

# **FD GENIE MC Samples**

## **New track reconstruction on 35t events**

T. Yang/FNAL  
July 22, 2015

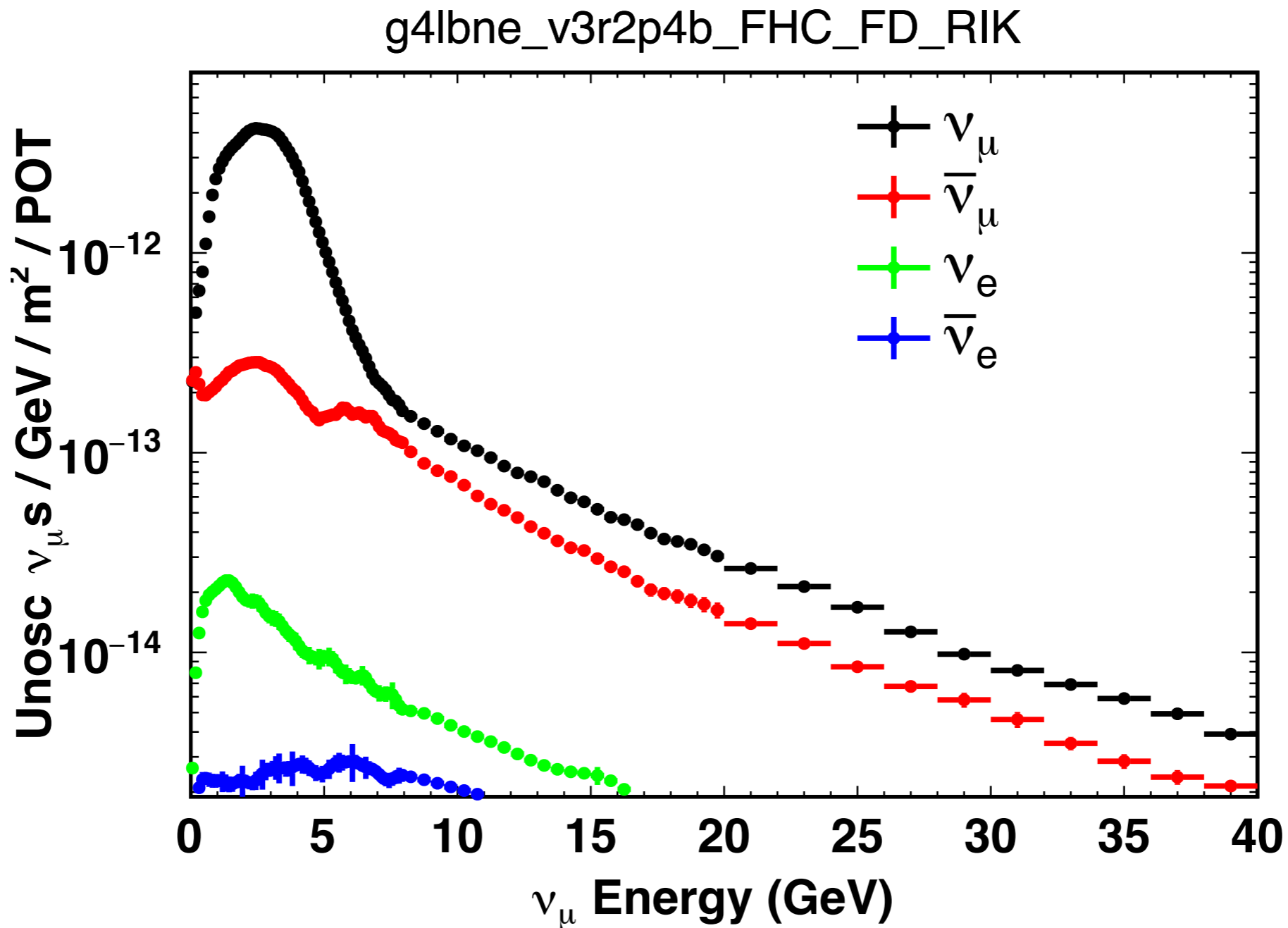
# FD GENIE MC Samples

---

- We decided to generate FD genie neutrino samples
  - Requested by David Adams and Dorota Stefan.
  - Develop shower reconstruction and e/ $\gamma$  separation algorithm.
  - Realistic sensitivity/detector optimization studies.

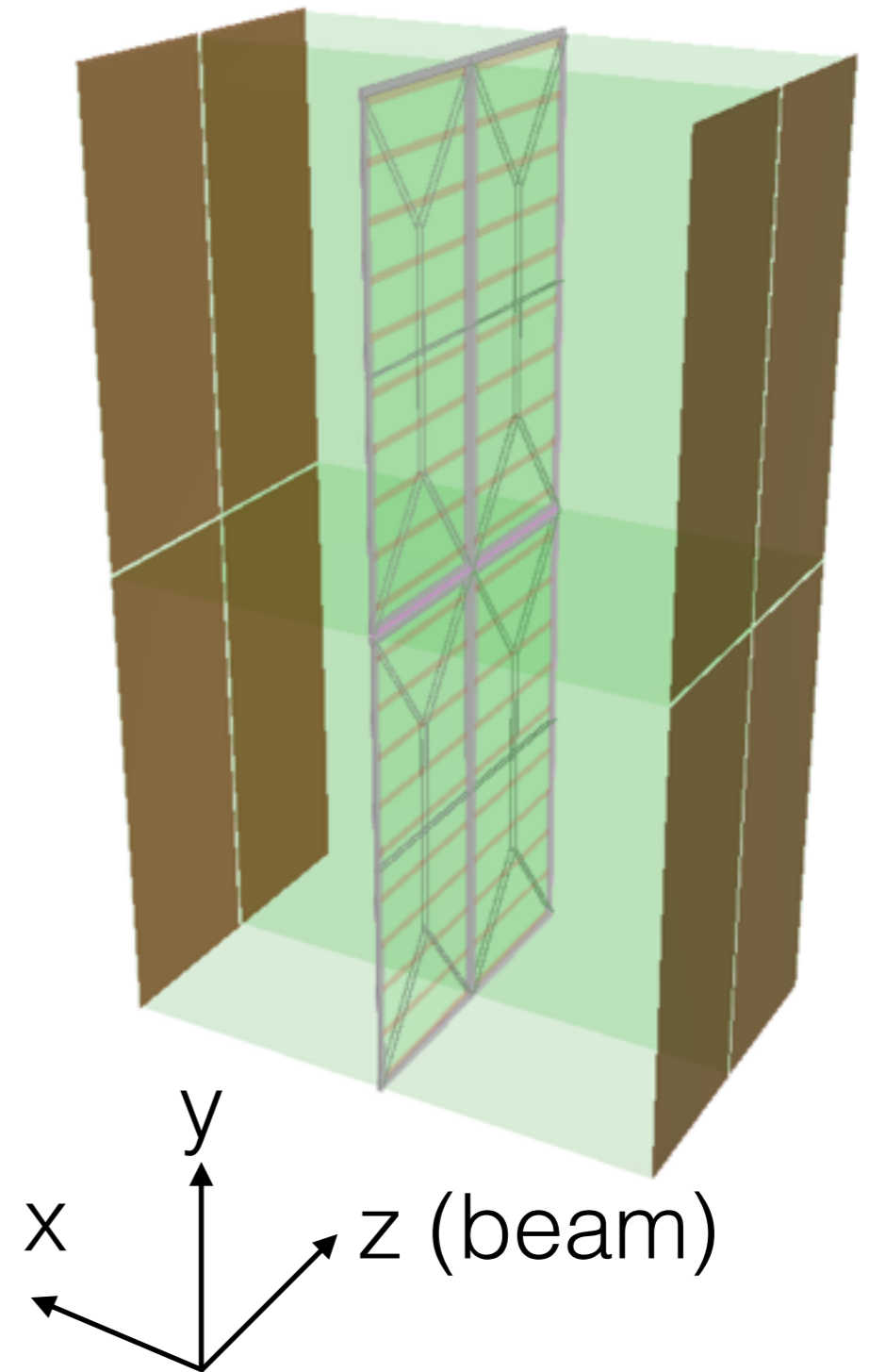
# Flux

- Use histogram flux file prepared by Tom



# Geometry

- dune10kt\_v1\_workspace
- 4 APAs, 8 TPCs
- x: [-3.6, 3.6] m  
y: [-6, 6] m  
z: [0, 5] m
- 36 degrees, 5 mm
- Other geometries (45 degrees, 3 mm) are available
- Thanks Tyler Alion for generating all the geometries.



# Configurations

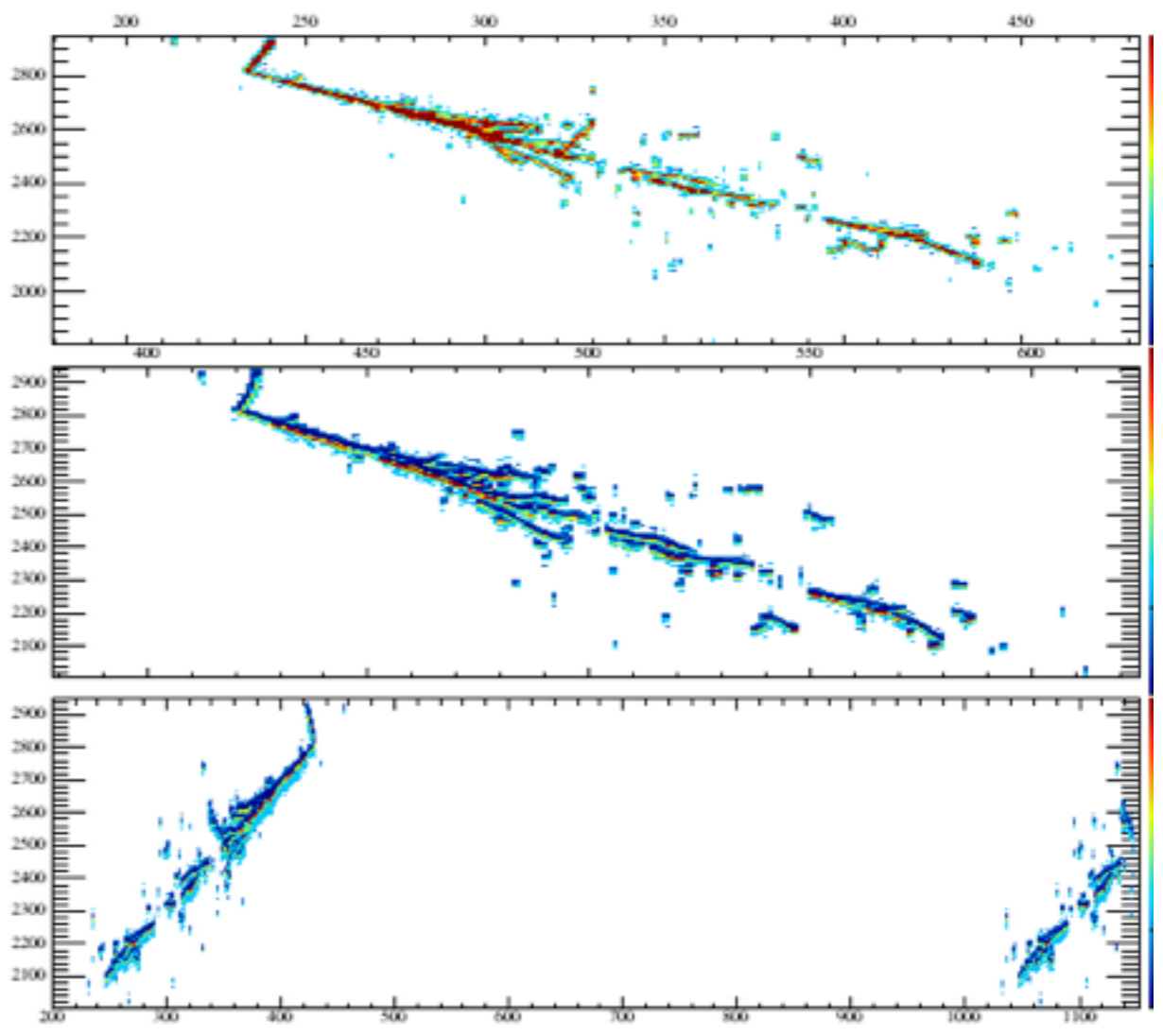
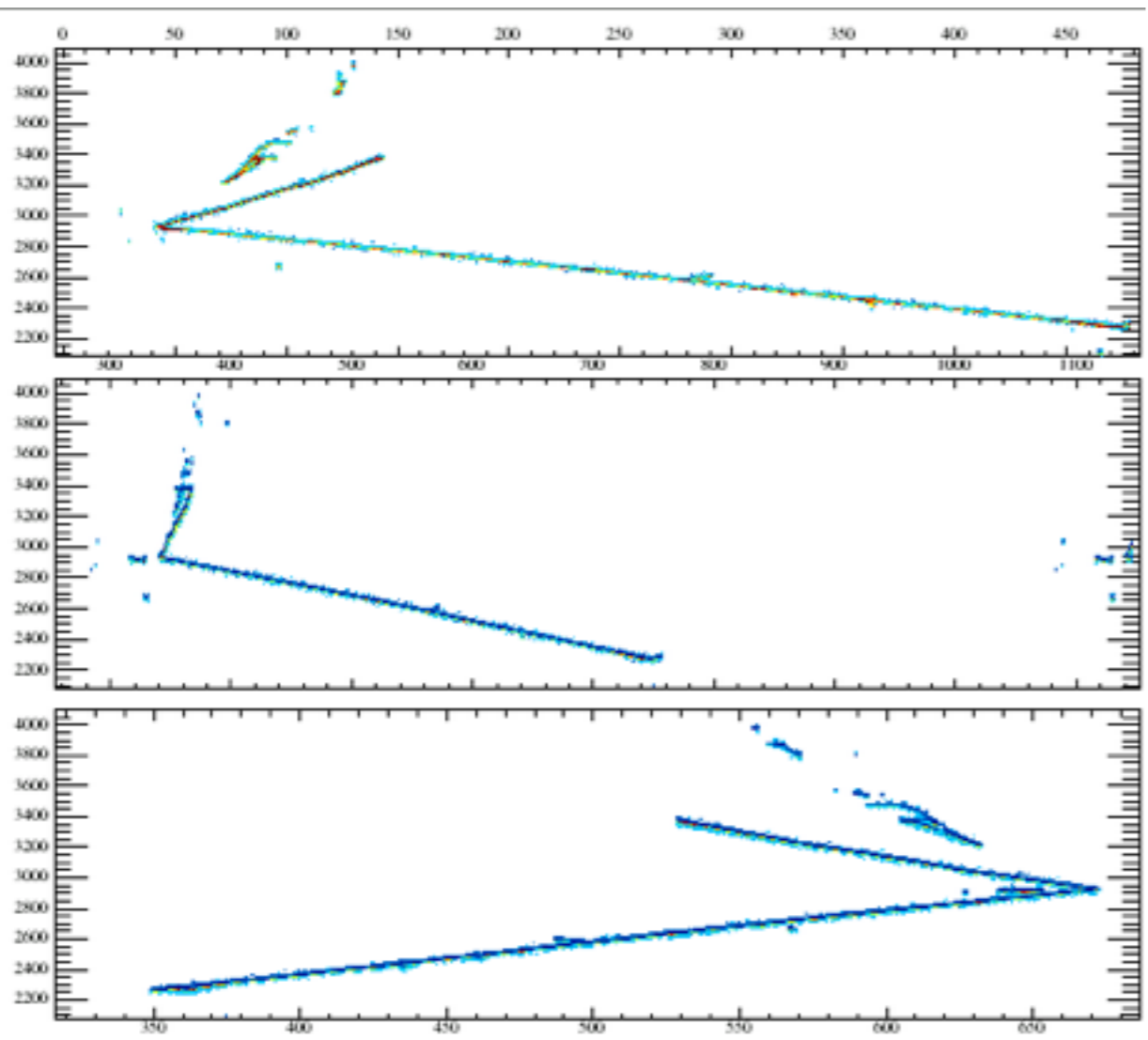
---

- Top volume: Cryostat
- BeamCenter: [0, 0, -1] #m
- BeamDirection: [0, 0.101, 0.995] # 101 mrad
- BeamRadius: 7 #m
- POT normalization was not used.
- Electron lifetime = 3 ms.
- ASIC gain = 14 mV/fC (second highest).
- Other configurations are similar to 35t.

# Samples

---

- 3 samples: beam, nue and nutau, each has 10000 events.
- beam sample (no osc): numu, numubar, nue, nuebar
  - /pnfs/lbne/persistent/users/tjyang/v04\_16\_00/detsim/  
prodgenie\_nu\_dune10kt\_workspace/
- nue sample: numu->nue, numubar->nuebar, nue->nutau, nuebar->nutaubar
  - /pnfs/lbne/persistent/users/tjyang/v04\_16\_00/detsim/  
prodgenie\_nue\_dune10kt\_workspace/
- nutau sample: numu->nutau, numubar->nutaubar, nue->numu, nuebar->numubar
  - /pnfs/lbne/persistent/users/tjyang/v04\_16\_00/detsim/  
prodgenie\_nutau\_dune10kt\_workspace/
- All samples are detector simulated samples.



$$\nu_{\mu} (1.6 \text{ GeV}) + {}^{40}\text{Ar} \rightarrow e^{-} (1.3 \text{ GeV}) + n (10.4 \text{ GeV}) + n (10.5 \text{ GeV}) + X + X$$

# Things to do

---

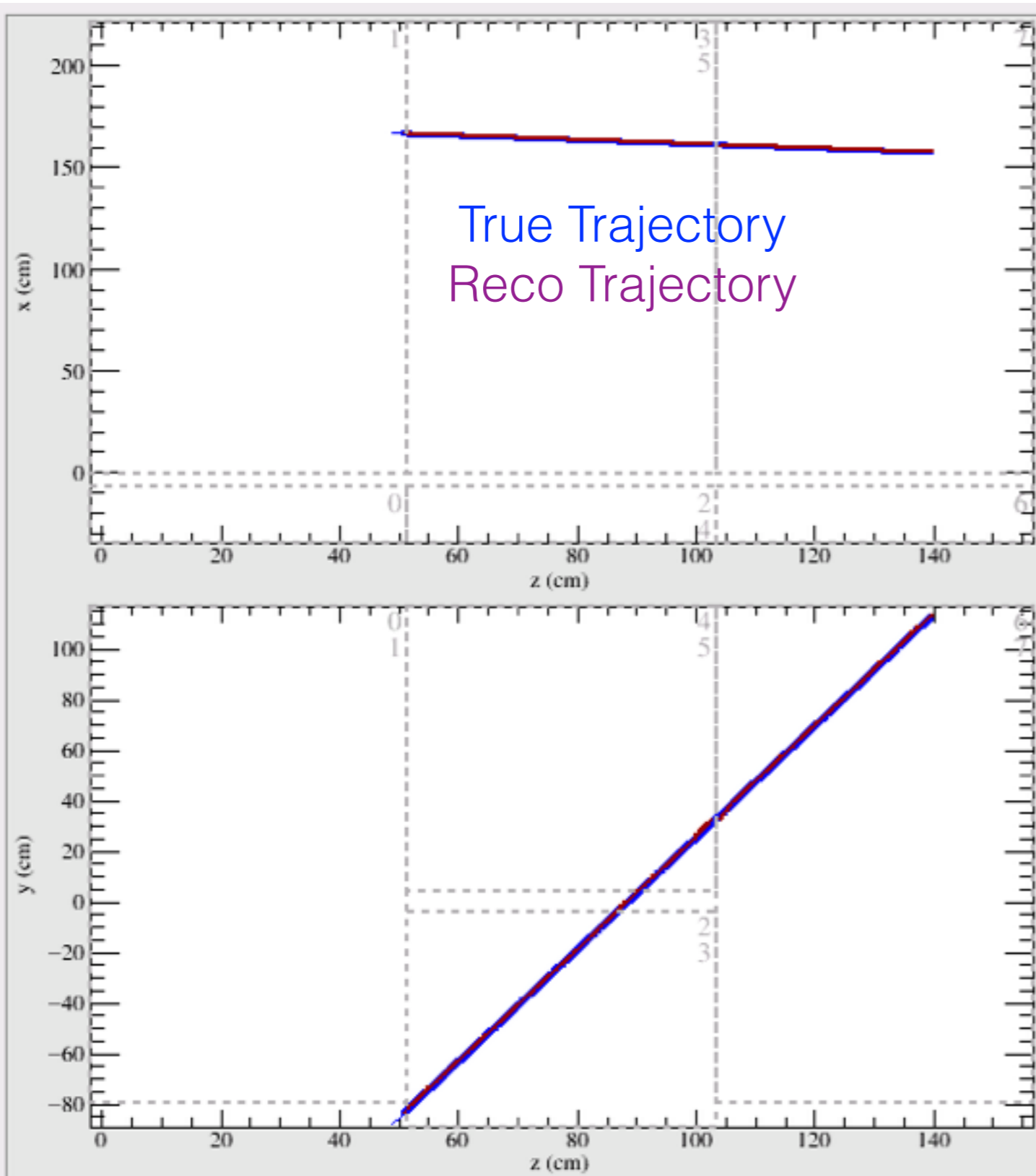
- Use flux ntuples for POT counting and to save more beam related information.
- Start hit/cluster/track/pandora reconstruction.
- Start working on other reconstruction items.
  - Vertex, shower, etc.
- Evaluate reconstruction efficiency.
- Evaluate signal efficiency and background rejection.
- Contributions are welcome.



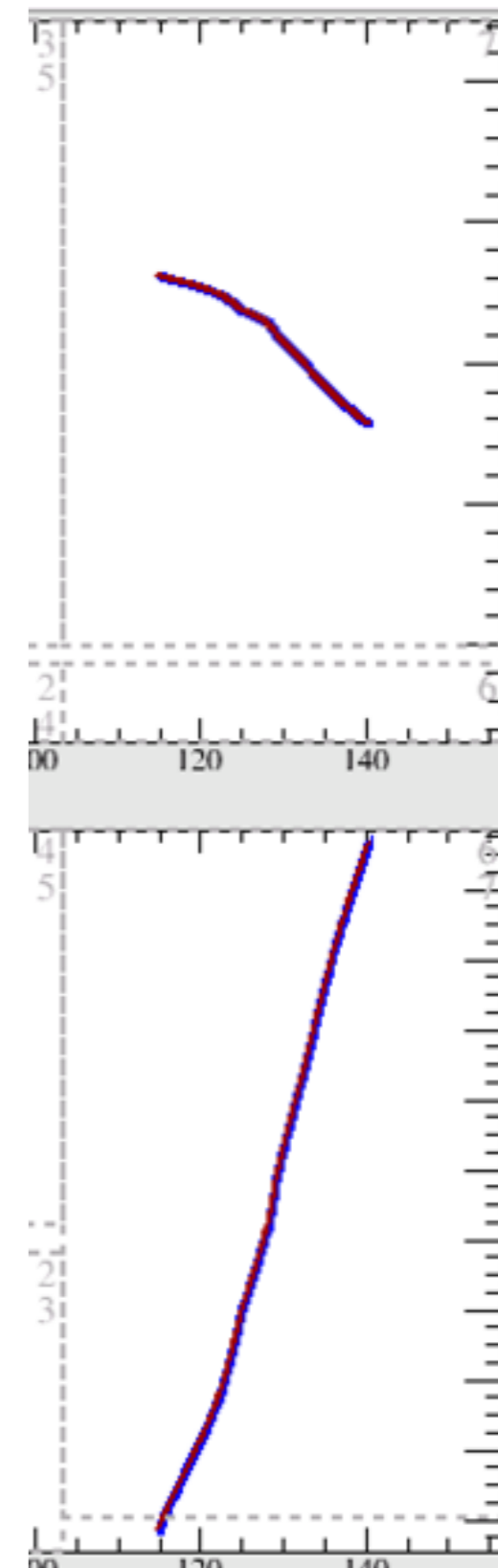
# Projection Matching Algorithm for track 3D reconstruction

---

- Dorota Stephan and Robert Sulej ported the Projection Matching Algorithm (pma) into larsoft:
  - <https://indico.fnal.gov/getFile.py/access?contribId=9&resId=0&materialId=slides&confId=10070>
- It uses ClusterCrawler (LineCluster) as input.
- I have run it on a few MCC 3.0 LSU AntiMuon events and it looks great.

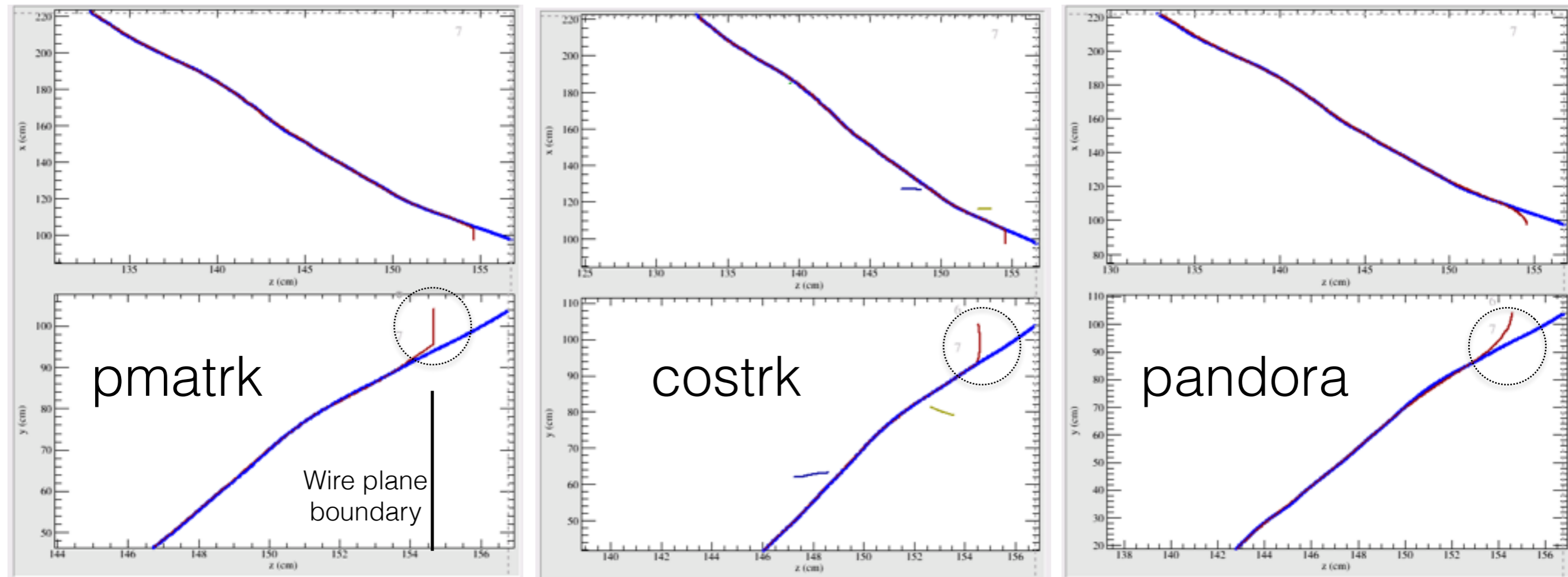


Long track



Curved track

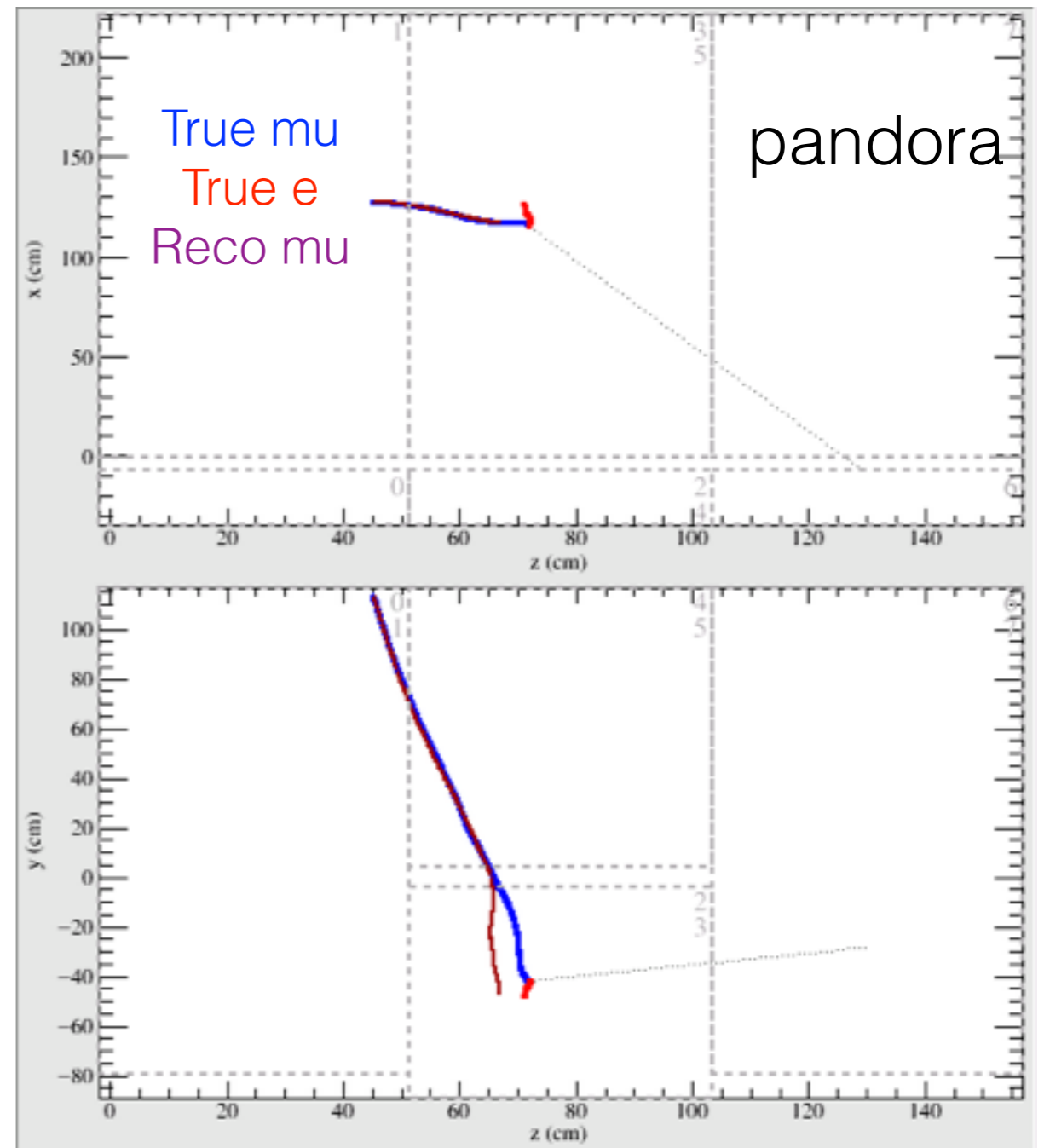
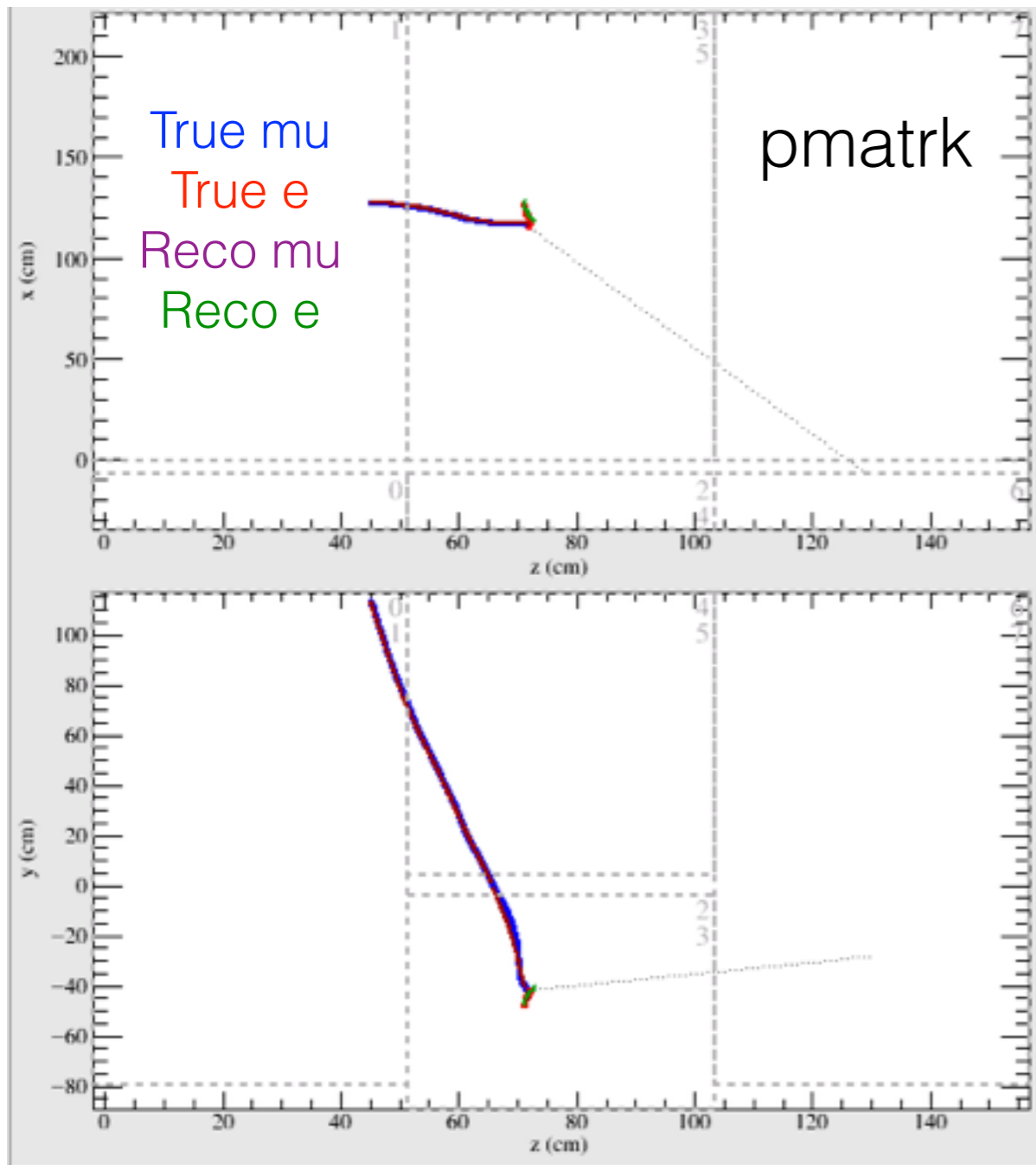
# Exiting track



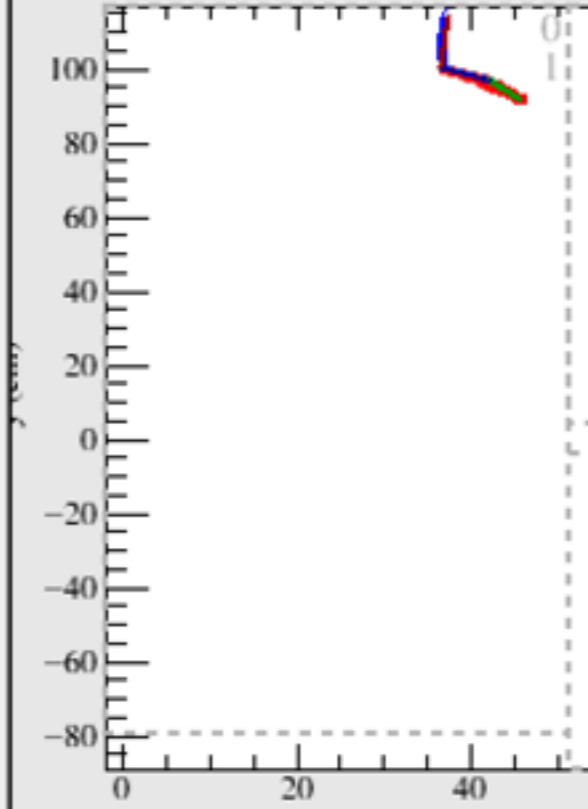
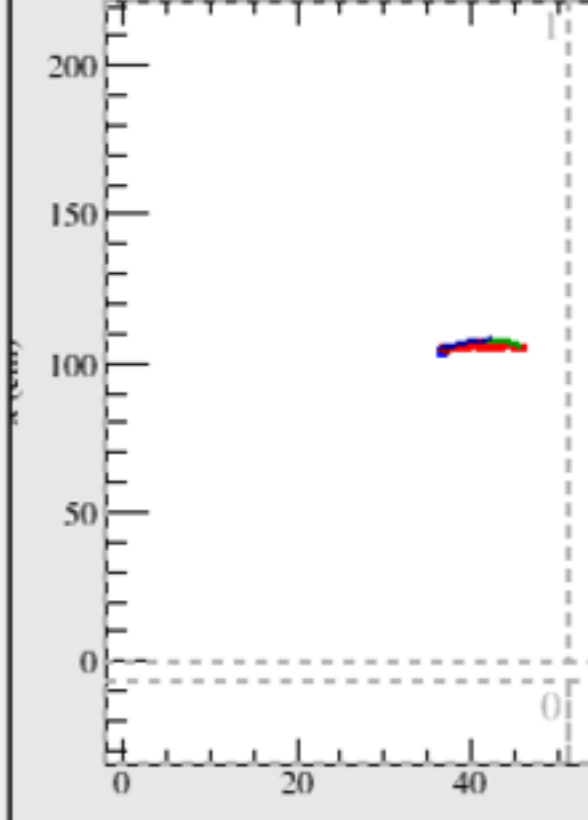
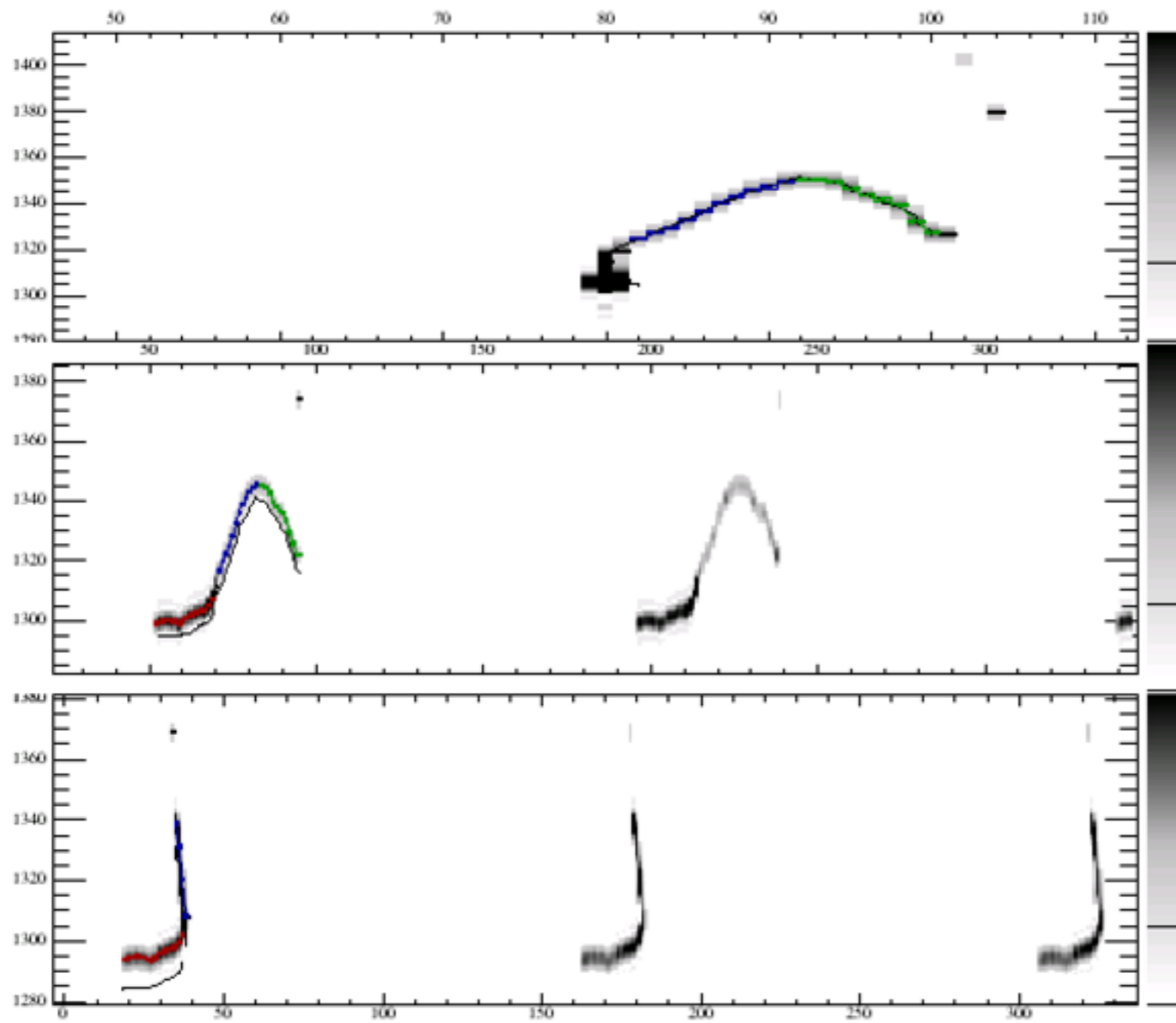
TPC boundary

Muon exits wire planes but the ionization electrons are still put on the nearest wires.

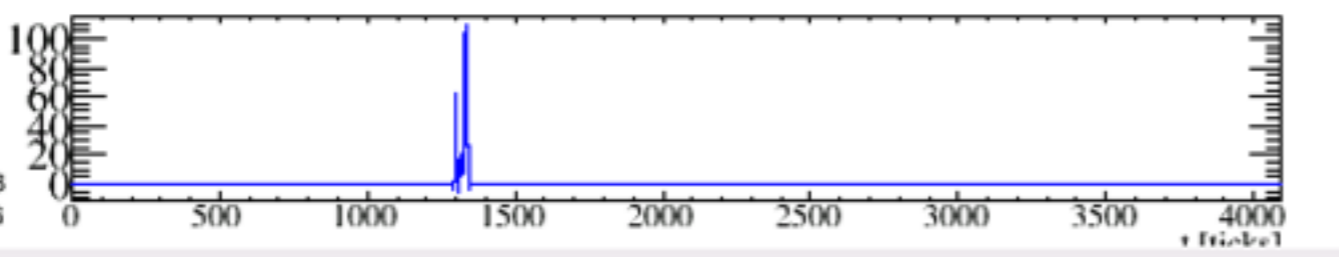
# Muon decay



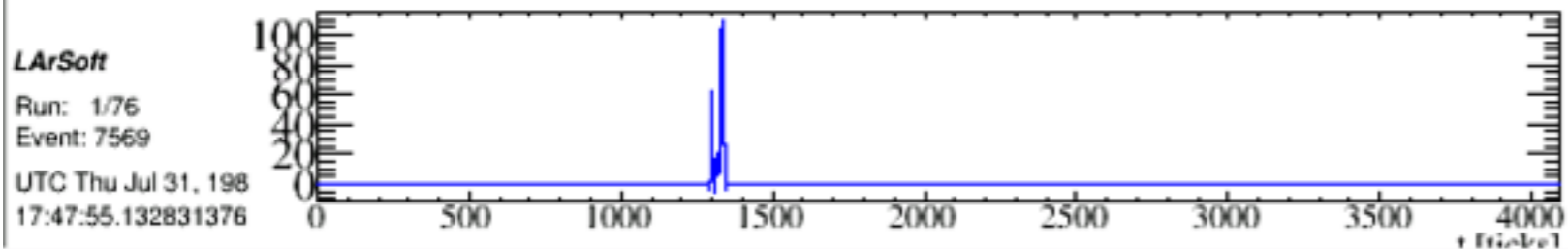
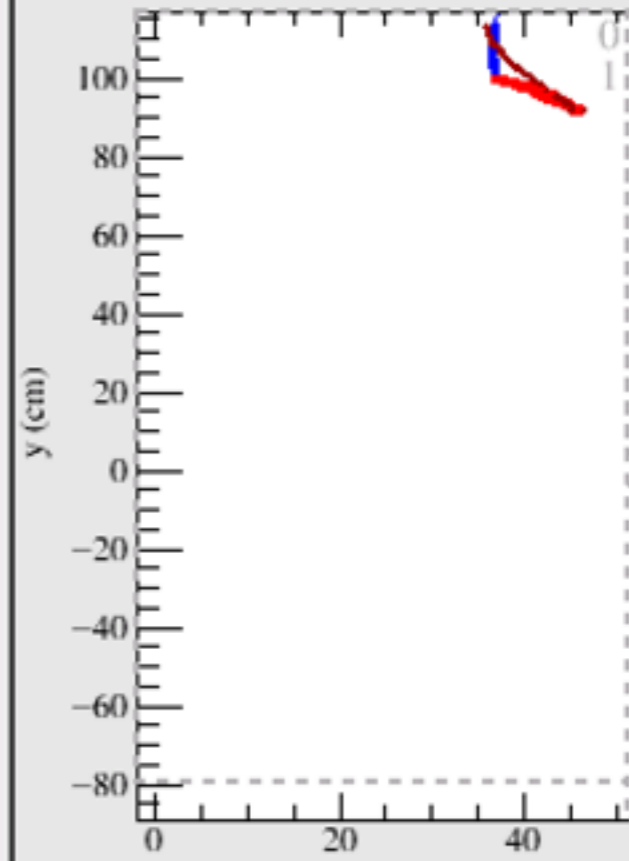
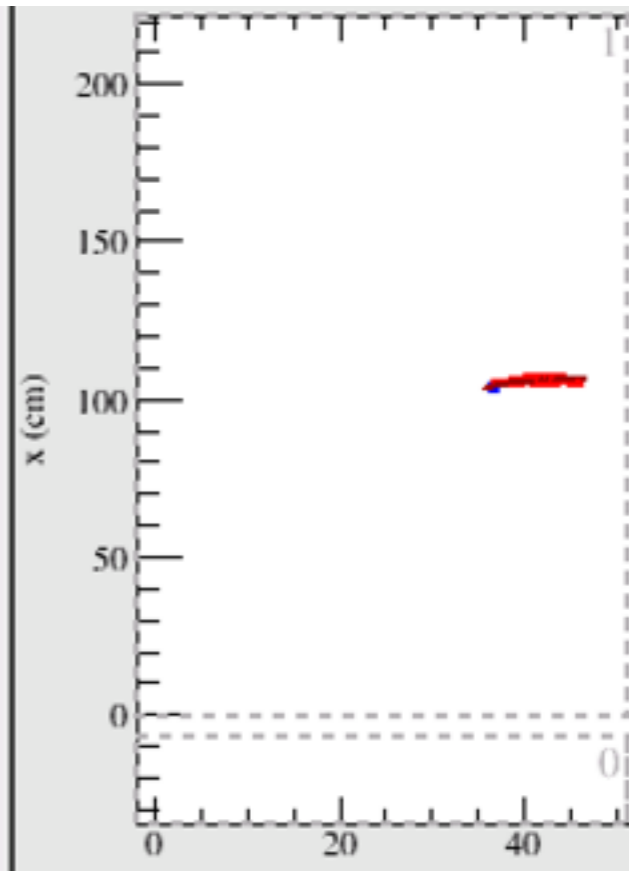
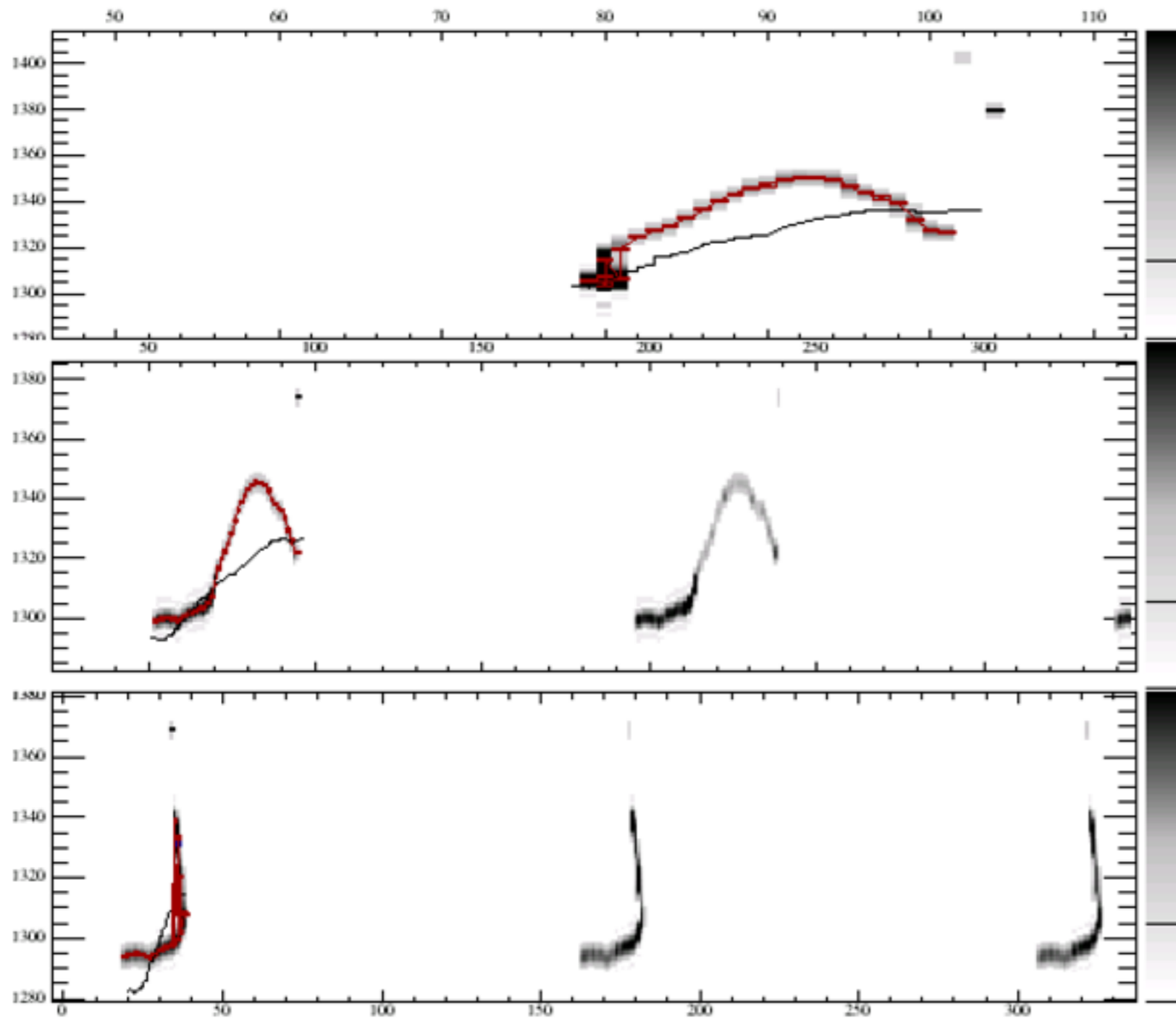
Pandora missed the electron stub.



**LArSoft**  
 Run: 1/76  
 Event: 7569  
 UTC Thu Jul 31, 198  
 17:47:55.132831376



pmatrk



Pandora