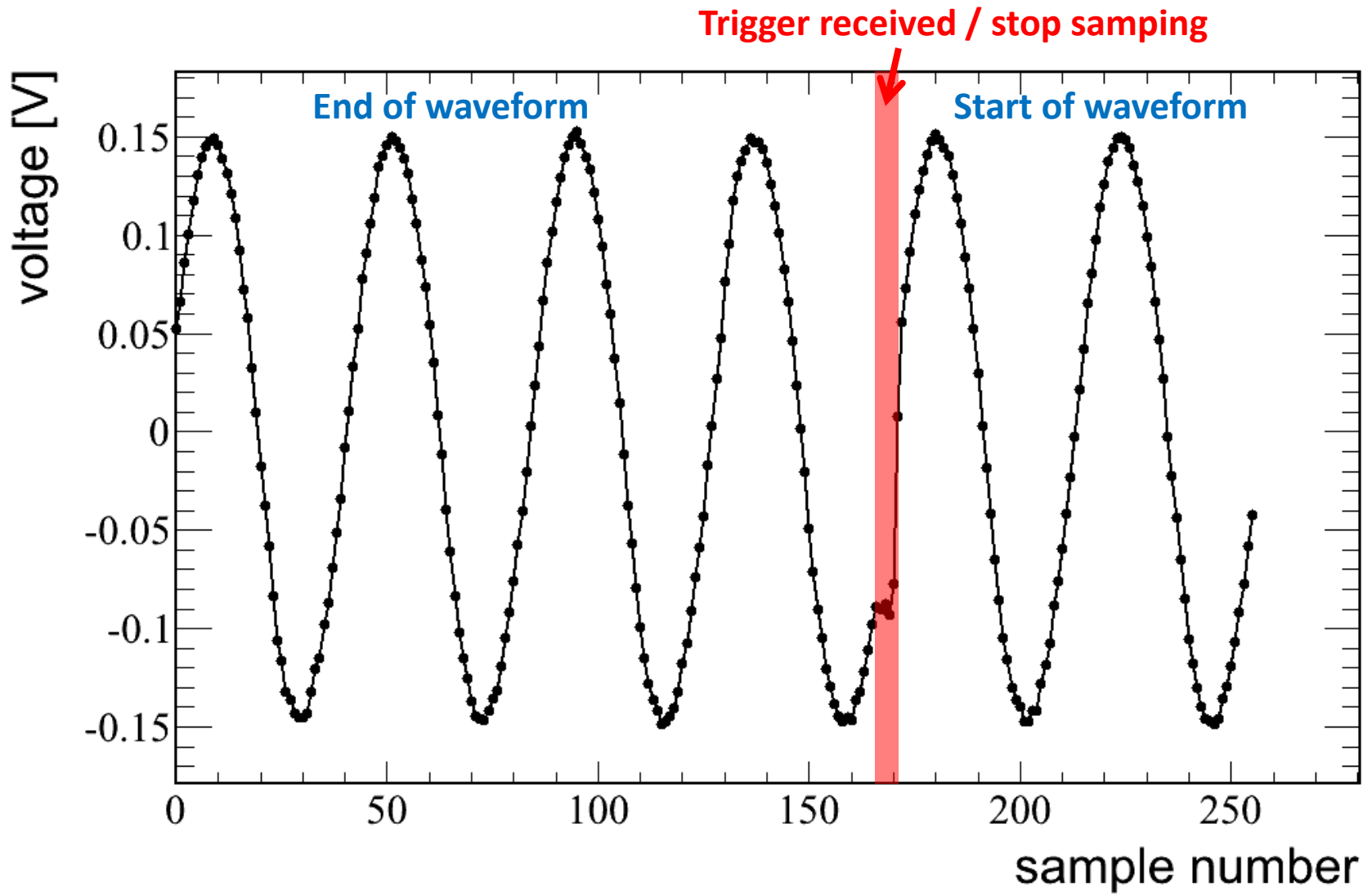


# PSEC4 Timing - Current Data Sample

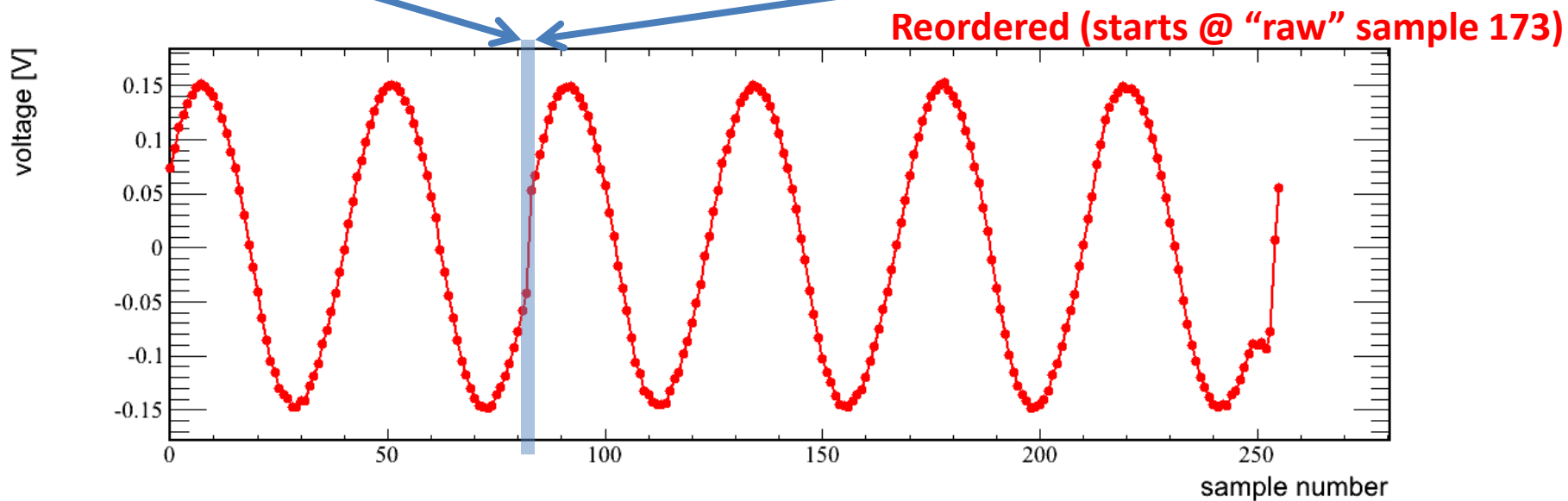
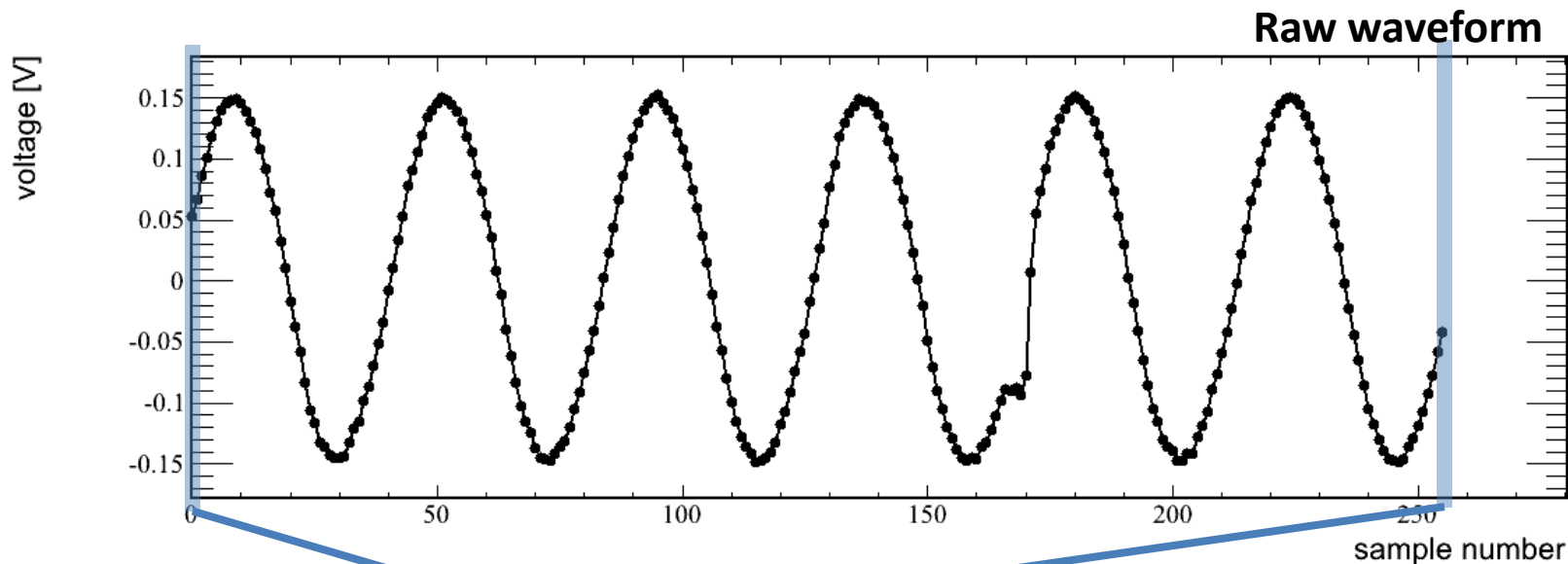
- Data provided by Eric in December:
  - 10.24 GSa/s
  - 240 MHz sine wave input
  - 20,000 events for CH3
  - 20,000 events for CH5
- Timing calibration with “zero-crossing” analysis.
  1. Reorder waveform
  2. Pedestal (re-)correction
  3. Zero crossings:
    - a) Measure period of waveform (in number of samples) to get average sampling rate.
    - b) Measure occupancy of zero crossings between each sample pair to get  $\Delta t$  for each sampling interval.

# Example “raw” event



Sample numbers must be reordered to properly align the waveform in time.

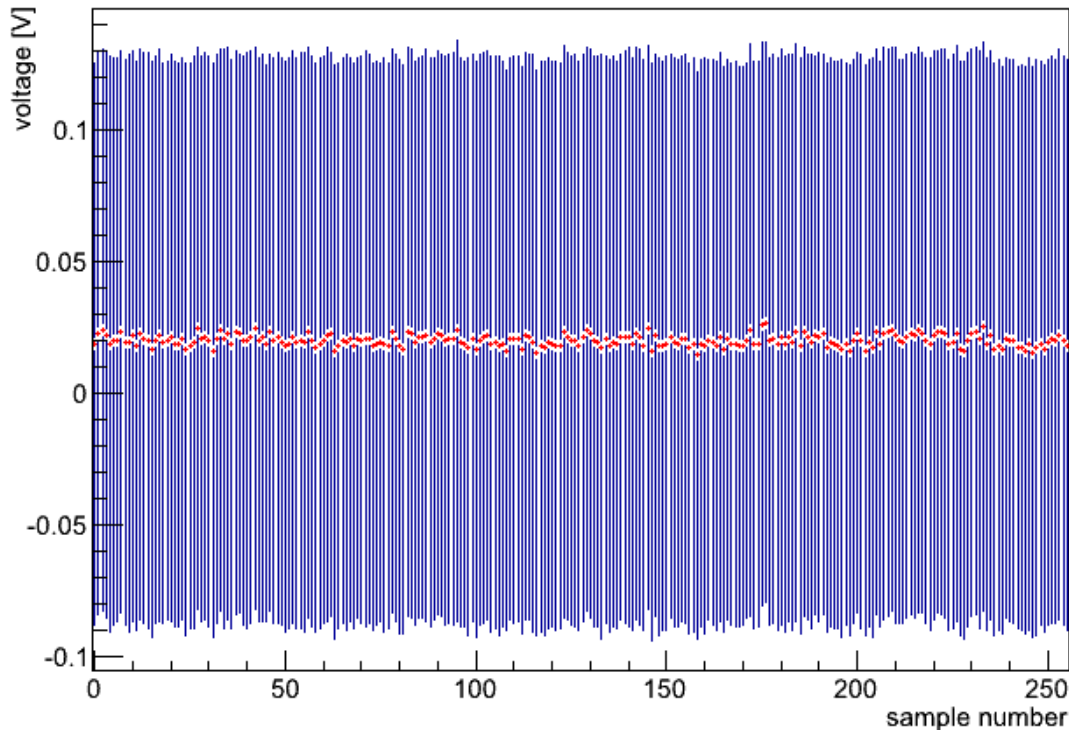
# Step 1 – Reordering waveform



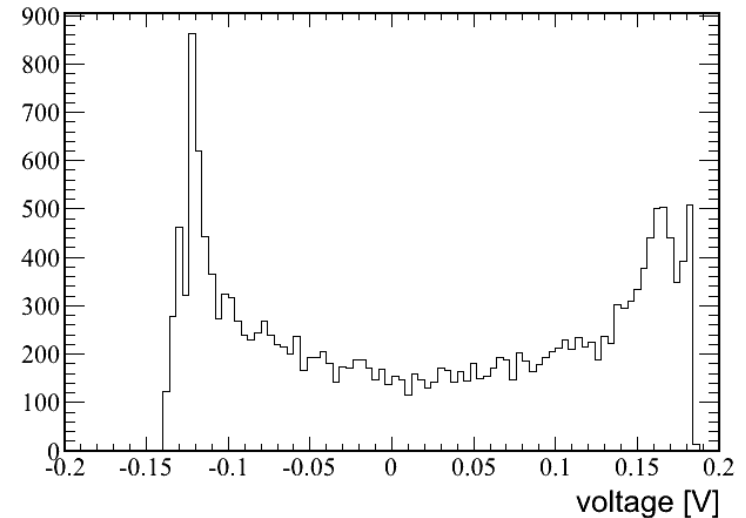
Known "gap" at wraparound point between sample 255 and 0

# Step 2 – Pedestal (re-)correction

Voltage Profile



Voltage histogram (sample 35)

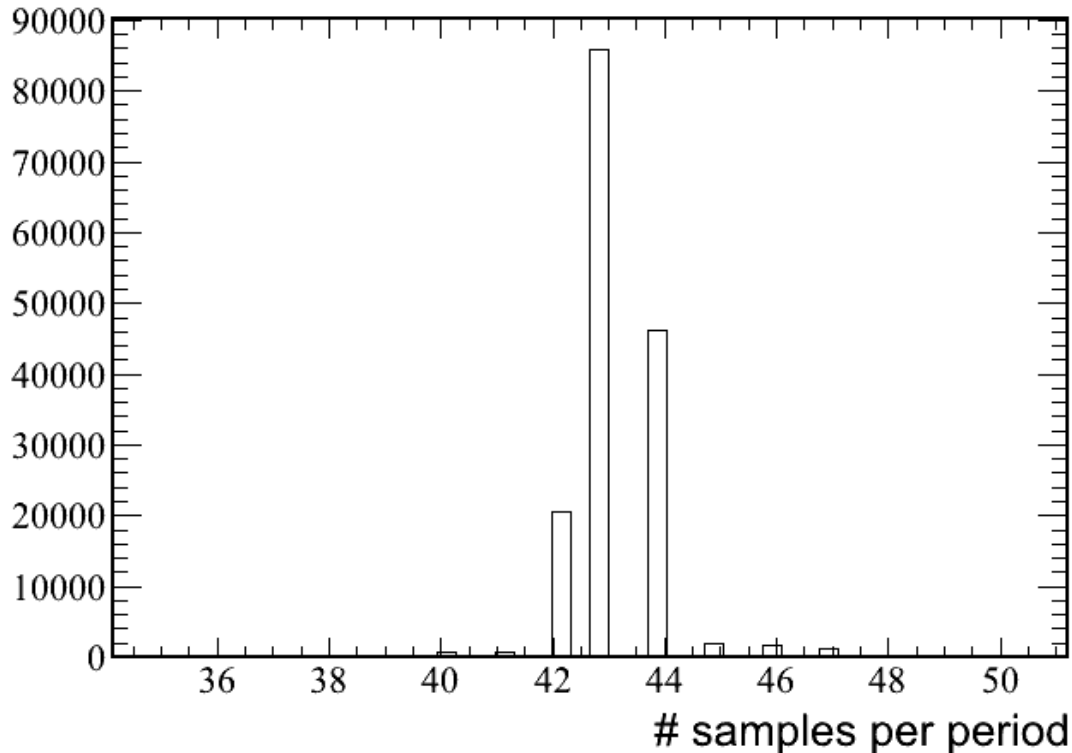


**Data is already pedestal subtracted, but looking at a profile histogram of voltage over all samples, a clear offset is present.**

**This is calculated and subtracted from each sample event-by-event.**

# Step 3a – Calculate Average $\Delta t$

- Histogram number of cells between periods:



Uses full period intervals (rising-to-rising or falling-to-falling).

Separately calculated for samples 0-82, 83-255 to avoid systematic offsets from sampling "gap."

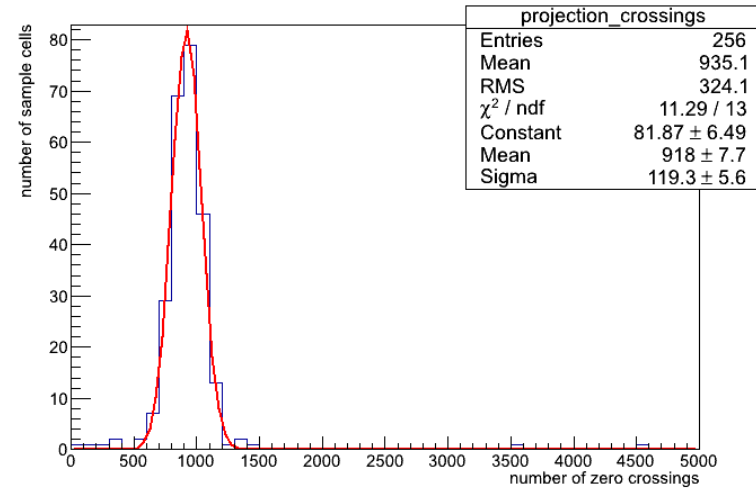
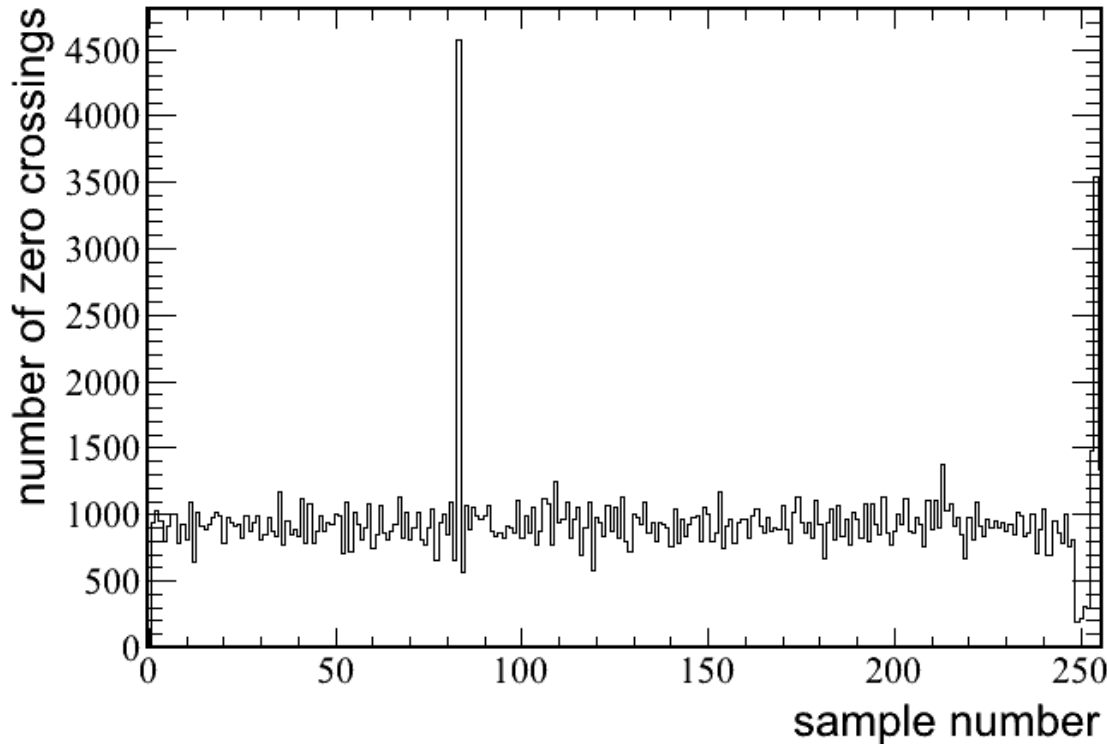
Mean: 43.22 samples

Corresponds to:

$\langle \Delta t \rangle = 96.4$  ps

$\langle f_{\text{samp}} \rangle = 10.37$  GSa/s

# Step 3b - Zero Crossing Occupancy



(Above) Projection of left plot onto y-axis.  
~13% spread in  $\Delta t$  values

Corresponding  $\Delta t$  files available for CH3 and CH5.

Still running some cross-checks / residuals with these  $\Delta t$  values.

