BL4S 2023
Introduction To Data Acquisition (Part II)

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September 18th 2023

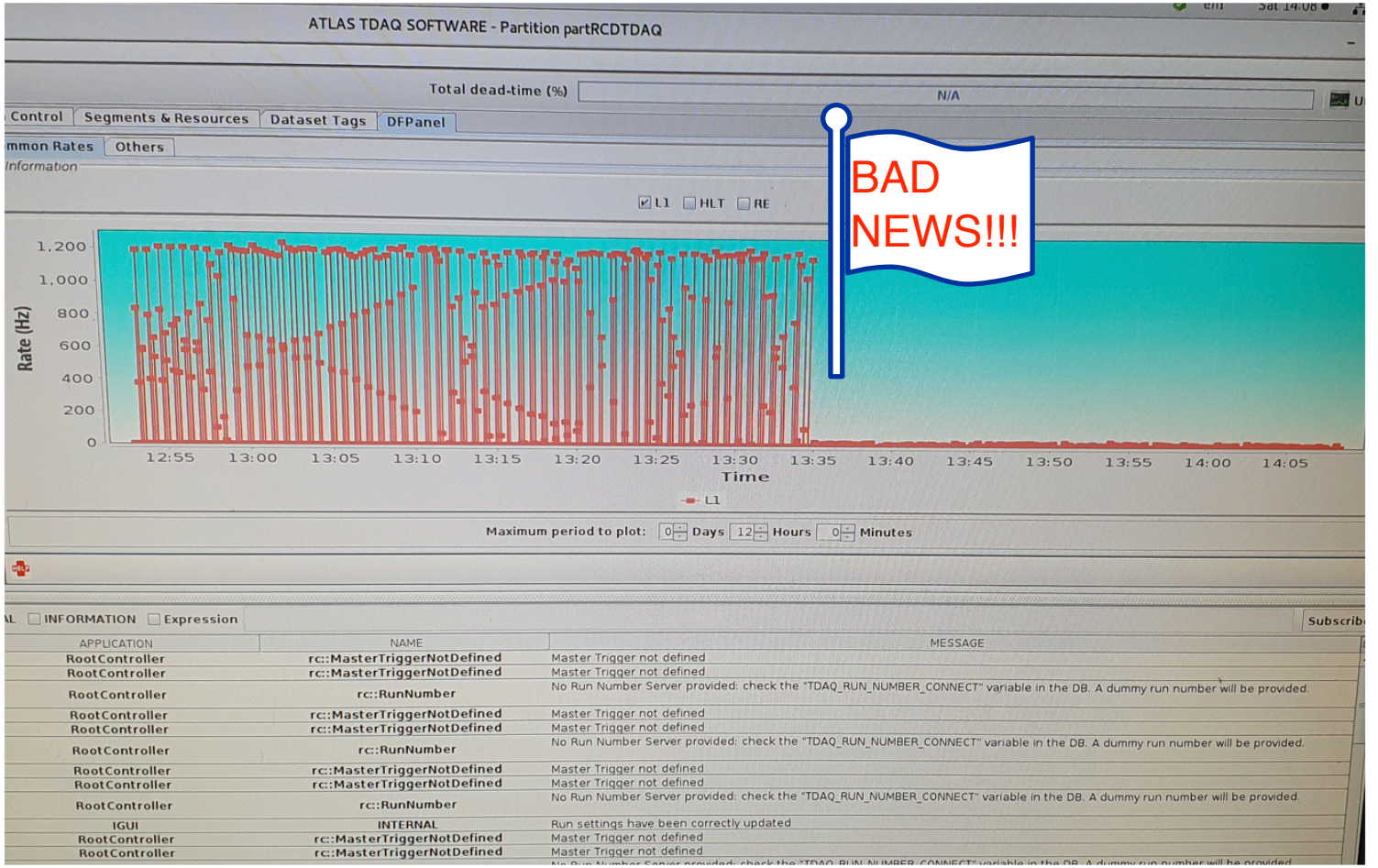
Outline

- What is next?
  - You will be doing your experiment!
  - Collecting your data
  - Analyzing
  - Hopefully having fun:)

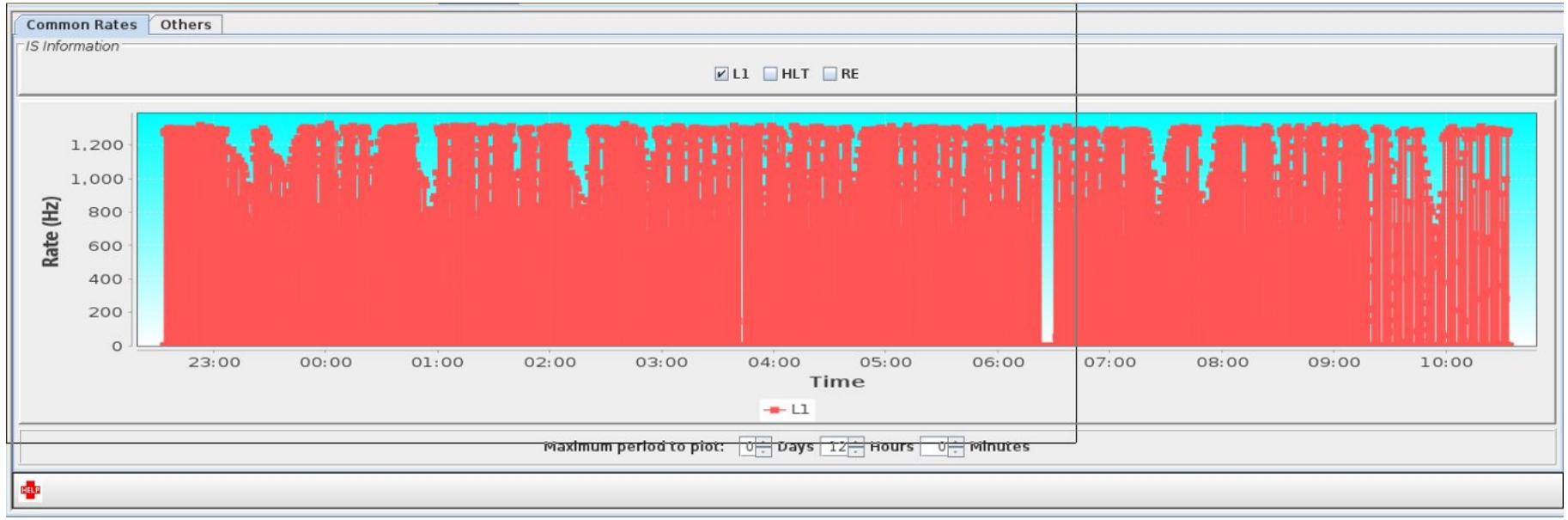
What has been happening at T10

- A lot!
  - Magnets are not working
  - Cherenkovs are not cooperating
  - Water leak on RF systems!

- Please be prepared!



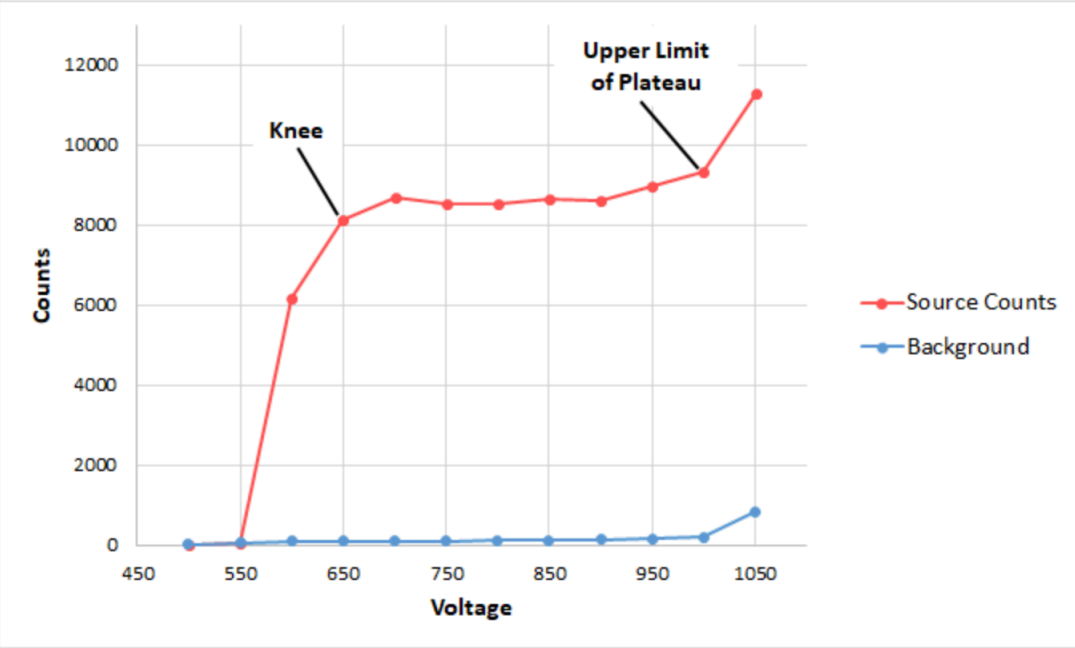
What is also happening at T10?



- We are having millions of particles per night!
  - Calibration of DWCs
  - Allignment of DWCs
  - Finding high voltage plateau of scintillators
  - Cable calibration of scintillators
- Be ready to analyze!

Speaking of high voltage plateau…

Figure 1 - Example Plateau Graph



source: https://ludlums.com/documents/technical-articles/341-determining-detector-operating-voltage

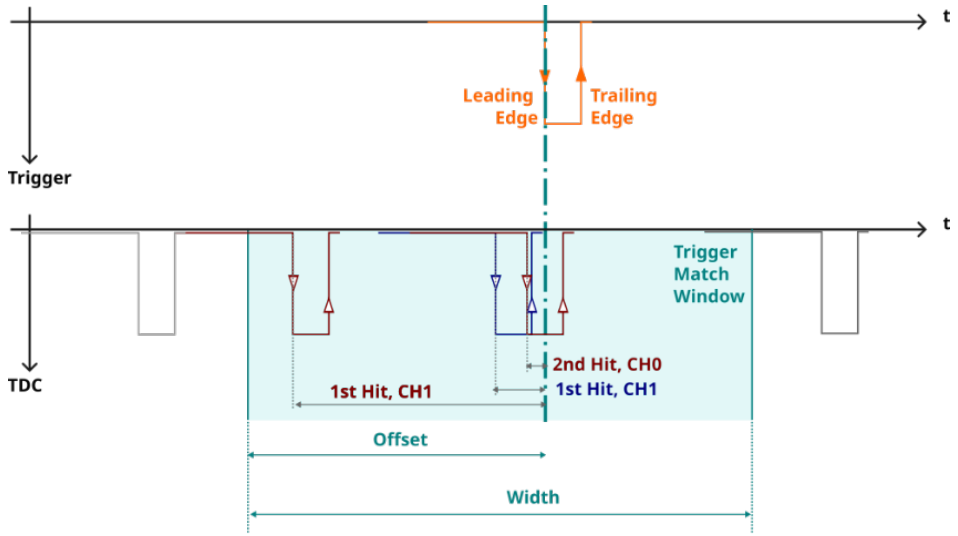
- The detectors we use have varying efficiency with respect to HV
  - Low >>> low efficiency
  - High >>> higher efficiency
  - Higher >>> still same higher efficiency
  - Too high >>> too bad!!!

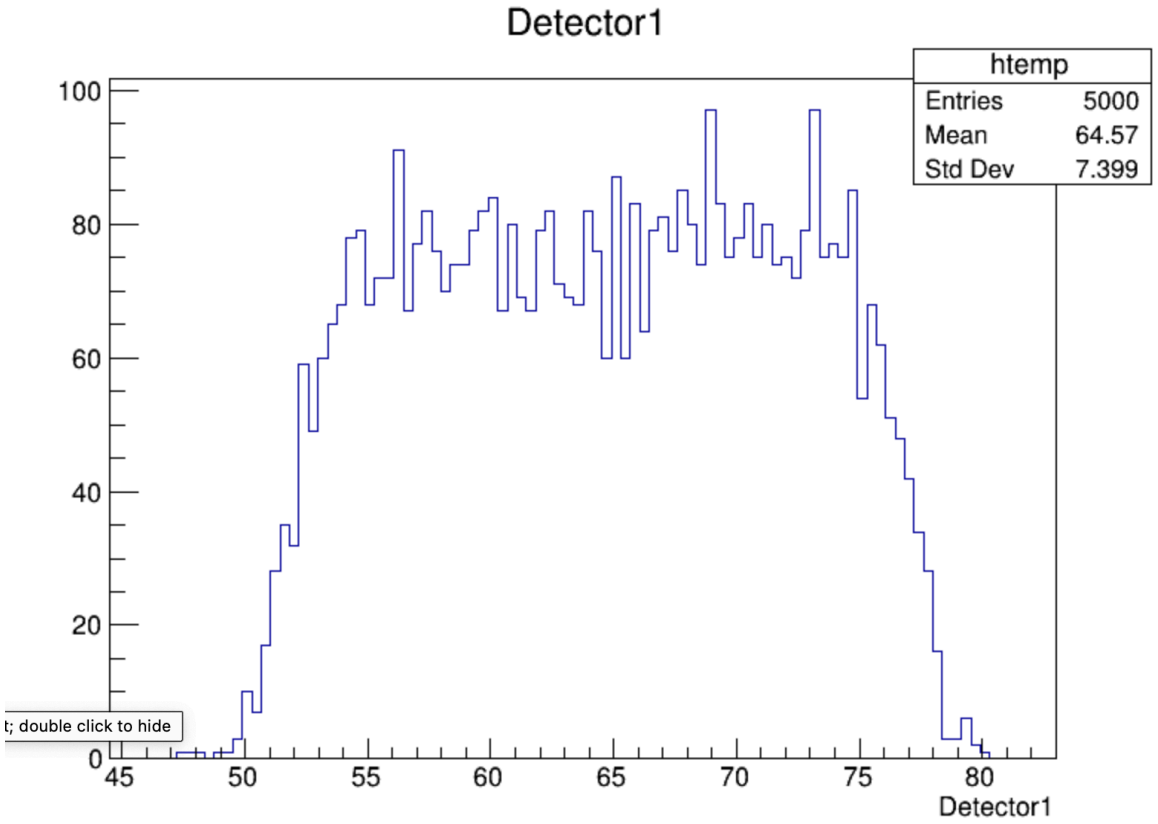
Speaking of high voltage plateau…

Custom	Name	I0Set	V0Set	IMon	VMon	Pw
01.000	CAL14	700.00 uA	1100.00 V	0.046 uA	0.68 V	Off
01.001	CAL10	700.00 uA	1200.00 V	0.102 uA	0.63 V	Off
01.002	CAL17	700.00 uA	1225.00 V	0.012 uA	0.26 V	Off
01.003	CAL15	700.00 uA	1100.00 V	0.054 uA	0.35 V	Off
01.004	CAL0	700.00 uA	1050.00 V	0.092 uA	0.62 V	Off
01.005	CAL7	700.00 uA	1100.00 V	0.104 uA	0.46 V	Off
01.006	CAL2	700.00 uA	1100.00 V	0.040 uA	1.89 V	Off
01.007	CAL4	700.00 uA	1150.00 V	0.096 uA	0.45 V	Off
01.008	CAL8	700.00 uA	1150.00 V	0.062 uA	0.46 V	Off
02.000	S2	2000.0 uA	2150.0 V	1499.0 uA	2151.0 V	On
02.001	S3	2000.0 uA	2150.0 V	1446.0 uA	2151.5 V	On
02.002	S4	2000.0 uA	2100.0 V	1350.5 uA	2102.0 V	On
03.000	DWC0	100.00 uA	2800.00 V	9.890 uA	2799.59 V	On
03.001	DWC1	100.00 uA	2800.00 V	33.404 uA	2799.79 V	On
03.002	DWC2	100.00 uA	2800.00 V	43.064 uA	2799.67 V	On
03.003	DWC3	100.00 uA	2800.00 V	43.038 uA	2799.67 V	On

- All of our detectors (Scintillators, DWCs, Calorimeters) went through this process
  - Cherenkovs are still going through! :)

How does a signal coming from a scintillator look like?





How does a signal coming from a scintillator look like?

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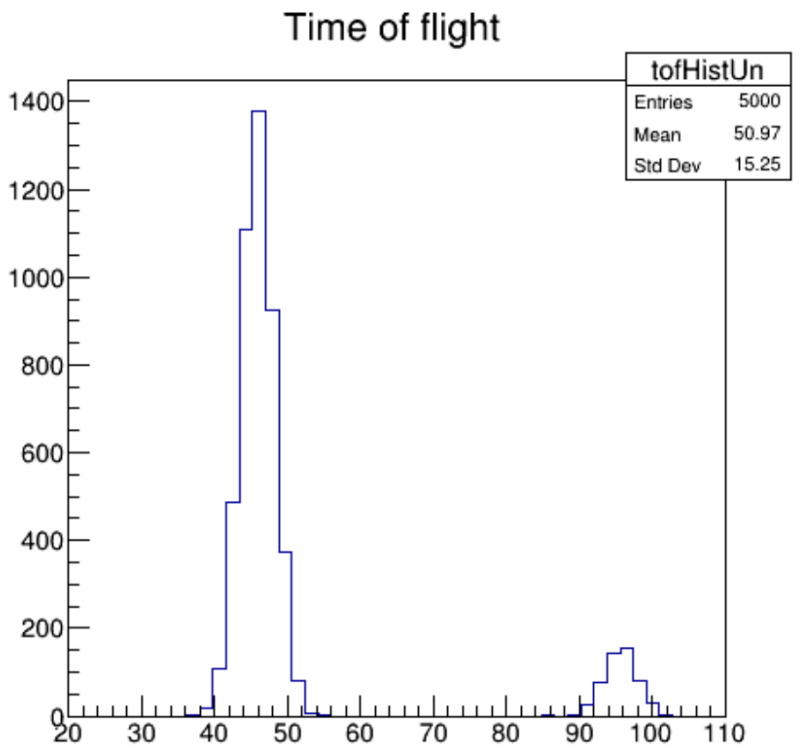

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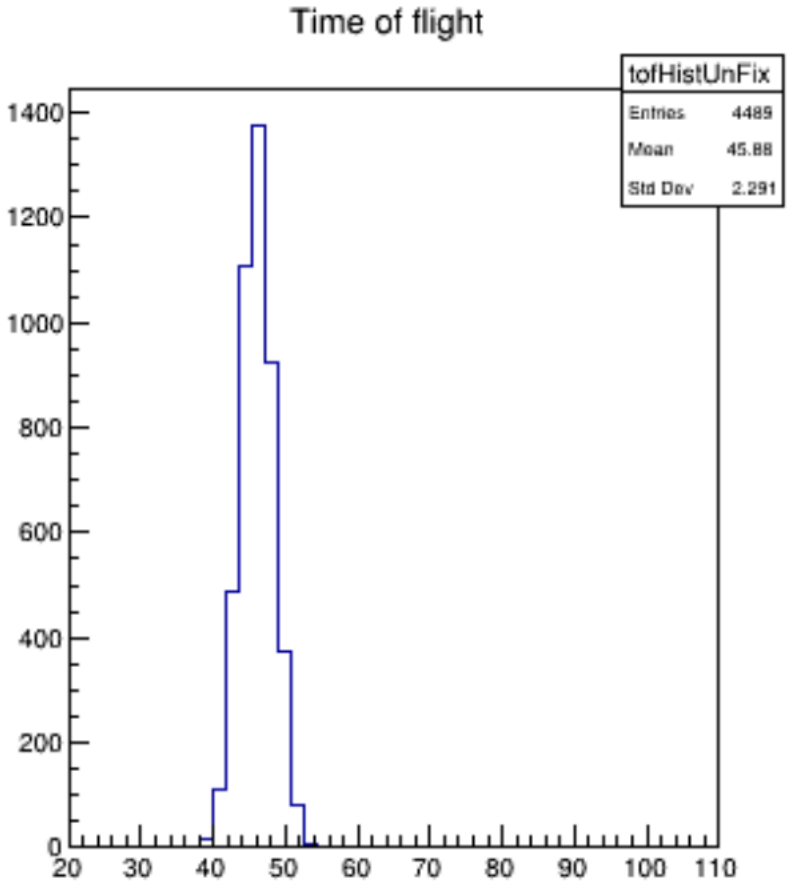
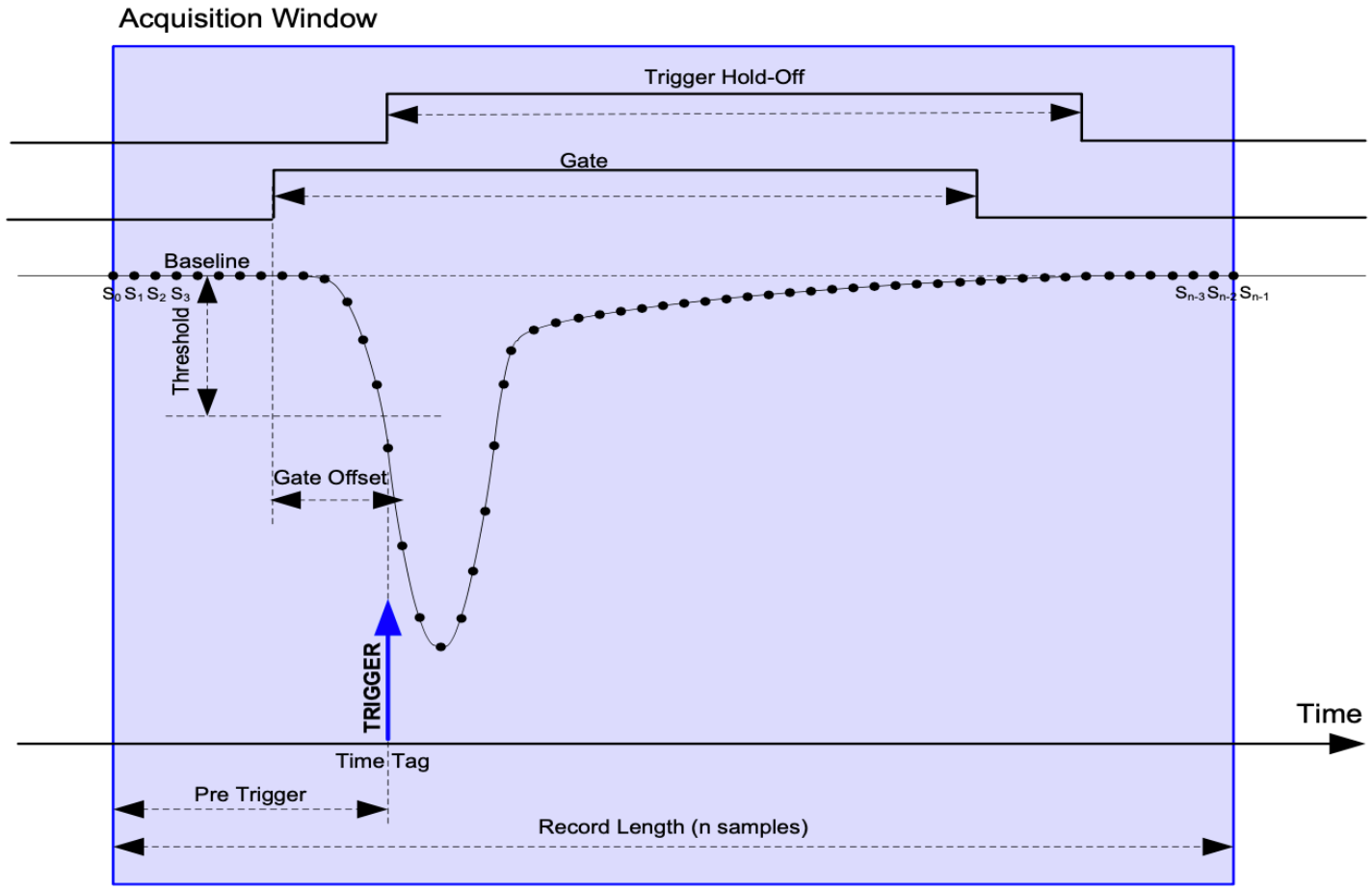


Charge integration at QDC



- Create a gate from your trigger
- Put the signal into the gate, which is the most important part!

How does a signal coming from a calorimeter look like?

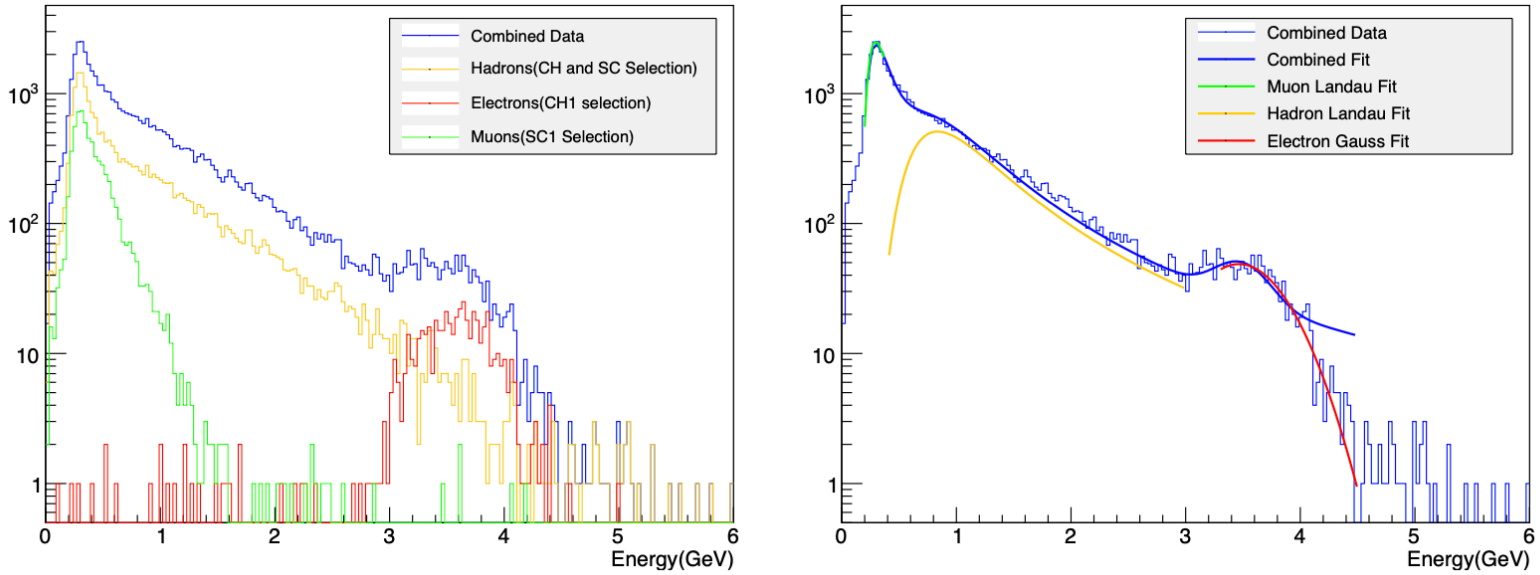


Figure 4.9: The total energy deposition in lead glass blocks for 4 GeV (run 1410444821). Left: Combined histogram, and separate histograms for electrons, muons and hadrons. Right: Separate fits to each particle type and general fit to the spectrum.

- We are not interested in approximate timing information (as in „when did we get any particles“)
- We are interested in the precise, per-particle information, including
  - their position along their way at certain points
  - their timing (which in turn gives us an idea about
    their energy and their momentum)
  - their type (positron, proton, pion, ...)
- It seems we need a DAQ system!

Thank you for your Attention!
Any Questions?