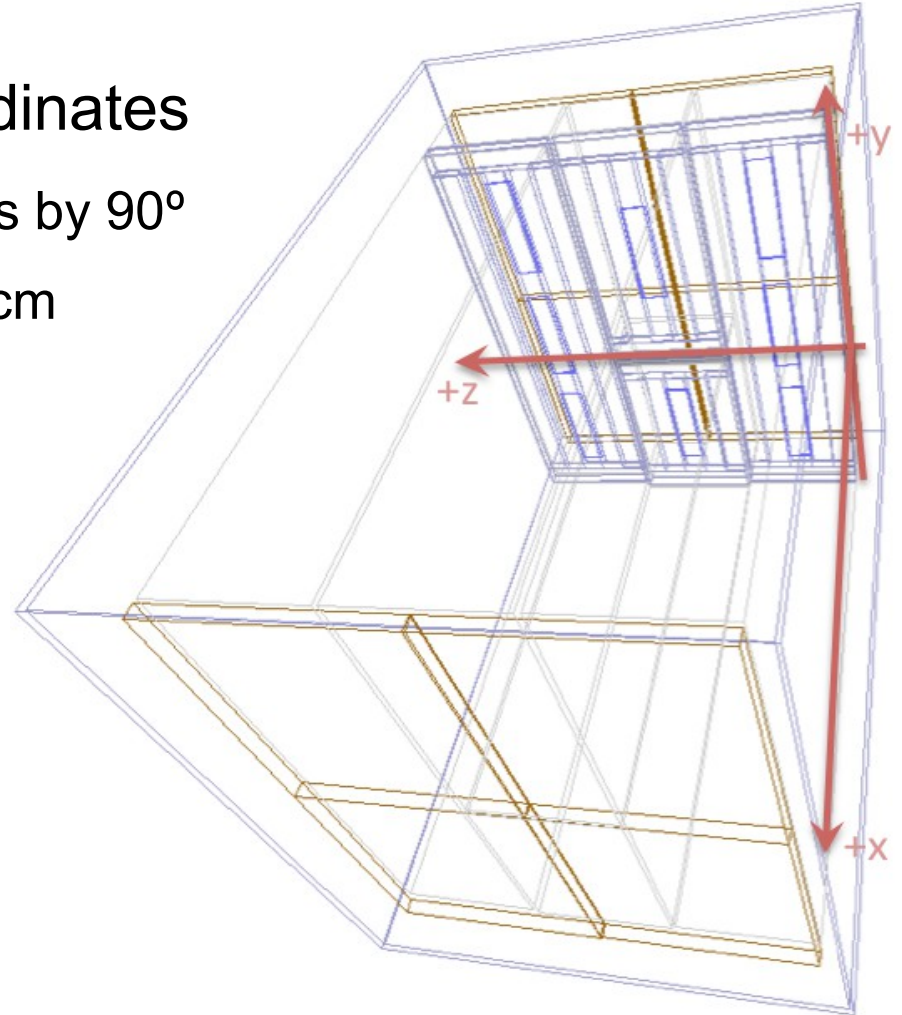


# Getting started with LArSoft

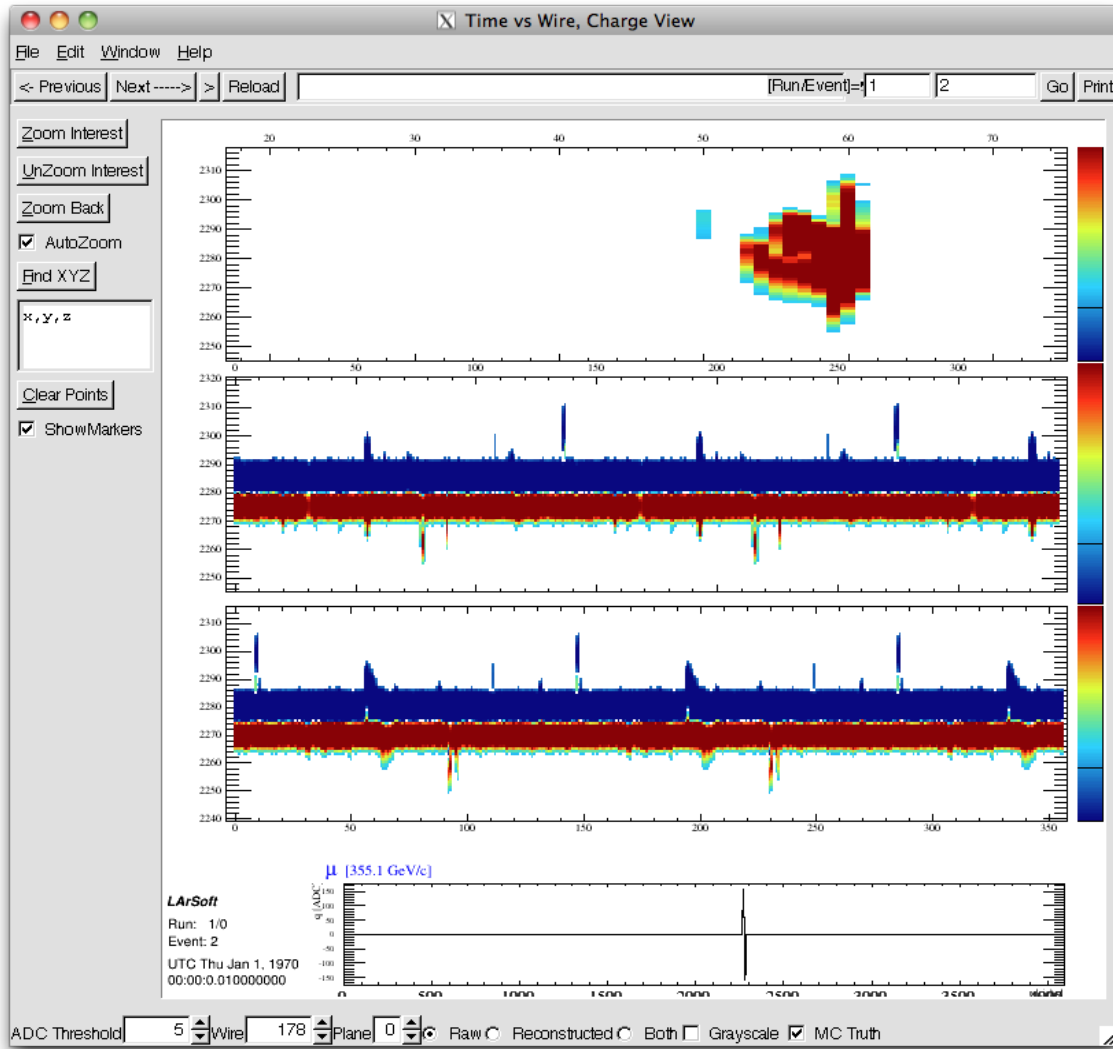
- Generating muons
- Standard event display
- RawevtDisplay
- Occupancy plots

# Generating muons

- The simulation coordinates are different from the physical coordinates
  - Rotated around the physical x-axis by  $90^\circ$
  - Origin offset by (+50, +10, +100) cm
- Initial particle momentum always along +z-axis
  - Particle gun: specify initial (x,y,z) and two rotations to define direction
- 2 output files:  
<file>\_gen.root and  
<file>\_hist.root

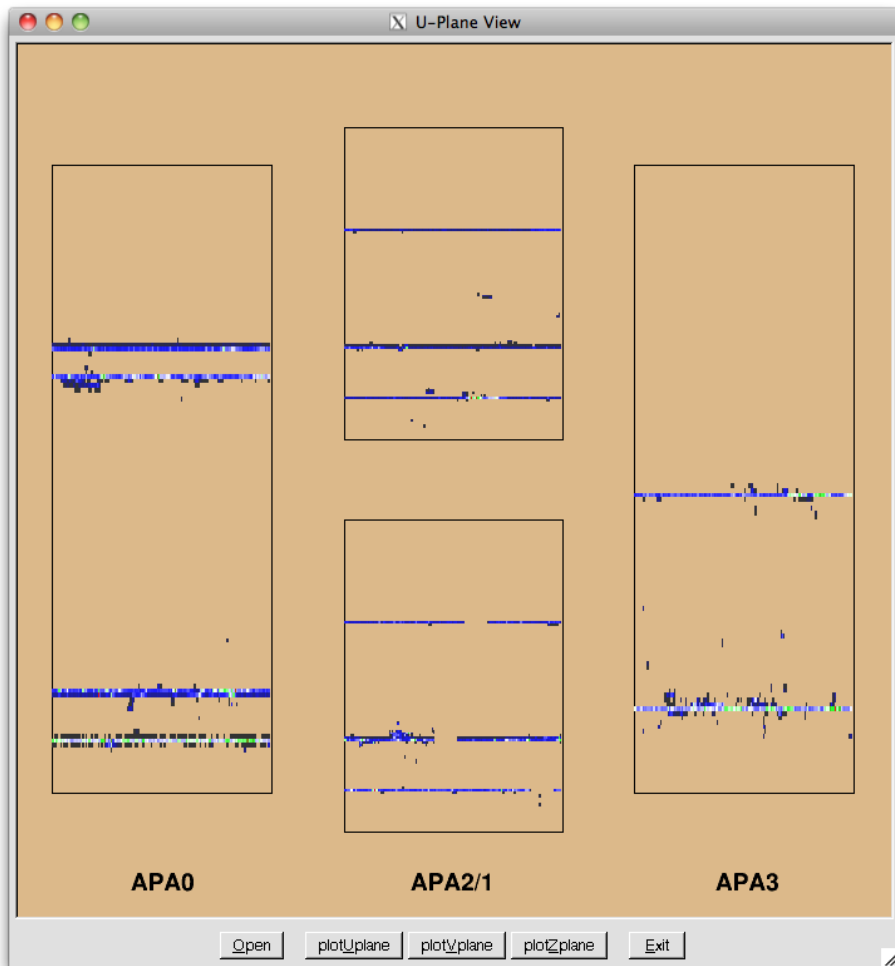


# Standard event display



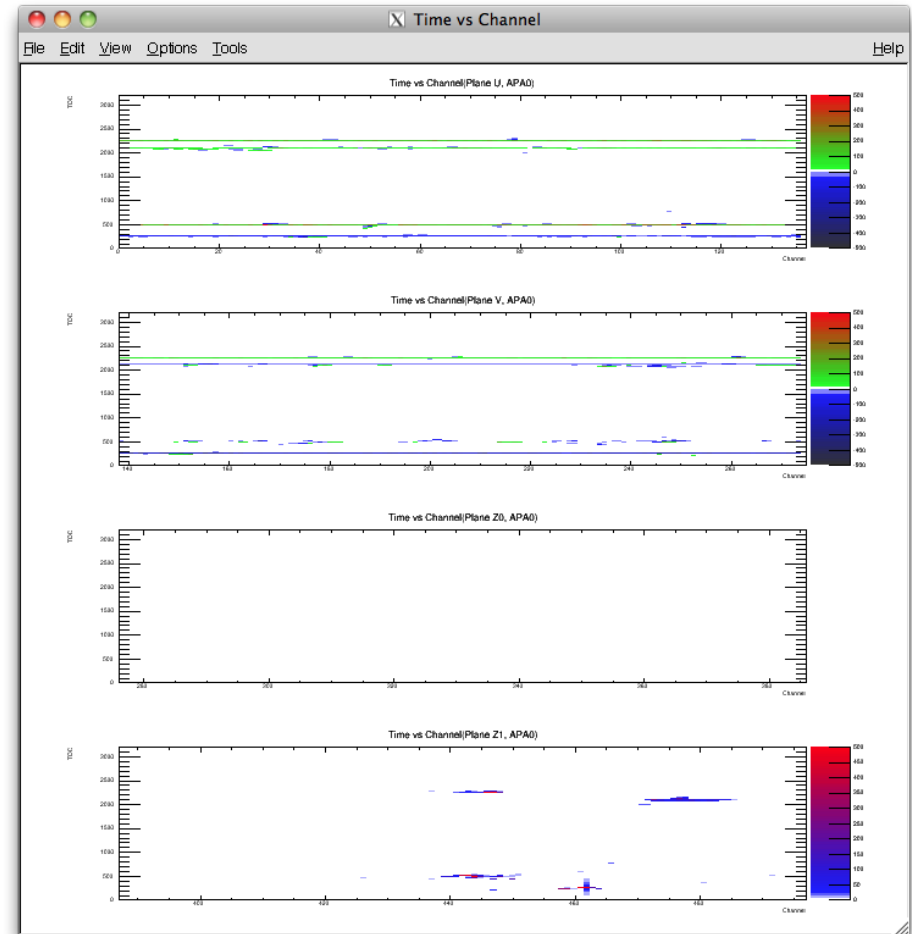
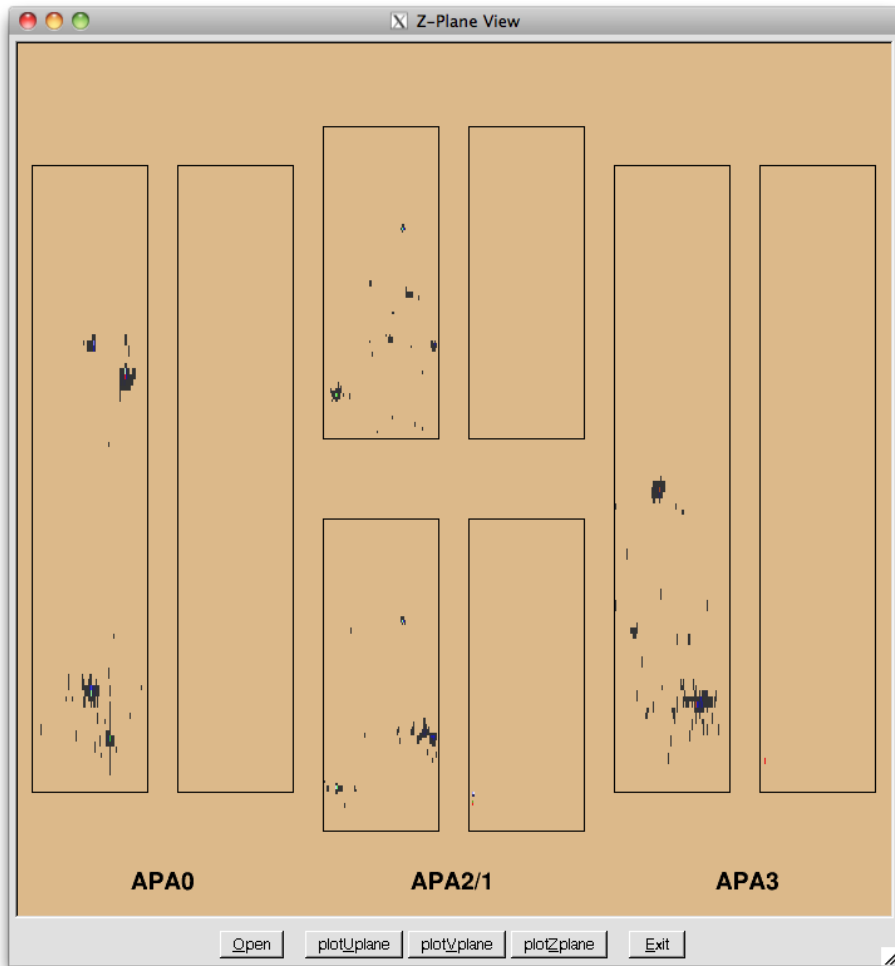
- Execute in larsoft
  - Uses a control file: `evd_lbne35t.fcl`
  - And reads in the generated data file: `<file>_gen.root`
- Only using it to scan a few events
  - Crashes if you try to do much else

# RawevtDisplay

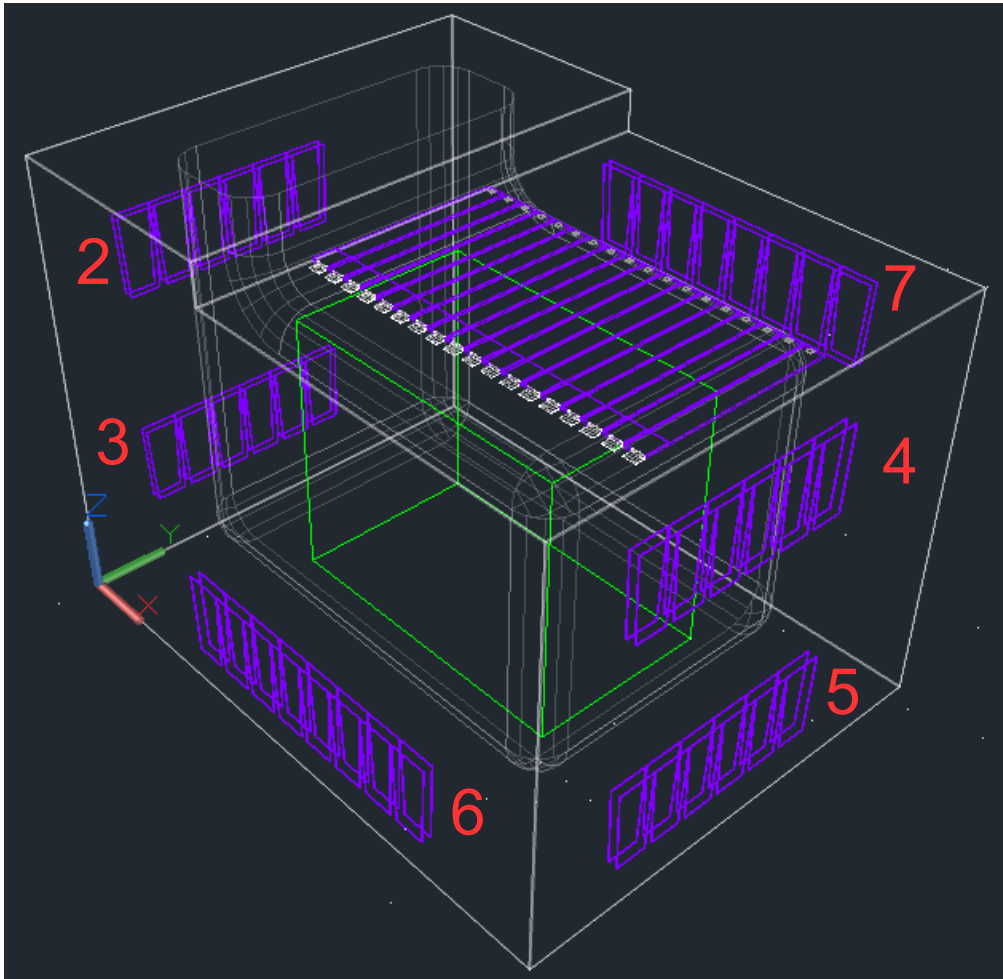


- Written by Seongtae Park
  - Part of lbnecode (in subdir RawevtDisplay)
- Execute LarSoft on `<file>_gen.root`
  - Control file: rawevt35t.fcl
  - Produces a new root file with 2D time vs channel histograms
- Then launch the GUI
  - `root -x RawEVD35t.C++`
  - Reads in 2D histos from the first step and displays them

# RawevtDisplay



# Muon counter triggers

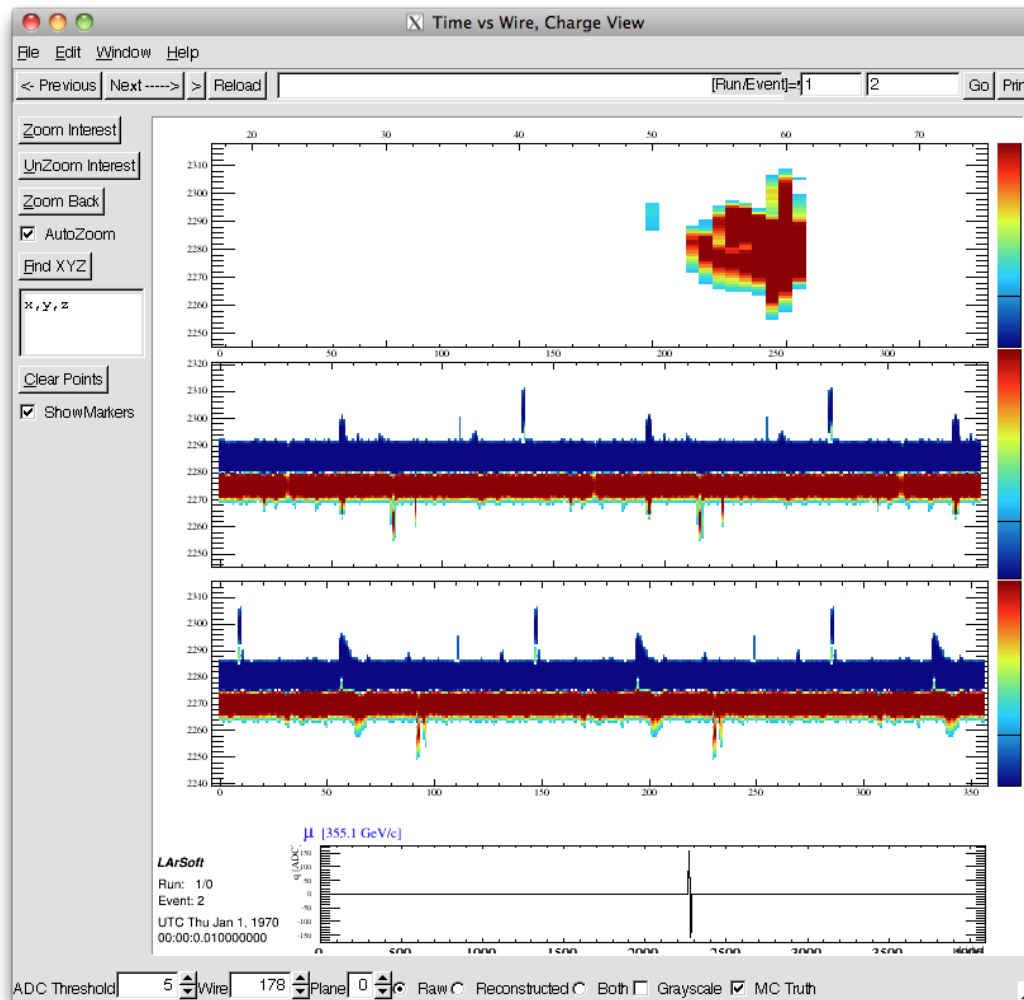


- Trigger 1
  - Muon telescope (top)
    - Muon counters are in exclusive OR at each level
- Trigger 2: 2 and 5
  - Triggers 2-4 muon counters are in normal OR within each group
- Trigger 3: 3 and 4
- Trigger 4: 6 and 7

# Occupancy plots

- Goal: look for dead channels
- Select a group of events in which all channels should be hit
  - As uniform as possible
- Plot 1D histograms of channel occupancy
- Look for gaps
  - Can we do this with muons?

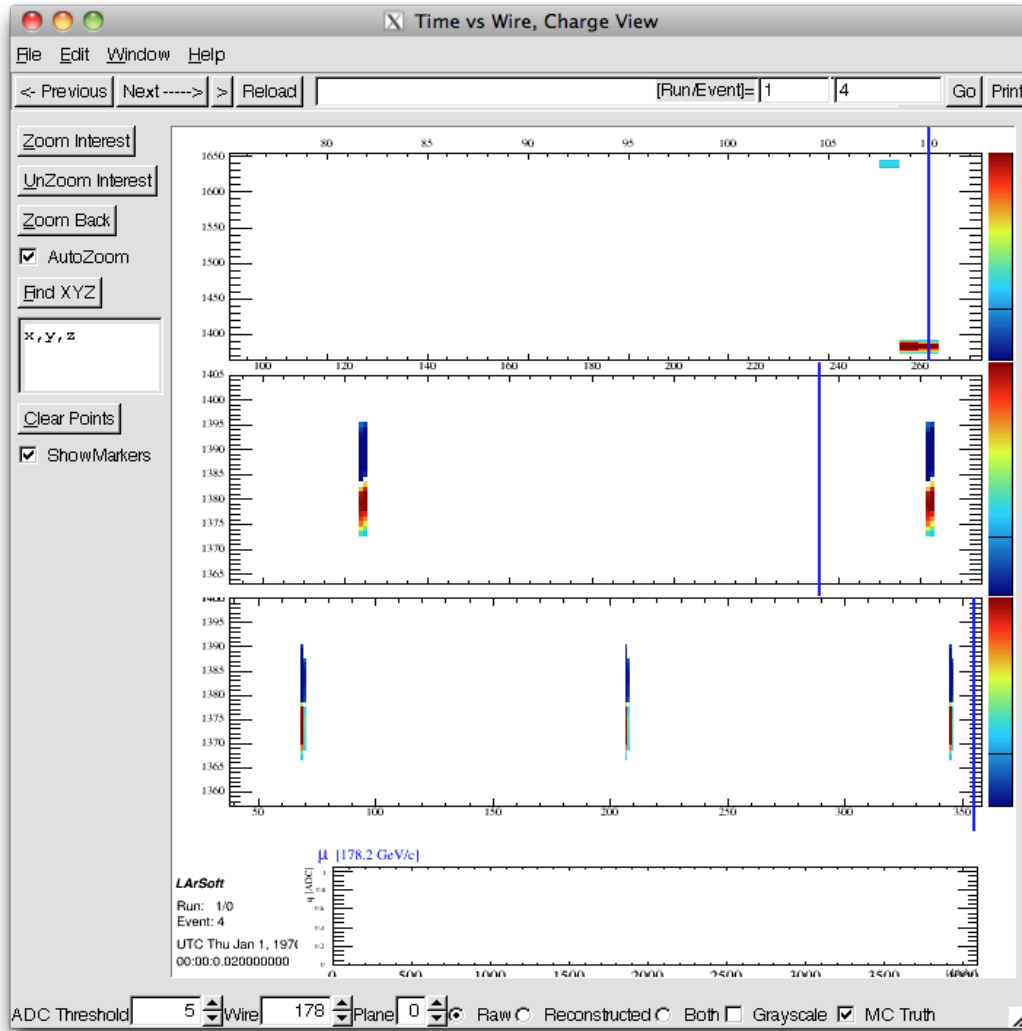
# Trigger 1: vertical-ish muons



- Few z-plane channels hit
- Almost all u- and v-plane channels hit
  - Can get fairly uniform occupancy plots with a small muon sample
- Can almost certainly get vertical muons in the large drift chamber
  - Can we select vertical muons in the small drift chamber with the telescope?



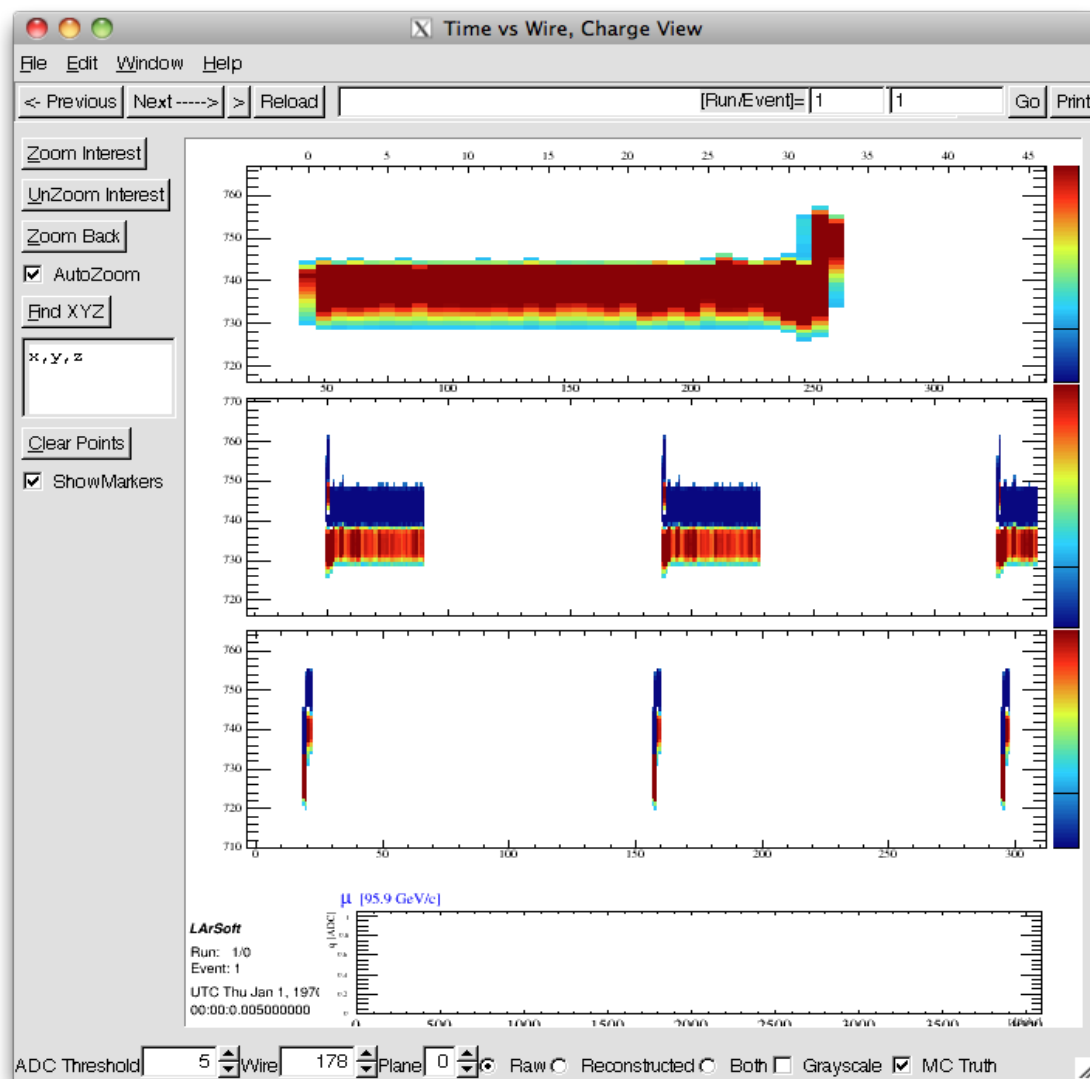
# Triggers 2 and 3



- Muons traversing the drift axis (x) of the detector
  - Slight angle of  $\sim 20^\circ$  going from low-to-high
- Hits in a few channels of each wire plane
  - Should have hits in the small drift chamber
  - Have to build up occupancy plots with a lot of counter triggers

# Trigger 4

- Muons roughly perpendicular (in y-z plane) to the drift axis
  - $\sim 30^\circ$  angle from the z-axis
- Many z-plane channels are hit
  - Some of u- and v-
  - Fairly uniform z wire occupancy plots from a small muon sample
- Not sure if this trigger will get many hits in the small drift chamber



# Conclusions

- Seems like good event sample to get channel occupancy plots with muons is some combination of triggers 1 and 4
- Next steps
  - Generate more statistics for each trigger
  - Write some simple 1D channel histograms
  - Figure out how to knock out channels in the simulation
  - Study how to find dead channels