Rough Explanation of Intensity Inversion near PMT

Undergraduate Intern
Byeongyoon Park

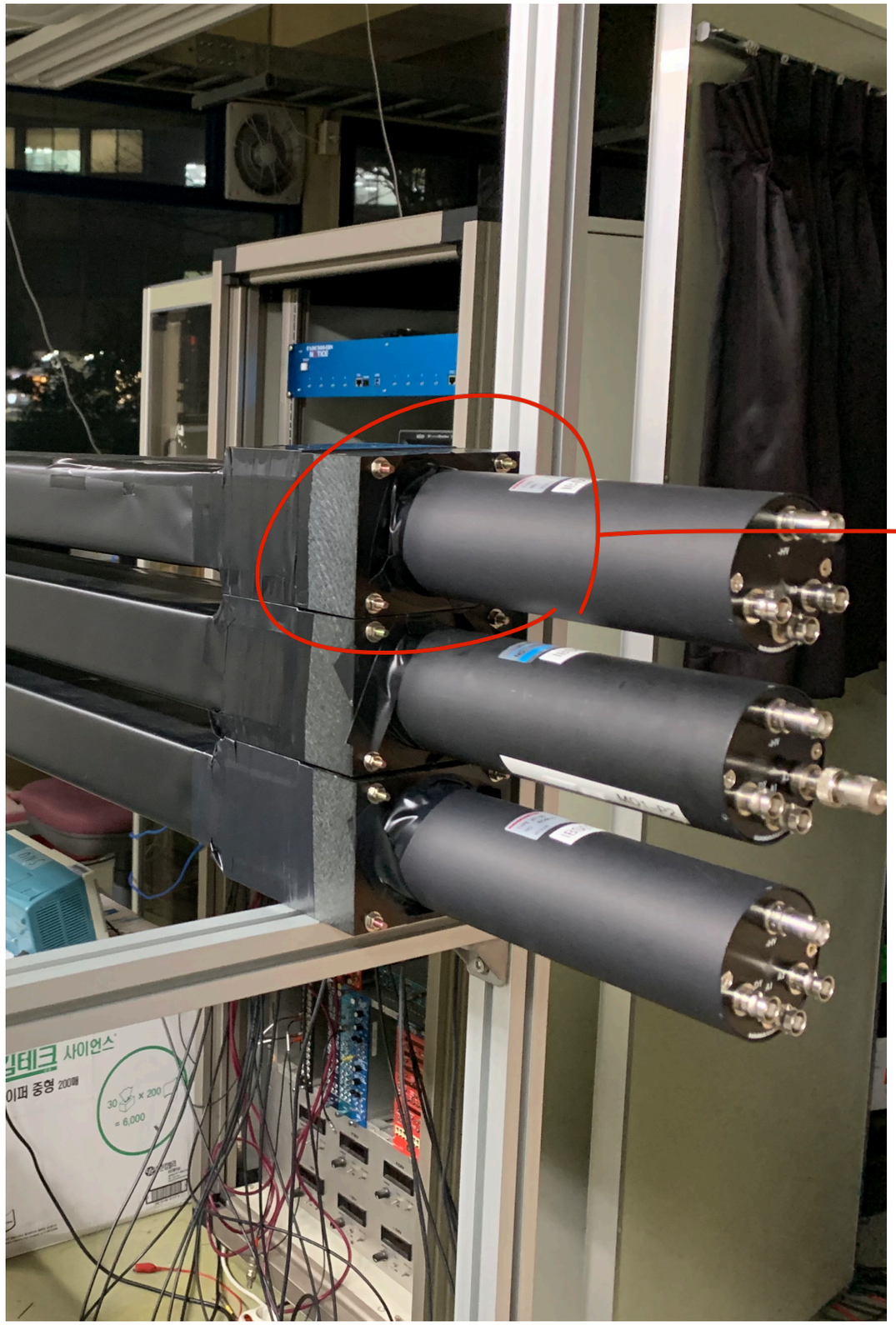
hist

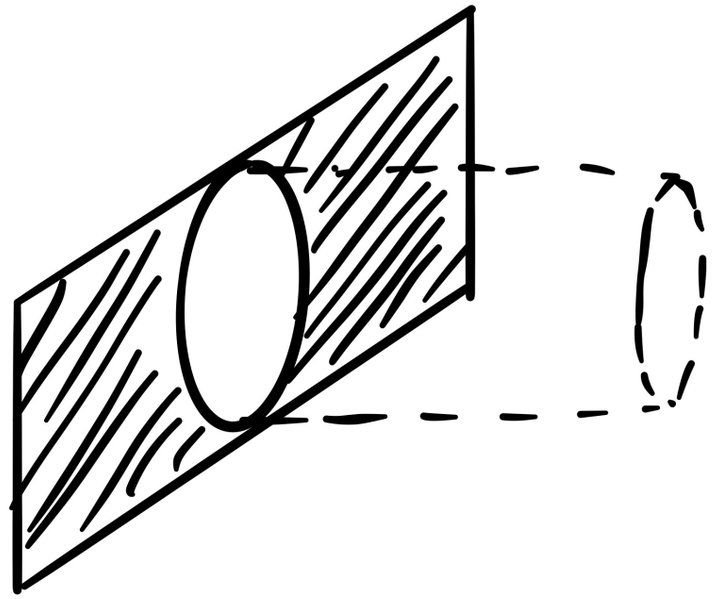
hist	
Entries	1067364
Mean x	−0.004363
Mean y	1.192
Std Dev x	0.4793
Std Dev y	0.7914

10
9
8
7
6
5
4
3
2
1
0

−0.8 −0.6 −0.4 −0.2 0 0.2 0.4 0.6 0.8

300
250
200
150
100
50
0





Rough Calculation

- Muon Intentisy

$$I(\theta) = I_0 \; cos^2\theta \; ^{1)} \; [m^{-2}s^{-1}str^{-1}]$$

(θ : zenith angle, I_0 : muon intensity at $\theta = 0$)

- Flux

$$F = \int_0^{\frac{\pi}{2}} I(\theta) \, | \, \hat{n} \, | \, d\Omega$$

1) S. Pethuraj et al., Measurement of Cosmic Muon angular distribution and vertical integrated flux by 2m X 2m RPC stack at IICHEP-Madurai

Rough Calculation

- Flux to horizontal plane

$$F_h = \frac{\pi}{2} I_0$$

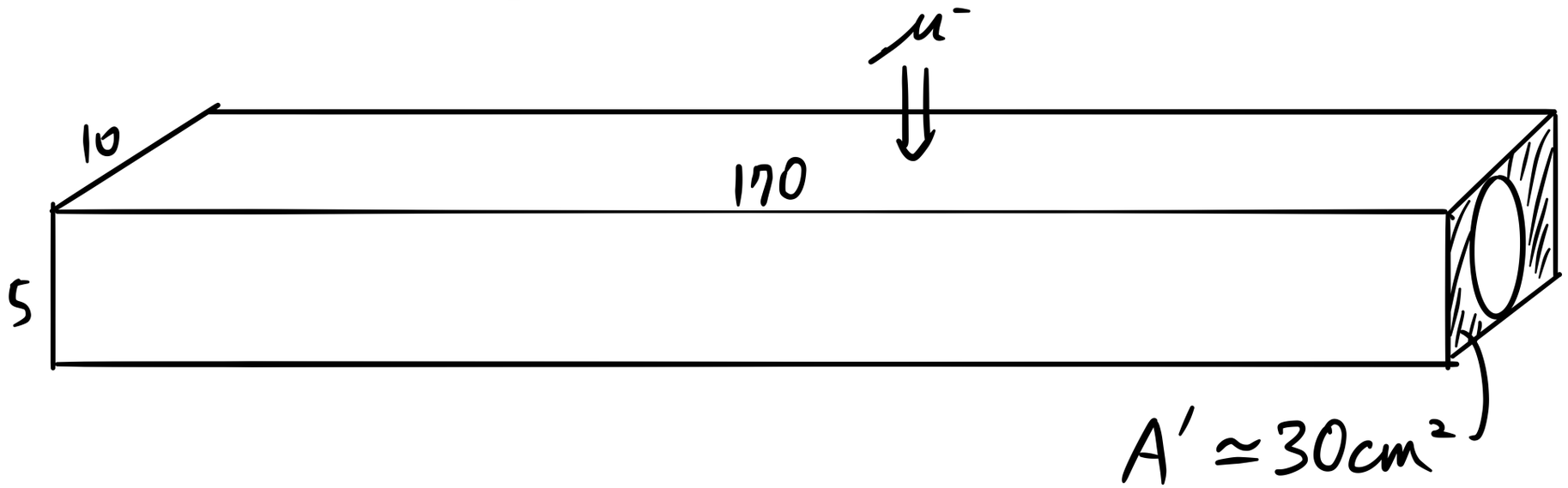
- Flux to vertical plane

$$F_v = \frac{\pi^2}{16} I_0$$

- Ratio : Independent to I_0

$$\frac{F_v}{F_h} = \frac{\pi}{8}$$

Rough Calculation

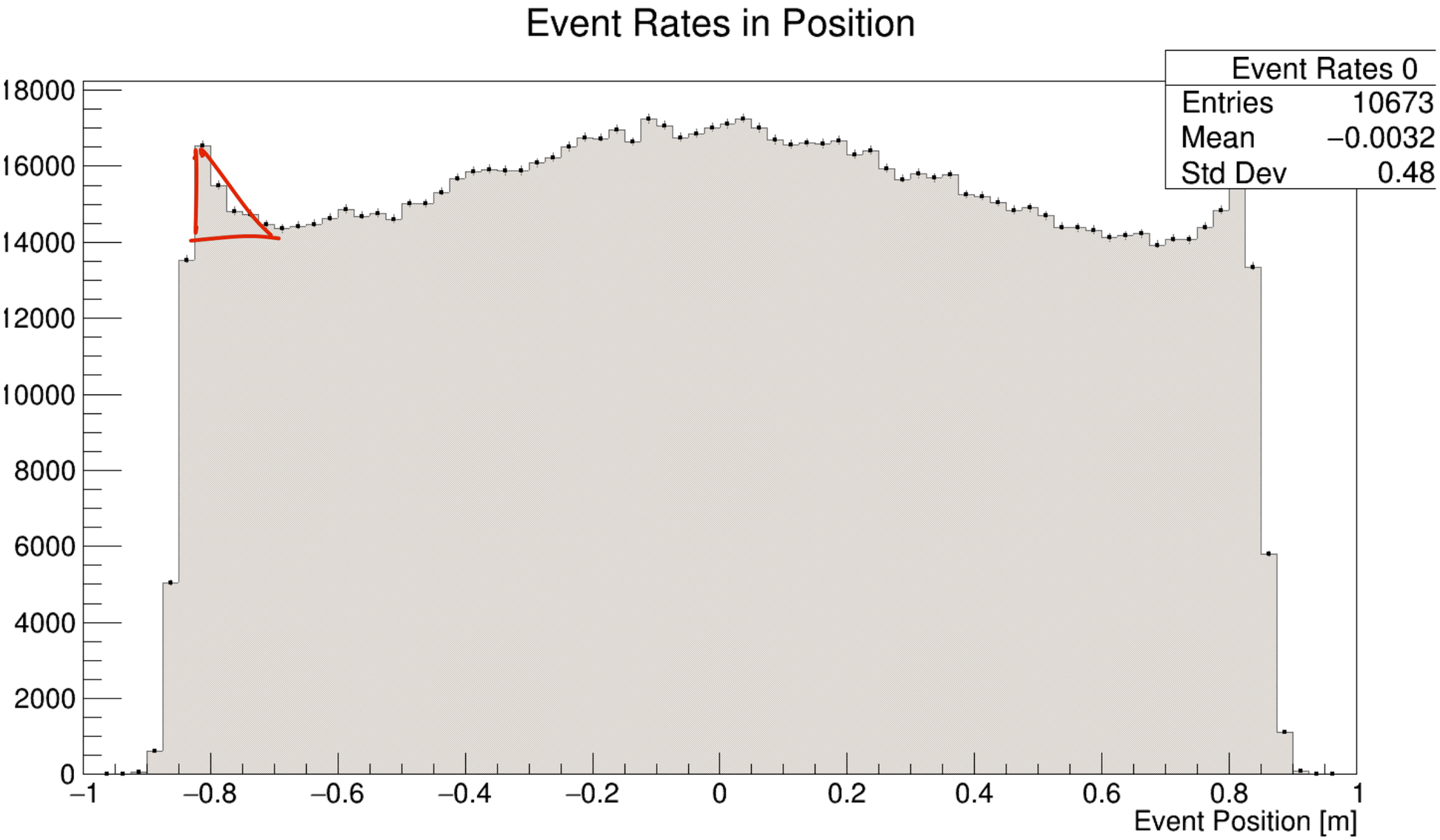


- Relative # of muons hit the scintillator

  - Total ≃ 2400

  - A` ≃ 12

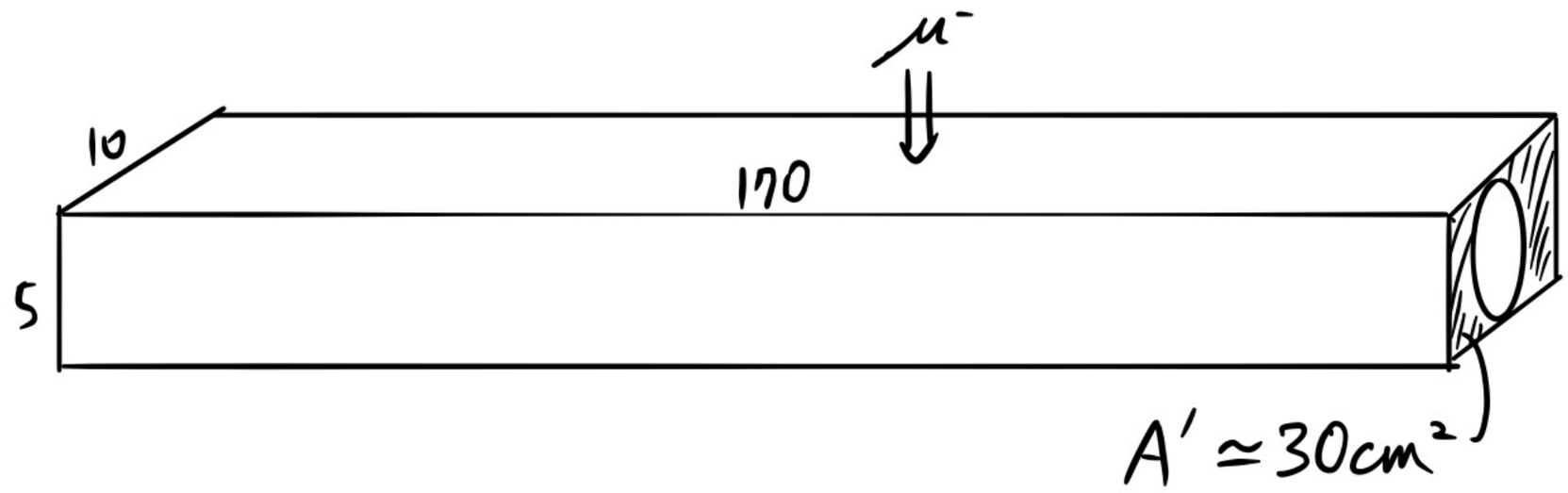
- Ratio of hits of muons on A` $\simeq \frac{1}{200} = 5 \times 10^{-3}$.



Roughly calculated # of muons $\simeq 3000 \times 4 \times 0.5 = 6{,}000$

Total # of muons $\simeq 100{,}000$

Ratio $\simeq 6 \times 10^{-3}$: similar to previous calculation!



$\Downarrow$ length $\times \sim \frac{1}{4}$