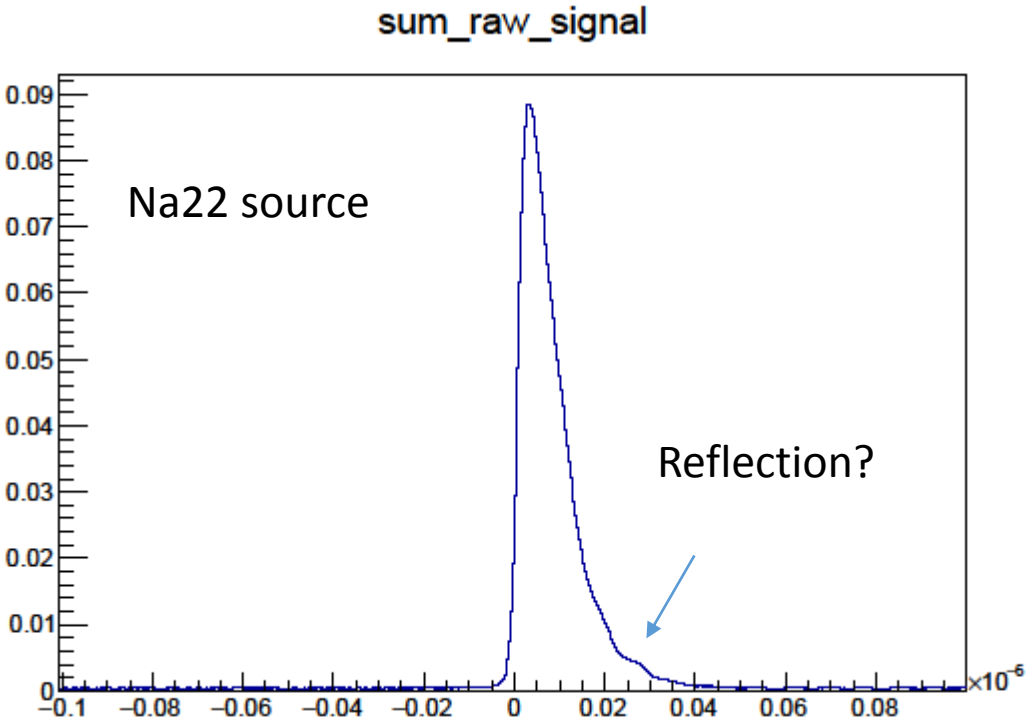
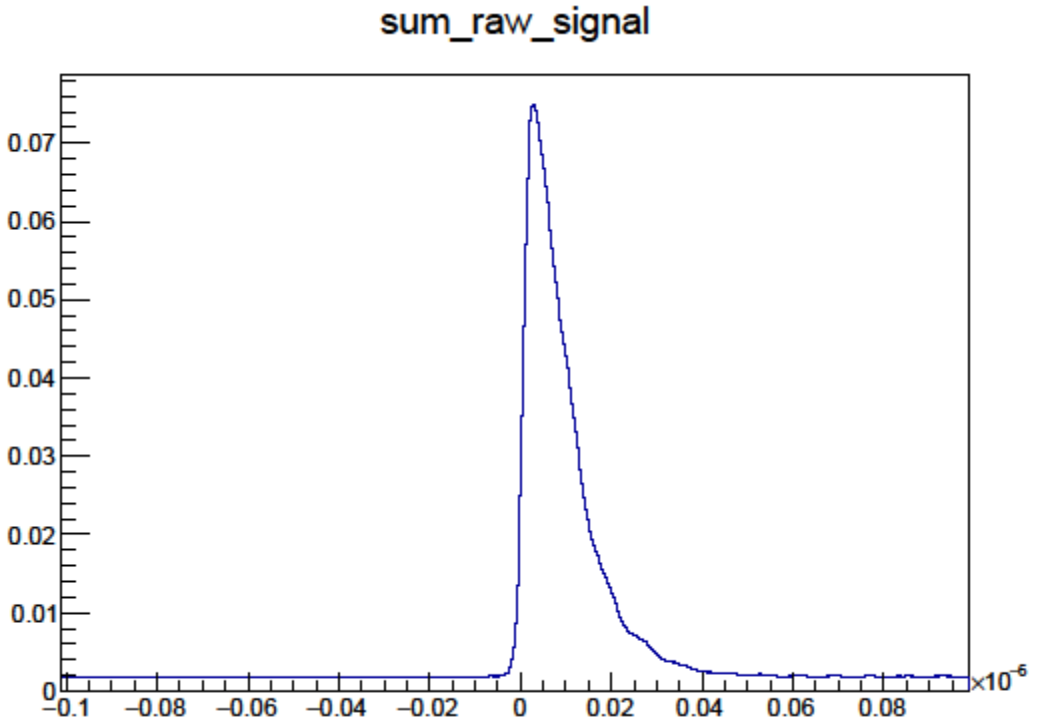
Positronium intensity measurement preparation

SNU

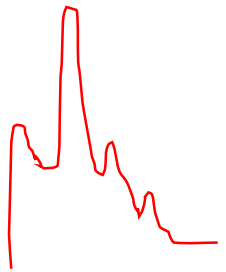
Bongho Kim

Pwo signal

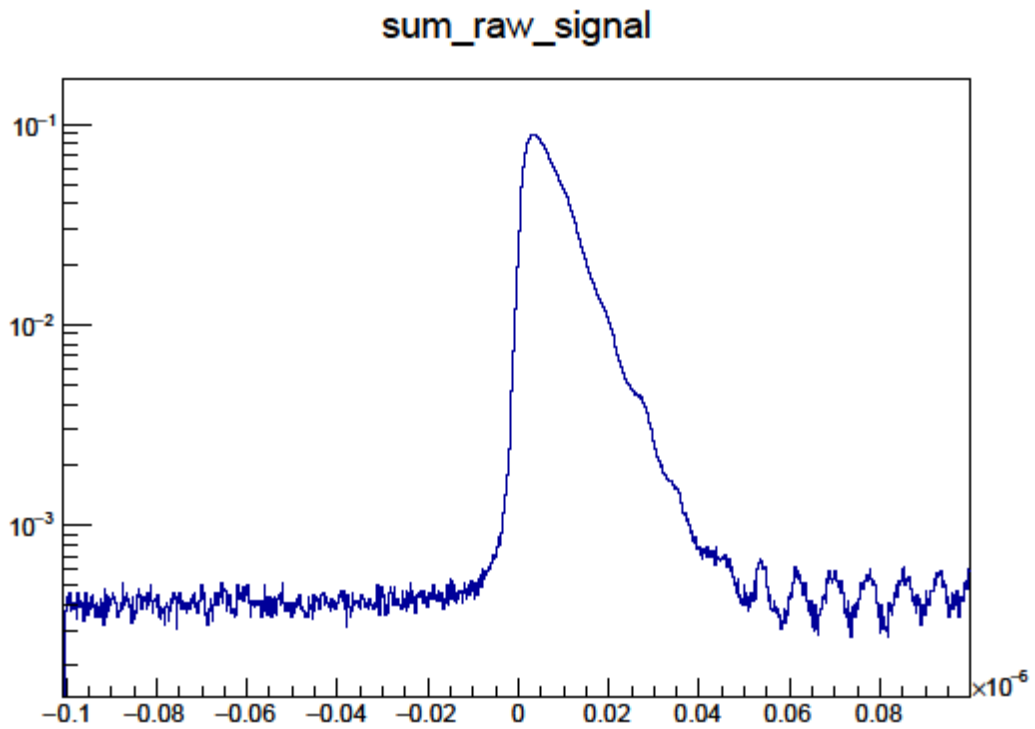


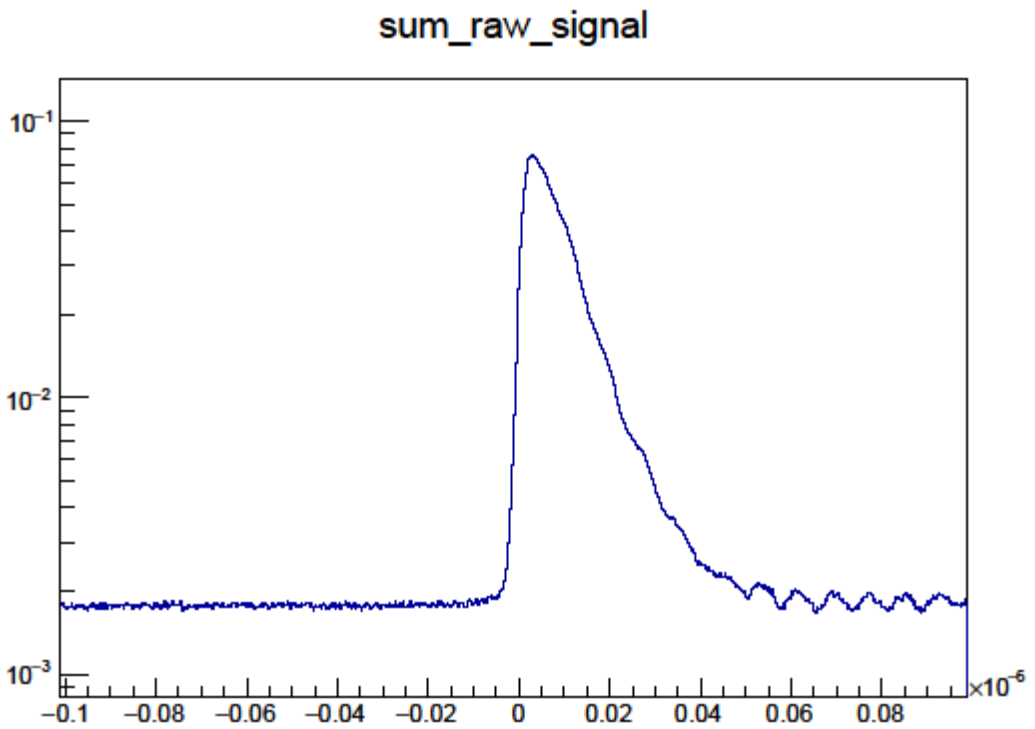


- Basic cut to reject bad noises and too big signals
- Each signals show several peaks normally →



PWO signal





- Ringing shown with 10ns period.

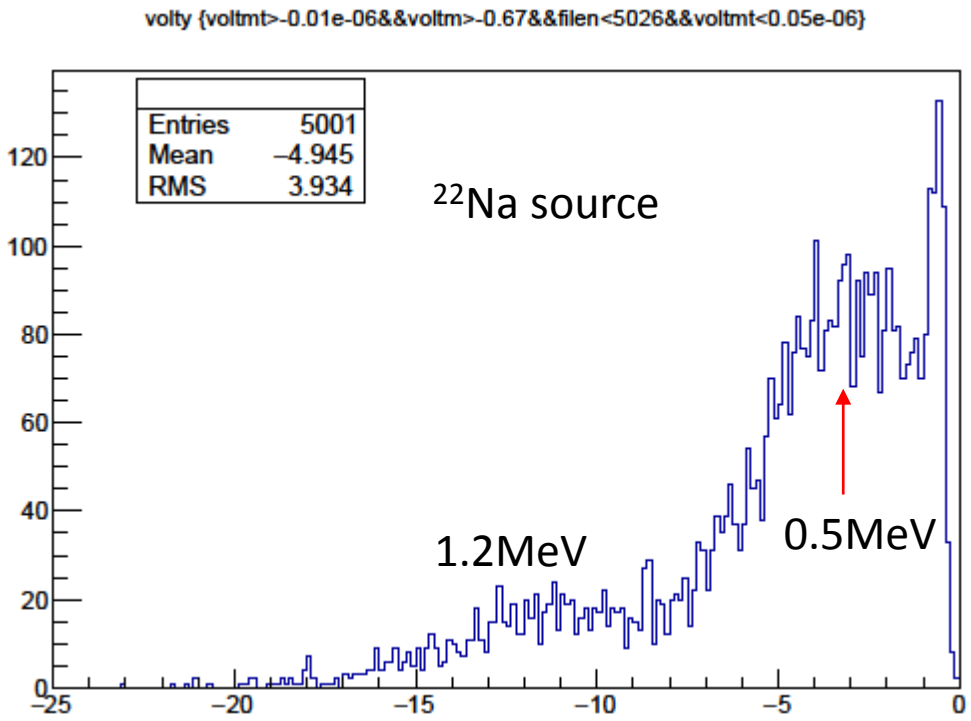
(hard to explain by signal reflection becuase wire length is just ~10cm..)

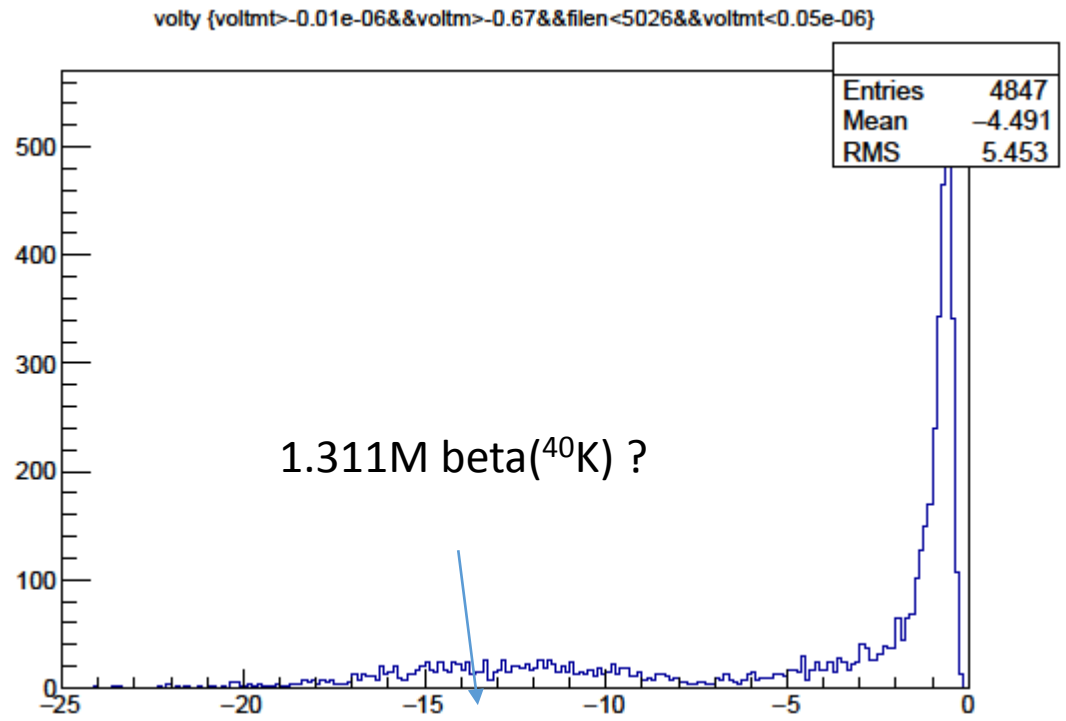
Delay ~5ns/m

How much we can achieve

- Will be depends on Oscilloscope spec.
- 8bit for adequate dynamic range
- 200ps/bin →time resolution is good enough
- Long time range means large data size.

Peak yield distribution





- I want to subtract noise and cosmic ray to analysis but at last time data taking, there was no counter.
- I got new data today with counter and discriminator(-30mV threshold limit which is below oscilloscope threshold used)

→Will be updated next time

Photo-electron number

- Vsum = ~4V (for 0.5MeV gamma)

$I = 4V/50\Omega = 0.08A = Q/\Delta t = Q/10ns$

$Q = 0.8C = 5x10^{9}\#(electron)$

$P.E = Q / (Gain \times efficiency) = 5x10^{9} /(8x10^{6} \times 0.8) = 7.5 \times 10^{2}$ #

← Too big…. Did I calculate something wrong?

The way to calibration

- Energy calibration
- Peak yield(v*s) for one 0.5MeV gamma to estimate yield.
- Peak yield of 1.2MeV gamma to check linearity? (y = a*x)

- Efficiency measurement
- Acceptance check of PWO crystal and plastic scintillator(or CsI) for back to back signal or « 1.2MeV and 0.5MeV » signal
- Today's data shows that plastic scintillator has too bad energy resolution
- At last time, I checked CsI detector but that has quite big noise compared with 0.5MeV gamma.

Last day setup

To do list

- PWO detector calibration
- Energy calibration & efficiency check
- Toy MC check

- Simulation preparation
- Positronium reflection inside cavity target(positronium target)
- Membrane geometry for positronium target (Si with holes inside)

- Helping to develop Antion detection →MCP & other detectors?