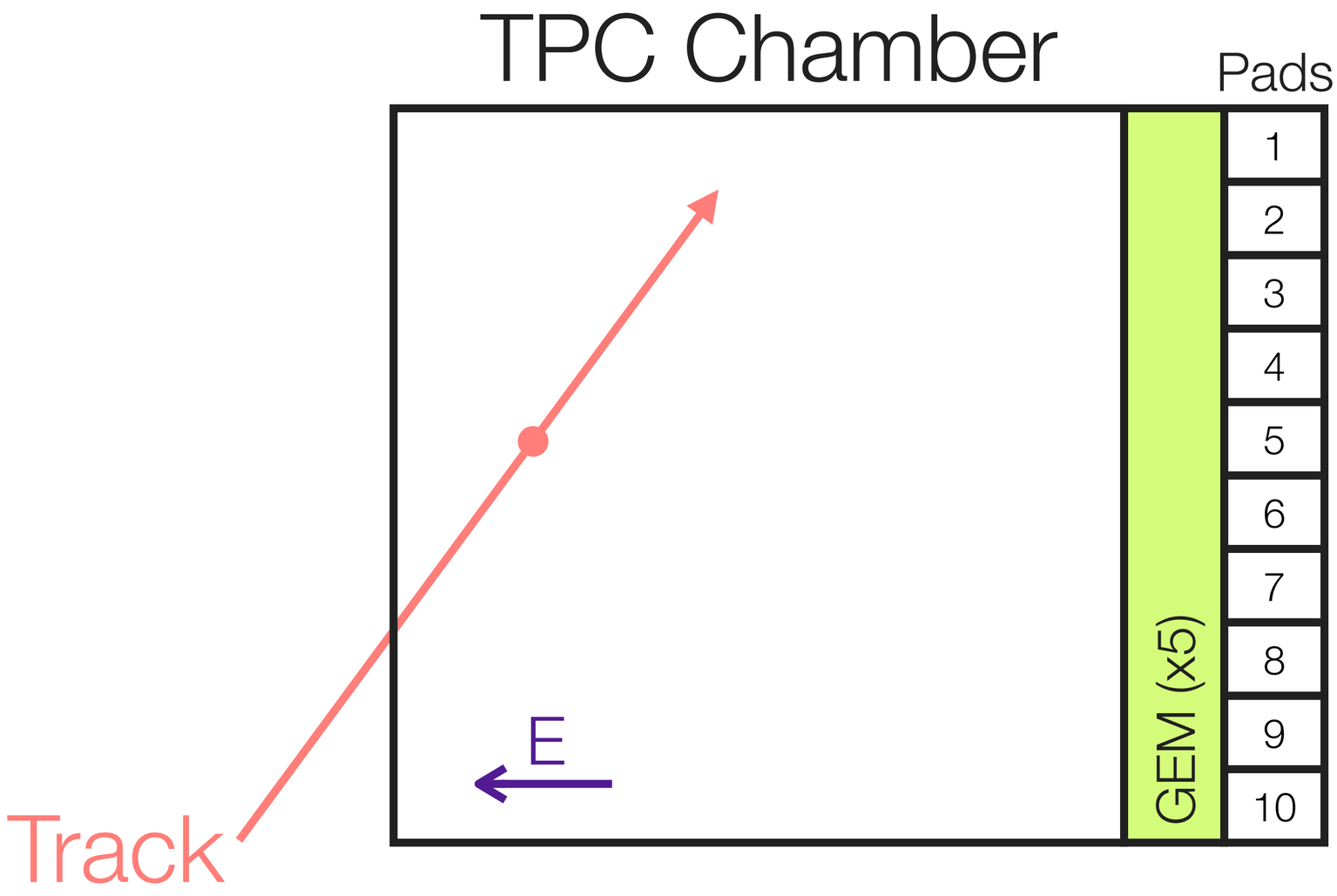
TPC Simulation

JungWoo Lee

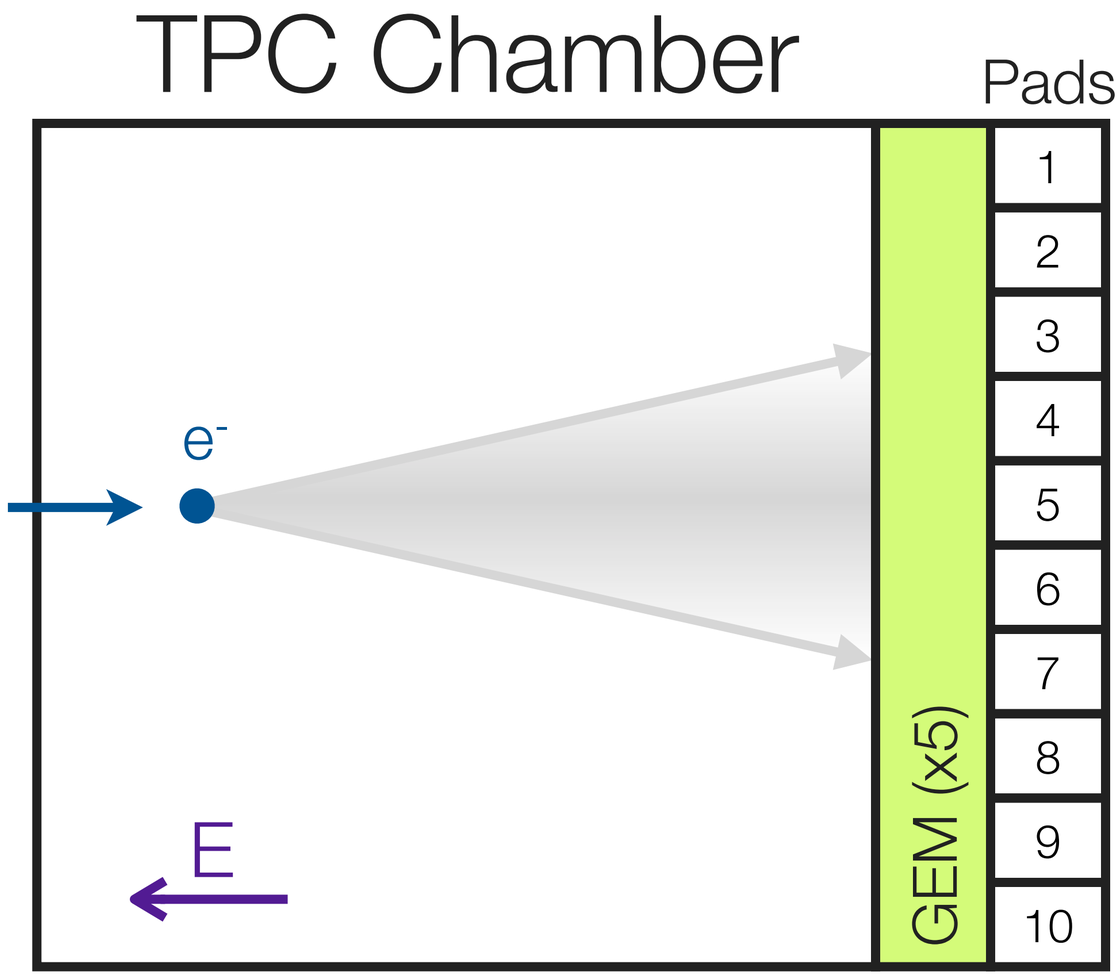
Group Meeting, 2013.8.30

Drift Simulation



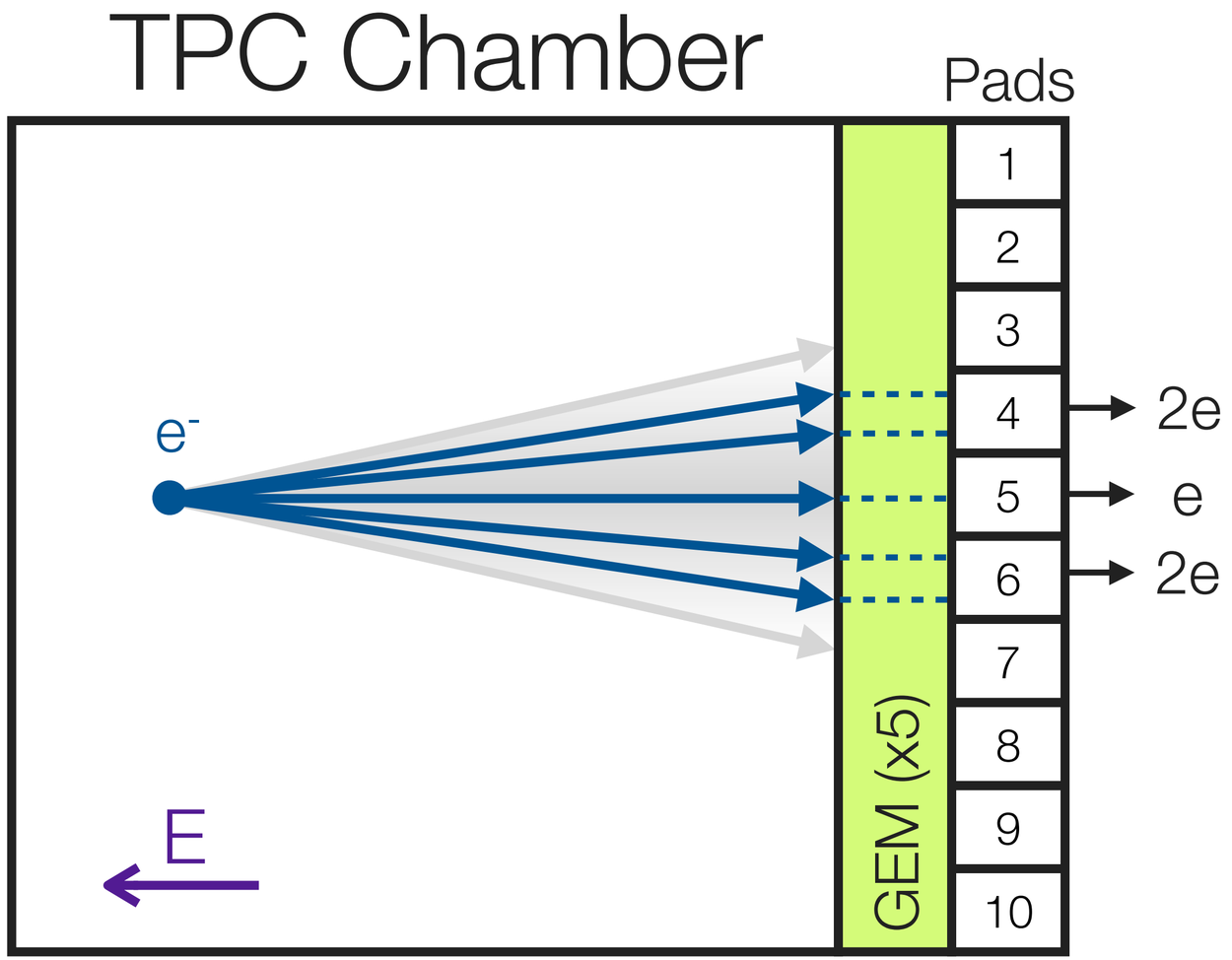
Drift Simulation

of Ionized electrons:
10



Drift Simulation

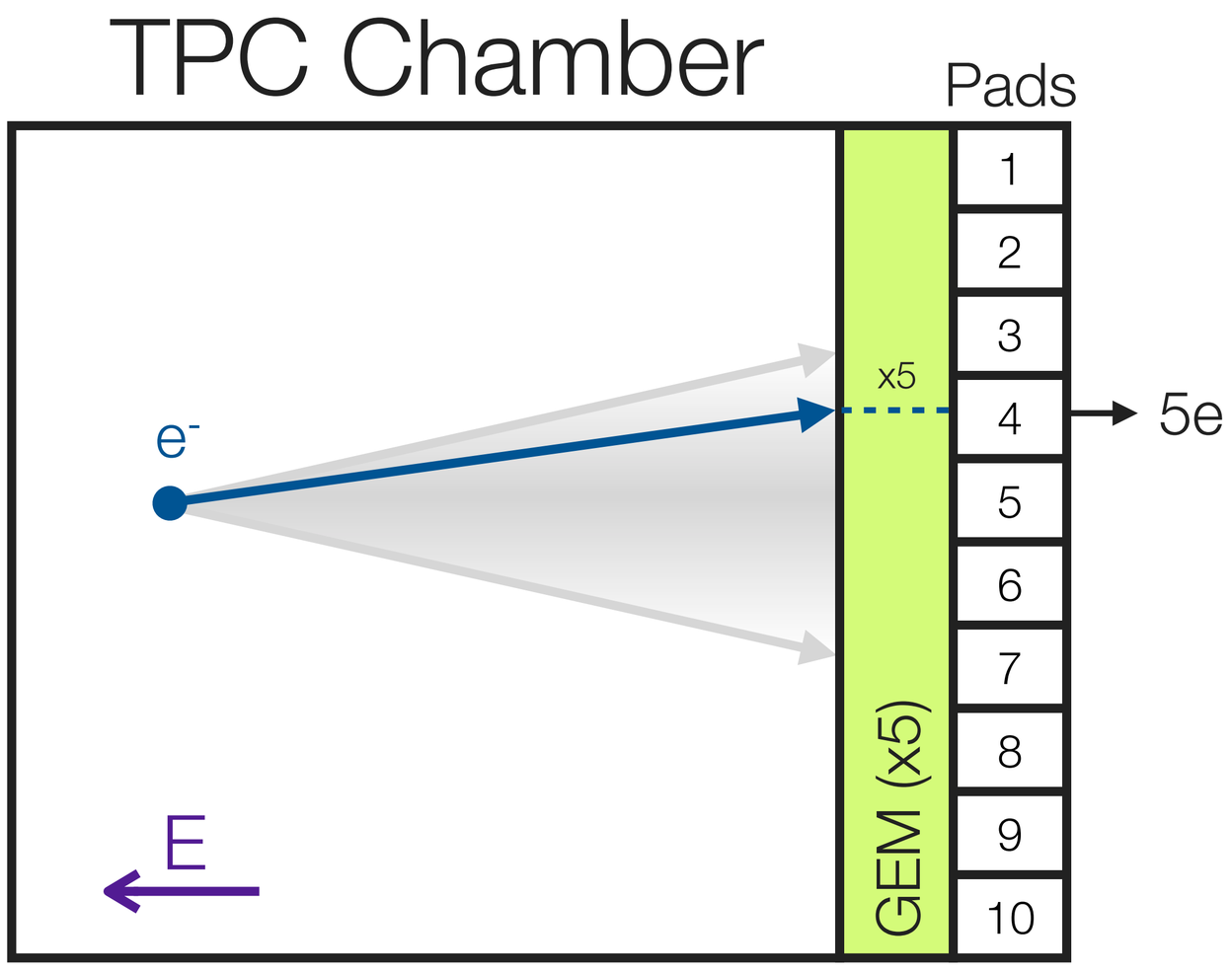
Old



x10

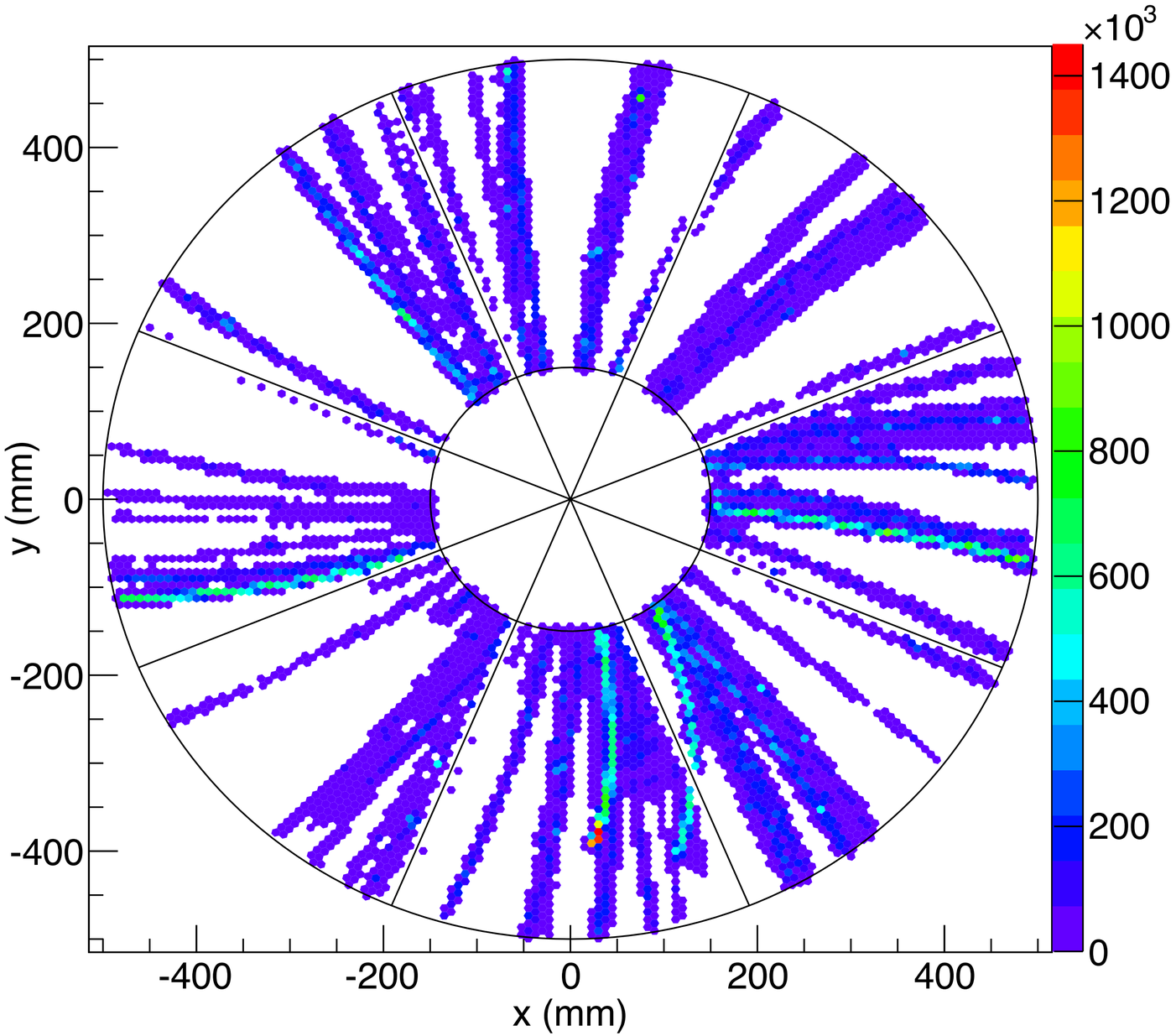
Drift Simulation

New



x10

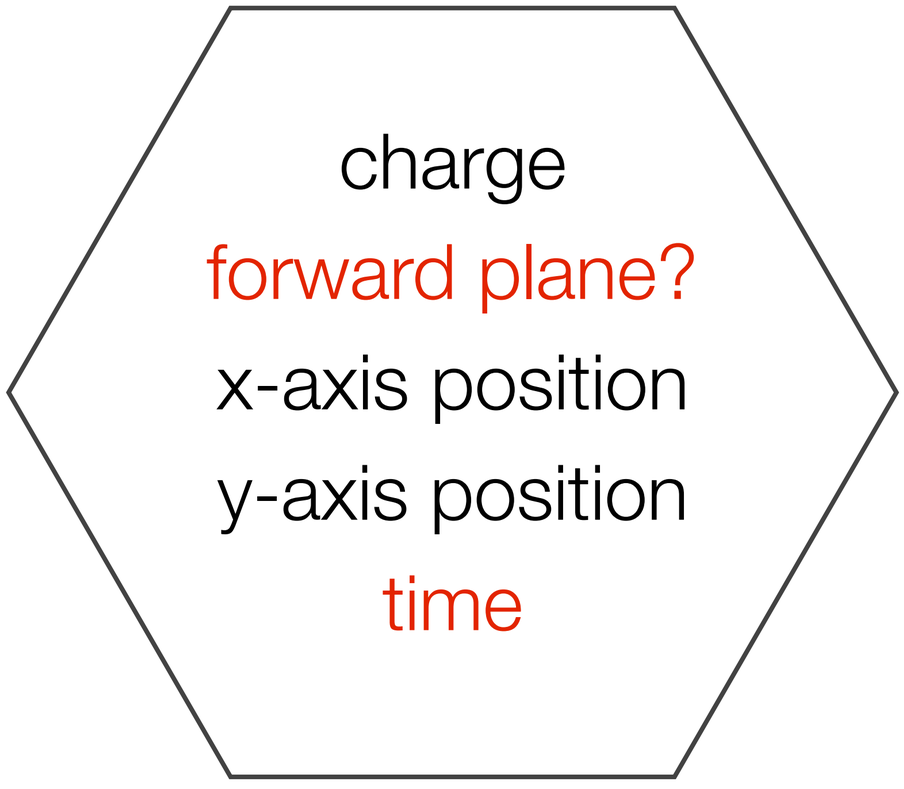
Digitized Data



No threshold

Order of z-axis : 10^4

Pad Information



No z-axis position!

z-axis position

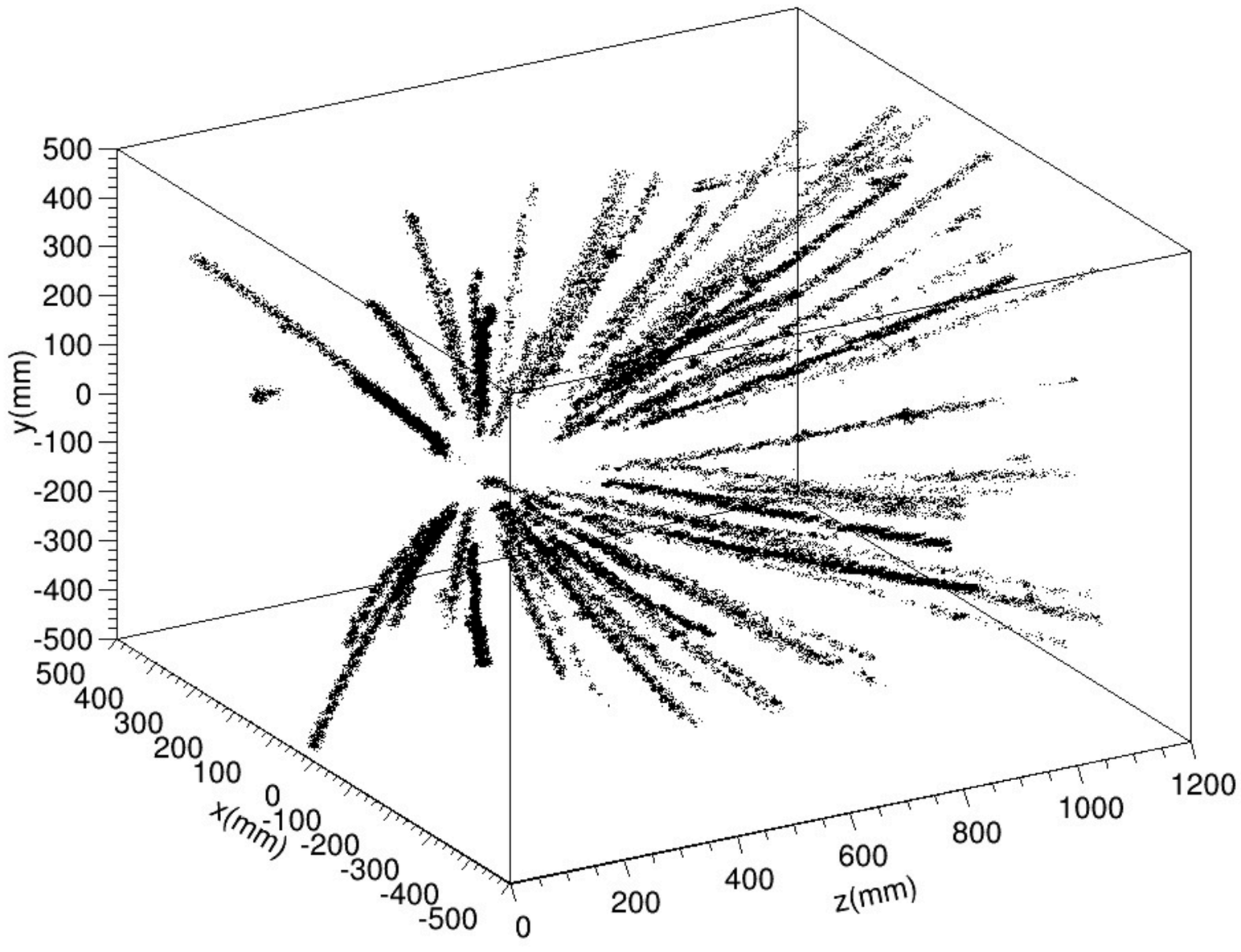
= time x (drift velocity)

drift velocity

= 49.86 μm/ns

= 49.86 x 10^6 mm/s

3D Plot of Digitized Data



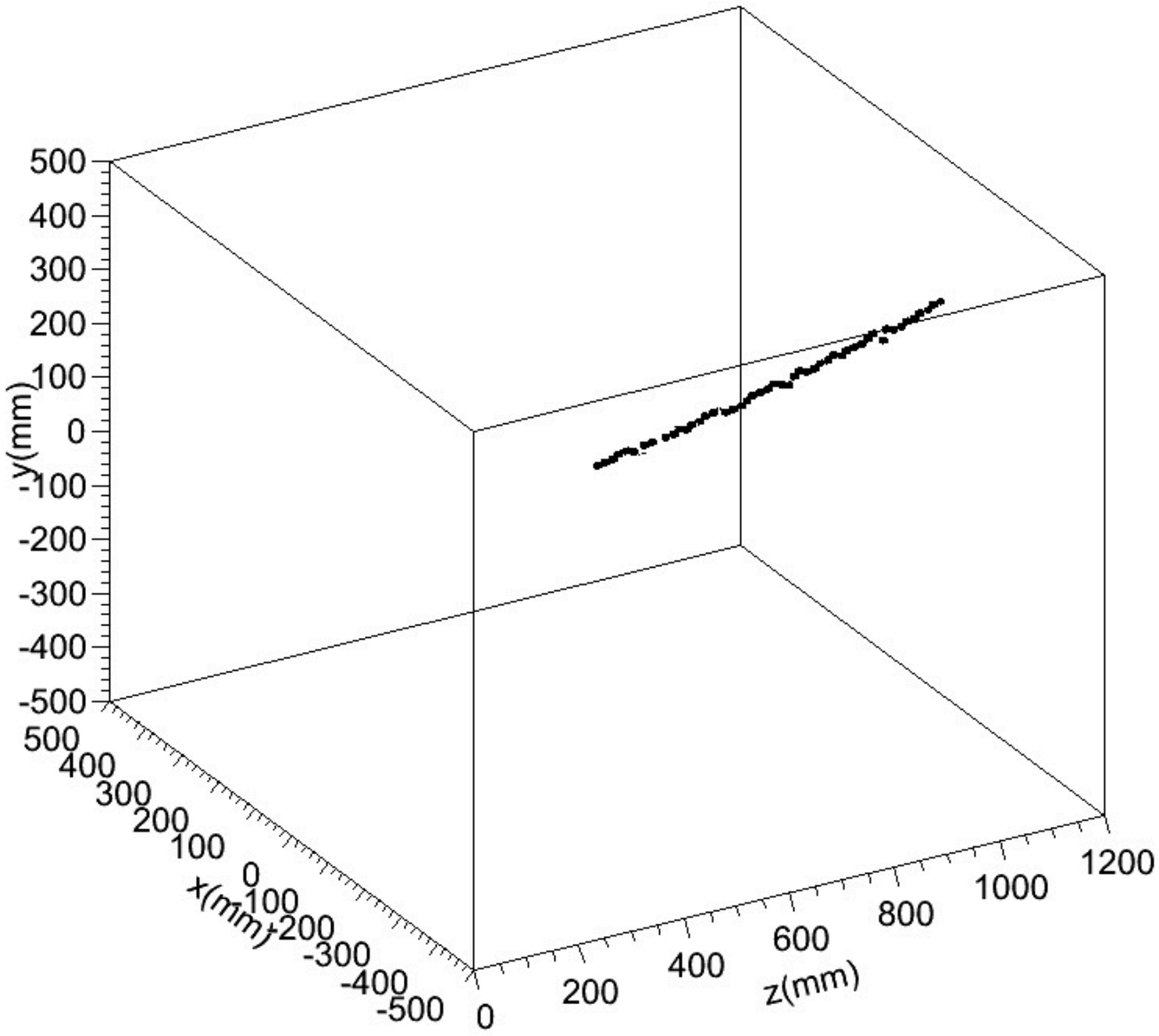
Clusterization

1. Clustering a track

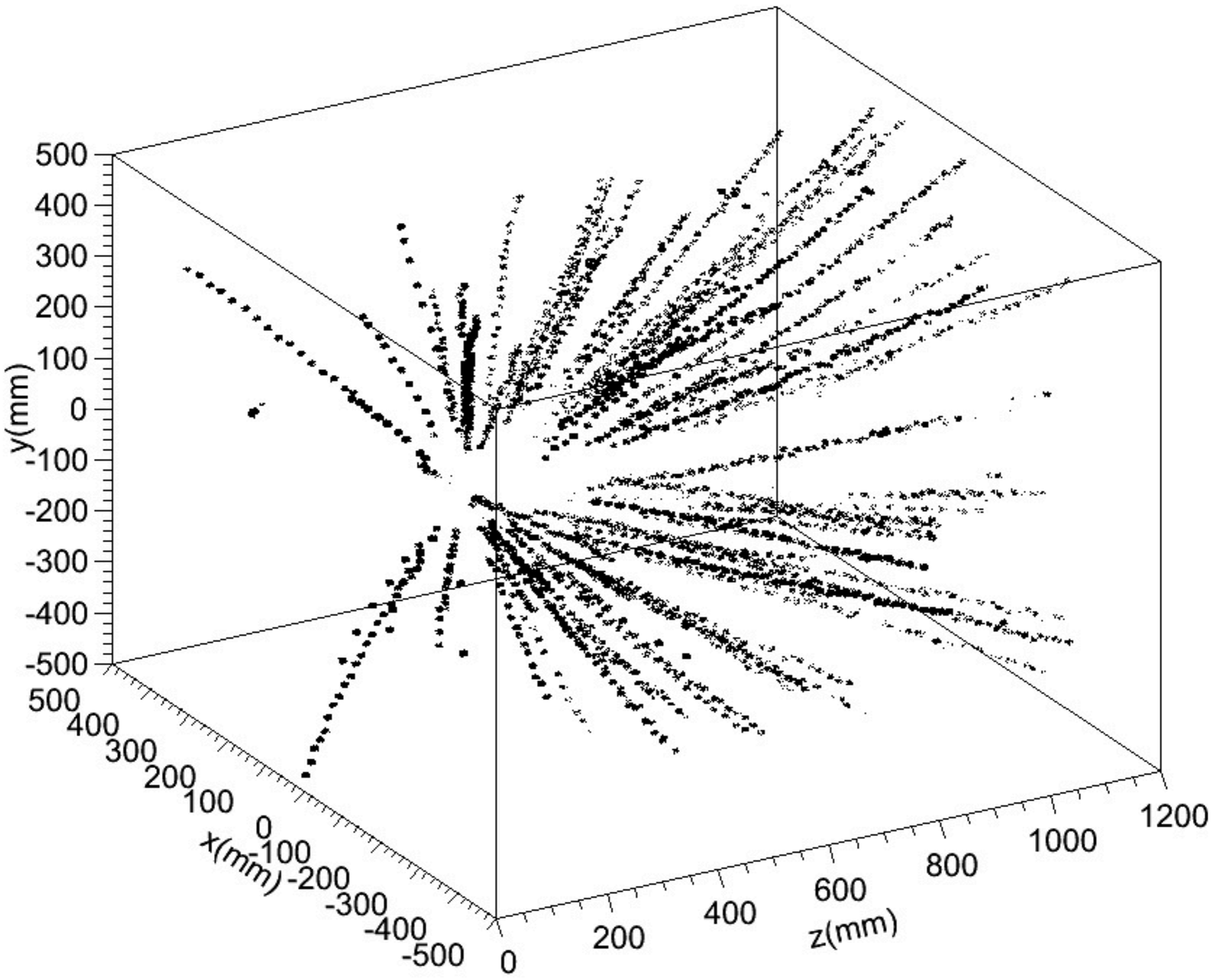
2. Clustering an whole event by clustering each track.

3. Clustering an whole event without track information.

1. A Track

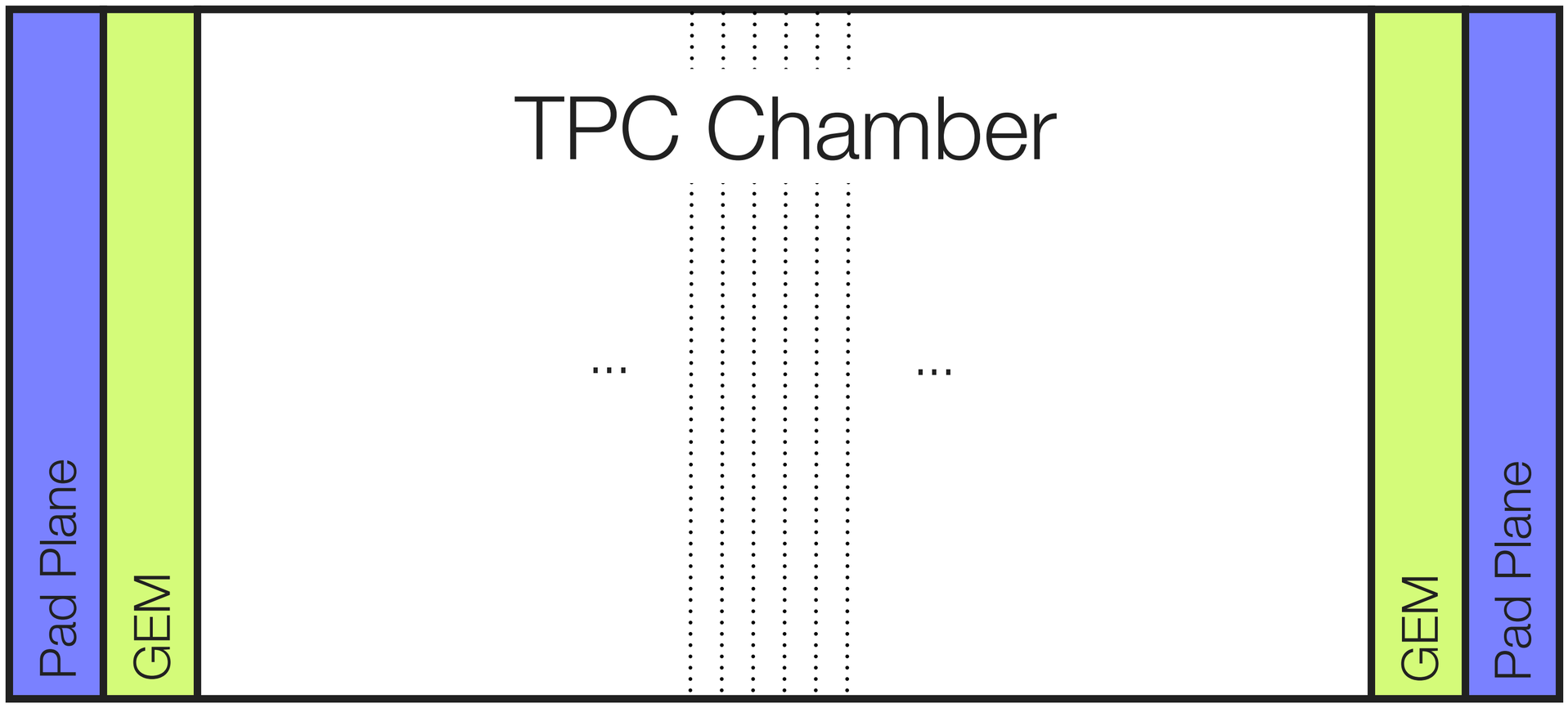

500
400
300
200
100
0
-100
-200
-300
-400
-500
y(mm)
500
400
300
200
100
0
-100
-200
-300
-400
-500
x(mm)
0
200
400
600
800
1000
1200
z(mm)

2. An Event (clustered track by track)



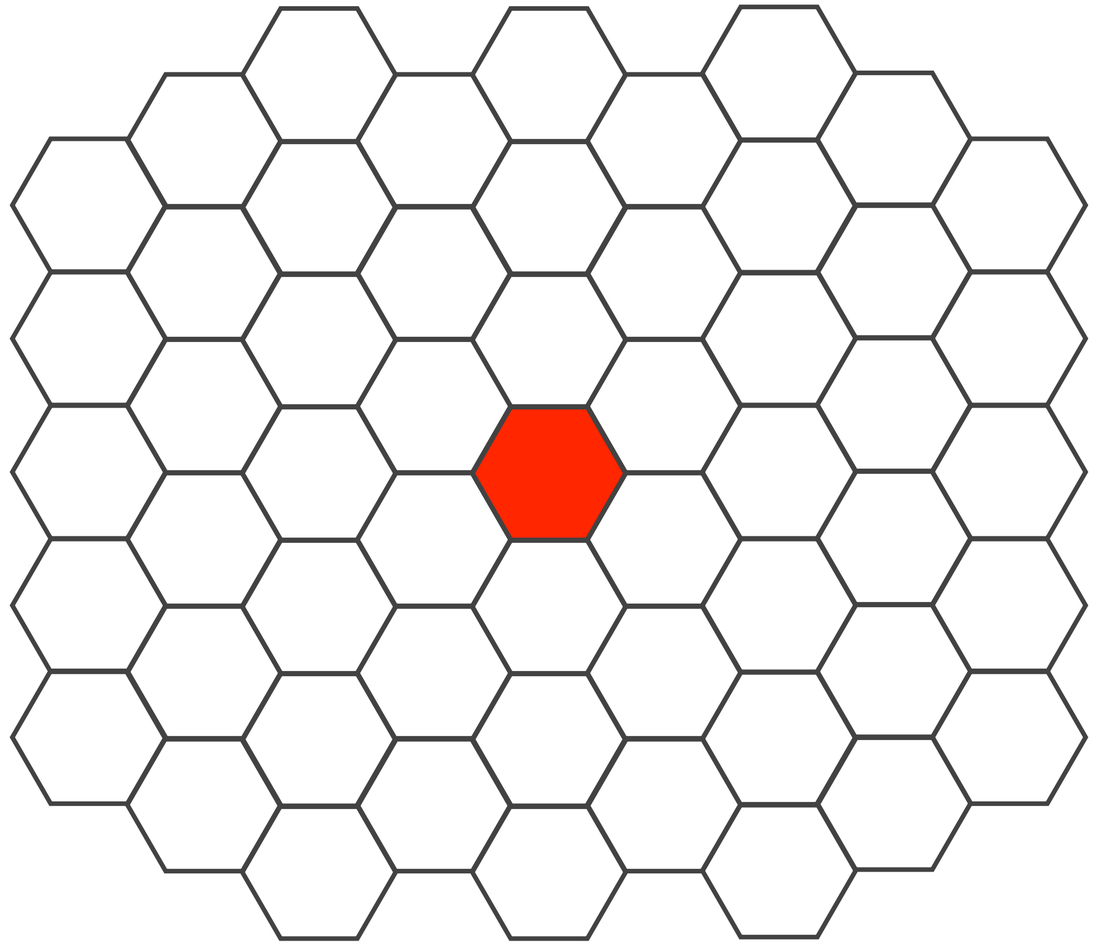
3. Clustering An Event Without Track Information

Clustering An Event



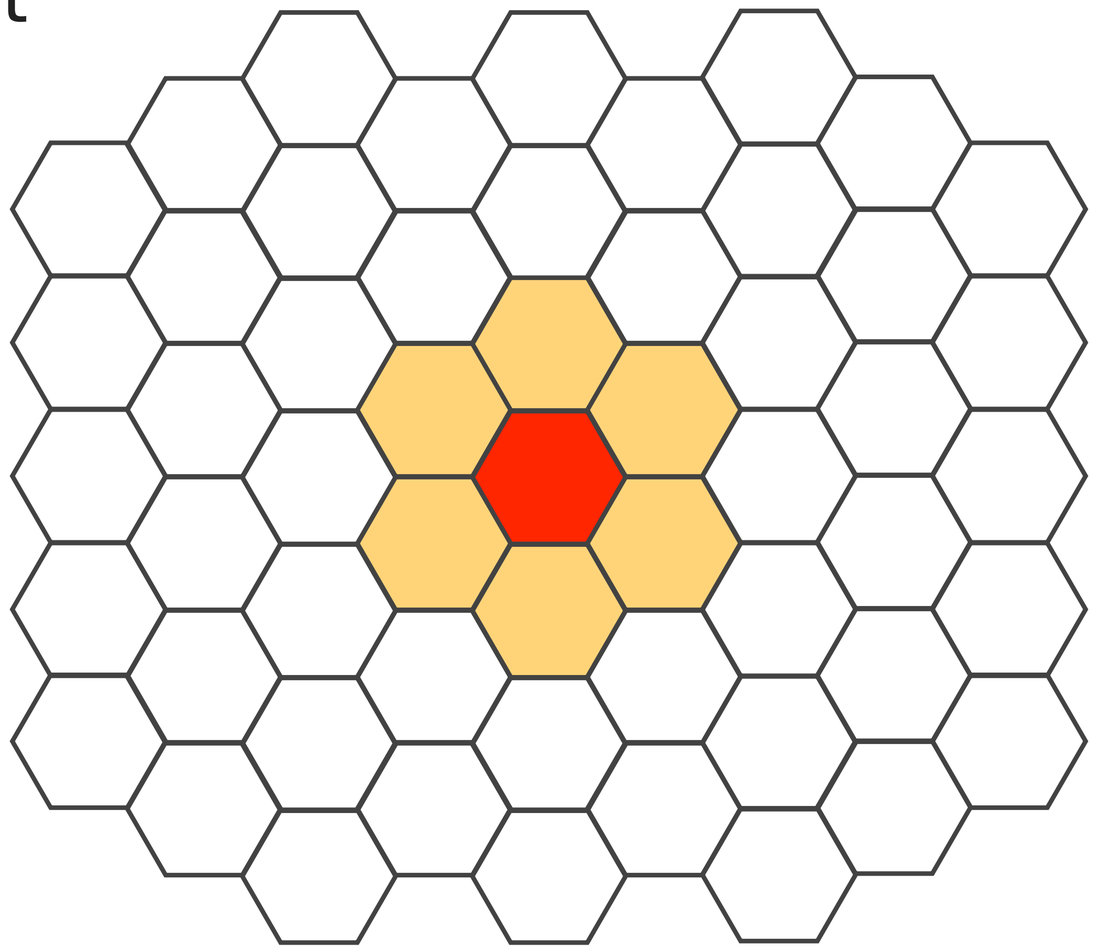
#**120** Sections along the z-axis; each section with 10mm in length

Neighboring Pads



Neighboring Pads

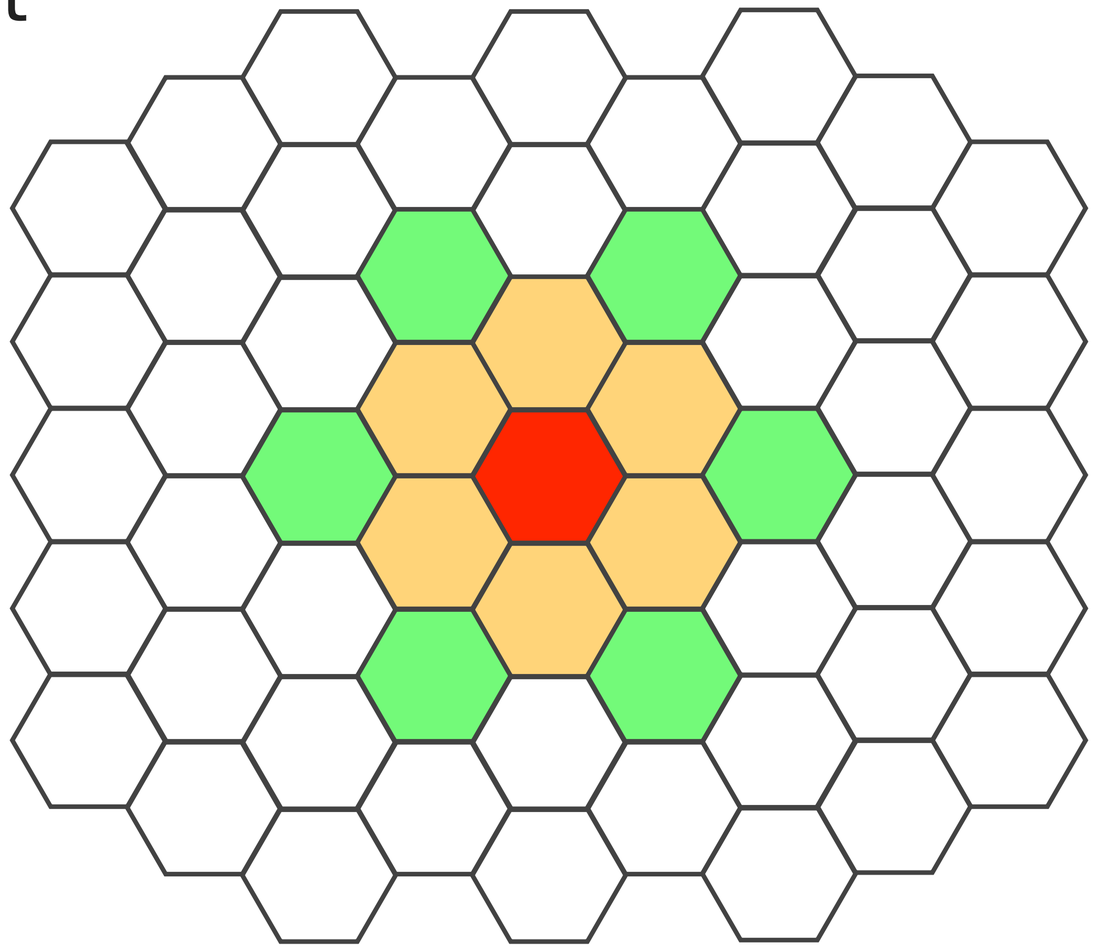
1st Nearest



6

Neighboring Pads

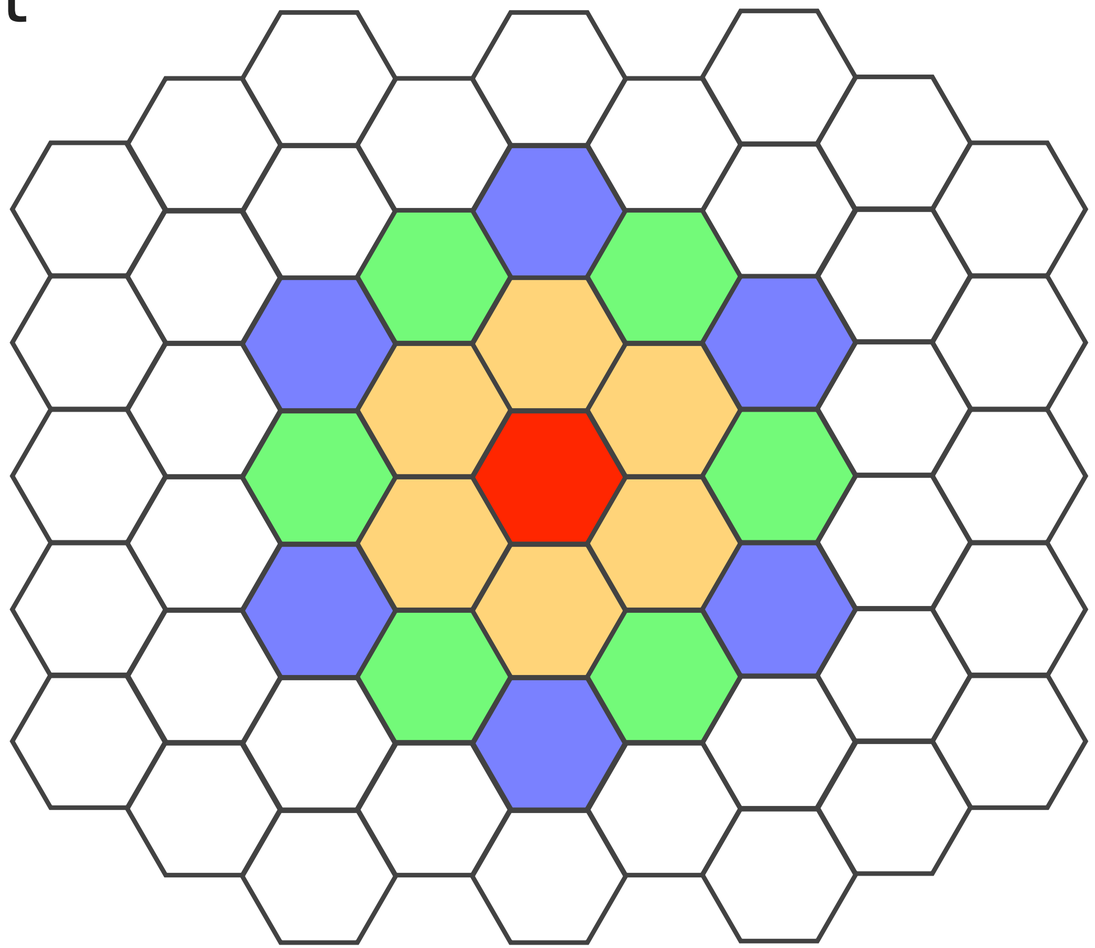
2nd Nearest



6

Neighboring Pads

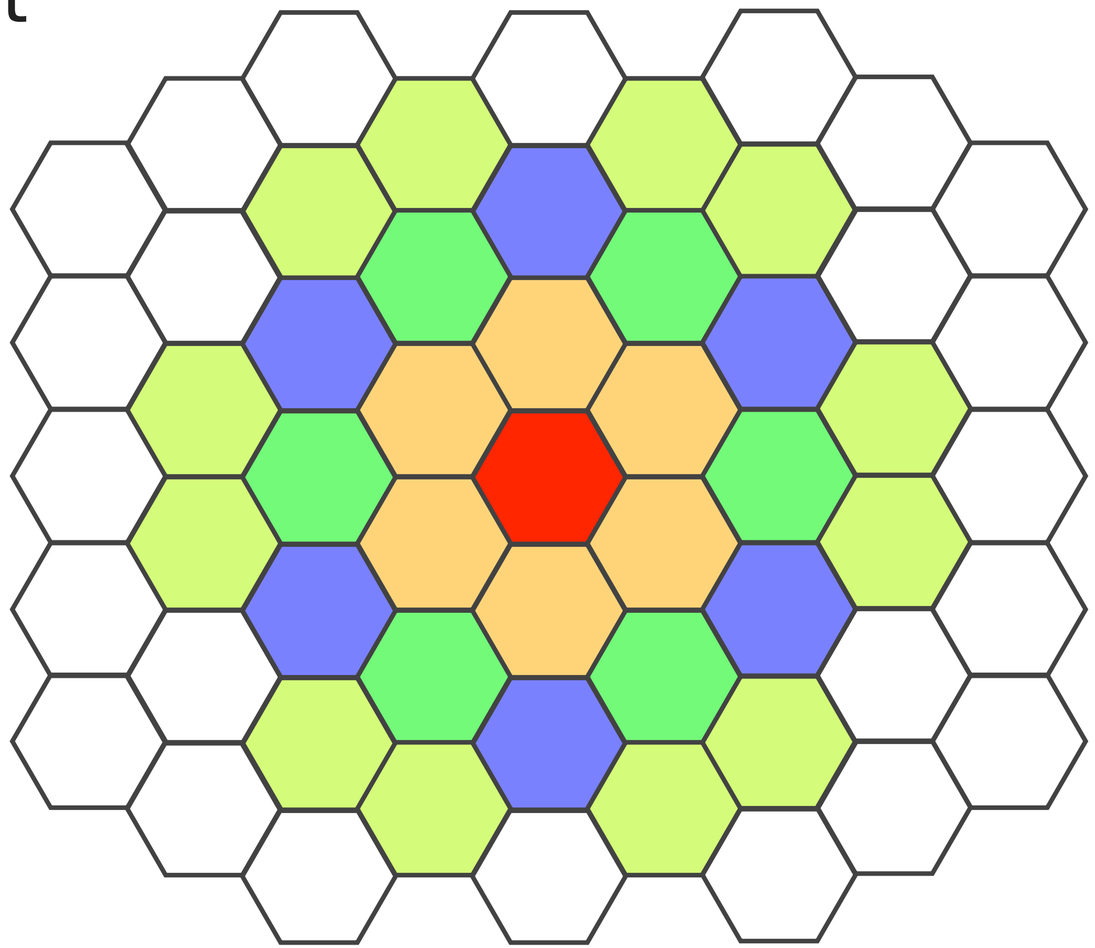
3rd Nearest



6

Neighboring Pads

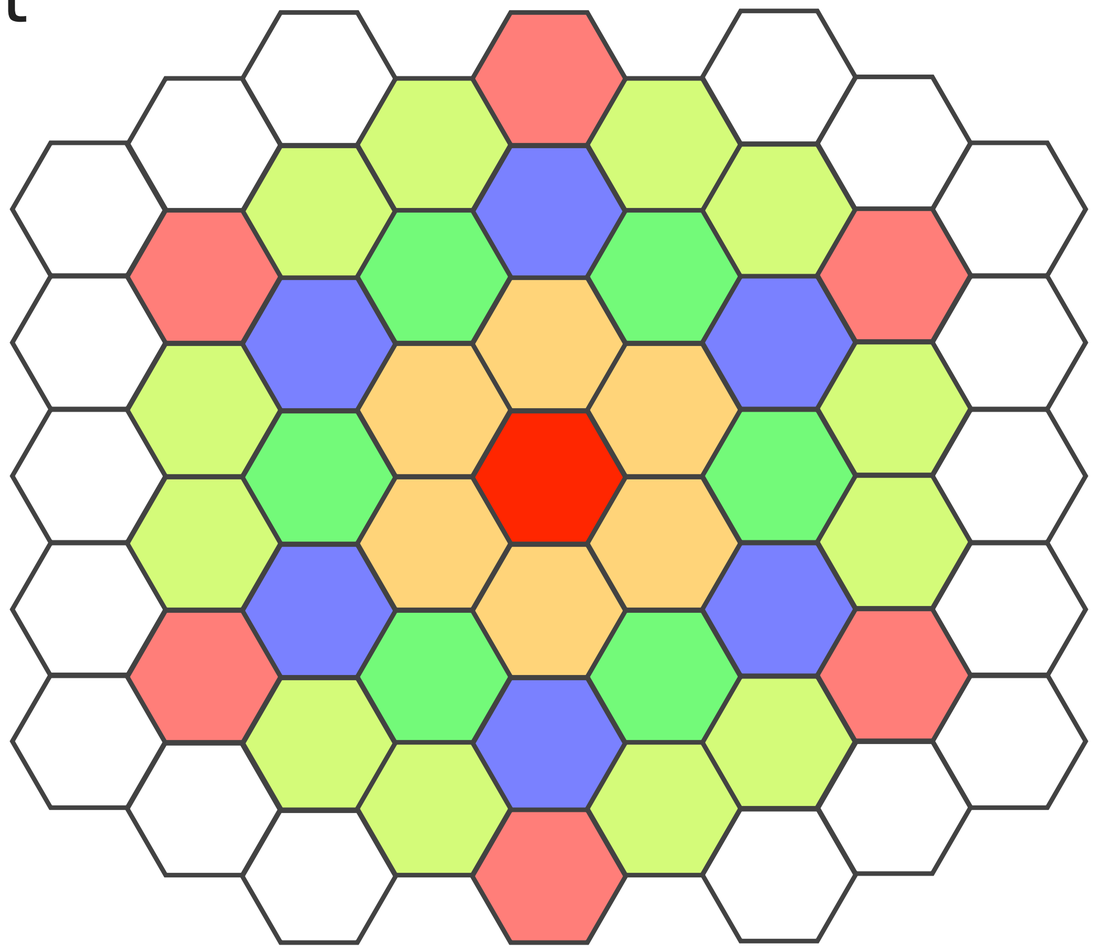
4th Nearest



12

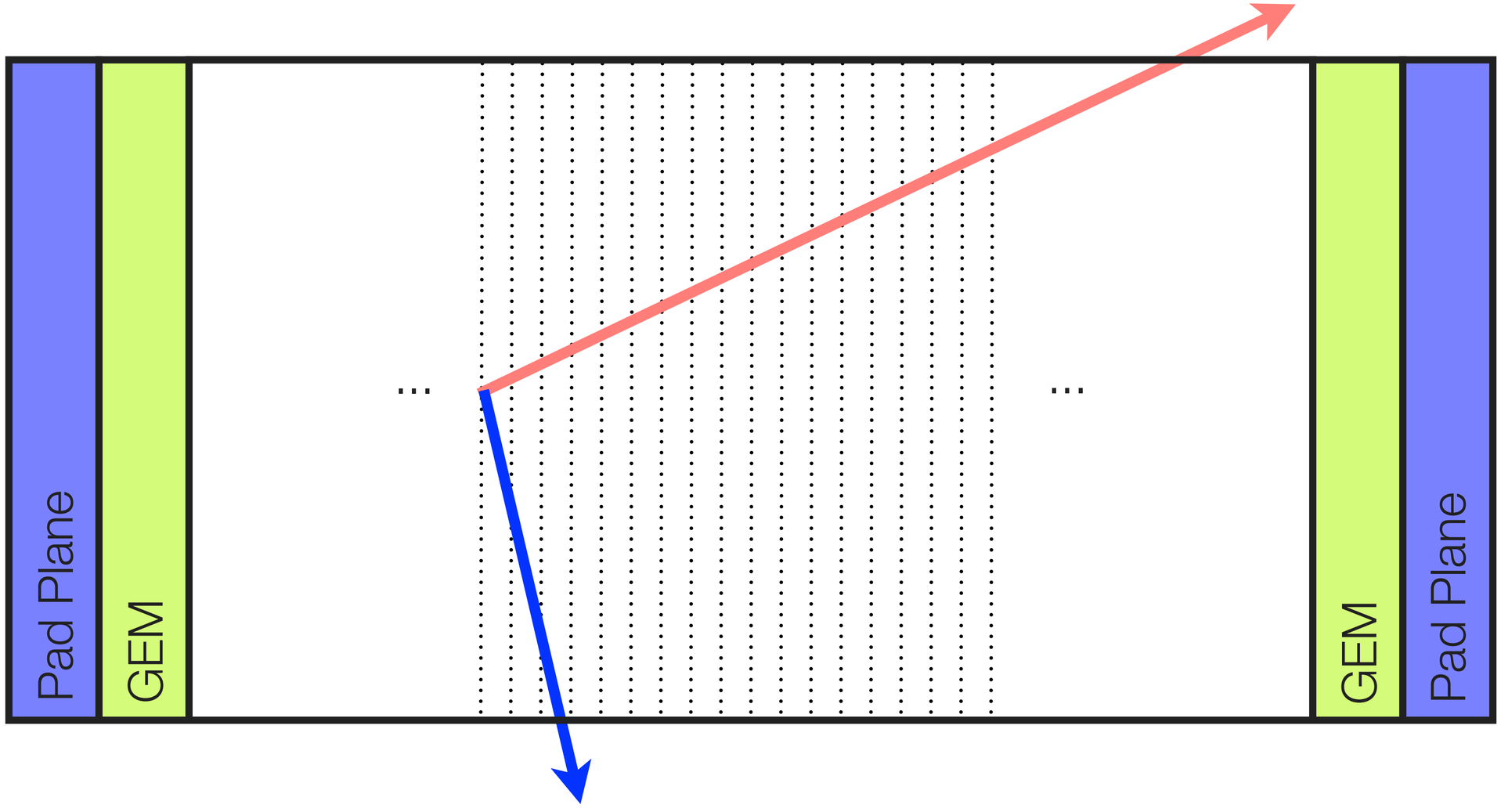
Neighboring Pads

5th Nearest



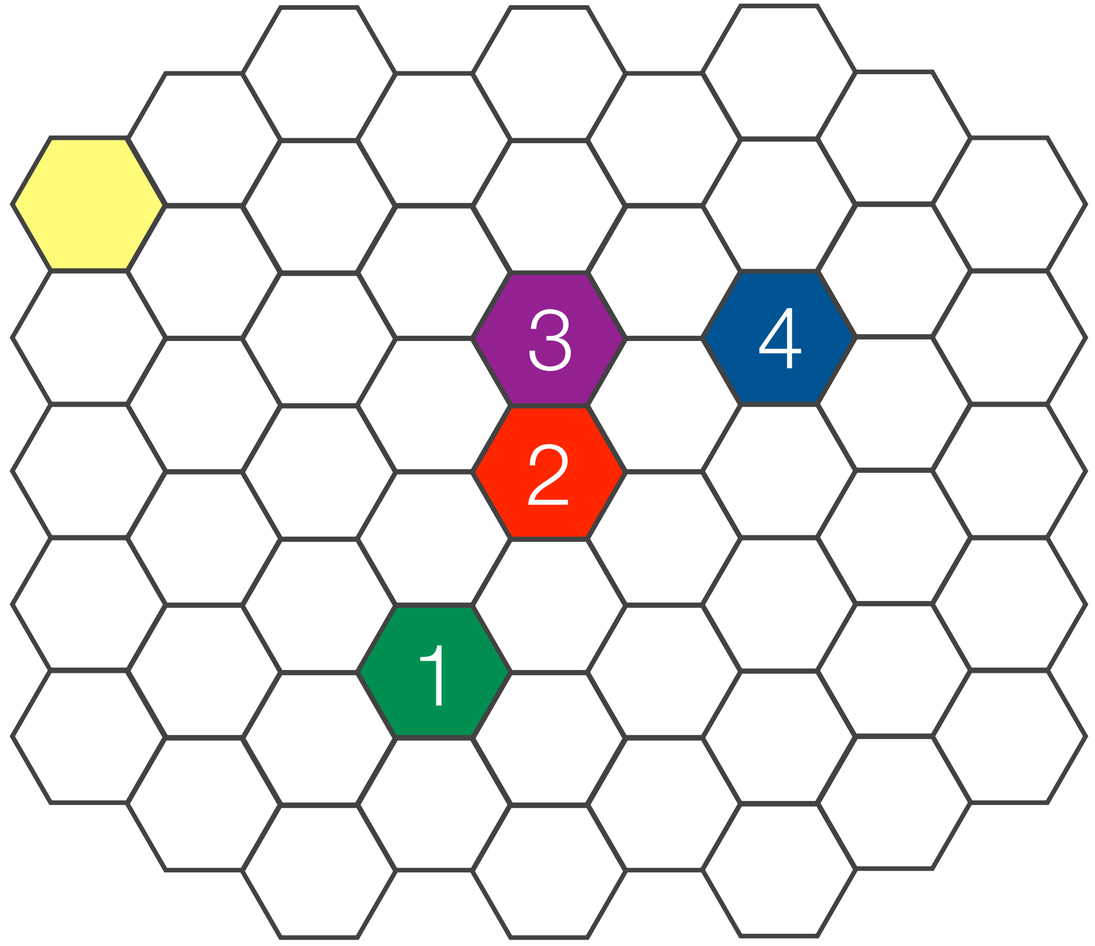
6

Neighboring Pads



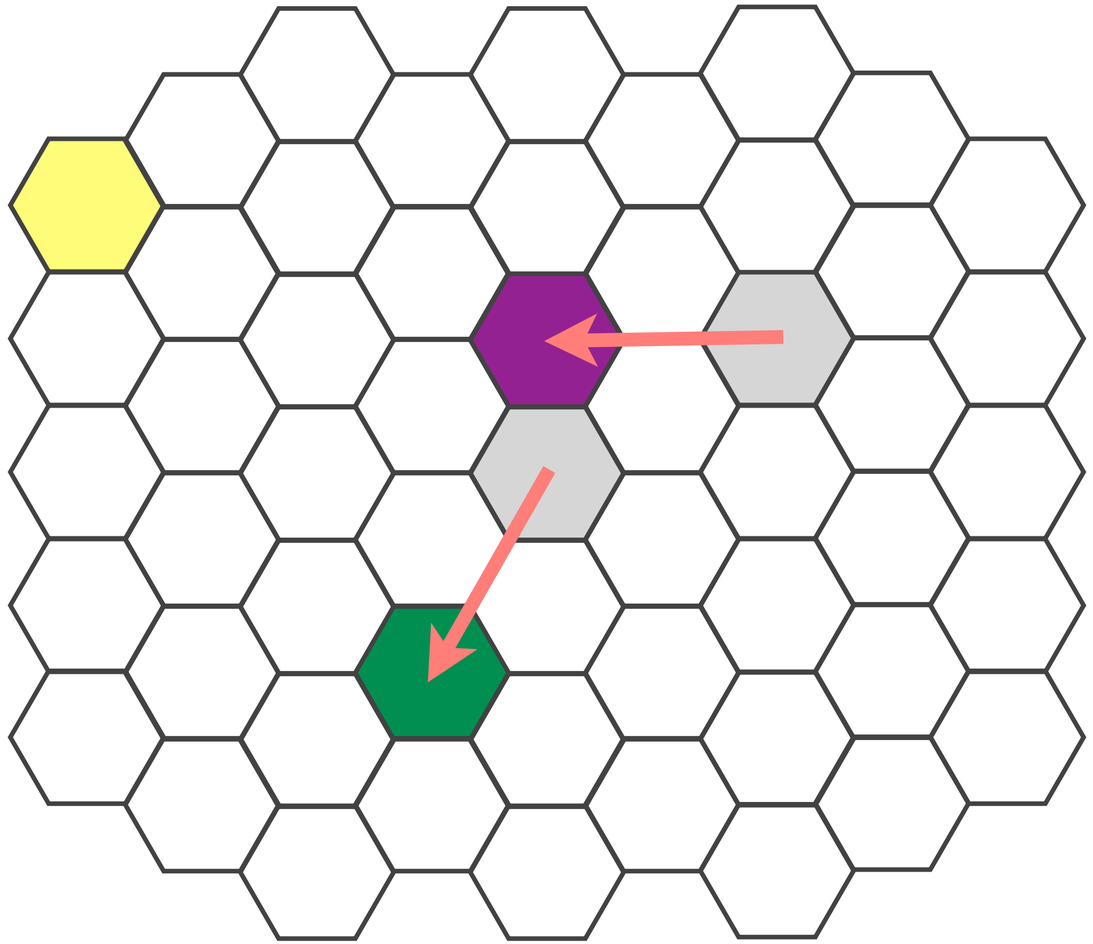
Neighboring Pads

Finding up to **3rd** nearest neighbor pads



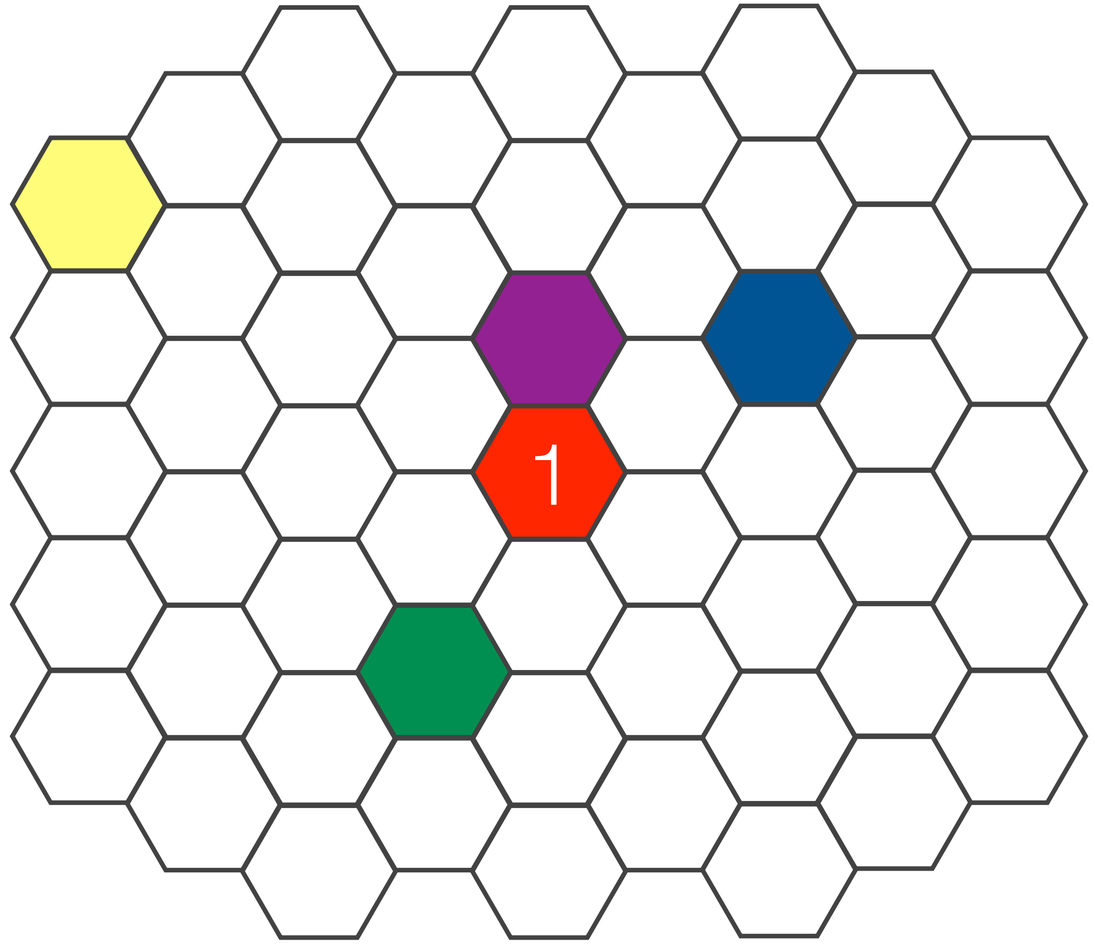
Neighboring Pads

Finding up to **3rd** nearest neighbor pads



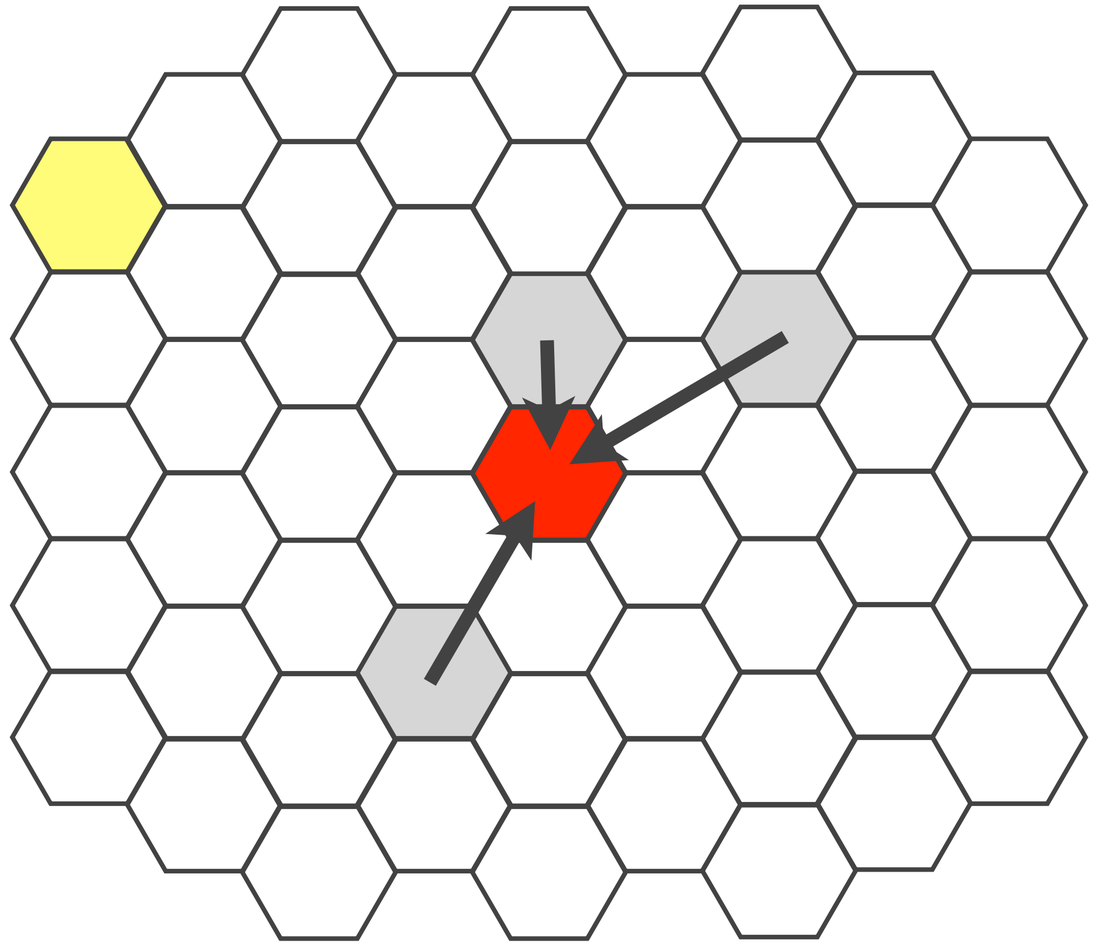
Neighboring Pads

Finding up to **3rd** nearest neighbor pads



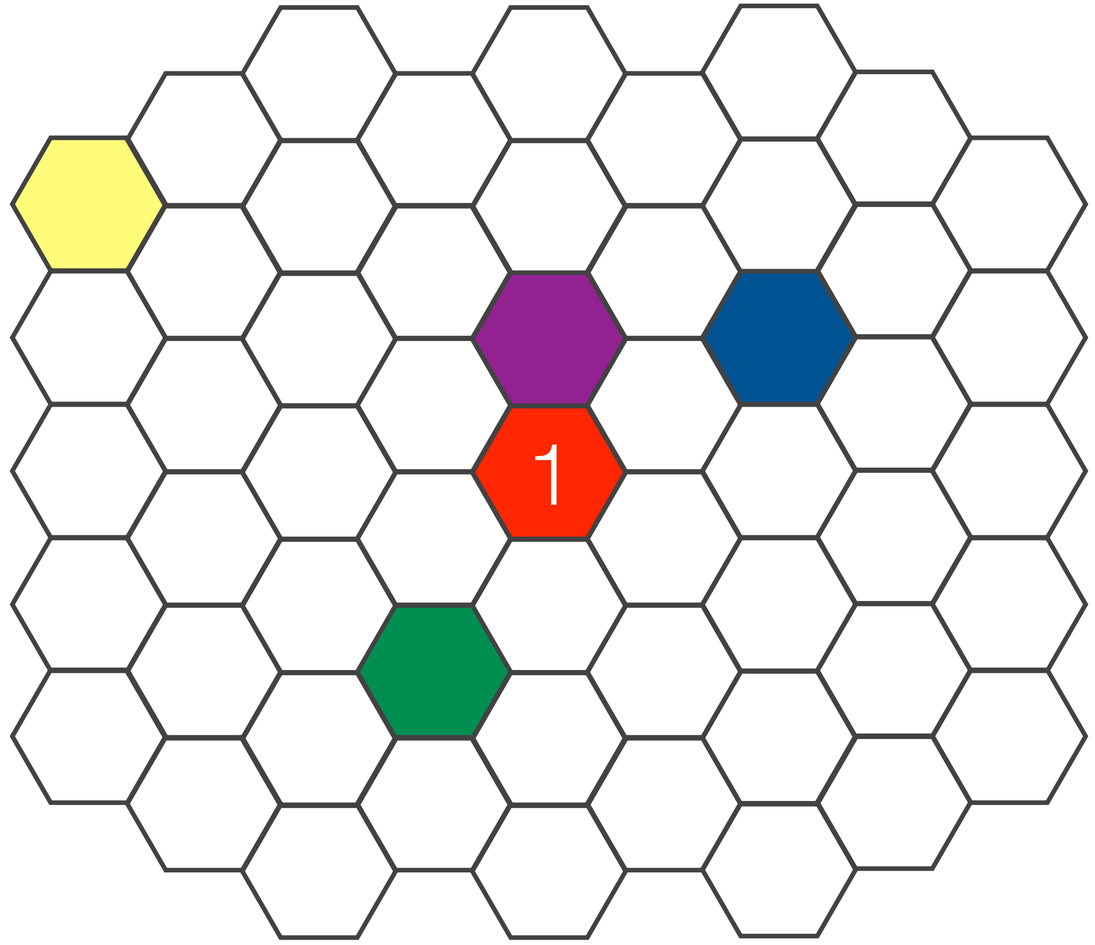
Neighboring Pads

Finding up to **3rd** nearest neighbor pads



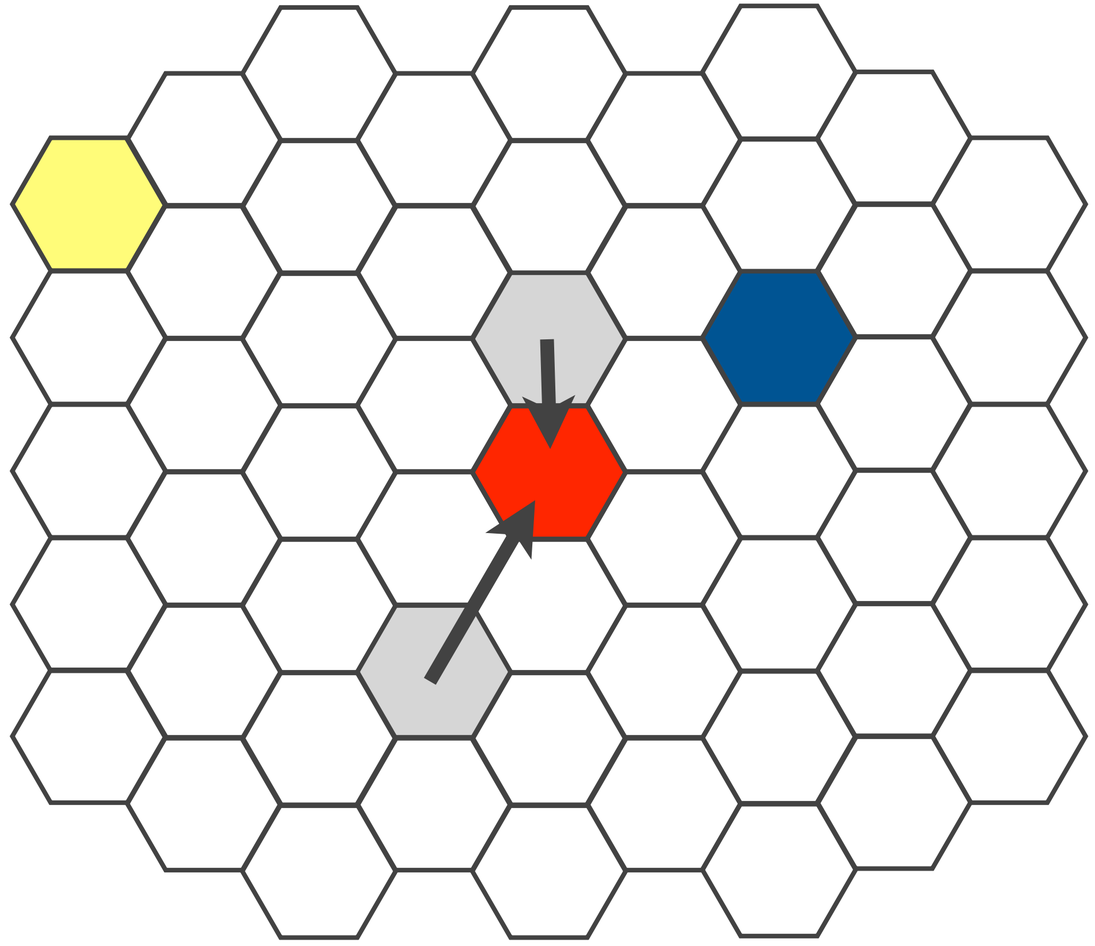
Neighboring Pads

Finding up to **2nd** nearest neighbor pads



Neighboring Pads

Finding up to **2nd** nearest neighbor pads



Clustered Data

Threshold is given to clustered point : if the total charge of the clustered point is smaller than 120 fC, the point is removed.

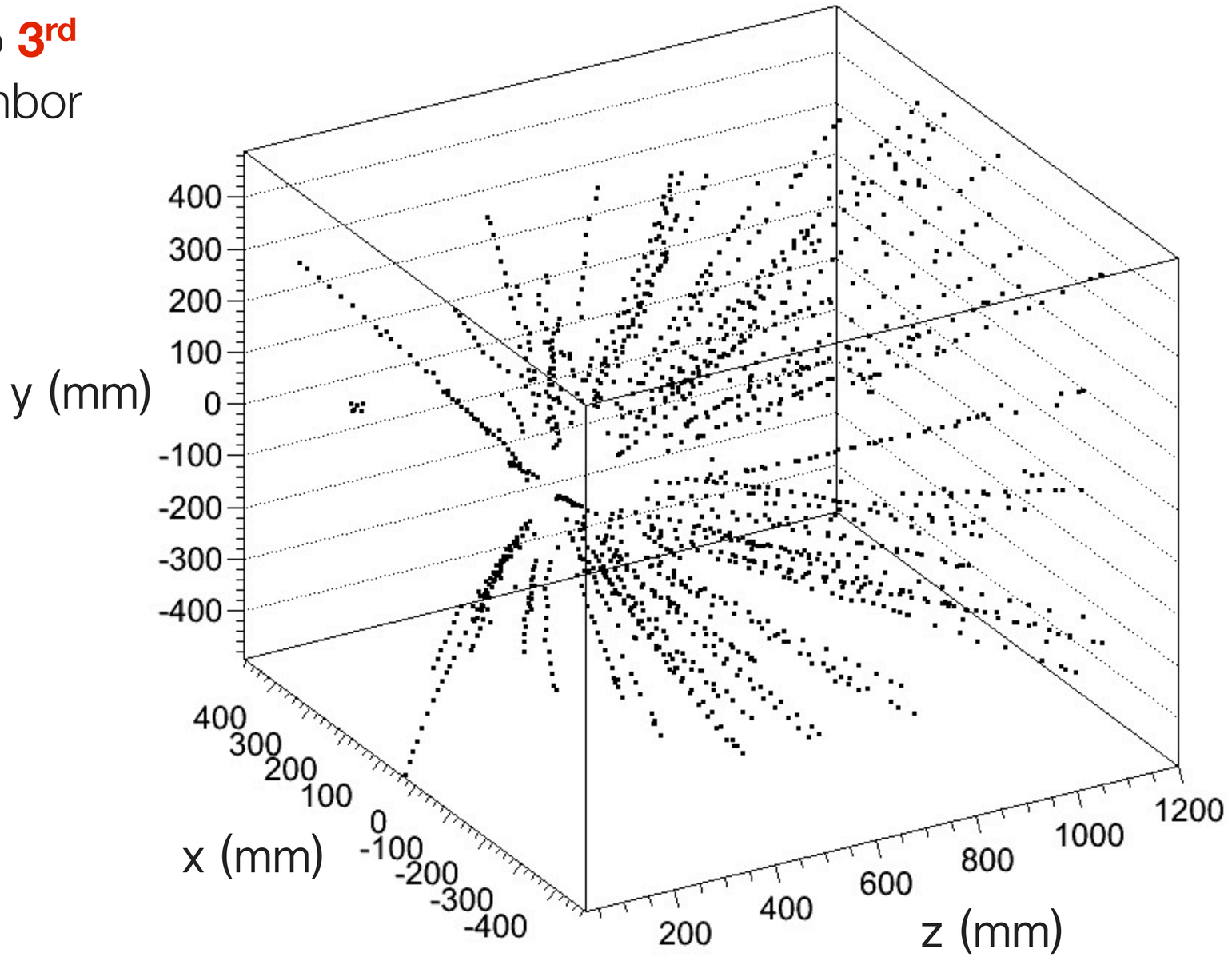
Center of charge : $x = \frac{\sum_i x_i q_i}{\sum_i q_i}$

$$X_{new} = \frac{X_{old} \times Q_{old} + x \times q}{Q_{old} + q}$$

X: x-axis center of charge, **Q**: sum of charge q.

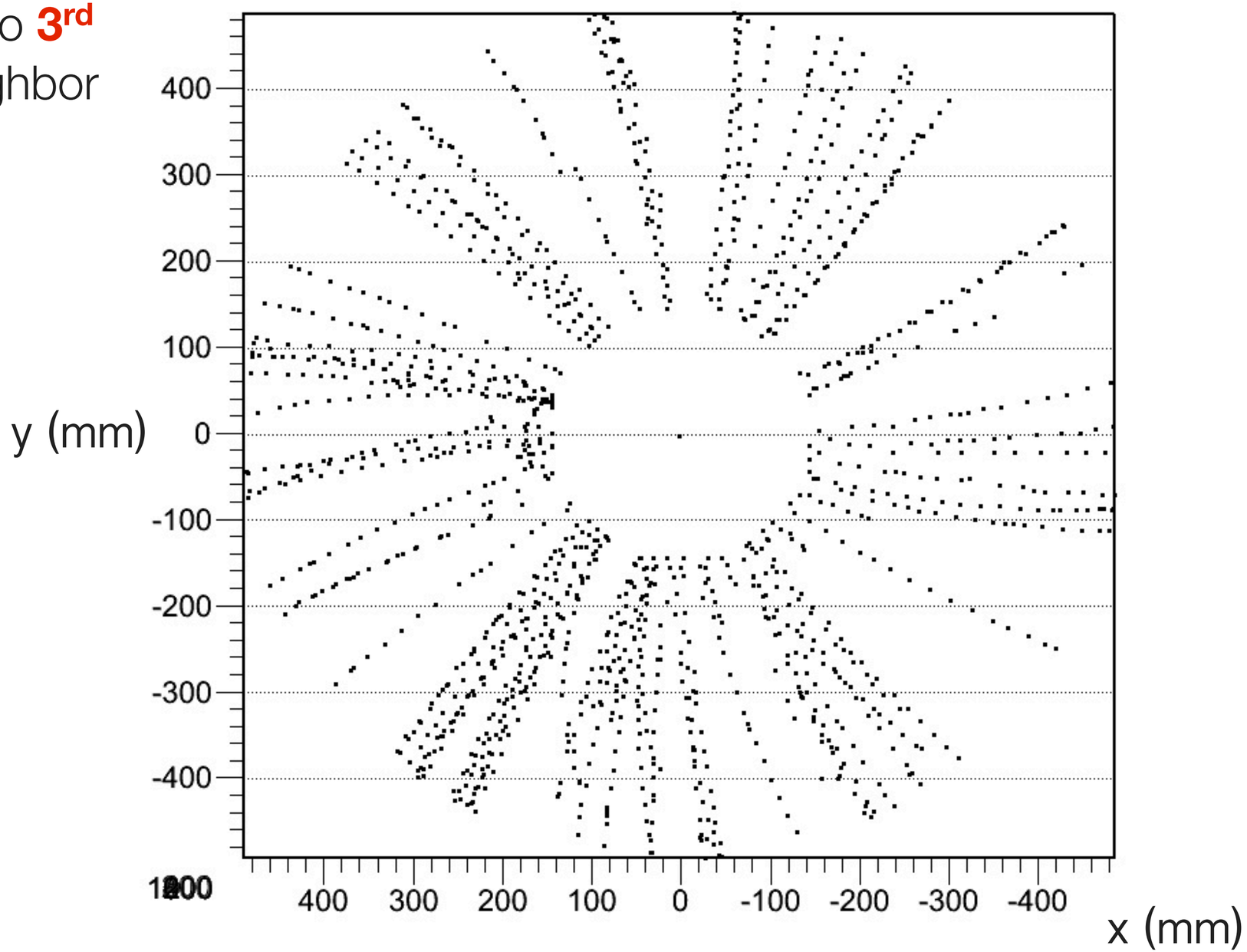
Clustered Data

Finding up to **3rd** nearest neighbor pads



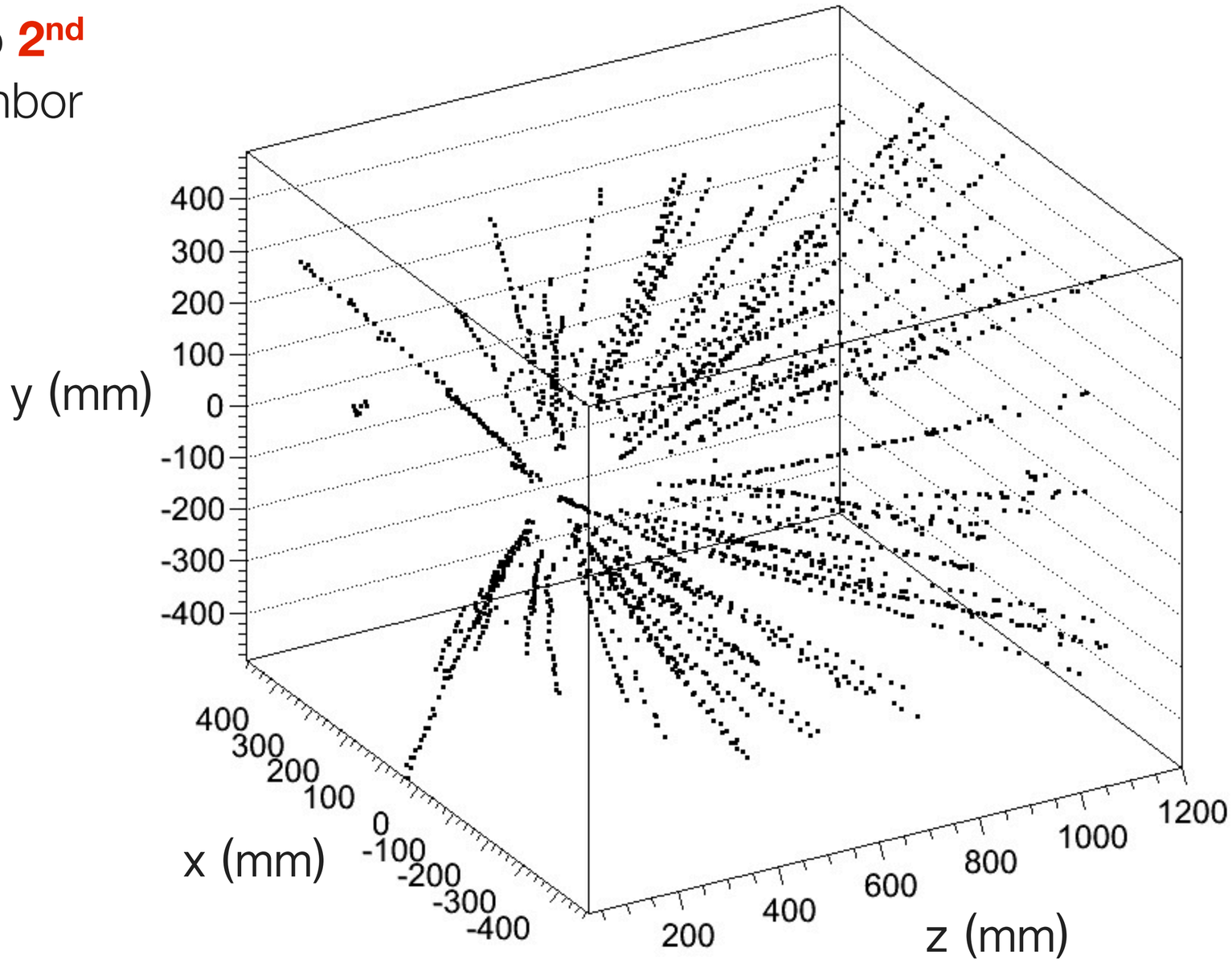
Clustered Data

Finding up to **3rd** nearest neighbor pads



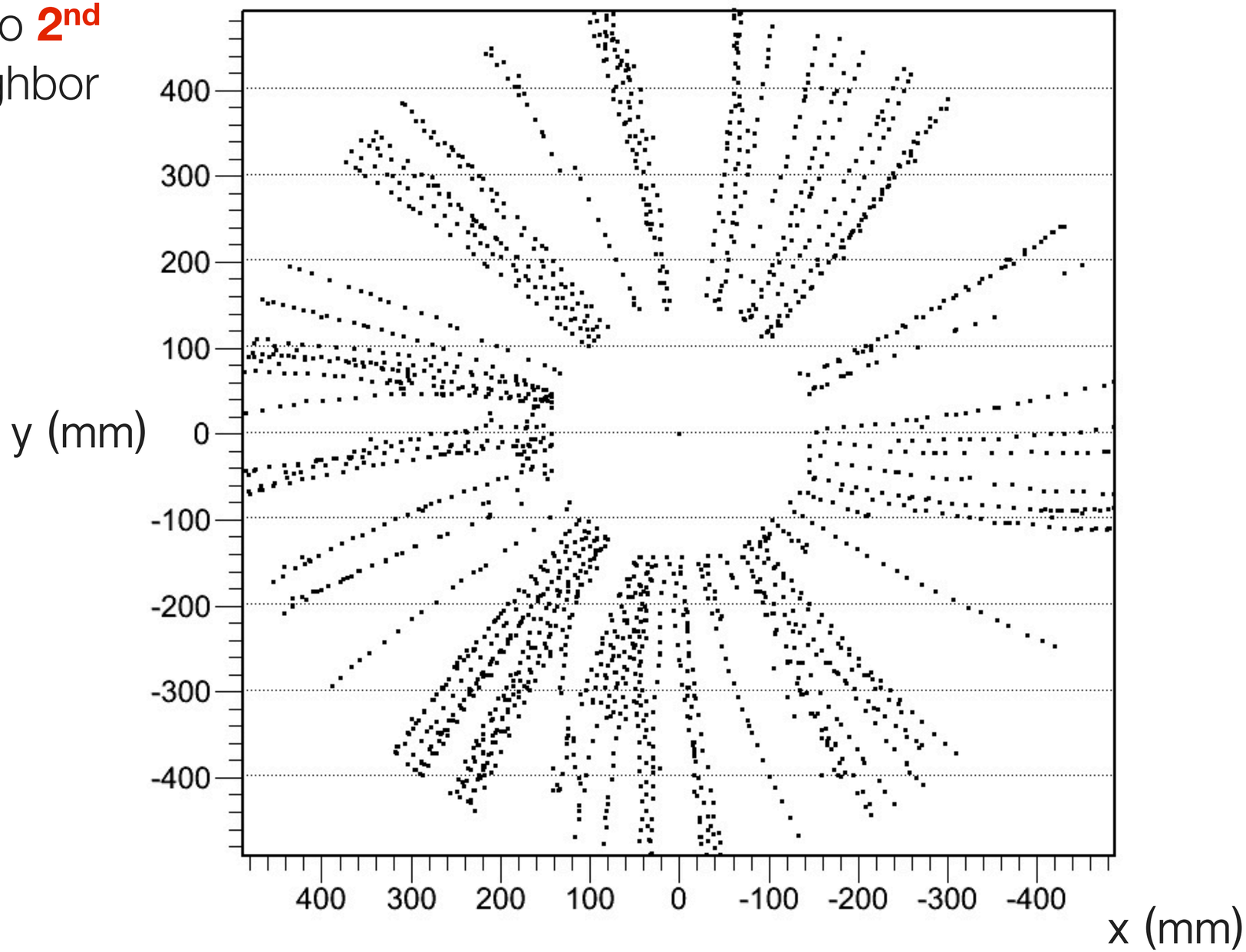
Clustered Data

Finding up to **2nd** nearest neighbor pads



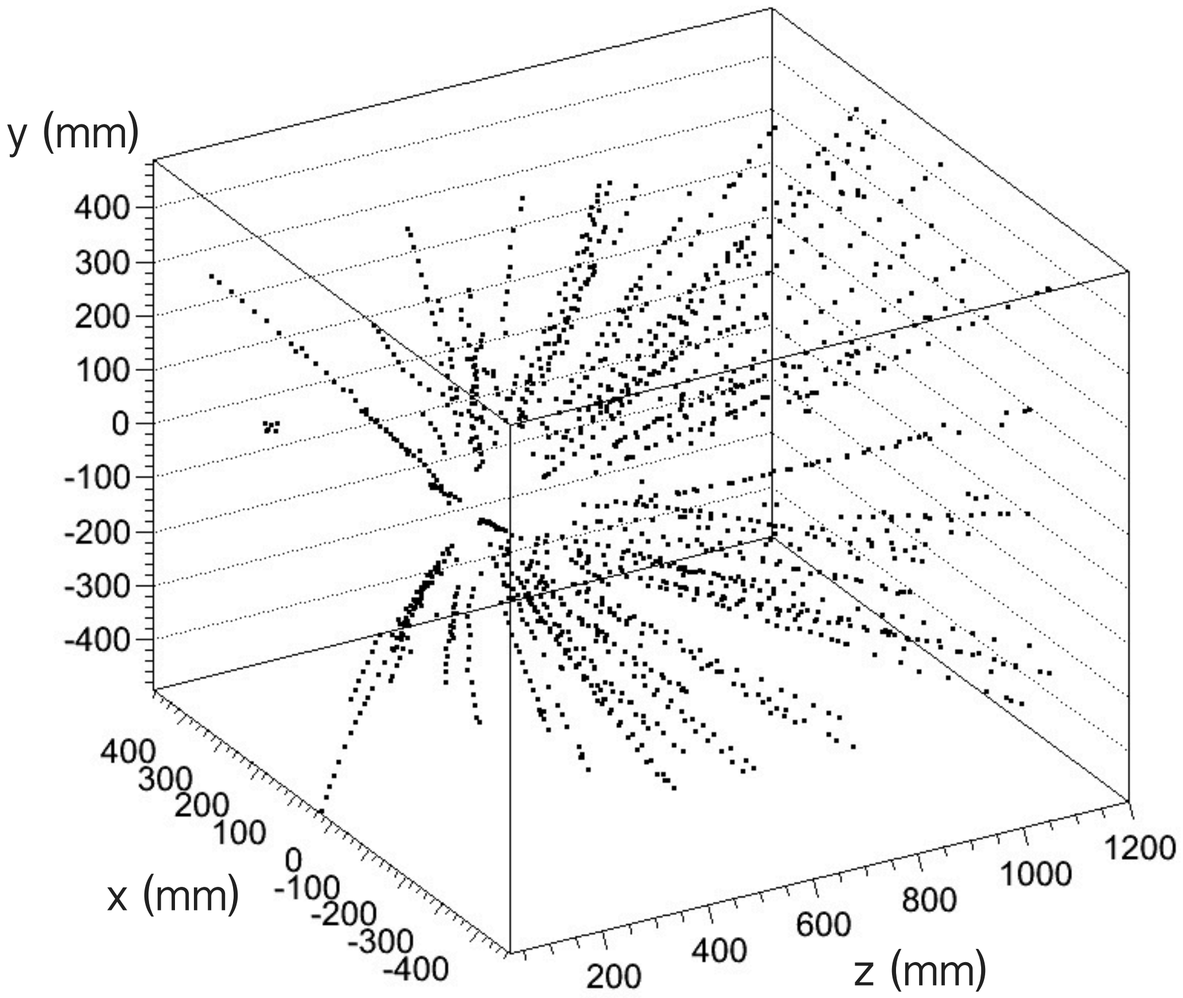
Clustered Data

Finding up to **2nd** nearest neighbor pads

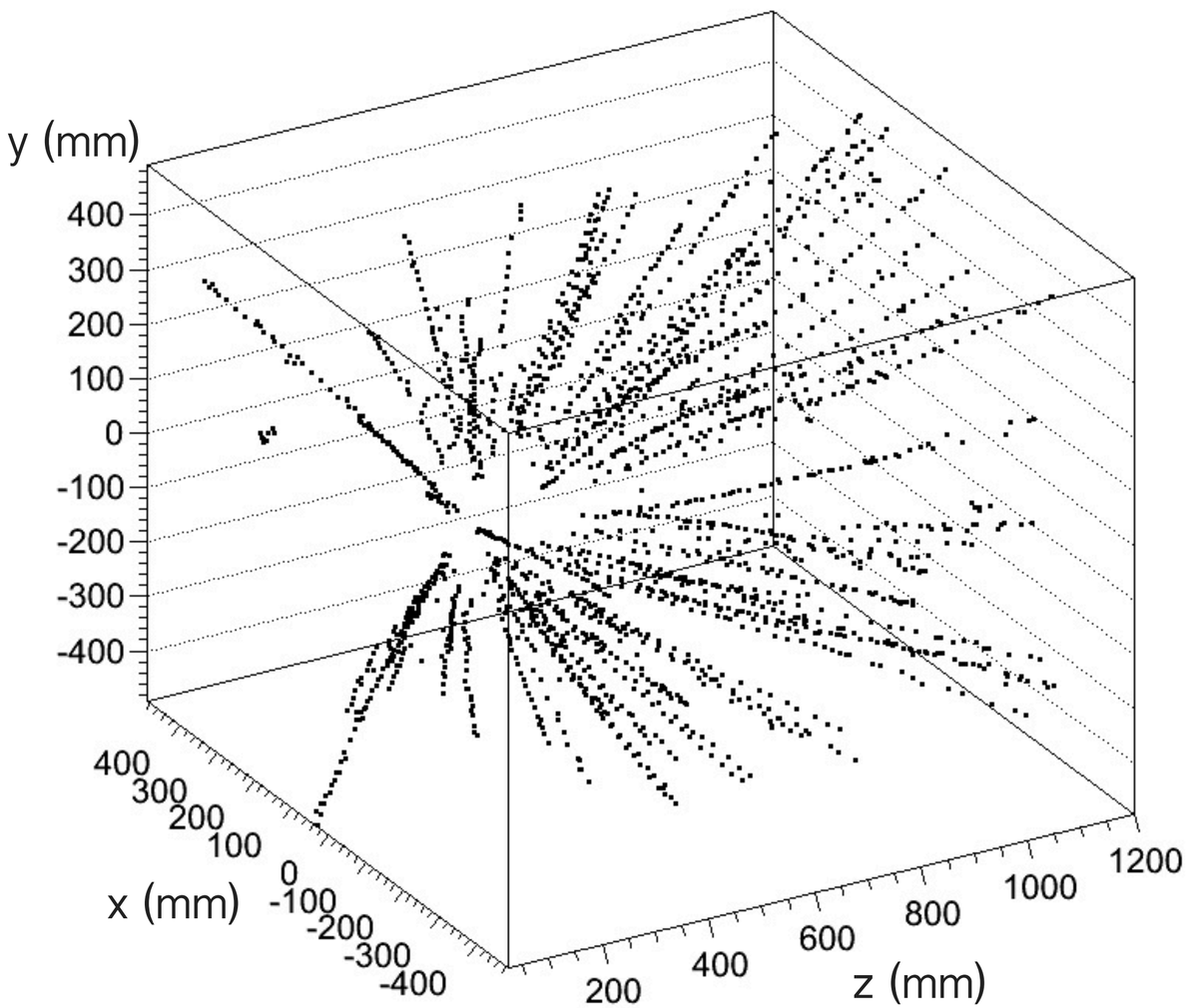


3rd vs 2nd

3rd nearest : 1440 points

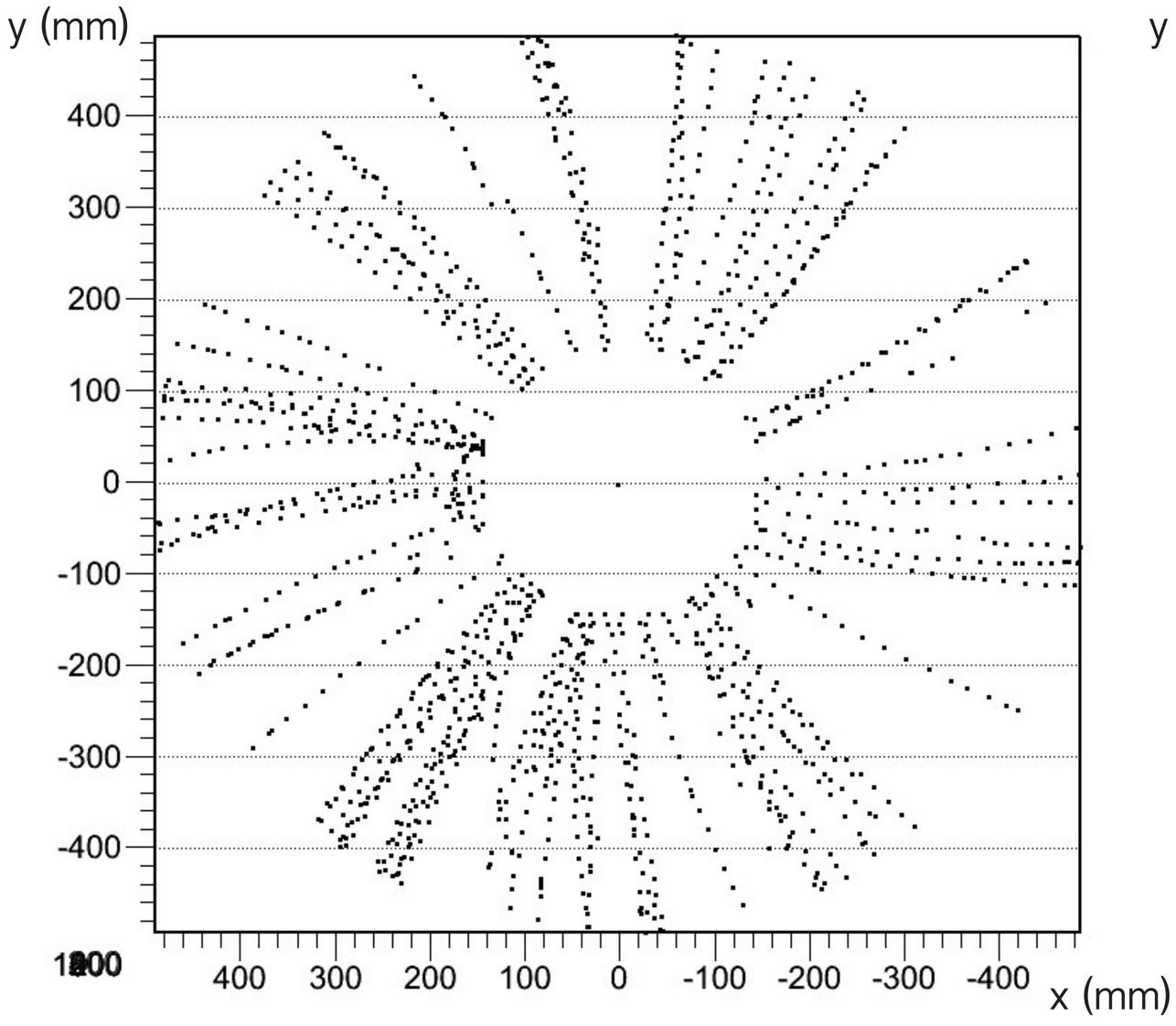


2nd nearest : 2009 points

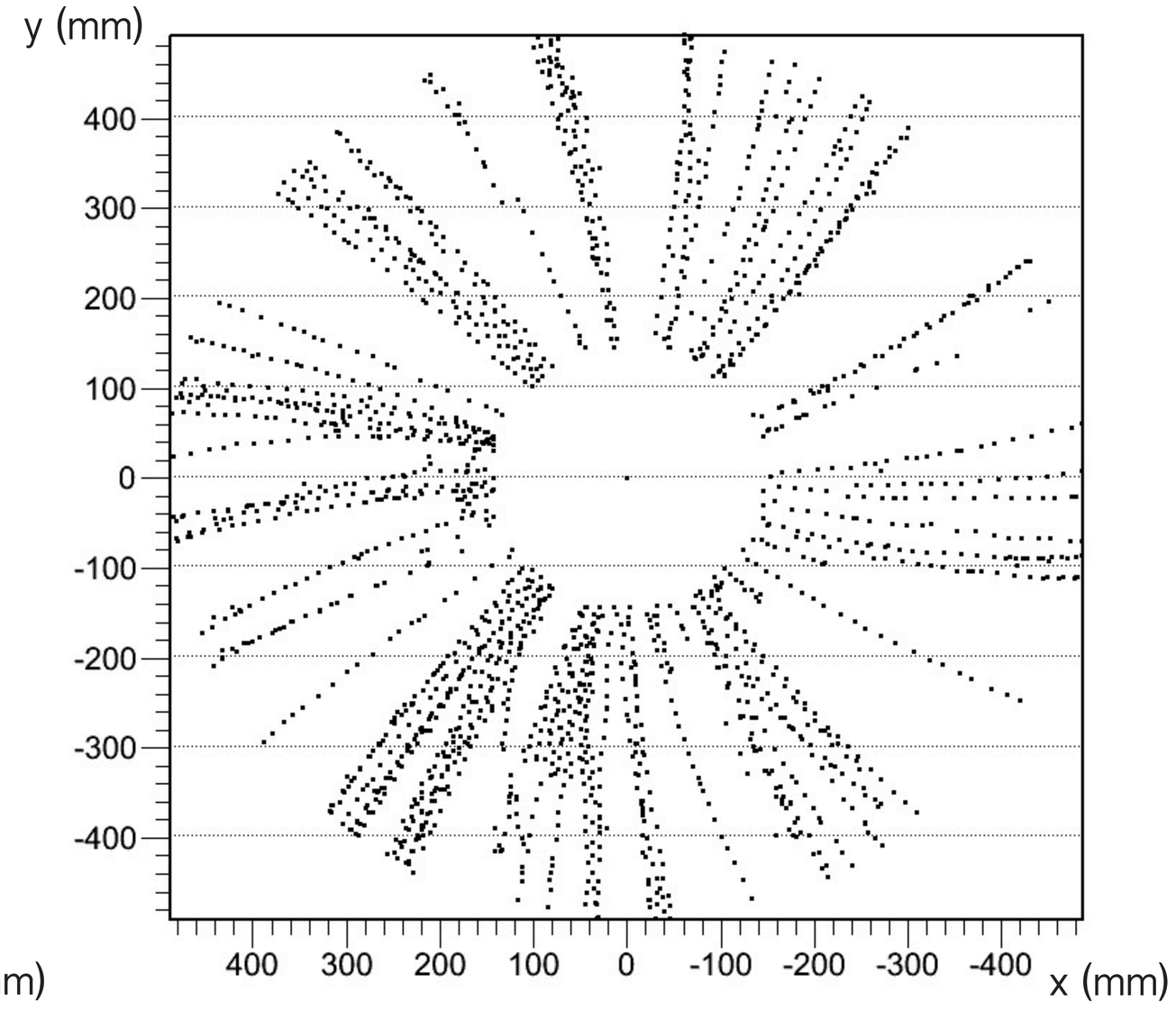


3rd vs 2nd

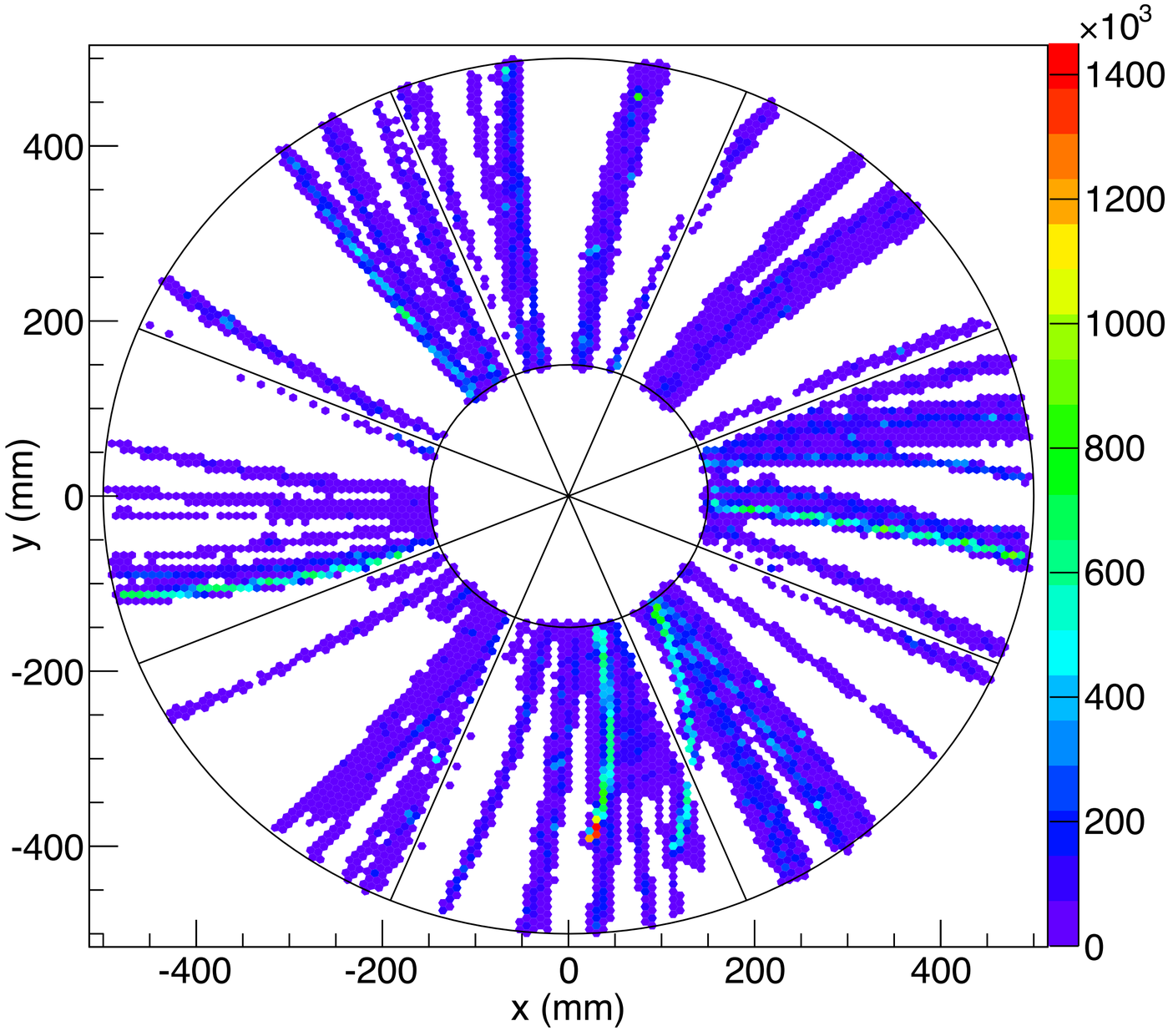
3rd nearest : 1440 points



2nd nearest : 2009 points



Back up slide



Conclusion

1. Changed digitized process from (gain→dispersion) to (dispersion→gain).

2. Successfully reconstructed digitized data in 3D plot.

- Used constant drift velocity.

3. Clusterization code is being written.

- Finding 3rd nearest neighbor pads looks better than finding 2nd nearest neighbor pads.

- Threshold is given to the clustered point.