

Review of Cuts we have studied so far:

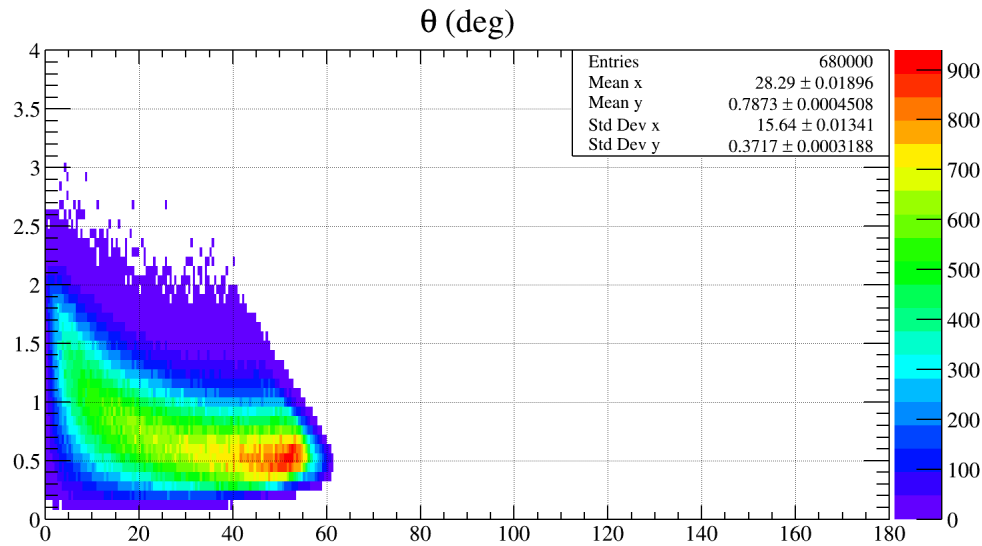
- Delta T for each particle species and sub detector
 - Kinematic Fitter Confidence Level
 - Beam Energy Cut
 - Beam Bunch Cut (RF Time)
 - Vertex Cuts
 - P vs Theta Cut for Photons (Reduces Secondaries)
 - Number of photons reconstructed in the event
-
- All of these have been discussed in detail in my Analysis Note

Review of Cuts we will discuss:

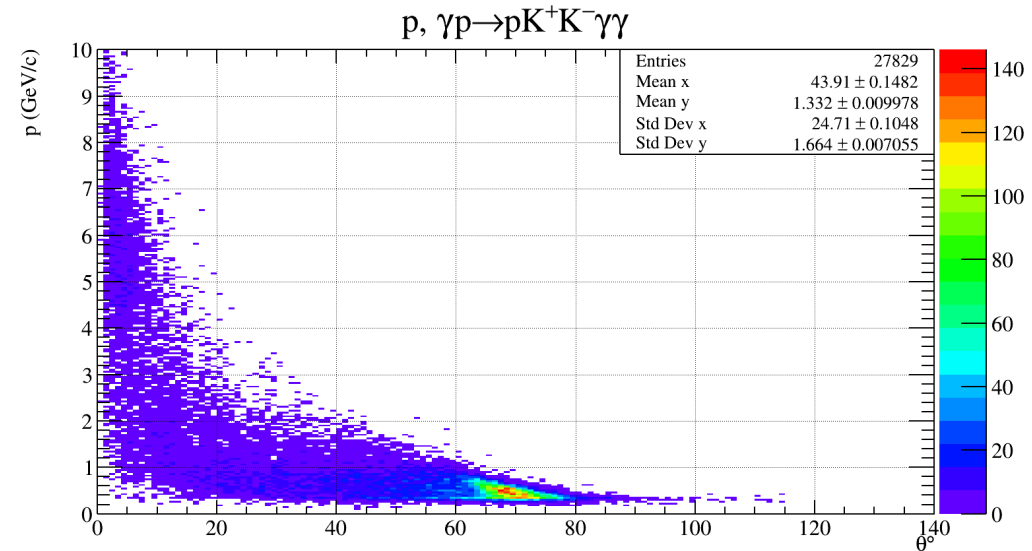
- Proton momentum cut
- How does the Barnes Cut perform in my analysis?
 - Comparing CL between ϕ η and ρ η
- Special Kaon cut for TOF to reduce ρ background
- We will also start peeking at final results today as well

P Vs Theta; Protons

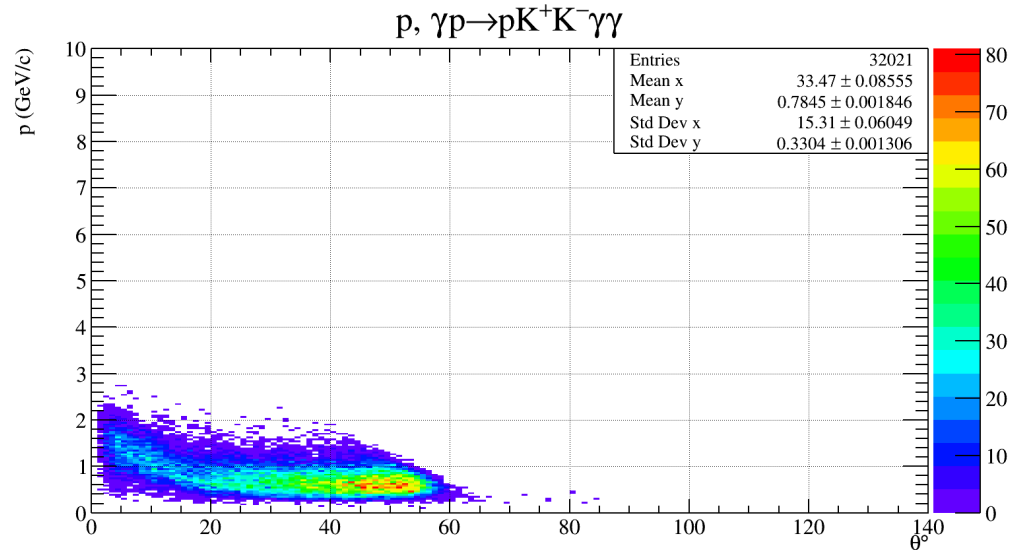
Thrown Monte Carlo



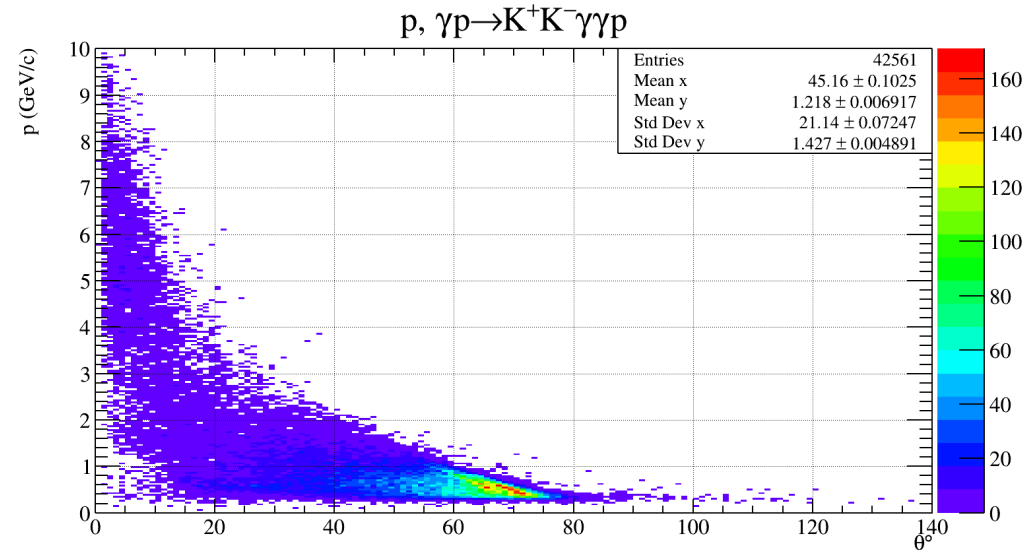
bggen



Accepted Monte Carlo

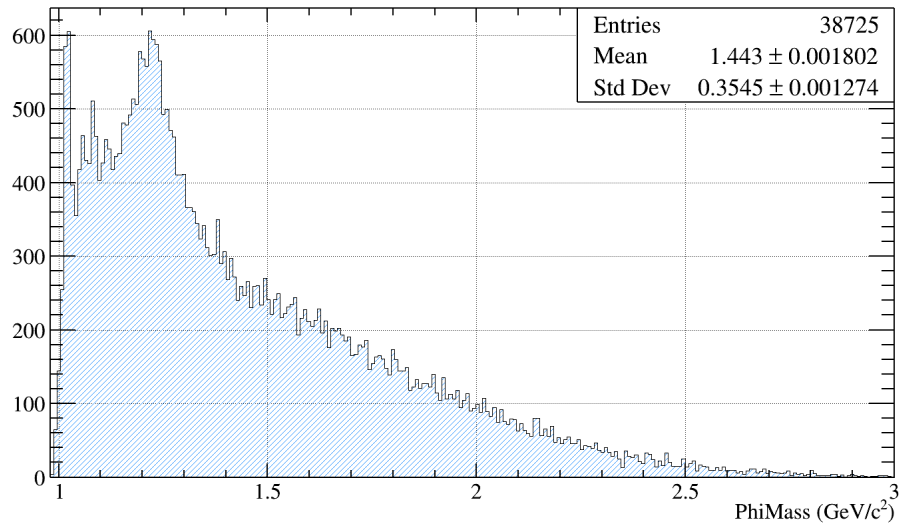


Data

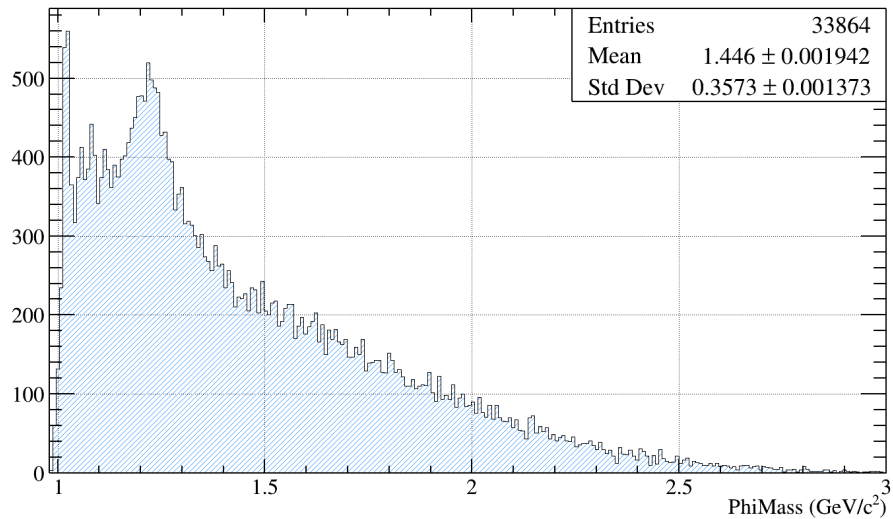


Barnes Cut Study for Phi

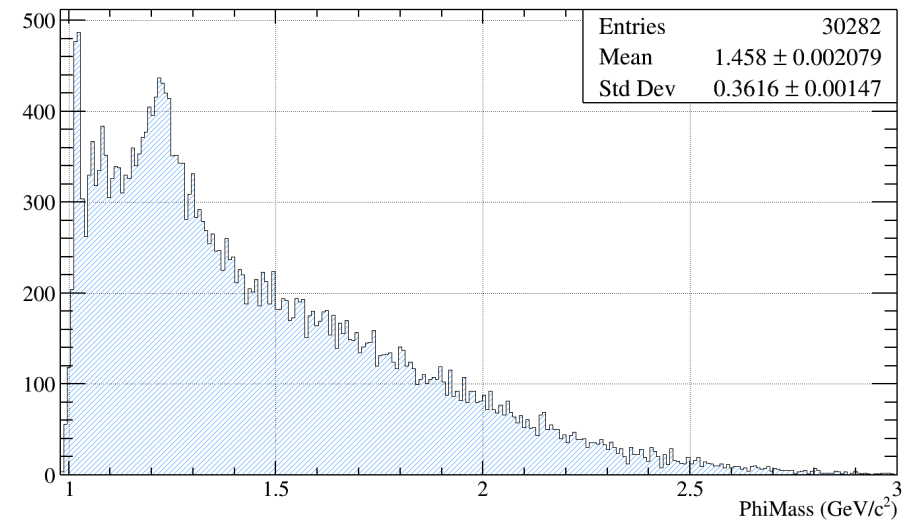
K+K- Mass, CL 4



K+K- Mass, CL 5, CL ratio 1

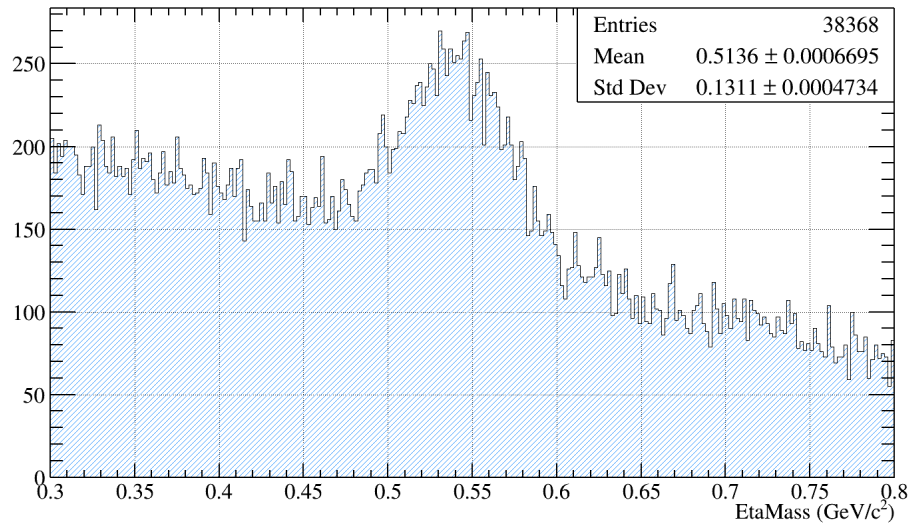


K+K- Mass, CL 5, CL ratio 10

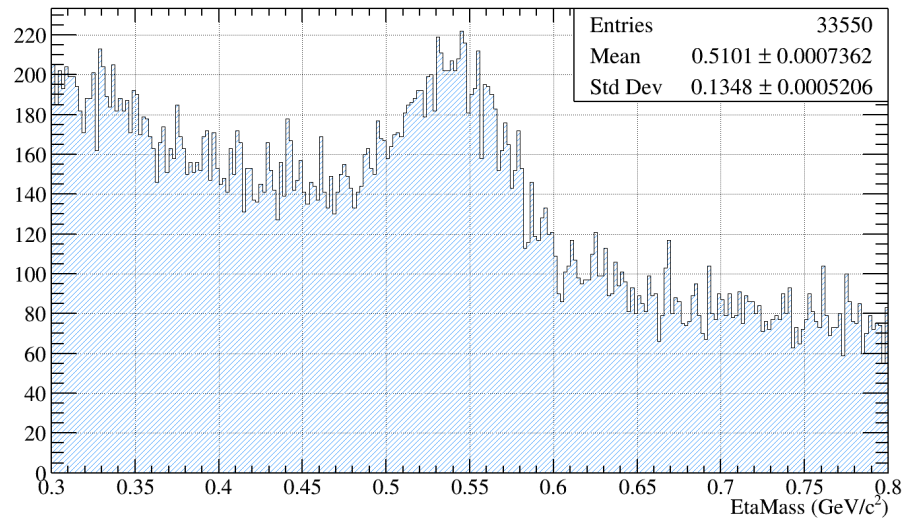


Barnes Cut Study for Eta

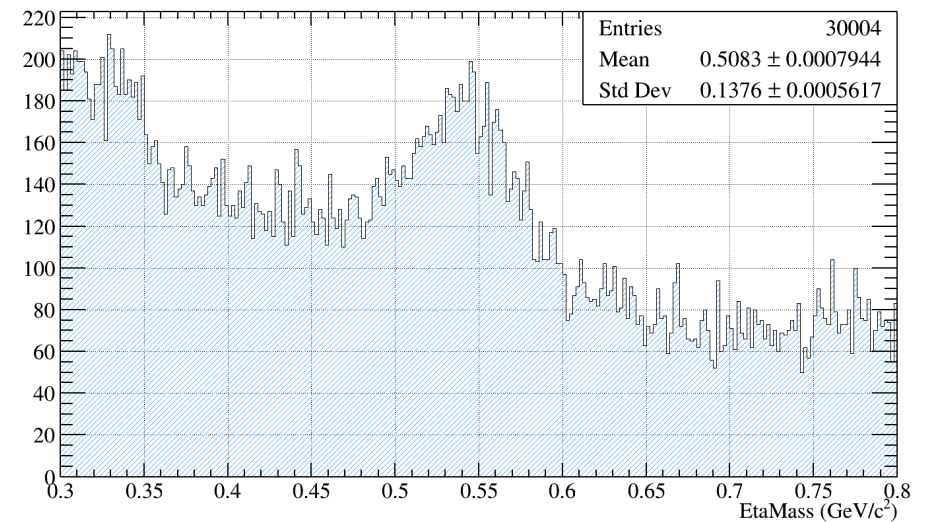
g1g2 Mass, CL 4



g1g2 Mass, CL 5, CL ratio 1



g1g2 Mass, CL 5, CL ratio 10



TOF Kaon Cut Derivation:

- The amount of time it takes a charged particle to reach the TOF in the lab frame is given by:

$$t = \frac{\delta X}{V} = \frac{\delta X}{\beta c}$$

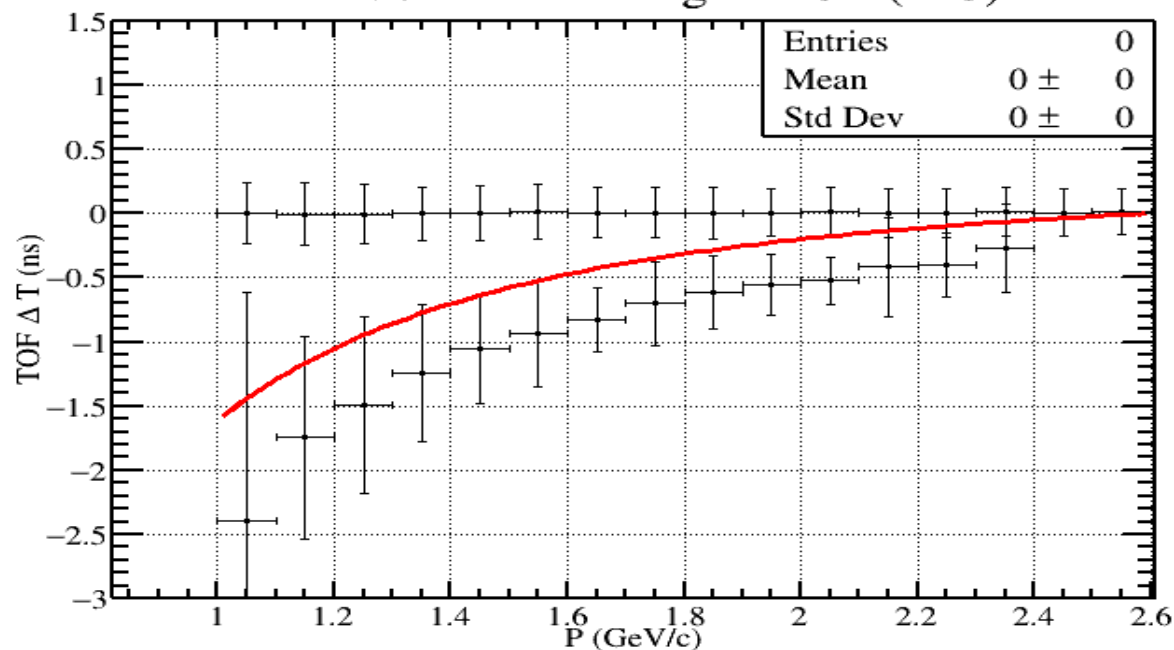
- The timing difference between a pion and a kaon is therefore given by:

$$\delta t = \frac{\delta X}{c} \left[\frac{\sqrt{m_{\pi}^2 + P^2} - \sqrt{m_k^2 + P^2}}{P} \right]$$

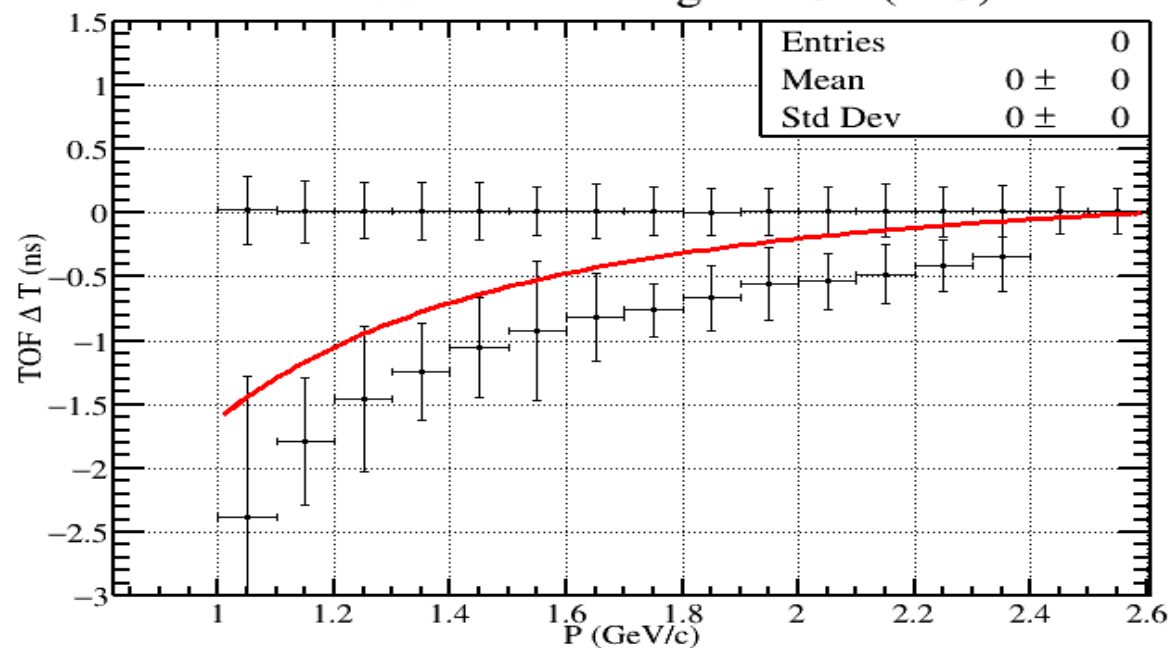
- Since we know the observed momentum, P , and the masses of a pion and kaon, as well as the distance to the time of flight detector, we can use this function to separate pions from kaons.

TOF Kaon Cut:

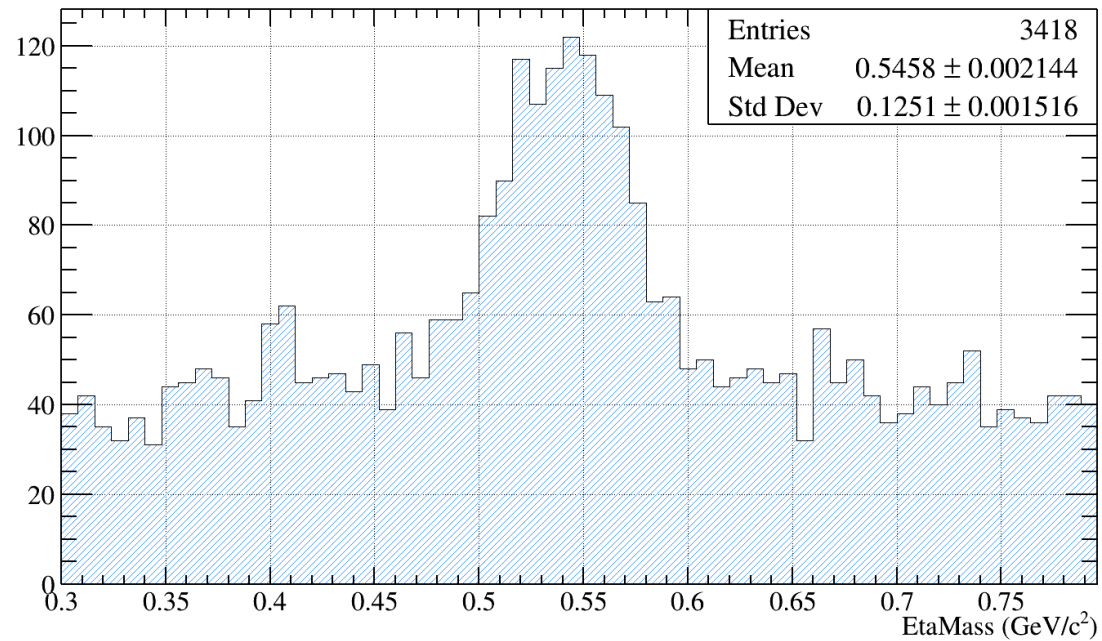
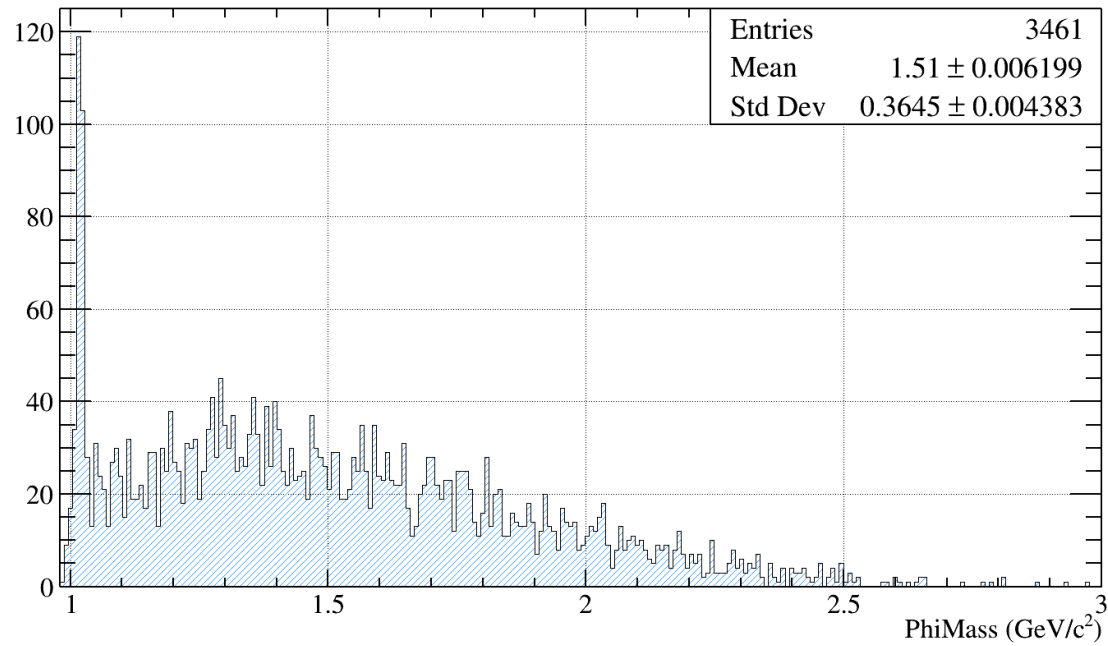
ΔT Vs P : K^+ Timing in TOF (MC)



ΔT Vs P : K^- Timing in TOF (MC)



Invariant Masses with TOF Kaon Cut and $CL = 10^{-4}$

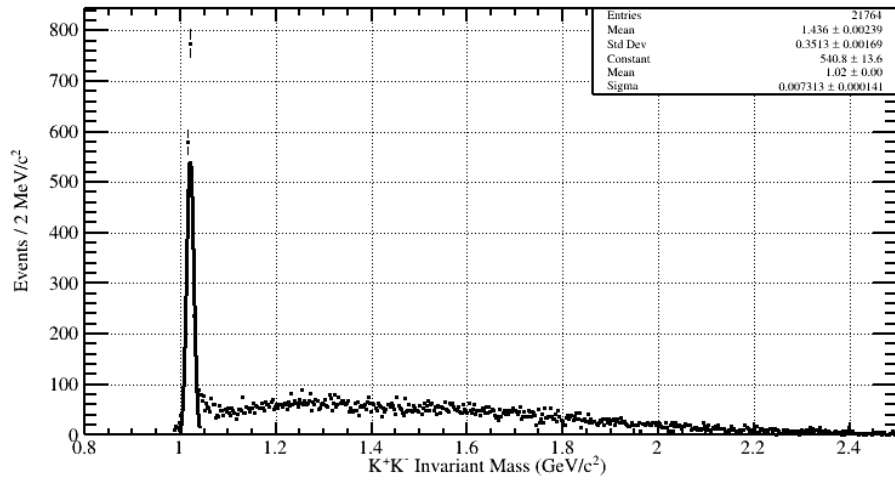


Final List of Cuts:

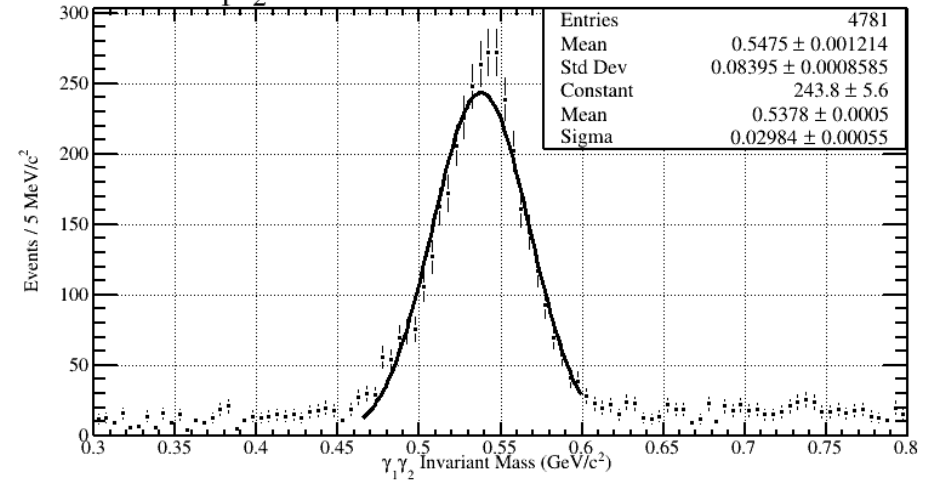
- dE/dX Cut for Proton
 - Delta T for each particle species and sub detector
 - Kinematic Fitter Confidence Level
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 - TOF Kaon Cut
-
- Number of photons reconstructed in the event

Overall Results, All Data

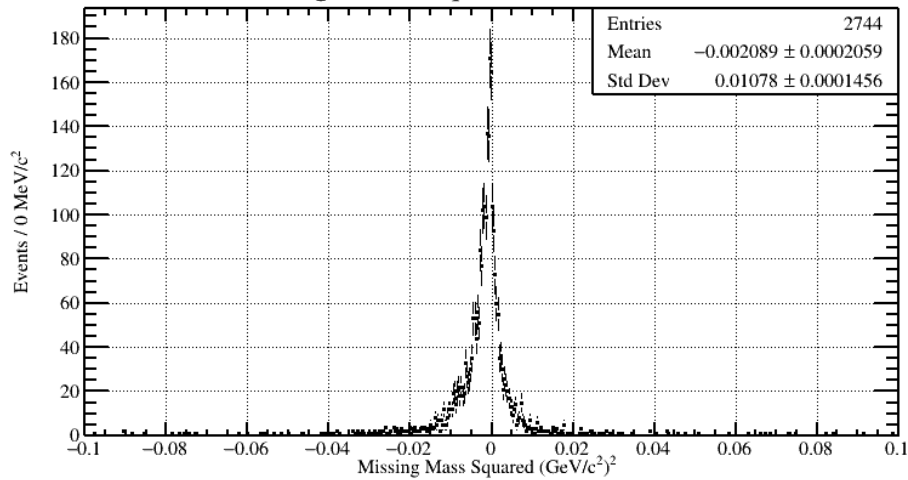
K^+K^- Invariant Mass (GeV/c^2) [2σ]



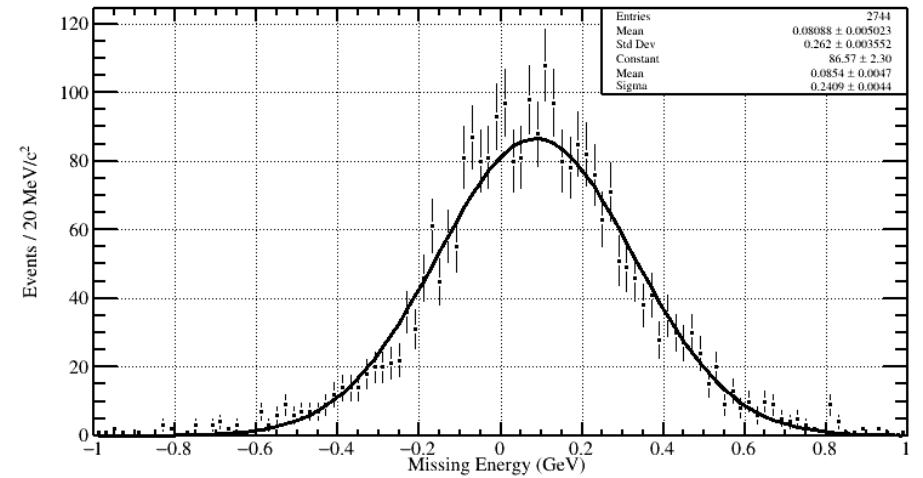
$\gamma_1\gamma_2$ Invariant Mass (GeV/c^2) [2σ]



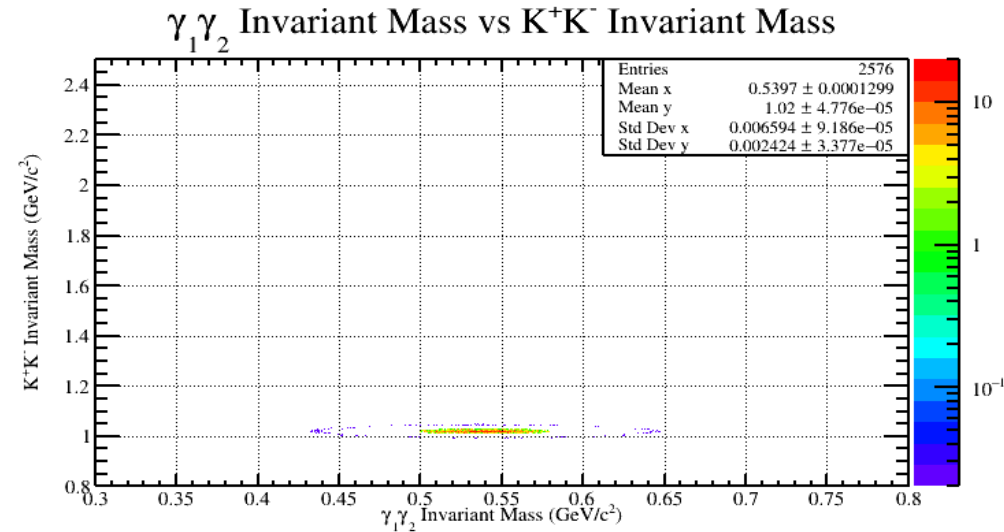
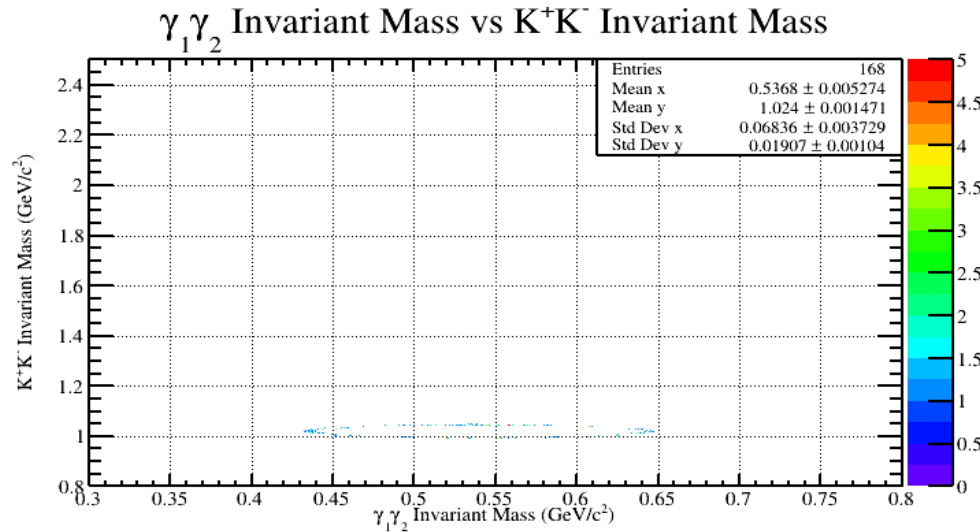
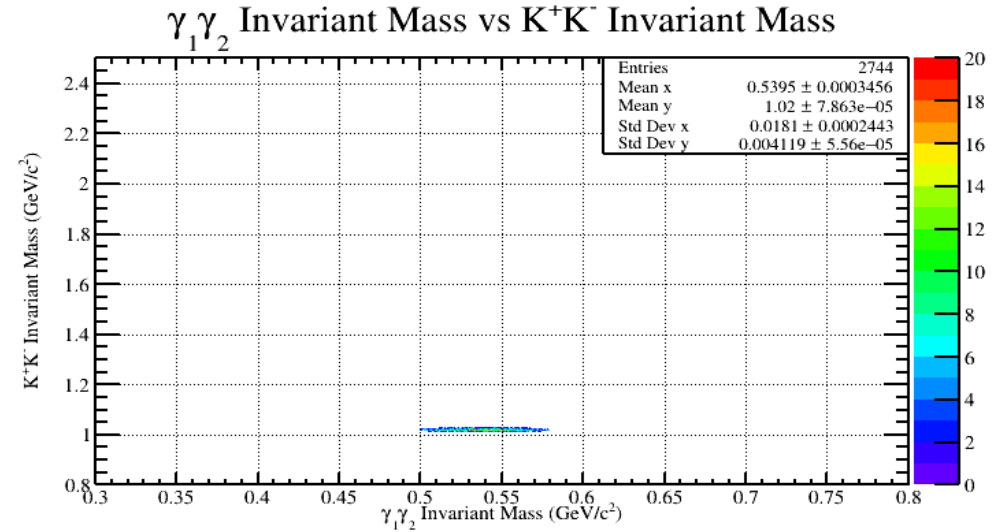
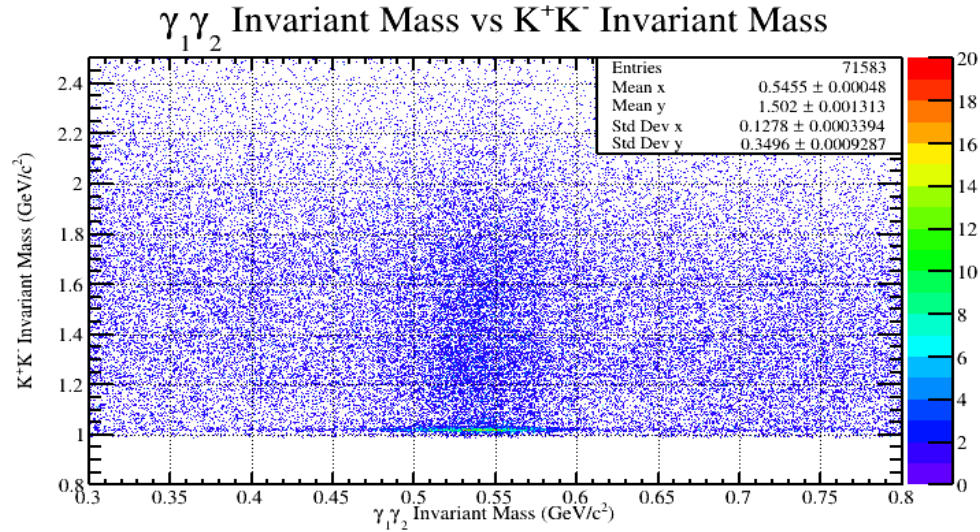
Missing Mass Squared (GeV/c^2)² [2σ]



Missing Energy (GeV) [2σ]

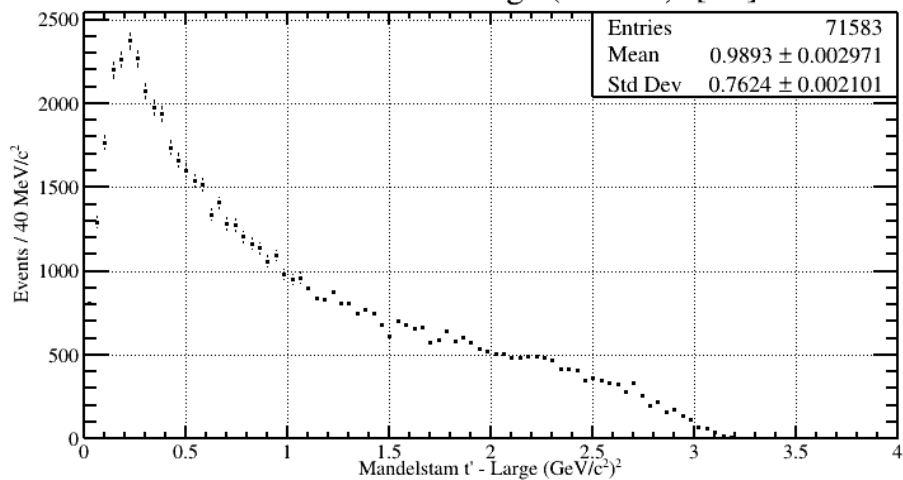


Signal And Background Cuts

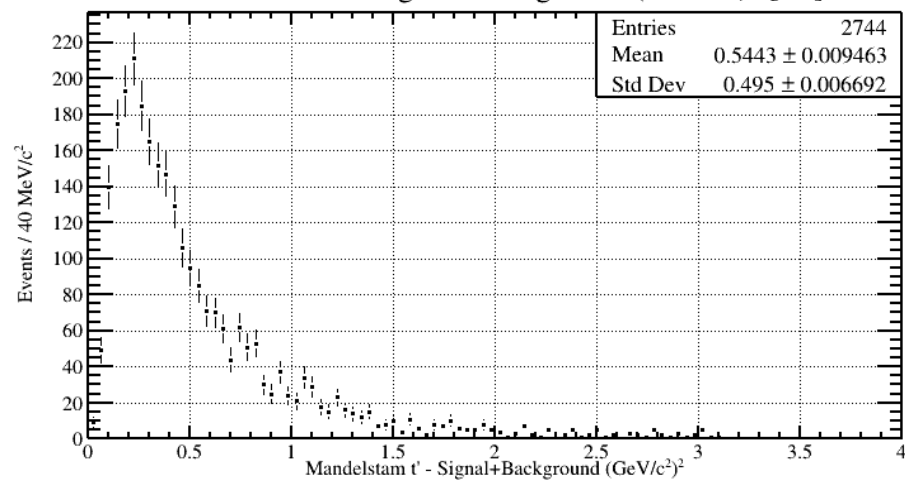


t'

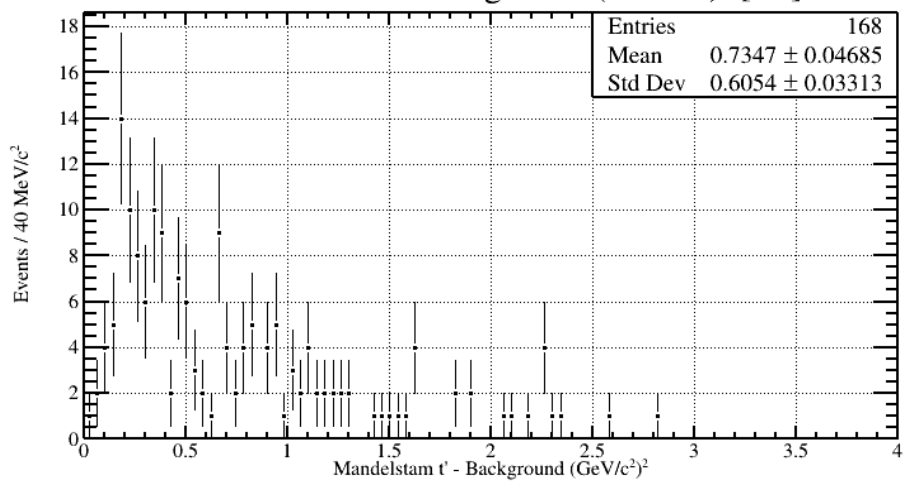
Mandelstam t' - Large $(\text{GeV}/c^2)^2$ [2σ]



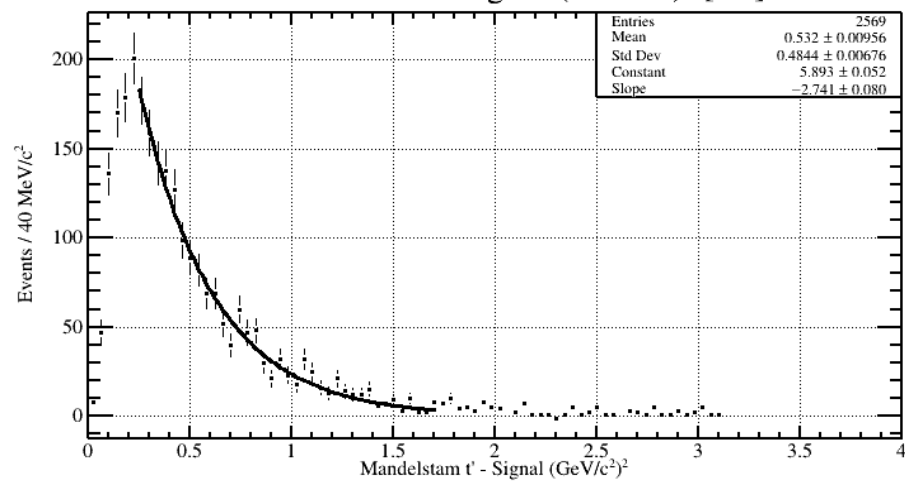
Mandelstam t' - Signal+Background $(\text{GeV}/c^2)^2$ [2σ]



Mandelstam t' - Background $(\text{GeV}/c^2)^2$ [2σ]

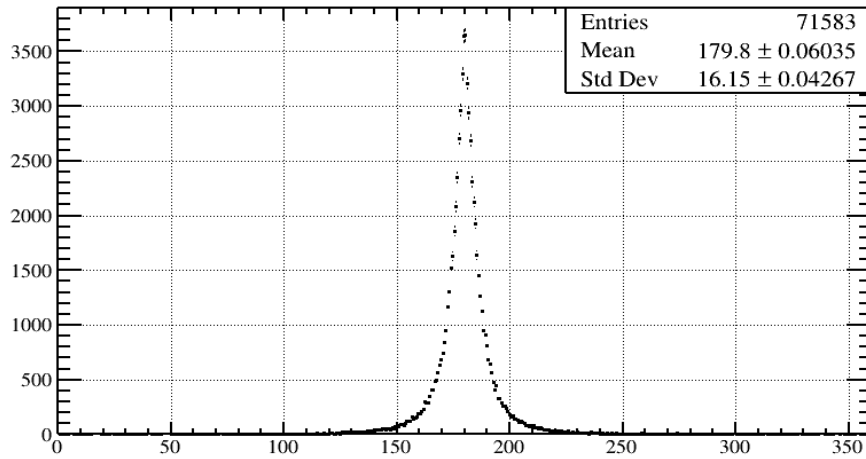


Mandelstam t' - Signal $(\text{GeV}/c^2)^2$ [2σ]

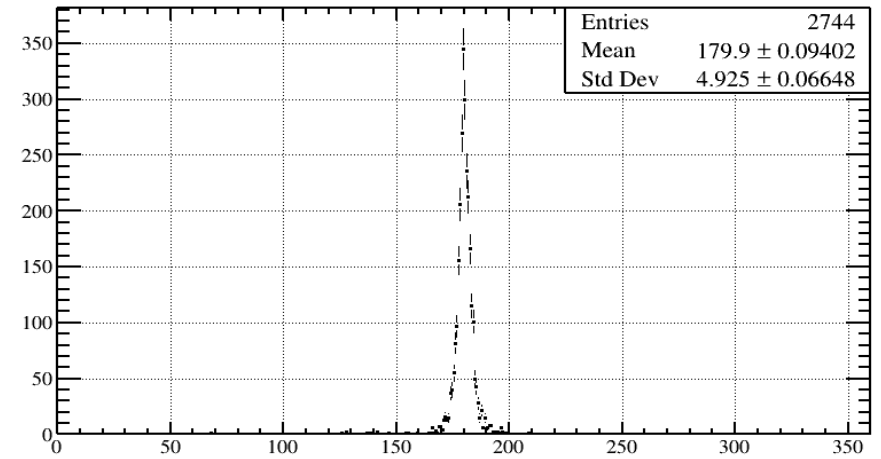


Delta Phi

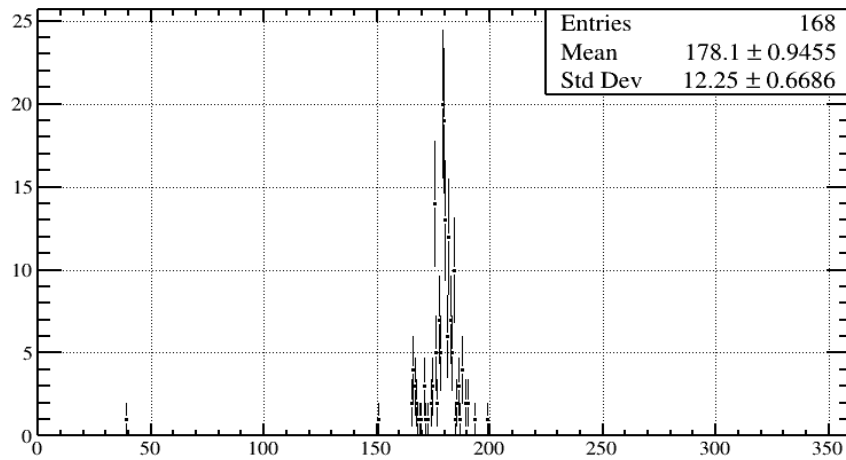
$\delta\phi$ (deg) - Large



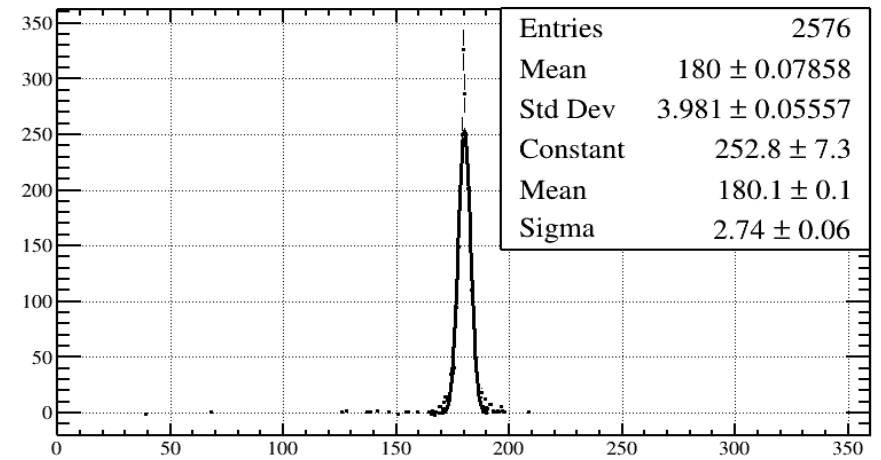
$\delta\phi$ (deg) - Signal+Background



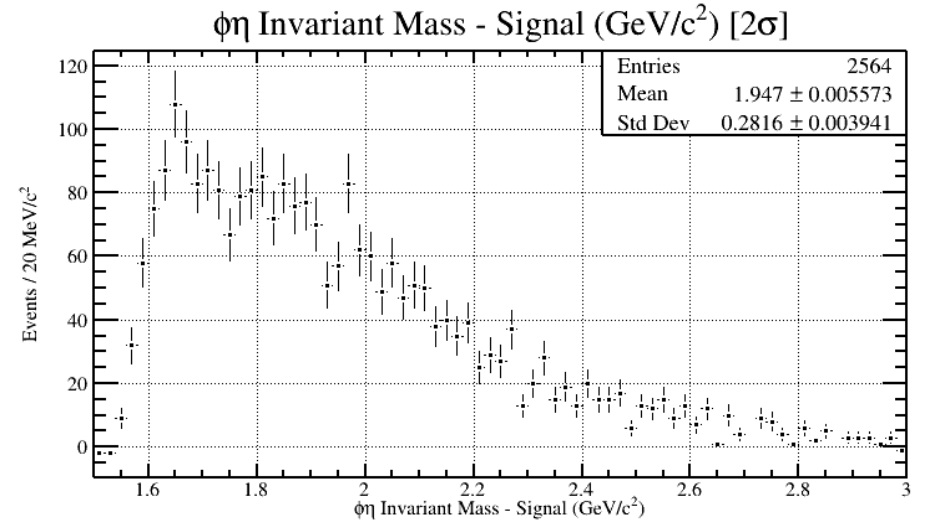
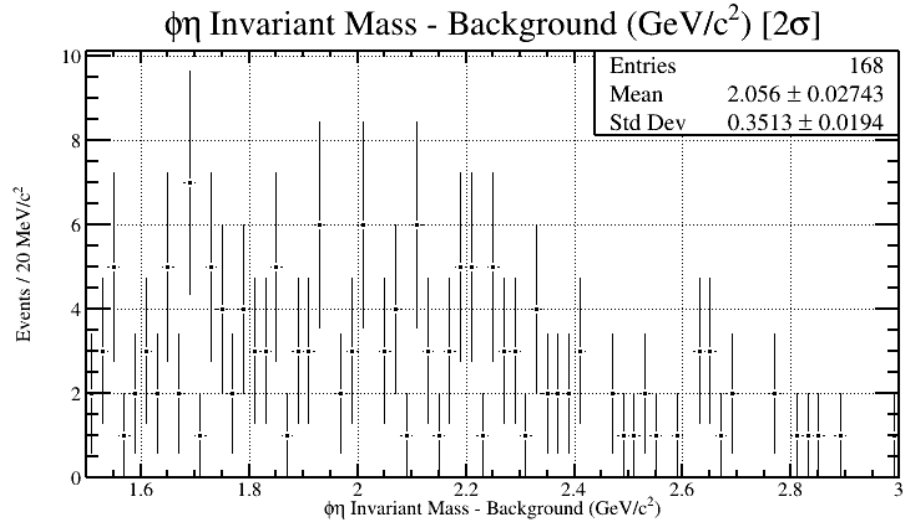
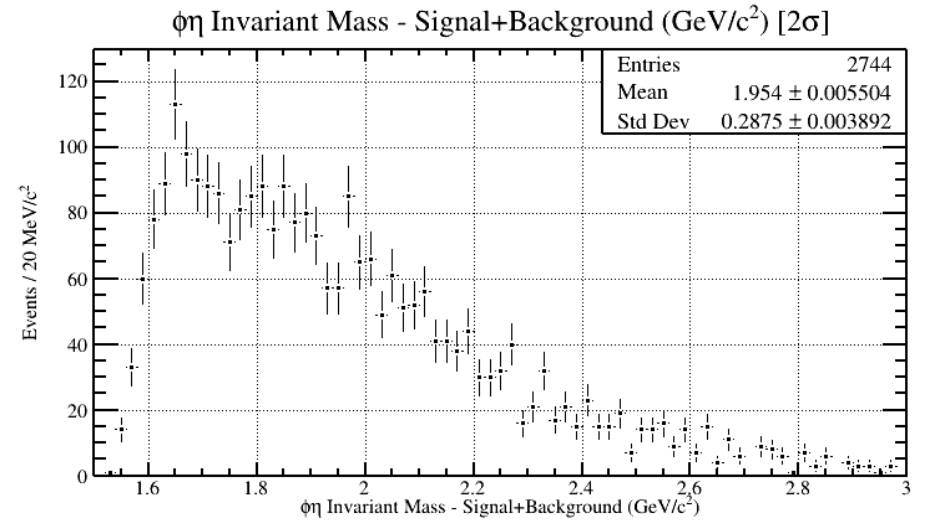
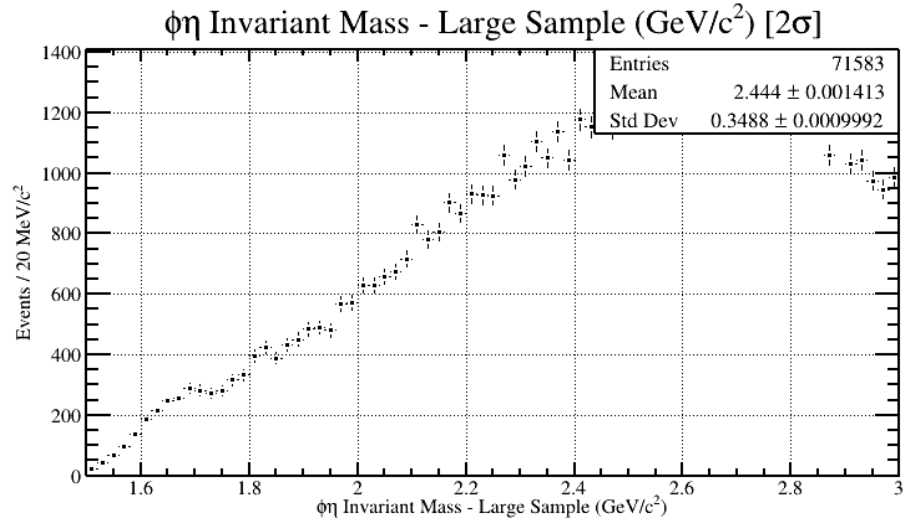
$\delta\phi$ (deg) - Background



$\delta\phi$ (deg) - Signal

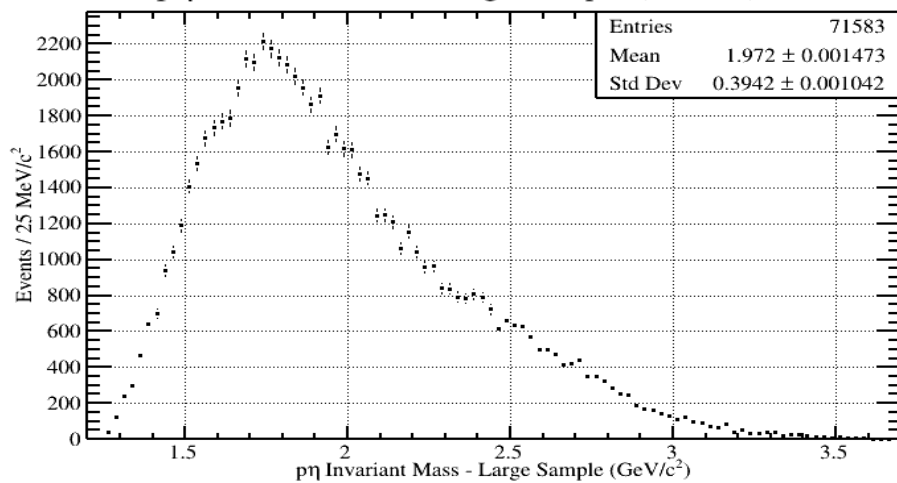


PhiEta Mass

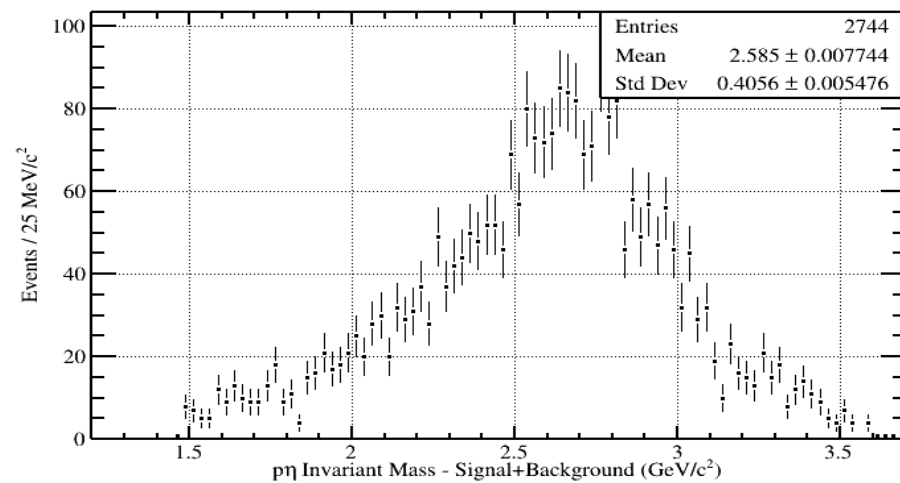


N*

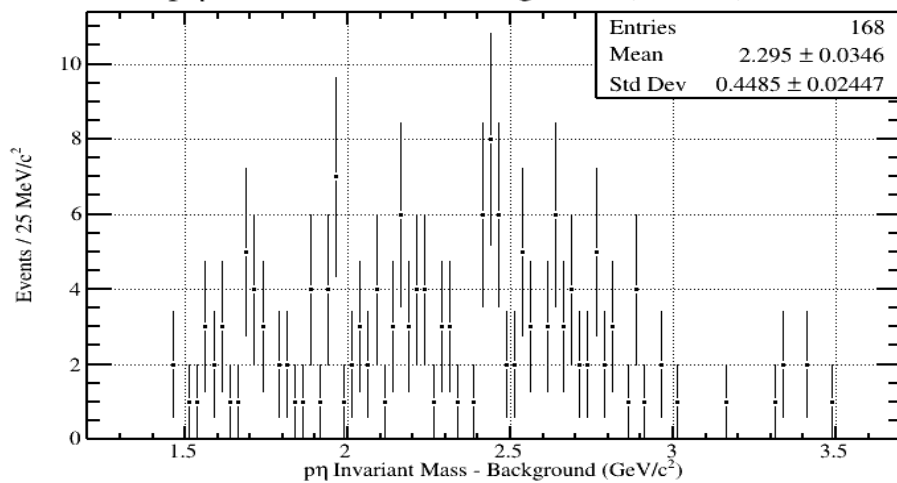
p η Invariant Mass - Large Sample (GeV/c²) [2 σ]



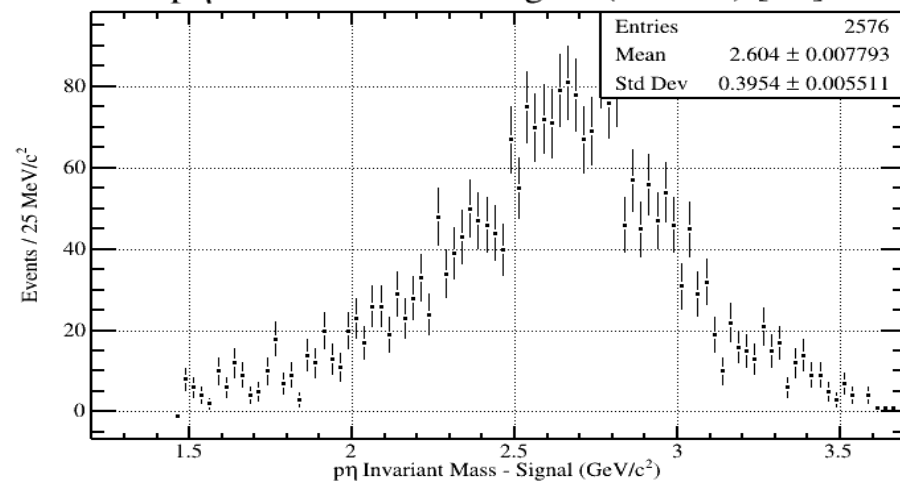
p η Invariant Mass - Signal+Background (GeV/c²) [2 σ]



p η Invariant Mass - Background (GeV/c²) [2 σ]

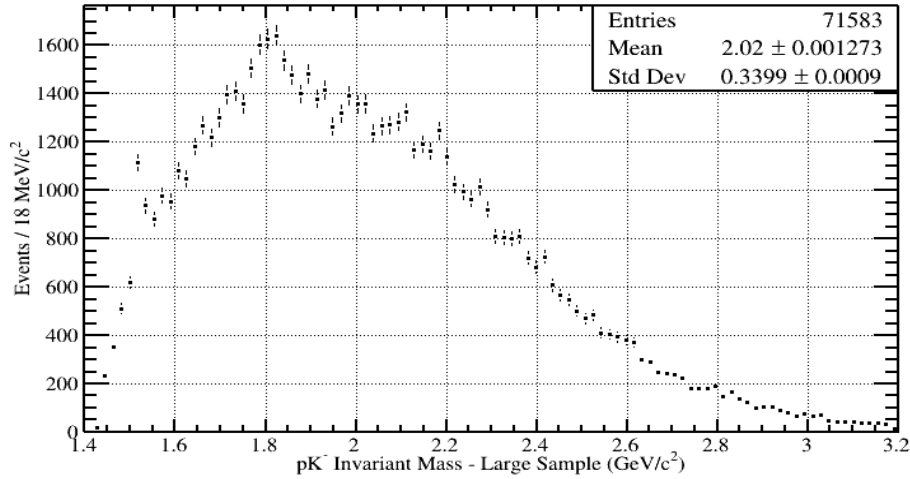


p η Invariant Mass - Signal (GeV/c²) [2 σ]

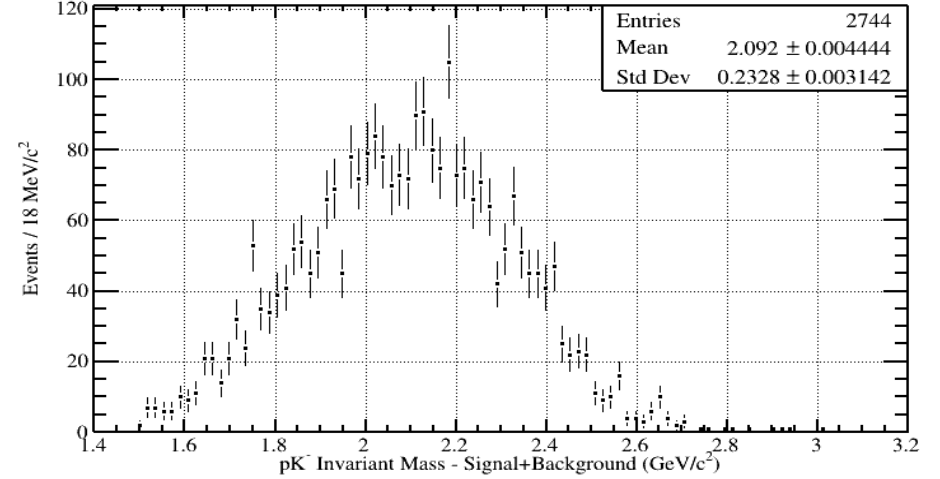


P K-

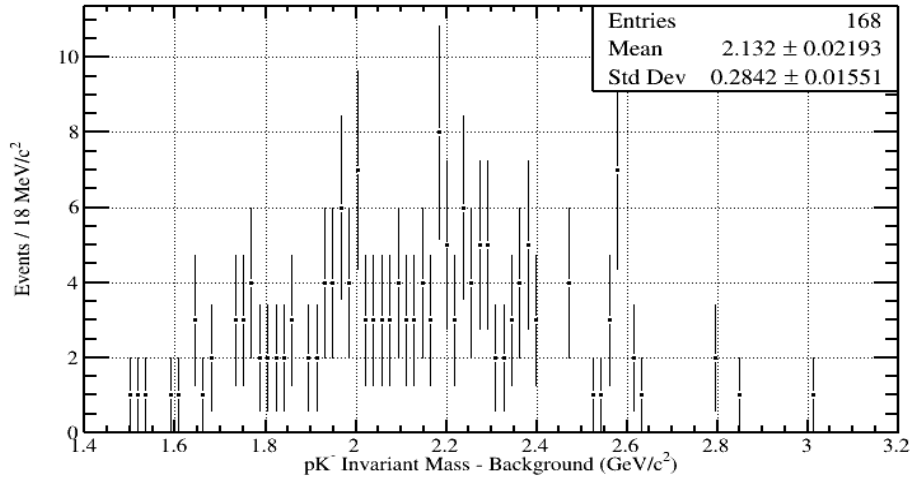
pK⁻ Invariant Mass - Large Sample (GeV/c²) [2 σ]



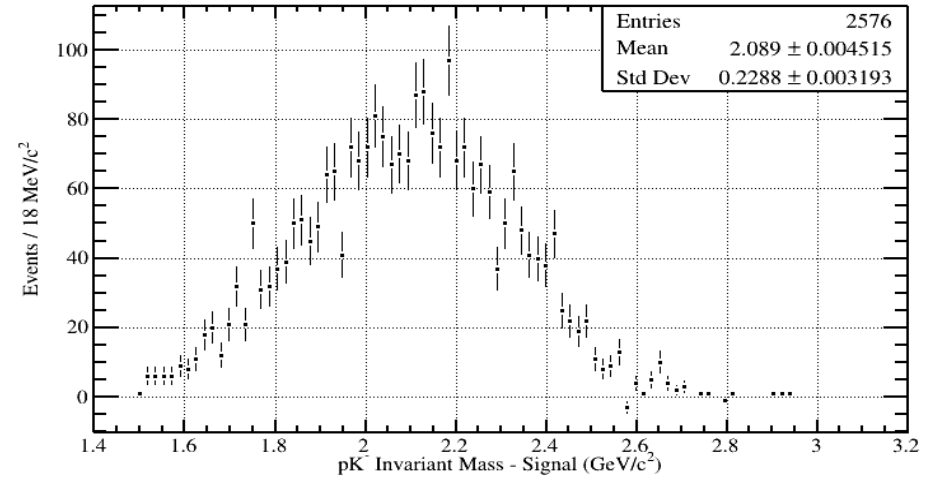
pK⁻ Invariant Mass - Signal+Background (GeV/c²) [2 σ]



pK⁻ Invariant Mass - Background (GeV/c²) [2 σ]

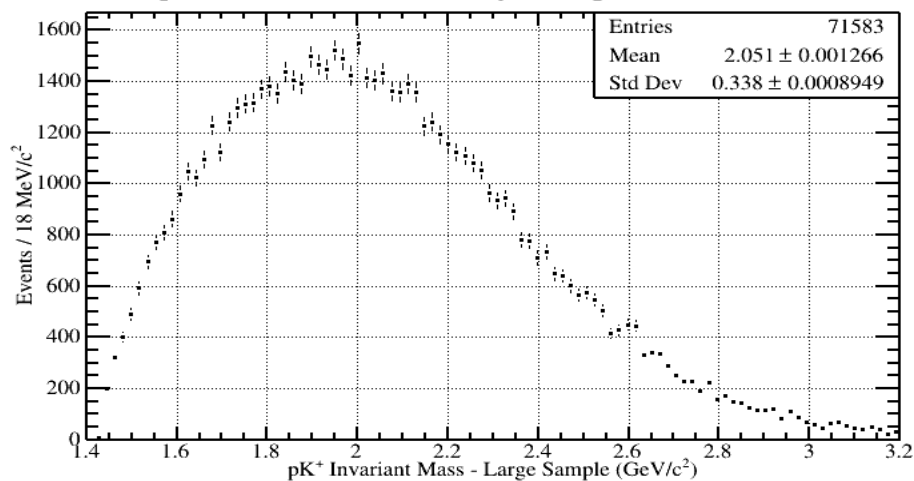


pK⁻ Invariant Mass - Signal (GeV/c²) [2 σ]

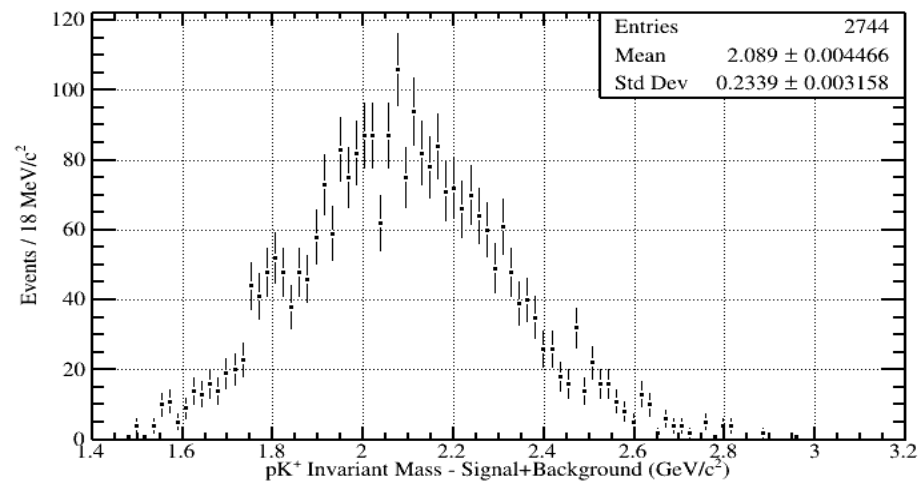


P K⁺

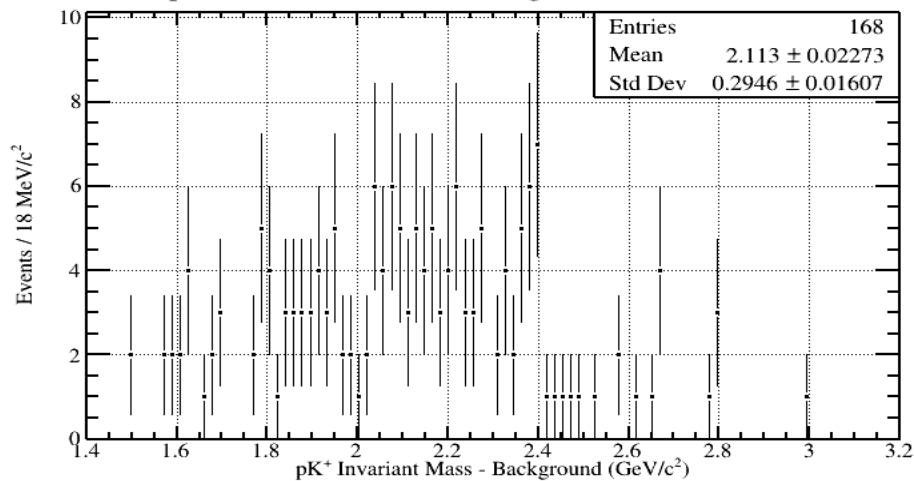
pK⁺ Invariant Mass - Large Sample (GeV/c²) [2 σ]



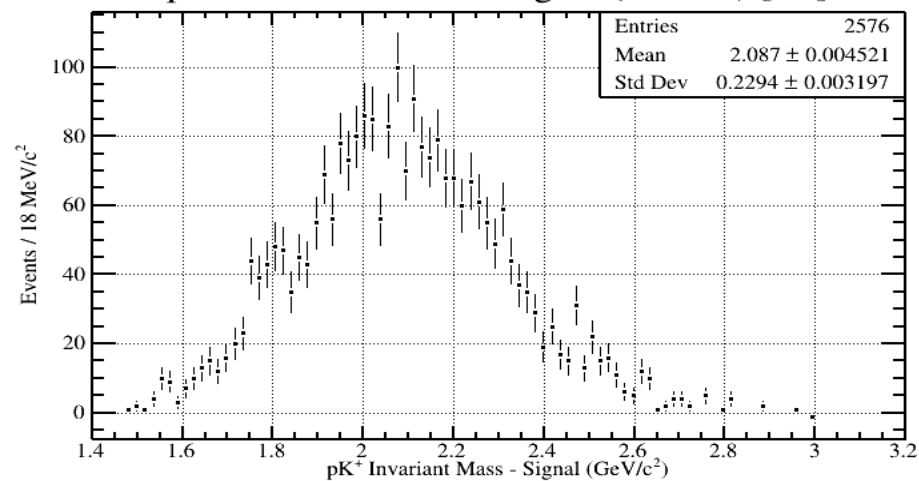
pK⁺ Invariant Mass - Signal+Background (GeV/c²) [2 σ]



pK⁺ Invariant Mass - Background (GeV/c²) [2 σ]

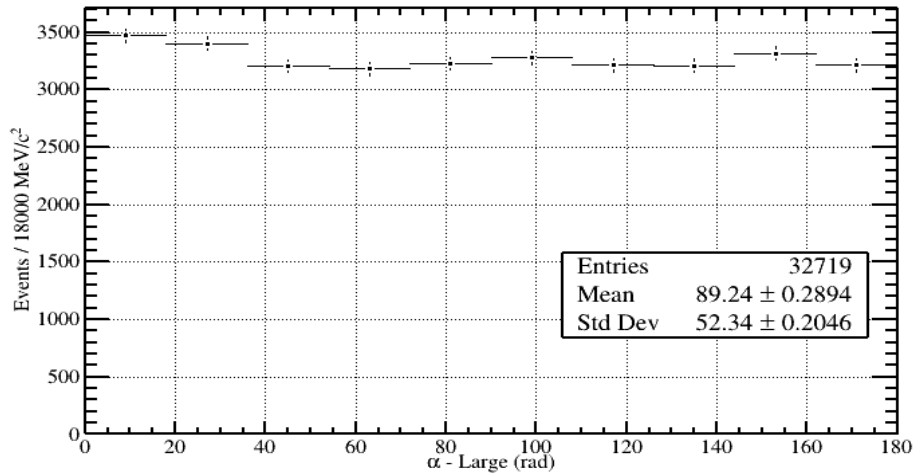


pK⁺ Invariant Mass - Signal (GeV/c²) [2 σ]

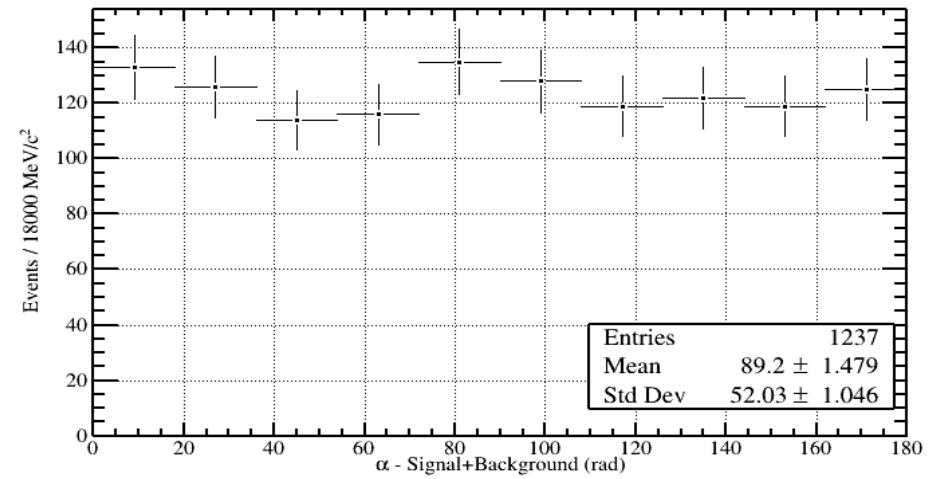


alpha

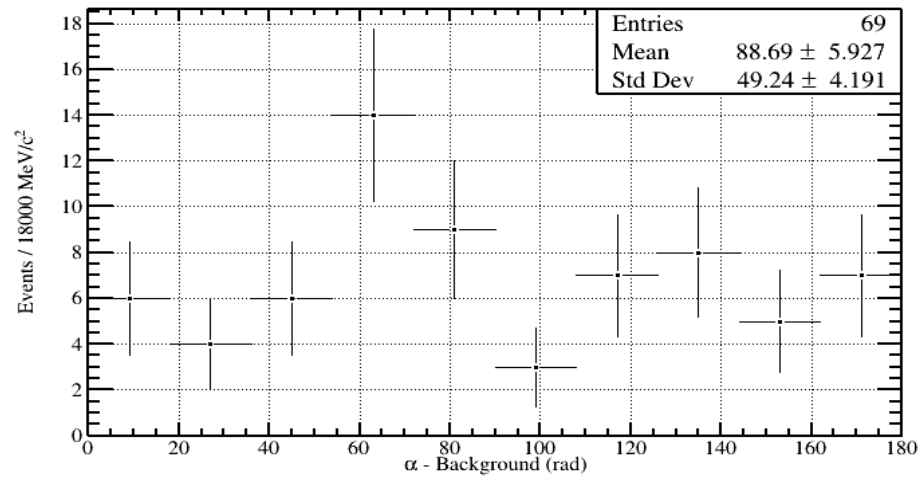
α - Large (rad) [2σ]



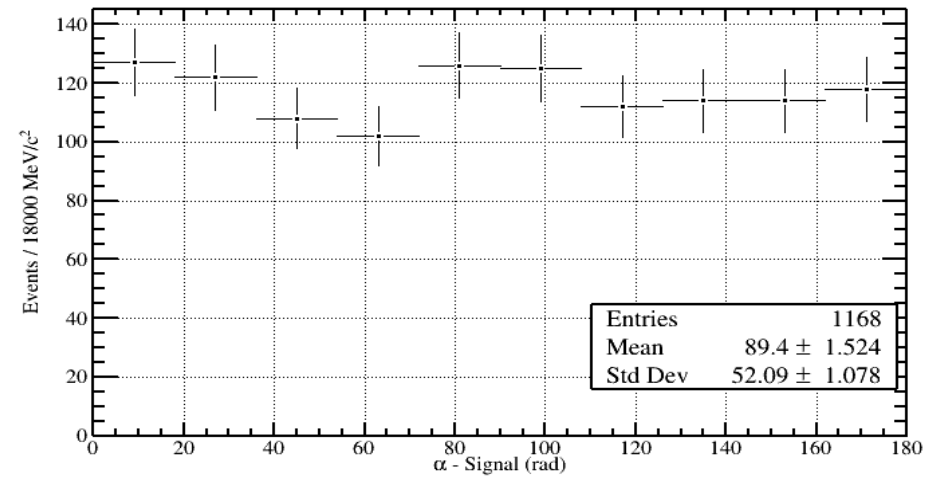
α - Signal+Background (rad) [2σ]



α - Background (rad) [2σ]

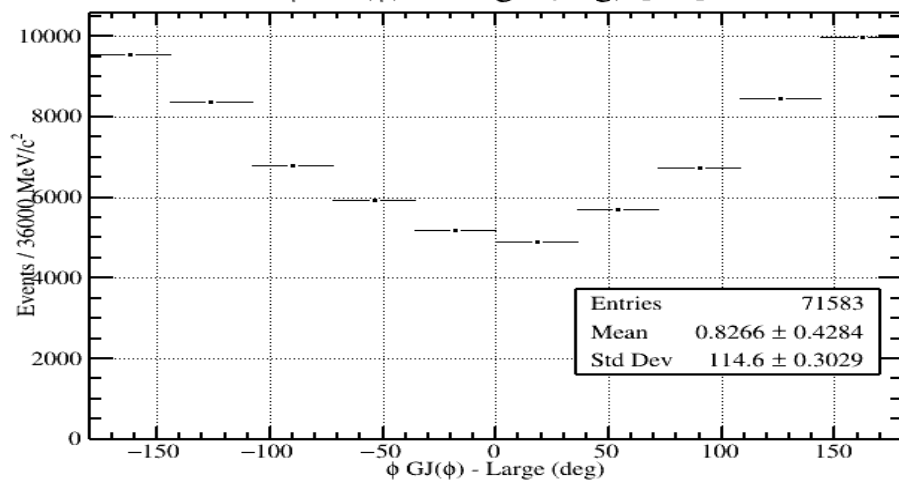


α - Signal (rad) [2σ]

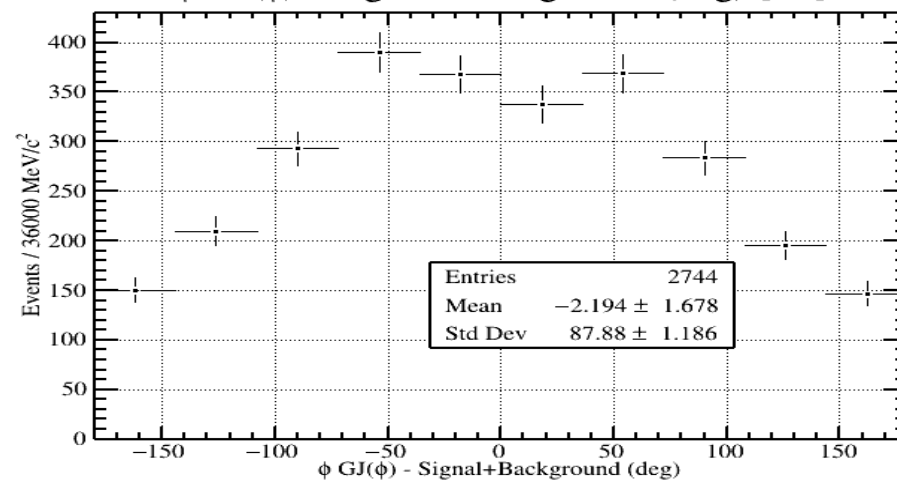


Phi Meson, GJ (phi)

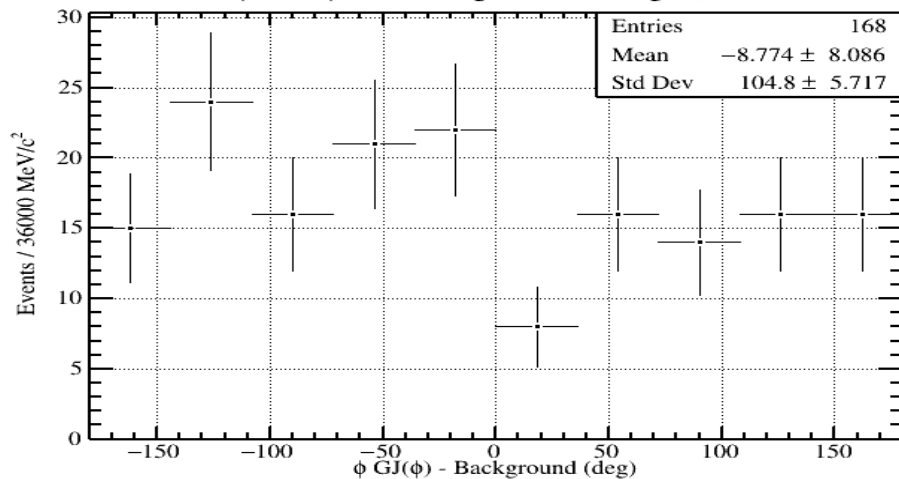
ϕ GJ(ϕ) - Large (deg) [2σ]



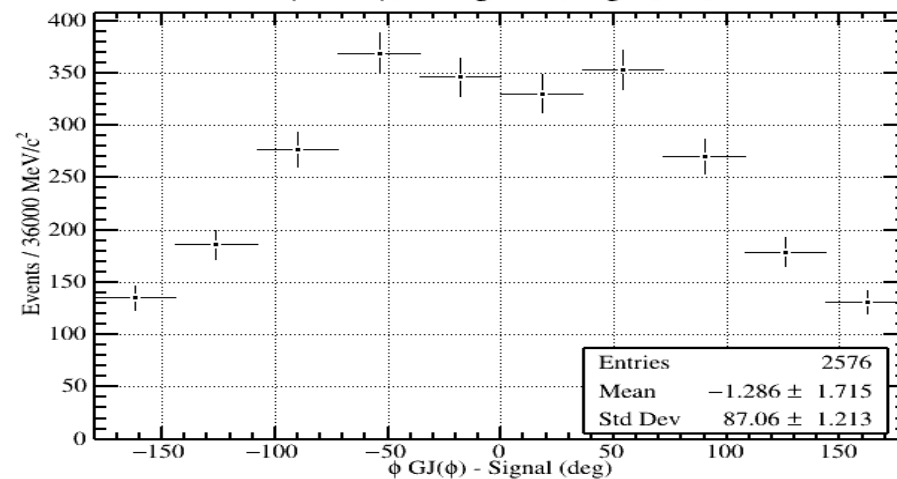
ϕ GJ(ϕ) - Signal+Background (deg) [2σ]



ϕ GJ(ϕ) - Background (deg) [2σ]

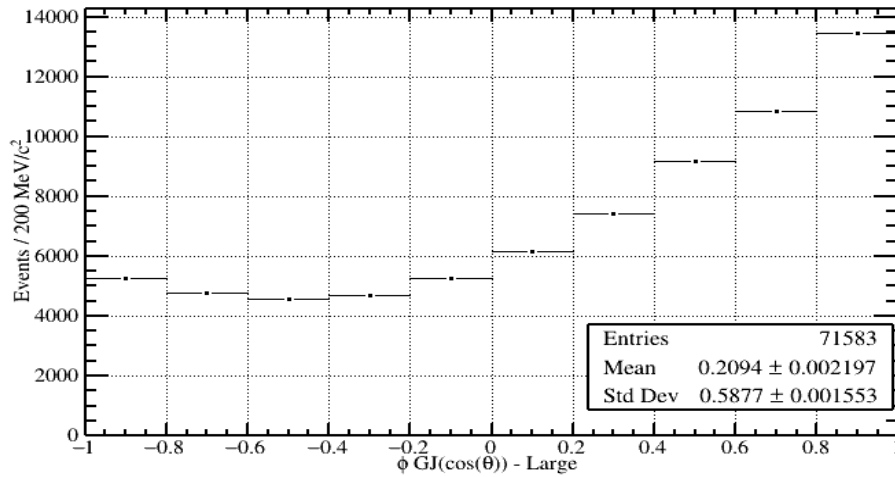


ϕ GJ(ϕ) - Signal (deg) [2σ]

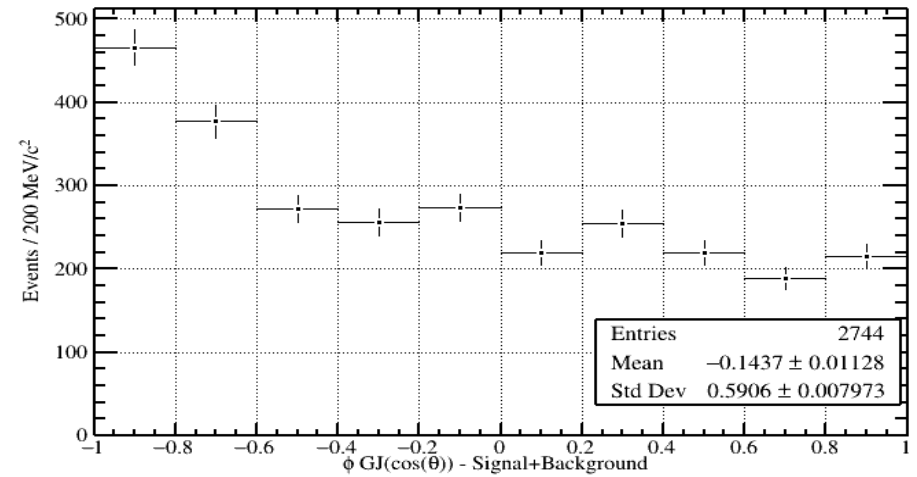


Phi Meson, GJ (cos)

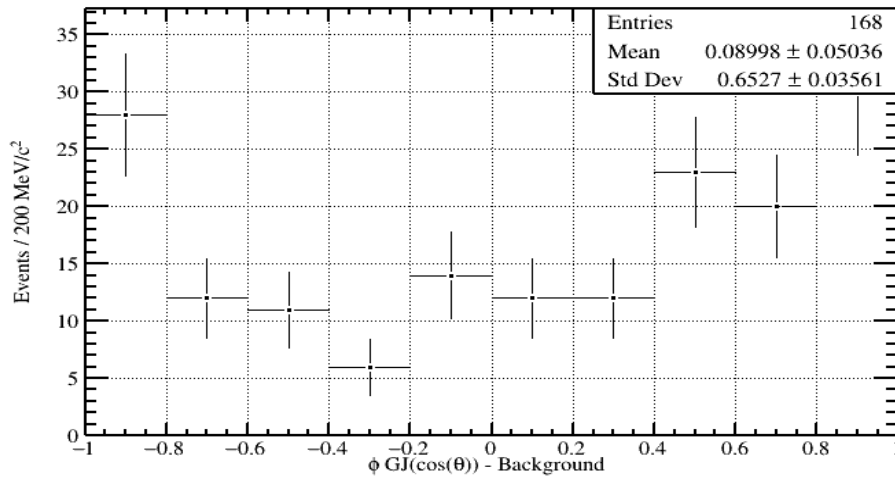
ϕ GJ(cos(θ)) - Large [2σ]



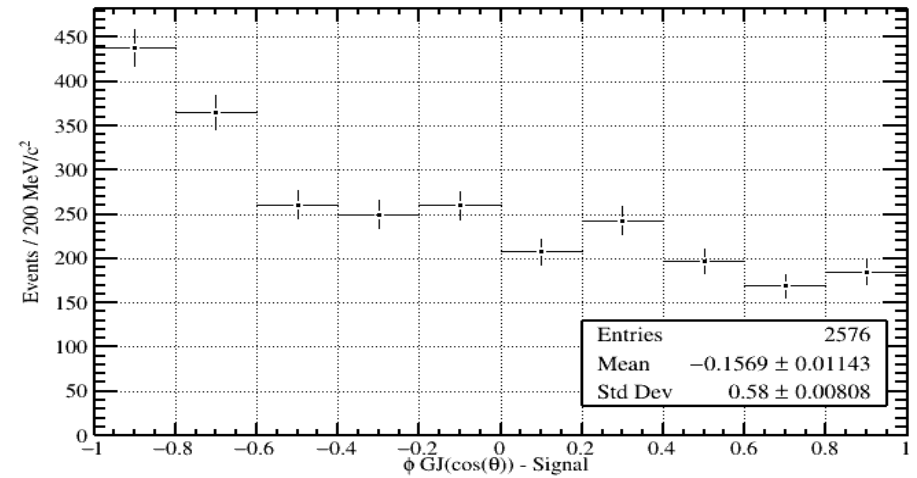
ϕ GJ(cos(θ)) - Signal+Background [2σ]



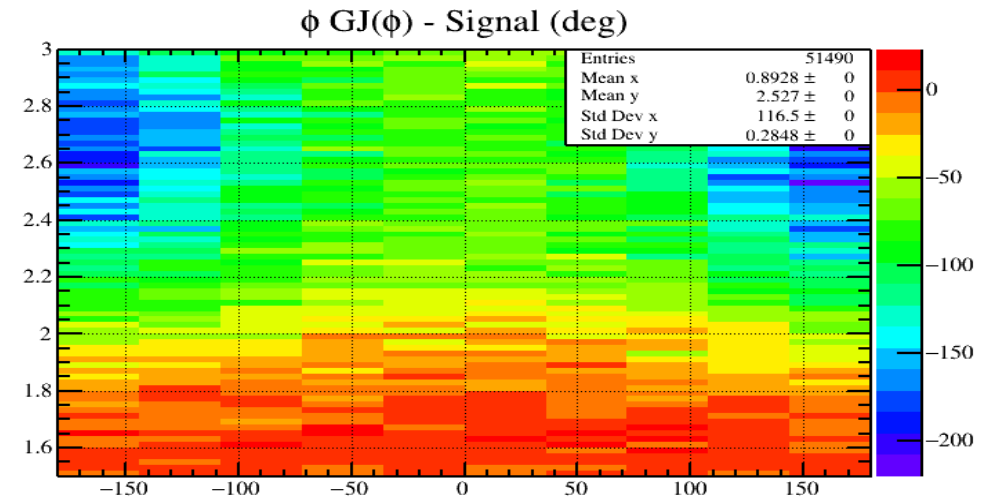
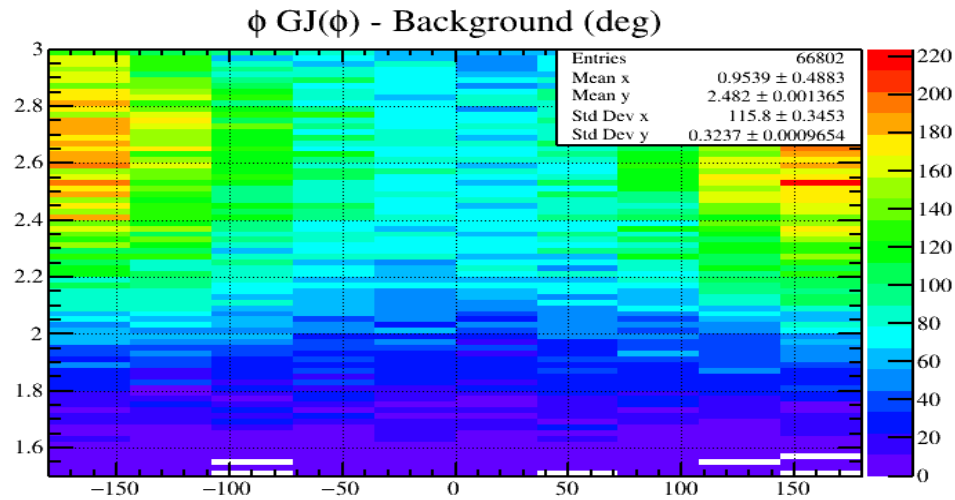
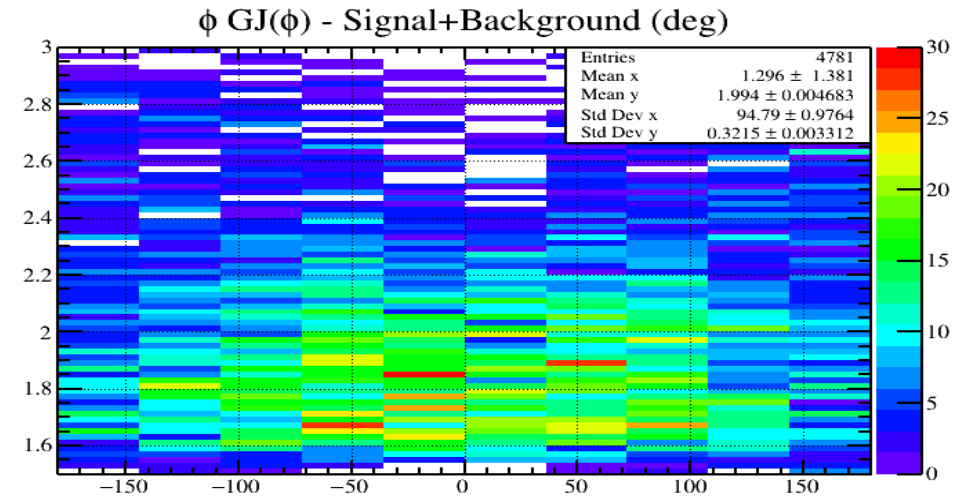
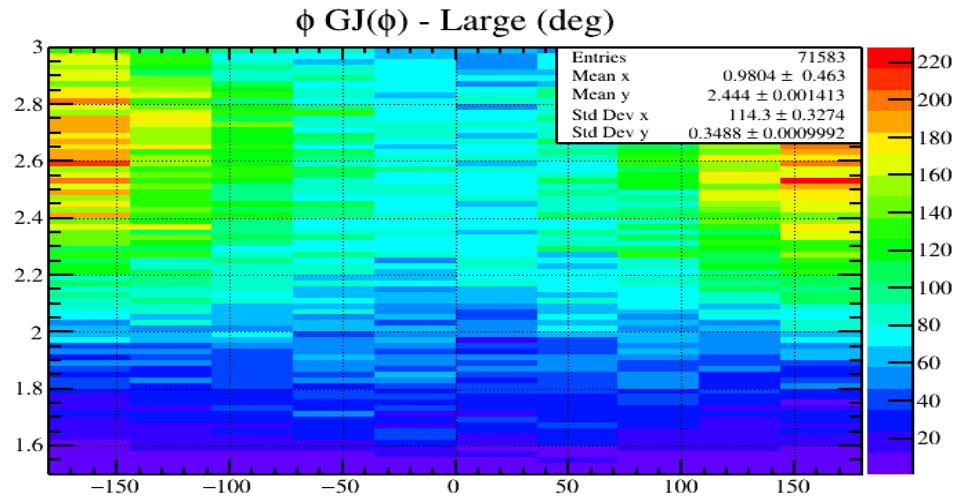
ϕ GJ(cos(θ)) - Background [2σ]



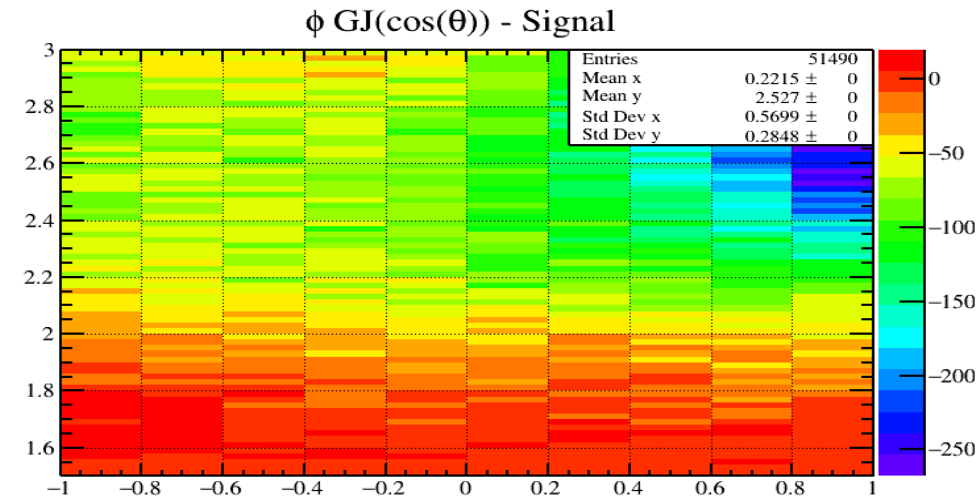
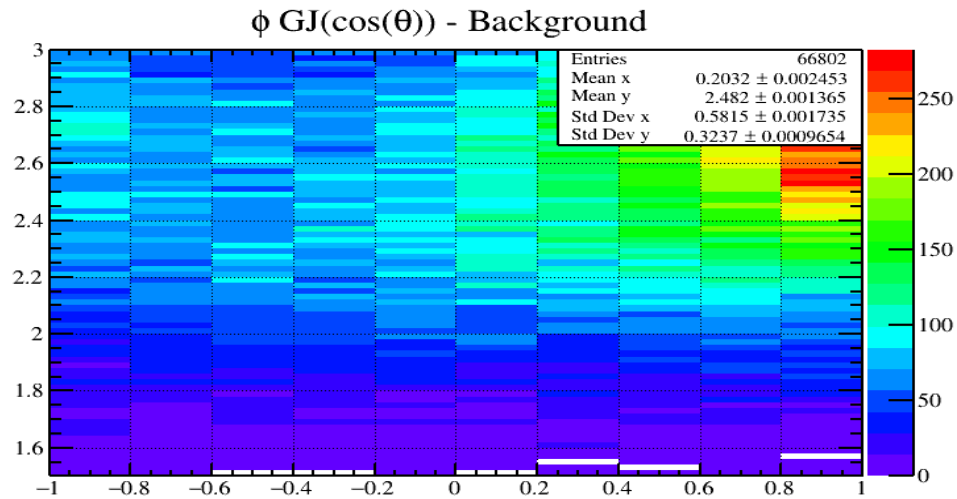
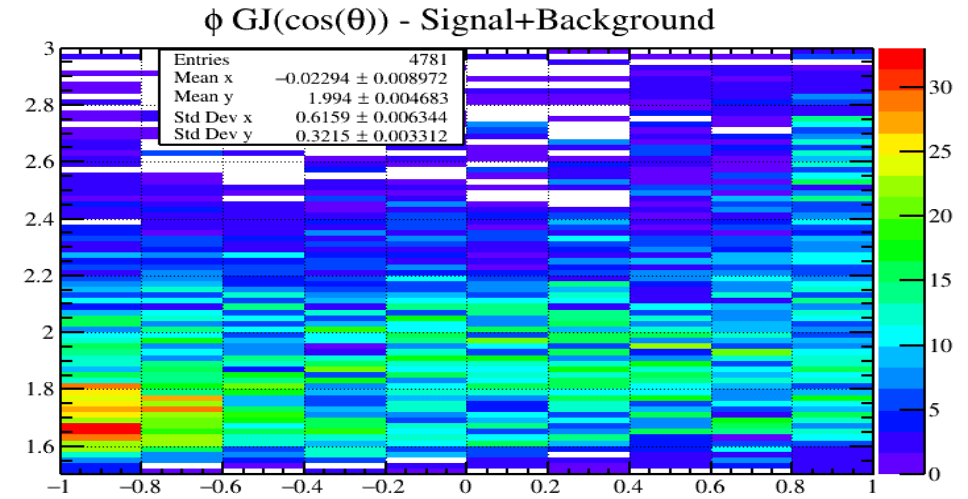
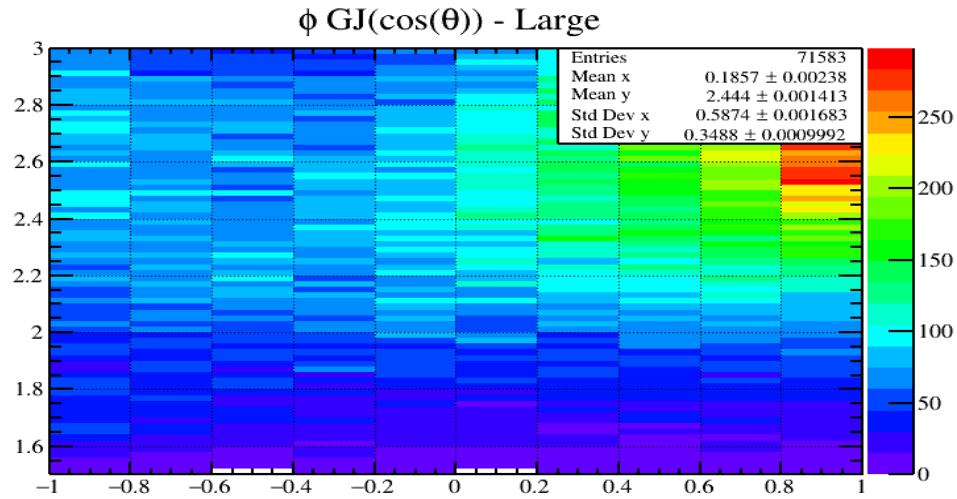
ϕ GJ(cos(θ)) - Signal [2σ]



PhiEta Mass Vs Phi Meson GJ (phi)

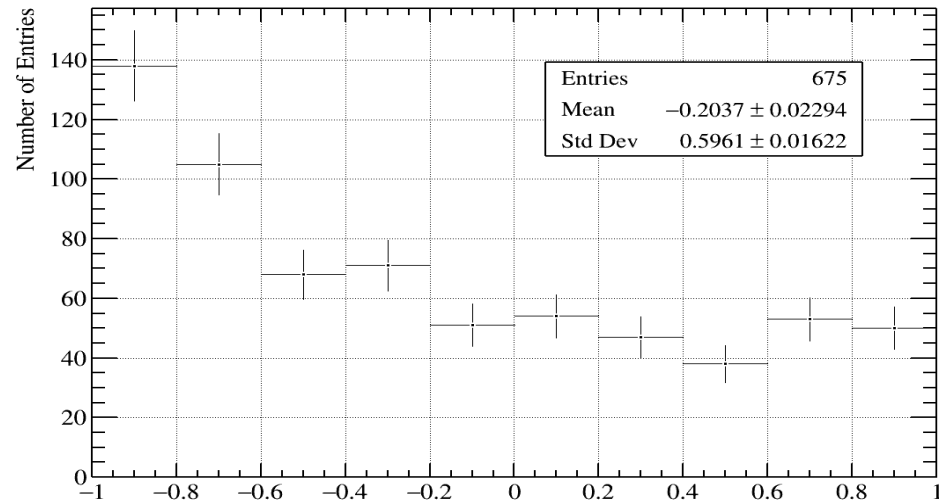


PhiEta Mass Vs Phi Meson GJ (cos)

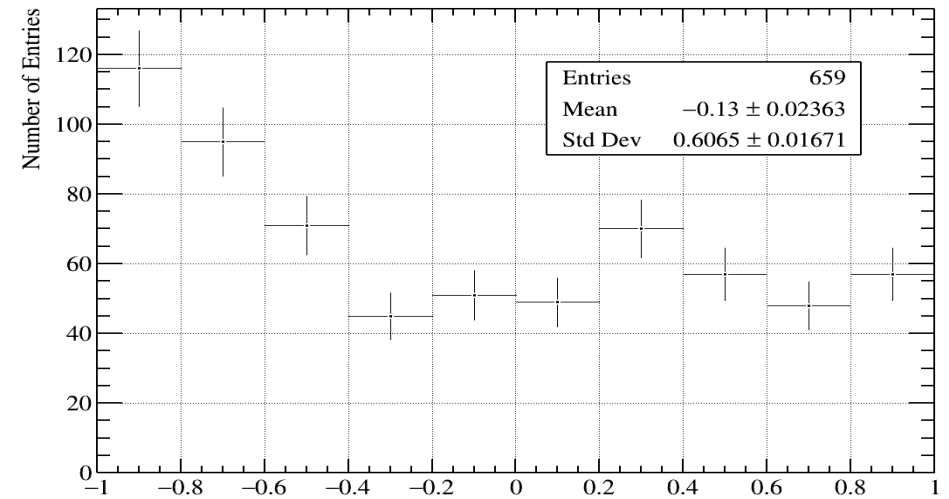


Phi Meson GJ (cos) Projections in Different PhiEta Mass Ranges

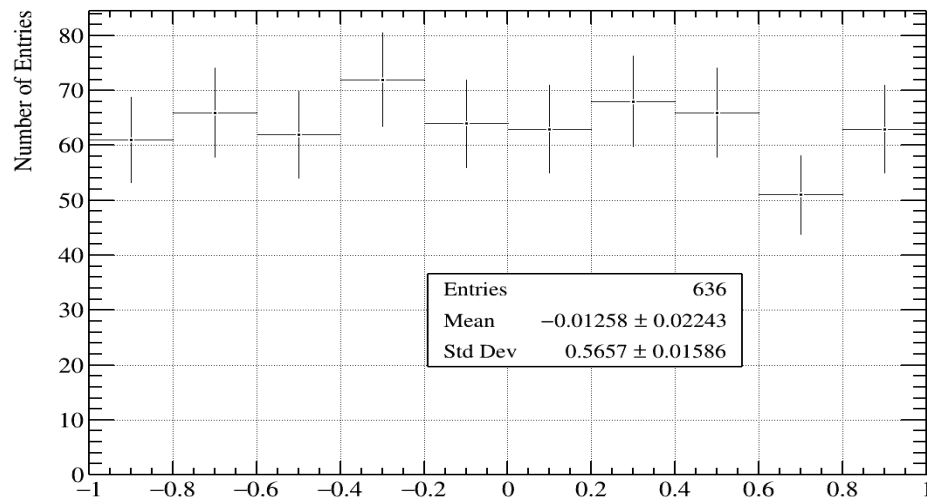
ProjectionX of biny=[6,10] [y=1.600..1.700]



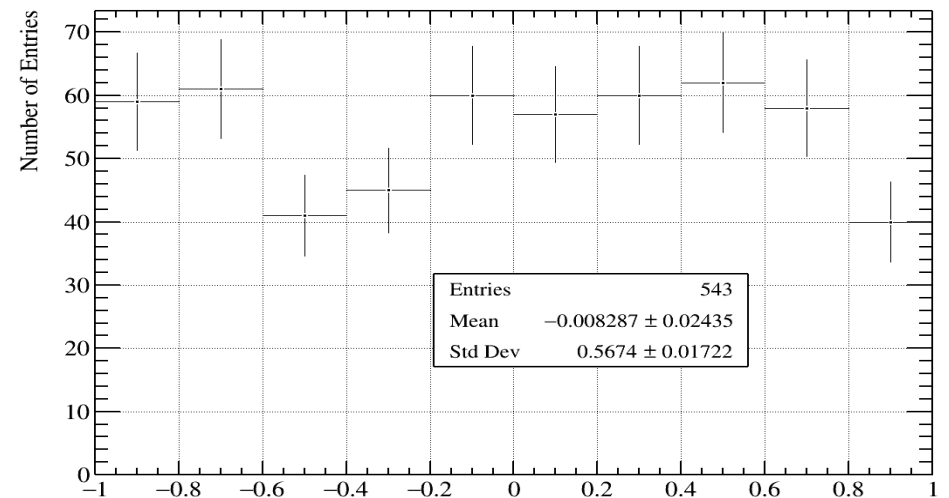
ProjectionX of biny=[13,17] [y=1.740..1.840]



ProjectionX of biny=[17,21] [y=1.820..1.920]

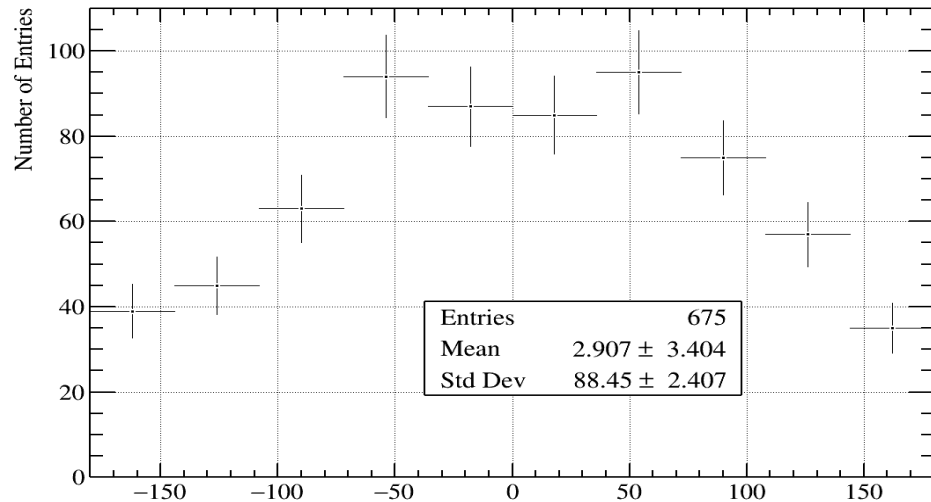


ProjectionX of biny=[22,26] [y=1.920..2.020]

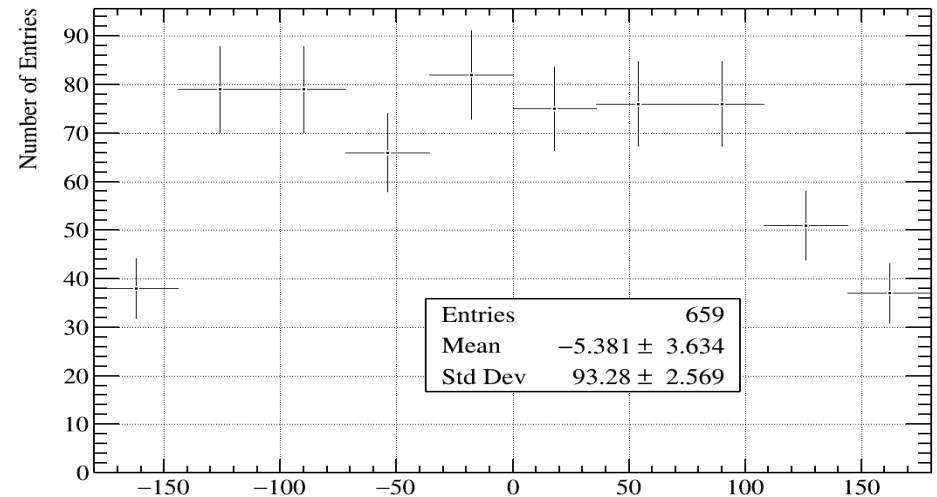


Phi Meson GJ (phi) Projections in Different PhiEta Mass Ranges

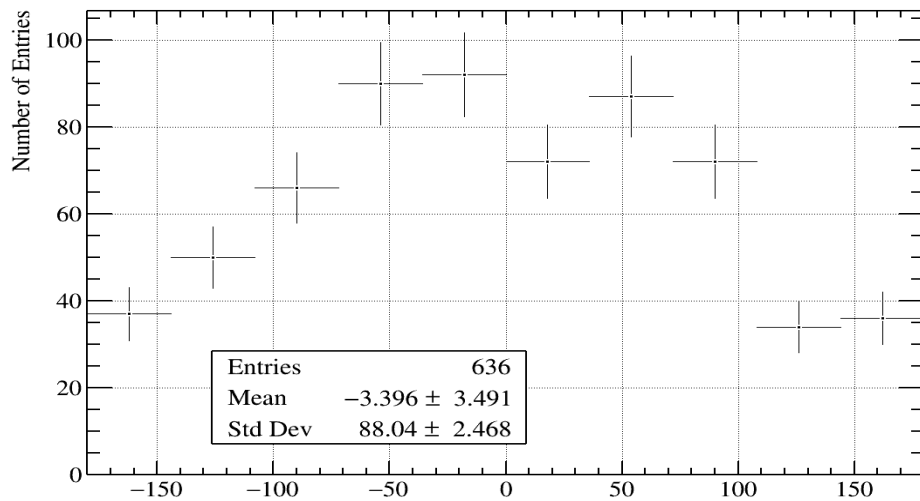
ProjectionX of biny=[6,10] [y=1.600..1.700]



ProjectionX of biny=[13,17] [y=1.740..1.840]



ProjectionX of biny=[17,21] [y=1.820..1.920]



ProjectionX of biny=[22,26] [y=1.920..2.020]

