

Dark rate measurement status report

Tokyo University of Science

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26th December, 2019

mPMT meeting

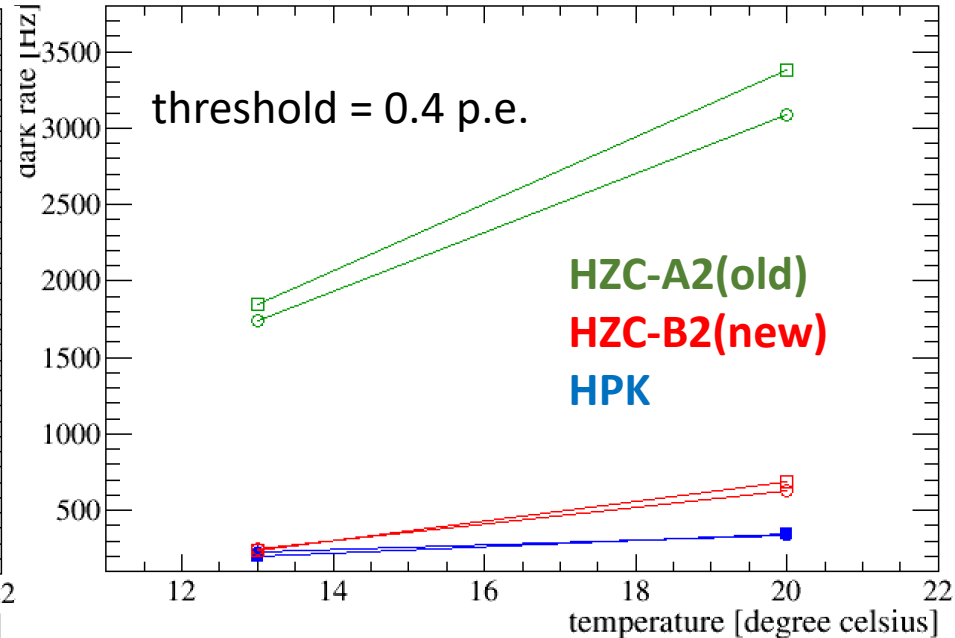
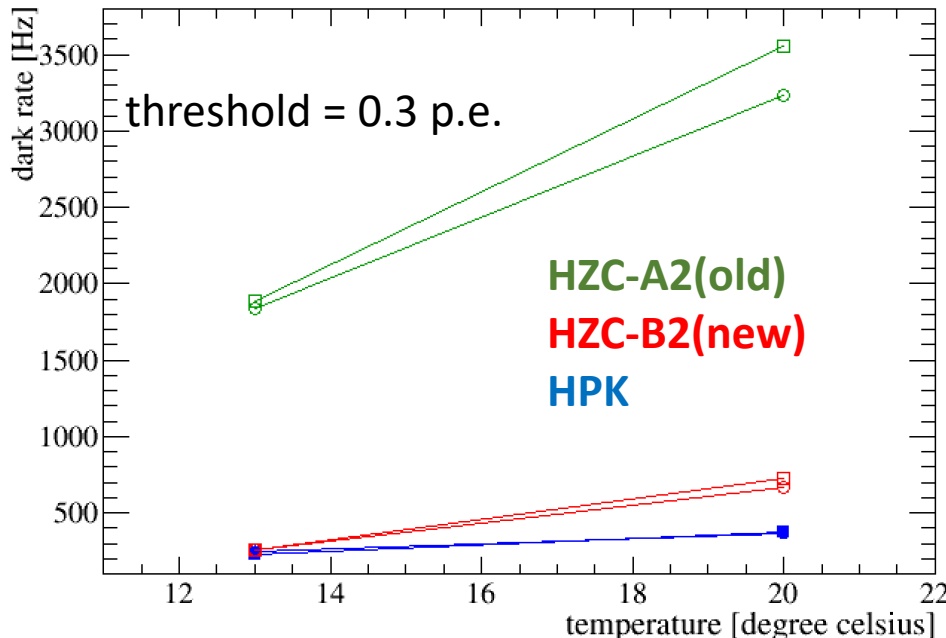
List of the PMTs

	ID	Type	HV	Negative	Positive
Hamamatsu	HPK	R14374	1250	✓	-
HZA new PMT	HZA-B1	XP72B2F	-	-	-
	HZA-B2	XP72B2F	Tuned HV	✓	-
HZA old PMT	HZA-A1	XP82B20	-	-	-
	HZA-A2	XP82B20	Tuned HV	✓ (this week)	-

This week...

- I tuned HV value of HZA-A2 to give almost same gain with HPK, then measured the dark rate.

Dark rate measurement



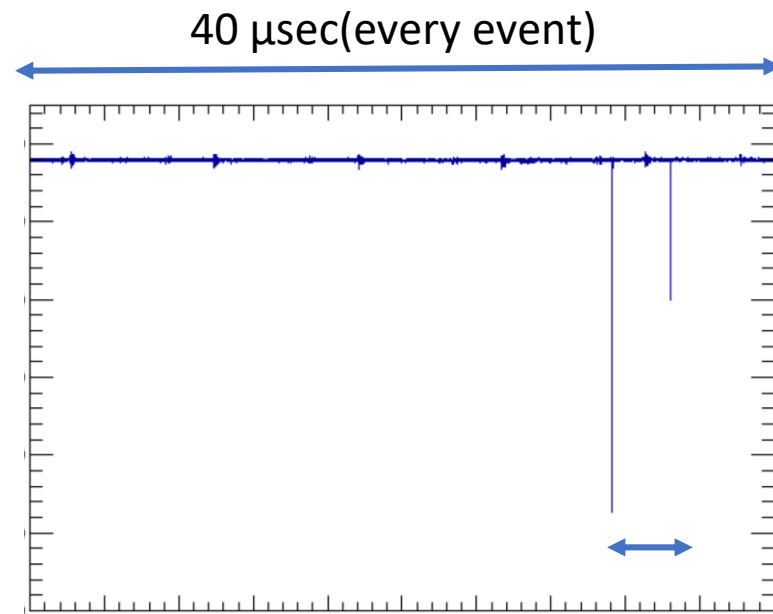
The temperature dependence of dark rate

- | | | |
|------------------------------|---------------------------------|---------------------------------|
| ■ - HPK 1 st time | □ - HZC-B2 1 st time | □ - HZC-A2 1 st time |
| ● - HPK 2 nd time | ○ - HZC-B2 2 nd time | ○ - HZC-A2 2 nd time |

- In my measurement, the order of rate were $HPK \leq HZC-B2 \ll HZC-A2$, but still more than 200 Hz at 13°C.

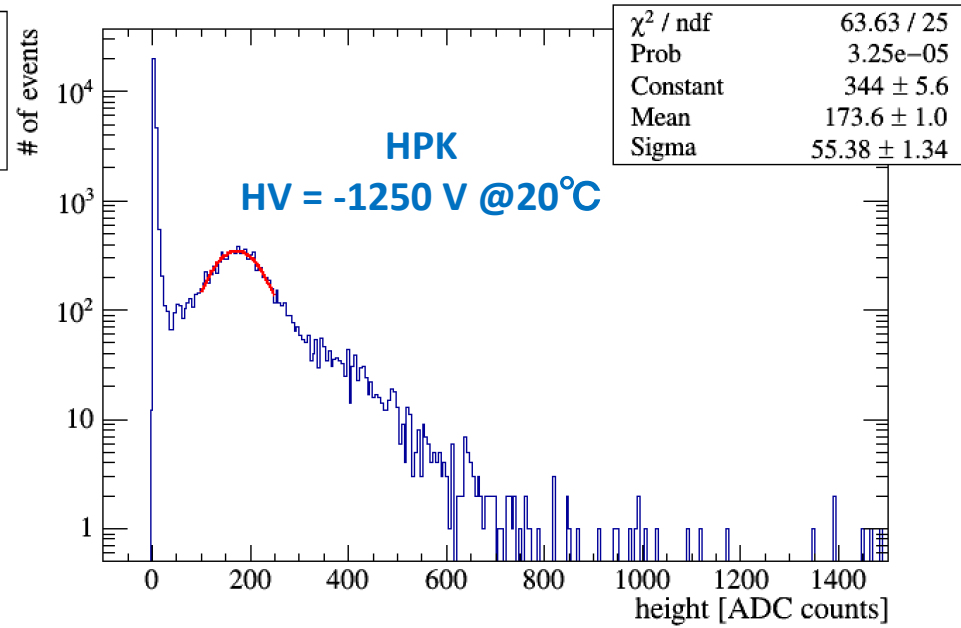
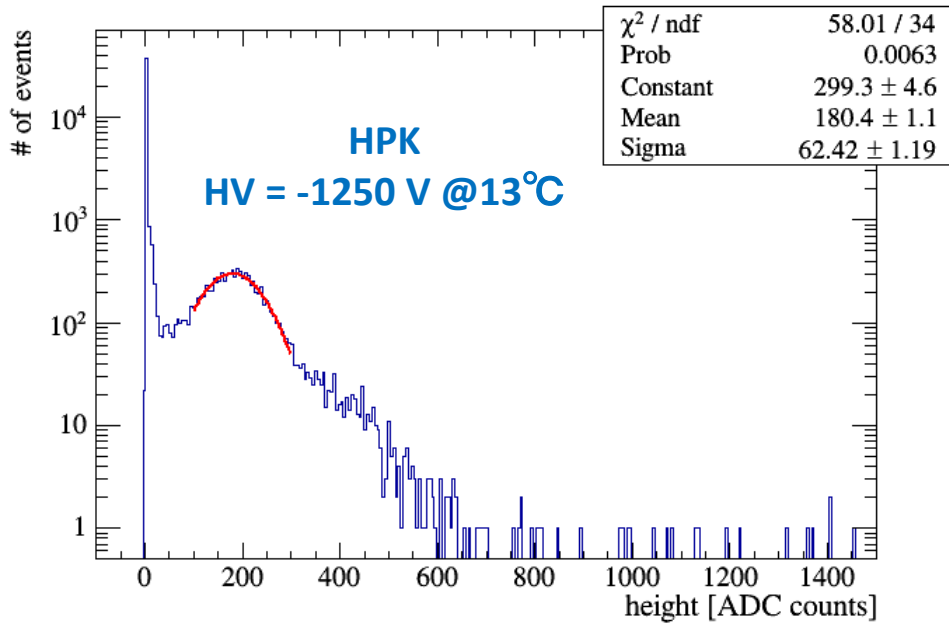
Future plan

- To decrease the rate, I will check
 - the time intervals of dark noises
 - the frequency of continuous signal.(for HPK and HZC-B2)



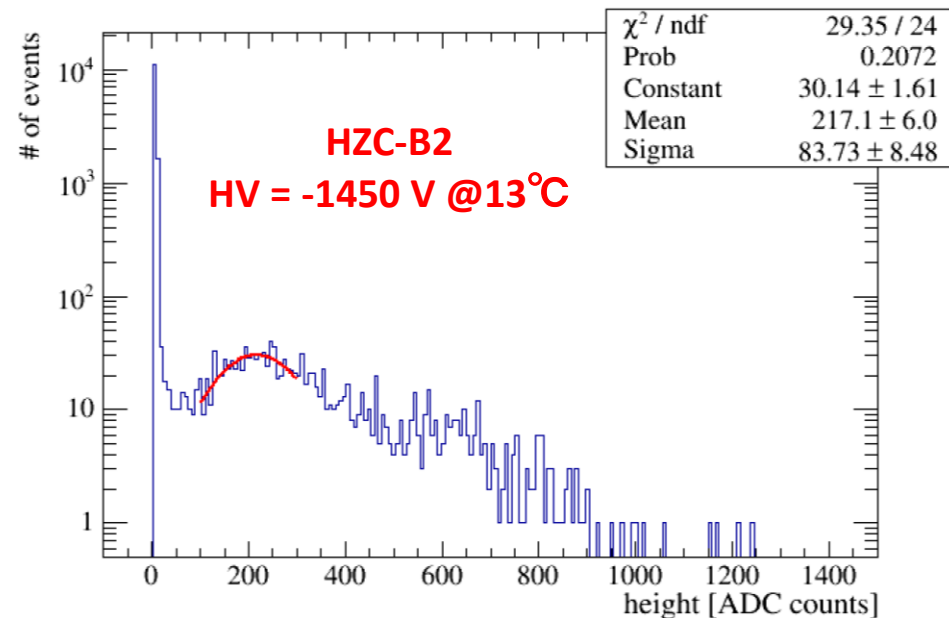
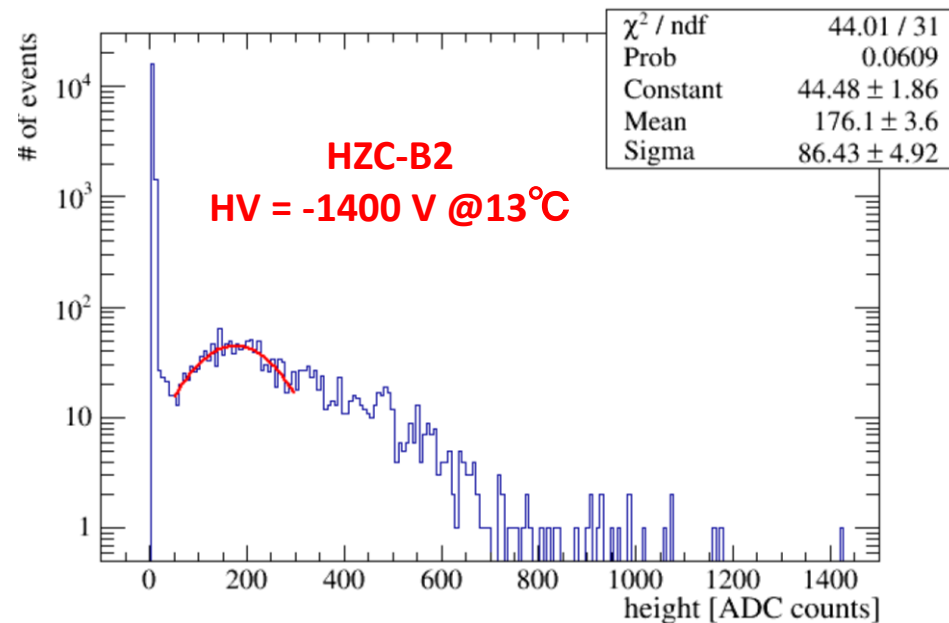
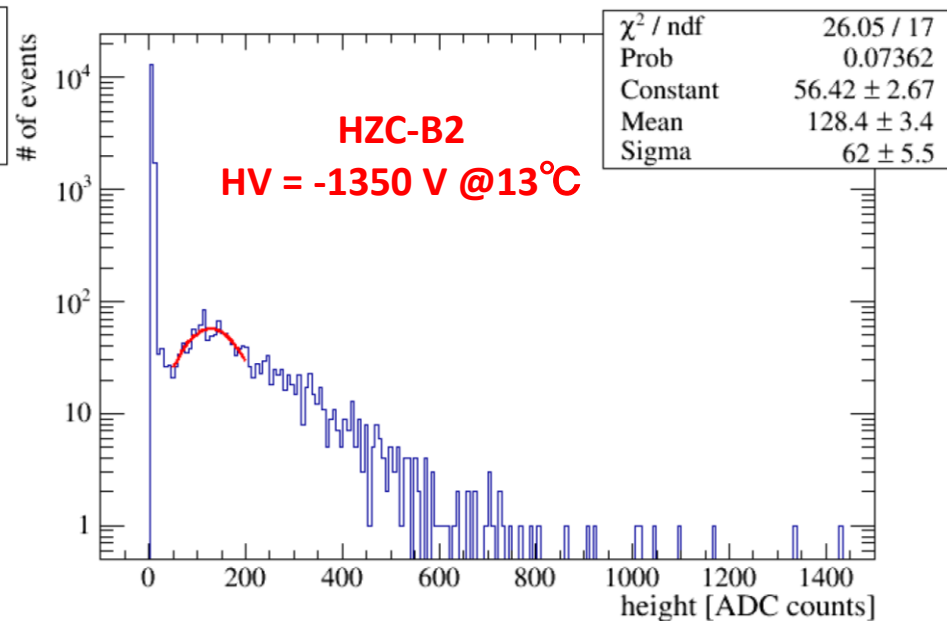
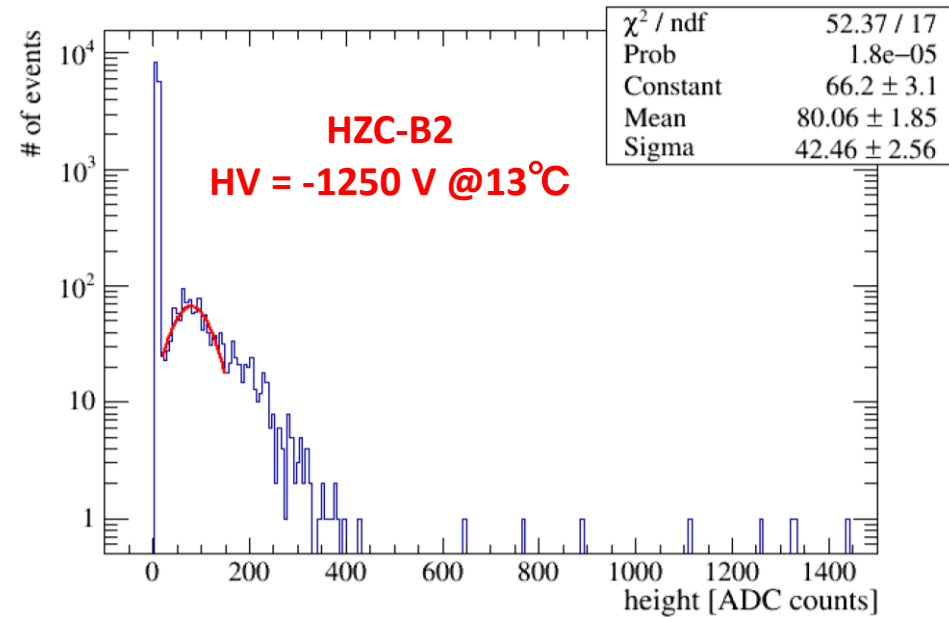
Event example (HPK @ 13°C)

Gain (HPK)



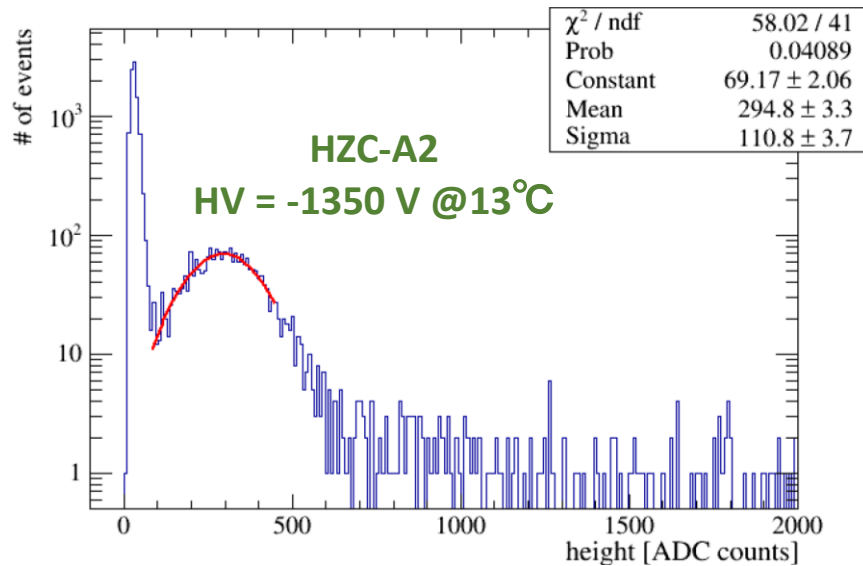
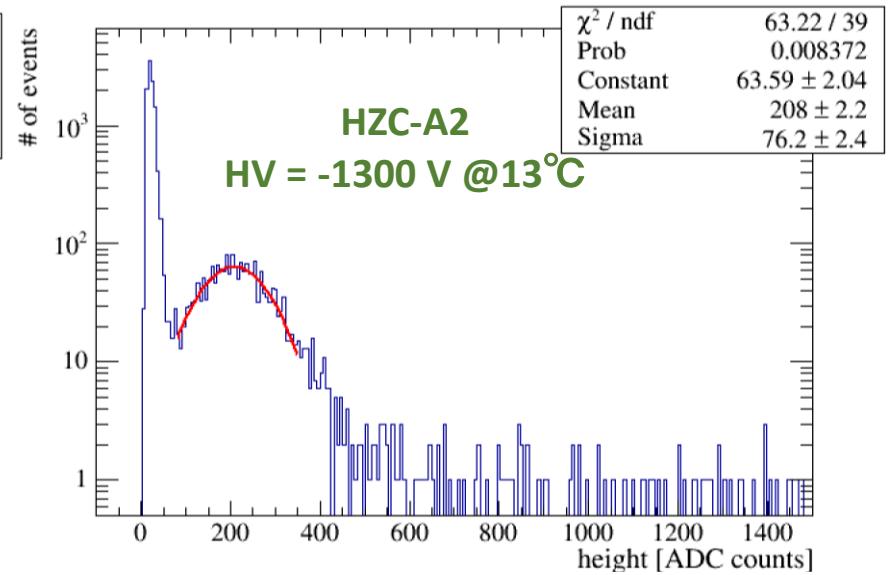
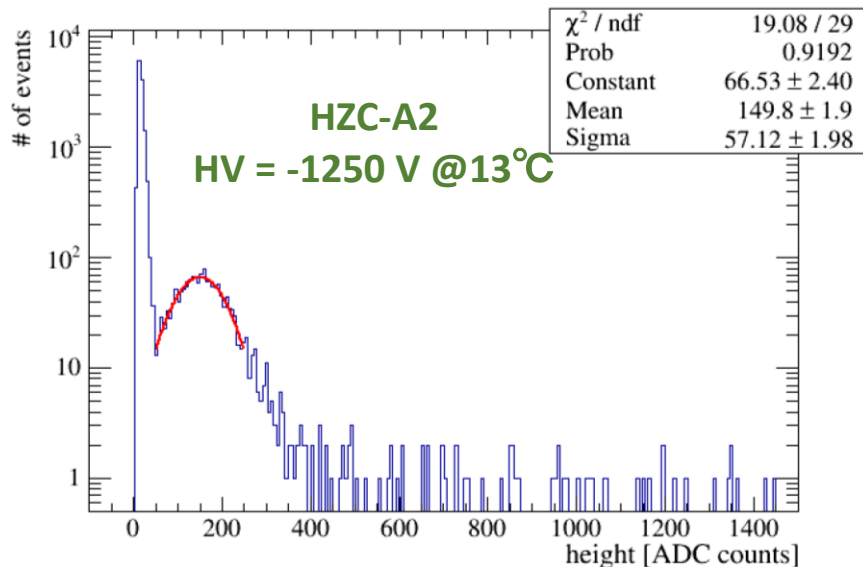
Gain at 13 degree Celsius

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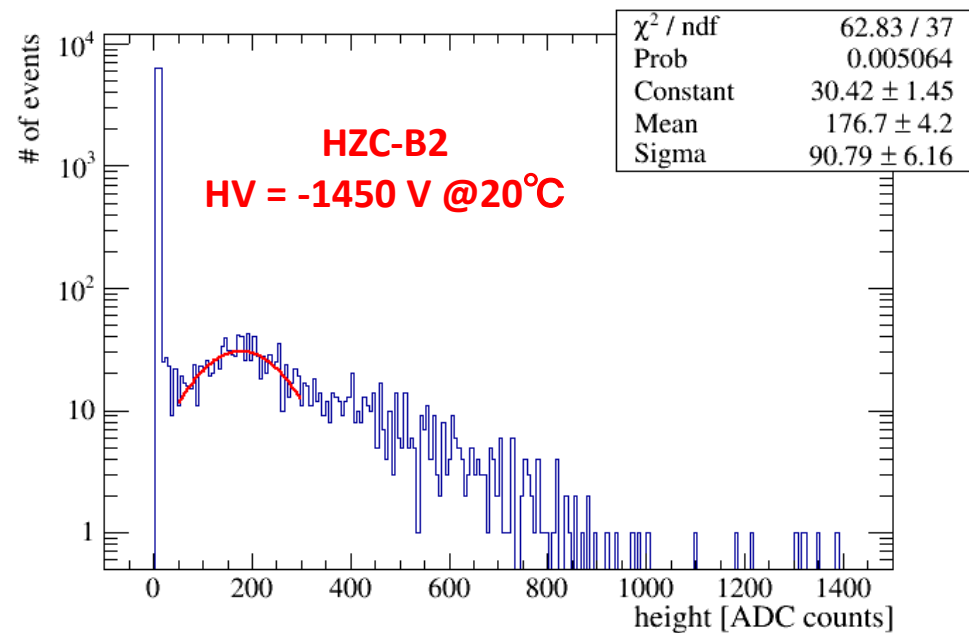
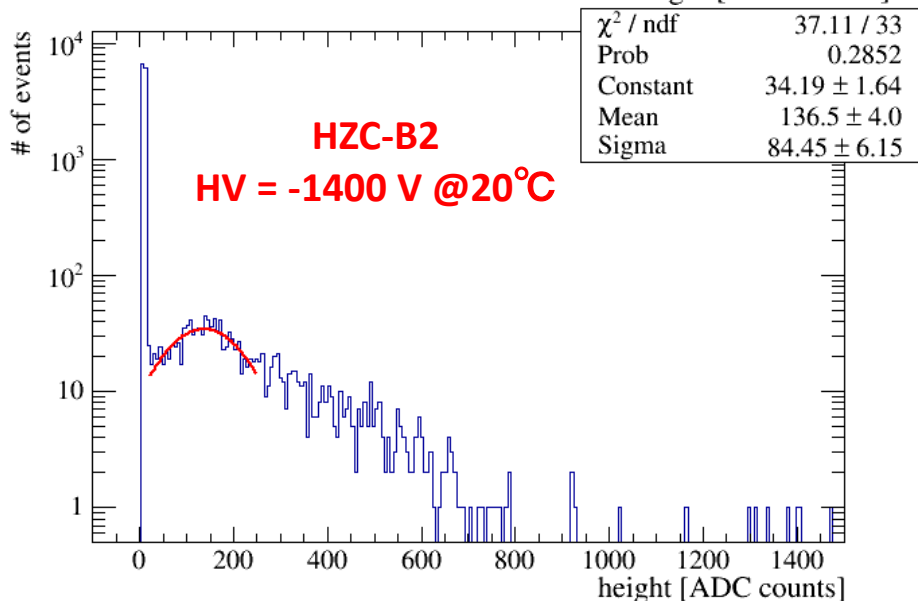
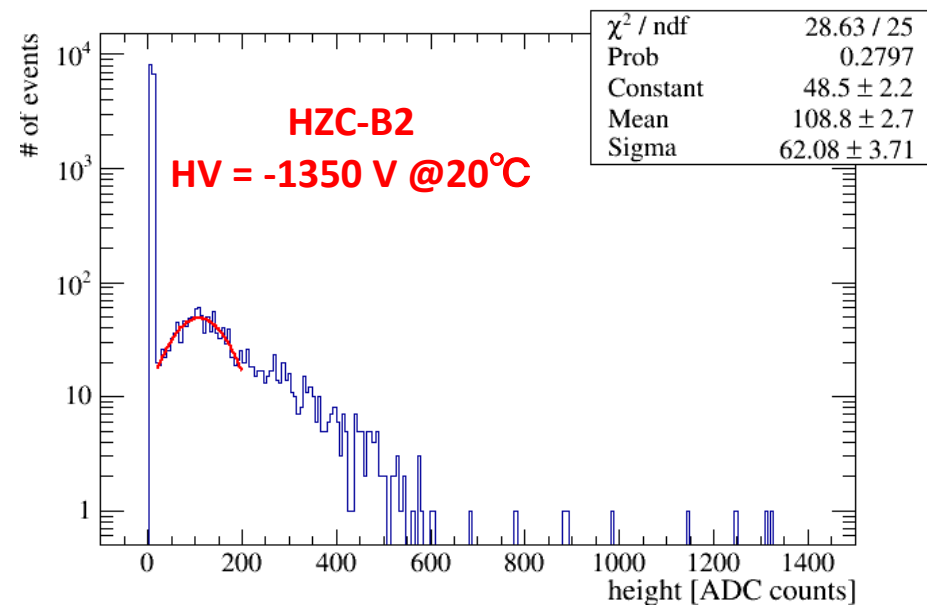
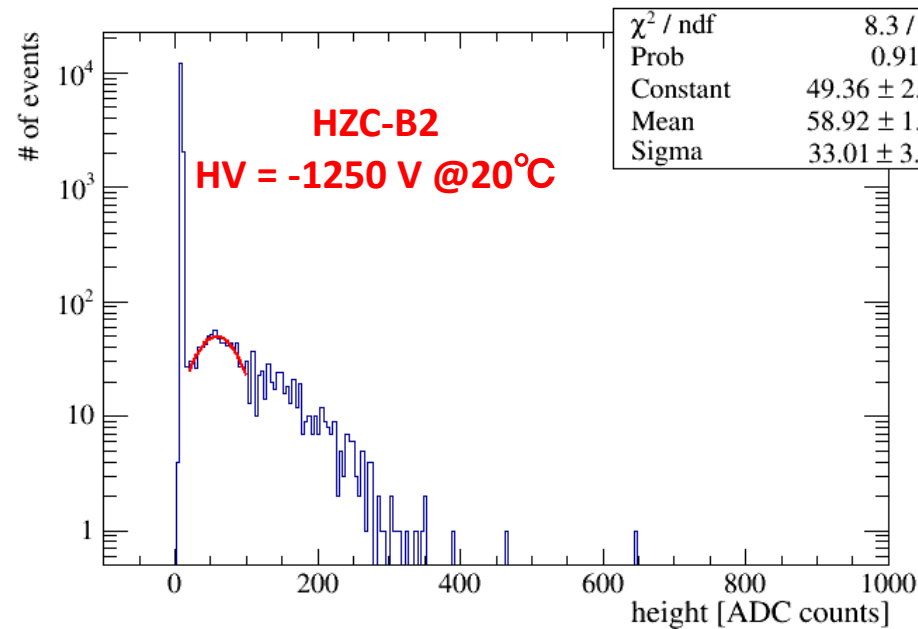
Gain at 13 degree Celsius

7



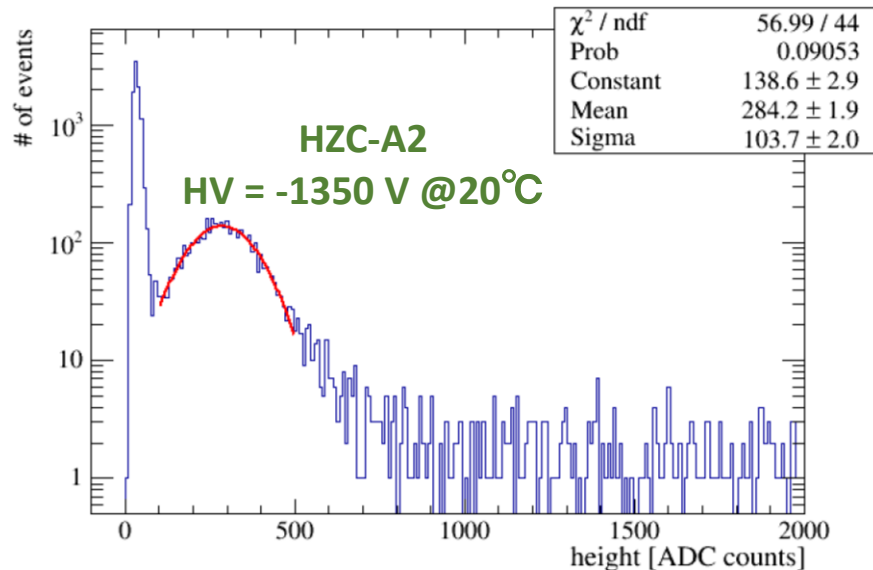
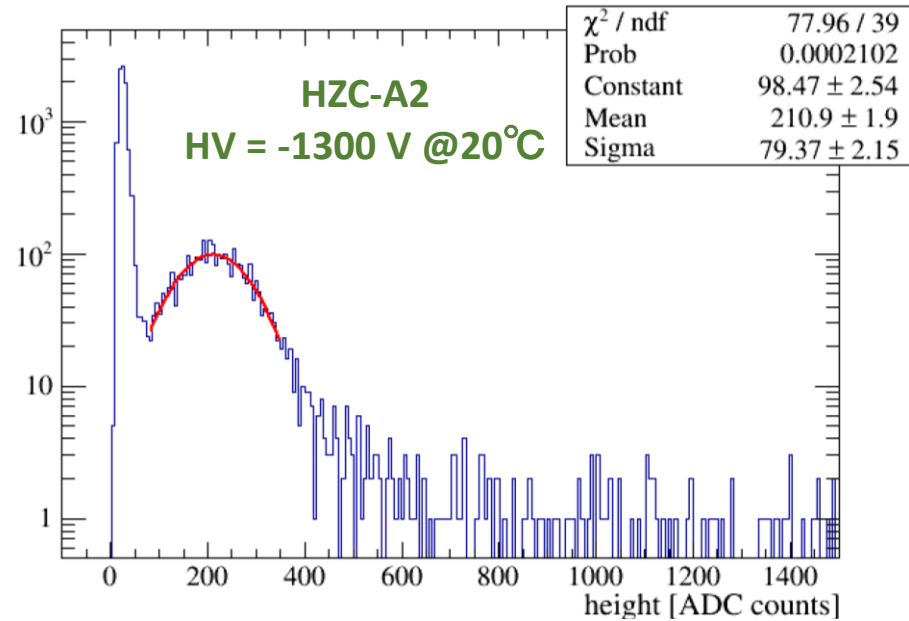
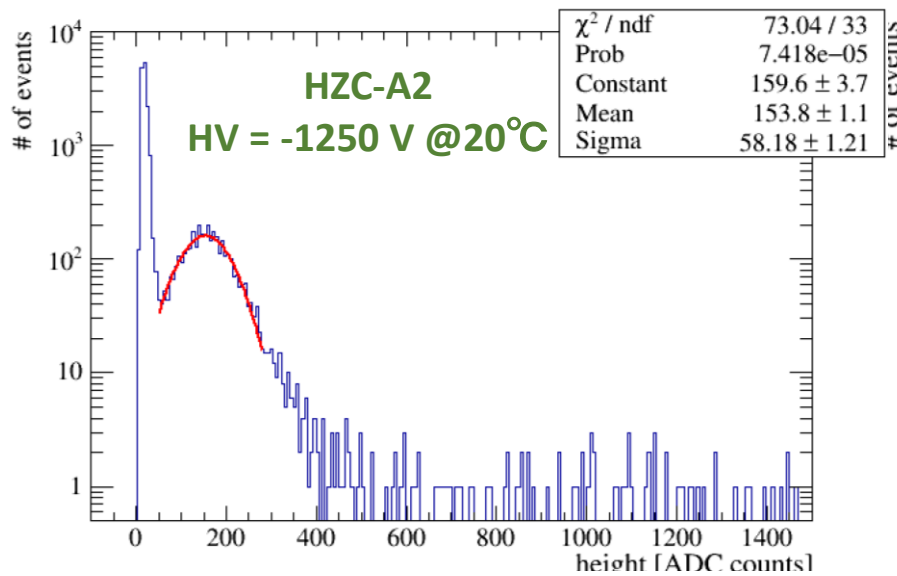
Gain at 20 degree Celsius

8



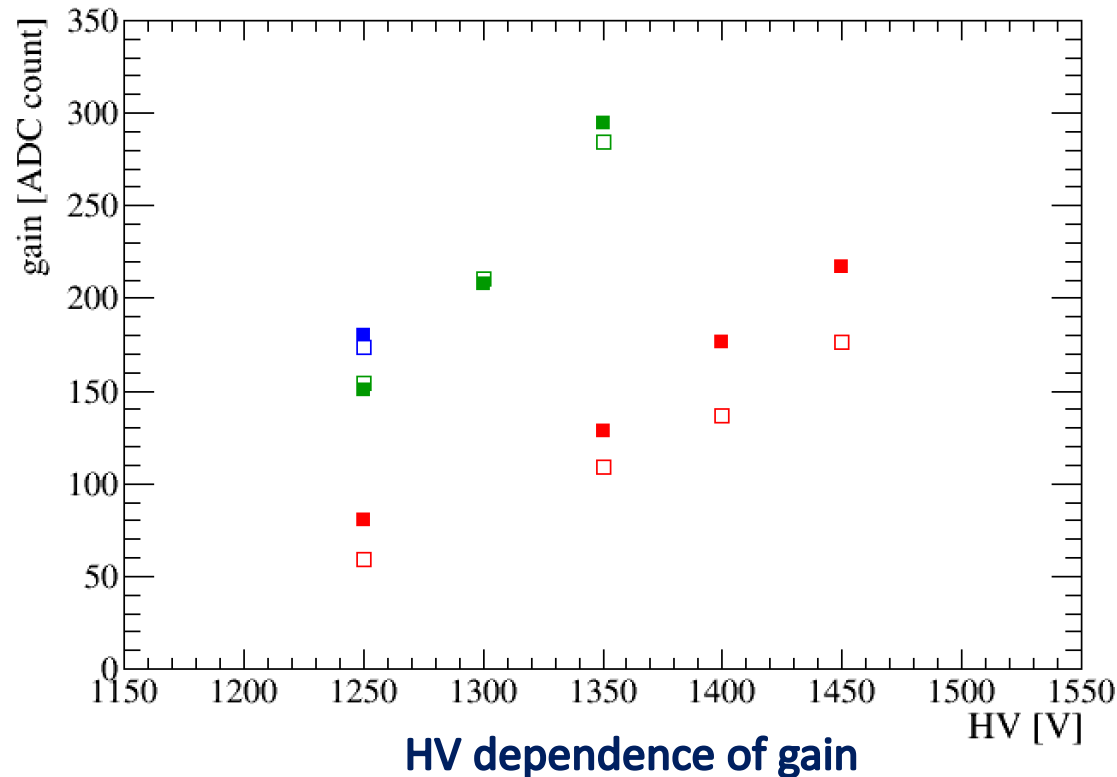
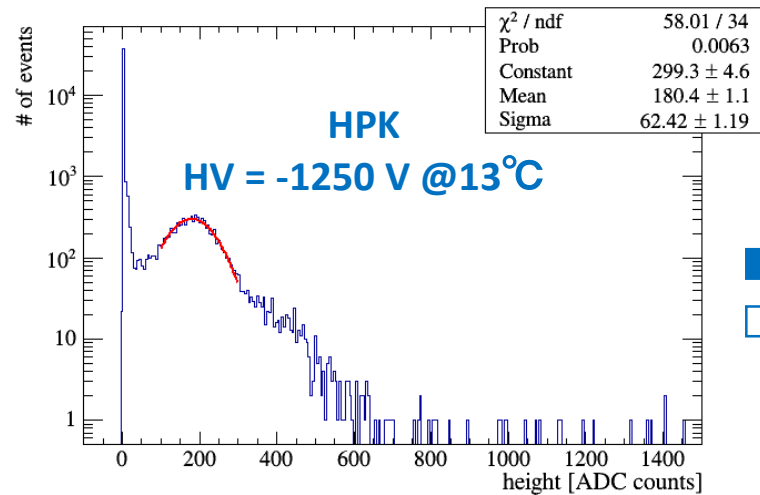
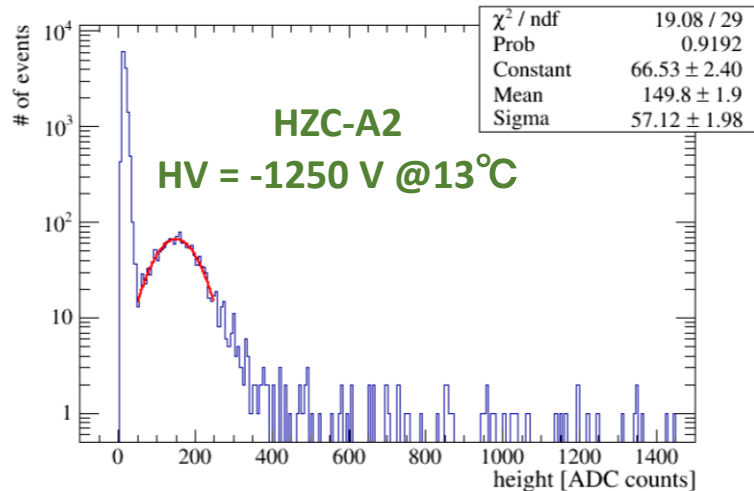
Gain at 20 degree Celsius

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HV dependence of gain

- Changing HV supplied to Chinese PMT, I measured 1 p.e. pulse height by illuminating low intensity laser.



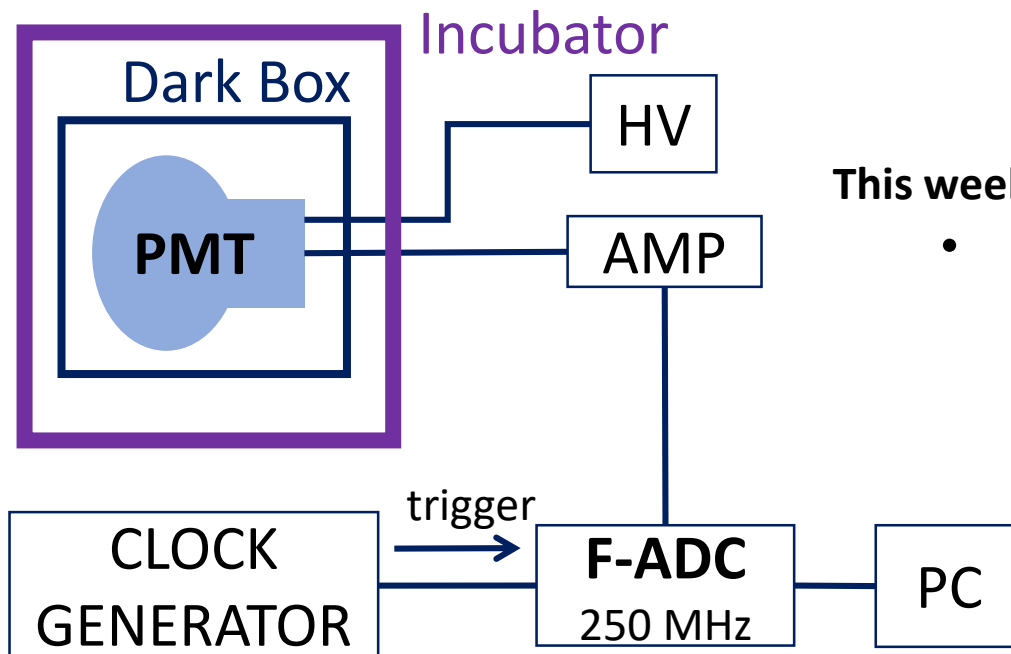
- - HPK@13°C ■ - HZC-B2@13°C ■ - HZC-A2@13°C
- - HPK@20°C □ - HZC-B2@20°C □ - HZC-A2@20°C

- 1250V for HZC-A2

Dark rate measurement

- We measured dark rate by F-ADC, keeping the temperature at 13 and 20 °C with incubator.
- We counted the dark noise signals above the threshold 0.3 p.e. and 0.4 p.e.
- To check the consistency, I took the data twice for each PMT.

Setup for dark rate measurement



This week measurement

- HV = -1250 V for HZC-A2