

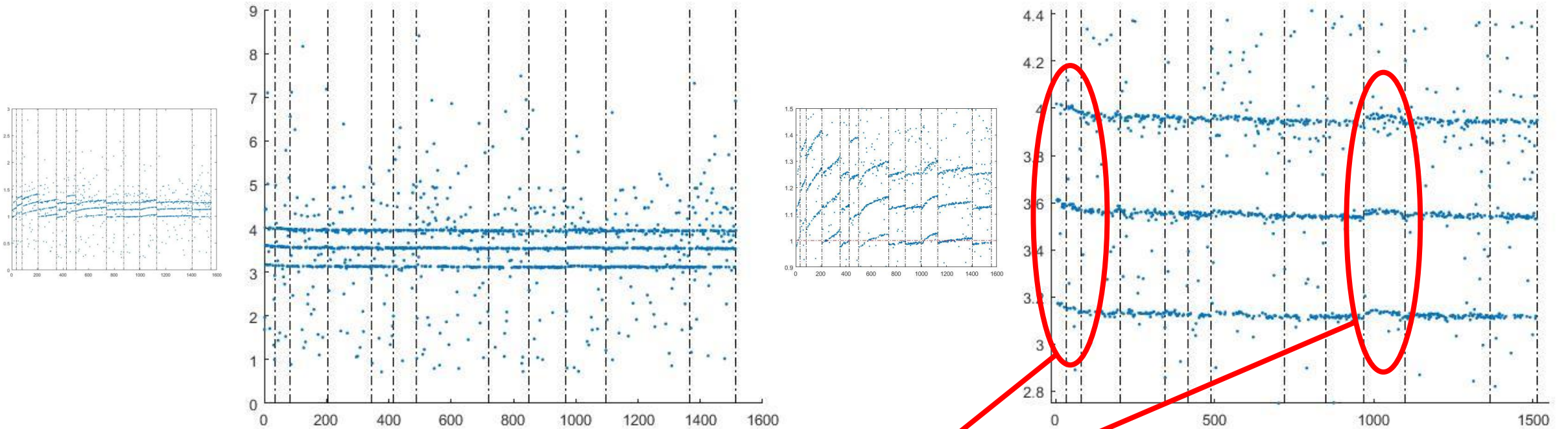
# Weekly Report

2019-01-07

Kim, Hanbeom

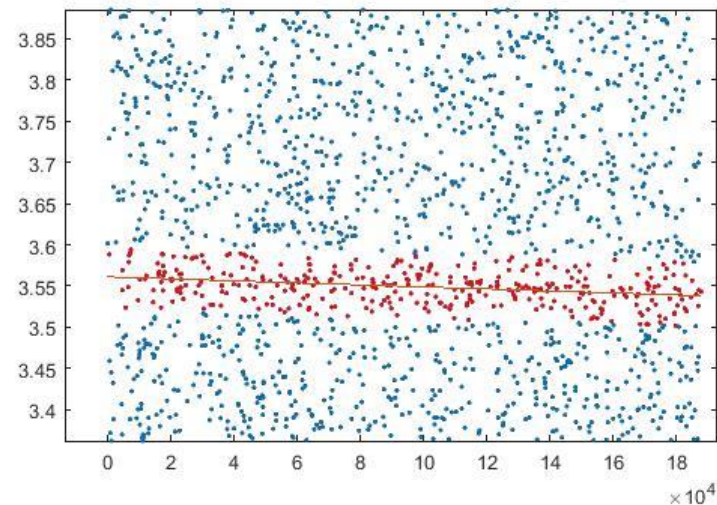
# Last Presentation (181203):

- What I have done (=studied):
  - Drift Correction (by K-40 1.460 MeV peak)

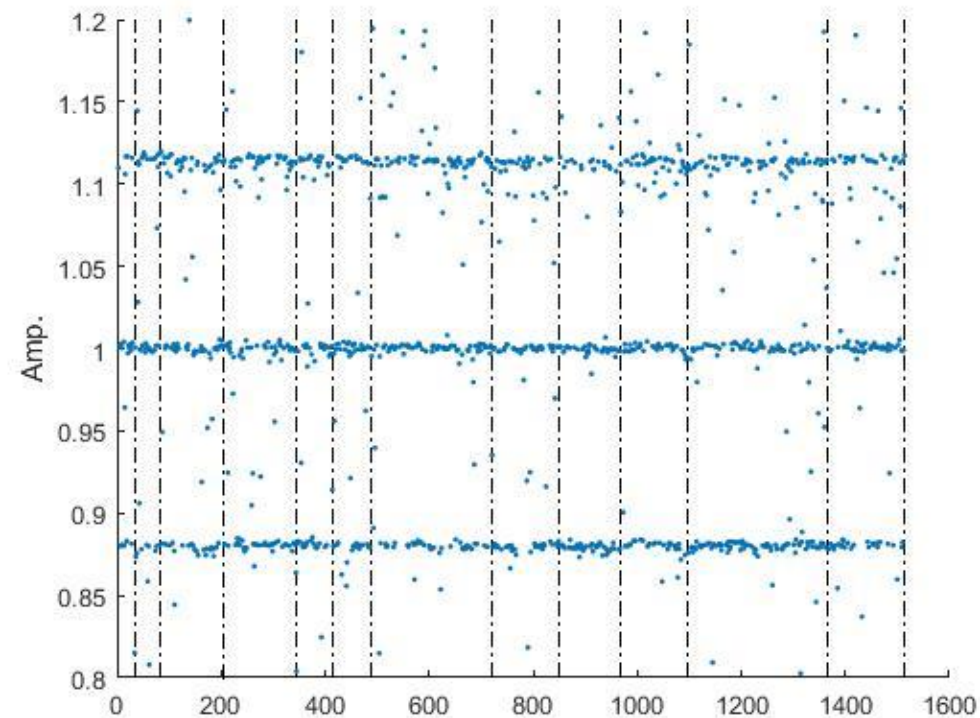
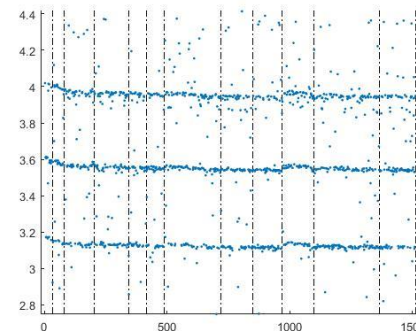
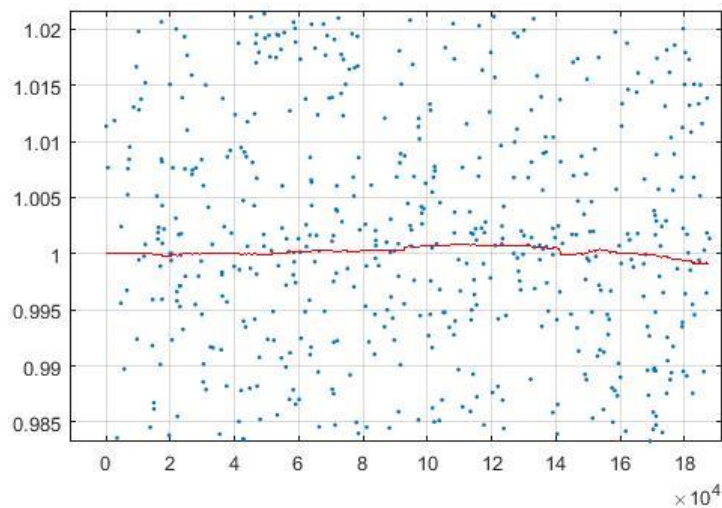
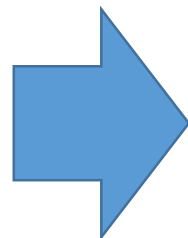


- But the resolution is still not satisfying...

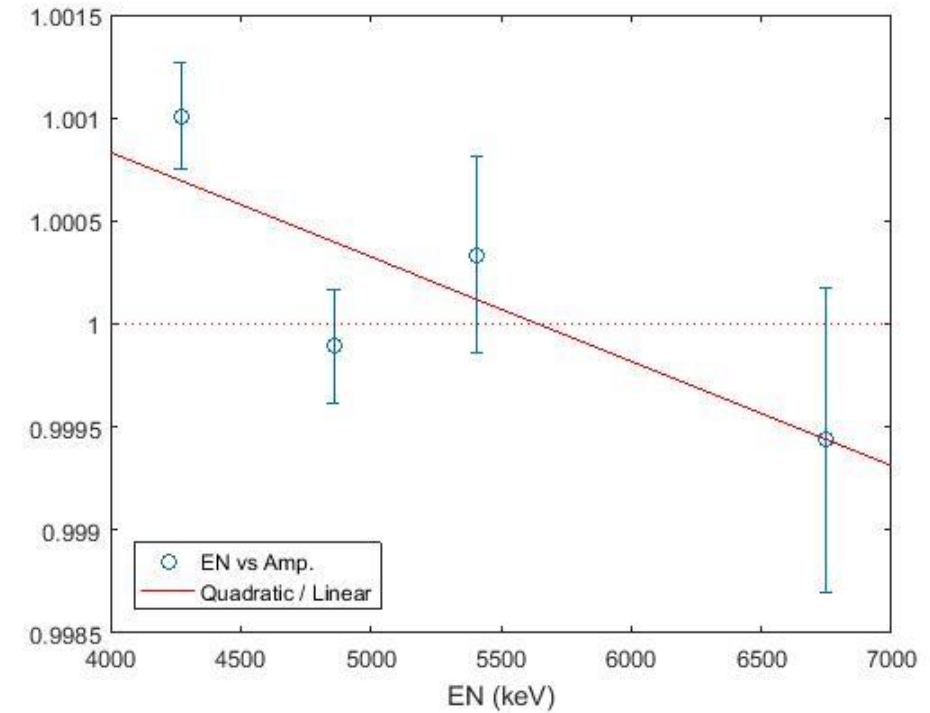
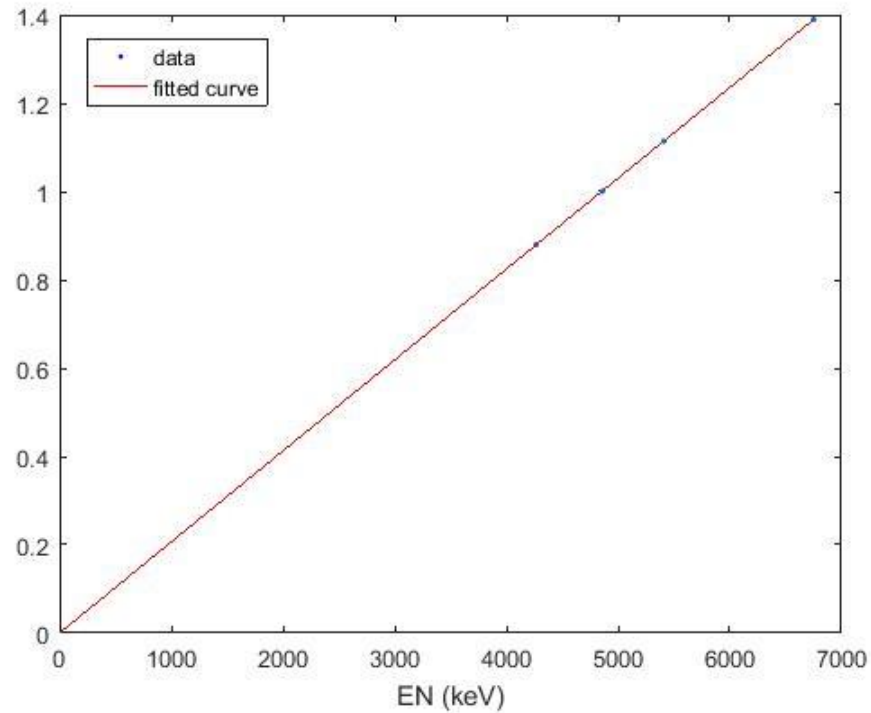
- 2<sup>nd</sup> Drift Correction



U-234 (4857.7 keV)  
The alpha peak  
with the most signals



- Calibration (2<sup>nd</sup> order polynomial)



General model:

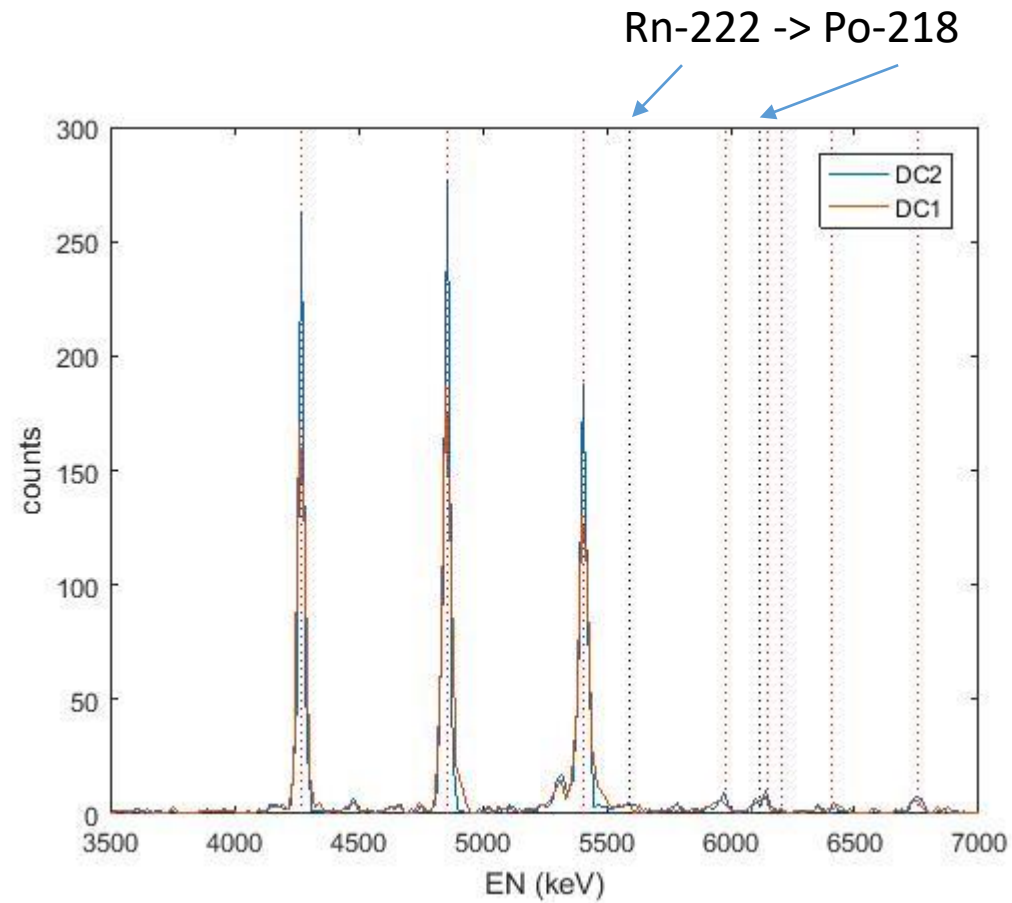
$$\text{amp2EN}(x) = a \cdot x^2 + b \cdot x$$

Coefficients (with 95% confidence bounds):

$$a = -1.043\text{e-}10 \quad (-2.885\text{e-}10, 7.985\text{e-}11)$$

$$b = 0.0002065 \quad (0.0002055, 0.0002076)$$

- Calibration (2<sup>nd</sup> order polynomial)



Alpha spectrum

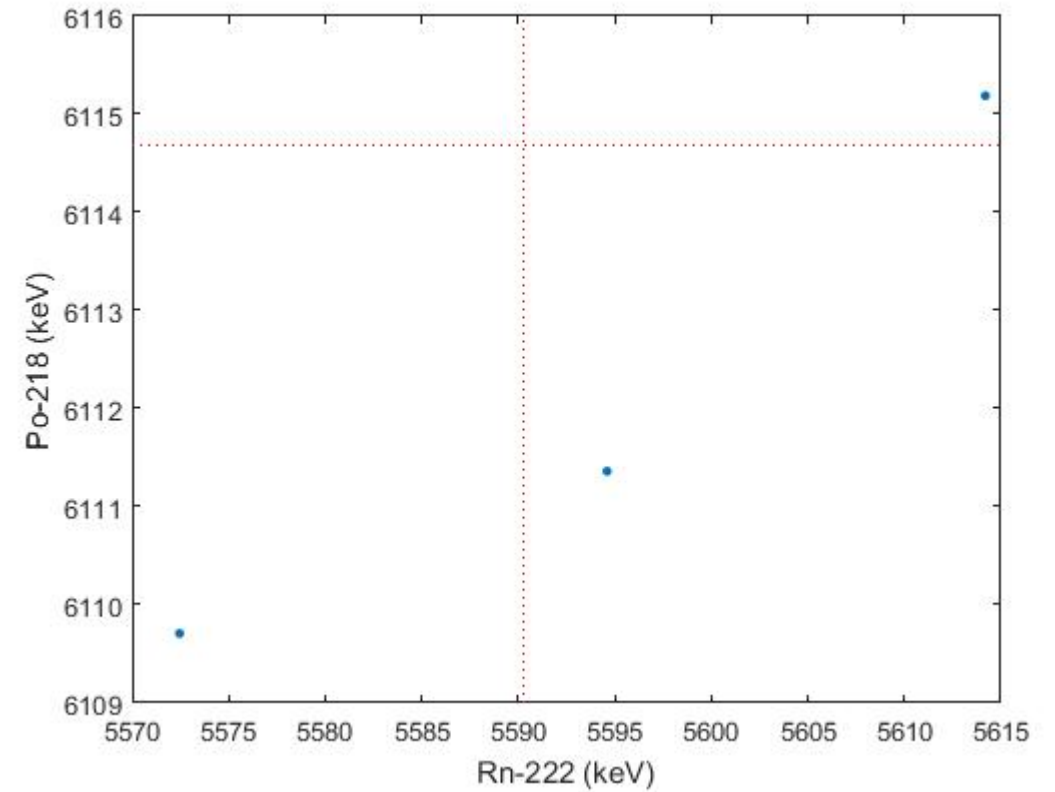
# $^{222}\text{Rn}$ - $^{218}\text{Po}$ decay pair

Mother	Daughter	$t_{1/2}$	Q/keV
$^{222}\text{Rn}$	$^{218}\text{Po}$	3.8235 days	5590.3
$^{218}\text{Po}$	$^{214}\text{Pb}$	3.10 min.,	6114.68

- 15 Rn-222 events found
- Theoretically, by tracing every events occurred within the 10 min. after Rn-222 events, one should find about 13~14 decay pairs..... (89.3 % Po should decay in 10 min. )

# $^{222}\text{Rn}$ - $^{218}\text{Po}$ decay pair

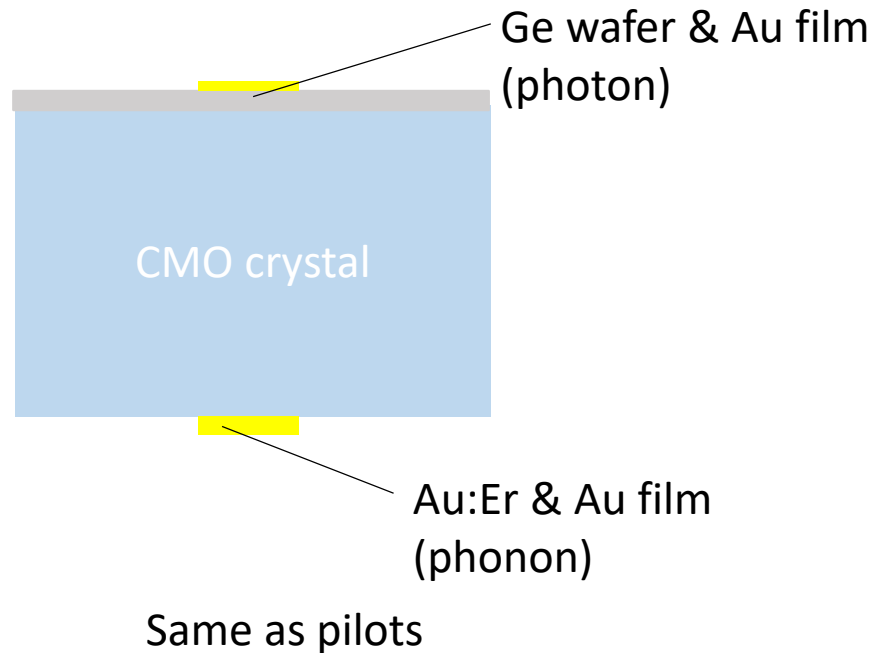
- However, only 3 pairs found.....



- The most probable reason is the corresponding signals were piled up.



- SB28 Data
  - 2015/05



Why old data?:

1. Better photon detector at past
  - Faster photon rise time:  $\sim 200$  us ( $\sim 300$  us in the latest pilot)
2. Due to previous studies, this dataset have (relatively) a large number of alpha signals

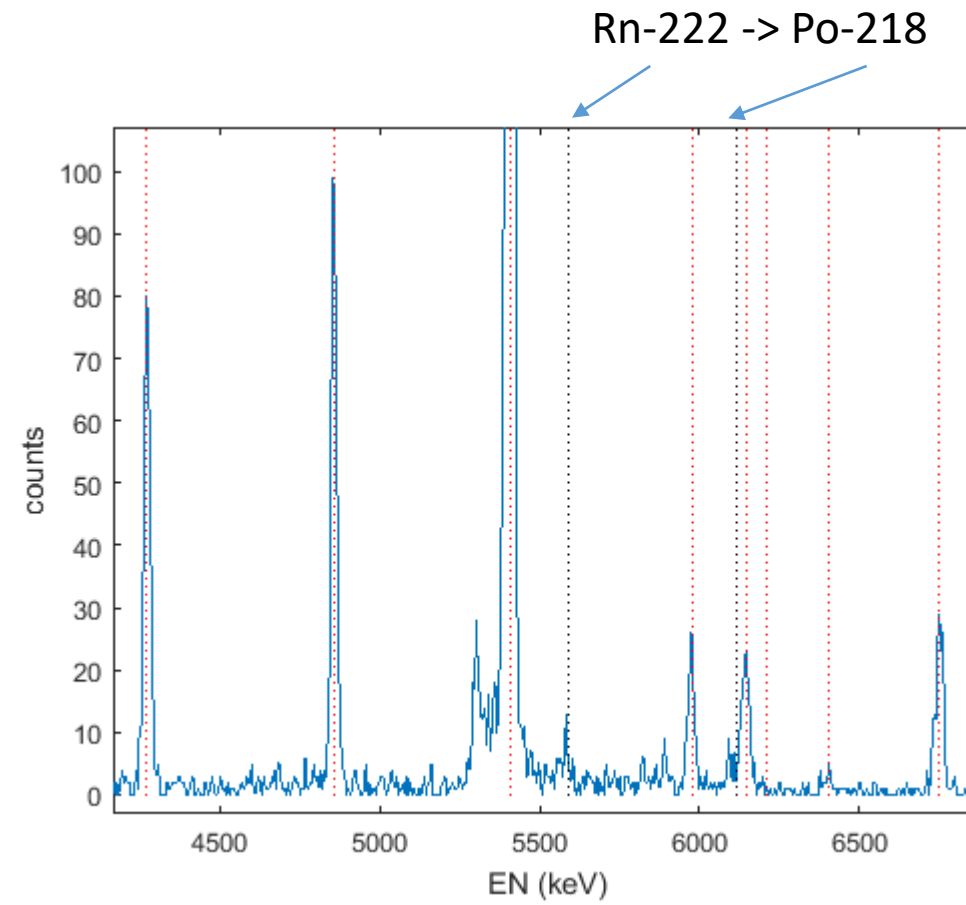
(used in:

KIM, Geon-Bo. *A  $0\nu\beta\beta$  search using large scintillating crystal with metallic magnetic calorimeter*. 2016. PhD Thesis. 서울대학교 대학원.

KIM, G. B., et al. A CaMoO<sub>4</sub> crystal low temperature detector for the AMoRE neutrinoless double beta decay search. *Advances in High Energy Physics*, 2015, 2015.)



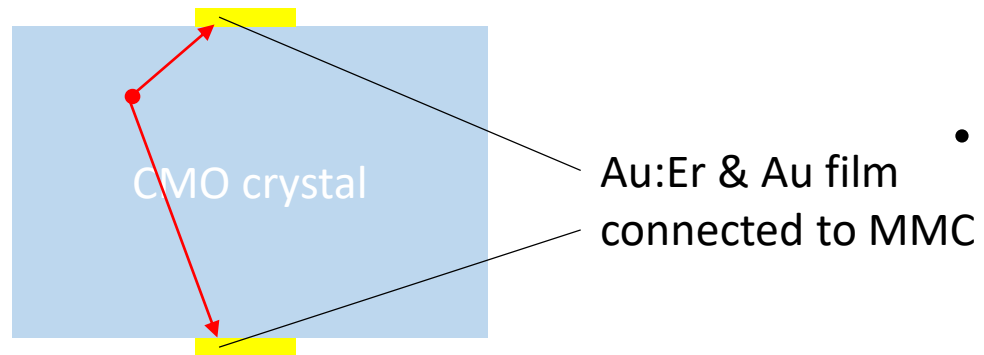
- SB28 Data



What do we want to do next with SB28 Data?

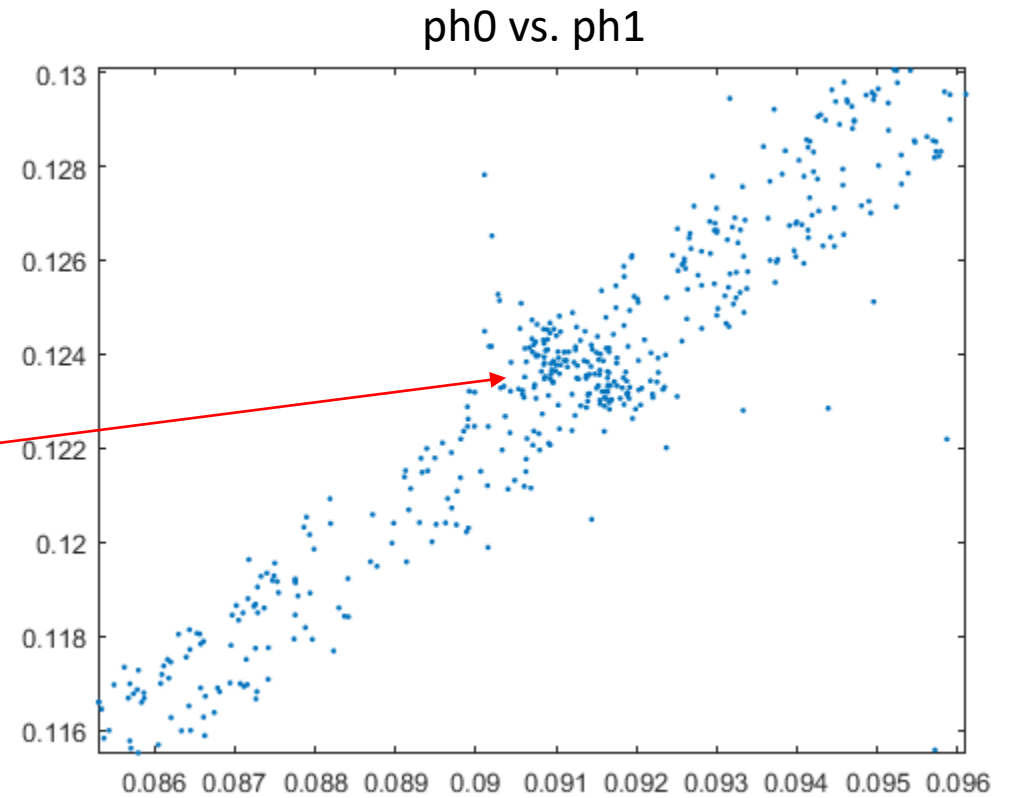
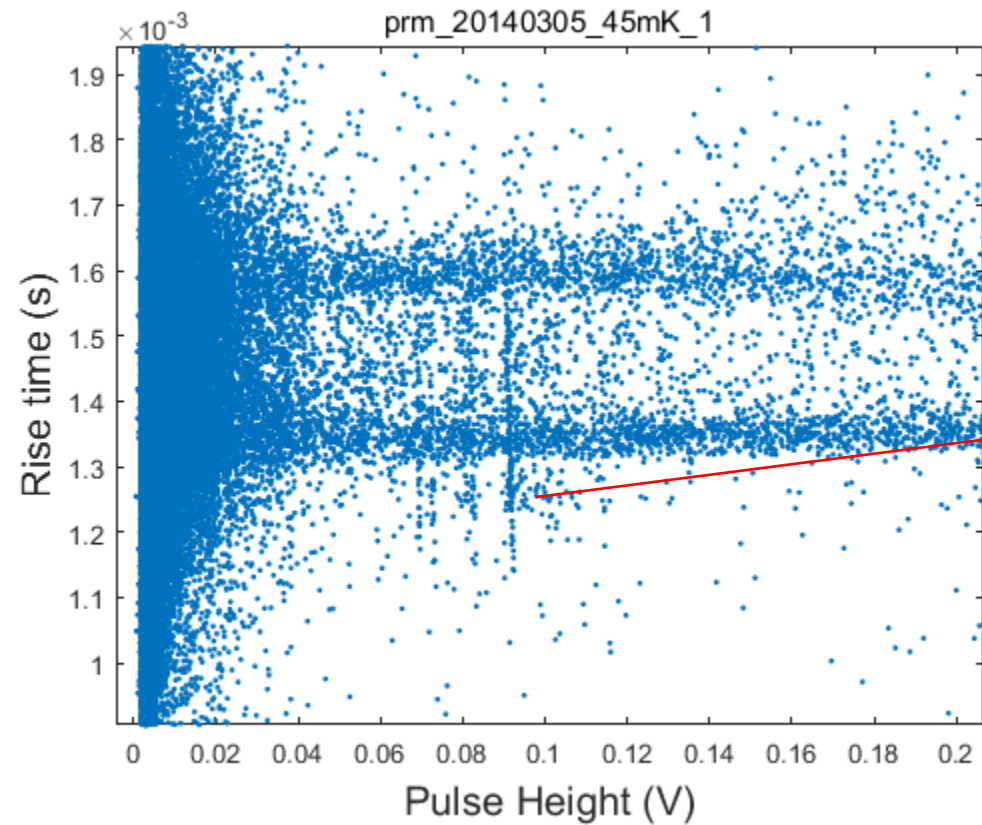
1. (As above) find Rn222-Po218 decay pairs and see the correlation between their energy
2. Identify parameters that can cancel out the position dependence by itself

- Dual Phonon Data
  - 20140225~0418
  - No photon detector



- The experiment was performed for position dependence.
- However, while the analysis on pulse discrimination has been done, the position dependence analysis hasn't begun.

- Dual Phonon Data



Negative slope of an alpha  
Strong enough?

# Other Slides...

- **Drift Correction**

- Choose a peak with a large number of signal
- and modify the whole set of data by fixing its slope and mean (or median)

Custom function at Matlab

1. `fix_slope`: make the slope of the chosen peak flat and set the value to 1
2. `median_filter`: find the median of amplitudes of signals near 1 and modify the amplitudes of all signals

