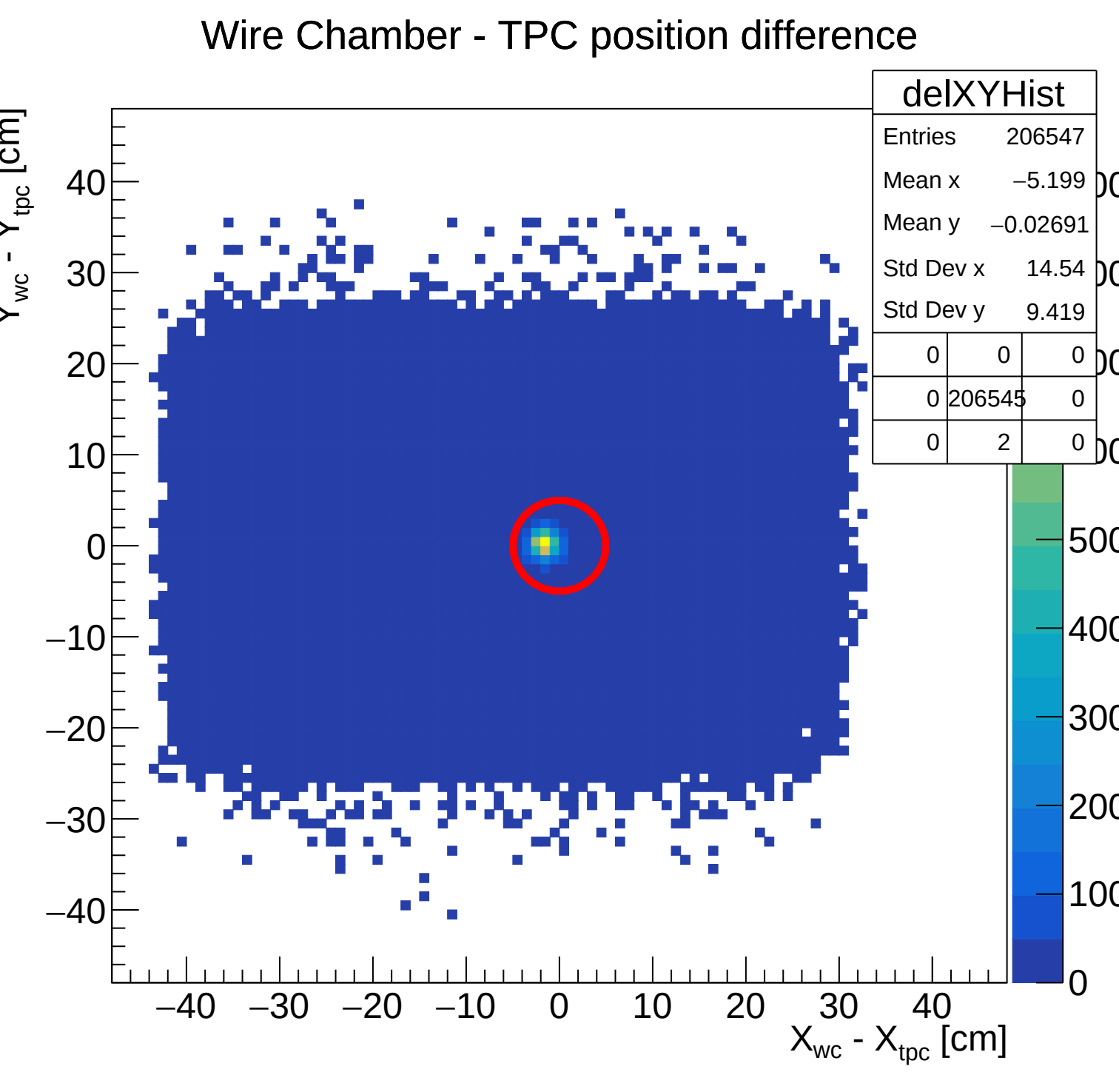
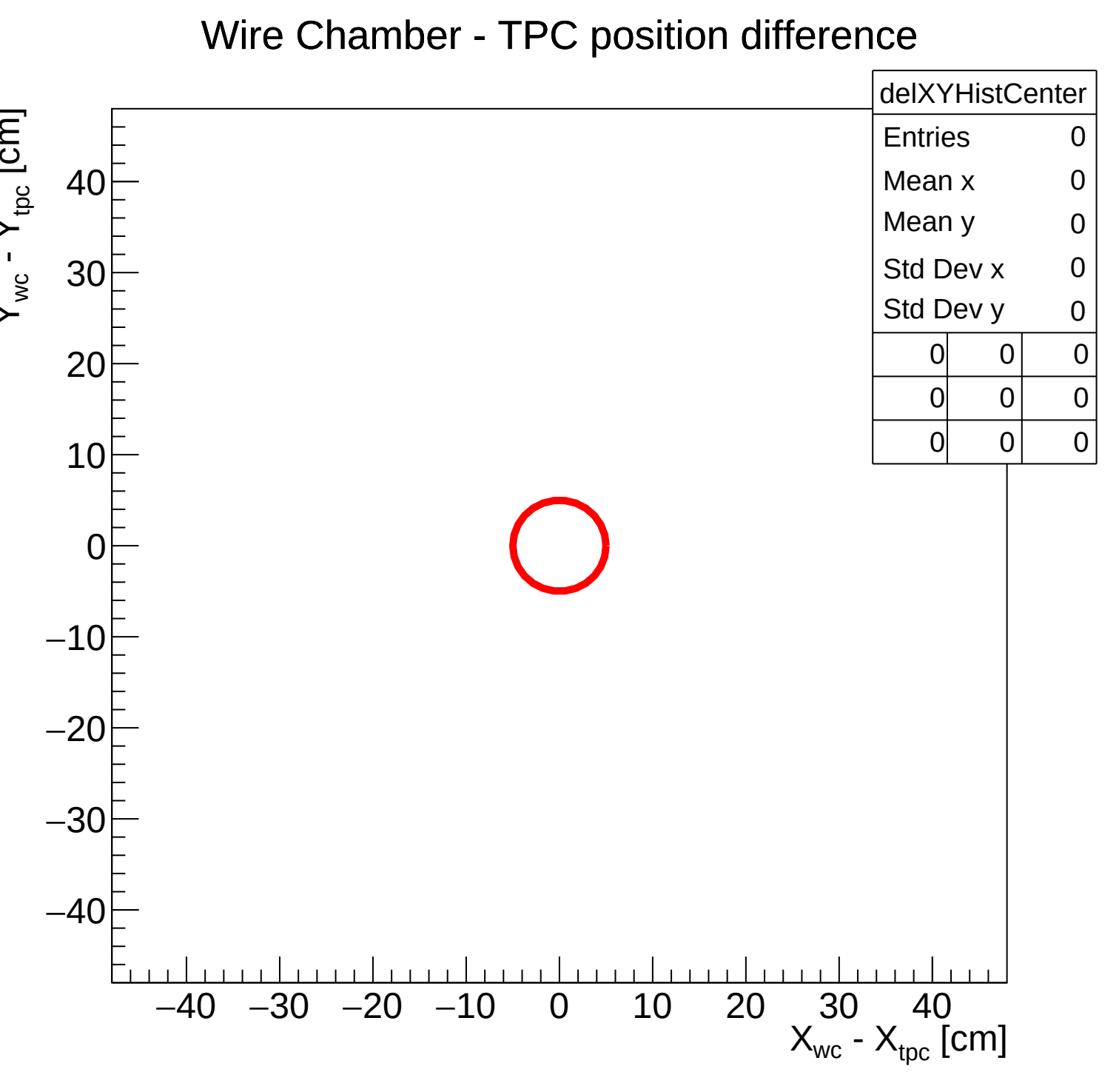
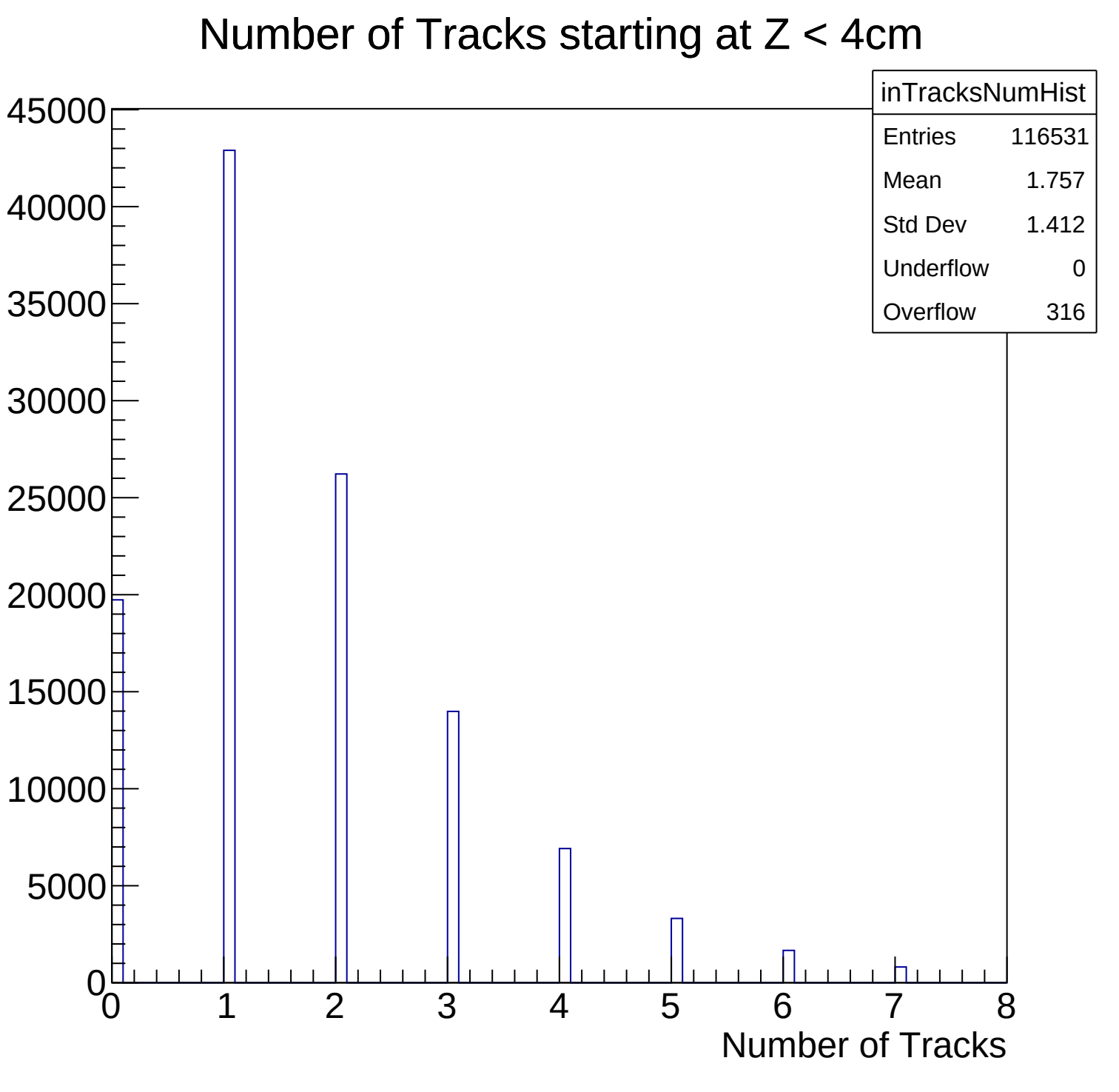
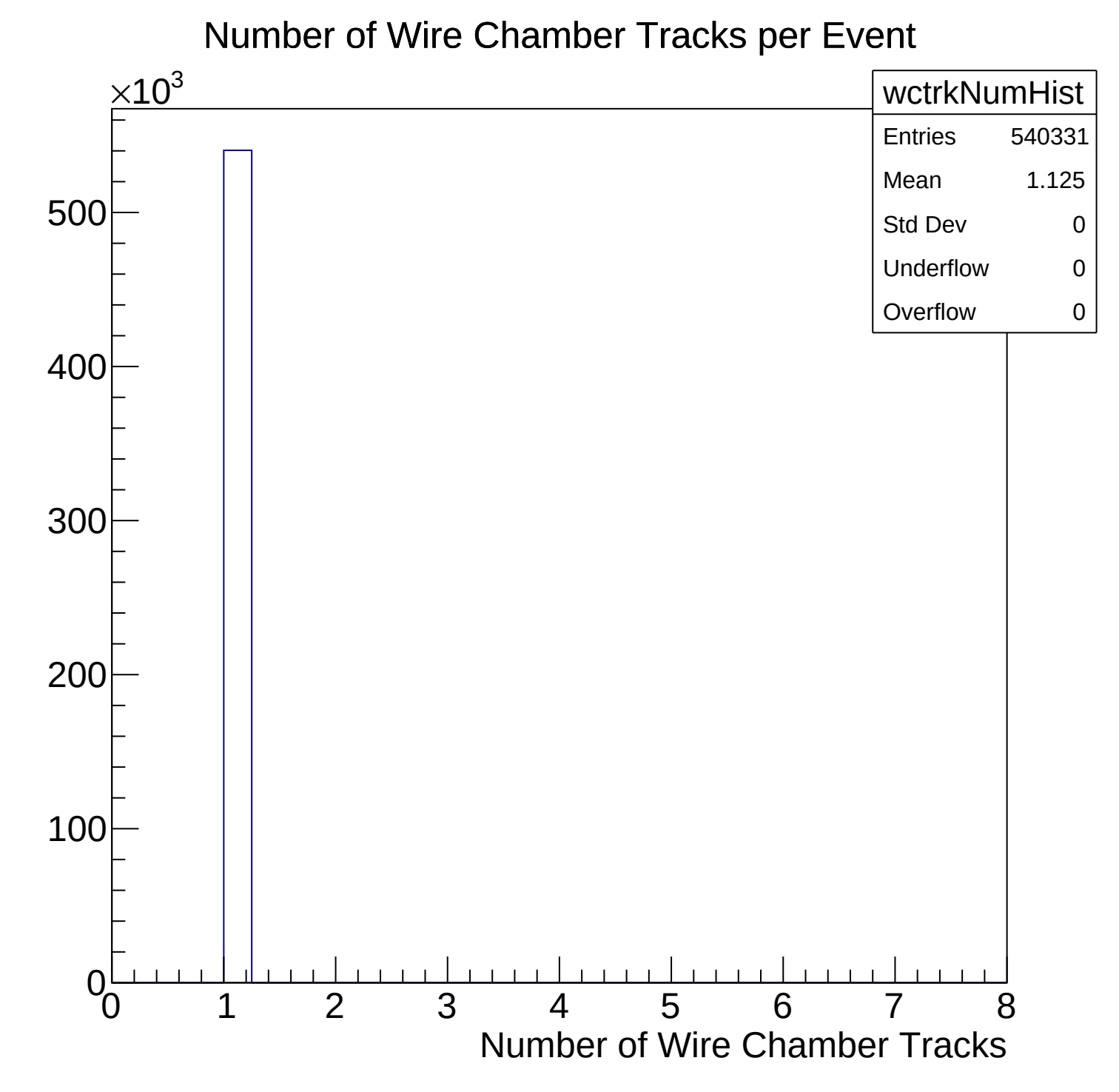
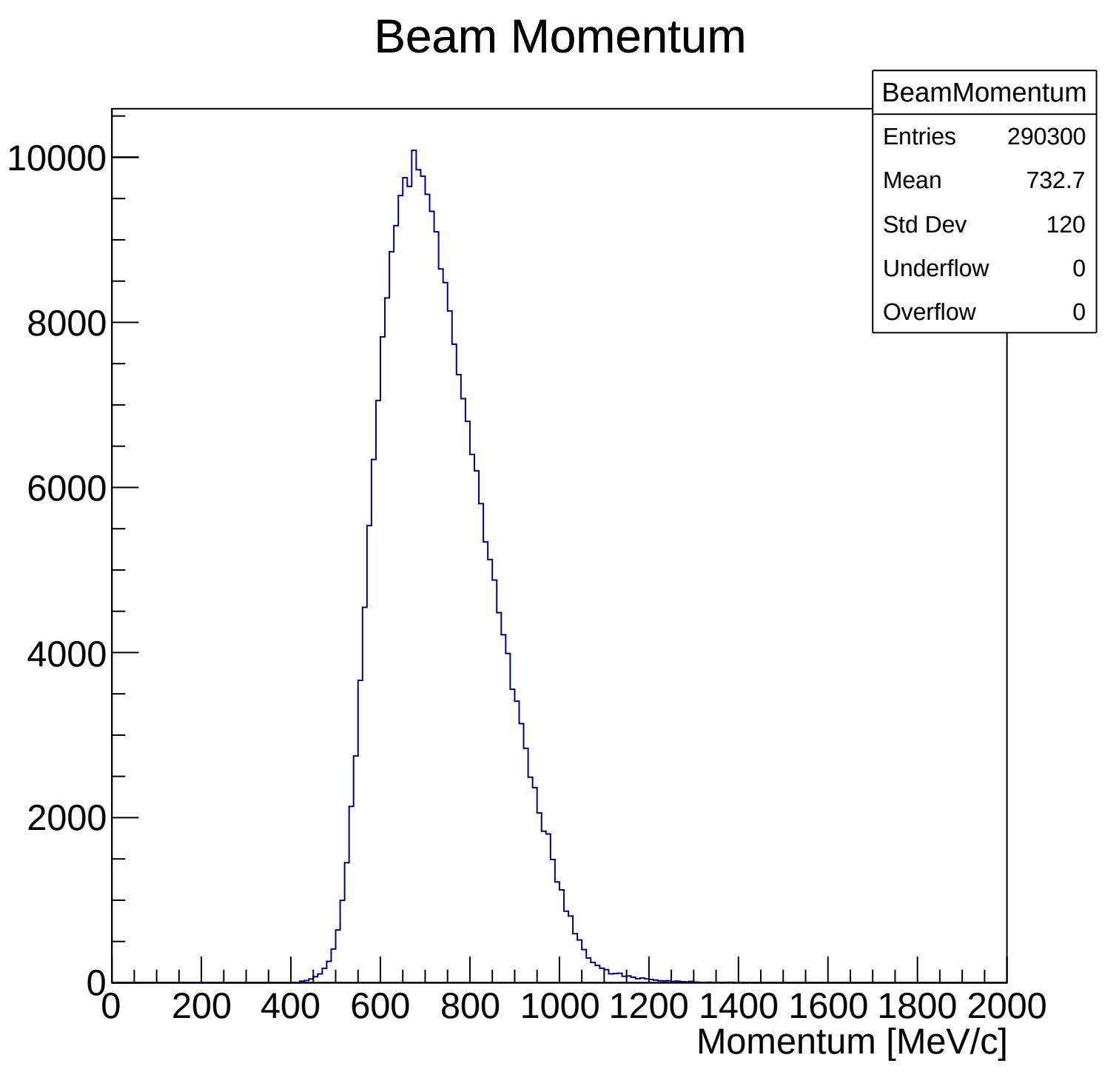
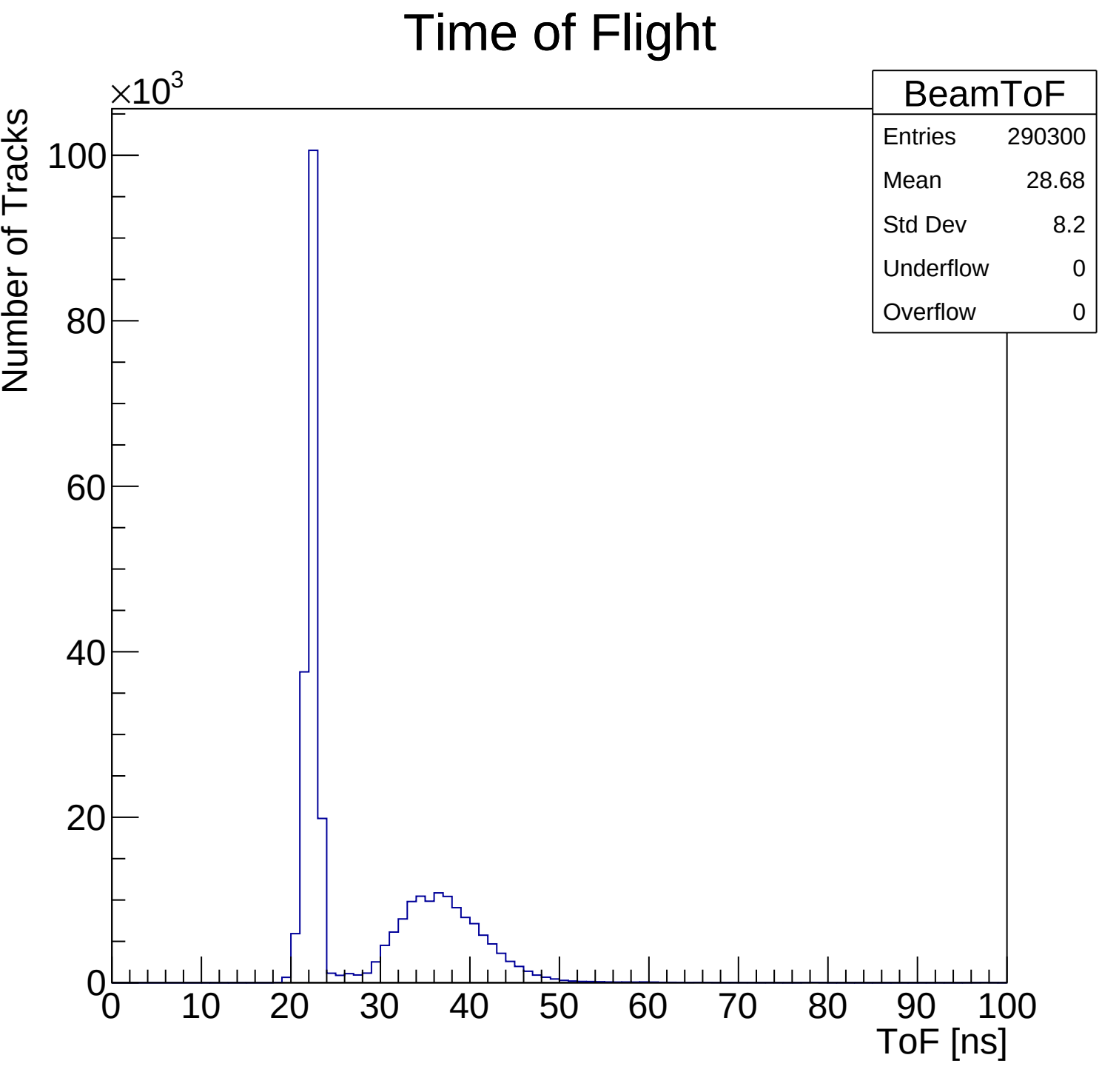

Wire Chamber - TPC position difference
delXYHist
Entries 206547
Mean x −5.199
Mean y −0.02691
Std Dev x 14.54
Std Dev y 9.419
0 0 0
0 206545 0
0 2 0
$Y_{wc} - Y_{tpc}$ [cm]
$X_{wc} - X_{tpc}$ [cm]
40
30
20
10
0
−10
−20
−30
−40
500
400
300
200
100
0

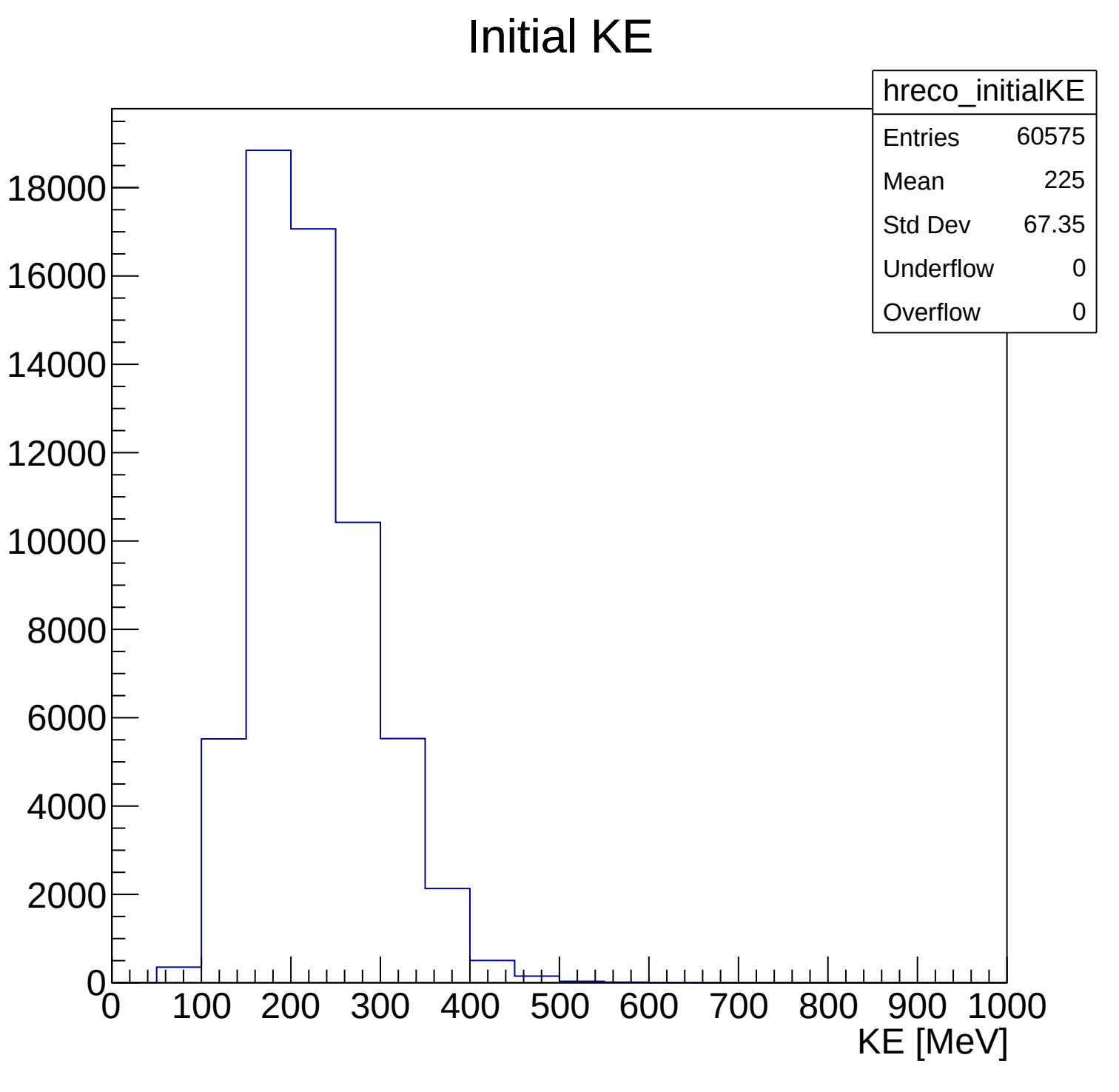

Wire Chamber - TPC position difference
delXYHistCenter
Entries 0
Mean x 0
Mean y 0
Std Dev x 0
Std Dev y 0
0 0 0
0 0 0
0 0 0
$Y_{wc} - Y_{tpc}$ [cm]
40
30
20
10
0
−10
−20
−30
−40
−40 −30 −20 −10 0 10 20 30 40
$X_{wc} - X_{tpc}$ [cm]

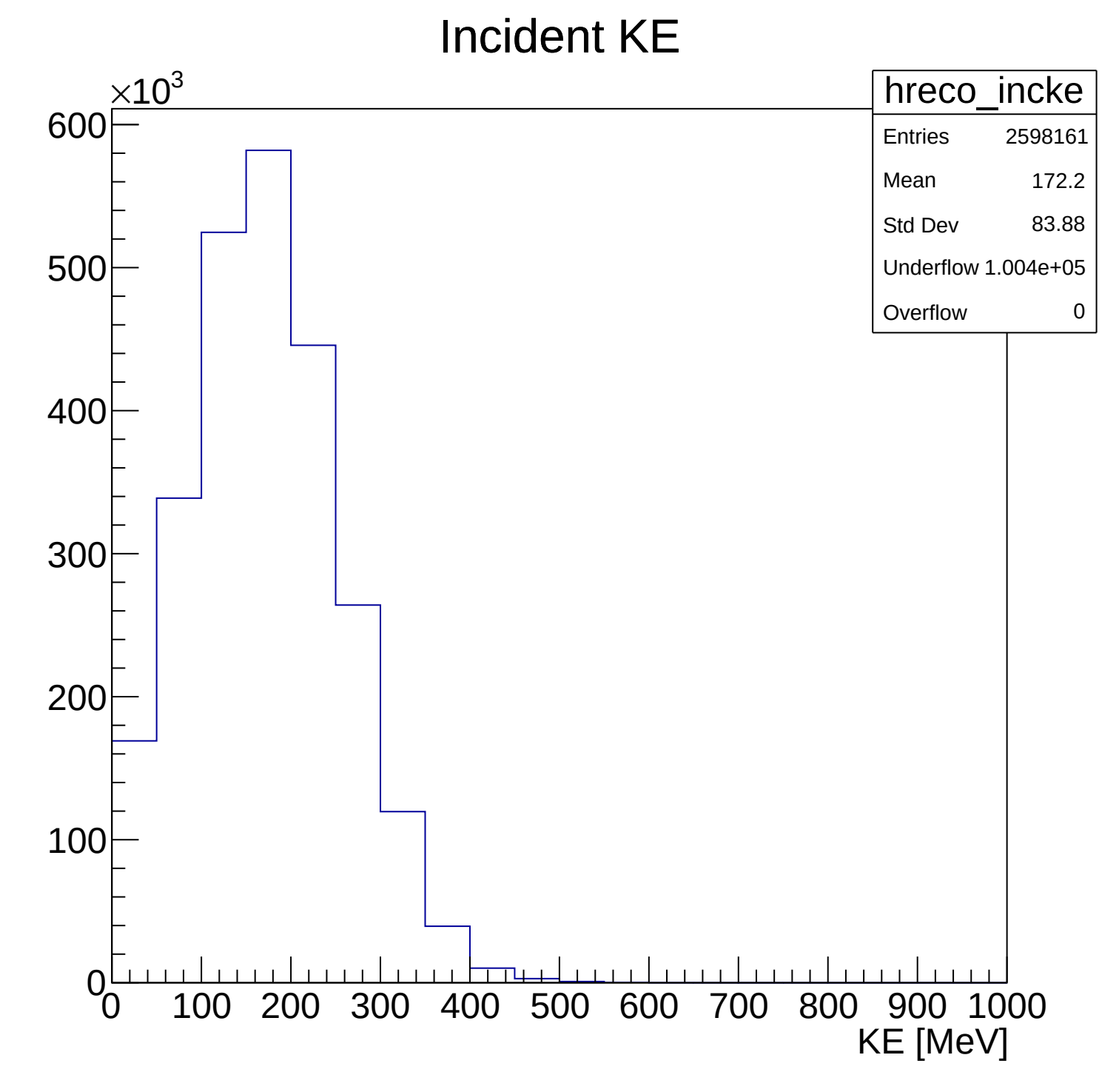

Number of Tracks starting at Z < 4cm
inTracksNumHist
Entries 116531
Mean 1.757
Std Dev 1.412
Underflow 0
Overflow 316
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
1
2
3
4
5
6
7
8
Number of Tracks

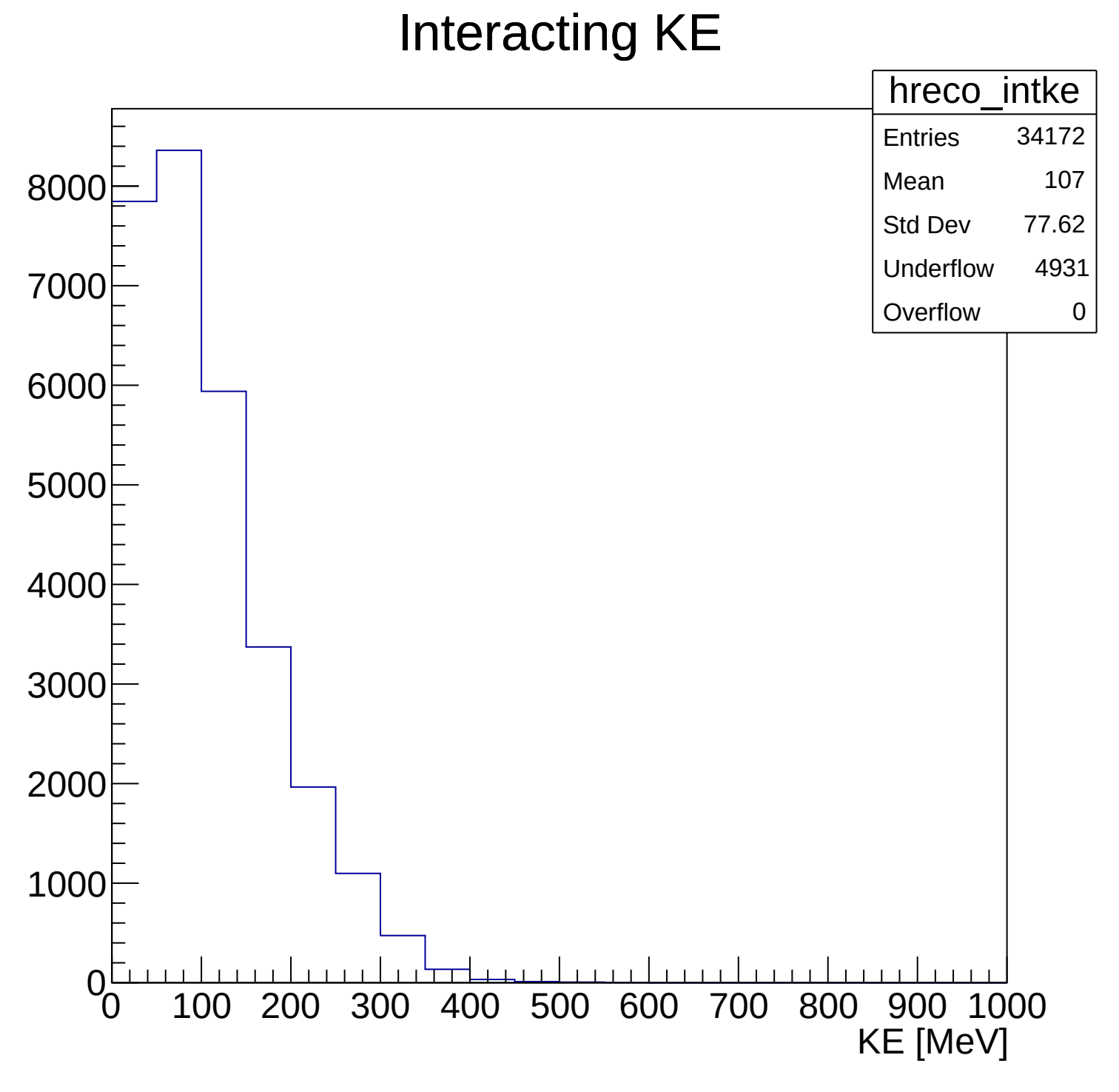

Number of Wire Chamber Tracks per Event
×10^3
wctrkNumHist
Entries 540331
Mean 1.125
Std Dev 0
Underflow 0
Overflow 0
500
400
300
200
100
0
0 1 2 3 4 5 6 7 8
Number of Wire Chamber Tracks

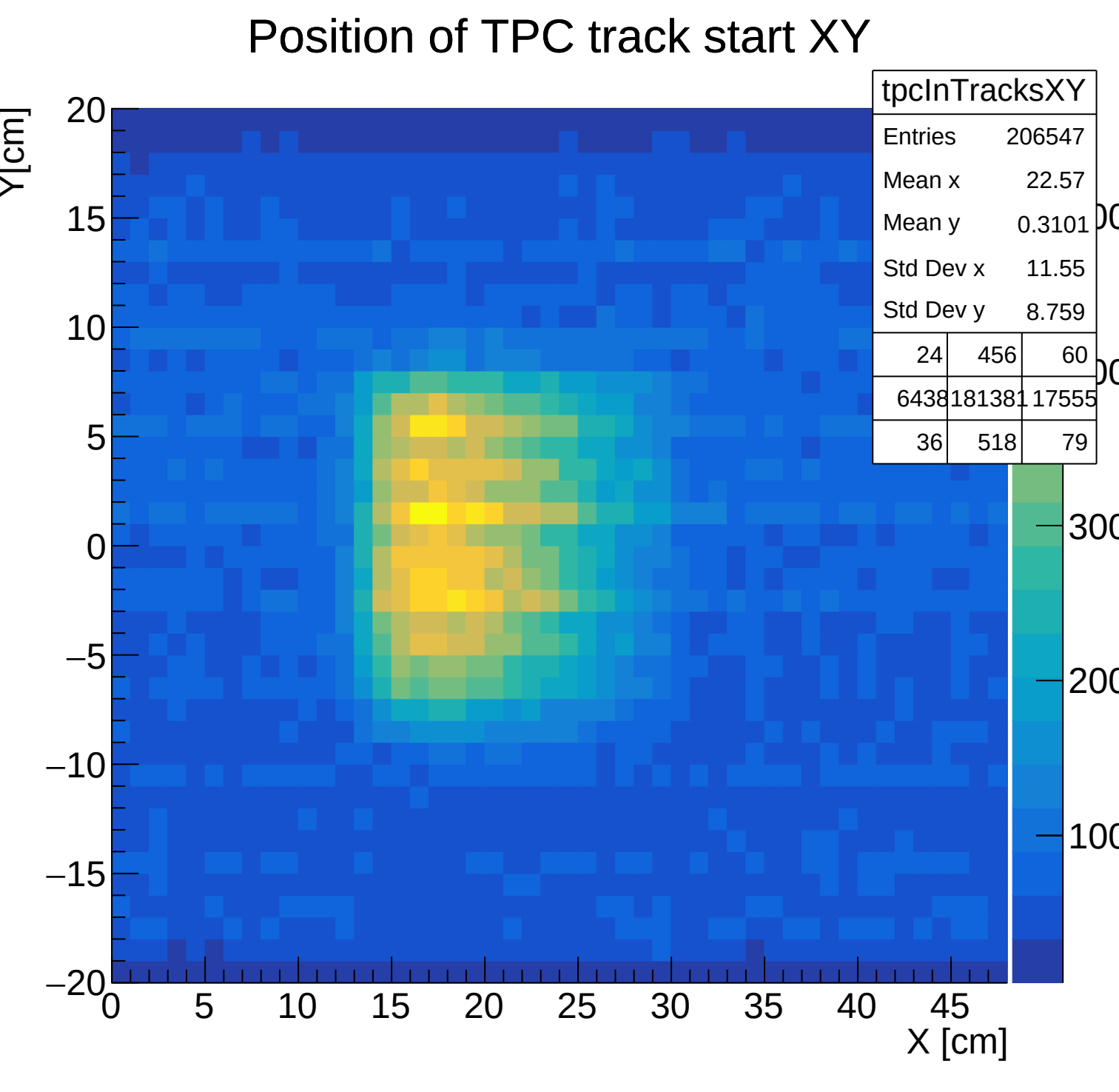

Beam Momentum
BeamMomentum
Entries 290300
Mean 732.7
Std Dev 120
Underflow 0
Overflow 0
10000
8000
6000
4000
2000
0
0 200 400 600 800 1000 1200 1400 1600 1800 2000
Momentum [MeV/c]

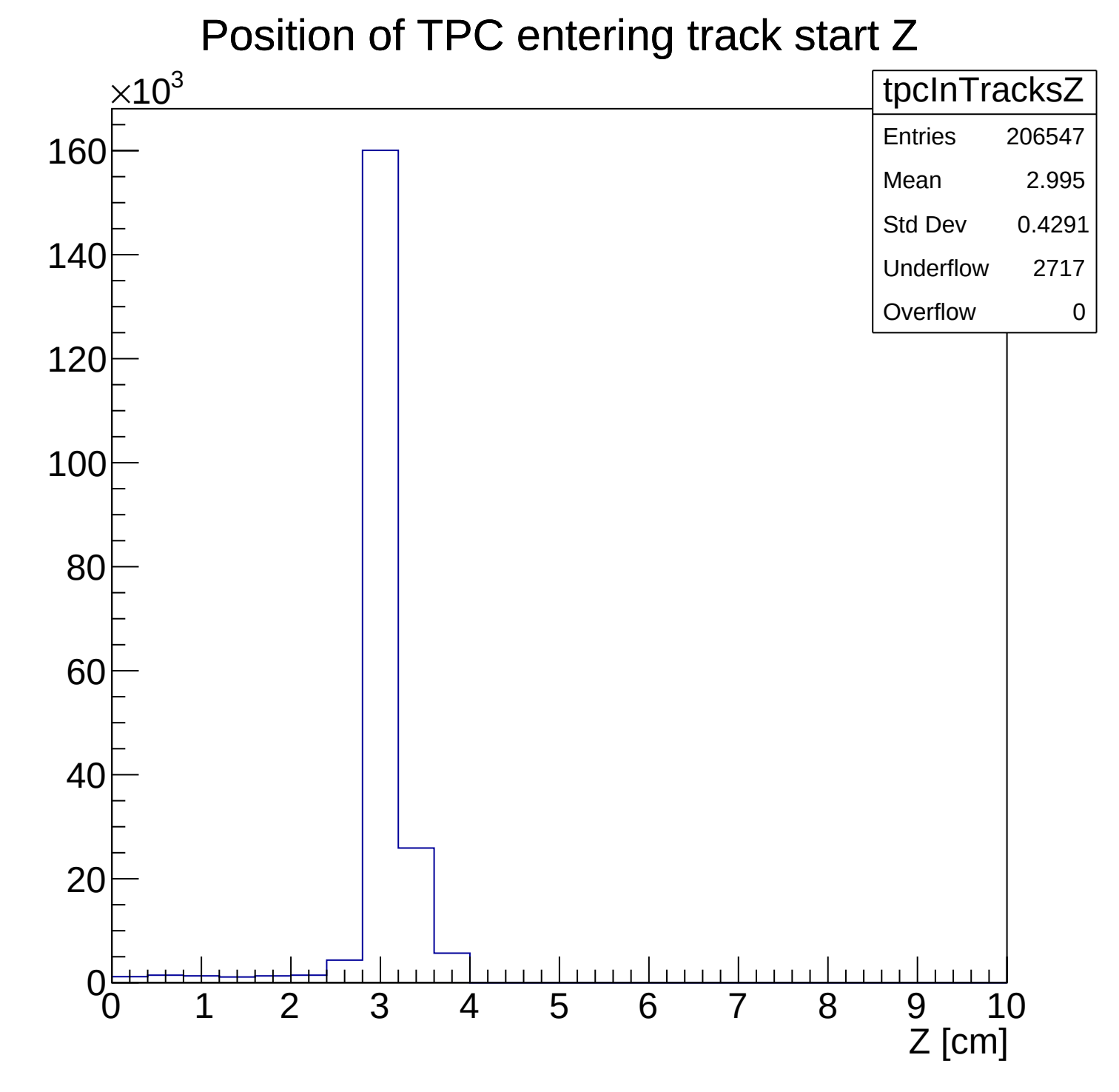

Time of Flight
BeamToF
Entries 290300
Mean 28.68
Std Dev 8.2
Underflow 0
Overflow 0
×10^3
Number of Tracks
ToF [ns]
0
20
40
60
80
100
0
10
20
30
40
50
60
70
80
90
100

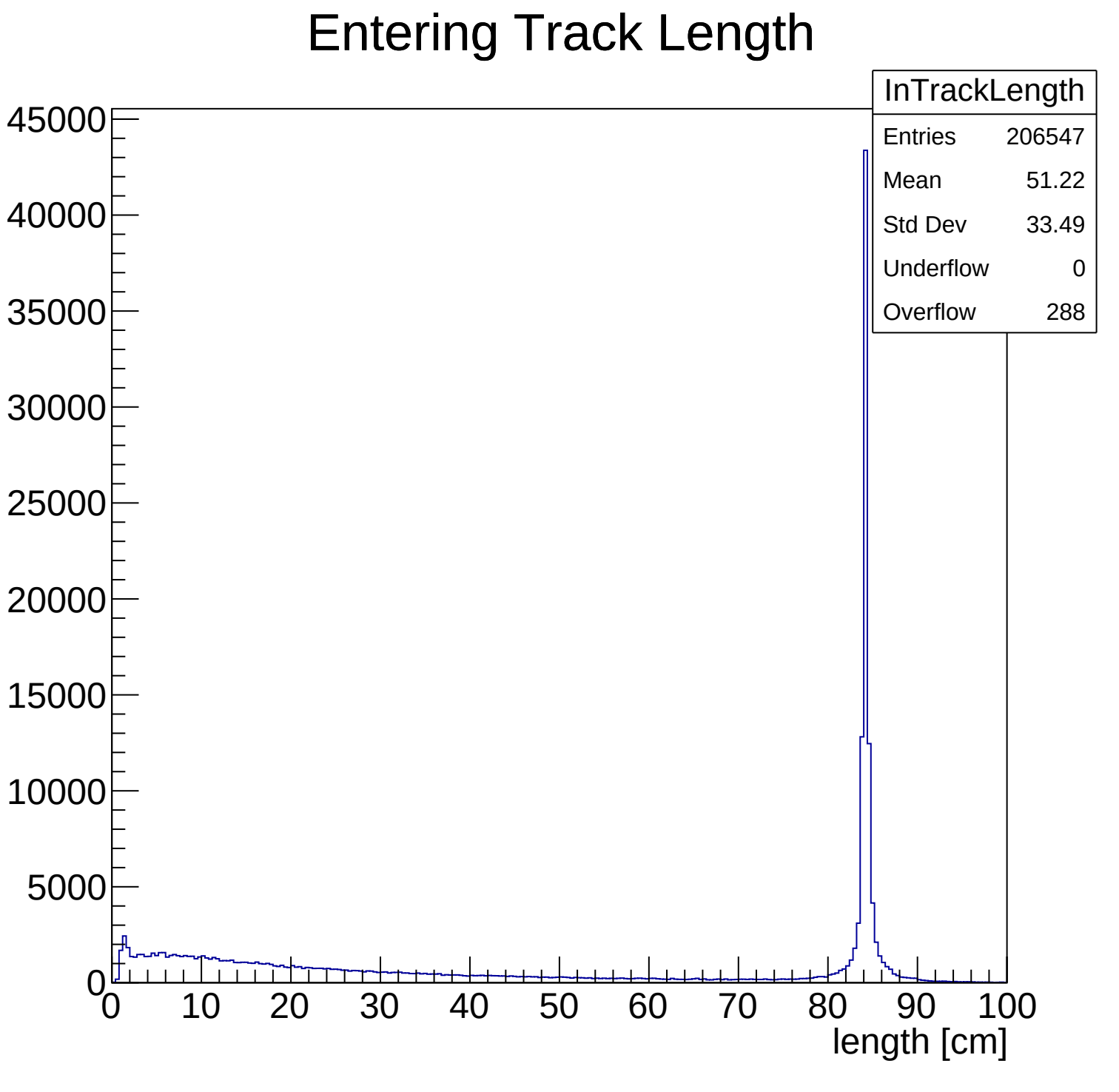

Initial KE
hreco_initialKE
Entries 60575
Mean 225
Std Dev 67.35
Underflow 0
Overflow 0
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0 100 200 300 400 500 600 700 800 900 1000
KE [MeV]

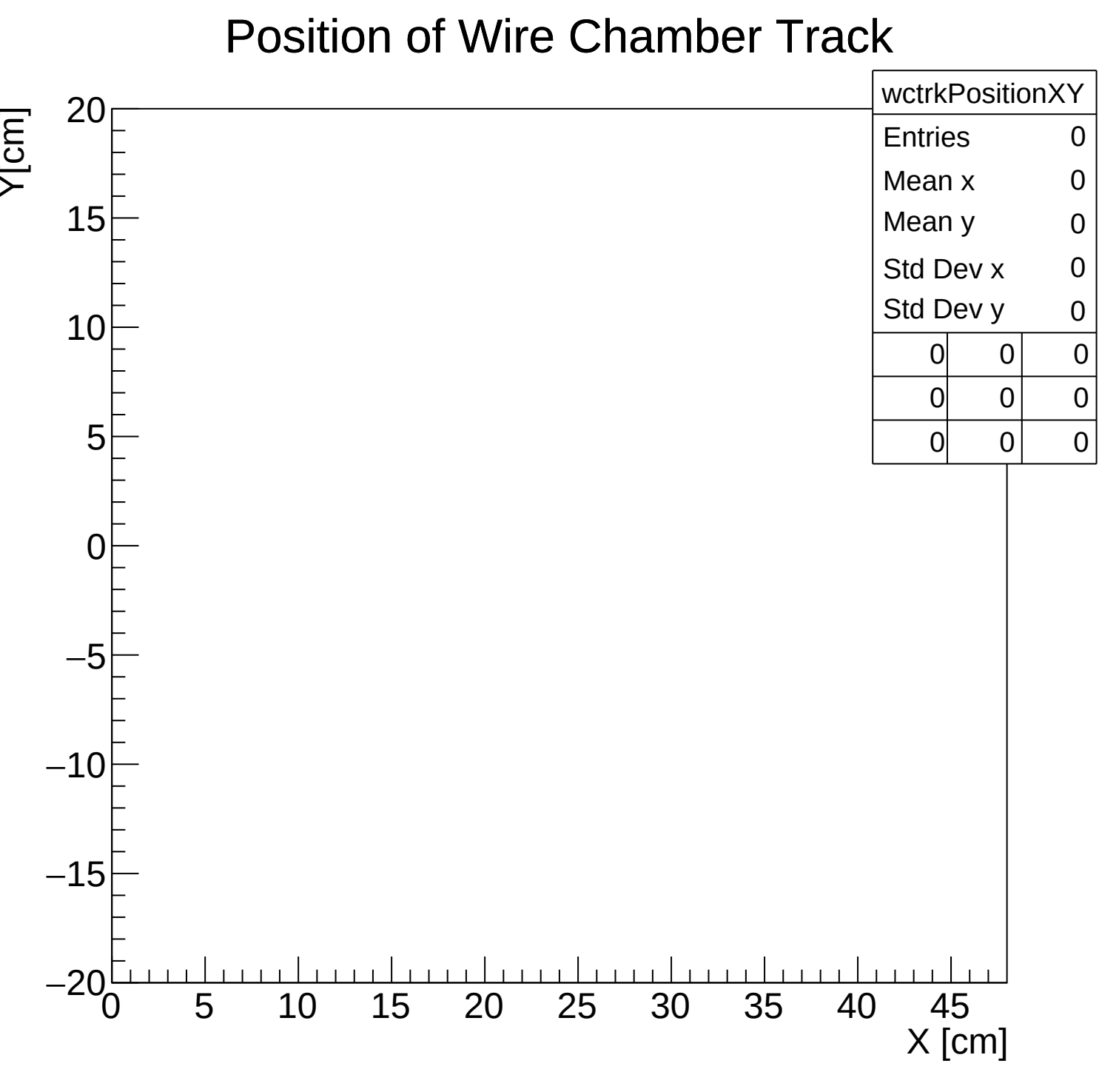

Incident KE
×10^3
600
500
400
300
200
100
0
0
100
200
300
400
500
600
700
800
900
1000
KE [MeV]
hreco_incke
Entries 2598161
Mean 172.2
Std Dev 83.88
Underflow 1.004e+05
Overflow 0

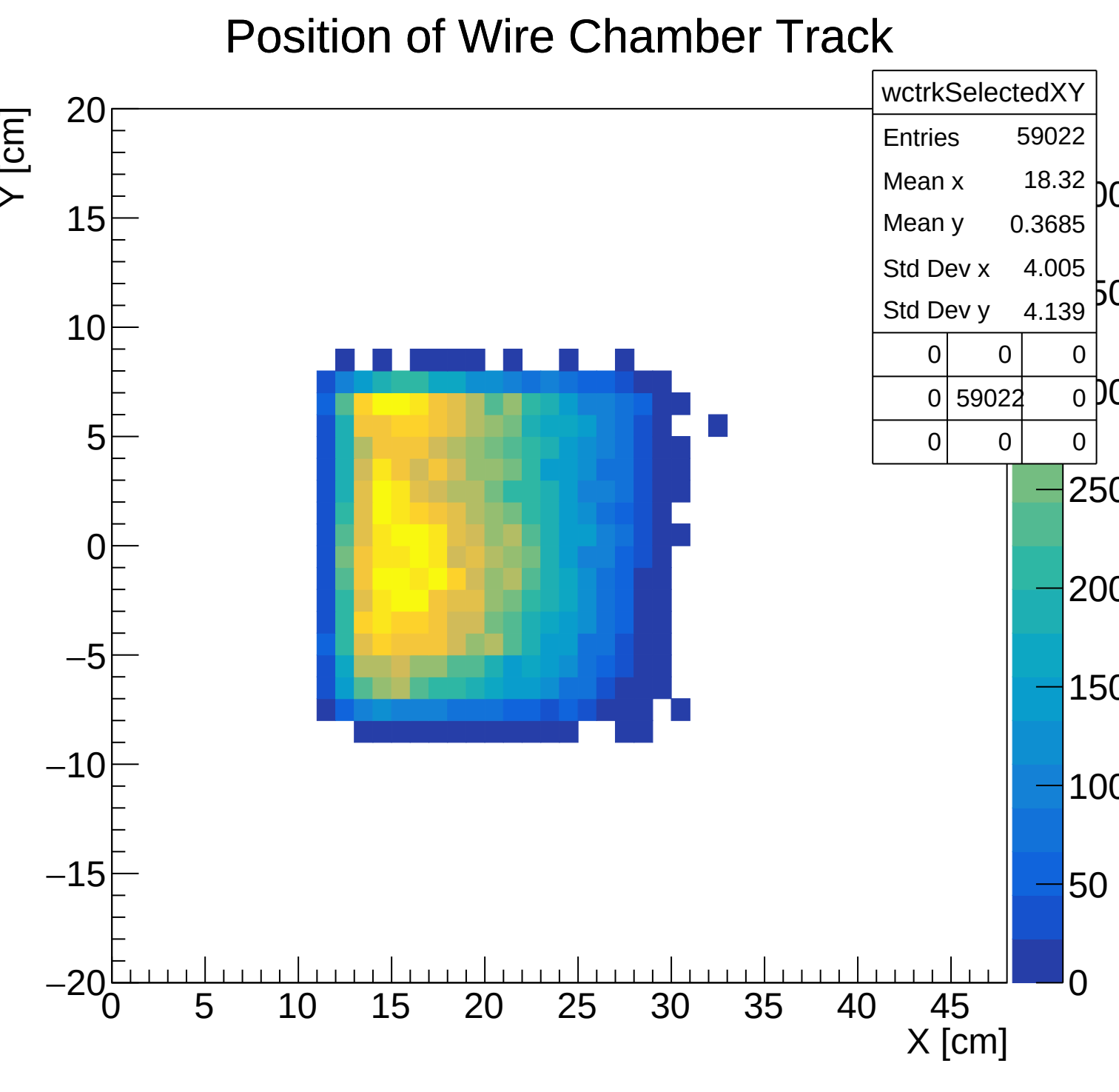

Interacting KE
hreco_intke
Entries 34172
Mean 107
Std Dev 77.62
Underflow 4931
Overflow 0
8000
7000
6000
5000
4000
3000
2000
1000
0
0 100 200 300 400 500 600 700 800 900 1000
KE [MeV]

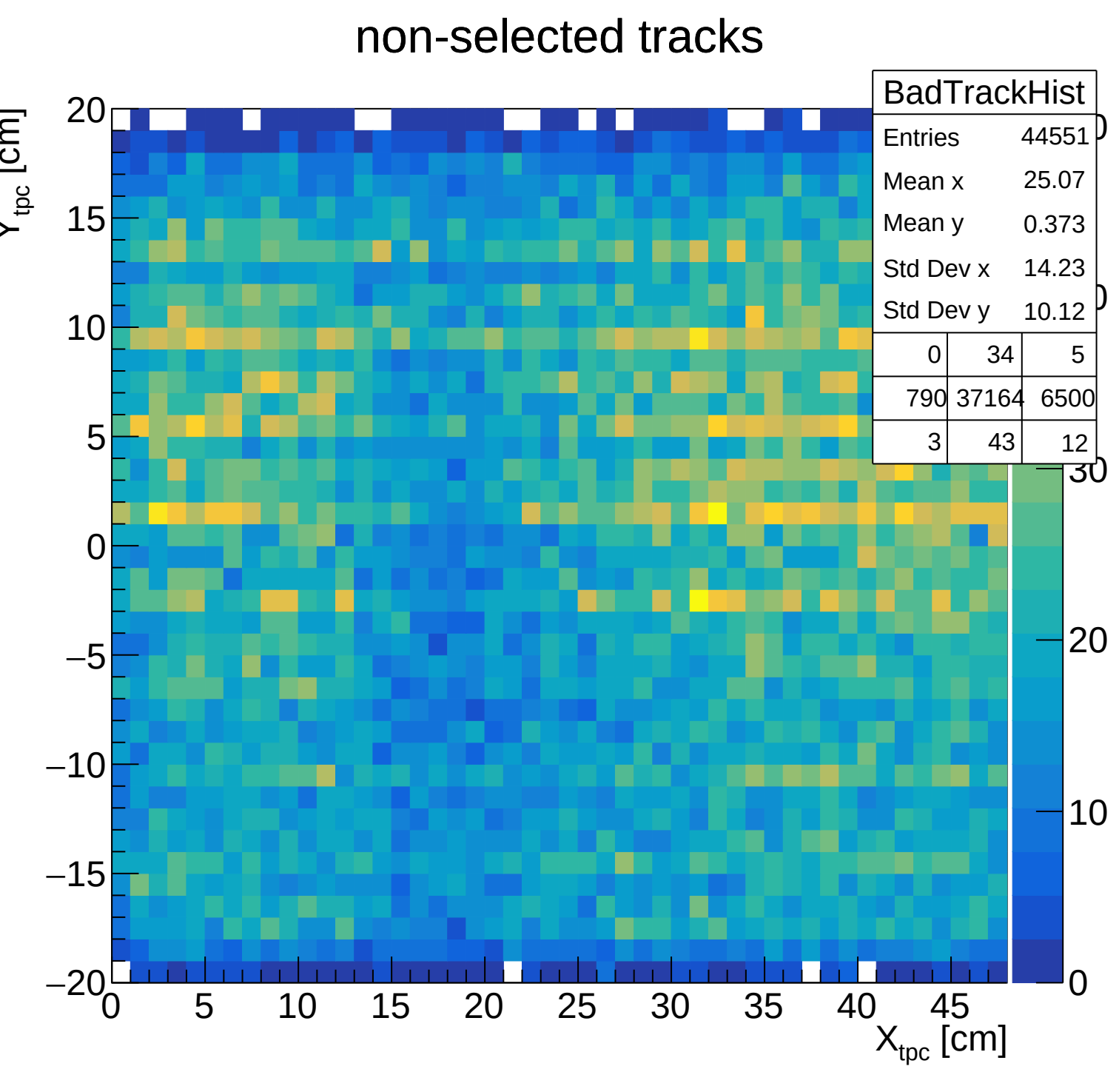

Position of TPC track start XY
tpcInTracksXY
Entries 206547
Mean x 22.57
Mean y 0.3101
Std Dev x 11.55
Std Dev y 8.759
24 456 60
6438 18138 1 17555
36 518 79
Y[cm]
X [cm]
20
15
10
5
0
−5
−10
−15
−20
0
5
10
15
20
25
30
35
40
45
300
200
100

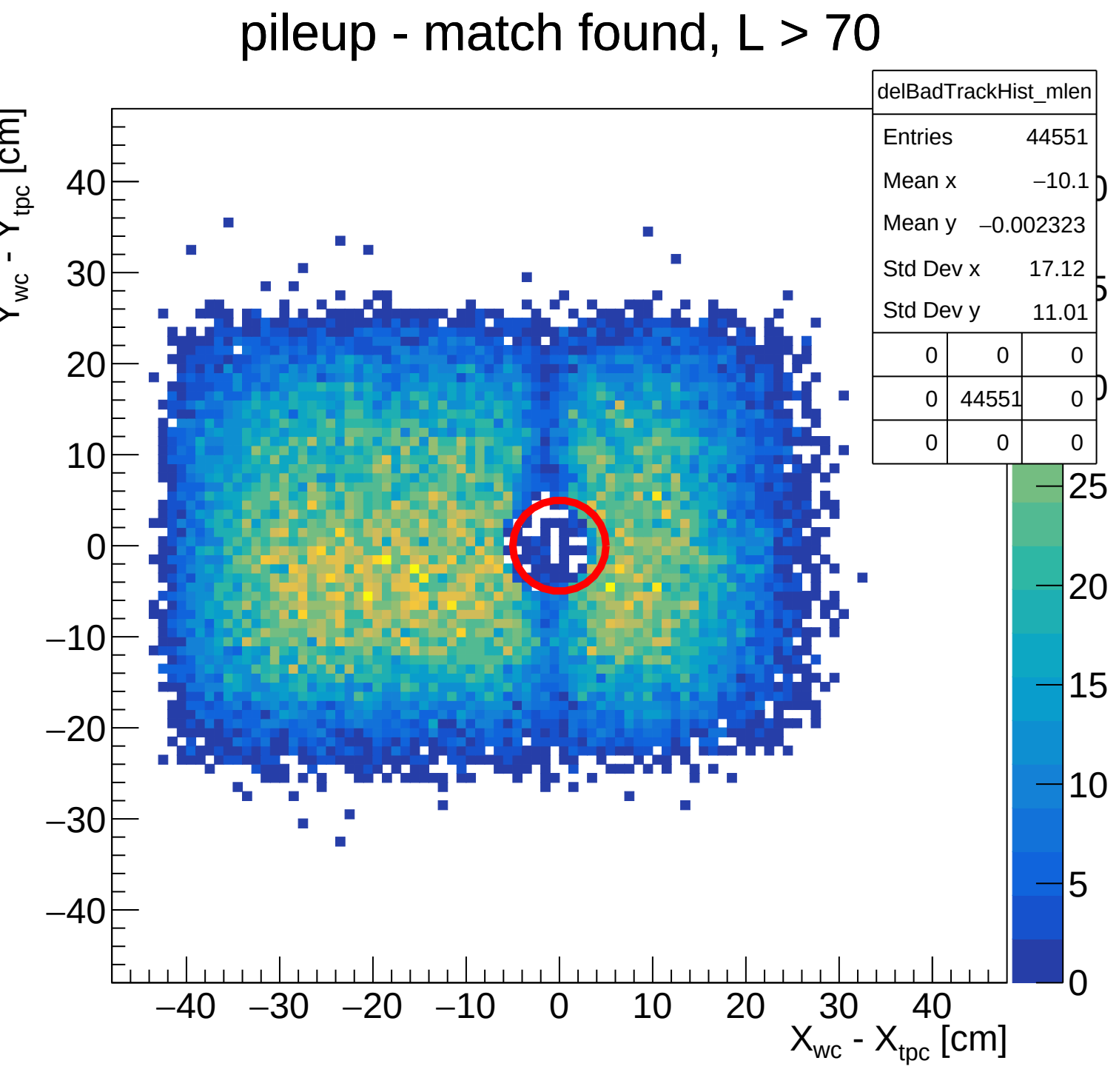

Position of TPC entering track start Z
×10^3
160
140
120
100
80
60
40
20
0
0
1
2
3
4
5
6
7
8
9
10
Z [cm]
tpcInTracksZ
Entries 206547
Mean 2.995
Std Dev 0.4291
Underflow 2717
Overflow 0

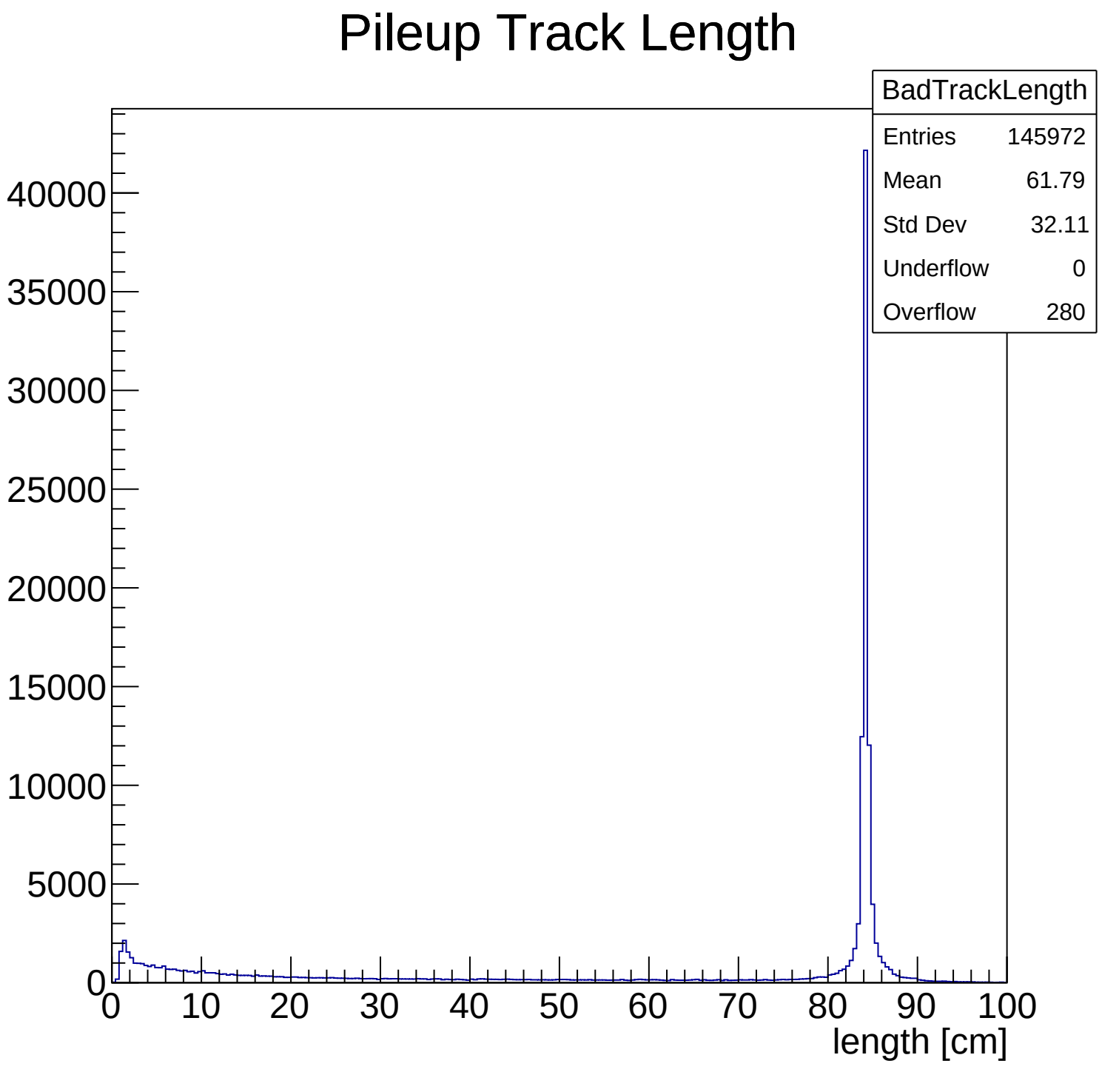

Entering Track Length
InTrackLength
Entries 206547
Mean 51.22
Std Dev 33.49
Underflow 0
Overflow 288
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0 10 20 30 40 50 60 70 80 90 100
length [cm]

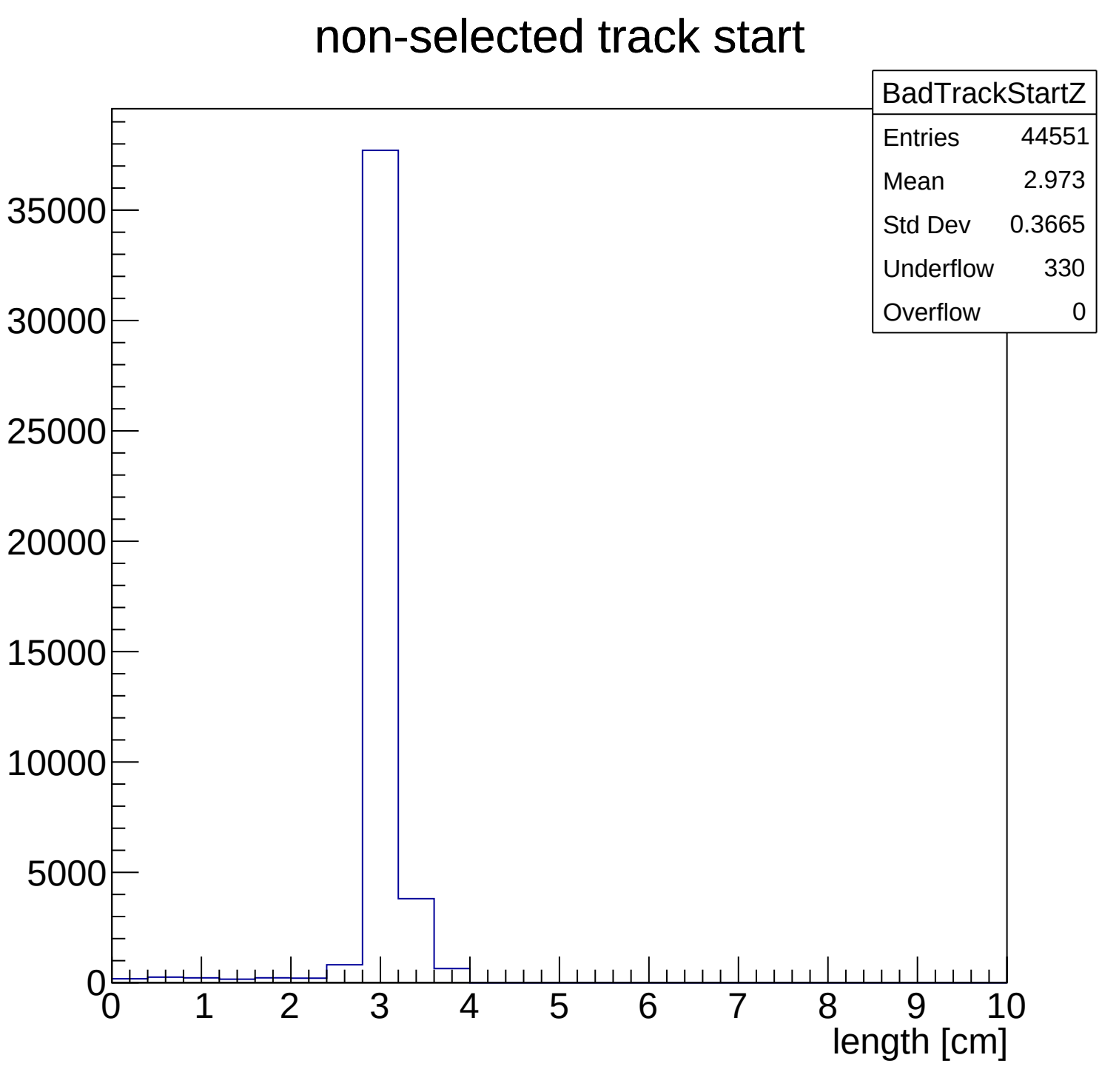

Position of Wire Chamber Track
wctrkPositionXY
Entries 0
Mean x 0
Mean y 0
Std Dev x 0
Std Dev y 0
0 0 0
0 0 0
0 0 0
Y[cm]
20
15
10
5
0
−5
−10
−15
−20
0
5
10
15
20
25
30
35
40
45
X [cm]

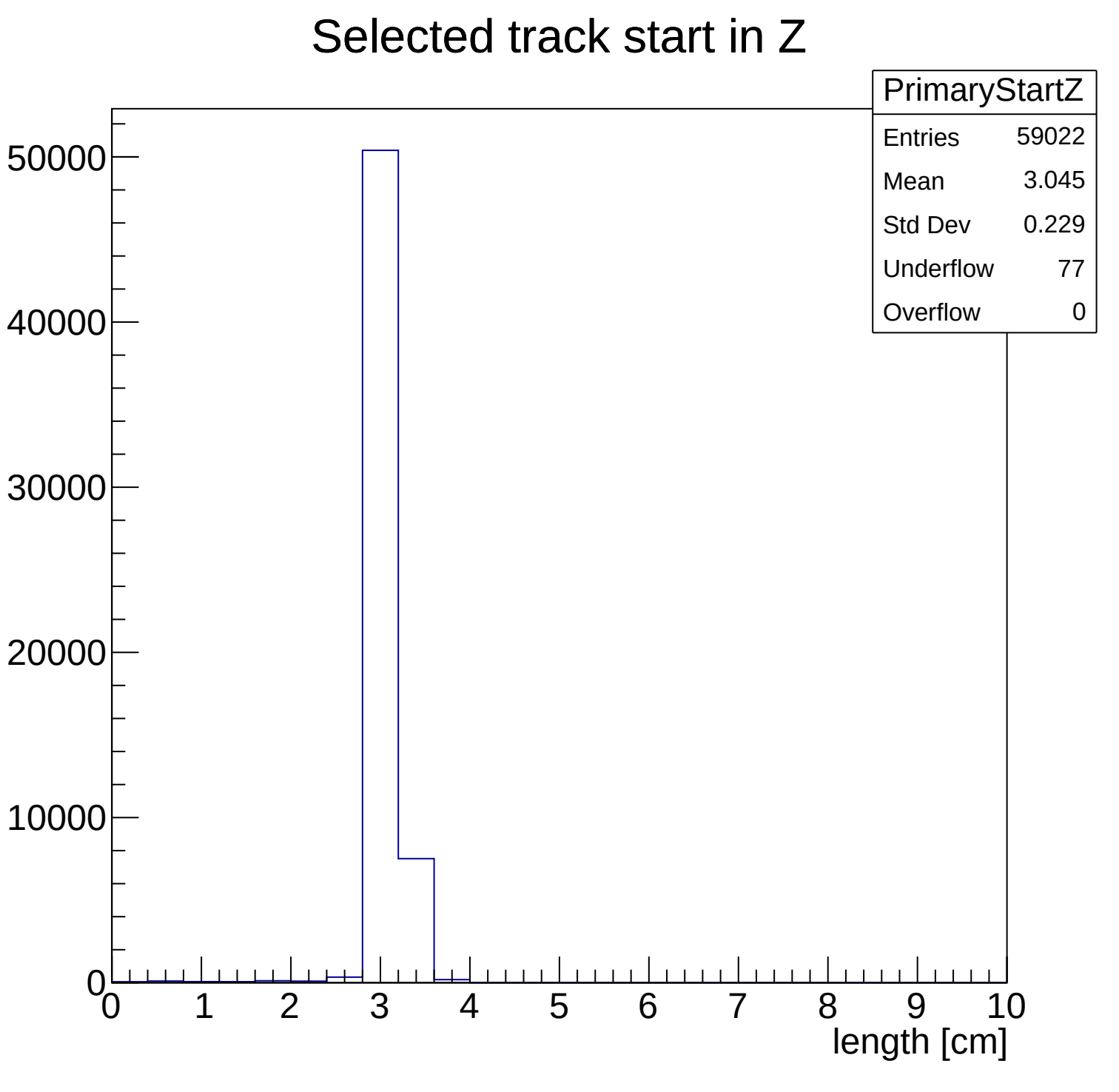

Position of Wire Chamber Track
wctrkSelectedXY
Entries 59022
Mean x 18.32
Mean y 0.3685
Std Dev x 4.005
Std Dev y 4.139
0 0 0
0 59022 0
0 0 0
Y [cm]
X [cm]
20
15
10
5
0
−5
−10
−15
−20
0
5
10
15
20
25
30
35
40
45
250
200
150
100
50
0

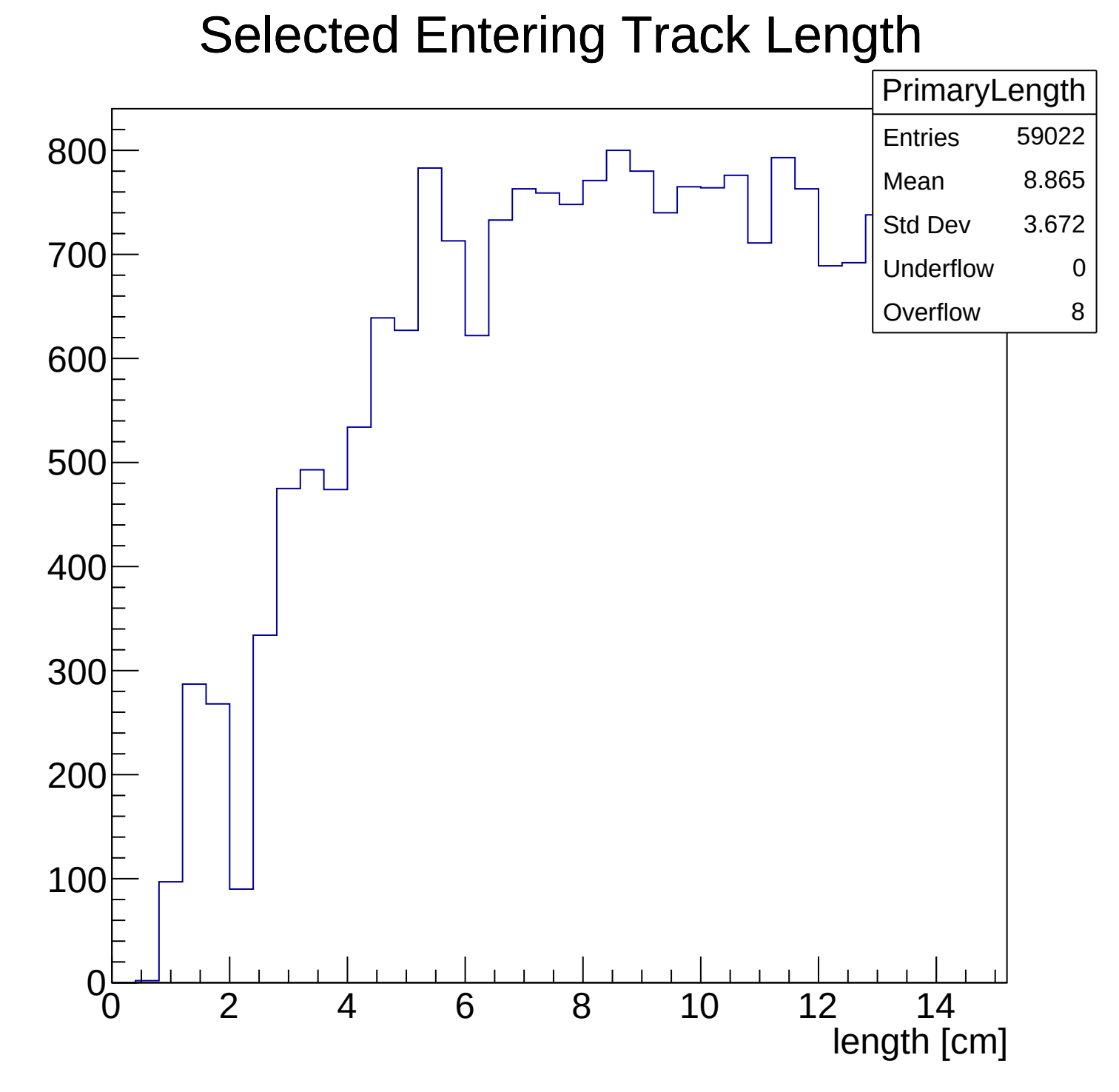

non-selected tracks
BadTrackHist
Entries 44551
Mean x 25.07
Mean y 0.373
Std Dev x 14.23
Std Dev y 10.12
0 34 5
790 37164 6500
3 43 12
Y_tpc [cm]
X_tpc [cm]
20
15
10
5
0
−5
−10
−15
−20
0
5
10
15
20
25
30
35
40
45
30
20
10
0

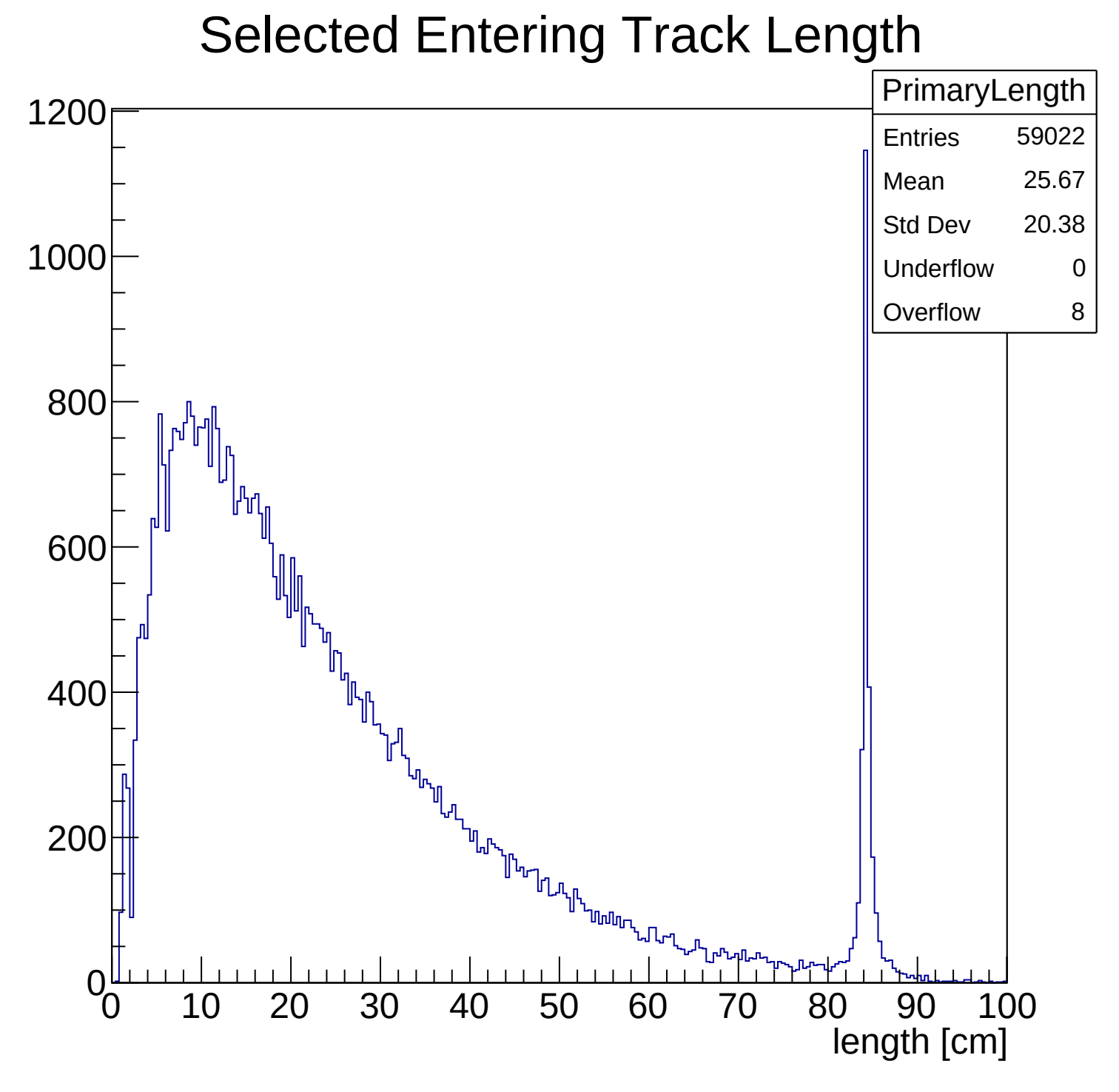

pileup - match found, L > 70
delBadTrackHist_mlen
Entries 44551
Mean x −10.1
Mean y −0.002323
Std Dev x 17.12
Std Dev y 11.01
0 0 0
0 44551 0
0 0 0
Y_wc - Y_tpc [cm]
X_wc - X_tpc [cm]
40
30
20
10
0
−10
−20
−30
−40
25
20
15
10
5
0


Pileup Track Length
BadTrackLength
Entries 145972
Mean 61.79
Std Dev 32.11
Underflow 0
Overflow 280
40000
35000
30000
25000
20000
15000
10000
5000
0
0
10
20
30
40
50
60
70
80
90
100
length [cm]

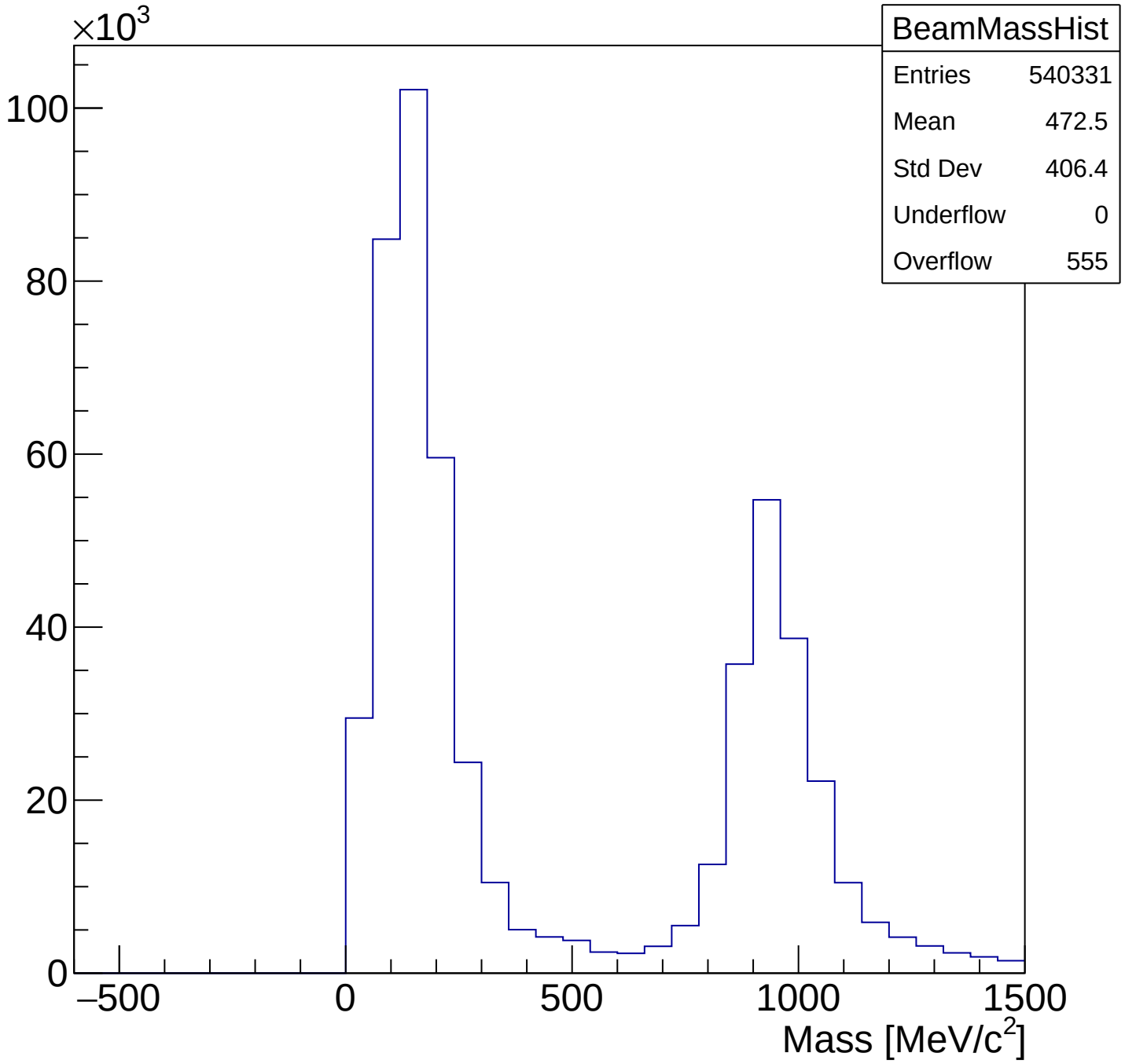

non-selected track start
BadTrackStartZ
Entries 44551
Mean 2.973
Std Dev 0.3665
Underflow 330
Overflow 0
35000
30000
25000
20000
15000
10000
5000
0
0 1 2 3 4 5 6 7 8 9 10
length [cm]

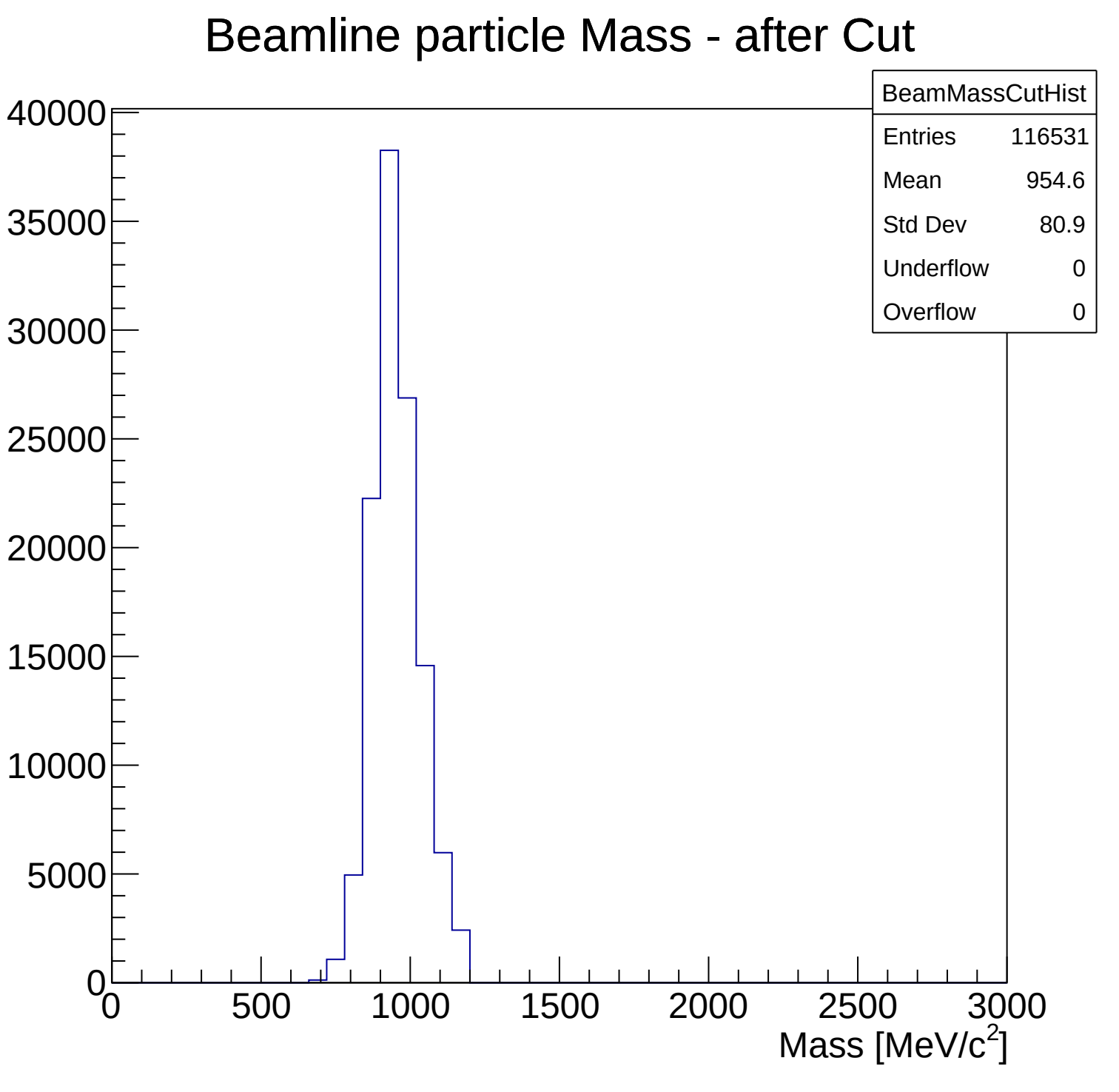

Selected track start in Z
PrimaryStartZ
Entries 59022
Mean 3.045
Std Dev 0.229
Underflow 77
Overflow 0
50000
40000
30000
20000
10000
0
0 1 2 3 4 5 6 7 8 9 10
length [cm]

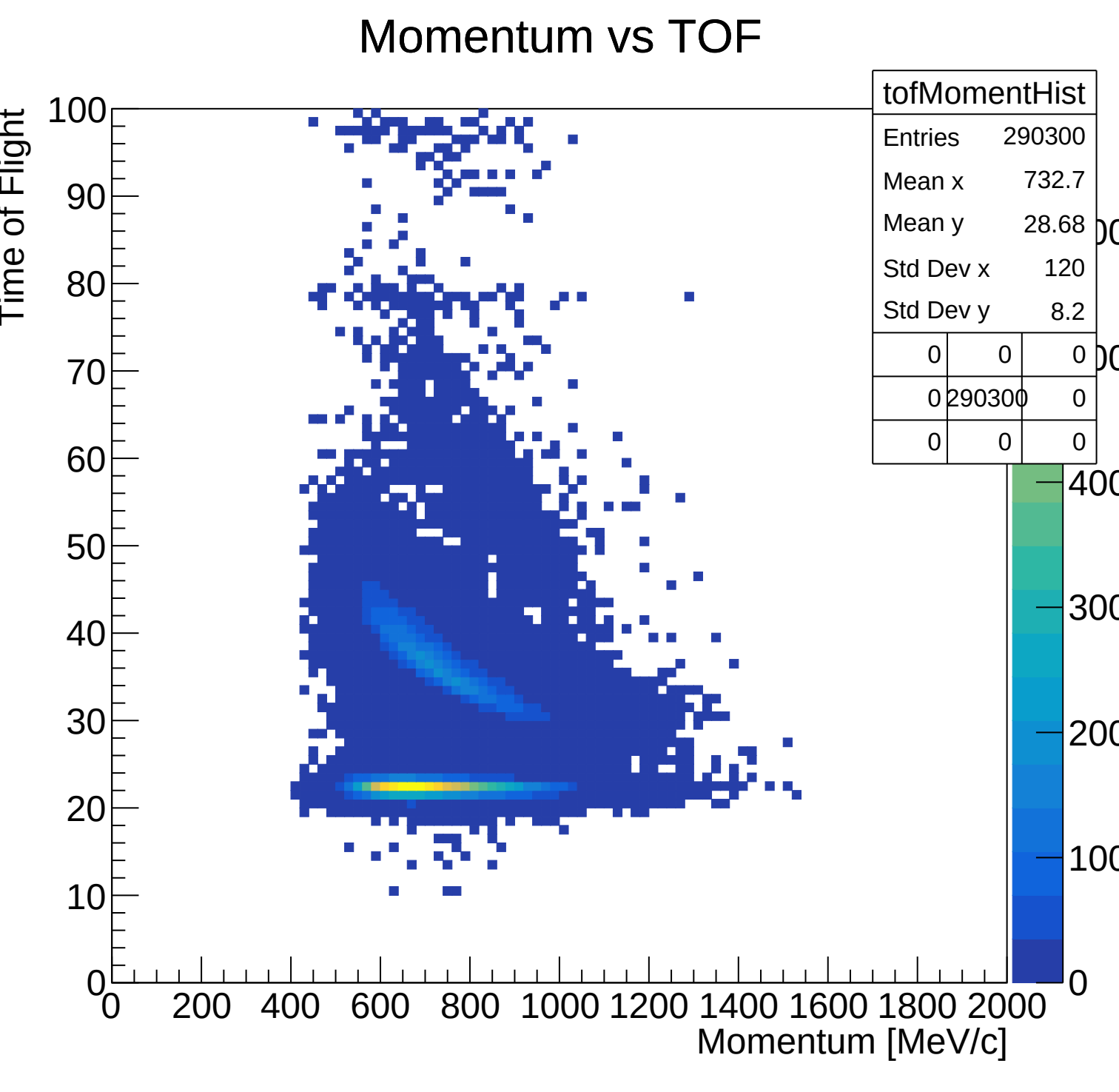

Selected Entering Track Length
PrimaryLength
Entries 59022
Mean 8.865
Std Dev 3.672
Underflow 0
Overflow 8
800
700
600
500
400
300
200
100
0
0
2
4
6
8
10
12
14
length [cm]

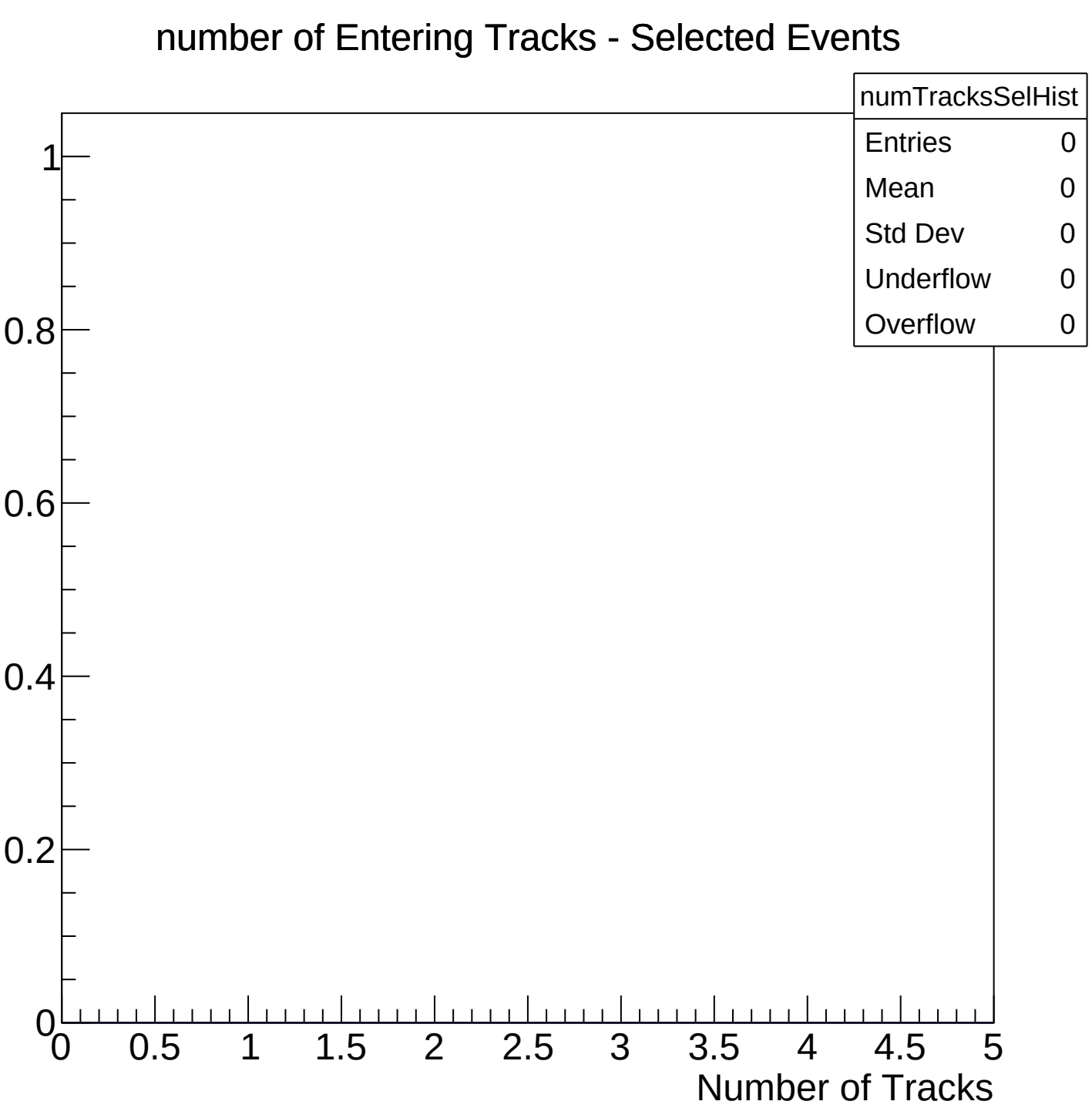

Selected Entering Track Length
PrimaryLength
Entries 59022
Mean 25.67
Std Dev 20.38
Underflow 0
Overflow 8
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
length [cm]

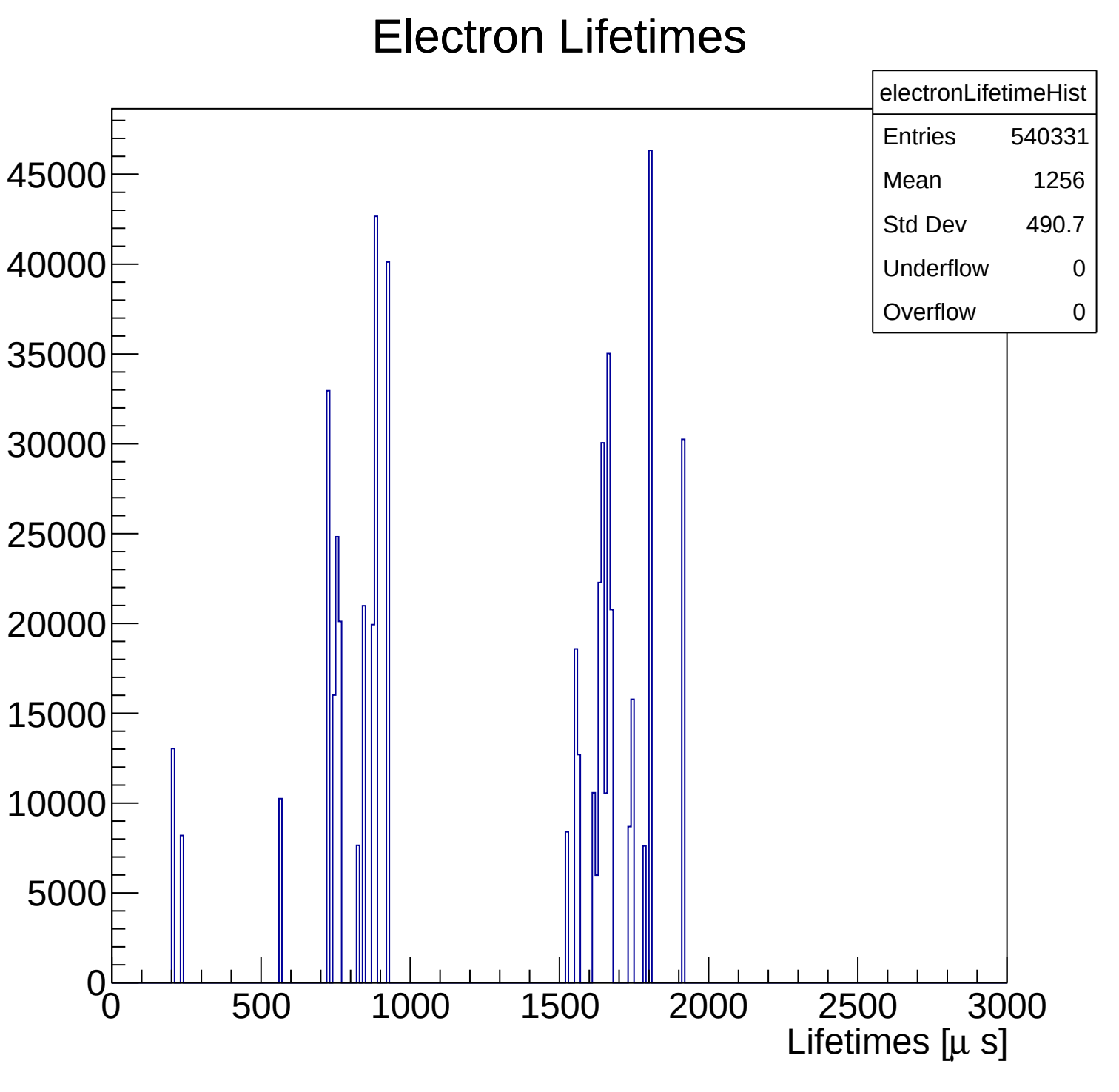
Beamline particle Mass



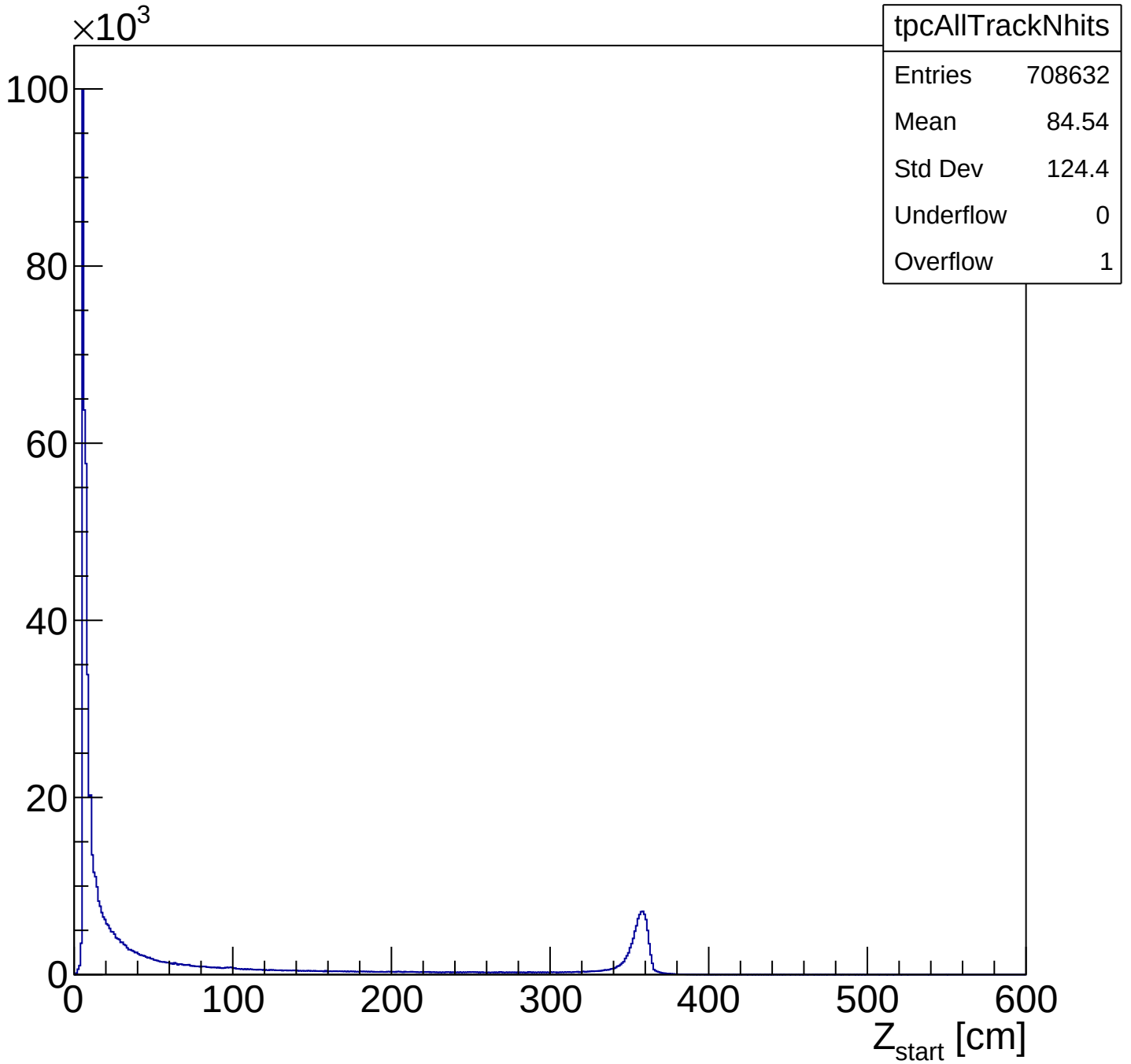

Beamline particle Mass - after Cut
BeamMassCutHist
Entries 116531
Mean 954.6
Std Dev 80.9
Underflow 0
Overflow 0
40000
35000
30000
25000
20000
15000
10000
5000
0
0
500
1000
1500
2000
2500
3000
Mass [MeV/c^2]


Momentum vs TOF
tofMomentHist
Entries 290300
Mean x 732.7
Mean y 28.68
Std Dev x 120
Std Dev y 8.2
0 0 0
0 290300 0
0 0 0
Time of Flight
Momentum [MeV/c]
0 200 400 600 800 1000 1200 1400 1600 1800 2000
0 10 20 30 40 50 60 70 80 90 100
0 100 200 300 400

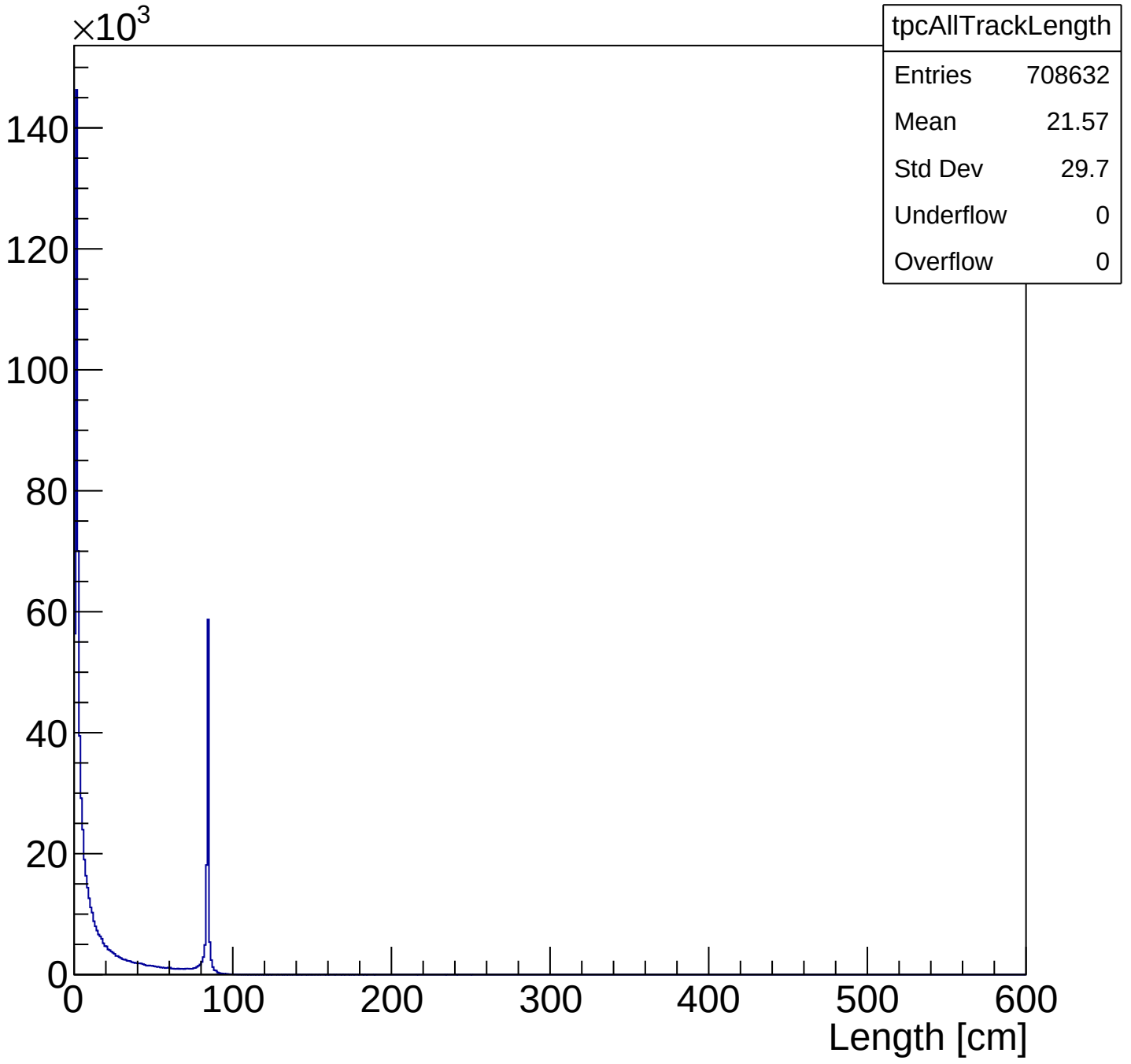

number of Entering Tracks - Selected Events
numTracksSelHist
Entries 0
Mean 0
Std Dev 0
Underflow 0
Overflow 0
1
0.8
0.6
0.4
0.2
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
Number of Tracks

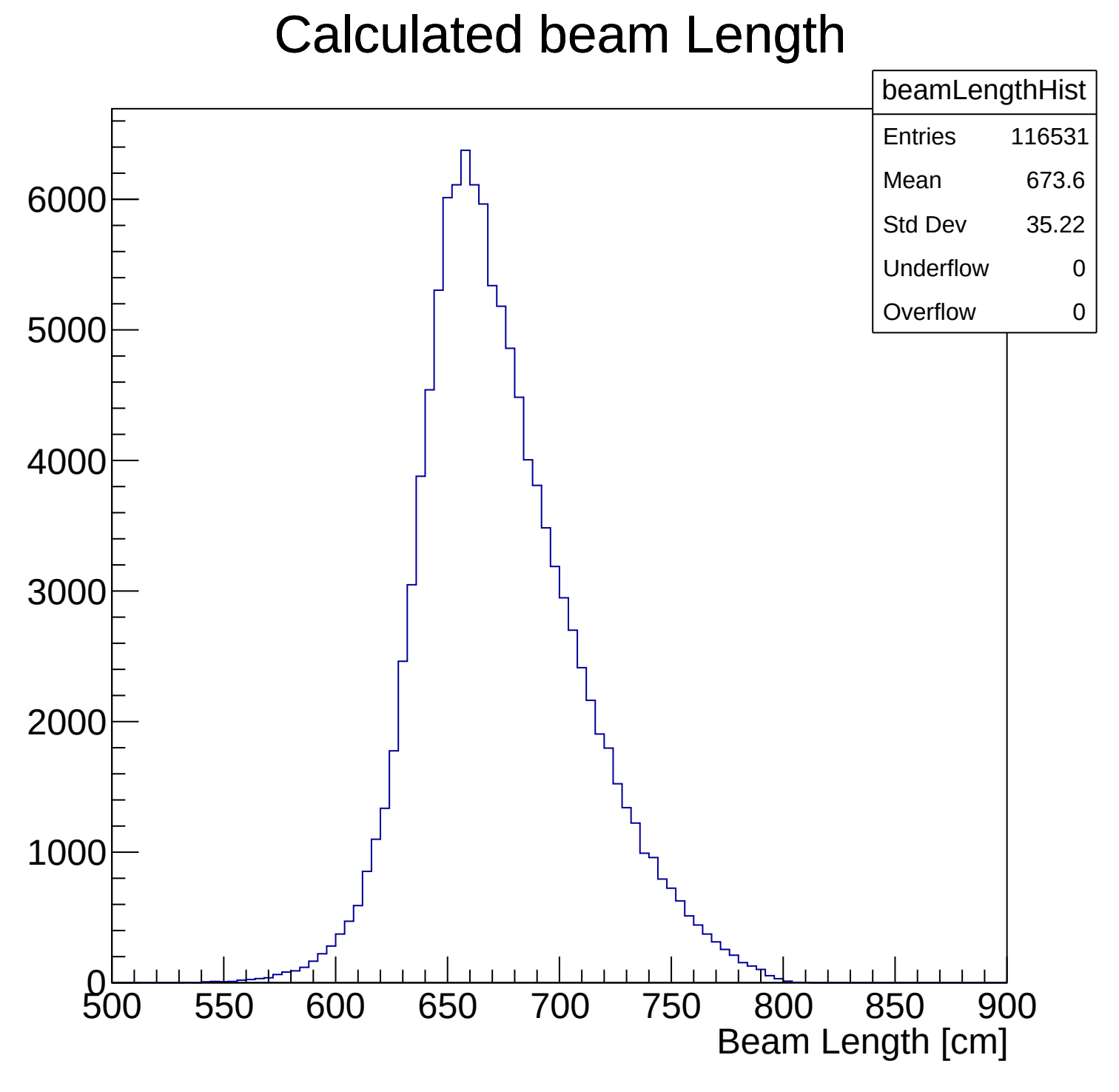

Electron Lifetimes
electronLifetimeHist
Entries 540331
Mean 1256
Std Dev 490.7
Underflow 0
Overflow 0
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
500
1000
1500
2000
2500
3000
Lifetimes [μ s]

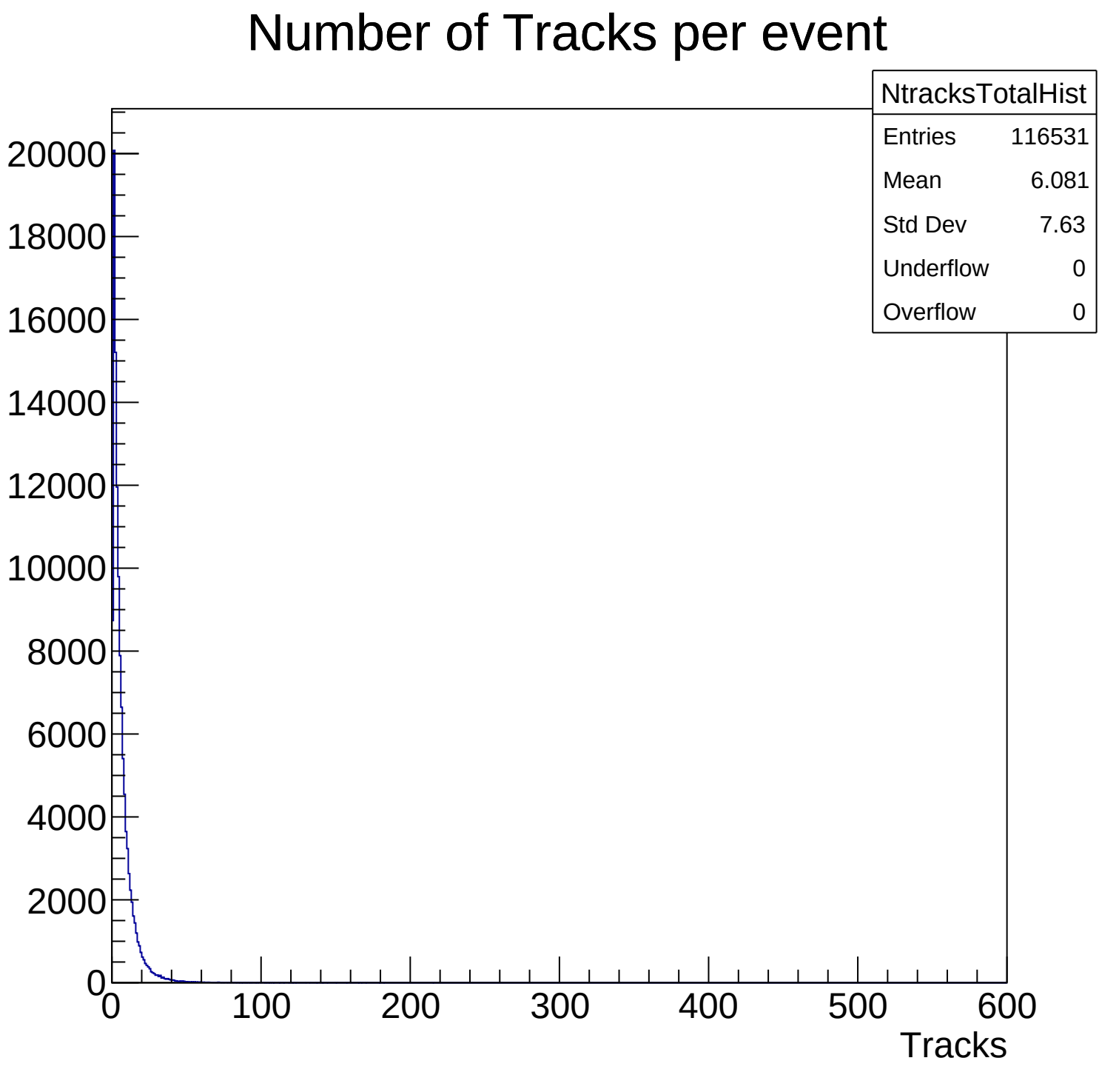
Number of Hits per Track

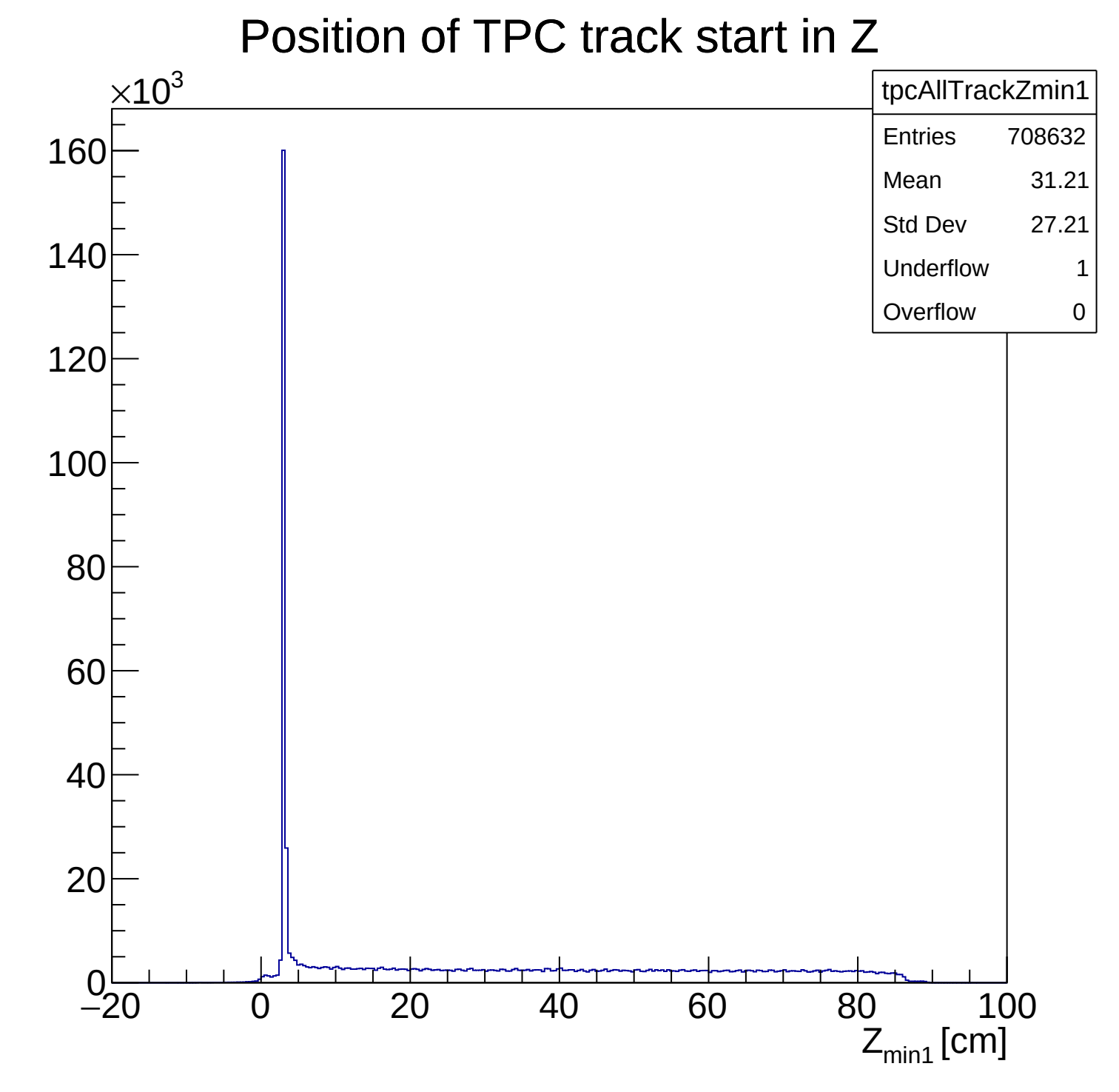


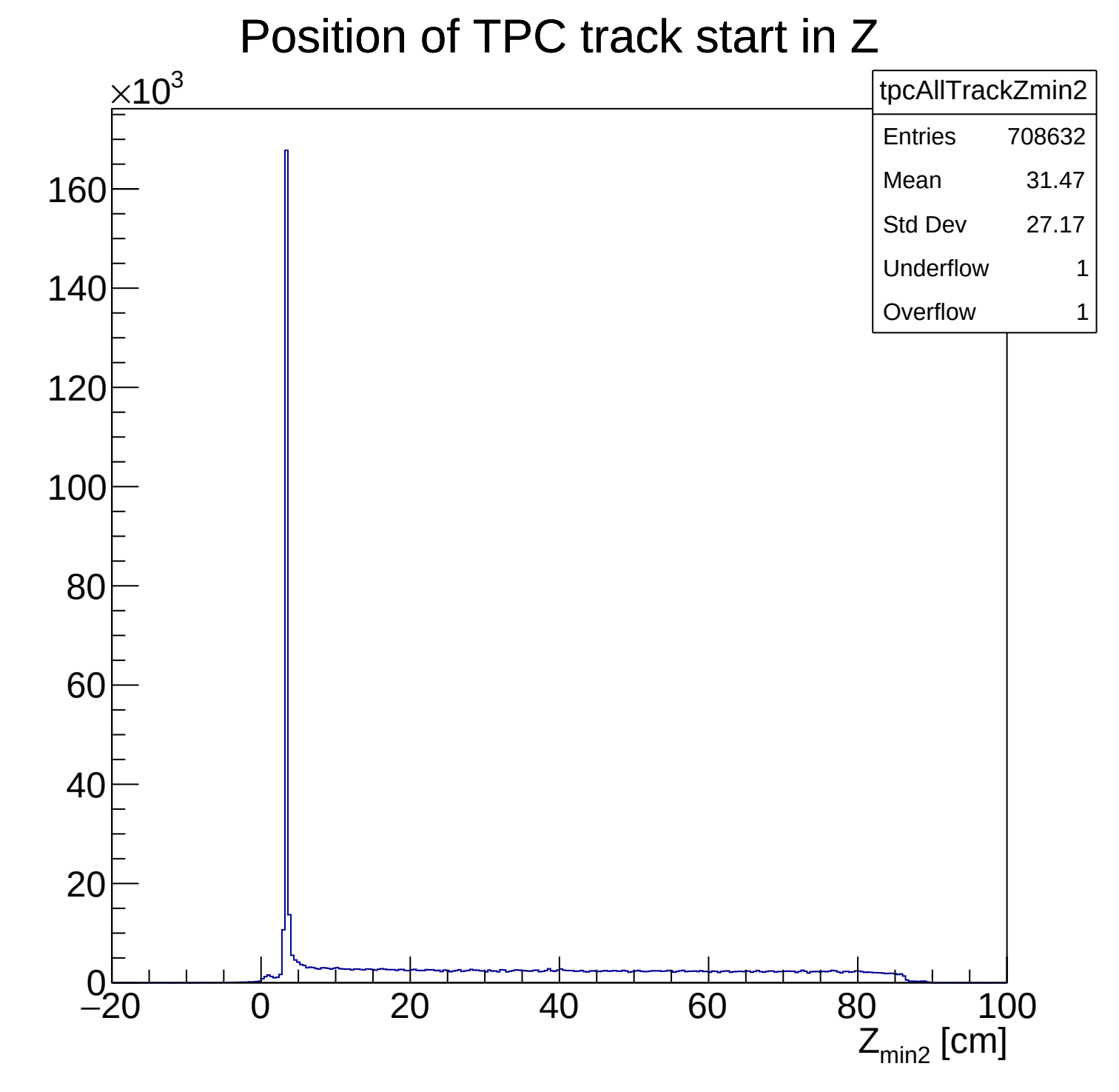
Length of All Tracks

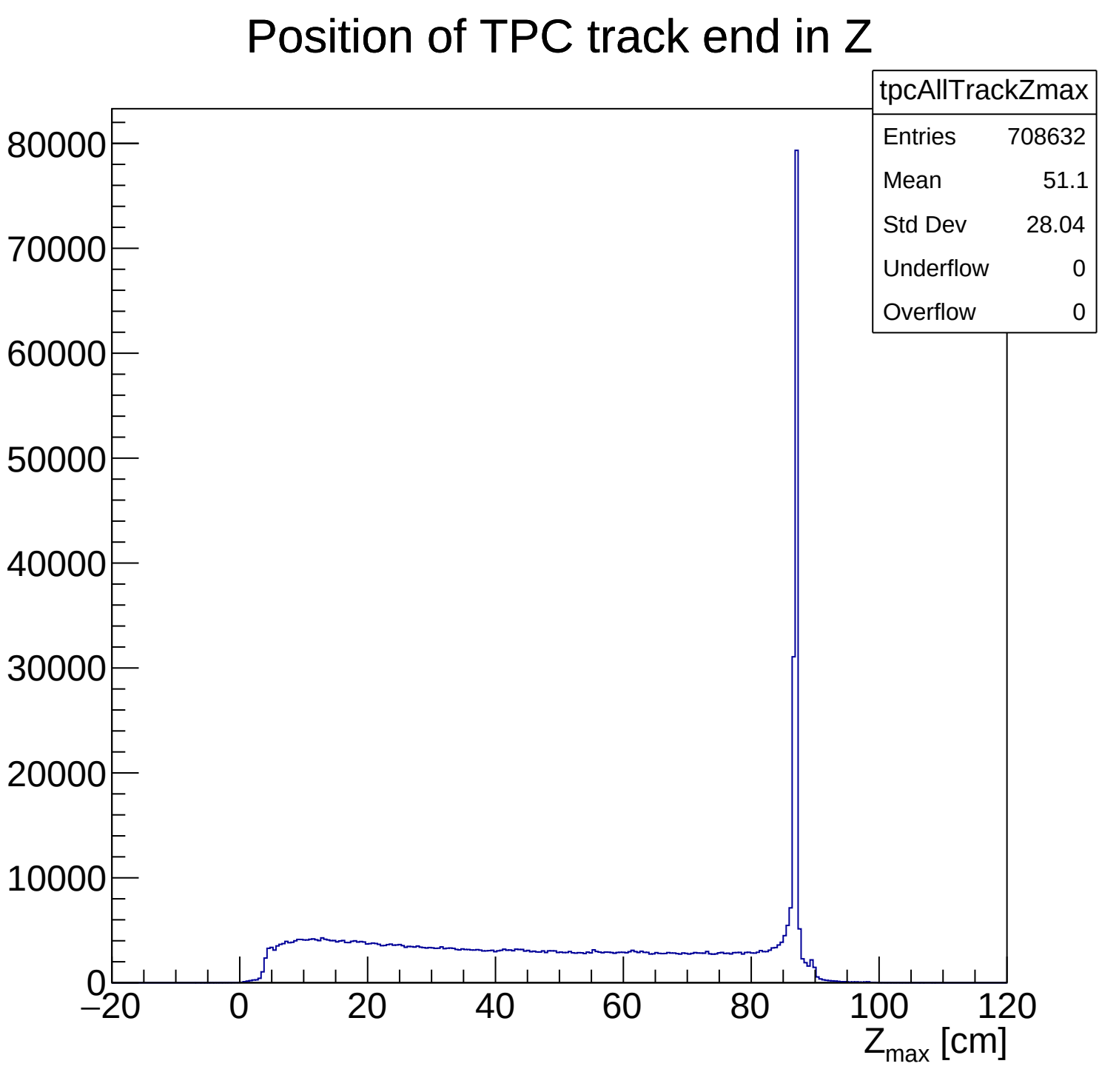


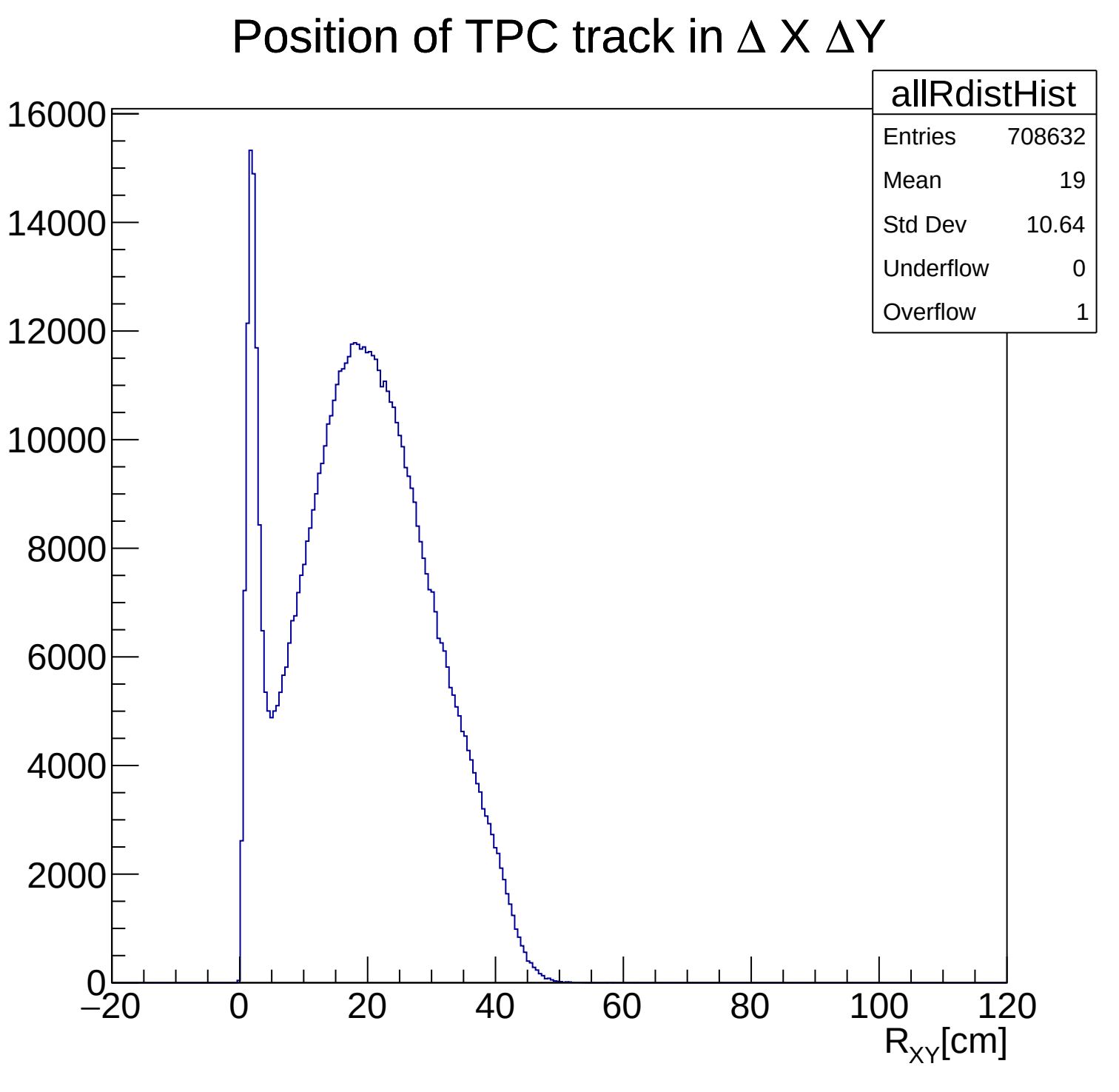

Calculated beam Length
beamLengthHist
Entries 116531
Mean 673.6
Std Dev 35.22
Underflow 0
Overflow 0
6000
5000
4000
3000
2000
1000
0
500
550
600
650
700
750
800
850
900
Beam Length [cm]


Number of Tracks per event
NtracksTotalHist
Entries 116531
Mean 6.081
Std Dev 7.63
Underflow 0
Overflow 0
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0
100
200
300
400
500
600
Tracks

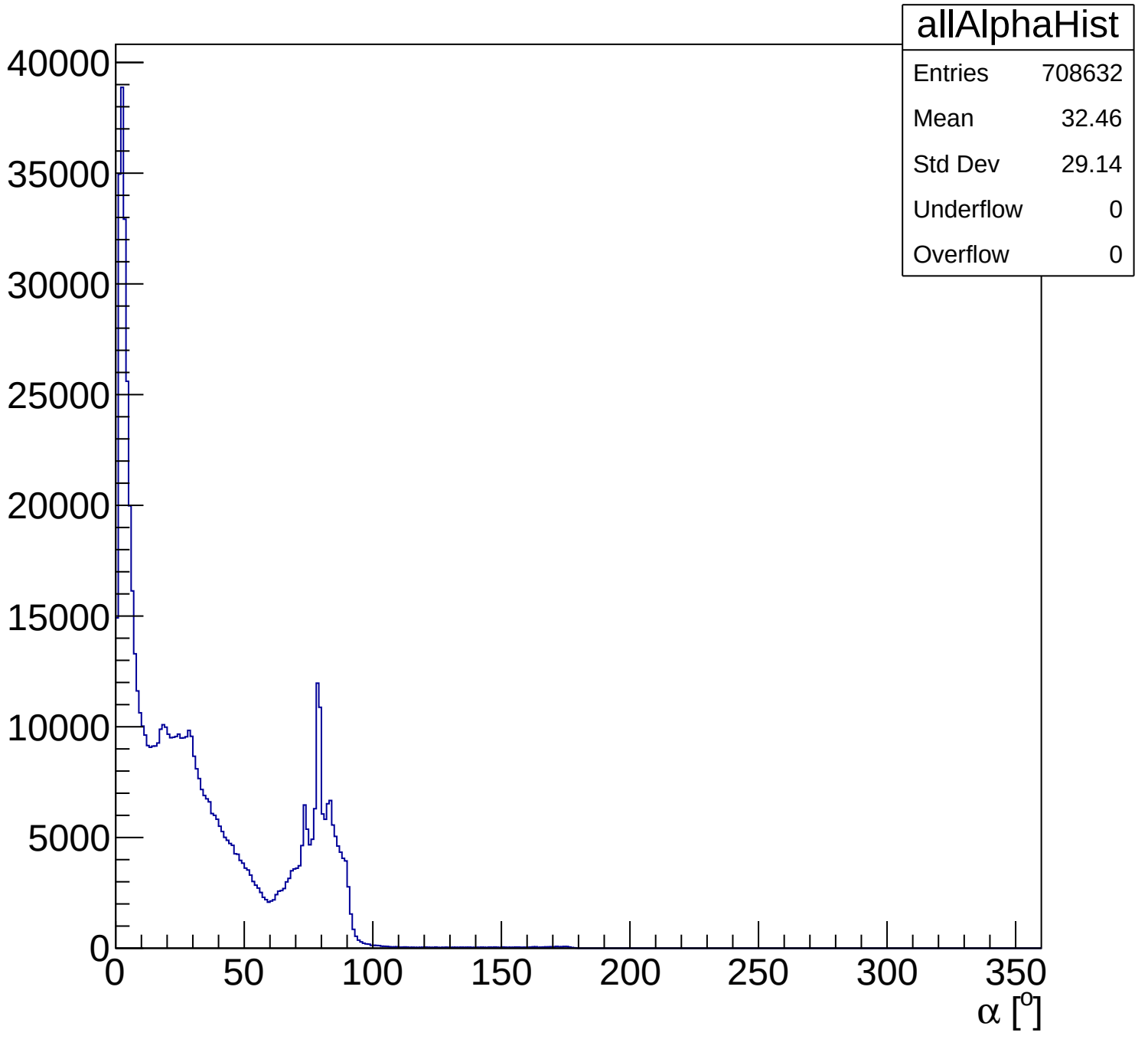

Position of TPC track start in Z
×10^3
160
140
120
100
80
60
40
20
0
−20
0
20
40
60
80
100
Z_min1 [cm]
tpcAllTrackZmin1
Entries 708632
Mean 31.21
Std Dev 27.21
Underflow 1
Overflow 0

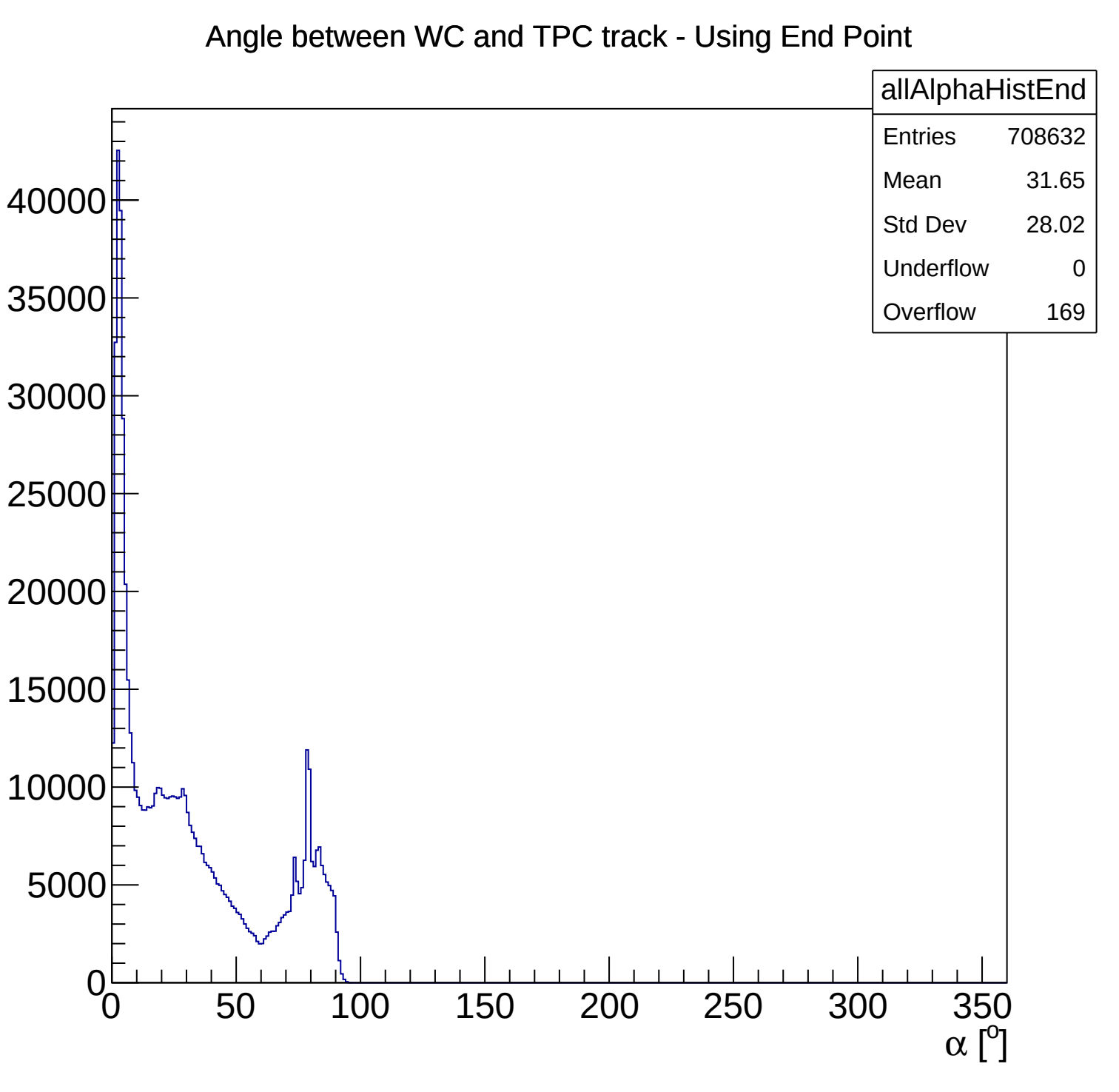

Position of TPC track start in Z
×10^3
tpcAllTrackZmin2
Entries 708632
Mean 31.47
Std Dev 27.17
Underflow 1
Overflow 1
160
140
120
100
80
60
40
20
0
−20
0
20
40
60
80
100
Z_min2 [cm]

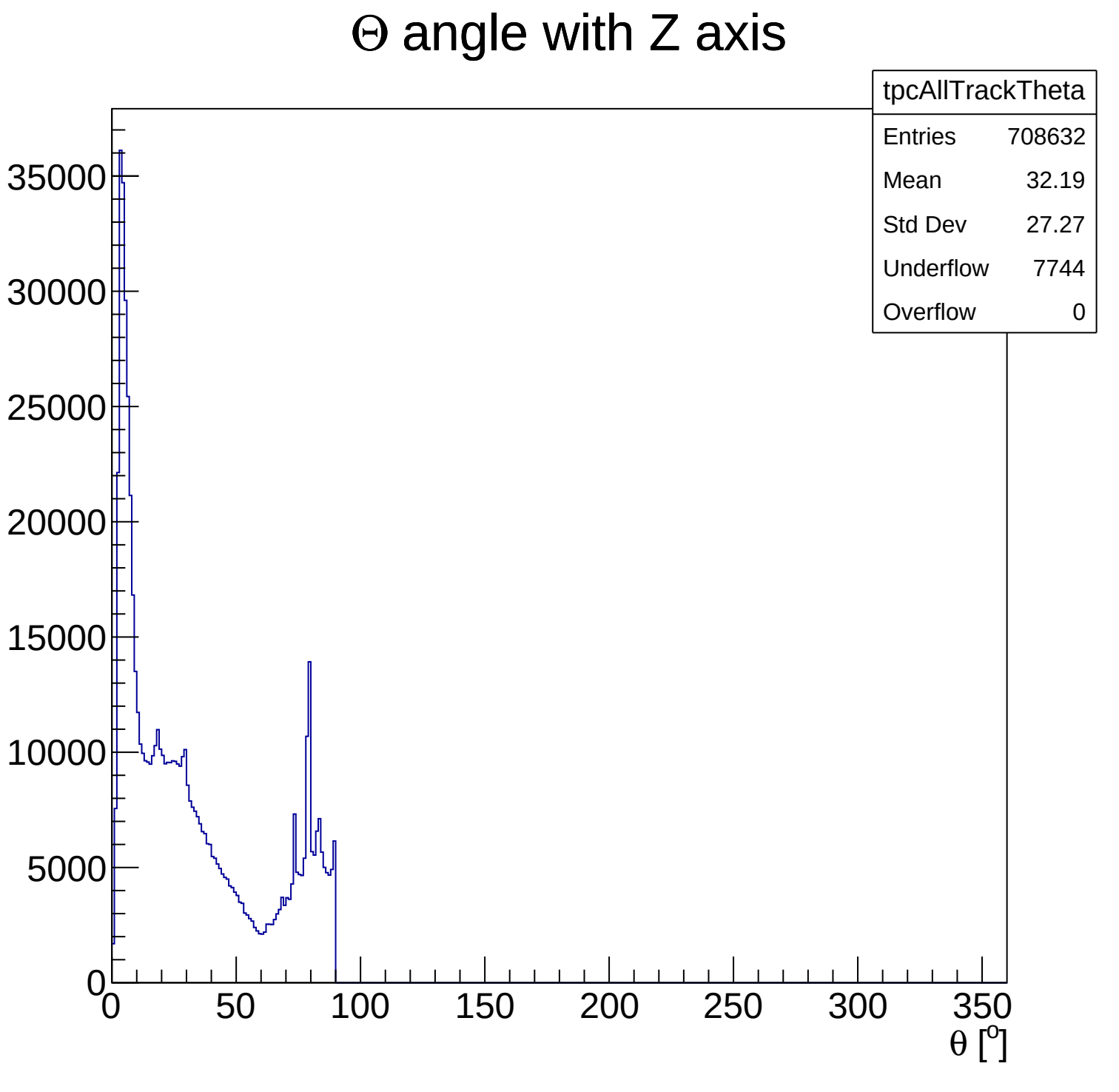

Position of TPC track end in Z
tpcAllTrackZmax
Entries 708632
Mean 51.1
Std Dev 28.04
Underflow 0
Overflow 0
80000
70000
60000
50000
40000
30000
20000
10000
0
−20
0
20
40
60
80
100
120
Z_{max} [cm]

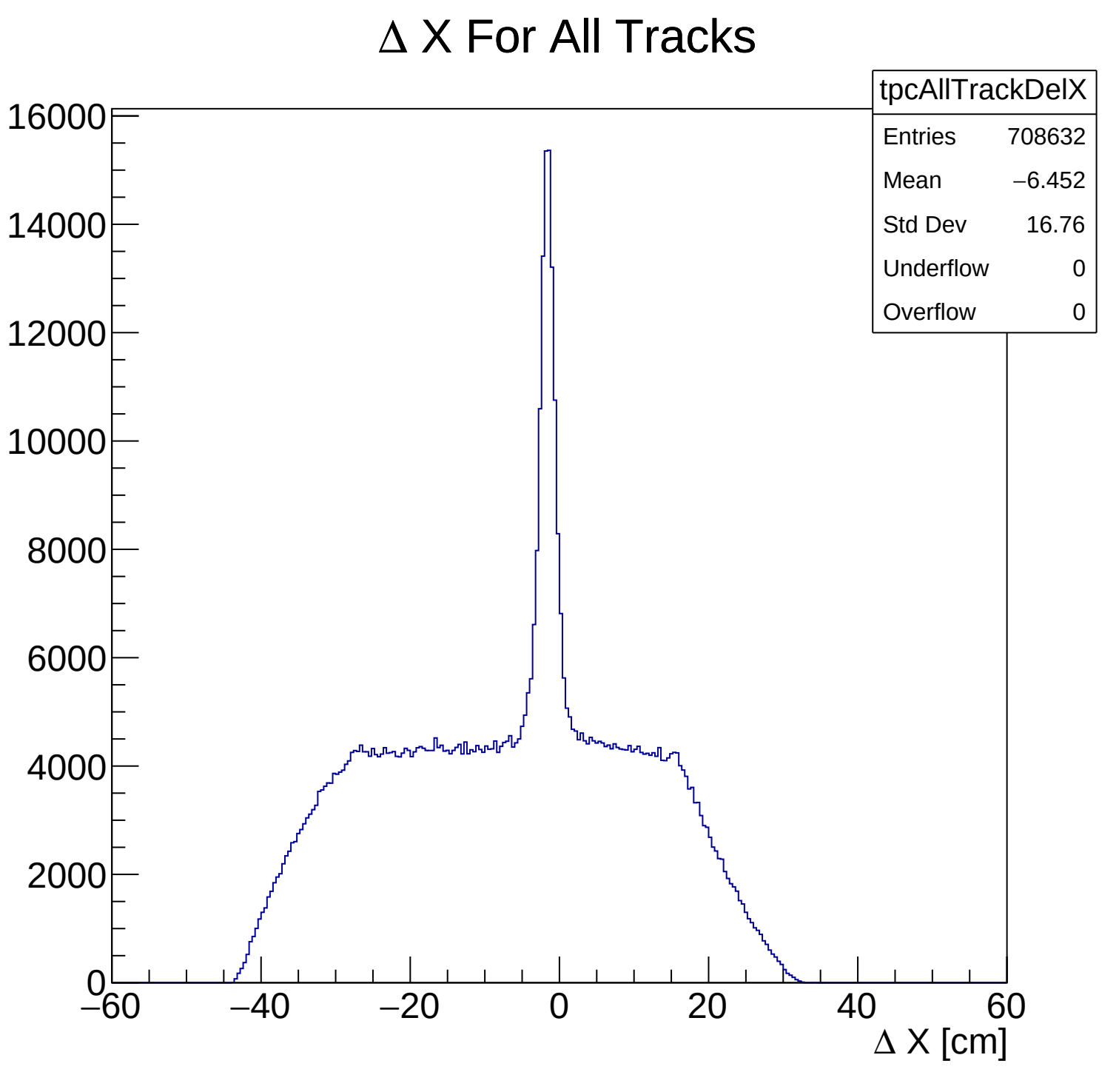

Position of TPC track in Δ X ΔY
allRdistHist
Entries 708632
Mean 19
Std Dev 10.64
Underflow 0
Overflow 1
16000
14000
12000
10000
8000
6000
4000
2000
0
−20
0
20
40
60
80
100
120
R_XY[cm]

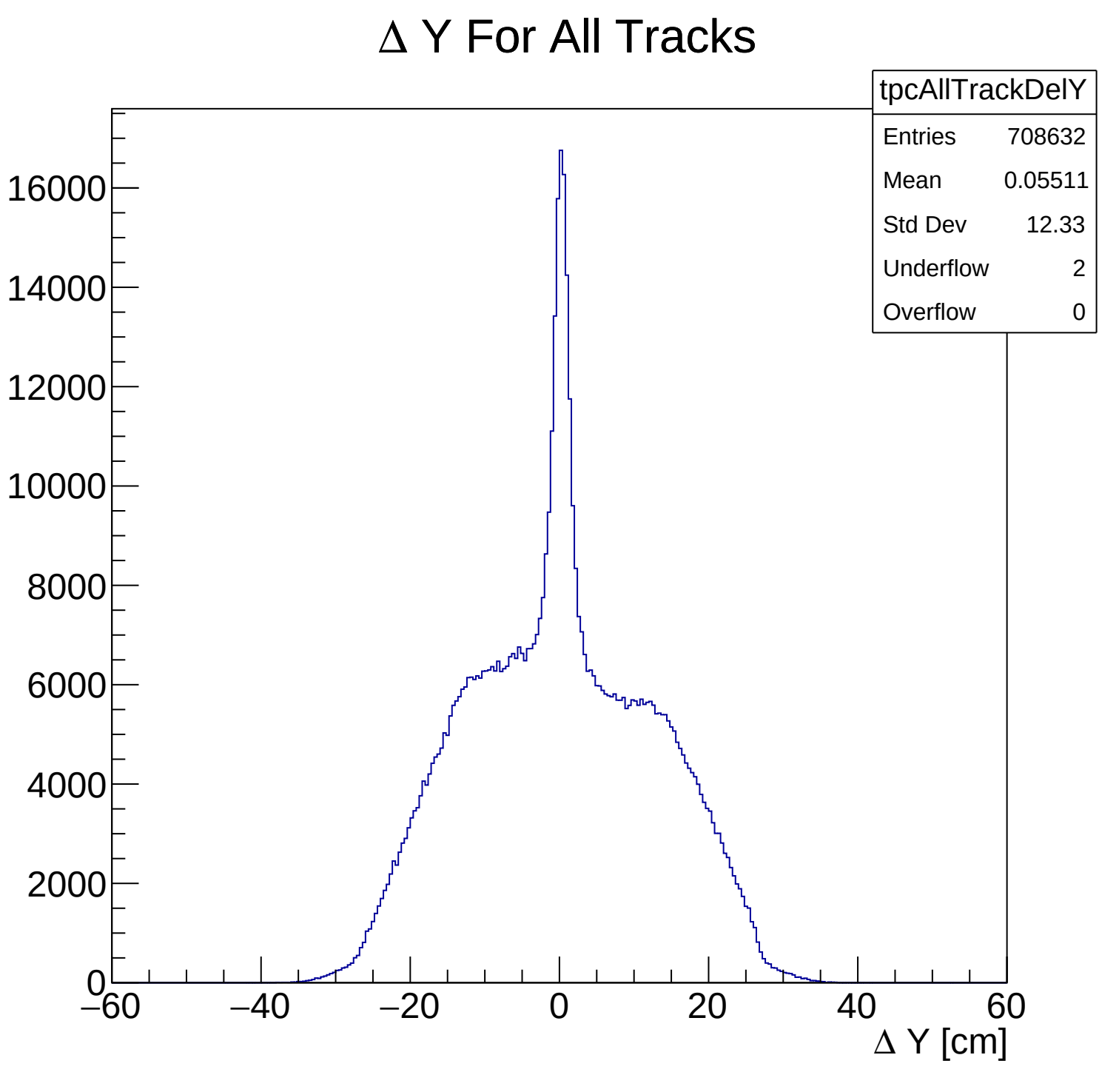
Angle between WC and TPC track

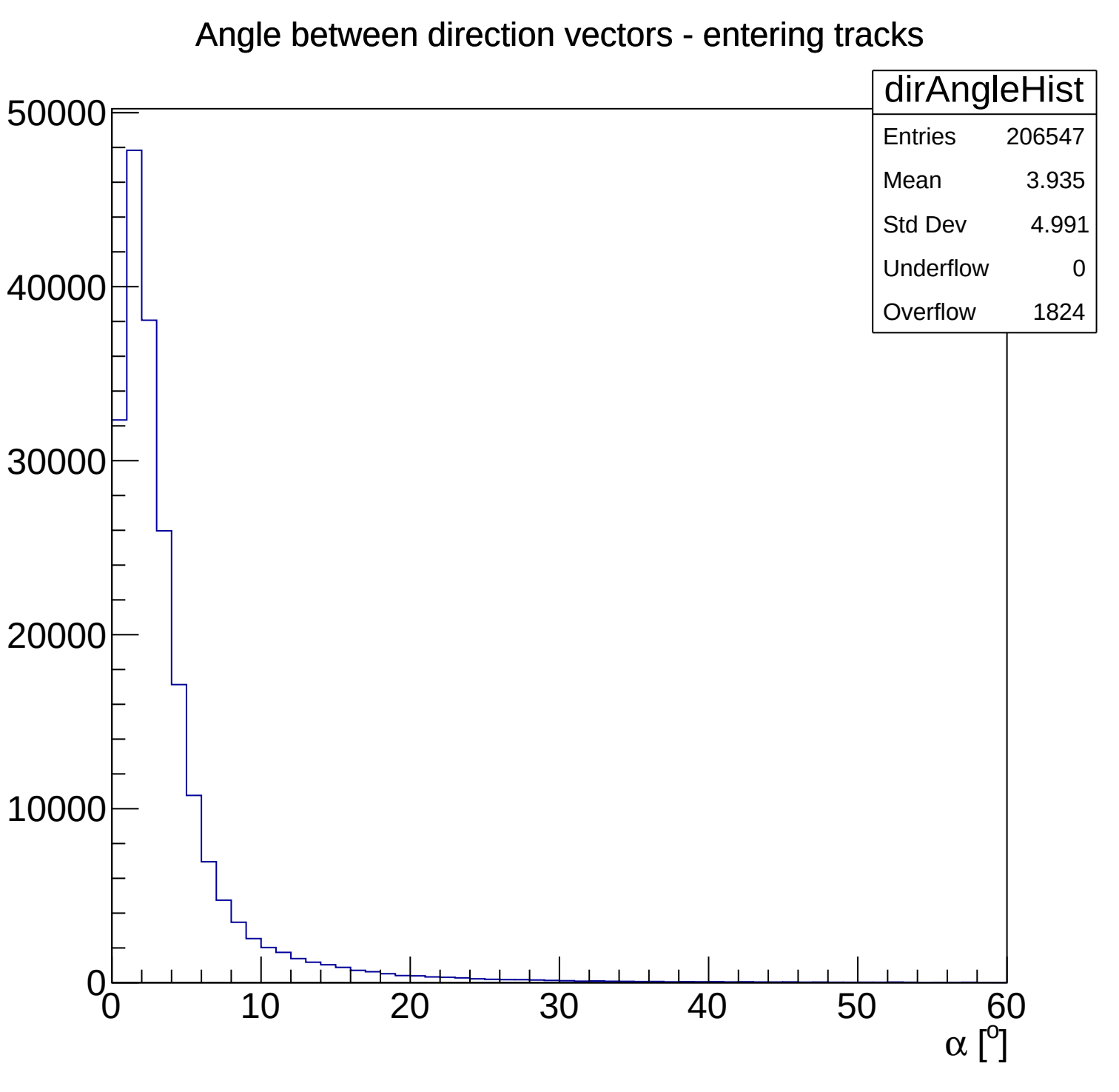


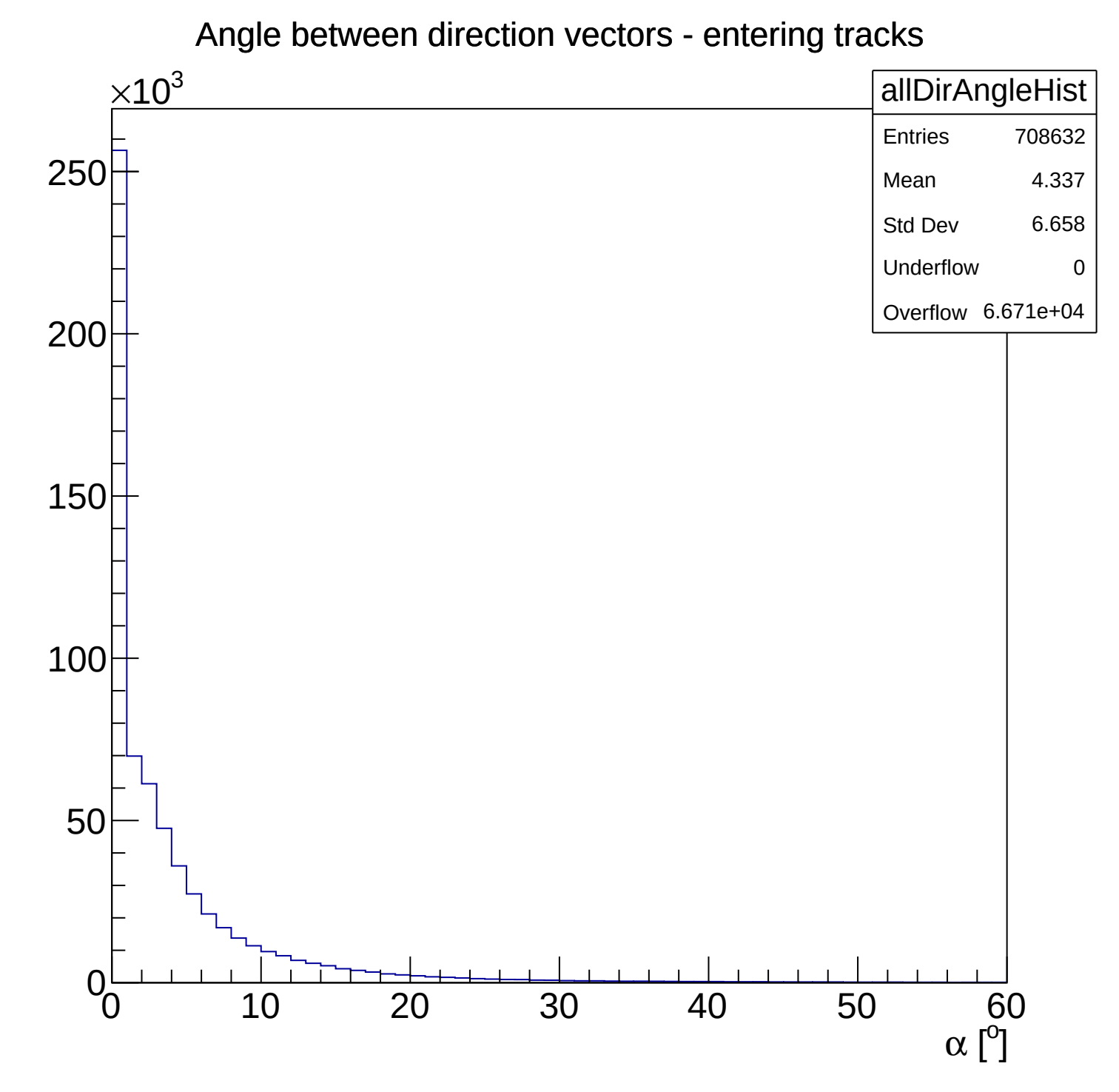

Angle between WC and TPC track - Using End Point
allAlphaHistEnd
Entries 708632
Mean 31.65
Std Dev 28.02
Underflow 0
Overflow 169
40000
35000
30000
25000
20000
15000
10000
5000
0
0
50
100
150
200
250
300
350
α [°]

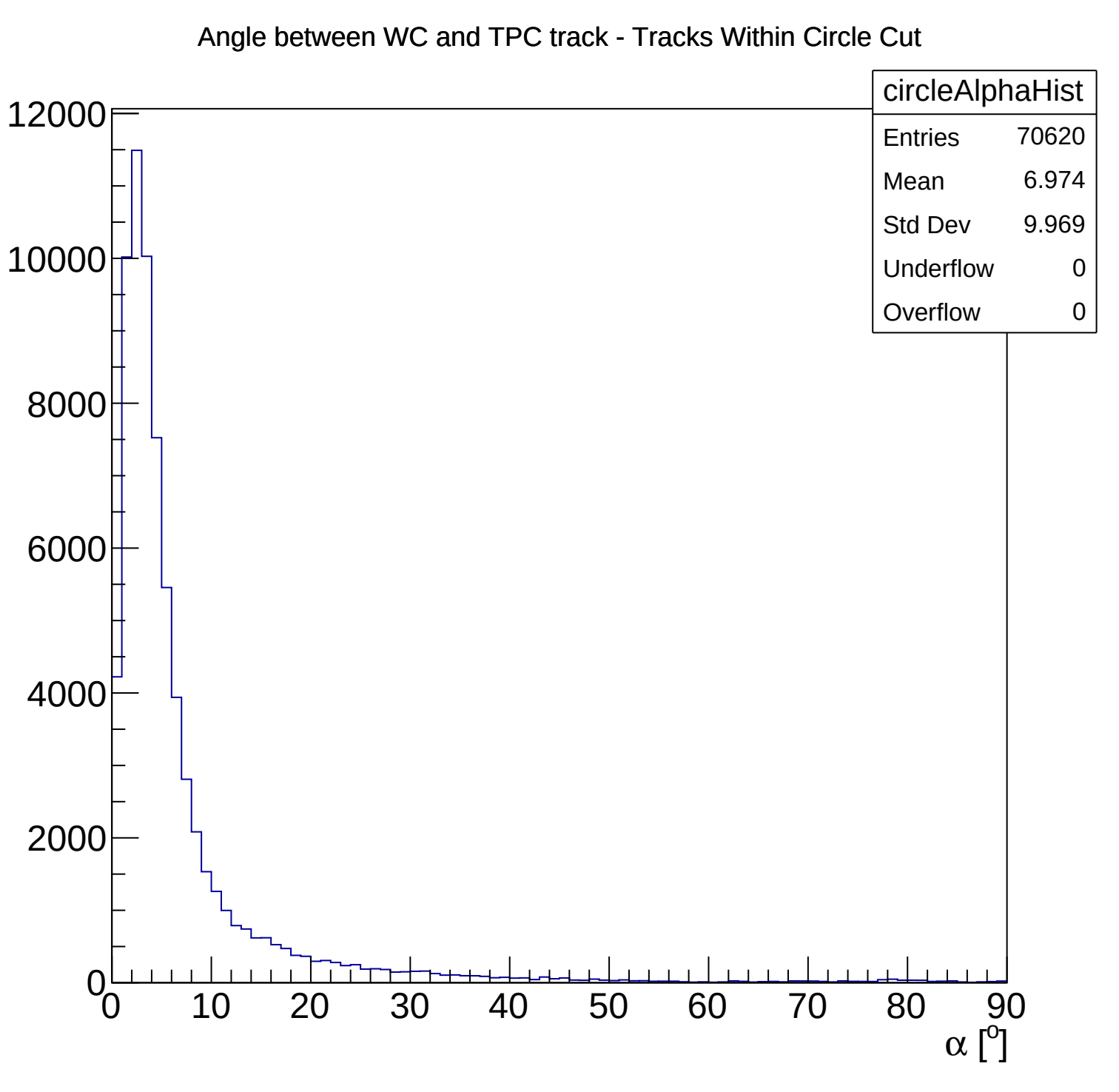

Θ angle with Z axis
tpcAllTrackTheta
Entries 708632
Mean 32.19
Std Dev 27.27
Underflow 7744
Overflow 0
35000
30000
25000
20000
15000
10000
5000
0
0
50
100
150
200
250
300
350
θ [°]

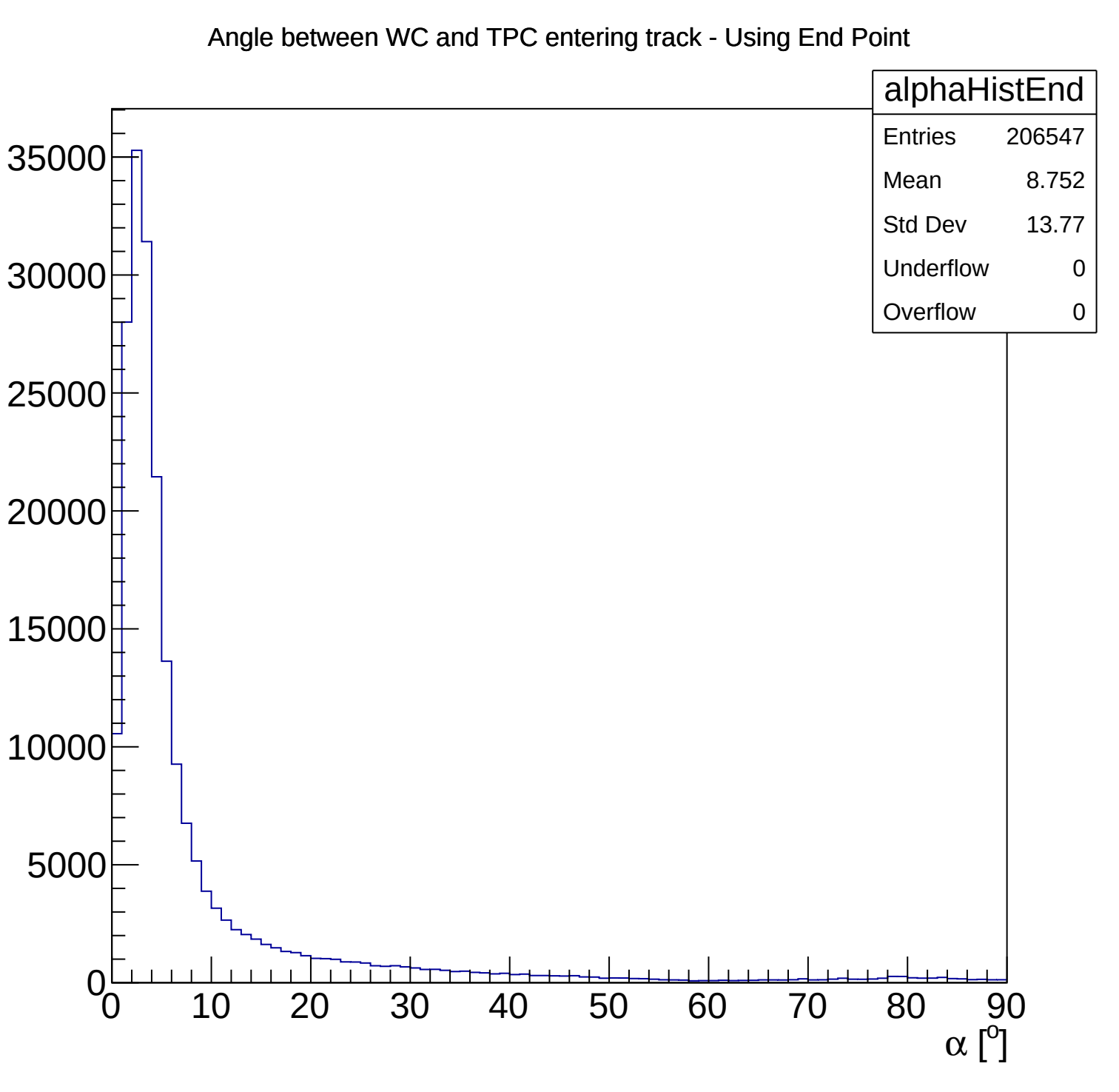

Δ X For All Tracks
tpcAllTrackDelX
Entries 708632
Mean −6.452
Std Dev 16.76
Underflow 0
Overflow 0
16000
14000
12000
10000
8000
6000
4000
2000
0
−60
−40
−20
0
20
40
60
Δ X [cm]

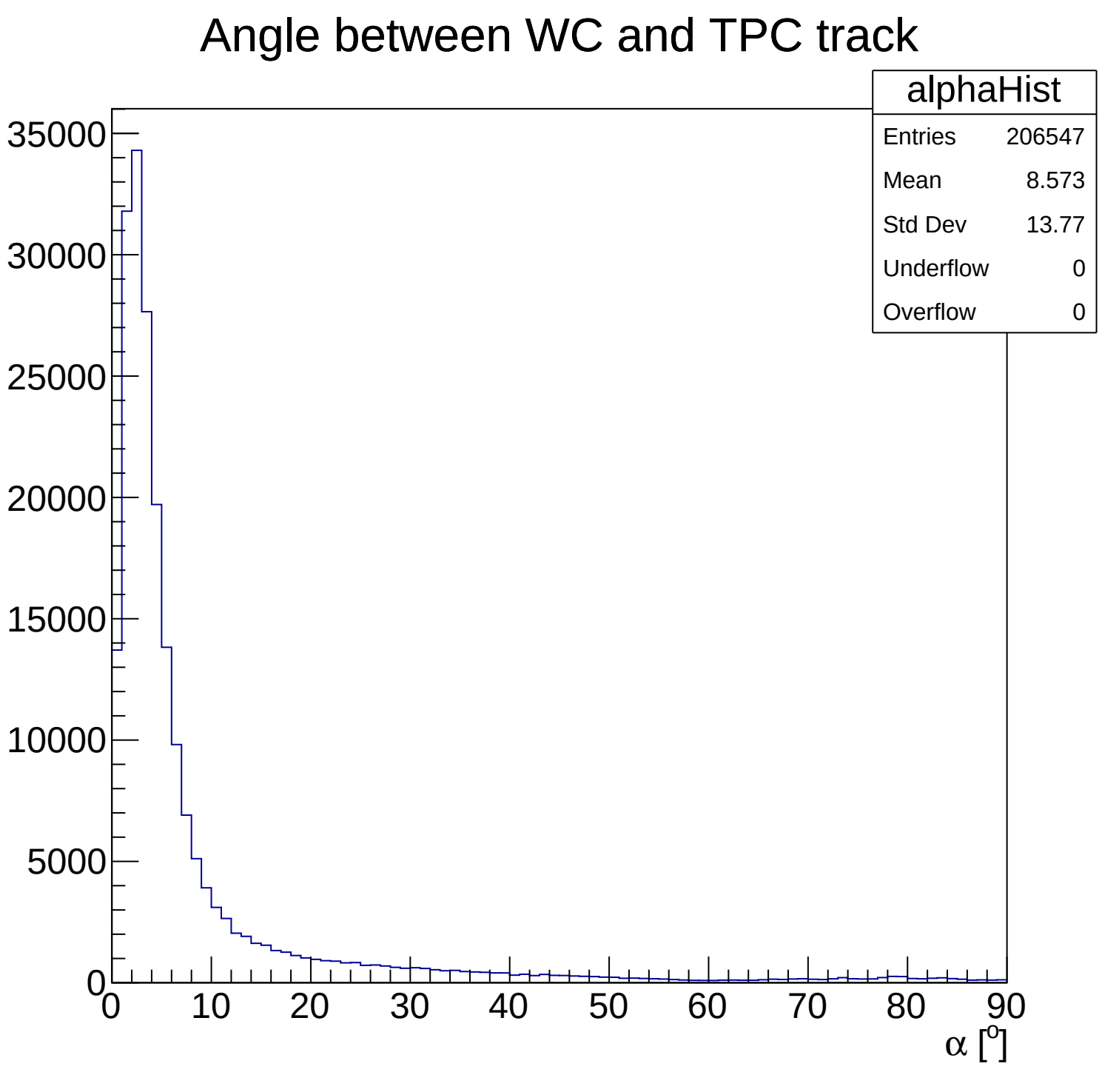

Δ Y For All Tracks
tpcAllTrackDelY
Entries 708632
Mean 0.05511
Std Dev 12.33
Underflow 2
Overflow 0
16000
14000
12000
10000
8000
6000
4000
2000
0
−60
−40
−20
0
20
40
60
Δ Y [cm]

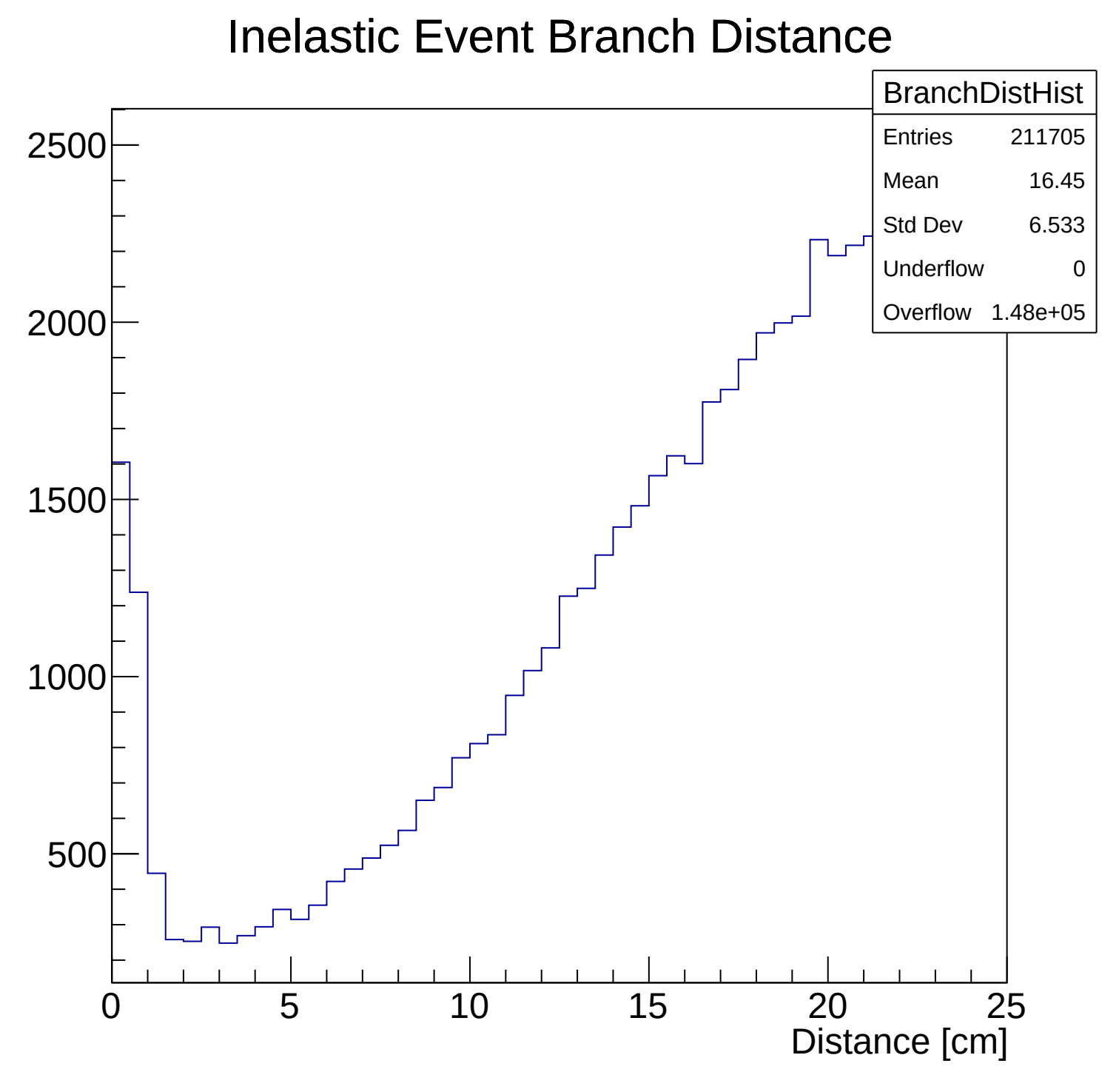

Angle between direction vectors - entering tracks
dirAngleHist
Entries 206547
Mean 3.935
Std Dev 4.991
Underflow 0
Overflow 1824
50000
40000
30000
20000
10000
0
0
10
20
30
40
50
60
α [°]

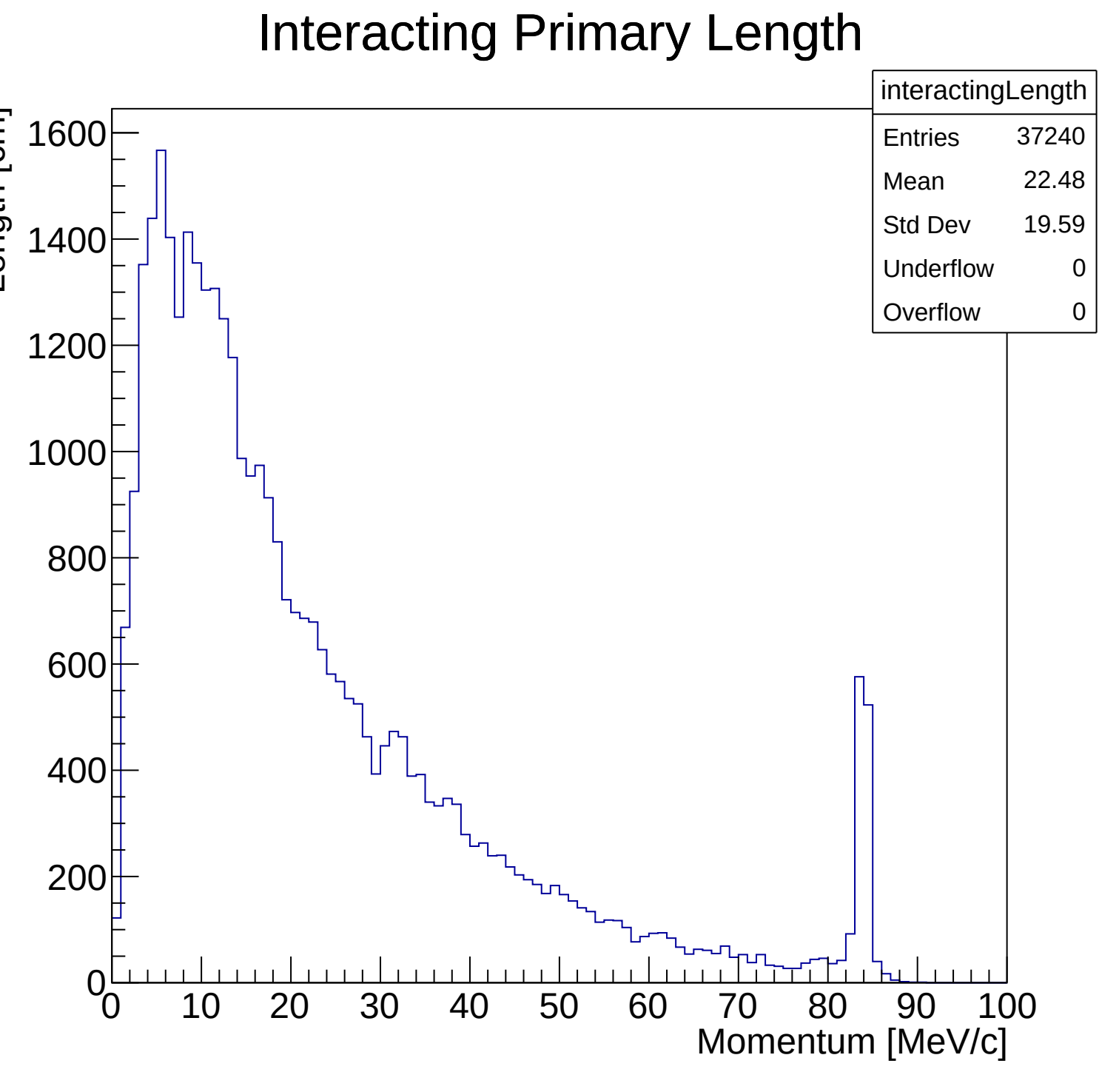

Angle between direction vectors - entering tracks
×10^3
250
200
150
100
50
0
0
10
20
30
40
50
60
α [°]
allDirAngleHist
Entries 708632
Mean 4.337
Std Dev 6.658
Underflow 0
Overflow 6.671e+04

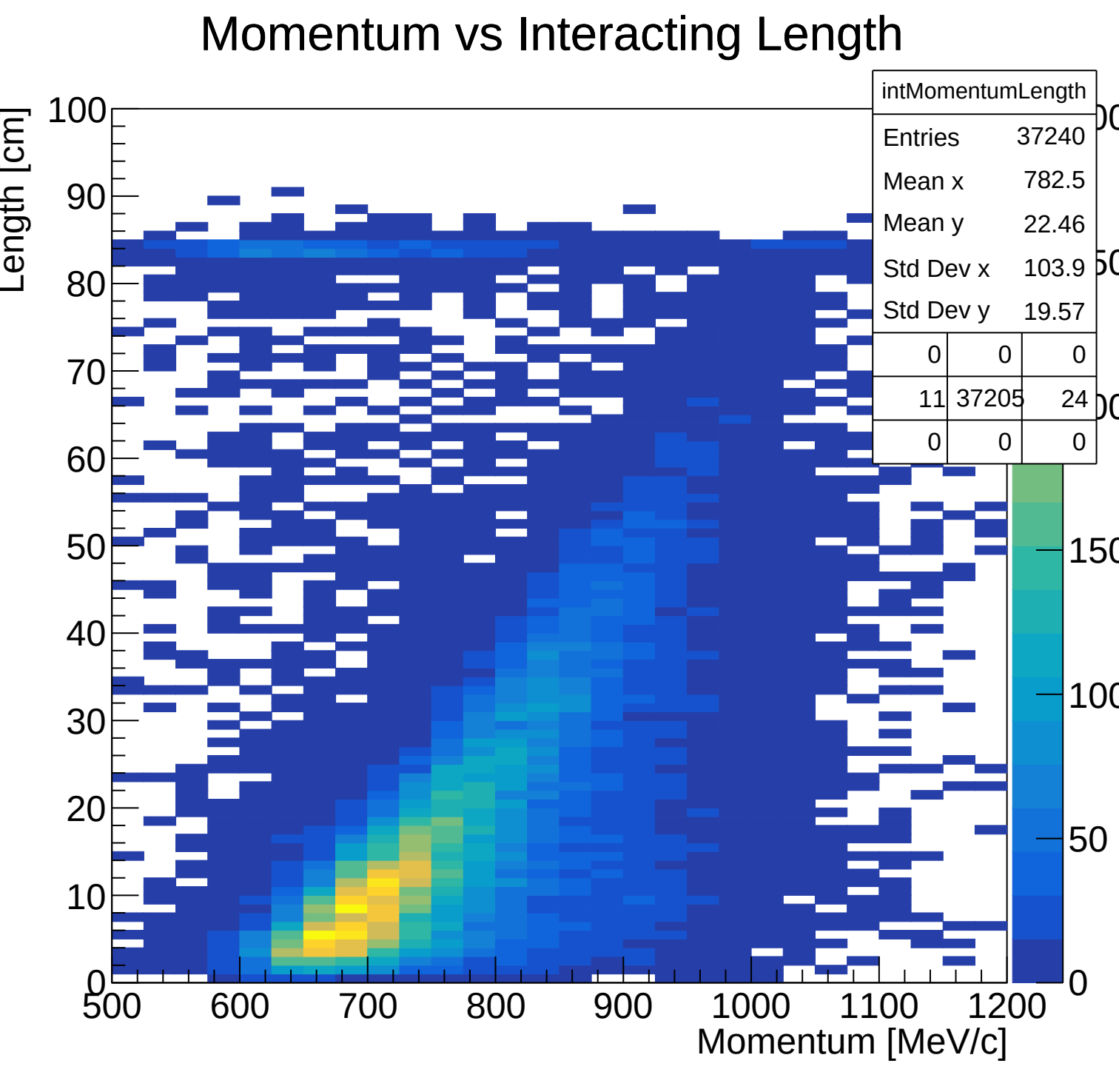

Angle between WC and TPC track - Tracks Within Circle Cut
circleAlphaHist
Entries 70620
Mean 6.974
Std Dev 9.969
Underflow 0
Overflow 0
12000
10000
8000
6000
4000
2000
0
0
10
20
30
40
50
60
70
80
90
α [°]

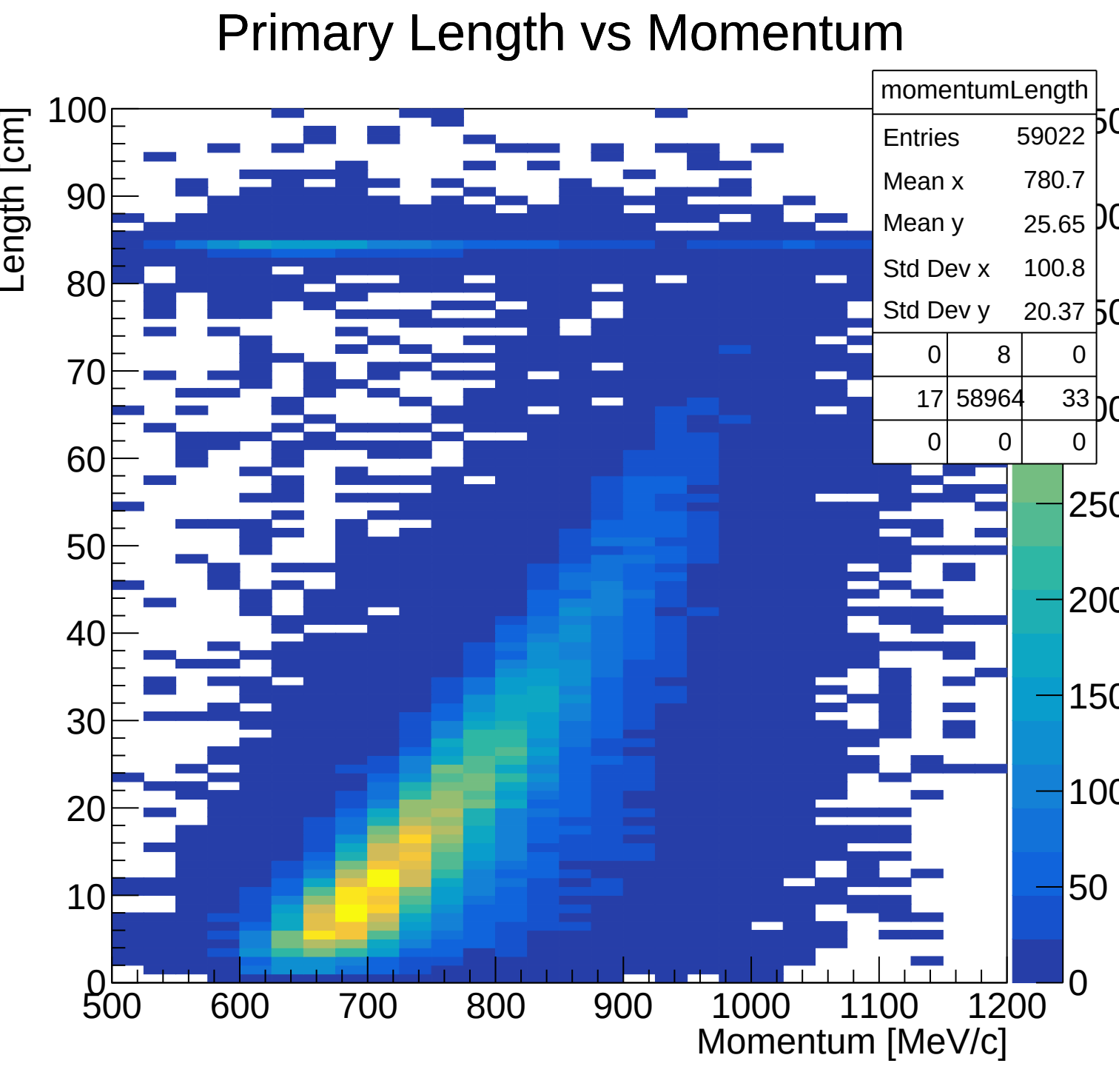

Angle between WC and TPC entering track - Using End Point
alphaHistEnd
Entries 206547
Mean 8.752
Std Dev 13.77
Underflow 0
Overflow 0
35000
30000
25000
20000
15000
10000
5000
0
0
10
20
30
40
50
60
70
80
90
α [°]

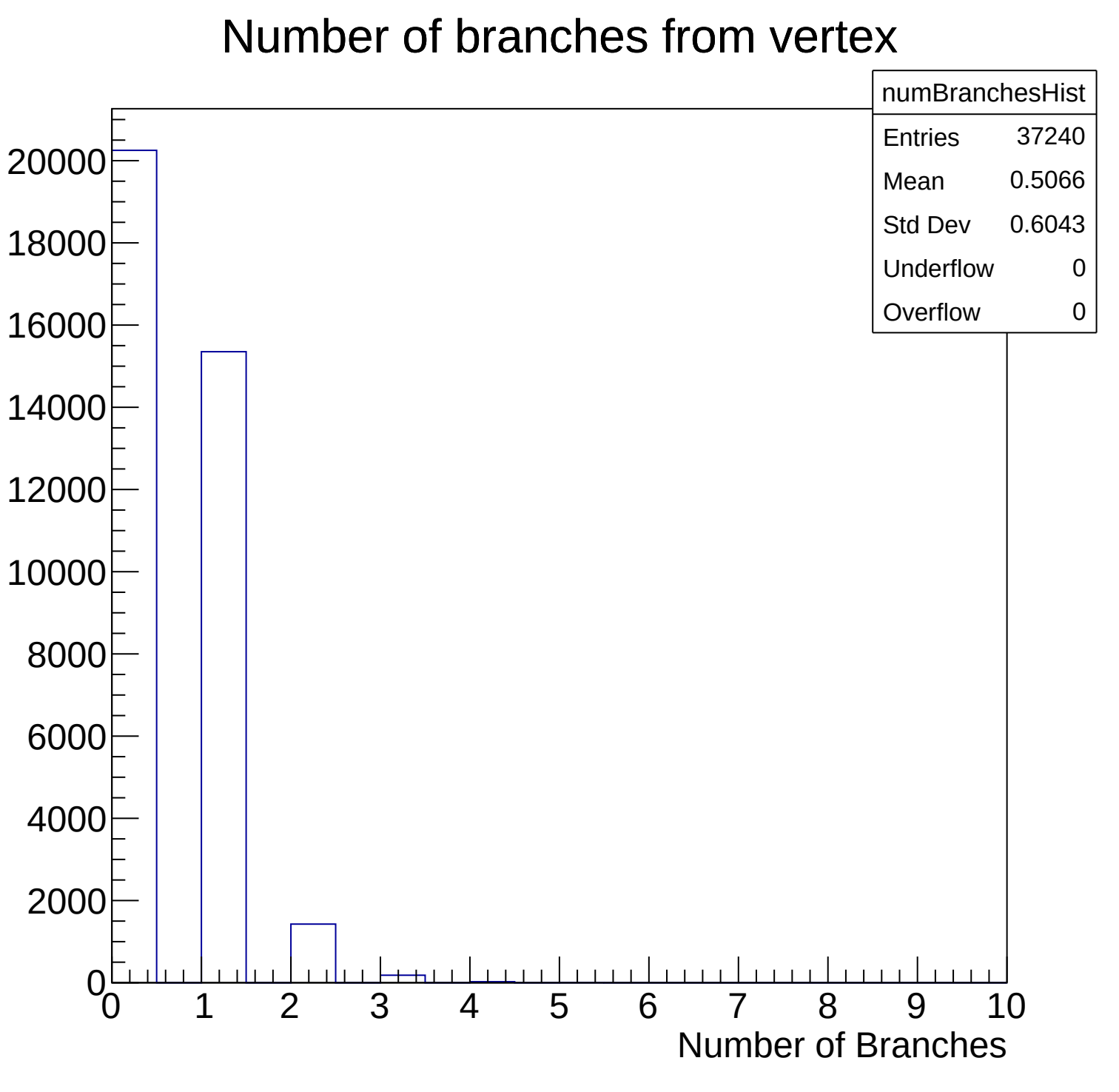

Angle between WC and TPC track
alphaHist
Entries 206547
Mean 8.573
Std Dev 13.77
Underflow 0
Overflow 0
35000
30000
25000
20000
15000
10000
5000
0
0
10
20
30
40
50
60
70
80
90
α [°]

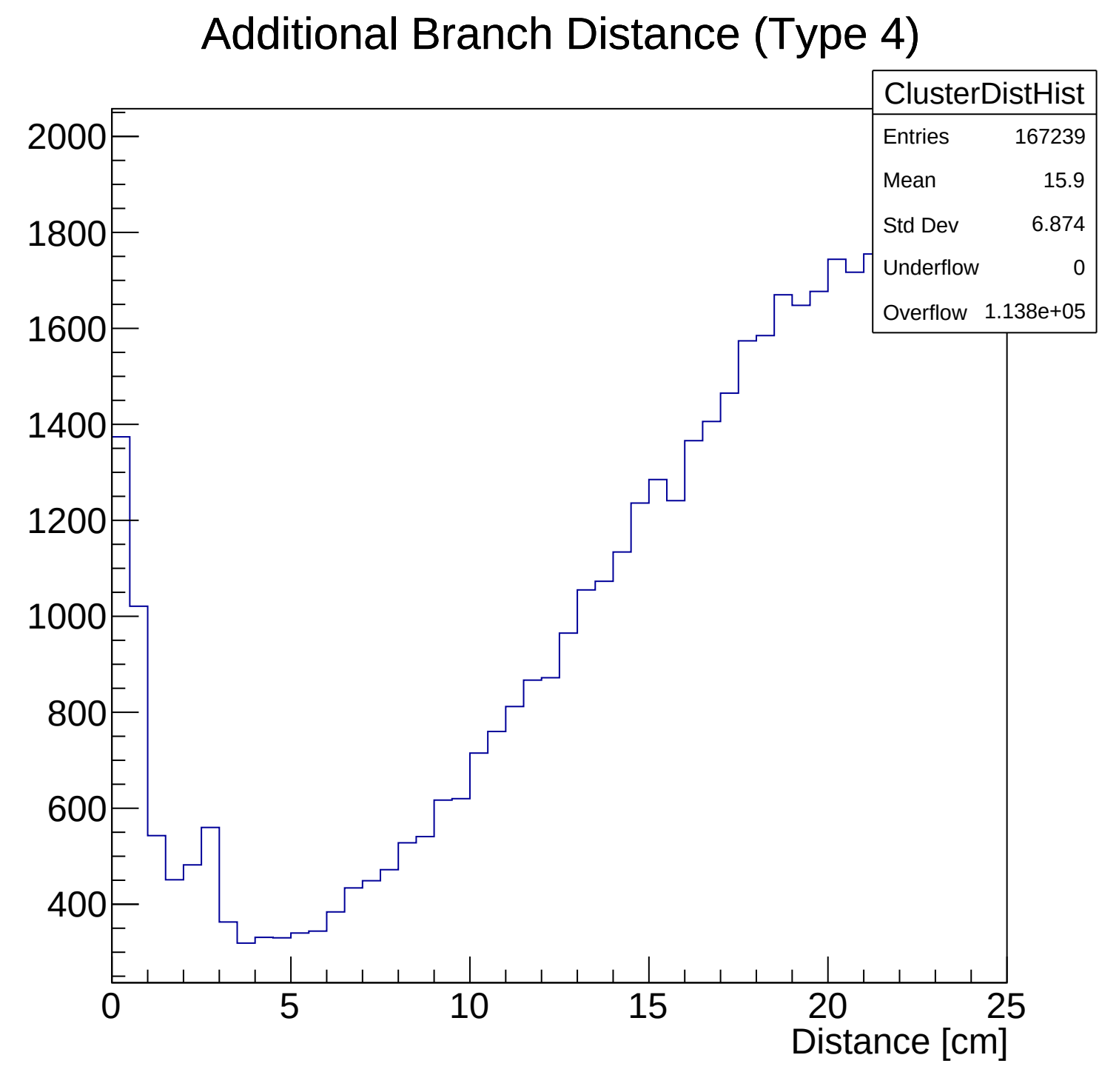

Inelastic Event Branch Distance
BranchDistHist
Entries 211705
Mean 16.45
Std Dev 6.533
Underflow 0
Overflow 1.48e+05
2500
2000
1500
1000
500
0
5
10
15
20
25
Distance [cm]

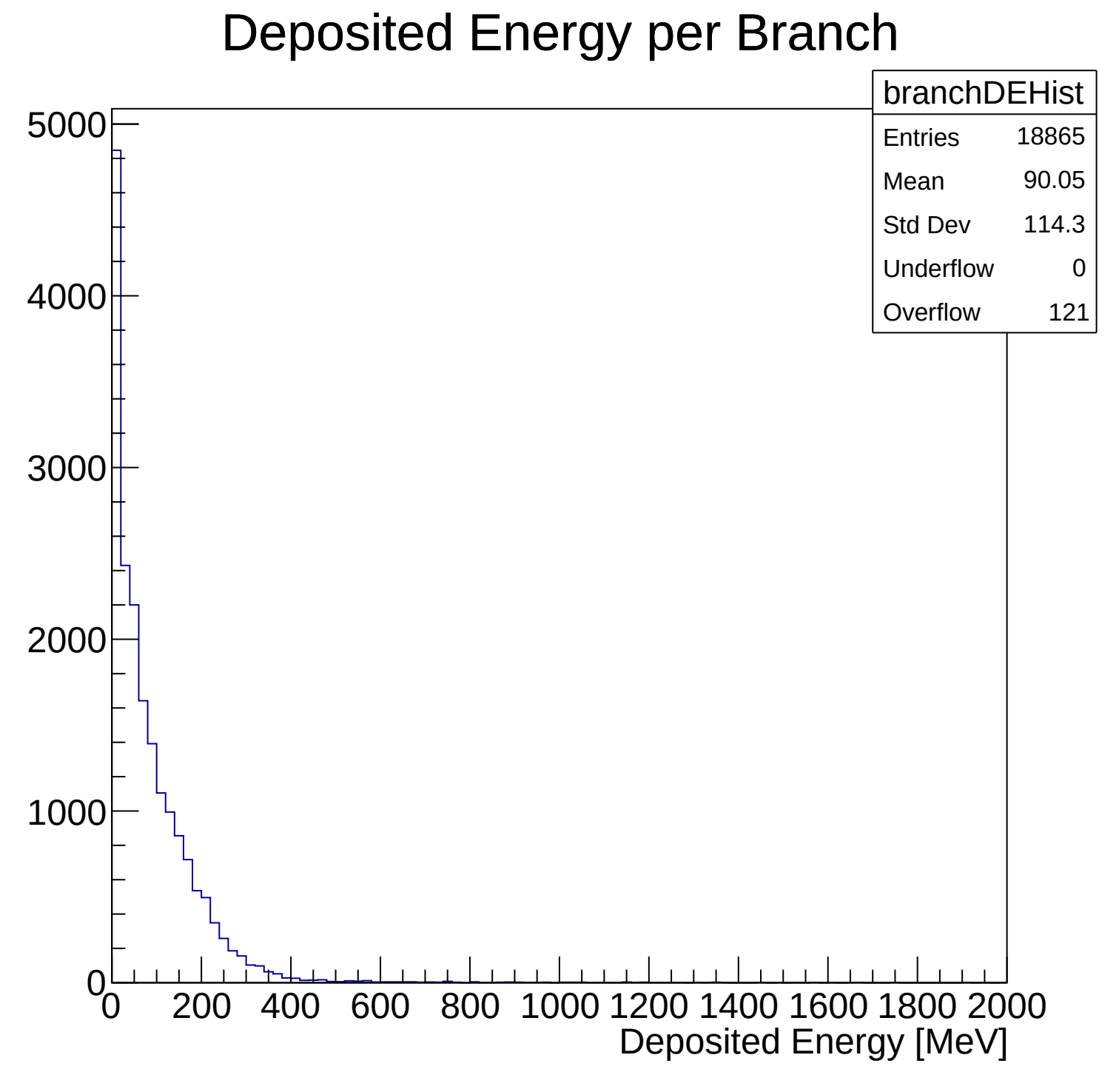

Interacting Primary Length
interactingLength
Entries 37240
Mean 22.48
Std Dev 19.59
Underflow 0
Overflow 0
Length [cm]
1600
1400
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
Momentum [MeV/c]

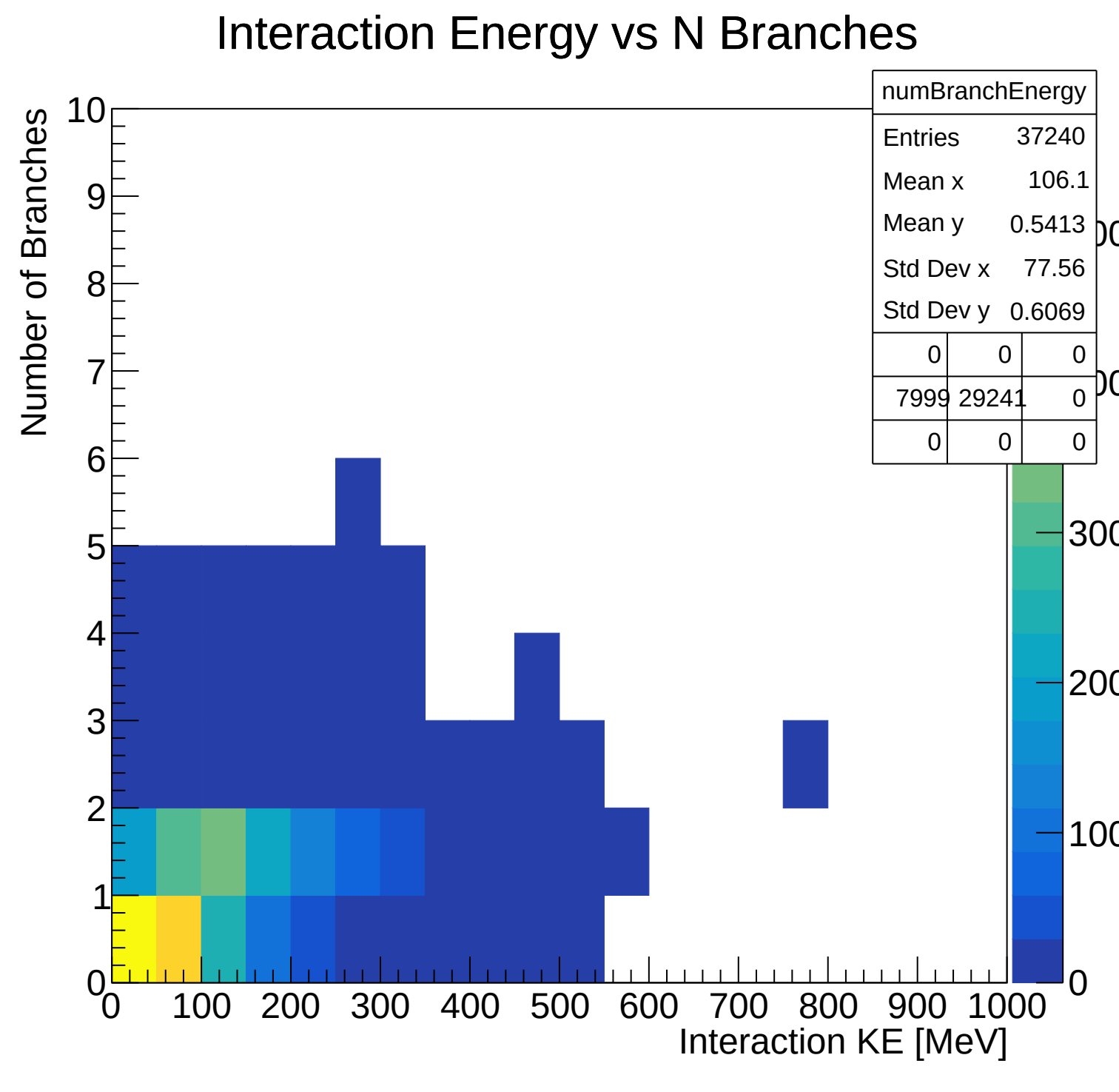

Momentum vs Interacting Length
intMomentumLength
Entries 37240
Mean x 782.5
Mean y 22.46
Std Dev x 103.9
Std Dev y 19.57
0 0 0
11 37205 24
0 0 0
Length [cm]
100
90
80
70
60
50
40
30
20
10
0
500
600
700
800
900
1000
1100
1200
Momentum [MeV/c]
150
100
50
0

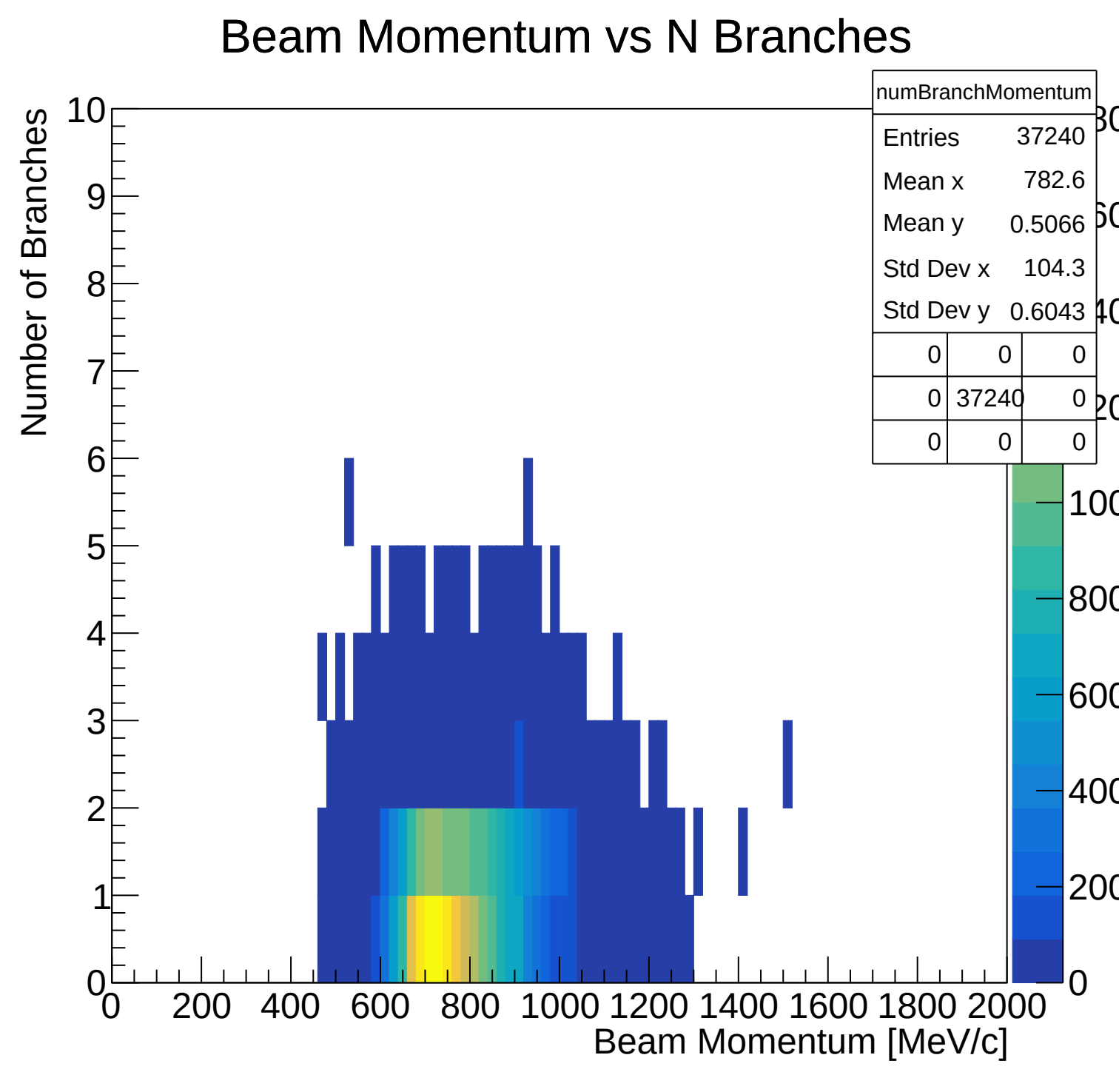

Primary Length vs Momentum
momentumLength
Entries 59022
Mean x 780.7
Mean y 25.65
Std Dev x 100.8
Std Dev y 20.37
0 8 0
17 58964 33
0 0 0
Length [cm]
Momentum [MeV/c]
0
10
20
30
40
50
60
70
80
90
100
500
600
700
800
900
1000
1100
1200
0
50
100
150
200
250

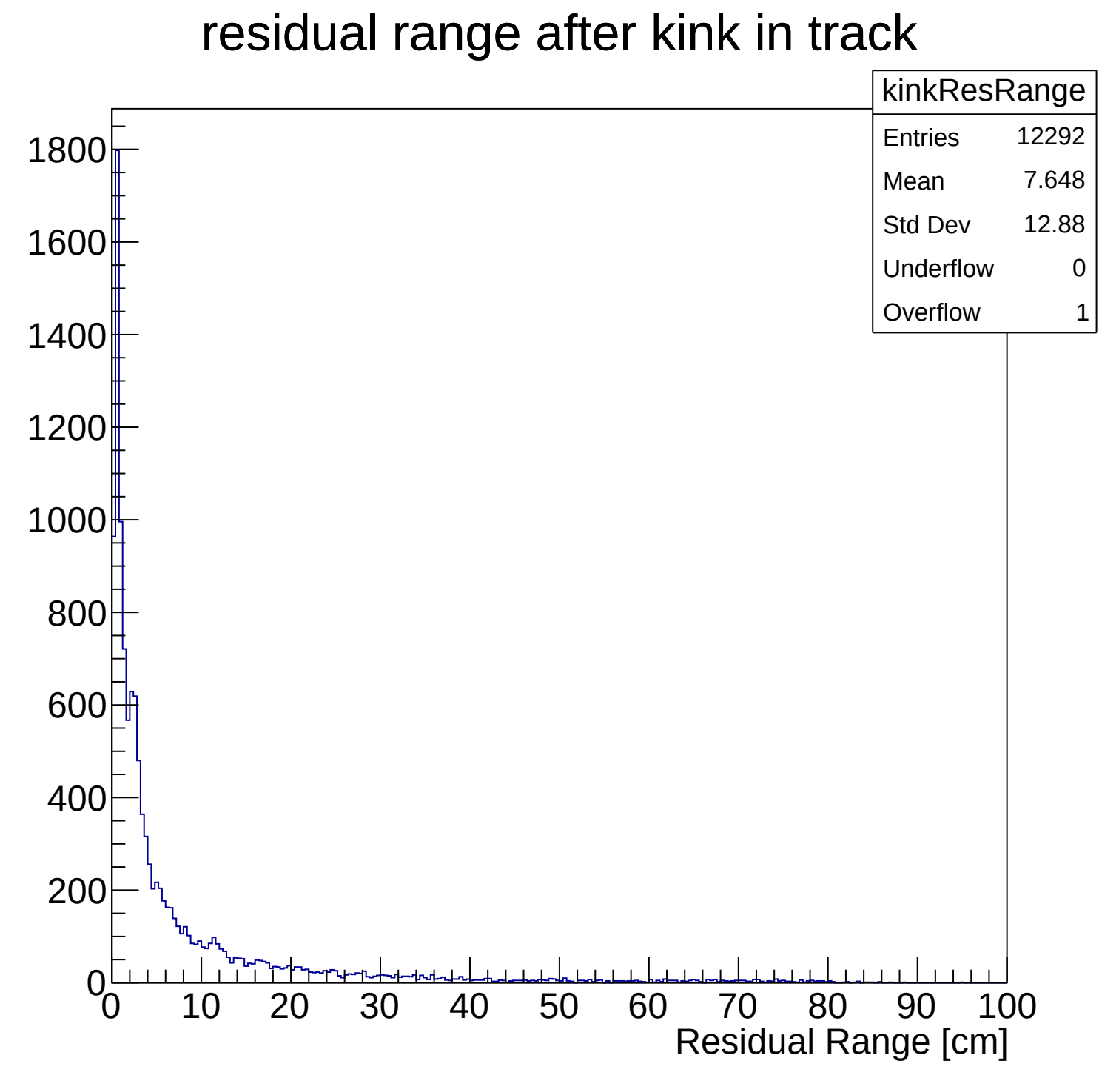

Number of branches from vertex
numBranchesHist
Entries 37240
Mean 0.5066
Std Dev 0.6043
Underflow 0
Overflow 0
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0 1 2 3 4 5 6 7 8 9 10
Number of Branches

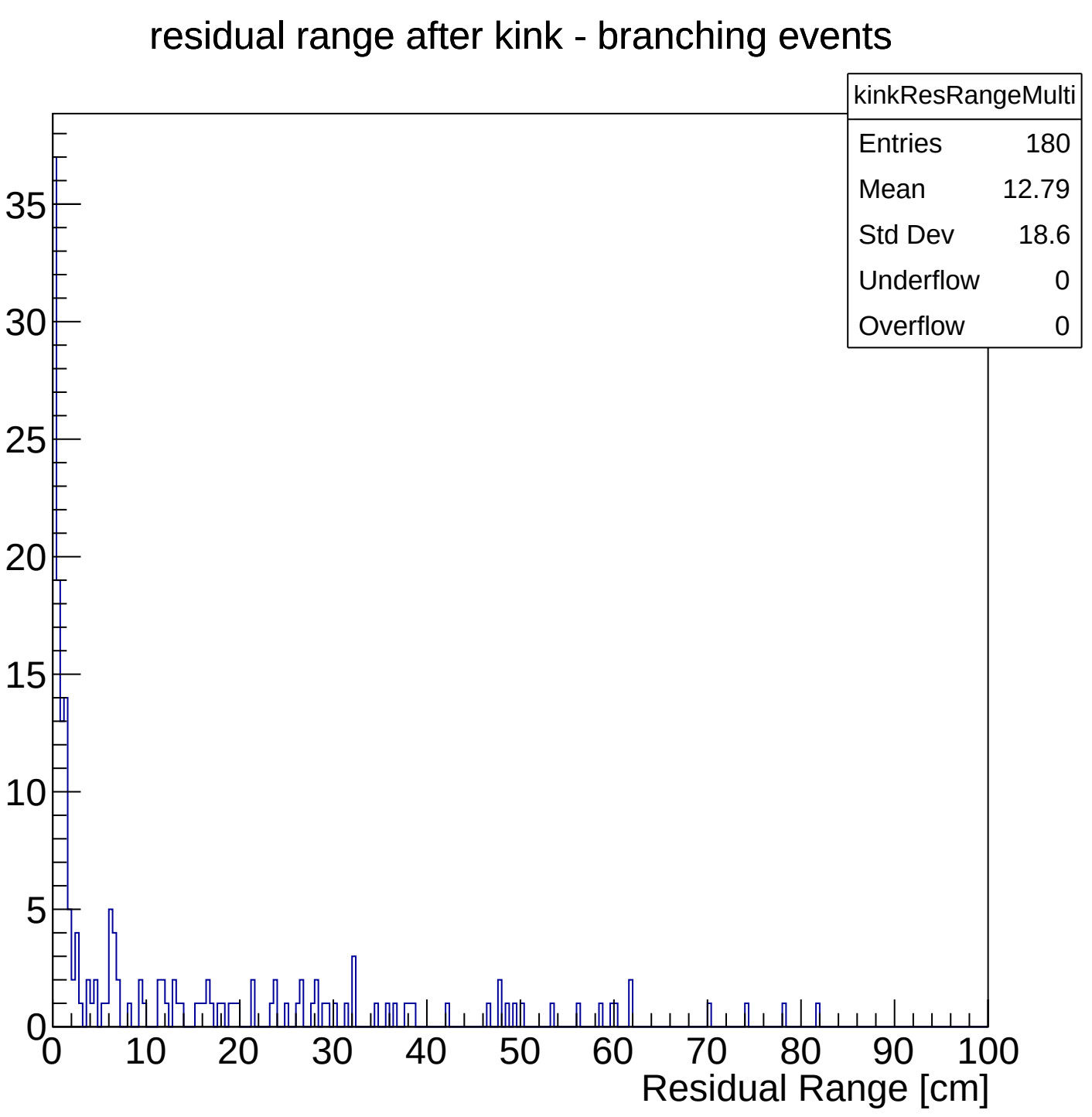

Additional Branch Distance (Type 4)
ClusterDistHist
Entries 167239
Mean 15.9
Std Dev 6.874
Underflow 0
Overflow 1.138e+05
2000
1800
1600
1400
1200
1000
800
600
400
0
5
10
15
20
25
Distance [cm]


Deposited Energy per Branch
branchDEHist
Entries 18865
Mean 90.05
Std Dev 114.3
Underflow 0
Overflow 121
5000
4000
3000
2000
1000
0
0 200 400 600 800 1000 1200 1400 1600 1800 2000
Deposited Energy [MeV]


Interaction Energy vs N Branches
numBranchEnergy
Entries 37240
Mean x 106.1
Mean y 0.5413
Std Dev x 77.56
Std Dev y 0.6069
0 0 0
7999 29241 0
0 0 0
Number of Branches
Interaction KE [MeV]
0 100 200 300 400 500 600 700 800 900 1000
0 1 2 3 4 5 6 7 8 9 10
0 100 200 300


Beam Momentum vs N Branches
numBranchMomentum
Entries 37240
Mean x 782.6
Mean y 0.5066
Std Dev x 104.3
Std Dev y 0.6043
0 0 0
0 37240 0
0 0 0
Number of Branches
Beam Momentum [MeV/c]
0 200 400 600 800 1000 1200 1400 1600 1800 2000
0 1 2 3 4 5 6 7 8 9 10
0 200 400 600 800 100


residual range after kink in track
kinkResRange
Entries 12292
Mean 7.648
Std Dev 12.88
Underflow 0
Overflow 1
1800
1600
1400
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
Residual Range [cm]


residual range after kink - branching events
kinkResRangeMulti
Entries 180
Mean 12.79
Std Dev 18.6
Underflow 0
Overflow 0
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Residual Range [cm]