

# Development of Digital CFD Method for NFADC500

18th. Apr. 2017

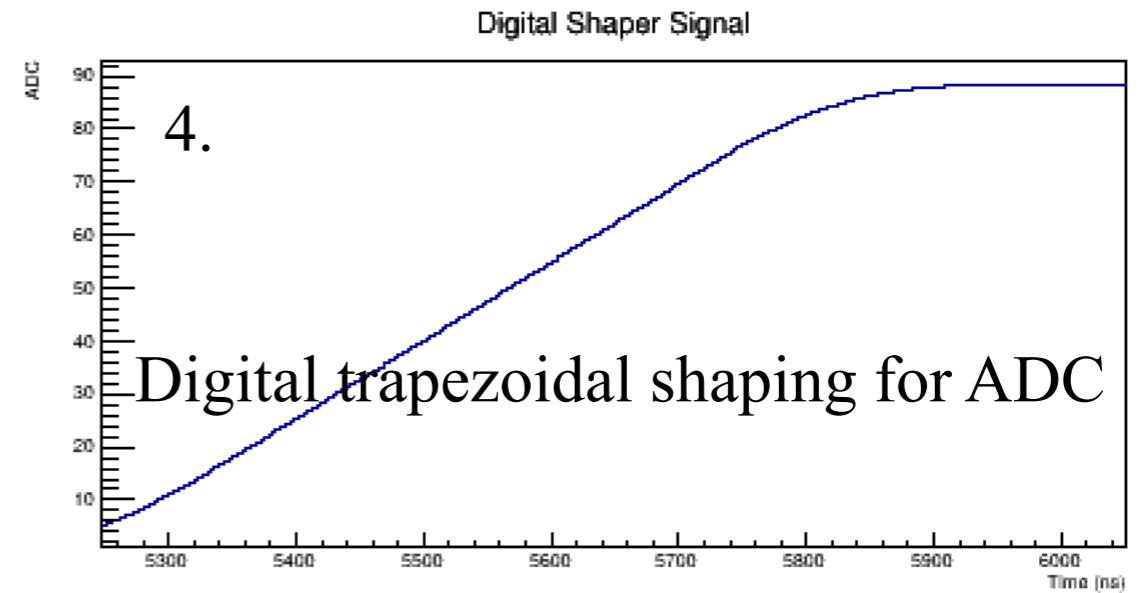
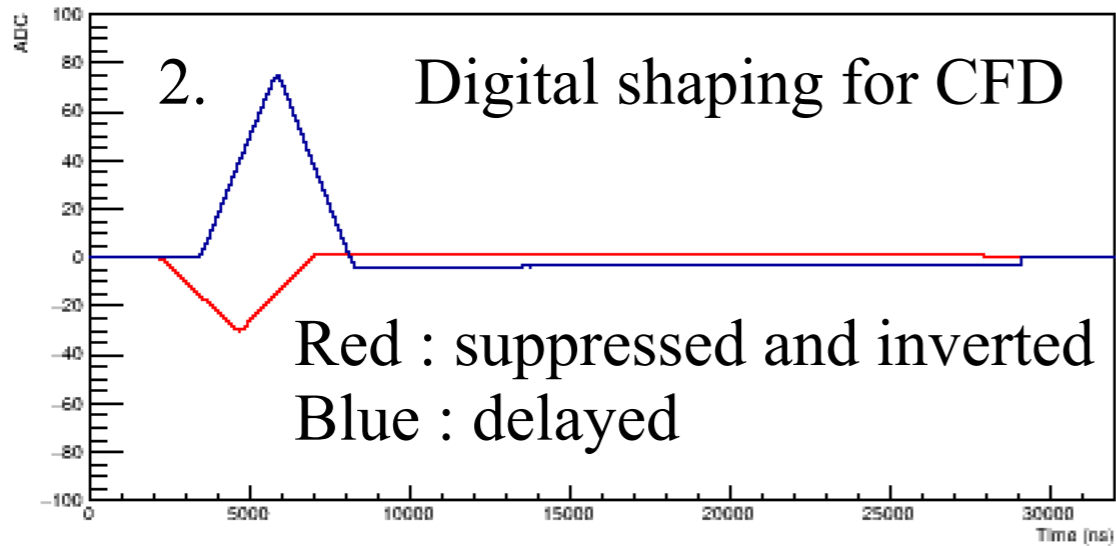
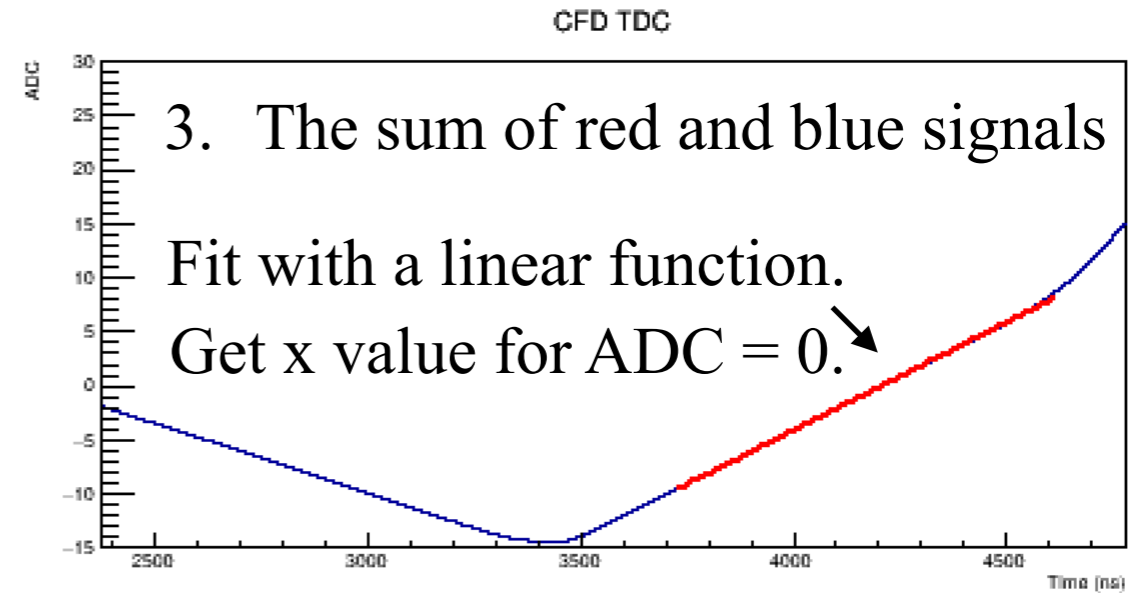
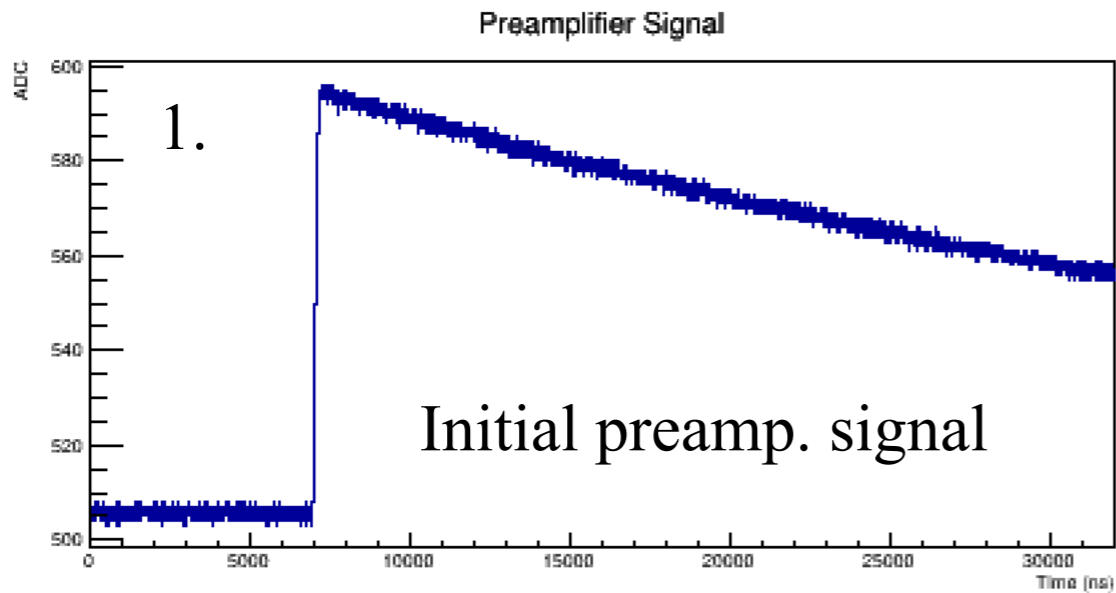
Byul Moon

# 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.

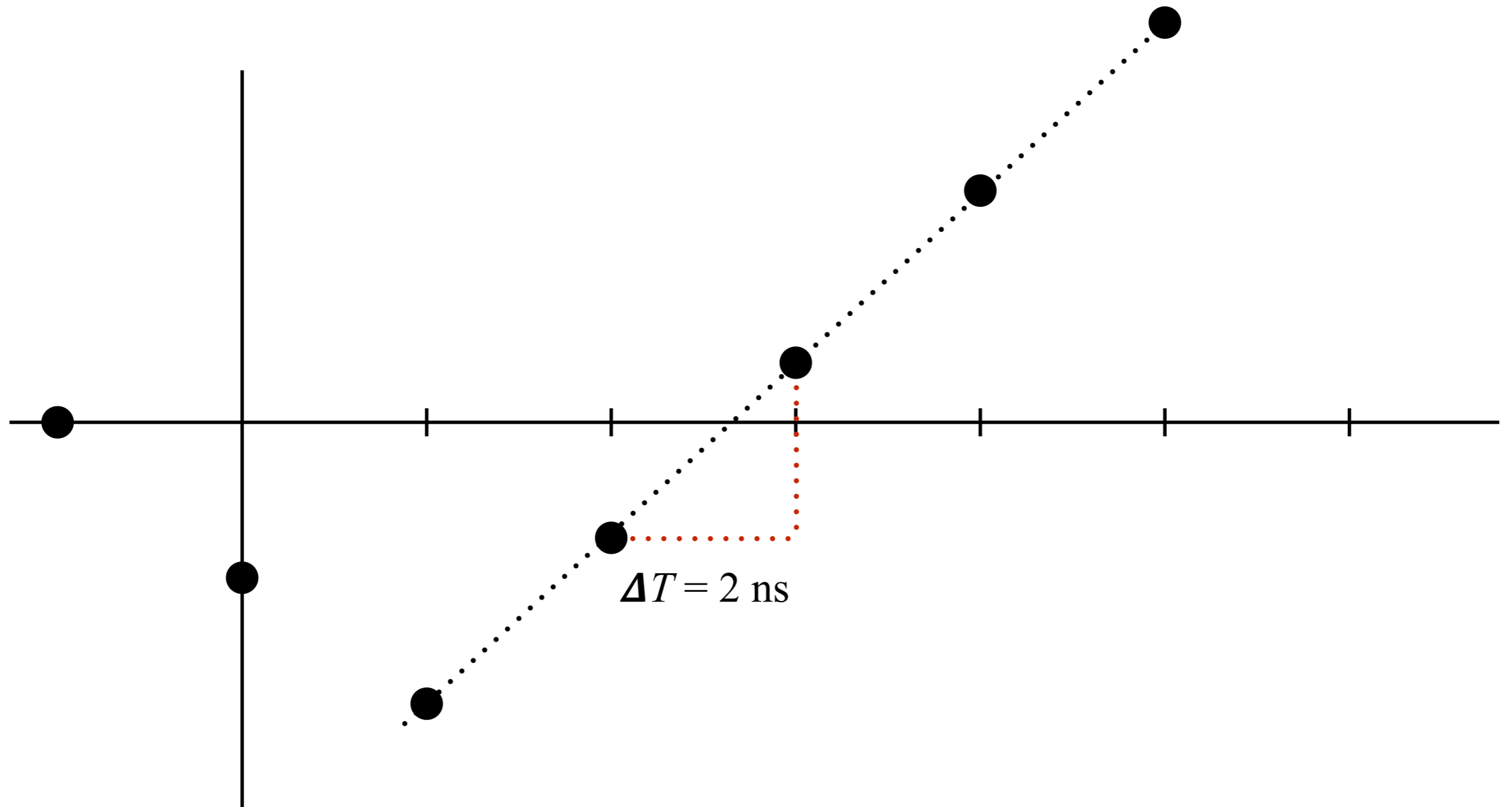
# dCFD for FADC

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



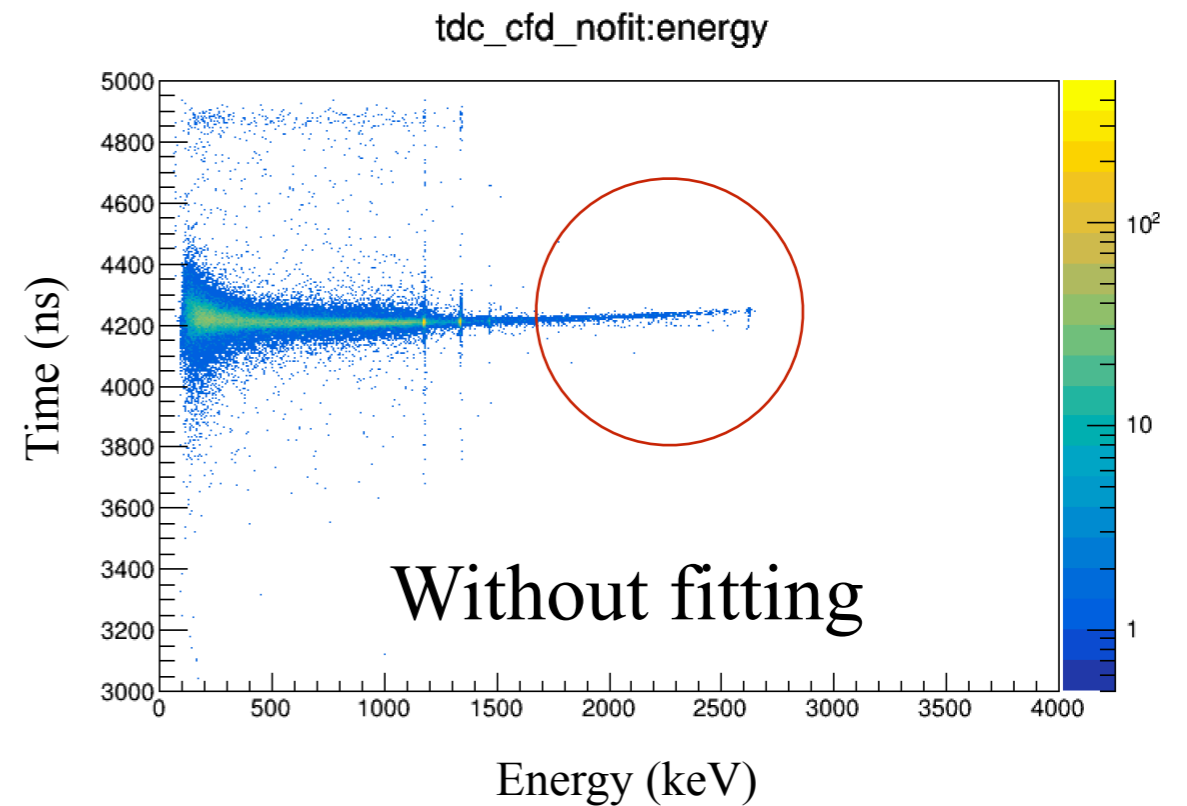
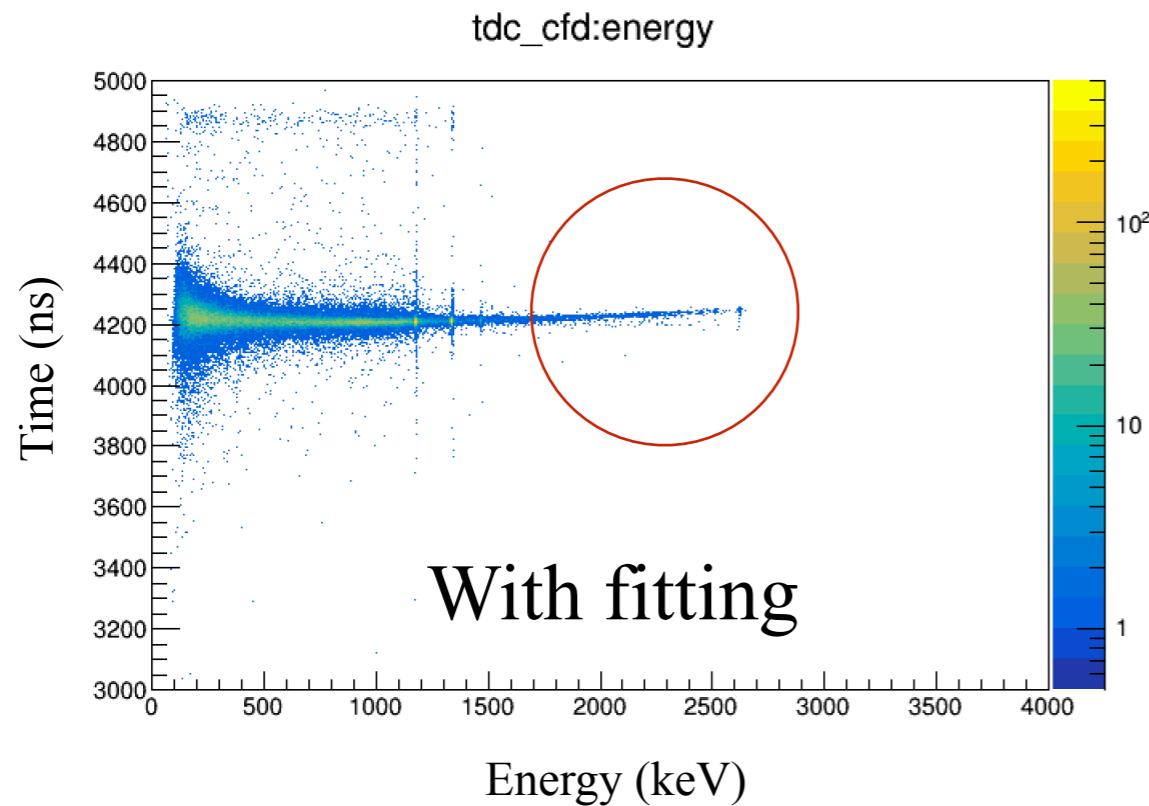
But it takes too much time to deduce TDCs!!

# dCFD for FADC



Able to deduce a TDC without fitting!!

# dCFD for FADC



$^{60}\text{Co}$  source

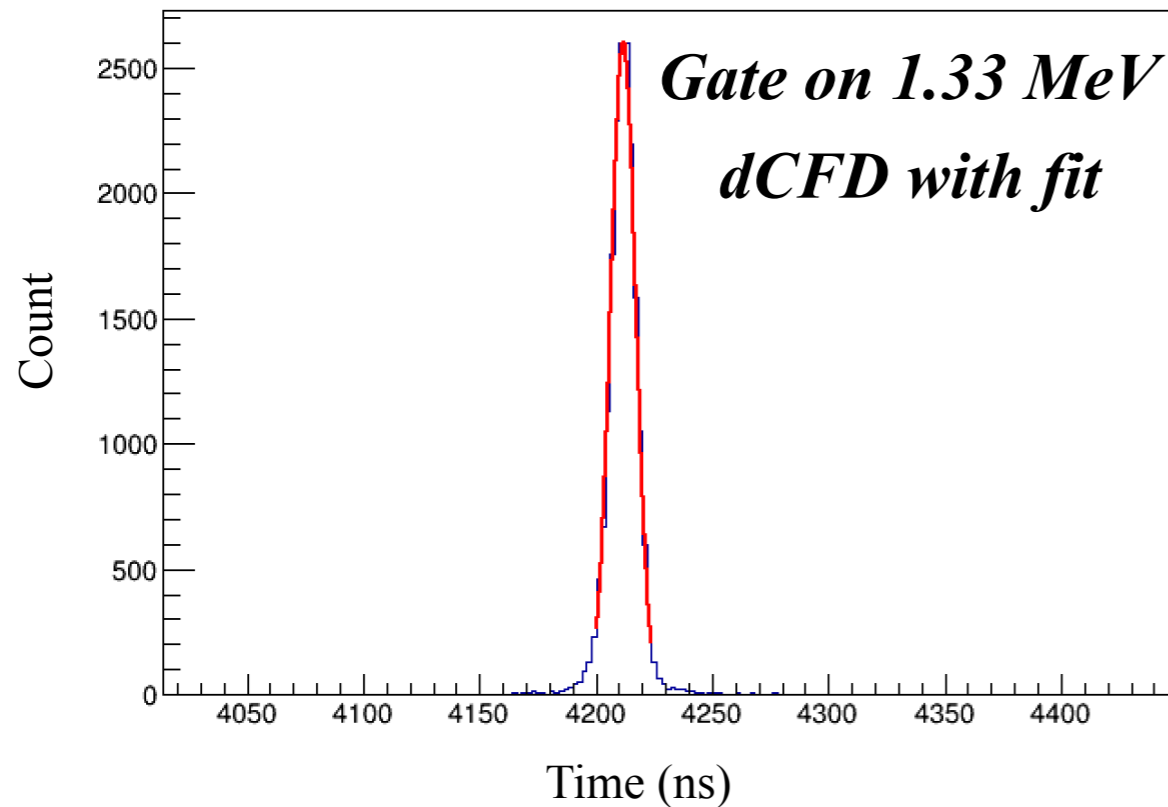
It seems pretty nice...

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.

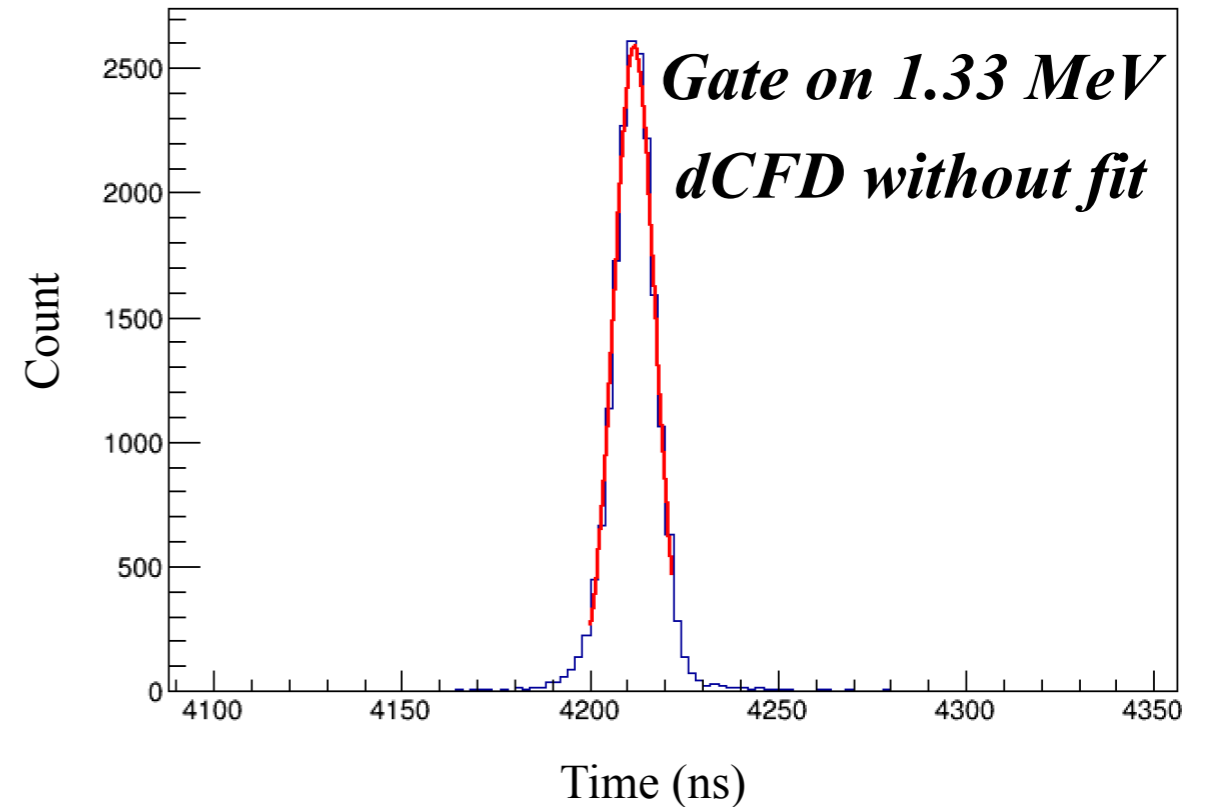
# dCFD for FADC

tdc\_cfd {energy > 1330 && energy < 1350}



12.81(10) ns at FWHM

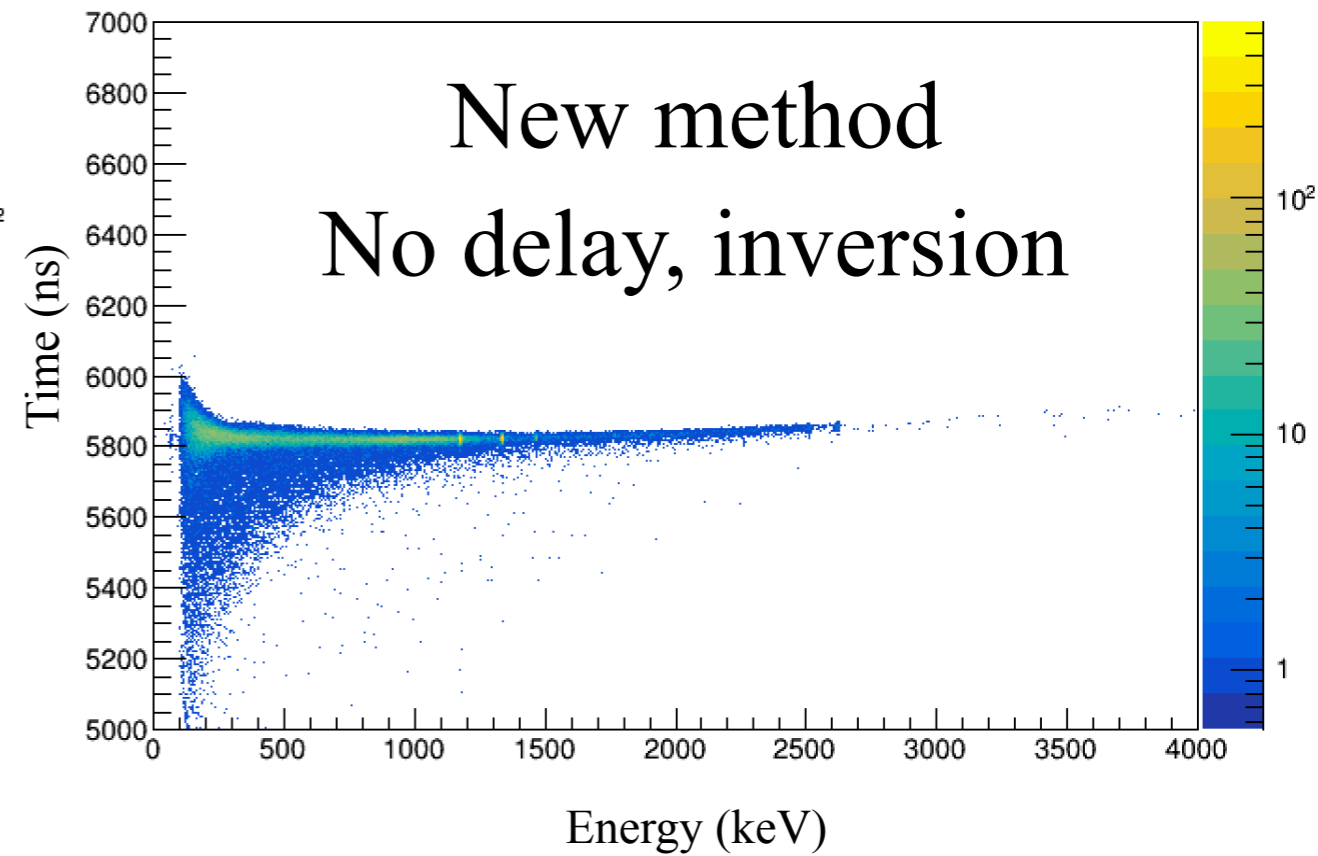
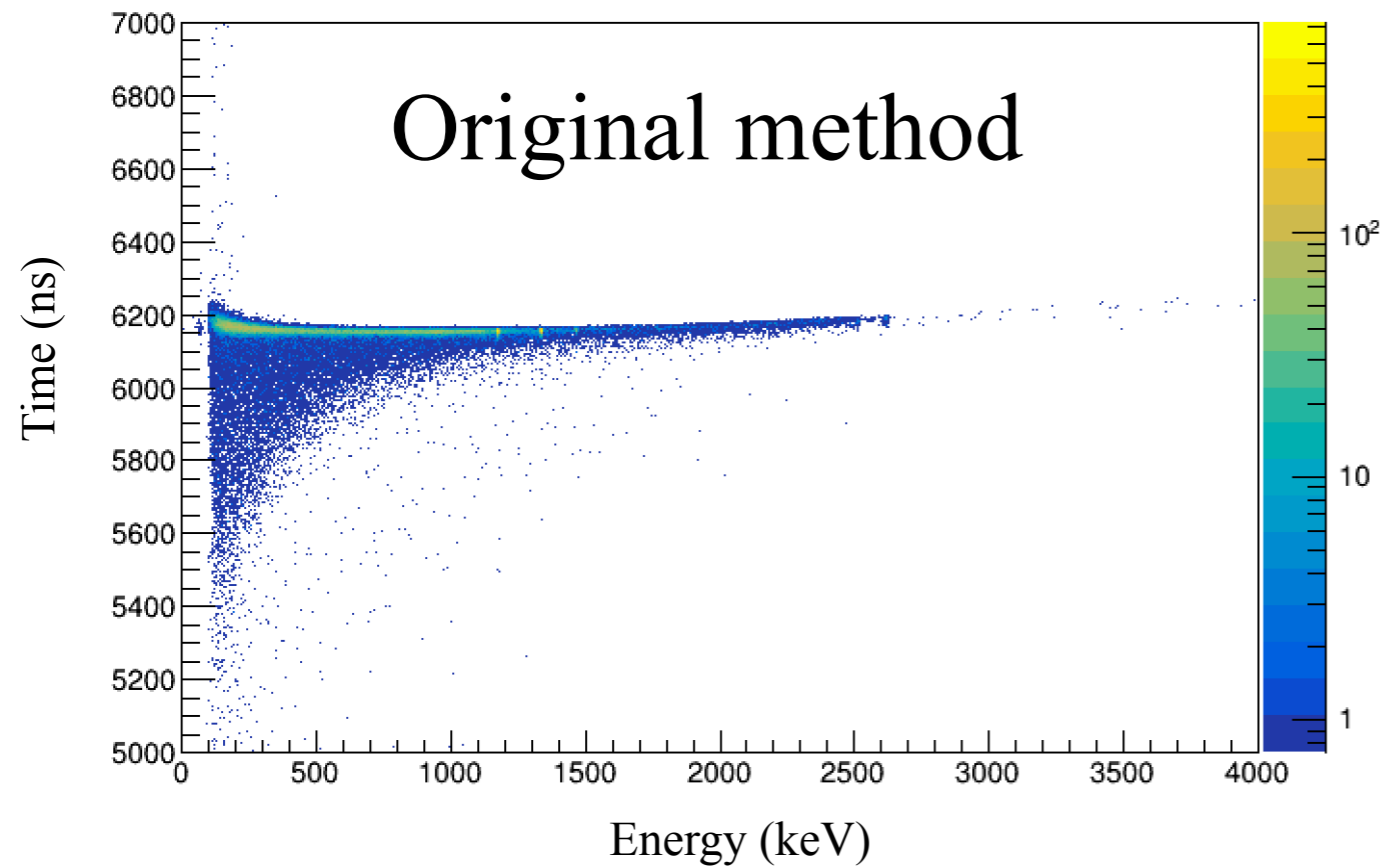
tdc\_cfd\_nofit {energy > 1330 && energy < 1350}



12.86(11) ns at FWHM

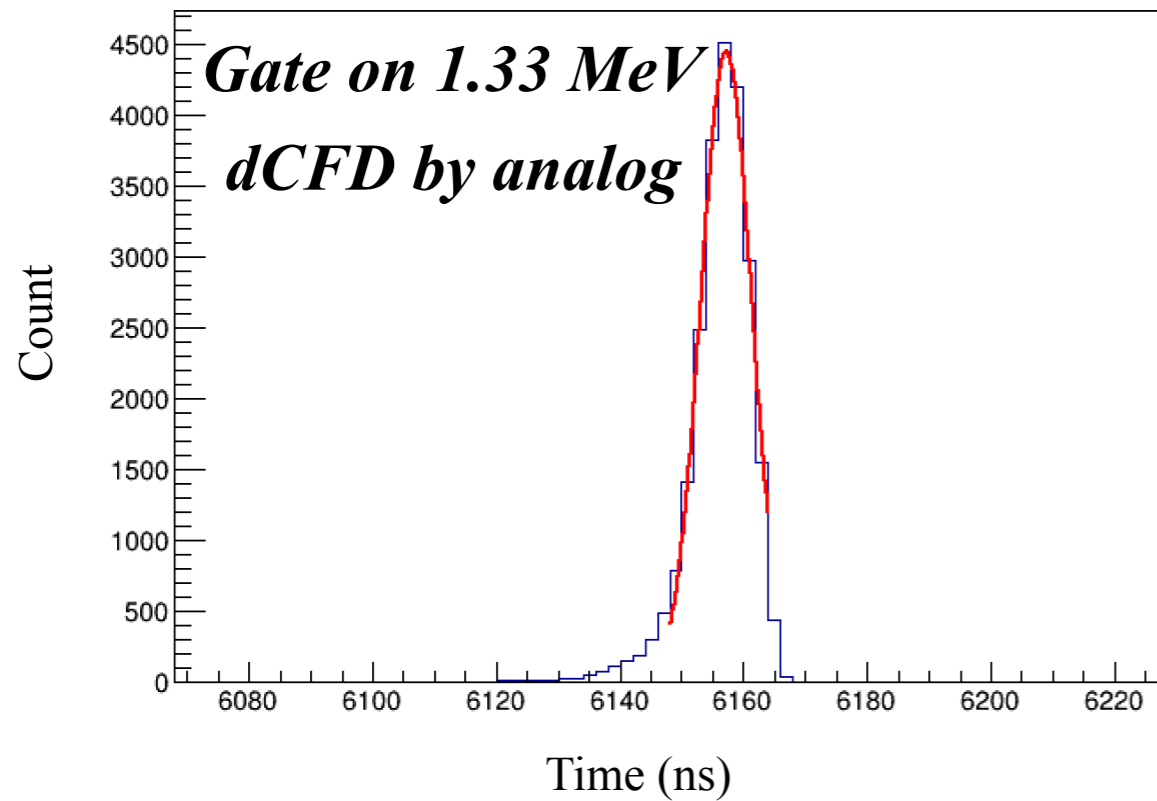
Almost same considering the error range.

# dCFD for FADC

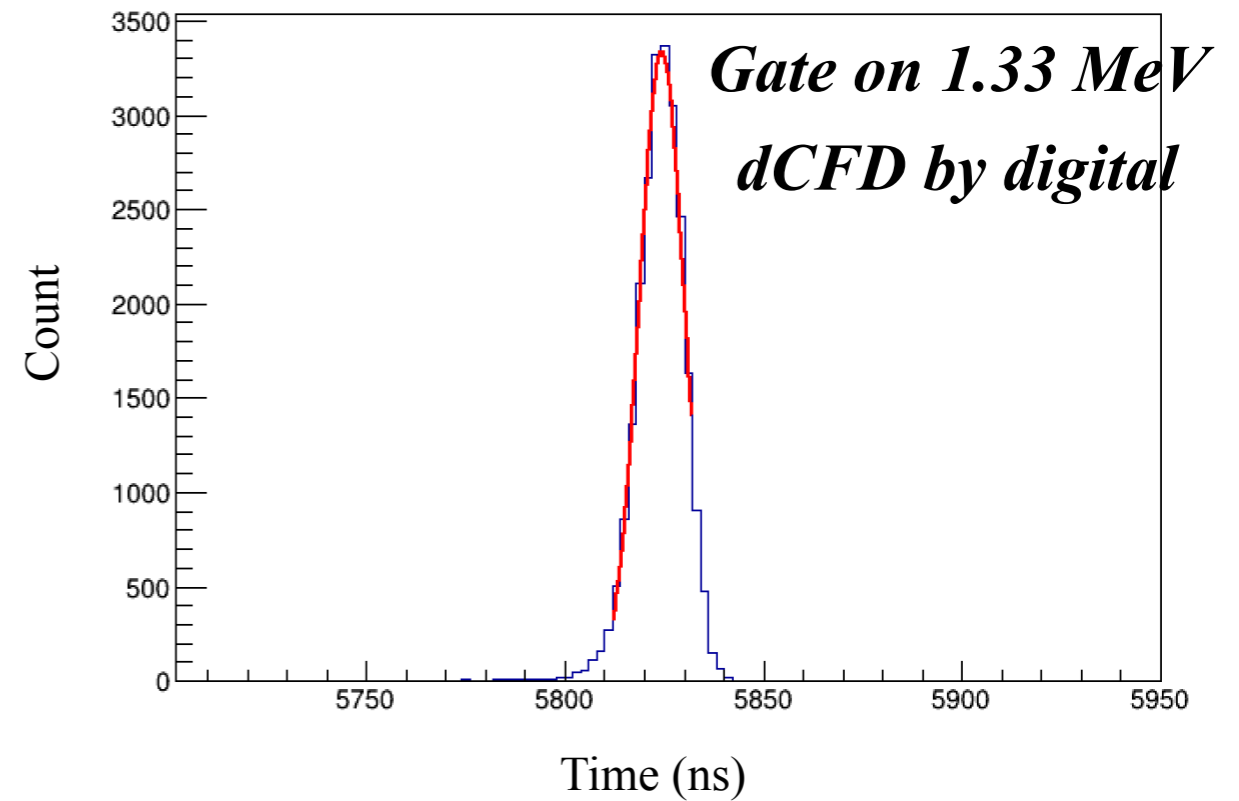


New approach compared to the last work.

# dCFD for FADC



9.73 ns at FWHM

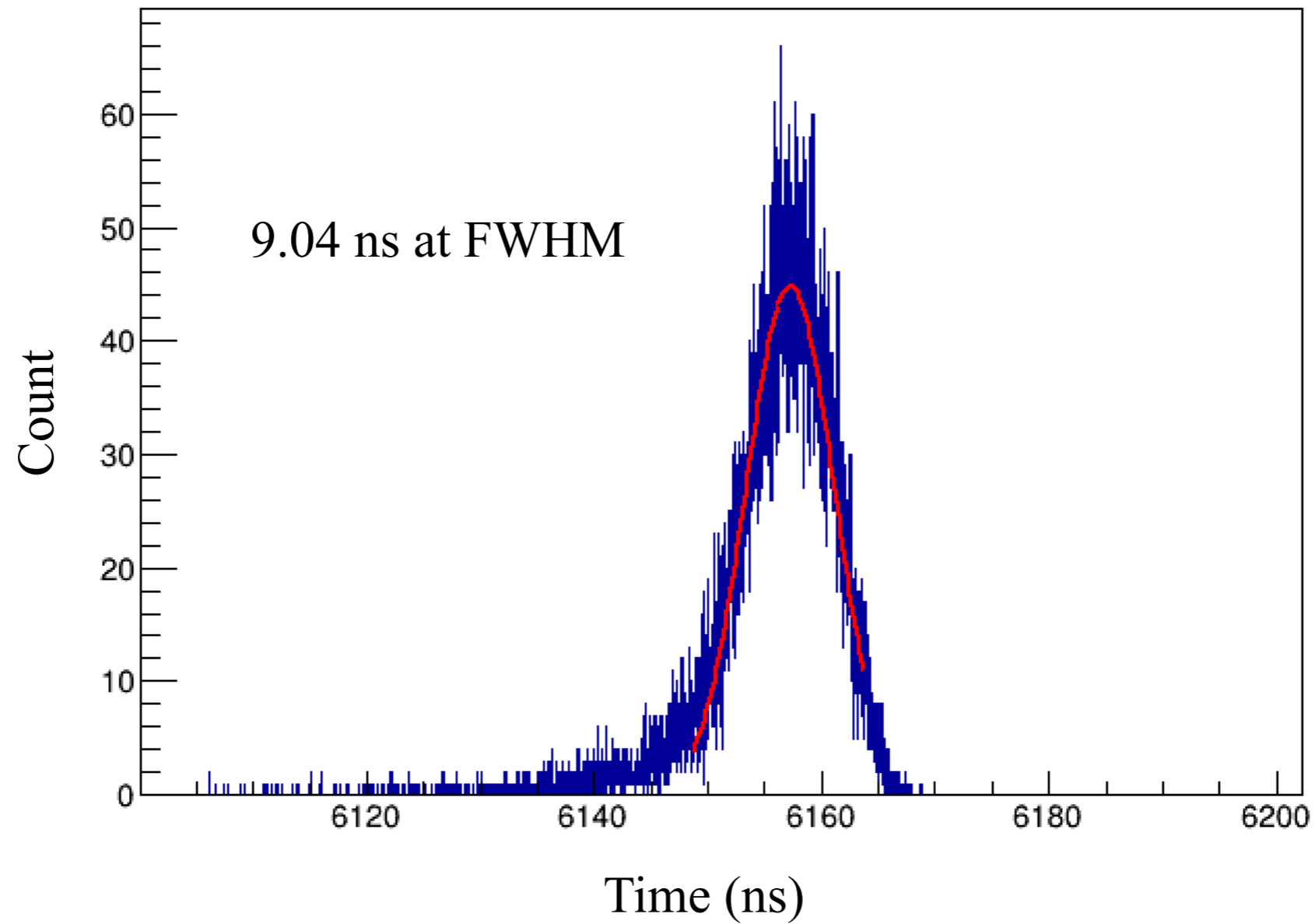


13.40 ns at FWHM

Analog type algorithm is better!!

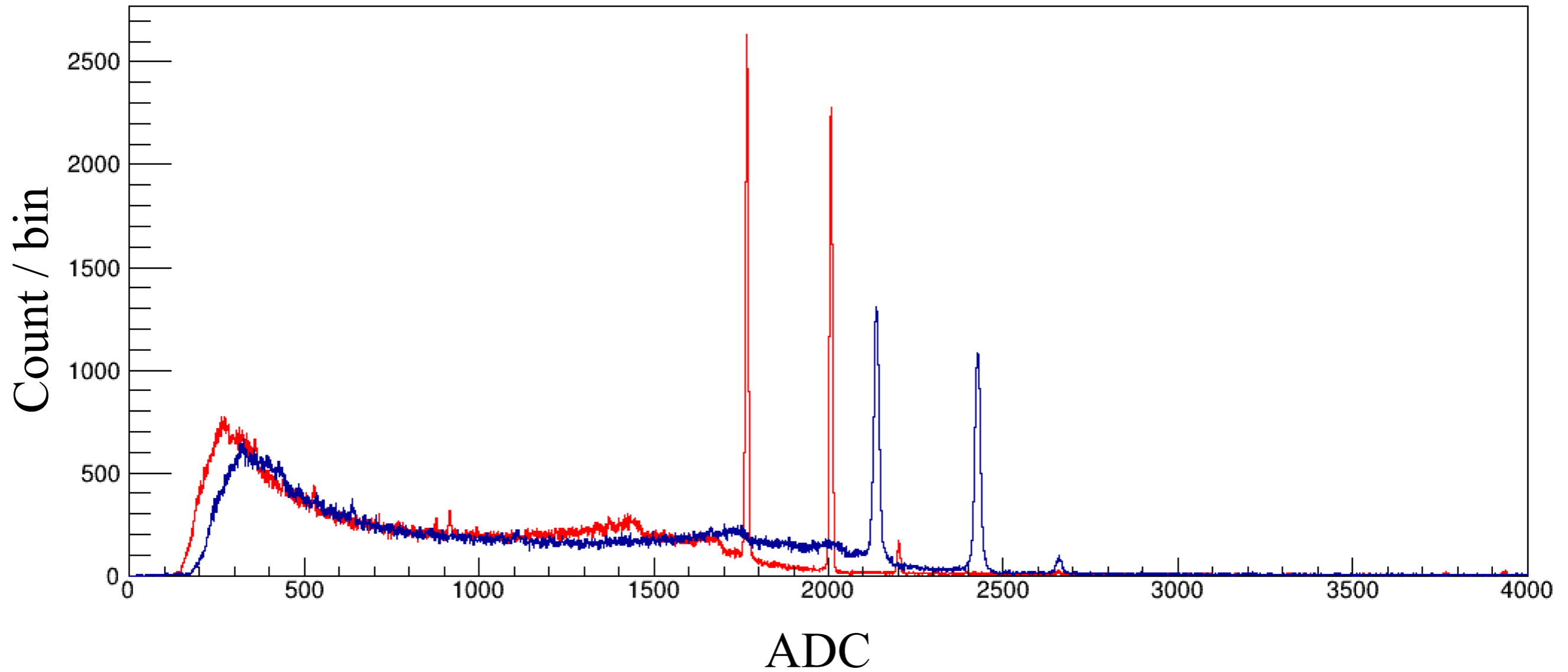


# dCFD for FADC



20 ps per a bin!!

# ADC for FADC



# Building New DAQ

File Help

Setting

NKFADC500 PROTOTYPE

Basic Parameters		Trigger Parameters	
Number of Modules	<input type="text" value="0"/>	Trigger Type	
Pedestal Trigger Interval in ms	<input type="text" value="0"/>	Trigger Delay	<input type="text" value="0"/>
Recording Length	<input type="text" value="0"/>	Trigger Coincidence Width	<input type="text" value="0"/>
Number of Events	<input type="text" value="0"/>	Coincidence Width	<input type="text" value="0"/>
ADC Parameters		ADC Threshold	<input type="text" value="0"/>
Pulse Polarity	<input type="text" value="0"/>	TDC Threshold	<input type="text" value="0"/>
ADC Offset	<input type="text" value="0"/>	Pulse Count Threshold	<input type="text" value="0"/>
ADC Delay	<input type="text" value="0"/>	Pulse Count Interval	<input type="text" value="0"/>
ADC Mode	<input type="text" value="0"/>	Pulse Width Threshold	<input type="text" value="0"/>
SET		Trigger Deadtime	<input type="text" value="0"/>
RUN		Zero Suppression	<input type="text" value="0"/>
STOP		Pulse Count Trigger	<input type="text" value="0"/>
		Pulse Width Trigger	<input type="text" value="0"/>
		Peak Sum Trigger	<input type="text" value="0"/>
		Peak Sum OR Trigger	<input type="text" value="0"/>