

# Electron Particle Gun Sample

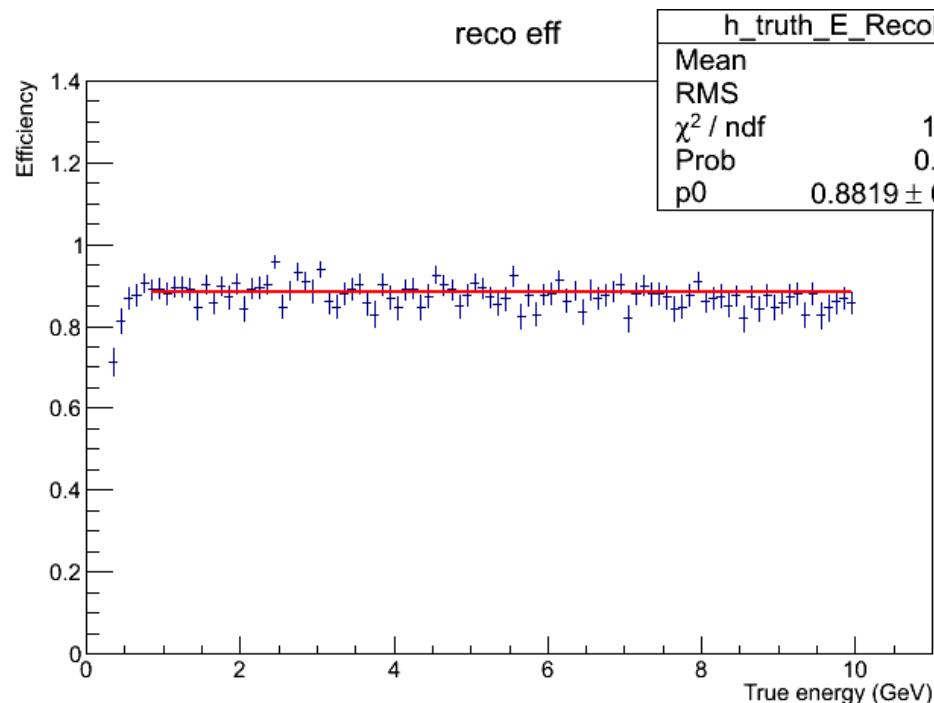
Energy:0-10 GeV flat distribution ; Angle:0-45 degree uniform

- Efficiency definition:

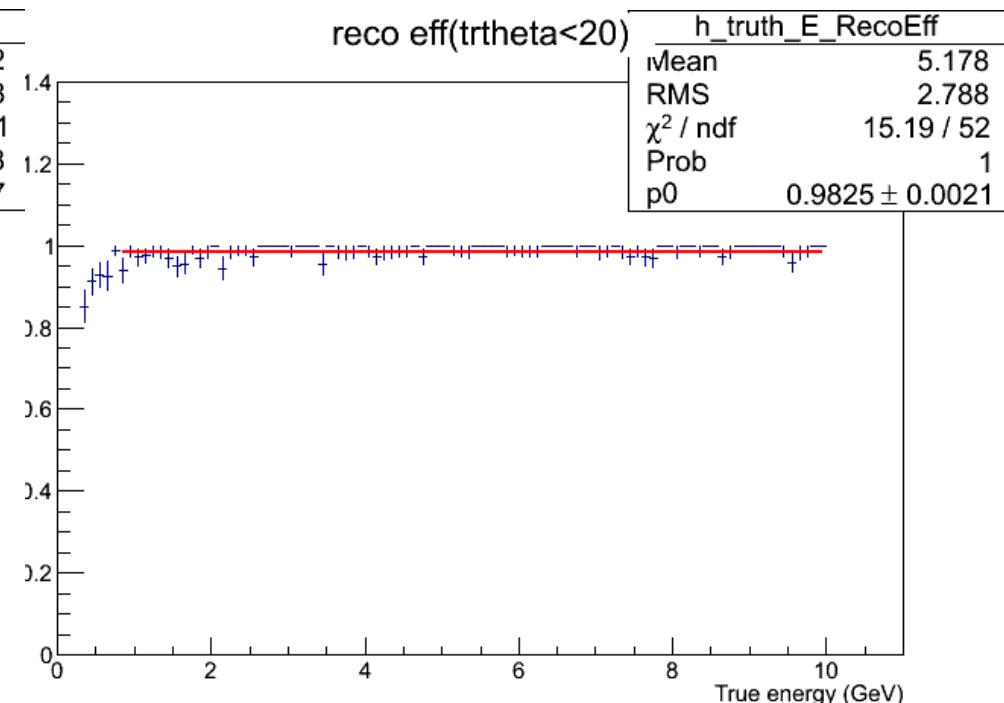
**Fraction of good reconstructed events out of total events in fiducial**

```
hist(truth_fiducial_evt==1 && XzUzDiff>=-2 && XzUzDiff<4 &&  
XzVzDiff>=-2 && XzVzDiff<4 && chi2PerDoF>0 && (vtx_mod<=60 &&  
neighborhoodEnergy/recoE_s<0.022 || vtx_mod>60 &&  
neighborhoodEnergy/recoE_s<0.042)) / hist(truth_fiducial_evt==1)
```

# Efficiency vs True Energy



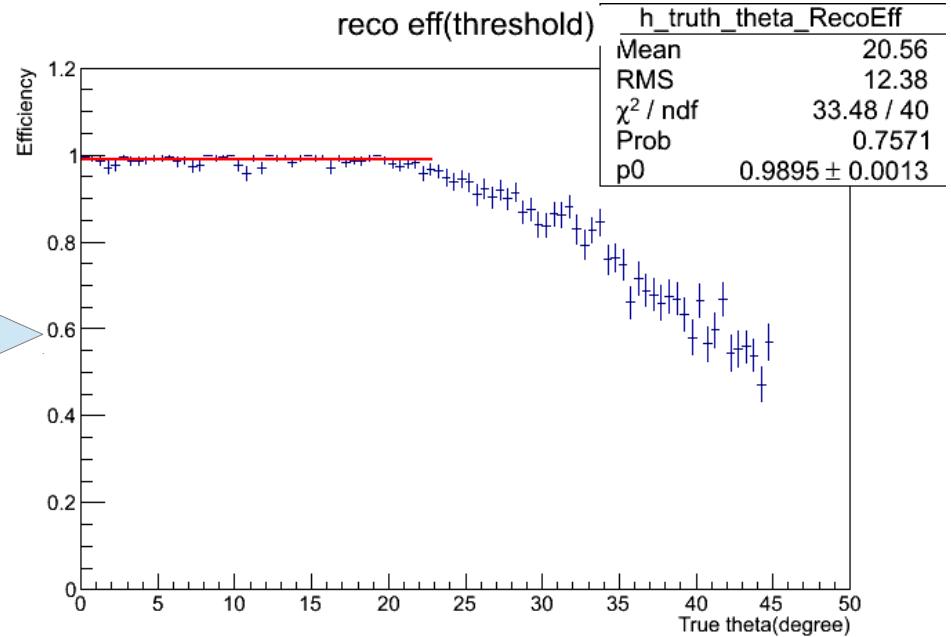
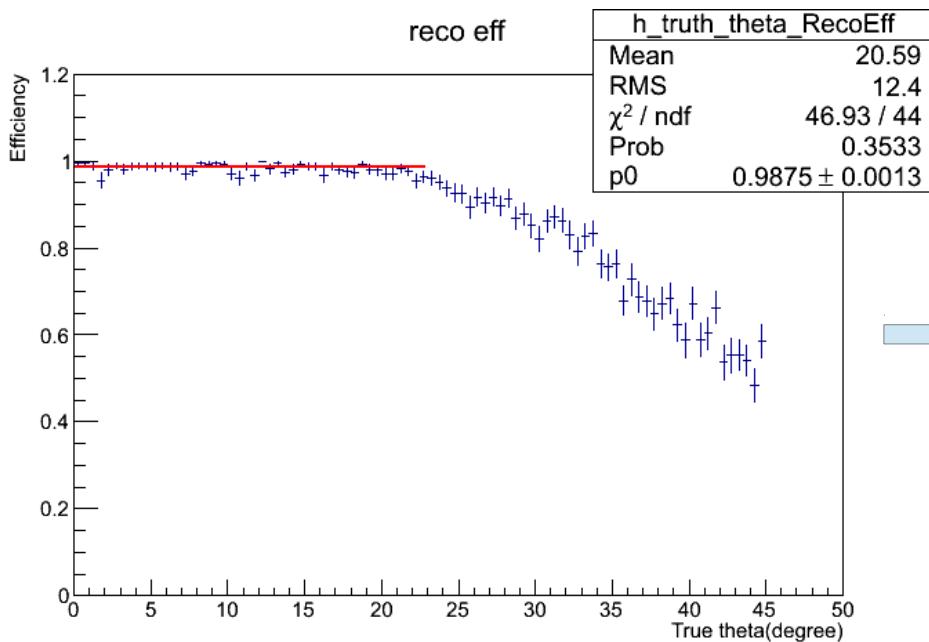
$0 < \text{angle} < 45$



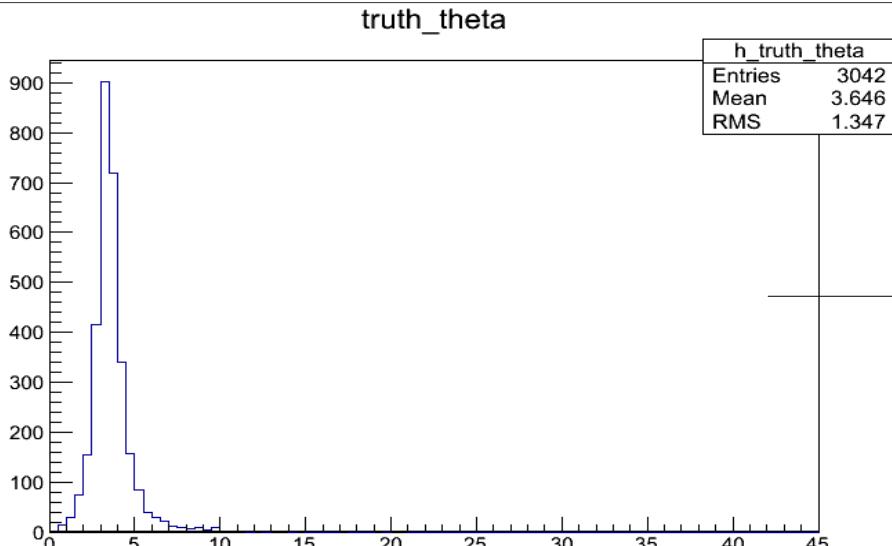
$0 < \text{angle} <= 20$

Efficiency increases significantly after the angle cut

# Efficiency vs True Theta



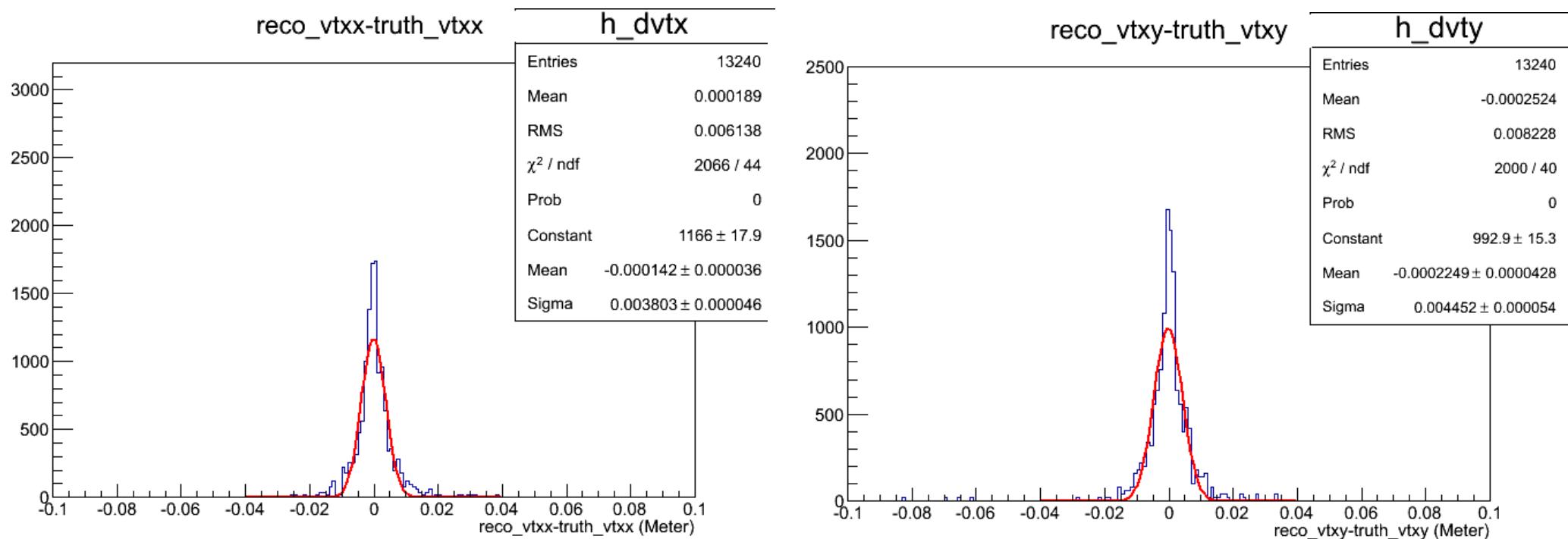
Efficiency increases after threshold cut



Truth\_theta distribution of nu e sample

18E20 pot; fiducial (truth\_fiducial\_evt==1);  
Most of the events in the sample are located  
within the high efficiency range

# Vertex X and Y Resolution

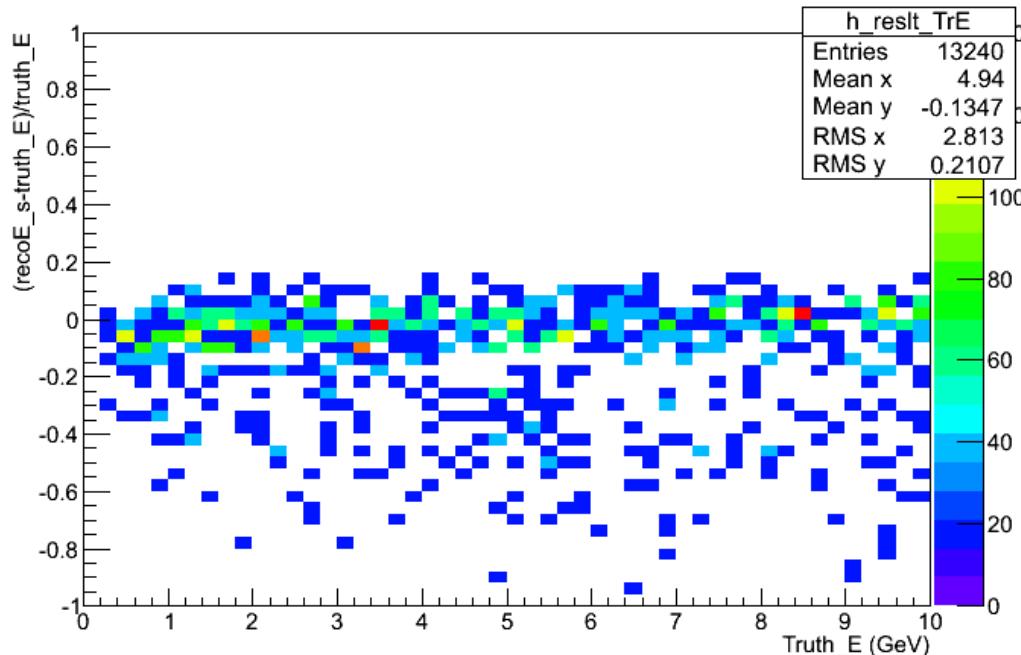


With reco cut

`truth_fiducial_evt==1 && XzUzDiff>=-2 && XzUzDiff<4 && XzVzDiff>=-2 && XzVzDiff<4 && chi2PerDoF>0 && (vtx_mod<=60 && neighborhoodEnergy/recoE_s<0.022 || vtx_mod>60 && neighborhoodEnergy/recoE_s<0.042)`

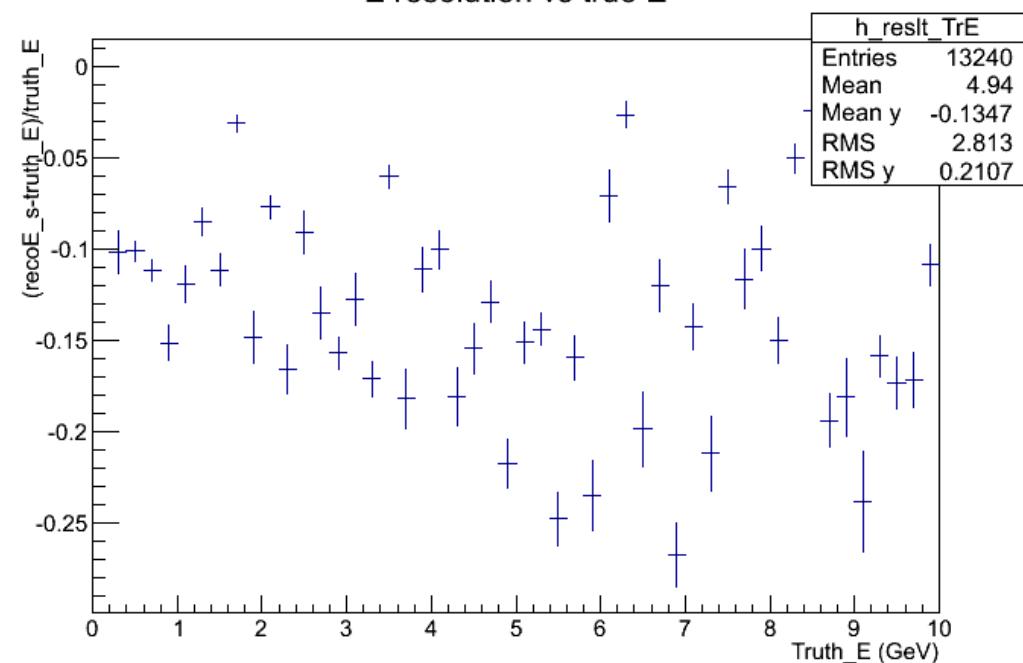
# Energy Resolution vs True E

E resolution vs true E



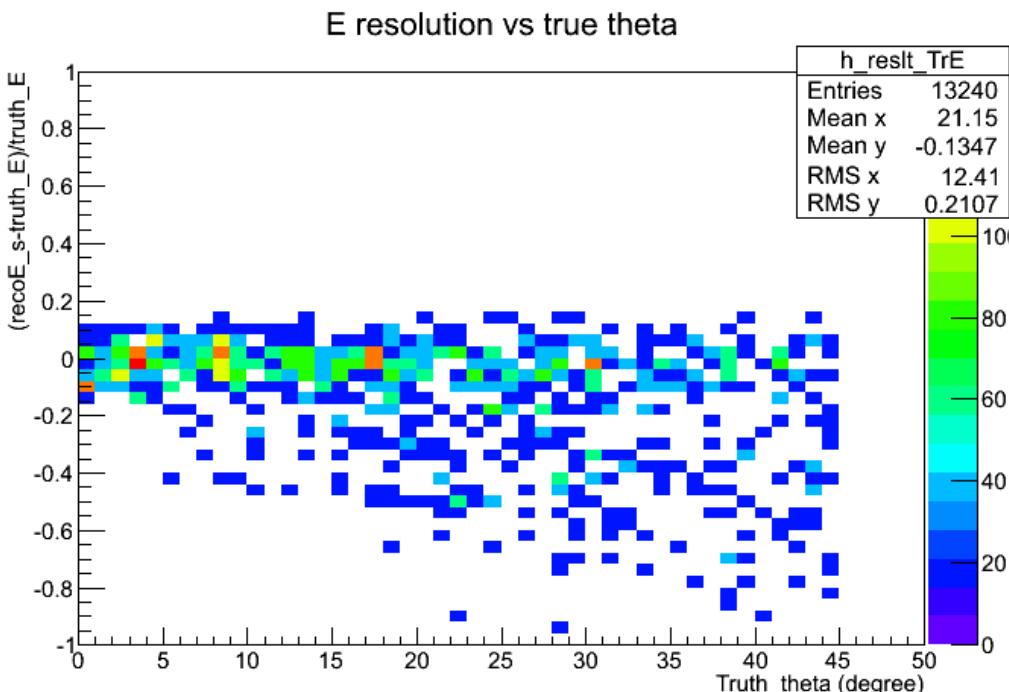
2D histogram

E resolution vs true E

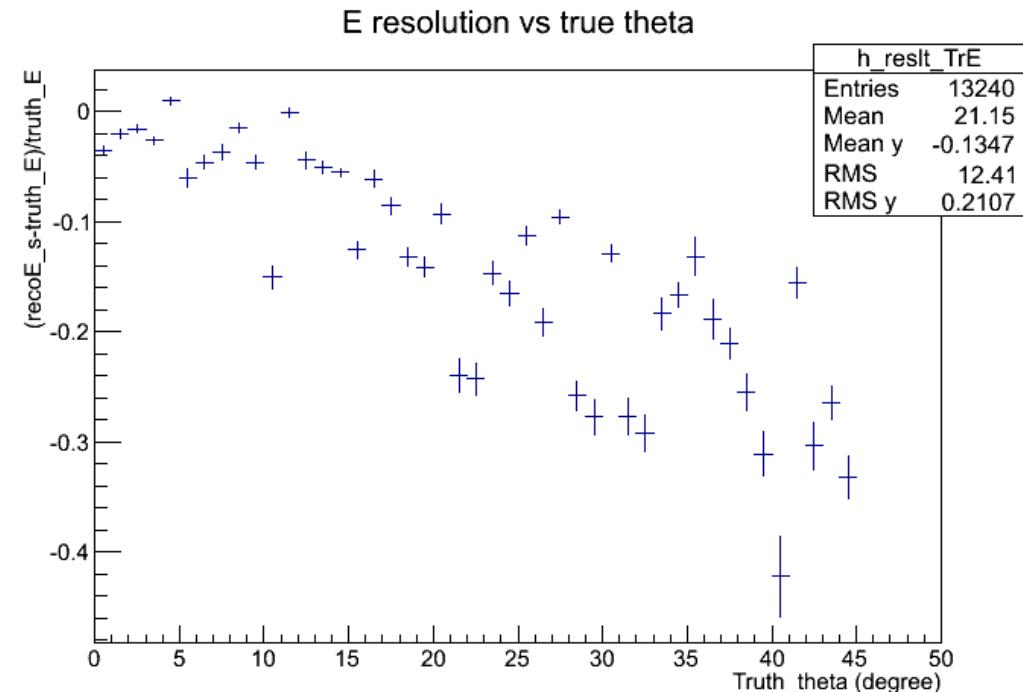


Profile histogram

# Energy Resolution vs True Theta

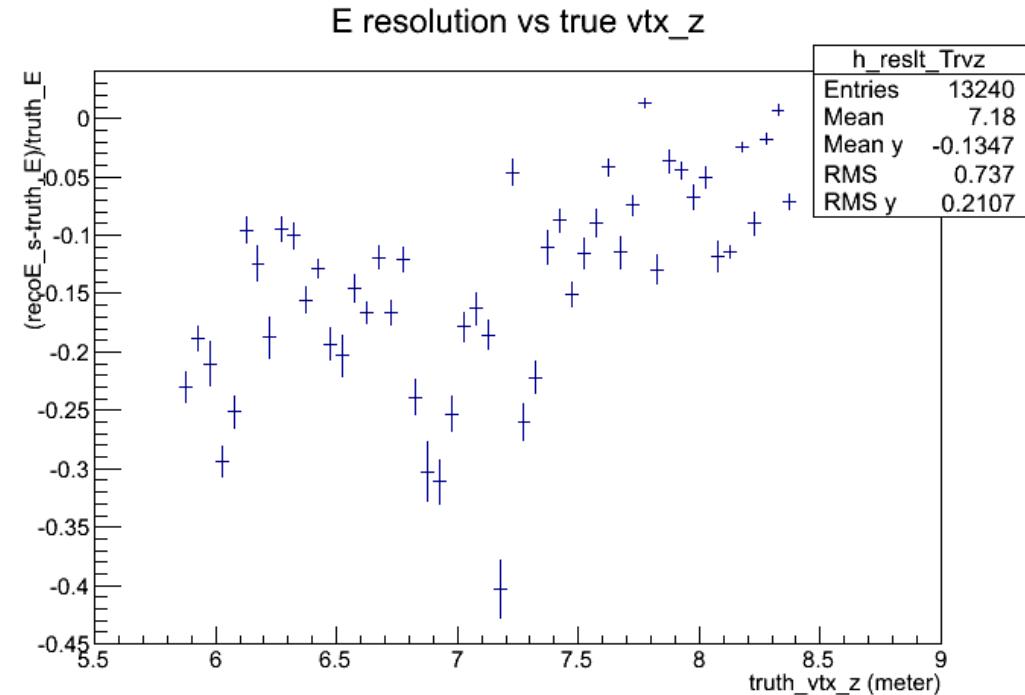
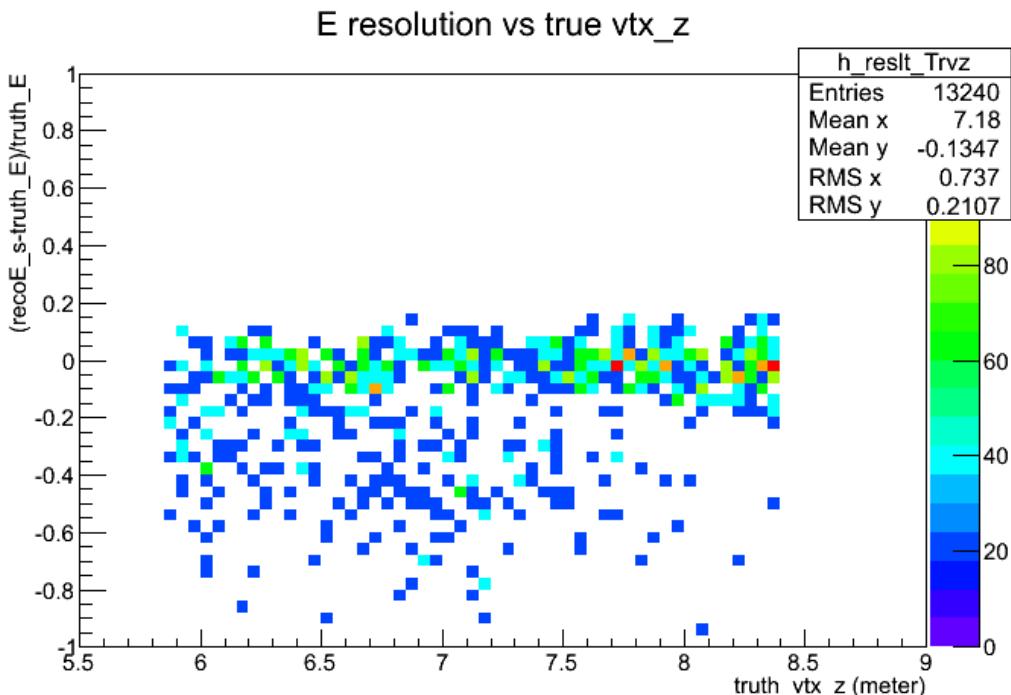


2D histogram



Profile histogram

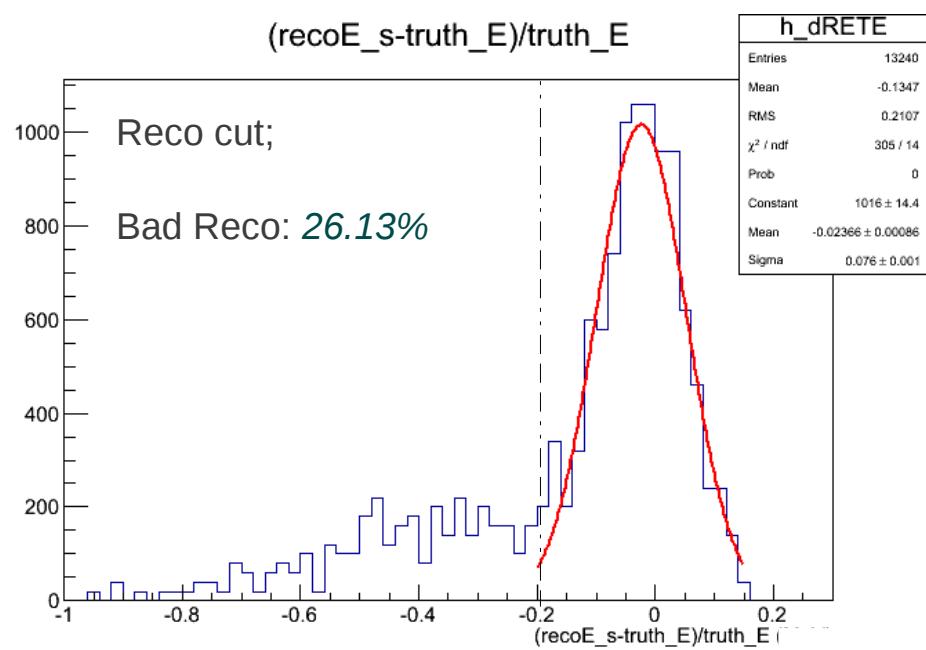
# Energy Resolution vs True Vertex Z



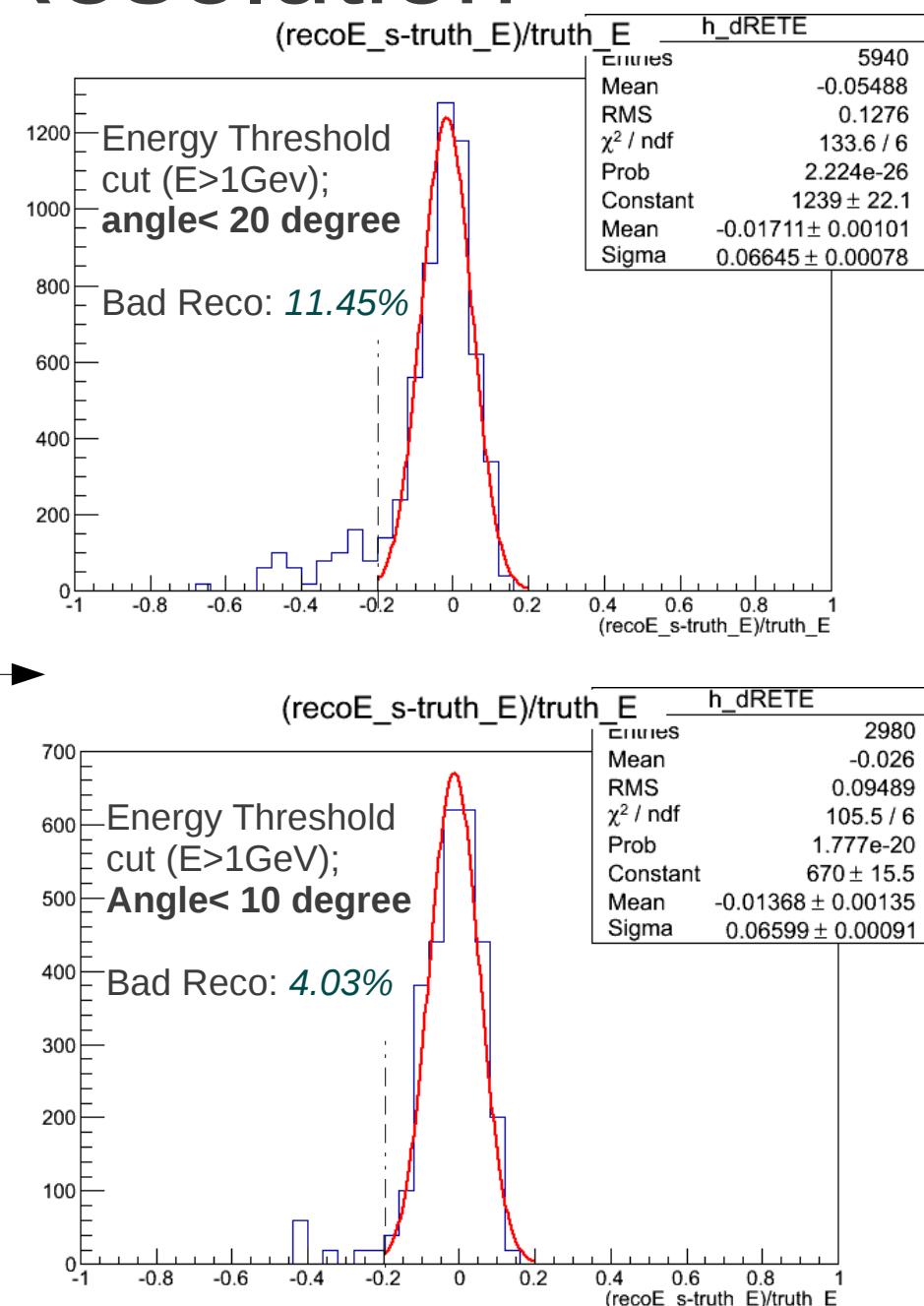
2D

Profile

# Reco Energy Resolution



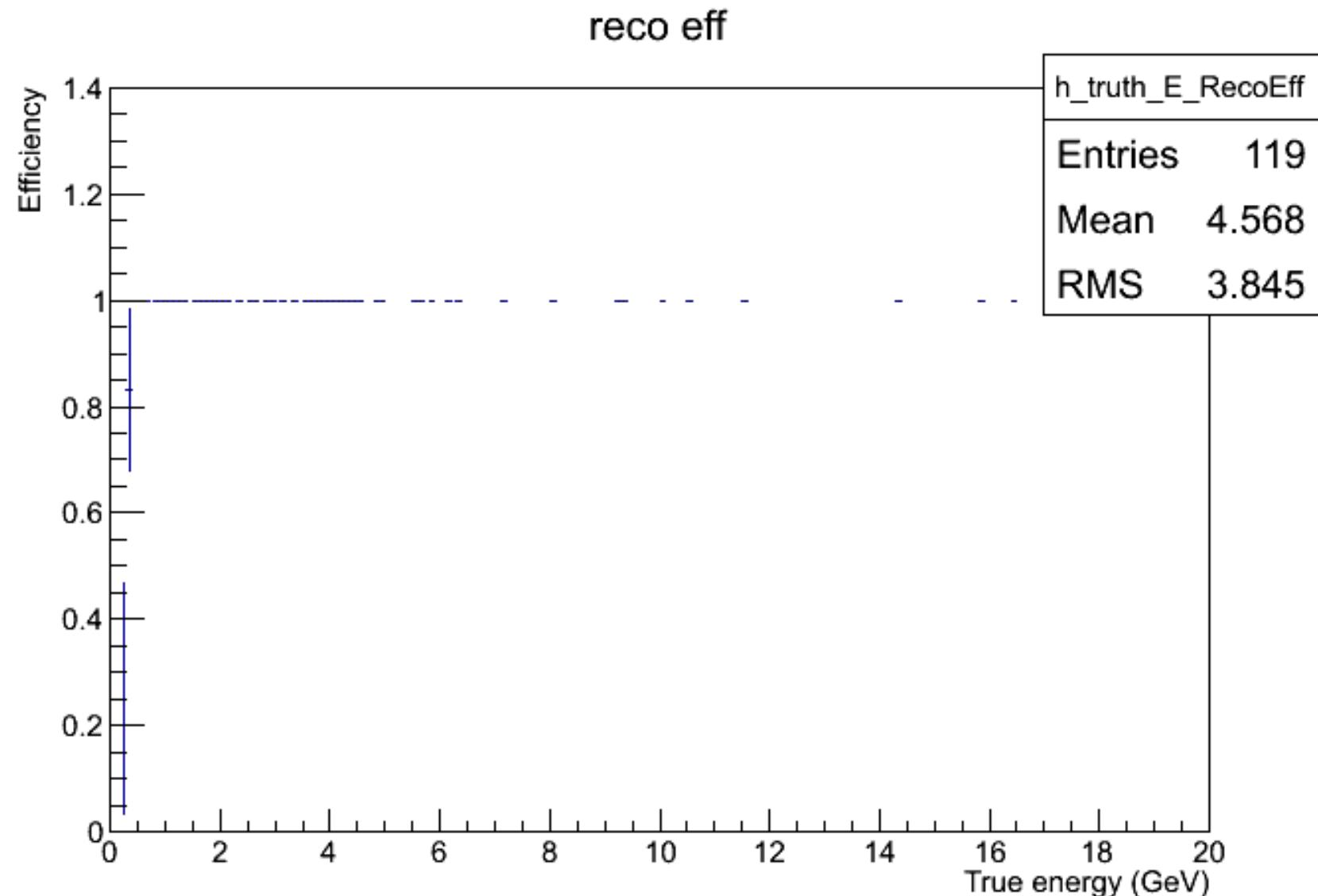
Bad Reconstruction:  
 $(\text{recoE}_s - \text{truth}_E) / \text{truth}_E < -0.2$



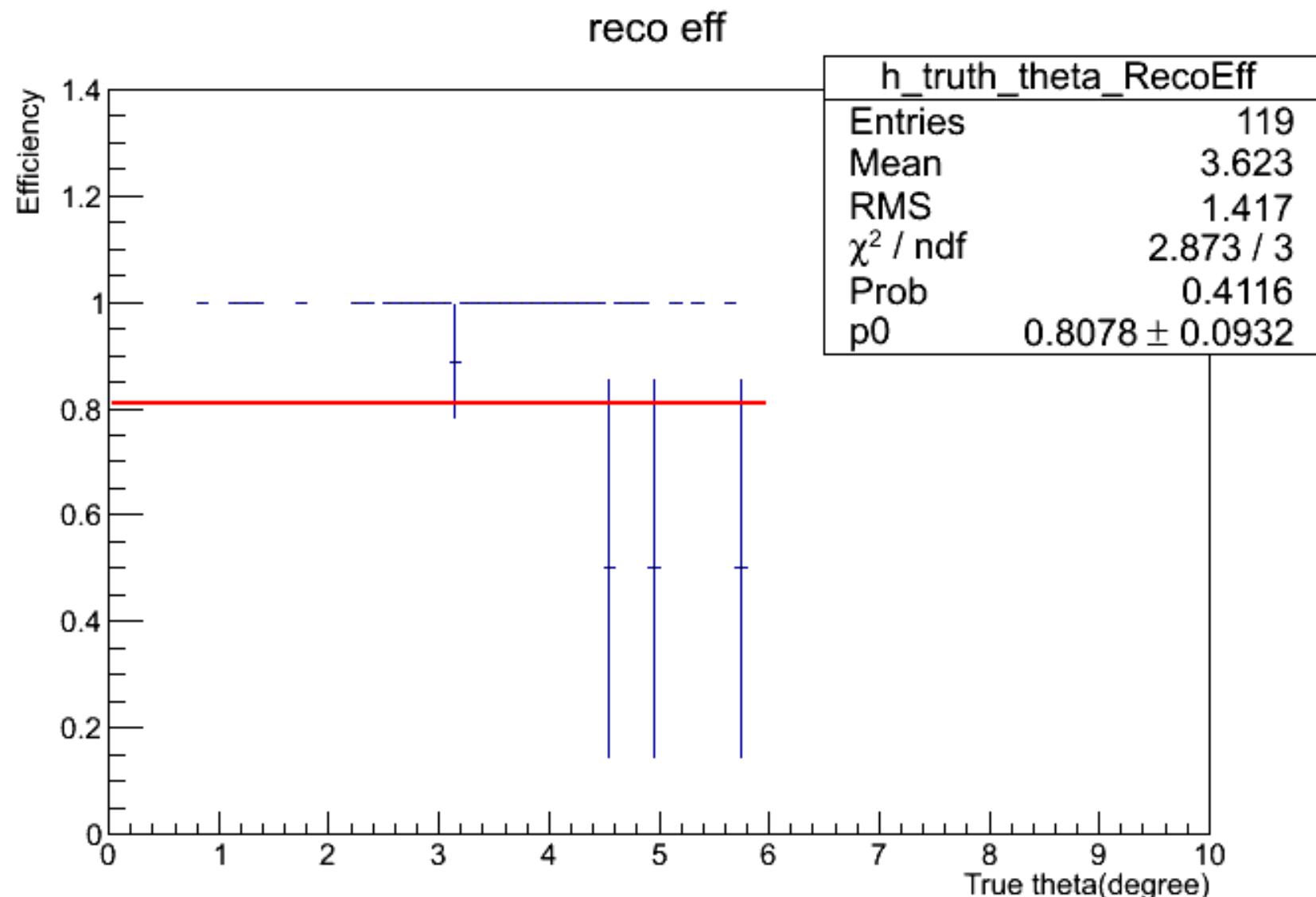
# Low Energy nu\_e Sample

- /minervadata/users/jwpark/mc\_production\_v10r2p3/grid/central\_value/minerva/ana/v10r2p3/00/01/00/(1-15)/  
SIM\_minerva\_0001000(1-15)\_\*\_Ana\_Tuple\_v3\_v10r2p3\_v6.root
- ~2.9E20 POT
- numu\_e interaction

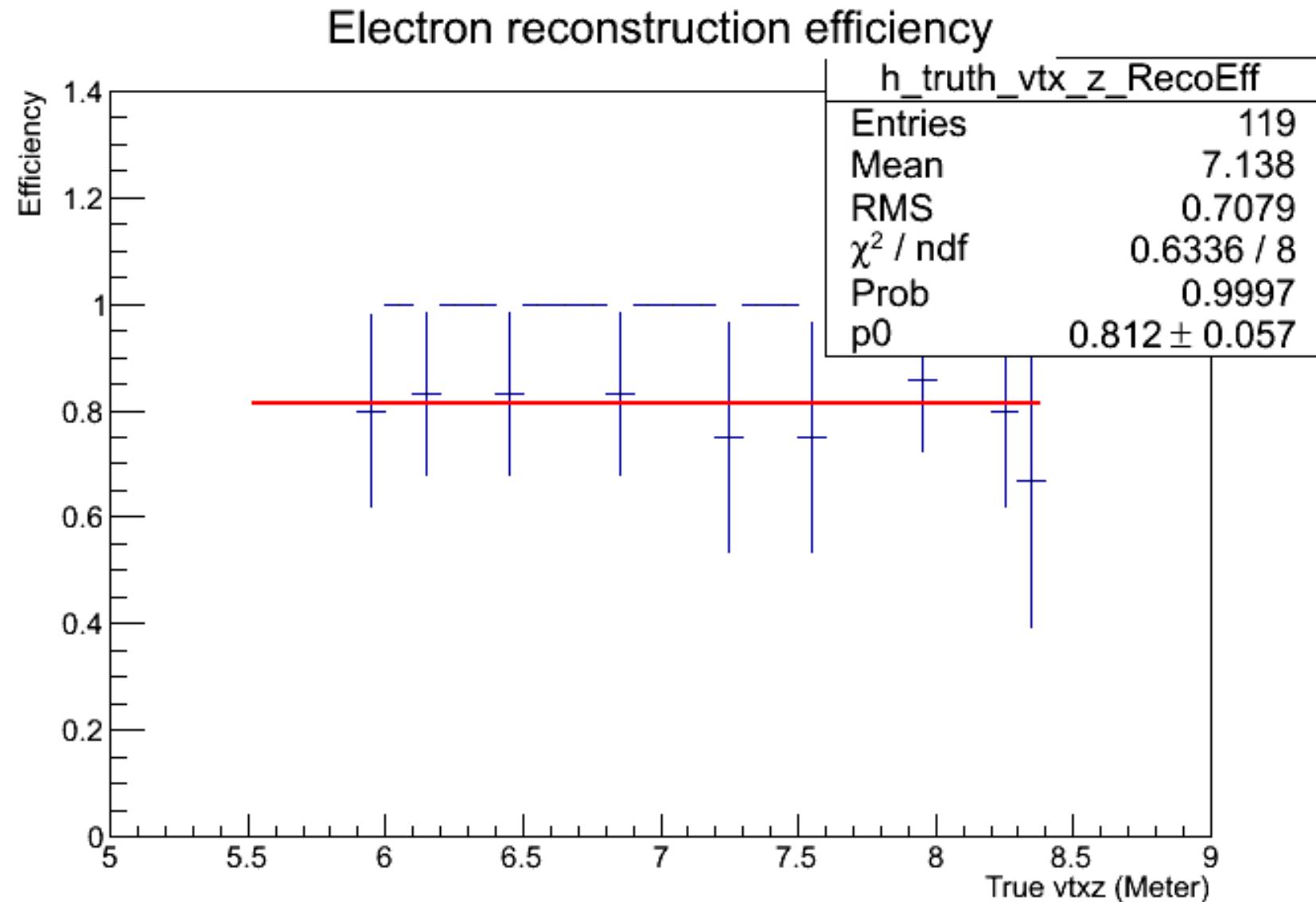
# Efficiency vs True Energy



# Efficiency vs True Theta

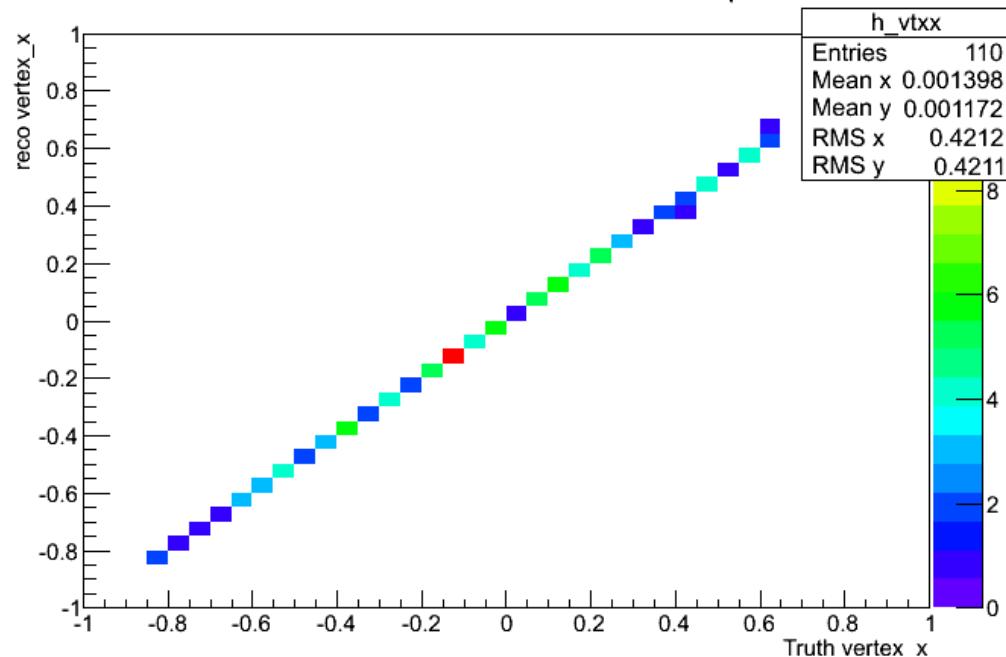


# Efficiency vs True VtxZ within Tracker Module (25-84)

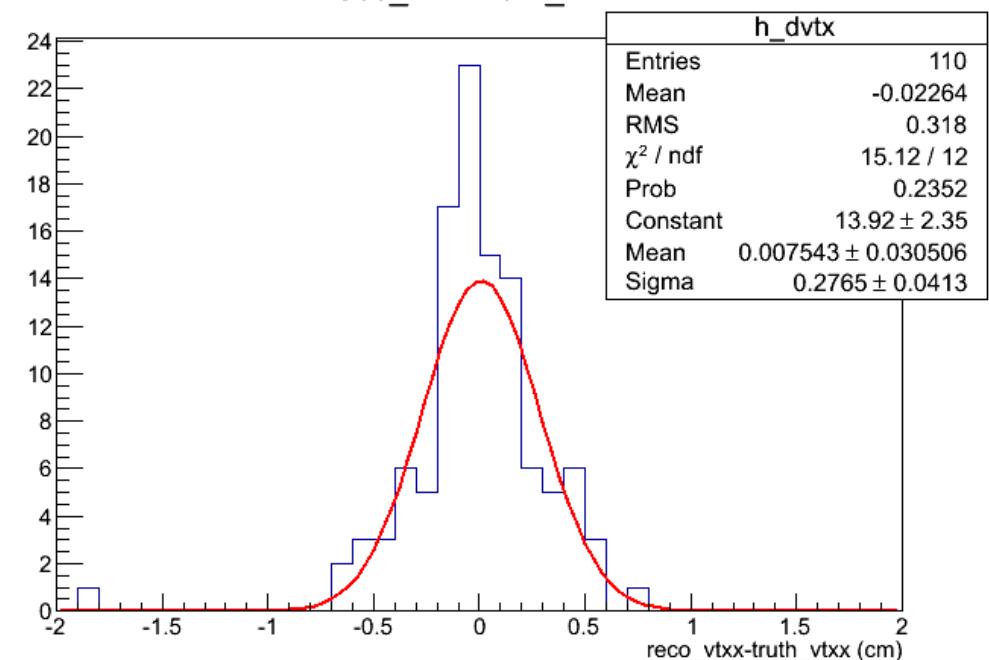


# Reco Vertex X vs Truth Vertex X

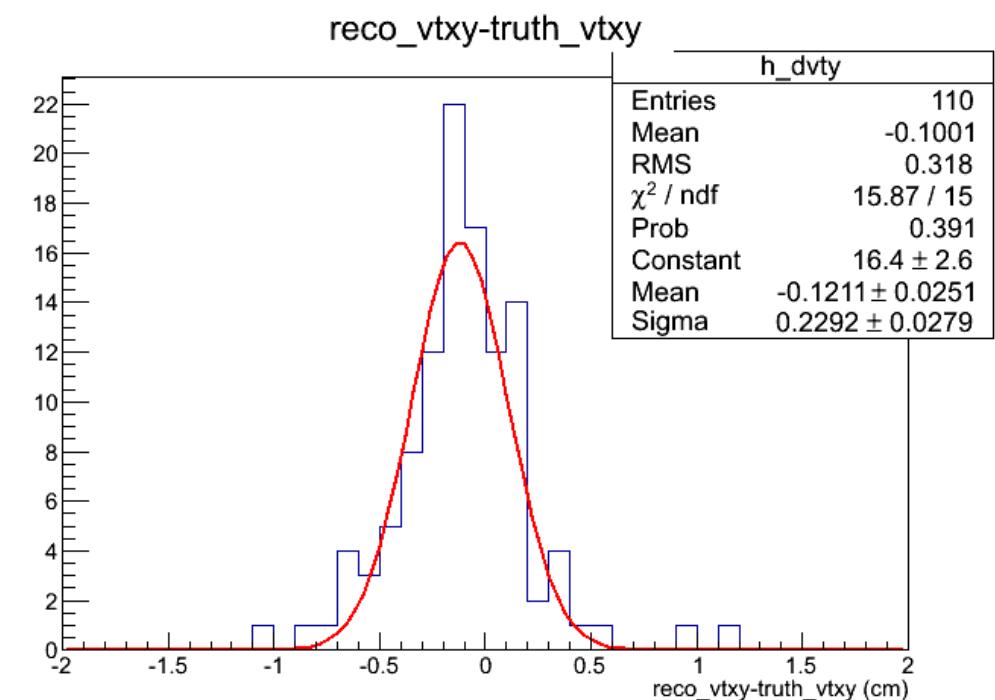
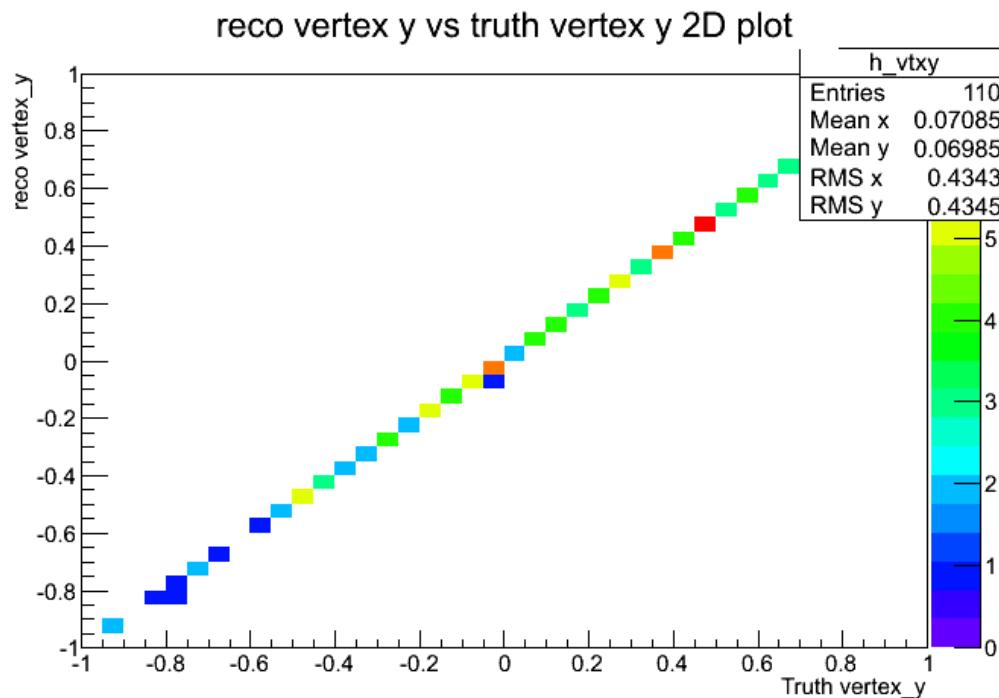
reco vertex x vs truth vertex x 2D plot



Resolution  
reco\_vtxx-truth\_vtxx

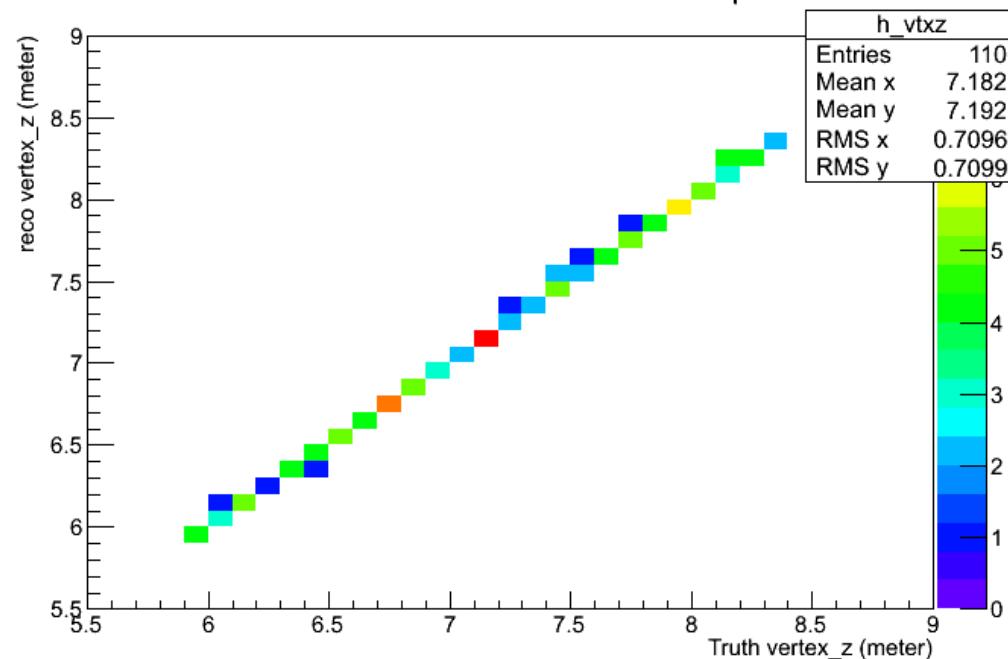


# Reco Vertex Y vs Truth Vertex Y



# Reco Vertex Z vs Truth Vertex Z

reco vertex z vs truth vertex z 2D plot



reco\_vtxz-truth\_vtxz

