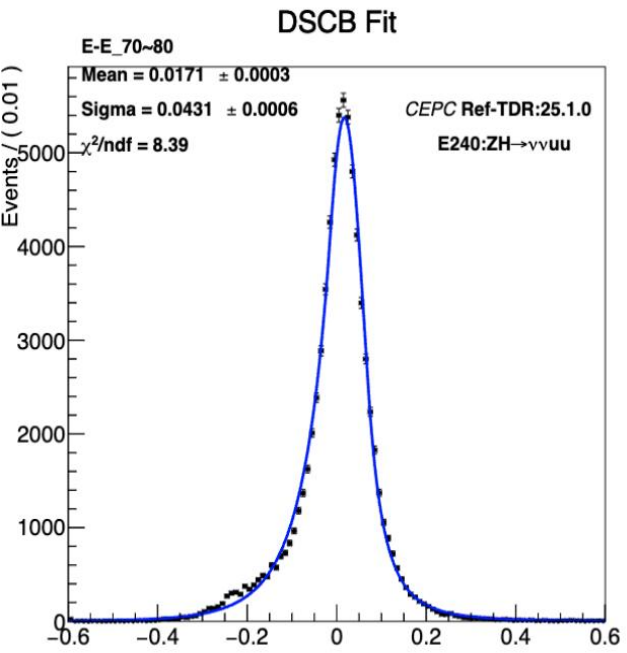
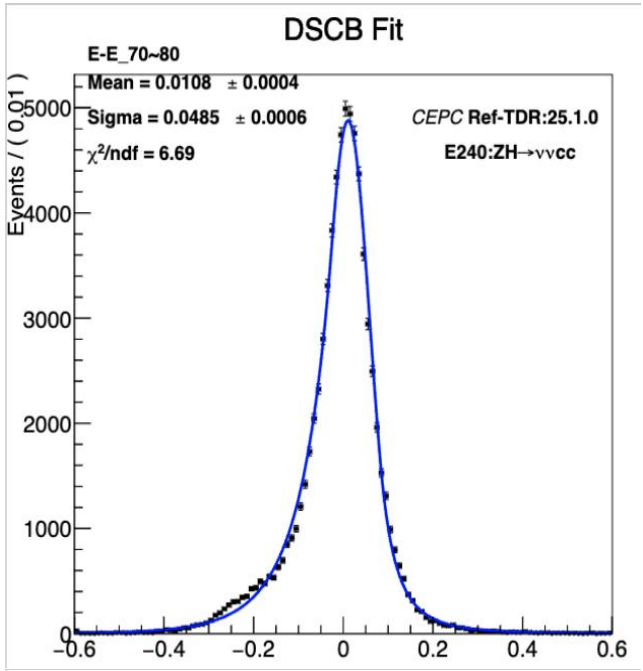
JES/JER

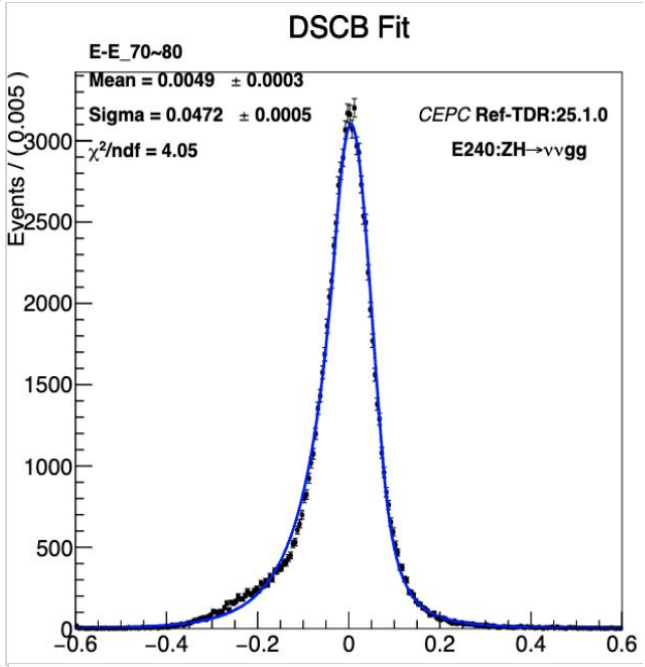
Hou Yingqi

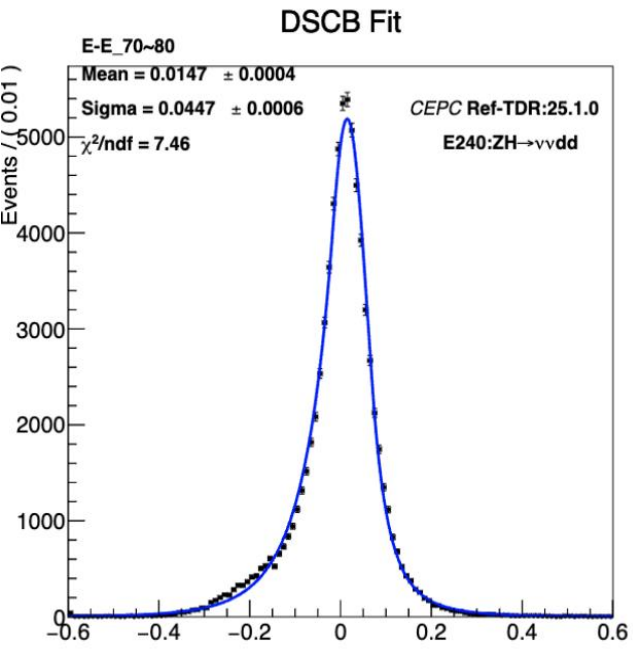
2025/2/26

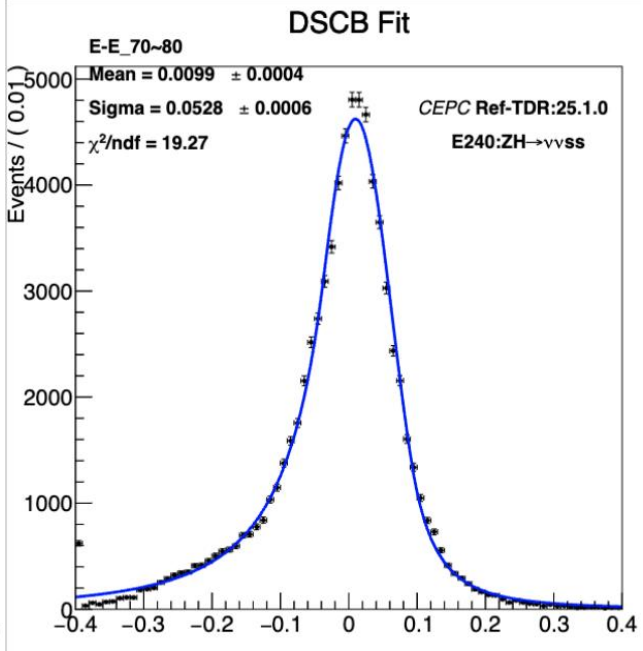
DeltaE of jet at 70~80GeV

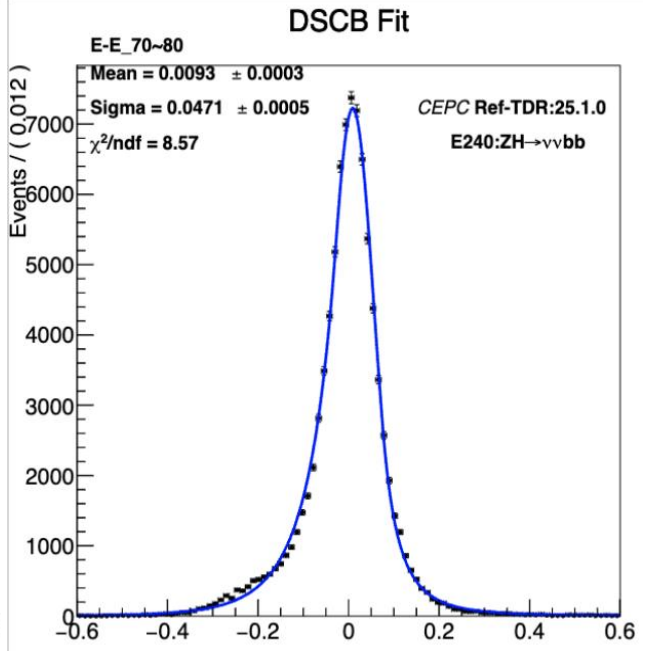




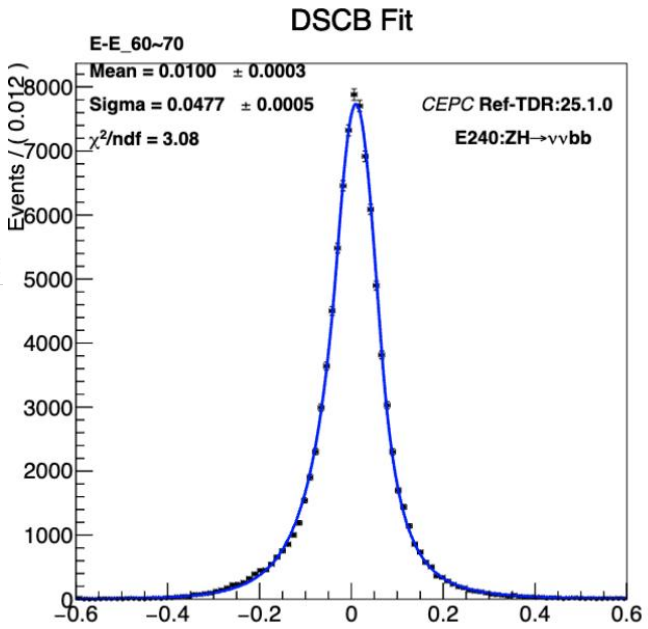






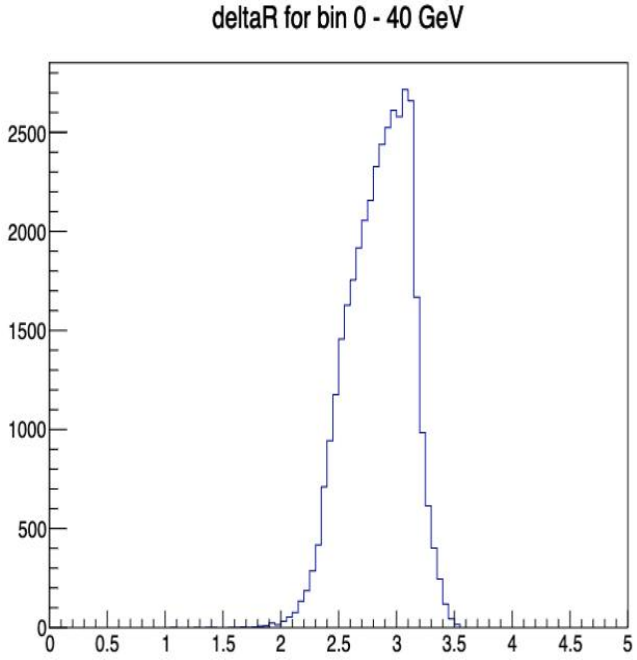


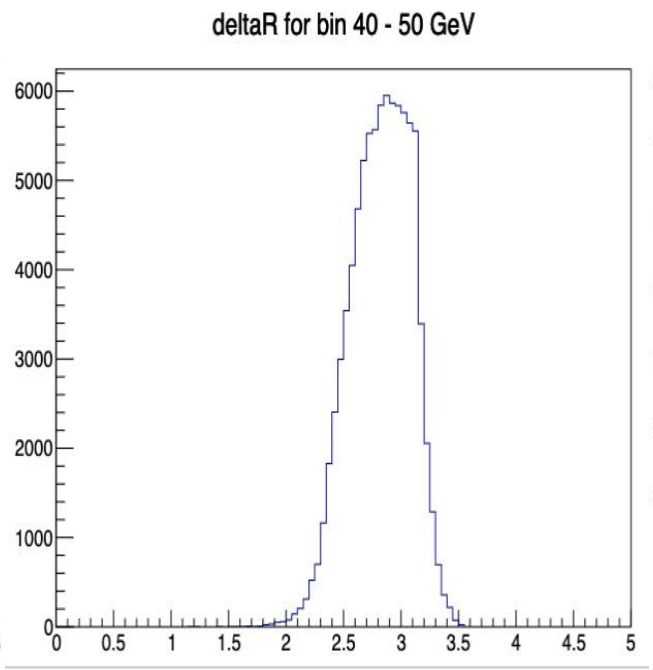
General fit

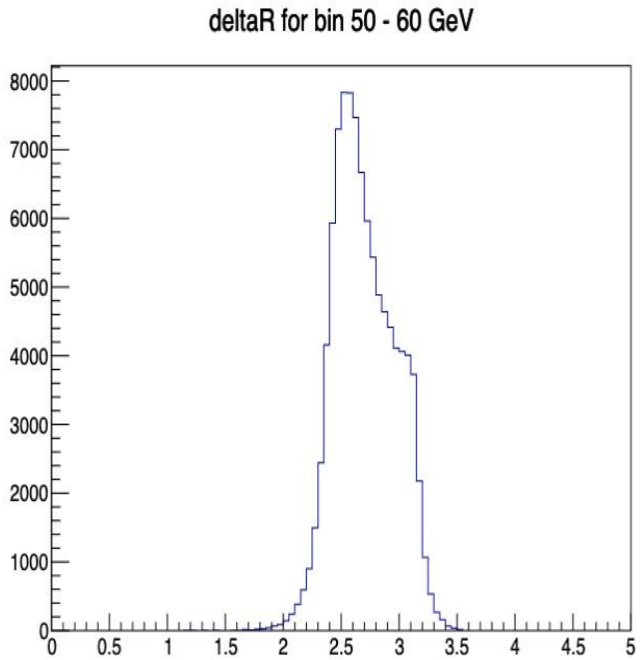


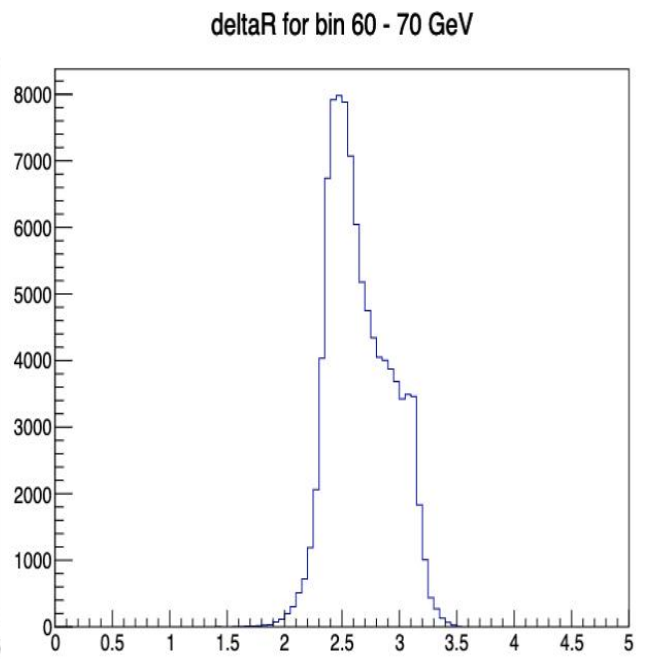
- ✓ The two sides are asymetrical, with a bump on the left

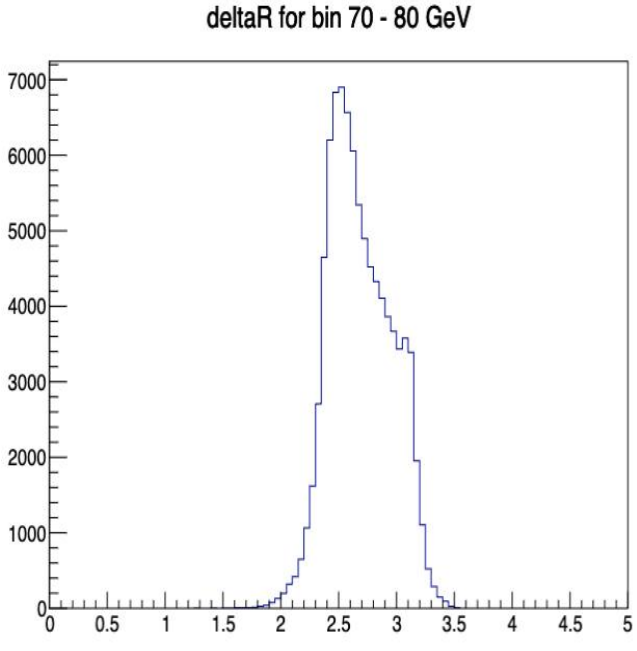
DeltaR of two jets(GEN) in nnHbb

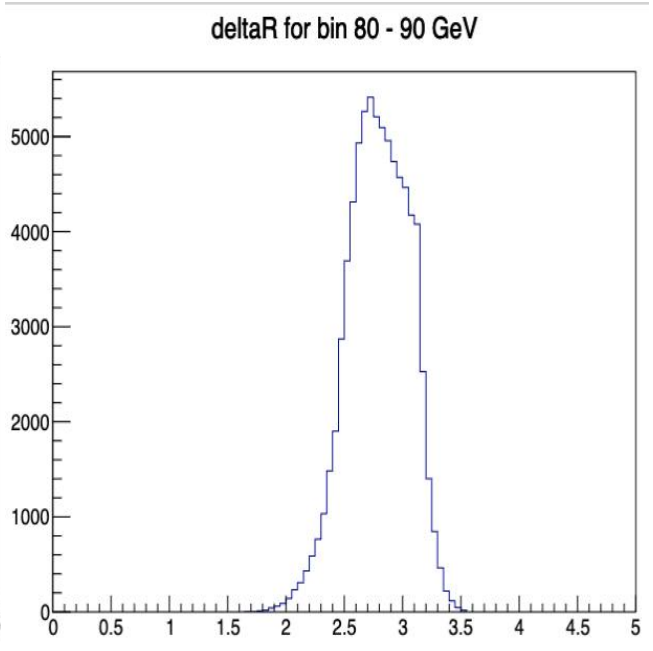


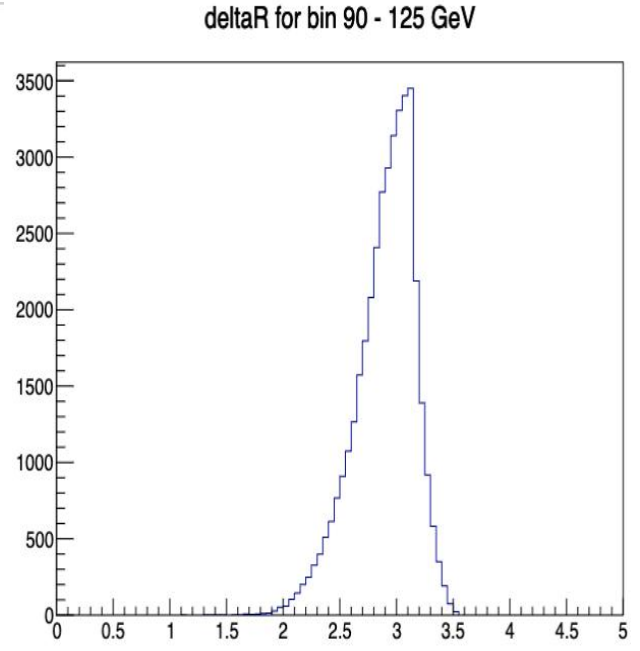








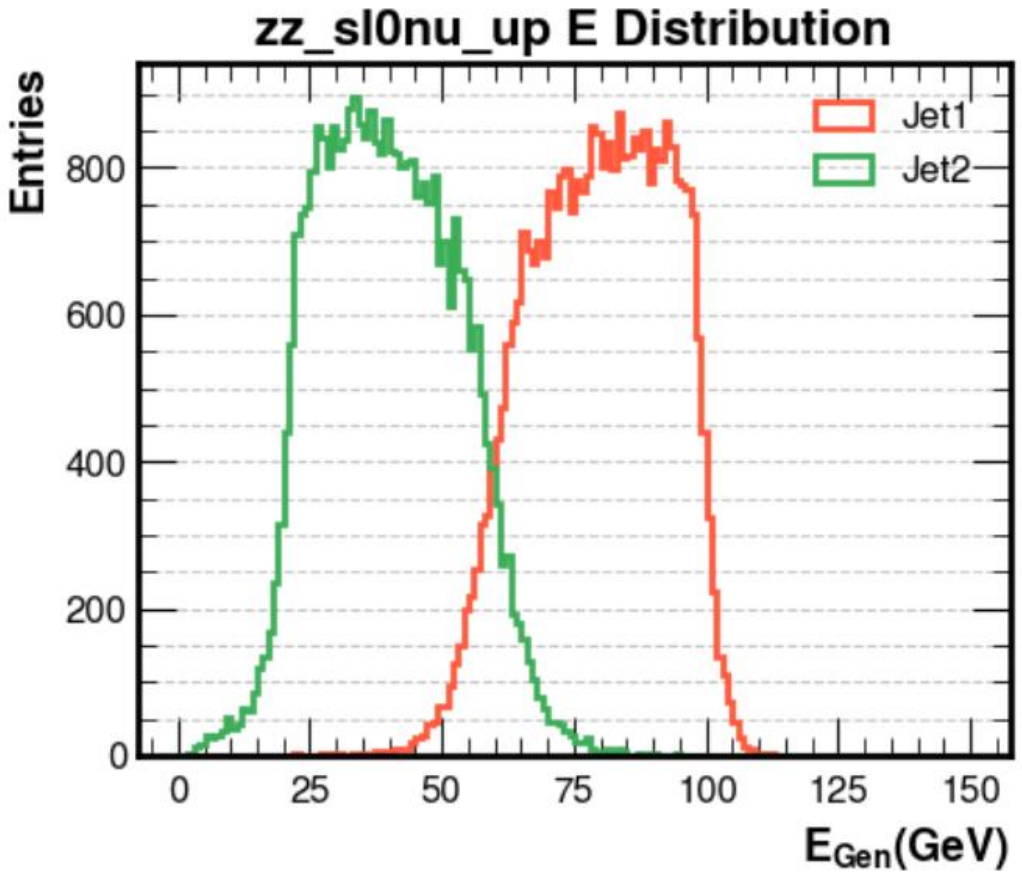




- ✓ deltaR is normal when Gen_jet energy is at 70~80GeV

zz_sl0nu_up jet energy distribution

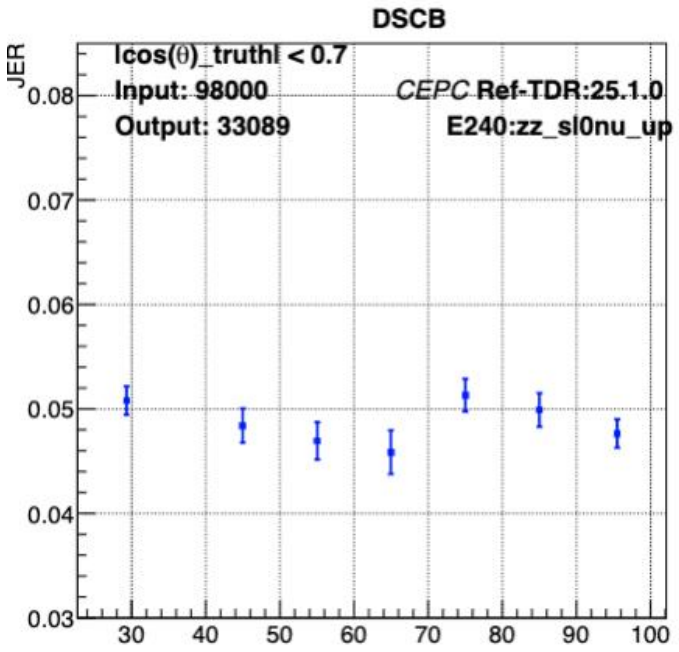
✓ costheta_truth<0.7

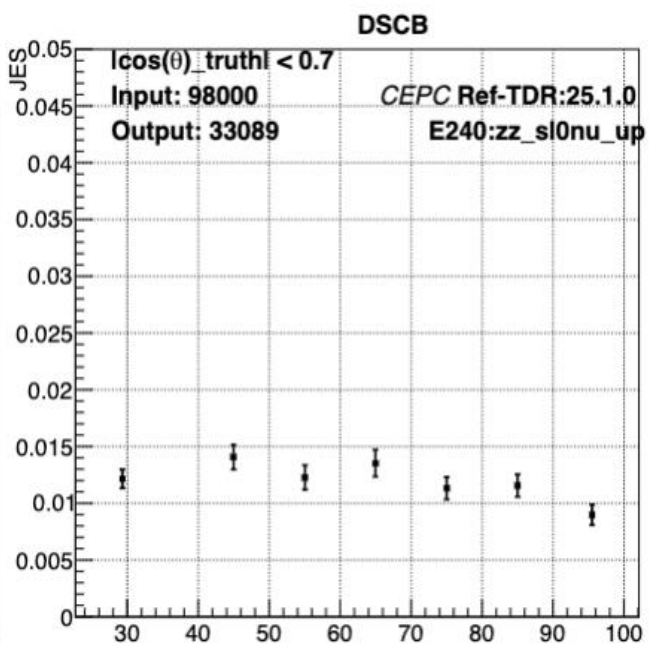


DSCB

JER

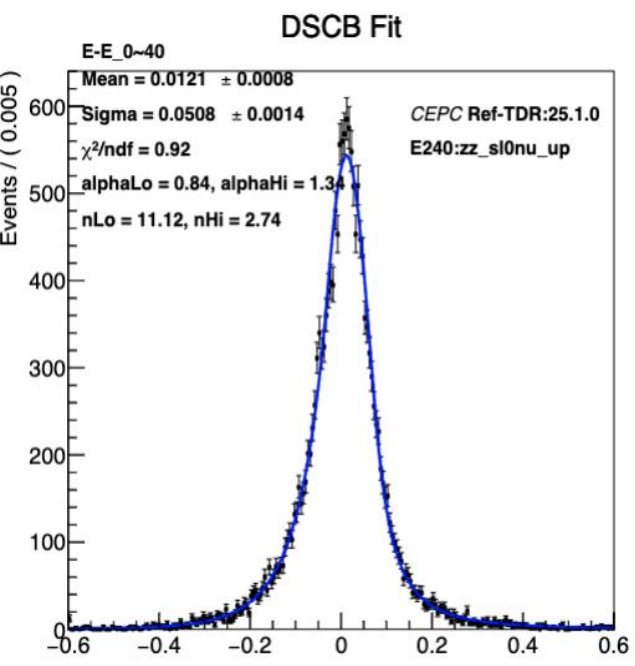
JES

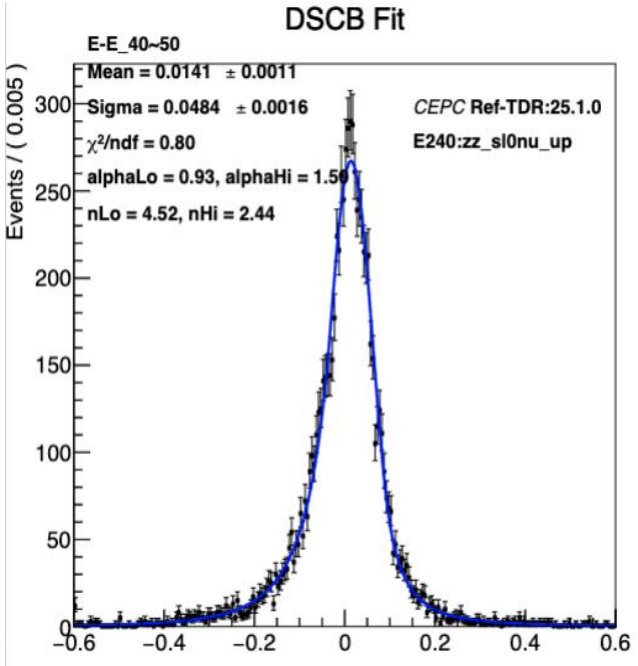


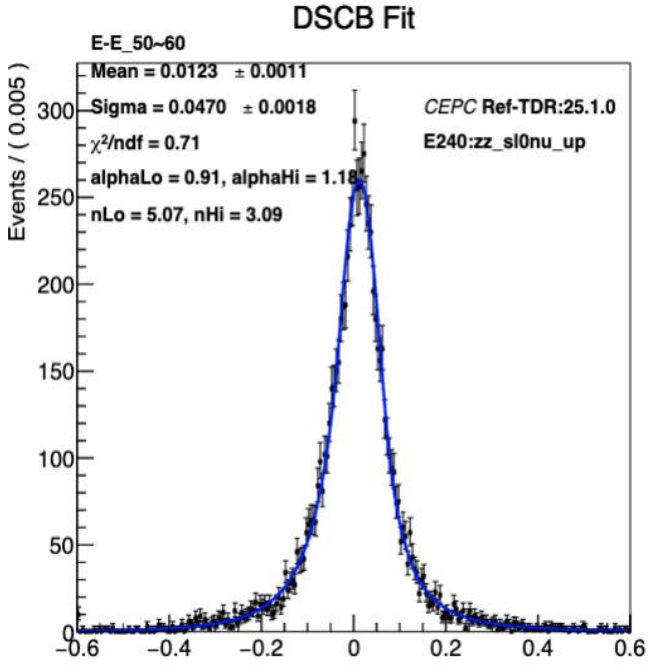


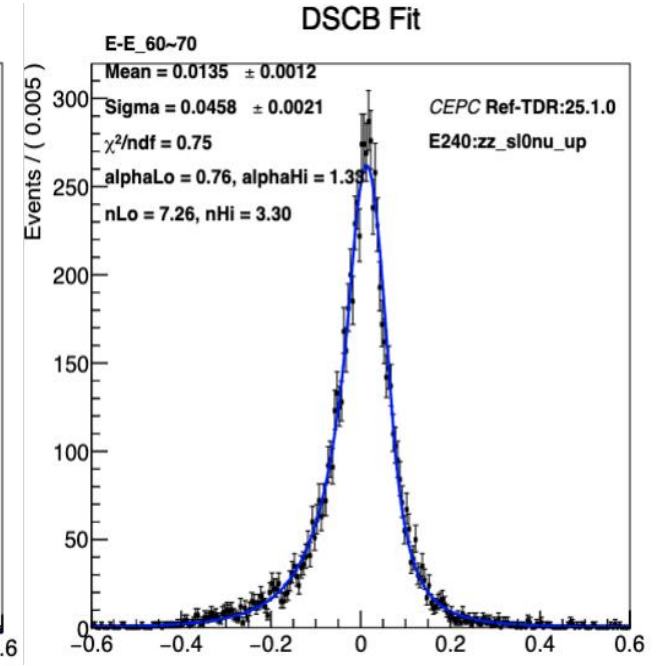
- JER has a jump at 70~80 GeV

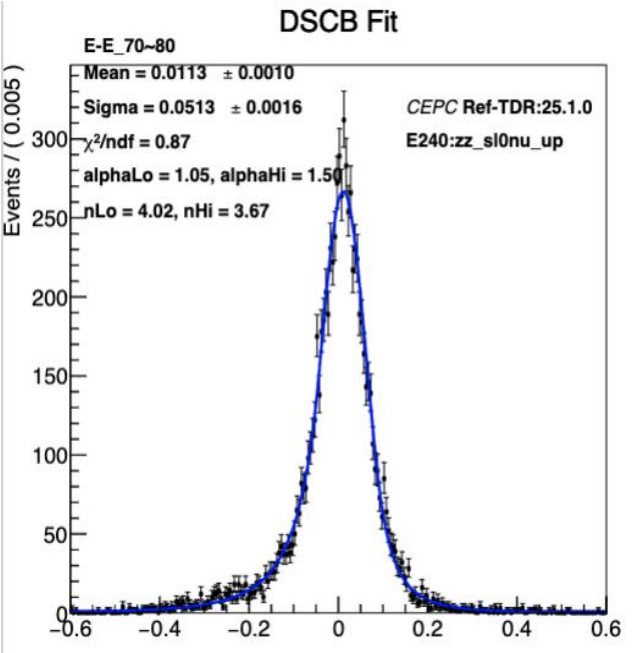
fit result

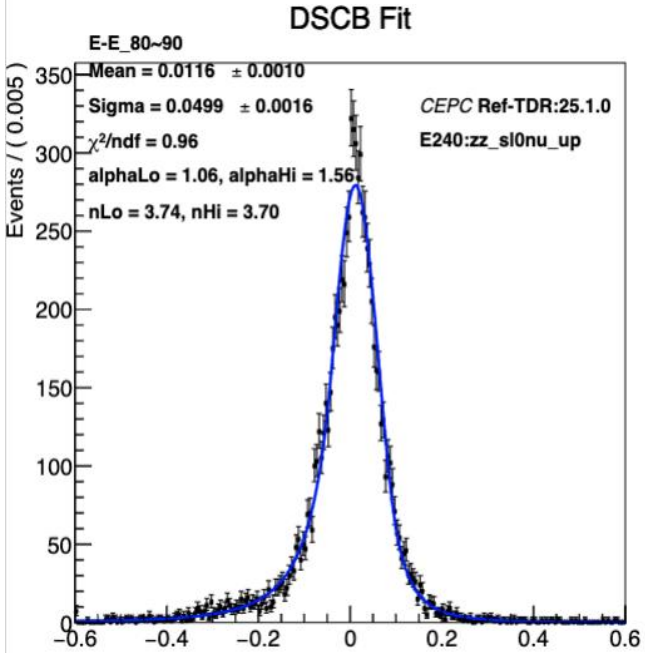

DSCB Fit
E-E_0~40
Mean = 0.0121 ± 0.0008
Sigma = 0.0508 ± 0.0014
χ²/ndf = 0.92
alphaLo = 0.84, alphaHi = 1.34
nLo = 11.12, nHi = 2.74
CEPC Ref-TDR:25.1.0
E240:zz_sl0nu_up
Events / (0.005)

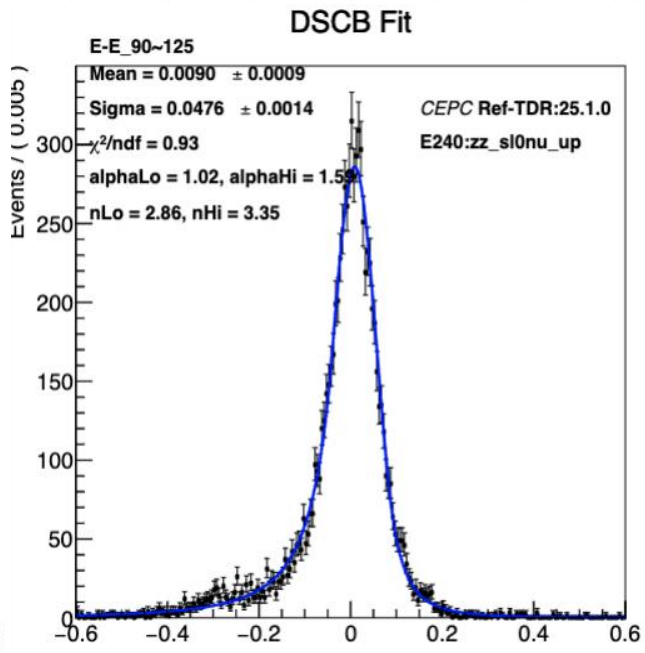

DSCB Fit
E-E_40~50
Mean = 0.0141 ± 0.0011
Sigma = 0.0484 ± 0.0016
χ²/ndf = 0.80
alphaLo = 0.93, alphaHi = 1.50
nLo = 4.52, nHi = 2.44
CEPC Ref-TDR:25.1.0
E240:zz_sl0nu_up
Events / (0.005)


DSCB Fit
E-E_50~60
Mean = 0.0123 ± 0.0011
Sigma = 0.0470 ± 0.0018
χ²/ndf = 0.71
alphaLo = 0.91, alphaHi = 1.18
nLo = 5.07, nHi = 3.09
CEPC Ref-TDR:25.1.0
E240:zz_sl0nu_up
Events / (0.005)


DSCB Fit
E-E_60~70
Mean = 0.0135 ± 0.0012
Sigma = 0.0458 ± 0.0021
χ²/ndf = 0.75
alphaLo = 0.76, alphaHi = 1.33
nLo = 7.26, nHi = 3.30
CEPC Ref-TDR:25.1.0
E240:zz_sl0nu_up
Events / (0.005)

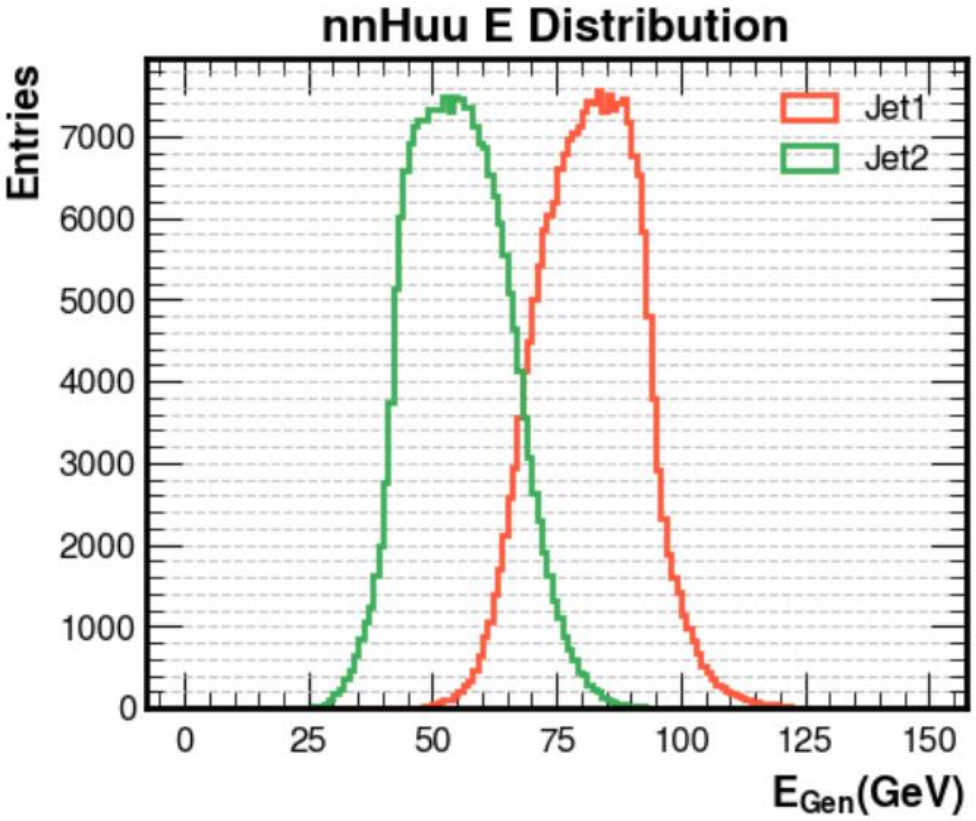

DSCB Fit
E-E_70~80
Mean = 0.0113 ± 0.0010
Sigma = 0.0513 ± 0.0016
χ²/ndf = 0.87
alphaLo = 1.05, alphaHi = 1.50
nLo = 4.02, nHi = 3.67
CEPC Ref-TDR:25.1.0
E240:zz_sl0nu_up
Events / (0.005)


DSCB Fit
E-E_80~90
Mean = 0.0116 ± 0.0010
Sigma = 0.0499 ± 0.0016
χ²/ndf = 0.96
alphaLo = 1.06, alphaHi = 1.56
nLo = 3.74, nHi = 3.70
CEPC Ref-TDR:25.1.0
E240:zz_sl0nu_up
Events / (0.005)


DSCB Fit
E-E_90~125
Mean = 0.0090 ± 0.0009
Sigma = 0.0476 ± 0.0014
χ²/ndf = 0.93
alphaLo = 1.02, alphaHi = 1.59
nLo = 2.86, nHi = 3.35
CEPC Ref-TDR:25.1.0
E240:zz_sl0nu_up

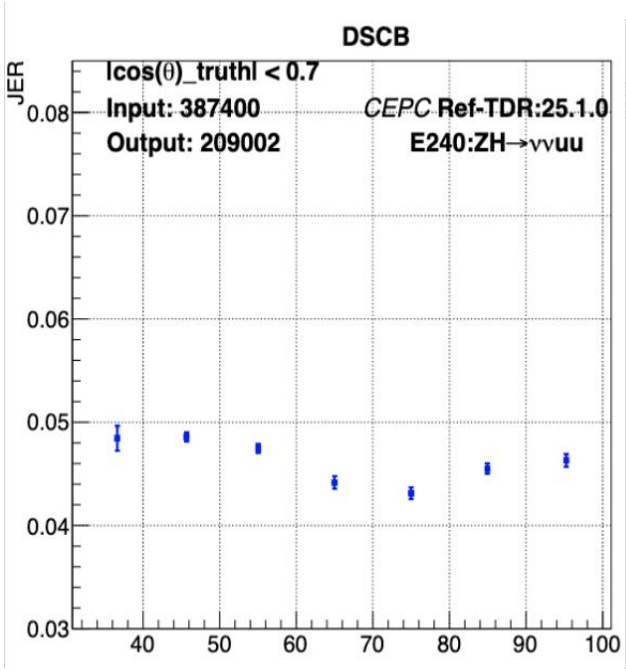
nnHuu jet energy distribution

✓ costheta_truth<0.7

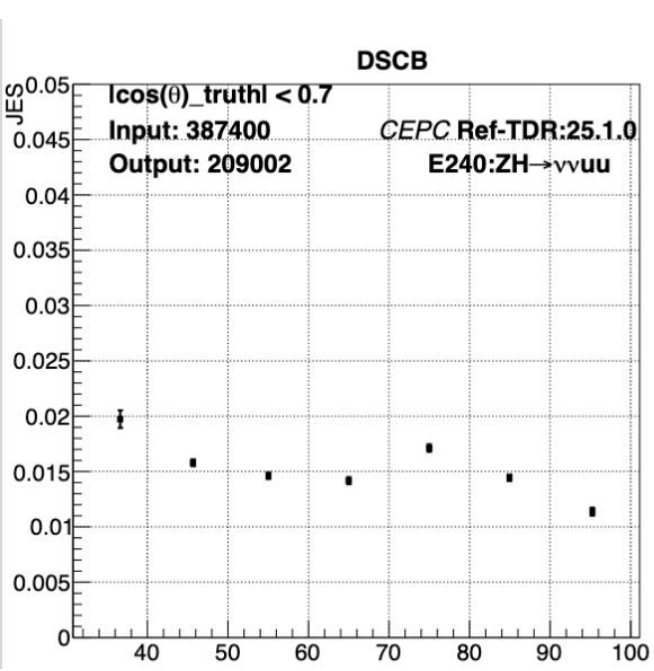


DSCB

JER

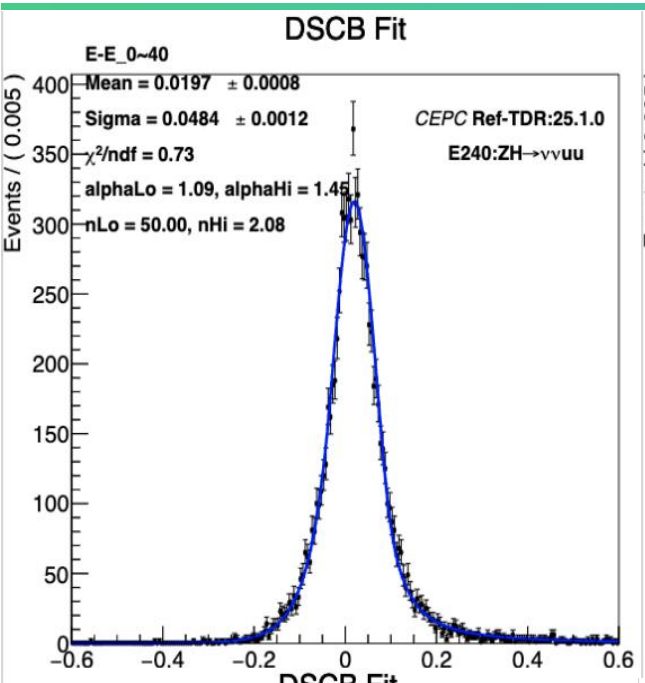


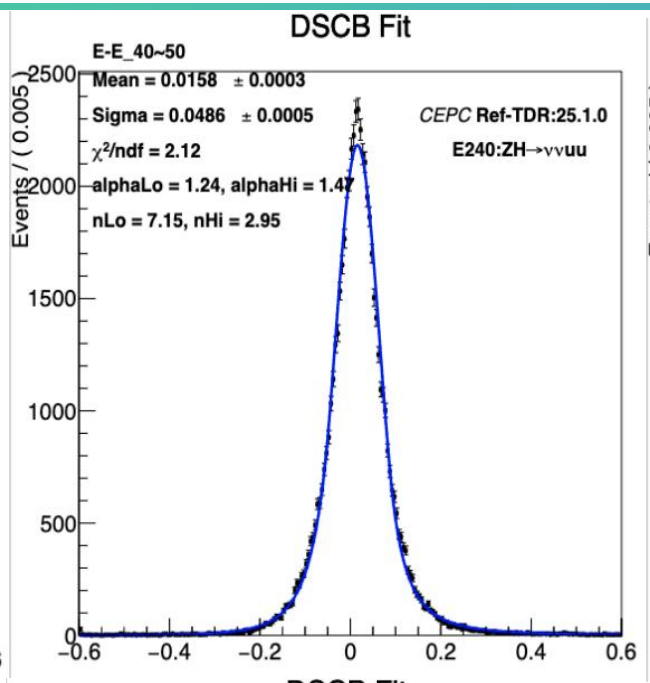
JES

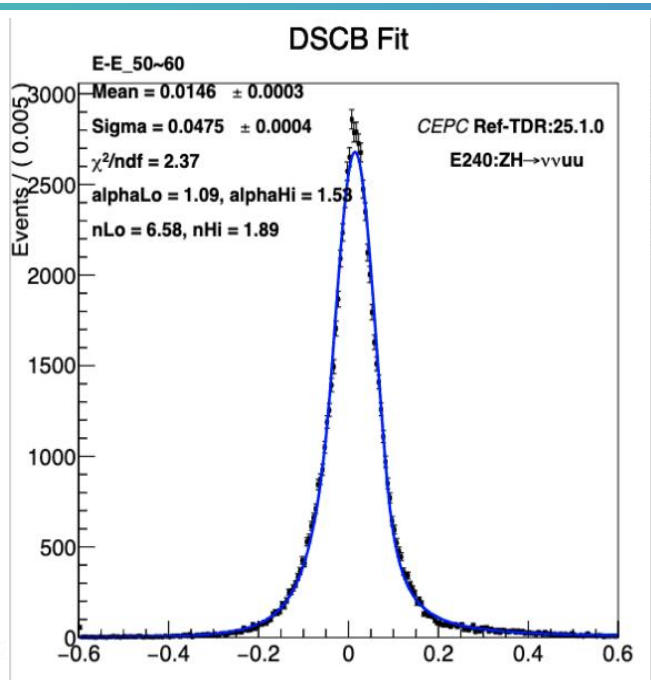


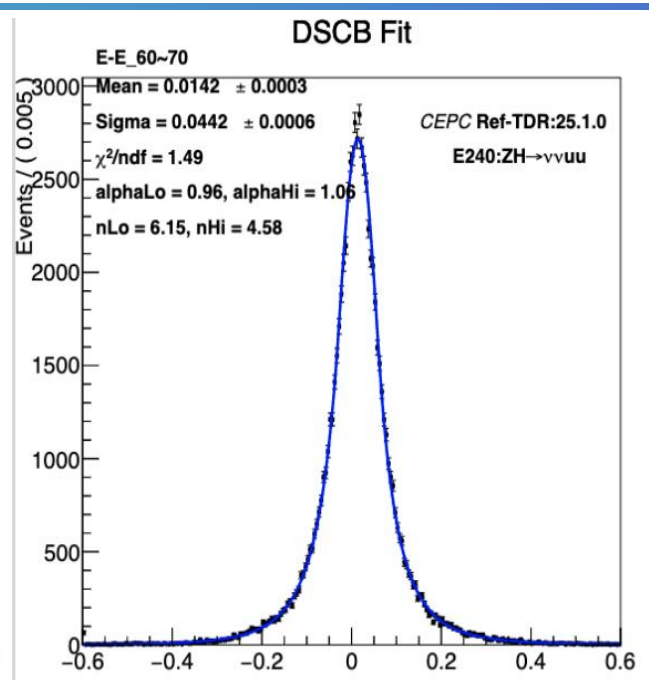
- JER has the smallest value between 70 to 80GeV.

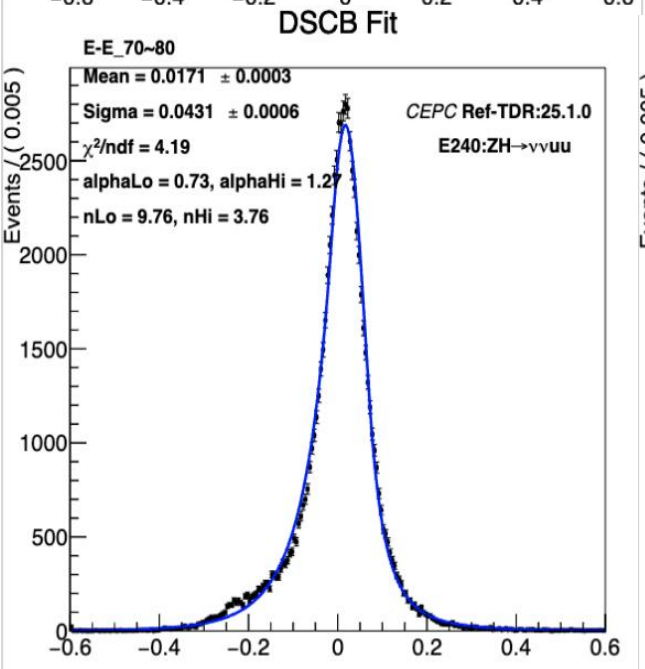
fit result

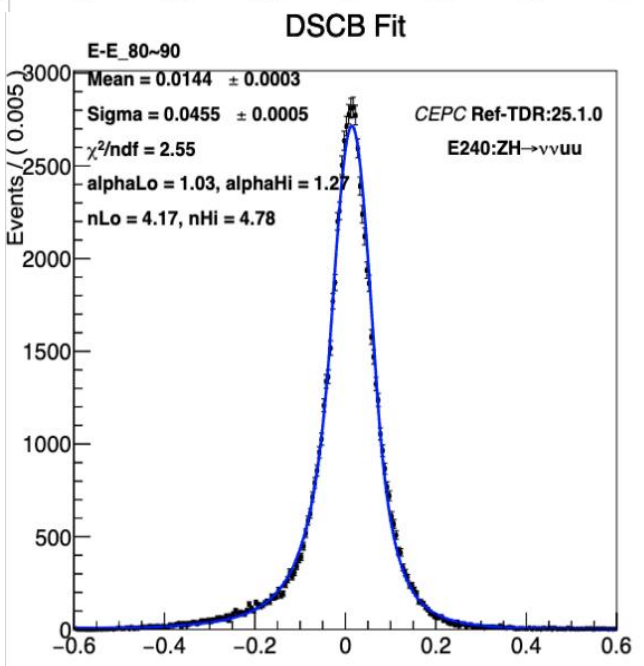

DSCB Fit
E-E_0~40
Mean = 0.0197 ± 0.0008
Sigma = 0.0484 ± 0.0012
χ²/ndf = 0.73
alphaLo = 1.09, alphaHi = 1.45
nLo = 50.00, nHi = 2.08
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄uū
Events / (0.005)

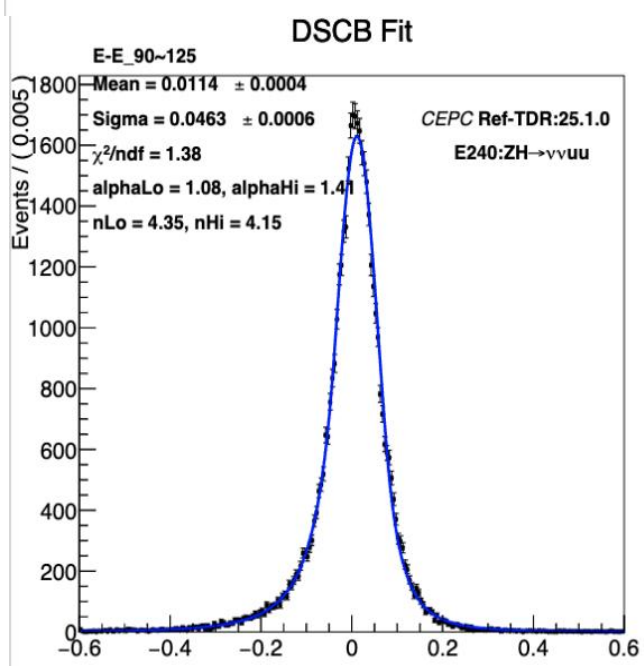

DSCB Fit
E-E_40~50
Mean = 0.0158 ± 0.0003
Sigma = 0.0486 ± 0.0005
χ²/ndf = 2.12
alphaLo = 1.24, alphaHi = 1.47
nLo = 7.15, nHi = 2.95
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄uū
Events / (0.005)


DSCB Fit
E-E_50~60
Mean = 0.0146 ± 0.0003
Sigma = 0.0475 ± 0.0004
χ²/ndf = 2.37
alphaLo = 1.09, alphaHi = 1.53
nLo = 6.58, nHi = 1.89
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄uū
Events / (0.005)

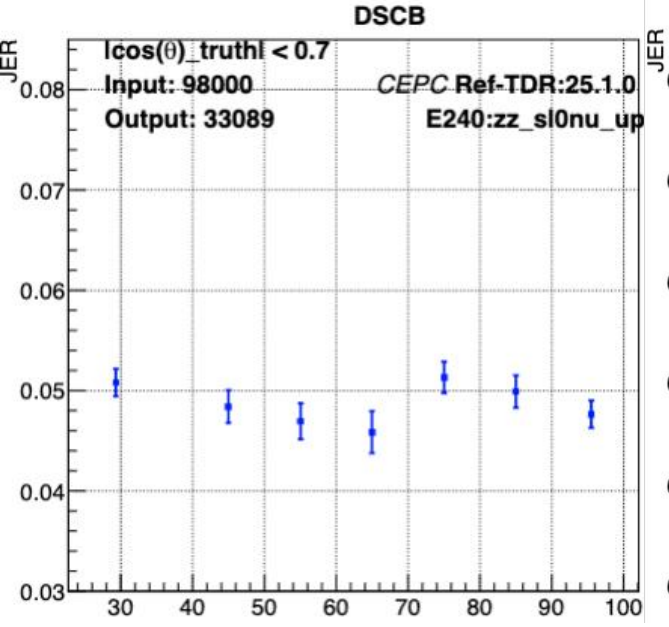

DSCB Fit
E-E_60~70
Mean = 0.0142 ± 0.0003
Sigma = 0.0442 ± 0.0006
χ²/ndf = 1.49
alphaLo = 0.96, alphaHi = 1.06
nLo = 6.15, nHi = 4.58
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄uū
Events / (0.005)

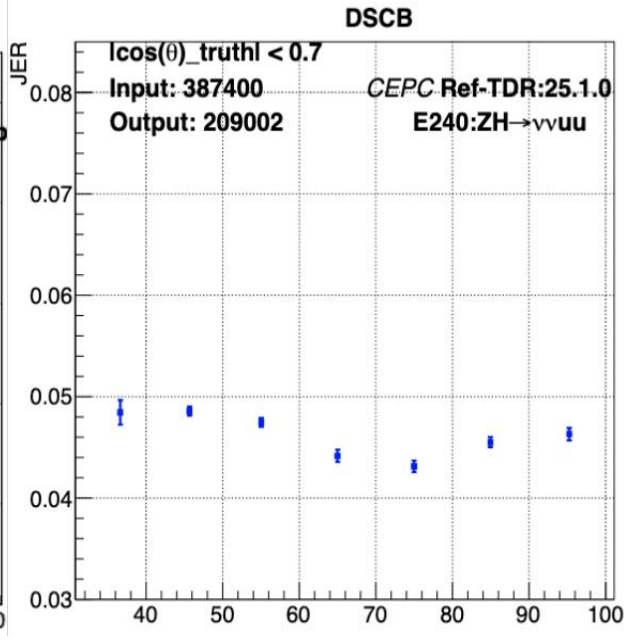

DSCB Fit
E-E_70~80
Mean = 0.0171 ± 0.0003
Sigma = 0.0431 ± 0.0006
χ²/ndf = 4.19
alphaLo = 0.73, alphaHi = 1.27
nLo = 9.76, nHi = 3.76
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄uū
Events / (0.005)

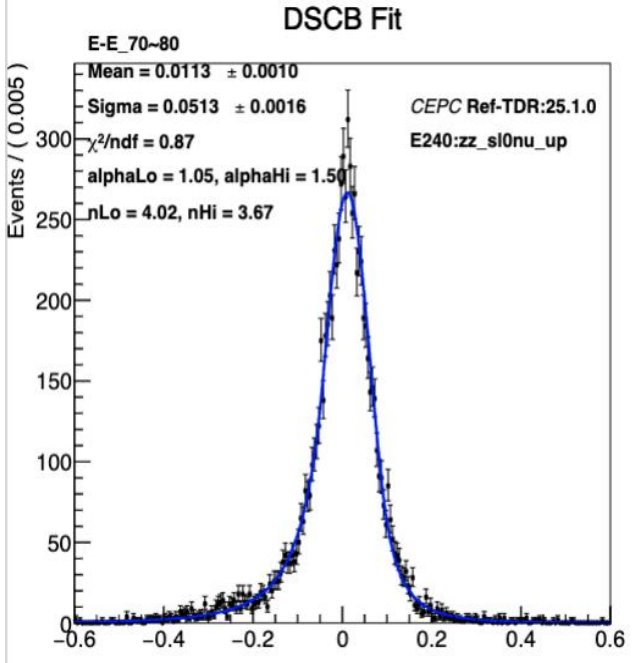

DSCB Fit
E-E_80~90
Mean = 0.0144 ± 0.0003
Sigma = 0.0455 ± 0.0005
χ²/ndf = 2.55
alphaLo = 1.03, alphaHi = 1.27
nLo = 4.17, nHi = 4.78
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄uū
Events / (0.005)

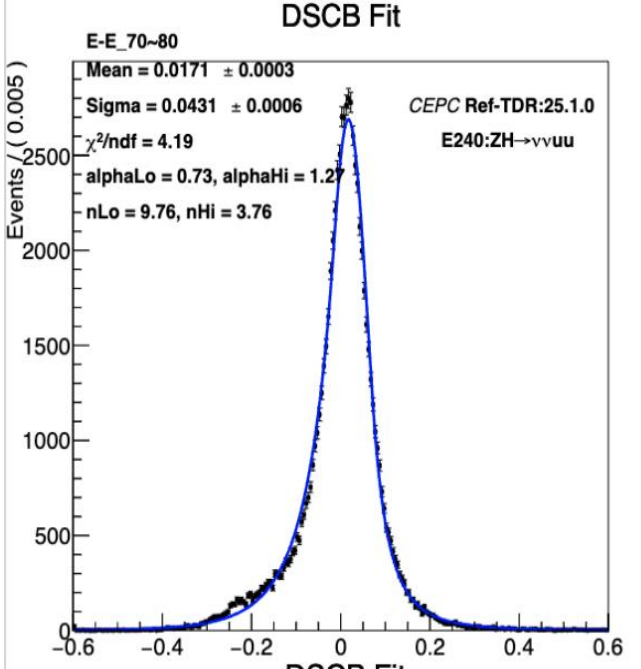

DSCB Fit
E-E_90~125
Mean = 0.0114 ± 0.0004
Sigma = 0.0463 ± 0.0006
χ²/ndf = 1.38
alphaLo = 1.08, alphaHi = 1.41
nLo = 4.35, nHi = 4.15
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄uū
Events / (0.005)

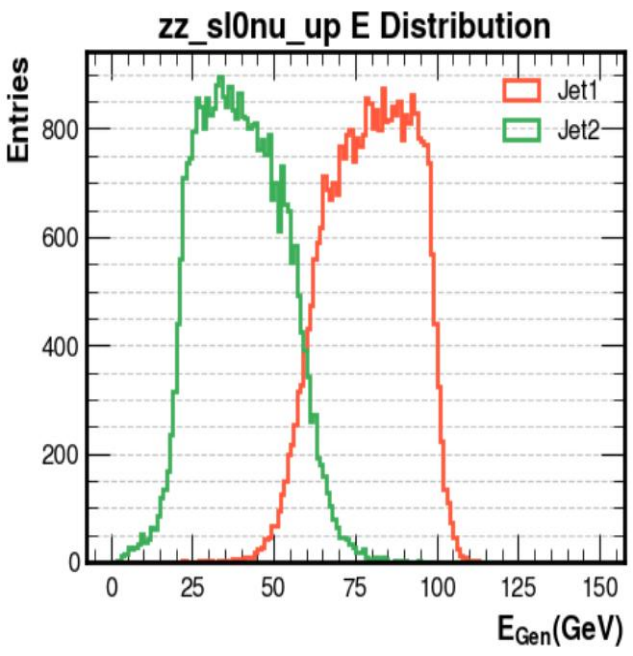
comparison of JER of u

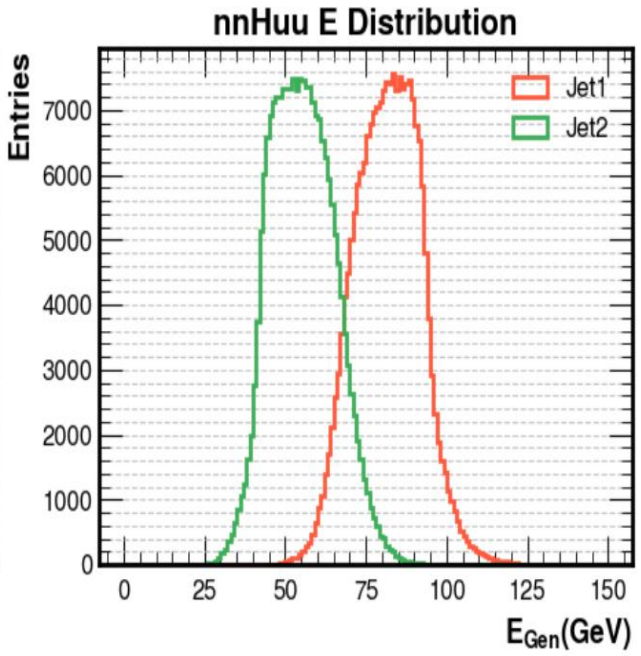


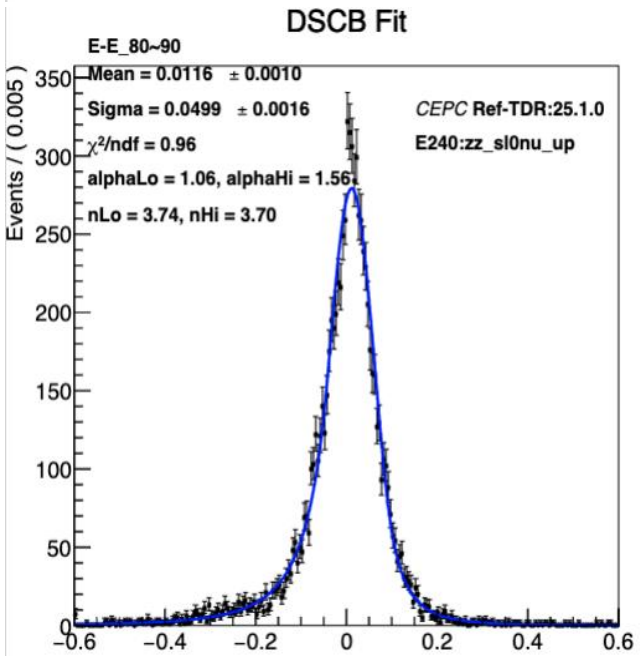


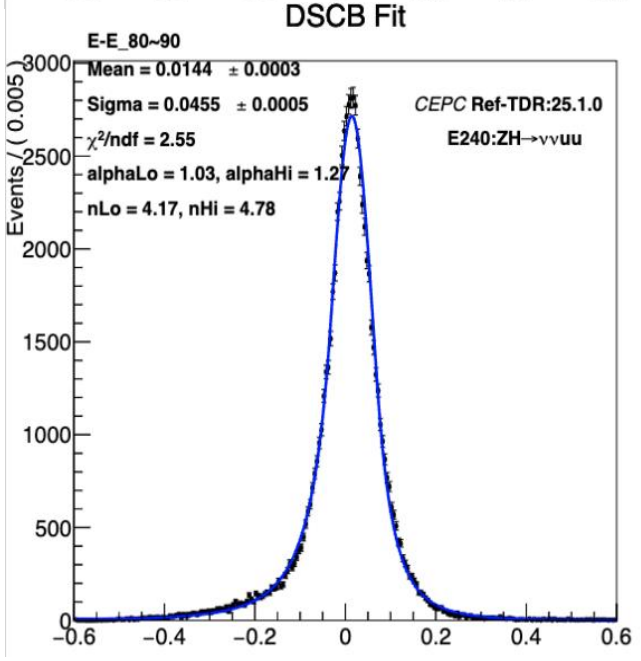








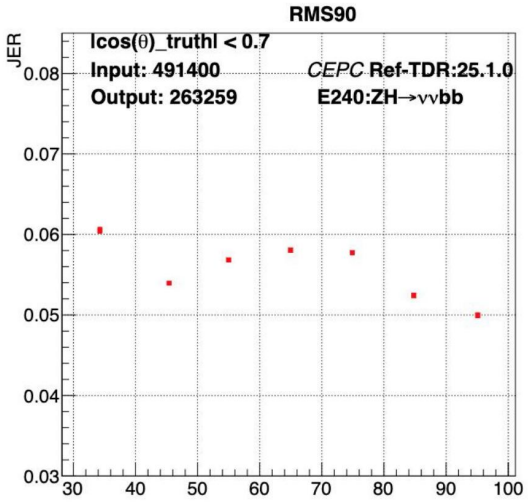


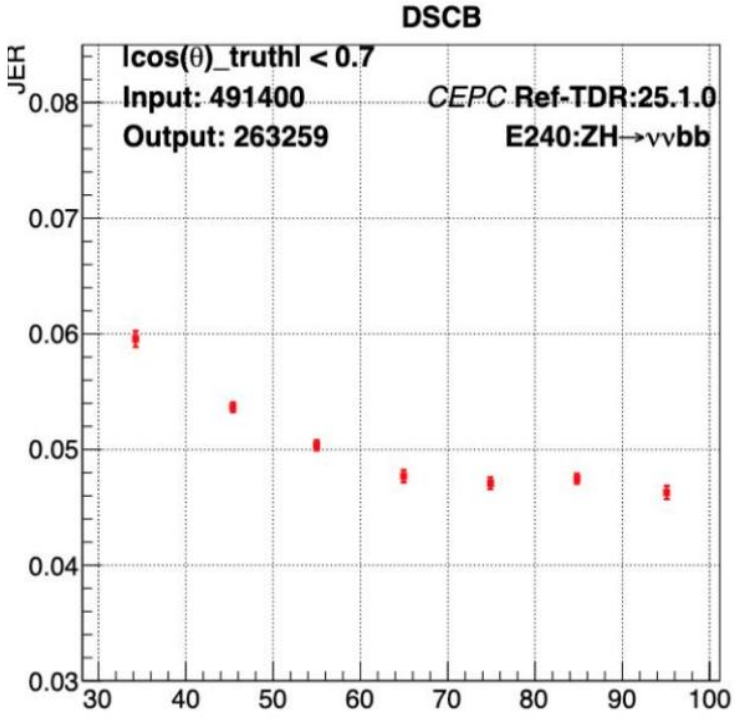


improvement of DSCB

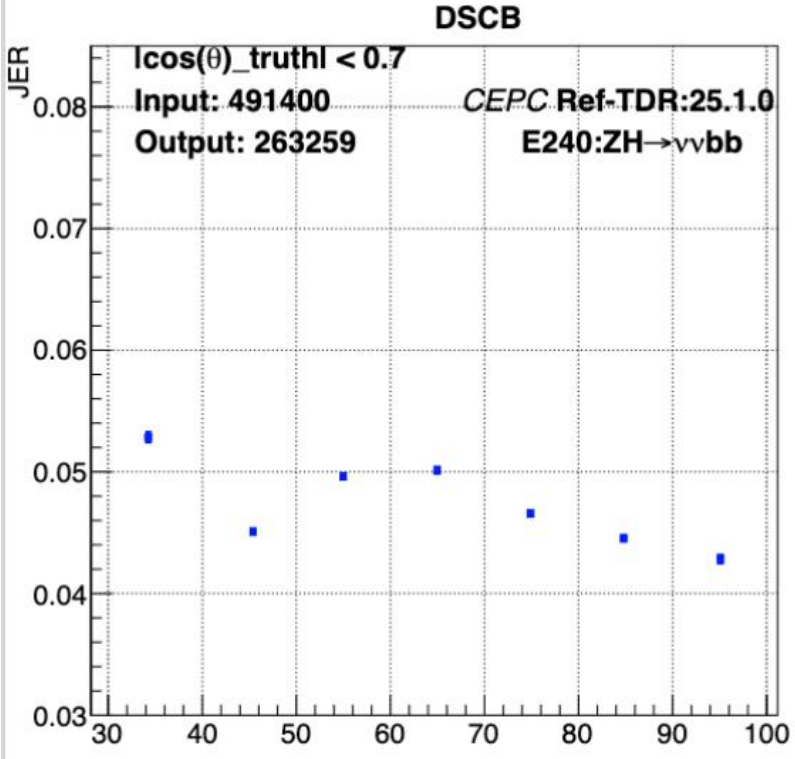
```
# 定义不同的 alphaLo, alphaHi, nLo, nHi 值，可以根据需要调整
alphaLo_values = [1, 1, 1.1, 1, 0.9, 1, 1]
alphaHi_values = [1.1, 1, 1.2, 1.2, 1.2, 1.2, 1.2]
nLo_values = [15, 9, 6.5, 5.0, 4, 5, 5]
nHi_values = [5, 10, 4, 6.0, 9, 6, 6]
```

```
alphaLo = ROOT.RooRealVar("alphaLo", "alphaLo", alphaLo_val)
alphaHi = ROOT.RooRealVar("alphaHi", "alphaHi", alphaHi_val)
nLo = ROOT.RooRealVar("nLo", "nLo", nLo_val, 0, 100)
nHi = ROOT.RooRealVar("nHi", "nHi", nHi_val, 0, 100)  # n是左
```

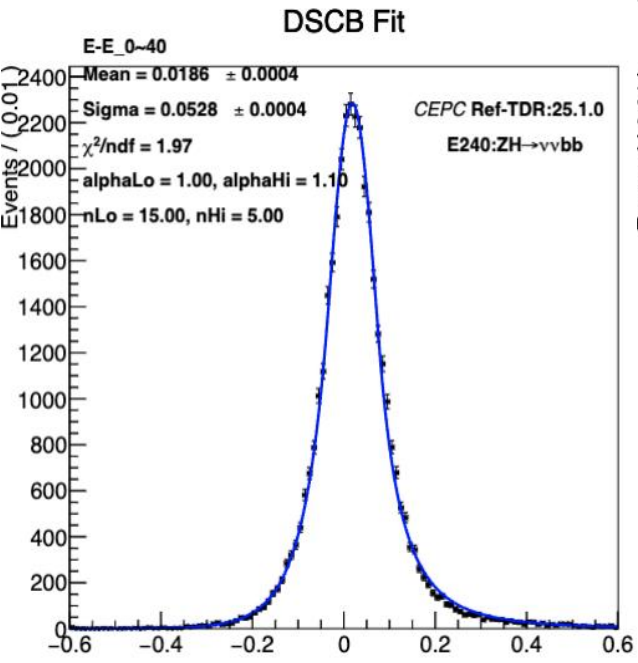


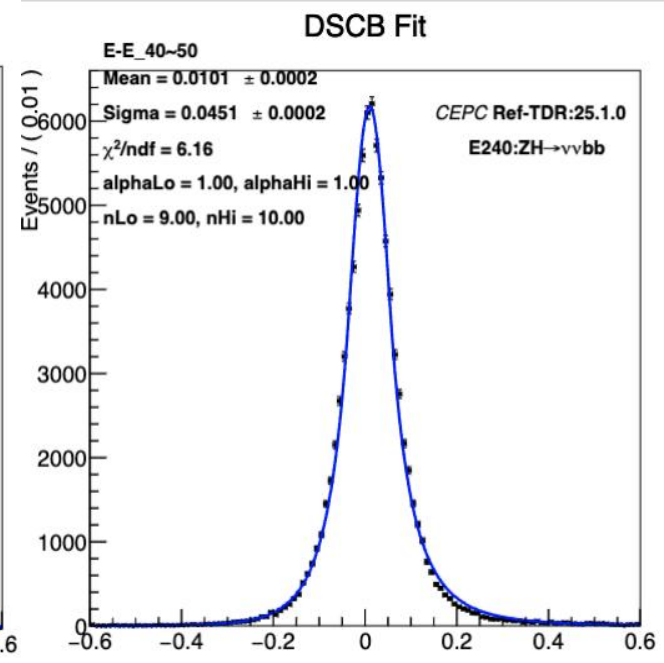


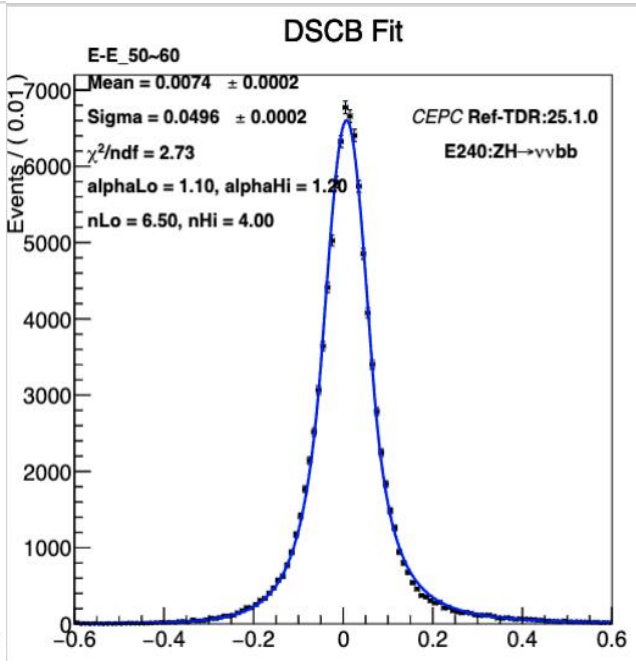
- Fix the corresponding four parameters so that the top data can be fitted.
- The JER of high energy region decreased significantly, but the overall trend was not obvious.
- The reliability of this methord needs futher discussion.

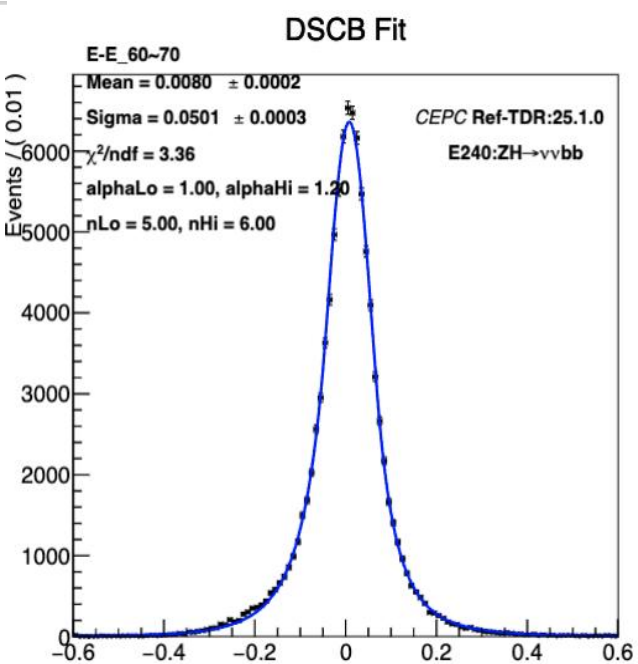


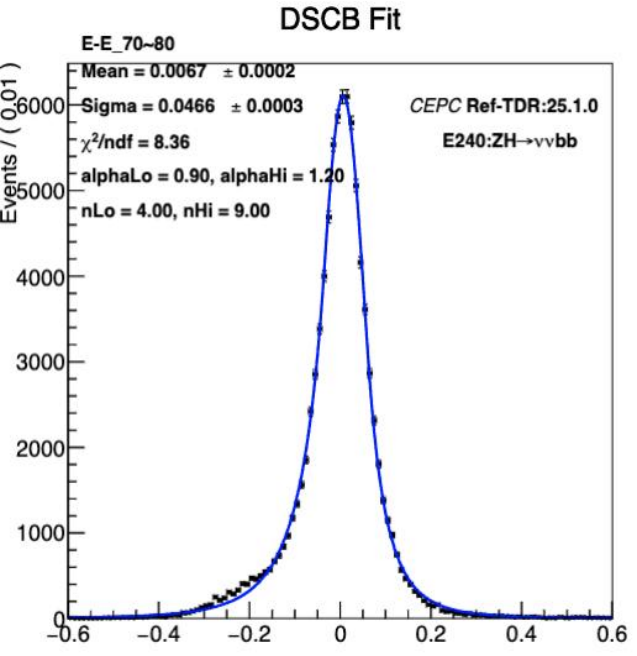
fit result of DSCB improved

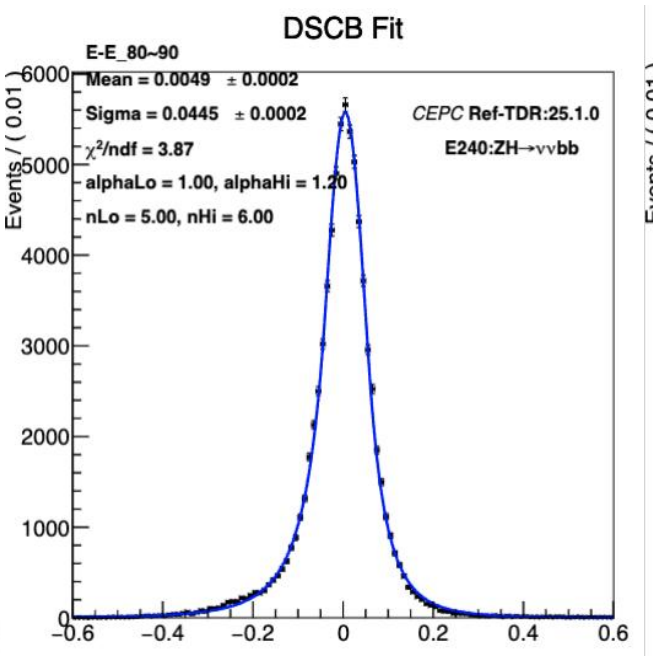


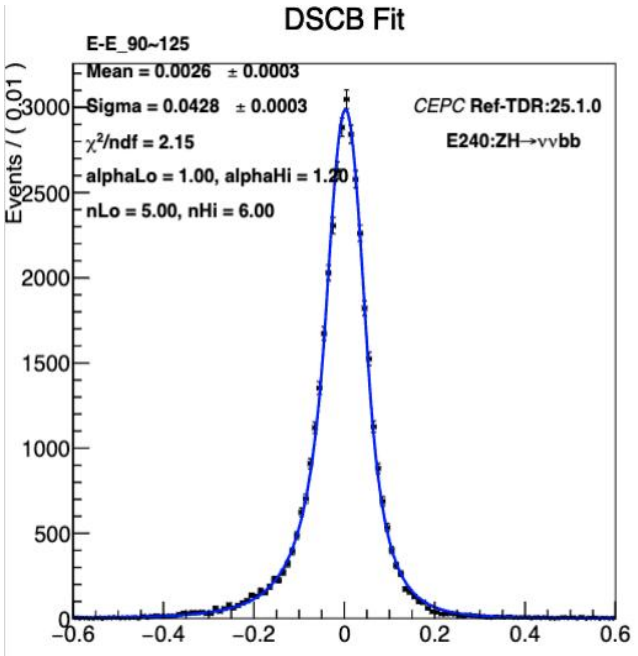






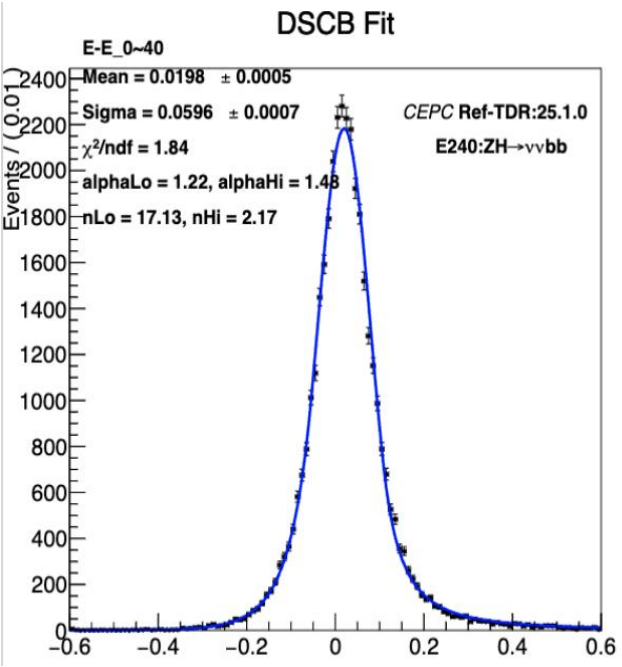


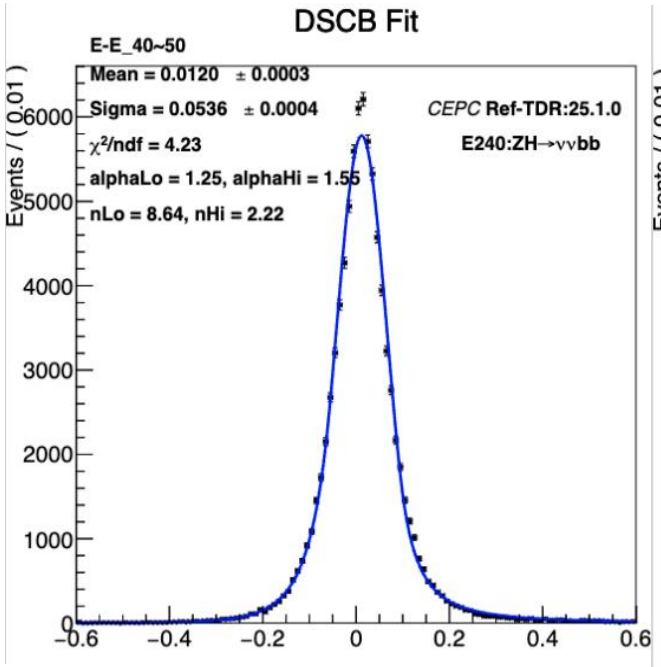


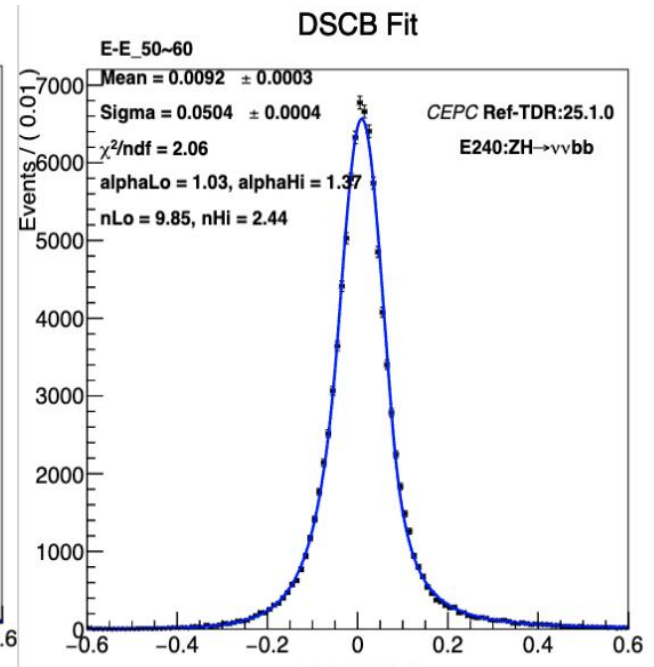


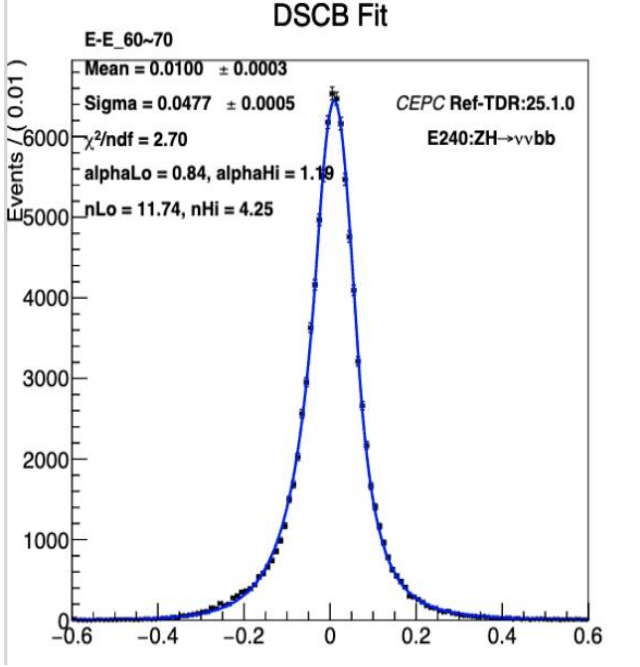
- ✓ The top of the range of about -0.1 to 0.1 is fully fitted, and the two sides are slightly less well fitted.

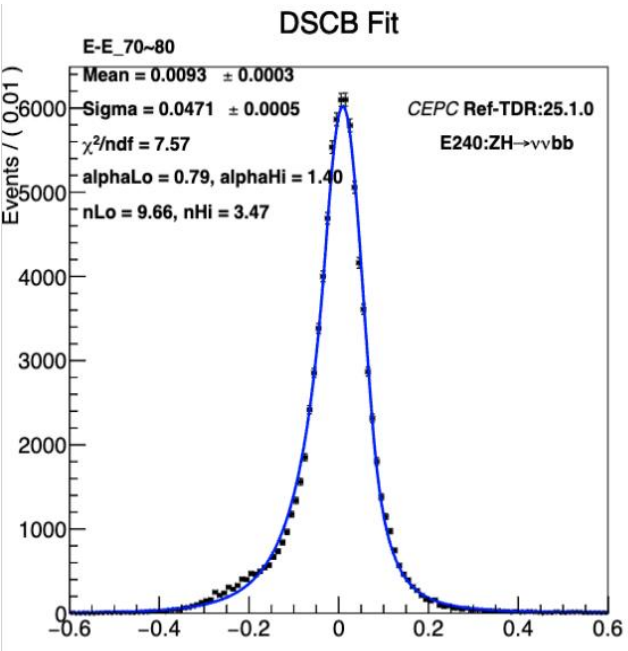
fir result of DSCB before

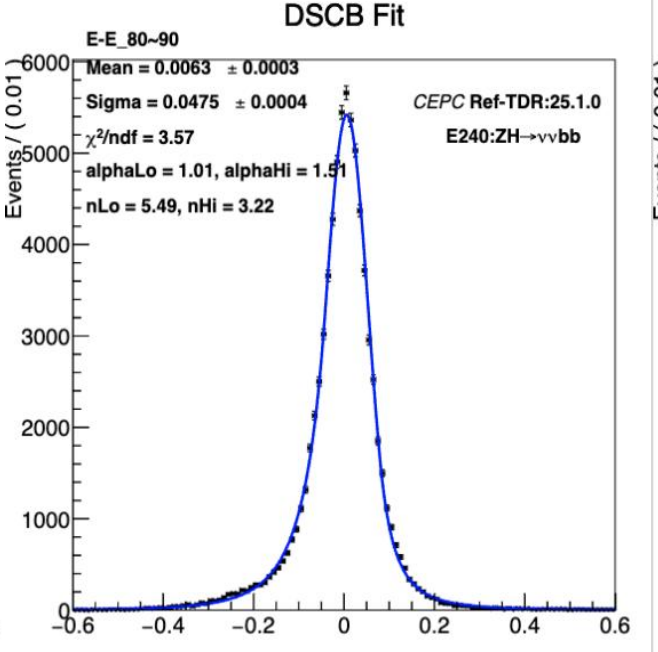


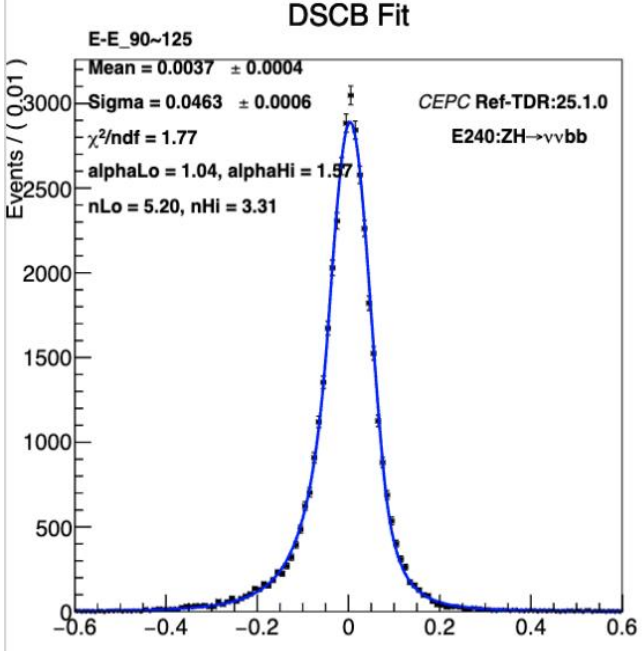


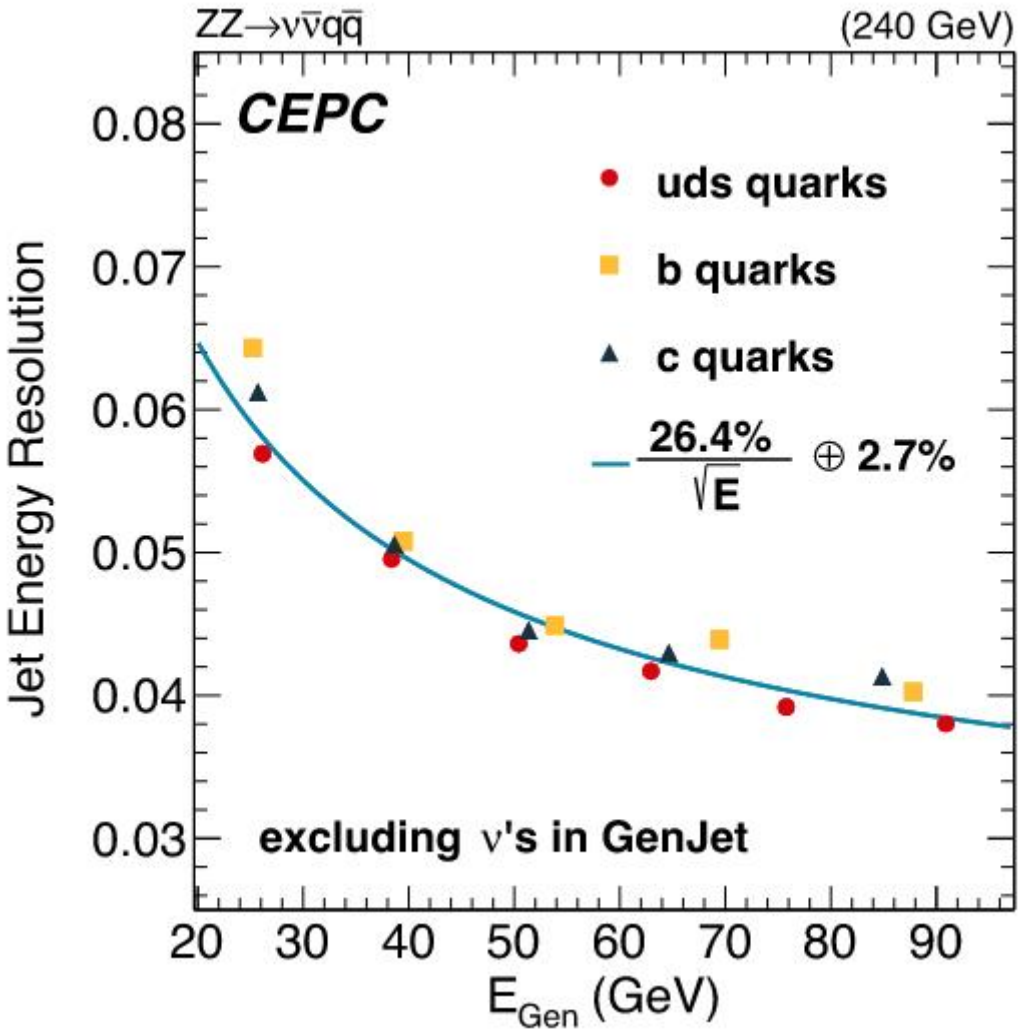




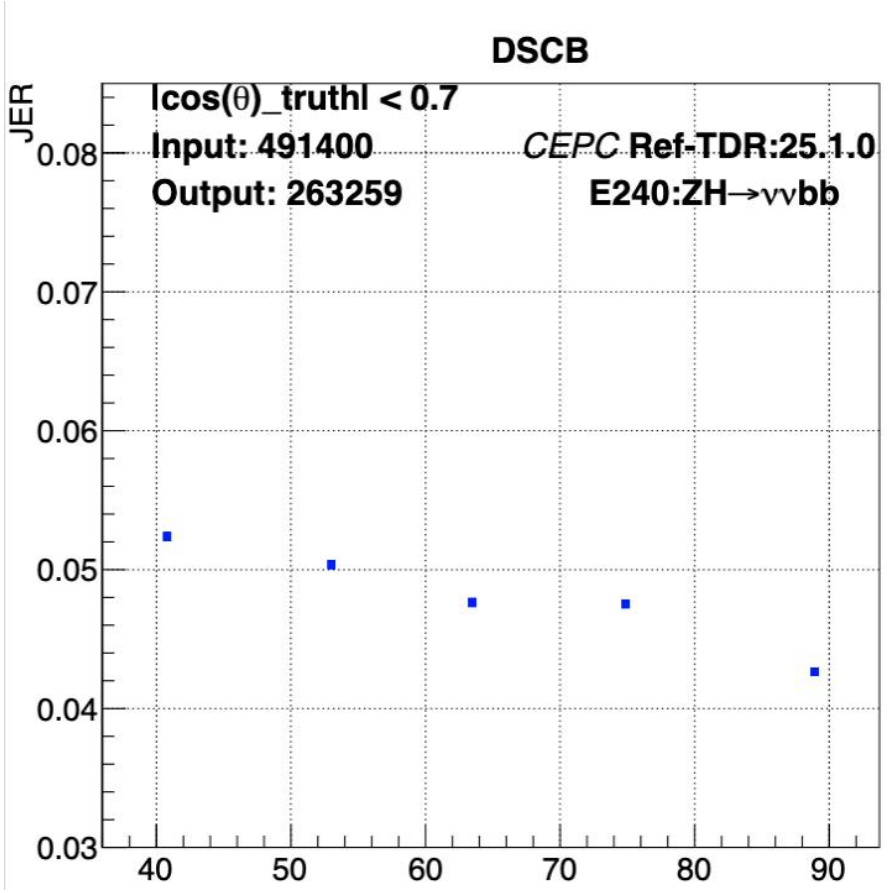




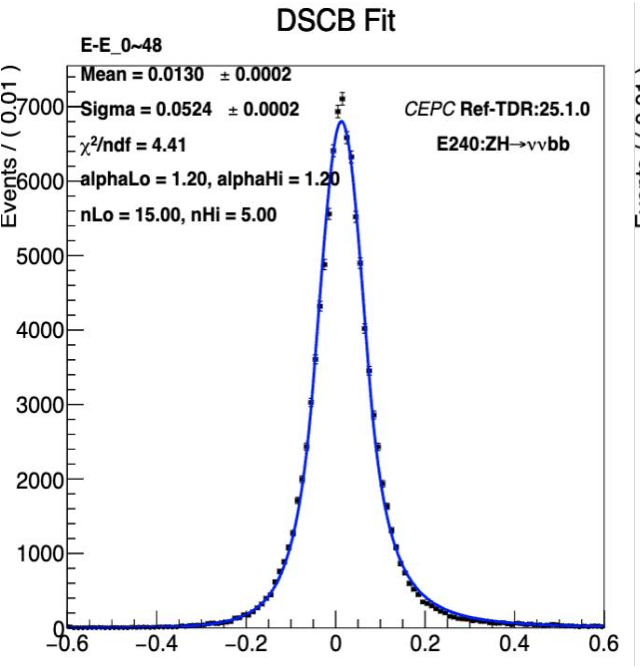


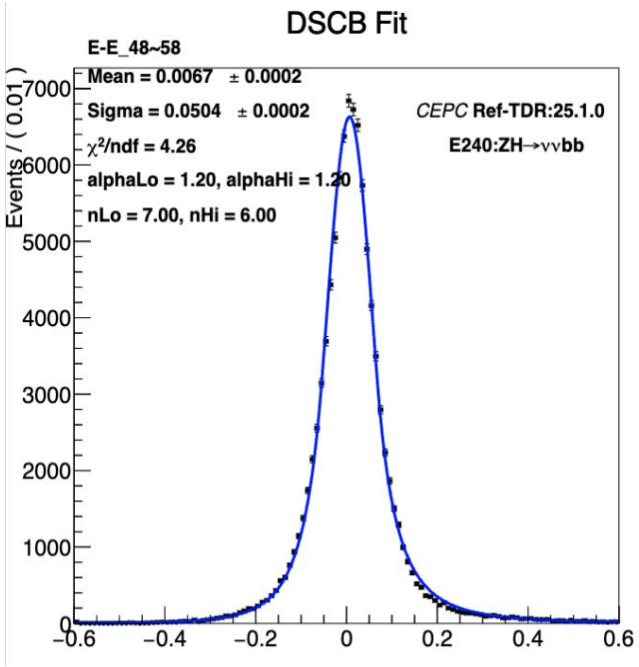


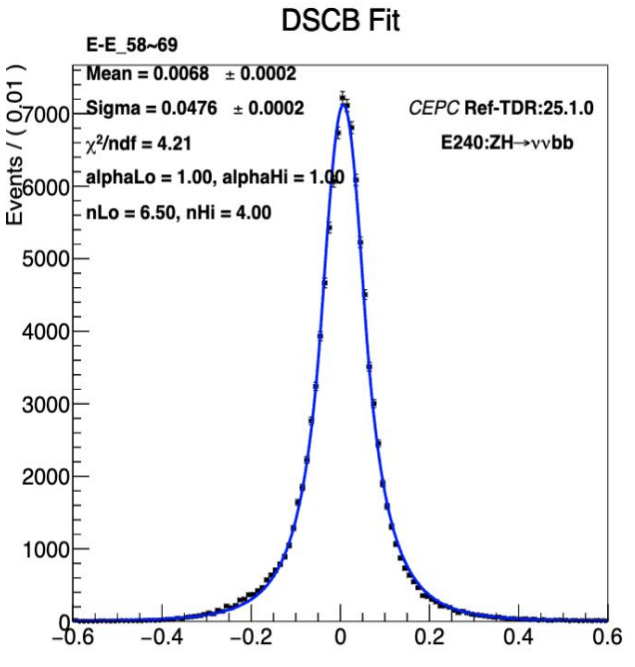
Each interval contains the same number of instances.

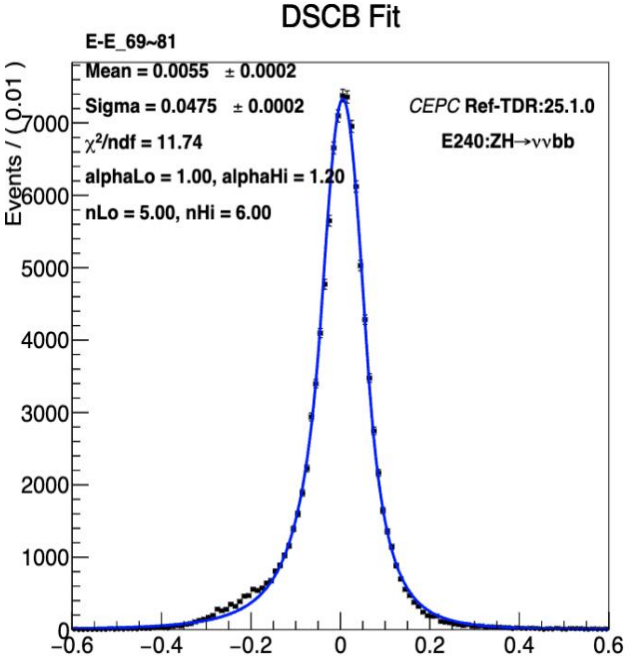


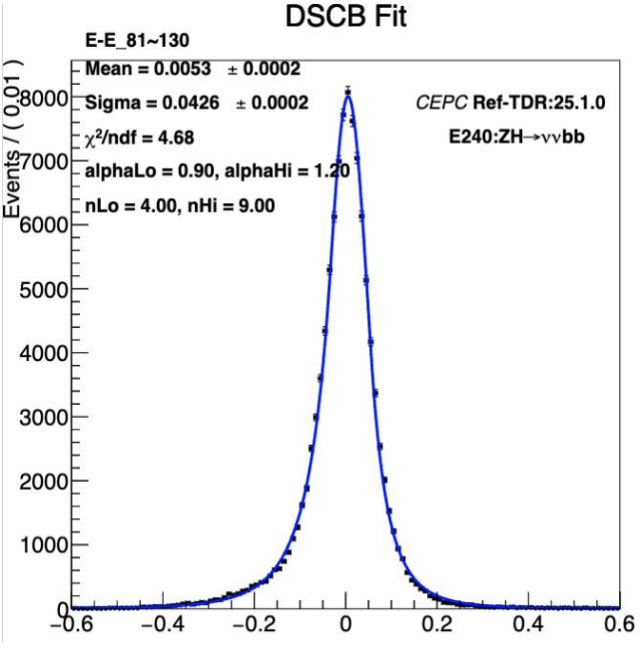
fit result


DSCB Fit
E-E_0~48
Mean = 0.0130 ± 0.0002
Sigma = 0.0524 ± 0.0002
χ²/ndf = 4.41
alphaLo = 1.20, alphaHi = 1.20
nLo = 15.00, nHi = 5.00
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄bb̄
Events / (0.01)


DSCB Fit
E-E_48~58
Mean = 0.0067 ± 0.0002
Sigma = 0.0504 ± 0.0002
χ²/ndf = 4.26
alphaLo = 1.20, alphaHi = 1.20
nLo = 7.00, nHi = 6.00
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄bb̄
Events / (0.01)


DSCB Fit
E-E_58~69
Mean = 0.0068 ± 0.0002
Sigma = 0.0476 ± 0.0002
χ²/ndf = 4.21
alphaLo = 1.00, alphaHi = 1.00
nLo = 6.50, nHi = 4.00
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄bb̄
Events / (0.01)


DSCB Fit
E-E_69~81
Mean = 0.0055 ± 0.0002
Sigma = 0.0475 ± 0.0002
χ²/ndf = 11.74
alphaLo = 1.00, alphaHi = 1.20
nLo = 5.00, nHi = 6.00
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄bb̄
Events / (0.01)


DSCB Fit
E-E_81~130
Mean = 0.0053 ± 0.0002
Sigma = 0.0426 ± 0.0002
χ²/ndf = 4.68
alphaLo = 0.90, alphaHi = 1.20
nLo = 4.00, nHi = 9.00
CEPC Ref-TDR:25.1.0
E240:ZH→νν̄bb̄
Events / (0.01)

Thanks!