Stony Brook University

Pedestal and Noise Studies

Stuck ADC and Signal

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Pedestal and Noise Algorithm

- We wanna measure the pedestal and the noise for each channel and feed this values to a text file for zero-suppression

- One issue: Stuck Bits might alter a gaussian fit to ADC distribution and bias the results

- Another issue: cosmics will be present even in Calibration Runs, so algorithm has to take this into account

Addressing the First Issue
Toy Fits

- Just as I studied gaussian fits with empty bins, now I looked at these fits removing part of the neighbors of empty bins

- I generate a gaussian distribution with Mean = 730 and sigma = 2 (similar to what we have in the boards)

- I randomly choose 2 bins close to the peak and set their values to zero ("stuck")

- Set the random bins neighbors to 20% of their value

Addressing the First Issue
Toy Fits

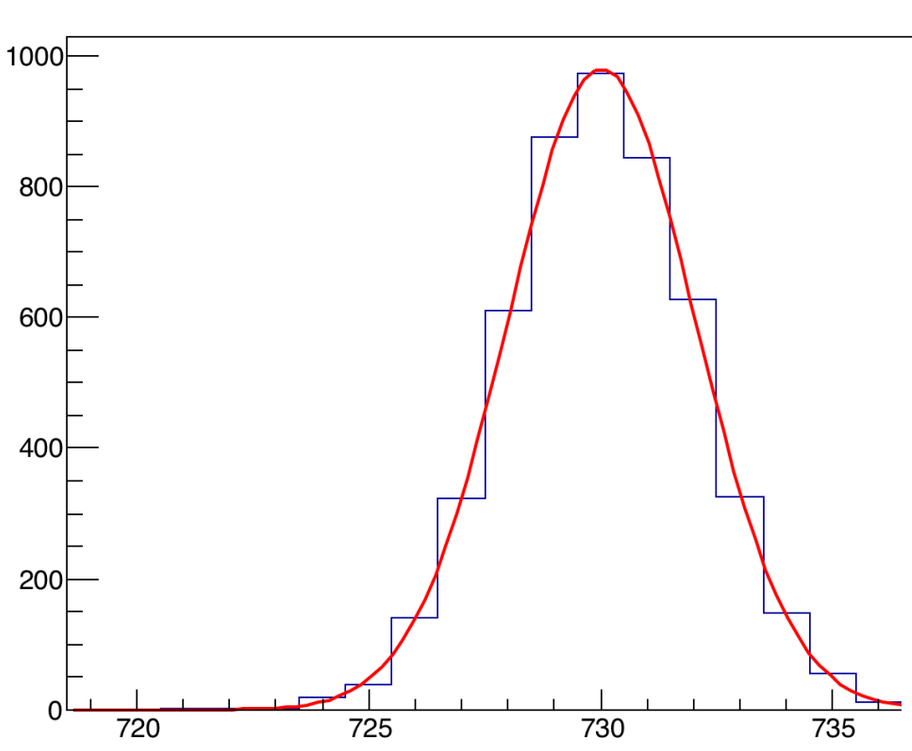
- This obviously will not prove that the gaussian fit will work, but we can have an idea of how the gaussian fits in ROOT will behave in these situations

- I chose a small sigma, bins close to the peak and 20% to try to simulate a worse case scenario

- Feedback on these procedure is more than welcome, I am not sure if this actually gives insight on the Stuck Bit issue

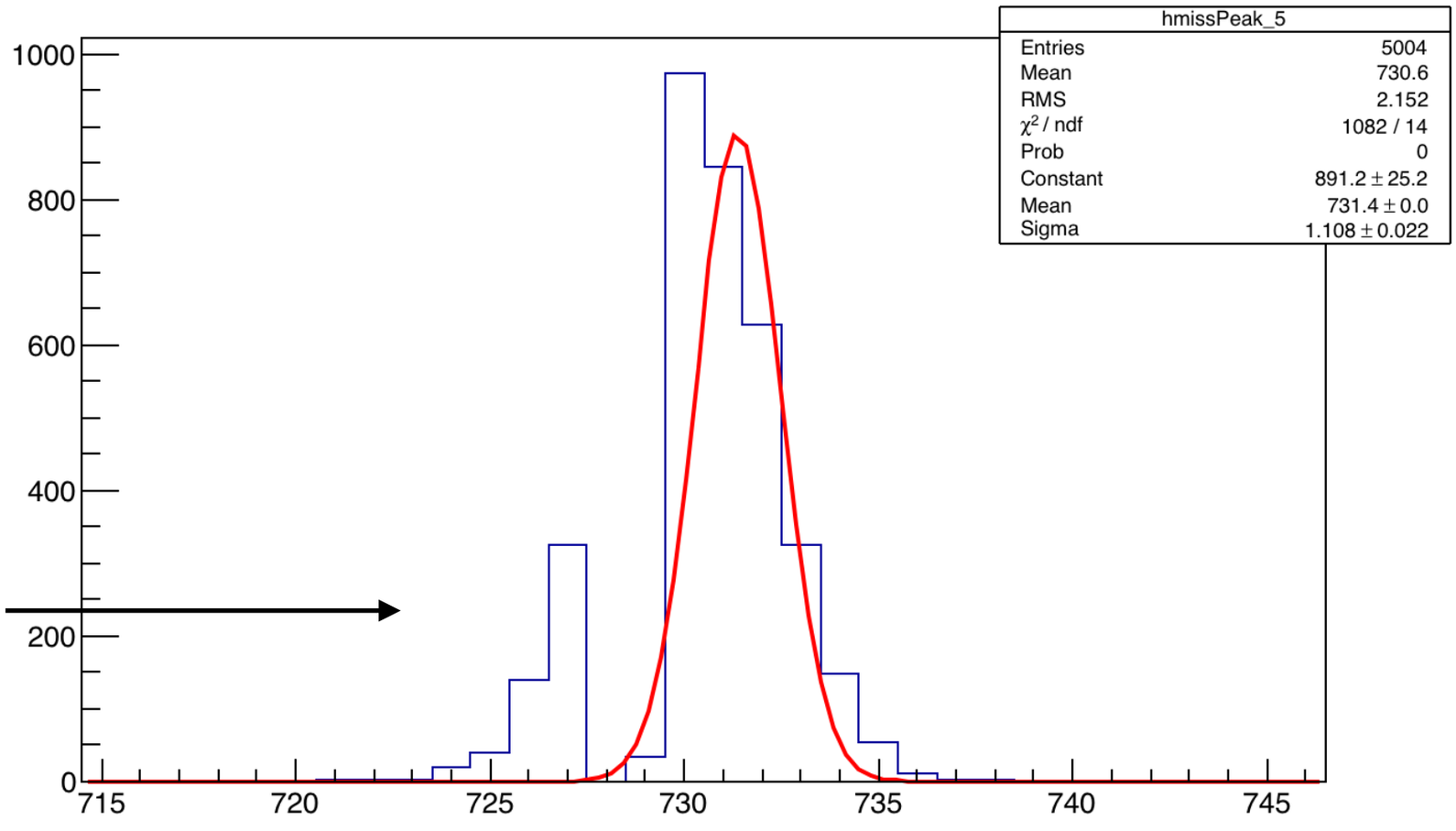
Addressing the First Issue
Toy Fits - Plots

In any case, here are some plots of the fits

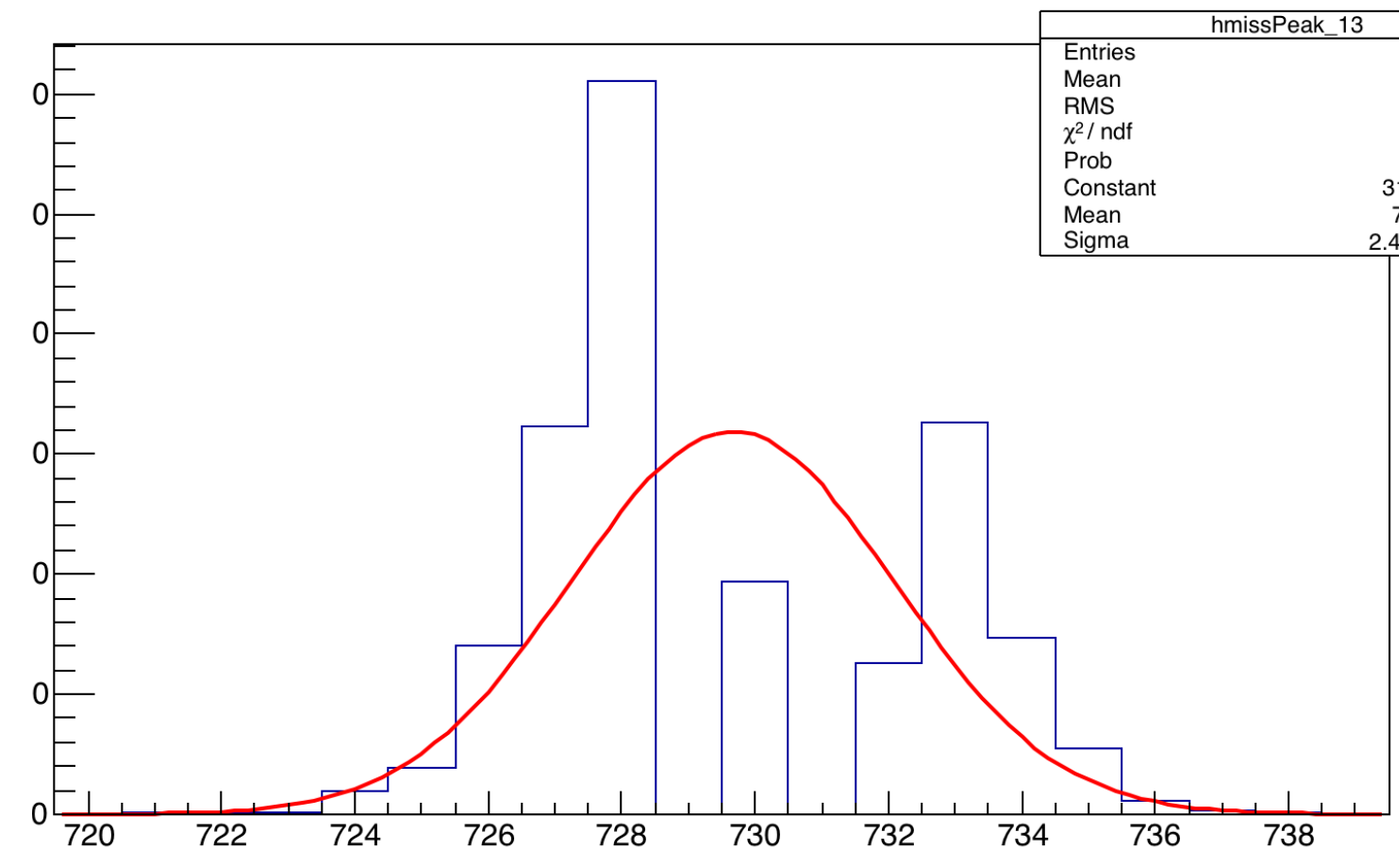


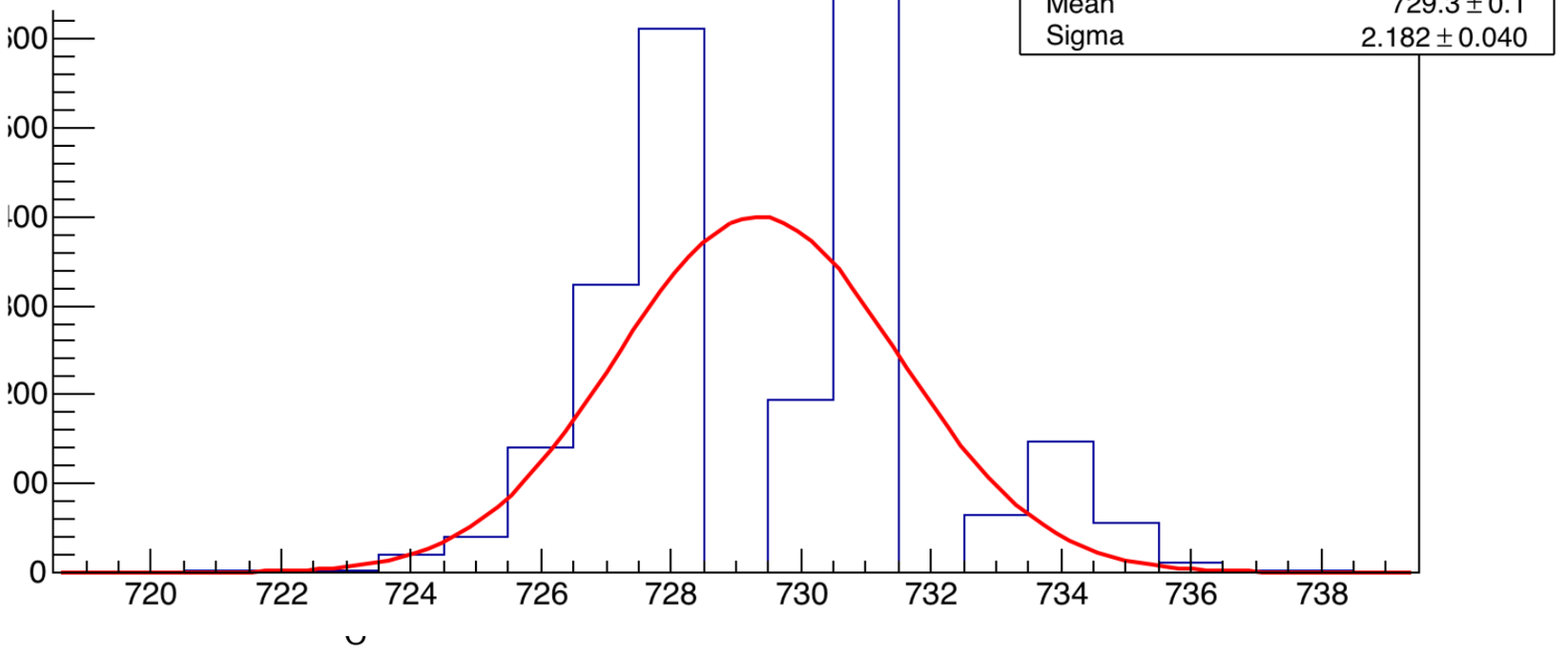
Original gaussian distribution

With 2 bins set to 0 and removing 80% of neighbors



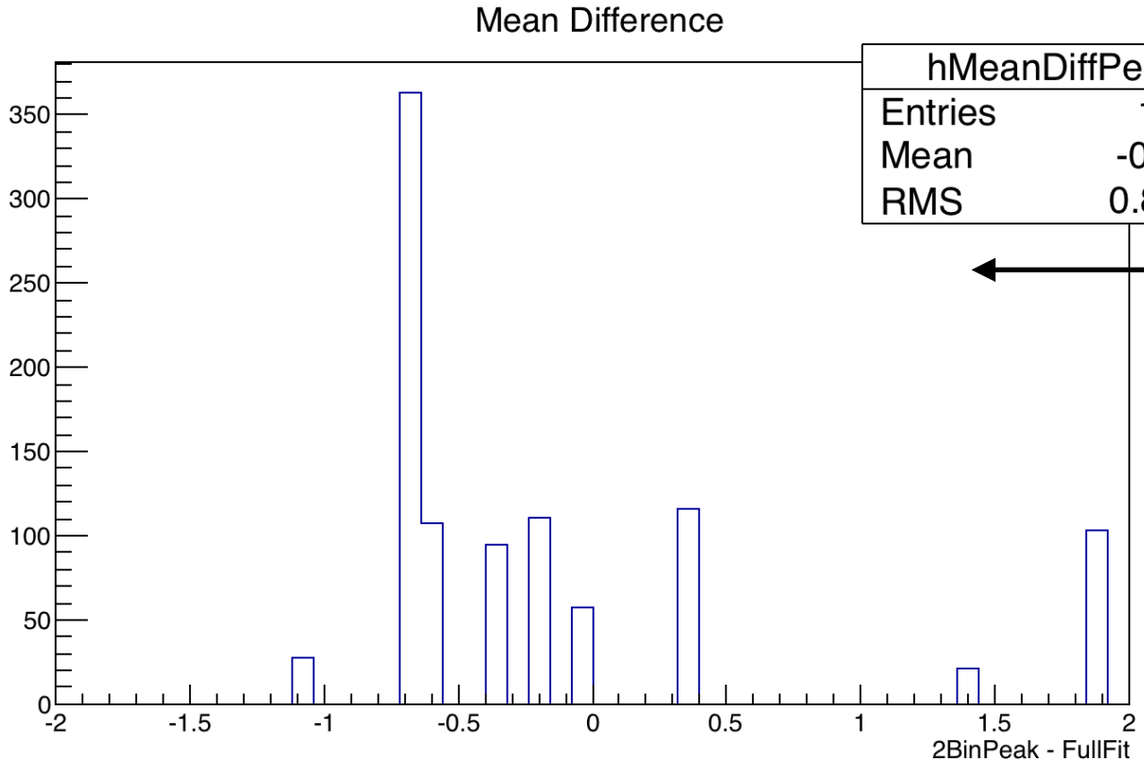
More Example Plots





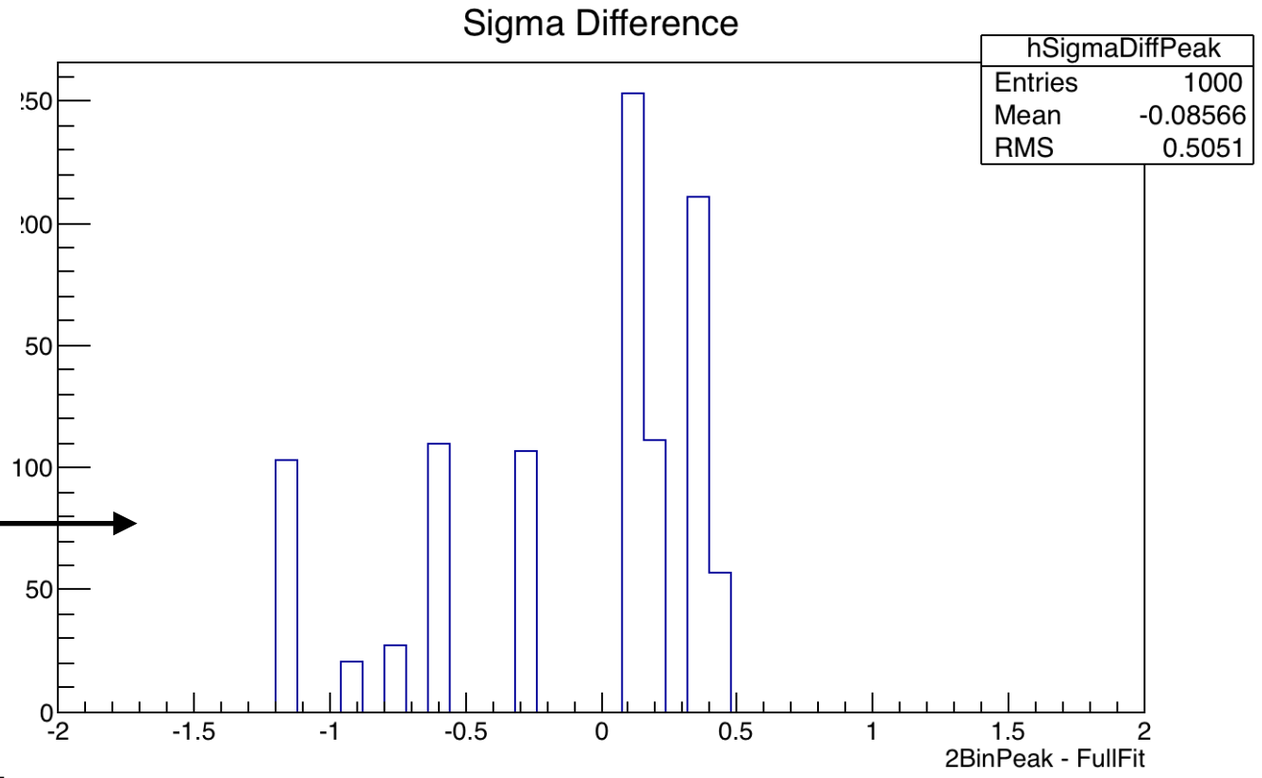
Addressing the First Issue
Toy Fits - Differences

Repeating 1000 times and plotting the distribution of the New Mean - Original Mean, same for Sigma



New Mean - Original

New Sigma - Original



Addressing the First Issue

- Some Means are off by 2 ADCs, 2/730 = 0.3%

- I do not know how much difference is acceptable here to pass to the zero-suppression algorithm

Addressing the Second Issue

- I implemented an algorithm based on Microboone that they use to look for chirping (Marvin showed me the algorithm, it is similar to an idea Tom and I discussed some time ago)

- If this algorithm also works well with Stuck ADCs, then I can use it instead of the Gaussian fits

- I haven't yet looked at Tickler Data with it (I'll do this for next week!)

- Looking at noise runs I found some channels with weird behavior

- I wanna test if this same idea applies for finding signal

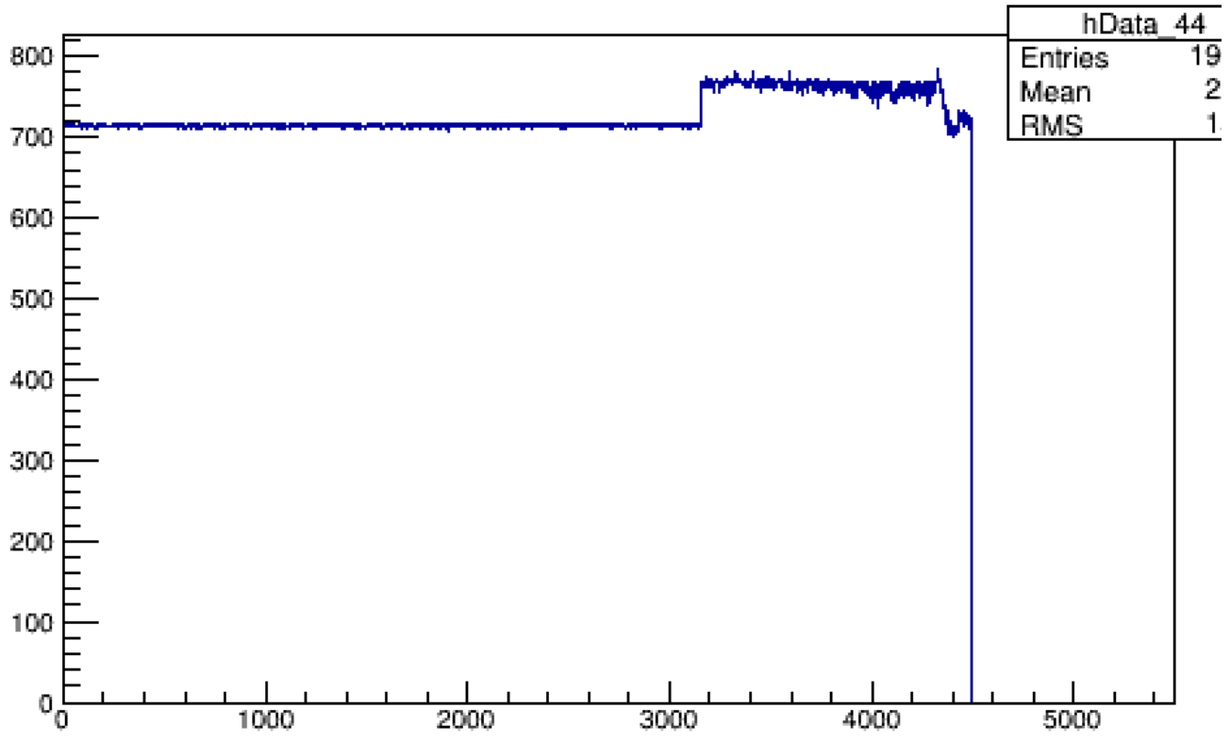
Algorithm

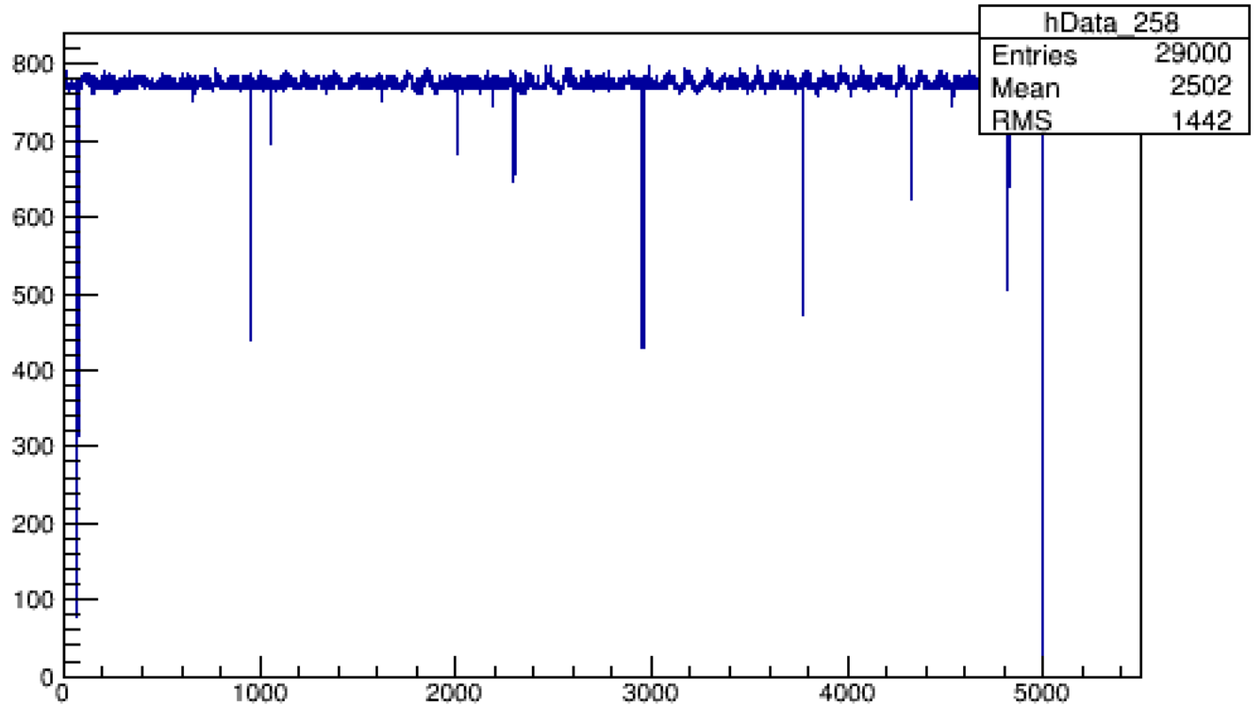
- Get all ADC samples of a channel in an event
- Separate the sample in windows (I used 500 samples in each window)
- Calculate Mean and RMS of these 500 samples
- Look for discrepancies in Mean and RMS

Algorithm

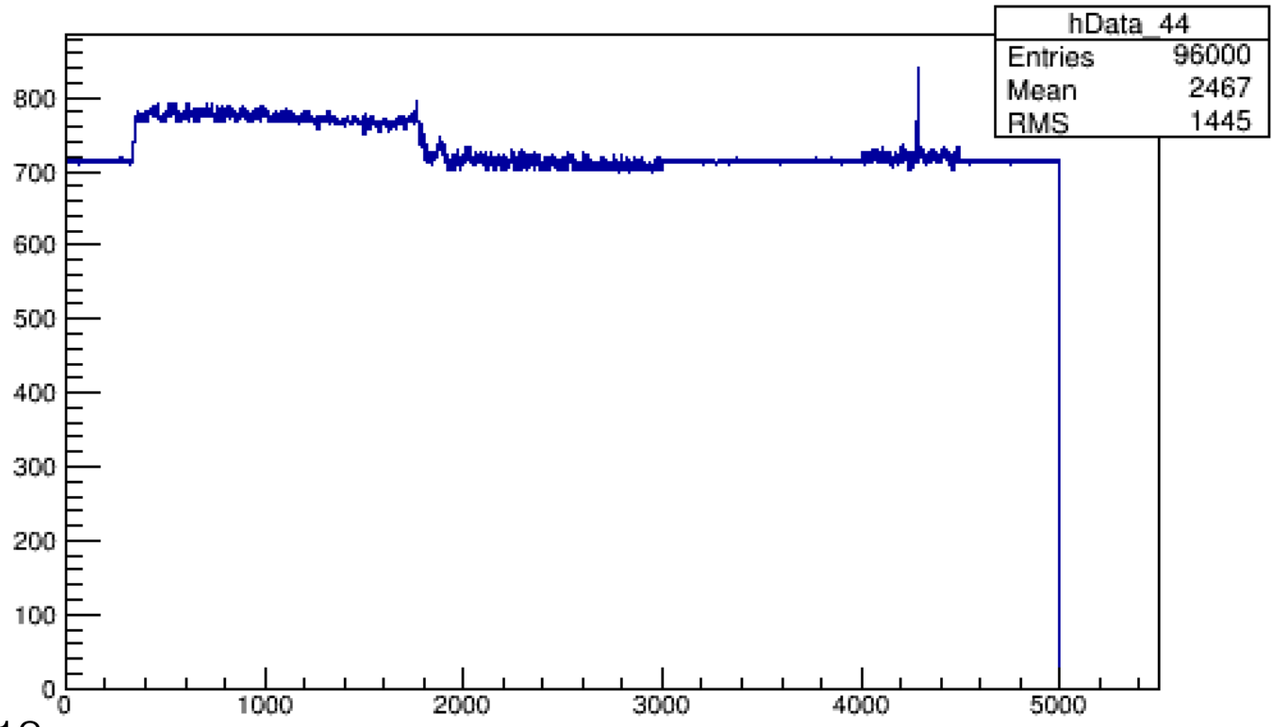
- Discrepancies definition:
  - I took the Max and Min Mean and RMS and defined
  - if (2.5*MinRMS < MaxRMS and MaxMean - MinMean > 10) then channel is “weird” (technical term)

Weird Channels





These are examples that were classified as weird by the algorithm so I eye-scanned those at those



Goal

- I wanna see if optimizing these numbers (number of windows and window length, RMS and Mean discrepancies) I can use this idea to find the presence of signal in the sample

- If signal is found, I can drop the window with signal and use the rest to calculate Pedestal and Noise

- Or I can drop the whole sample and look for another one without it, since cosmics will not hit the whole detector at once

- If this works, I think calculating Mean/RMS will work just as good as making the gauss-fit and taking Mean/Sigma, but it will be faster

- Also, I think this approach can handle well the 11kHz noise, but I need to hear ideas about this