



First View to CRP5 NP02 Cold Box Data Waveforms

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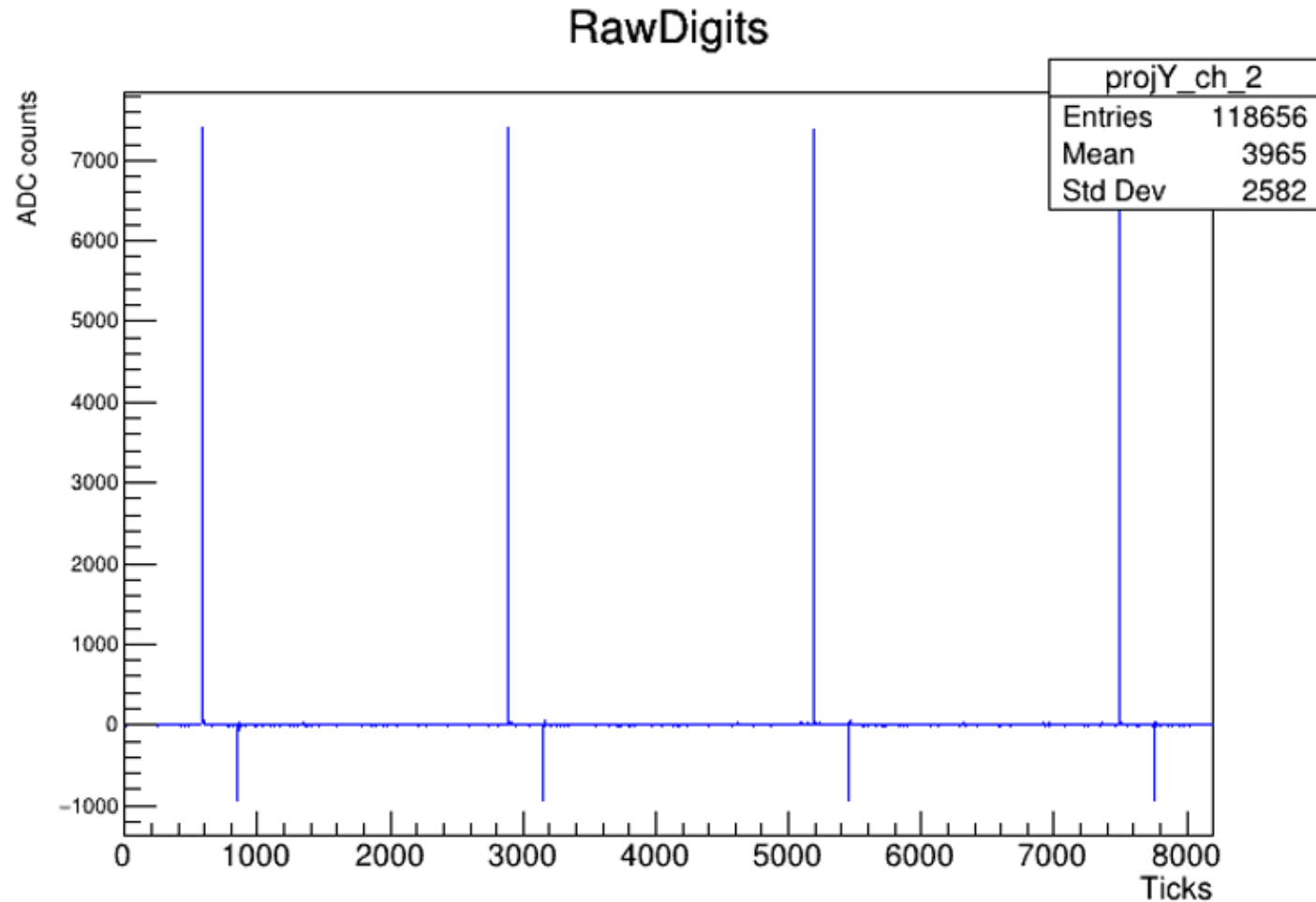
03/28/2024



The Setup

- **The Dataset:** PD CRP5 Second Cold Box Test pulser calibration data.
 - np02_bde_coldbox_run021040_0000_dataflow0_datawriter_0_20230209T113102.hdf5.
 - Run 21040 (DAC = 30, gain = 14 mV/fC, shaping time = 2 μ s, baseline = low).
- Translating from **.hdf5** to **.root** format.
- From h_daq we take the Y-Projection for each channel.
 - 3072 channels for NP02 data.

Raw Waveforms



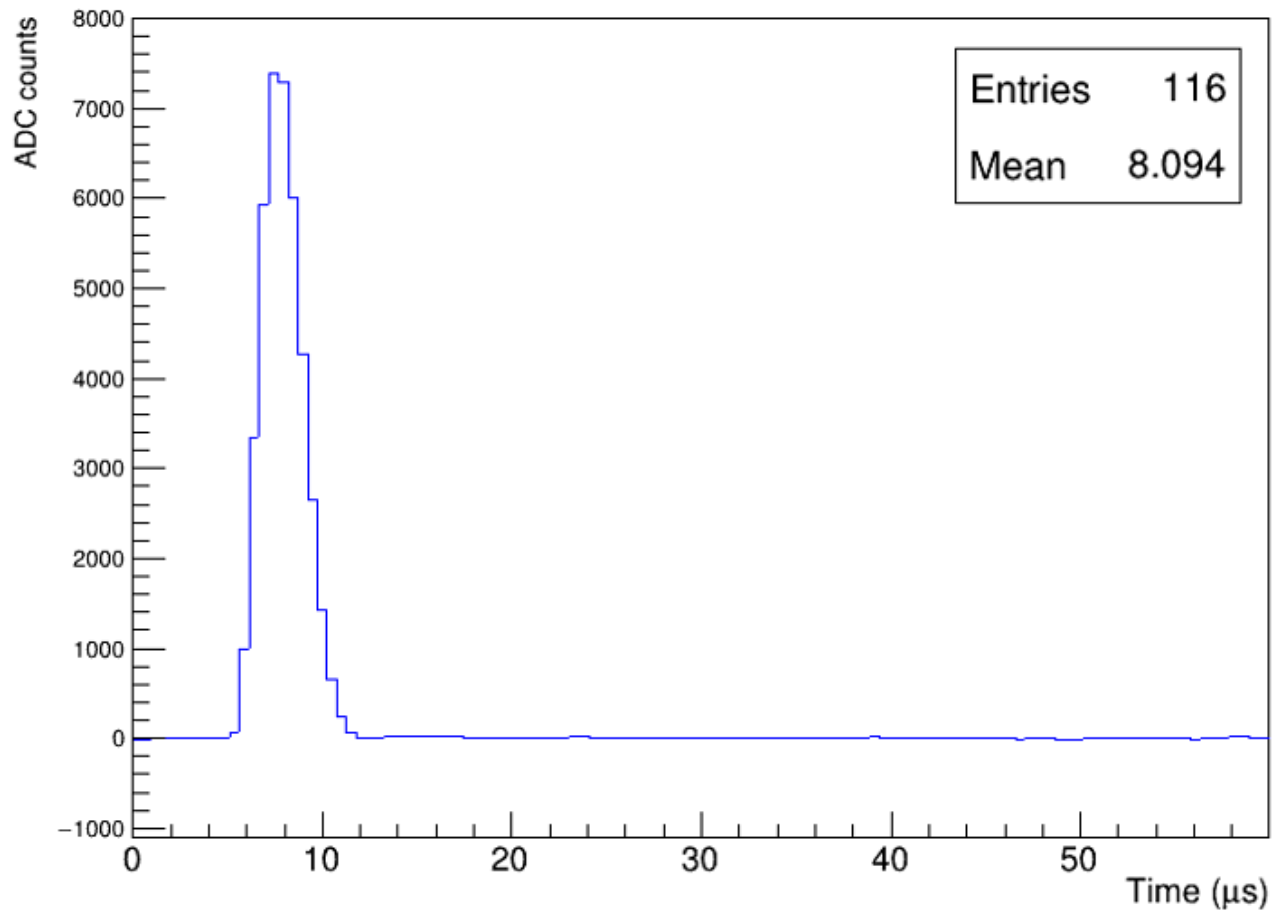
Developing a Peak-Finding Algorithm

Finds all maximum positive and negative peaks for each channel.

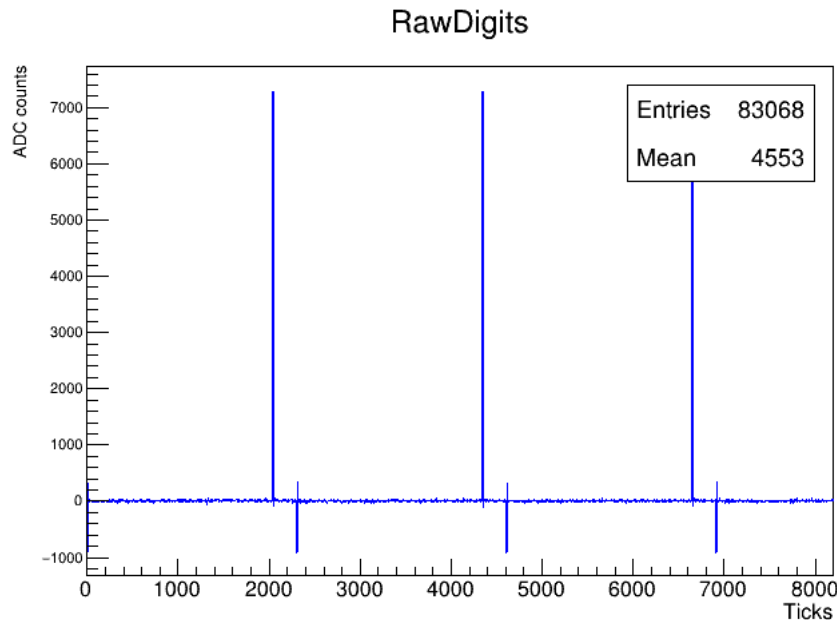
- Based on **thresholds**:
 - 5,000 ADCs for positive peaks.
 - -200 ADCs for negative peaks.
- Finds noisy channels and skips them (for now).

Single Waveform Example

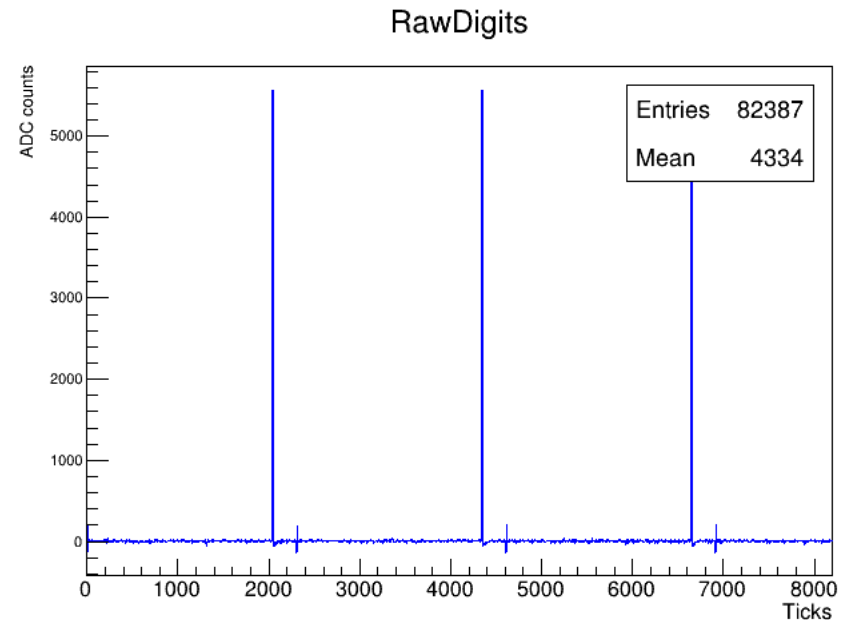
First Waveform, Channel 2



Peak Finder Challenges

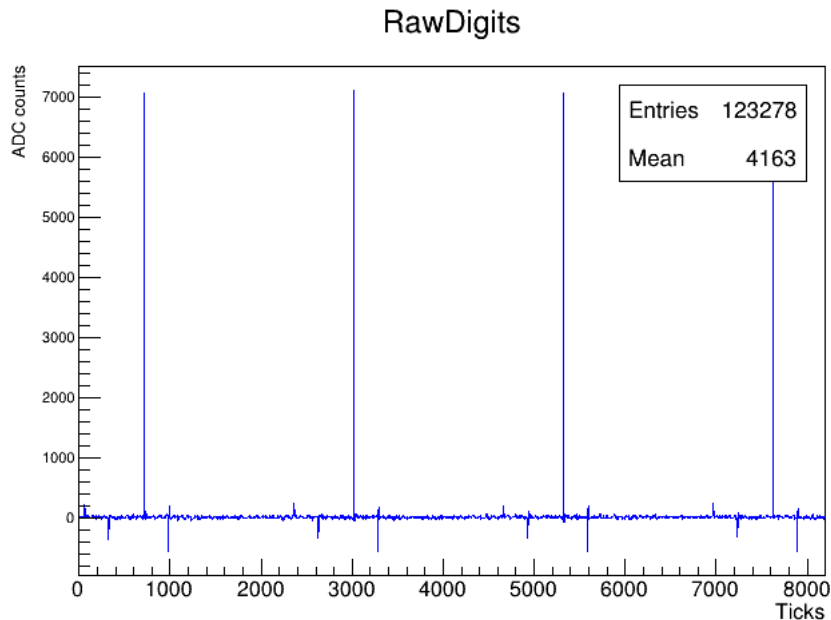


Ch. 568
Negative peak start

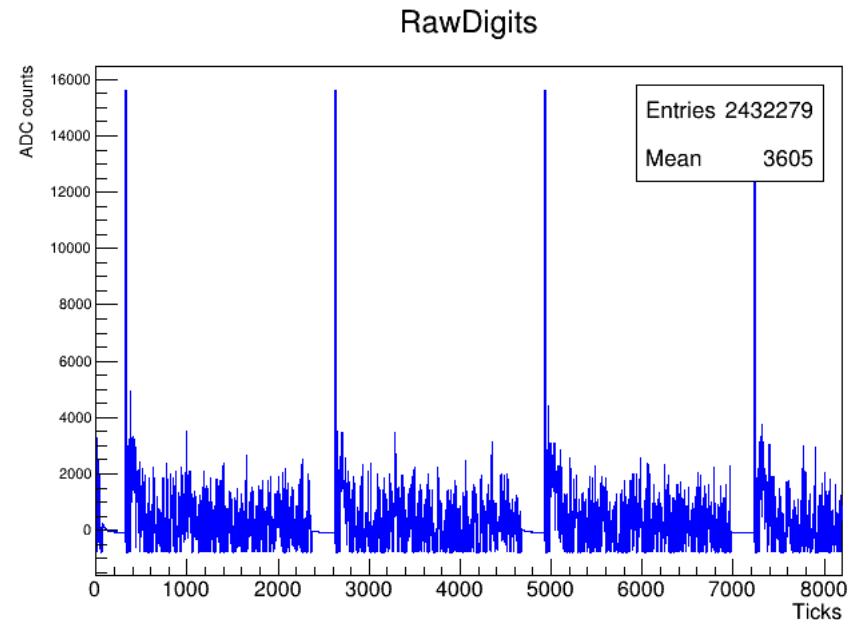


Ch. 573
Very small negative peaks

Peak Finder Challenges



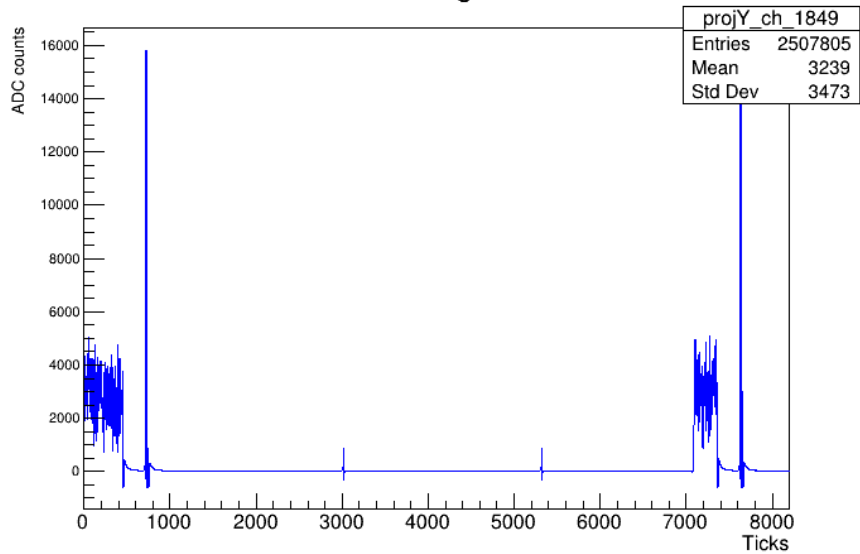
Ch. 1238
Noisy Baseline



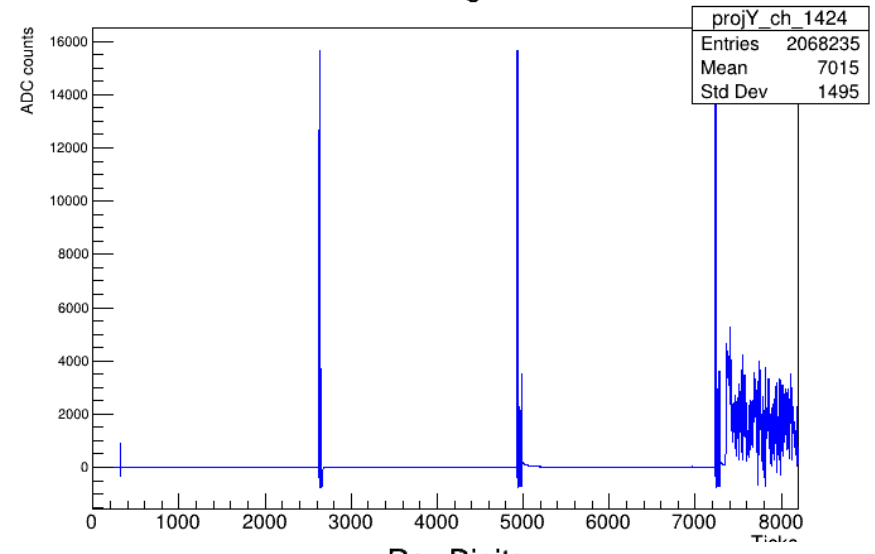
Ch. 182
Very noisy channels*

Interesting Channels

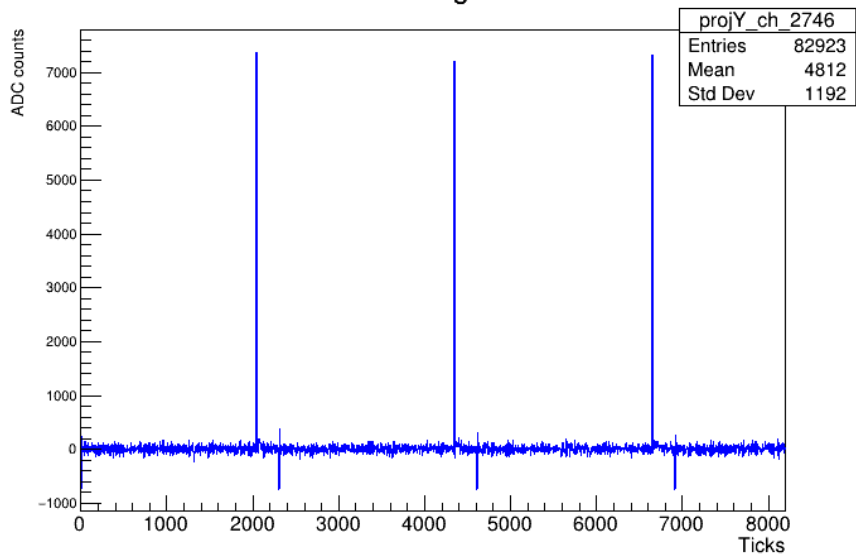
RawDigits



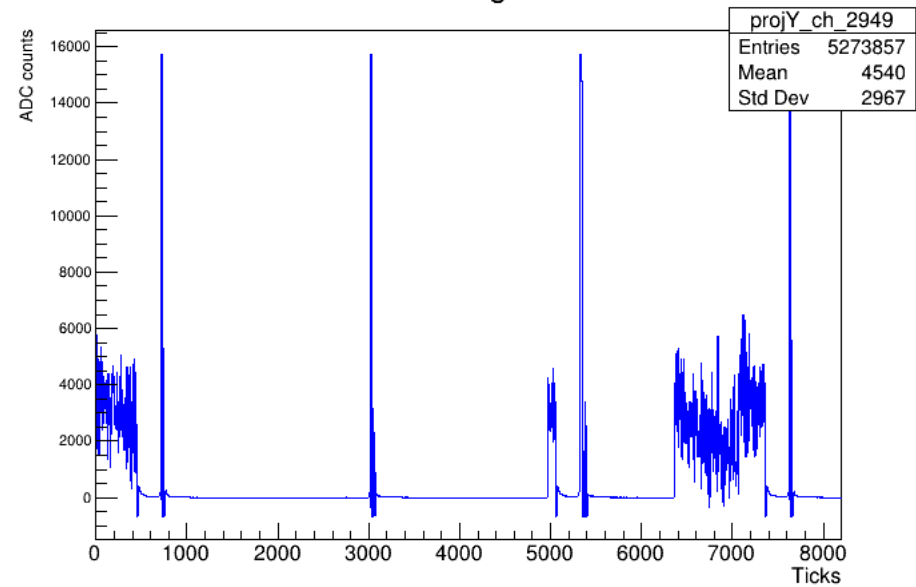
RawDigits



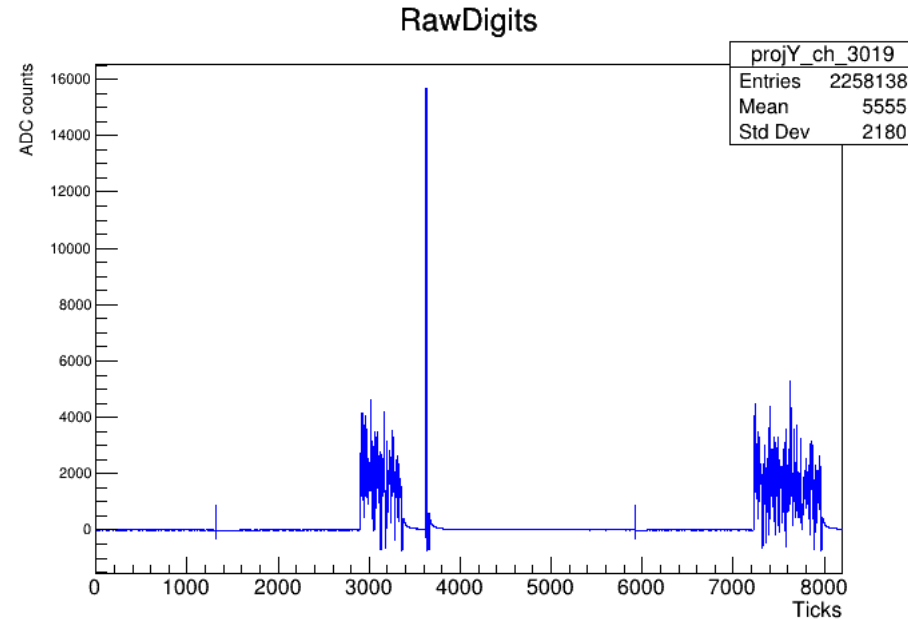
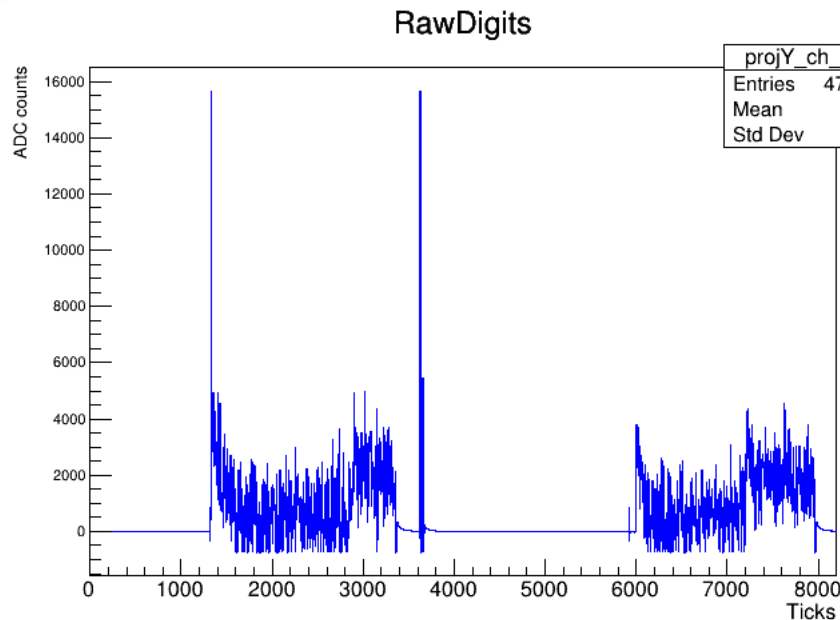
RawDigits



RawDigits



Interesting Channels



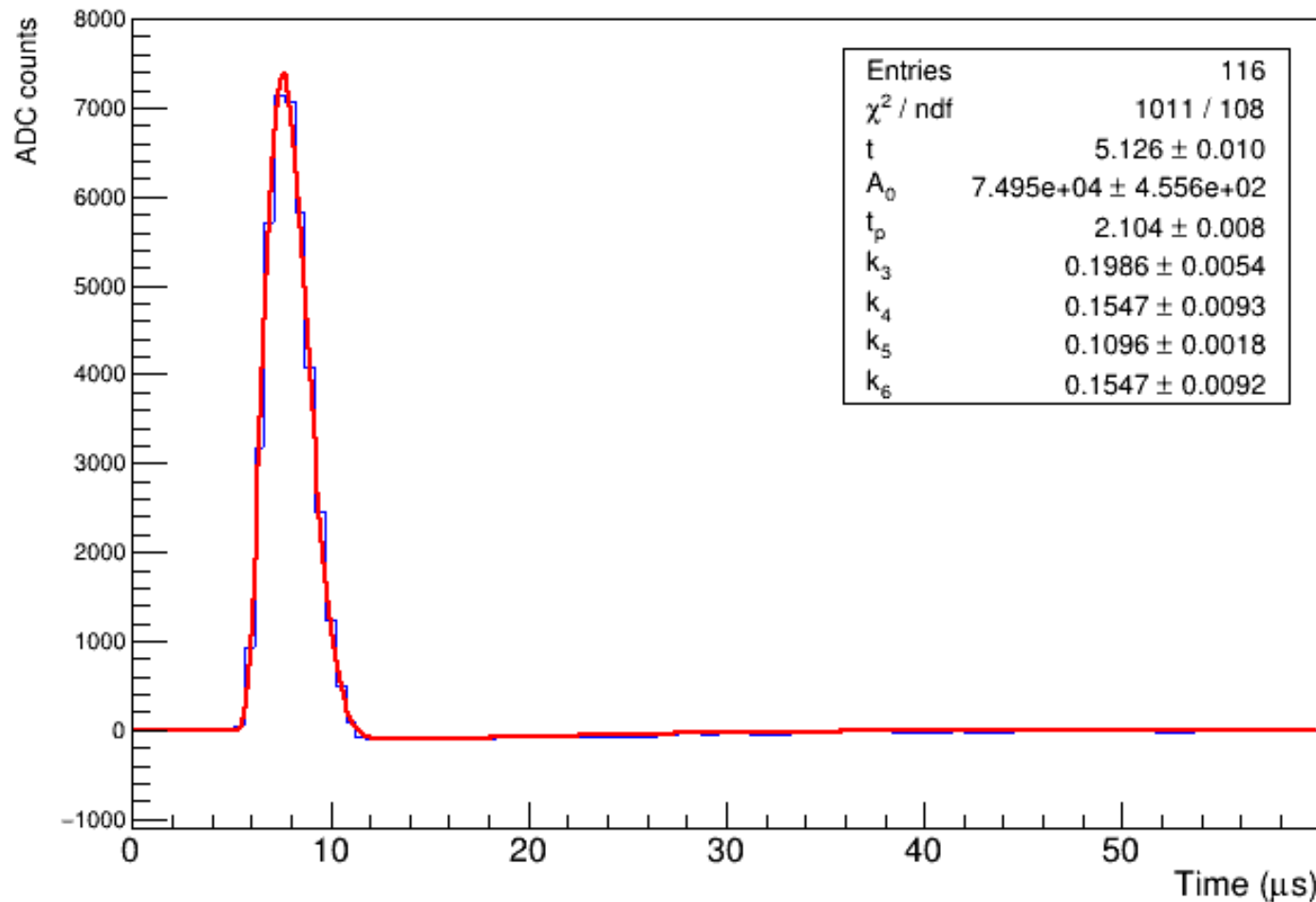
✓ Characterized by huge spikes, easily detected and discarded.

Fitting Waveforms

- Using Xin's Fit Function
- Used previously in MicroBooNE
(<https://arxiv.org/pdf/1804.02583.pdf>)
- 7 parameters:
 - t : time in μs
 - A_0 : amplitude of the pulse in ADCs
 - t_p : peaking time constant in μs
 - k_3
 - k_4
 - k_5
 - k_6

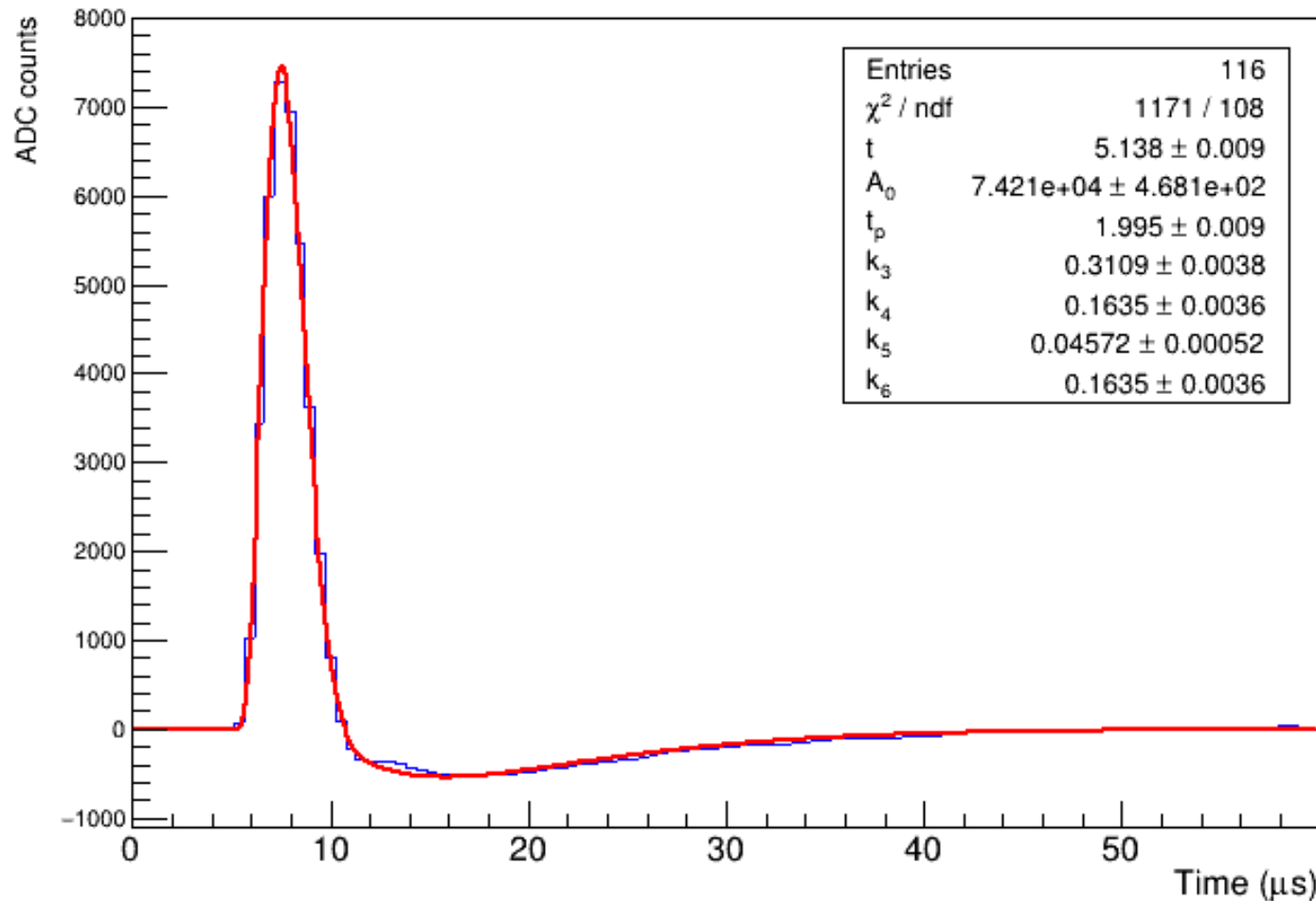
Fitting Waveforms

First Waveform, Channel 3066



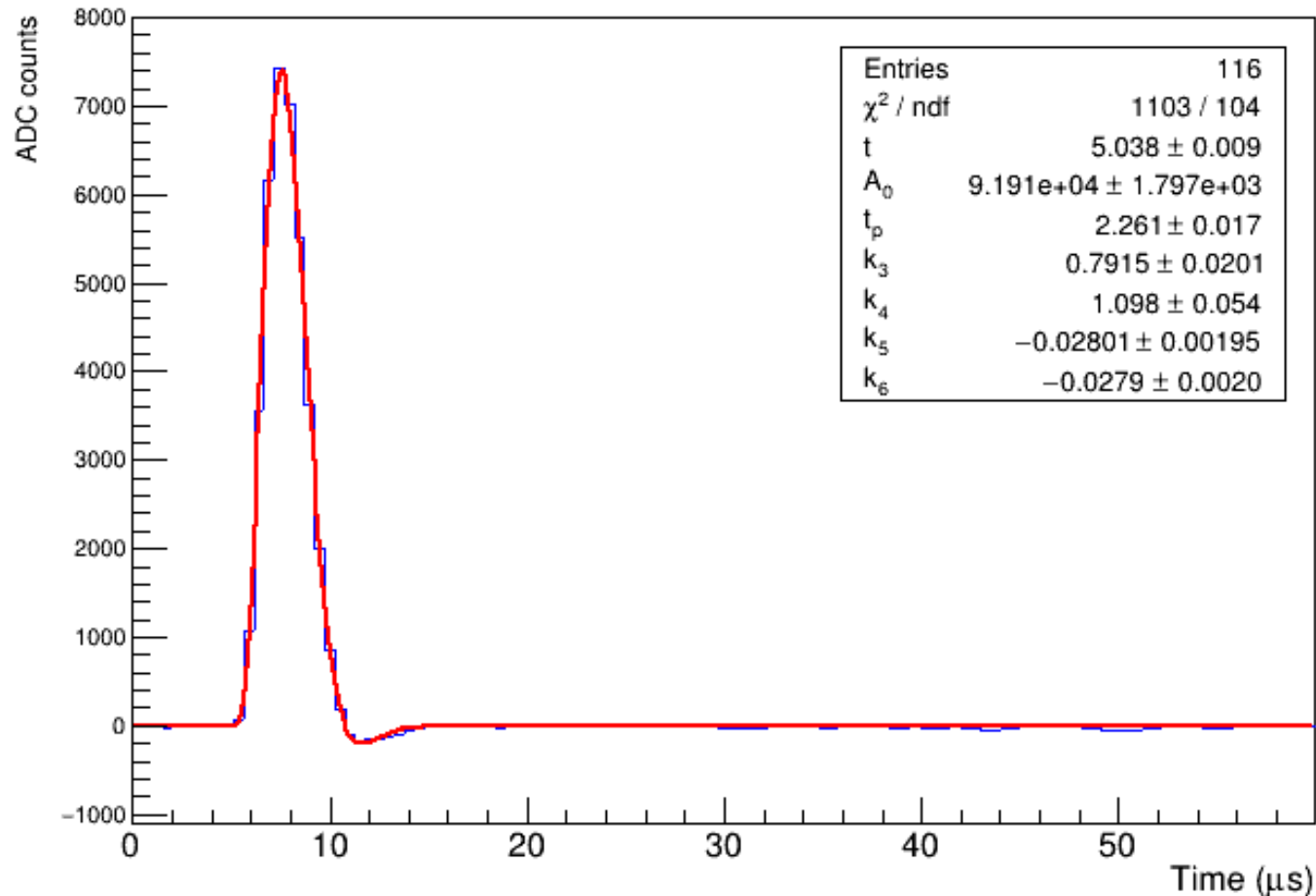
Fitting Waveforms

First Waveform, Channel 3018



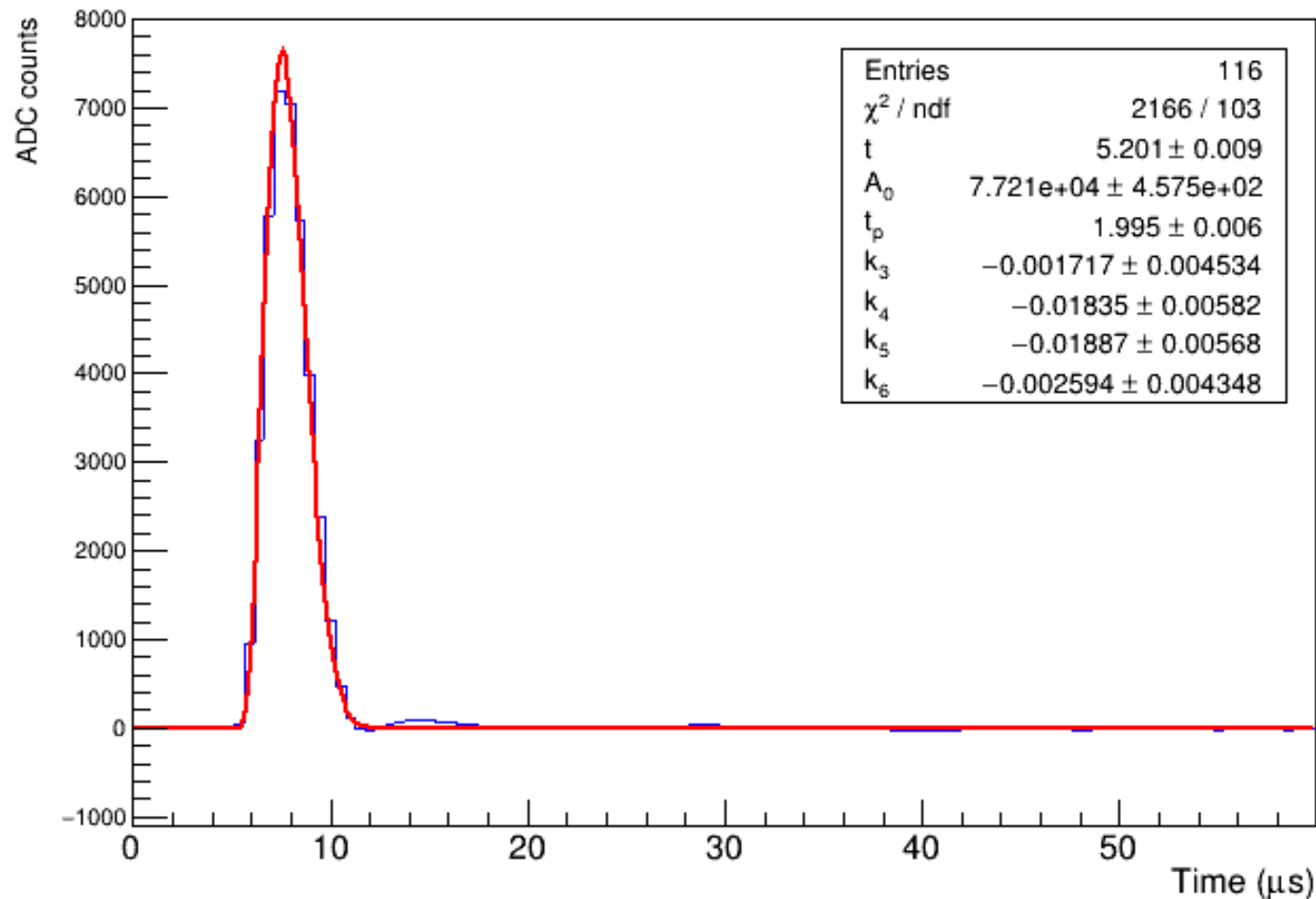
Fitting Waveforms

First Waveform, Channel 181



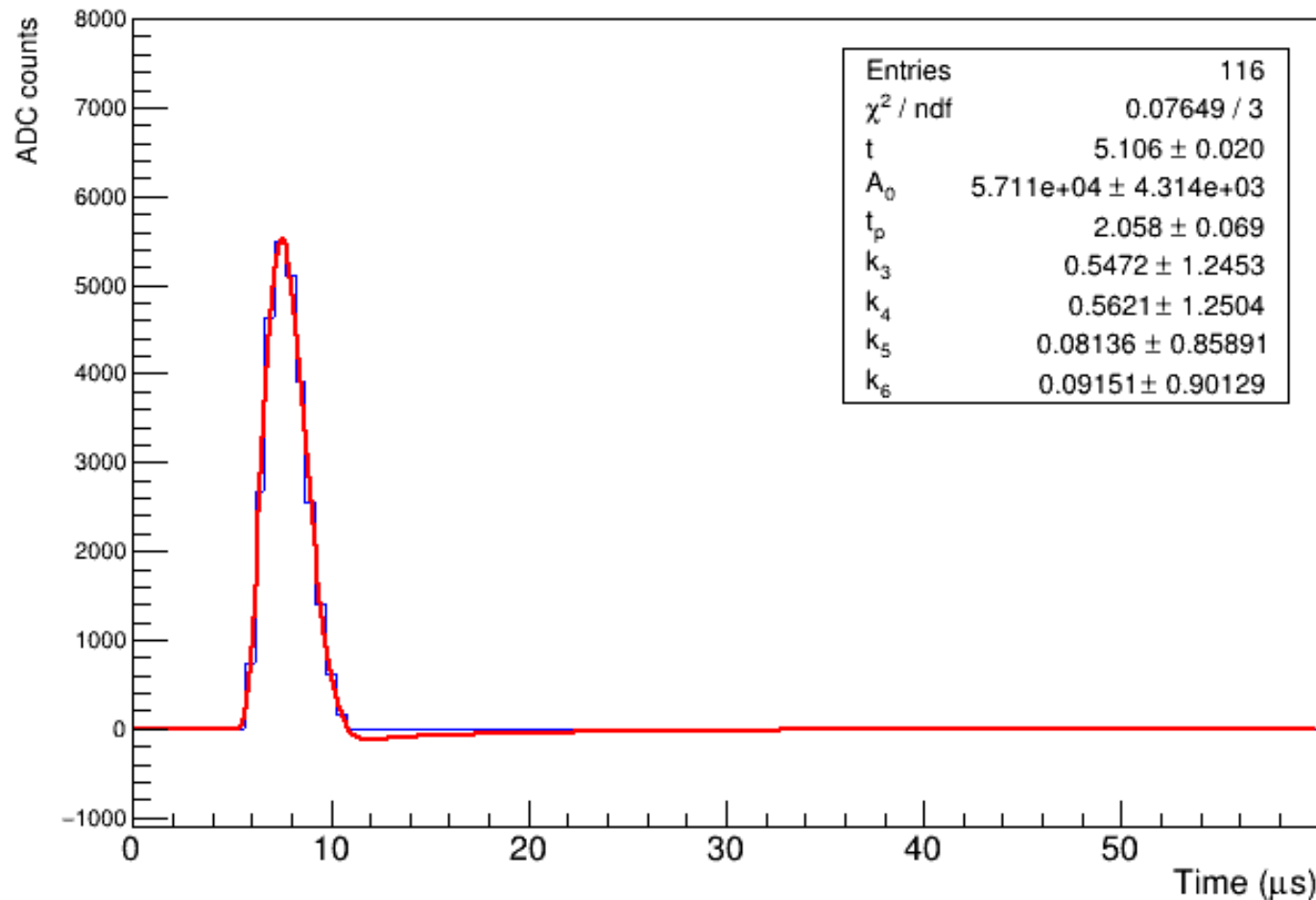
Fitting Waveforms

First Waveform, Channel 1236



Fitting Waveforms

First Waveform, Channel 1428



Next Steps

- Keep working on improving the fittings.
 - Pattern search for cases where fit misbehaves.
 - Consider some cuts related to baseline mean, r.m.s.

