# Development of Digital CFD Method for NFADC500

18th. Apr. 2017

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# Motivation

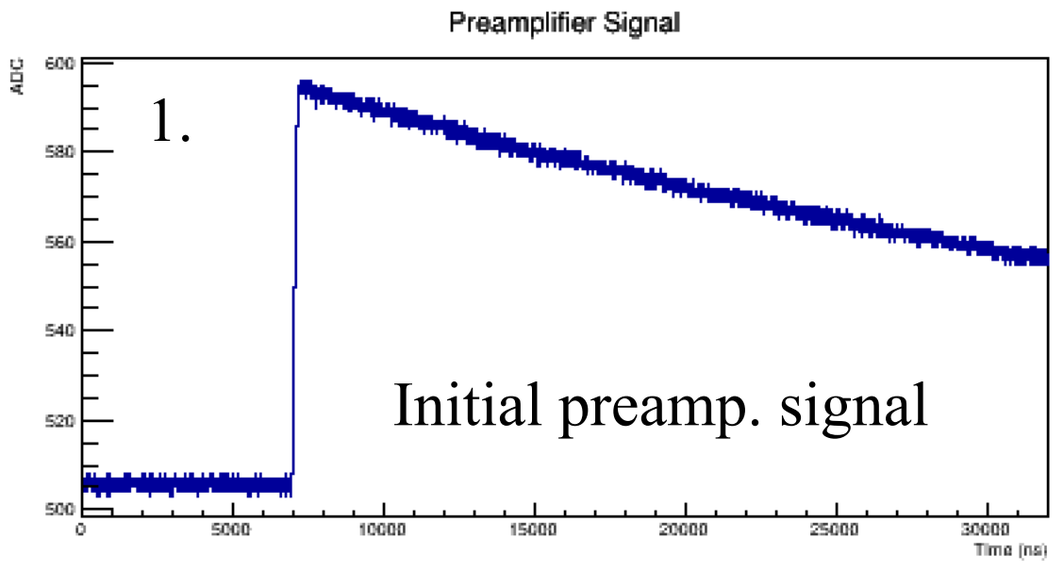
- Analog TFA-CFD method is the best method to deduce a good timing resolution for a solid state detector.

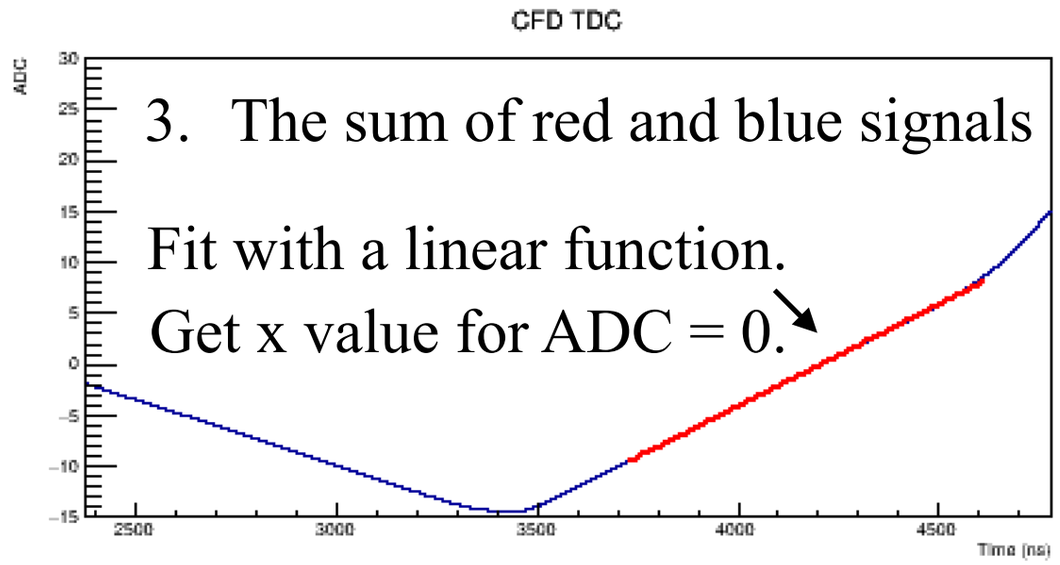
- As the nuclear experiment aims the digital type rather than the analog type, it requires the digital CFD method.

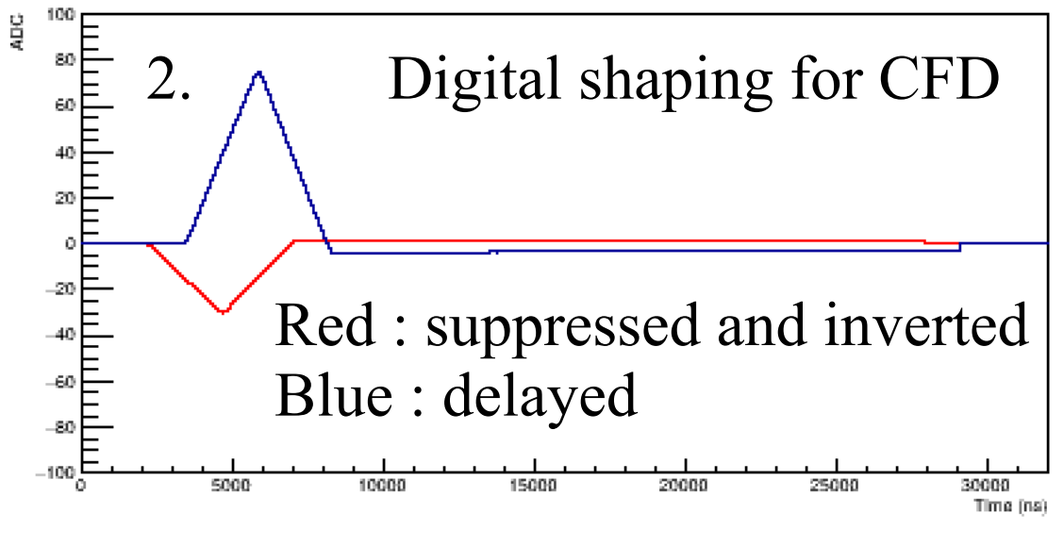
- In the past, the dCFD method provided poorer resolution than the aCFD method. However, as the technology for the digitization has been improved, the resolution also has been improved.

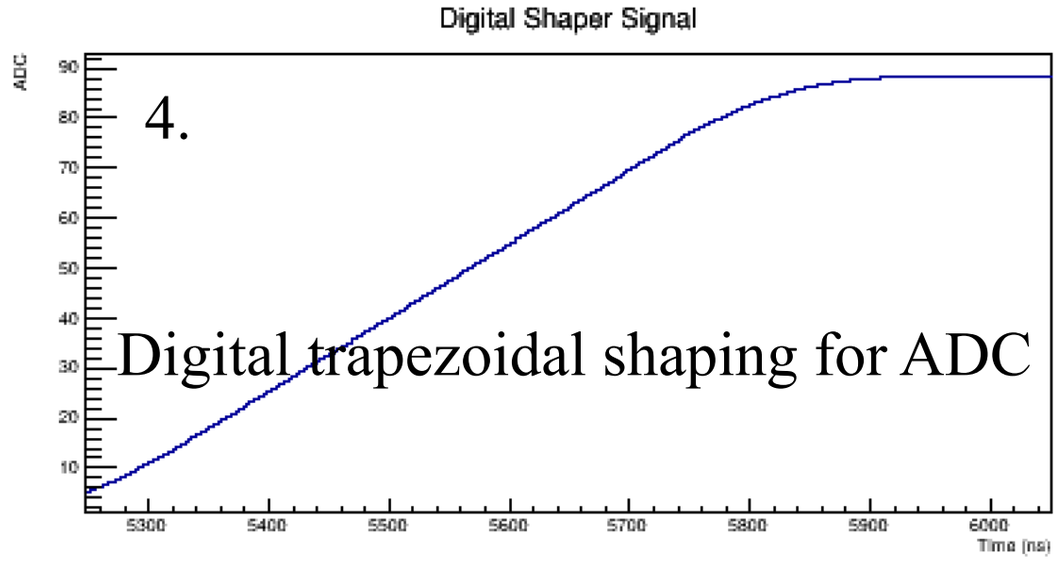
# dCFD for FADC

x-axis in time (ns) and y-axis in ADC



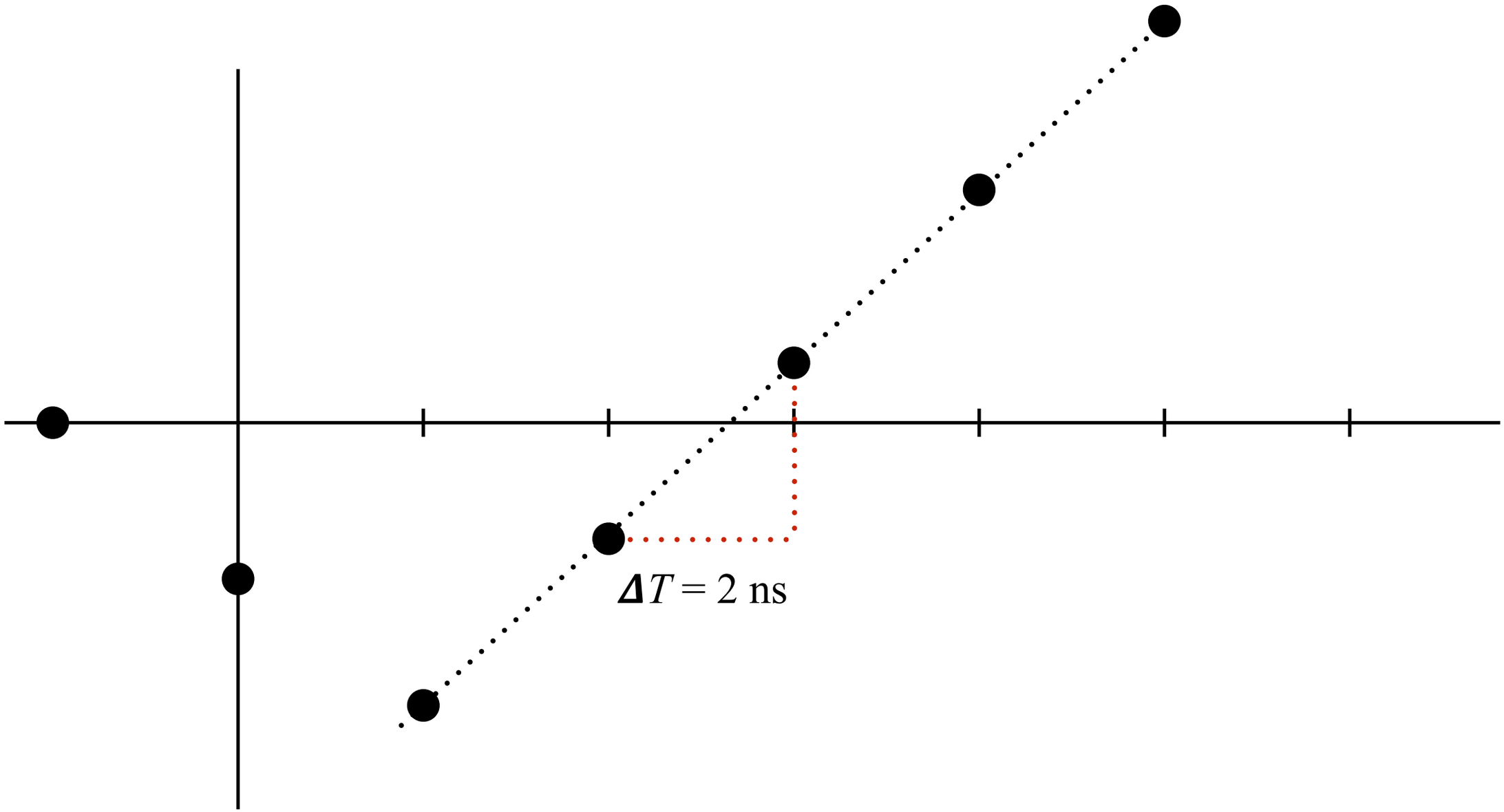



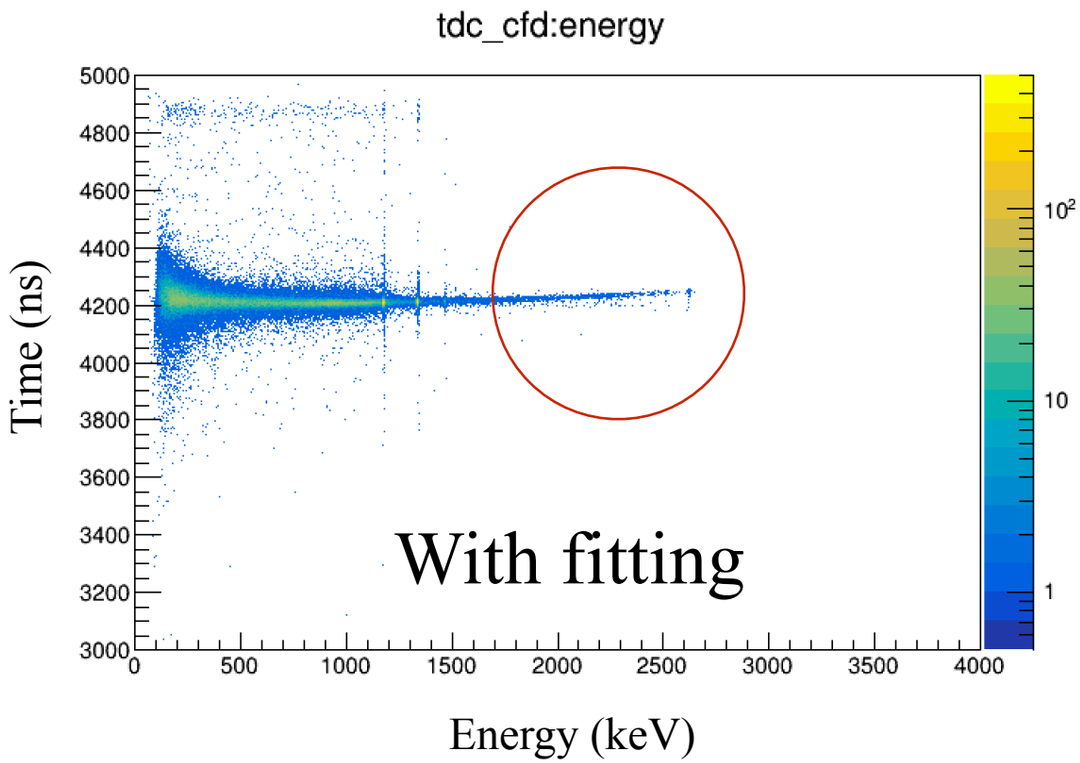

But it takes too much time to deduce TDCs!!

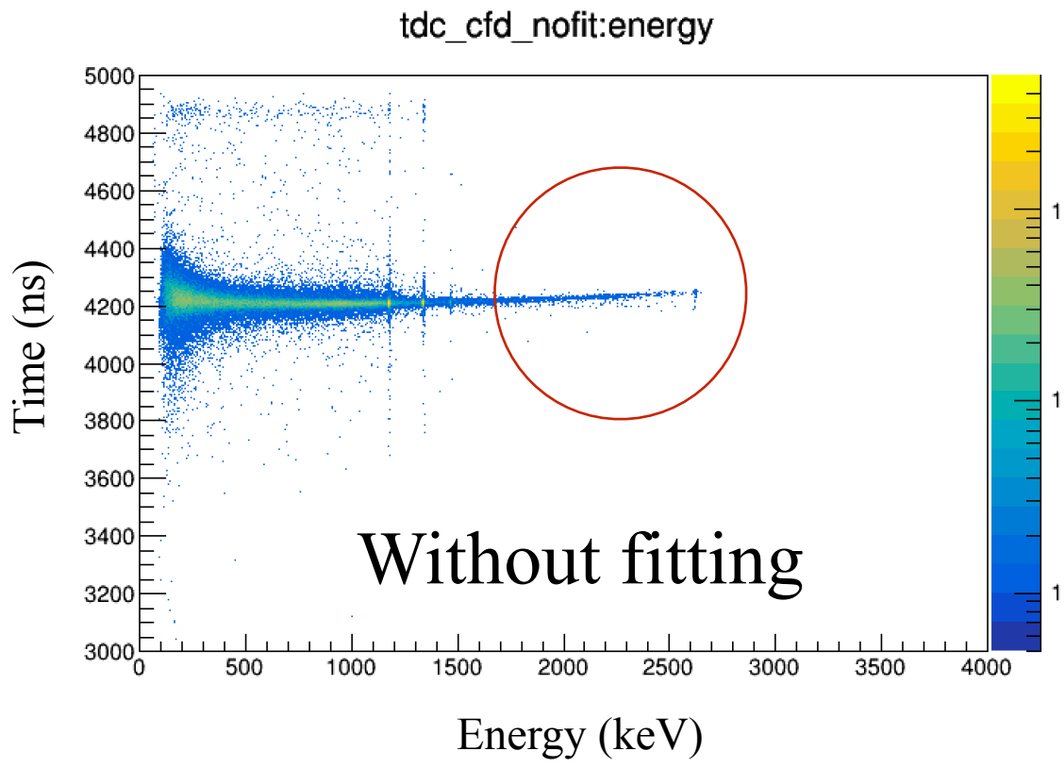
# dCFD for FADC




Able to deduce a TDC without fitting!!

# dCFD for FADC

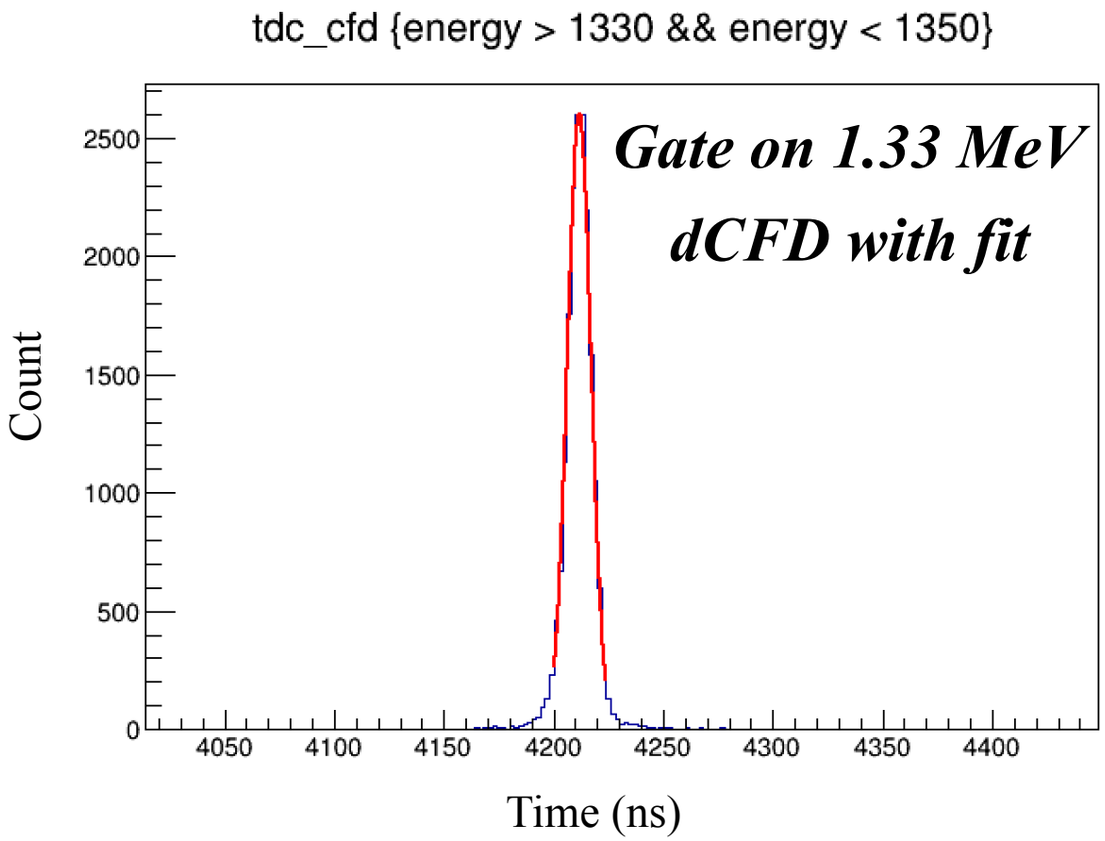


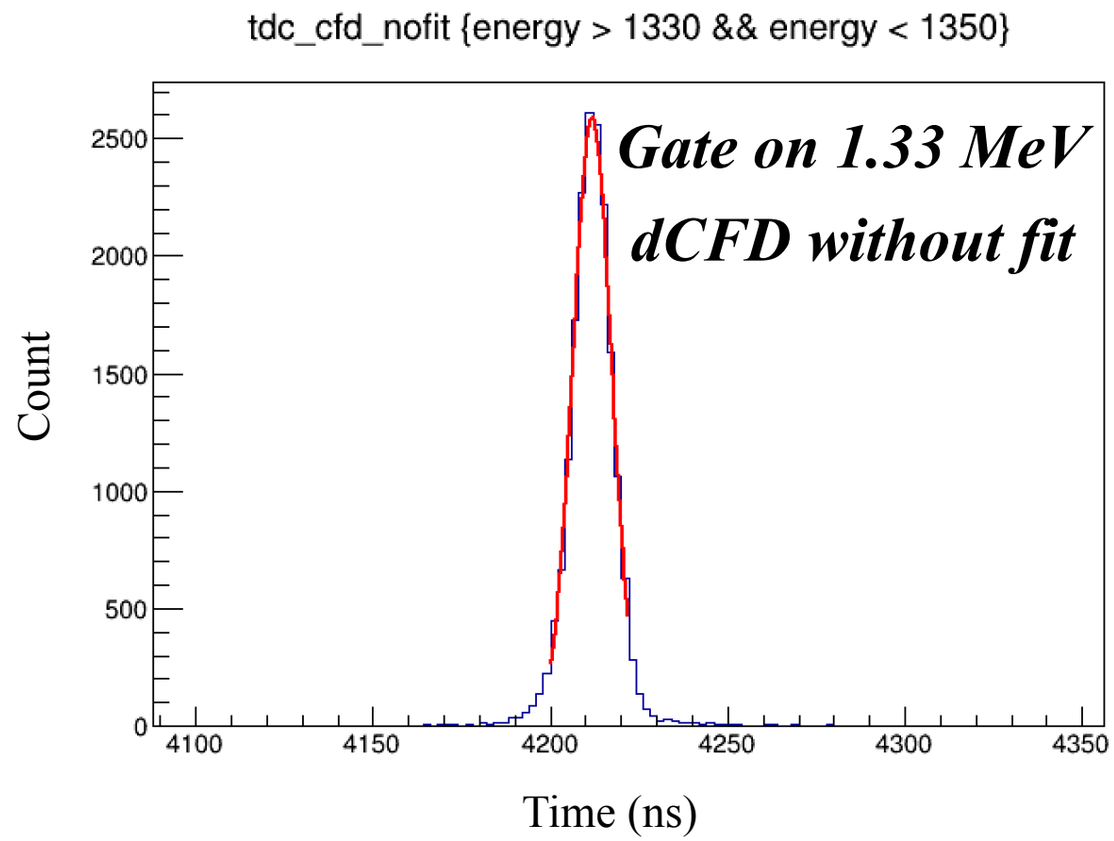

$^{60}$Co source

It seems pretty nice…
BUT there is a curved tail at high ADC values.
Still looking for the reason but it seems due to the problem in the detector itself.

# dCFD for FADC



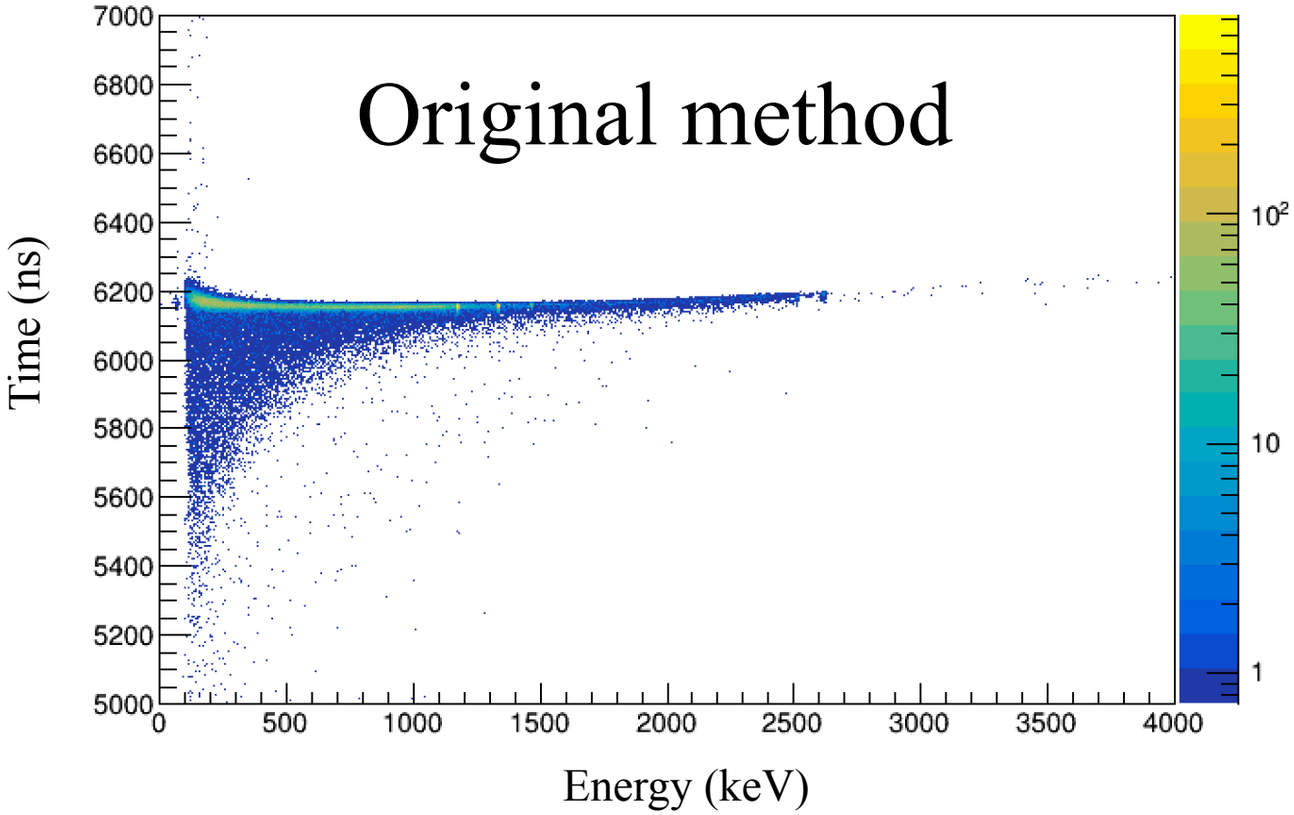

12.81(10) ns at FWHM

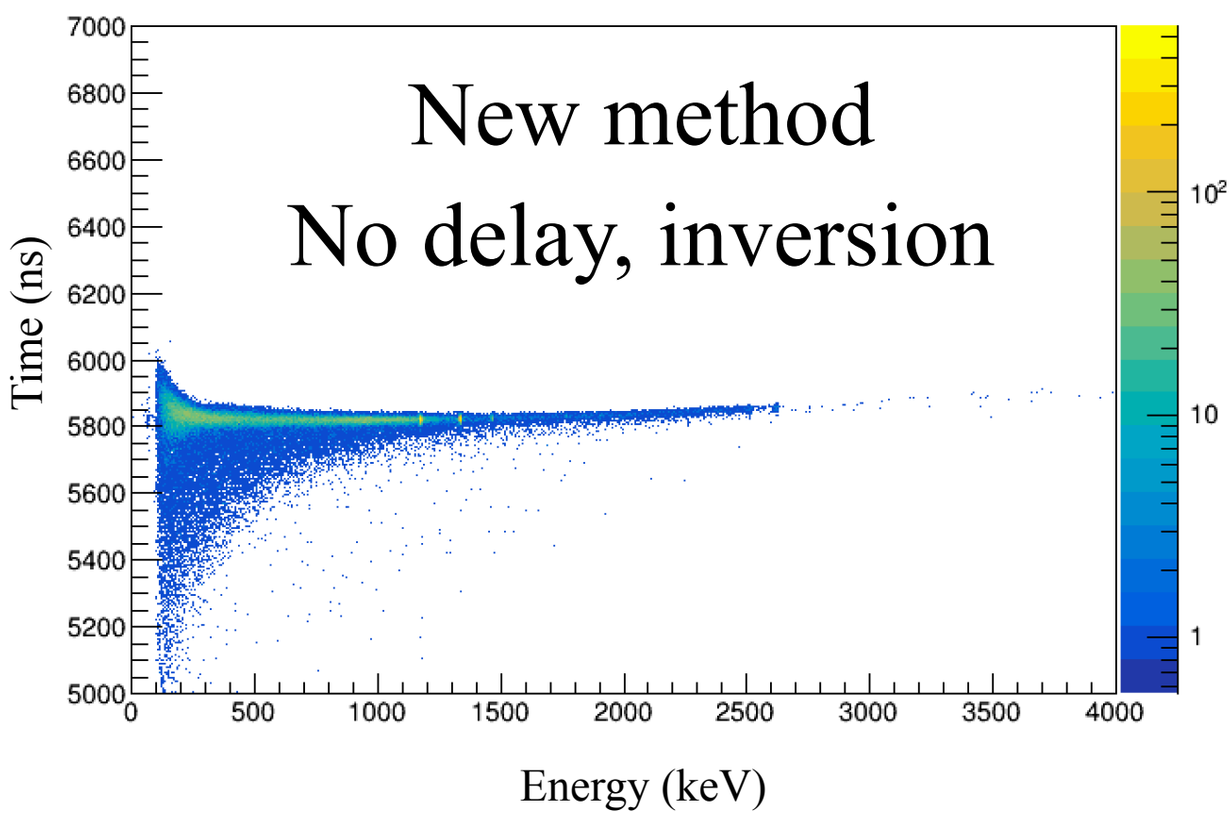



12.86(11) ns at FWHM

Almost same considering the error range.

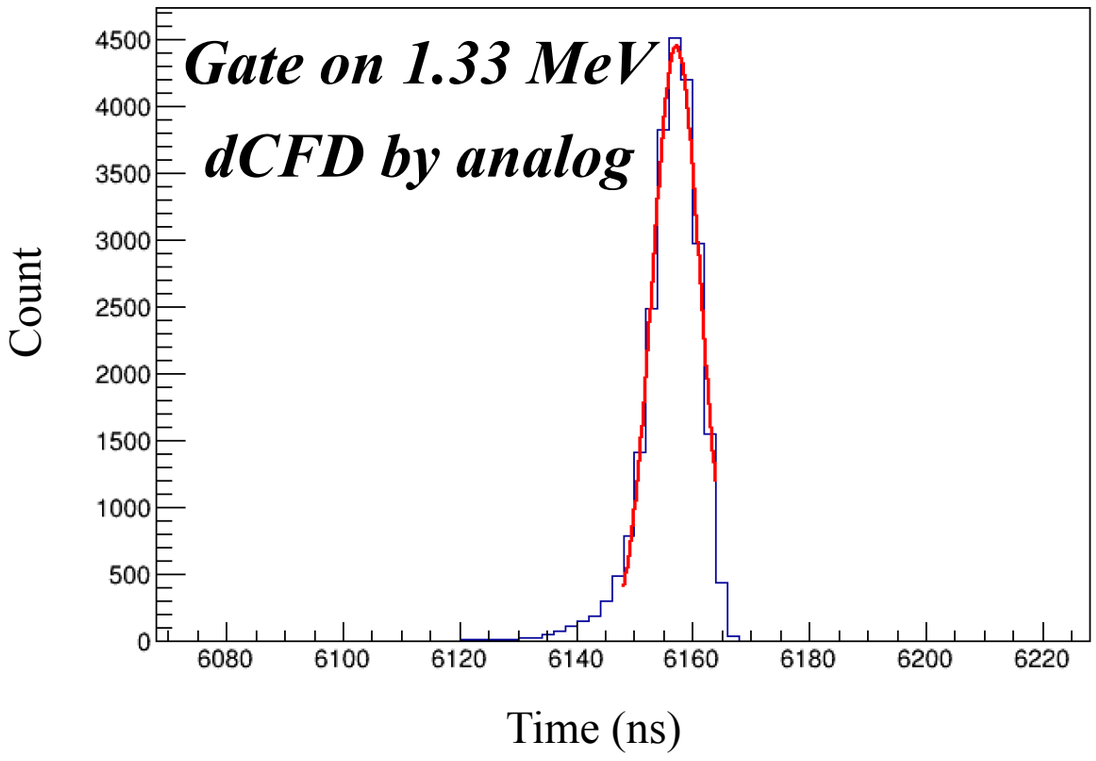
# dCFD for FADC



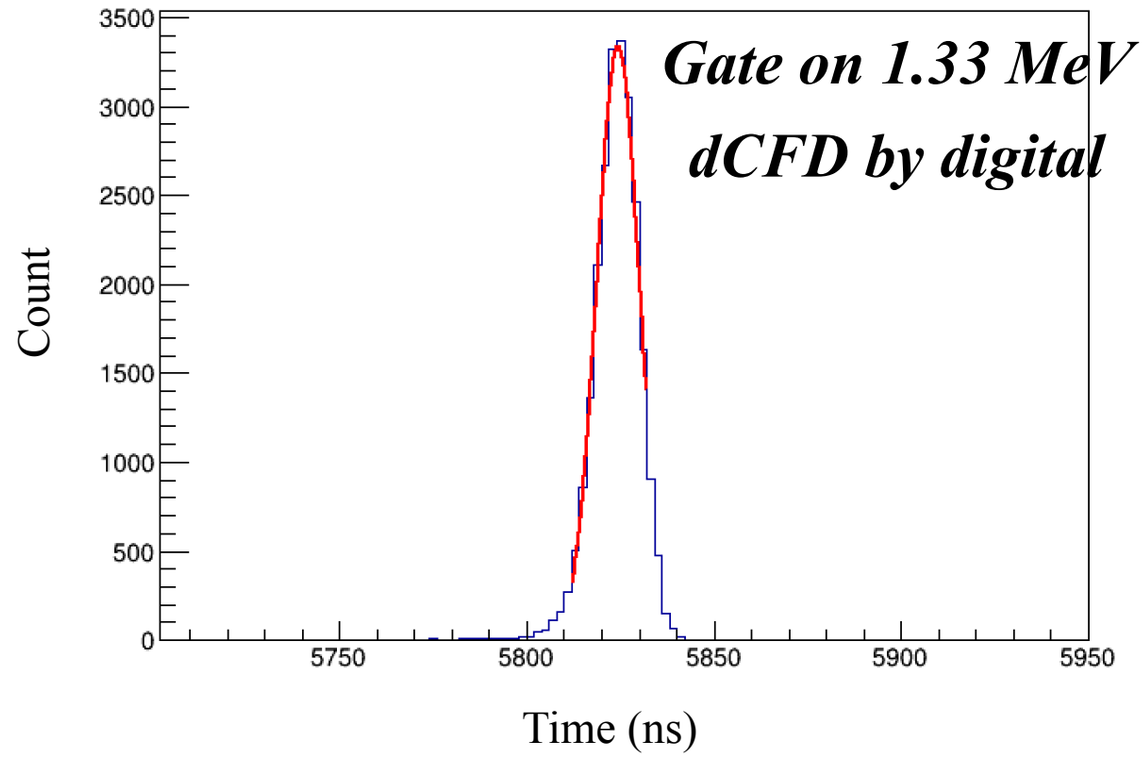




New approach compared to the last work.

# dCFD for FADC



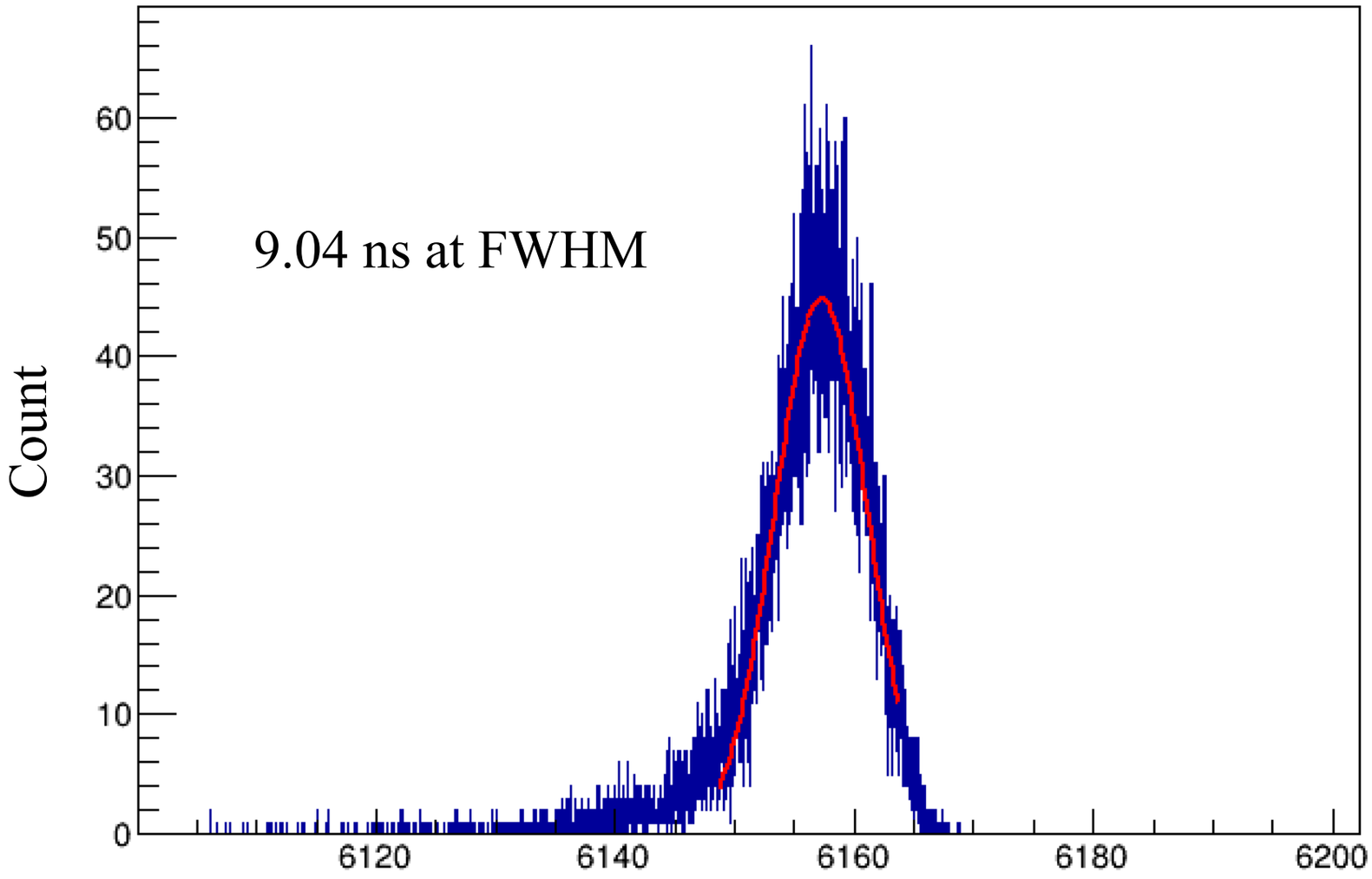

9.73 ns at FWHM




13.40 ns at FWHM

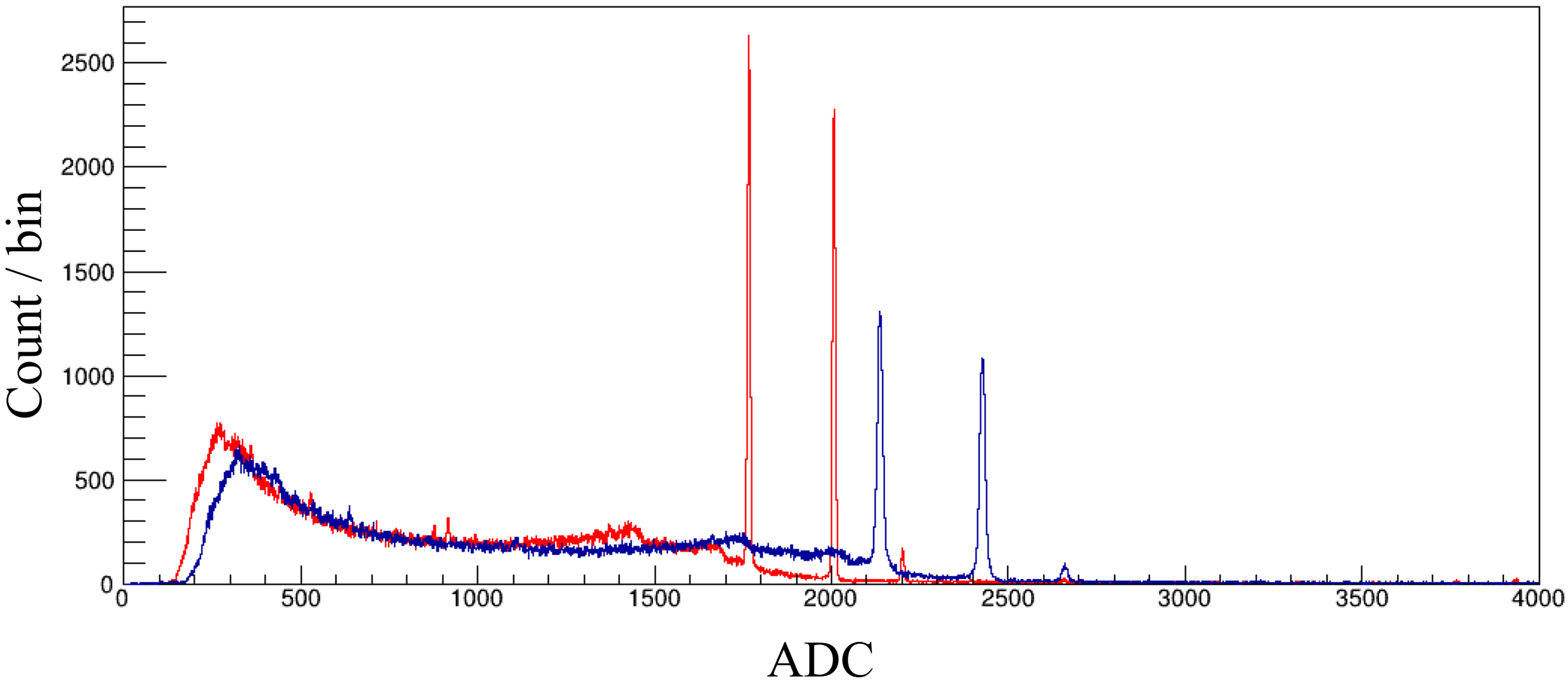
Analog type algorithm is better!!

# dCFD for FADC




20 ps per a bin!!

# ADC for FADC


Count / bin
2500
2000
1500
1000
500
0
0
500
1000
1500
2000
2500
3000
3500
4000
ADC

# Building New DAQ