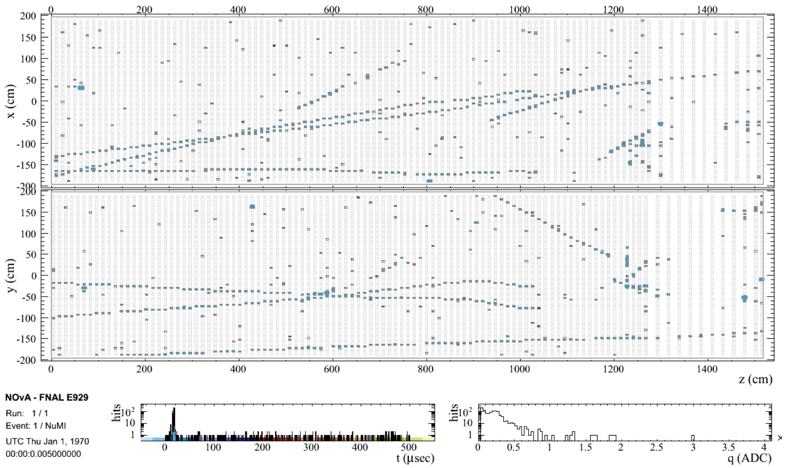
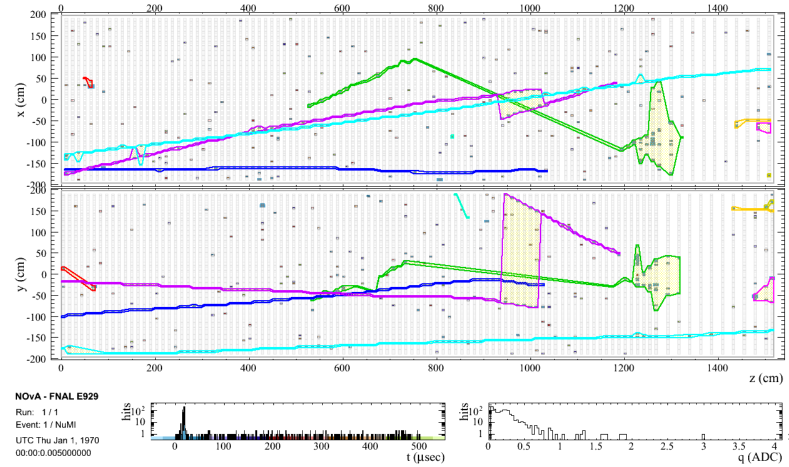
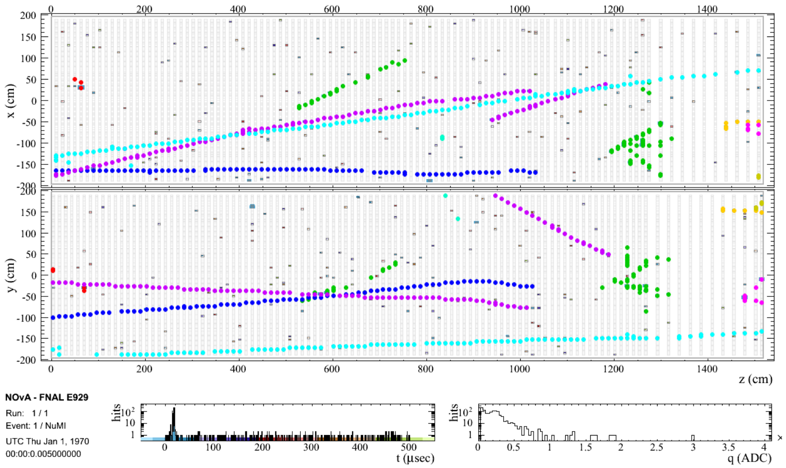
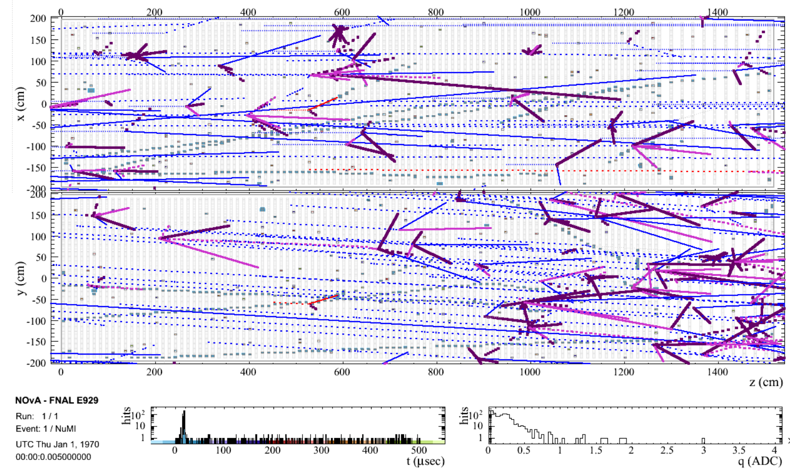
Event Display Tutorial









Michael Baird

NOvASoft Tutorials

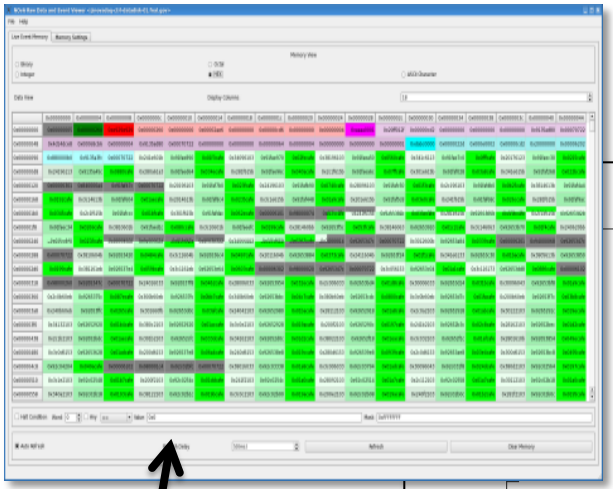
Wednesday – 04/02/14

What is the EVD and why should you use it?

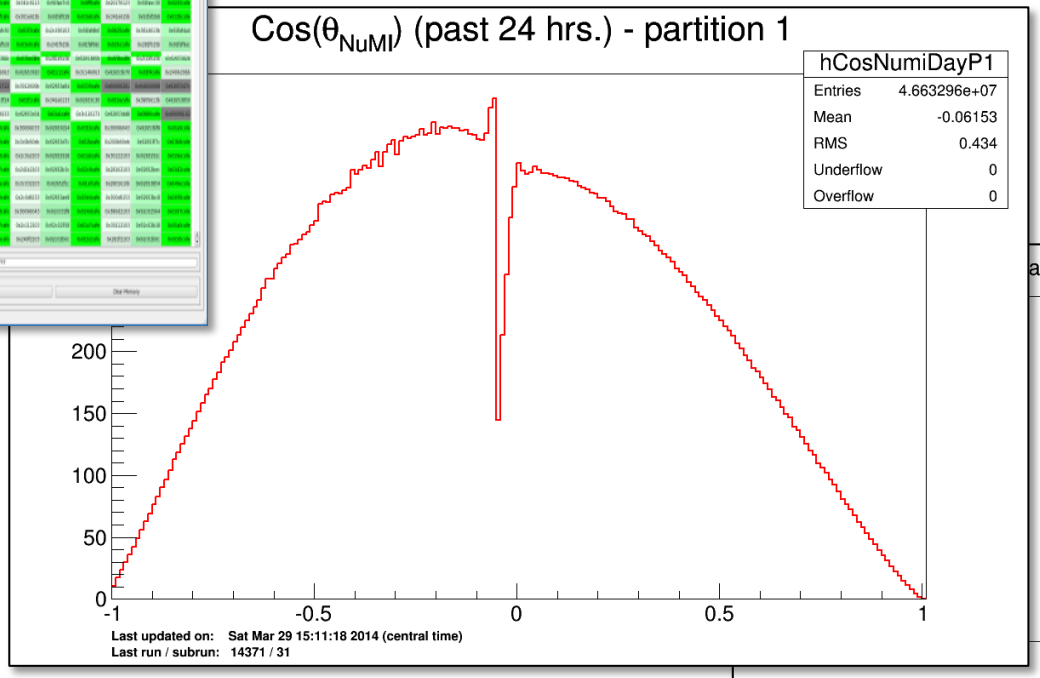
- The event display is a very handy tool for displaying our data events.
- It is a root GUI that is designed to display information arranged in the same way as the physical layout of the detector.
- It lives in the offline world in the packages EventDisplay and EventDisplayBase.
- The event display shows you directly what is really happening in the detector and represents a unique way of looking at the data that can't be seen by simply looking at plots of reconstruction variables.

NOTE: The EVD can do lots of different things, I only have time to show you just a few of the basic features…

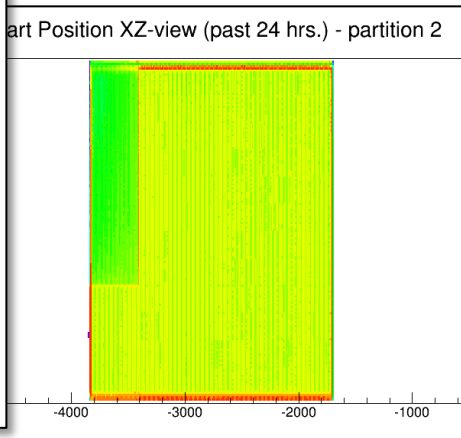
Representing the Data.

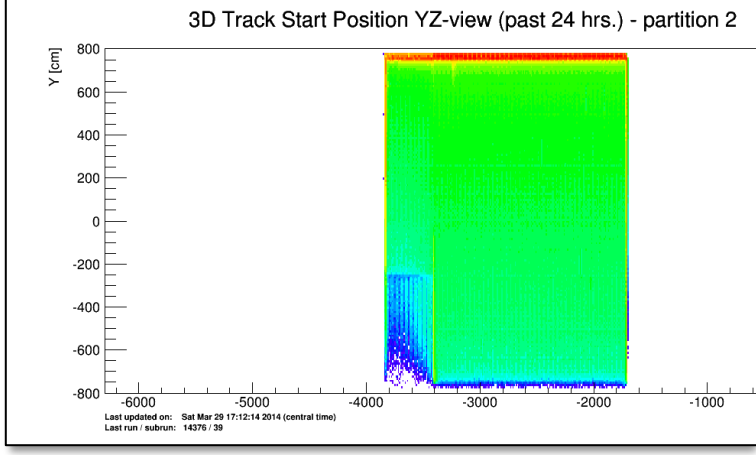


Memory Viewer

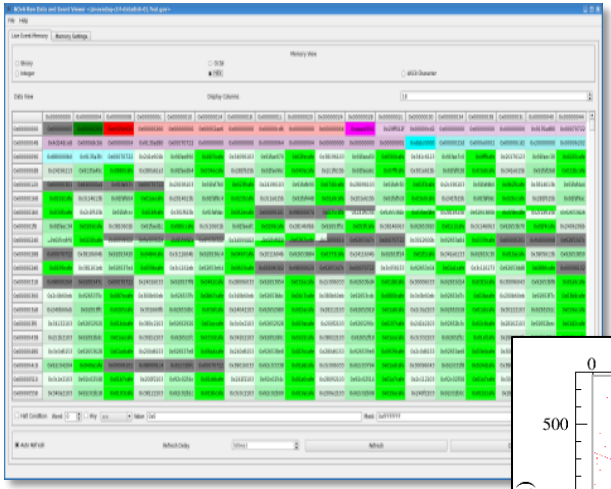


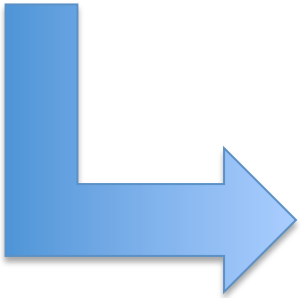
Making reco plots

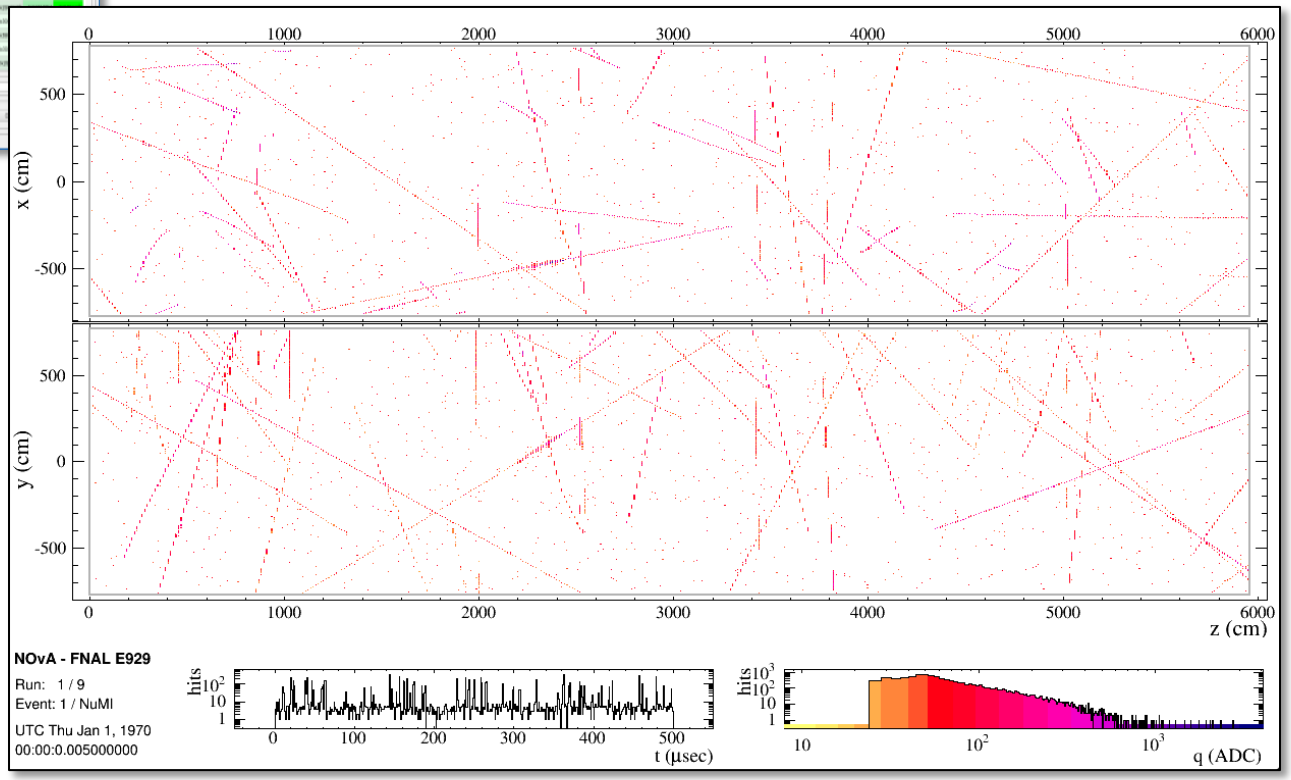




There are many ways to look at the data, in the raw (seen above using the memory viewer), or by making plots out of final reconstruction quantities. BUT this doesn't always give you a feel for what is happening in the detector…







The EVD displays the raw data one event at a time in a graphical form that is understandable to humans.

How do you run it and how can you tell what's in a file?

Running the EVD:

- (set up your offline environment)
- nova –c evd.fcl {/path/filename}.root
- The input file must be a reconstructed data file (not a CAF file) that has been processed at least through daq2rawdigit (i.e. a file that ends in *.root NOT *.raw)

Q: How do you know what data products exist in a file and what modules put them there?

A: Use the *eventdump* module

- nova –c eventdump.fcl {/path/filename}.root

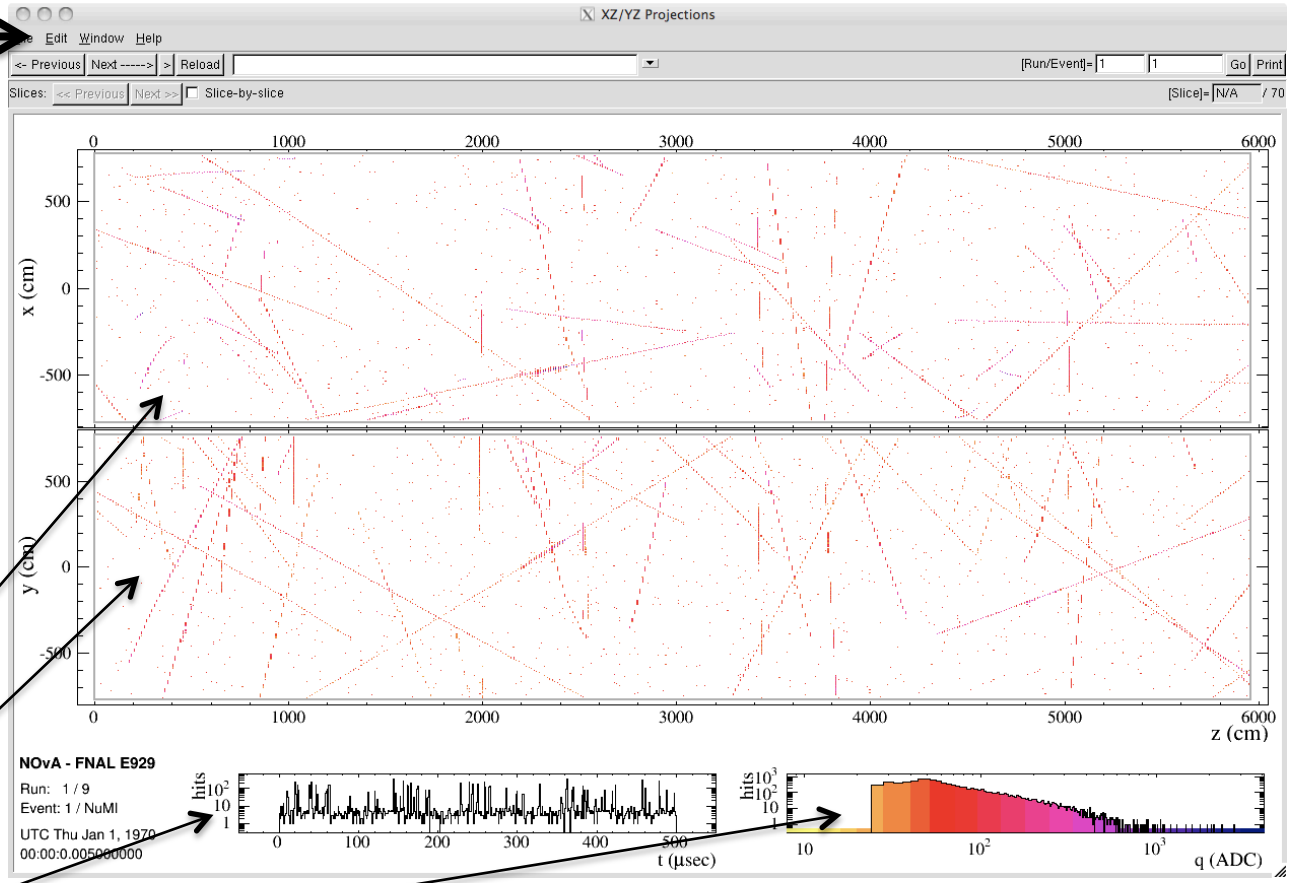
Sample evendump output:

PROCESS NAME | MODULE LABEL..... | PRODUCT INSTANCE NAME | DATA PRODUCT TYPE..... | ..SIZE
CosmicsGen.| generator..... | ..... | std::vector<simb::MCTruth>..... | ...136
Batch..... | discretetrackmerge | ..... | std::vector<rb::Vertex>..... | 36
Batch..... | discretetrack..... | chains..... | std::vector<rb::Track>..... | ..1577
Batch..... | slicer..... | ..... | std::vector<rb::Cluster>..... | 62

Basic EVD layout

To manipulate the drawing options, open the options tabs here:

Edit -> ConfigureDrawing -> RawDrawingOptions



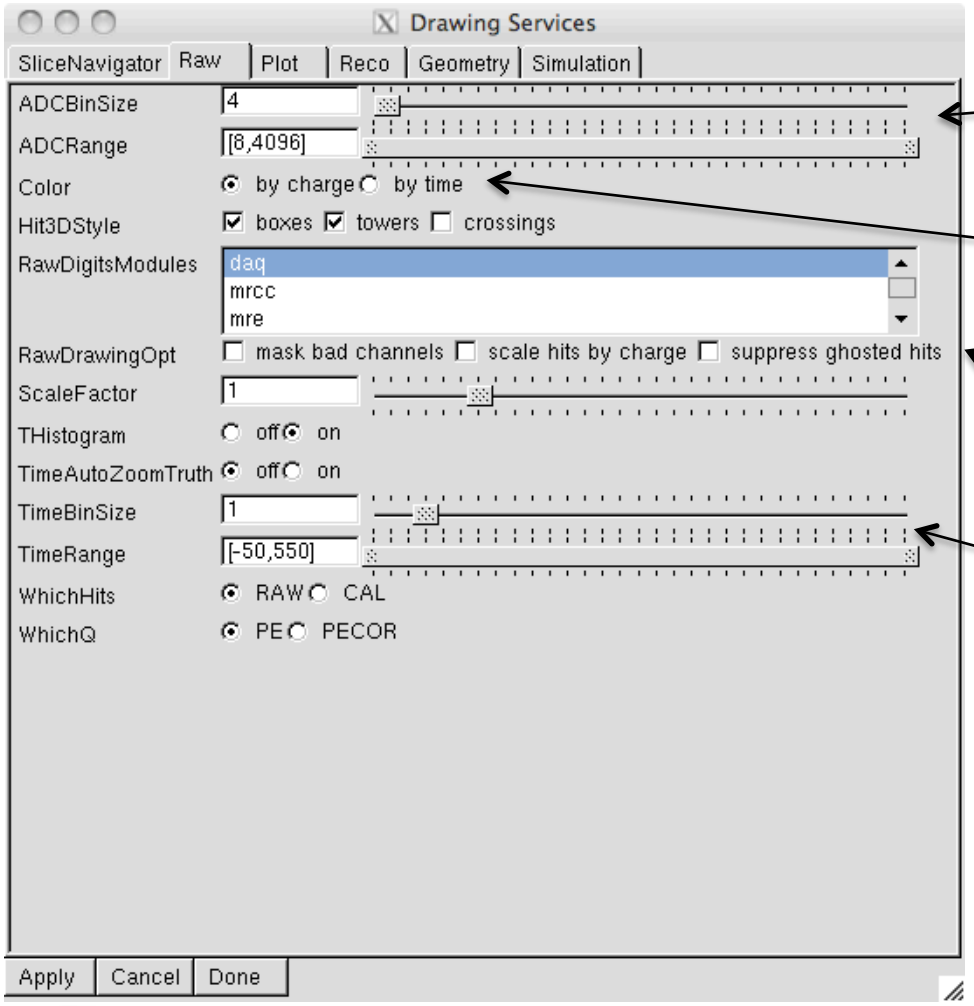
XZ and YZ views of cell hits

Each of these is a root canvas that can be zoomed and manipulated as you would a normal root canvas.

histo showing cell hit times

histo showing cell hit ADC values

Raw Drawing Options



manipulate the ADC histogram binning and/or range

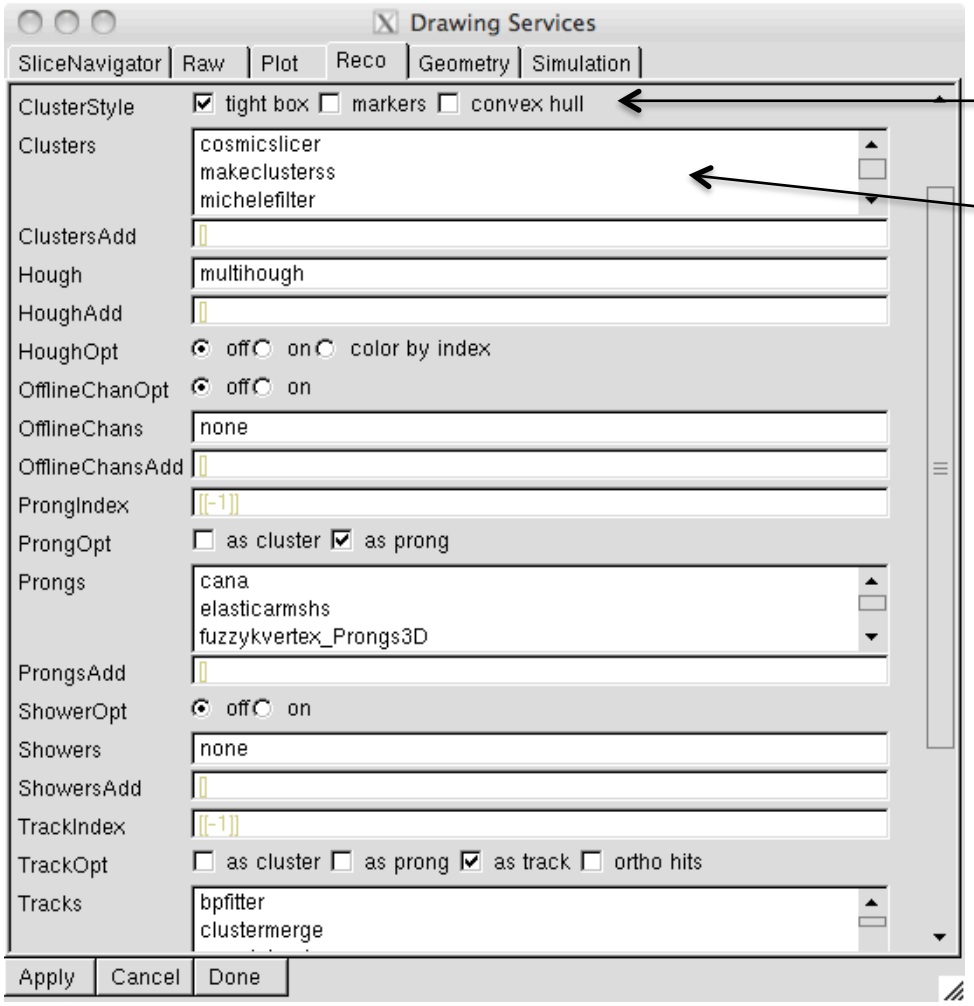
choose to color hits by ADC or by time

choose to not draw all hits

manipulate the time histogram binning and/or range

Press APPLY to use the selected options

Reco Drawing Options



Example for Drawing Clusters:

choose cluster drawing style

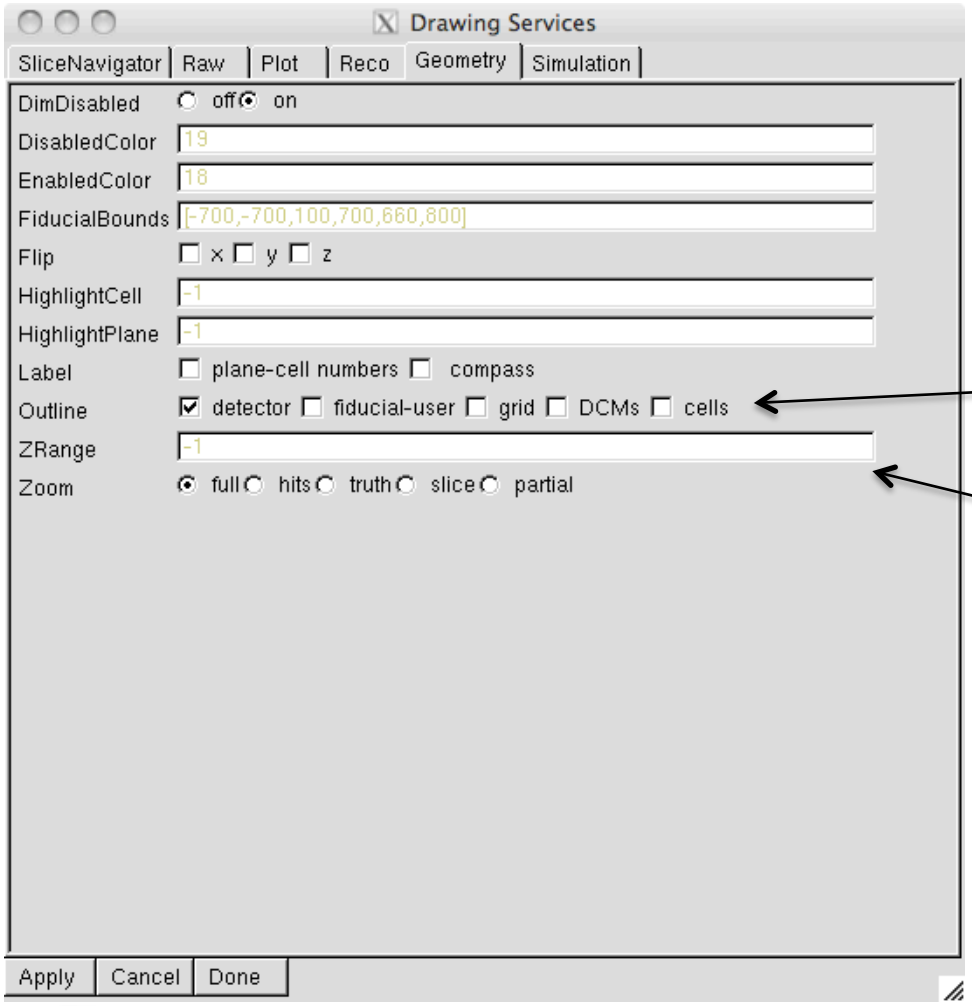
choose the module that made the clusters OR type in a module label in the box below and press enter

do the same thing to draw prongs

do the same thing to draw tracks

Press APPLY to use the selected options

Geometry Drawing Options

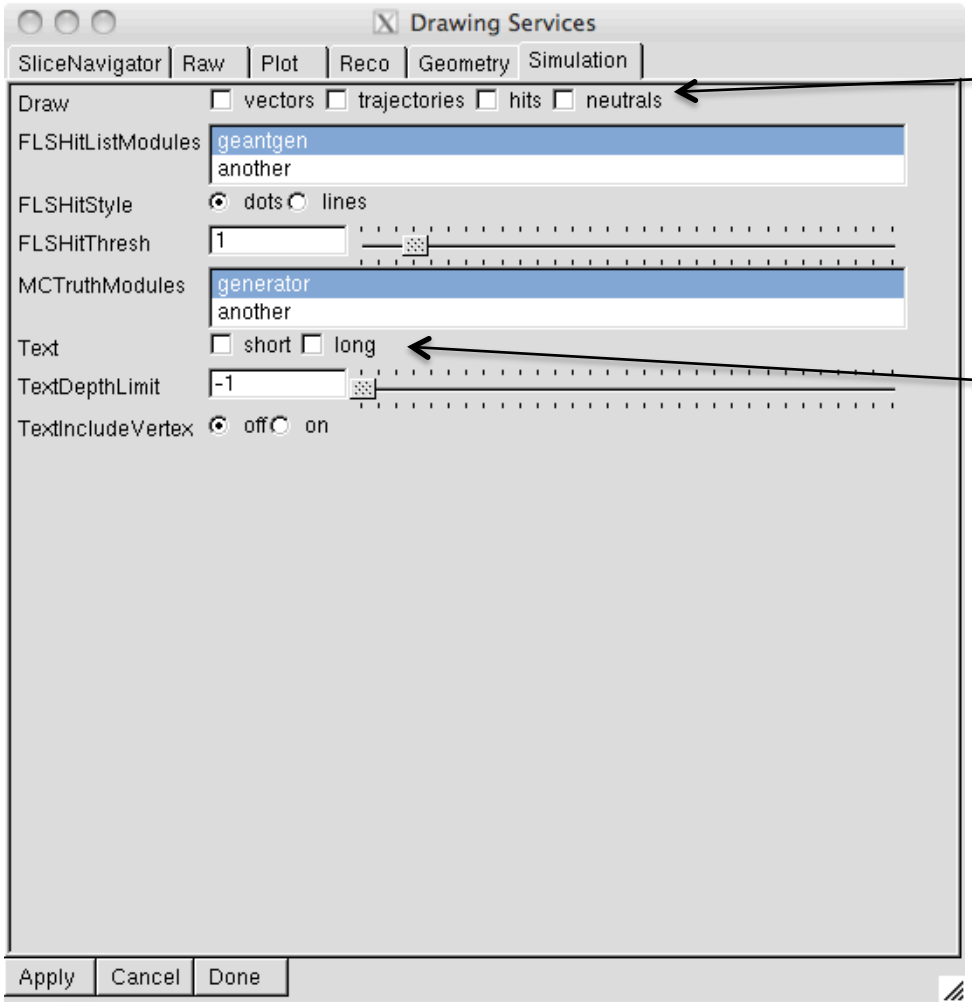


choose to draw an outline around different physical things

choose to auto zoom on a specific Z range OR specify a Z range to always zoom in on

Press APPLY to use the selected options

Simulation Drawing Options



choose what type of MC Truth information to draw

choose to print text about particle energies and reactions

(short text draws on the canvas and long text prints to the terminal window)

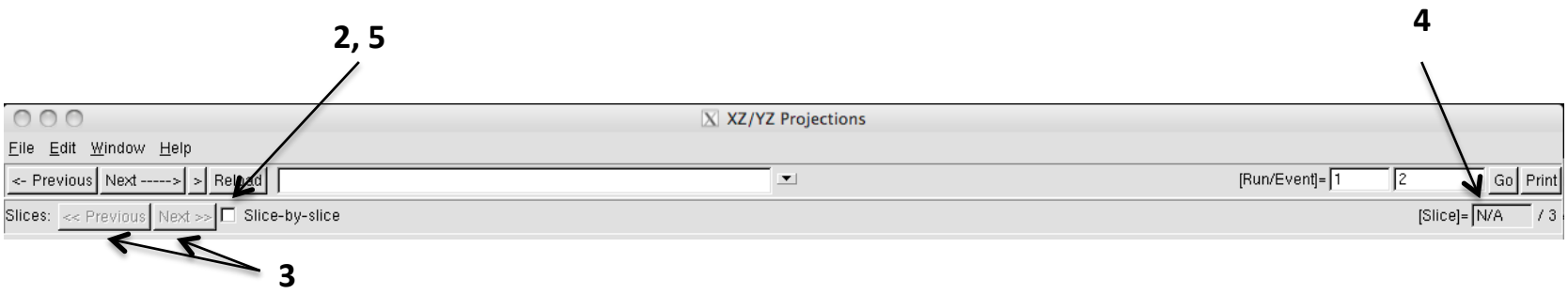
Press APPLY to use the selected options

The Slice Navigator

The “Slice Navigator” allows you look at each slice in an event one at a time. This is handy when looking at an event with multiple slices since these events can often be a confusing mess of visual information. This is also handy if for example, your analysis code tells you that something funny happened in the 12th slice of a given event. You can then open up this event in the Event Display and display only the 12th slice with the slice navigator. To use the slice navigator, do the following:

1. Turn on drawing slices by selecting the appropriate things from the reco drawing options tab (see slide 8.)
2. Turn on the slice navigator by checking the “slice-by-slice” box shown below.
3. Navigate through the slices by clicking on the previous and next buttons.
4. OR, select a specific slice by typing it in this box.

5. BEFORE moving on to the next event, turn slice navigation back off (otherwise you can get segfaults.)



Setting Up Default Drawing Options

Are you tired yet of opening up the event display and setting all of the drawing options the way that you prefer them to be EVERY TIME before you look at any events? Well if not, then you soon will be. BUT don't worry, you can set the default drawing options to whatever you want them to be so the the EVD starts by drawing things the way you prefer them.

First, copy the evd_services.fcl file to your job directory. From the base of your test release, execute:

cp $SRT_PUBLIC_CONTEXT/job/evd_services.fcl job/

This file contains all of the default drawing options for the EVD. Change whatever options you want here, then run the EVD from your test release.

Examples:

- Drawing slices made by slicer with the "marker-style" option
  - in standard_recodrawingopt – ClusterStyle, change "val:1" to "val:2"
  - in standard_recodrawingopt – Clusters, change "val:[]" to "val:["slicer"]"
- Drawing hits colored by time and zoomed in on the NuMI beam spill window
  - in standard_rawdrawingopt - Color, change "val:0" to "val:1"
  - in standard_rawdrawingopt - TimeRange, change "val:[-50,550]" to "val:[218,236]"

Using the Auto-Print Feature

The EVD also has an auto-print feature that will automatically spool through as many events as you wish and print pictures of them to disk. This is handy if you are working on a reconstruction package for example, and in addition to showing performance plots, you want to make a document with 30 event displays showing directly what your reconstruction does. Trust me, it is a pain to flip through each picture and hit print every time.

To turn this on, first edit the evd_services.fcl file (as described on the previous slide) to set your drawing options. The last set of options in this file will allow you to turn on the auto-print feature. Set "AutoPrintMax" to the number of pictures that you want to make and set "AutoPrintPattern" to the file name string that you want to use. Then simply run the event display and sit back while it does all of the work for you (it will quit when it is done.)

EVD References:

An EVD wiki:

https://cdcvs.fnal.gov/redmine/projects/novaart/wiki/Running_the_EventDisplay

Note: This is a little out of date, but a volunteer could update it!