Reviews of Reconstruction Anomalies

October 28th Update

SuperFGD Prototype Analysis Meeting

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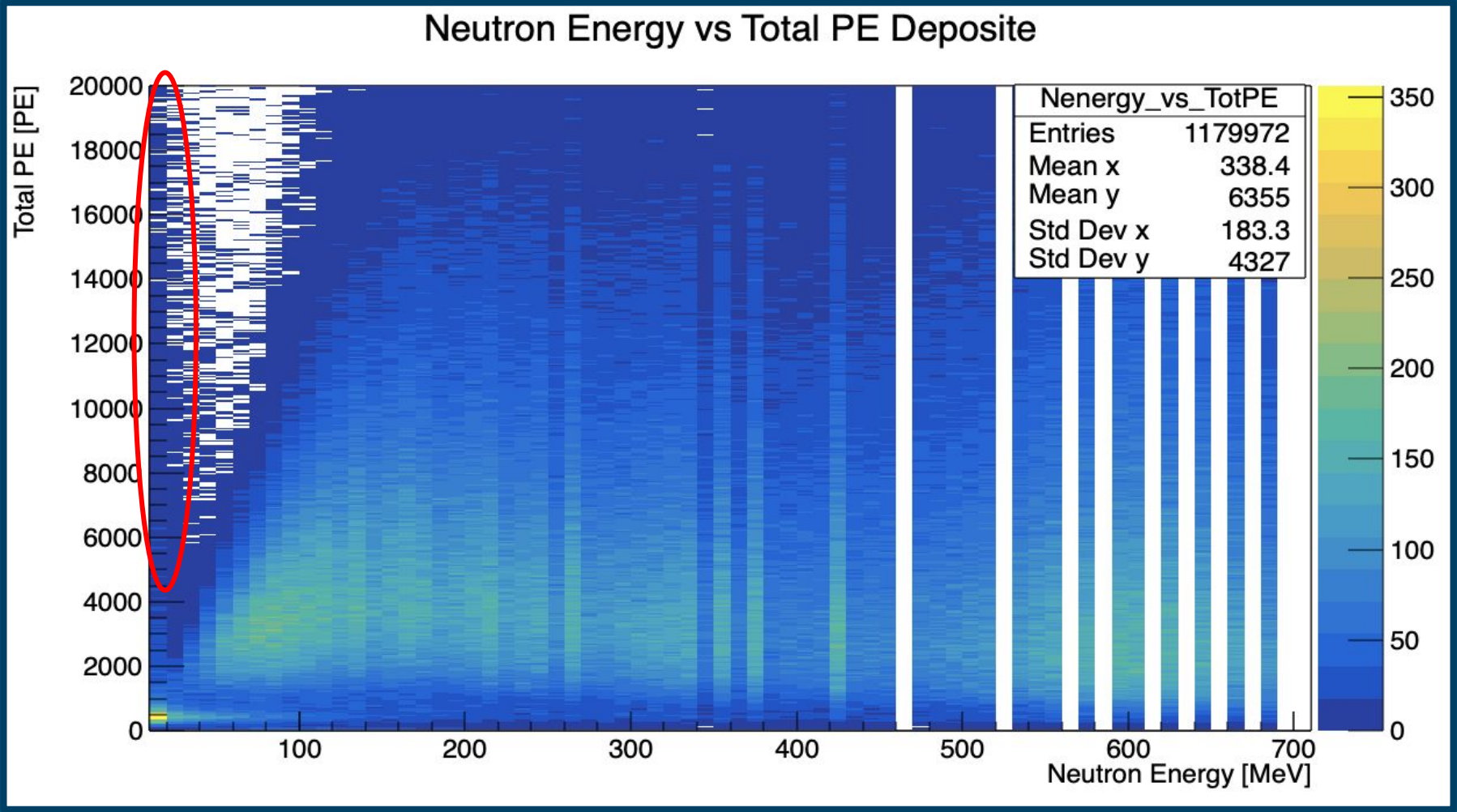
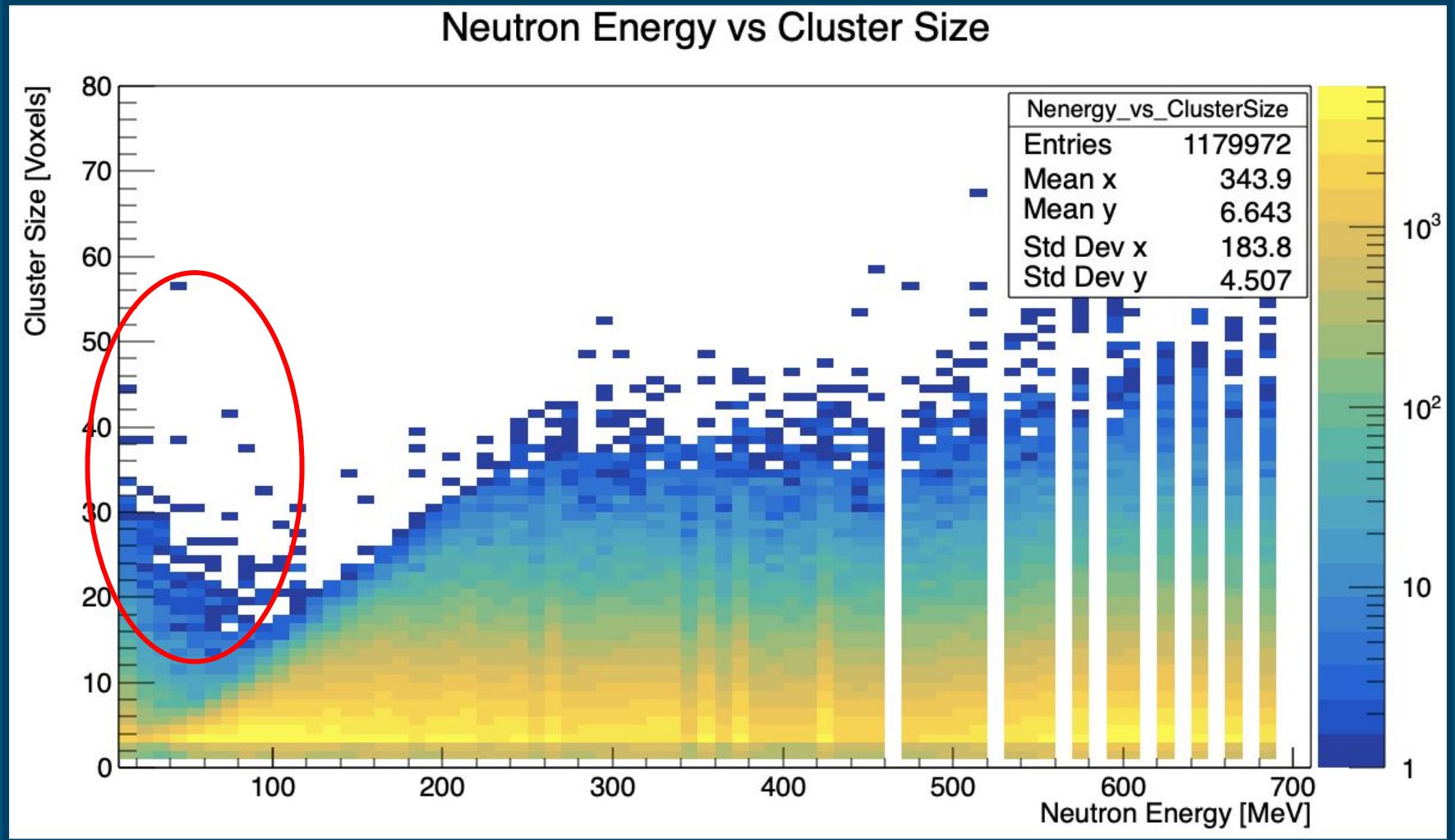
Overview

- Quick Recap
- Different time tick cuts effect on low energy events.
- How linearity cut mimics this effect.
- Low energy and high PE/Voxel events.
    - Relationship and types of events included.

Quick Recap

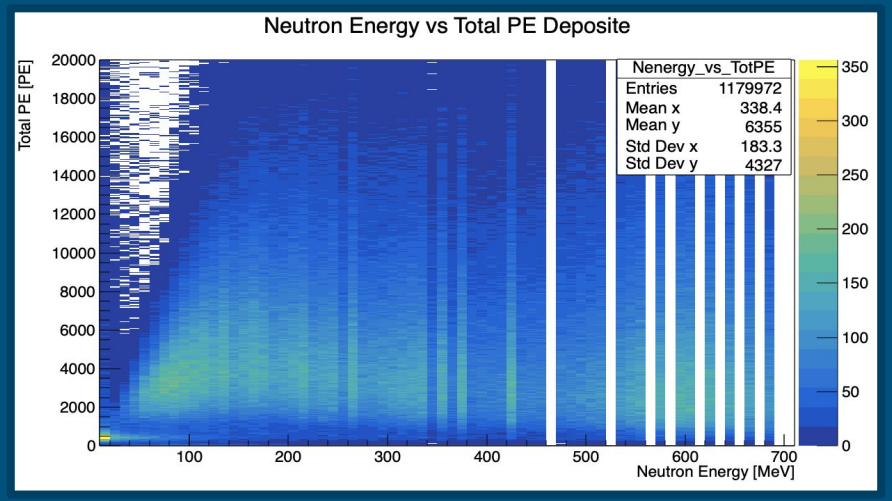

Neutron Energy vs Total PE Deposite
Total PE [PE]
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
100
200
300
400
500
600
700
Neutron Energy [MeV]
Nenergy_vs_TotPE
Entries 1179972
Mean x 338.4
Mean y 6355
Std Dev x 183.3
Std Dev y 4327
350
300
250
200
150
100
50
0

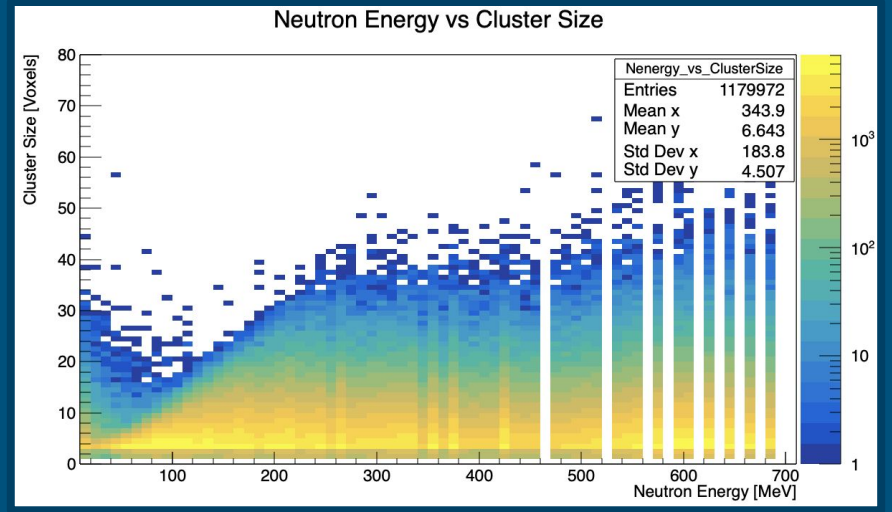

Neutron Energy vs Cluster Size
Nenergy_vs_ClusterSize
Entries 1179972
Mean x 343.9
Mean y 6.643
Std Dev x 183.8
Std Dev y 4.507
Cluster Size [Voxels]
Neutron Energy [MeV]
0
10
20
30
40
50
60
70
80
100
200
300
400
500
600
700
1
10
10^2
10^3

Plot Specifications

- Time Tick Cut of 1 tick or 2.5 ns
- Voxel PE cut of 50 PE
- Neutron Energy vs Cluster Size is Log scale

These become important to note when comparing to future plots





Different Time Tick Cuts Effect on Low Energy Events

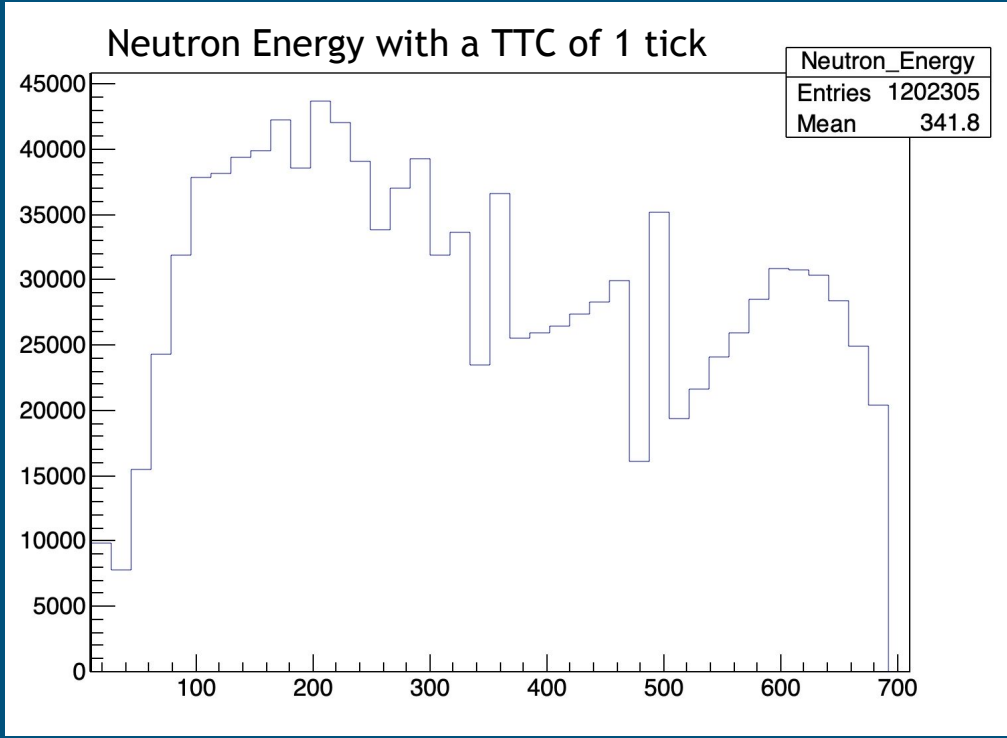
Time Tick Cut and Energy

Done

- 5 PE cut on Hits
  - If MP has < 3 hits cut
- Time Clustering
- Voxelization
  - 20 Voxel PE Cut
  - If SubEvent < 2 voxels cut
- Spatial Clustering

Not Done

- Linearity Cut
- Track Fitting
- Vertex Finding



Time Tick Cut and Energy

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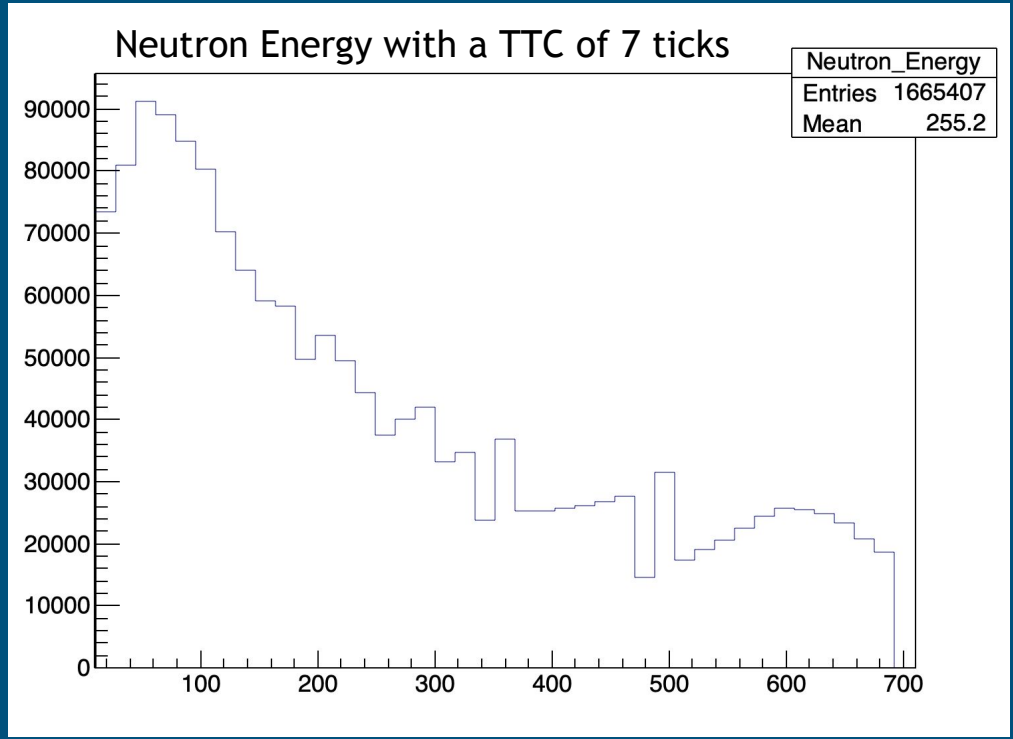
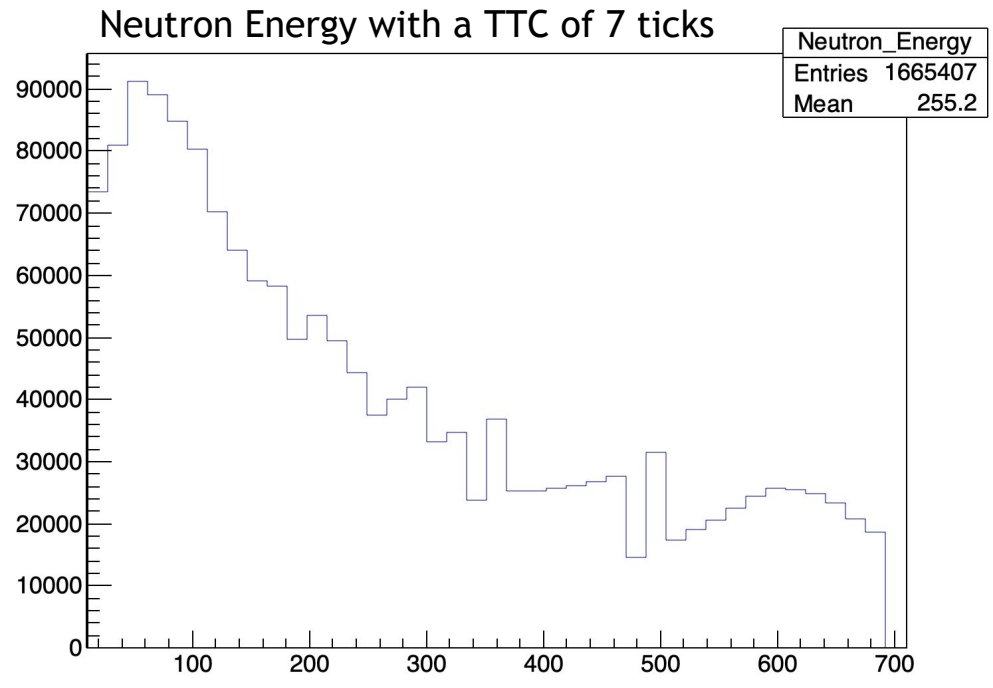
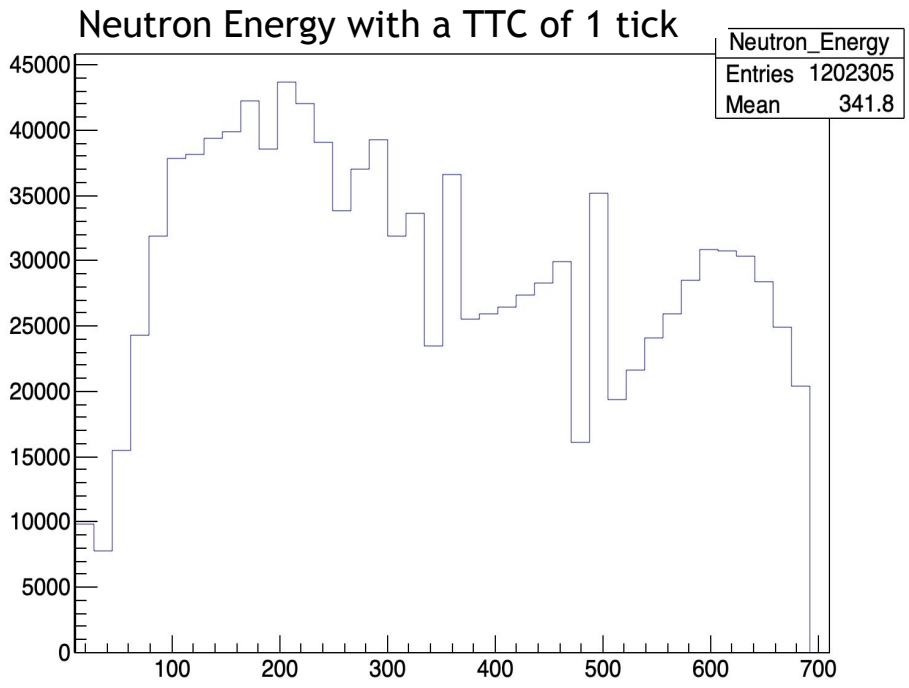


Time Tick Cut and Energy

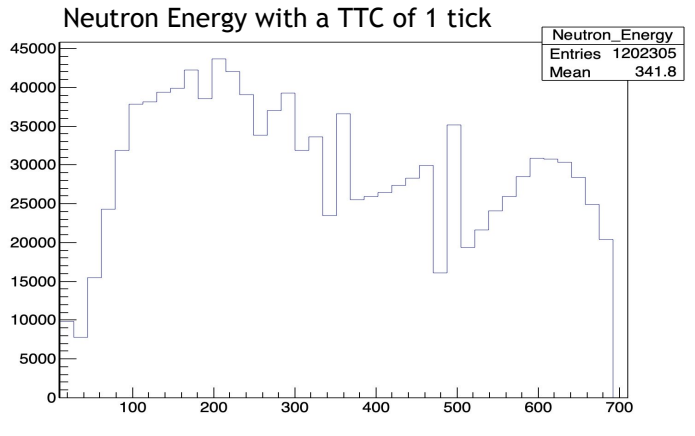


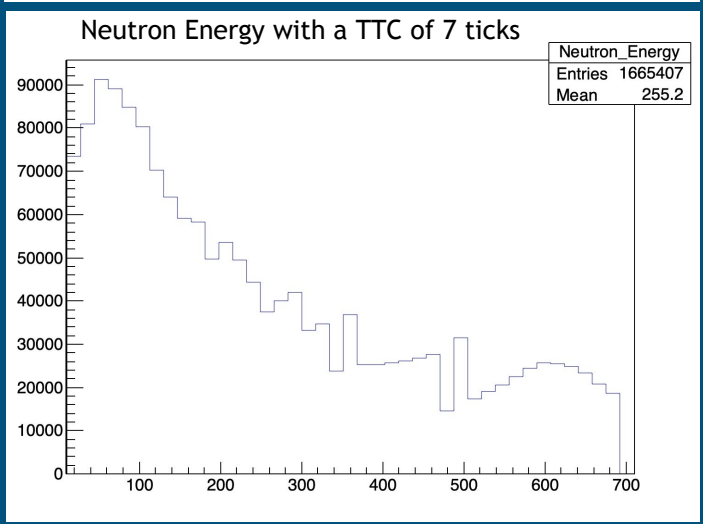


Time Tick Cut and Energy

From a data set of 3.6 billion events

- 899,326 events are selected with a TTC of 1 tick
- 1,563,180 events are selected with a TTC of 7 ticks

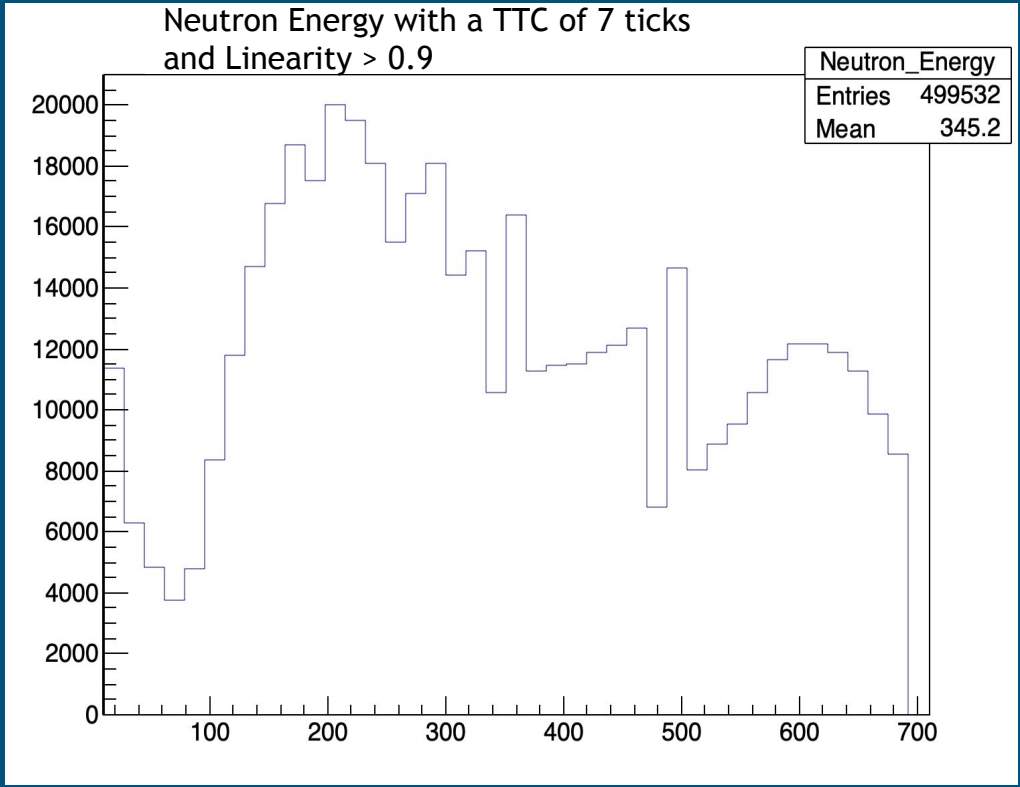




Linearity and Energy

How did we not see TTC's effect before?

A linearity cut of > 0.9 also removes low energy events and mimics this effect.



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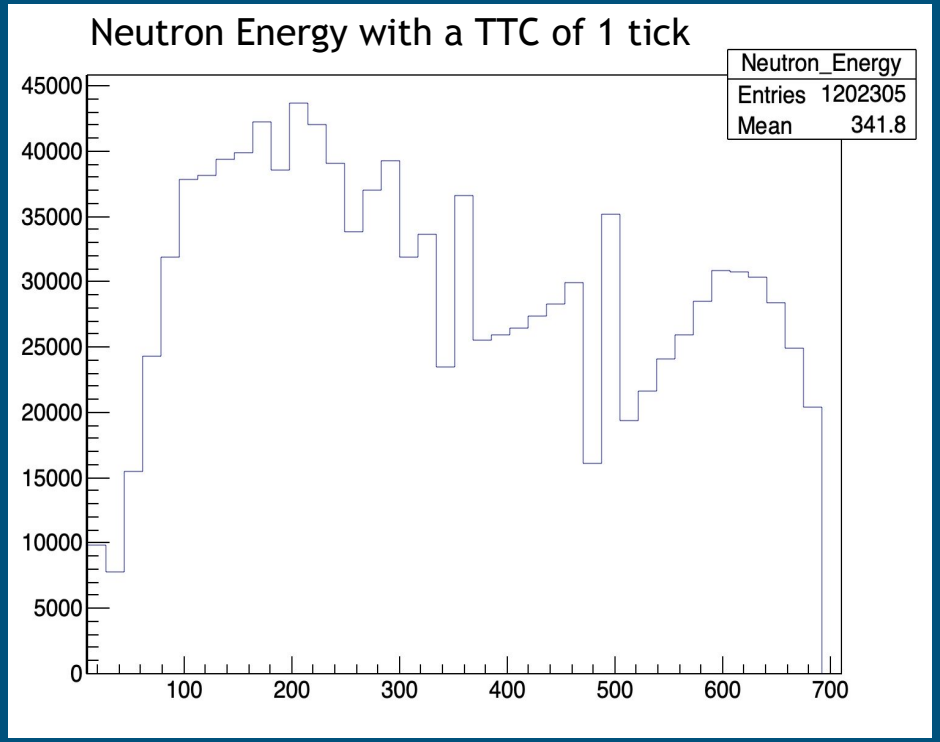
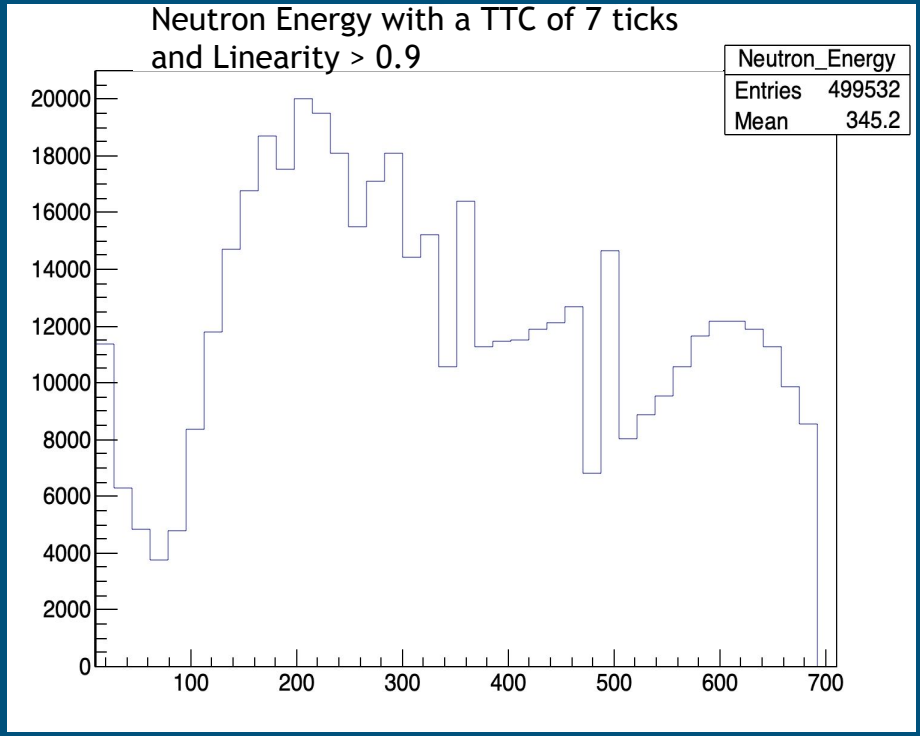
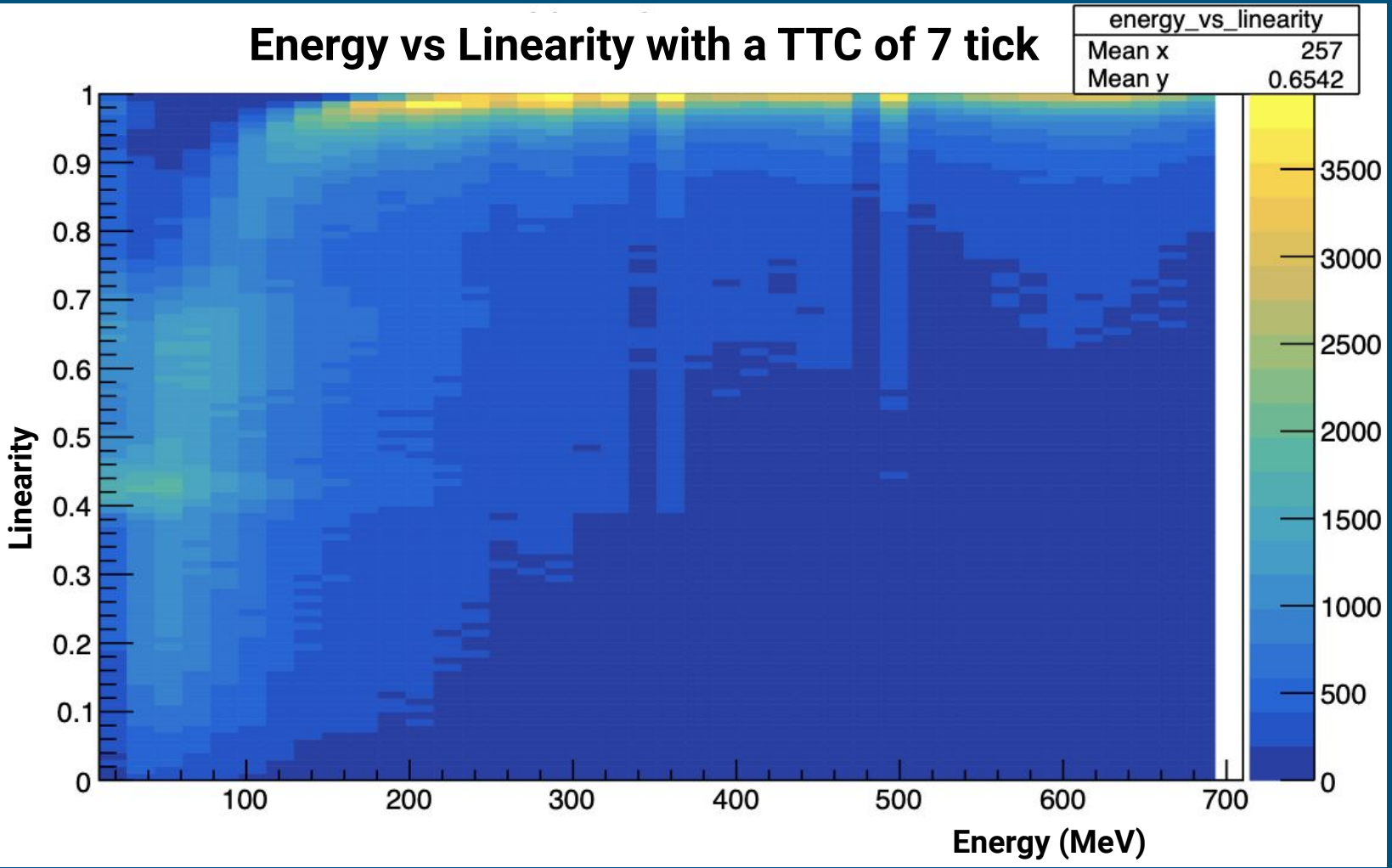
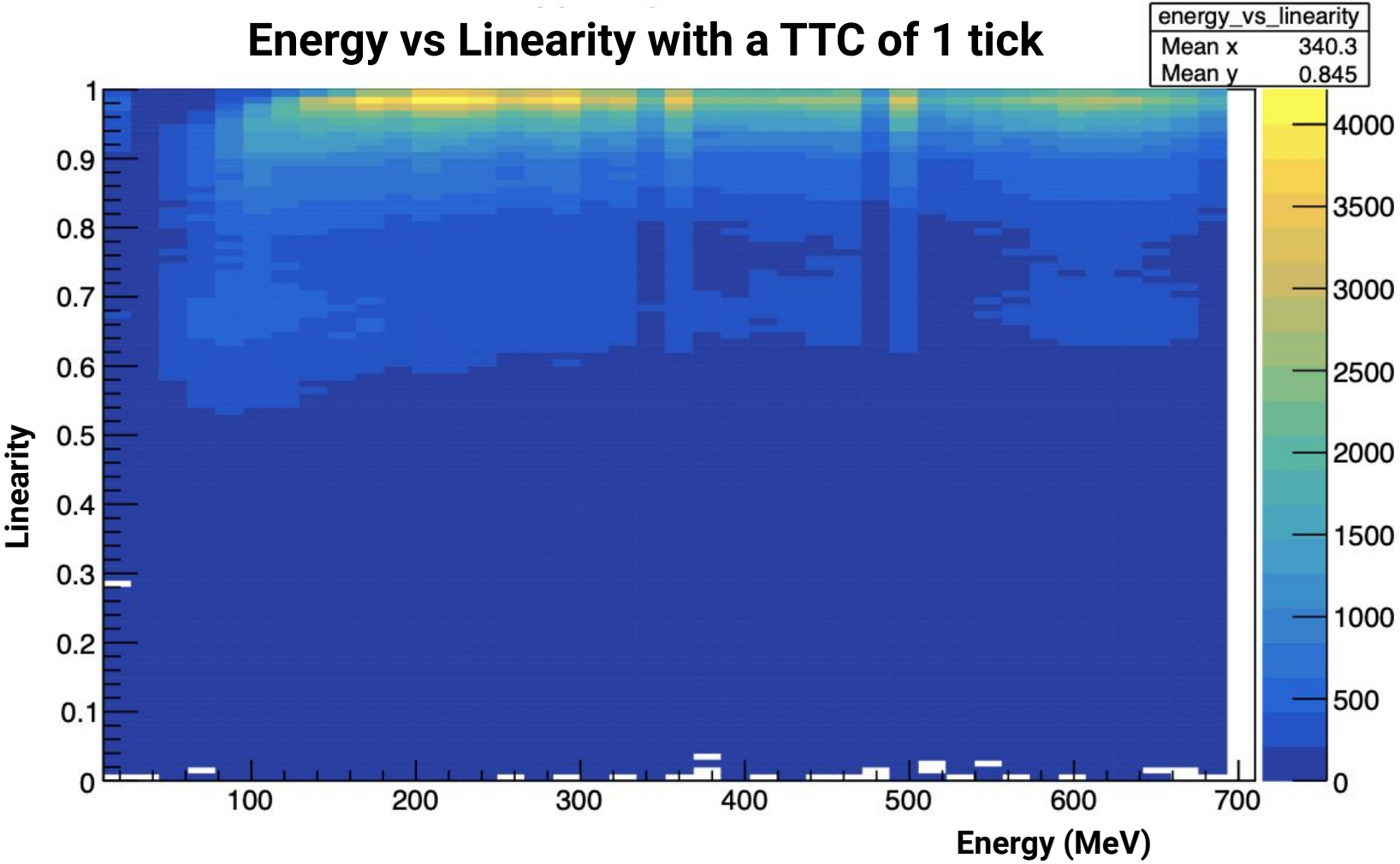




Energy vs Linearity with a TTC of 7 tick



Energy vs Linearity with a TTC of 1 tick

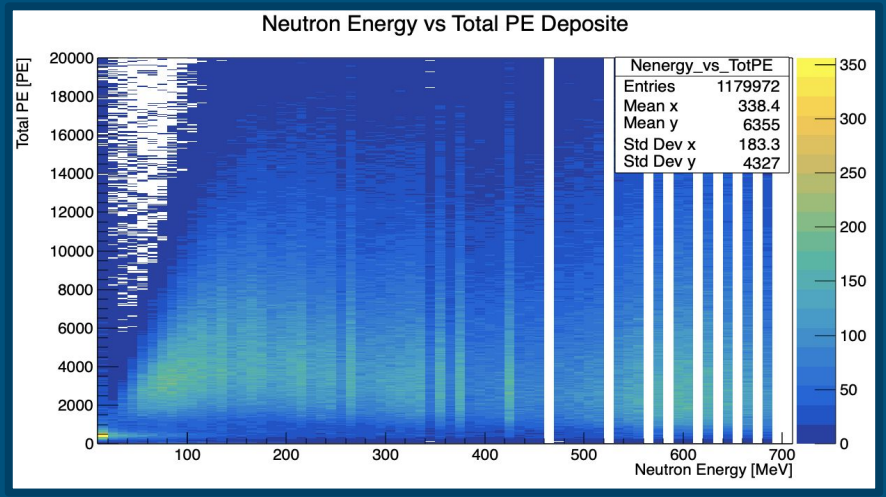


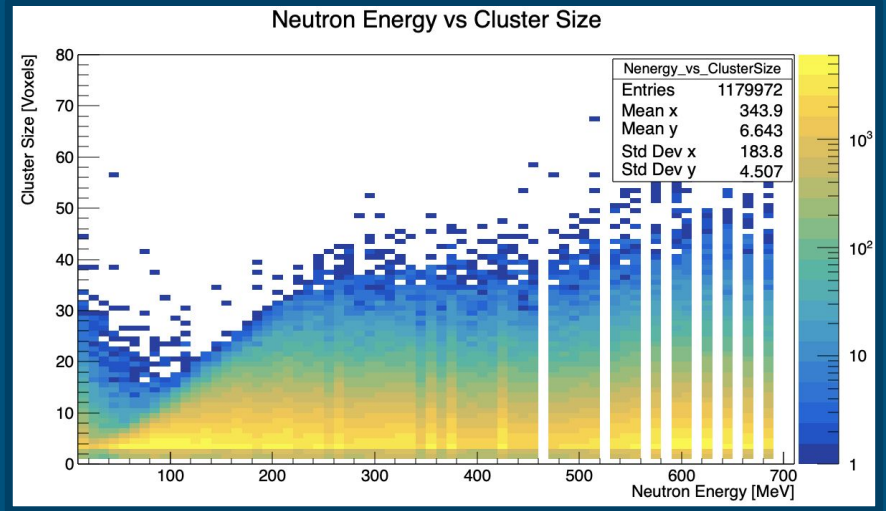
Low Energy and High PE/Voxel Events

Plot Specifications

- Time Tick Cut of 1 tick or 2.5 ns
- Voxel PE cut of 50 PE
- Neutron Energy vs Cluster Size is Log scale

*Because we are planning to use a TTC of 7 ticks we should look at a different set of events

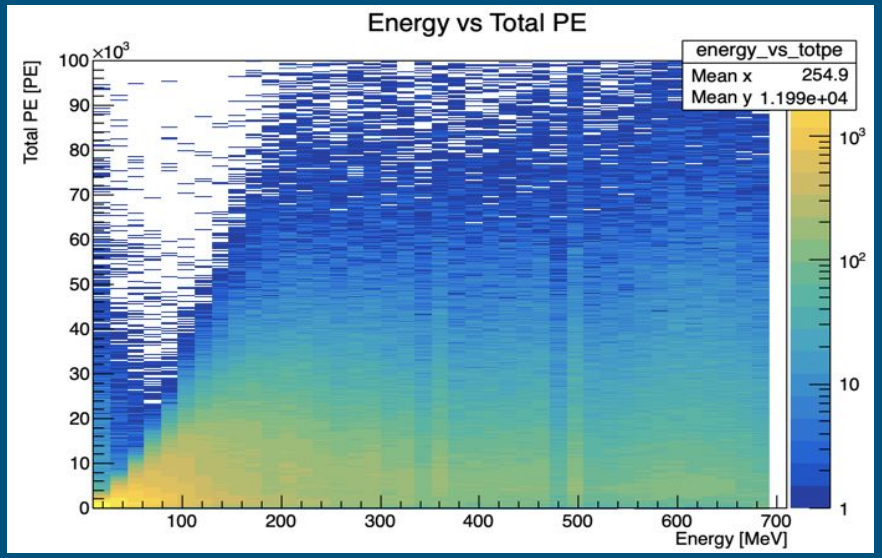


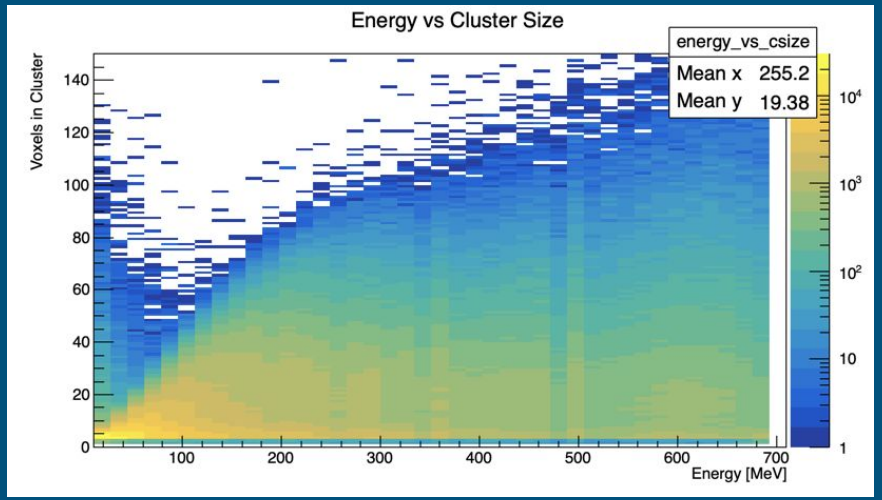


Plot Specifications

- Time Tick Cut of 7 tick or 2.5 ns
- Voxel PE cut of 20 PE
- Log scale

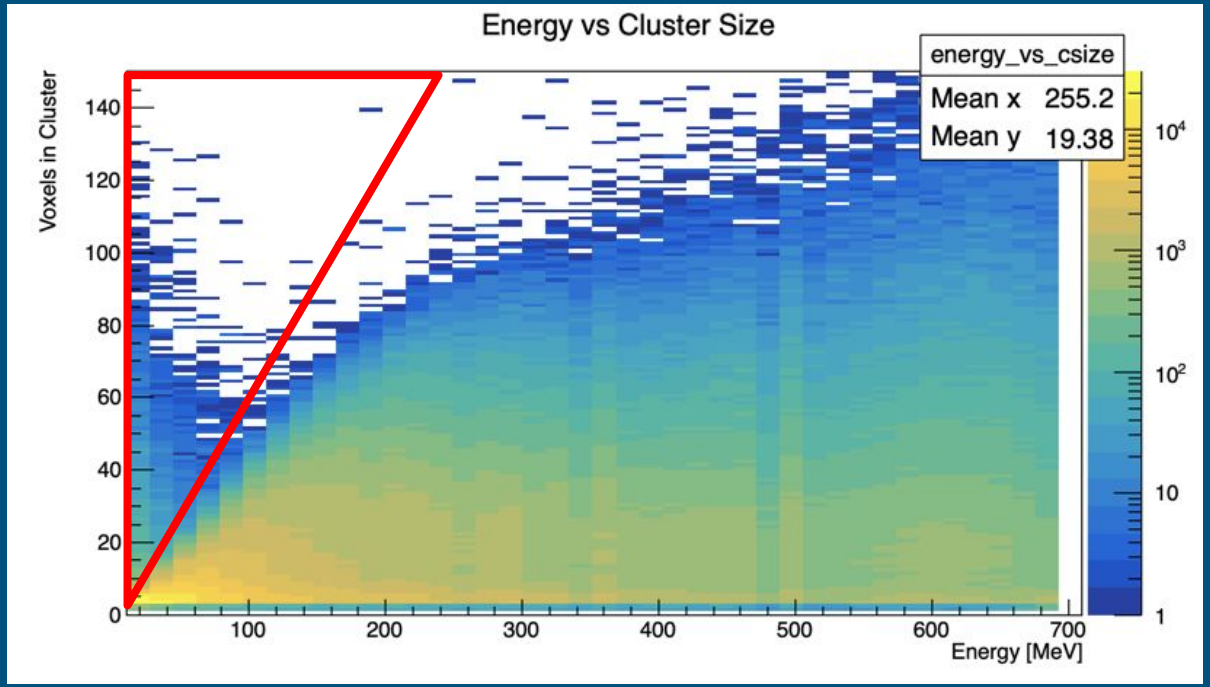
*Notice the y-axis has dramatically increased range due to the increase events





Are High PE and High Voxel Events Related

- Compare the two variables
  - ➢ This gave somewhat unclear results
- Do a cut on one set of events and see if the other set is also completely removed
- We can do a 2d cut to remove this portion of events



- Do a cut on one set of events and see if the other set is also completely removed

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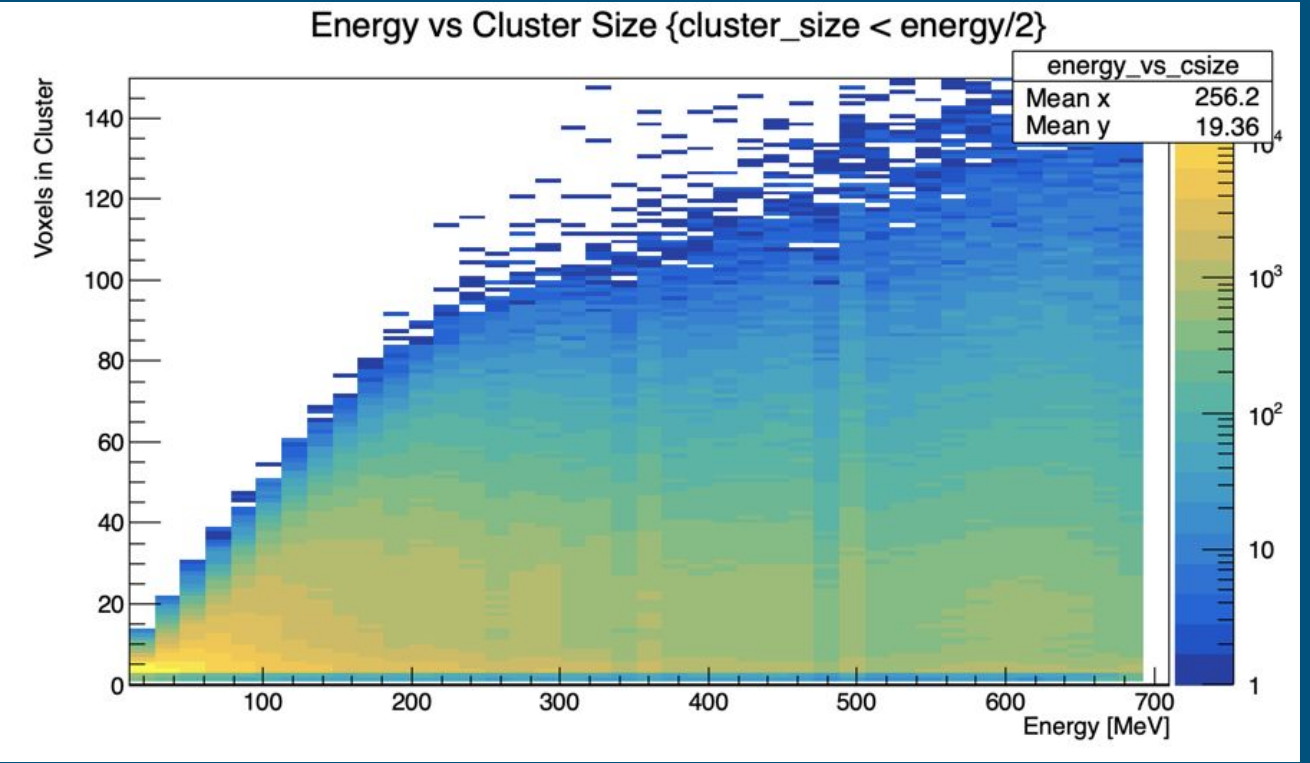
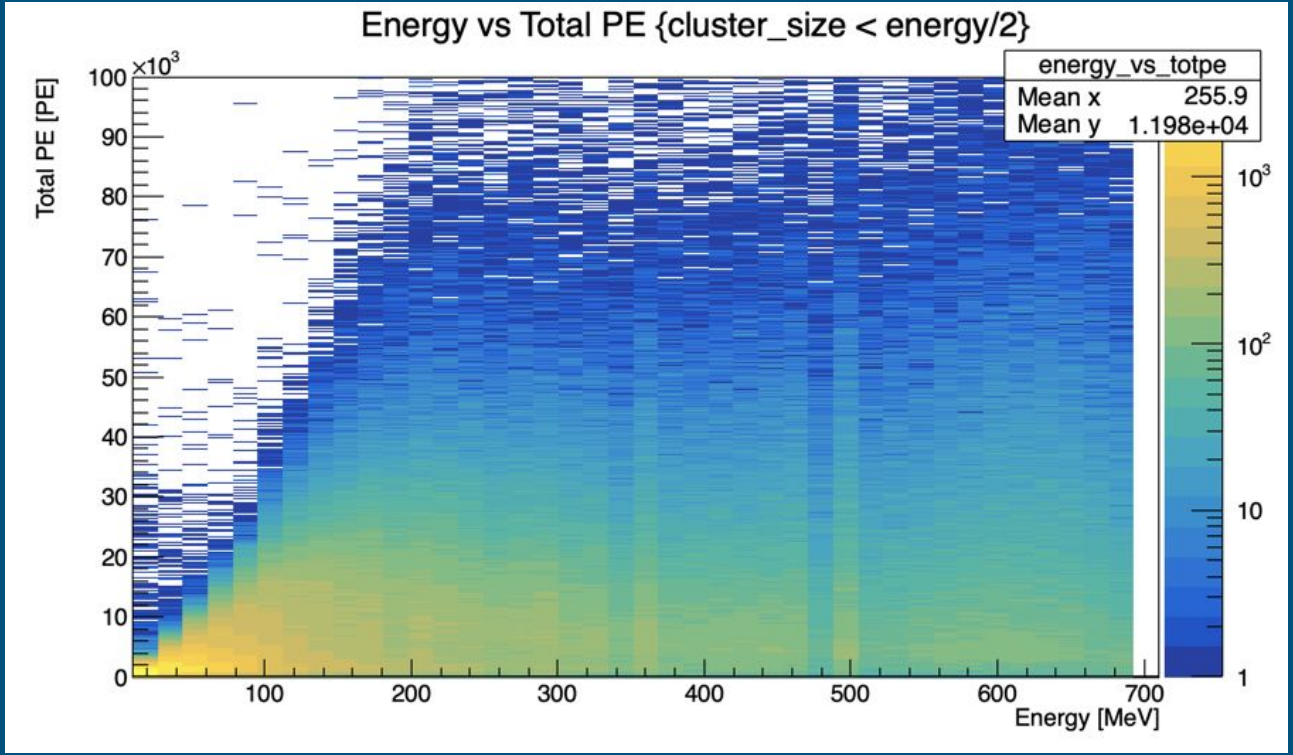
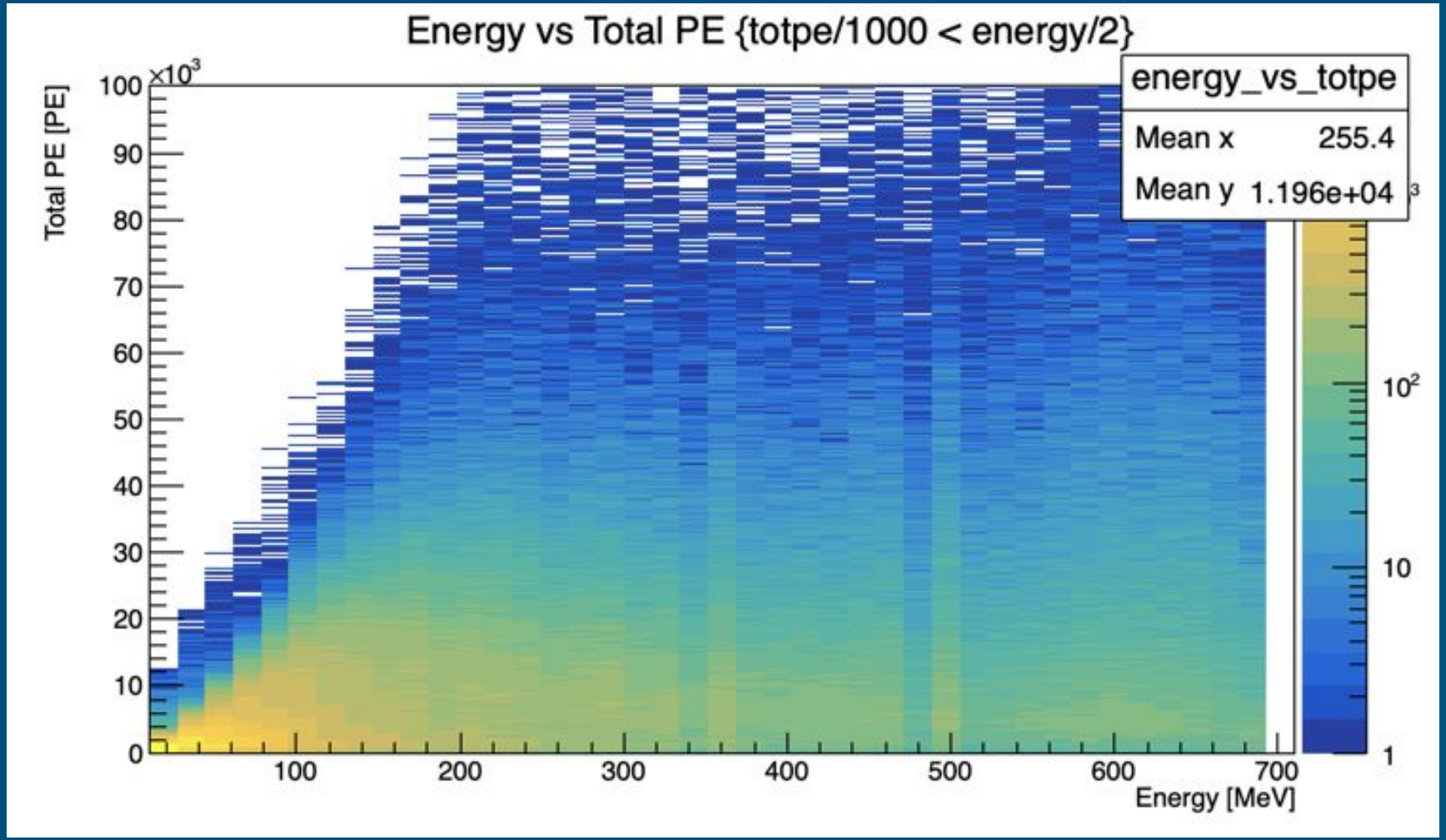
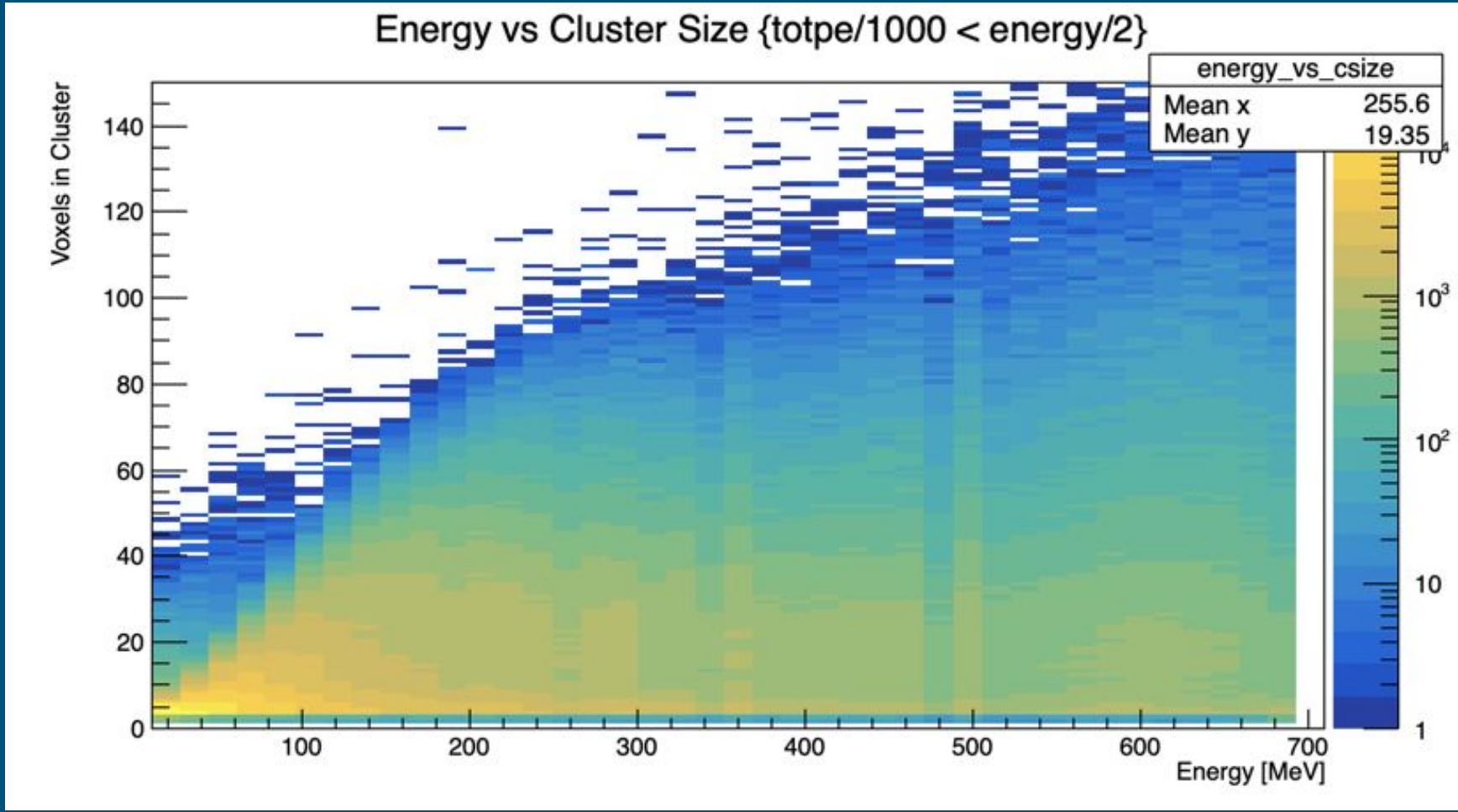


Are High PE and High Voxel Events Related

- Clearly a large portion are related, but not all the events that are low energy and (high cluster size) are (high PE)



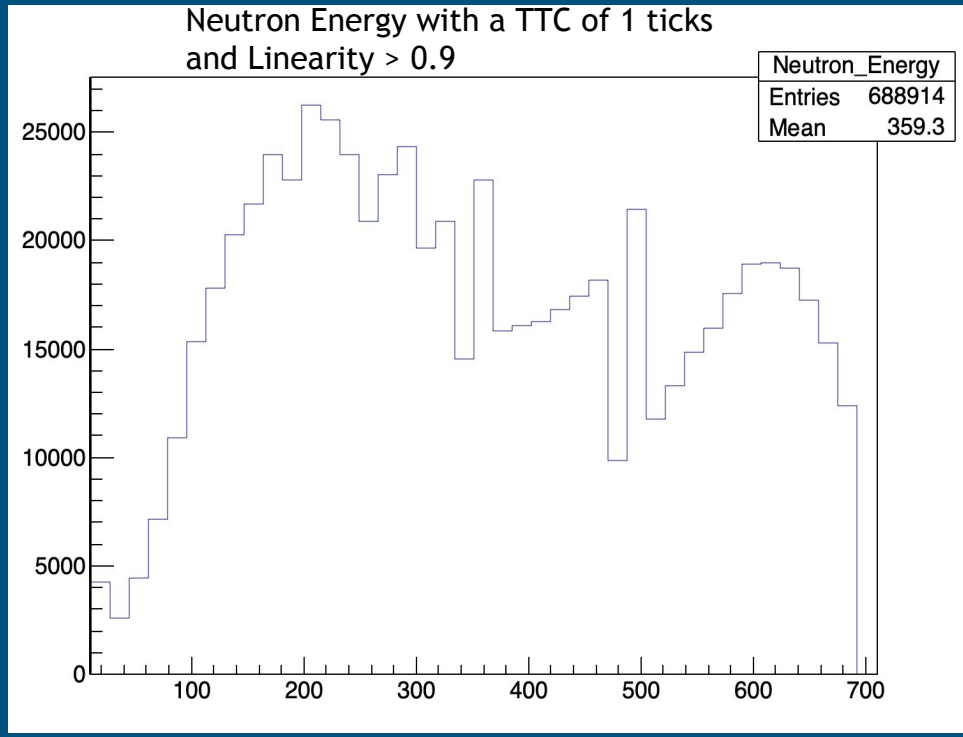

Energy vs Total PE {totpe/1000 < energy/2}
energy_vs_totpe
Mean x 255.4
Mean y 1.196e+04
Total PE [PE]
×10³
100
90
80
70
60
50
40
30
20
10
0
100
200
300
400
500
600
700
Energy [MeV]
10²
10
1

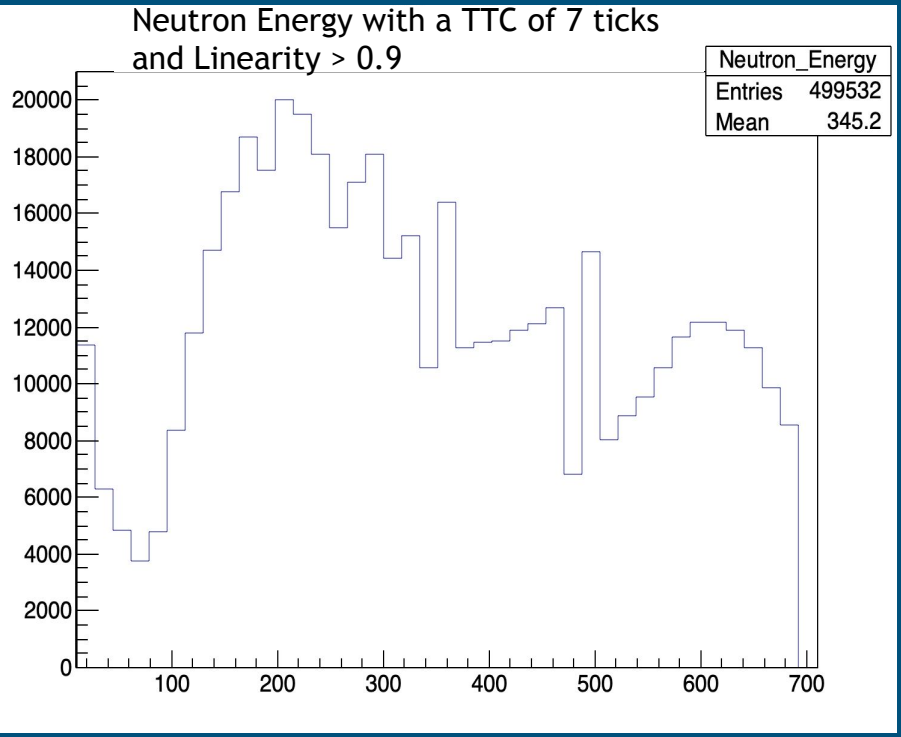

Energy vs Cluster Size {totpe/1000 < energy/2}
energy_vs_csize
Mean x 255.6
Mean y 19.35
Voxels in Cluster
0
20
40
60
80
100
120
140
100
200
300
400
500
600
700
Energy [MeV]
1
10
10^2
10^3

Summary

1. Time Tick Cut of 1 tick is removing many low energy low linearity events.
2. There are a large number of low energy low linearity events, many of which would get removed by a linearity cut.
3. The low energy and high voxel events are related to low energy and high PE events, but are not the same set of events.

Backup


Neutron Energy with a TTC of 1 ticks
and Linearity > 0.9
Neutron_Energy
Entries 688914
Mean 359.3
25000
20000
15000
10000
5000
0
100
200
300
400
500
600
700


Neutron Energy with a TTC of 7 ticks
and Linearity > 0.9
Neutron_Energy
Entries 499532
Mean 345.2
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
100
200
300
400
500
600
700