Evaluation of INTT

Nara WU : Miu Morita

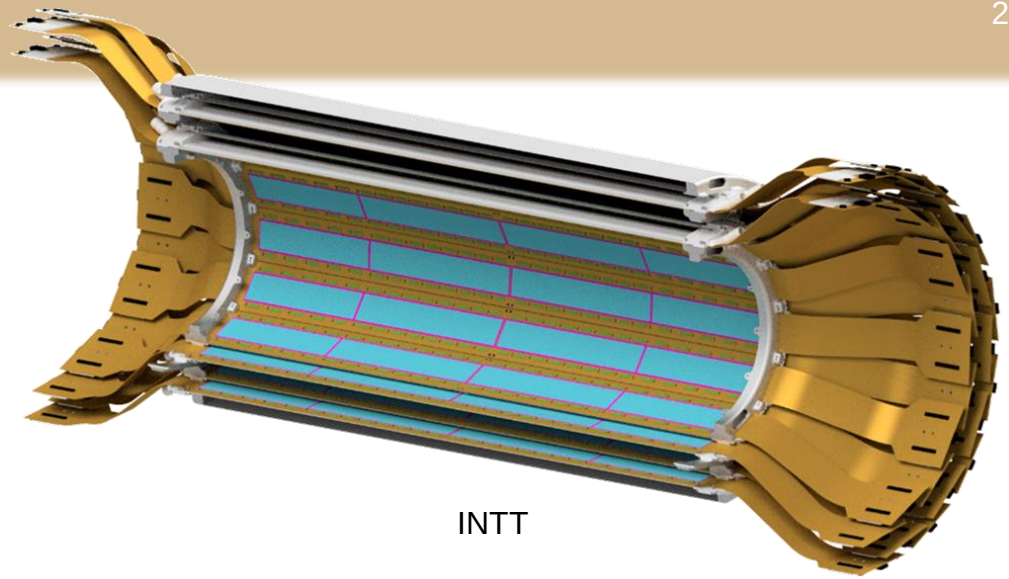
INTT Performance

Parameters

FPHX chip

1. Threshold setting (DAC)
2. Effect of noise
3. Efficiency
4. Bonded wire

-> is there anything else?



INTT

Sensor

- Rate (number of events per unit time)
- Efficiency(compare with PMT)

We have to check that if it's sufficient to meet the required performance of INTT

Full Ladder

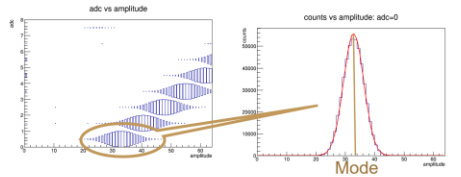
Method

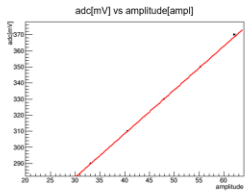
1.Threshold setting (DAC)

Calculate and Offset every channel 3

- It has positive relationship between amplitude(input) and adc(output)
- Decide amplitude Mode value by fitting gaussian each adc
- Guess offset using Voltage[mV] = 4 * DAC value + 210
- Slope means correlation coefficient between amplitude(input)and adc[mV](output)

★DAC is digital analog converter
★adc is analog digital converter





DAC	DAC value	Voltage[mv]
DAC 0	20	290
DAC 1	25	310
DAC 2	30	330
DAC 3	35	350
DAC 4	40	370
DAC 5	45	390
DAC 6	50	410
DAC 7	55	430

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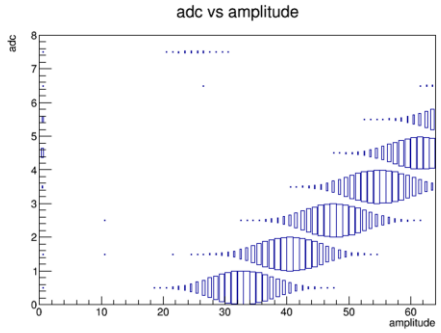
Calculate and Offset every channel 4

- This is two-dimensional histogram adc(output) vs amplitude(input)
- Blue box issue hits number rate
- It has positive relationship between amplitude(input) and adc(output)



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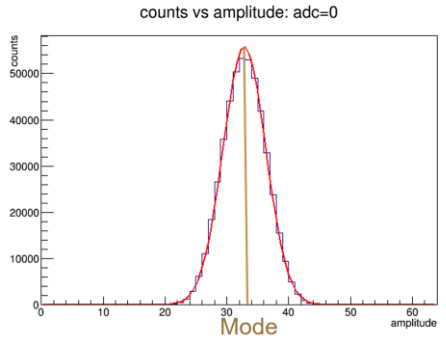
Calculate and Offset every channel 5

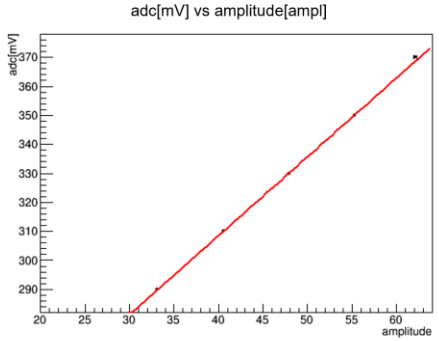
- This is histogram whose X-axis is amplitude(input) when adc==0
- Fit gaussian and chose amplitude mode value



2020/08/05 HEPL in NWU: Miu Morita

Calculate and Offset every channel 6

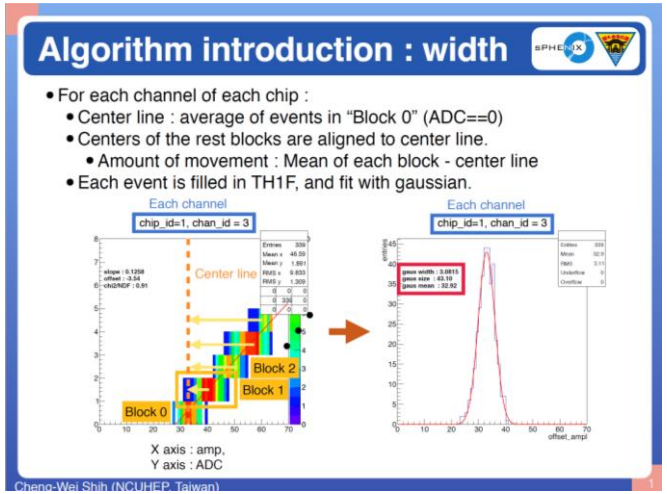
- This is graph adc[mV] vs amplitude[ampl]
- Plot amplitude mode value every adc
- It has positive relationship between amplitude(input) and adc(output)

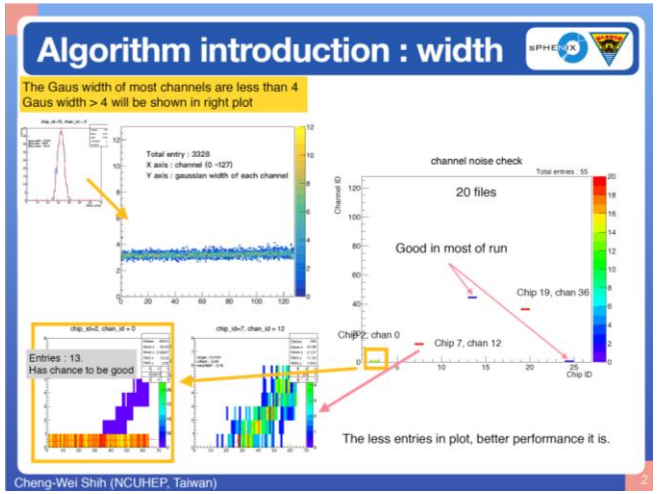


2020/08/05 HEPL in NWU: Miu Morita

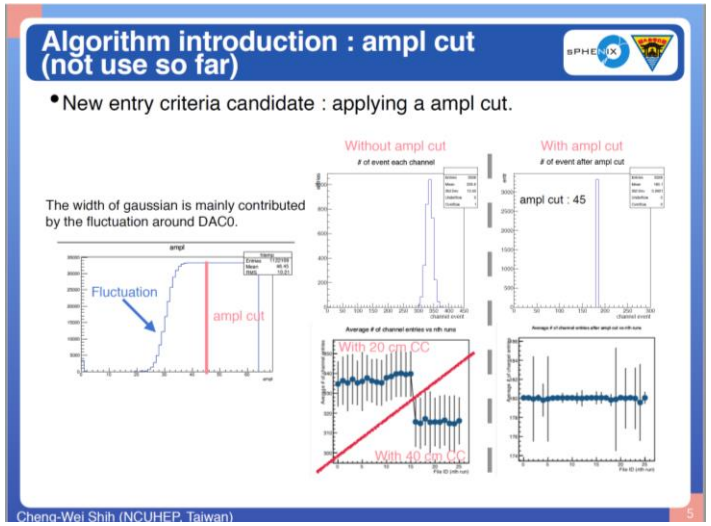
Method

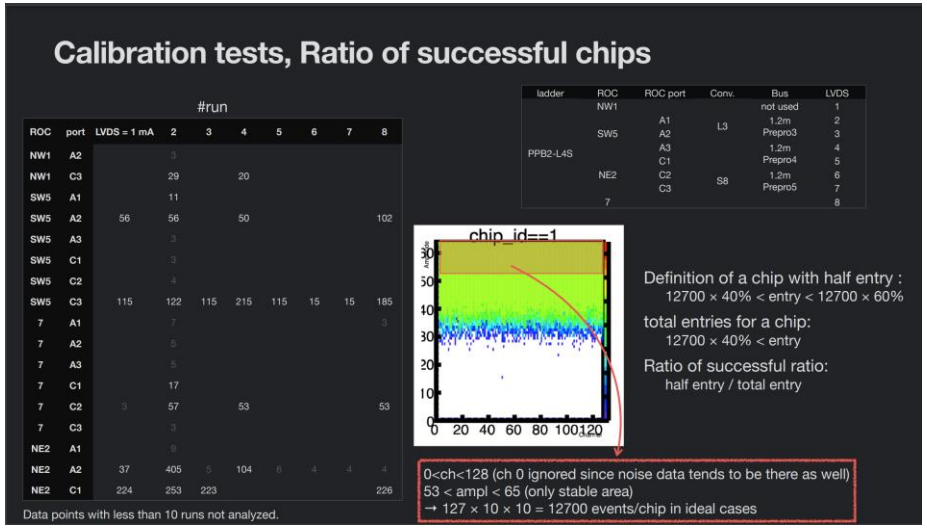
2.Effect of noise





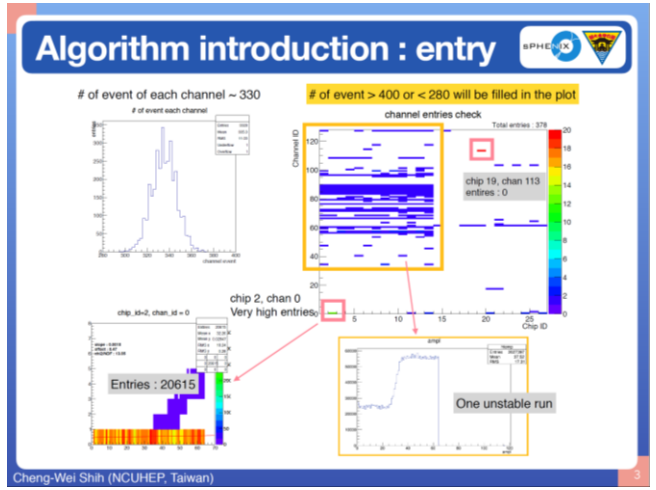
3. Efficiency



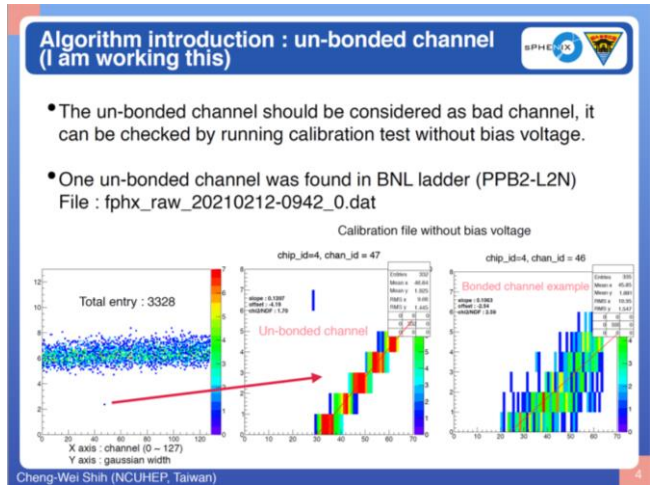


Made by Genki.Nukazuka

Which performance



4. Bonded wire



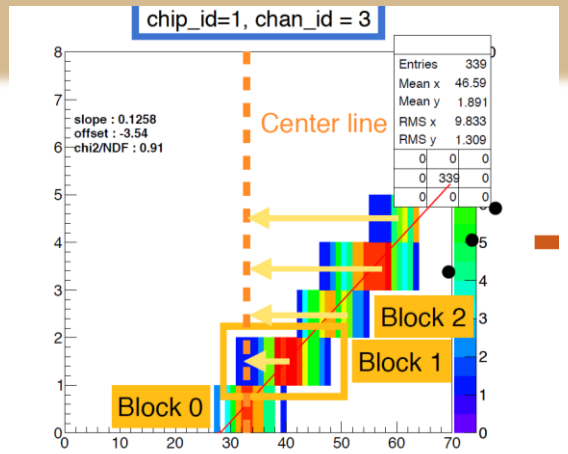
criteria

1. Threshold setting (DAC)
   ->What value is good?

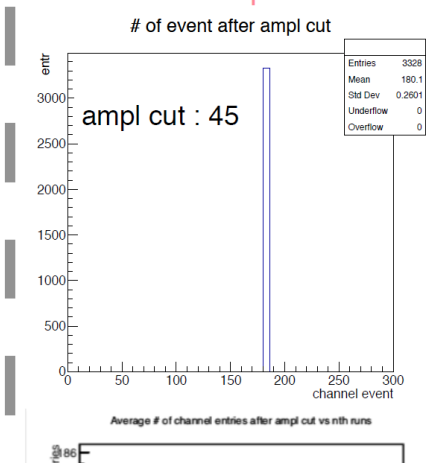
2. Effect of noise
   ->I wonder it is good to stack blocks of different widths

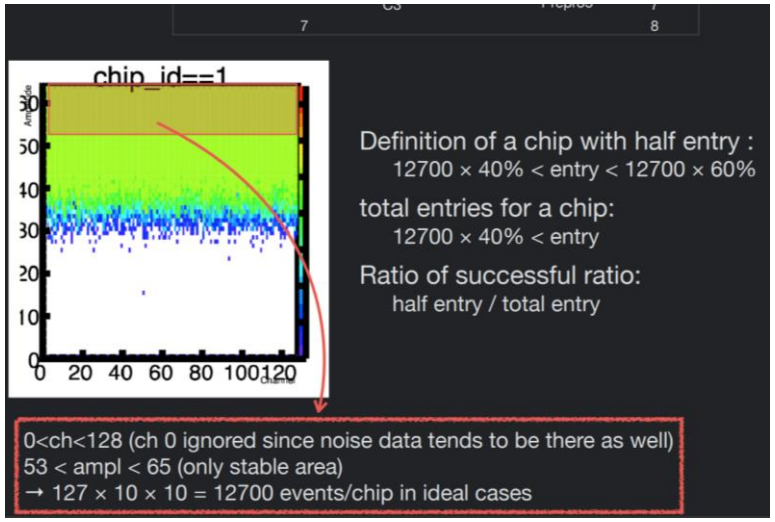
3. Efficiency
   ->why they use these value?

4. Bonded wire
   ->What value do we set as threshold?



With ampl cut





I think we discuss the value that we should use as criteria before proceeding with the evaluation

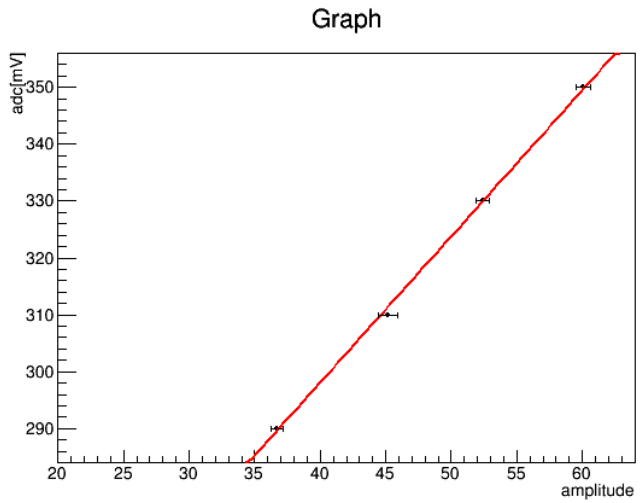
Summary

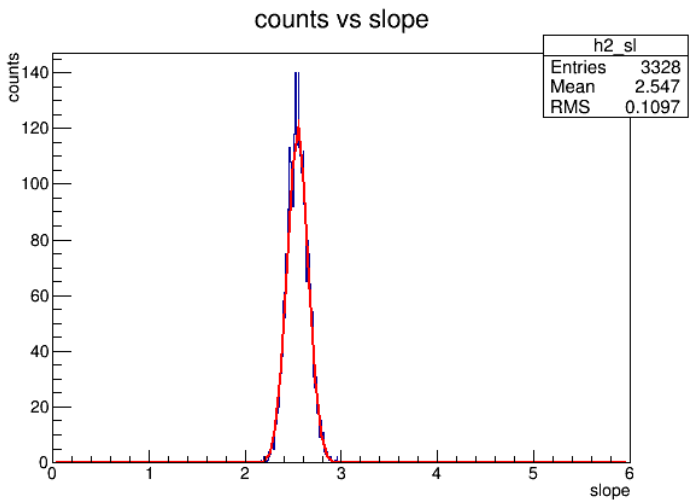
- We have 4 methods of calculation for evaluating FPHX chip now
- But the value of criteria of these is not decided with reason
- I think we discuss the value that we should use as criteria before proceeding with the evaluation

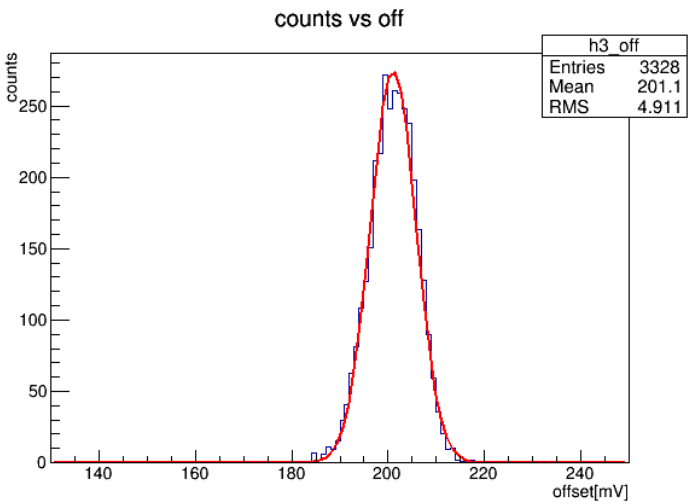
Back Up

Slope and offset

roc	roc_port	conversion	bus	LVDS
NE2	A2	s8	N/A	2mA







Data Analysis

- Evaluate the threshold using the test pulse data
- Compare the threshold value w/ and w/o Bus Extender

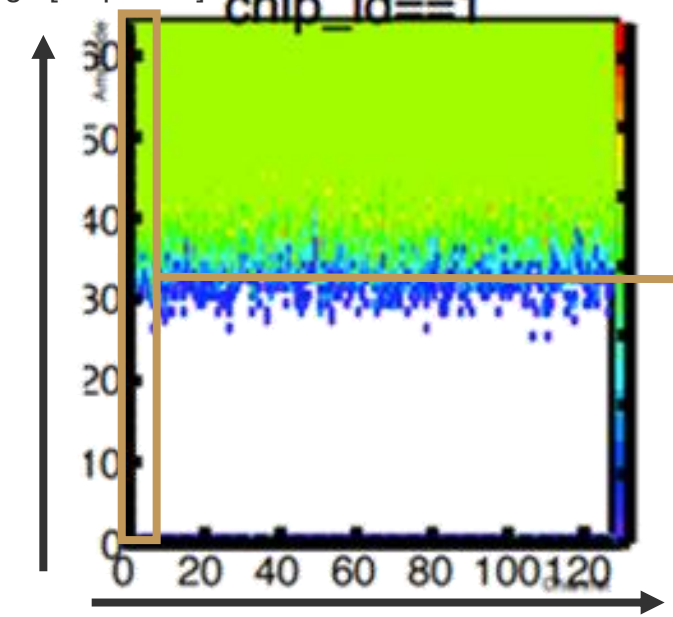
Calculate parameter from Fit function

Fit func : f(x) = [p0] × erf((x - [p1]) / [p2]) + 5

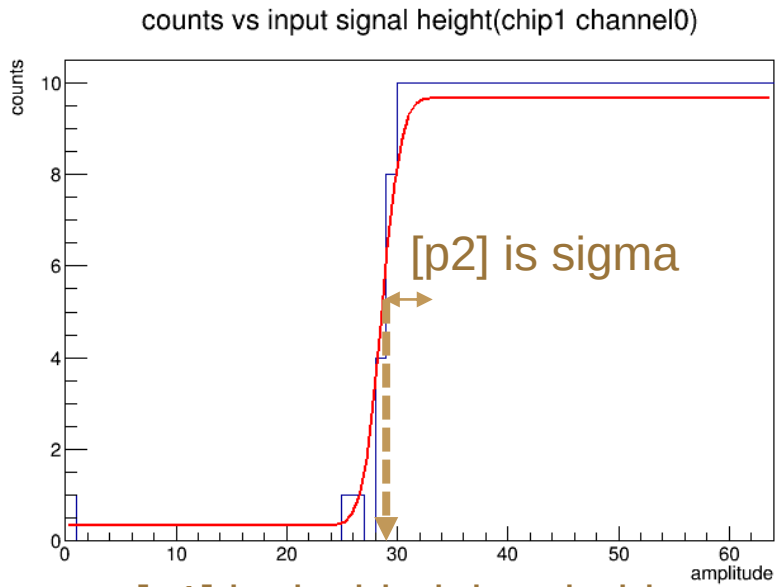
※[p0], [p1] and [p2] are parameters

Error func : erf(x)

$$\mathrm{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2}\, dt$$

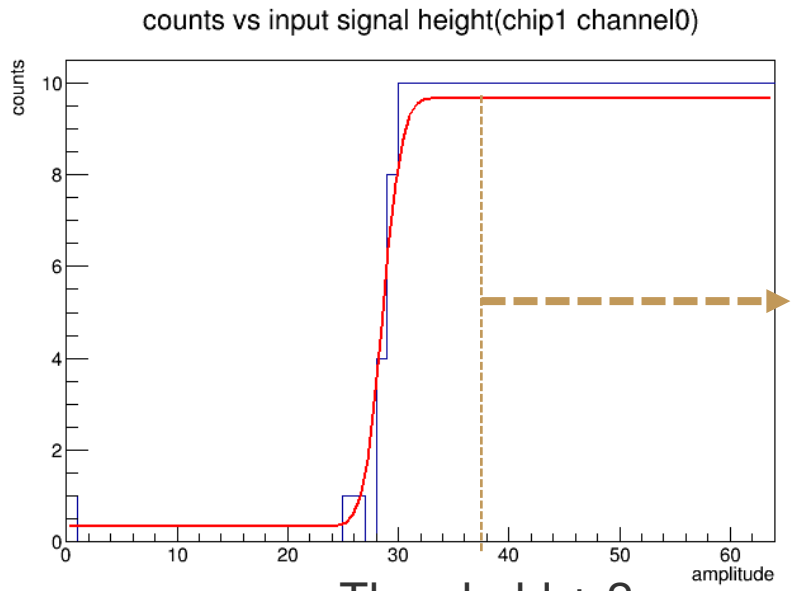


Pick up 1 channel



[p1] is decided threshold

Rate



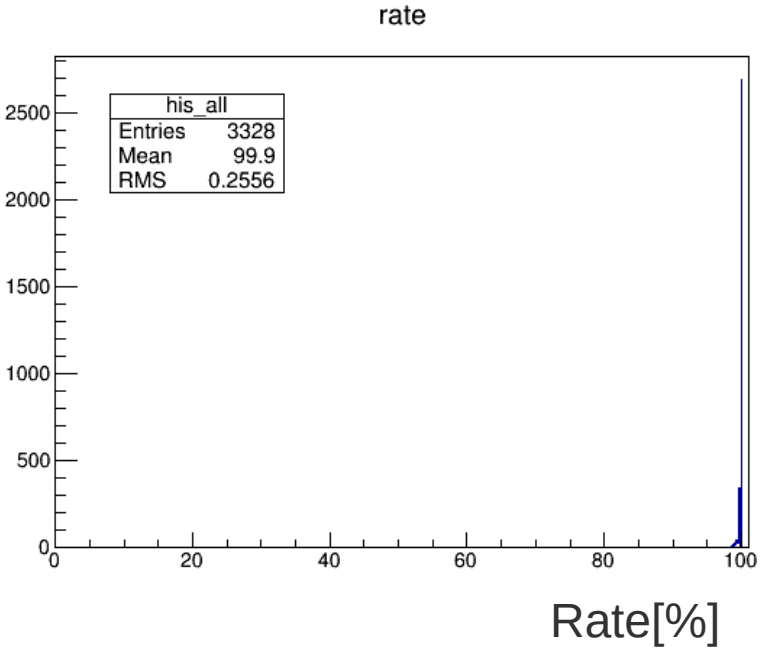
Threshold + 2σ

Rate calculation

$$rate\left(\%\right) = \left(1 - \frac{\Delta A}{\langle A \rangle}\right) \times 100$$

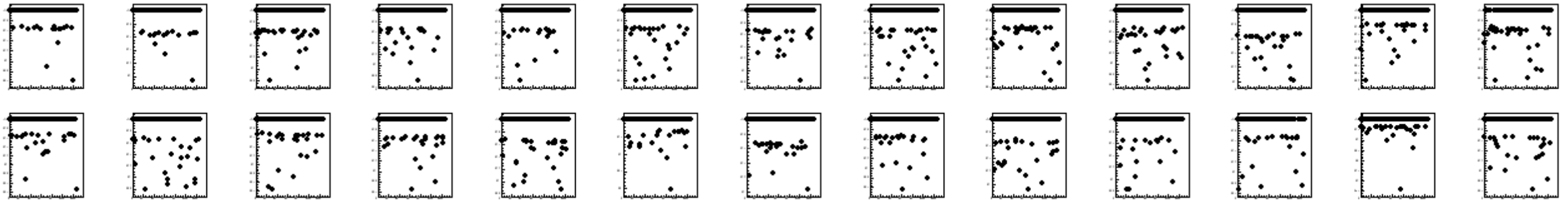
$$\Delta A = \frac{\sum_n \sqrt{(A_i - \langle A \rangle)^2}}{N}$$

Aj :actual data
<A> :10
ΔA :diffential from 10 to actual data
N : 64 – (threshold + 2σ)



Rate[%]

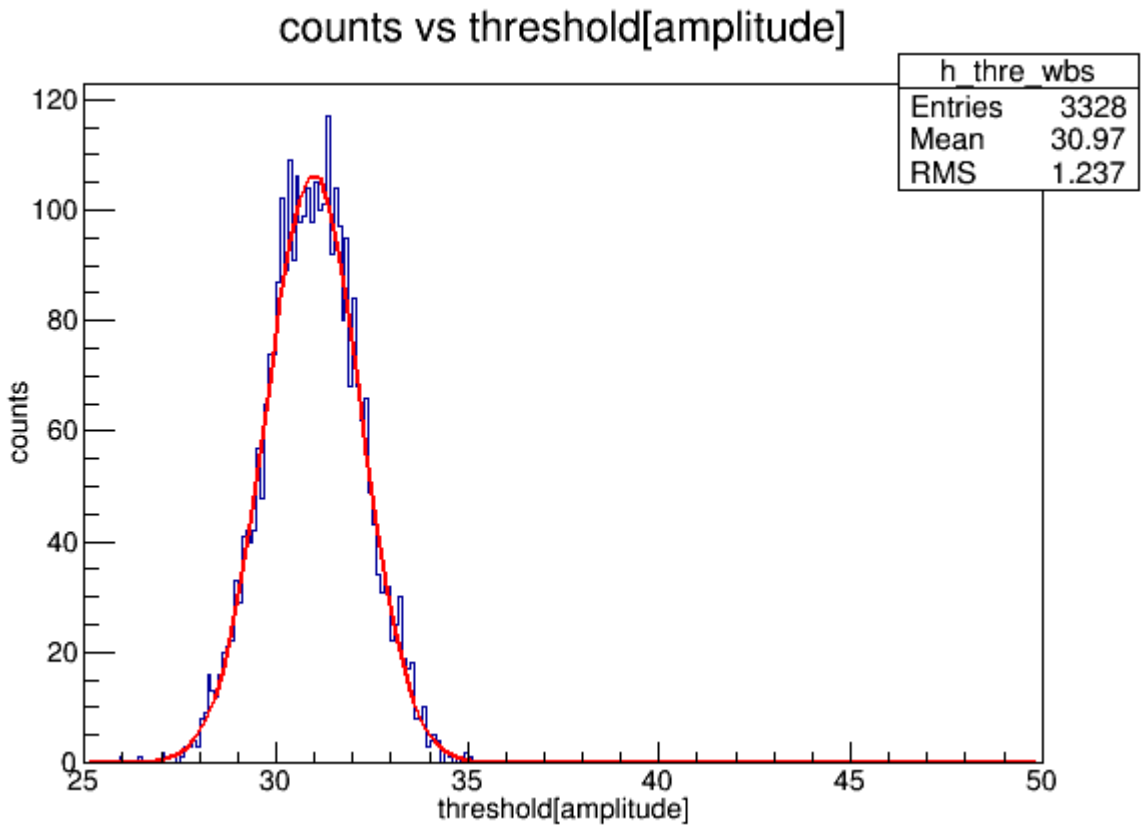
channel

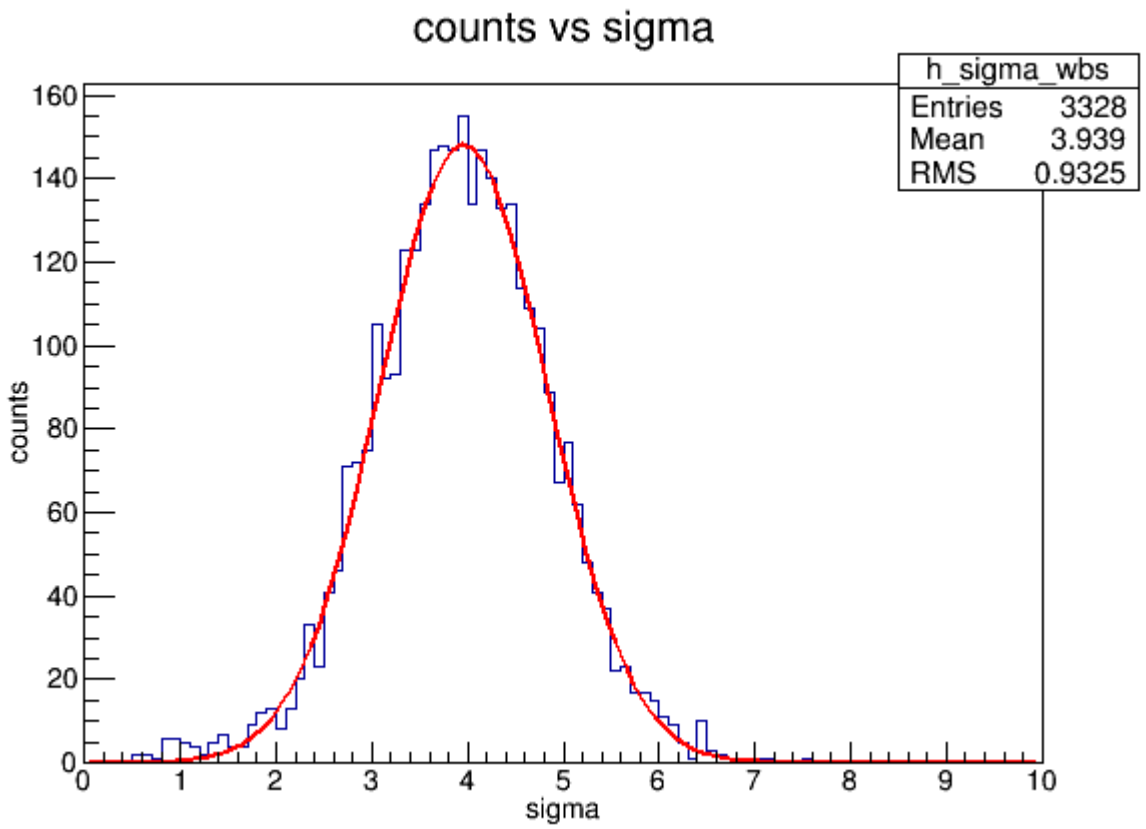


Chip01 ----------> 13

Chip14 ----------> 26

Threshold and sigma





Sigma[amplitude]