

Update of
Effect of Chamber Efficiency
on Rate Dependence

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Tokyo Tech
Kei Nagai

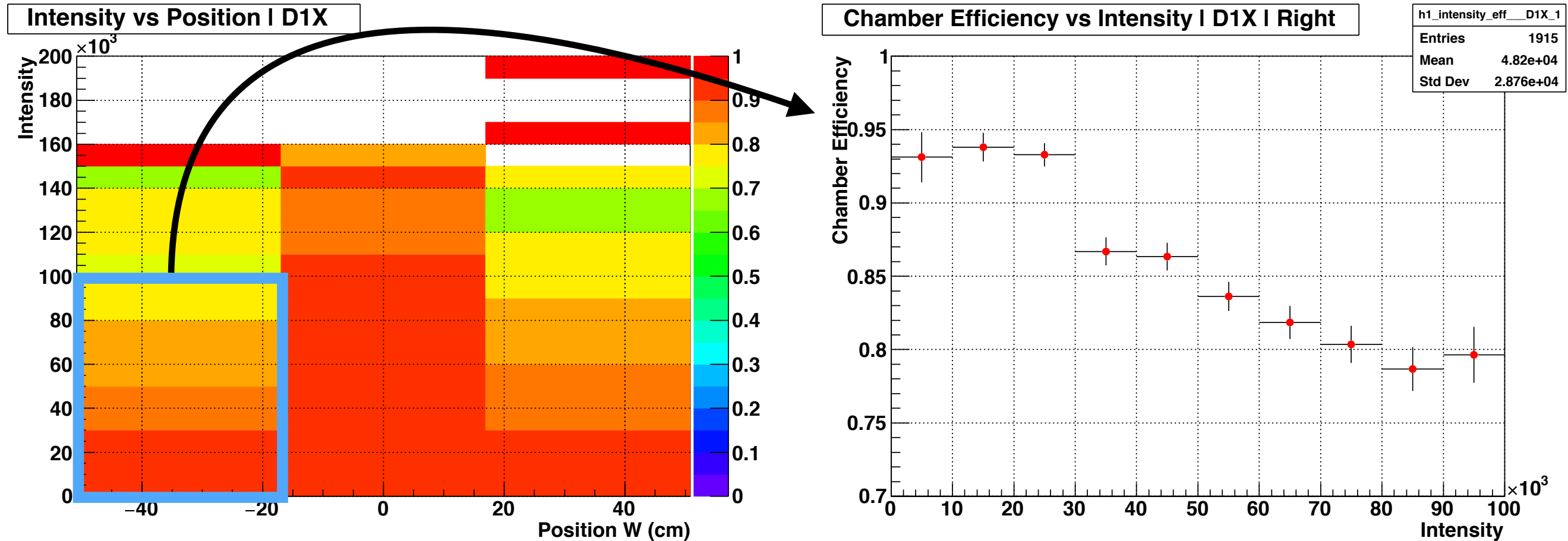
Chamber Efficiency?

- Definition of single plane chamber efficiency:
 - # of tracks with 18 hits / (# of tracks with 18 hits + that with 17 hits)
 - 17 hits: the track doesn't have a track correlated hit at target plane
- Not pure chamber efficiency
 - including read out and tracker performance
- Chamber efficiency has rate dependence?
 - possible, there are some causes (I don't analyse separately)
 - high intensity causes high occupancy on each chamber plane (software)
 - ◉ more true hits are removed by hit removal as cluster or after-pulse
 - high intensity can reduce gas gain (hardware)
 - rate tolerance of readout (hardware)

Data

- #57 data (sampling, run range: 8916-10122)
 - R001 raw data
 - r1.4.0 kTracker
 - it is also old ver. but may be ok for efficiency estimation
 - use only LH2 target data
- Track selection
 - $\text{chisq} < 10$
 - number of track correlated hits ≥ 17

Chamber Efficiency

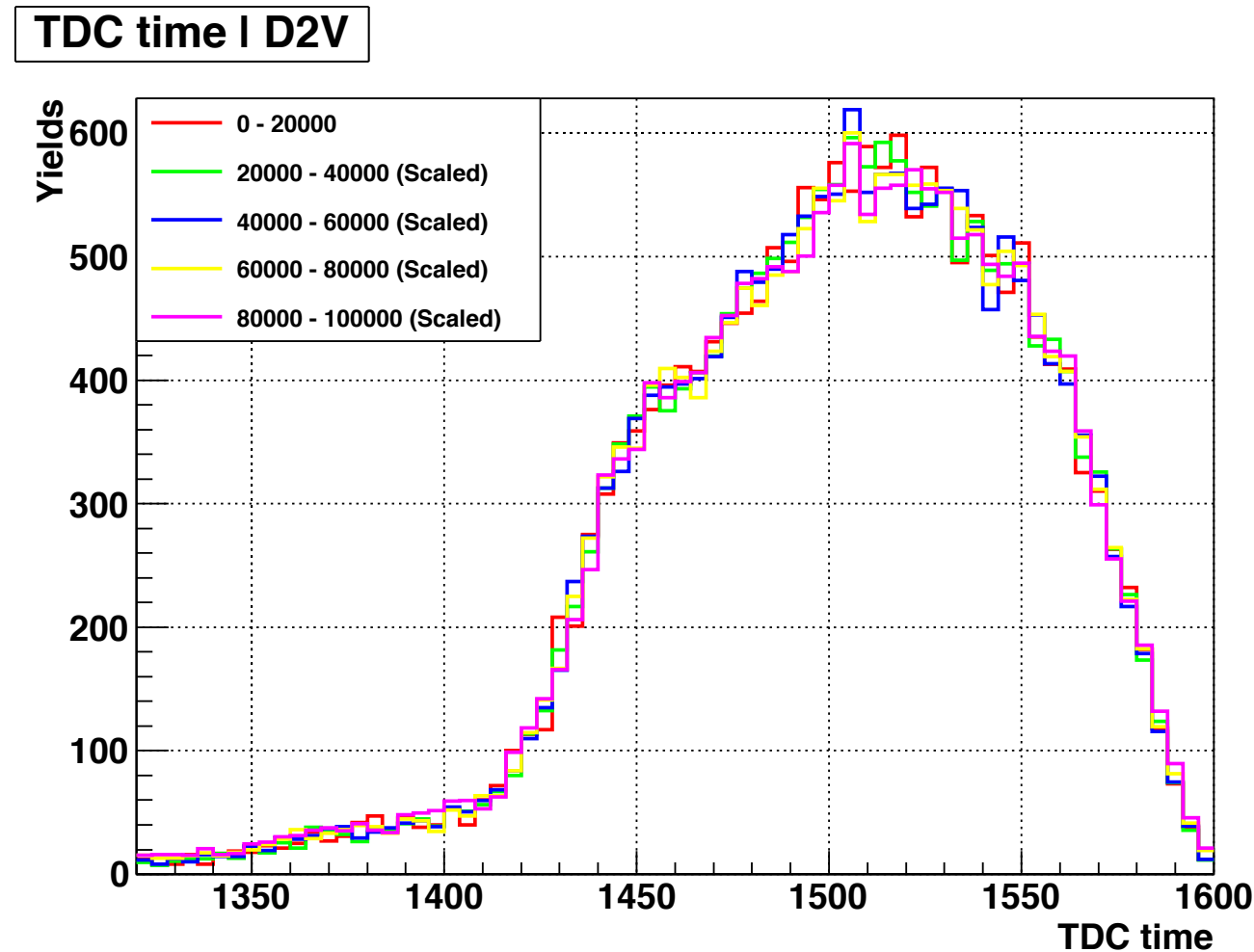


- z-axis: efficiency
- efficiency is low at edge and high intensity
- What makes the drop of chamber efficiency at high intensity?

Possible Causes of Efficiency Drop

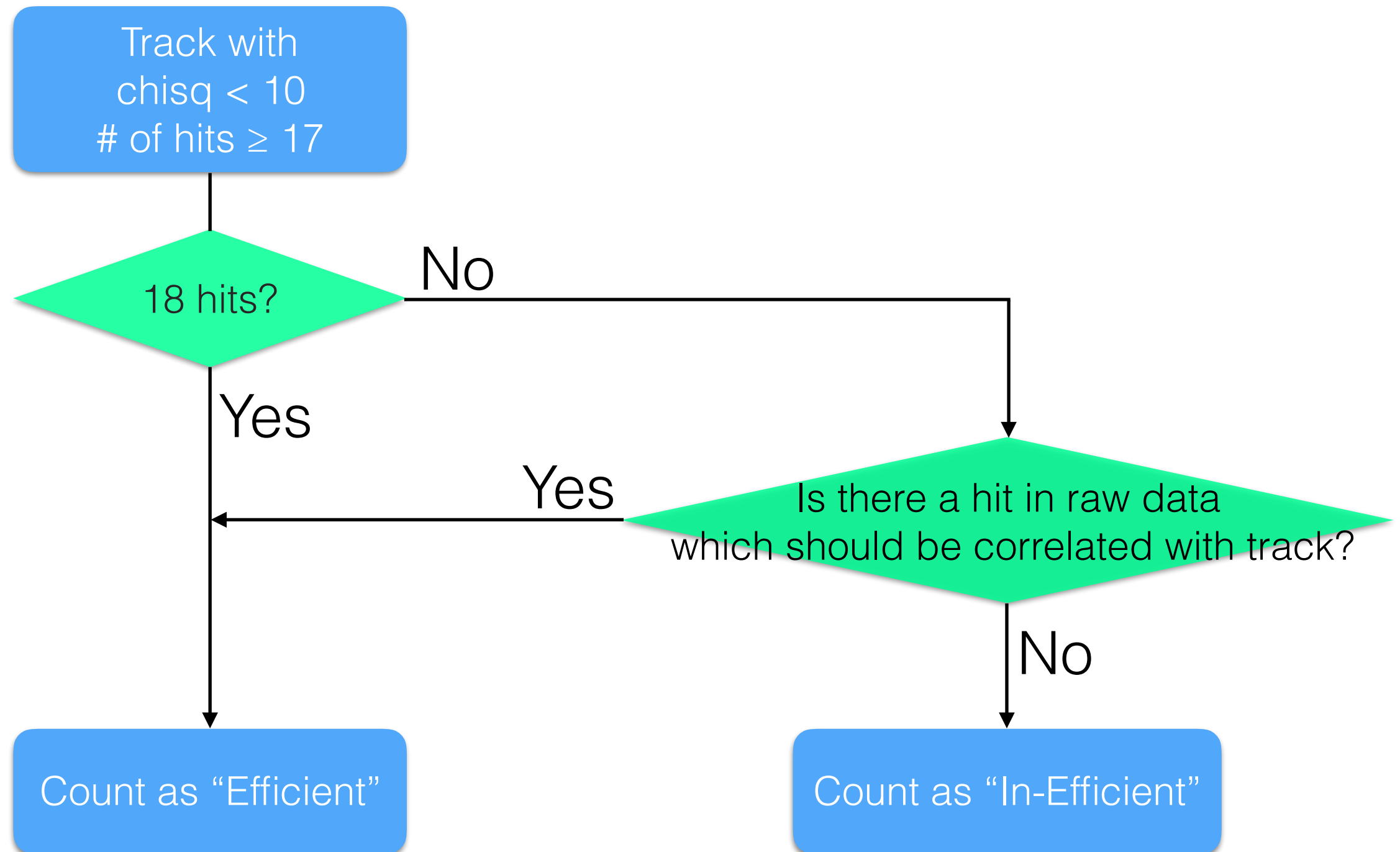
- Rate tolerance of readout
- Gas gain drop
- Rate dependence of RT-curve
- Hit removal
 - after-pulse removal
 - cluster removal
 - hit at cell edge (cluster size: 2)
 - electric noise (cluster size: 2 (only D3p))
 - electric noise (cluster size: 3 or more (all the planes))
 - delta-ray (cluster size: 3 or more)

Rate Dependence of RT-curve



- If there is rate dependence of RT-curve, the TDC distribution changes by beam intensity
- TDC distributions of 5 different beam intensity are completely the same
→ RT-curve is independent from beam intensity

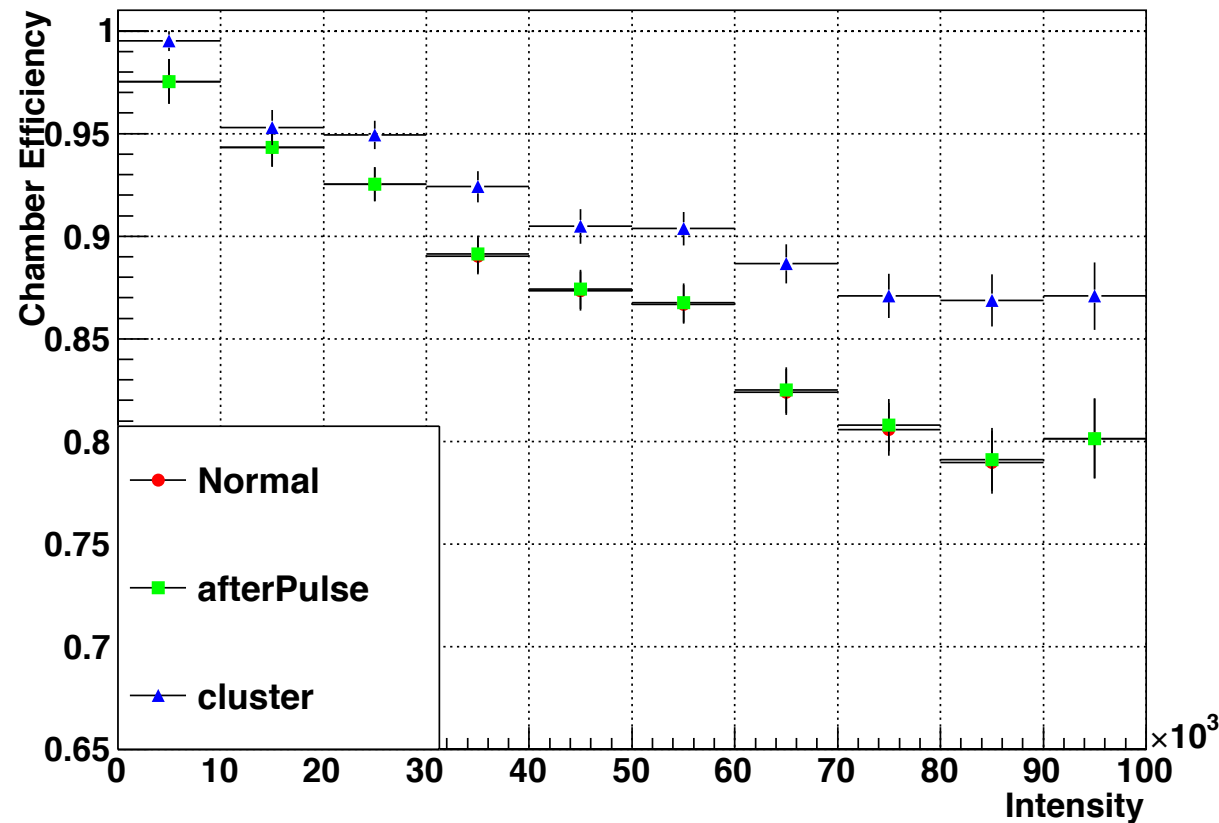
Checking the effects of hit removal



- using raw data, check if there is a hit which should be correlated with track and be removed by hit removal

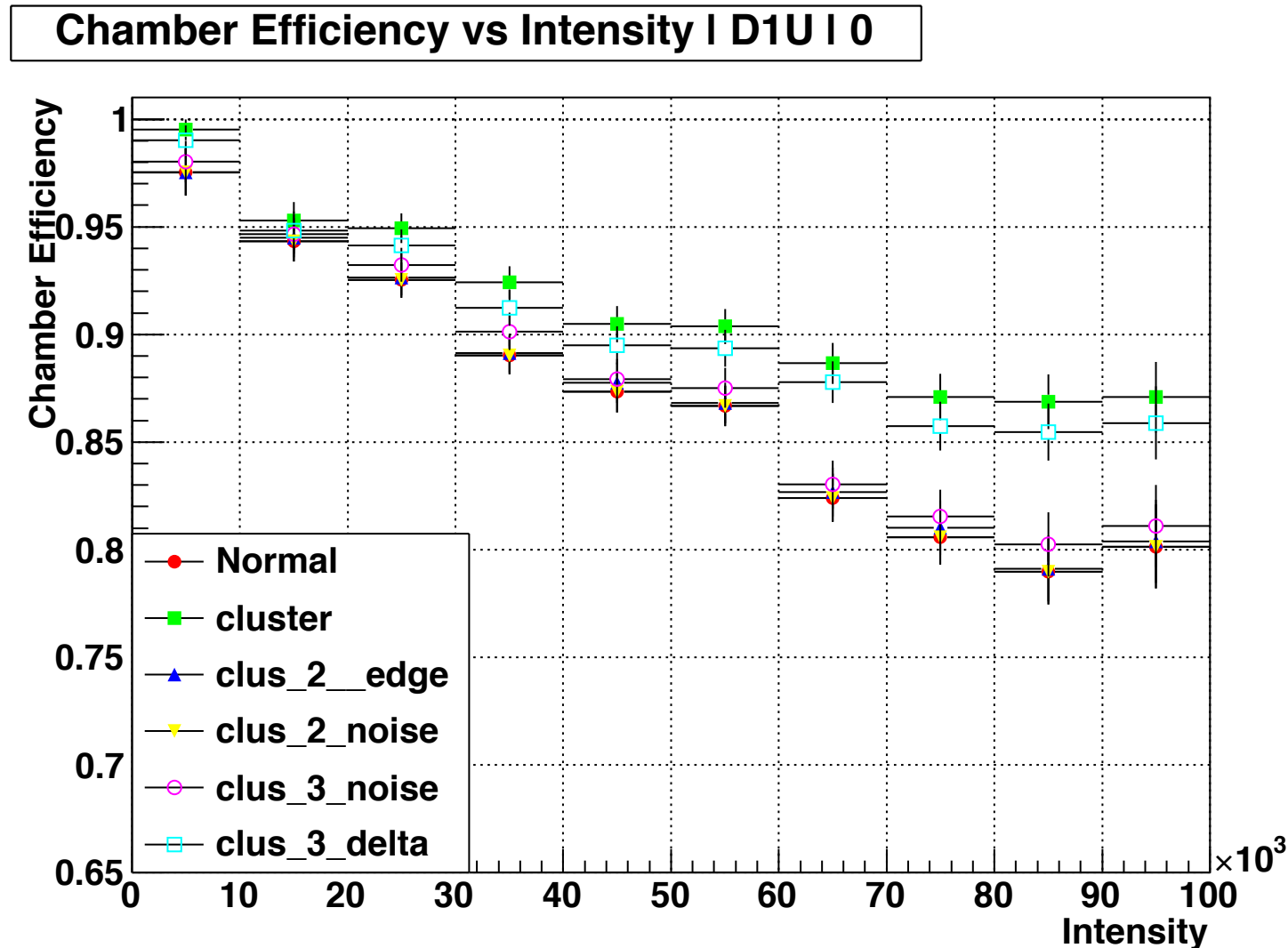
Checking the effects of hit removal

Chamber Efficiency vs Intensity | D1U | 0



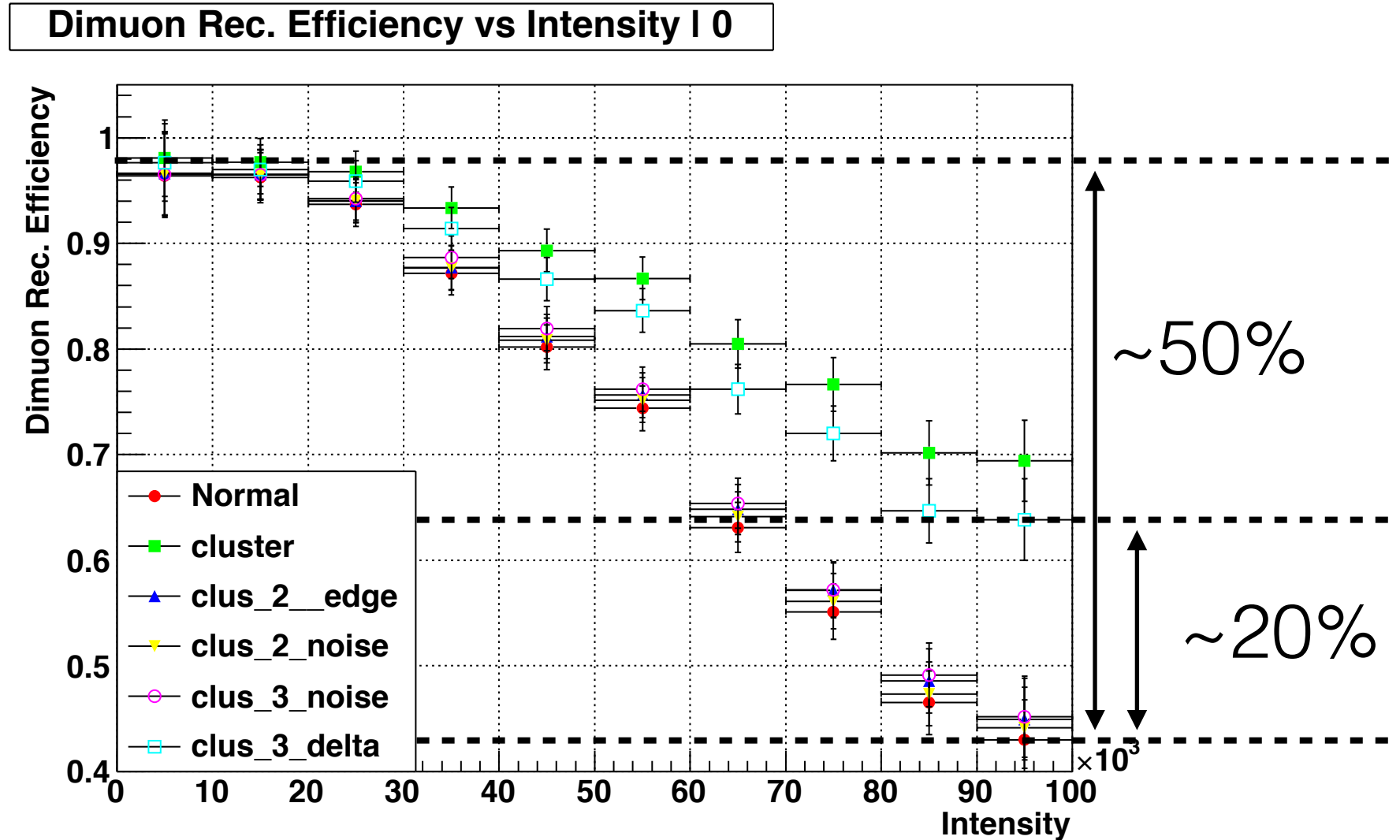
- Normal: chamber efficiency which is shown usually
- afterPulse: that without the effect of after-pulse removal
- cluster: that without the effect of cluster removal
- red points are overlapped with green points
 - the effect of after-pulse removal is really small
- blue points are much higher than the others
 - cluster removal drops chamber efficiency

Which cluster removal?



- clus_3_delta mostly affects the chamber efficiency drop
 - delta-ray removal
- tracking speed gets slower without this cut compared to that with this cut, but not too slow

Effects on the Dimuon Efficiency?



- without delta-ray removal, the dimuon rec. efficiency recovers by 40% (= 20% / 50%)

Summary

- RT-curve doesn't have rate dependence
- delta-ray removal affects rate dependence mostly
 - without delta-ray removal, 40% of dimuon rec. efficiency drop recovers
 - tracking speed is acceptable without the delta-ray removal