TPC software 연구현황

이정우

LAMPS Meeting, 2013. 8. 6.

Simulation Conditions

Geant4 Simulation

- IQMD data of soft model, 250 MeV was used.
- C10 (Ar 90% + CO_2 10%) gas was used.

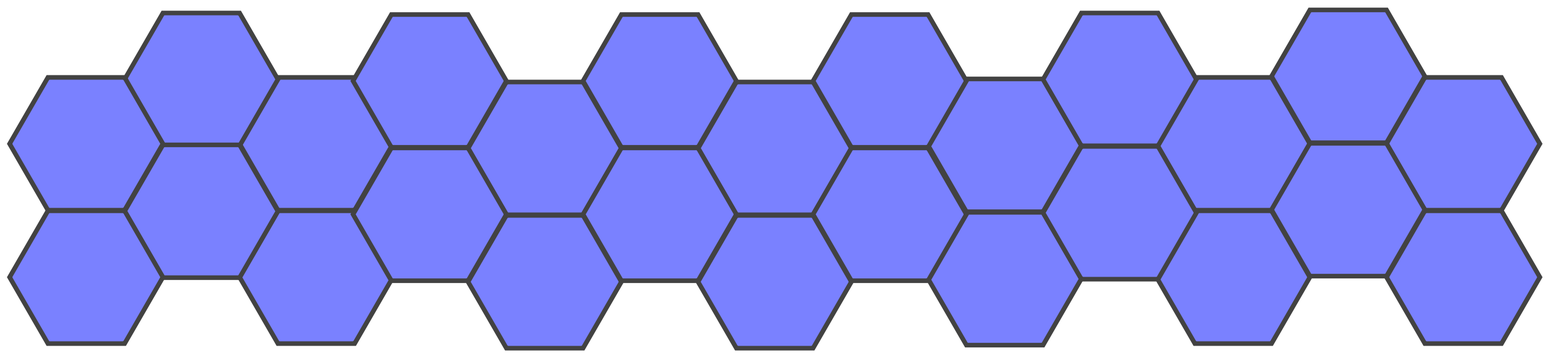
Digitization

- Hexagonal pad with 5mm side length.
- MAYA & Non-MAYA

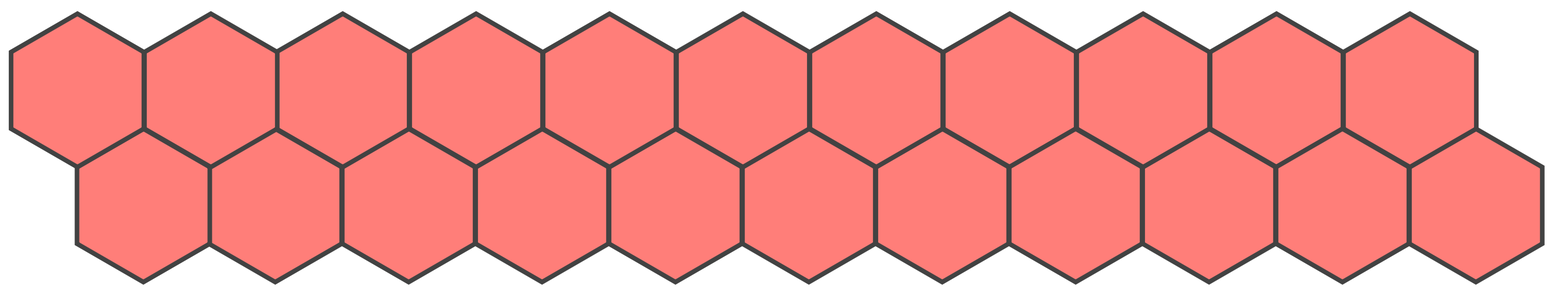
Clusterization & Kalman Filter

Pad Pattern

MAYA



Non-MAYA



Digitization

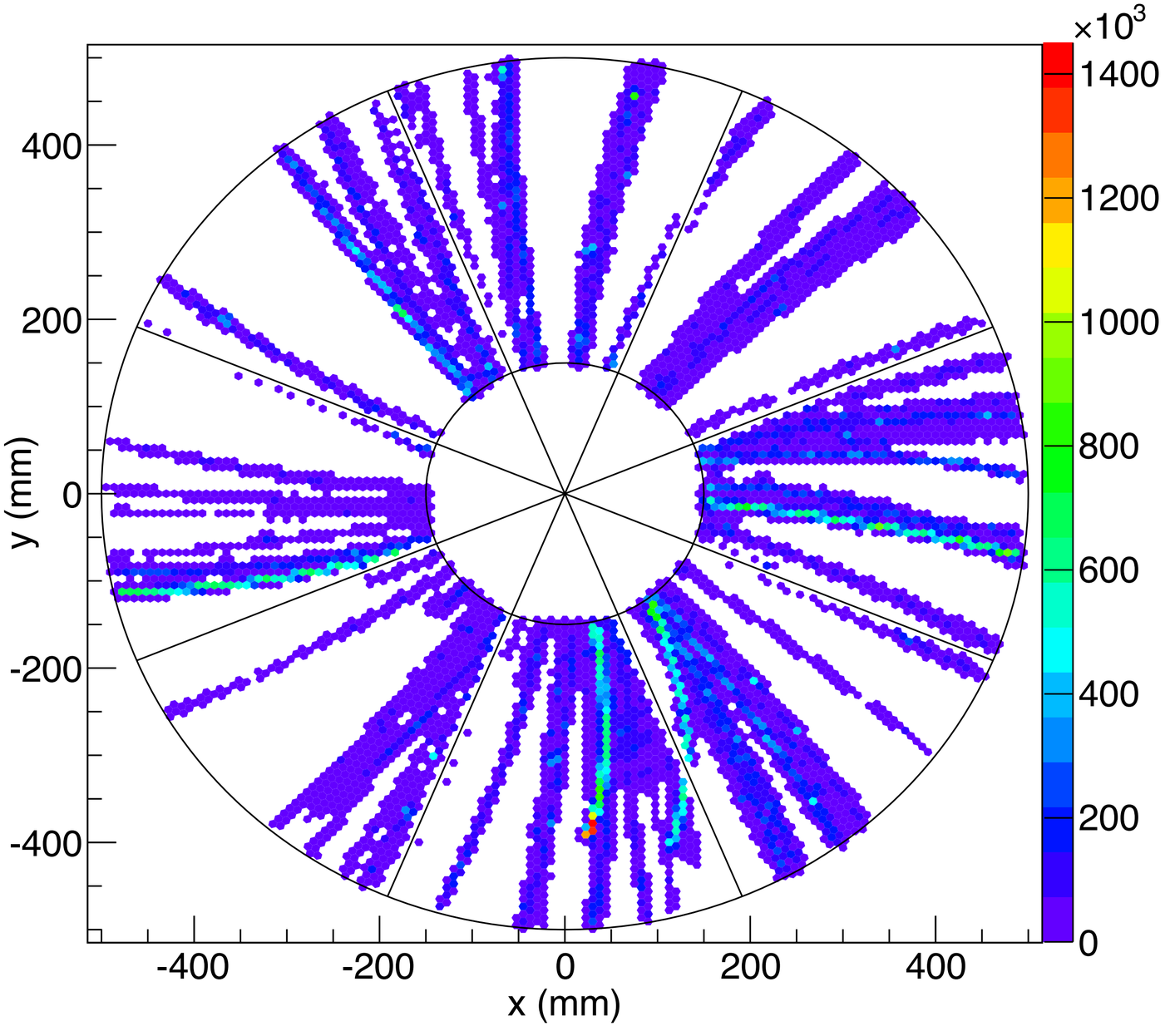
charge

pad ID

forward plane?

time

Pad



Time Resolution

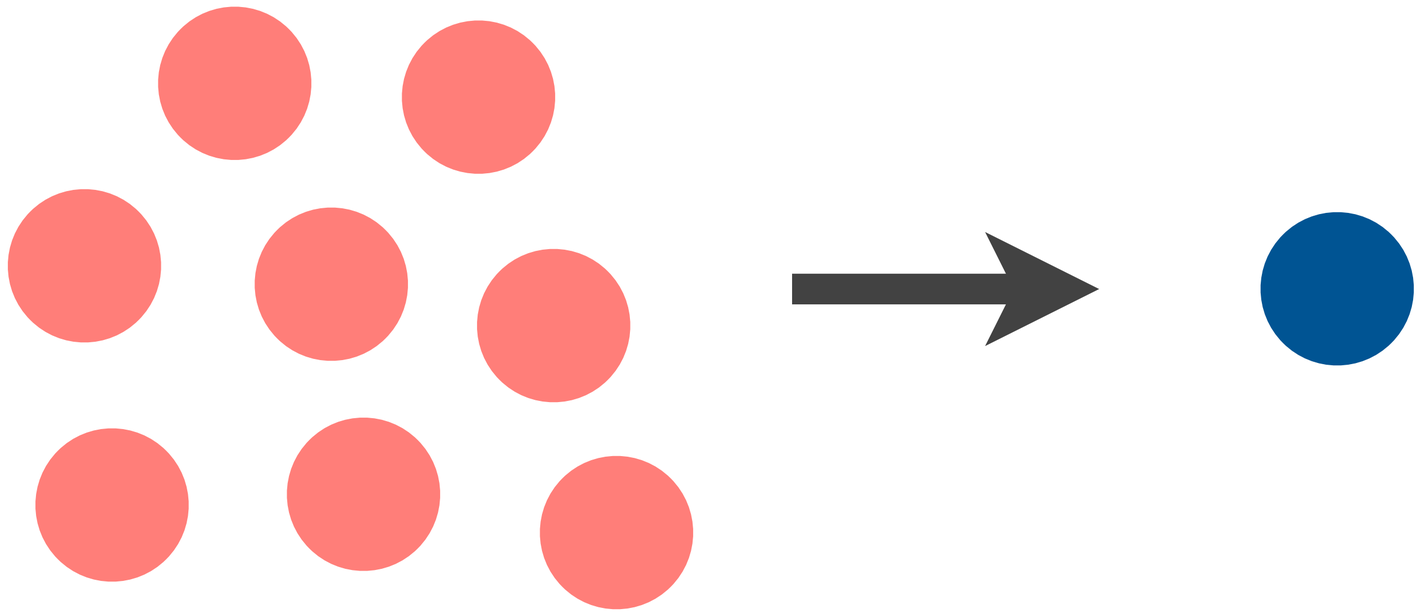
Time resolution of SAMURAI TPC : **20 ns**

If we apply the same time resolution to LAMPS TPC, resolution of position in z-axis would be

~ (20 ns) x (50 μm/ns) = 1 mm.

Clusterization

Gathering group of points in to one point.



Center of charge

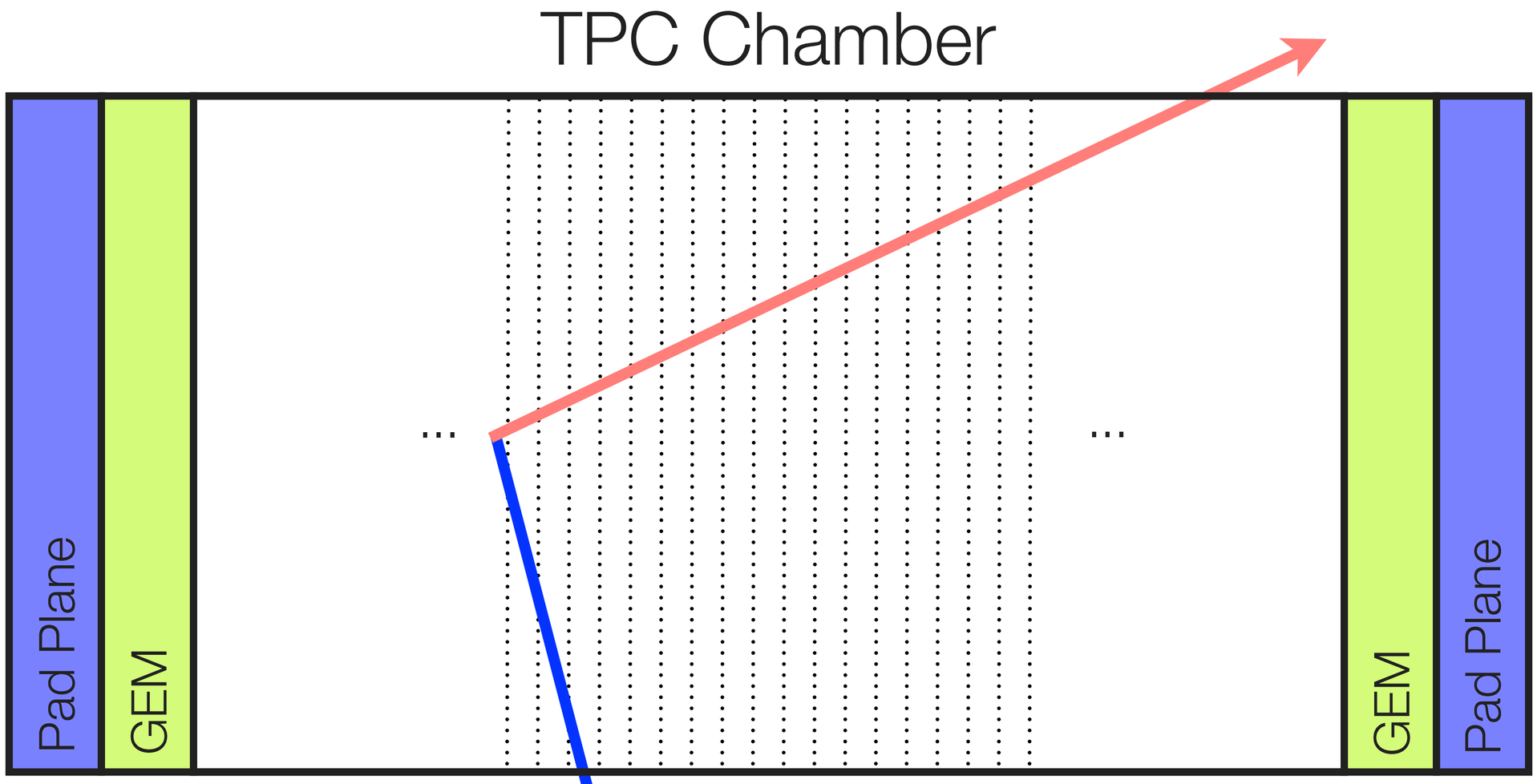
$$x = \frac{\Sigma_i \, x_i q_i}{\Sigma_i \, q_i}$$

Total charge

$$q = \Sigma_i \, q_i$$

Threshold was given to clustered point, so that if total charge of the clustered point is less than **120 fC**, point was to be removed.

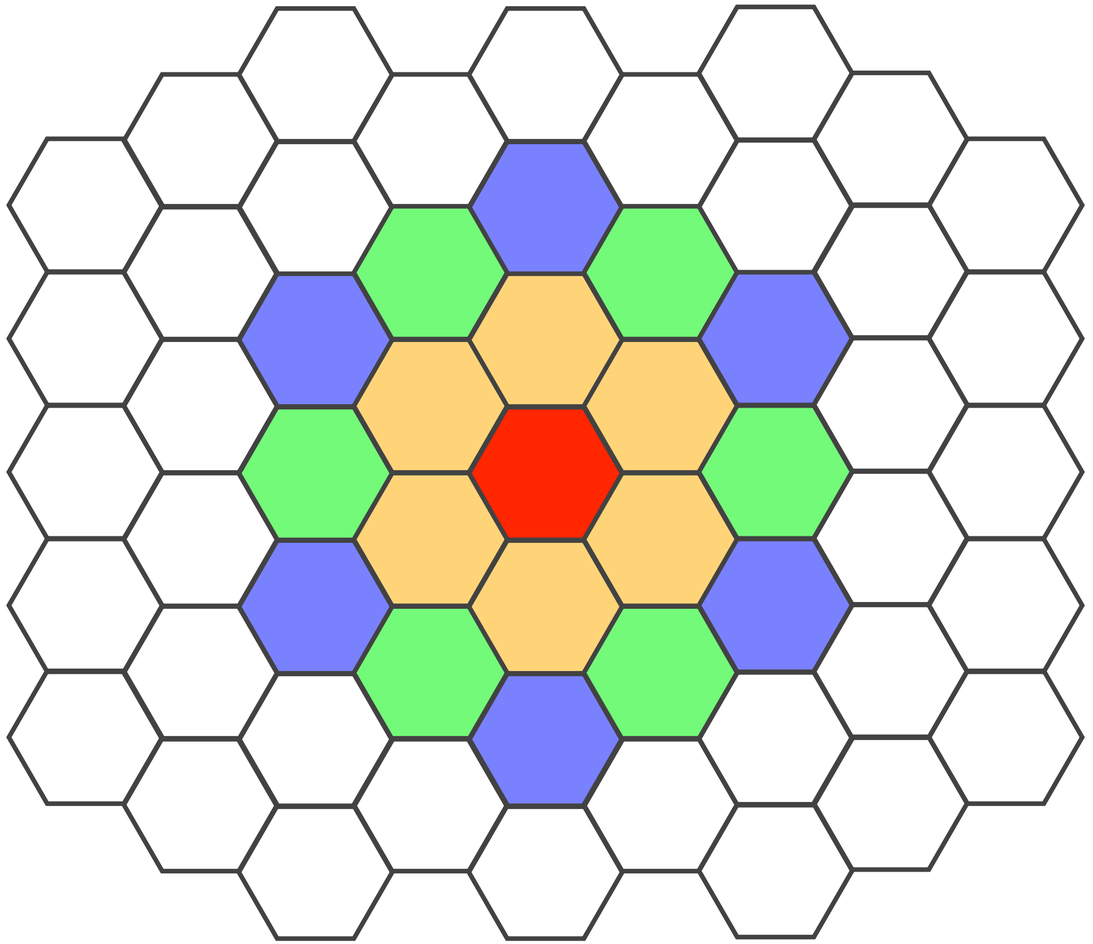
Clusterization



#**120** Sections along the z-axis; each section with 10mm in length

Nearest Neighbors of a Pad

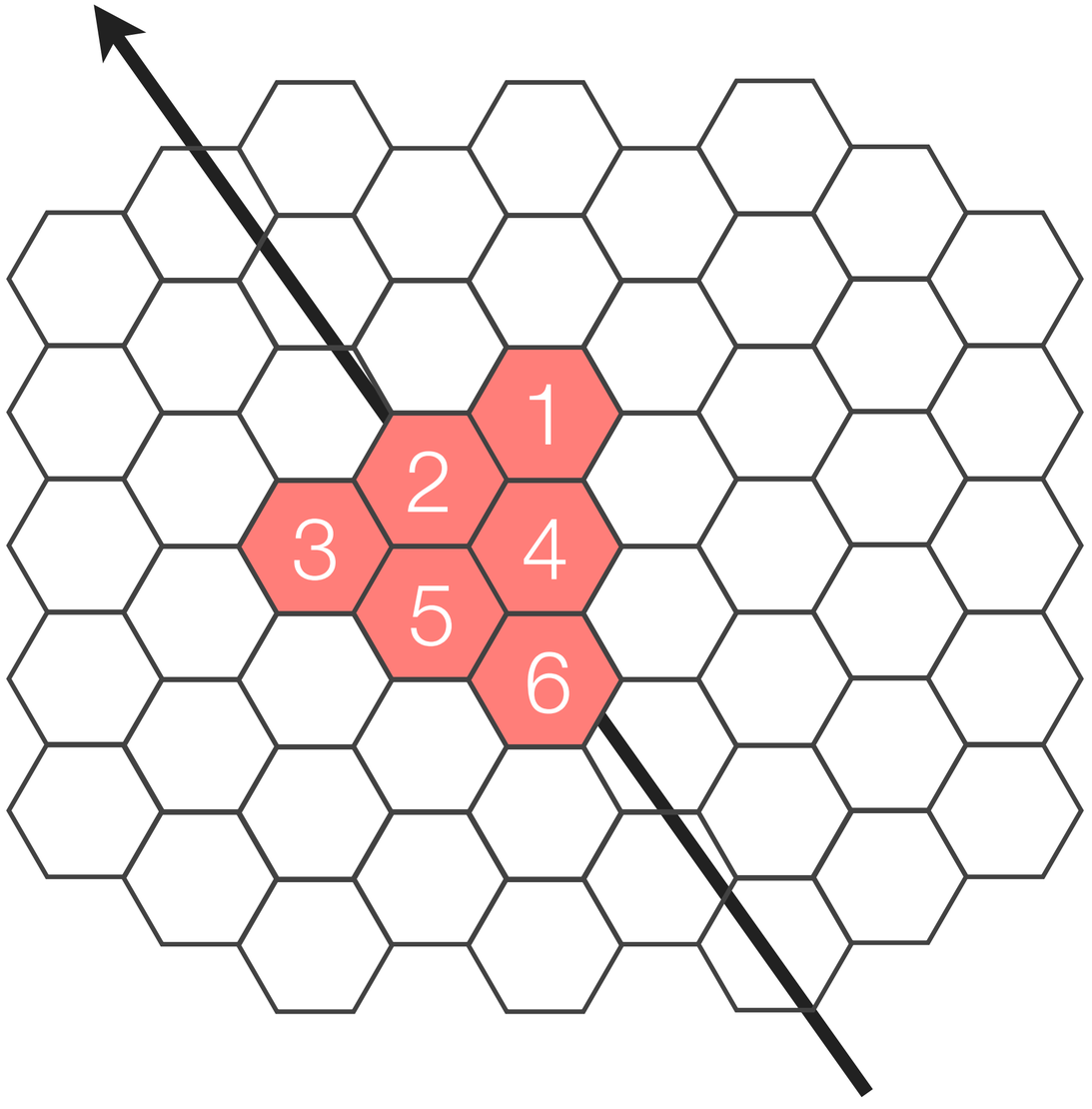
3rd Nearest



6x3

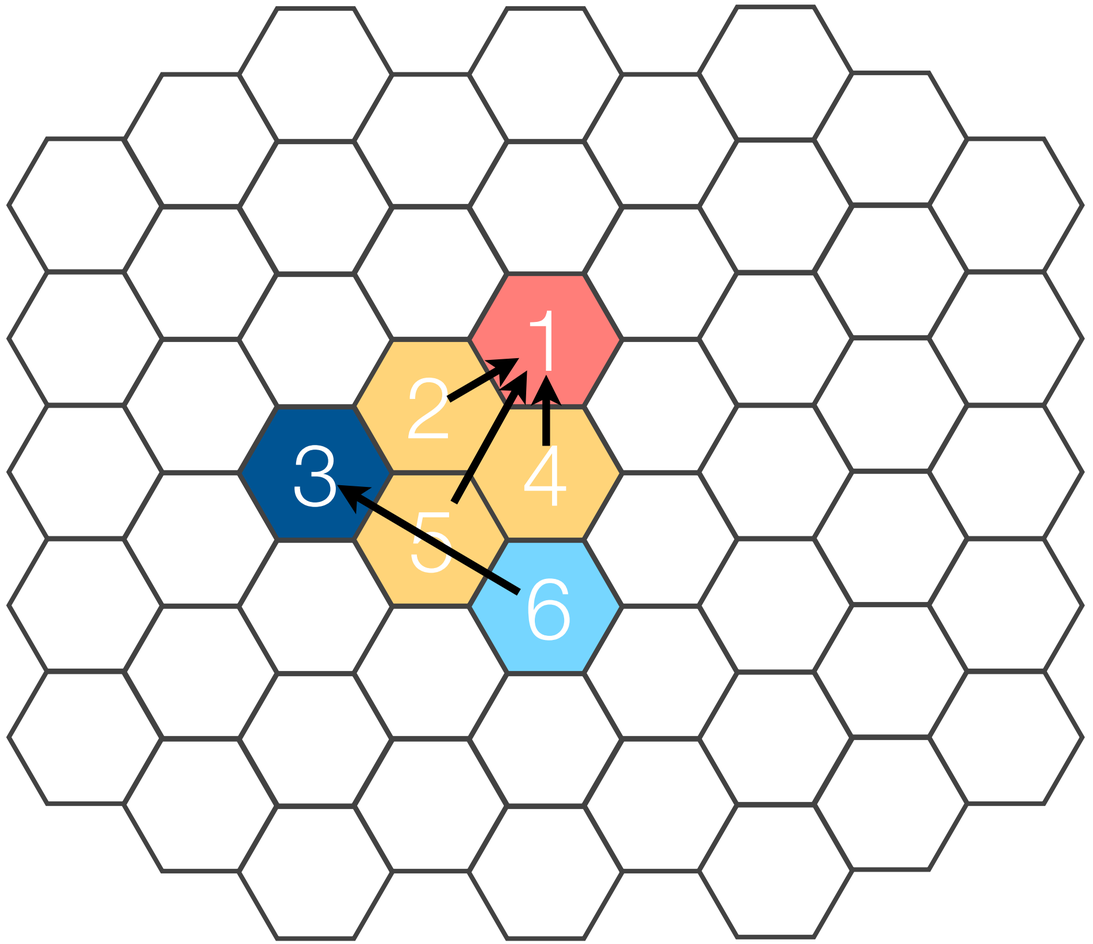
Gathering Pad Information

nth Nearest



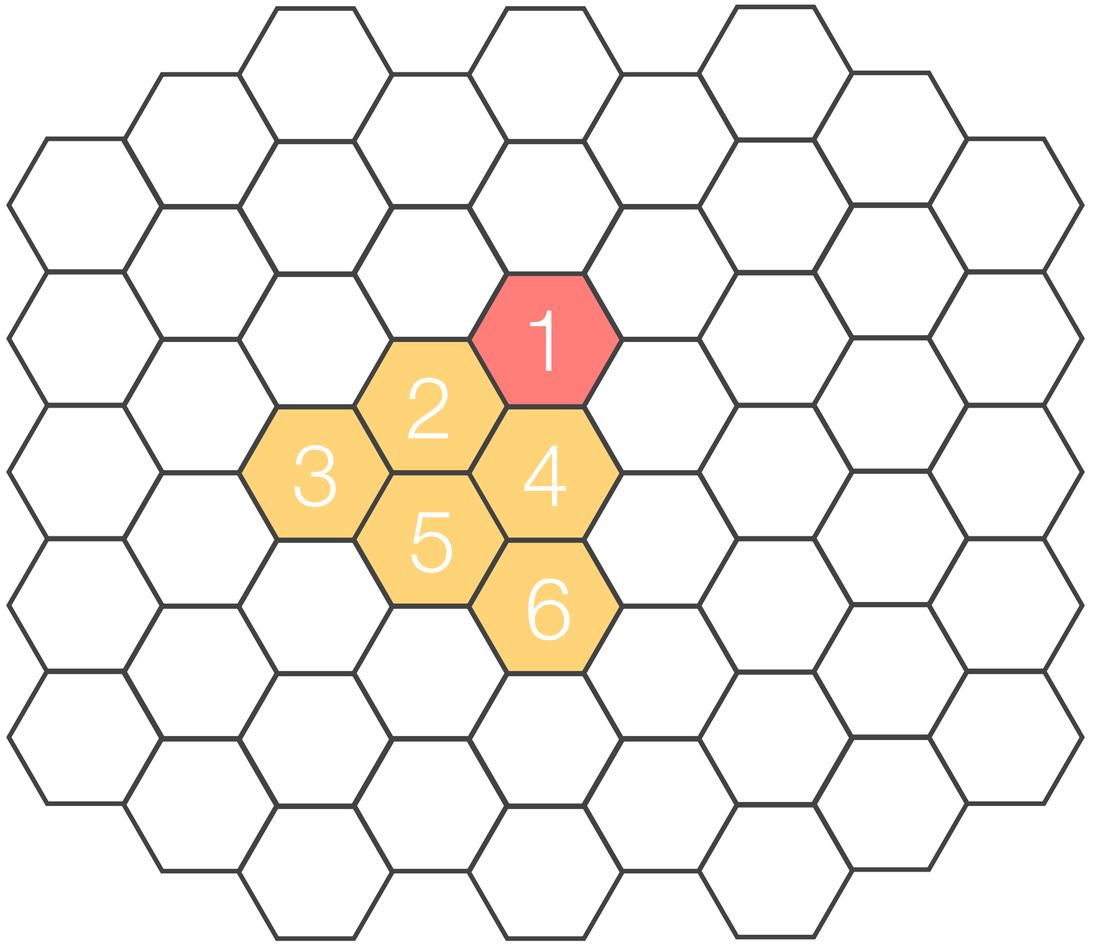
Gathering Pad Information

2nd Nearest



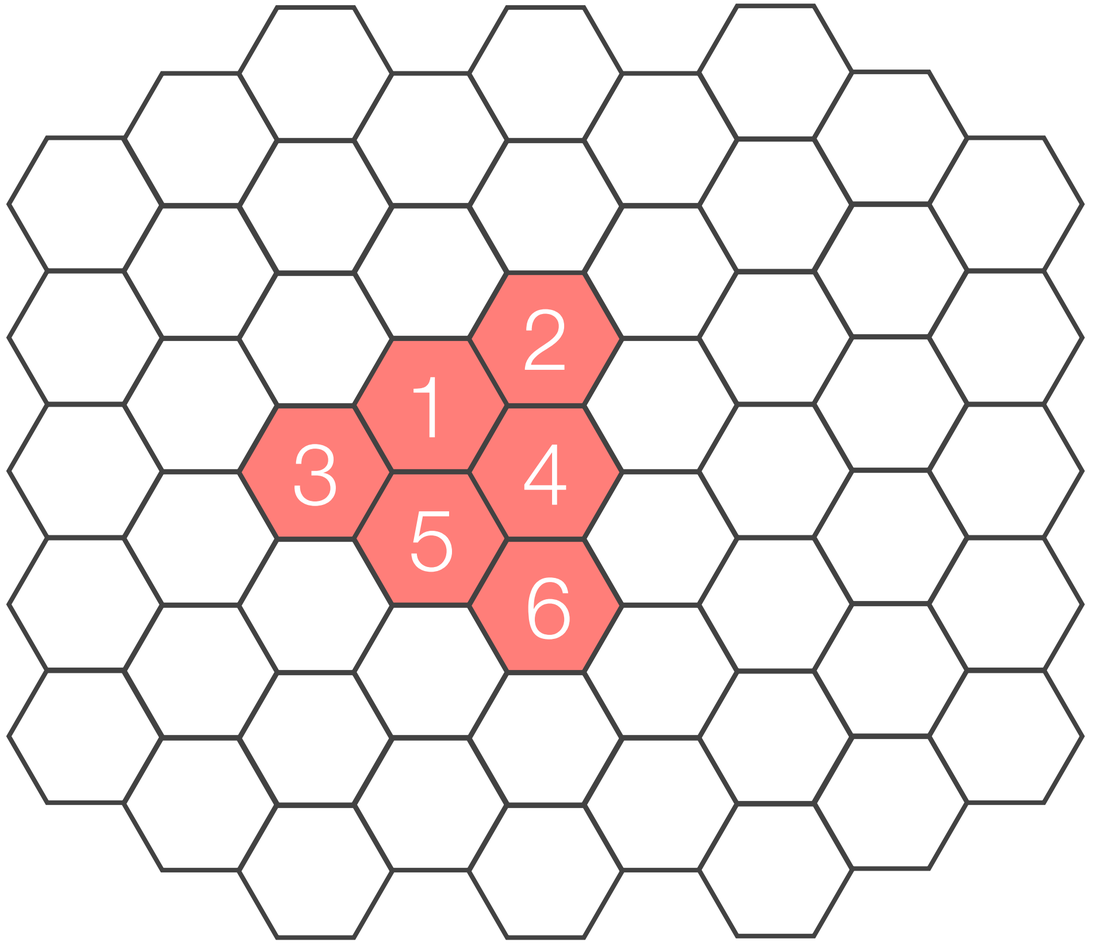
Gathering Pad Information

3rd Nearest



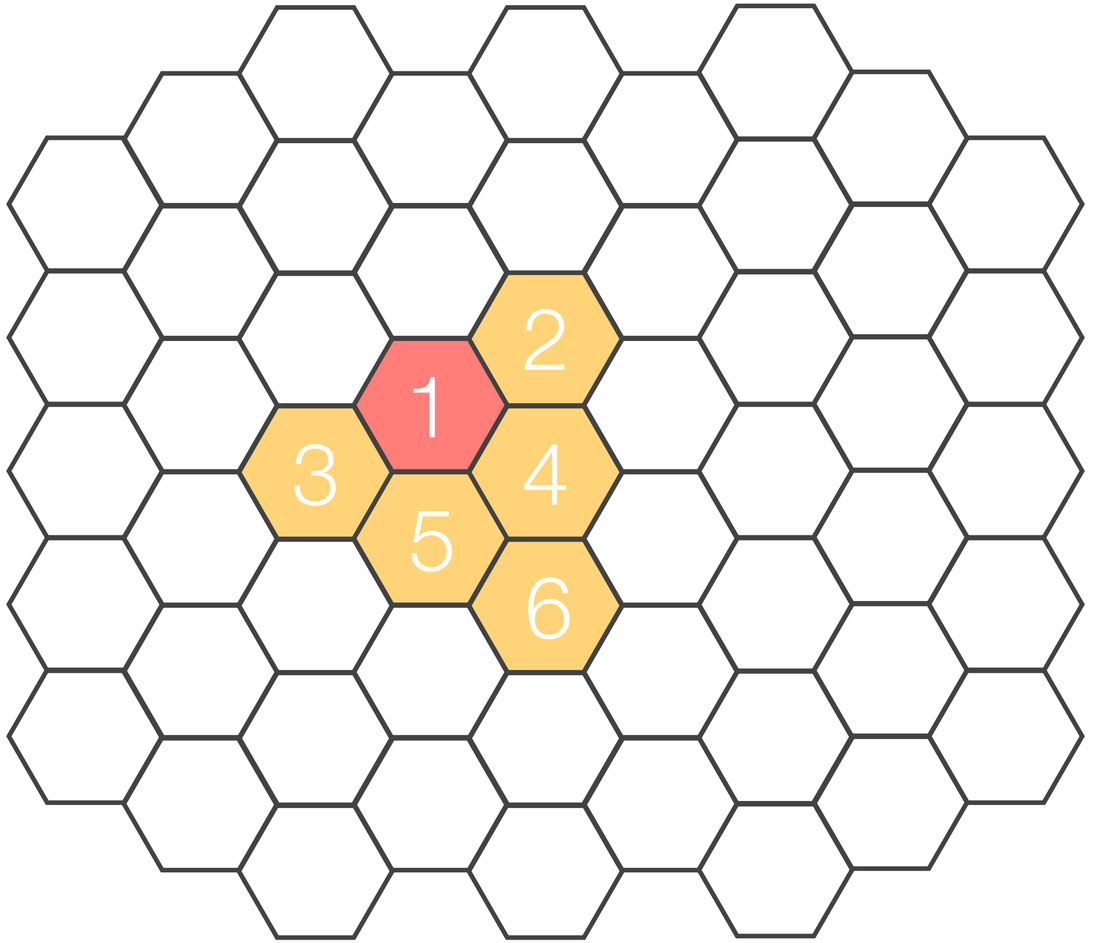
Gathering Pad Information

2nd Nearest

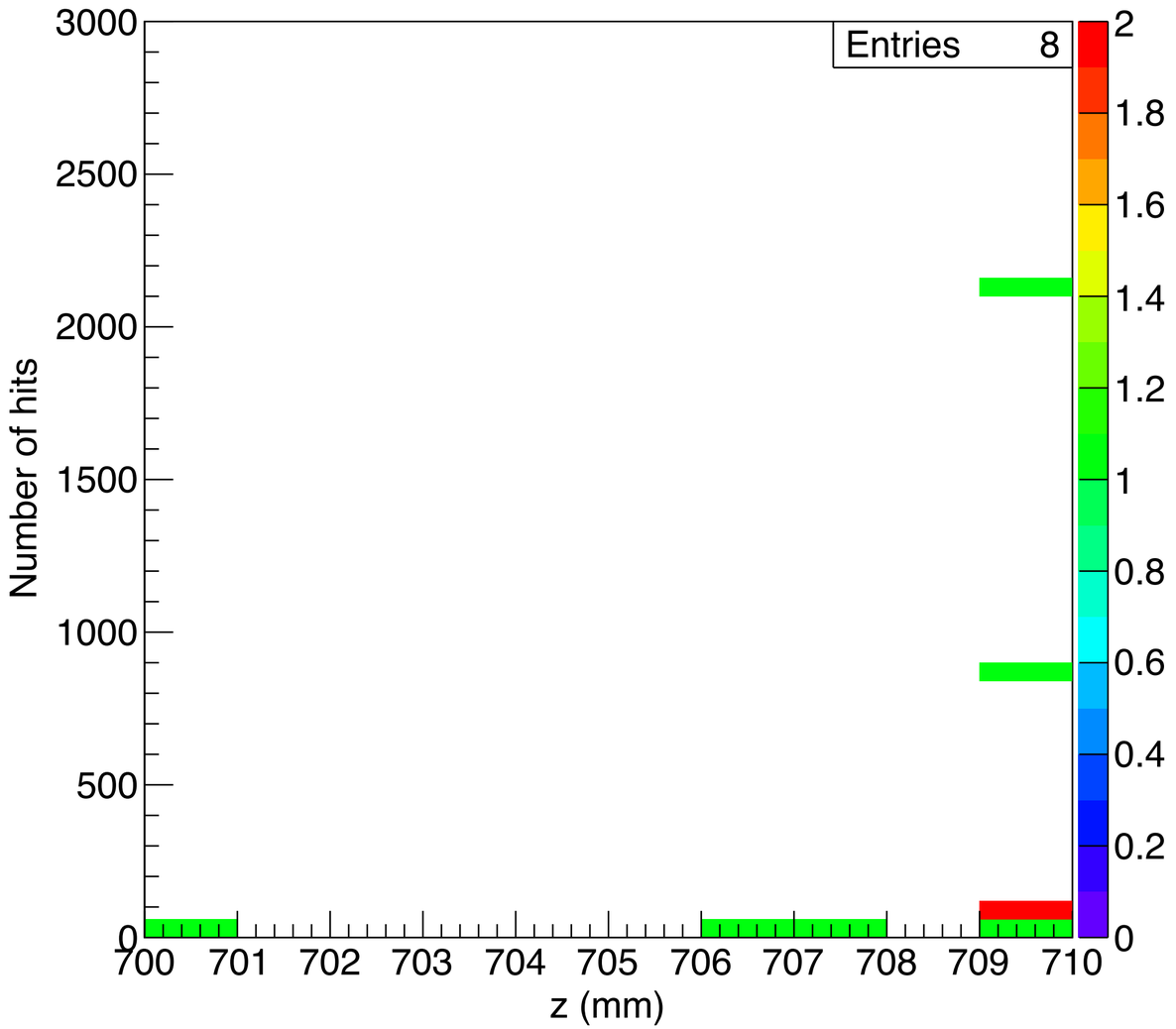


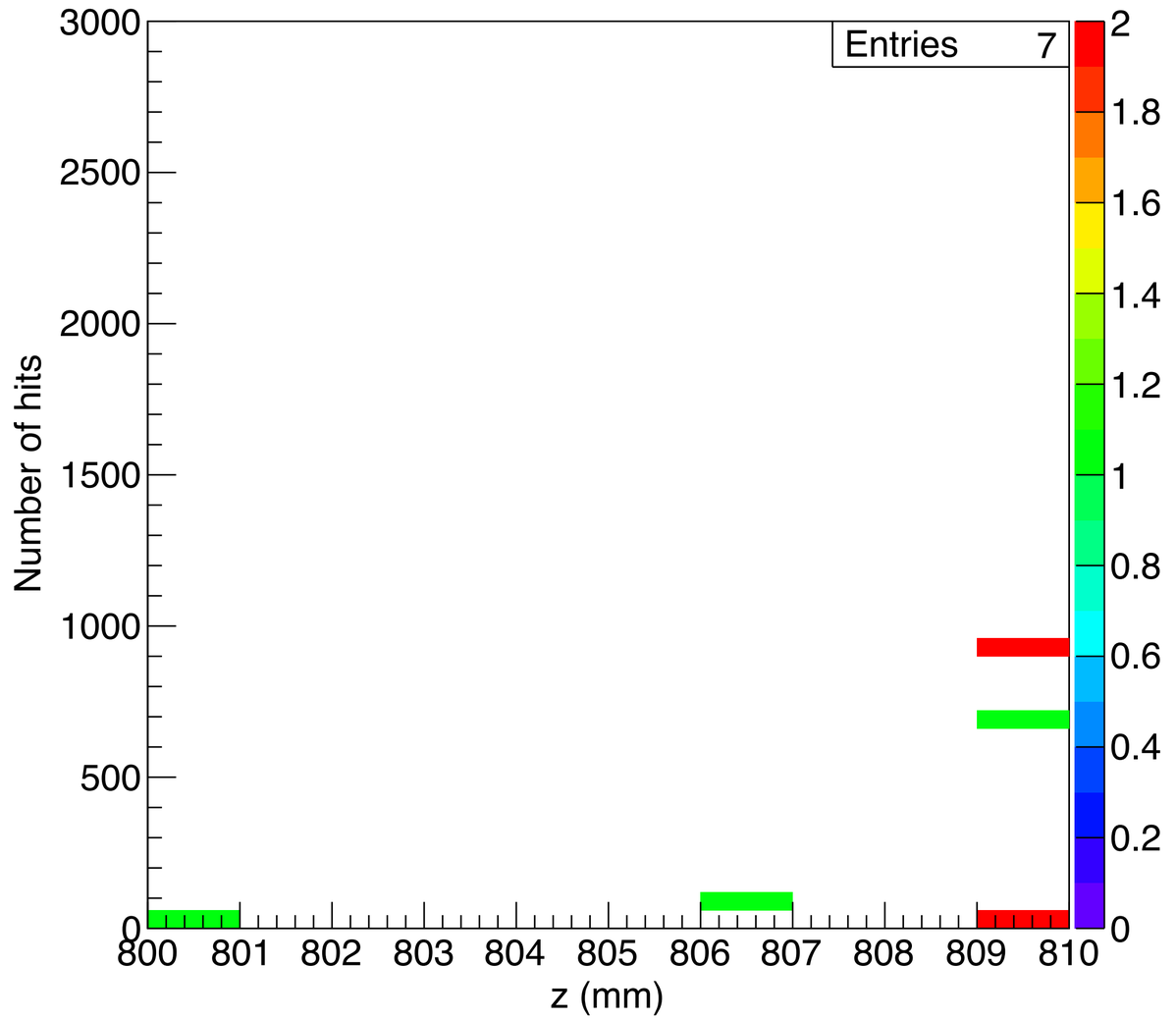
Gathering Pad Information

2nd Nearest



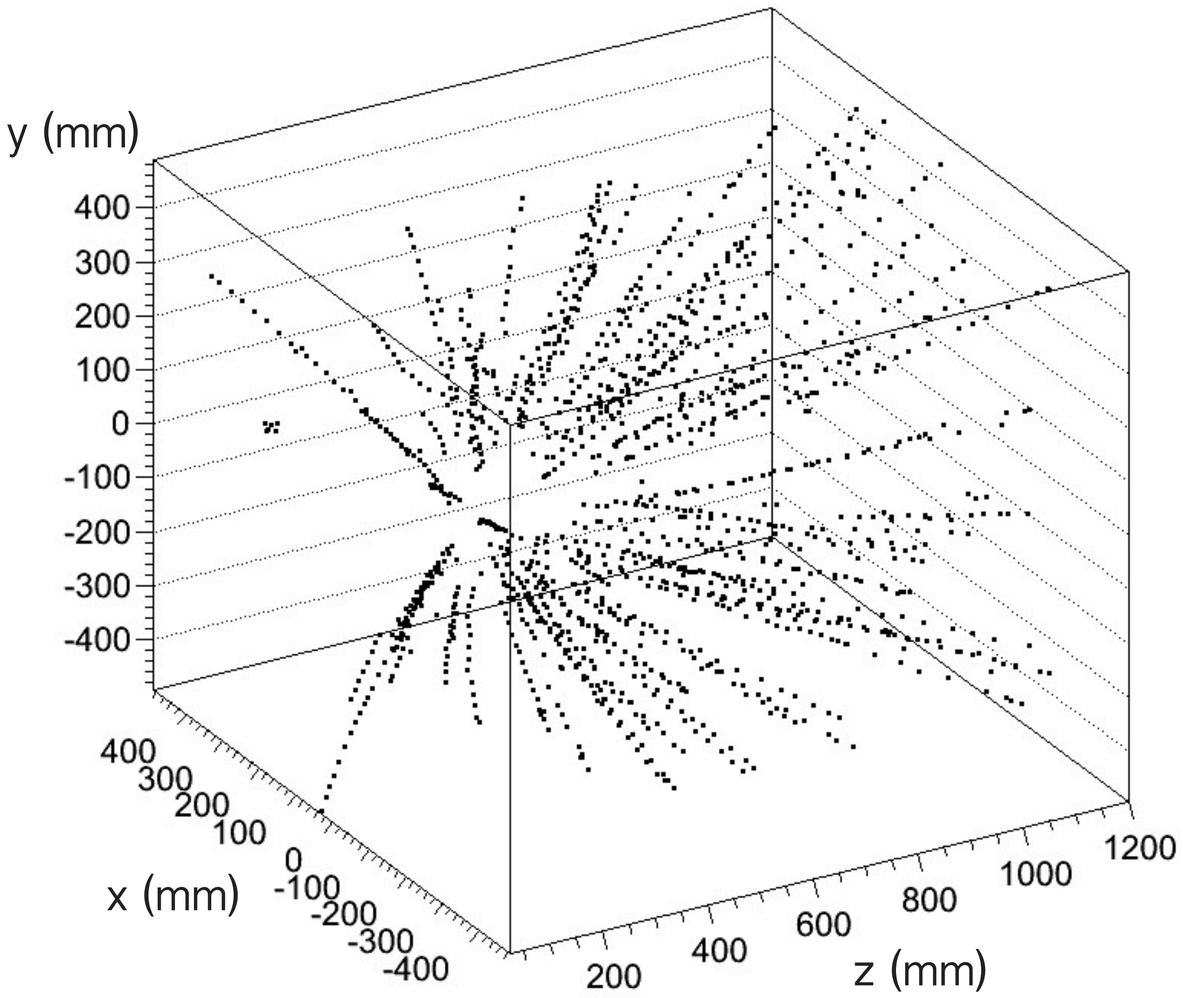
Time, Charge Correlation



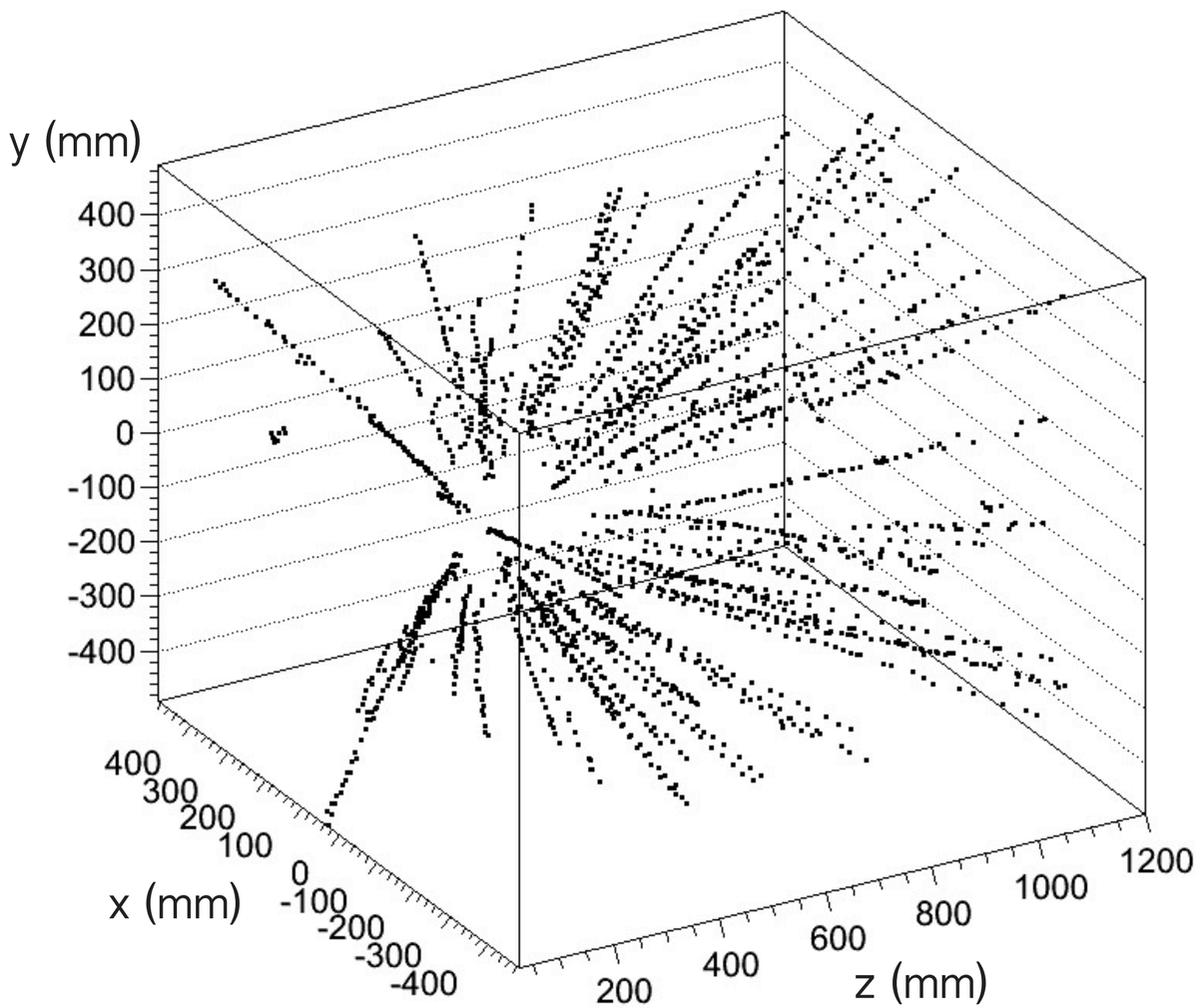


3rd vs 2nd

3rd nearest : 1440 points

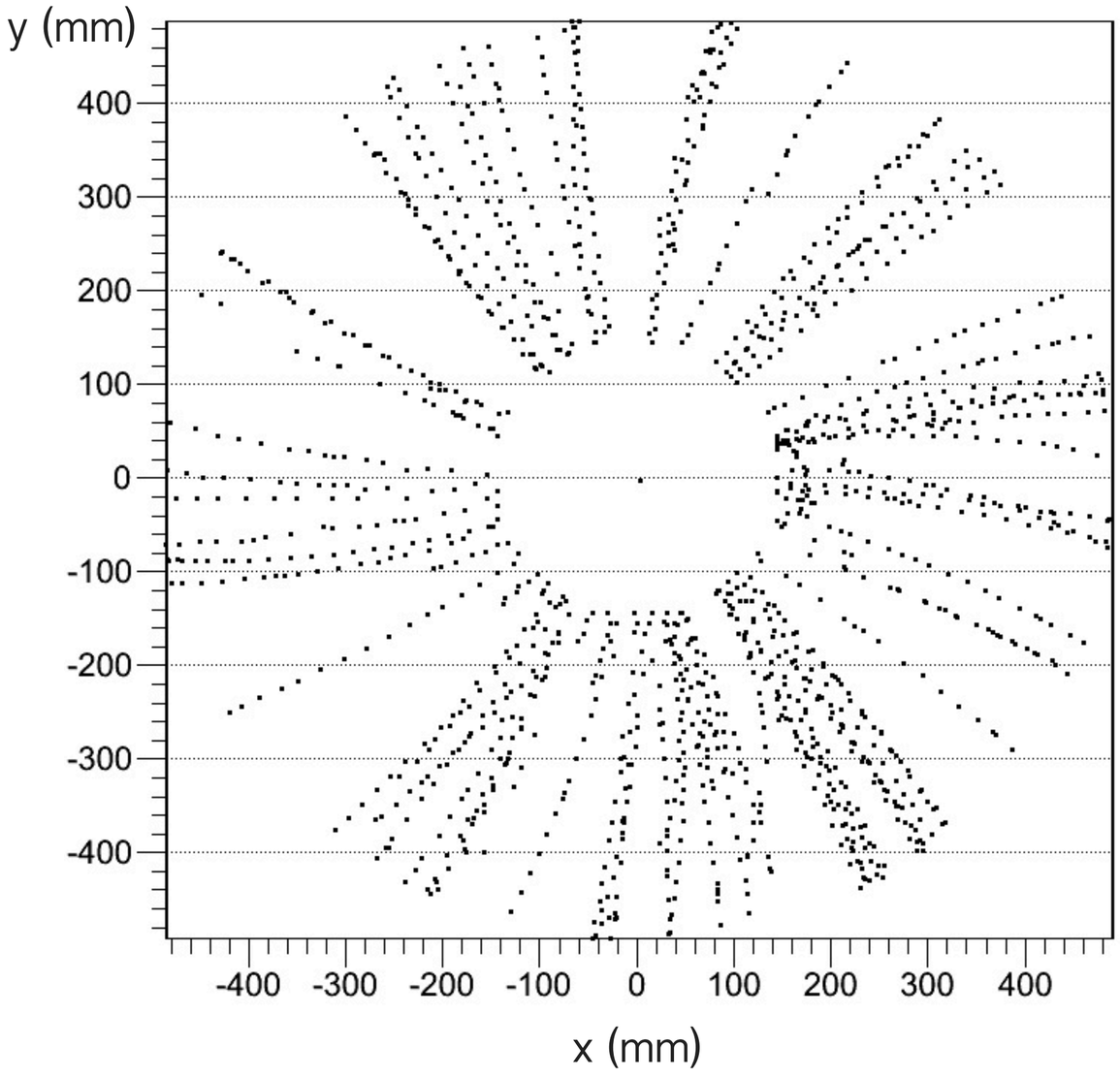


2nd nearest : 2009 points

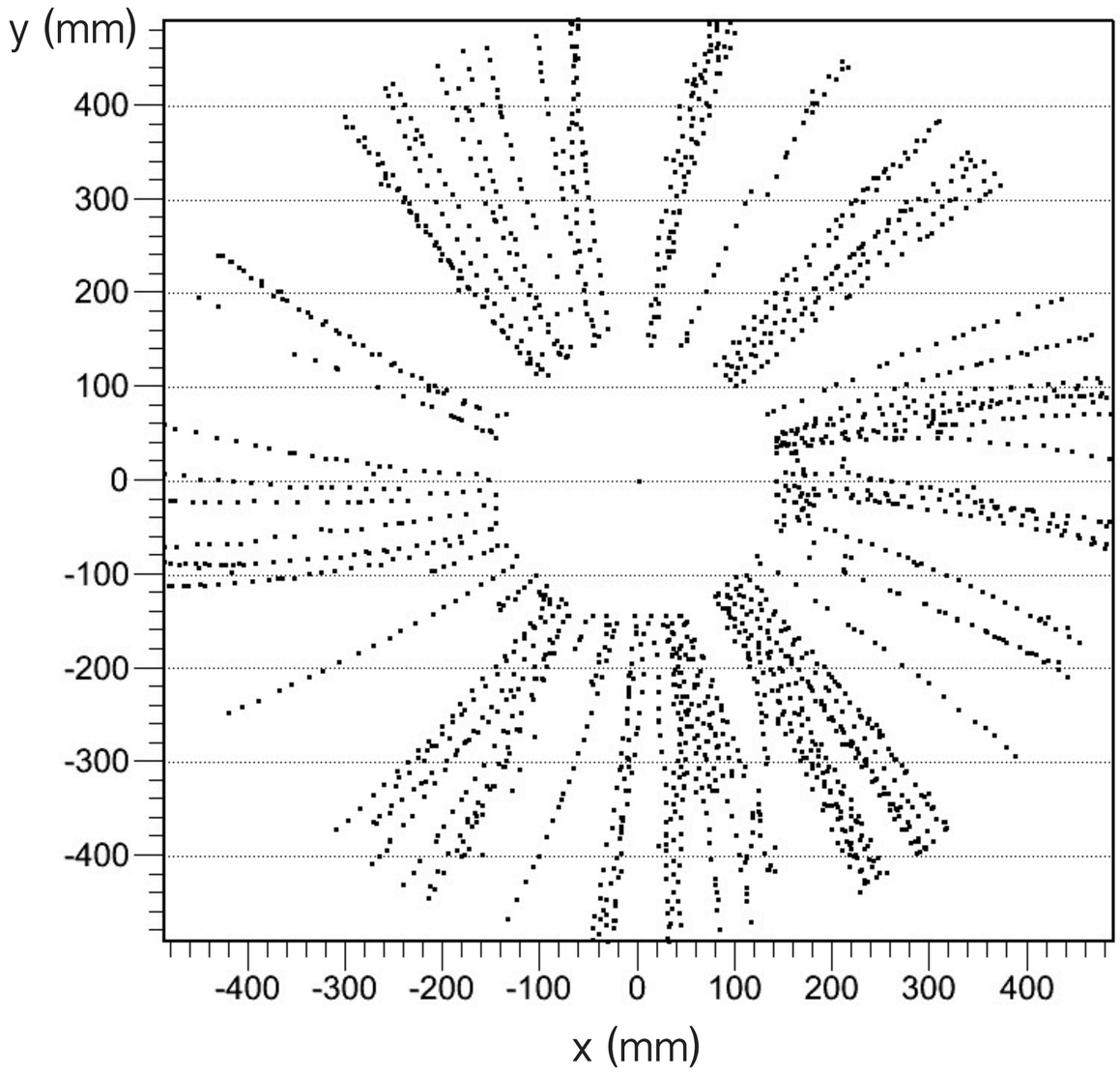


3rd vs 2nd

3rd nearest : 1440 points

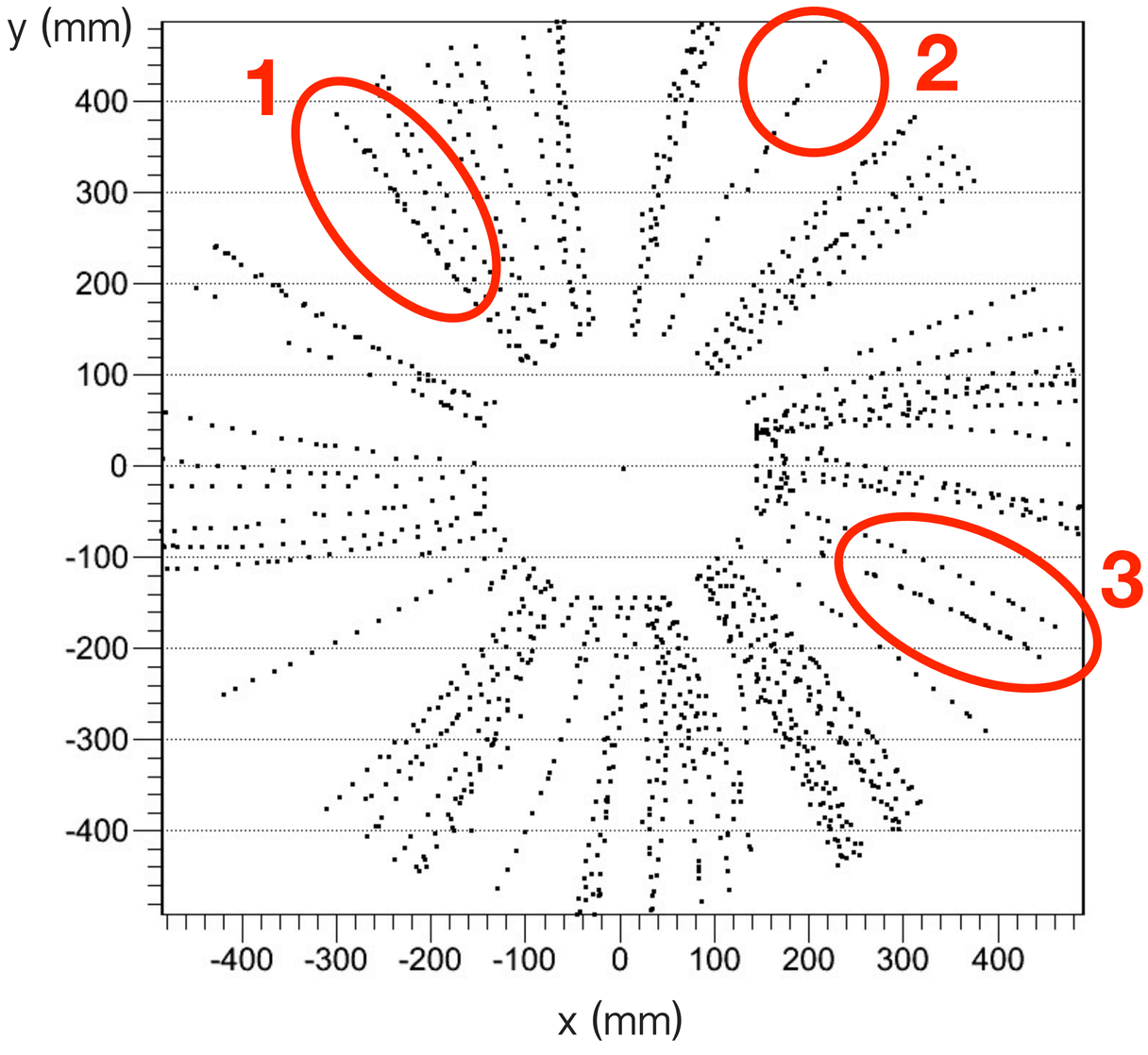


2nd nearest : 2009 points

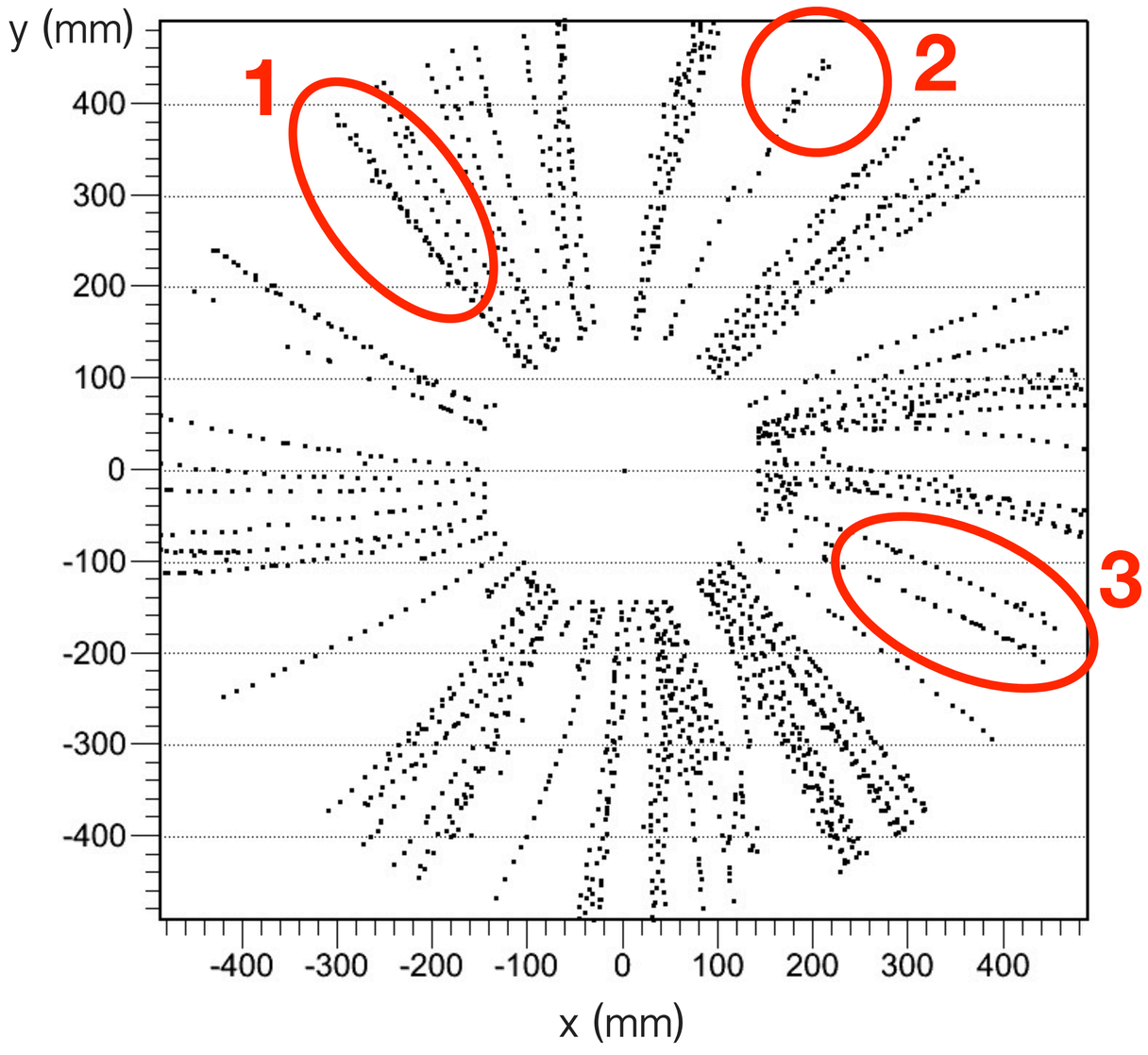


Differences

3rd nearest : 1440 points



2nd nearest : 2009 points



Differences

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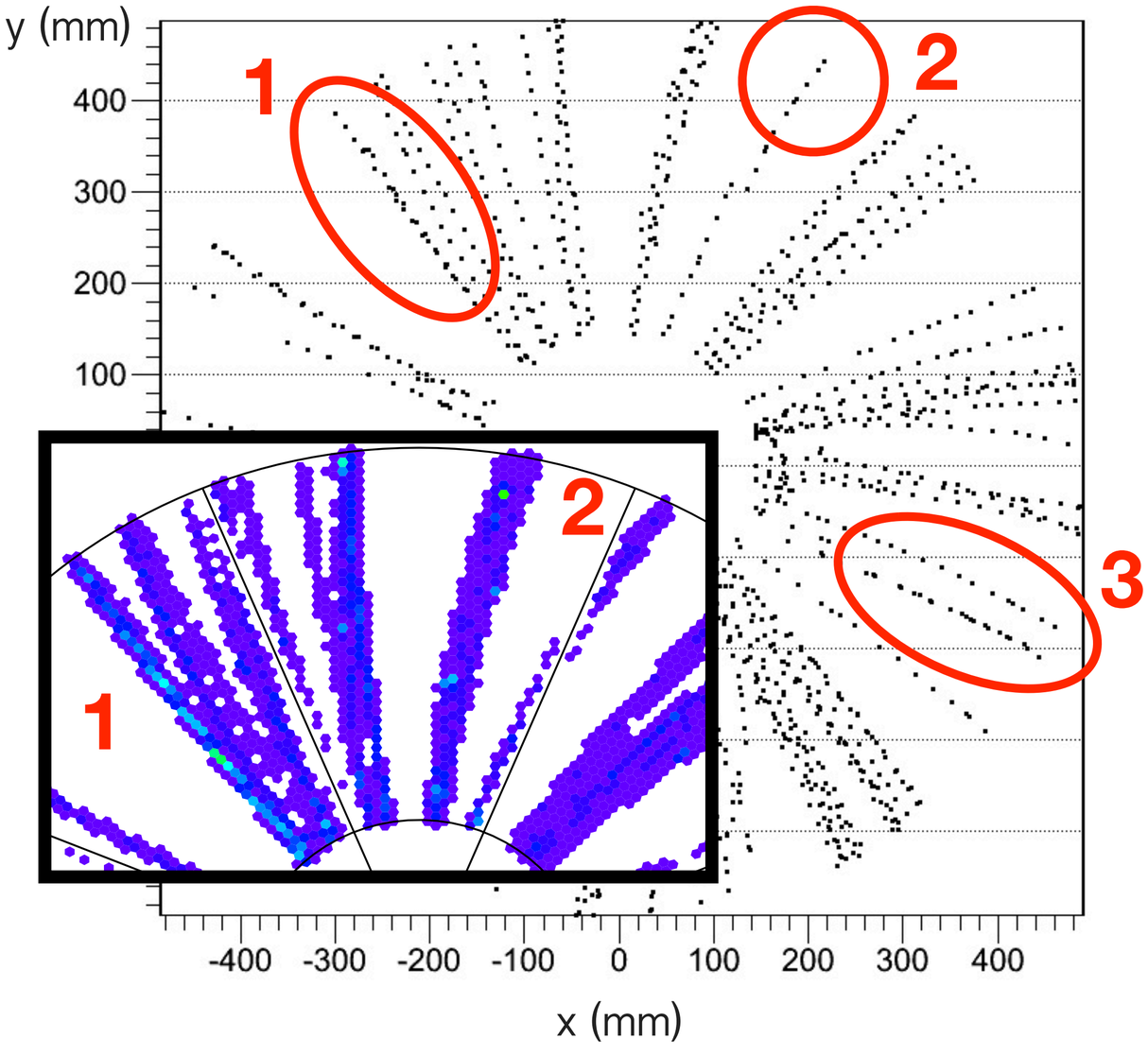
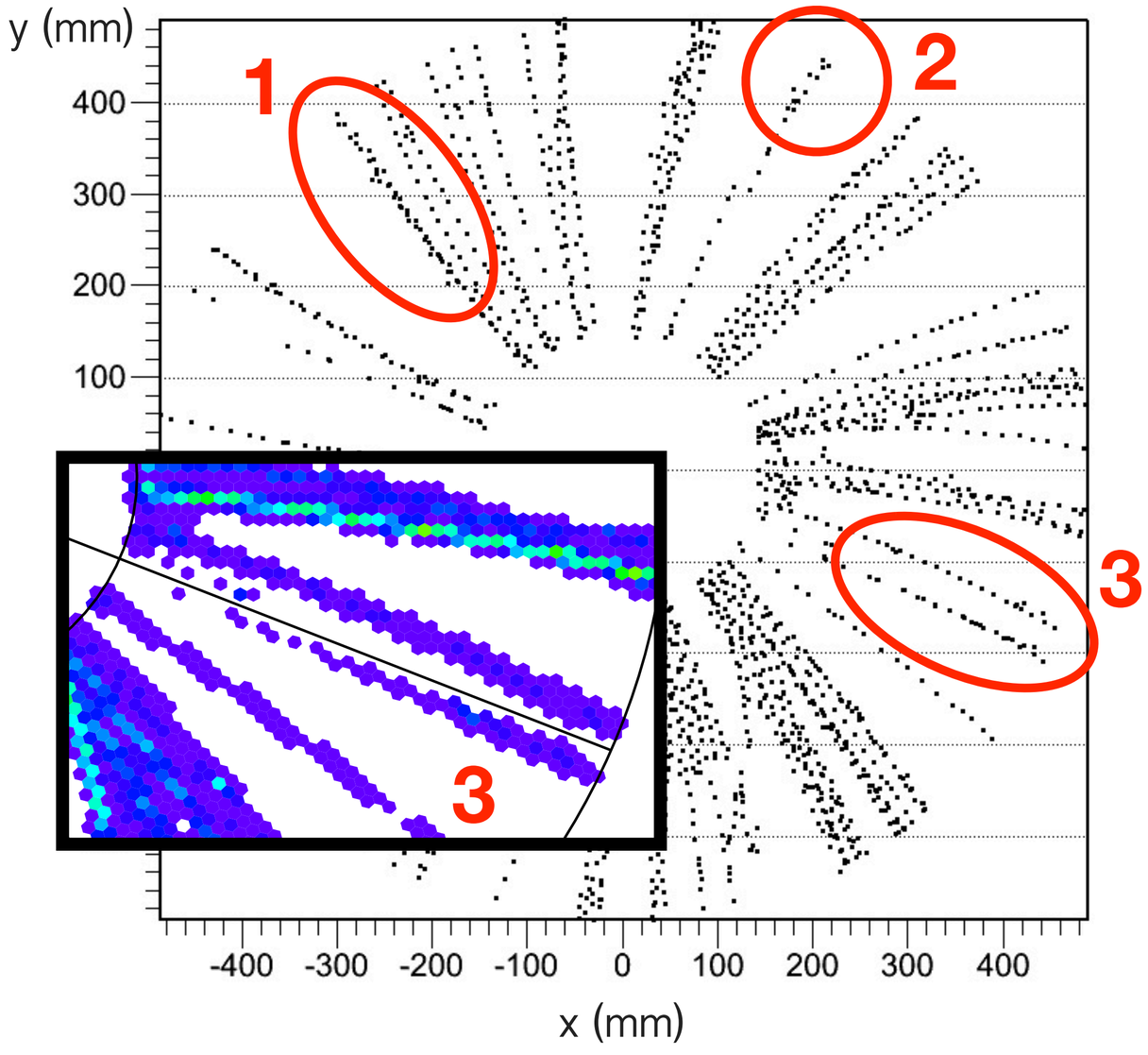
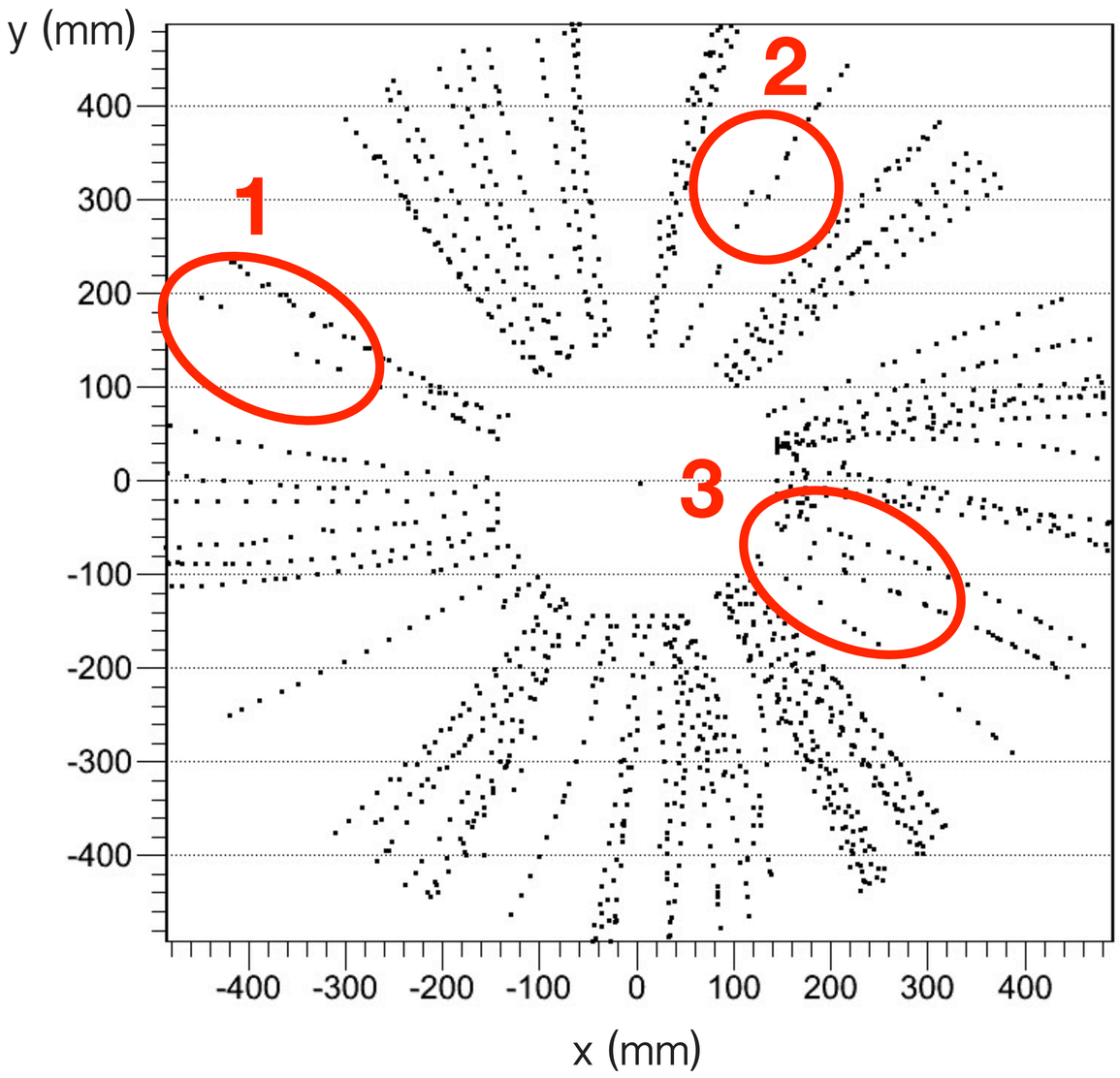


2nd nearest : 2009 points

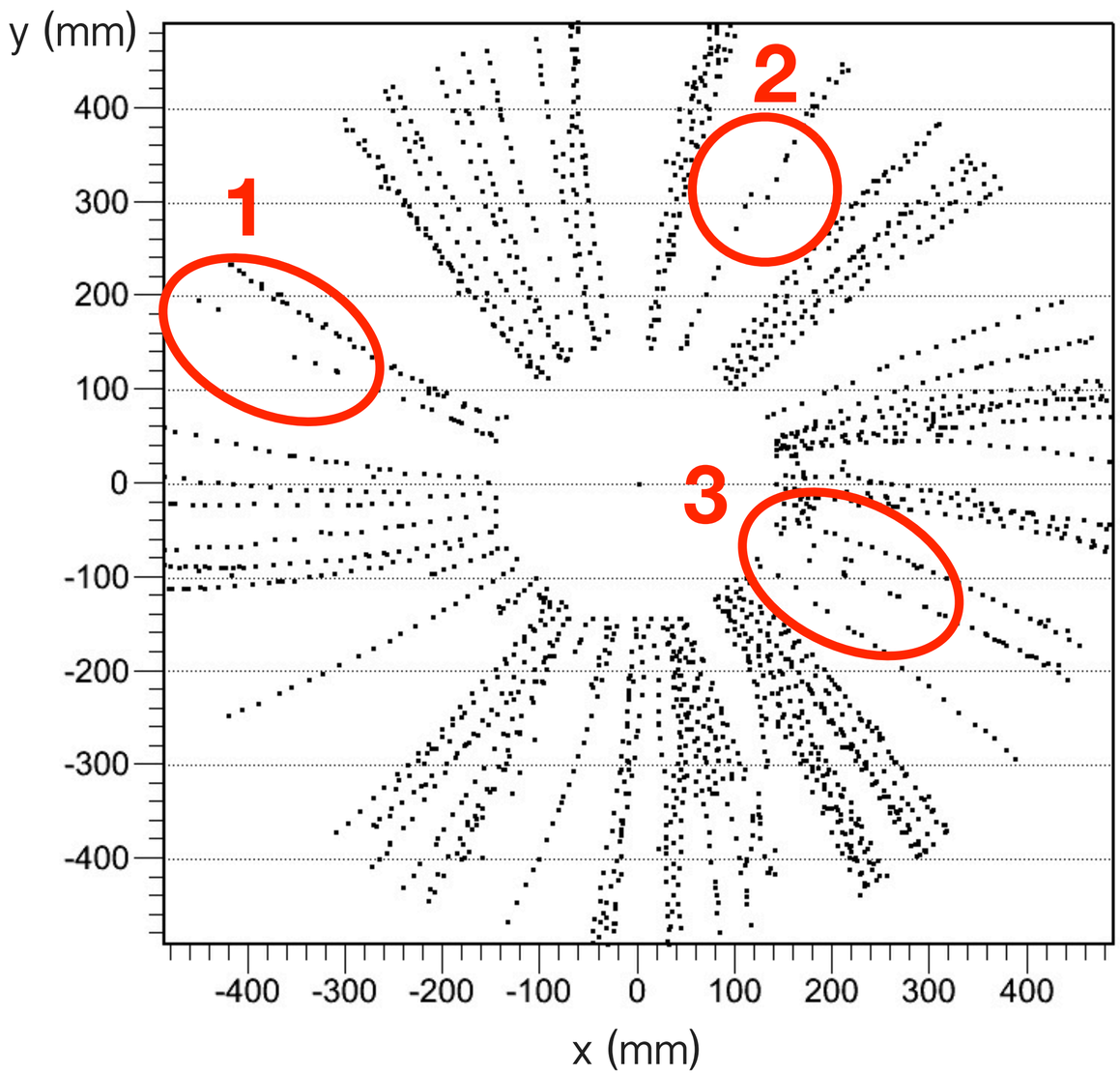


Discontinuity

3rd nearest : 1440 points



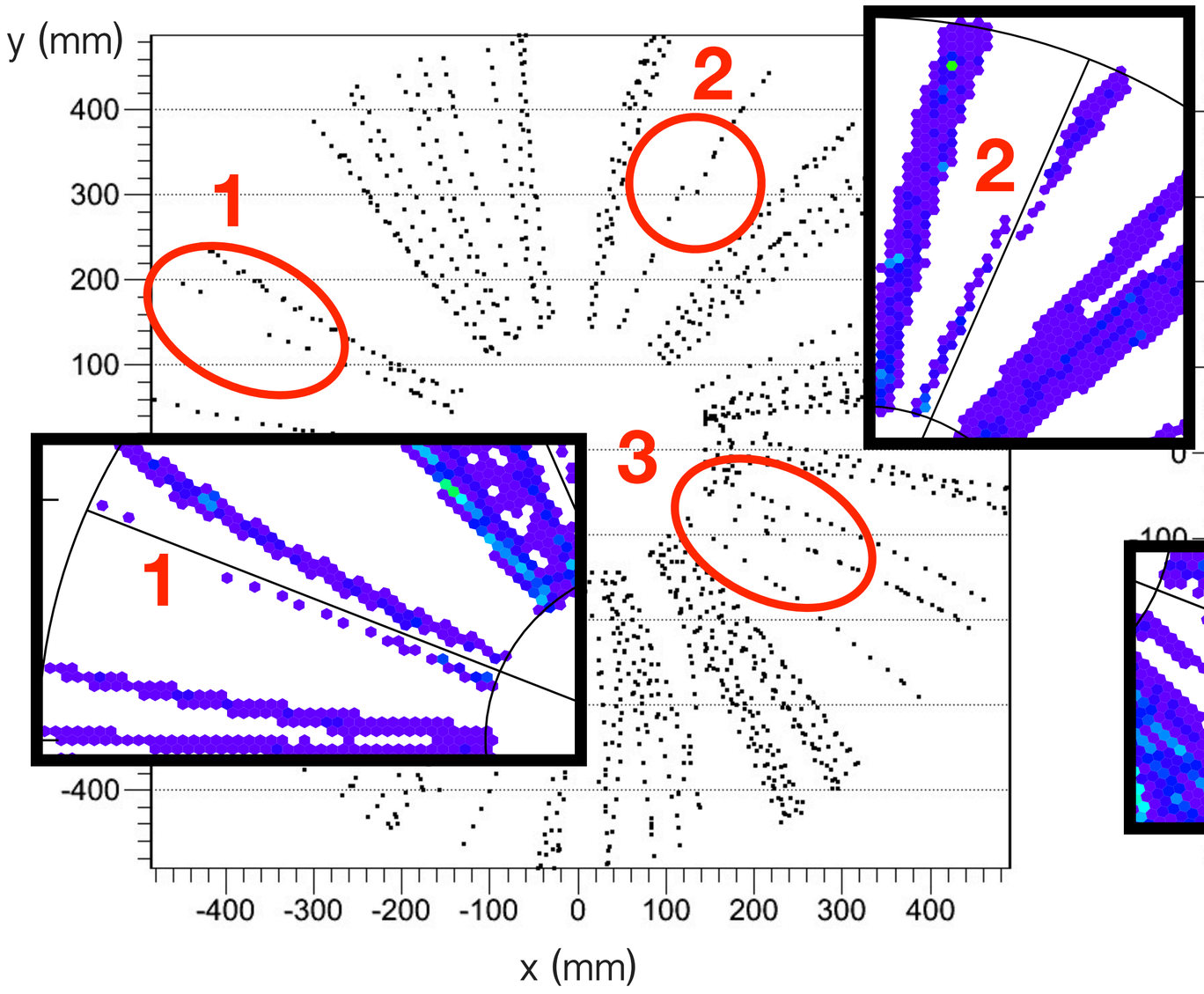
2nd nearest : 2009 points

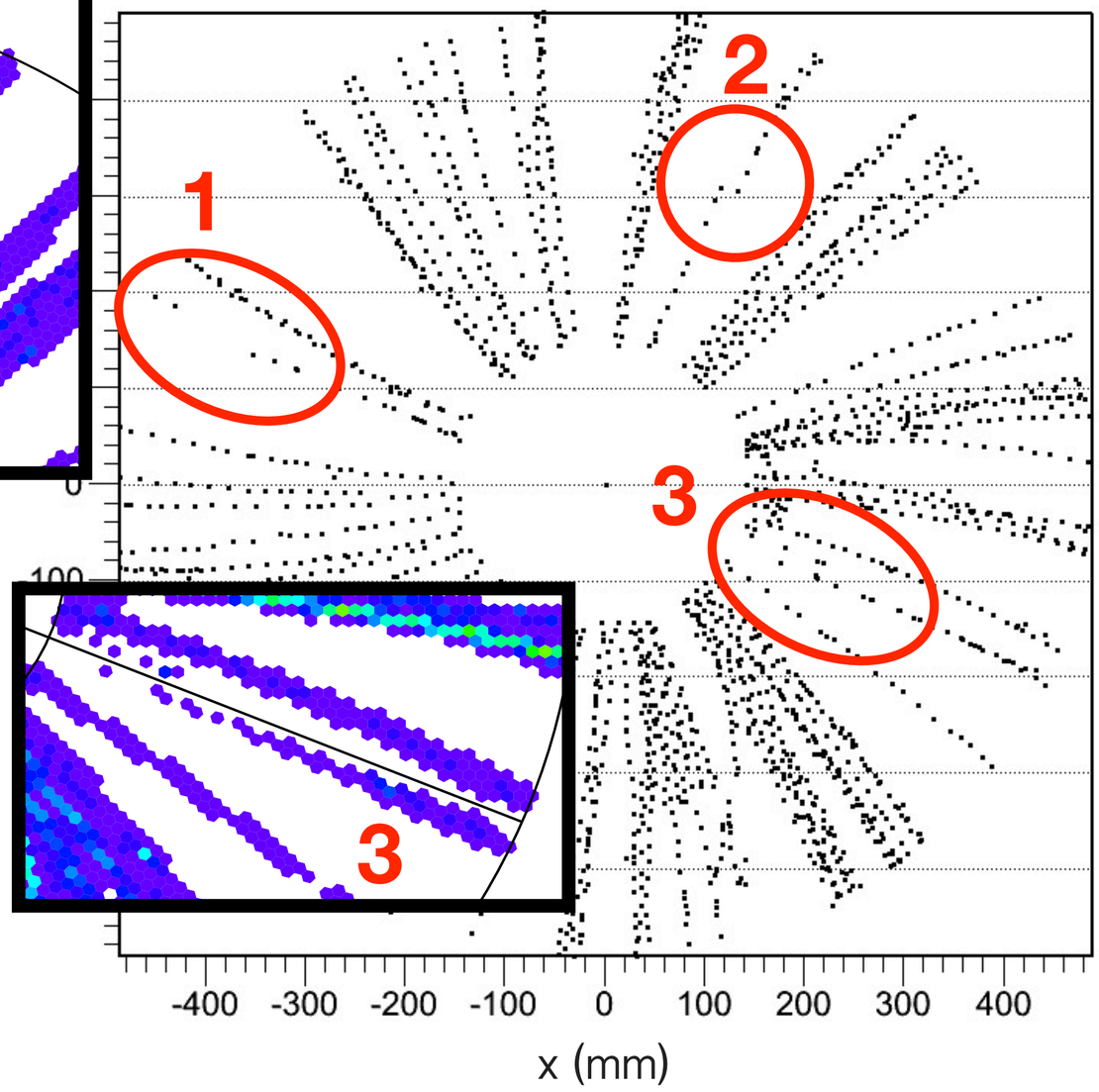


Discontinuity

3rd nearest : 1440 points

2nd nearest : 2009 points

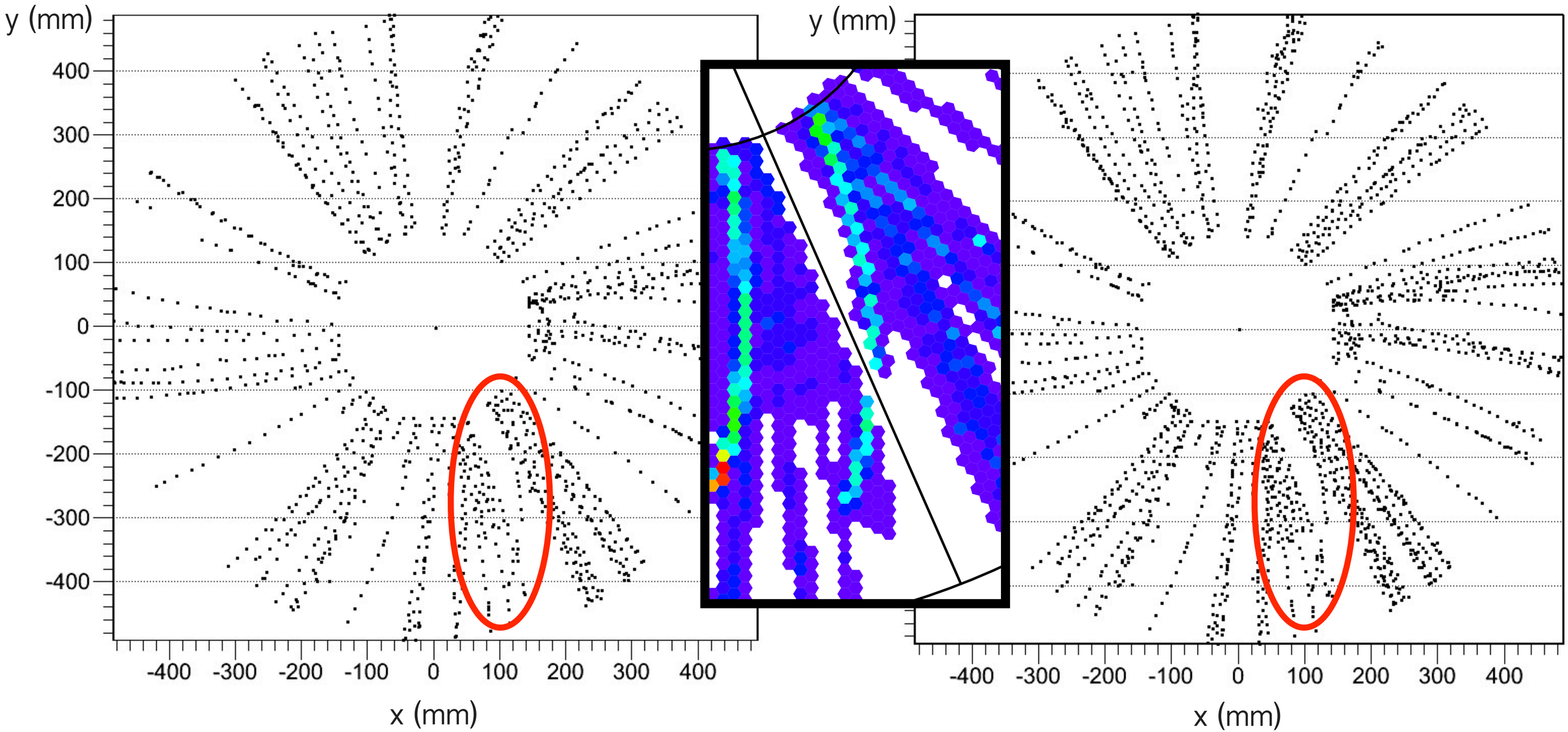




Other issues

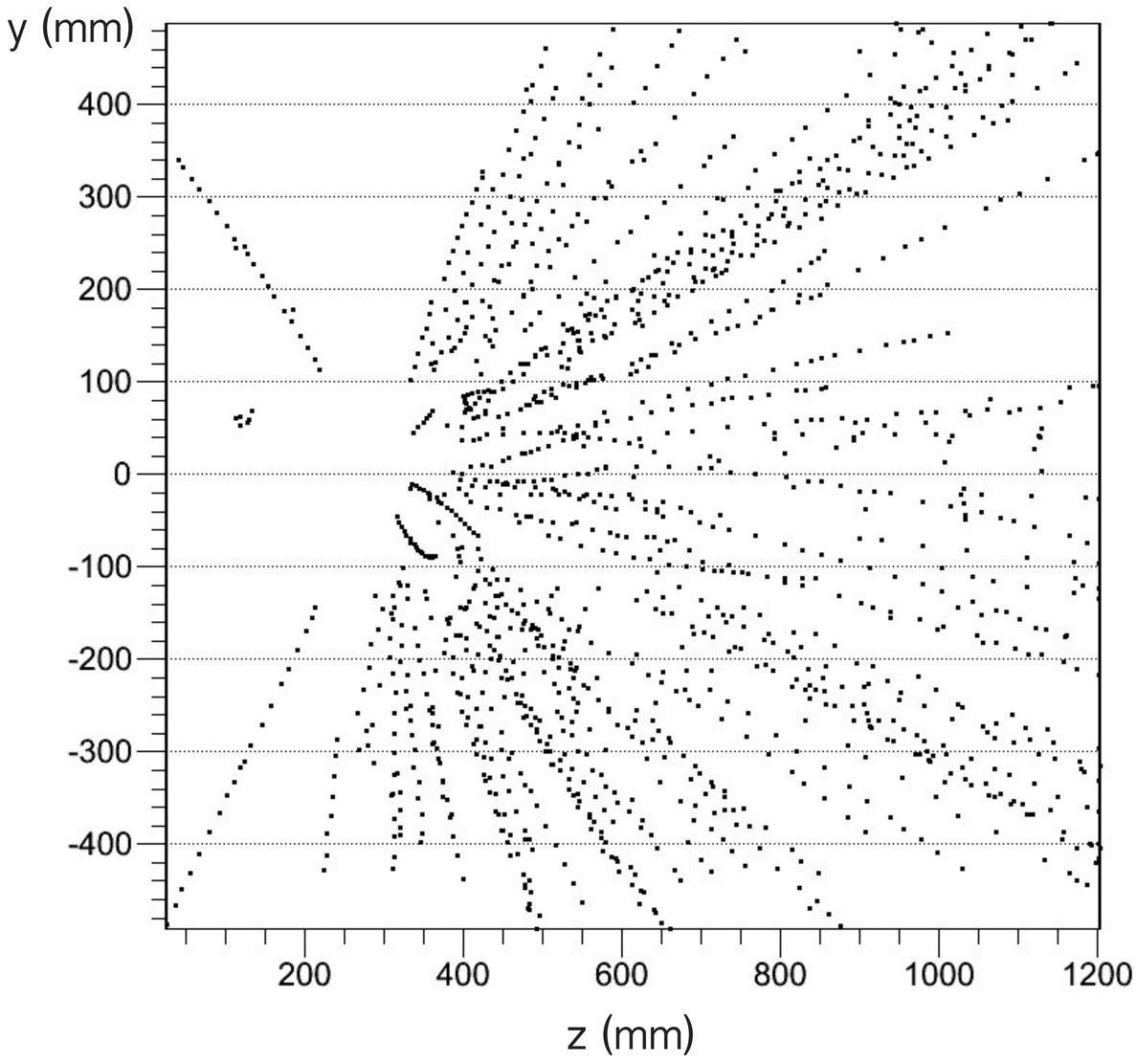
3rd nearest : 1440 points

2nd nearest : 2009 points

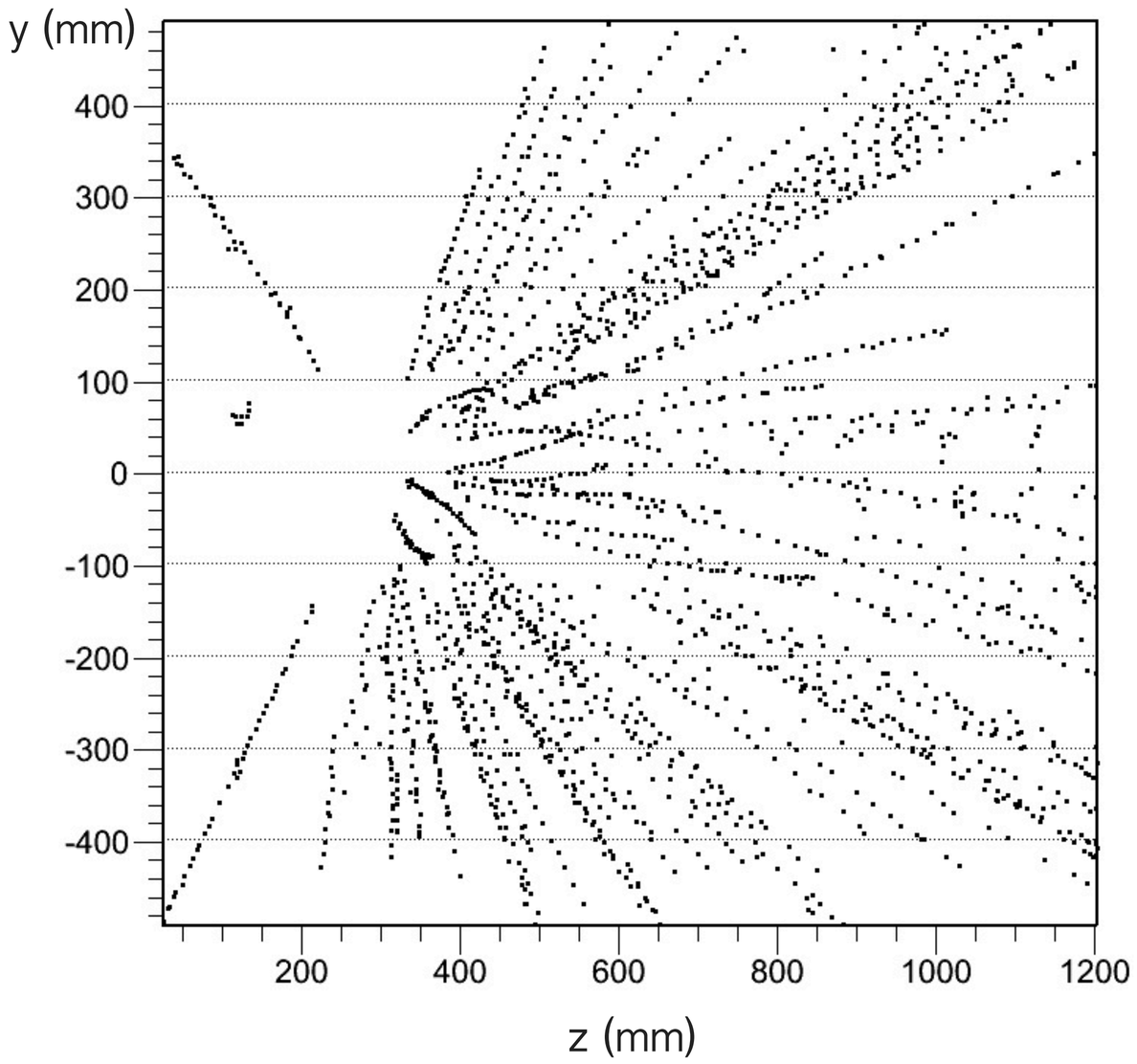


Side View

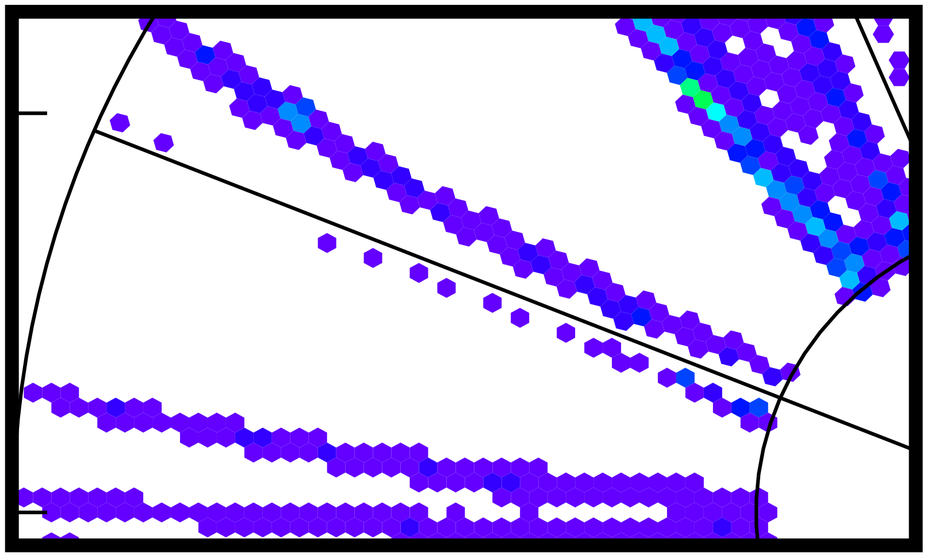
3rd nearest : 1440 points

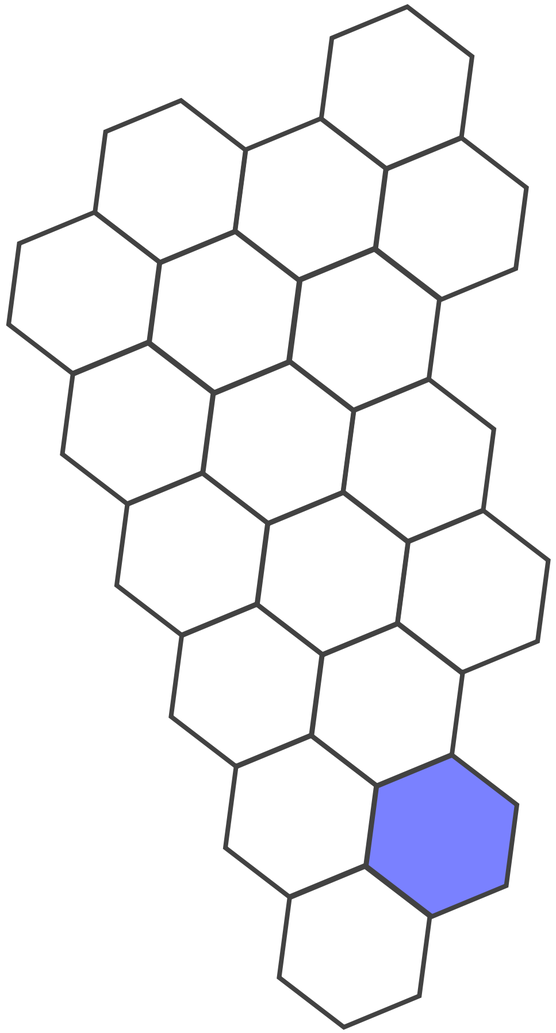


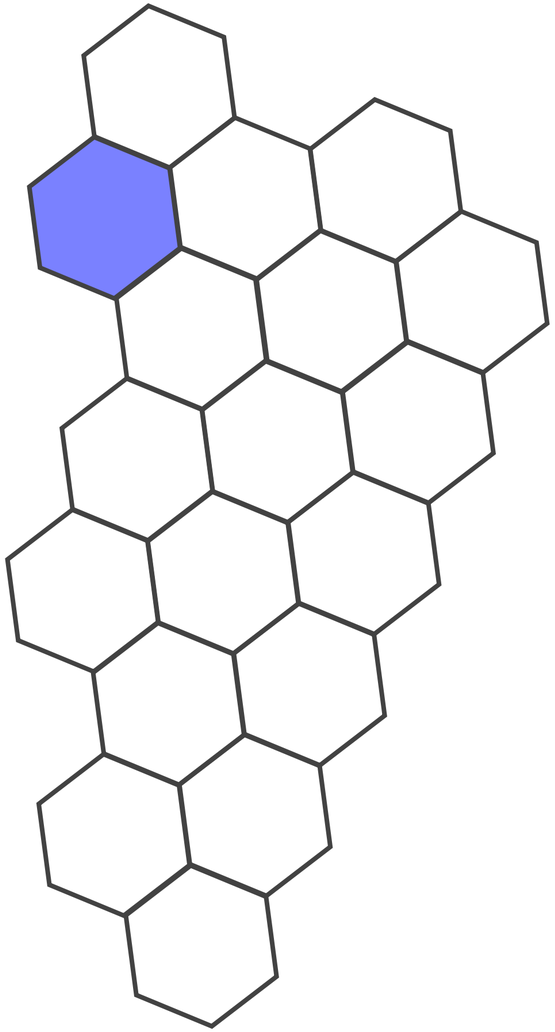
2nd nearest : 2009 points



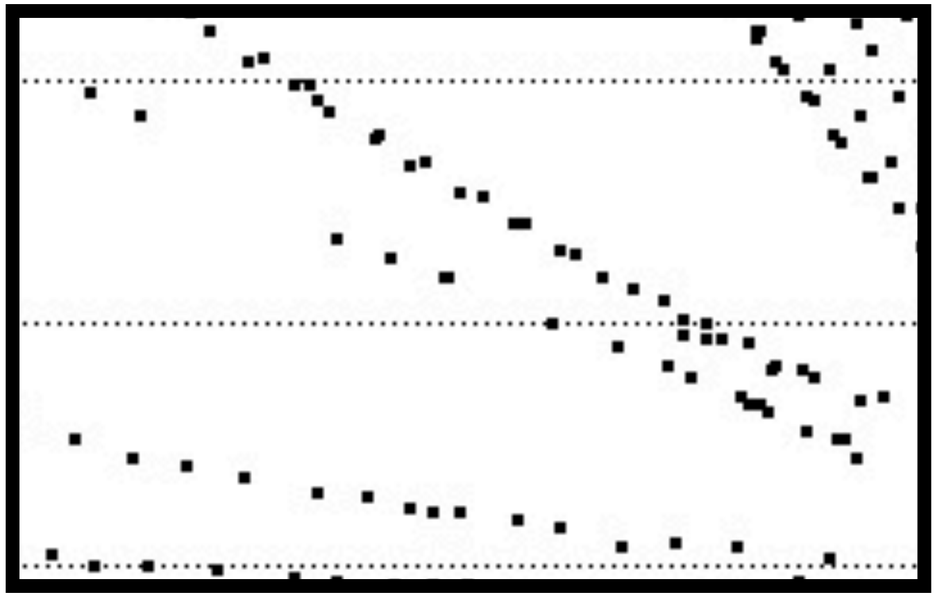
Section Gap Problem

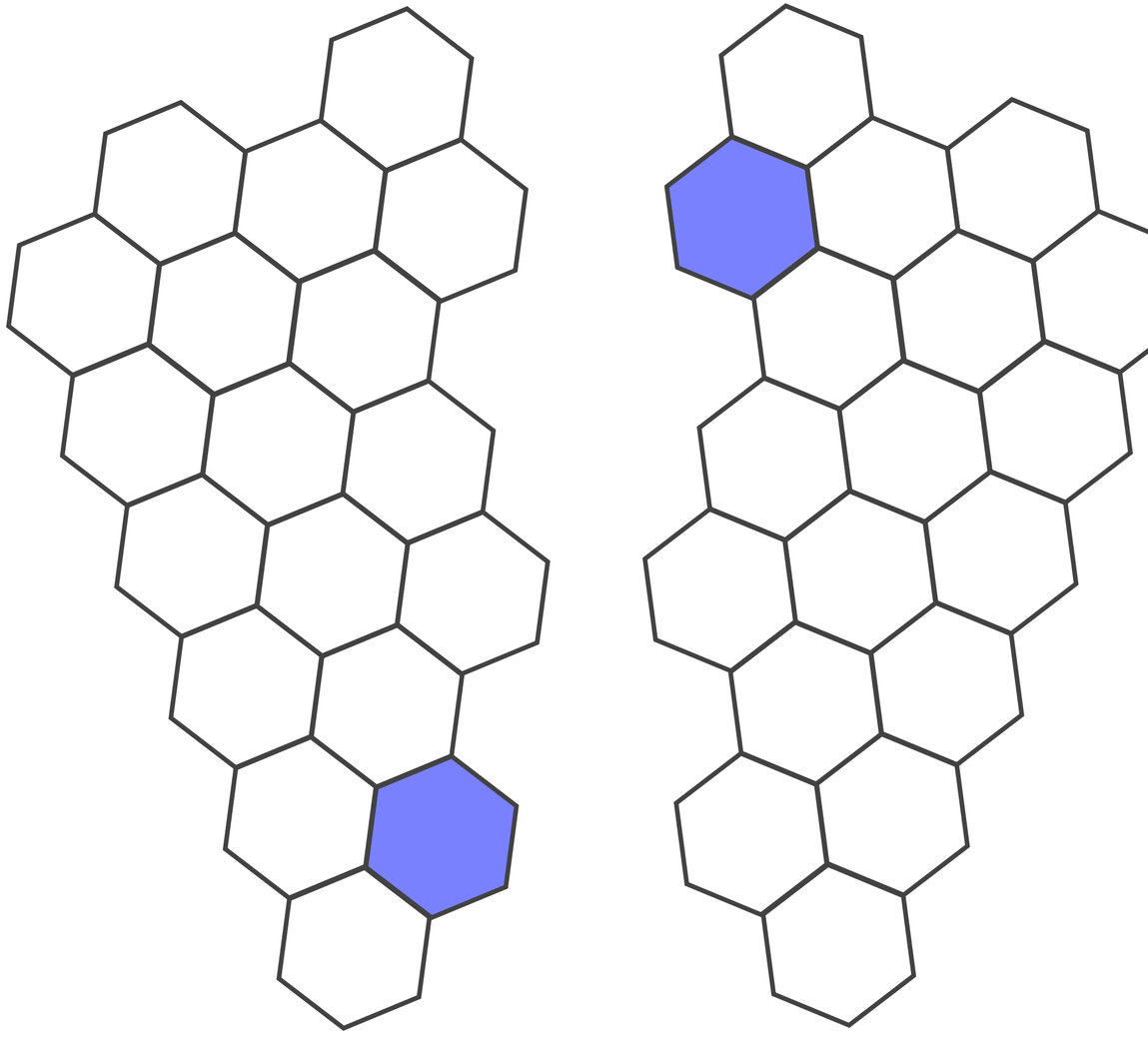






Section Gap Problem



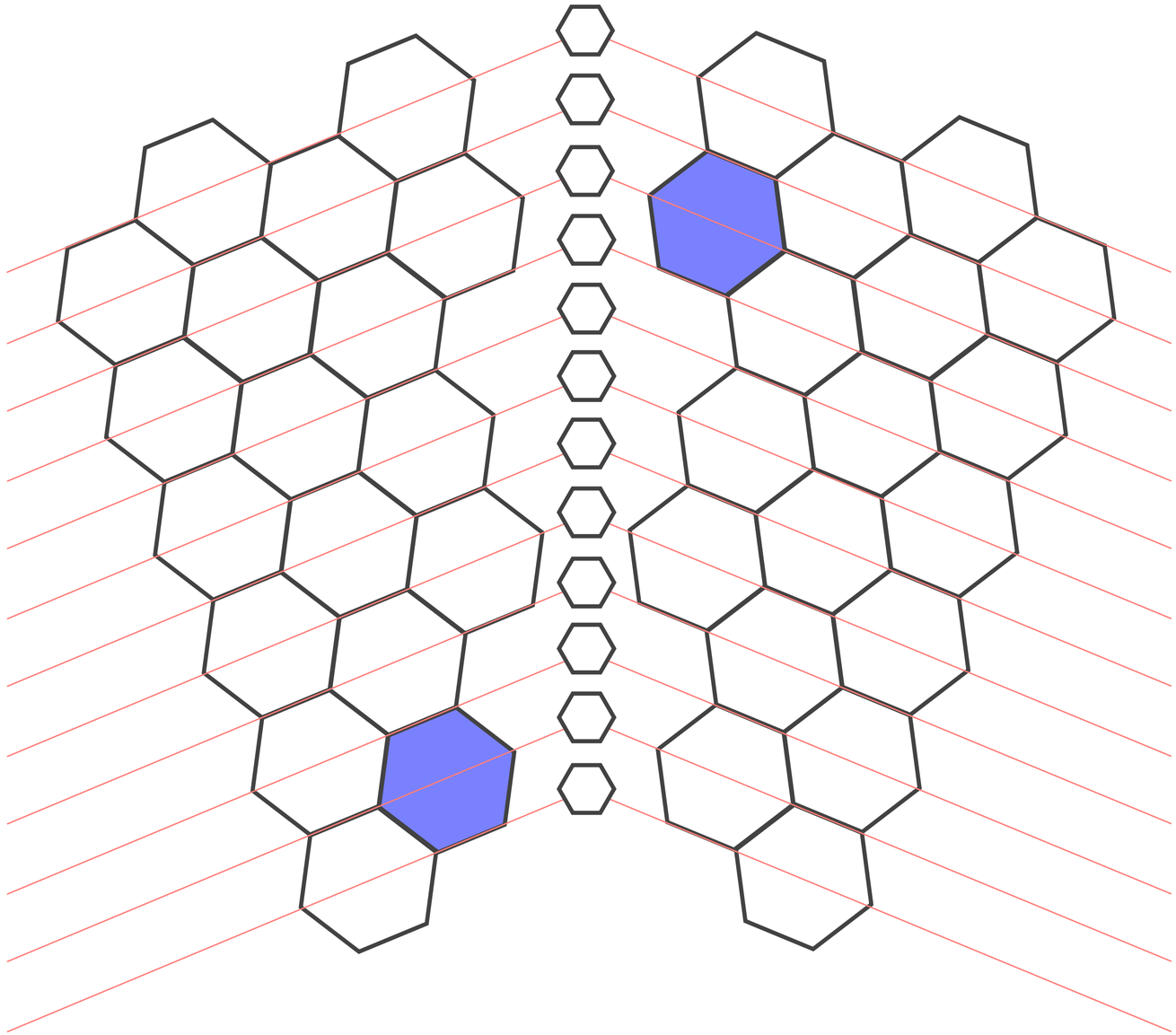


Section Gap Problem

Virtual points for each row.

Charge of virtual point...?

Virtual point will be activated when cluster forms at the end of the row.



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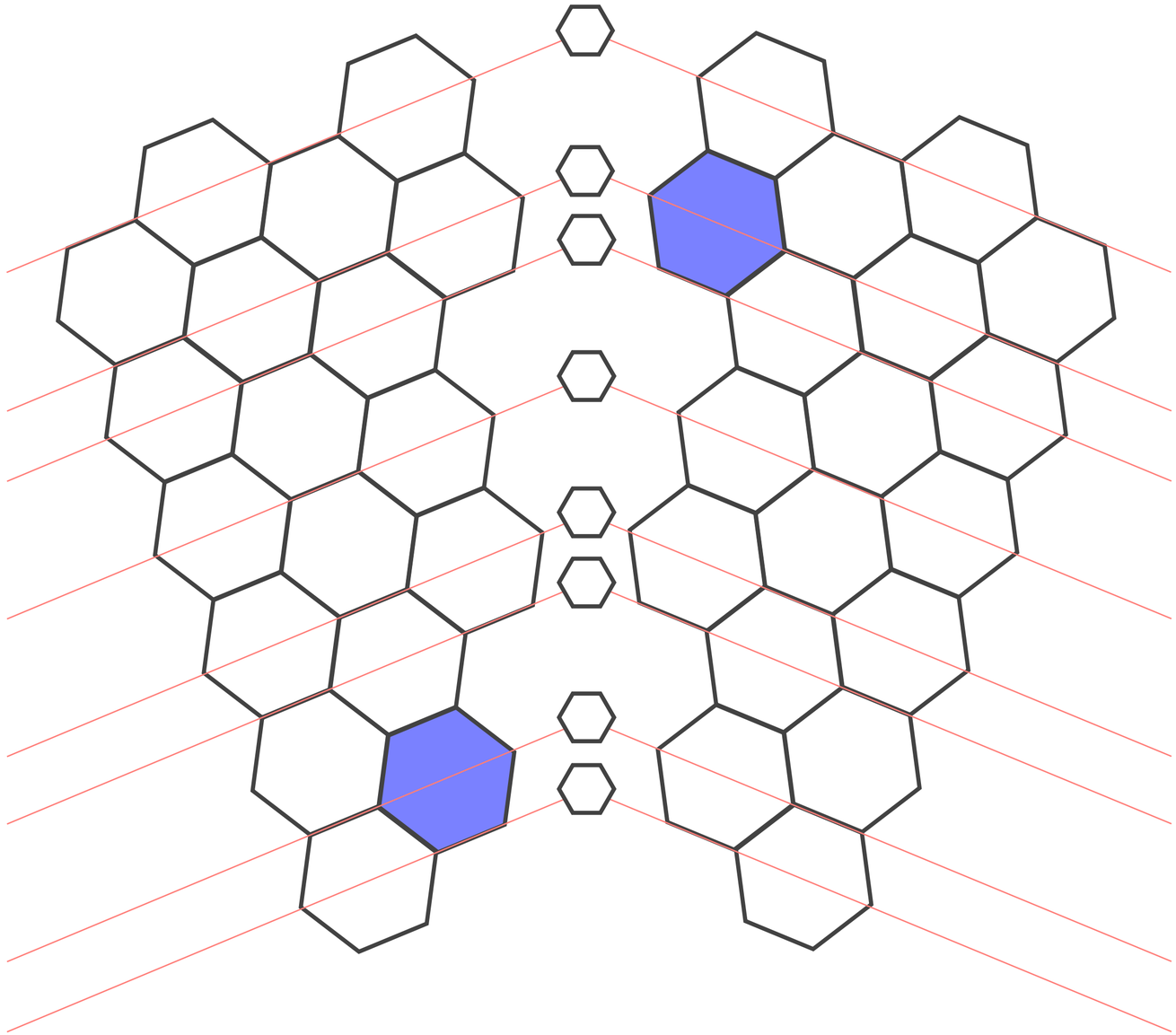

Section Gap Problem

Virtual points for each row.

Charge of virtual point...?

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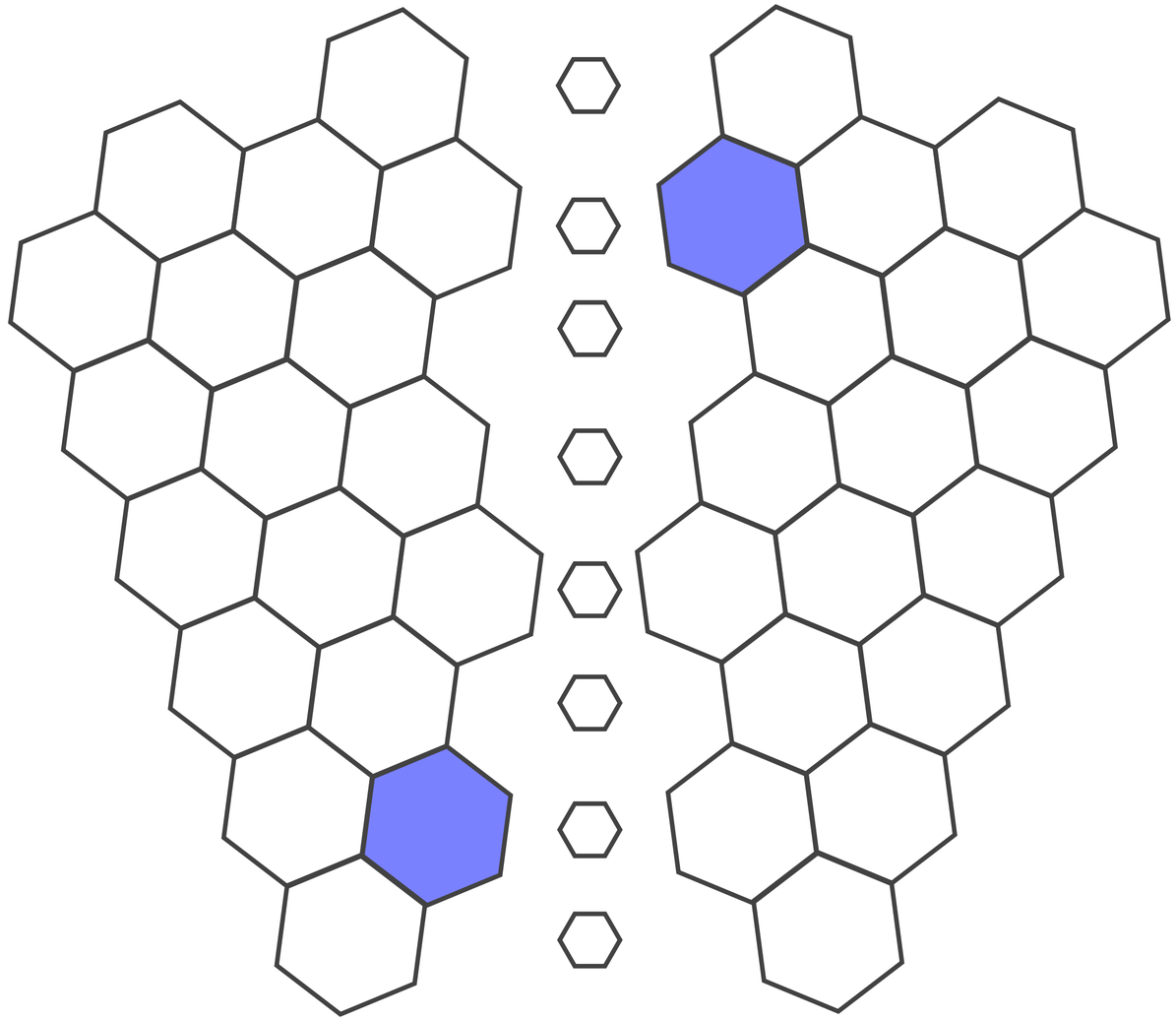
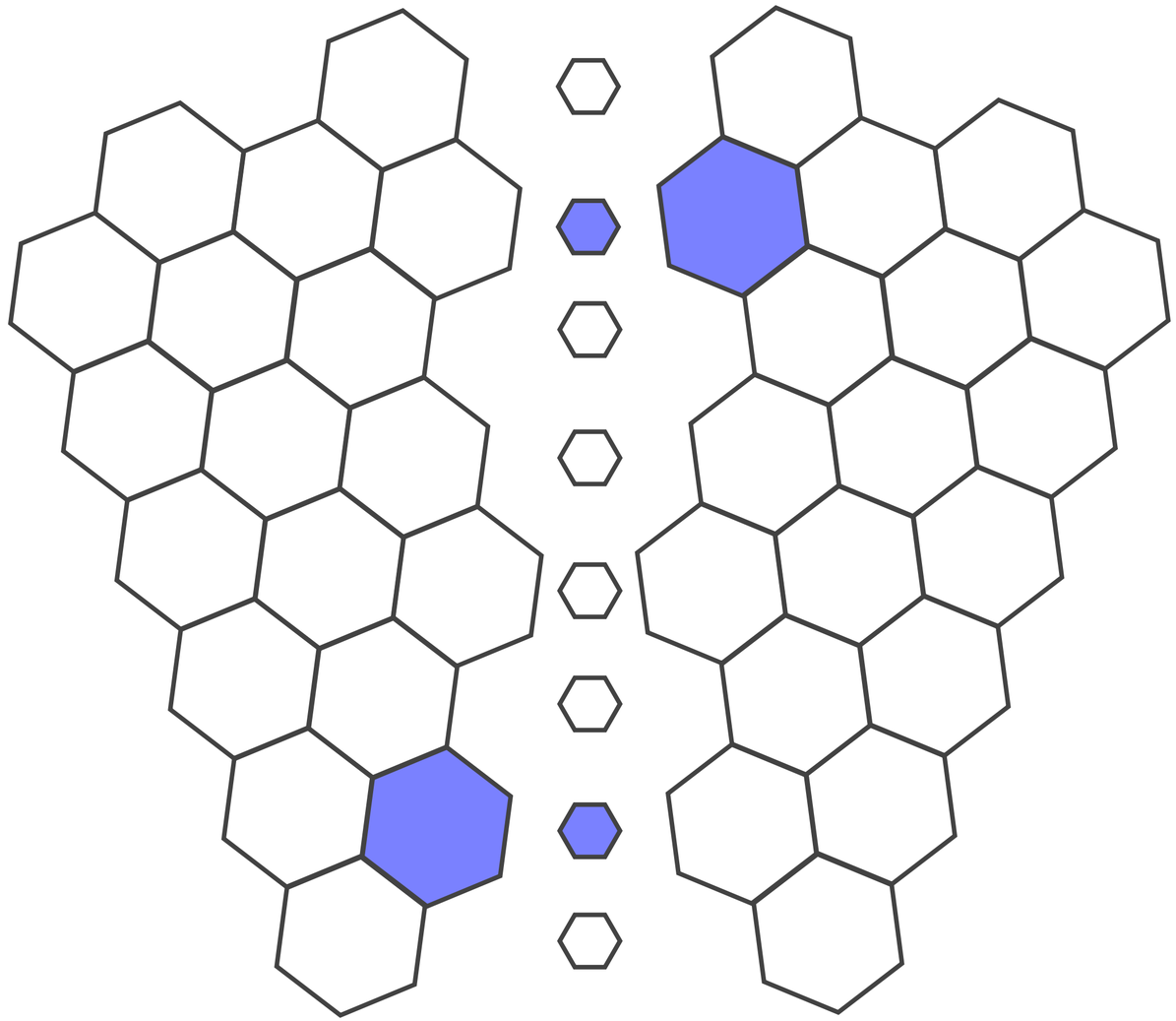


Section Gap Problem

Discontinuity of virtual charge →
Create virtual points in between.

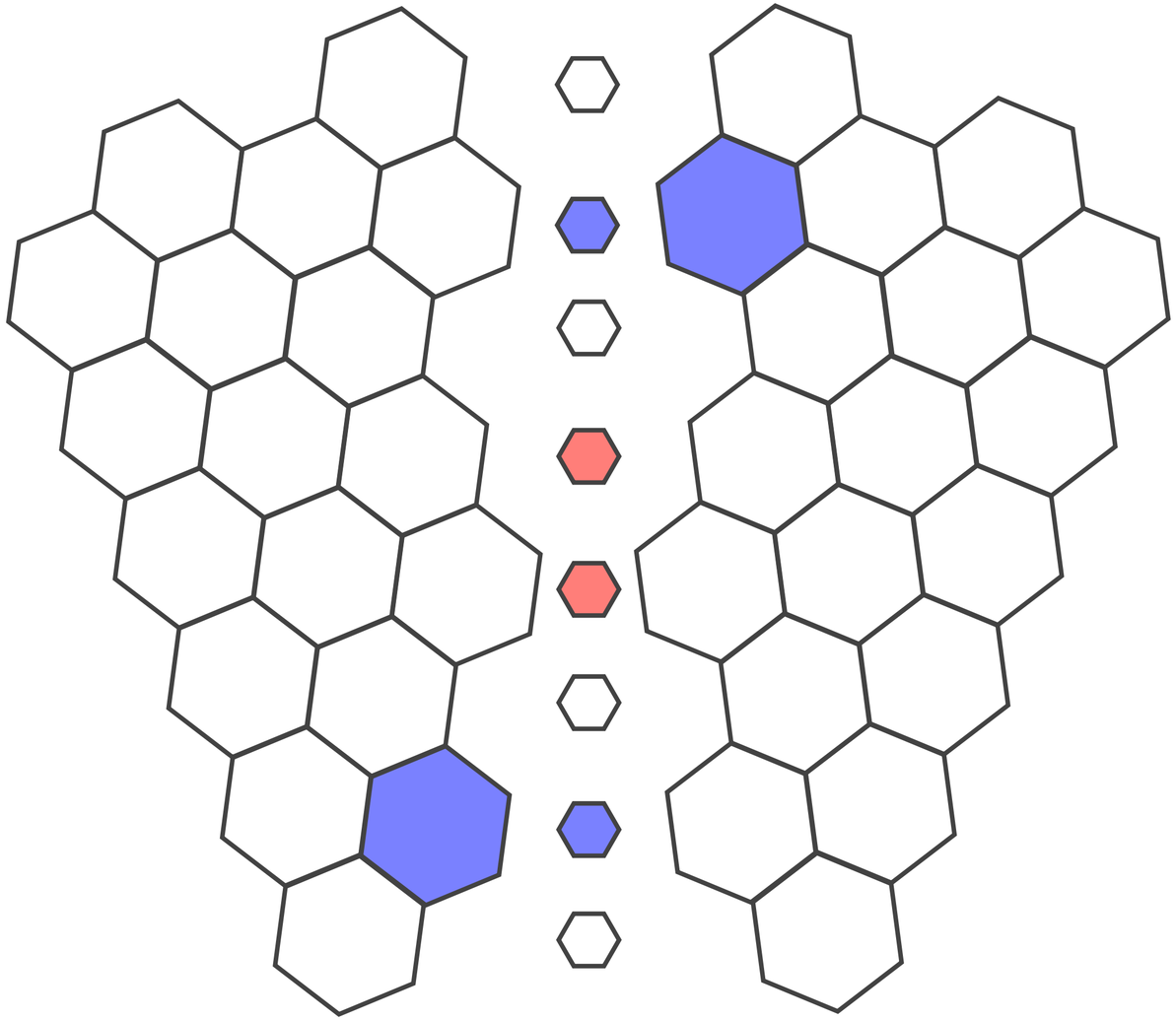
Discontinuity = Gap that is larger than maximum recognizable distance of “Kalman Filter”.



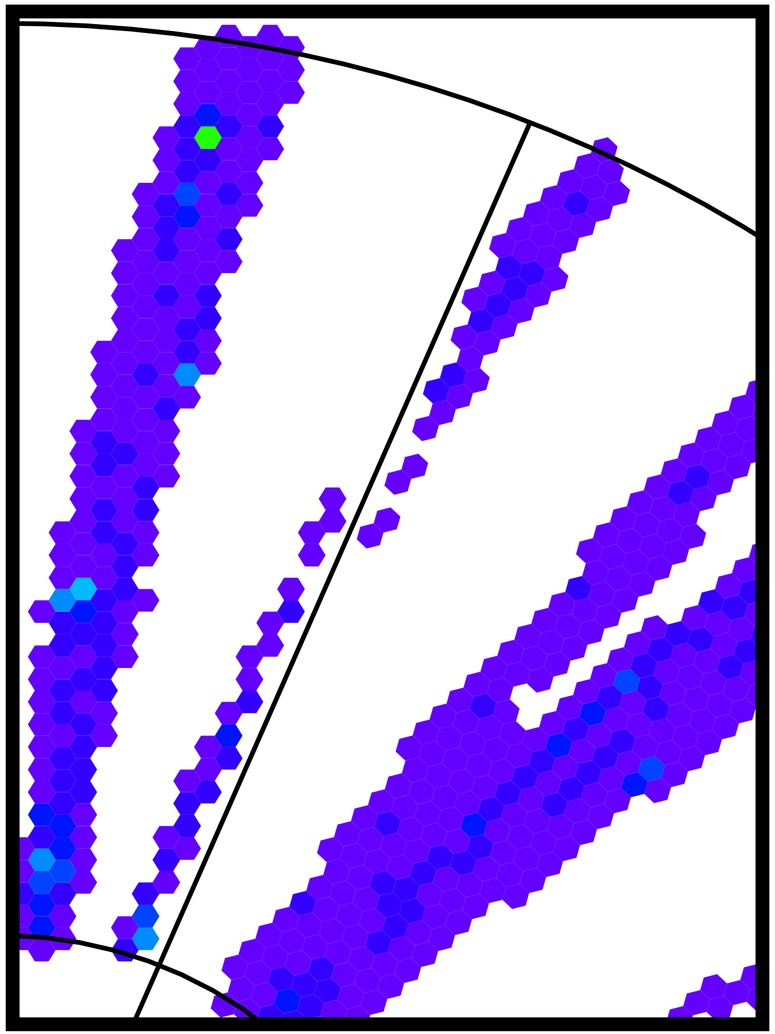
Section Gap Problem

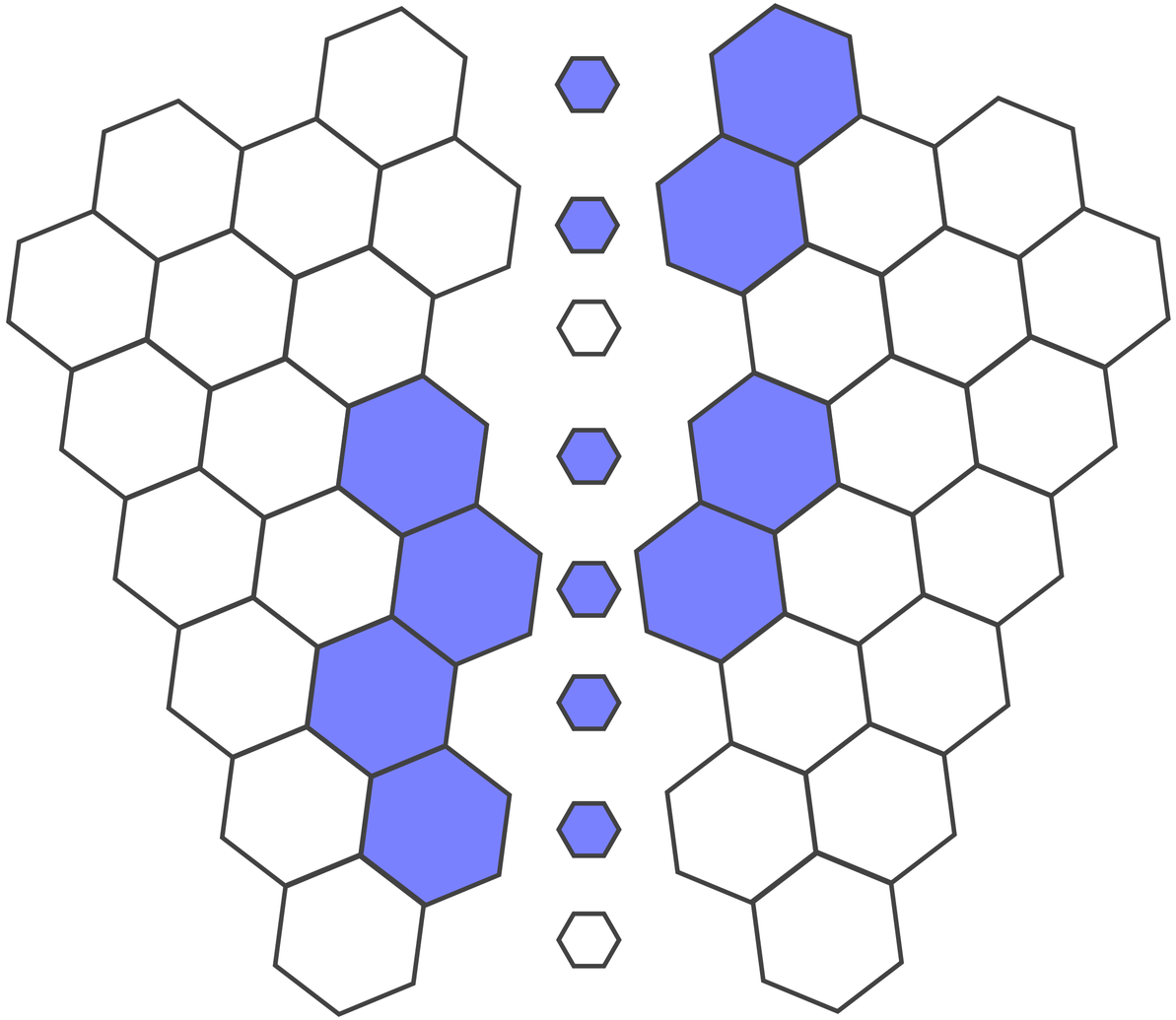
Geometrical position of virtual clusters will be rearranged in condition where center of charge does not change.(?)

Weighting factor in Kalman Filter for these created points will be relatively small.

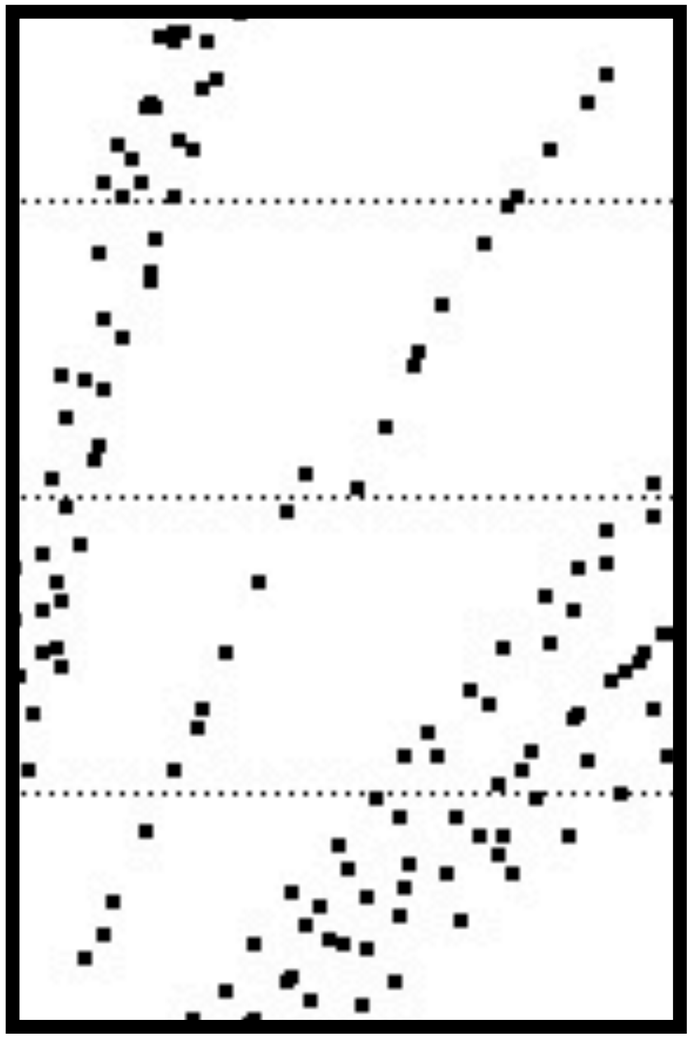


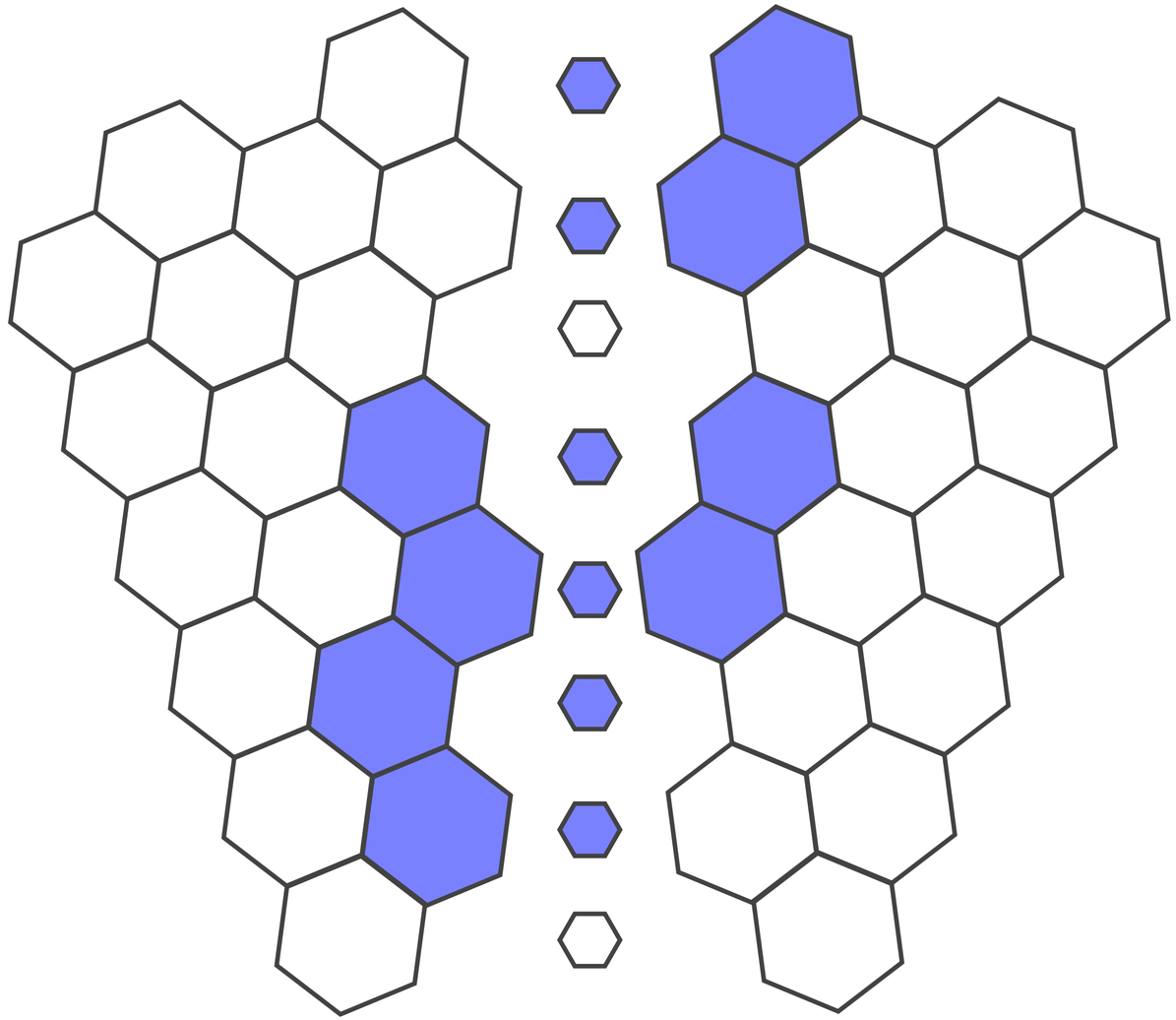
Section Gap Problem



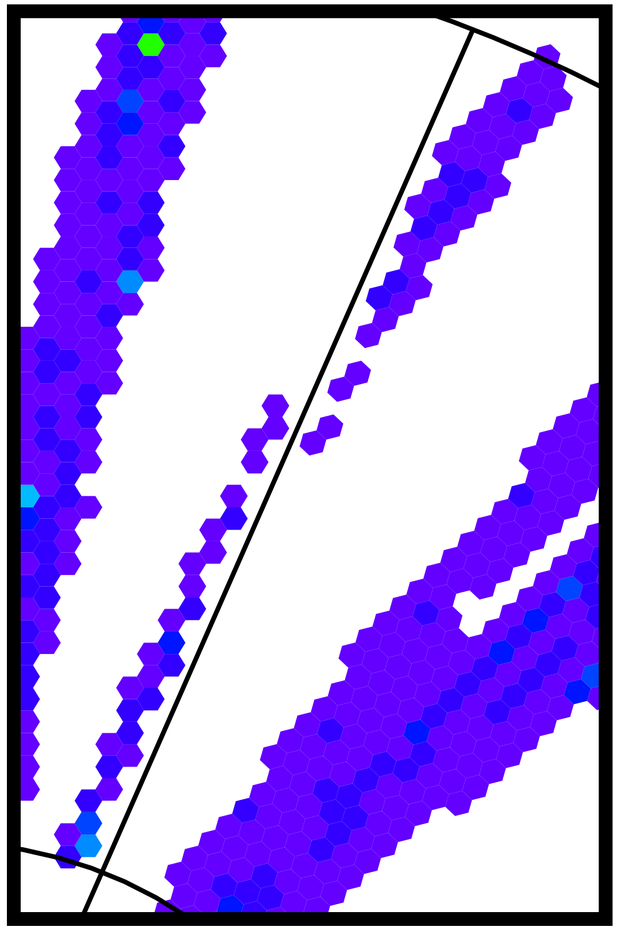


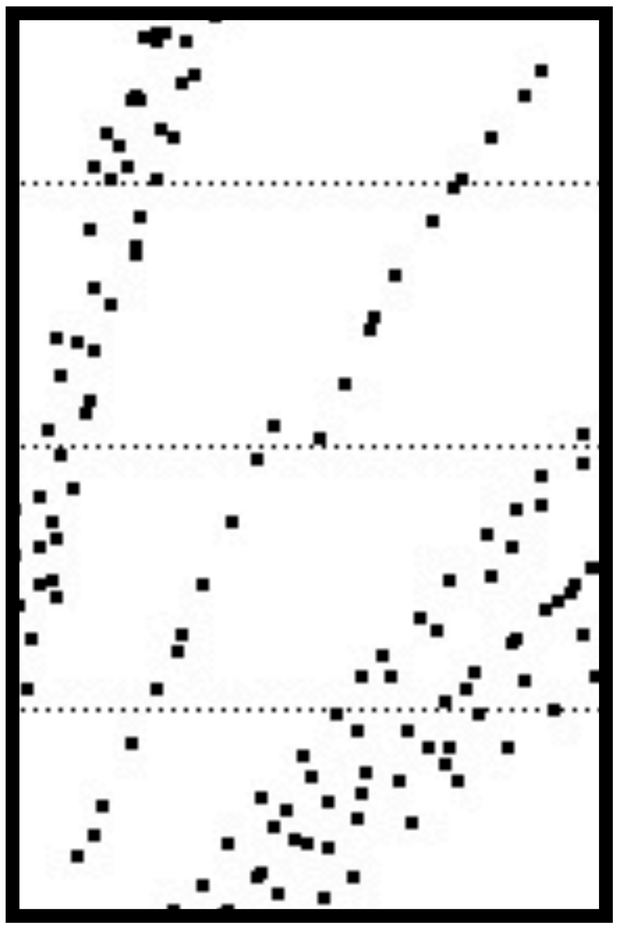
Section Gap Problem

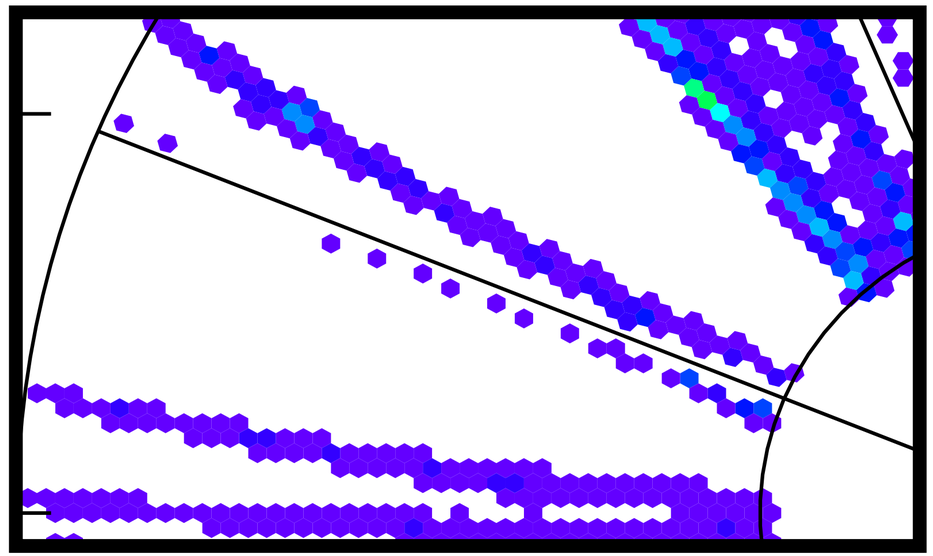


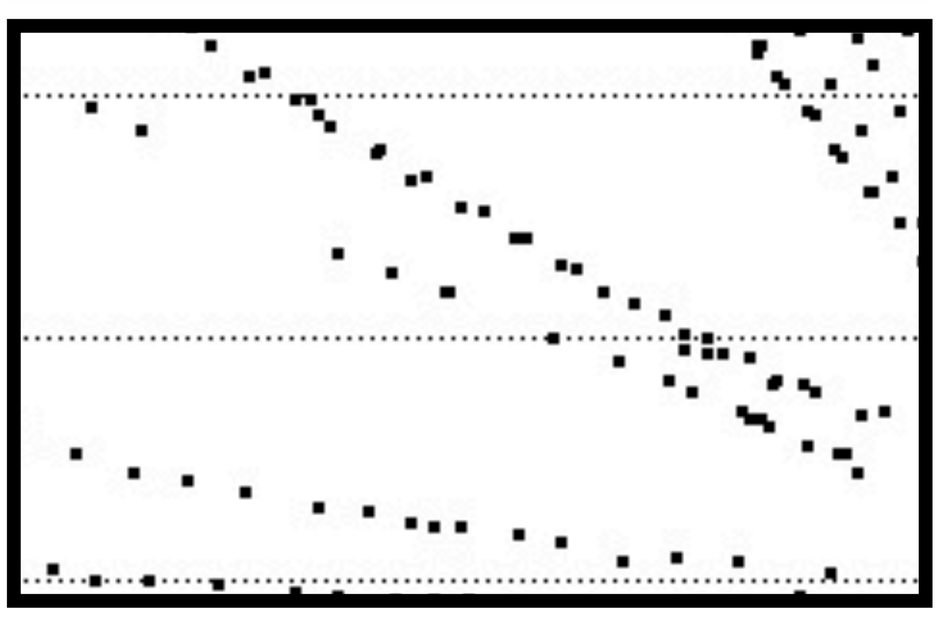


Section Gap Problem









Conclusion

Clusterization

- Problems found in gathering n^{th} nearest pad informations.
- Correlation between time and charge exists.
- Tried clusterization with 2^{nd} and 3^{rd} nearest cases and found some differences.
- Working on section gap problem.