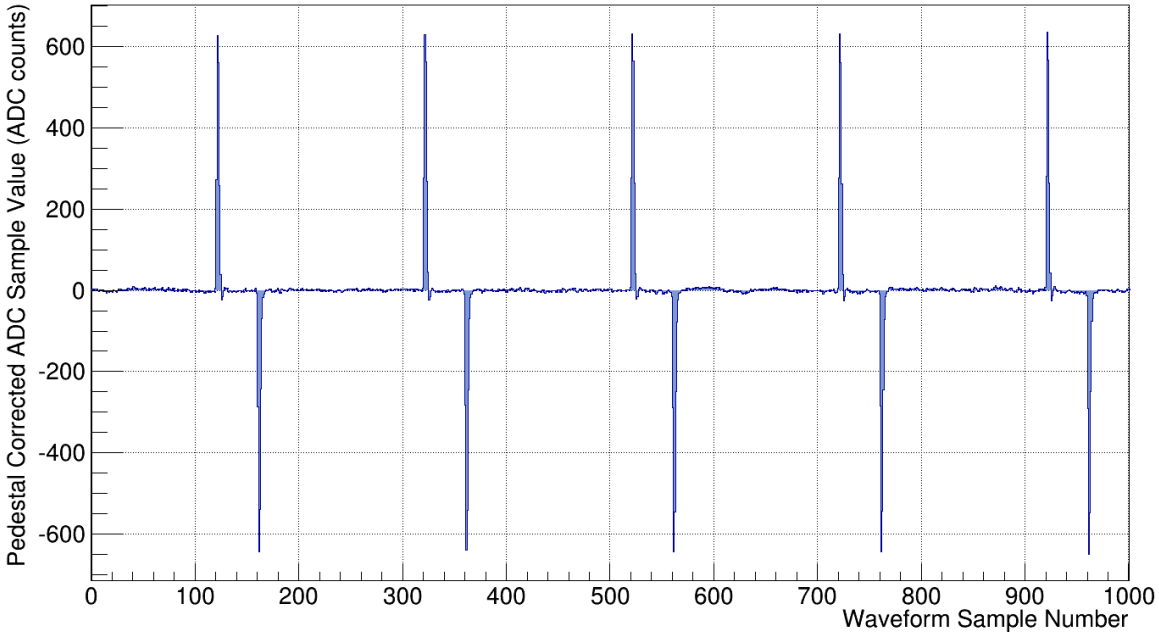
uBoone Electronics Response - Recent Pulser Data

20150811 - B. Kirby,
uBoone Detector Performance Meeting

Recent Pulser Data Runs

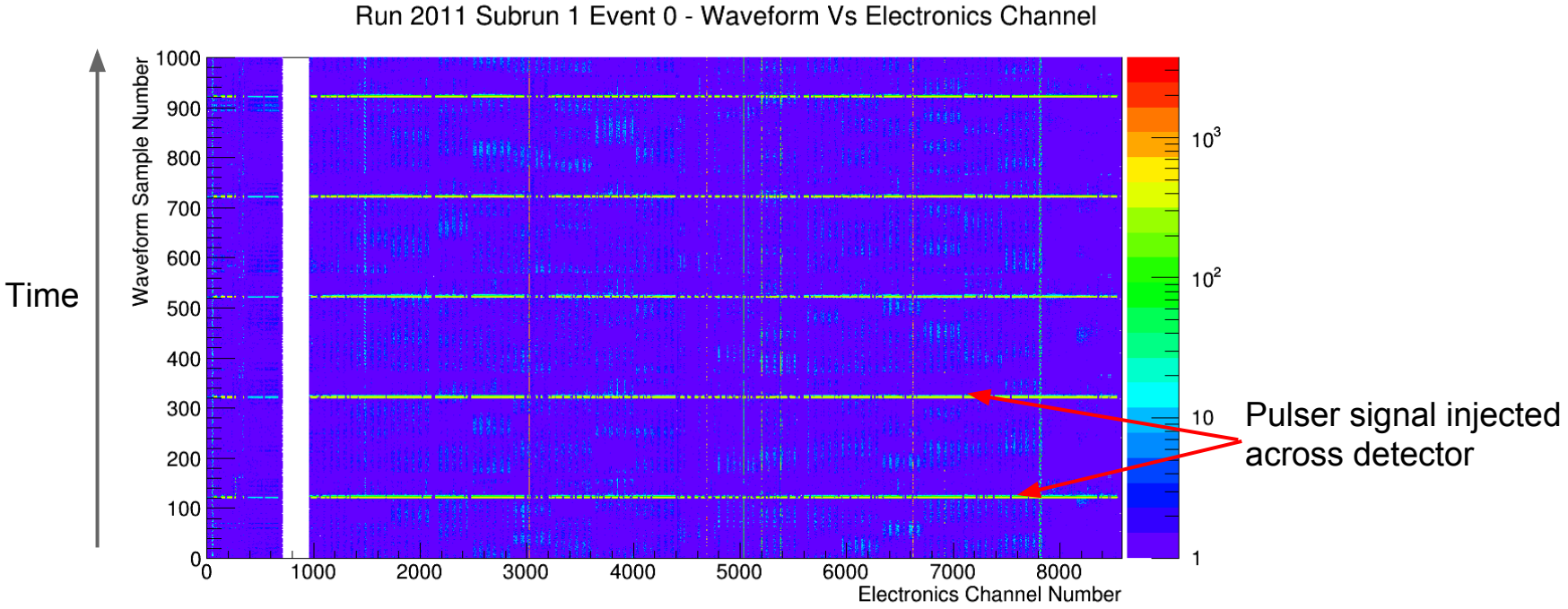
- Pulser data runs used to measure certain electronics response parameters
- Most recent pulser runs of interest:
  - Run 1072 - before wire bias, FT 2 & 4 not configured
  - Run 1075 - before wire bias, FT 2 & 4 configured
  - Run 1102 - after wire bias
  - Run 1111 - after wire bias, long pulser run
- Focus on run 1111 in this presentation

uBoone Pulser Runs



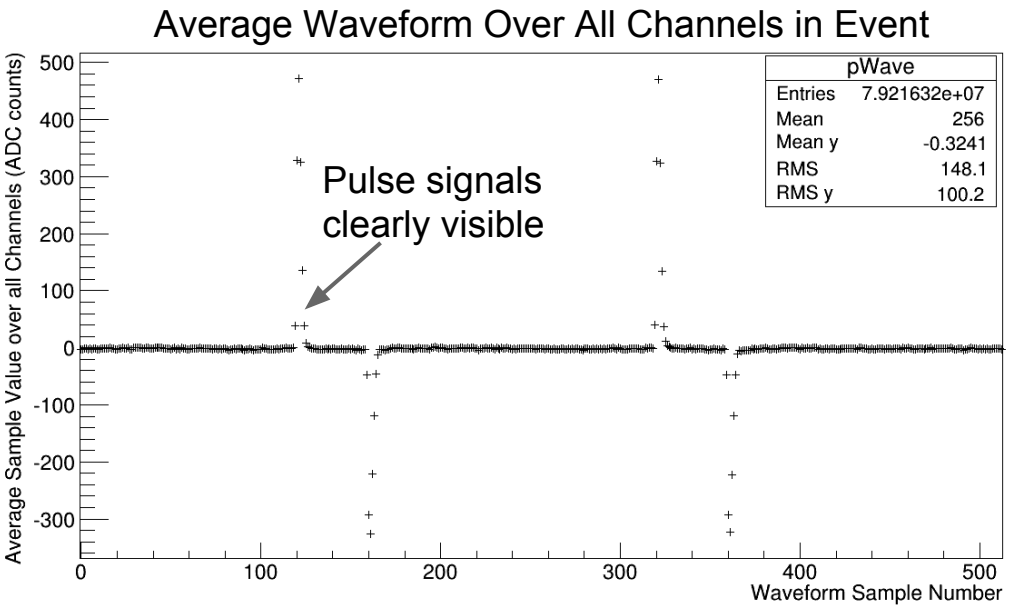
- Positive and negative going pulser signal clearly visible

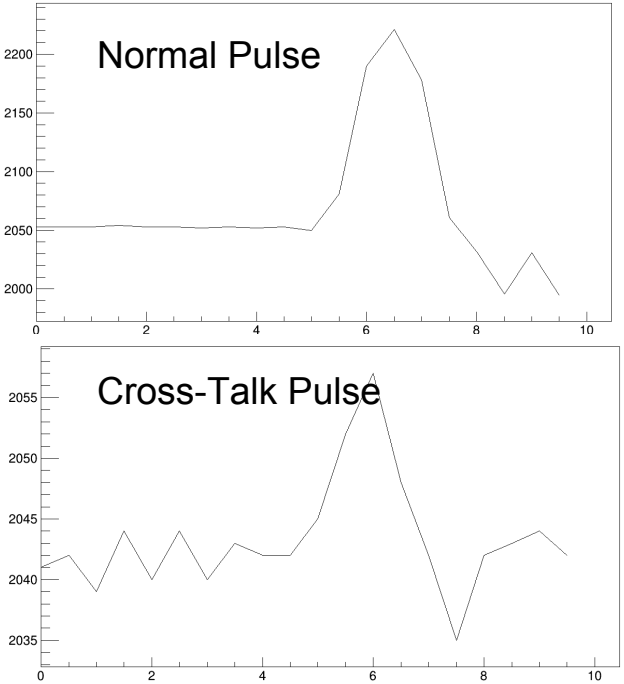
uBoone Pulser Waveform Vs Ch



- Plot shows waveform vs channel #
- Pulser signals clearly time synchronized across detector
  - Allows unbiased pulse selection

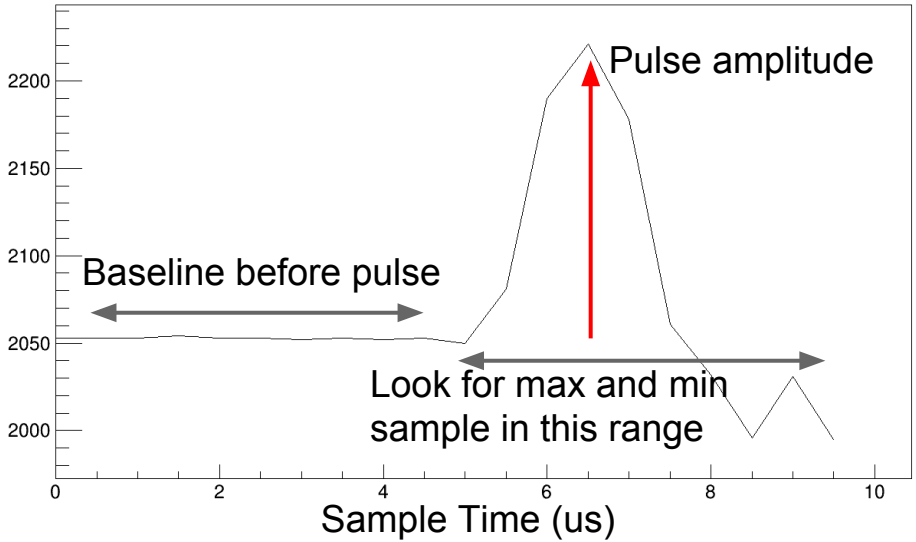
Unbiased Pulse Selection

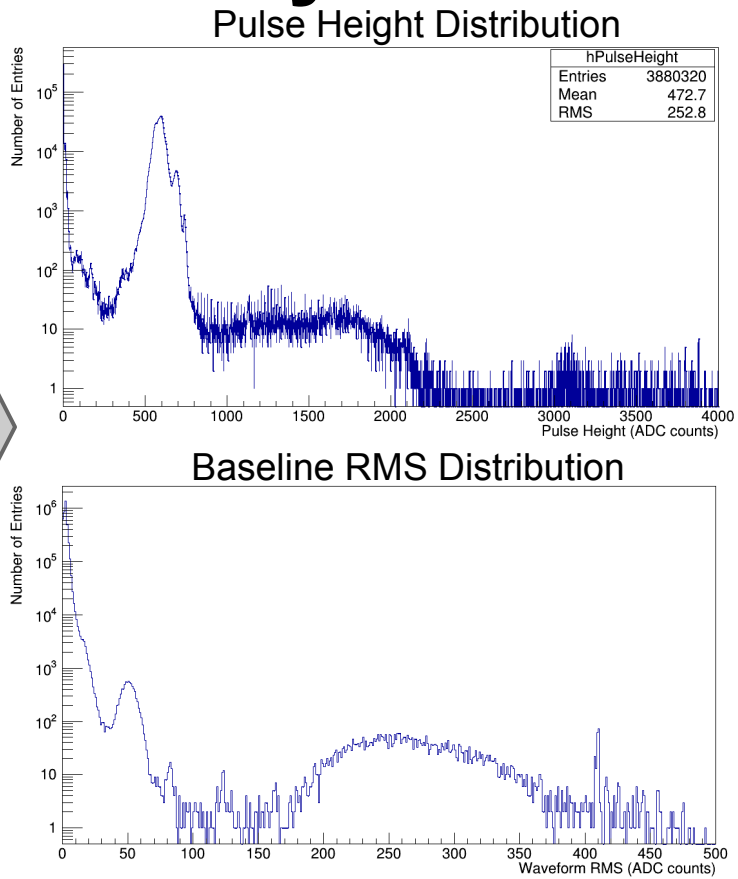




- Produce a cumulative histogram averaging over all waveforms in event
- Identify pulse times using this overall histogram
  - Use to identify channel waveform sections that should contain a pulse
  - Avoids the use of a pulse-finding algorithm, can find very small pulses

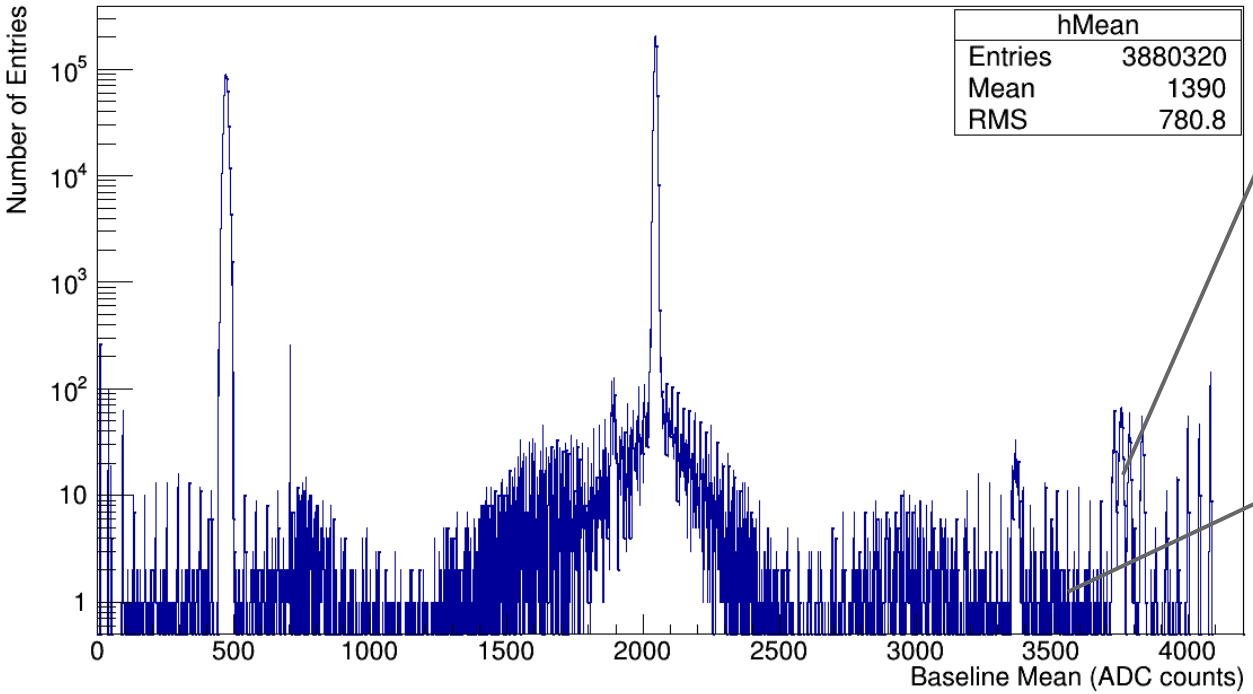
Waveform Section Pulse Analysis



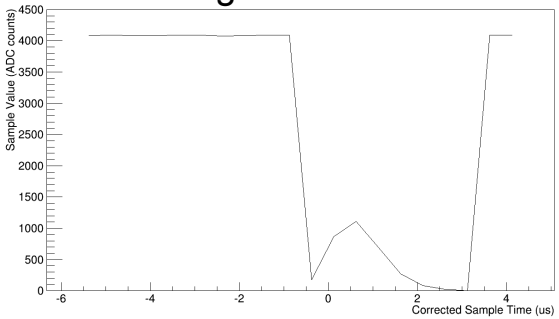


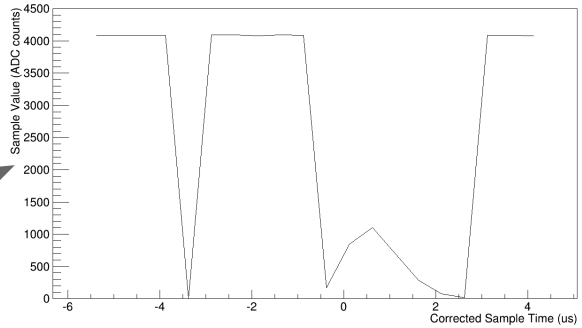
- Measure pulse height in each waveform section
  - Noise level in pedestal directly before pulse
  - Max and min sample (get pulse height)

Baseline Distribution



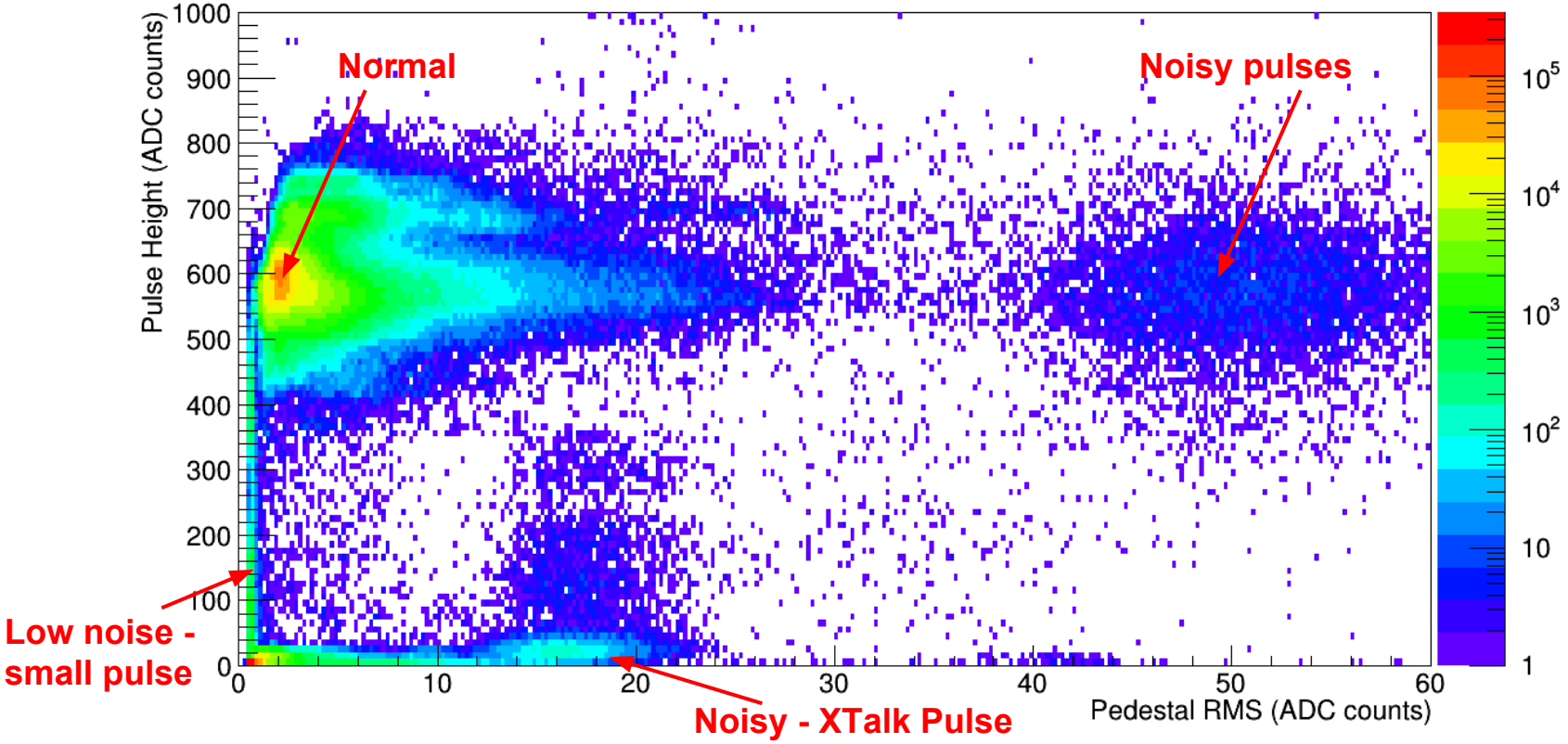
High Baseline





- Variation in baseline distribution

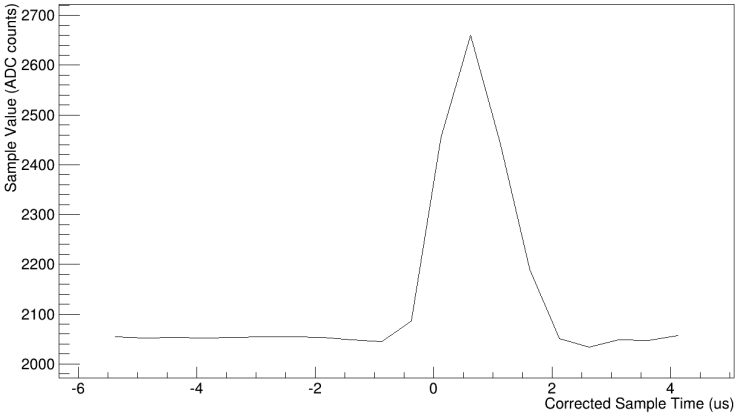
Pulse Height Vs RMS Distribution



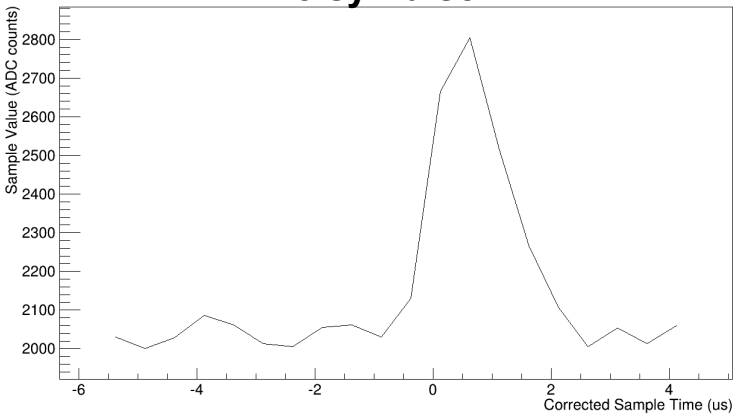
- Pulse height vs pedestal RMS shows several different types of pulses

Different Pulse Types

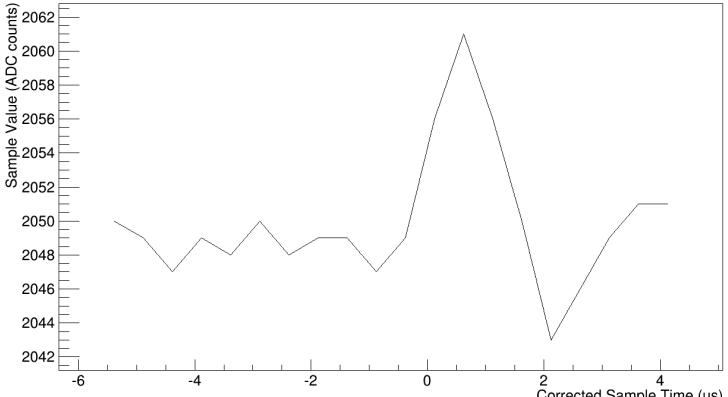
Normal Pulse



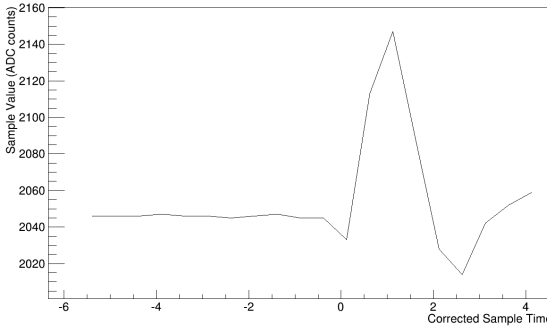
Noisy Pulse

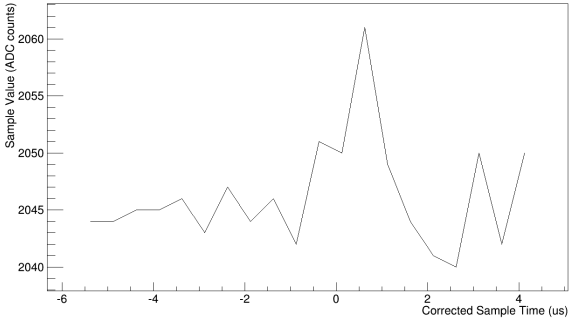


Cross Talk Pulse



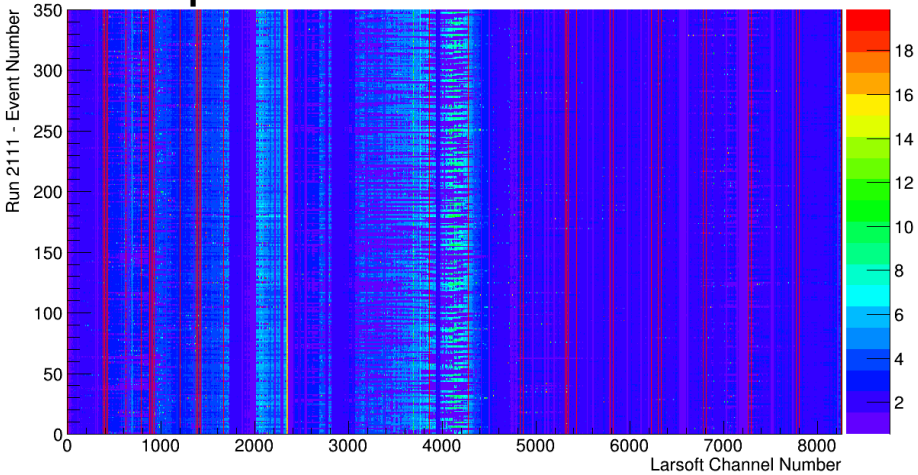
Low Noise - Small Pulse / No Pulse



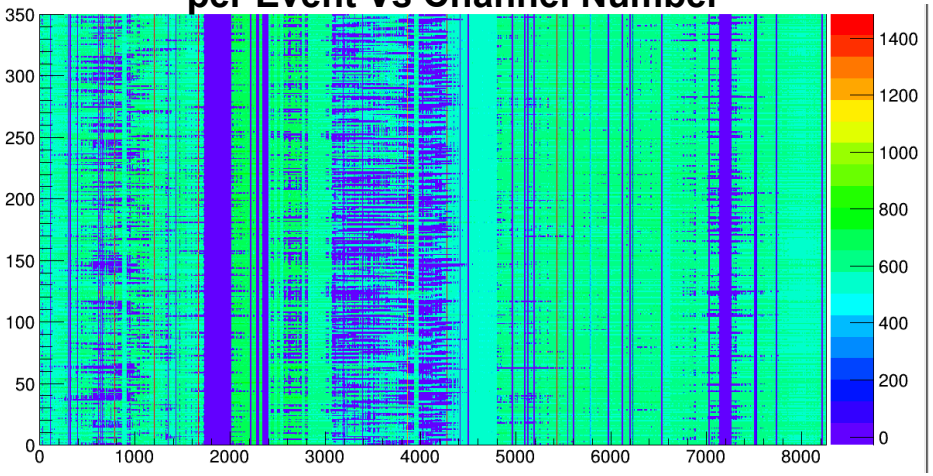


Mean RMS, Pulse Height per Event

Average Pedestal RMS (ADC counts) per Event Vs Channel Number



Average Pulse Height (ADC counts) per Event Vs Channel Number

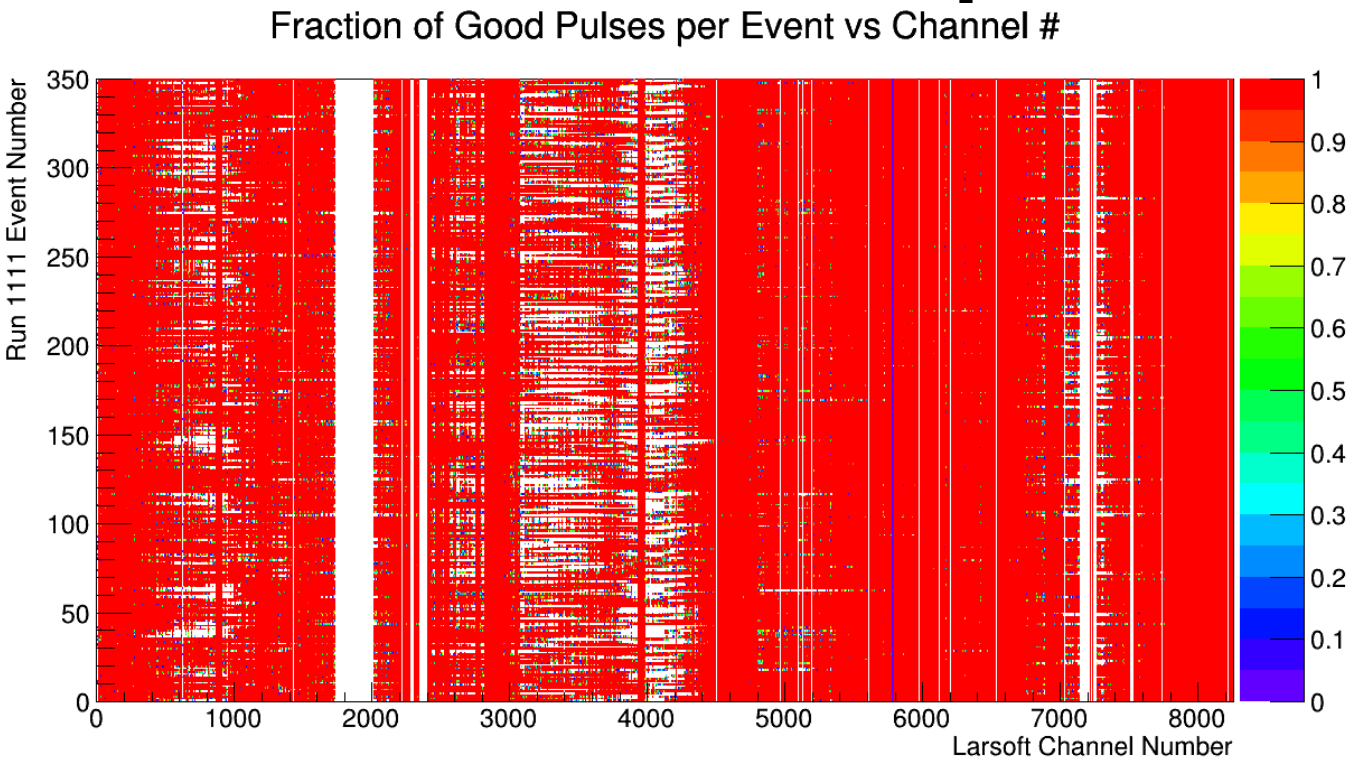


- See significant variation in pedestal rms and measured pulse heights on an event by event basis
- Mainly affect induction wire channels, collection channels relatively stable

Pulse Selection

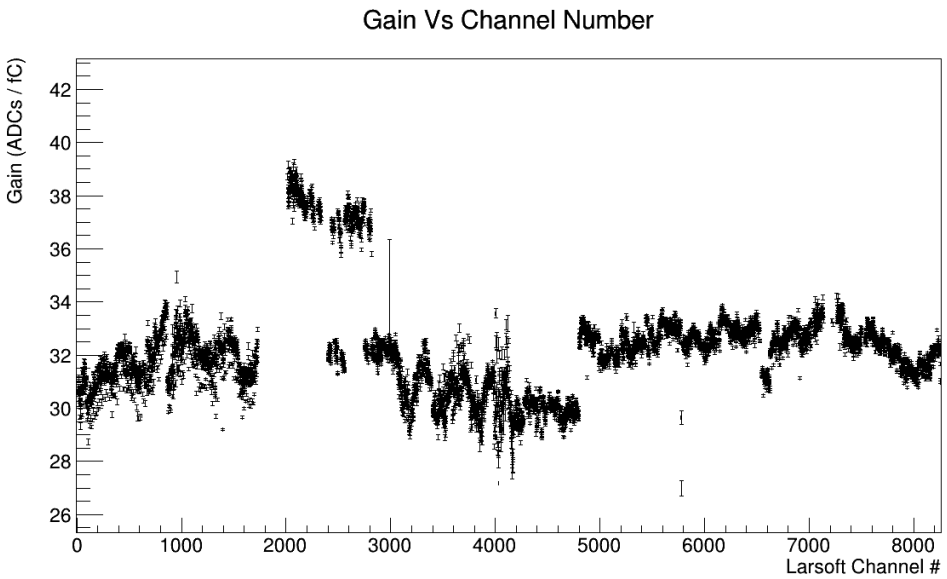
- Cut 1: reject pulses with local baseline > 2600
- Cut 2: require local rms between 0.8 and 35 ADC counts
  - Roughly 200 to 9000e-
- Cut 3: require pulse height between 380 to 850 ADCs
  - Roughly 15 to 25fC
  - Consistent with nominal gain

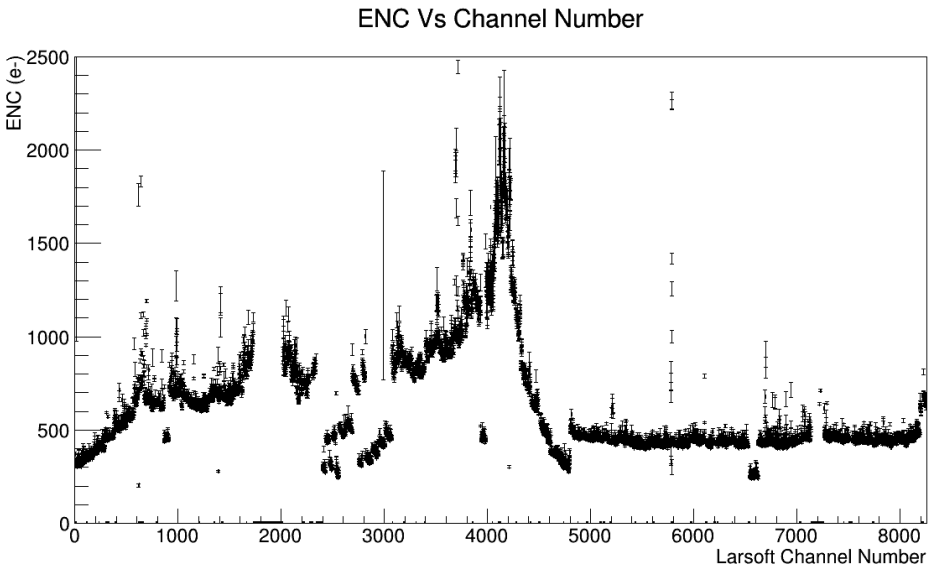
Number of Good Pulses per Event



- Many channels have intermittent performance
- Fractional time that channel has desired gain/noise level is a good metric

Gain and Noise Measurements





- Apply selection cuts to identify “good” pulses
- Measure gain and ENC
  - **~7310 channels with gain between 26 to 40 ADCs/fC, ENC between 200 and 3000 e-**

Plans

- Express performance on an ASIC basis
  - Need to get channel mapping correct with latest swizzled data
  - Explore options with problematic ASICs
- Compare performance with pre-wire bias
- Suggestions?