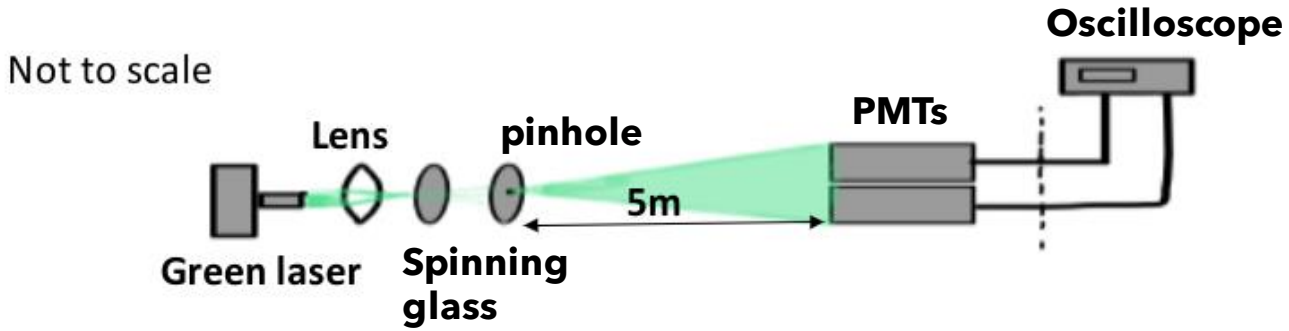
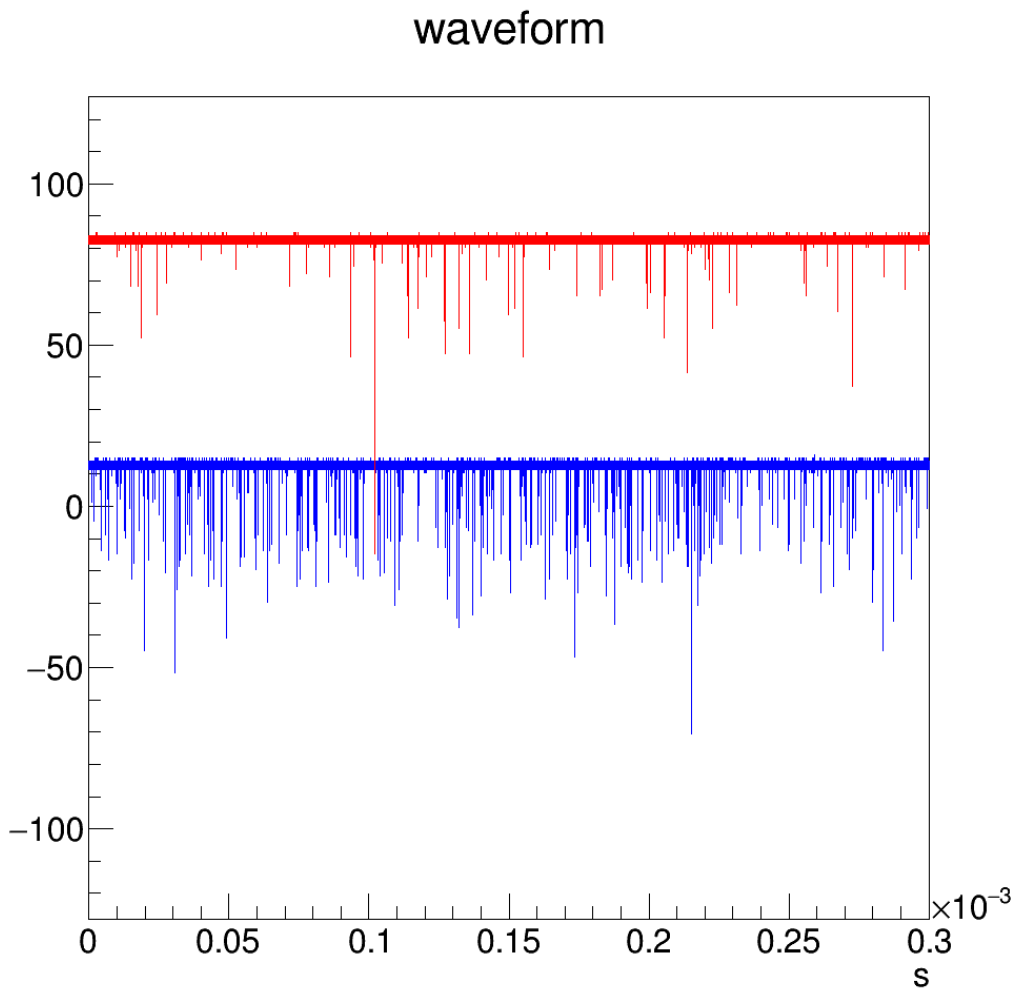
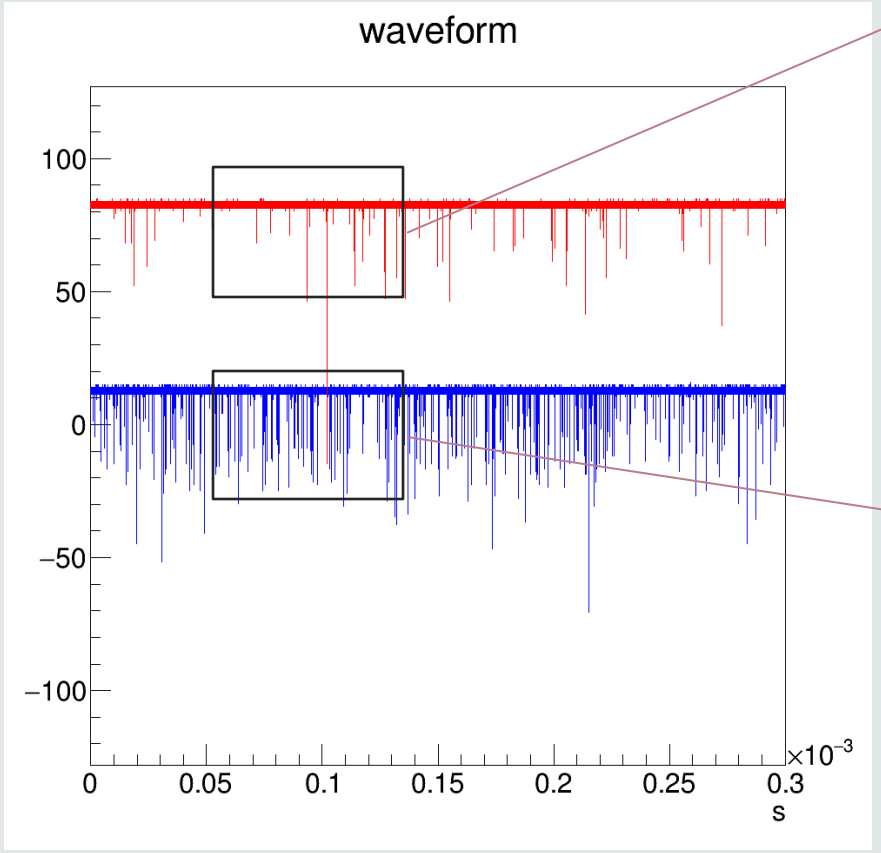
Analyzing HBT interferometry in Lab

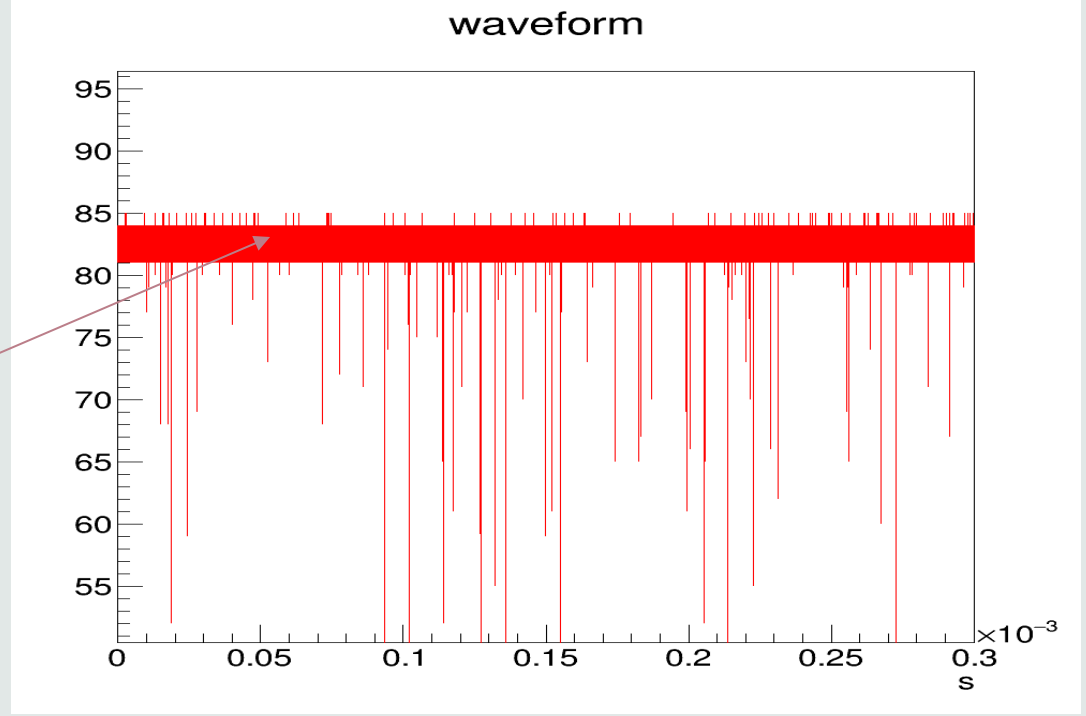
The waveform that we get from PMTs and Oscilloscope

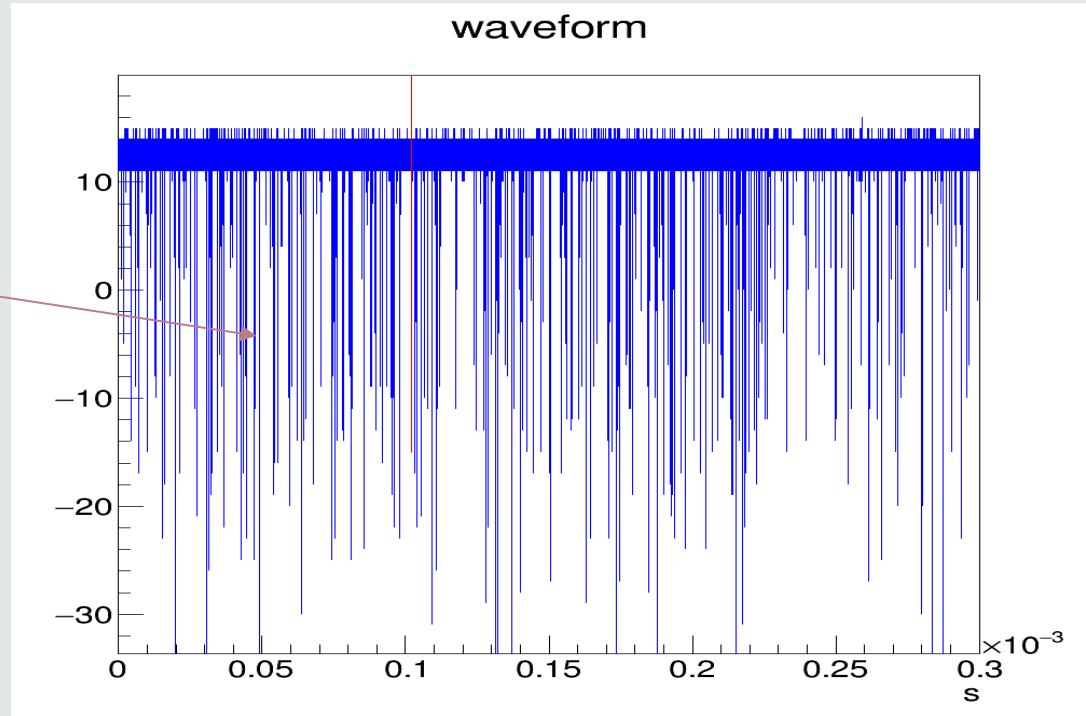




Zooming in via Y axis

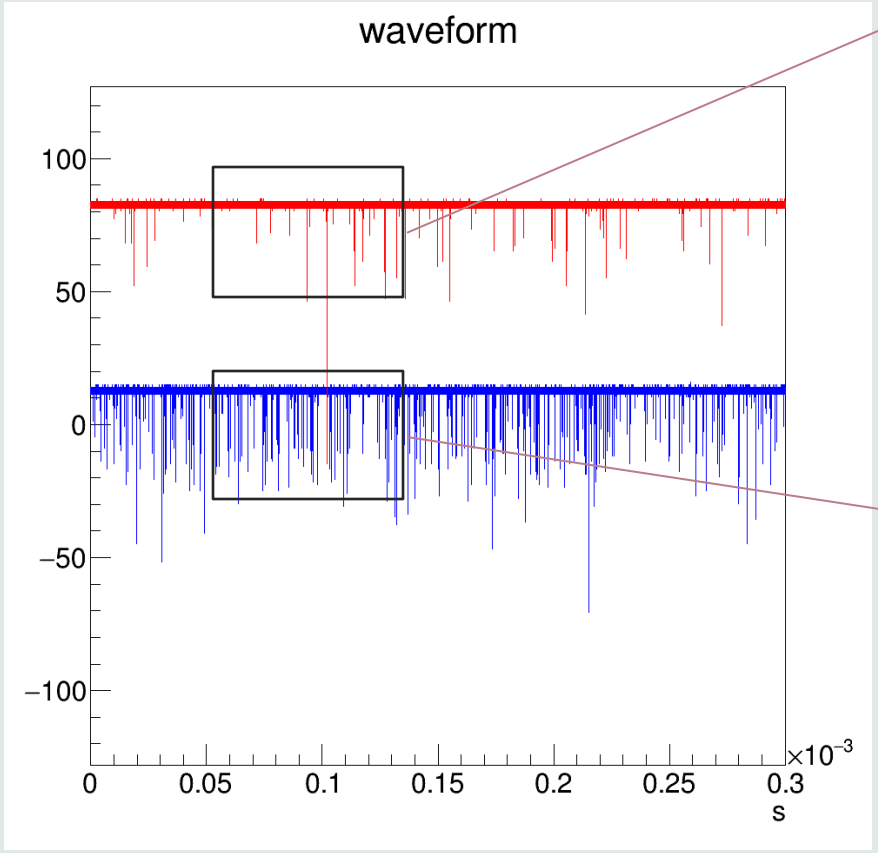


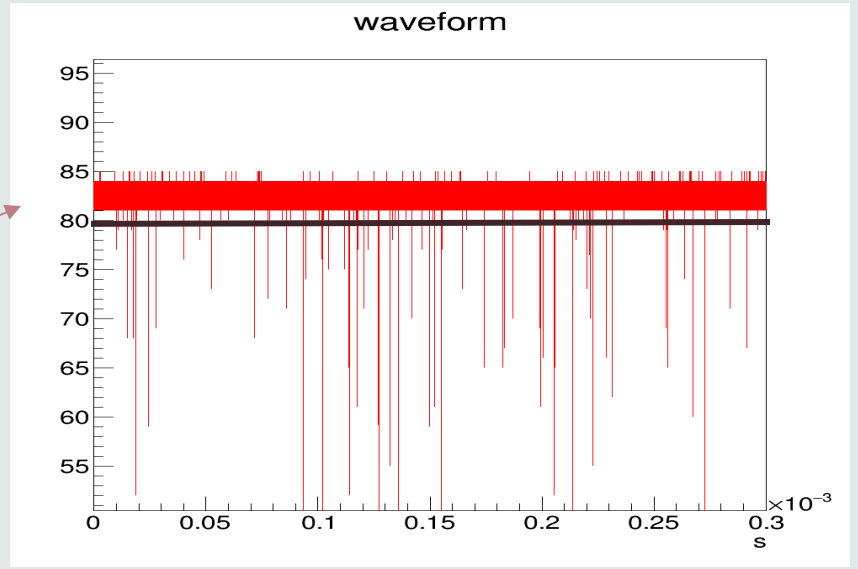


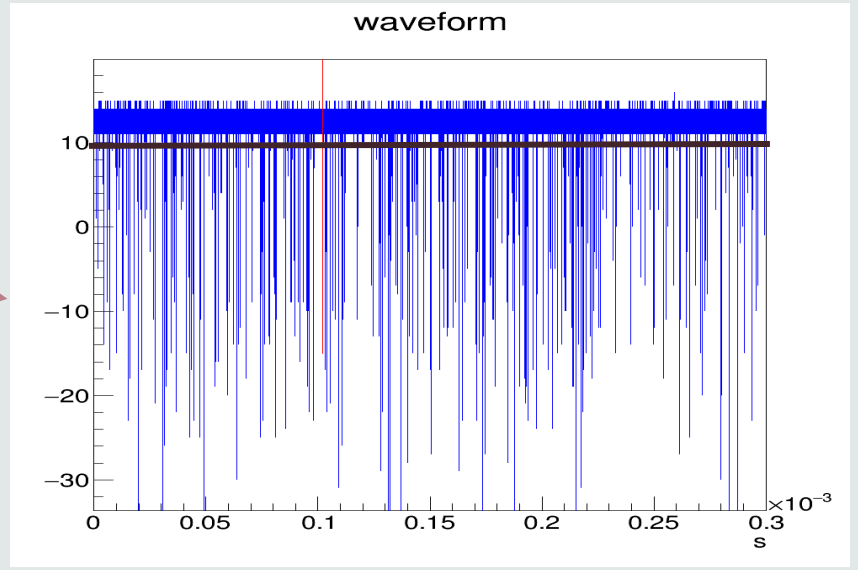


How to solve the PMTs noise issue

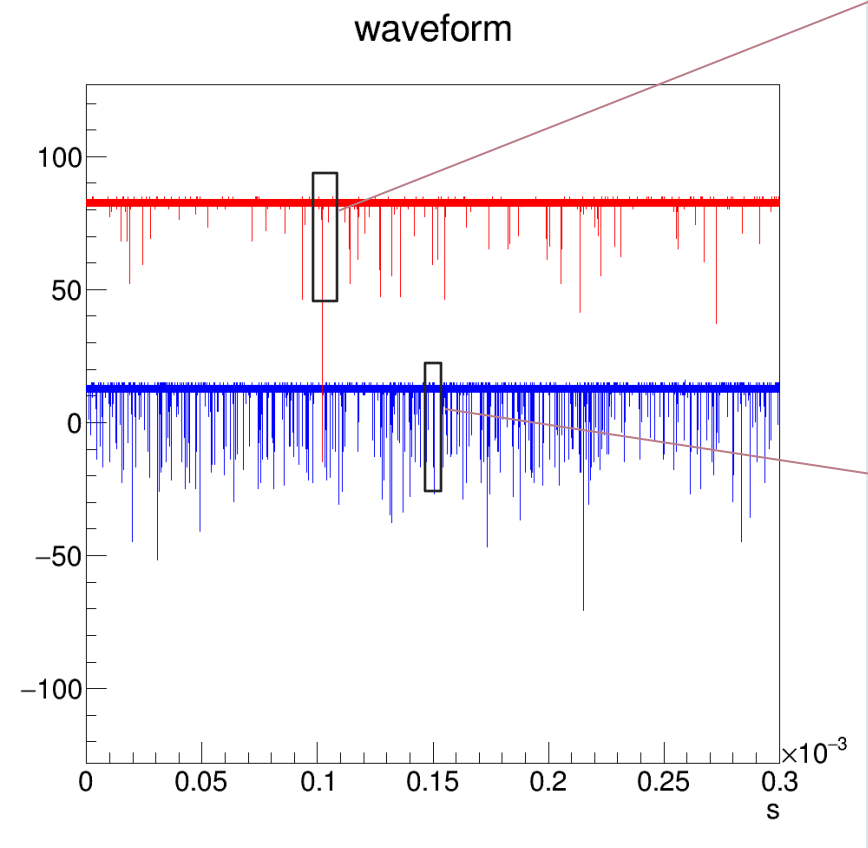
- We set a threshhold

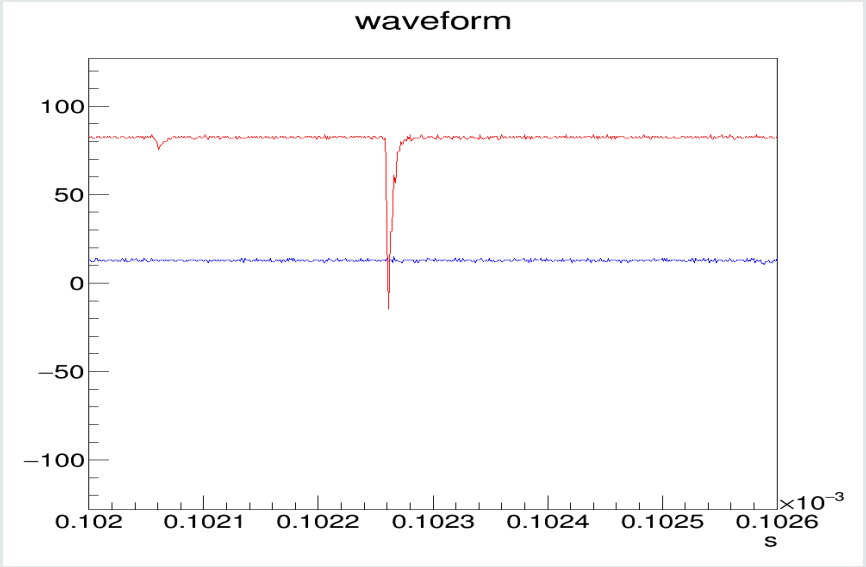


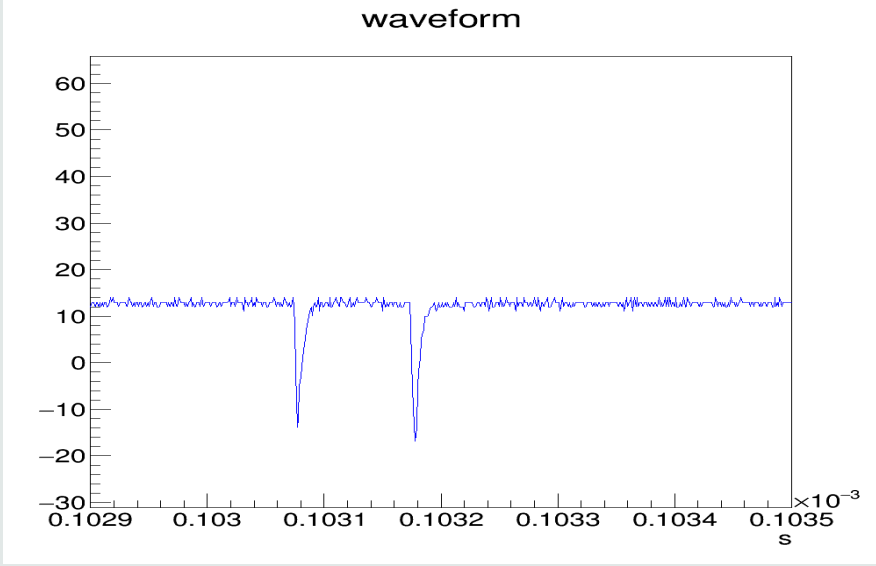




Zooming in via X axis

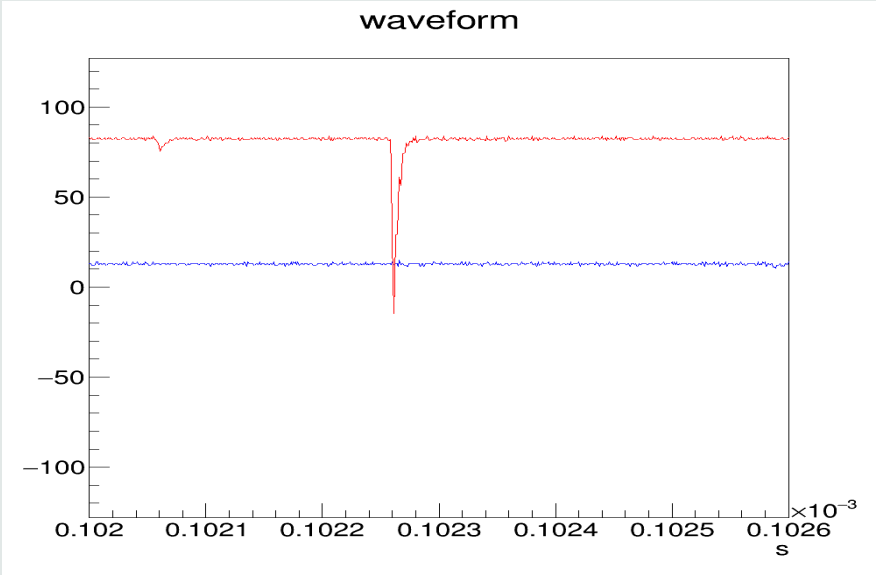


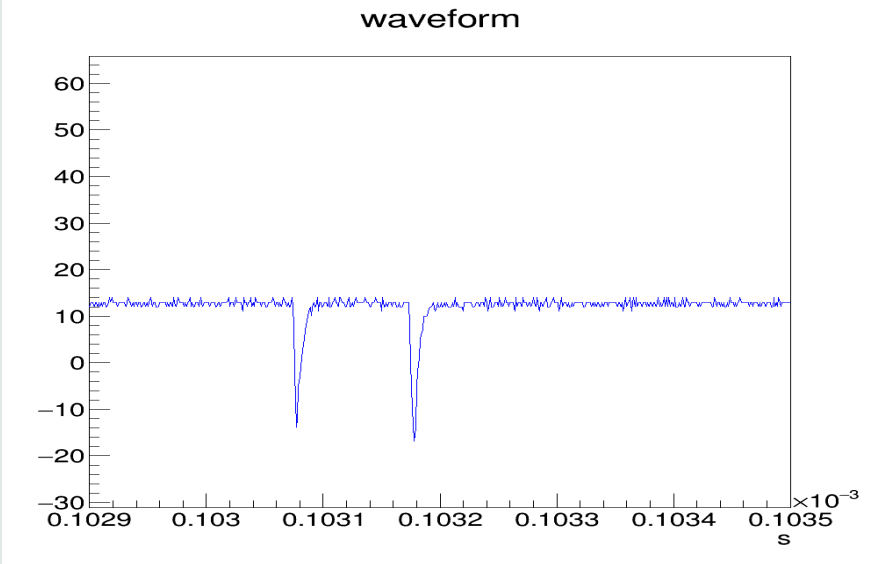




Deadtime

- The width of the signals are between 10 to 20 ns
- We skip 15 nanosecond the moment we find a sign





Two ways of analyzing

A:

Finding the position of peaks

And fill the histogram with

Fill CF ->(T[i]-T[j], 1.0)

Where Tis the position of nth signal in time.

B:

Going over all the samples

And fill the histogram with

Fill CF-> ((i-j)*dt, W[i]W[j])

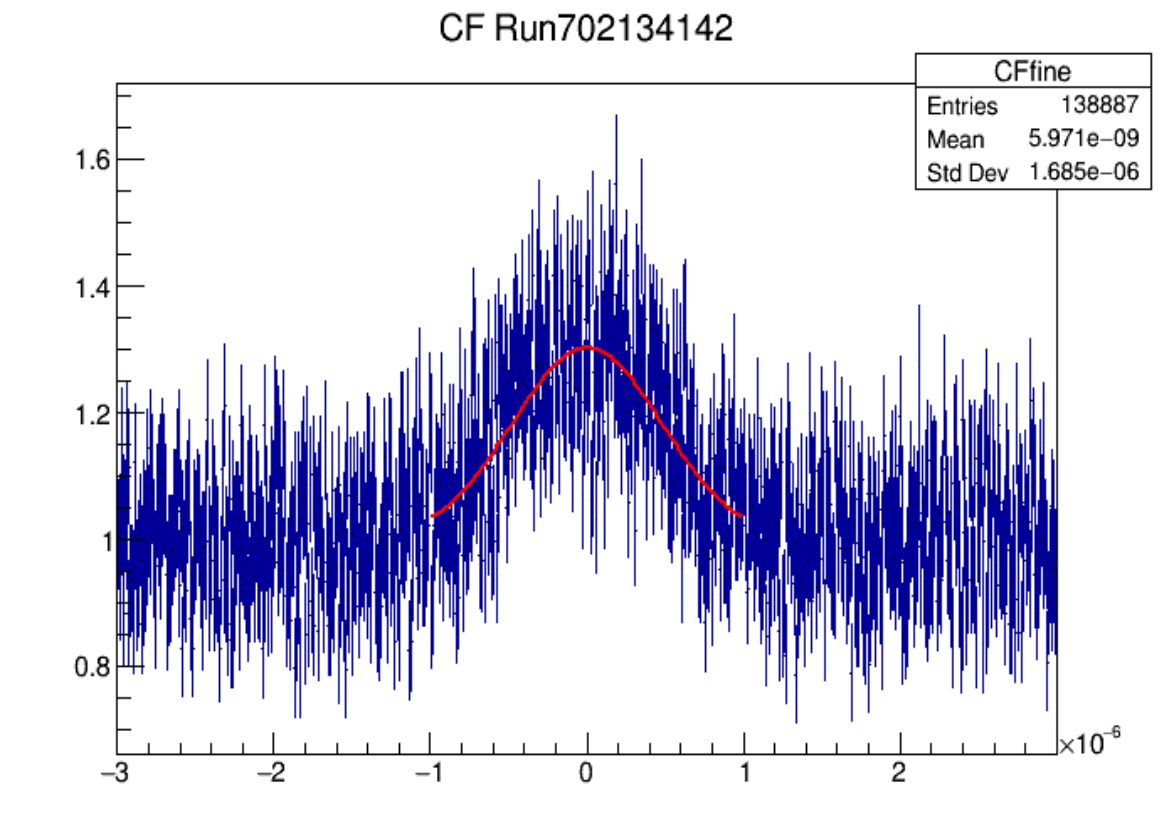
Where W is the value of waveform at a given time.

Results

A: Finding the position of peaks

Fit Result:

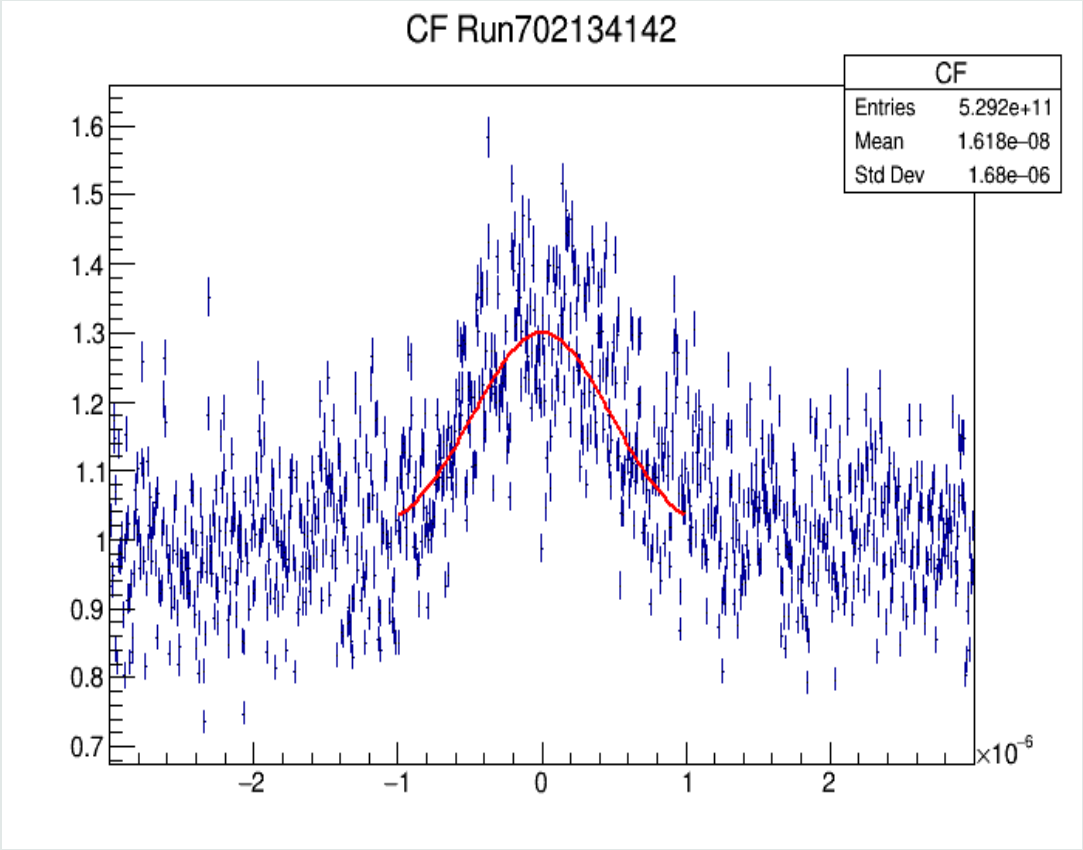
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	p0	3.03108e-01	1.00679e-02	7.44225e-05	1.46391e-02
2	p1	4.79481e-07	1.79728e-08	1.32878e-10	1.05035e+04



B: Going over all the samples

Fit Result:

NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	p0	3.04333e-01	2.49310e-03	2.77251e-06	9.85127e-03
2	p1	4.69071e-07	4.36345e-09	-2.25553e-12	7.76005e+02



Advantages of using method A for dim sources

- In our case:

There were e5 samples in each event and between 100-300 event in each run

This means 9e10 operations on each event with method B.

There are between 70 to 300 signals in each event which makes it 9e4 operation

That would be a save in time of analyzing and also the volume of data we record

Method	**description**	**Time**
A	Correlating the signal positions in time	23s
B	Correlating all the samples	359 m 41 s*

* It is not doing all 9e10 operation(but 9e8 because of sliding window)