Qvector Analysis

2023/03/06 INTT MT

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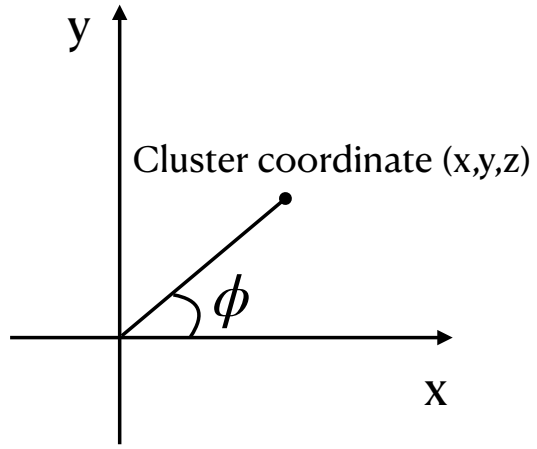
Definition of Qx, Qy and ψ

- $\phi = \arctan\left(\frac{y}{x}\right)$
- $Q_x^{obs} = \frac{\sum_i \omega_i \cos(n\phi)}{\sum_i \omega_i}$, $Q_y^{obs} = \frac{\sum_i \omega_i \sin(n\phi)}{\sum_i \omega_i}$
- $\psi = \frac{1}{n}\tan^{-1}\frac{Qx}{Qy}$



Analysis in the case of n=2, $\omega_i = 1$ using coordinates of INTT cluster

ψ is a angle between the reaction plane and the xy-plane.

The reaction plane is a plane that includes the straight line connecting the centers of the nuclei and the beam axis.

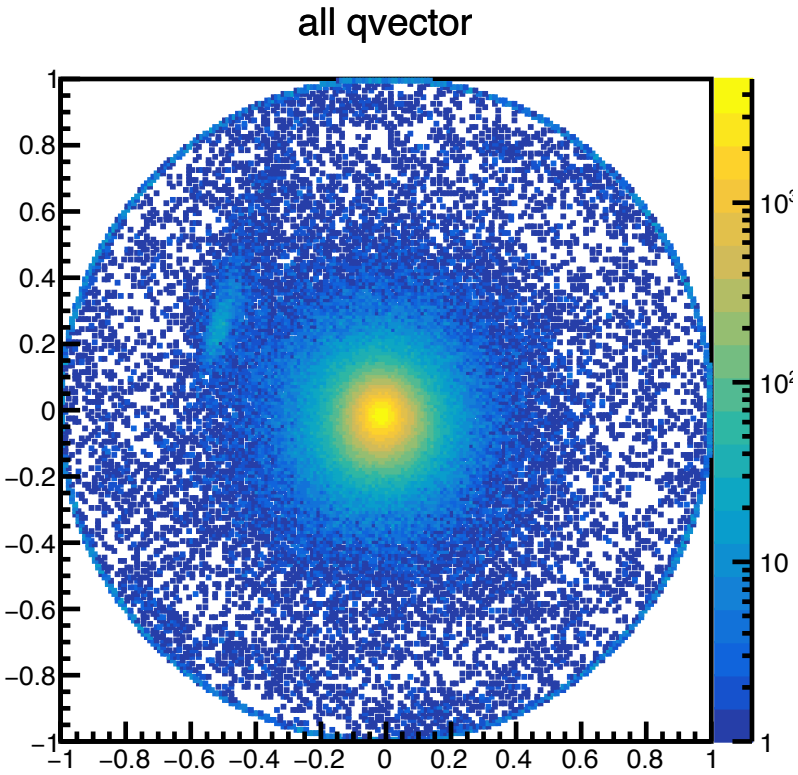
Run and Cut condition

- Run20869(Zero field run) : All events (55k events)

- INTT Hits
  - Hotdead channels
  - BCO
- INTT Clusters
  - ADC > 45

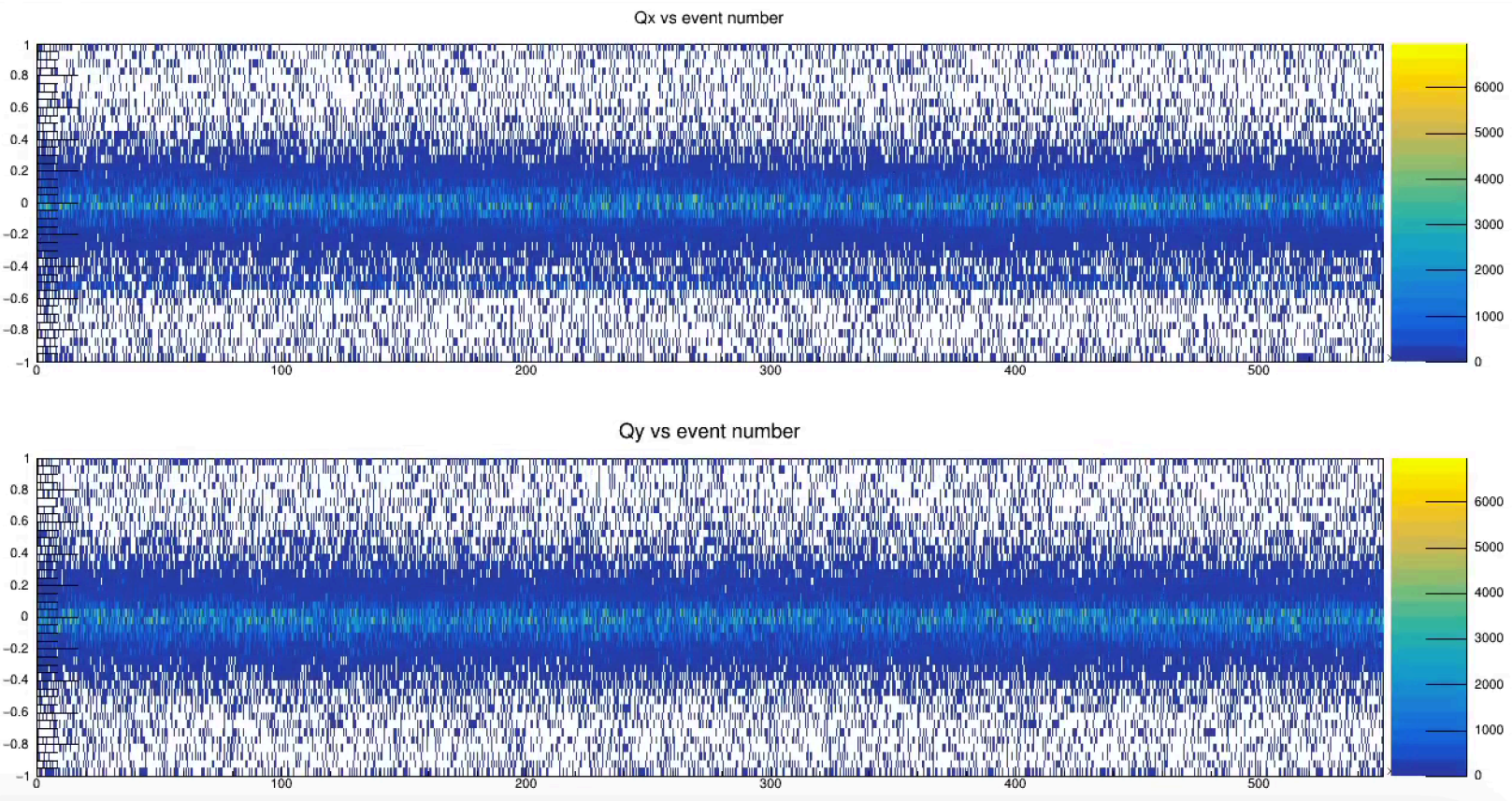
Qvector

- X axis: Qx
- Y axis: Qy
- Exist the island-like distribution
- The distribution is obstacle for recentering



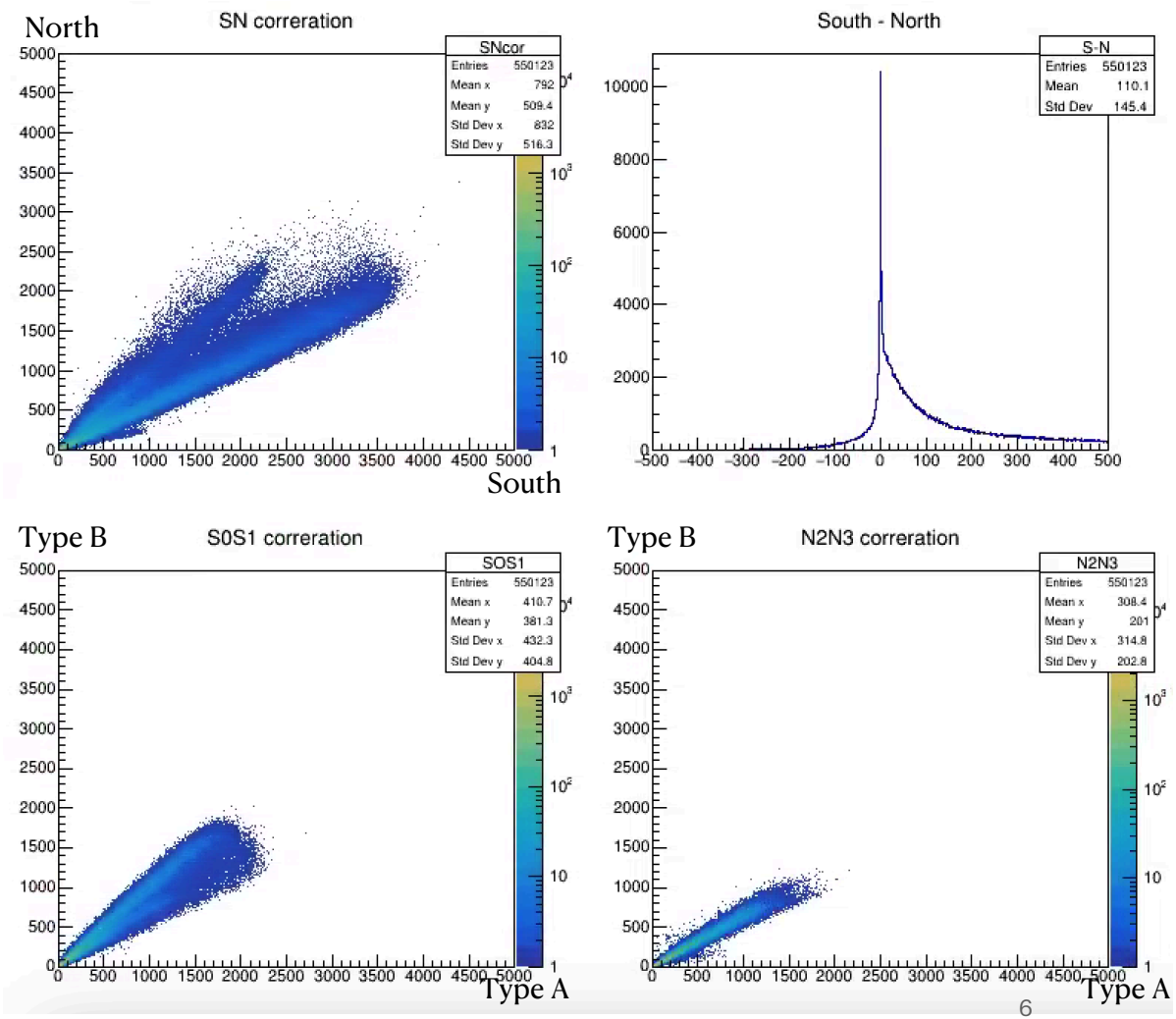
Qx, Qy vs event number

Bco, hotdead, adcカットあり



- X axis: event number
- Y axis: Qx or Qy
- Weight: number of cluster
- There is no run dependent

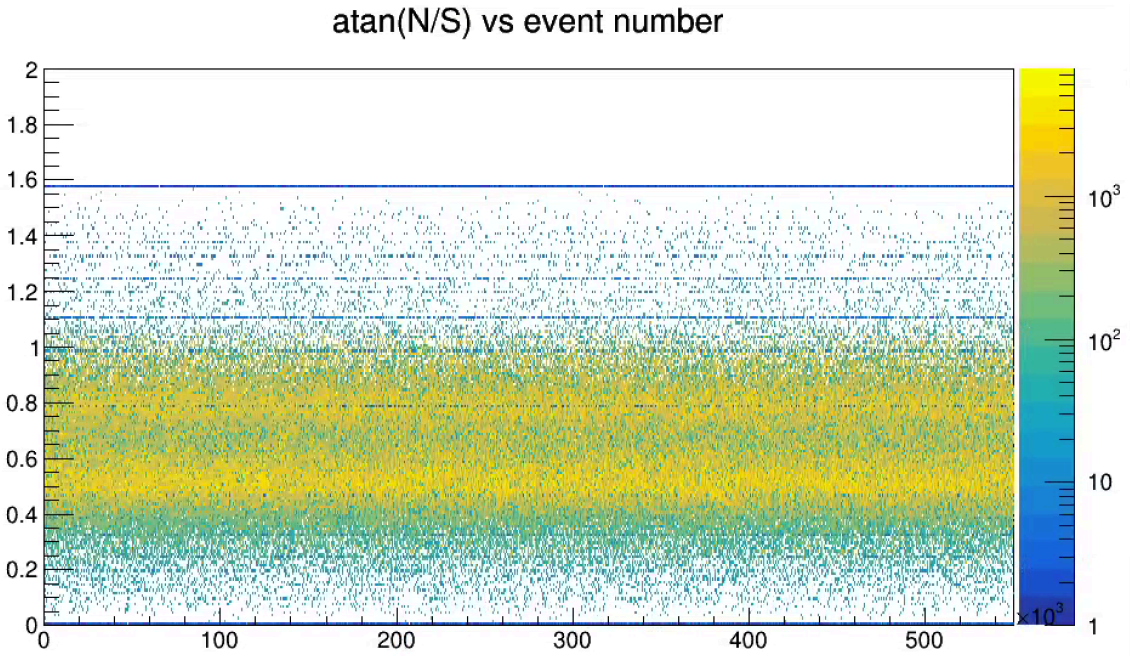
Correlation between the number of clusters in INTT



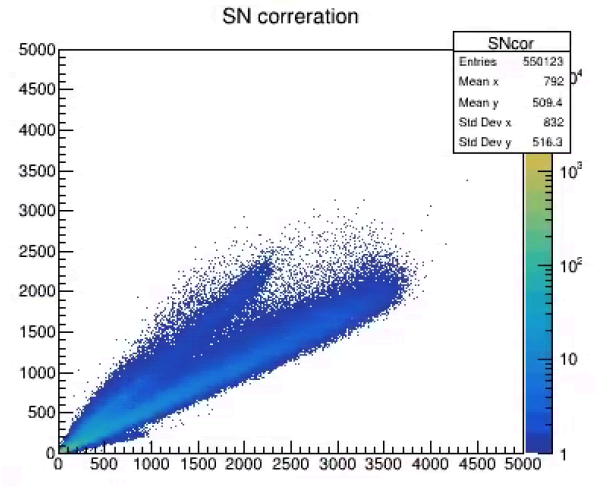
- Upper left : INTT divide south and north
- Upper right: Difference in number of cluster
- Lower left: INTT south divide by sensor type
- Lower right: INTT north divide by sensor type

Correlation between the number of clusters in INTT

Run dependence

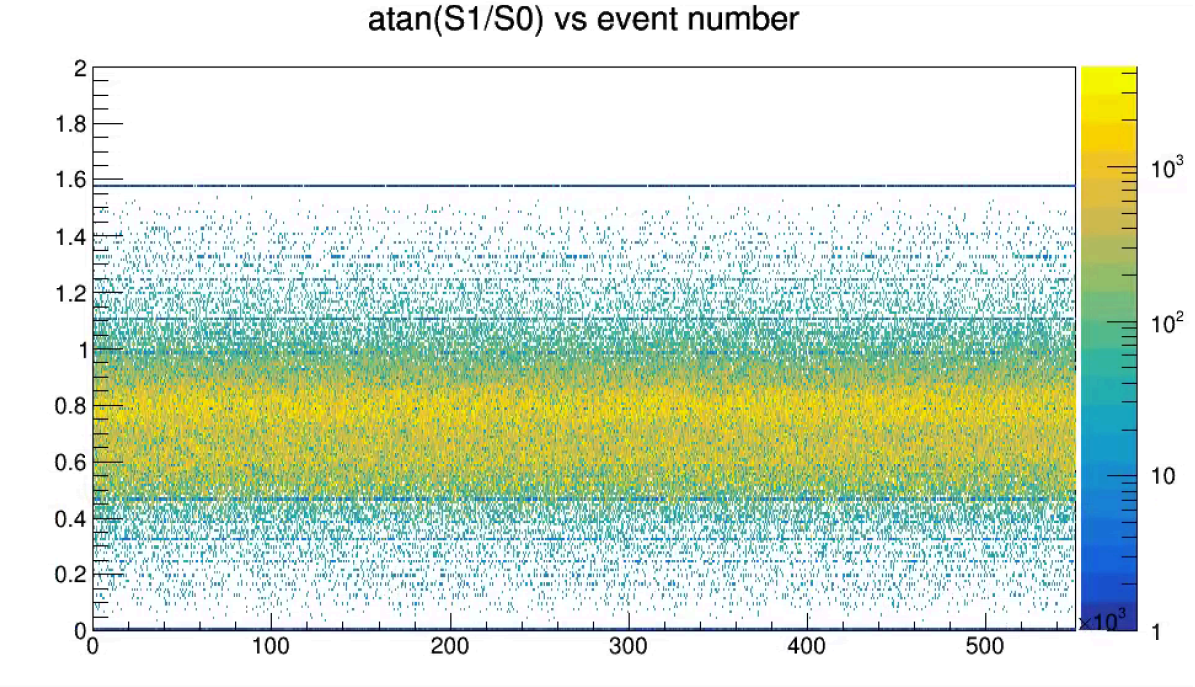


- X axis: event number
- Y axis: $\arctan \frac{\text{North}}{\text{South}}$
- Weight: number of cluster in INTT

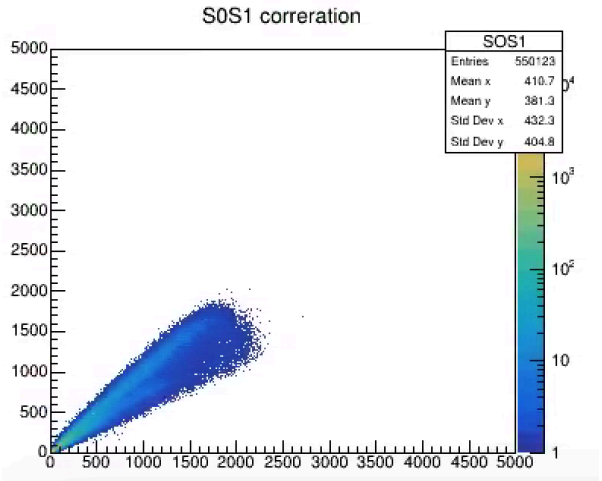


Correlation between the number of clusters in INTT

Run dependence

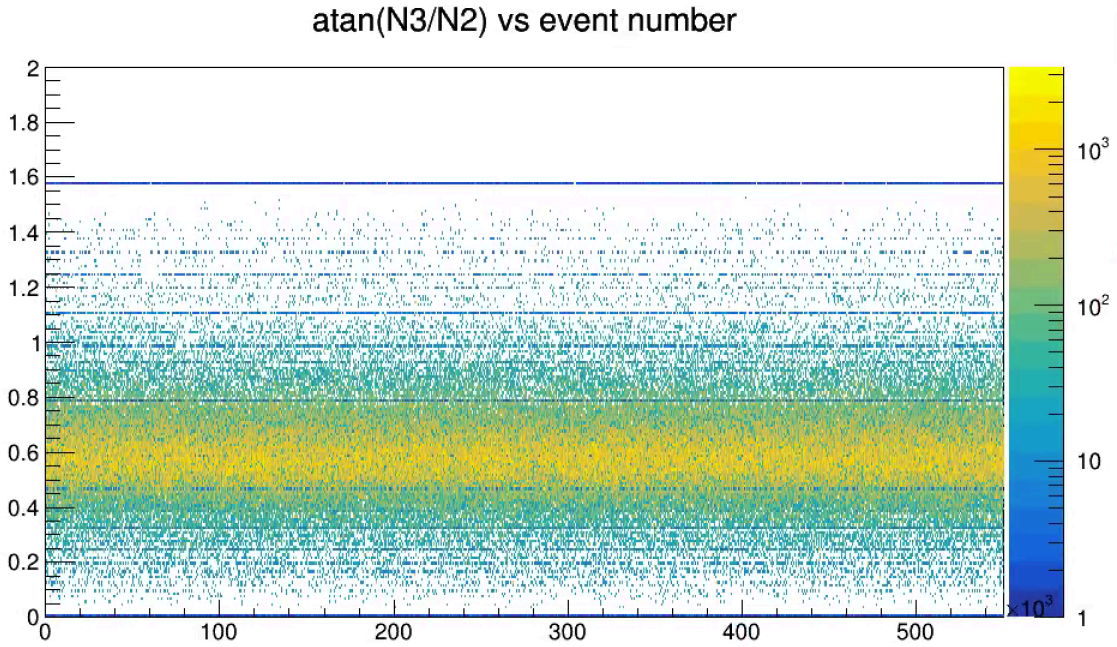


- X axis: event number
- Y axis: $\arctan \frac{\text{South typeB}}{\text{South typeA}}$
- Weight: number of cluster in INTT South

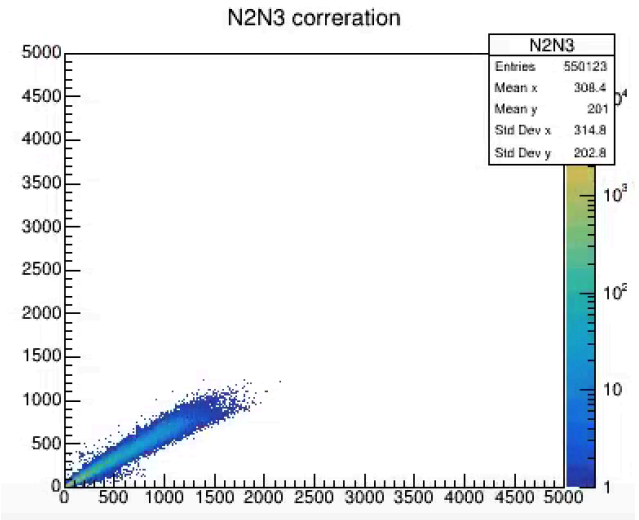


Correlation between the number of clusters in INTT

Run dependence



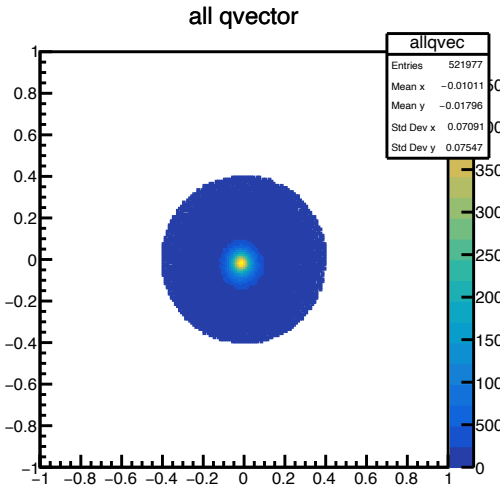
- X axis: event number
- Y axis: $\arctan \frac{\text{North typeB}}{\text{North typeA}}$
- Weight: number of cluster in INTT North

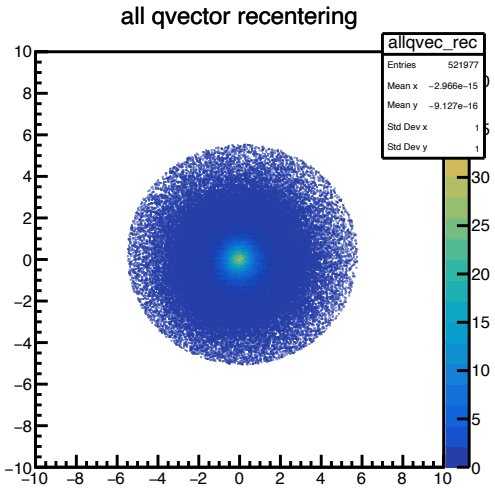


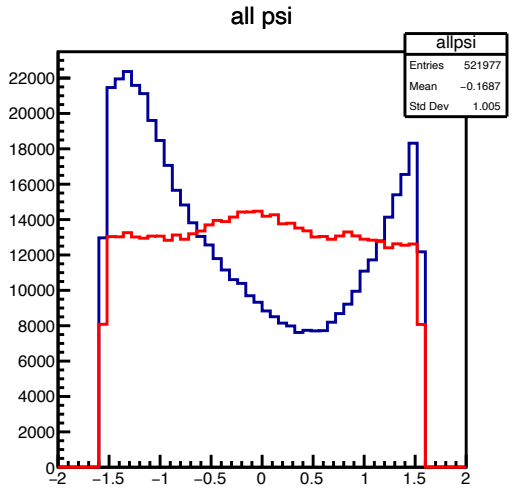
Recentering calibration

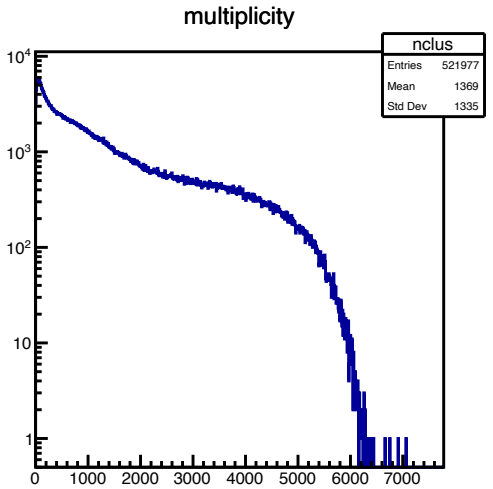
- Recentering calibration revises the effect which made by beam doesn't throw center of detector
- $Q_x^{rec} = \dfrac{Q_x^{obs} - \langle Q_x^{obs} \rangle}{\sigma_x}$, $Q_y^{rec} = \dfrac{Q_y^{obs} - \langle Q_y^{obs} \rangle}{\sigma_y}$
- $\psi_2^{re-cent} = \dfrac{1}{2} \tan^{-1} \dfrac{Q_x^{rec}}{Q_y^{rec}}$
- Add cut $\sqrt{Q_x^2 + Q_y^2} < 0.4$ to remove the island-like distribution

Qvector Recentering









- Blue line: before recentering
- Red line: after recentering

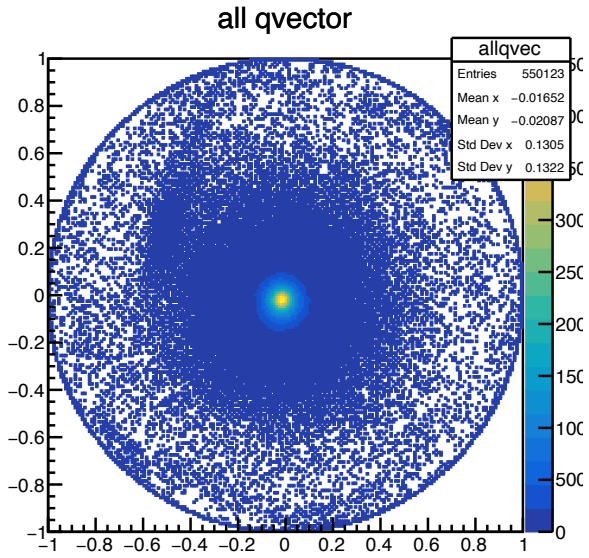
To do list

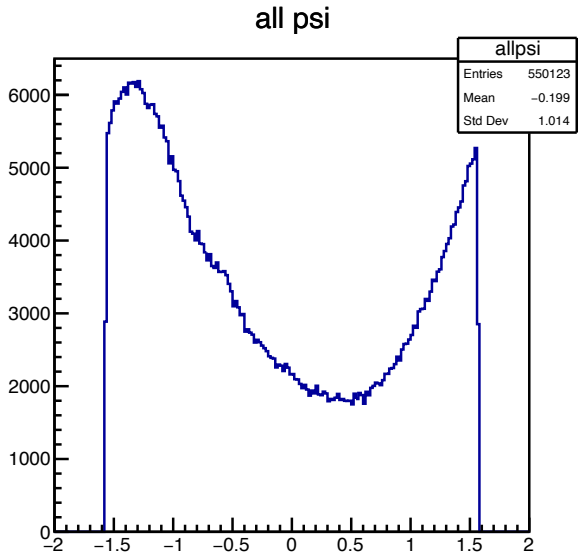
- Search what made the island-like distribution
- Write code for flattering
  - Fluttering is the removal of distortions in the recentering ψ distribution

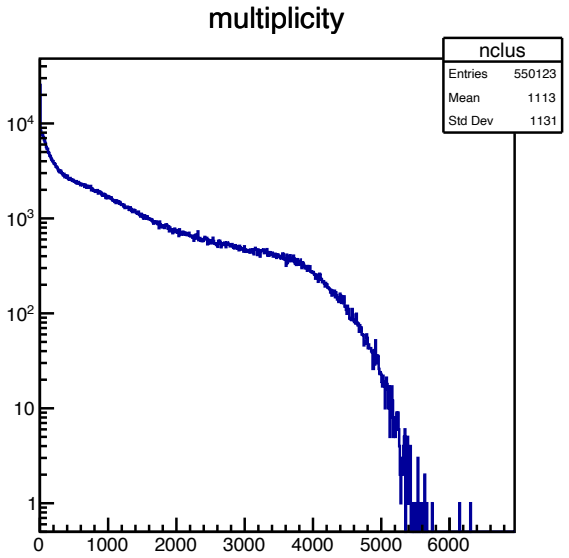
Back Up

Qvector

Hotdead, Adc カットあり All event



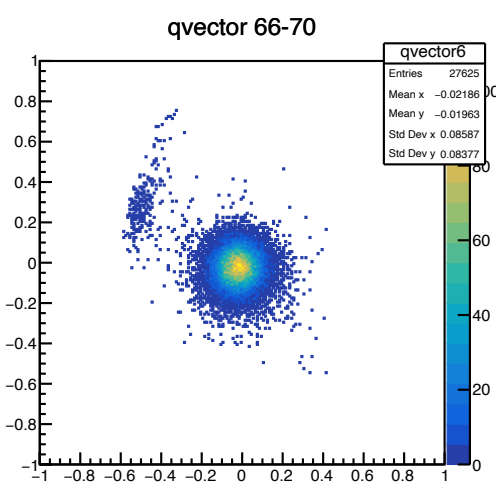


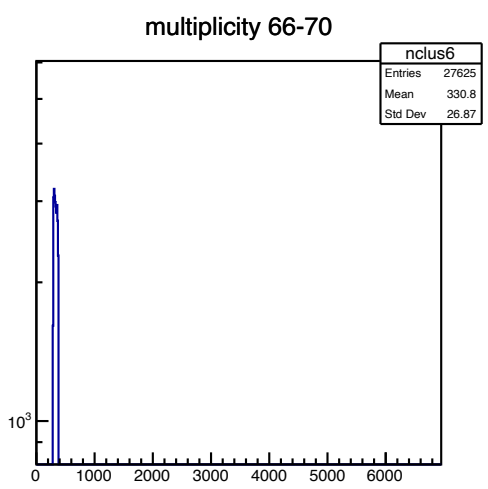


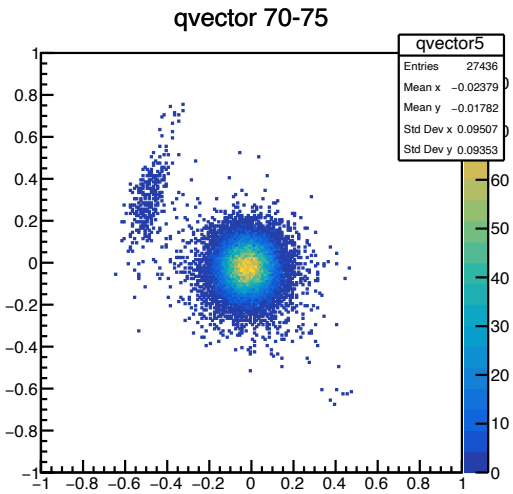
Qvector

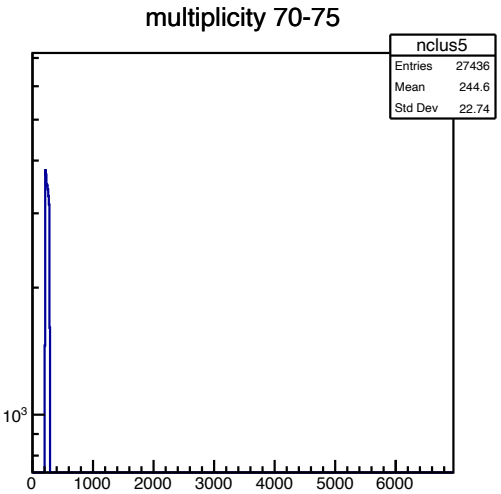
Divide by multiplicity

- Divided into 20 parts by multiplicity
- Exist the island-like distribution in 75% ~ 50% area

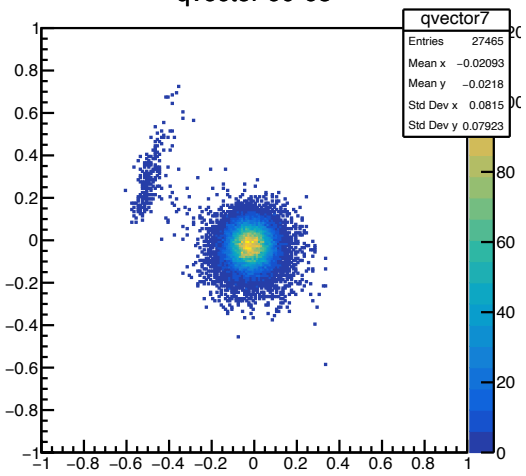




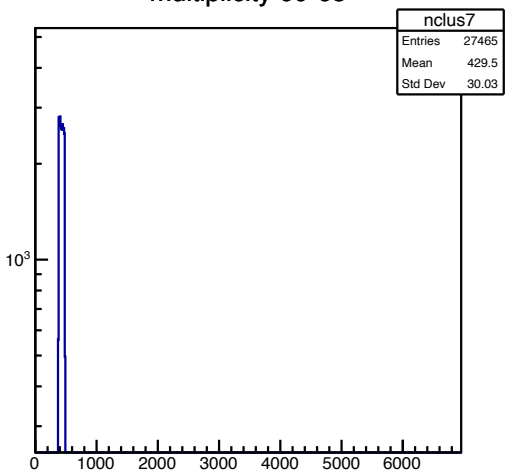




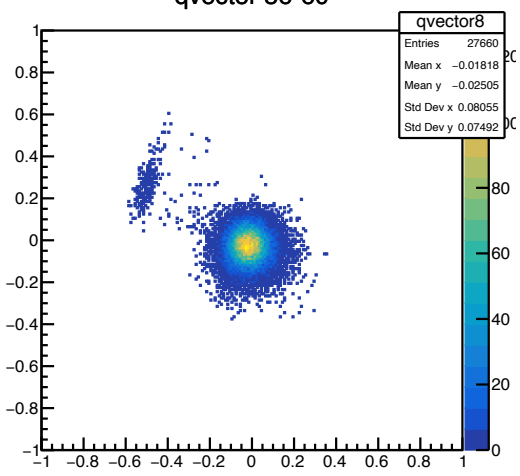
qvector 60-65



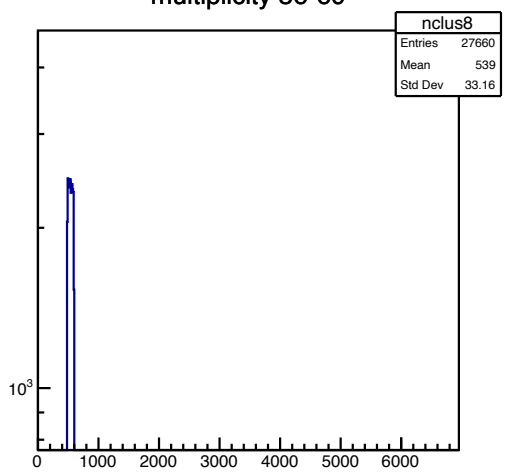
multiplicity 60-65



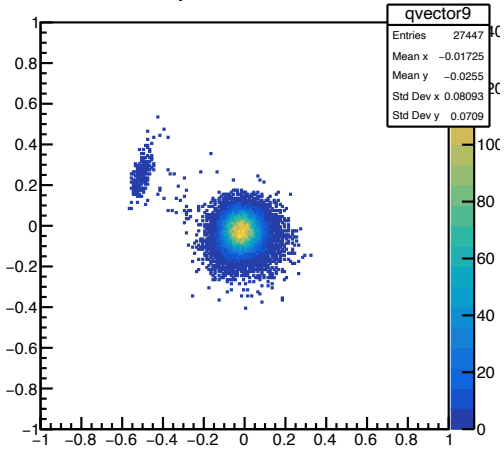
qvector 56-60



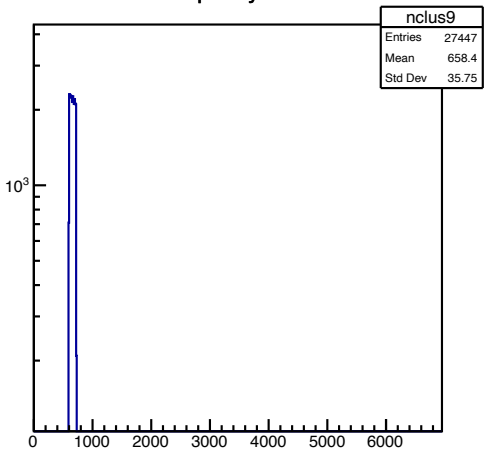
multiplicity 56-60



qvector 50-55

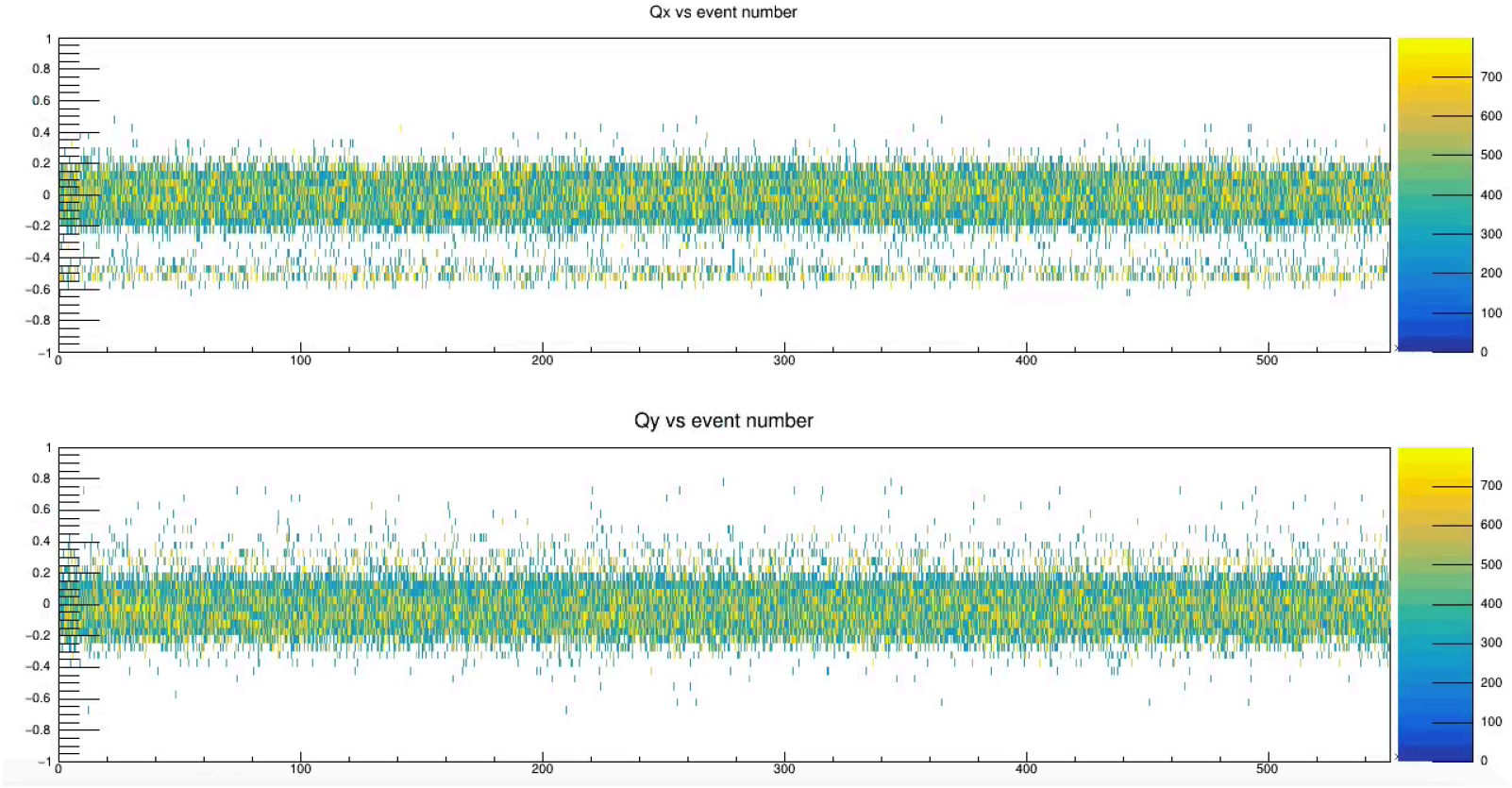


multiplicity 50-55



Qx, Qy vs event number

Bco, hotdead, adcカットあり



- Sort by multiplicity in exist the island-like distribution
- 200<multiplicity<800
- About 75~50% area
- Bias of Qx doesn't depend on event number