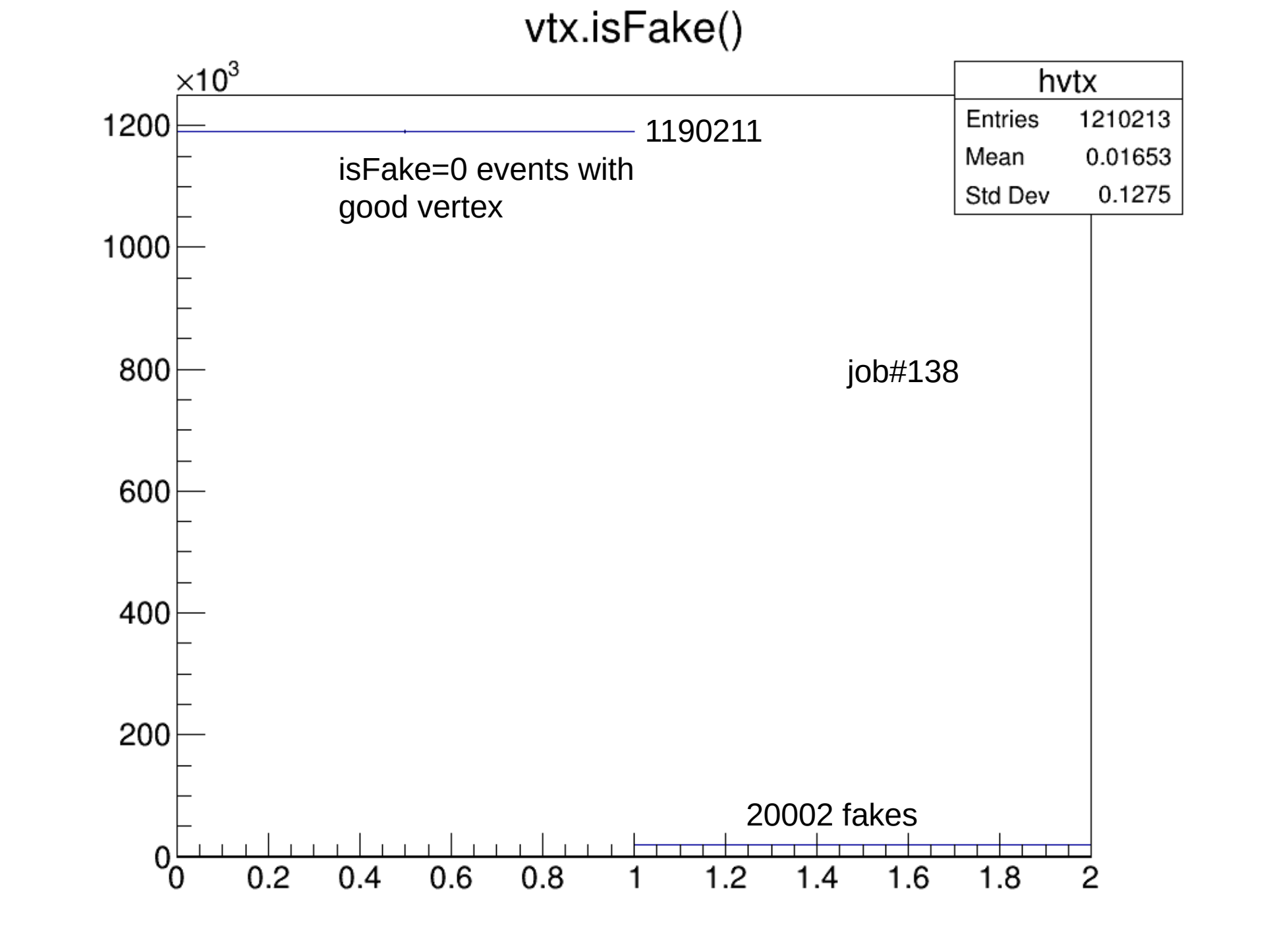
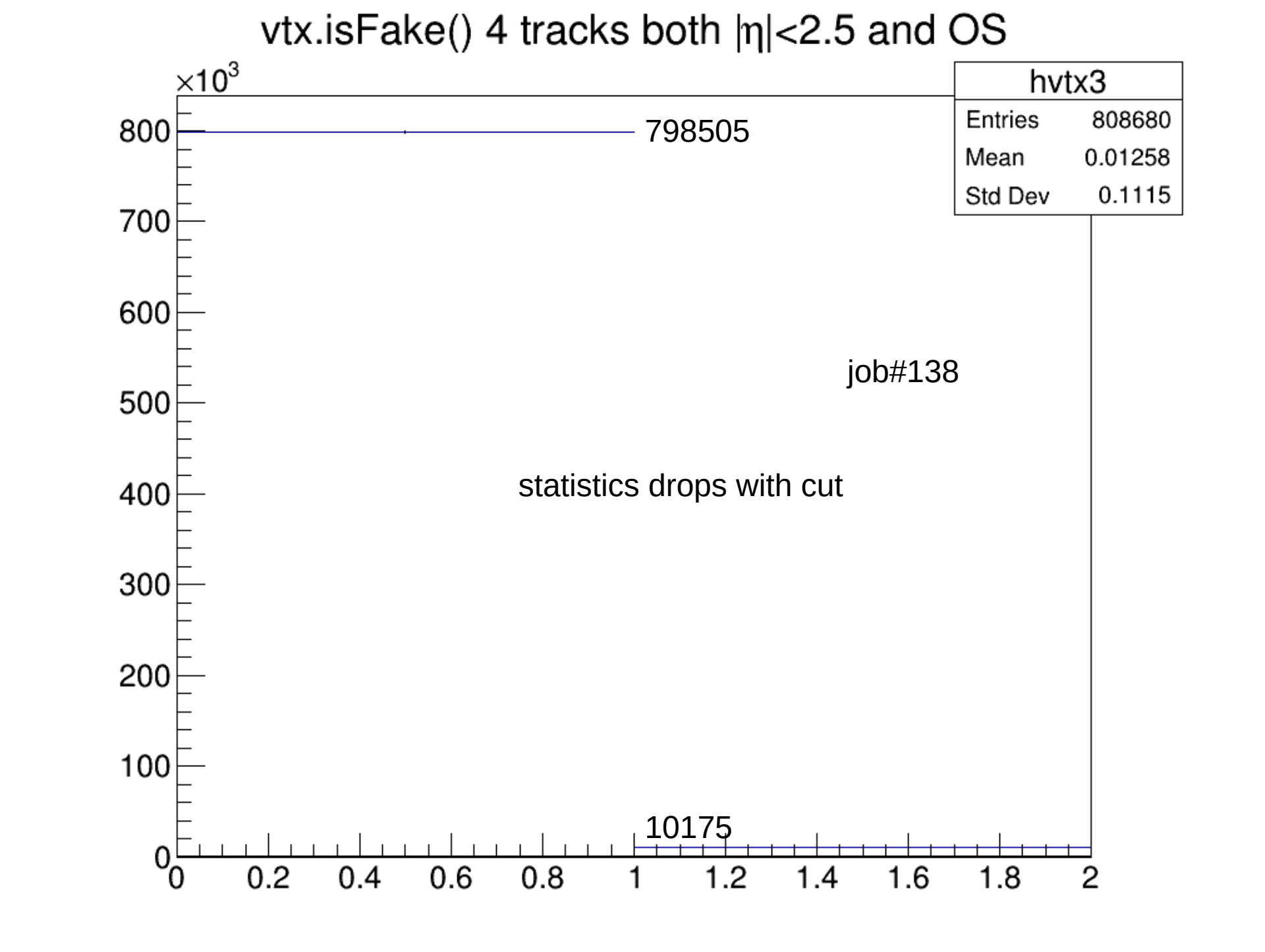
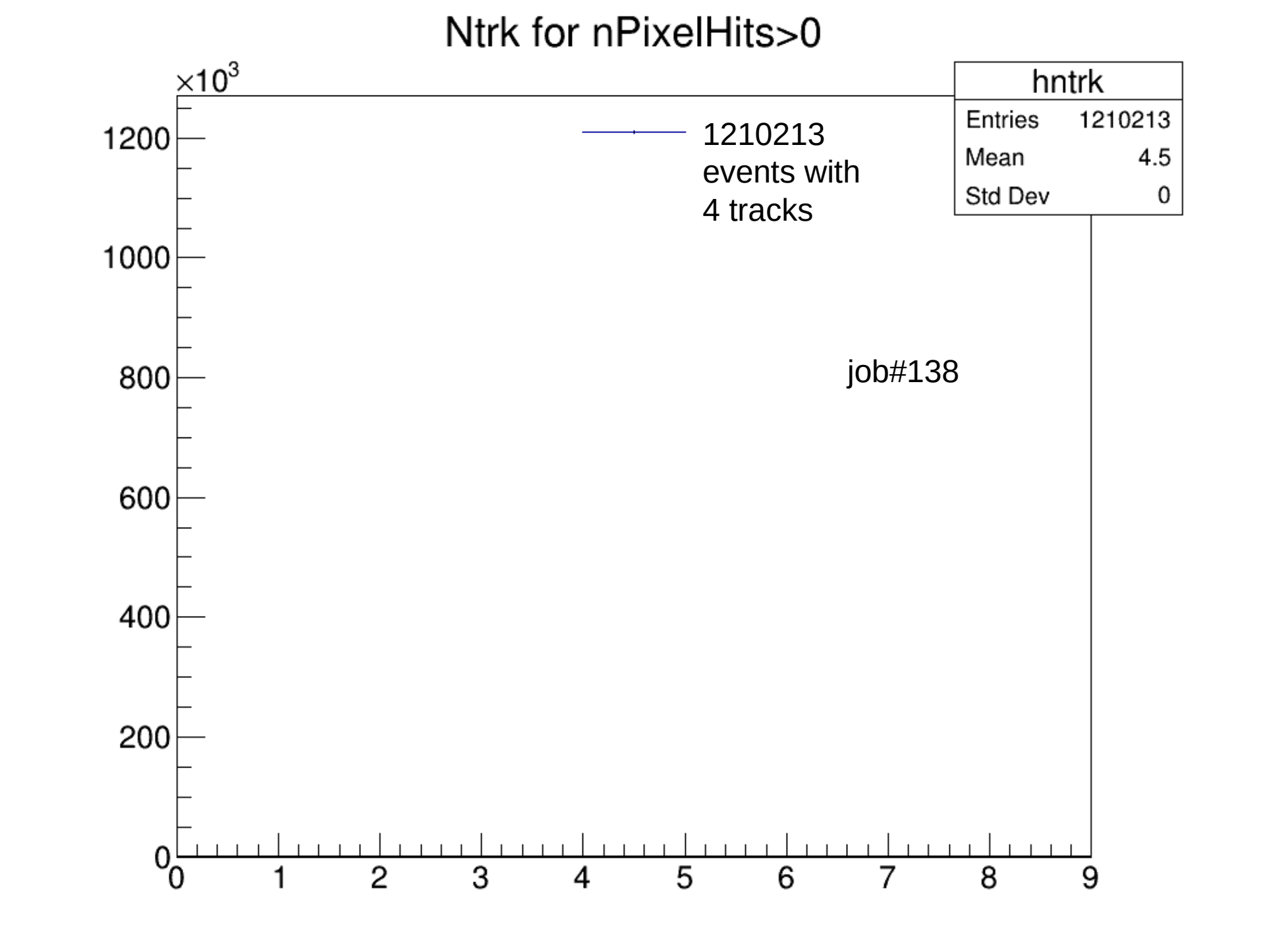
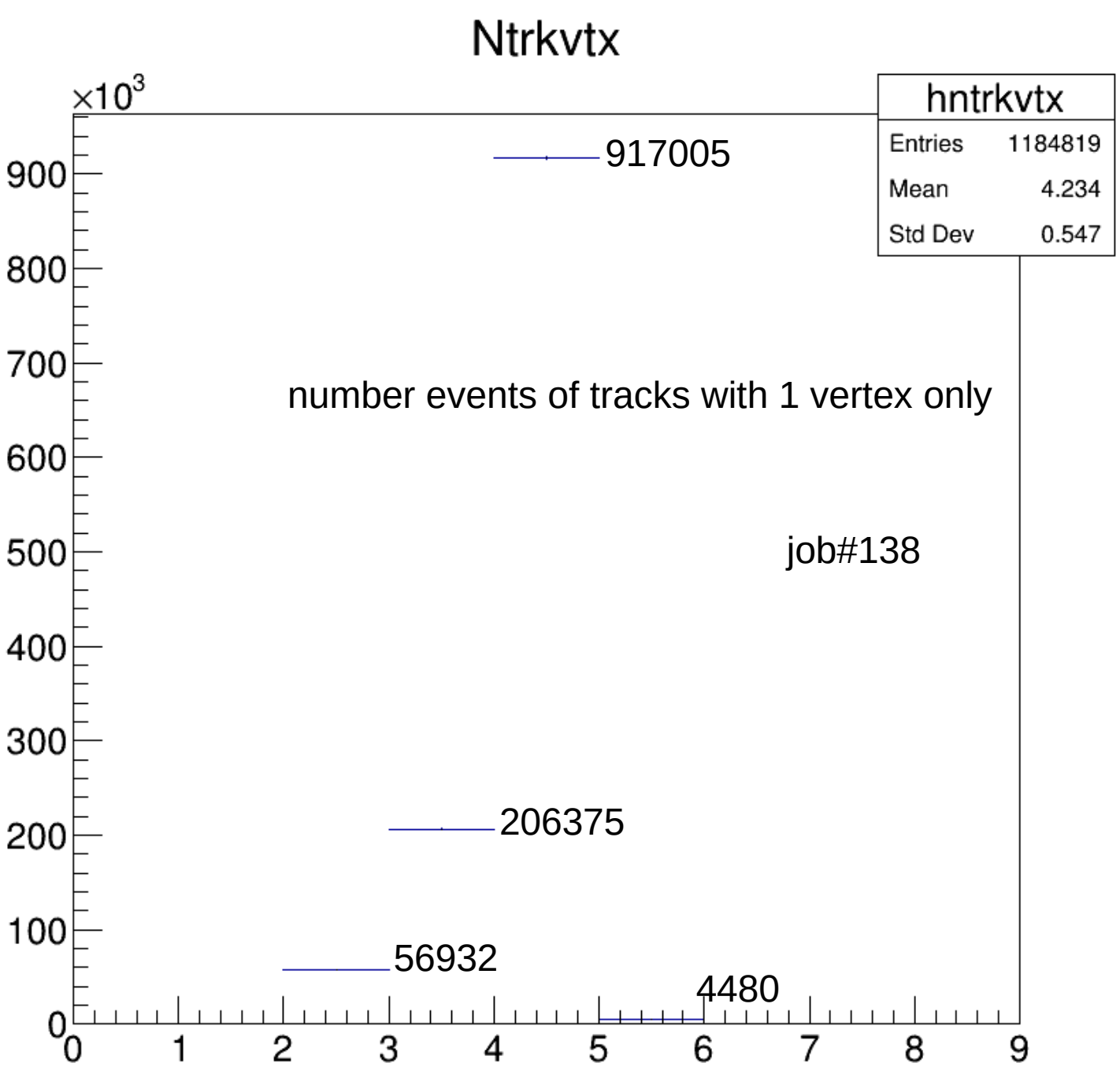
conditions:

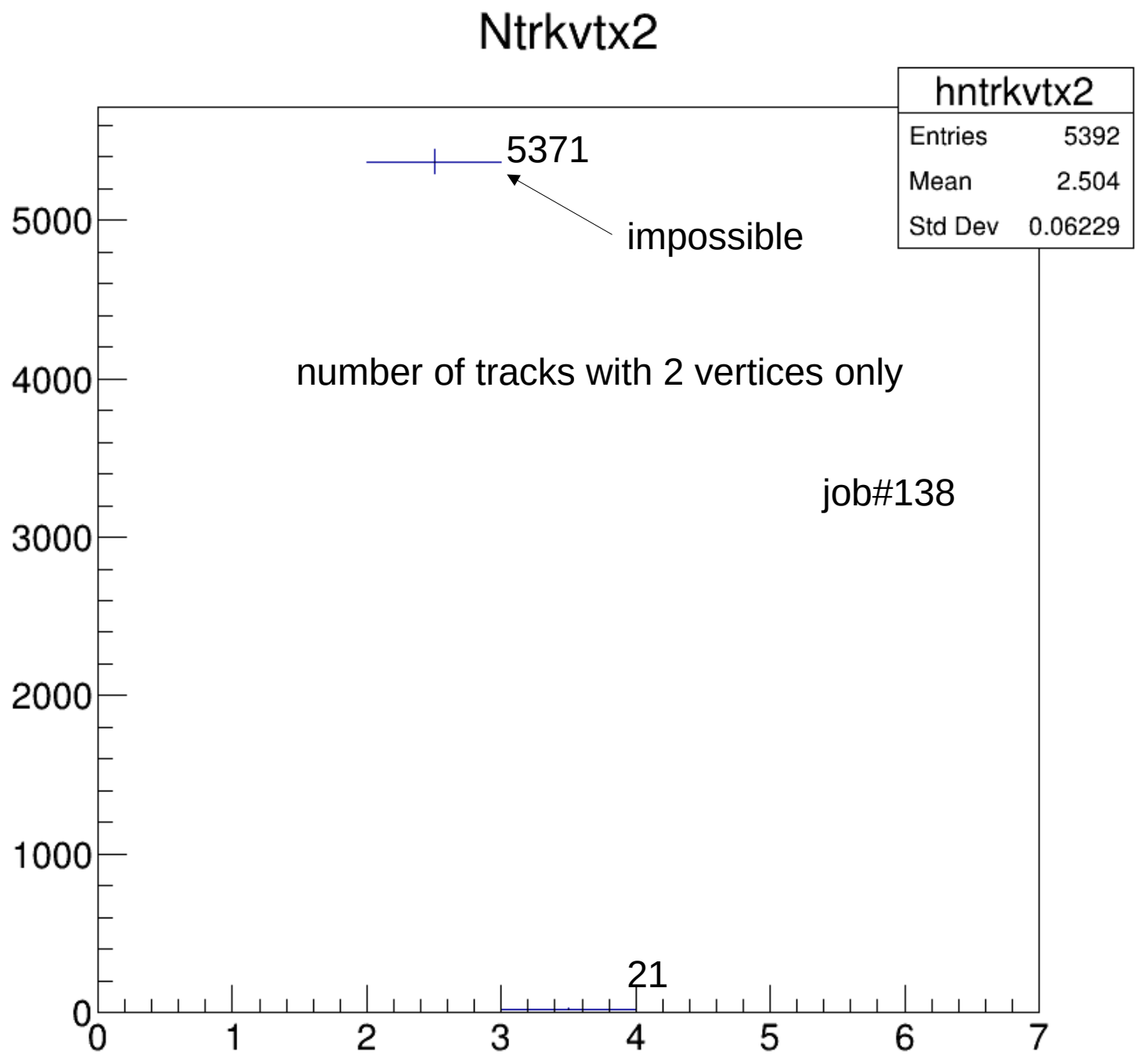
1. pTcut=0.0
2. no CTpycut
3. no CTpxcut
4. PID yes
5. total charge = 0
6. charge of the pion-pairs = 0
7. fiducial yes

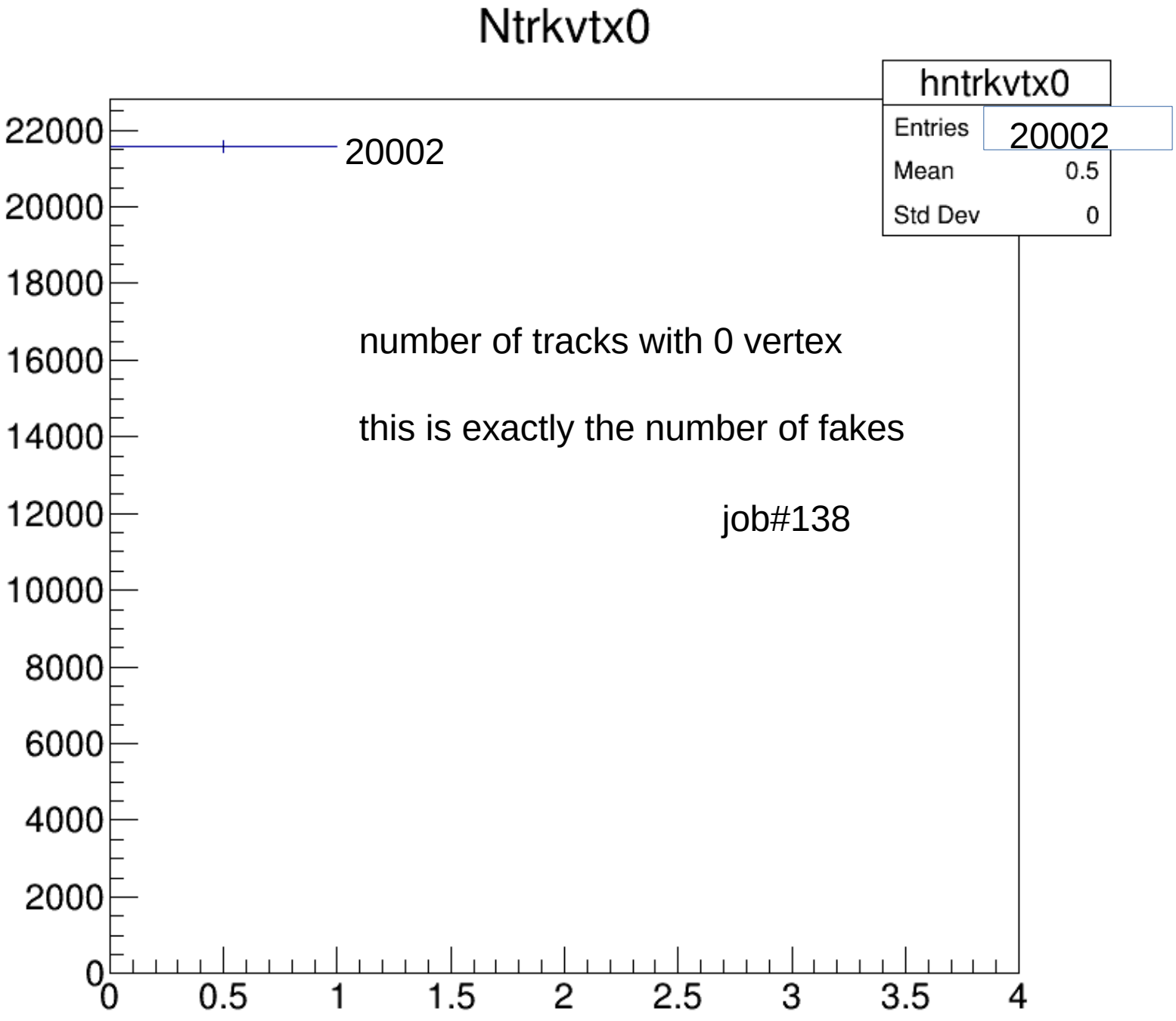

vtx.isFake()
×10^3
1200
1000
800
600
400
200
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
hvtx
Entries 1210213
Mean 0.01653
Std Dev 0.1275
1190211
isFake=0 events with
good vertex
job#138
20002 fakes

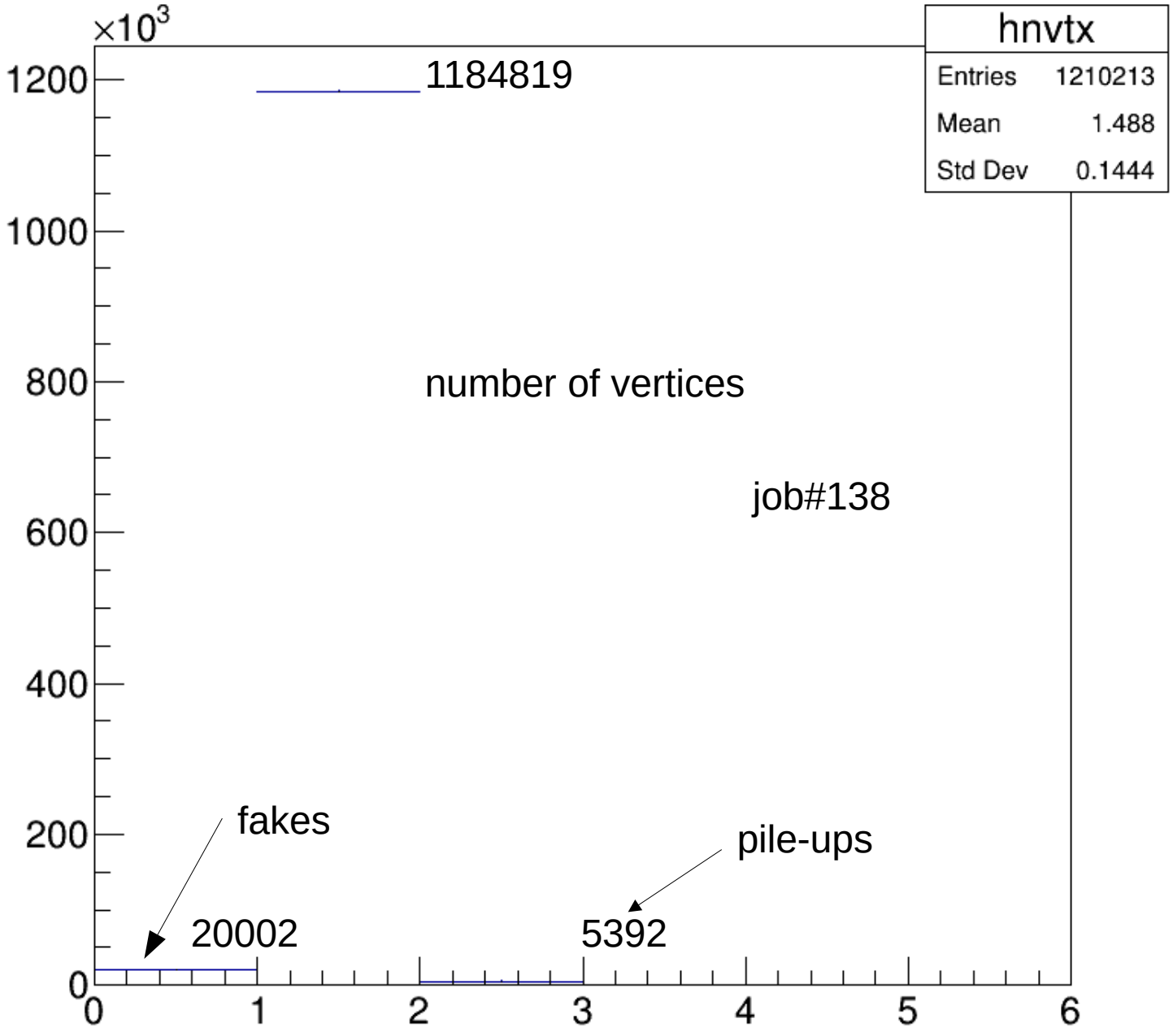

vtx.isFake() 4 tracks both |η|<2.5 and OS
×10^3
800
700
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
hvtx3
Entries 808680
Mean 0.01258
Std Dev 0.1115
798505
10175
job#138
statistics drops with cut

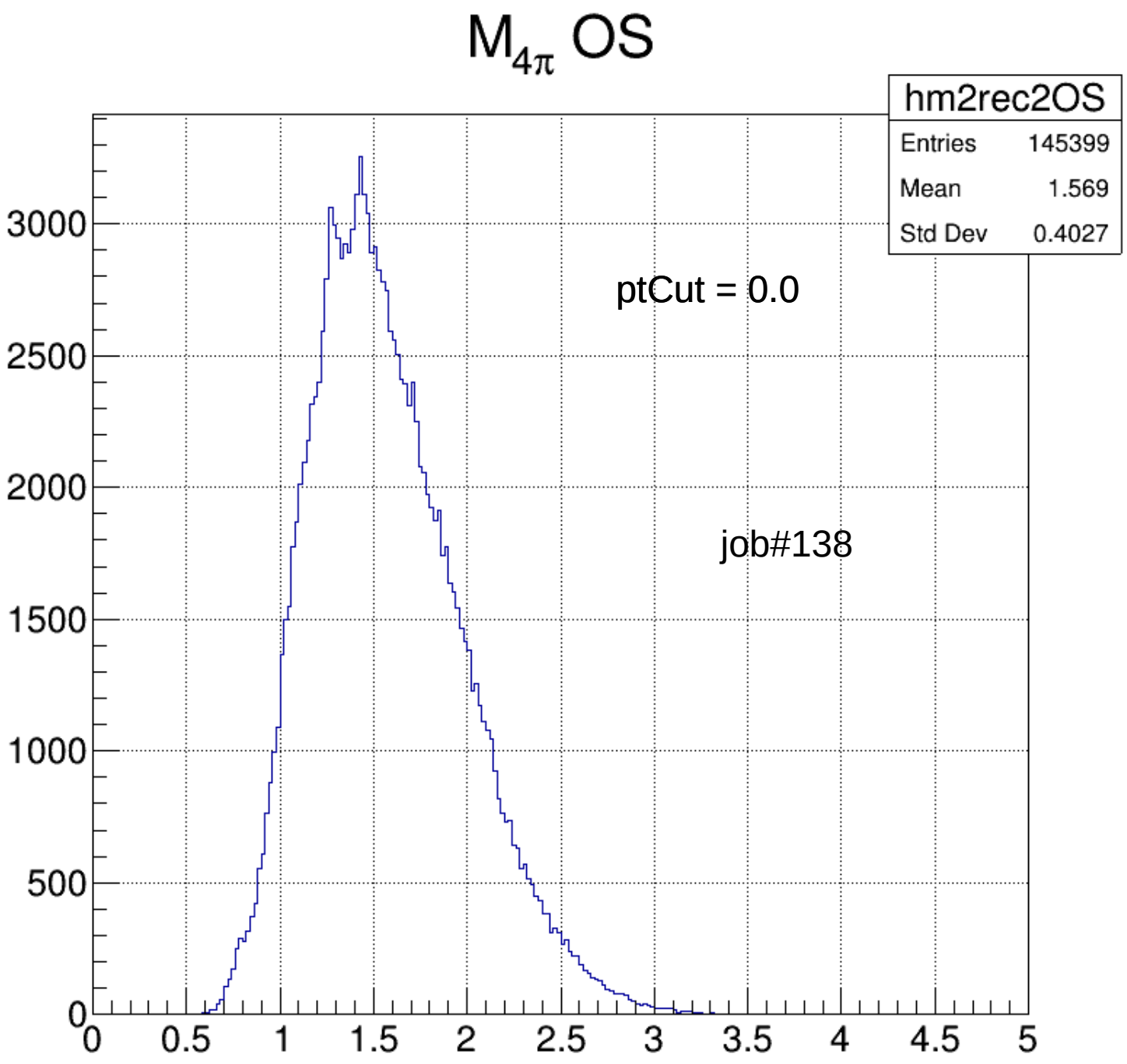

Ntrk for nPixelHits>0
×10^3
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
hntrk
Entries 1210213
Mean 4.5
Std Dev 0
1210213
events with
4 tracks
job#138

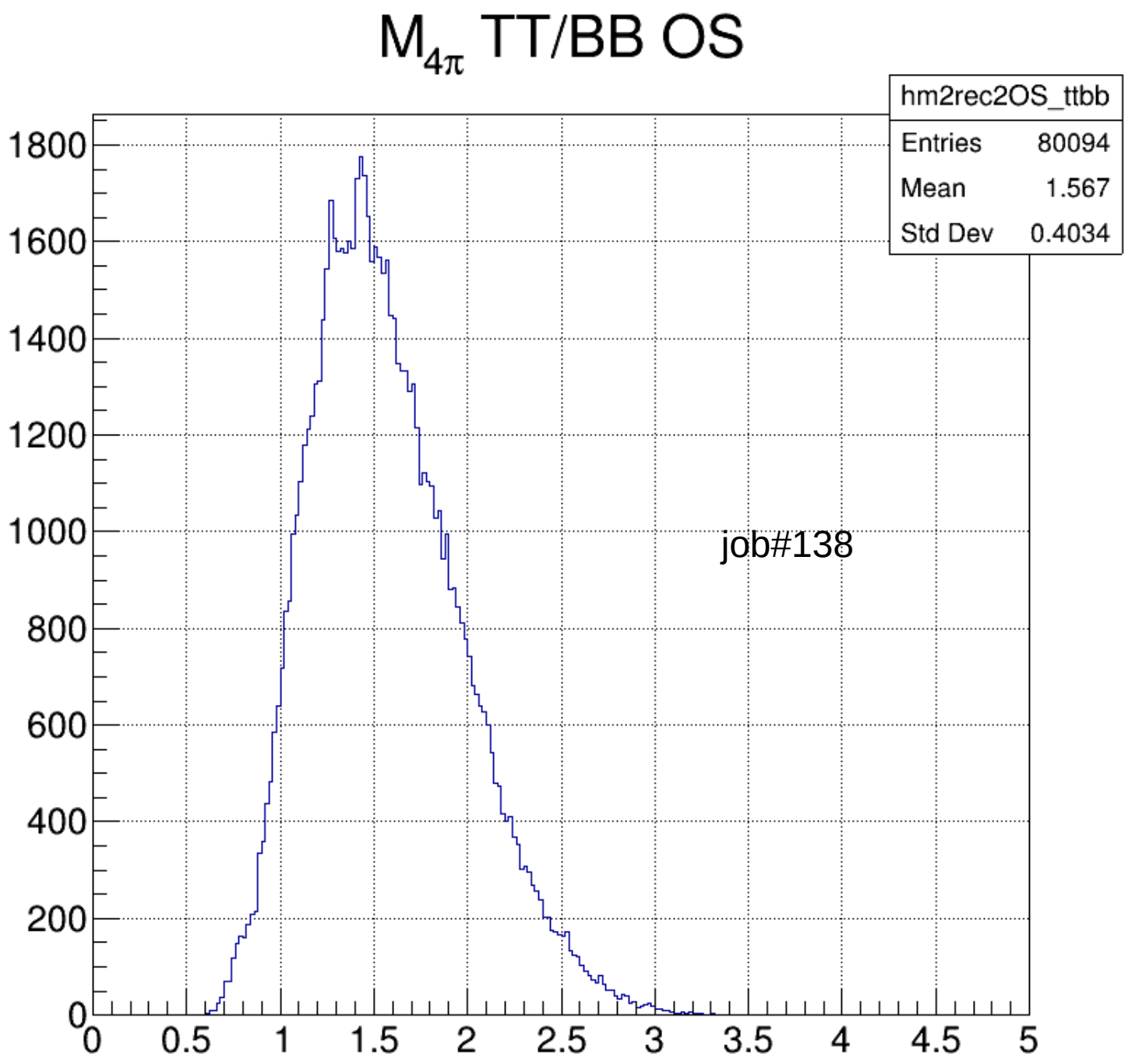

Ntrkvtx
hntrkvtx
Entries 1184819
Mean 4.234
Std Dev 0.547
×10^3
900
800
700
600
500
400
300
200
100
0
0 1 2 3 4 5 6 7 8 9
917005
number events of tracks with 1 vertex only
job#138
206375
56932
4480

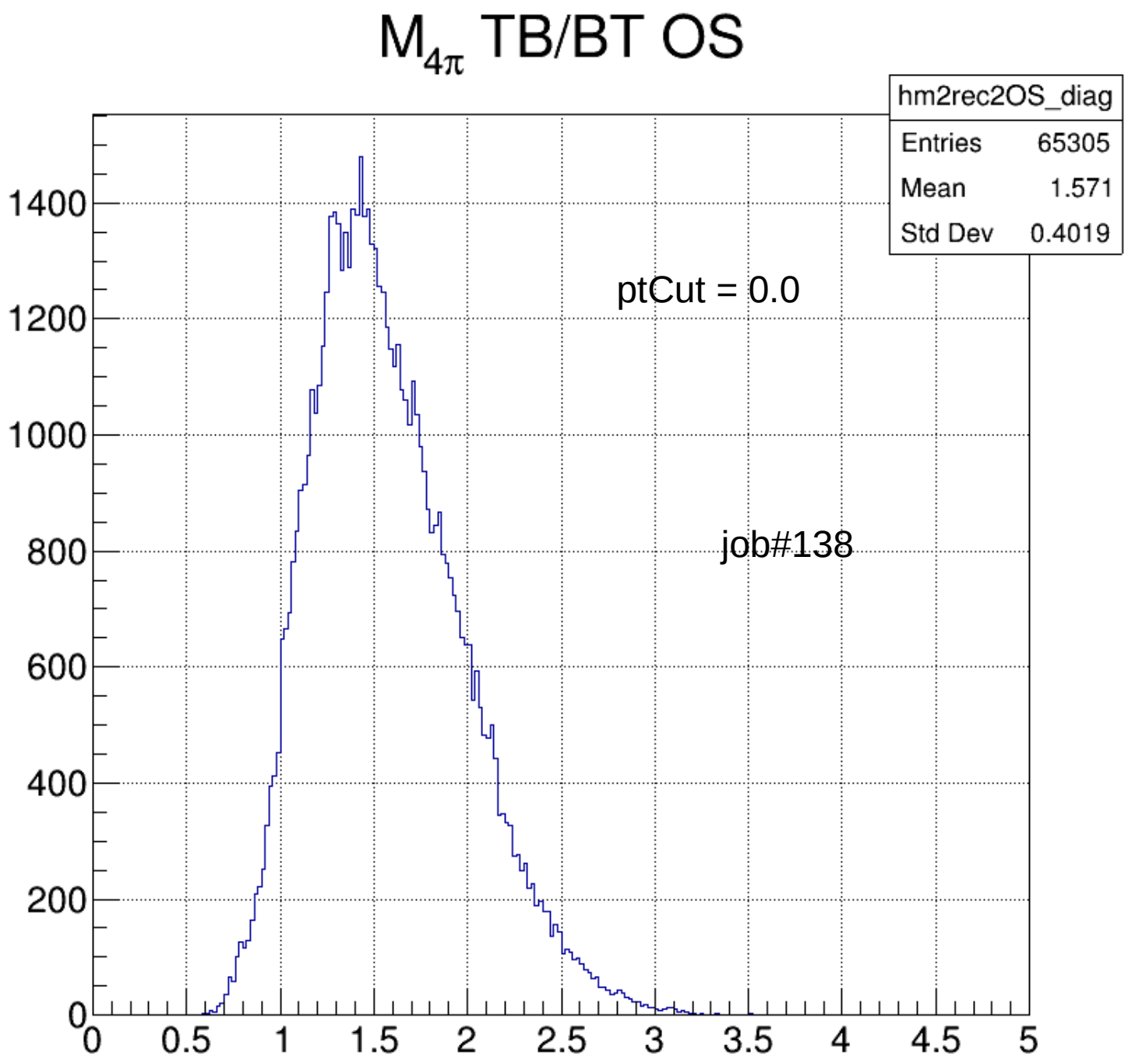

Ntrkvtx2
hntrkvtx2
Entries 5392
Mean 2.504
Std Dev 0.06229
5371
impossible
number of tracks with 2 vertices only
job#138
21
5000
4000
3000
2000
1000
0
0
1
2
3
4
5
6
7

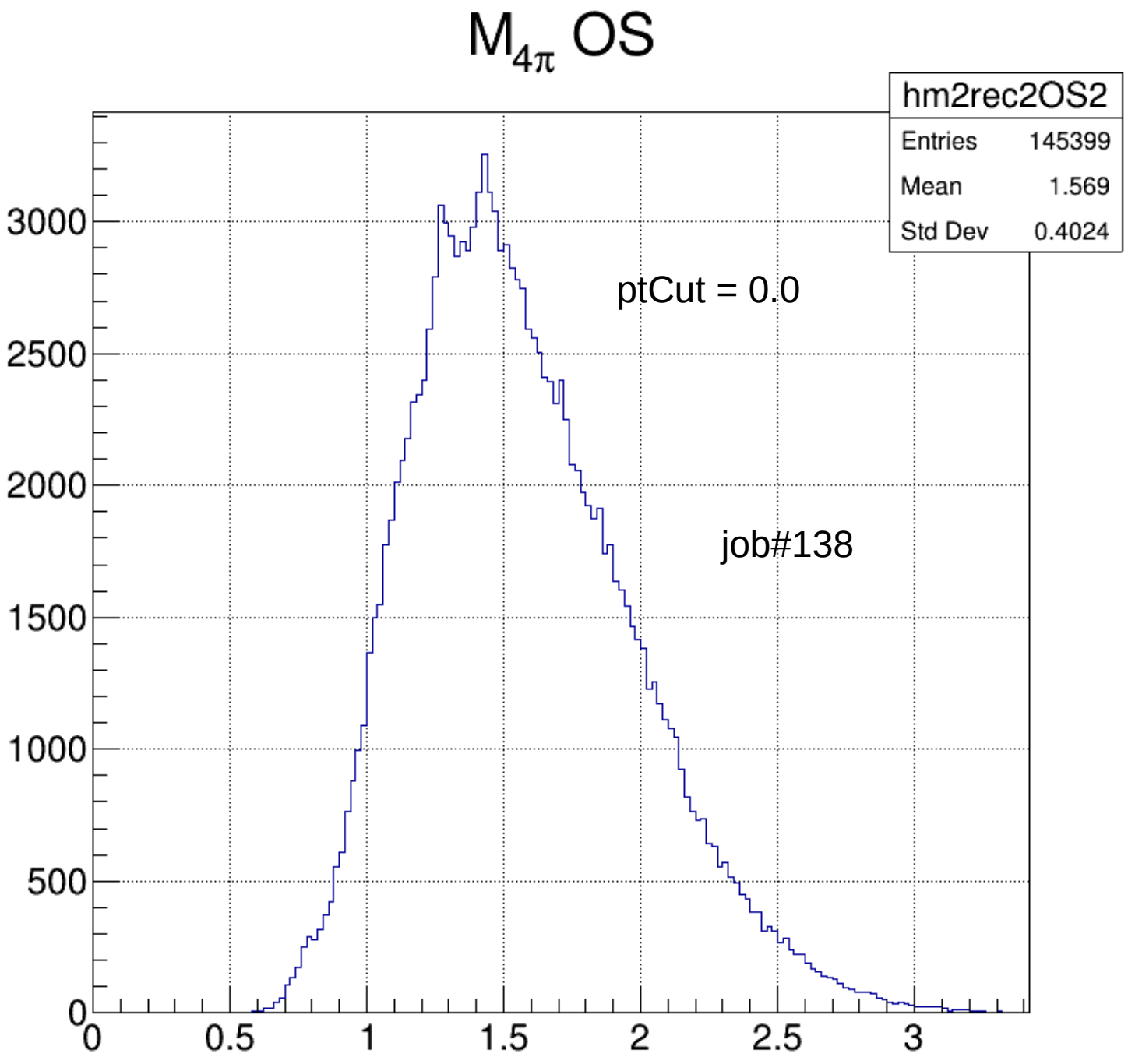

Ntrkvtx0
hntrkvtx0
Entries 20002
Mean 0.5
Std Dev 0
20002
number of tracks with 0 vertex
this is exactly the number of fakes
job#138
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0 0.5 1 1.5 2 2.5 3 3.5 4

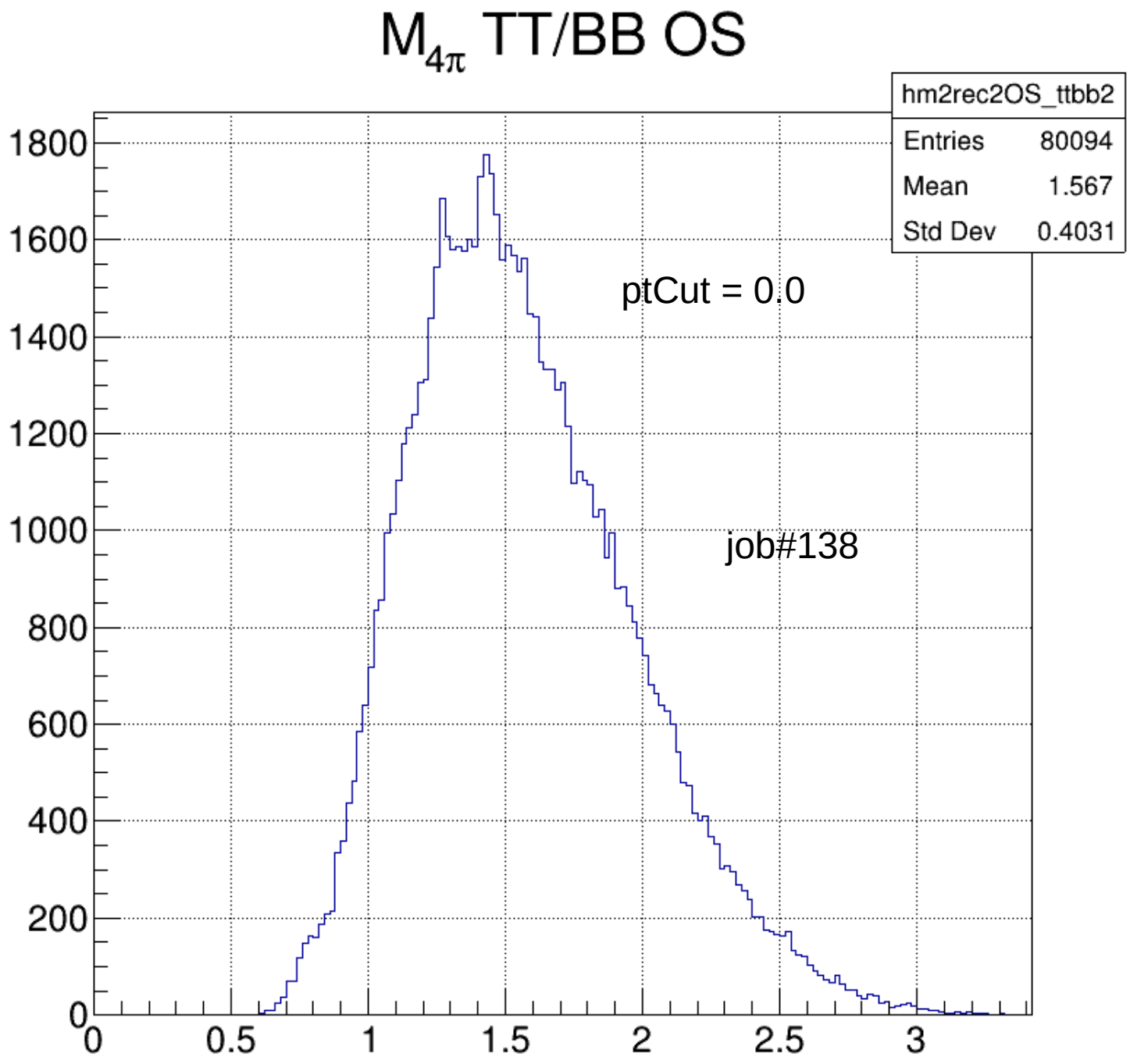

Nvtx
×10^3
hnvtx
Entries 1210213
Mean 1.488
Std Dev 0.1444
1184819
number of vertices
job#138
fakes
20002
pile-ups
5392
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6

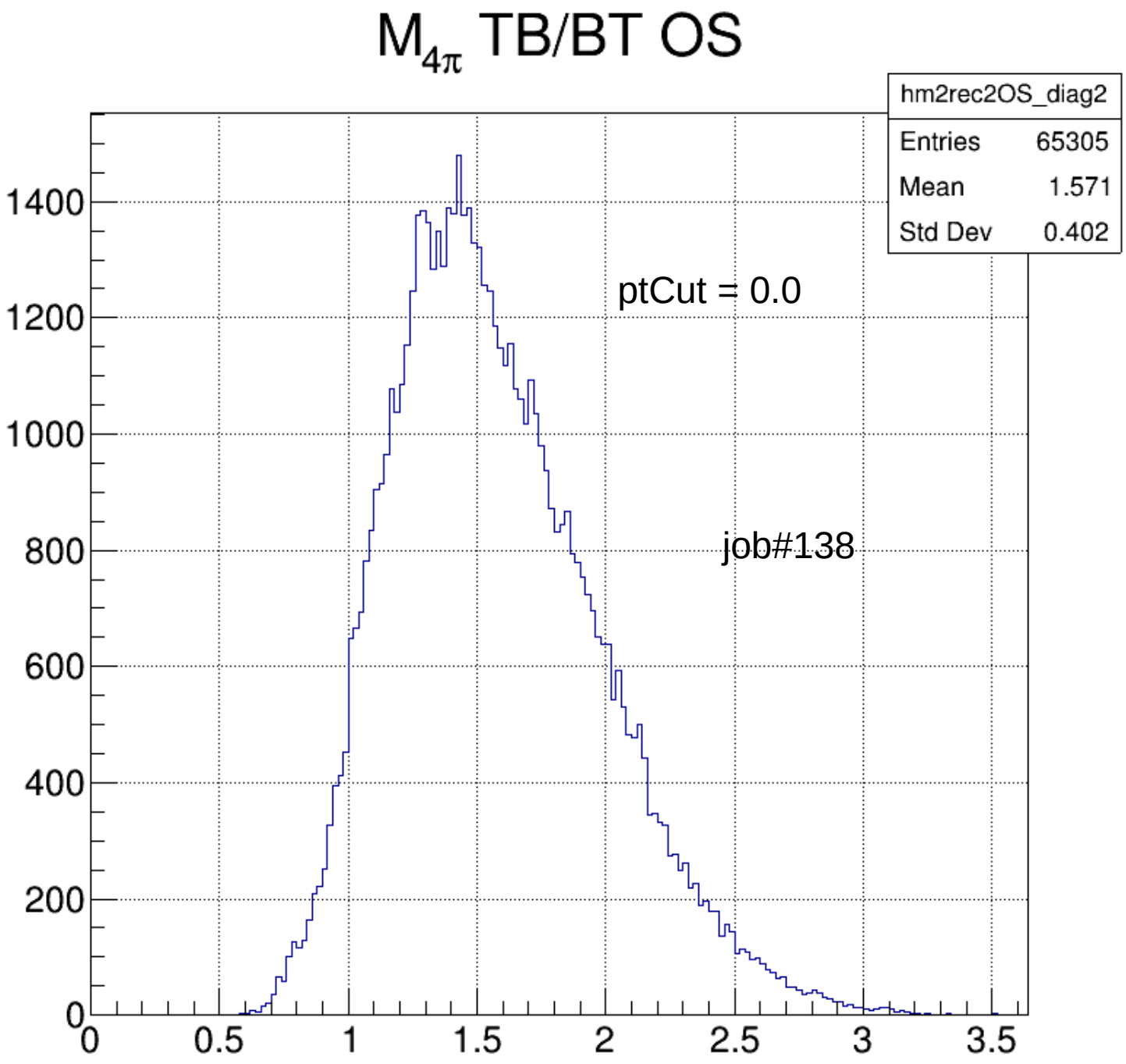

$M_{4\pi}$ OS
hm2rec2OS
Entries 145399
Mean 1.569
Std Dev 0.4027
ptCut = 0.0
job#138
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

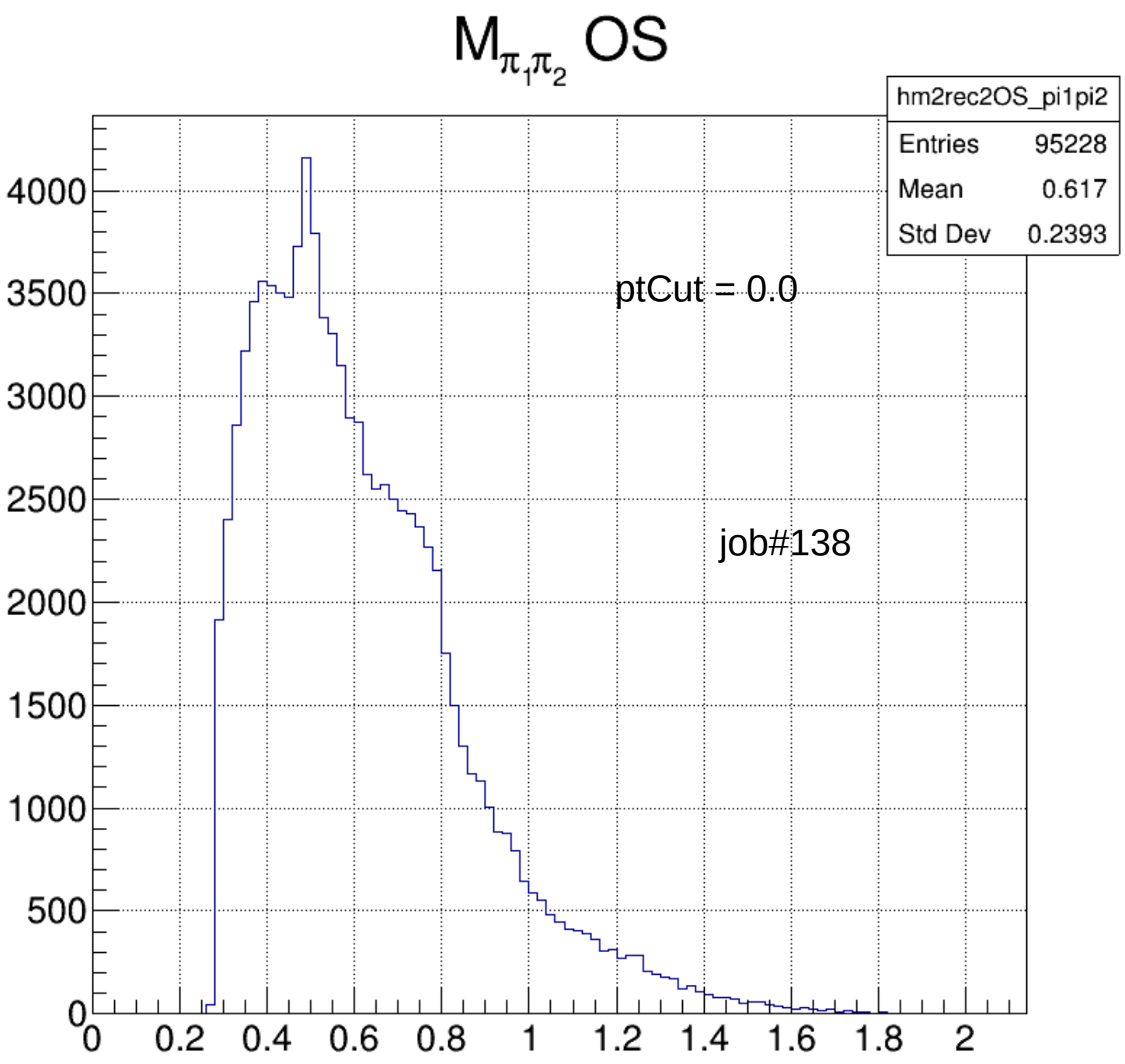

$M_{4\pi}$ TT/BB OS
hm2rec2OS_ttbb
Entries 80094
Mean 1.567
Std Dev 0.4034
job#138
1800
1600
1400
1200
1000
800
600
400
200
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

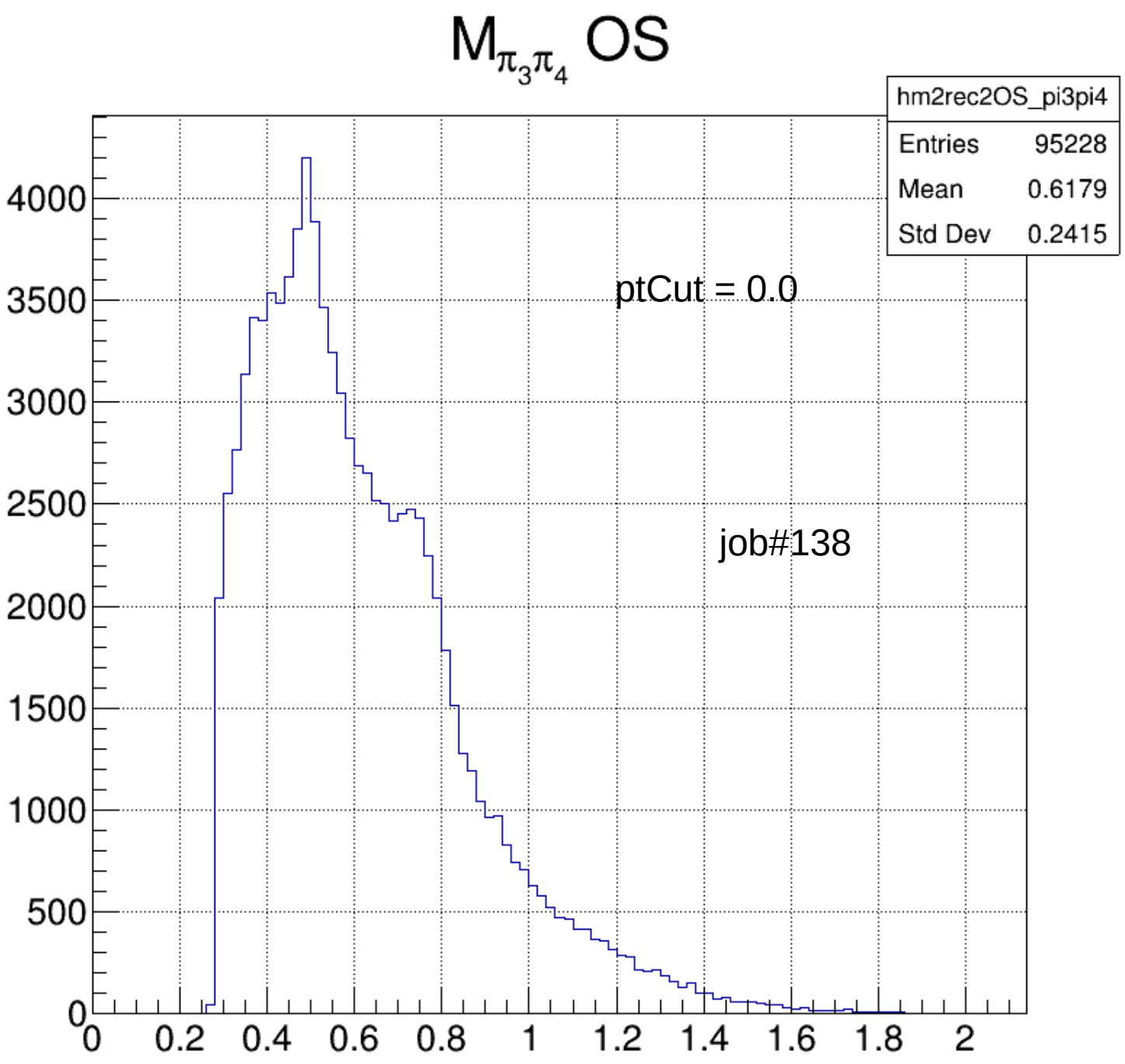

$M_{4\pi}$ TB/BT OS
hm2rec2OS_diag
Entries 65305
Mean 1.571
Std Dev 0.4019
ptCut = 0.0
job#138
1400
1200
1000
800
600
400
200
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5

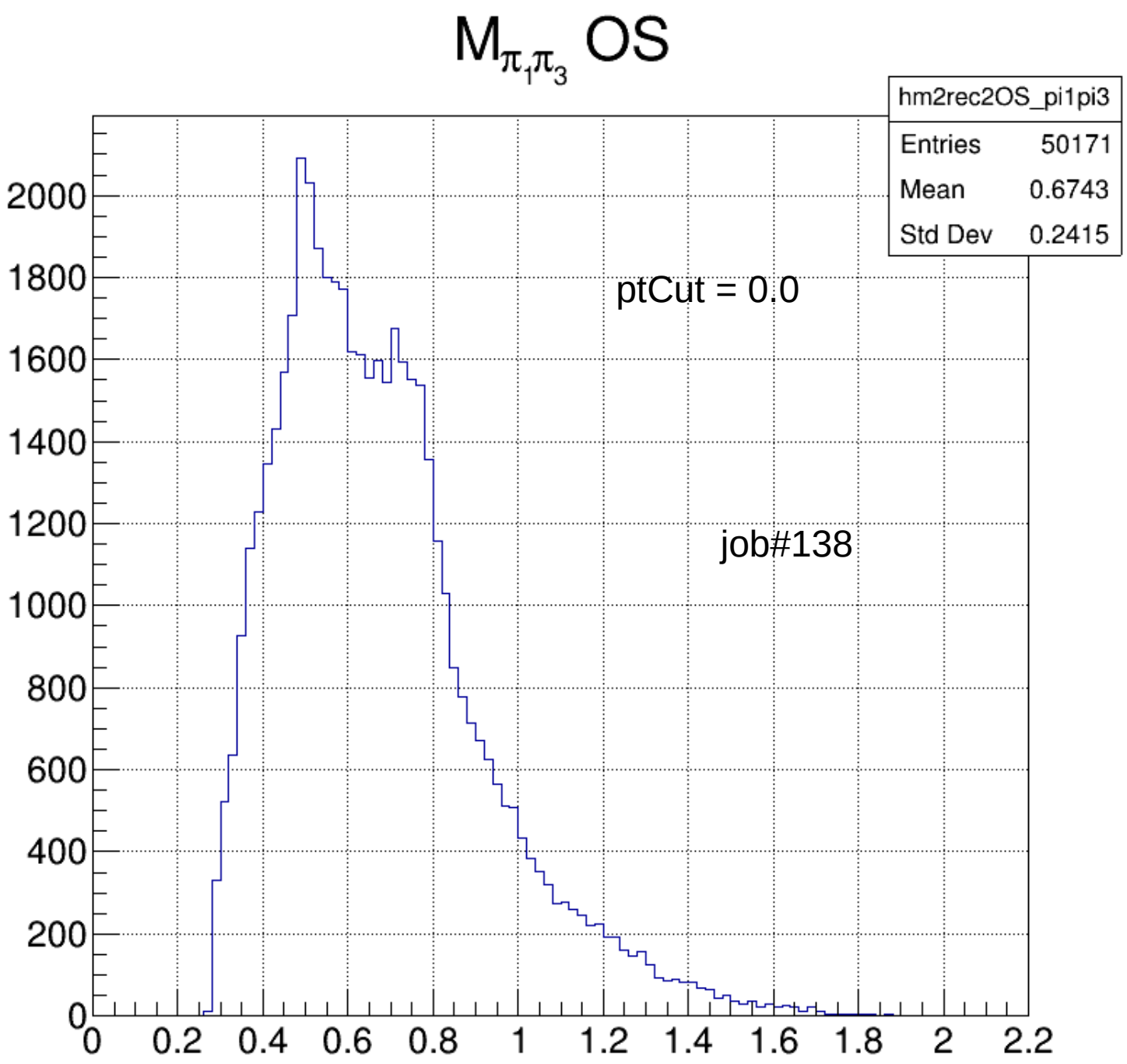

$M_{4\pi}$ OS
hm2rec2OS2
Entries 145399
Mean 1.569
Std Dev 0.4024
ptCut = 0.0
job#138
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
3

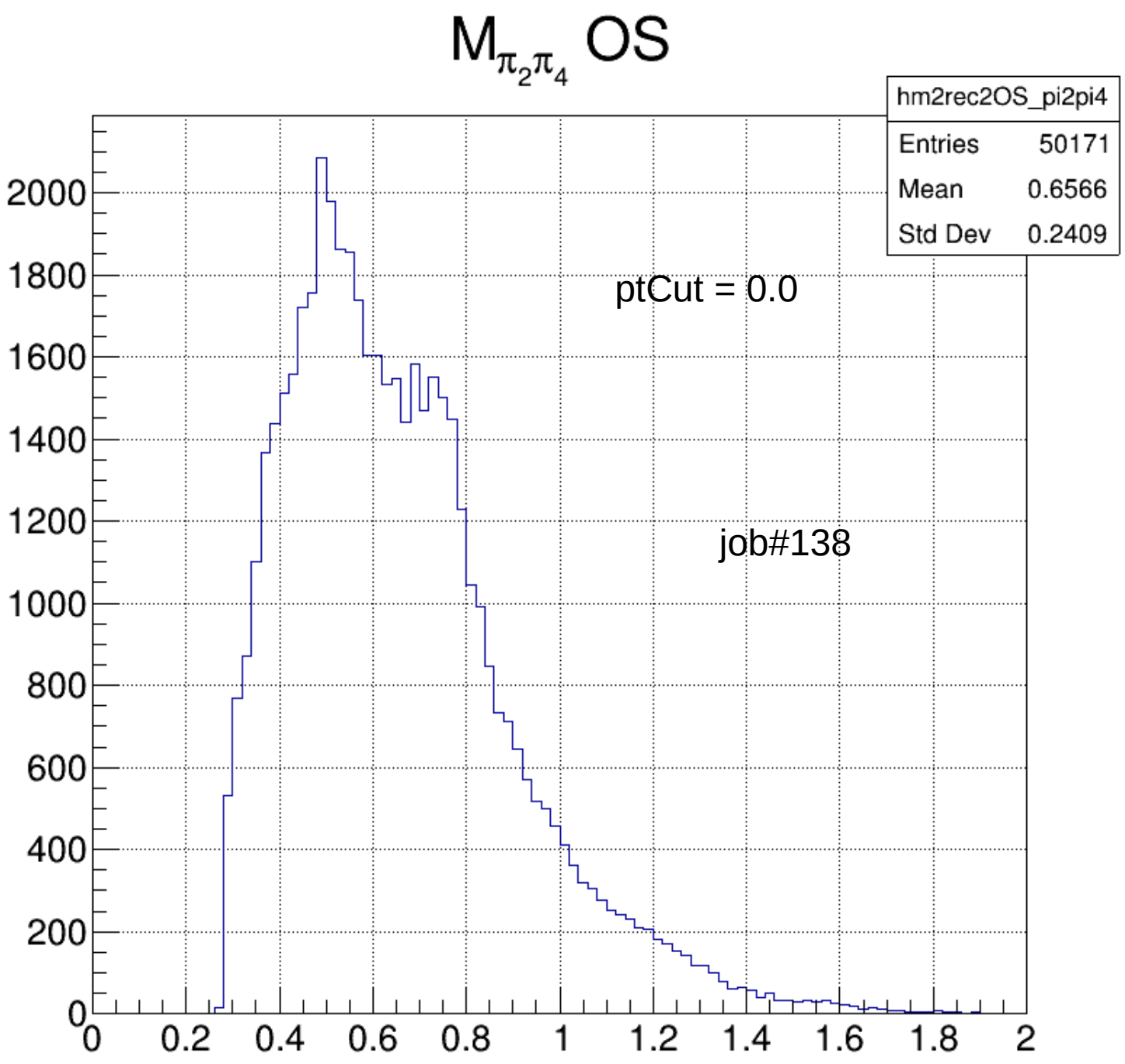

$M_{4\pi}$ TT/BB OS
hm2rec2OS_ttbb2
Entries 80094
Mean 1.567
Std Dev 0.4031
ptCut = 0.0
job#138
1800
1600
1400
1200
1000
800
600
400
200
0
0
0.5
1
1.5
2
2.5
3

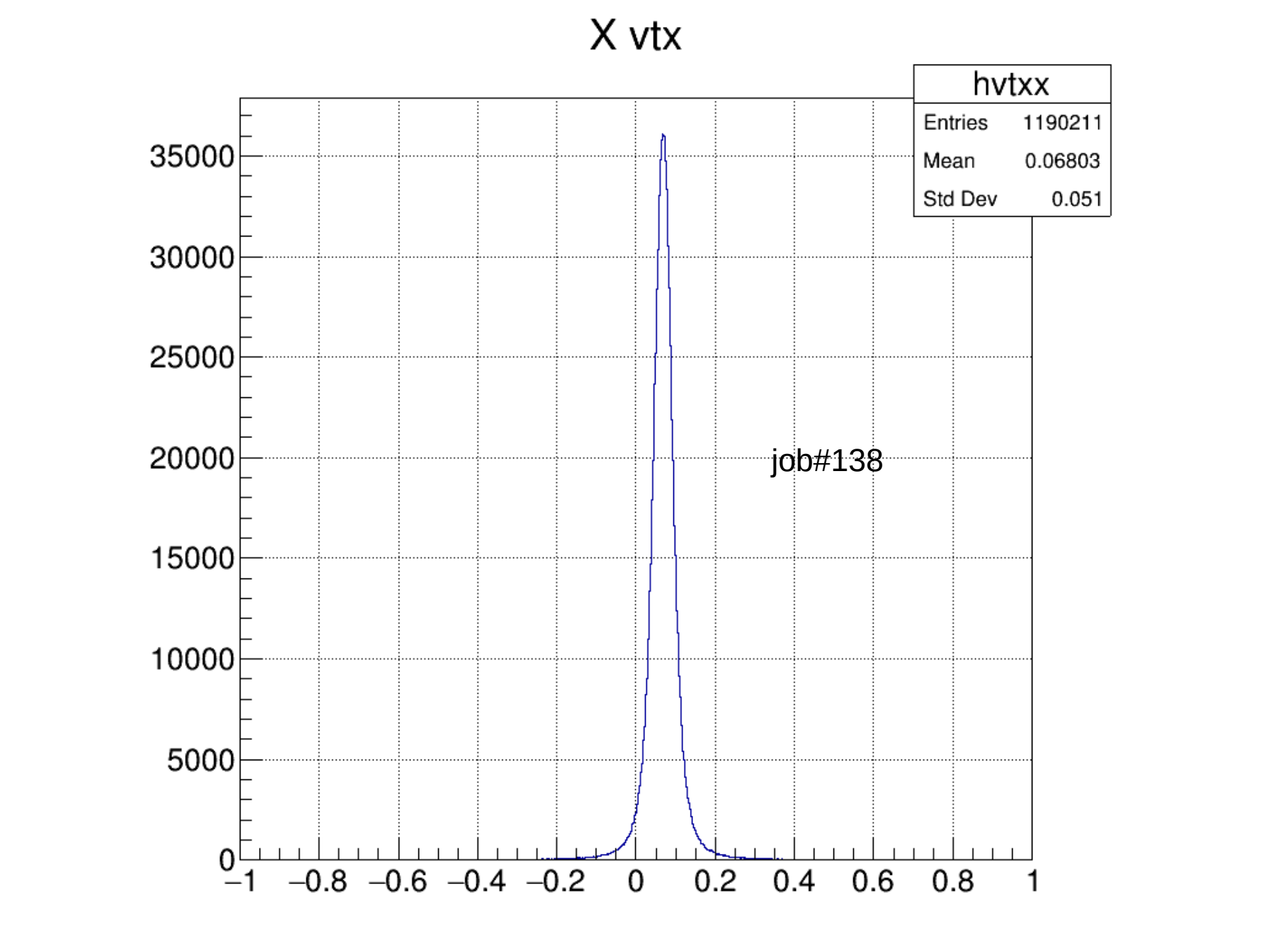

$M_{4\pi}$ TB/BT OS
hm2rec2OS_diag2
Entries 65305
Mean 1.571
Std Dev 0.402
ptCut = 0.0
job#138
1400
1200
1000
800
600
400
200
0
0
0.5
1
1.5
2
2.5
3
3.5

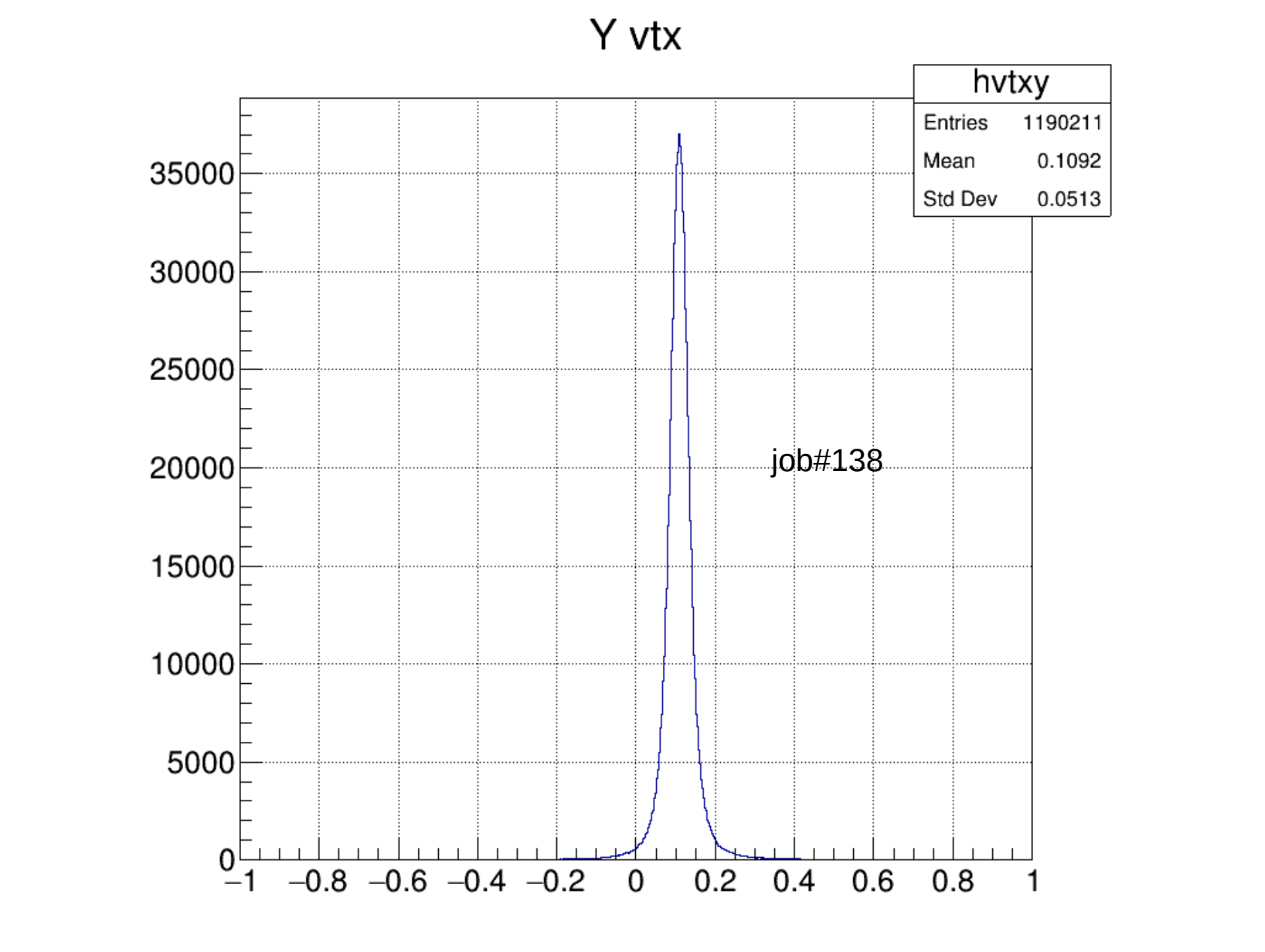

$M_{\pi_1\pi_2}$ OS
hm2rec2OS_pi1pi2
Entries 95228
Mean 0.617
Std Dev 0.2393
ptCut = 0.0
job#138
4000
3500
3000
2500
2000
1500
1000
500
0
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2

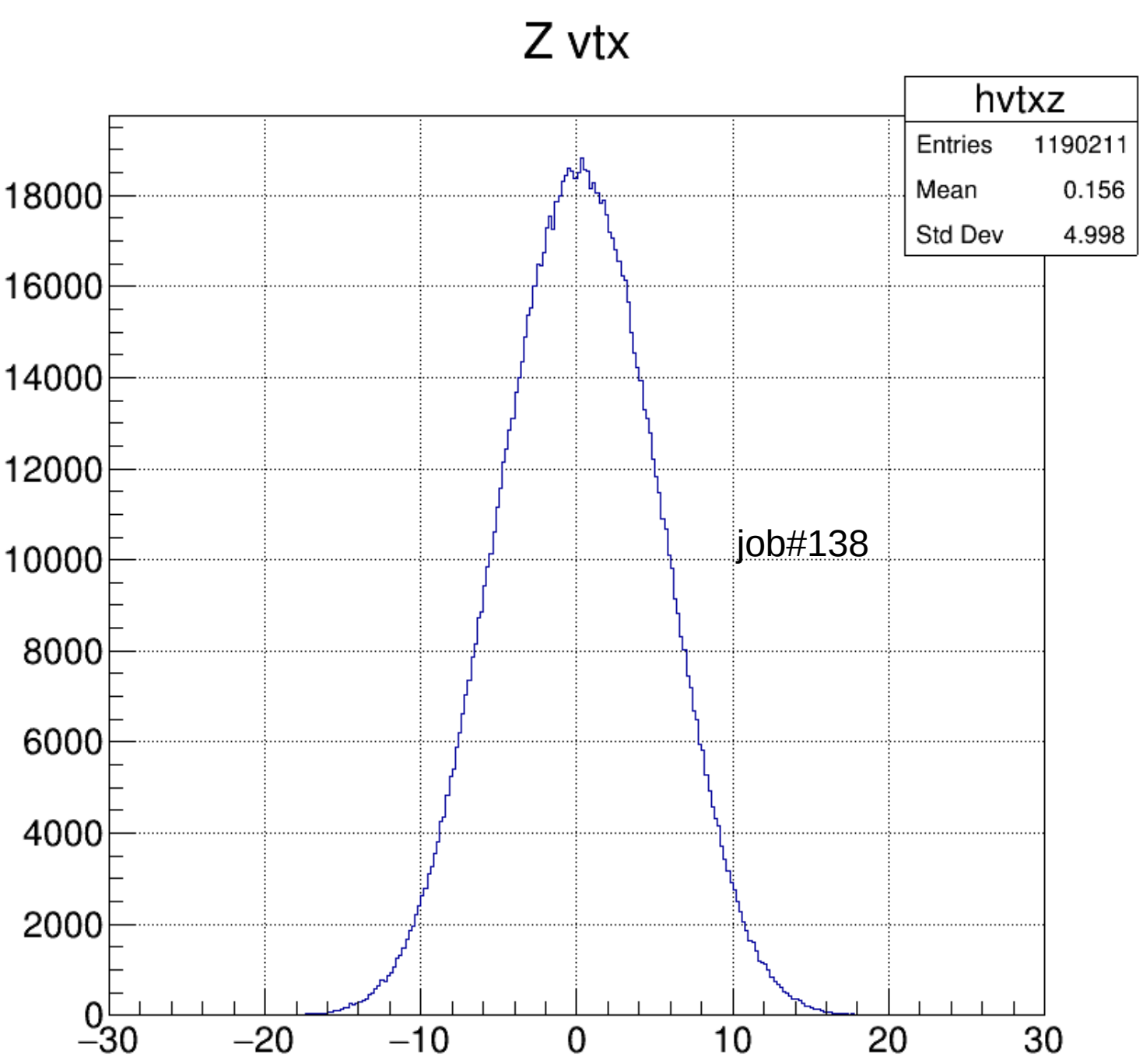

$M_{\pi_3\pi_4}$ OS
hm2rec2OS_pi3pi4
Entries 95228
Mean 0.6179
Std Dev 0.2415
ptCut = 0.0
job#138
4000
3500
3000
2500
2000
1500
1000
500
0
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2

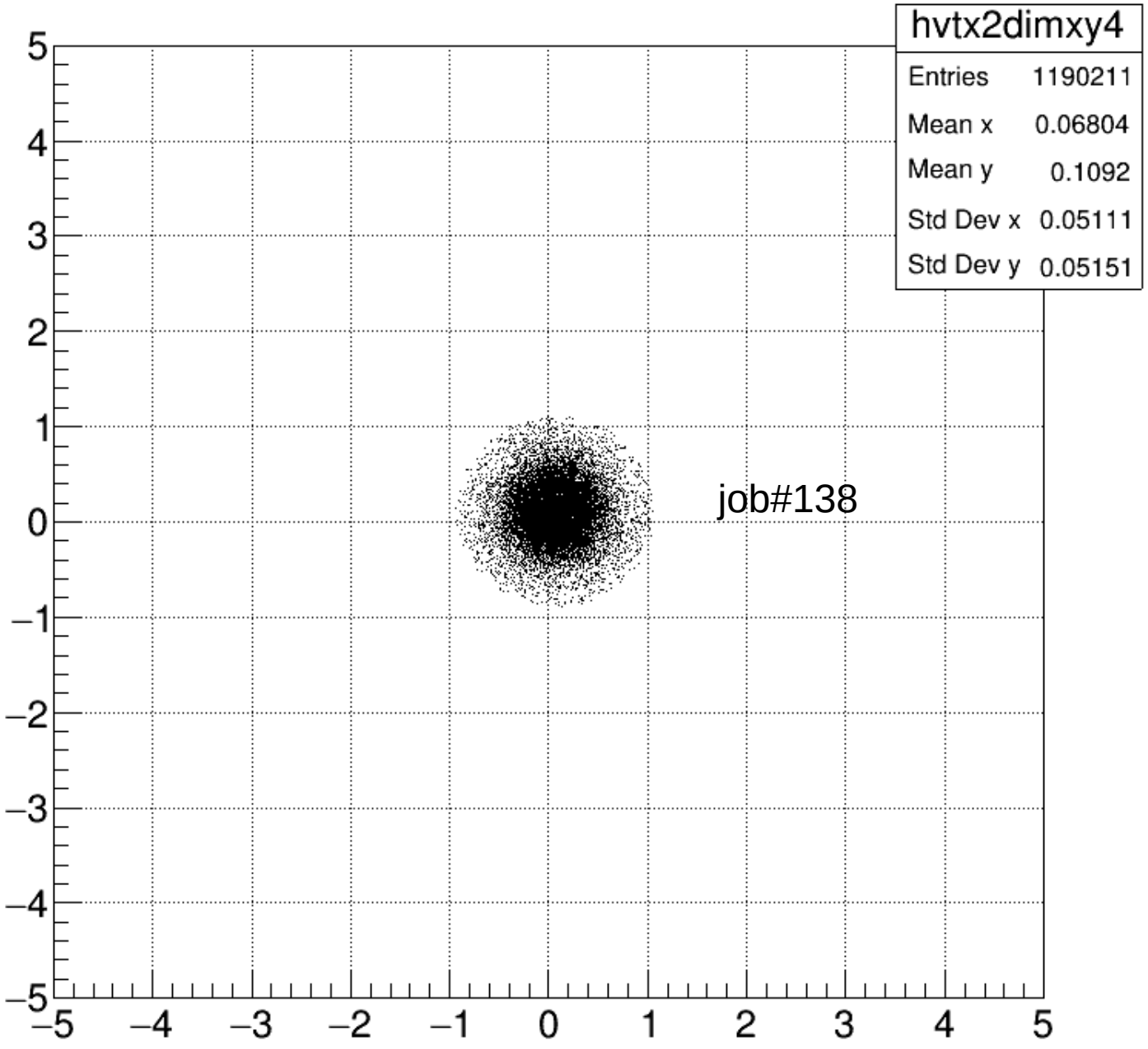

$M_{\pi_1\pi_3}$ OS
hm2rec2OS_pi1pi3
Entries 50171
Mean 0.6743
Std Dev 0.2415
ptCut = 0.0
job#138
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2

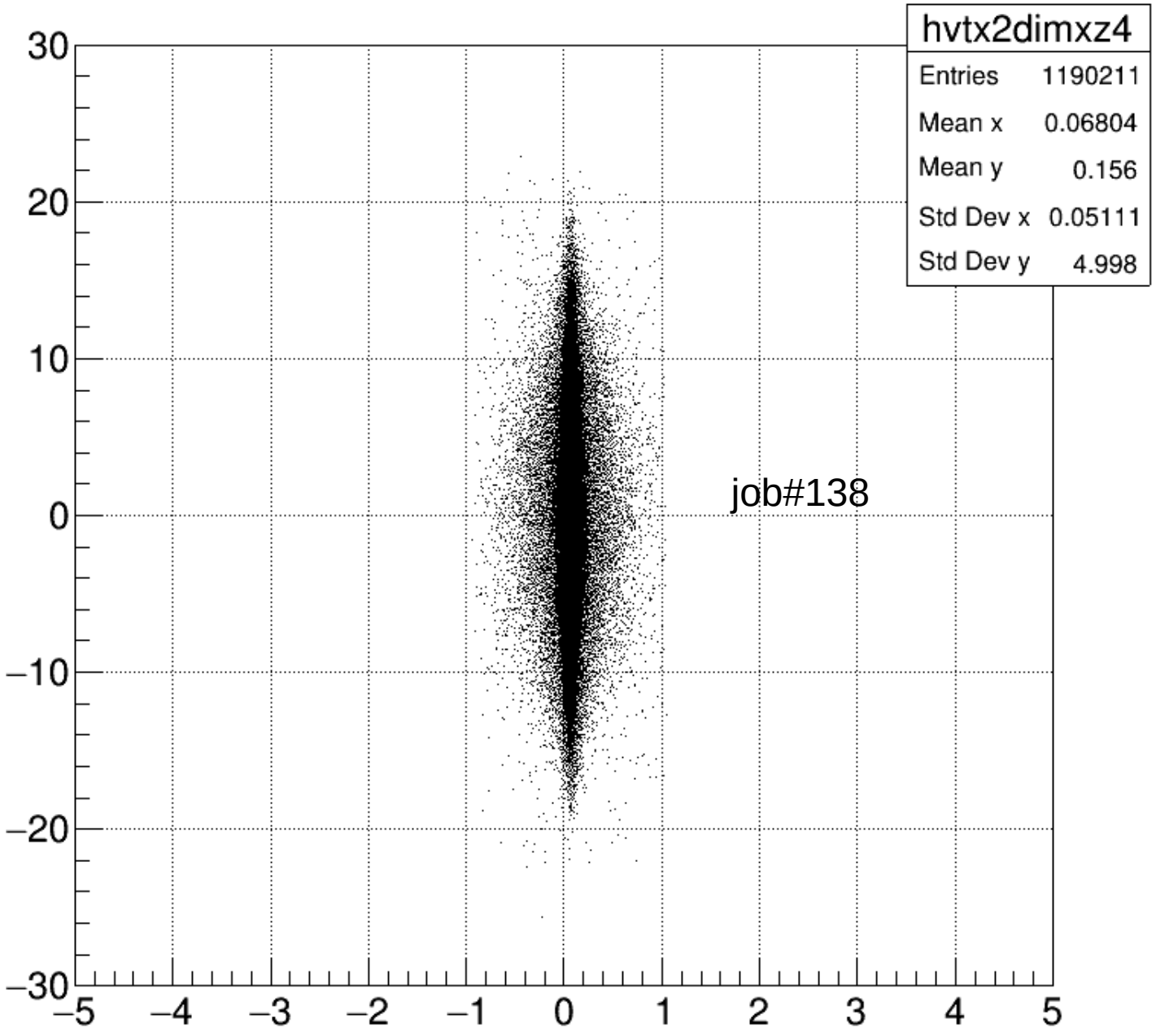

$M_{\pi_2\pi_4}$ OS
hm2rec2OS_pi2pi4
Entries 50171
Mean 0.6566
Std Dev 0.2409
ptCut = 0.0
job#138
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2

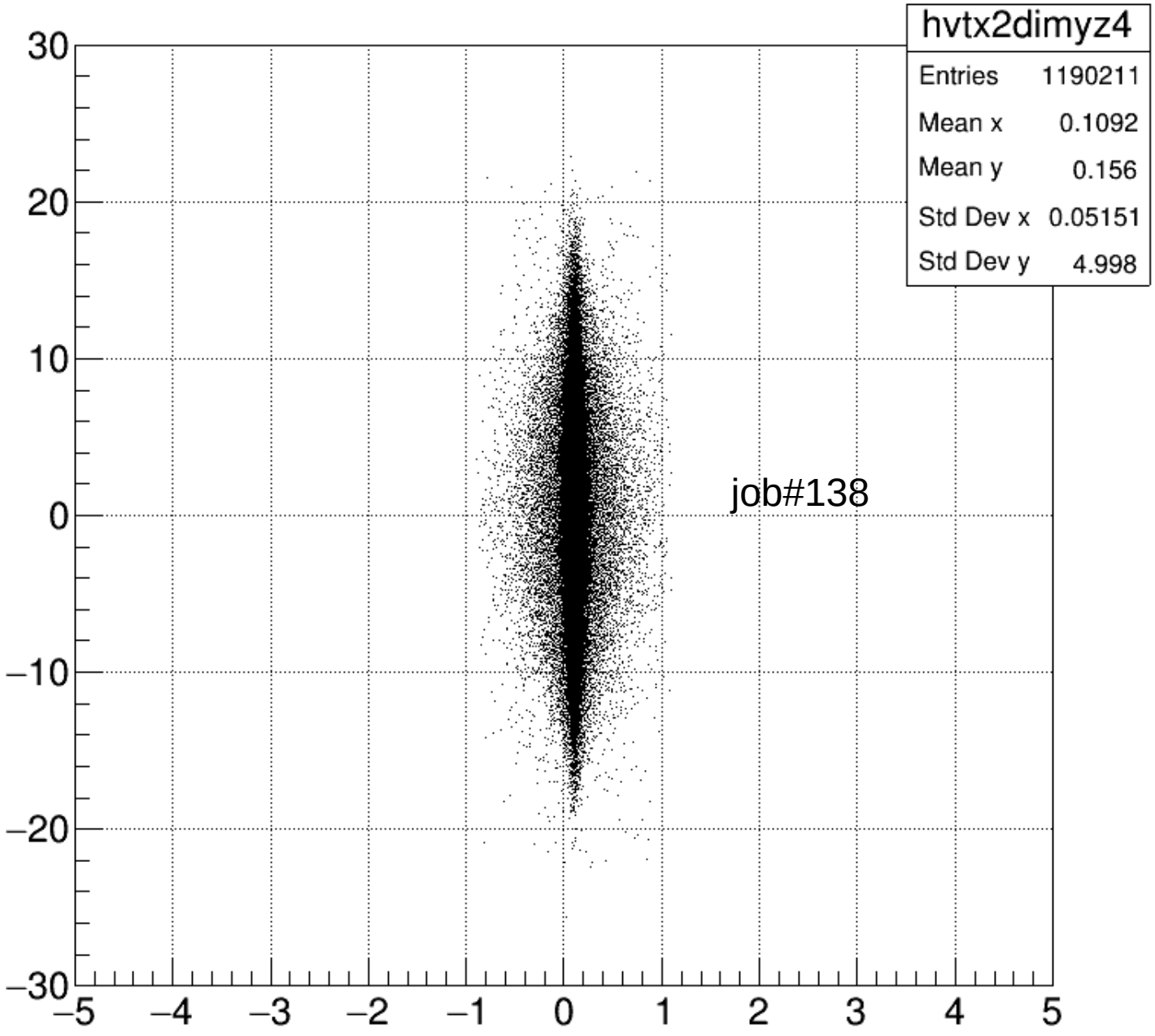

X vtx
hvtxx
Entries 1190211
Mean 0.06803
Std Dev 0.051
job#138
35000
30000
25000
20000
15000
10000
5000
0
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1


Y vtx
hvtxy
Entries 1190211
Mean 0.1092
Std Dev 0.0513
job#138
35000
30000
25000
20000
15000
10000
5000
0
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1


Z vtx
hvtxz
Entries 1190211
Mean 0.156
Std Dev 4.998
job#138
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
−30
−20
−10
0
10
20
30


X vs Y vtx
hvtx2dimxy4
Entries 1190211
Mean x 0.06804
Mean y 0.1092
Std Dev x 0.05111
Std Dev y 0.05151
job#138
5
4
3
2
1
0
−1
−2
−3
−4
−5
−5
−4
−3
−2
−1
0
1
2
3
4
5


X vs Z vtx
hvtx2dimxz4
Entries 1190211
Mean x 0.06804
Mean y 0.156
Std Dev x 0.05111
Std Dev y 4.998
job#138
30
20
10
0
−10
−20
−30
−5
−4
−3
−2
−1
0
1
2
3
4
5


Y vs Z vtx
hvtx2dimyz4
Entries 1190211
Mean x 0.1092
Mean y 0.156
Std Dev x 0.05151
Std Dev y 4.998
job#138
30
20
10
0
−10
−20
−30
−5
−4
−3
−2
−1
0
1
2
3
4
5

Vertex Collection: using iVtx→Print() per event:

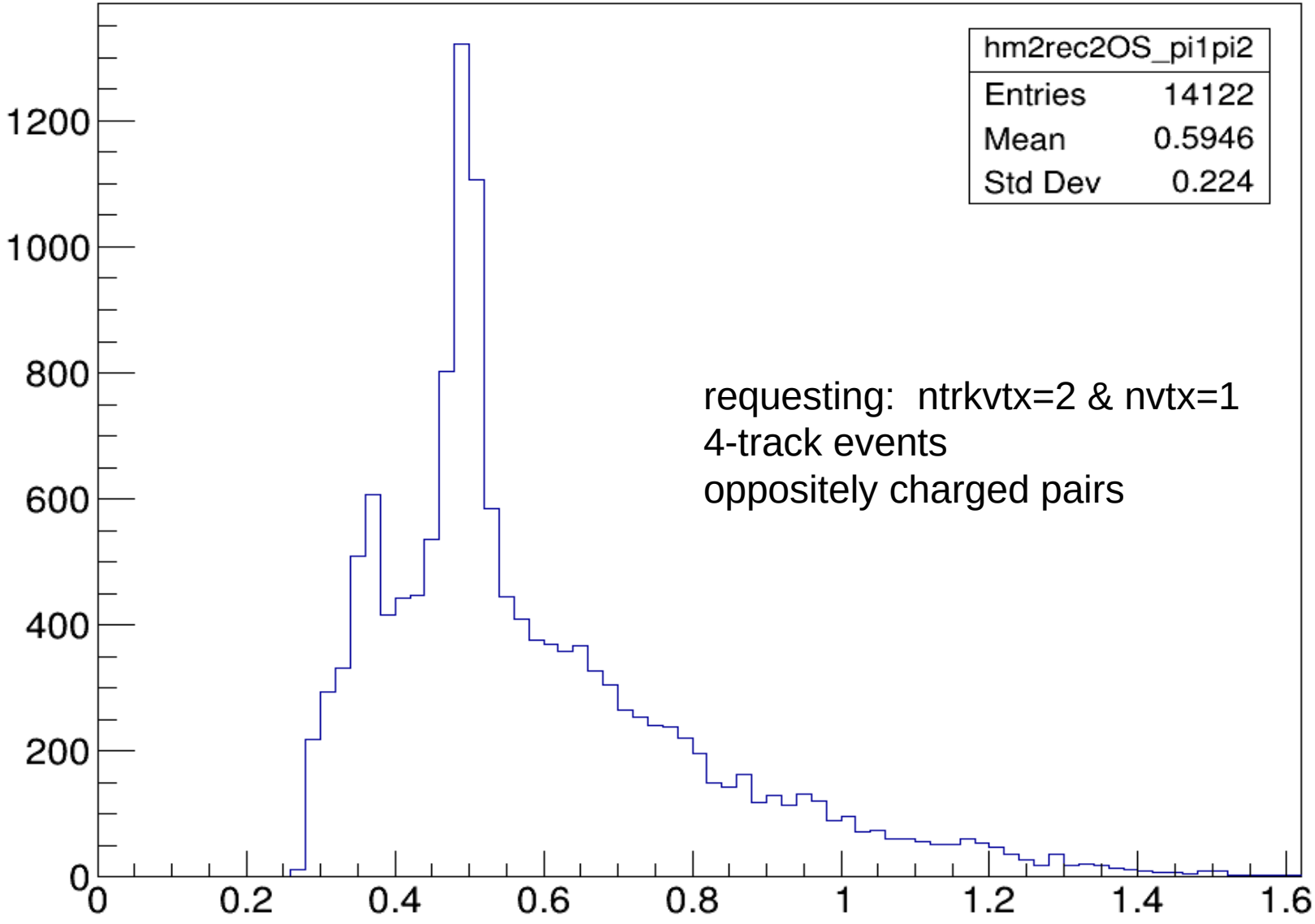
vertex information:
id : 0
x : 0.0868251
y : 0.13628
z : -0.700064
error x : 0.149151
error y : 0.0408441
error z : 0.264829
validity : 1
fake : 0
chi2 : 0.0083628
ndof : 0.942757
chi2n : 0.00887058
ntracks : 2
SumPtTracks: 0.737237

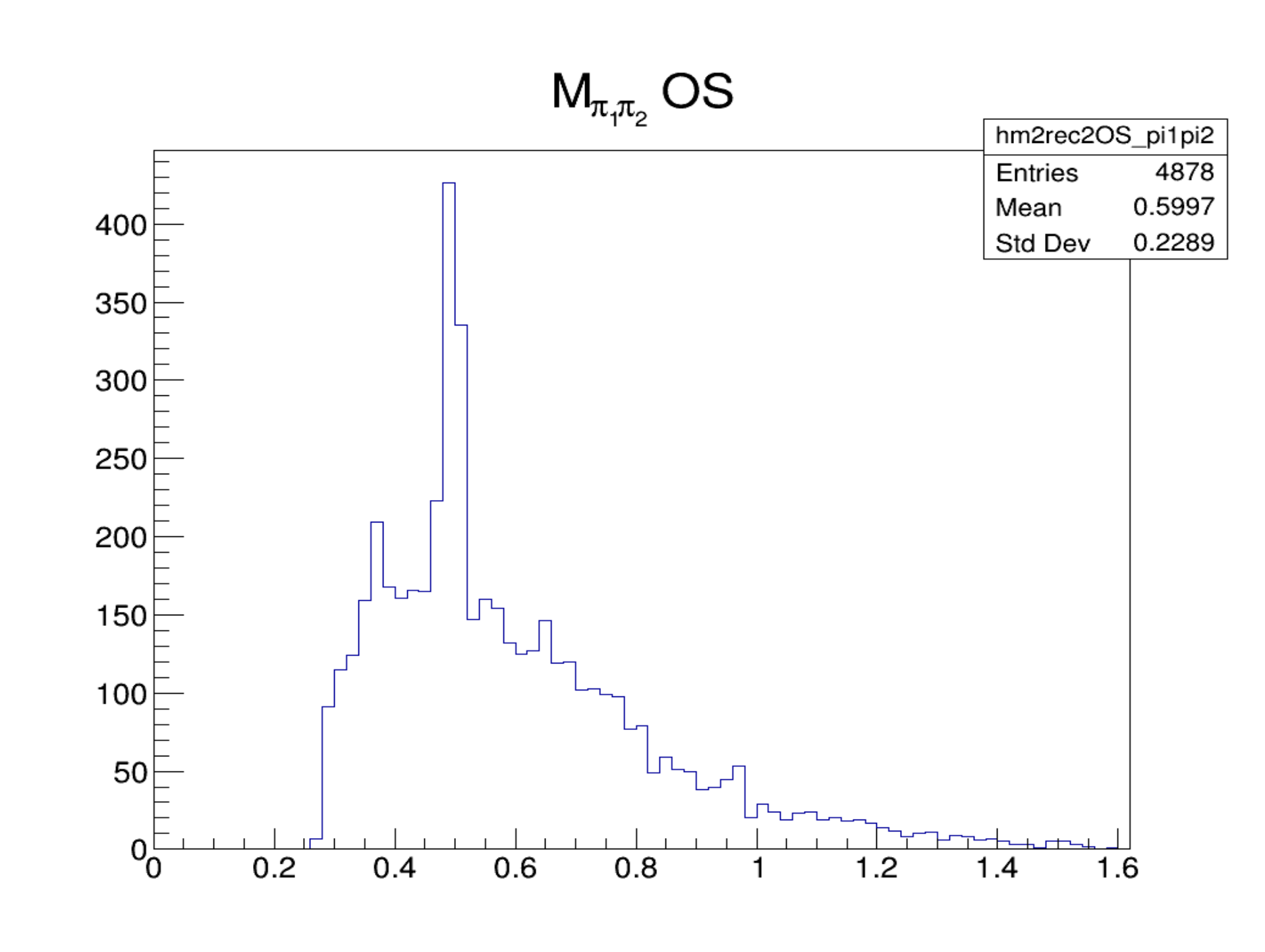
vertex information:
id : 0
x : 0.0445989
y : 0.135187
z : 6.41865
error x : 0.0312259
error y : 0.0336866
error z : 0.0297338
validity : 1
fake : 0
chi2 : 0.991081
ndof : 4.86067
chi2n : 0.203898
ntracks : 4
SumPtTracks: 1.03838

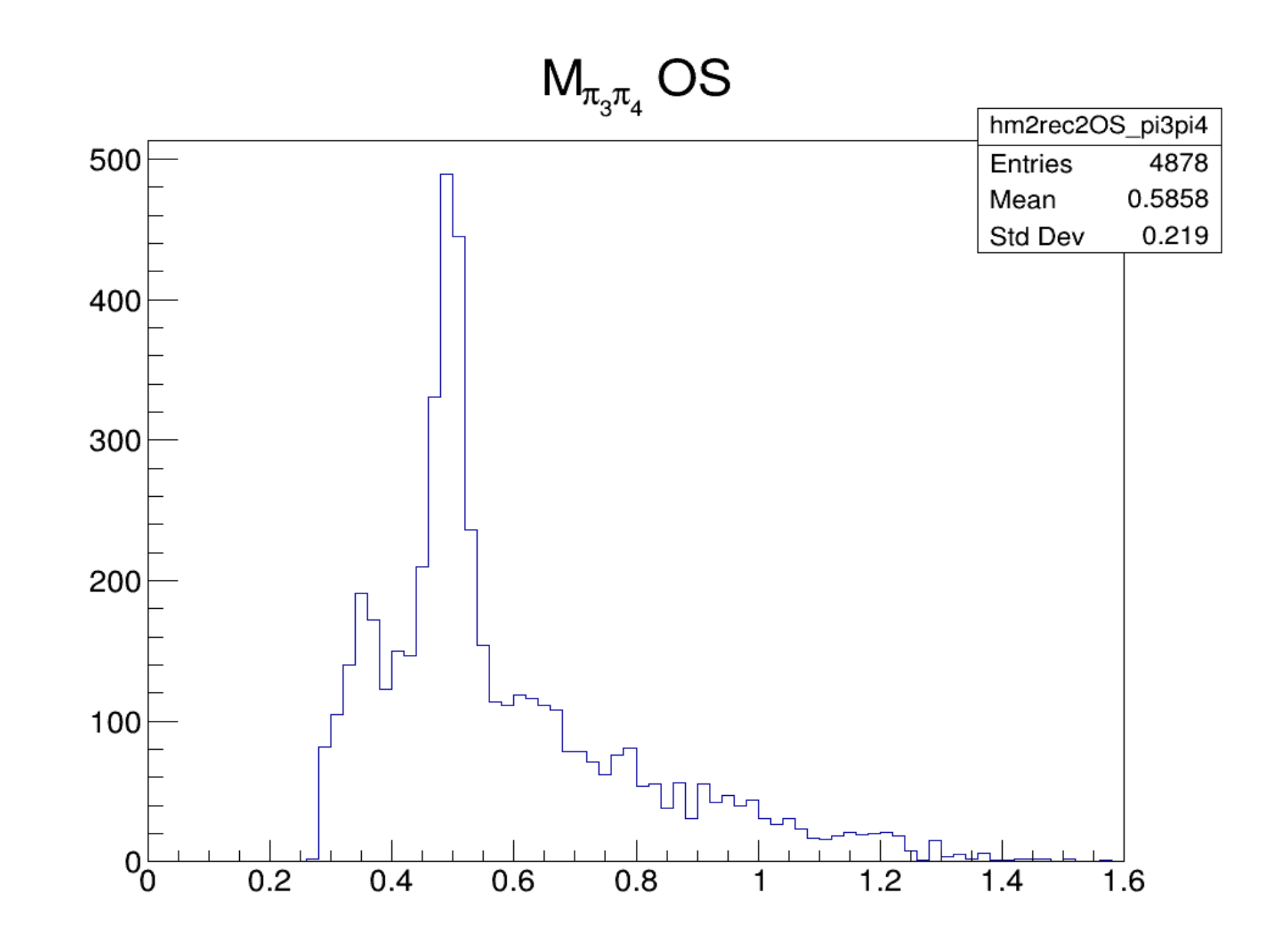
vertex information:
id : 0
x : 0.0719692
y : 0.0268902
z : -5.04181
error x : 0.0355899
error y : 0.0282491
error z : 0.150801
validity : 1
fake : 0
chi2 : 2.91895
ndof : 2.80123
chi2n : 1.04202
ntracks : 3
SumPtTracks: 1.58471

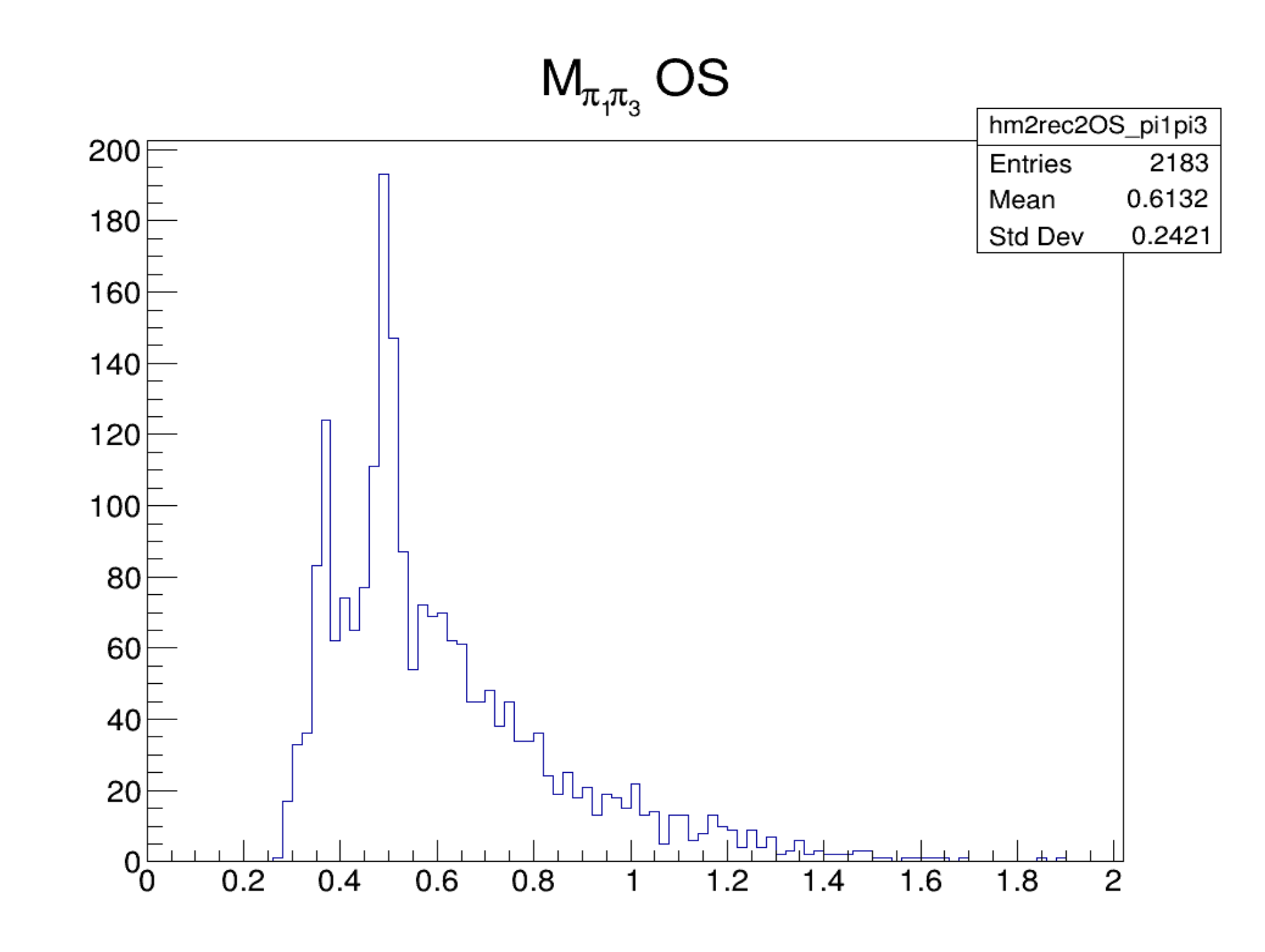
We do not have secondary vertex information in the code, only primary.
However, we do have secondary vertex in the data: K-shorts do appear!
see next plots

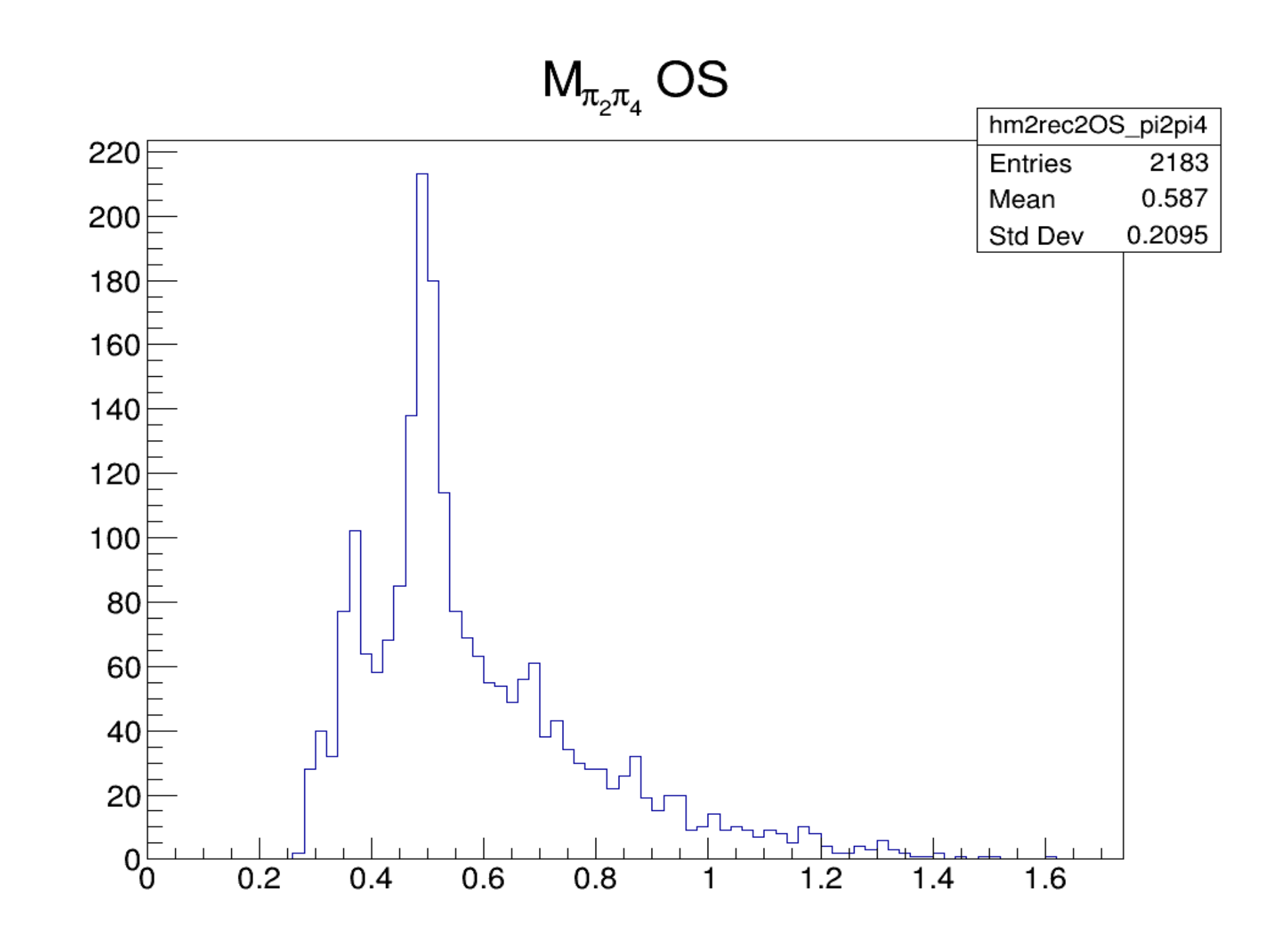
$M_{\pi_1\pi_2}+M_{\pi_3\pi_4}+M_{\pi_1\pi_3}+M_{\pi_2\pi_4}$ OS




$M_{\pi_1\pi_2}$ OS
hm2rec2OS_pi1pi2
Entries 4878
Mean 0.5997
Std Dev 0.2289
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6


$M_{\pi_3\pi_4}$ OS
hm2rec2OS_pi3pi4
Entries 4878
Mean 0.5858
Std Dev 0.219
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6


$M_{\pi_1\pi_3}$ OS
hm2rec2OS_pi1pi3
Entries 2183
Mean 0.6132
Std Dev 0.2421
200
180
160
140
120
100
80
60
40
20
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2


$M_{\pi_2\pi_4}$ OS
hm2rec2OS_pi2pi4
Entries 2183
Mean 0.587
Std Dev 0.2095
220
200
180
160
140
120
100
80
60
40
20
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6

why do we have a K-short peak in the pion-pair mass distribution plots, requesting ntrkvtx=2 & nvtx=1 for the 4-track events, but the transverse x & y positions are primary?

contradictory !

something is wrong with vertex system