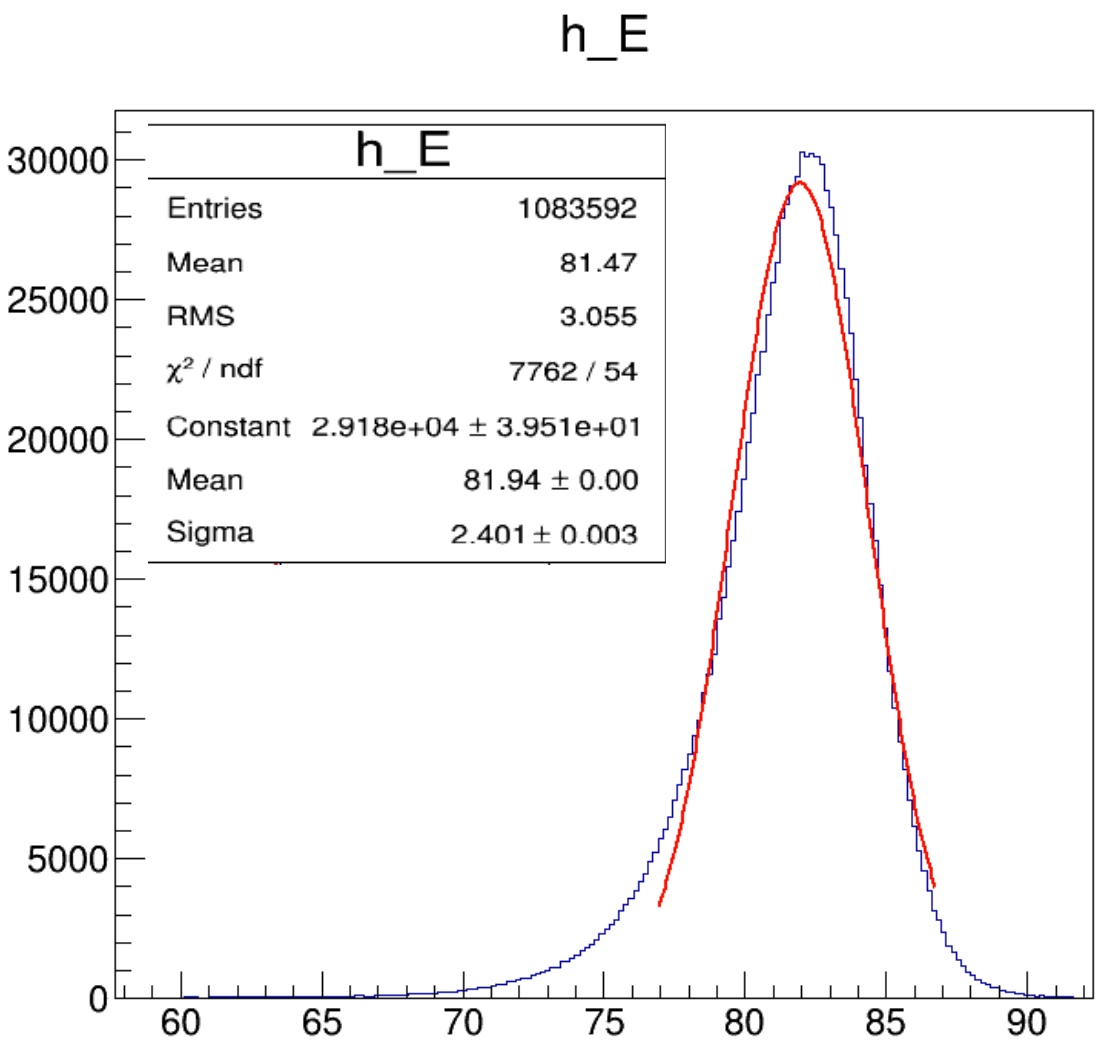

E_{mean}/E_{true}
1.02
1.01
1
0.99
0.98
0
50
100
150
Energy [GeV]
Bef.Cor.
Aft.Cor.
Arbor Aft.Cor.

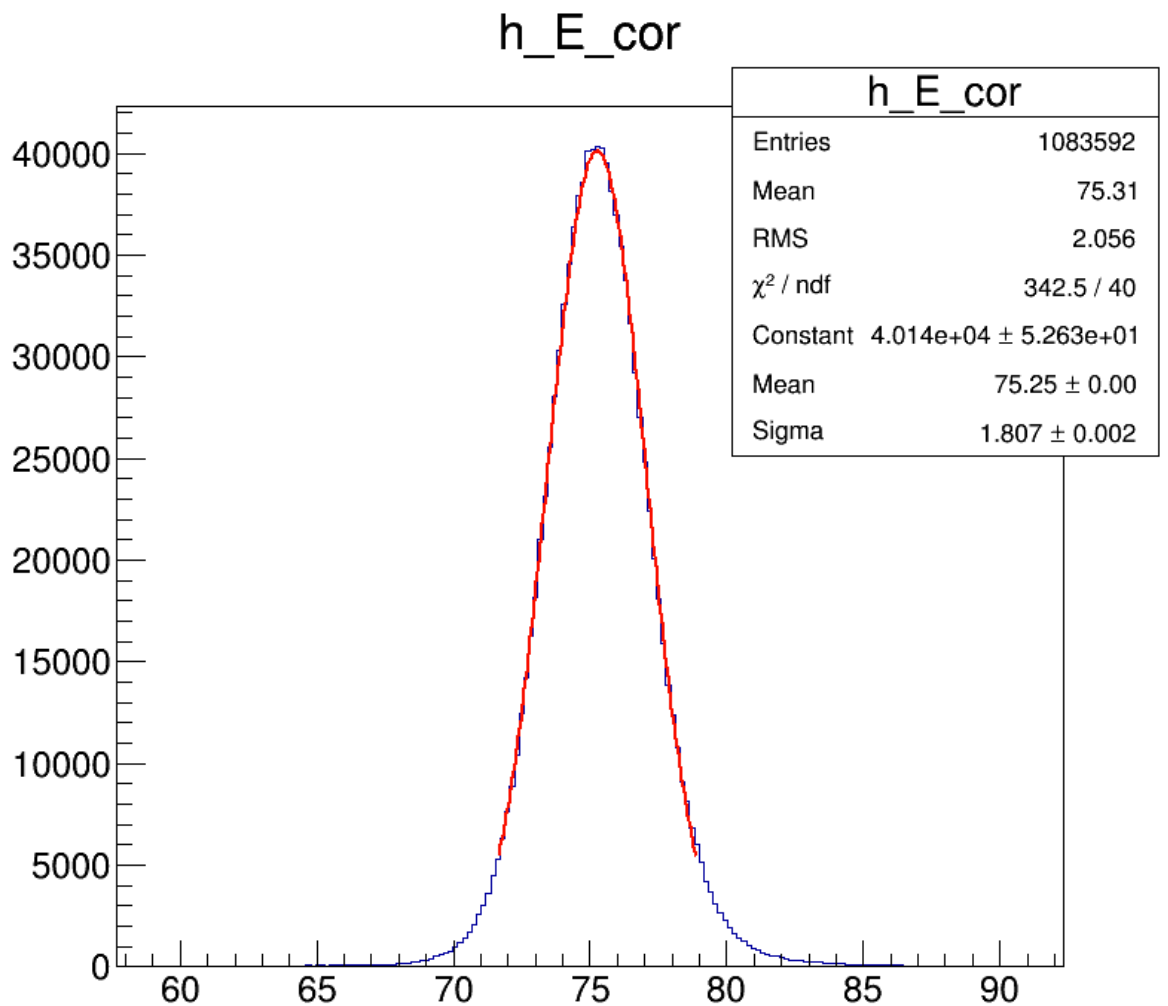

Energy Resolution (σ/Mean)
0.2
0.15
0.1
0.05
1
10
10^2
Energy [GeV]
SimHits Bef.Cor.
SimHits Aft.Cor.
Arbor Aft.Cor.

```
  {
     float temp_a=sqrt(EMC*EMC);
     x=exp((-EMC+aaa)/ab)+ac/sqrt(EMC)+ad*EMC;
     y=1/(exp((-EMC+ba)/bbb)+bc/sqrt(EMC)+bd*EMC)+be;
     f1=1/(exp((-EMC+ff1a)/ff1b)+ff1c/sqrt(EMC)+ff1d*EMC);
     f2=1/(exp((-EMC+ff2a)/ff2b)+ff2c/sqrt(EMC)+ff2d*EMC);
     EMC=x*ArEhito20+f1*ArEhite20p+y*ArEhito10+f2*ArEhite10;
     float temp_b=sqrt(EMC*EMC);
     diff=fabs(temp_a-temp_b);
  }
  _costheta=cos(CluTheta);

  if(EMC/inputCluster->getEnergy() < 0.5) EMC = inputCluster->getEnergy();

  Ethetacorr=(50/(0.294596*fabs(_costheta)*fabs(_costheta)-1.58336*fabs(_costheta)+49.9219))


  float ModuleCluPhi = 0;
  if(CluPhi > 17.5)
  {
     ModuleCluPhi = CluPhi - int((CluPhi -17.5)/45)*45;
  }
  else
  {
     ModuleCluPhi = CluPhi - int((CluPhi -17.5)/45)*45 + 45;
  }

  if(ModuleCluPhi>=17.5 && ModuleCluPhi<20.5 ) Ephicorr=(50/(-0.122*ModuleCluPhi*ModuleCluPh
.+2.76*ModuleCluPhi+38.04));
  if(ModuleCluPhi>=20.5 && ModuleCluPhi<22.5 ) Ephicorr=(50/(0.22*ModuleCluPhi*ModuleCluPhi-
.43*ModuleCluPhi+81.69));
  if(ModuleCluPhi>=22.5 && ModuleCluPhi<62.5 ) Ephicorr=50*(0.00839675/sqrt(ModuleCluPhi)+0.
00369287*logf(ModuleCluPhi)+0.0174033);

  EMC=EMC*Ethetacorr*Ephicorr;

  //return EMC;
  return inputCluster->getEnergy();
```



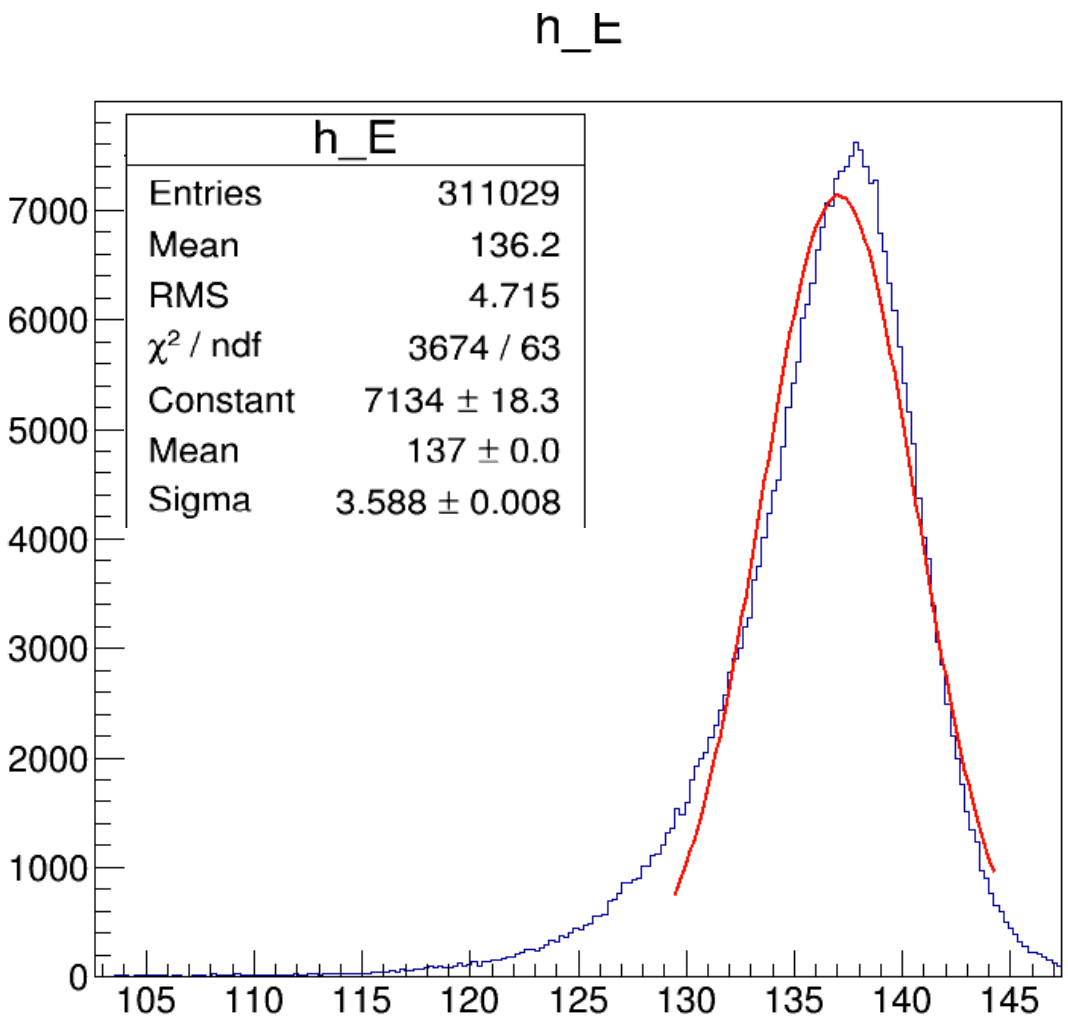
75GeV

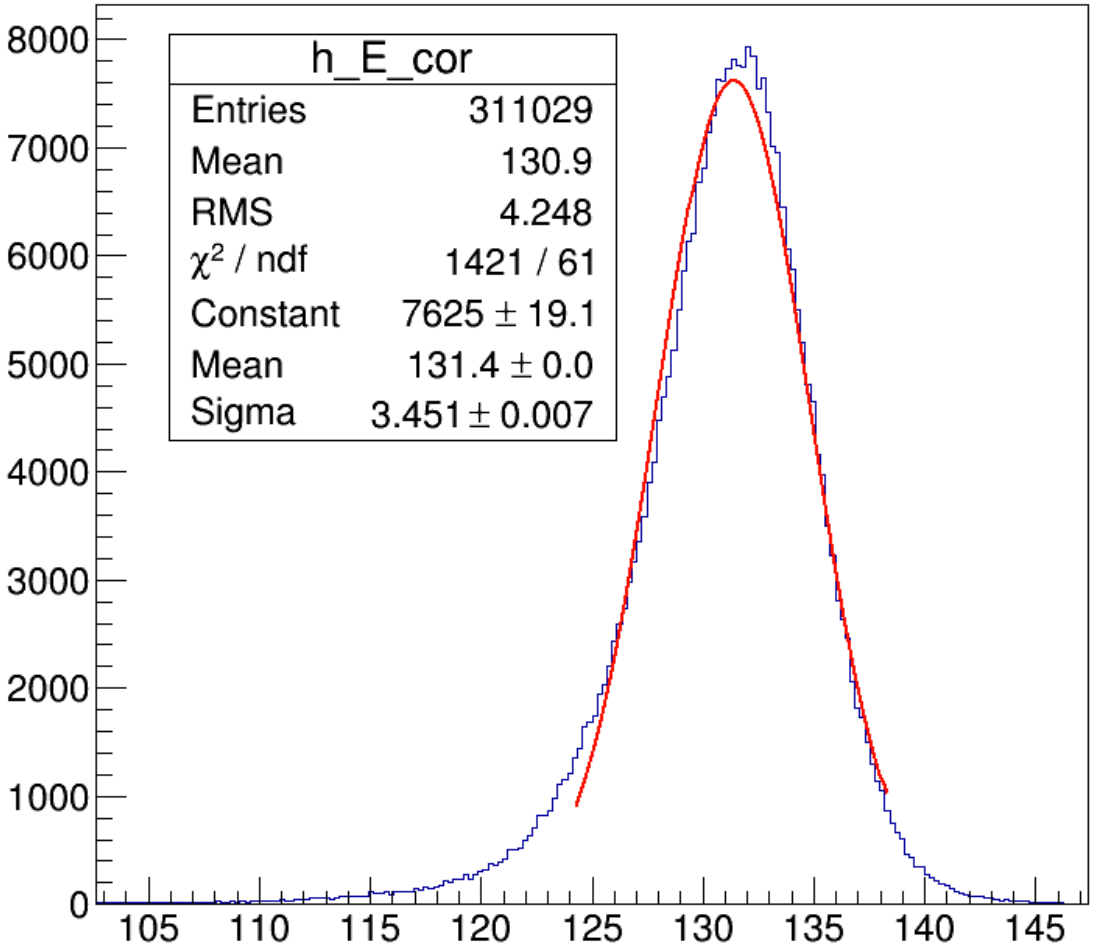

h_E
h_E
Entries 1083592
Mean 81.47
RMS 3.055
χ² / ndf 7762 / 54
Constant 2.918e+04 ± 3.951e+01
Mean 81.94 ± 0.00
Sigma 2.401 ± 0.003
30000
25000
20000
15000
10000
5000
0
60
65
70
75
80
85
90


h_E_cor
h_E_cor
Entries 1083592
Mean 75.31
RMS 2.056
χ² / ndf 342.5 / 40
Constant 4.014e+04 ± 5.263e+01
Mean 75.25 ± 0.00
Sigma 1.807 ± 0.002
40000
35000
30000
25000
20000
15000
10000
5000
0
60
65
70
75
80
85
90

125GeV

Calibration?
关于分辨率的定义?
分categories?

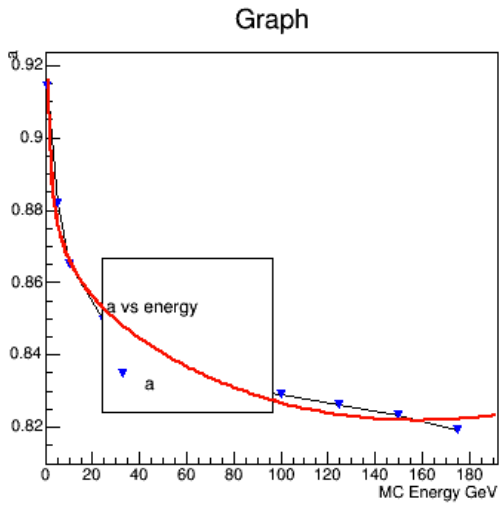


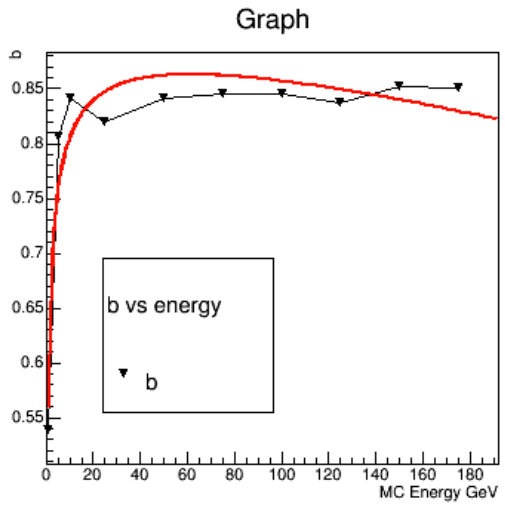


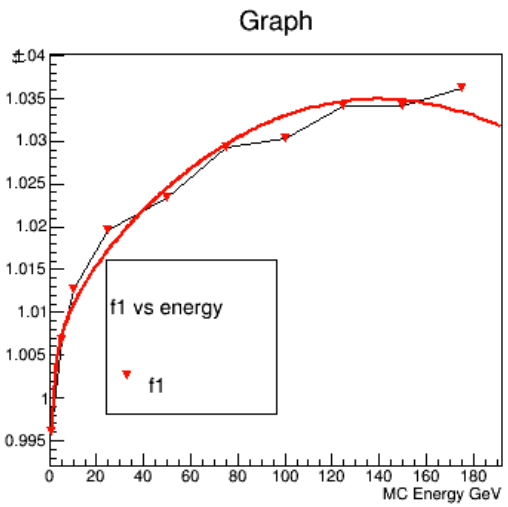
Calibaration

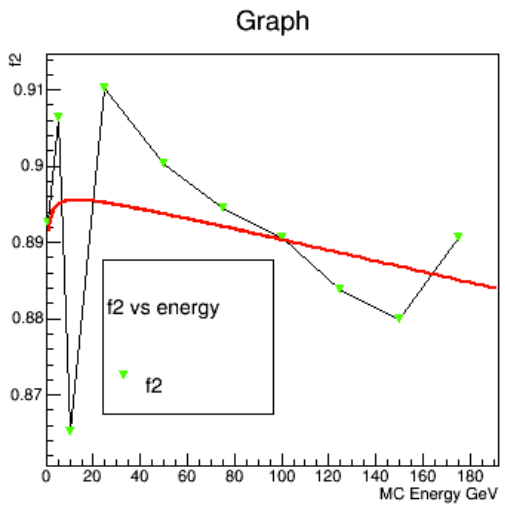
- E1=A*奇数层能量(<20)+B*偶数层能量(<20)+C*奇数层能量(>=20)+C*偶数层能量(>=20)
- E2=M*（0-19层Hit数量）+N*（21-29层Hit数量）
- E=F*E1+(1-F)*E2

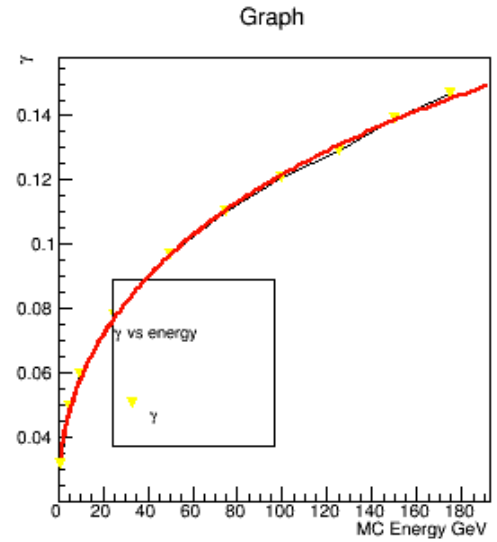
3.Calibration

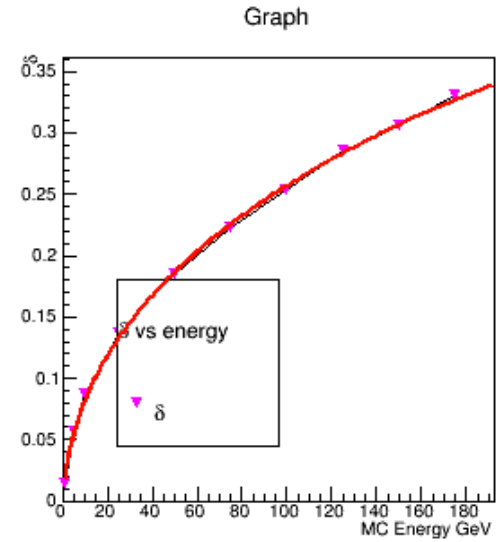


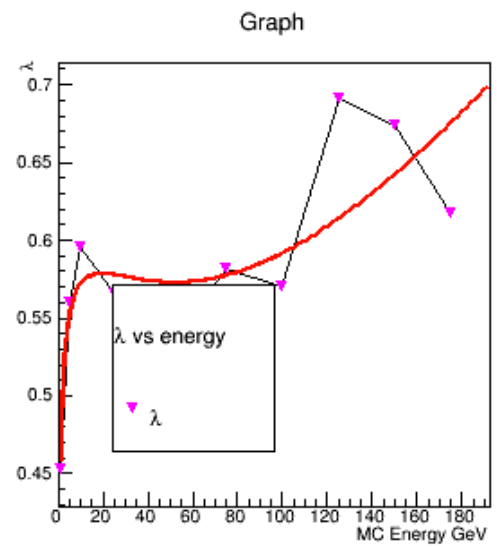












Next Step

- 1 Finish Note
- 整理code，检查

- 2 CluterEnergy Correction (0-50，50-100，100-150)关于Resolution的定义。
- 3.Calibaration
- 4.Diphoton mass
- 5.PhotonID
- 6.。。。

EB case//EE case

- Using Truth information -> approaching to the ideal case

- Reco information -> approaching to the ideal case

- Source sh 环境容易出错。