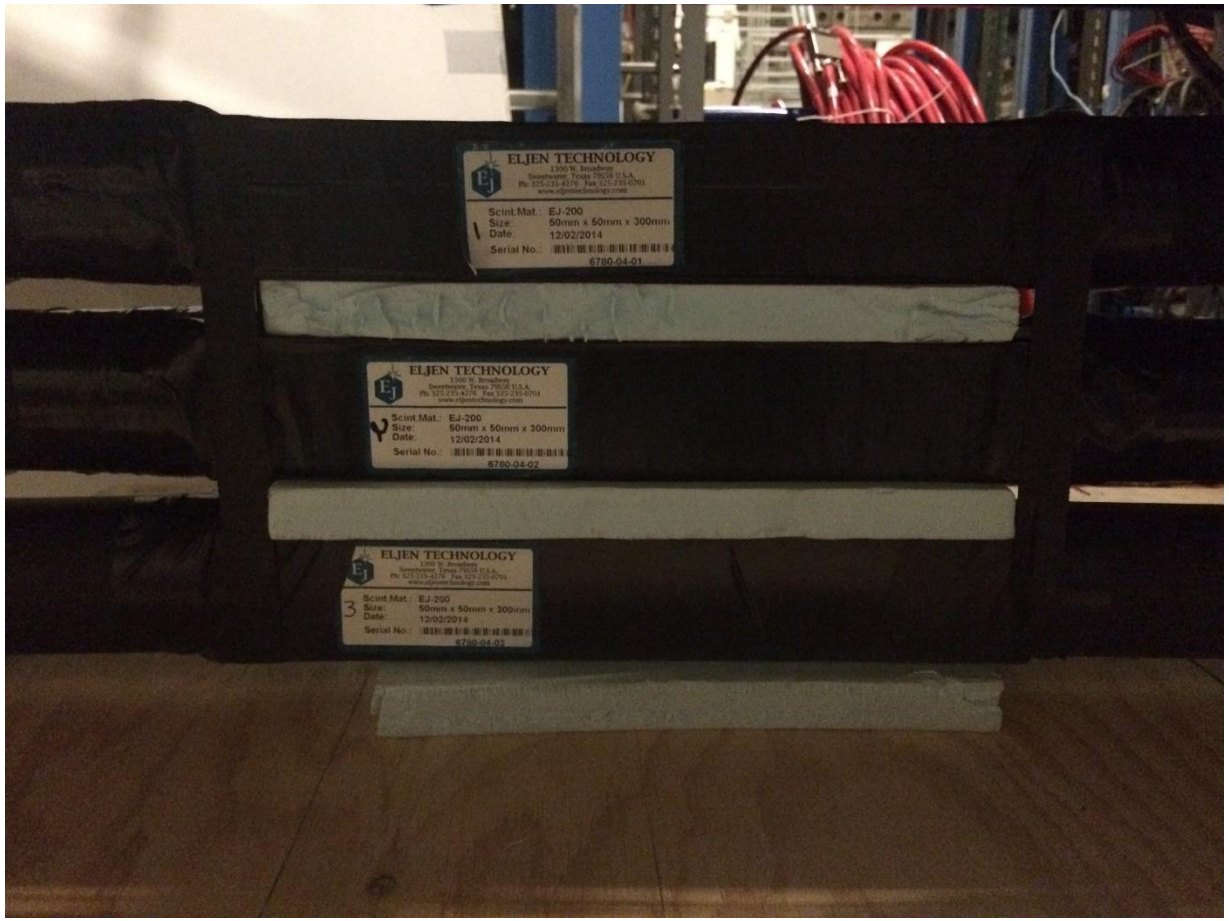
Three bar time resolution test update

Ye Tian

Shandong University

5/18/2017

Time resolution of three bar test method



$$T = \frac{t0+t3+t2+t5}{4} - \frac{t1+t4}{2}$$

The first item is time reconstructed by top and bottom bar, the second item is time got from middle bar. The difference between these two items indicates system time resolution.

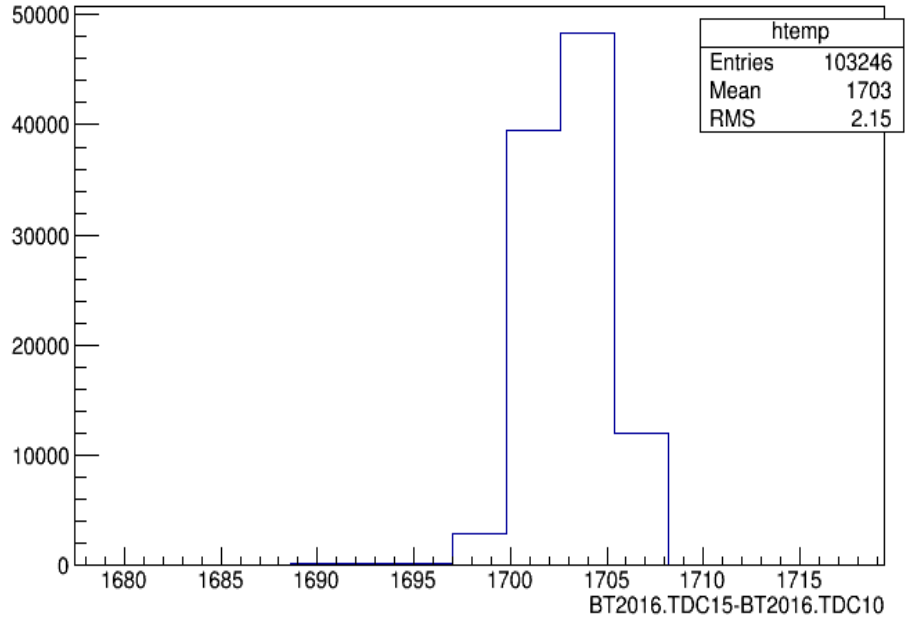
Applying assumption $\sigma_{bar} = \frac{1}{\sqrt{2}}\sigma_{PMT}$

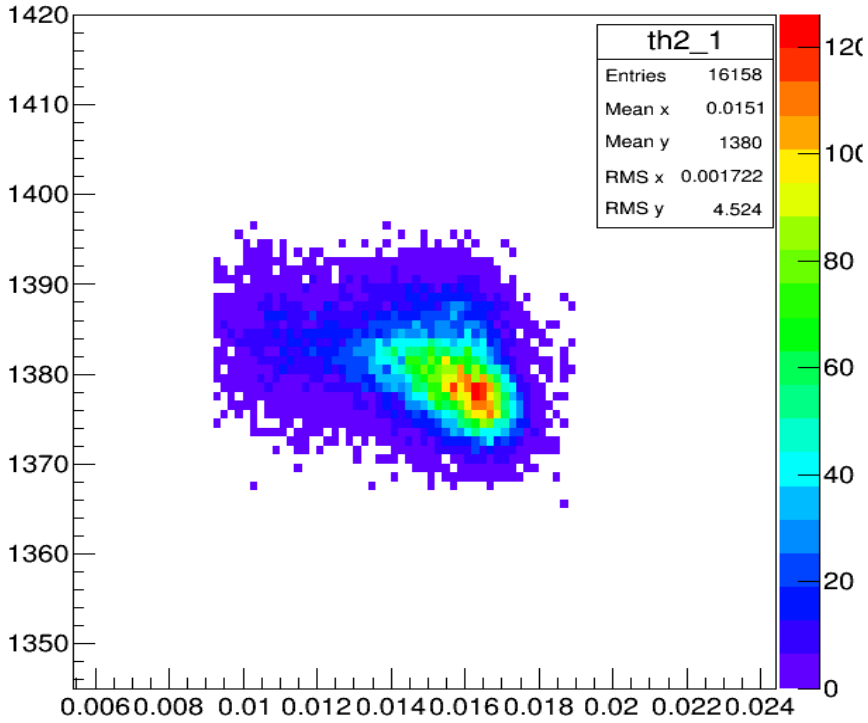
Since every PMT is identical, scintillator time resolution will be calculated as:

$$\sigma = \sqrt{\frac{2}{3}}\sigma_T$$

Trigger time problem

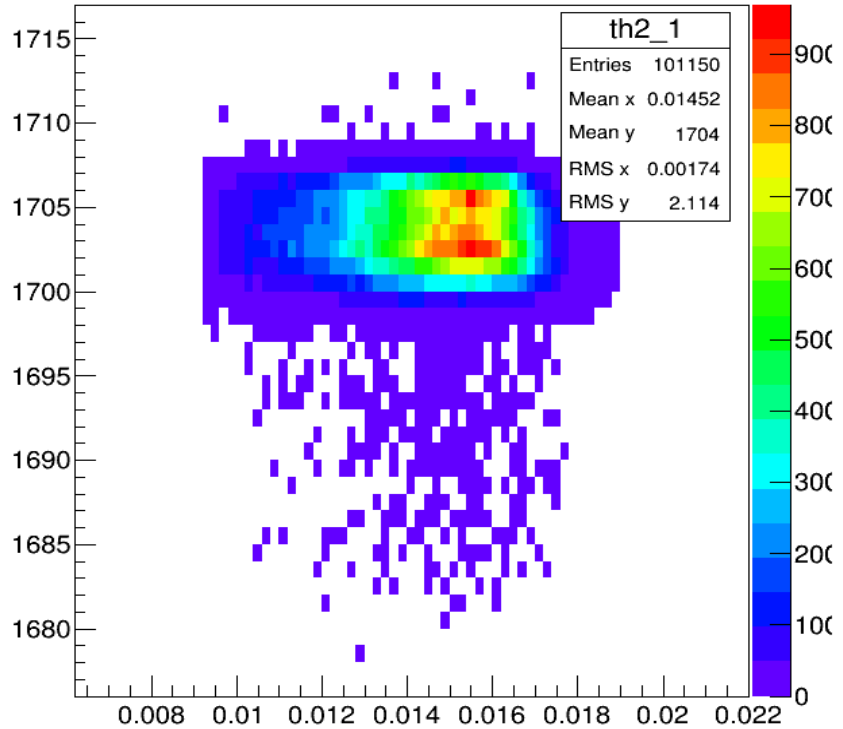
- Replace the discriminator with another one, trigger time get a little better





Old

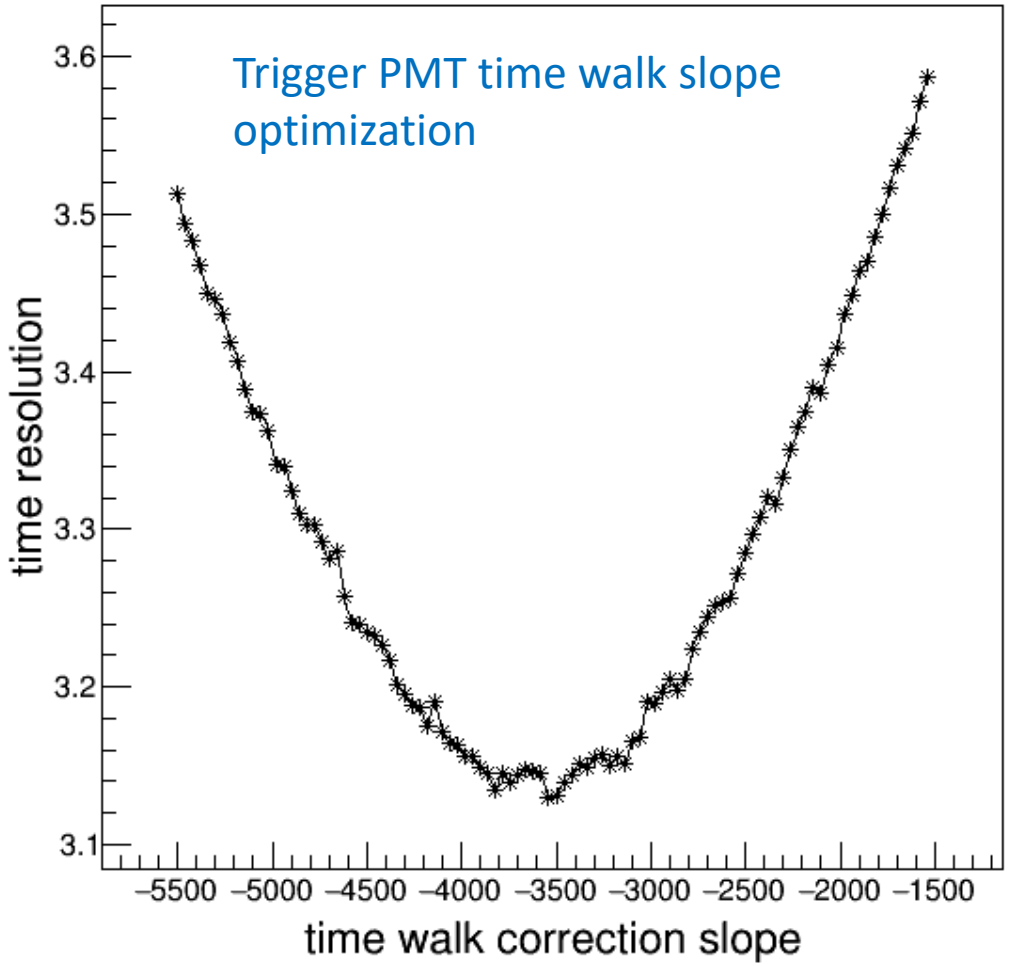
New



Add time walk correction on trigger PMT

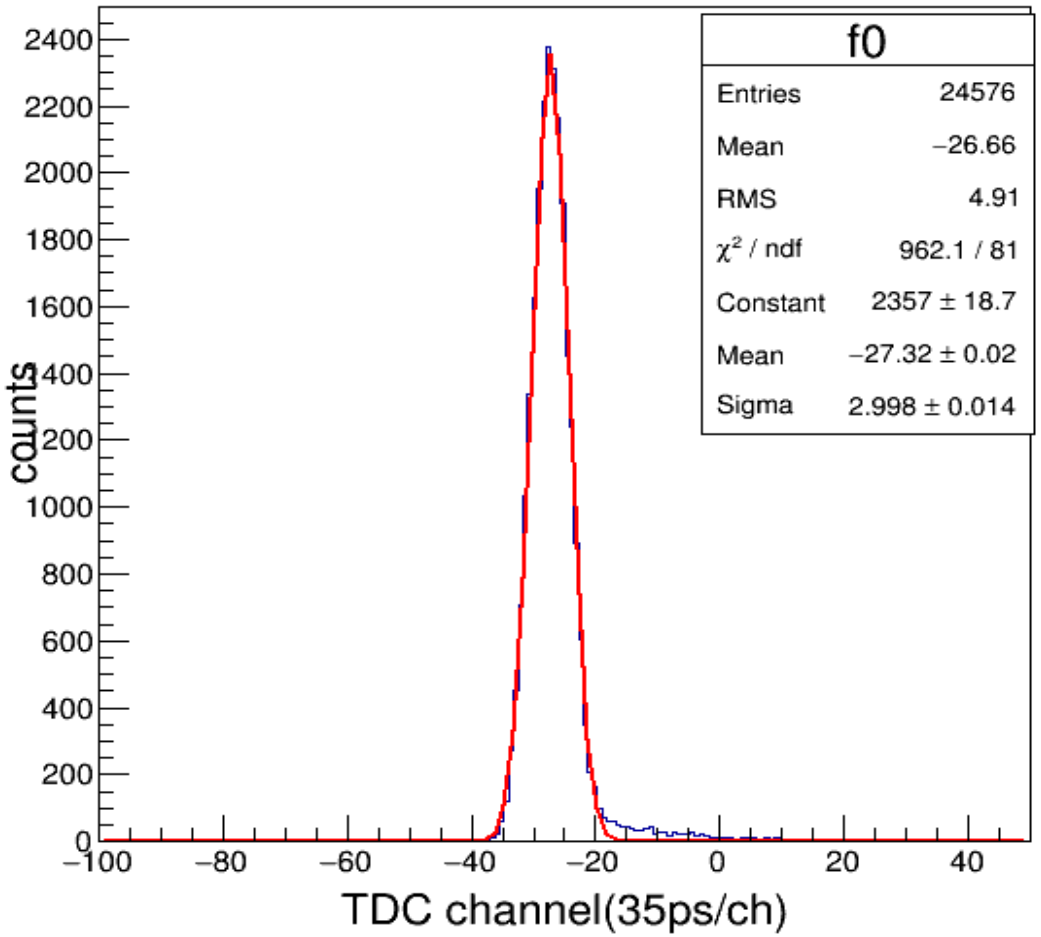
Processing and cut

- Time walk correction for top and bottom bar PMT
- Time walk correction for trigger bar
- Low signal and high signal cut
- Hit position cut



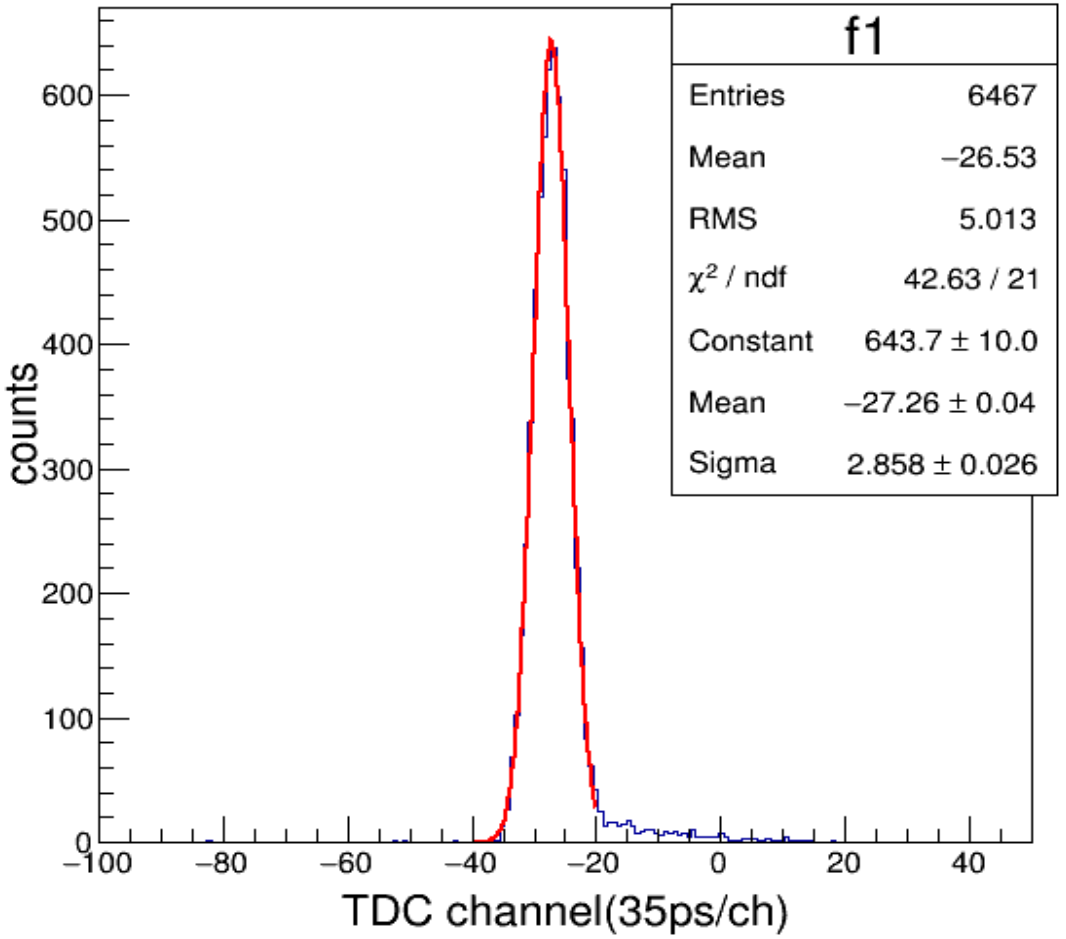
Reference bar test result

Includeing all cuts and correction



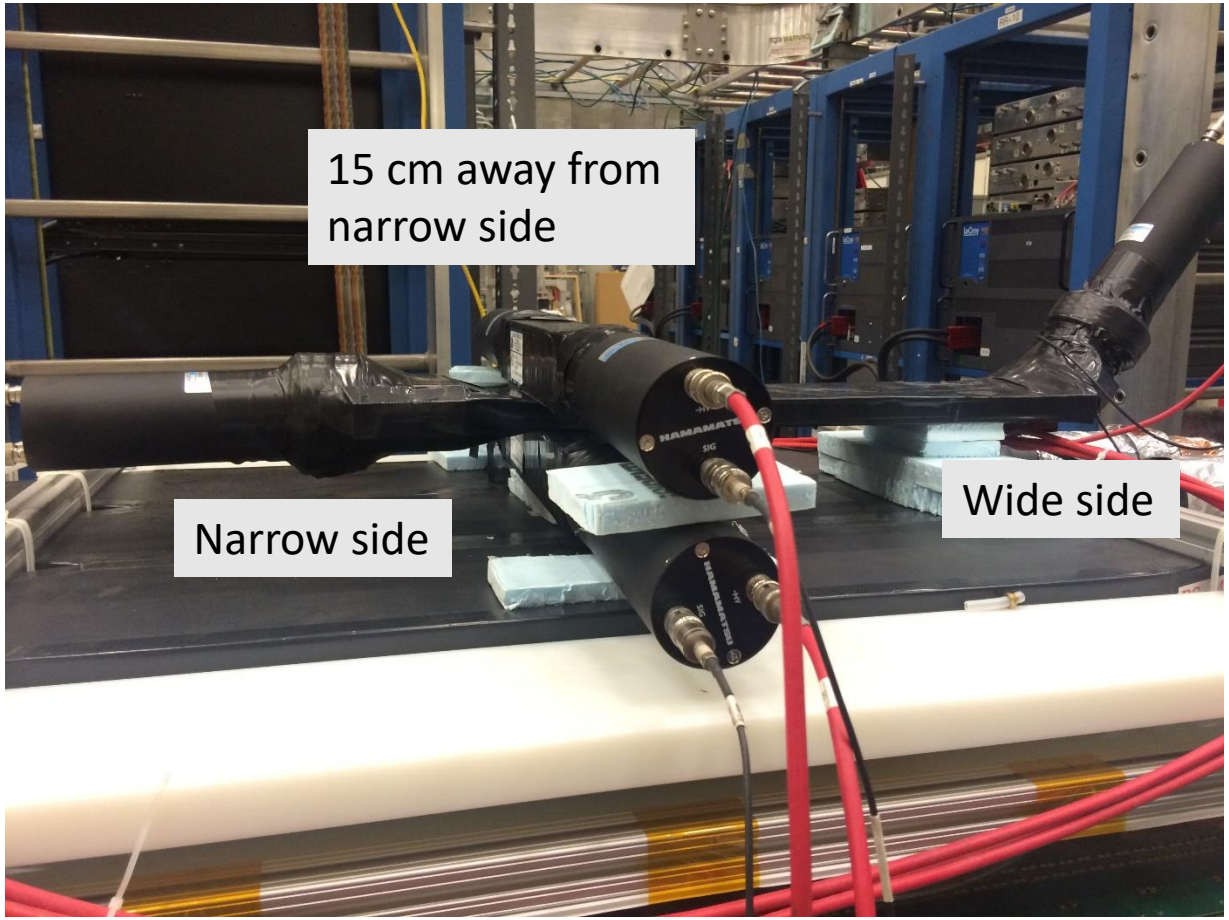
Time resolution: 2.998* 35ps * $\sqrt{\frac{2}{3}} = 85.7ps$

Add trigger PMT FADC cut(not necessary)



Time resolution: 2.858* 35ps * $\sqrt{\frac{2}{3}} = 81.67ps$

FASPD time resolution test



Still in test, signal in SPD is much lower than reference bar, trying to use higher HV.

Calculation to get time resolution:

$\sigma_m = sqrt(\sigma_T{}^2\text{-}0.5*\sigma_r{}^2)$

(need to check if not placed in center)

Where σ_r= 82ps