Comparison of timing cuts - ILD and CLIC_o3_v12

Sascha Dreyer

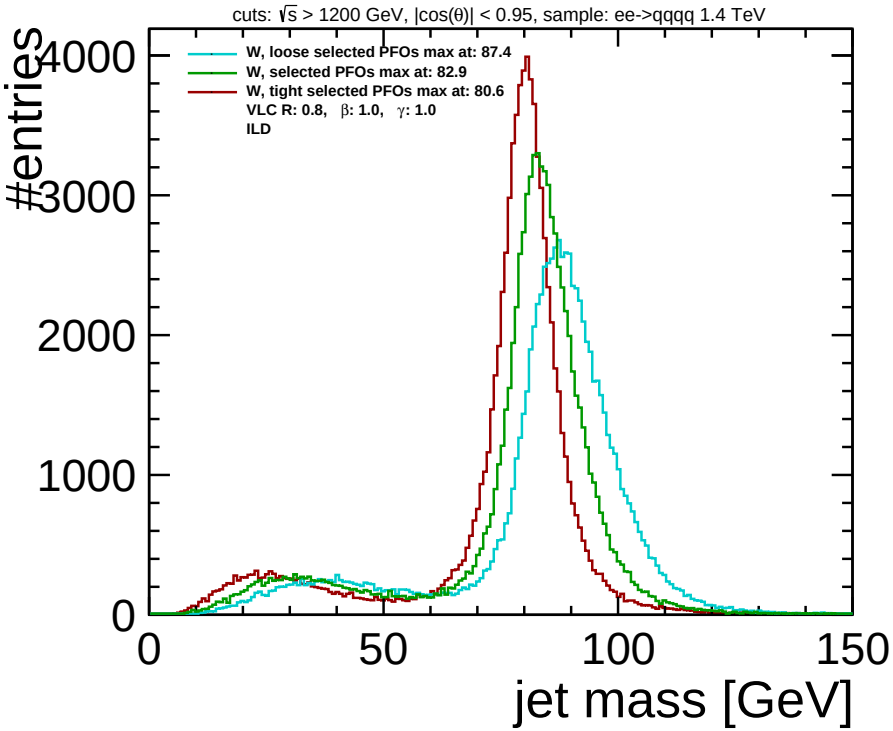
CLICdp software meeting

August 15, 2017

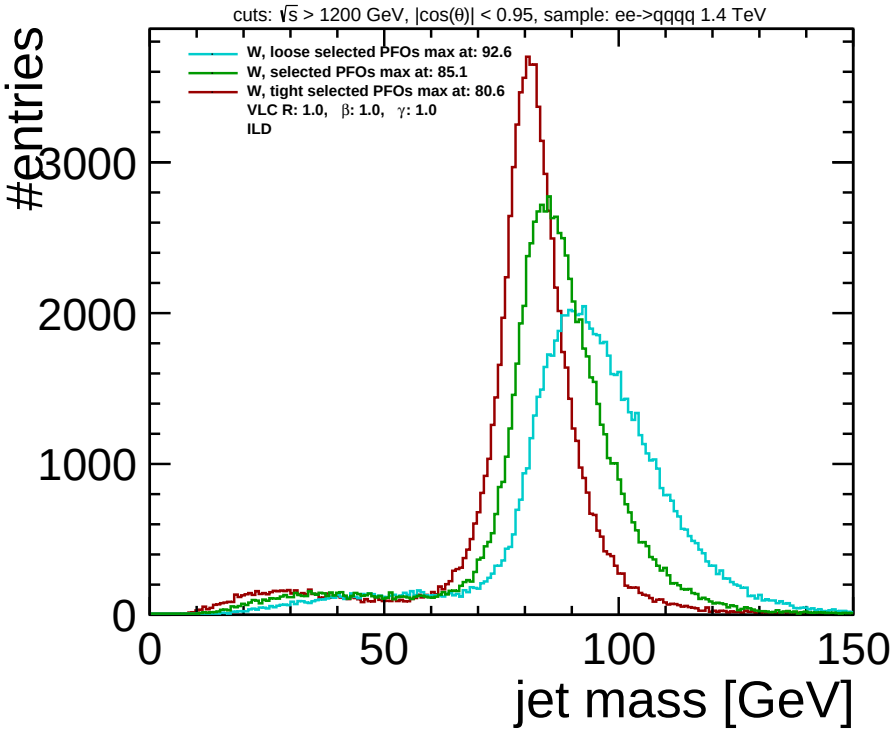
Study: ILD ↔ CLIC_o3_v12

- W jet mass distribution of CLIC_ILD (with overlay) and CLIC_o3_v12 (with and w.o. overlay) at 1.4 TeV
- ee → qqqq, CLIC_ILD: id4034, CLIC_o3_v12: id8307 (official framework, production by Andre Sailer)
- Reconstructed using VLC jet clustering algorithm ($\beta = \gamma = 1.0$) using different radii
- W tagging via MC quarks, collections: tight, selected, loose

CLIC_ILD $r = 0.8$



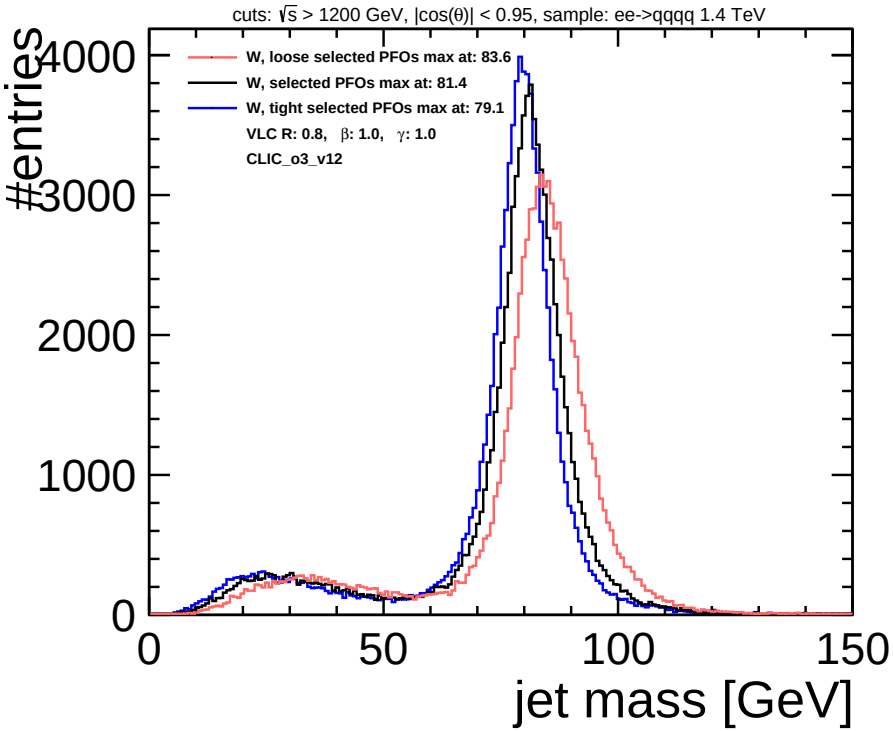
CLIC_ILD $r = 1.0$



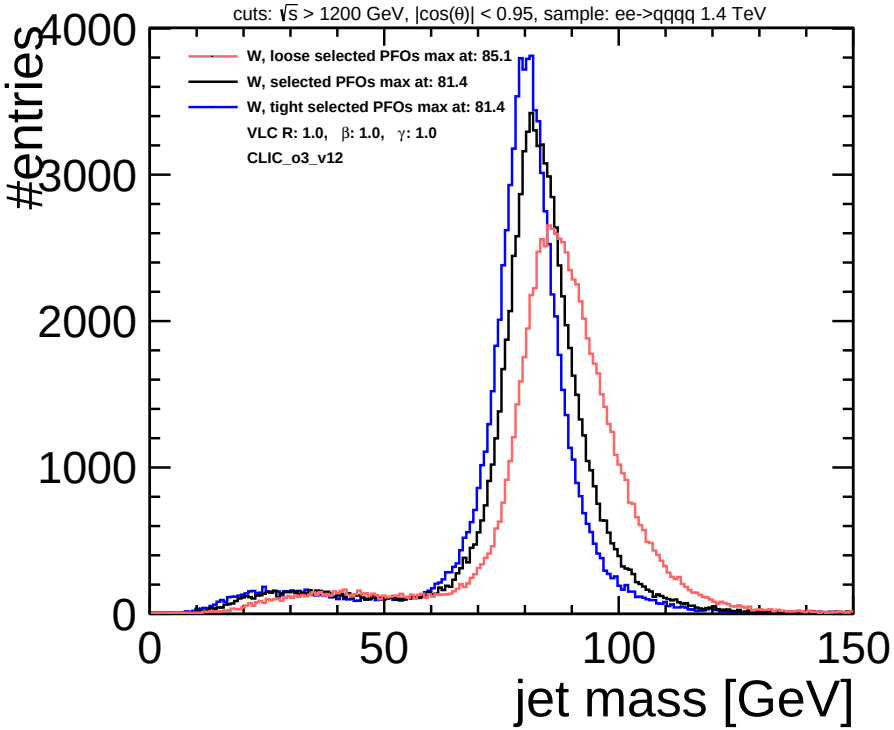
Overview CLIC_o3_v12 with overlay

CLIC_o3_v12, tight, selected, loose

- $r = 0.8$



- $r = 1.0$

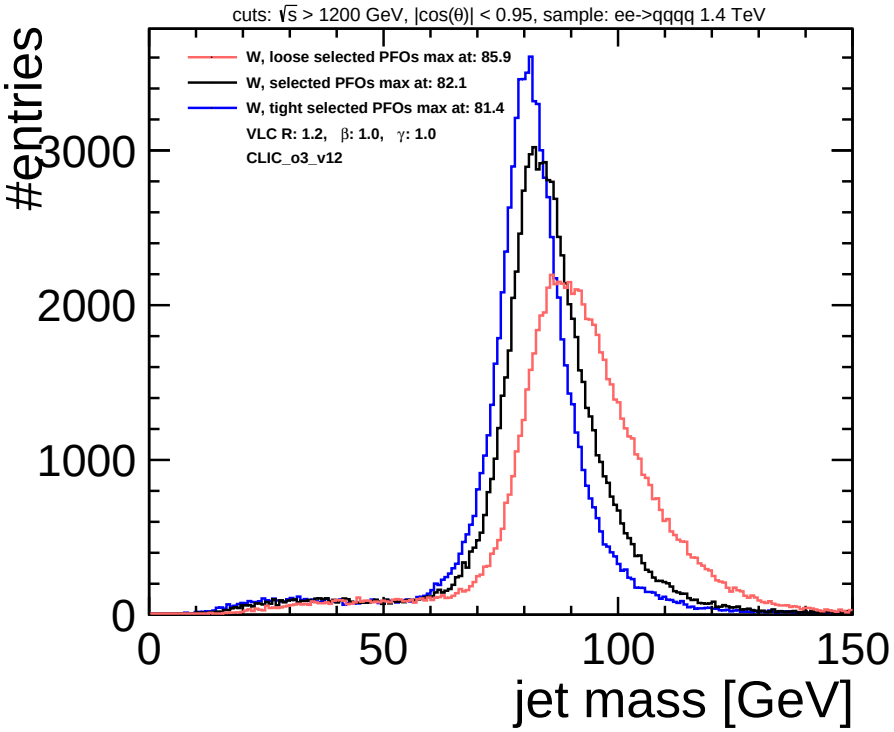


- All histograms scaled to same #entries: higher peak → narrower distribution → better

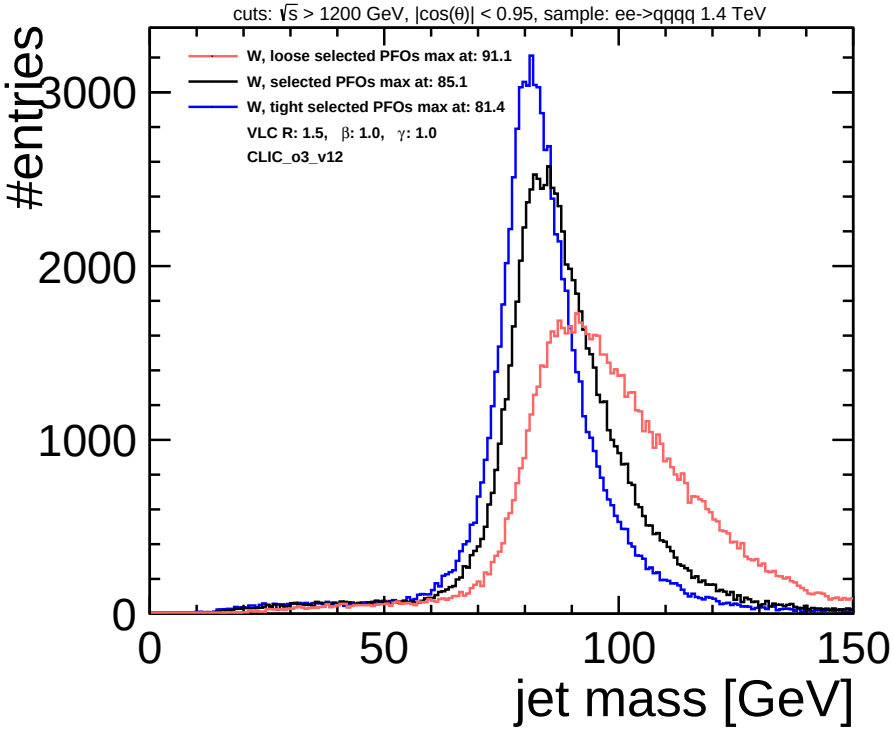
Overview CLIC_o3_v12 with overlay

CLIC_o3_v12, tight, selected, loose

- $r = 1.2$

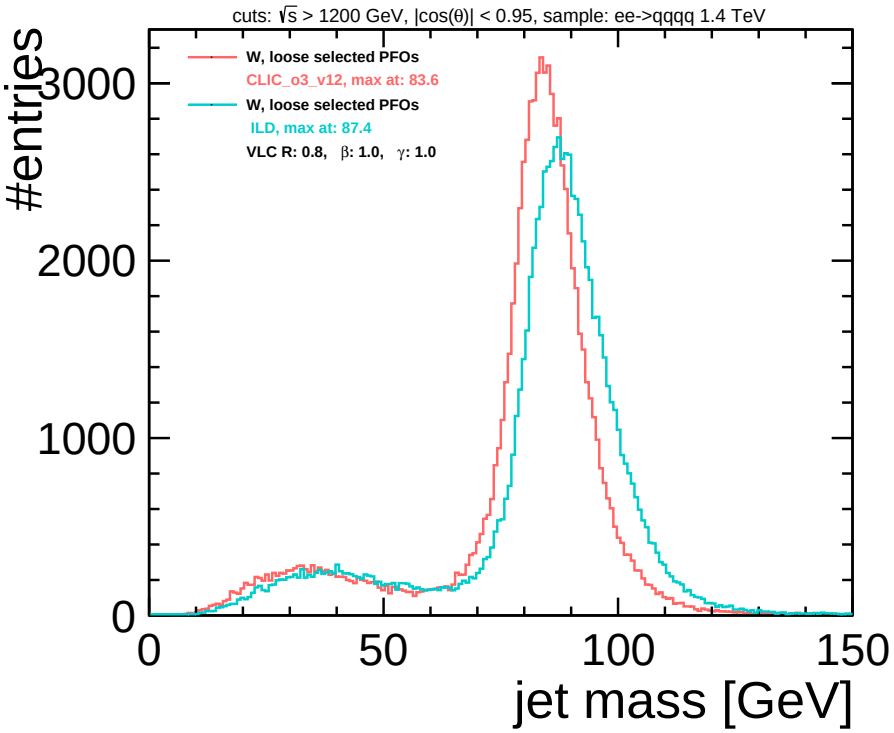


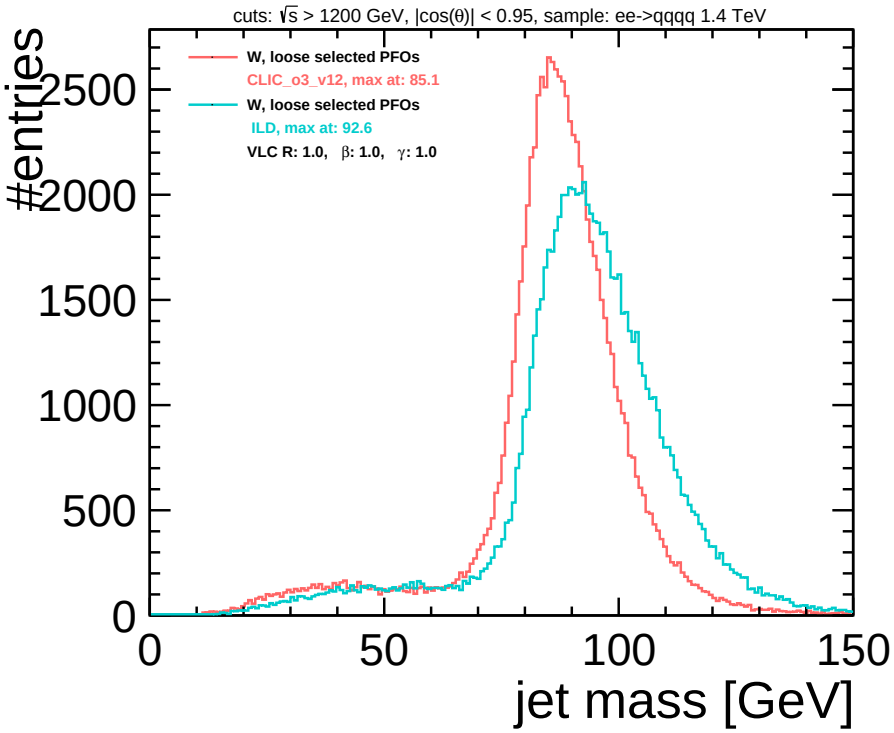
- $r = 1.5$



Detailed comparison: Loose

- Loosely selected PFOs, CLIC_o3_v12, CLIC_ILD
  - $r = 0.8$
  - $r = 1.0$

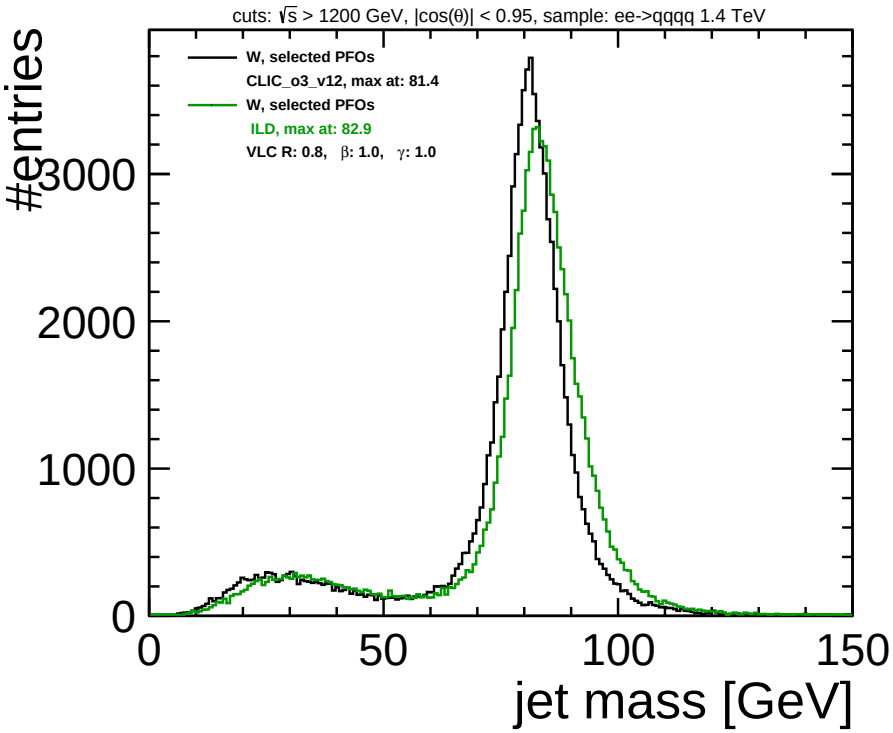




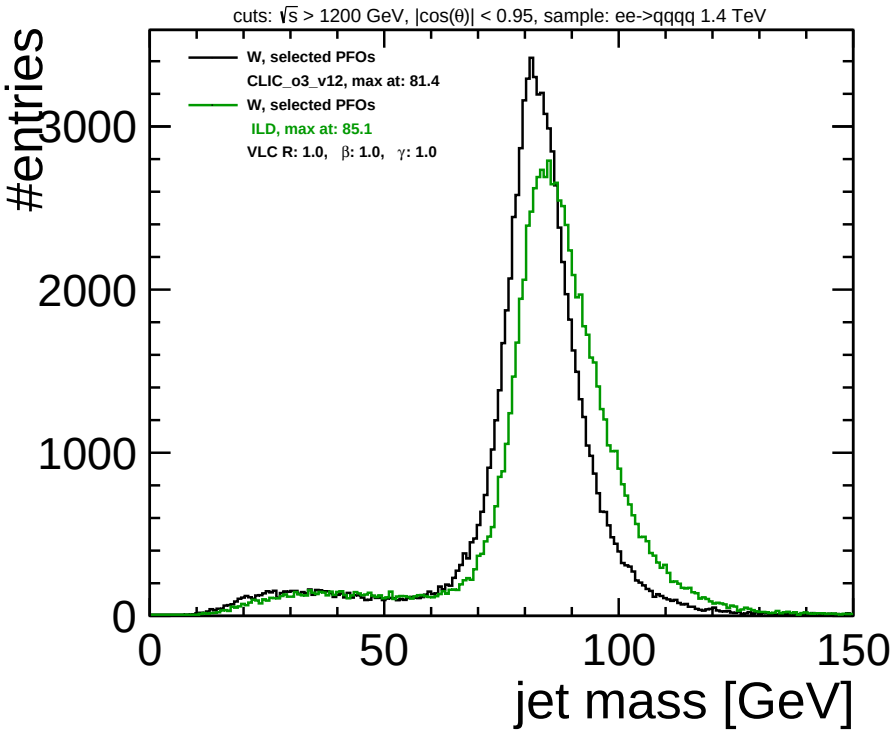
- Loose collection usually not considered at 1.4 TeV but considerably better now
  - narrower distribution and peak closer to W mass

Detailed comparison: Selected

- Selected PFOs compared, CLIC_o3_v12, CLIC_ILD
  - $r = 0.8$



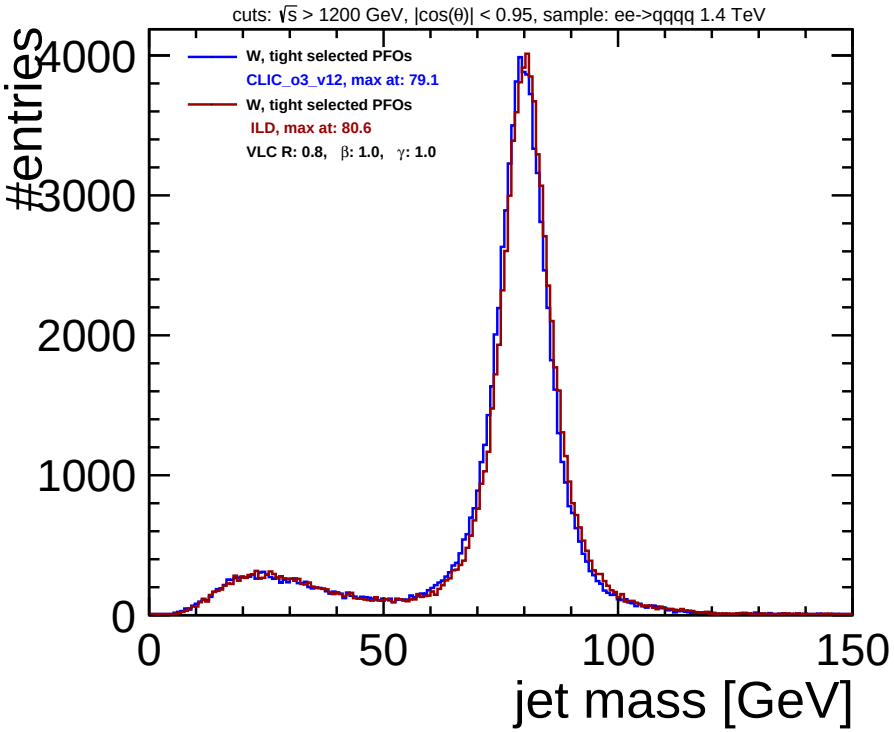
  - $r = 1.0$

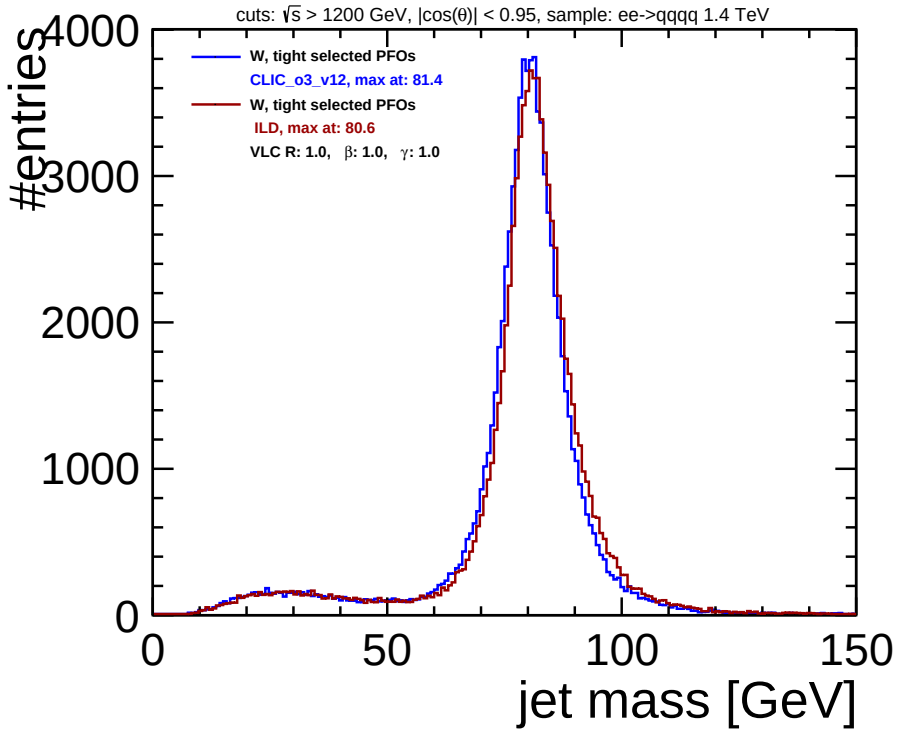


- Smaller difference, shift to slightly lower masses
  - closer to W mass

Detailed comparison Tight selected

- Tight selected PFOs compared, CLIC_o3_v12, CLIC_ILD
  - $r = 0.8$
  - $r = 1.0$



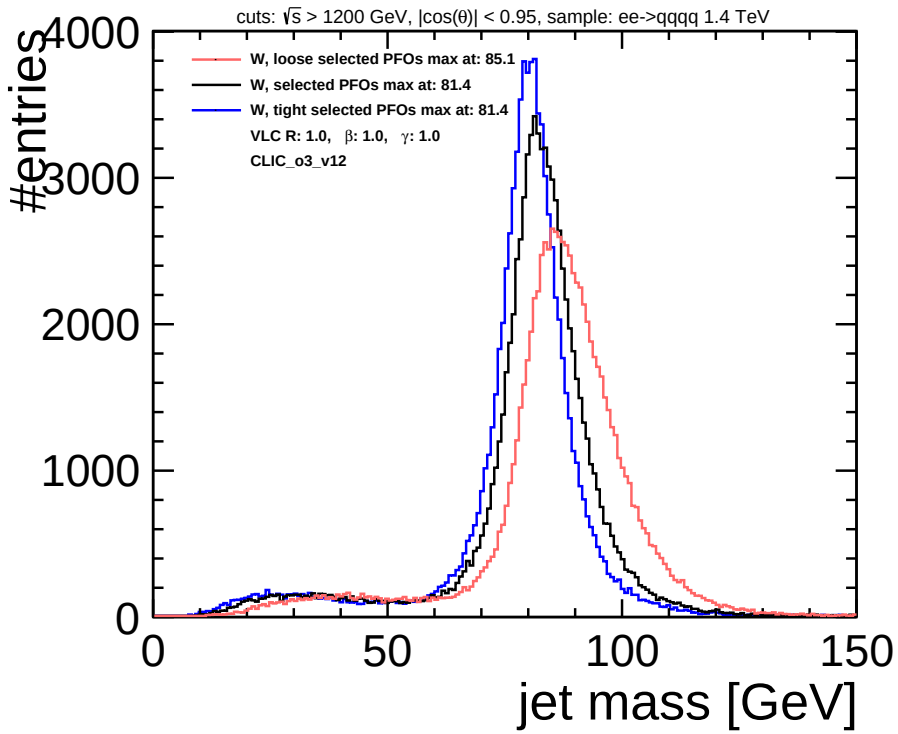


- Tight selected PFOs show very similar W jet mass distributions

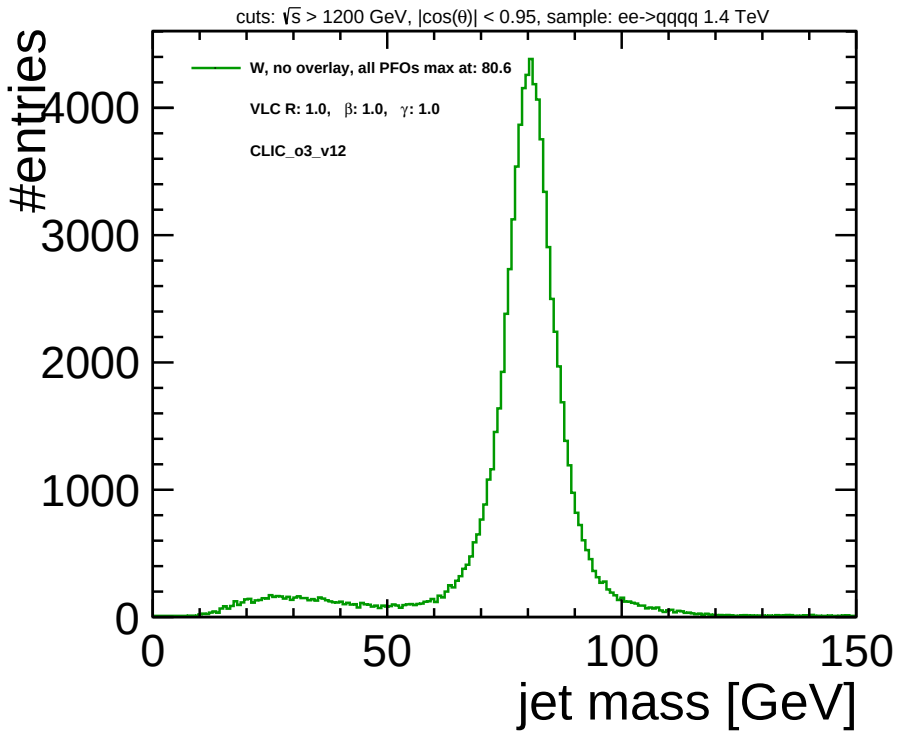
Study: Overlay

- ee $\rightarrow$ qqqq, overlay: id8307. w.o. overlay: id8581
- Reconstructed using VLC jet clustering algorithm ($\beta = \gamma = 1.0$) using different radii
- W tagging via MC info, collections for overlay: Loose, Selected, TightSelected, all PFOs without overlay

with overlay

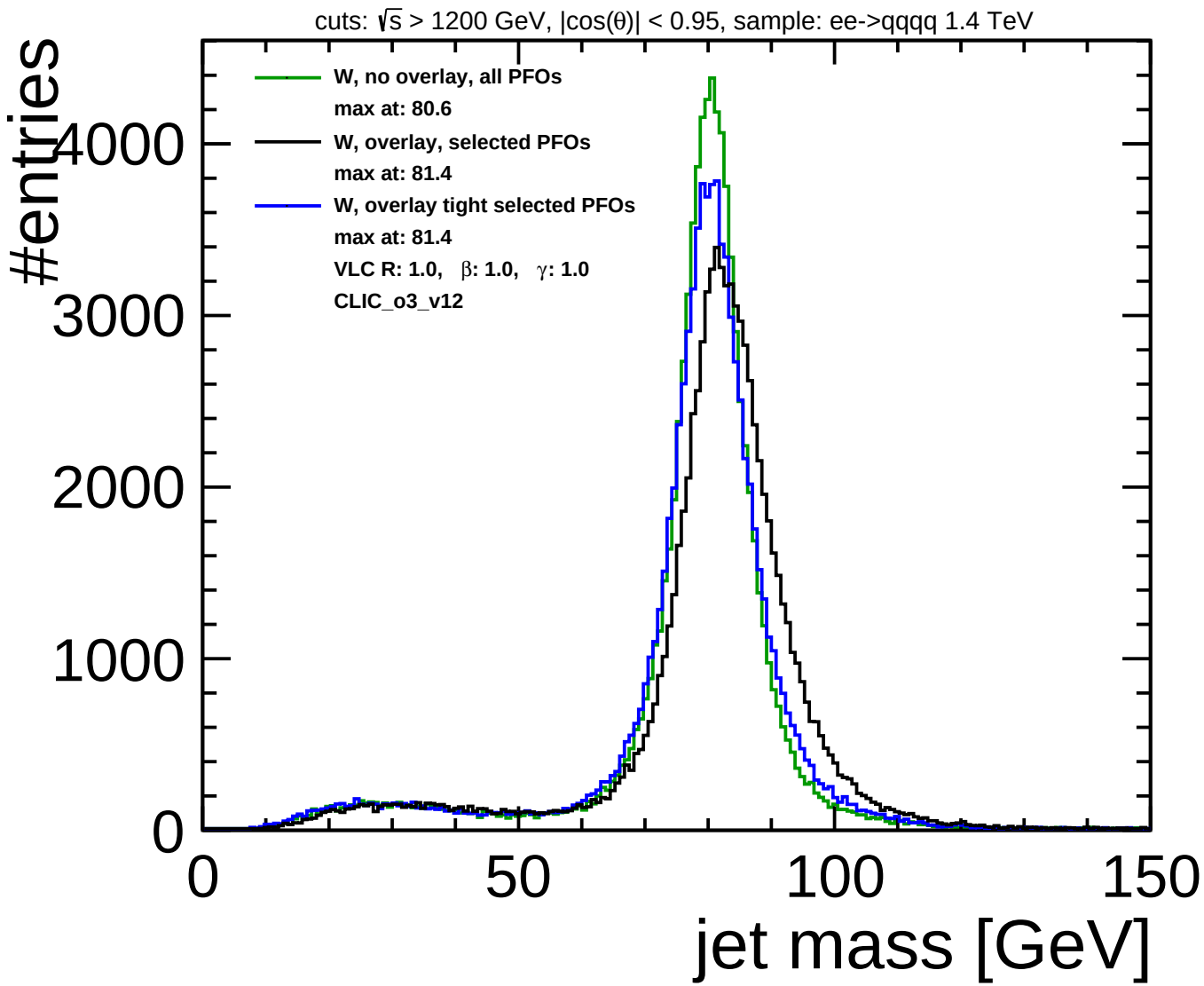


without overlay



Overview overlay $\leftrightarrow$ no overlay

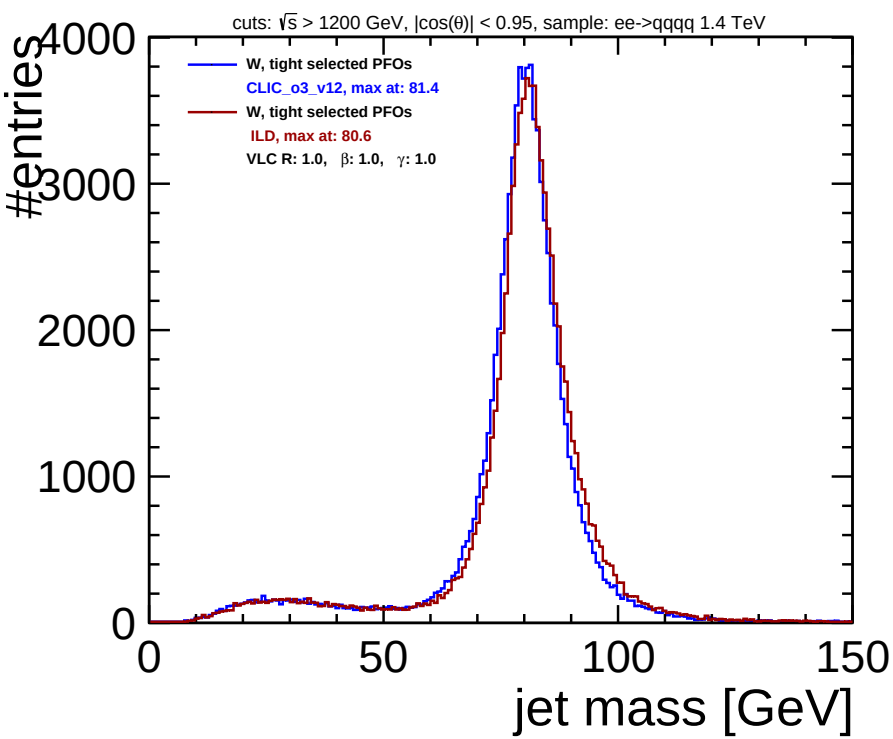
- $r = 1.0$ no overlay, overlay selected, overlay tight selected



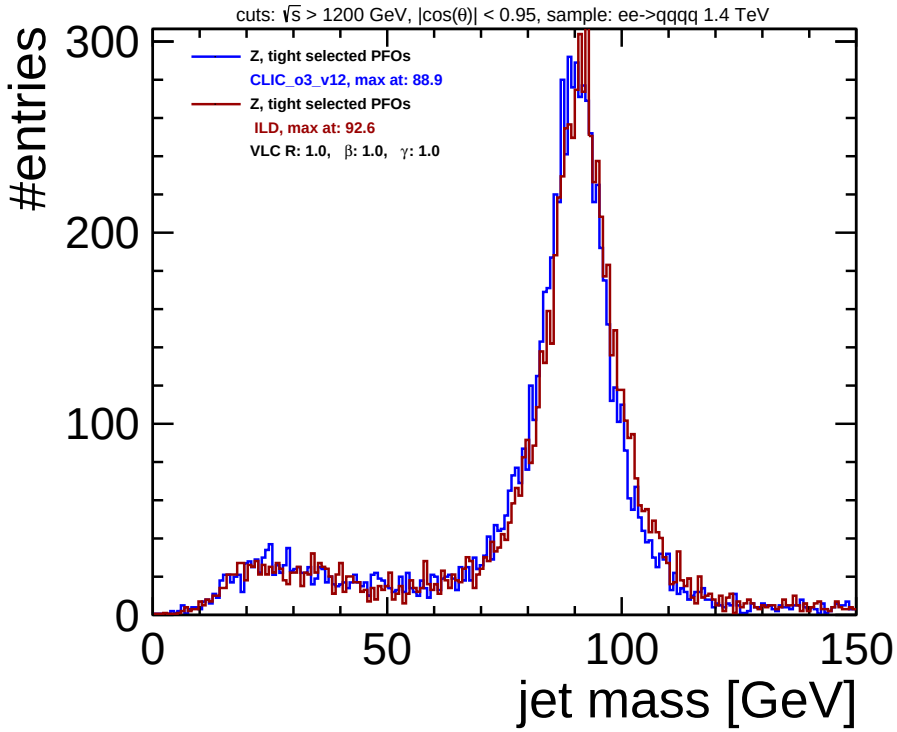
Proposal for overlay

- maybe: use tight selected collection for W and Z at $r = 1.0$
- CLIC_o3_v12, CLIC_ILD

- W jet mass



- Z jet mass

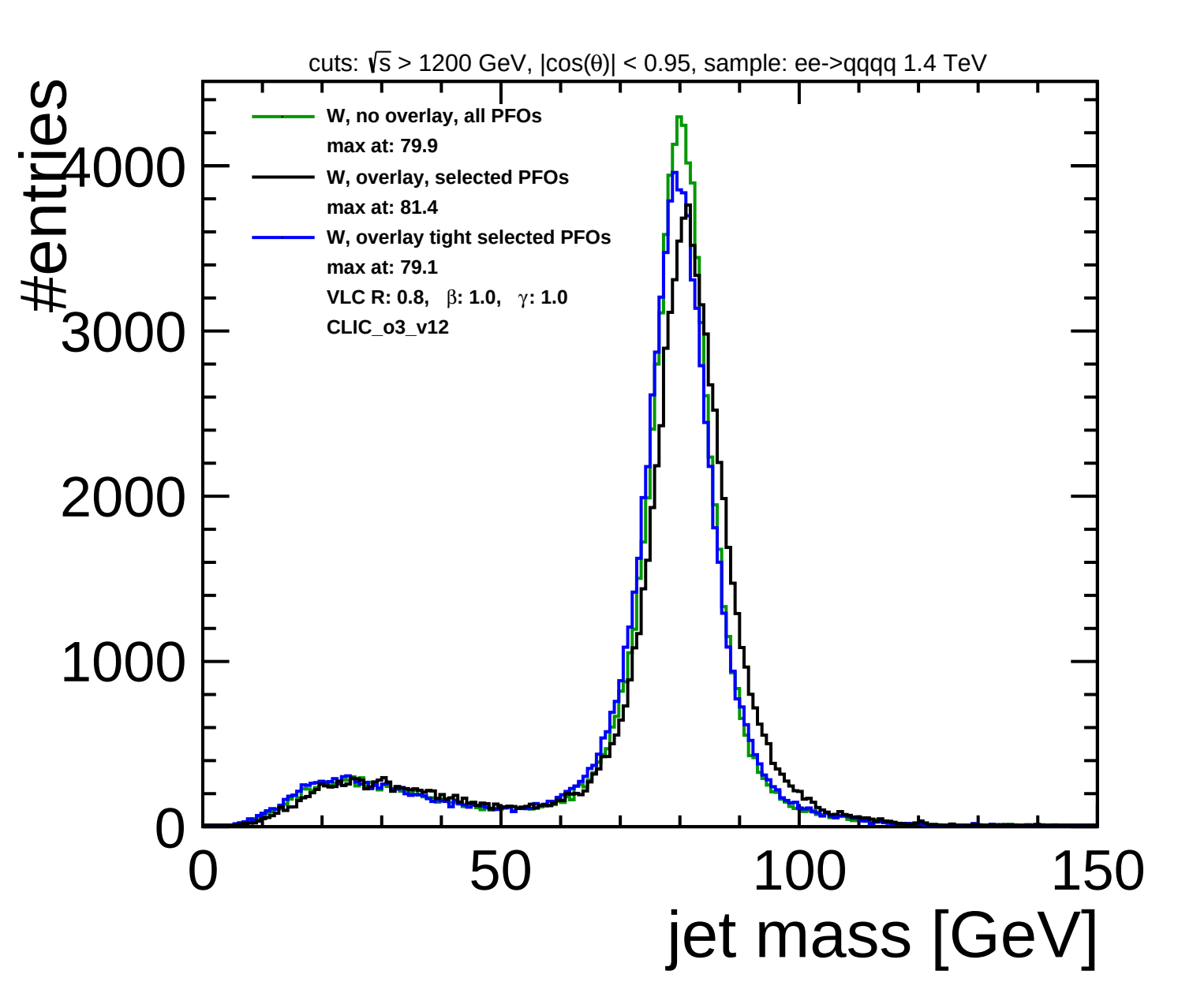


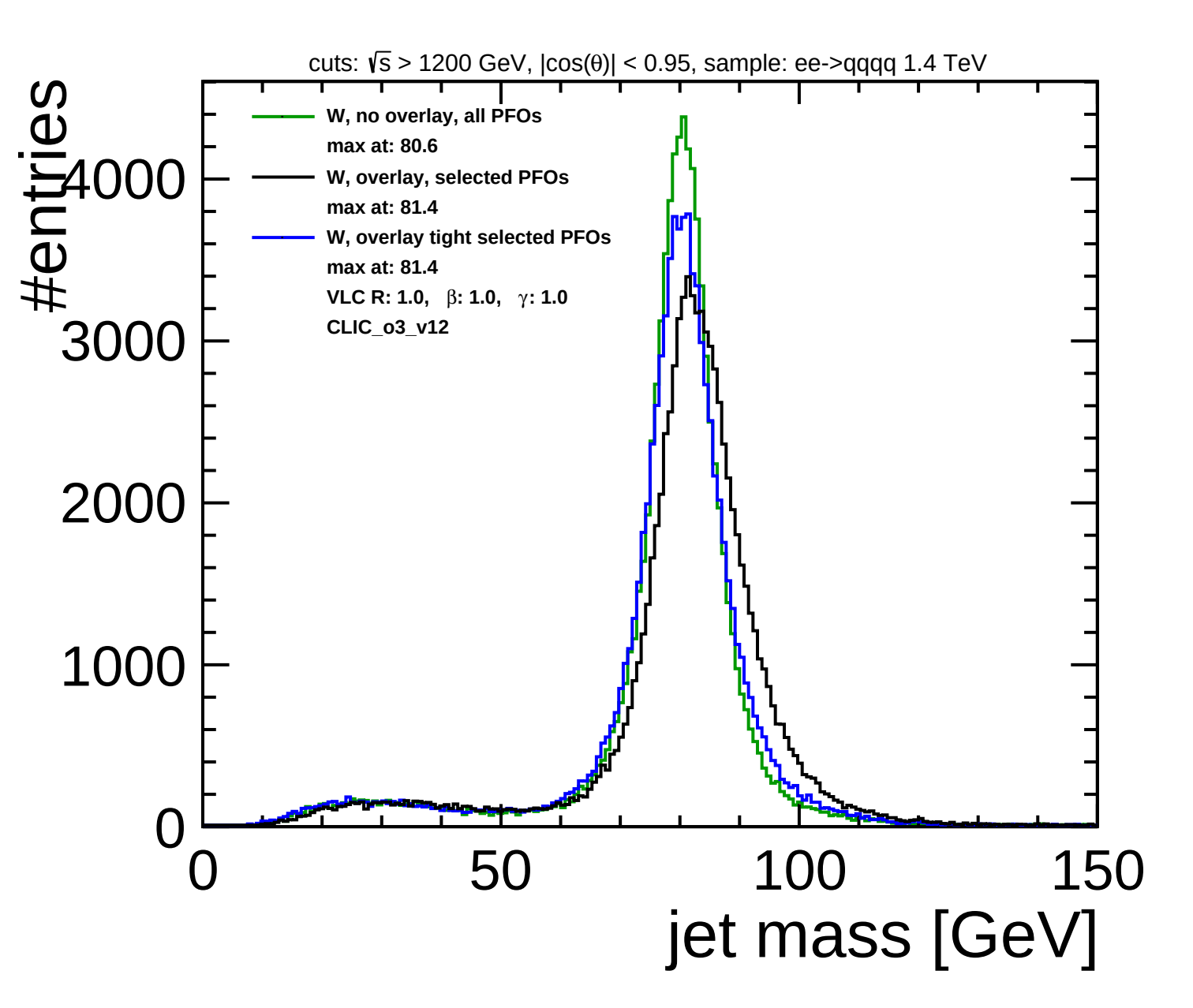
Summary and Outlook

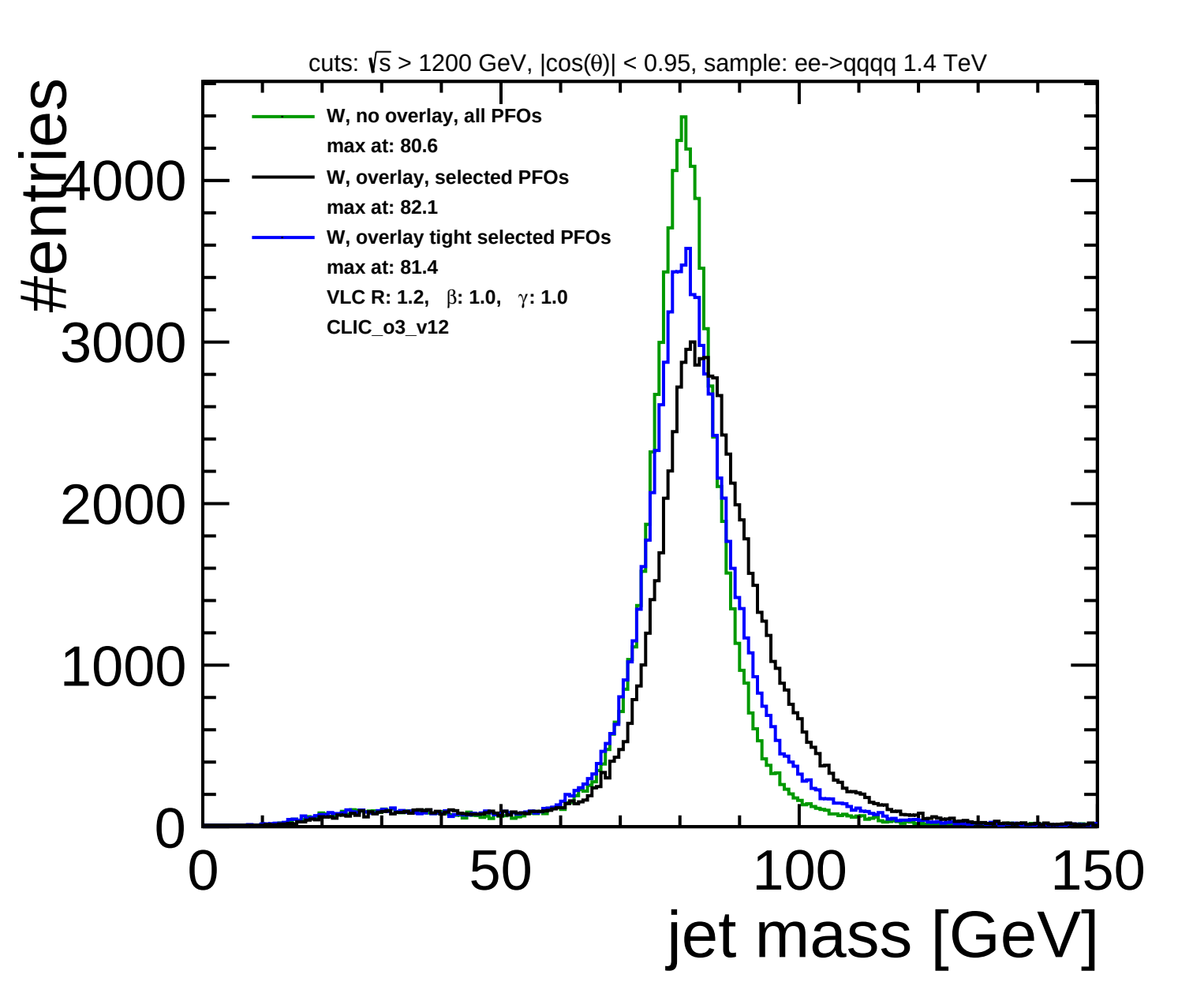
- Timing cuts seem to work 'out of the box' for new detector model and overlay
- Loosely selected PFOs perform much better compared to CLIC_ILD (narrower and higher peak)
- Loose cuts in total too loose (W mass peak at too high masses), selected and tight do far better job
- w.o. overlay: r=1.0 maximum closest to W mass
- Use tight selected PFO collection for W jet study at r=1.0?

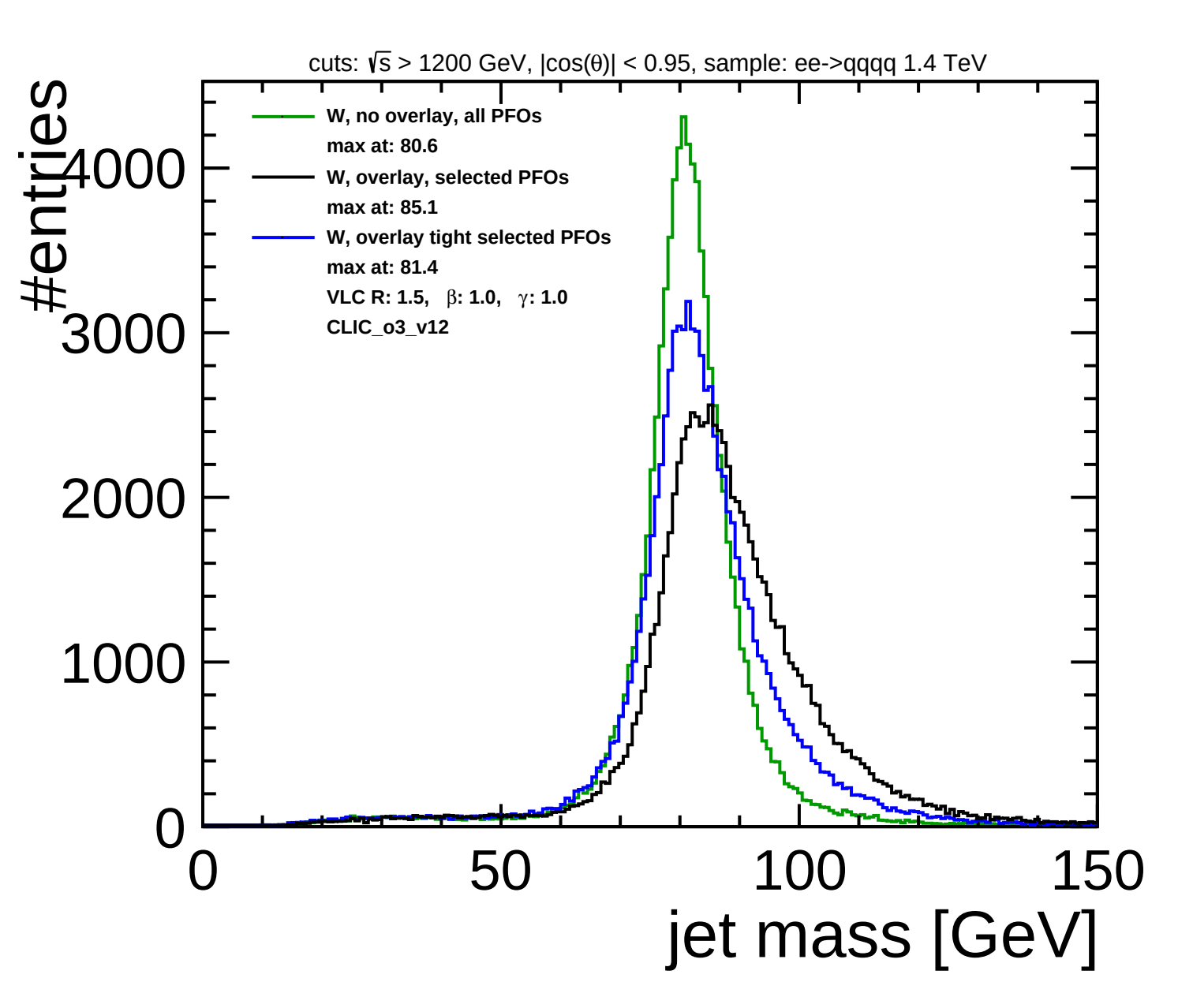
Backup

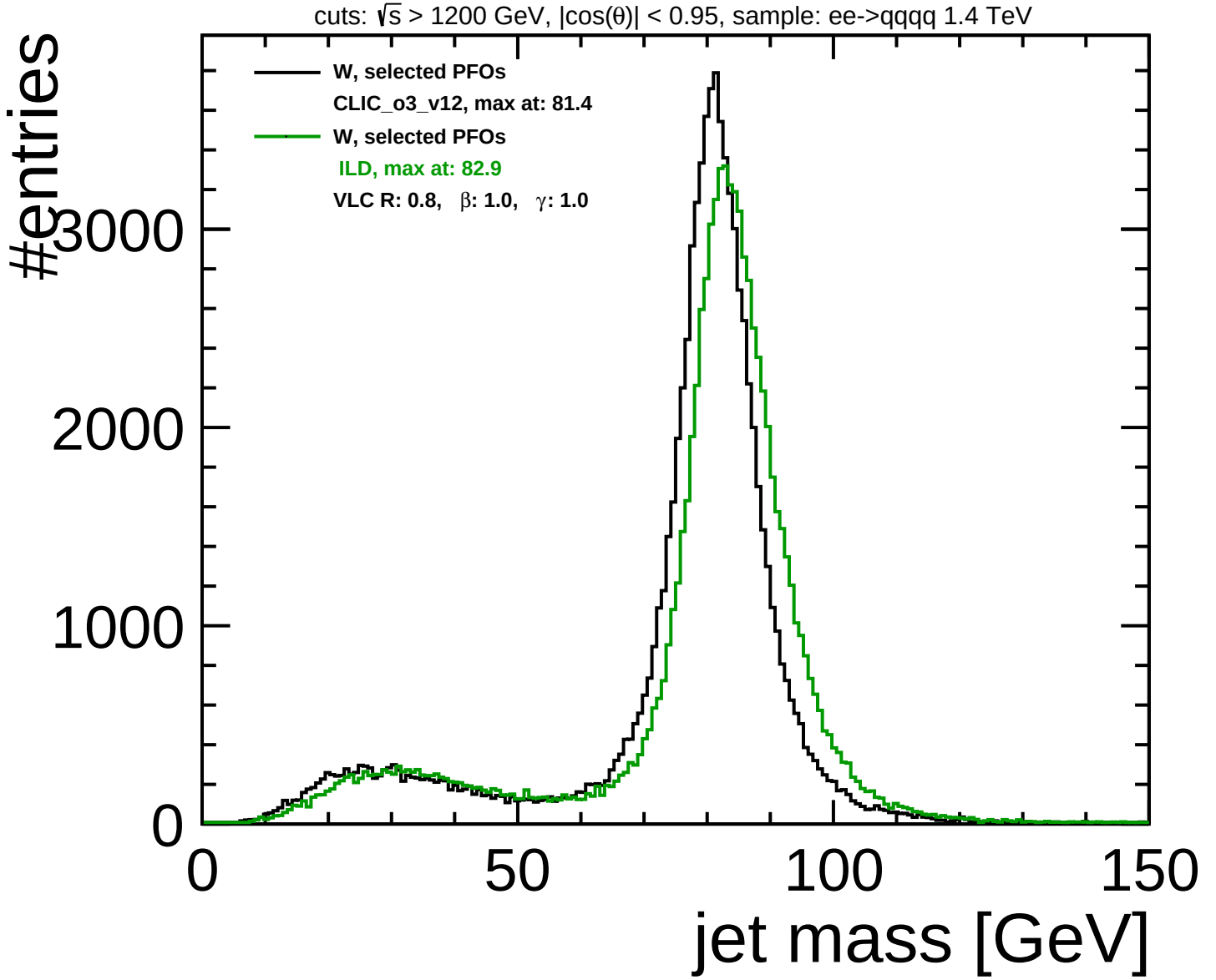
Backup

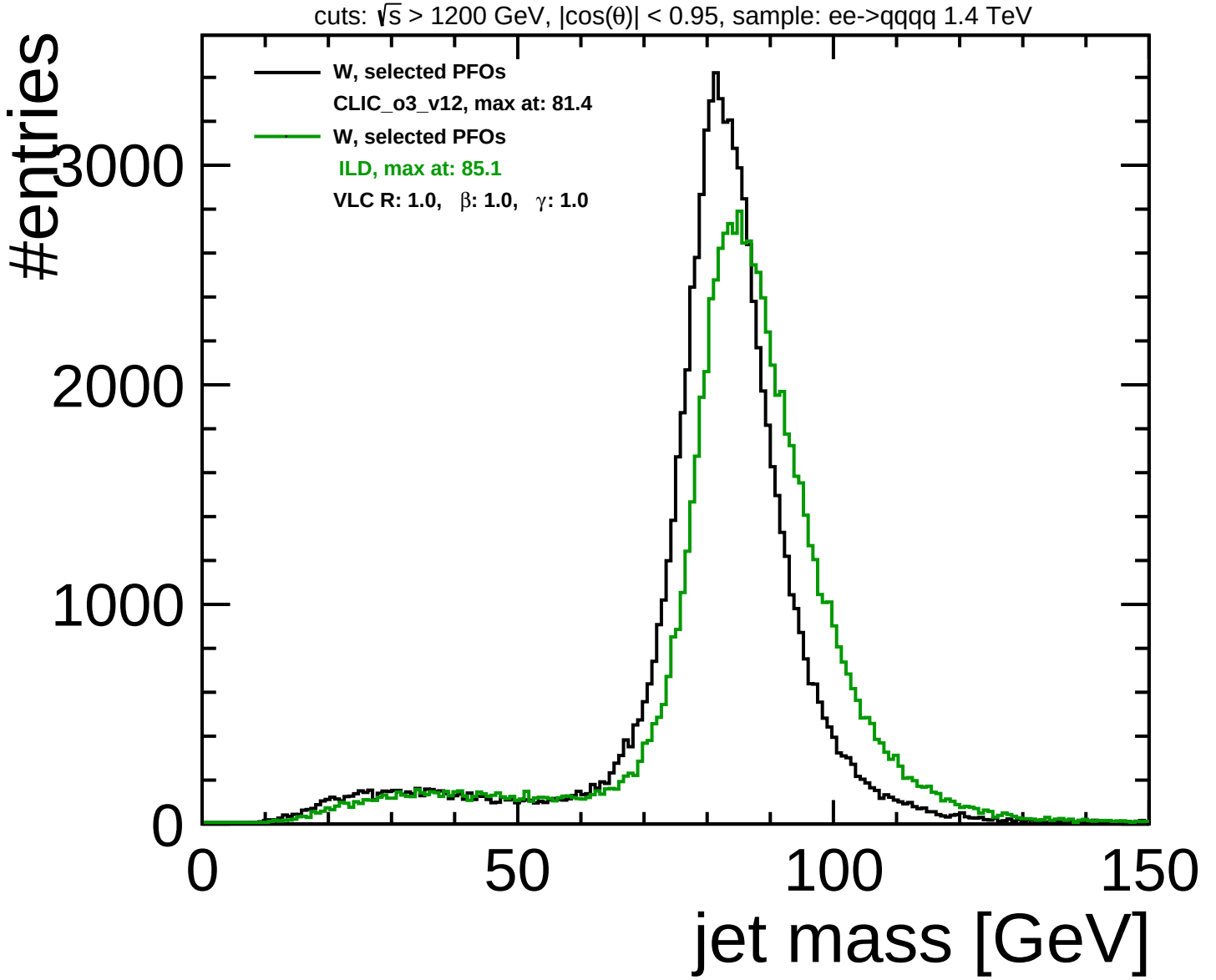

cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, no overlay, all PFOs
max at: 79.9
W, overlay, selected PFOs
max at: 81.4
W, overlay tight selected PFOs
max at: 79.1
VLC R: 0.8, β: 1.0, γ: 1.0
CLIC_o3_v12
#entries
0
1000
2000
3000
4000
0
50
100
150
jet mass [GeV]

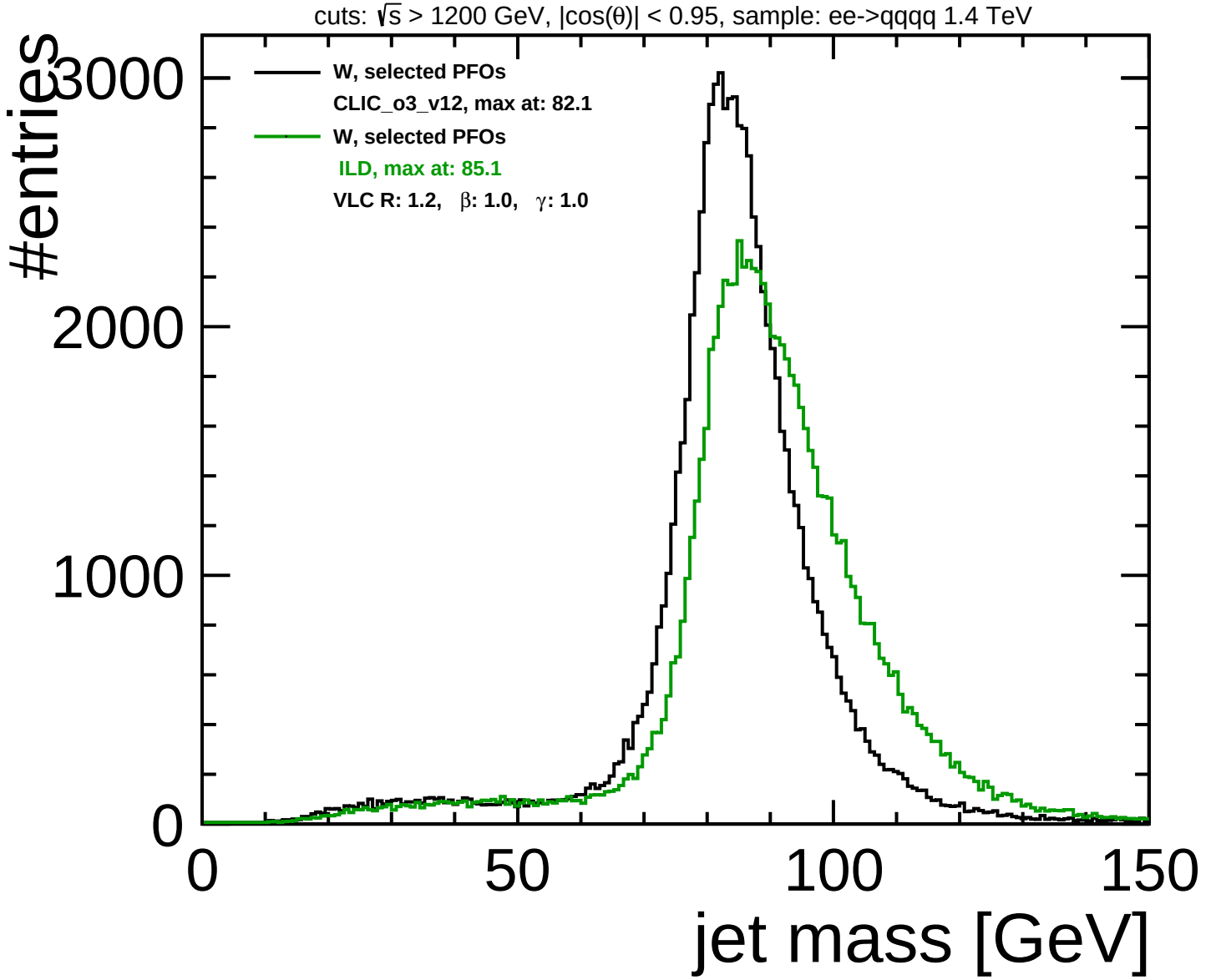

cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, no overlay, all PFOs
max at: 80.6
W, overlay, selected PFOs
max at: 81.4
W, overlay tight selected PFOs
max at: 81.4
VLC R: 1.0, β: 1.0, γ: 1.0
CLIC_o3_v12
#entries
4000
3000
2000
1000
0
0
50
100
150
jet mass [GeV]

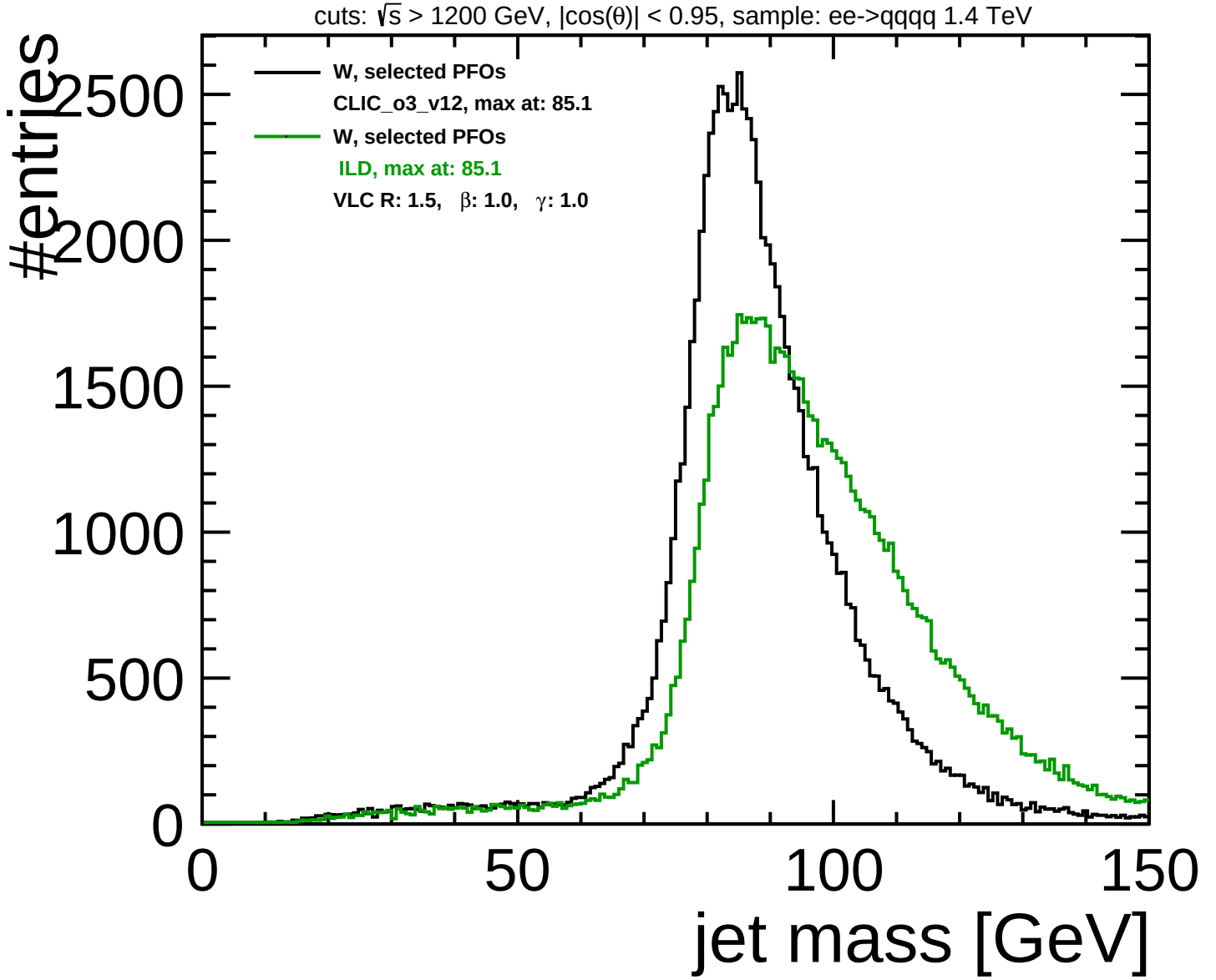

cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
#entries
jet mass [GeV]
W, no overlay, all PFOs
max at: 80.6
W, overlay, selected PFOs
max at: 82.1
W, overlay tight selected PFOs
max at: 81.4
VLC R: 1.2, β: 1.0, γ: 1.0
CLIC_o3_v12
0
1000
2000
3000
4000
0
50
100
150

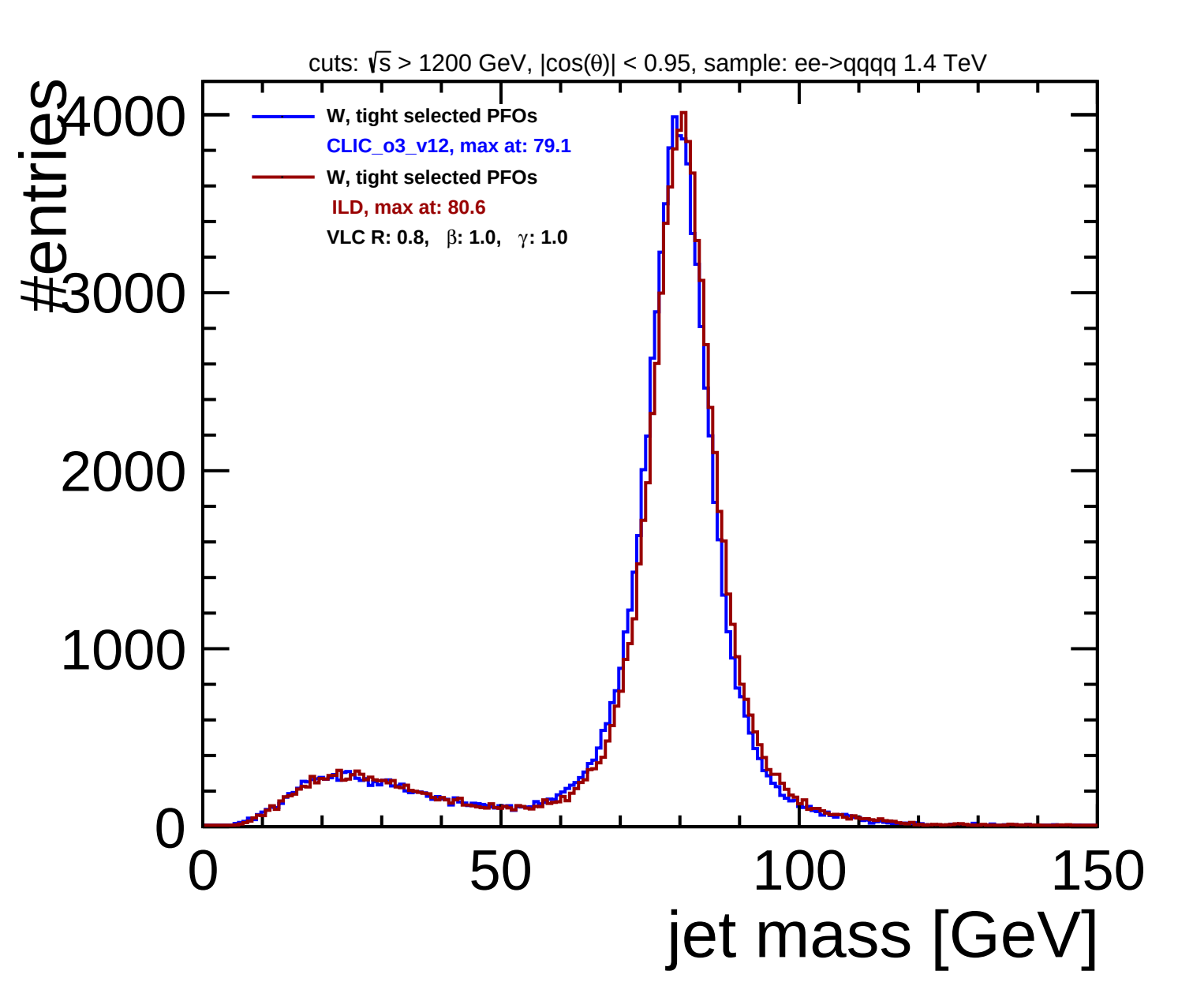

cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, no overlay, all PFOs
max at: 80.6
W, overlay, selected PFOs
max at: 85.1
W, overlay tight selected PFOs
max at: 81.4
VLC R: 1.5, β: 1.0, γ: 1.0
CLIC_o3_v12
#entries
0
1000
2000
3000
4000
0
50
100
150
jet mass [GeV]

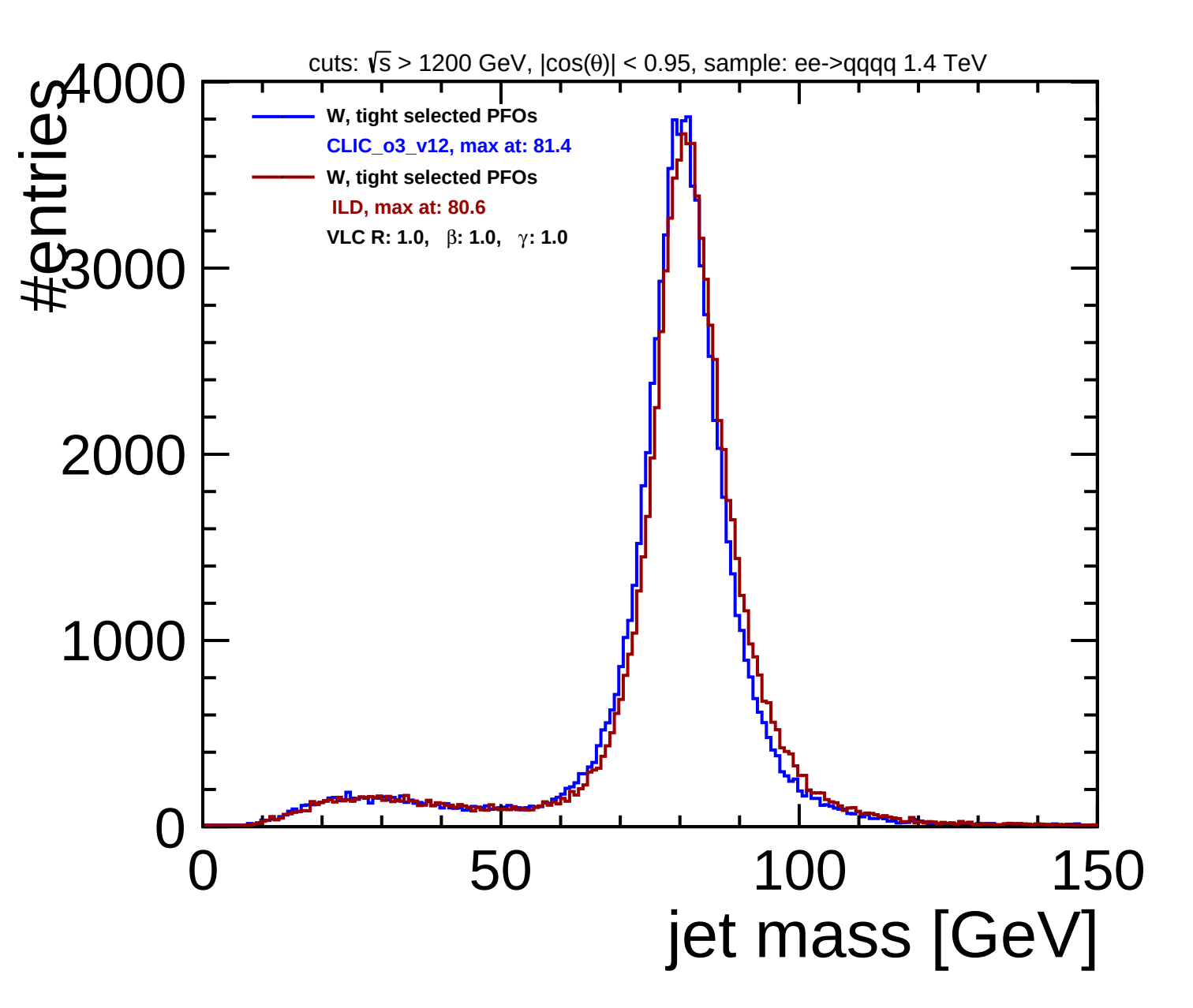

cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, selected PFOs
CLIC_o3_v12, max at: 81.4
W, selected PFOs
ILD, max at: 82.9
VLC R: 0.8, β: 1.0, γ: 1.0
#entries
3000
2000
1000
0
0
50
100
150
jet mass [GeV]

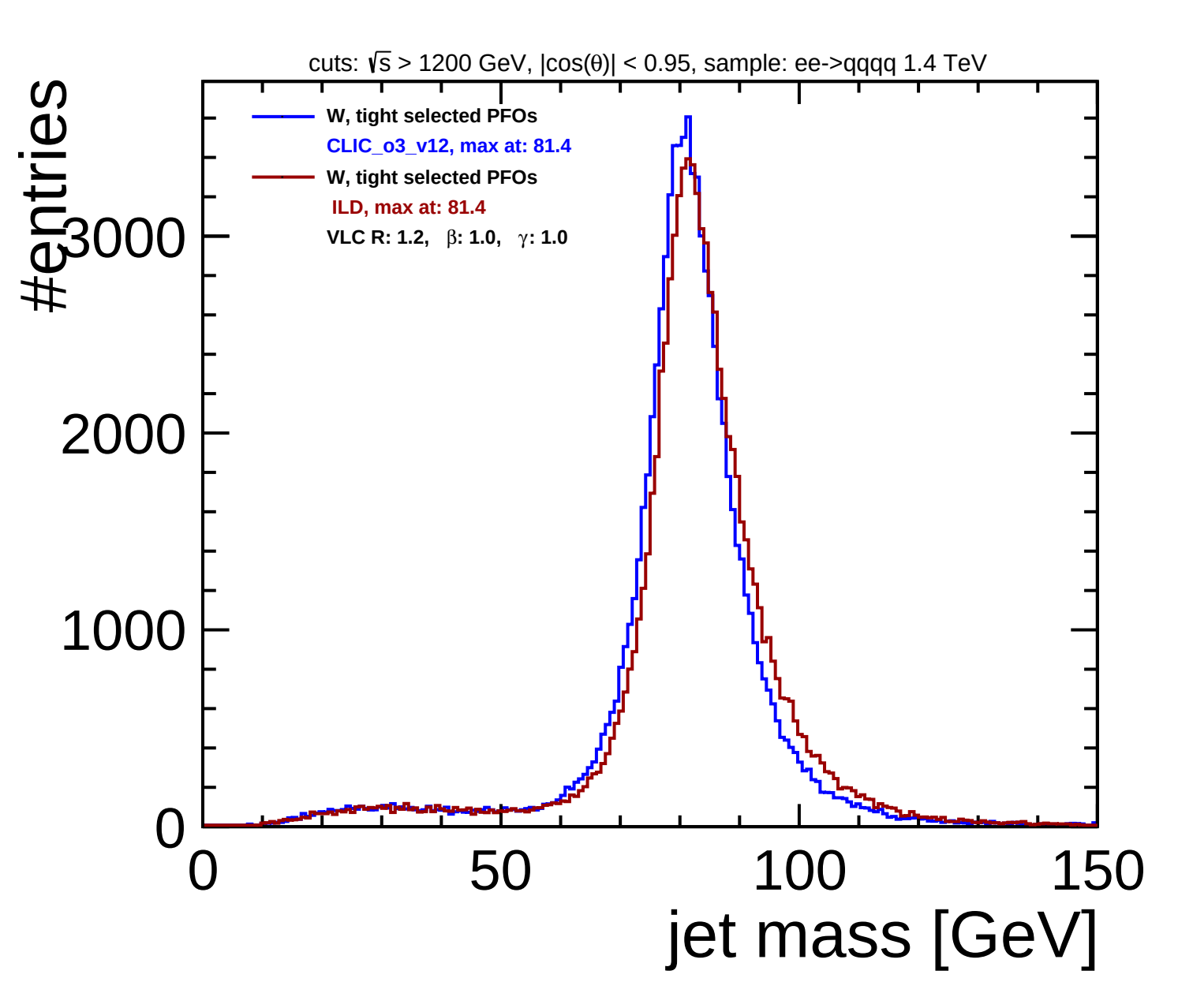

cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, selected PFOs
CLIC_o3_v12, max at: 81.4
W, selected PFOs
ILD, max at: 85.1
VLC R: 1.0, β: 1.0, γ: 1.0
#entries
3000
2000
1000
0
0
50
100
150
jet mass [GeV]

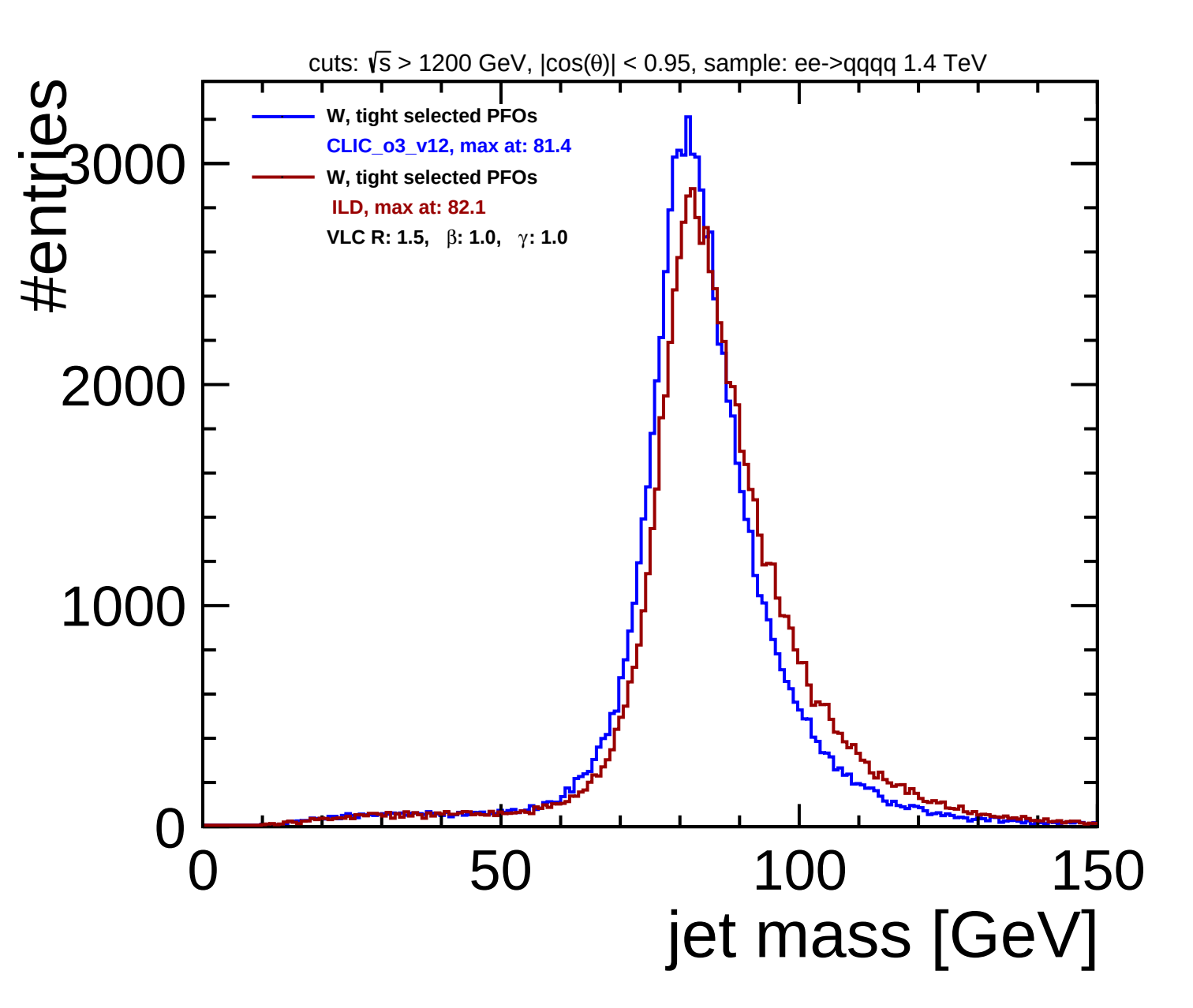

cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
#entries
3000
2000
1000
0
0
50
100
150
jet mass [GeV]
W, selected PFOs
CLIC_o3_v12, max at: 82.1
W, selected PFOs
ILD, max at: 85.1
VLC R: 1.2, β: 1.0, γ: 1.0

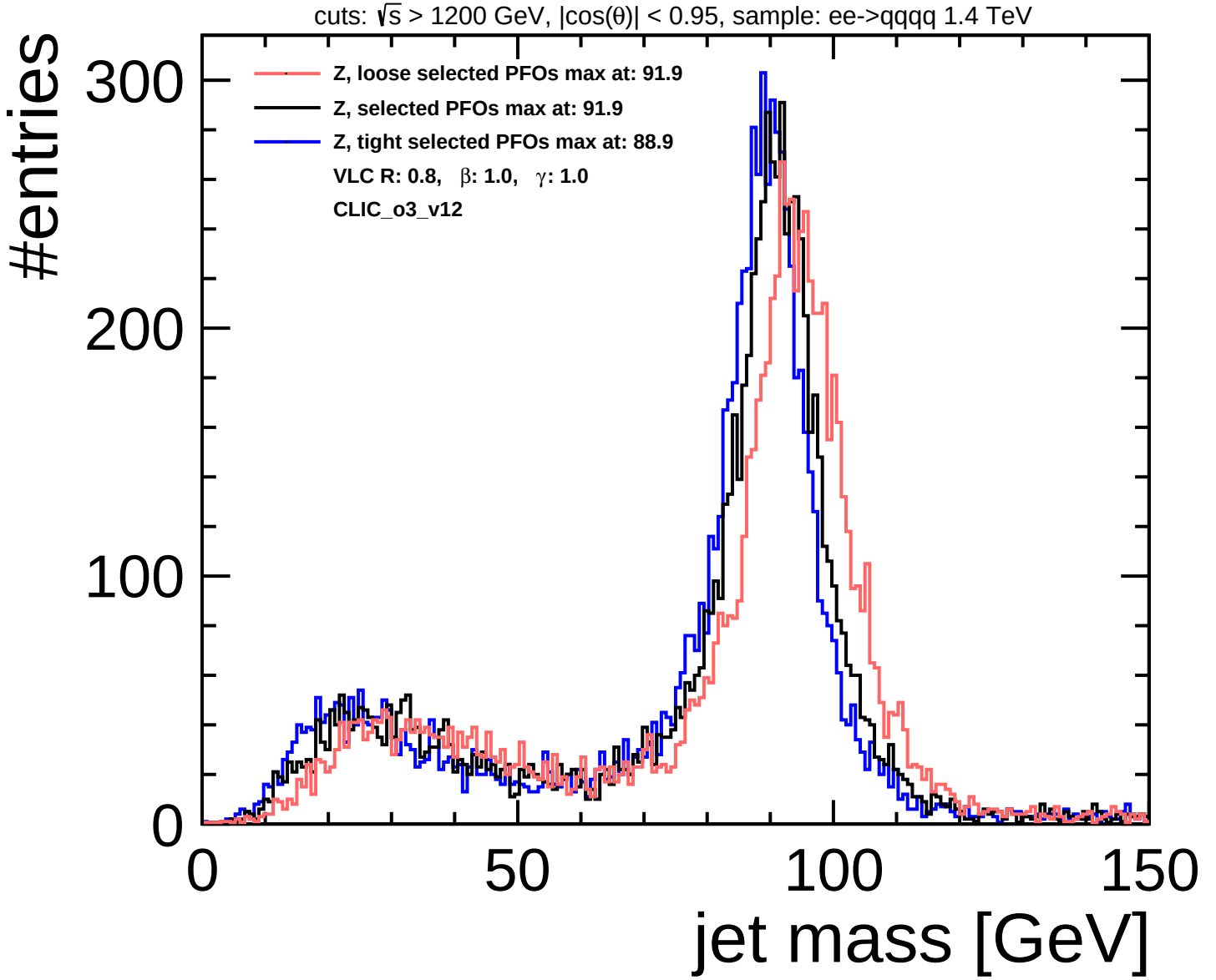

cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, selected PFOs
CLIC_o3_v12, max at: 85.1
W, selected PFOs
ILD, max at: 85.1
VLC R: 1.5, β: 1.0, γ: 1.0
#entries
2500
2000
1500
1000
500
0
0
50
100
150
jet mass [GeV]

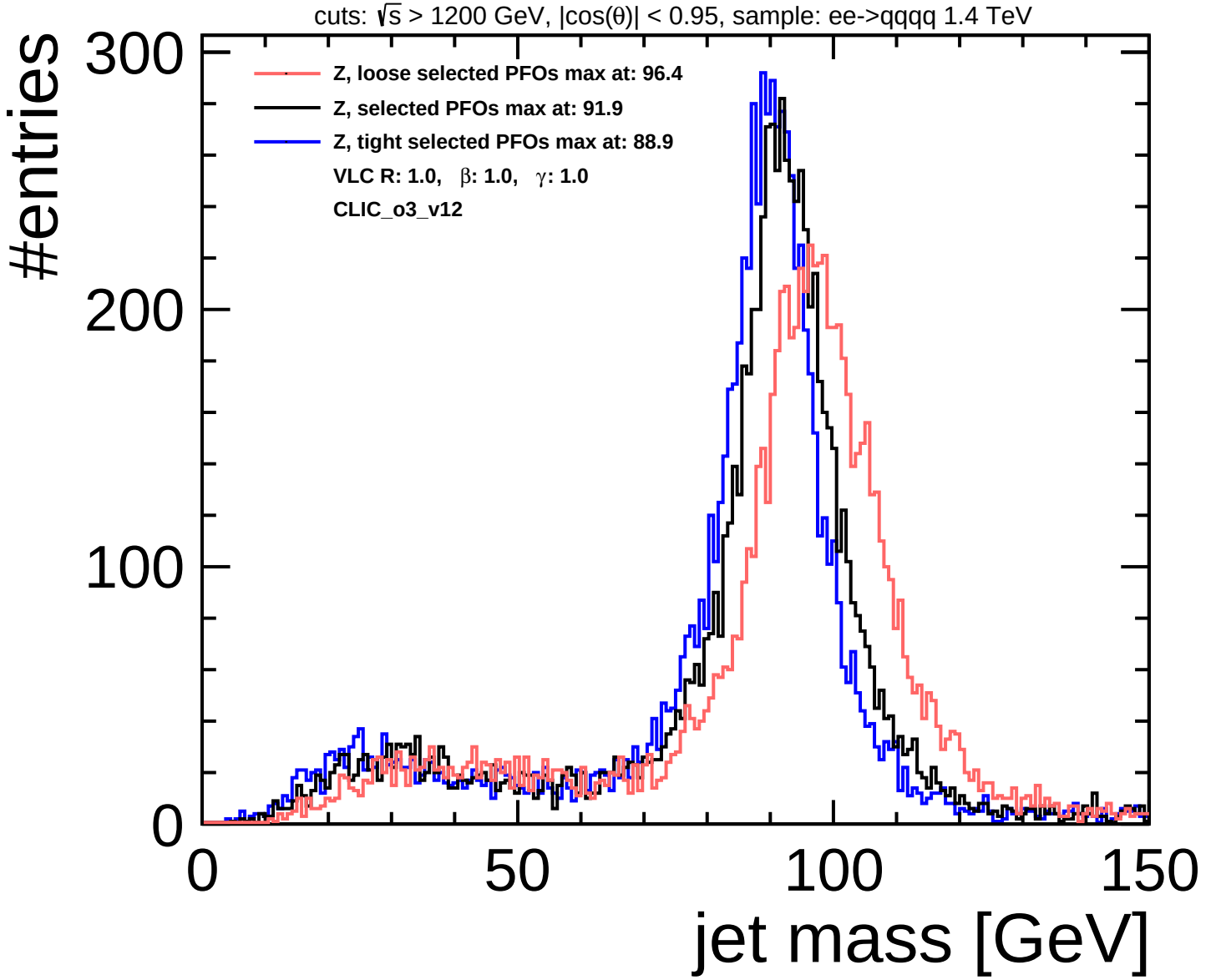

cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, tight selected PFOs
CLIC_o3_v12, max at: 79.1
W, tight selected PFOs
ILD, max at: 80.6
VLC R: 0.8, β: 1.0, γ: 1.0
#entries
4000
3000
2000
1000
0
0
50
100
150
jet mass [GeV]


cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, tight selected PFOs
CLIC_o3_v12, max at: 81.4
W, tight selected PFOs
ILD, max at: 80.6
VLC R: 1.0, β: 1.0, γ: 1.0
#entries
jet mass [GeV]
0
1000
2000
3000
4000
0
50
100
150


cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, tight selected PFOs
CLIC_o3_v12, max at: 81.4
W, tight selected PFOs
ILD, max at: 81.4
VLC R: 1.2, β: 1.0, γ: 1.0
#entries
3000
2000
1000
0
0
50
100
150
jet mass [GeV]


cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
W, tight selected PFOs
CLIC_o3_v12, max at: 81.4
W, tight selected PFOs
ILD, max at: 82.1
VLC R: 1.5, β: 1.0, γ: 1.0
#entries
3000
2000
1000
0
0
50
100
150
jet mass [GeV]


cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
Z, loose selected PFOs max at: 91.9
Z, selected PFOs max at: 91.9
Z, tight selected PFOs max at: 88.9
VLC R: 0.8, β: 1.0, γ: 1.0
CLIC_o3_v12
#entries
0
100
200
300
0
50
100
150
jet mass [GeV]


cuts: √s > 1200 GeV, |cos(θ)| < 0.95, sample: ee->qqqq 1.4 TeV
Z, loose selected PFOs max at: 96.4
Z, selected PFOs max at: 91.9
Z, tight selected PFOs max at: 88.9
VLC R: 1.0, β: 1.0, γ: 1.0
CLIC_o3_v12
#entries
jet mass [GeV]
0
100
200
300
0
50
100
150