K1.8 meeting

Report from E05 group

Toshiyuki Gogami

26 Dec 2014

Contents

Cosmic ray test

of (Prototype) Water Cherenkov detector

- PMT comparison (H11284 vs. H6522)
- Position dependence (y-dependence)
- Normal acrylic window → UVT acrylic window

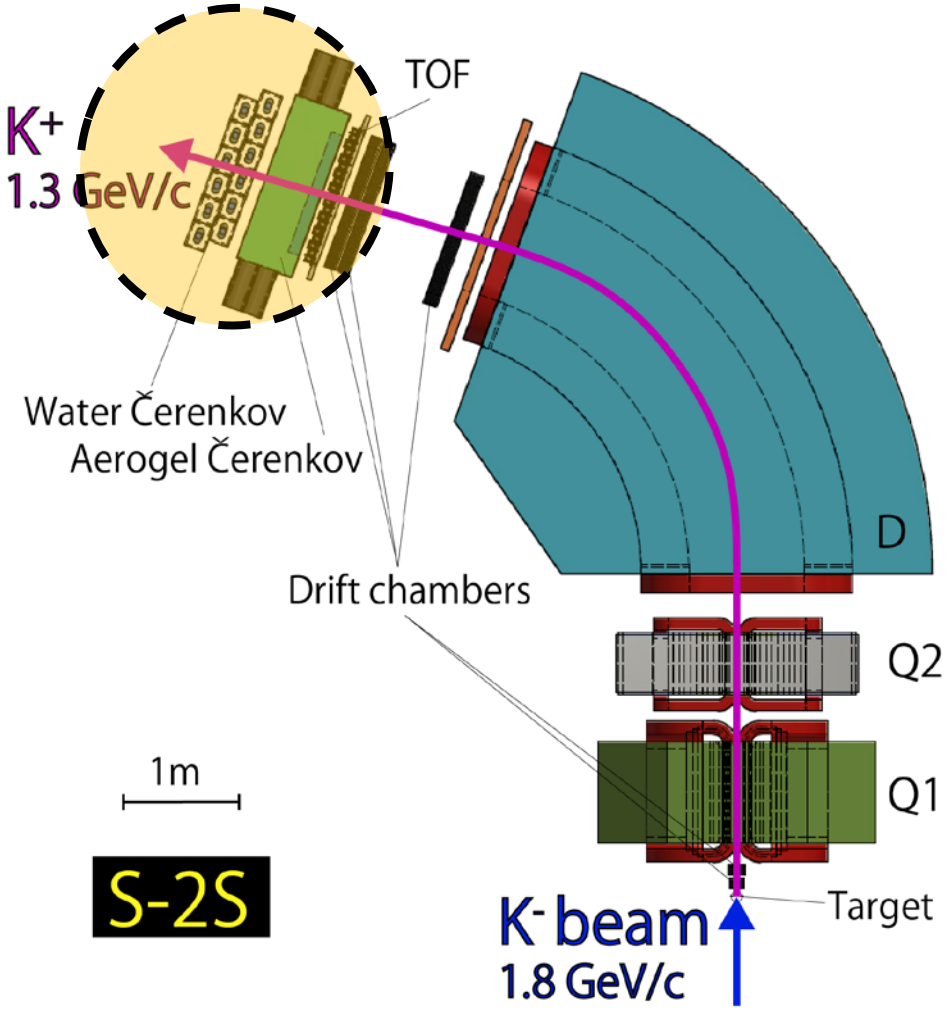
Goal of development of Water Cherenkov detector

Goal:

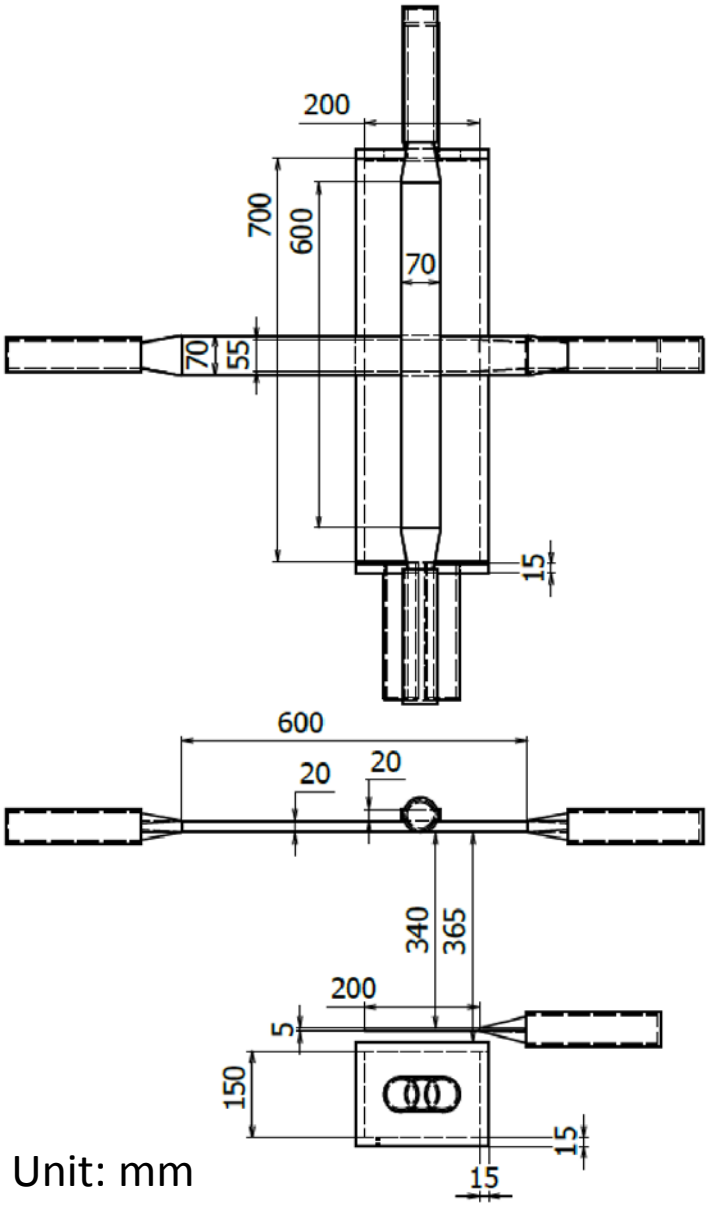
NPE for 1.3 GeV/c $K^+ \geq 50$

(NPE for β=1 particle ≥ 60)

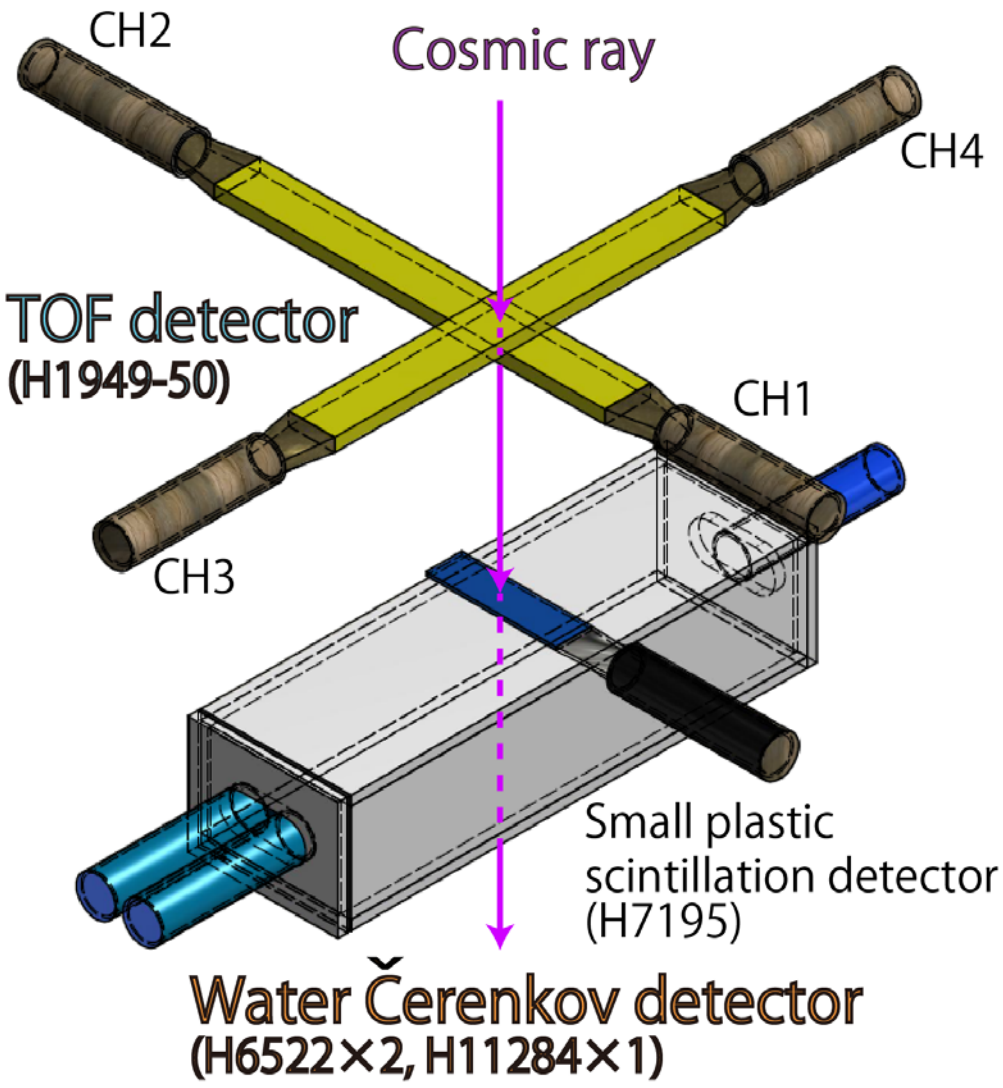
p rejection eff. > 90%
K^+ survival ratio > 99%
for 1.3 GeV/c *@ trigger*



Experimental setup

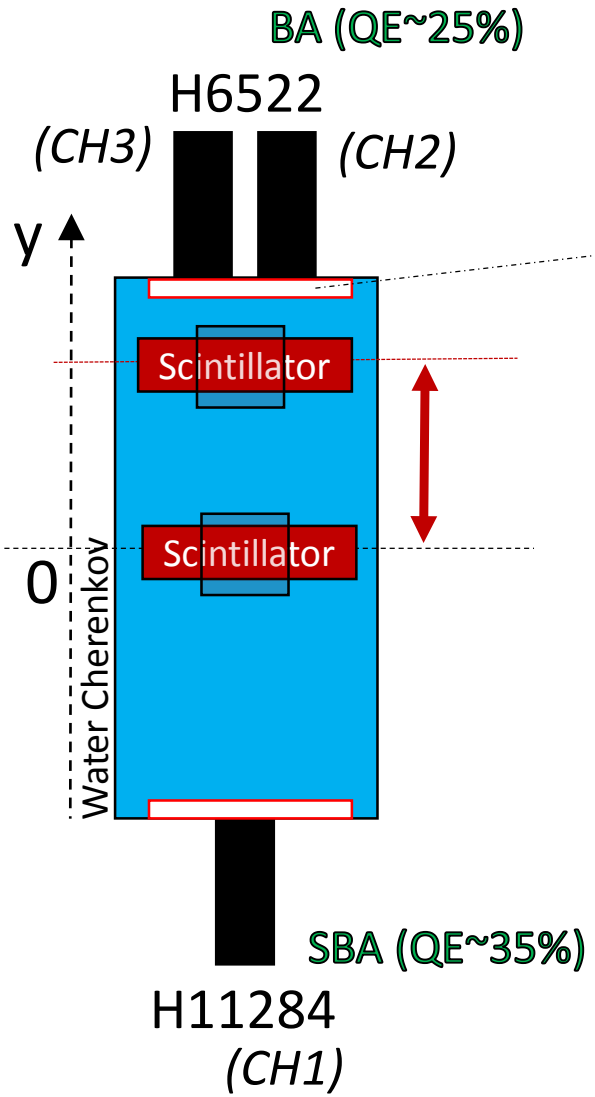


Unit: mm




精製水

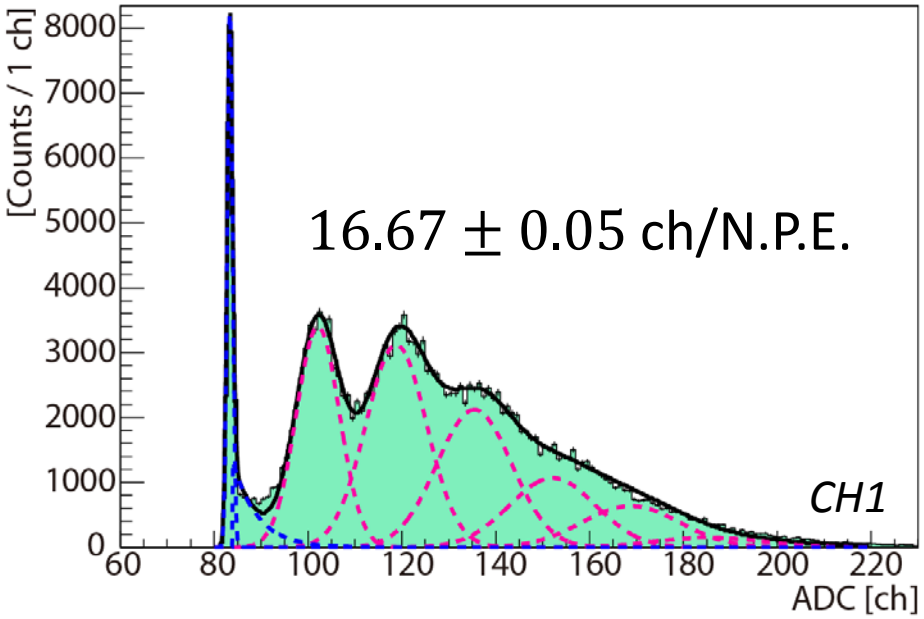
Coordinate definition

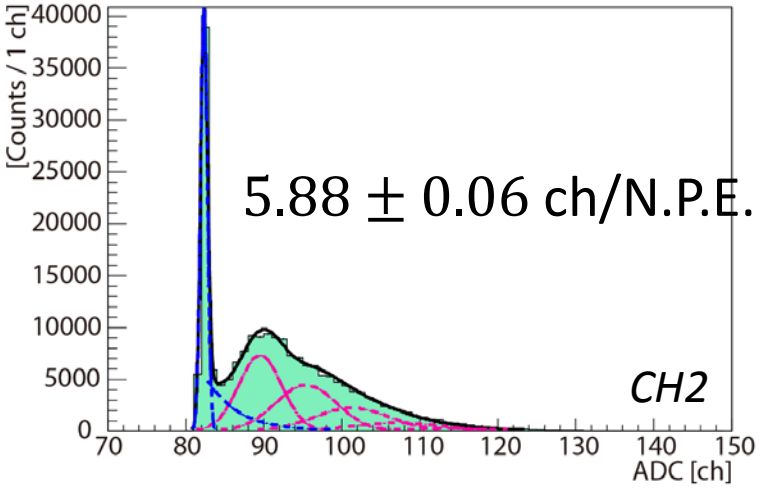


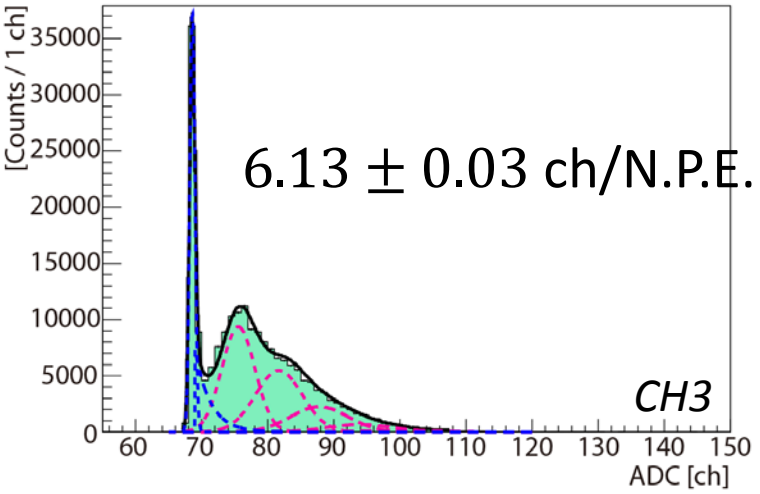
Data were taken with

y = -25.0, -12.5, 0.0, 12.5, 25.0 cm

Calibration with LED data

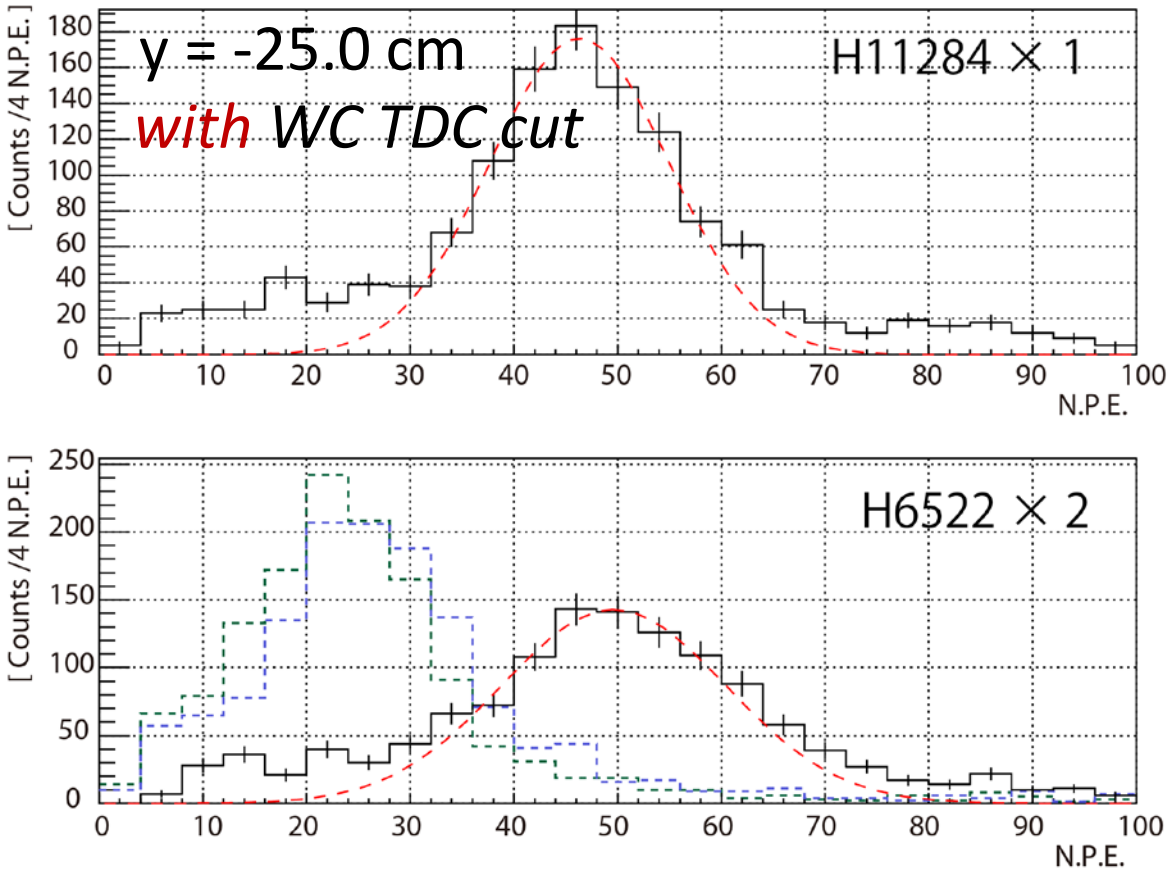






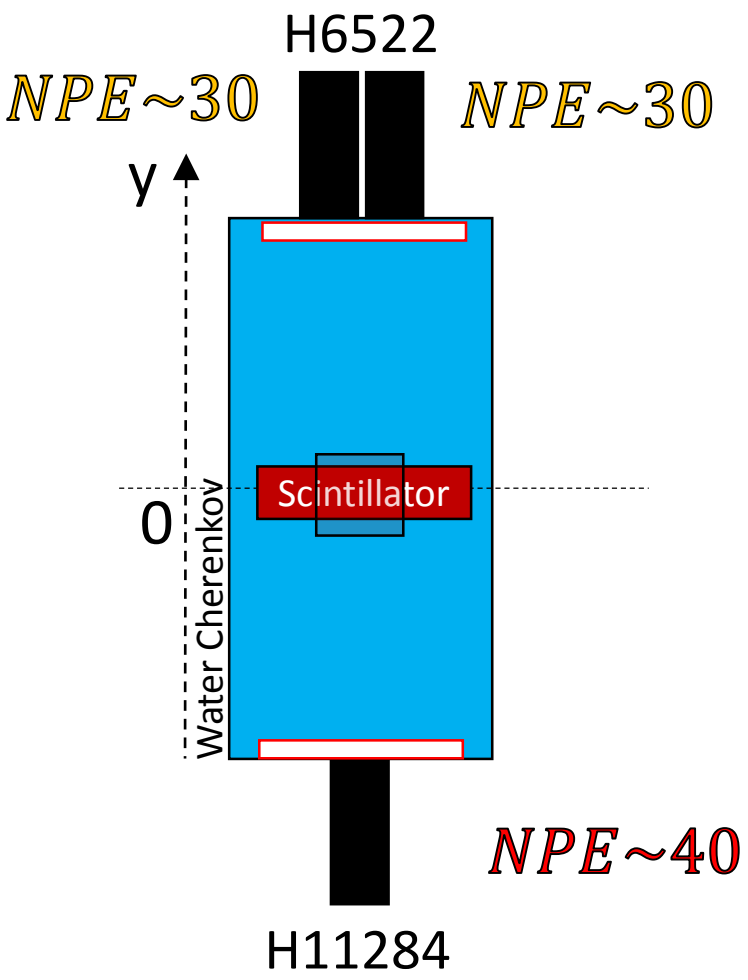
Fitting function:
E.H.Bellamy *et al.* , *NIM* **A** 339, 468-476 (1994)

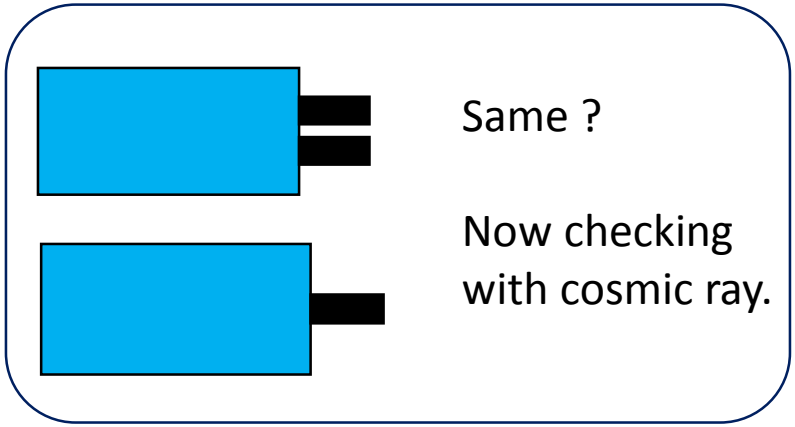
ADC → Number of Photo Electron



Gaussian fitting
→ N.P.E.

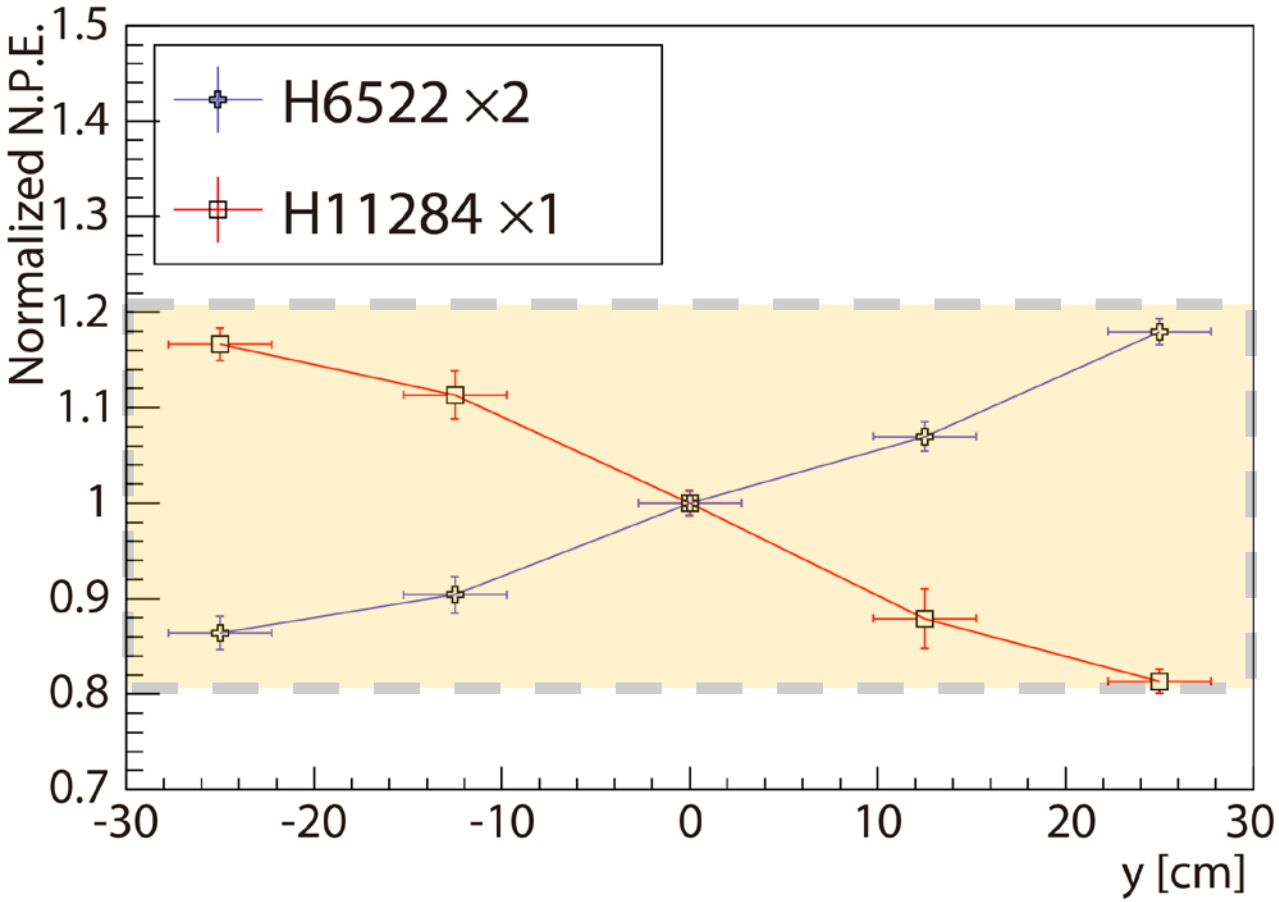
Results (y=0)





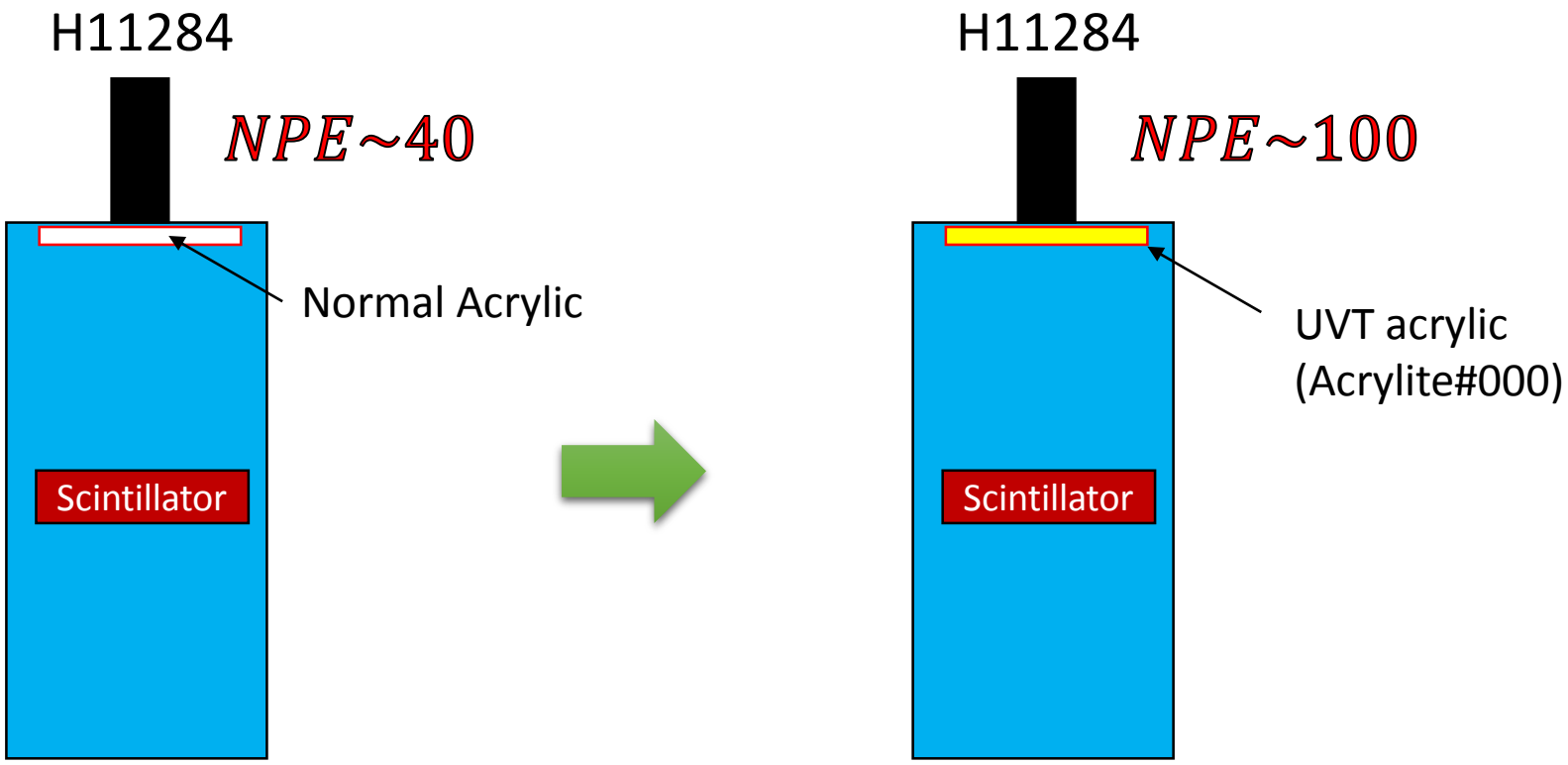
In simulation → almost same

The number of photoelectrons (ratio)



$\pm 20\%$

Window
Normal acrylic → UVT acrylic



Summary

Cosmic ray test
of (Prototype) Water Cherenkov detector

PMT comparison (Normal acrylic window)

- H6522: NPE~30
- H11284: NPE~40

Goal for one segment: 60
→ Goal for one PMT: 30

Position dependence

- ±20% in 30 cm

→ Sum of top and bottom PMTs expect to be flat.

Window

- Normal acrylic window + H11284: NPE~40
- UVT acrylic window + H11284: NPE~100

Outlook

Cosmic ray test

- Other windows
- Individual difference of PMT
- Grease

Geant4 simulation

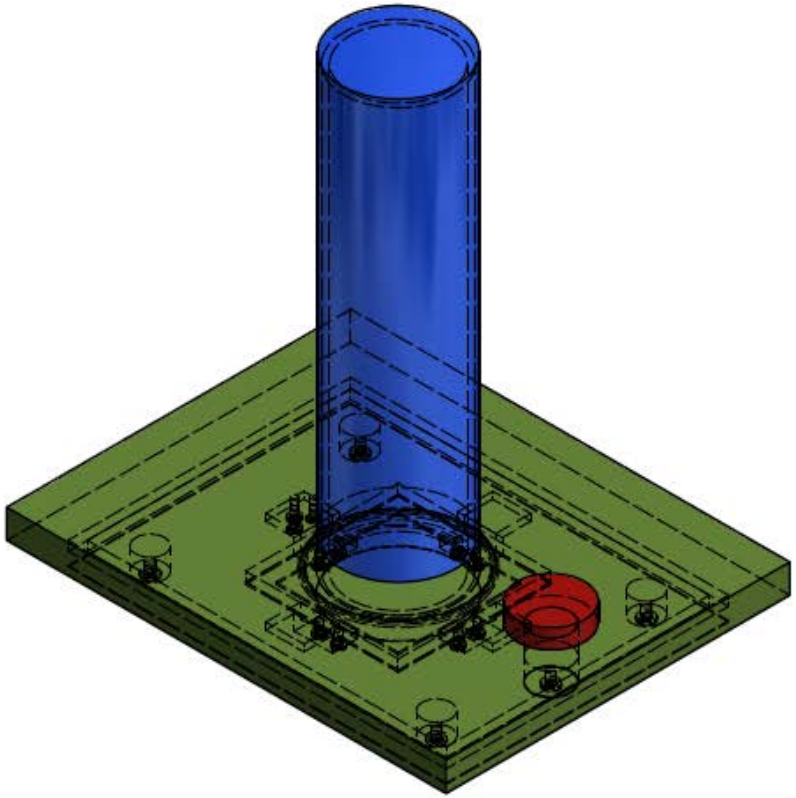
- Effects on trigger due to reactions in water
- *p* rejection efficiency and K^+ survival ratio

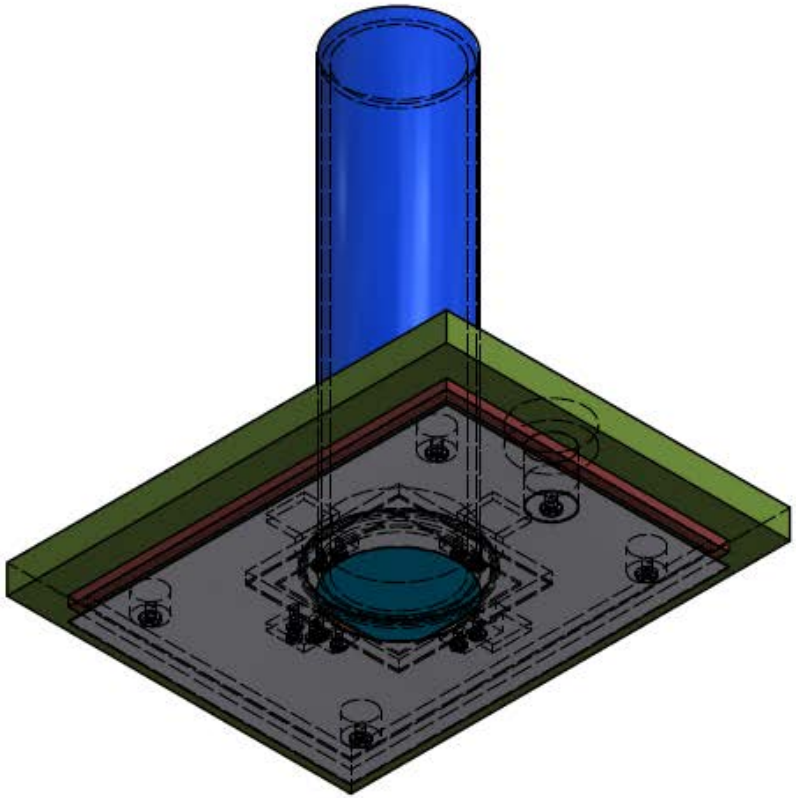
Design

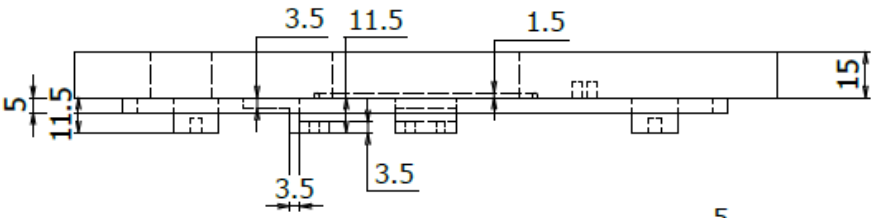
- Can be thinner ?
- Frame

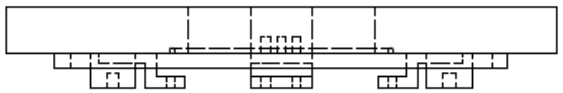
Backup

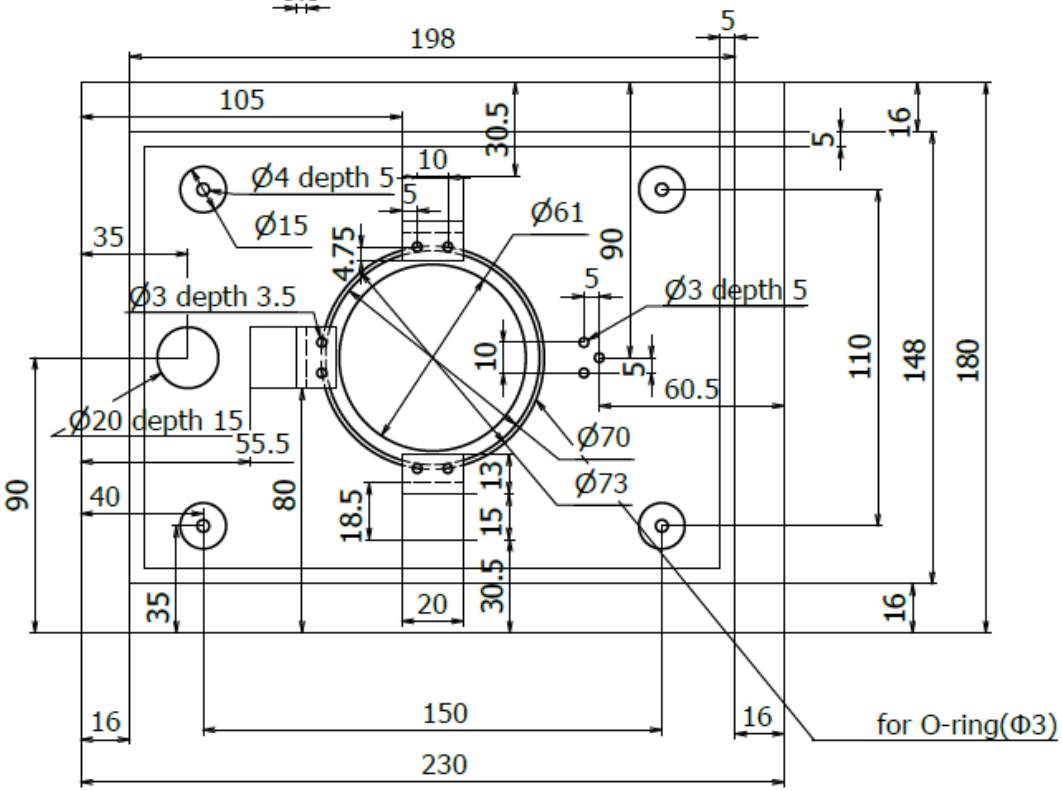
Cap design
for window test

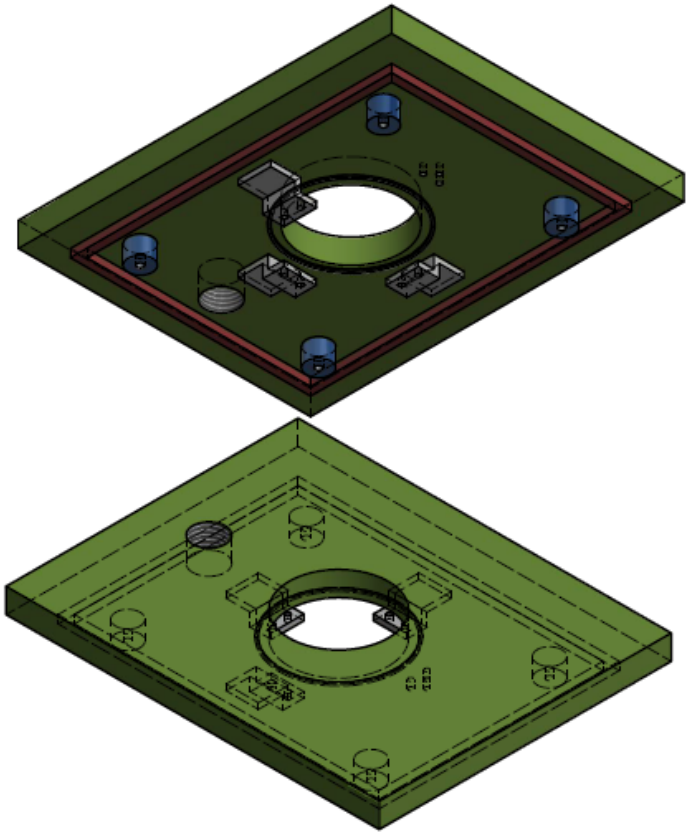












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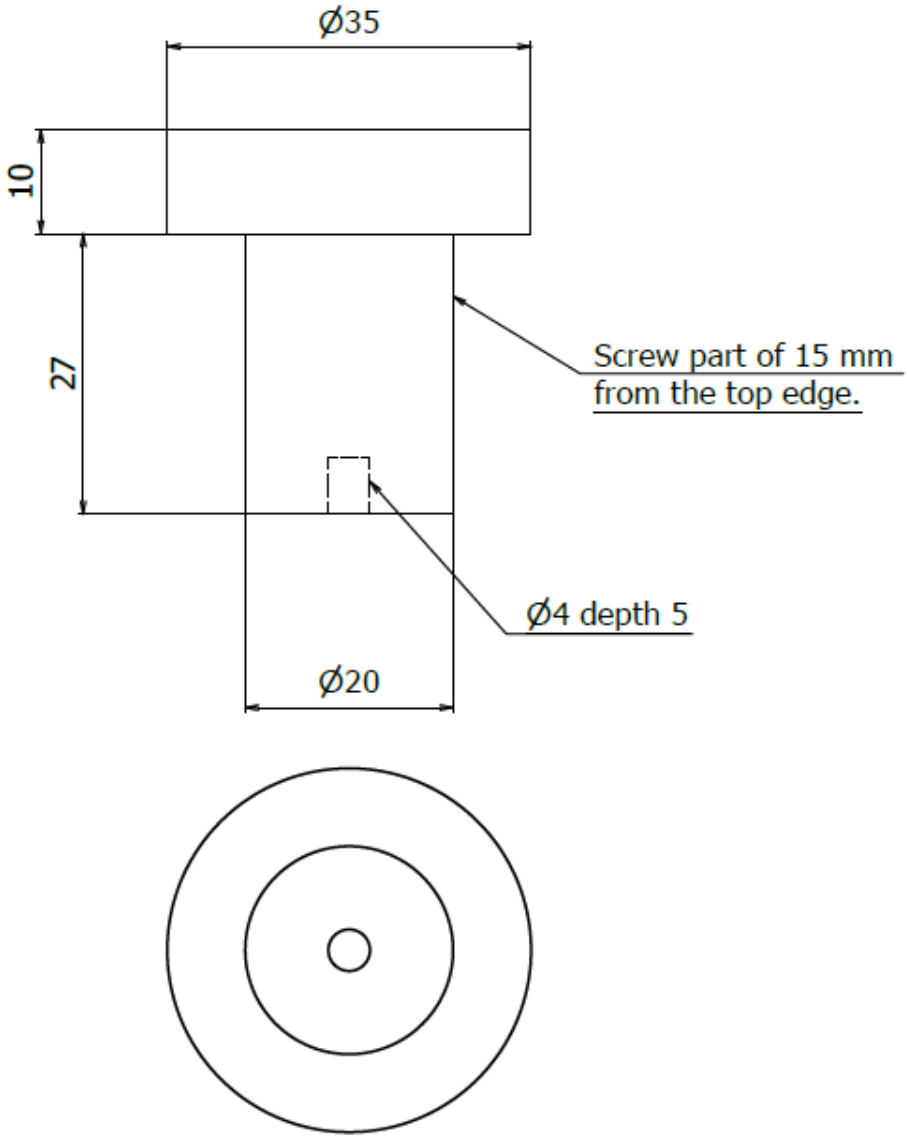
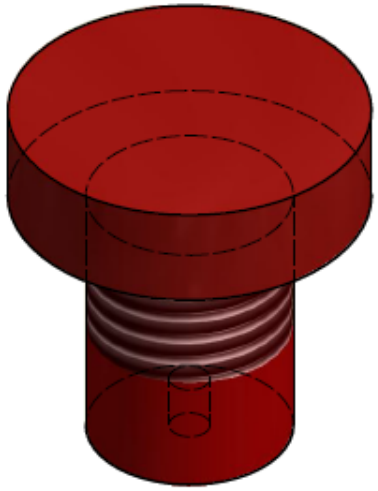
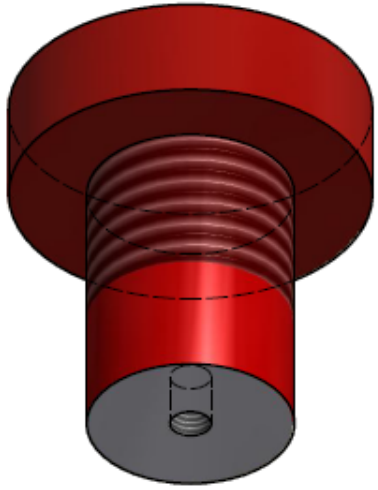
		名前	日付	
		作成者	2014/11/06	T. Gogami
		確認者		
		承認者		
				window_test_cap
				2 / 10
				A3







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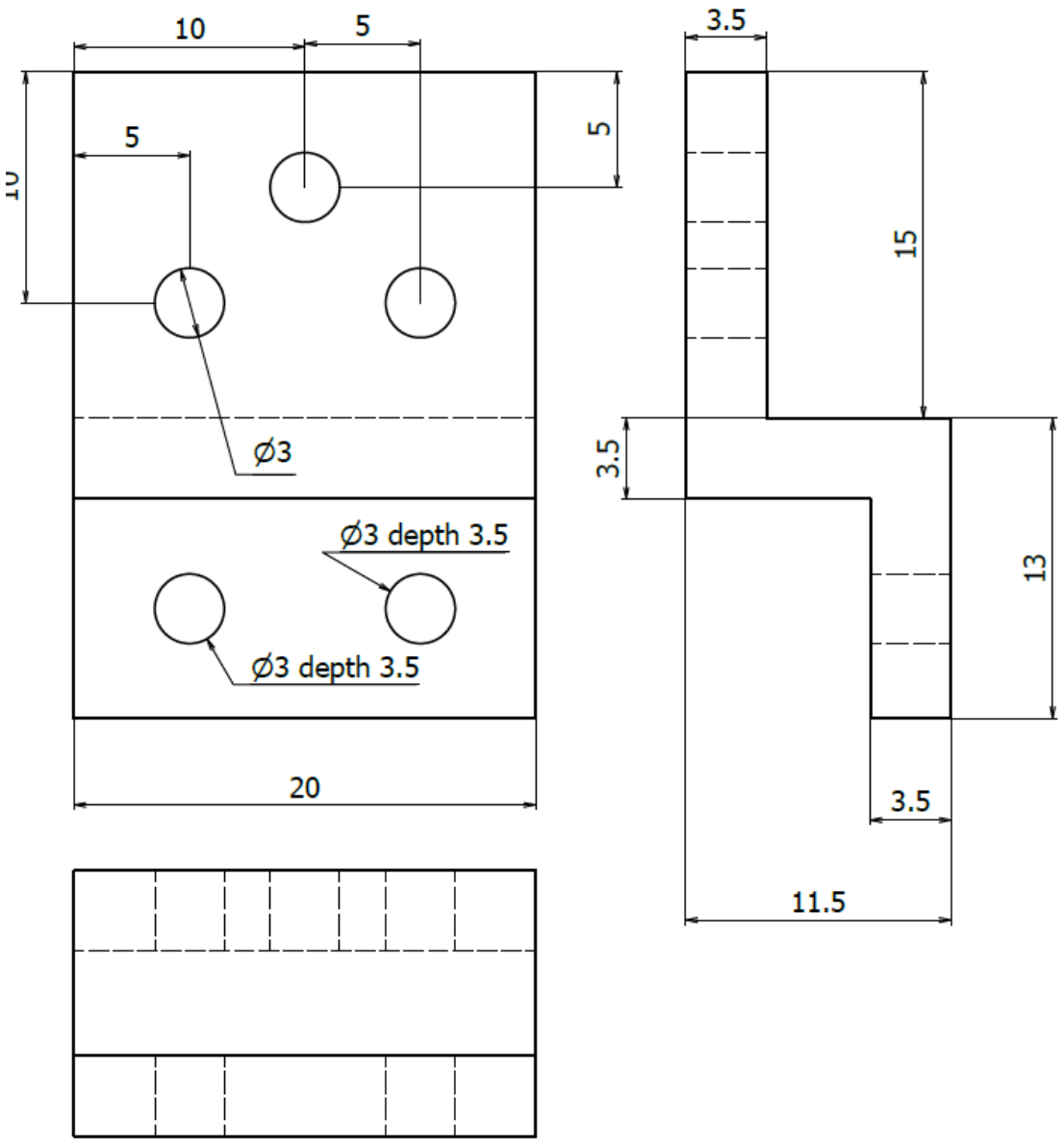
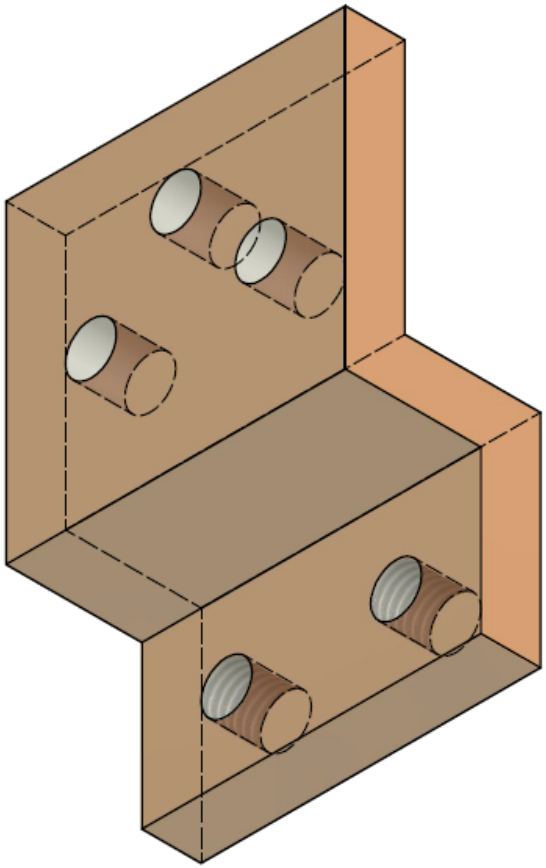
	名前	日付	
作成者		2014/11/06	T. Gogami
確認者			
承認者			
			window_test_cap





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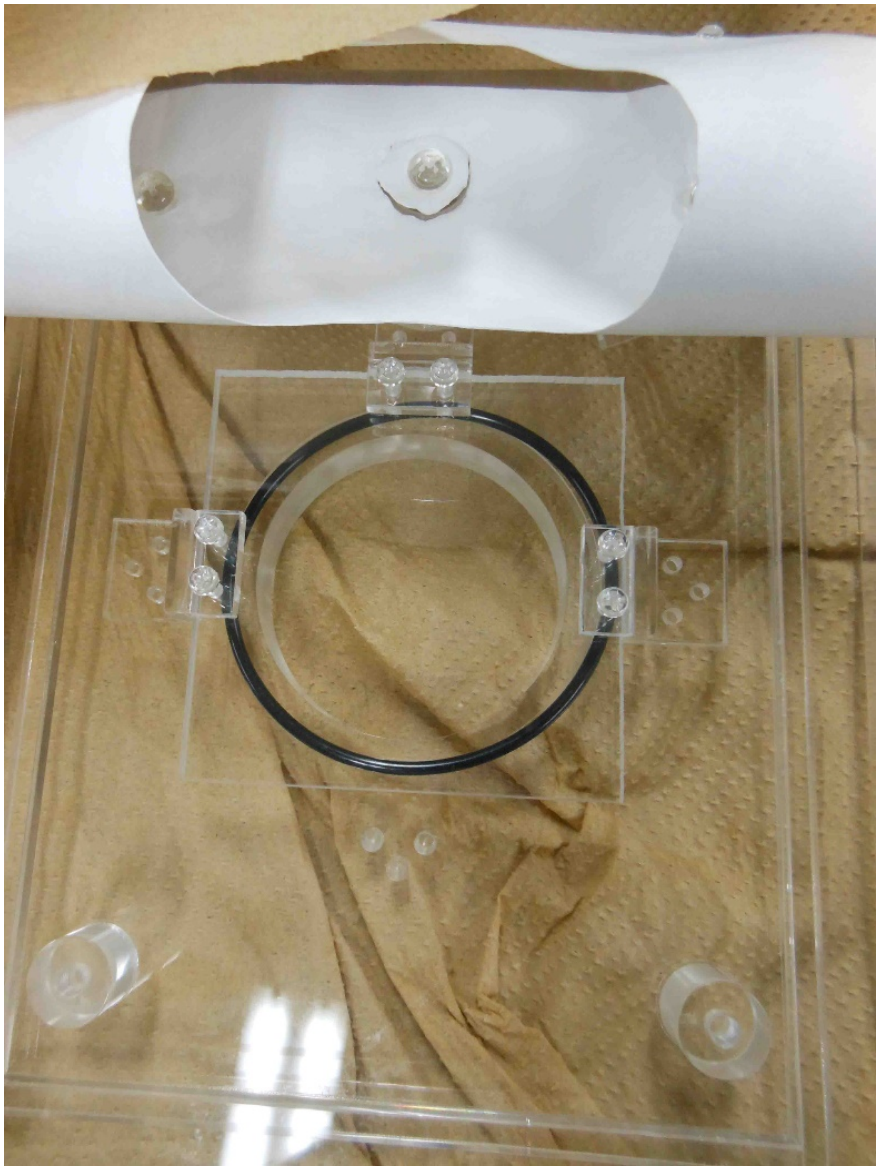
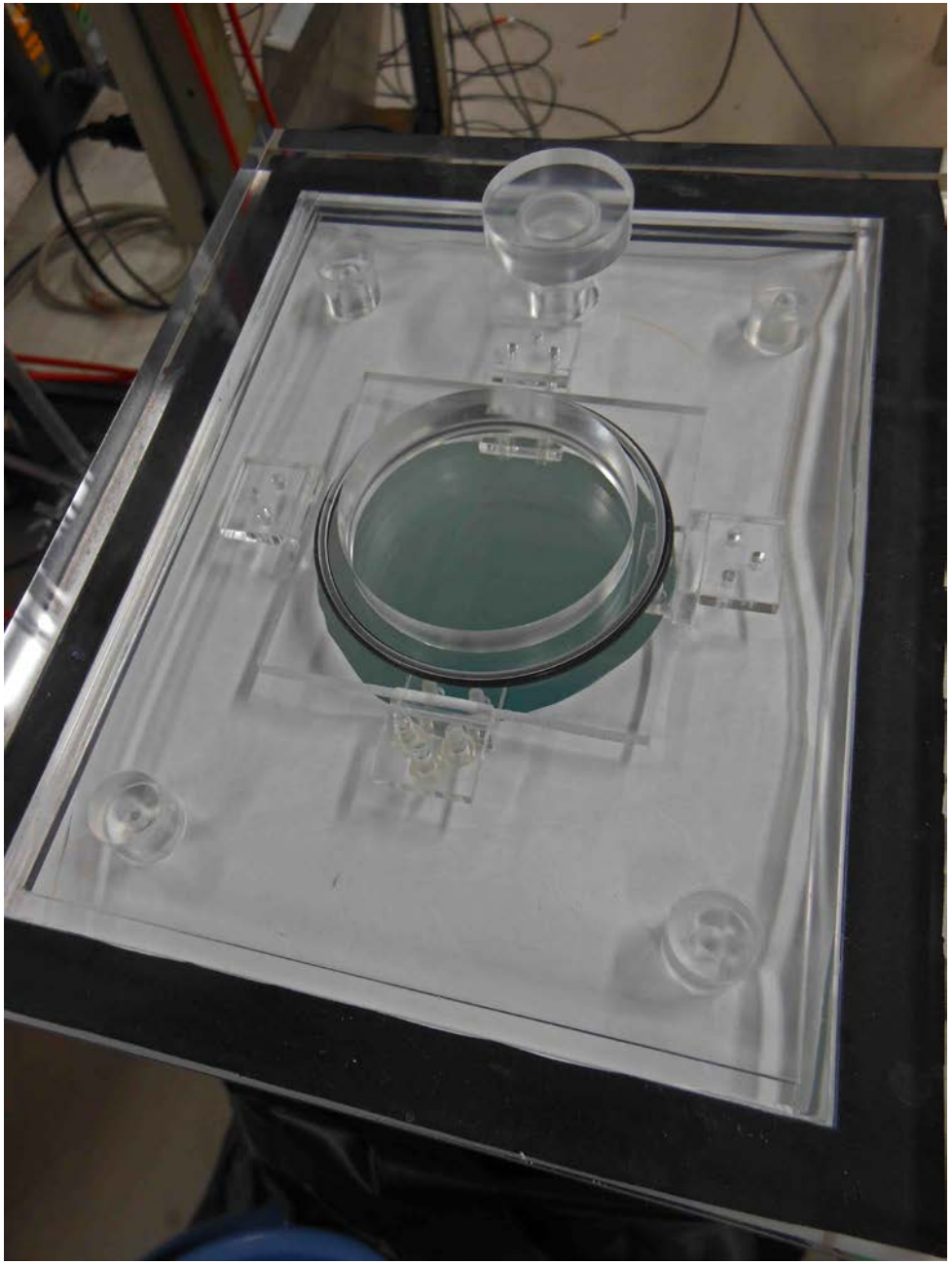
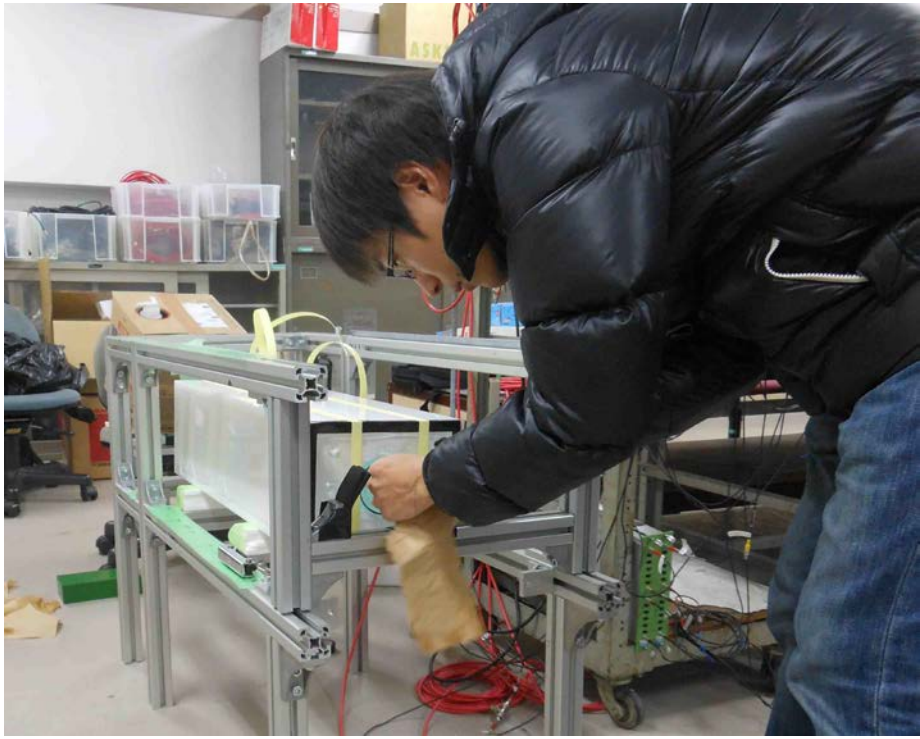
	名前	日付 2014/11/06	T. Gogami
			window_test_cap 3 / 10

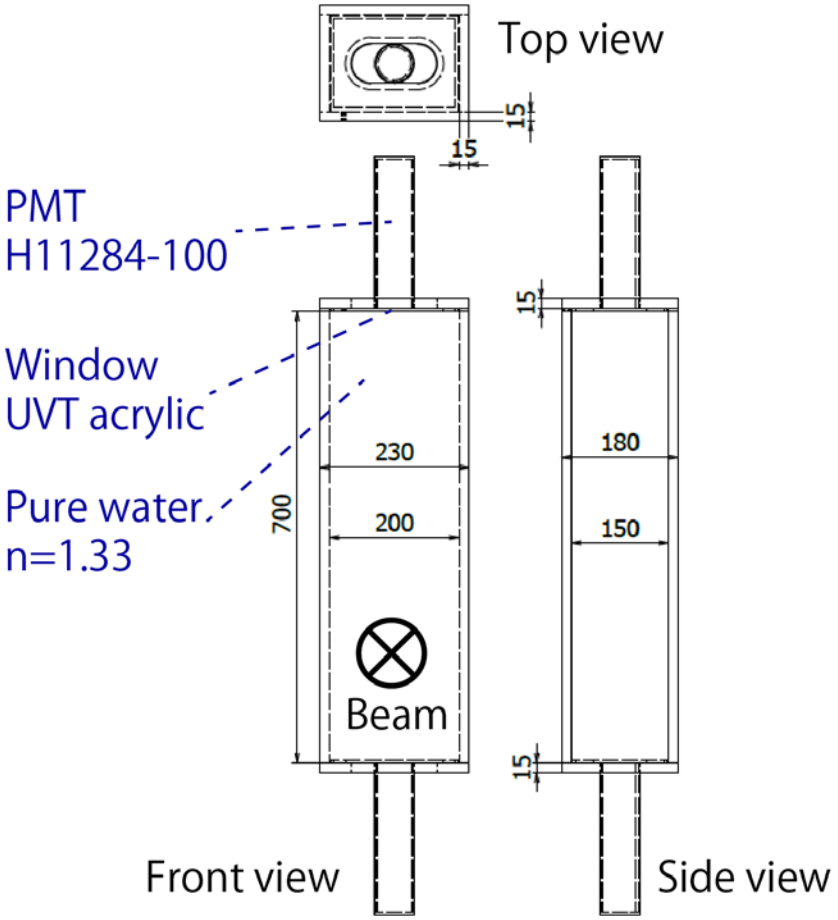


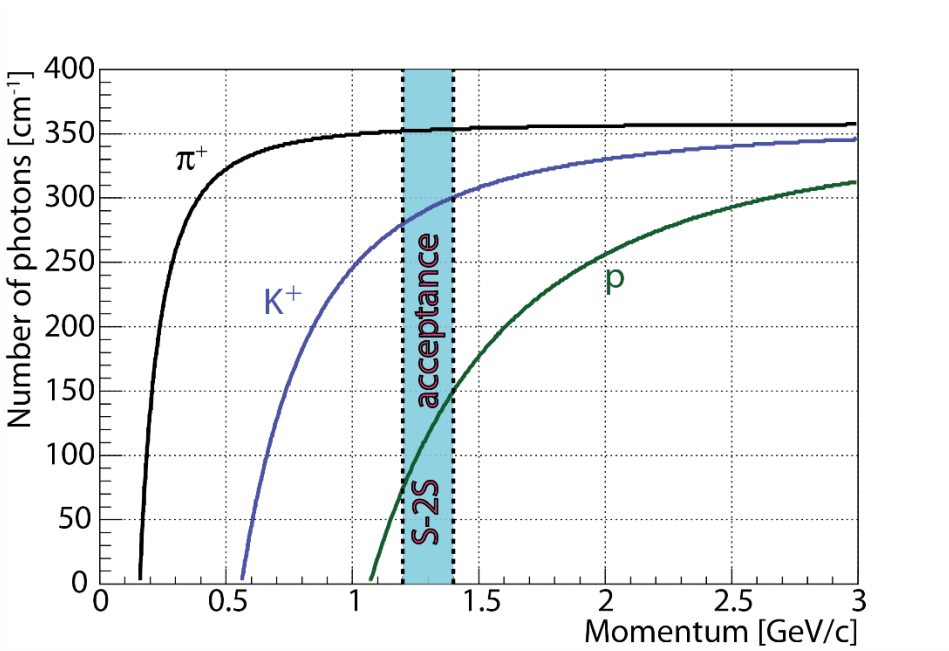



LUXO

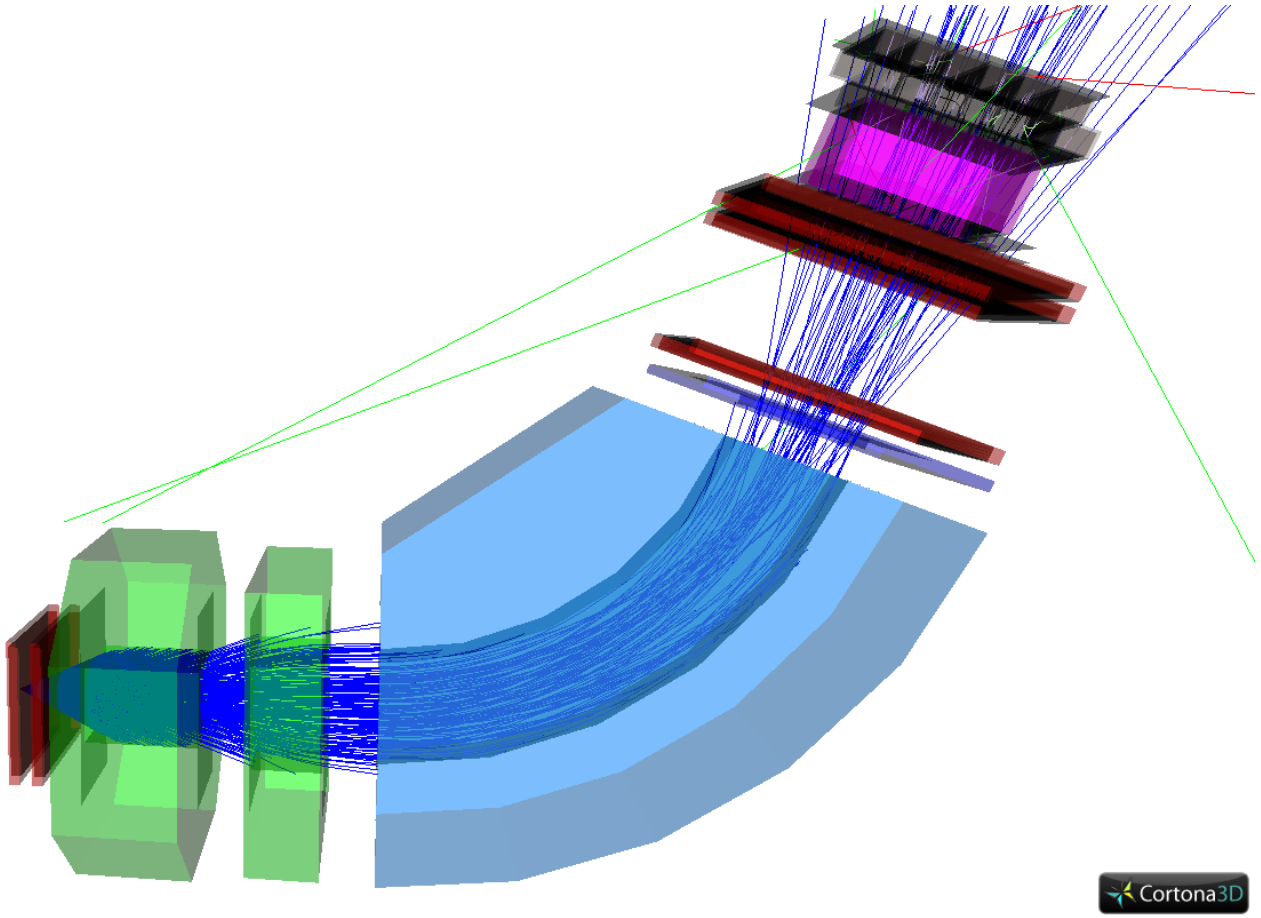


Prototype
water Cherenkov detector

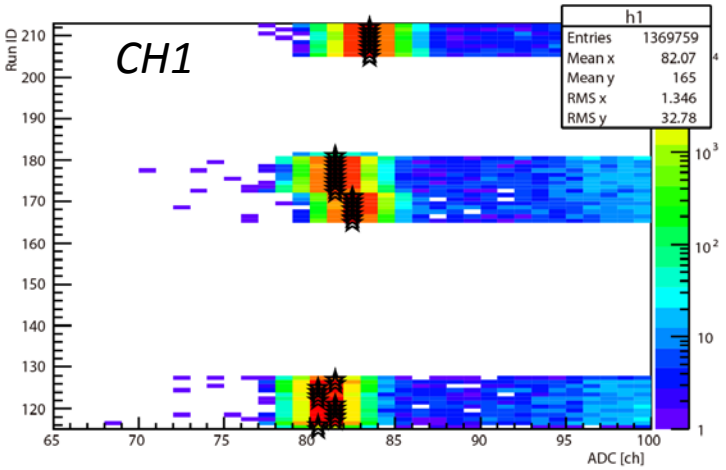


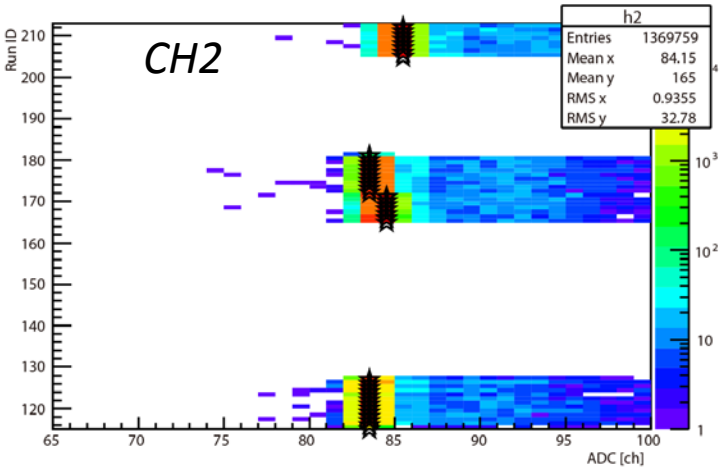


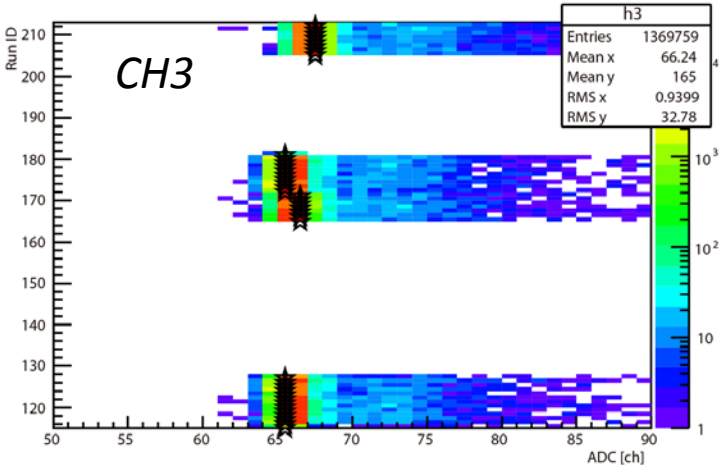
Geant4 (S-2S)



Pedestal movement

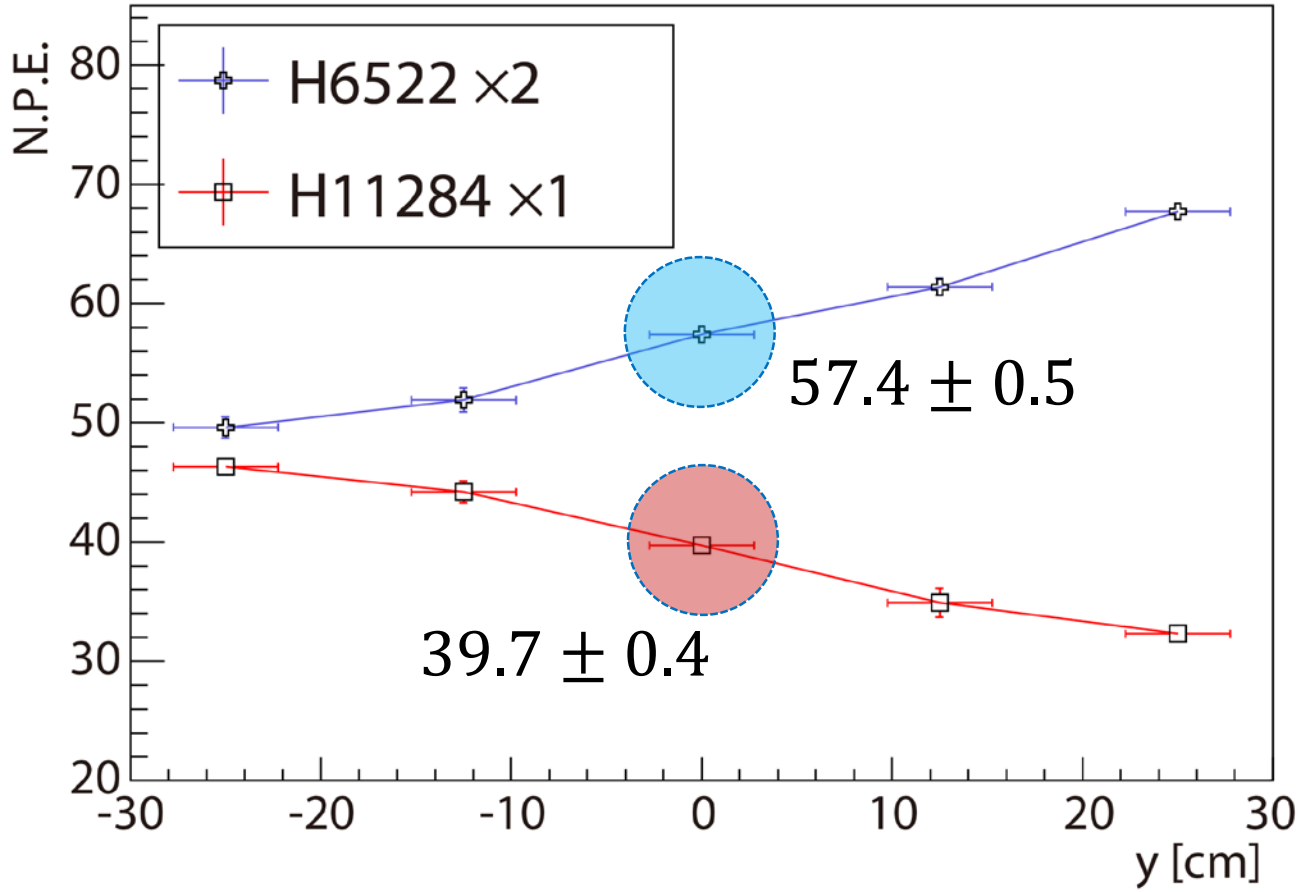




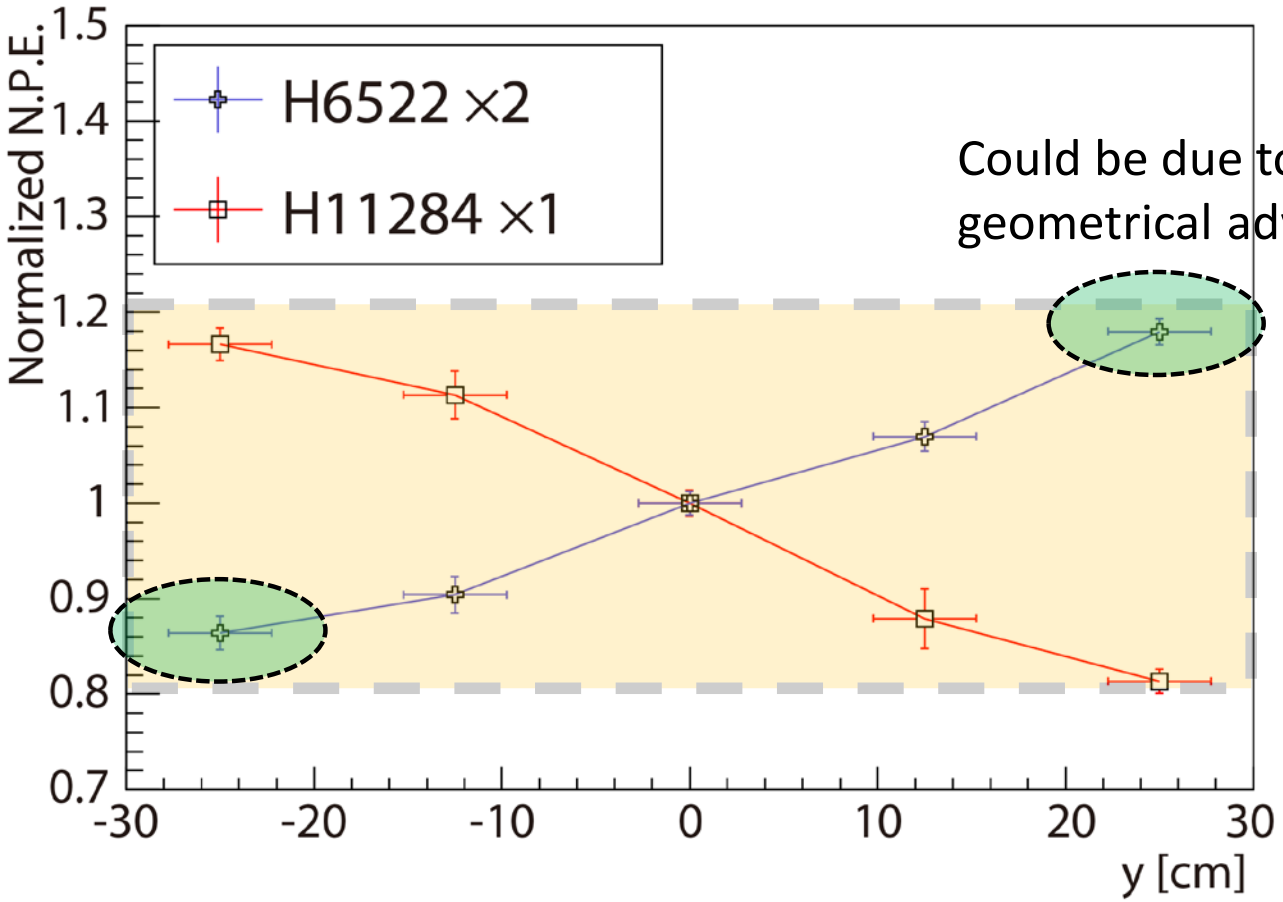


Pedestal parameter was applied for run by run.

The number of photoelectron (absolute value)



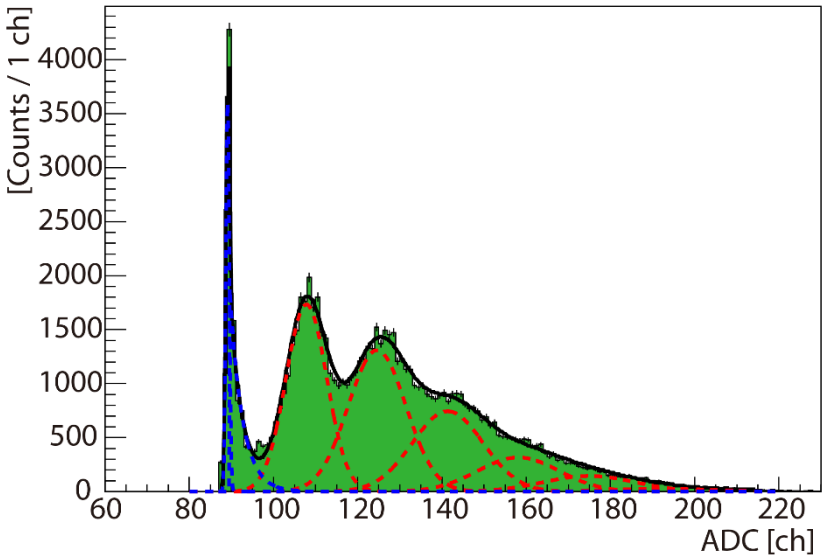
The number of photoelectron (ratio)

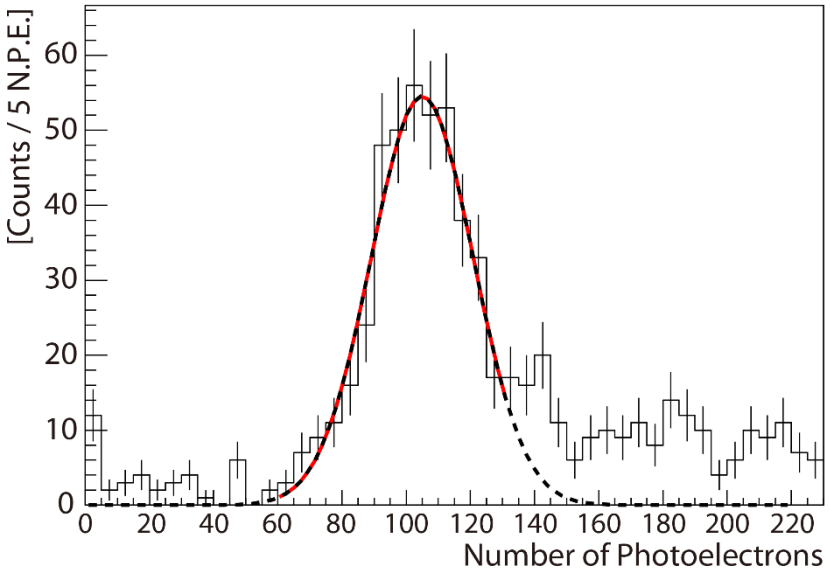


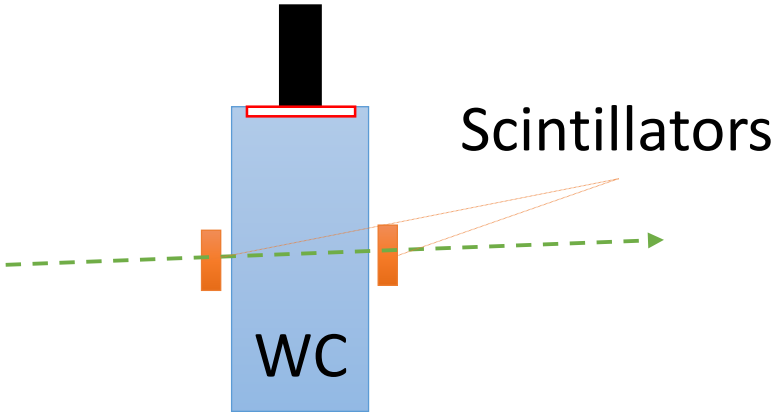
Could be due to geometrical advantage.

$\pm 20\%$

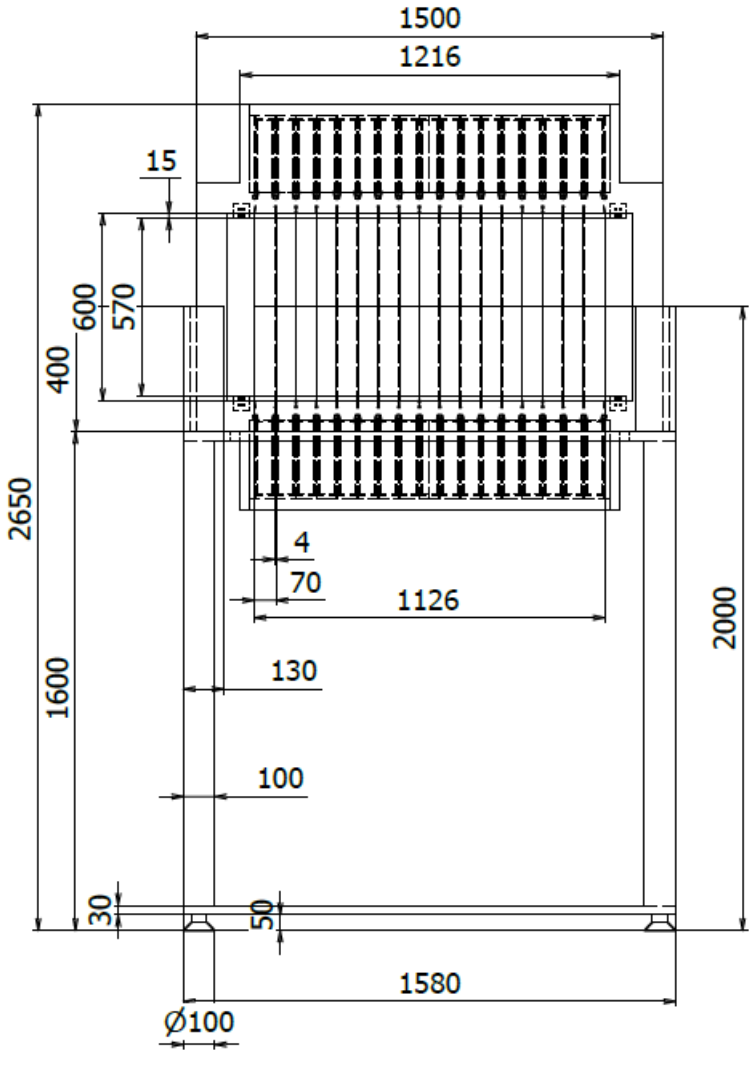
Cosmic ray test with a window of Acrylite#000

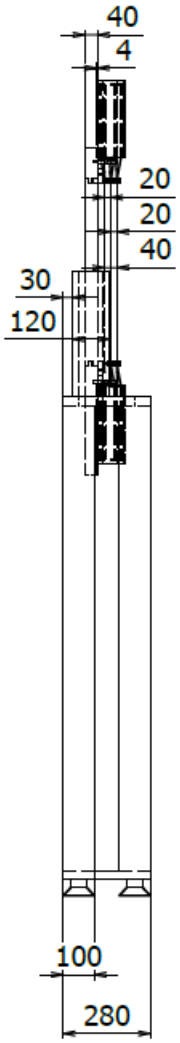


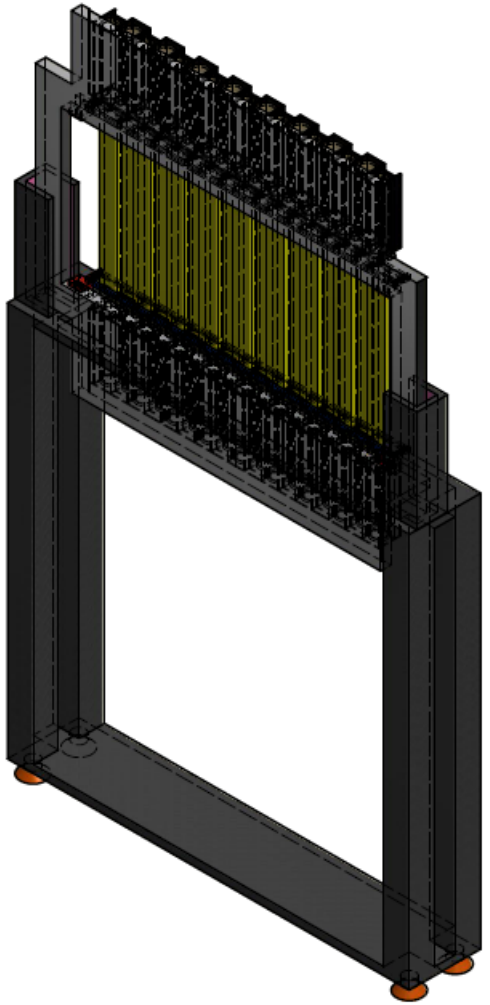




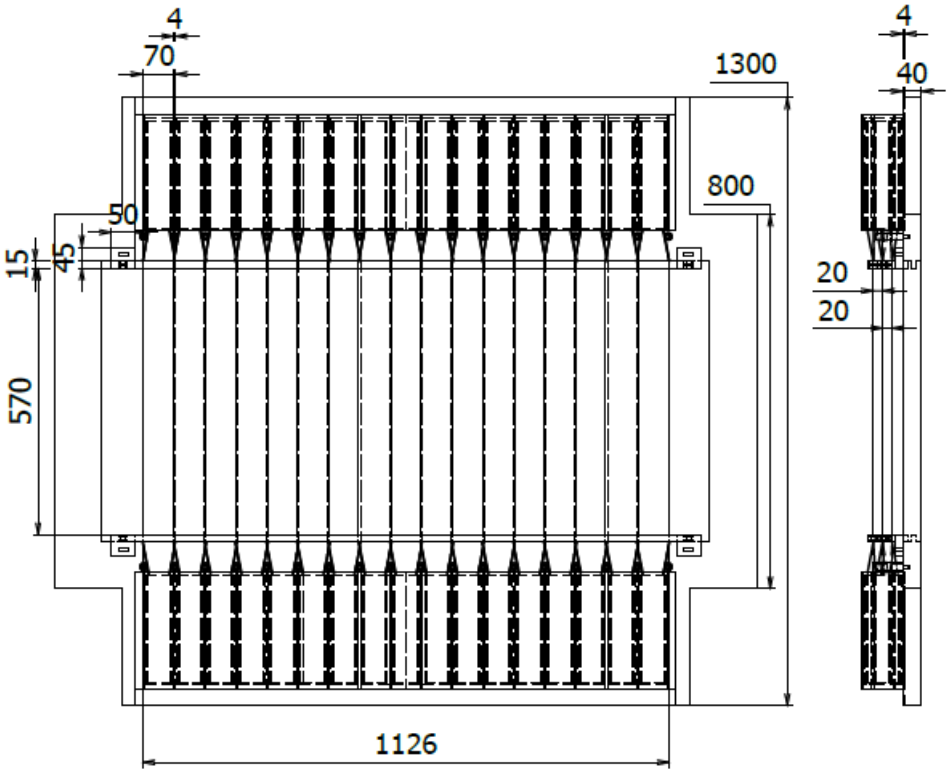
TOF detector (idea)

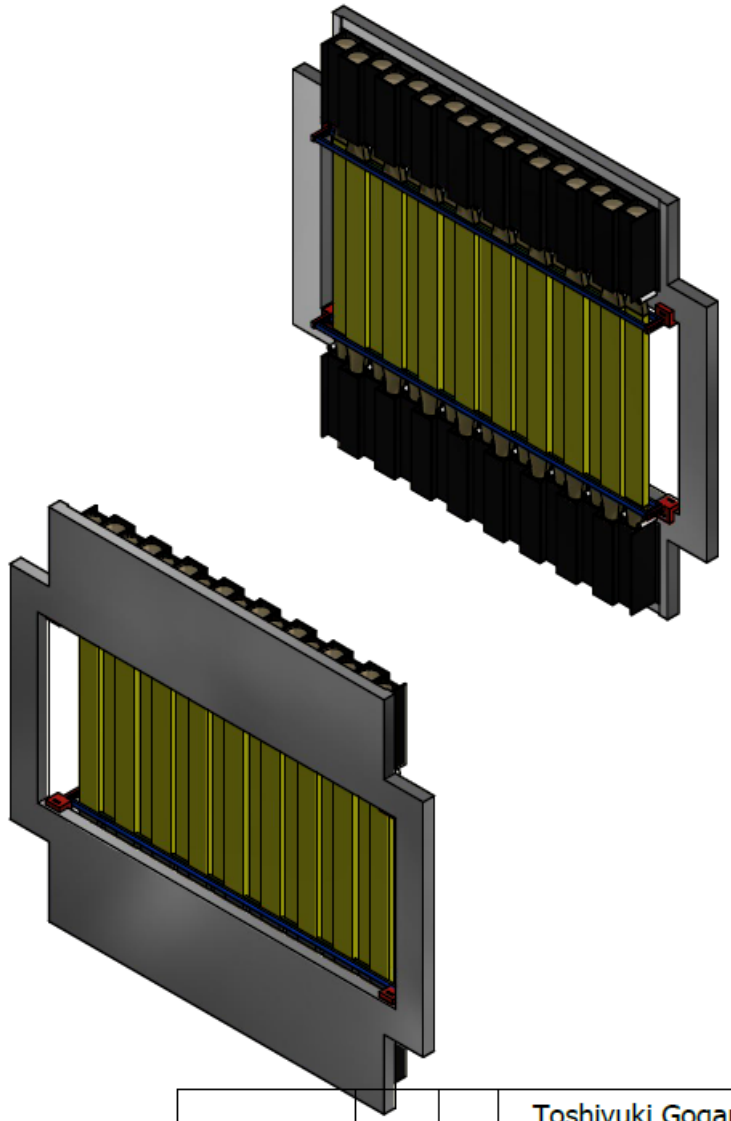




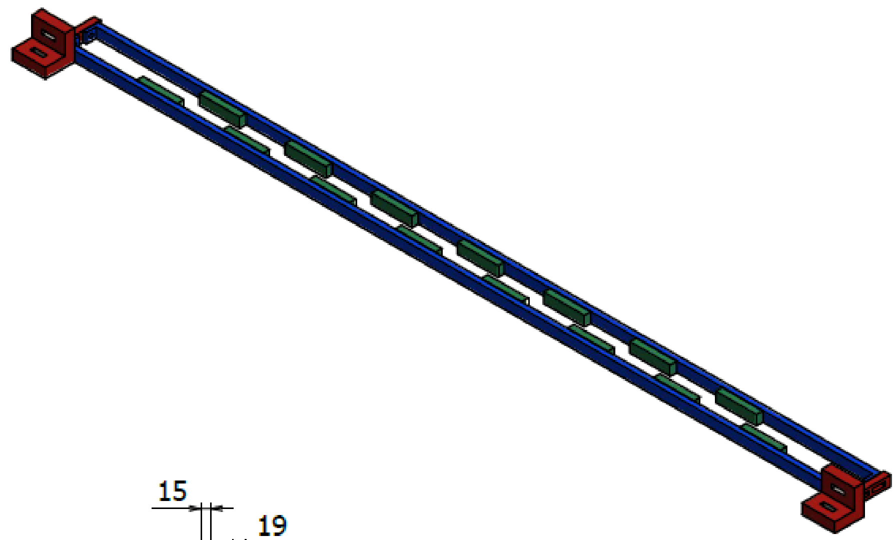


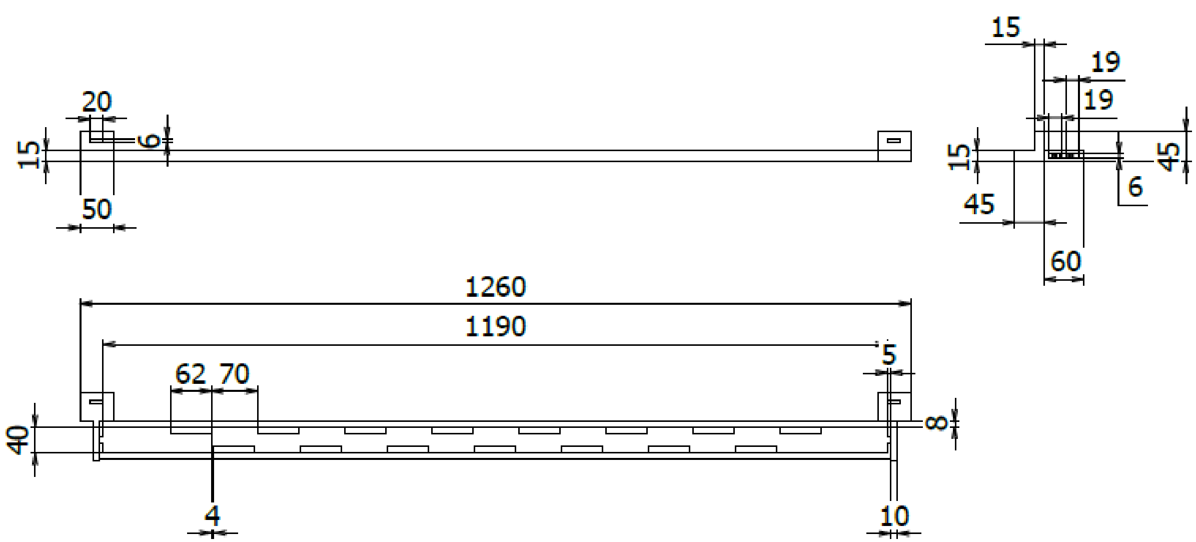
							Toshiyuki Gogami
					名前	日付	
					作成者	2014/12/09	Whole design of TOF
					確認者		
					承認者		
							tof_staggered17_with_frame 1/4
							A3



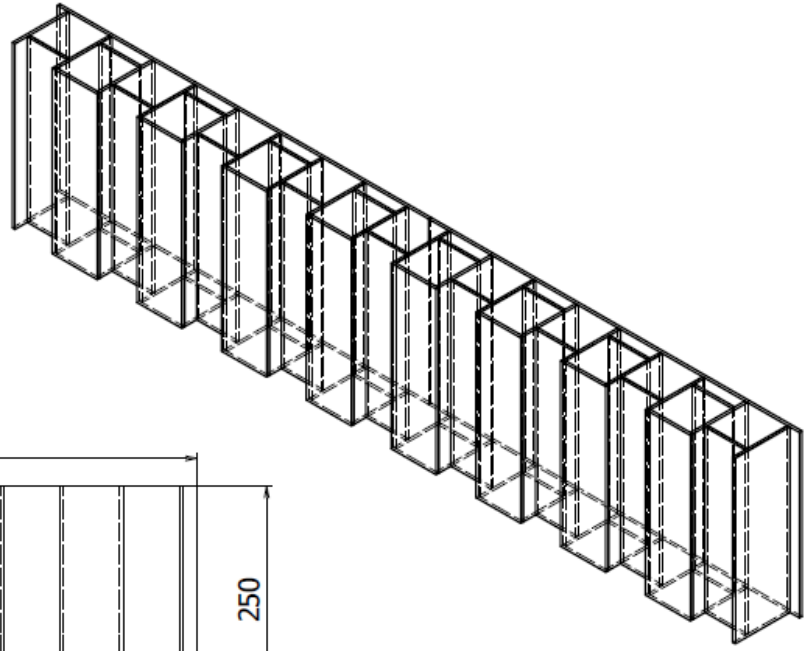


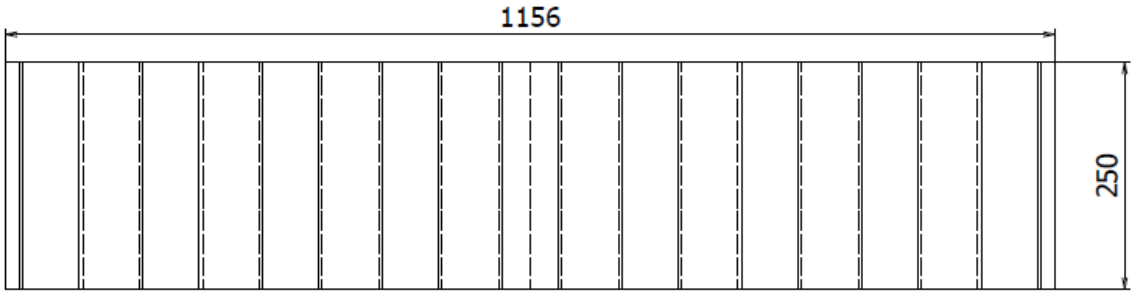
							Toshiyuki Gogami
					名前	日付	
				作成者		2014/12/09	TOF
				確認者			
				承認者			
							tof_staggered17_with_frame 2 / 4
							A3

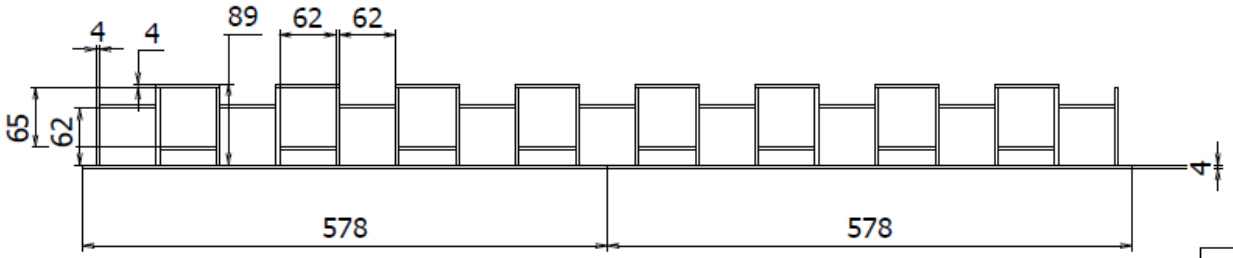




名前	日付	Toshiyuki Gogami
作成者	2014/12/09	Spacer
確認者		
承認者		
		tof_staggered17_with_frame 3/4
		A3



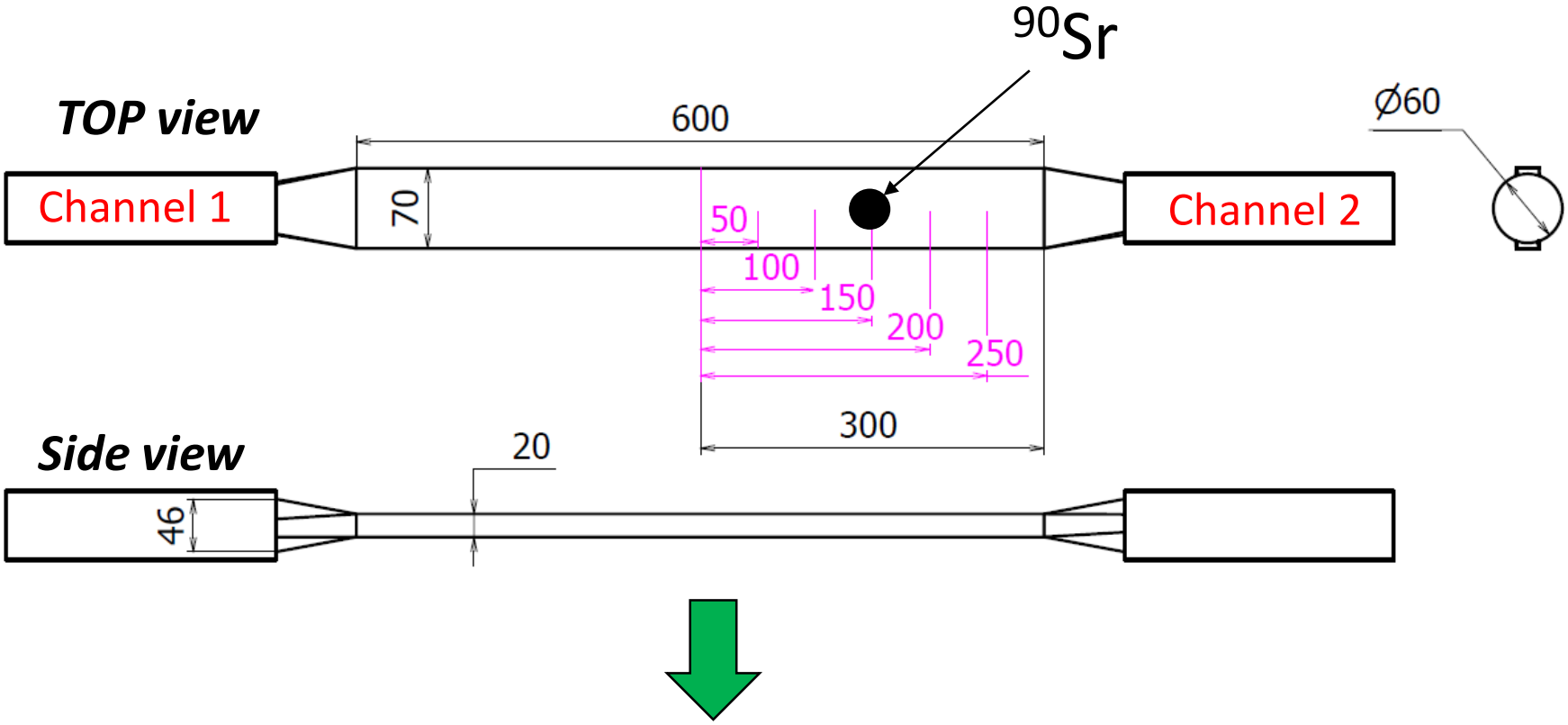




				Toshiyuki Gogami
		名前	日付	
		作成者	2014/12/09	Magnetic field shield
		確認者		
		承認者		
				tof_staggered17_with_frame 4/4
				A3

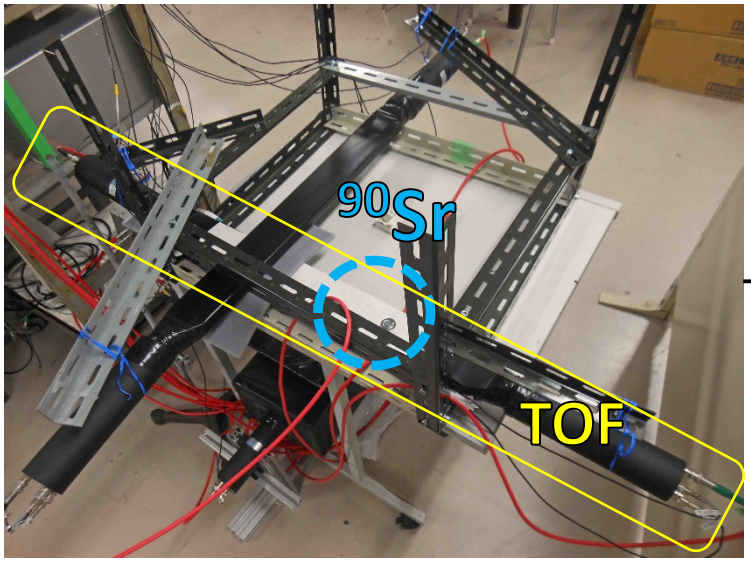
Speed of light
in S-2S TOF detector

Experimental setup

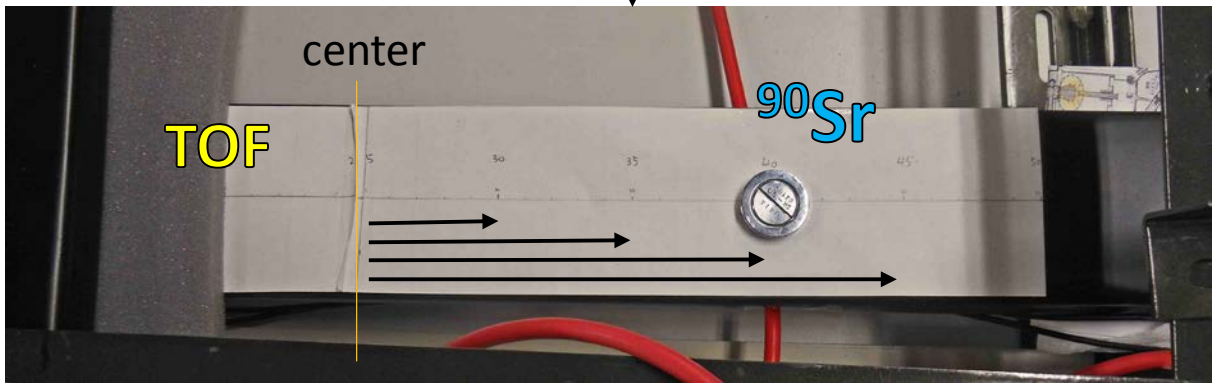


Measured the time difference between signals from two PMTs.

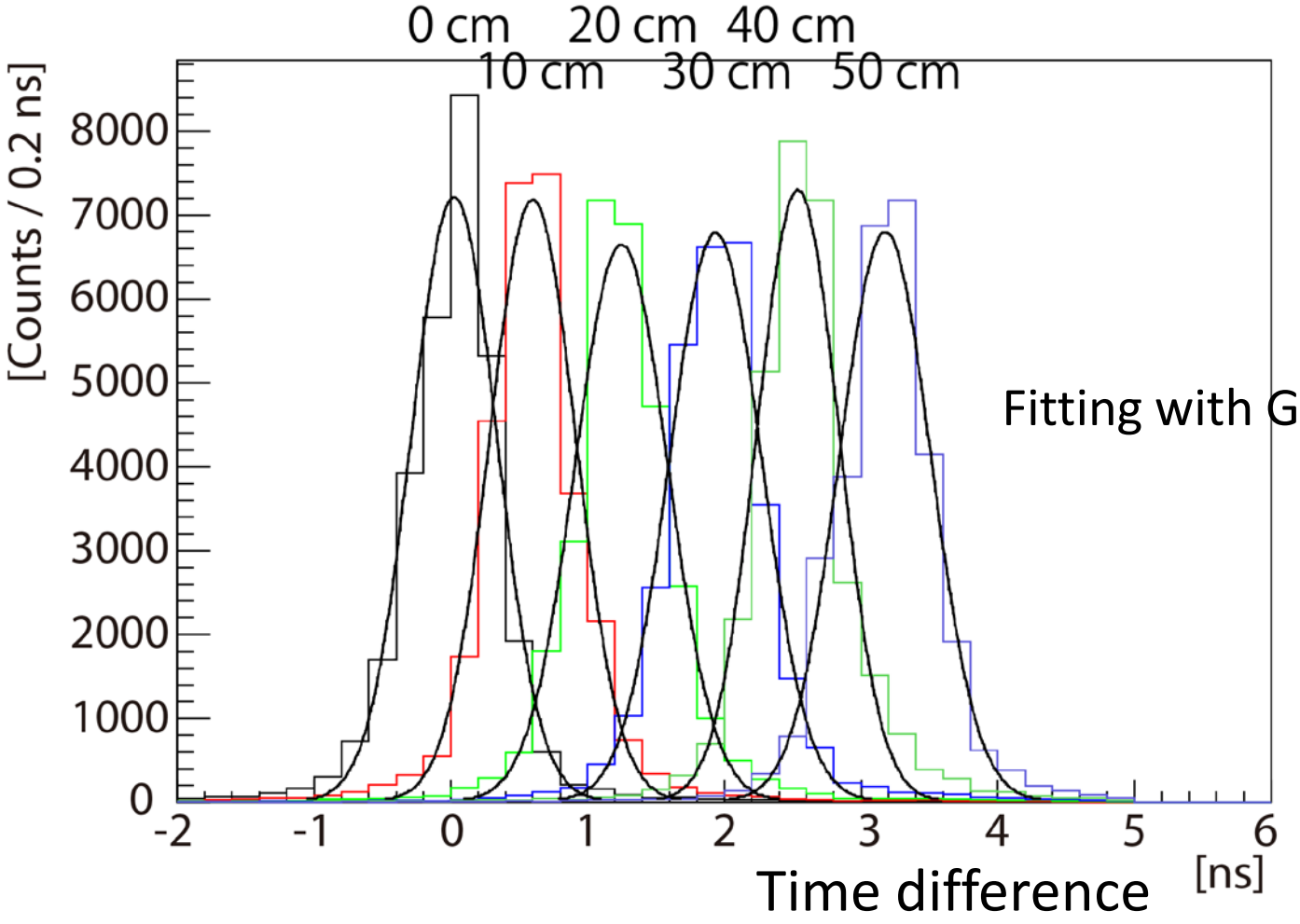
Experimental setup (Photograph)



ZOOM

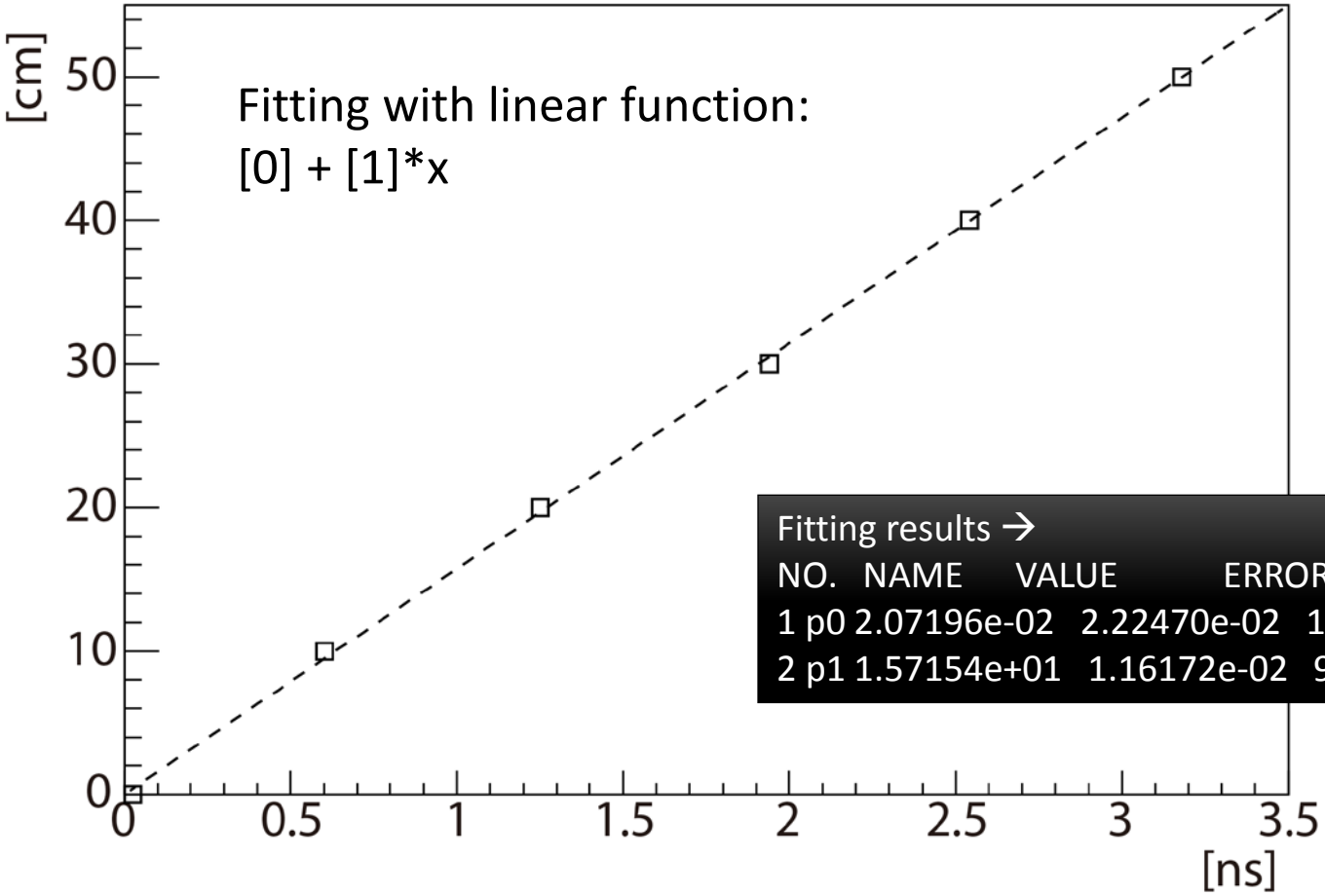


Time difference between two PMT signals



Fitting with Gaussian function

Results



The effective speed of light in TOF detector:

$(1.57 \pm 0.01) \times 10^8$ [m/s]