# INGRID activity

Akira murakami, kyoto-u

4/23/2010 Calibration & performance session
at T2K collaboration meeting

# Run29, 30, 31 data taking

- Data taking of Run29,30,31
  - Total # of proton by CT5 : 3.4e18 protons.
  - Total # of good spill : 1.7e5 spills.
- There was no trouble, no miss spill during DAQ running.

- Detector setting
  - ΔV of MPPC = 1.1 V
  - Integration time = 500 nsec
  - TDC threshold is 2.5 p.e.

# Flow chart of event selection

Make timing cluster(more than 4 hits within 100nsec)

# of active planes > 1 &&
p.e./active layer > 6.5

On time

***Beam related event***

↓

Report about this events

# of active planes > 2 &&
p.e./active layer > 6.5

Tracking

Track matching

On time

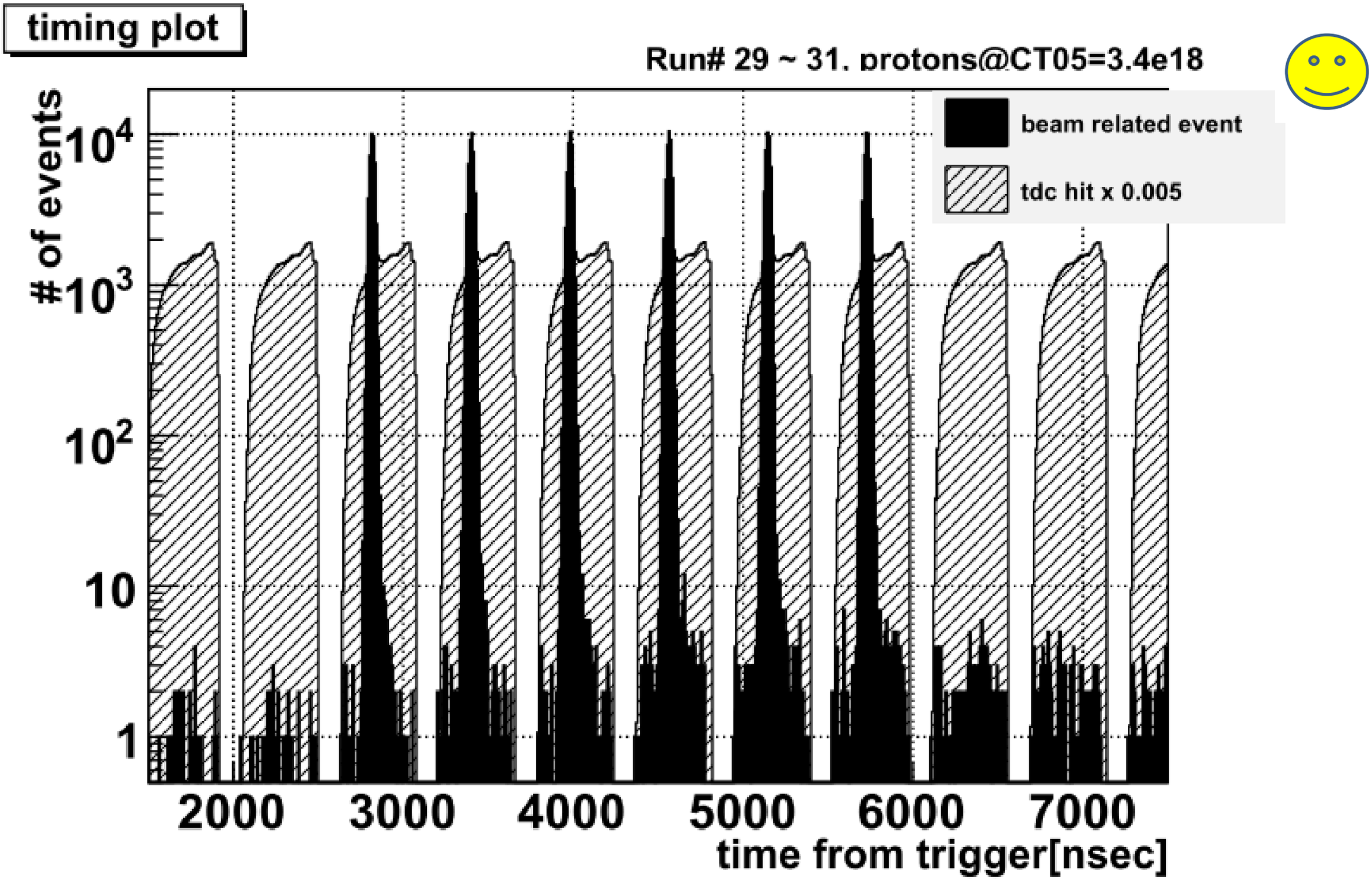
Upstream VETO

Fiducial volume

***neutrino event***

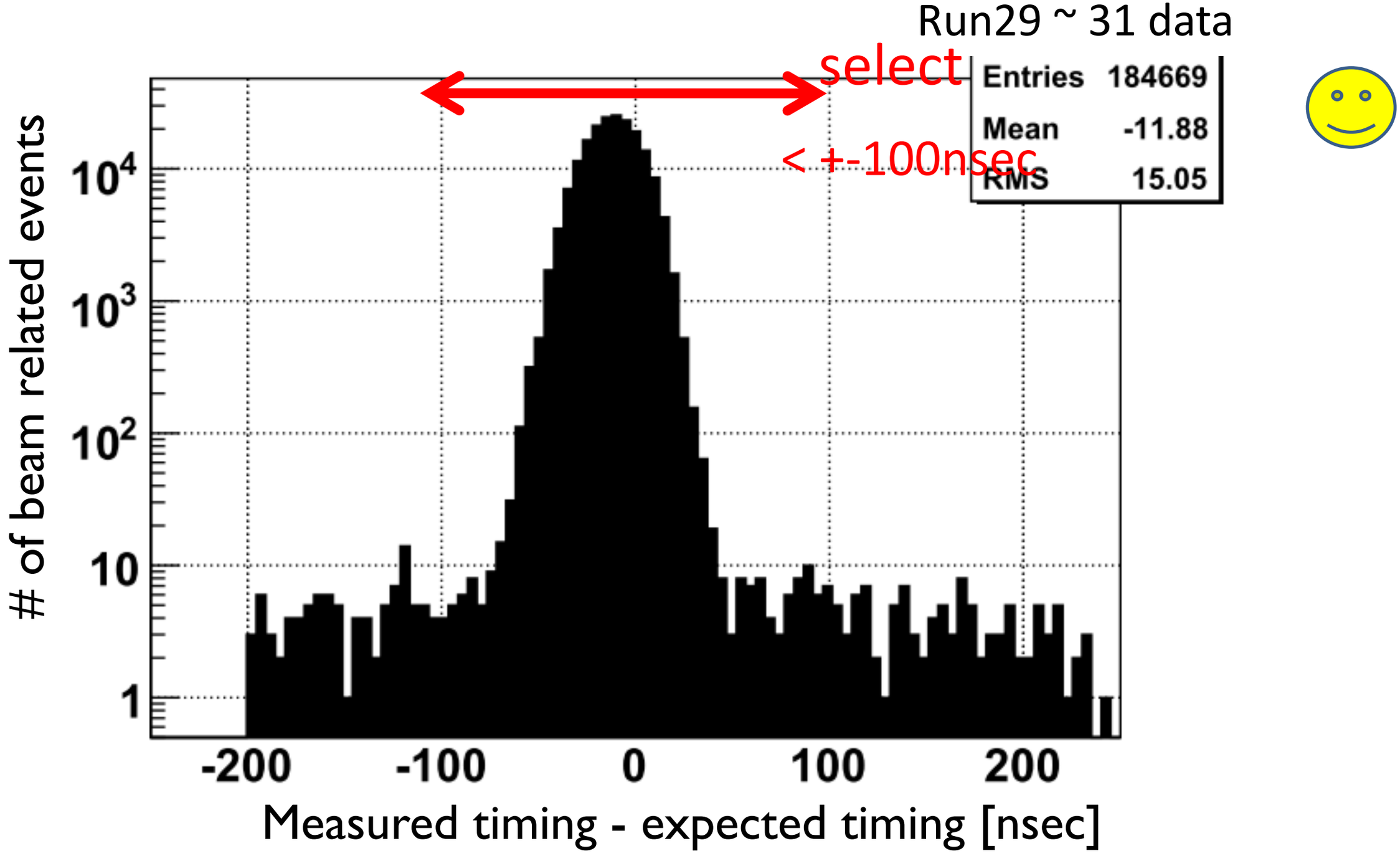
data set: Run29 ~ 31,
172818 spills, $3.4 \times 10^{18}$protons@CT05

# Beam timing


timing plot
Run# 29 ~ 31, protons@CT05=3.4e18
beam related event
tdc hit x 0.005
# of events
$10^4$
$10^3$
$10^2$
10
1
2000
3000
4000
5000
6000
7000
time from trigger[nsec]

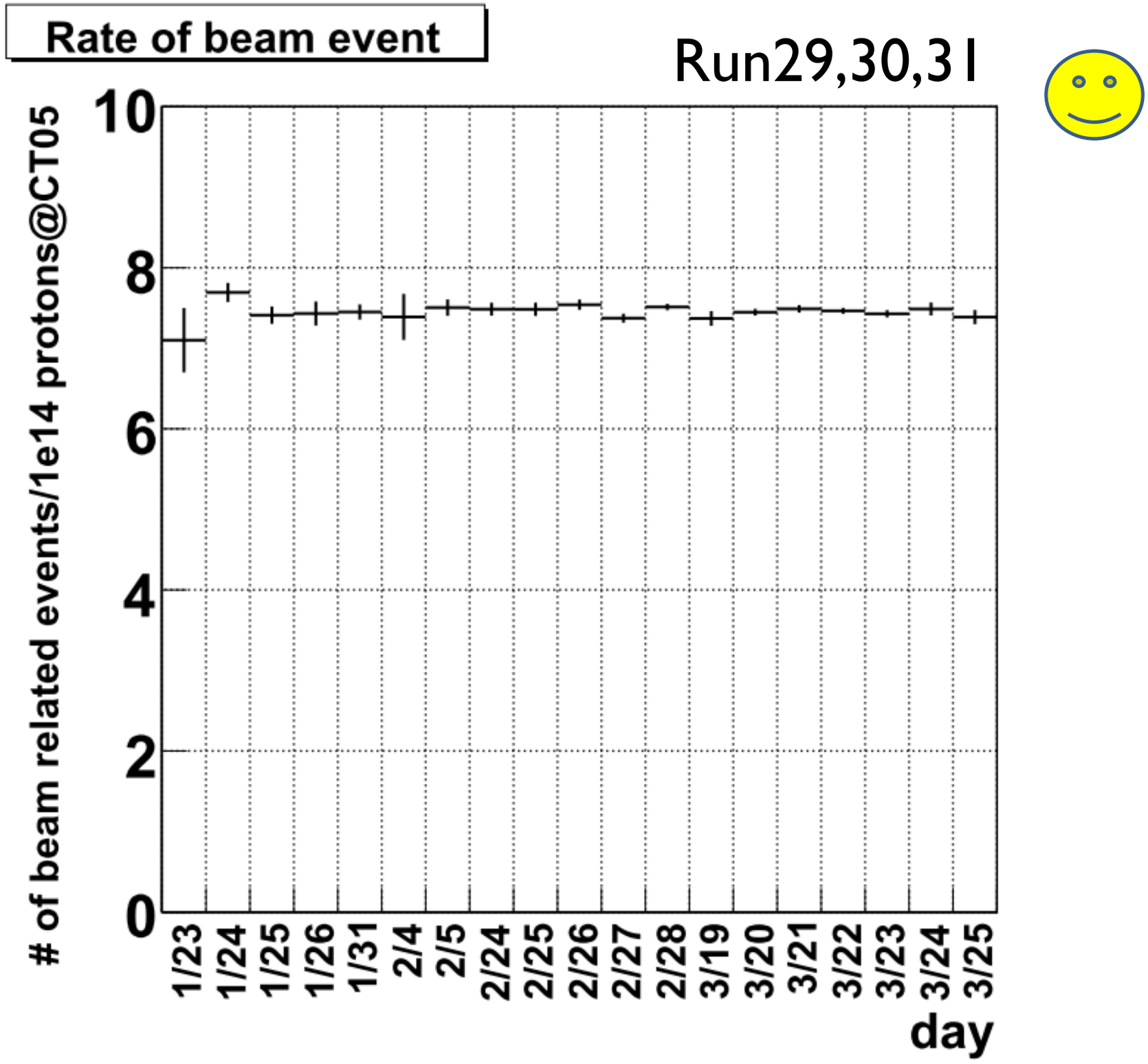
# Beam timing from expectation

Events in 100 nsec difference from expected beam timing calculated with beam timing by CT5 are "on time" events.



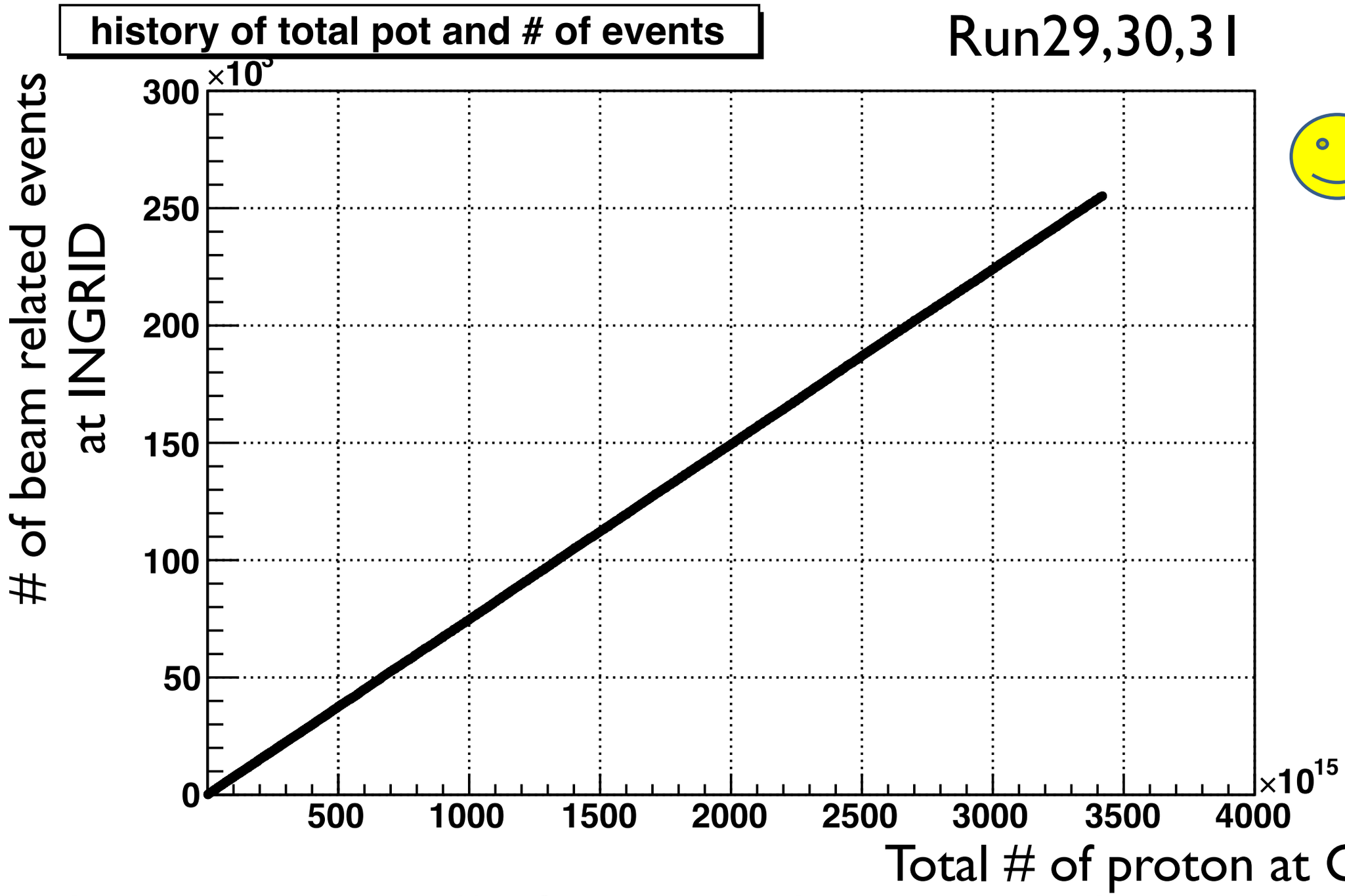
# Stability of data taking

## ~ beam related events ~



# Stability of data taking

## ~ beam related events ~





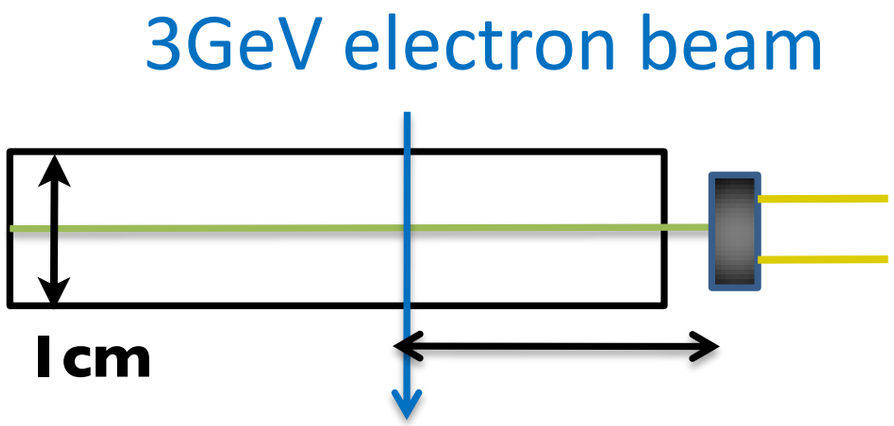

According to increase # of protons, beam related events increse.

→ Data taking is stable.

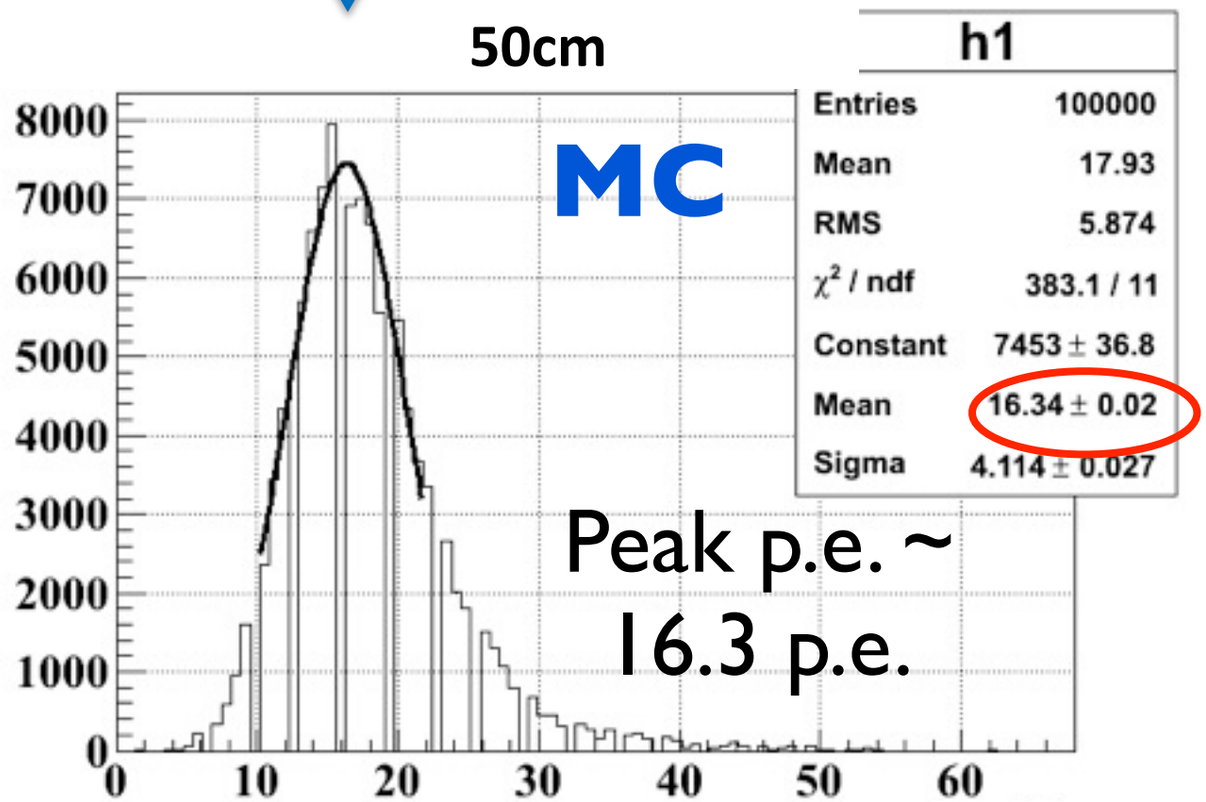
# Status of INGRID Detector MC

- Progress in updating INGRID MC.
  - Add some detector response effect.
- There are some items needed to add detector response effect.
- Need compare of MC with real data (cosmic, beam).
  - Now progress one by one.

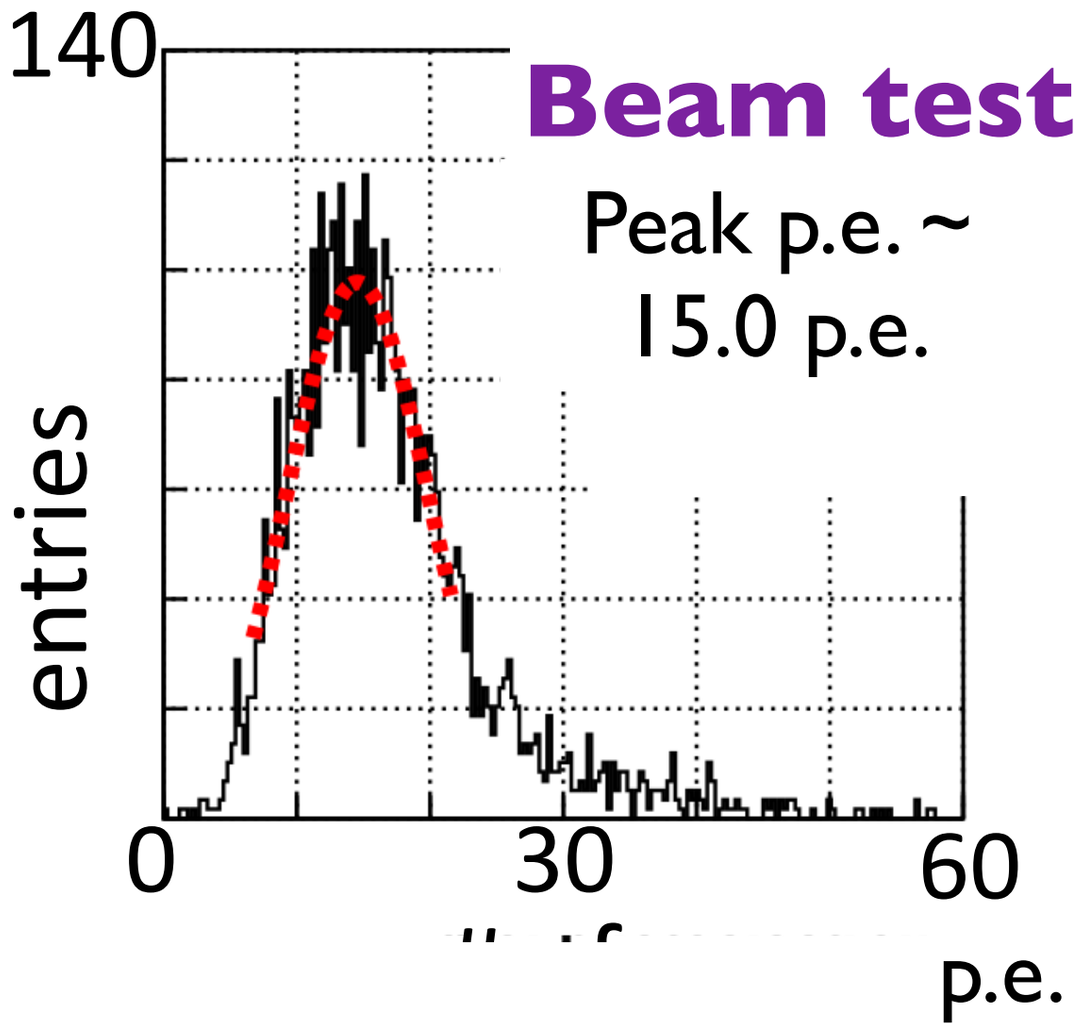
# Comparison with beam test (1ch)




After add some detector response effect, again simulate Fuji beam test MC.




Peak p.e. ~ 16.3 p.e.




**Beam test**

Peak p.e. ~ 15.0 p.e.

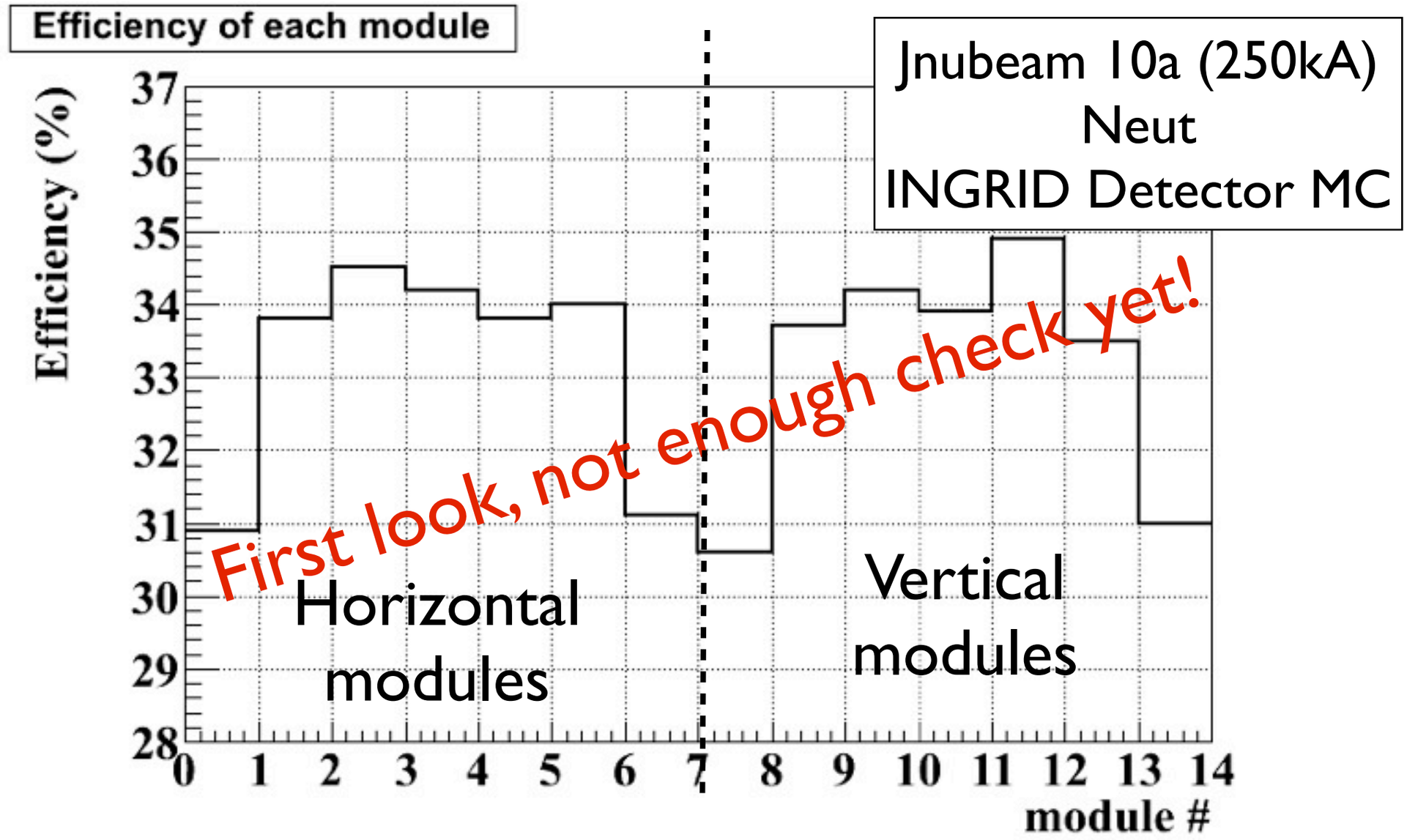
These p.e. value are corrected by cross-talk & after pulse effect.

<u>Roughly 10% difference between MC and data.</u>

# Efficiency of each module

Efficiency = (# of events after neutrino event select) / (# of neutrino interaction within modules)

Neutrino event select is explained by Otani-san at ND280 beam.




Progress in checking & tuning INGRID Detector MC.

# Summary

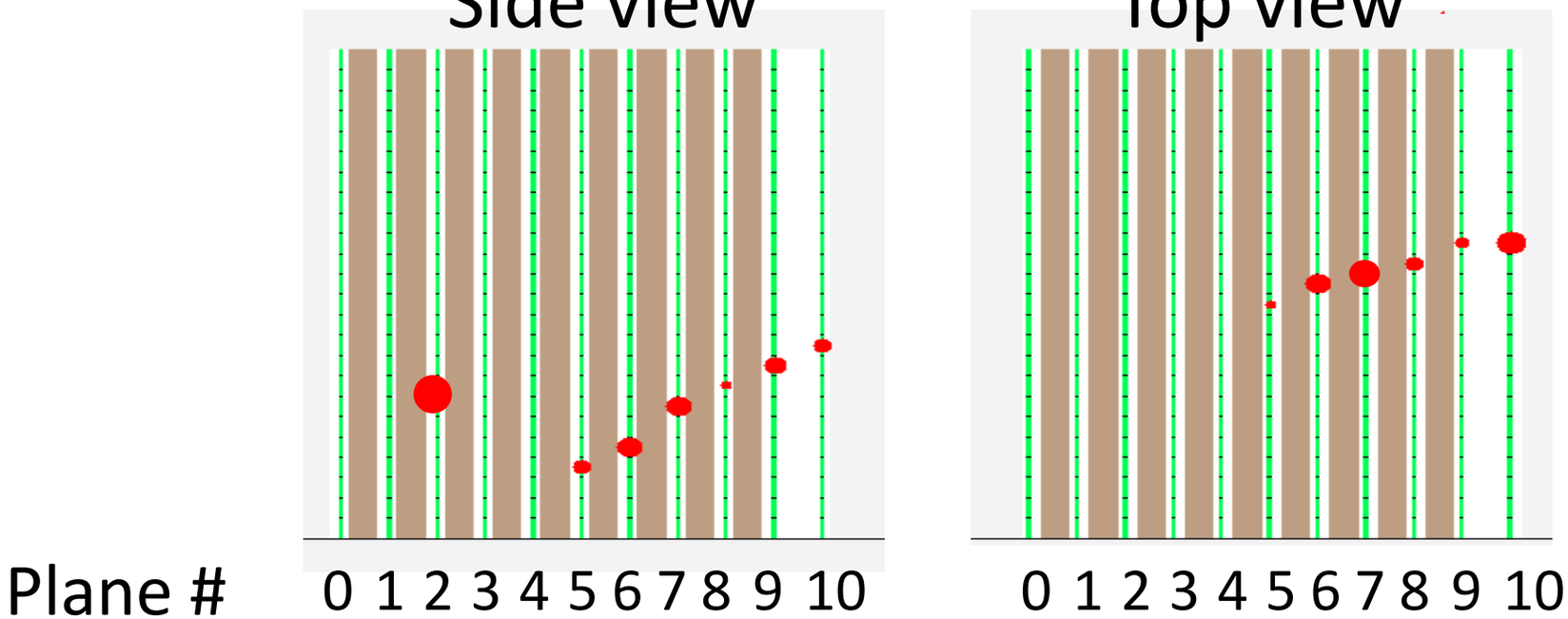
- Data taking of INGRID is very stably.
  - No critical trouble and no miss spills during DAQ running.
- Progress in MC tuning & study
  - There are many factors needed to consider.
- Progress in comparison MC with real data (beam, cosmic) one by one for estimation systematic error.

# Back up

# Variables for selection of beam event

- Active plane(Plane#0 is not used. only plane#1 ~ 10 )
  - Coincidence hit at side and top view(TDC threshold = 2.5p.e.)
- p.e. / active layer
  - ( Total p.e. in active planes ) / ( # of active planes × 2 )

*example*

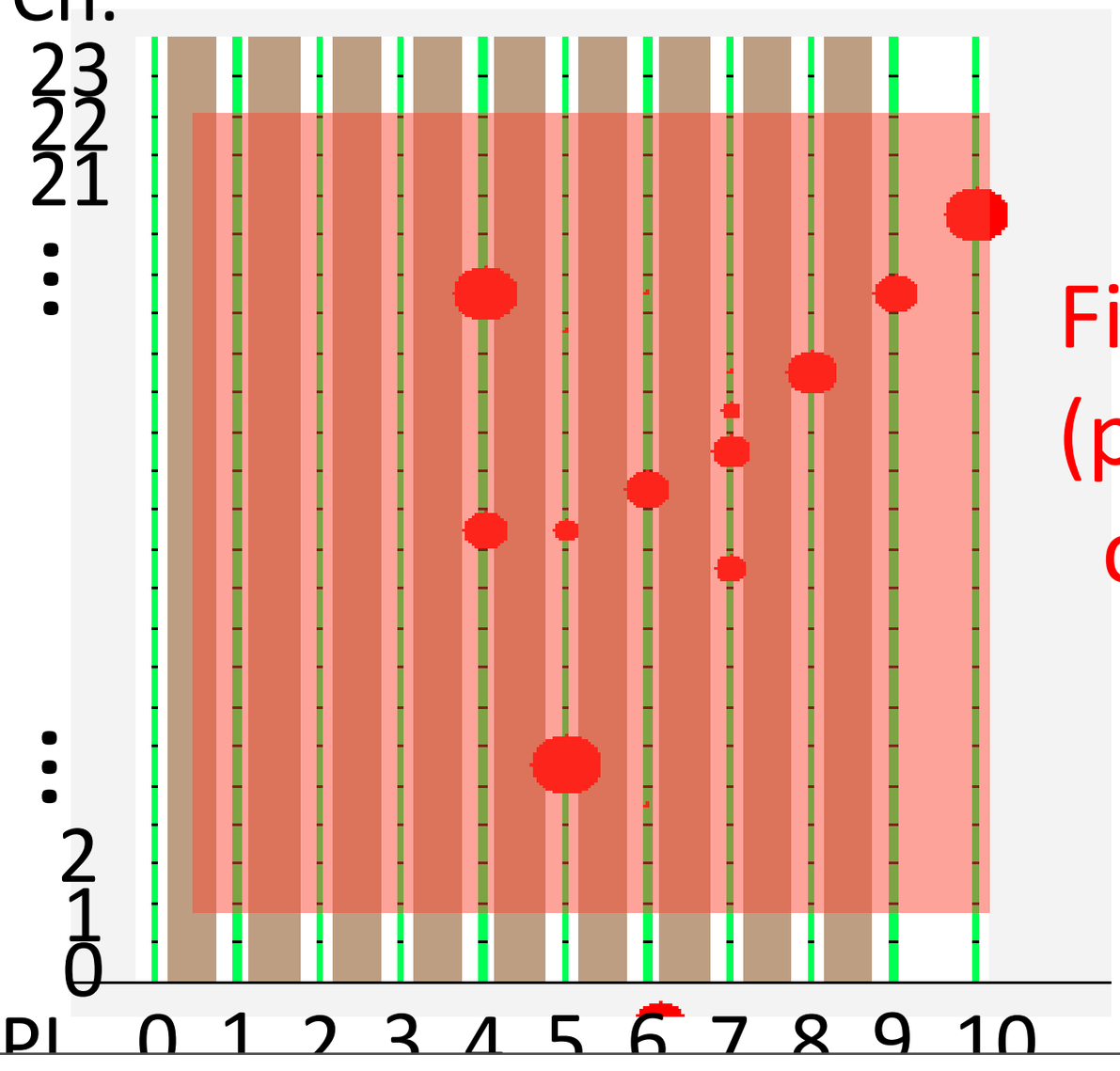



- # of active planes = 6(plane# 5 ~ 10)
- p.e. / active layer = total p.e. in plane# 5~10 / ( 6x2 )

# Fiducial volume cut

Because there is a gap(10~20cm) b/w tracking planes and VETO, particle from out side can not be rejected.

➡ We defined fiducial volume and selected the event whose vertex is within fiducial.




Fiducial volume (plane 1 ~ 10 ch.2 ~ 21)

# MC tuning item

- Fiber attenuation → added to MC
- Scintillator quenching → added to MC
- MPPC response → added to MC
- Hit time → not yet
- Electric response (p.e. > ADC, time > TDC, logical delay) → not yet
- Hit efficiency for each channel → not yet
  - Edge structure of scintillator → not yet
- MPPC dirk current noise → not yet
- MPPC - Fiber coupling constant → not yet

Many items are needed to consider.
But, not need for install all of these item soon.