

# Various LarSoft items of interest

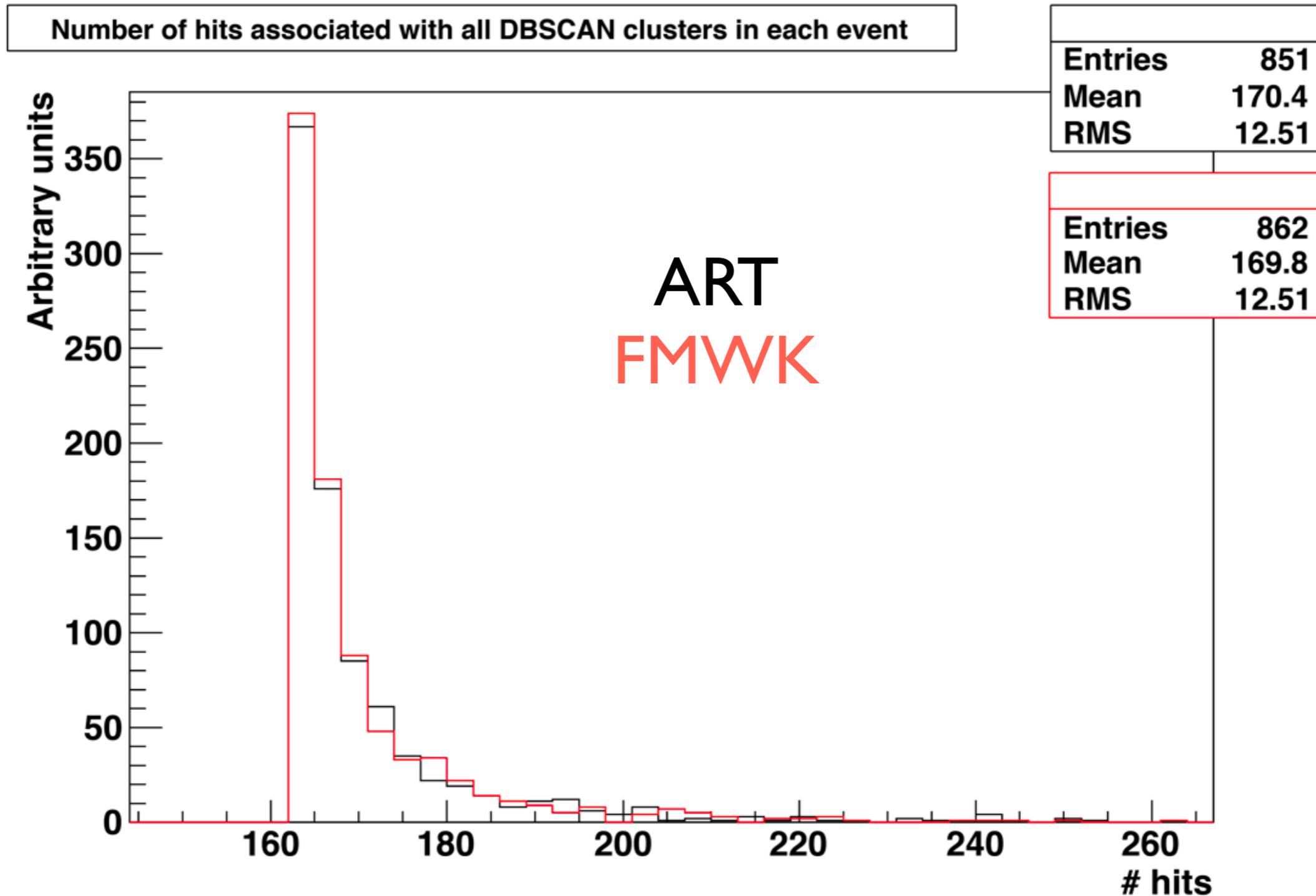
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11/11/2010

# HoughLineFinder and VertexFinder in ART

- The HoughLineFinder, HoughLineFinderAna, HarrisVertexFinder, and VertexMatch modules have been successfully ported to ART. Thanks to Eric Church for a lot of help on this!
- A few non-port-related bugs have been fixed in the meantime! It is always useful to revisit pieces of code in an analytical way.

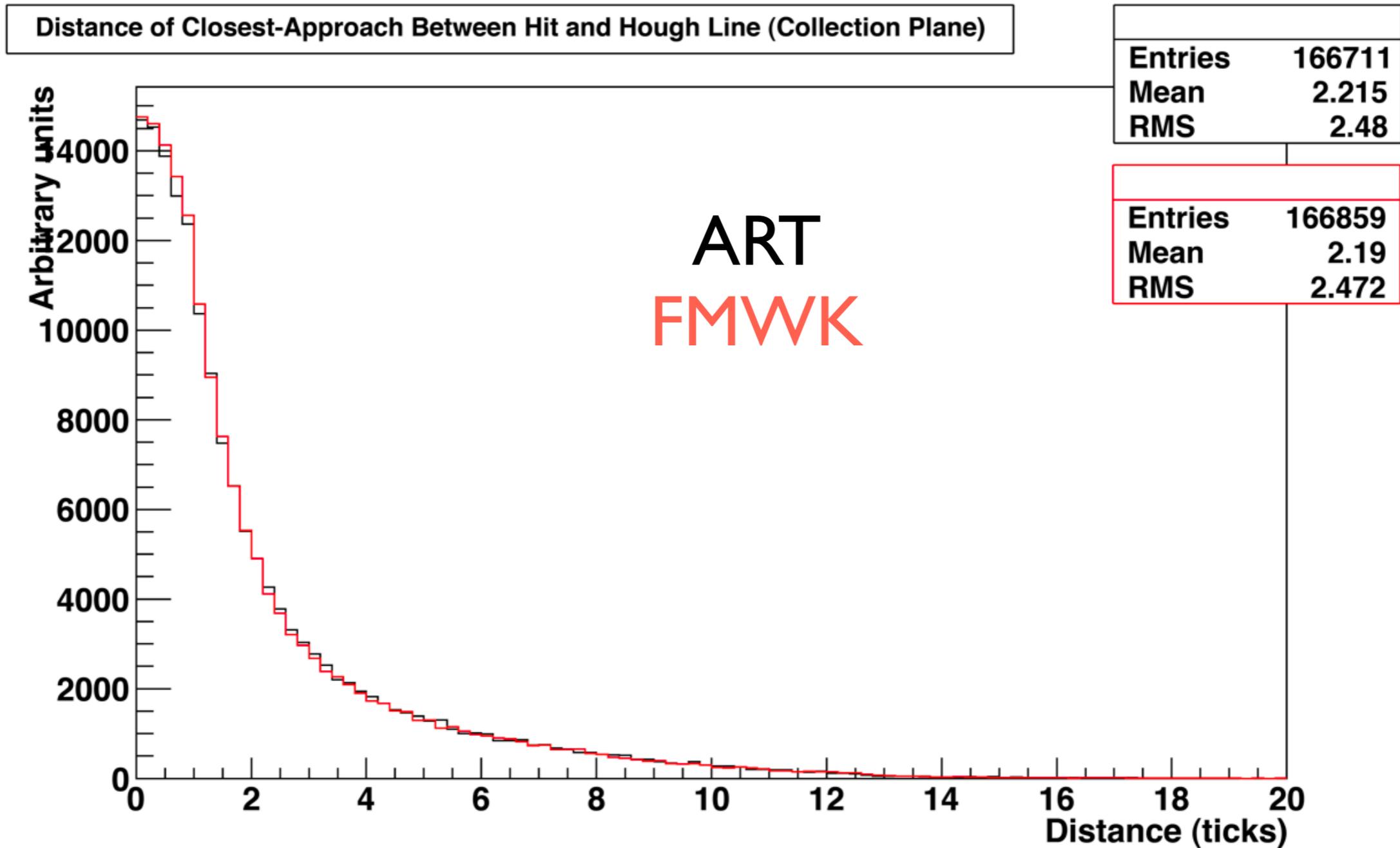
**A few ART-FMWK simulation-  
based comparison plots**

# Simulated 6.0 GeV/c horizontal muons



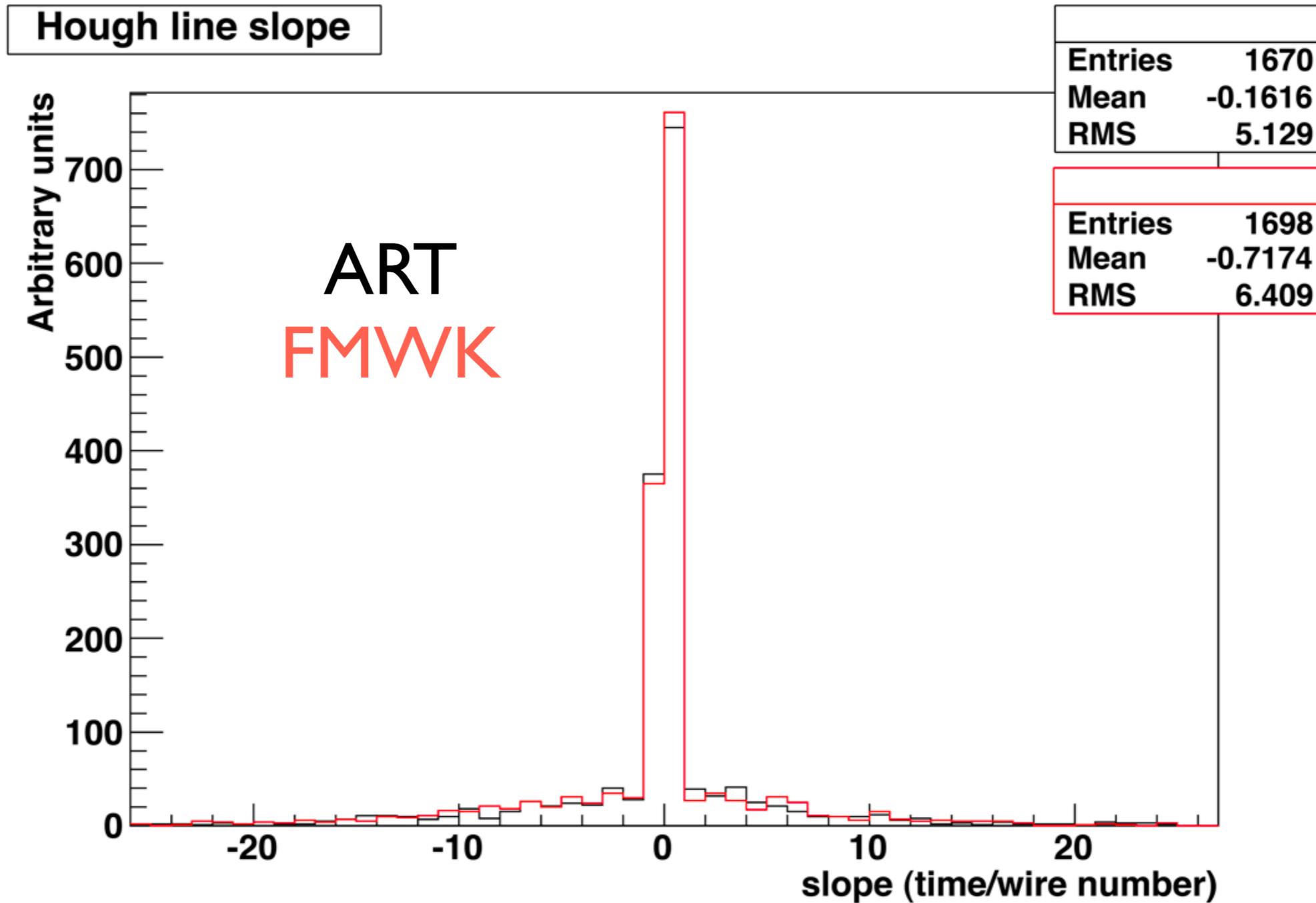
(collection plane)

# Simulated 6.0 GeV/c horizontal muons



(collection plane)

# Simulated 6.0 GeV/c horizontal muons



(collection plane)

**Hand scan update  
(related to LArSoft)**

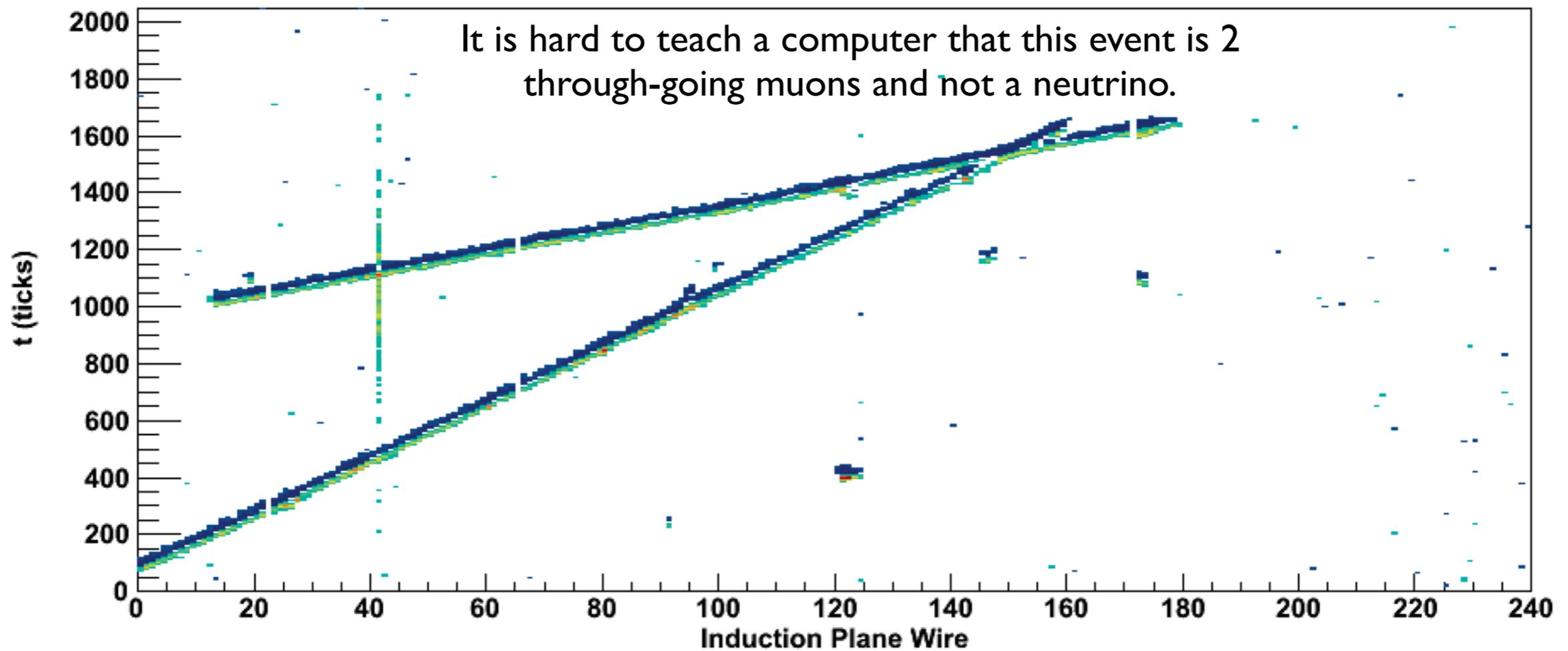
# Intro.

- ArgoNeuT took approximately  $\sim 480,000$  beam spills in the two weeks of neutrino-mode running.
- A software filter has been developed by Brian Page to weed out the empty beam spills and many through-going muons, leaving about  $\sim 2\text{-}3\%$  of the total ( $\sim 10,000\text{-}15,000$ ) to be analyzed by humans.
- $\sim 99\%$  of neutrino events are left over after the filtering.
- The hand scan involves looking at each (wire, time) event in both planes separately and characterizing the event.
- ArgoNeuT has begun its neutrino-mode “hand scan”.

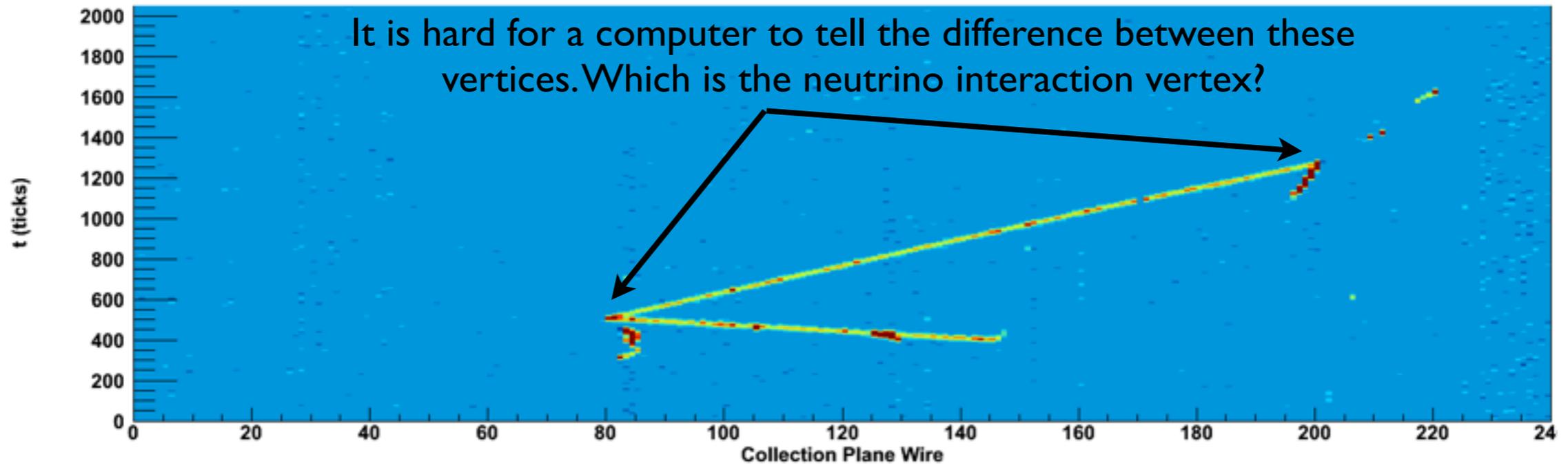
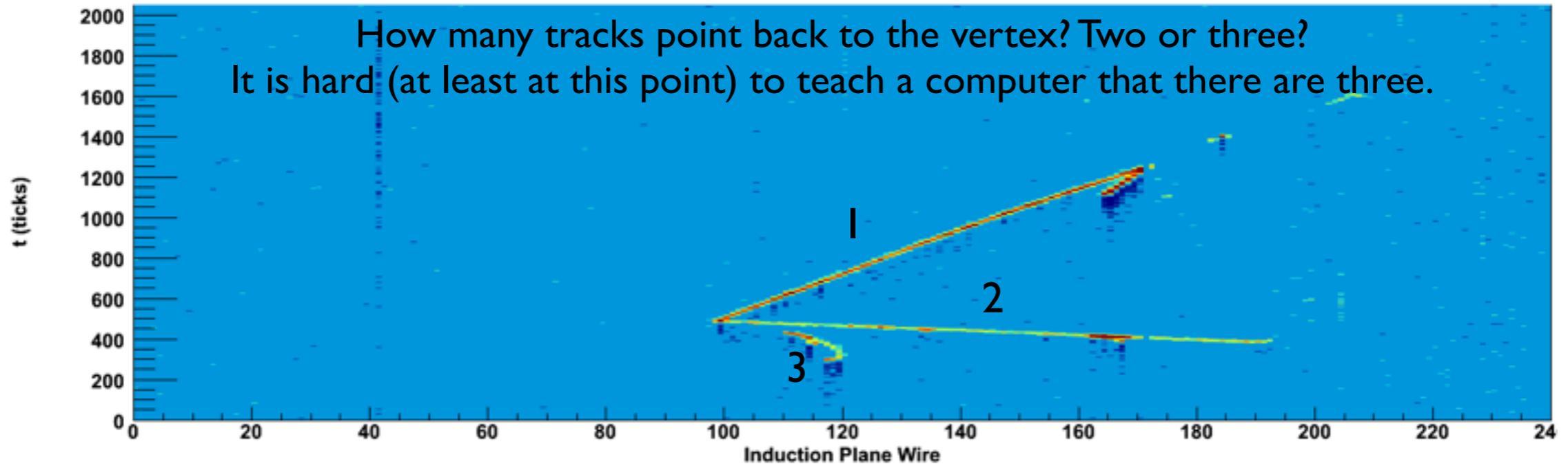
# Intro. cont'd.

- The purpose of the hand scan is to isolate a sample of neutrino events to make the downstream reconstruction processes more efficient/accurate and to provide information about the events themselves.
- A human can often be better than a computer algorithm at figuring out if an event is neutrino-induced or not, especially in the case of 3D imaging LArTPCs.
- A human can also be better at determining the number of tracks/showers in the event and the primary event vertex position.
- Taking advantage of human intelligence on a small sample of events provides a means to measure efficiency/accuracy of software and can provide helpful insight in writing pattern recognition and characterization algorithms. Also, it can speed up analysis!
- A hand-scan on a small sample of data could be very useful to MicroBooNE, LAR20, etc. as well.

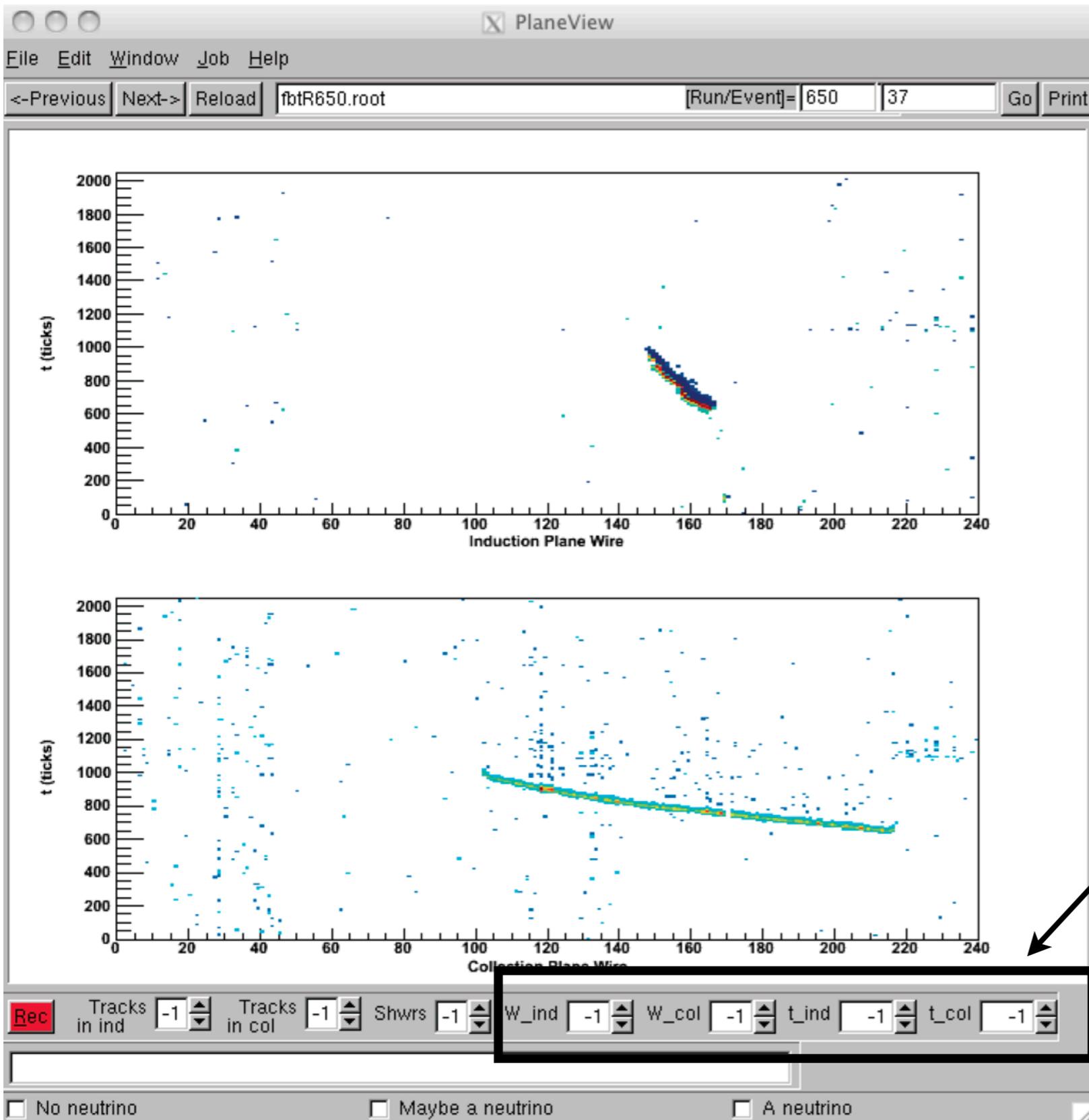
# An example



# An example



# The hand scan widget

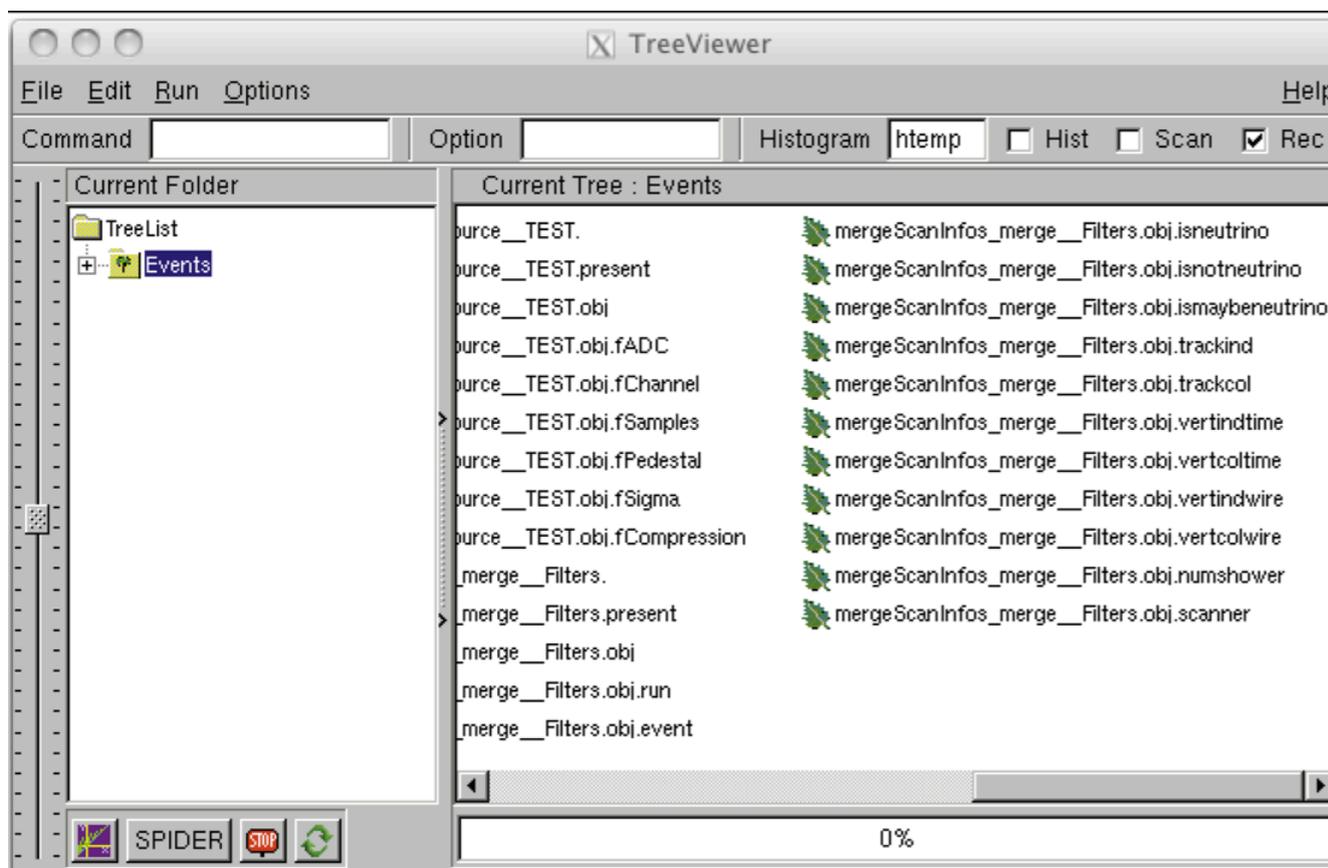


- Hand scan is now quite fast!
- Clicking on both wire planes in succession can tell if the 2D points you clicked on correspond to a 3D point on a detector boundary.
- Vertex is clickable. In other words, these values are filled in automatically when you hold shift and left click.

**MergeScan, ScanInfo, and ScanFilter**

# MergeScan and ScanInfo

- The MergeScan class and ScanInfo base class are used to merge the results of a hand scan with the event record.
- The module takes the .txt output from the scanner results and appends it to the event record.
- Downstream reconstruction algorithms can now consider the results of the hand scan in their analyses.



The event record in ART  
(now with clickable/  
plotable variables!)

# ScanFilter

- ScanFilter is an event filter (in the Filters package) that is based on hand scan results.
- The ScanFilter tells downstream reconstruction algorithms to run or not based on the results of the hand scan for the event in question.
- For example, one can specify that “I only want to study neutrino events with 2 tracks and 0 clusters with a vertex in the fiducial volume. Please ignore all other events in this analysis”.