TPC Simulation

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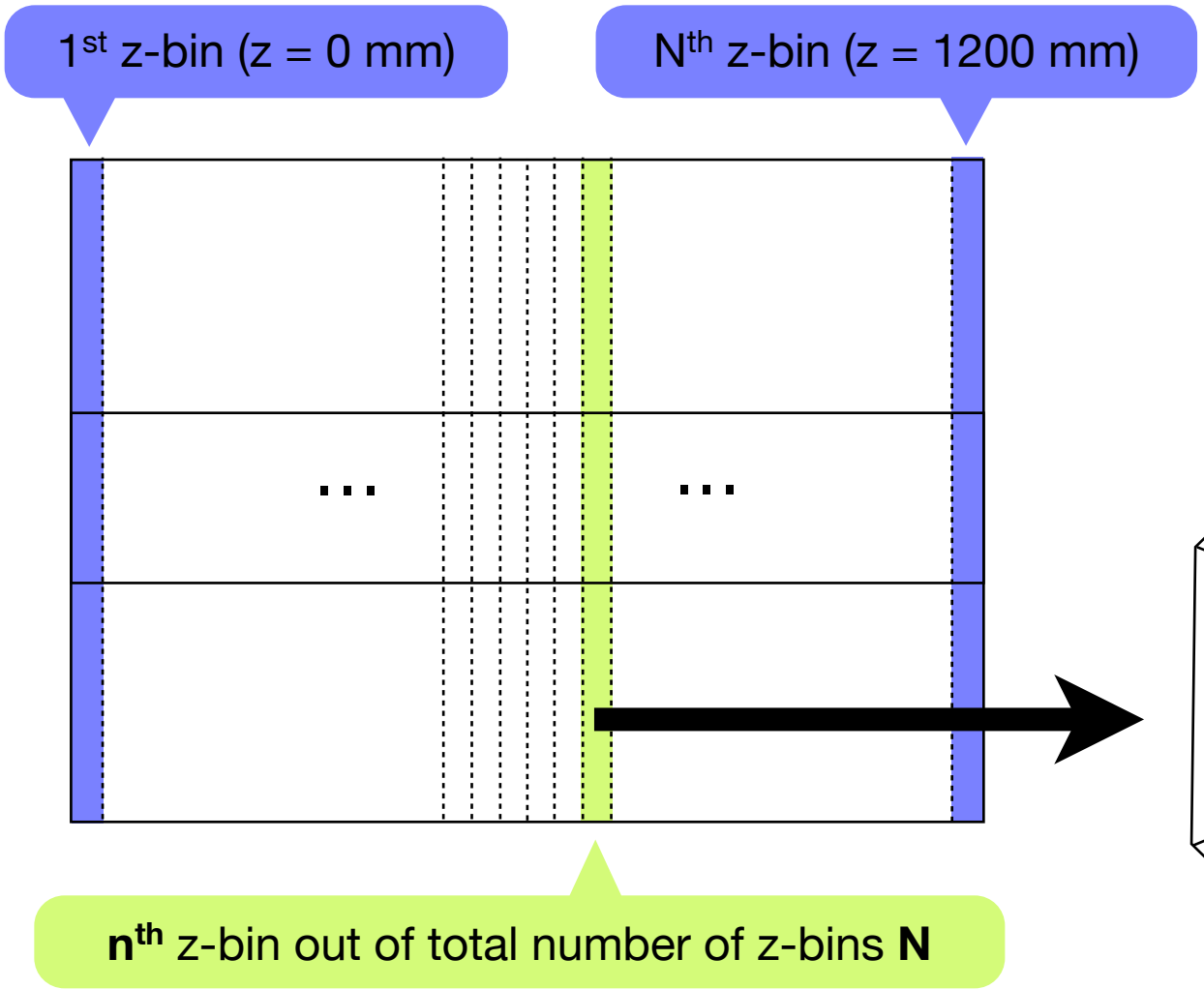
Clusterization Process

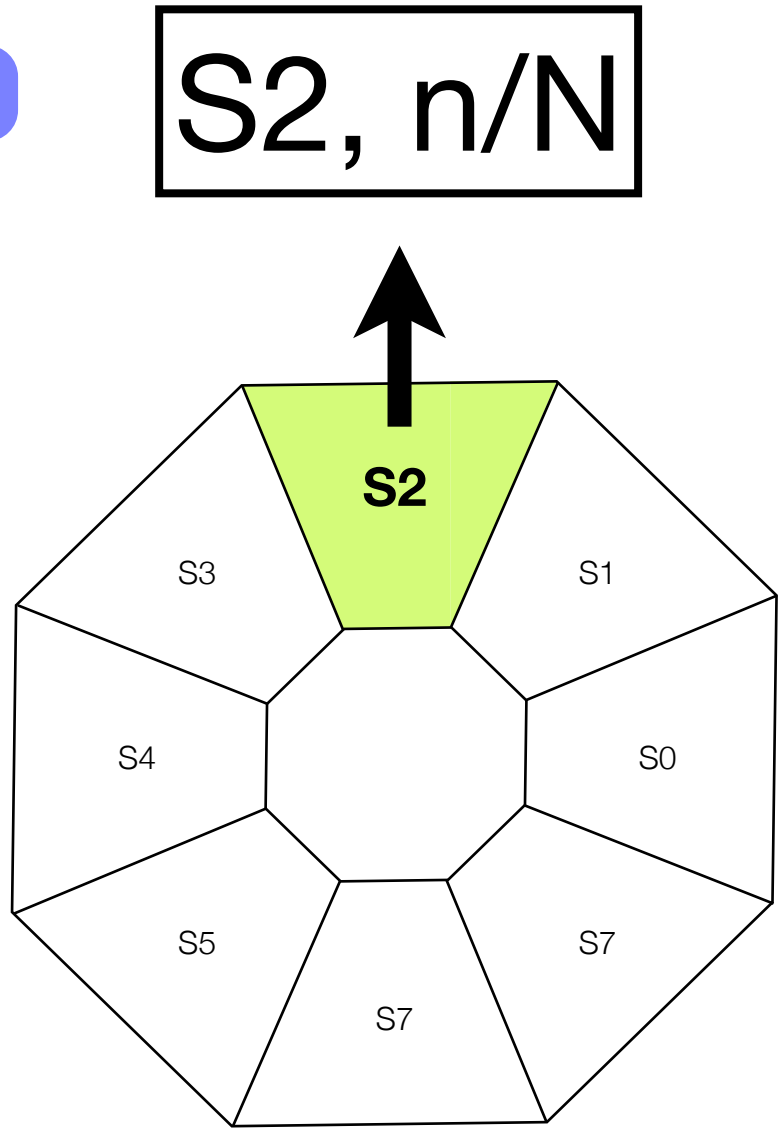
1. Define a **sector**(smallest data set for clusterization).
2. Define three **projection planes**.
3. **Project** charge data into each planes.
4. **Find peaks** for each planes.

5. **Find** overlaps(**cluster centers**) of three peaks from each planes.
6. **Make cluster** with cluster center and cluster size(currently gathering up to 3rd nearest pads).
7. **Remove data** used to make clusters from data set.

8. **Iterate 5→7** until the data set is empty.

Define Sector

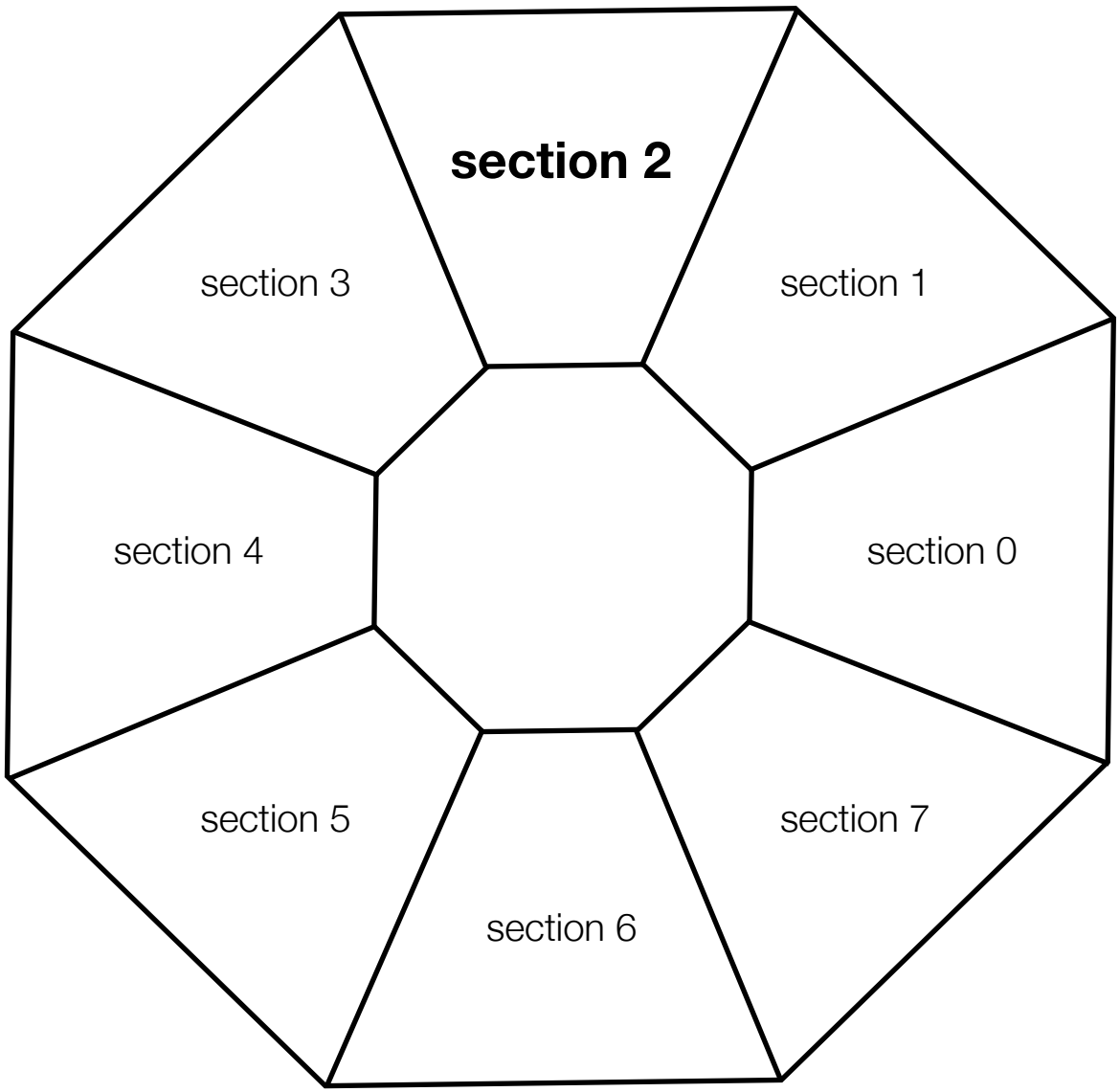




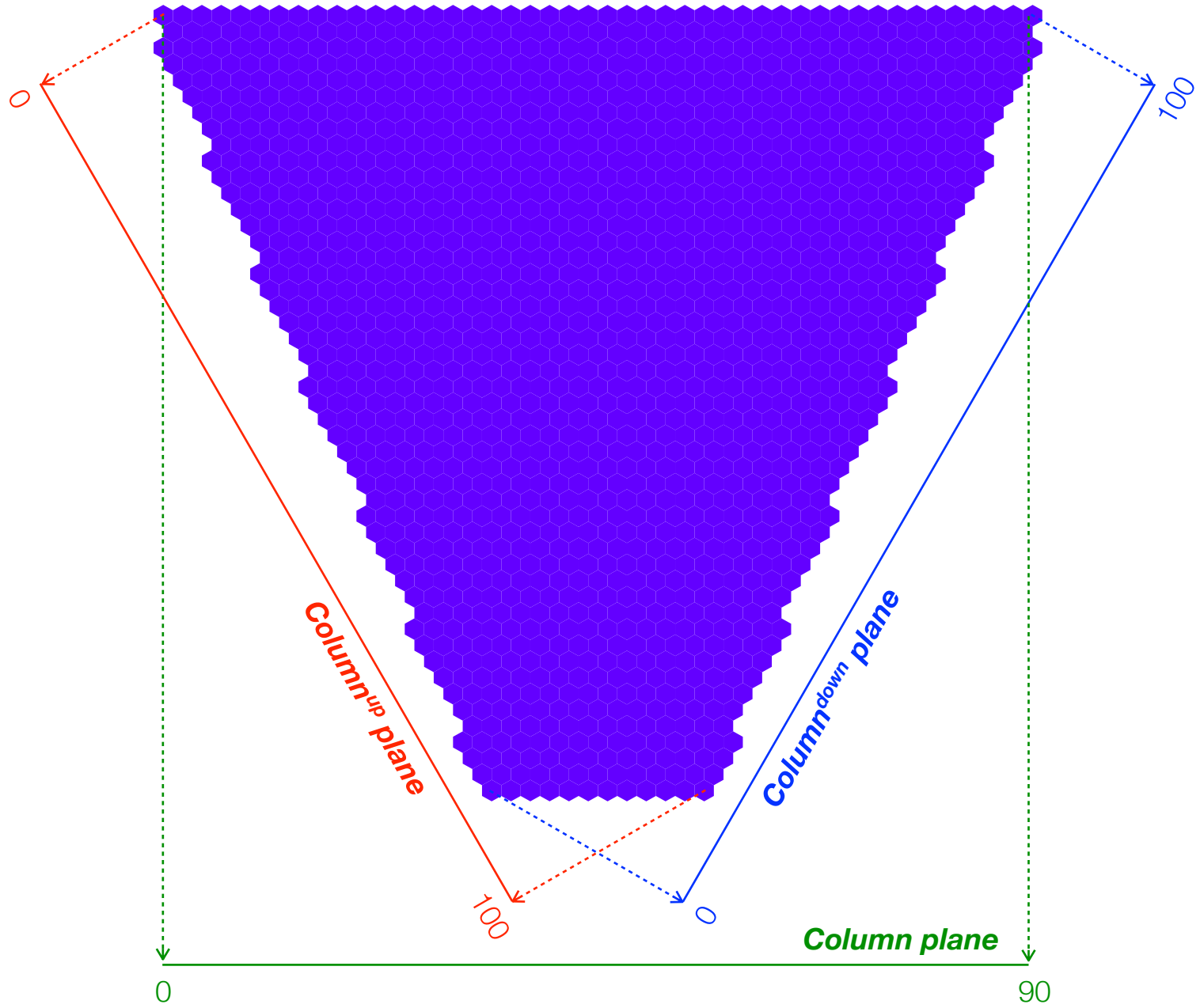
※ Collision occurs at z = 300 mm

Pad Plane

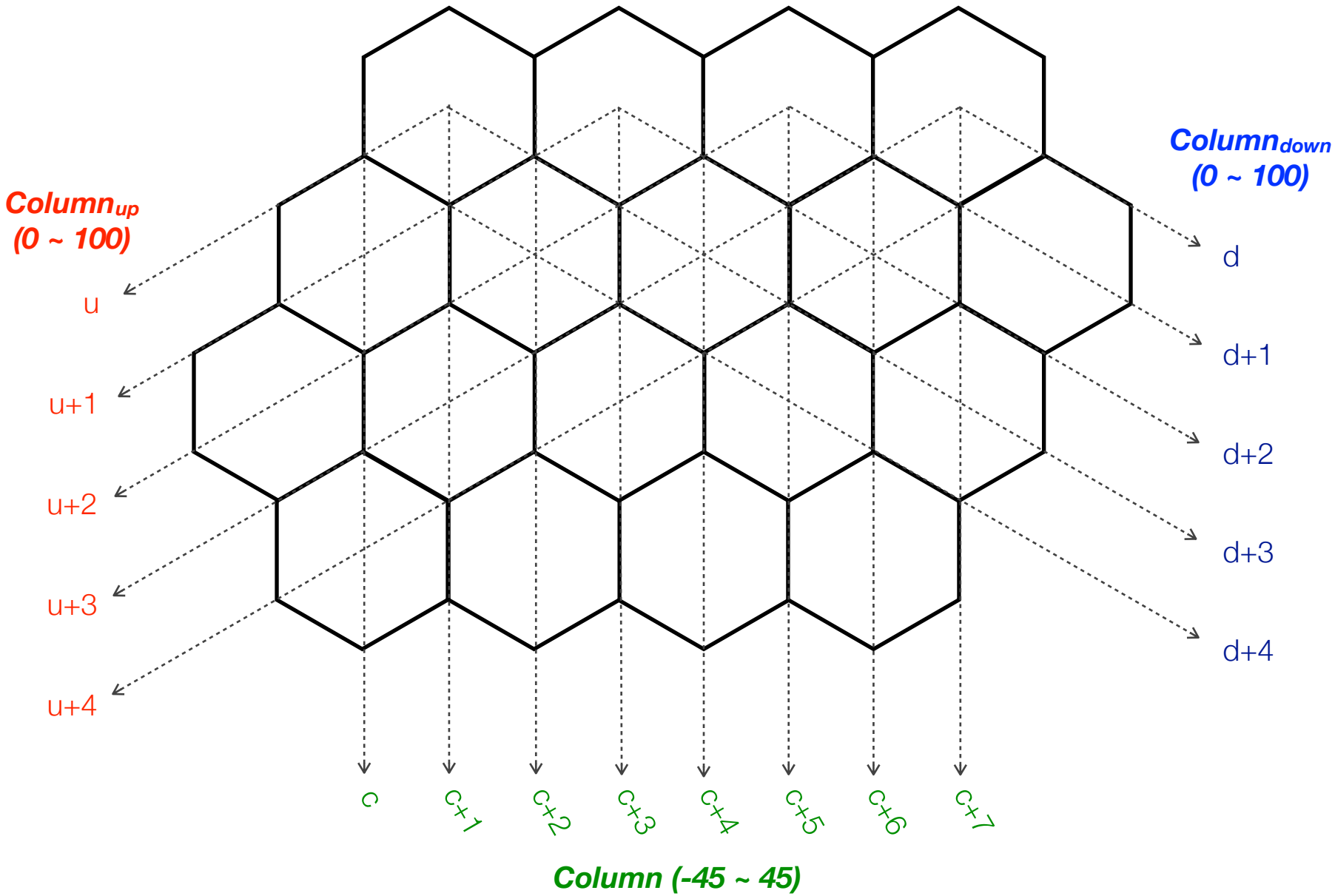
Pad Plane


section 2
section 3
section 1
section 4
section 0
section 5
section 7
section 6

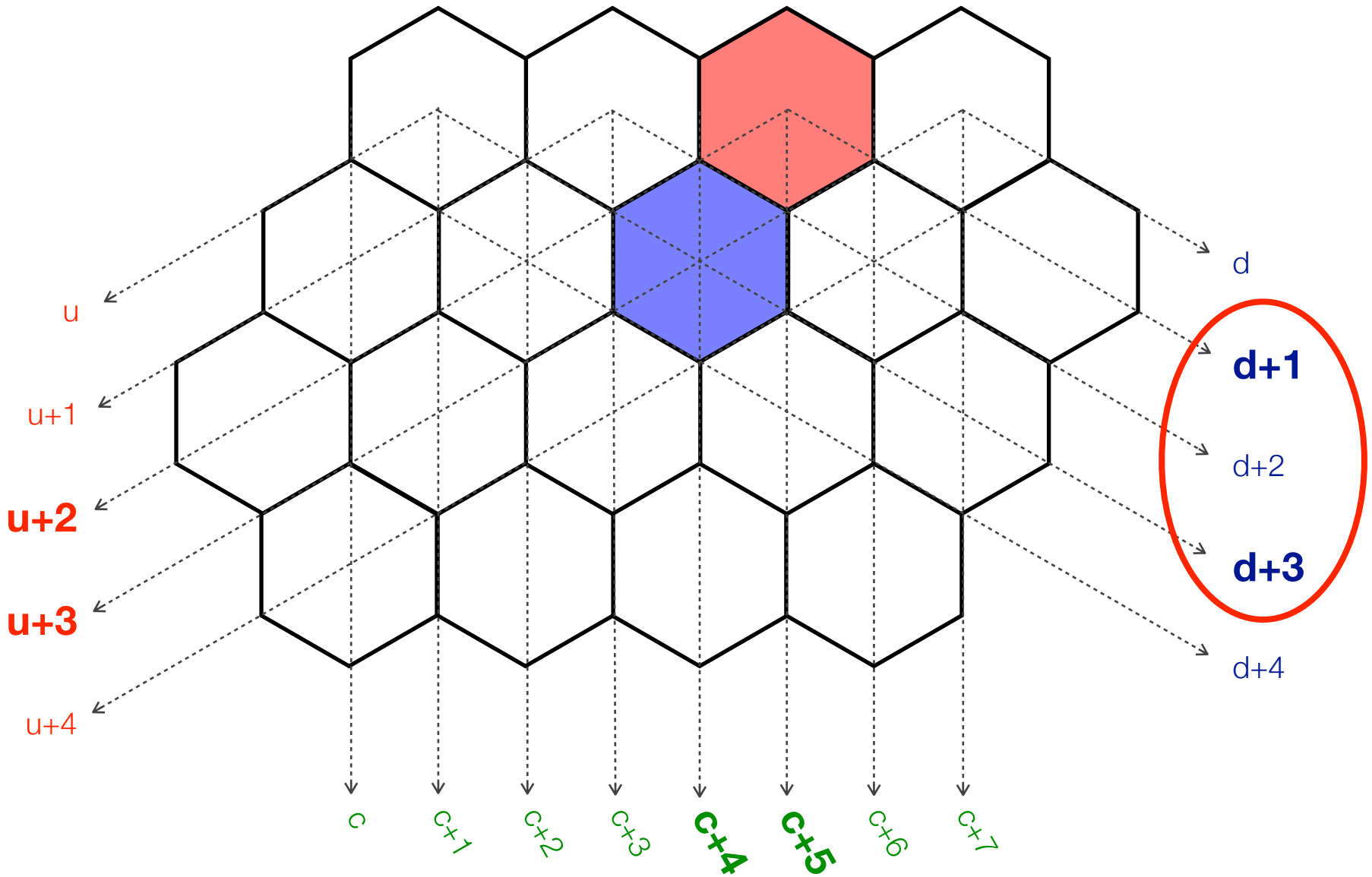
Projection Planes



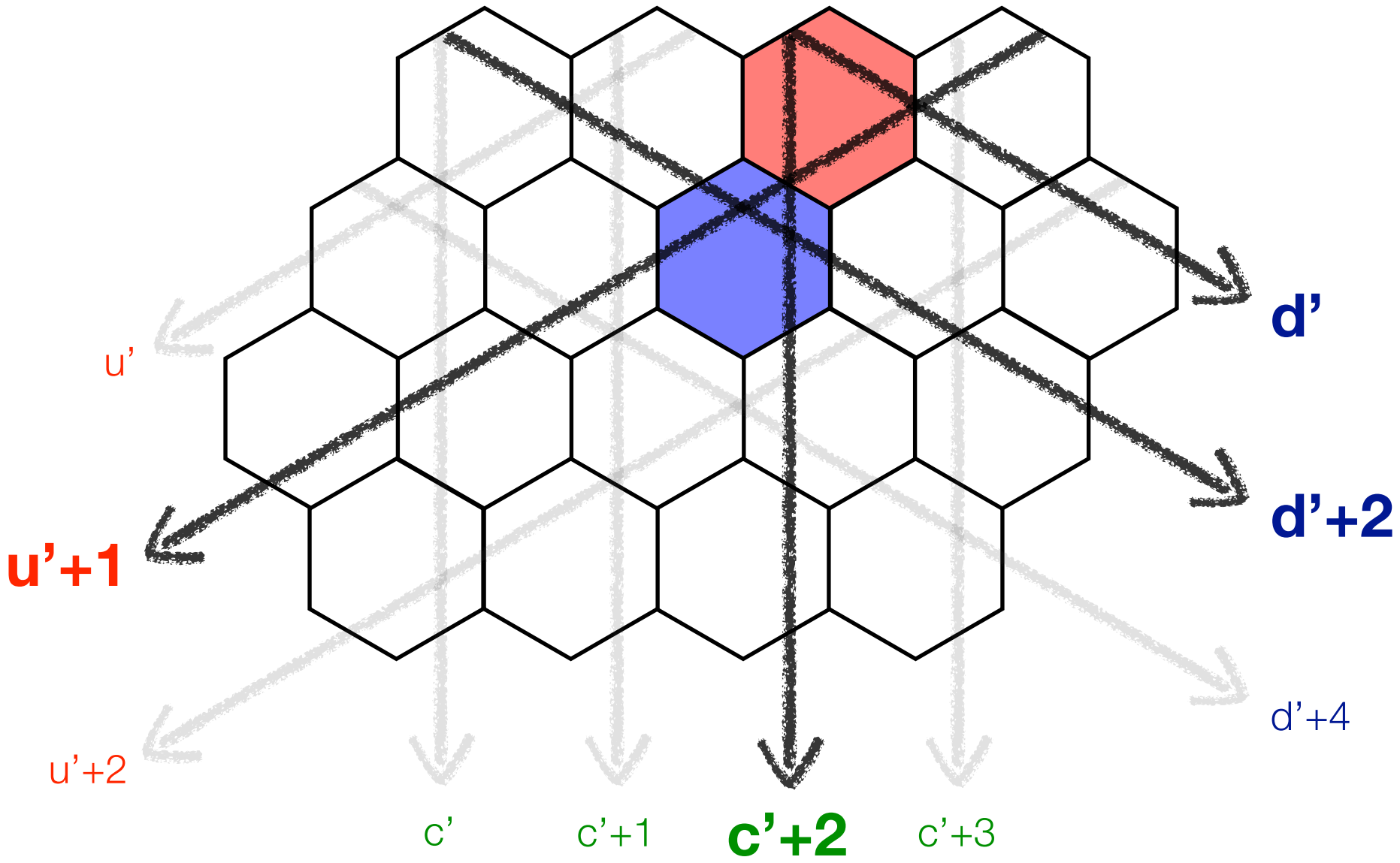
Columns


Column_up
(0 ~ 100)
u
u+1
u+2
u+3
u+4
Column_down
(0 ~ 100)
d
d+1
d+2
d+3
d+4
c
c+1
c+2
c+3
c+4
c+5
c+6
c+7
Column (-45 ~ 45)

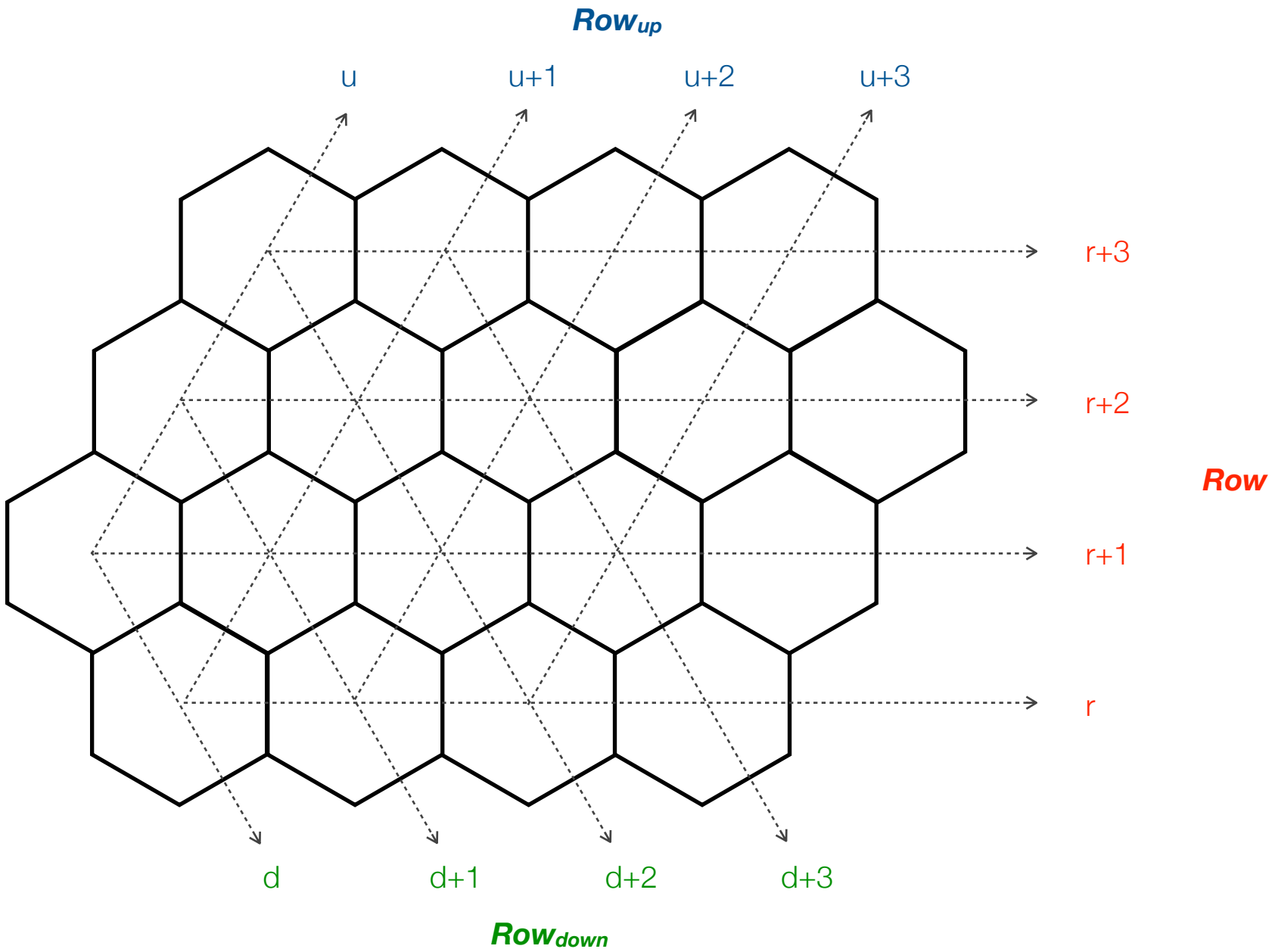
Columns



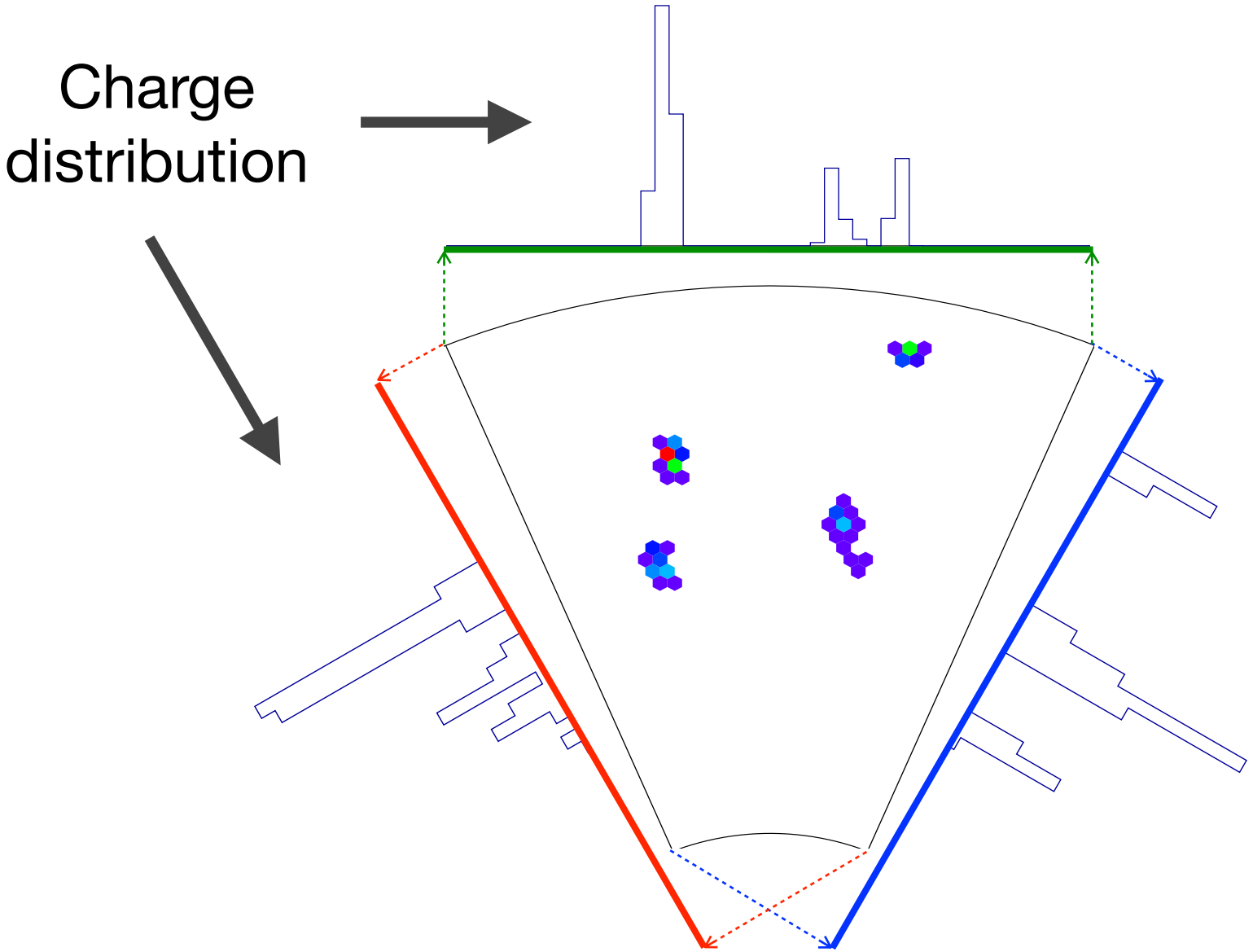
New Columns



Rows

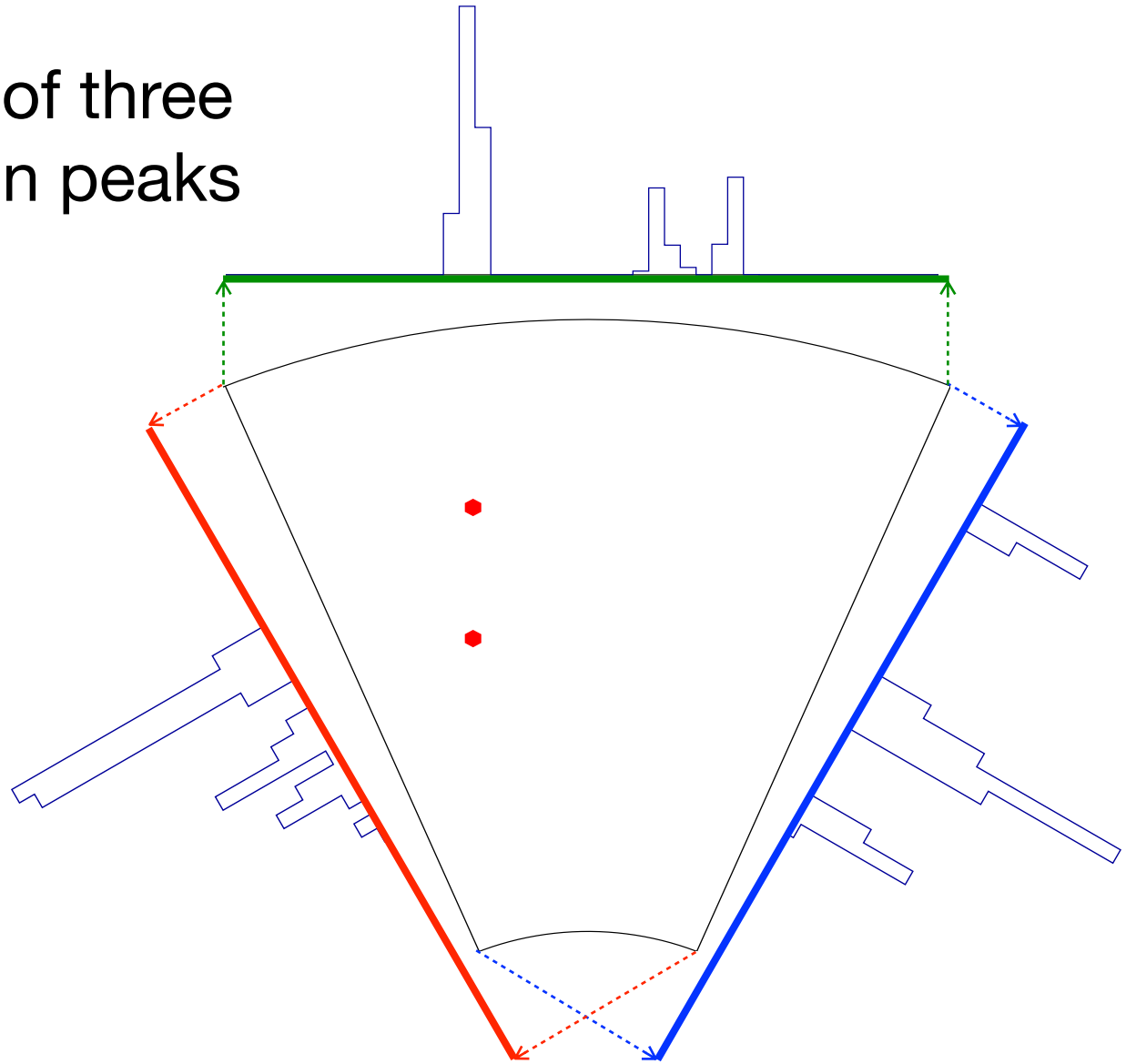


S2, 85/120

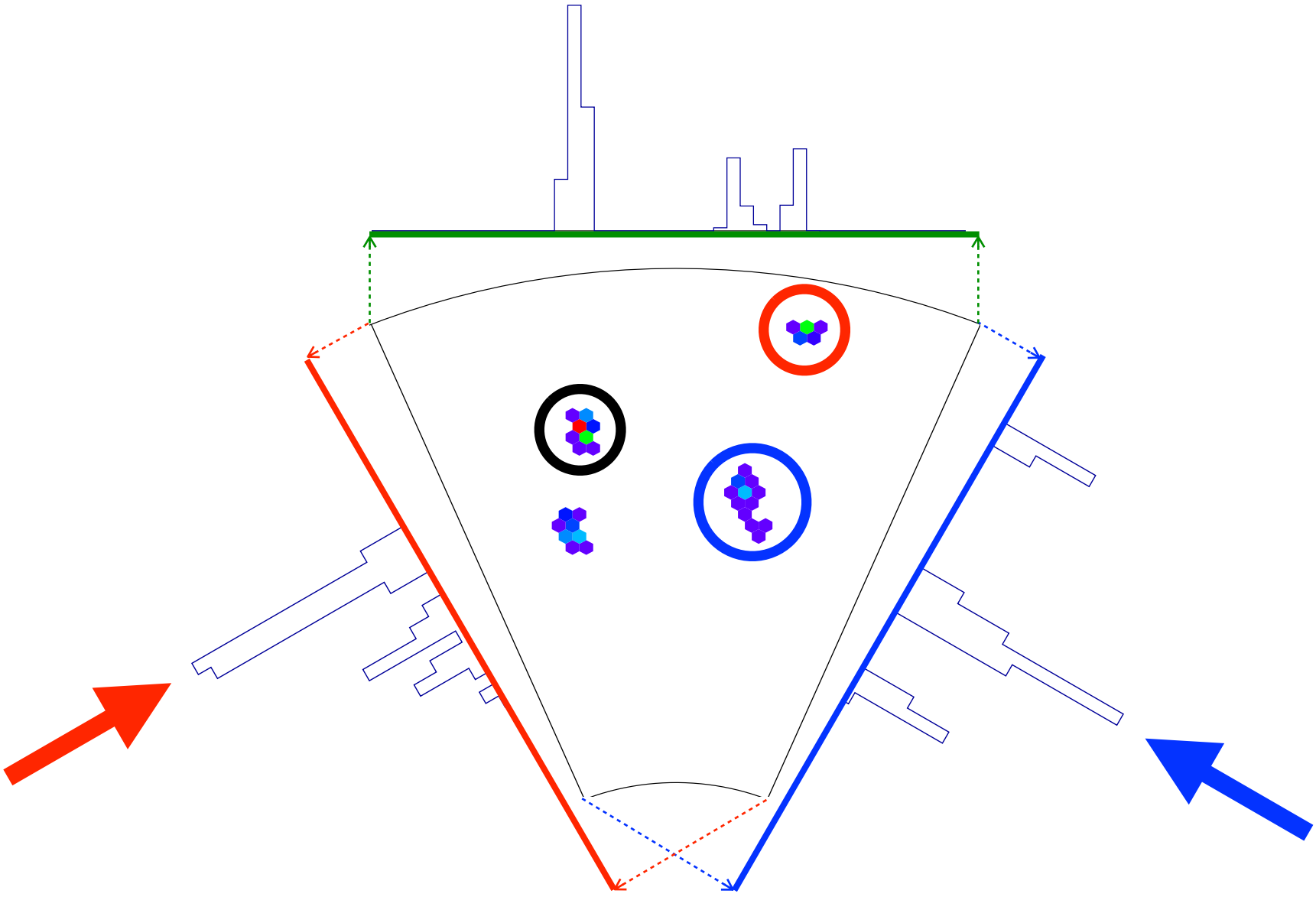


S2, 85/120

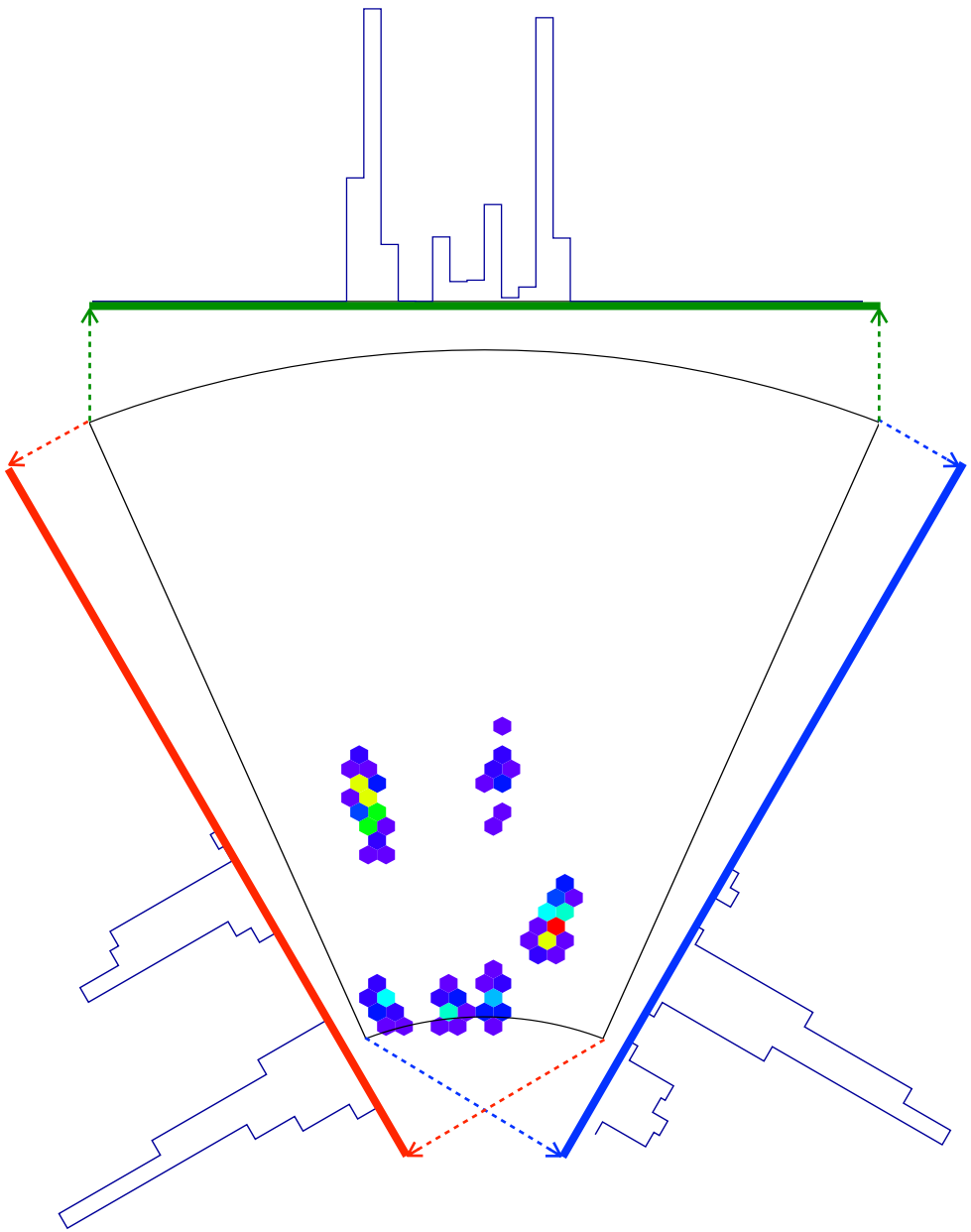
Overlap of three projection peaks



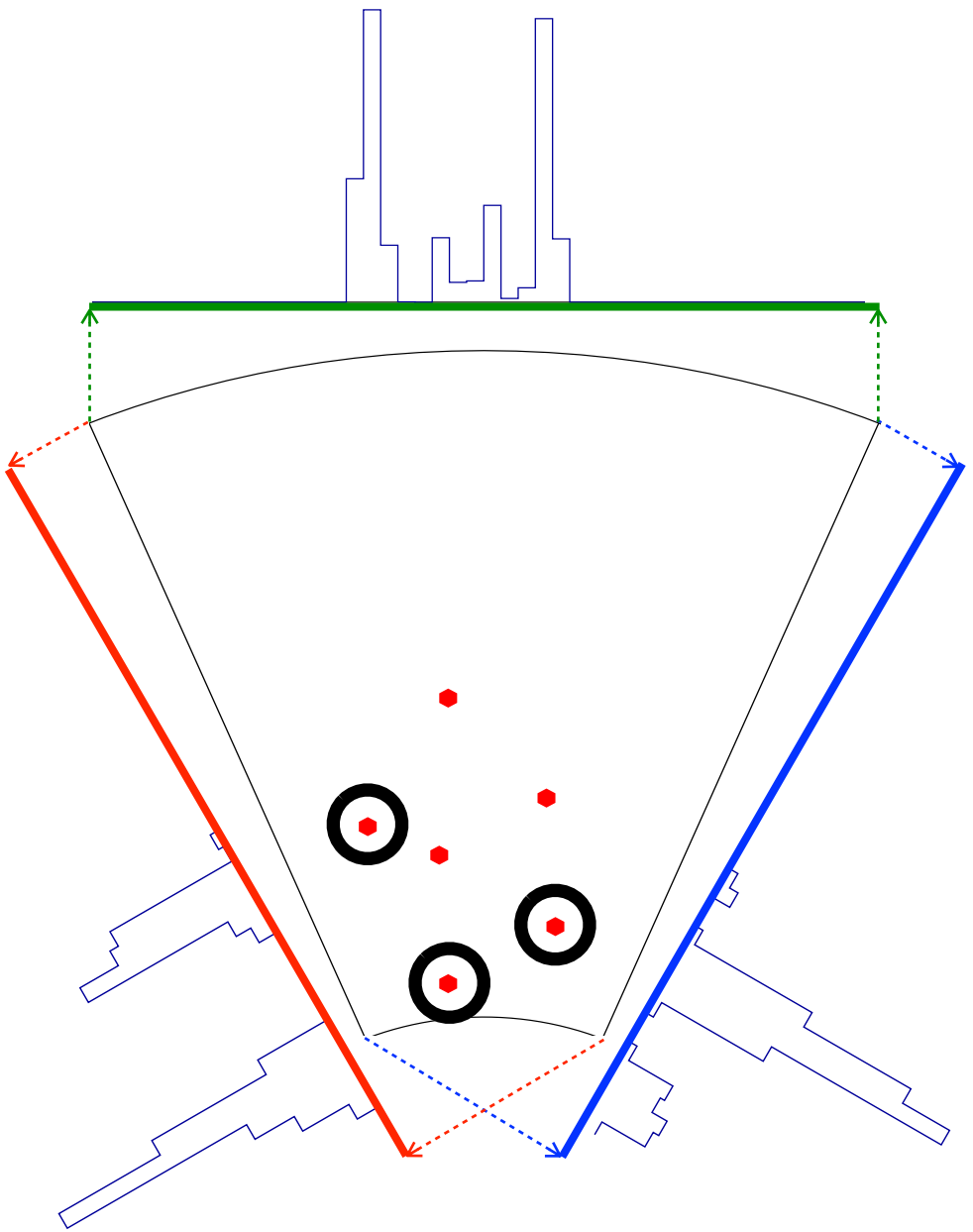
S2, 85/120



S6, 40/120



S6, 40/120



Issues

1) Every cluster centers are not found at once
   → **Iteration, give error to a peak**

2) Fake points
   → No problem. No charge data to gather!

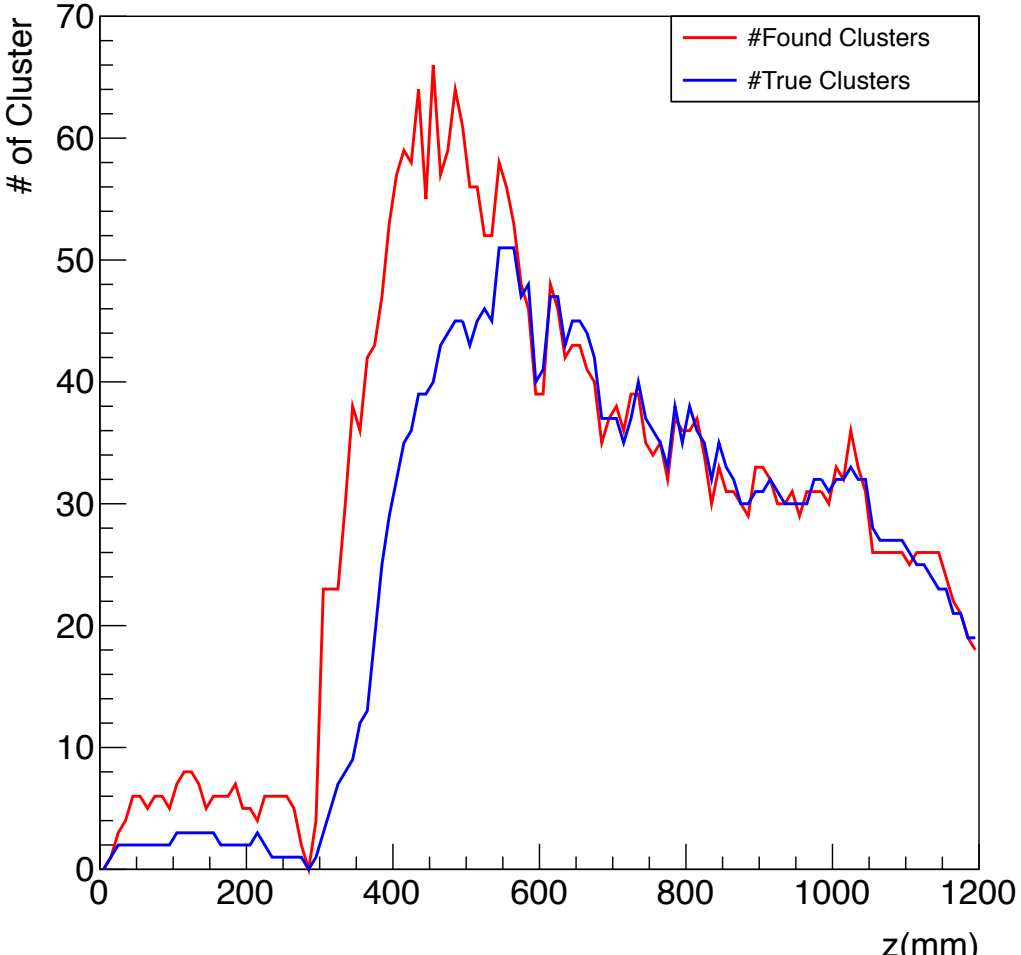
3) Long cluster
   → **Cluster size, finer z-binning**

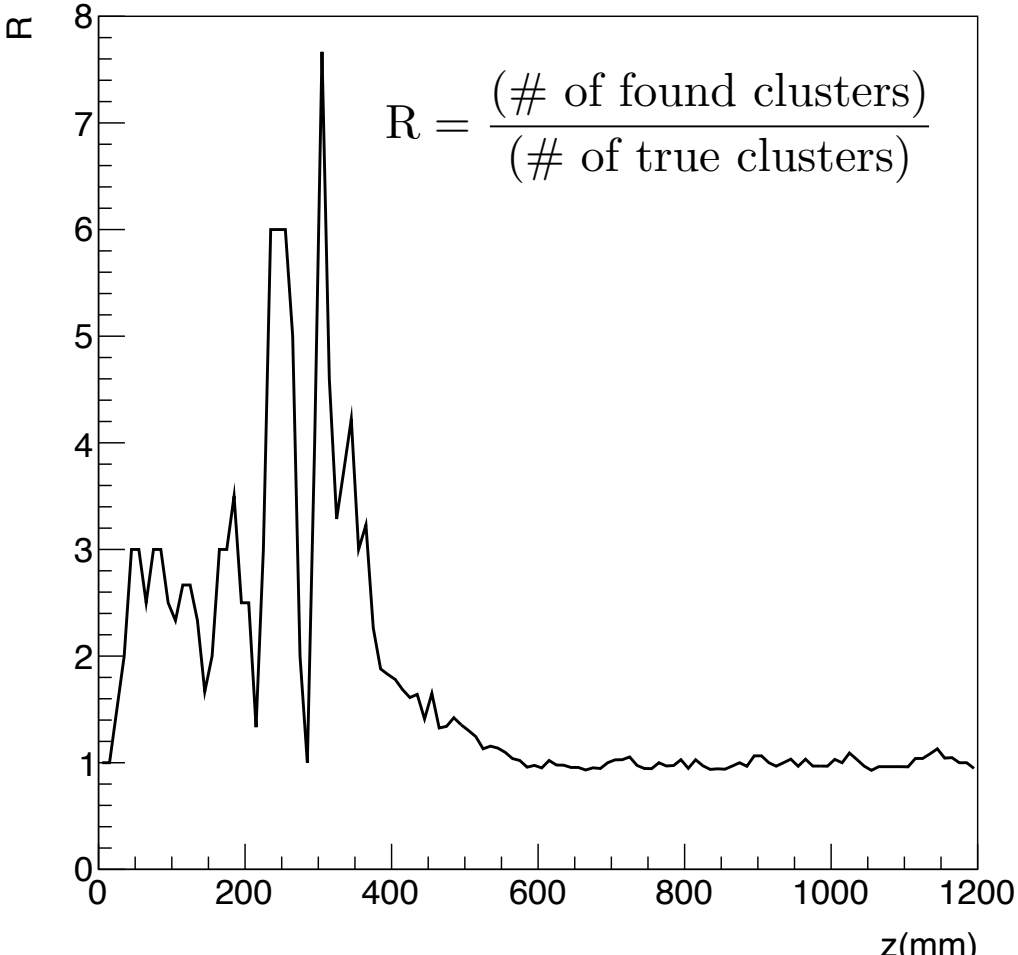
4) **Ratio**, $\mathrm{R} = \dfrac{(\#\text{ of found clusters})}{(\#\text{ of true clusters})}$

Case 1

z(mm) = **0~1200** : (Bin size) = **10 mm**

10 mm

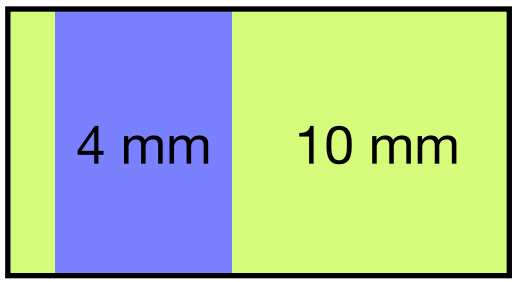


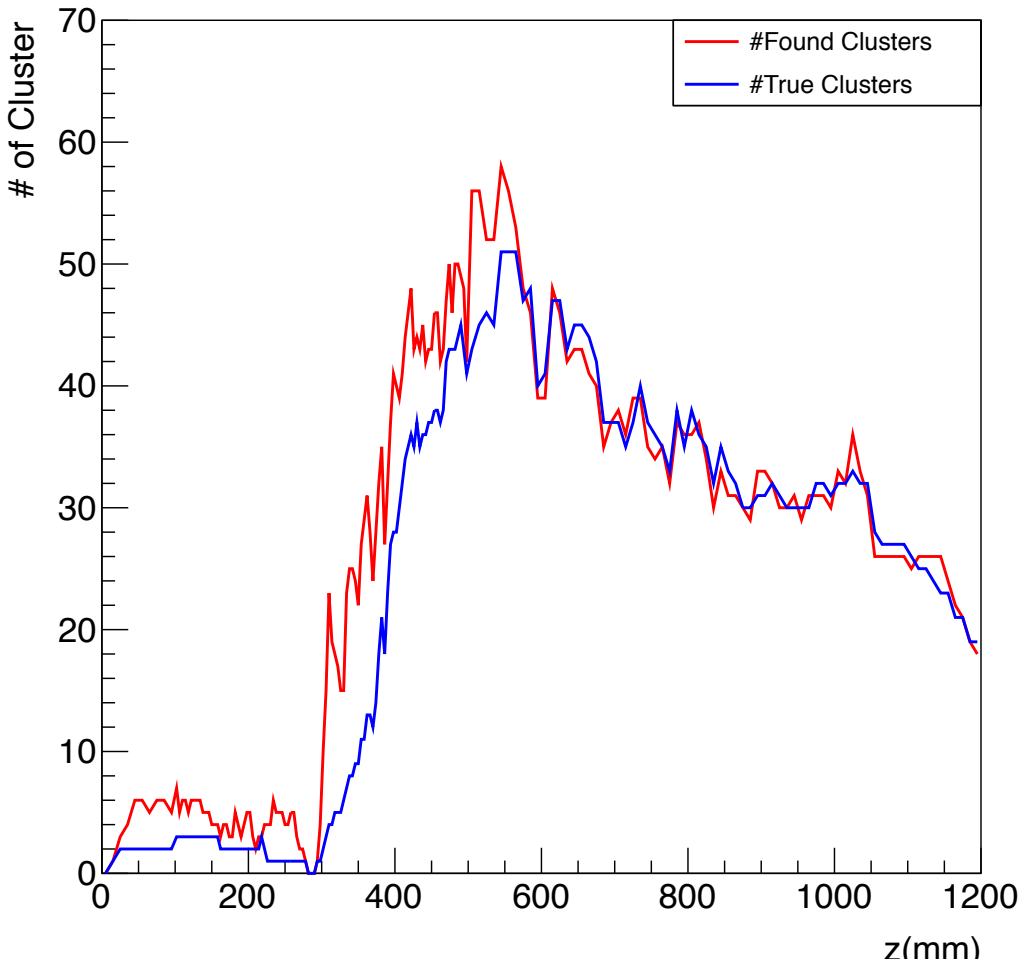


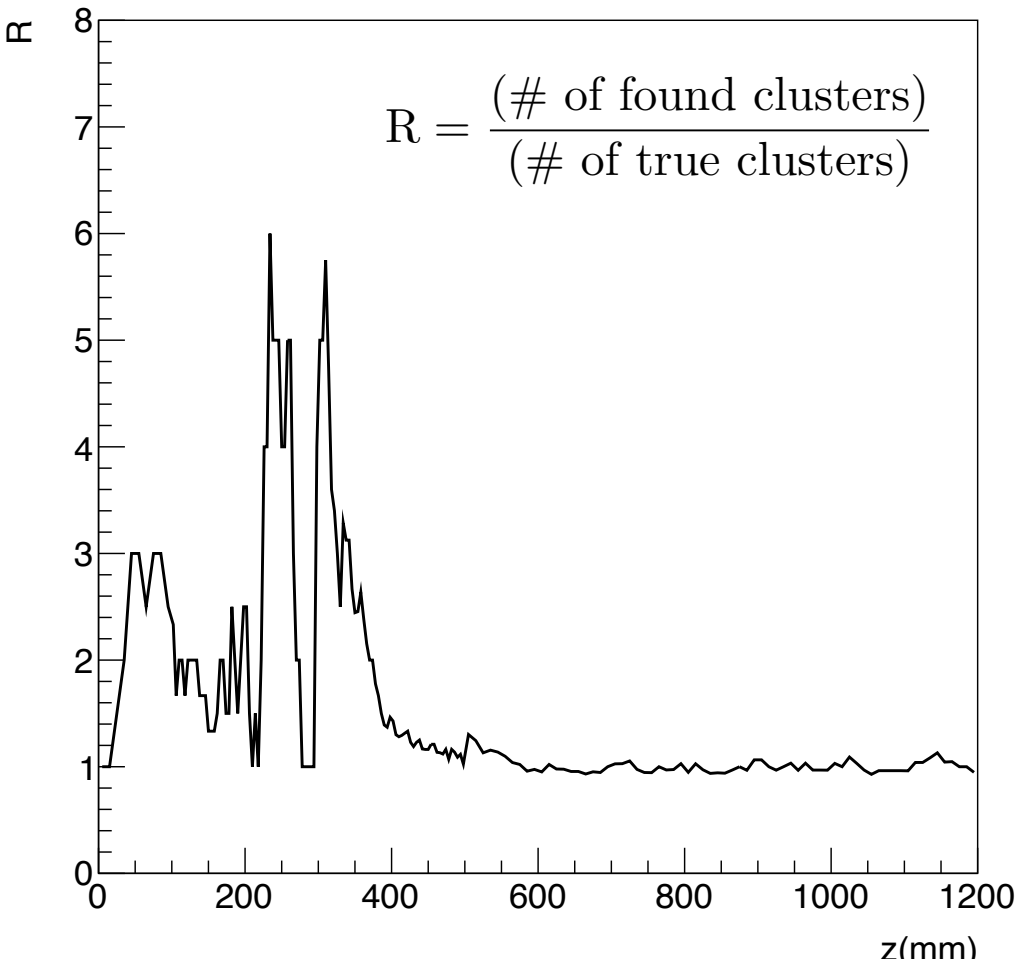
Case 2

z(mm) = **100~500** : (Bin size) = **4 mm**

z(mm) ≠ **100~500** : (Bin size) = **10 mm**



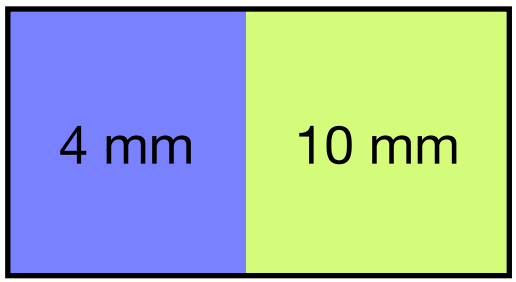


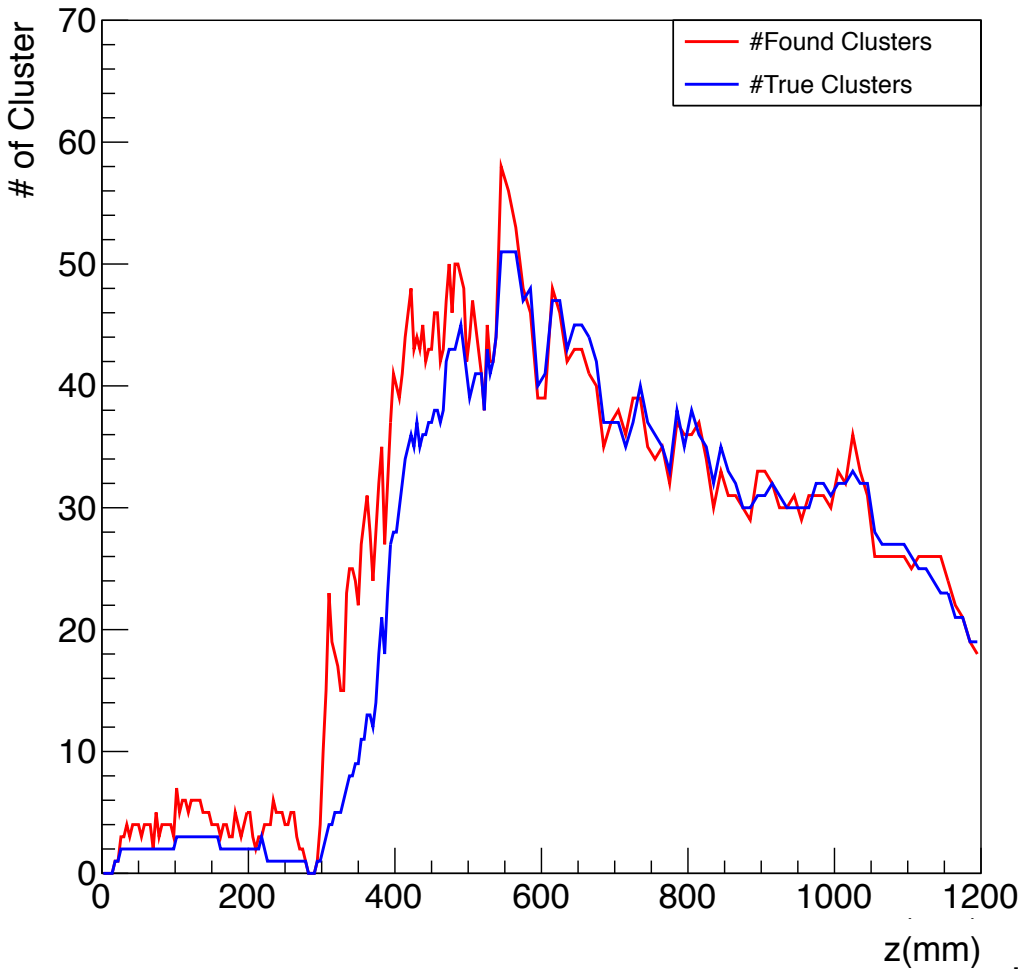


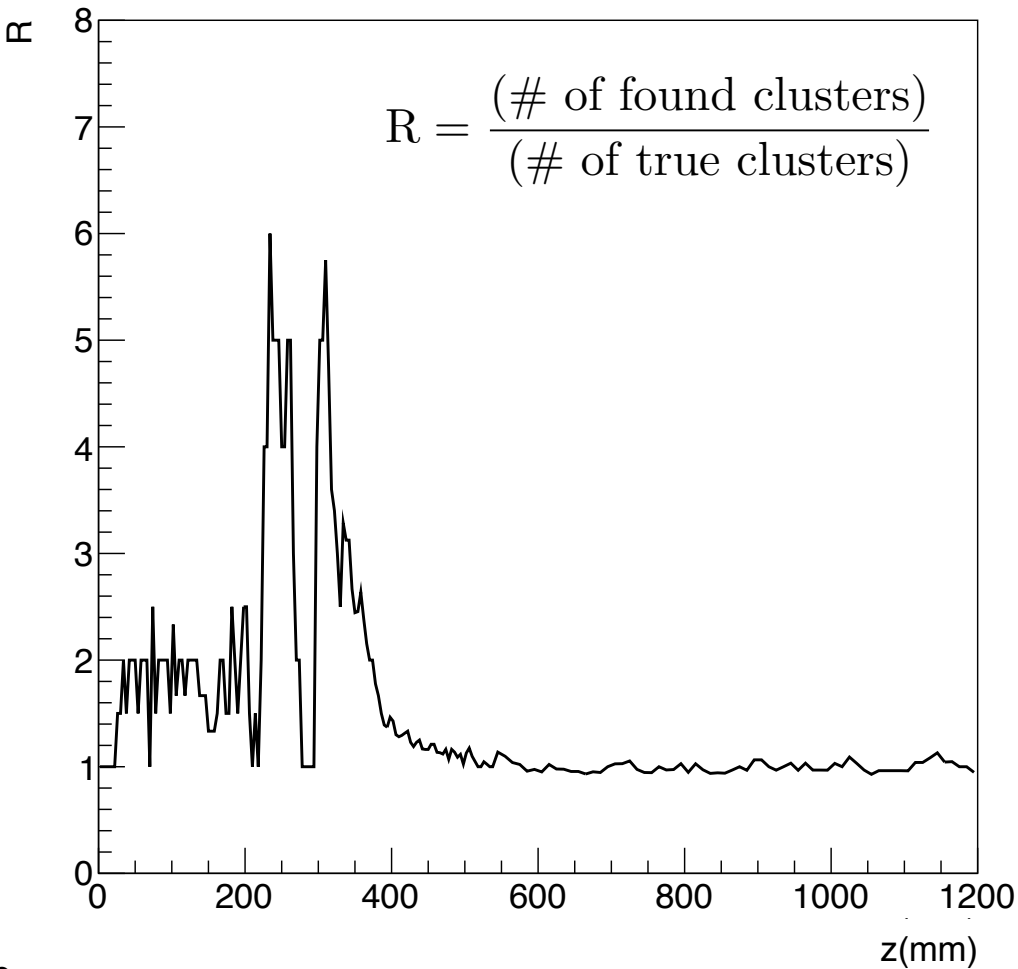
Case 3

z(mm) = **0~540** : (Bin size) = **4 mm**

z(mm) = **540~1200** : (Bin size) = **10 mm**



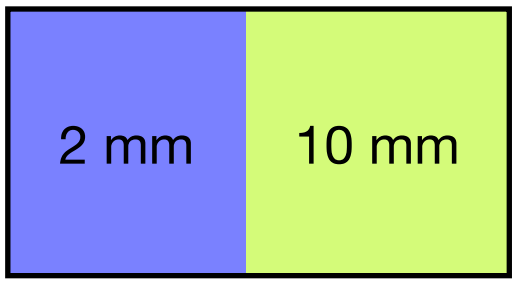


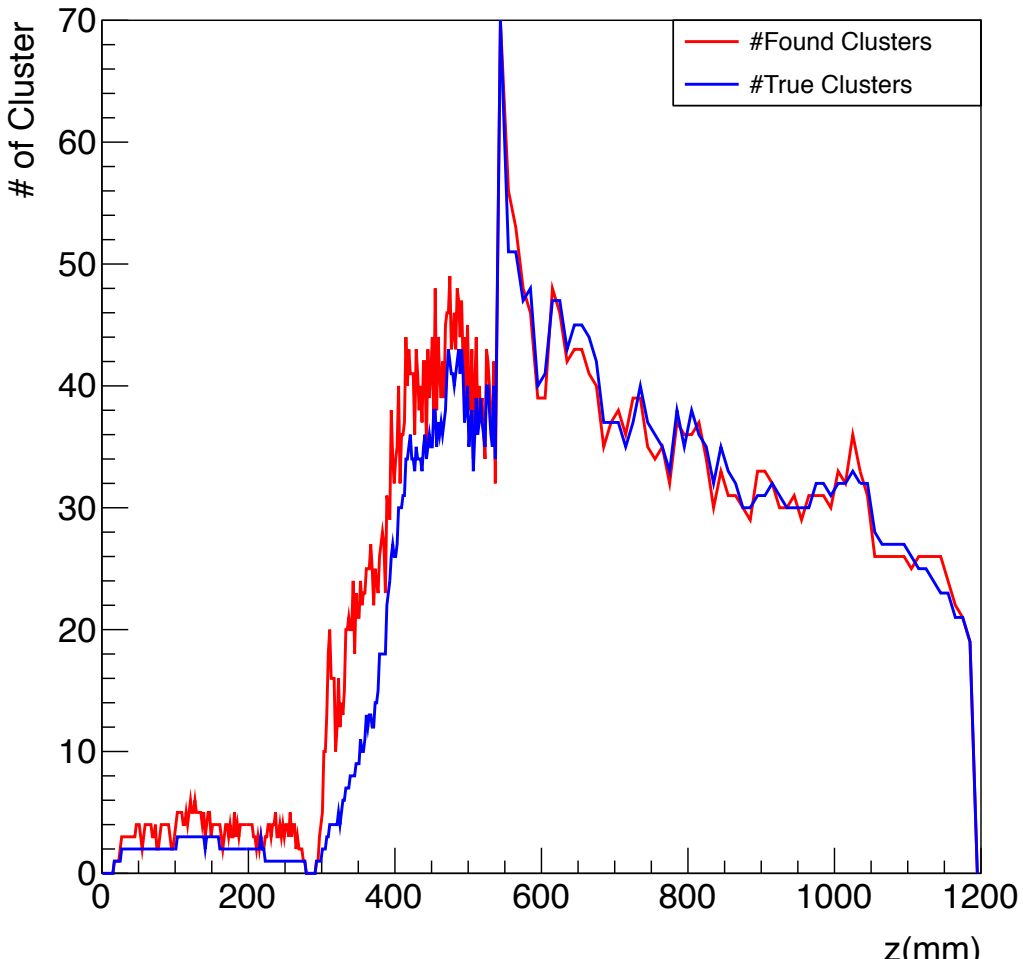


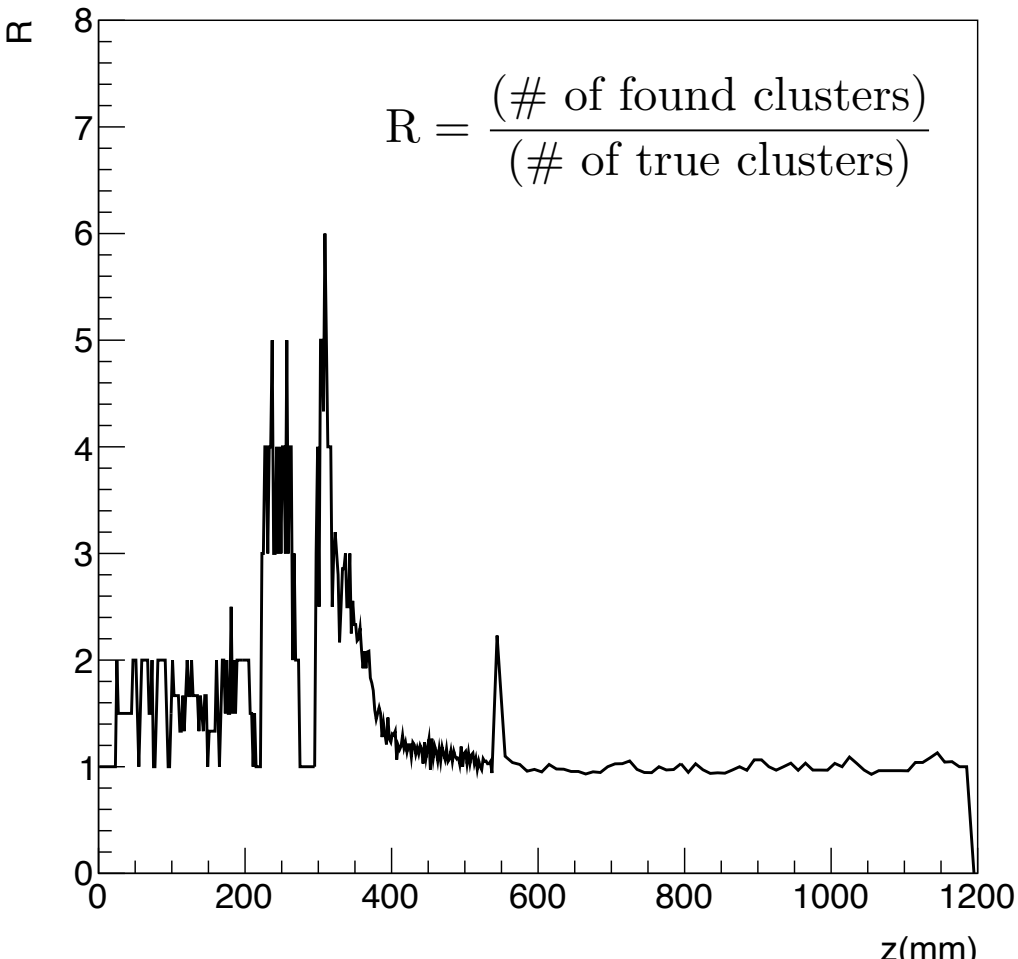
Case 4

z(mm) = **0~540** : (Bin size) = **2 mm**

z(mm) = **540~1200** : (Bin size) = **10 mm**



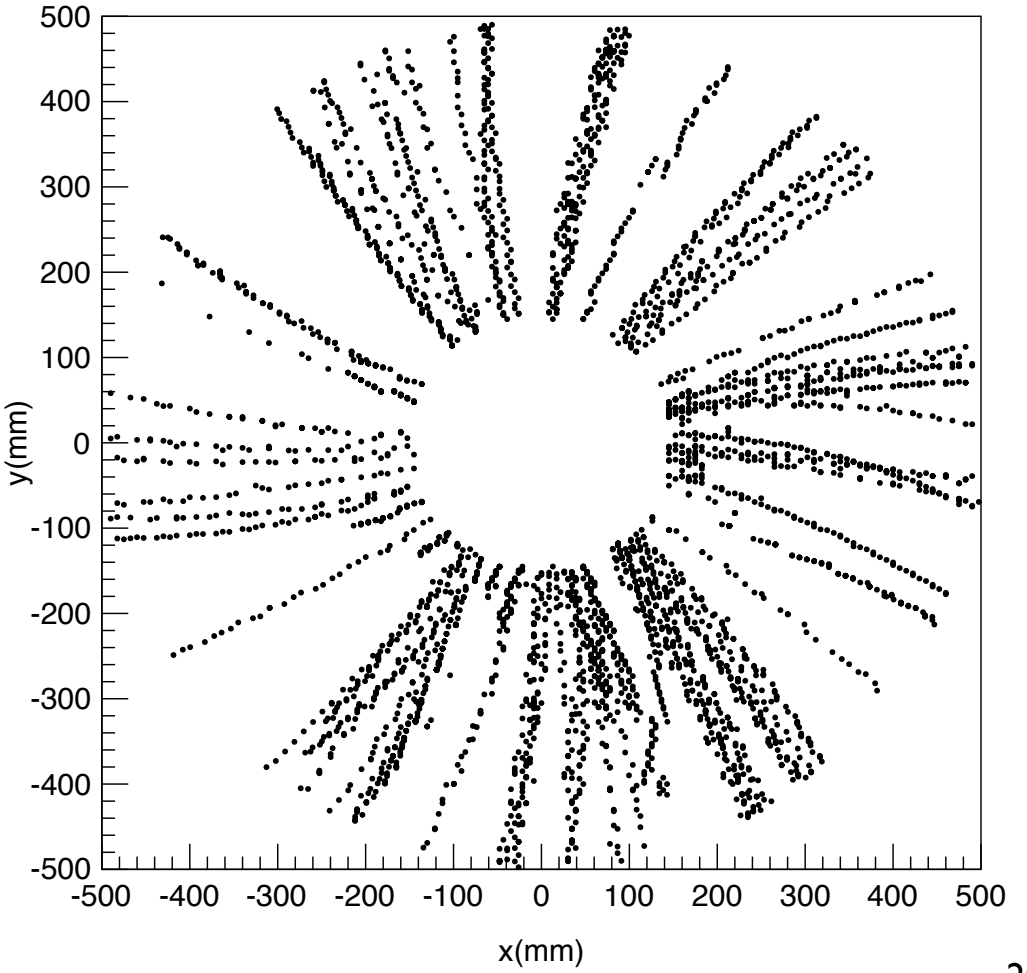


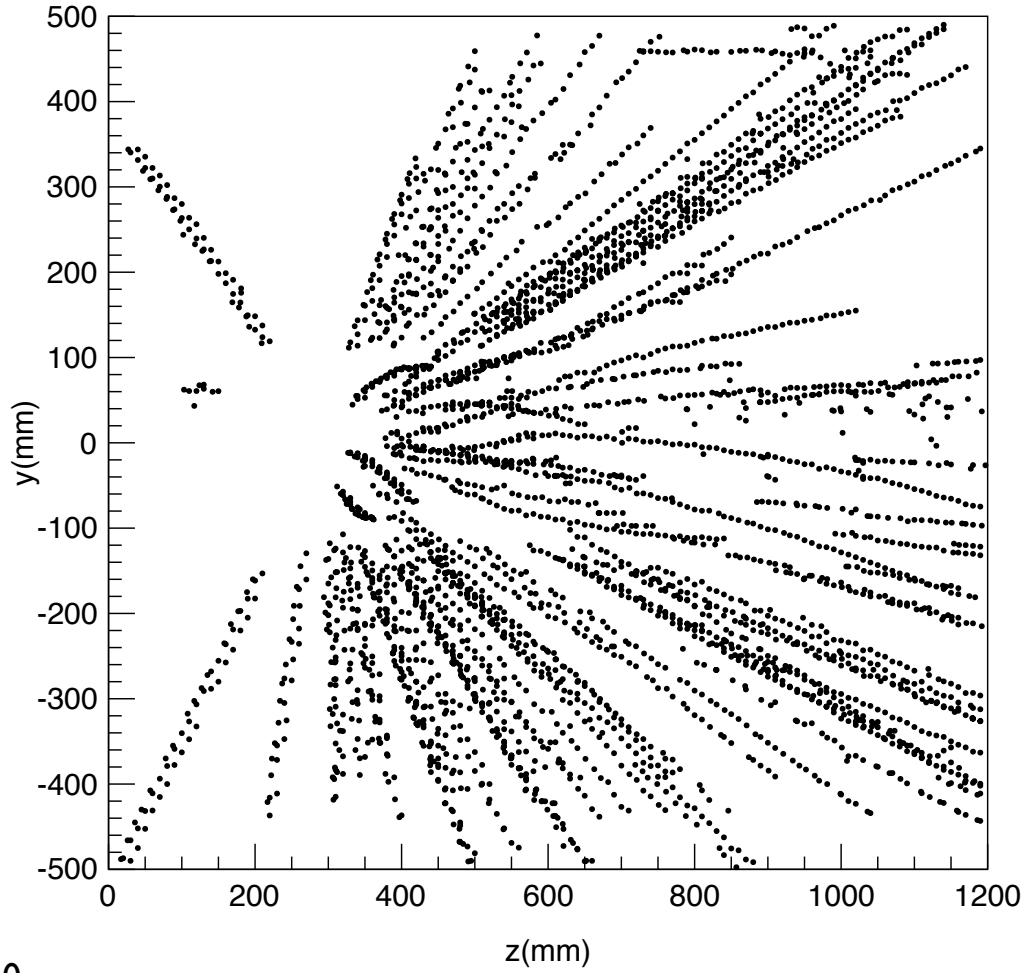


Case 1

z(mm) = **0~1200** : (Bin size) = **10 mm**

10 mm

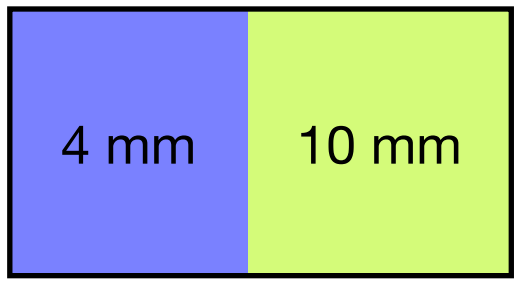


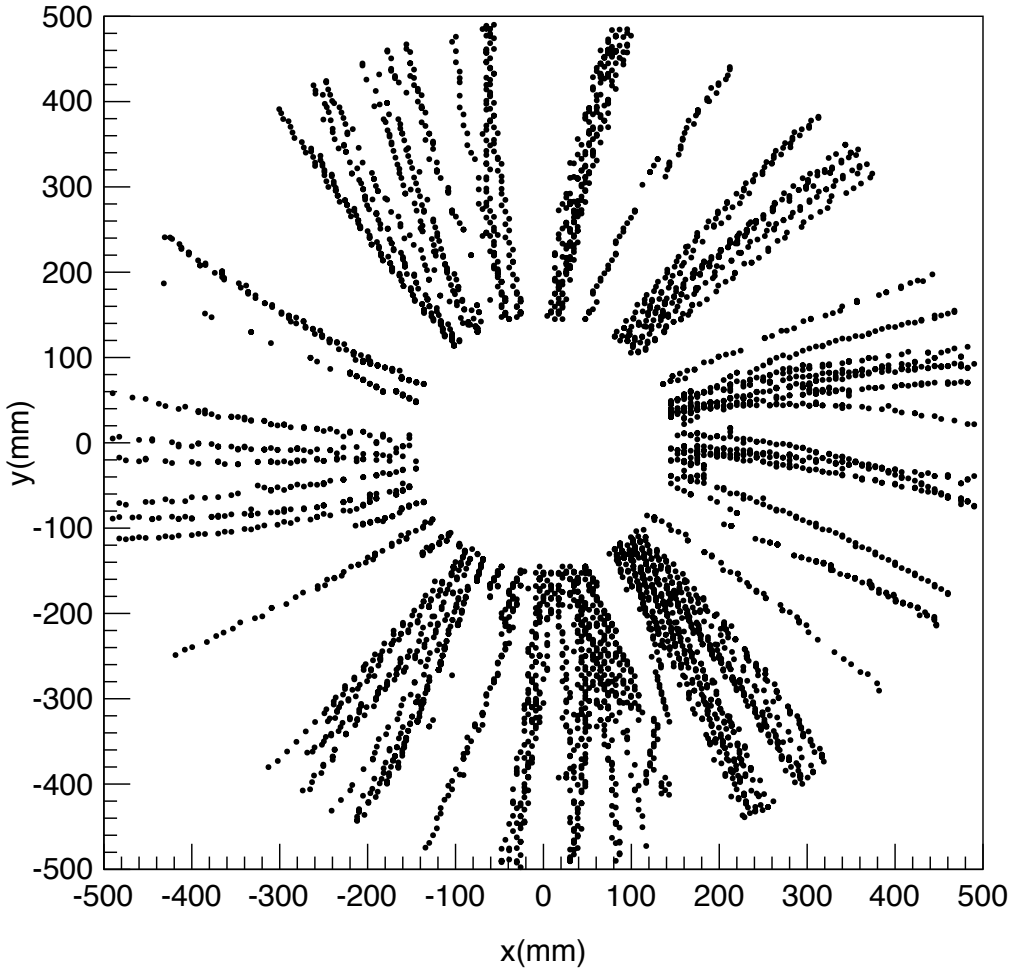


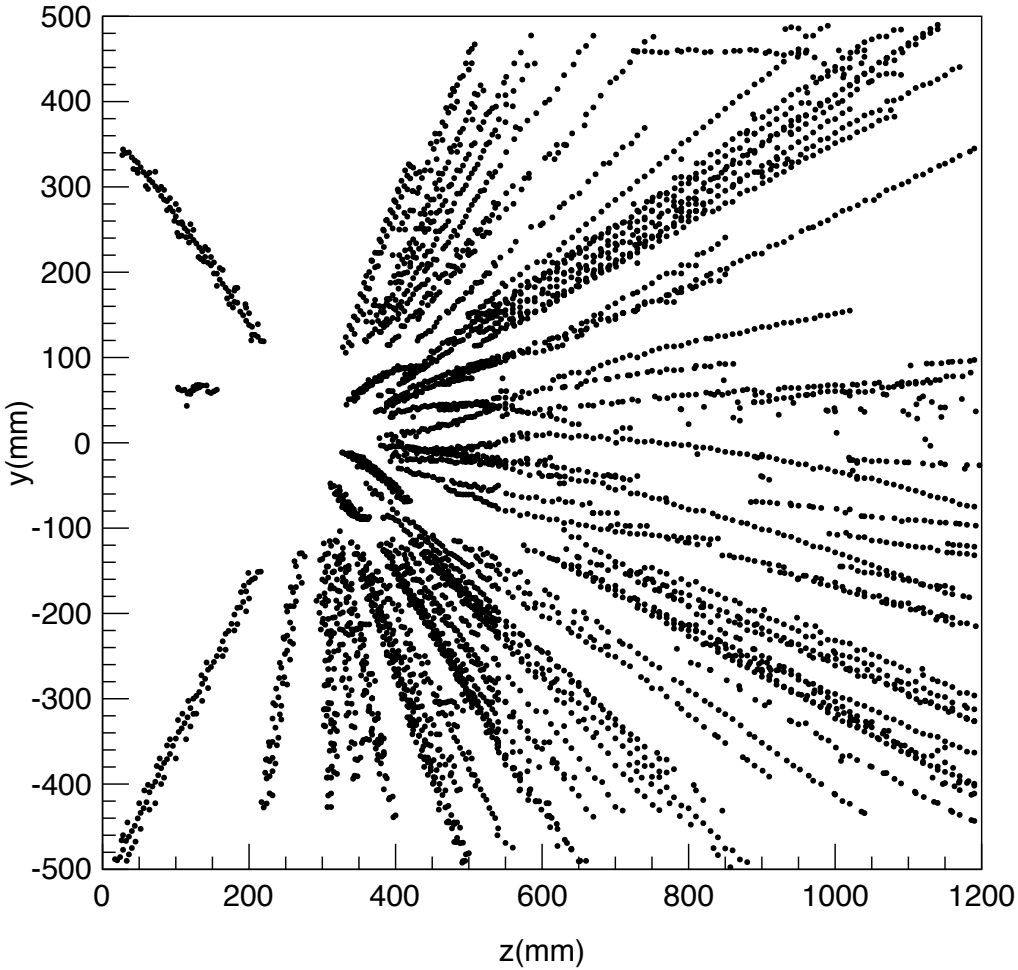
Case 3

z(mm) = **0~540** : (Bin size) = **4 mm**

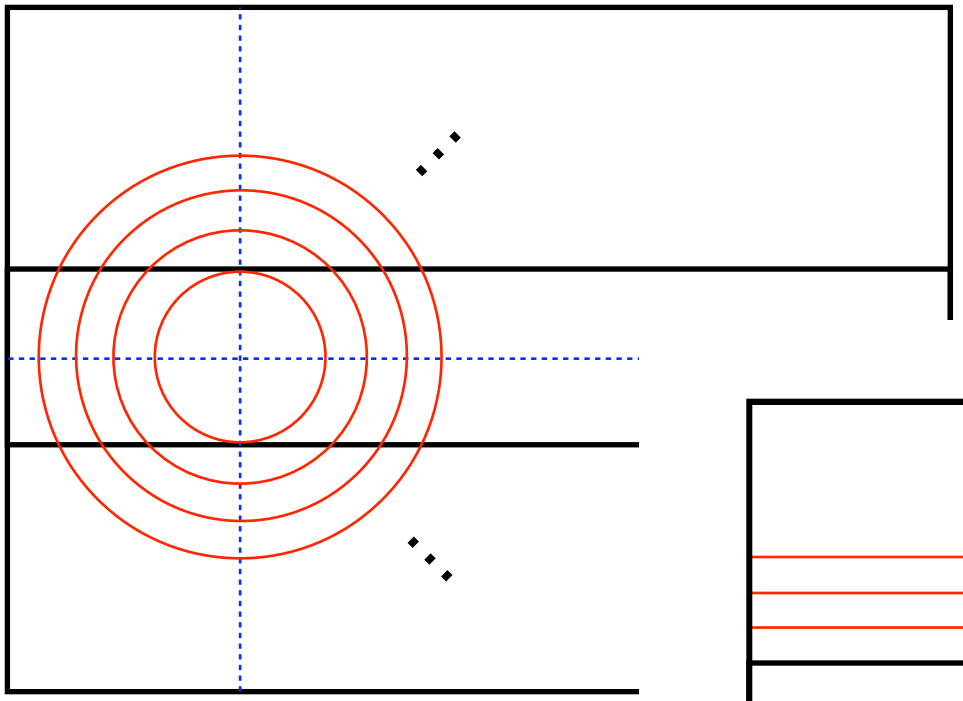
z(mm) = **540~1200** : (Bin size) = **10 mm**





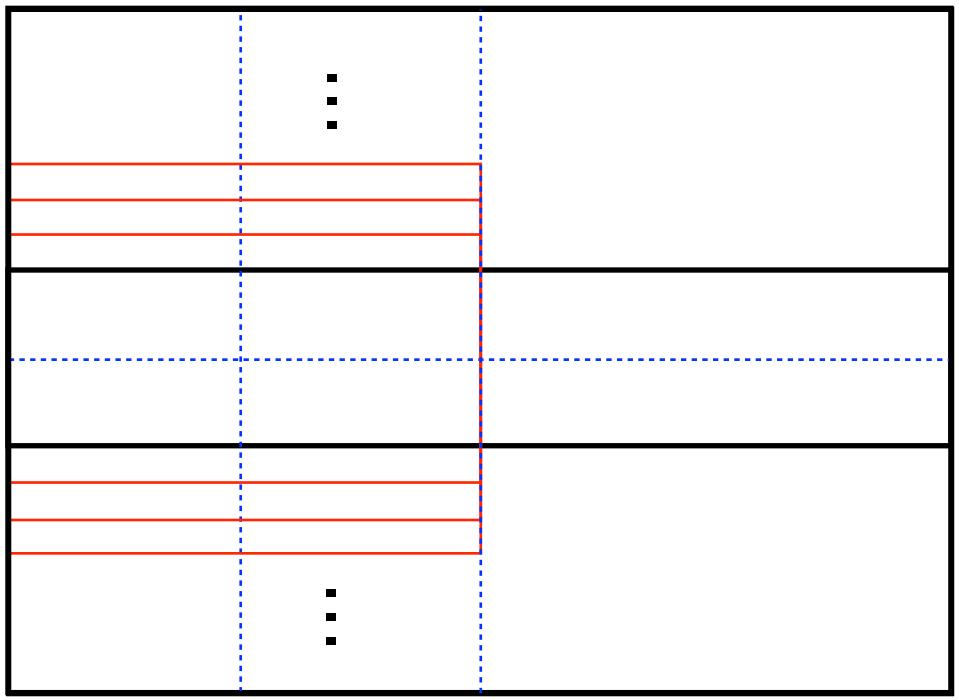


Binning



: r-binning with sphere

r-binning with cylinder :



Summary

1. Cluster center was found with **3 projection planes**(only works in z-binning). Other ways of finding centers?
→ Cluster center is found to be **local maximum**.

2. Effect of **finer binning**.

3. Smarter way of defining **cluster size**.

4. Other kinds of **binning**.

PANDA : TPC → STT

✓ **FOPI** TPC code