FCalPulse Test Beam Analysis Meeting

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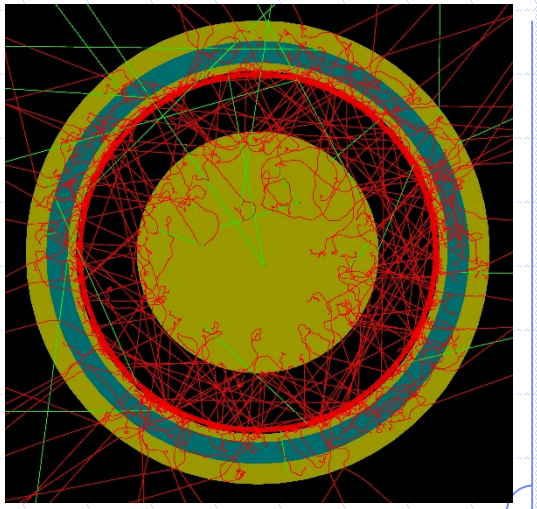
15 September 2021



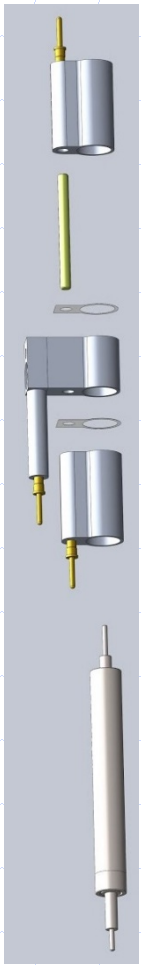
v1

Agenda

- Cryostat performance, present status, and future studies – Rob Walker
- Summary of runs – Billie Lubis
- Matching BPC events and Digitizer events – Sasha Savine
- A peek at the data – John R.

FCal Rod/Tube Pulses at HV = 250 V. Source in Segment B

Exploded view of Rod/Tube Electrode



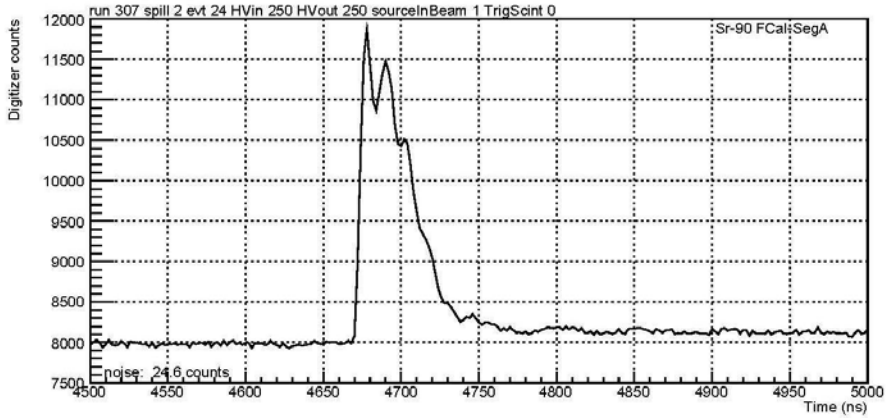
Segment A

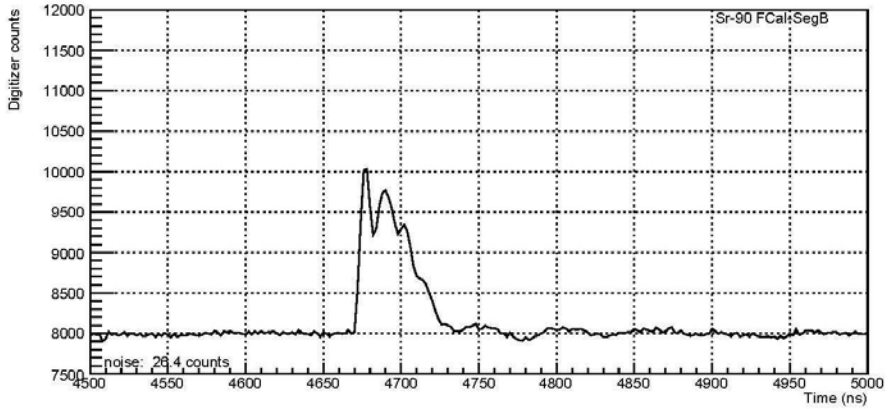
Segment B

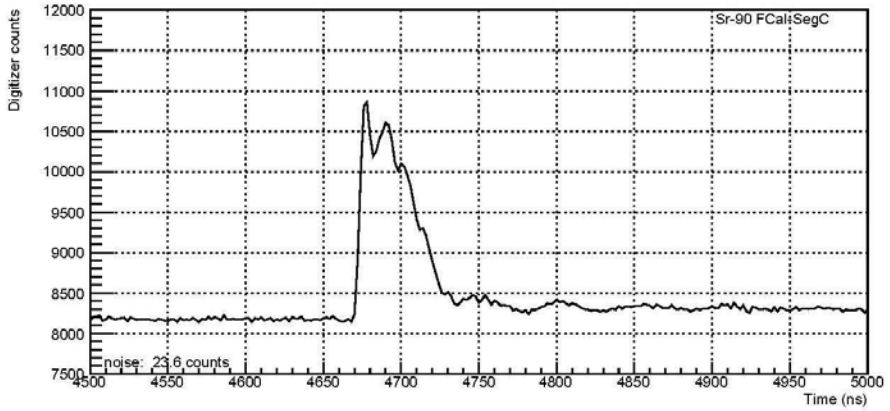
Segment C

Source in Rod

Note: Segments A and C are longer than Segment B



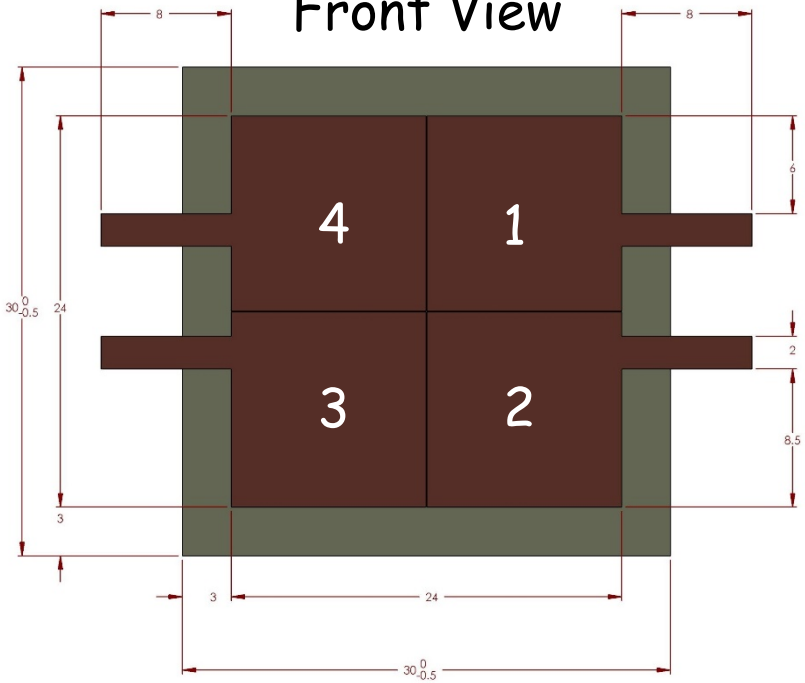


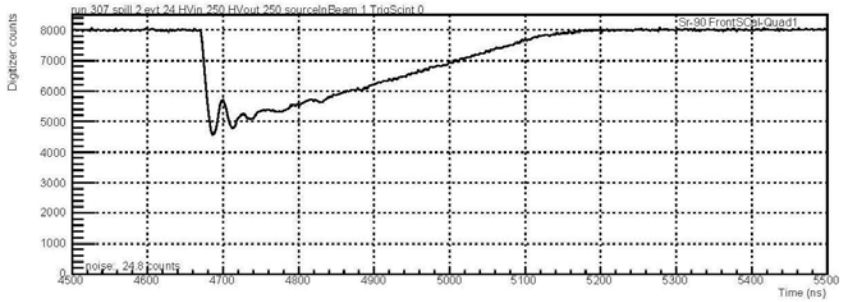


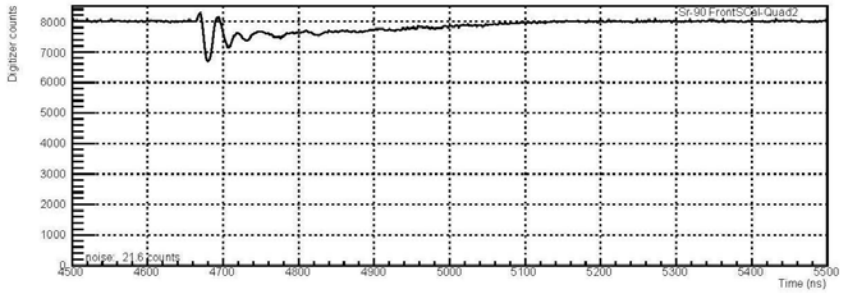
Shower Calorimeter 7 Pulses Same Event

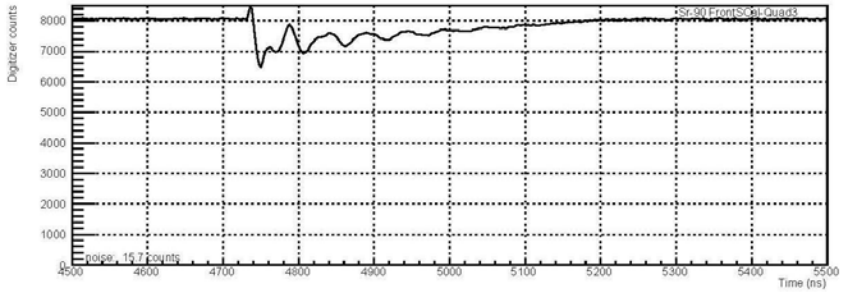
HV at +1500 V

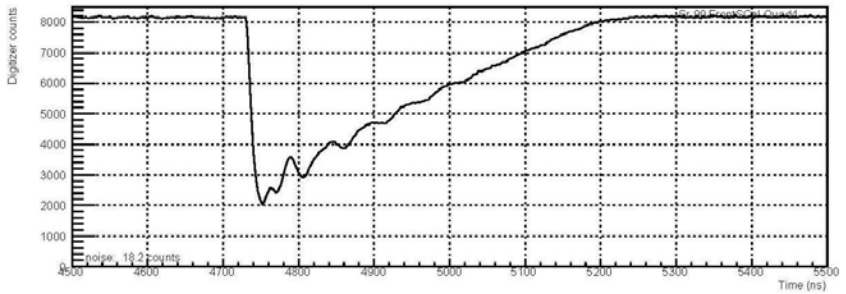
Shower Cal electrode Front View



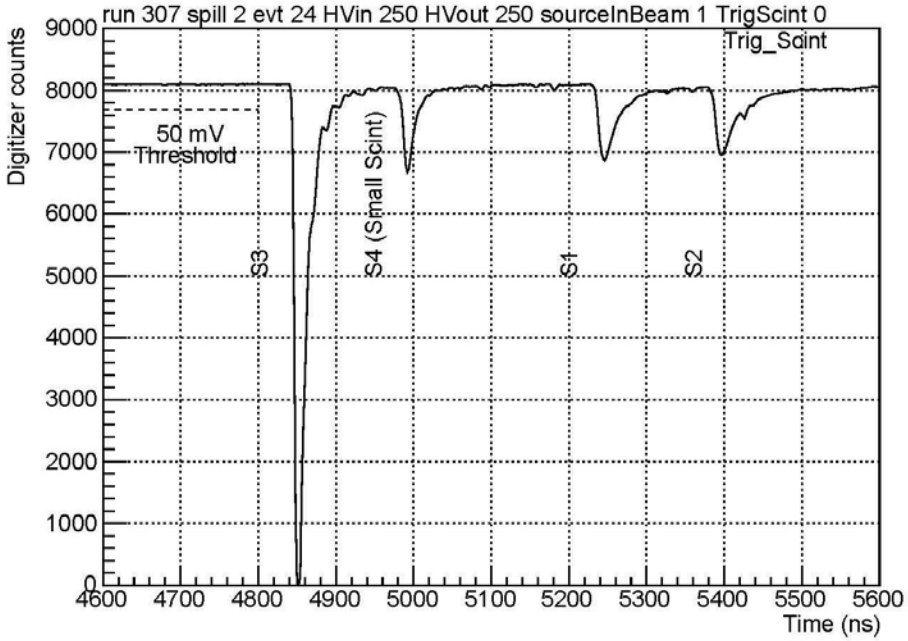


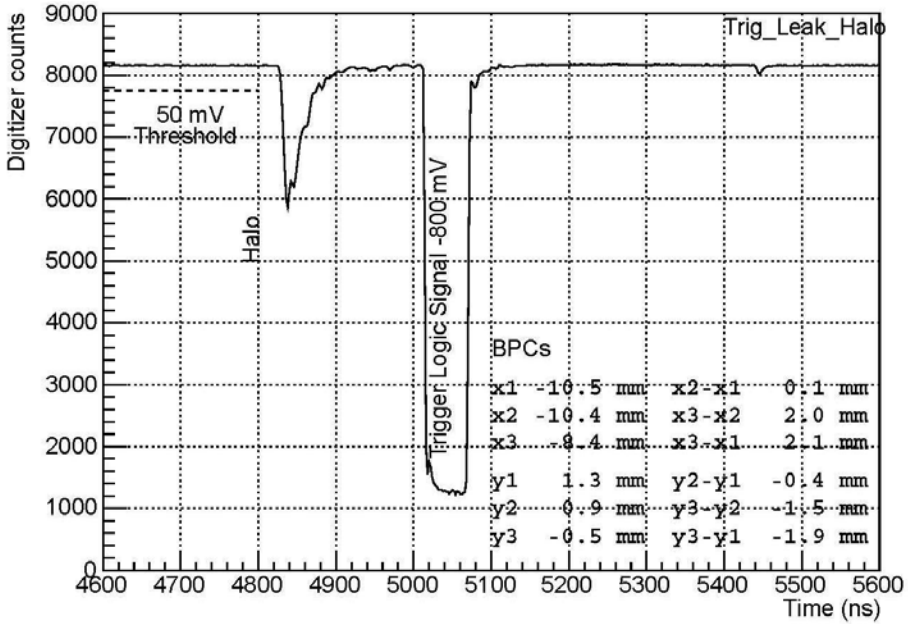






Scintillator Pulses Same Event

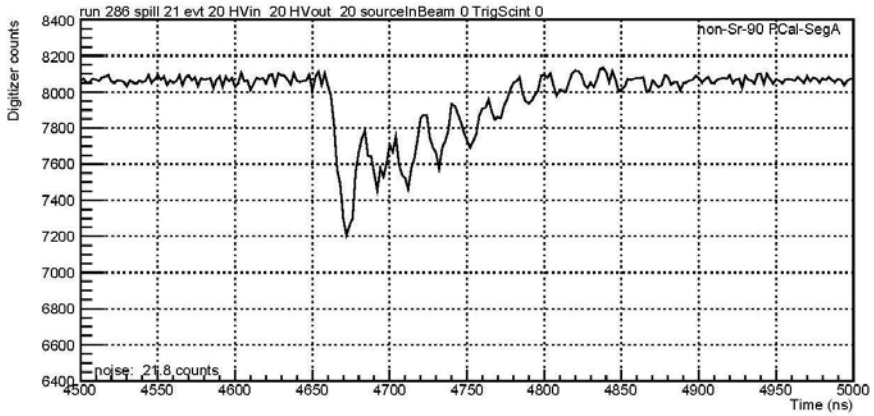


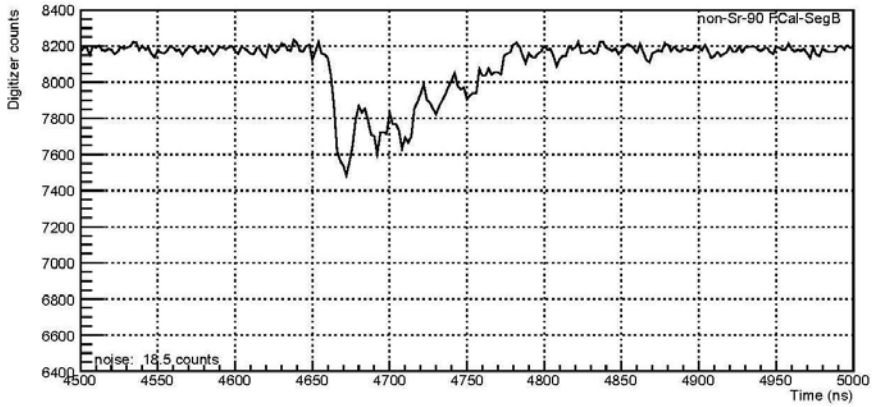


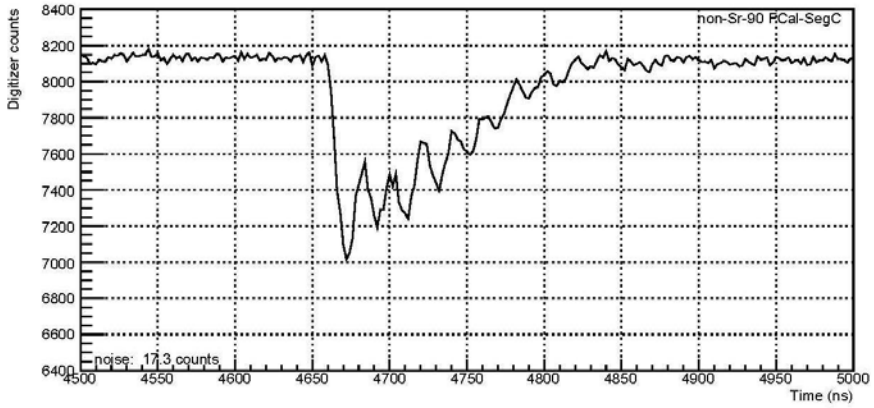
Plus a table of beam chamber data

FCal Rod/Tube Pulses at HV = 20 V. No source

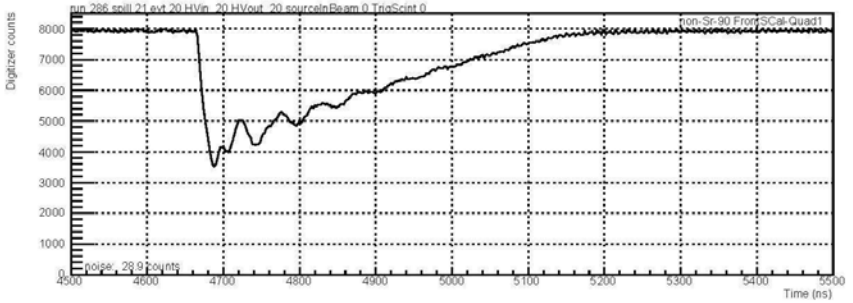
Remarkably good signal-to-noise.

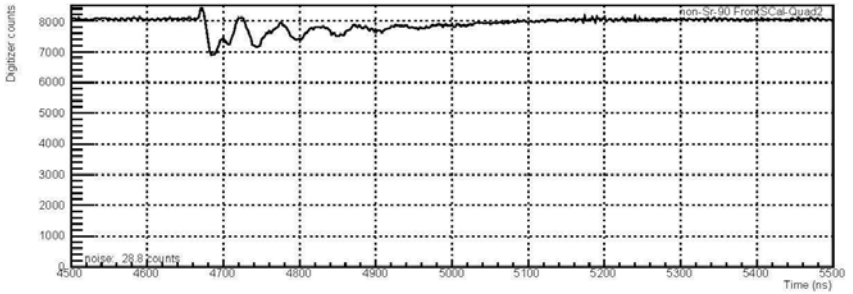


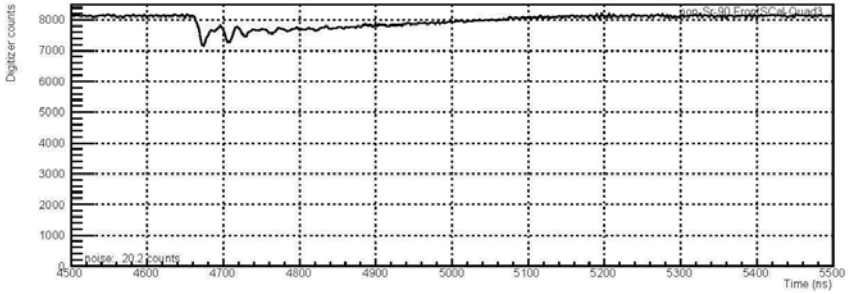


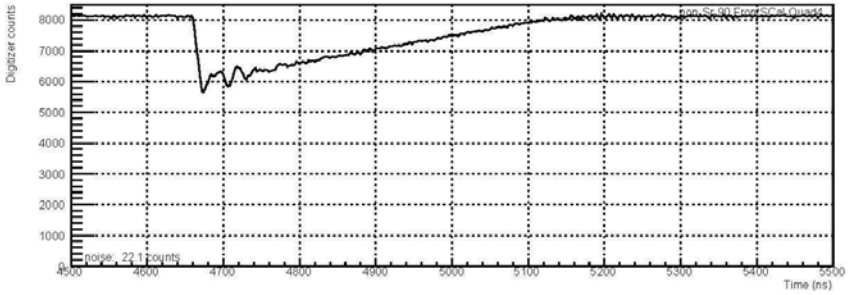


Shower Calorimeter 7
Pulses
Same Event

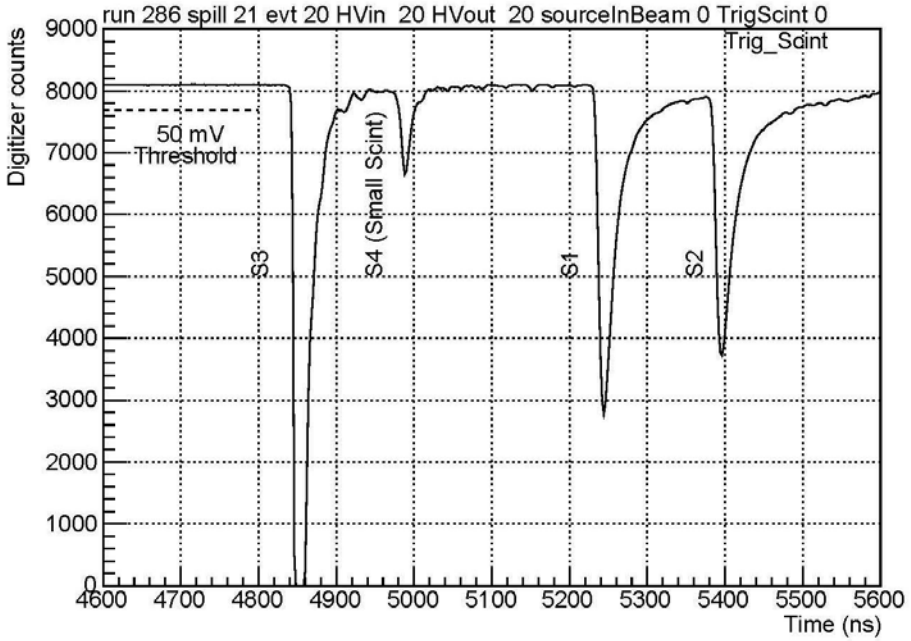


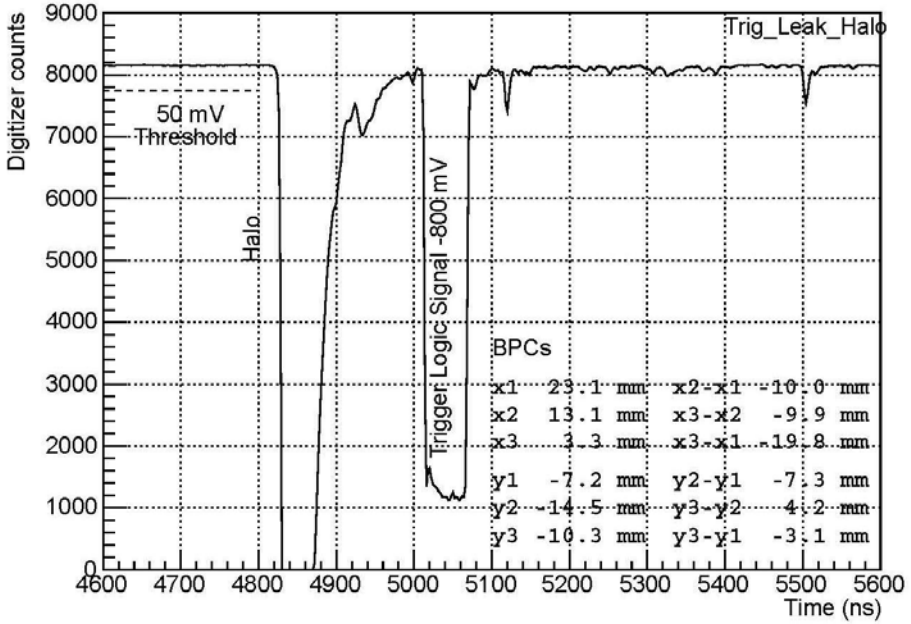






Scintillator Pulses Same event





Initial observations

- Signal-to-noise is better than expected
  - Electronics noise was calculated to be 13 digitizer counts rms
  - Observed to be 20 – 30 digitizer counts (see plots on previous slides.
  - Signal pulses are generally larger than estimates
- Trigger timing
  - Jumps around by ±8 ns from event-to-event
  - Offset from one digitizer to the next

Initial Observations – Con't

- Damped oscillations superimposed on pulses
  - Amplitude of oscillation is independent of amplitude of the pulse
  - Oscillations are different on Shower Cal vs. FCal
  - Oscillations are similar on three FCal segments
  - Oscillations are similar on SCal quads 1 & 2
  - Oscillations are similar on SCal quads 3 & 4
- We need to understand these oscillations

Initial Observations – Con't

- The material in the beam upstream of the cryostat causes too many Beam Profile Chamber (BPC) hits. We'll need the full BPC data for the analysis.

Auxiliary Tests

- With LAr in the cryostat, measure FCal middle tube segment HV current draw as a function of applied HV
- With cryostat opened, apply test pulses to electrodes and look for oscillations and cross talk
- Use Network Analyzer to characterize the frequency response of the electronics chain

Links to photos and drawings

- For FCalPulse mechanicals see

https://goo.gl/photos/8f2G1mHXgcDtDAnX9 for drawings

https://photos.app.goo.gl/peQ1GosCpxrPe7N5A for pictures

Or

http://atlas.physics.arizona.edu/Arizona_Atlas_Downloads/walker/FCalPulse