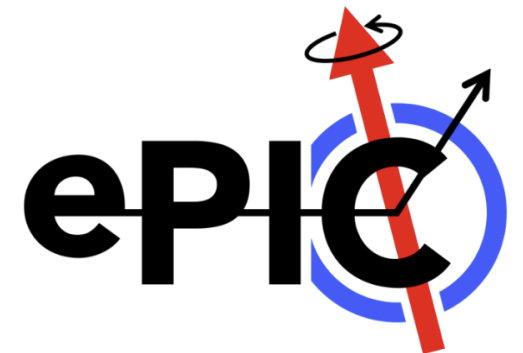


BIC Lightguide study

Bo Gyeong SEO, Jun Seop SHIN, Shin Hyung KIM

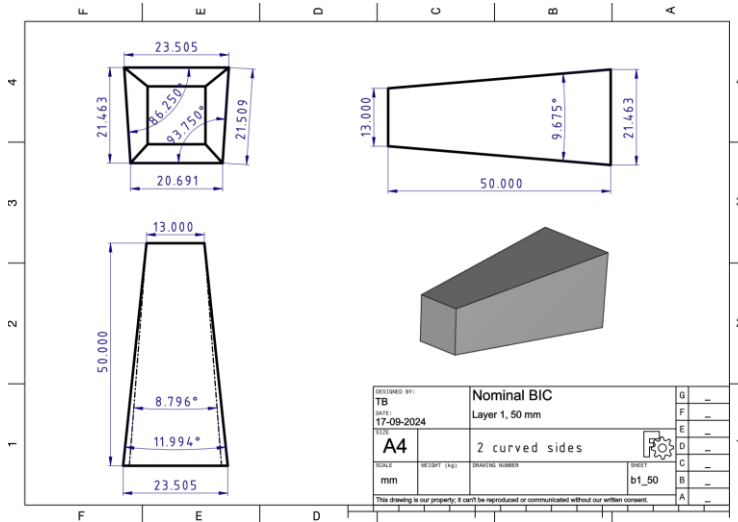
Department of Physics, Kyungpook National University



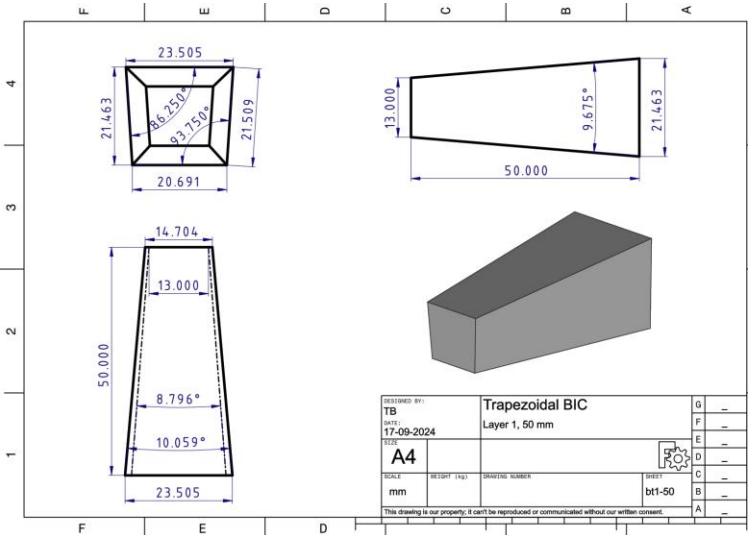


Recap) Lightguide shape

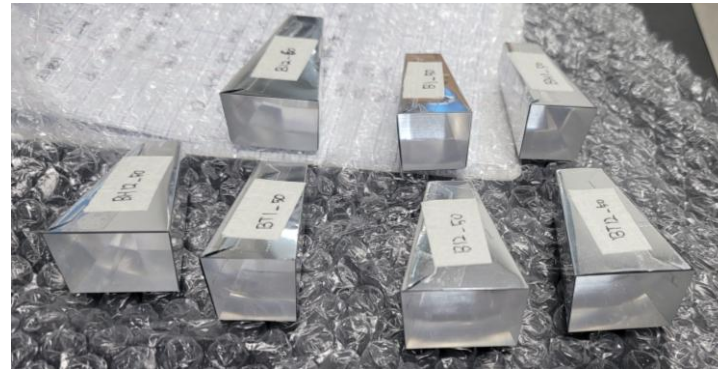
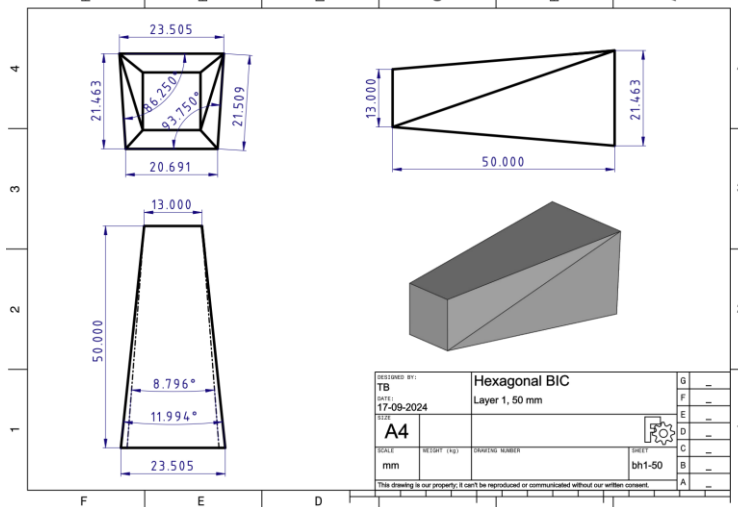
Nominal (B1-50)



Trapezoidal (BT1-50)

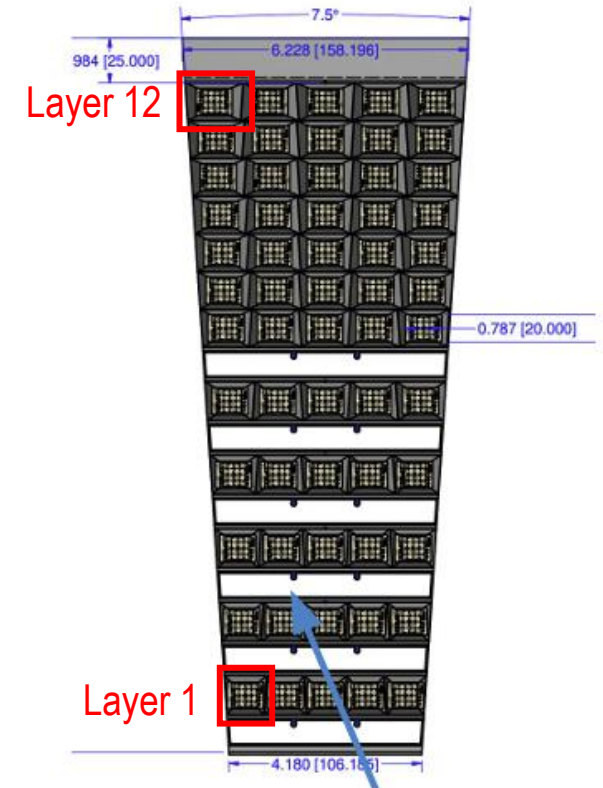


Hexagonal (BH1-50)



Cast acrylic lightguide wrapped with Al Mylar

Sector End View

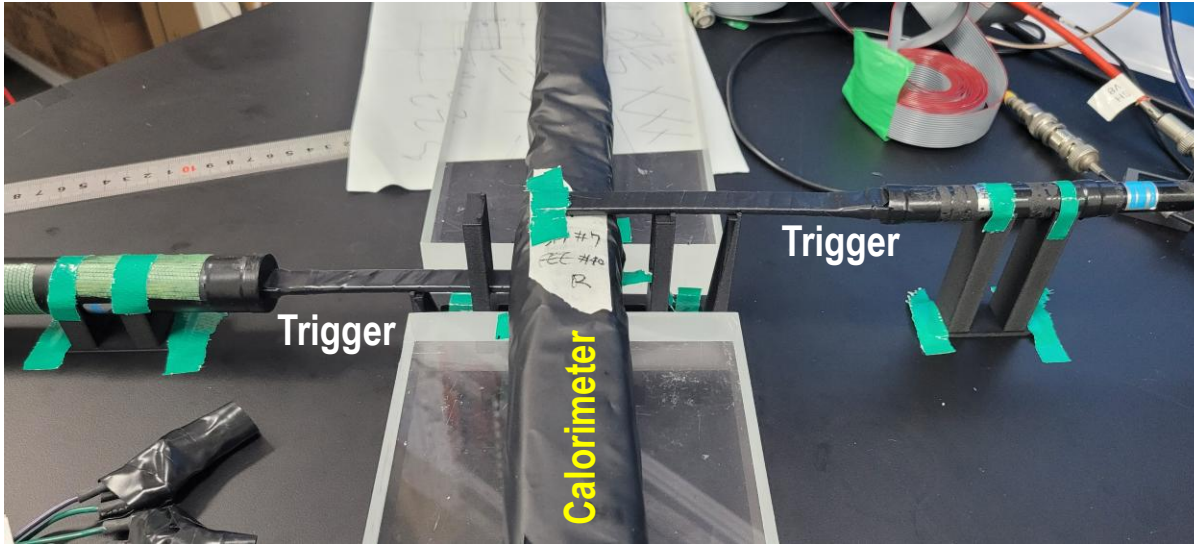


Pb/SciFi Layer (1.4X0)

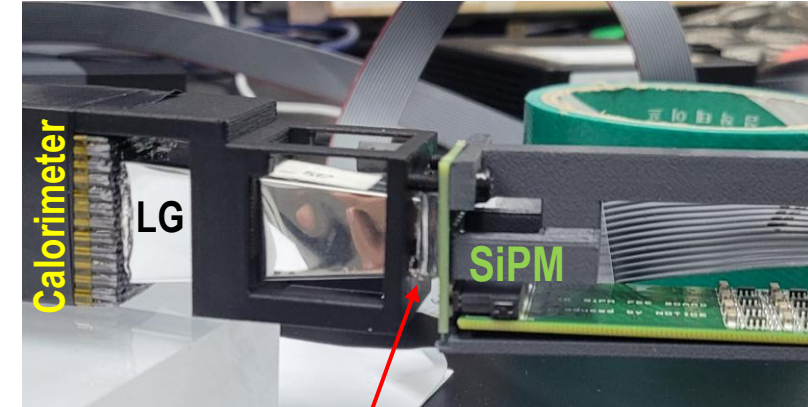
- 5 readout cells per layers
- 1 light-guide per cell

Barrel Imaging Calorimeter
Technical Drawings
T. O'Connor, K. Bailey

Recap) Cosmic test setup

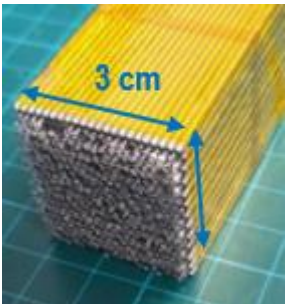


Cosmic test setup

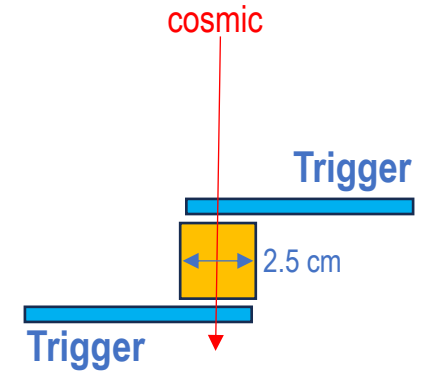
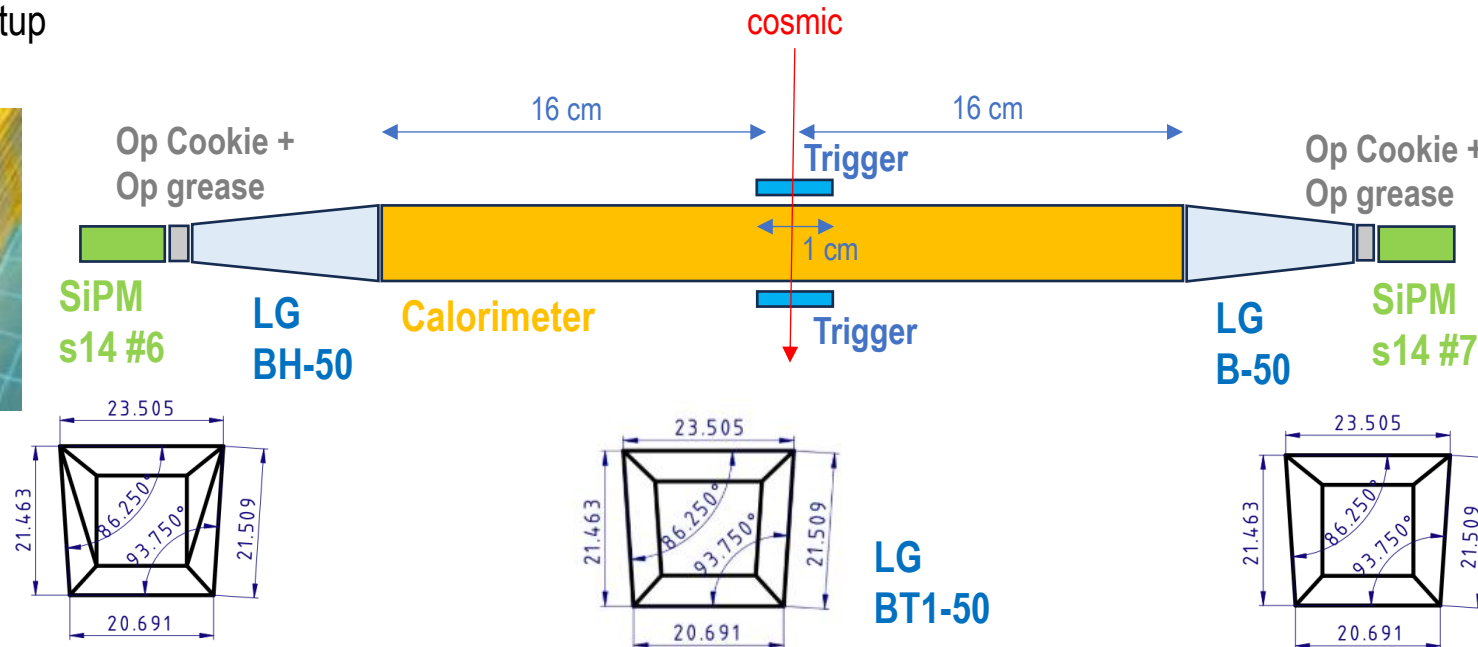


Optical cookie
+ Optical grease

SiPM : S14
Bias Voltage : 40.5 – 41 V

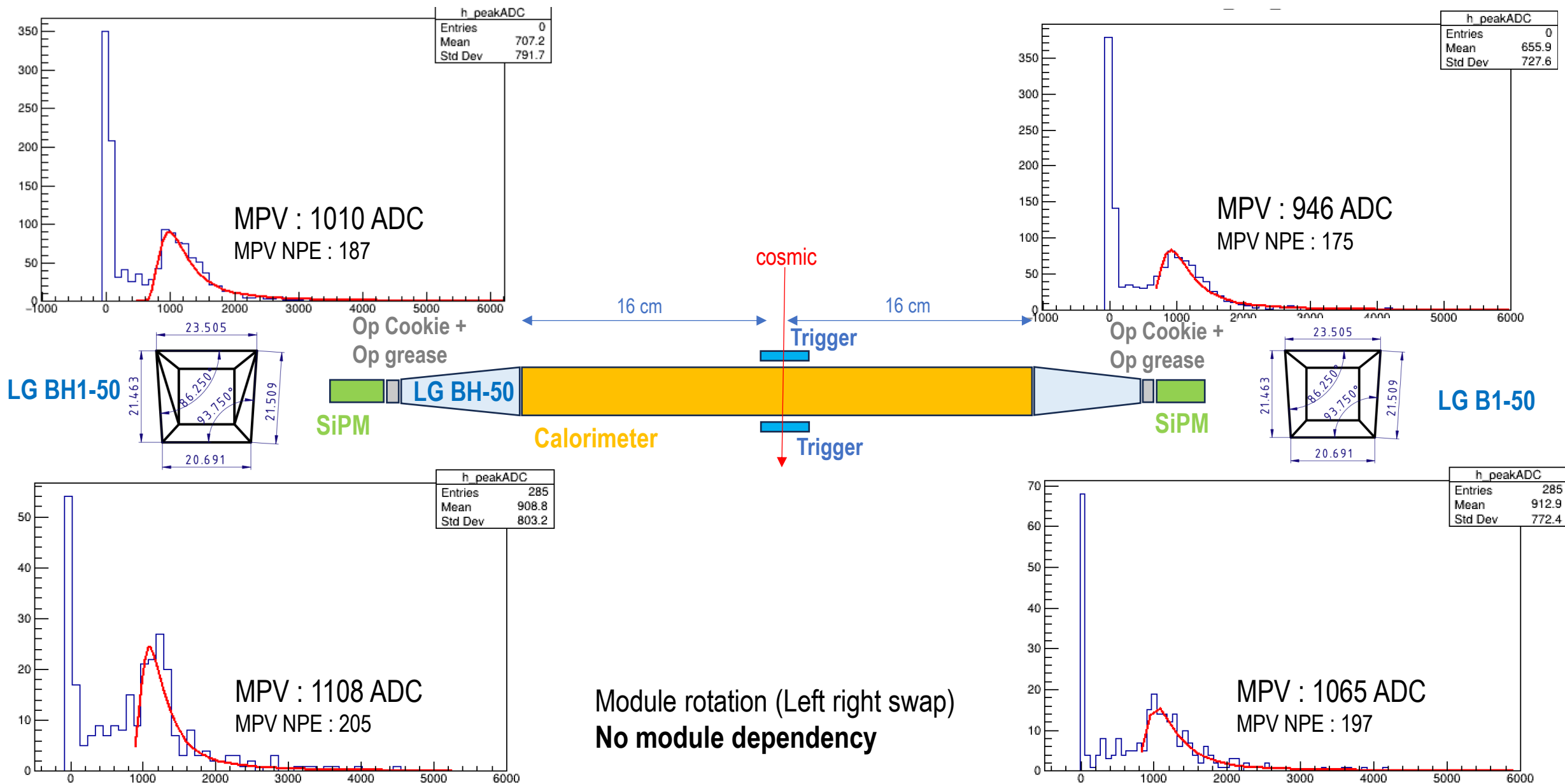


Calorimeter



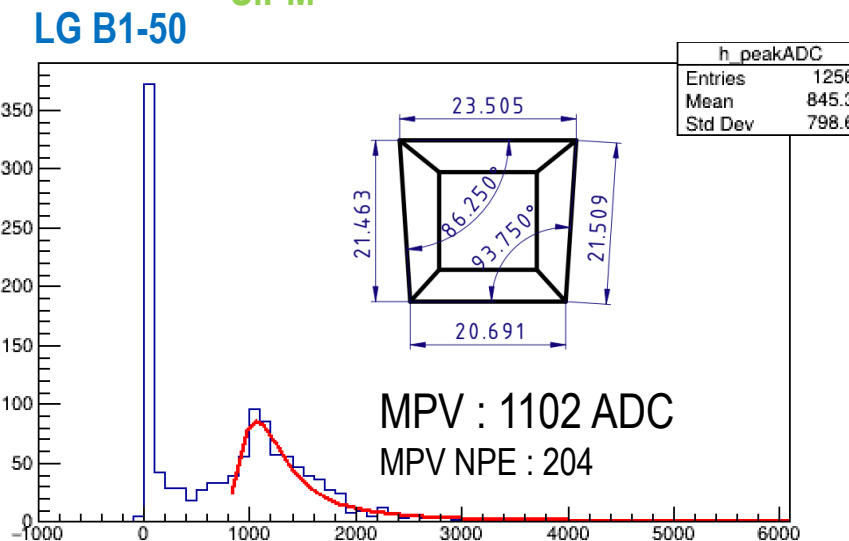
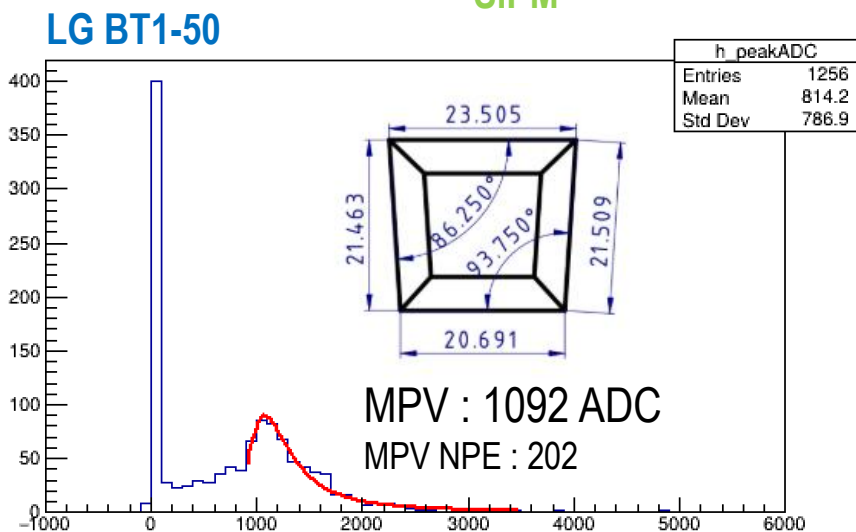
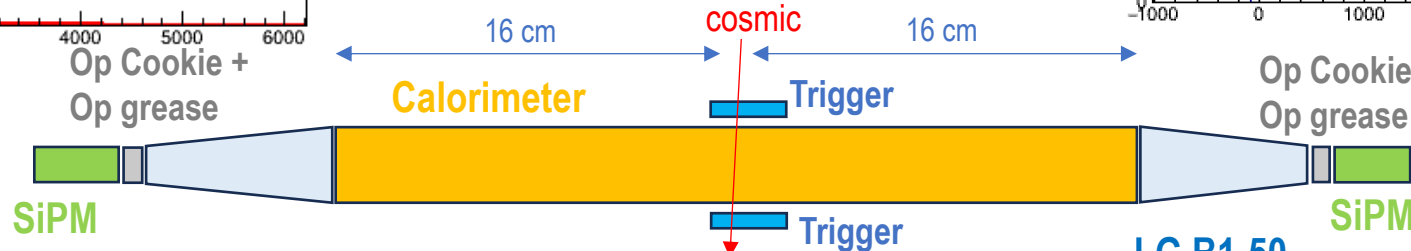
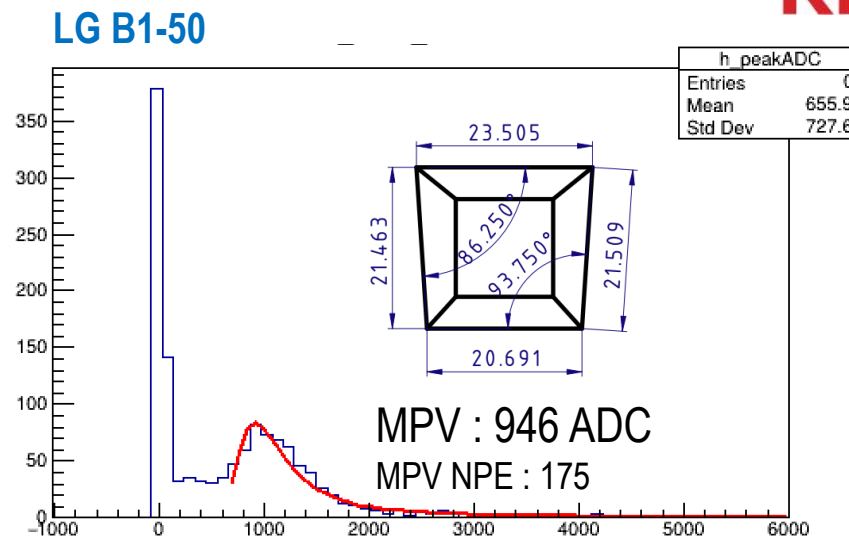
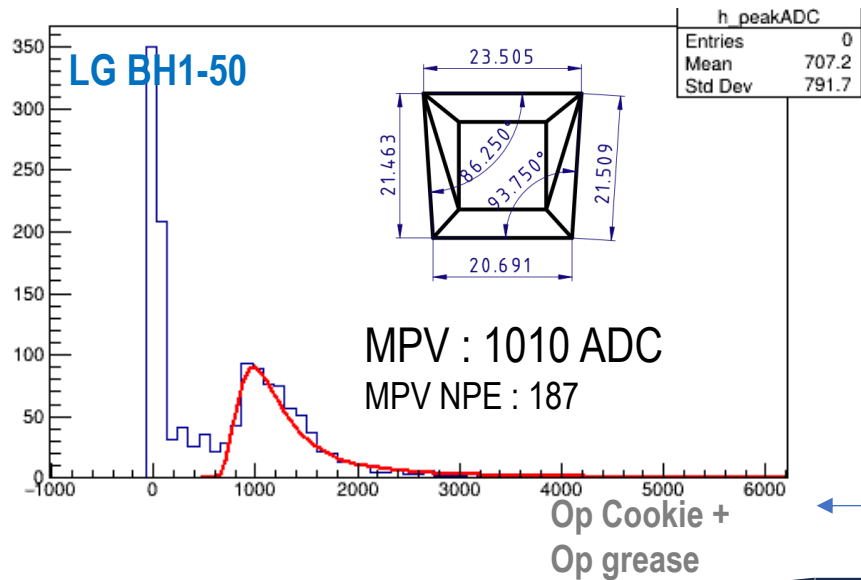
Trigger window : 10 mm * 250 mm
Rate : 20 ~ 30 events per hour

Recap) Module dependency

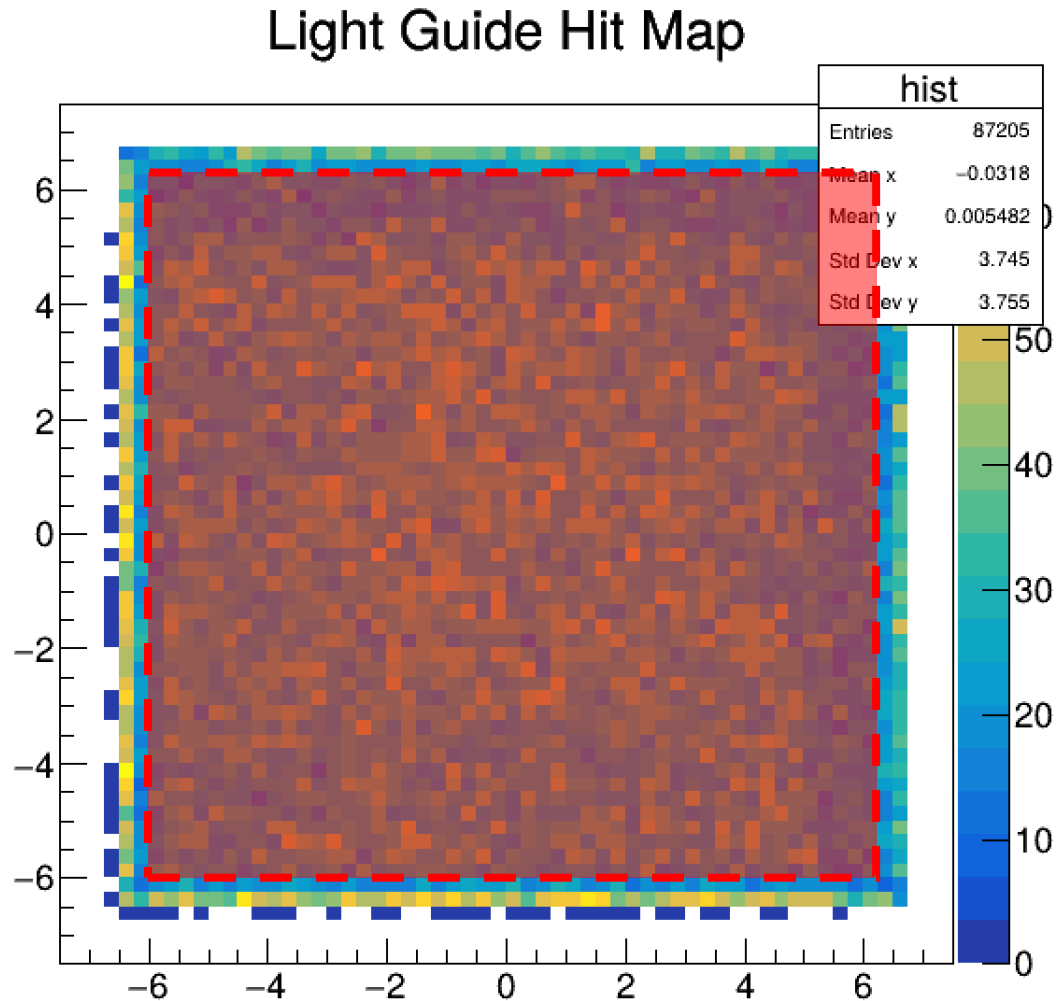


Module rotation (Left right swap)
No module dependency

Recap) Module dependency



Almost no difference in light yield
BH1-50 > B1-50 > BT1-50



Region of interest

Simulation result

$$\text{NAAD} = 1 - \frac{1}{N\bar{Y}} \sum_{i=1}^N |Y_i - \bar{Y}|$$

Normalized Absolute Average Deviation (NAAD)

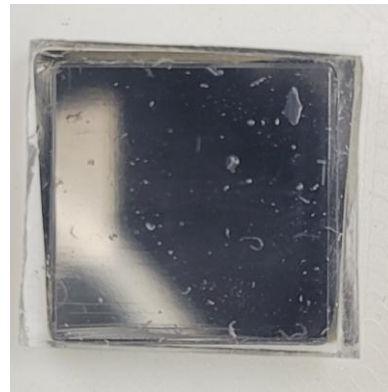
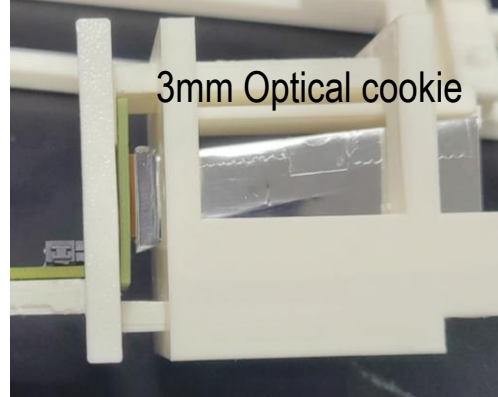
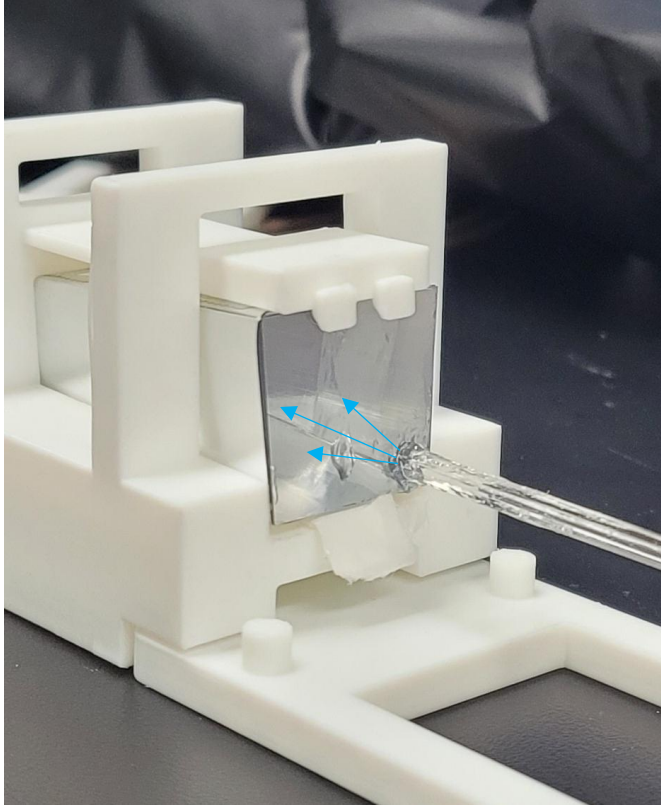
N : number of pixels in the region of interest

Y_i : bin in the region of interest

Y : average bin value of the region of interest.

1 : perfect uniformity

-1 : worst uniformity



Light mixing setup

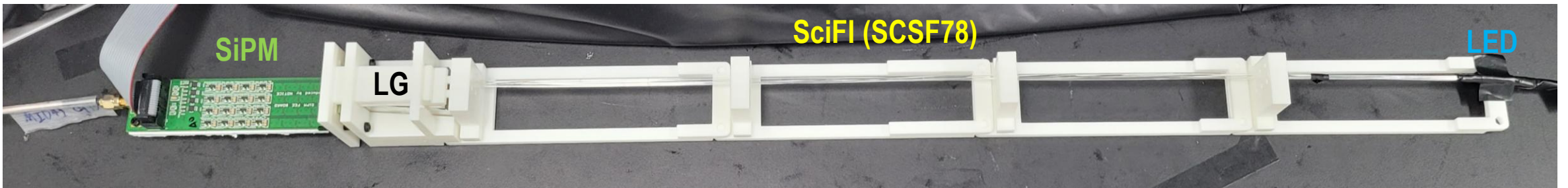
1. 7 Fiber at right obtuse corner

2. **Light yield per SiPM ch. (spe calibrated)**

SPE = 5.6 ADC ch. (~ 0.5 mV)

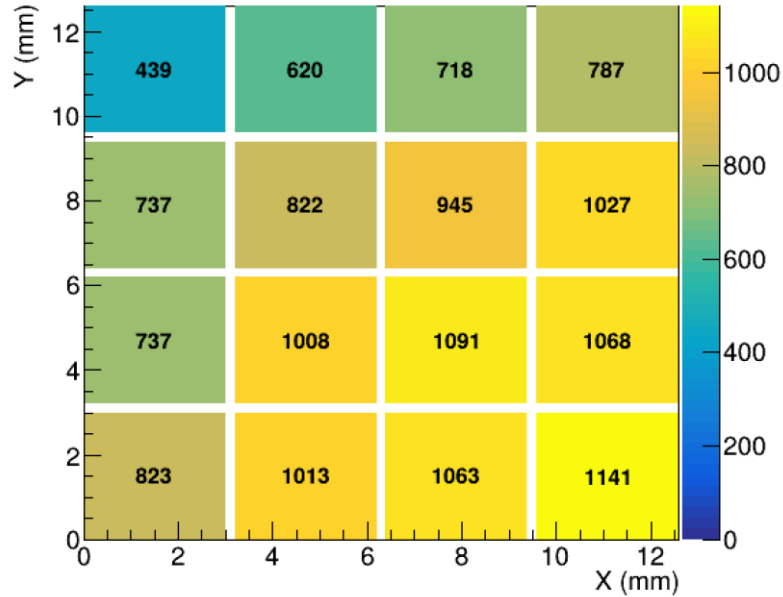
Fiber bundle (7 fibers)

polished with 2000 grit sandpaper





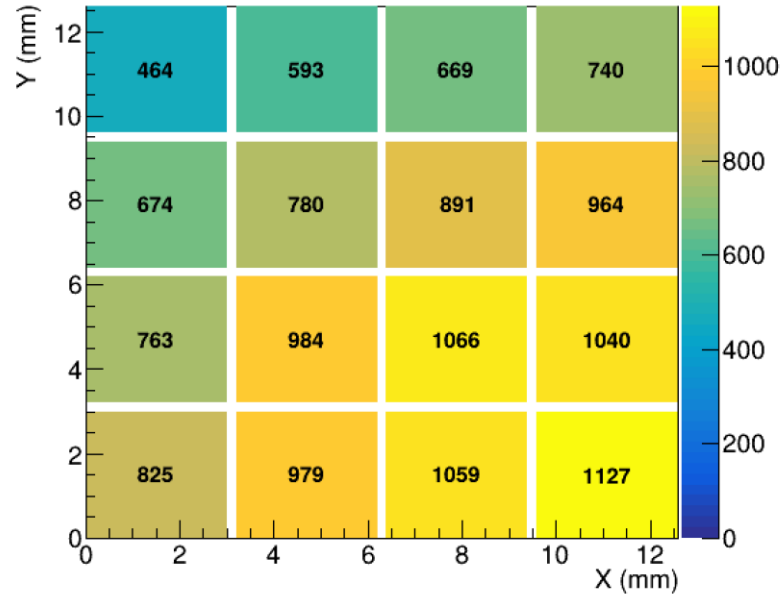
B1-50_rightObtuse



NAAD : 0.7072

Mean : 877

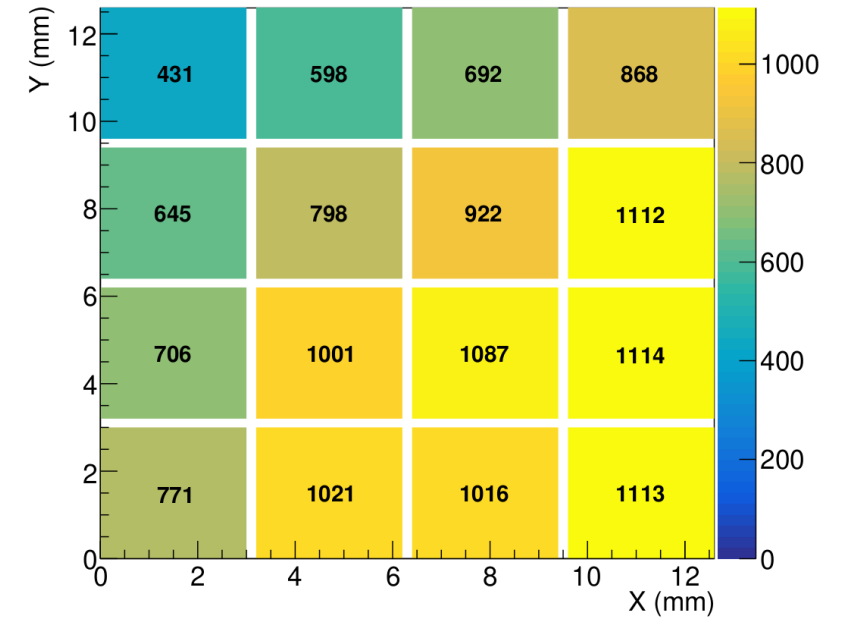
BT1-50_rightObtuse



NAAD : 0.7114

Mean : 851

BH1-50_rightObtuse



NAAD : 0.6772

Mean : 868

NAAD with 16 channels, Lightmixing experiment
Experiment with 1mm optical cookie will be conducted



G-tech (Japan)

- BT1-50 (\$135) and BH1-50 (\$125) ordered (2 of them each)
 - Nominal lightguide unavailable (curved surface)
 - Lower cost for mass production
- Tolerance
 - Side : ± 0.3 mm
 - Length : ± 0.1 mm
- Canada manufacturer : cost & tolerance ?

