

LHRS Scintillator Calibration

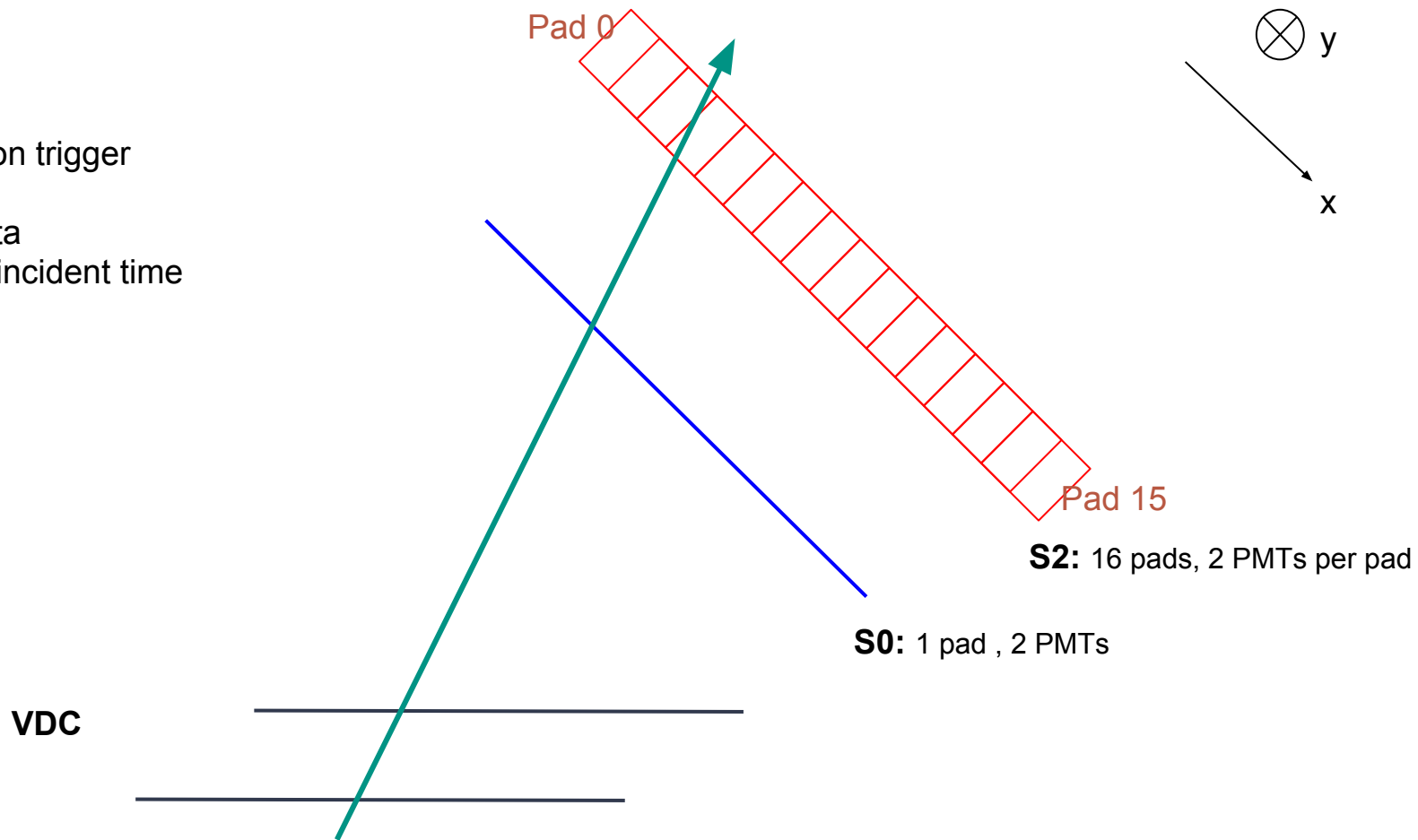
Shujie Li

With Florian, Tong, Bishnu

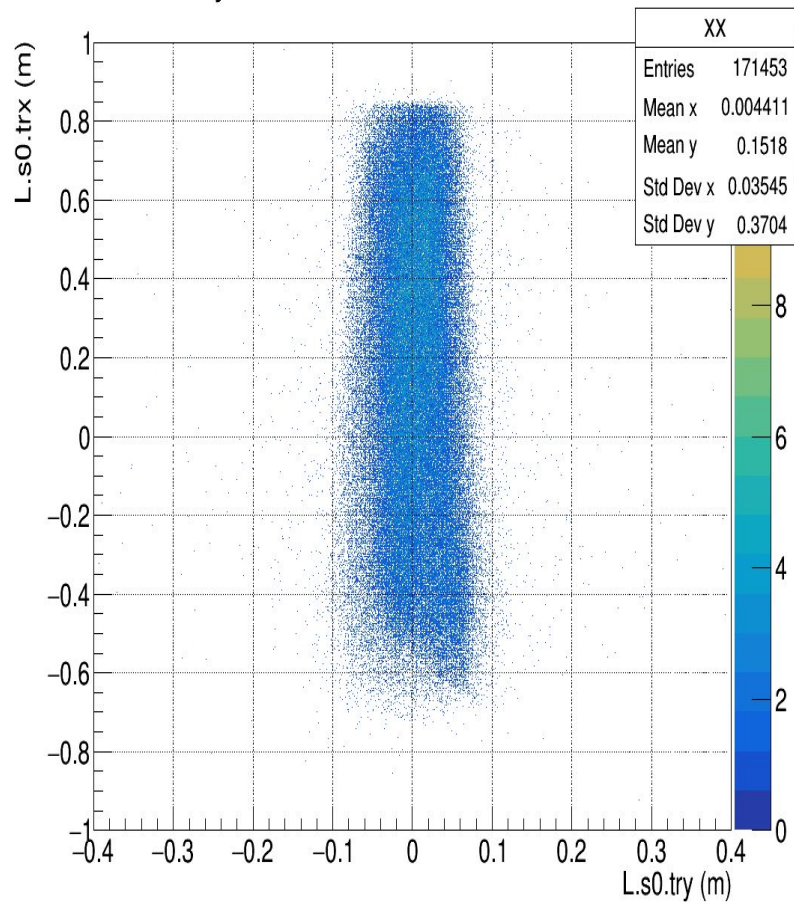
06. 12, 2018

S0 and S2:

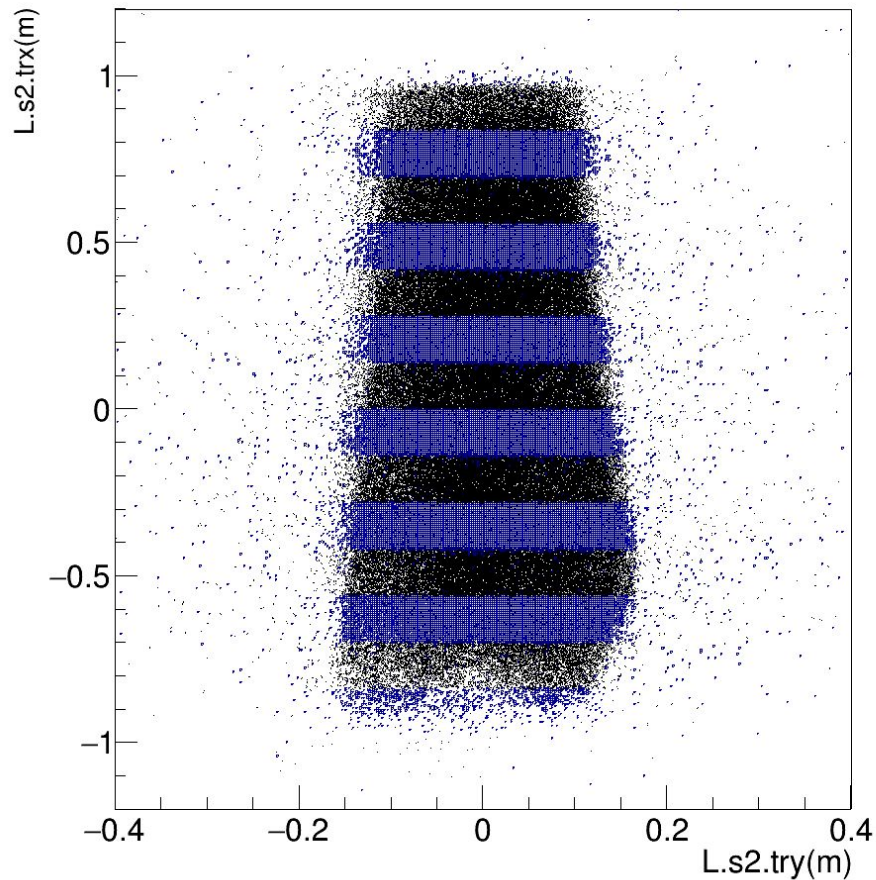
- Production trigger
- Timing
 - Beta
 - Coincident time



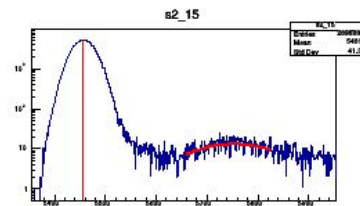
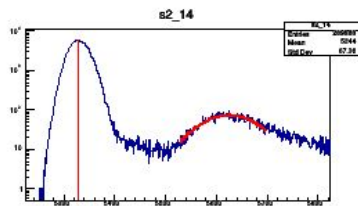
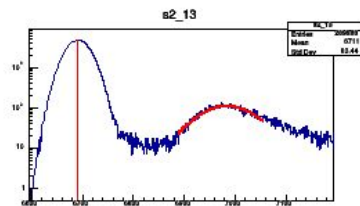
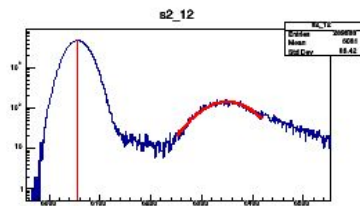
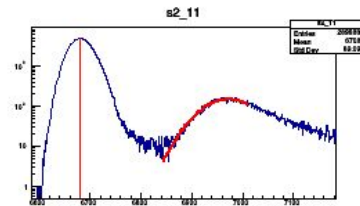
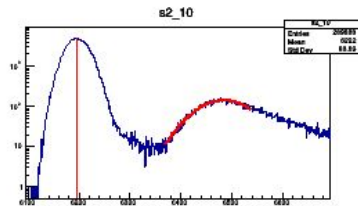
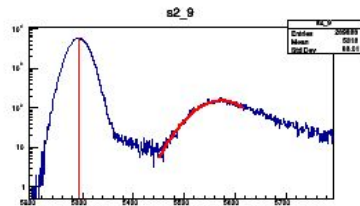
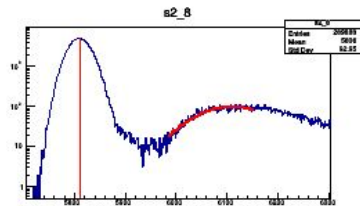
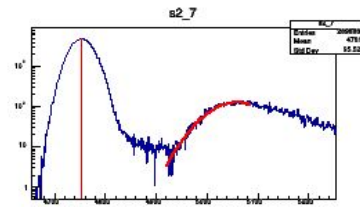
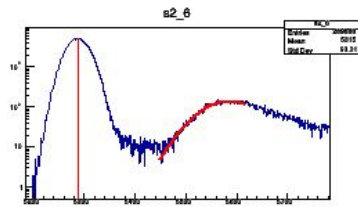
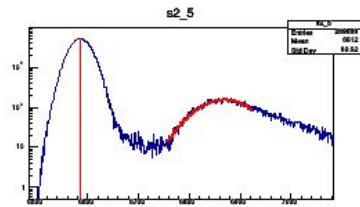
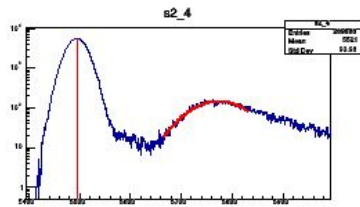
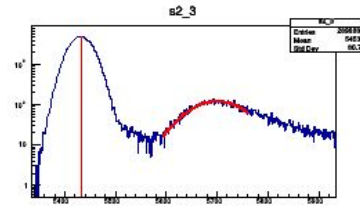
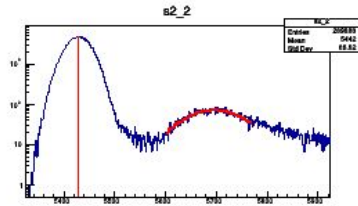
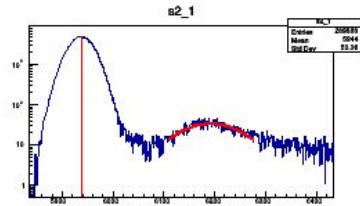
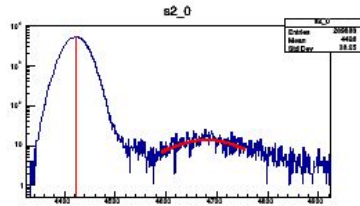
Projected track in s0 Coord.



Projected track in s2 Coord.

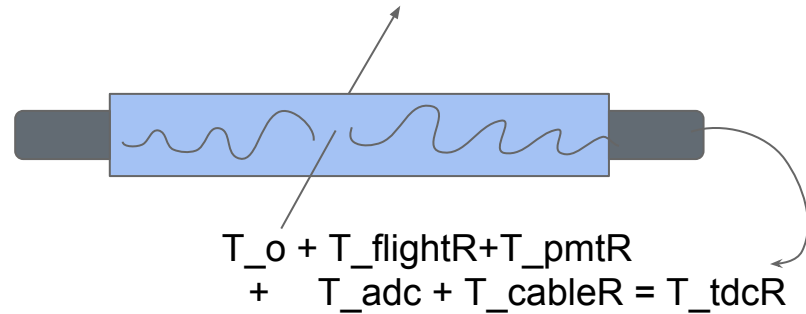


1. ADC Calibration: subtract pedestals, align peaks



2. TDC Calibration

- Align right PMTs for s2 pads
- Left to right PMT relative time
- Time-walk corrections



2. TDC Calibration

a. Align right PMTs for s2 pads:

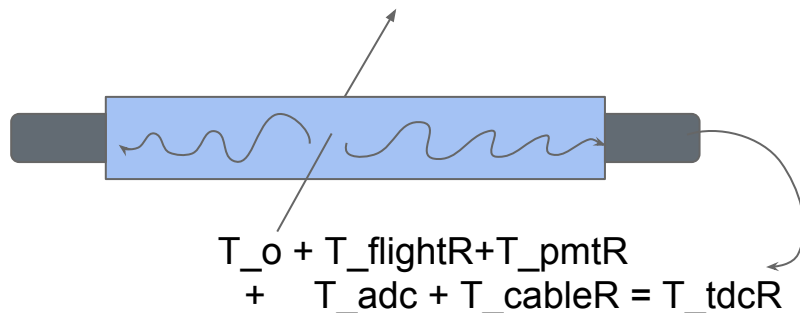
If one electron hits two pads (n,n+1):

$$T_o[n] = T_o[n+1]$$

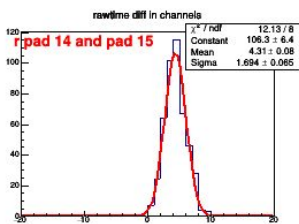
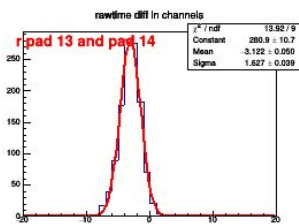
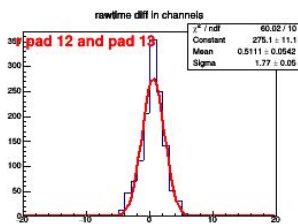
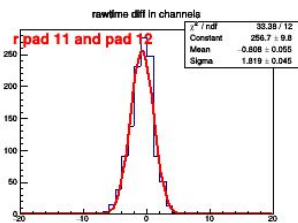
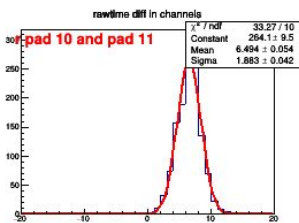
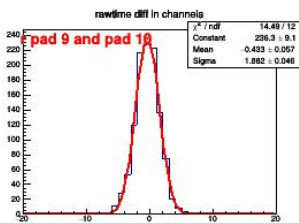
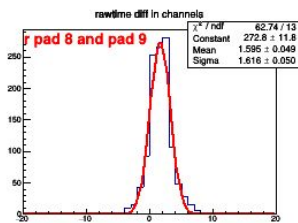
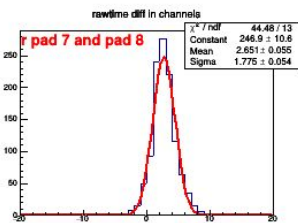
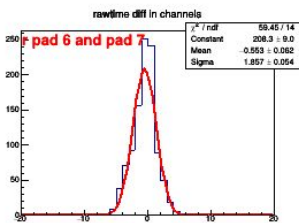
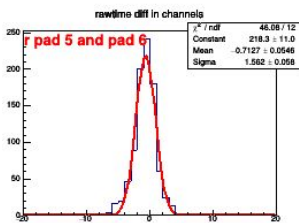
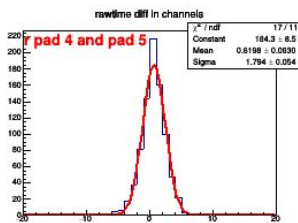
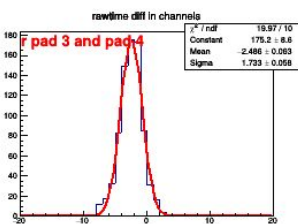
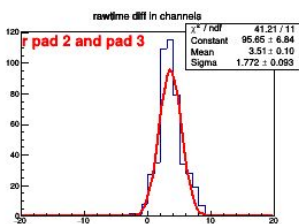
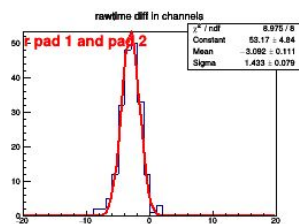
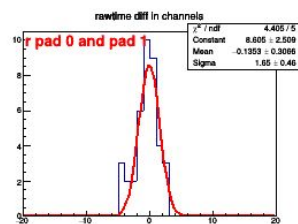
$$T_{\text{flightR}}[n] = T_{\text{flightR}}[n+1]$$

$$T_{\text{adcR}}[n] = T_{\text{adcR}}[n+1]$$

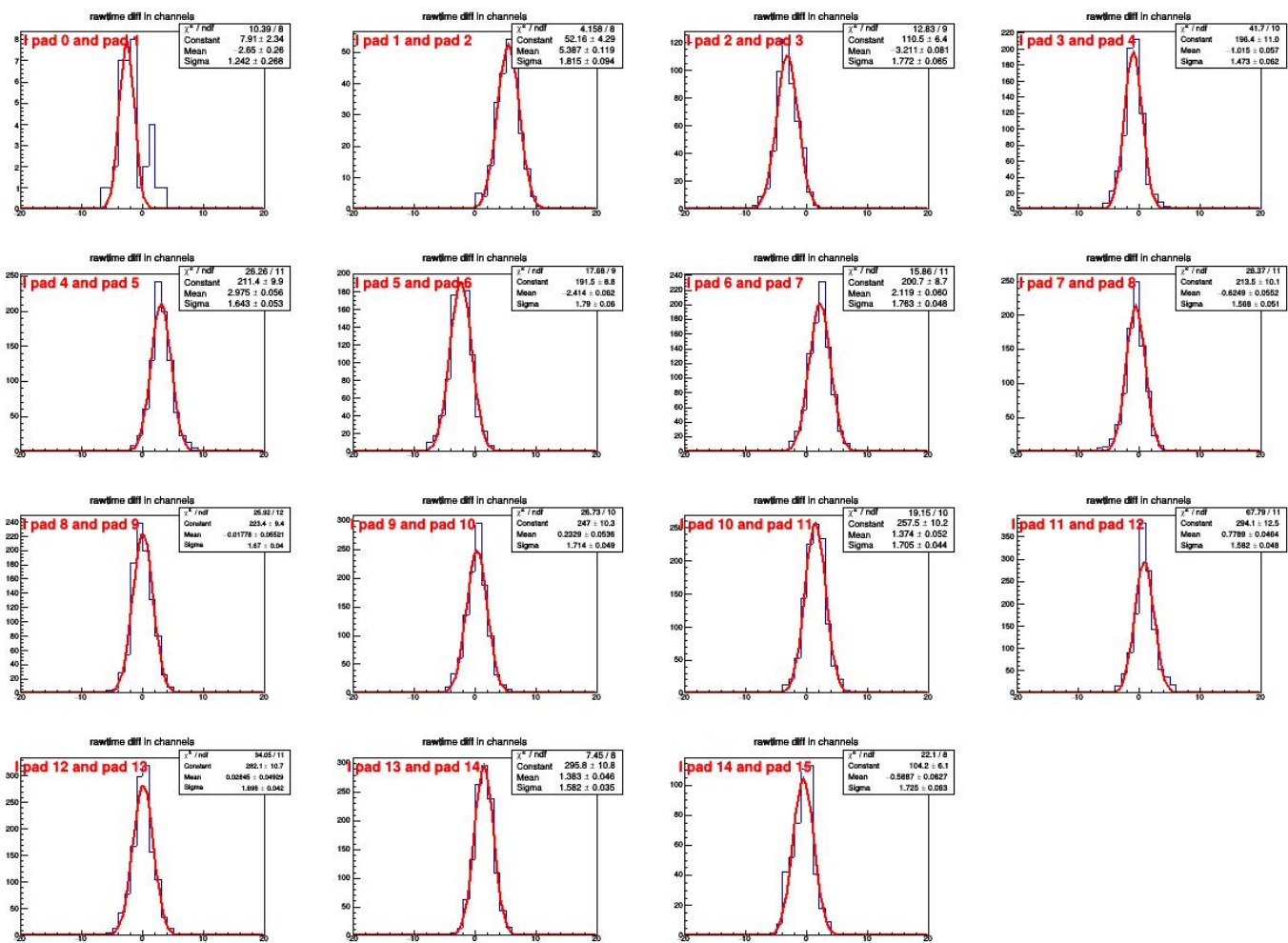
$$\Rightarrow T_{\text{tdcR}}[n] - T_{\text{tdcR}}[n+1] = T_{\text{cableR}}[n] - T_{\text{cableR}}[n+1]$$



Right side PMTs:



Left side PMTs:



2. TDC Calibration

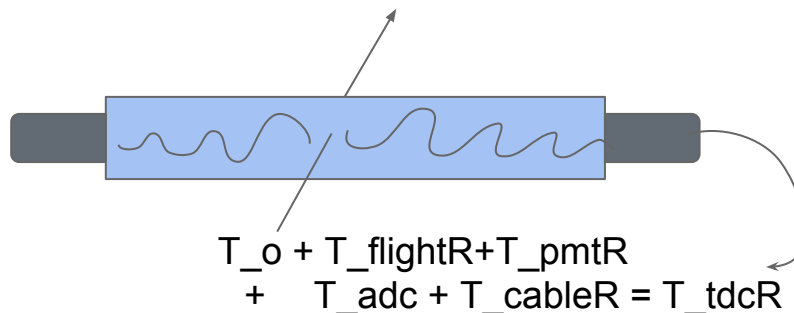
b. Left to right PMT relative time

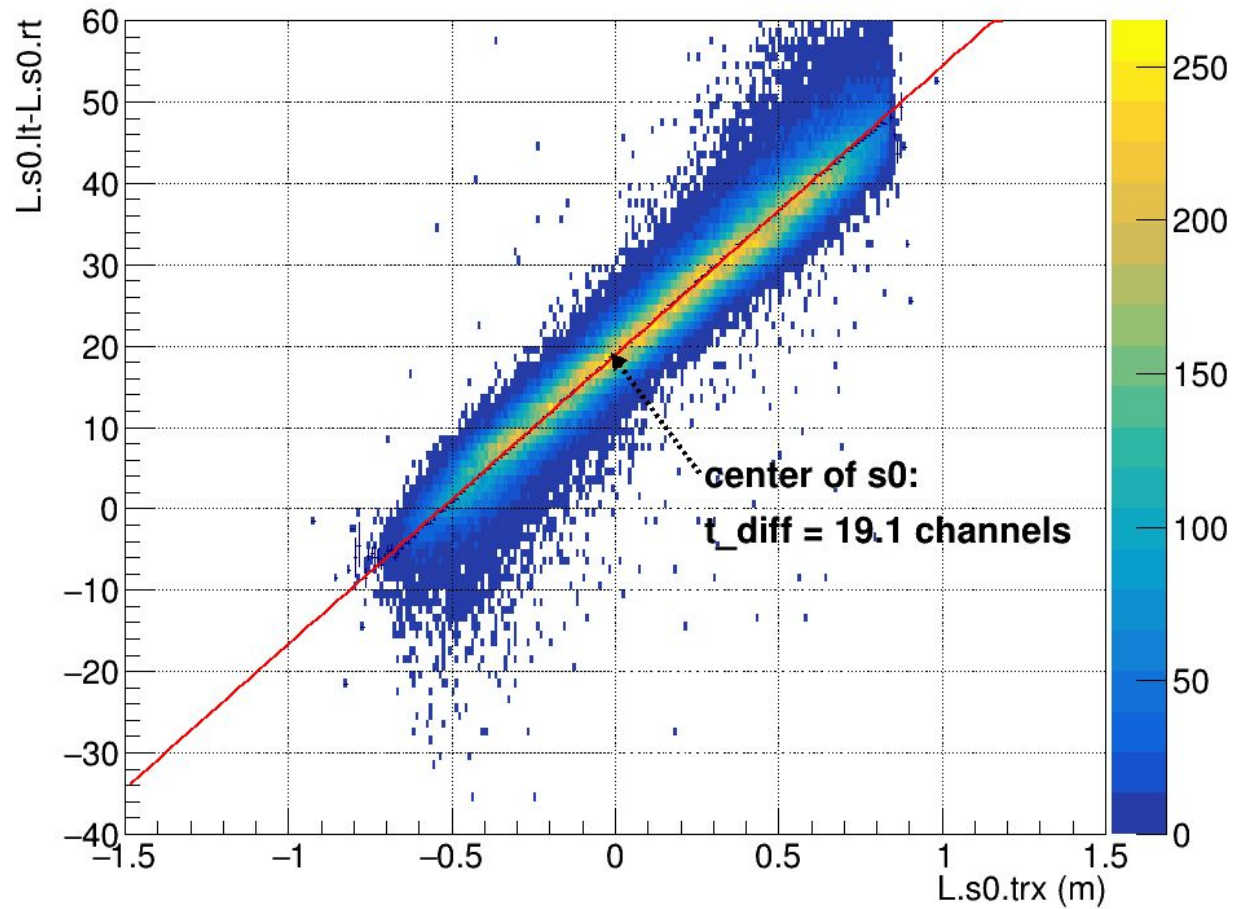
If one electron hits the **center** of s0:

$$T_{\text{flightL}}[n] = T_{\text{flightR}}[n+1]$$

$$T_{\text{adcL}}[n] = T_{\text{adcR}}[n+1]$$

$$\begin{aligned} \Rightarrow T_{\text{tdcR}} - T_{\text{tdcL}} \\ = (T_{\text{cableR}} + T_{\text{pmtR}}) - (T_{\text{cableL}} + T_{\text{pmtR}}) \end{aligned}$$



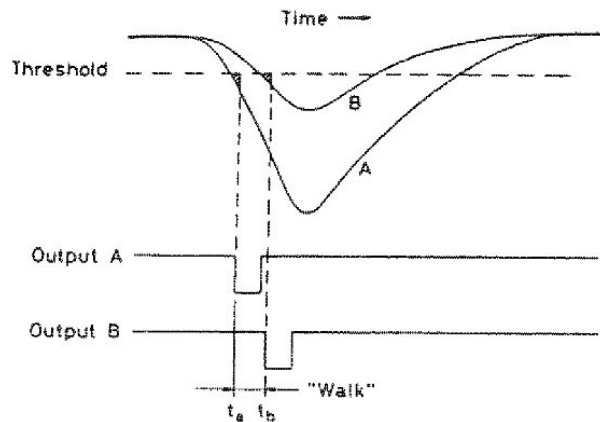


2. TDC Calibration

C. Time-walk corrections:

Trigger-time depends on when trigger signals pass the discriminator threshold
==> ADC amplitude

W Leo's book:



Default function:

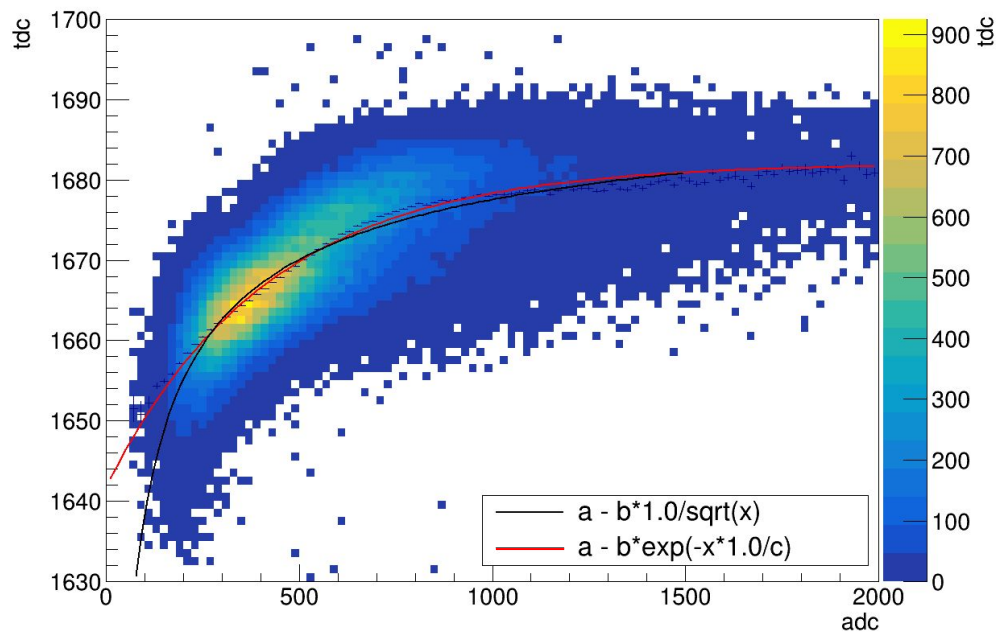
$$T_{\text{adc}} = a - b / \sqrt{\text{adc}}$$

New function:

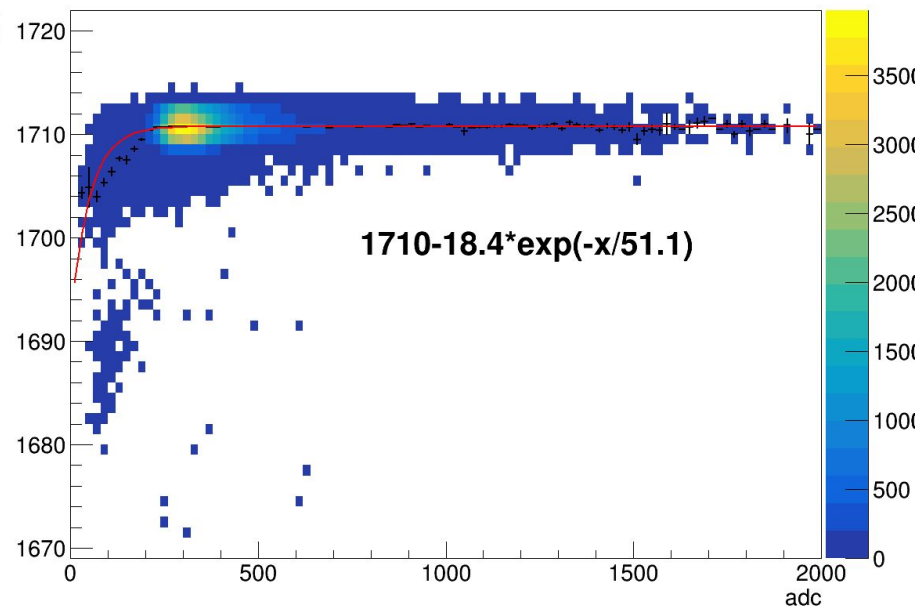
$$T_{\text{adc}} = a - b * \exp(-x/c)$$

2. TDC Calibration

s0 right PMT timewalk

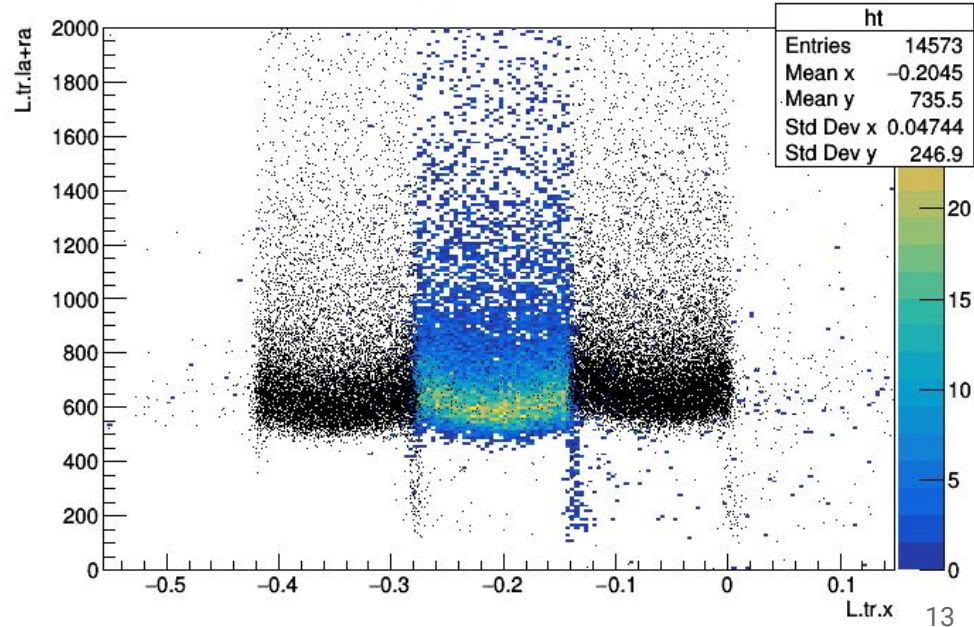
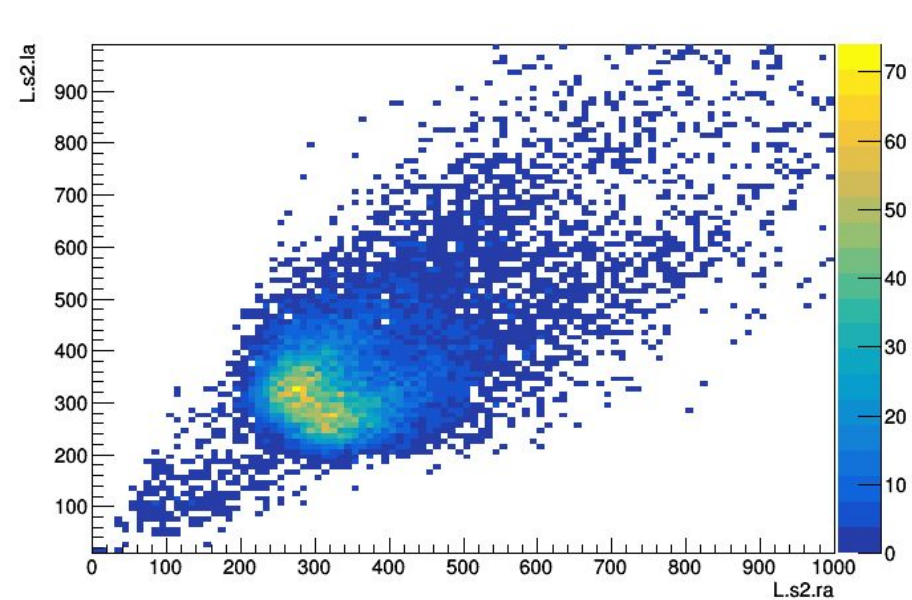


s2 pad 6 right PMT



Questions:

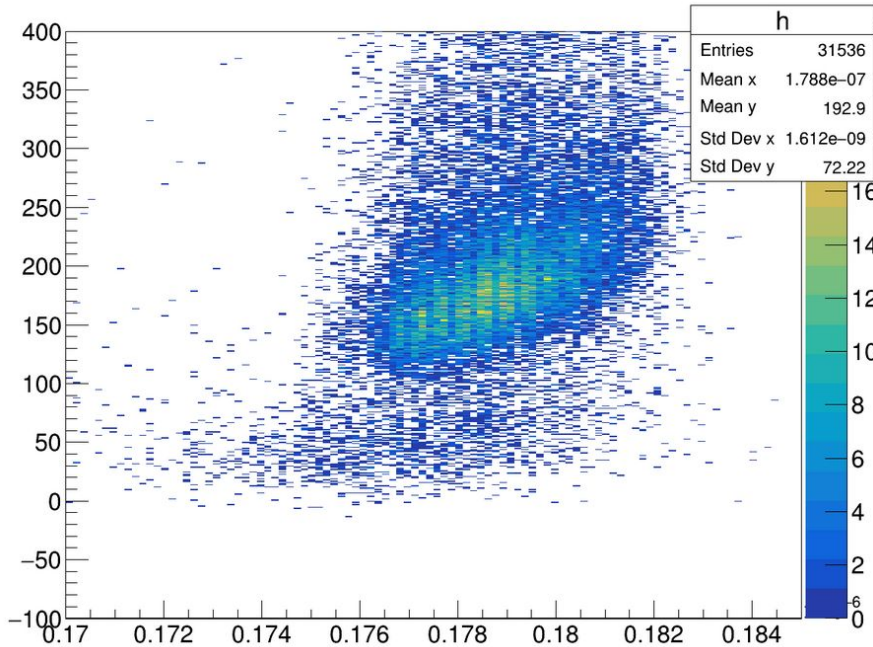
S2 small ADC signals from overlapping area?



Questions:

S2 with F1TDC v.s TDC:

R.s2.la_c[4];(F1FirstHit[15]-F1FirstHit[20])*56.23e-12 {DR.bit5>0&&R.s2.t_pads==4}



Ls2.la_c[4];Ls2.r[4](((DL_bht2>0 && L_cerazum_co>2000 && (L_pr11.s+L_pr12.e)>!(Hsci_D1_P0t*900))&&(L_trn==1))&&(L_s2.t_pads==4))

