2022/11/4

INTT EFFICIENCY CALCULATION

NWU Yumika Namimoto

INTT Efficiency

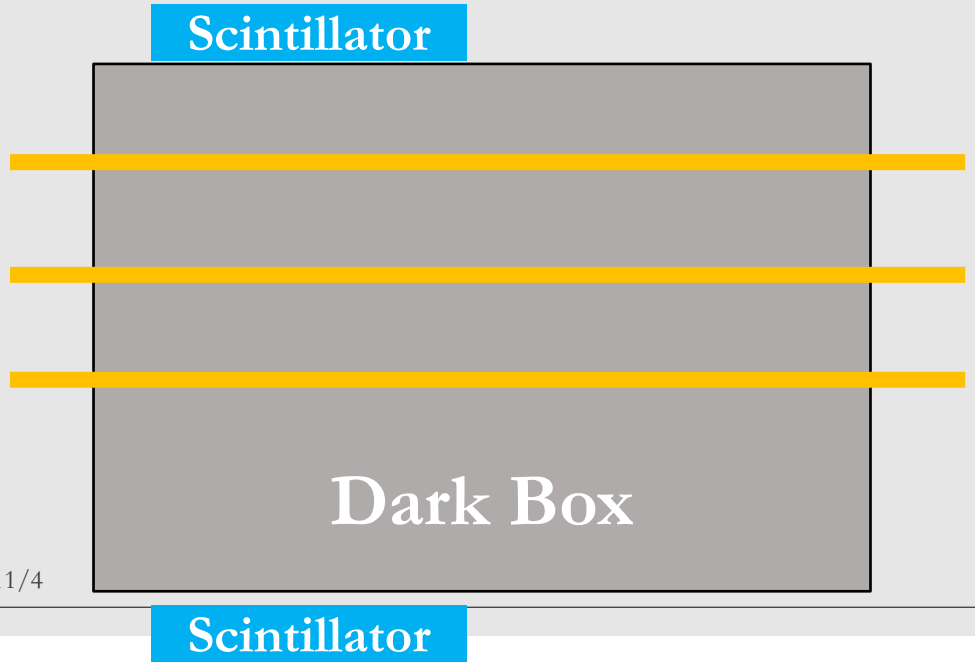
- Last December, INTT JP team did beam test at Tohoku univ. in Japan.
- We got 99% detection efficiency, but we couldn't confirm that effects of BCO on efficiency.

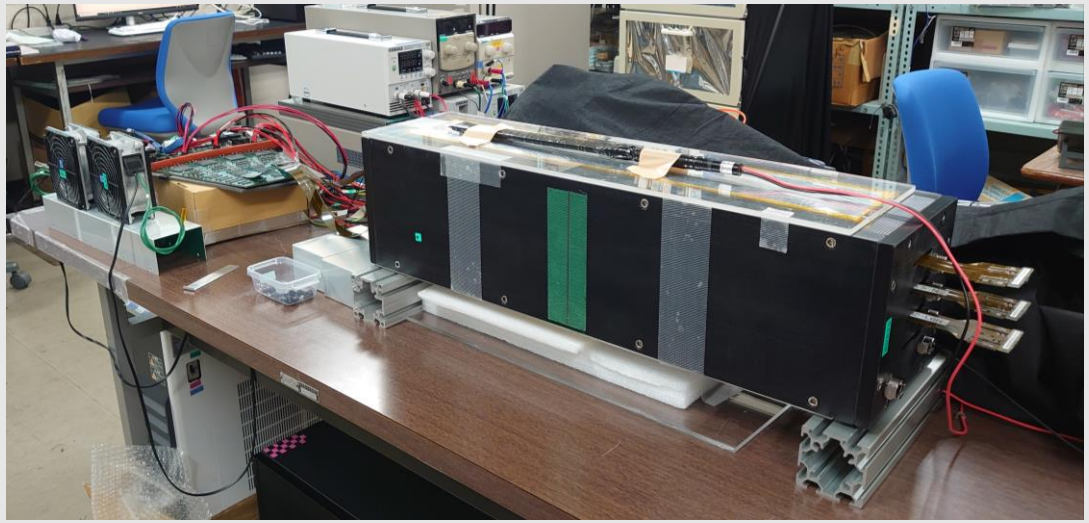
- Therefore we should do cosmic measurements to confirm BCO effects.

- Now I calculate the efficiencies by some cutting conditions to confirm the efficiency calculated by the beam test, and in preparation to confirm BCO effects.

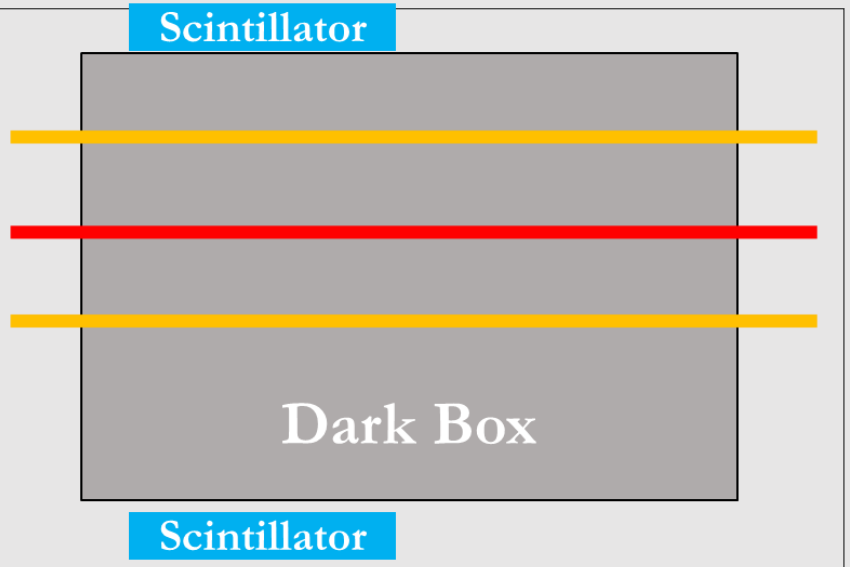
Setup in NWU

- We use 3 ladders for cosmic measurements. (Upper: Taiwan ladder, middle: PPB2-L5, lower: PPB2-L6)
  - Setup is same as beam test.
- Trigger: 2 scintillators





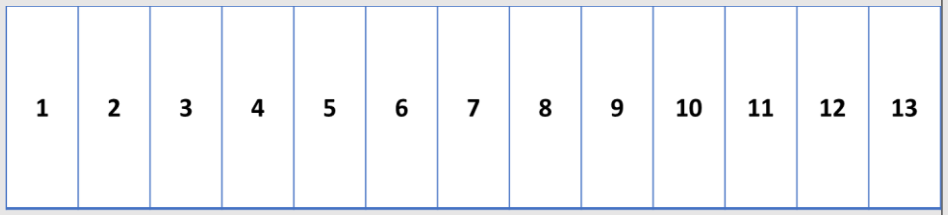
Definition of efficiency



- I calculate only **middle ladder** efficiency now.

- :Definition:
- Upper and lower ladders have **only 1** cluster at same chip.

(Note: I divide a half ladder into 13 chips.)



- If middle ladder detects some clusters, it define "**detected**".
- If middle ladder **does not** detect cluster, it define "**undetected**".

Efficiency: chip limits

1, No limits(Upper and lower ladders have **1** cluster at **same chip** and Middle ladder has some clusters in **anywhere**)

$$\text{Efficiency} = \frac{5944}{5973} = 99.51\%$$

2, All ladders have cluster(s) at same chip

$$\text{Efficiency} = \frac{5864}{5973} = 98.18\%$$

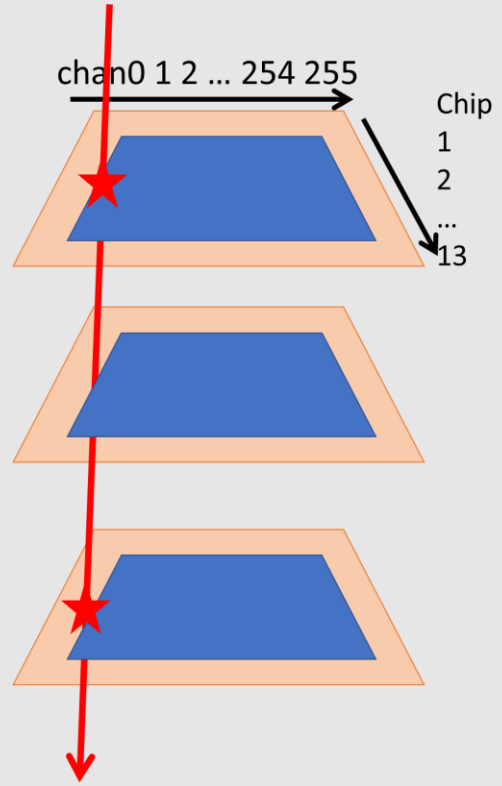
3, Authorize $|(\text{Upper and lower ladder chip}) - (\text{Middle ladder chip})| \leq 1$

$$\text{Efficiency} = \frac{5934}{5944} = 99.81\%$$

Efficiency: channel limit

- If cosmic rays go through outside channels(ex: channel 0, 255) it's difficult to detect.
- Therefore we should cut off outside channels signals.

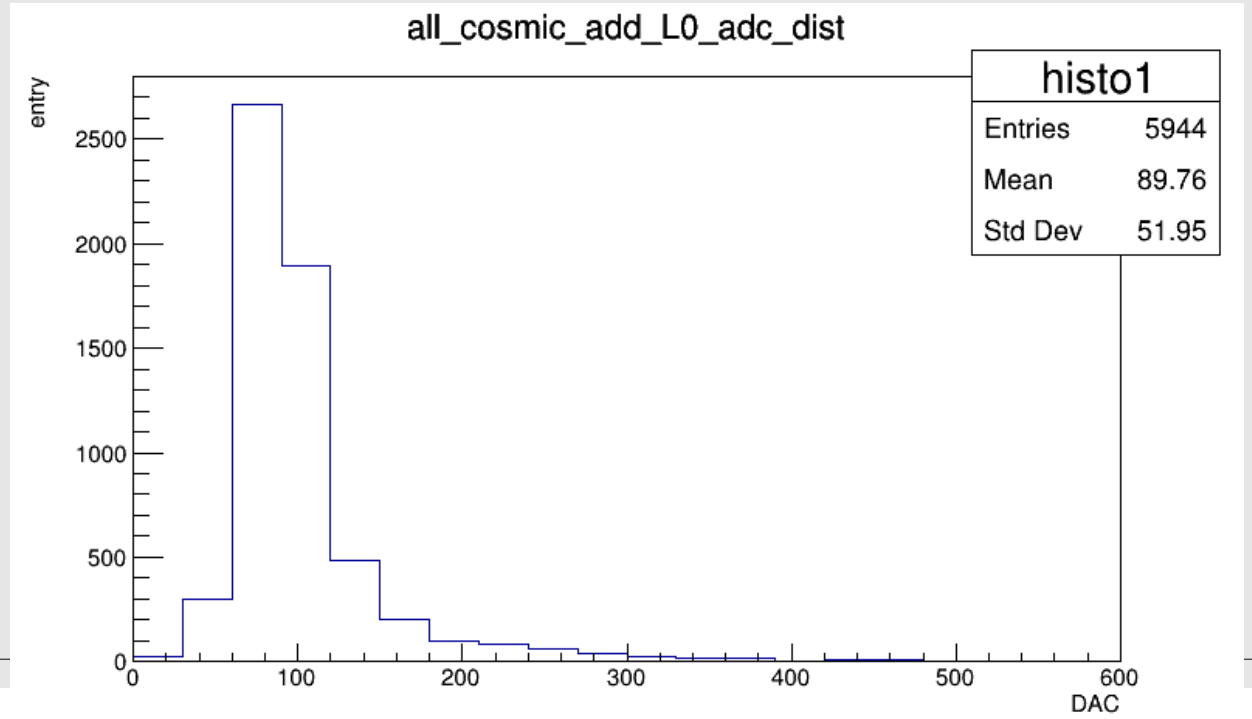
- If we ignore chan 0-10 and 245 – 255,
- $\frac{5670}{5685} = 99.74\%$



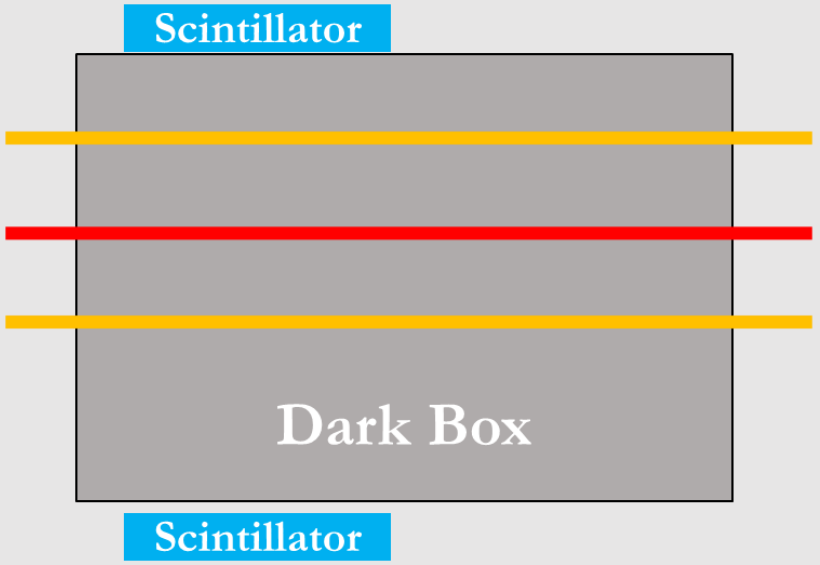
Efficiency: ADC limit

- DAC setting is below.
- ADC histogram shows over 210 because clustering has been done.
- MIP peak is in ADC 60-120.

DAC 0	15
DAC 1	30
DAC 2	60
DAC 3	90
DAC 4	120
DAC 5	150
DAC 6	180
DAC 7	210



Effiency: ADC limit



1, ADC value in upper and lower ladder clusters are limited over 60.

$$\frac{5410}{5429} = 99.65\%$$

2, ADC value in middle ladder clusters are limited over 60.

$$\frac{5610}{5639} = 99.49\%$$

3, ADC value in all ladders clusters are limited over 60

$$\frac{5130}{5159} = 99.44\%$$

Summary

- I try to calculate efficiencies in some cutting conditions.

To do next;

- Make new cutting condition by residual distribution.
- Combination some cutting conditions and calculate efficiencies.