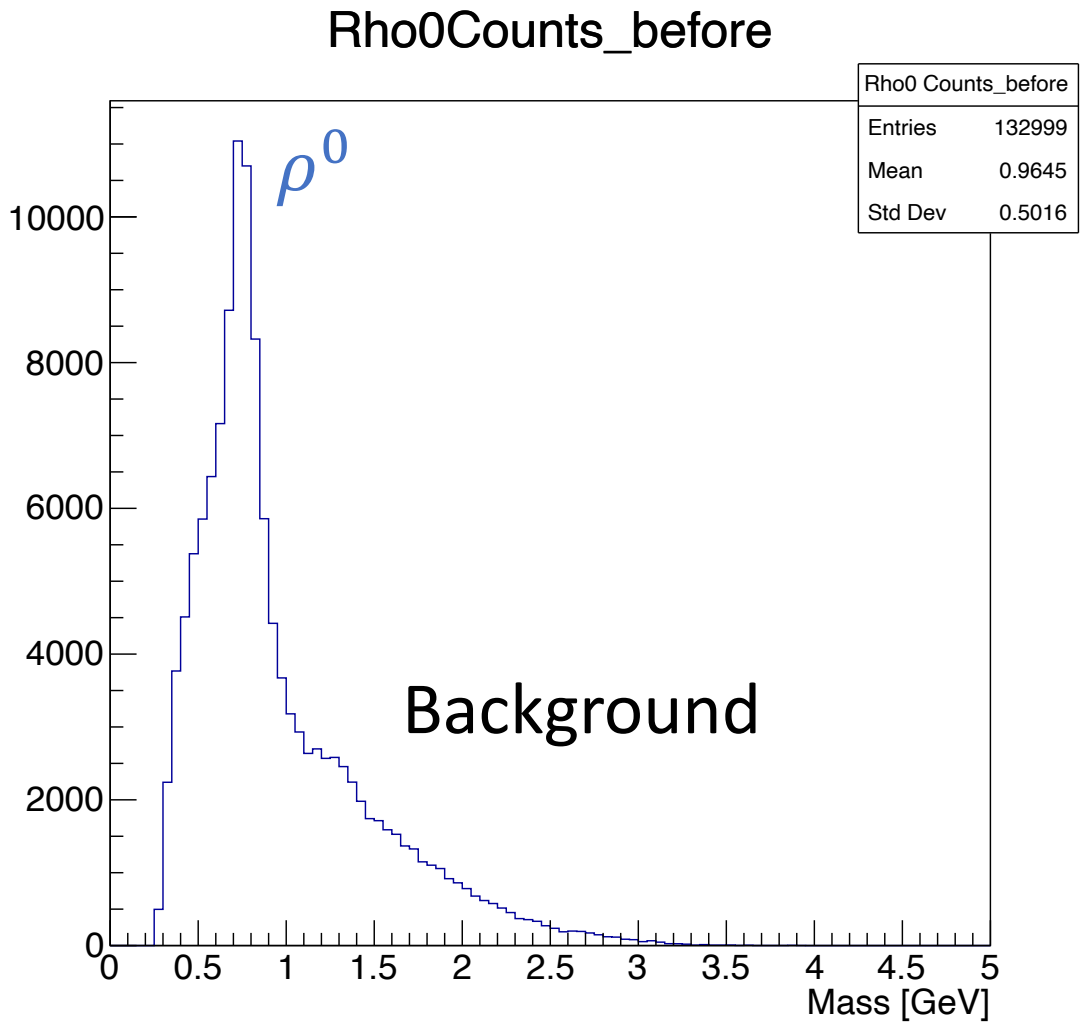
$\gamma\ d \rightarrow \rho^0\ p\ (n) \rightarrow \pi^+\ \pi^-$ p (n)

- Reaction: $\gamma\ d \rightarrow \pi^+\ \pi^-\ p\ (n)$
- 1 REST file from deuterium data
- Event Selection:
  - 2 positive and 1 negative track
  - Kinematic fitting with F4 vertex constraint, and confidence level > 0.01
  - tagger accidental subtracted with 4 beam bunches on each side
  - standard GlueX PID cuts (timing and dE/dx)

Invariant Mass before cuts

$$\gamma\, d \rightarrow \pi^{+}\, \pi^{-}\, p\, (n)$$

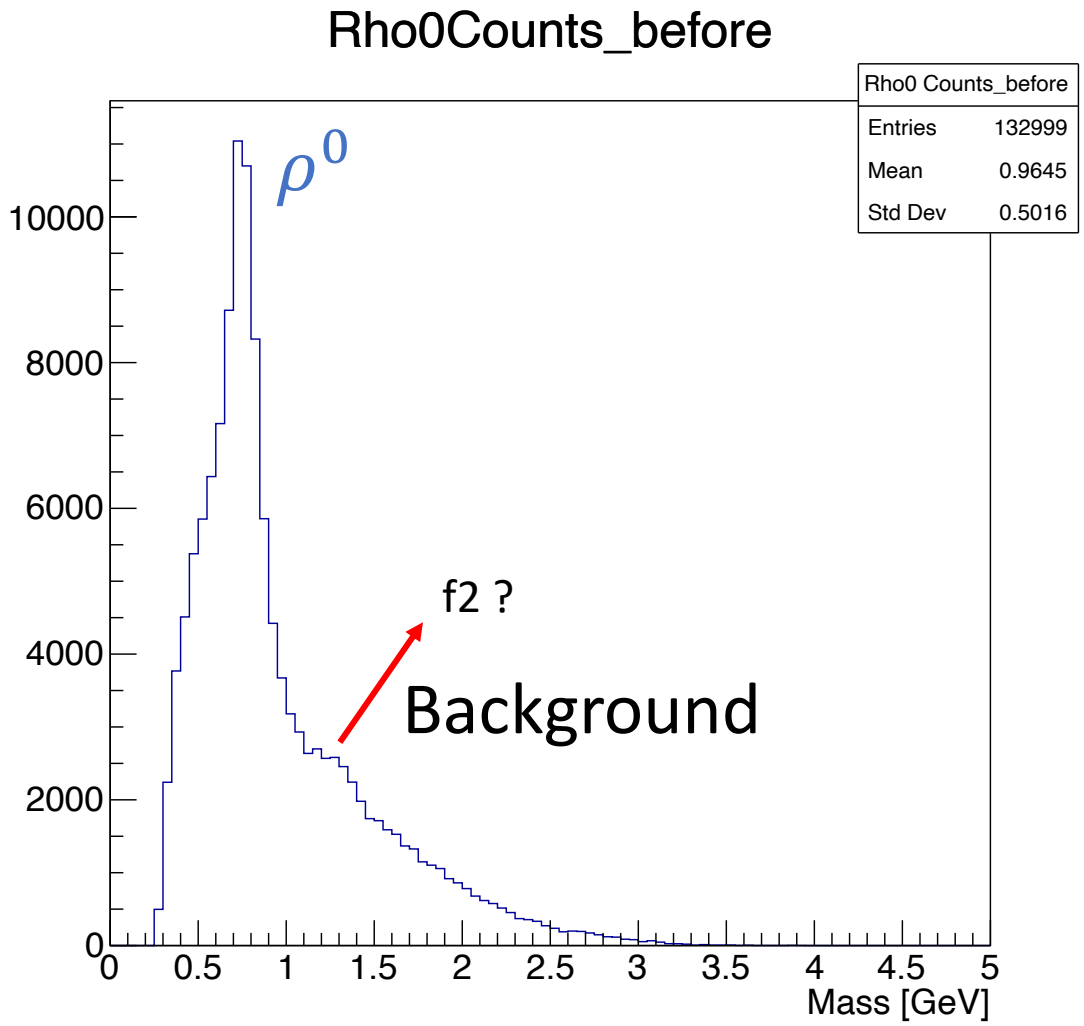
- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction



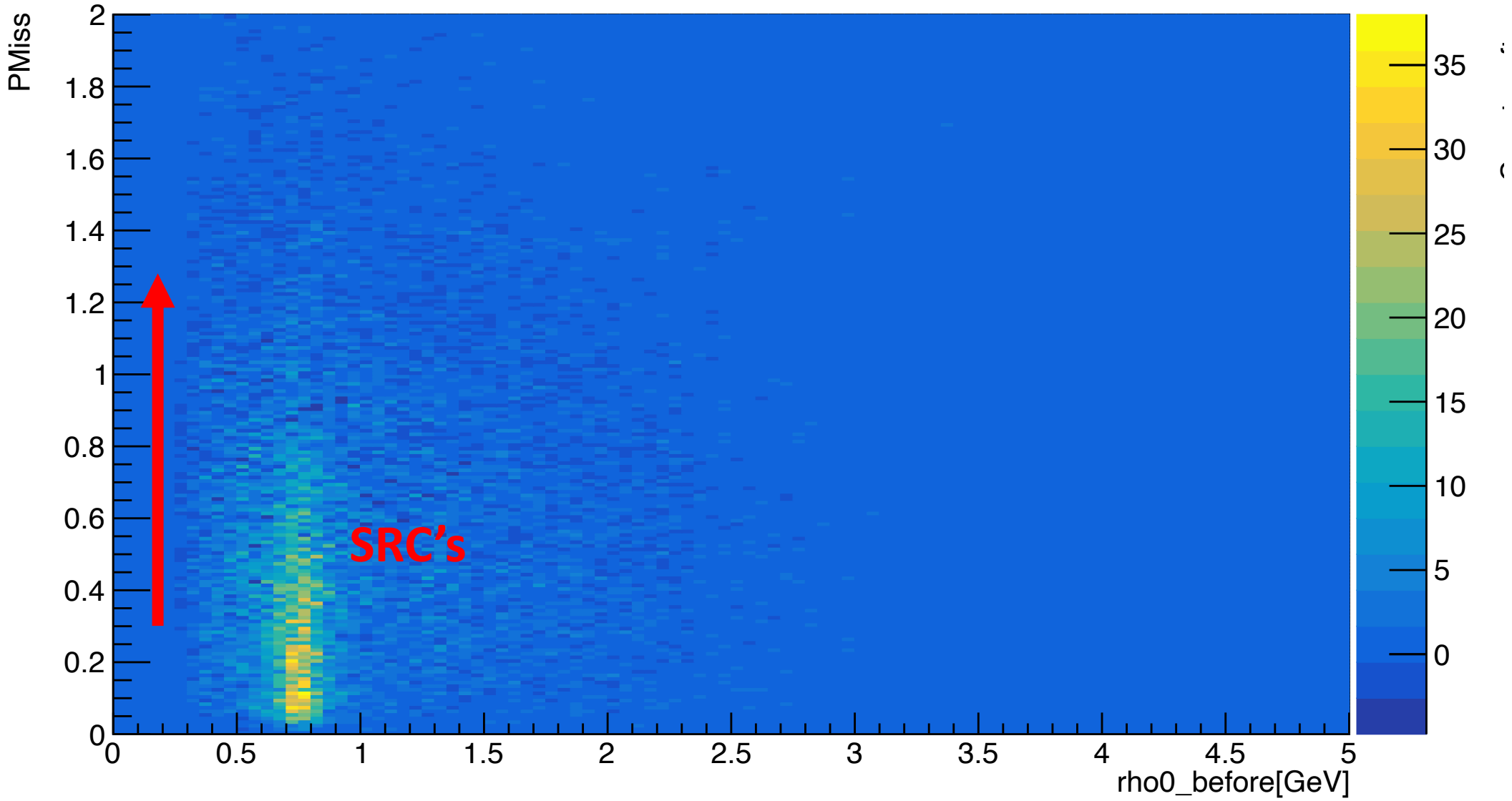
Invariant Mass before cuts

$$\gamma\, d \rightarrow \pi^+\, \pi^-\, p(n)$$

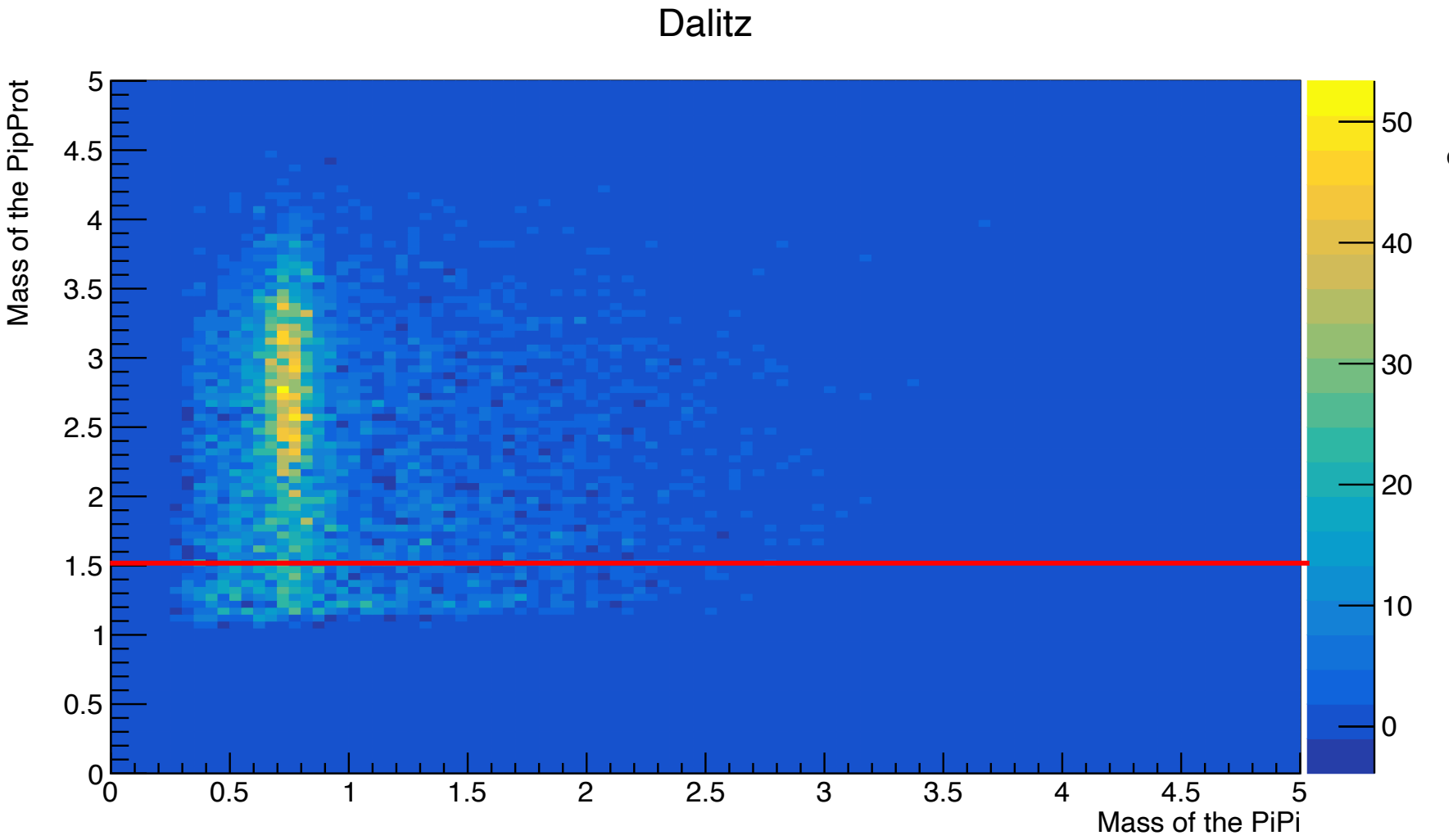
- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction



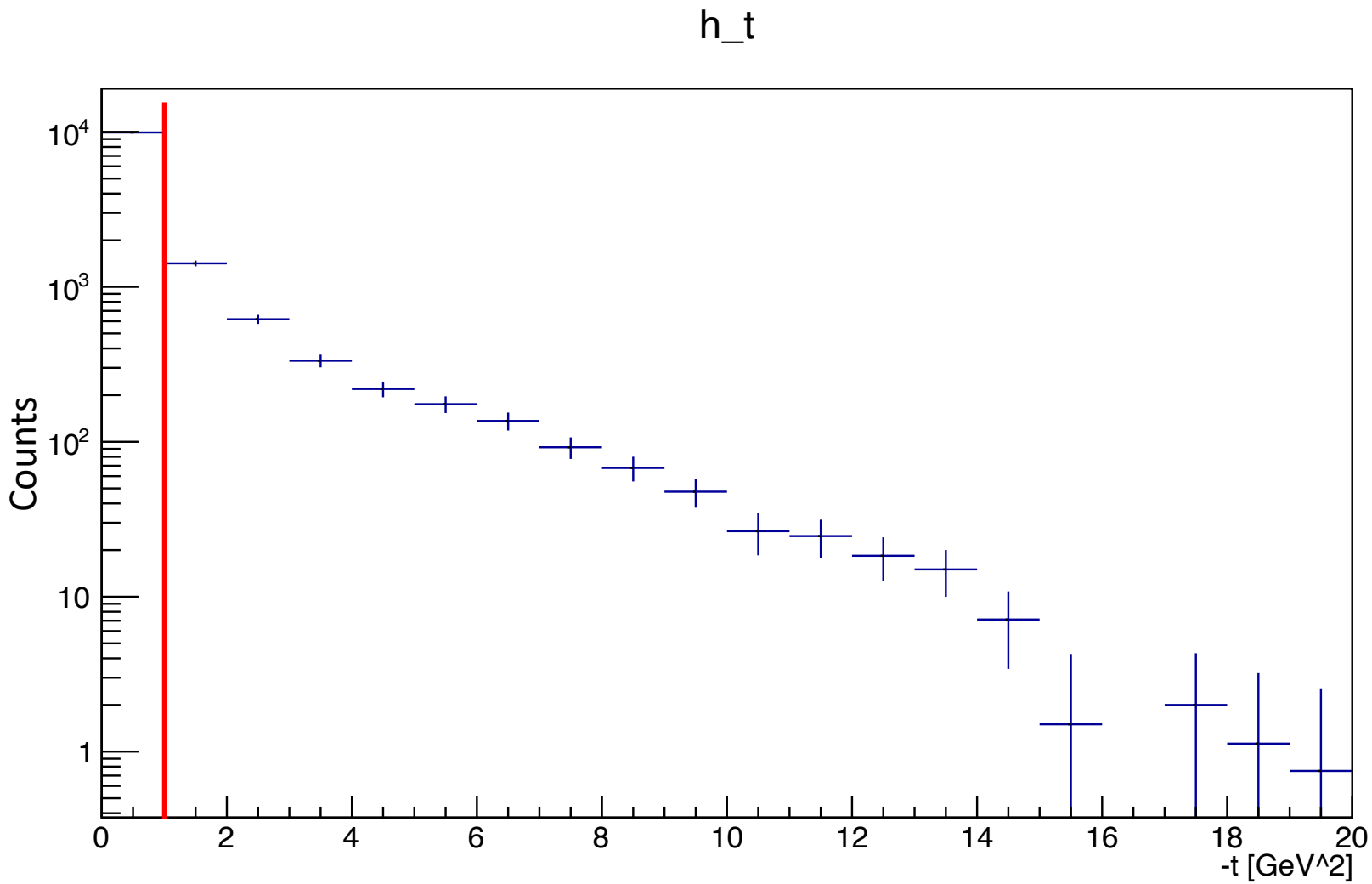
rho0 vs pmiss before



$M_{\pi^+\pi^-}$ vs $M_{\pi^+ p}$ $\rightarrow$ $M_{\pi^+ p} > 1.5$ GeV



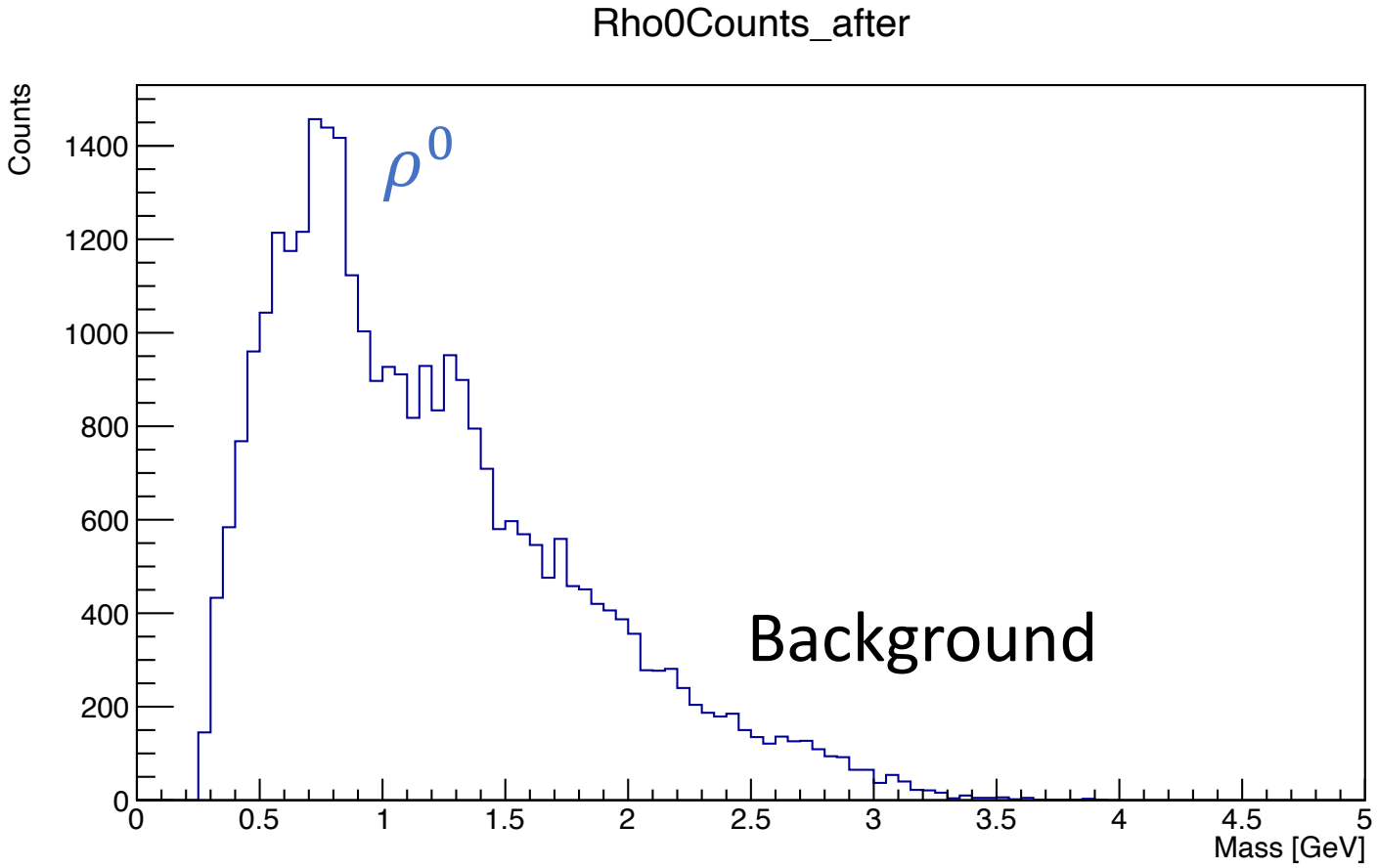
High Momentum Transfer → |t| > 1



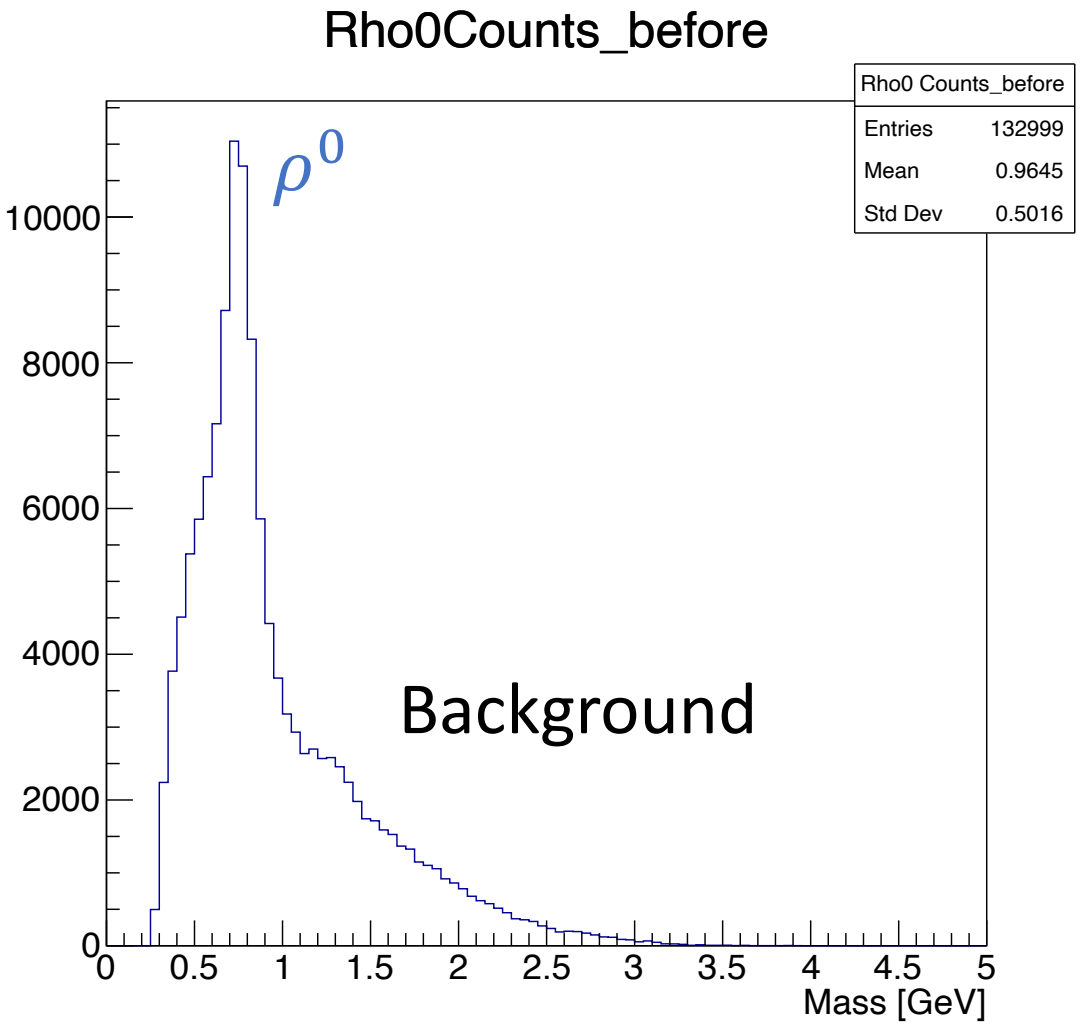
Invariant Mass after cuts

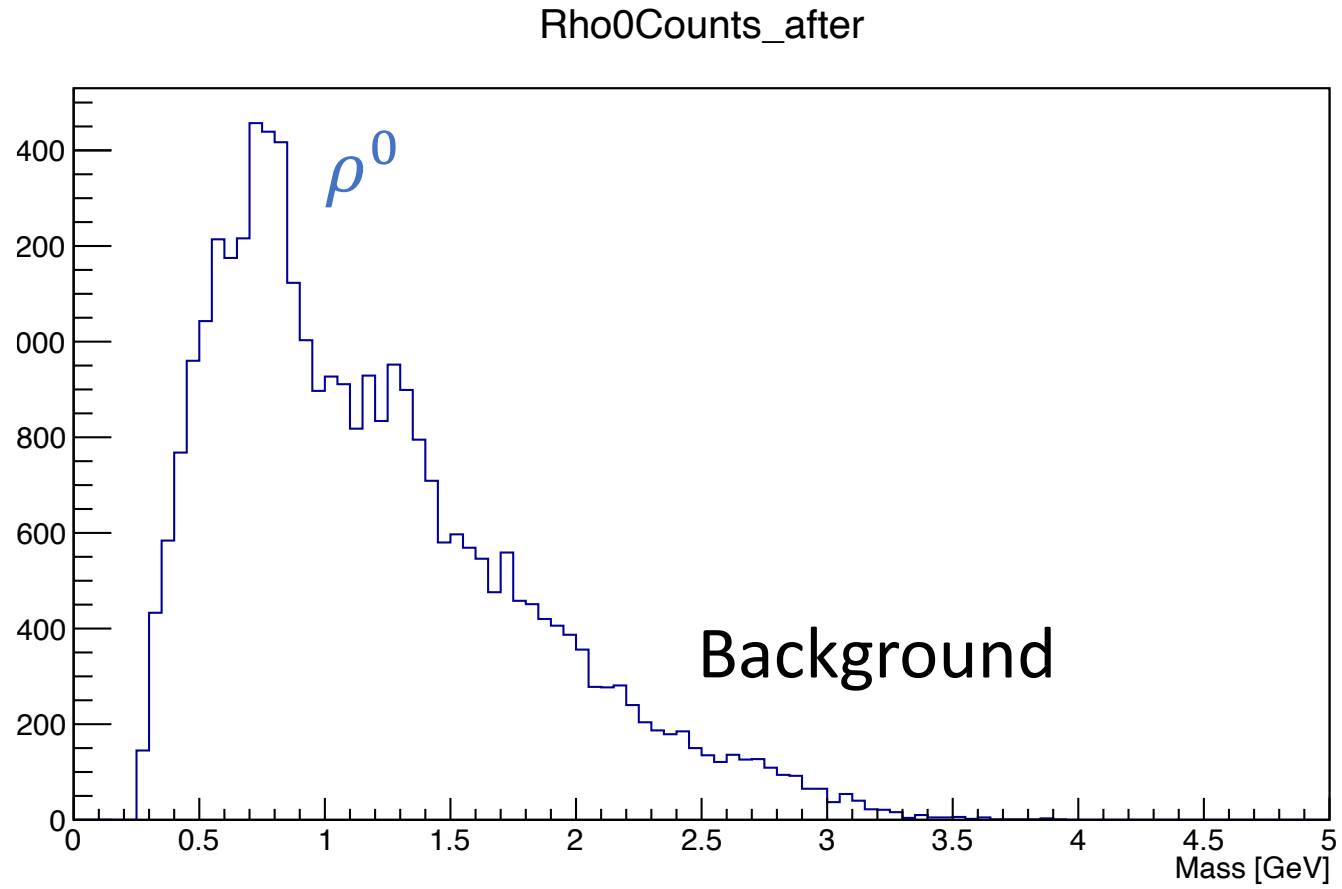
$$\gamma\, d \rightarrow \pi^{+}\, \pi^{-}\, p\ \ (n)$$

- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction
  - $M_{\pi^+\, p}$ > 1.5
  - |t| > 1



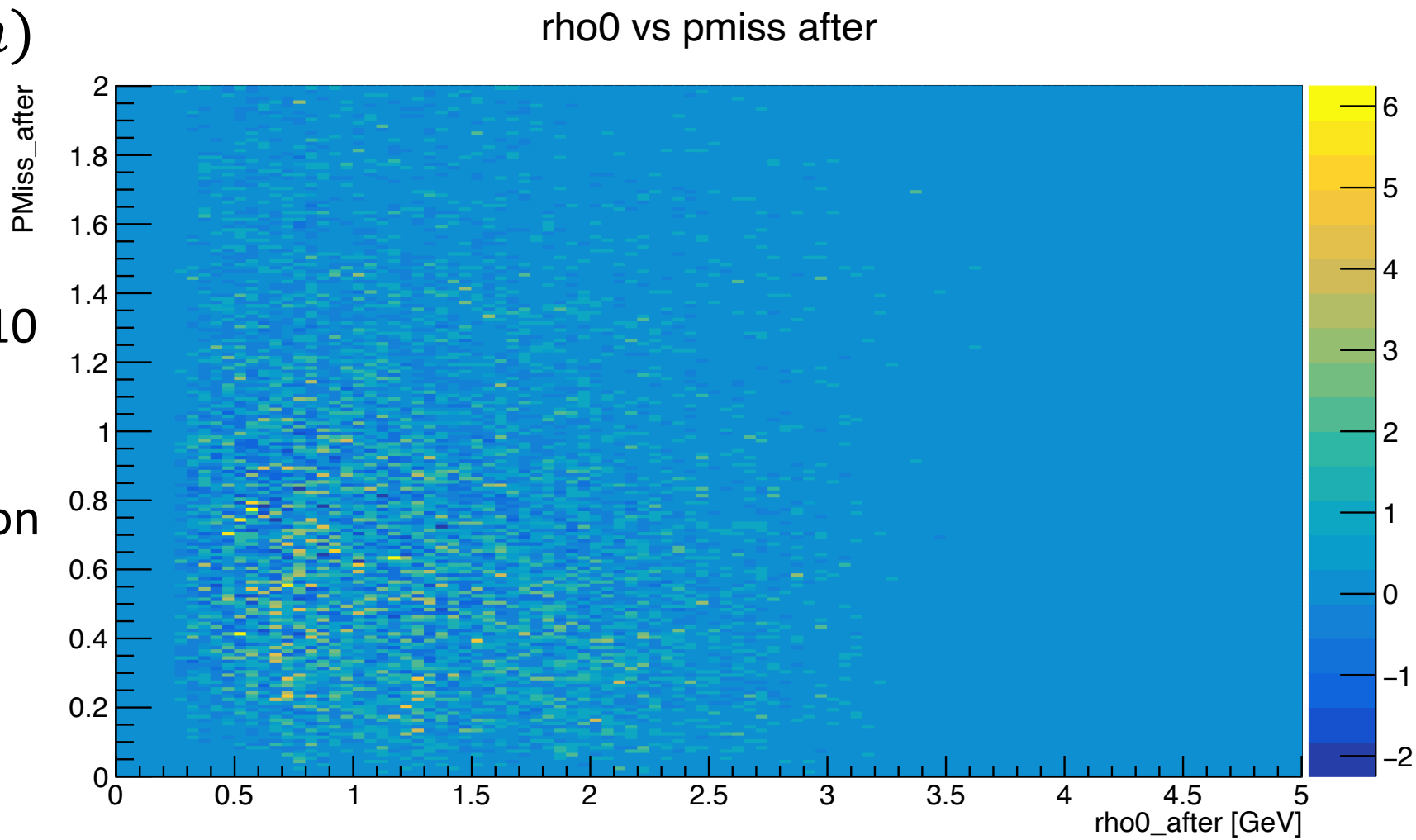
Invariant Mass $\gamma\, d \rightarrow \pi^+\, \pi^-\, p\, (n)$





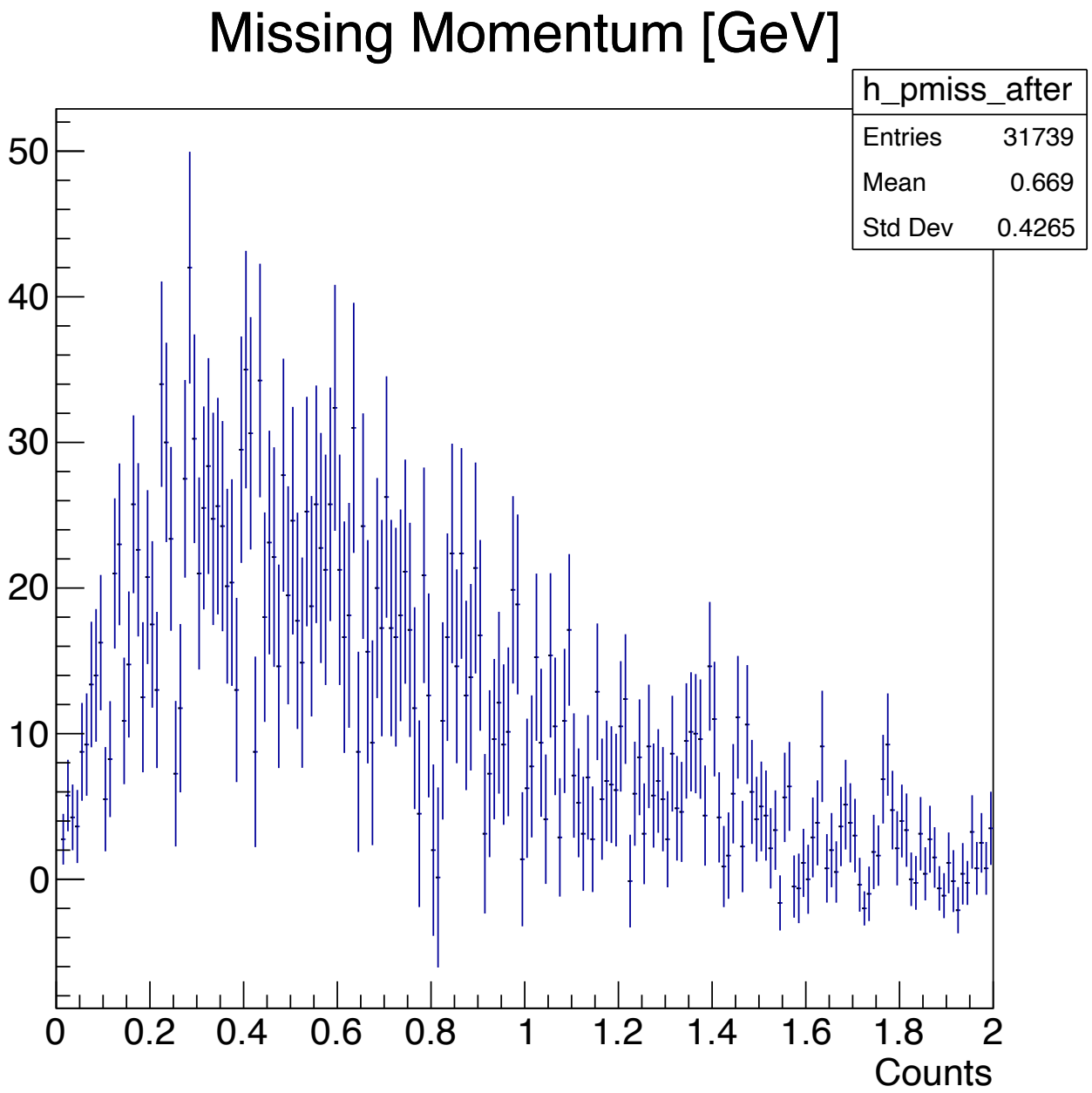
$$\gamma\, d \rightarrow \pi^+\, \pi^-\, p(n)$$

- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction
  - $M_{\pi^+\, p}$ > 1.5
  - |t| > 1



$$\gamma\, d \rightarrow \pi^+\, \pi^-\, p(n)$$

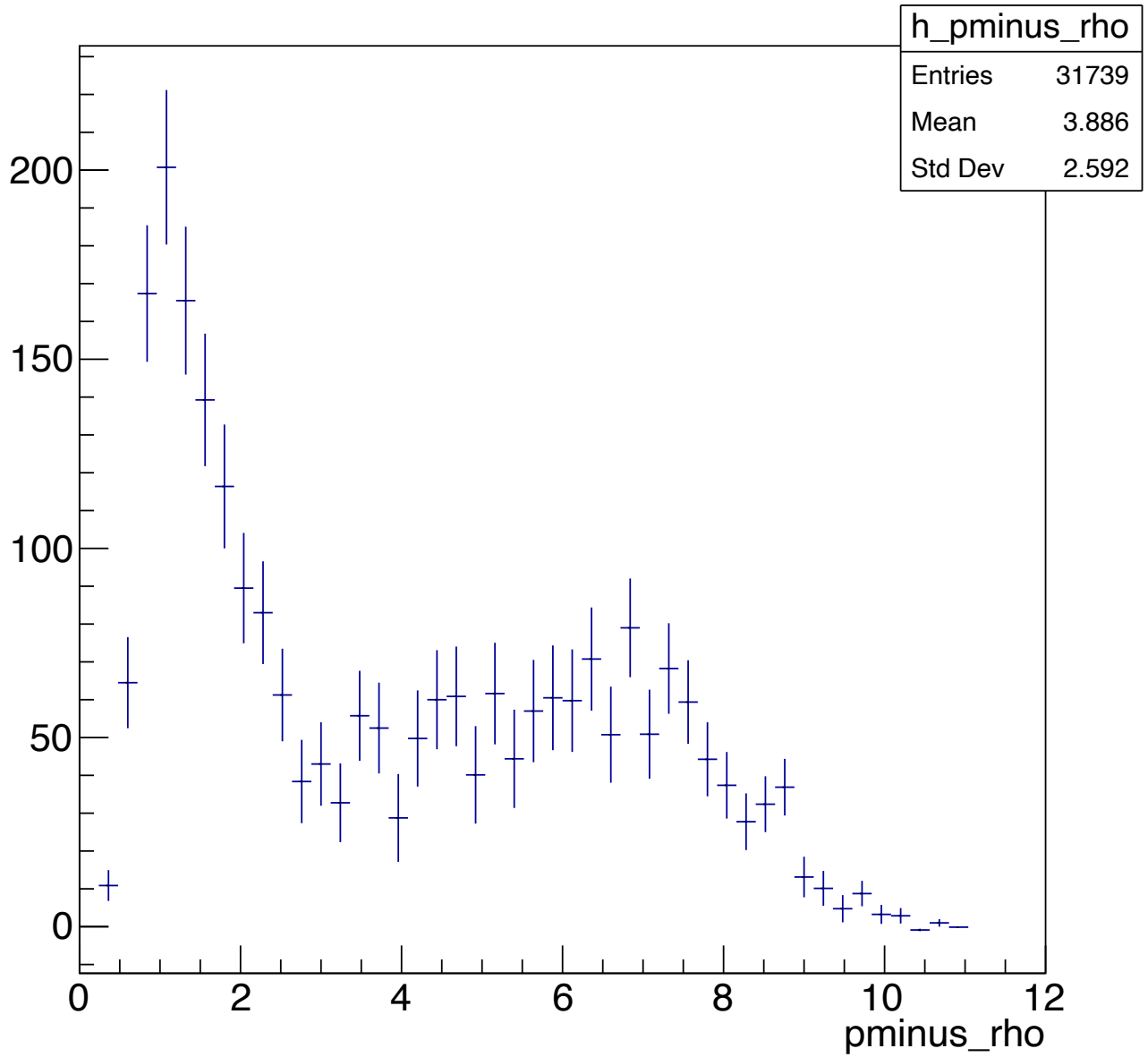
- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction
  - $M_{\pi^+\, p}$ > 1.5
  - |t| > 1



$$p^- = E_{beam} - (\pi^-[Z] + \pi^+[Z])$$

$$\gamma\, d \rightarrow \pi^+\, \pi^-\, p(n)$$

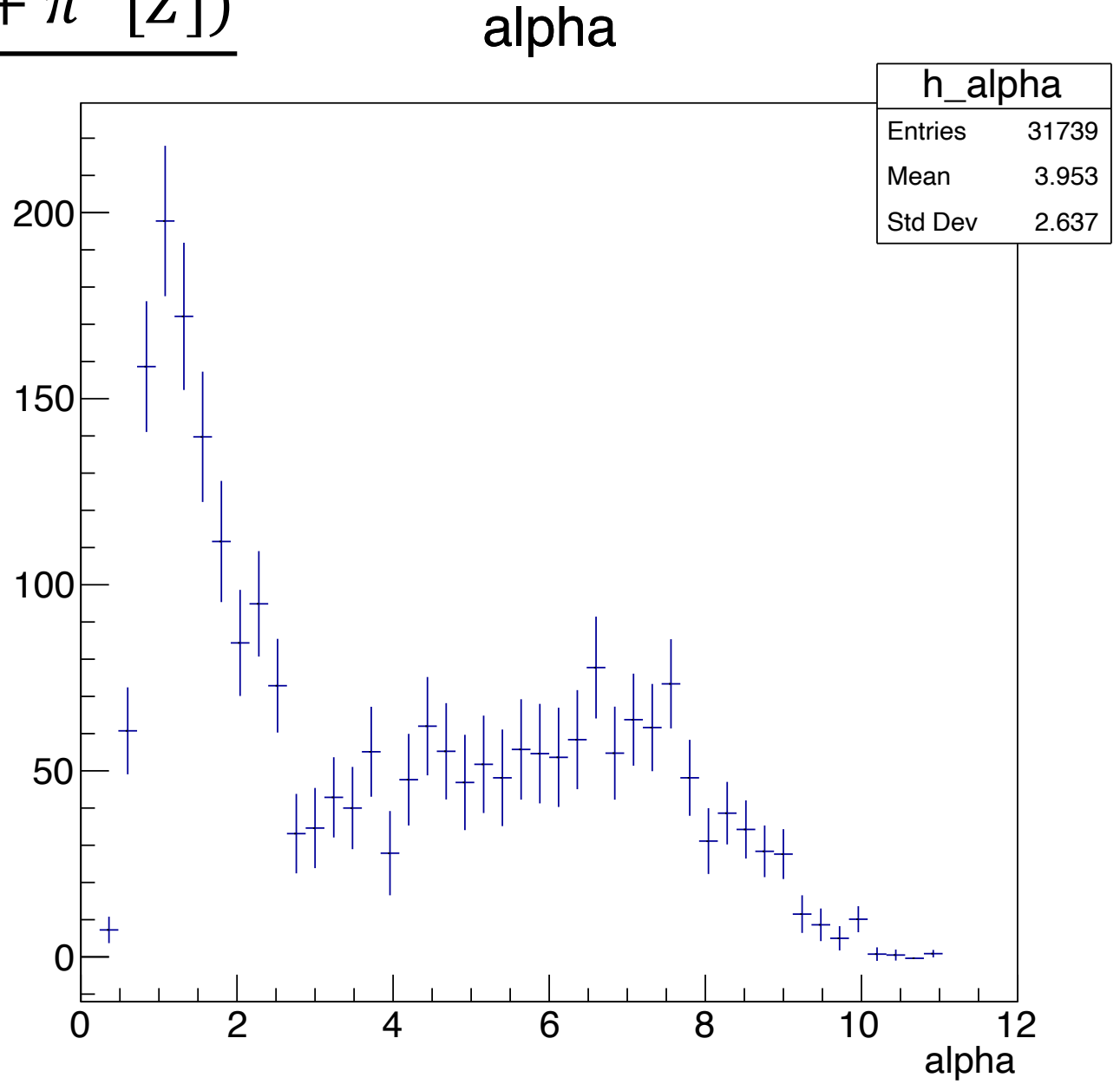
- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction
  - $M_{\pi^+ p}$ > 1.5
  - |t| > 1



$$\alpha = \frac{p^- = E_{beam} - (\pi^-[Z] + \pi^+[Z])}{mN = 0.983}$$

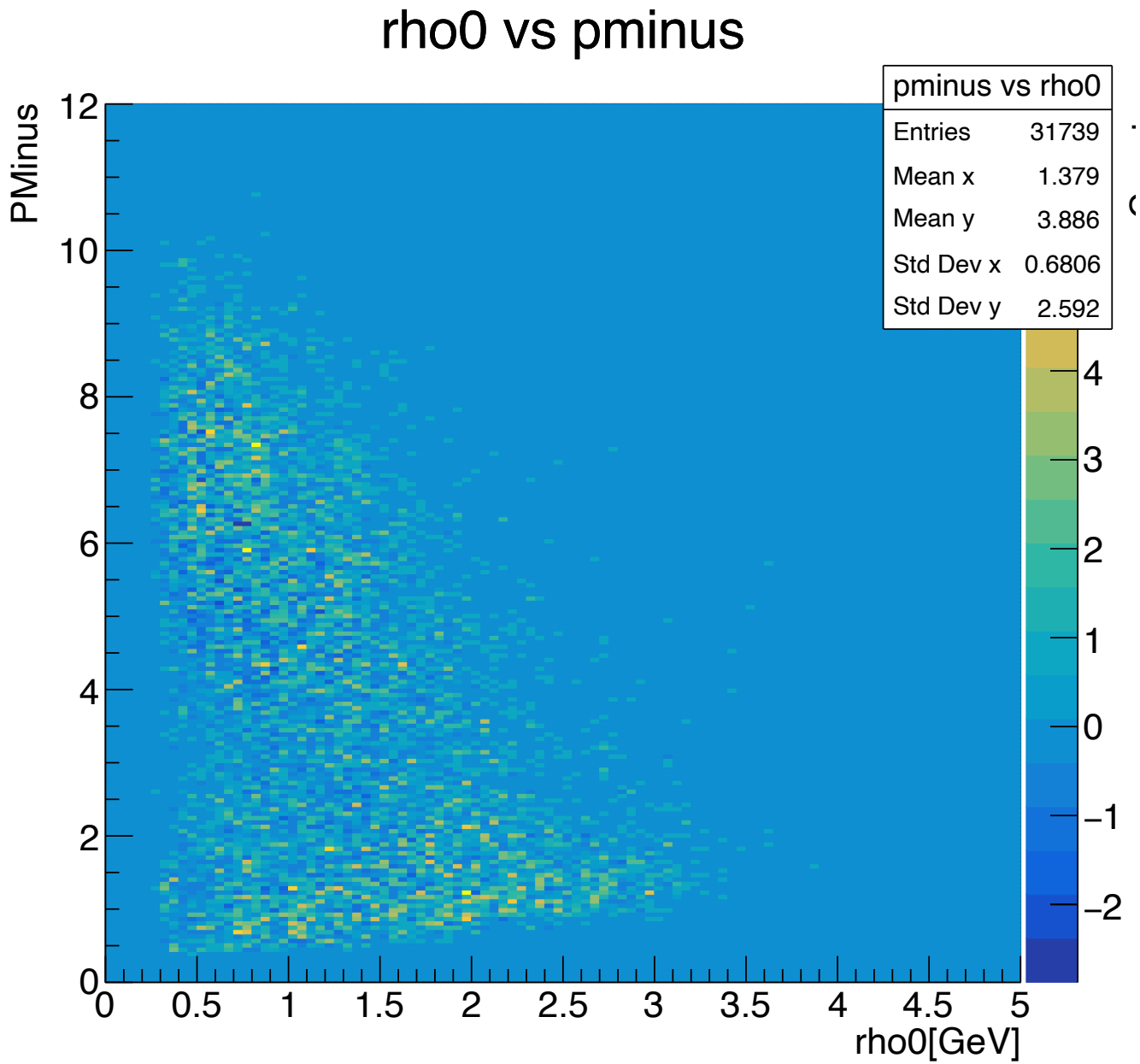
$$\gamma\, d \rightarrow \pi^+\, \pi^-\, p(n)$$

- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction
  - $M_{\pi^+ p}$ > 1.5
  - |t| > 1



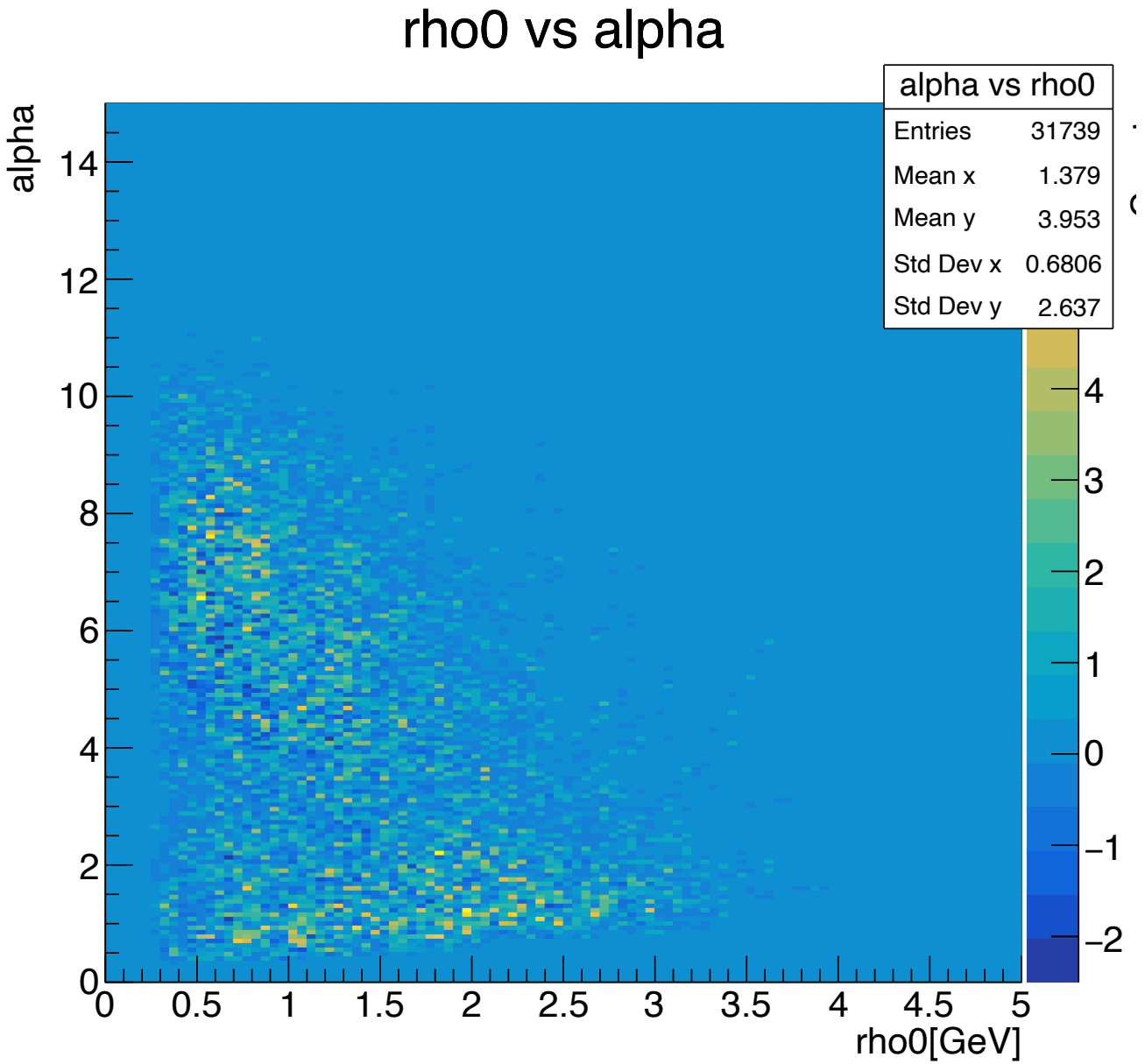
$$\gamma\, d \rightarrow \pi^{+}\, \pi^{-}\, p(n)$$

- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction
  - $M_{\pi^{+}\, p}$ > 1.5
  - |t| > 1



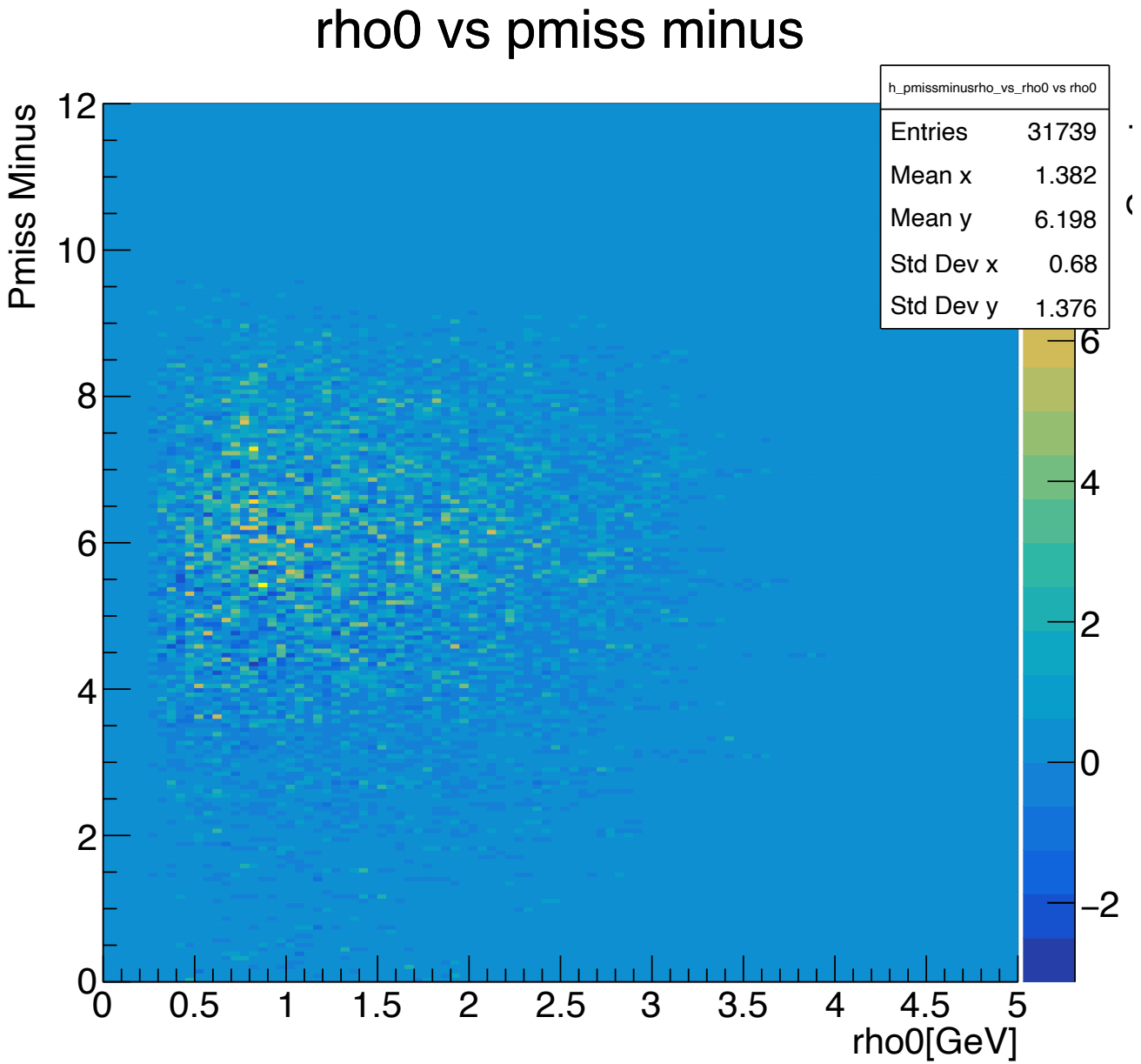
$$\gamma\, d \rightarrow \pi^+\, \pi^-\, p(n)$$

- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction
  - $M_{\pi^+\, p}$ > 1.5
  - |t| > 1



$$\gamma\, d \rightarrow \pi^{+}\, \pi^{-}\, p(n)$$

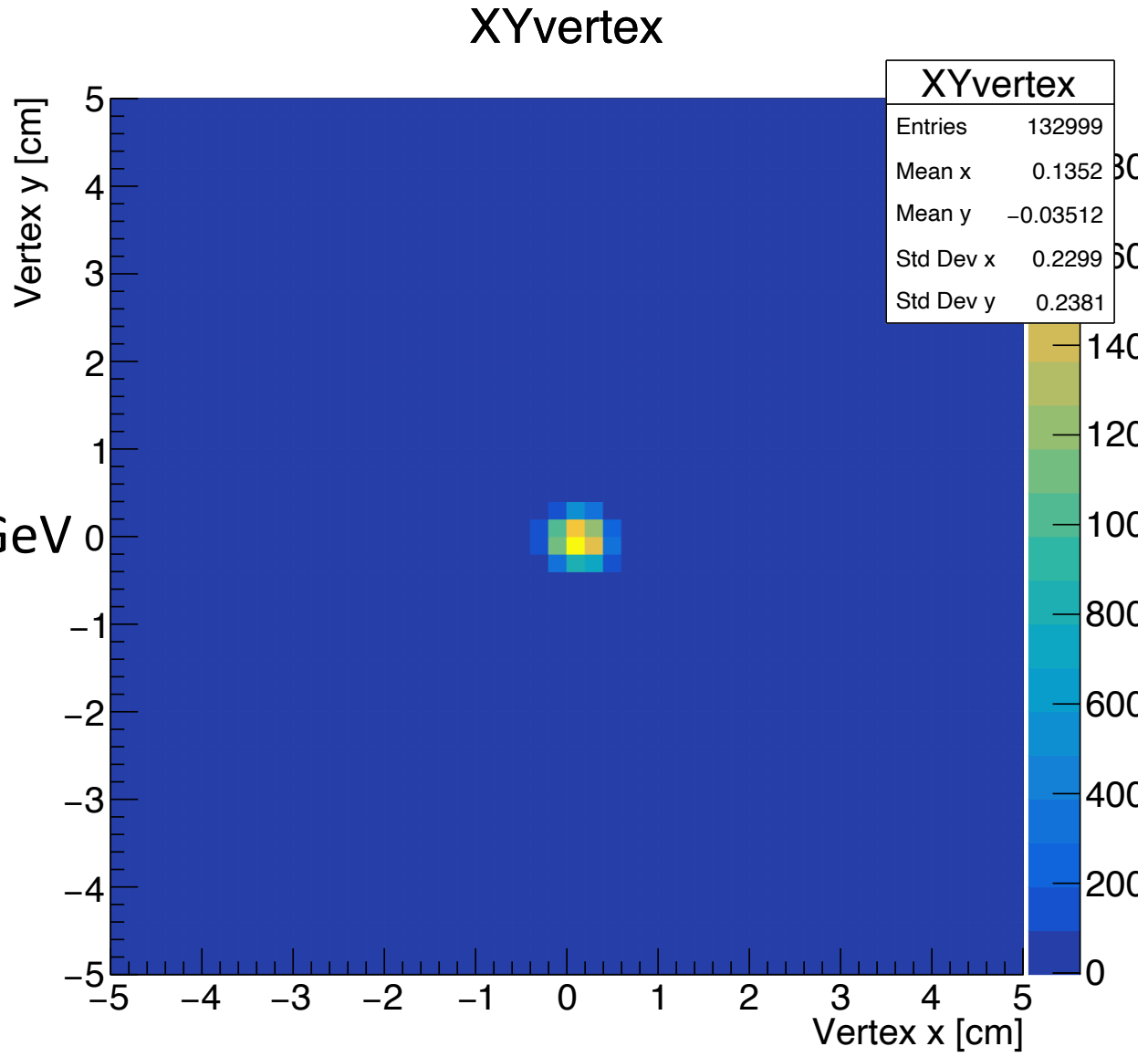
- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction
  - $M_{\pi^{+}\, p}$ > 1.5
  - |t| > 1



Vertices

$$\gamma\, d \rightarrow \pi^{+}\, \pi^{-}\, p\ \ (n)$$

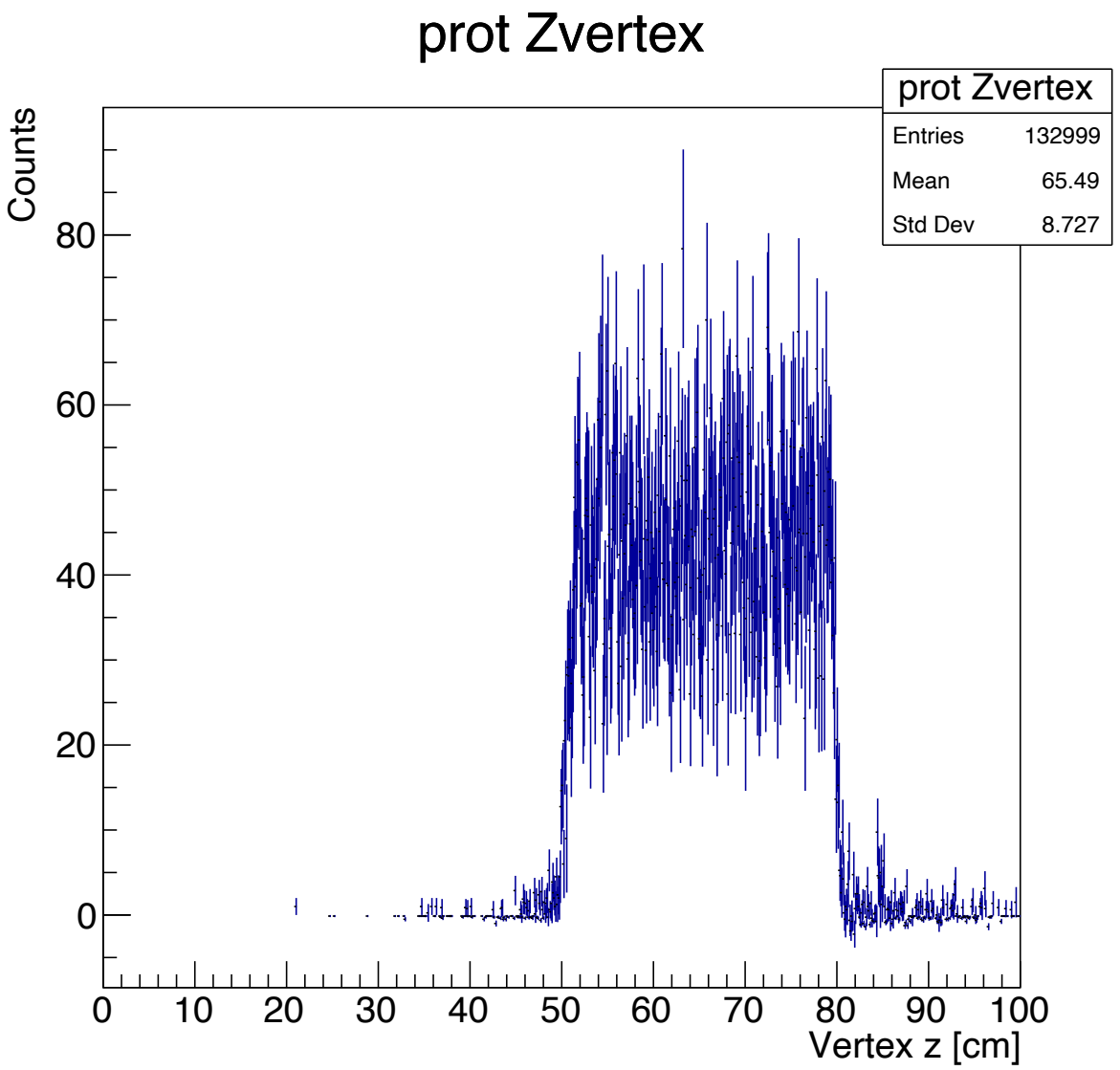
- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - OffTime Subtraction



Vertices

$$\gamma\, d \rightarrow \pi^+\, \pi^-\, p(n)$$

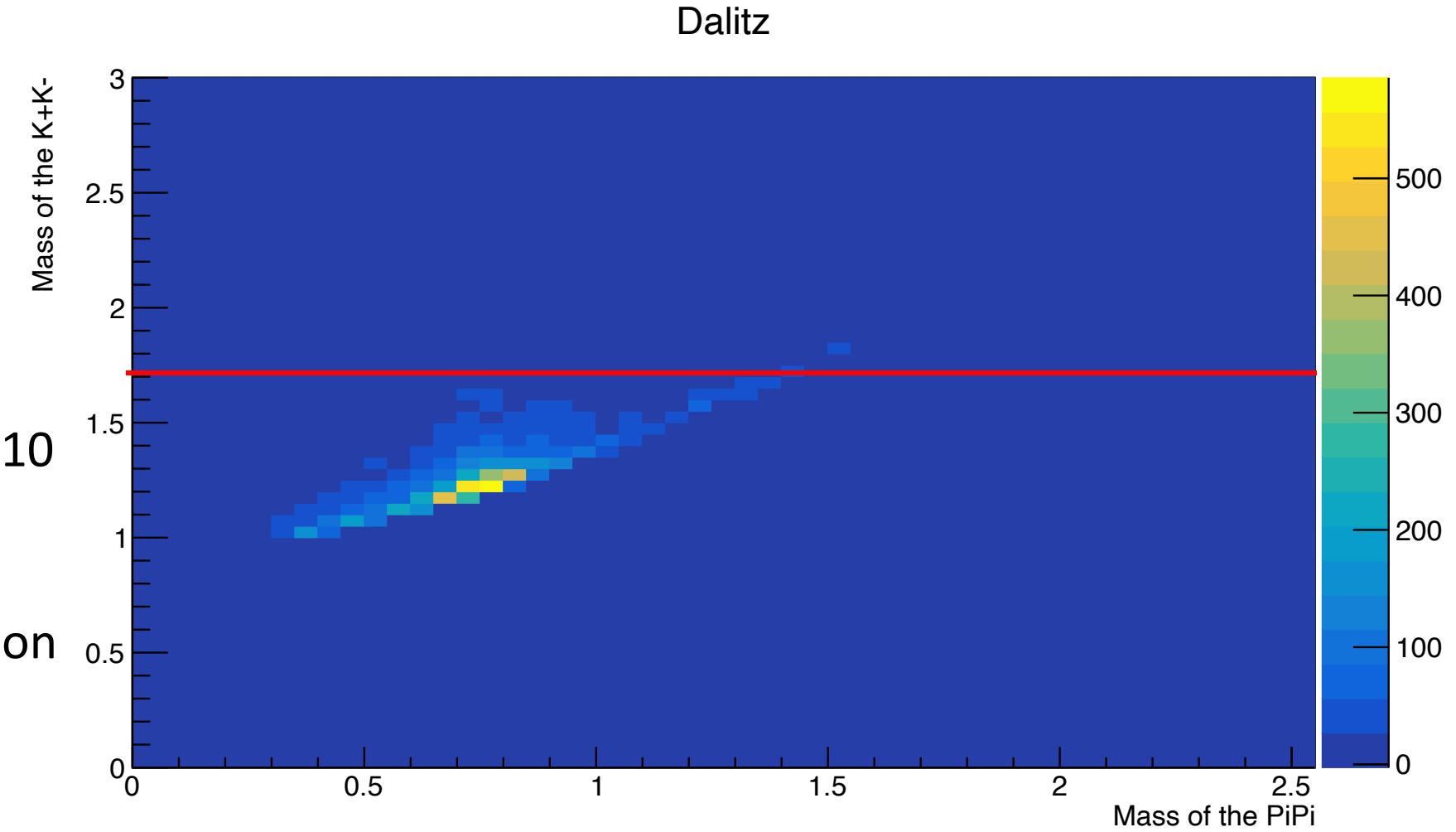
- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - OffTime Subtraction



ϕ vs ρ^0

$$\gamma\, d \rightarrow \pi^+\, \pi^-\, p$$

- Cuts Applied
  - KFCL > 0.01
  - PIDCL> 0.1
  - 6 GeV < Ebeam < 10 GeV
  - CL > 0.05
  - OffTime Subtraction



Next steps

- Compare with simulation
- Investigate different momentum variations
  - p_{proxy} *
  - k_{miss} *
- Determine where rho0 events are going in the detector (Θ, ϕ)
- Run over empty cell data
- Try with other targets
- Vertex cuts

* Assuming standing pair