

Performance of film refreshing

Taku NAKAMURA

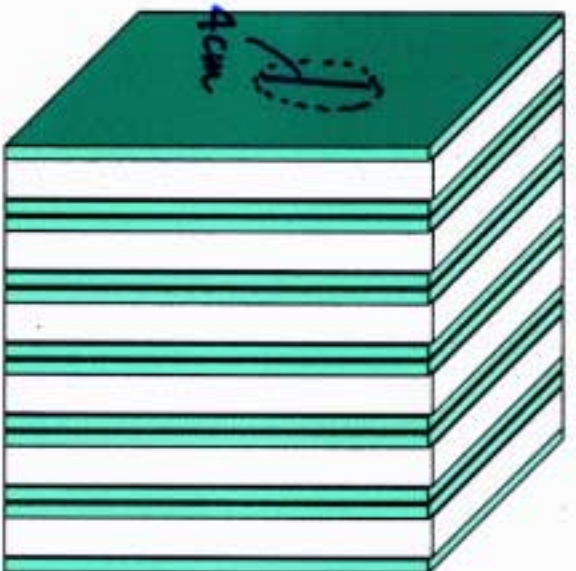
Nagoya University

1. Refreshing reproducibility for beam tracks
2. Refreshing for Cosmic Rays
3. Preliminary study for CS refreshing

Refresh Beam Test

CERN

10 GeV/c π^-
Beam

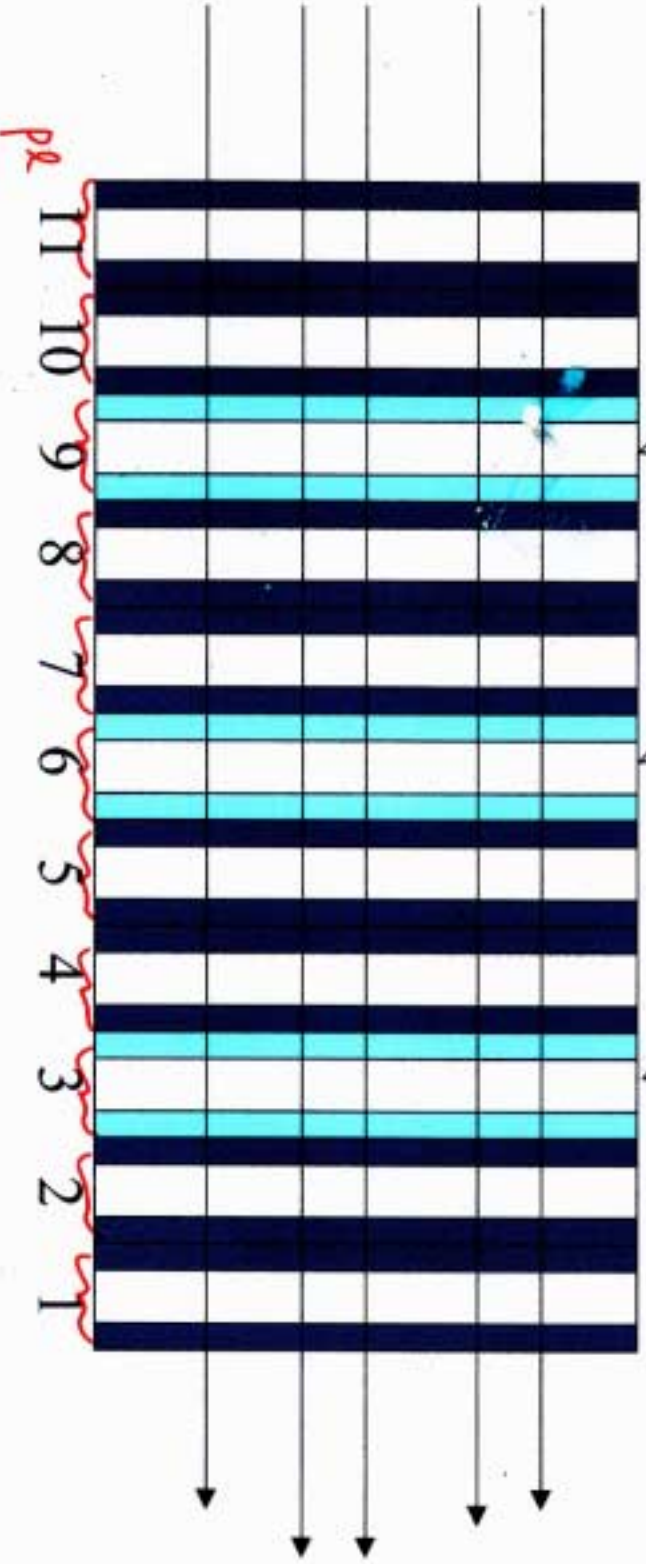


30°C RH98%

3 days

2 days

1 day



angle

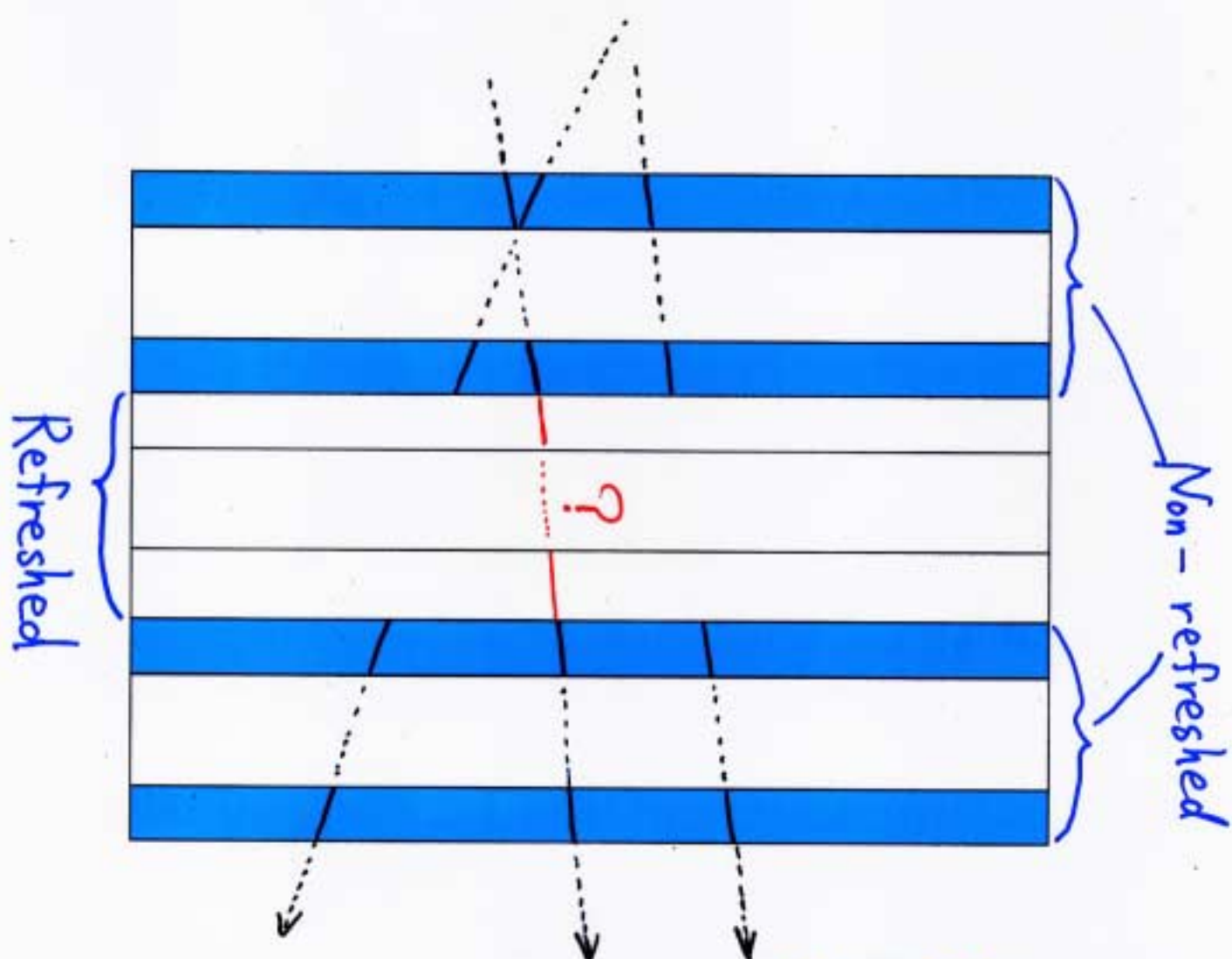
density

- 50 mrad $10^9/cm^2$
- 150 mrad $10^9/cm^2$
- 250 mrad $10^9/cm^2$
- 350 mrad $10^9/cm^2$

a taking

3 min

m

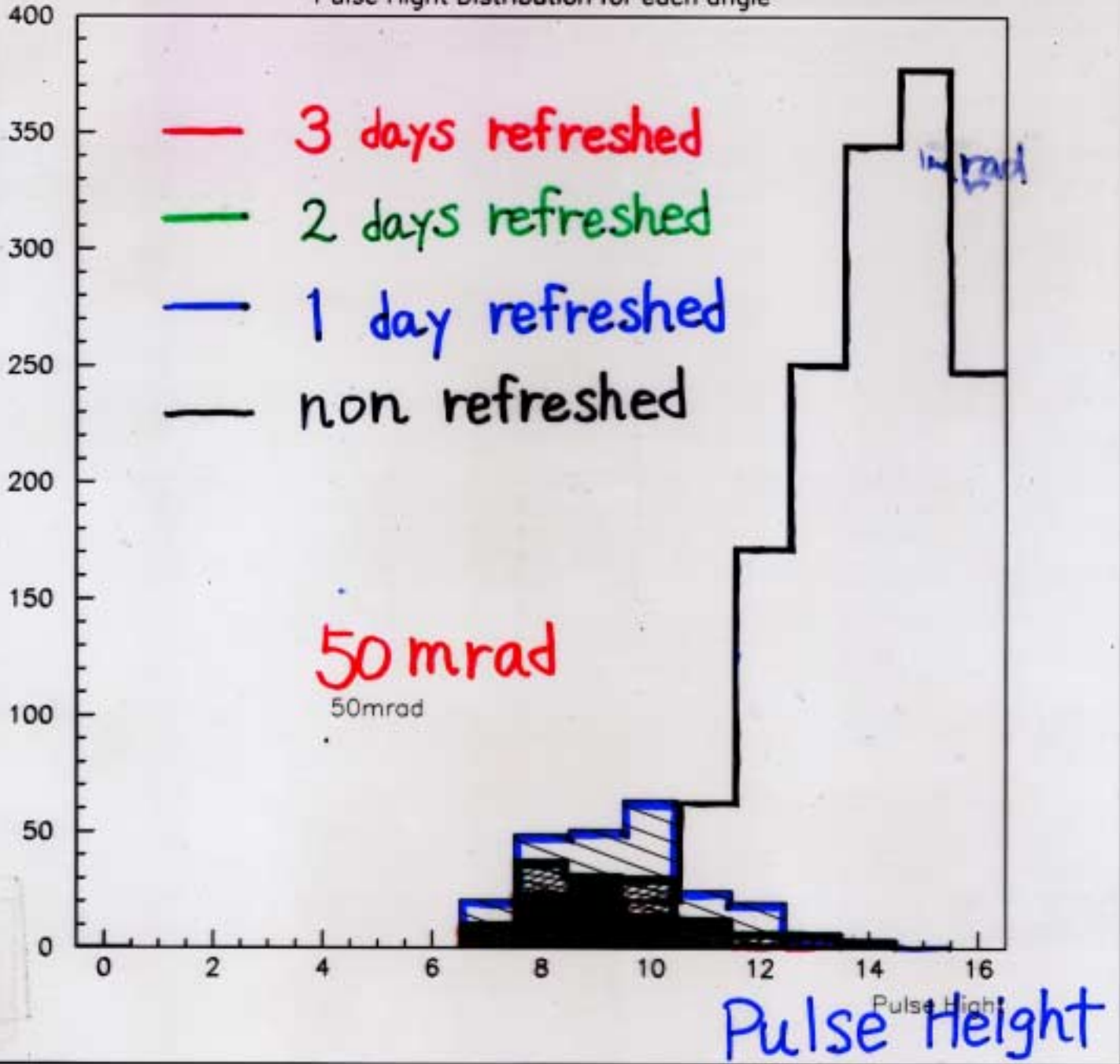


$$\text{Erasing rate} = \frac{\text{not detected in refreshed plate}}{\text{penetrate 3 plates}}$$

penetrated at least 2 films

Pulse Height Distribution

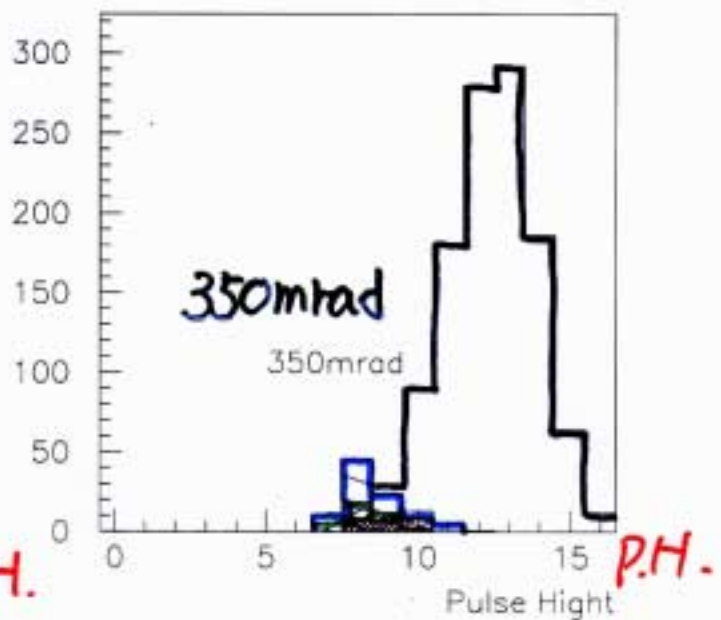
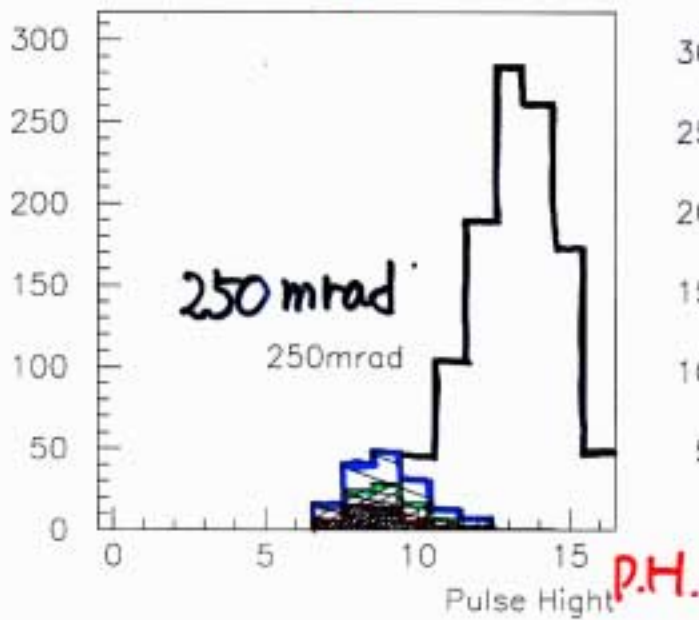
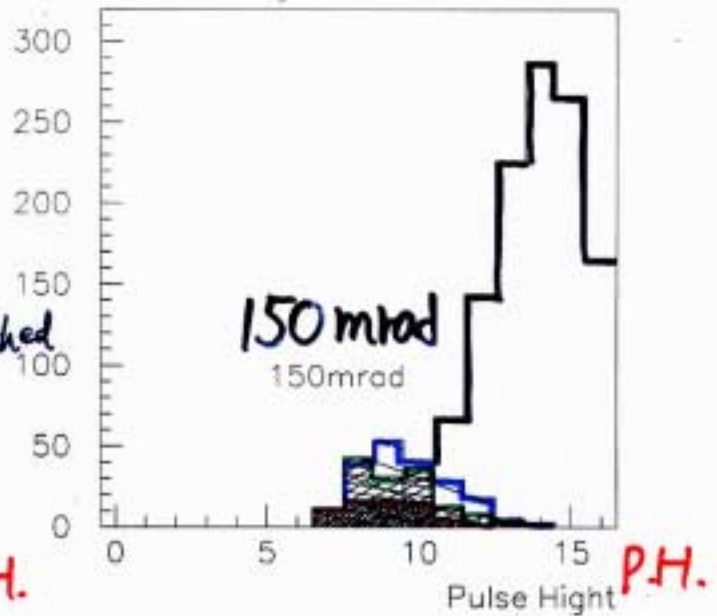
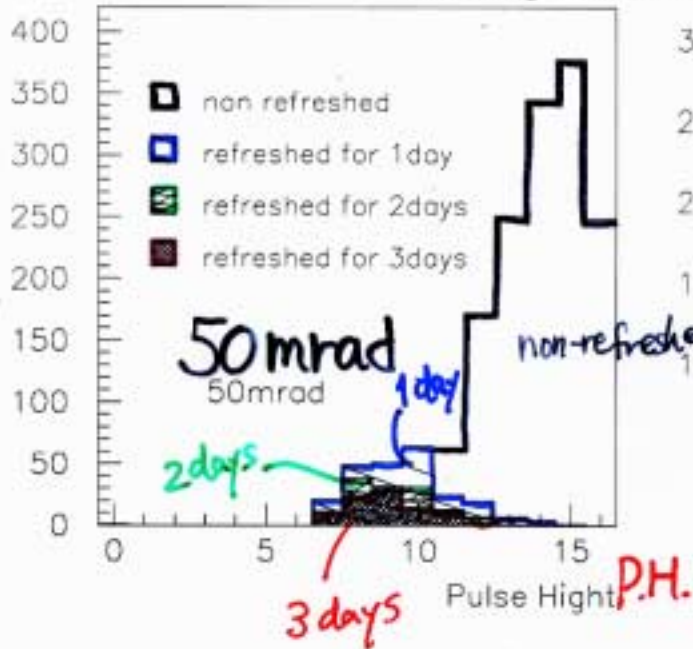
Pulse Hight Distribution for each angle



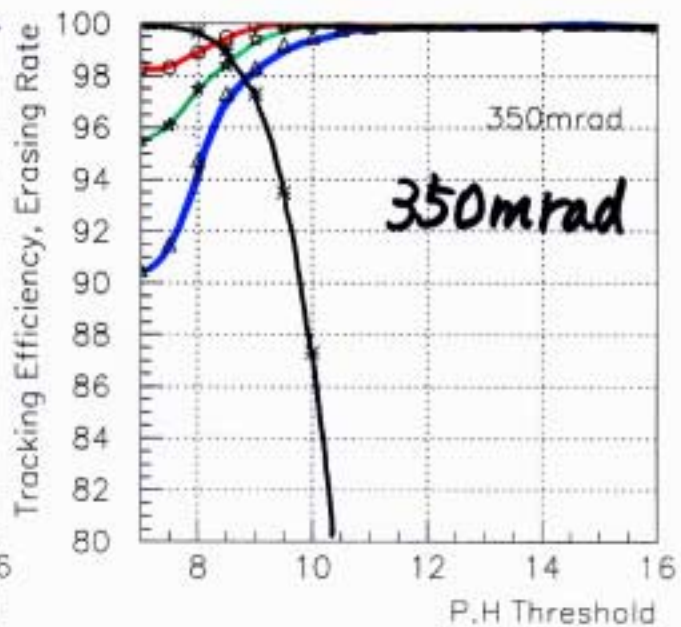
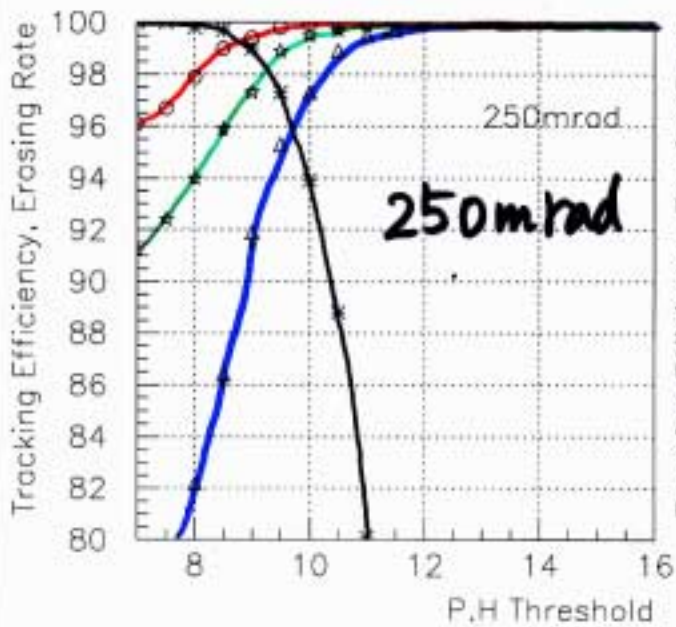
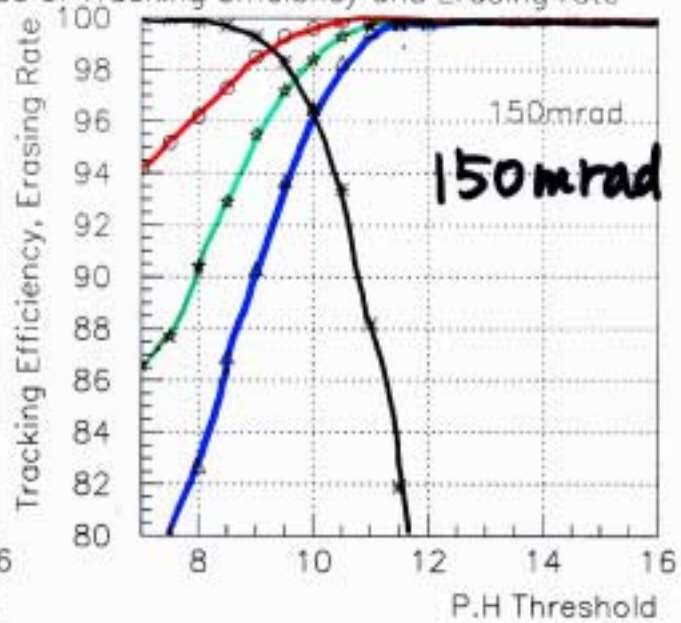
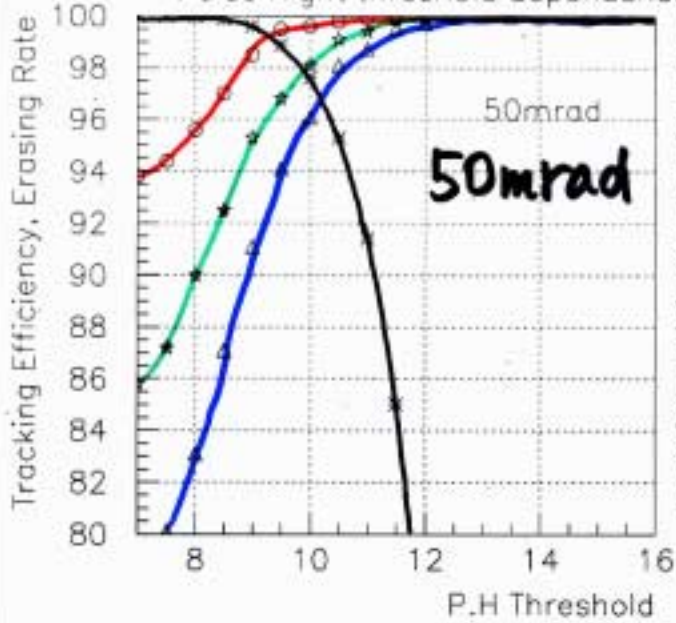
CERN

Pulse Height Distribution

Pulse Height Distribution for each angle



Pulse Height threshold dependence of Tracking efficiency and Erasing rate



Refresh Reproducibility Test

KEK

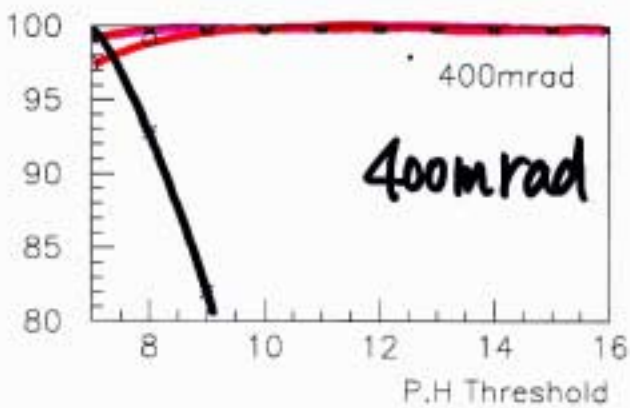
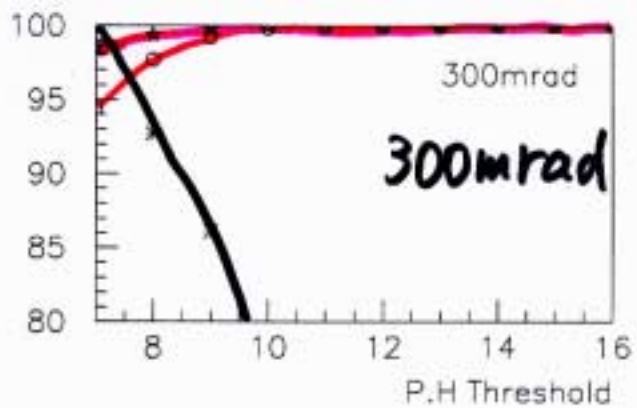
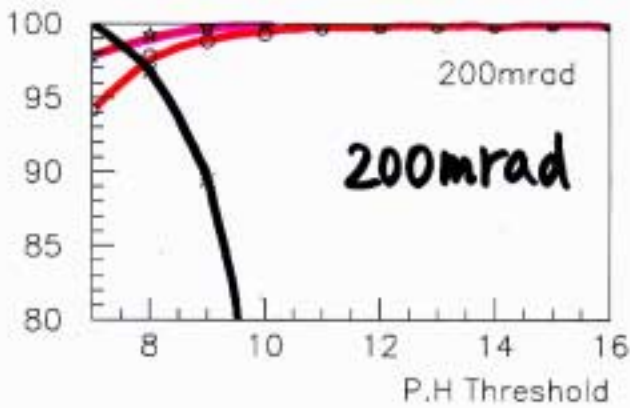
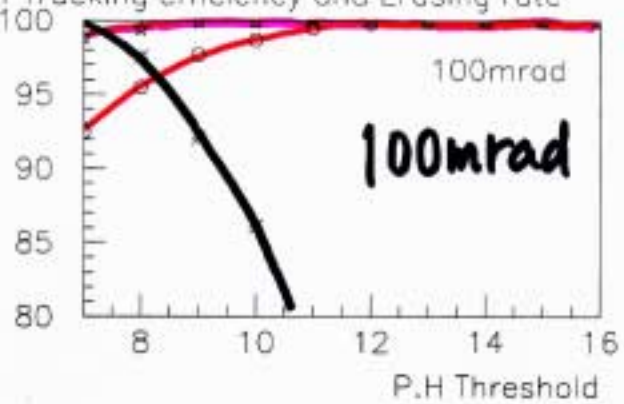
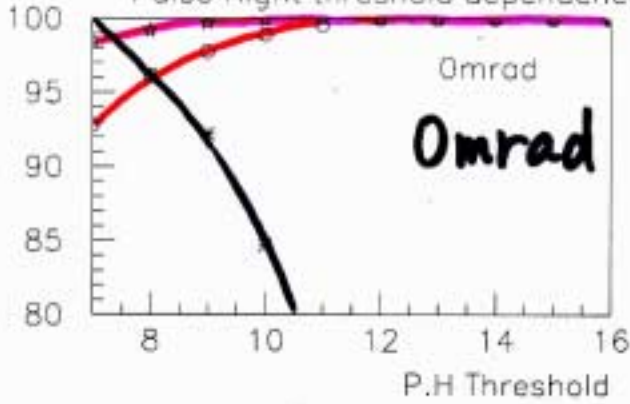
4 GeV/c π^+ beam

- 3 days refresh (reproducibility)
- 5 days refresh

angle

0	mrad	10^4 / cm^2
100	mrad	10^4
200	mrad	10^4
300	mrad	10^4
400	mrad	10^4

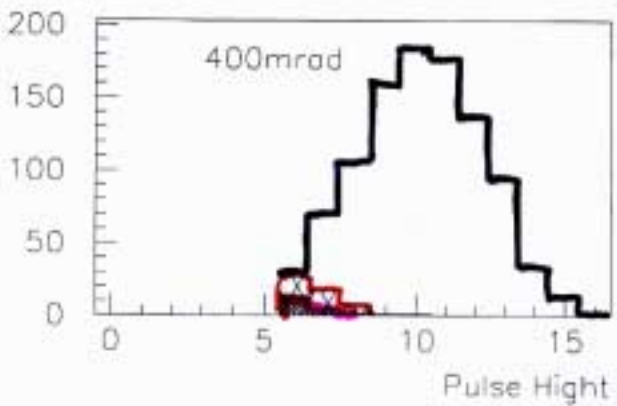
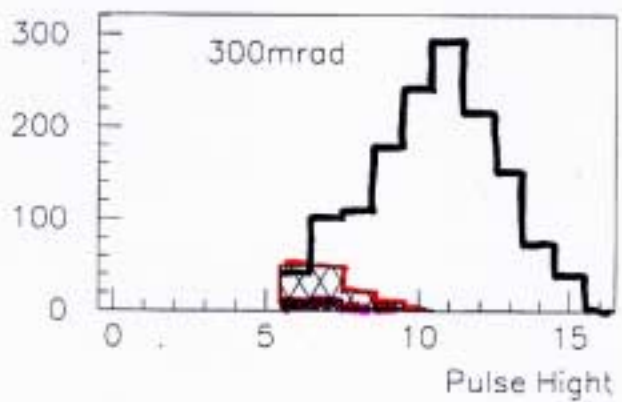
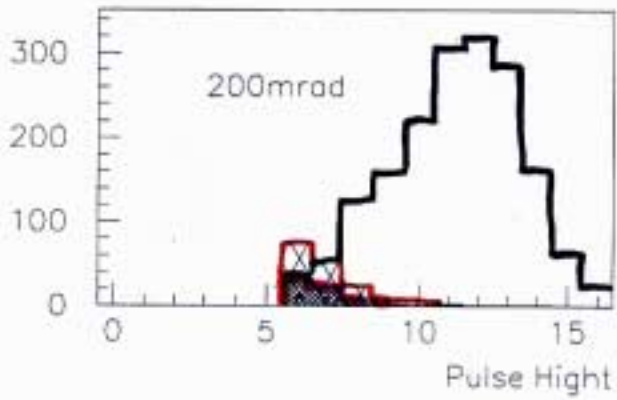
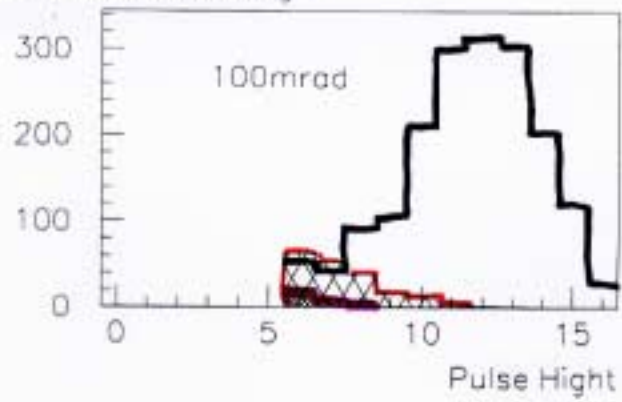
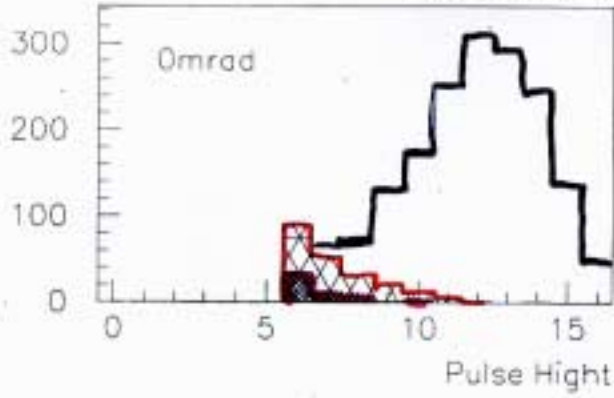
Pulse High threshold dependence of Tracking efficiency and Erasing rate



*: Tracking efficiency
⊖ : refreshed for 3 days
● : 5 days

- refreshed for 5 days (30°C, 98% R.H)
- ▣ refreshed for 3 days (30°C, 98% R.H)

Pulse Hight Distribution for each angle

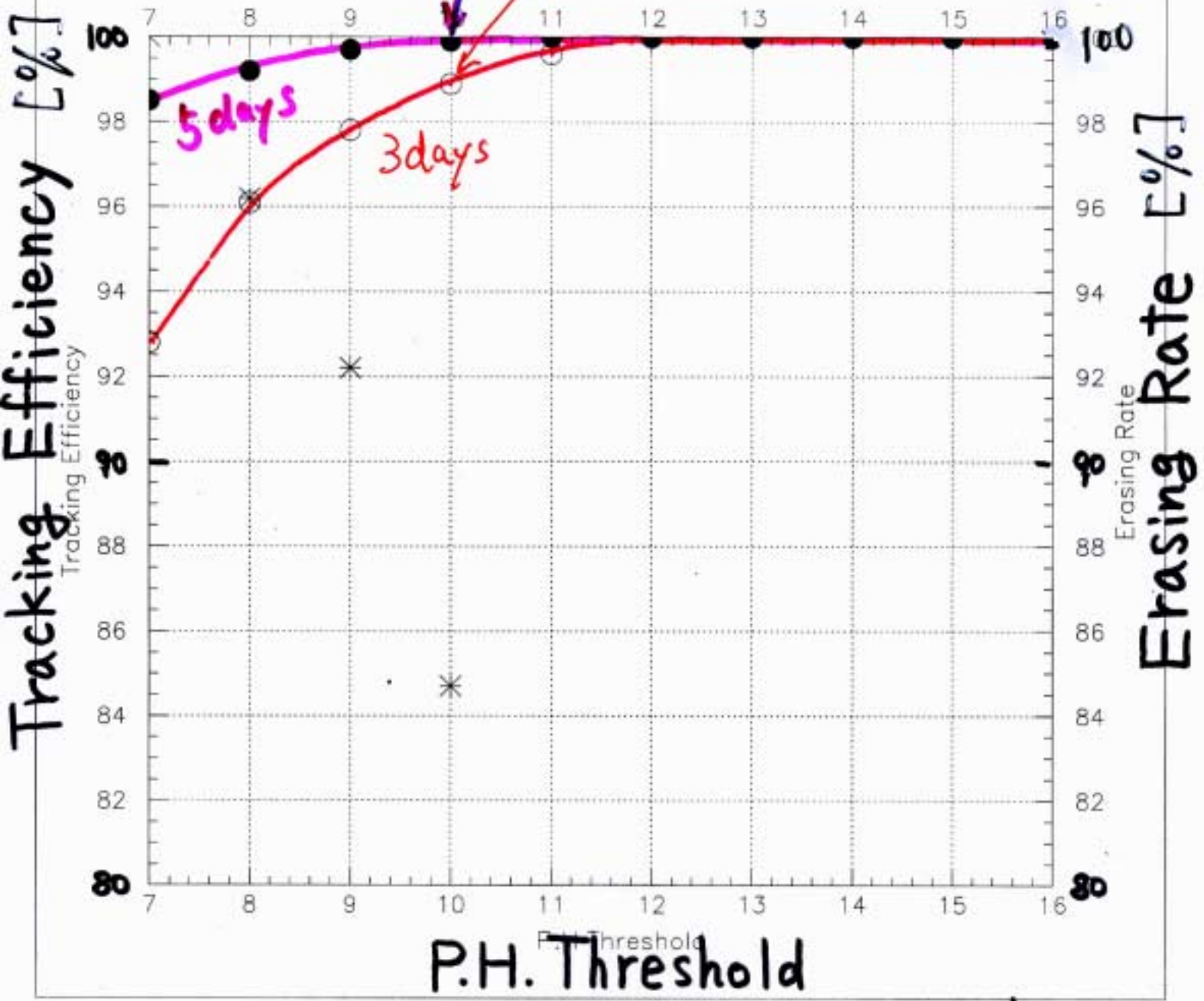


Omrad

~99.6%

~98.7%

Pulse Height threshold dependence of Tracking efficiency and Erasing rate

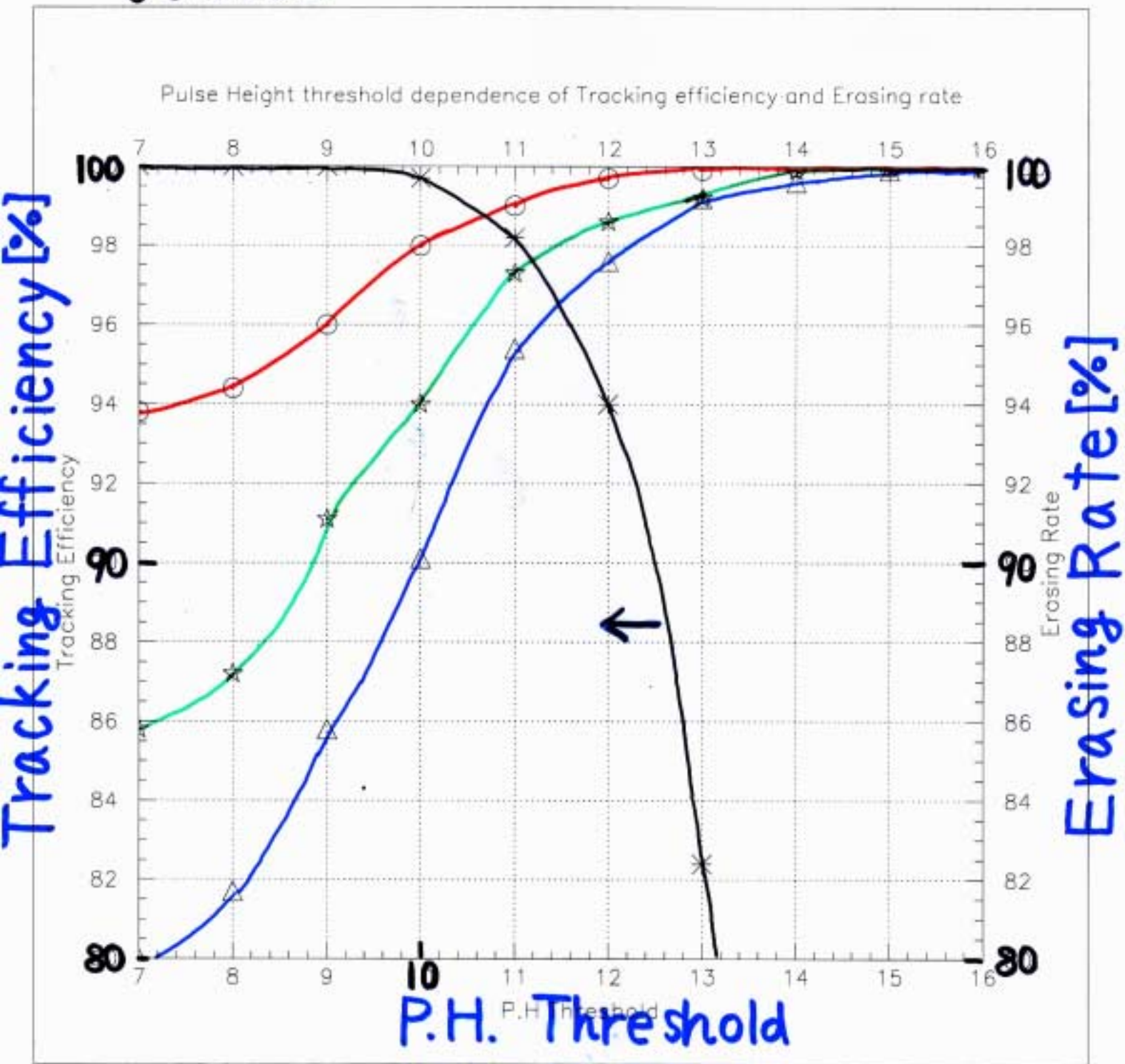


*: Tracking efficiency

Erasing rate
O: refreshed for 3 days
●: 5 days

CERN

50mrad

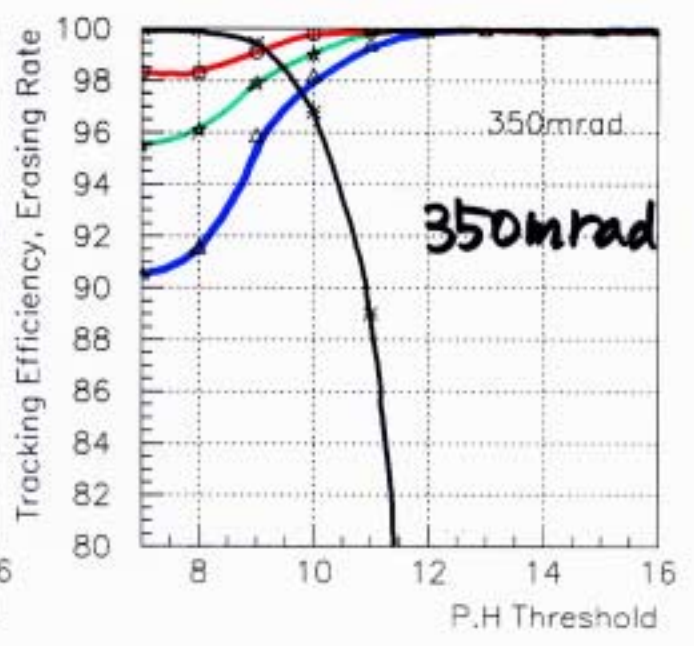
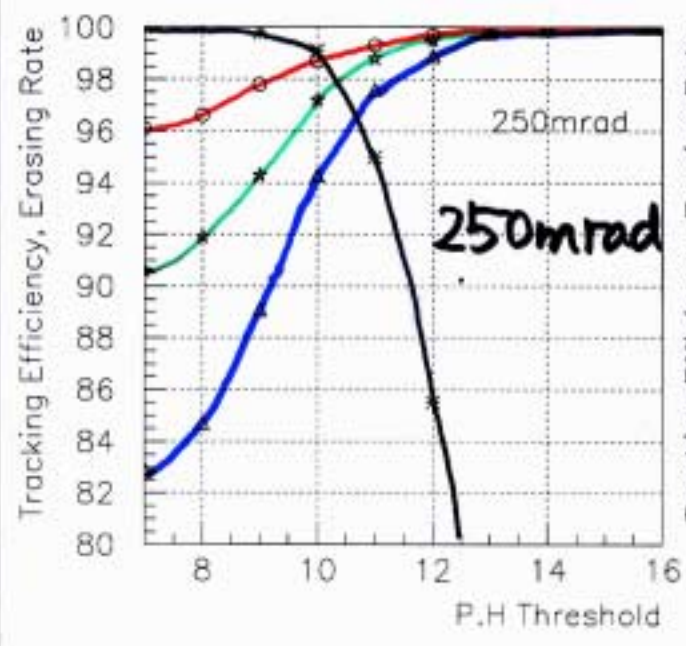
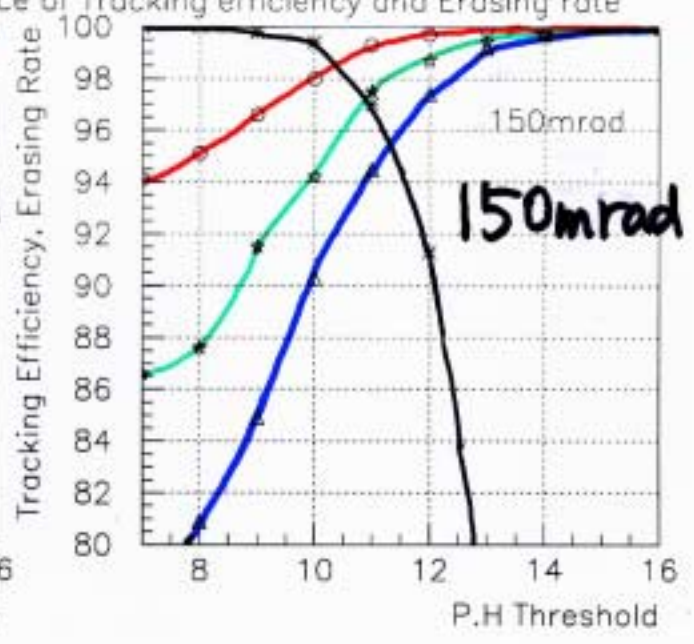
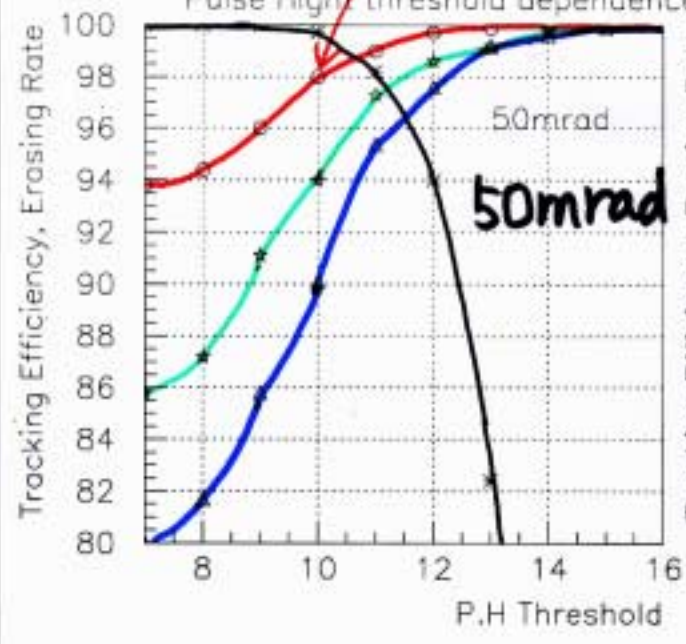


*: Tracking efficiency

Erasing rate
O: refreshed for 3 days
☆: 2 days
Δ: 1 day

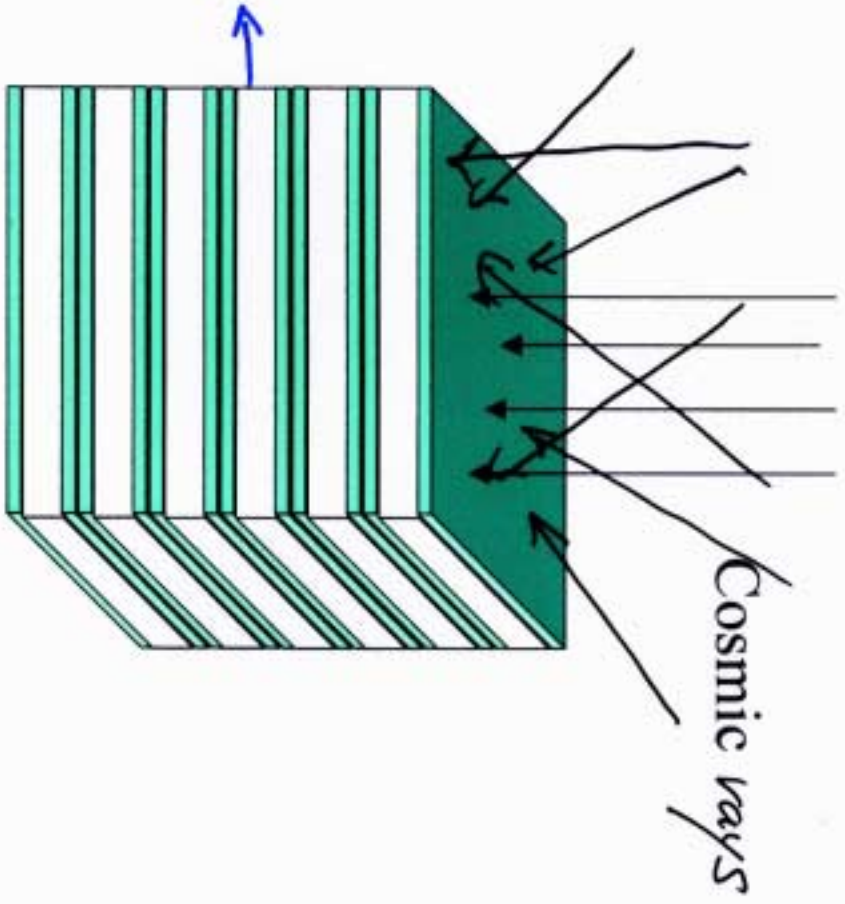
98% erased!

Pulse High threshold dependence of Tracking efficiency and Erasing rate



Expose @ Nagoya
30 days

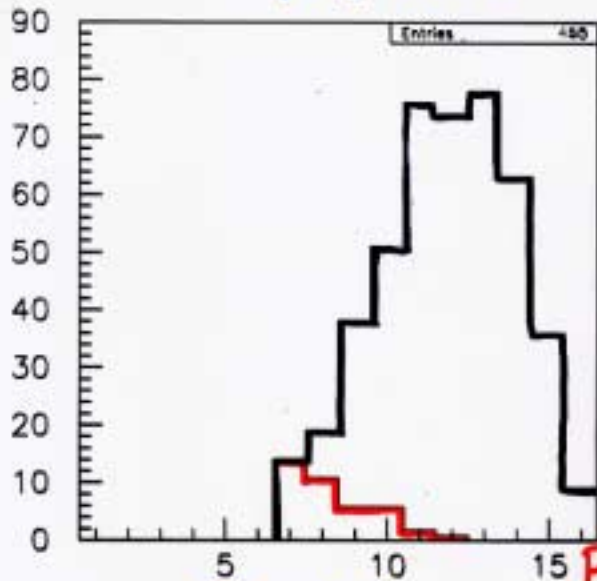
Refresh
3 days



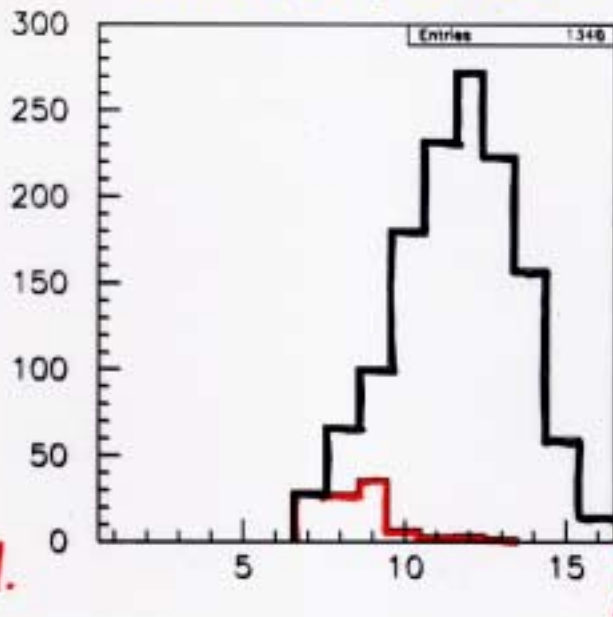
Data taking : 1 cm^2

COSMIC ray

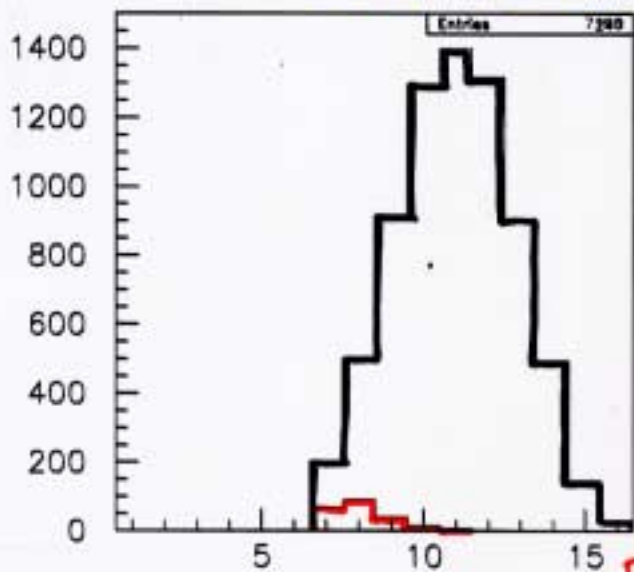
$|\theta| < 0.1$



$0.1 < |\theta| < 0.2$



$0.2 < |\theta| < 0.56$



— non refreshed

— 3 days refreshed

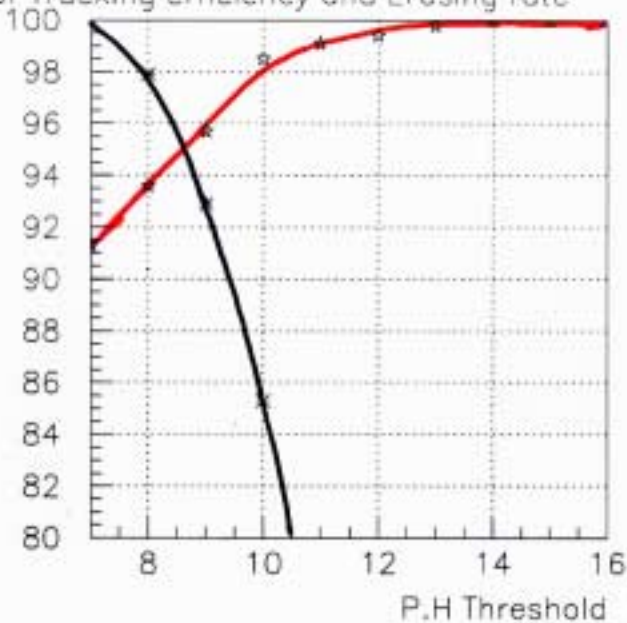
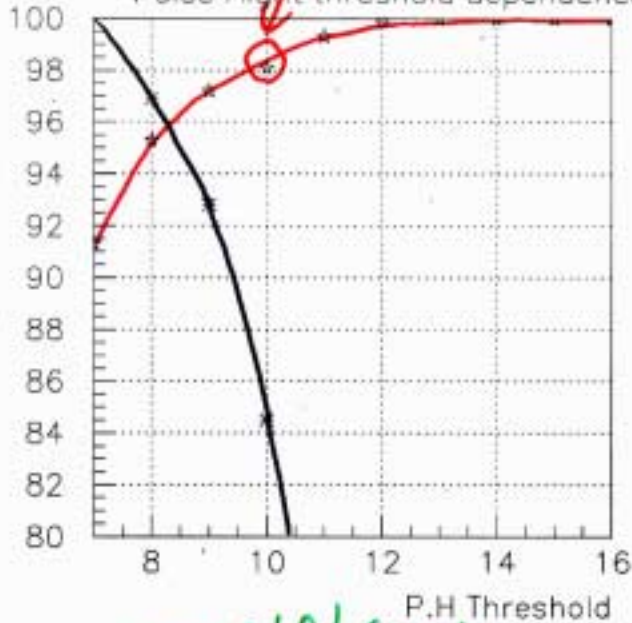
COSMIC

98% need!

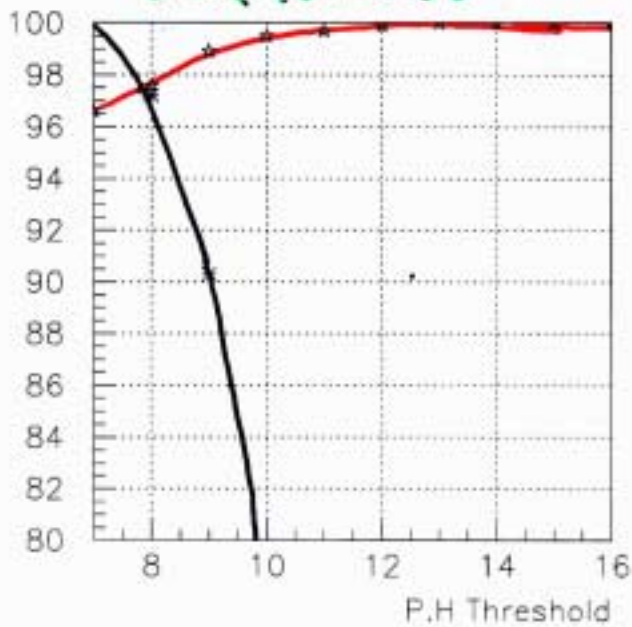
$|\theta| < 0.1$

$0.1 < |\theta| < 0.2$

Pulse Height threshold dependence of Tracking efficiency and Erasing rate



$0.2 < |\theta| < 0.56$



— refreshed for 3 days

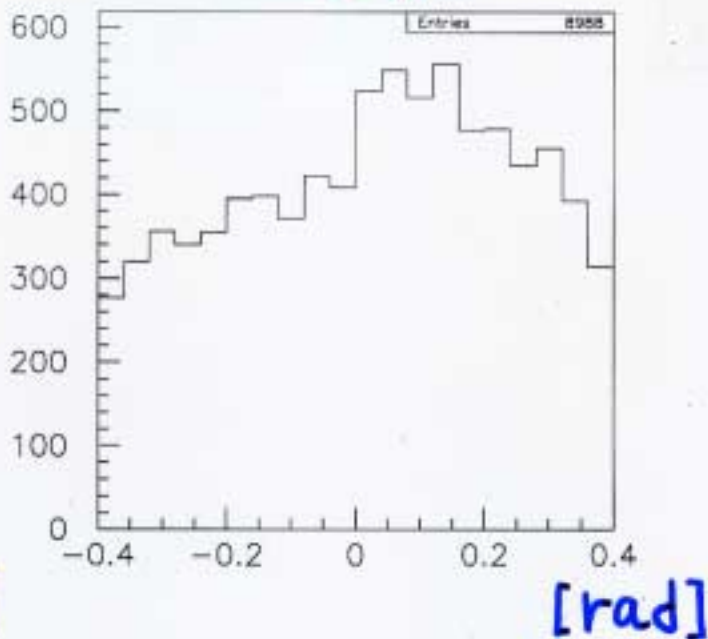
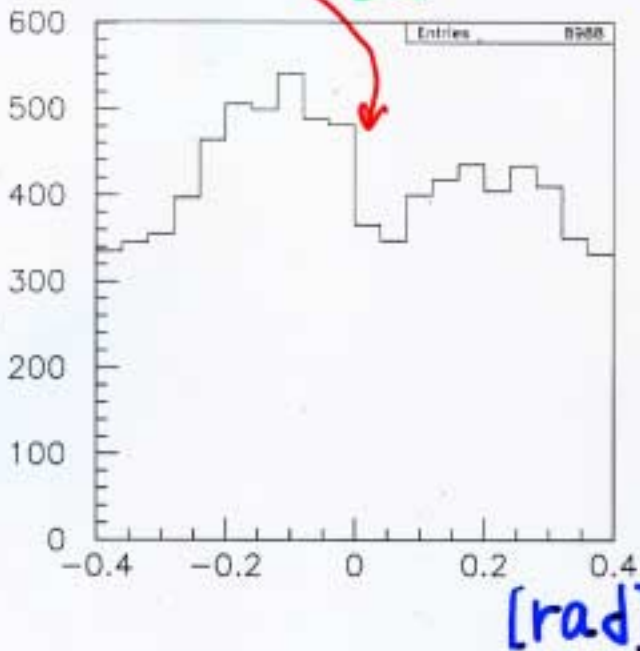
— tracking efficiency

Asymmetric!

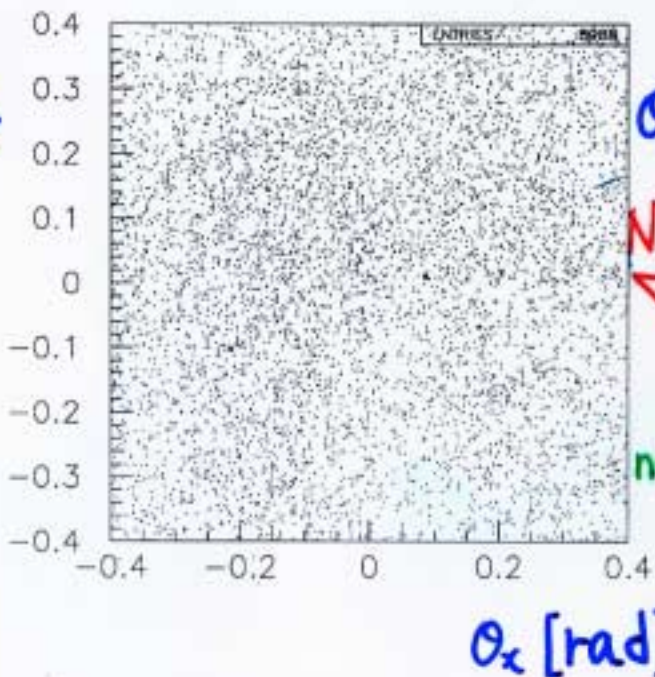
θ_x

8988/cm²

θ_y



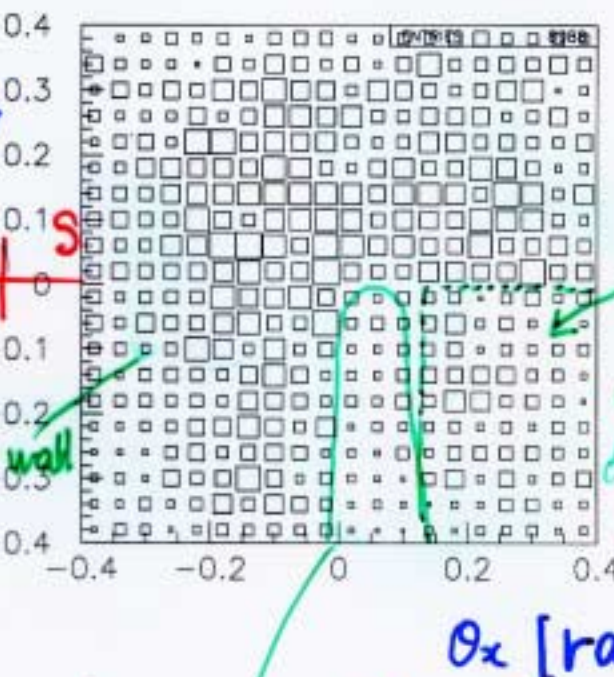
θ_y



θ_y



no wall



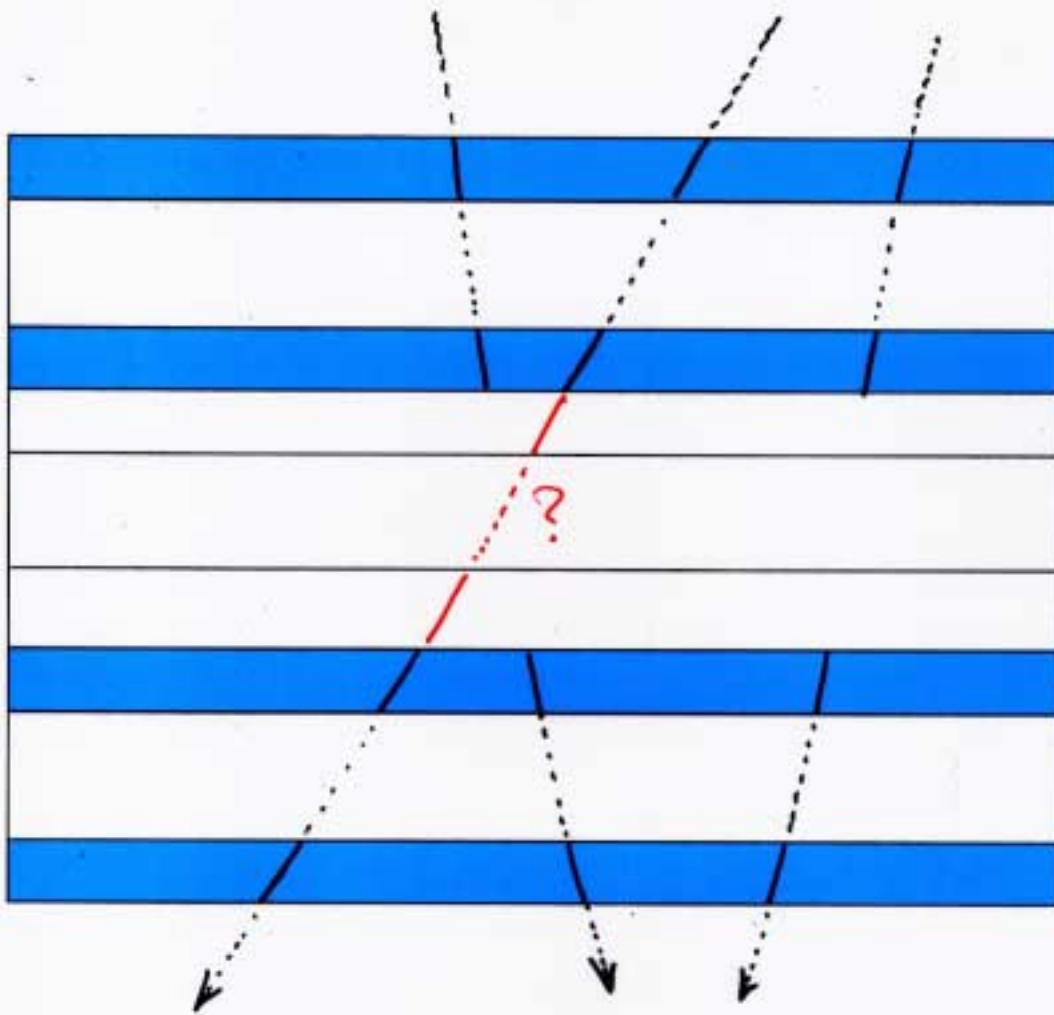
shadow of the asymmetric bath floor

θ_x [rad]

θ_x [rad]

shadow of a Concrete Pole of this building

Cosmic



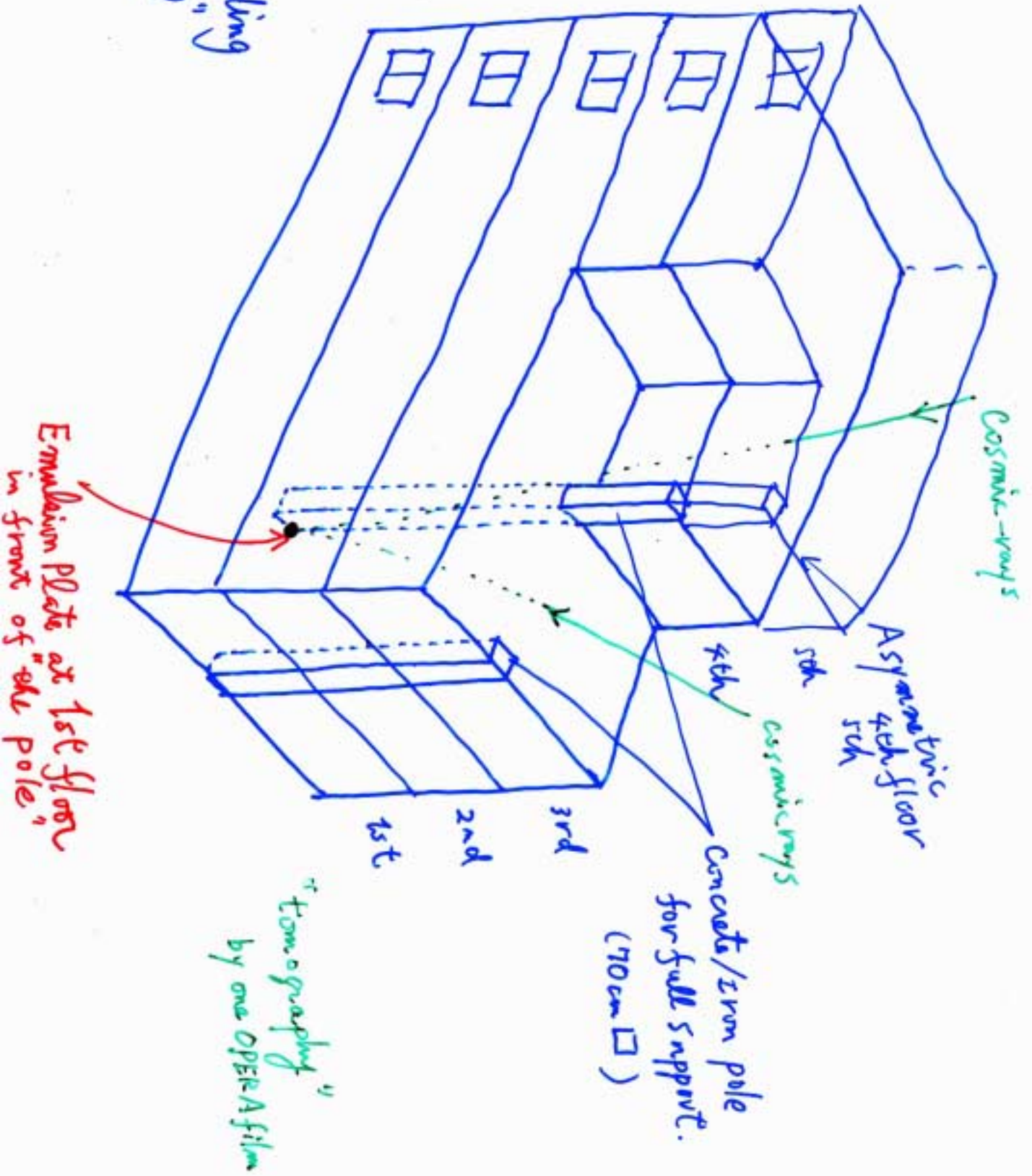
Refreshed

Non-refreshed

Erasing rate

$$= 1 - \frac{\text{number of penetrating 3 plates tracks}}{\text{number of penetrating 2 plates tracks}}$$

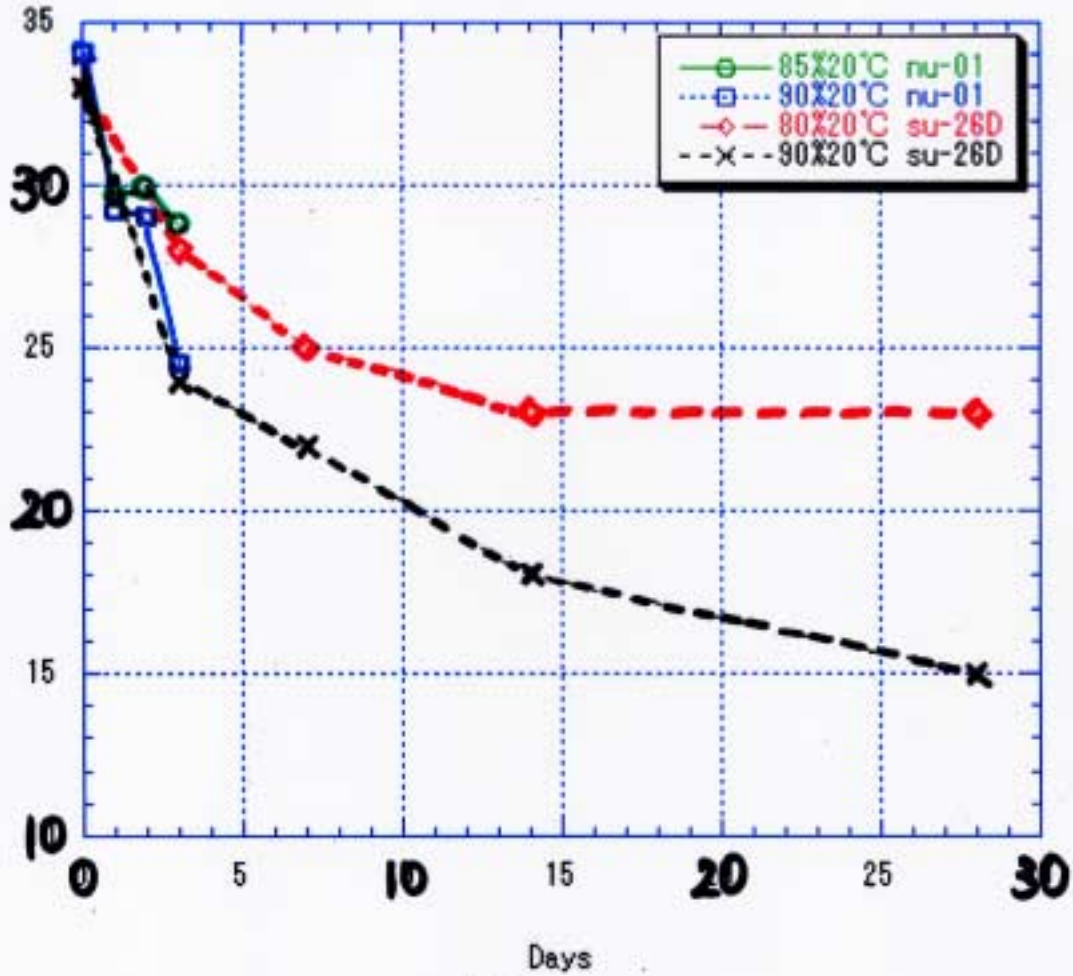
Building
"新田"



20°C

Grain Density

Grain Density



Days

Better



- ⊖ : 85% 20°C NU-01
- ⊞ : 90% 20°C NU-01
- ◇ : 80% 20°C SU-26
- *- : 90% 20°C SU-26

Summary

- Erasing performance of 2 Beam tests are comparable.
- Tracking efficiency are different.
 - ↳ difference of the thickness of emulsion layer.

- Erasing rate : 5 days > 3 days.
- Erasing rate of cosmic ray $\sim 98\%$

reproduced!

CS

90% R.H , 20°C

- Keep efficiency ~ 2 days
- possible to erase in a few month.