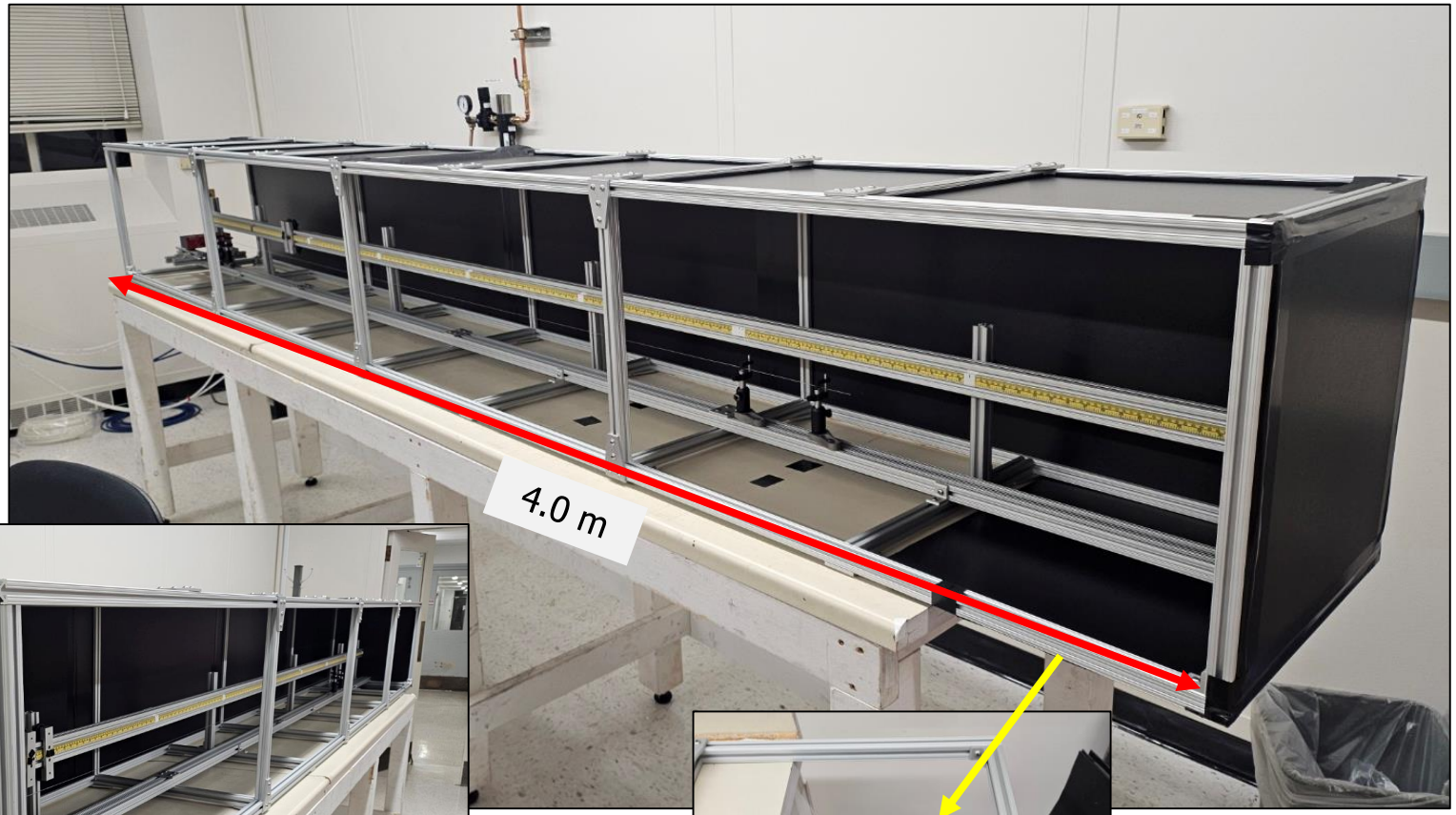
BIC System Testing Meeting

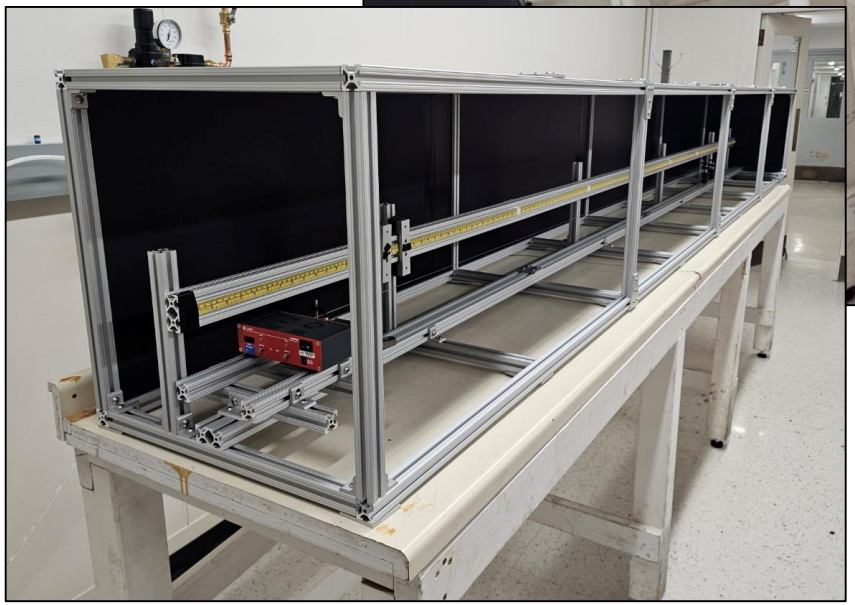
02. 11. 2025

Seoyun Jang

SciFi Measurement

Setup @B102

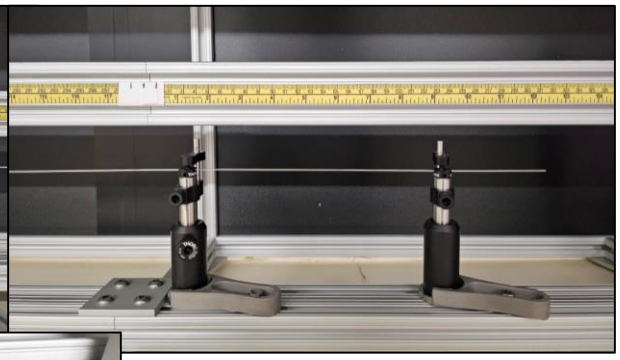


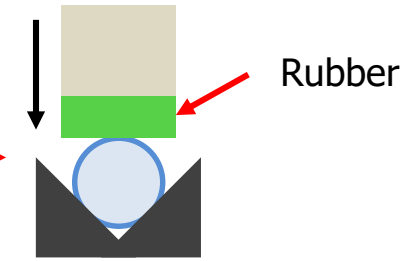


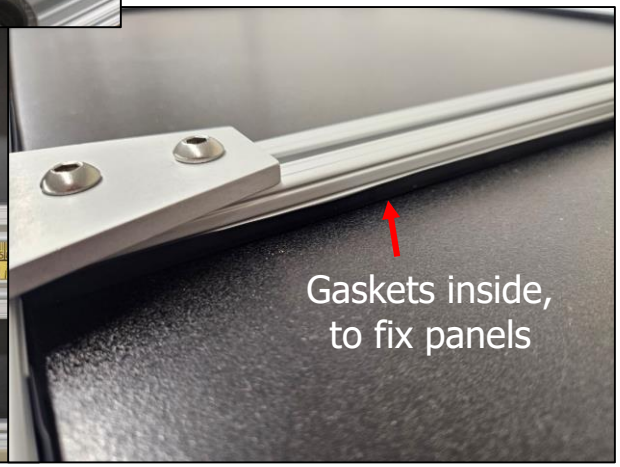
Need more Table…
if we extend setup

SciFi Measurement

Setup @B102

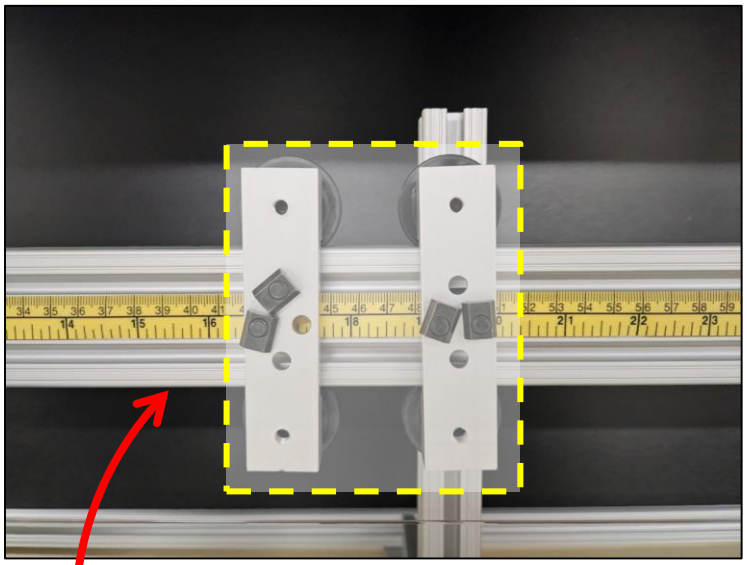


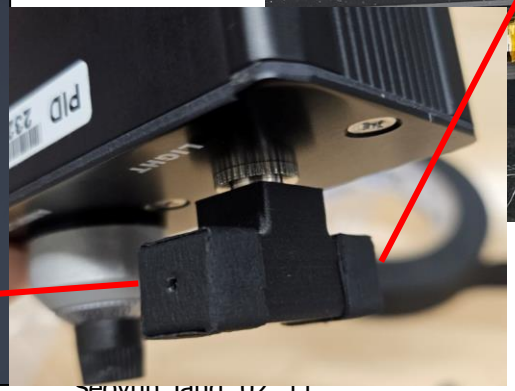




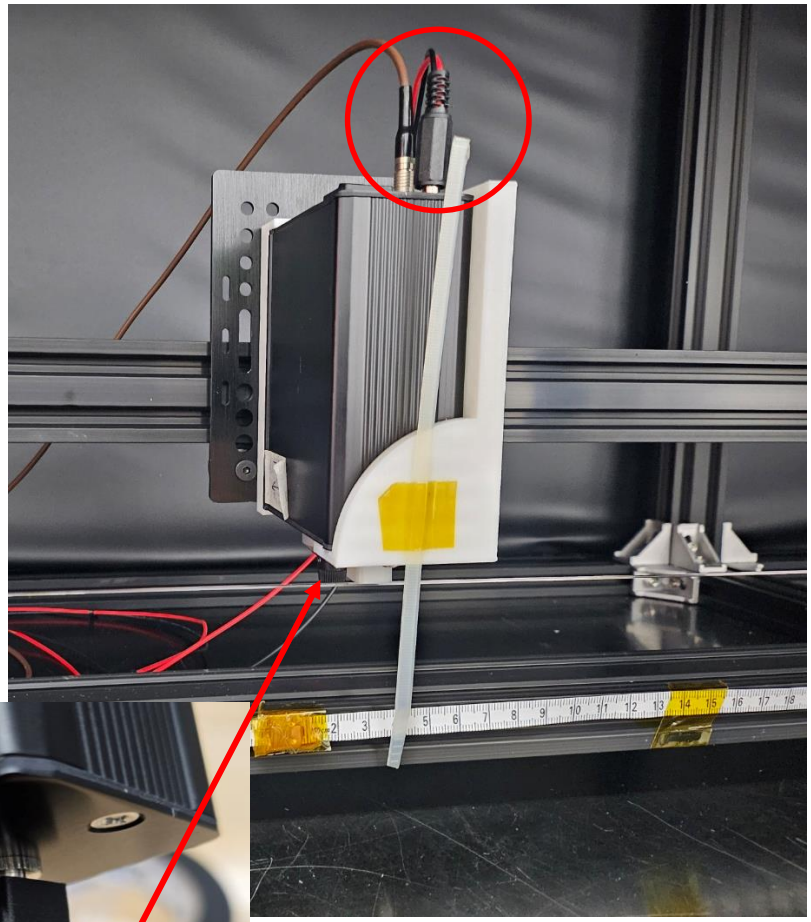
SciFi Measurement

To do – LED Driver Jig





Need extension for power cable (>3 m) (12 V)



Setup done at @UoS, Korea

SciFi Measurement
To do

- **Writing instructions & log for SciFi measurements.**

  LINK : Instruction Log

  Instruction will include setup specification, hardware & software setting (HERA), data taking & analysis

  Log is for recording measurements for each programs, each fibers, at each distance.

- Measurements to do – **Attenuation Length Measurement** (SCSF-78, 3.0 m)

  - Setup Stability Test

    Measure 10 times in same condition – same fiber, same position, same LED amplitude

  - Reproductivity Test

    Reproduce & compare attenuation length measurement results done in Korea.

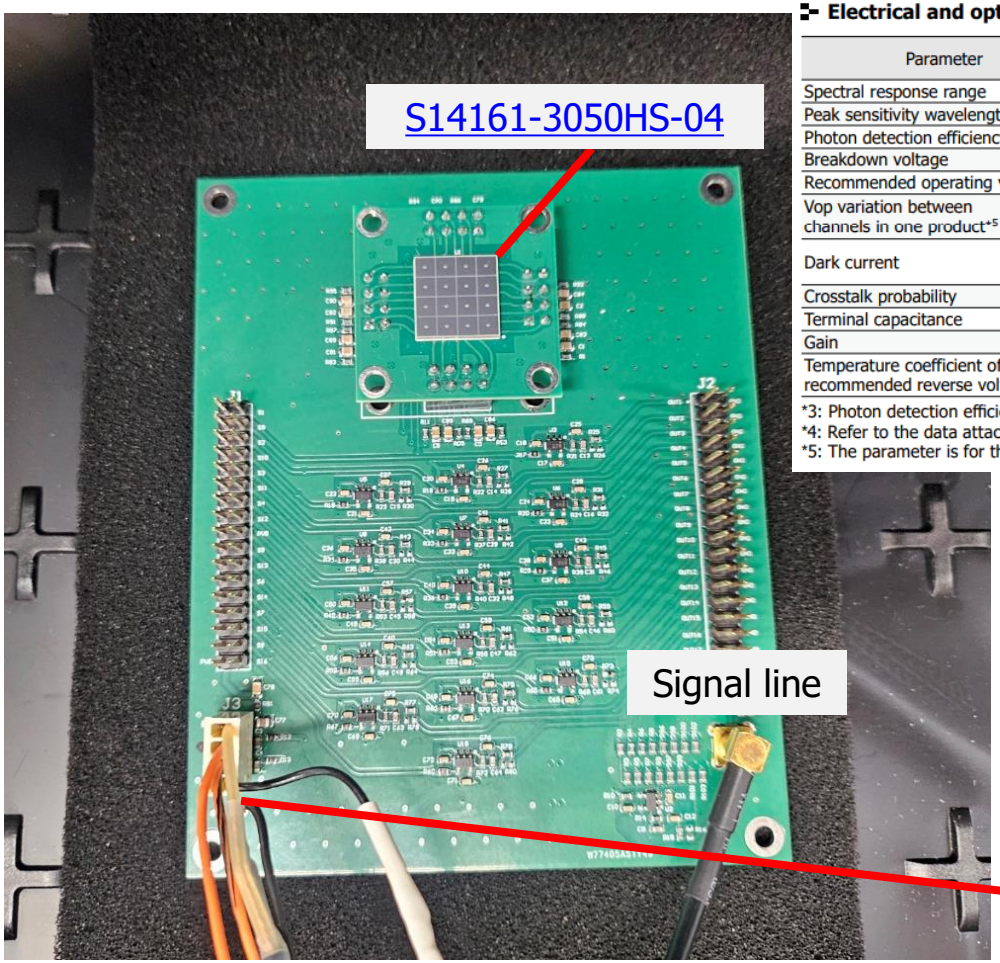
    Measure attenuation length of same fiber several (~5) times, measure fluctuation.

  - Measure Samples (Single Cladding, Double Cladding) (Short & Long Attenuation component)

  - Extend Setup for longer fibers – 3.8m, 4.5m, 5.5m (?)

- Effective Speed Measurement, Timing (?)

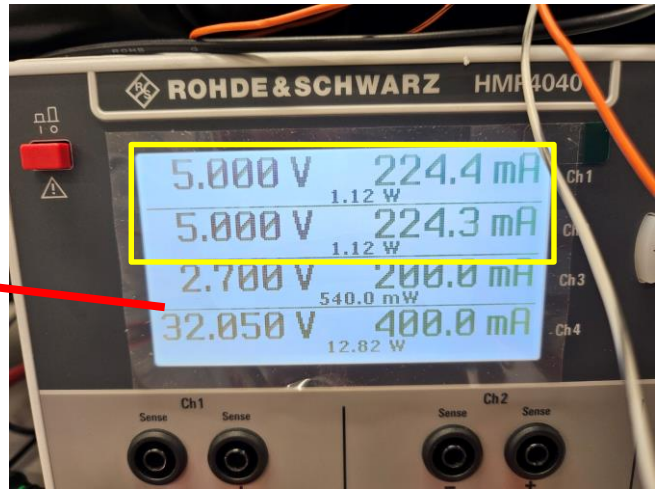
SiPM Working Test
Hardware Setup



Electrical and optical characteristics (Typ. Ta=25 °C, Vover=2.7 V, unless otherwise noted)

Parameter		Symbol	S14160/S14161 -3050HS-04, -08	S14160/S14161 -4050HS-06	S14160/S14161 -6050HS-04	unit
Spectral response range		λ	270 to 900			nm
Peak sensitivity wavelength		λp	450			nm
Photon detection efficiency at λp*3		PDE	50			%
Breakdown voltage		VBR	38			V
Recommended operating voltage*4		Vop	VBR + 2.7			V
Vop variation between channels in one product*5	Typ.	-	0.1			V
	Max.		0.2			
Dark current	Typ.	ID	0.6	1.1	2.5	μA
	Max.		1.8	3.3	7.5	
Crosstalk probability		-	7			%
Terminal capacitance		Ct	500	900	2000	pF
Gain		M	2.5×10^6			-
Temperature coefficient of recommended reverse voltage		ΔTVop	34			mV/°C

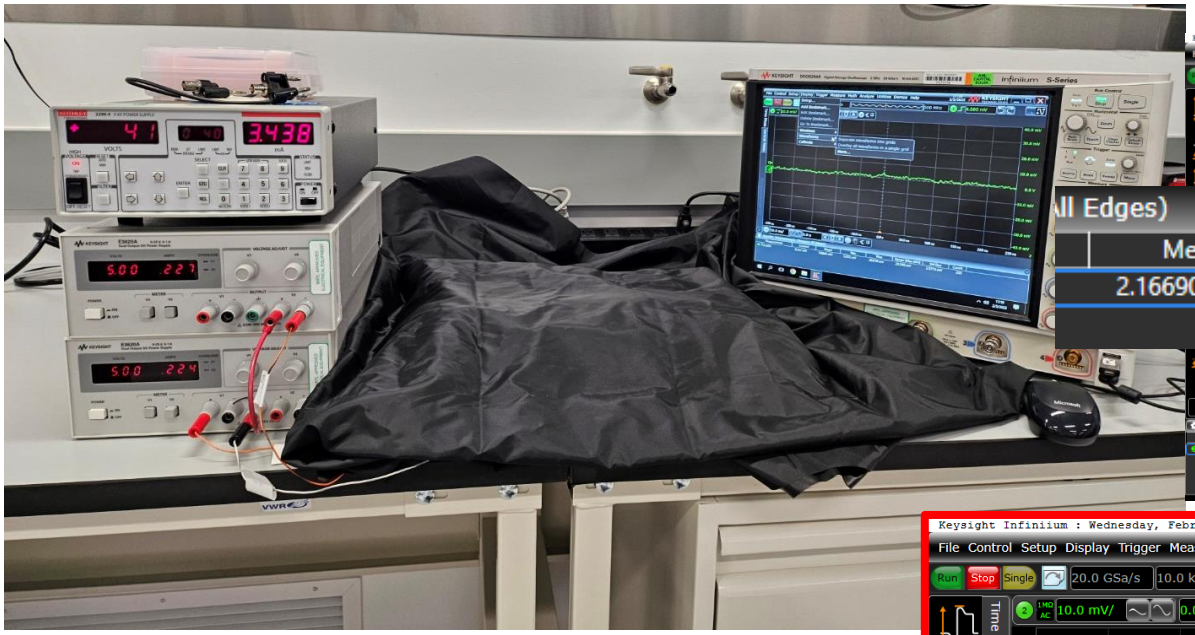
*3: Photon detection efficiency does not include crosstalk and afterpulses.
*4: Refer to the data attached for each product.
*5: The parameter is for the S14161 series (multichannel type)

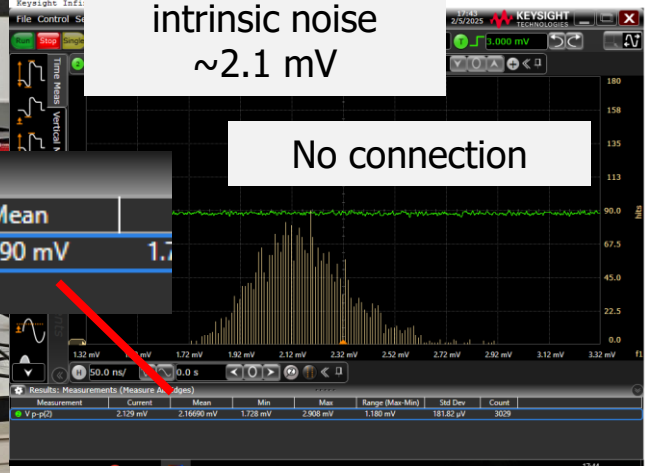


± 5 V, ~225 mA

SiPM Working Test

Dark Count Measure



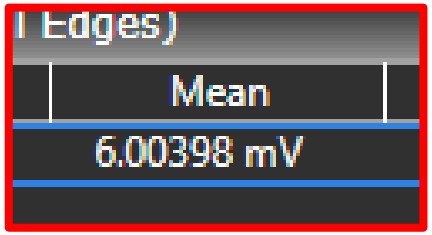


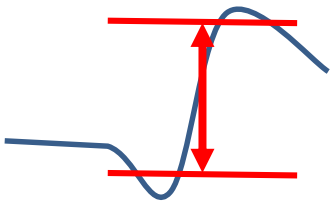
Oscilloscope intrinsic noise ~2.1 mV

No connection

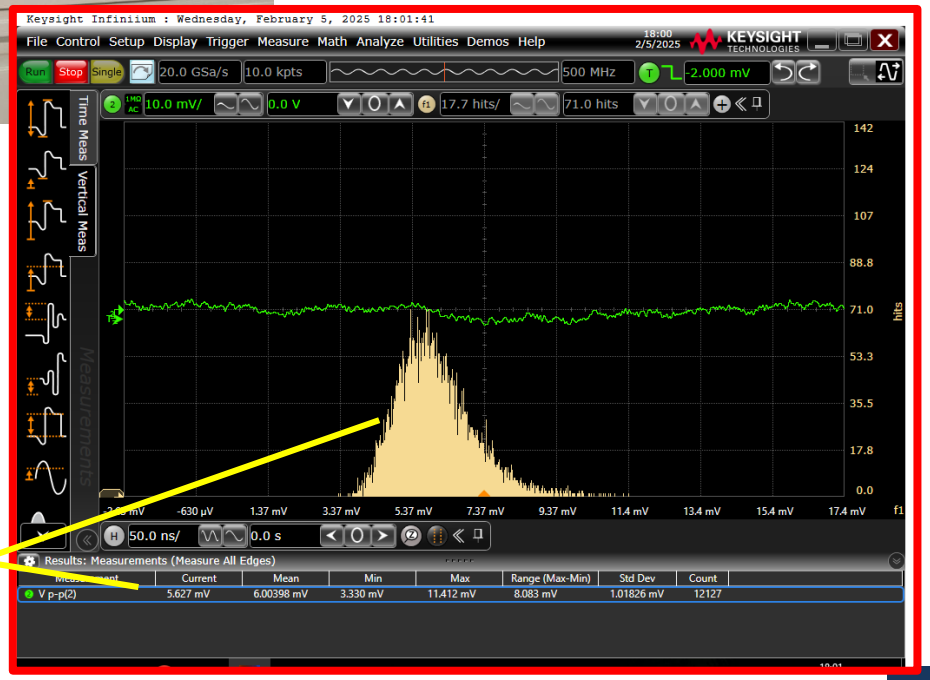
40.5 V, thr=-2mV

No Source



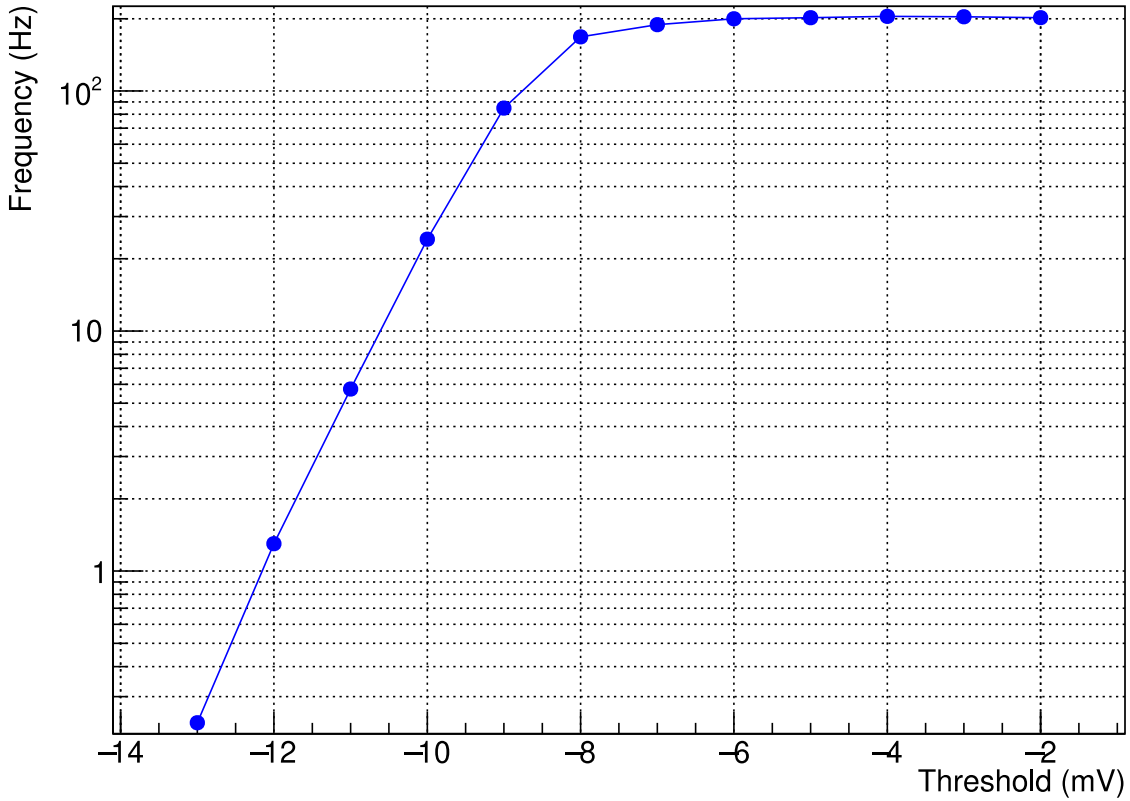


Peak height Measurement Histogram



SiPM Working Test

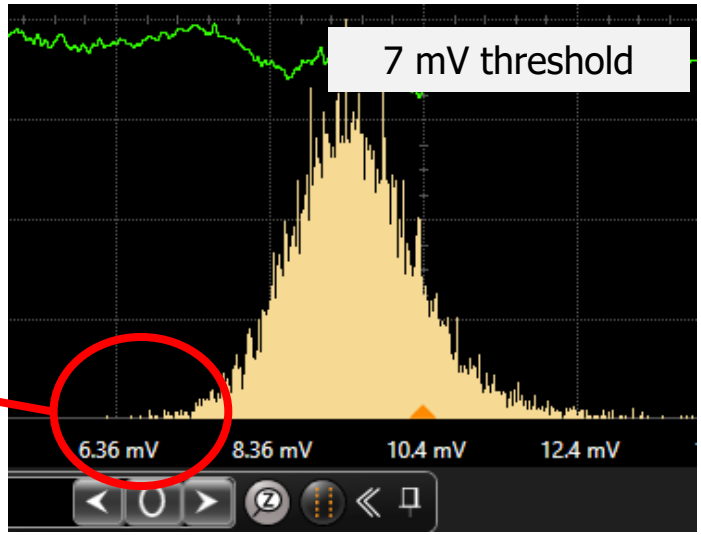
Threshold vs Frequency



40.5 V, thr=-2~-13 mV

No Source

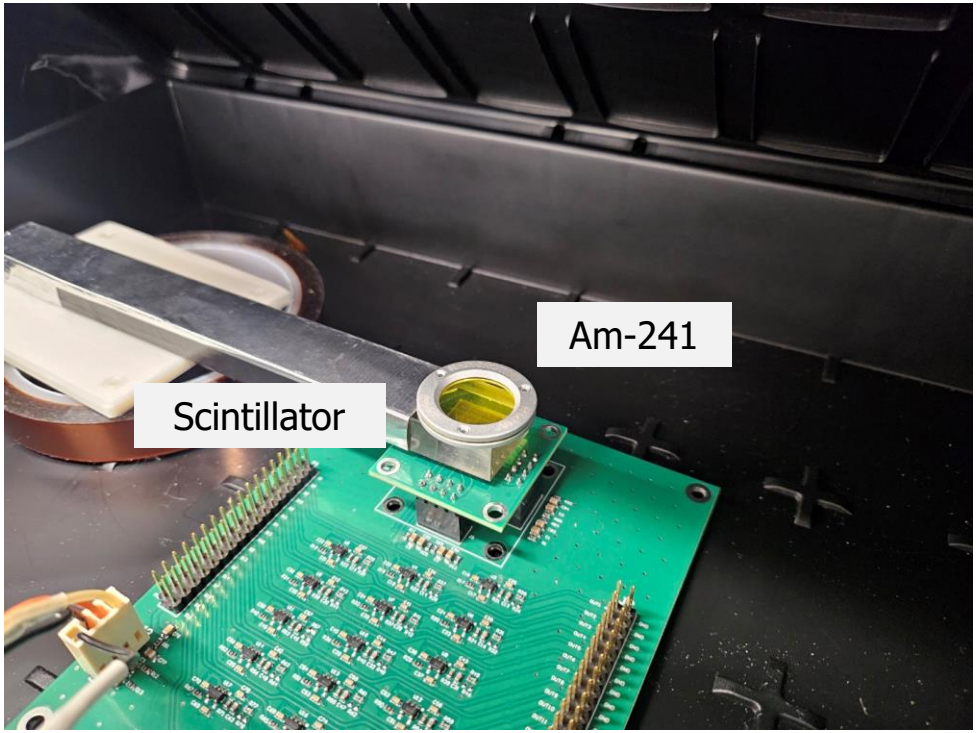
1 mV step,
Steep decrease at -9 mV
Plots on Backup



Mechanism of measuring peak and threshold is different, small discrepancy on left tail of histogram

SiPM Working Test

Am-241 Source Test

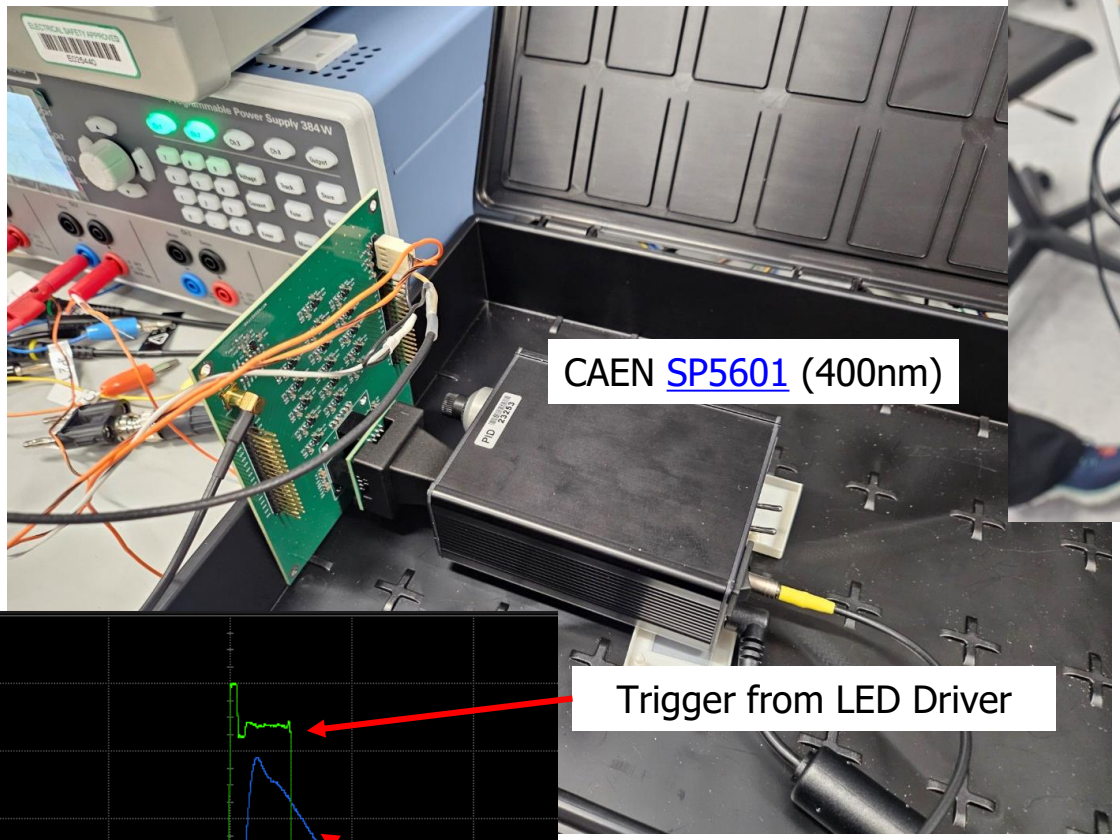


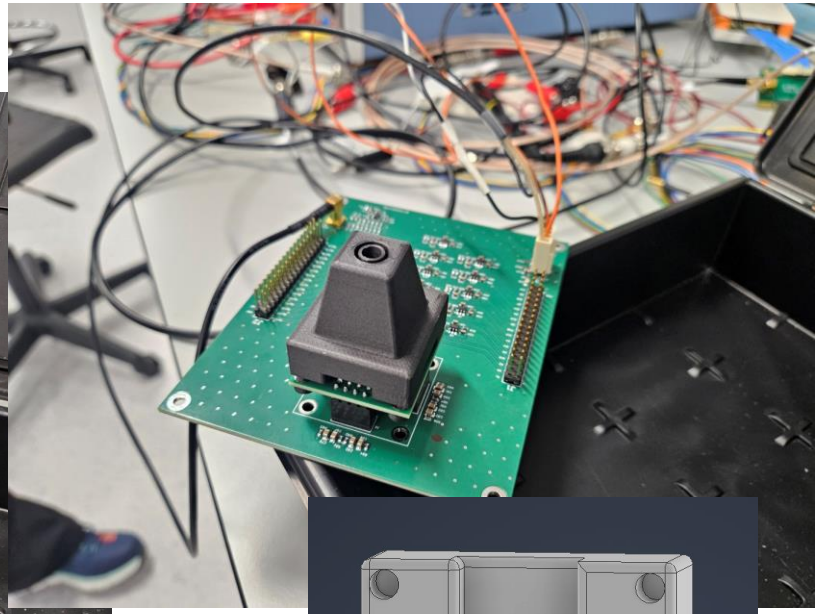
40.5 V, Am-241

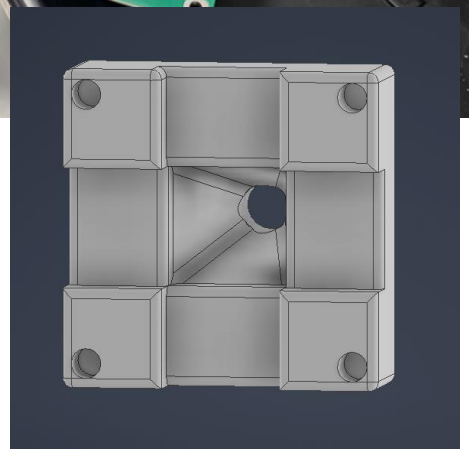
800 mV, 600 mV clear signal

SiPM Working Test

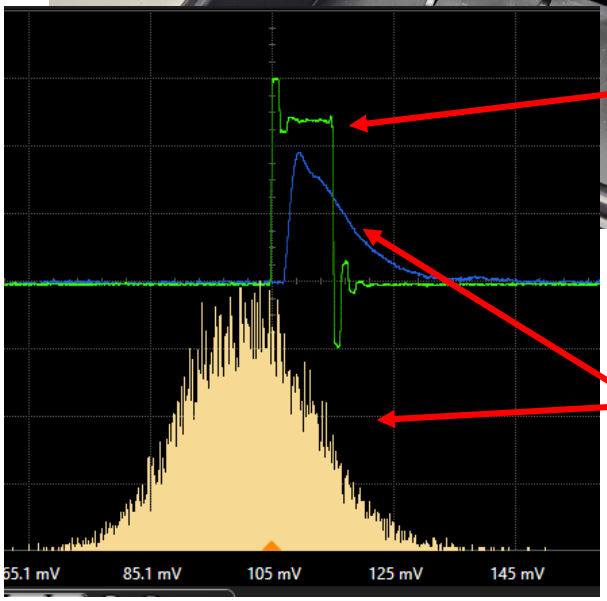
LED Driver Test





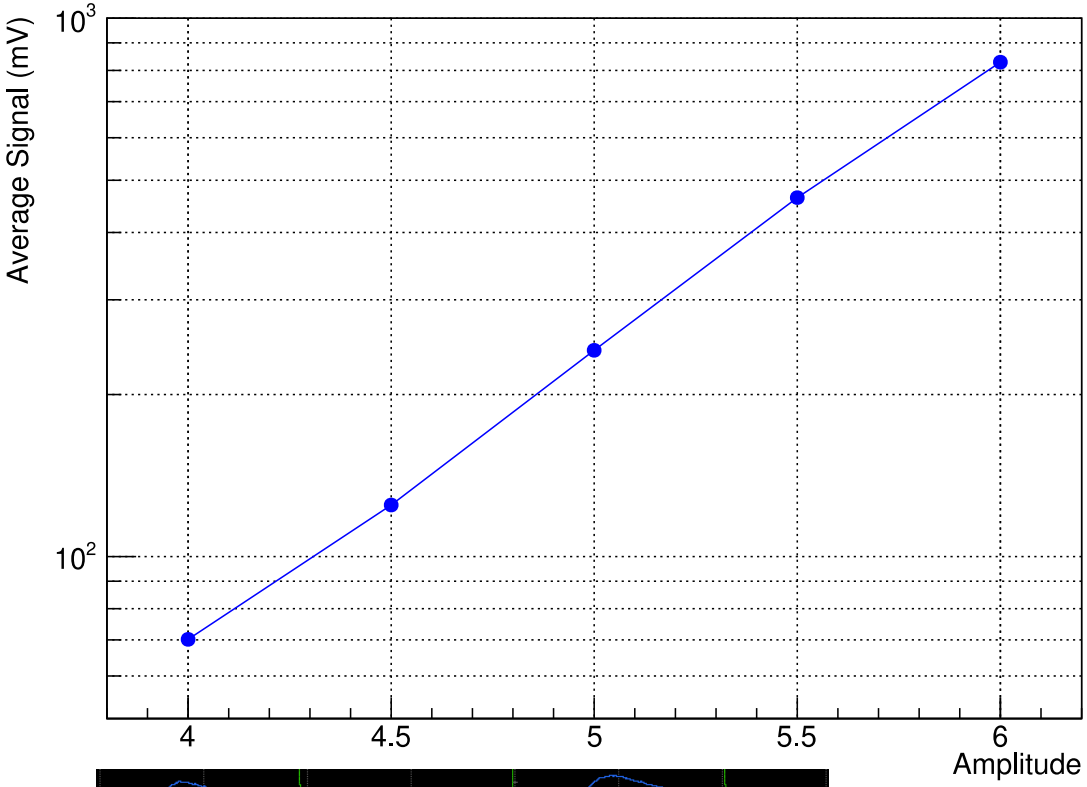


3D-Printed Jig btw LED & SiPM



SiPM Working Test

LED Driver Amplitude vs Signal



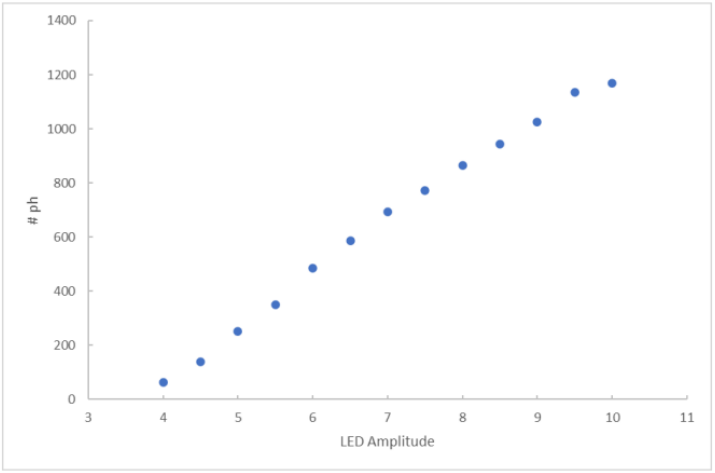
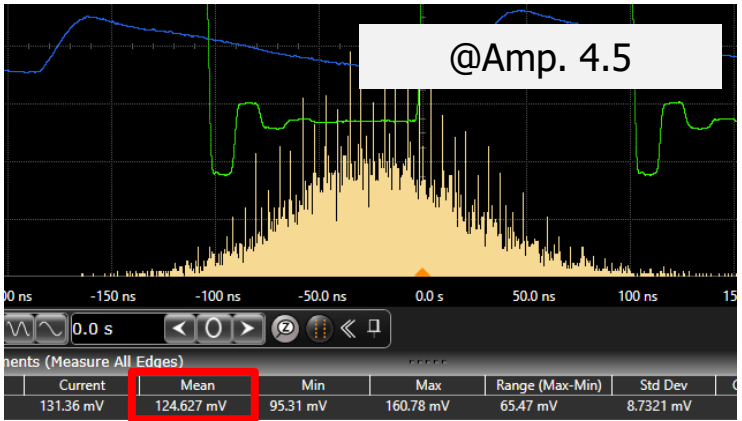


Fig. 8.4: Photons versus LED Amplitude (@2 kHz)

From SP5601 Spec. Sheet

39.5 V, LED Driver
LED Amplitude 4~6
Y-aixis : Average of signal height



Why does signal increase logarithmic?...
# of photon increases linearly for LED amplitude…

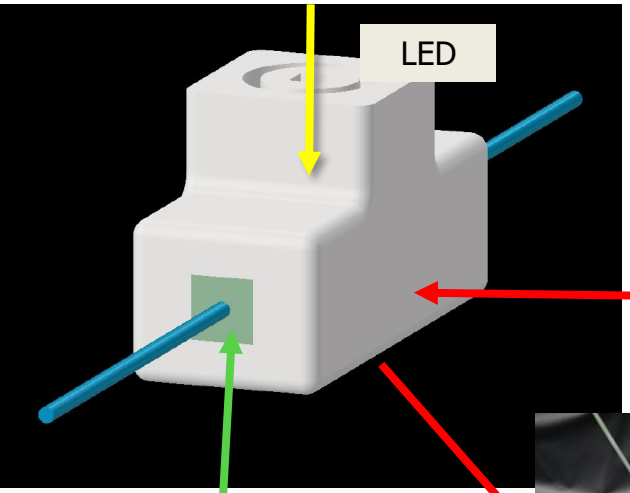
Backup

Frame Setup
3D-printed jigs

- List & Order frame for setup (Done)

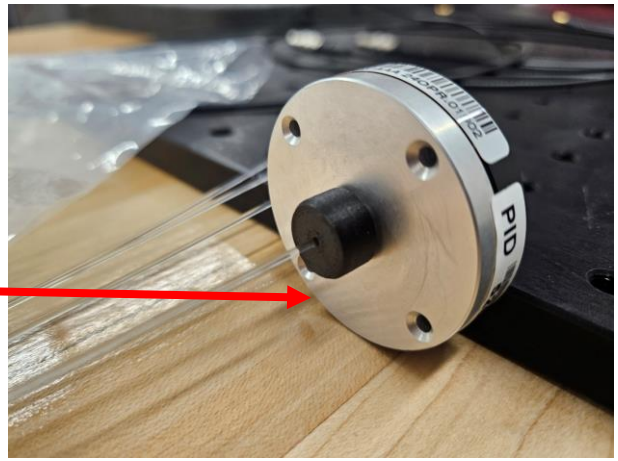
  Order lists : https://drive.google.com/file/d/1pRRCbUB6zlsG_Dazbil6ydLXdZAahnC3/view?usp=sharing

  3D printed jigs

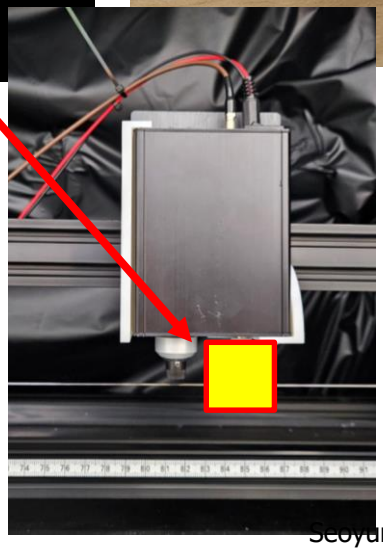


LED to SciFi

Soft material (sponge, foam, …)



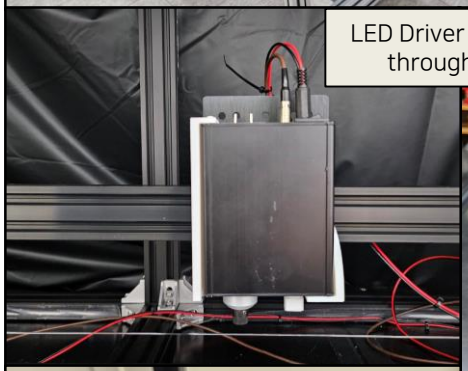
SciFi to SiPM



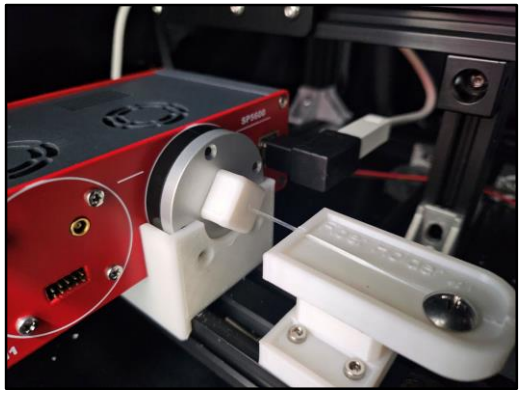
Hold and aligns fiber with LED driver,
while the driver moving on rail.

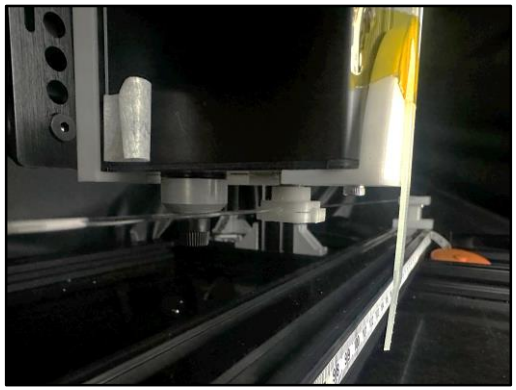
Setup at UoS

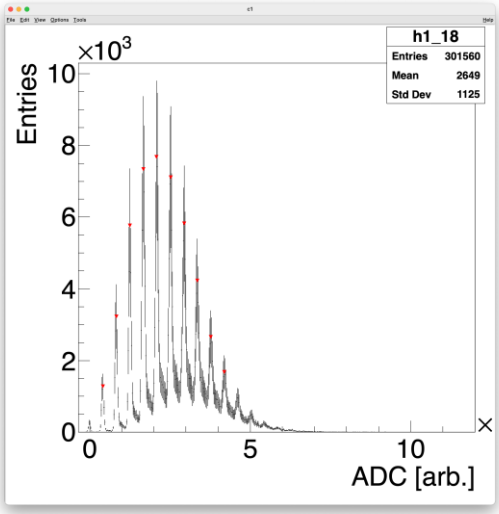
SP5600E, LED on rail

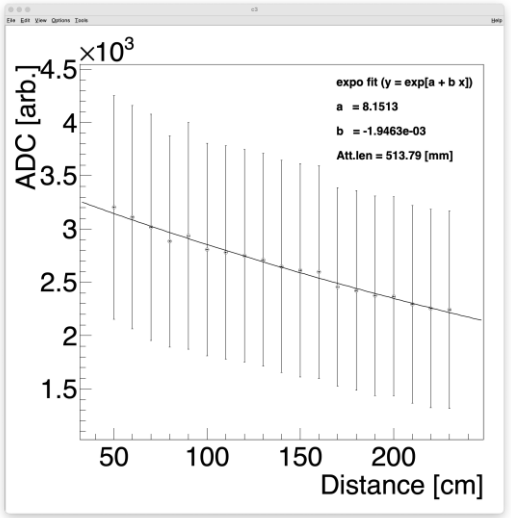


LED Driver moving through rail





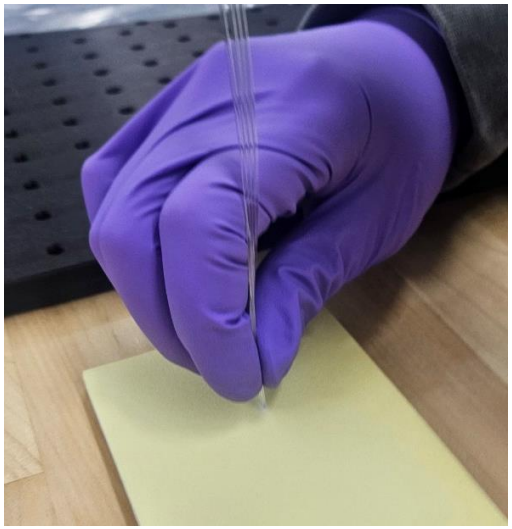




Preliminary Results (SCSF-78), measured on UoS setup.

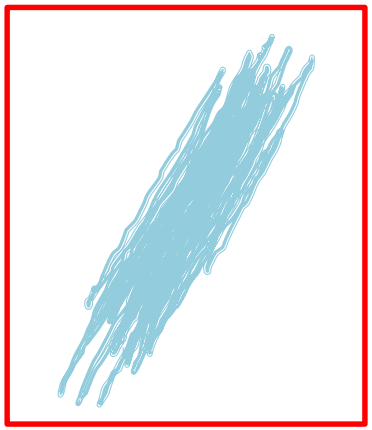
Fiber Polishing
Instruction

Please **wear GLOVES** on all process. (Latex, Silicon, …)

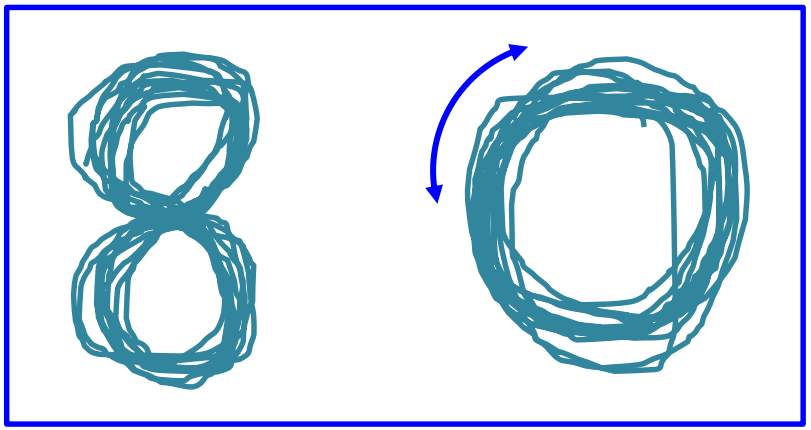


0. Align & grip 3~4 fibers near 1cm point from the edge.

1. Grind fibers on 400 grit sandpaper, until they become flat. (~1 min.)



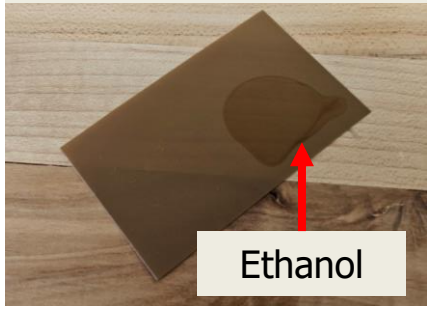
X



O

Grind fibers drawing 8 or O shape, to make edge of fibers perpendicular

5 μm -> 3 μm -> 1 μm



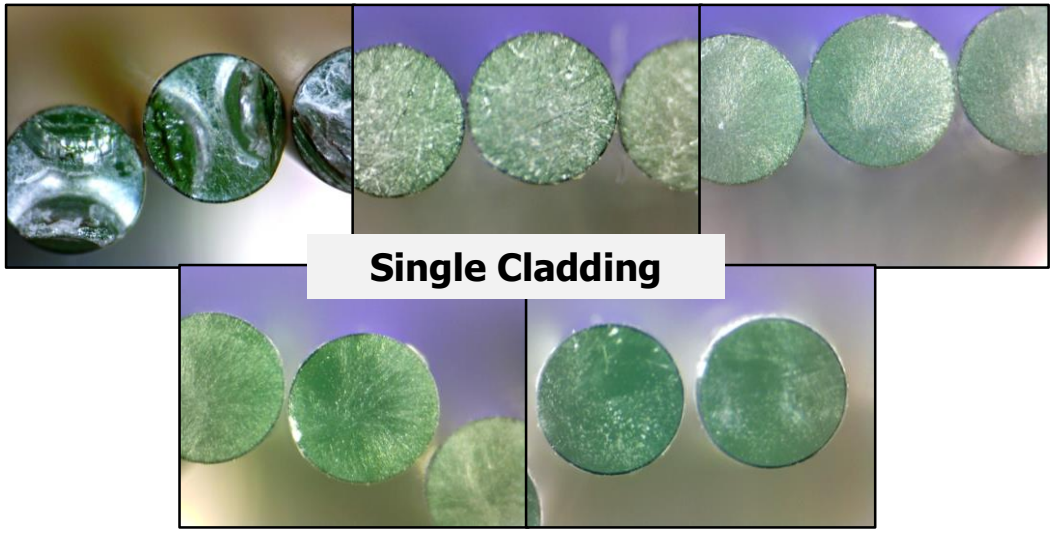
2. Grind fibers on polishing films, 5 μm -> 3 μm -> 1 μm. (each ~2 min.)

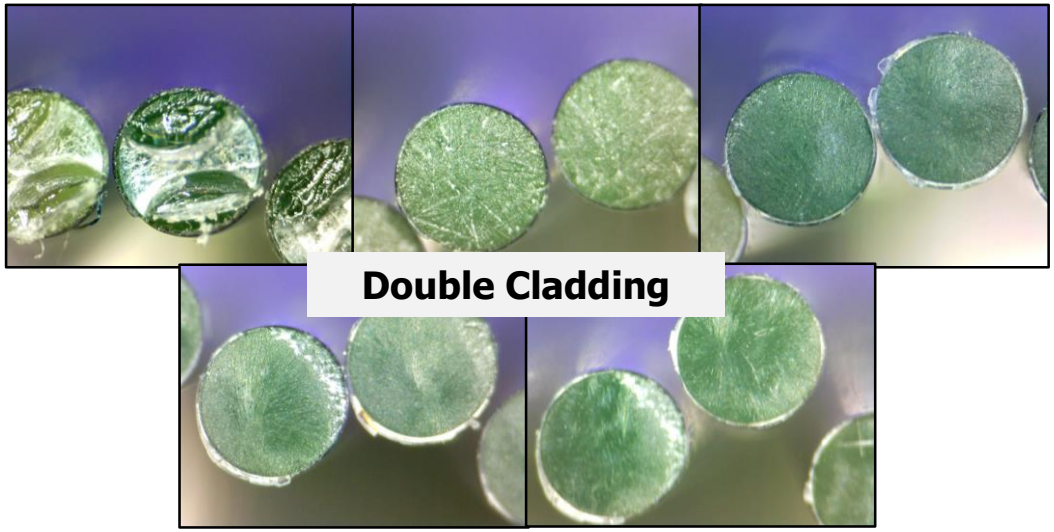
Spray ethanol on polishing films before grinding, and clean up fiber with ethanol swab after each process.

This helps eliminating grinded particles of fibers on them.

Fiber Polishing

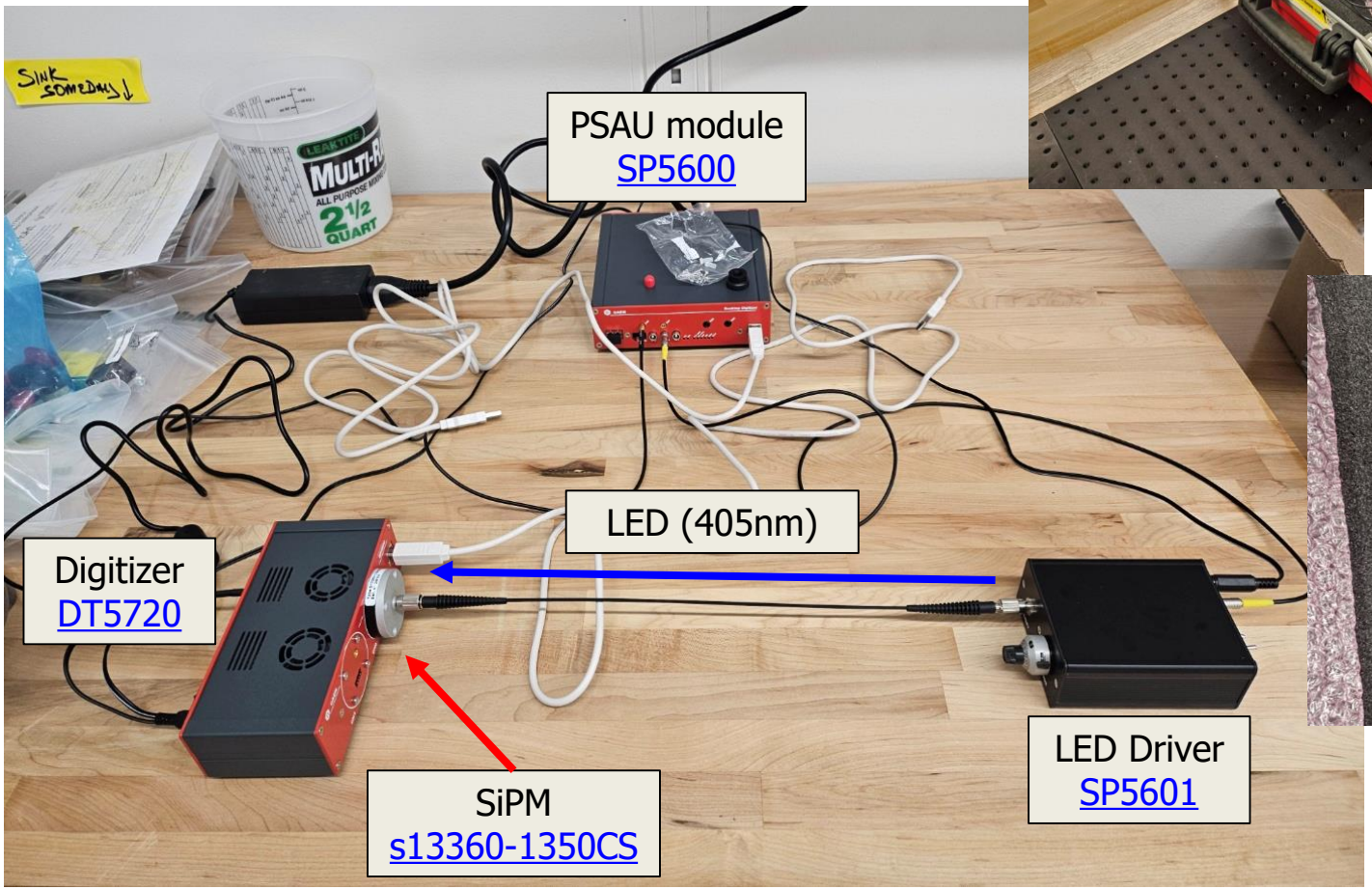
SC & DC





SP5600E Working Test

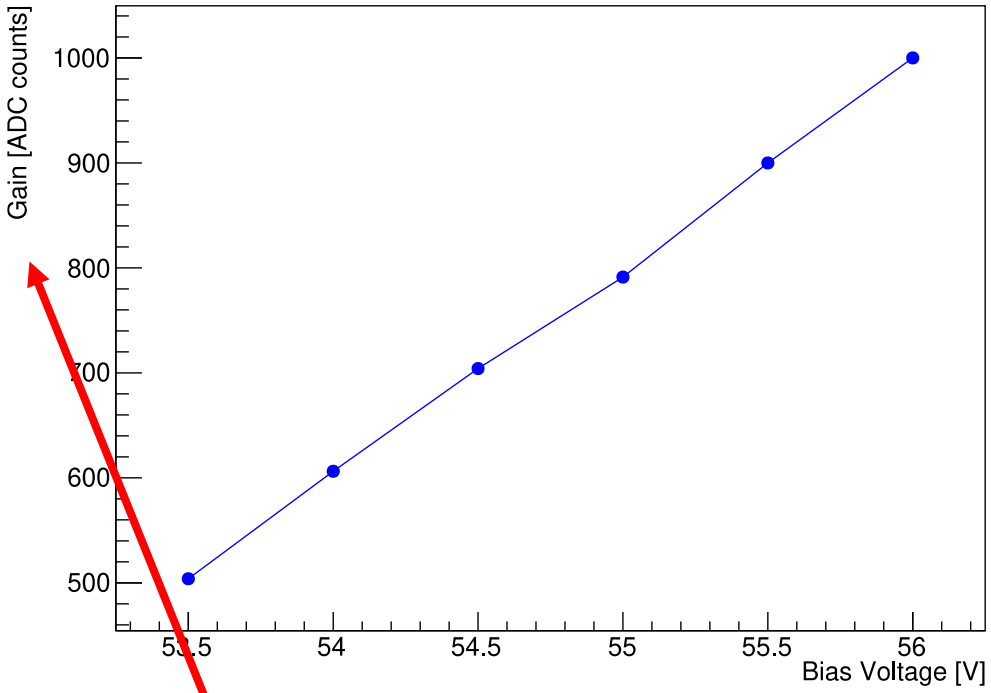
Hardware Setup

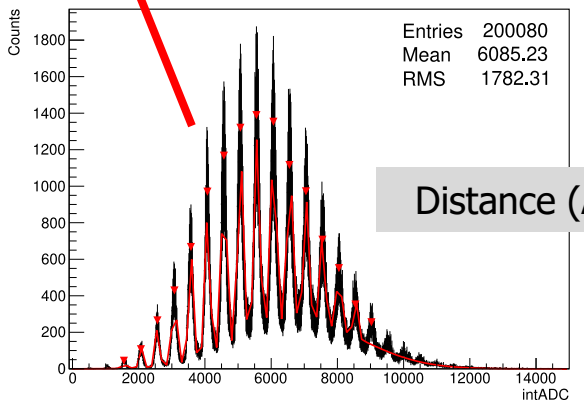


SP5600E Working Test

Gain vs Bias Voltage

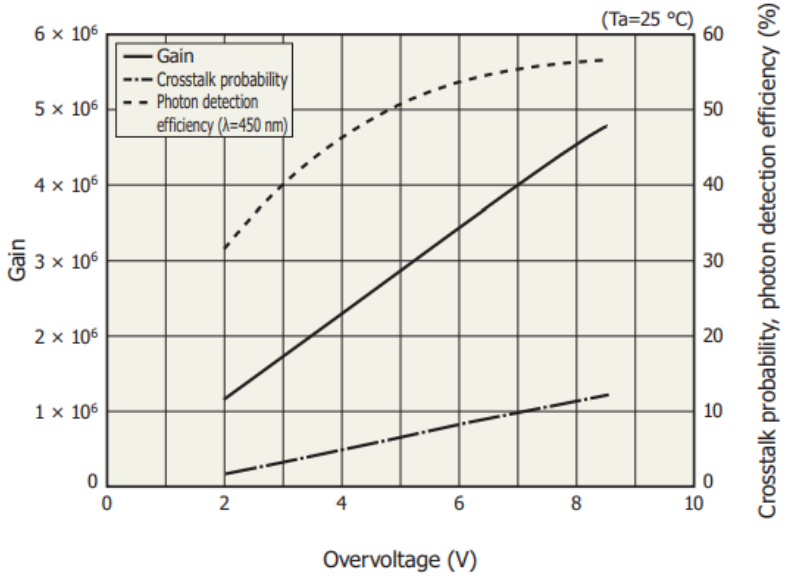
SiPM #1, (V_{BD} = 53 V), ΔADC vs Voltage





Distance (ADC) between 3rd, 4th peak

S13360-1350CS



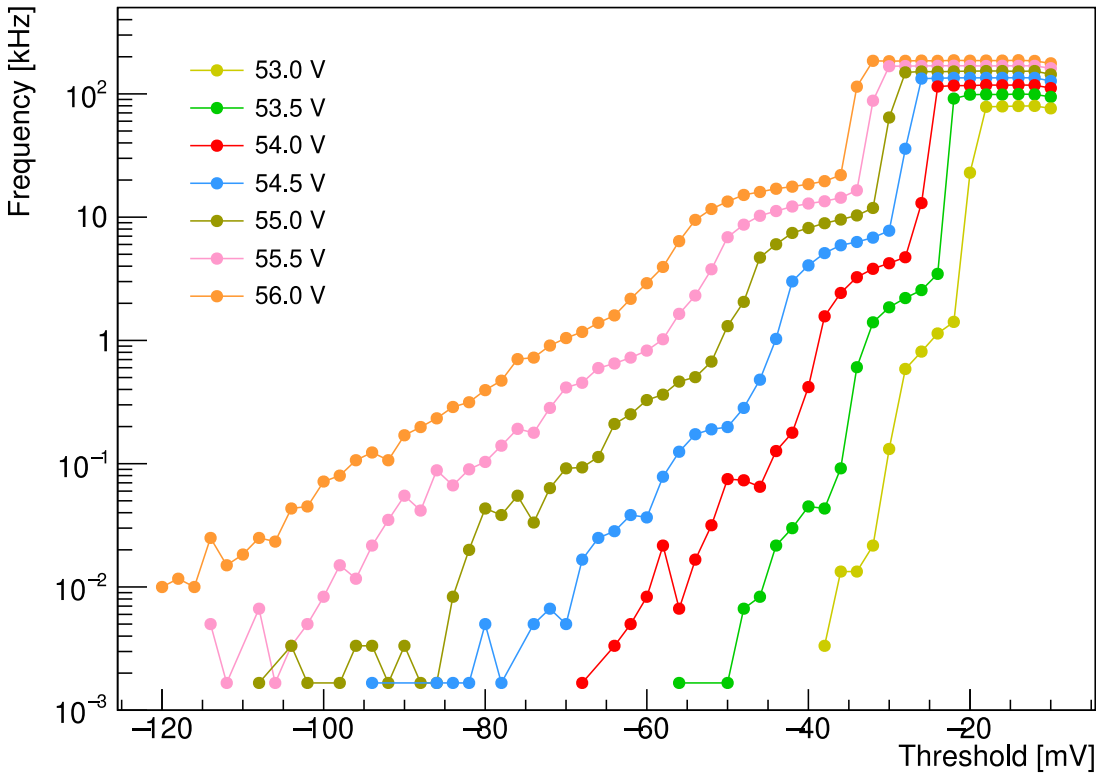
From spec. sheet (link)

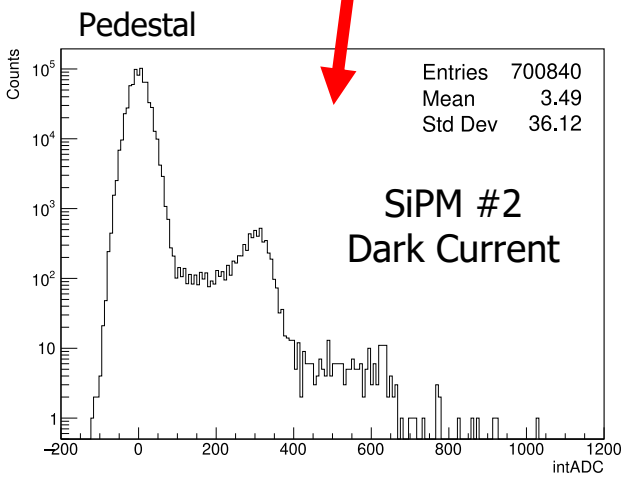
Seoyun Jang, 02. 11.

SP5600E Working Test

Threshold vs Frequency

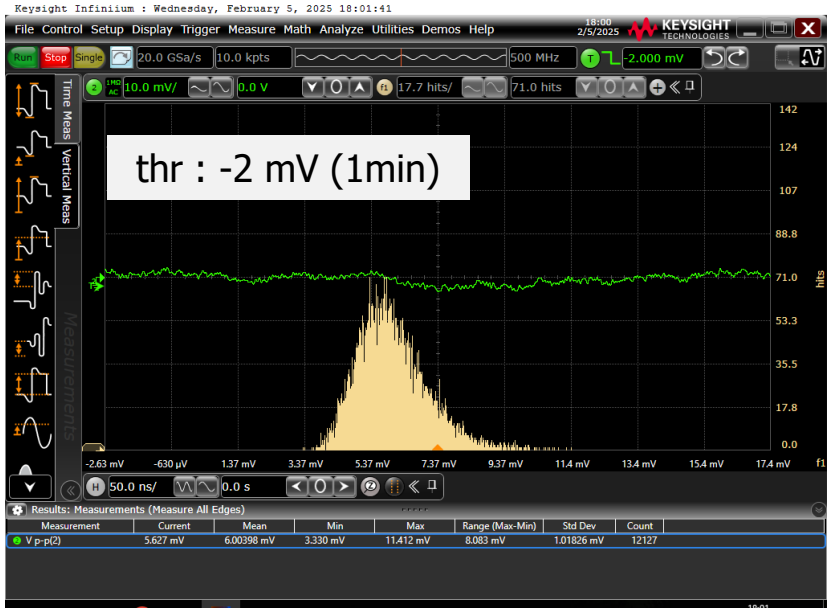
SiPM #1, 53.0 V ~ 56.0 V, 2mV interval

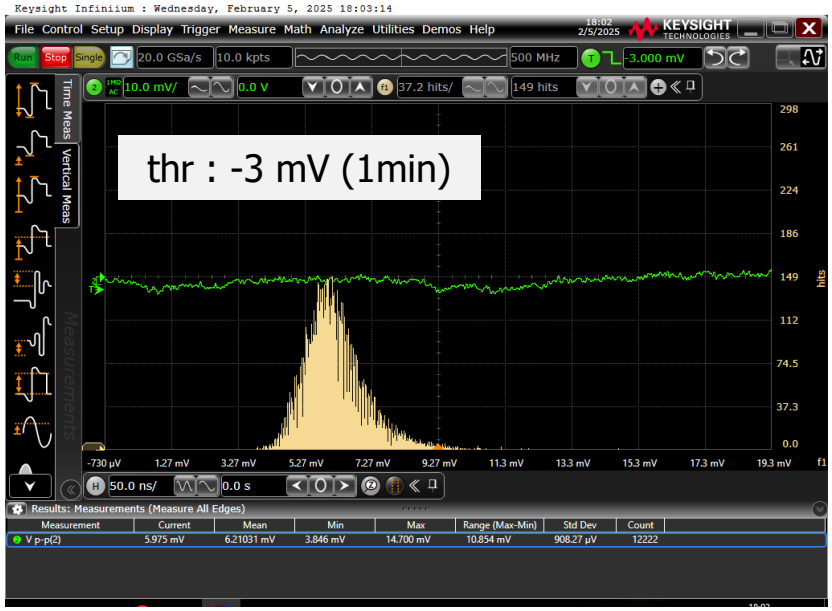


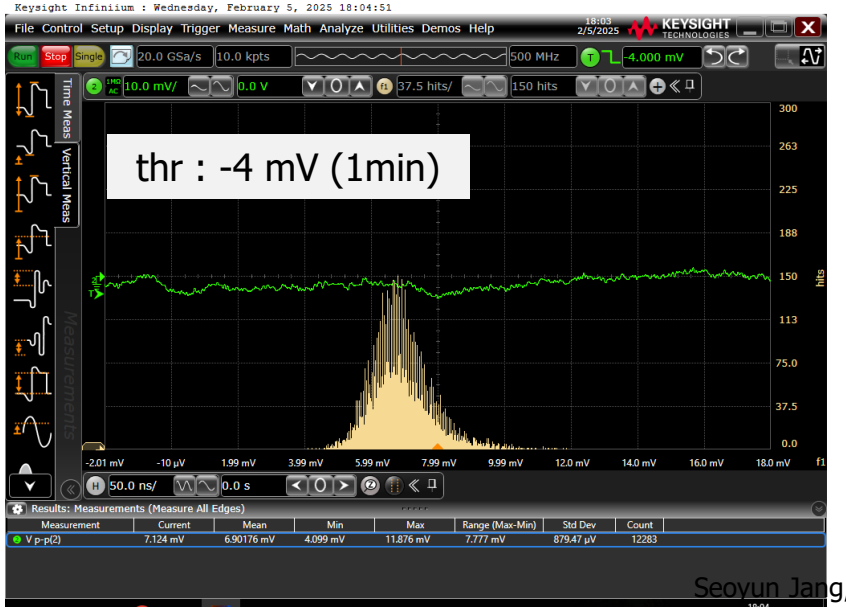


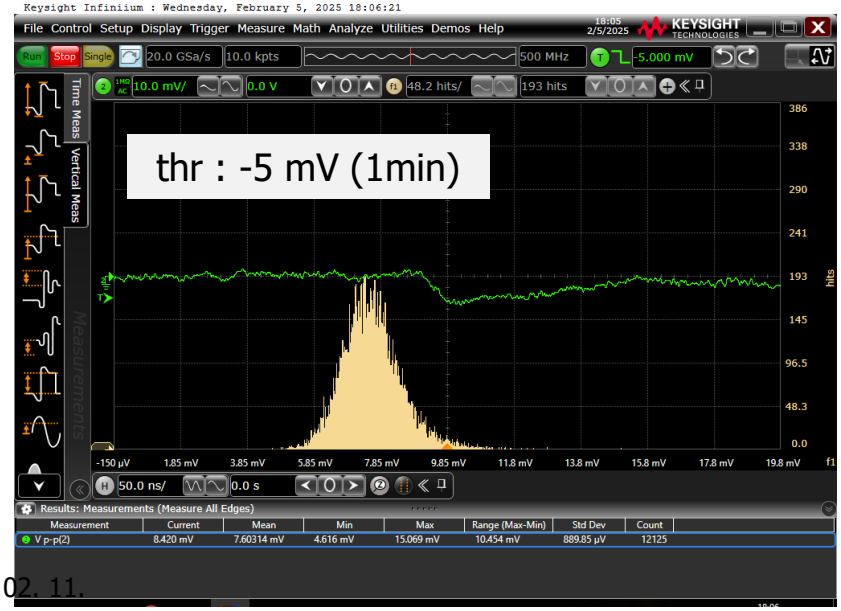
SiPM Working Test

Threshold vs Frequency



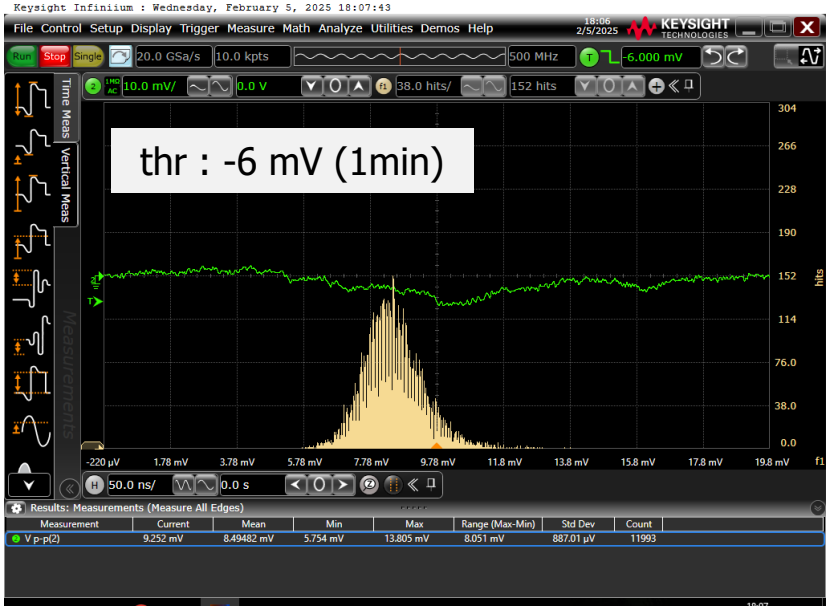


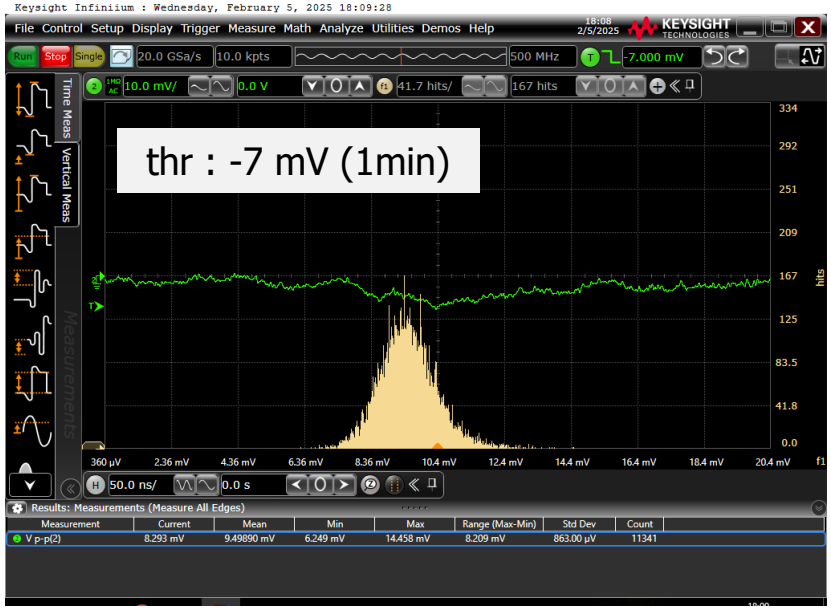


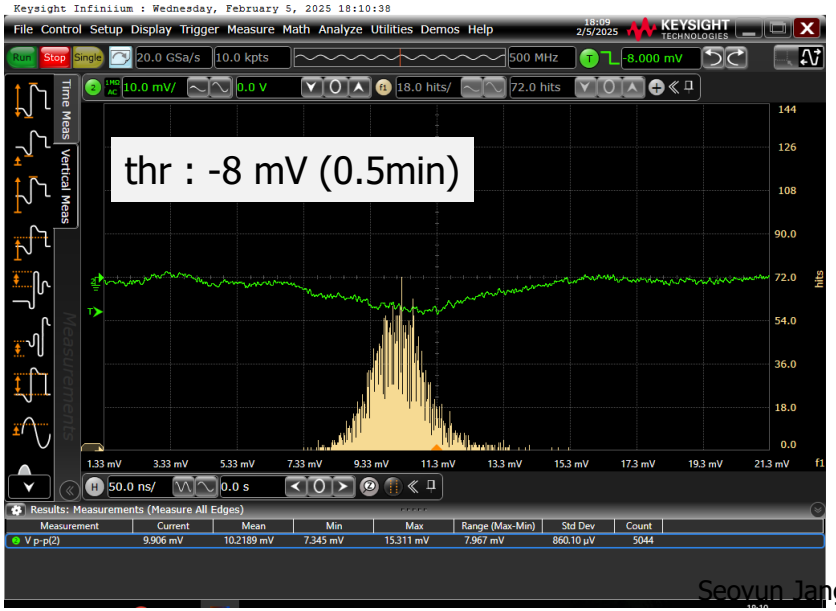


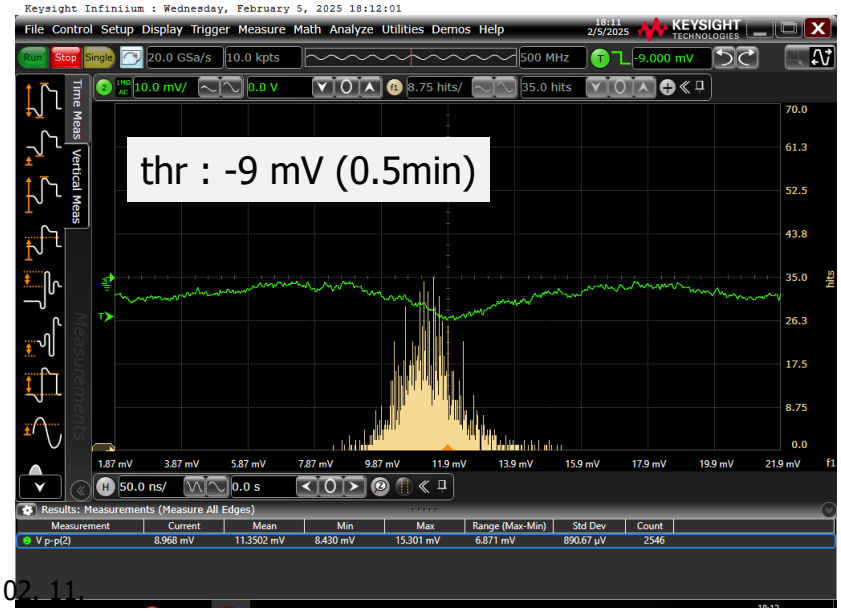
SiPM Working Test

Threshold vs Frequency



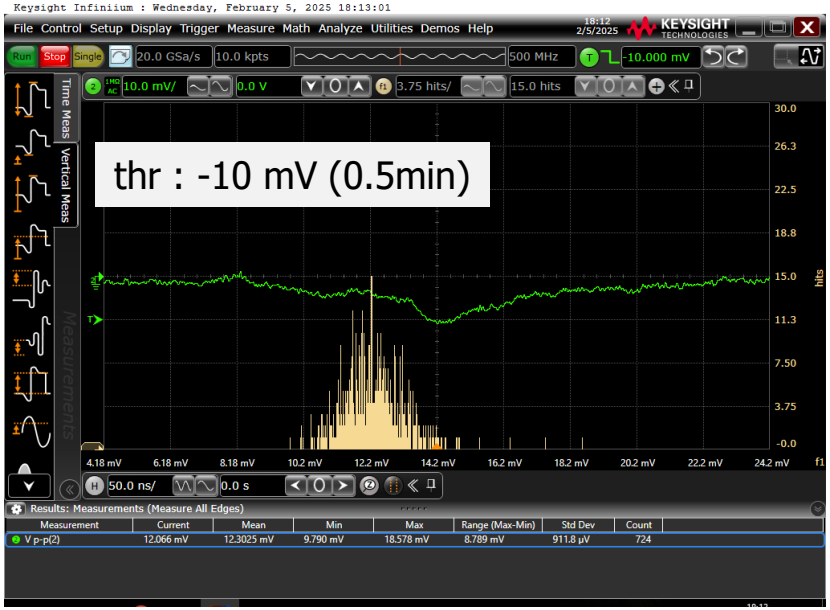


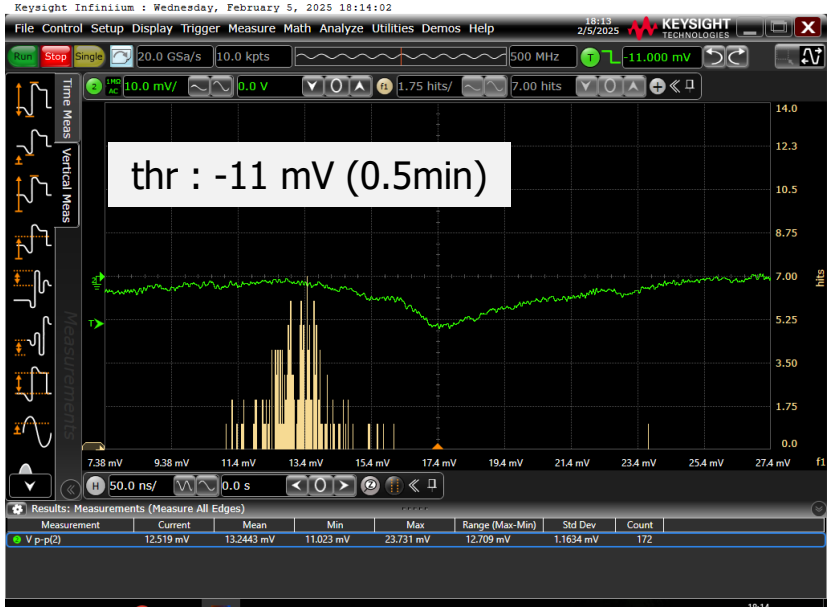


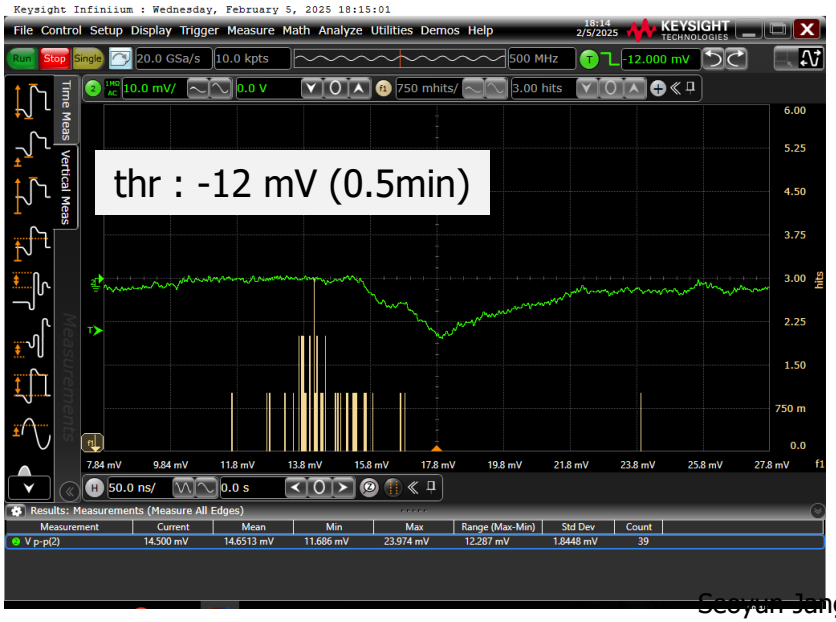


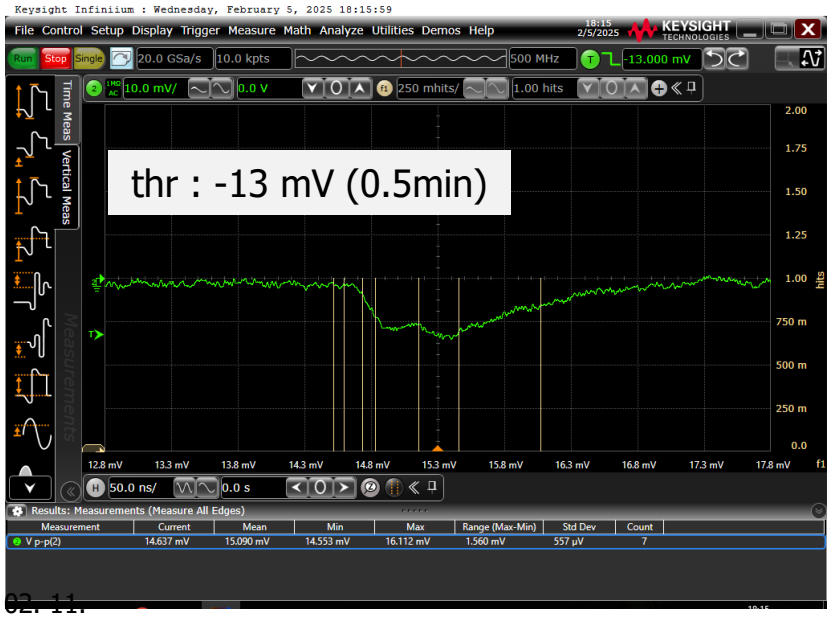
SiPM Working Test

Threshold vs Frequency









SiPM Working Test

LED Driver Amplitude vs Signal