$\gamma p \longrightarrow p K^- K^+ \pi^0$ background exploration, likelihood methods

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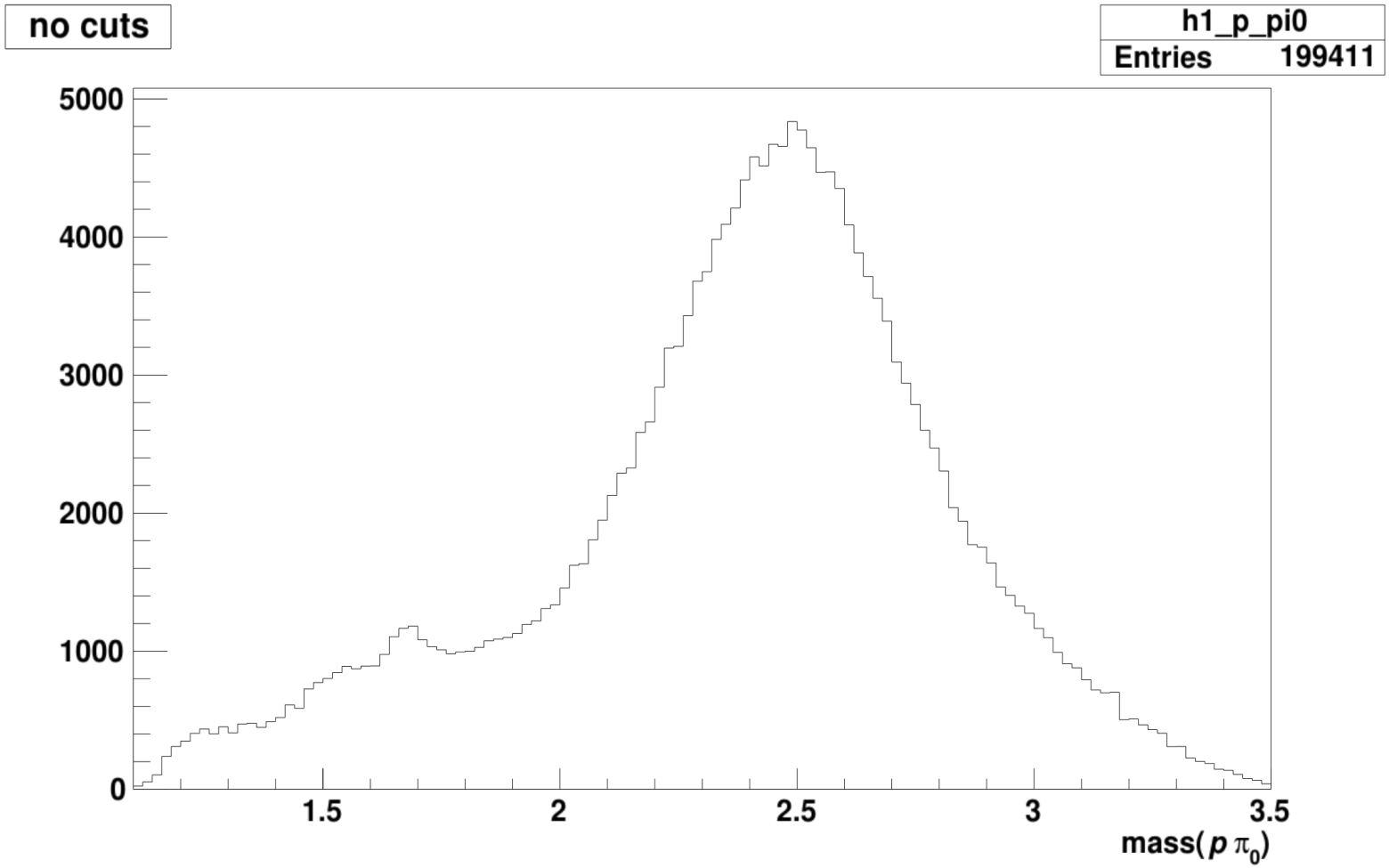
June 5th, 2024

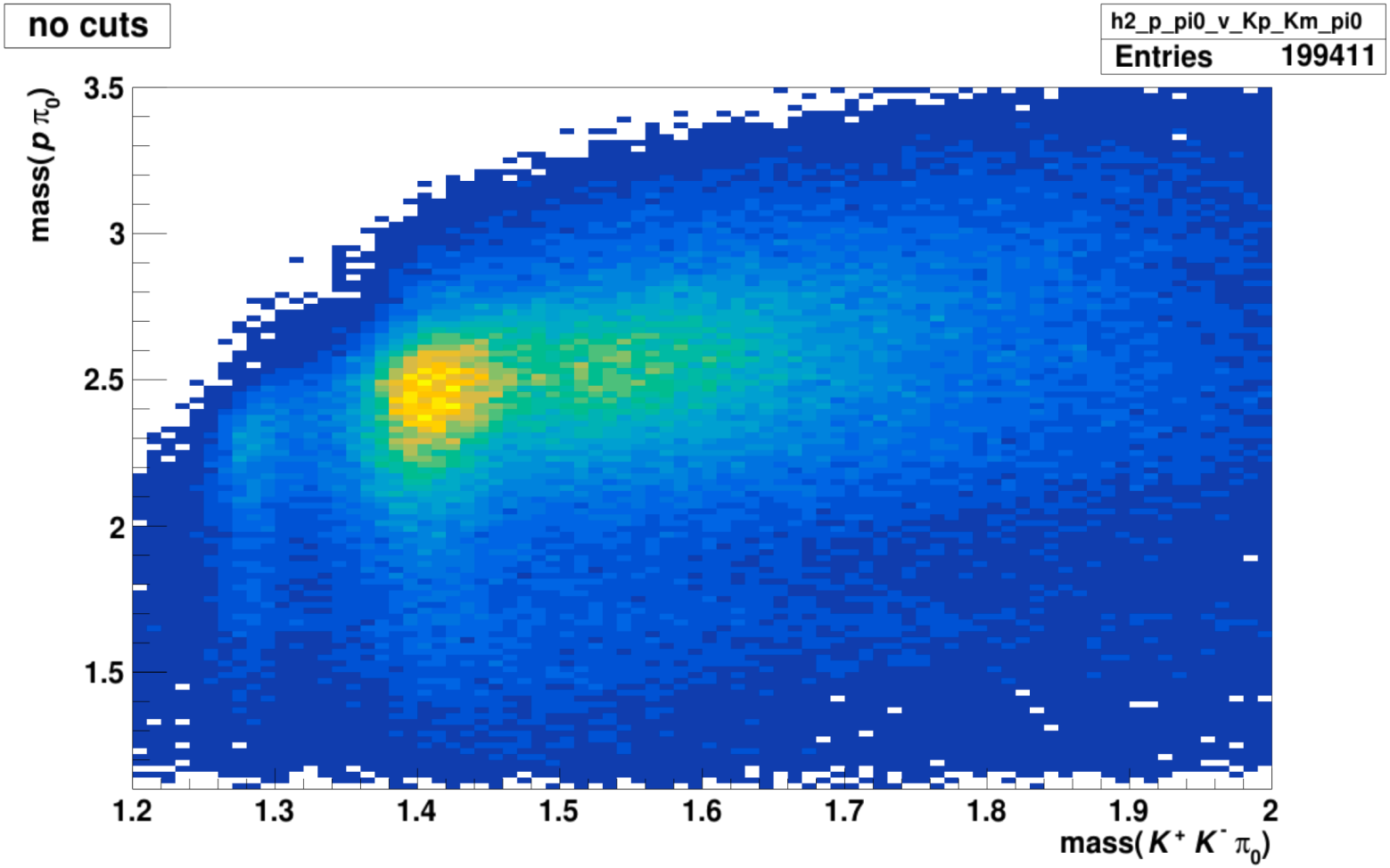
Baryonic background

- Focusing on $p\ \pi_0$ and $p\ K^-$
- Looking at mass spectra individually, and plotted against $K^+\ K^-\ \pi_0$ mass spectrum
- So far, there is no indication of strong baryonic states present

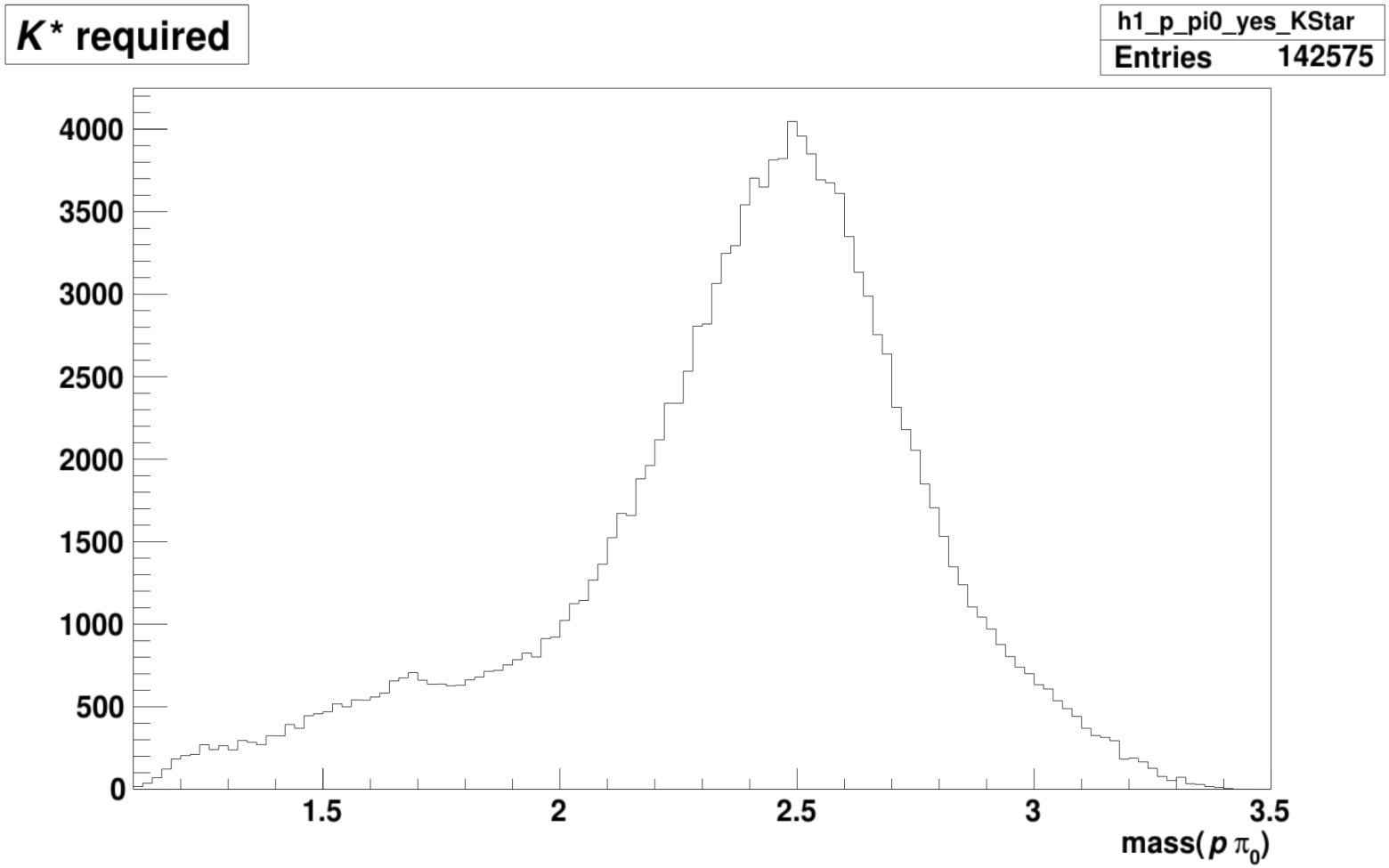
$p\ \pi_0$


no cuts
h1_p_pi0
Entries 199411
5000
4000
3000
2000
1000
0
1.5
2
2.5
3
3.5
mass(p π0)

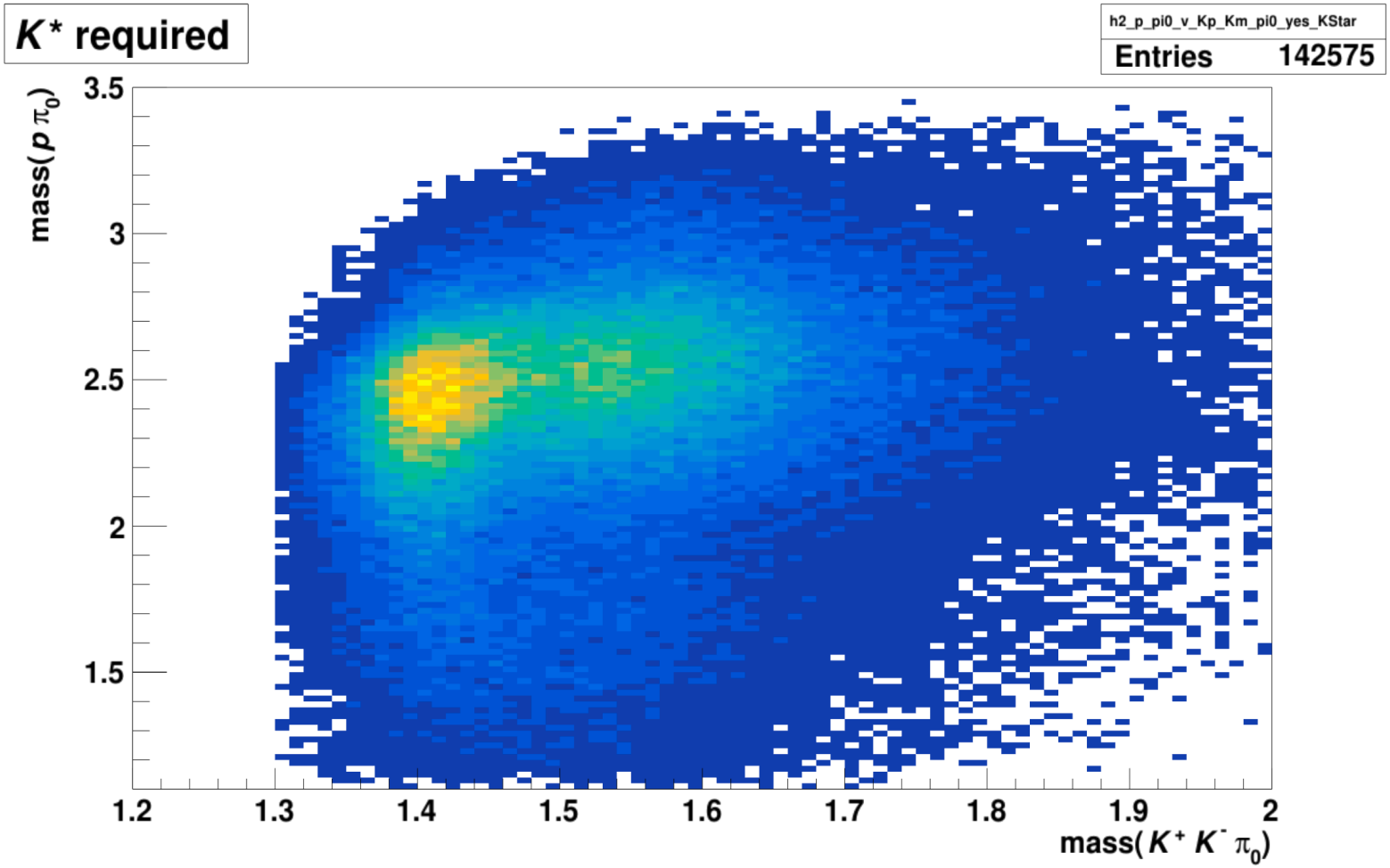
$p\ \pi_0$


no cuts
h2_p_pi0_v_Kp_Km_pi0
Entries 199411
mass($p\ \pi_0$)
3.5
3
2.5
2
1.5
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
mass($K^+\ K^-\ \pi_0$)

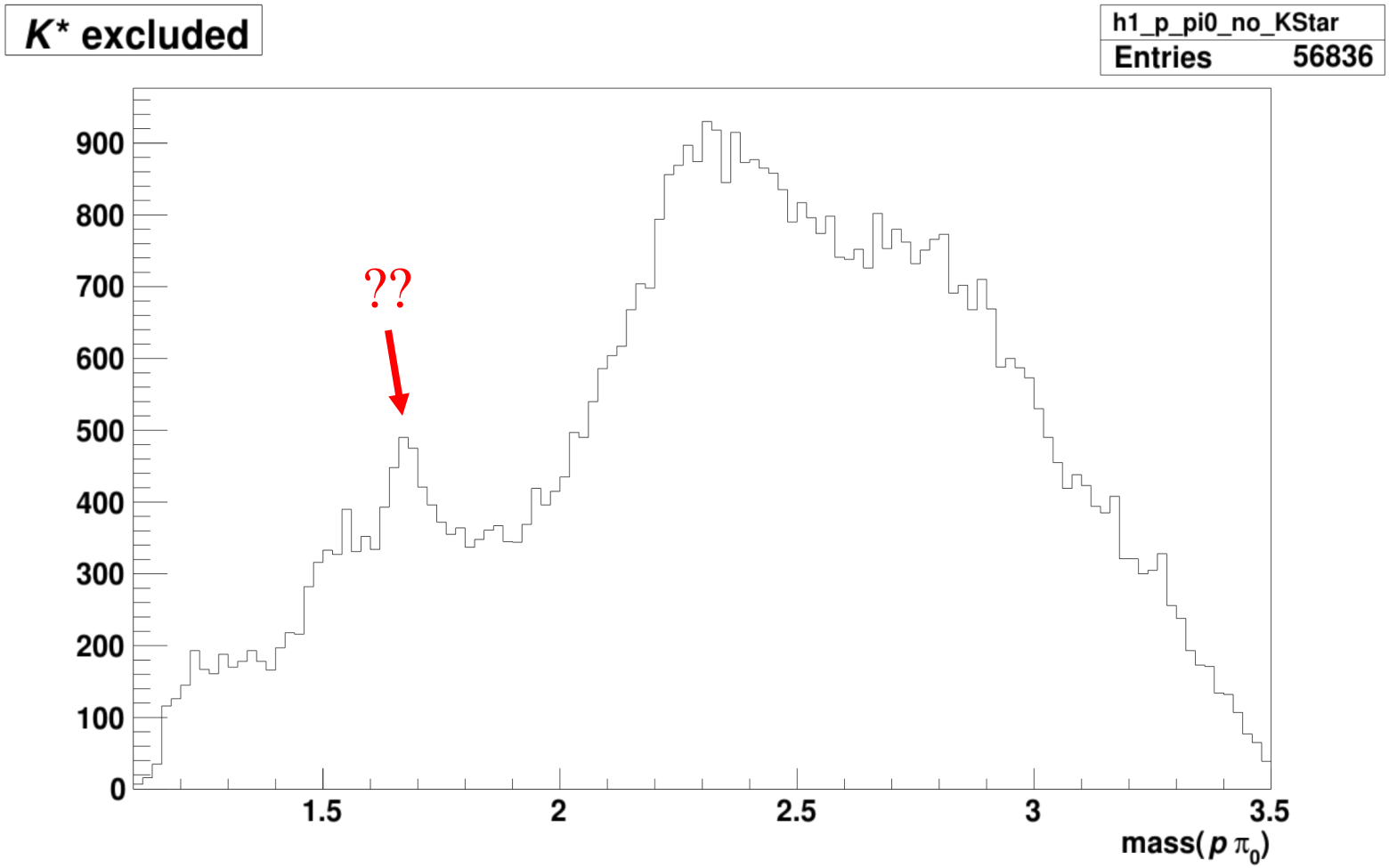
$p\ \pi_0$


K* required
h1_p_pi0_yes_KStar
Entries 142575
4000
3500
3000
2500
2000
1500
1000
500
0
1.5
2
2.5
3
3.5
mass(p π0)

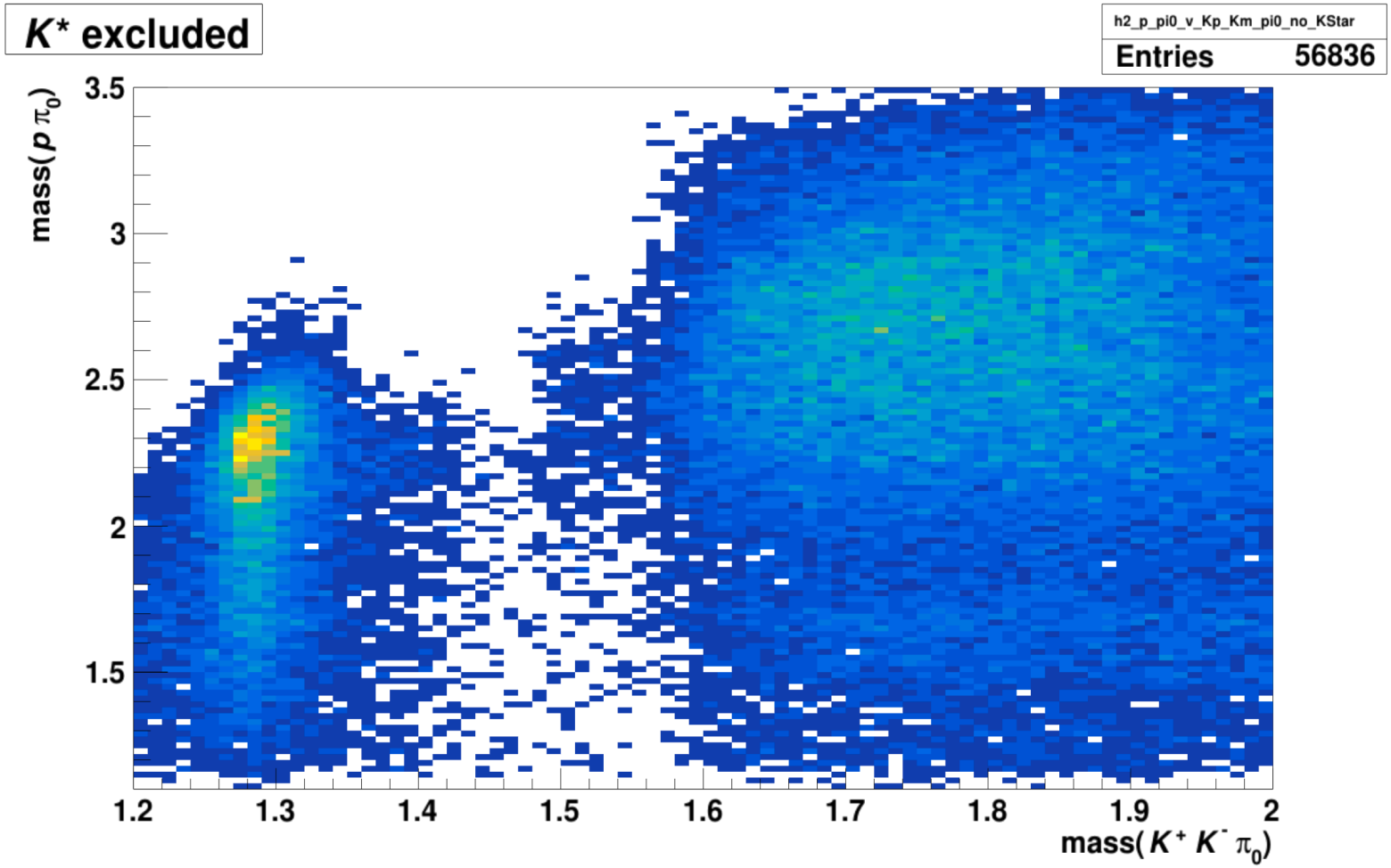
$p\ \pi_0$


K* required
h2_p_pi0_v_Kp_Km_pi0_yes_KStar
Entries 142575
mass(p π0)
3.5
3
2.5
2
1.5
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
mass(K+ K- π0)

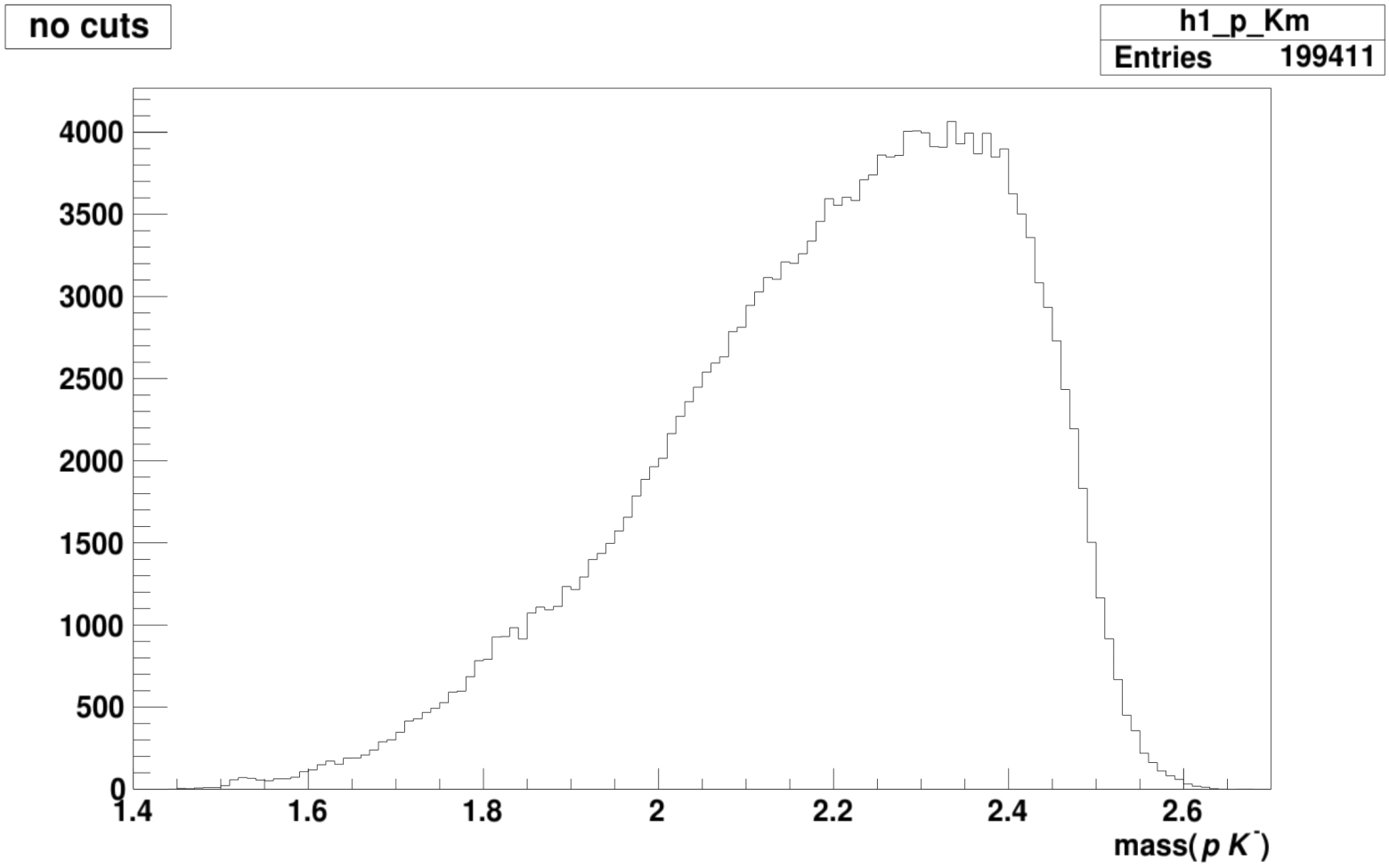
$p\ \pi_0$


K* excluded
h1_p_pi0_no_KStar
Entries 56836
??
900
800
700
600
500
400
300
200
100
0
1.5
2
2.5
3
3.5
mass(p π0)

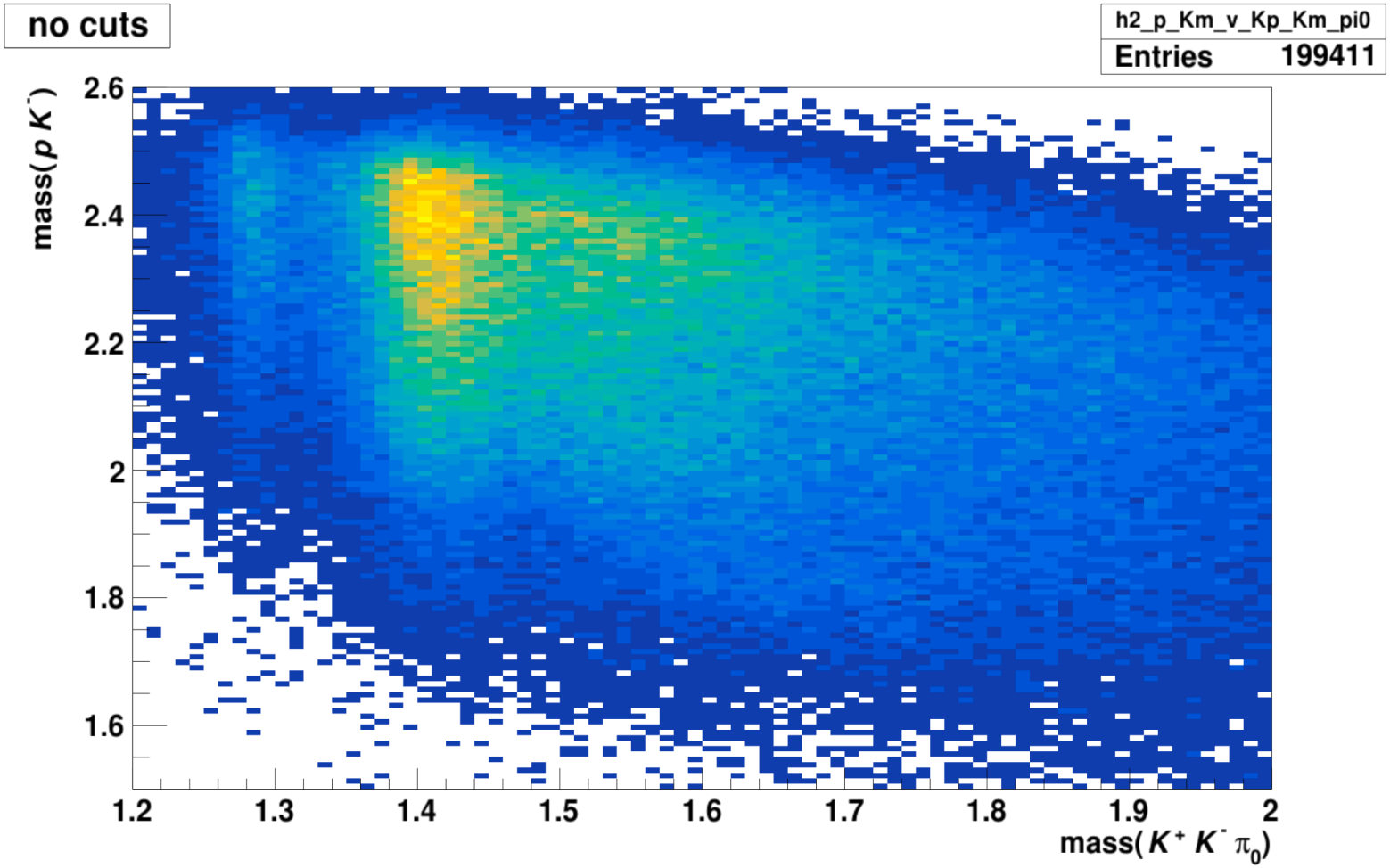
$p\ \pi_0$


K* excluded
h2_p_pi0_v_Kp_Km_pi0_no_KStar
Entries 56836
mass(p π0)
3.5
3
2.5
2
1.5
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
mass(K+ K- π0)

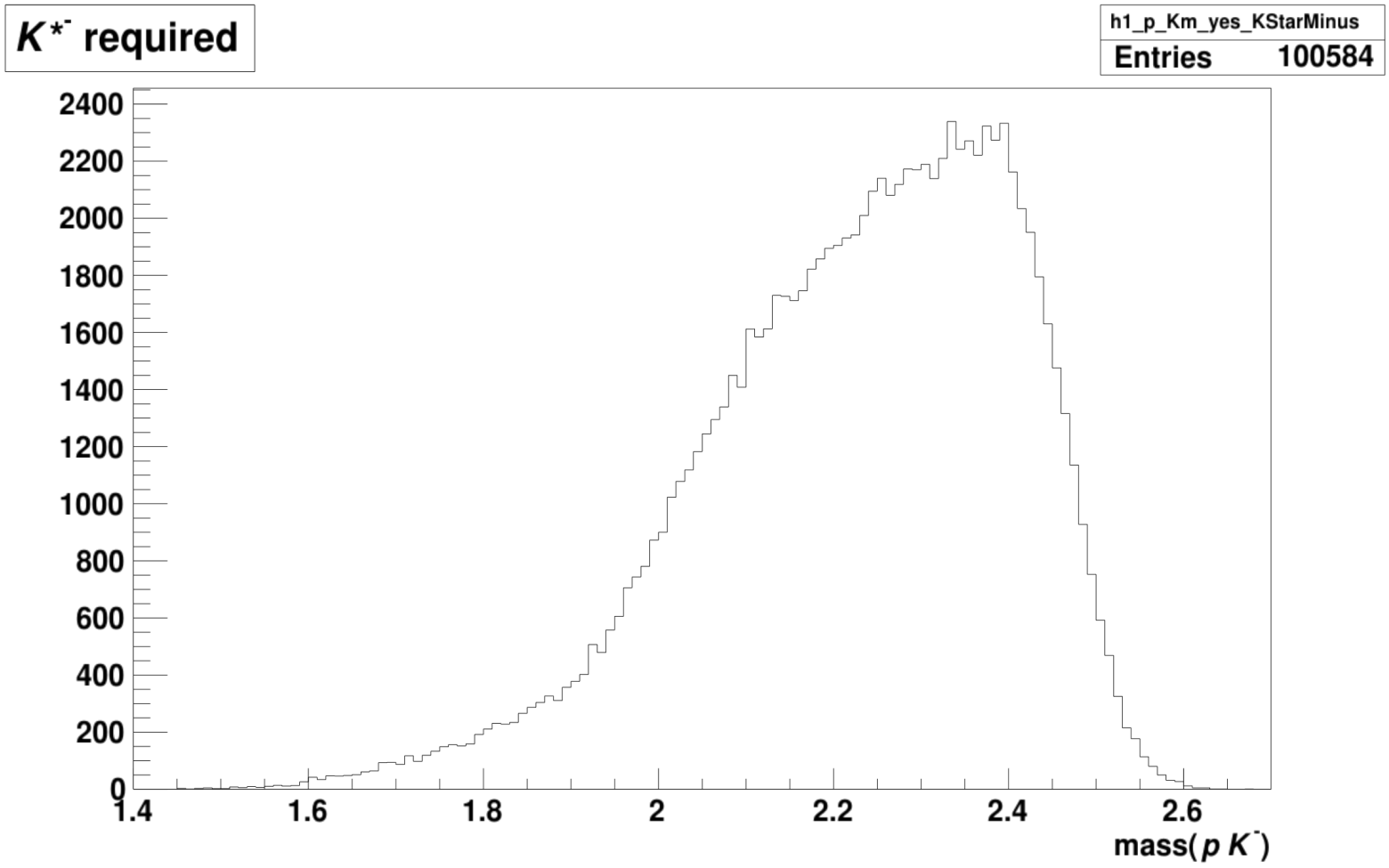
$p\ K^-$


no cuts
h1_p_Km
Entries 199411
4000
3500
3000
2500
2000
1500
1000
500
0
1.4
1.6
1.8
2
2.2
2.4
2.6
mass(p K⁻)

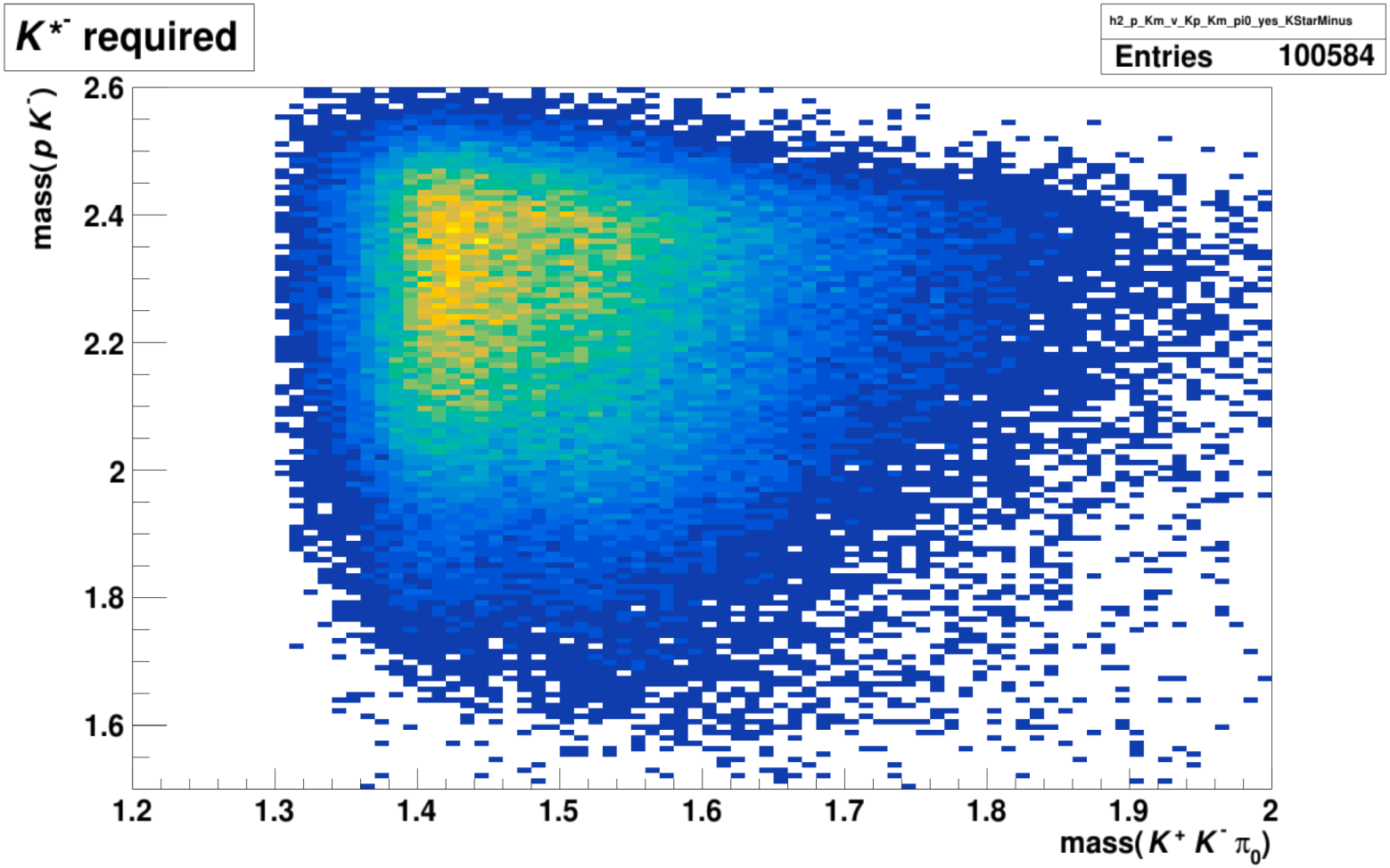
$p\ K^-$


no cuts
h2_p_Km_v_Kp_Km_pi0
Entries 199411
mass(p K⁻)
2.6
2.4
2.2
2
1.8
1.6
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
mass(K⁺ K⁻ π₀)

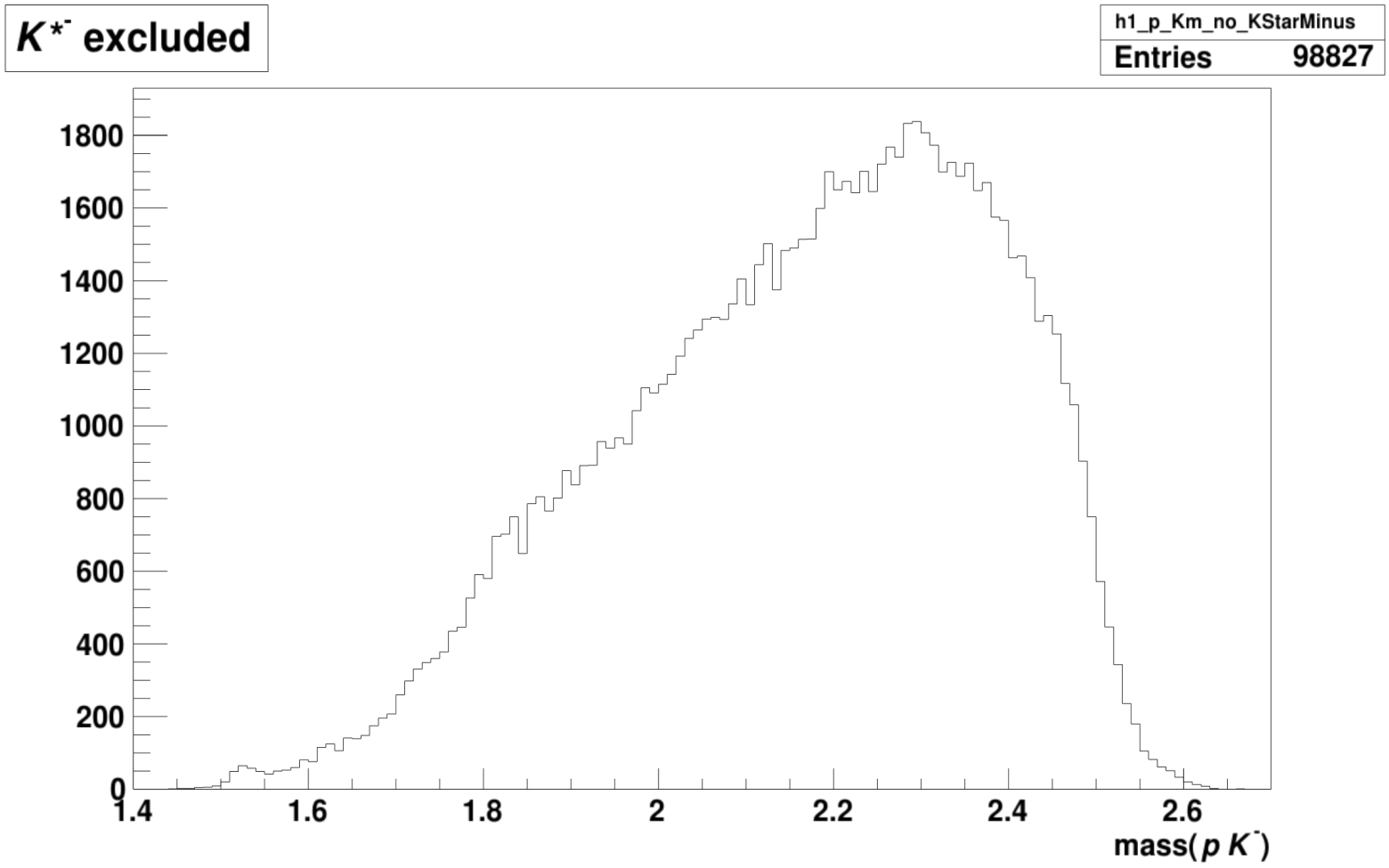
$p\ K^-$


K*- required
h1_p_Km_yes_KStarMinus
Entries 100584
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1.4
1.6
1.8
2
2.2
2.4
2.6
mass(p K-)

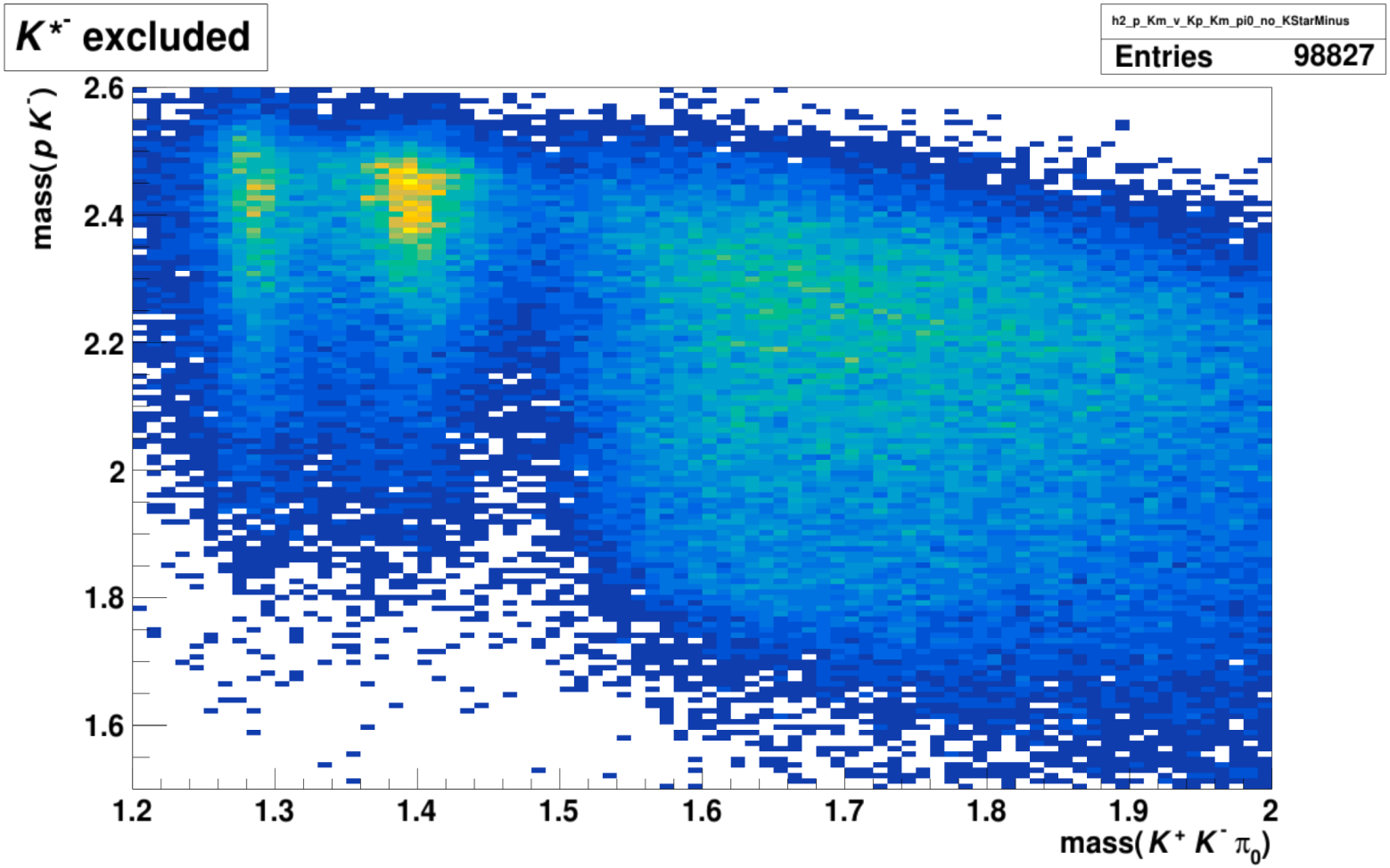
$p\ K^-$


K*- required
h2_p_Km_v_Kp_Km_pi0_yes_KStarMinus
Entries 100584
mass(p K-)
2.6
2.4
2.2
2
1.8
1.6
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
mass(K+ K- π0)

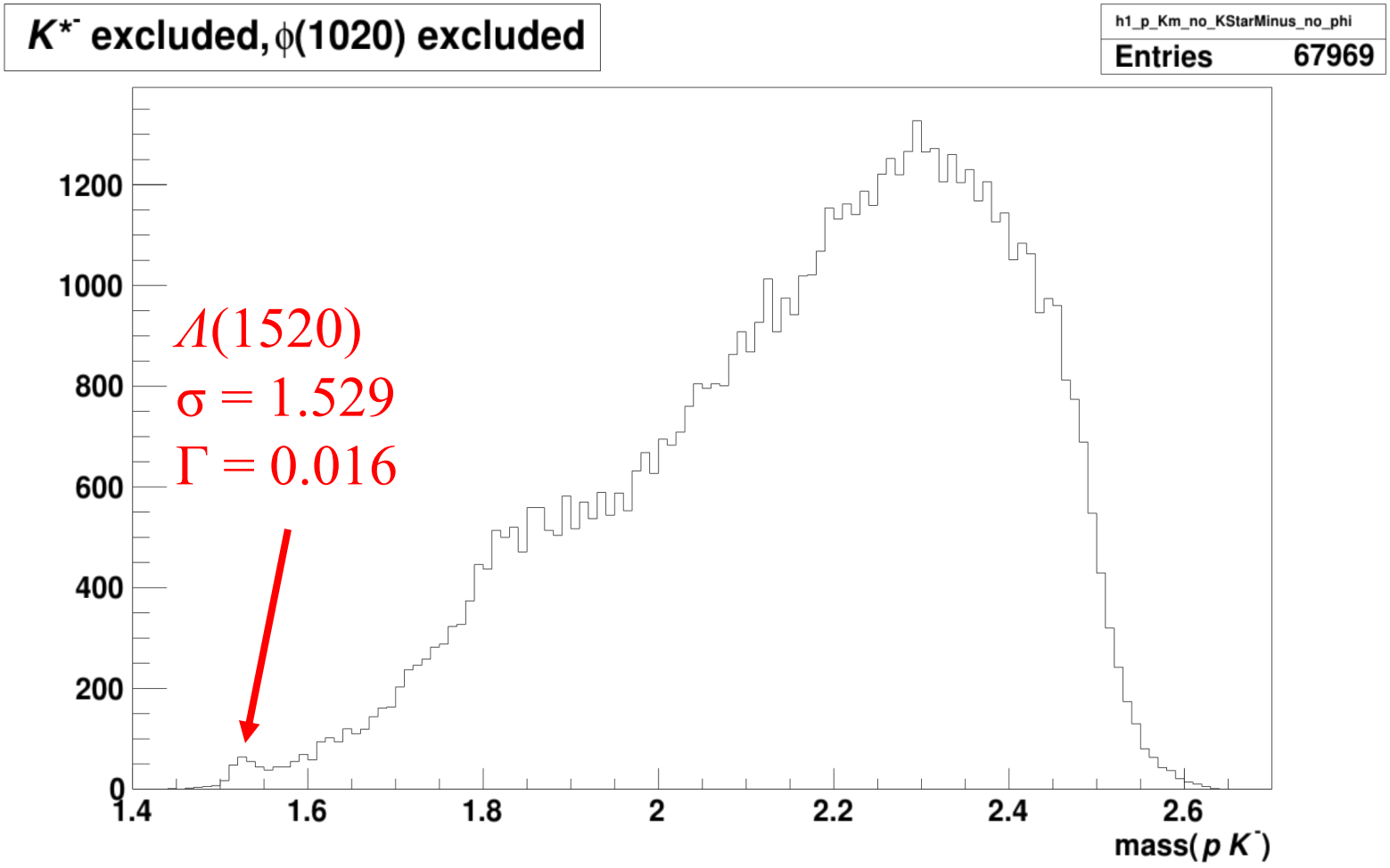
$p\ K^-$


K*- excluded
h1_p_Km_no_KStarMinus
Entries 98827
1800
1600
1400
1200
1000
800
600
400
200
0
1.4
1.6
1.8
2
2.2
2.4
2.6
mass(p K-)

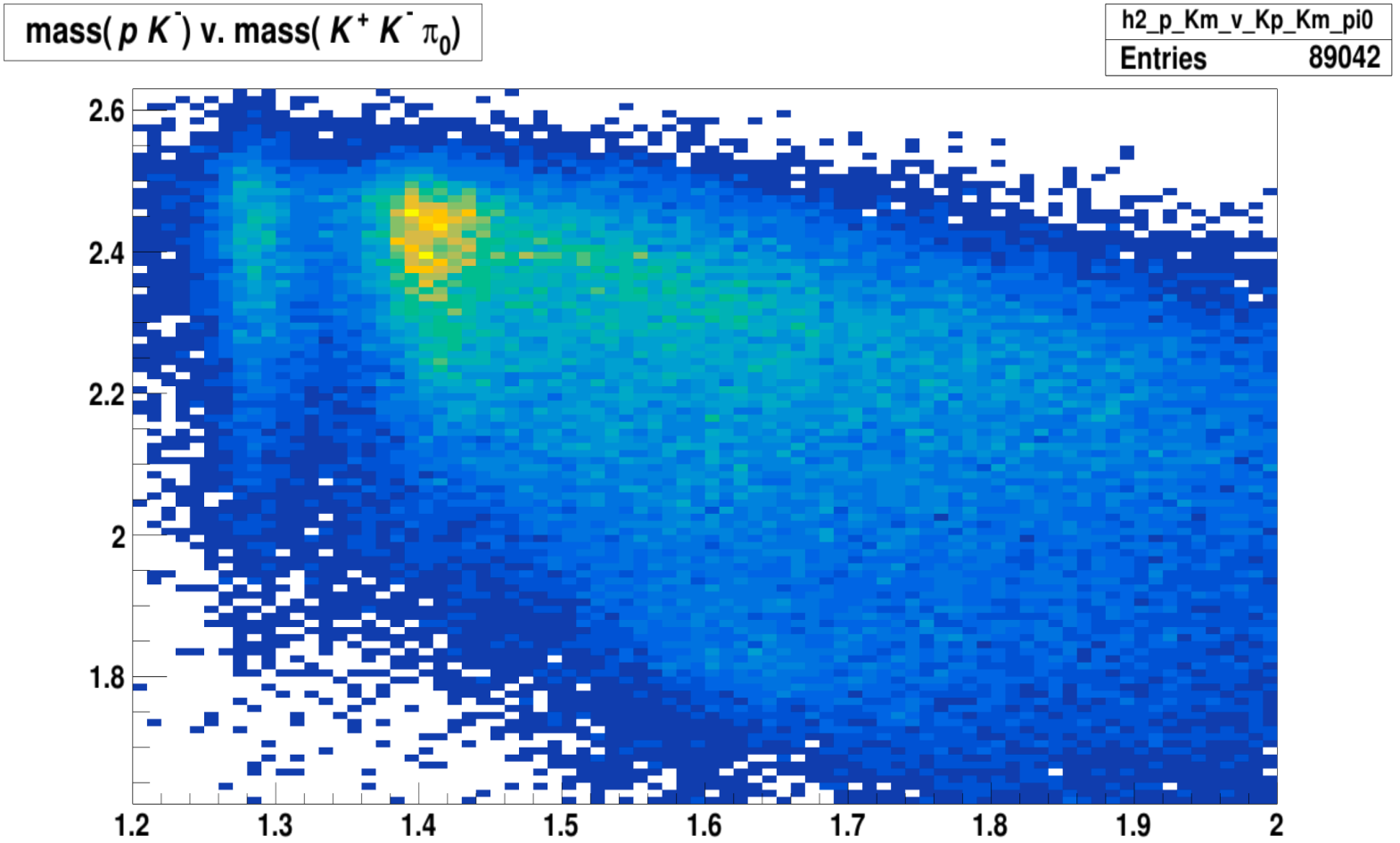
$p\ K^-$


K*- excluded
h2_p_Km_v_Kp_Km_pi0_no_KStarMinus
Entries 98827
mass(p K-)
2.6
2.4
2.2
2
1.8
1.6
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
mass(K+ K- π0)

$p\ K^-$


K*- excluded, ϕ(1020) excluded
h1_p_Km_no_KStarMinus_no_phi
Entries 67969
Λ(1520)
σ = 1.529
Γ = 0.016
1200
1000
800
600
400
200
0
1.4
1.6
1.8
2
2.2
2.4
2.6
mass(p K-)

No K^{*-} or $\phi(1020)$



Updates for next time: wave set selection

- Test statistics (likelihood ratio test, Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC)) are considered on a per-mass-bin basis
- The likelihood ratios of different fits, for a given bin, are now compared to a χ^2 distribution with the correct degrees of freedom