

# FD Reconstruction Efficiencies Studies

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# Technical Details

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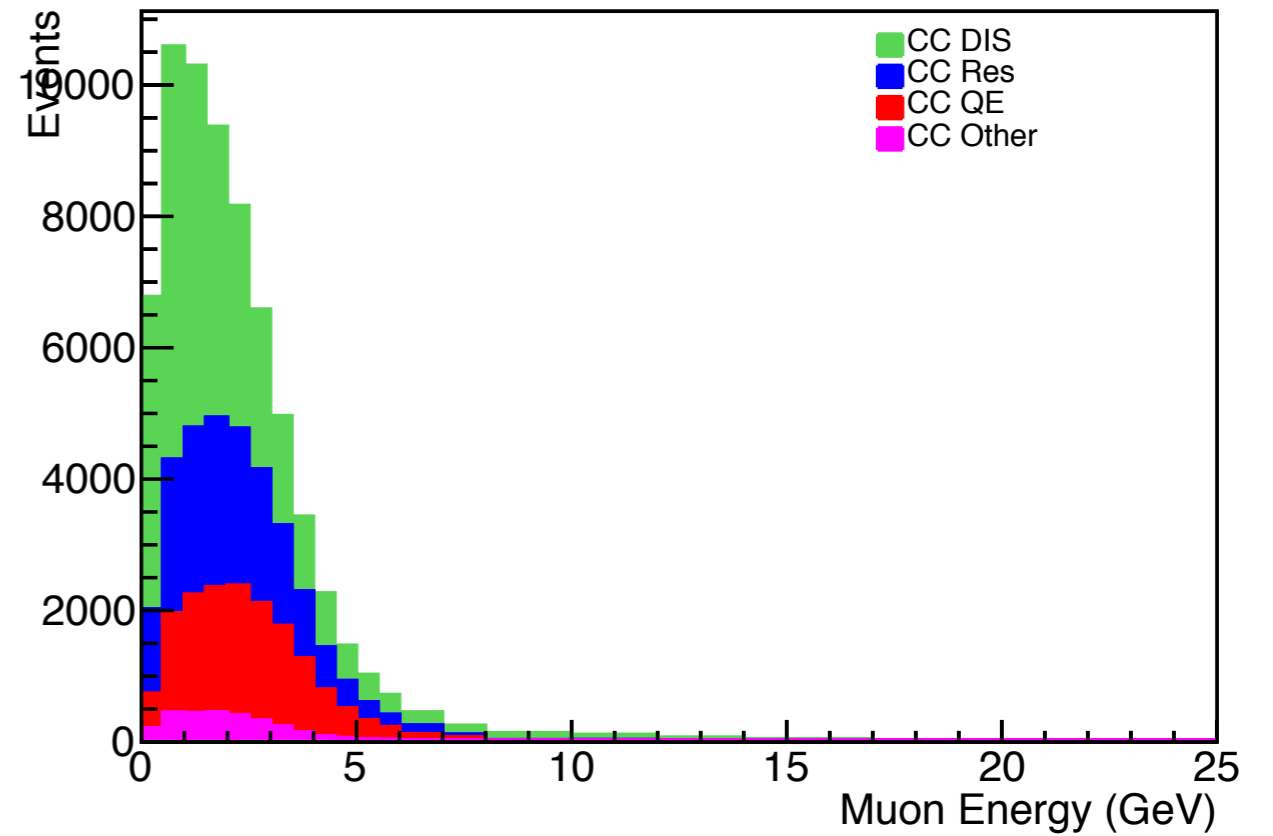
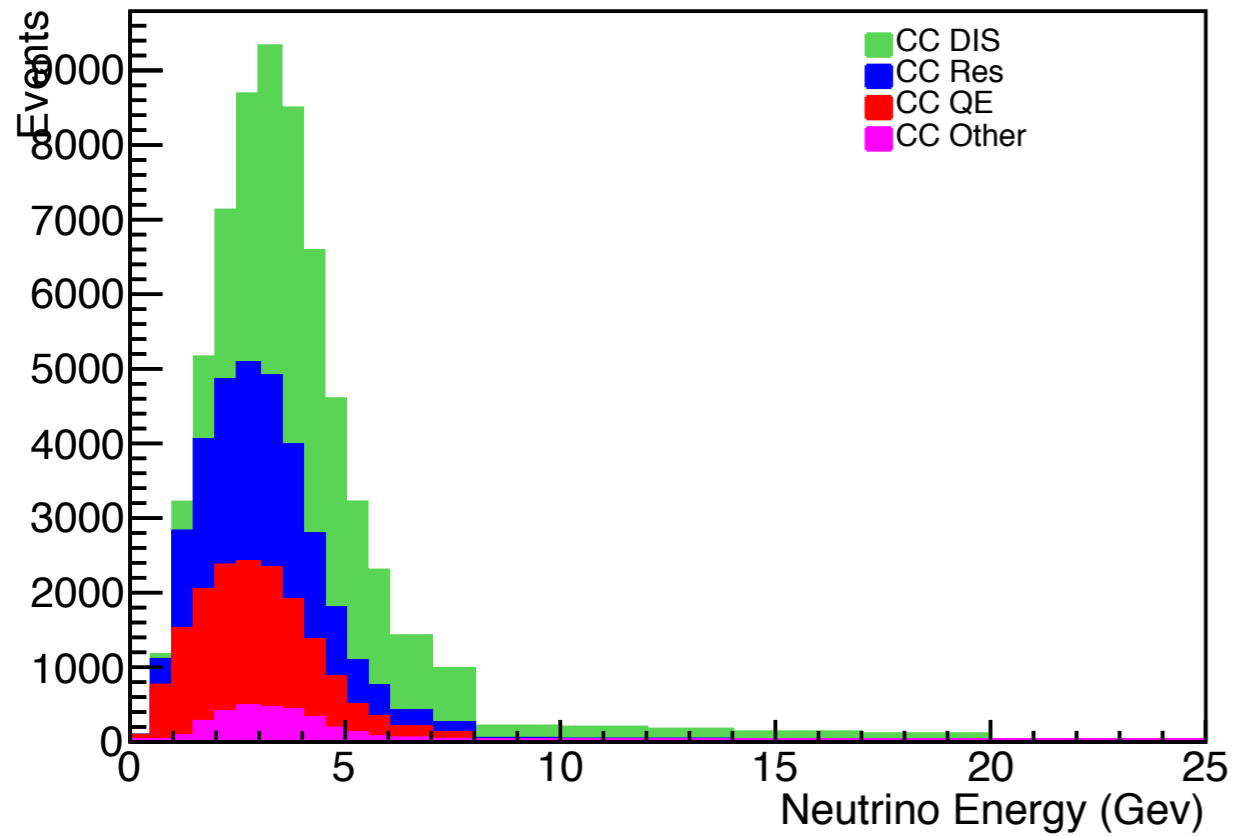
## Sample used MC 4.0

- ❖ Location /pnfs/lbne/persistent/dunepro/v04\_20\_00/
- ❖ LArSoft v 04\_20\_00 e7:prof
- ❖ 35t-4APA version 5
- ❖ Muon neutrinos unoscillated sample

## Selection

- ❖ Muon neutrino events
- ❖ Charged current events (~69k events)
- ❖ Tracking efficiency for primary lepton (muon)
- ❖ Tracking efficiency for leading pion  $\pi^\pm$
- ❖ Two tracks algorithms “pmtrack” and “pmtrackdc”
- ❖ Plot as function of true momentum(energy/angle)

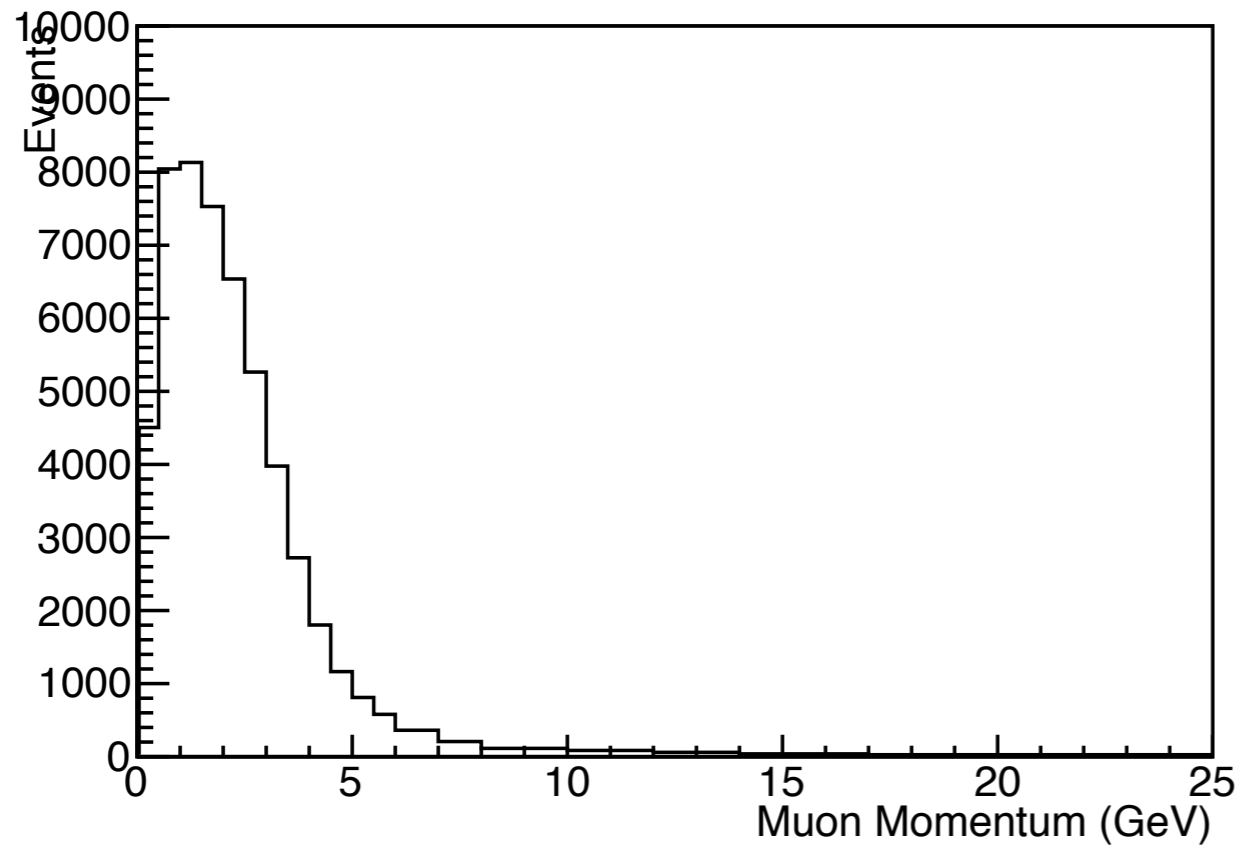
# CC $\nu_\mu$ Events



CC event =  $\nu_\mu + \text{Ar} \rightarrow \mu + X$

# Muon Tracking Efficiency (CC $\nu\mu$ Events)

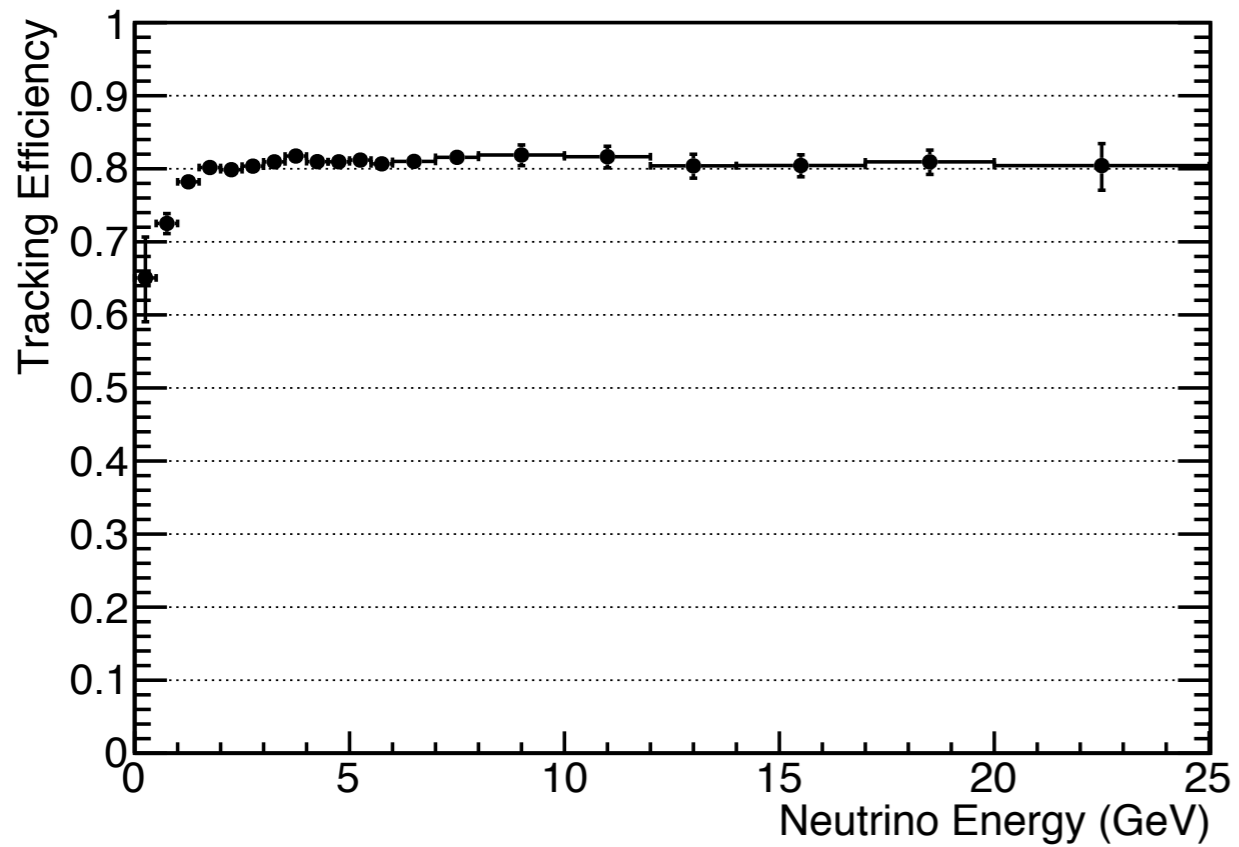
CC events with a muon track reconstructed



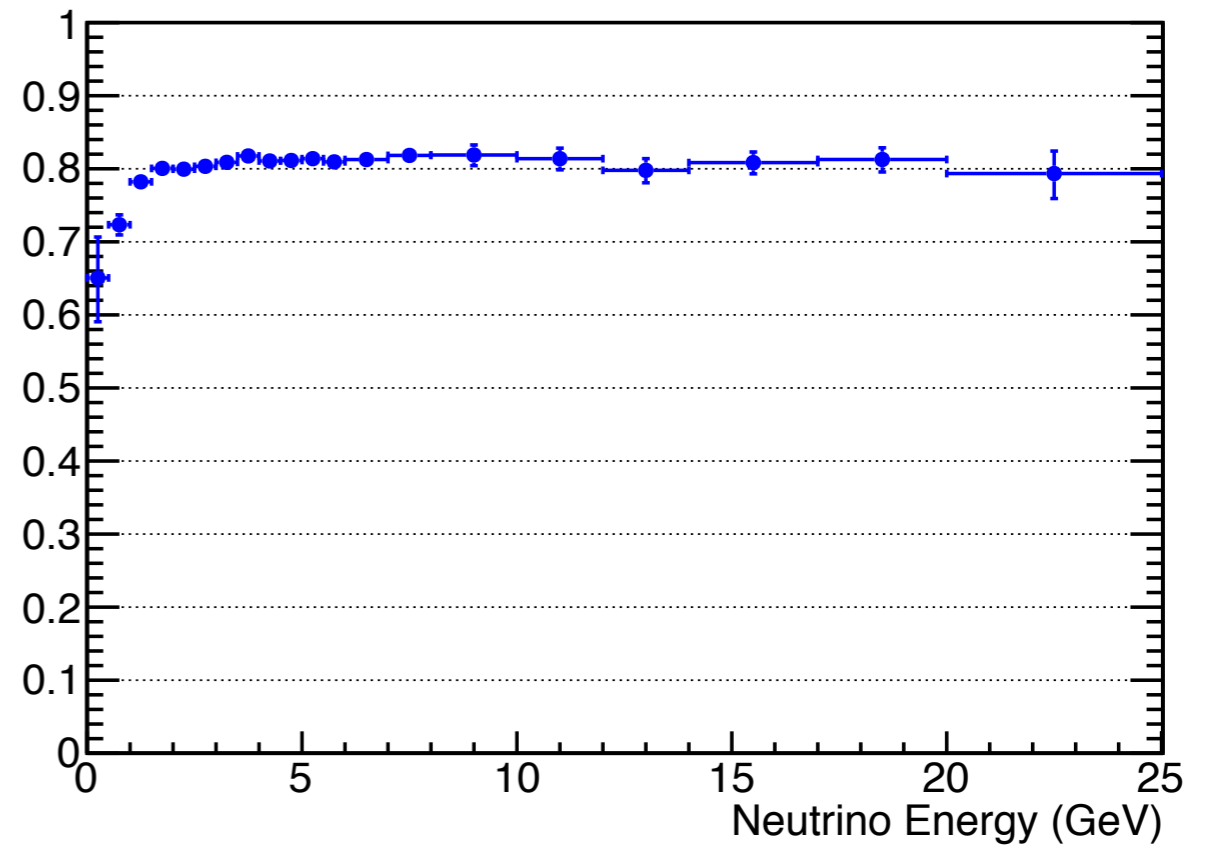
$$\text{Eff} = \frac{\text{CC events w/track}}{\text{CC events}}$$

# Muon Tracking Efficiency (CC $\nu_\mu$ Events)

PMTrack

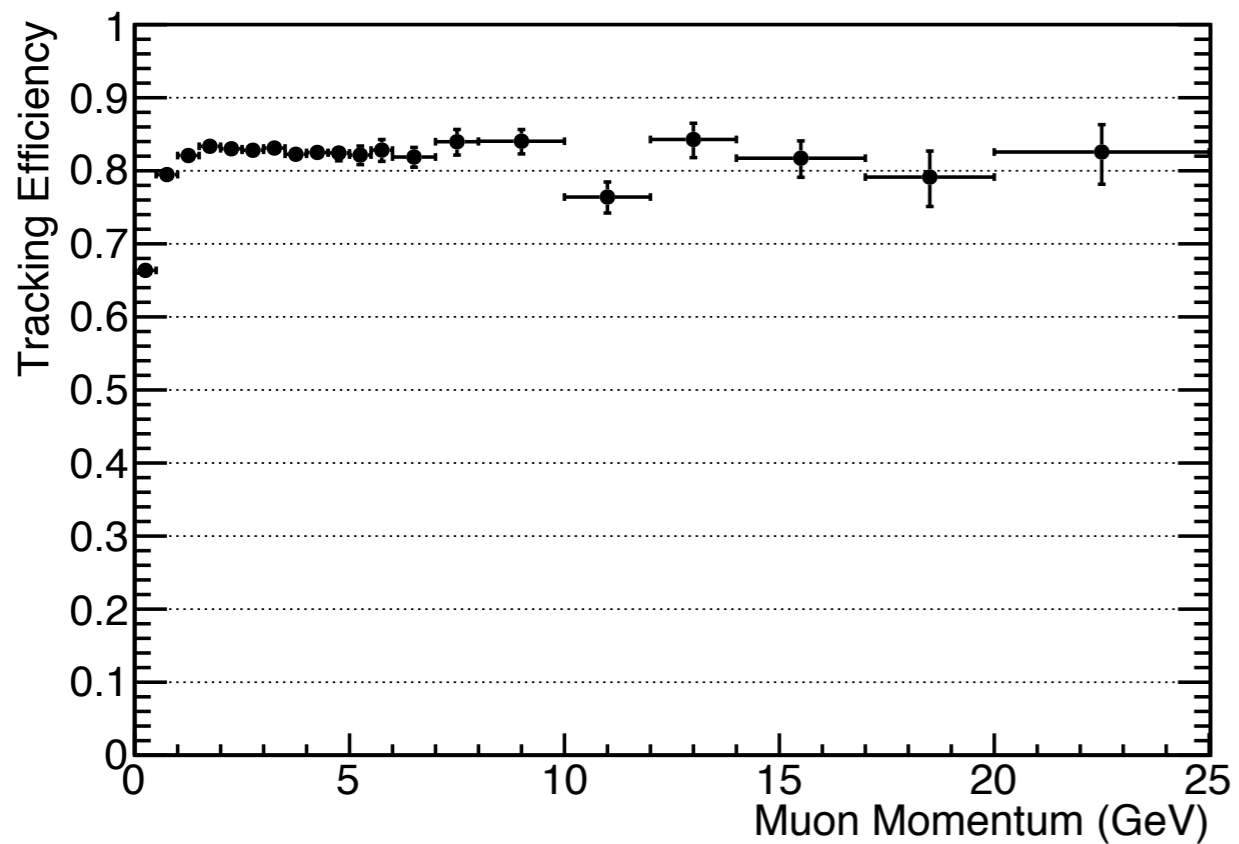


PMTrack w/ DC

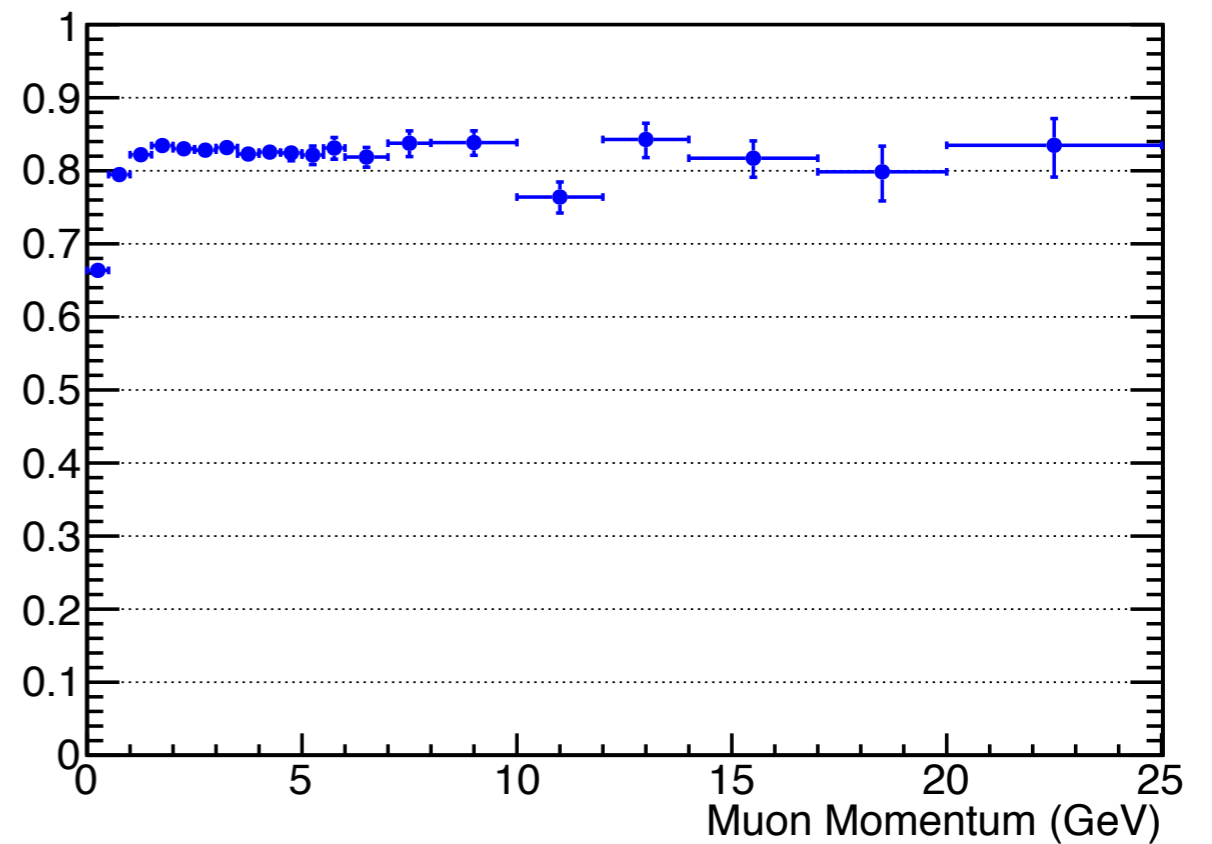


# Muon Tracking Efficiency (CC $\nu\mu$ Events)

## PMTrack

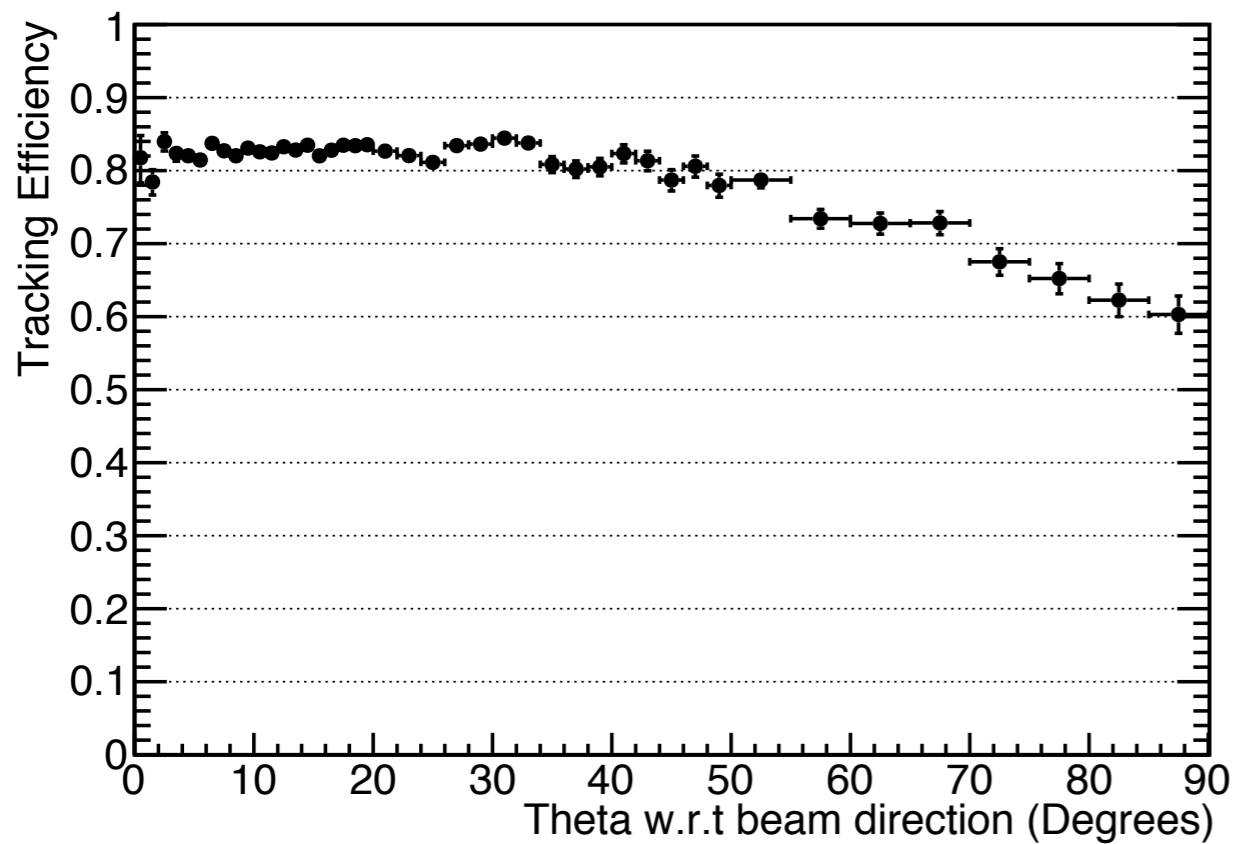


## PMTrack w/ DC

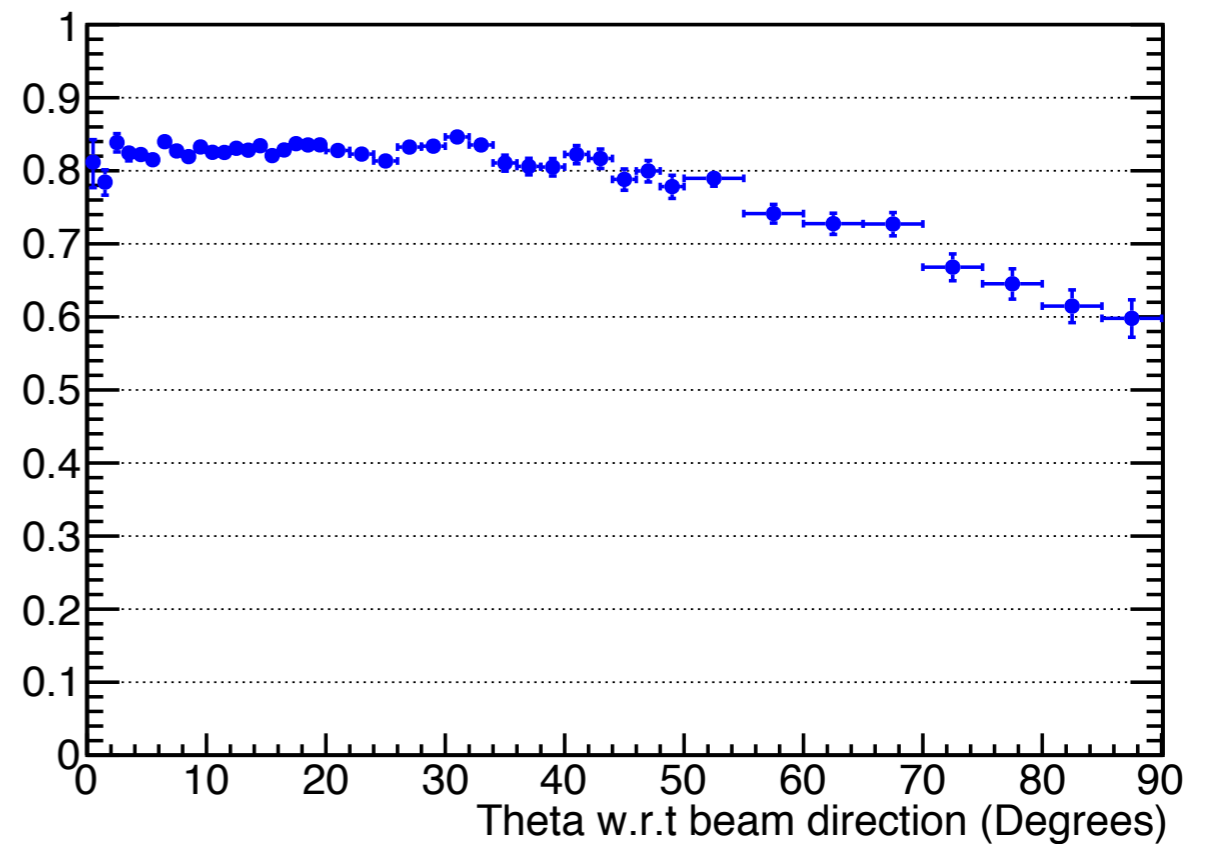


# Muon Tracking Efficiency (CC $\nu_\mu$ Events)

PMTrack

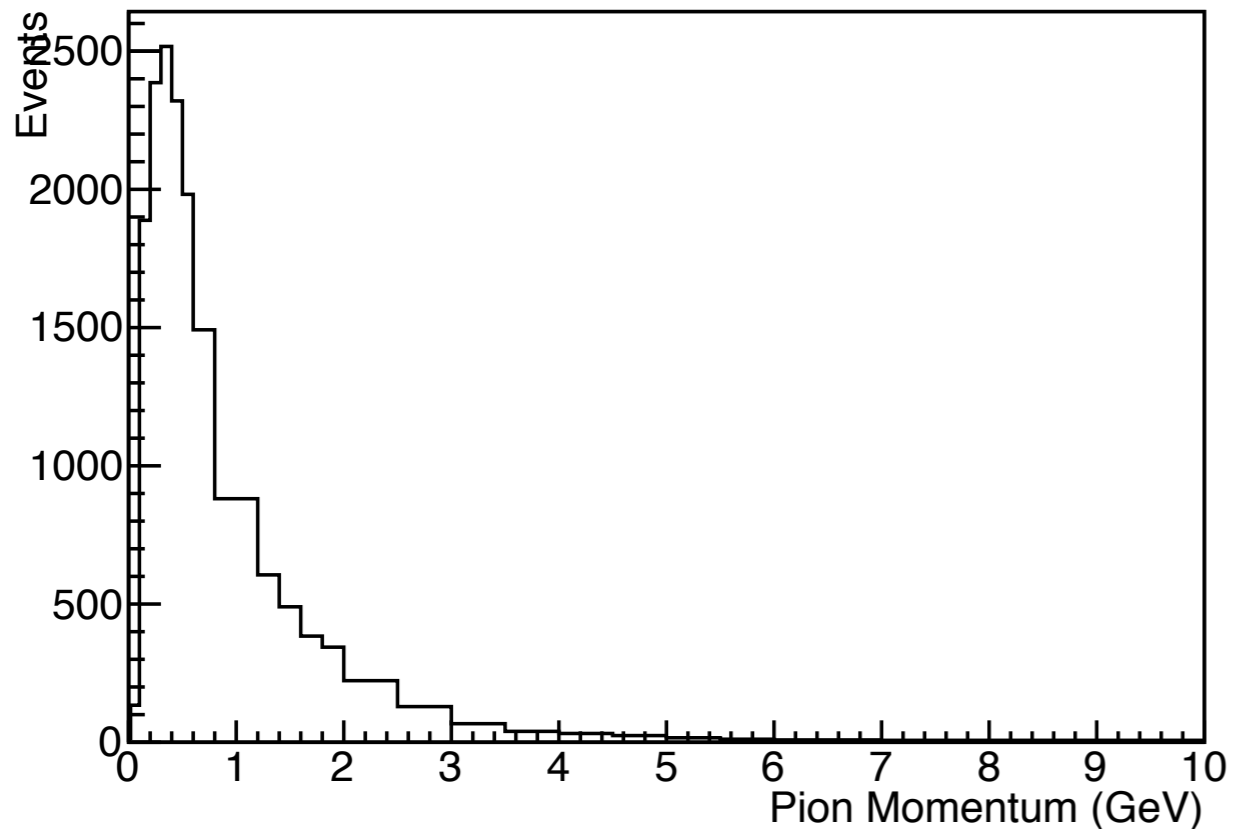


PMTrack w/ DC

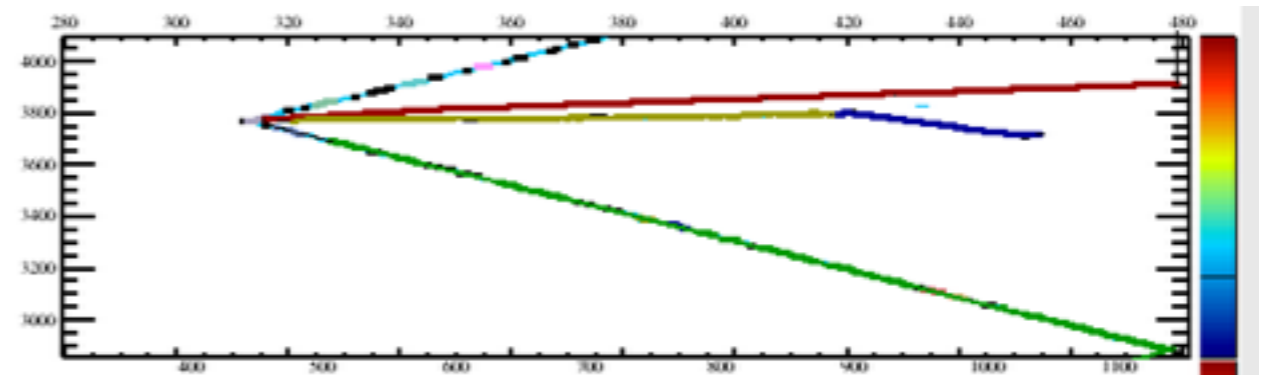
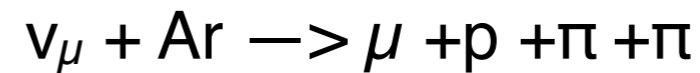


# Pion ( $\pi^\pm$ ) Tracking Efficiency (CC $\nu_\mu$ Events)

CC  $\pi^\pm$  with a pion track reconstructed



$$\text{Eff} = \frac{\text{CC } \pi^\pm \text{ events w/track}}{\text{CC } \pi^\pm \text{ events}}$$

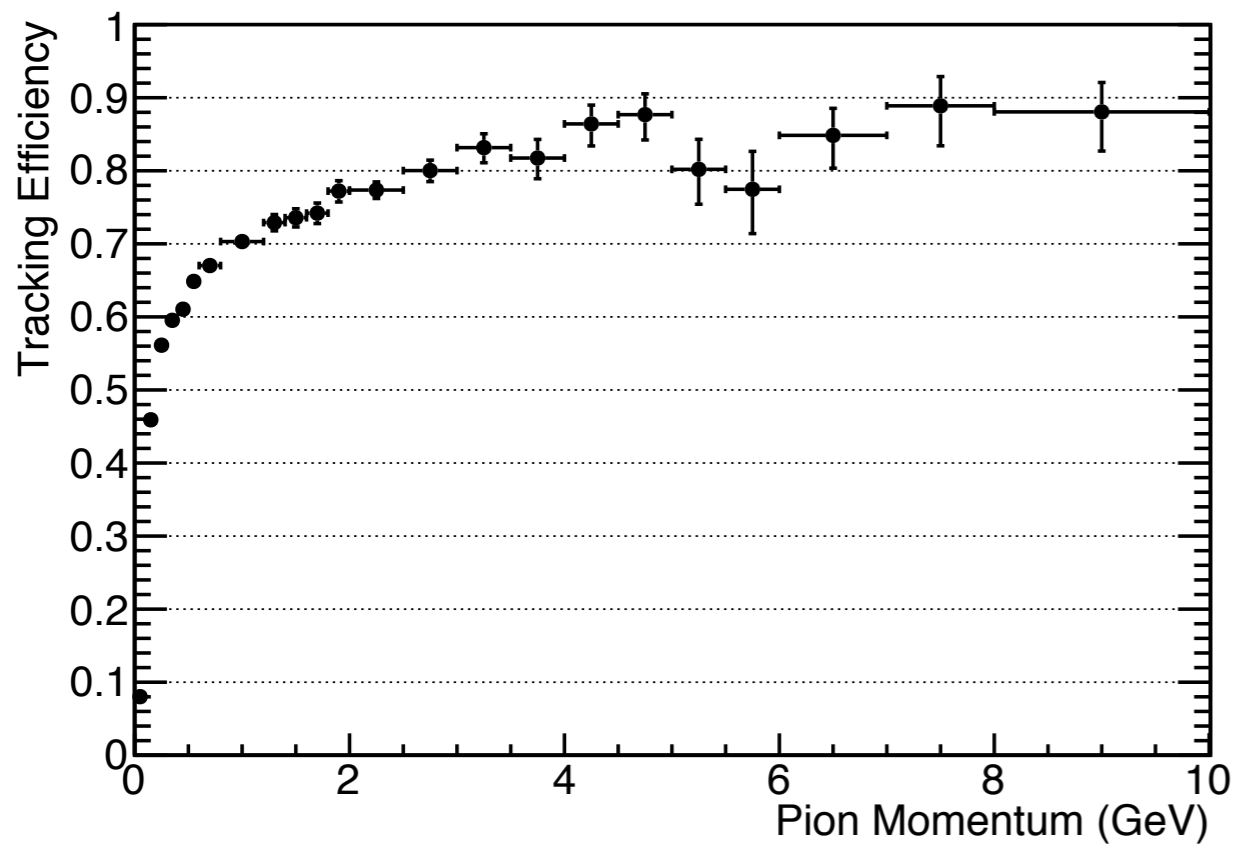


For multi-pion events plot as a function of the leading pion

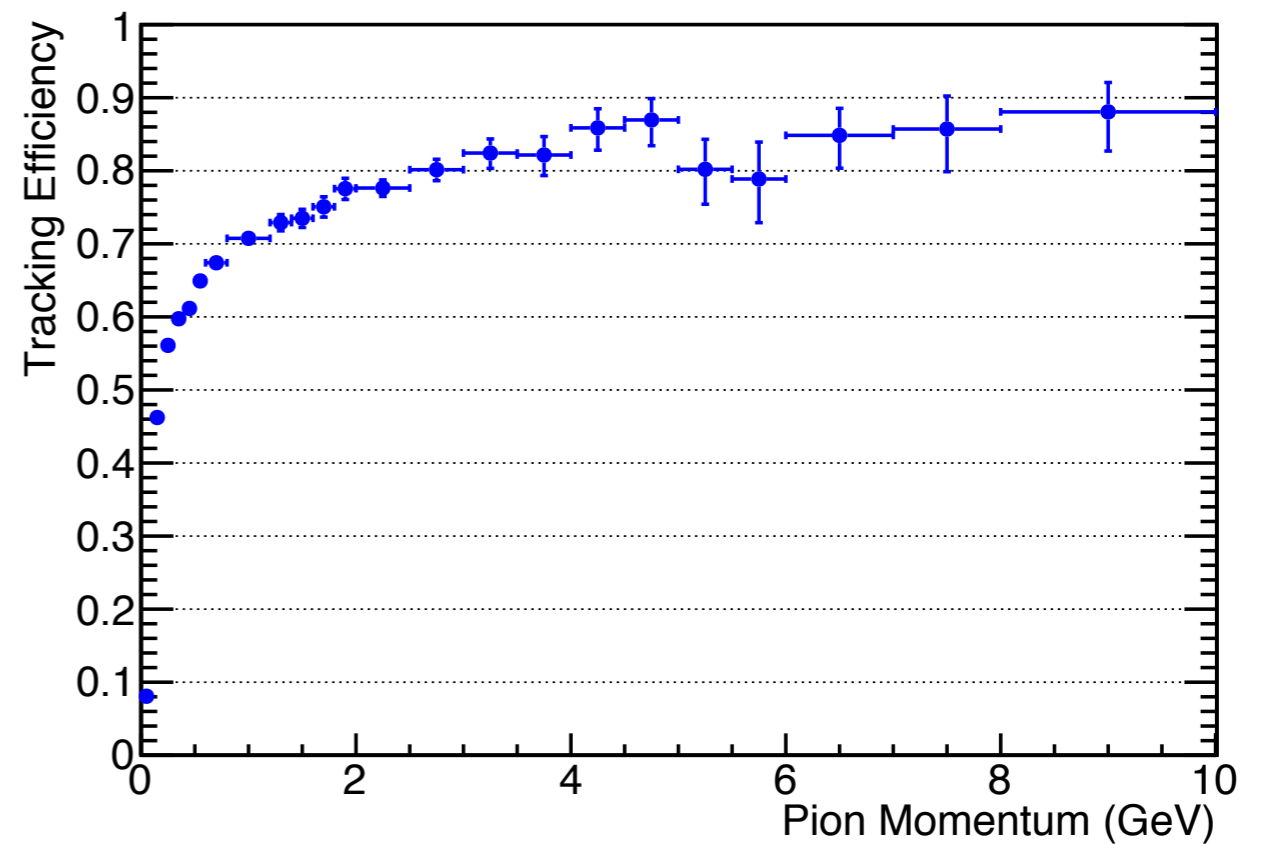


# Pion Tracking Efficiency (CC $\nu\mu$ Events)

PMTrack

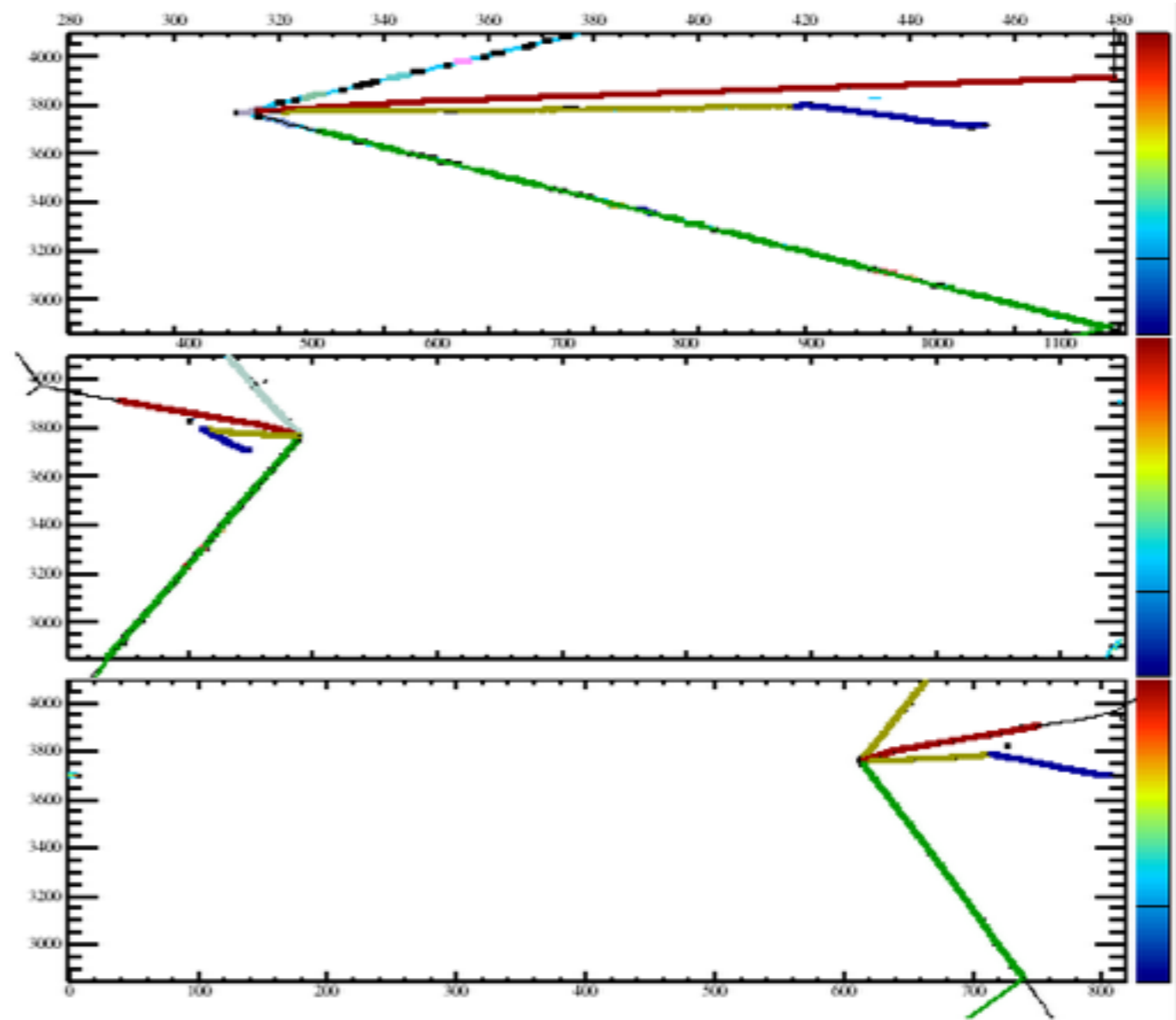


PMTrack w/ DC



# Comments

- ❖ Define a fiducial volume
- ❖ Proton tracking efficiency
- ❖ Suggestions?

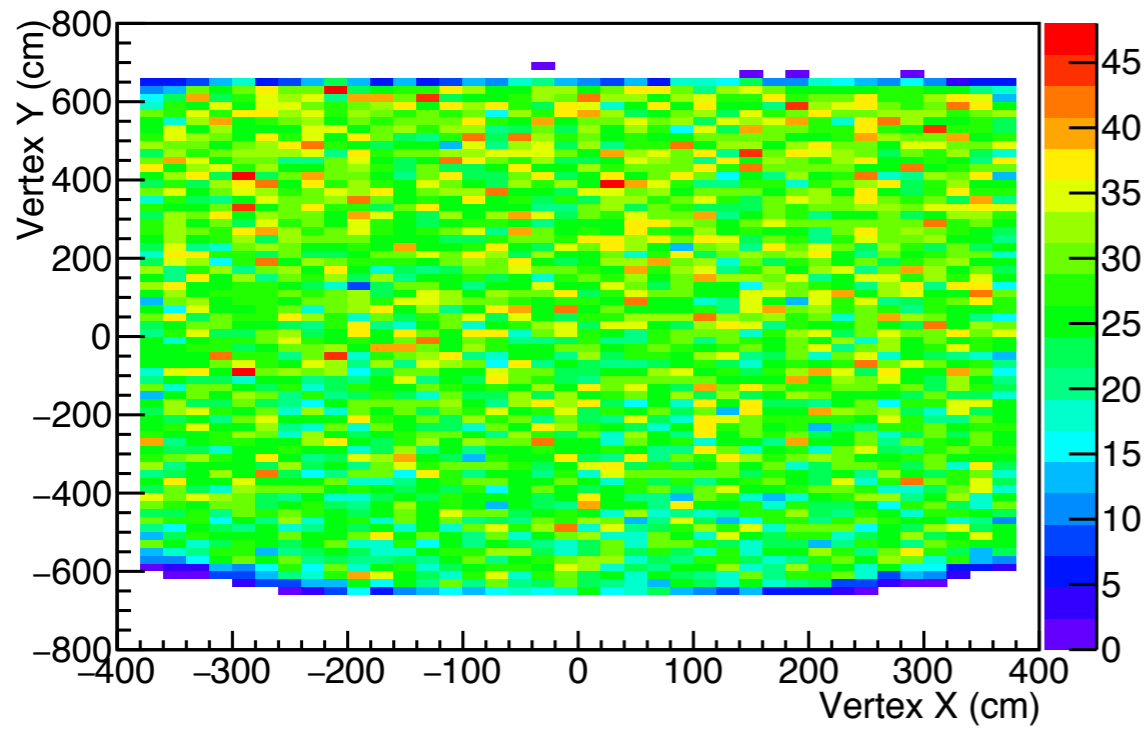


# Extras

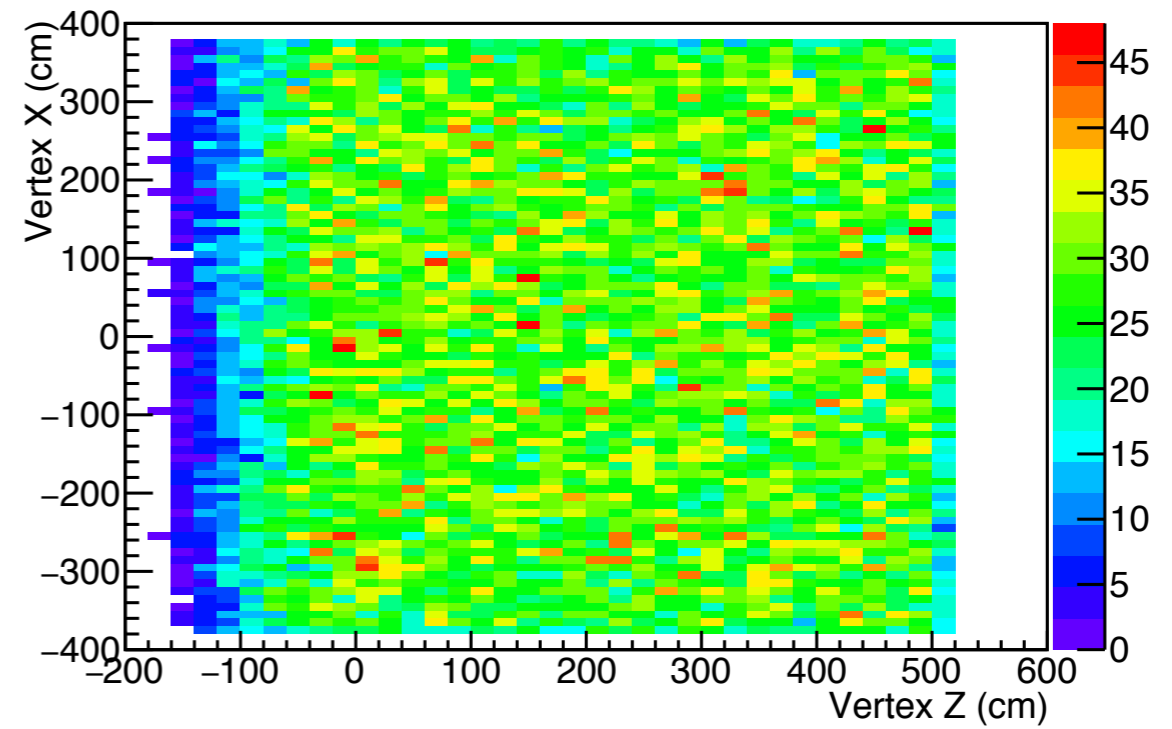
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# CC $V_\mu$ Events Vertices

Vertex X vs Y



Vertex X vs Z



Vertex Y vs Z

