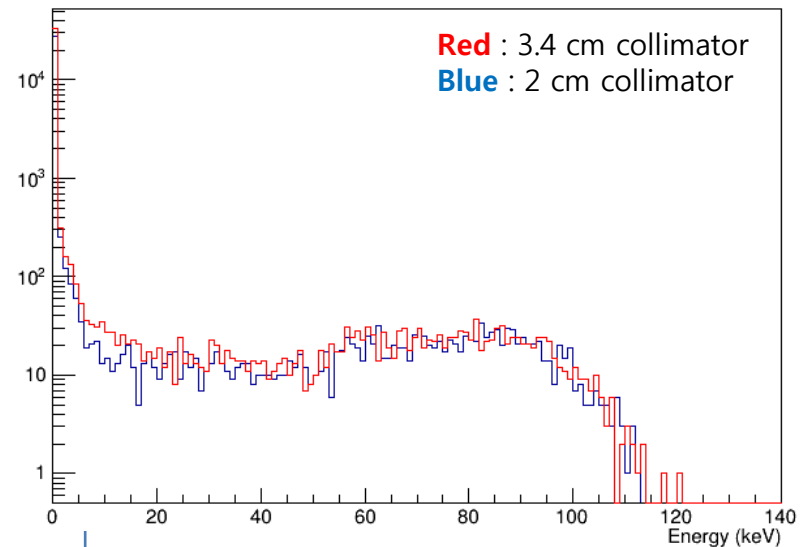
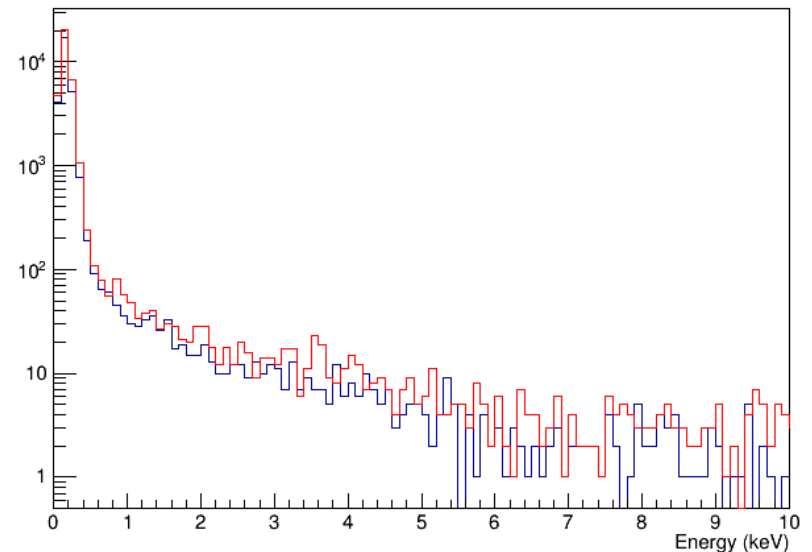


Test with smaller collimator

	3.4 cm diameter	2.0 cm diameter
NaI single rate (Hz)	~ 4,000	~ 3,400
ND coincidence rate (Hz)	~ 9	~ 7
Bkg rate (cluster/1us)	0.27	0.22

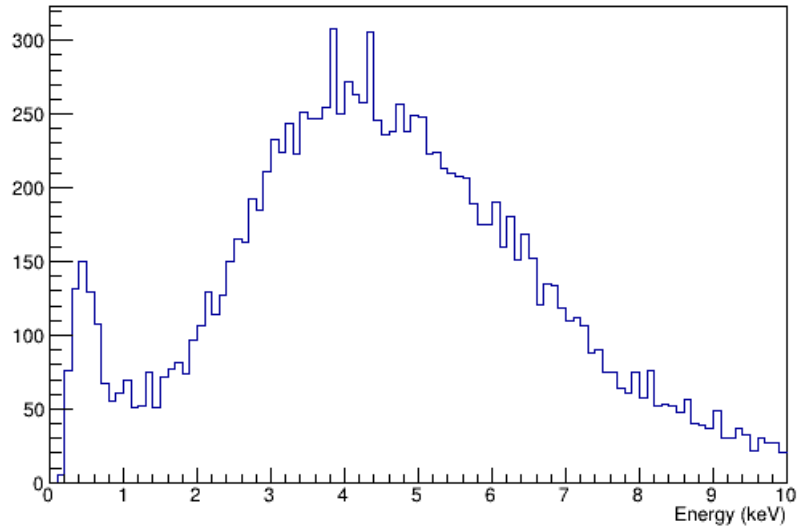


Zoomed

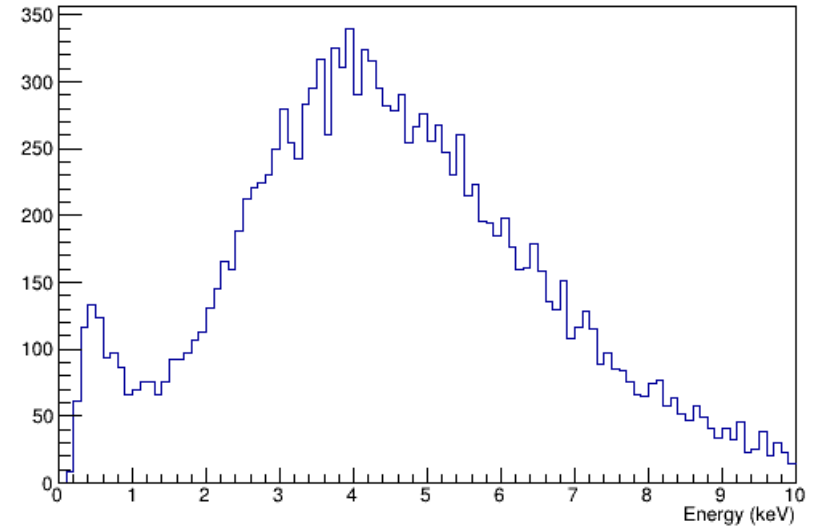


NaI deposit energy (36 hour data)

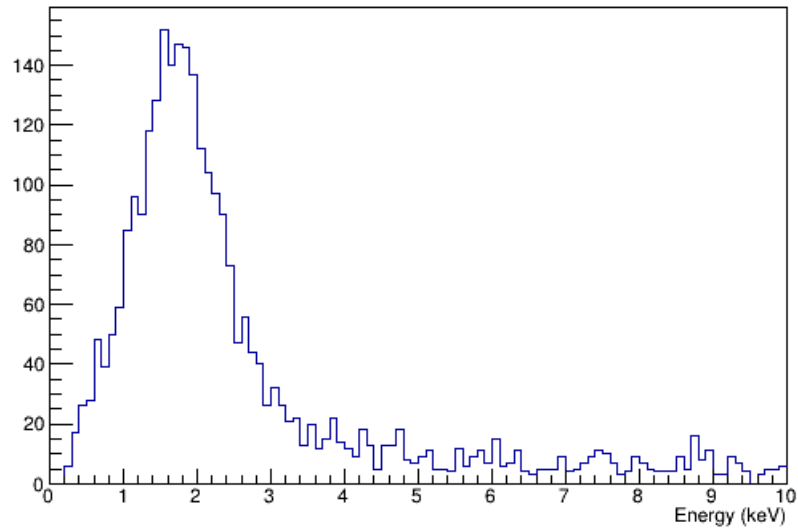
ND 1 (30°)



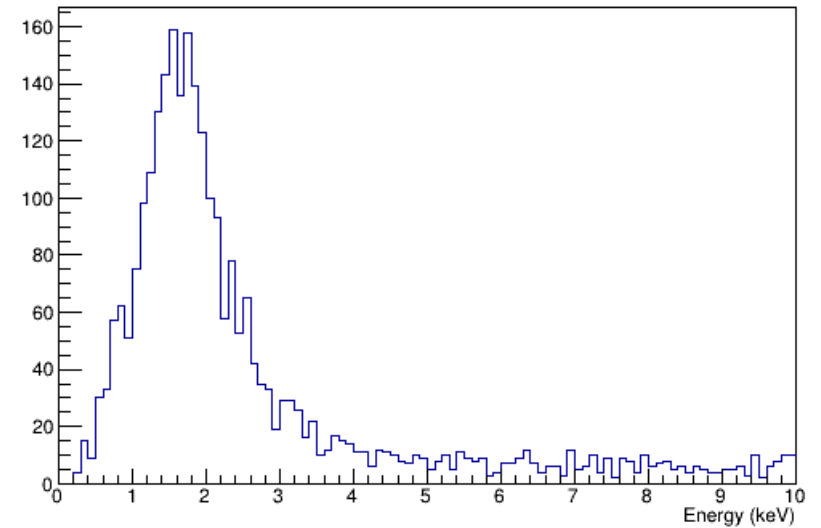
ND 2 (30°)



ND 3 (75°)

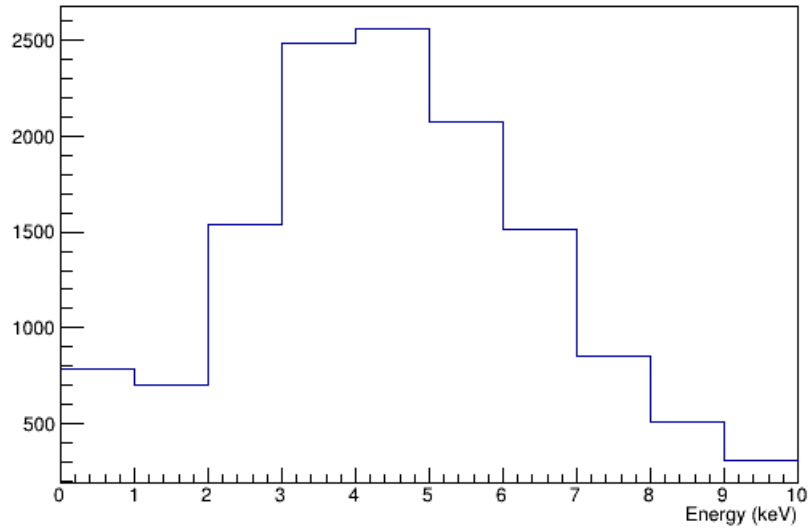


ND 4 (75°)

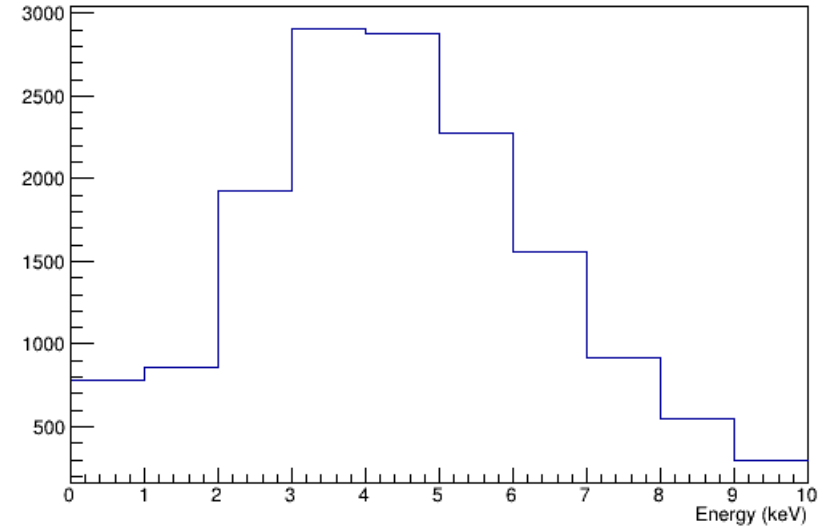


NaI deposit energy (36 hour data)

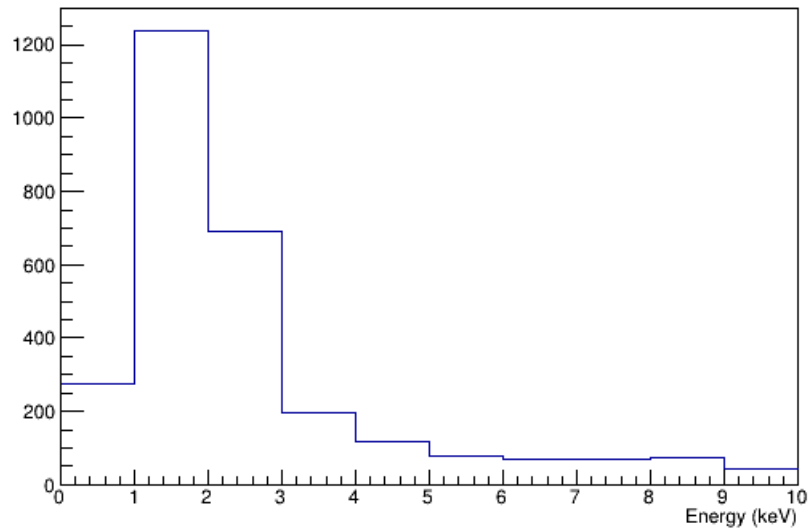
ND 1 (30°)



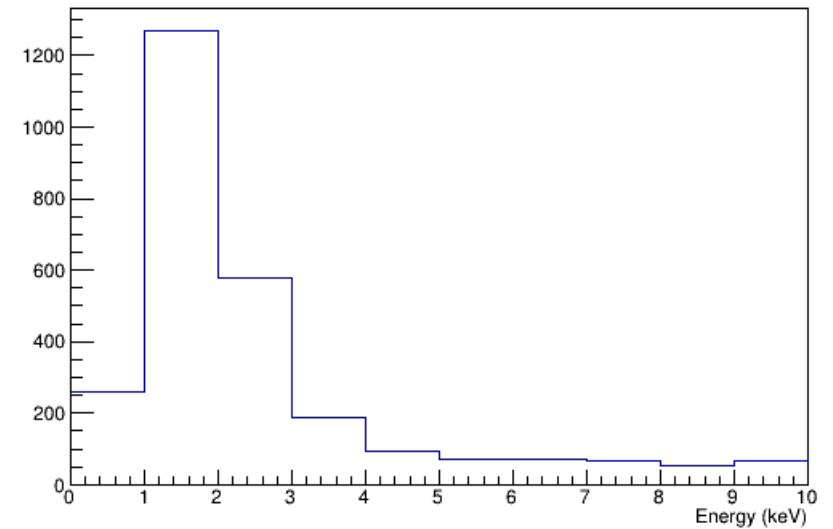
ND 2 (30°)



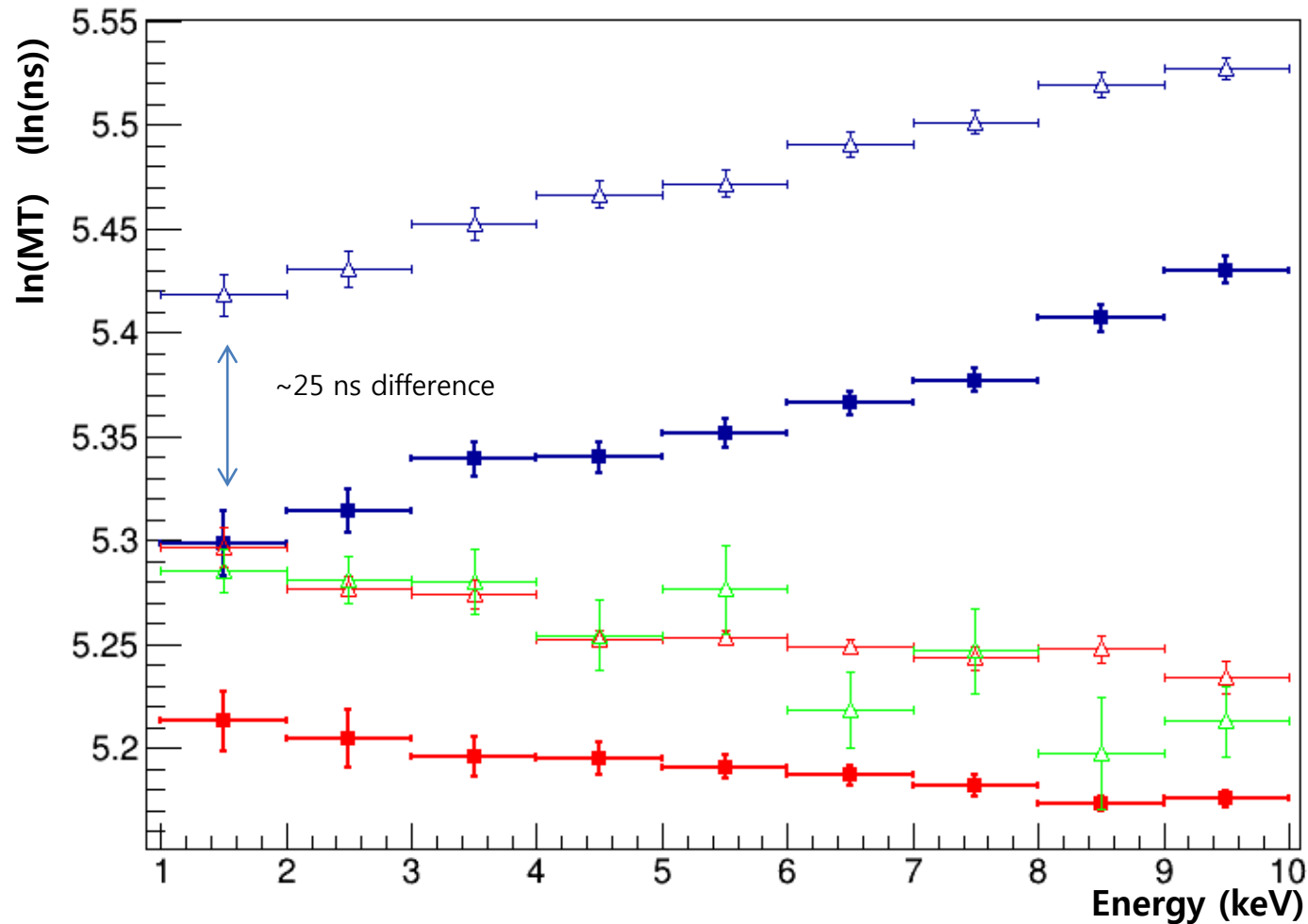
ND 3 (75°)



ND 4 (75°)



$\ln(\text{MT})$ (36 hour data)



Electron recoils (Blue)

Bold Square : Previous measurement (Cs137 - ~ 20 Hz)

Thin Triangle : This measurement (Na22 - $\sim 1,000$ Hz)

Nuclear recoils (Red + Green)

Bold Square : Previous measurement

Thin Triangle : This measurement

Red : 30 degree (Na recoil)

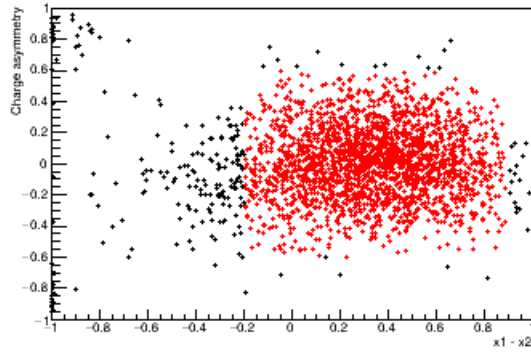
Green : 75 degree (I recoil)

Summary & Plans

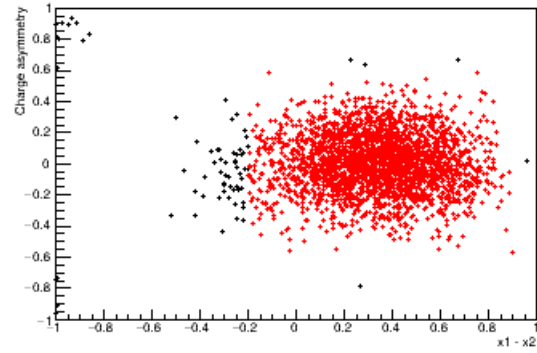
- **mean decay time of current setup is longer than previous measurement ($\sim 20\text{ns}$ for n, $\sim 25\text{ ns}$ for g)**
- **Compare mean decay time with different data sets**
 - Gamma data : Co60 (different crystal from same powder)
Cs137 (this weekend)
 - Neutron data : with smaller collimator

Event selection for coincidence neutrons

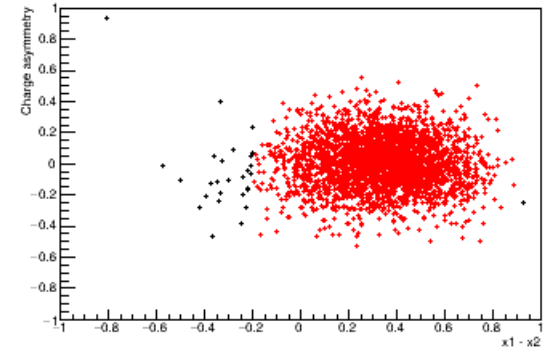
1~2 keV



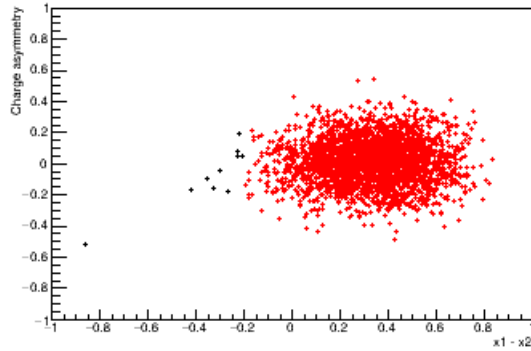
2~3 keV



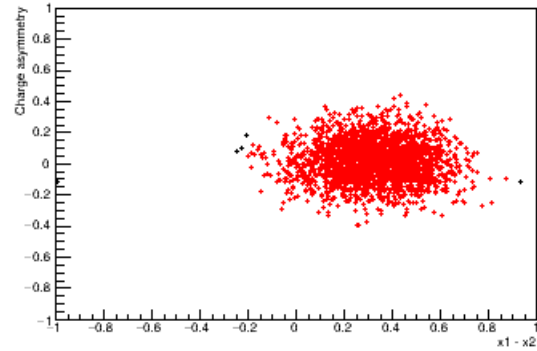
3~4 keV



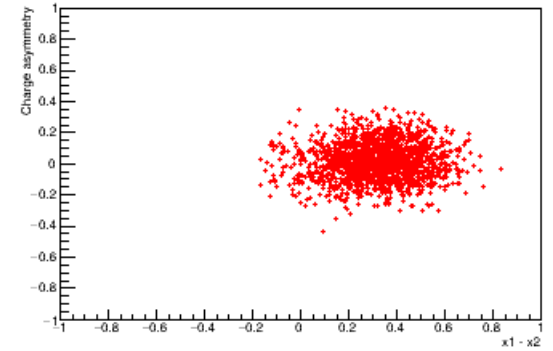
4~5 keV



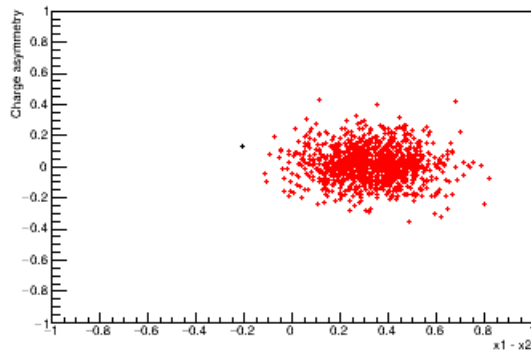
5~6 keV



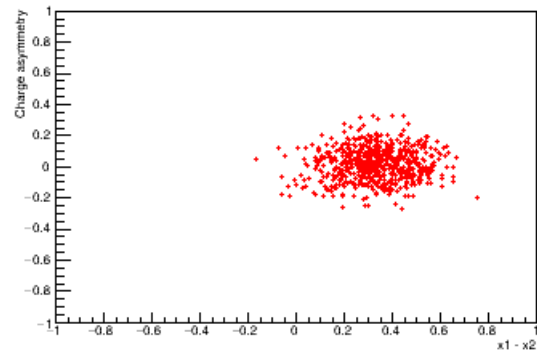
6~7 keV



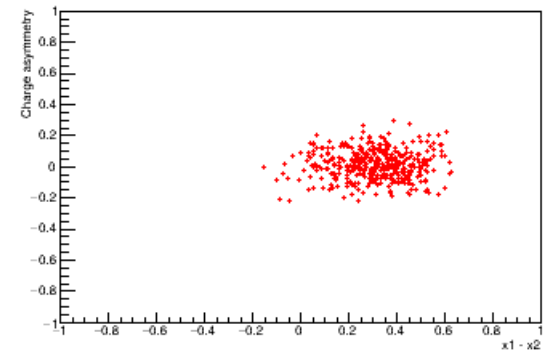
7~8 keV



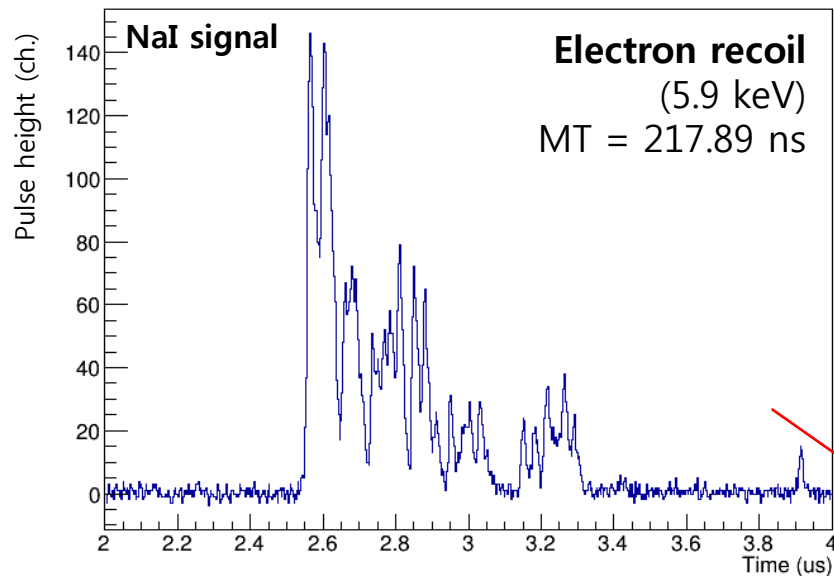
8~9 keV



9~10 keV



Calculate mean decay time of each signal

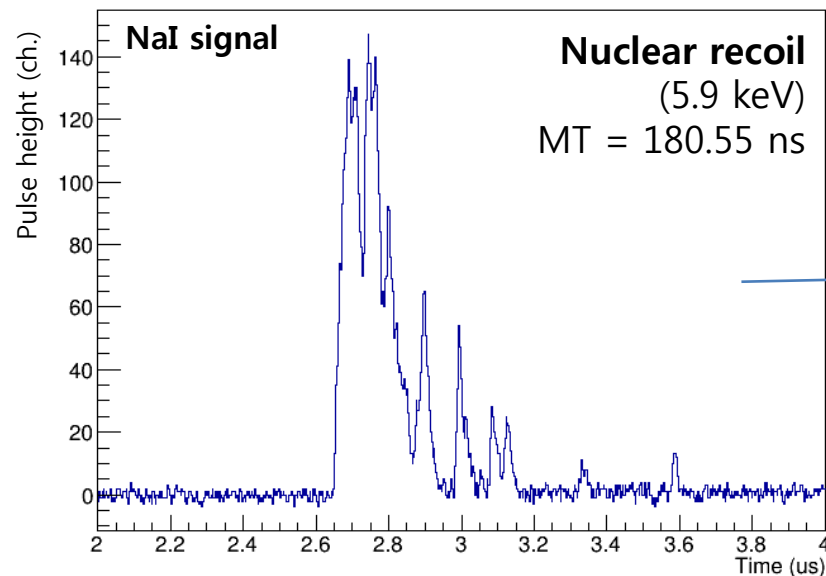


- Discriminate nuclear recoils and electron recoils with natural logarithm of the mean decay time (MT)

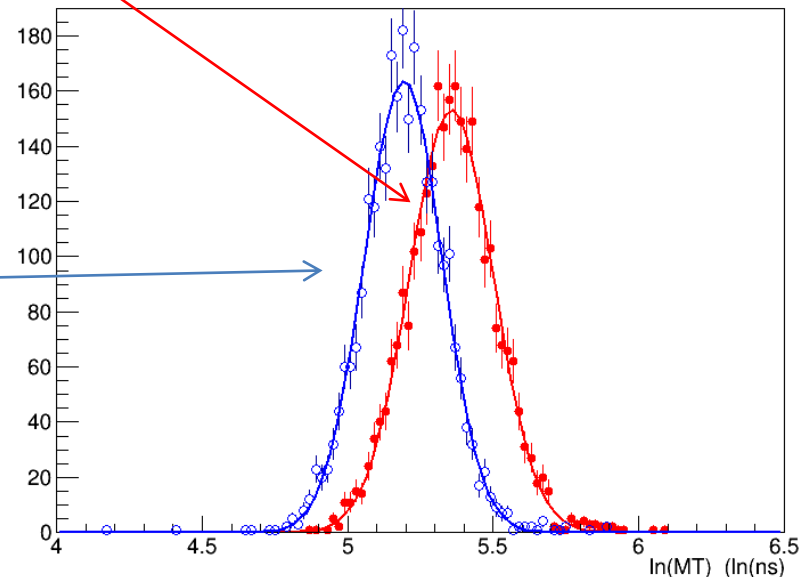
$$: \ln(\text{MT}) = \ln\left(\frac{\sum A_n t_n}{\sum A_n} - t_0\right)$$

A_n : charge of n th cluster

t_n : time of n th cluster ($t_n - t_0 < 1.5$ us)



$\ln(\text{MT})$ for 5~6 keV events



Number of clusters before 2 us (PSD, TOF, >1 keV)

	PMT1	PMT2	SUM
Low NG power (PSD measurement)	0.10	0.09	0.19
Low NG power (QF measurement)	0.06	0.06	0.12
High NG power (QF measurement)	0.35	0.32	0.67
High NG power (current)	0.13	0.21	0.35

(unit : Clusters / 1 us)

- * **PSD measurement** : ~0.9 m from generator
- * **QF measurement, current setup** : ~1.5 m from generator
- * **Low NG power** : ~ 10^7 neutrons / sec
- * **High NG power** : ~ $2 \cdot 10^8$ neutrons / sec

Number of clusters before 2 us (PSD, TOF, >1 keV)

With long Cu shield

	PMT1	PMT2	SUM
DT = 8us	0.14	0.16	0.30
+ 5cm lead block	0.11	0.14	0.25
DT = 32us	0.11	0.14	0.25
DT = 64us	0.13	0.15	0.28

With short Cu shield

	PMT1	PMT2	SUM
DT = 8us	0.17	0.19	0.36
+ 5cm lead block	0.10	0.12	0.23
DT = 32us	0.11	0.14	0.25
DT = 64us	0.12	0.15	0.27

(unit : Clusters / 1 us)