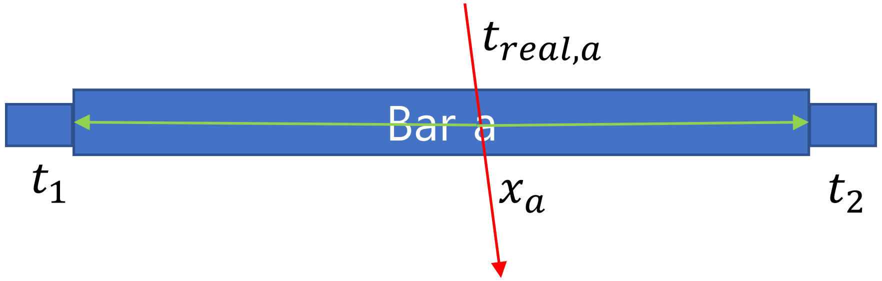
Timing Calibration



- $t_1 = t_{real,a} + \frac{x_a}{v_a} + \Delta t_1$ where $\Delta t_1 = \Delta t_{cable} + \Delta t_{electronics} + \Delta t_{PMT}$
- $t_2 = t_{real,a} + \frac{L - x_a}{v_a} + \Delta t_2$
- $t_{real.a} = \frac{t_1 + t_2}{2} - \frac{\Delta t_1}{2} - \frac{\Delta t_2}{2} - \frac{L}{2v_a}$
- Similarly, $t_{real.b} = \frac{t_3 + t_4}{2} - \frac{\Delta t_3}{2} - \frac{\Delta t_4}{2} - \frac{L}{2v_b}$

Timing Calibration

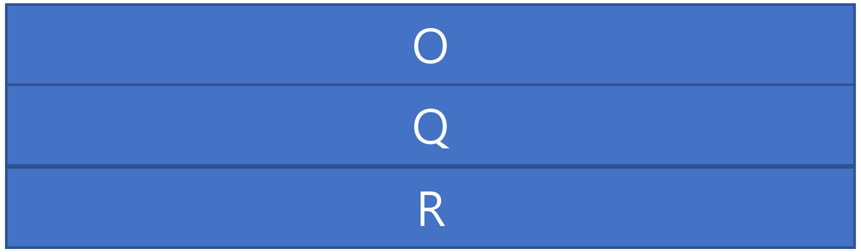
- Assume that relative electronic time shifts about a certain channel are always same even though the configuration of bars are changed.
- If one sets Δt_1 as an offset and represent other Δt_is in terms of Δt_1, dt between bars can be presented as follows :
- $t_{real.a} - t_{real.b} = (\frac{t_1+t_2}{2} - \frac{\Delta t_1}{2} - \frac{\Delta t_1+s_2}{2} - \frac{L}{2v_a})$ - $(\frac{t_3+t_4}{2} - \frac{\Delta t_1+s_3}{2} - \frac{\Delta t_1+s_4}{2} - \frac{L}{2v_b})$

$= \frac{t_1+t_2}{2} - \frac{t_3+t_4}{2} - \frac{L}{2v_a} + \frac{L}{2v_b} - \frac{s_2-s_3-s_4}{2}$

- No dependence on the offset

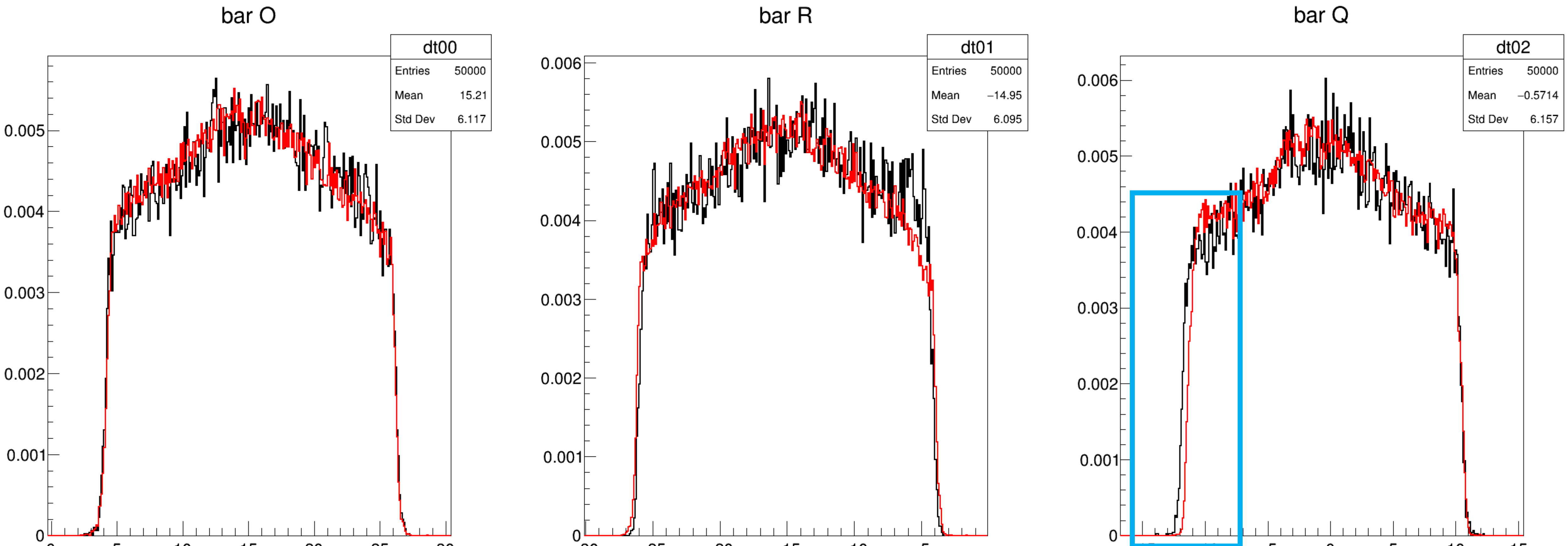
Timing calibration

- Calibrate the timing with left, and test with right.



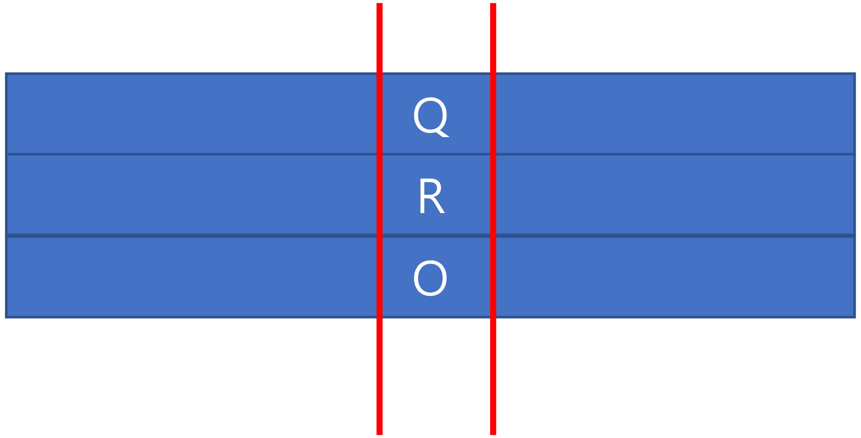
Timing calibration

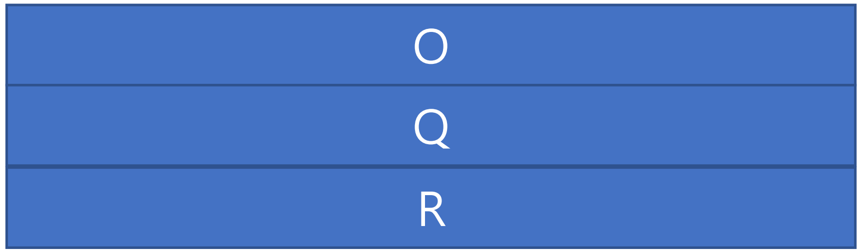
- Some shift ?
- Width variation of bar R is reasonable but Q's one is odd.



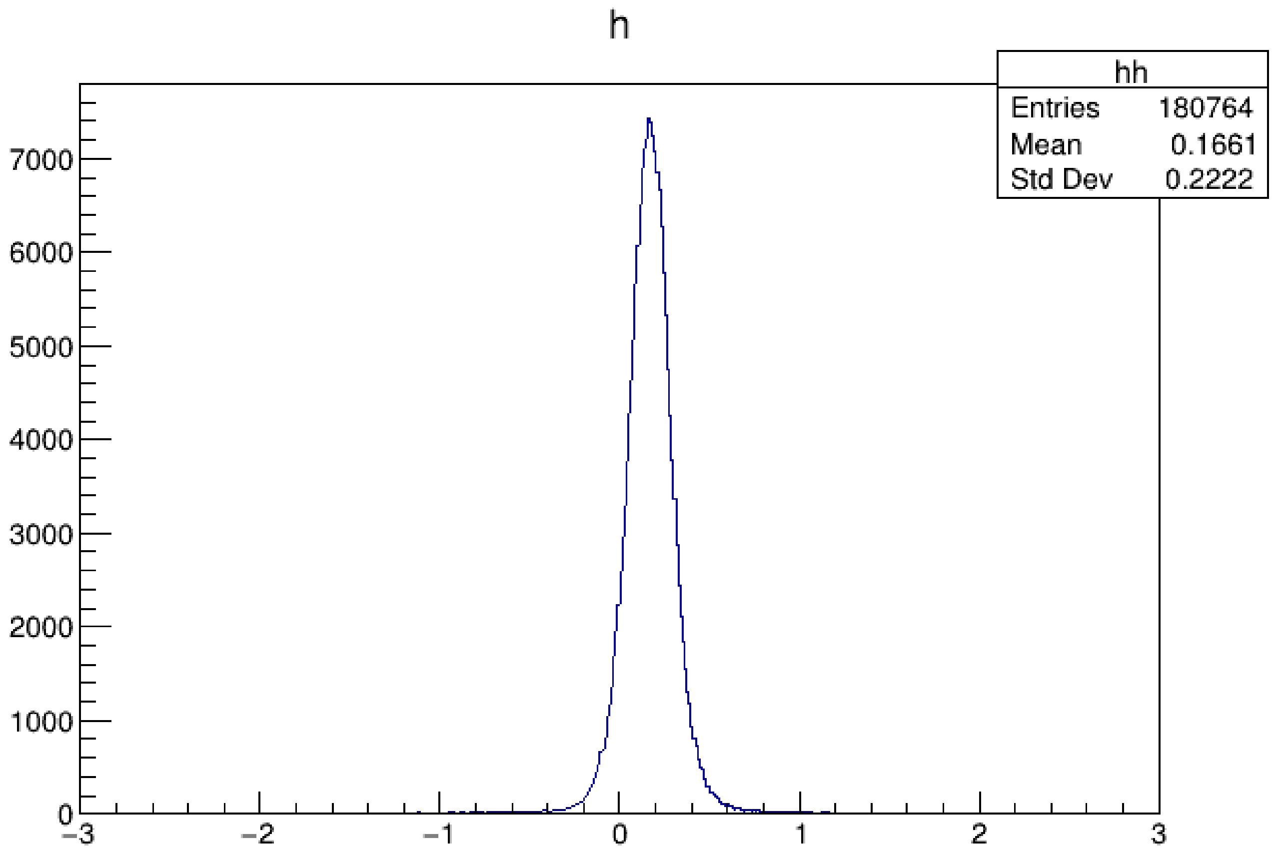
Timing calibration

- Calibrate dt(OQ) in the left conf. and test dt(OQ) in right conf.
- Center cut and dx cut are given.



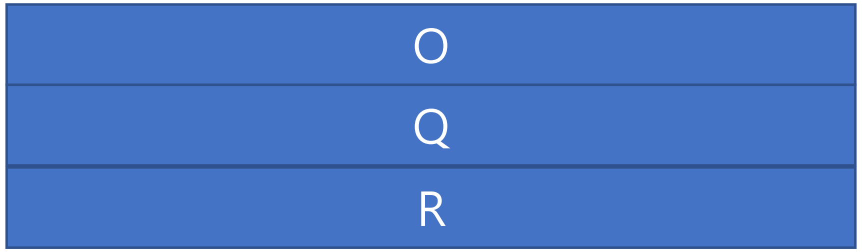


Timing calibration



Timing Calibration

- Calibrate dt(OR) and dt(RQ) in the left conf. and test in right conf.
- No cut is given.



Timing calibration

- Mean value : 0.2679 , 0.3666, 0.6332
- It is correct in 100ps order. Is it coincidence? or really correct?