

Status of the fiducial volume test analysis

- Introduction
- Data quality check
- Decision of ATM p.e./count constant
- Charge distribution
- Distribution of the number of hit PMTs
- Cherenkov cone cut

2km video meeting Oct 6, 2005

G. Mitsuka

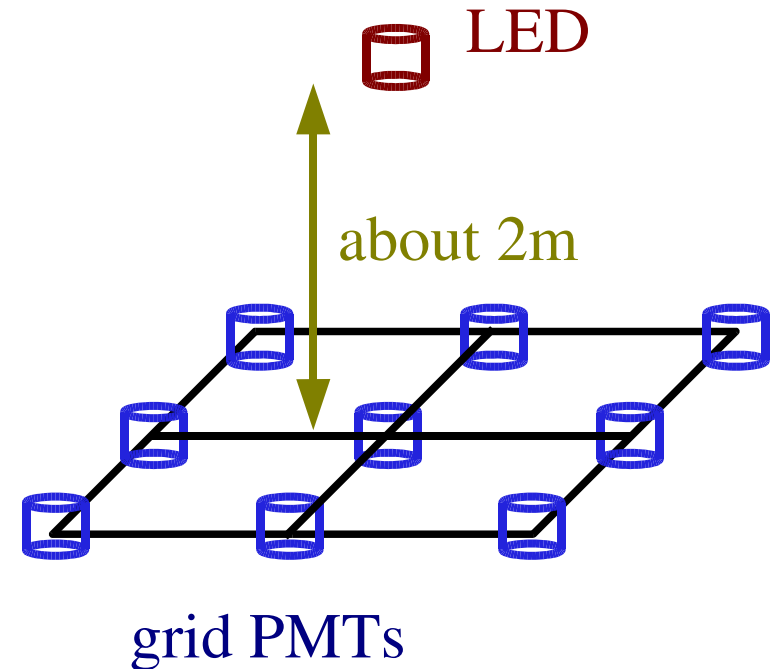
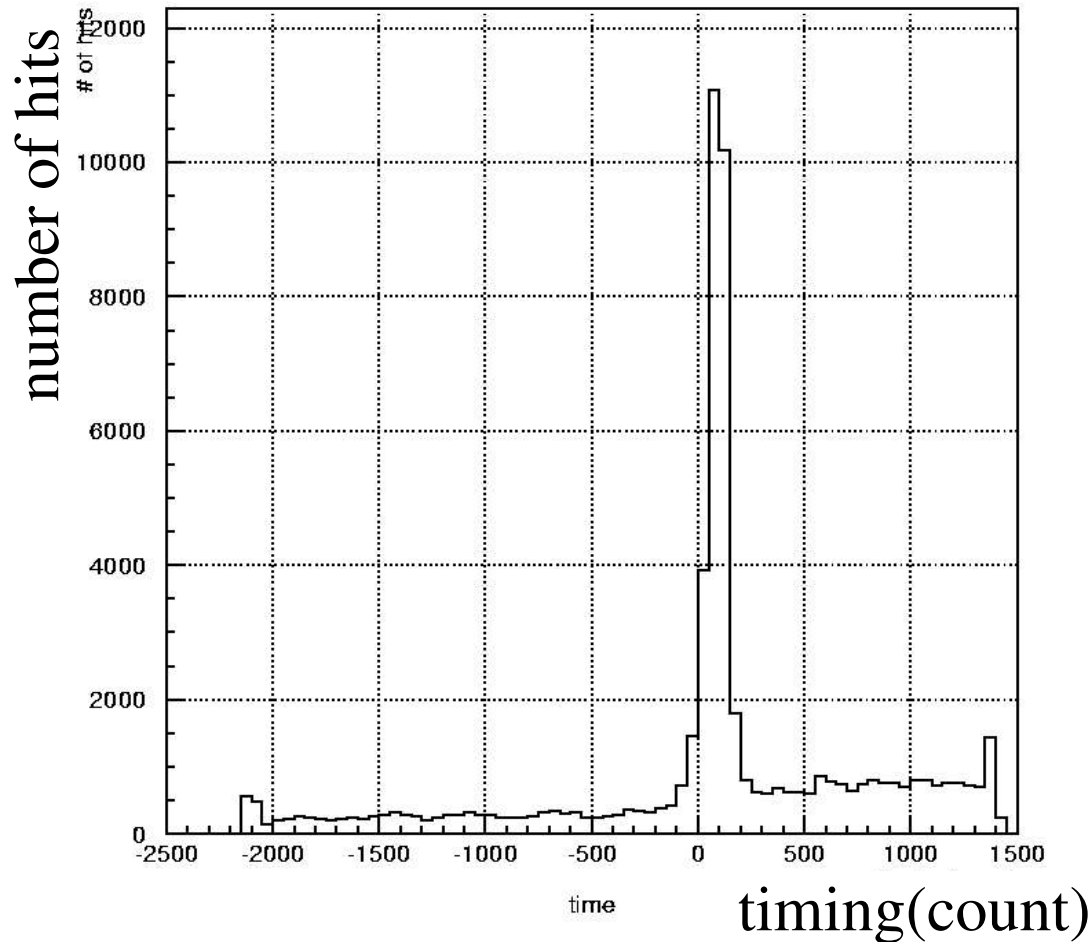
K. Okumura

Introduction

- The quality of grid PMTs is checked using hit timing
- Count to p.e. constants are decided using LED run
- Monte calro generation
- Charge distribution
- Number of hit PMTs (N_{hit}) is compared between data and MC
- New cut is checked, which use charge summation in/out cherenkov cone

Quality check using hit timing

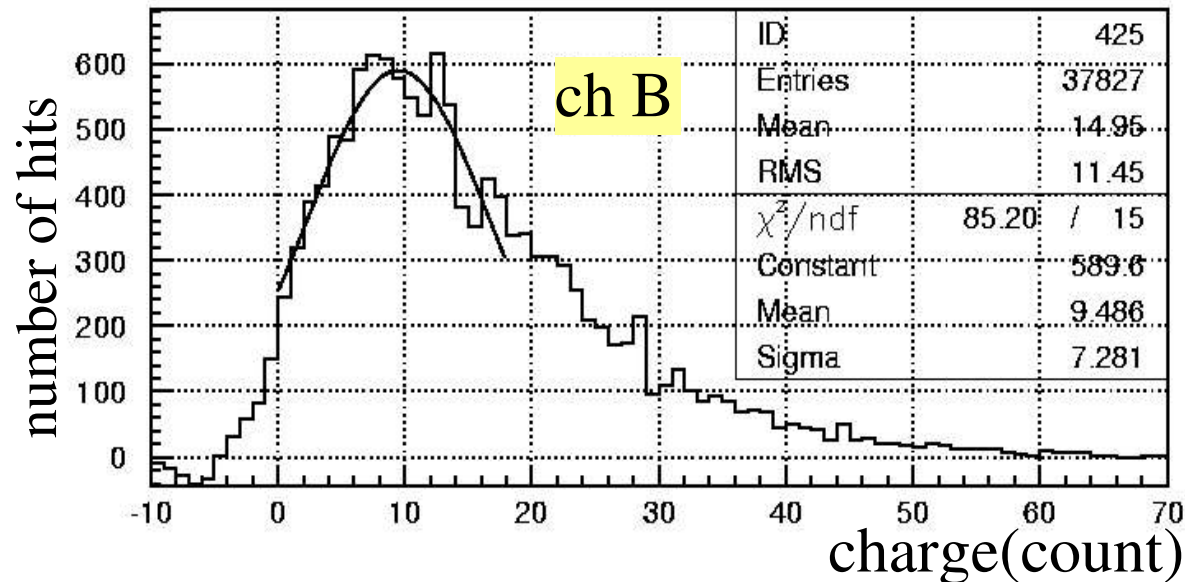
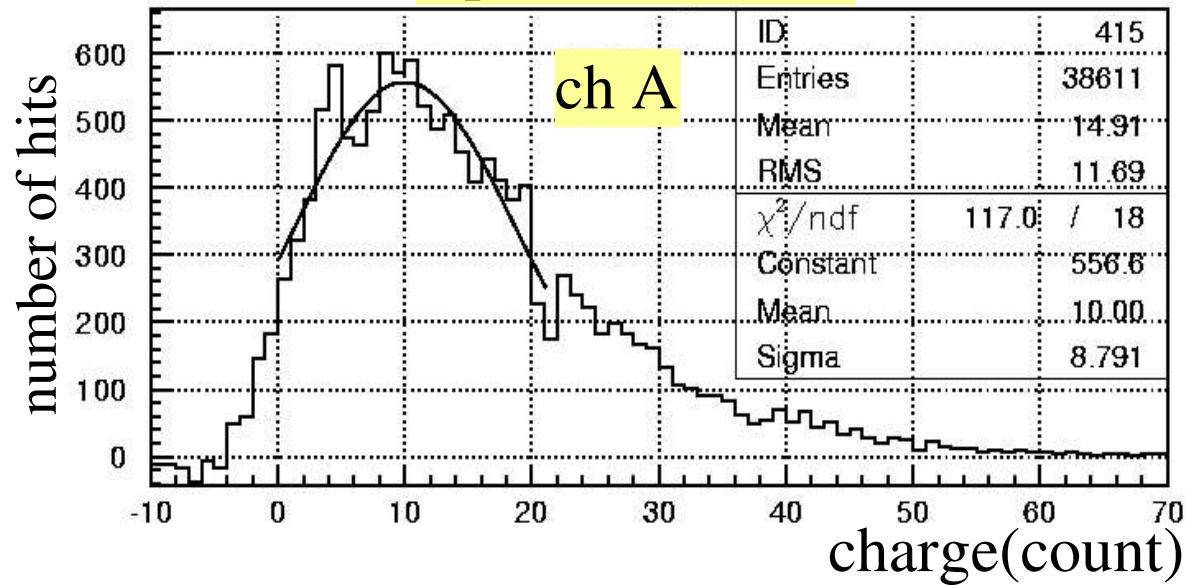
LED run



- The intensity of LED light is set to be around 1p.e.
- Triggered by trigger signal from the pulser used for LED

Decision of ATM p.e./count constants

1 p.e. distribution



- Count to p.e. constants are decided at ChA/B separately using LED run data
- Shape is fit with gaussian
- Signal within $-200 < \text{timing}(\text{count}) < 200$ is used for decision
- In other PMTs, constant is about 10 on average
- These constants are used for analysis

Monte calro generation

Particle generation

- Particle is cosmic ray muon, energy spectrum is assumed
- Vertex is the head of CRP

Detector simulation

- The detector simulator is same as K2K
- The parameter of the reflection at the surface of PMT is that of 20 inch PMT
- Geometries of grid PMTs(position, direction) are considered
- Charge signal for grid PMT is smeared by 1 p.e. distribution of 20 inch PMT

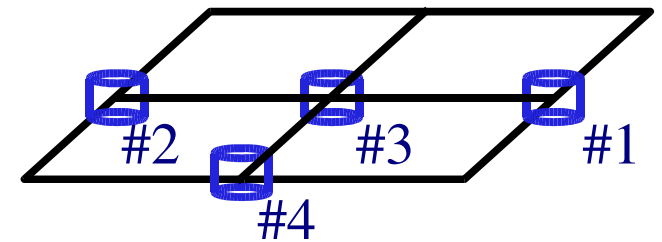
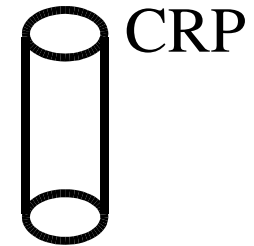
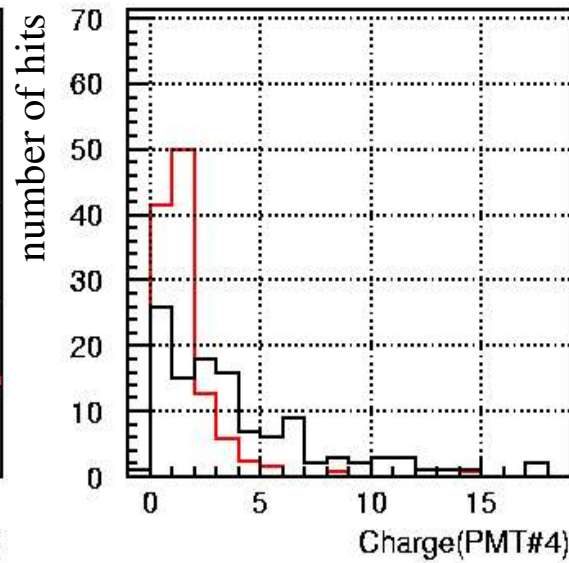
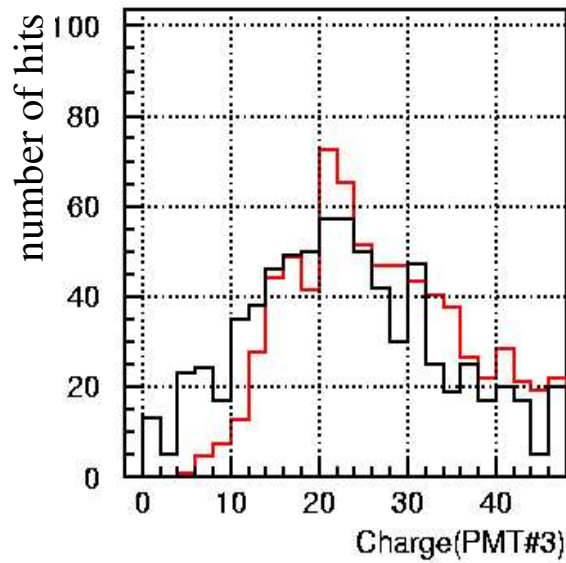
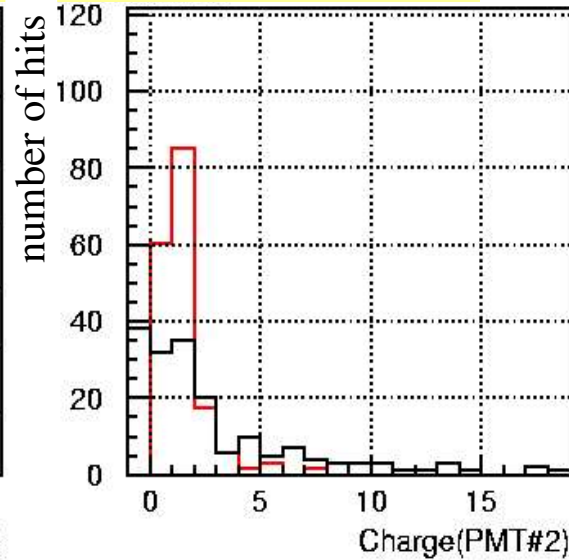
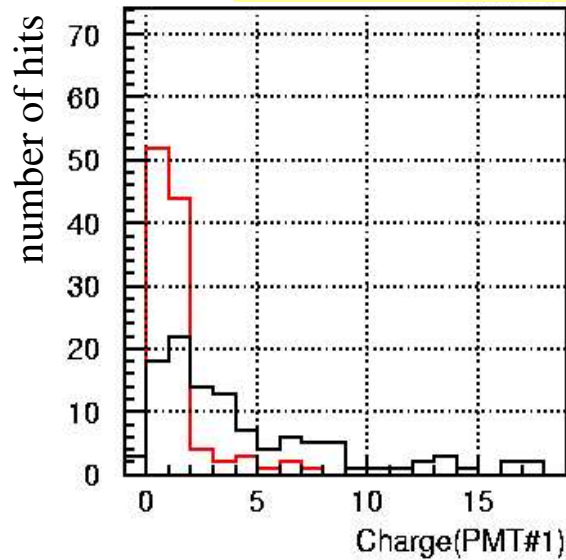
Charge distribution (1)

normal run (CRP Z=+200cm)

Data : Black

MC : Red

- MC is normalized by the number of hits of data

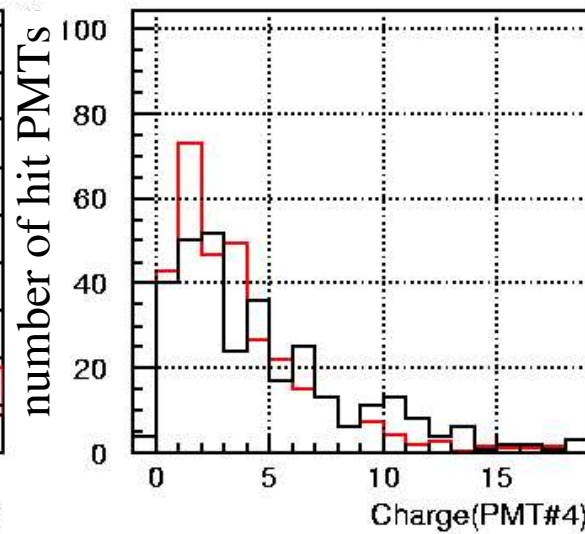
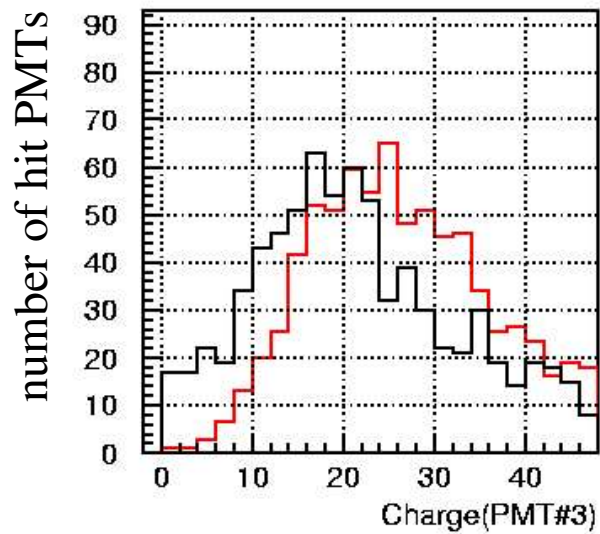
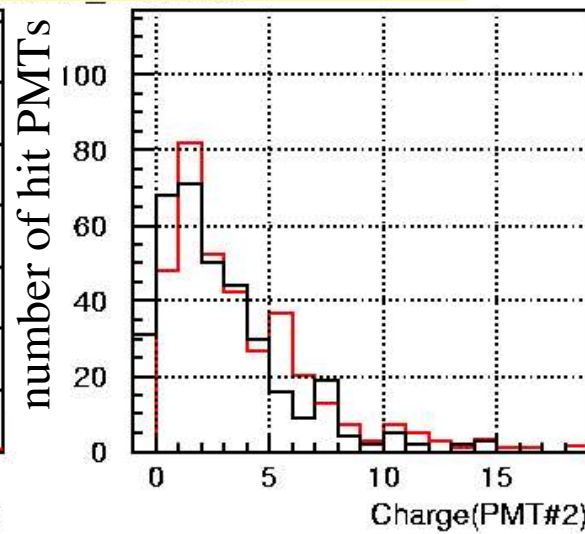
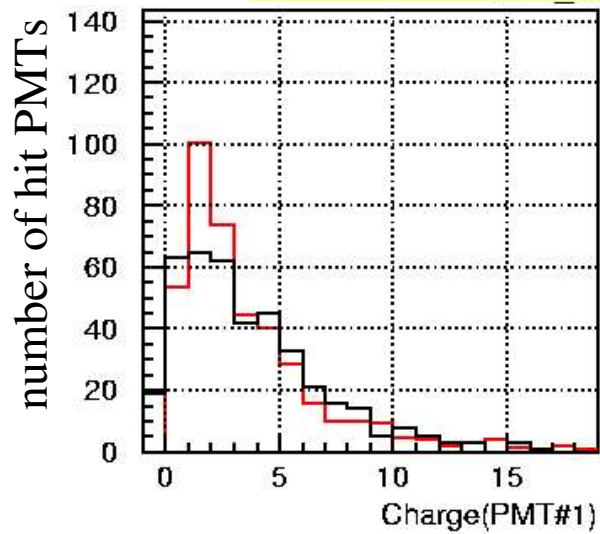


Charge distribution (2)

normal run (CRP Z=+220cm)

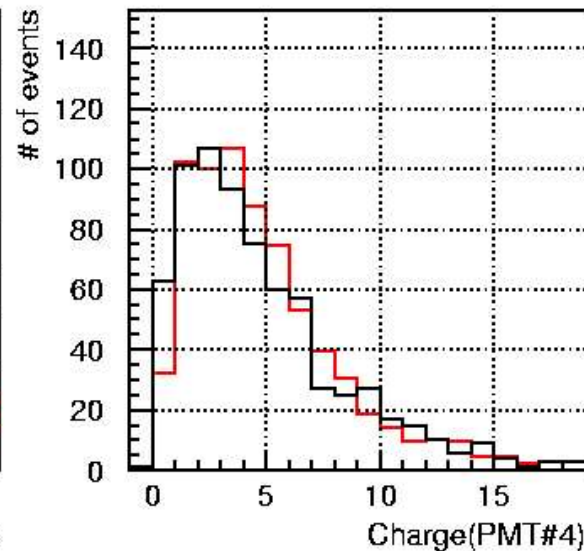
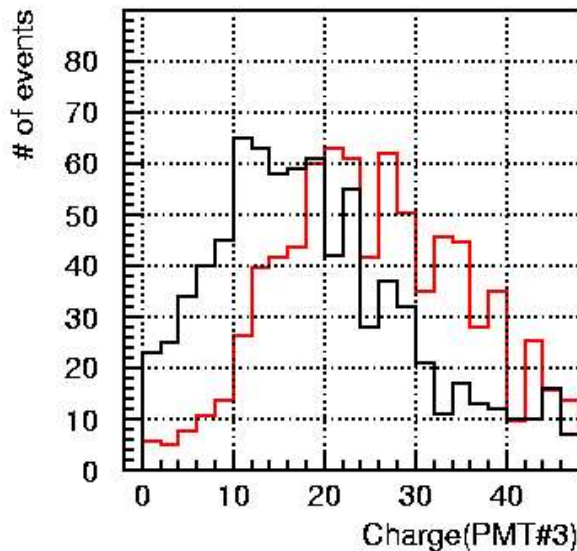
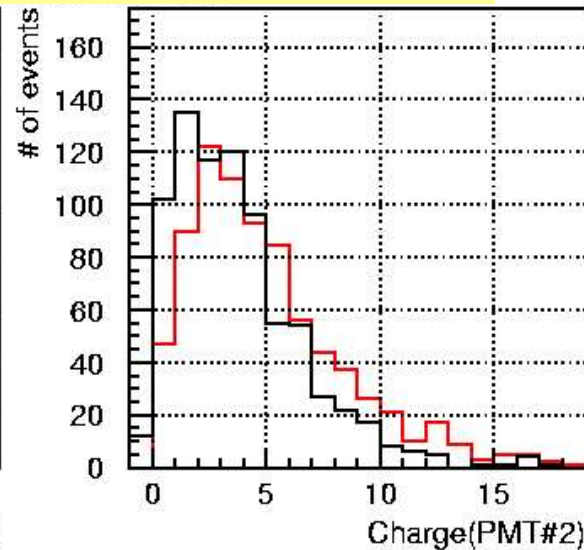
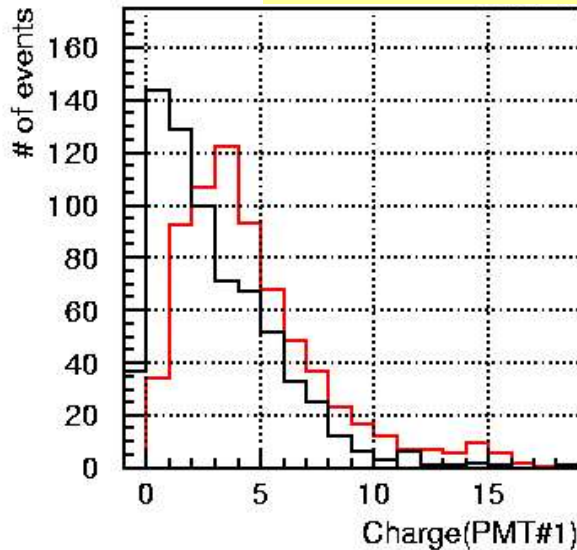
Data : Black

MC : Red



Charge distribution (3)

normal run (CRP Z=+240cm)



Data : Black

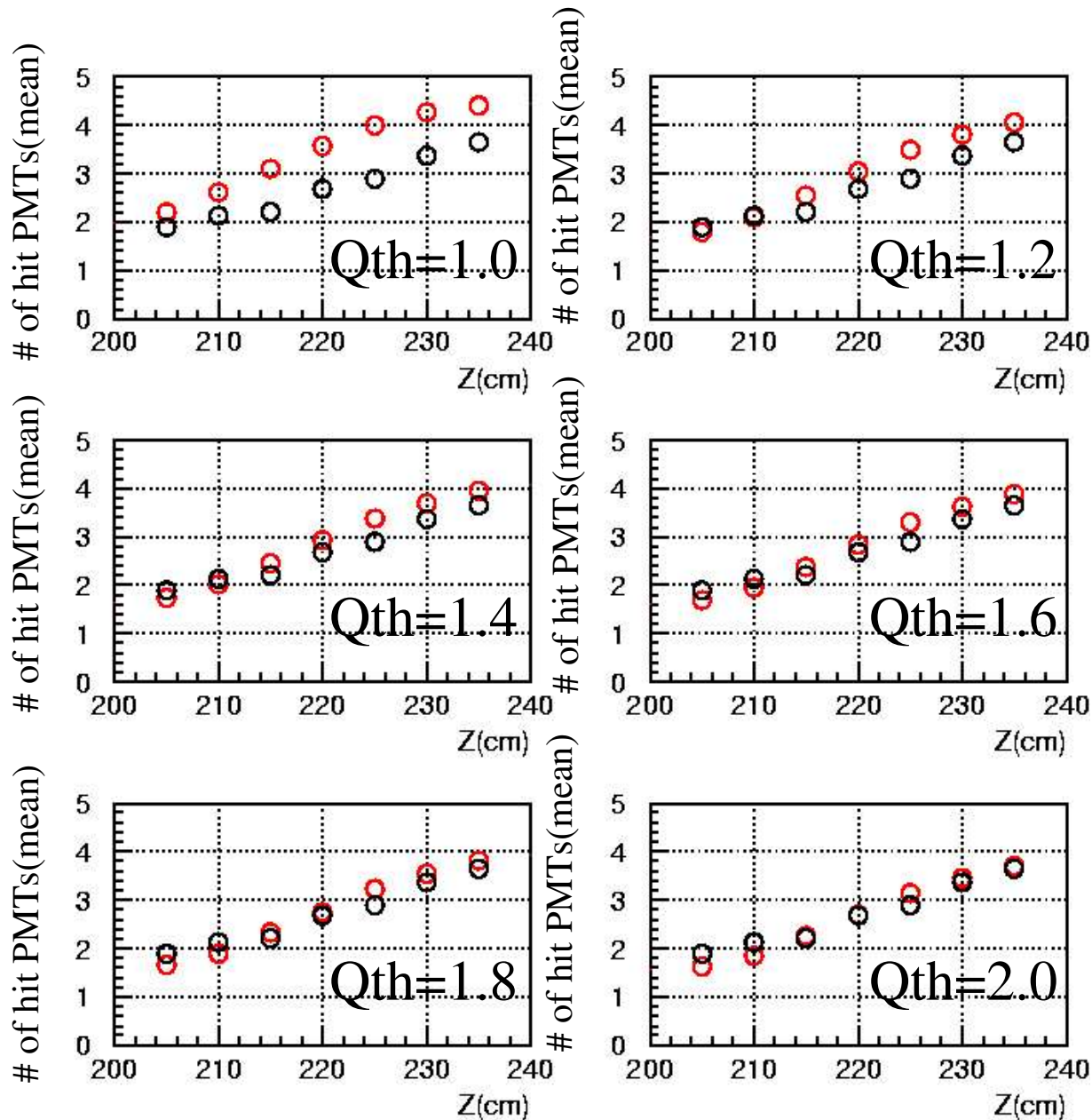
MC : Red

- The similarity of the shape between data and MC is changed at each Z and each PMT
- At low Z, charge of data tend to be relatively greater than MC, on the other hand, at high Z, tend to be smaller than MC

need to study these parameters

Water transparency and light scattering at ultraviolet region (The peak of the quantum efficiency of the grid PMT exists at UV region)

Nhit distribution



Data : Black

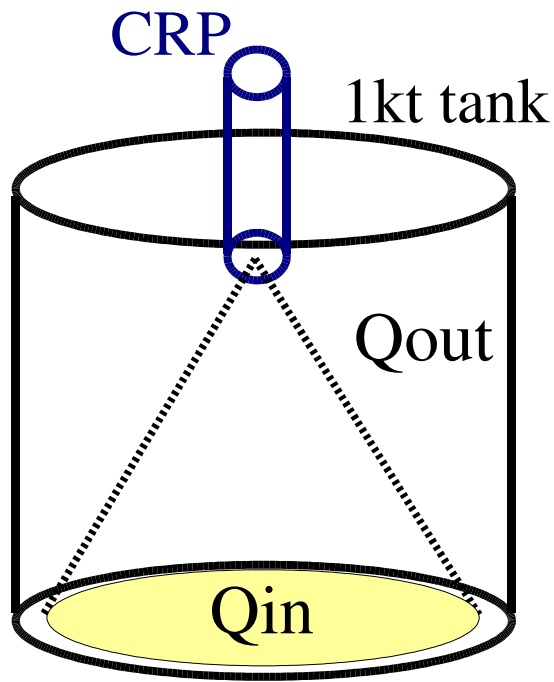
MC : Red

- At high Qth, the slope of data is similar to MC
- At low Z, Nhit of data tend to be relatively greater than MC, on the other hand, at high Z, tend to be smaller than MC
- These tendency seems to be consistent with that of charge distribution

Cherenkov cone cut (under study)

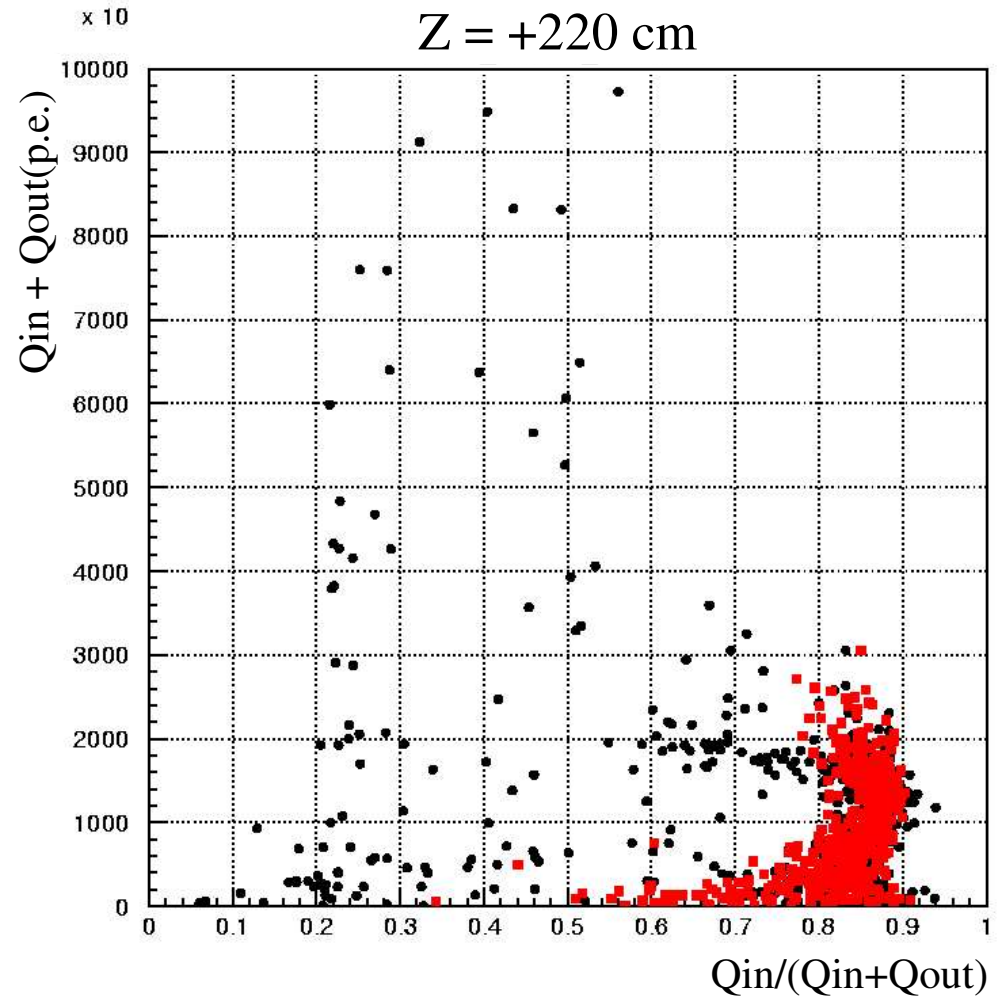
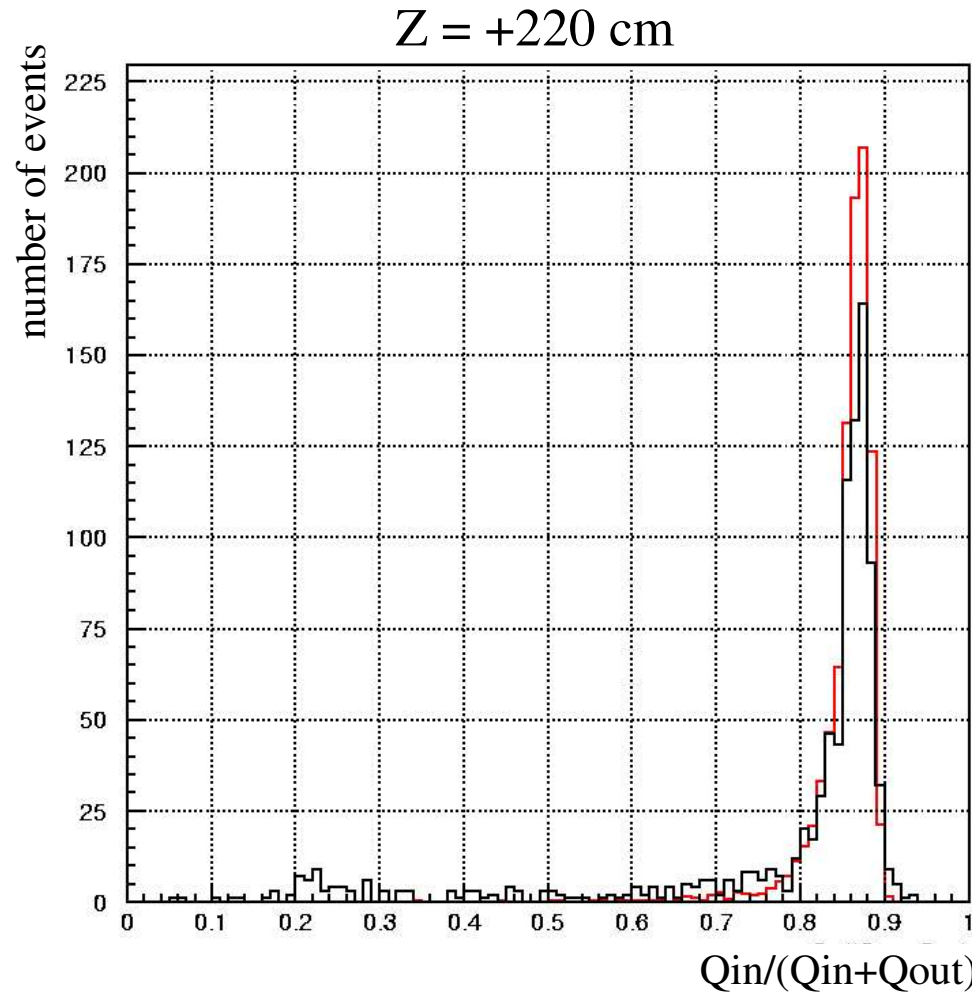
Purpose : to select muon whose direction is vertically down

Parameter : $Q_{in}/(Q_{in}+Q_{out})$, $Q_{in}+Q_{out}$



- Opening angle of cherenkov cone is defined as 42°
- The vertex is the head of CRP ($200 \leq Z \leq 240$)
- The direction is vertical down

Cherenkov cone cut (under study)



- The shape of charge ratio of data is similar to MC well, also in other CRP hight
- Pedestal events with large total charge is rejected by total charge cut
- Criteria will be defined as scanning these events

Summary

- Data quality seems to be good
- Count to p.e. constant is about 10 on average
- Monte calro is generated using the same program as K2K
- The similarity of the shape between data and MC is changed at each Z and each PMT
- In the nhit distribution, the slope of data is similar to MC, at high Z
- Cherenkov cone cut will be used for the analysis soon