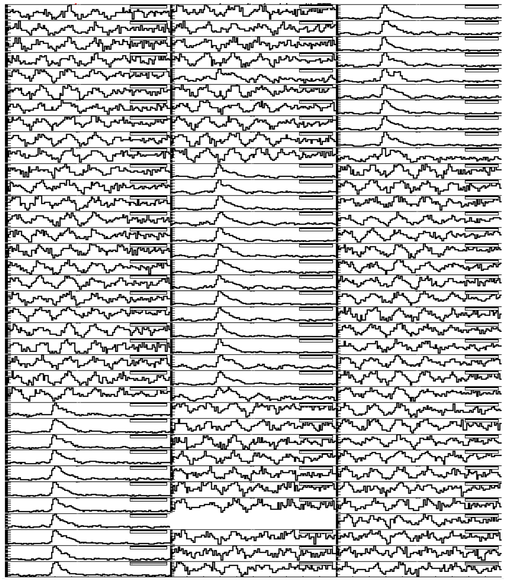
Analysis of cosmic runs 55 and 56 (December 20-21, 2022)

- Analysis was performed using only the variable NPS.cal.fly.adcSampWaveform (it contains the waveforms for all the blocks) of the rootfiles

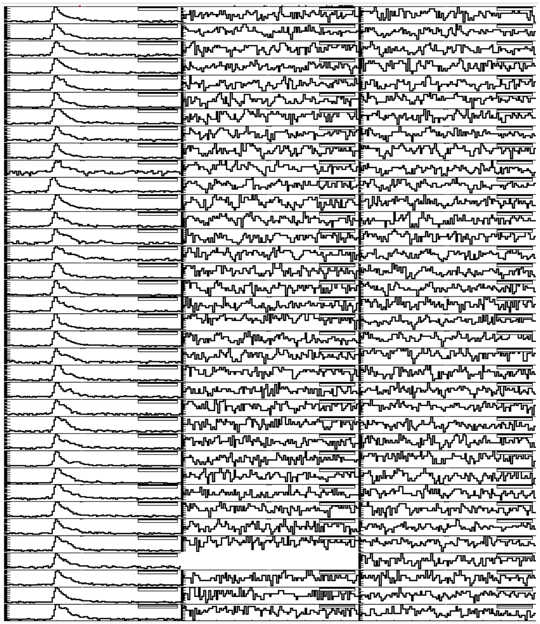
- Block 39 is missing (no data)

- there are some weird data for block 196 (not supposed to belong to the 3 first colomn) diagonal hit

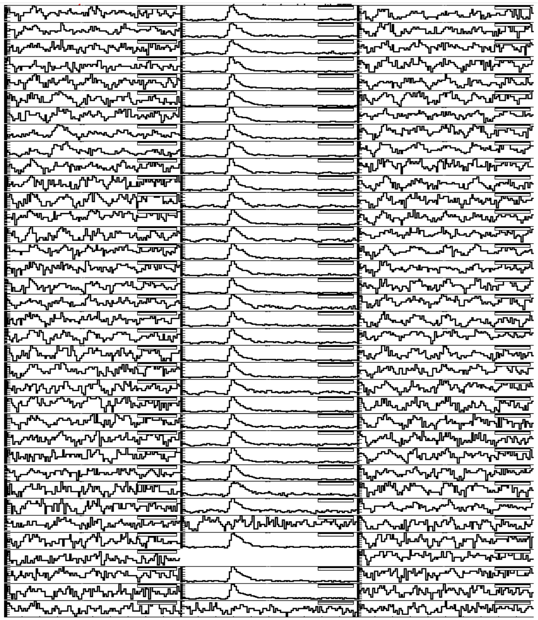


Block numbering looks correct !

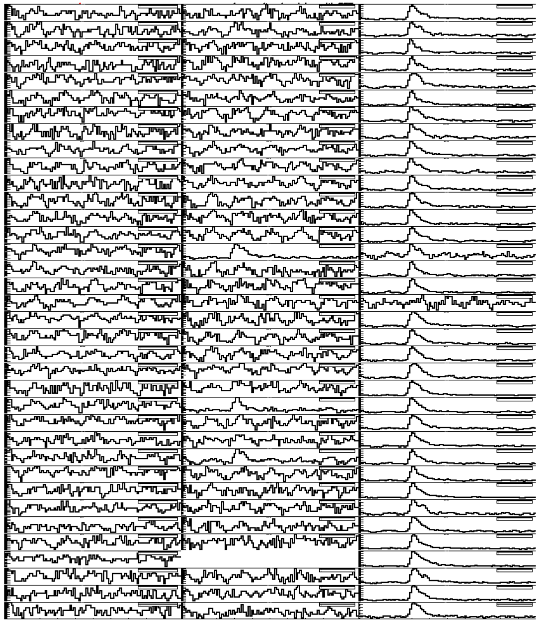
1st colomn hit

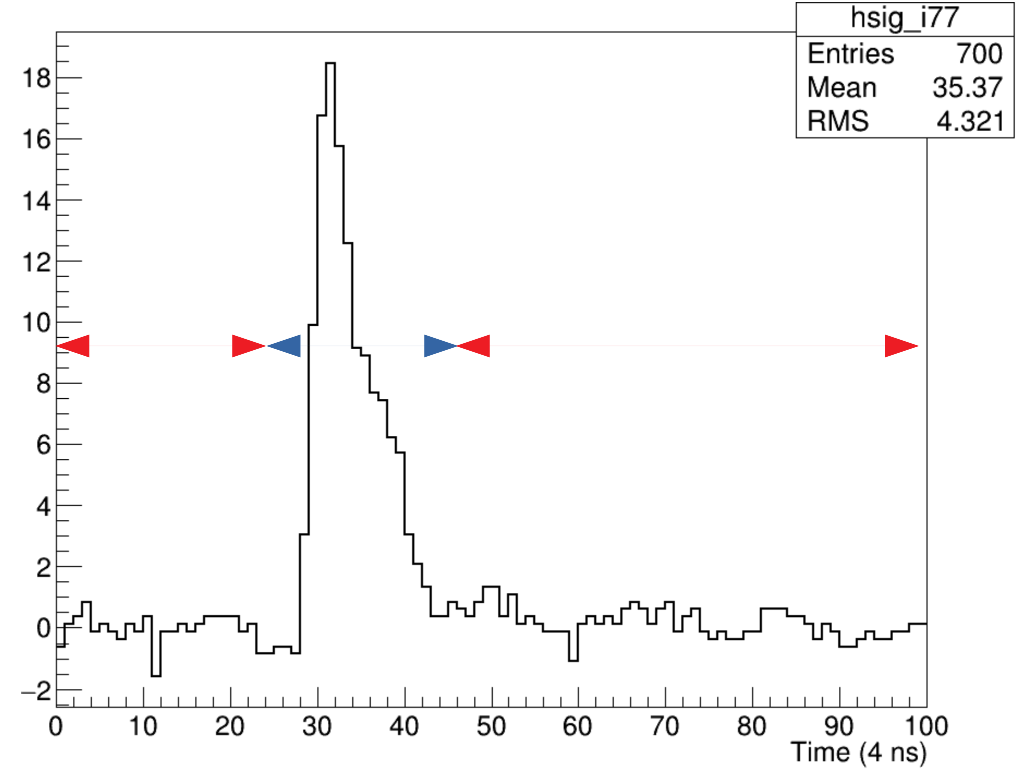


2nd colomn hit



3rd colomn hit





waveform analysis (fit) not done here !

There is a fancier way to do this analysis. It was implemented by M. Jones and it is available in the ROOT tree.

Pulse time = bin number corresponding to the pulse maximum

<time_i> = Good pulse average time for bloc i (after gaussian fit of the pulse time spectrum)

Pulse window for block i = between <time_i> - 6 (x4ns) and <time_i> + 16 (x4ns)

Background window = all (between 0 and 100(x4ns) but the pulse window

Pulse energy = Pulse window integral – normalized Background window integral

Noise study is performed in the background window (see slide 7)

For a given bloc i, I draw :

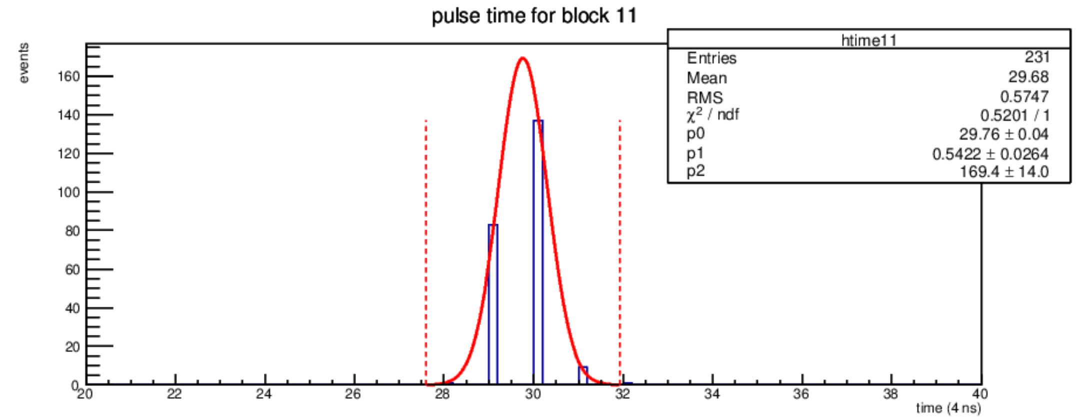
- the pulse time spectrum and the pulse energy spectrum when a cosmic muon at minimum ionisation is detected in the top block and the bottom block of the corresponding colomn
(ex if i=11, bottom block=0 and top block=35).

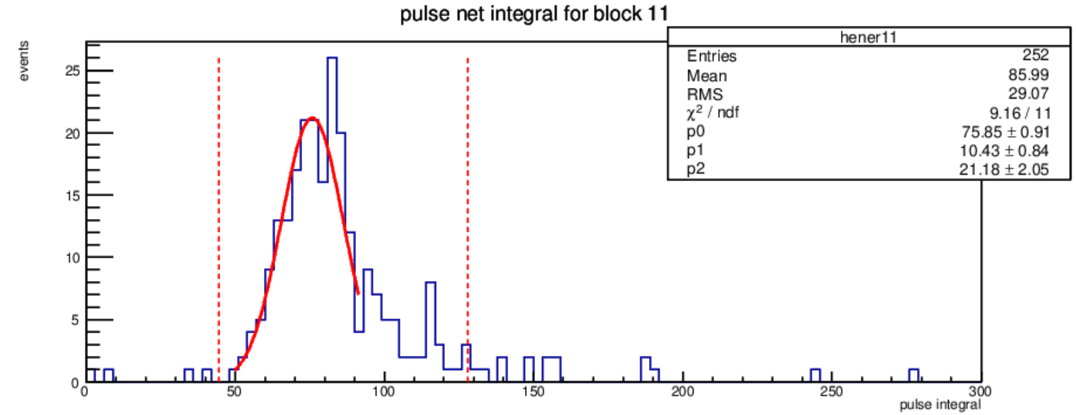
- Perform a gaussian fit on the time and energy spectra

- cosmic muons at minimum ionisation are defined (for each bloc) by the following cuts (vertical red lines) :
|time_i - <time_i>| **<** 4 sig
<energy_i> - 3 sig **<** energy_i **<** <energy_i> + 5 sig

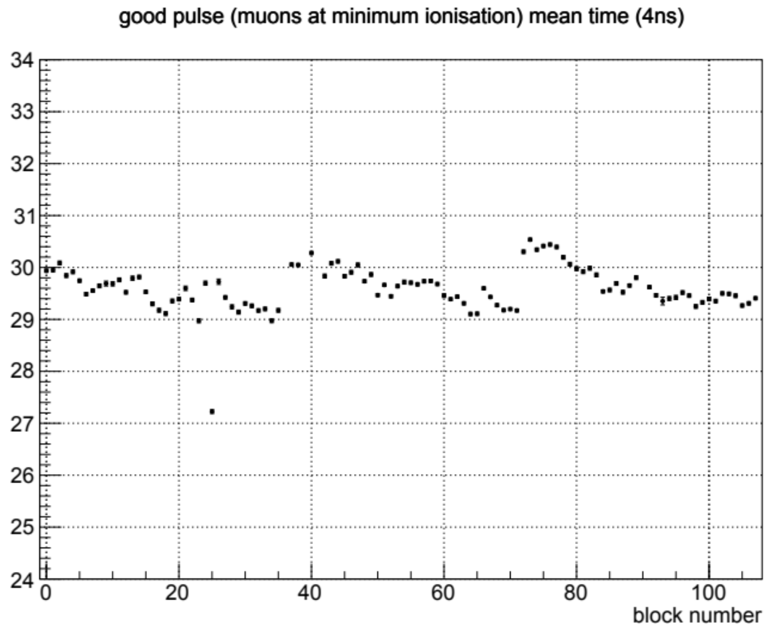
- See file “time-ener_f.ps” for all the blocks

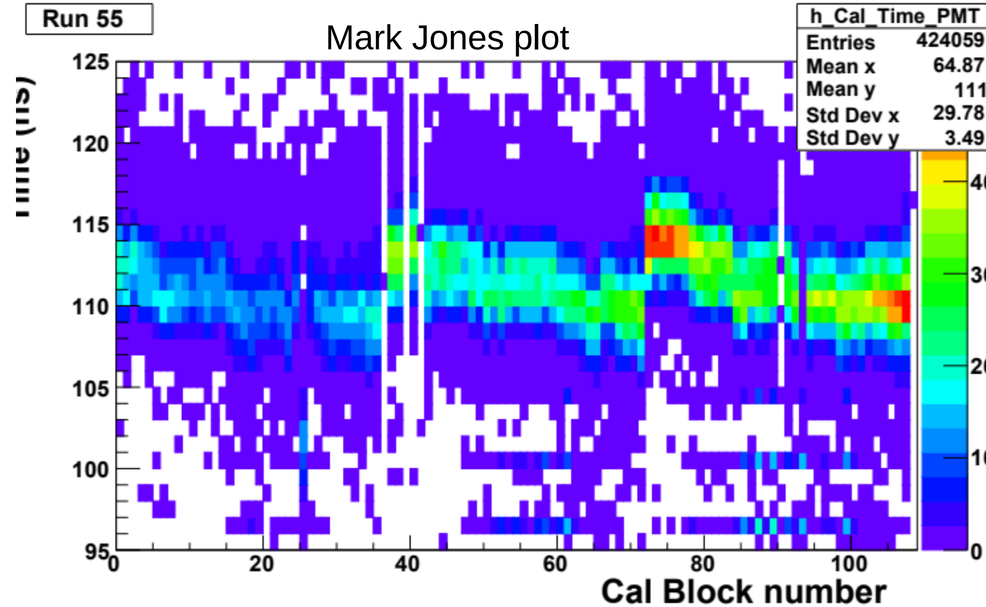
- Can use these events to get an average waveform shape for each block (or may be use higher energy pulse?)

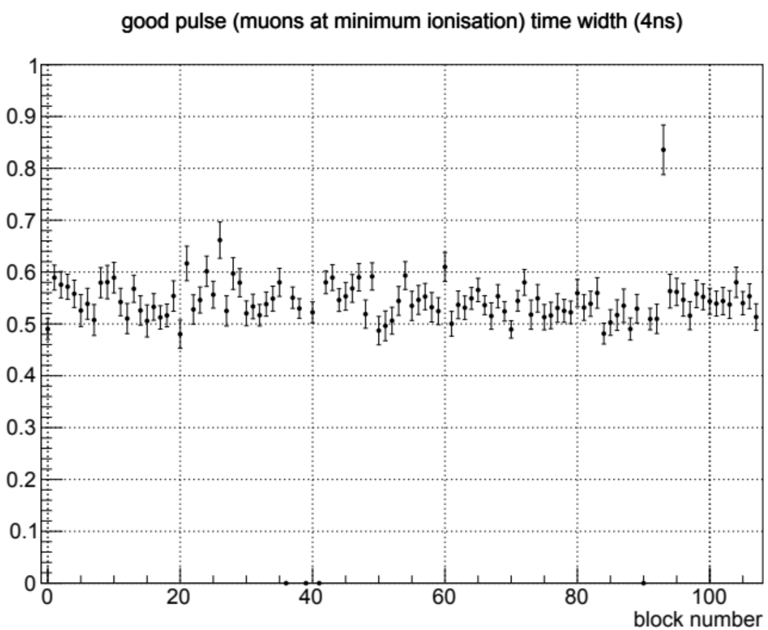




Pulse time results







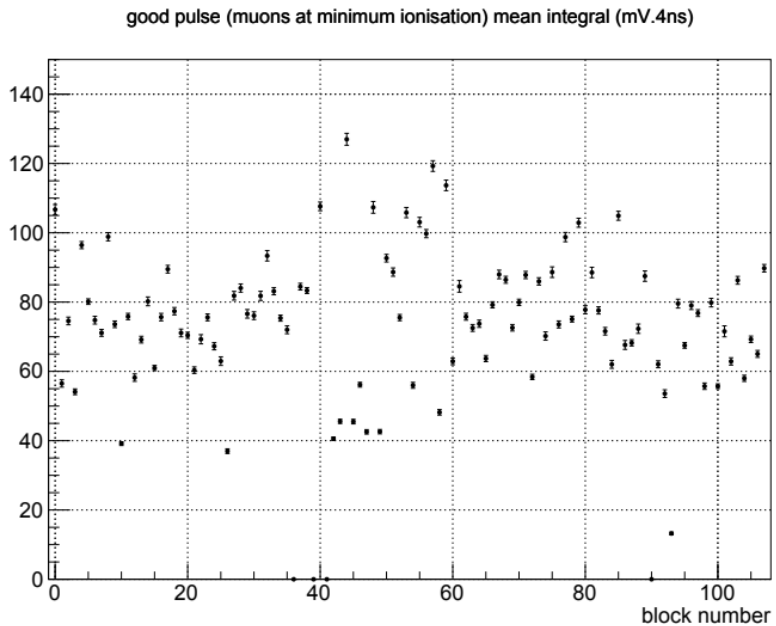
- No data for block 39

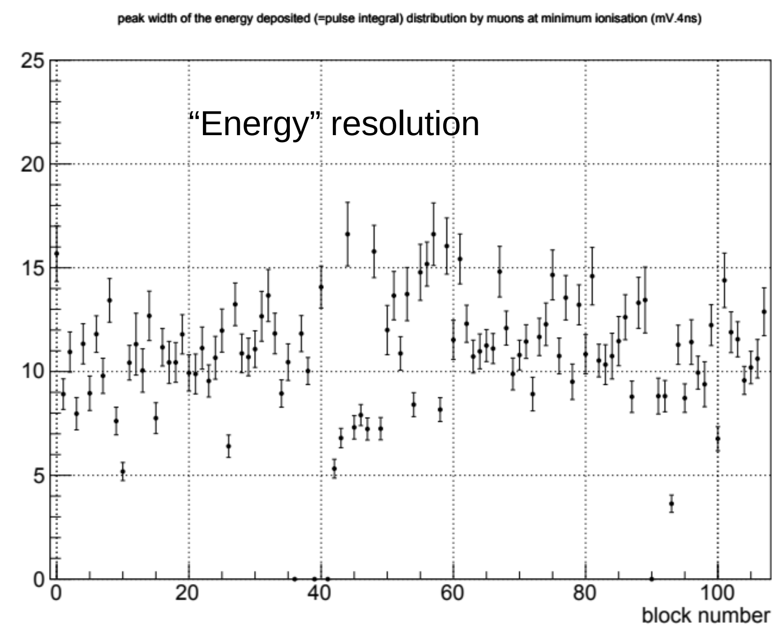
- No good signals in blocks 36, 41 and 90

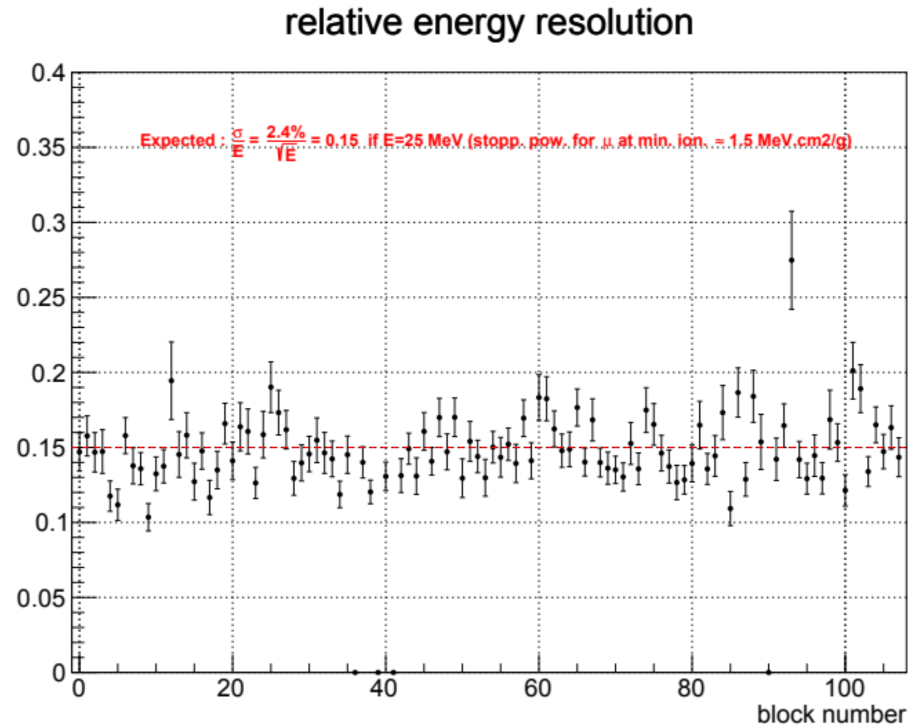
- block 93 has a large time resolution

- Time resolution is around 2ns but we should have a better resolution if waveform analysis is performed.

Pulse energy results







- No data for block 39

- No good signals in blocks 36, 41 and 90

- Some blocks (especially 93) have a low pulse energy or amplitude, may be HV too low.

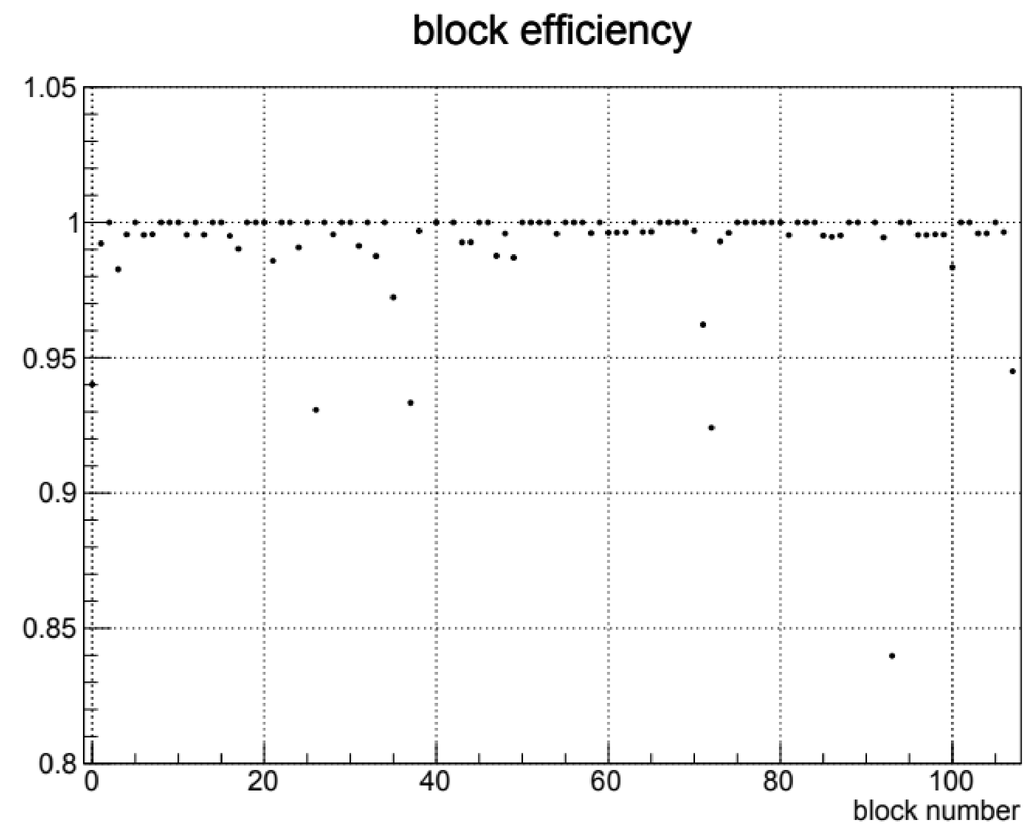
- Energy relative resolution is as expected.

- For a given block i, select muons at minimum ionization (see slide 3) in bloc i-1 and i+1 and look to the response (time and energy) of this bloc.

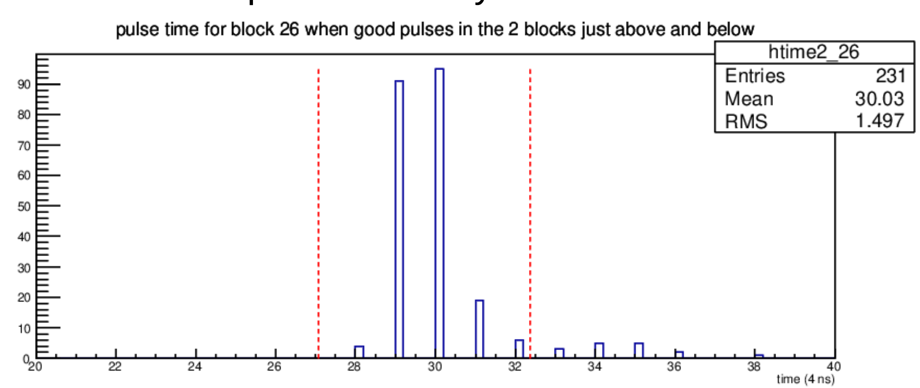
- special care for the blocks at the edge or for blocks with no signal (ex: i+2 instead of i+1 in this case)

- good response if :
|time_i - <time_i>| **<** 4 sig
<energy_i> - 3 sig **<** energy_i

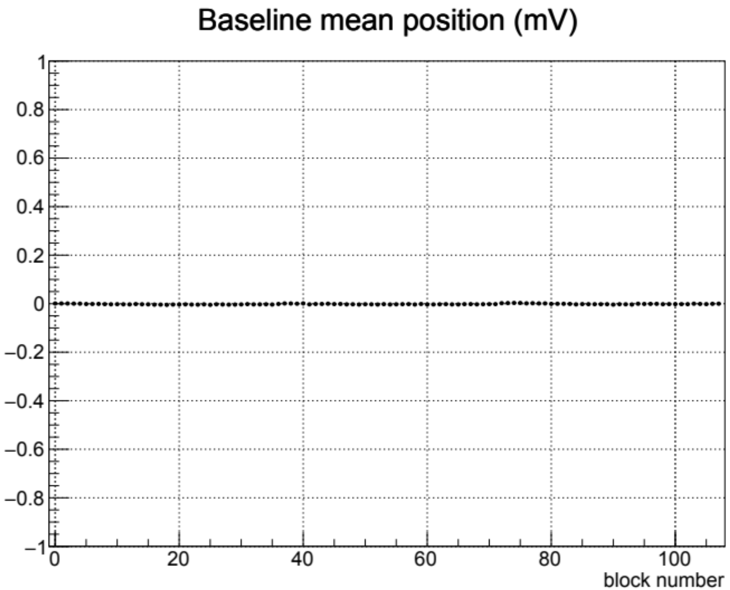
- Compute the efficiency



Efficiency > 98% for all blocks except :
- blocks at the edge (0,35,…,107) because the efficiency cannot be computed correctly
- block 26 because of a weird tail in the time spectrum
- blocks with no signal (36, 41, 90)
- block 93 (see slides 4 and 5)

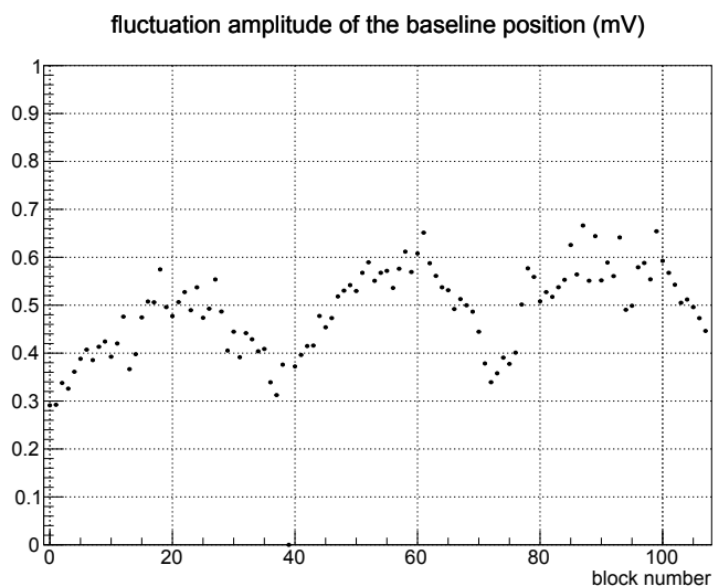


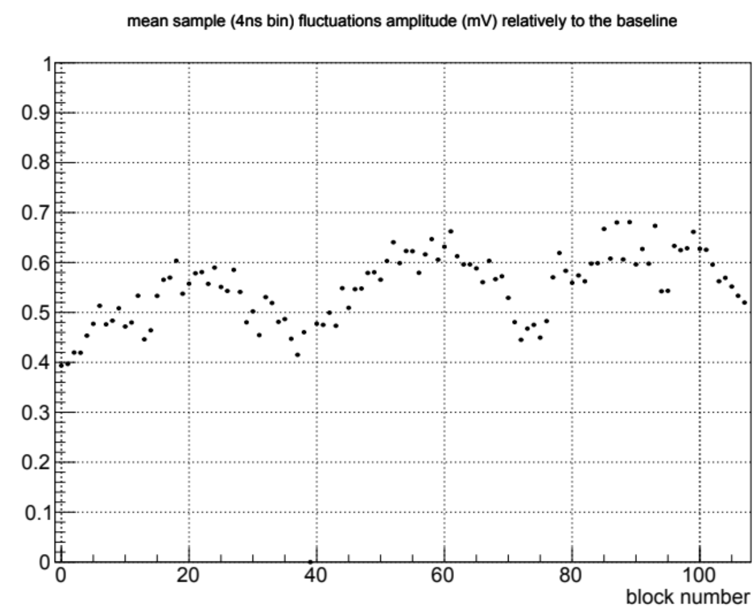
Background study



- the pedestal is well subtracted from the waveform

- Background fluctuations < 1mV in average





Perspectives: in case of large oscillations of the background we can use the fast fourier transform (FFT) to reduce specific harmonics (see “FFTmag.ps” for the average FFT of each bloc).