Background from dust

In NEWS meeting @Napoli 27-28/Oct./2016

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topic

- mg scanning (demonstration) for gram scale

  Only fix sample

  MAA dev. + fix sample 2 sample

- Dust generation point(s) study

  Room dust effect

Demonstration of Scanning

Aim

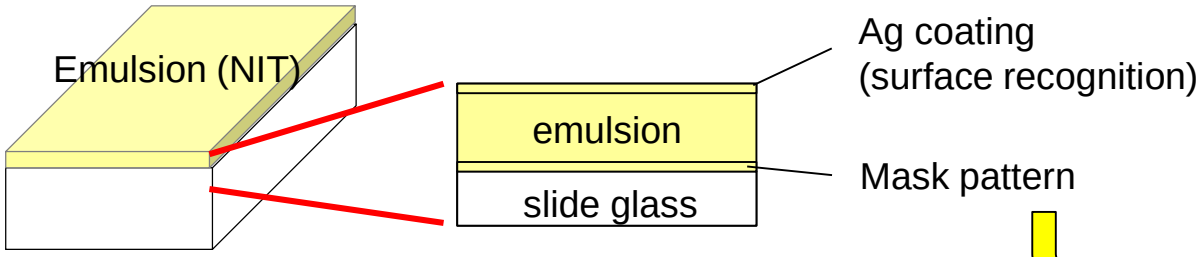
Demonstration in miri-gram scale towards a gram scale experiment

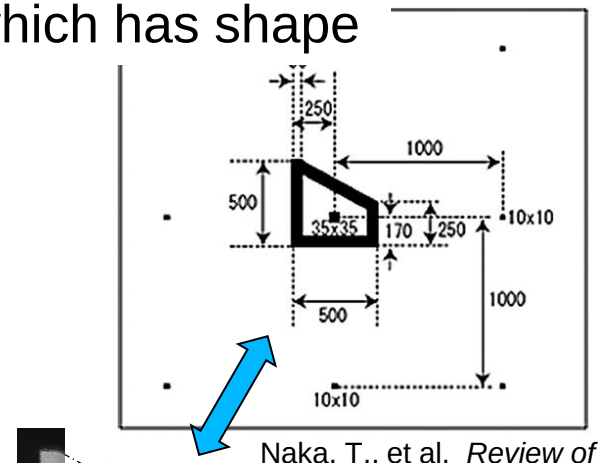
1st scan

2nd scan

(3rd scan)

- Area scan =>ellipse fit *only used ellipticity
- 3 times re-scanning for each candidates
  => Determining by the number of hits and the average ellipticity
- Detail analysis to candidates which has shape
  => Umemoto talk





Naka, T., et al. *Review of Scientific Instruments* 86.7 (2015): 073701.

mask pattern

- ~30 % efficiency @100keV.nr Carbon
- "Only fix", "MAA dev. + fix" (2 sample)

Sample information

Batch ID; FAN077f (f = filtered)

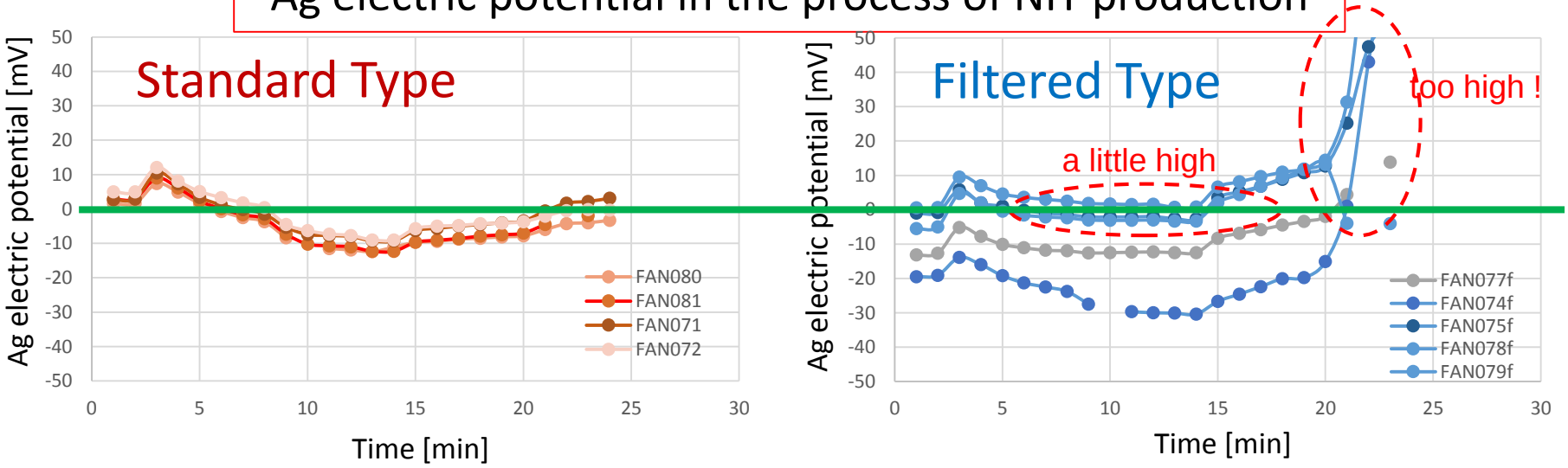
- Only fix sample => It can be study dust event
- MAA dev. + fix sample => fog effect and other

**Now, filtered NIT turning is not perfect

Fog level depend on “Ag conductivity” in production

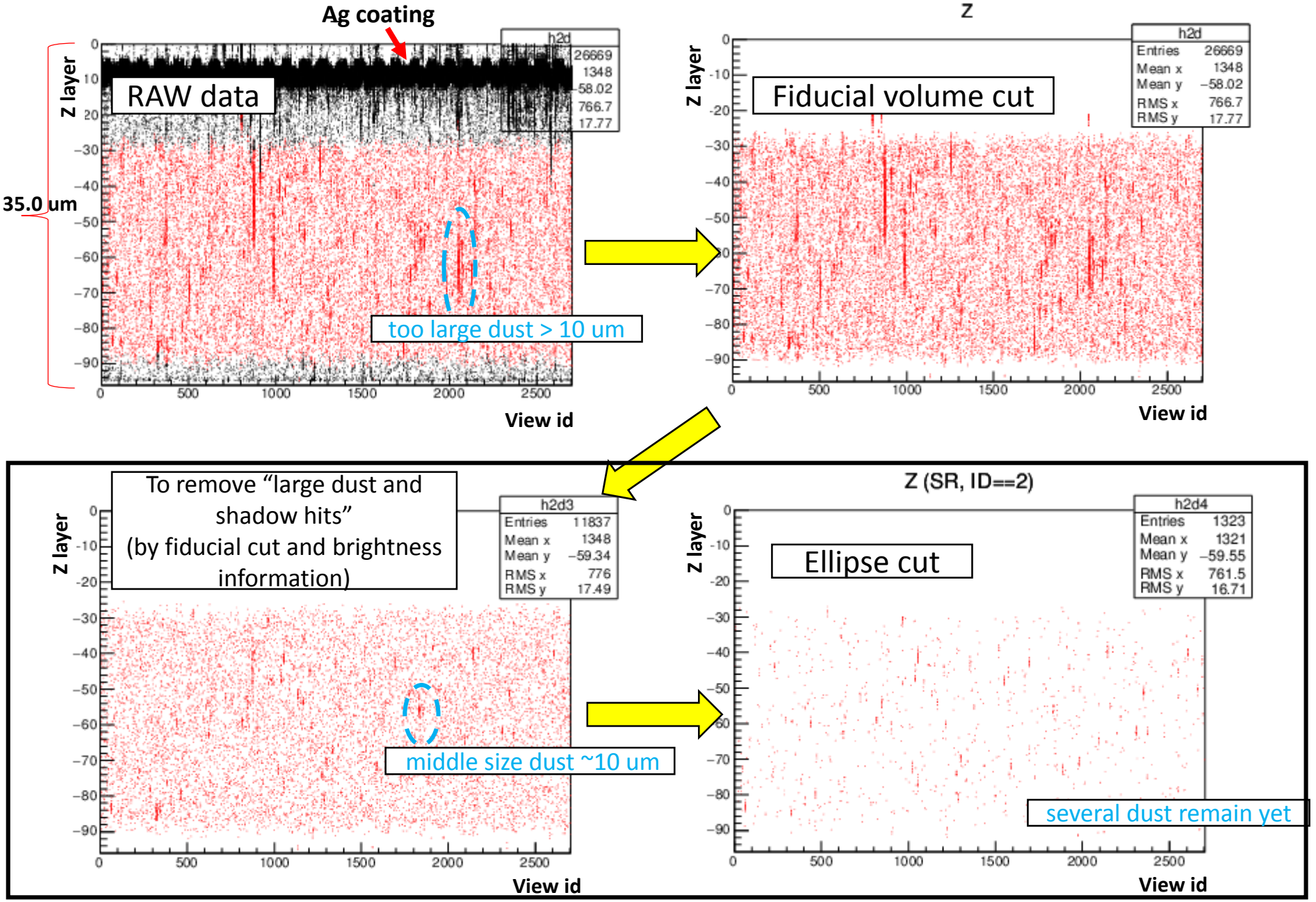
(Silver rich -> become foggy, too halogen rich -> become low sensitivity)

Ag electric potential in the process of NIT production

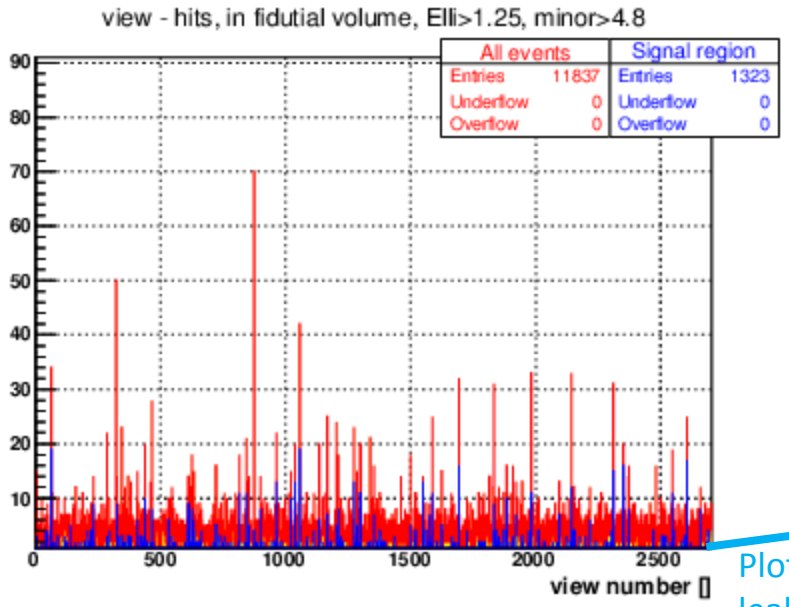


All filtered types were strange behavior.

(Only fix sample) Raw data and removal of large type dust

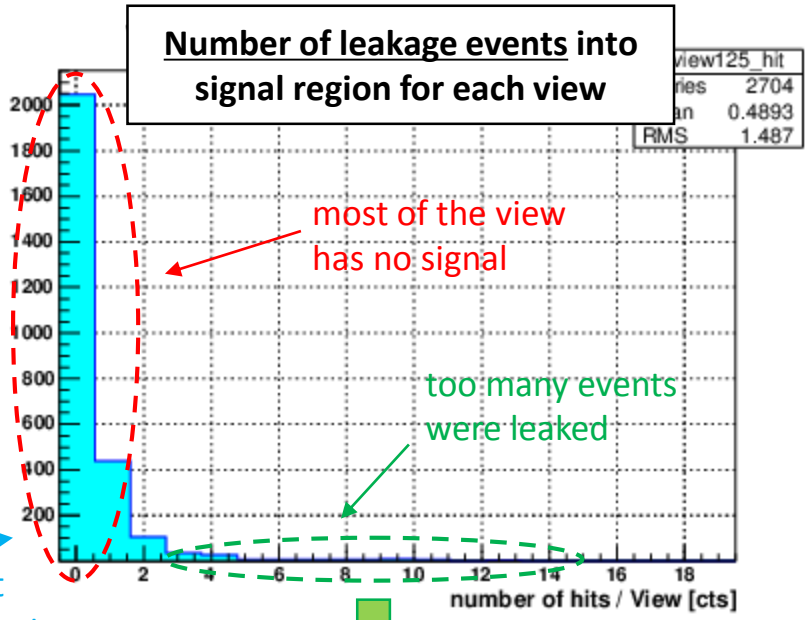


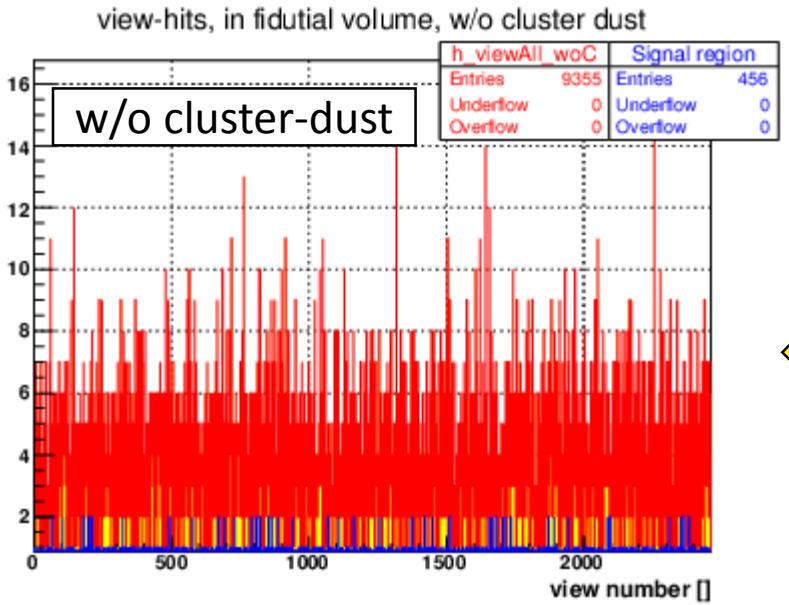
(Only fix sample) to remove cluster type dust

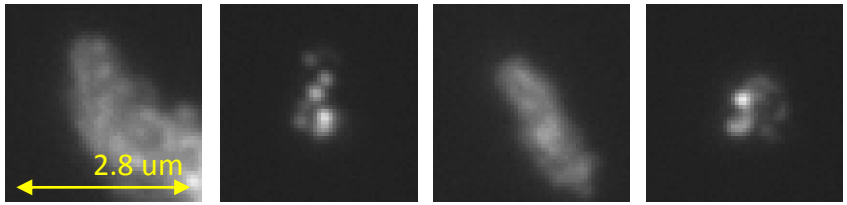


Plots about leakage events

Number of leakage events into signal region for each view





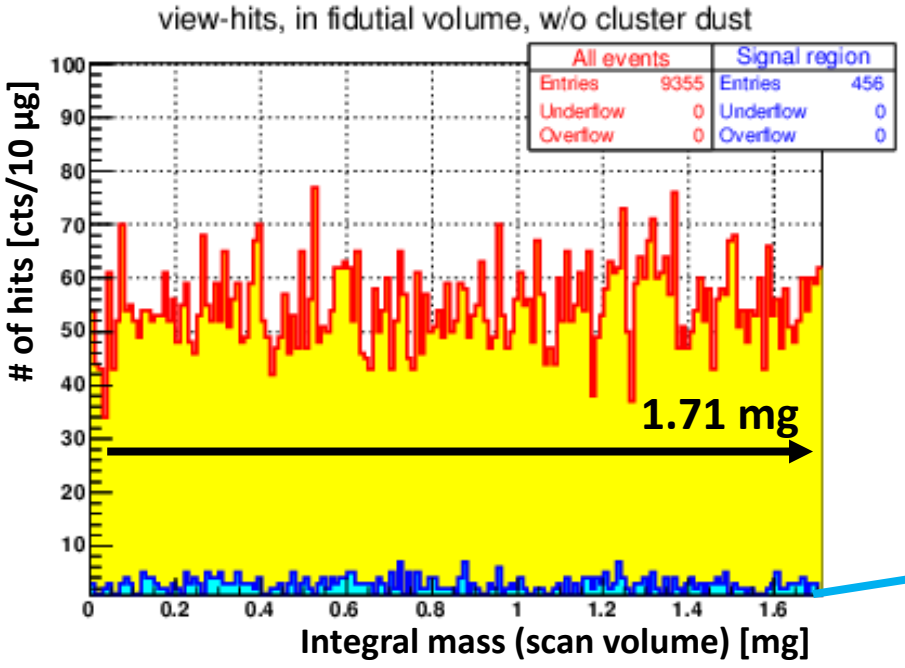


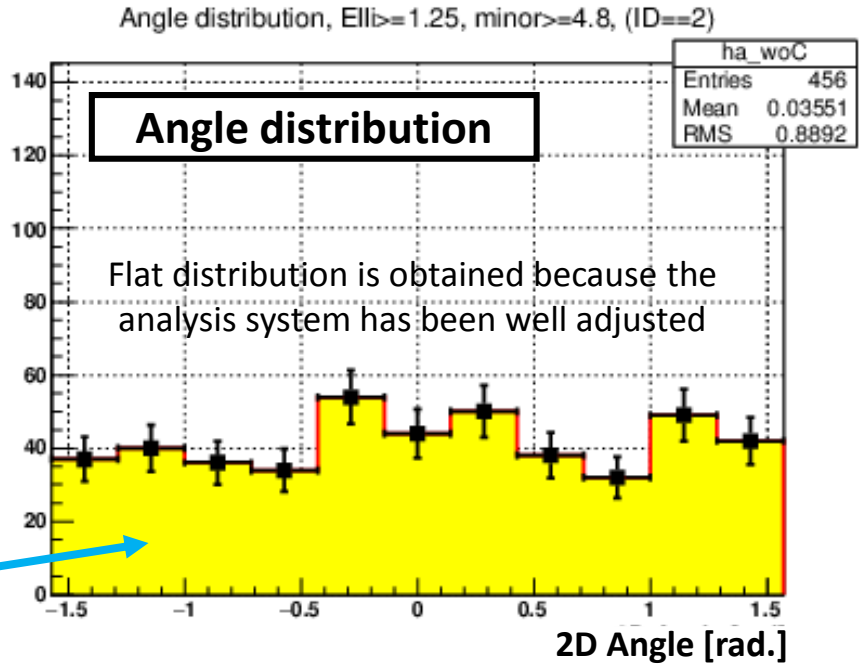
Multiple hits were occurred by cluster type dust (middle size dust)

It is easy to remove by reconstruct of cluster, because these hits have gathered in a narrow volume

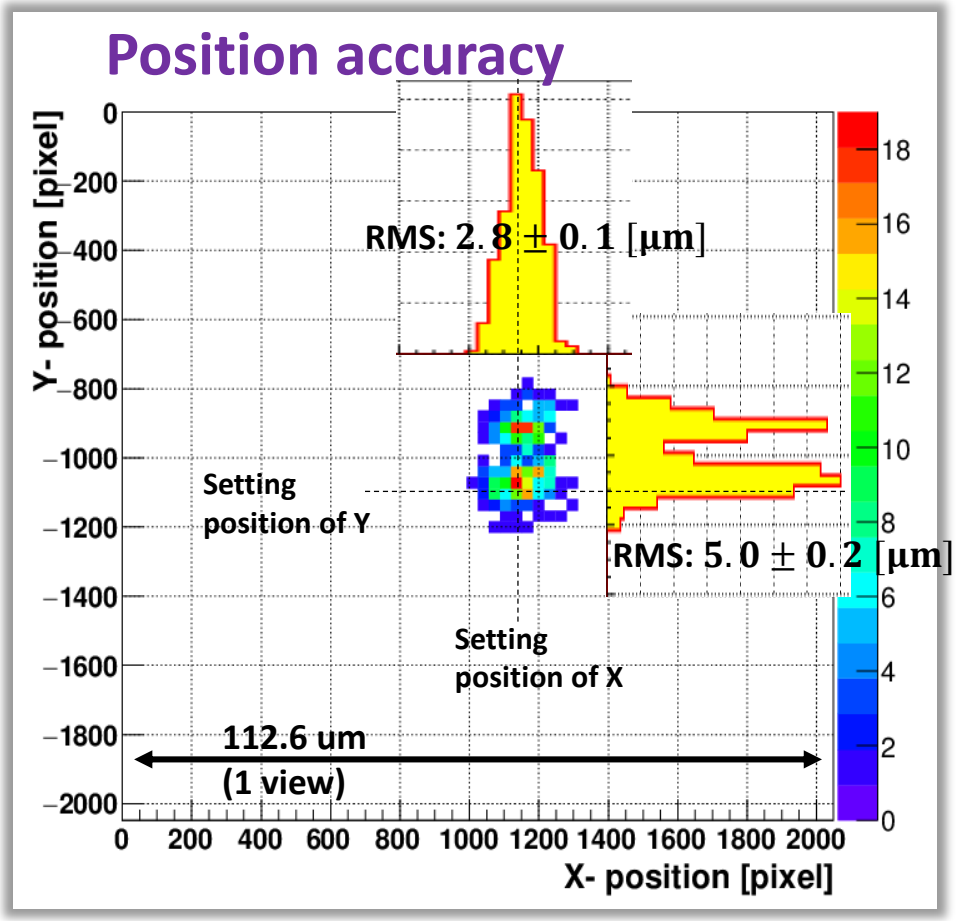
(only fix sample) 1st scanning (volume scan)

- **Scan volume:** 1.20 [mm^3] -> 6.86 [mg] /2.83 [hour]
- **after fiducial cut:** 0.30 [mm^3] -> 1.71 [mg]
  - aberration area cut: ~50 %
  - surface and bottom cut: 38 %
  - large or cluster type dust: ~19 % (total 75 % cut)
- **send to 2nd scan:** 456 [eve.] /1.71 [mg]





(Only fix sample) 2nd scan (scanned 3 times for each candidates)

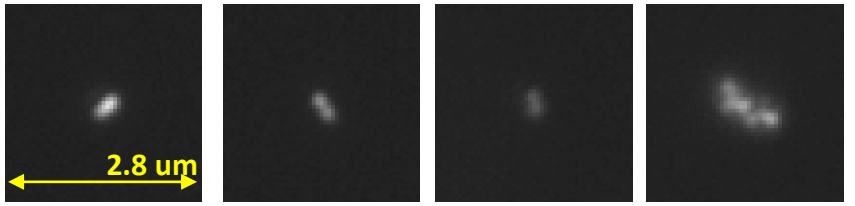


- **Accuracy of position (maximum):**
  - X: ± 8.3 [μm]
  - Y: $+5.5, -19.3$ [μm]

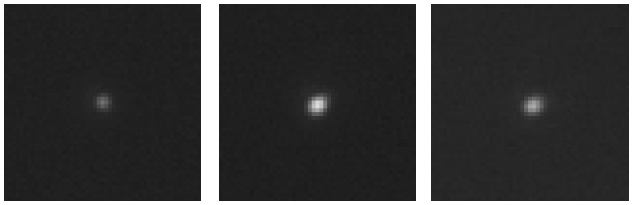
Classification of 2nd scanning result

All event: 456 [eve.] / 1.71 [mg]

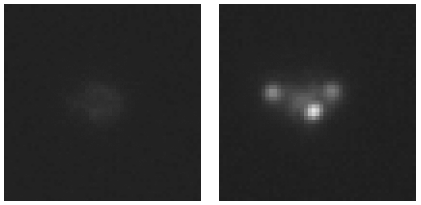
- **Track-like events: 319 [eve.] (70 %)**



- **Fog-like events: 108 [eve.] (24 %)**

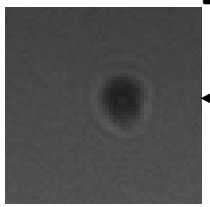


- **Remained cluster type dust: 12 [eve.] (3 %)**



(hits ≠ 3)

- **Other: 17 [eve.] (4 %)**



Summary of scanning about "only fix" sample

1st scan

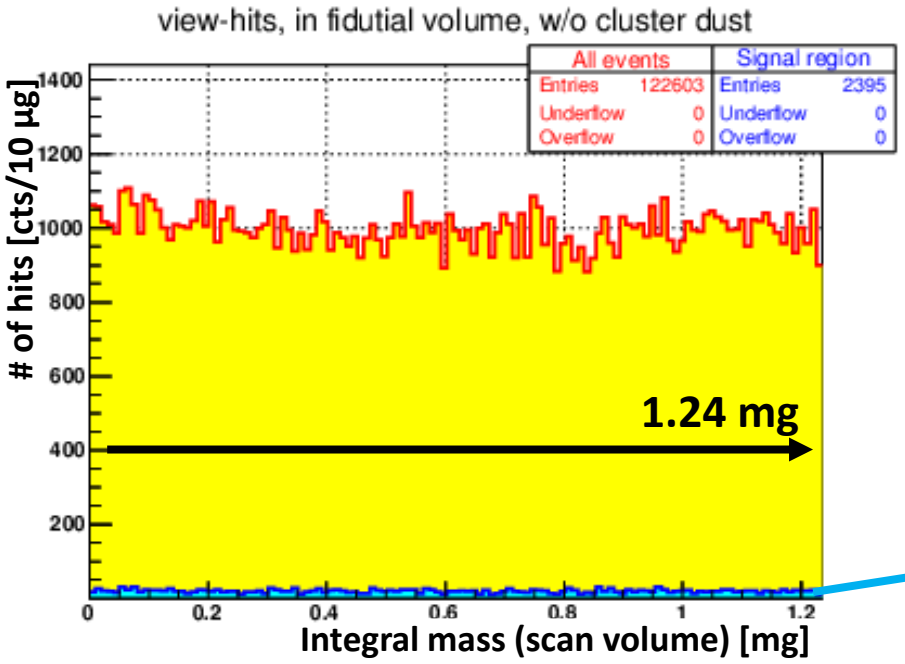
- Scan volume: 1.20 [mm^3] -> 6.86 [mg]
- after fiducial cut: 0.30 [mm^3] -> 1.71 [mg]
  - aberration area cut: ~50 %
  - surface and bottom cut: 38 %
  - large or cluster type dust: ~19 % (total 75 % cut)
- send to 2nd scan: 456 [eve.]/1.71 [mg]

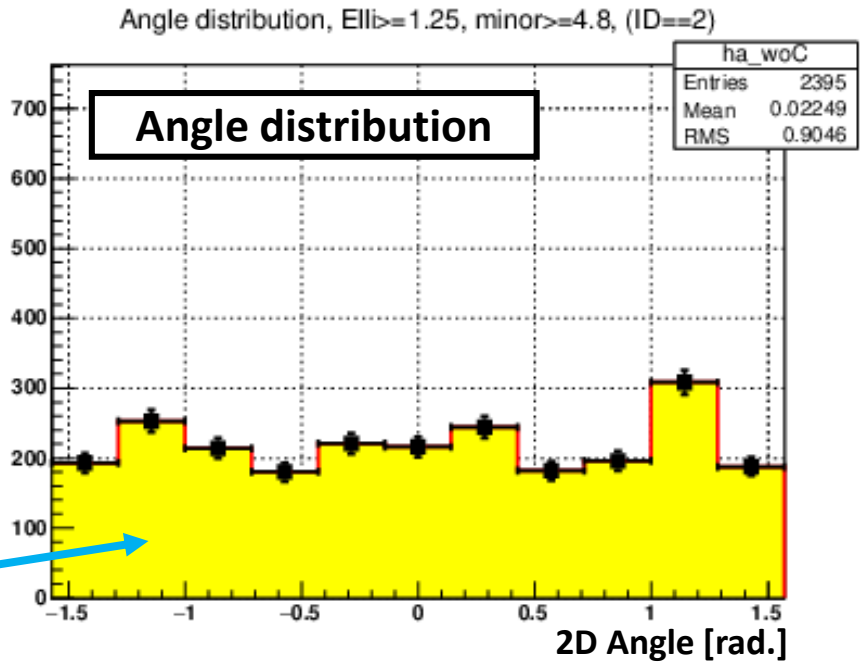
2nd scan

- # of scanning: 456 [eve.] x3 = 1368 [times]
- send to 3rd scan: 319 [eve.]/1.71 [mg]

(MAA dev. + fix sample) 1st scanning (volume scan)

- **Scan volume: 1.20 [mm^3] -> 6.86 [mg] /3.53 [hour]**
- **after fiducial cut: 0.30 [mm^3] -> 1.24 [mg]**
  - **- aberration area cut: ~50 %**
  - **- surface and bottom cut: 38 %**
  - **- large or cluster type dust: ~26 % (total 82 % cut)**
- **send to 2nd scan: 2395 [eve.] /1.24 [mg]**



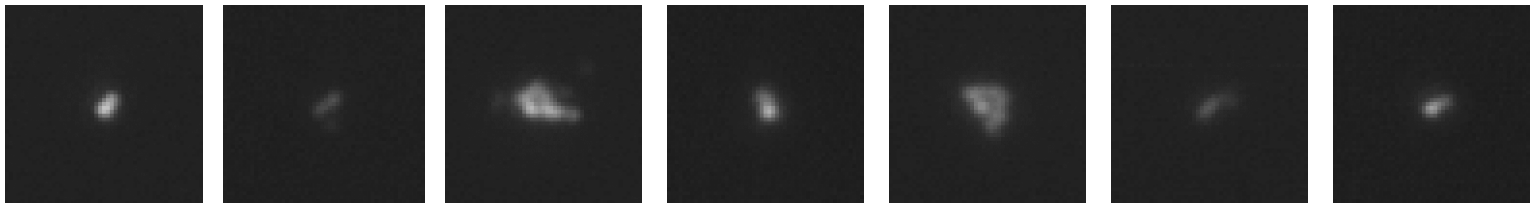


(MAA dev. + fix sample) 2nd scanning (event by event scan)

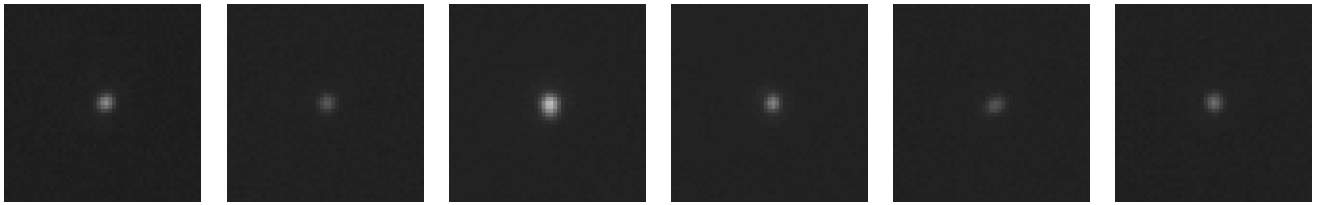
Classification of 2nd scanning result

All event: 2395 [eve.] / 1.24 [mg]

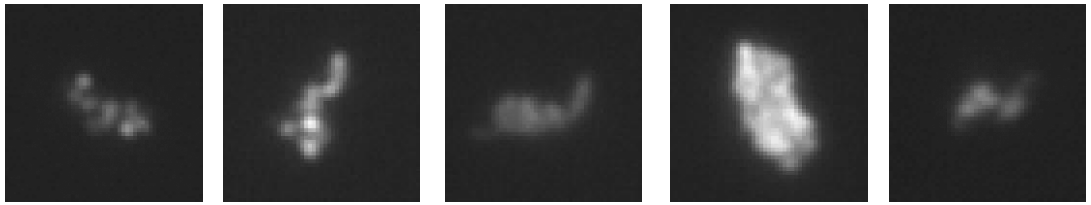
- **Track-like events: 1528 [eve.] (64 %)**



- **Fog-like events: 589 [eve.] (25 %)**



- **Remained cluster type dust: 124 [eve.] (5 %)**



- **Other: 154 [eve.] (6 %)**

  scan miss induced by camera dust

Summary of scanning about "MAA dev. + fix" sample

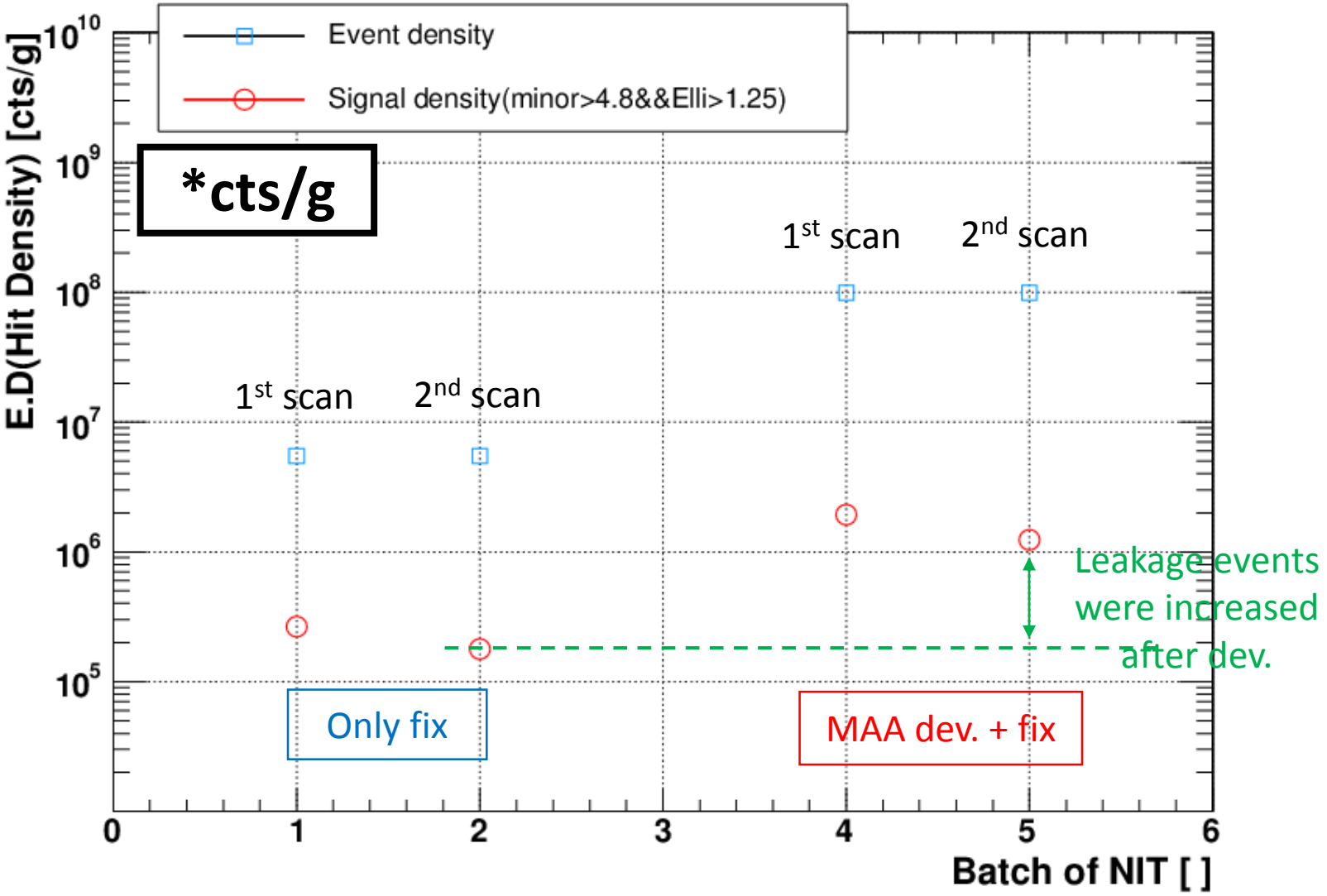
1st scan

- Scan volume: 1.20 [mm^3] -> 6.86 [mg]
- after fiducial cut: 0.22 [mm^3] -> 1.24 [mg]
  - aberration area cut: ~50 %
  - surface and bottom cut: 38 %
  - large or cluster type dust: ~26 % (total 82 % cut)
- send to 2nd scan: 2395 [eve.]/1.24 [mg]

2nd scan

- # of scanning: 2395 [eve.] x3 = 7185 [times]
- send to 3rd scan: 1528 [eve.]/1.24 [mg]

Comparison “only fix” <=> “MAA + fix” sample



Points

- # of fog events also increased after development.

  => Ag electric potential turning and improvement of development

- Leakage events into signal region were also increased after development.

  => The search for the cause

  => filament control by development

- At least, half of leakage events looks like **dummy events (not track like)**

  => it needs **other parameter** in 1st scanning

- Dust problem and reduce leakage events

  => study of **3rd scanning**

  and **reduction of existence**

Dust generation point(s) search

- Room dust effect

Making a samples

Thermostatic bath; **~35deg.**
(Gelatin in beaker)

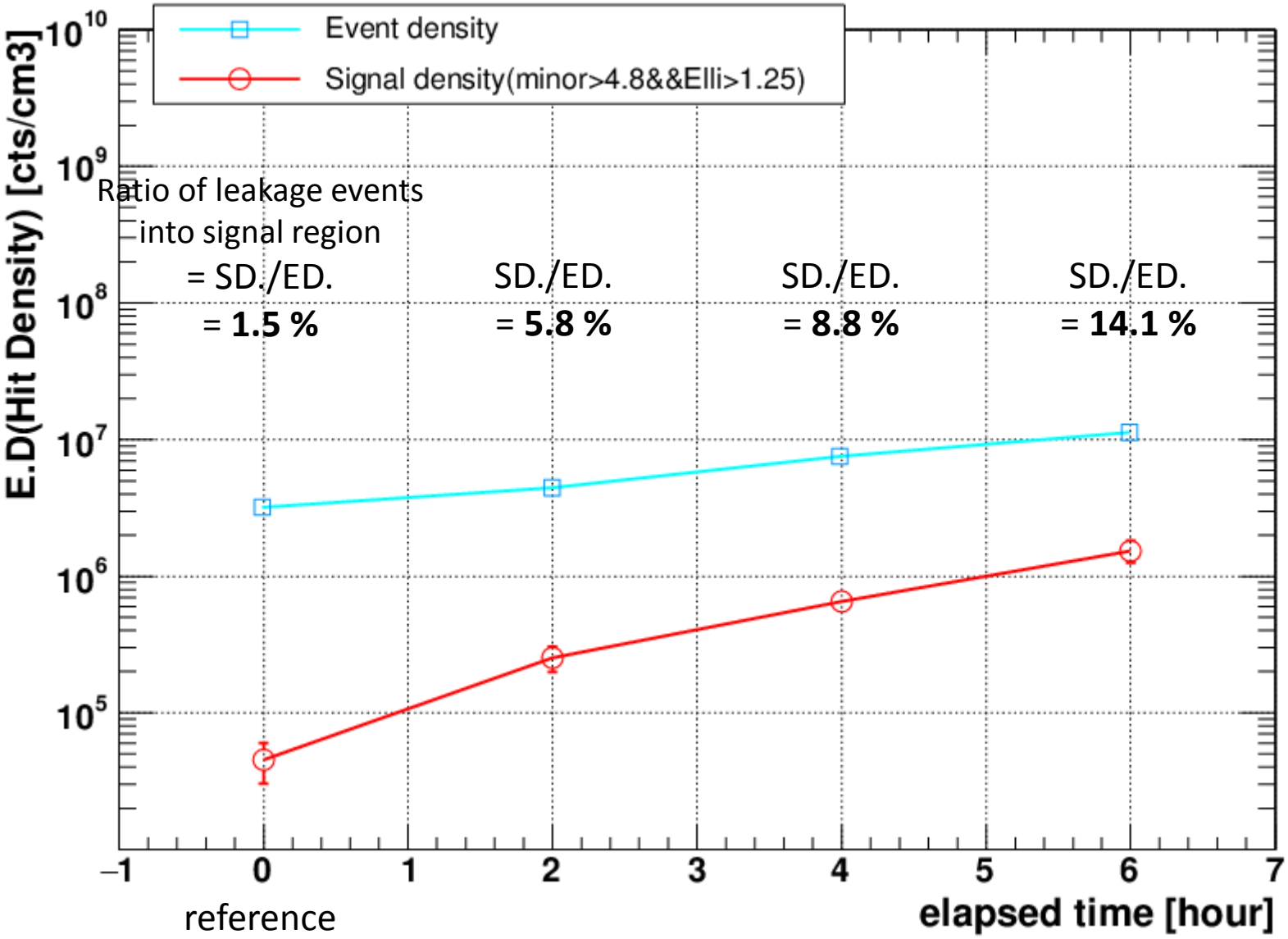
Filtered-gelatin continues to rotate in beaker **without cover**

Sample list

Elapsed time 0 hour (Reference)
2 hour
4 hour
6 hour (4 Sample)

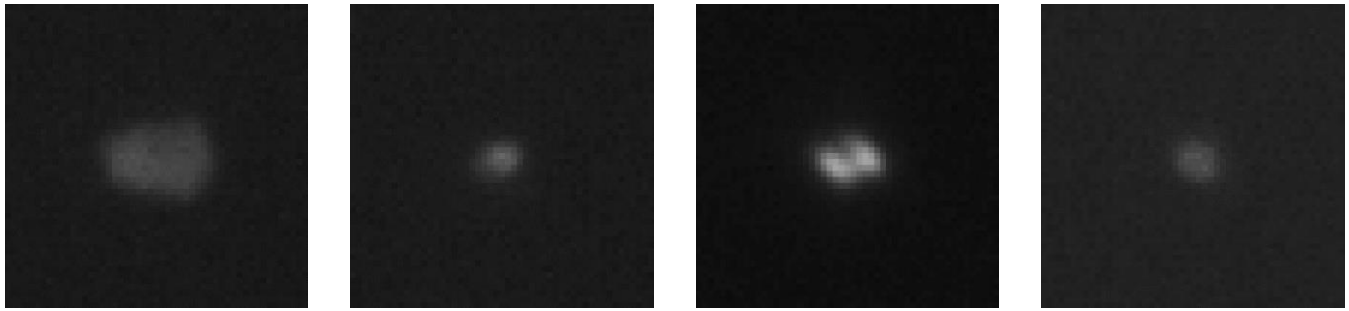
*Not production room but preparation room

Data of “Room effect” 1



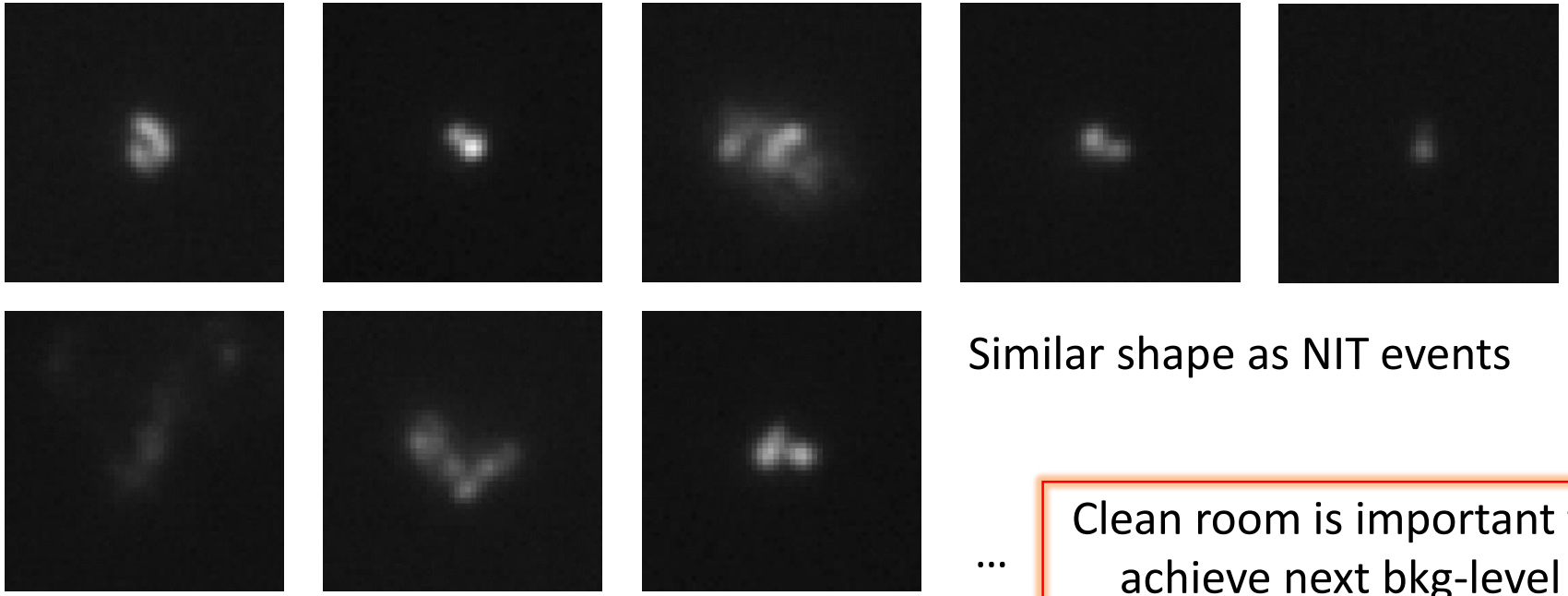
Images of signal region events

0 hour sample (Reference)



...

6 hour sample



Similar shape as NIT events

...

Clean room is important to achieve next bkg-level

points

- Room effect can be look and not spherical noise were increased

  => Clean room is needed and important.

- Also examined the kind of effect of water, but significant differences were not observed.