

20171215 STATUS REPORT

Ahram lee

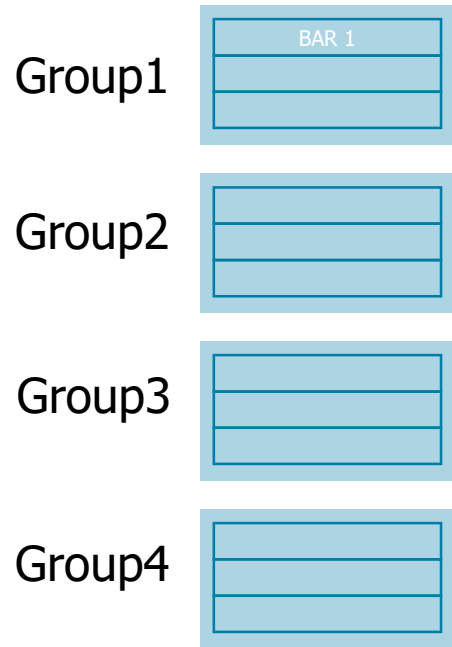
CERN Data Information

/dataRC_old/	#181	07-21 (3h)	11,528 entries	4bar trigger, th=200 12bar trigger
	#202		19,632 entries	
/dataRC/	#48	08-17 ~ 08-18 (2d)	218,112 entries	6bar trigger, th=100
	#76	08-21 ~ 08-22 (2d)	177,860 entries	
	#120	08-25 ~ 08-29 (4d)	928,000 entries	
	#151	08-30 ~ 09-06 (7d)	1,502,436 entries	
	#170	bhokim($\sim 10/2$)	434,340 entries	
	#172	bhokim($10/2 \sim$)	204,244 entries	
	#174		518,896 entries	

Time resolution

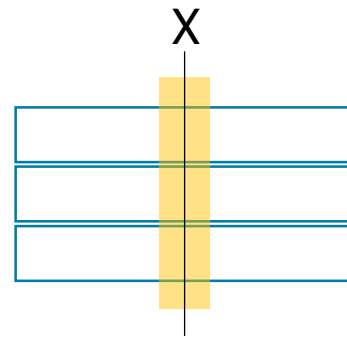
On various positions – analysis method

1. Grouping



2. Region selecting

select the events within $\pm 5\text{cm}$ from the position(X).



$$X \in \{-80, -70, \dots, 0, \dots, 70, 80\}$$

3. dT distribution fitting & Reducing

$$dTmean_x = Tmean_1 - Tmean_2$$

$$dTmean_y = Tmean_2 - Tmean_3$$

$$dTmean_z = Tmean_3 - Tmean_1$$

or

$$dTfast_x = Tfast_1 - Tfast_2$$

$$dTfast_y = Tfast_2 - Tfast_3$$

$$dTfast_z = Tfast_3 - Tfast_1$$

$$\sigma_x^2 = \sigma_1^2 + \sigma_2^2$$

$$\longrightarrow \sigma_y^2 = \sigma_2^2 + \sigma_3^2$$

$$\sigma_z^2 = \sigma_3^2 + \sigma_1^2$$

Time resolution

On various positions – analysis method

Error propagation

For $f(A, B, C)$,
$$(\Delta f)^2 = \left(\frac{\partial f}{\partial A}\right)^2 (\Delta A)^2 + \left(\frac{\partial f}{\partial B}\right)^2 (\Delta B)^2 + \left(\frac{\partial f}{\partial C}\right)^2 (\Delta C)^2 + 2[\dots \text{cov}(A, B), (B, C), (C, A) \dots]$$

Using the error propagation above (ignoring covariance terms),

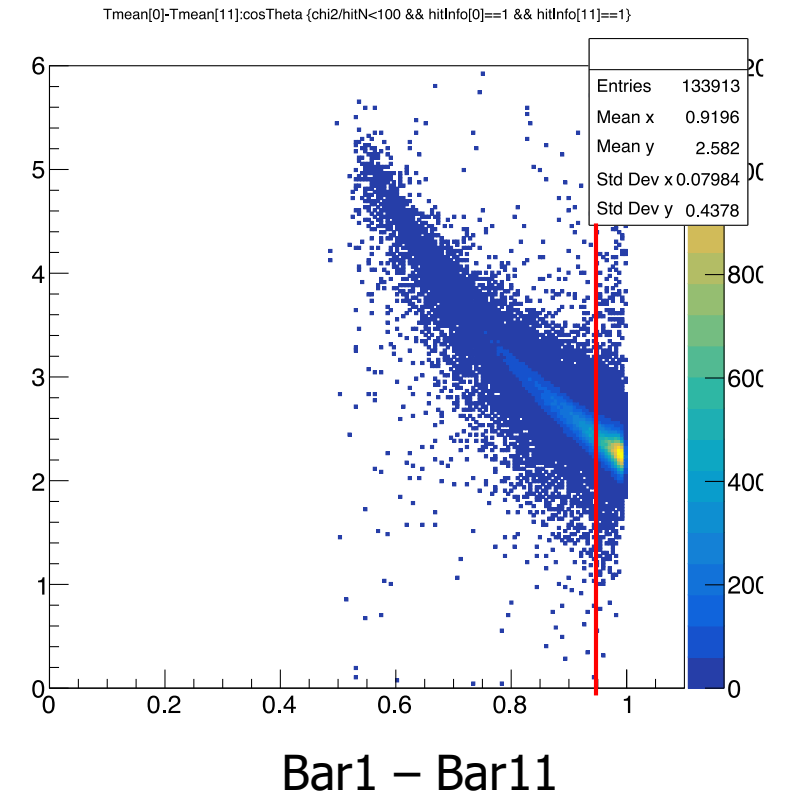
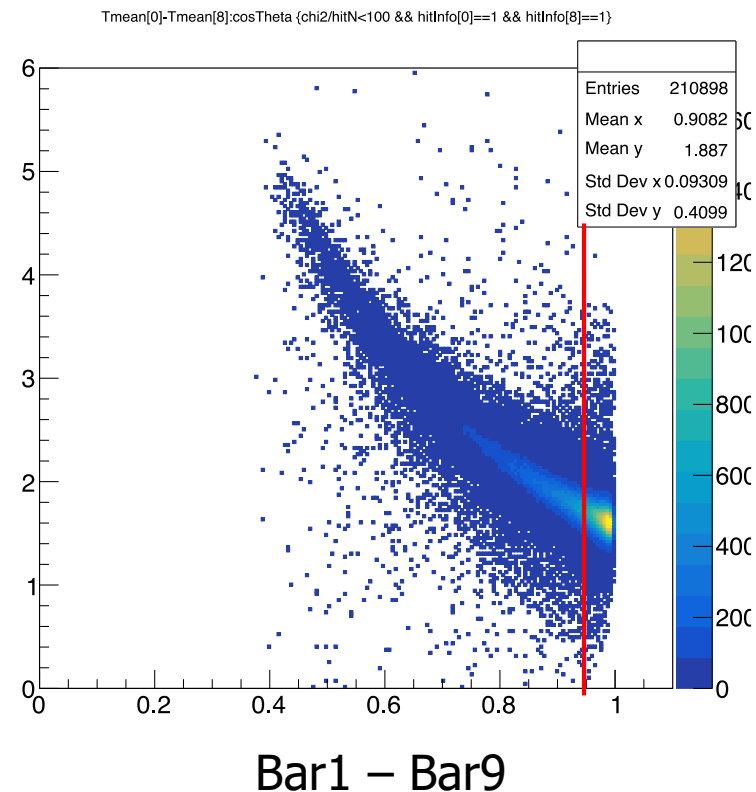
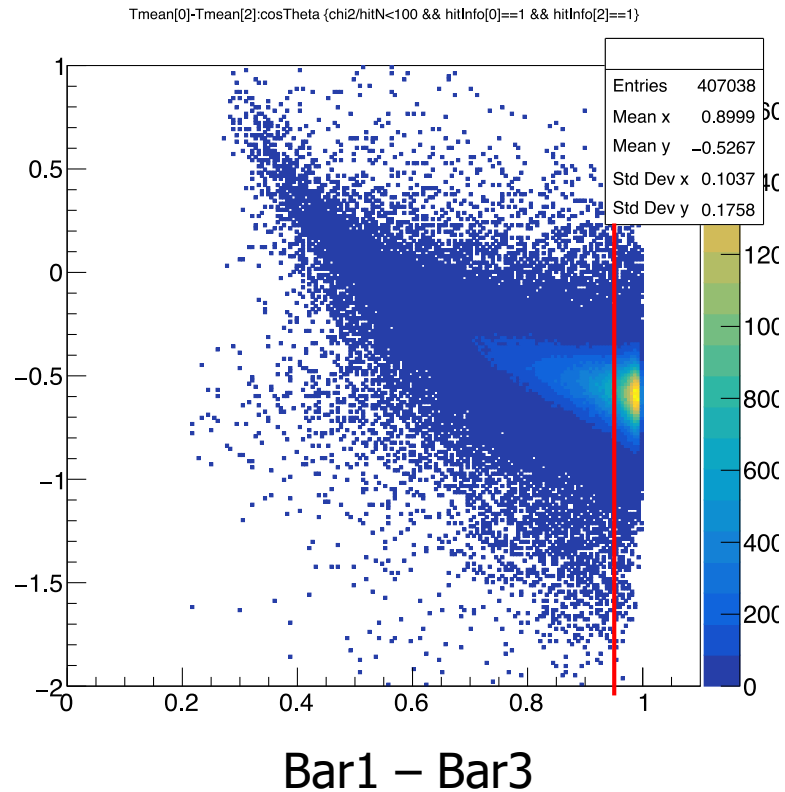
For the time-resolution of each bar

$$\begin{aligned} \sigma_1 = \sqrt{\frac{\sigma_x^2 - \sigma_y^2 + \sigma_z^2}{2}} &\longrightarrow (\Delta\sigma_1)^2 \cong \left(\frac{\partial f}{\partial \sigma_x}\right)^2 (\Delta\sigma_x)^2 + \left(\frac{\partial f}{\partial \sigma_y}\right)^2 (\Delta\sigma_y)^2 + \left(\frac{\partial f}{\partial \sigma_z}\right)^2 (\Delta\sigma_z)^2 \\ &= \frac{\sigma_x^2 (\Delta\sigma_x)^2 + \sigma_y^2 (\Delta\sigma_y)^2 + \sigma_z^2 (\Delta\sigma_z)^2}{2(\sigma_x^2 - \sigma_y^2 + \sigma_z^2)} \\ &\neq (\Delta\sigma_x)^2 + (\Delta\sigma_y)^2 + (\Delta\sigma_z)^2 \end{aligned}$$

Time resolution

Angle dependency

x: cosTheta, y: dTmean



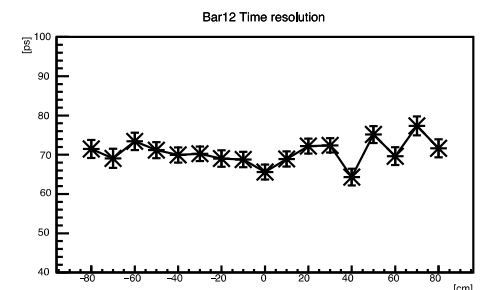
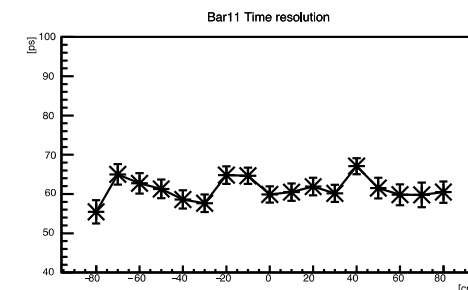
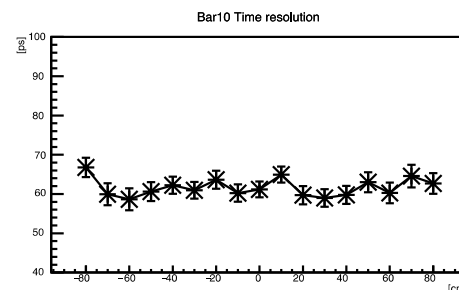
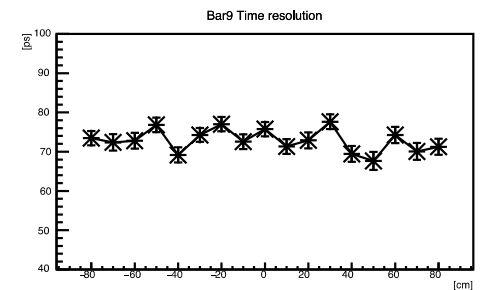
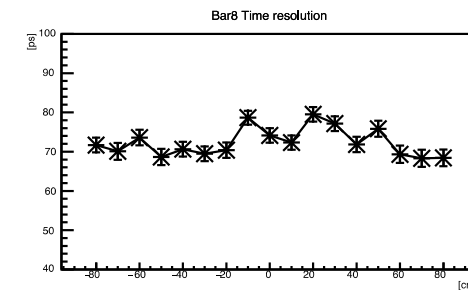
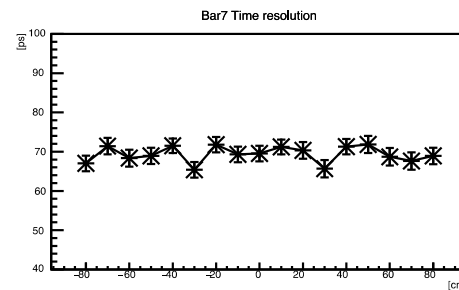
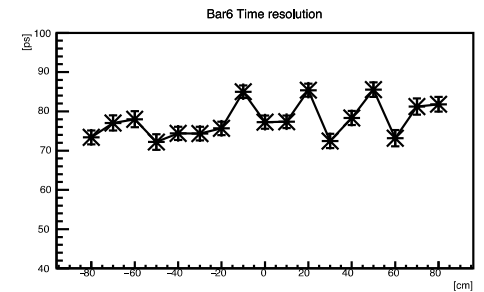
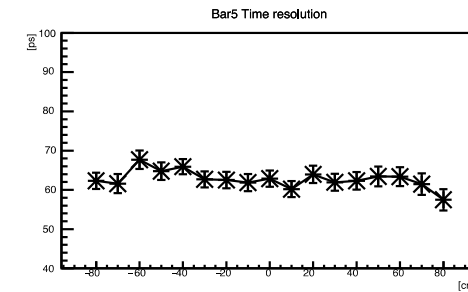
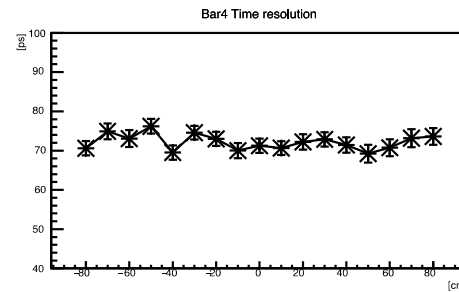
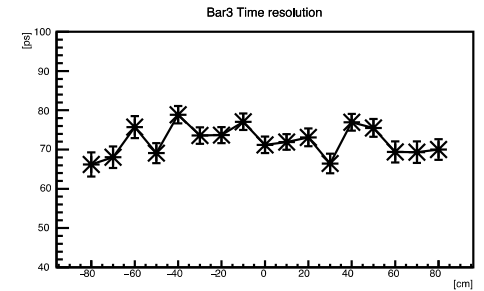
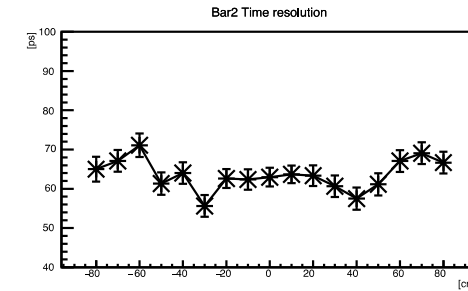
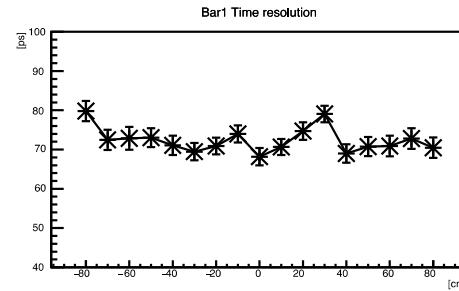
Time resolution

On various positions

#151

With $\cos\theta > 0.95$,
different error propagation

bar	1	2	3
	4	5	6
	7	8	9
	10	11	12



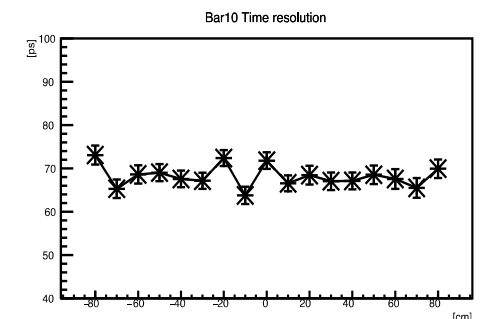
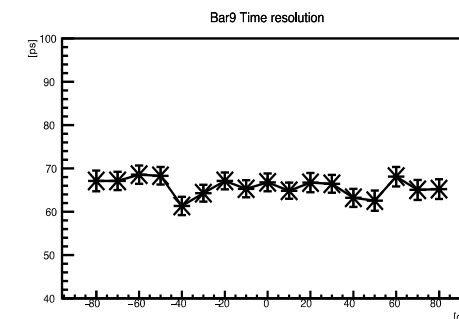
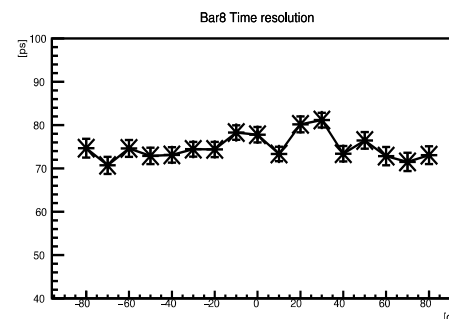
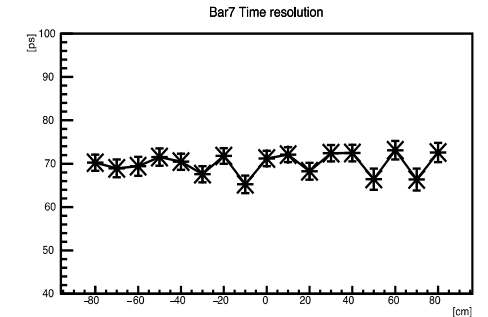
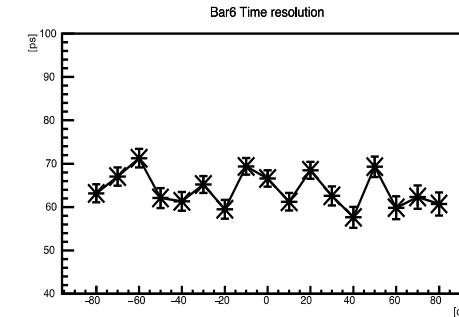
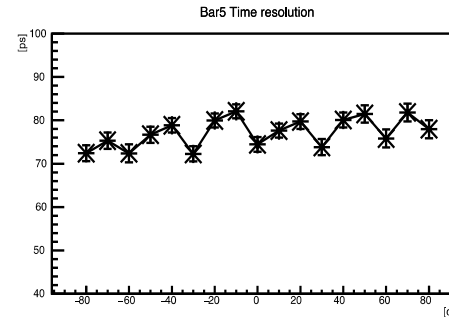
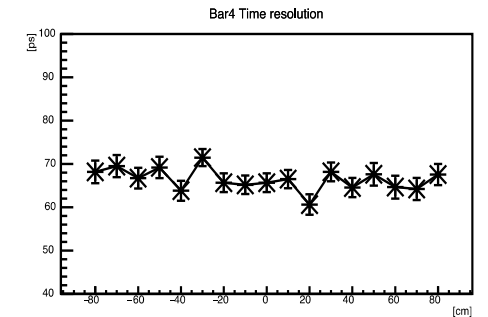
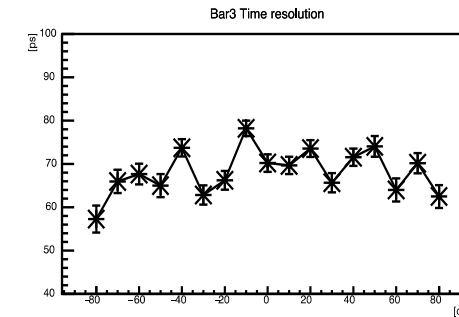
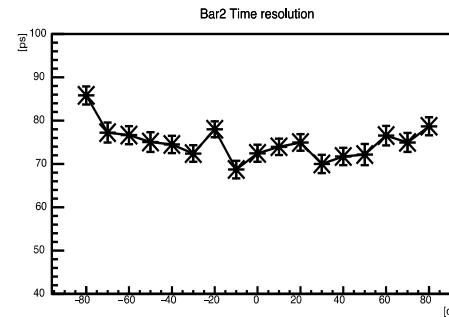
Time resolution

On various positions

#151

With $\cos\Theta > 0.95$,
different error propagation

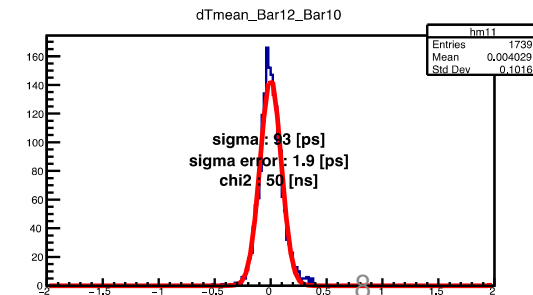
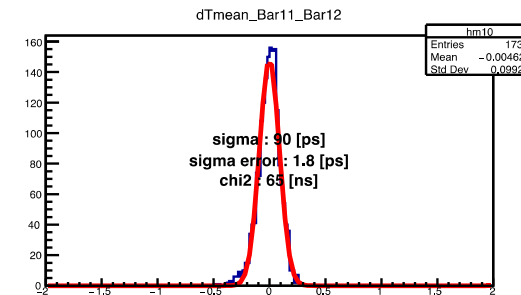
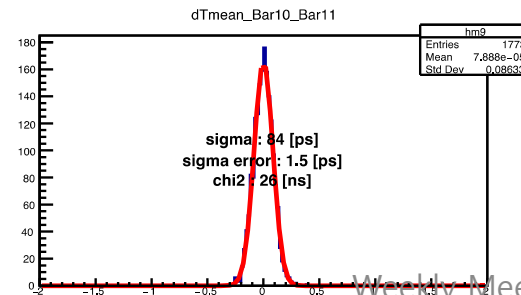
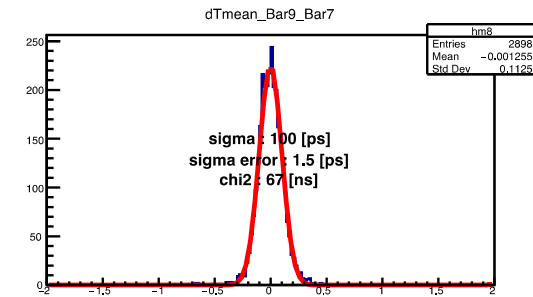
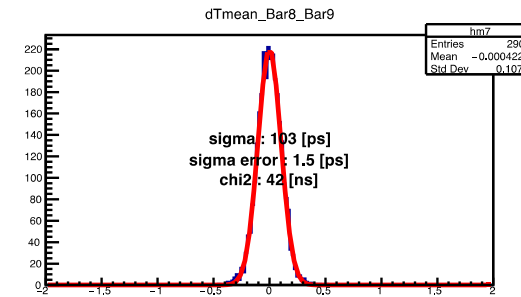
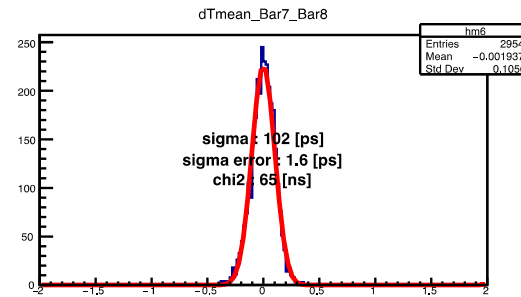
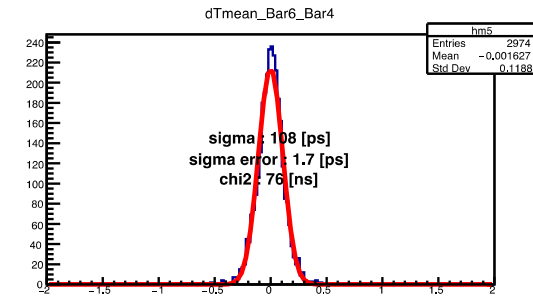
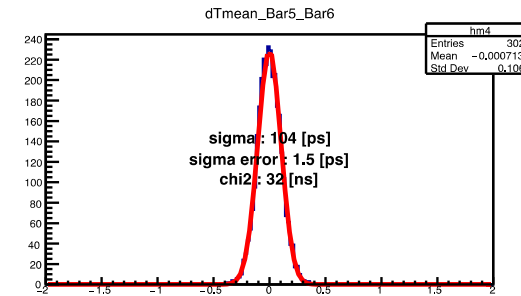
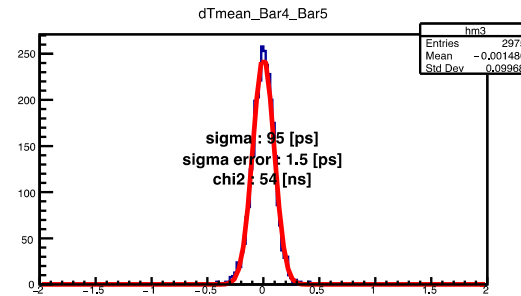
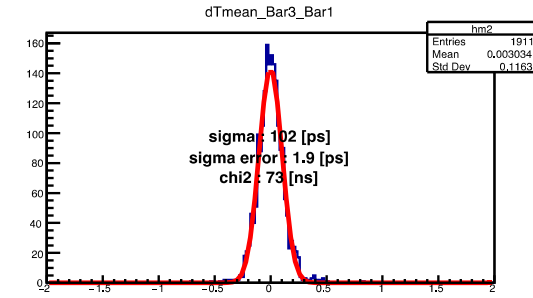
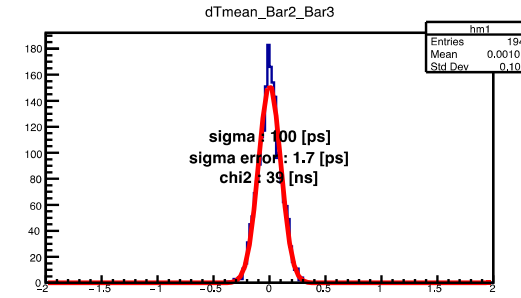
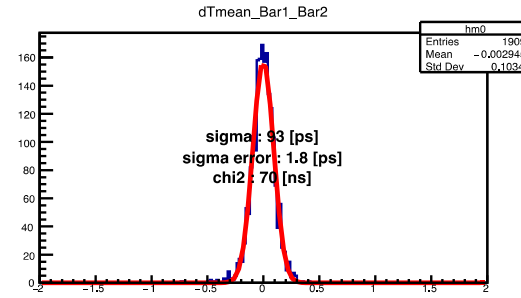
bar	2	3	4
	5	6	7
	8	9	10



Time resolution #151

At 0cm(center)
Grouping 0
(123/456/789/101112)
Bin# = 200

$\text{Chi2}/\text{hitN} < 100$
 $\text{Costheta} > 0.95$
 $-5\text{cm} < dT < +5\text{cm}$



Time resolution

Without position division

#151

Bar#	Resolution [ps] (error)	Bar#	Resolution [ps] (error)
1	70 (1.1)	7	74 (0.9)
2	69 (1.1)	8	74 (0.9)
3	75 (1.0)	9	74 (0.9)
4	72 (0.9)	10	64 (1.1)
5	64 (1.0)	11	67 (1.0)
6	81 (0.8)	12	72 (1.0)

Average time-resolution ~ 71 ps
* light speed ~ 14.6 cm/ns
→ the position-resolution ~ 1.04 cm

Position resolution #151

Chi2/hitN < 100
Average ~1.09 cm

Bar#	Resolution [cm] (error)
1	1.00 (0.001)
2	1.06 (0.001)
3	1.11 (0.001)
4	1.12 (0.001)
5	1.10 (0.001)
6	1.13 (0.001)

Bar#	Resolution [cm] (error)
7	1.18 (0.001)
8	1.18 (0.001)
9	1.09 (0.001)
10	1.03 (0.001)
11	1.01 (0.002)
12	1.02 (0.001)

