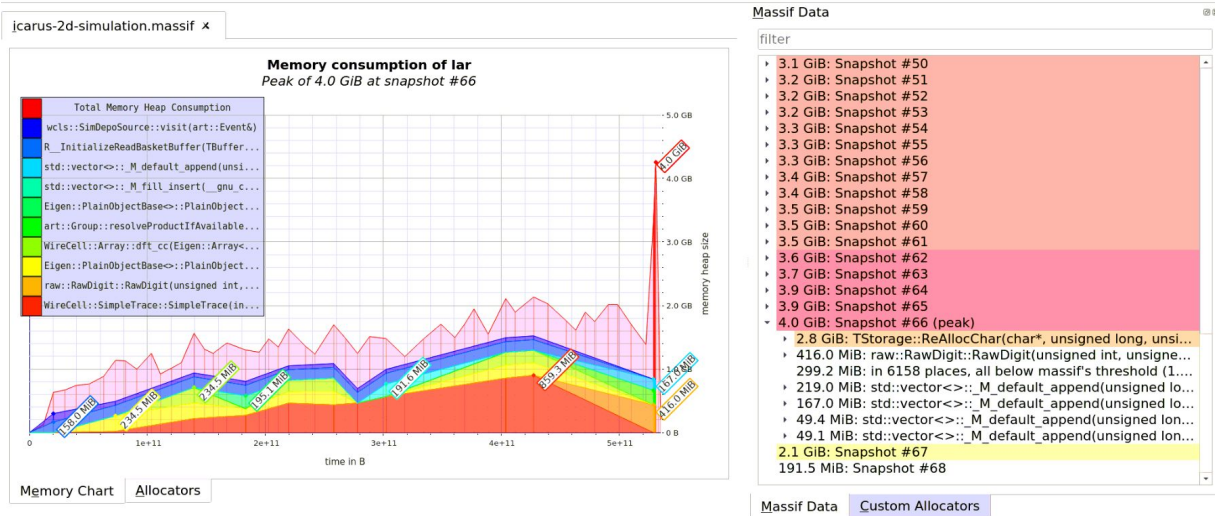


TPC Simulation and Signal Processing Status

Wenqiang Gu

2D simulation of cosmics (1.3M depos)



```
60 local wcls_output = {
61 // ADC output from simulation
62 // sim digits: wcls.output.digits(name="simdigits", tags=["orig"]),
63 sim_digits: [
64 g.pnode{
65 type: 'wclsFrameSaver',
66 name: 'simdigits%d' %n,
67 data: {
68 // anode: wc.tn(tools.anode),
69 anode: wc.tn(duanodes[n]),
70 digitize: true, // true means save as RawDigit, else recob::Wire
71 frame_tags: ['daq%d' %n],
72 // Three options for nticks:
73 // - If nonzero, force number of ticks in output waveforms.
74 // - If zero, use whatever input data has. (default)
75 // - If -1, use value as per LS's detector properties service.
76 // nticks: params.daq.nticks,
77 // nticks: -1,
78 // chanmaskmaps: ['bad'],
79 },
80 }, nin=1, nout=1, uses=[duanodes[n]]
81 for n in std.range(0,3)],
82
```

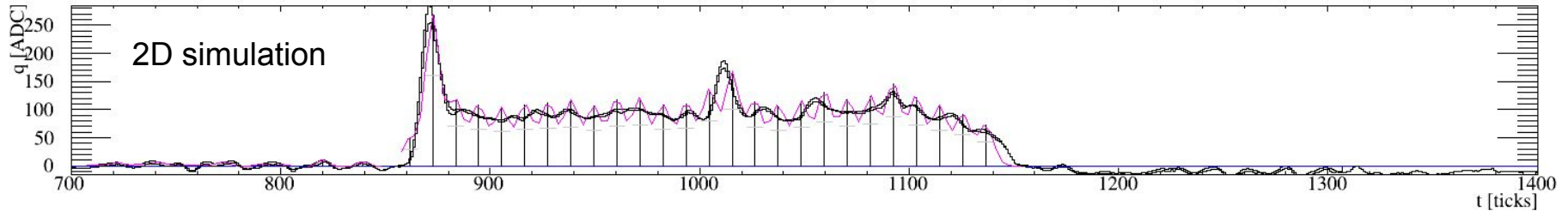
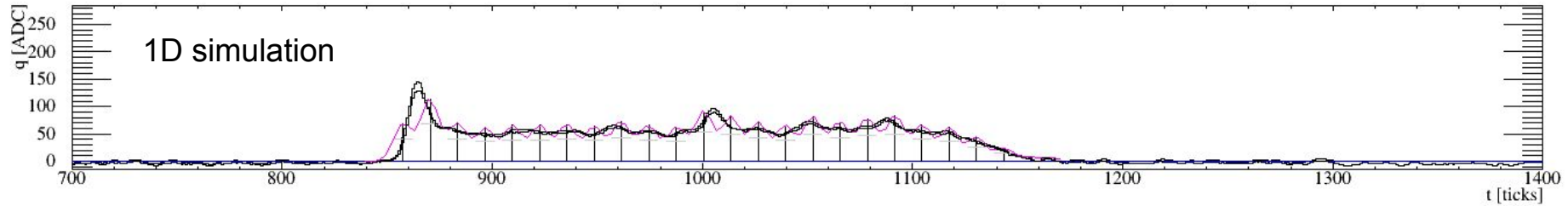
- ROOT IO takes most of the memory usage
- WireCell takes a few, but should be fine

===

Peak virtual memory usage (VmPeak) : 4914.52 MB
Peak resident set size usage (VmHWM): **4510.72 MB**

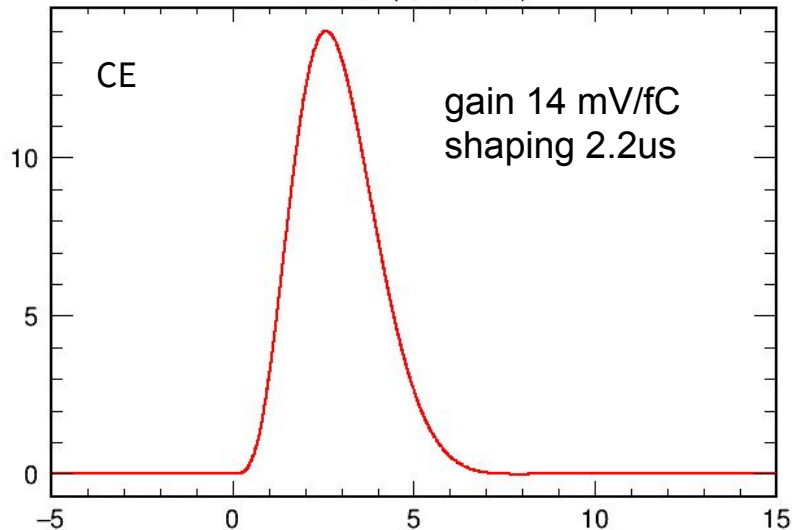
- Single instance of **WireCellToolkit** with 4 components of FrameSaver (larsoft)
- How to reduce ROOT IO?
 - bundle two-volume simulation with multi-threading?

Collection plane raw waveform

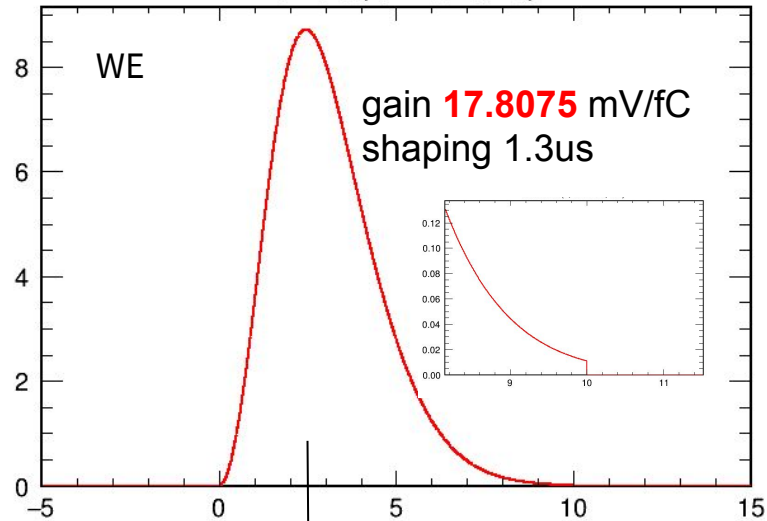


150/ 280 ~ 0.54 scaling factor in response?

coldelec(x, 14.0, 2.2)



warmelec(x, 17.8075, 1.3)



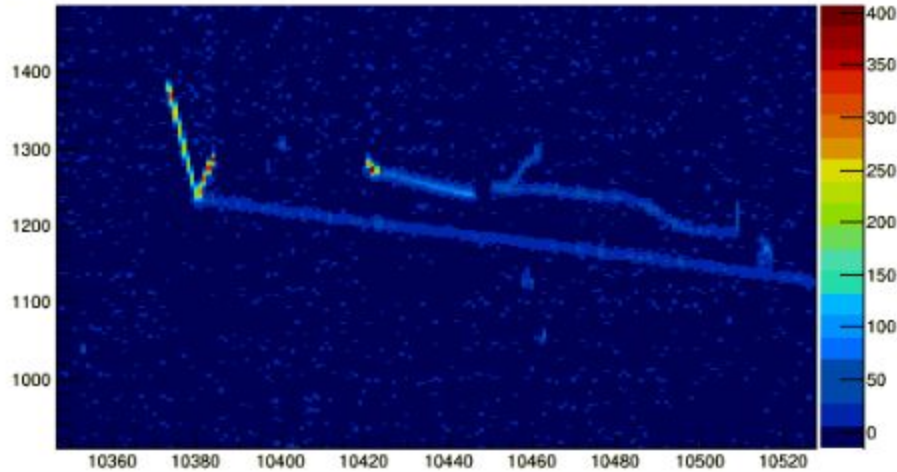
cutoff at 10us is about 0.13% of peak

- Warm Electronics (WE) gain default configuration now is 30 mV/fC
 - While actual gain is 17.8075
- 17.8075/30 ~ 0.59 scaling factor

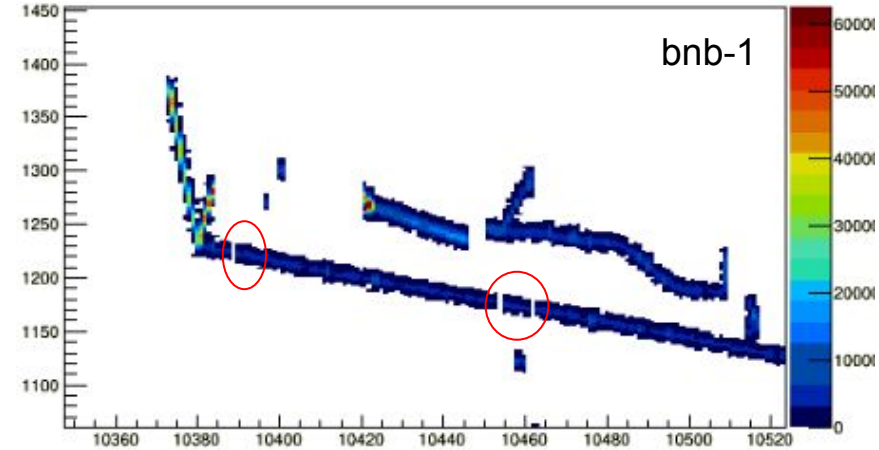
- WE response integral = 29.84 mV*us/fC
- pulse measurement at CERN = 0.027fC/(ADC*us) = 29.84mV*us/fC

4095 ADC <=> (3300 - 0.8) mV

hw_raw120

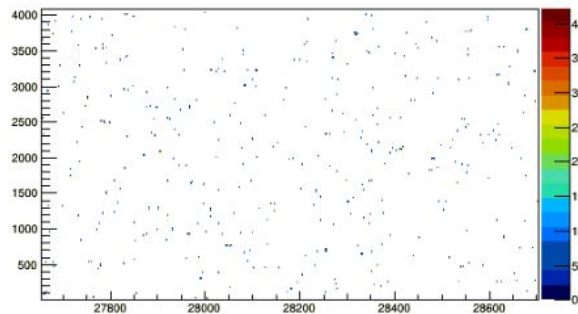


hw_gauss120

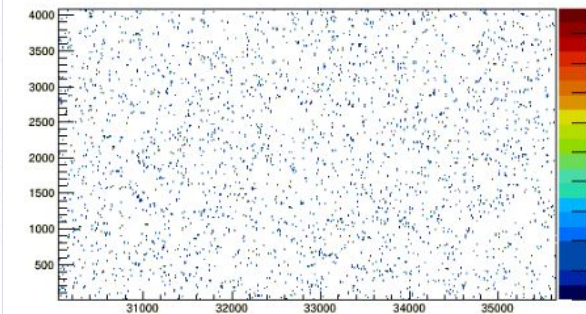


- To understand the gaps in charge deconvolution (noise filter? decon threshold?)
- To have a more balanced noise level for the middle induction plane

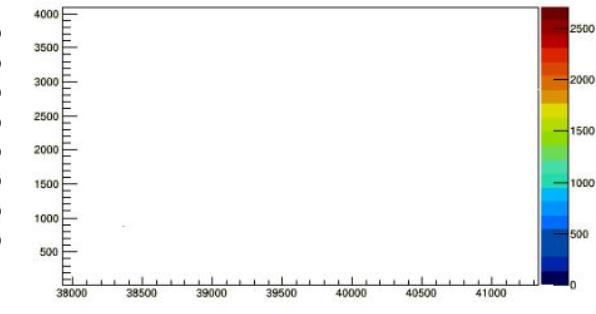
hu_gauss112

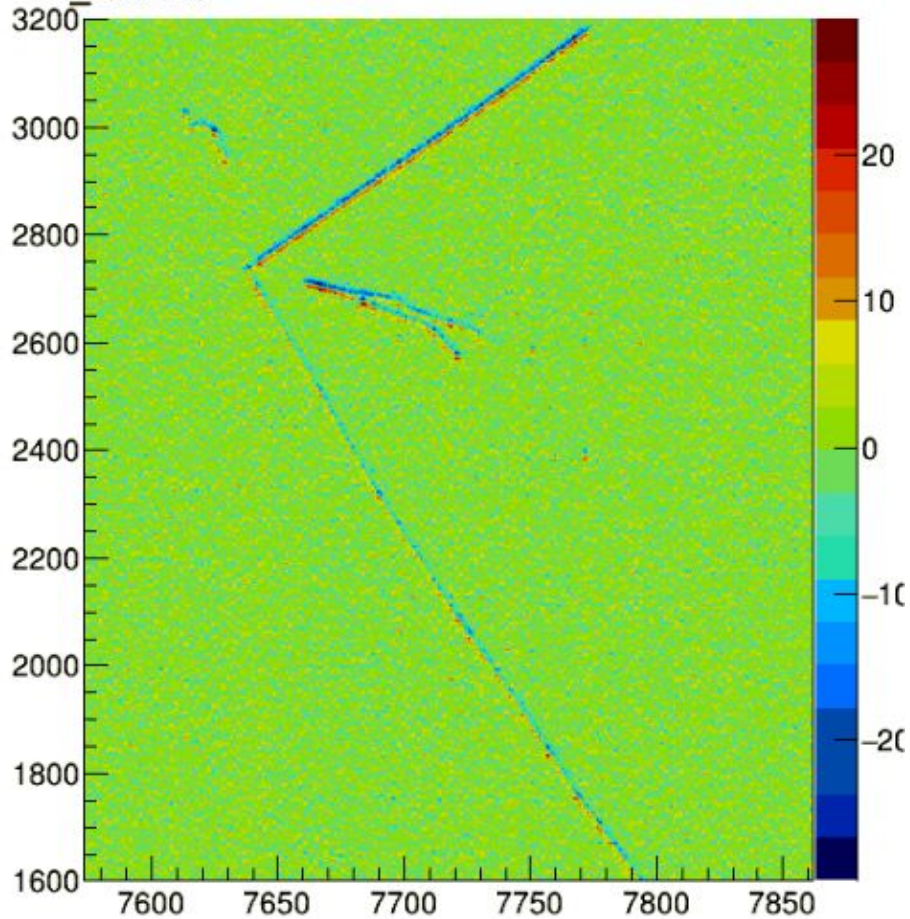
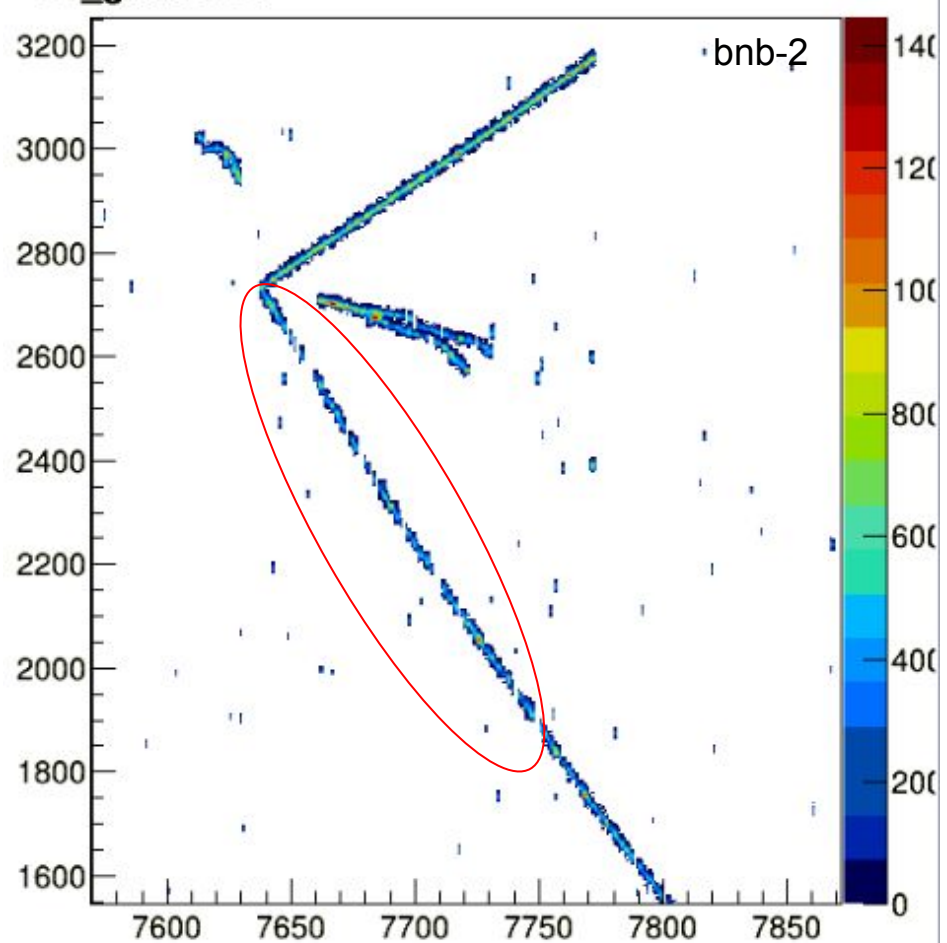


hv_gauss112

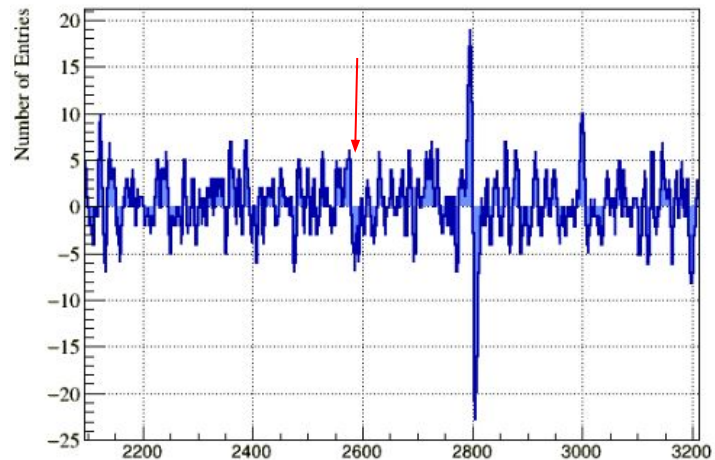


hw_gauss122

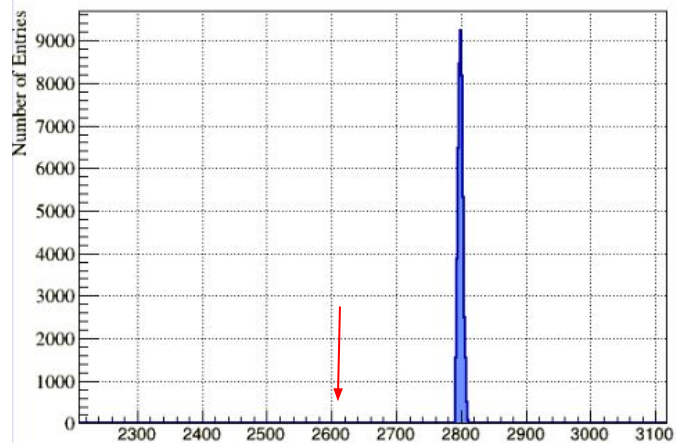


hv_raw110**hv_gauss110**

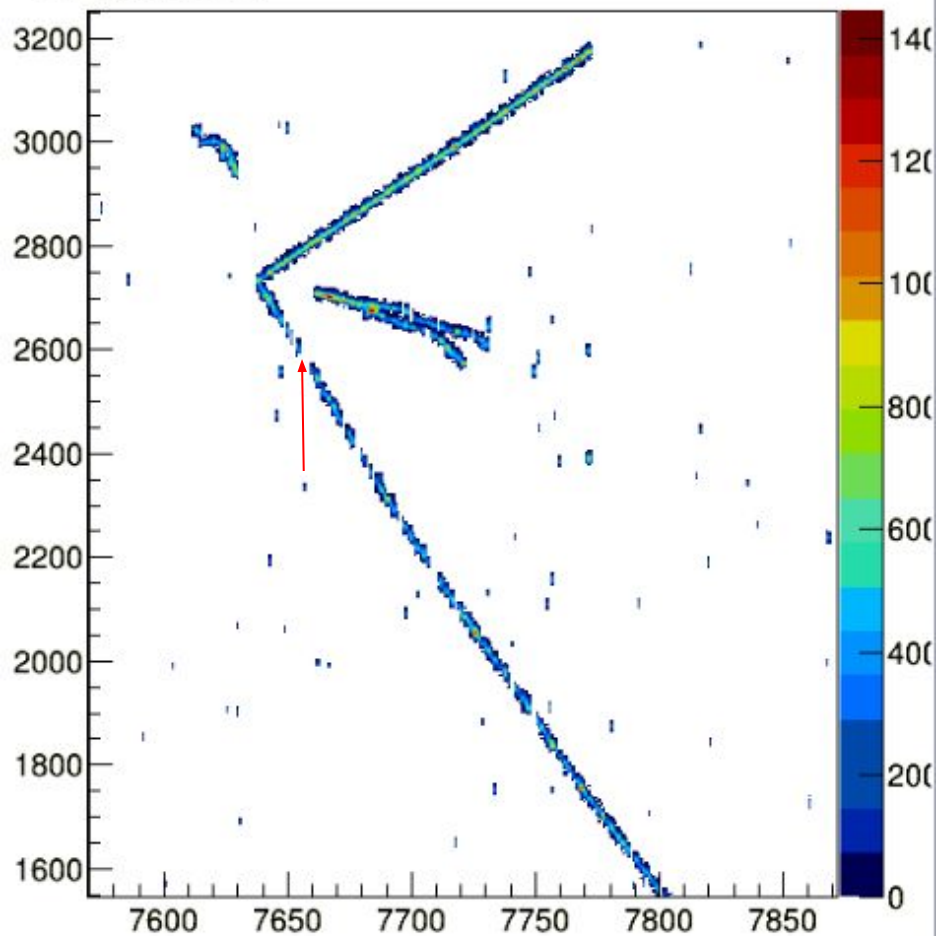
ProjectionY of blnx=5259 [x=7657.5..7658.5]



ProjectionY of blnx=5258 [x=7657.5..7658.5]



hv_gauss110



Summary

- WireCell is in the larsoft/icarus release now
- Interested in reducing the memory usage per core
 - multithreading in wirecell may help
- Some correction on the warm electronics gain according to the pulse measurement at CERN
- 10 BNB events has been simulated, will tune the signal processing based on this sample