

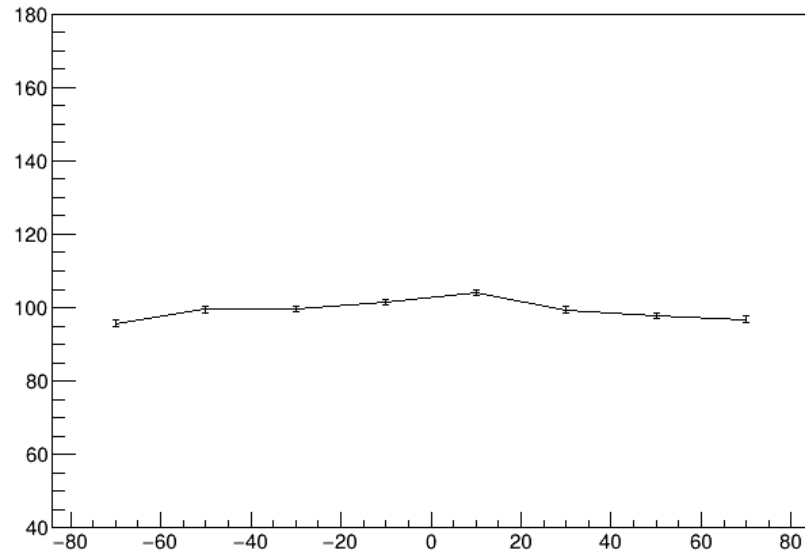
Weekly Meeting

2020/03/25

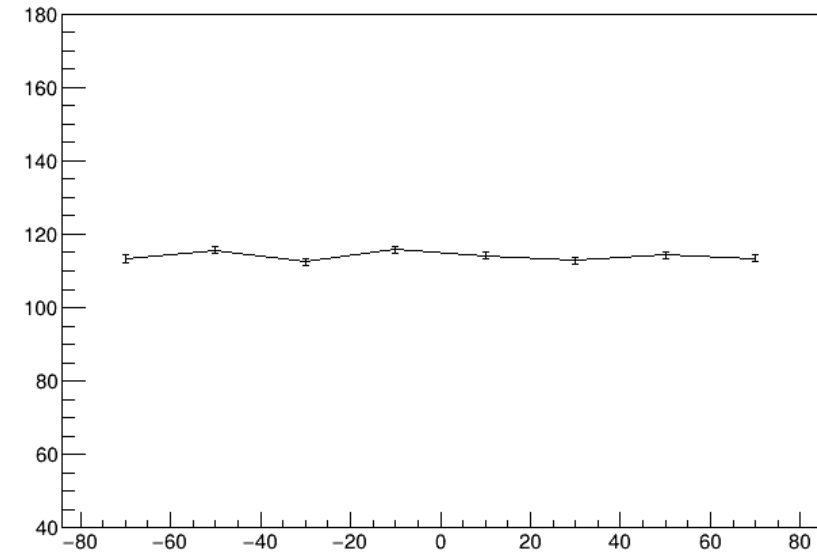
ByungChan Lee

Time Resolution

10cm avg

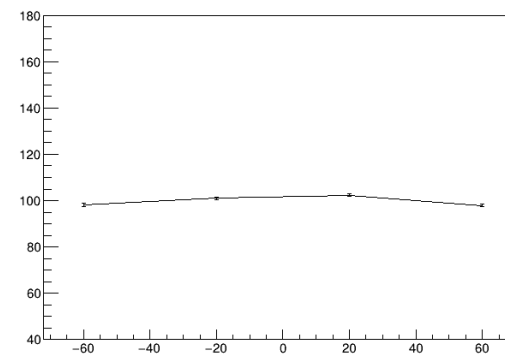


5cm avg

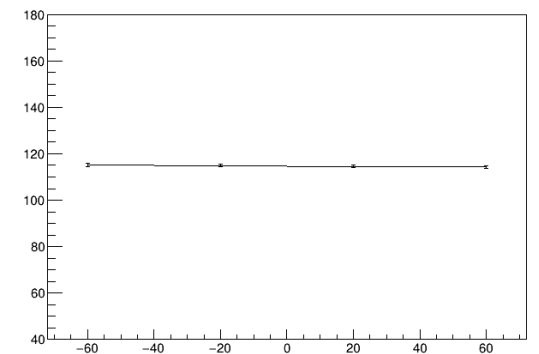


- Linear interpolation
- 3 Bars average
- 10 cm vs 5 cm
- 99 ps vs 114 ps

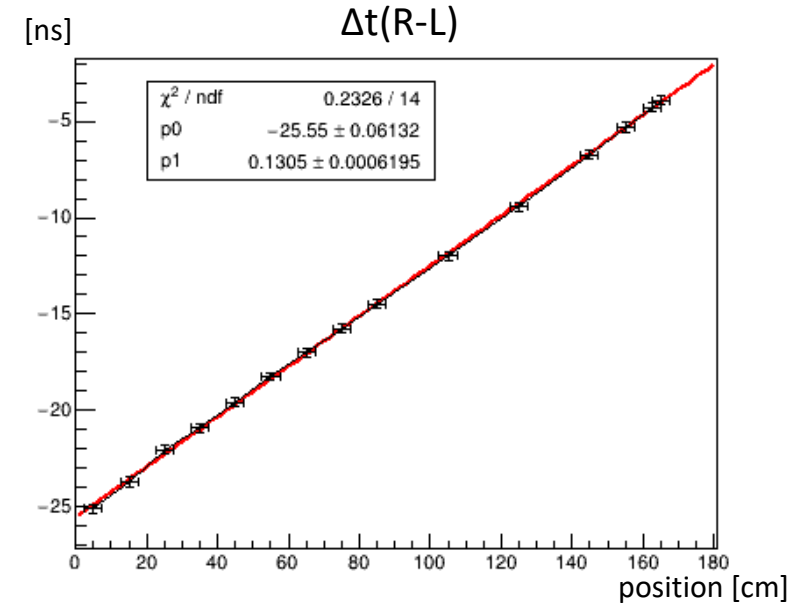
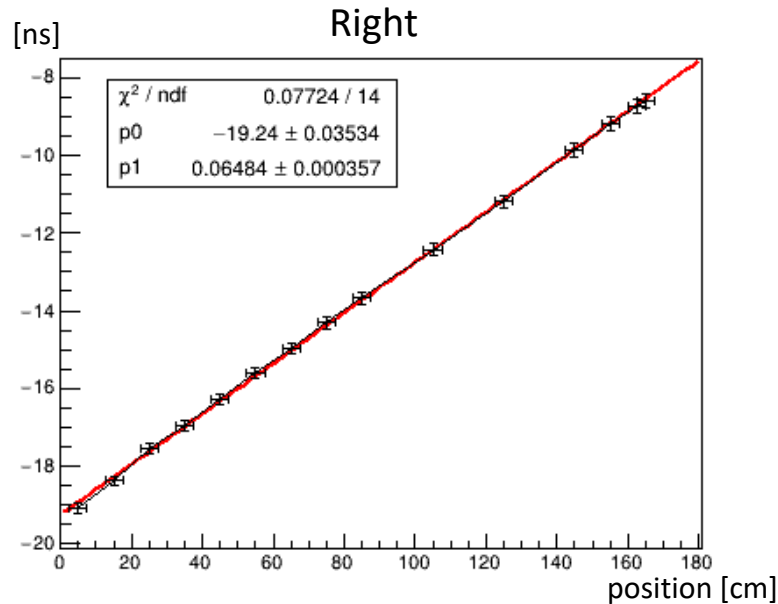
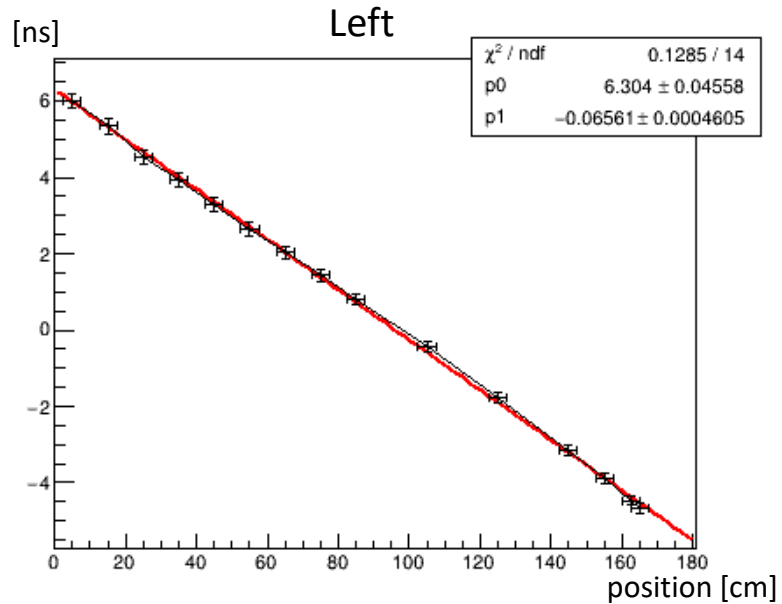
10cm avg



5cm avg



Speed

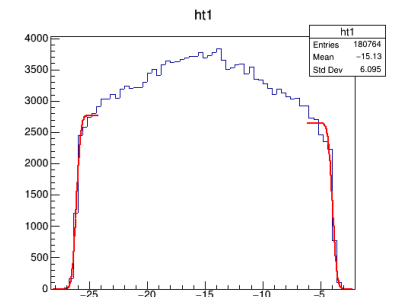


- x : position (0cm : Right PMT side)
- y : Mean of time distribution
- Linear Fitting (not include point errors)

error : $\pm 2.5\text{cm}$
 error : 1 sigma

- Right : 15.24 $\pm$ 0.11 [cm/ns]
- Left : 15.42 $\pm$ 0.08 [cm/ns]
- Δt : 15.33 $\pm$ 0.07 [cm/ns]

**** Bar Q**
 15.318 $\pm$ 0.007 [cm/ns]



Speed

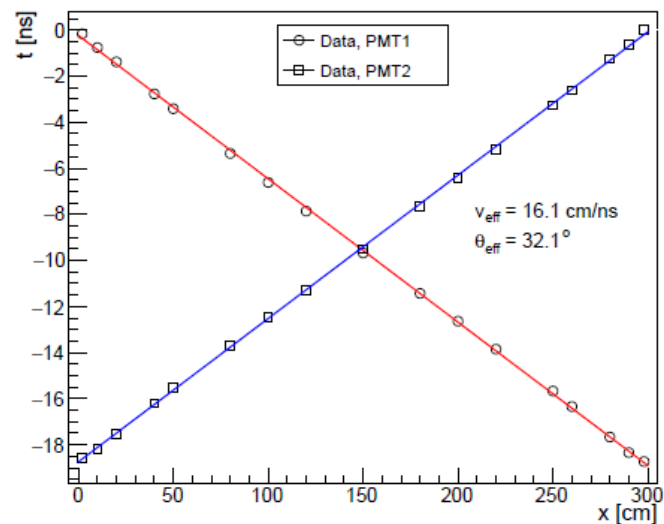


Figure 6: Time as measured by PMT1 and PMT2 as a function of the interaction position x along the bar.

A. Blondel, D. Breton, A. Dubreuil, A. Khotyantsev, A. Korzenev, J. Maalmi et al., Study of timing characteristics of a 3 m long plastic scintillator counter using waveform digitizers, Nucl. Instrum. Meth. A877 (2018) 9–15, [1610.05667]

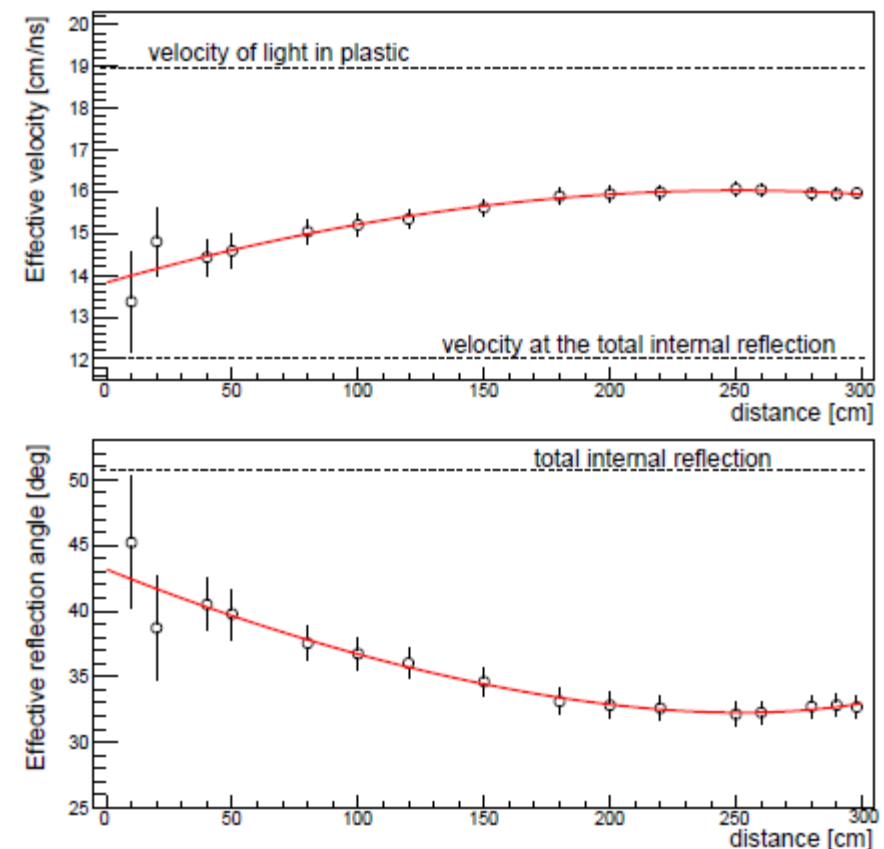
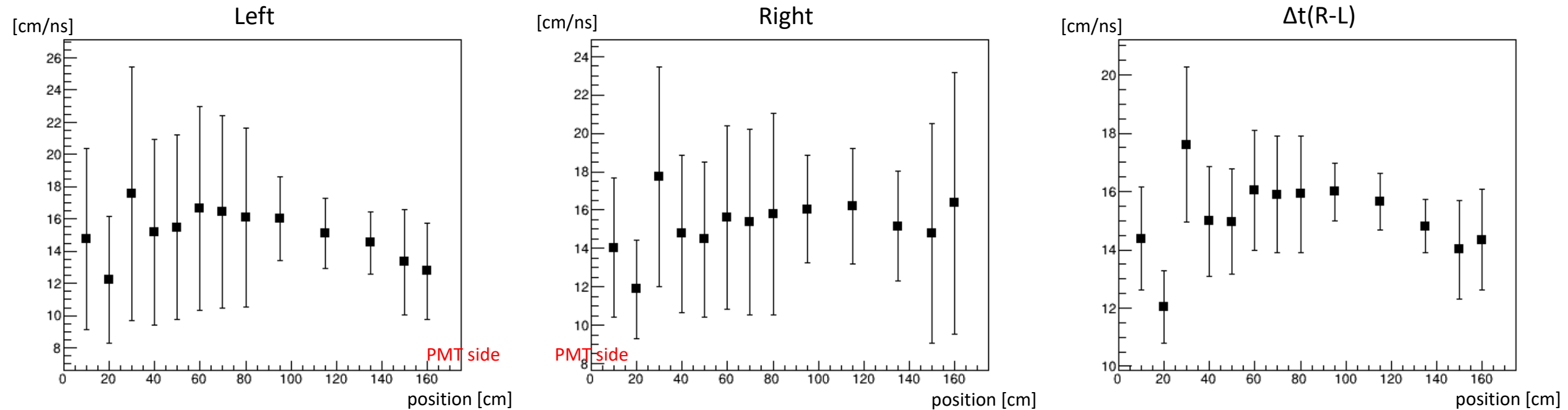


Figure 7: The effective average signal velocity along the x axis (top) and the corresponding reflection angle (bottom) as a function of position along the bar, as viewed by PMT1.

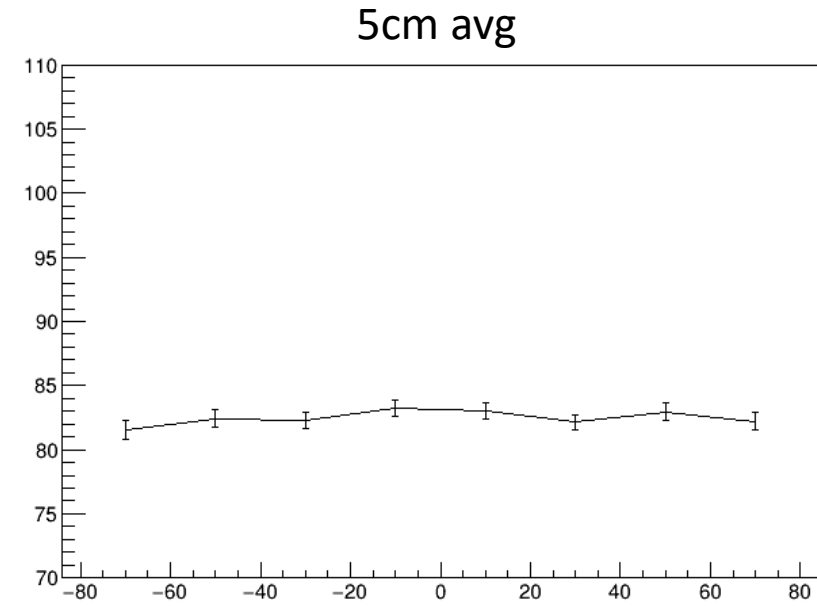
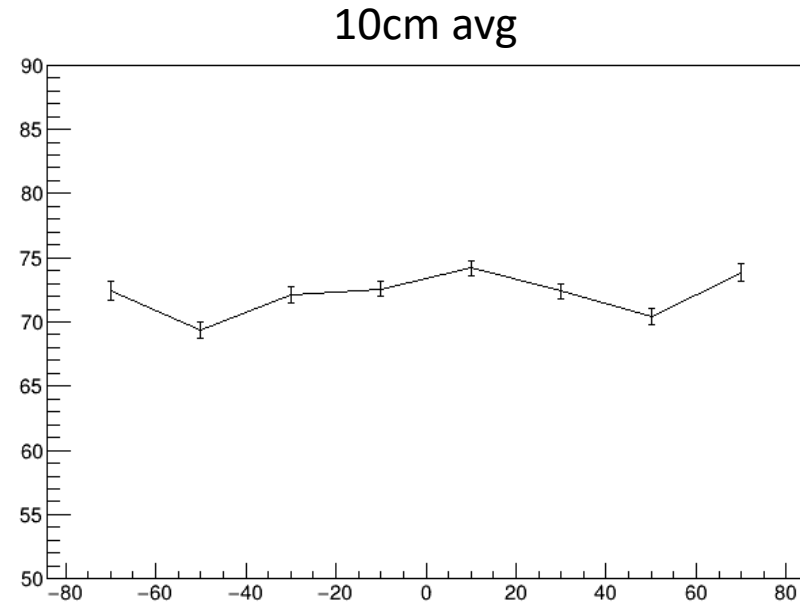
Speed



- $\Delta x/\Delta t$
- Large Error

Back up

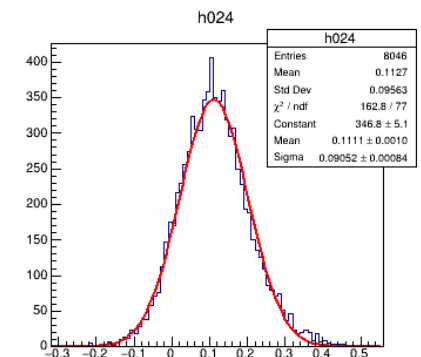
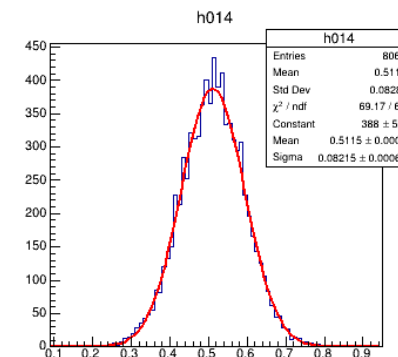
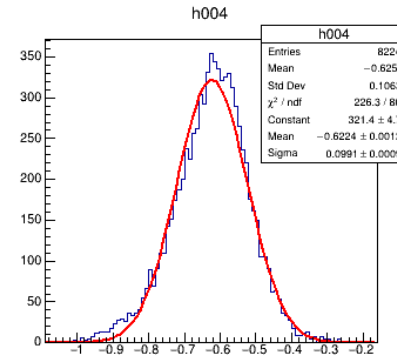
Time Resolution



- Bessel + Linear interpolation
- 3 Bars average
- 10 cm vs 5 cm

Time Resolution Revised

- $t_i : t_{bar_i} - (\sum_j t_{bar_j} - t_{bar_i})/2 - t_{correction}$
- $\sigma_i = \sqrt{(12\sigma_i^2 - 2\sum_j \sigma_j^2)/9}$
- $t_{correction} = 1.5 * (1 - i) * \Delta y / (c * \cos\theta)$



- $\chi^2/\text{NDF} < 3$
- Thickness : 10cm
- cosine > 0.8

- $\chi^2/\text{NDF} < 3$
- Thickness : 5cm
- cosine > 0.8

- Time Resolution 0 : 84.7 ± 0.9 [ps]
- Time Resolution 1 : 53.5 ± 1.4 [ps]
- Time Resolution 2 : 75.9 ± 1.0 [ps]
- Time Resolution avg : 72.2 ± 0.6 [ps]

- Time Resolution 0 : 91.1 ± 1.0 [ps]
- Time Resolution 1 : 68.1 ± 1.3 [ps]
- Time Resolution 2 : 86.4 ± 1.0 [ps]
- Time Resolution avg : 82.5 ± 0.6 [ps]

Backup

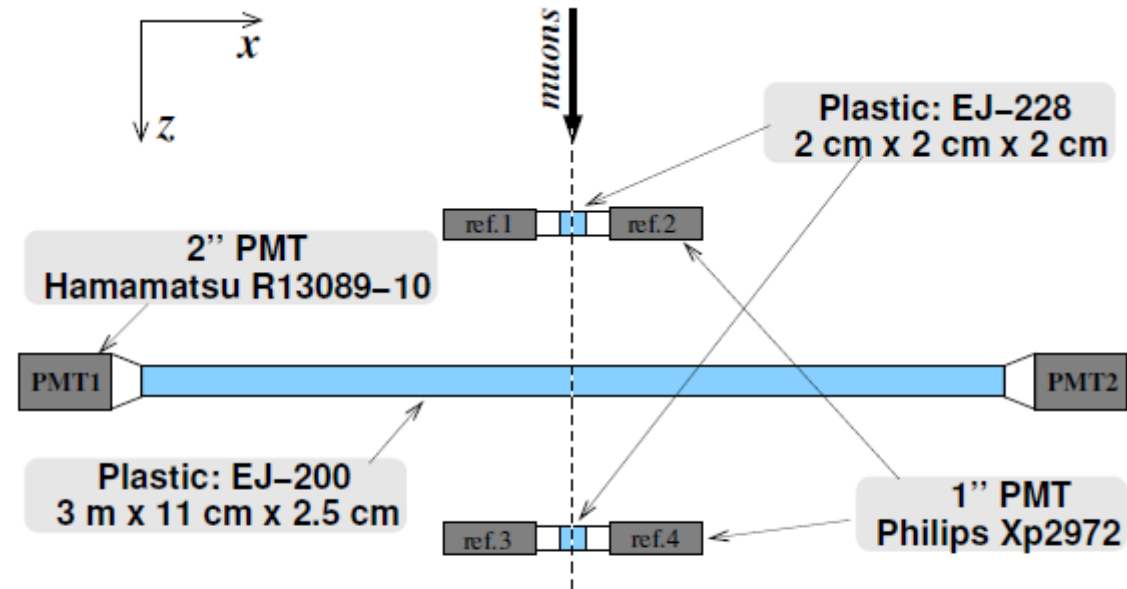


Figure 1: Schematic top view of the experimental setup. The outputs of all 6 PMTs are connected to a single acquisition module.