

Low-Energy and high-PE events

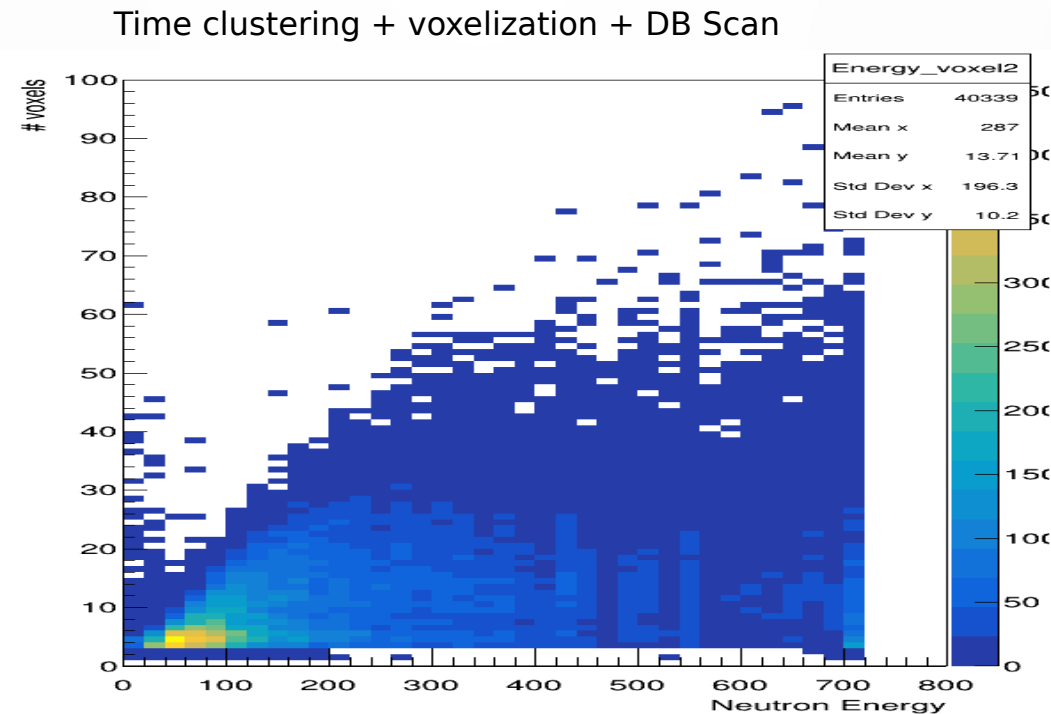
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Guang Yang (Stony Brook University)

October, 28th 2020

Selection

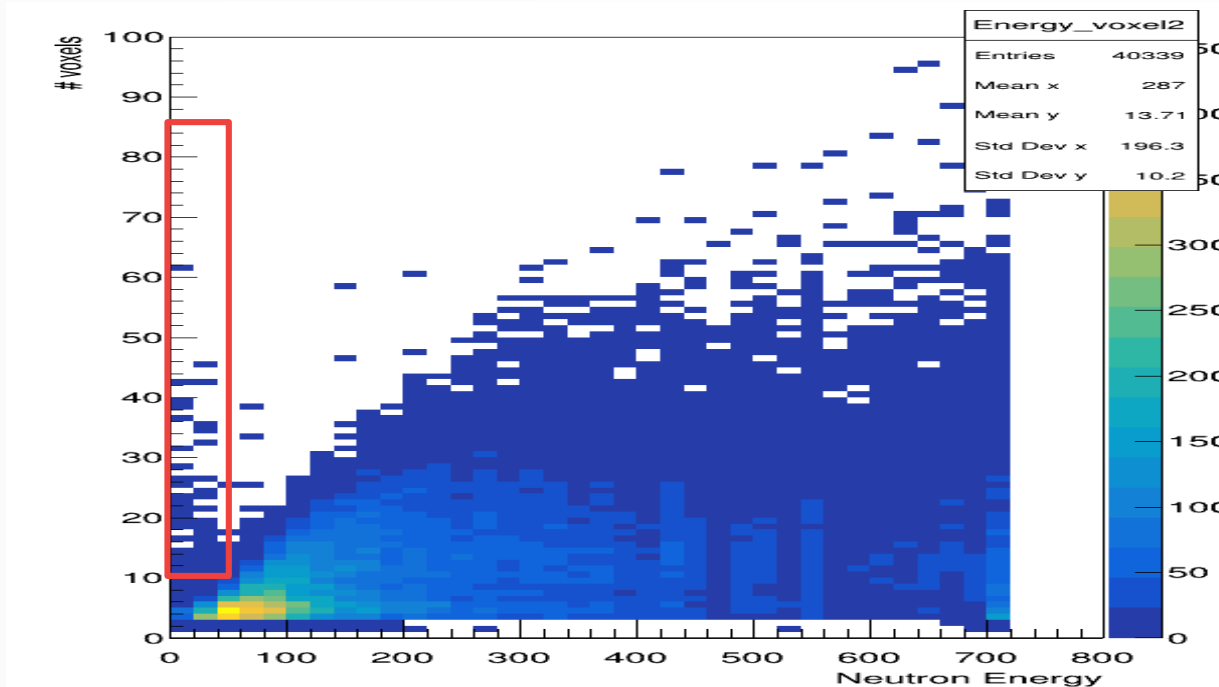
We did the selection like the following:

- Hits time : $-326 \text{ ticks} < Dt < 340 \text{ ticks}$ with $1 \text{ tick} = 2.5 \text{ ns}$
- PE cut of the Hits : 10 pe
- Time clustering with single time cluster for each event
- Use hits to make voxels
- Do spatial clustering with single spatial cluster for each event (DB Scan)
- Look at the Linearity



Motivation

- We want to look at the low-energy with high number of voxel events (time clustering + voxelization + Spatial clustering)

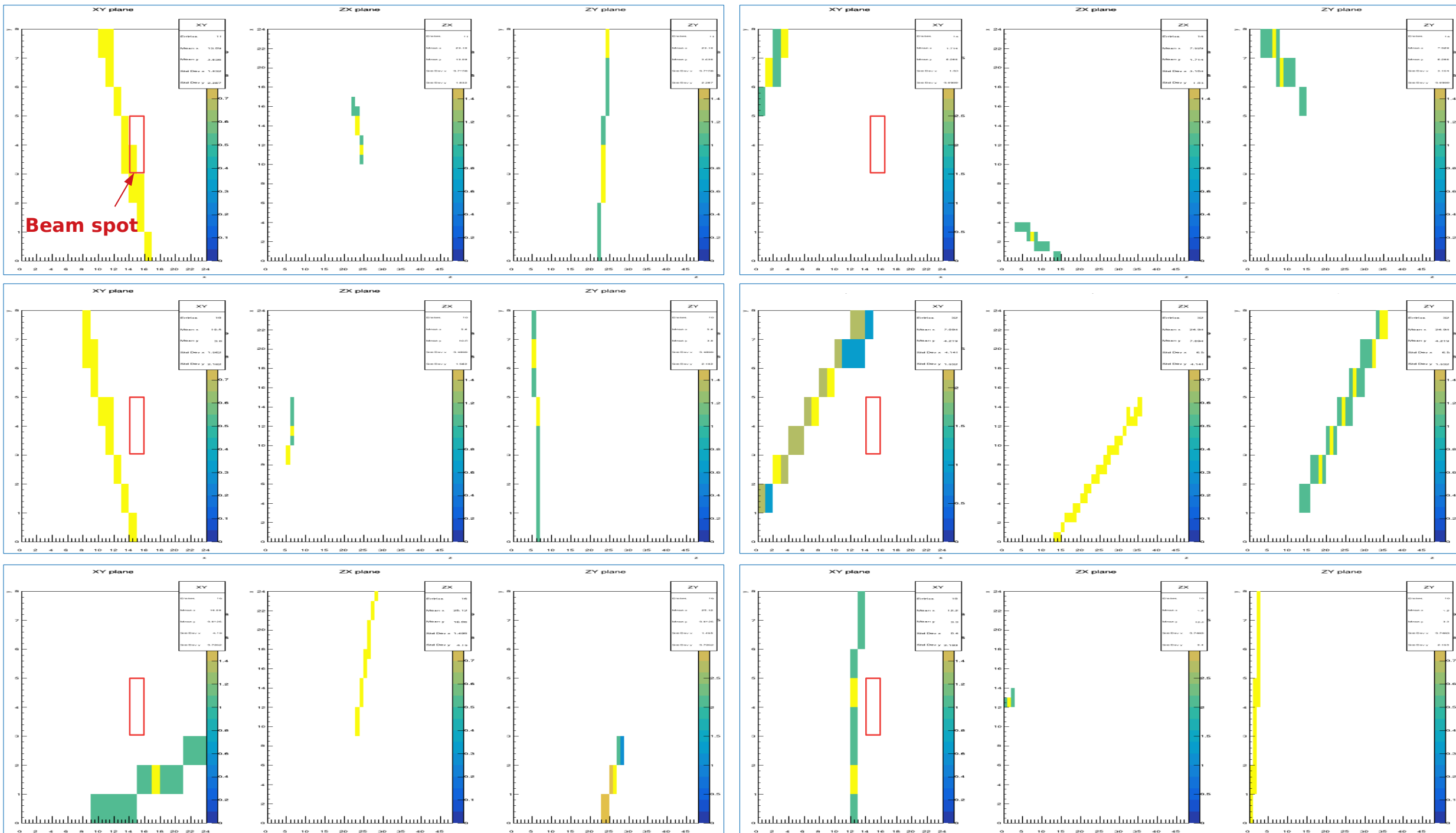


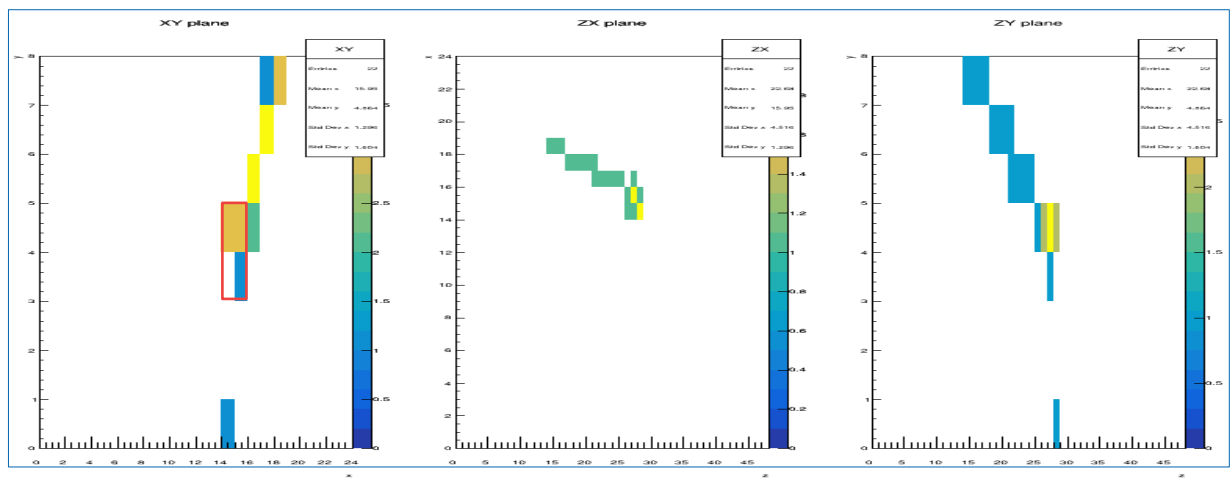
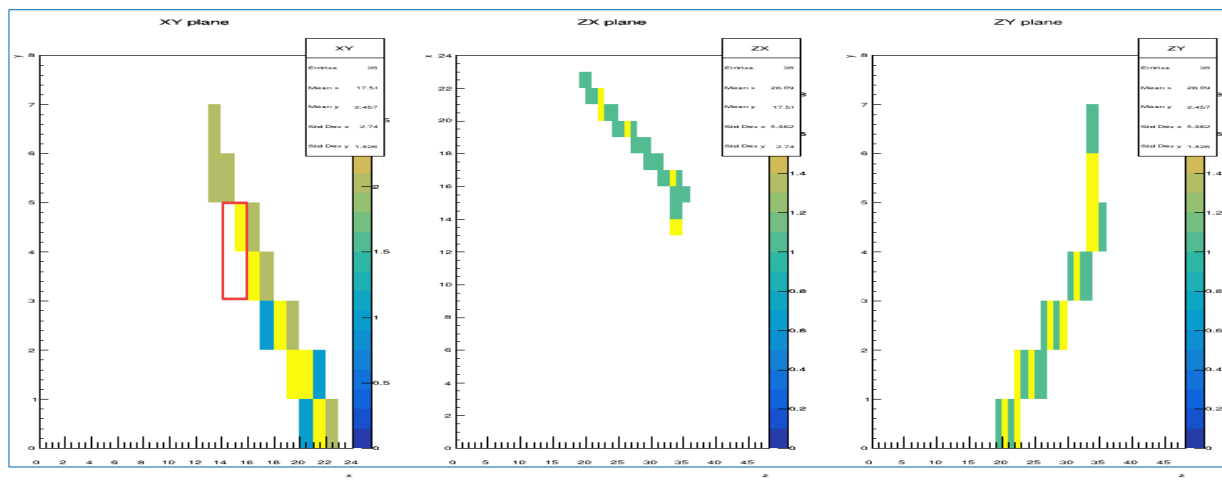
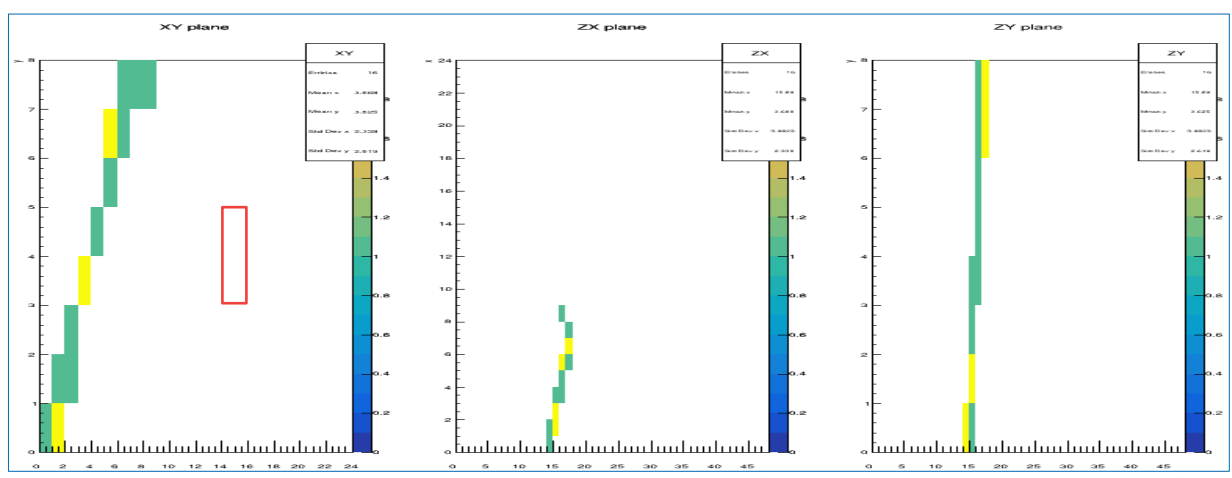
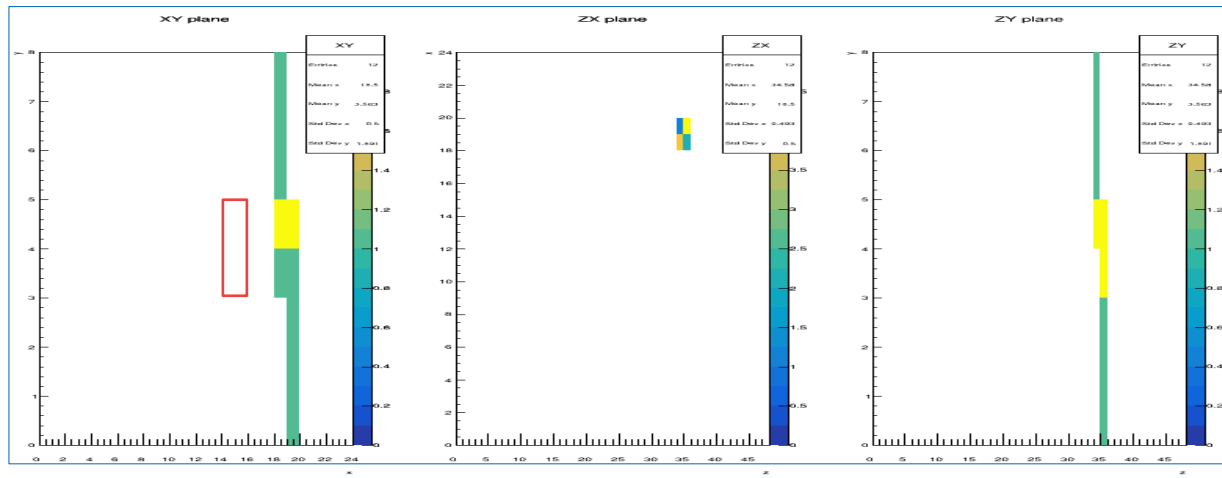
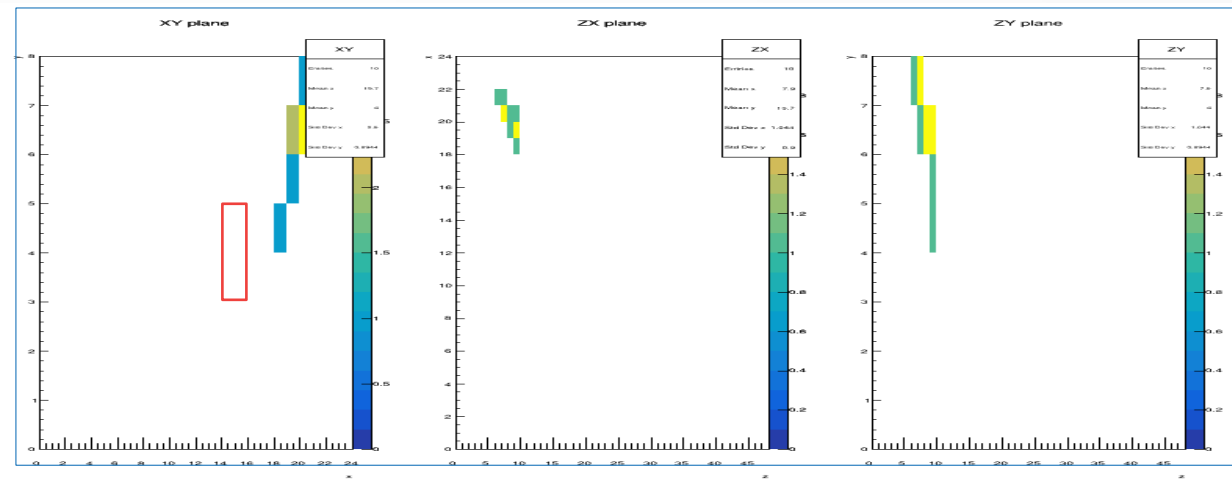
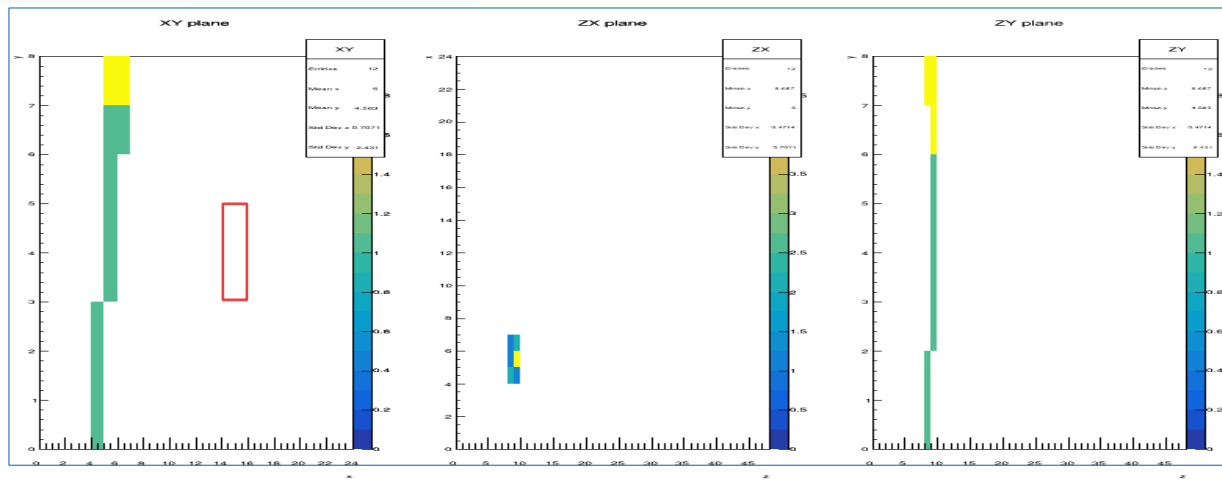
Time clustering + voxelization + DB Scan

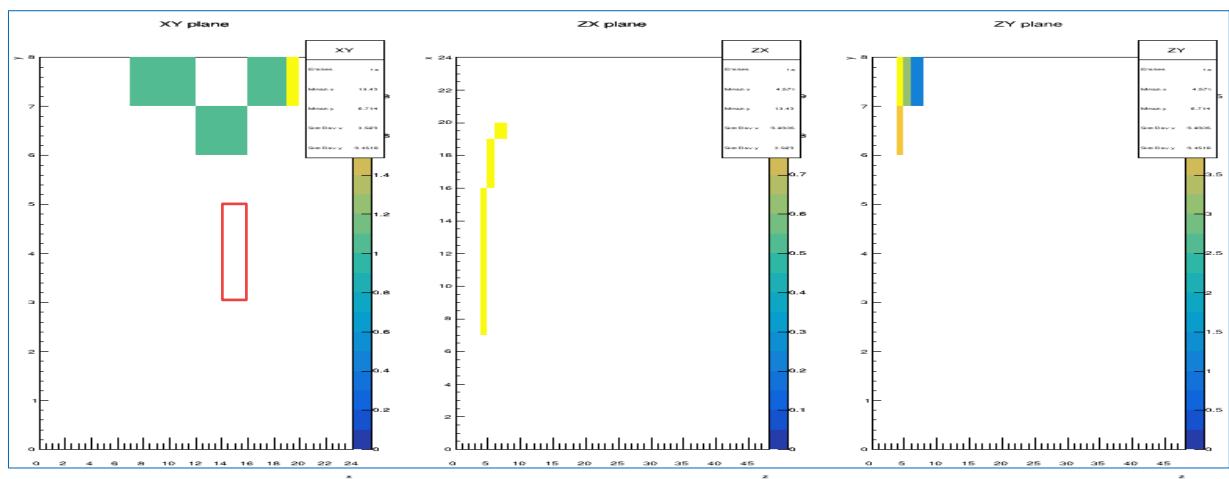
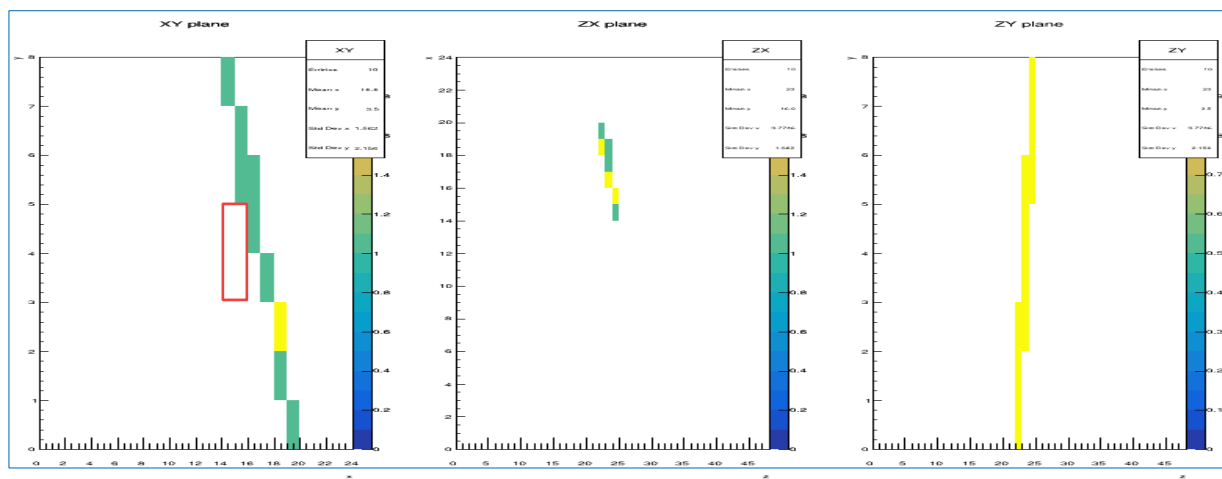
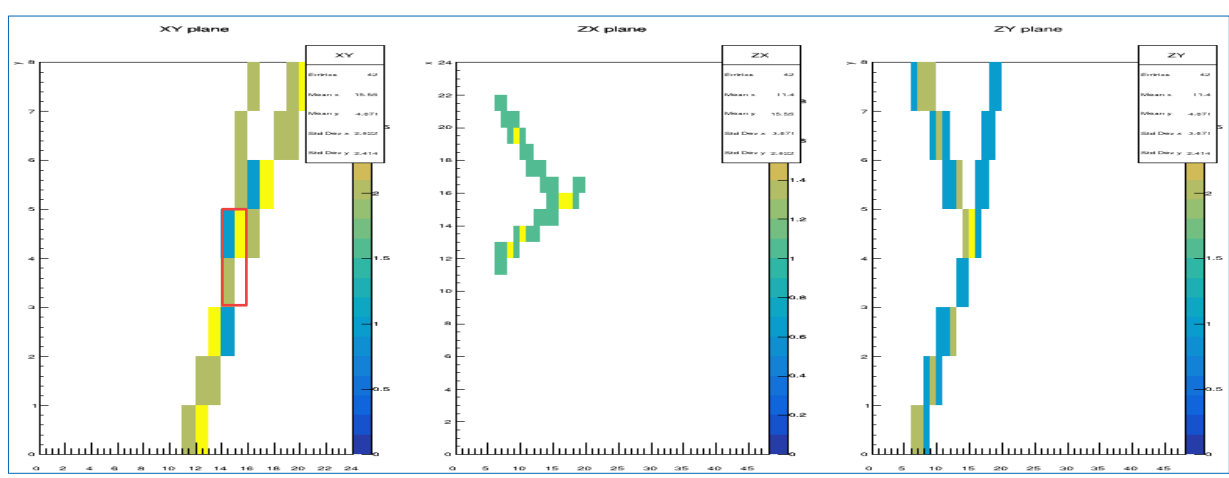
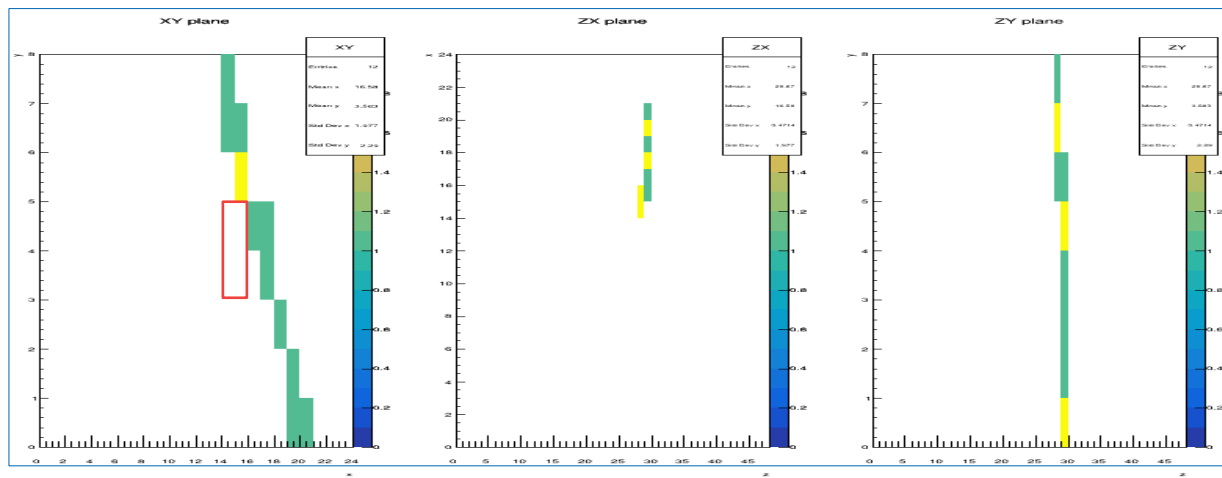
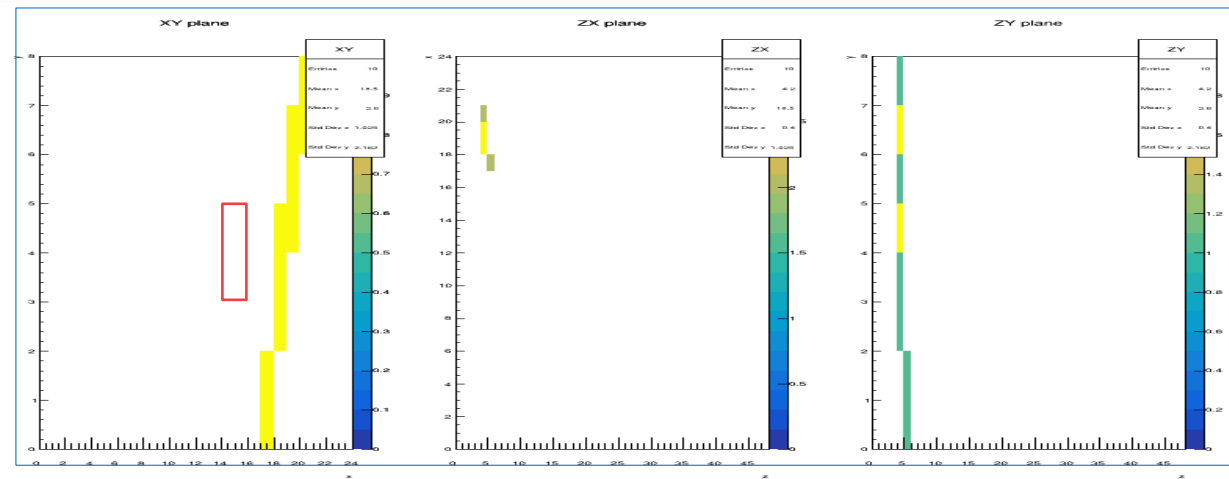
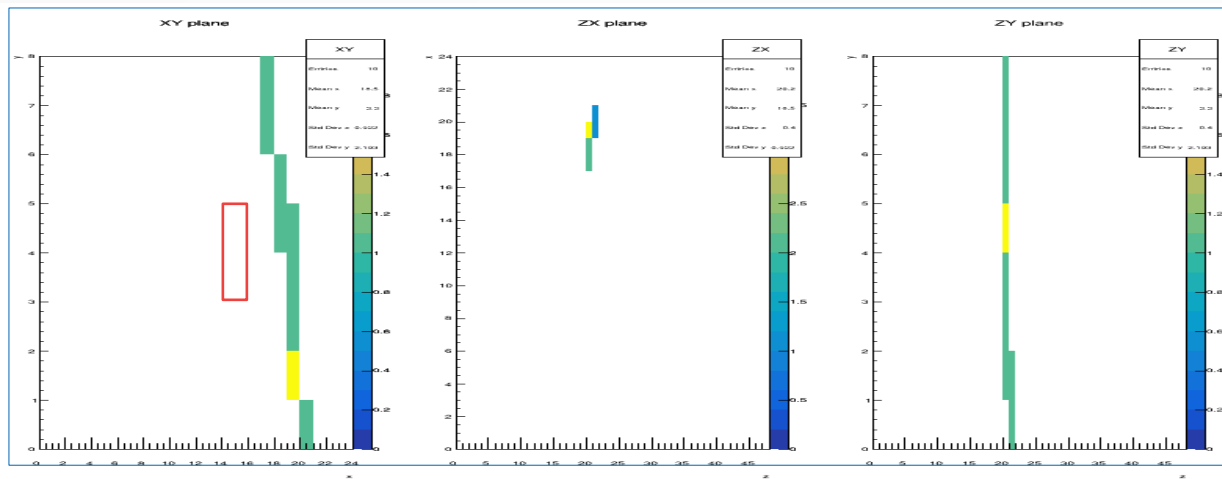
Low-energy (<50 Mev) and high number of voxels (>10 voxels)

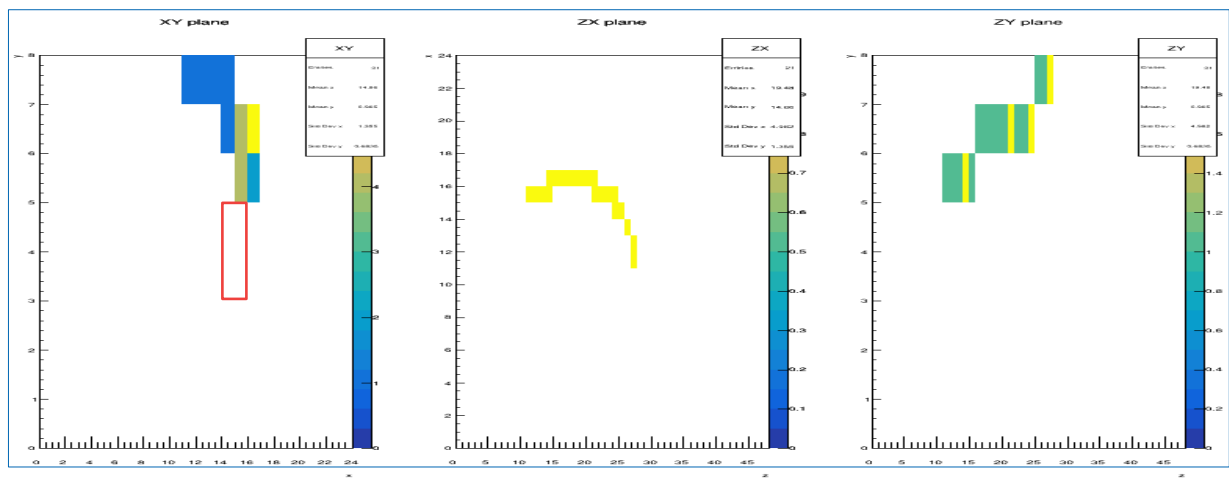
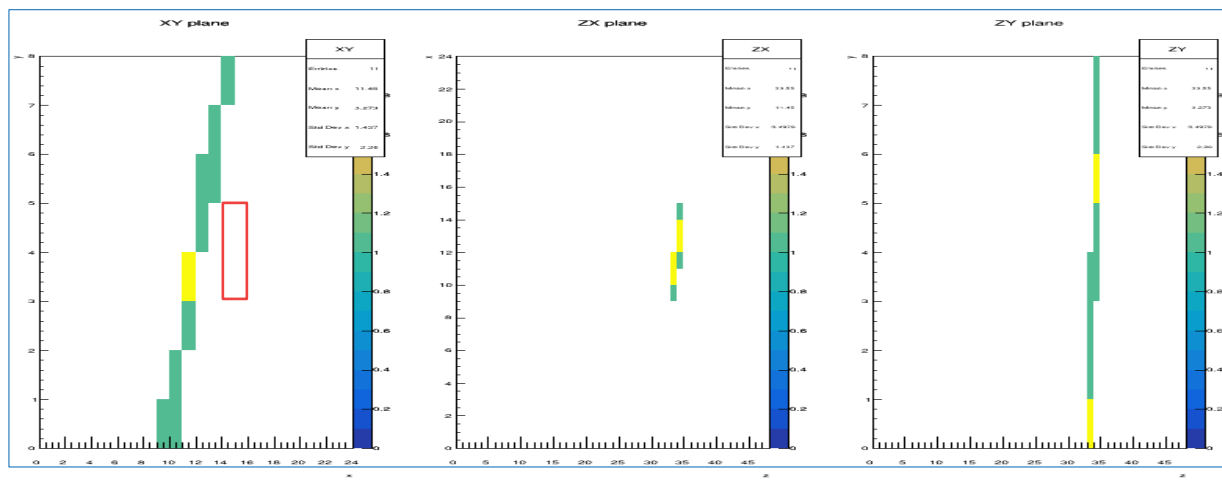
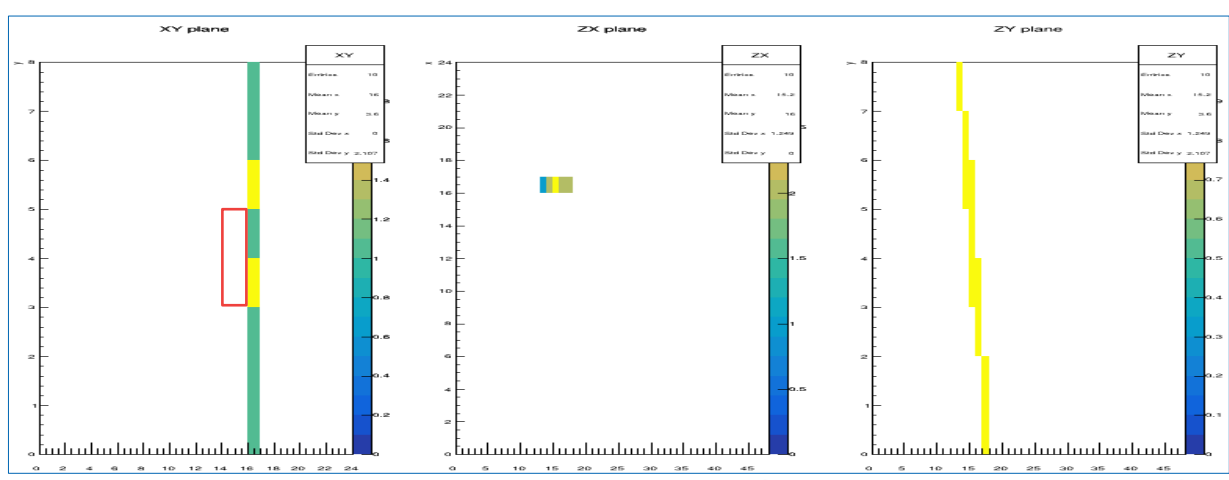
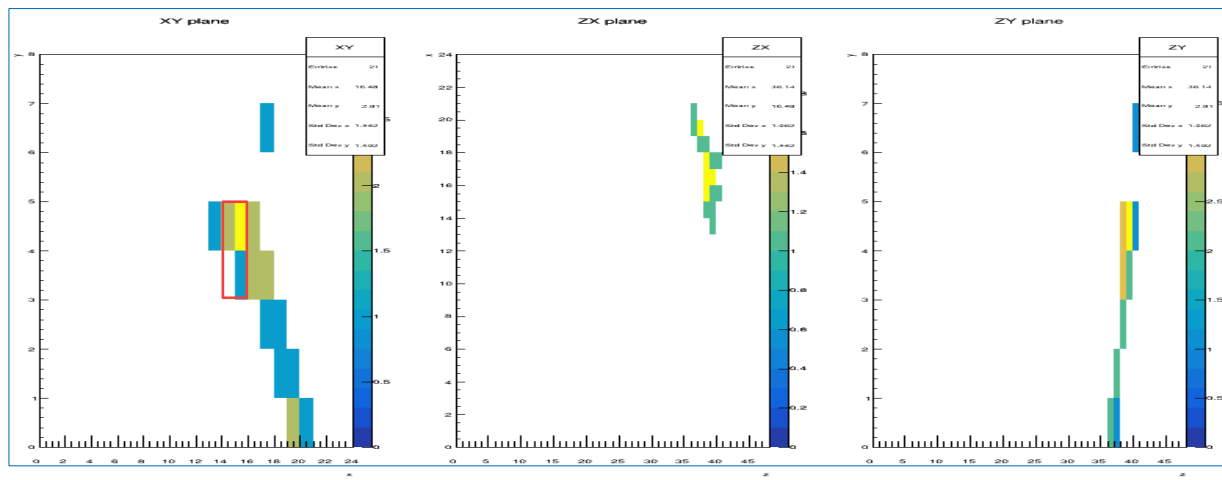
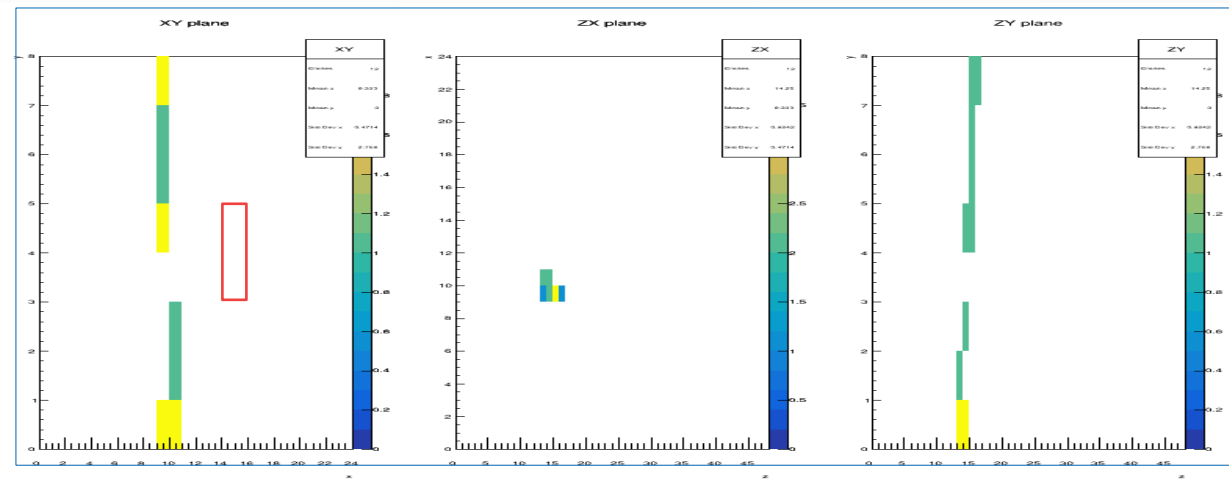
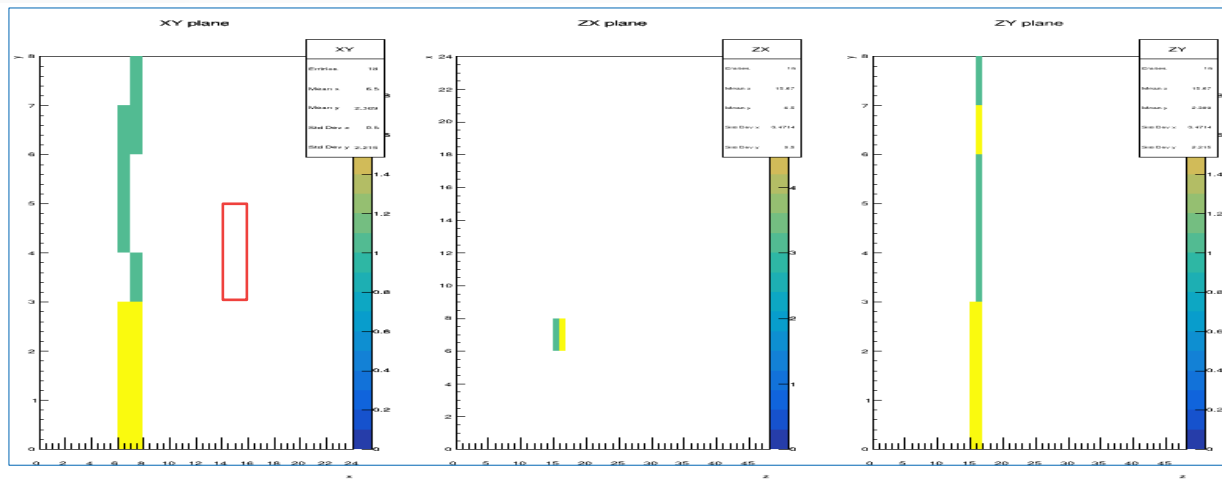
- I classified the each events with low energy (<50Mev) and high number of voxels (>10) in 3 different categories :
 - 1- The Cosmics : each event with at least one voxel on the top or bottom part or also side part of the detector
 - 2- Shower-like blob : event with bad linearity (<0.9)
 - 3- The remain events (not classified event, not category 1 or 2)

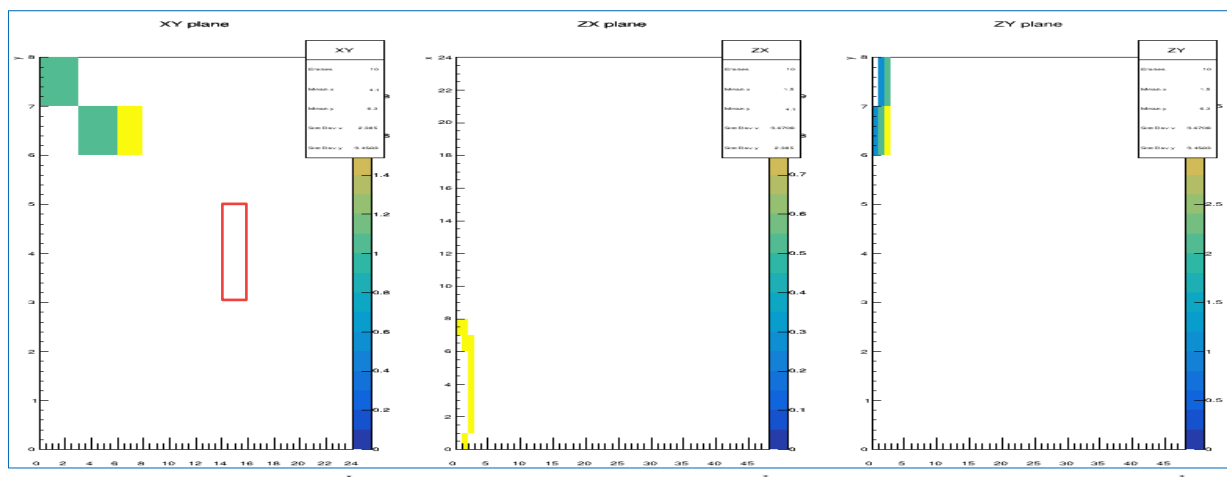
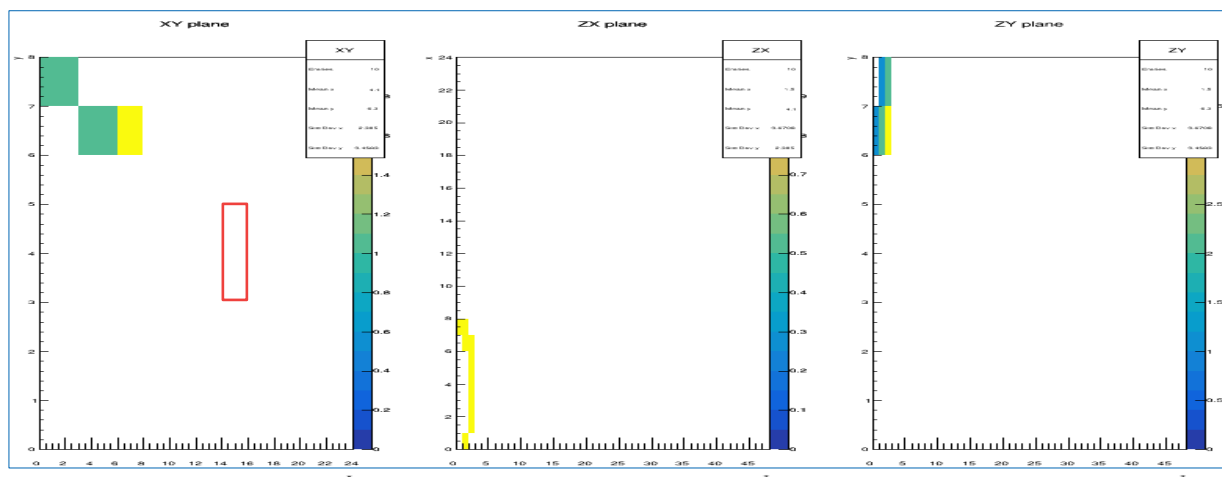
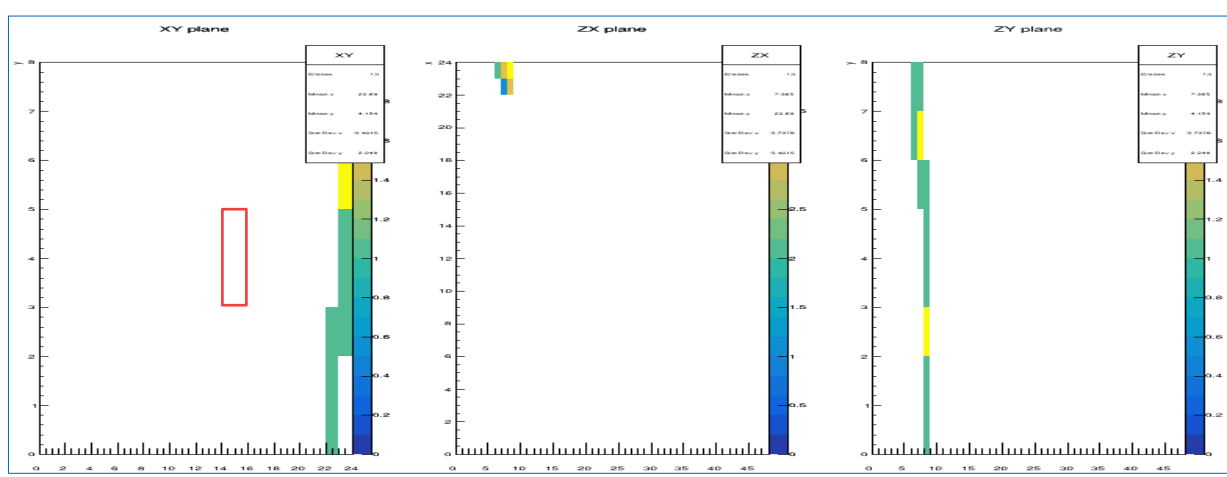
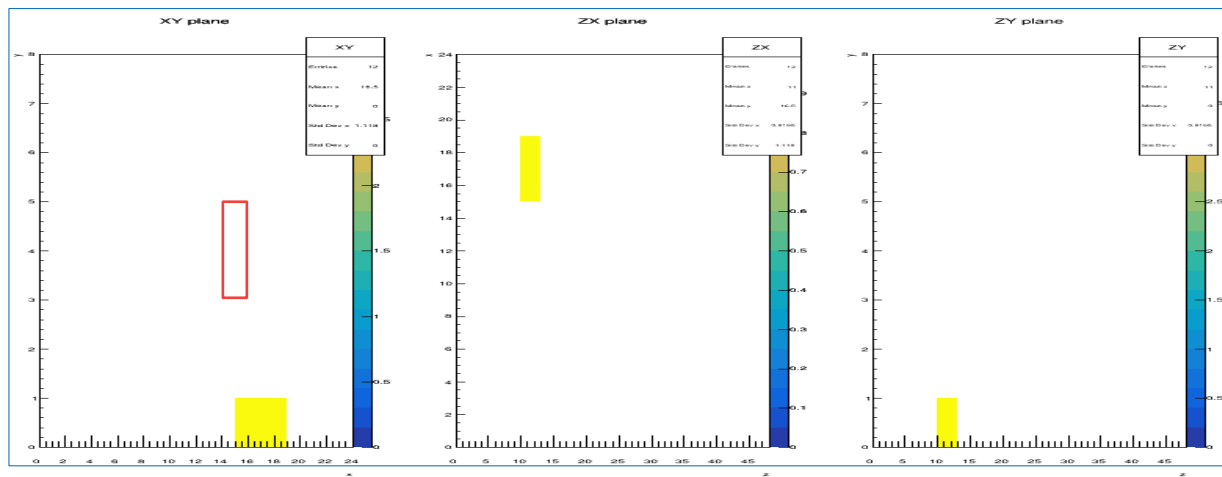
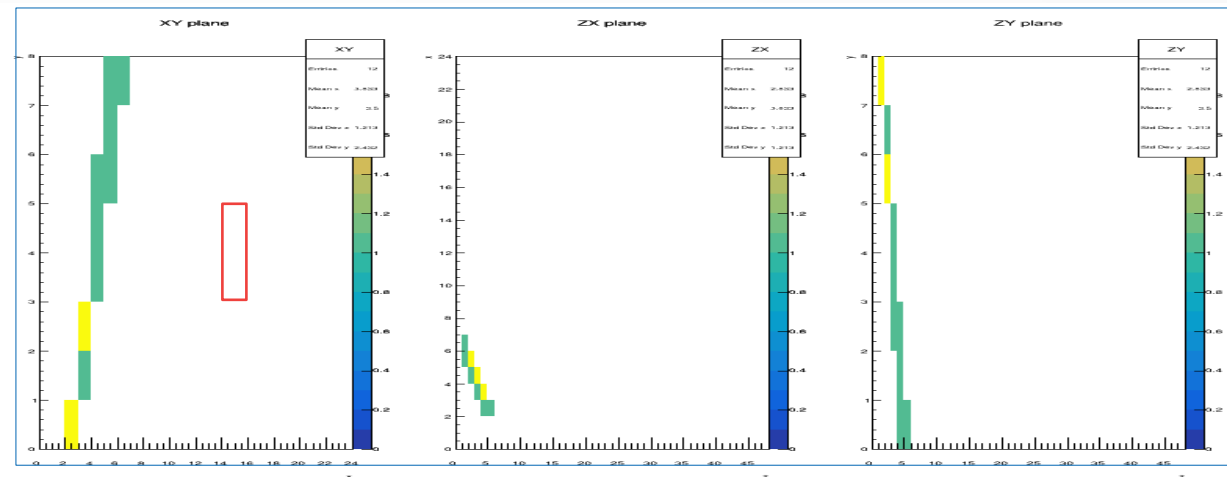
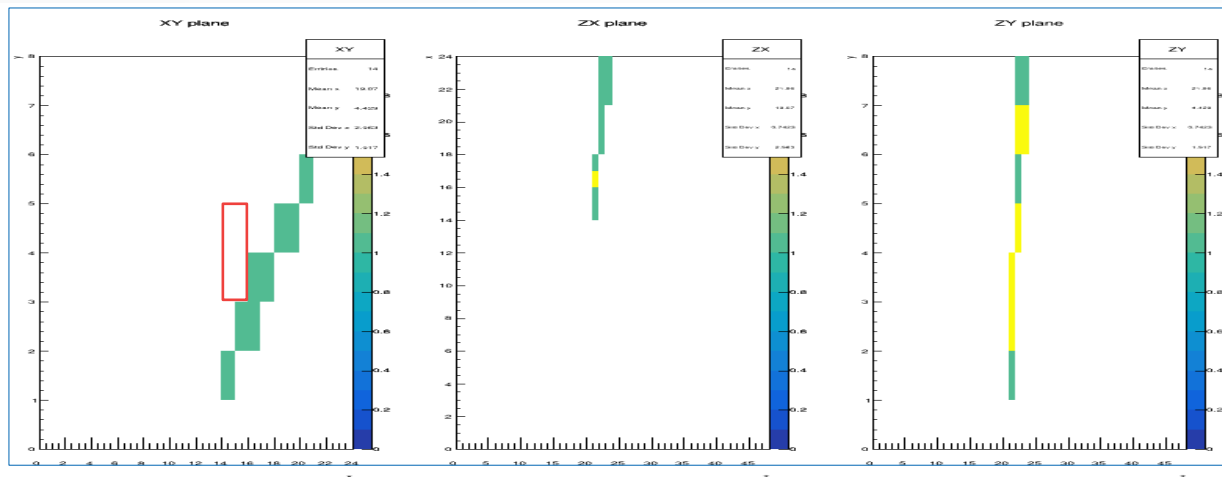
Category 1 (Cosmics) : each event with at least one voxel on the top or bottom part or also side part of the detector.

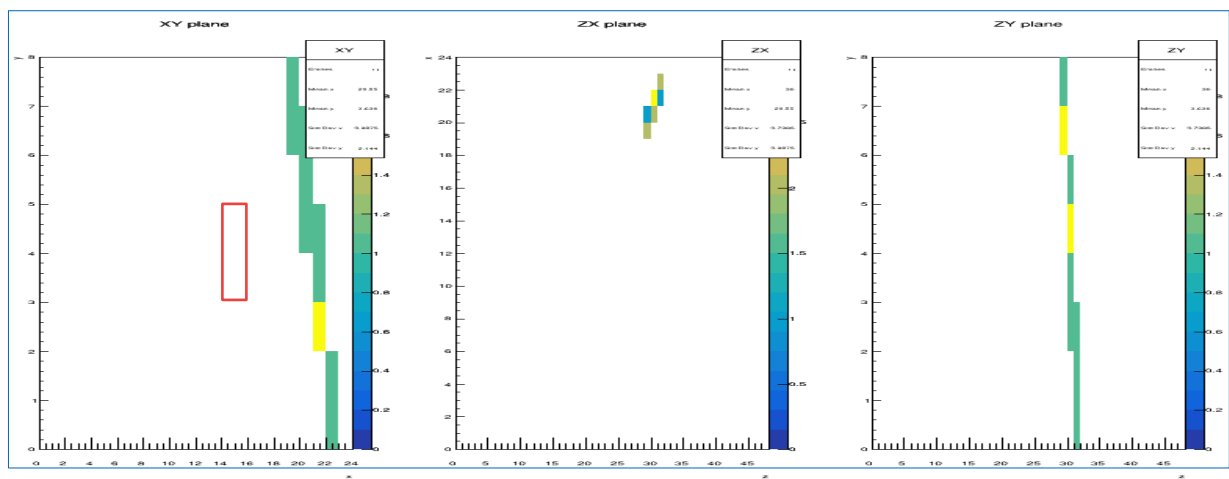
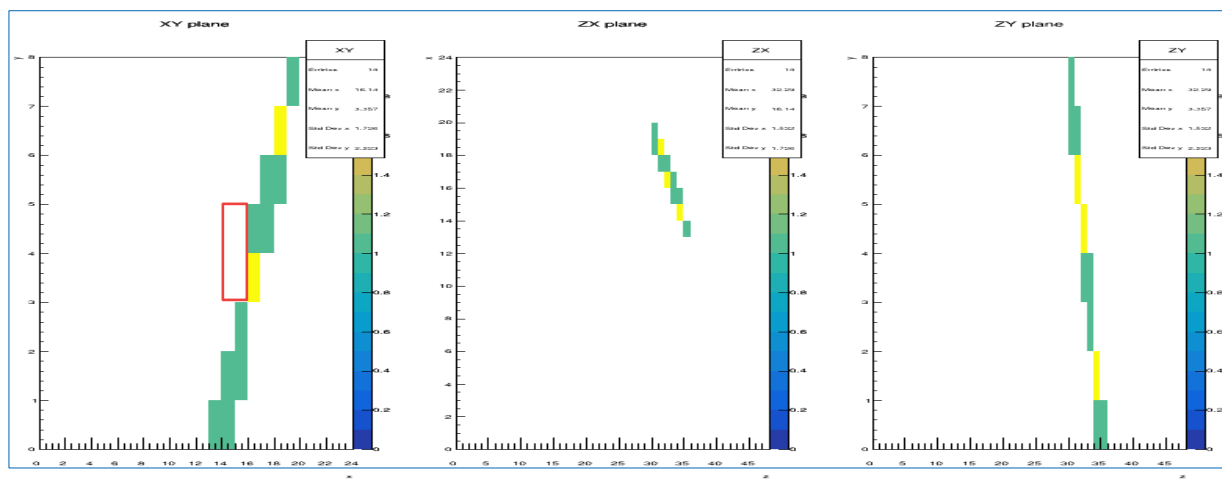
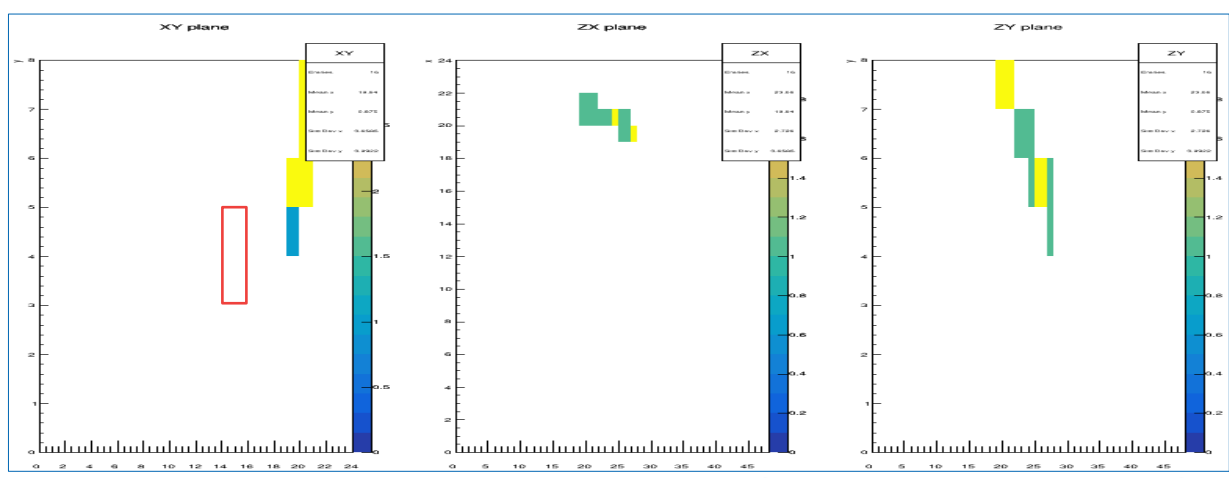
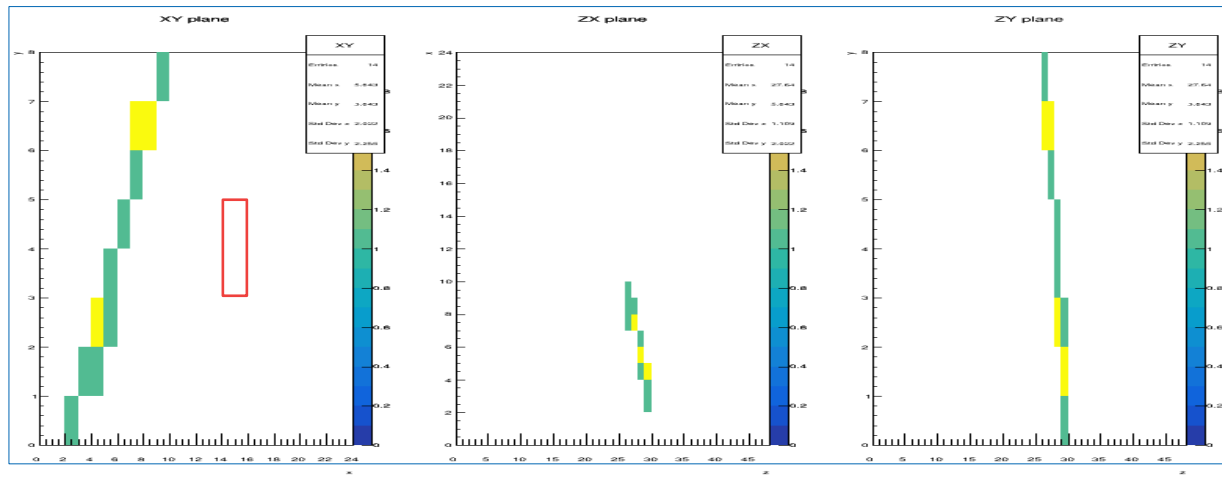
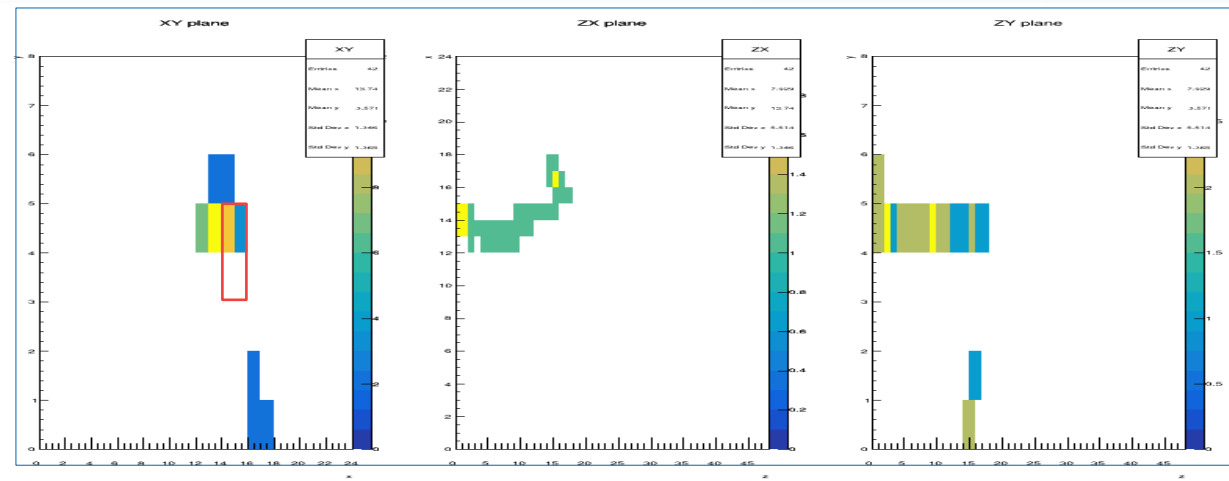
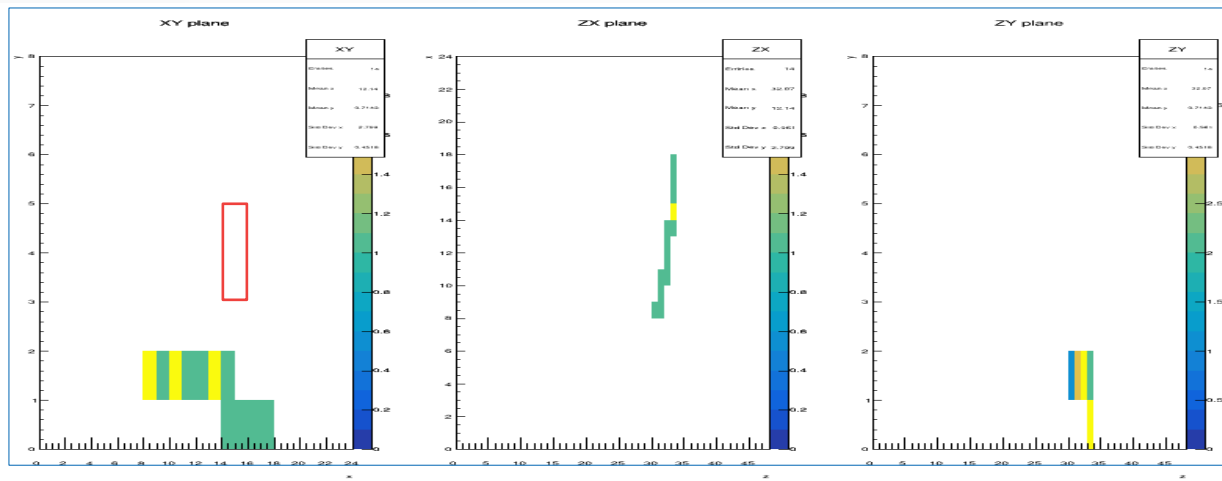


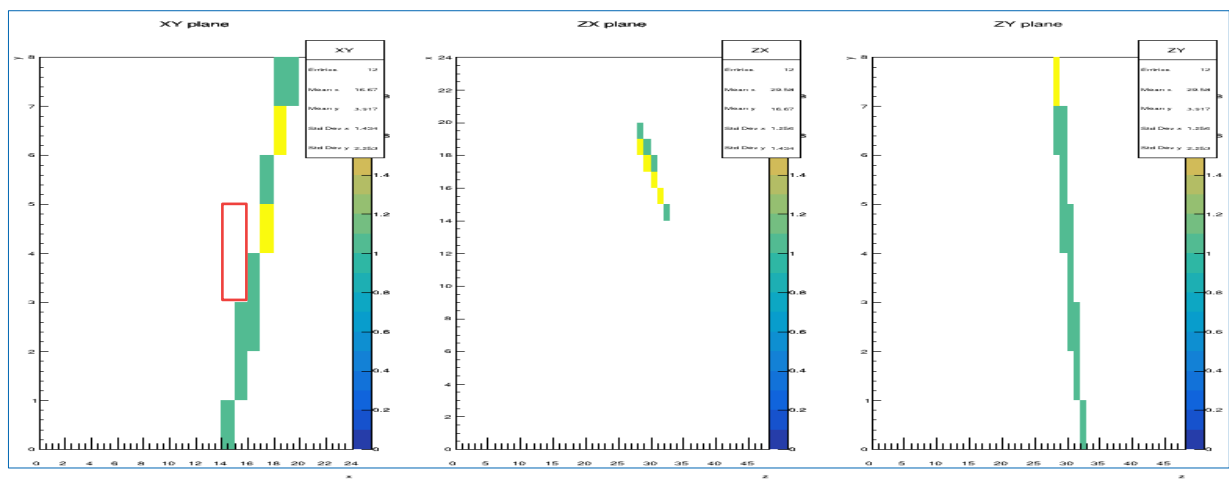
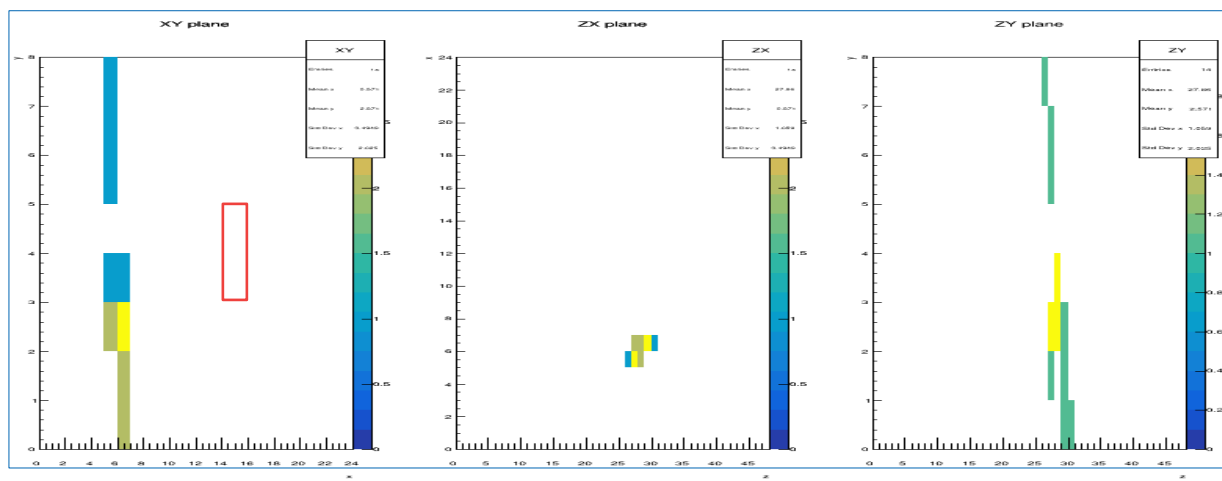
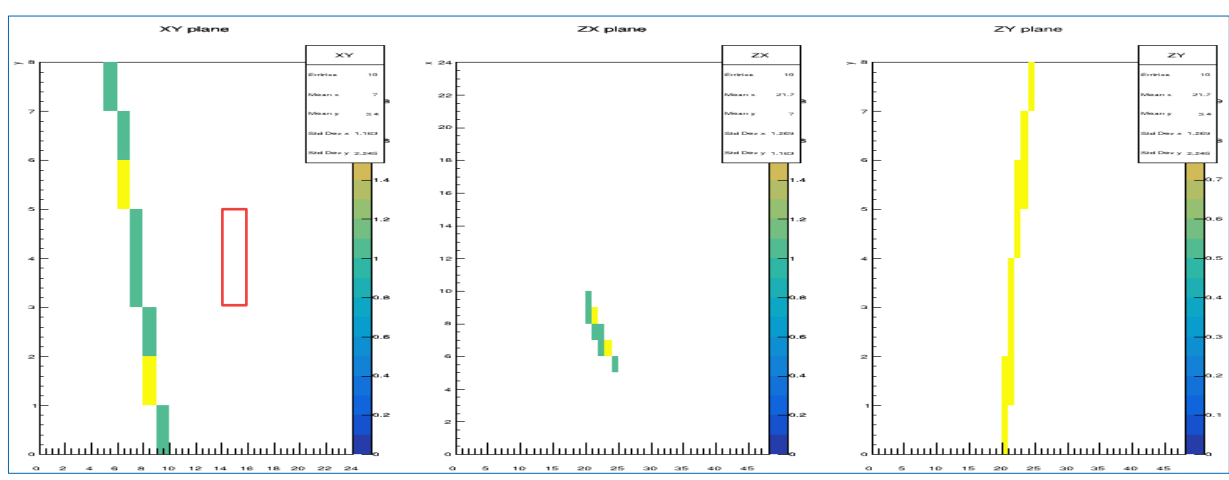
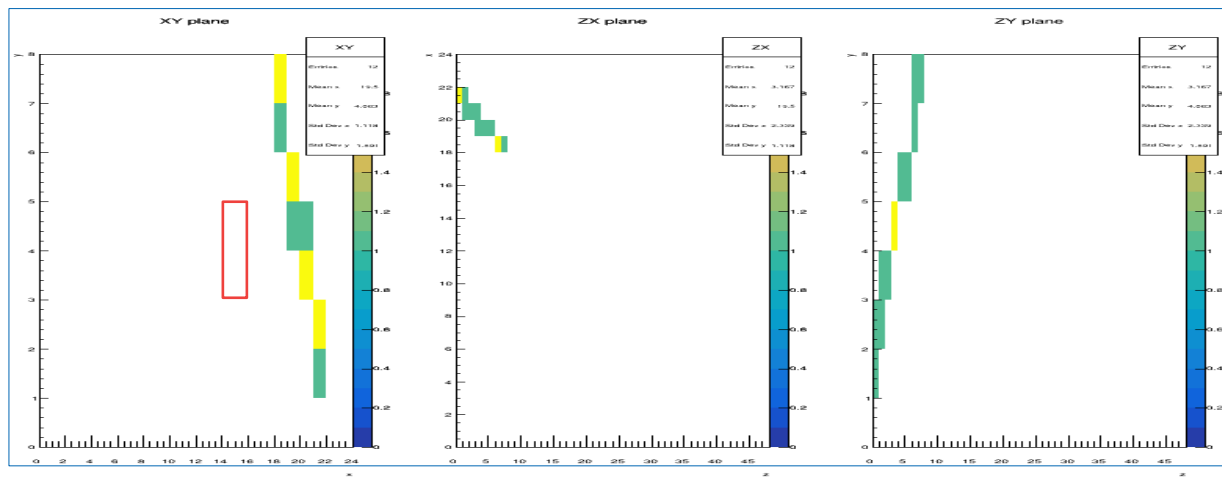
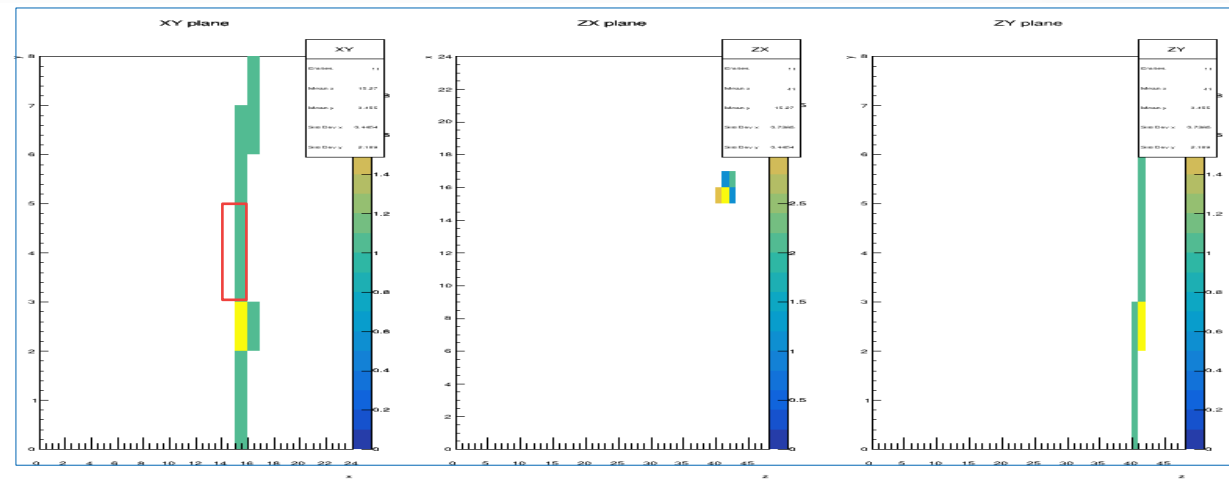
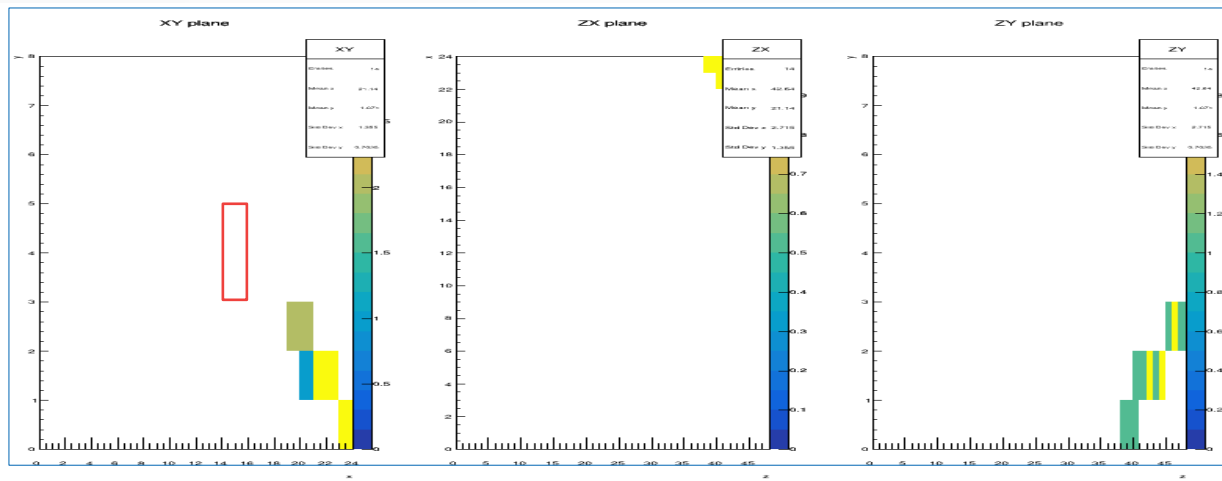


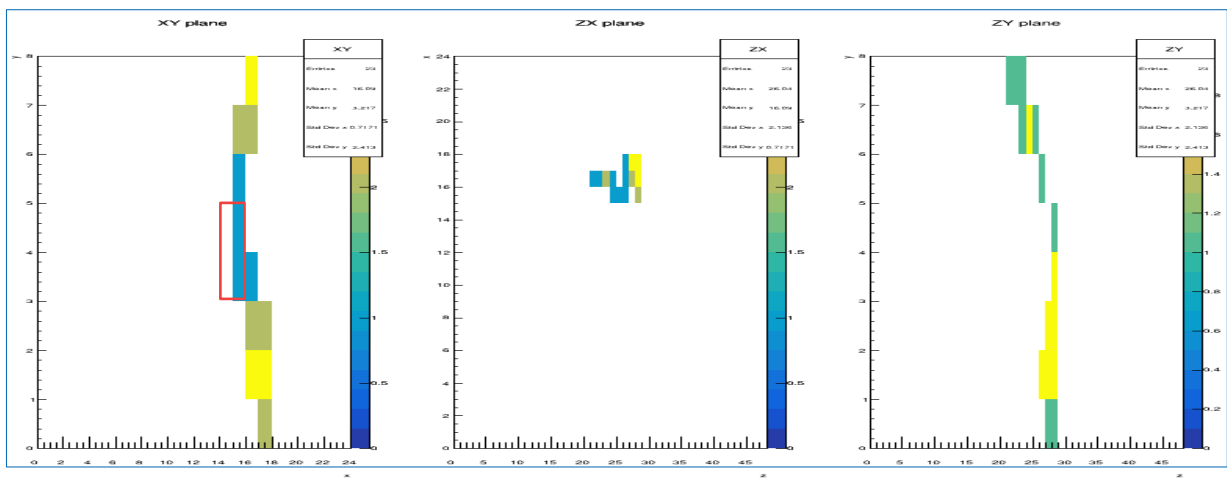
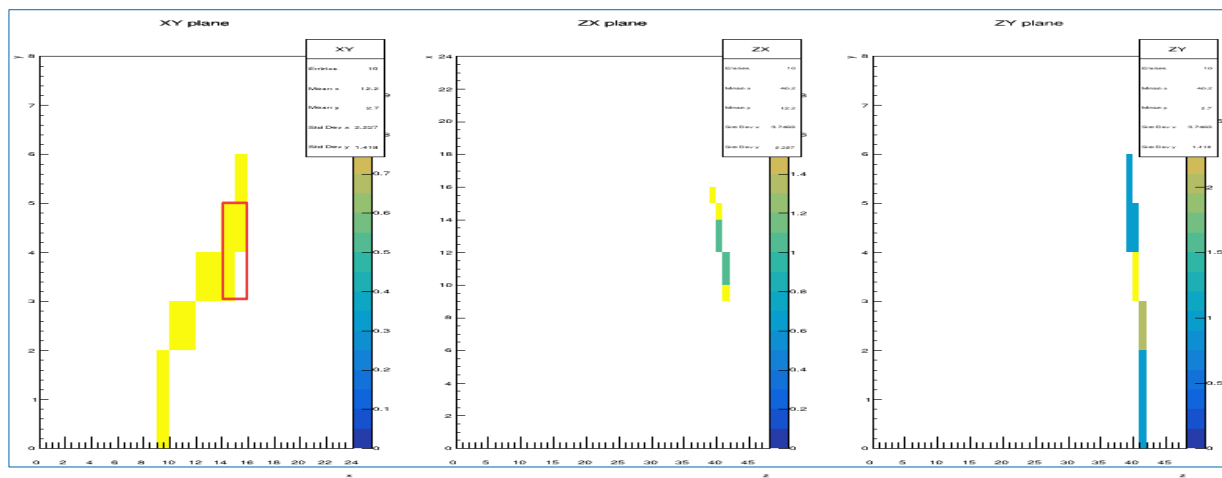
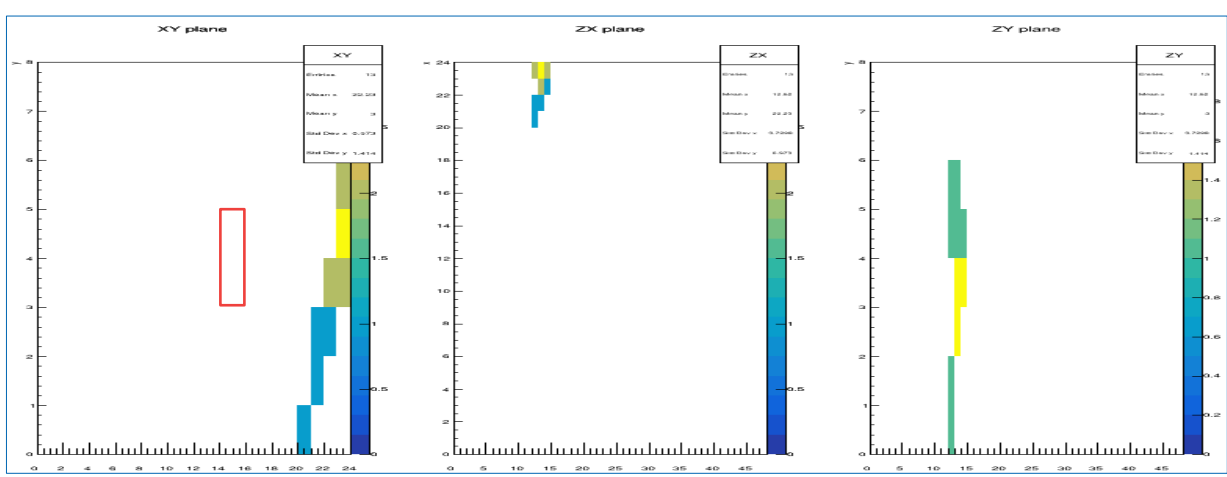
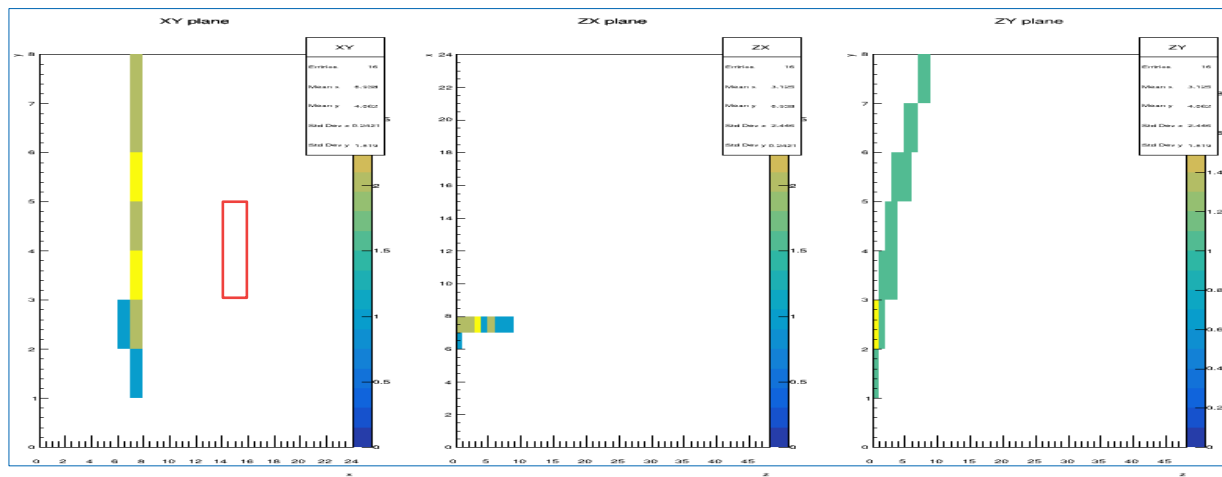
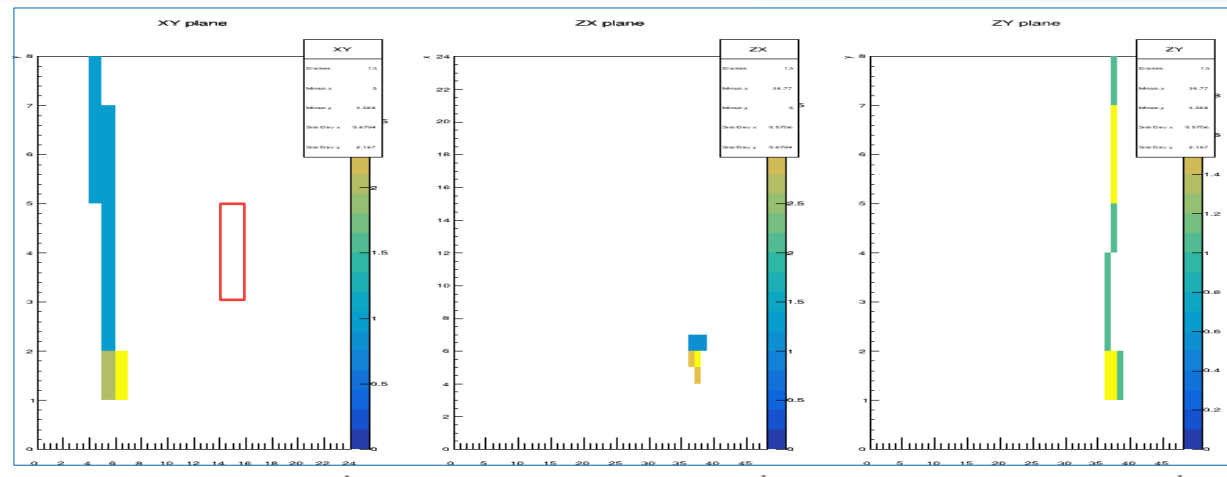
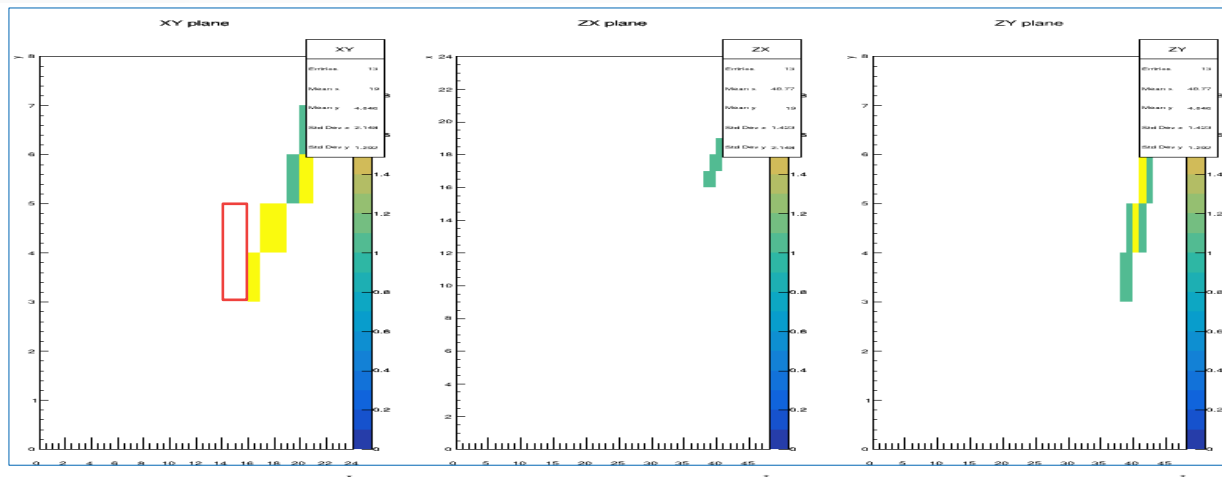


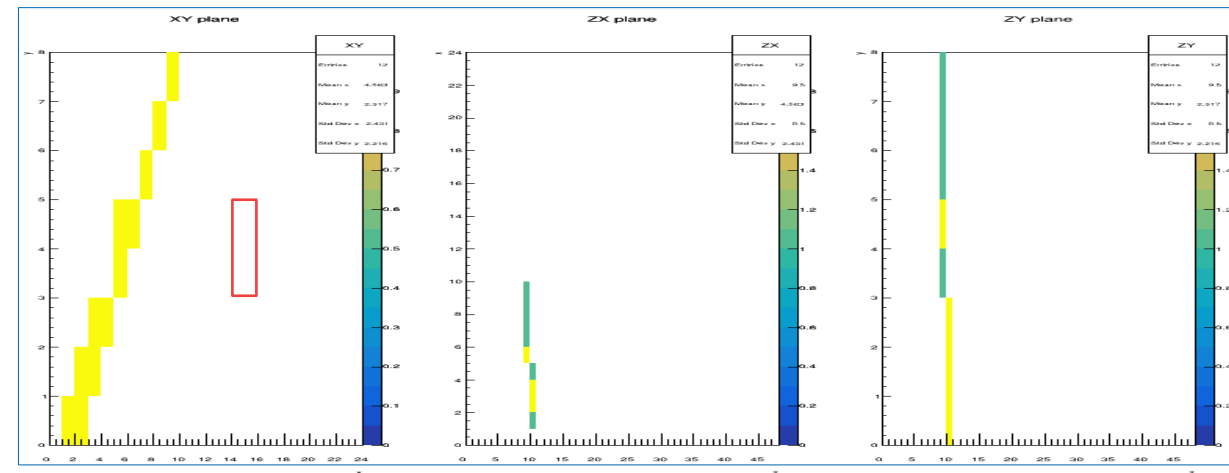
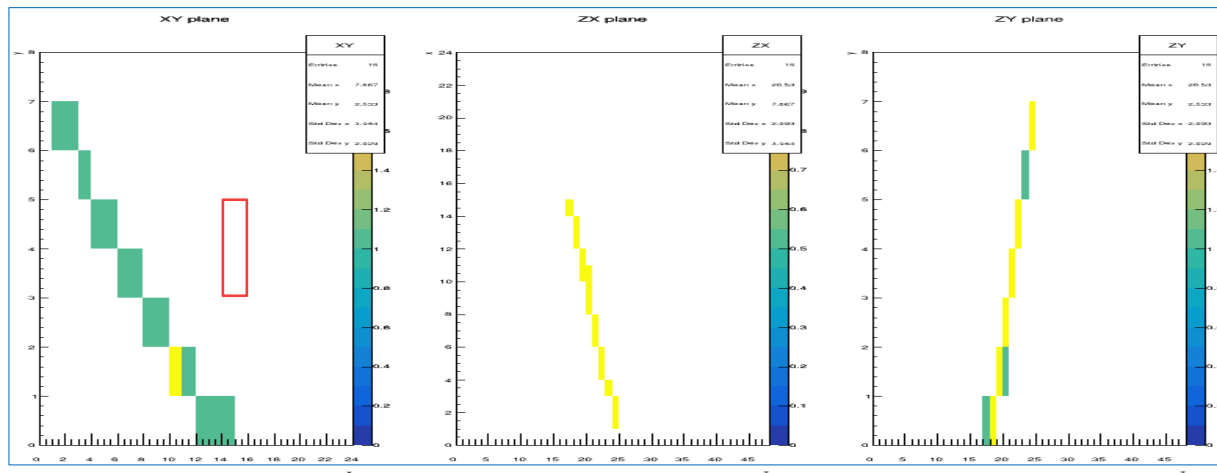
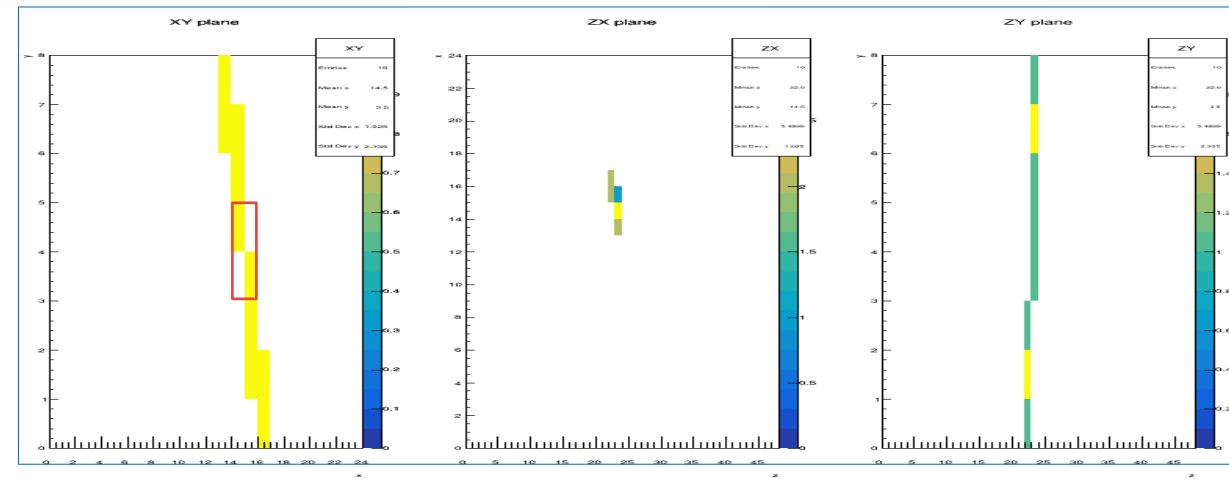
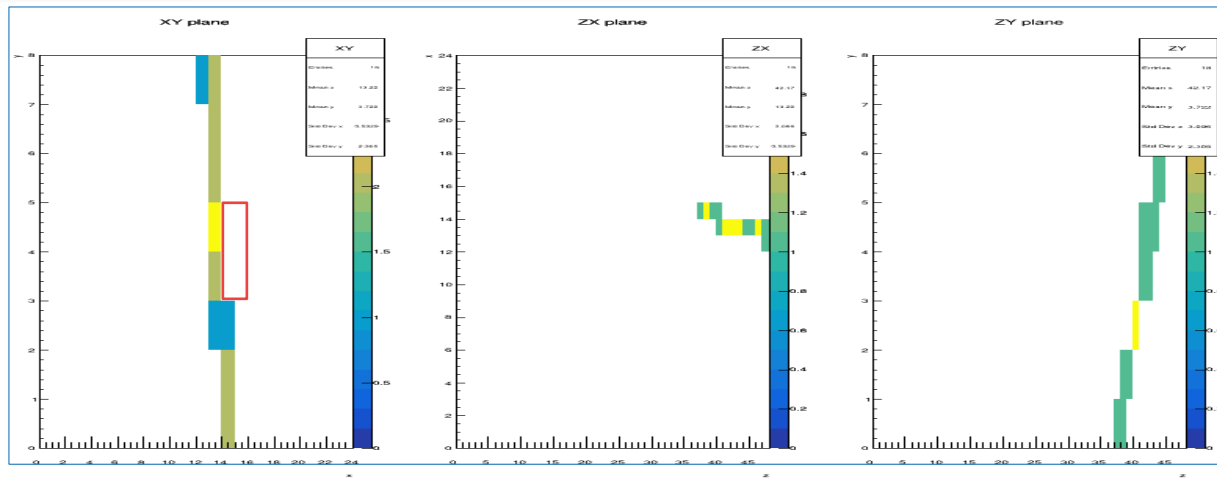






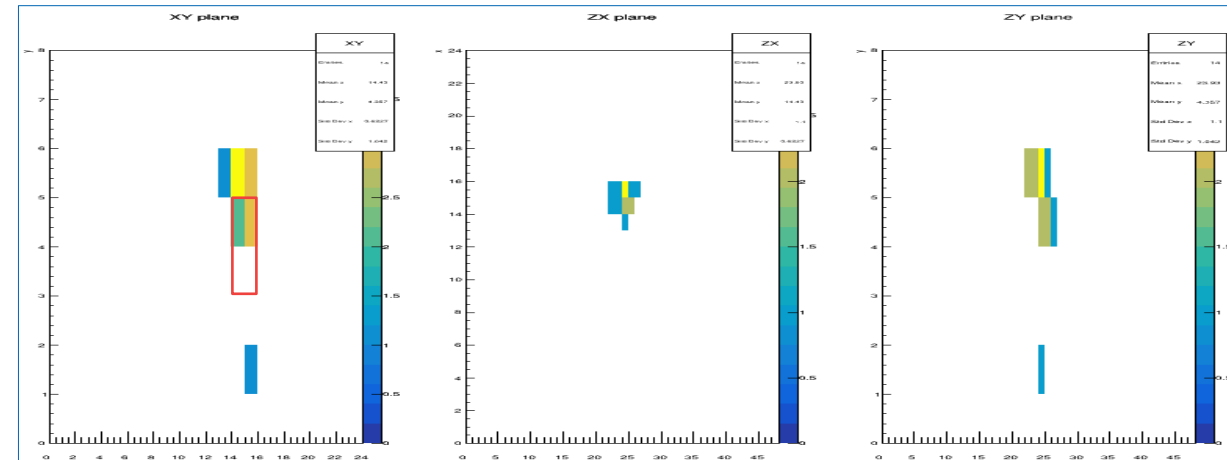
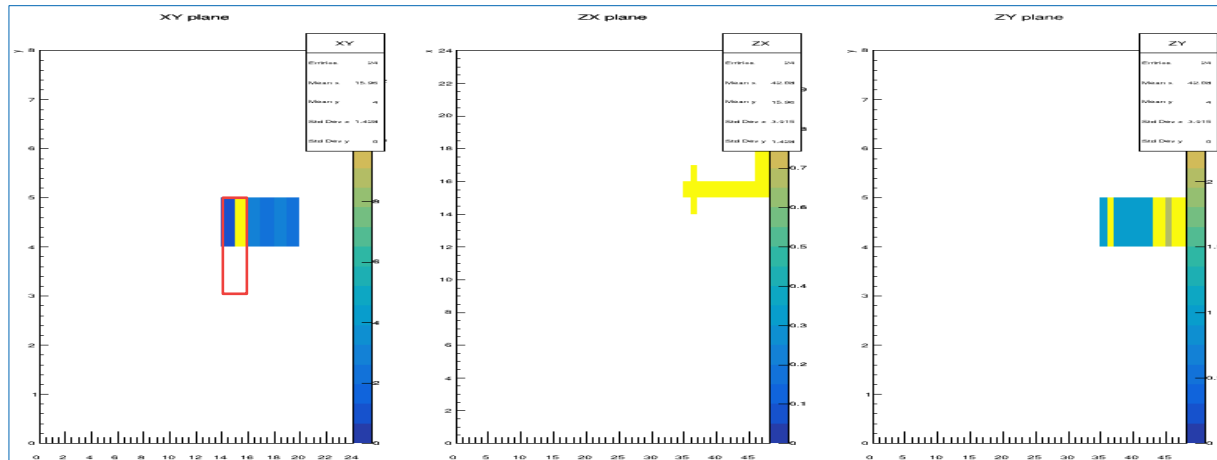
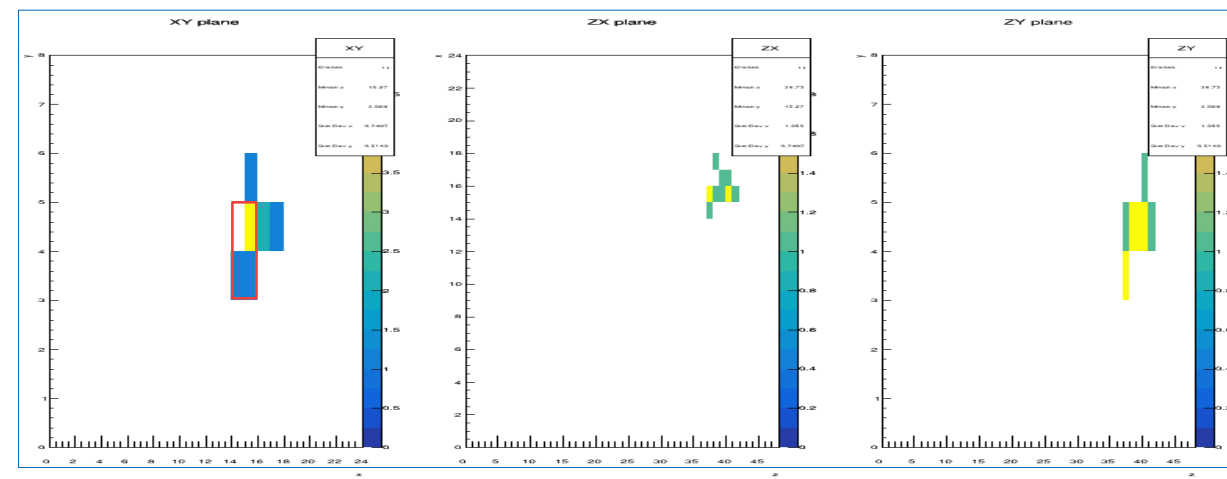
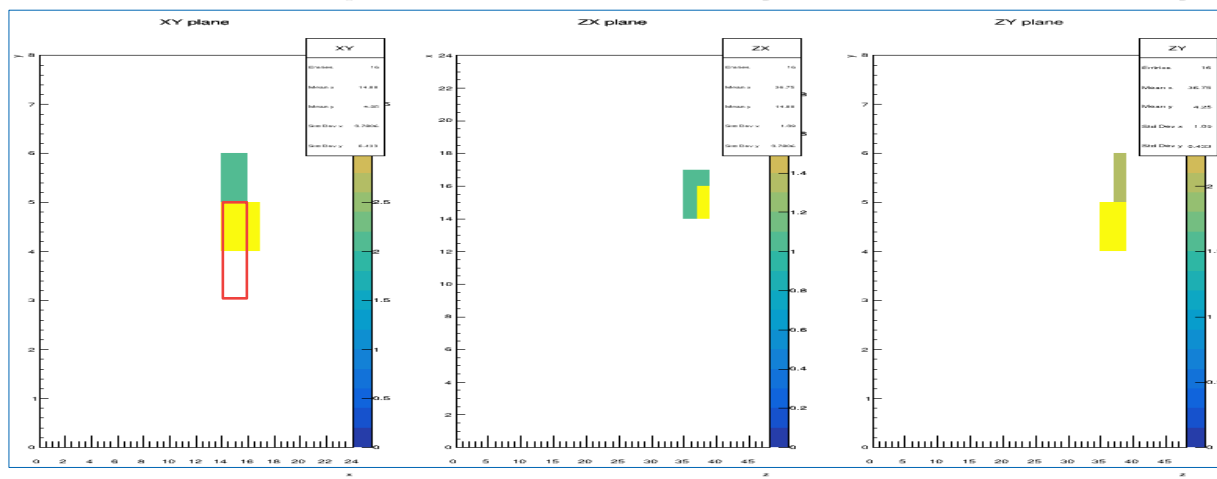
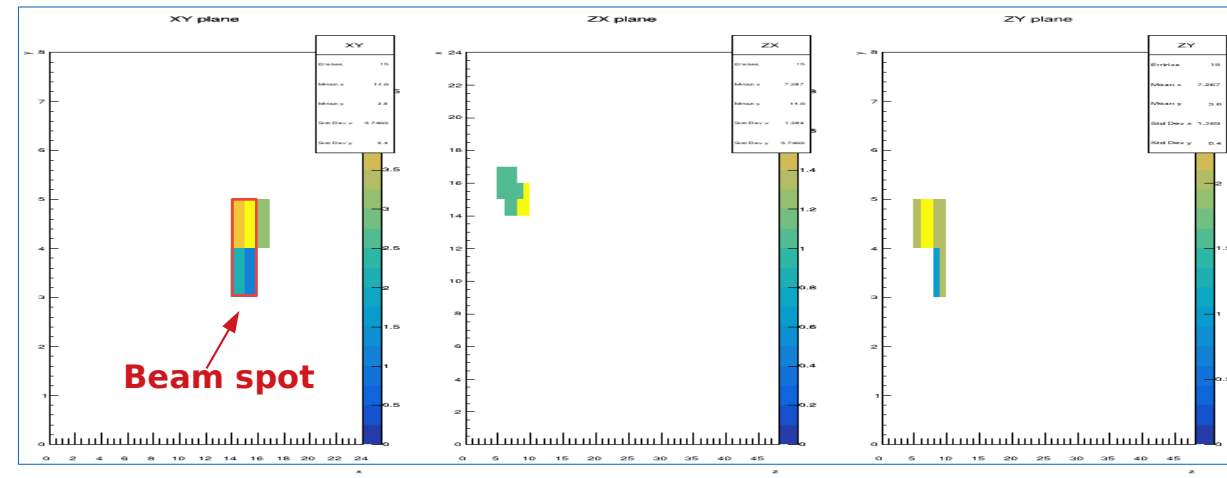
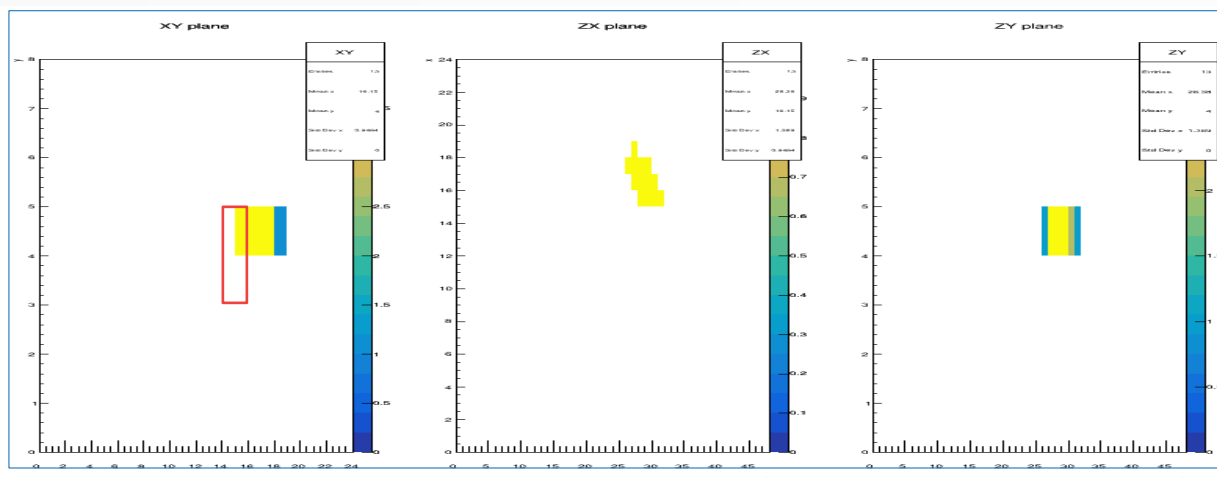


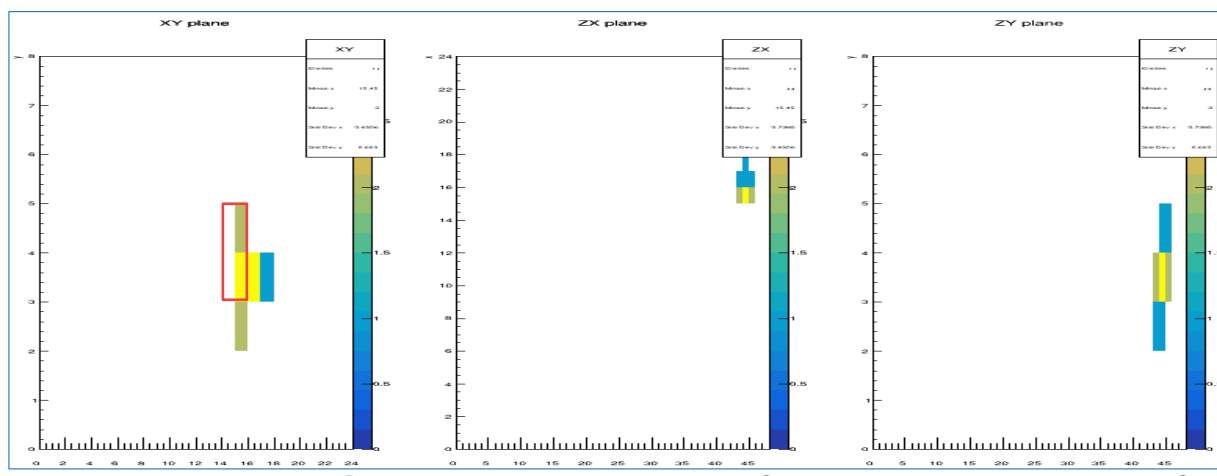
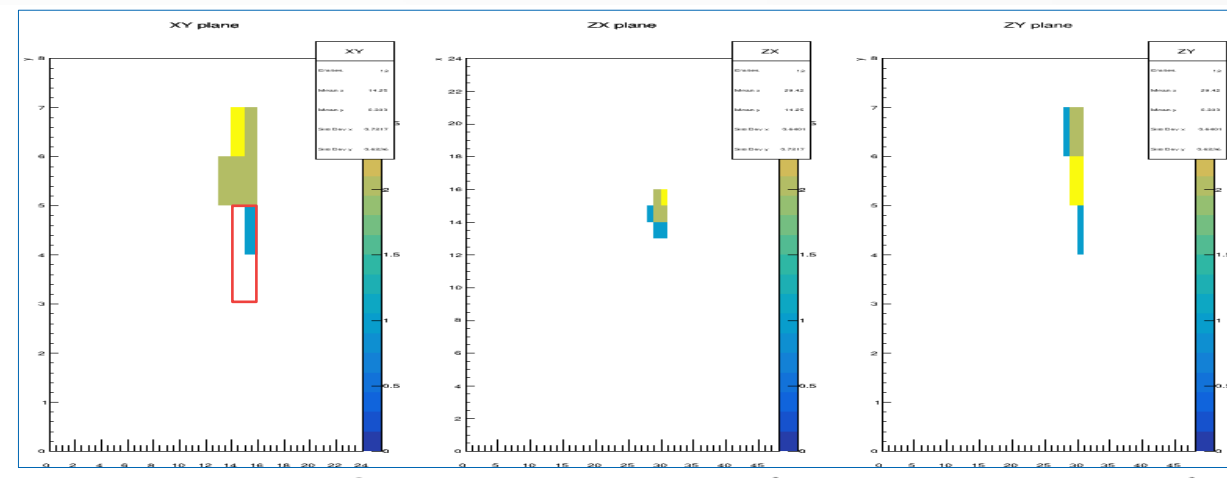
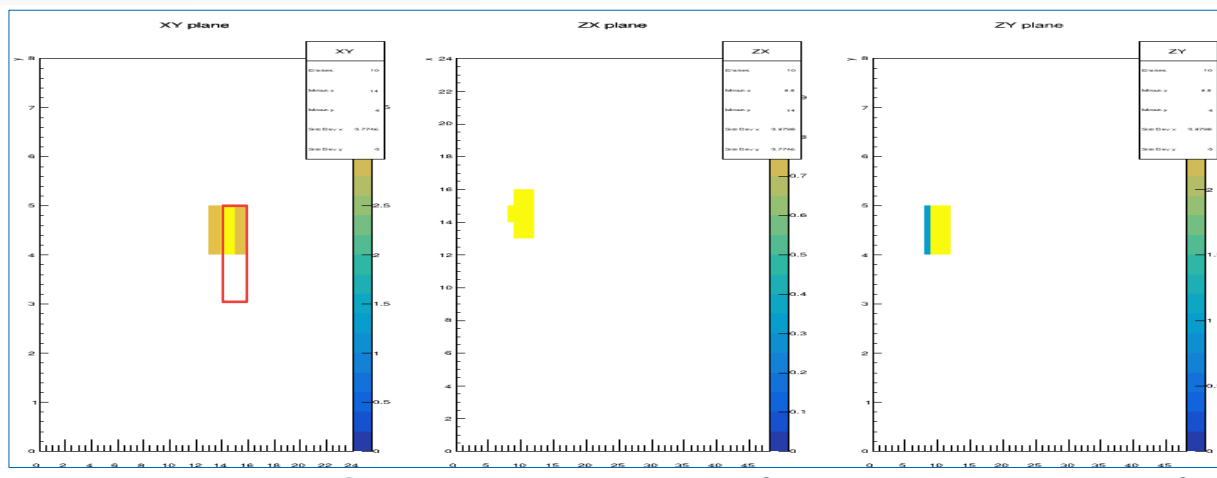




- The cosmics are 42% of the low energy with high number voxel selection (52/122)

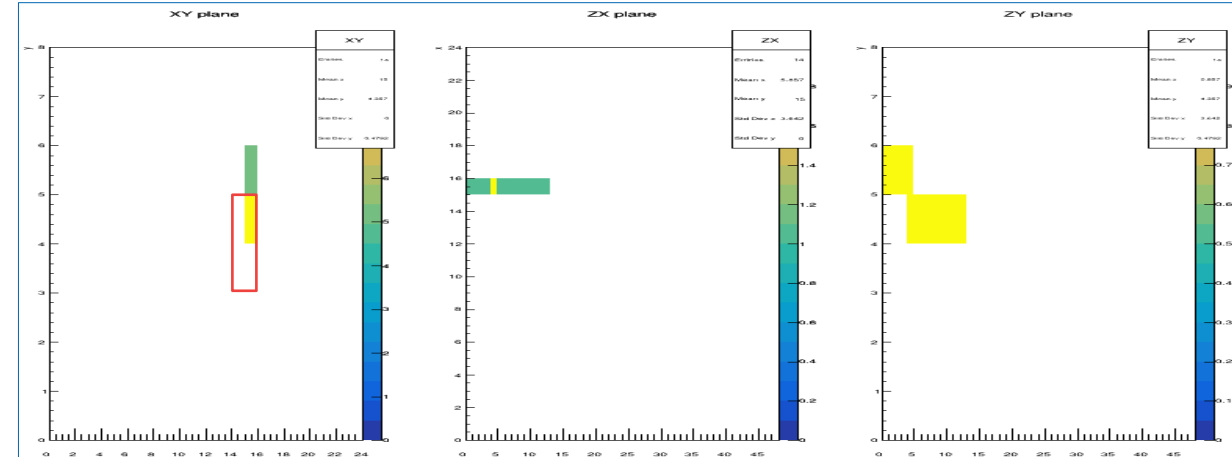
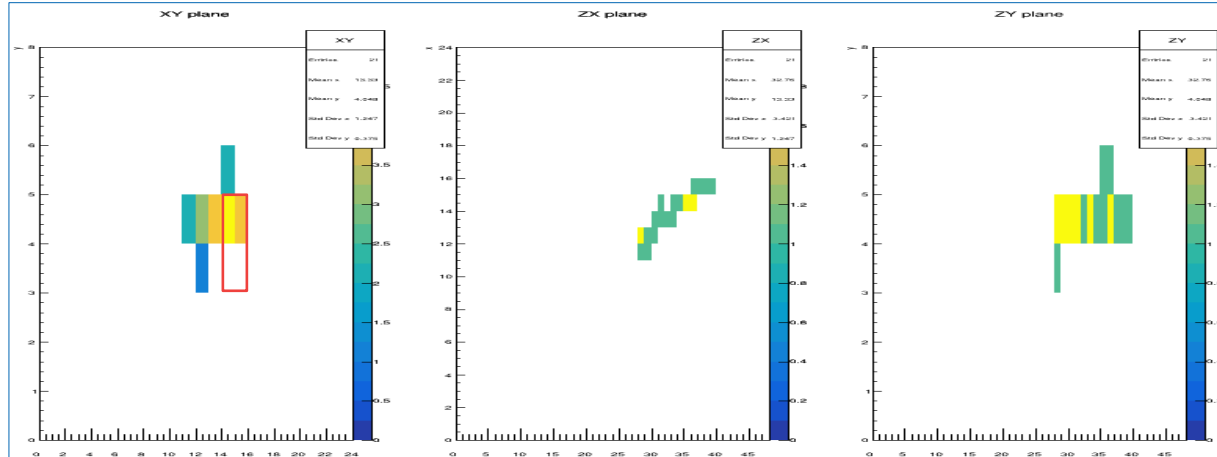
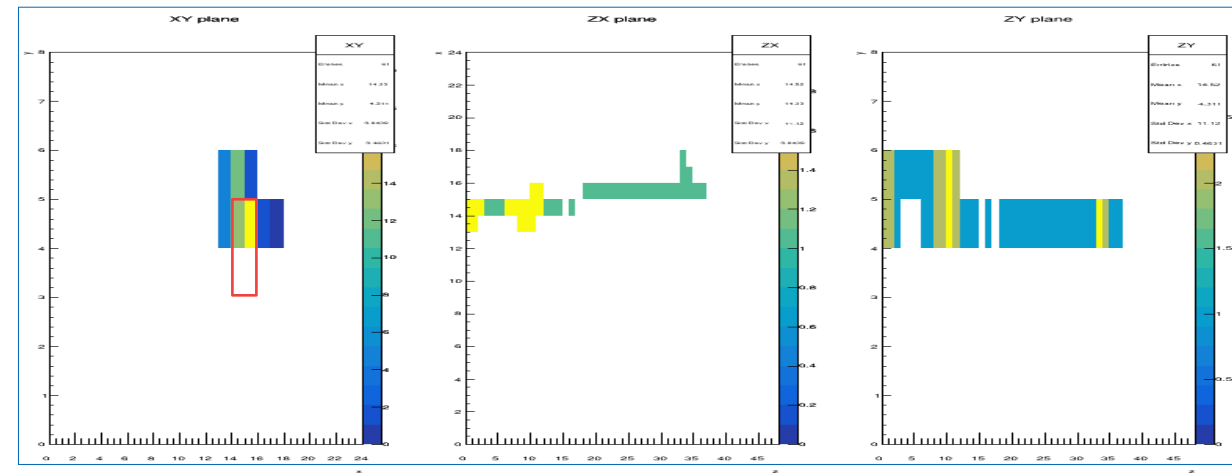
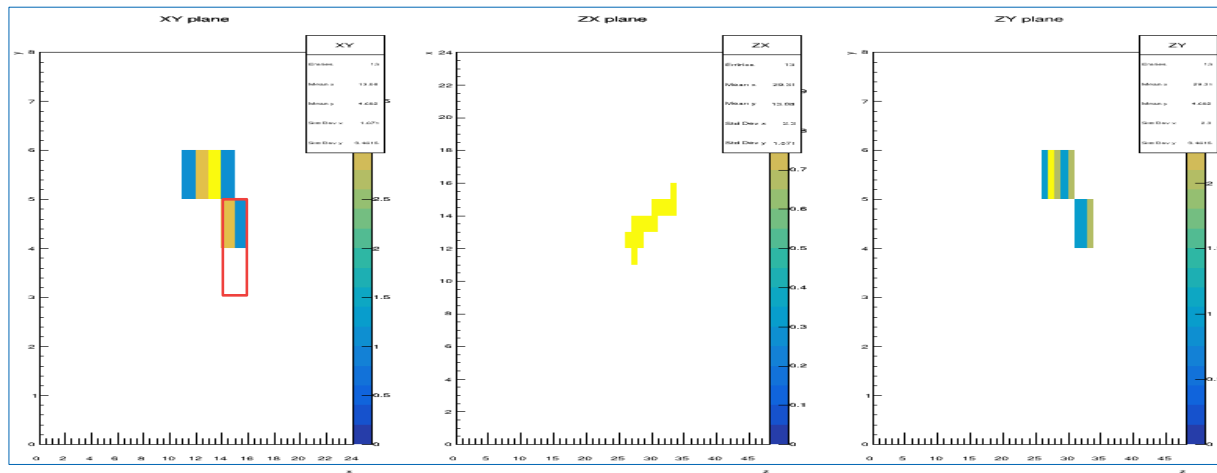
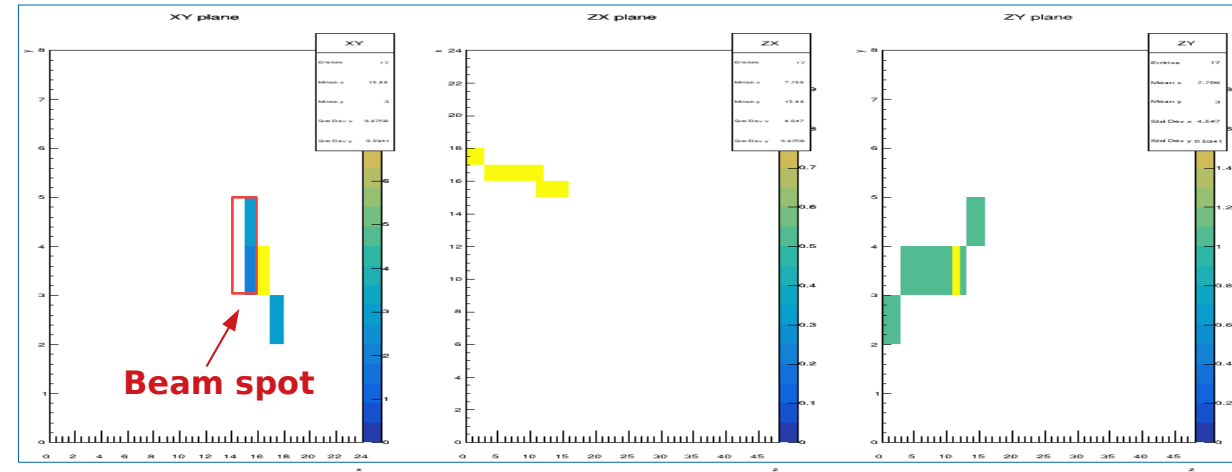
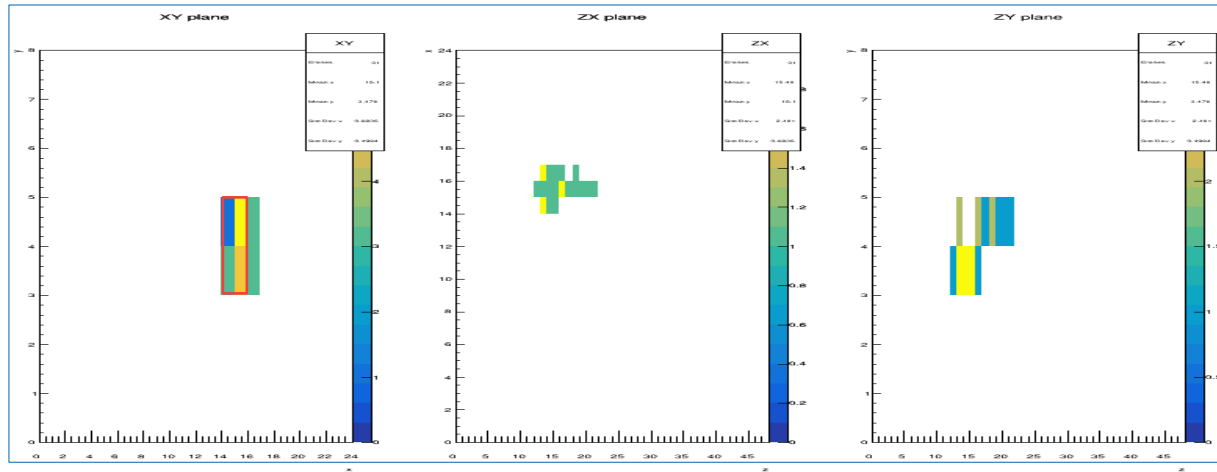
Category 2 (shower-like blob) : event with bad linearity (<0.9).

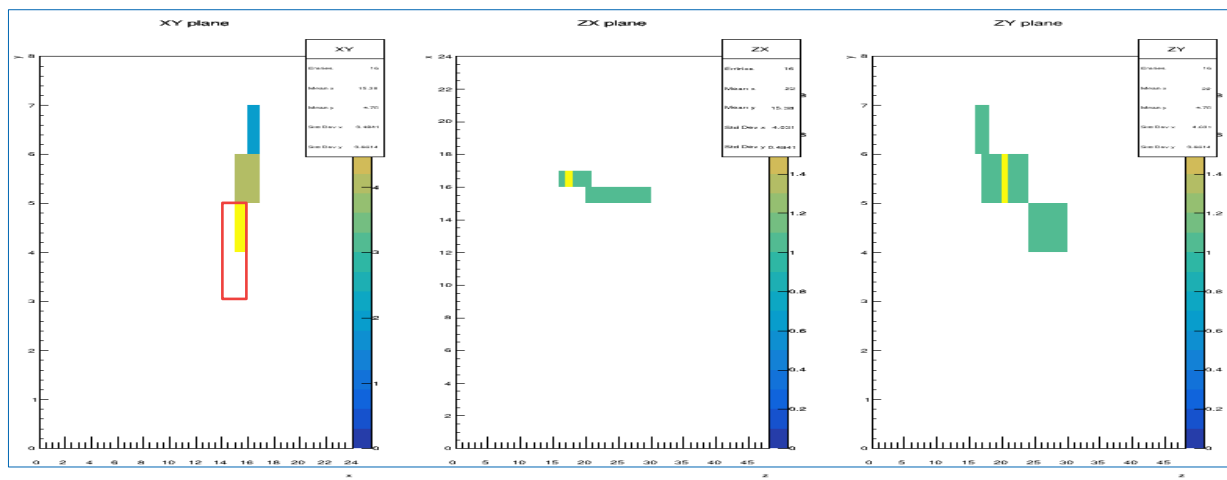
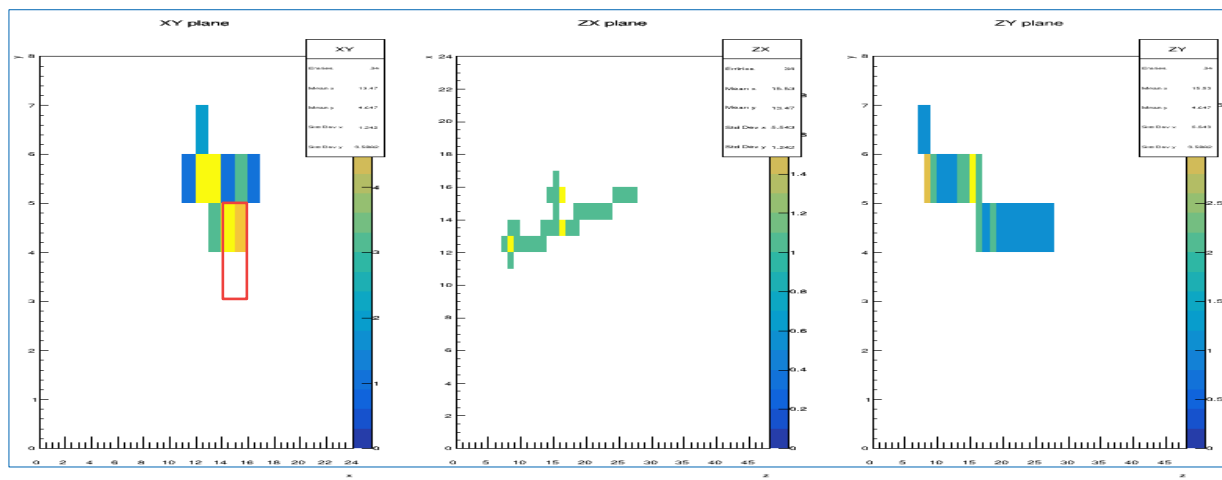
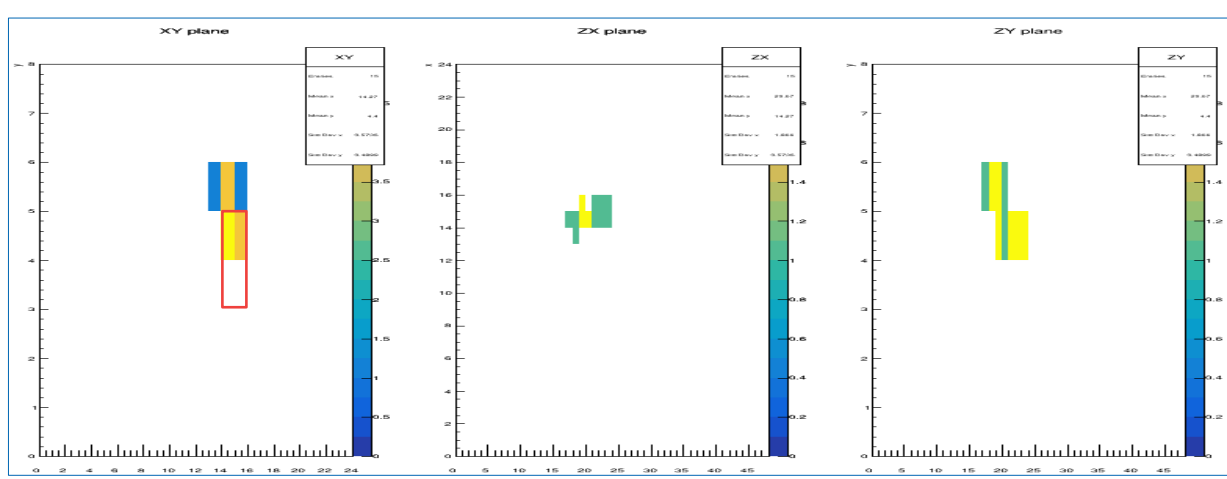
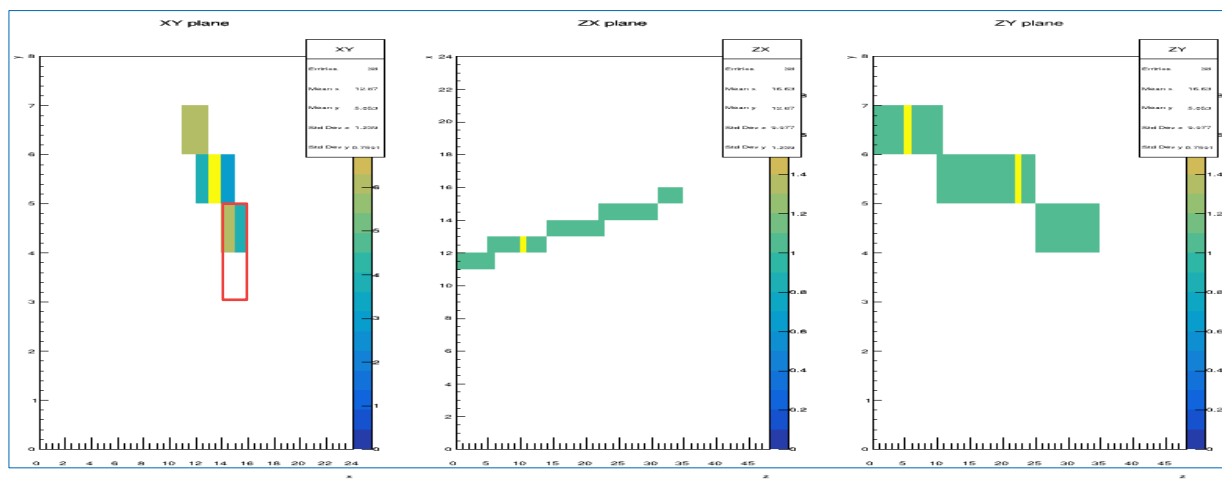
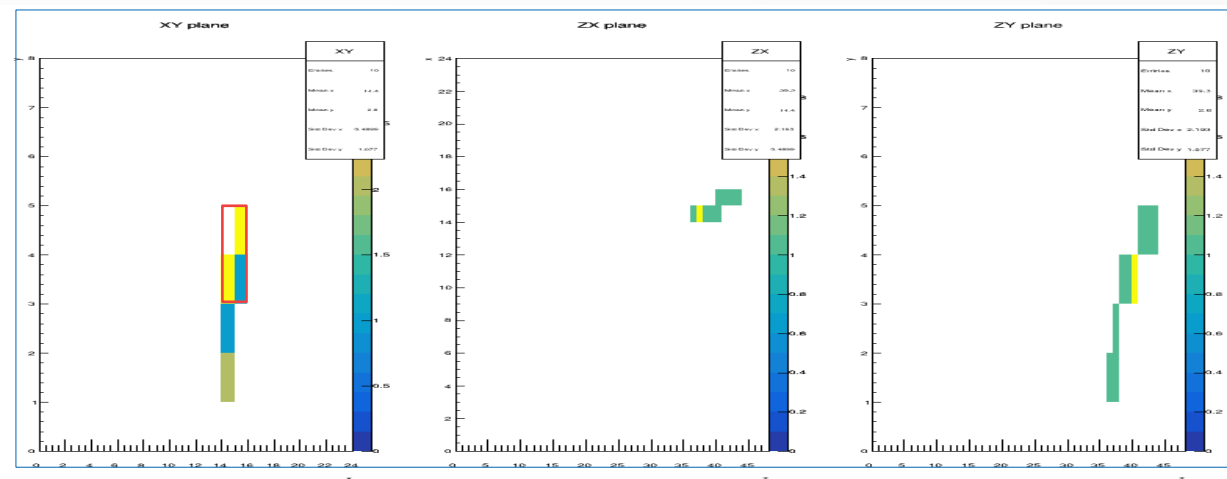
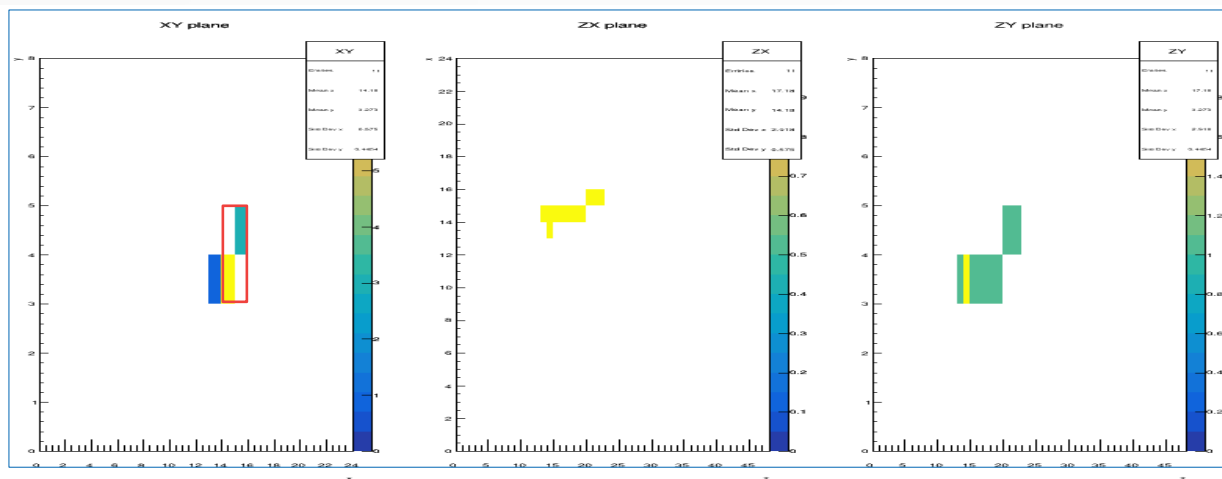


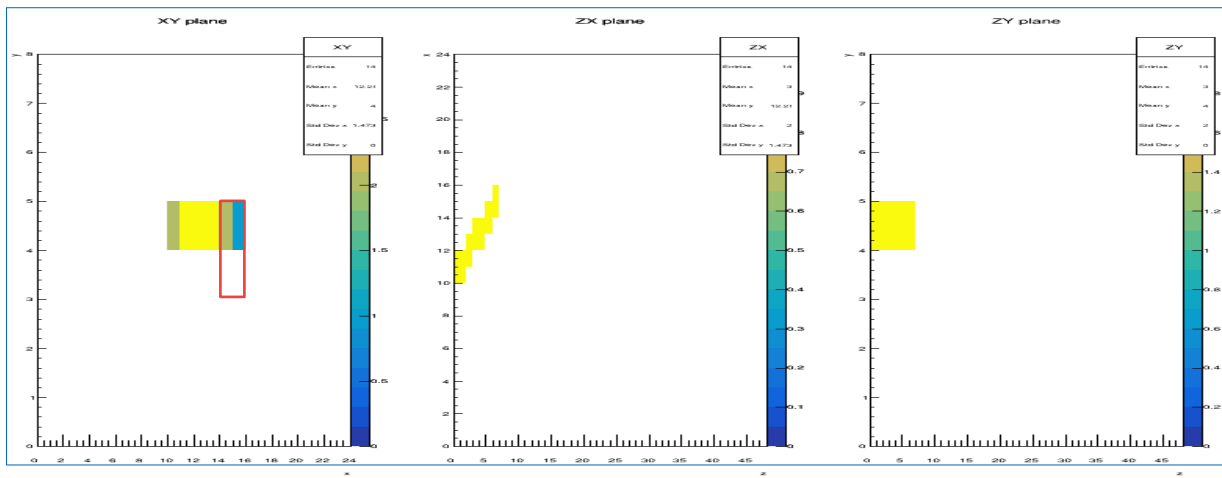
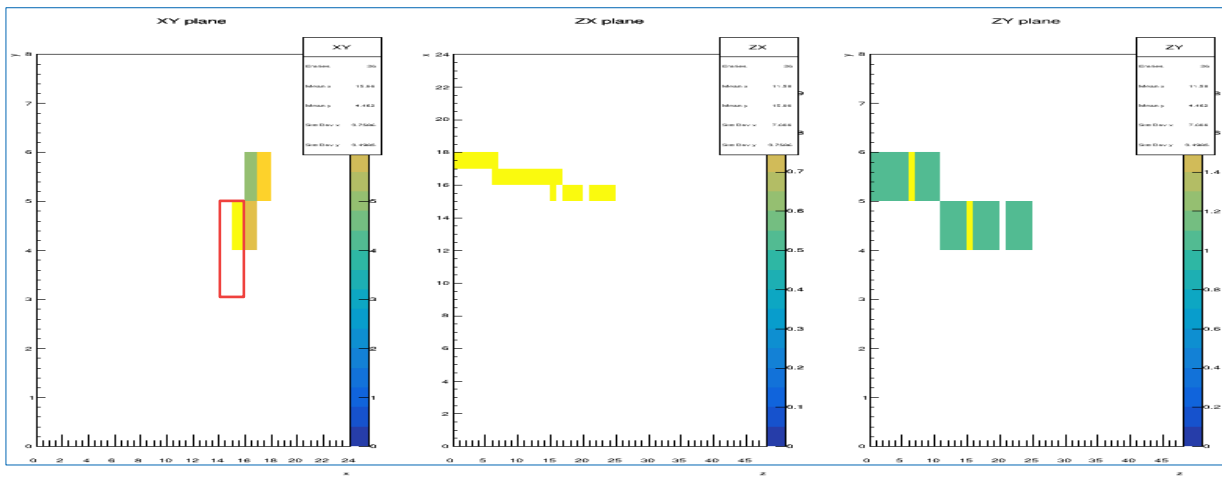
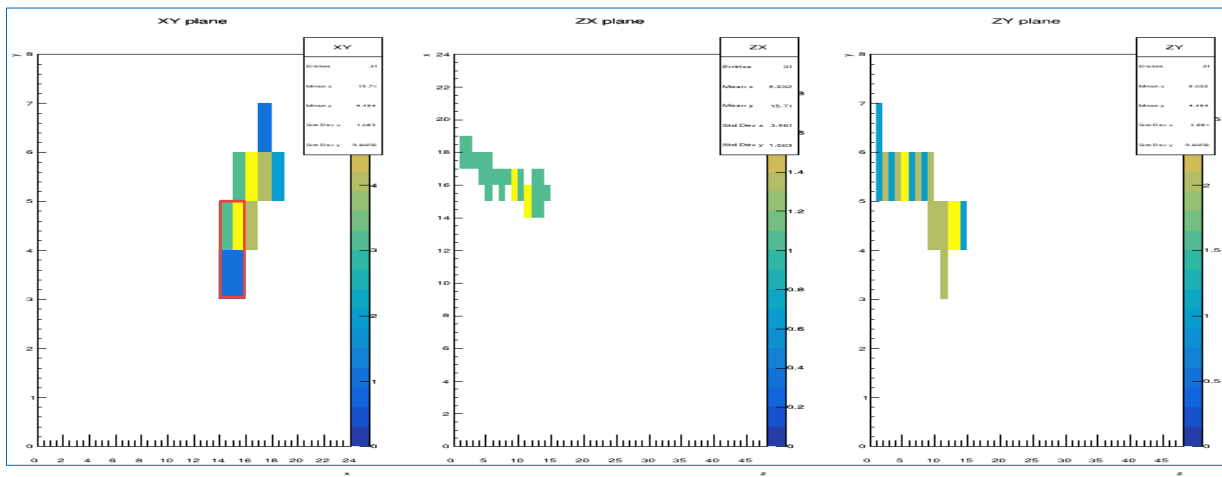
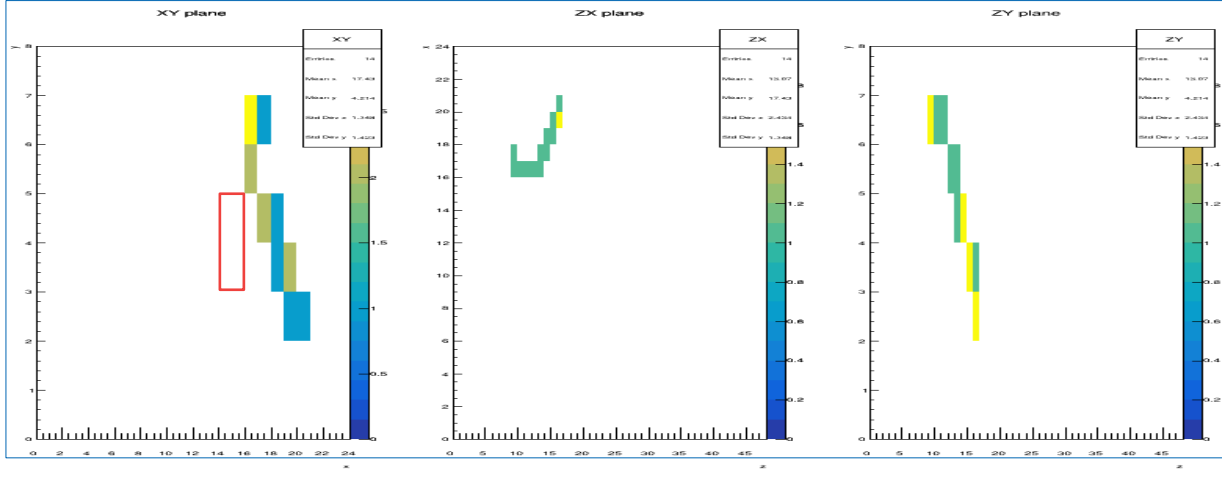
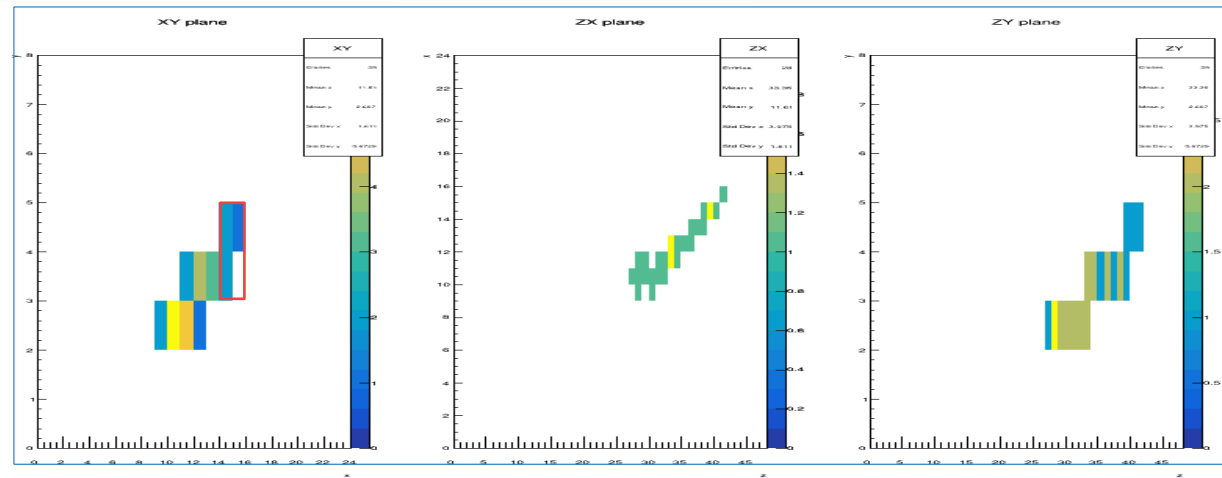
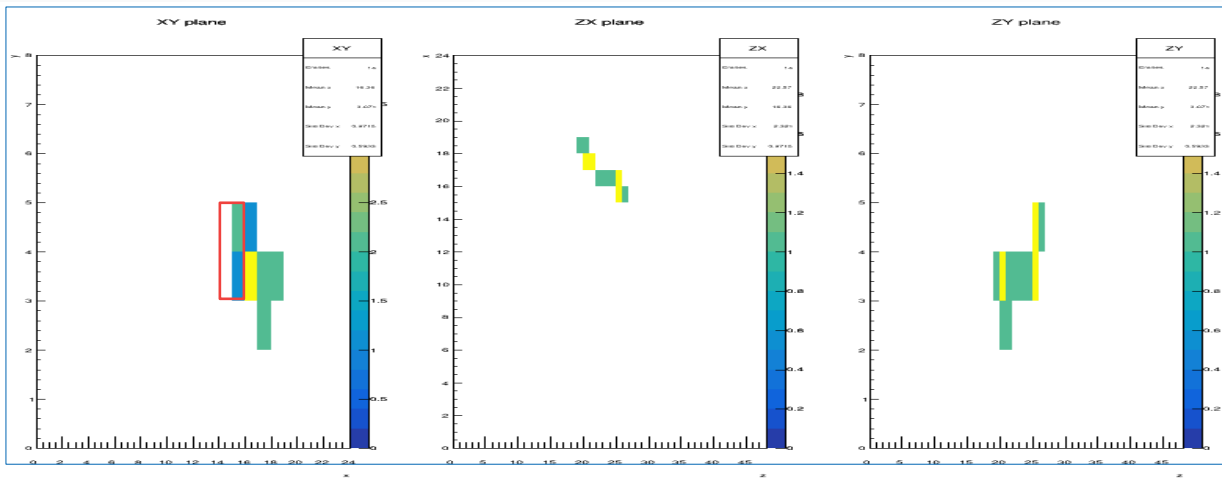


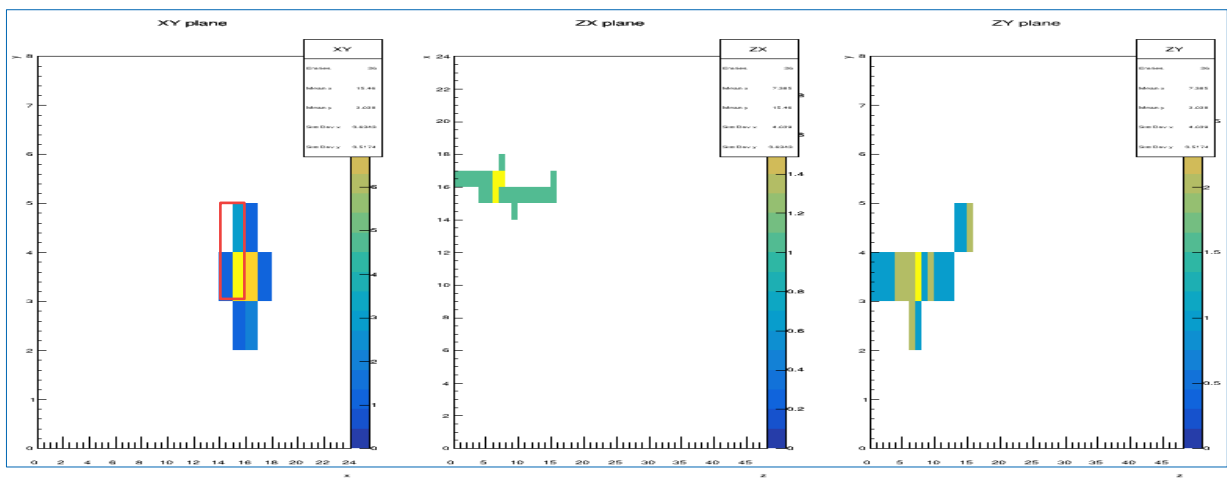
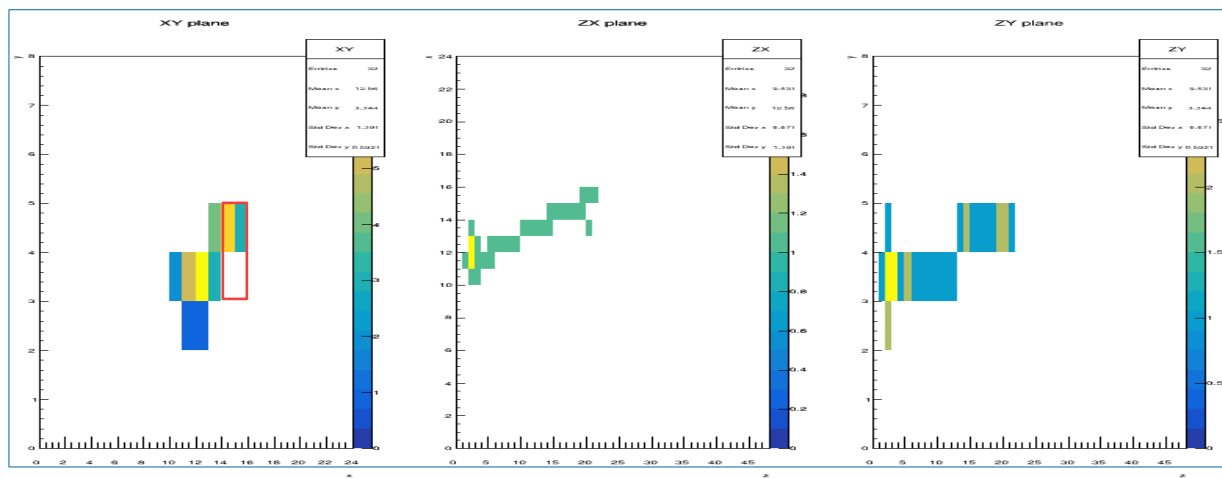
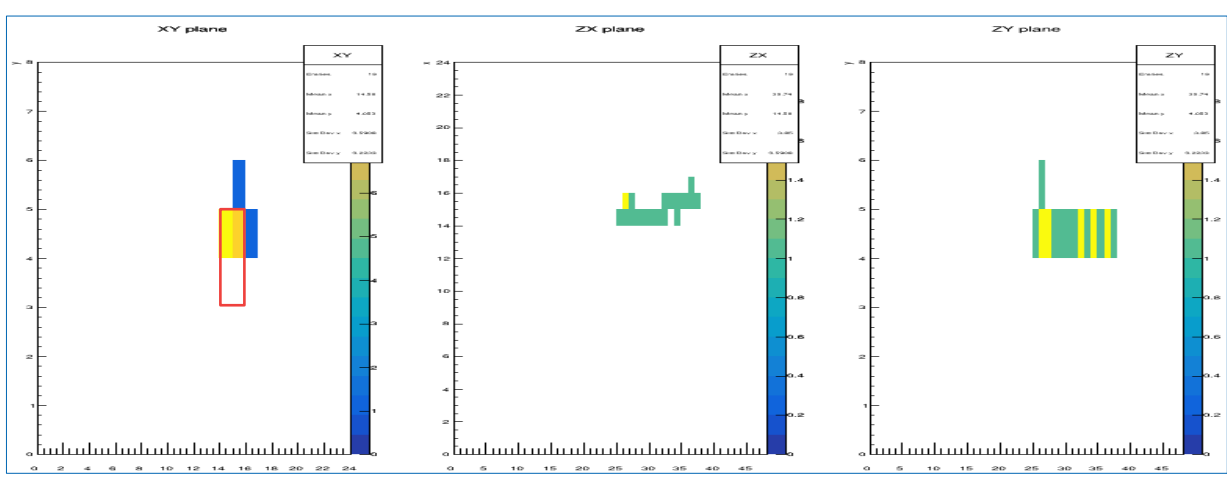
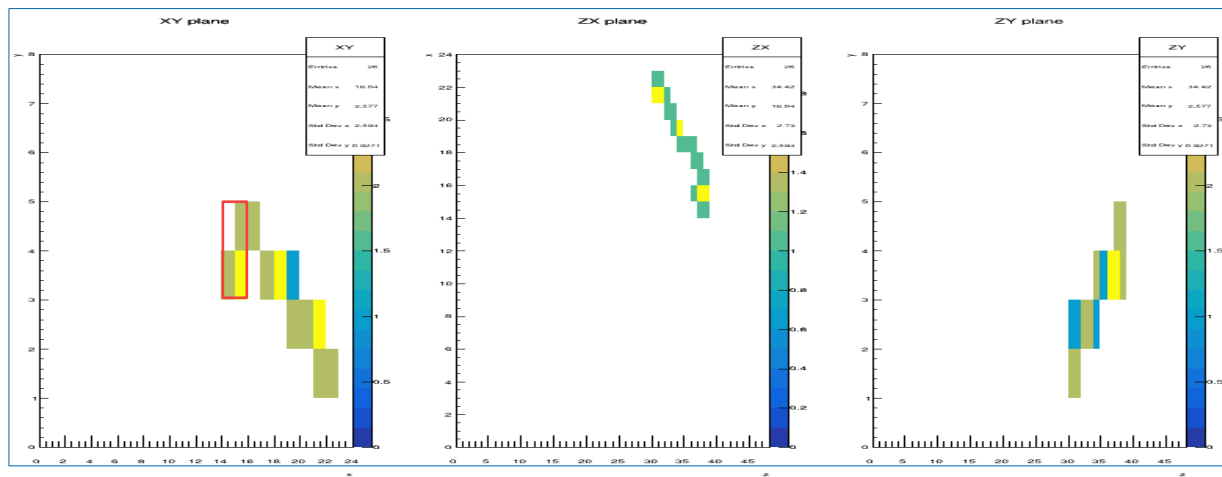
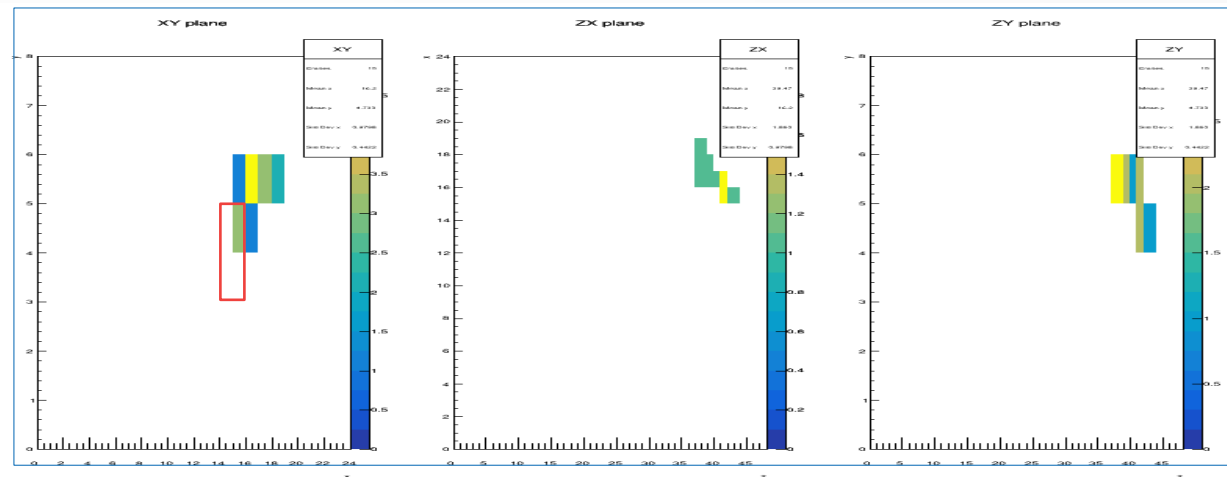
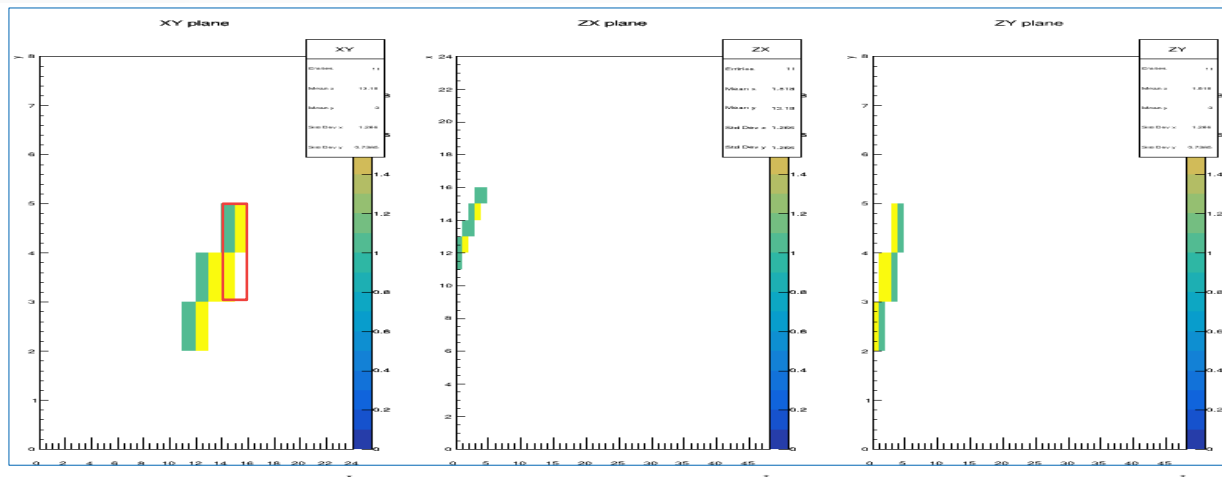
- The shower-like blob are 12% of the low energy with high number voxel selection (15/122)

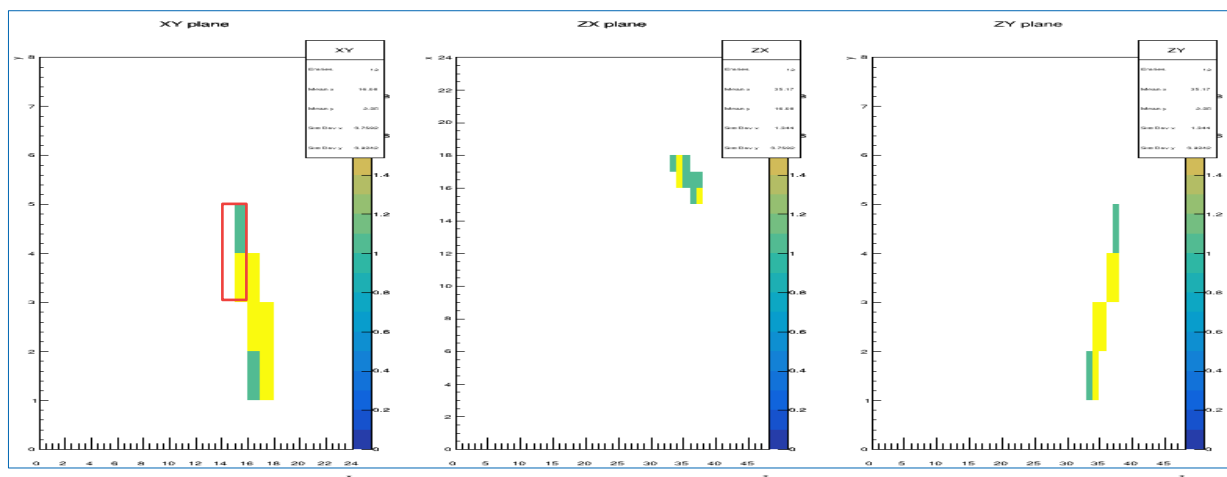
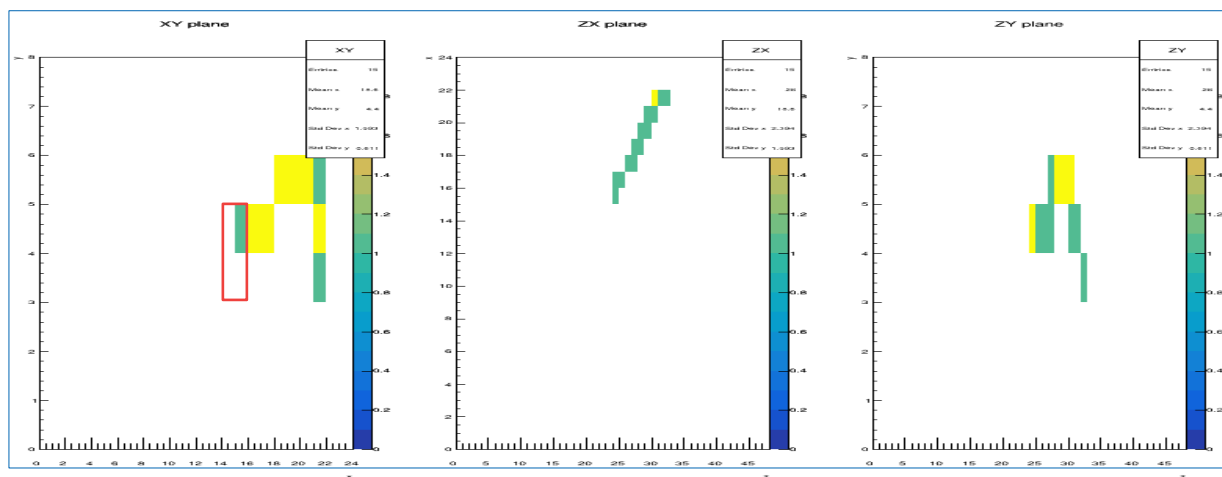
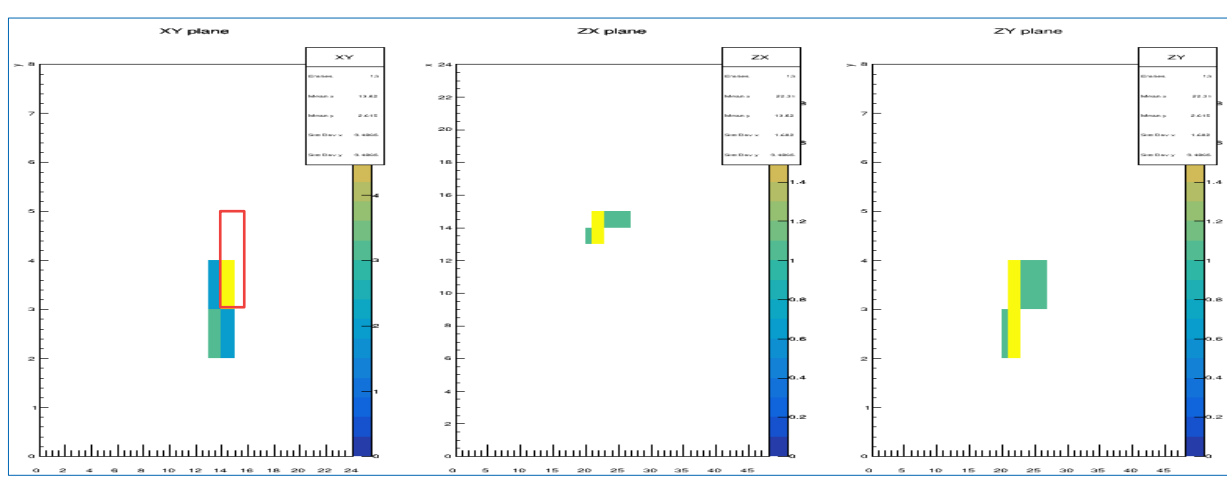
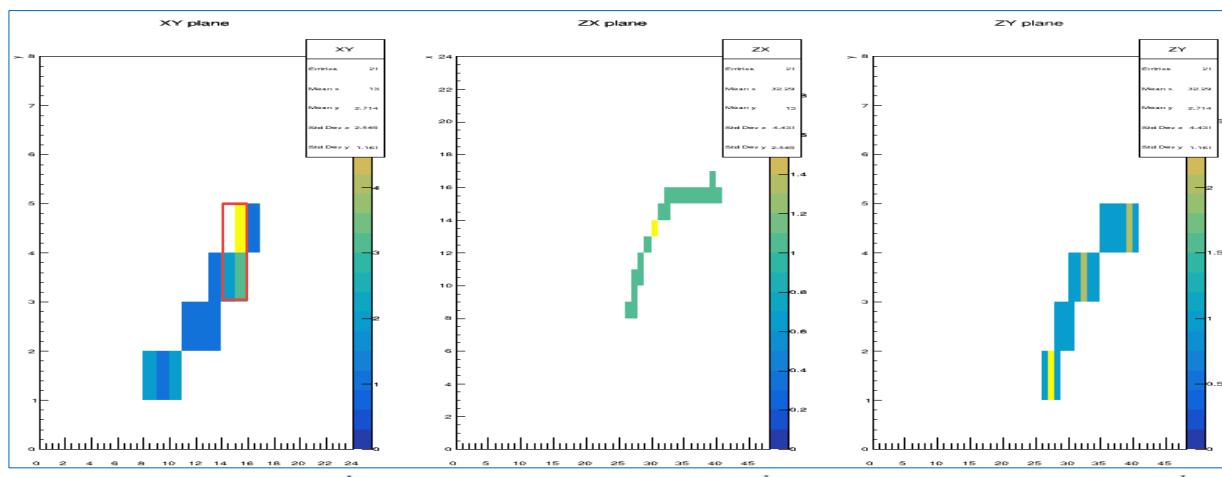
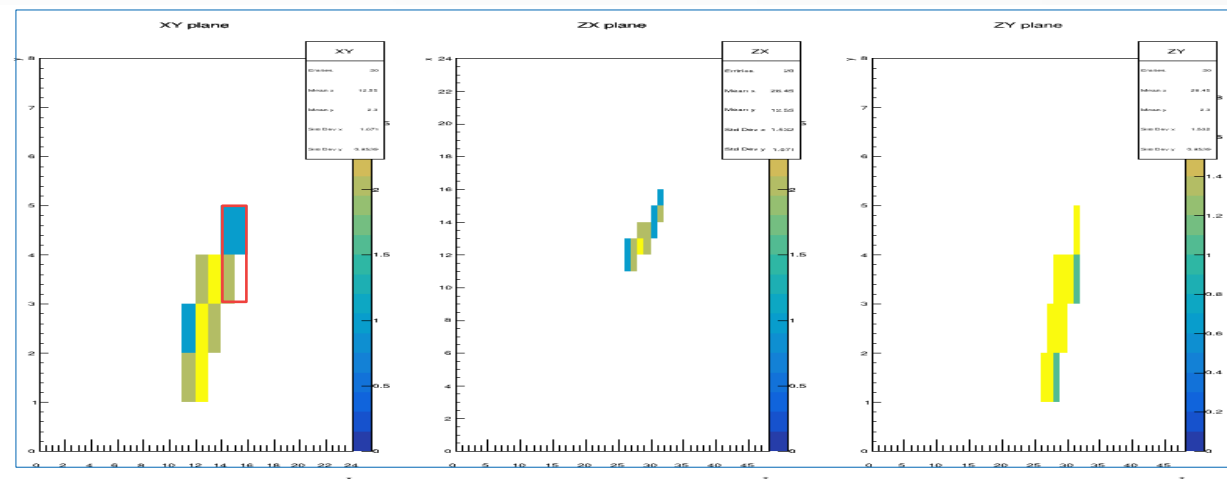
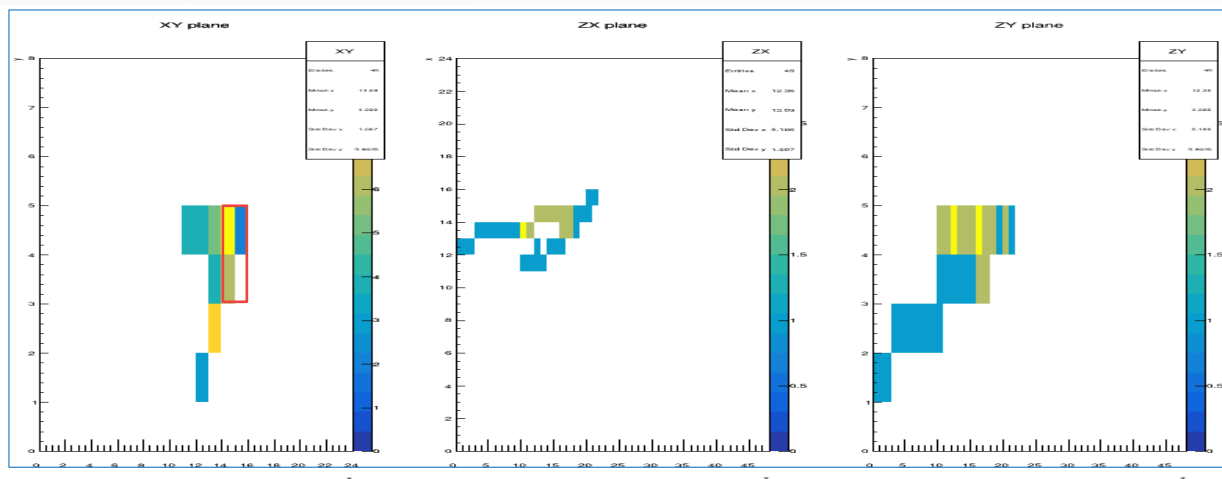
Category 3 (remain events) : Not classified event, not category 1 or 2.

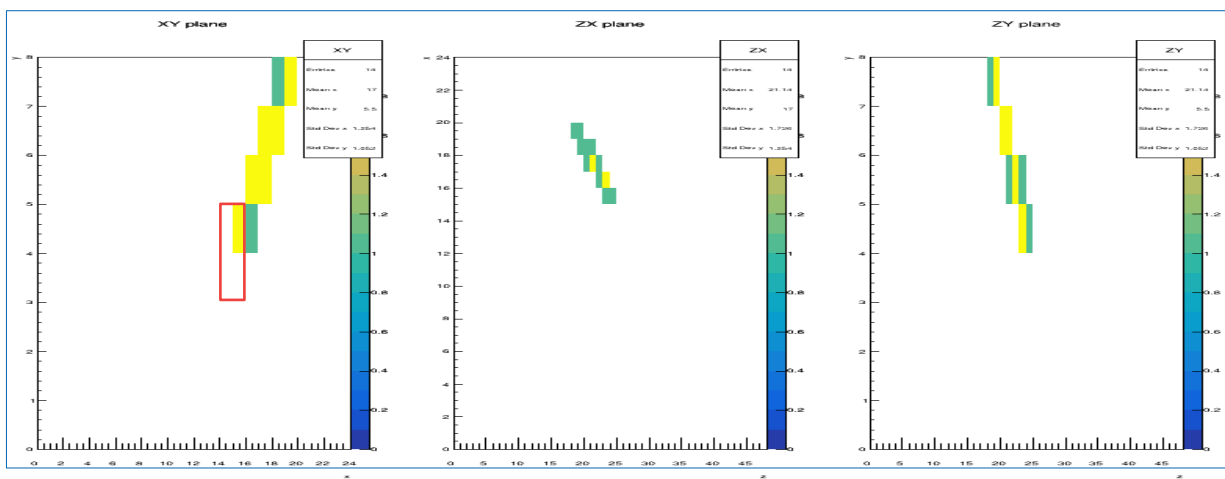
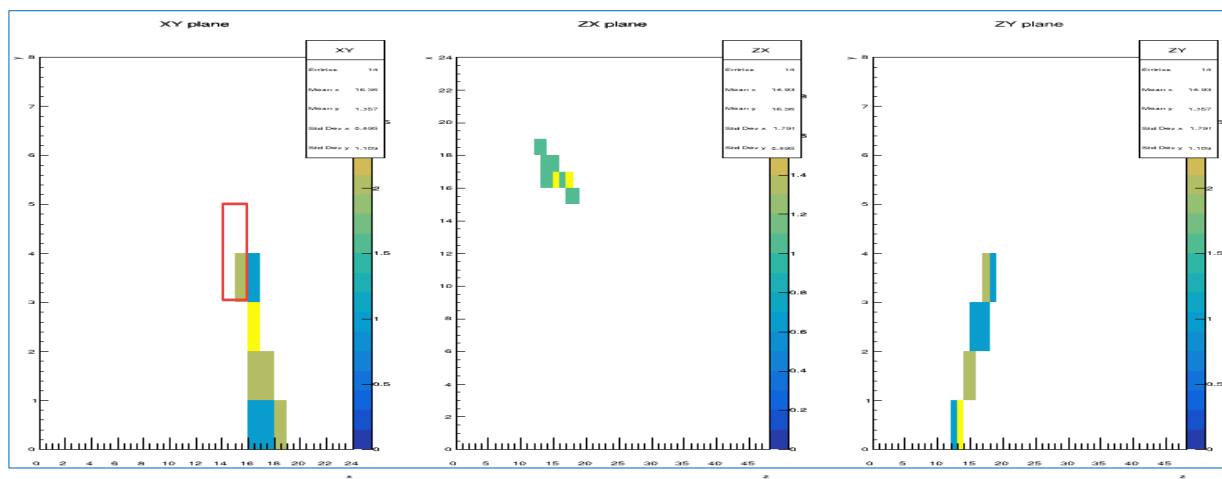
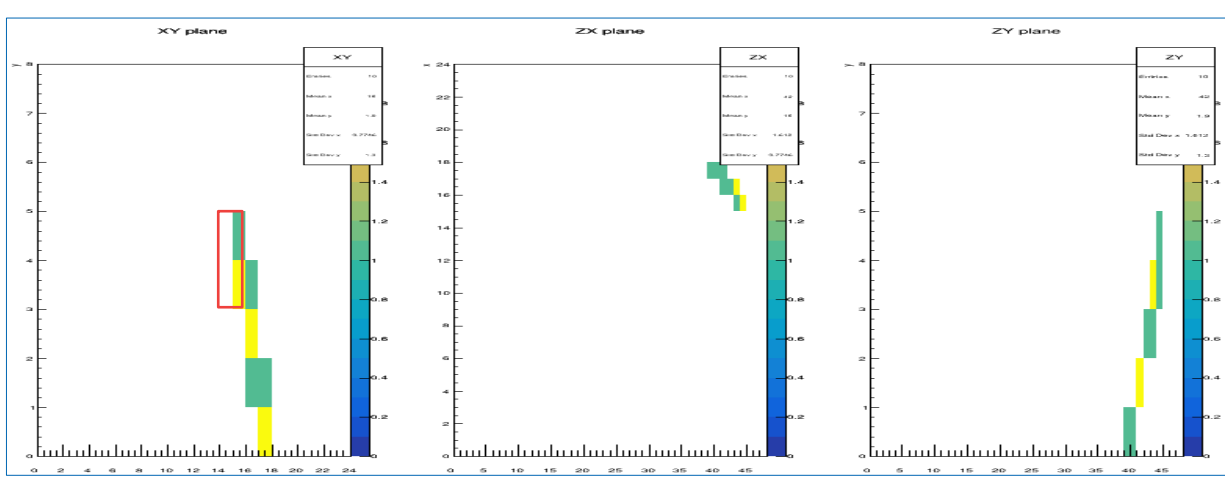
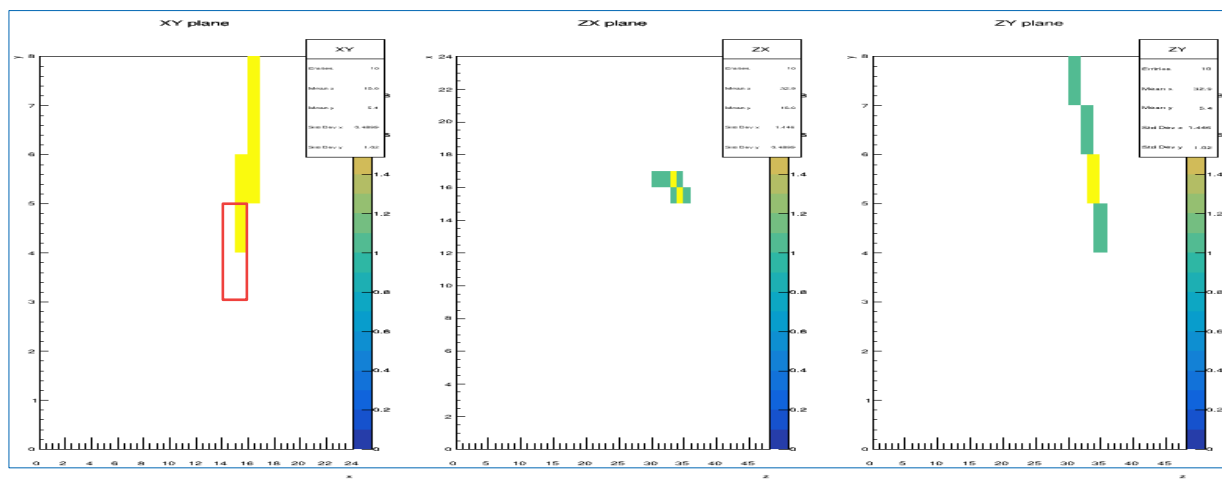
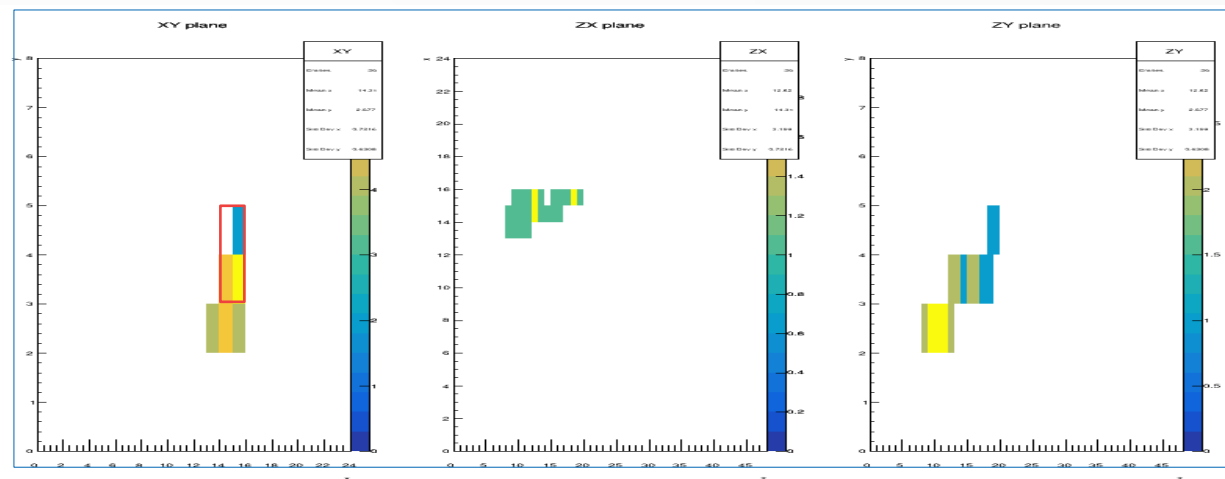
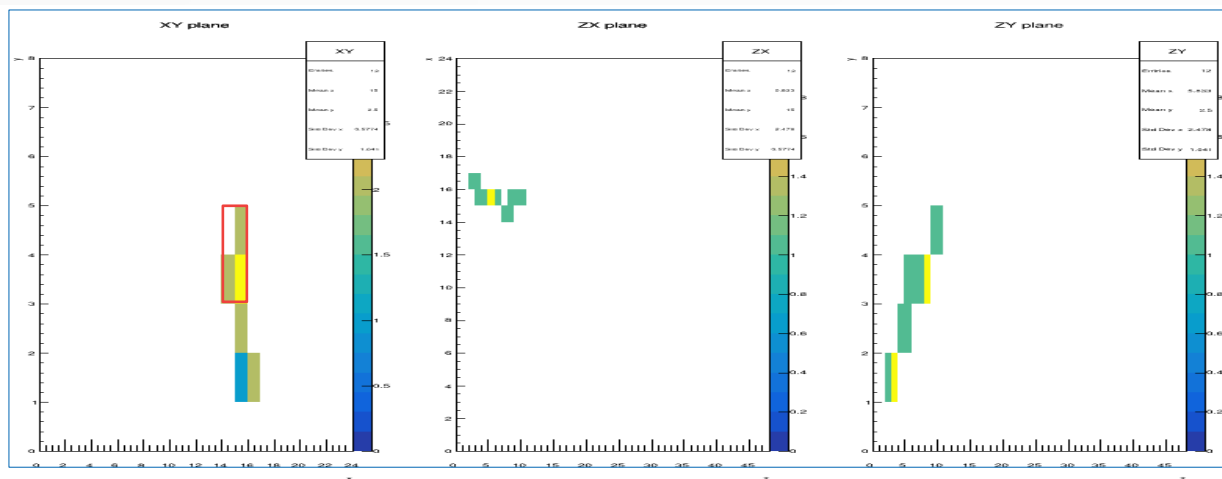


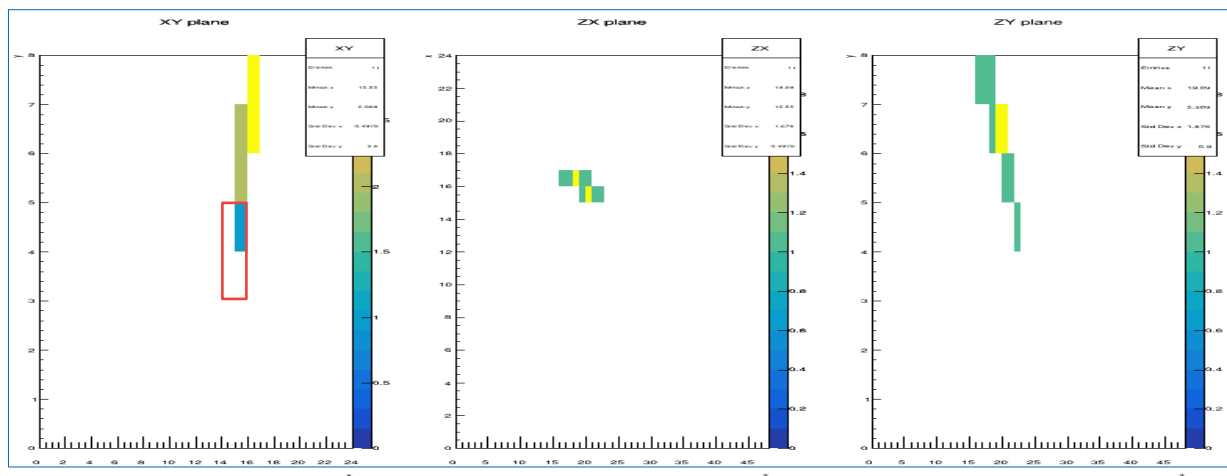
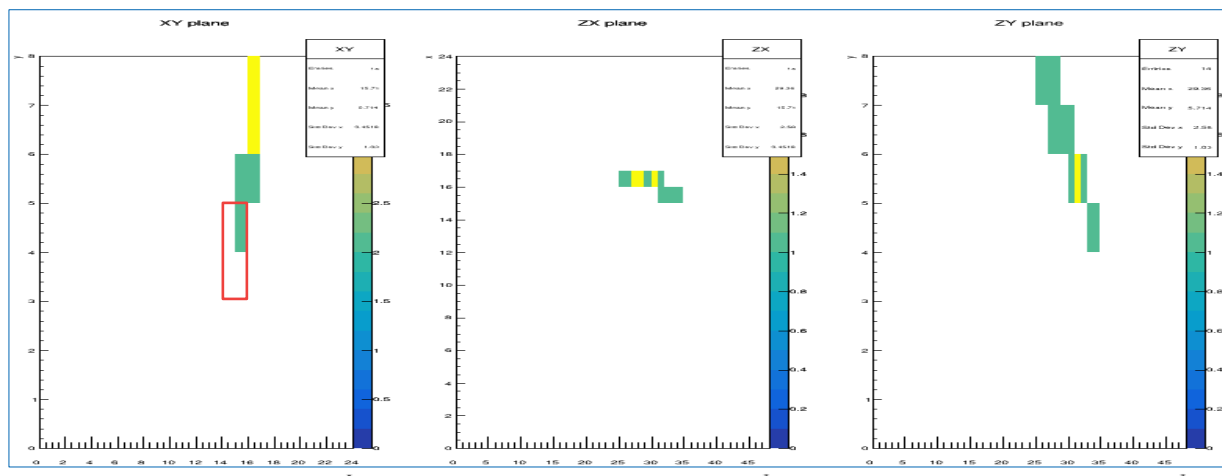
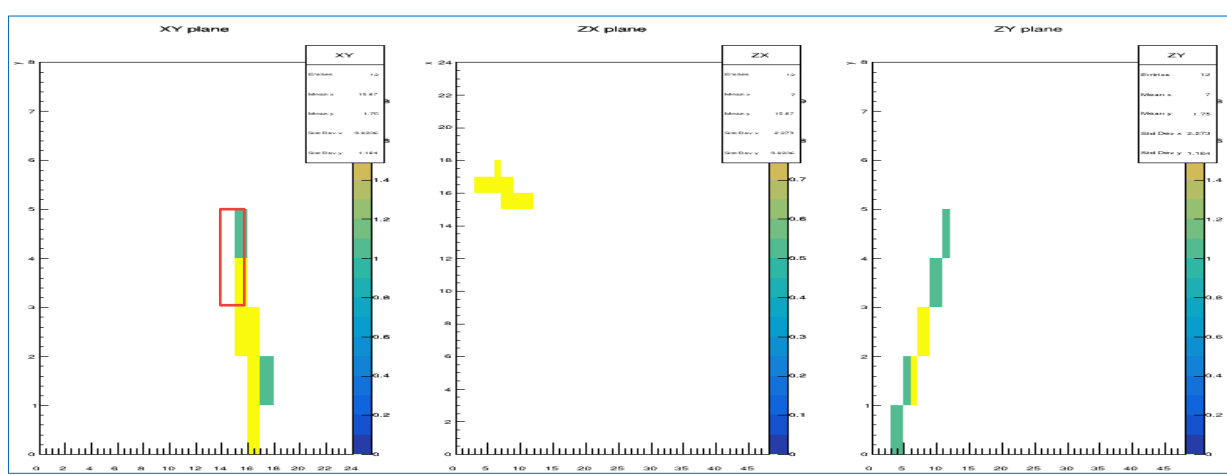
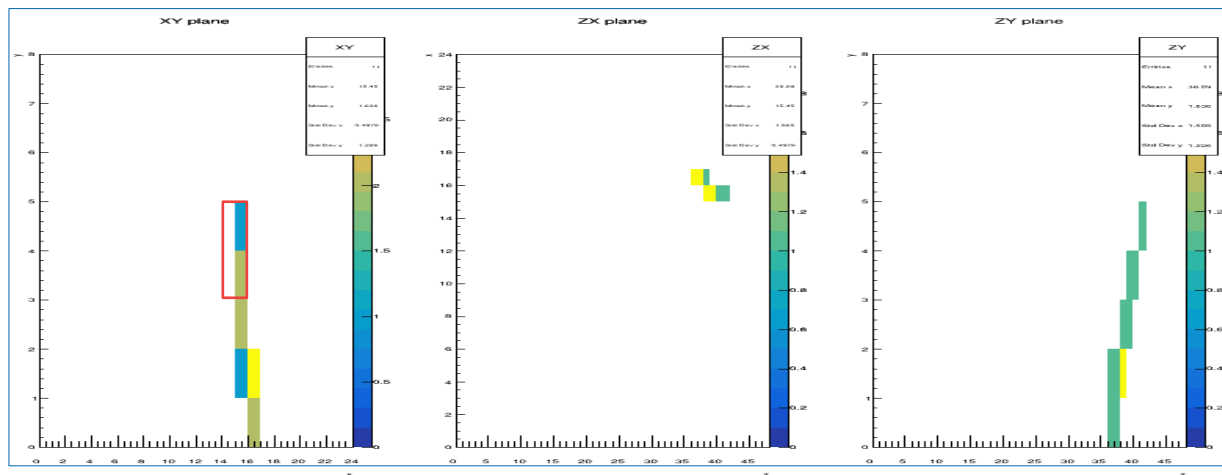
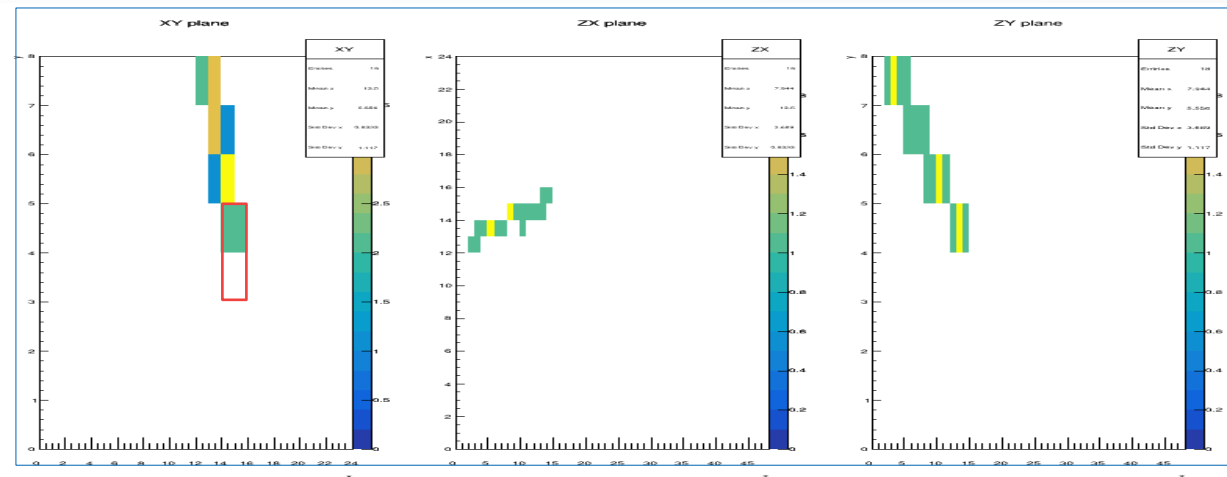
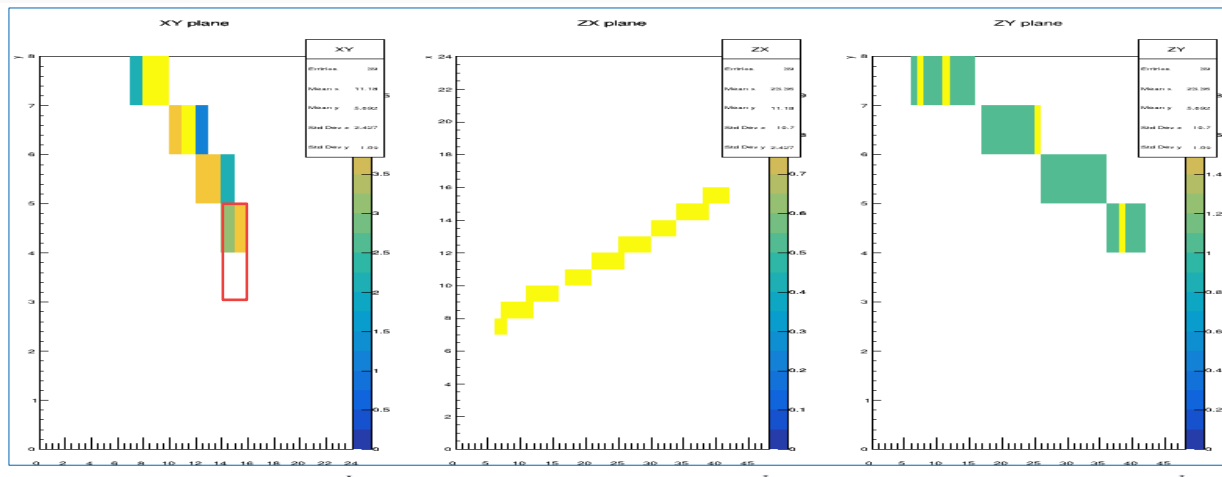


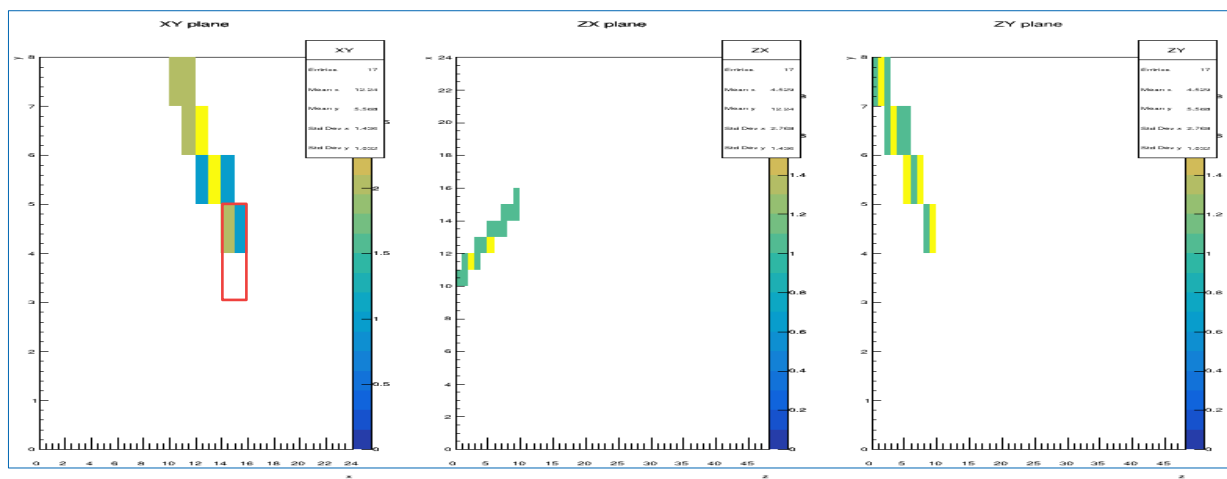
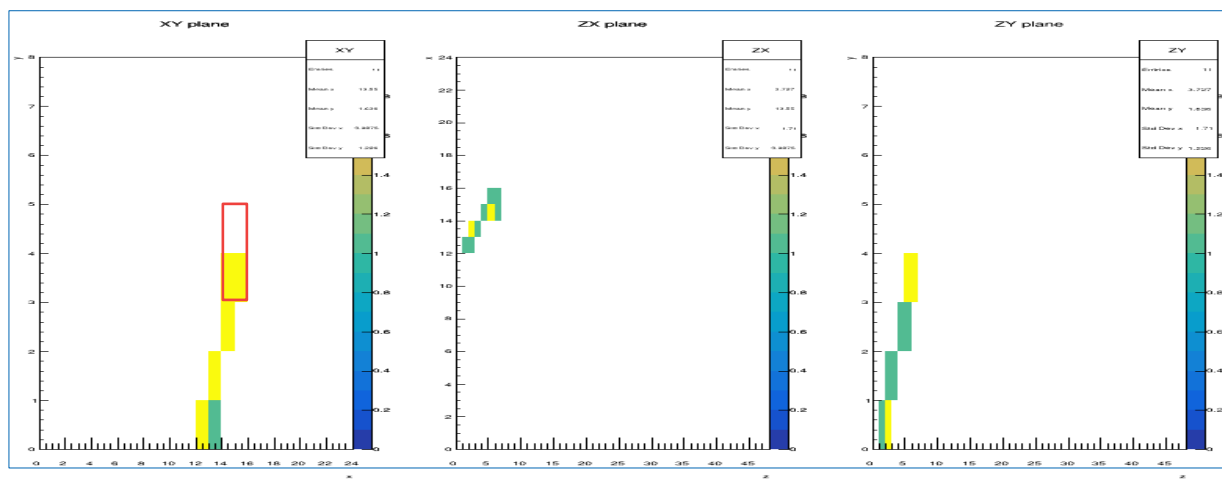
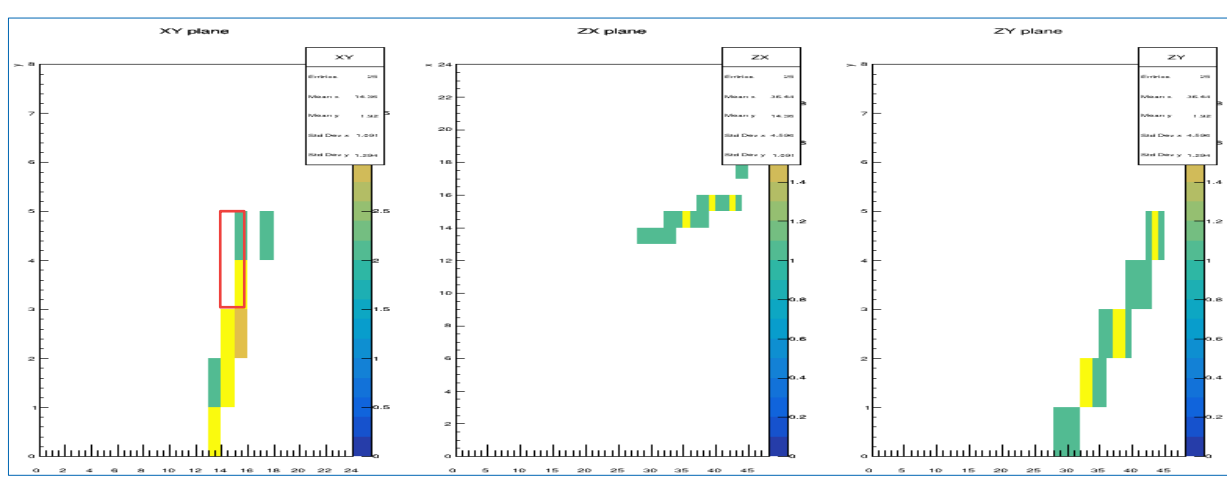
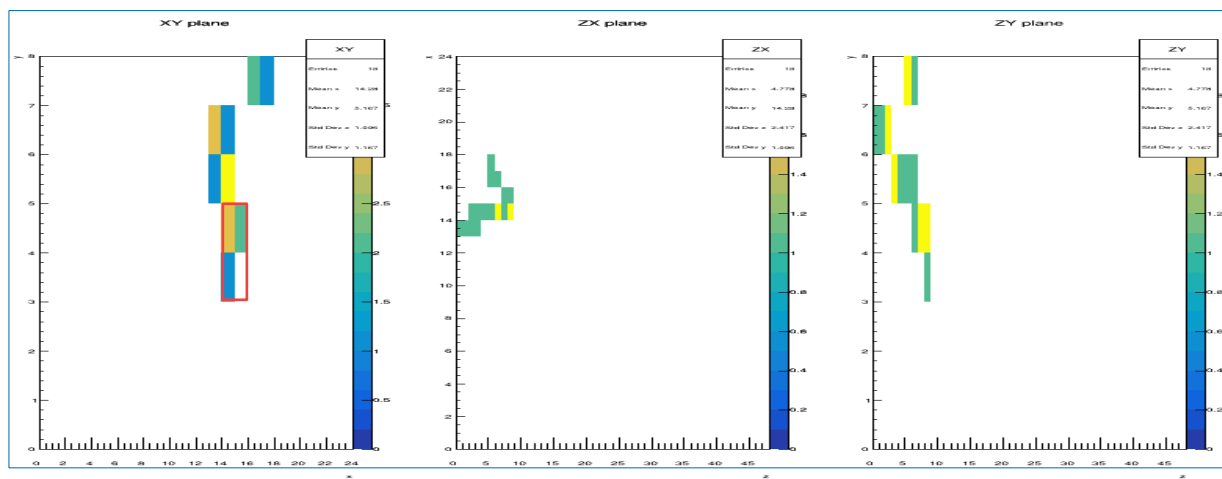
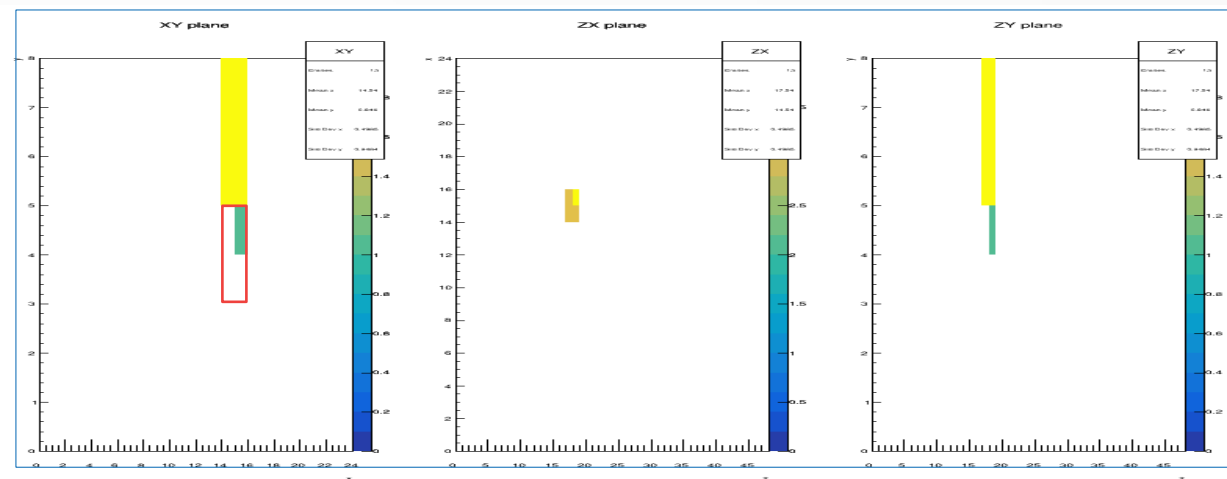
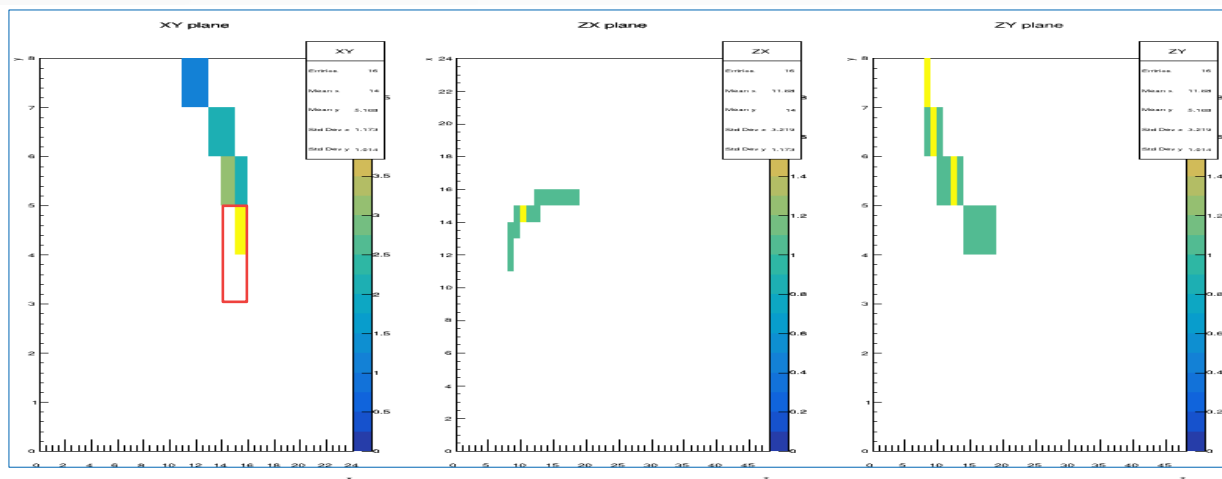


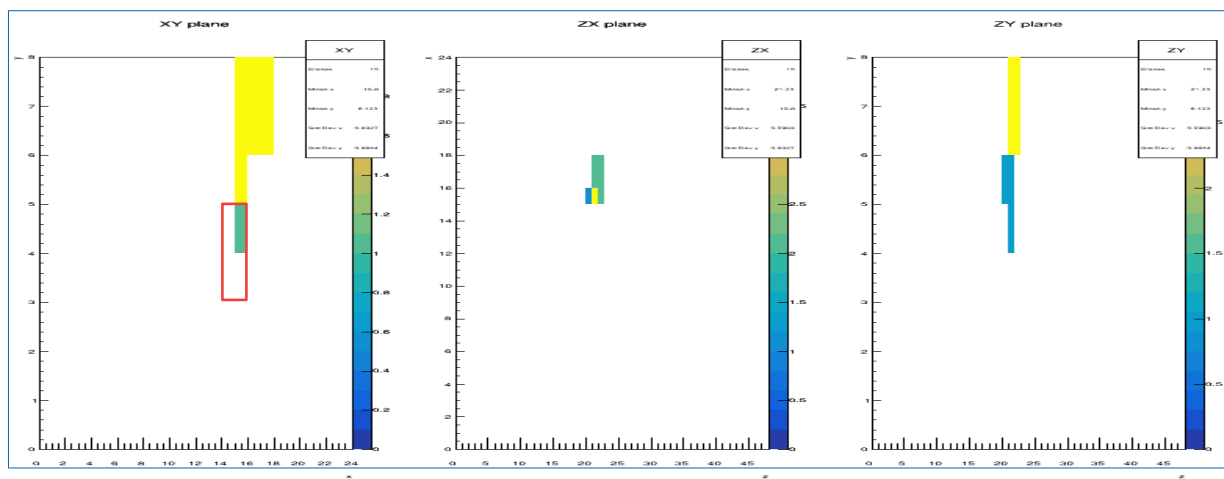
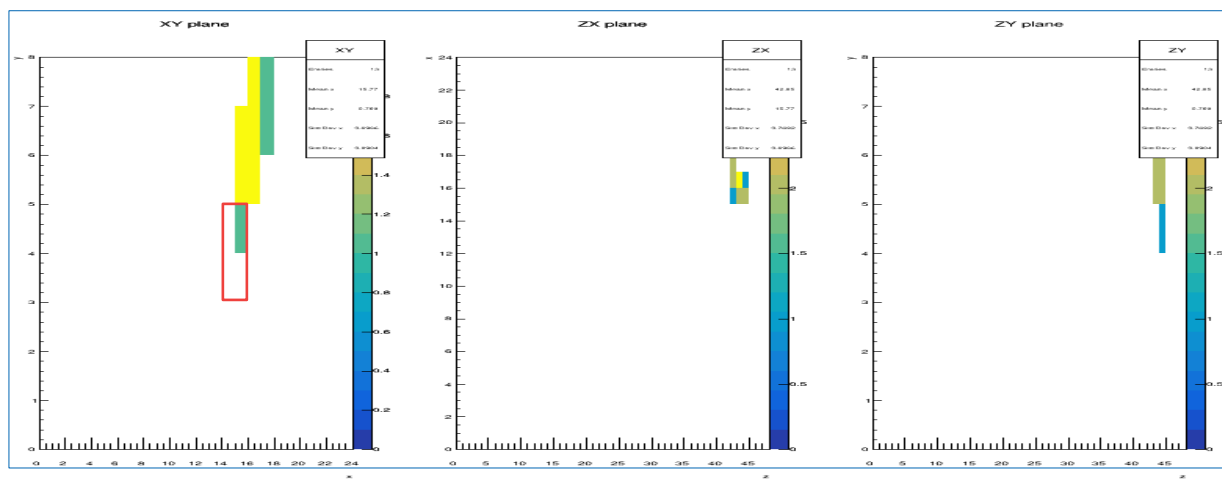
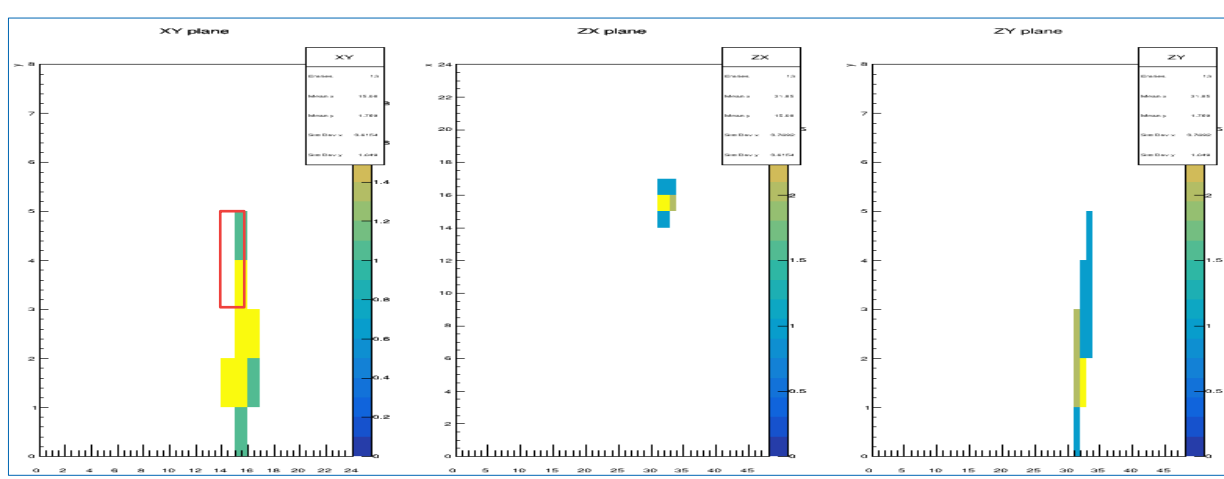
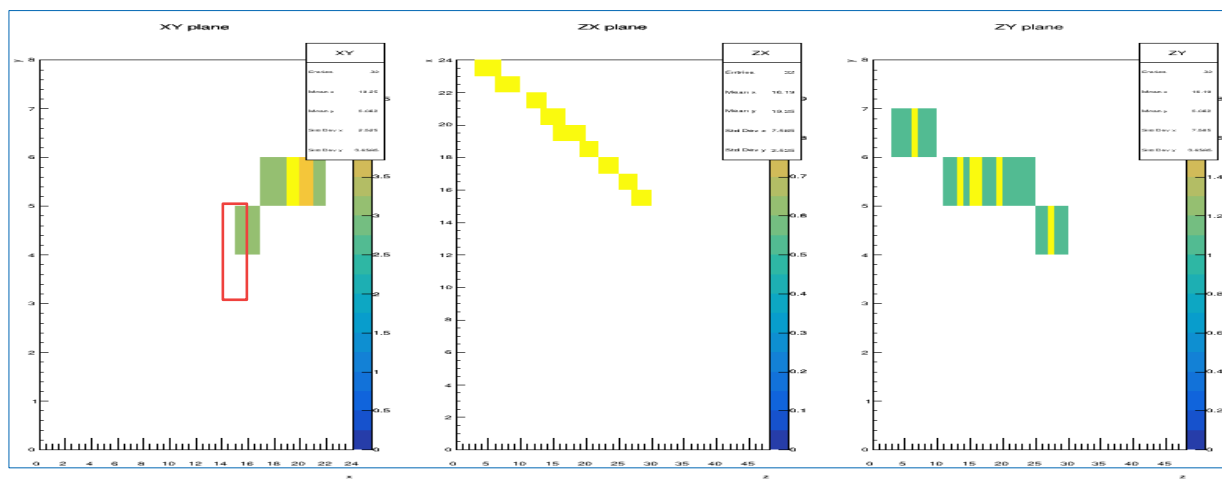
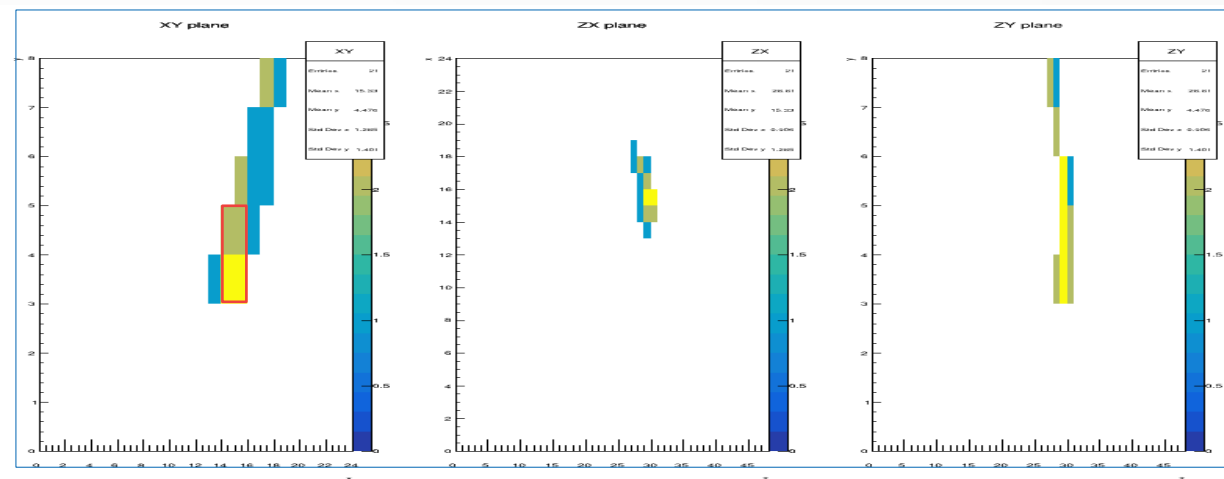
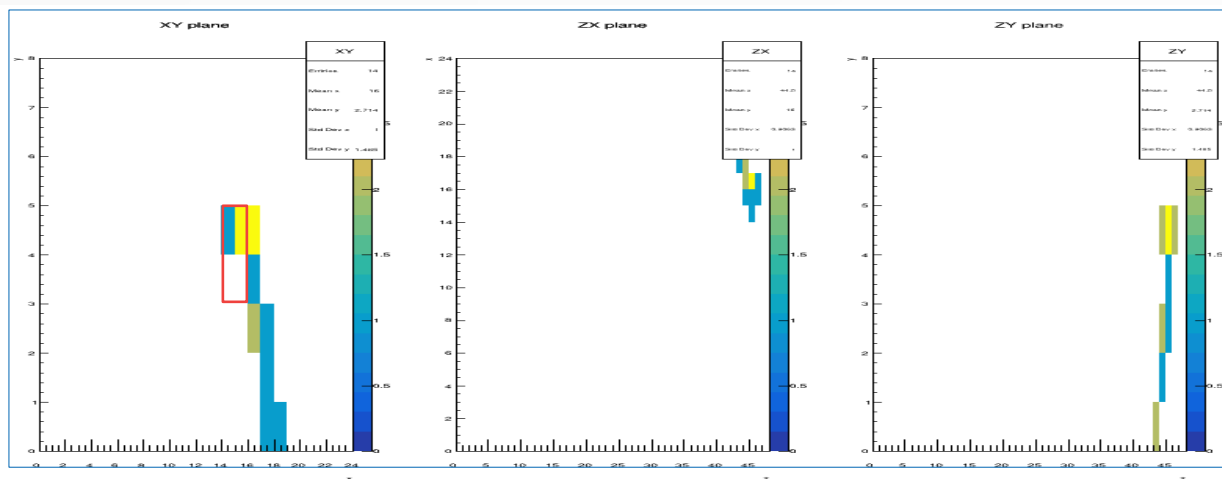


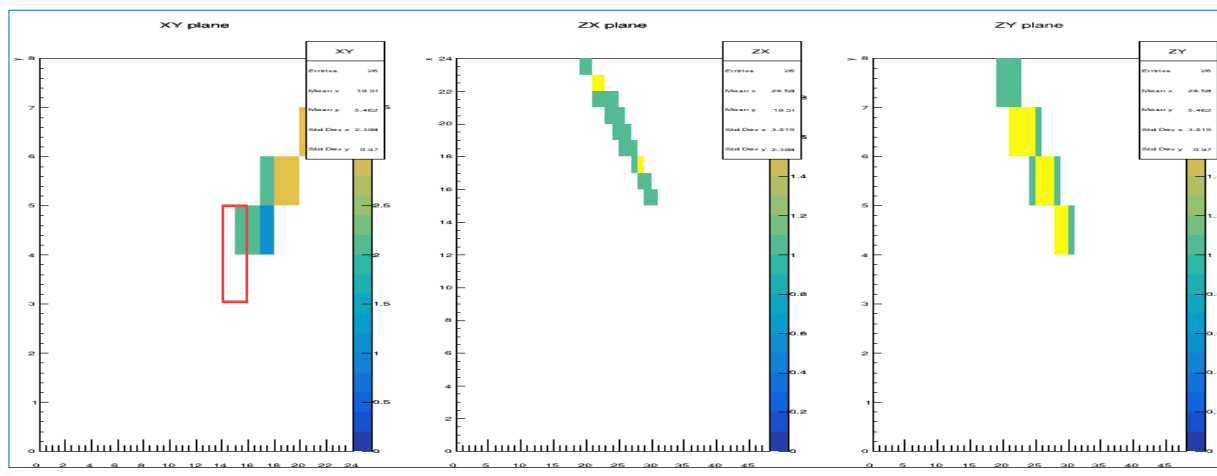










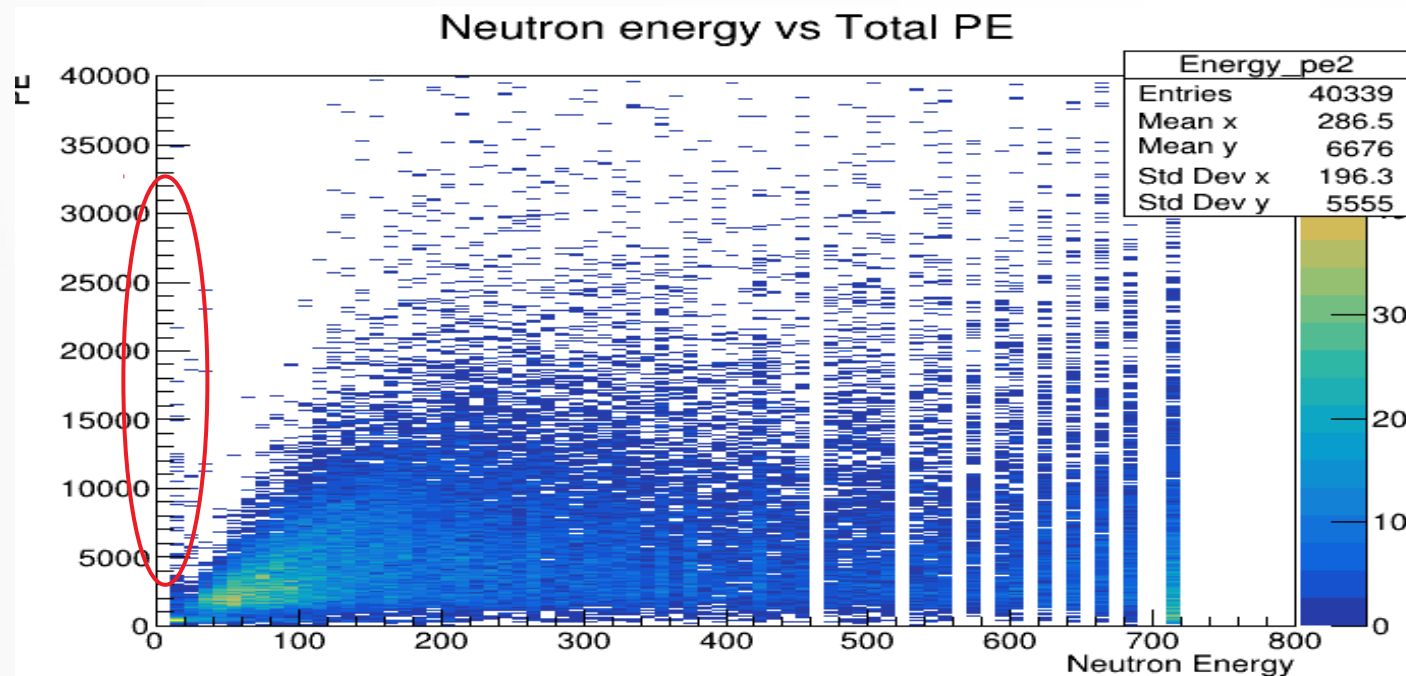


- The remain events are 45% of the low energy with high number voxel selection (55/122)

Low-energy with high PE events

We did the selection like the following:

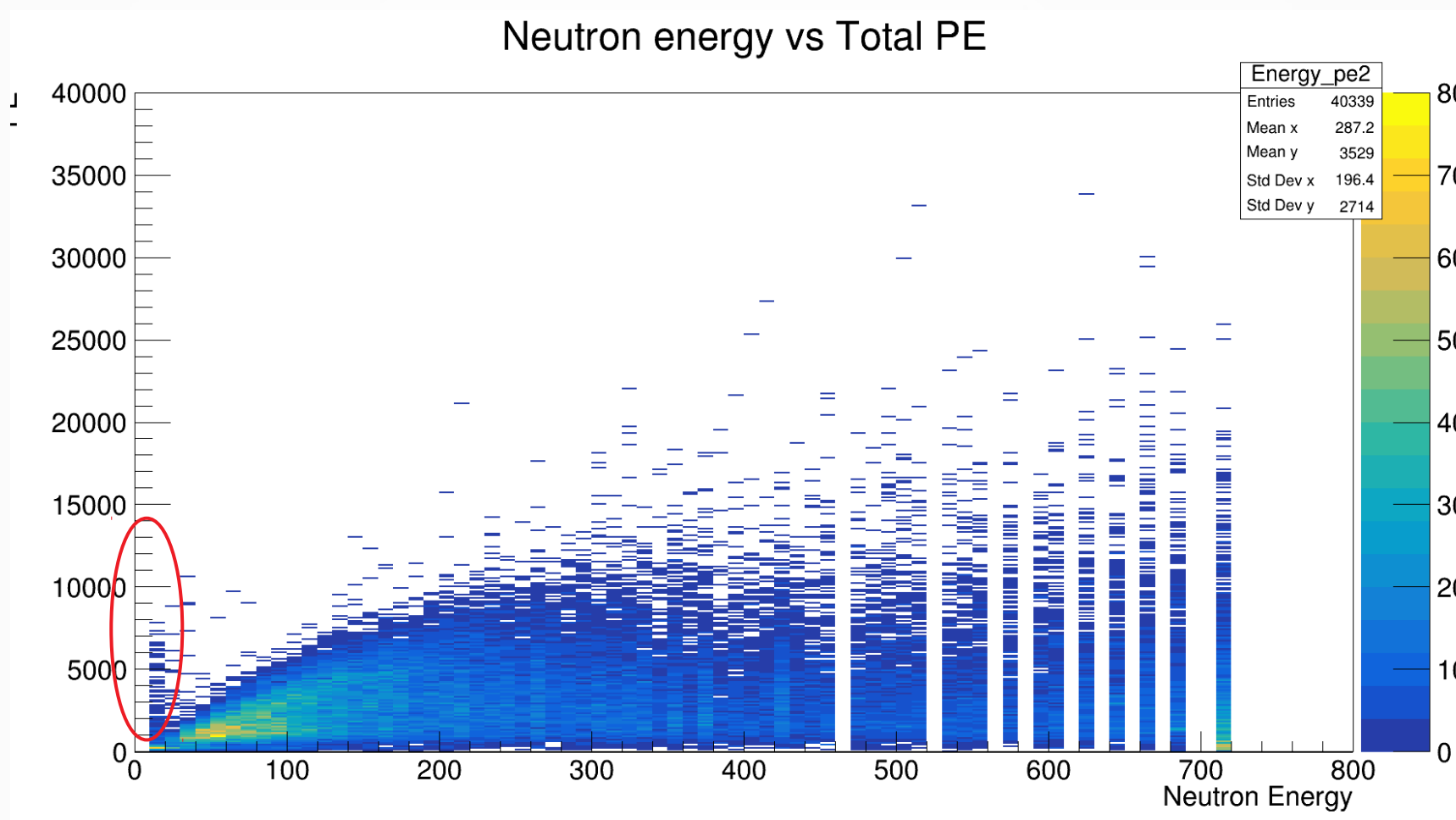
- Hits time : $-326 \text{ ticks} < Dt < 340 \text{ ticks}$ with $1 \text{ tick} = 2.5 \text{ ns}$
- PE cut of the Hits : 10 pe
- Time clustering with single time cluster for each event
- Use hits to make voxels
- Do spatial clustering with single spatial cluster for each event (DB Scan)
- The PE of the voxel is the sum of the PE in 3 plane (XY, XZ and YZ)



Low-energy with high PE events

New PE definition

- We will skip the PE from XY plane to get the PE of the voxel. The PE of each voxel will be the sum of PE from XZ and YZ planes.



Low-energy with high PE events

Conclusion

- There is 3 categories of events in the low energy with high number of voxel:
 - Cosmics
 - Shower-like blob
 - Remain events
- Taking out the XY pe does not contribute significantly to the low energy with high pe events