



# 1P0N and 3P0N Tau Reconstruction

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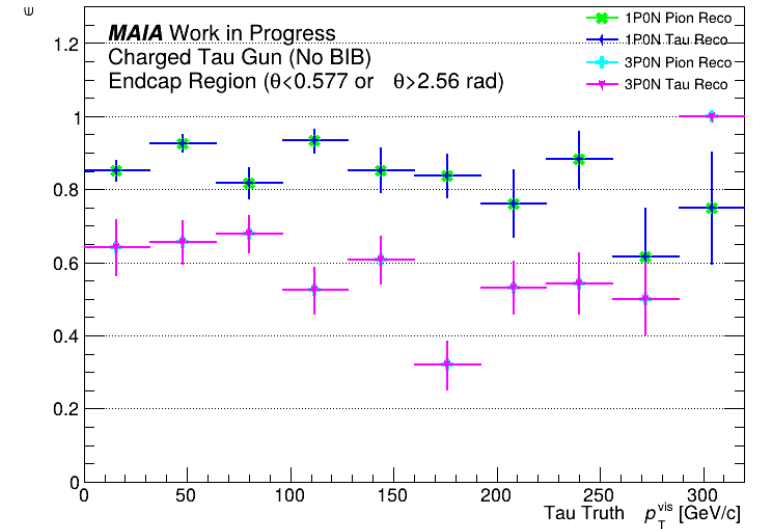
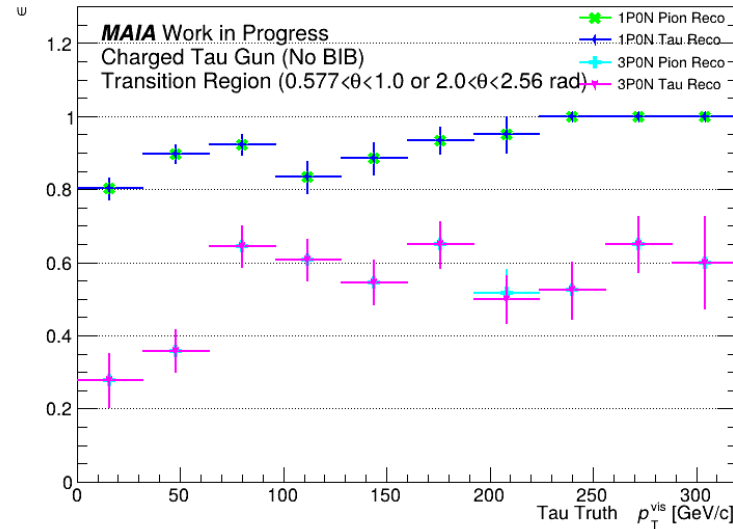
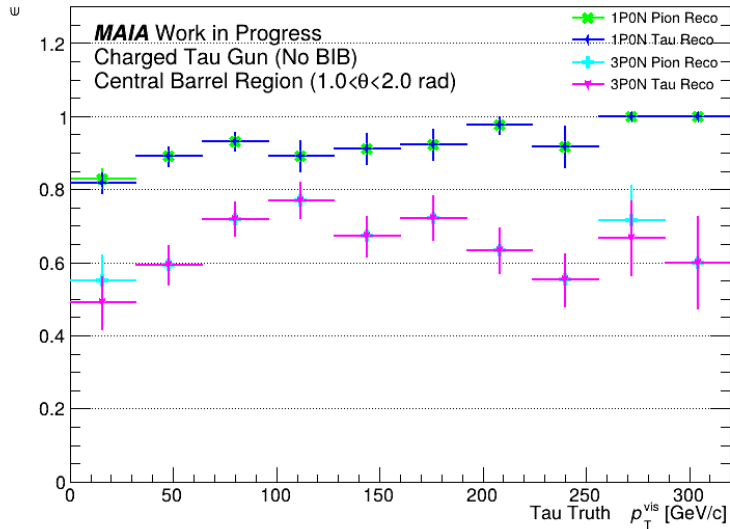
MAIA Detector Tau Studies

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# Overview

- Electron study
- Poster plots

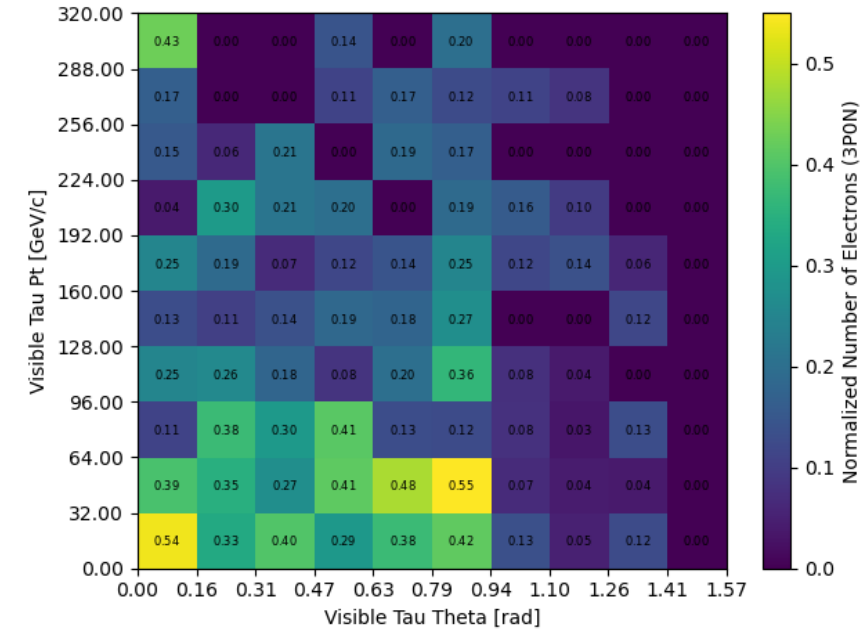
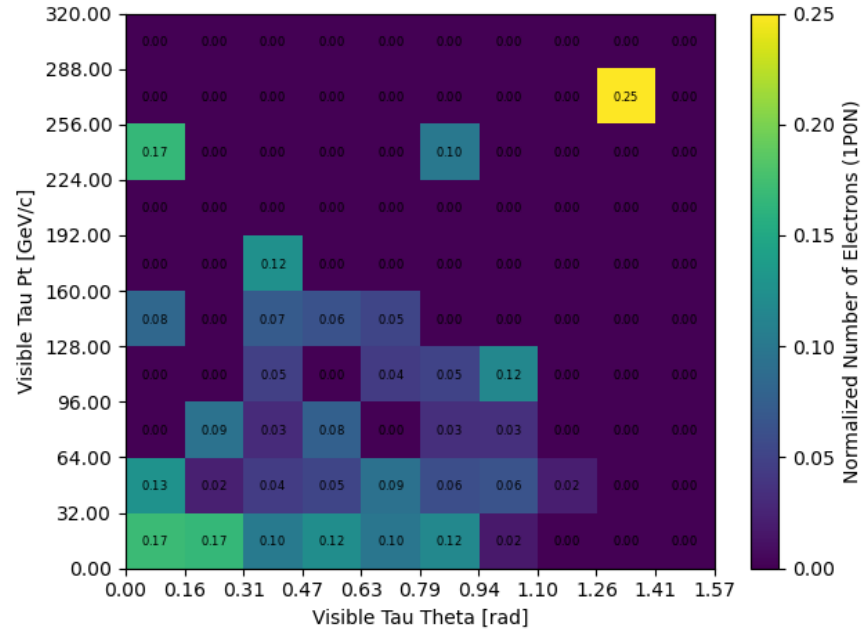
# Updated 1P0N and 3P0N Reco Efficiencies



Decay Mode	$\pi^\pm$ Reco Efficiency	$\tau^\pm$ Reco Efficiency
1P0N	87.68%	87.58%
3P0N	59.47%	59.15%

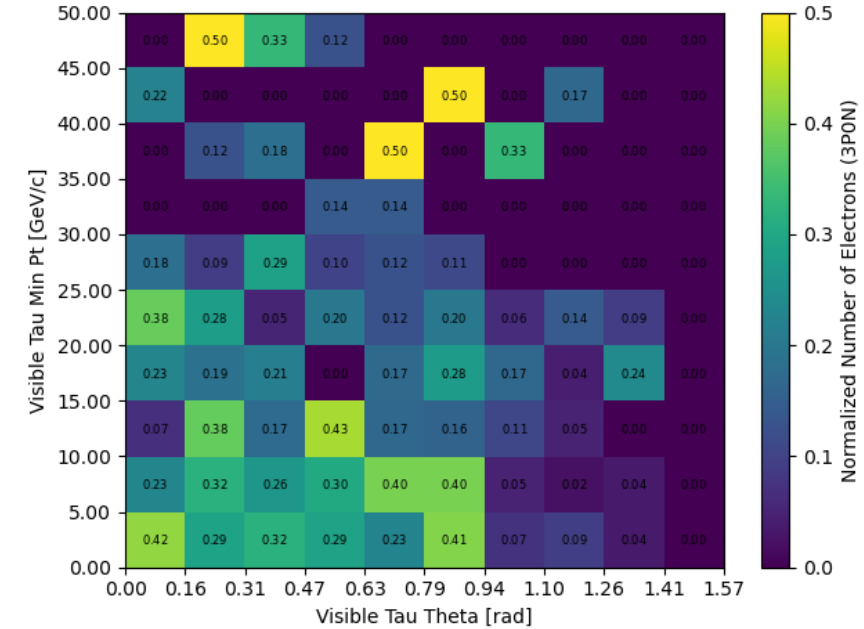
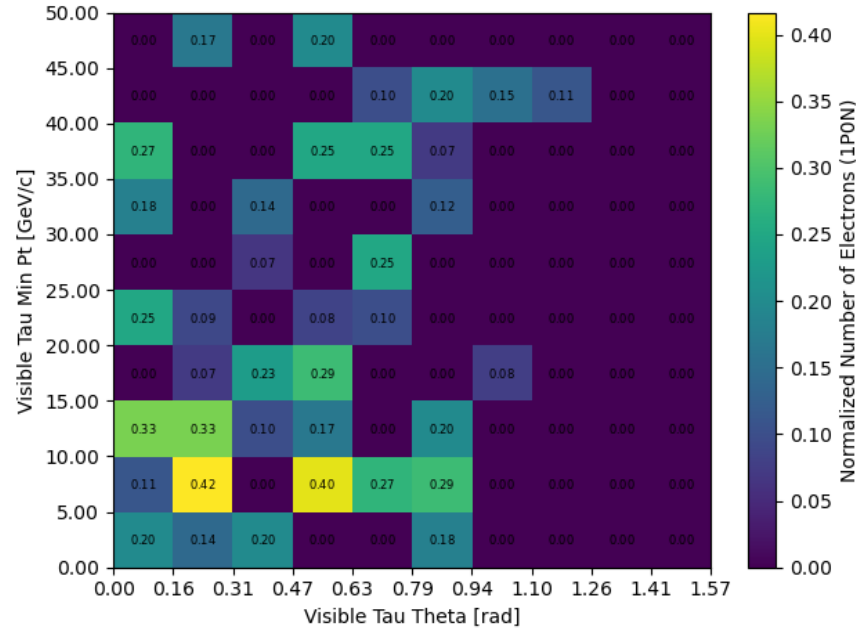
- Loosened MaxTrackSigmaOverP -> 0.30 selection in Pandora reconstruction to boost efficiencies
  - Roughly 1% for both 1P0N and 3P0N
- Behavior of 3P0N efficiencies at low  $p_T$  bins in transition region not a consequence of new reconstruction
  - Tested different reconstruction configurations and saw same behavior in each trial
  - Possibly due to increase in electron misidentification due to low  $p_T$  objects that travel the largest distances through the solenoid

# Number of Reco Electrons vs $p_T$ vs $\theta$



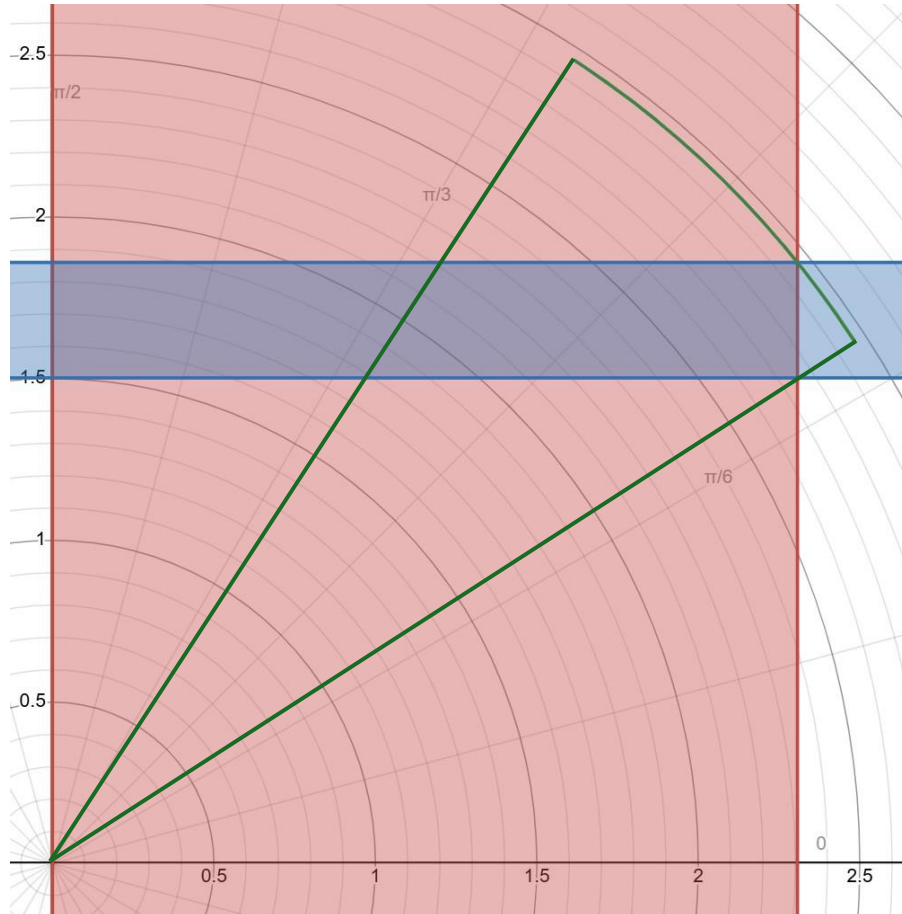
- Number of reco electrons normalized by total number of entries in each bin
- $\theta \rightarrow |\theta - \frac{\pi}{2}|$  to better visualize entries in central barrel, transition, and endcap regions
  - Transition region between 0.577 and 0.993
- 3P0N events have a clear increase in frequency of electron reconstruction at low  $p_T$  in transition and central regions

# Number of Reco Electrons vs $p_T^{min}$ vs $\theta$



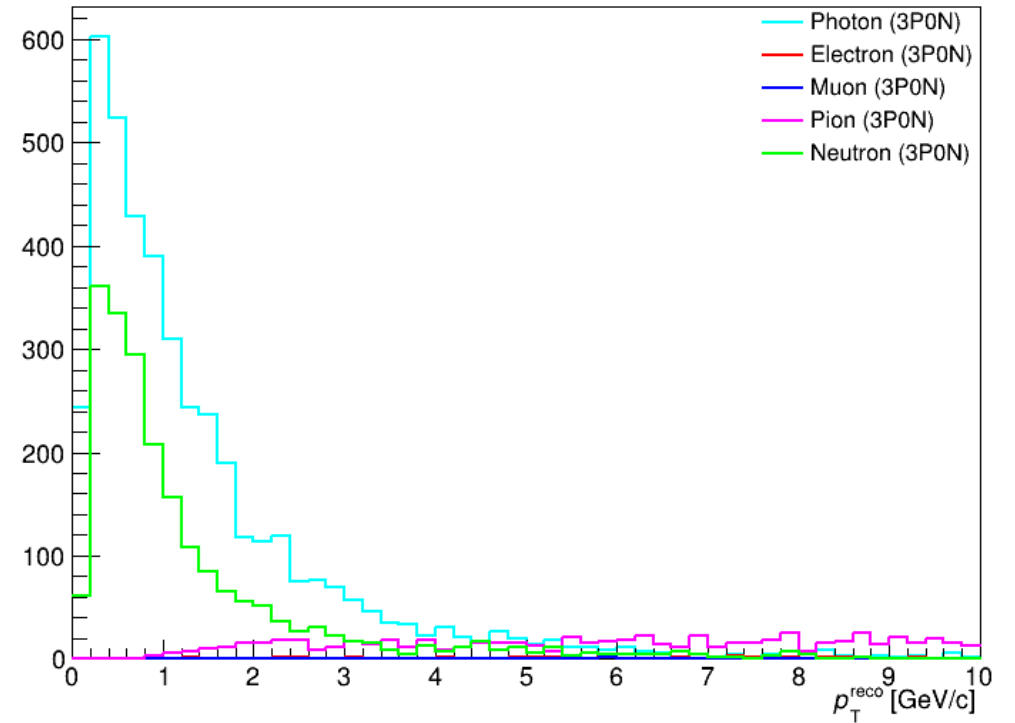
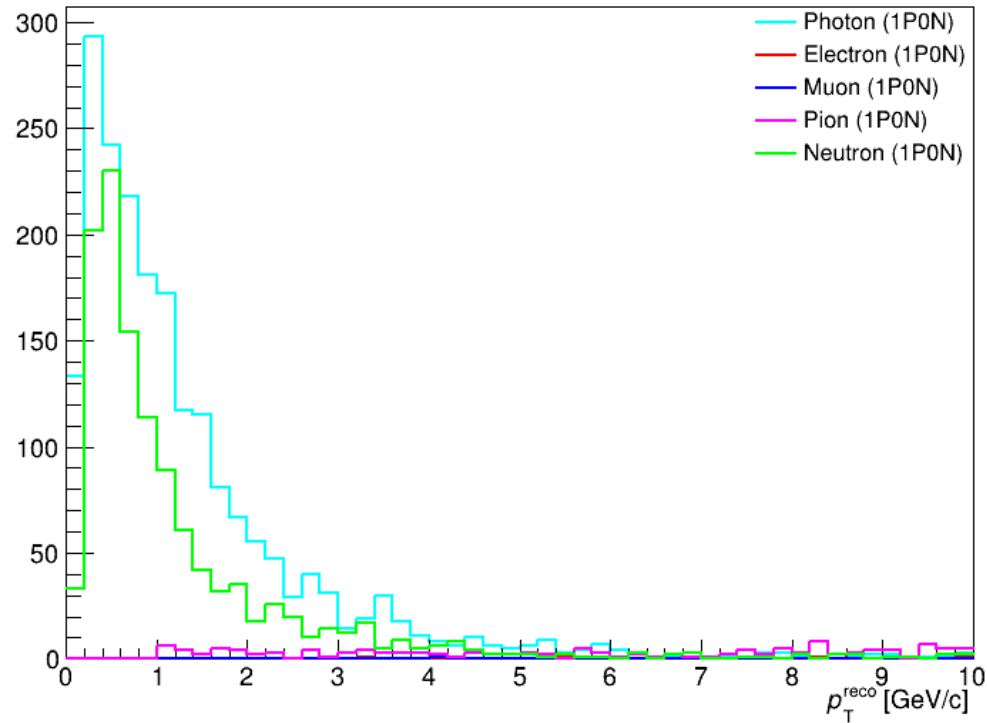
- Number of reco electrons normalized by total number of entries in each bin
- $\theta \rightarrow |\theta - \frac{\pi}{2}|$  to better visualize entries in central barrel, transition, and endcap regions
  - Transition region between 0.577 and 0.993
- $p_T^{min}$  given by smallest  $p_T$  of  $\pi^\pm$  in  $\tau^\pm$  decay
- 1P0N events missing entries in some low  $p_T^{min}$  bins in transition region
- 3P0N events have a clear increase in frequency of electron reconstruction at low  $p_T^{min}$  in transition and central regions

# Visualizing the Transition Region

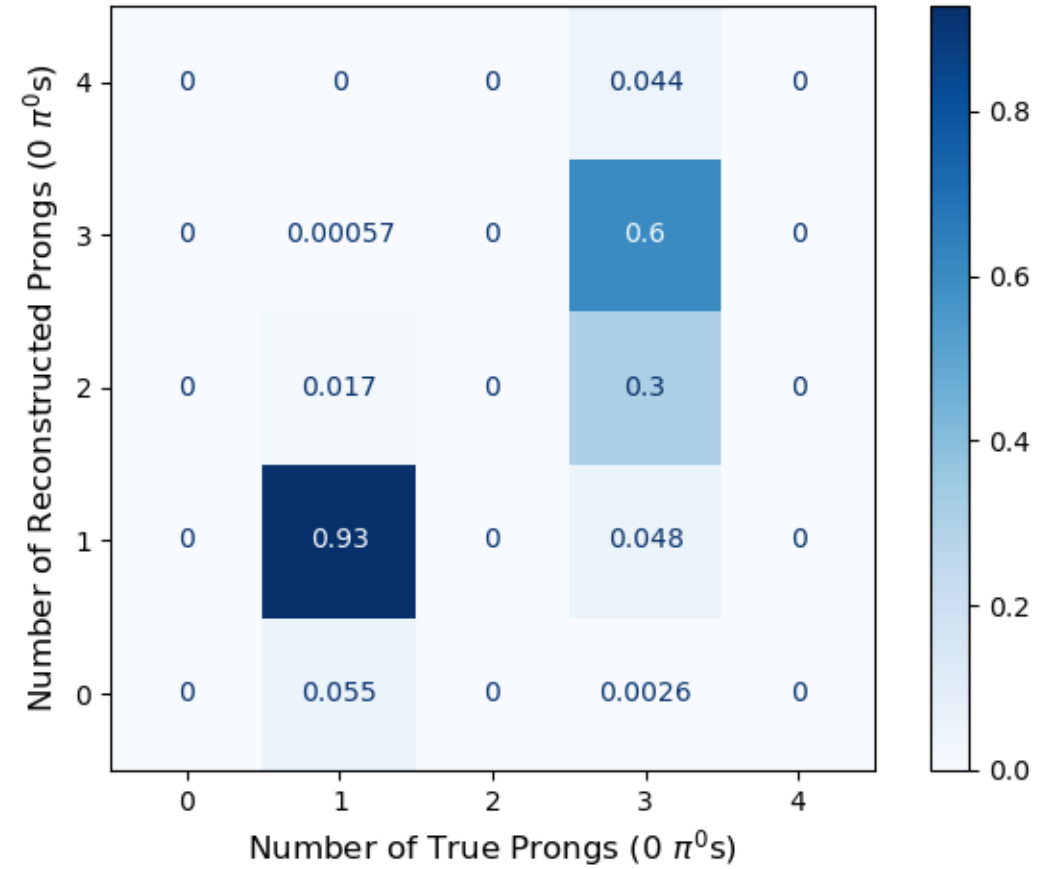
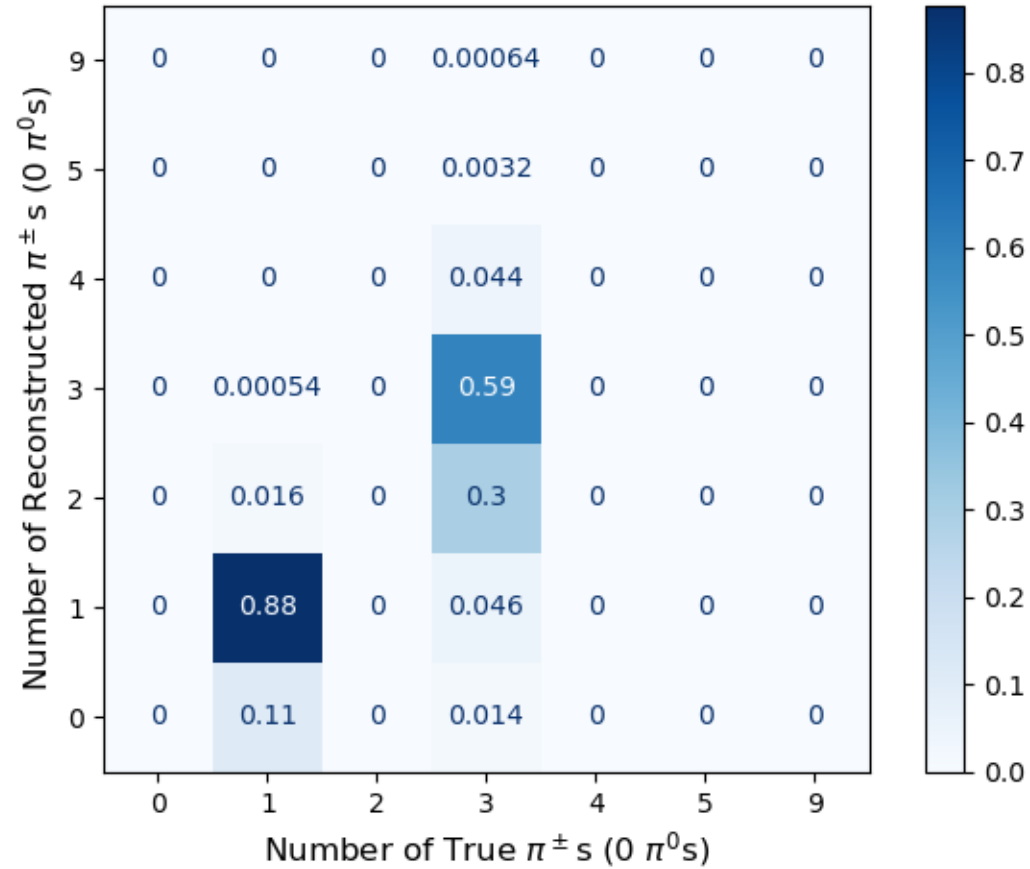


- Solenoid given by blue box enclosed in red box
- Green arch gives  $\theta$  range of transition region
- Transition region covers volume of solenoid where particles travel through longest and shortest distances
- Does the increase of low  $p_T$   $\pi^\pm$ s traveling through this region for 3P0N events explain the corresponding behavior in efficiency?

# $p_T$ of PFOs in Loose Tau Search Cone (0.25 rad)



# Pion and Tau Identification





# 3P0N Event Display

