

SOKENDAI KEK Tsukuba/JPARC

Summer Student Program



Student: Valera Spasiano

HOMETOWN



BACHELOR DEGREE in physics:



UNIVERSITY OF
NAPLES
"FEDERICO II"



Currently doing a
Master degree in
particle physics



UNIVERSITY OF
ROME "LA
SAPIENZA"



MAIN INTEREST:

- PHYSICS
- ART
- PIANO

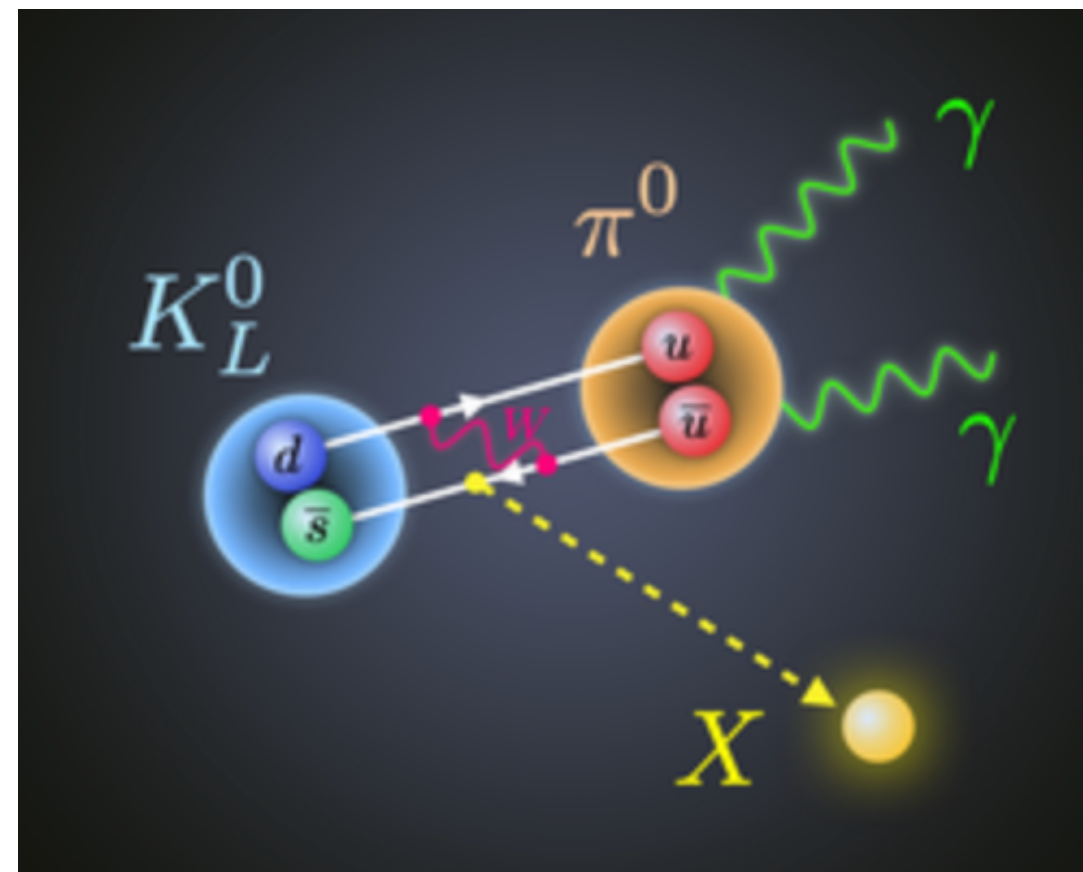


The experiment

OBJECTIVE

- Search for the rare decay: $K_L \rightarrow \pi^0 \nu \bar{\nu}$

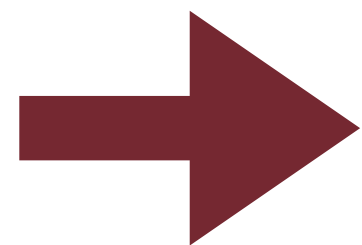
A flavor-changing neutral current process
Highly suppressed in the Standard Model
Sensitive to new physics (e.g., CP violation, SUSY)



WHY IS IT IMPORTANT?

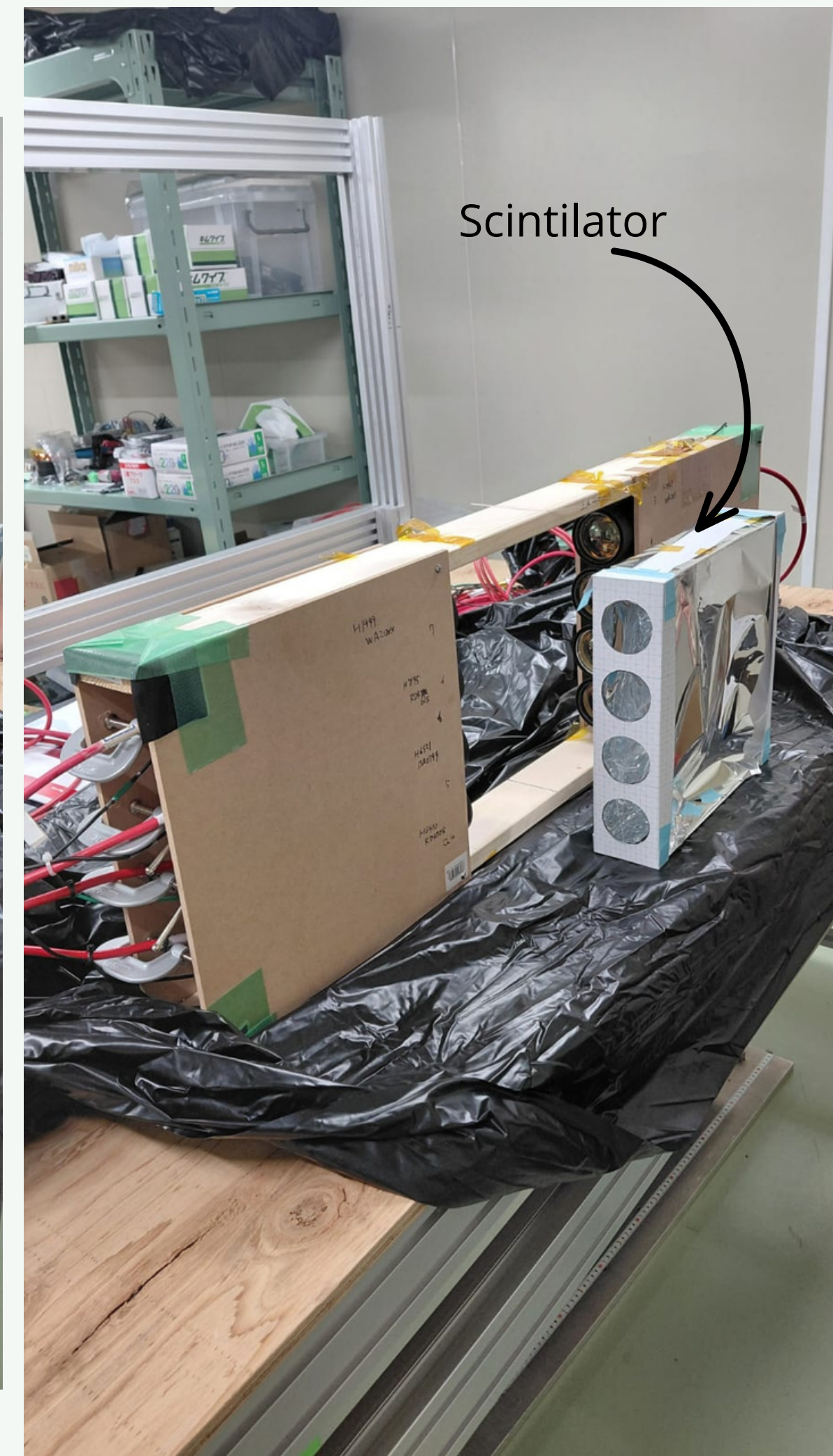
- SM prediction: $\text{BR}(K_L \rightarrow \pi^0 \nu \bar{\nu}) \sim 3 \times 10^{-11}$

Ultra-clean theoretical calculation
Deviation $\rightarrow$ Evidence for new physics

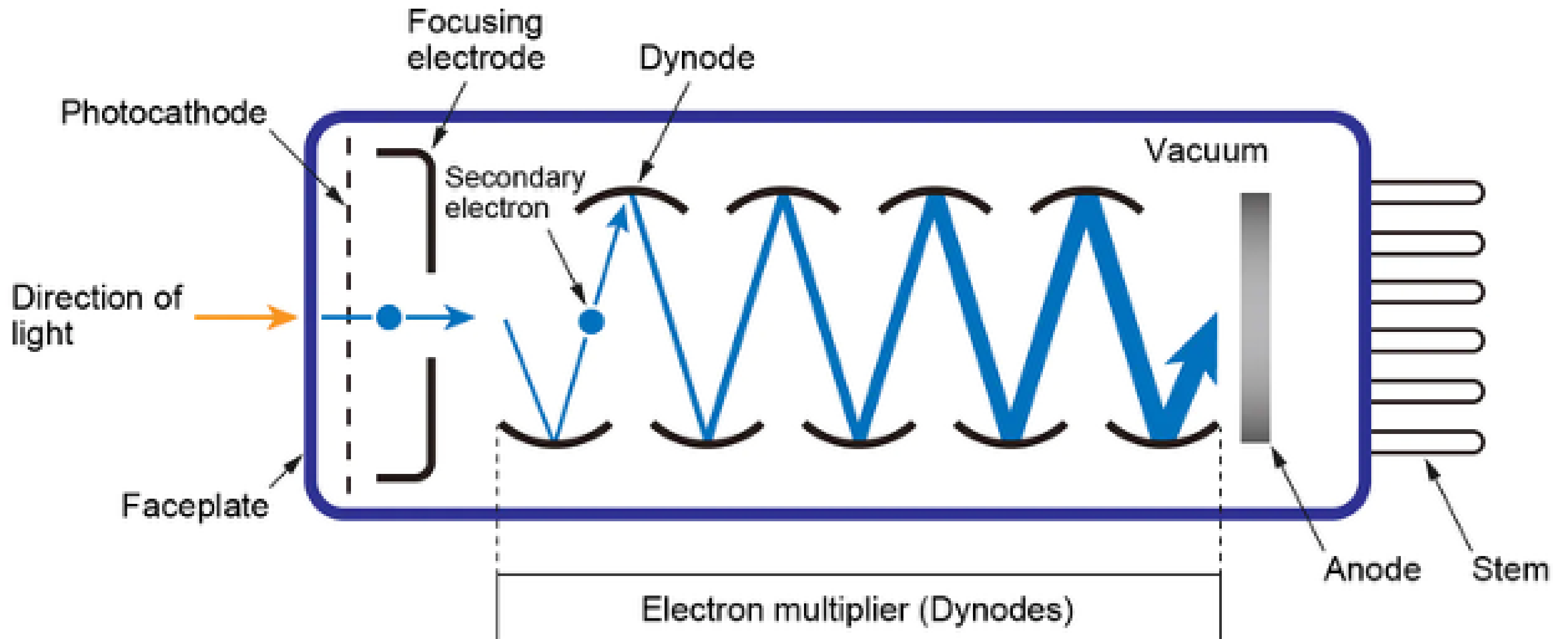


KOTO is a leading experiment in precision kaon physics
A signal would indicate violation of the Standard Model

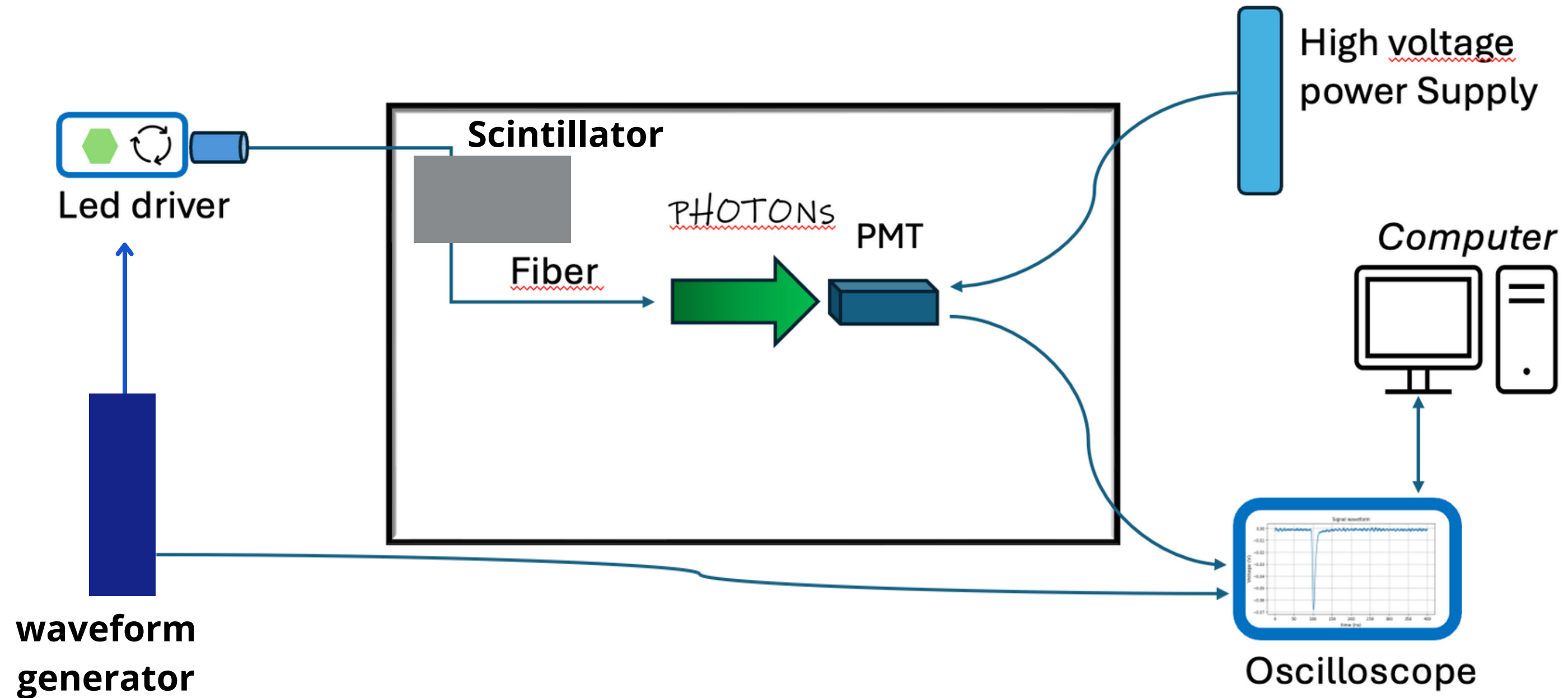
Characterization of FilmBHCV



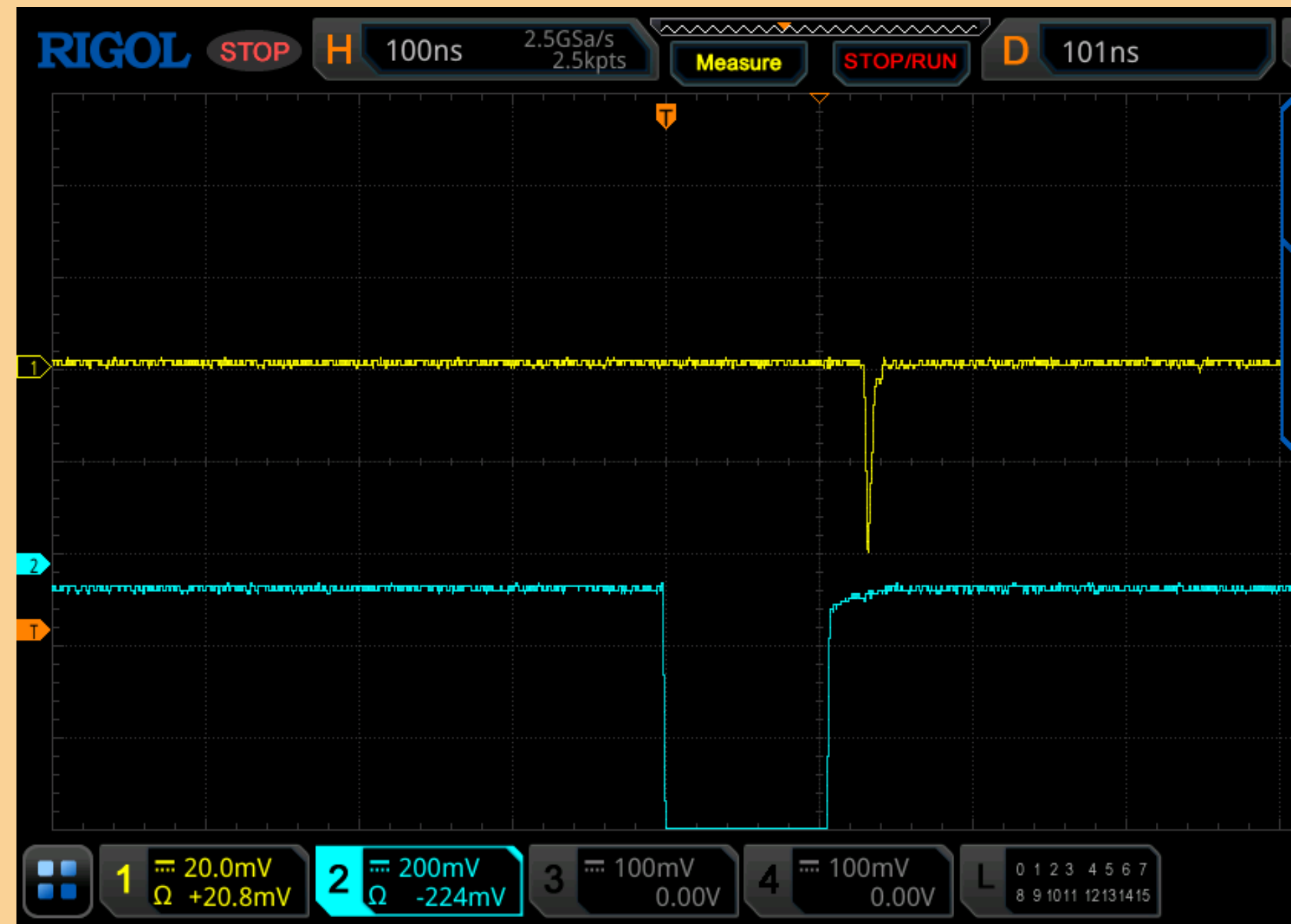
PMT



Experimental setup

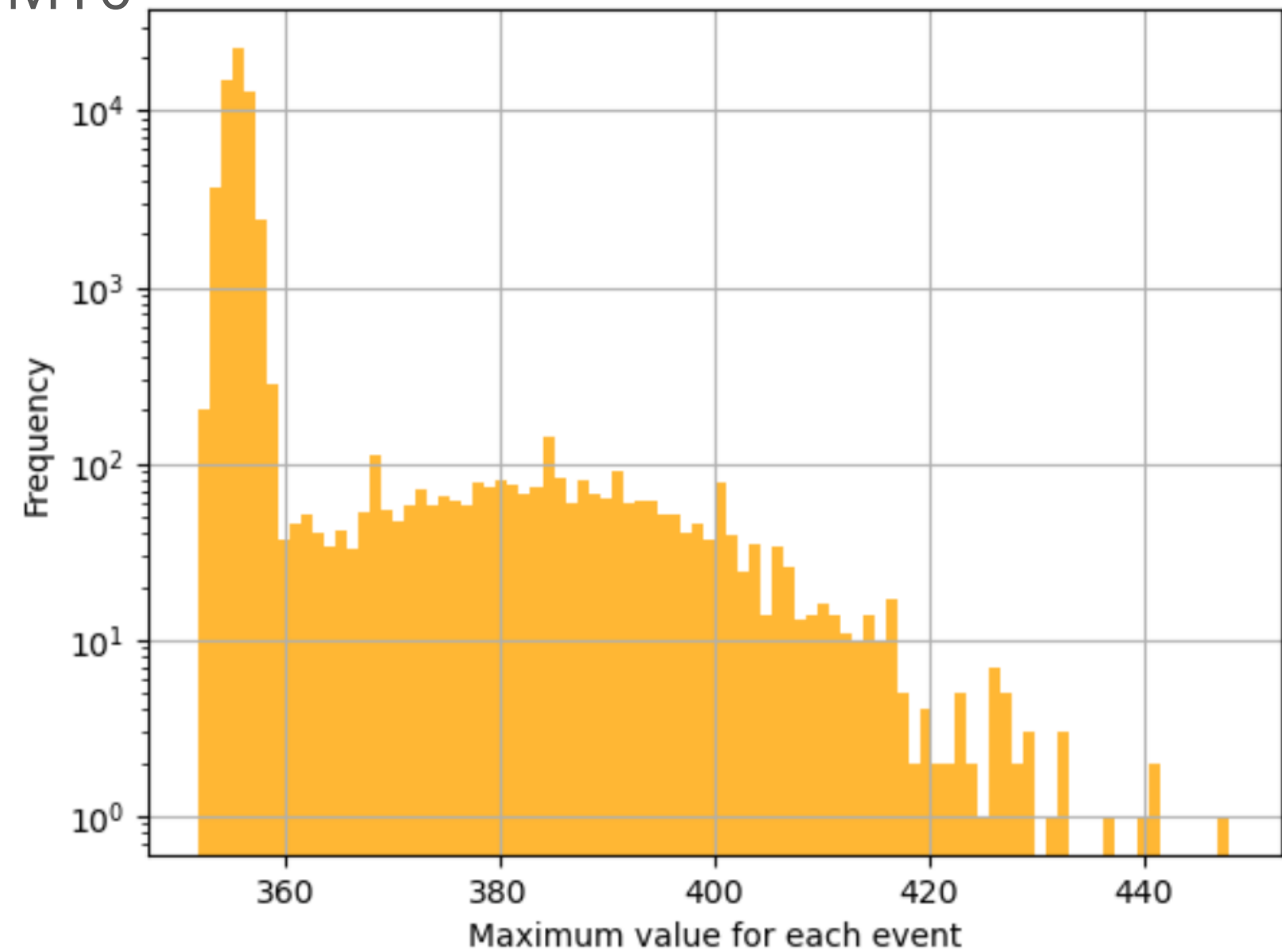


Coincidence between pulse and PMT signals



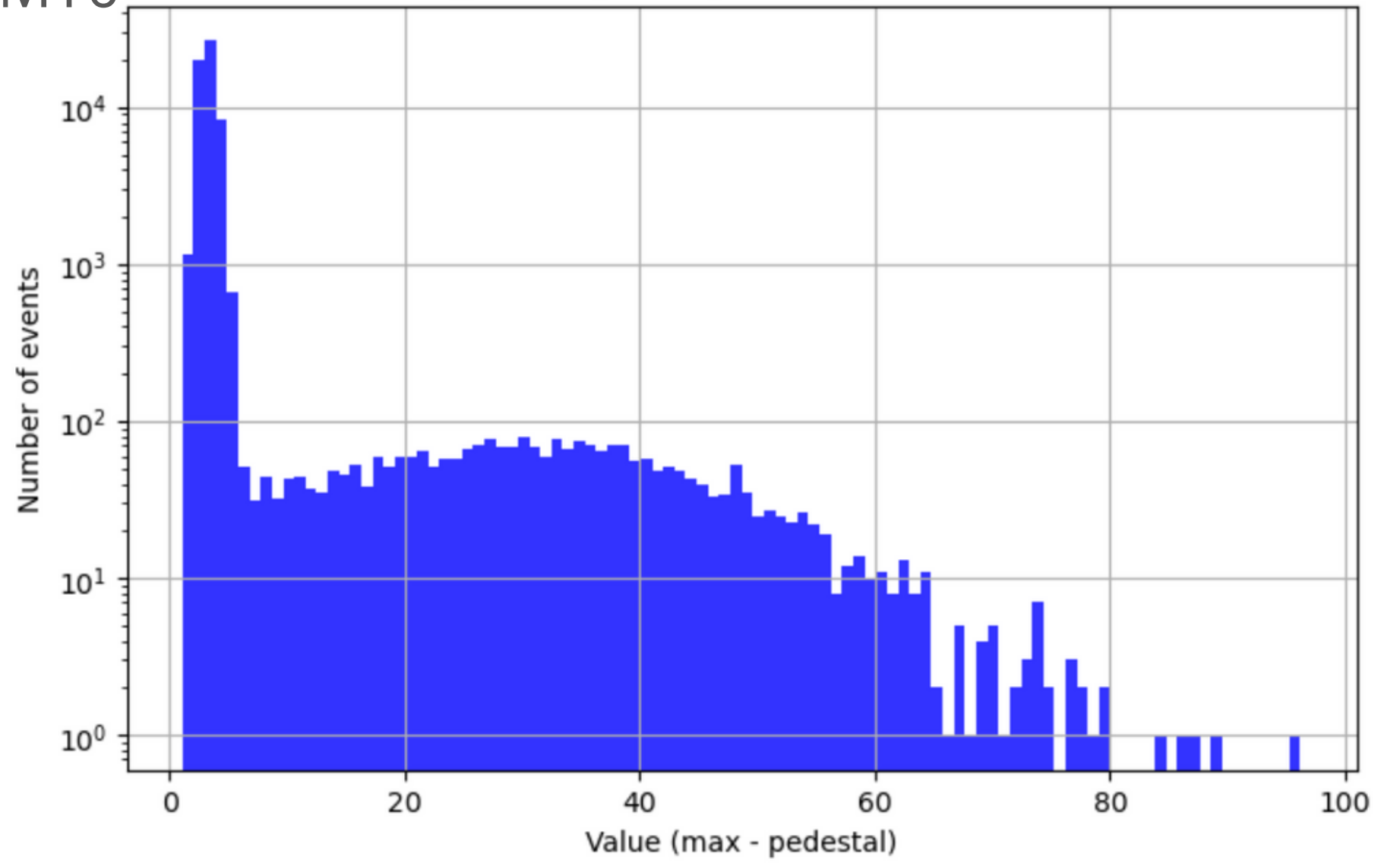
PMT0

Histogram of maximum value for each events

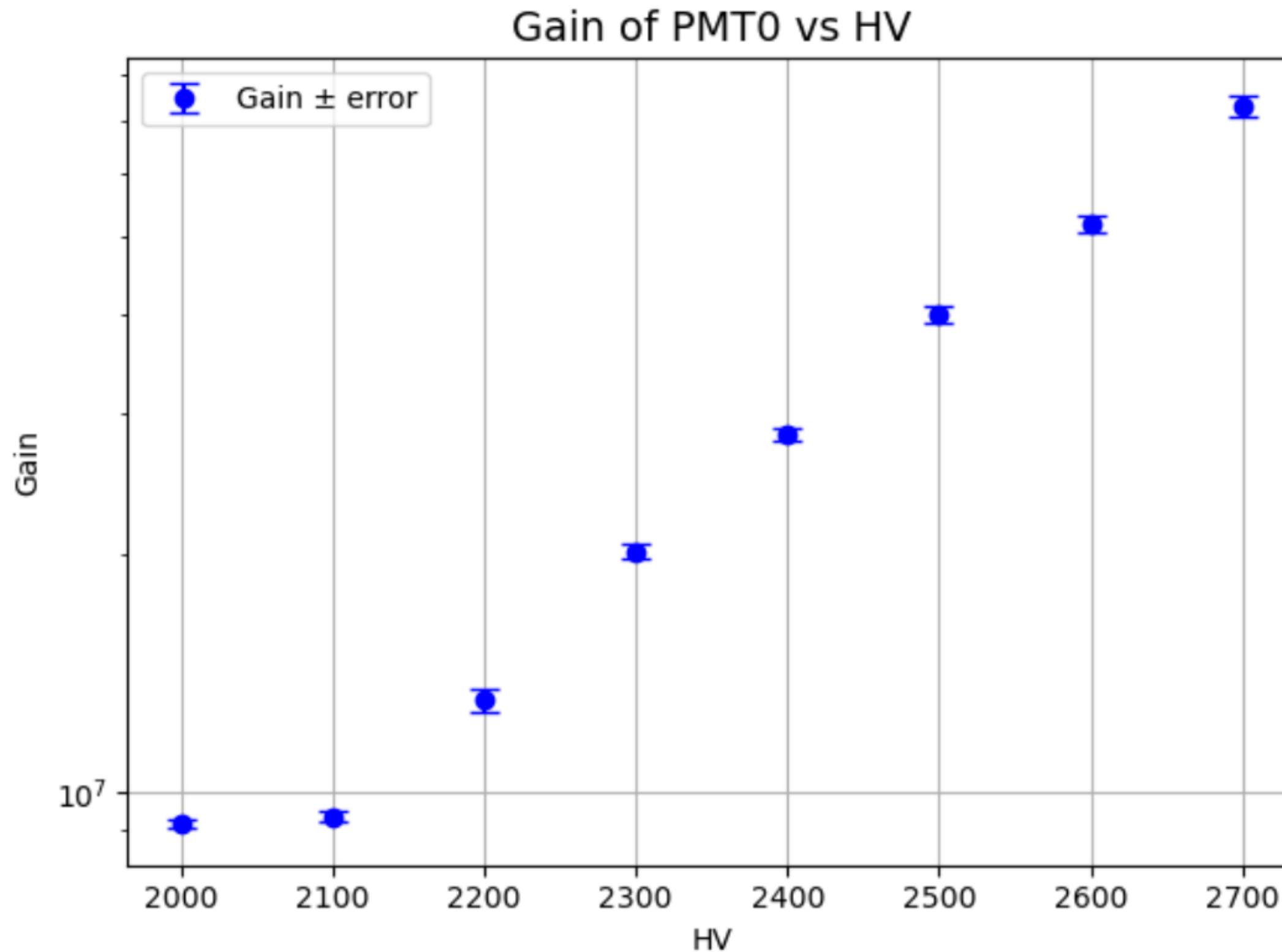


PMT0

Histogram of (max - pedestal) for each event



Gain of PMT0 vs HV



Gain of the PMTs

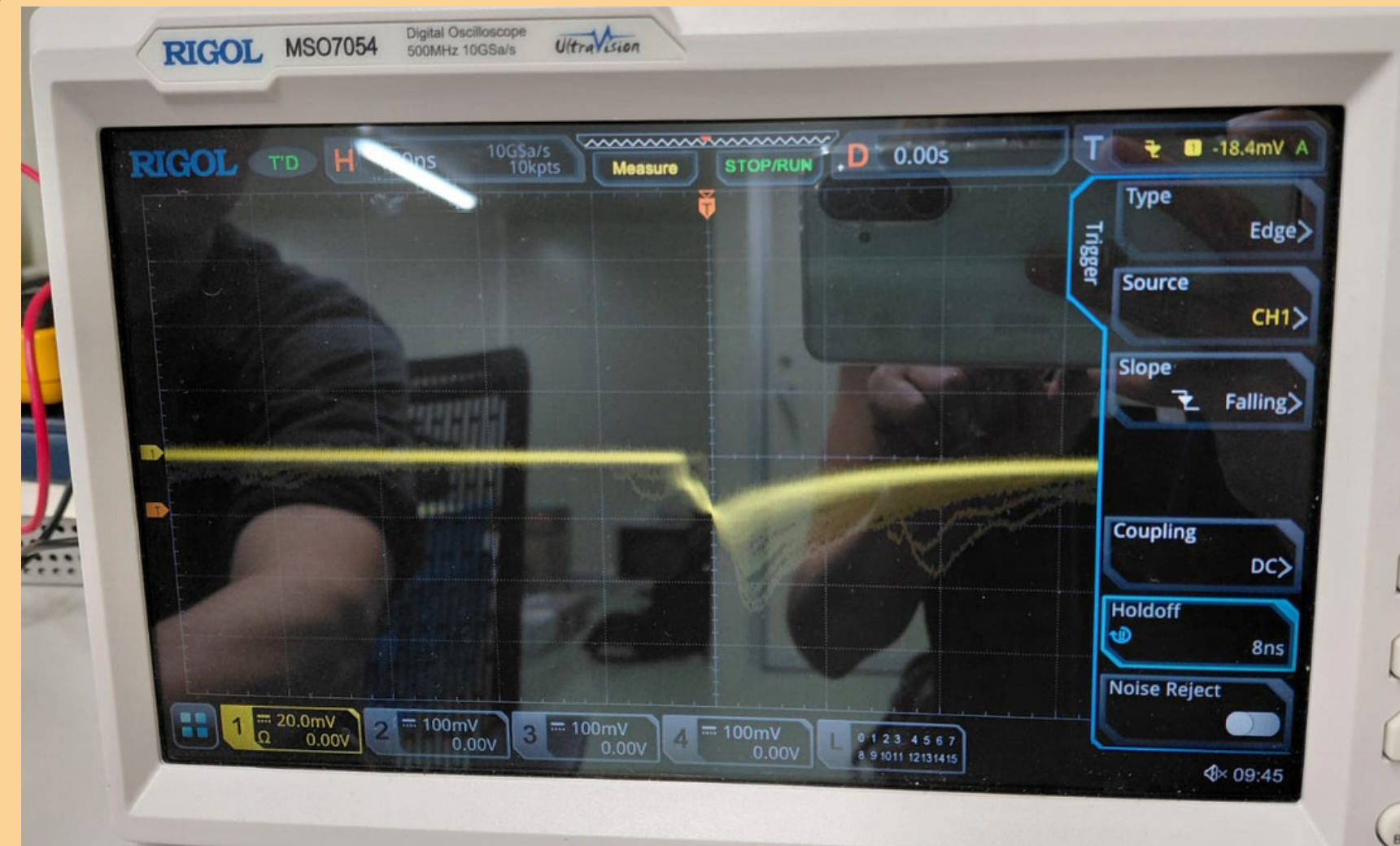
PMT	Gain	Uncertainty ($\pm$)	HV (V)
PMT0	9.1×10^6	1×10^5	2000
PMT1	9.64×10^6	9×10^4	2100
PMT2	9.18×10^6	9×10^4	2100
PMT3	8.93×10^6	9×10^4	2100
PMT4	2.11×10^7	3×10^5	2300
PMT5	2.05×10^7	2×10^5	2200
PMT6	1.20×10^7	2×10^5	2200
PMT7	1.30×10^7	1×10^5	2300

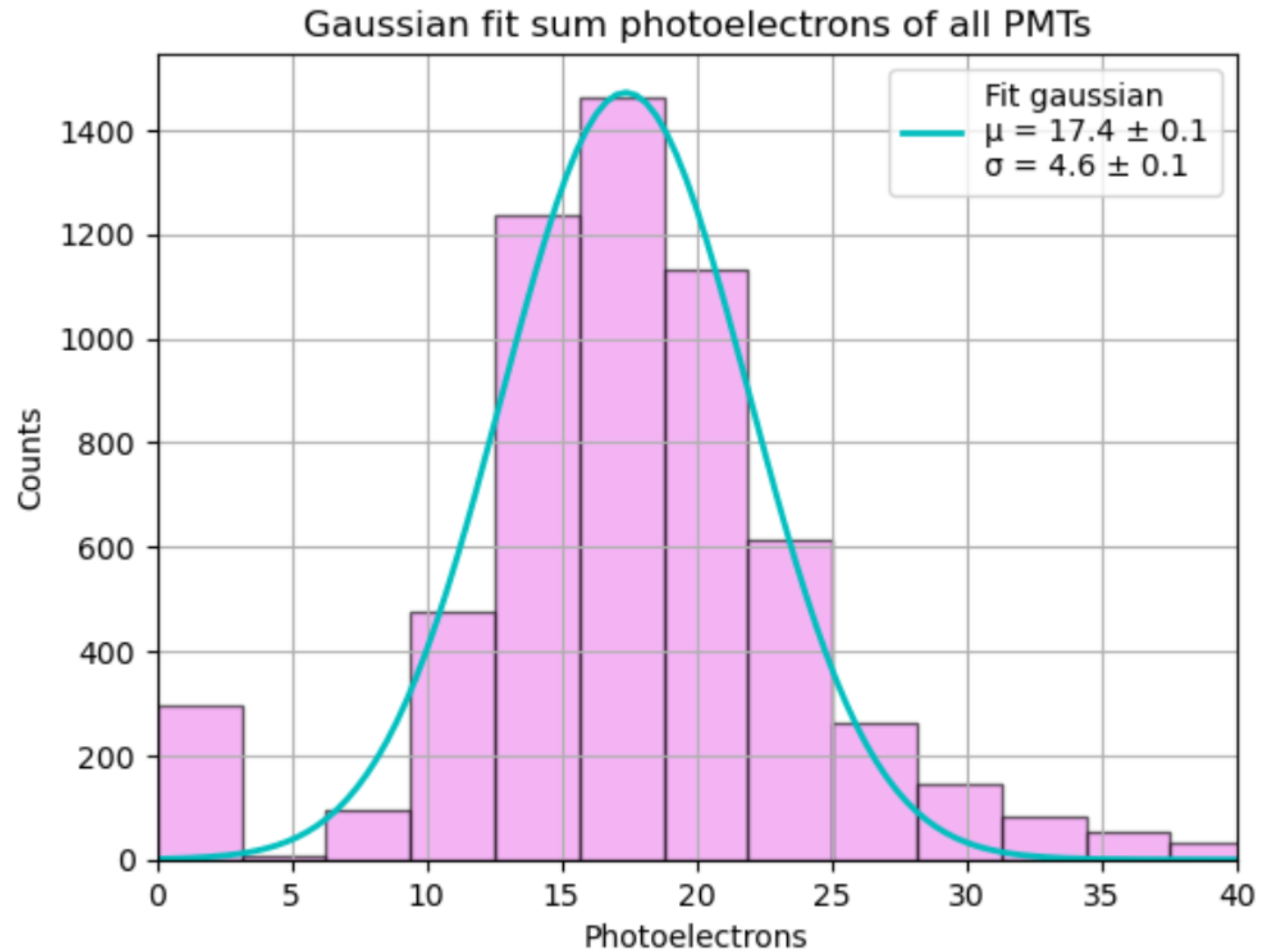
Scintillator +
SiPM = trigger

Setup with radioactive source

Radioactive
source

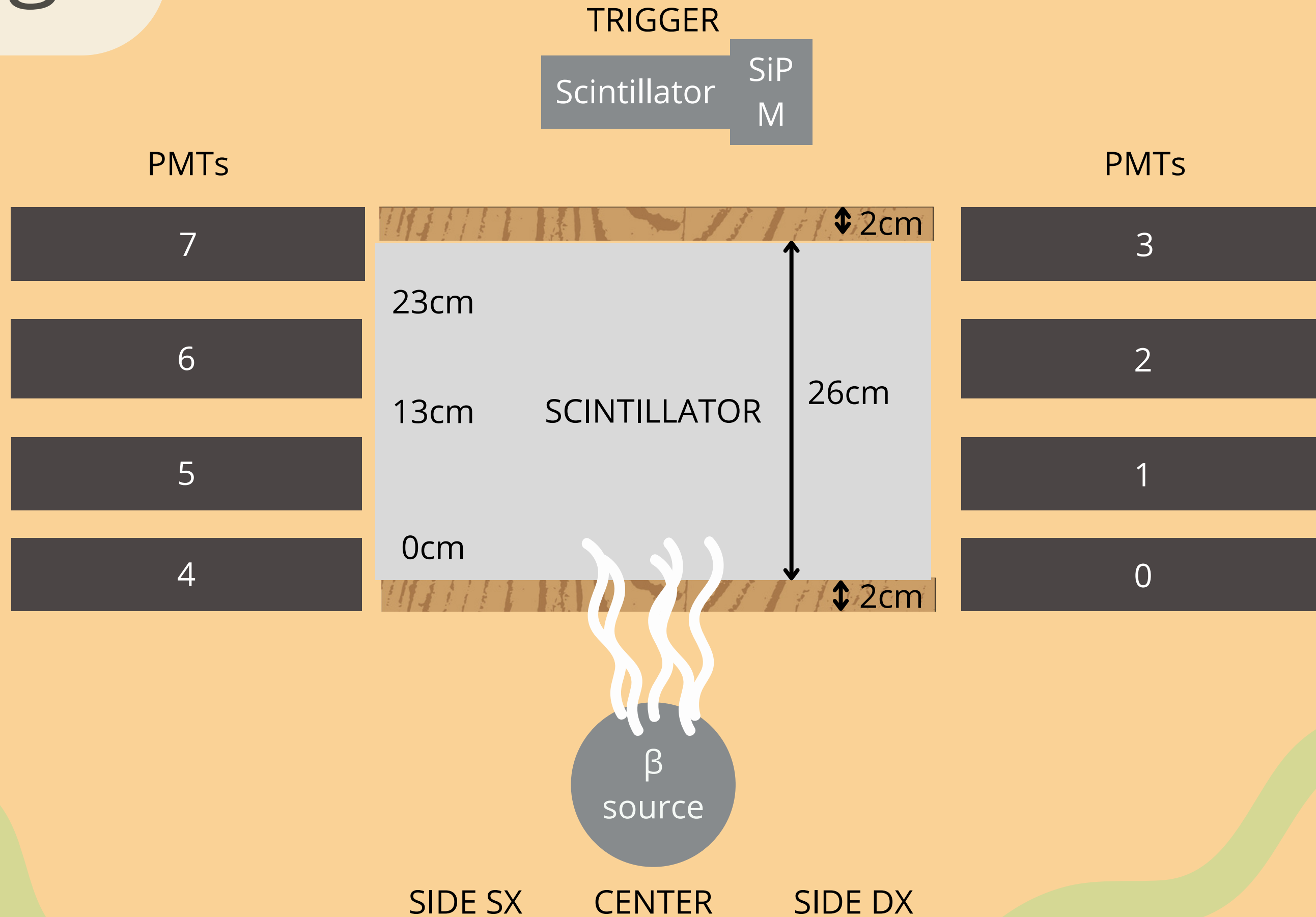
Signal of radioactive source
from Scintillator + SiPM



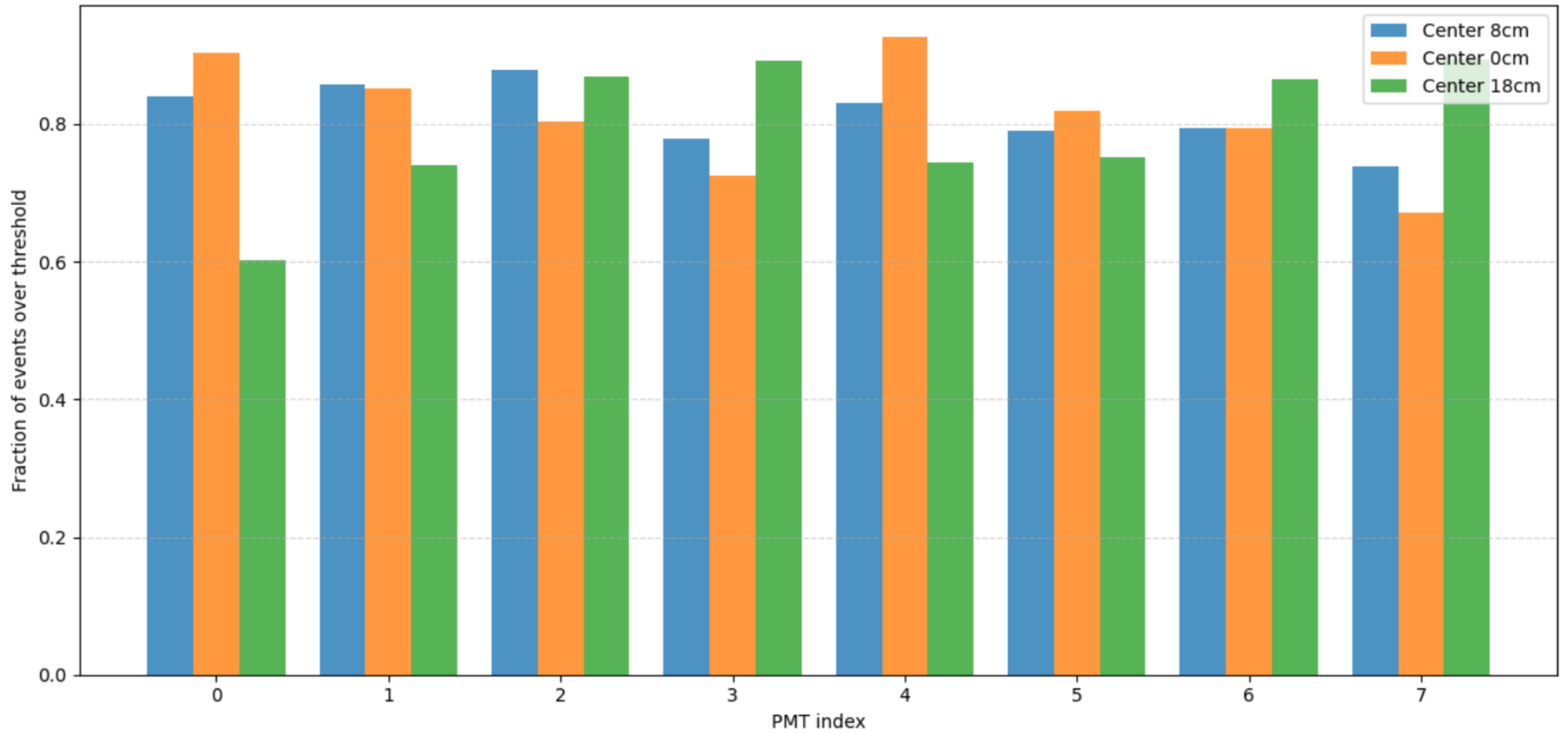


Photoelectron
peak

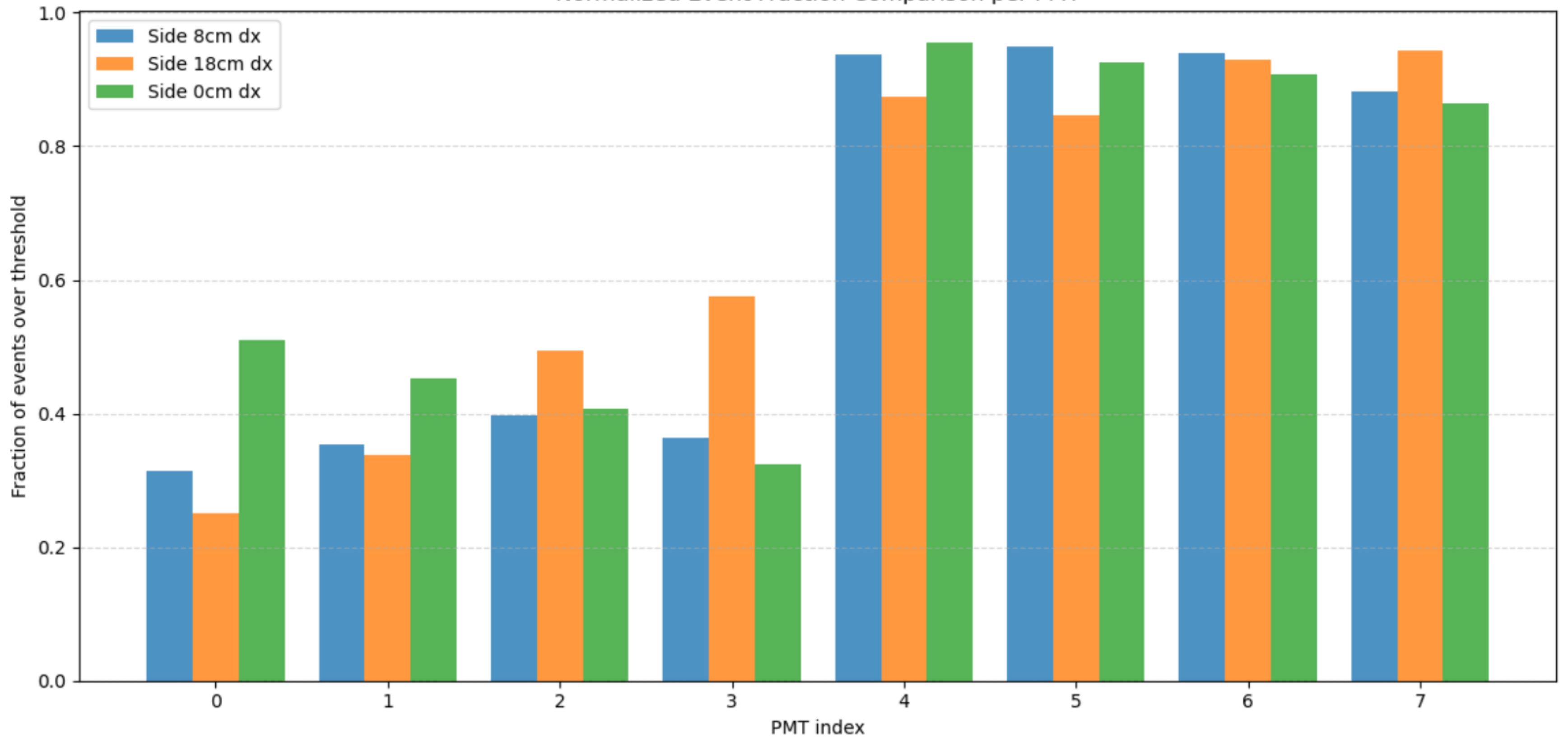
Setting



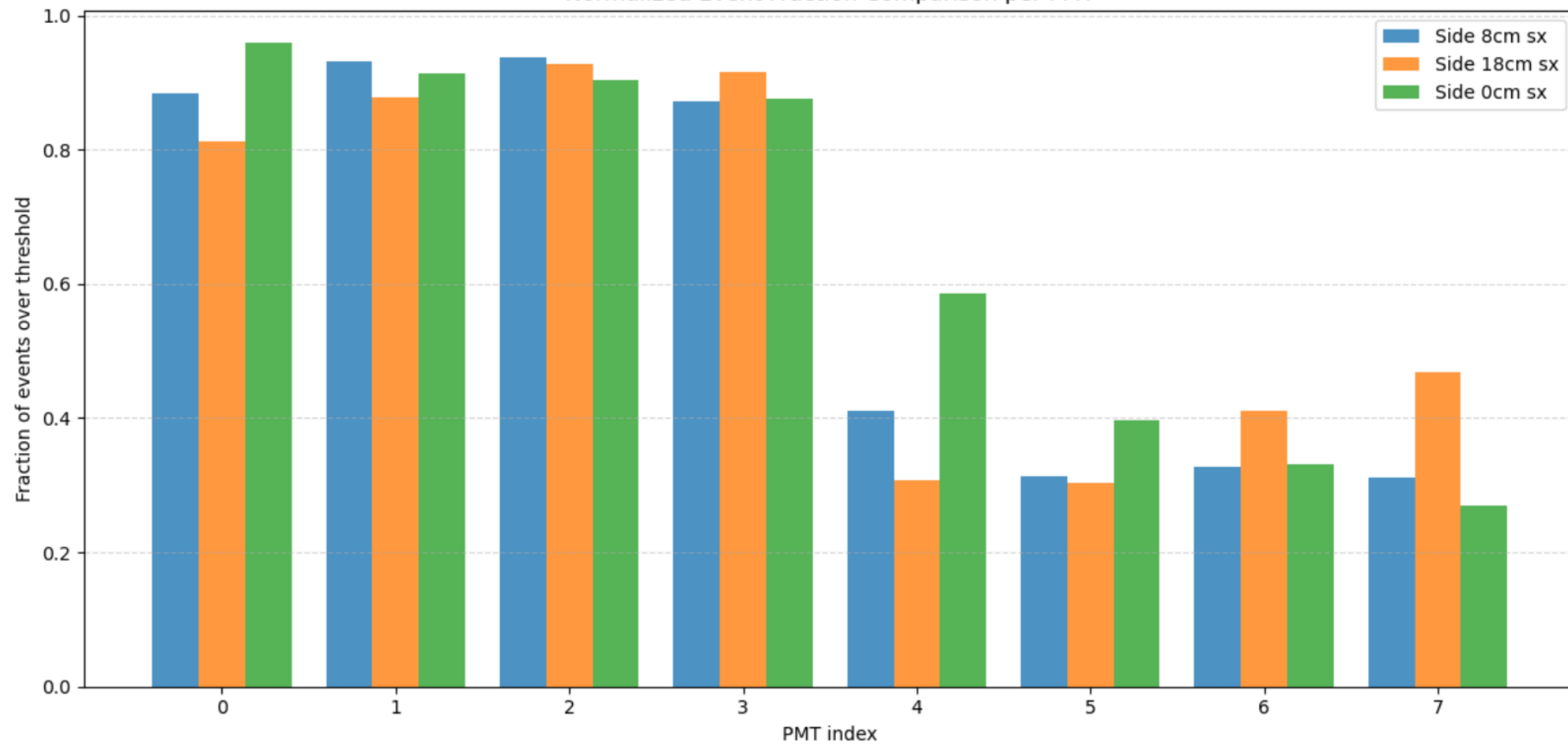
Normalized Event Fraction Comparison per PMT



Normalized Event Fraction Comparison per PMT

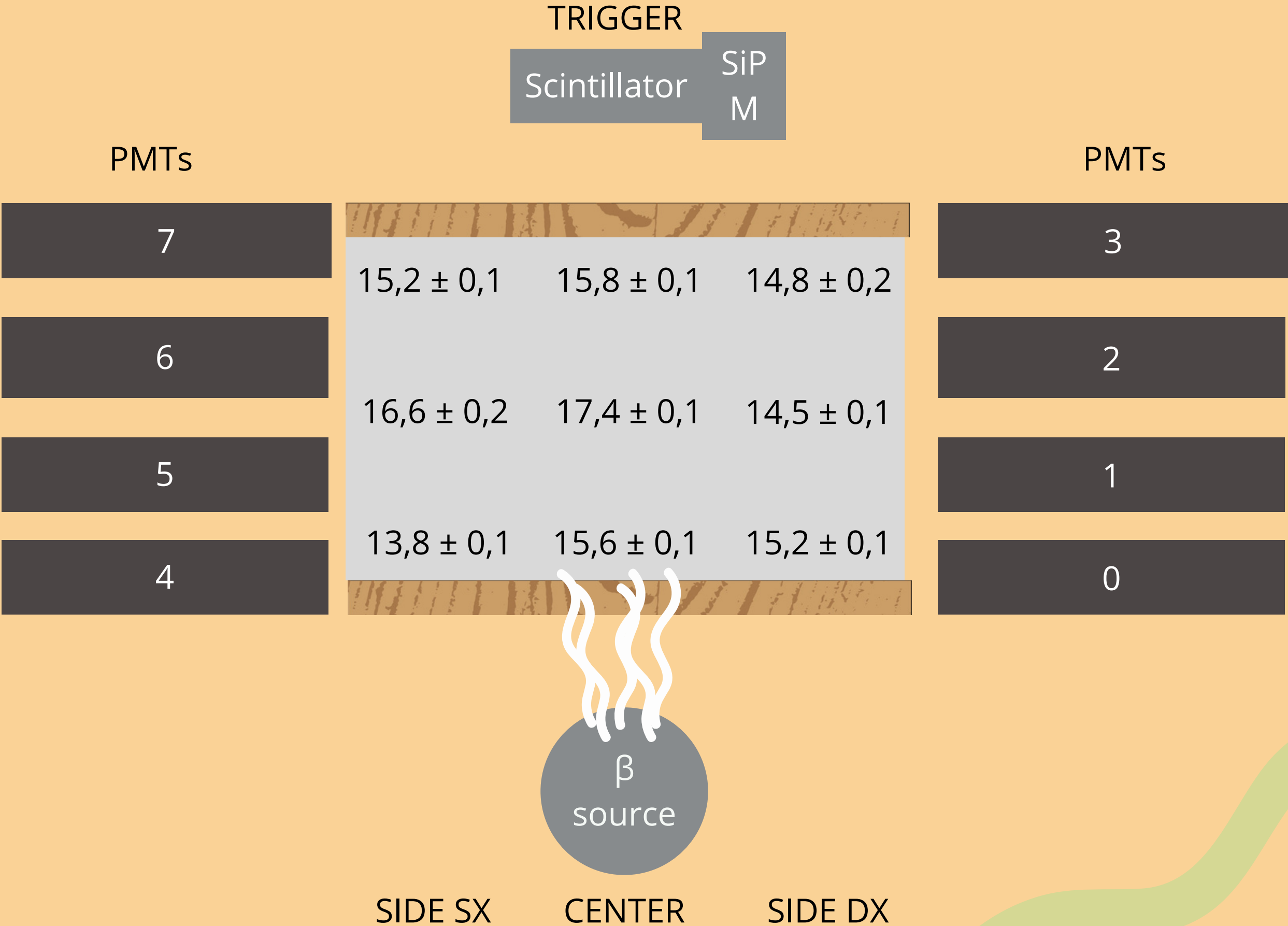


Normalized Event Fraction Comparison per PMT



Setting	μ	μ error
Side sx 8cm	16,6	0,2
Side sx 18cm	15,2	0,1
Side sx 0cm	13,8	0,1
Center 8cm	17,4	0,1
Center 0cm	15,6	0,1
Center 18cm	15,8	0,1
Side dx 0cm	15,2	0,1
Side dx 8cm	14,5	0,1
Side dx 18 cm	14,8	0,2

RESULTS





*Thanks
for
attention*