LAMPS Meeting

August 13, 2020   Kang, Byungmin

Scintillator for BTOF

Flat Scint

1500   150

Guide Scint

90

45

- Readout side area=
Flat: 90(W) X 10(T)=
900 mm^2
Guide: 45(W) X
10(T)= 450 mm^2

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Cosmic Test Setup

Figure: GM: Guide MPPC, FP: Flat PMT, GP: Guide PMT
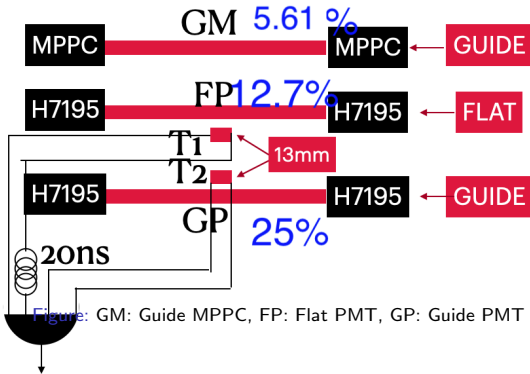
$$CollectionEff = \frac{SensitiveArea}{ReadArea} * Q.E.$$

- H7195 (Cathode $\phi = 46$ mm) is PMT
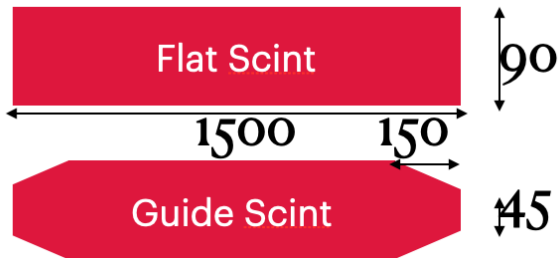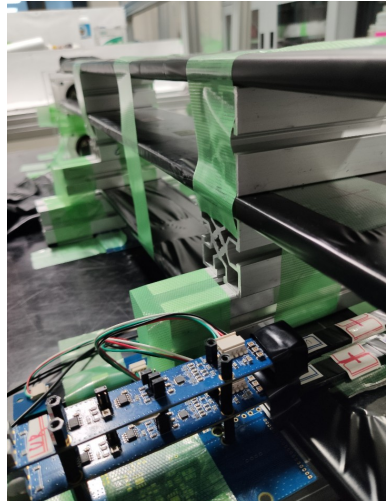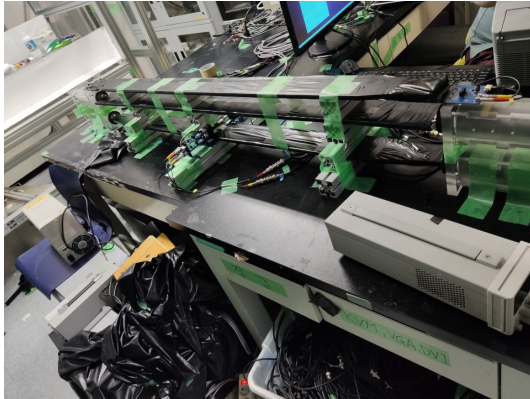- 8 MPPC(S13360-3050PE; Area = 9 mm^2) is used.

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Cosmic Test Setup

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Time resolution(After Timewalk Correction)

GM	FM	GP	nev
297±9.2	233±11.7	115.3±23.6	1103

$$\Sigma\sigma_t^2 = 394$$

Table: Previous result, GM had Bad optical coupling

- ToF was determined by GM,FM,GP.

name	Det	T1	T2	nev	$\sqrt{T_1^2 + T_2^2}$
GM	218±2.1	69±6.6	96.9±4.7	4423	119
FP	251±2.4	63.6±9.5	101±6.0	4486	119
GP	169±1.9	46.9±6.9	108±3.0	4450	117
$\Sigma\sigma_t^2$	373	Note: ± is NOT from TW; Just from Gaussian Fit.			

Table: Current result: Guided seg shows better resolution.

- ToF is determined with Detector, and T1,T2.

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Rough σ_t Estimation, for Different MPPC

$$\sigma_t^2 = \sigma_0^2 + \sigma_{ph}^2/N_{ph}$$
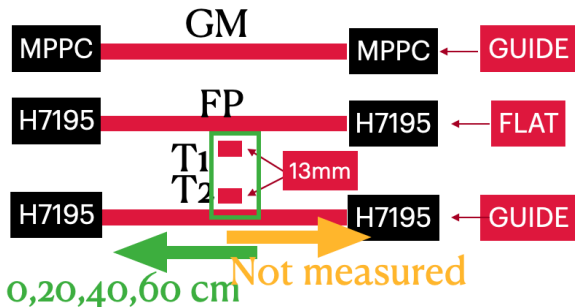
Compare GM and GP: $\frac{GPN_{ph}}{GMN_{ph}} = 4.5$

$$\sigma_{GM}^2 - \sigma_{GP}^2 = 3.5\sigma_{ph}^2/GPN_{ph} = 137.7^2 = 3.5 * 73^2; \quad \sigma_0 = 152$$

If we use five 6×6 mm^{2}MPPCs, we could achive

$$\sigma_{66} = \sqrt{\sigma_0^2 + \sigma_{ph}^2 * 4.5 * \frac{72mm^2}{180mm^2}} = 180ps$$

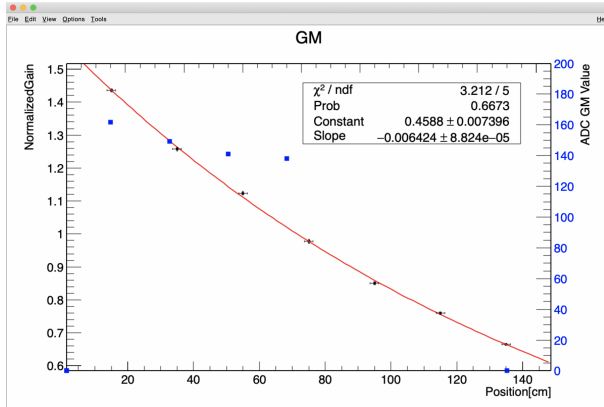The same way, 8×4 by 4 MPPC gives ~ 183ps

Attenuation measurement

- Attenuation was measured by moving trigger position.(LR gain Offline Callibrated)
- Attenuation:
  GM=156 cm
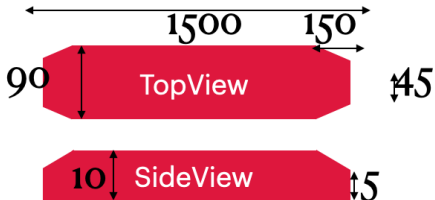 GP= 115 cm
  FP= 88 cm
- GM Value is not stable on edge

$$G_{L,cal} = \frac{G_L}{\sqrt{G_L * G_R}}; \quad G_{R,cal} = \frac{G_R}{\sqrt{G_L * G_R}} * \frac{G_{L,center}}{G_{R,center}}$$

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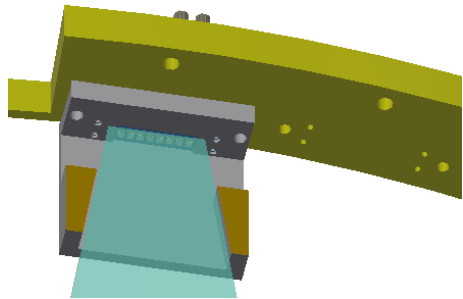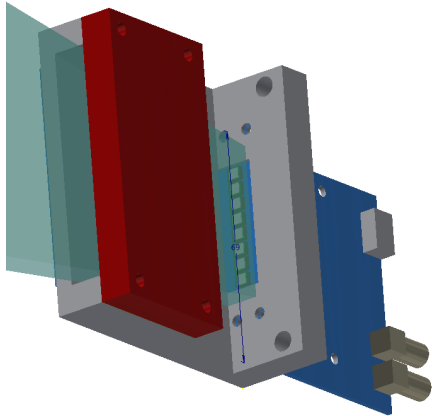
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Attenuation data

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Another type Scintillator(On Plan)

1500   150

90   TopView   45

10   SideView   5

- ReadArea: $450 \to 225 \text{ mm}^2$

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BTOF Frame&Board Holder

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FTOF Frame&Board Holder

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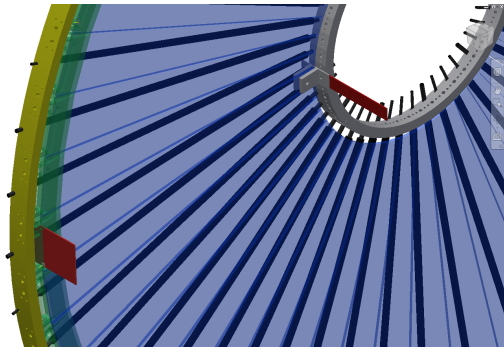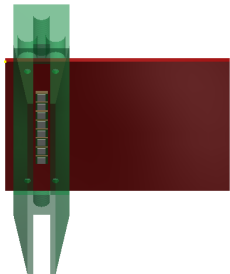
Summary

- Guided Scintillator shows better time resolution.
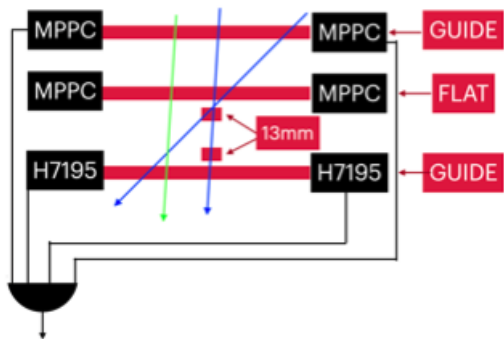- ToF can be improved, by increasing N_{ph} on MPPC.
- BTOF/FTOF Frame design is ongoing.

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BACKUP

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Previous Setup

- Photon detector on FLAT seg is different.

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Collection Efficiency

Det	Sensitive	Readout	Q.E.
GM	9 mm^2*8(# MPPC)	450 mm^2	0.35
FP	46 mm*10 mm	900 mm^2	0.25
GP	FullCover	450 mm^2	0.25

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GP Attenuation

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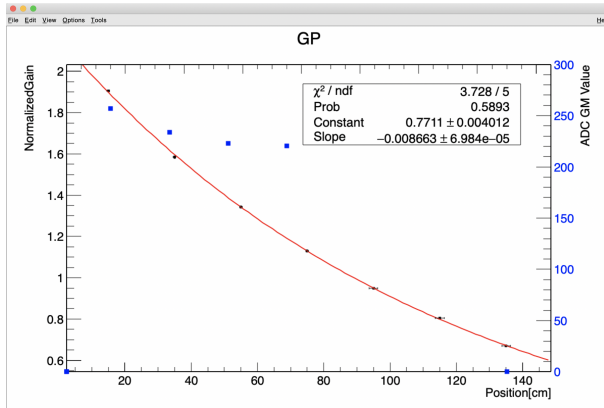
FP Attenuation

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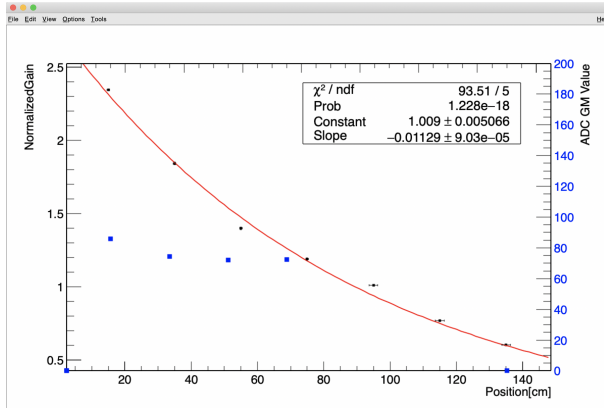
Time resolution(Date: 0813)

GM	FM	GP	nev
297±9.2	233±11.7	115.3±23.6	1103

$$\Sigma \sigma_t^2 = 394$$

Table: Previous result, GM had Bad optical coupling

- ToF was determined by GM,FM,GP.

name	Det	T1	T2	nev	$\sqrt{T_1^2 + T_2^2}$
GM	212±4.3	87±10.5	83±11.0	1299	121
FP	223±4.2	65.6±14.3	101±9.3	1326	120
GP	168±1.9	39±16.5	114±5.6	1308	121
$\Sigma \sigma_t^2$	373→351	-	-	-	-

Table: Current result: Guided seg shows better resolution.

- FP resolution was improved, after rasing PMT gain.(MPV $\sim 80 \rightarrow \sim 120$)

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