File : RG-A outbending with correction (veronique code on pi+ pi-)

Number of hipo file : 50

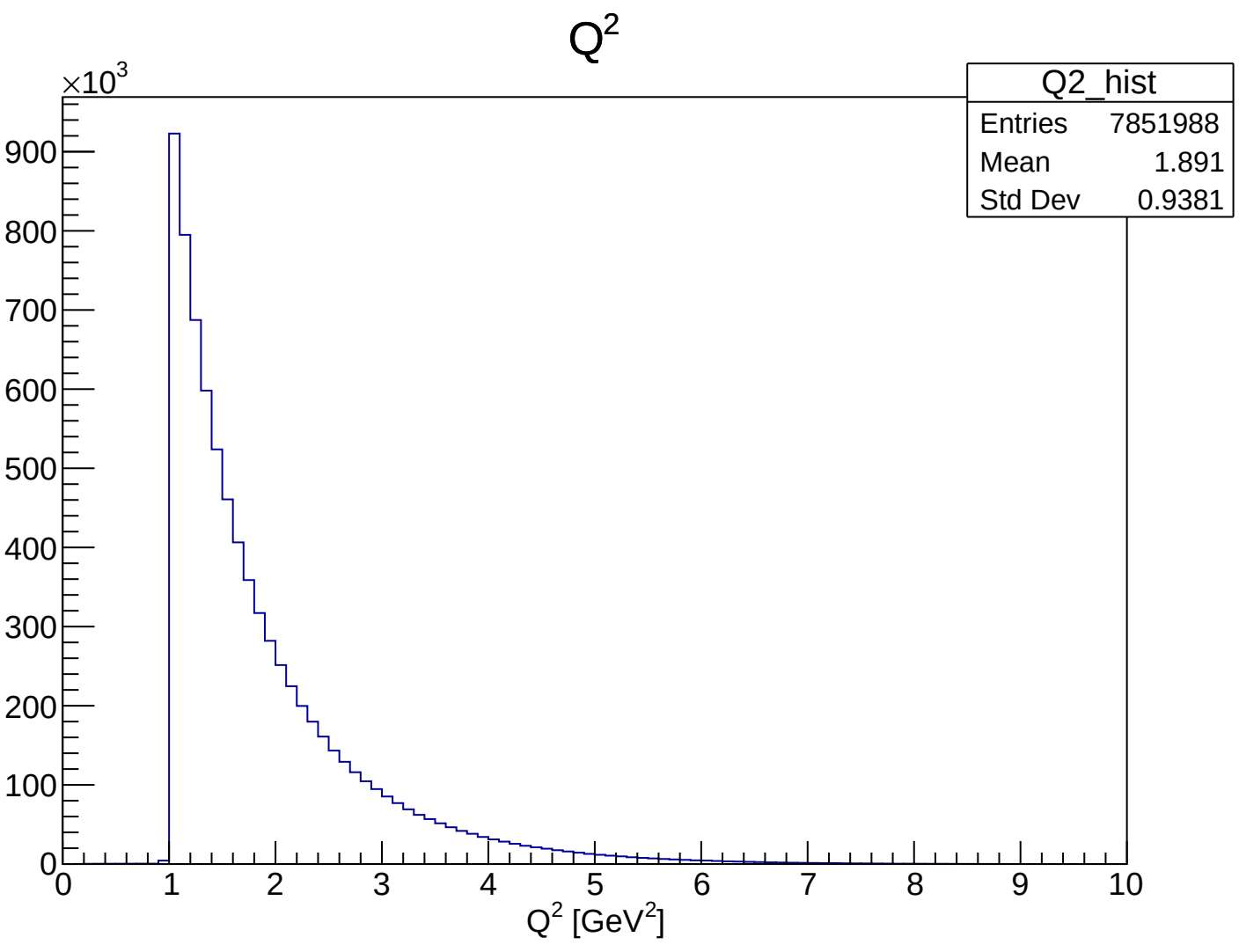
Summary of cuts for the next plots:

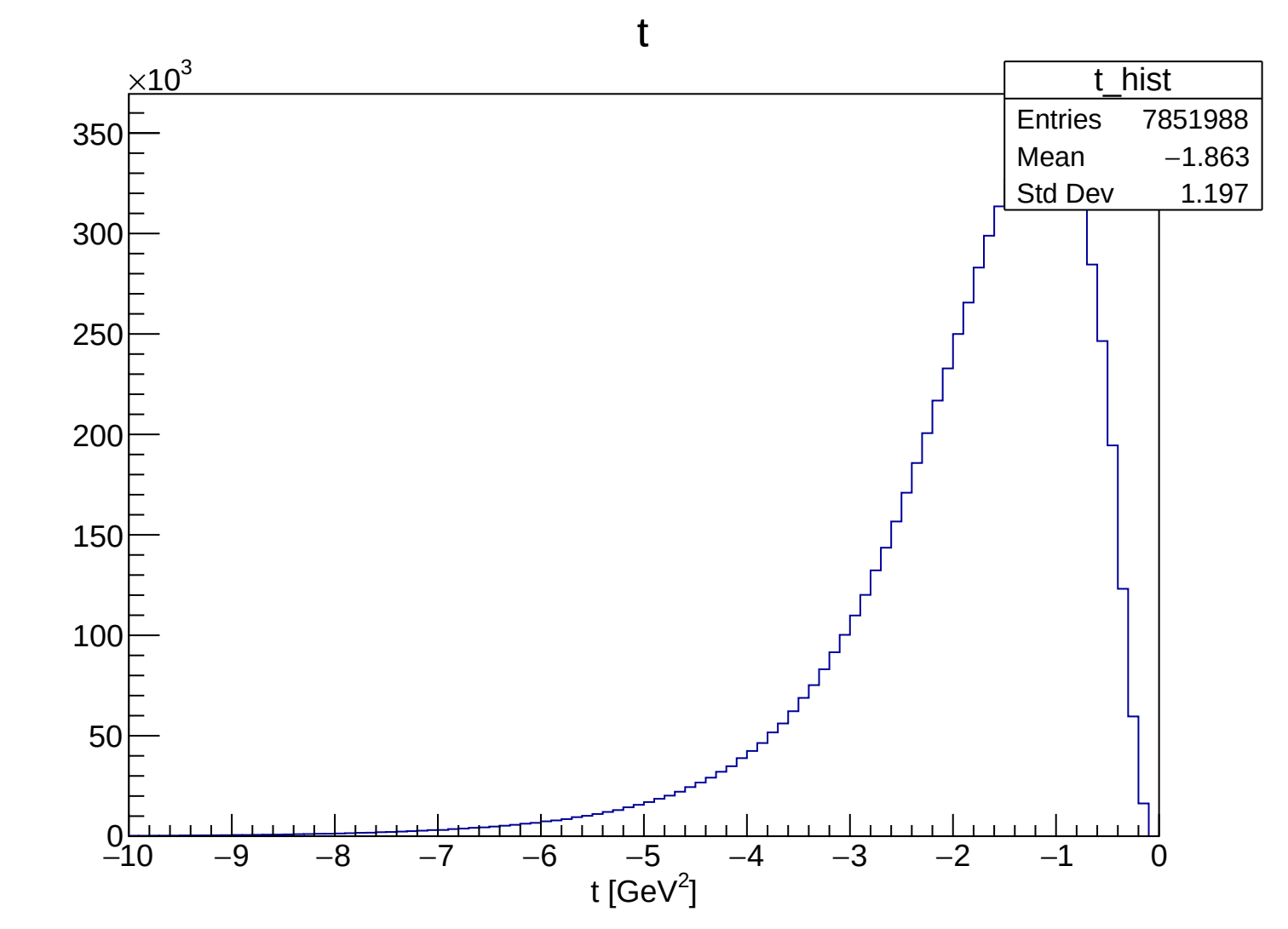
- Cut already present in nSidis files (like p_e^- > 2 GeV, Q^2 > 1 GeV)

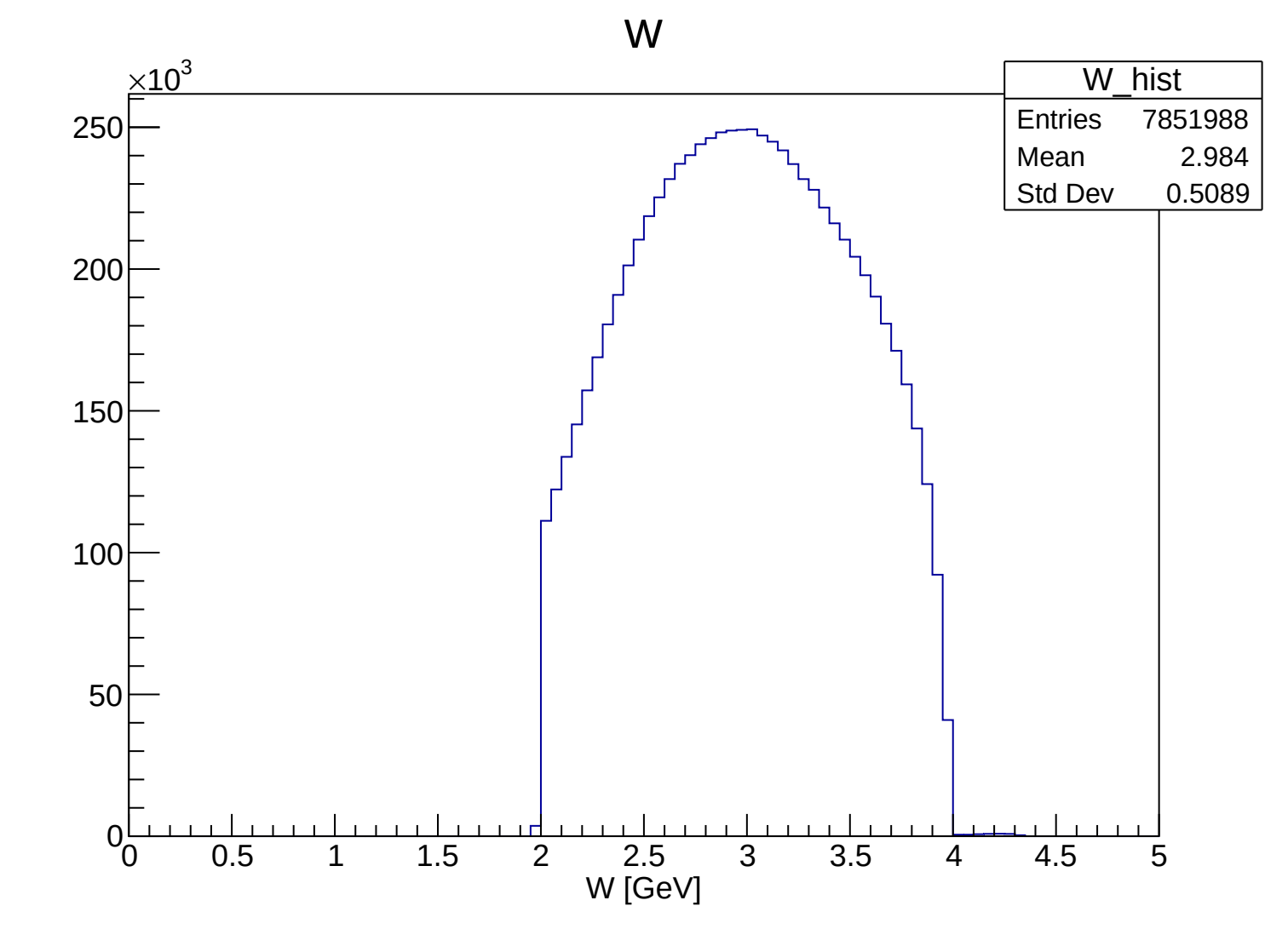
- Only 1 proton, π^+ >= 1, π^- >= 1, e^- >= 1

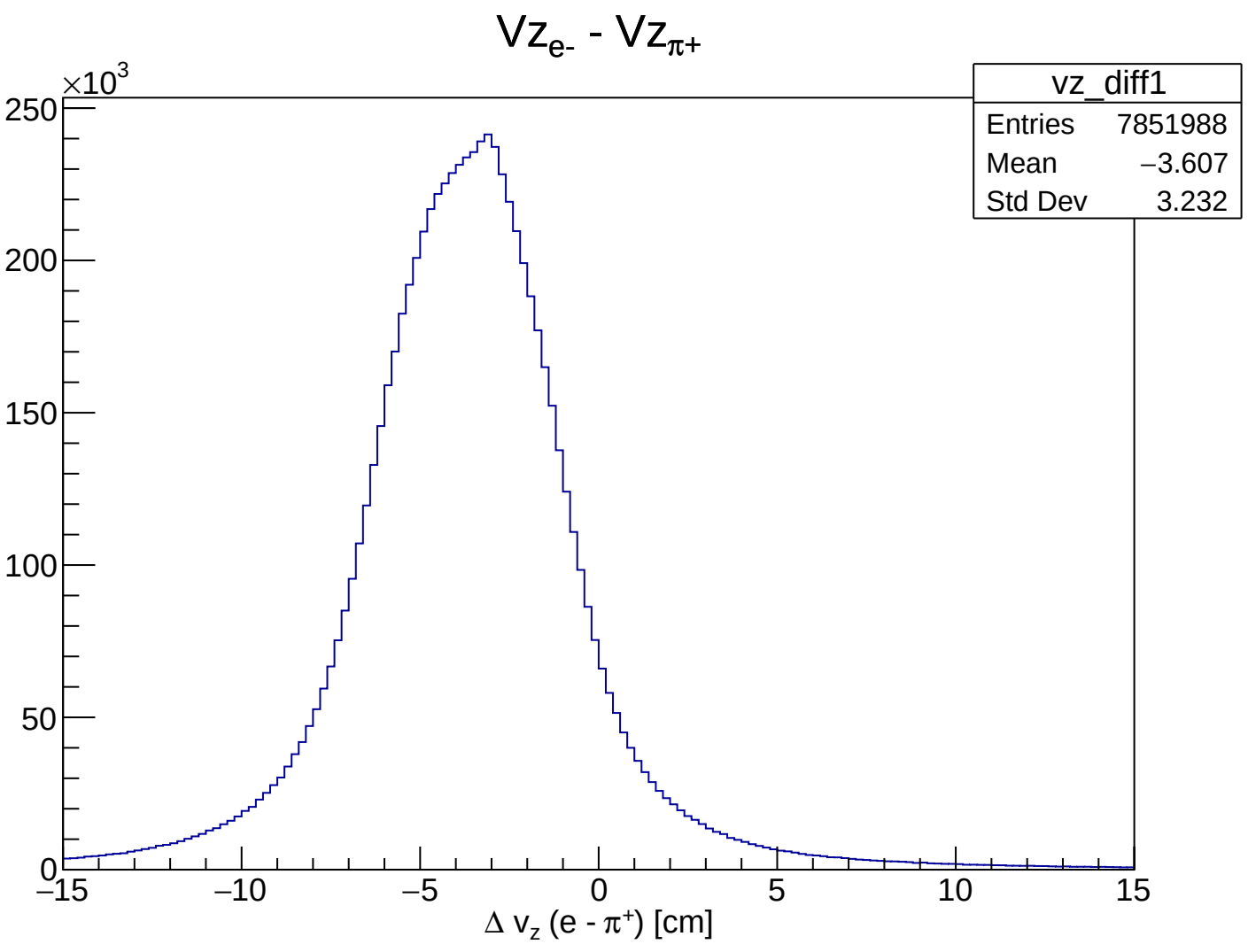
- Very large cut on Missing mass, Invariant mass π^+ π^-

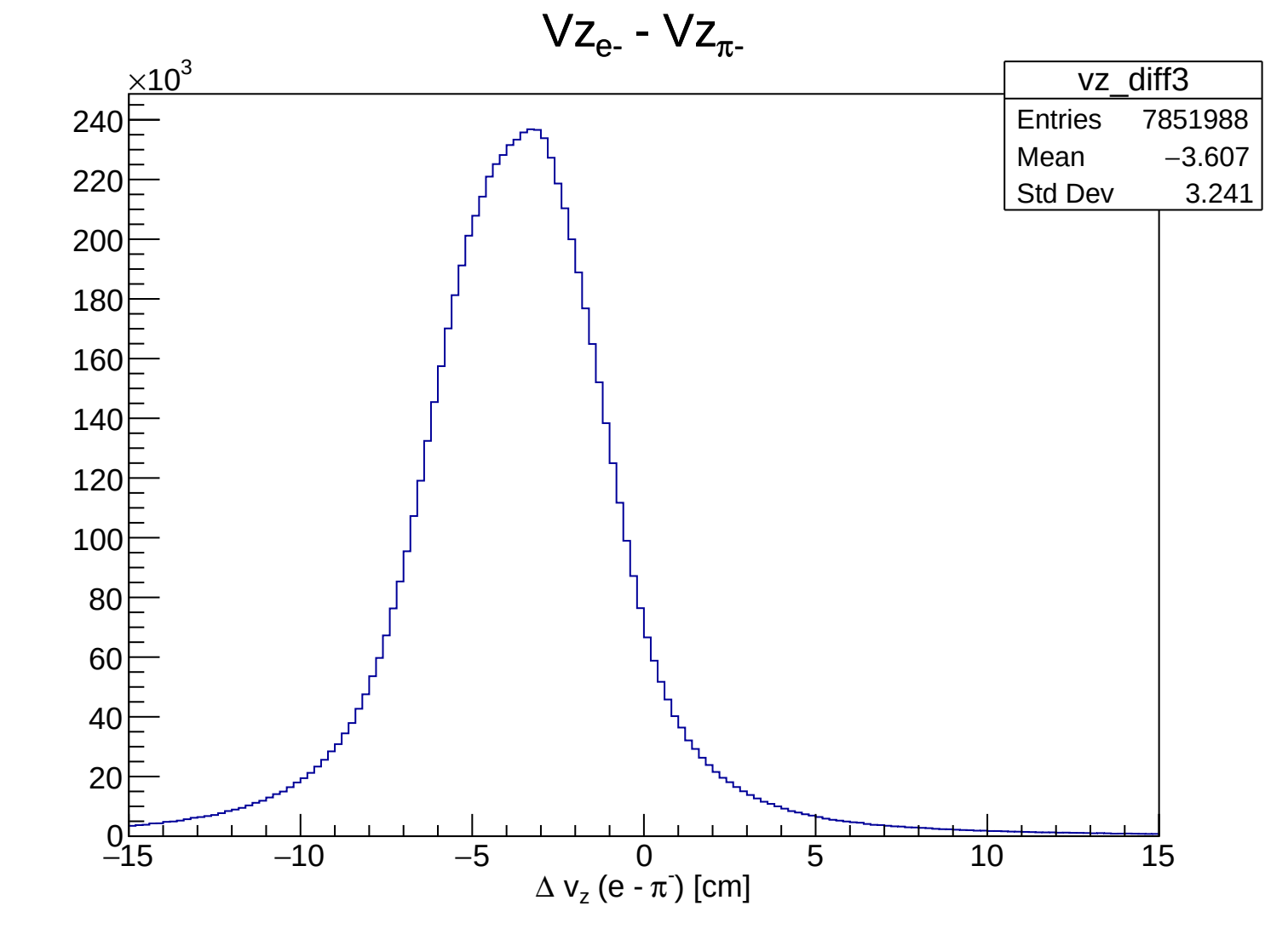
and Invariant mass Ks Kl (cut between 0 and 3 GeV)

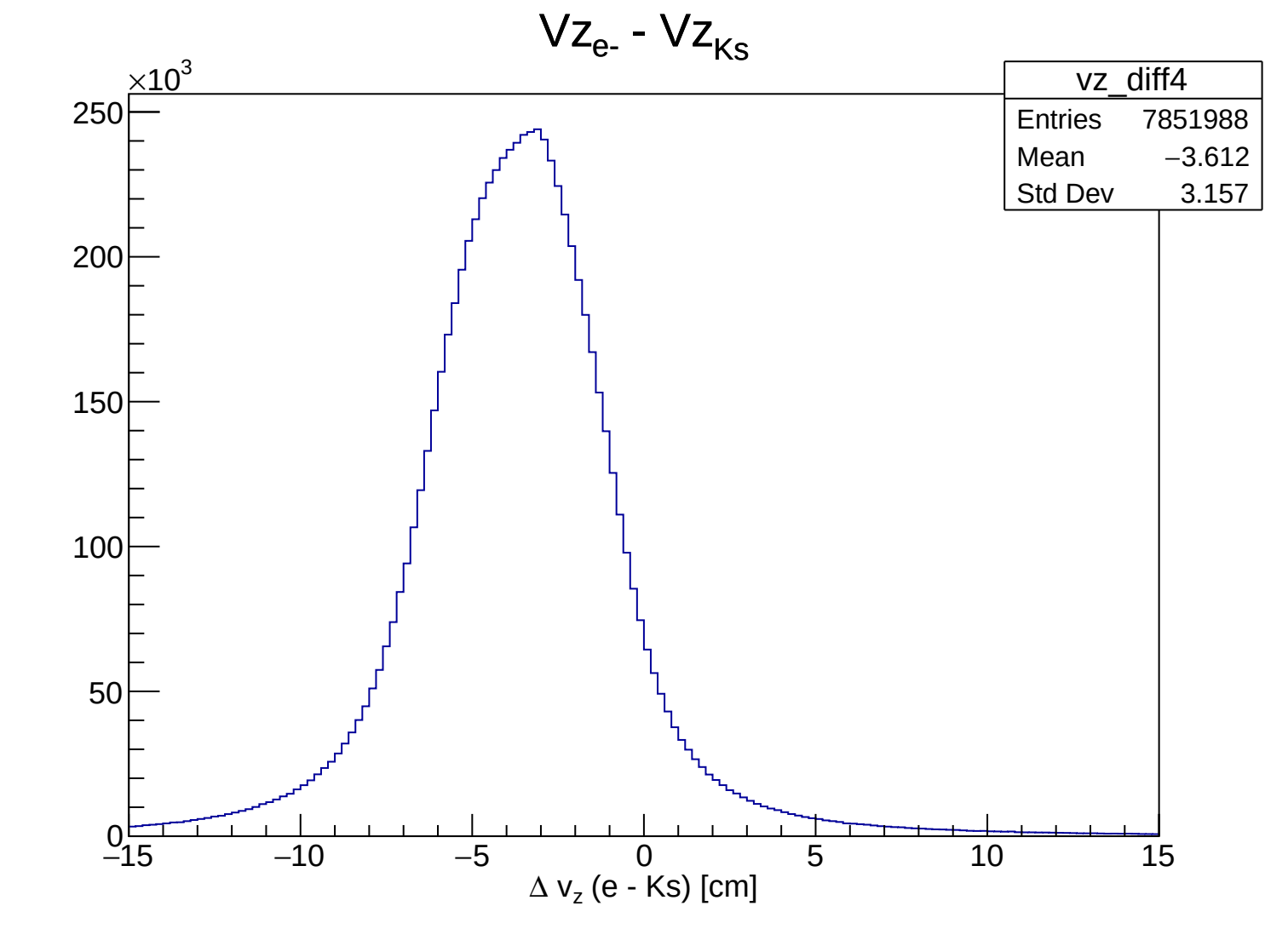

Q^2
$\times 10^3$
900
800
700
600
500
400
300
200
100
0
0
1
2
3
4
5
6
7
8
9
10
Q^2 [GeV^2]
Q2_hist
Entries 7851988
Mean 1.891
Std Dev 0.9381

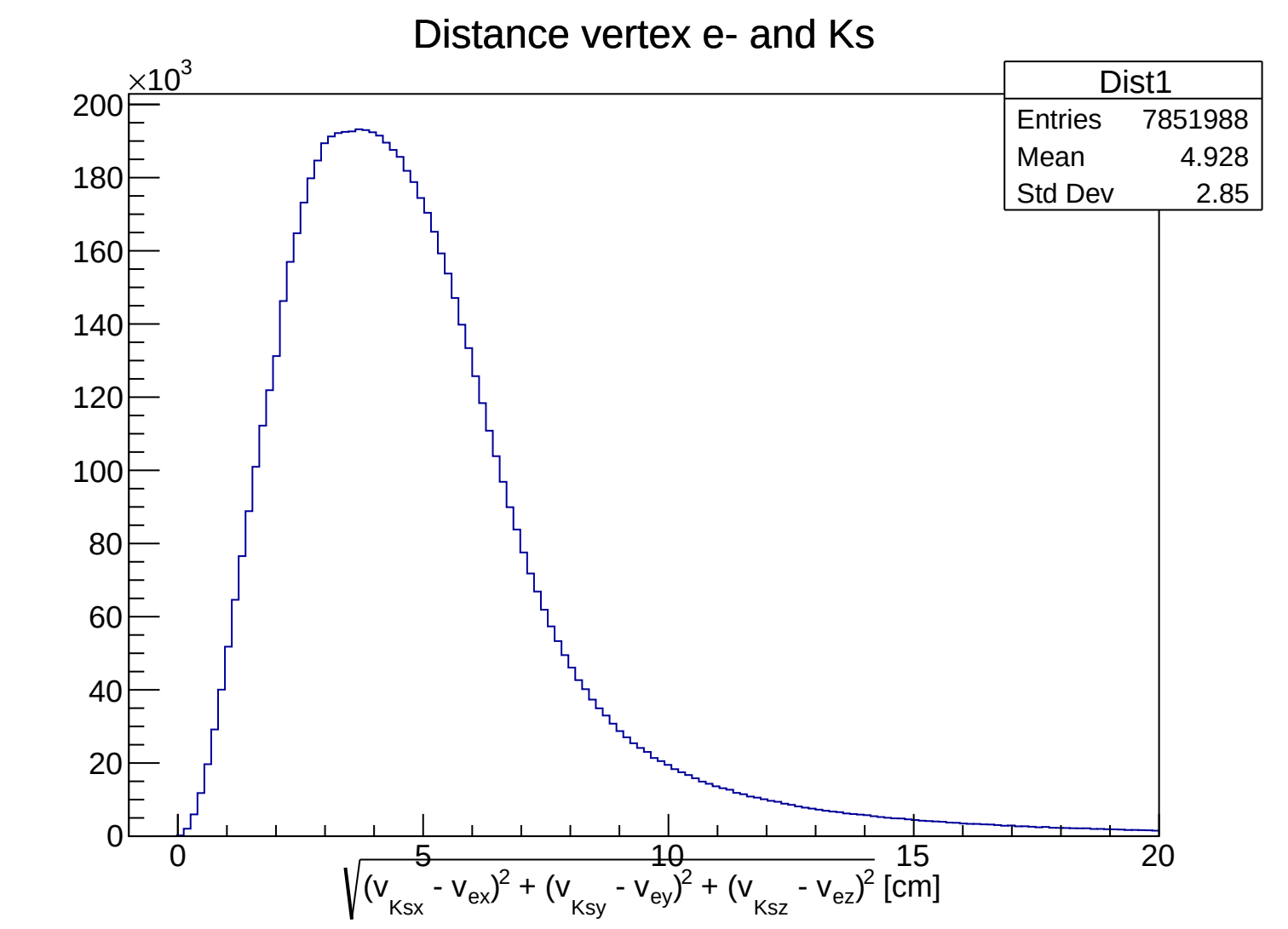

t
×10^3
350
300
250
200
150
100
50
0
−10
−9
−8
−7
−6
−5
−4
−3
−2
−1
0
t [GeV^2]
t_hist
Entries 7851988
Mean −1.863
Std Dev 1.197

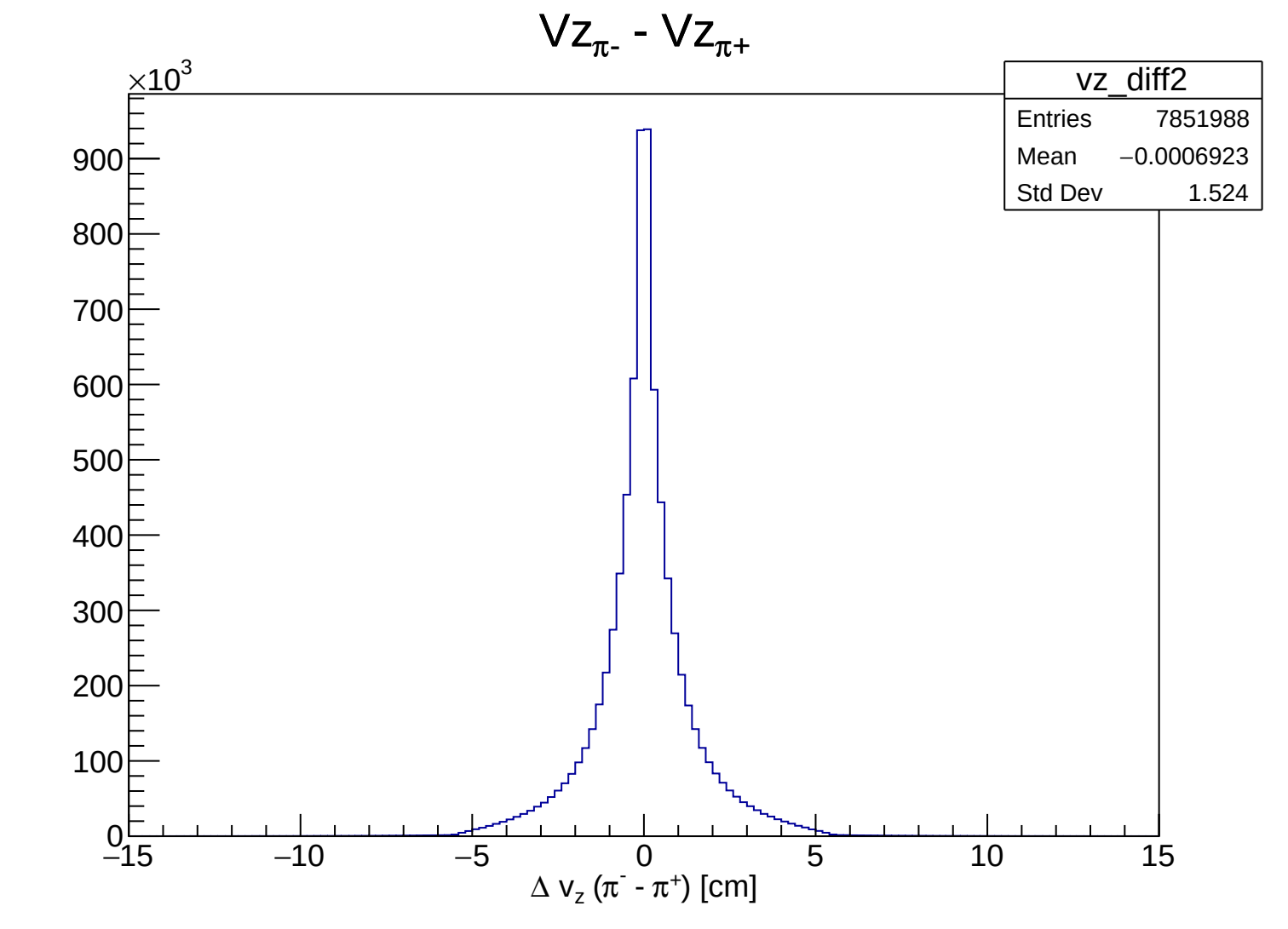

W
×10^3
250
200
150
100
50
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
W [GeV]
W_hist
Entries 7851988
Mean 2.984
Std Dev 0.5089

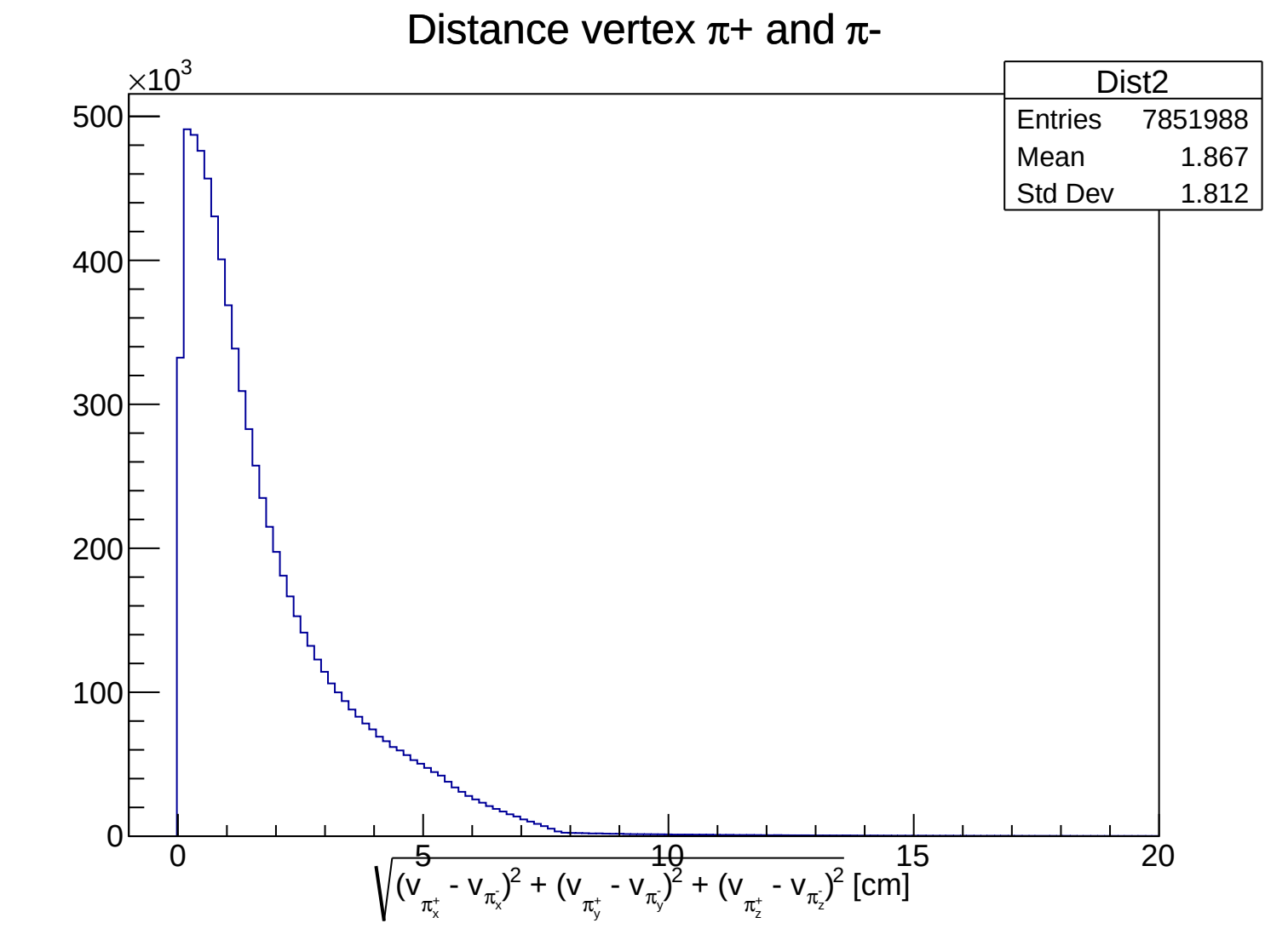

Vz$_{e-}$ - Vz$_{\pi+}$
×10^3
250
200
150
100
50
0
–15
–10
–5
0
5
10
15
Δ v$_z$ (e - π$^+$) [cm]
vz_diff1
Entries 7851988
Mean –3.607
Std Dev 3.232

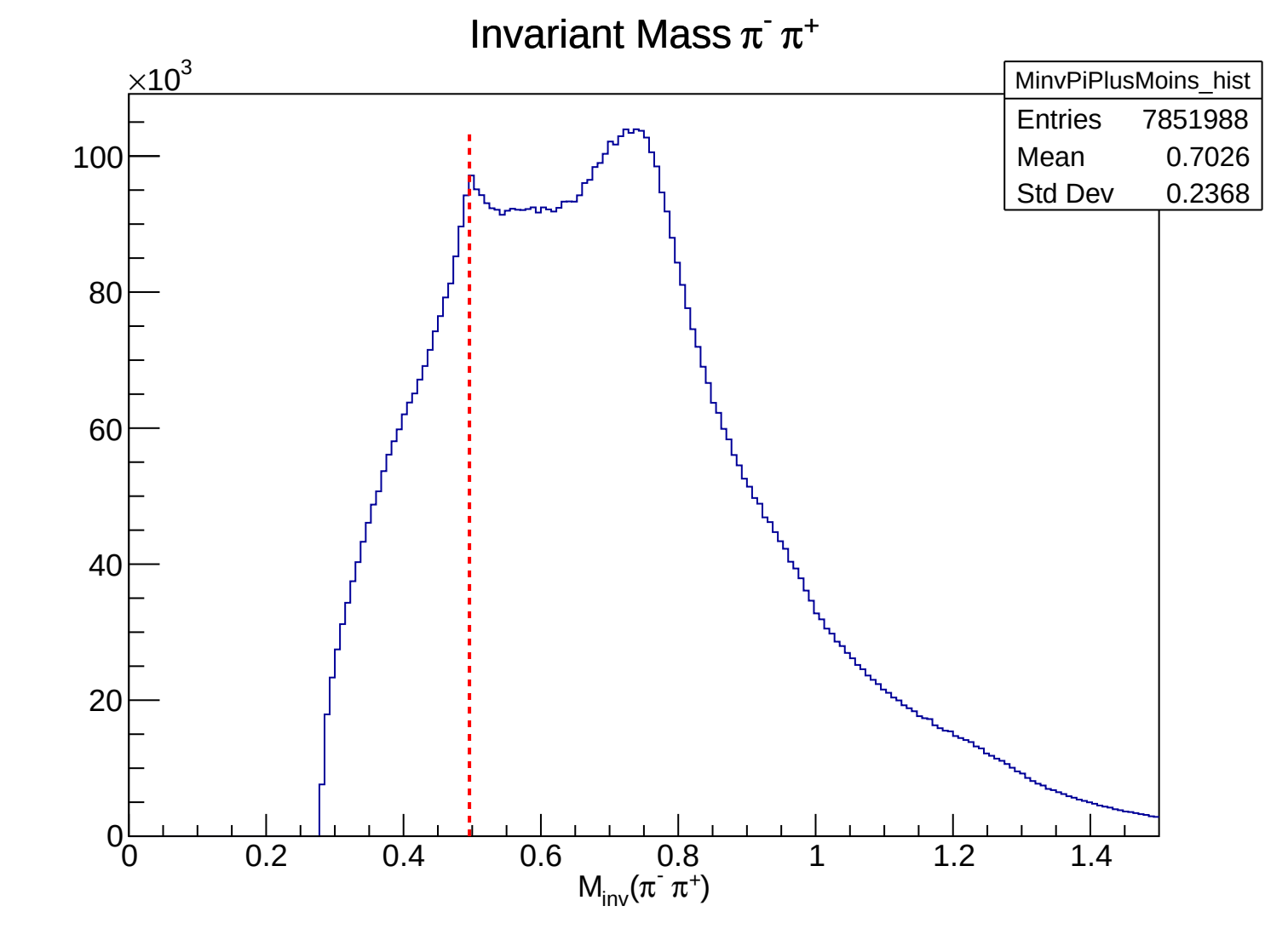

Vz$_{e-}$ - Vz$_{\pi-}$
×10^3
vz_diff3
Entries 7851988
Mean −3.607
Std Dev 3.241
240
220
200
180
160
140
120
100
80
60
40
20
0
−15
−10
−5
0
5
10
15
Δ v$_z$ (e - π$^-$) [cm]

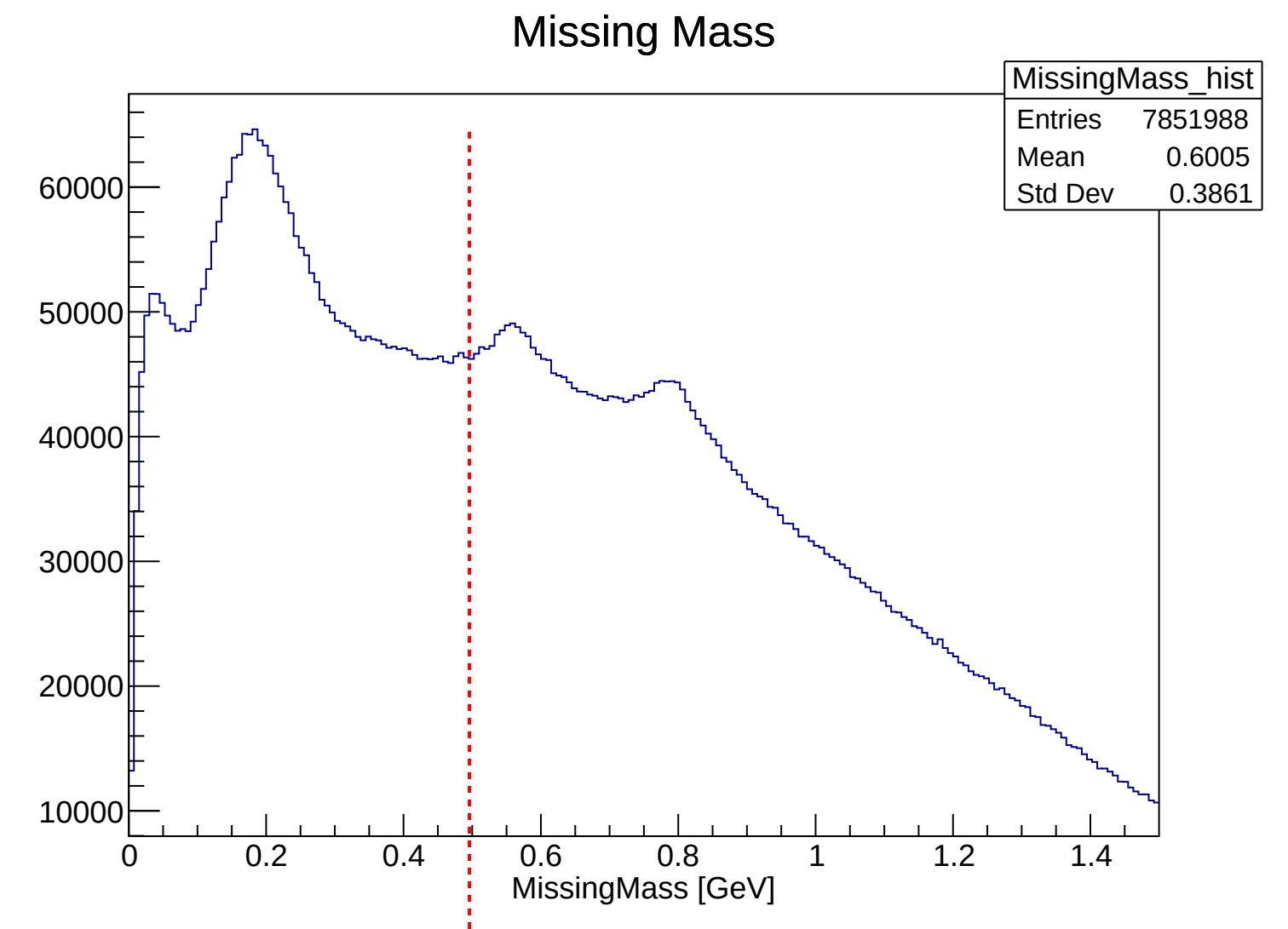

Vz_e- - Vz_Ks
×10^3
250
200
150
100
50
0
−15
−10
−5
0
5
10
15
Δ v_z (e - Ks) [cm]
vz_diff4
Entries 7851988
Mean −3.612
Std Dev 3.157

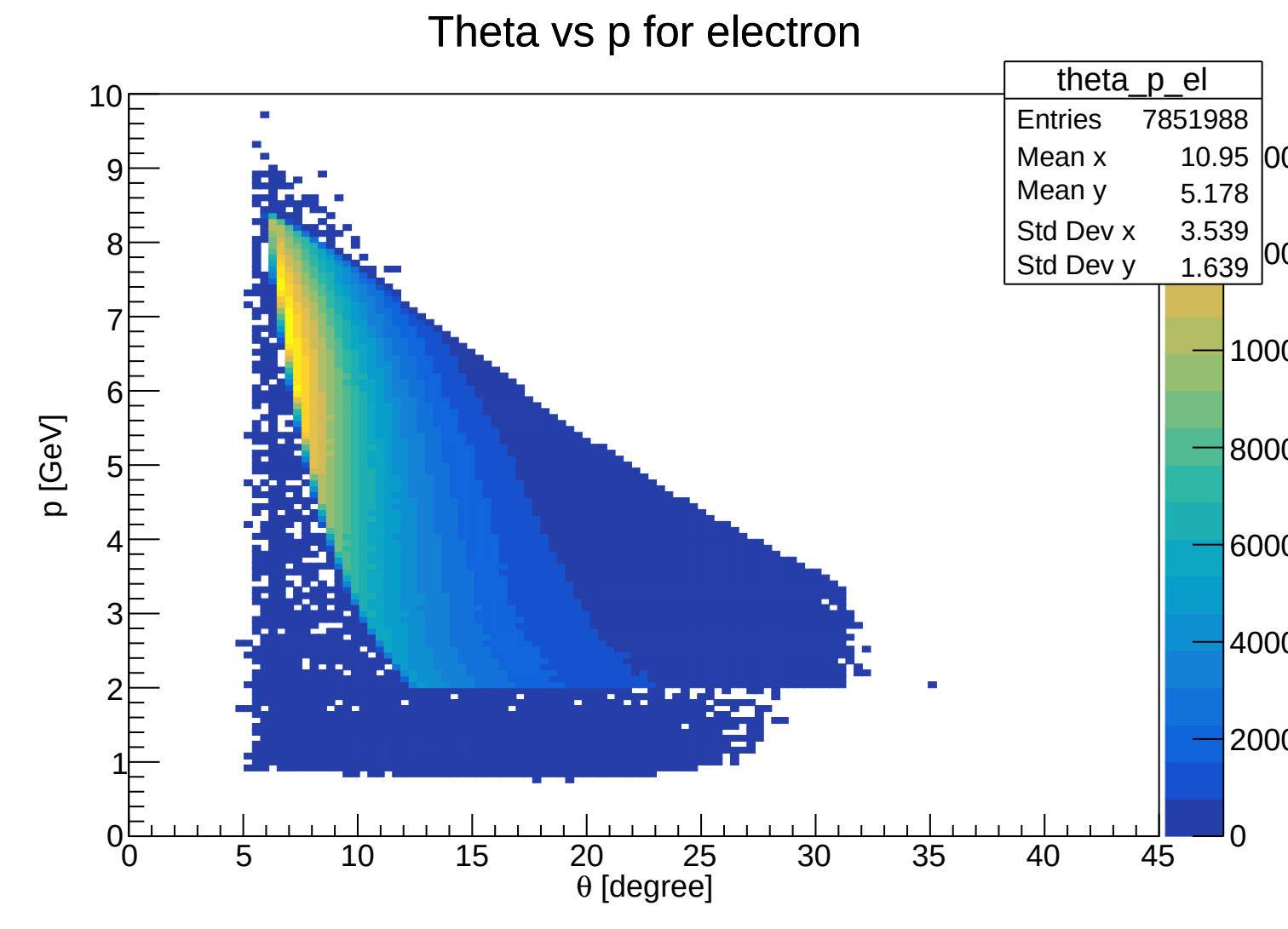

Distance vertex e- and Ks
Dist1
Entries 7851988
Mean 4.928
Std Dev 2.85
×10^3
200
180
160
140
120
100
80
60
40
20
0
0
5
10
15
20
√((v_Ksx - v_ex)^2 + (v_Ksy - v_ey)^2 + (v_Ksz - v_ez)^2 [cm]

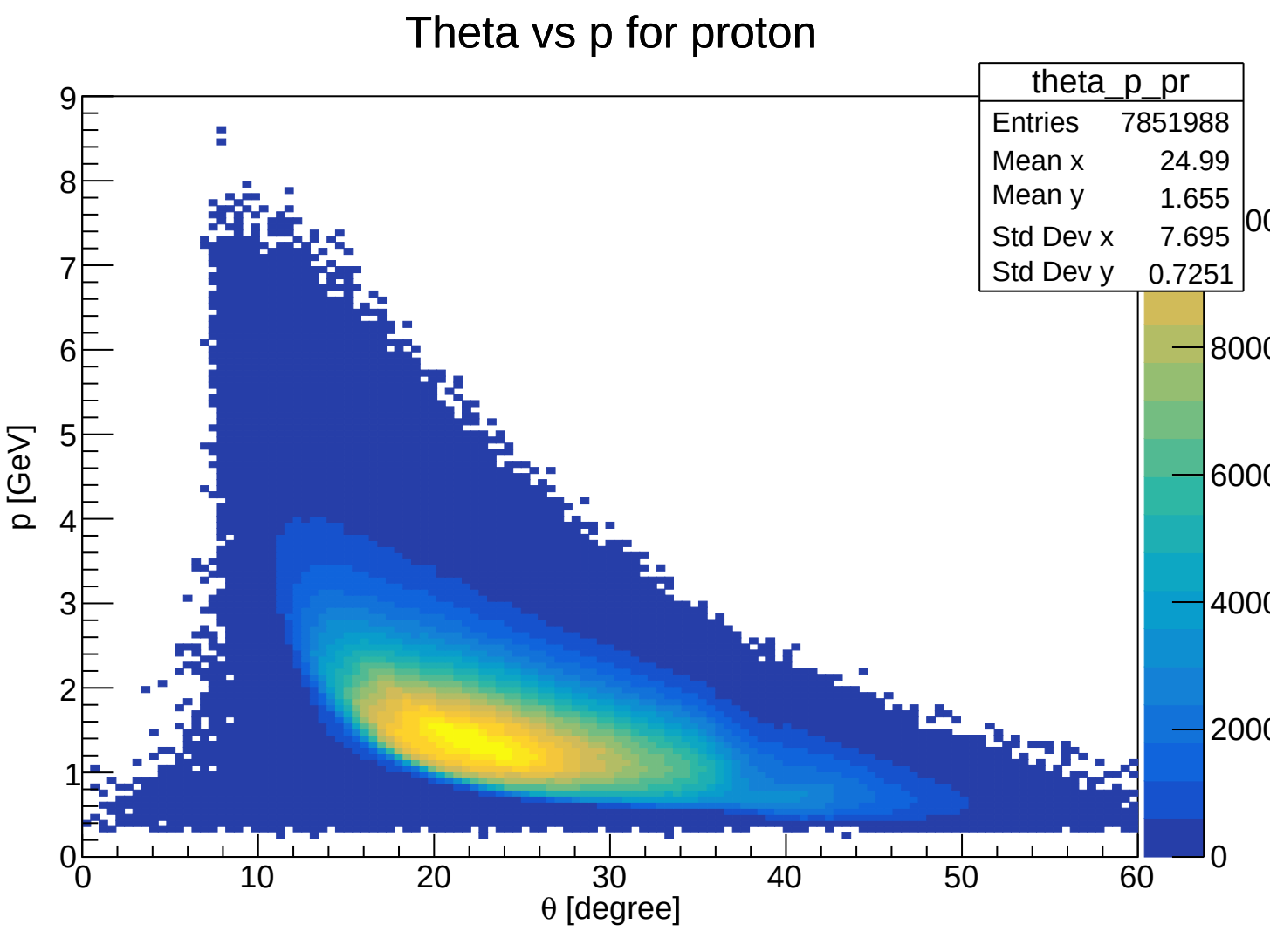

Vz$_{\pi-}$ - Vz$_{\pi+}$
×10^3
vz_diff2
Entries 7851988
Mean −0.0006923
Std Dev 1.524
900
800
700
600
500
400
300
200
100
0
−15
−10
−5
0
5
10
15
Δ v$_z$ (π$^-$ - π$^+$) [cm]

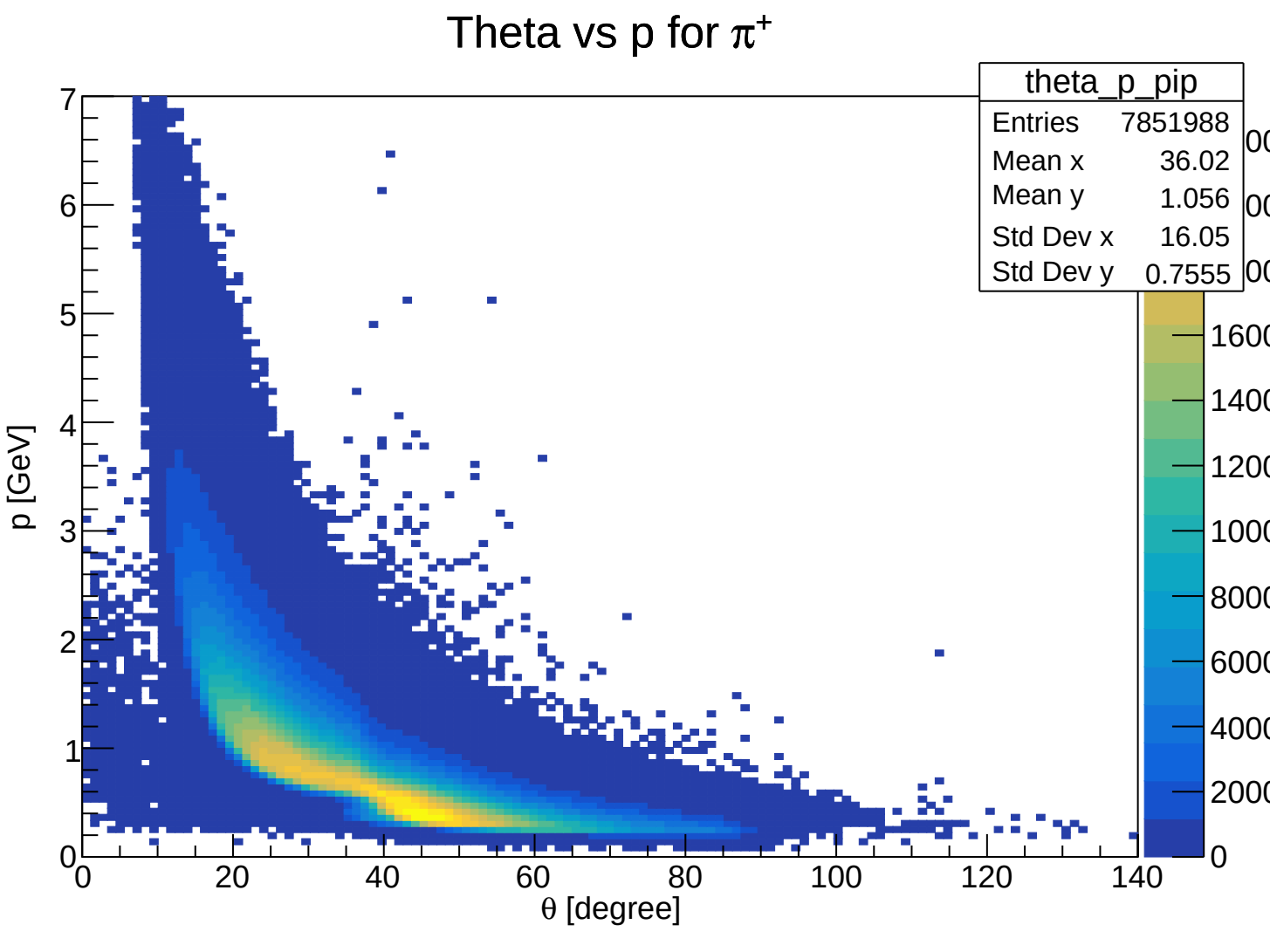

Distance vertex π+ and π-
×10^3
Dist2
Entries 7851988
Mean 1.867
Std Dev 1.812
500
400
300
200
100
0
0
5
10
15
20
$\sqrt{(v_{\pi_x^+} - v_{\pi_x^-})^2 + (v_{\pi_y^+} - v_{\pi_y^-})^2 + (v_{\pi_z^+} - v_{\pi_z^-})^2}$ [cm]

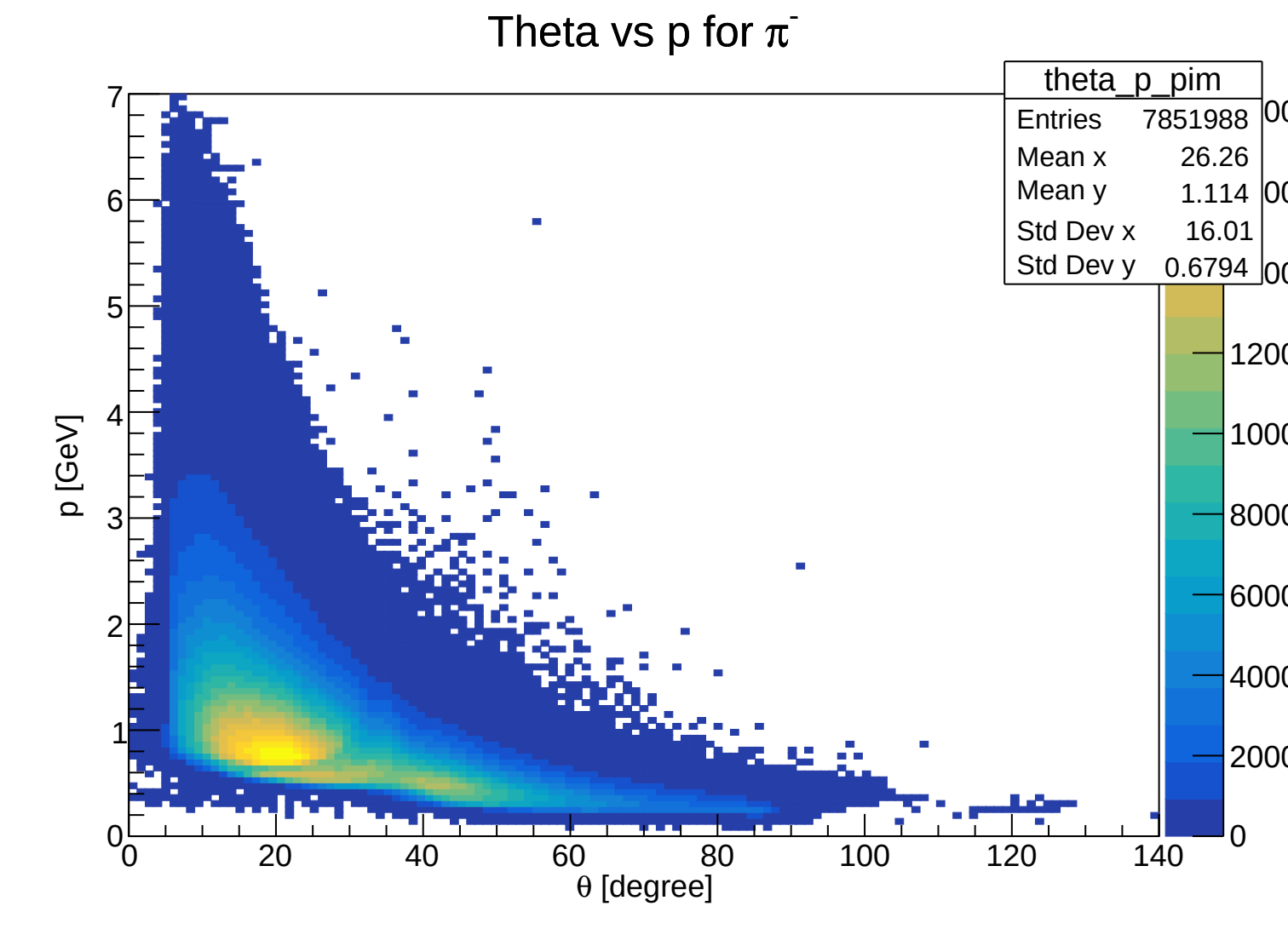

Invariant Mass π⁻ π⁺
×10³
MinvPiPlusMoins_hist
Entries 7851988
Mean 0.7026
Std Dev 0.2368
100
80
60
40
20
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
M_inv(π⁻ π⁺)

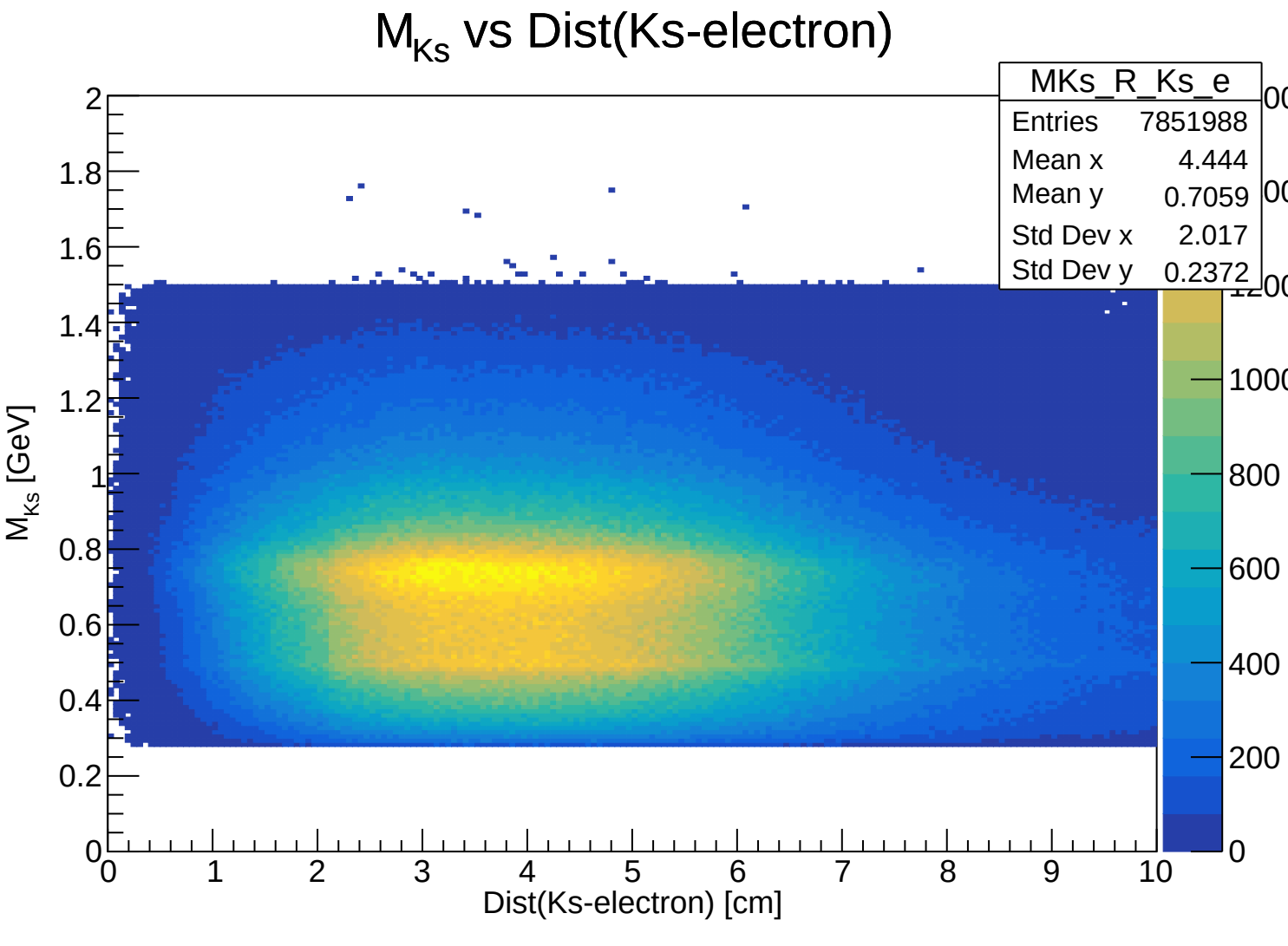

Missing Mass
MissingMass_hist
Entries 7851988
Mean 0.6005
Std Dev 0.3861
60000
50000
40000
30000
20000
10000
0
0.2
0.4
0.6
0.8
1
1.2
1.4
MissingMass [GeV]

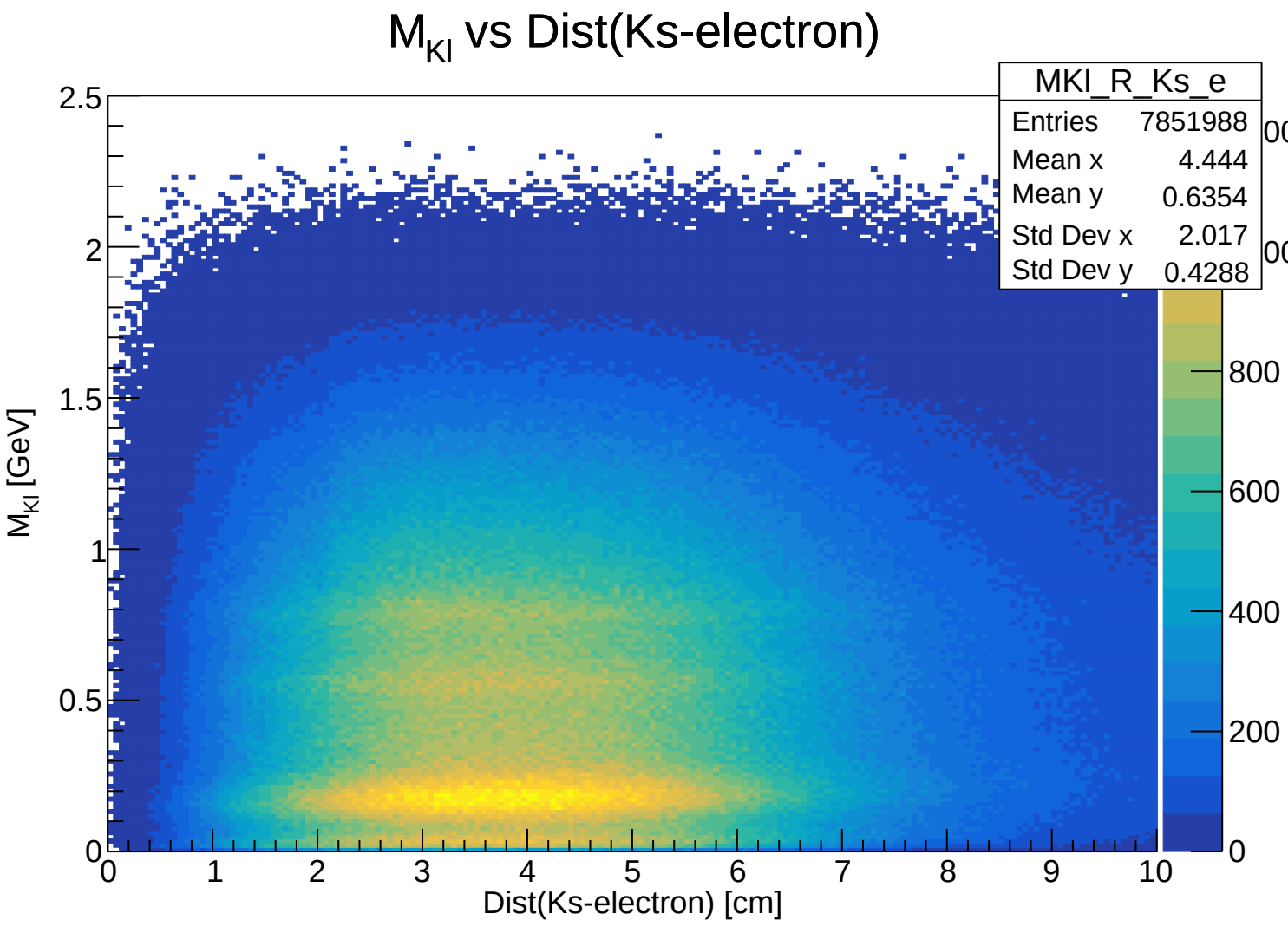

Theta vs p for electron
theta_p_el
Entries 7851988
Mean x 10.95
Mean y 5.178
Std Dev x 3.539
Std Dev y 1.639
p [GeV]
θ [degree]
0
1
2
3
4
5
6
7
8
9
10
0
5
10
15
20
25
30
35
40
45
0
2000
4000
6000
8000
1000

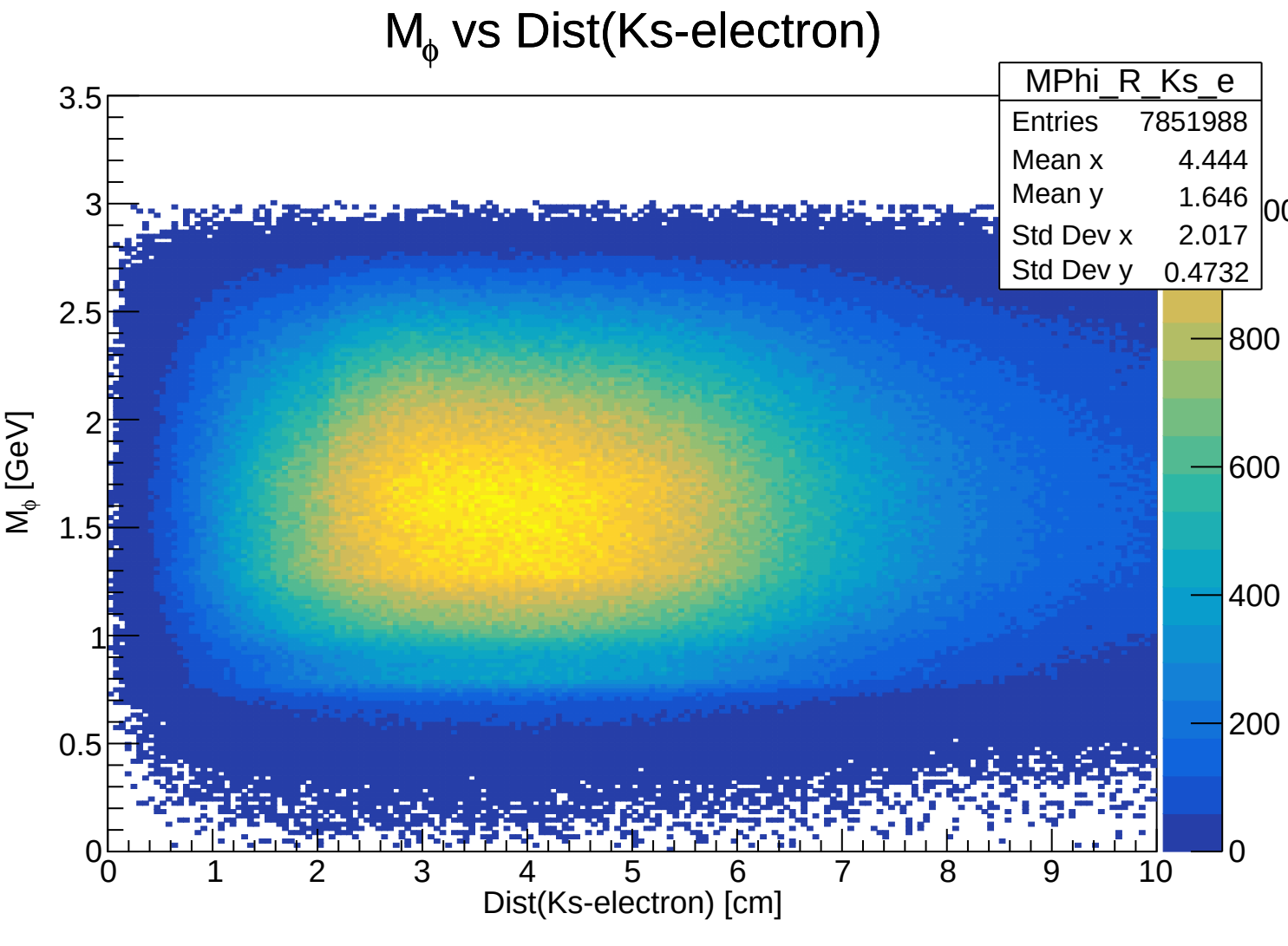

Theta vs p for proton
theta_p_pr
Entries 7851988
Mean x 24.99
Mean y 1.655
Std Dev x 7.695
Std Dev y 0.7251
p [GeV]
θ [degree]
0
10
20
30
40
50
60
1
2
3
4
5
6
7
8
9
8000
6000
4000
2000

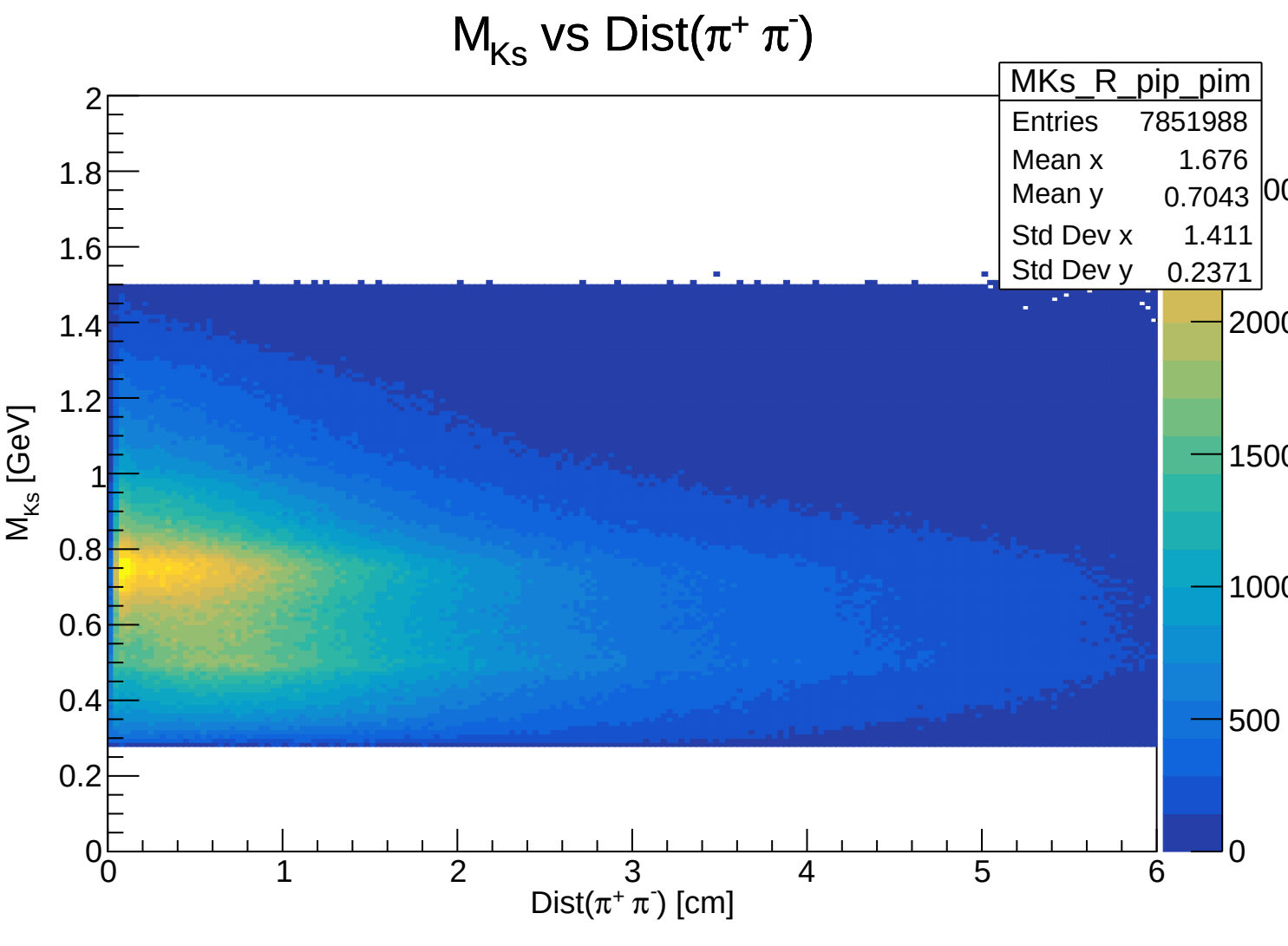

Theta vs p for π^+
theta_p_pip
Entries 7851988
Mean x 36.02
Mean y 1.056
Std Dev x 16.05
Std Dev y 0.7555
p [GeV]
θ [degree]
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
2000
4000
6000
8000
1000
1200
1400
1600

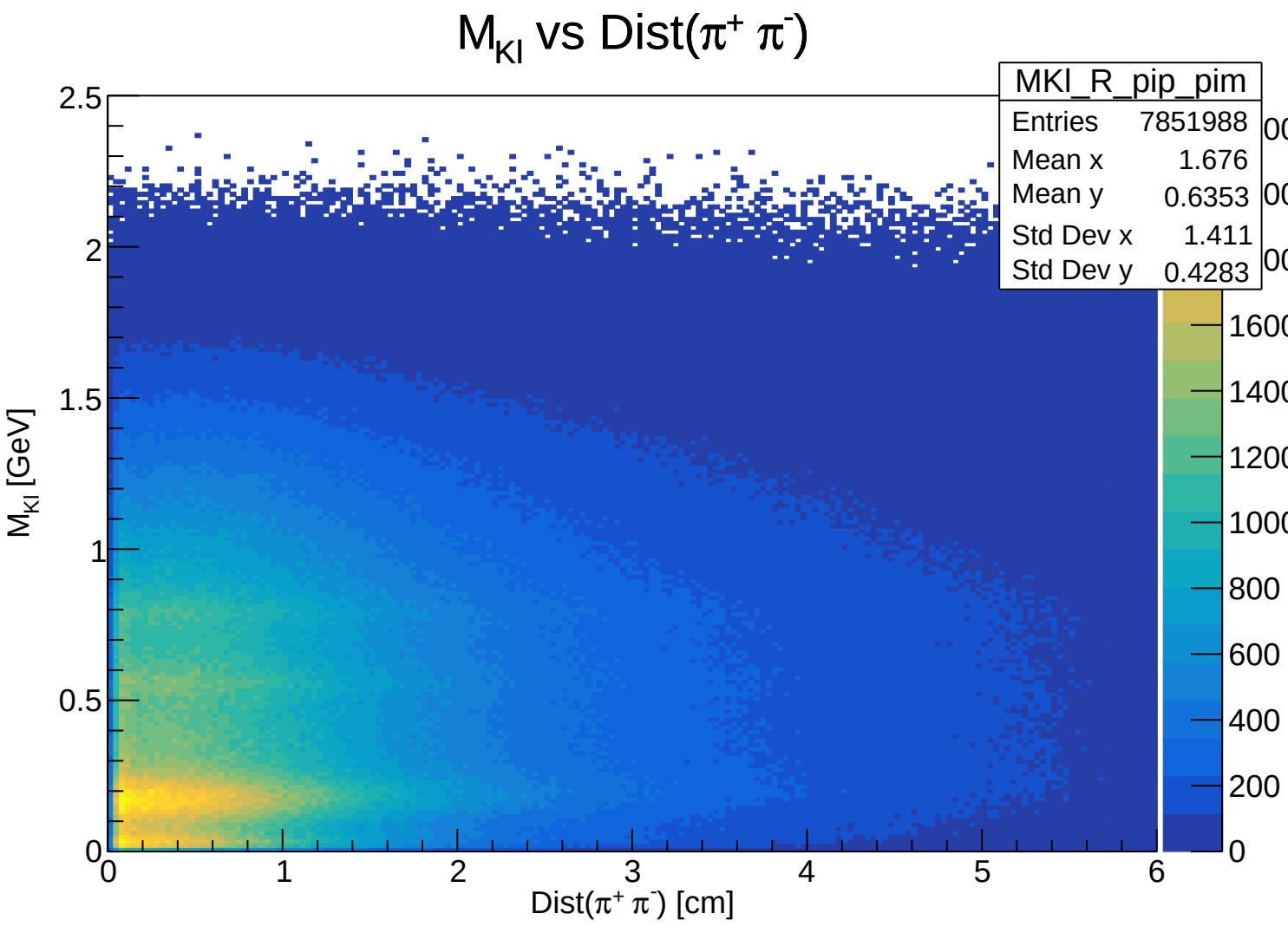

Theta vs p for π⁻
theta_p_pim
Entries 7851988
Mean x 26.26
Mean y 1.114
Std Dev x 16.01
Std Dev y 0.6794
p [GeV]
θ [degree]
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
2000
4000
6000
8000
1000
1200

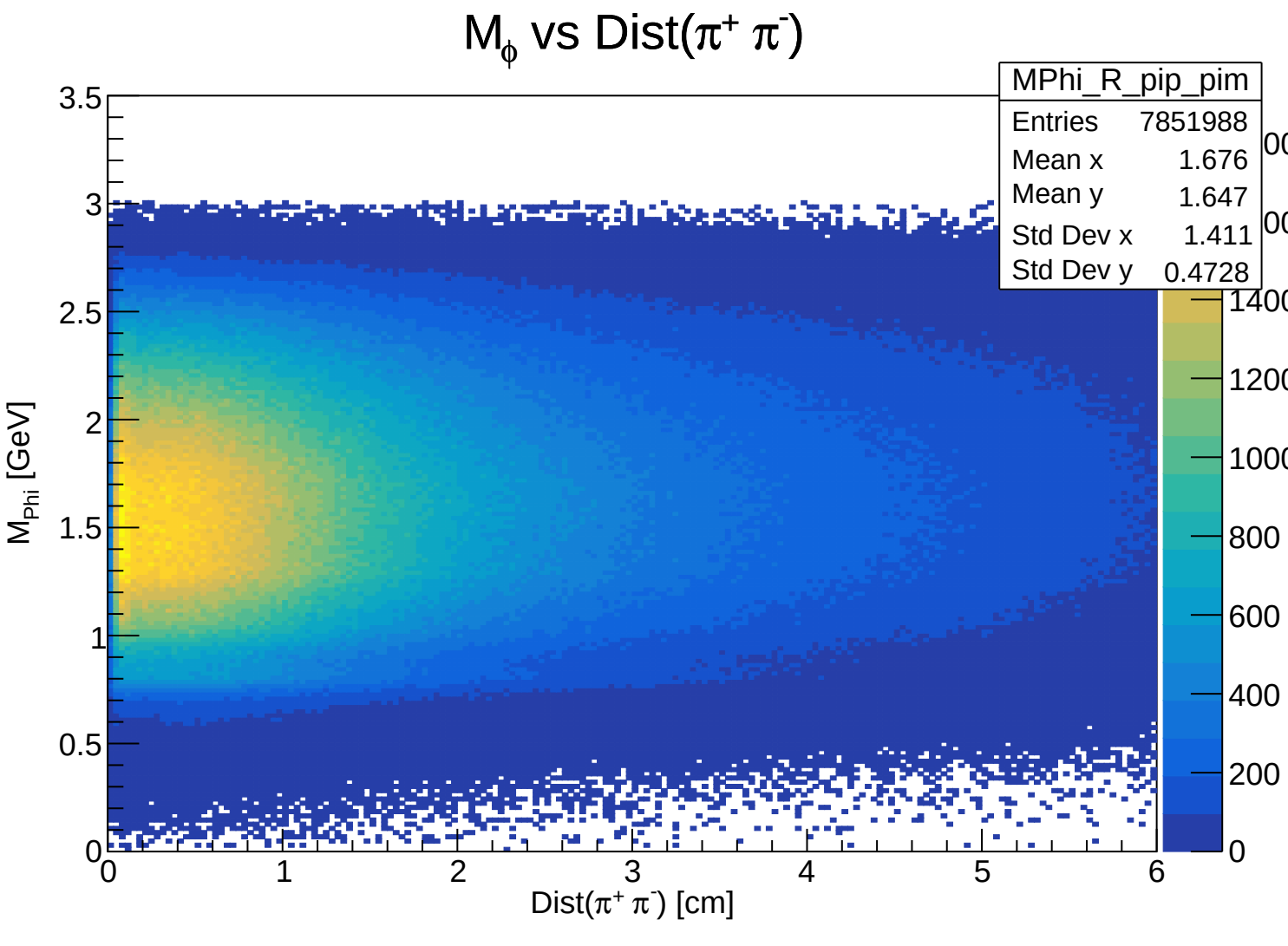

M_{Ks} vs Dist(Ks-electron)
MKs_R_Ks_e
Entries 7851988
Mean x 4.444
Mean y 0.7059
Std Dev x 2.017
Std Dev y 0.2372
M_{Ks} [GeV]
Dist(Ks-electron) [cm]
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
1
2
3
4
5
6
7
8
9
10
200
400
600
800
1000

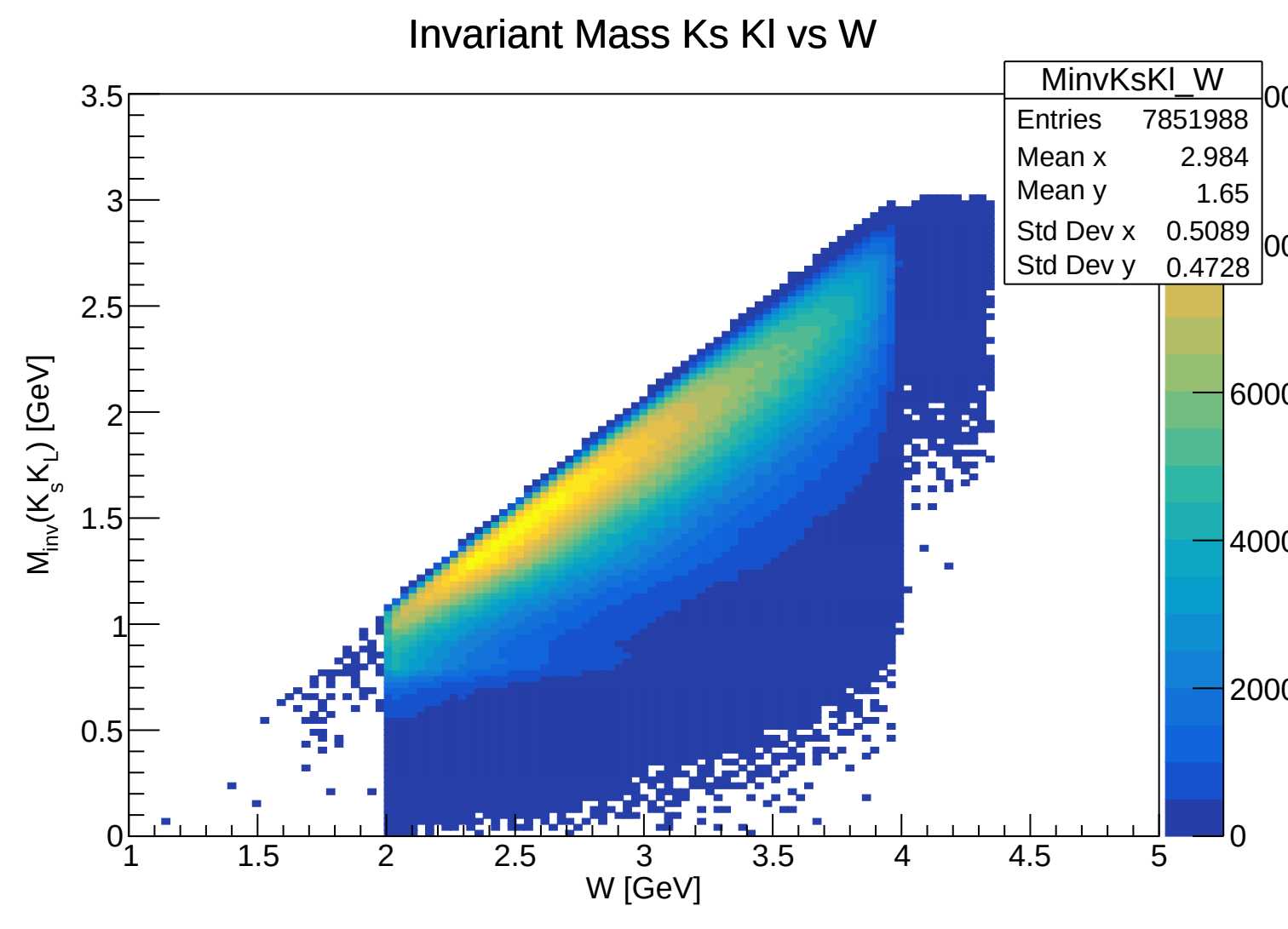

M_{Kl} vs Dist(Ks-electron)
MKl_R_Ks_e
Entries 7851988
Mean x 4.444
Mean y 0.6354
Std Dev x 2.017
Std Dev y 0.4288
M_{Kl} [GeV]
Dist(Ks-electron) [cm]
0
0.5
1
1.5
2
2.5
0
1
2
3
4
5
6
7
8
9
10
200
400
600
800

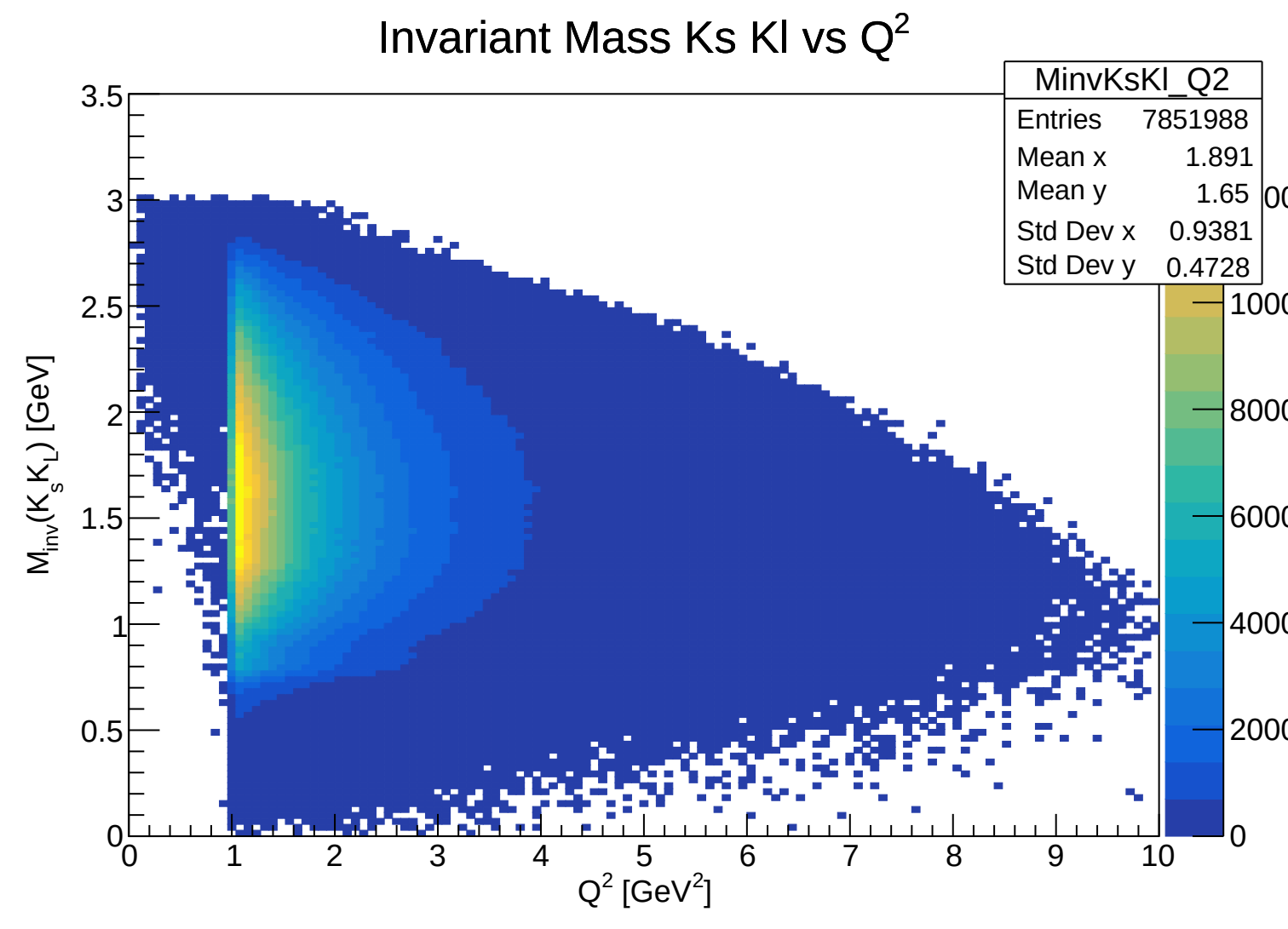

M$_\phi$ vs Dist(Ks-electron)
MPhi_R_Ks_e
Entries 7851988
Mean x 4.444
Mean y 1.646
Std Dev x 2.017
Std Dev y 0.4732
M$_\phi$ [GeV]
Dist(Ks-electron) [cm]
0
0.5
1
1.5
2
2.5
3
3.5
0
1
2
3
4
5
6
7
8
9
10
0
200
400
600
800

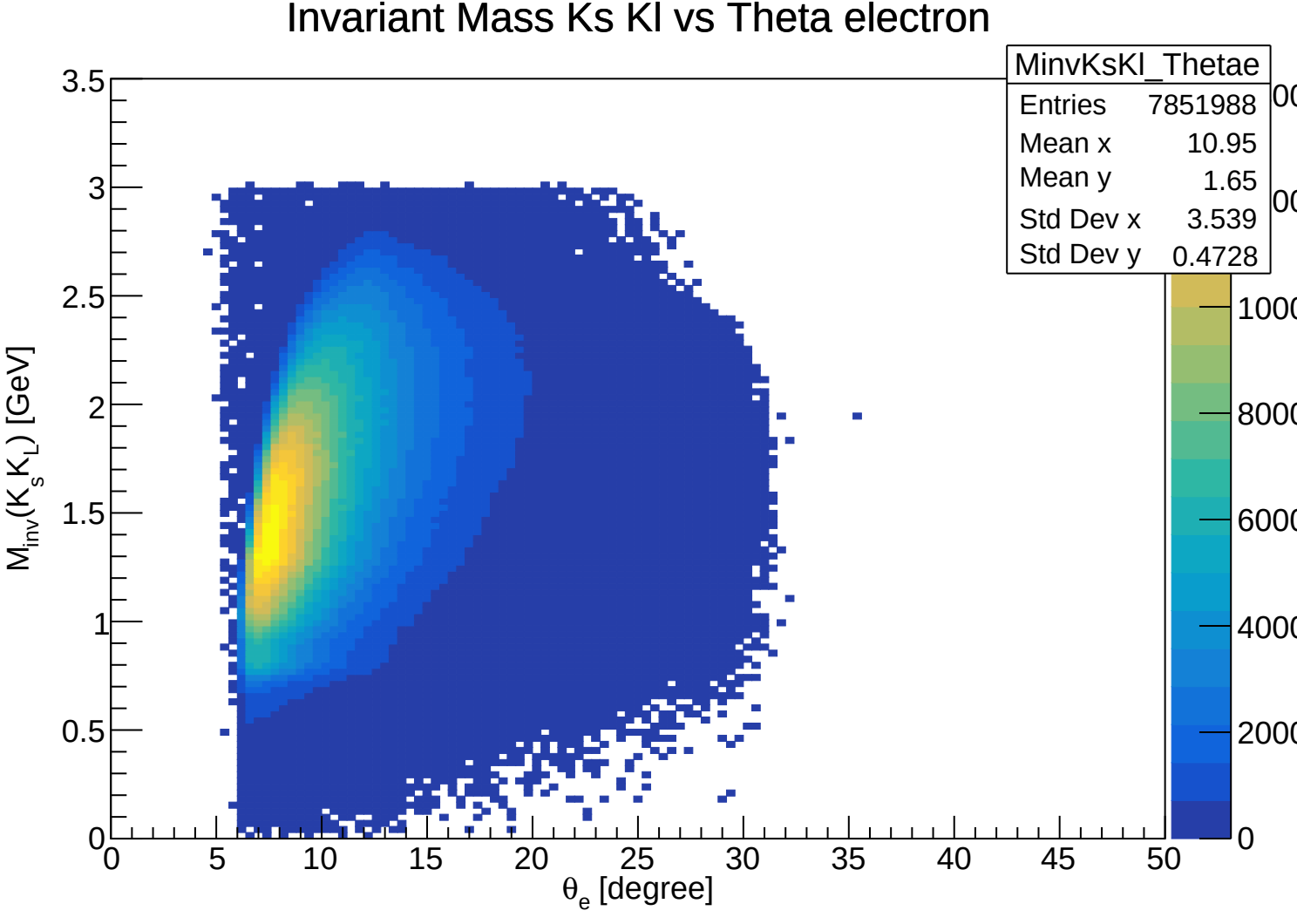

M_{Ks} vs Dist(π^+ π^-)
MKs_R_pip_pim
Entries 7851988
Mean x 1.676
Mean y 0.7043
Std Dev x 1.411
Std Dev y 0.2371
M_{Ks} [GeV]
Dist(π^+ π^-) [cm]
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
1
2
3
4
5
6
500
1000
1500
2000


M_{Kl} vs Dist(π^+ π^-)
MKl_R_pip_pim
Entries 7851988
Mean x 1.676
Mean y 0.6353
Std Dev x 1.411
Std Dev y 0.4283
M_{Kl} [GeV]
Dist(π^+ π^-) [cm]
0
0.5
1
1.5
2
2.5
0
1
2
3
4
5
6
0
200
400
600
800
1000
1200
1400
1600


M$_\phi$ vs Dist(π^+ π^-)
MPhi_R_pip_pim
Entries 7851988
Mean x 1.676
Mean y 1.647
Std Dev x 1.411
Std Dev y 0.4728
M$_{Phi}$ [GeV]
Dist(π^+ π^-) [cm]
0
0.5
1
1.5
2
2.5
3
3.5
0
1
2
3
4
5
6
200
400
600
800
1000
1200
1400


Invariant Mass Ks Kl vs W
MinvKsKl_W
Entries 7851988
Mean x 2.984
Mean y 1.65
Std Dev x 0.5089
Std Dev y 0.4728
$M_{inv}(K_S K_L)$ [GeV]
W [GeV]
0
0.5
1
1.5
2
2.5
3
3.5
1
1.5
2
2.5
3
3.5
4
4.5
5
2000
4000
6000


Invariant Mass Ks Kl vs Q2
MinvKsKl_Q2
Entries 7851988
Mean x 1.891
Mean y 1.65
Std Dev x 0.9381
Std Dev y 0.4728
M_inv(K K_L) [GeV]
Q2 [GeV2]
0
0.5
1
1.5
2
2.5
3
3.5
0
1
2
3
4
5
6
7
8
9
10
1000
2000
4000
6000
8000


Invariant Mass Ks Kl vs Theta electron
MinvKsKl_Thetae
Entries 7851988
Mean x 10.95
Mean y 1.65
Std Dev x 3.539
Std Dev y 0.4728
$M_{inv}(K_S K_L)$ [GeV]
θ_e [degree]
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30
35
40
45
50
0
2000
4000
6000
8000
1000

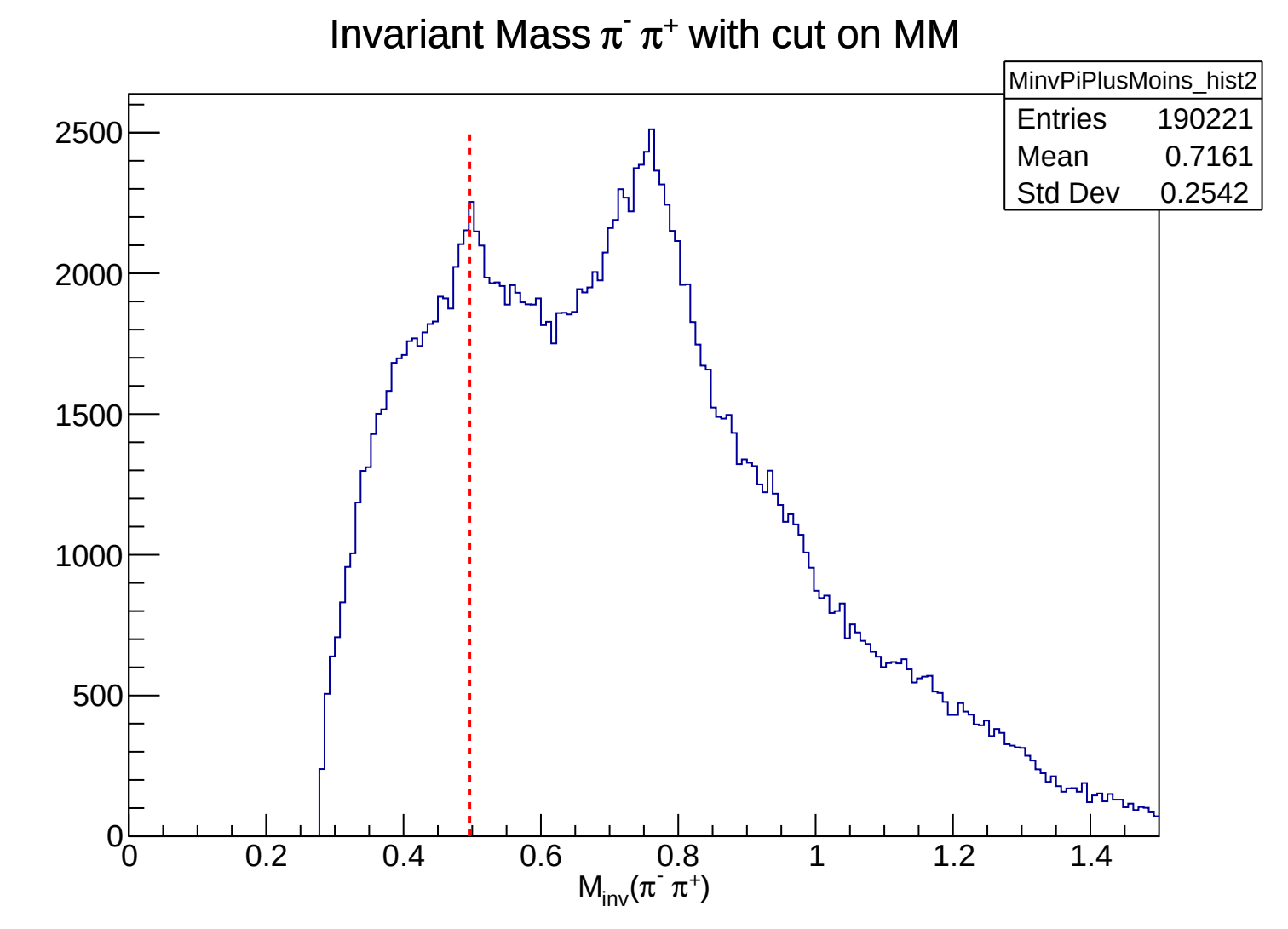
Summary of cuts for the next plots:

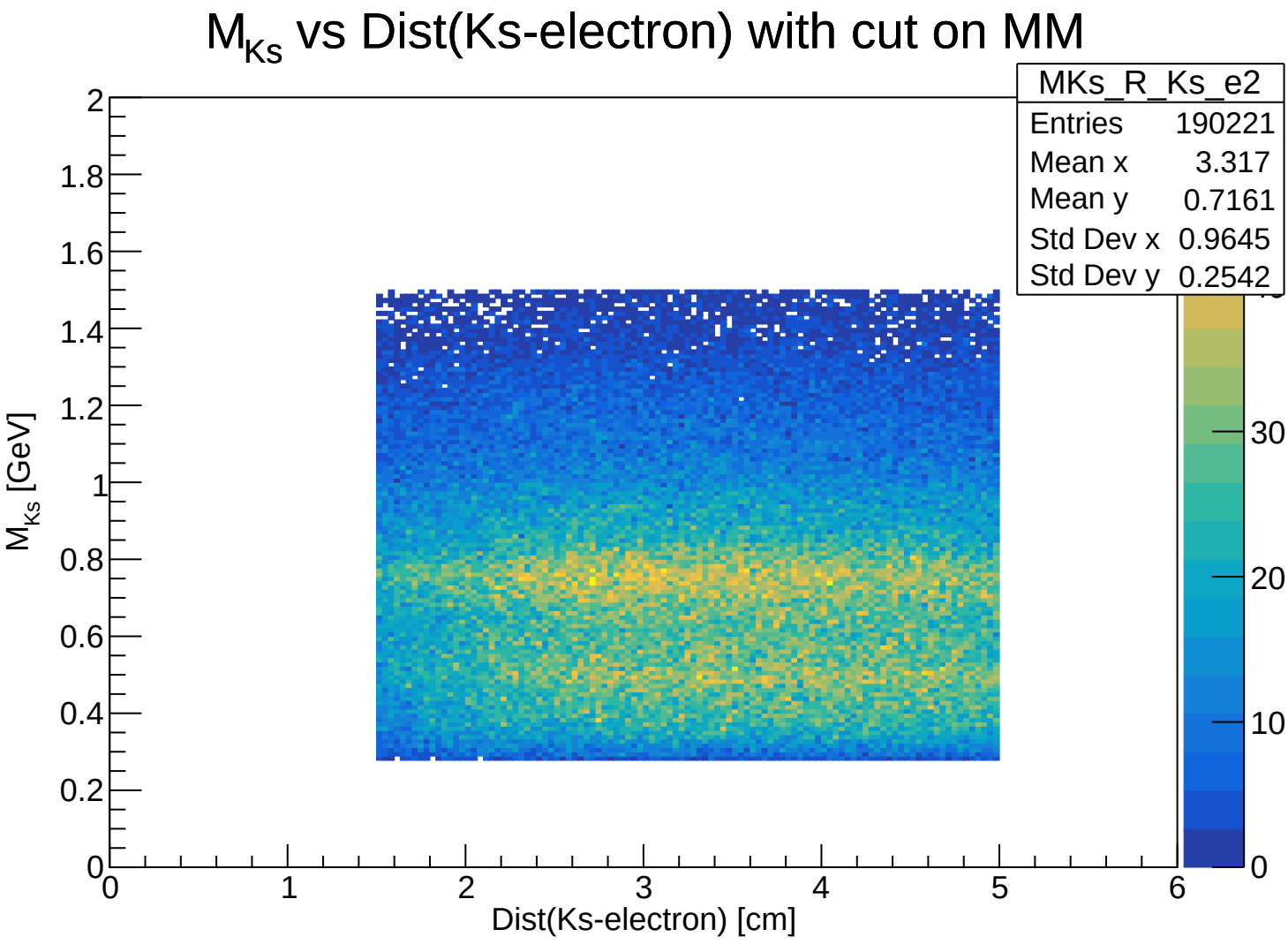
- Add a cut on missing mass : 0.4 < MM < 0.6 GeV

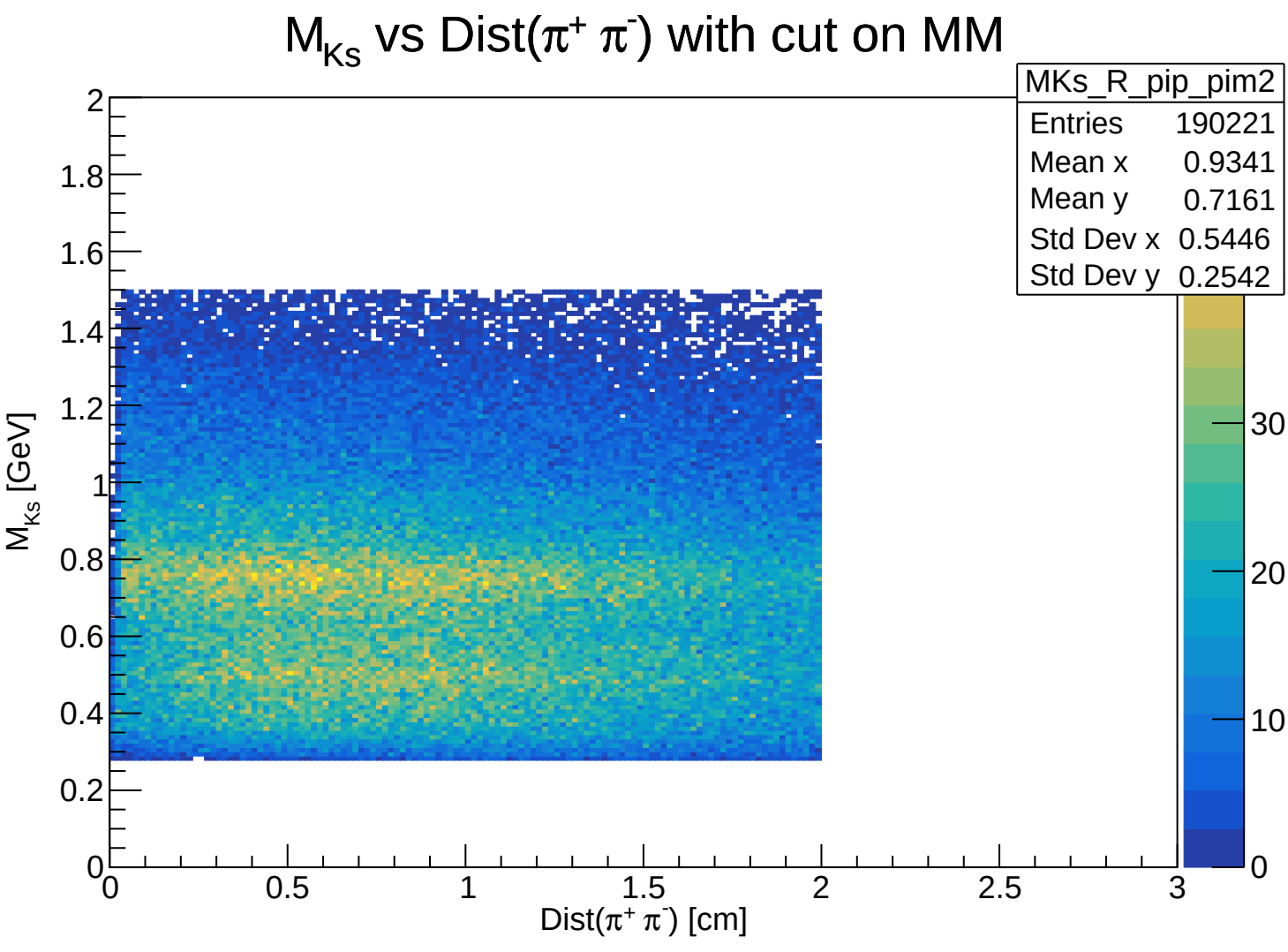
- Add a cut on distance (on x y z) of vertex e- and Ks : 1.5 < R_1 < 5.0 cm

- Add a cut on distance (on x y z) of vertex pi+ pi- : 0 < R_2 < 2 cm

- pi+ and pi- need to be in FD


Invariant Mass π⁻ π⁺ with cut on MM
MinvPiPlusMoins_hist2
Entries 190221
Mean 0.7161
Std Dev 0.2542
2500
2000
1500
1000
500
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
M_inv(π⁻ π⁺)

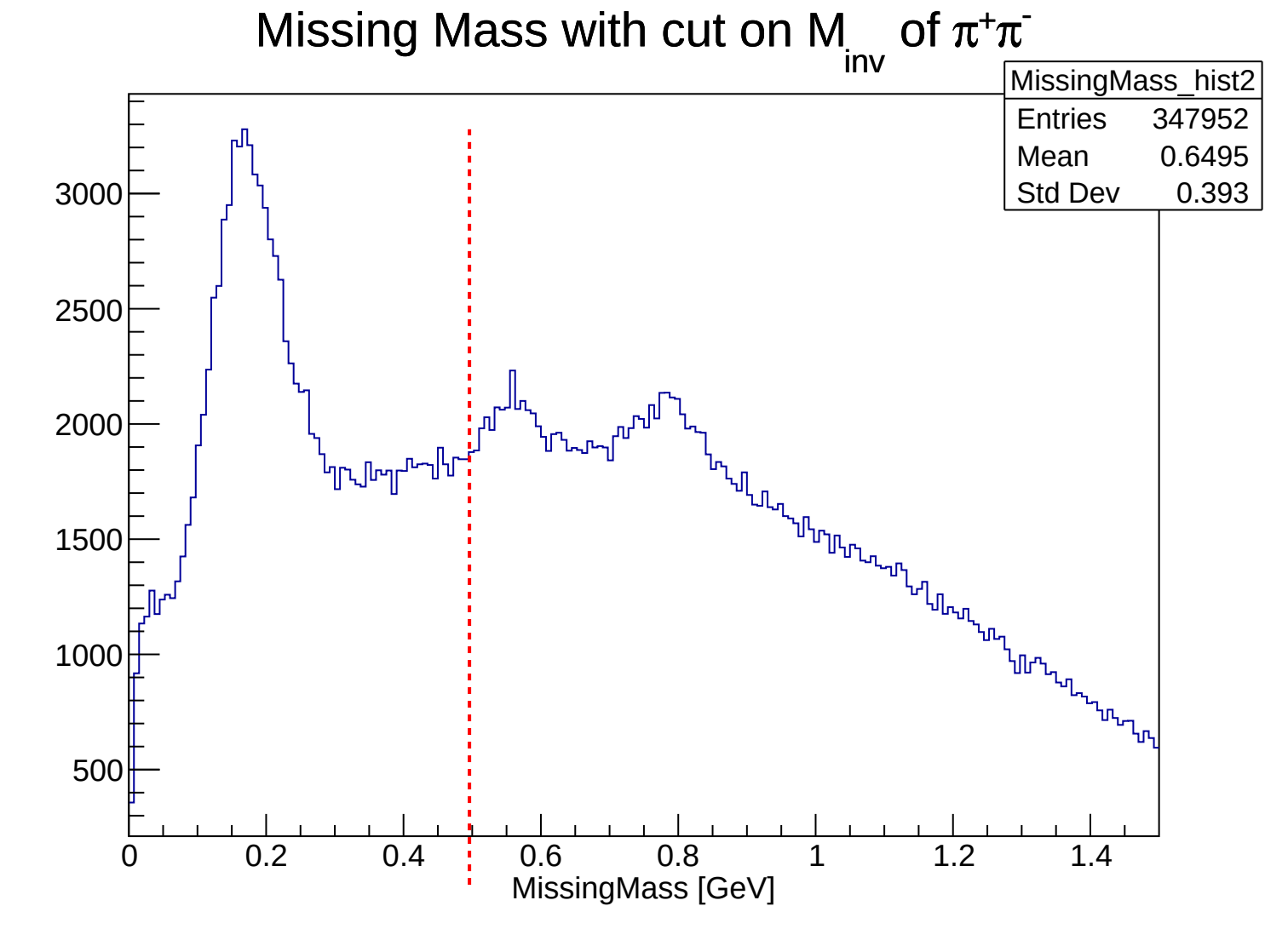

M_{Ks} vs Dist(Ks-electron) with cut on MM
MKs_R_Ks_e2
Entries 190221
Mean x 3.317
Mean y 0.7161
Std Dev x 0.9645
Std Dev y 0.2542
M_{Ks} [GeV]
Dist(Ks-electron) [cm]
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
1
2
3
4
5
6
0
10
20
30

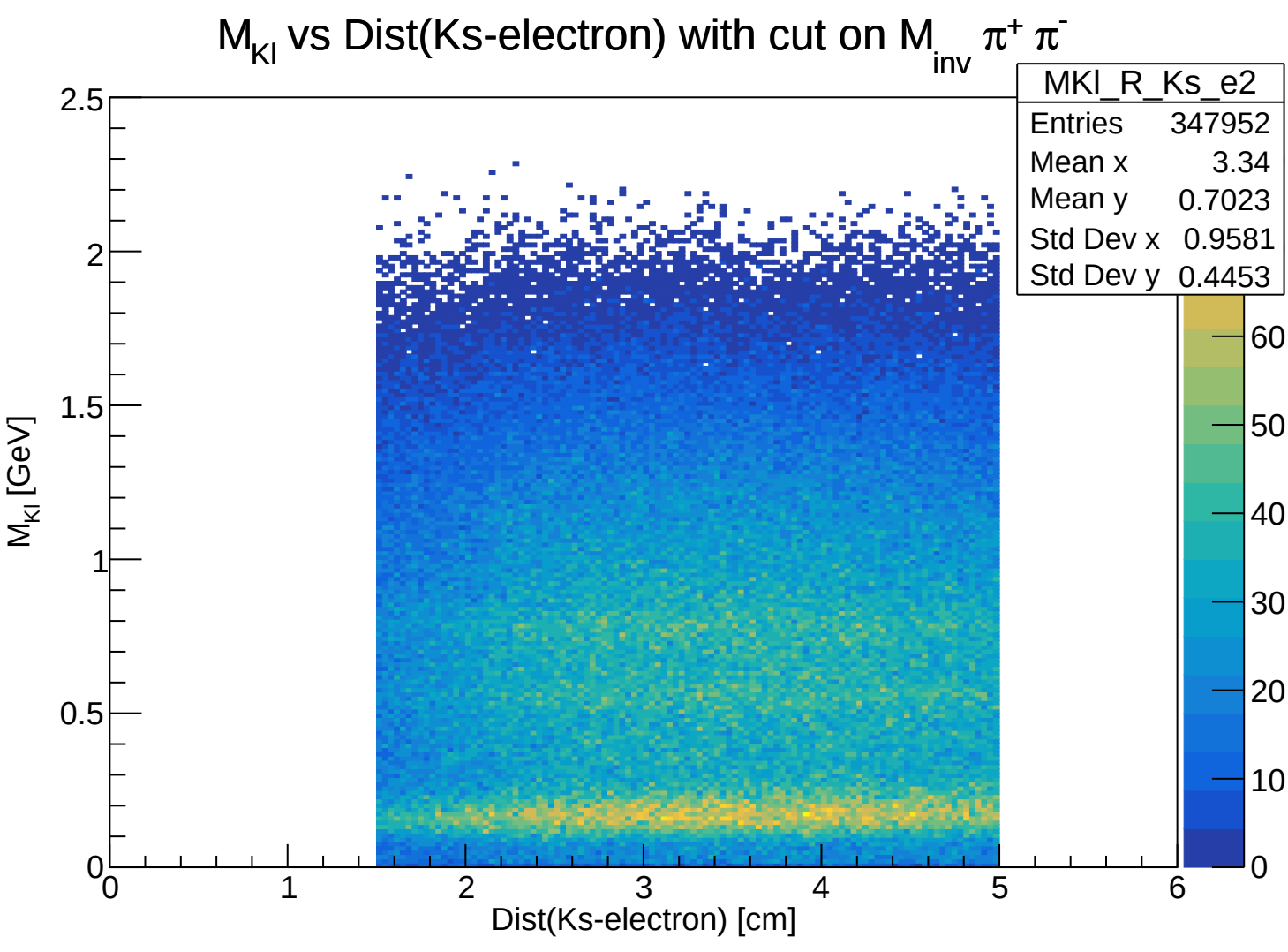

M_{Ks} vs Dist(π^+ π^-) with cut on MM
MKs_R_pip_pim2
Entries 190221
Mean x 0.9341
Mean y 0.7161
Std Dev x 0.5446
Std Dev y 0.2542
M_{Ks} [GeV]
Dist(π^+ π^-) [cm]
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0.5
1.5
2.5
3
10
20
30

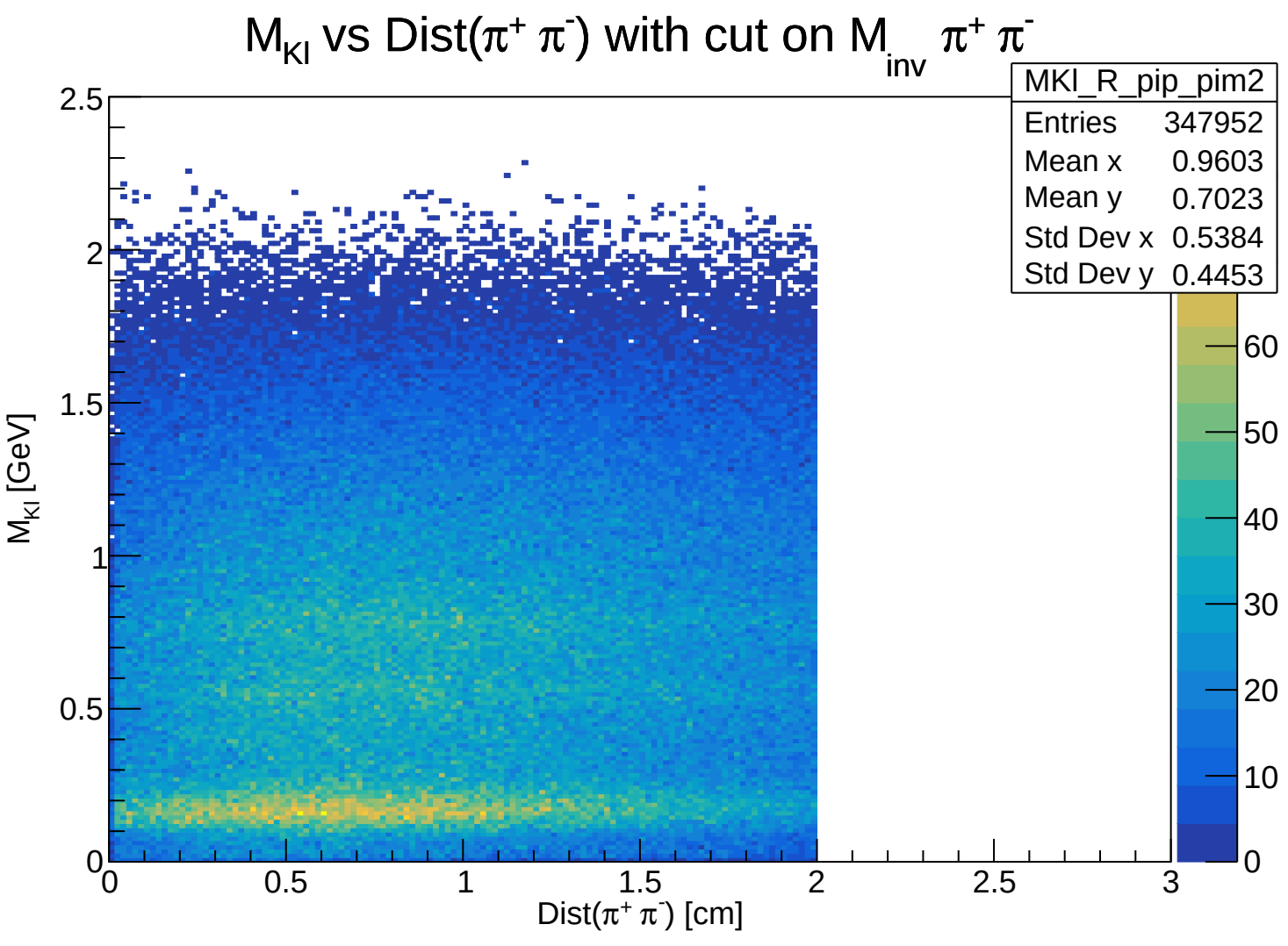
Summary of cuts for the next plots:

- Replace the cut on missing mass by the cut on invariant mass pi+ pi- :

$0.4 < M_{inv} < 0.6$ GeV

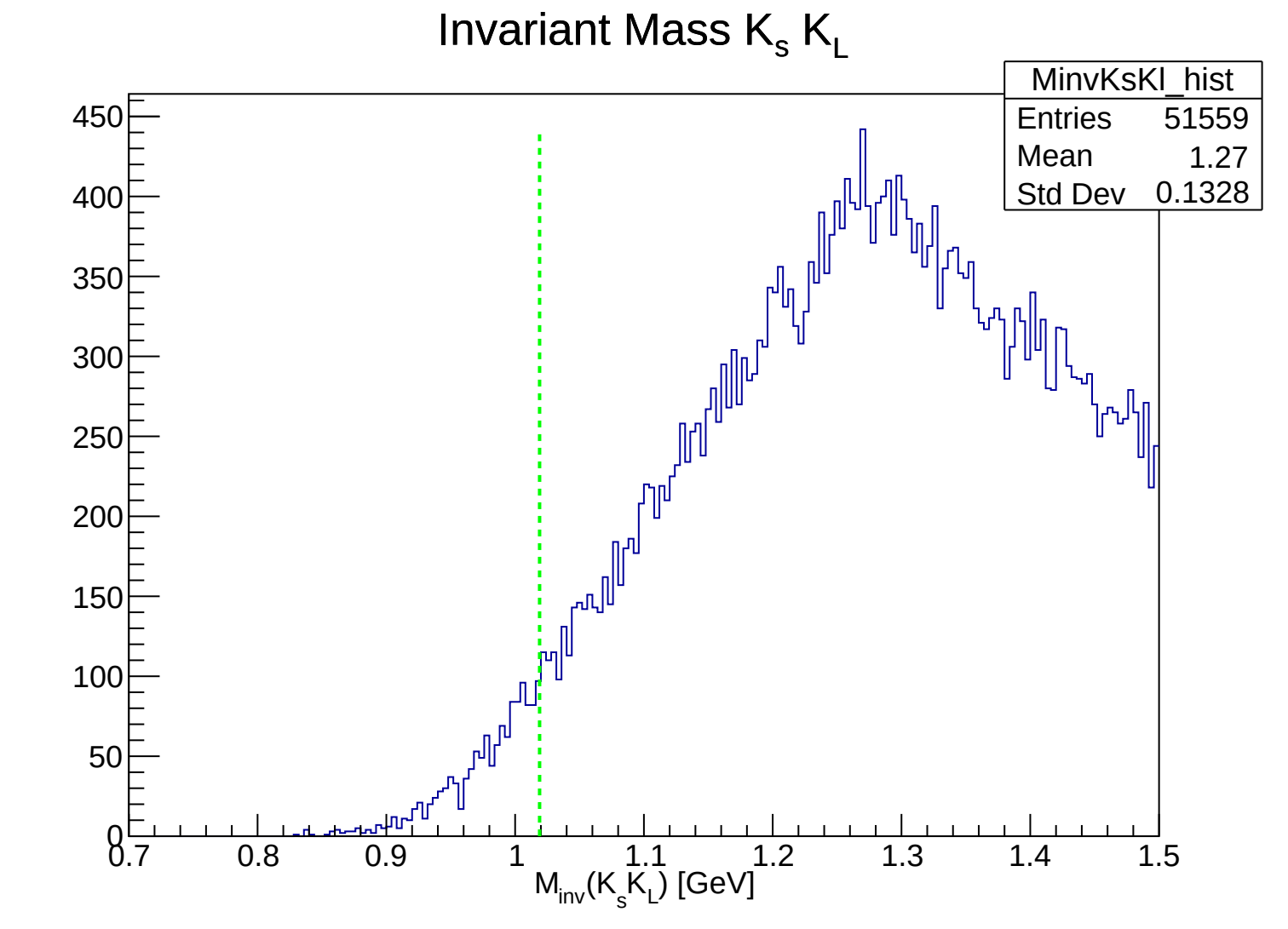

Missing Mass with cut on M inv of π+π-
MissingMass_hist2
Entries 347952
Mean 0.6495
Std Dev 0.393
3000
2500
2000
1500
1000
500
0
0.2
0.4
0.6
0.8
1
1.2
1.4
MissingMass [GeV]

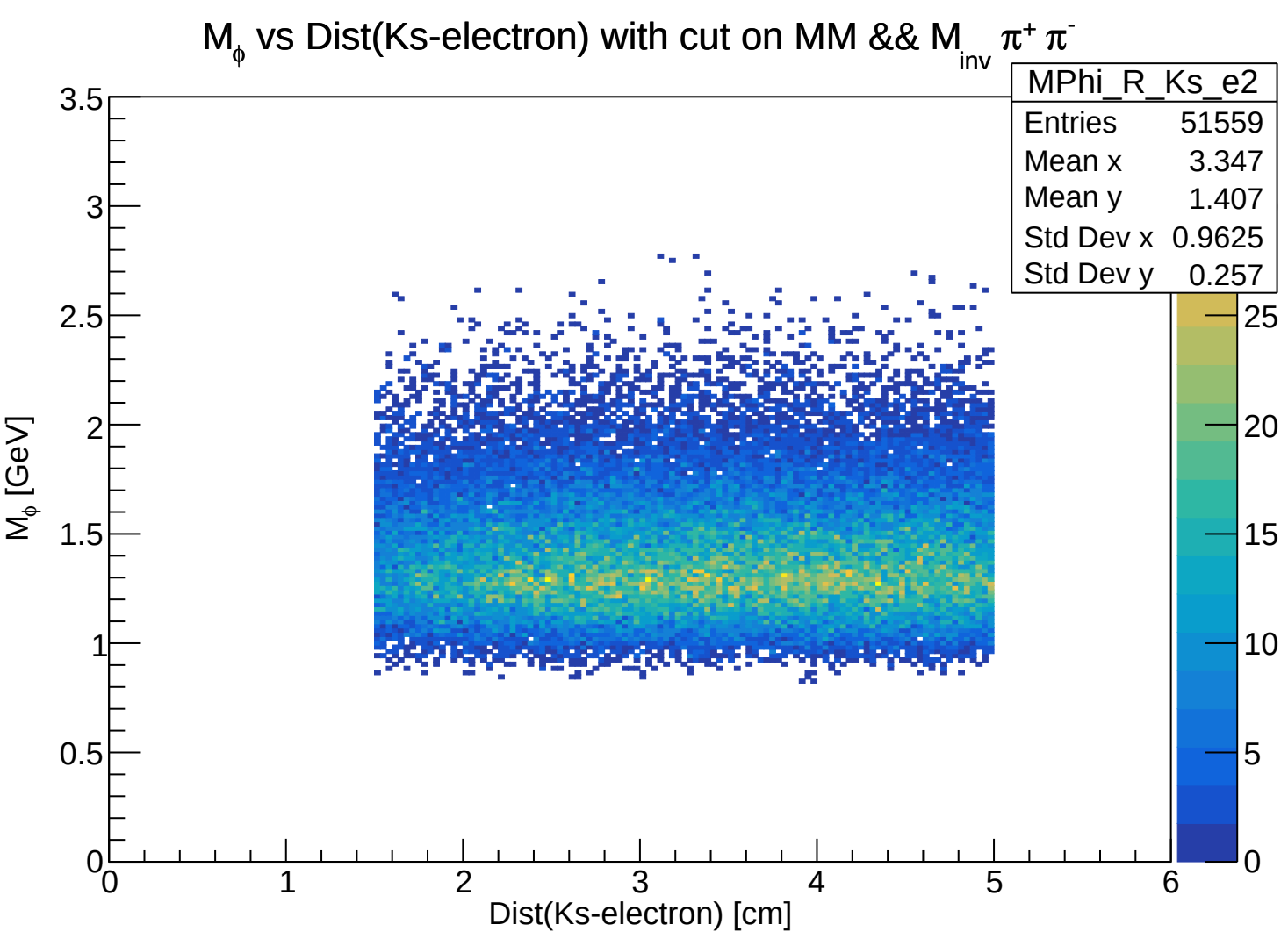

M_Kl vs Dist(Ks-electron) with cut on M_inv π+ π-
MKl_R_Ks_e2
Entries 347952
Mean x 3.34
Mean y 0.7023
Std Dev x 0.9581
Std Dev y 0.4453
M_Kl [GeV]
Dist(Ks-electron) [cm]
0
0.5
1
1.5
2
2.5
0
1
2
3
4
5
6
0
10
20
30
40
50
60

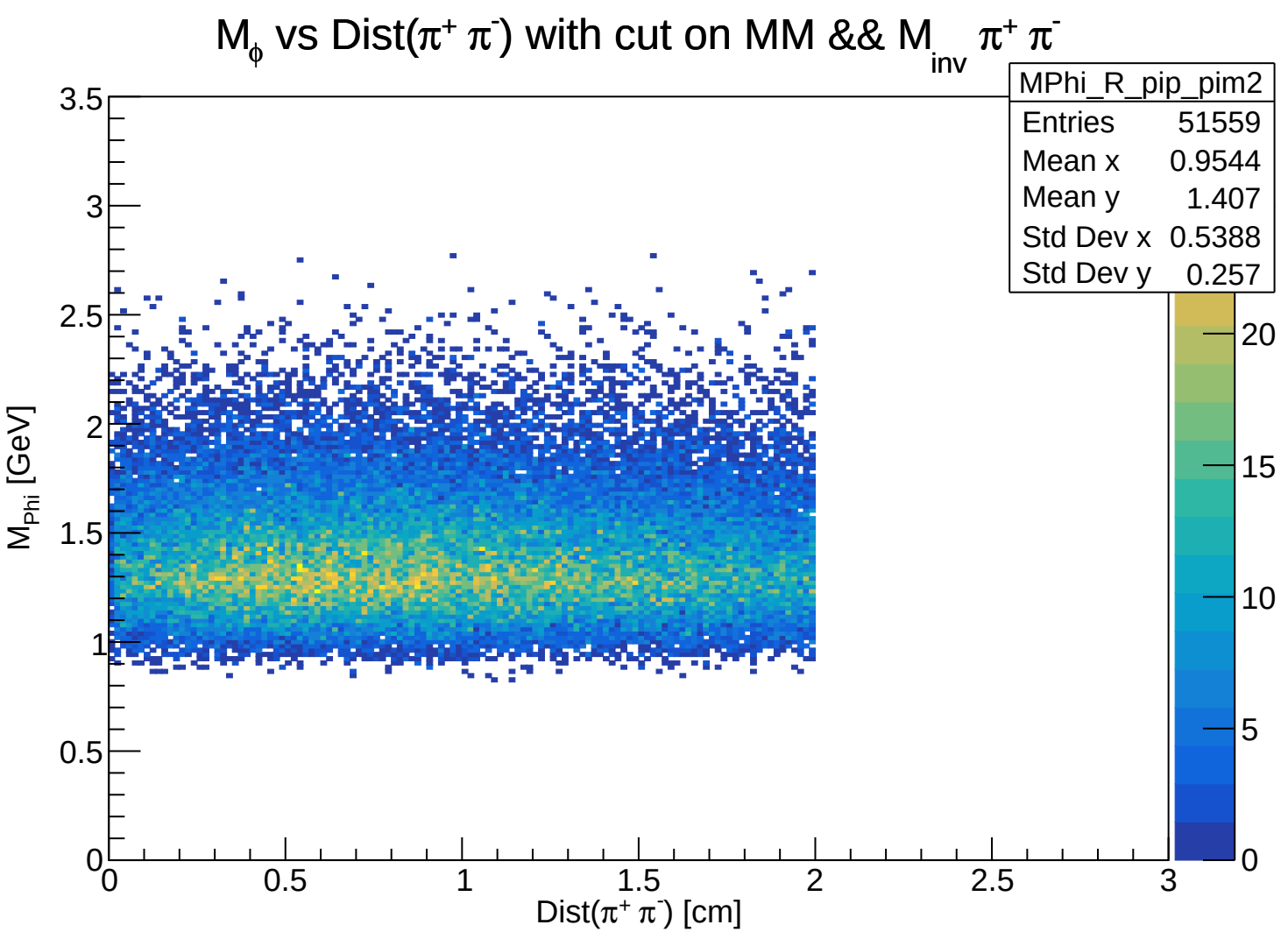

M_{Kl} vs Dist(π^+ π^-) with cut on M_{inv} π^+ π^-
MKl_R_pip_pim2
Entries 347952
Mean x 0.9603
Mean y 0.7023
Std Dev x 0.5384
Std Dev y 0.4453
M_{Kl} [GeV]
Dist(π^+ π^-) [cm]
0
0.5
1
1.5
2
2.5
3
10
20
30
40
50
60

Summary of cuts for the next plots:

- both cut are present (in invariant mass pi+ pi- and missing mass)

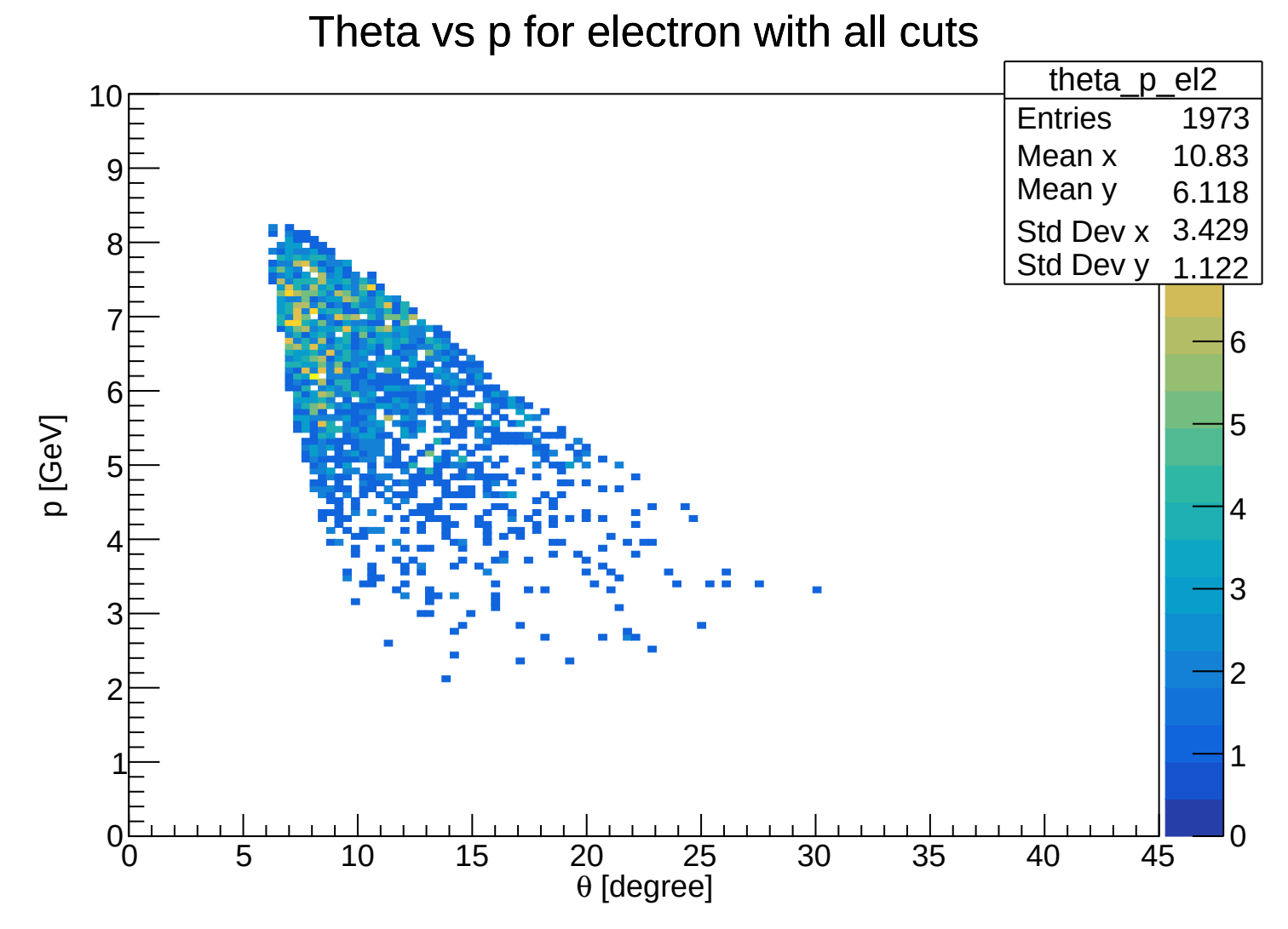

Invariant Mass K_s K_L
MinvKsKl_hist
Entries 51559
Mean 1.27
Std Dev 0.1328
450
400
350
300
250
200
150
100
50
0
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
$M_{inv}(K_s K_L)$ [GeV]

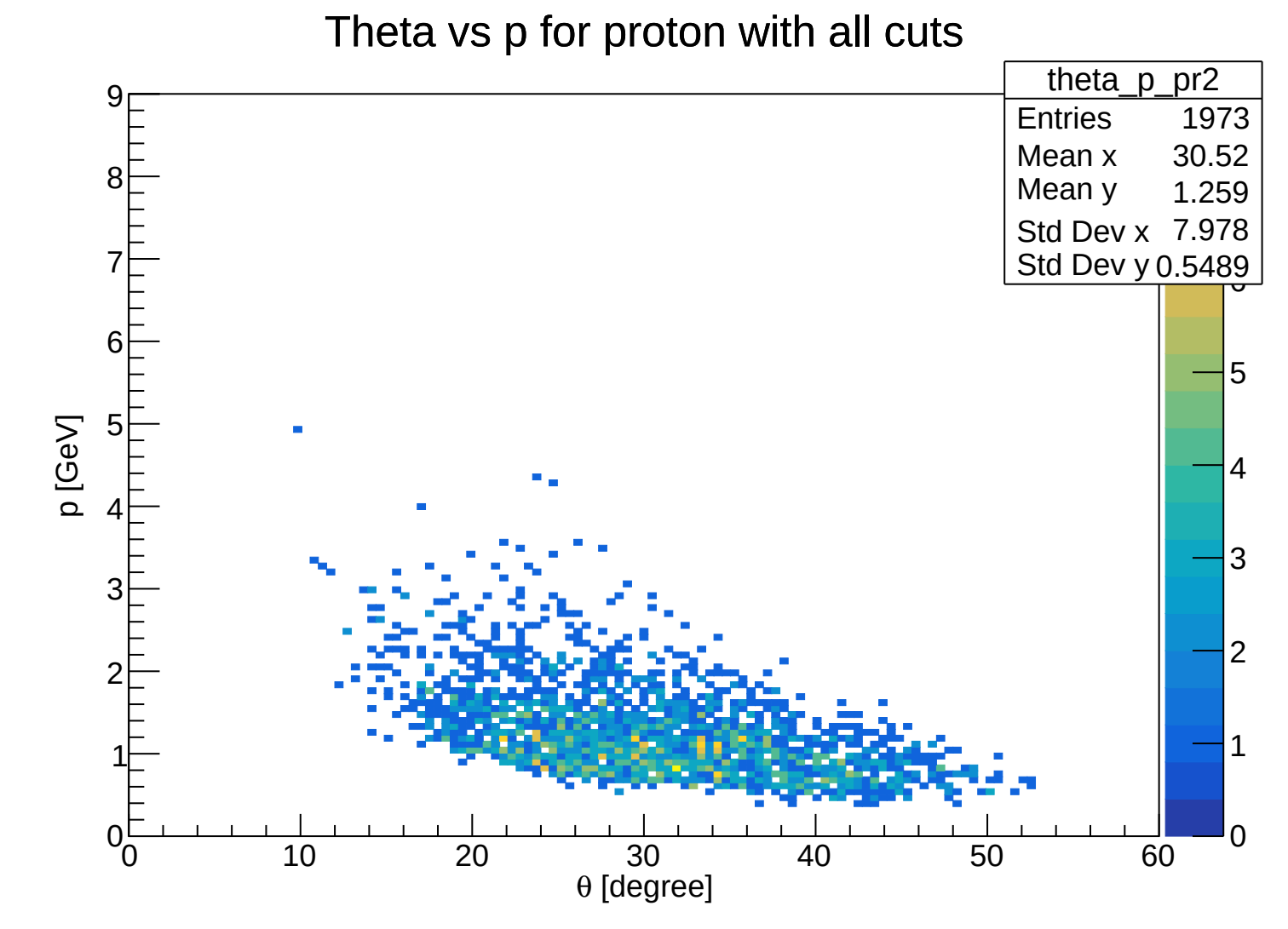

M$_\phi$ vs Dist(Ks-electron) with cut on MM && M$_{inv}$ π^+ π^-
MPhi_R_Ks_e2
Entries 51559
Mean x 3.347
Mean y 1.407
Std Dev x 0.9625
Std Dev y 0.257
M$_\phi$ [GeV]
Dist(Ks-electron) [cm]
0
0.5
1
1.5
2
2.5
3
3.5
0
1
2
3
4
5
6
0
5
10
15
20
25

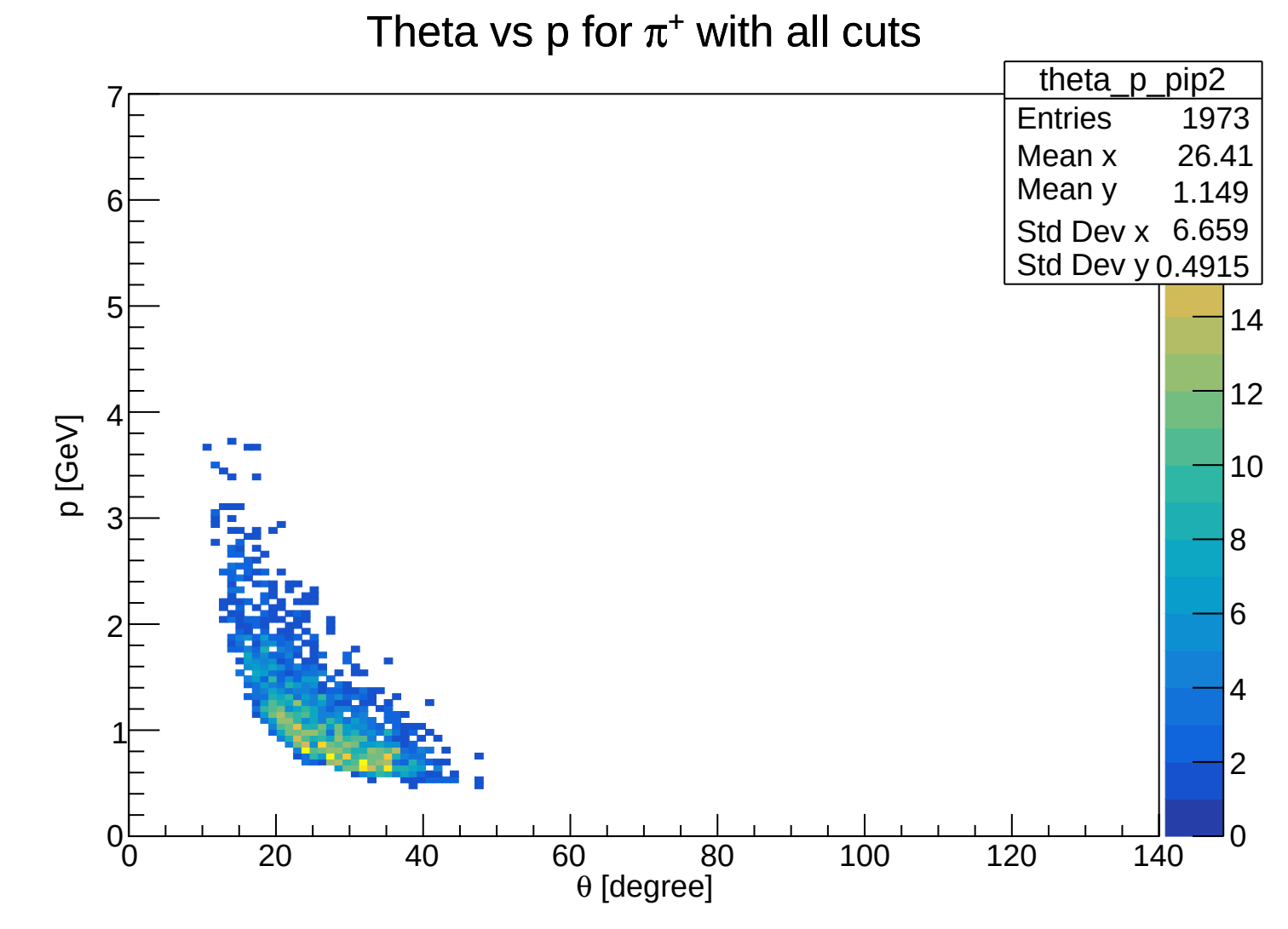

M_ϕ vs Dist(π^+ π^-) with cut on MM && M_{inv} π^+ π^-
MPhi_R_pip_pim2
Entries 51559
Mean x 0.9544
Mean y 1.407
Std Dev x 0.5388
Std Dev y 0.257
M_{Phi} [GeV]
Dist(π^+ π^-) [cm]
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20

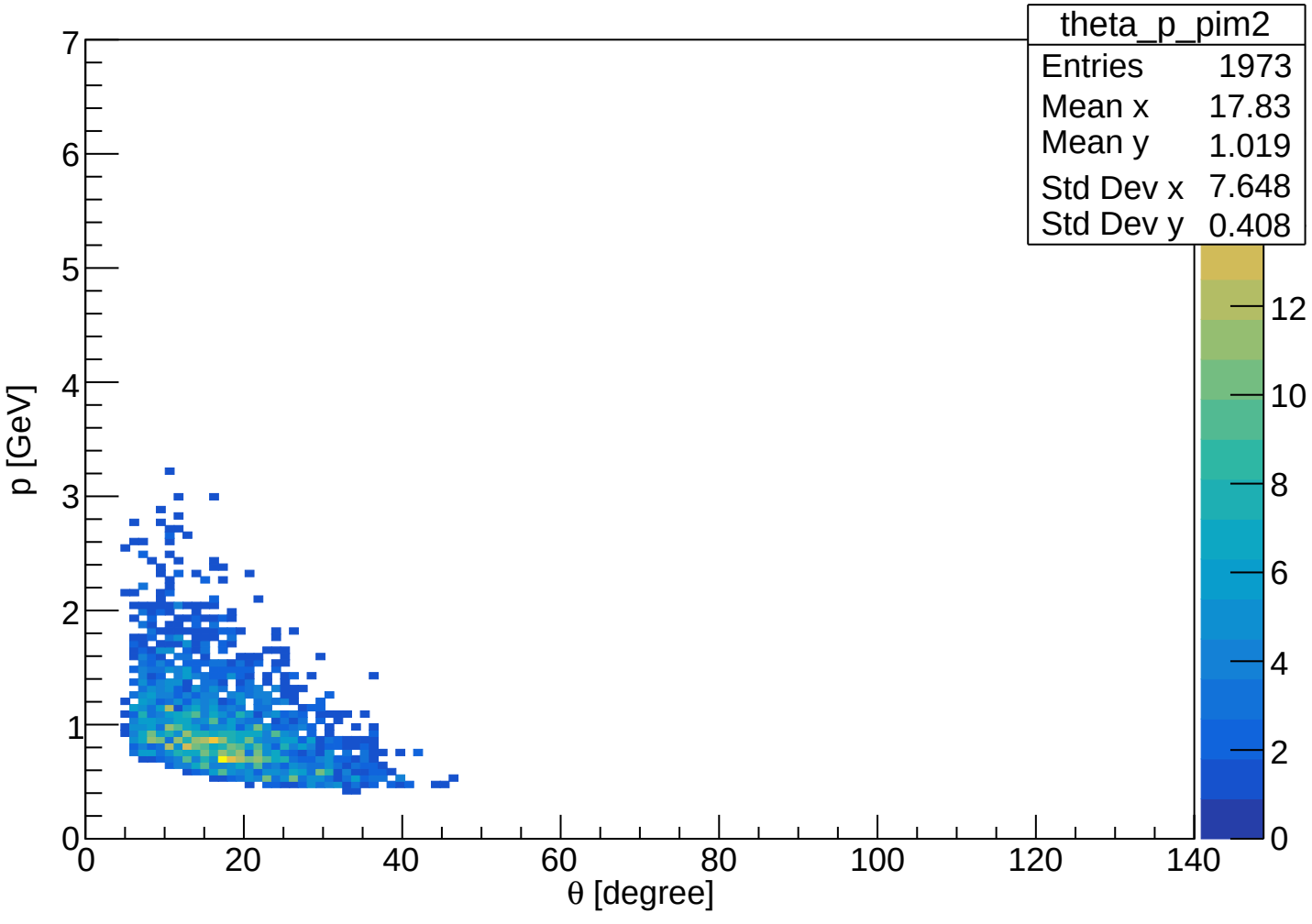
Test on p vs θ for all particle to see if the absence of signal comes from acceptance :

- All cuts + 0.8 < M_{ϕ} < 1.2 GeV


Theta vs p for electron with all cuts
theta_p_el2
Entries 1973
Mean x 10.83
Mean y 6.118
Std Dev x 3.429
Std Dev y 1.122
p [GeV]
θ [degree]
0
1
2
3
4
5
6
7
8
9
10
0
5
10
15
20
25
30
35
40
45


Theta vs p for proton with all cuts
theta_p_pr2
Entries 1973
Mean x 30.52
Mean y 1.259
Std Dev x 7.978
Std Dev y 0.5489
p [GeV]
θ [degree]
0
10
20
30
40
50
60
1
2
3
4
5
6
7
8
9


Theta vs p for π+ with all cuts
theta_p_pip2
Entries 1973
Mean x 26.41
Mean y 1.149
Std Dev x 6.659
Std Dev y 0.4915
p [GeV]
θ [degree]
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
0
2
4
6
8
10
12
14


Theta vs p for π⁻ with all cuts
theta_p_pim2
Entries 1973
Mean x 17.83
Mean y 1.019
Std Dev x 7.648
Std Dev y 0.408
p [GeV]
θ [degree]
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
0
2
4
6
8
10
12