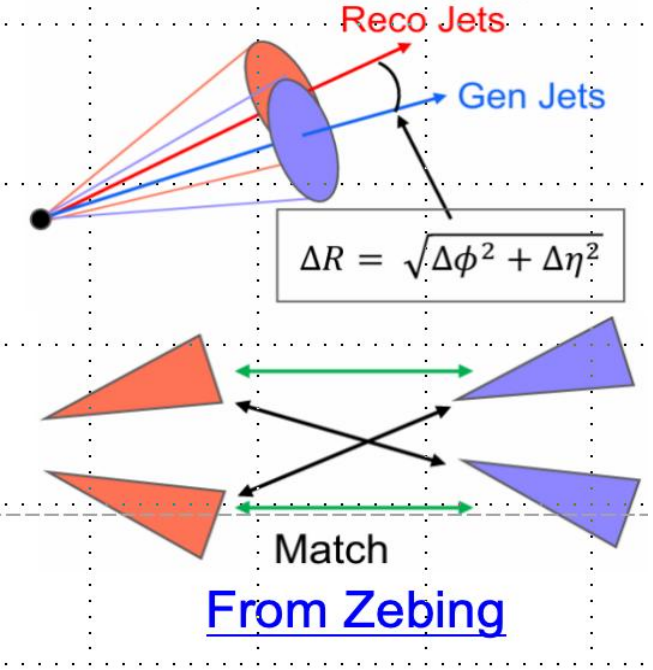
JES/JER

Hou Yingqi

2025/3/19

Genmatch



From Zebing

➢ before

```
data_barrel[ (data_barrel["jet1_GENMatch_id"] != data_barrel["jet2_GENMatch_id"]) ]
```

◆ only cases 1 and 2 are excluded, but case4 is also included.

① GEN1–>1 GEN2–>1

② GEN1–>2 GEN2–>2

③ GEN1–>1 GEN2–>2

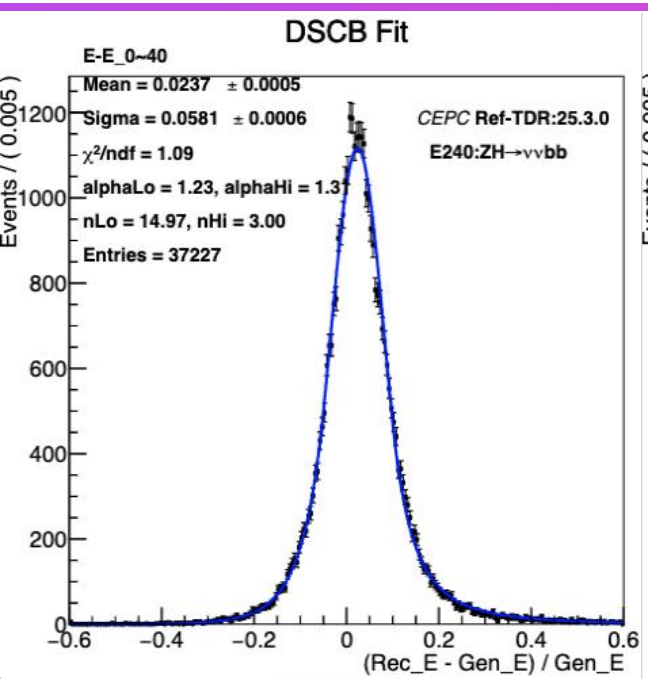
④ GEN1–>2 GEN2–>1

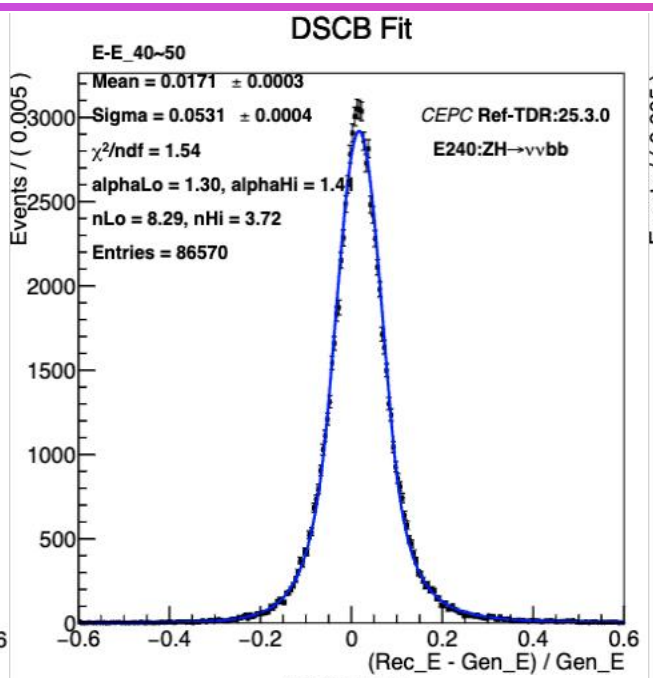
➢ now

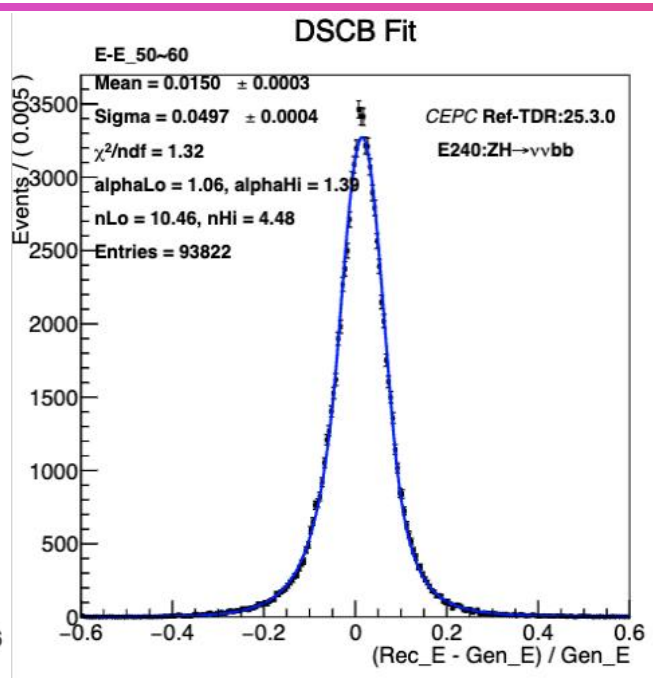
```
data1_barrel[(data1_barrel["jet1_GENMatch_id"] ==0) & (data1_barrel["jet2_GENMatch_id"] ==1)]
```

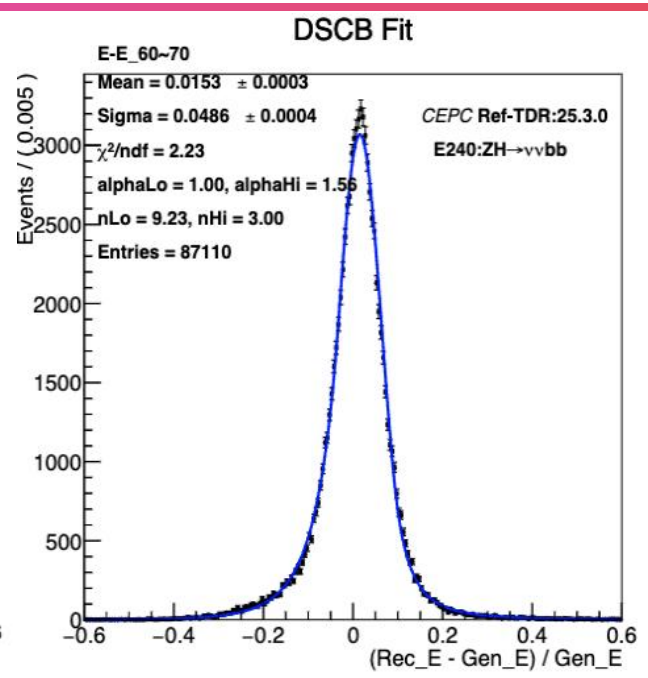
◆ only cases 3 are included.

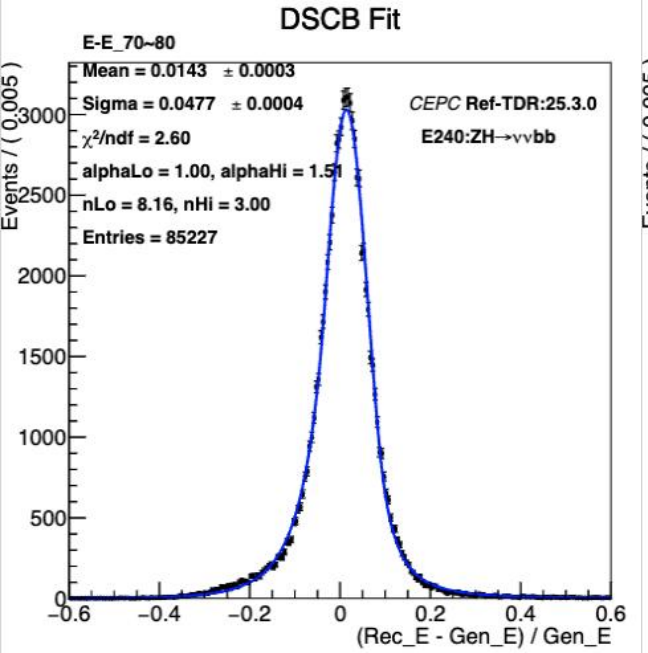
fit result

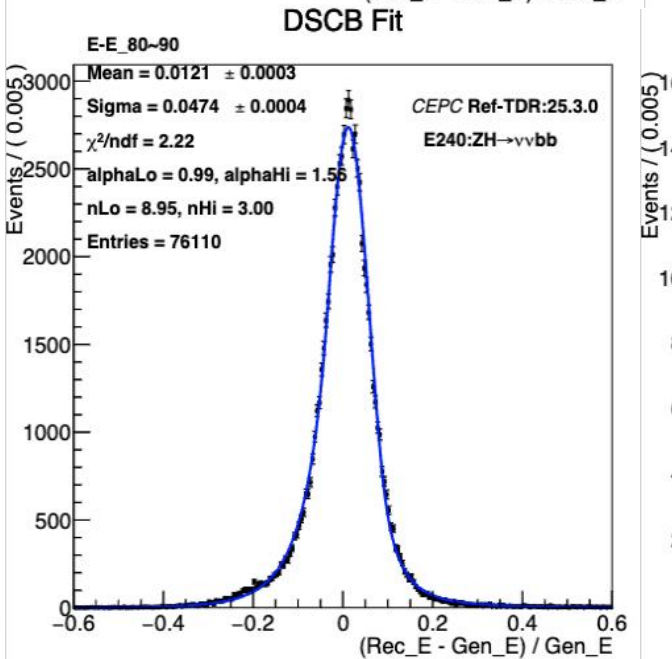

DSCB Fit
E-E_0~40
Mean = 0.0237 ± 0.0005
Sigma = 0.0581 ± 0.0006
χ²/ndf = 1.09
alphaLo = 1.23, alphaHi = 1.31
nLo = 14.97, nHi = 3.00
Entries = 37227
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

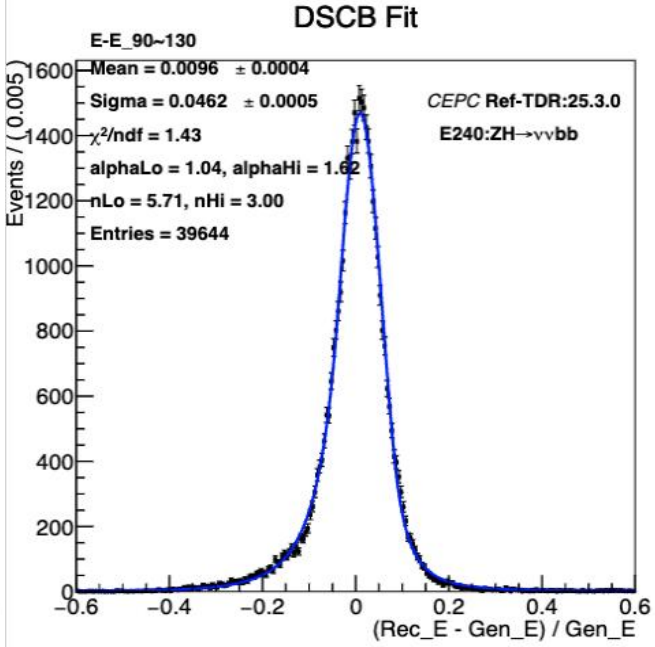

DSCB Fit
E-E_40~50
Mean = 0.0171 ± 0.0003
Sigma = 0.0531 ± 0.0004
χ²/ndf = 1.54
alphaLo = 1.30, alphaHi = 1.41
nLo = 8.29, nHi = 3.72
Entries = 86570
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E


DSCB Fit
E-E_50~60
Mean = 0.0150 ± 0.0003
Sigma = 0.0497 ± 0.0004
χ²/ndf = 1.32
alphaLo = 1.06, alphaHi = 1.39
nLo = 10.46, nHi = 4.48
Entries = 93822
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E


DSCB Fit
E-E_60~70
Mean = 0.0153 ± 0.0003
Sigma = 0.0486 ± 0.0004
χ²/ndf = 2.23
alphaLo = 1.00, alphaHi = 1.56
nLo = 9.23, nHi = 3.00
Entries = 87110
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

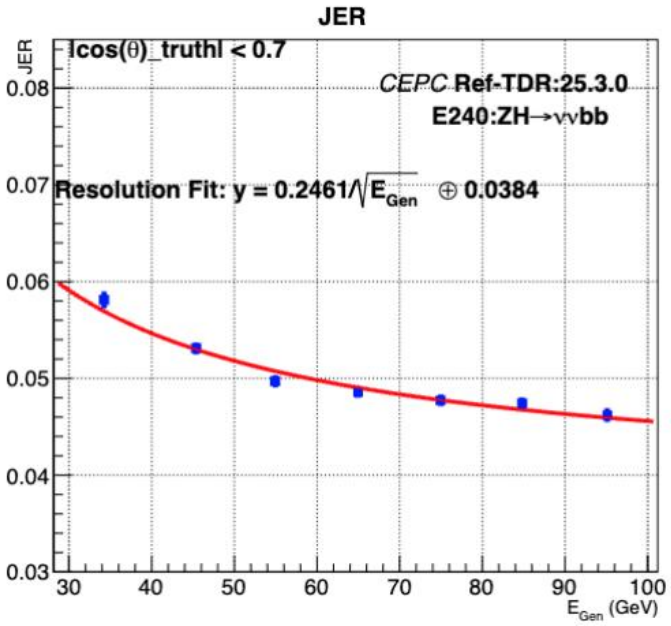

DSCB Fit
E-E_70~80
Mean = 0.0143 ± 0.0003
Sigma = 0.0477 ± 0.0004
χ²/ndf = 2.60
alphaLo = 1.00, alphaHi = 1.51
nLo = 8.16, nHi = 3.00
Entries = 85227
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

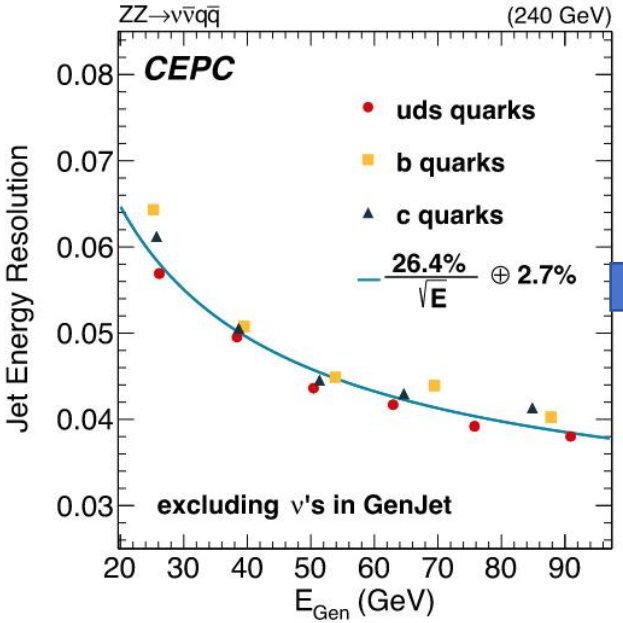

DSCB Fit
E-E_80~90
Mean = 0.0121 ± 0.0003
Sigma = 0.0474 ± 0.0004
χ²/ndf = 2.22
alphaLo = 0.99, alphaHi = 1.55
nLo = 8.95, nHi = 3.00
Entries = 76110
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E


DSCB Fit
E-E_90~130
Mean = 0.0096 ± 0.0004
Sigma = 0.0462 ± 0.0005
χ²/ndf = 1.43
alphaLo = 1.04, alphaHi = 1.62
nLo = 5.71, nHi = 3.00
Entries = 39644
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

Compare

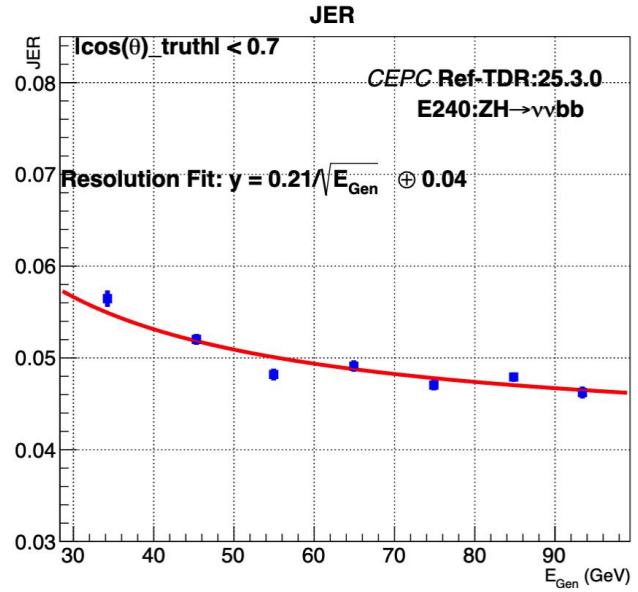
now





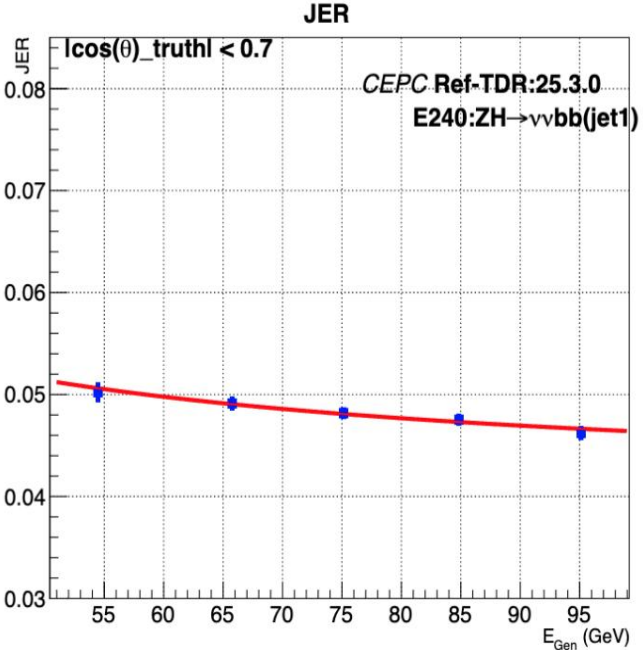
CDR

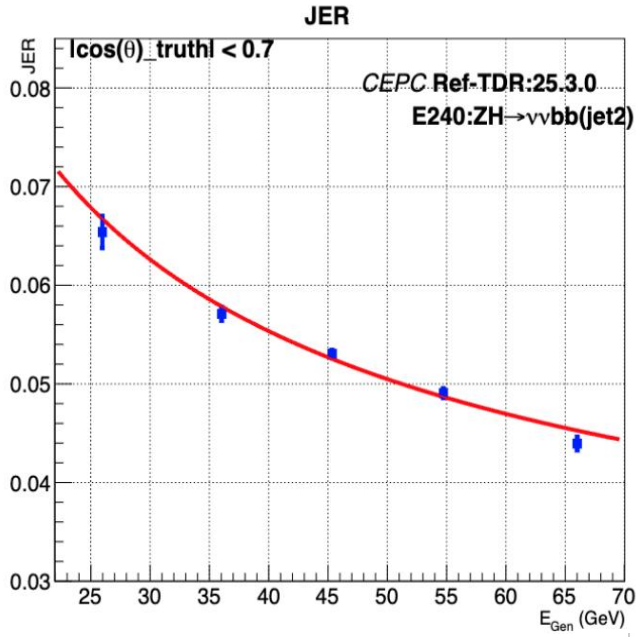
befor



- The point hopping problem is solved.

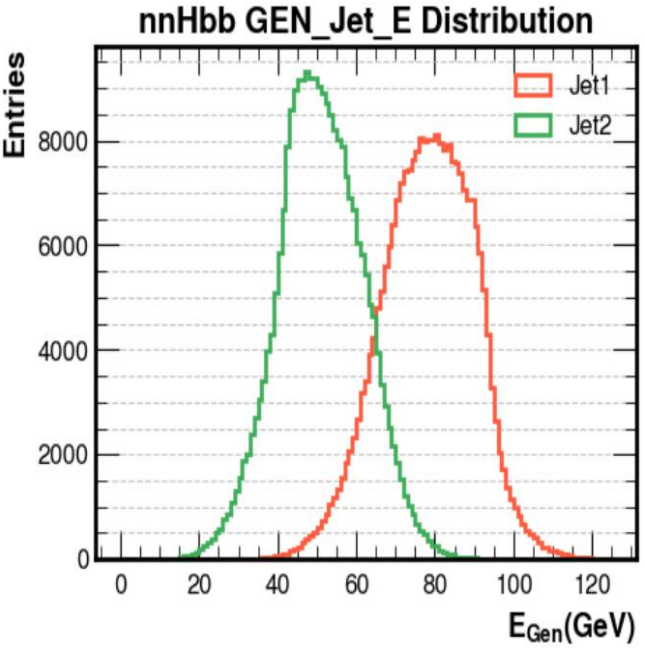
jet1 and jet2

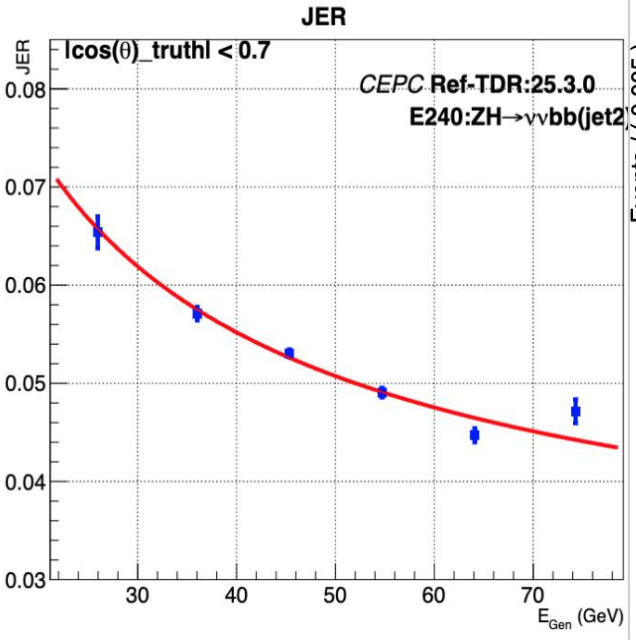


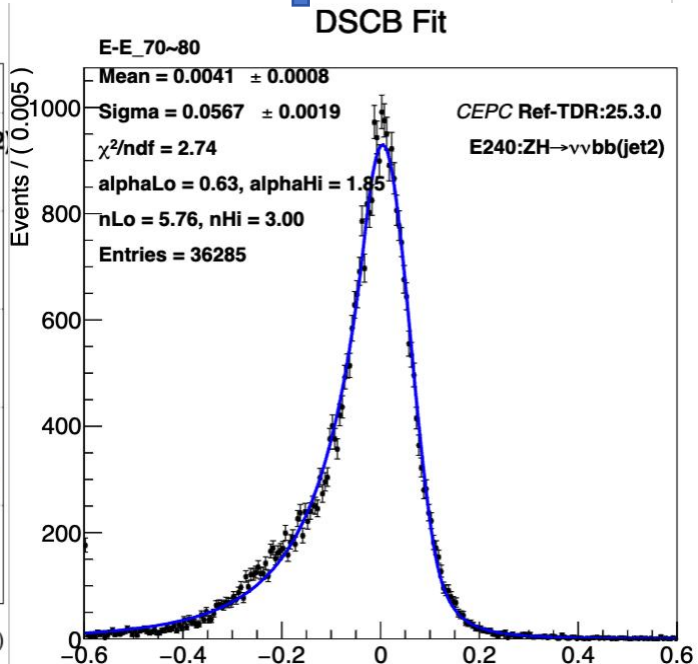


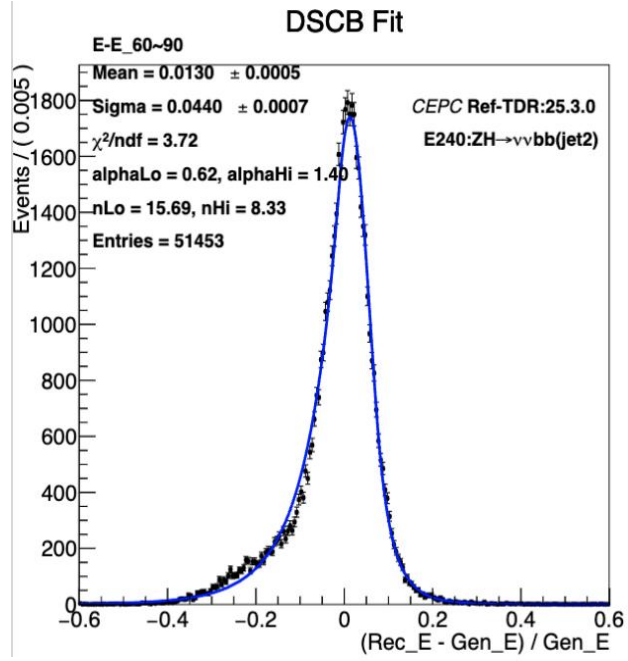
- But jet2 at 70~80GeV also have some problems.

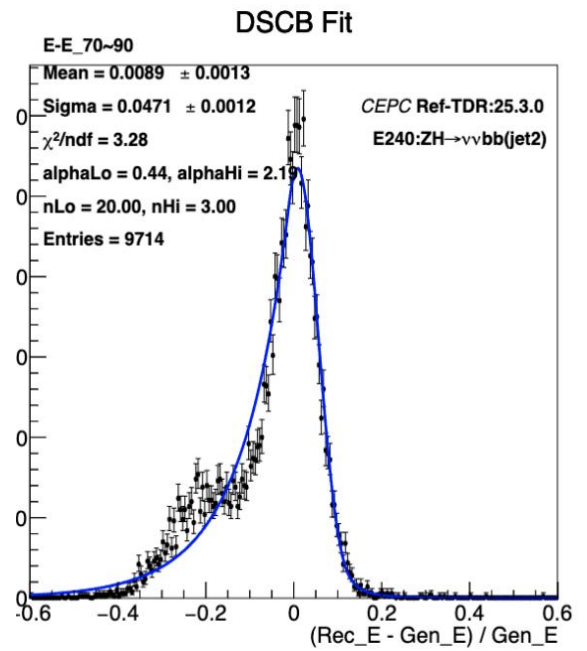
with endcap





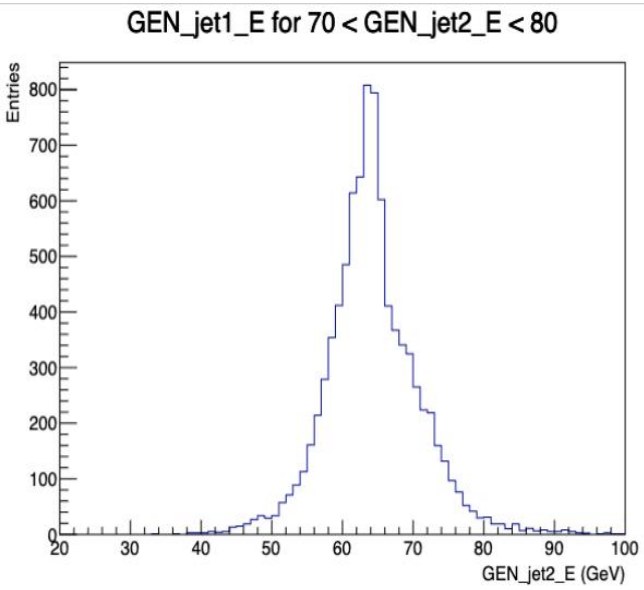


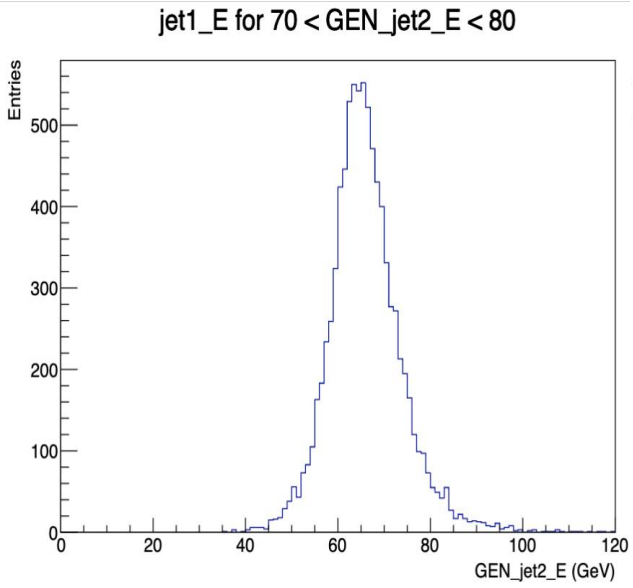


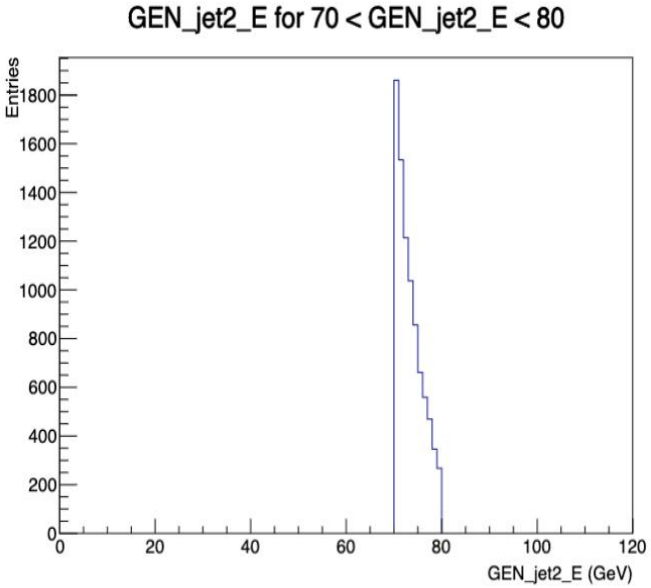


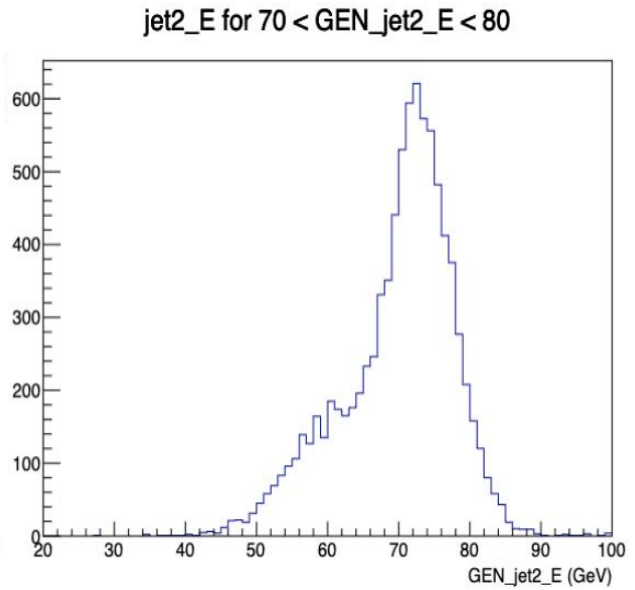
jet1 and jet2

- in 70~80GeV

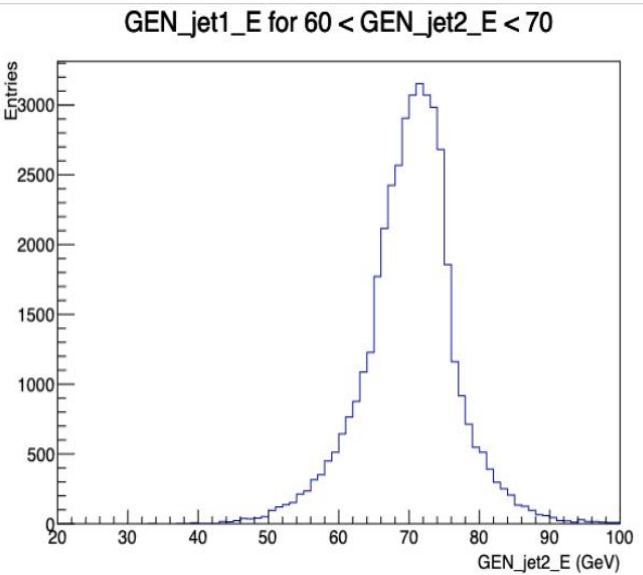


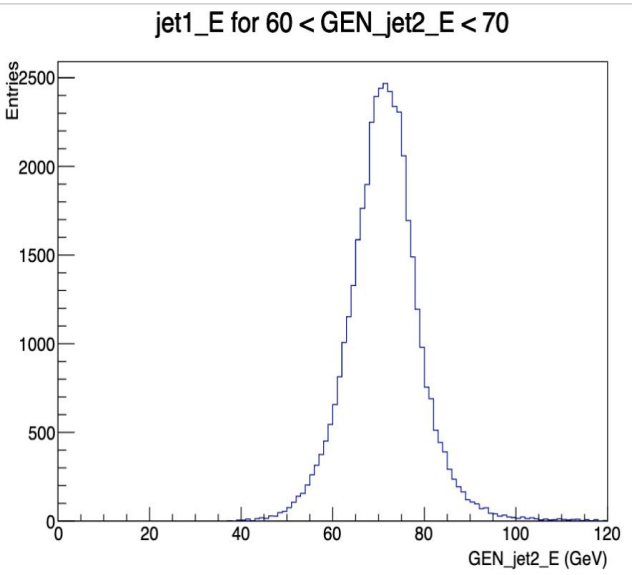


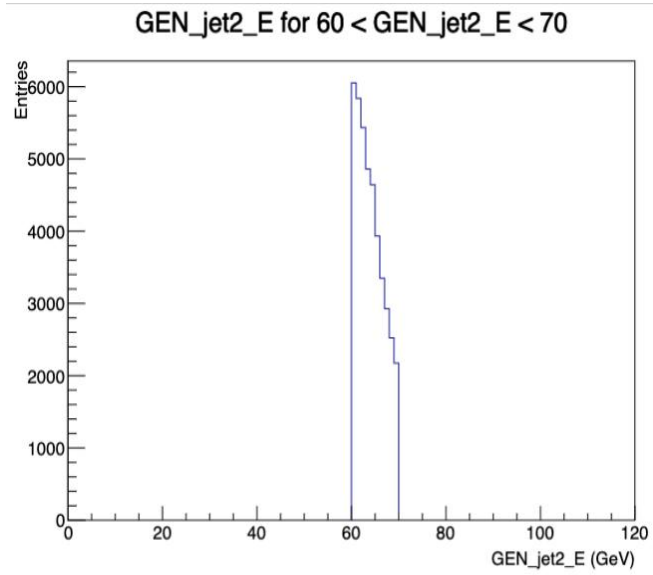


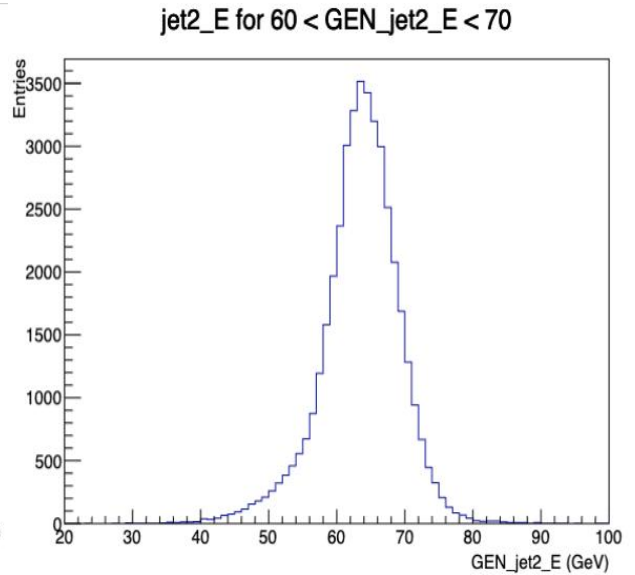


- in 60~70GeV



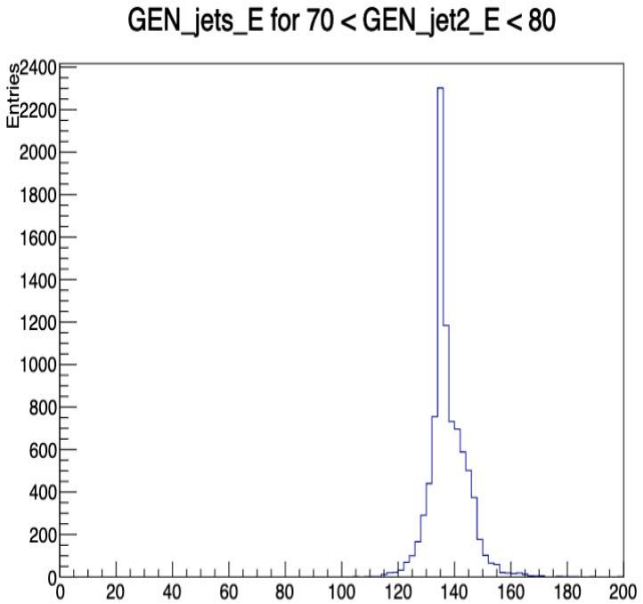


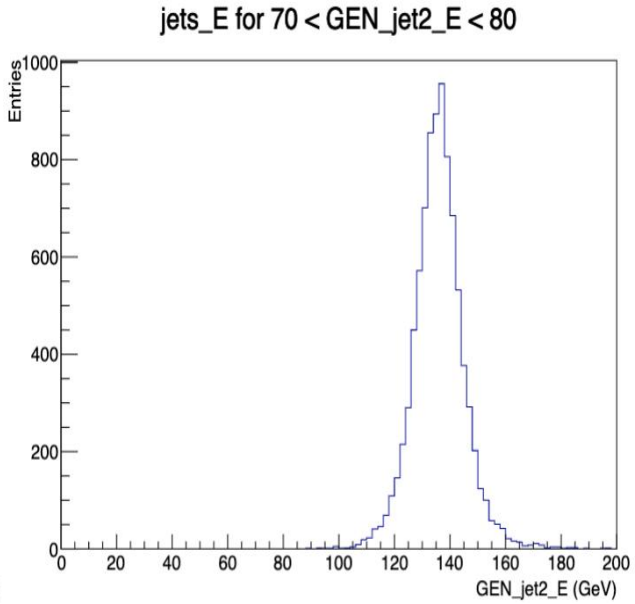


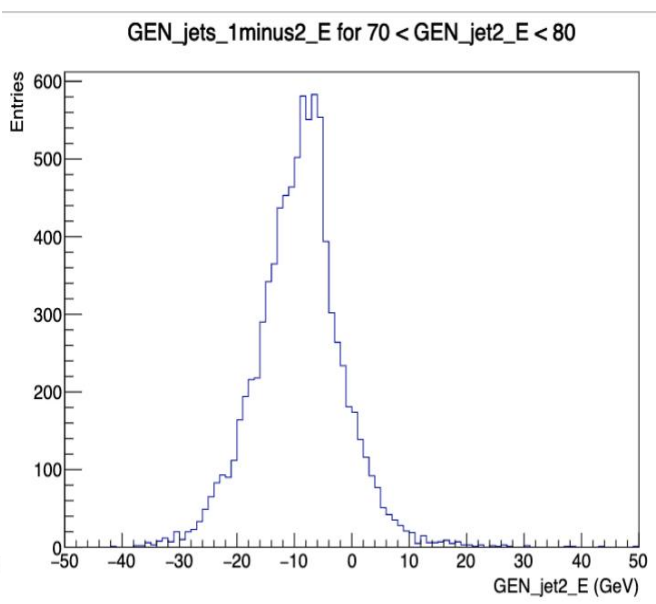


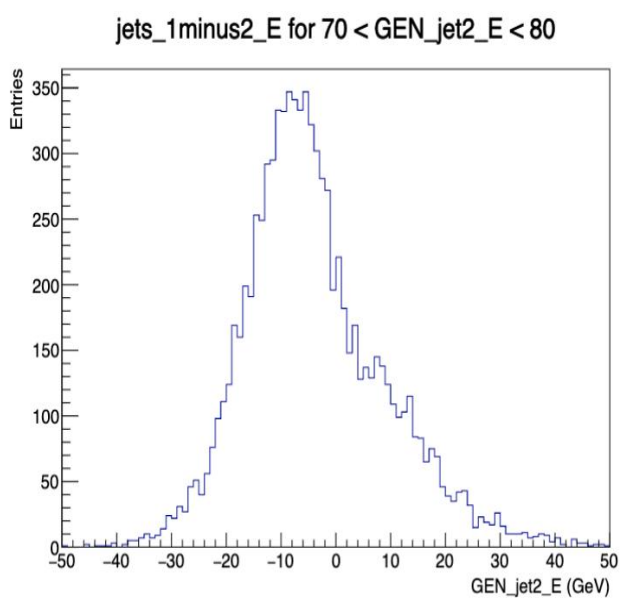
jet1 and jet2

- in 70~80GeV

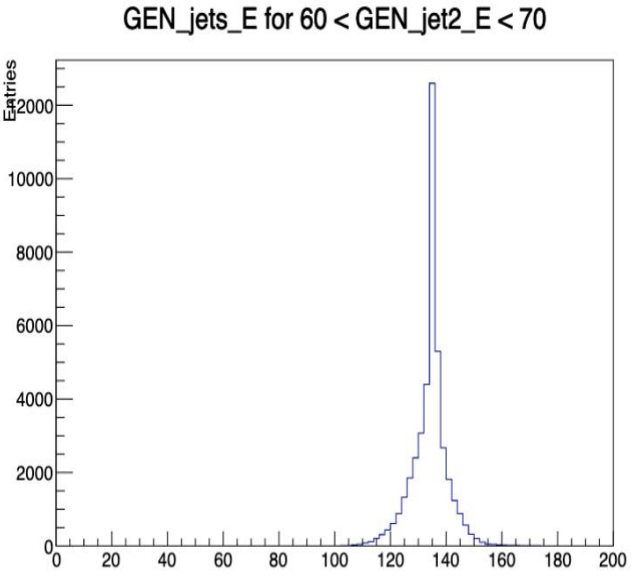


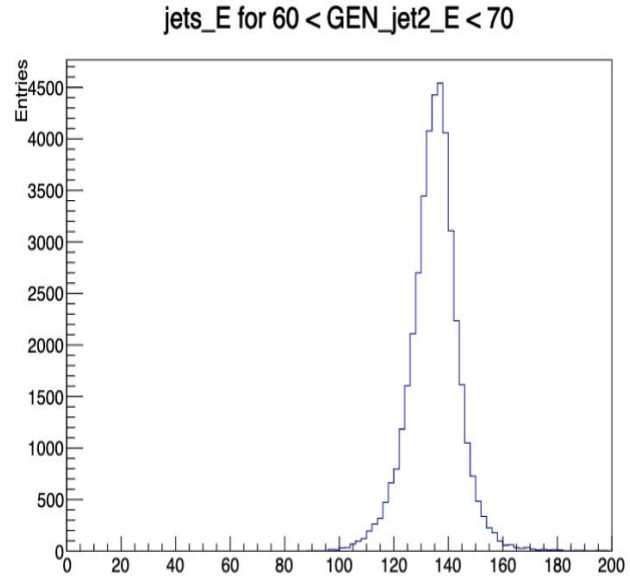


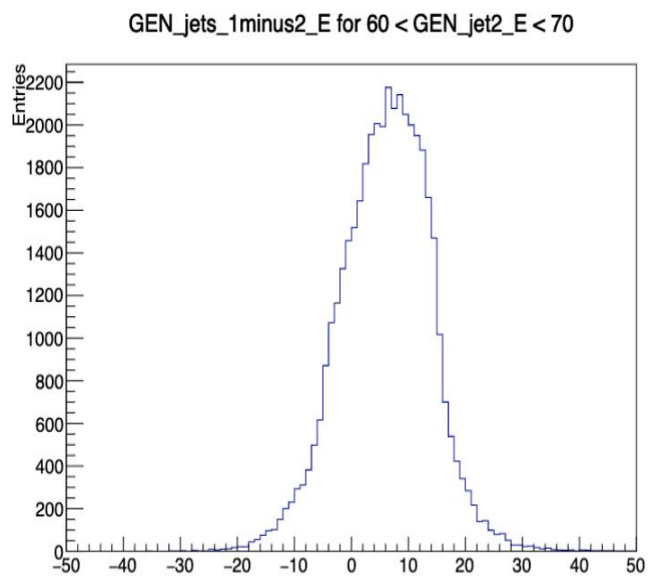


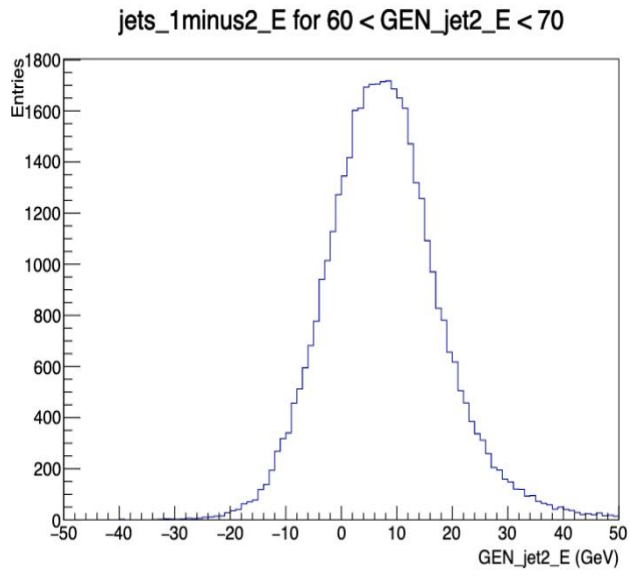


- in 60~70GeV



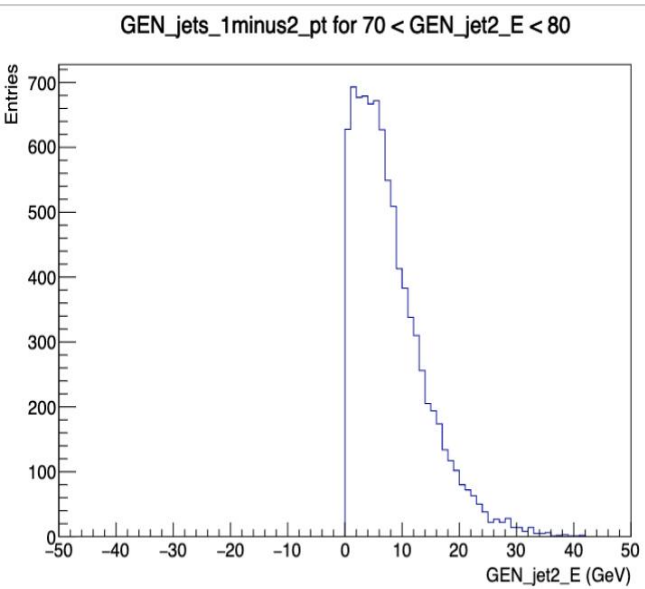


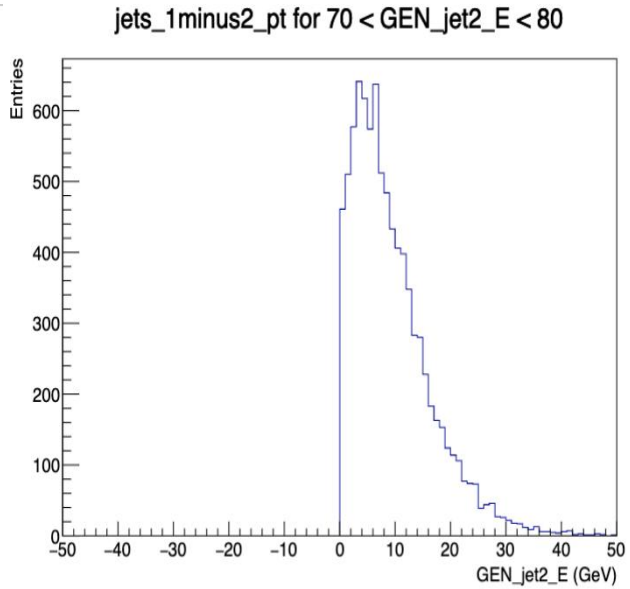




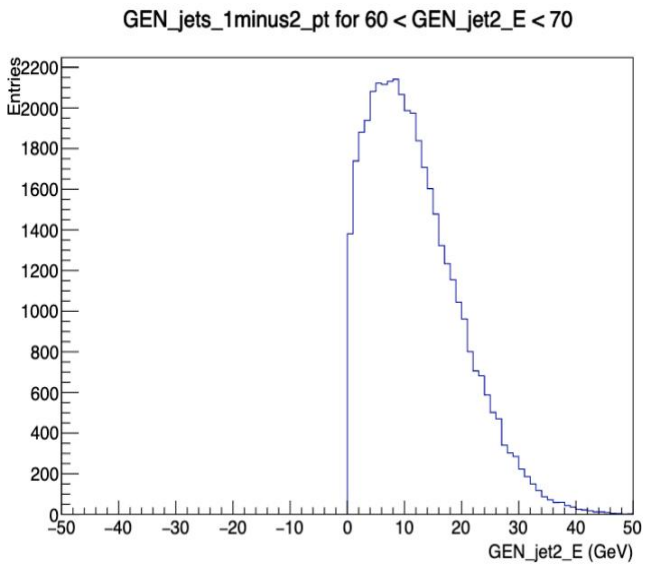
jet1 and jet2

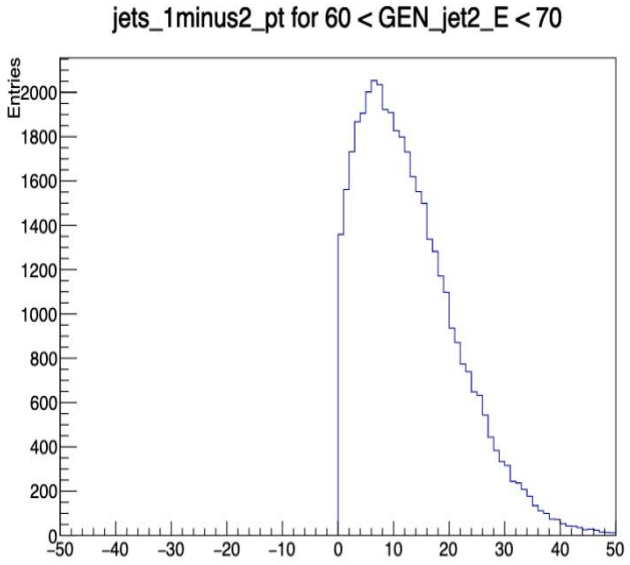
- in 70~80GeV



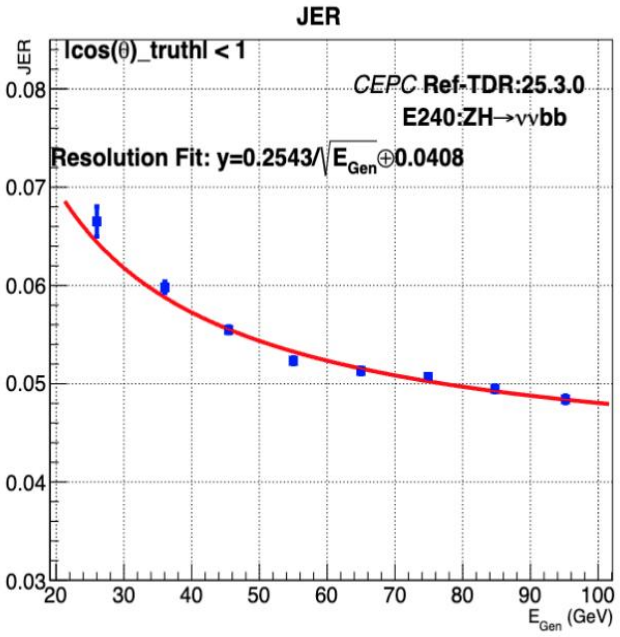


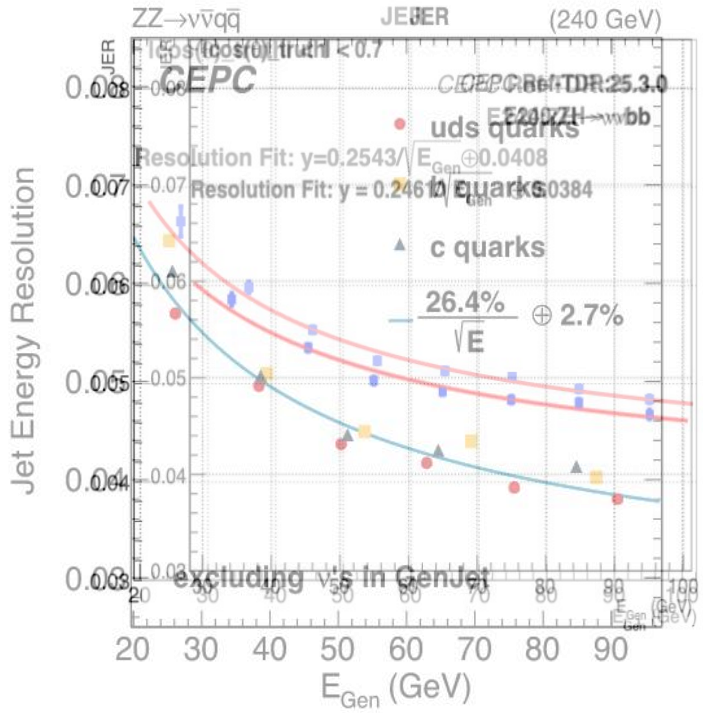
- in 60~70GeV



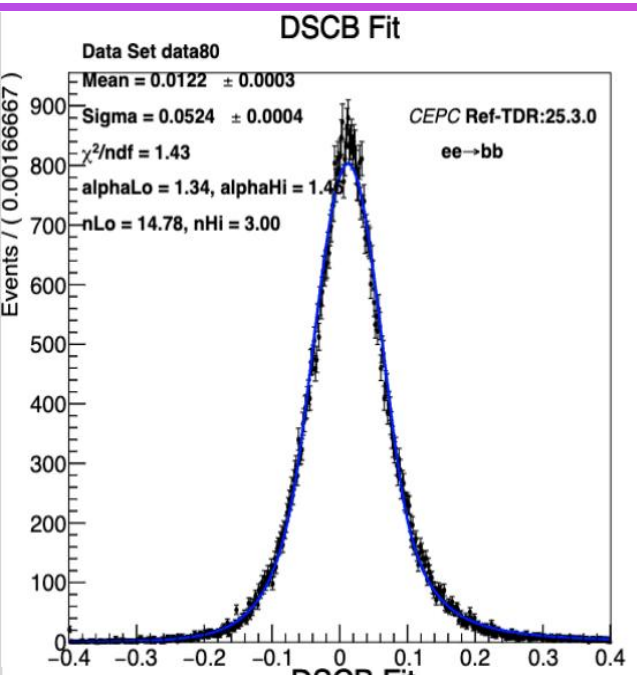


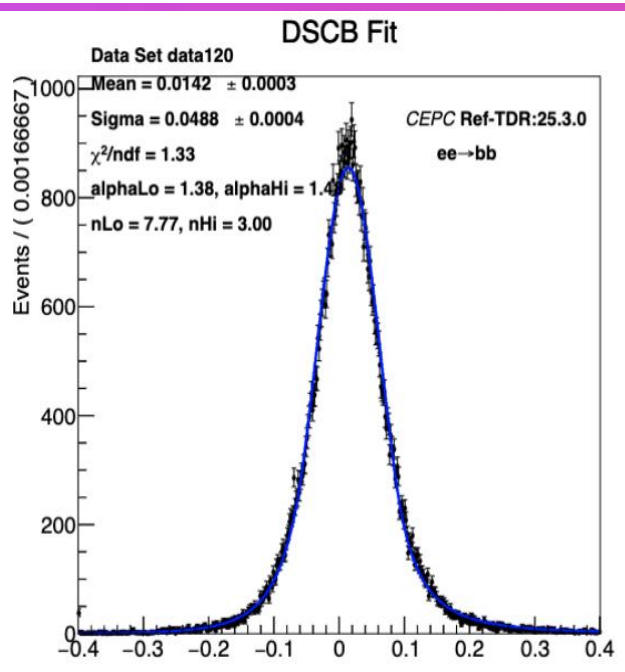
with endcap

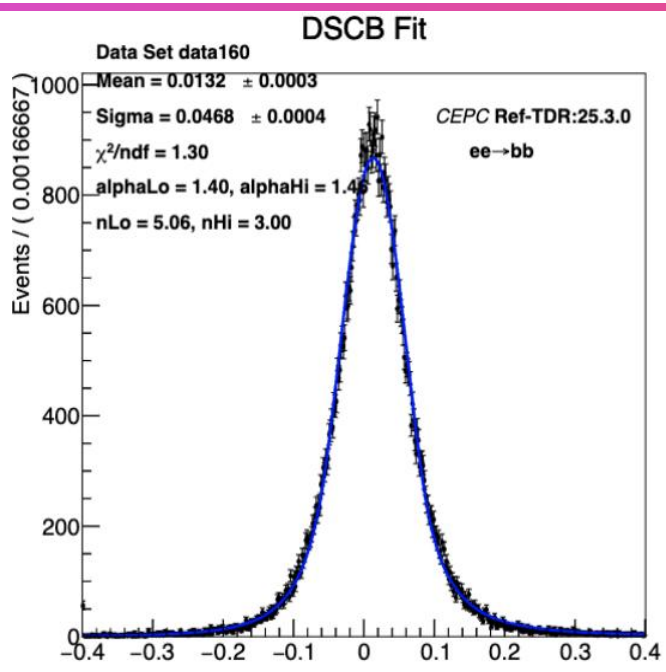

JER
|cos(θ)_truth| < 1
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb
Resolution Fit: y=0.2543/√E_Gen⊕0.0408
JER
E_Gen (GeV)

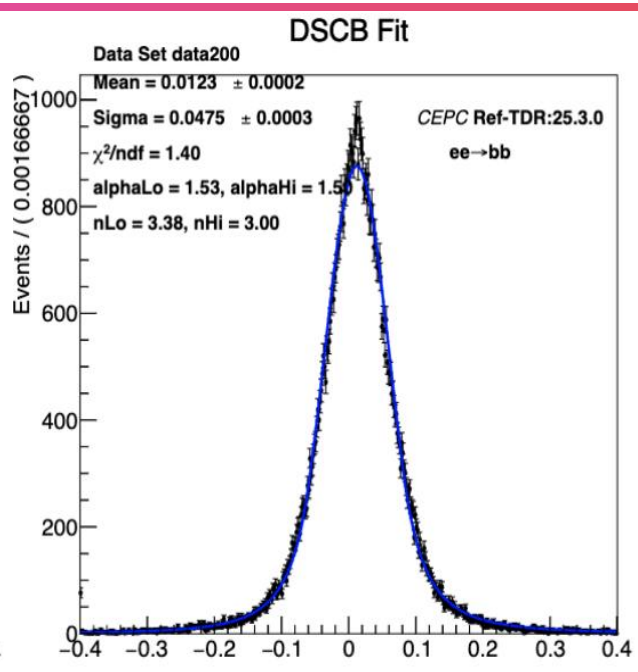

ZZ→νν̄qq̄
JER
(240 GeV)
|cos(θ)_truth| < 0.7
CEPC
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb
uds quarks
b quarks
c quarks
Resolution Fit: y=0.2543/√E_Gen⊕0.0408
Resolution Fit: y = 0.2461/√E_Gen⊕0.0384
26.4%/√E ⊕ 2.7%
excluding νs in GenJet
Jet Energy Resolution
E_Gen (GeV)

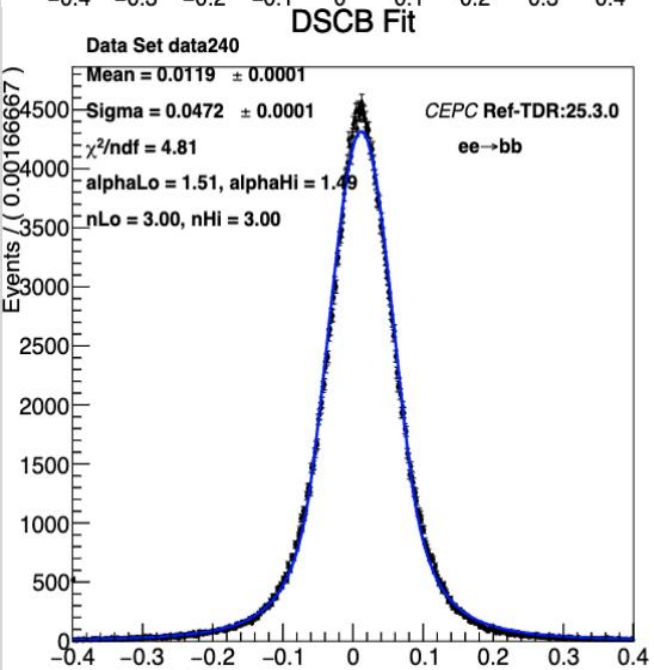
eebb

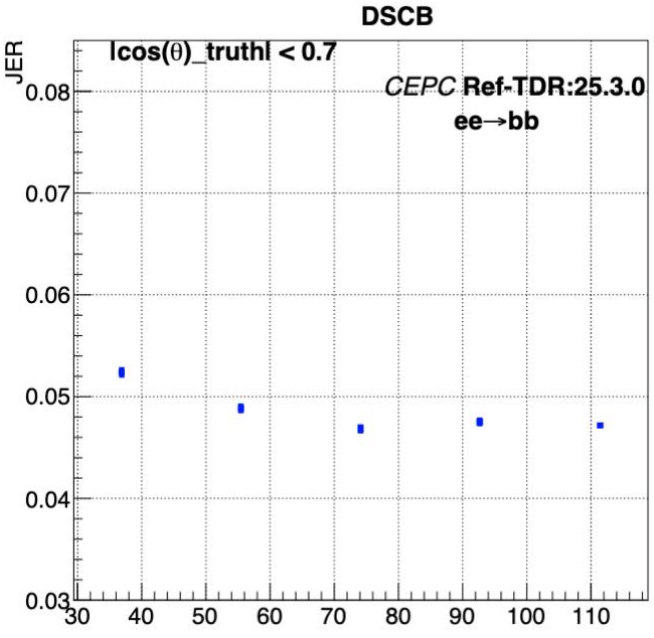

DSCB Fit
Data Set data80
Mean = 0.0122 ± 0.0003
Sigma = 0.0524 ± 0.0004
χ²/ndf = 1.43
alphaLo = 1.34, alphaHi = 1.45
nLo = 14.78, nHi = 3.00
CEPC Ref-TDR:25.3.0
ee→bb
Events / (0.00166667)


DSCB Fit
Data Set data120
Mean = 0.0142 ± 0.0003
Sigma = 0.0488 ± 0.0004
χ²/ndf = 1.33
alphaLo = 1.38, alphaHi = 1.45
nLo = 7.77, nHi = 3.00
CEPC Ref-TDR:25.3.0
ee→bb
Events / (0.00166667)

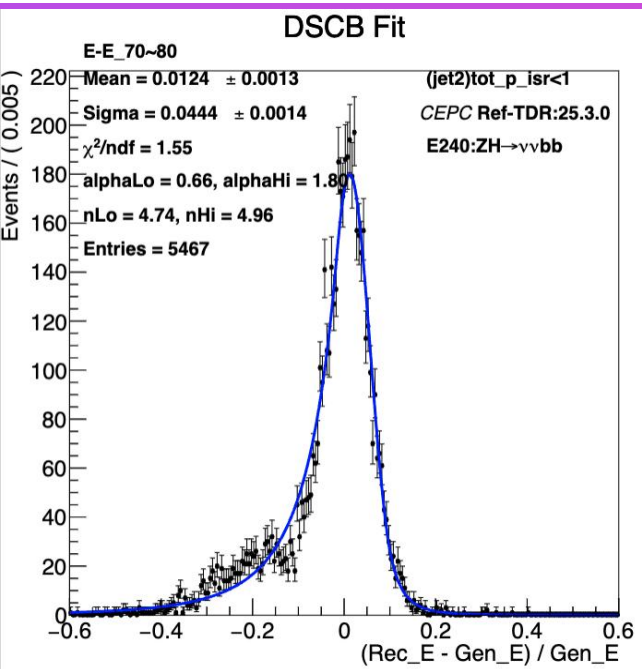

DSCB Fit
Data Set data160
Mean = 0.0132 ± 0.0003
Sigma = 0.0468 ± 0.0004
χ²/ndf = 1.30
alphaLo = 1.40, alphaHi = 1.45
nLo = 5.06, nHi = 3.00
CEPC Ref-TDR:25.3.0
ee→bb
Events / (0.00166667)

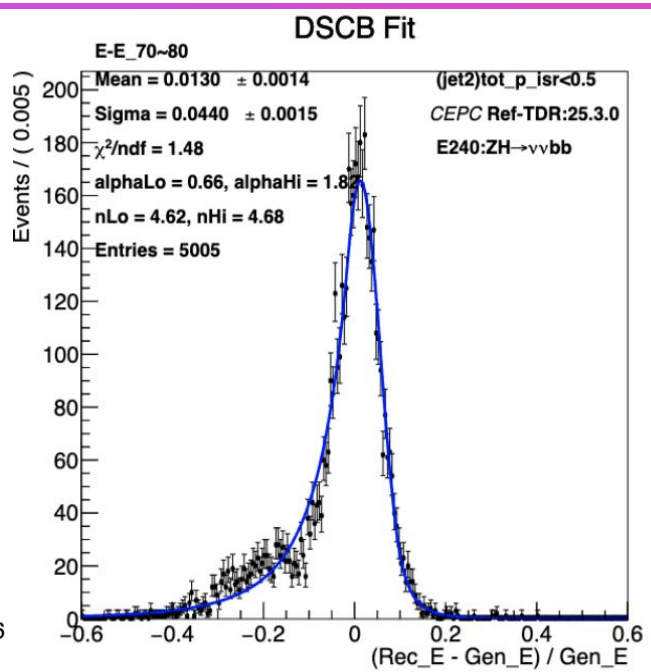

DSCB Fit
Data Set data200
Mean = 0.0123 ± 0.0002
Sigma = 0.0475 ± 0.0003
χ²/ndf = 1.40
alphaLo = 1.53, alphaHi = 1.50
nLo = 3.38, nHi = 3.00
CEPC Ref-TDR:25.3.0
ee→bb
Events / (0.00166667)

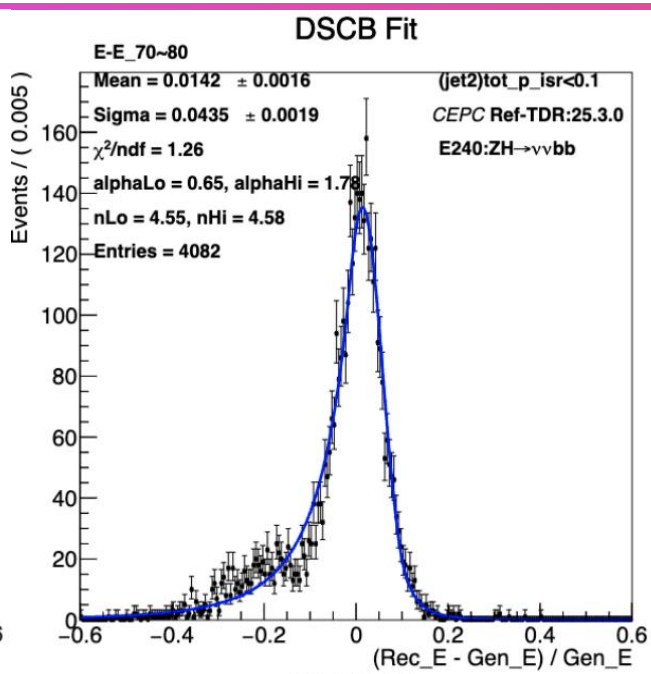

DSCB Fit
Data Set data240
Mean = 0.0119 ± 0.0001
Sigma = 0.0472 ± 0.0001
χ²/ndf = 4.81
alphaLo = 1.51, alphaHi = 1.49
nLo = 3.00, nHi = 3.00
CEPC Ref-TDR:25.3.0
ee→bb
Events / (0.00166667)

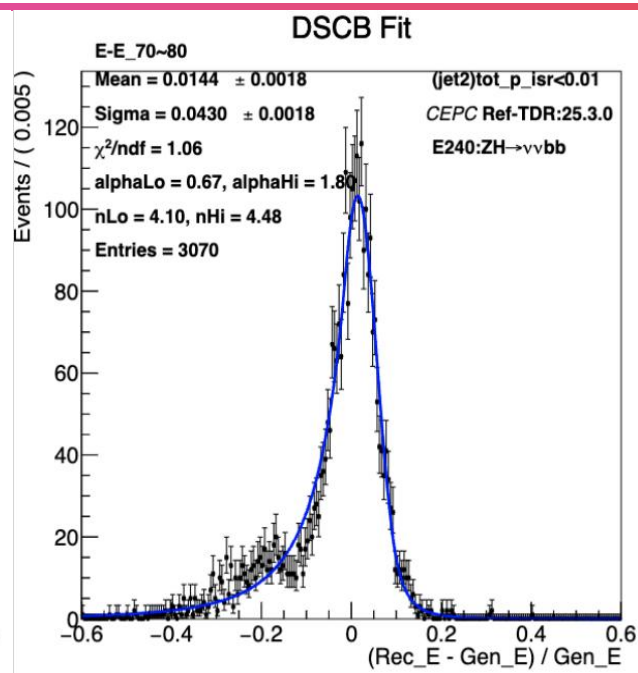

DSCB
|cos(θ)_truth| < 0.7
CEPC Ref-TDR:25.3.0
ee→bb
JER

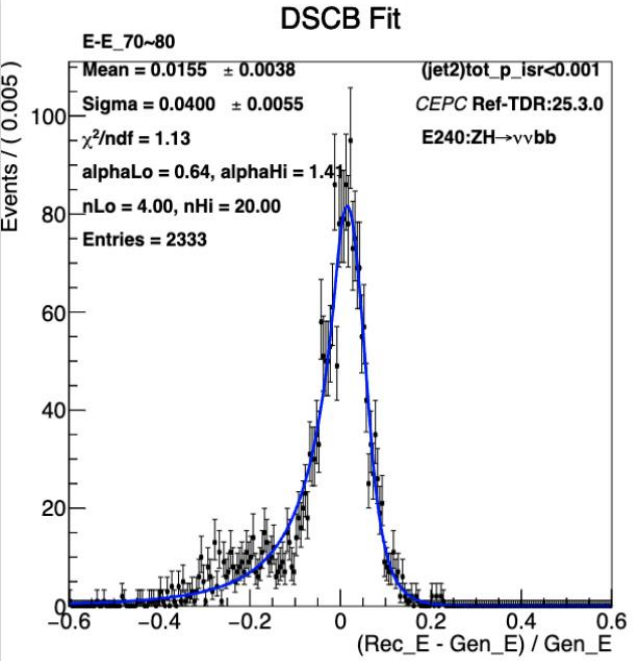
Back up!

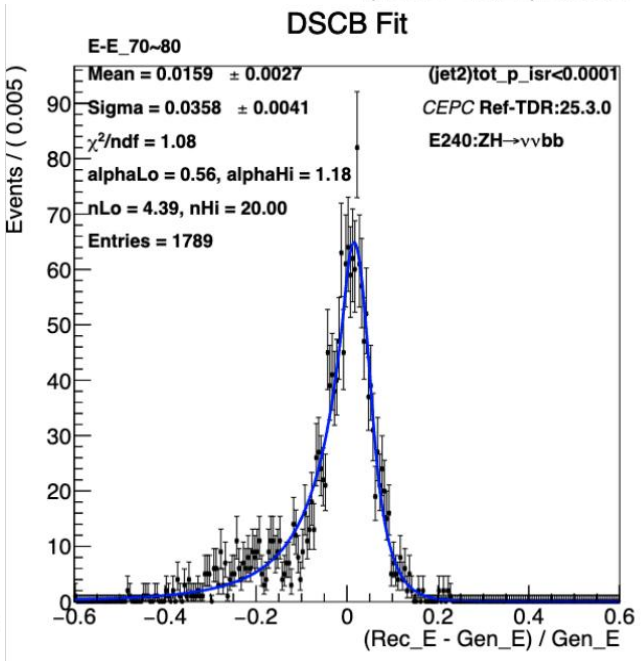

DSCB Fit
E-E_70~80
Mean = 0.0124 ± 0.0013
Sigma = 0.0444 ± 0.0014
χ²/ndf = 1.55
alphaLo = 0.66, alphaHi = 1.80
nLo = 4.74, nHi = 4.96
Entries = 5467
(jet2)tot_p_isr<1
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

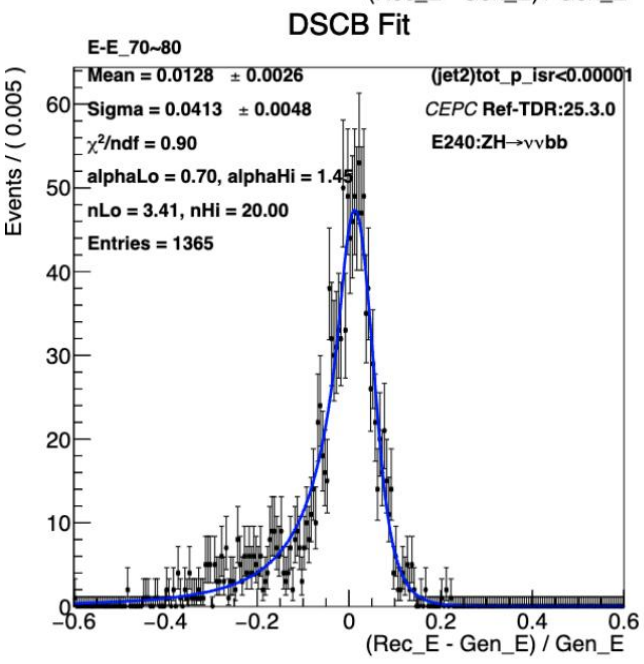

DSCB Fit
E-E_70~80
Mean = 0.0130 ± 0.0014
Sigma = 0.0440 ± 0.0015
χ²/ndf = 1.48
alphaLo = 0.66, alphaHi = 1.82
nLo = 4.62, nHi = 4.68
Entries = 5005
(jet2)tot_p_isr<0.5
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

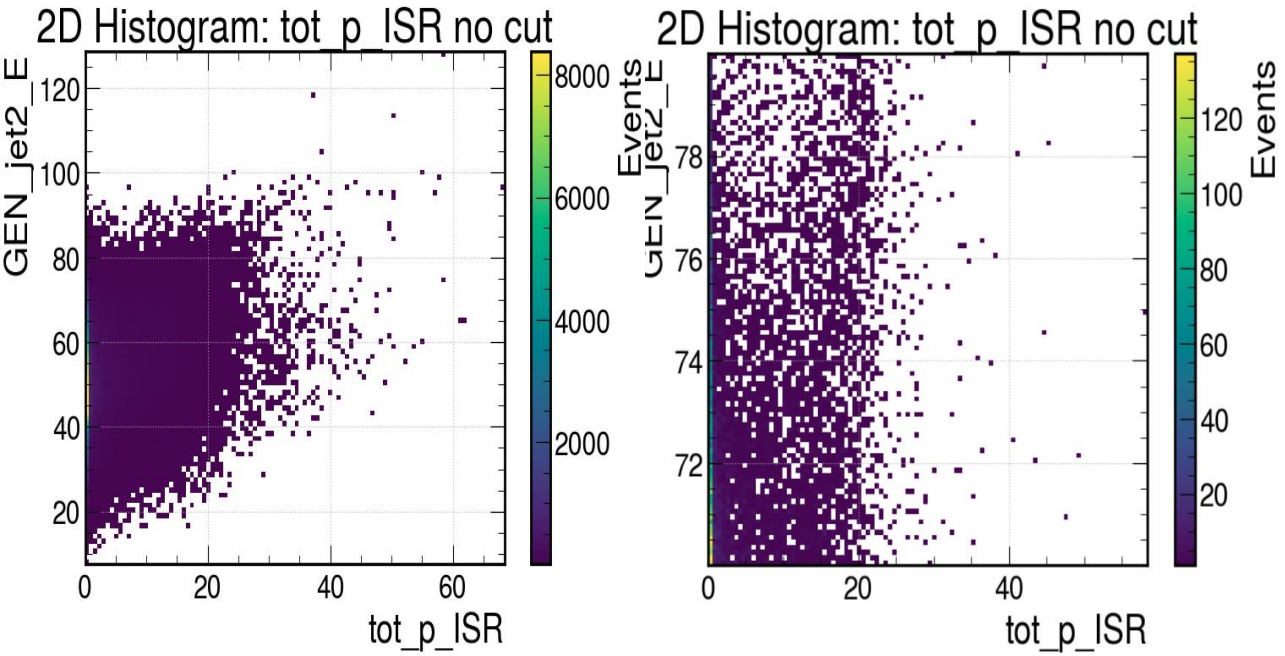

DSCB Fit
E-E_70~80
Mean = 0.0142 ± 0.0016
Sigma = 0.0435 ± 0.0019
χ²/ndf = 1.26
alphaLo = 0.65, alphaHi = 1.78
nLo = 4.55, nHi = 4.58
Entries = 4082
(jet2)tot_p_isr<0.1
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E


DSCB Fit
E-E_70~80
Mean = 0.0144 ± 0.0018
Sigma = 0.0430 ± 0.0018
χ²/ndf = 1.06
alphaLo = 0.67, alphaHi = 1.80
nLo = 4.10, nHi = 4.48
Entries = 3070
(jet2)tot_p_isr<0.01
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

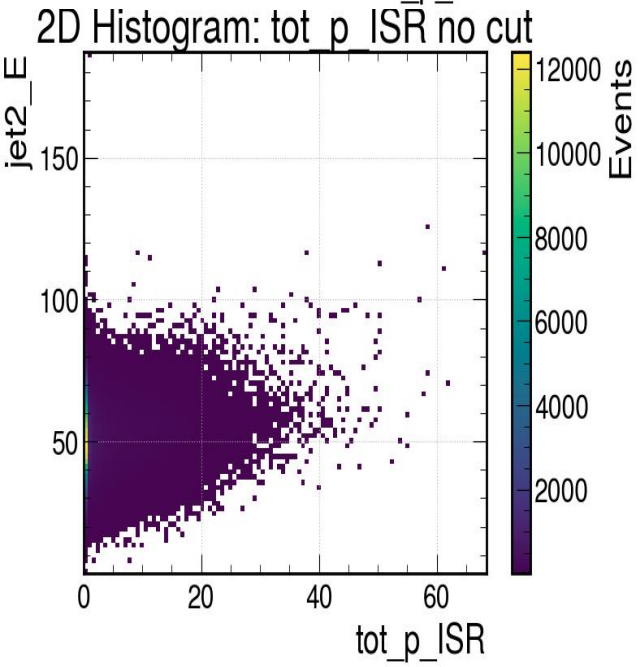

DSCB Fit
E-E_70~80
Mean = 0.0155 ± 0.0038
Sigma = 0.0400 ± 0.0055
χ²/ndf = 1.13
alphaLo = 0.64, alphaHi = 1.41
nLo = 4.00, nHi = 20.00
Entries = 2333
(jet2)tot_p_isr<0.001
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

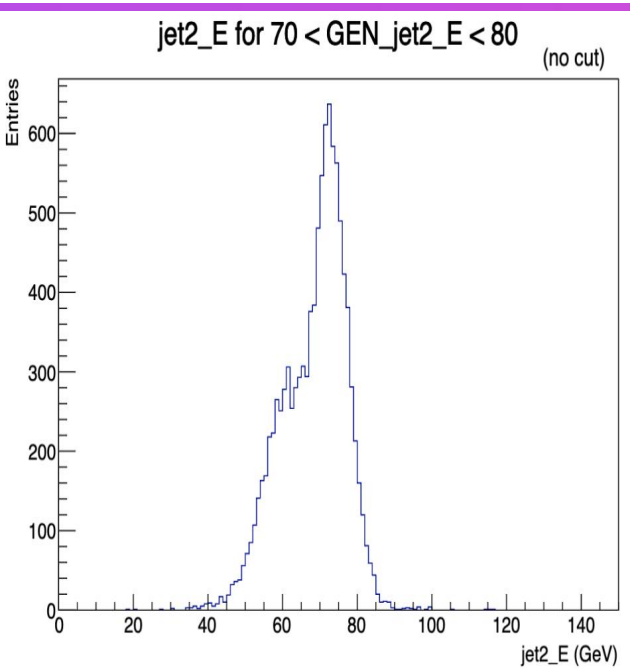

DSCB Fit
E-E_70~80
Mean = 0.0159 ± 0.0027
Sigma = 0.0358 ± 0.0041
χ²/ndf = 1.08
alphaLo = 0.56, alphaHi = 1.18
nLo = 4.39, nHi = 20.00
Entries = 1789
(jet2)tot_p_isr<0.0001
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

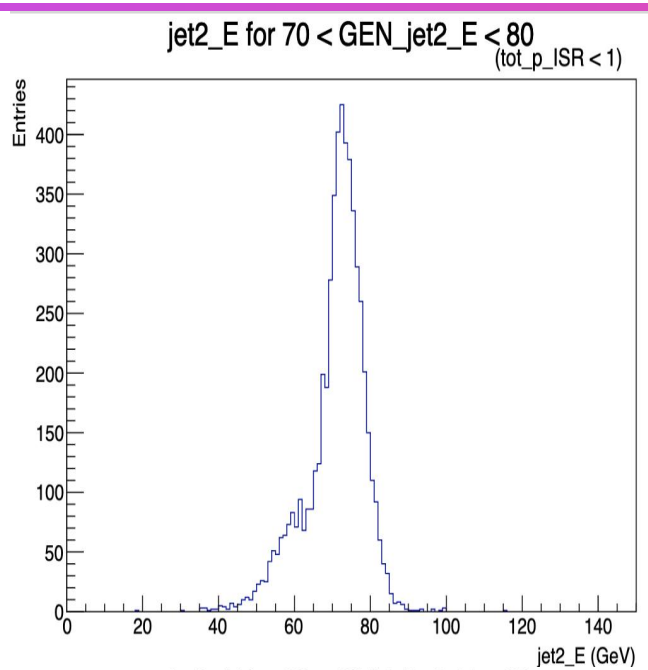

DSCB Fit
E-E_70~80
Mean = 0.0128 ± 0.0026
Sigma = 0.0413 ± 0.0048
χ²/ndf = 0.90
alphaLo = 0.70, alphaHi = 1.45
nLo = 3.41, nHi = 20.00
Entries = 1365
(jet2)tot_p_isr<0.00001
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

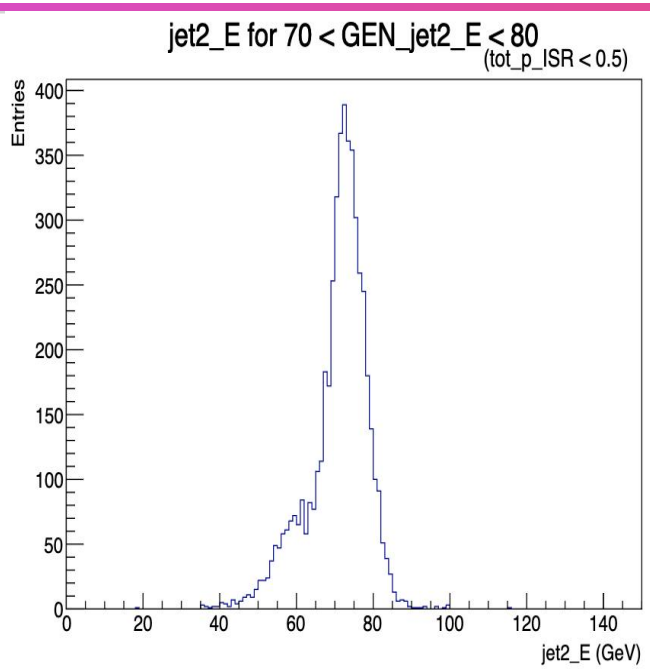

2D Histogram: tot_p_ISR no cut
GEN_jet2_E
tot_p_ISR
Events

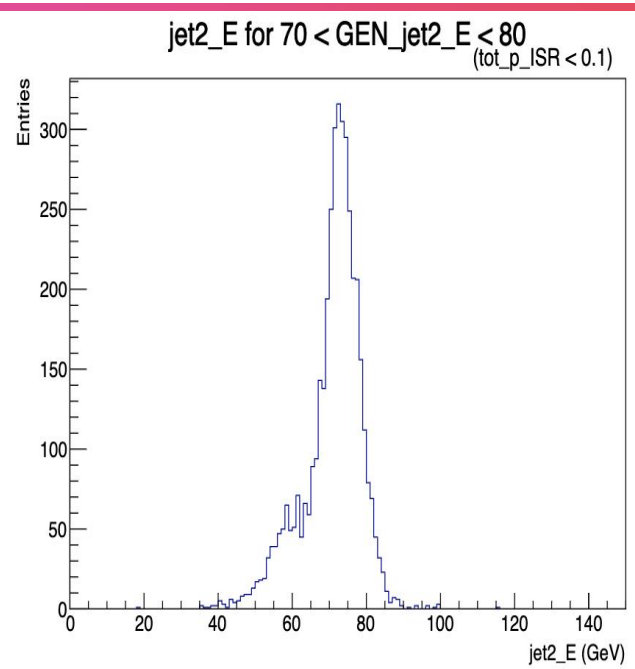
2D Histogram: tot_p_ISR no cut
GEN_jet2_E
tot_p_ISR
Events

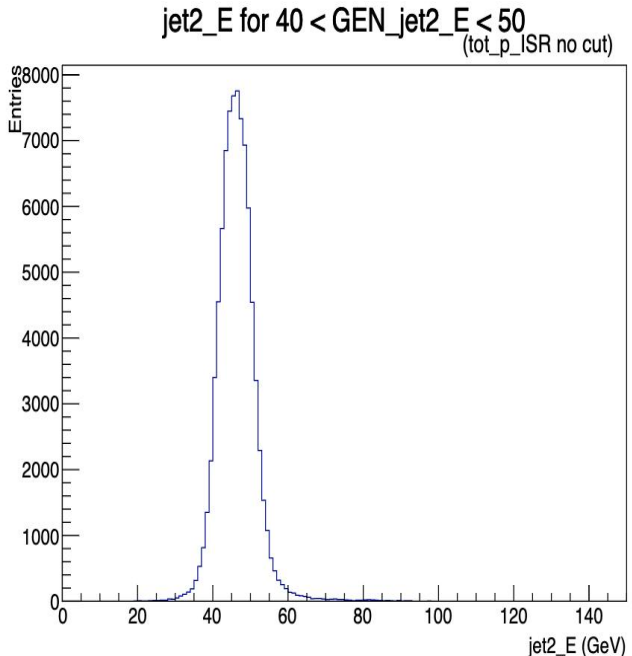

2D Histogram: tot_p_ISR no cut
jet2_E
tot_p_ISR
Events

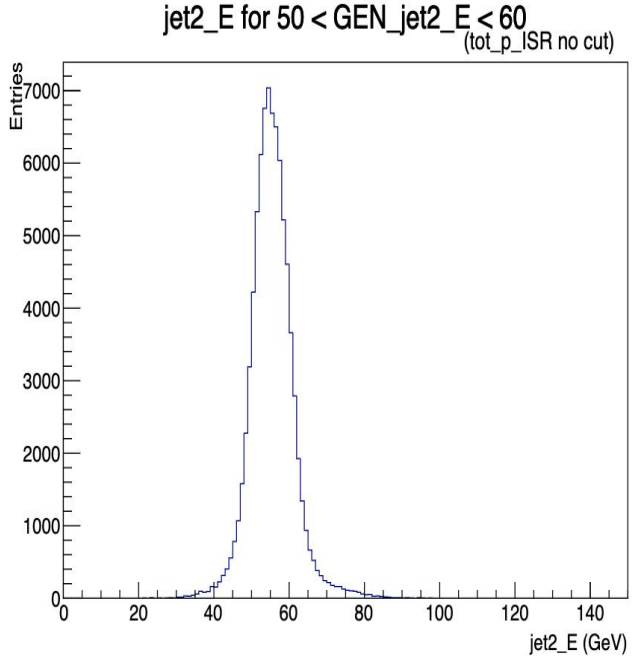

jet2_E for 70 < GEN_jet2_E < 80
(no cut)
Entries
jet2_E (GeV)

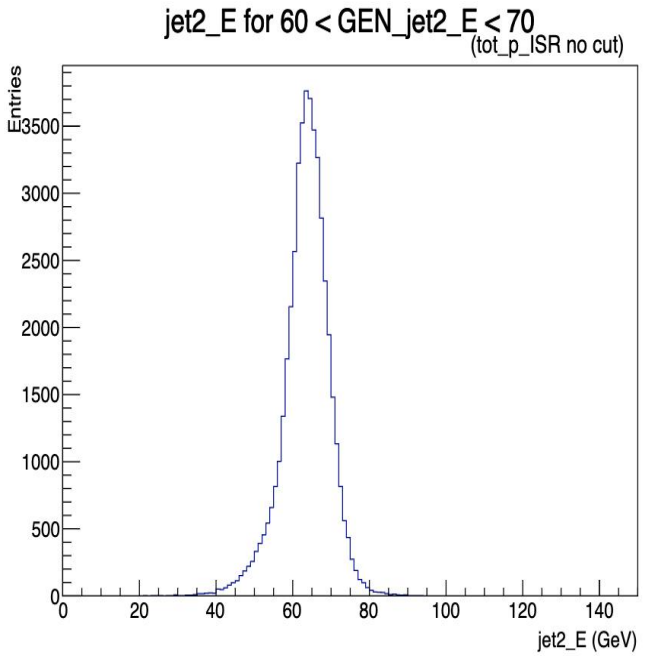

jet2_E for 70 < GEN_jet2_E < 80
(tot_p_ISR < 1)
Entries
jet2_E (GeV)

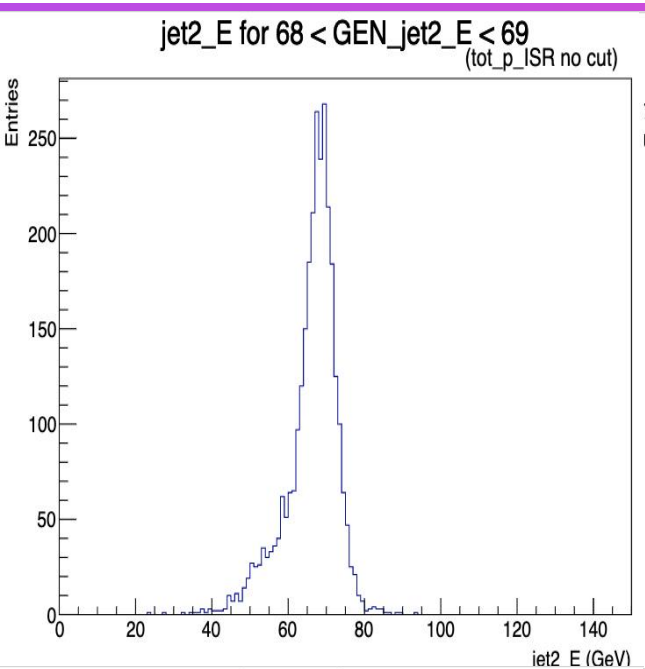

jet2_E for 70 < GEN_jet2_E < 80
(tot_p_ISR < 0.5)
Entries
jet2_E (GeV)

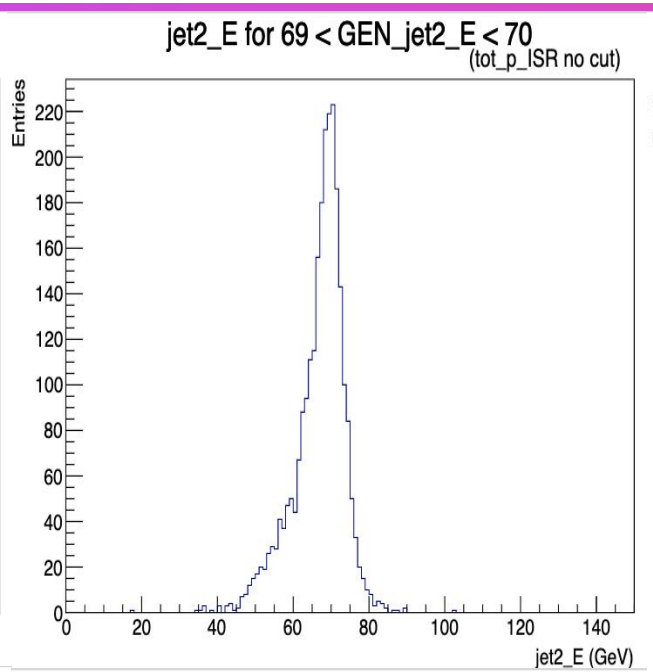

jet2_E for 70 < GEN_jet2_E < 80
(tot_p_ISR < 0.1)
Entries
jet2_E (GeV)

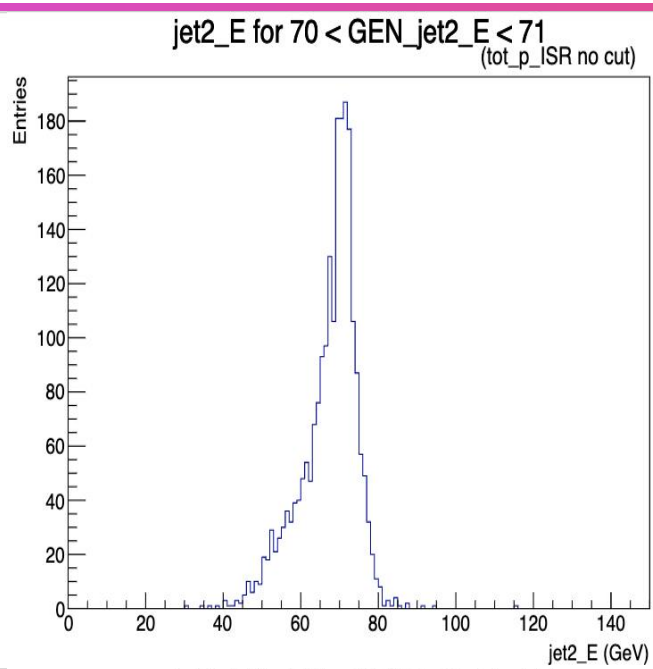

jet2_E for 40 < GEN_jet2_E < 50
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

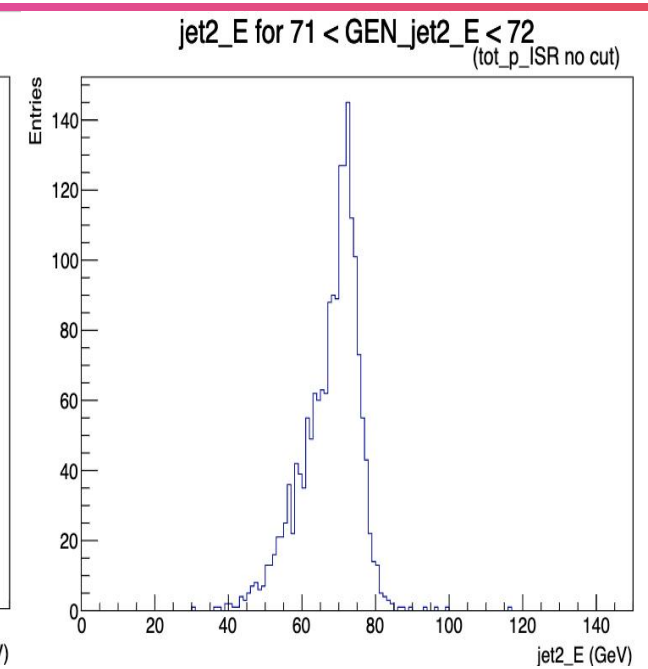

jet2_E for 50 < GEN_jet2_E < 60
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

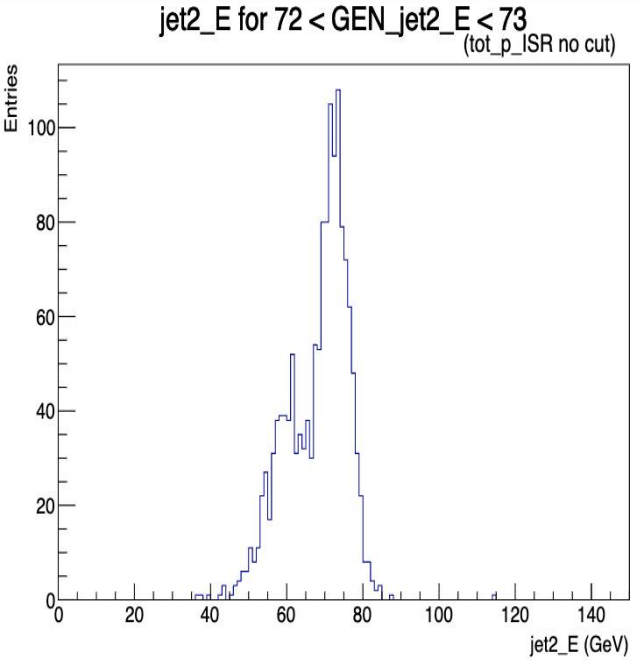

jet2_E for 60 < GEN_jet2_E < 70
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

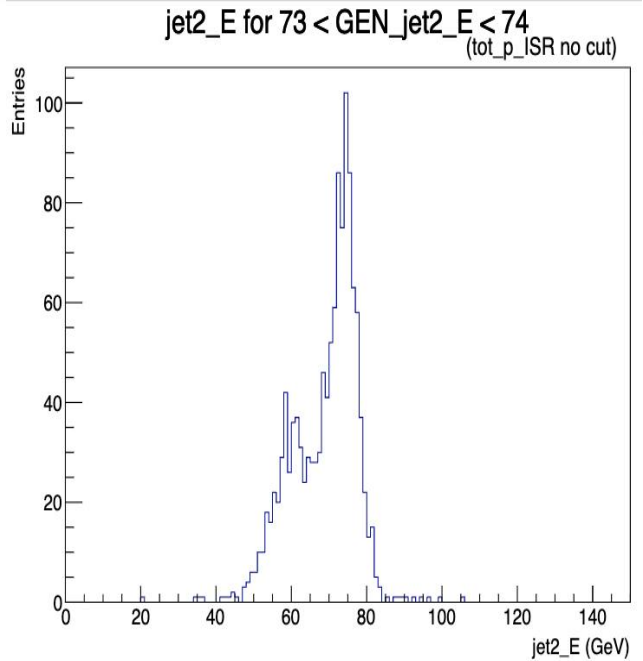

jet2_E for 68 < GEN_jet2_E < 69
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

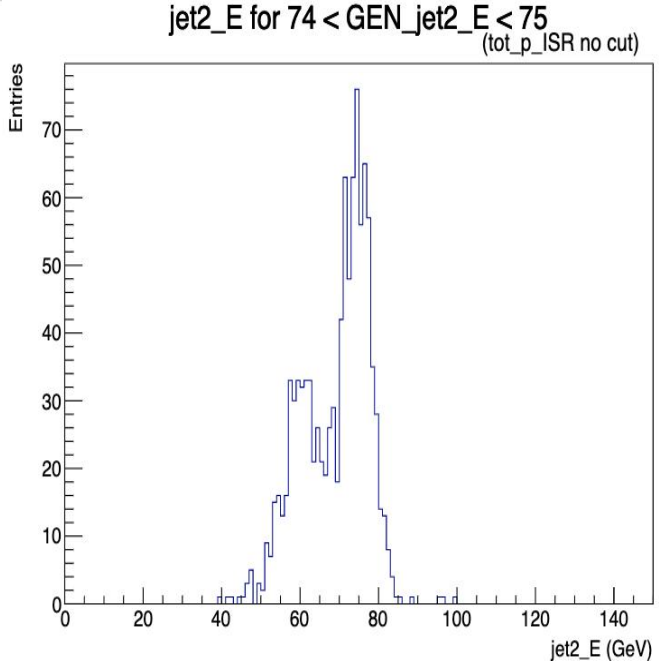

jet2_E for 69 < GEN_jet2_E < 70
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

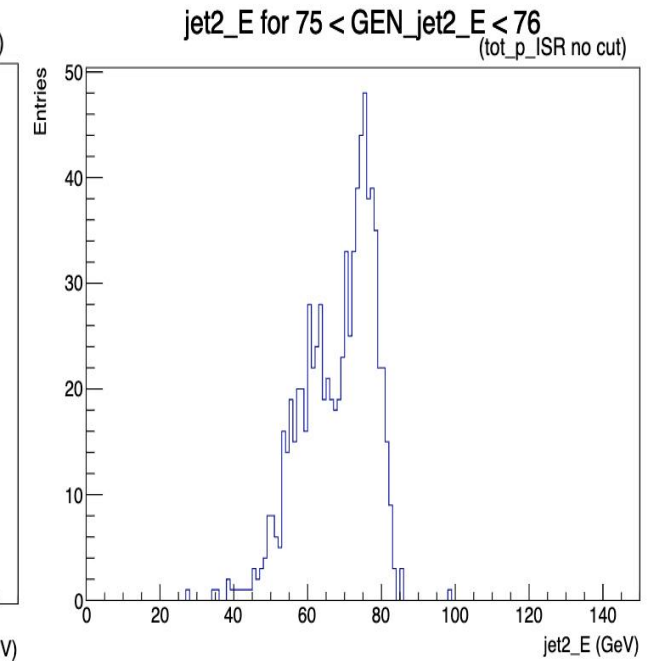

jet2_E for 70 < GEN_jet2_E < 71
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

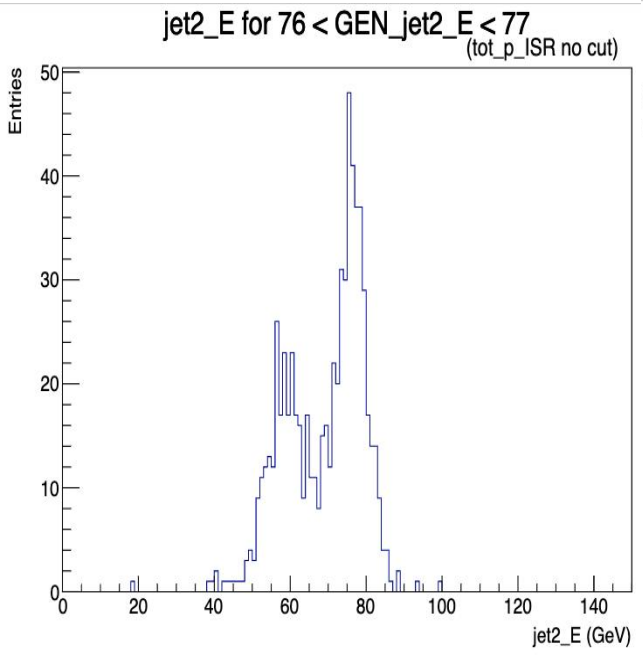

jet2_E for 71 < GEN_jet2_E < 72
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

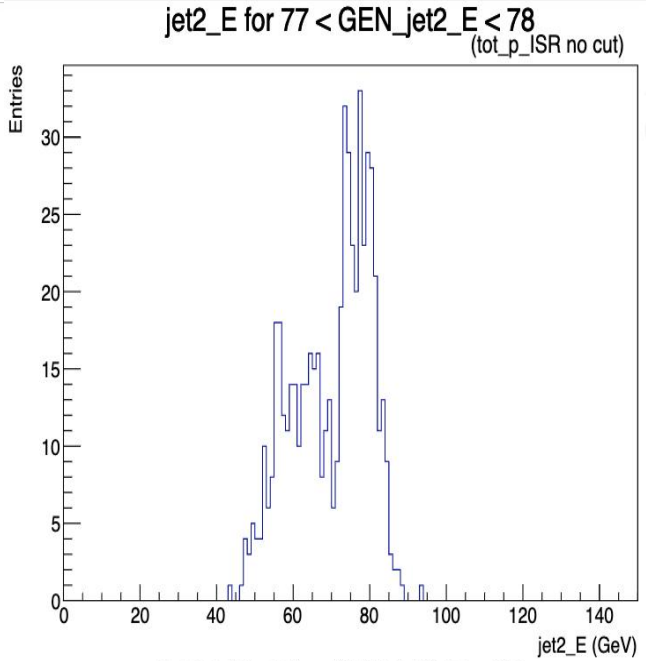

jet2_E for 72 < GEN_jet2_E < 73
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

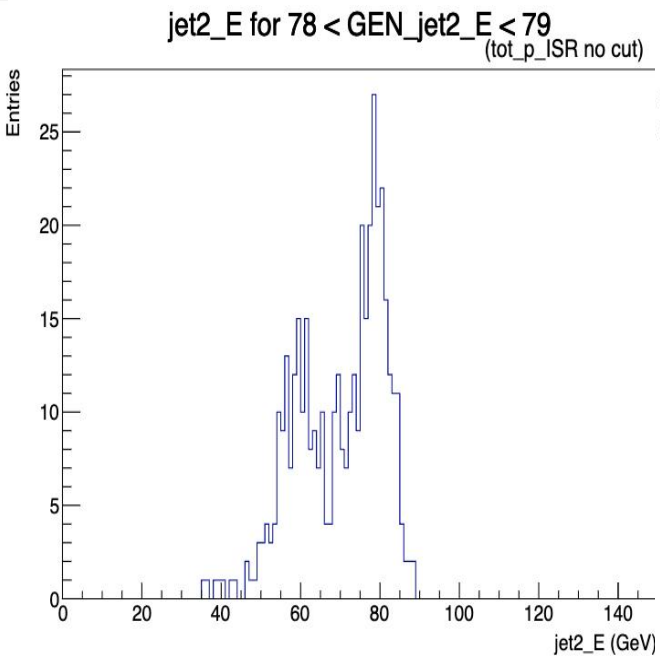

jet2_E for 73 < GEN_jet2_E < 74
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

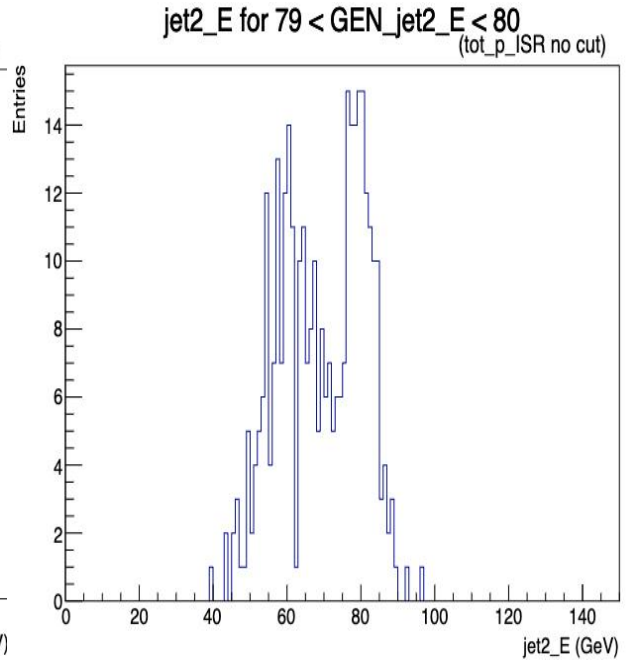

jet2_E for 74 < GEN_jet2_E < 75
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

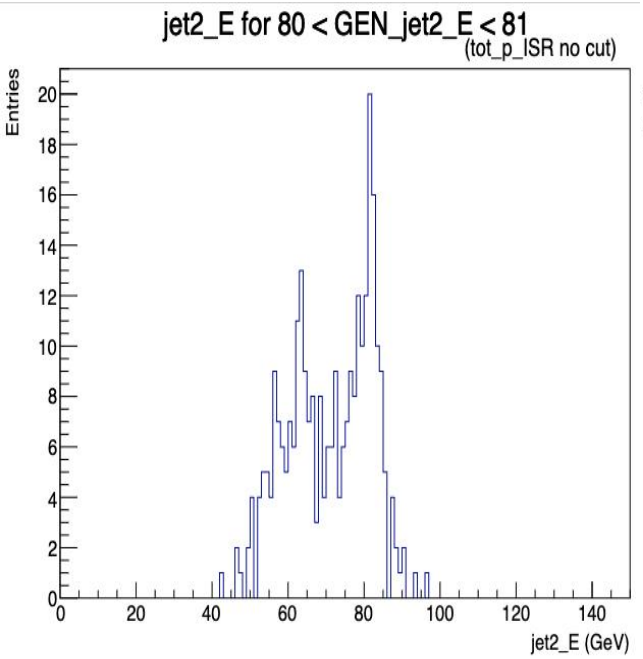

jet2_E for 75 < GEN_jet2_E < 76
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

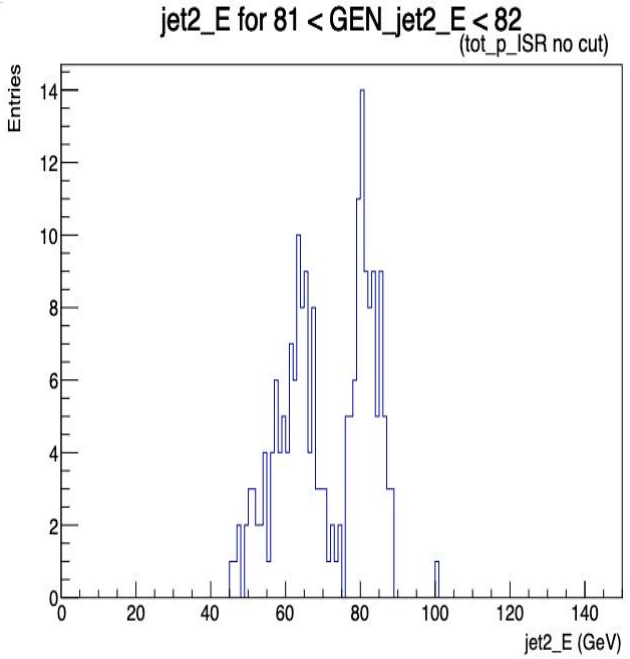

jet2_E for 76 < GEN_jet2_E < 77
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

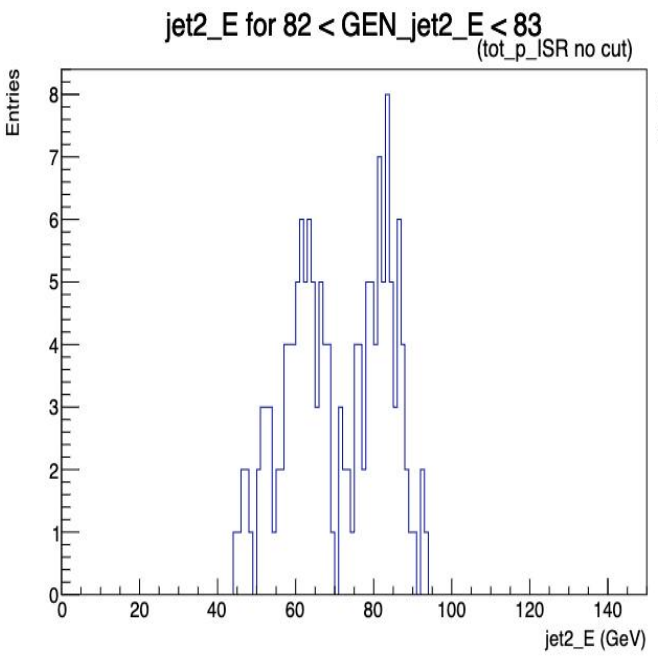

jet2_E for 77 < GEN_jet2_E < 78
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

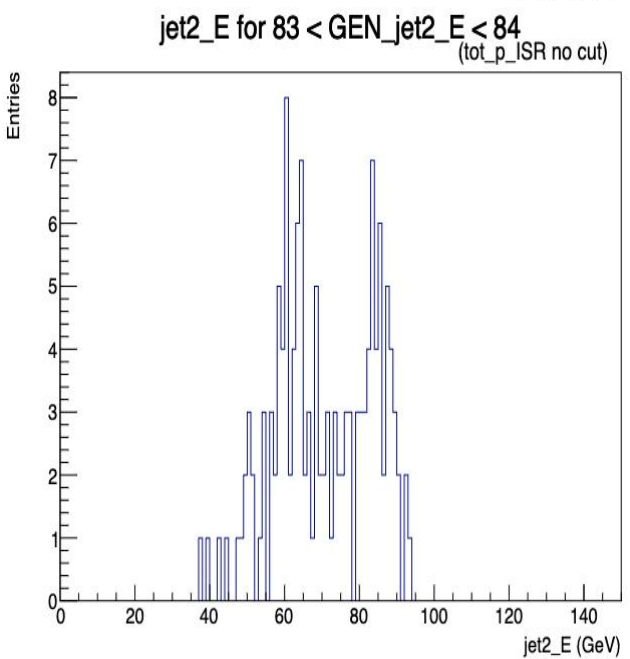

jet2_E for 78 < GEN_jet2_E < 79
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

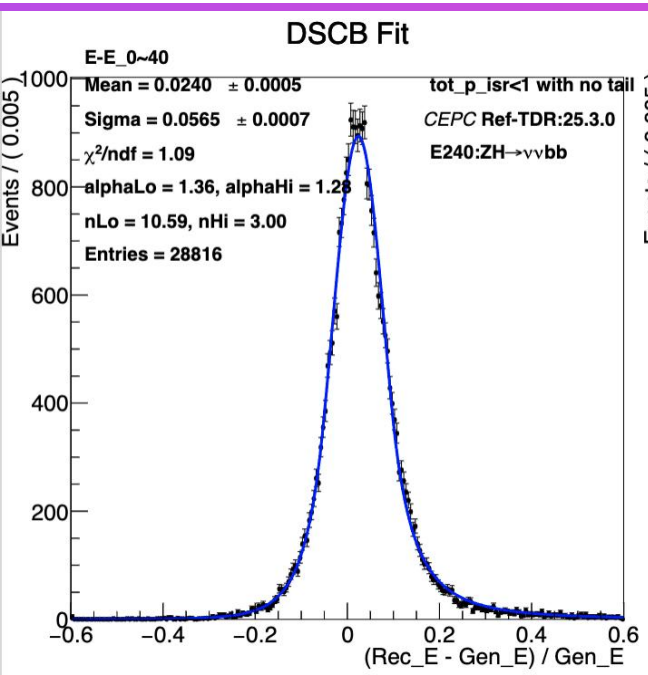

jet2_E for 79 < GEN_jet2_E < 80
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

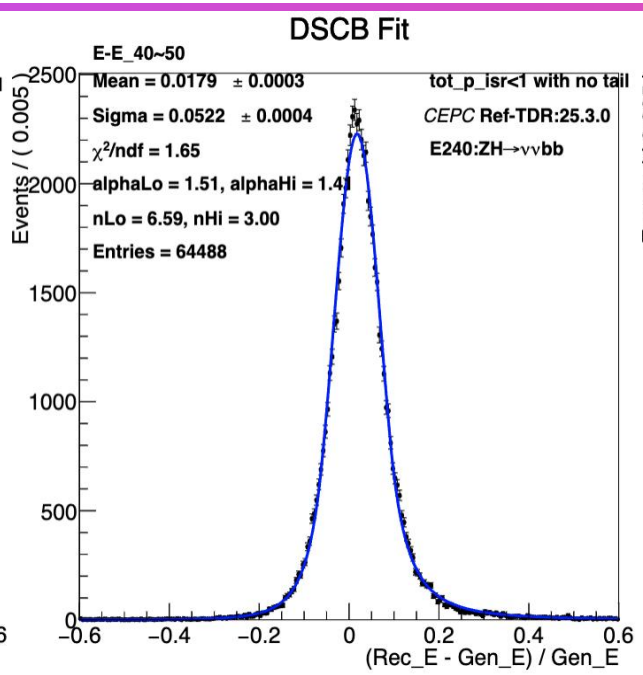

jet2_E for 80 < GEN_jet2_E < 81
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

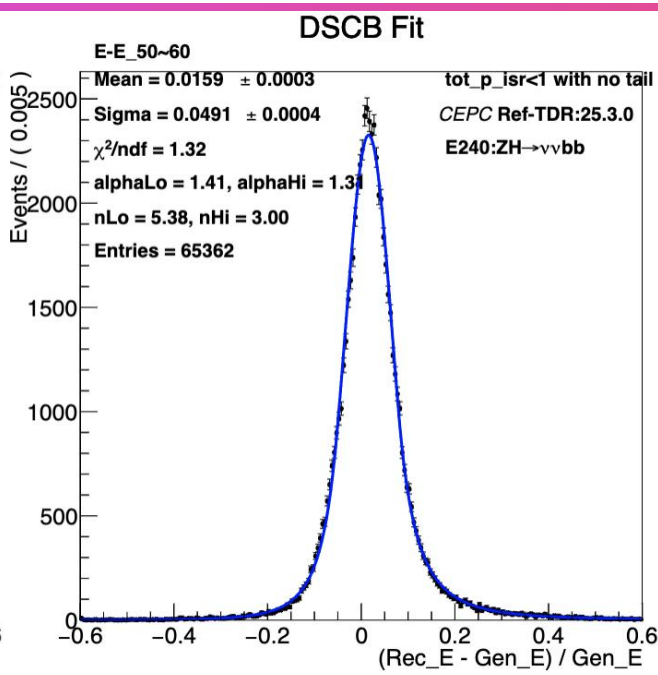

jet2_E for 81 < GEN_jet2_E < 82
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

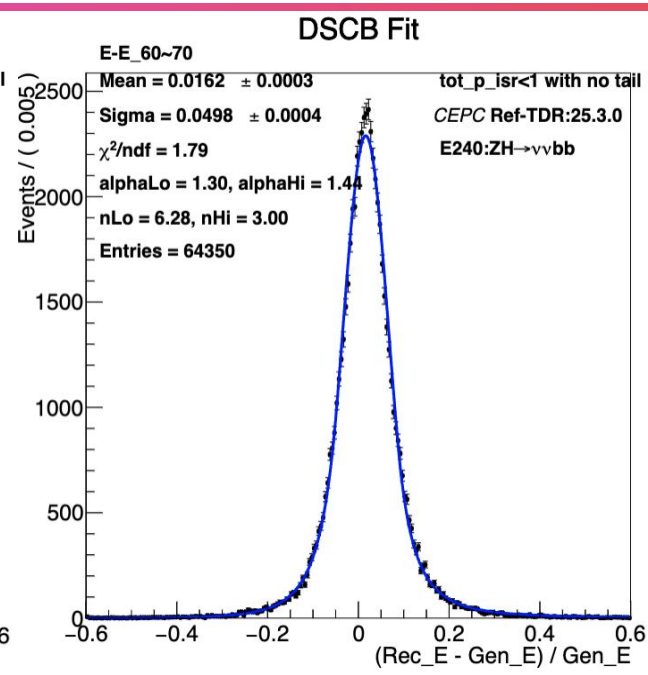

jet2_E for 82 < GEN_jet2_E < 83
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

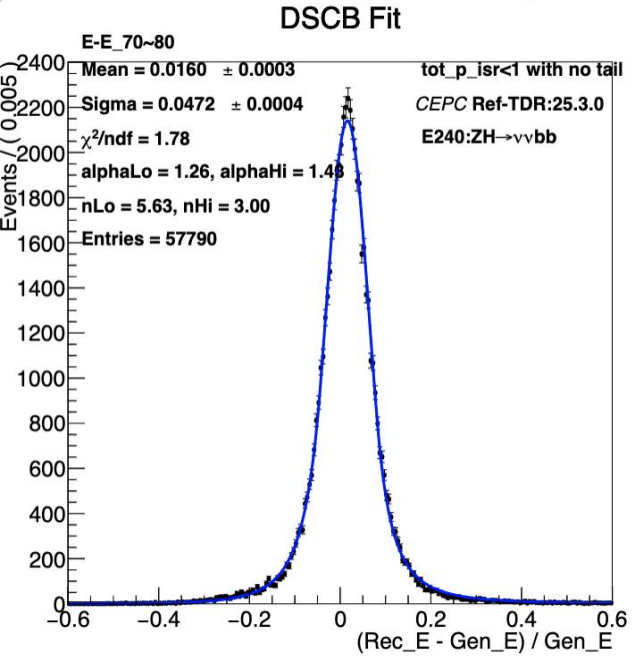

jet2_E for 83 < GEN_jet2_E < 84
(tot_p_ISR no cut)
Entries
jet2_E (GeV)

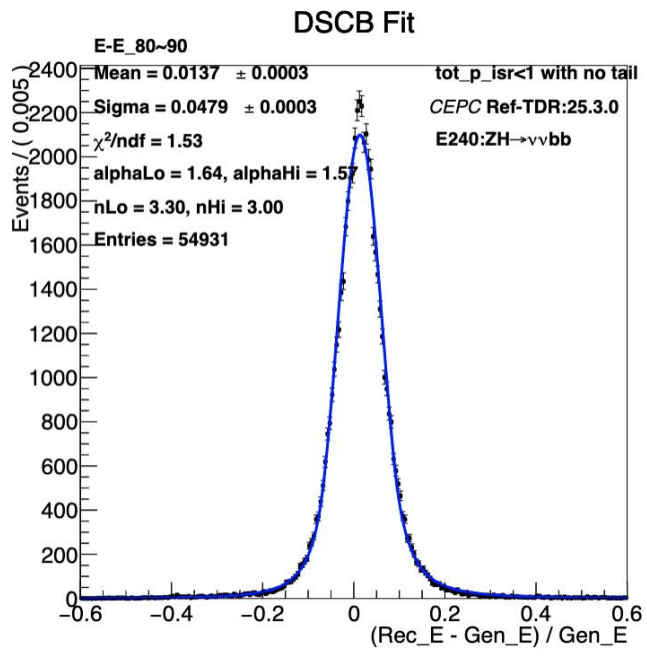

DSCB Fit
E-E_0~40
Mean = 0.0240 ± 0.0005
Sigma = 0.0565 ± 0.0007
χ²/ndf = 1.09
alphaLo = 1.36, alphaHi = 1.28
nLo = 10.59, nHi = 3.00
Entries = 28816
tot_p_isr<1 with no tail
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E

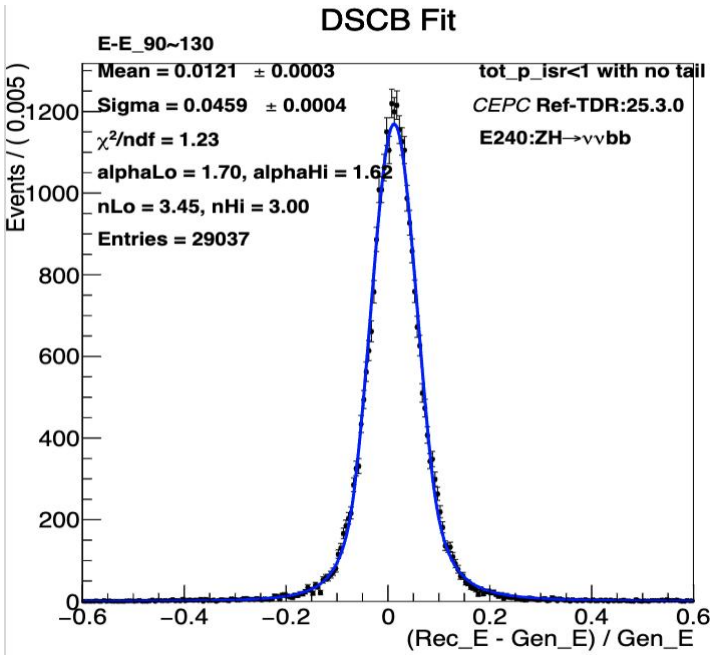

DSCB Fit
E-E_40~50
Mean = 0.0179 ± 0.0003
Sigma = 0.0522 ± 0.0004
χ²/ndf = 1.65
alphaLo = 1.51, alphaHi = 1.41
nLo = 6.59, nHi = 3.00
Entries = 64488
tot_p_isr<1 with no tail
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E


DSCB Fit
E-E_50~60
Mean = 0.0159 ± 0.0003
Sigma = 0.0491 ± 0.0004
χ²/ndf = 1.32
alphaLo = 1.41, alphaHi = 1.31
nLo = 5.38, nHi = 3.00
Entries = 65362
tot_p_isr<1 with no tail
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E


DSCB Fit
E-E_60~70
Mean = 0.0162 ± 0.0003
Sigma = 0.0498 ± 0.0004
χ²/ndf = 1.79
alphaLo = 1.30, alphaHi = 1.44
nLo = 6.28, nHi = 3.00
Entries = 64350
tot_p_isr<1 with no tail
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E


DSCB Fit
E-E_70~80
Mean = 0.0160 ± 0.0003
Sigma = 0.0472 ± 0.0004
χ²/ndf = 1.78
alphaLo = 1.26, alphaHi = 1.43
nLo = 5.63, nHi = 3.00
Entries = 57790
tot_p_isr<1 with no tail
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E


DSCB Fit
E-E_80~90
Mean = 0.0137 ± 0.0003
Sigma = 0.0479 ± 0.0003
χ²/ndf = 1.53
alphaLo = 1.64, alphaHi = 1.57
nLo = 3.30, nHi = 3.00
Entries = 54931
tot_p_isr<1 with no tail
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E


DSCB Fit
E-E_90~130
Mean = 0.0121 ± 0.0003
Sigma = 0.0459 ± 0.0004
χ²/ndf = 1.23
alphaLo = 1.70, alphaHi = 1.62
nLo = 3.45, nHi = 3.00
Entries = 29037
tot_p_isr<1 with no tail
CEPC Ref-TDR:25.3.0
E240:ZH→νν̄bb̄
Events / (0.005)
(Rec_E - Gen_E) / Gen_E