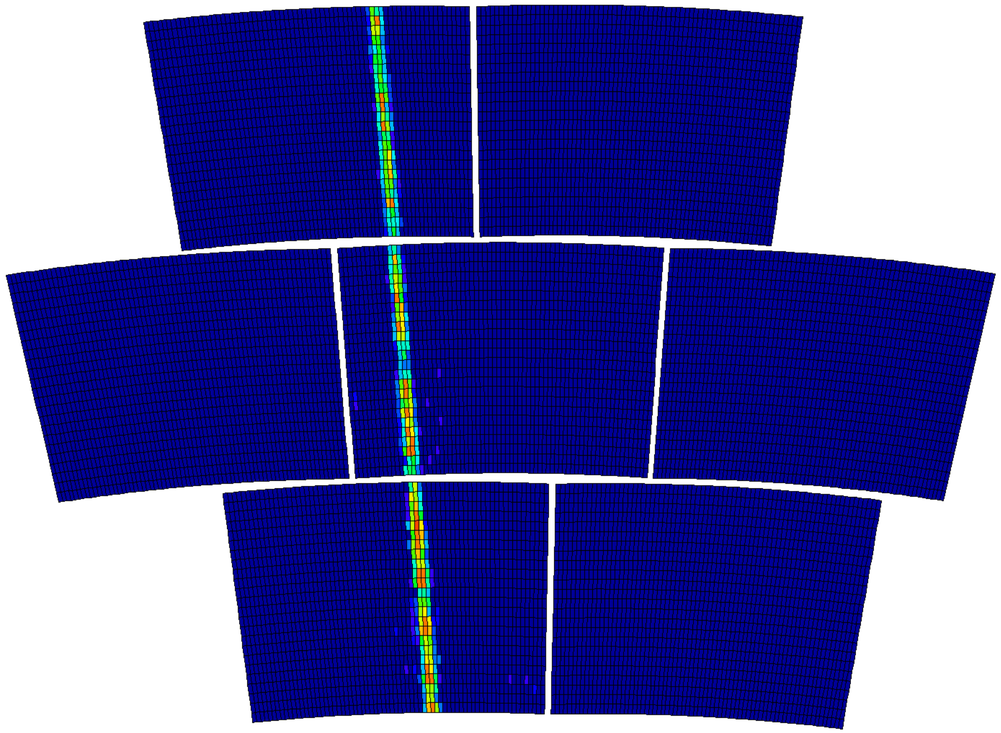
dE/dx resolution



dE/dx resolution

- **Charge correlation between rows**
  - **Pad size: width 3 mm × height 7 mm**

Row by row charge correlation
make resolution worse
(due to large deposit from δ-ray and diffusion)

charge correlation Qrow : Qrow+1

B=0T, correlation factors are
δ-ray and diffusion cover the rows

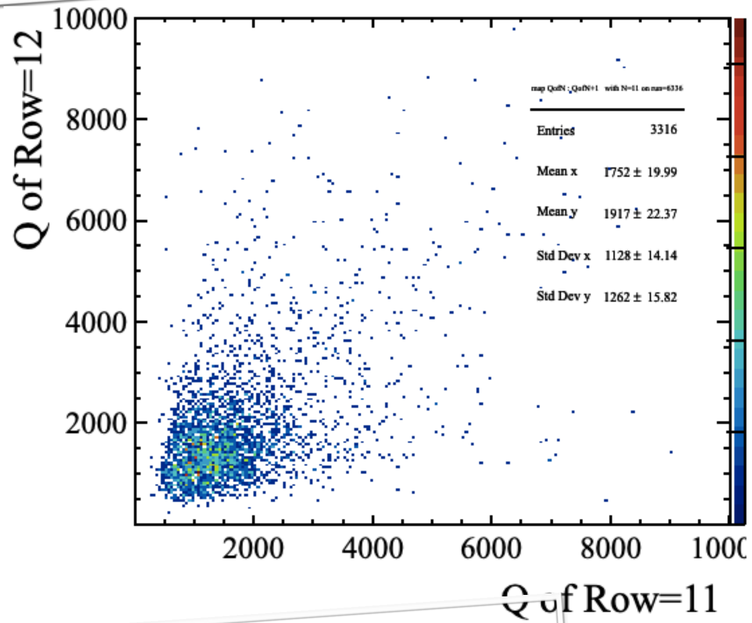
```
Z= 50 aveCorr = 0.341
Z=300 aveCorr = 0.459
Z=550 aveCorr = 0.545
```

B=1T,
small correlation …

```
Z=100 aveCorr = 0.136
Z=300 aveCorr = 0.151
Z=550 aveCorr = 0.155
```

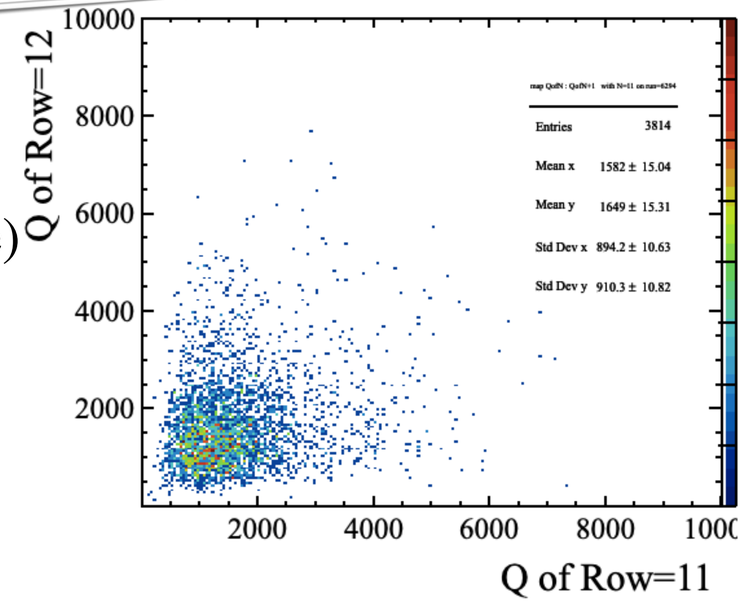
B=0T, Drift length ~ 500 mm

(example)



B=1T, Drift length ~ 500 mm

(example)



dE/dx resolution

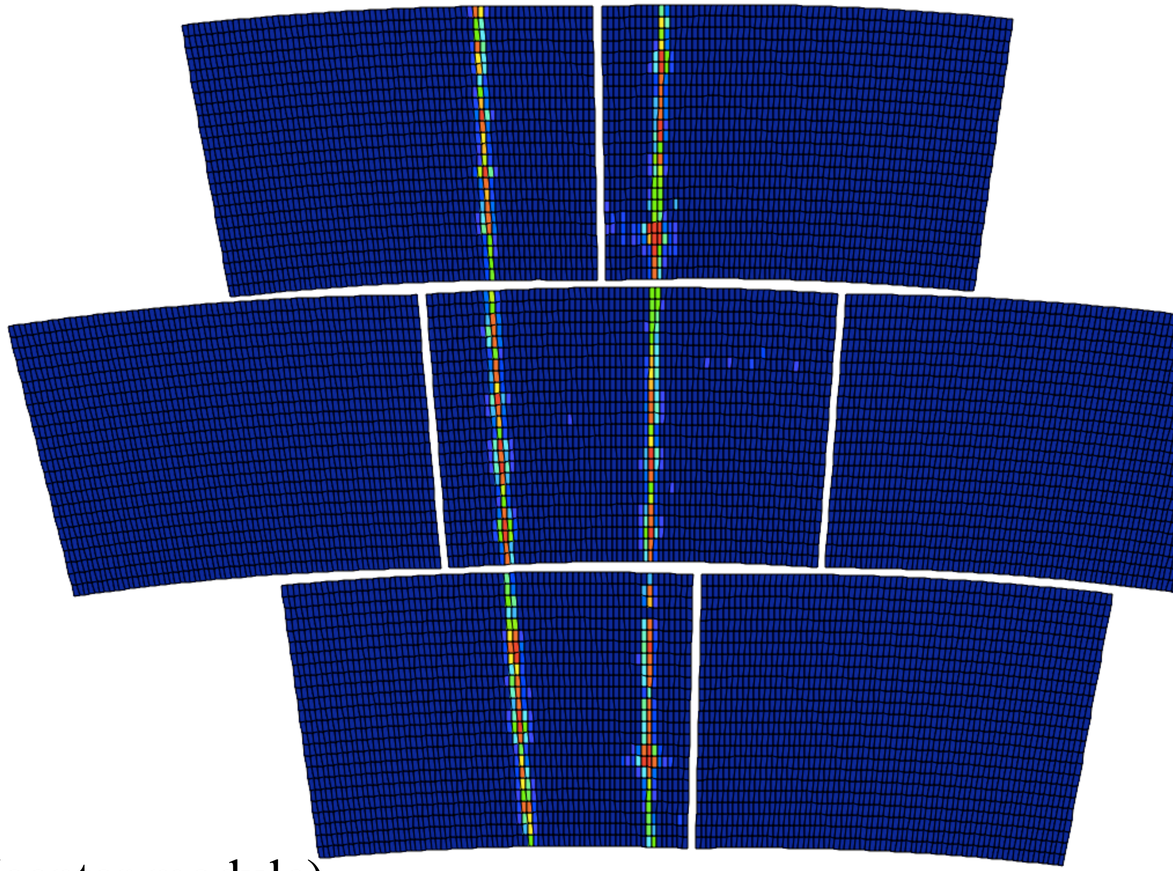
- **Truncated Mean method**

The most robust estimator

Ed= 230V/cm
Data selection :
{ #of tracks=1, **~2000 events available**

- **2 data set (drift 30 ~ 300 mm are merged)**

Look the center module.



- **Injection point difference (① & ② region)**
- **charge spread is a bit different**
- **track angles are slightly different** { ① **-3 degrees** (center module) ② **0 degrees** (center module)

According to Asian-GEM study,
$\phi = 0°$ and 20° give the same performance $4.7 \pm 0.02\%$ (220 sampling)

dE/dx resolution

- **Truncated Mean method**

  The most robust estimator

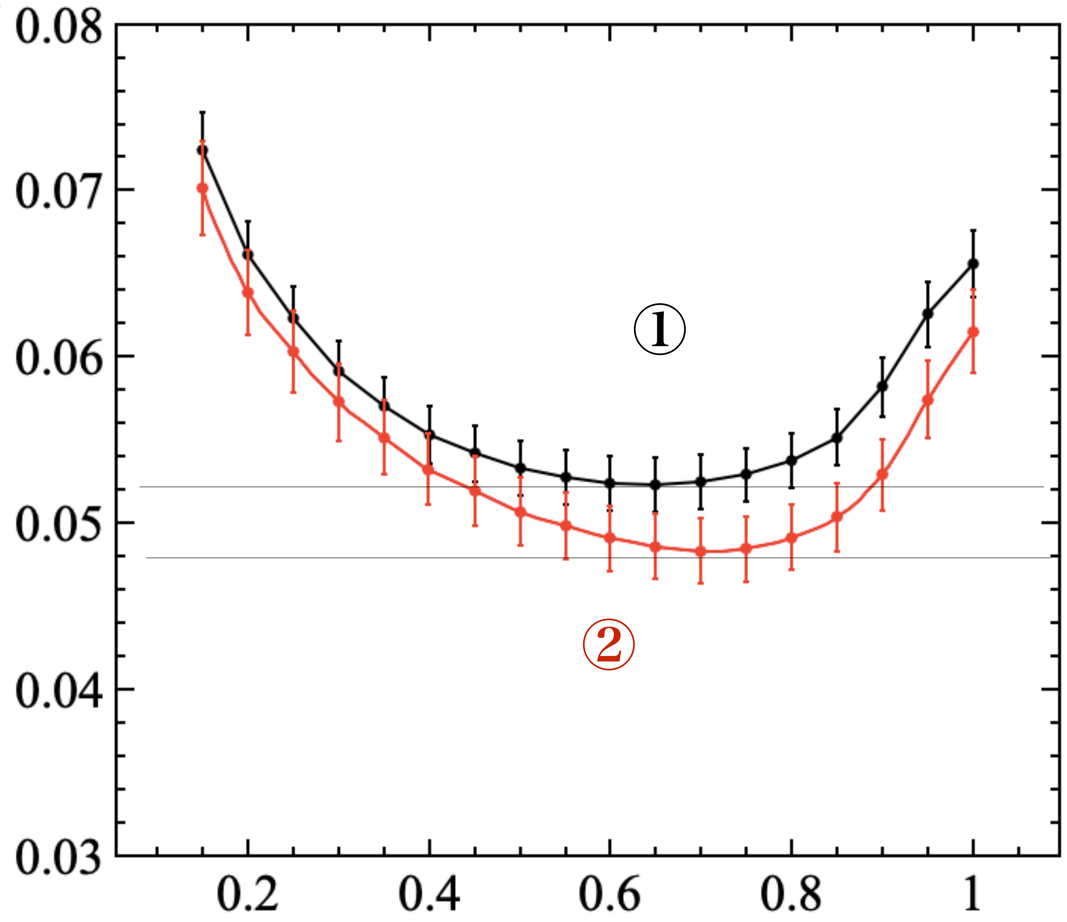
  Ed= 230V/cm
  Data selection :
  { #of tracks=1, **~2000 events available**

- **2 data set (drift 30 ~ 300 mm are merged)**

Look the center module.

- **Injection point difference (① & ② region)**
- **charge spread is a bit different**
- **track angles are slightly different** { **① -3 degrees** (center module) / **② 0 degrees** (center module)

Look the center module.



- ① **5.2% ± 0.2%**
- ② **4.8% ± 0.2%**

stat error is large…
charge spread ?

dE/dx resolution: understanding using Simulation

- **Heed + Garfield++**

Track heed 5 GeV electron : 110 electrons / cm

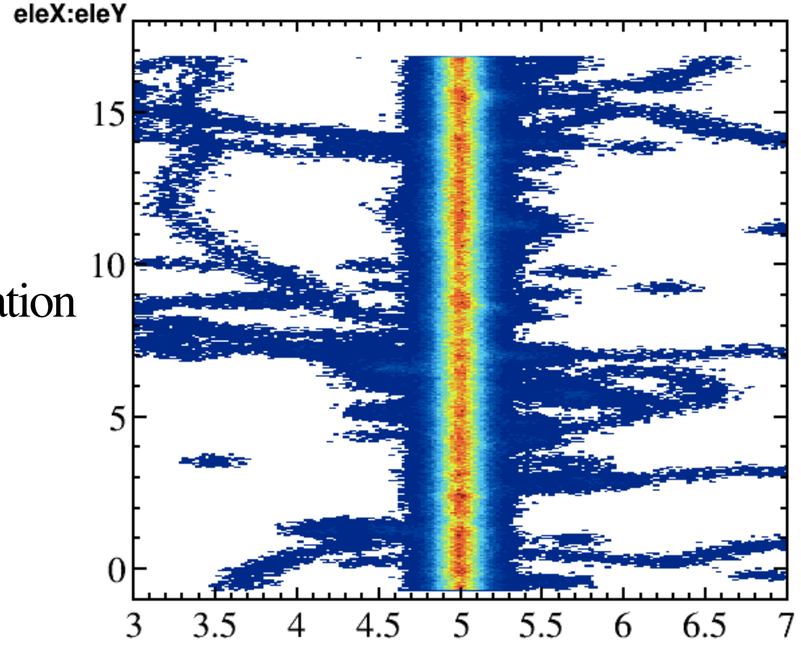
Drift distance 100 mm

AvalancheMicroscopic (under T2K gas)

Gas amplification : Polya function

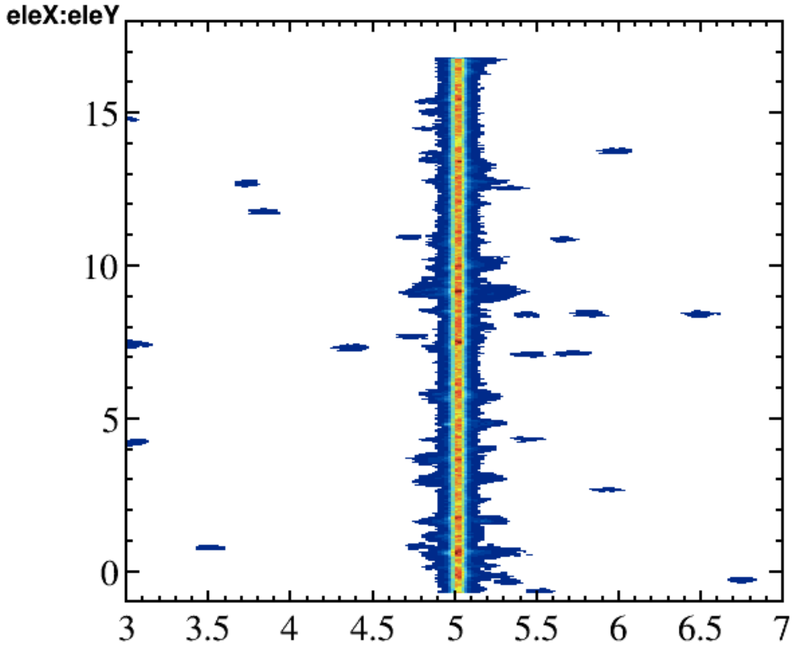
<gain> = 1000, f = 0.7

Accumulation of tracks B=0



- **pad-height is set to 7 mm**

B=1



B=0T, correlation factors is

Z= 100 aveCorre = 0.33 , similar with data

B=1T, correlation factors is

Z= 100 aveCorre = 0.12 , similar with data

dE/dx resolution: understanding using Simulation

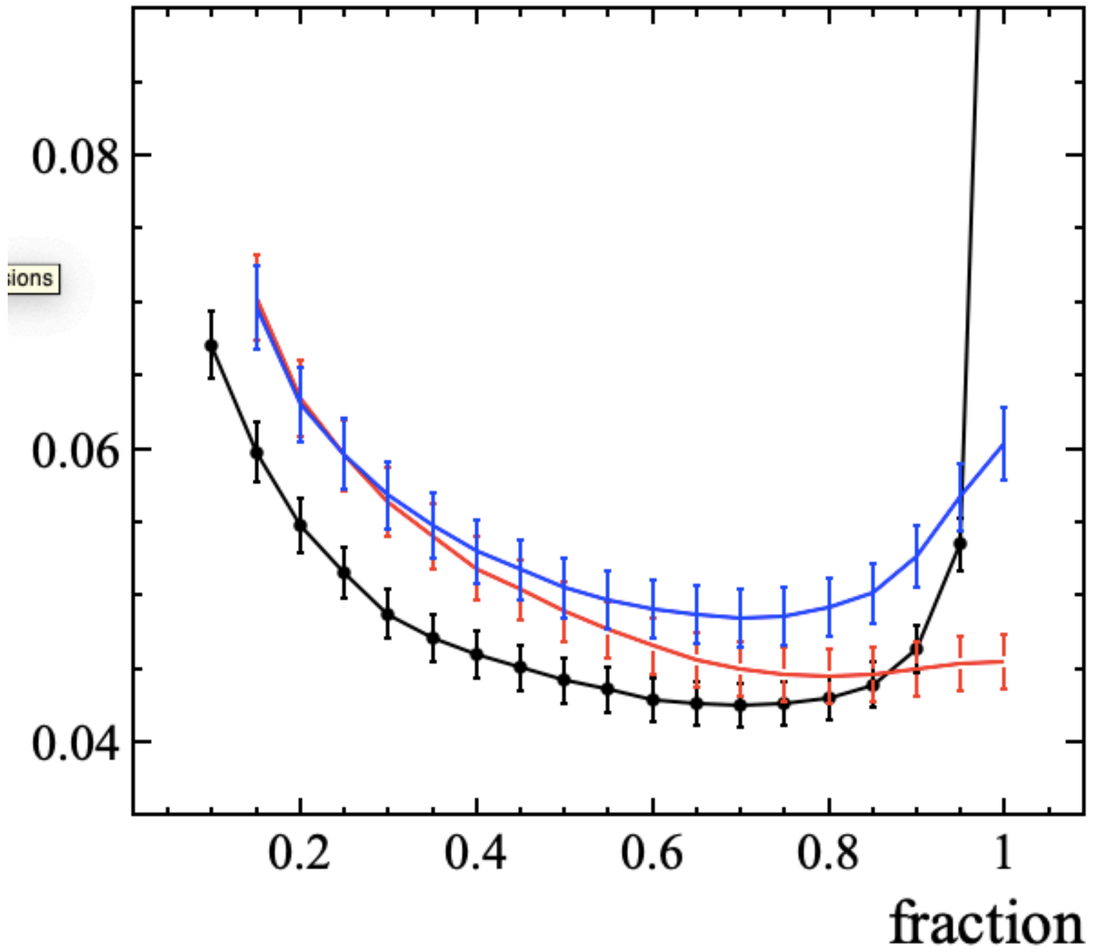
- **Magnetic field 1T with Ed=230V/cm**
  24 pad rows with 7mm pad-height are set
  #of sampling is 170

Black: simulation ～4.3%

Blue : Data (position ②) ～4.8%
#of tracks = 1

Red : Data (position ②) ～4.5%
#of tracks = 1
Exclude hits including saturated pulses

dE/dx resolution



- If charge is properly collected without saturation, data will reach minimum of simulation
- Behavior for small fraction is still unclear what main sources are…

Summary

- dE/dx resolution with 3-module fit reaches to ~5%
- The variation depending on the position is observed
- Try to understand the behavior using the simulation,
  it is under the investigation

dE/dx resolution

- **Truncated Mean method**

  The most robust estimator

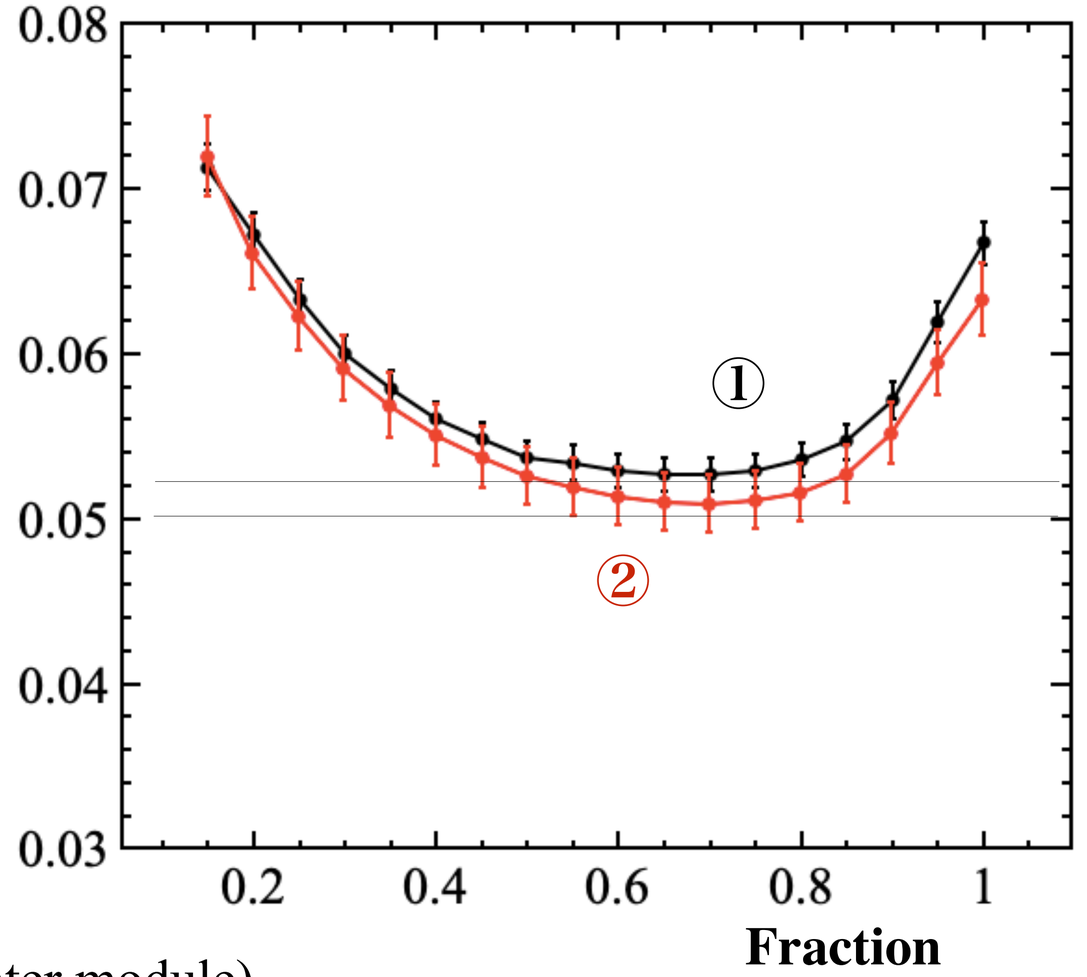
  Ed= 230V/cm
  Data selection :
  { #of tracks=1,

- **2 data set (drift 30 ~ 300 mm are merged)**

Perform 3-module fitting:

- **Injection point difference (① & ② region)**
- **charge spread is a bit different**
- **track angles are slightly different**

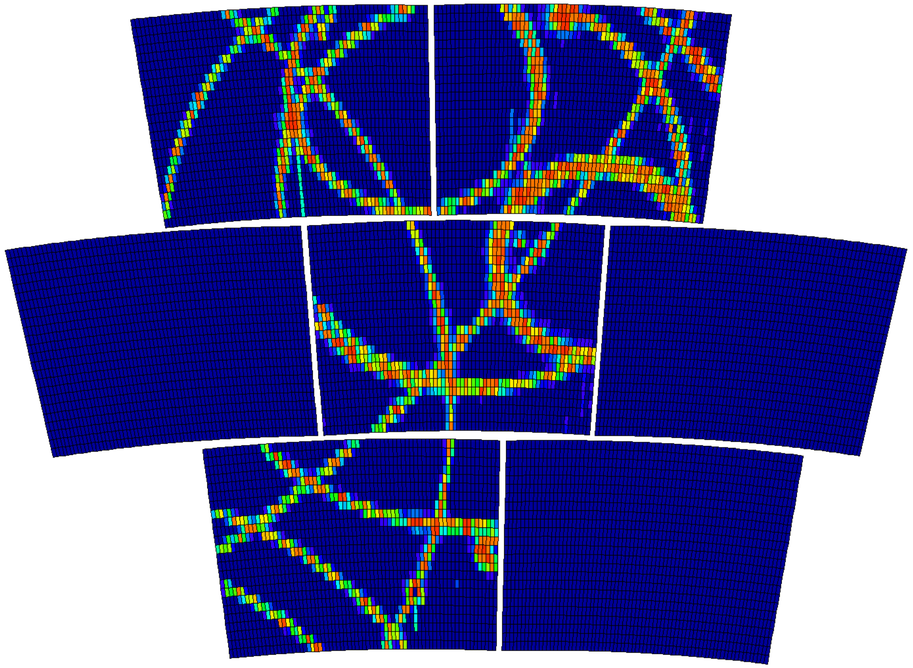
{ ① -3 degrees (center module)
② 0 degrees (center module)



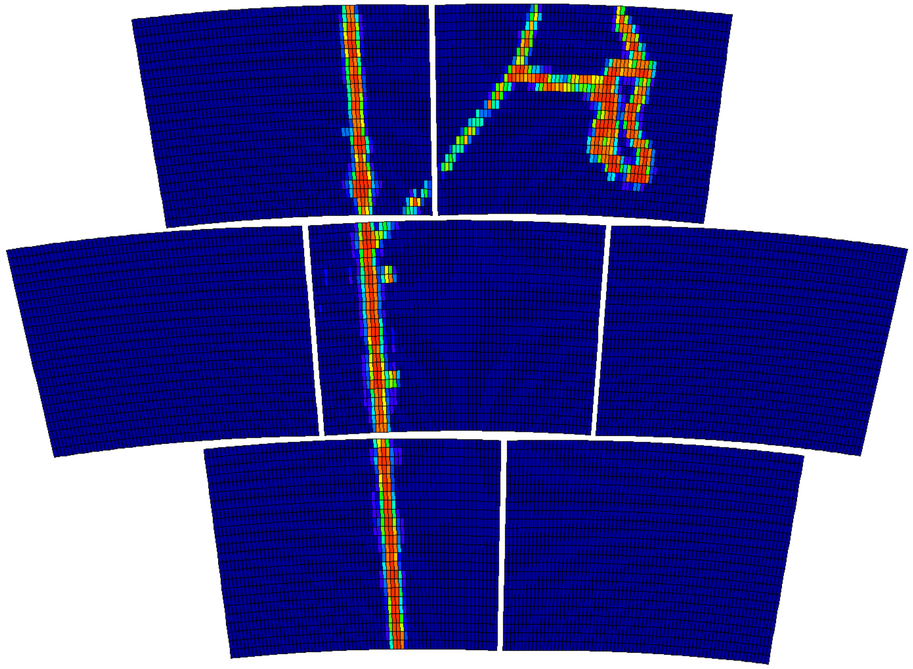
{
- **① 5.2% ± 0.1%**
- **② 5.0% ± 0.1%**

stat error is large…
charge spread ?

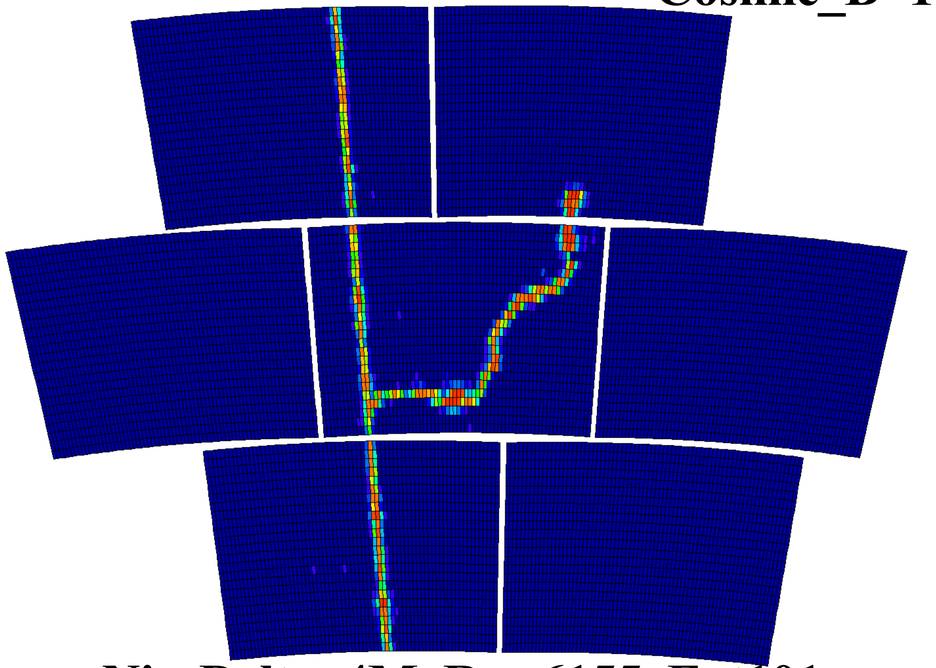
Nice events



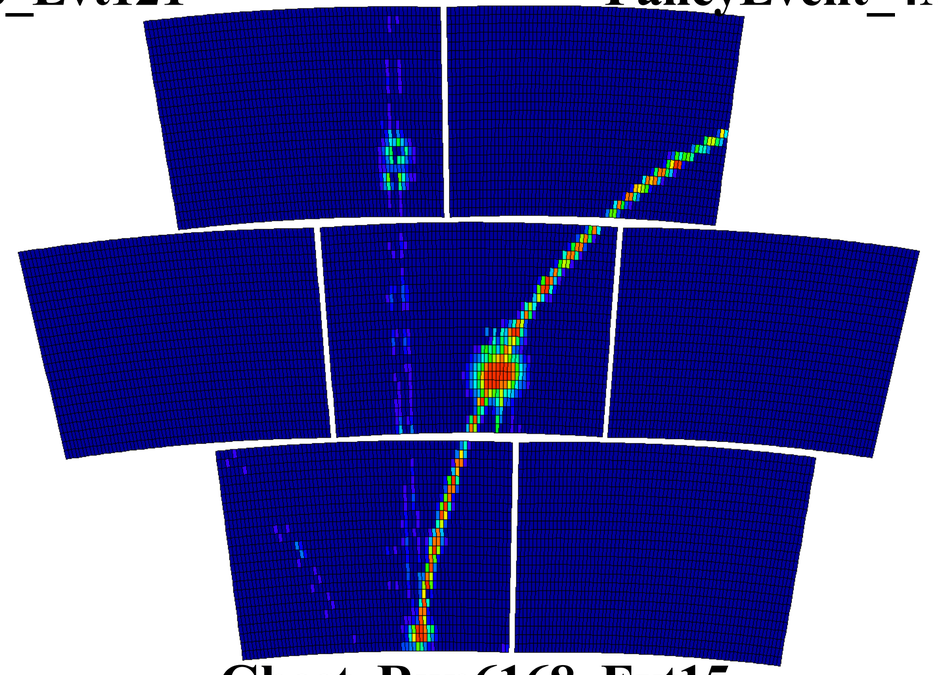
Cosmic_B=1T_Run6138_Evt121



FancyEvent_4M_Run6160_Evt46



NiceDelta_4M_Run6155_Evt101



Ghost_Run6168_Evt15