ToF12 Progress Report

ToF12 Technical Working Group Meeting

Jefferson Lab, Newport News, VA

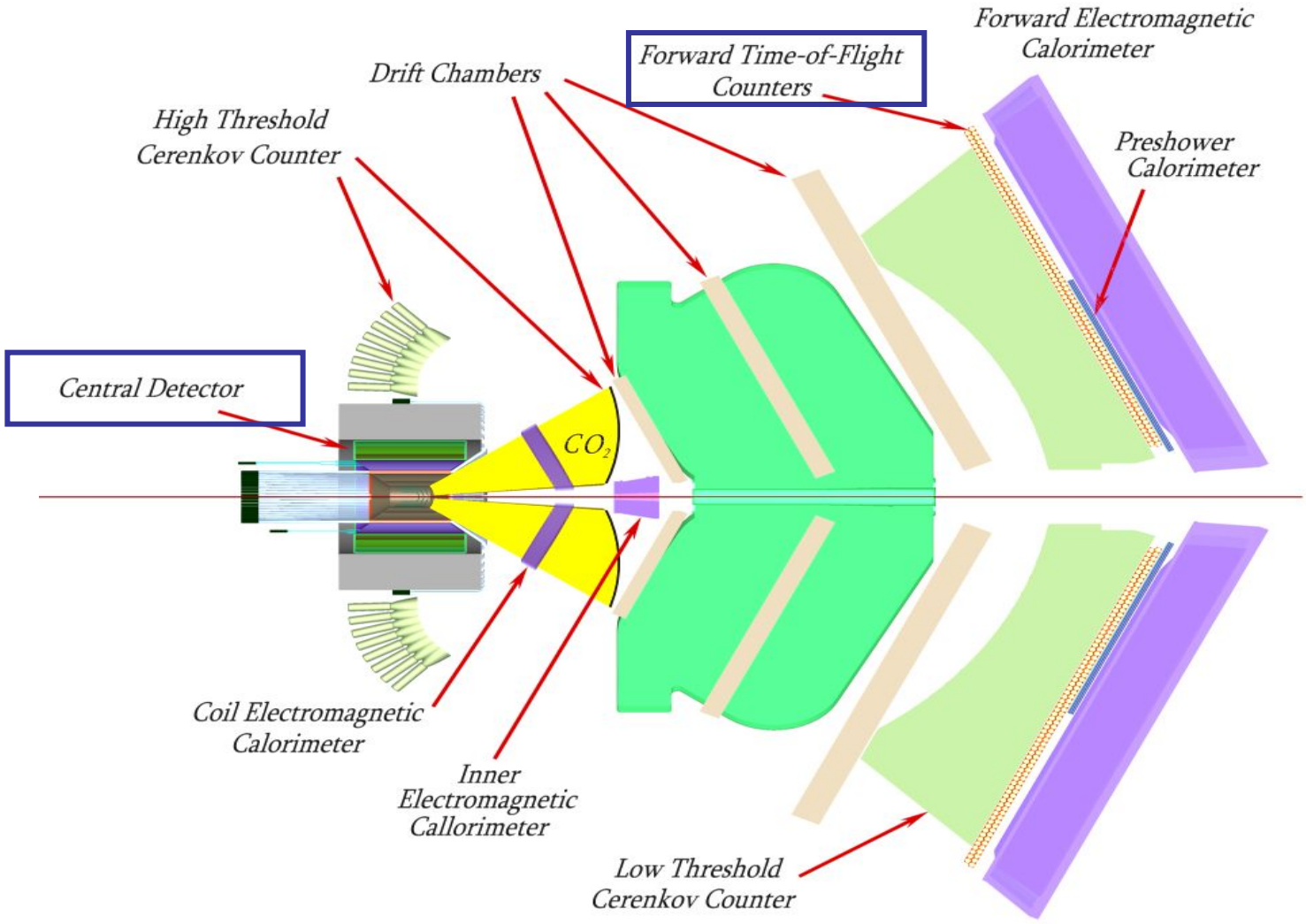
Ralf W. Gothe

University of South Carolina

Test Results, Ongoing Work, Still To-Do, and More …

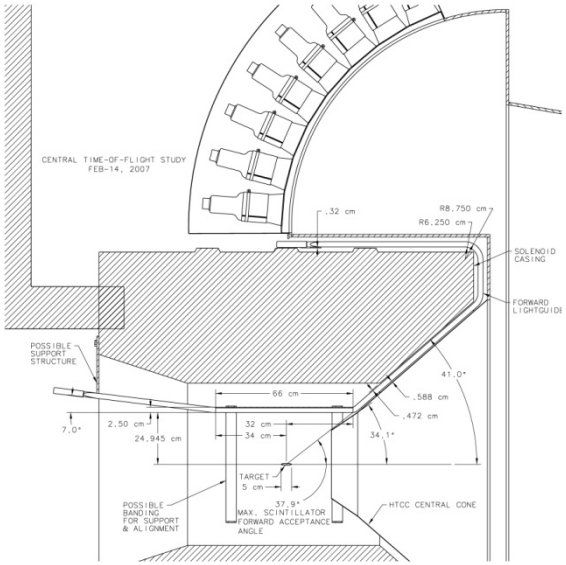
Central and Forward Time-of-Flight Upgrade

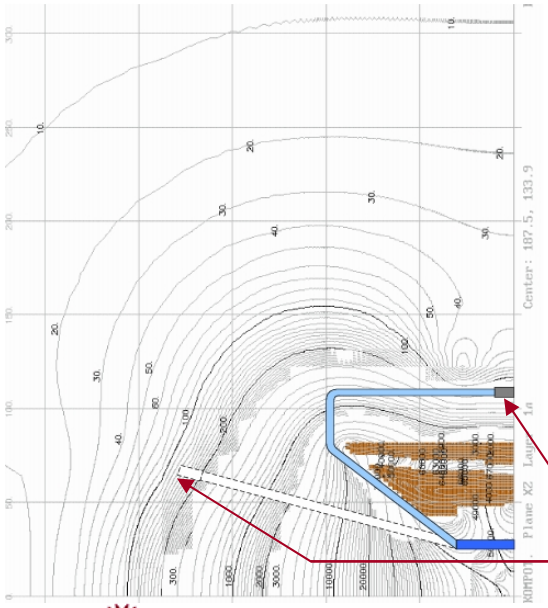
JLab Designer



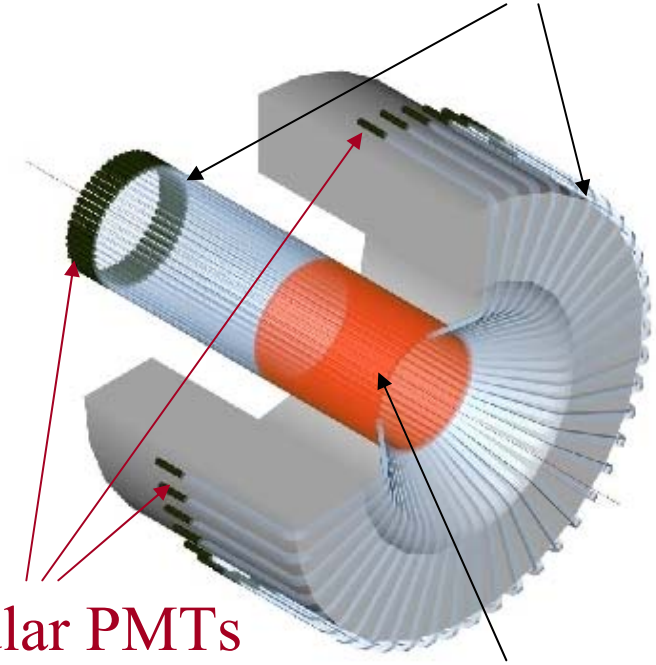
Central Time-of-Flight Upgrade

KNU Nuclear Physics Group





1 to 2.5 m long light guides



Regular PMTs

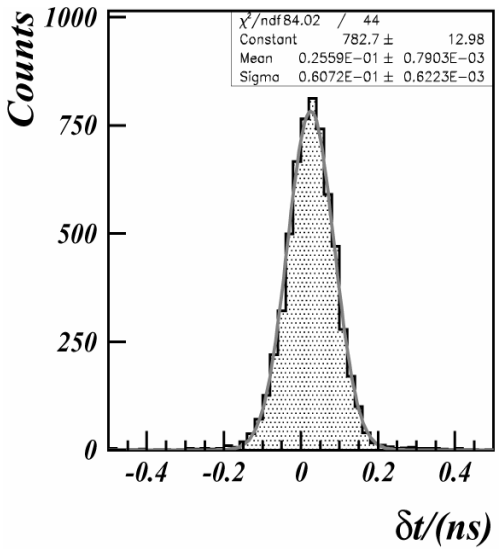
Central scintillator barrel

R2083 PMTs are in 200 to 300 Gauss B-fields

R2083 Timing Resolution Results

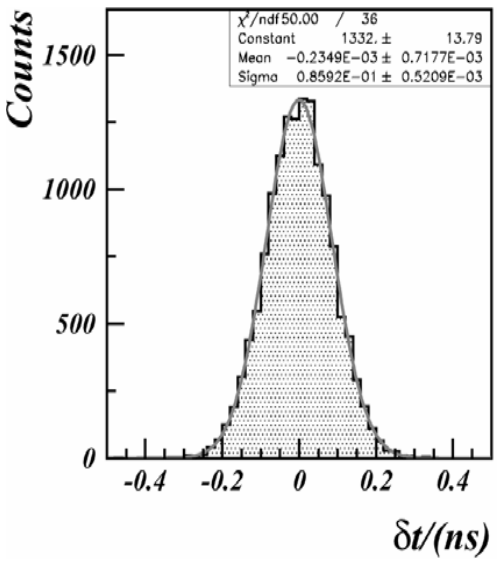
KNU Nuclear Physics Group

No light guides

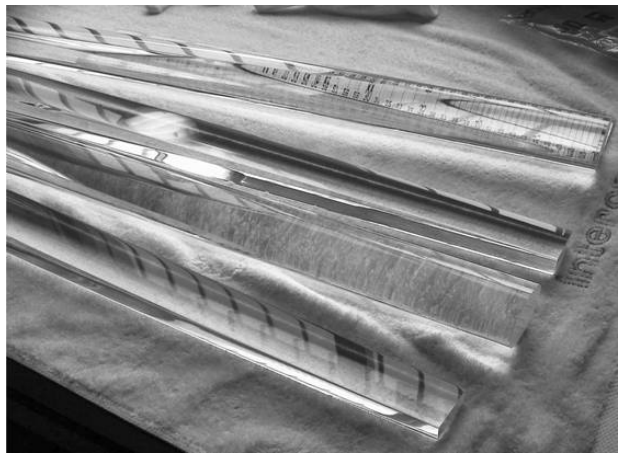


σ = 52.0 ± 0.6 ps

1m light guides



σ = 83.6 ± 0.6 ps

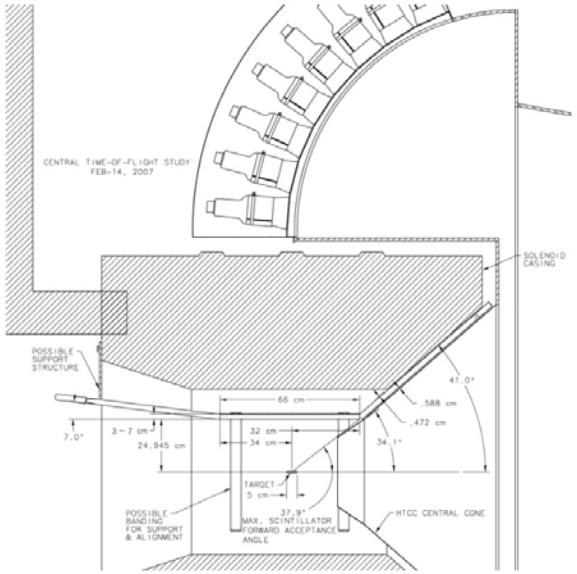


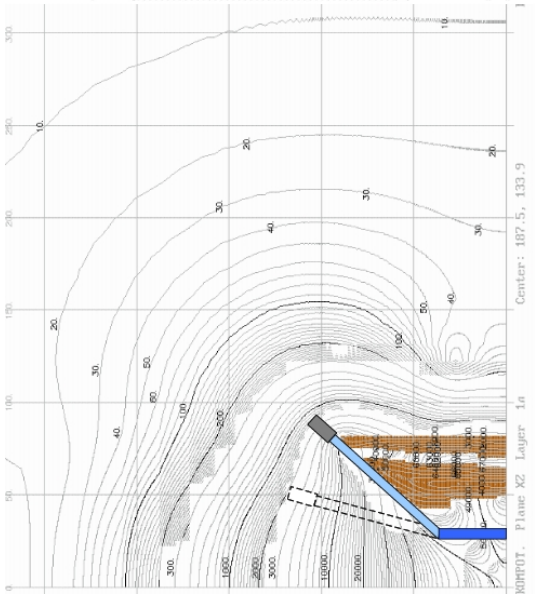
1m light guides

1 m long single bent and 2.5 m long triple bent light guides will never reach σ = 50 ps requirements

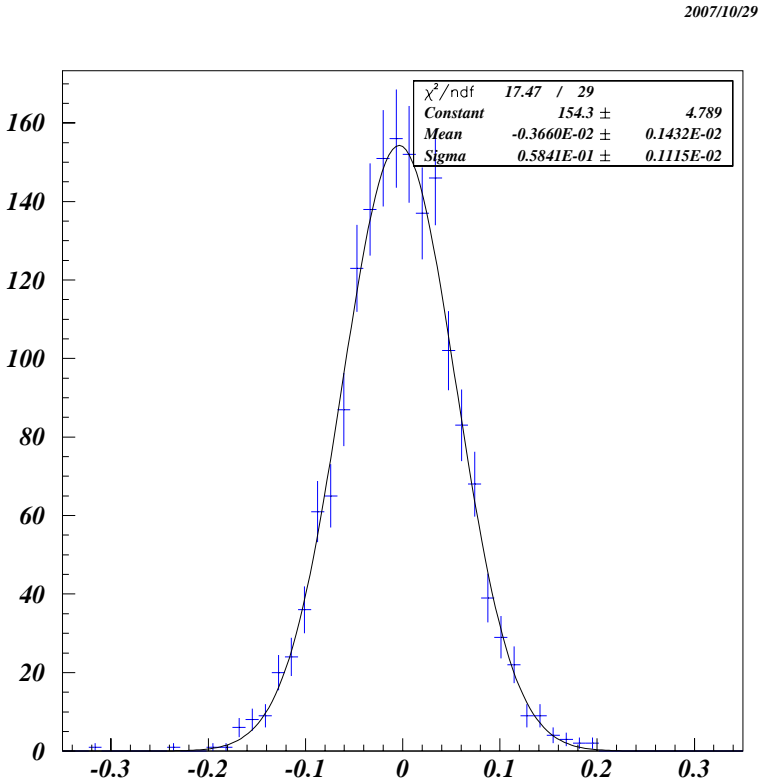
R7761-70 Timing Resolution Results

KNU Nuclear Physics Group





- Shorter 50 to 80 cm ling single bent lights
- Fine mesh PMTs are in 0.3 to 1 T B-fields

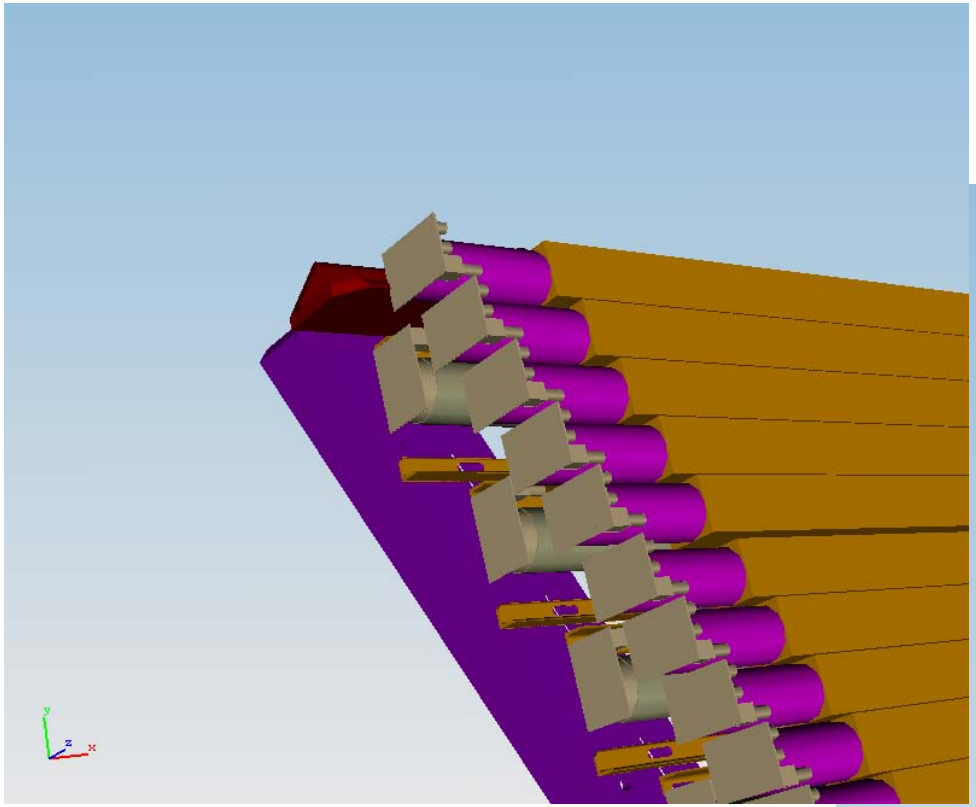


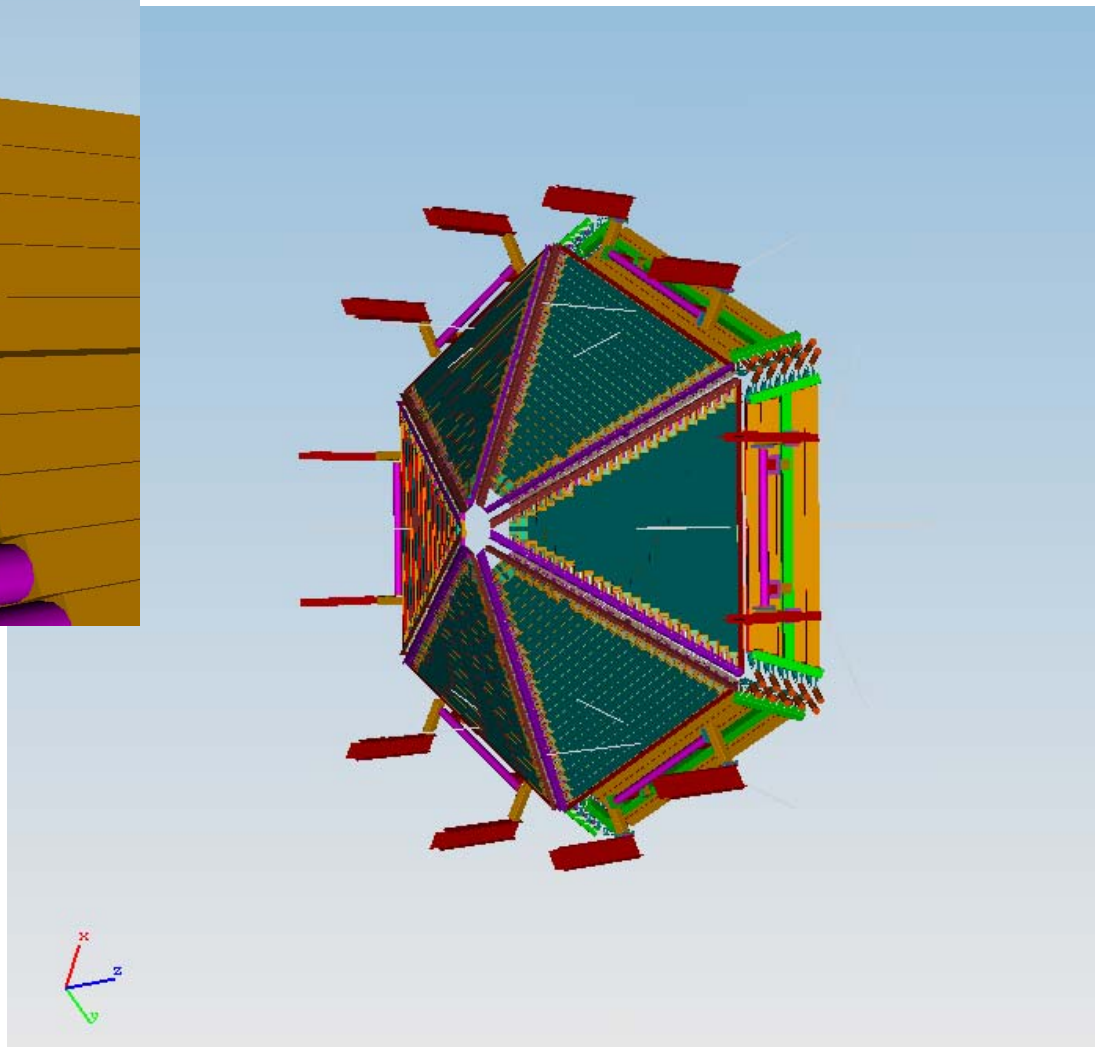
No magnetic field
No light guides

$\sigma = 58.4 \pm 0.6$ ps

Forward Time-of-Flight Upgrade

JLab Designer

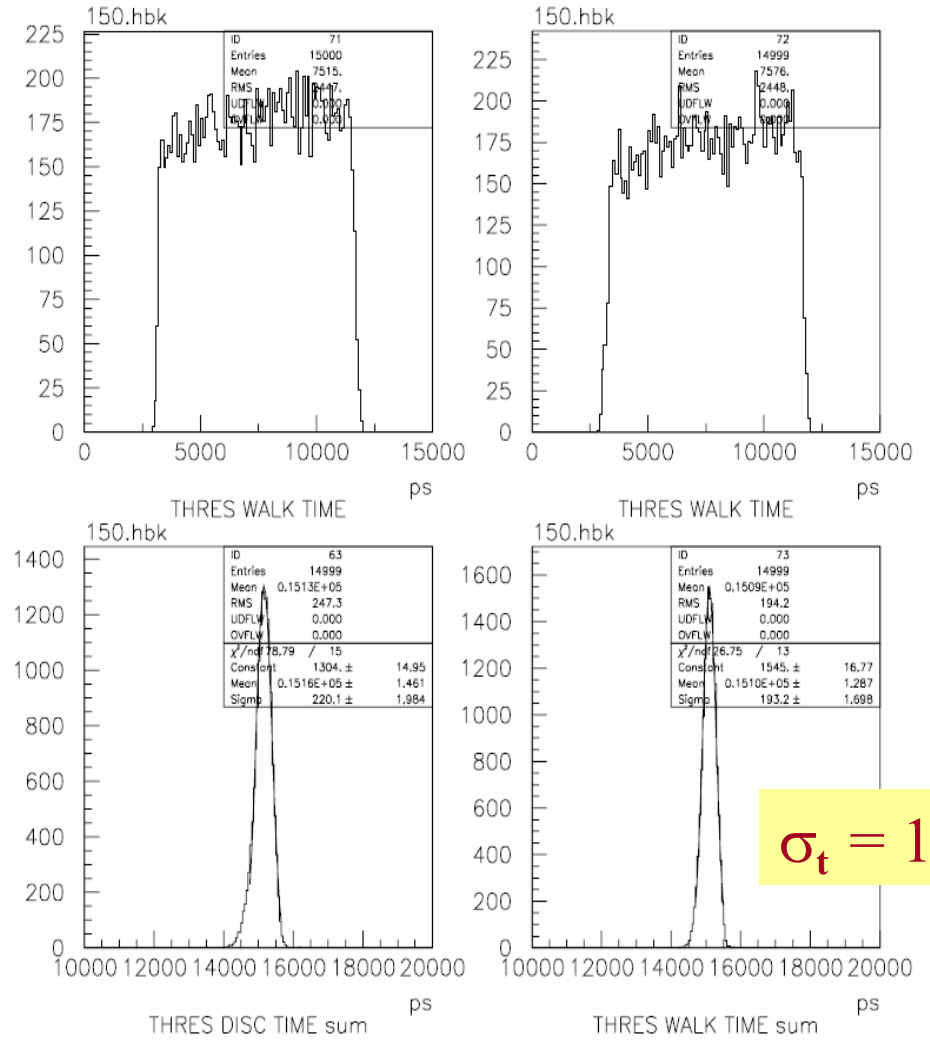




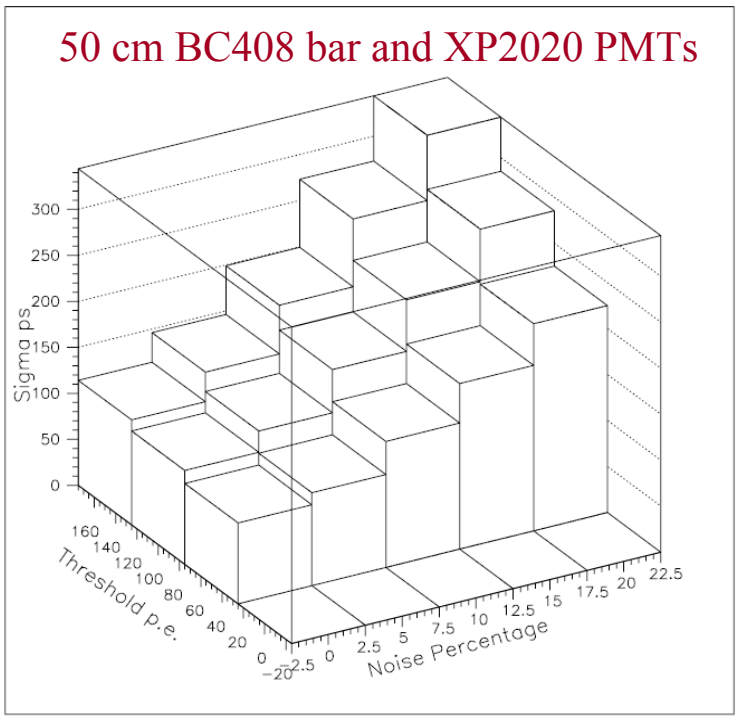
Simulation of the Time Resolution

Gordon Mutchler

150 cm BC408 bar and XP2020 PMTs



50 cm BC408 bar and XP2020 PMTs

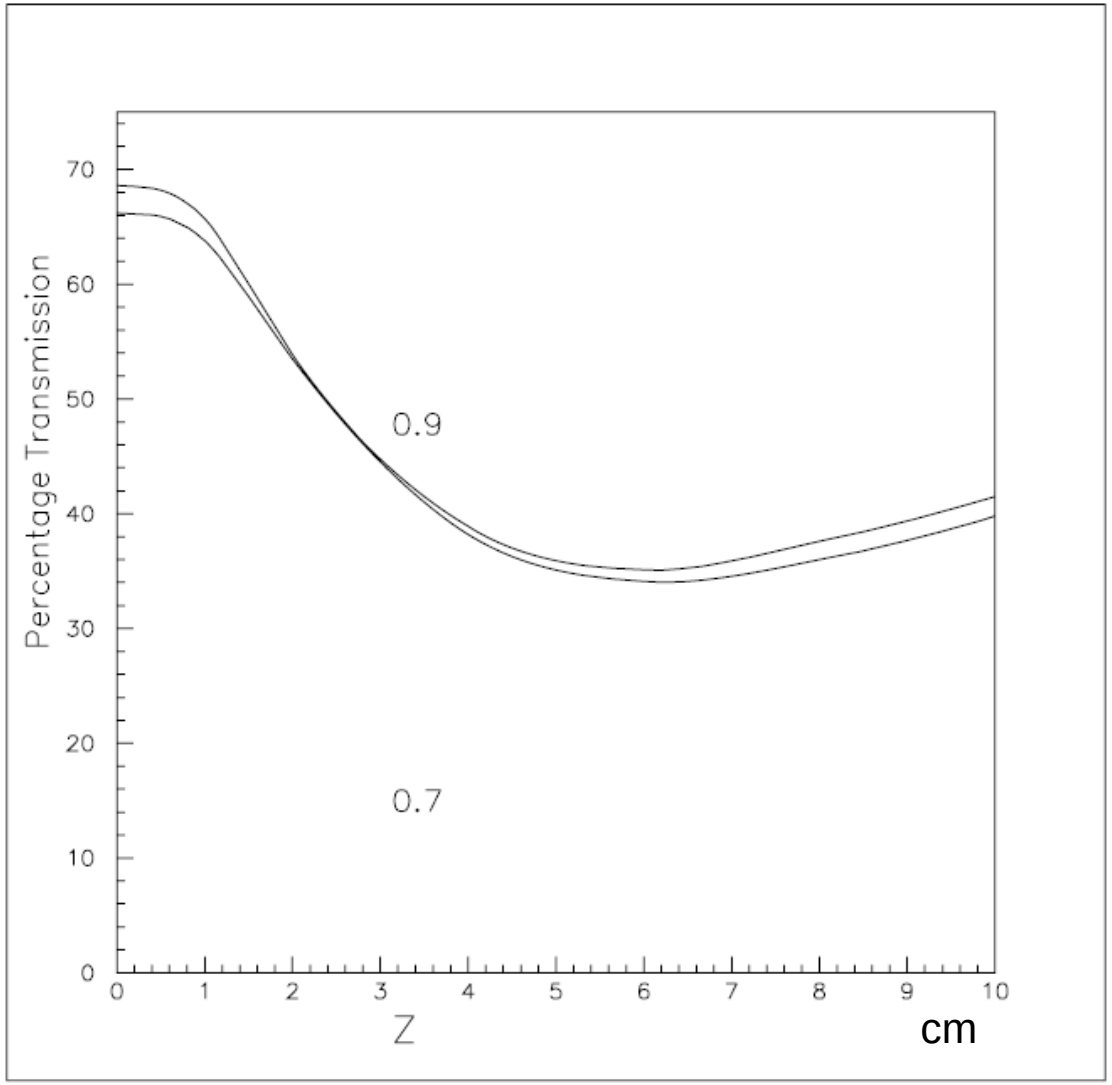


σ_t = 193 ps

Threshold at 50 photo-electrons and 10% noise

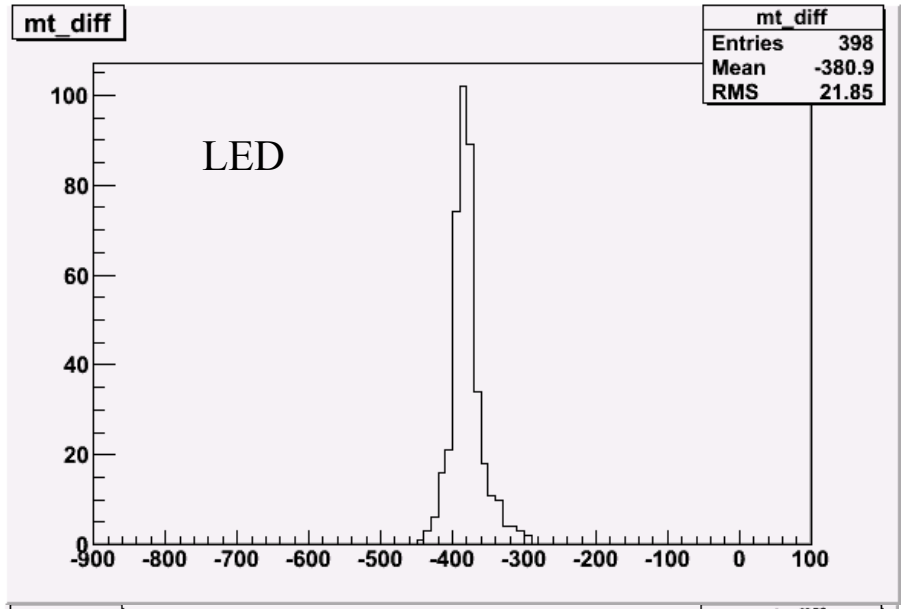
Simulation of Various Light Guides

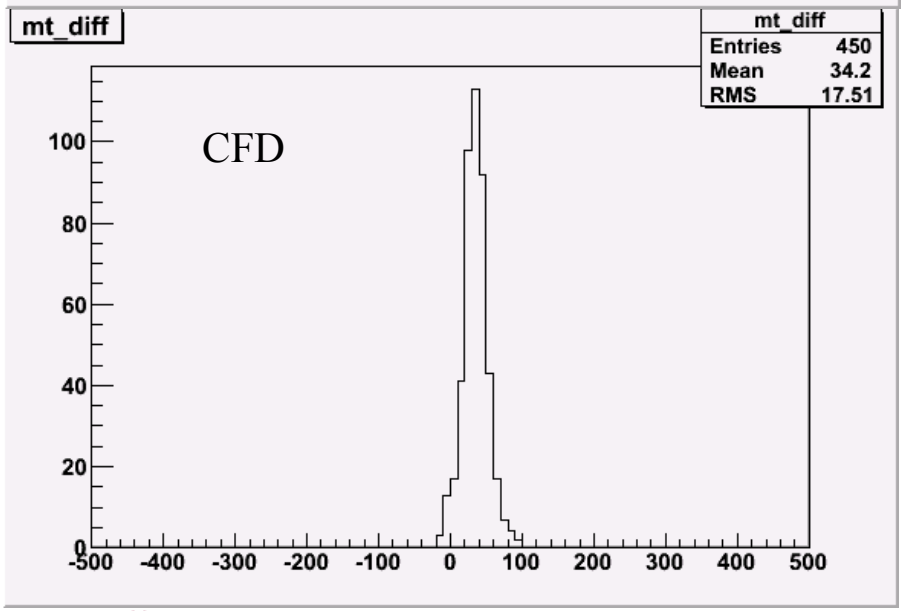
Gordon Mutchler



The plot shows ratio of the light that has entered the light guide to the amount that enters the glass envelope of the photomultiplier tube in dependence of the light guide length for two different reflectivities of the wrapping material.

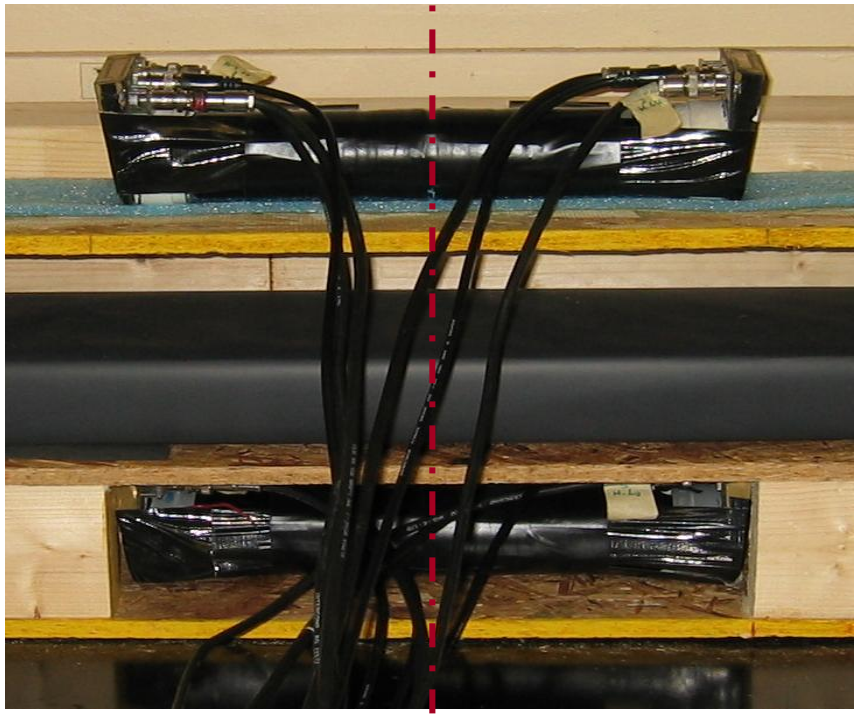
Time Resolution Difference Method





Haiyun Lu

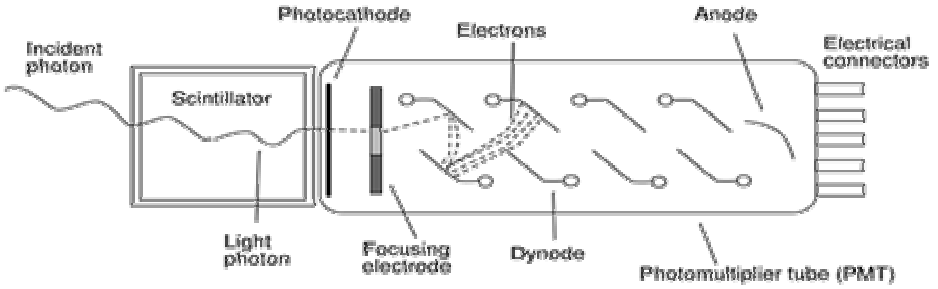
Cosmic Rays



$\sigma_t = 340$ ps

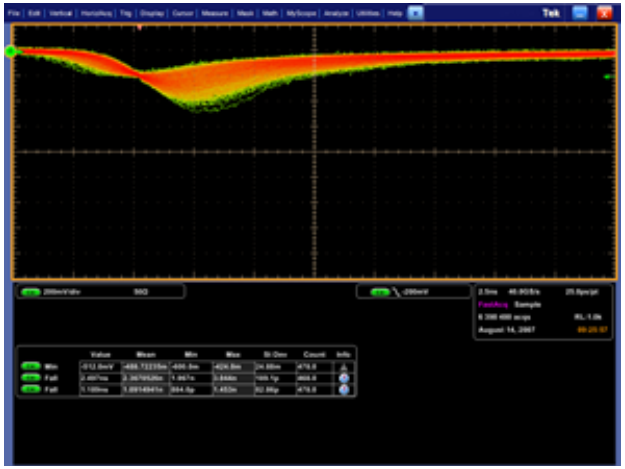
PMT and Mu-Metal Test Results

Dominik Gothe

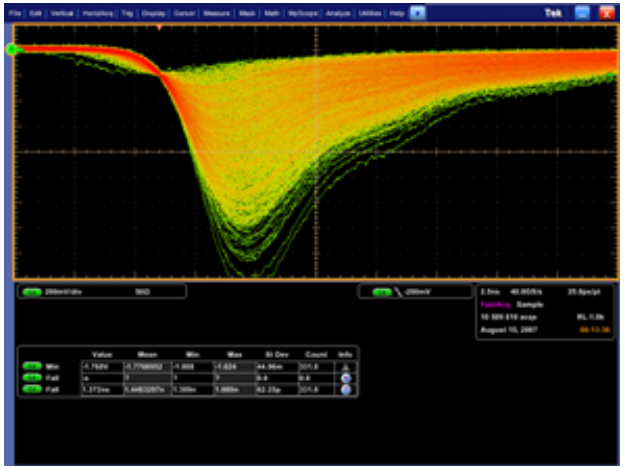


10 G axail B-field

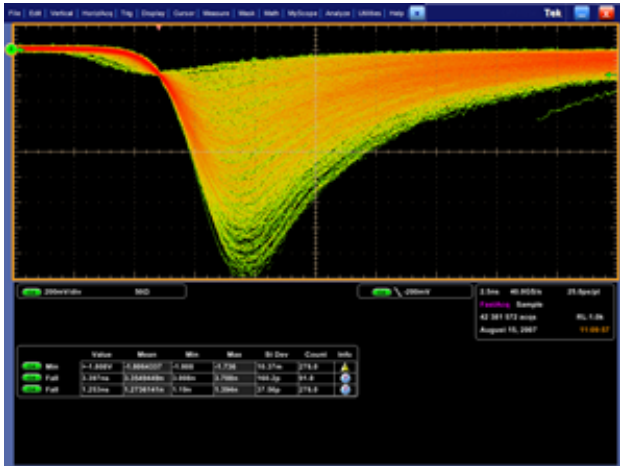
No shielding



1mm Mu-cylinder



1mm Mu-cylinder with cap

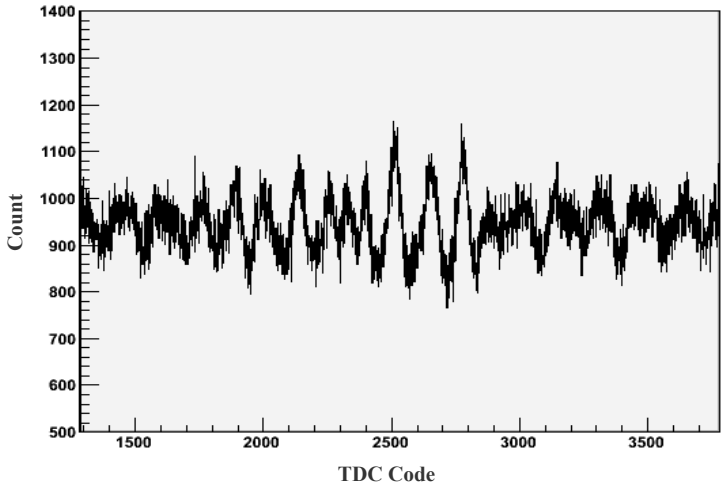


TDC Nonlinearity Tests

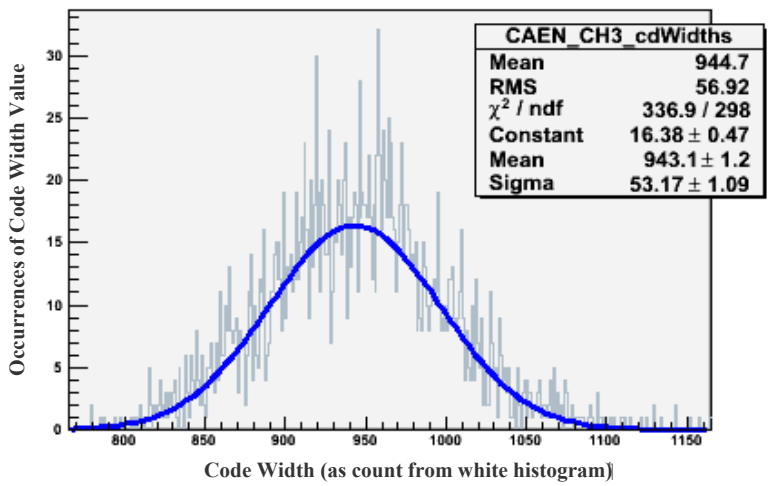
Single Channel Example

Evan Phelps

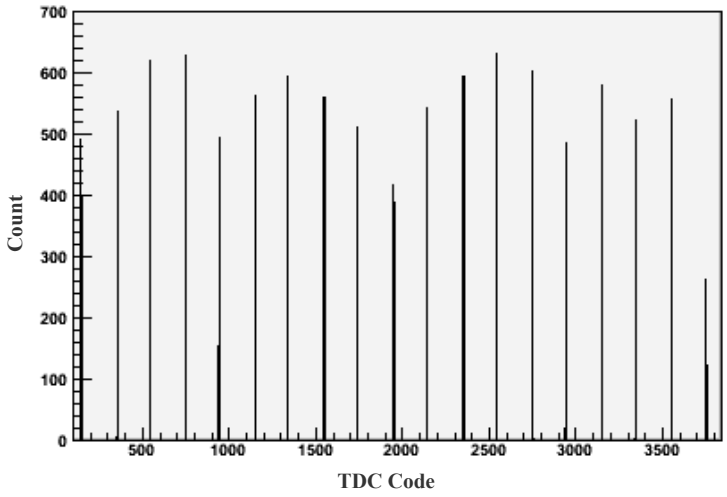
Caen-414 Ch3 White Histogram



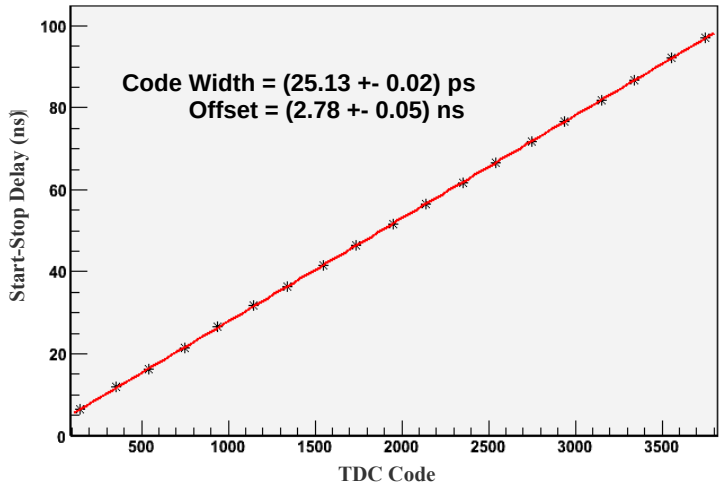
Caen-414 Ch3 Code Width Distribution



Caen-414 Ch3 Timed Cable Delays

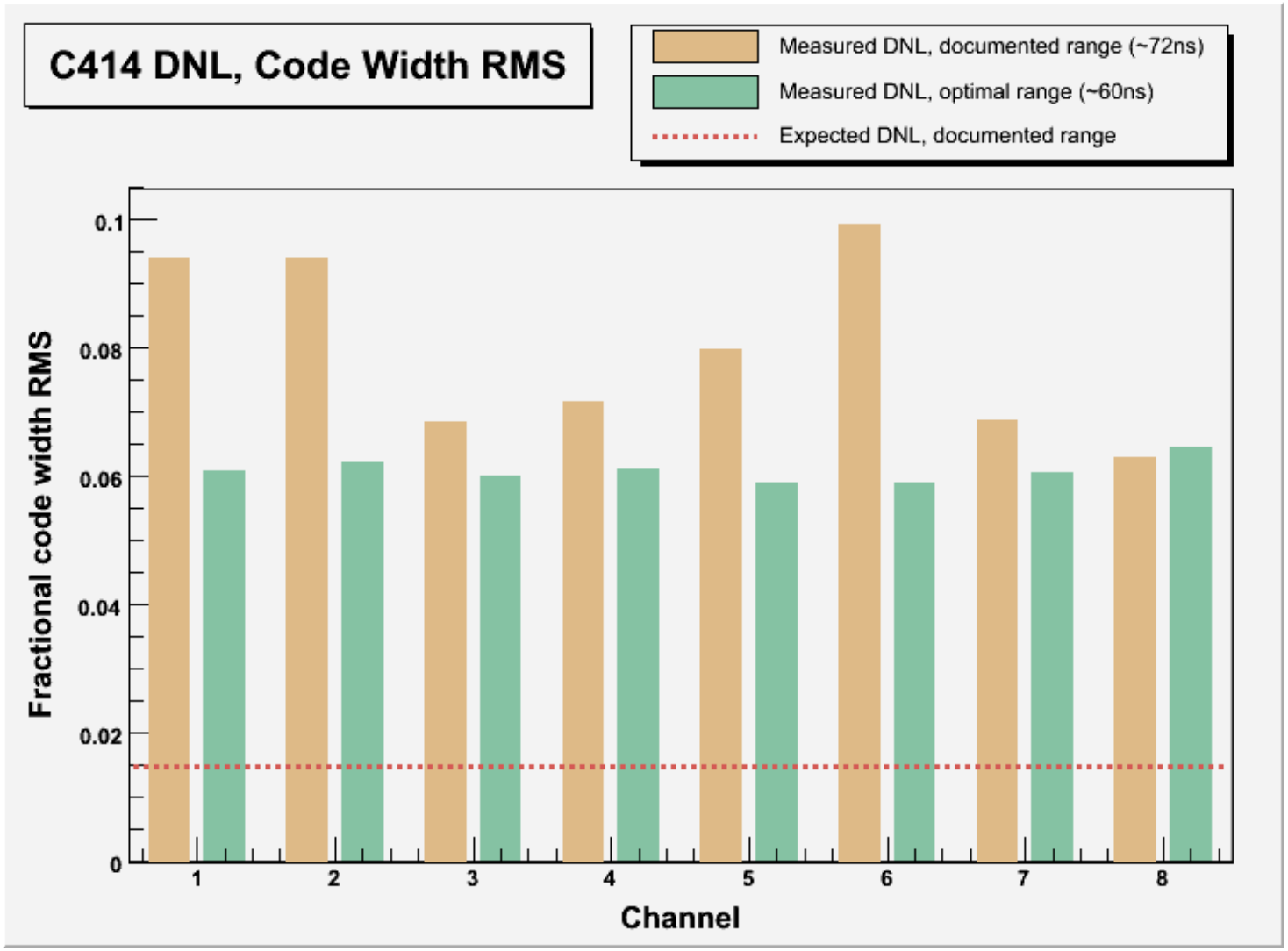


Caen-414 Ch3 Integral Nonlinearity



TDC Nonlinearity Test Results

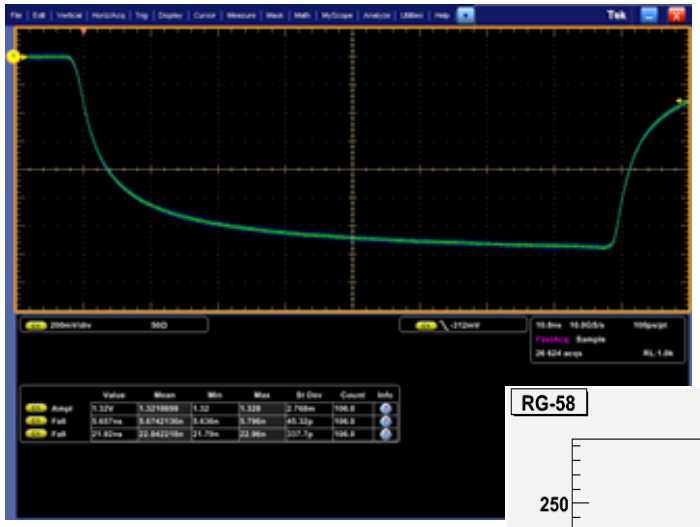
Evan Phelps

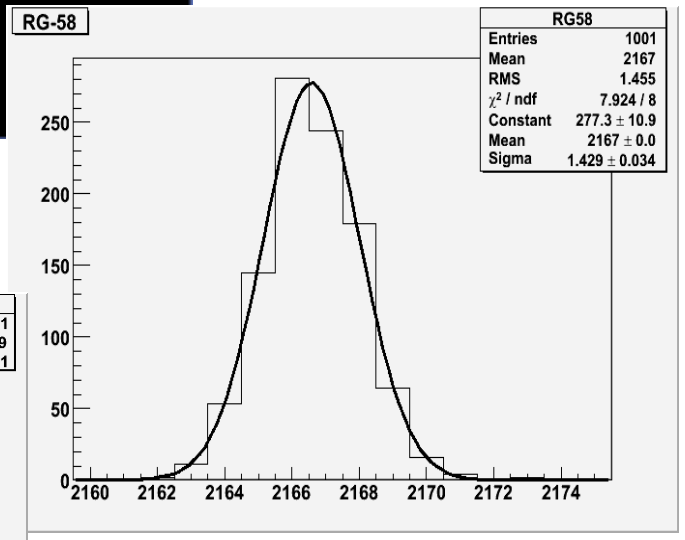


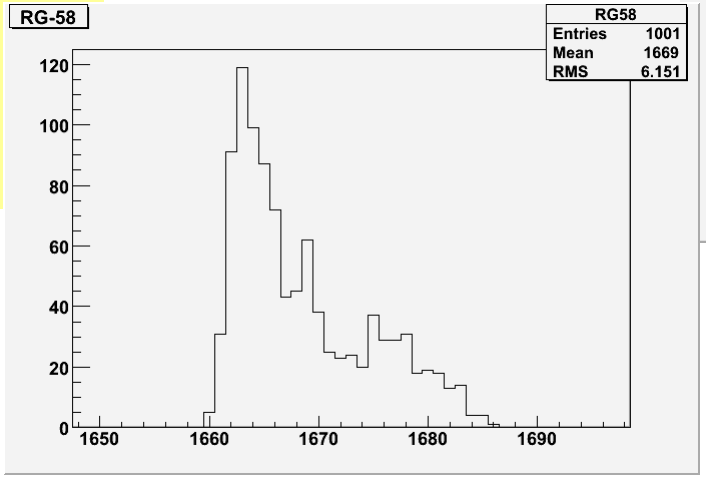
Cable Attenuation Tests

Collin Eacker

- Oscilloscope was used to measure rise times from 30% to 70% and 10% to 90% of leading edge. Amplitude was also measured in volts.
- TDC was used to determine resolution of each cable in picoseconds.
- ADC measured the integrated charge of each cable.



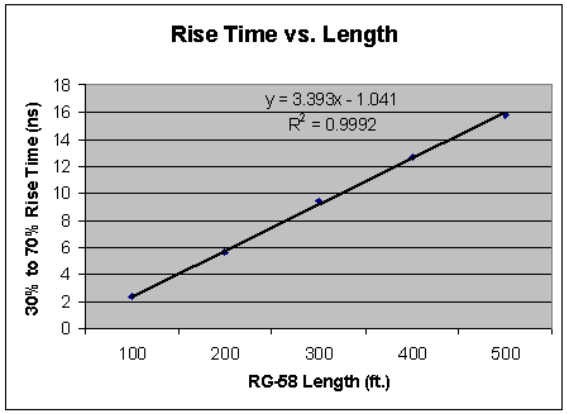


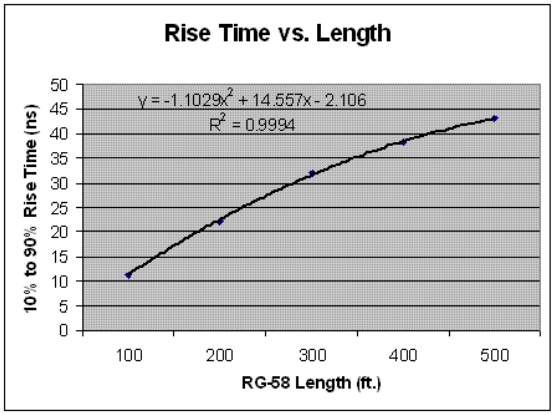


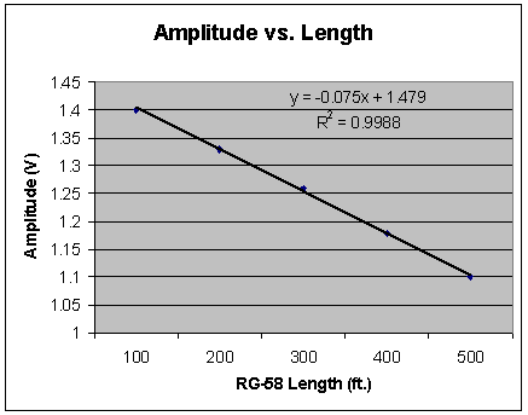
Cable Attenuation Test Results

Collin Eacker

	RG-58	RG-9913	RG-8	RG-214	RG-174
Cable Length (ft.)	200	251.5	202.2	95.3	128.2
Rise Times 30/70 (ns)	5.67	1.78	2.69	1.36	4.3
10/90	22.04	10.55	12.69	7.01	18.03
Amplitude (V)	1.32	1.4	1.432	1.464	1.072
Resolution (ps)	36.13	19.64	19.9	18.36	59.4
Charge (pC)	1078	1110	1123	1139	952





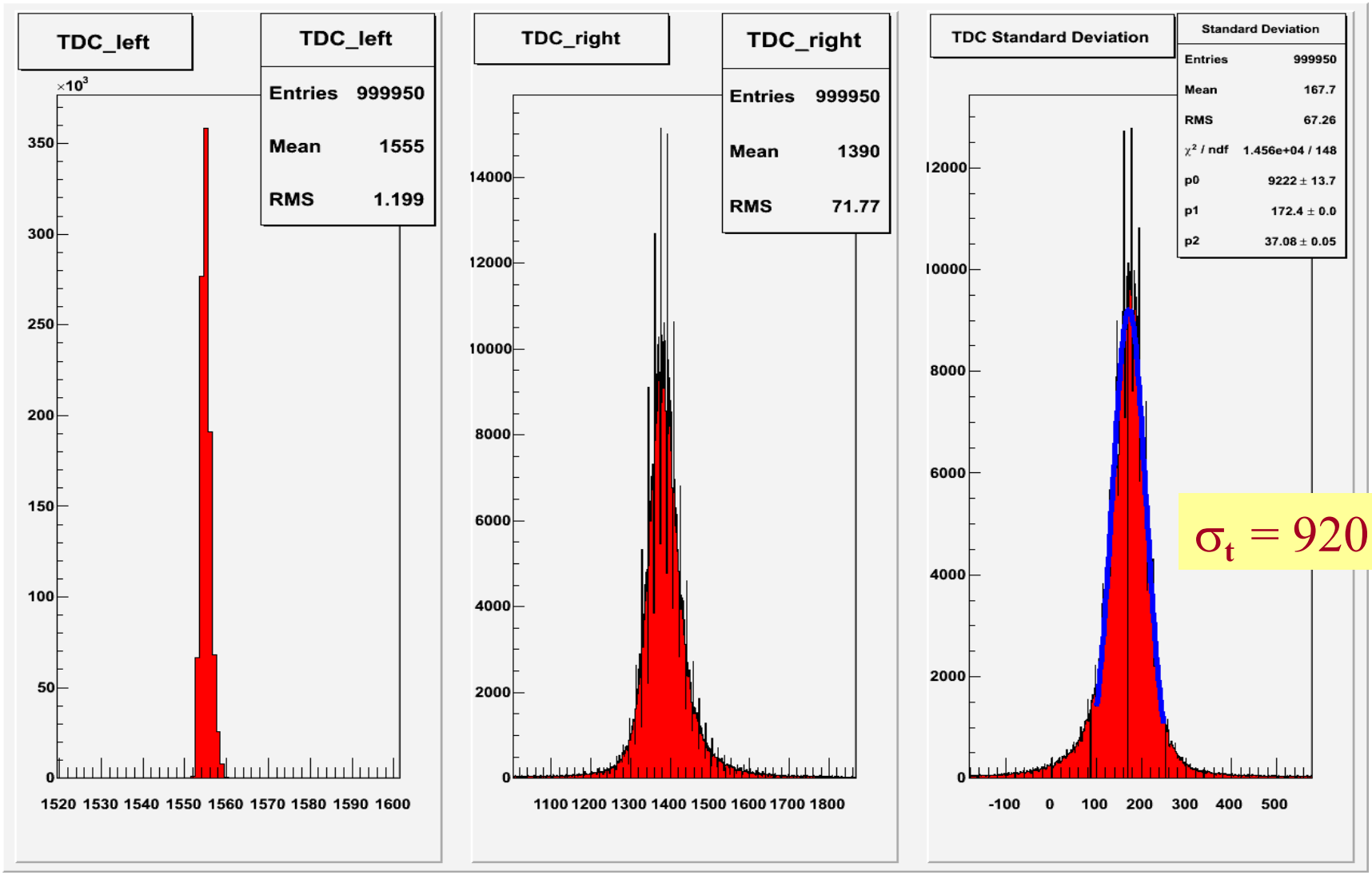


Supplement

Time Resolution Source Method

$t_x = t_l - t_r$

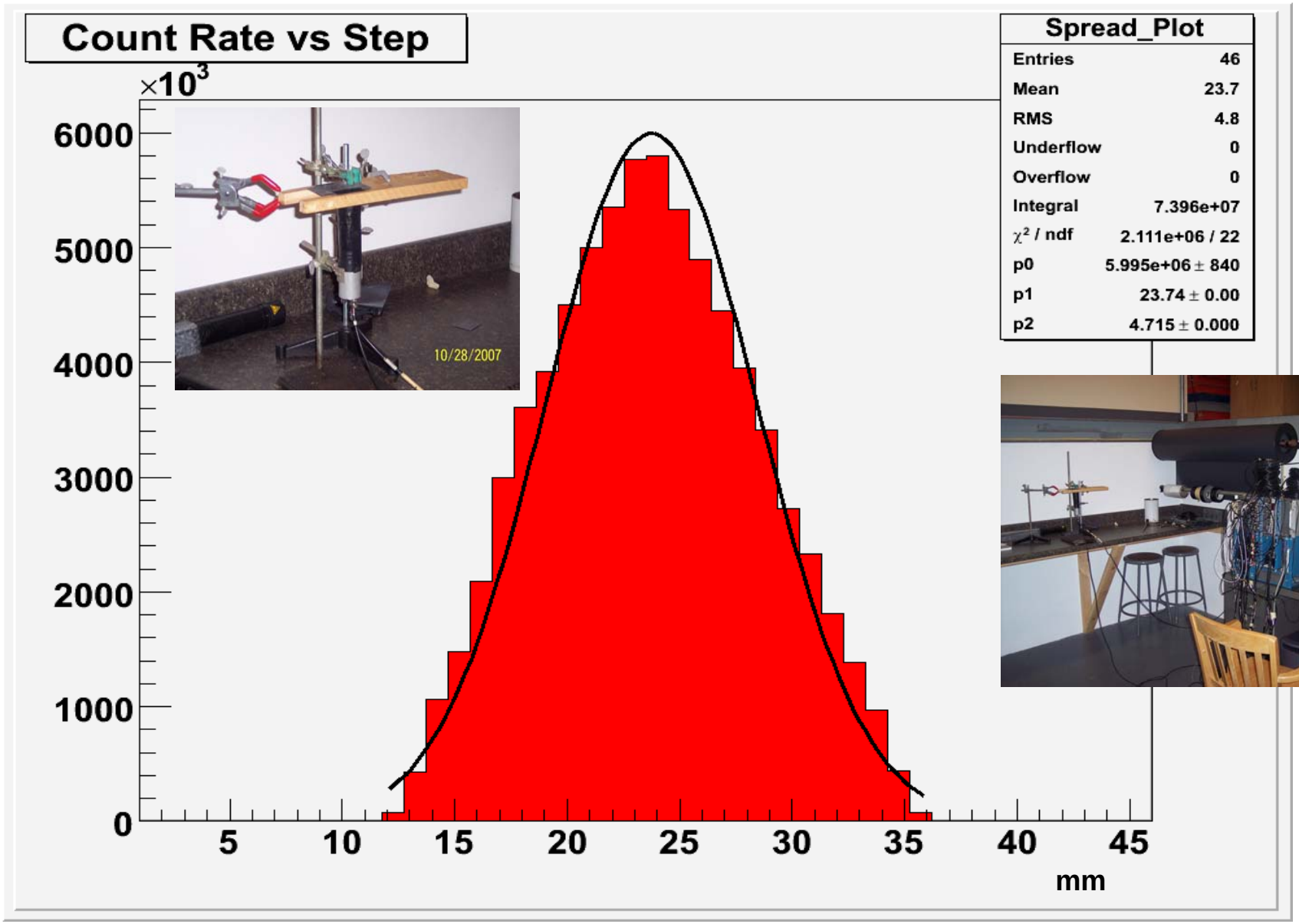
Lewis Graham



$\sigma_t = 920$ ps

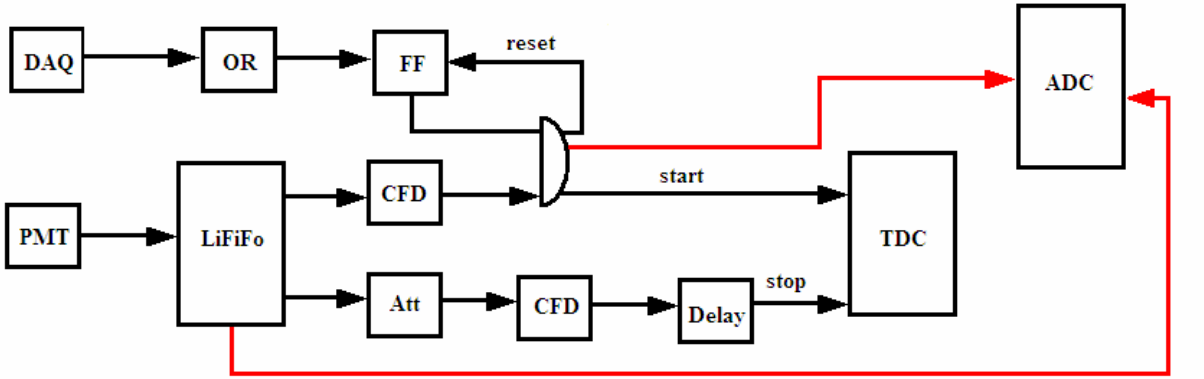
Time Resolution Source Method

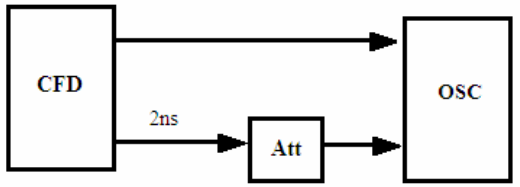
Lewis



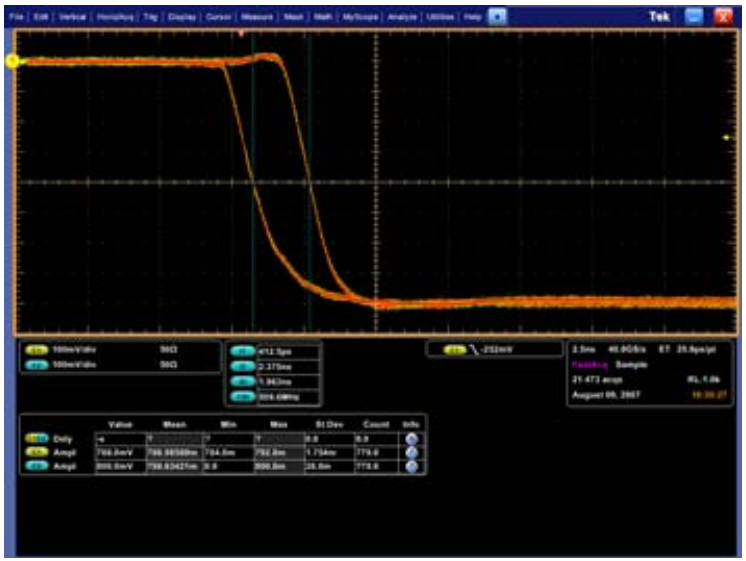
Constant Fraction Discriminator Tests

Legna Torres

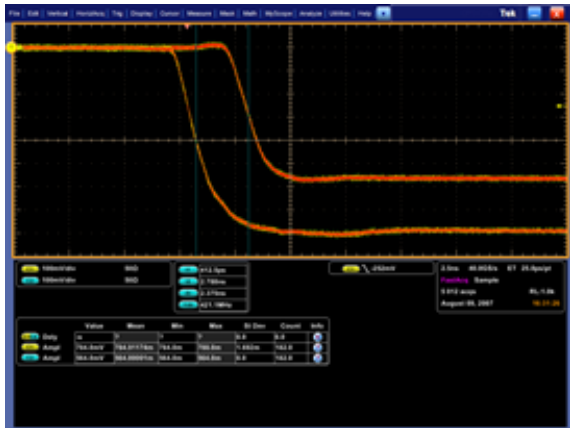




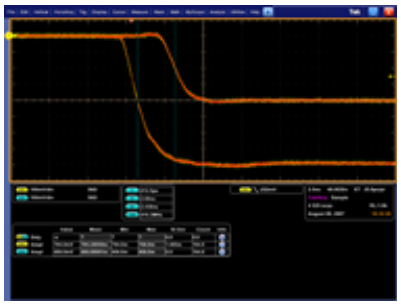
0 dB



3 dB



6 dB



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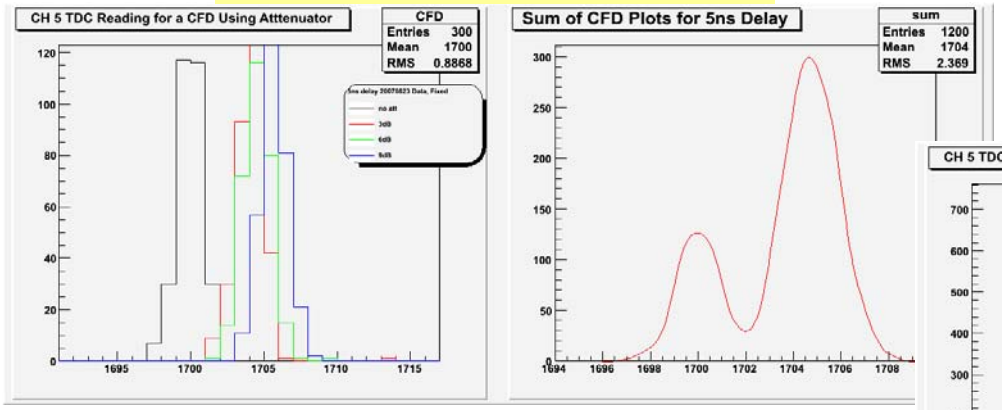
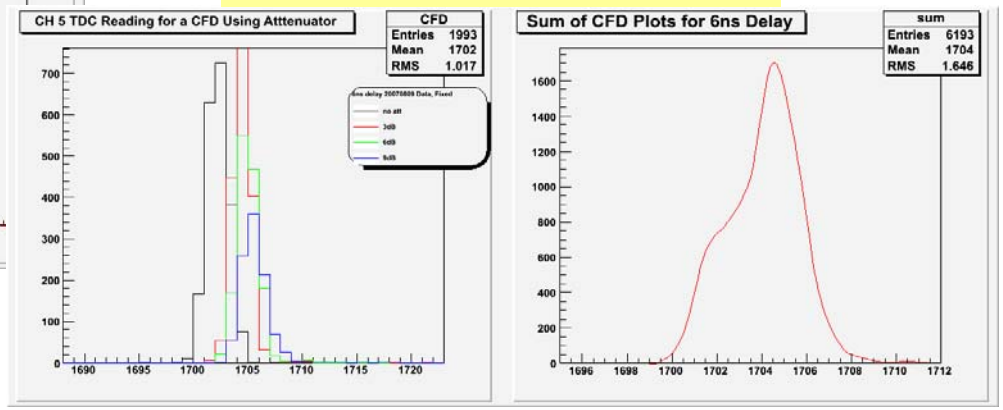
Constant Fraction Discriminator Test Results

Legna Torres

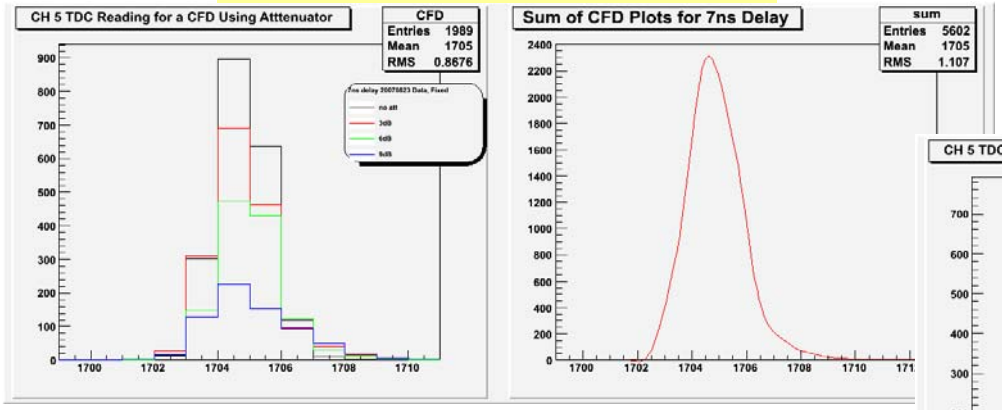
RMS 59 ps at 5 ns delay



RMS 41 ps at 6 ns delay



RMS 27 ps at 7 ns delay



RMS 38 ps at 8 ns delay