

Developing EM calorimeter for COMET -surface state of GSO-

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◎Contents

- experiment outline
 - about COMET and EM calorimeter
 - experiment theme
- experiment progress
 - experiment1:reproducibility
 - experiment2:measuring light intensity
- schedule

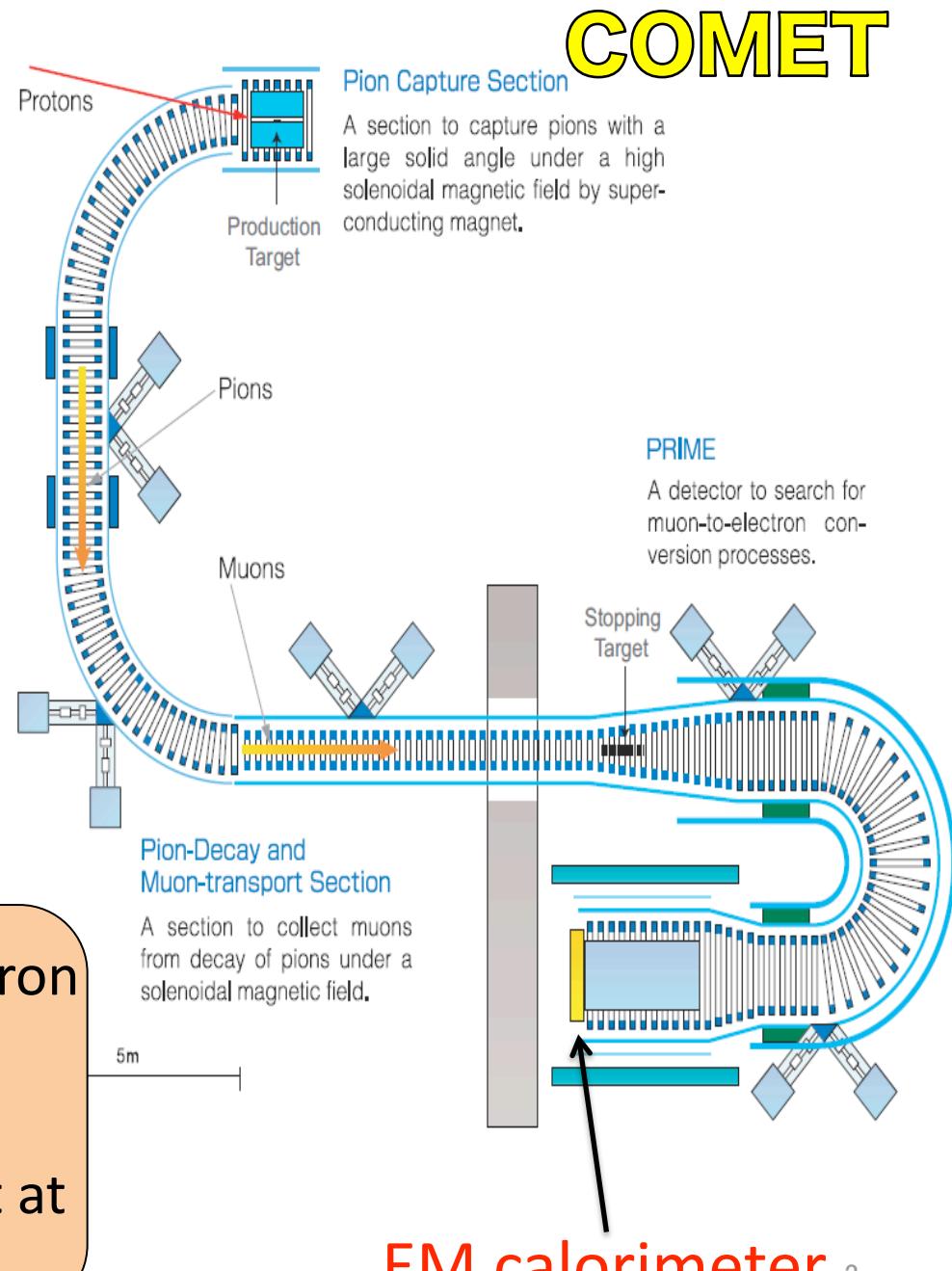
experiment outline

• The aim of the COMET experiment is to search for coherent ν -less conversion of μ to e. (μ -e conversion)
If this conversion is discovered, new model which is above standard model will be sured.

I'm working about “EM calorimeter” at detector part.

• This role is ...

- to measure the energy of electron and make an event trigger.
- to recognize kinds of particle.
- to support some measurement at tracker.



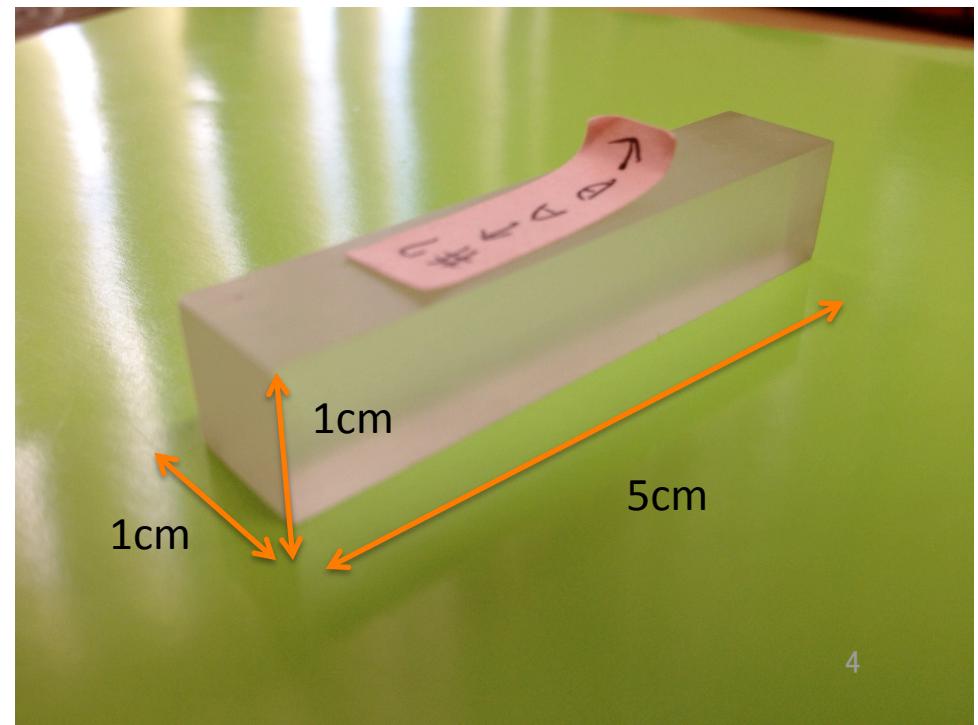
●Theme

Consider the best way of polishing and wrapping which increase light intensity of GSO, which is material for calorimeter, by measuring light intensity in some states of GSO surface.

1. Make set-up and analyze peaks
with doing experiment of
reproducibility

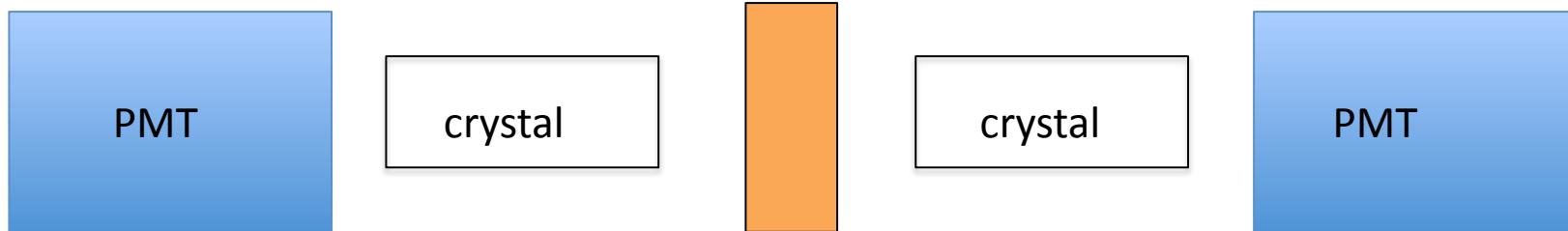
2. Measure light intensity...
 { without polishing
 after polishing
 after polishing and wrapping

3. Simulate by **Geant4**

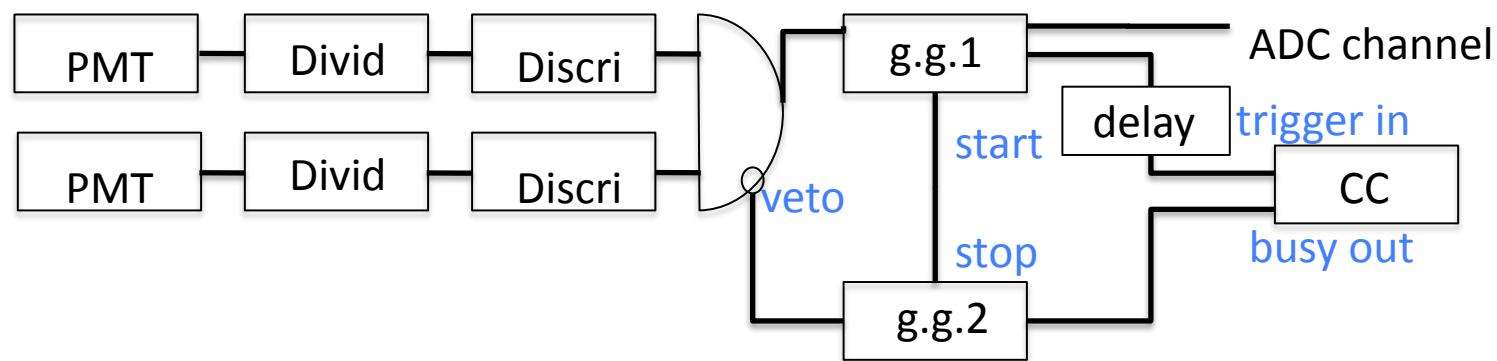
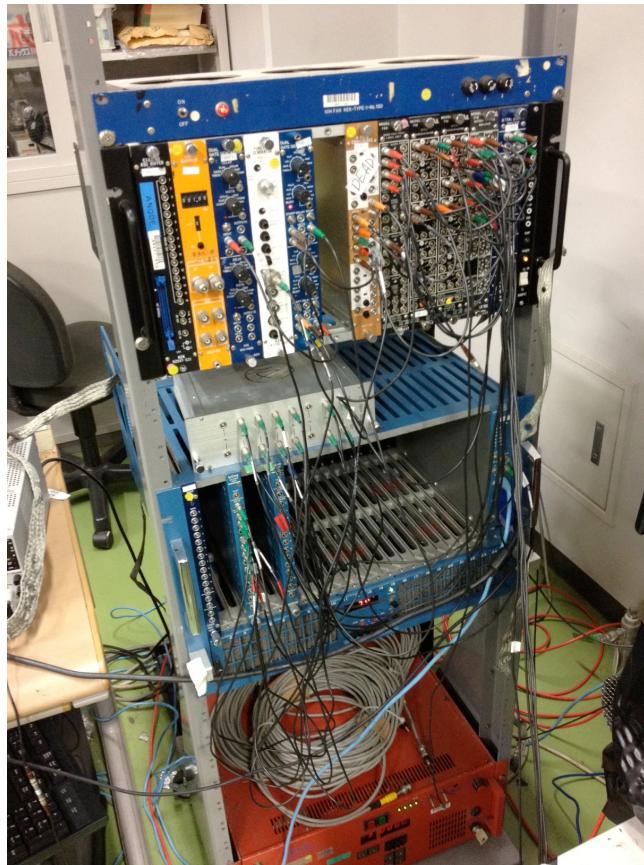


◎Set-up

- detector part



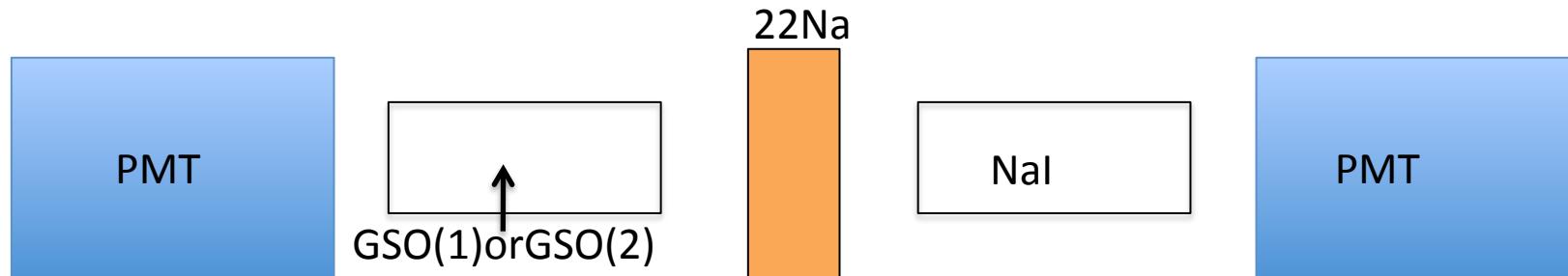
- logic



experiment progress

• experiment 1: reproducibility

Measure reproducibility for changing crystals and make set-up



experiment procedure

set GSO(1), take off source



measure pedestal



set source



measure coincidence

set GSO(2), take off source



measure pedestal



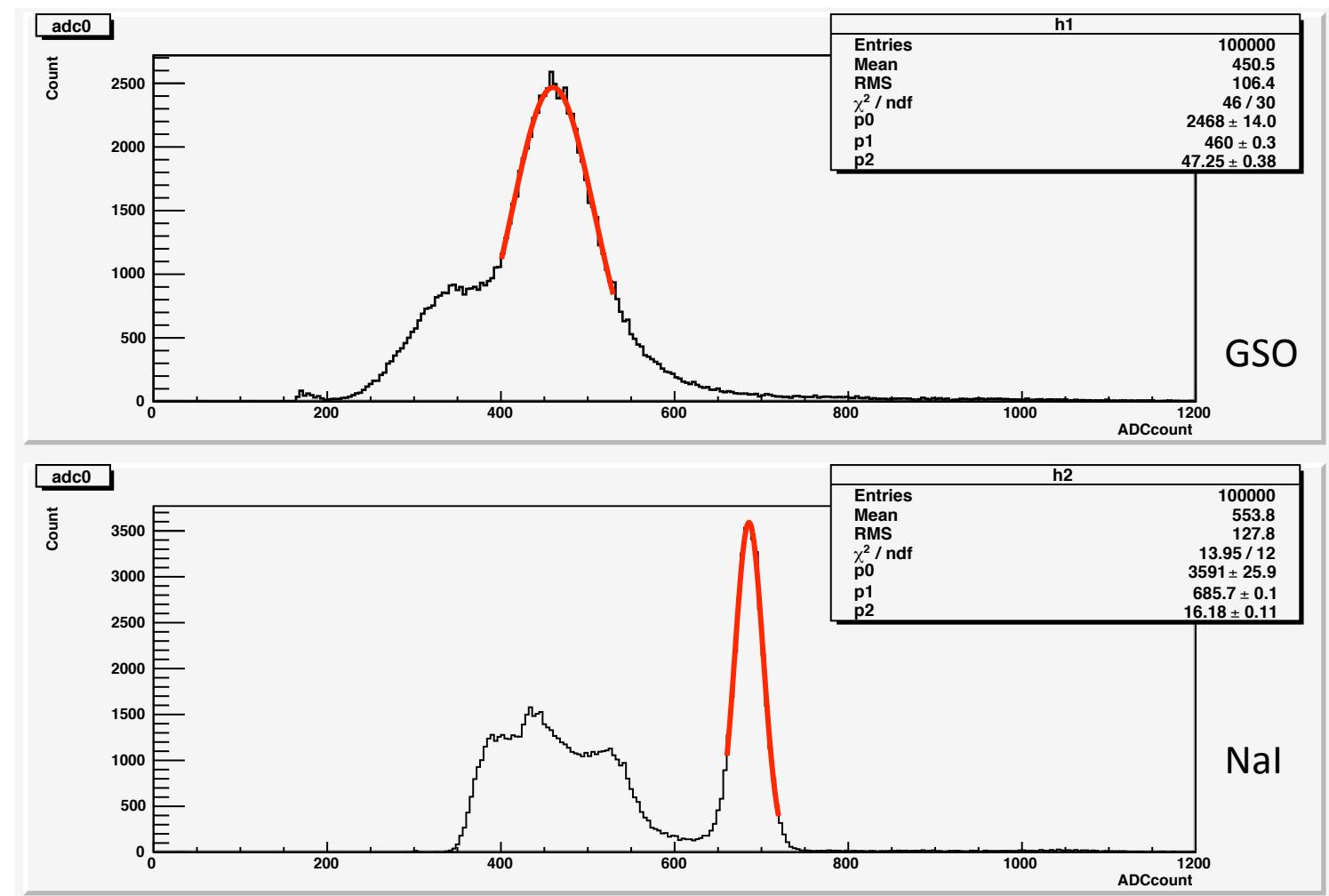
set source



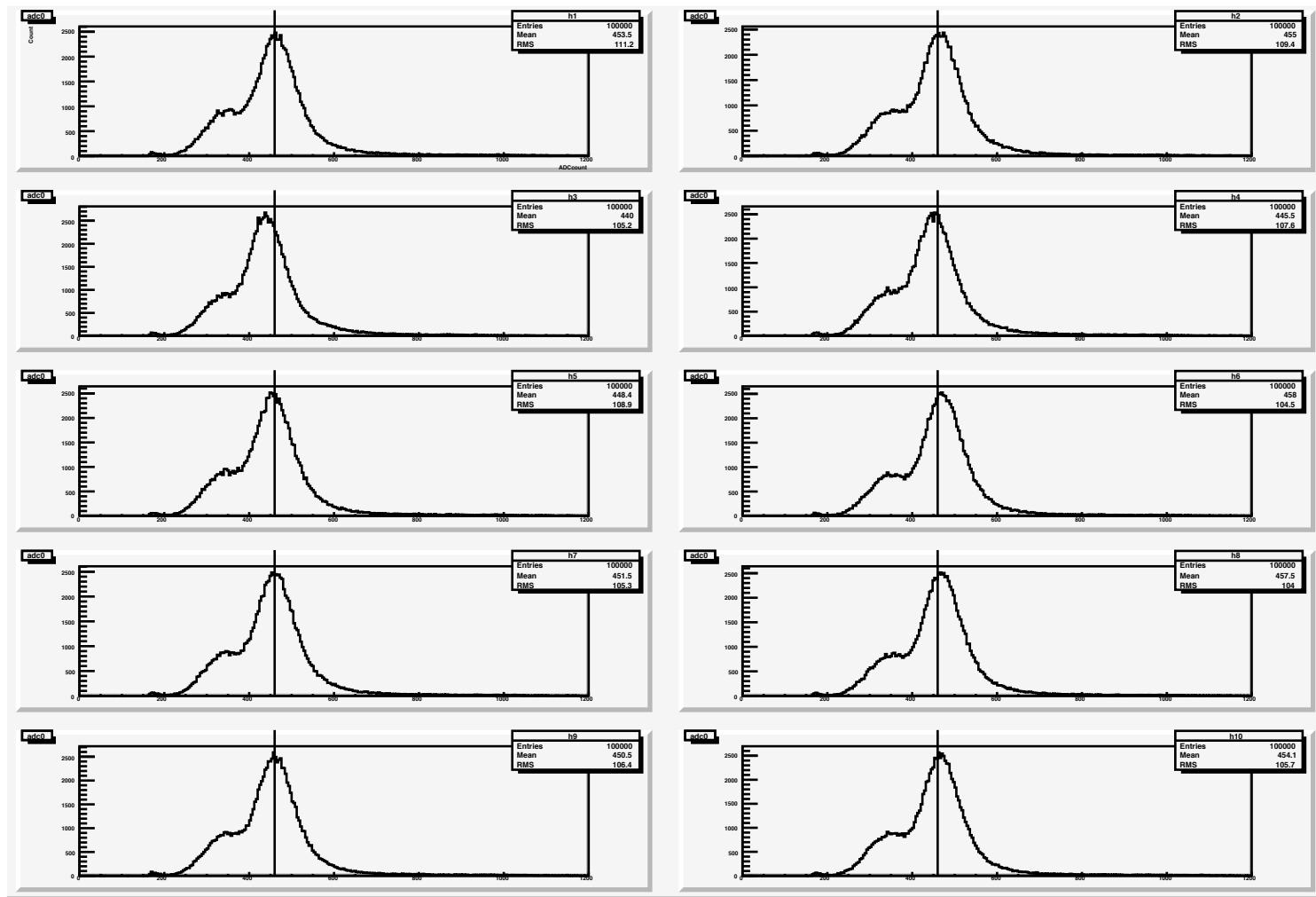
measure coincidence

Compare peak position of **coincidence**, and calculate reproducibility.

▪ Result



graph1 reproducibility GSO-NaI GSO(2) 4th



graph2 reproducibility GSO(1)-NaI

(Vertical lines are the average for peak position)

All of these spectrum are GSO's

GSO1	
count	ADC0
1	463.0
2	465.7
3	440.5
4	451.0
5	455.6
6	471.6
7	460.5
8	468.7
9	460.0
10	466.0
ave	460.3

GSO2	
count	ADC0
1	458.8
2	462.9
3	431.0
4	446.9
5	453.2
6	457.4
7	456.0
8	456.0
9	452.4
10	455.1
ave	453.0

peak position and average(GSO1 , GSO2 , unit : ch)

	GSO1	GSO2
pedestal(ch)	146.0	146.0
average(ch)	460.3	452.9
energy calibration(keV/ch)	1.63	1.68
σ (ch)	8.8	8.3
σ (keV)	14.25	13.88

I got reproducibility **2.8%** for 511 keV.

In following experiment, I will discuss with premise that reproducibility is **2.8%**.

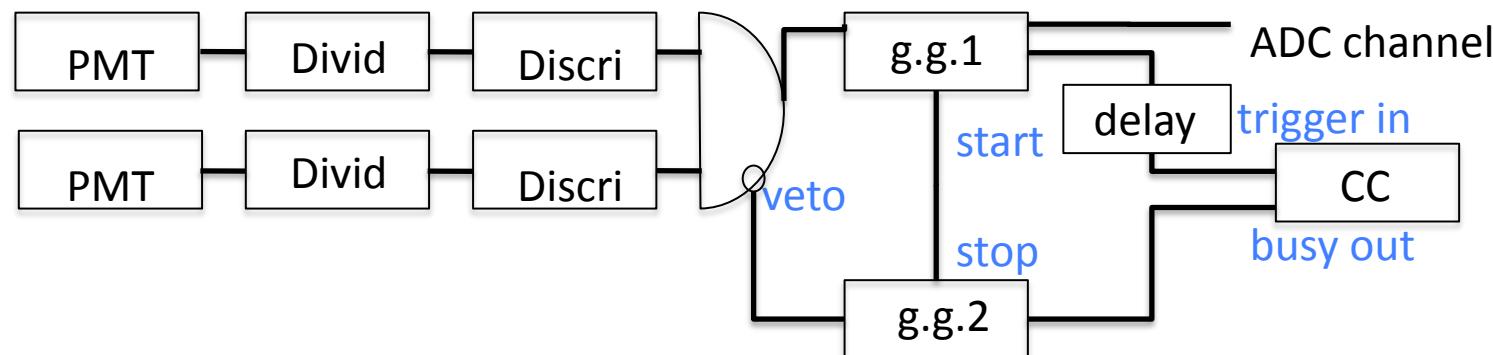
• experiment2:

Measuring light intensity (without polishing)

- Measure **light intensity of GSO without polishing**.
- Compare light intensity of GSO without polishing with that of GSO after it and with wrapping by peak position.
- Distinguish between peak of 511keV and that of Compton effect for easy to fit.
- Measure **6 times** about each crystal and raise accuracy to 1% level.

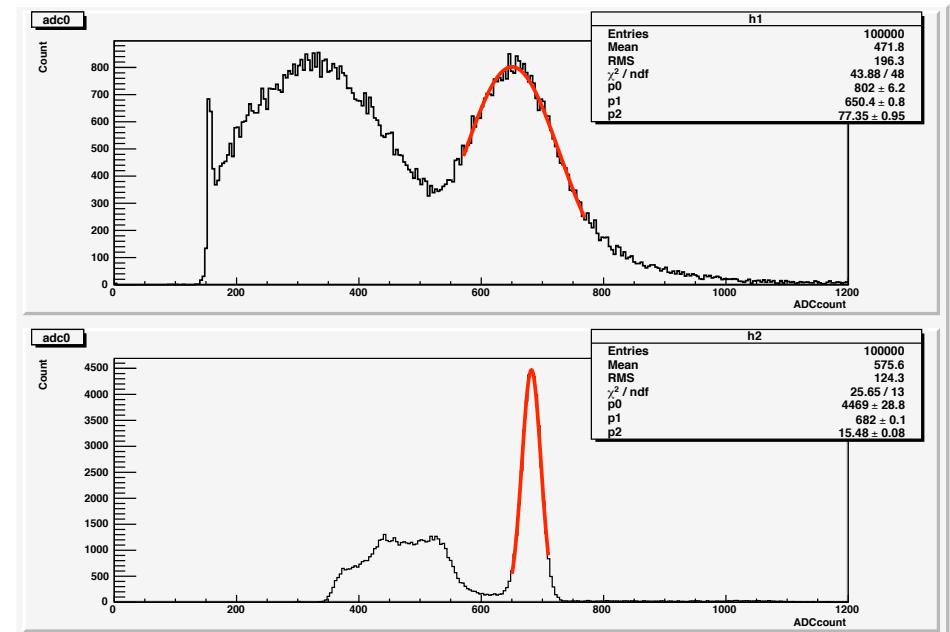
Values of threshold and applied voltage are following table.

	GSO	NaI
applied voltage(V)	1800	1370
threshold(mV)	-67.6	-150

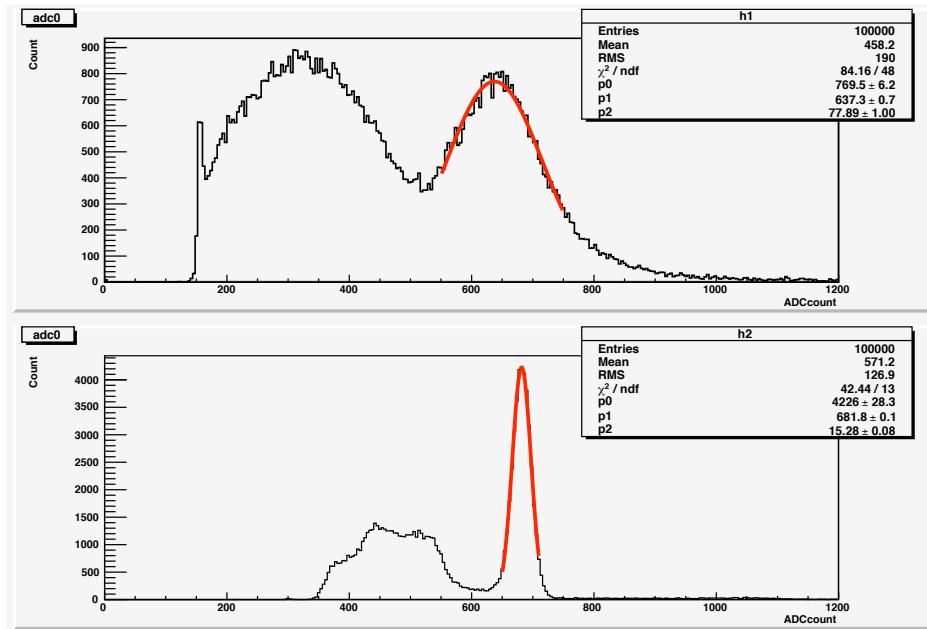


▪ Result
spectrum and fitting about GSO1

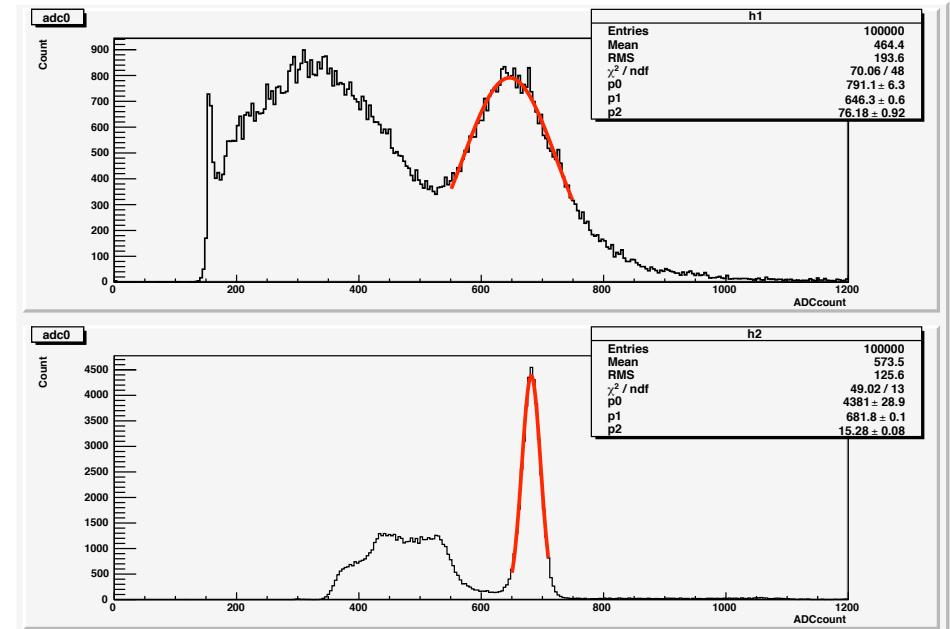
upside:GSO
downside:Nal



graph3 GSO1 1st



graph4 GSO1 2nd



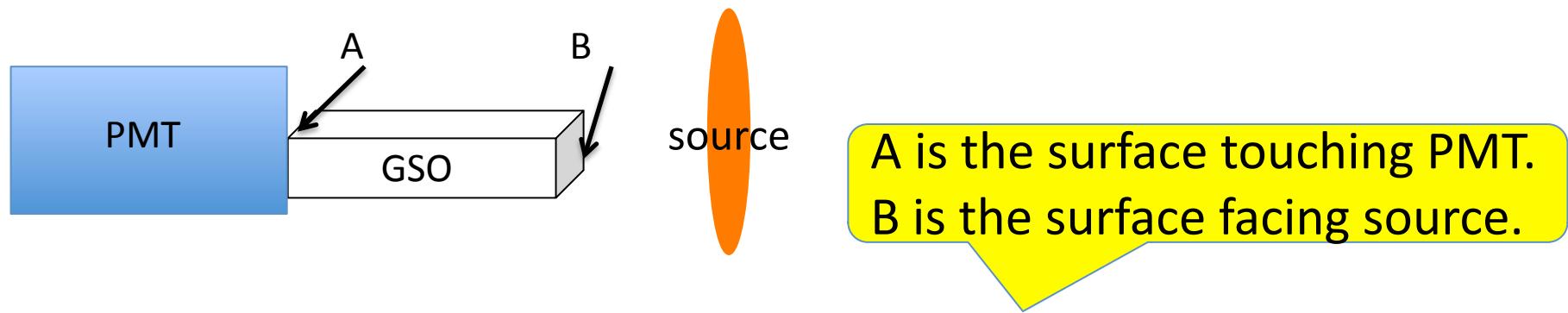
graph5 GSO1 3rd

	gso1	gso2	gso3	gso4	gso5	gso6	gso7
1	649.2	634.5	701.0	710.8	736.9	709.0	627.5
2	637.3	637.9	700.4	688.6	723.3	703.8	629.0
3	646.3	637.0	697.1	697.1	728.3	698.5	621.3
4	647.6	645.7	697.7	695.0	723.2	705.7	622.4
5	648.7	637.4	692.1	698.0	731.7	700.9	615.1
6	653.0	633.0	684.0	694.9	731.8	695.6	623.0
ave	647.0	637.6	695.4	697.4	729.2	702.3	623.1

table : peak position and average (no polished)
 (vertical range: time , horizontal range ; crystal name , unit : ch)

Compare this data with data of GSO after polishing and with wrapping

- Measuring light intensity without polishing has finished. Then I sent crystals to HITACHI at 5th Dec
- The way of polishing is following table.



	side	A	B
GSO1	×	×	×
GSO2	O	×	×
GSO3	O	O	×
GSO4	O	O	O
GSO5	×	×	O
GSO6	×	O	O
GSO7	x(GSO7 is spare)		

table : the way of polishing(O...mirror surface x...no polish)¹⁴

schedule

2011/10 • experiment of **reproducibility**

2011/11,12 • improve setup, analyze peaks

• measure light intensity **without polishing**

commission HITACHI to polish GSO



simulating by Geant4 ← **NOW**

2012/1 • crystals will return

{ measure light intensity **after polishing**
 { measure light intensity **with wrapping**