PROTODUNE-VD SPE templates

WIth suggestion and help of the jedis:
Francesca and Henrique

RUNS per channel

Calibration:

C5 39357
C6 39358,39359
C7 39360
C8 39361
M3 39360
M4 39360
M7 39365
M8 39366

Larsoft channel map
LArsoft code: Y0NX
Y: 1 for C , 2 for M
N: for membrane or cathode module number
X:Arapuca channel (0 or 1)

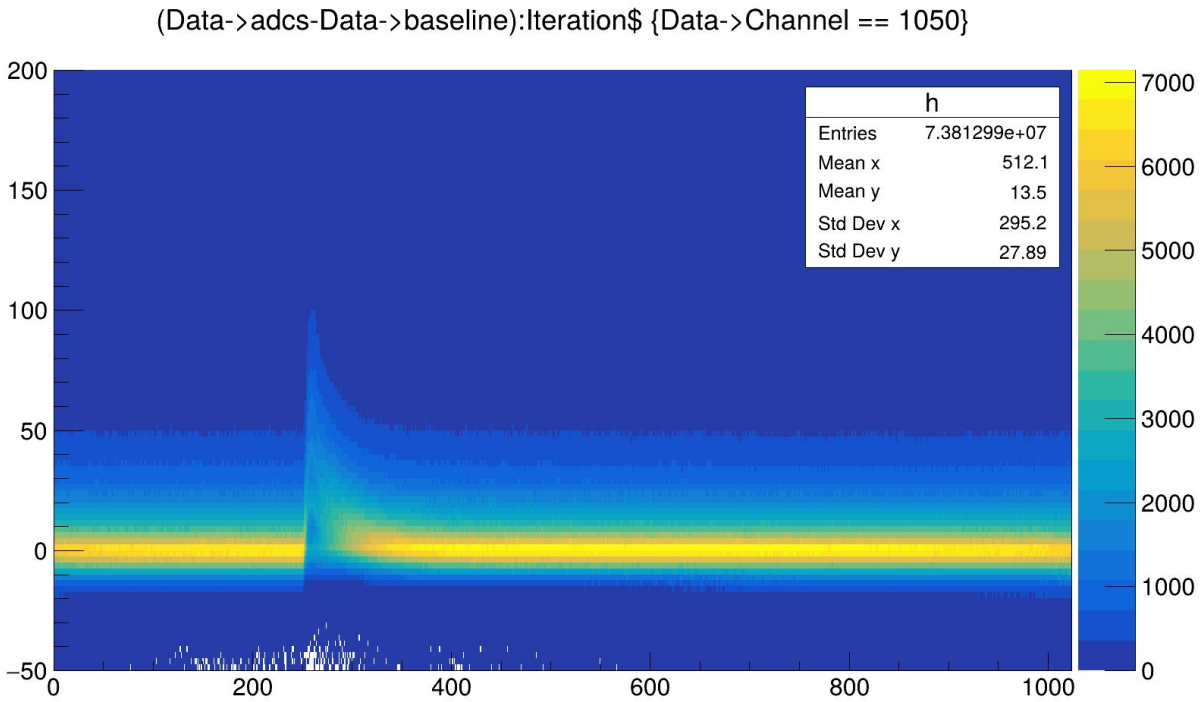
Ex: C5 ch0 → 1050
C5 ch1→ 1051

1 STEP

Integral (n_1, n_2): → 255 and 265
Determine the sum of values from n1 to n2
Baseline (c, t): → 8 and 12
For each waveform, compute the mode. Then, calculate the average starting from the waveform's beginning.
If a point falls within the region [mode−c,mode+c], skip *t* ticks and continue.
Noise (n): → 240
Compute the standard deviation over the first *n* ticks.
Pre-signal Amplitude (n): →240
Find the minimum and maximum values within the first *n* ticks (before the signal).
Signal Amplitude (n_1, n_2): →300 until 1023
Find the minimum and maximum values between ticks n_1 and n_2.
Post Signal Amplitude (n_1, n_2): →350 until 1023
Find the minimum and maximum values between ticks n_1 and n_2.

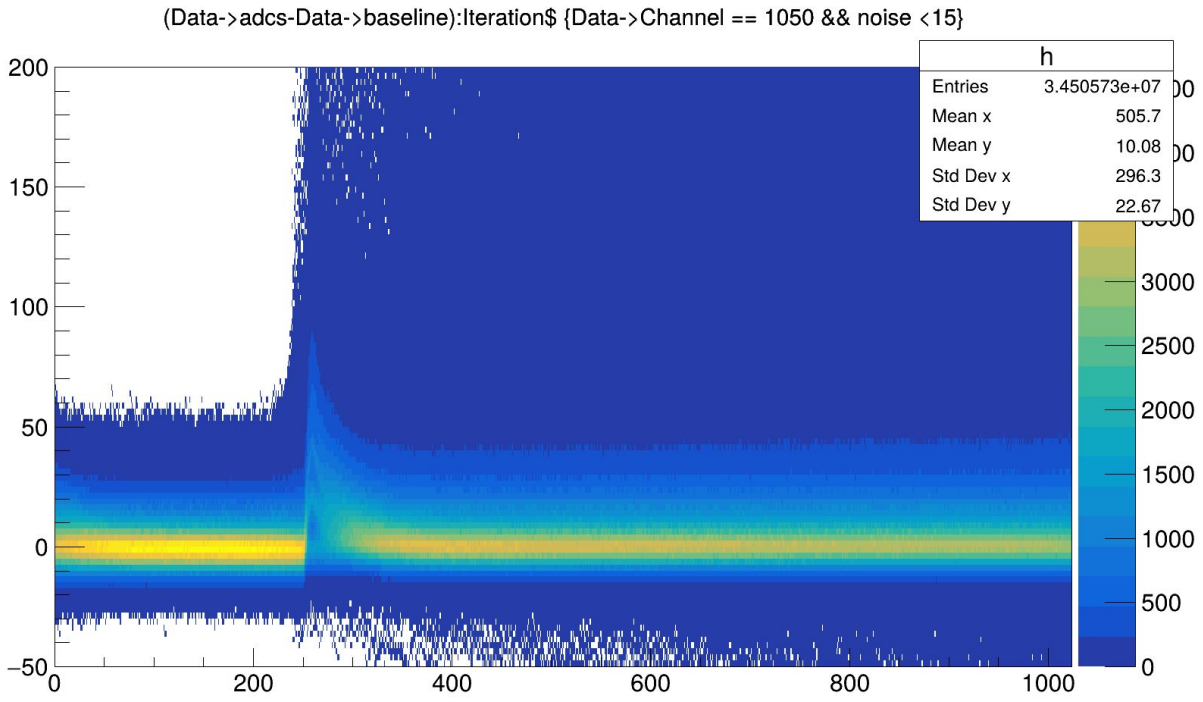
FULL persistence

Ex: Ch 1050

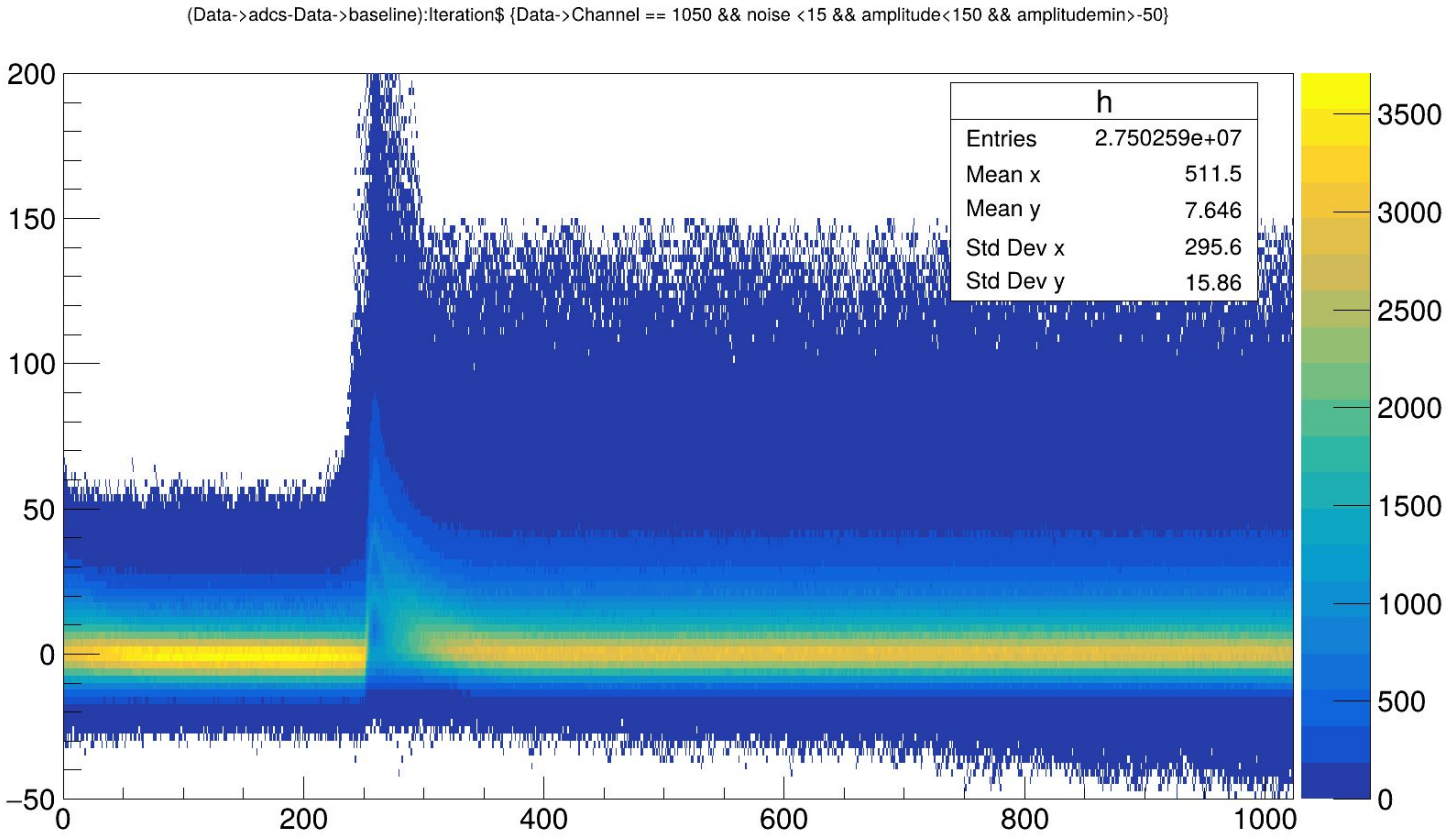


FULL persistence

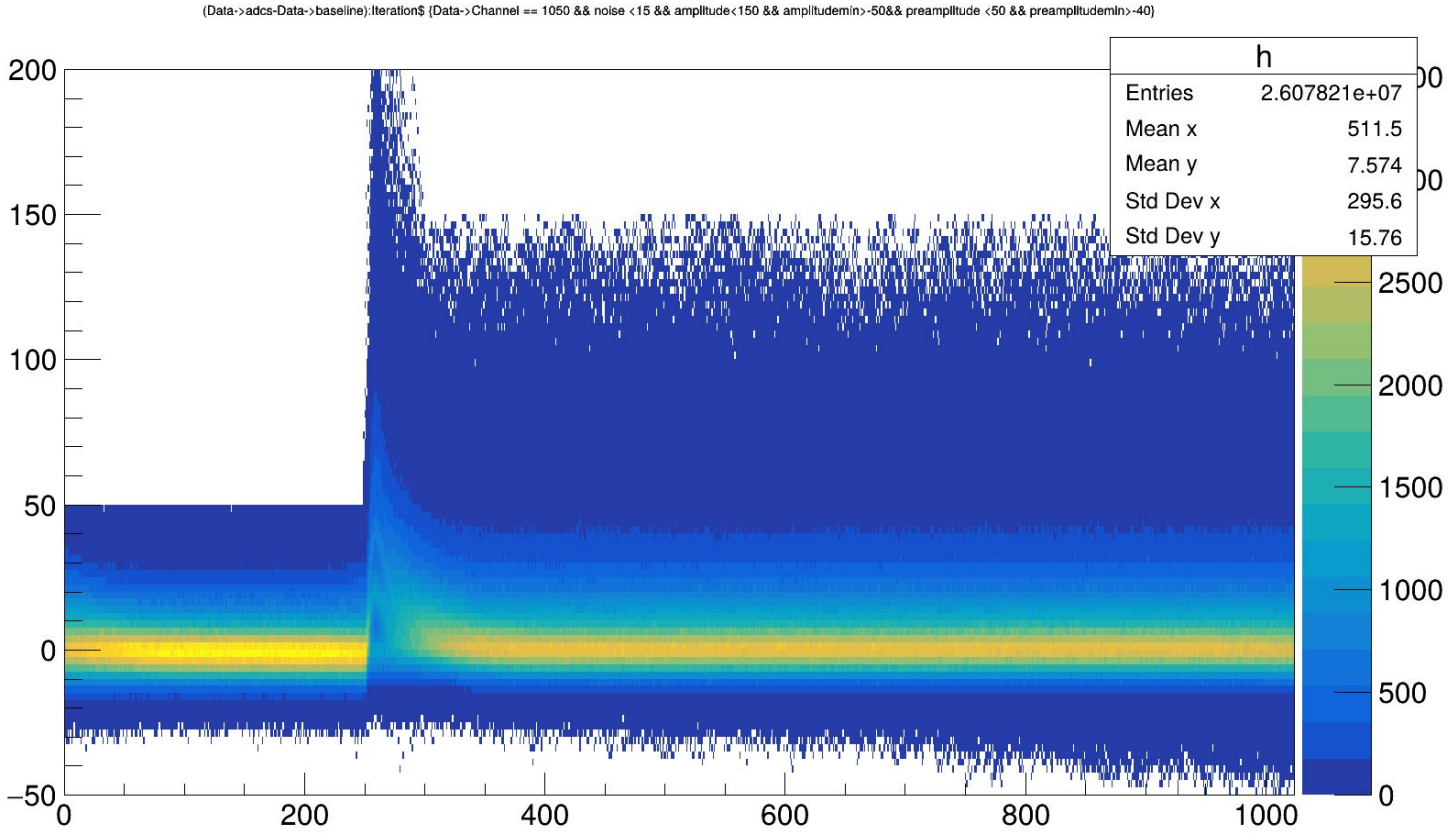
Noise < 15



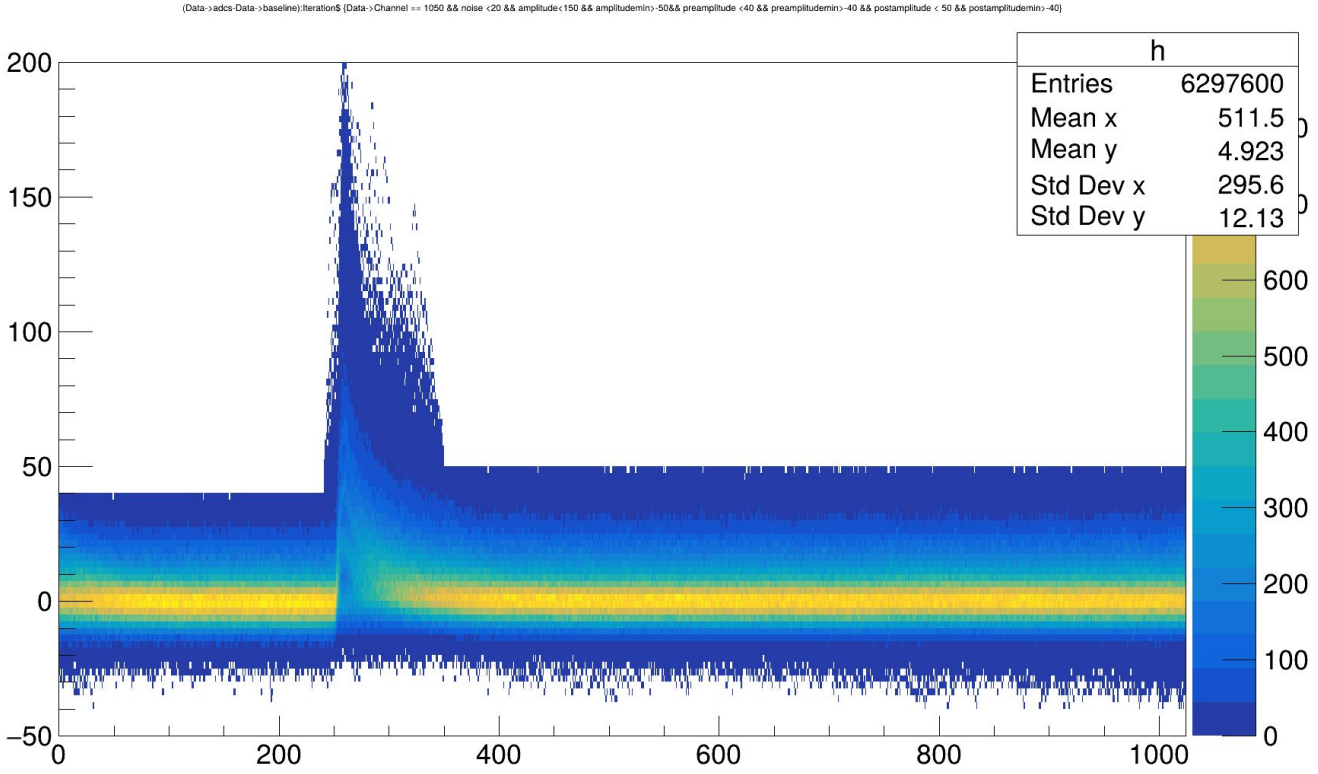
Noise < 15
Amplitude <150
AmplitudeMin>-50



Noise < 15
Amplitude <150
AmplitudeMin>-50
PreAmplitude < 50
PreAmplitudeMin>-40



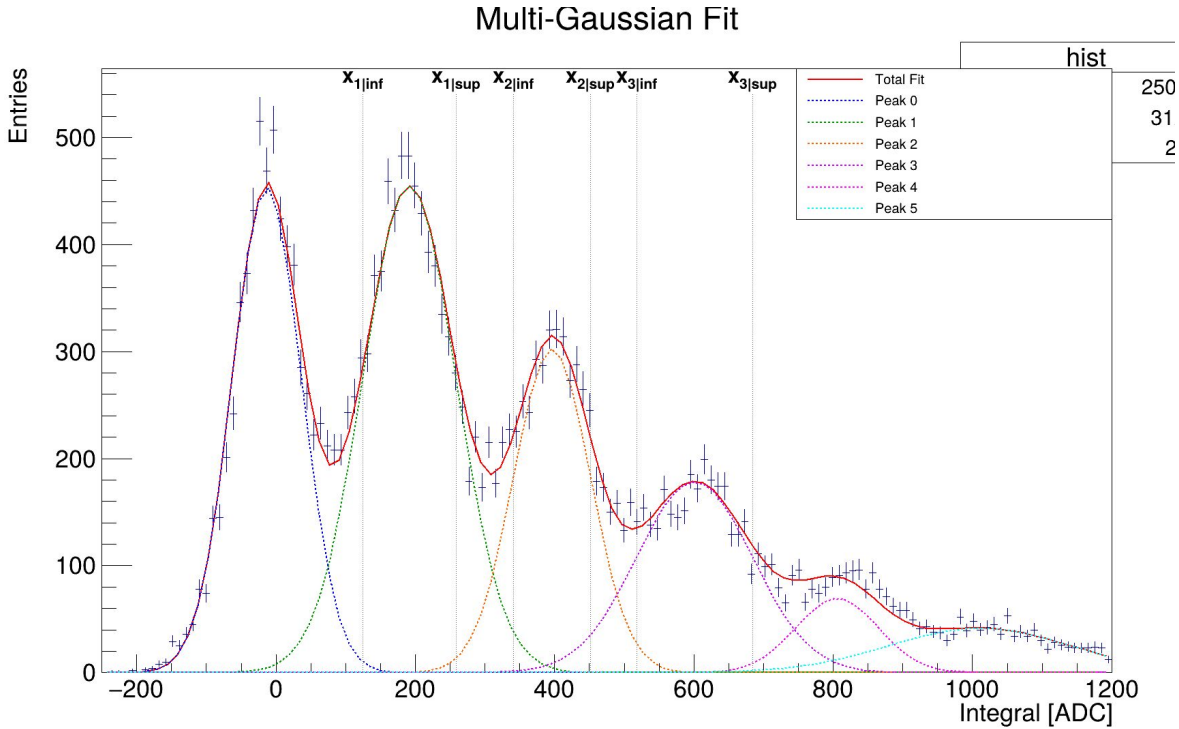
Noise < 20
Amplitude <150
AmplitudeMin>-50
PreAmplitude < 50
PreAmplitudeMin>-40
PostAmplitude<50
PostAmplitudeMIn>-40



2 STEP – Calculate the finger plots and selection of the regions

The regions are chosen from the fit of each gaussian: [mean-sigma,mean+sigma]

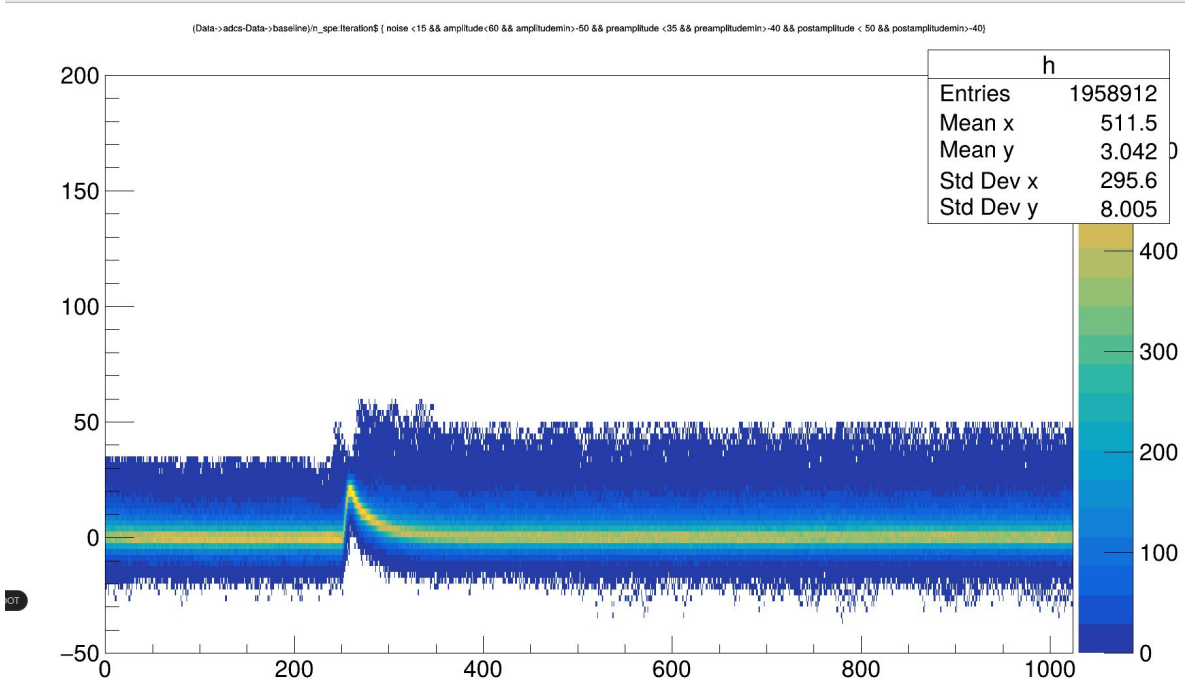
To increase statistics, until the third peak is used



2 STEP PLUS– Persistence of the selected waveforms normalized by SPE

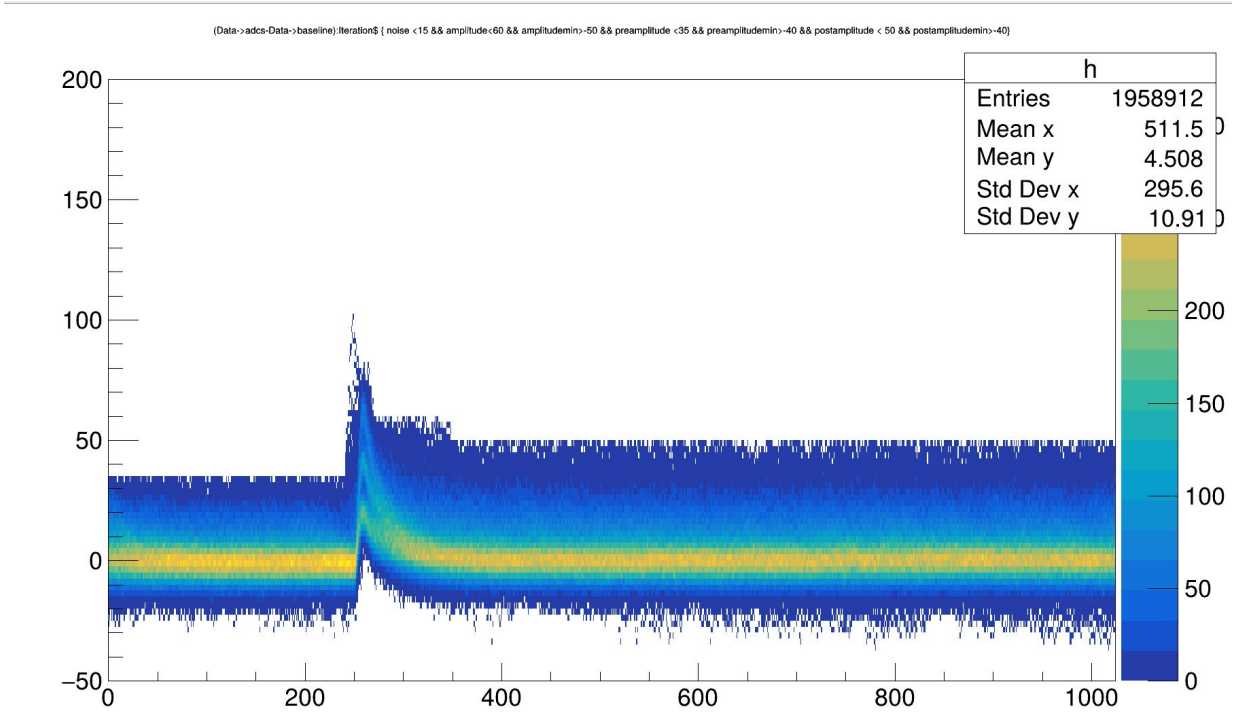
To clean better the selection, redefined the region Signal Amplitude (n_1, n_2): →270 until 1023

Noise < 15
Amplitude <60
AmplitudeMin>-50
PreAmplitude < 35
PreAmplitudeMin>-40
PostAmplitude<50
PostAmplitudeMIn>-40



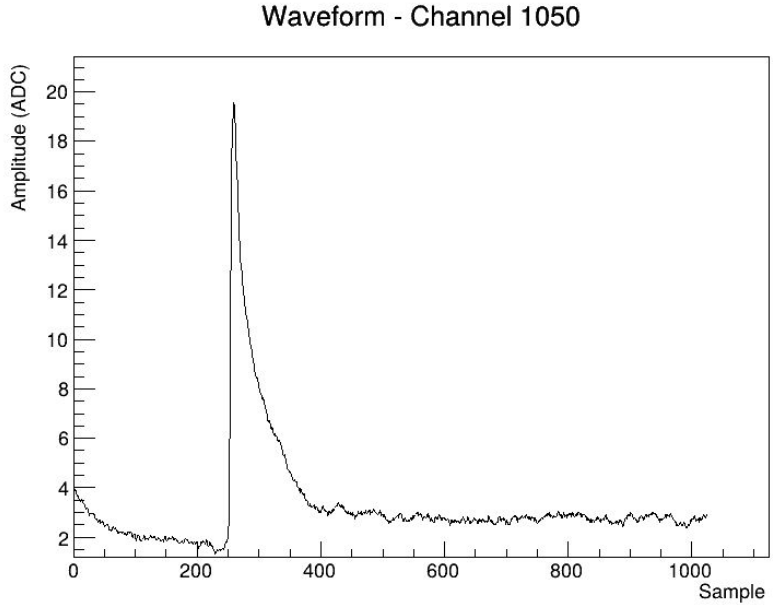
2 STEP PLUS– Persistence of the selected waveforms without normalization

Noise < 15
Amplitude <60
AmplitudeMin>-50
PreAmplitude < 35
PreAmplitudeMin>-40
PostAmplitude<50
PostAmplitudeMIn>-40



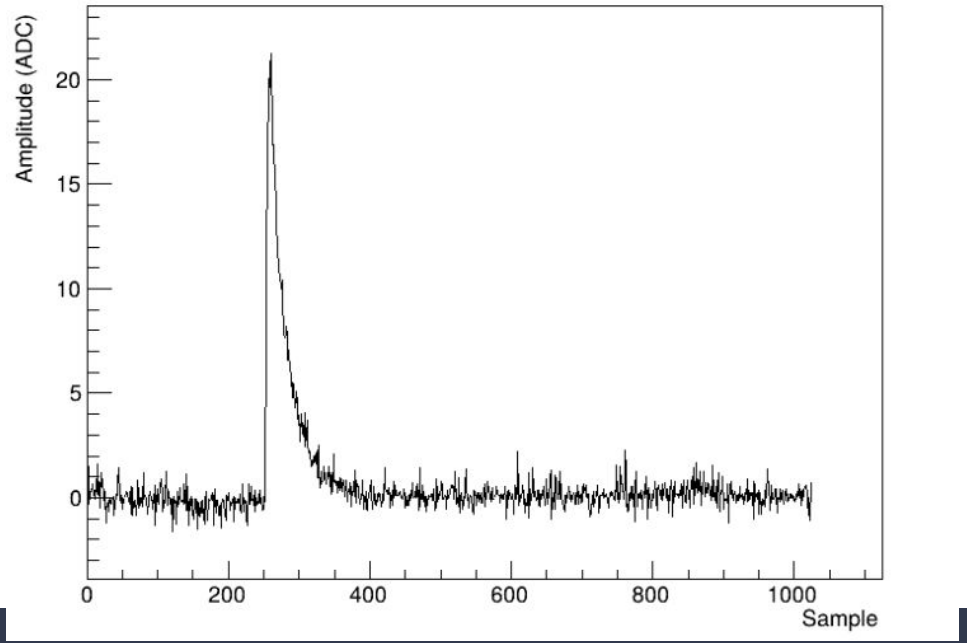
3 STEP

Because of the high amount of light noise, calculating only the average does not provide a correct baseline.

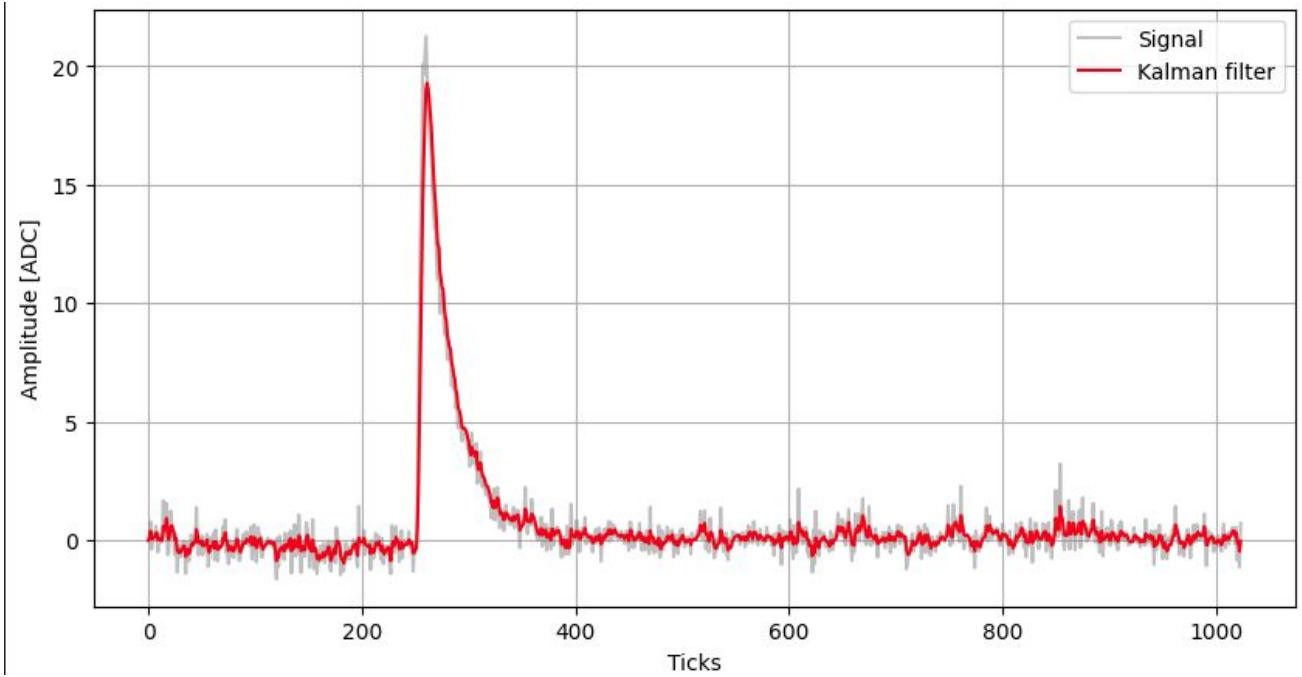


3 STEP

Solution: Per each tick calculate the mode, and then calculate the average between values falling inside [mode-sigma,mode+sigma]
Where sigma is 0.5 of the Mode-centered standard deviation



4 STEP - Optional Filtering Step using a simple Kalman filter



Removes some spikes, without deforming the wf

https://en.wikipedia.org/wiki/Kalman_filter