Development of Digital CFD Method for NFADC500

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Motivation

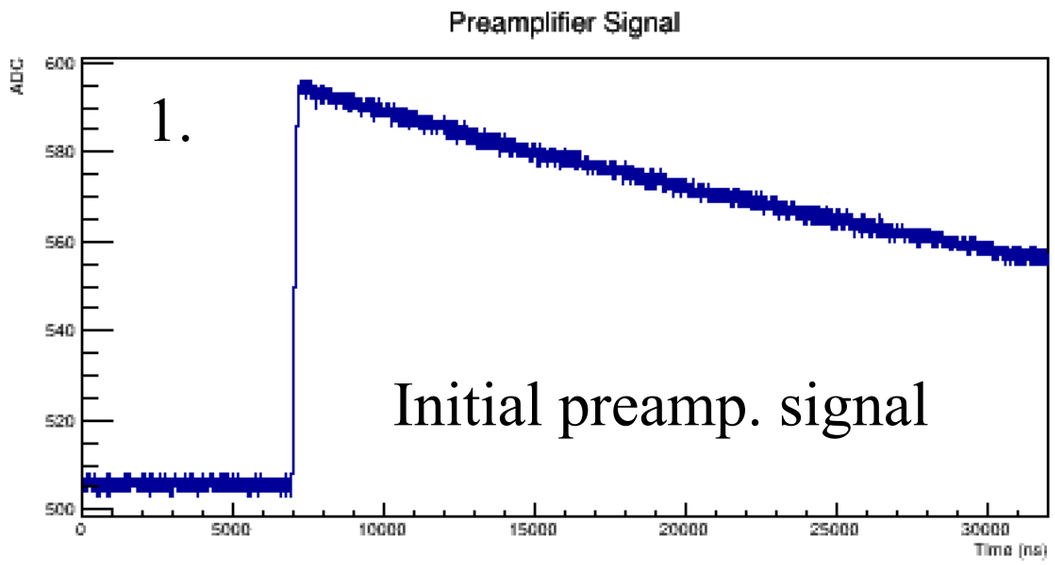
- Analog TFA-CFD method is the best method to deduce a good timing resolution for a solid state detector.

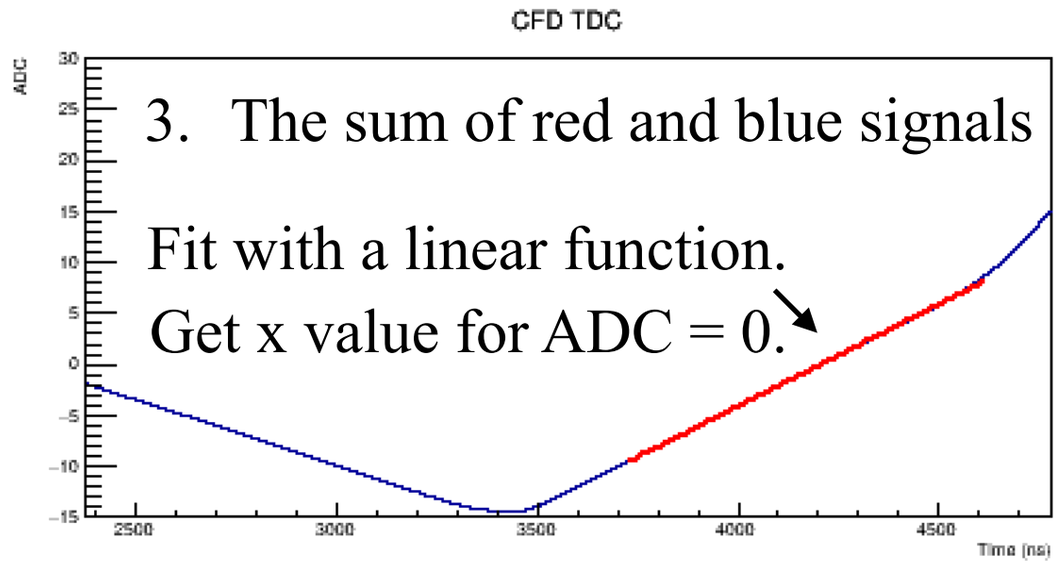
- As the nuclear experiment aims the digital type rather than the analog type, it requires the digital CFD method.

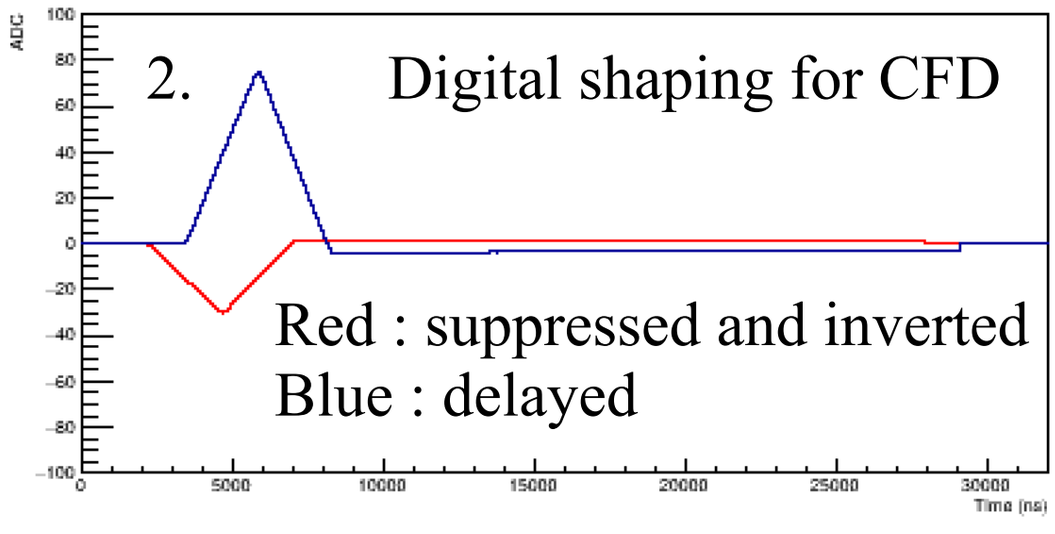
- In the past, the dCFD method provided poorer resolution than the aCFD method. However, as the technology for the digitization has been improved, the resolution also has been improved.

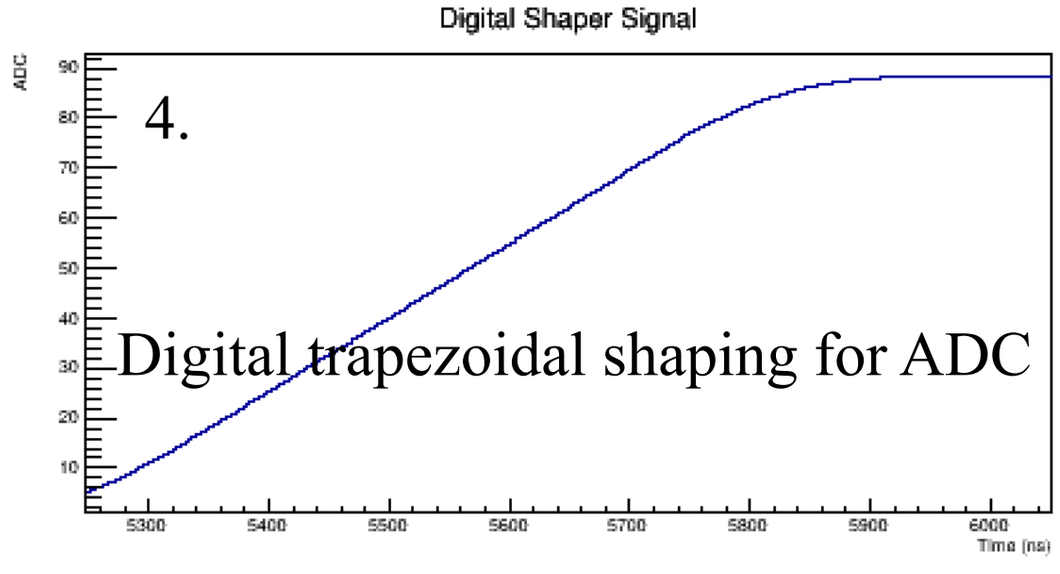
dCFD for FADC

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



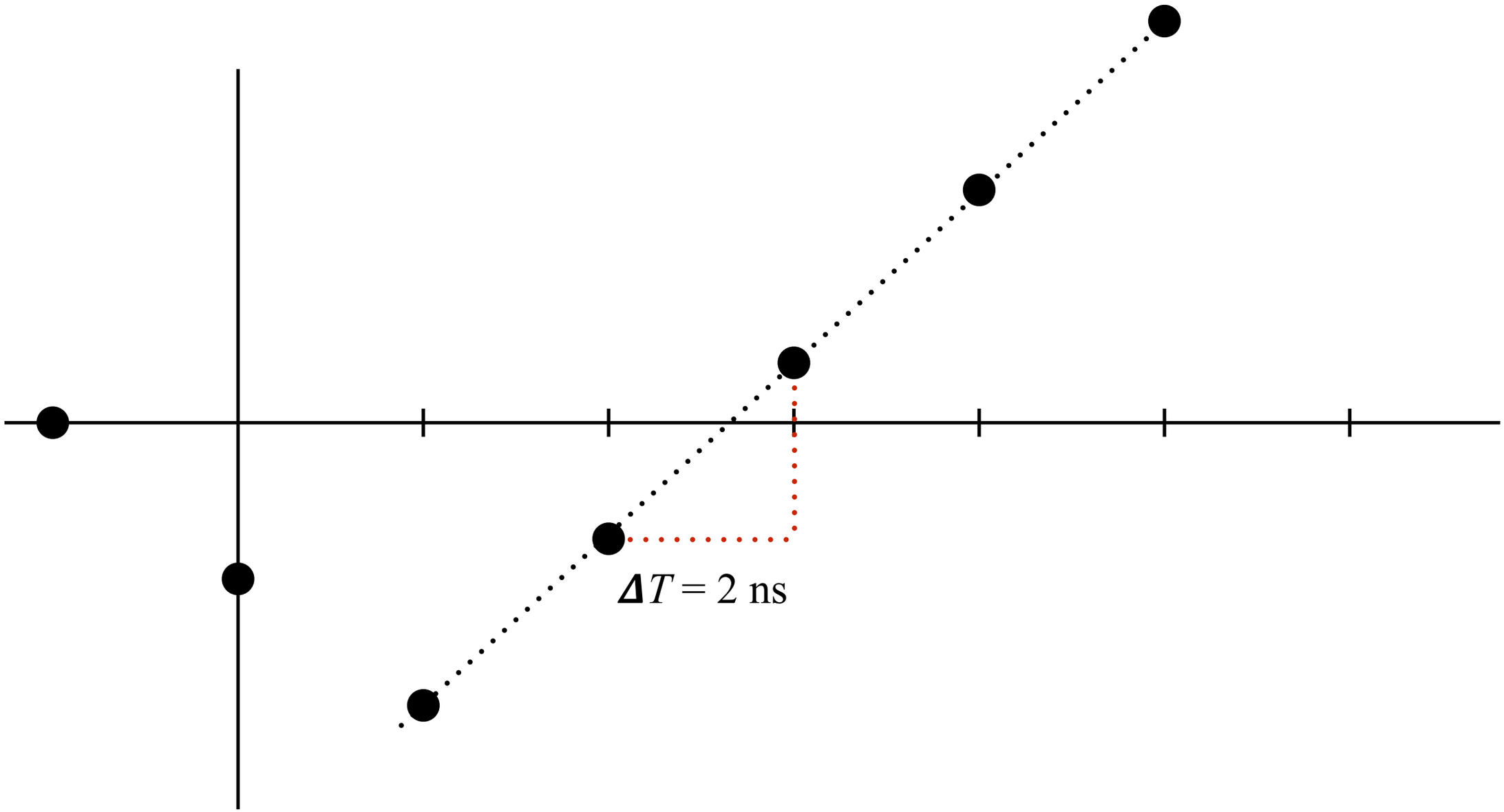






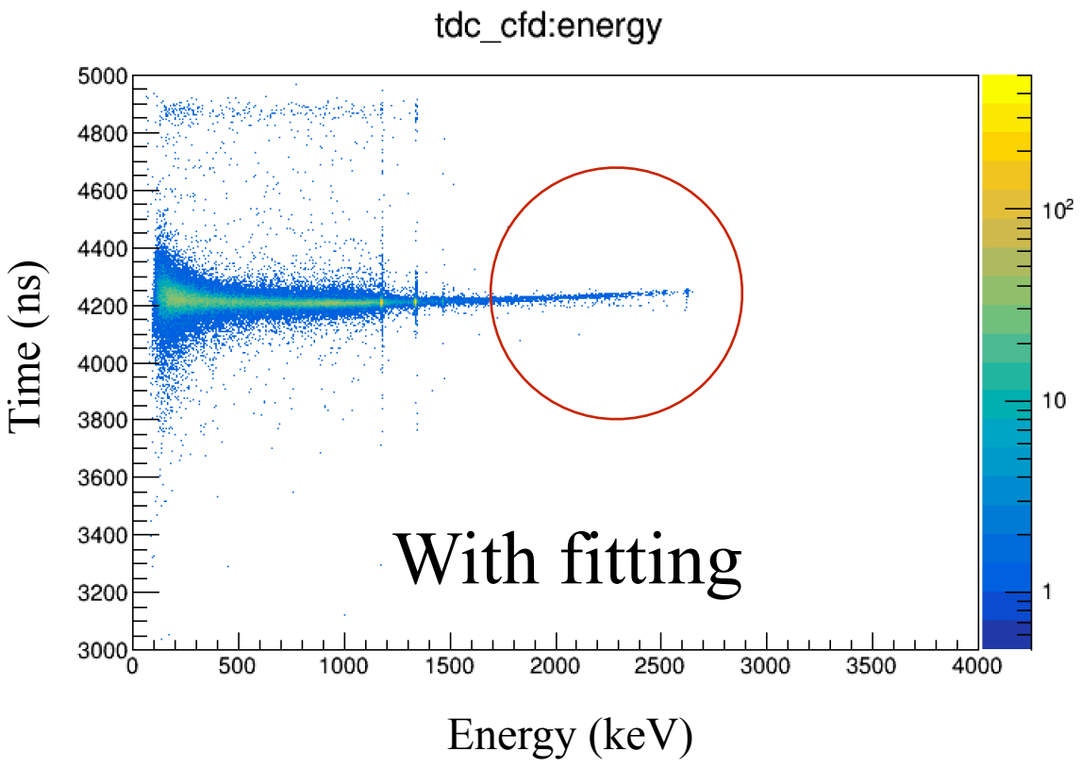
But it takes too much time to deduce TDCs!!

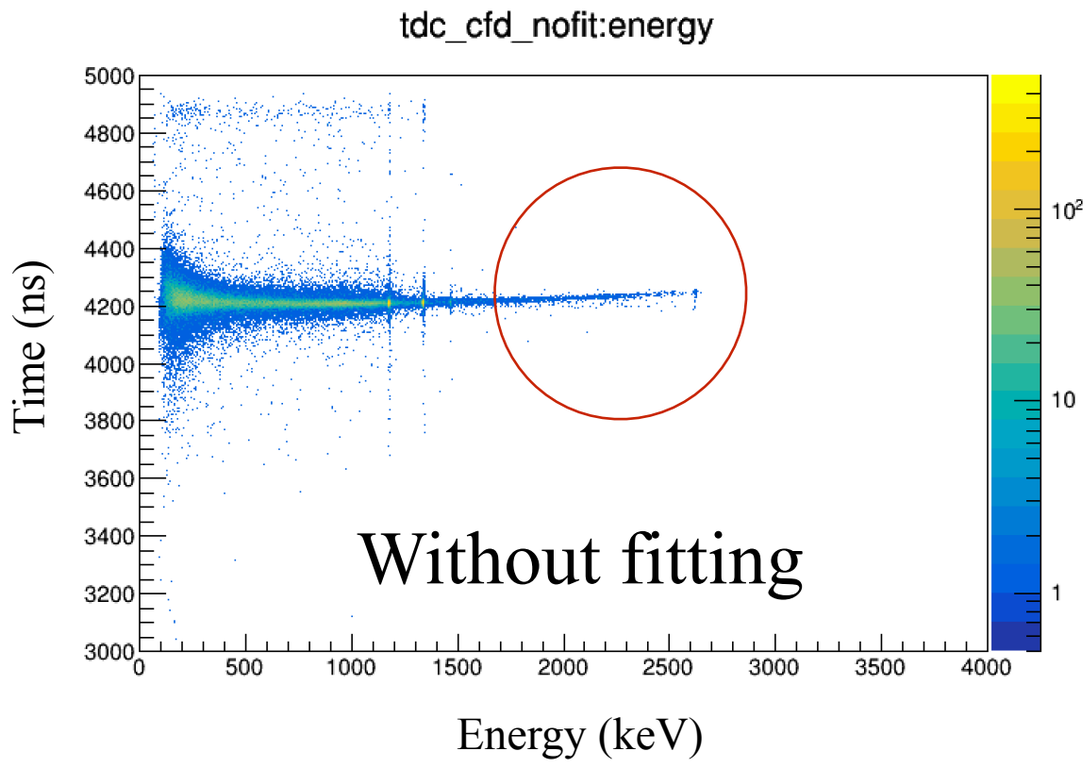
dCFD for FADC



Able to deduce a TDC without fitting!!

dCFD for FADC

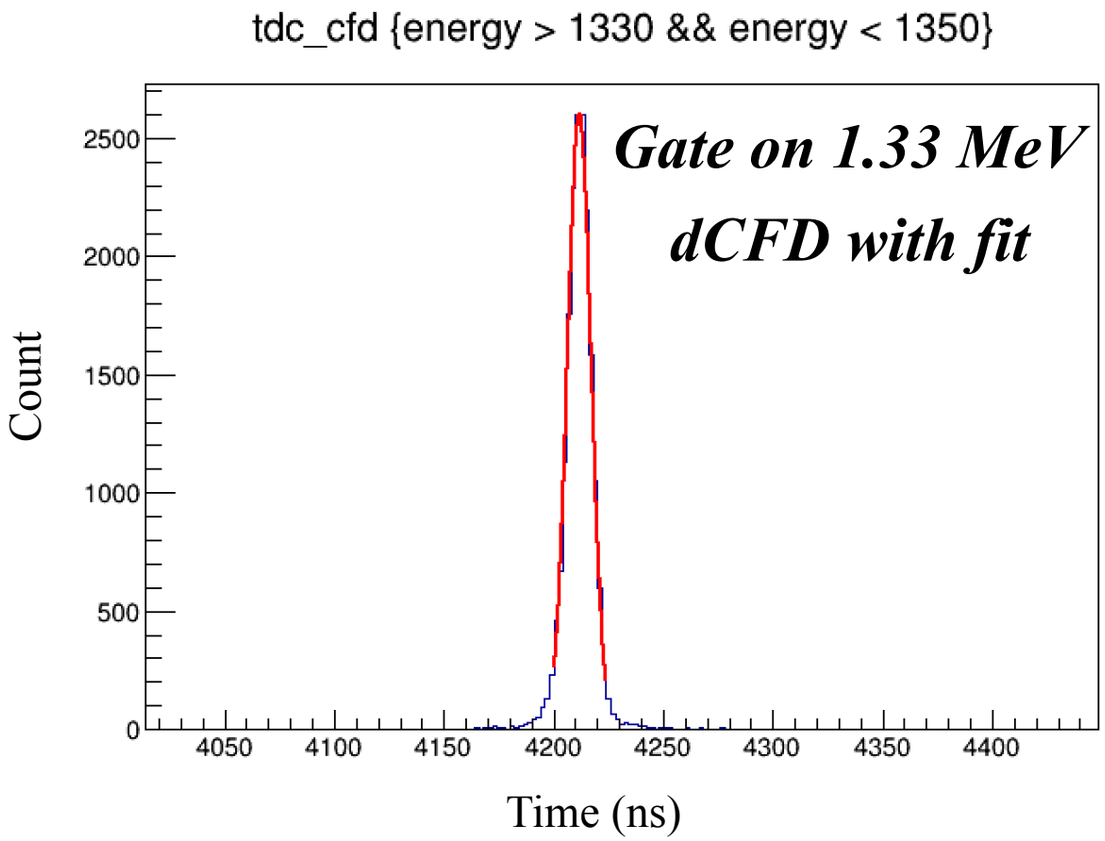




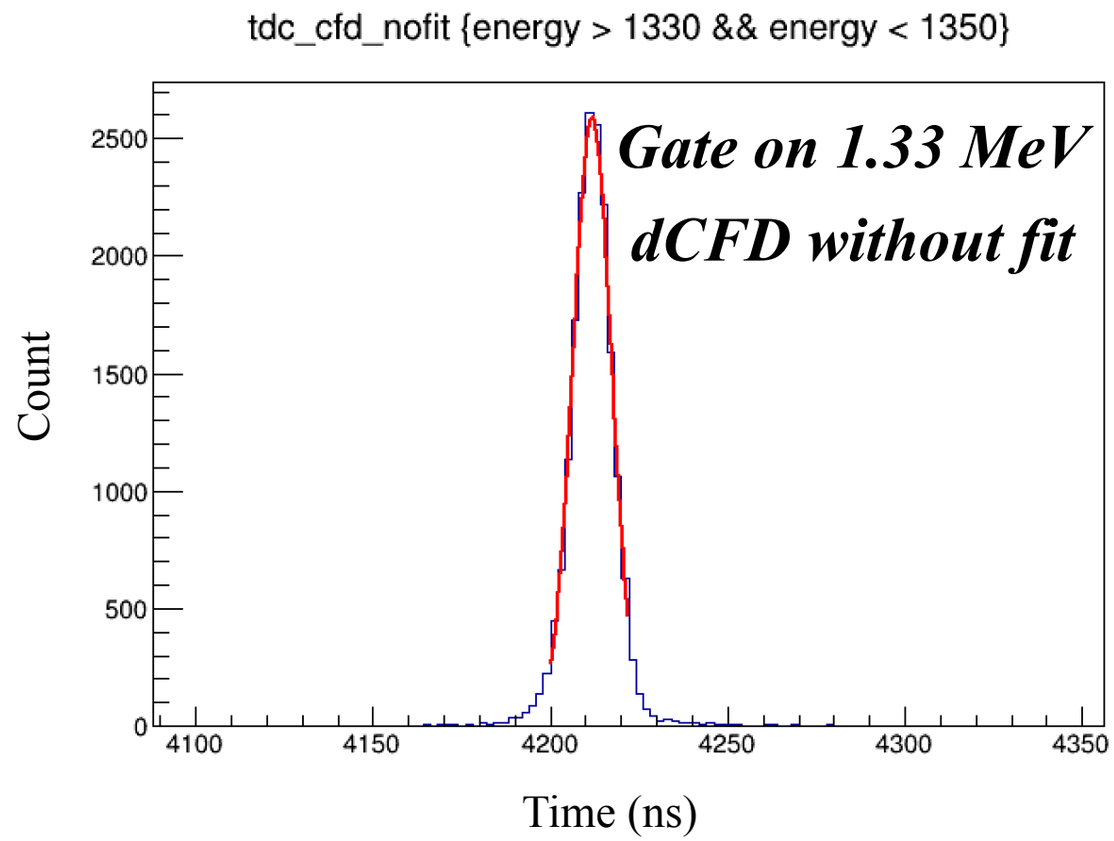
^{60}Co source

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.

Future Plan

- Find out the reason why the curved tail is formed.
- Get the best timing resolution by changing parameters such as the rising time, fraction, or delay.
- Compare with the leading edge method.
- Compare with the analog TFA-CFD result… but there is no way to have such an experiment.
- Finally build a GUI online monitoring, decoder and analysis tool for NFADC500… in the future…?