DBSCAN efficiency study (Part 1)

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LArSoft Meeting

05/13/10

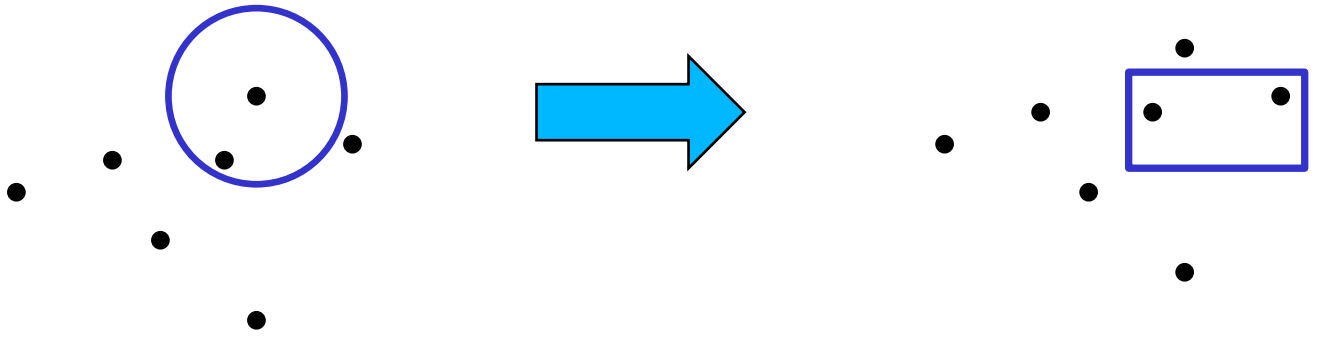
Purpose

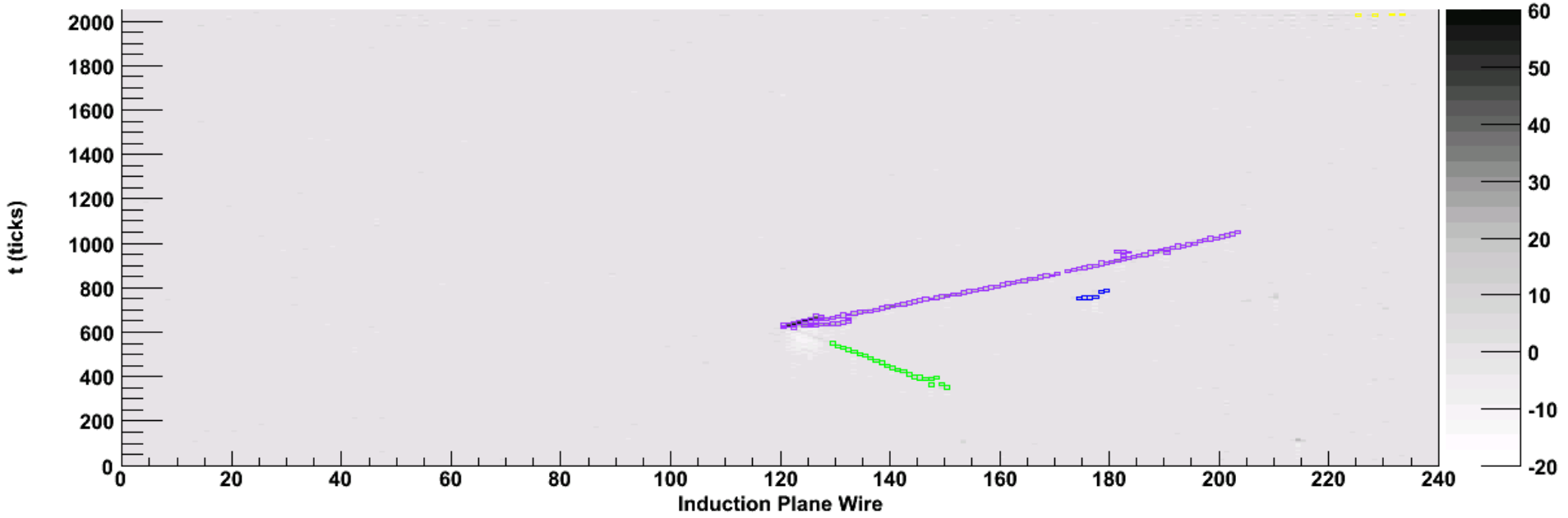
- Determine the best parameters for DBSCAN

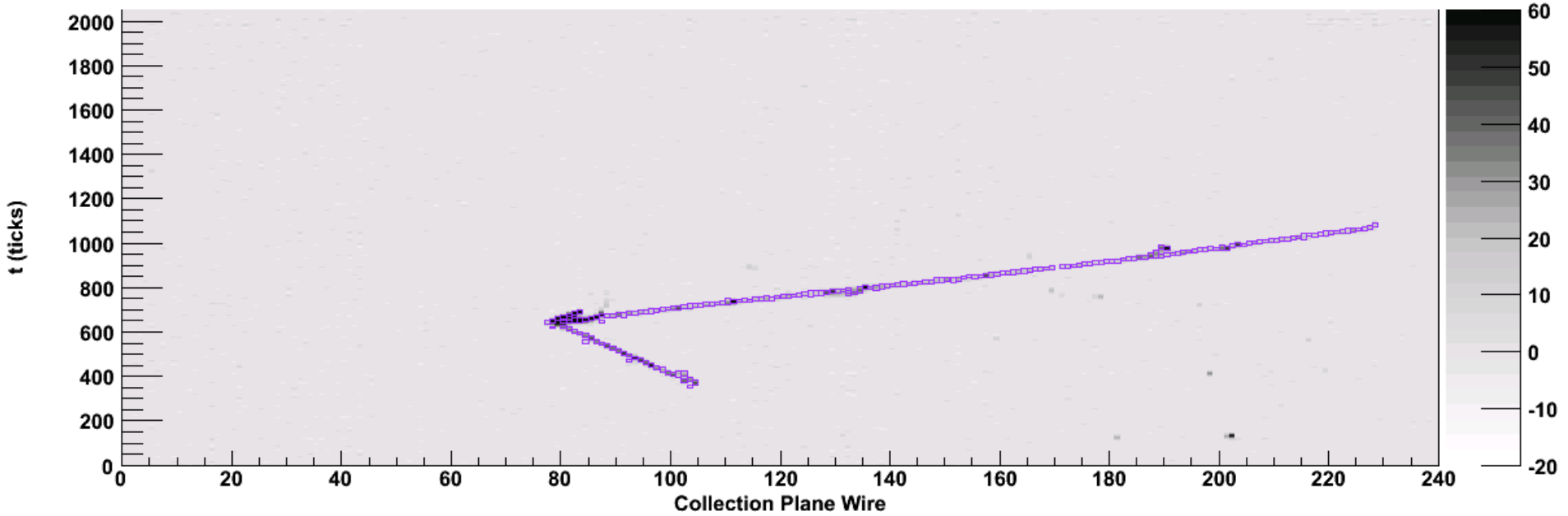
  -best distance function

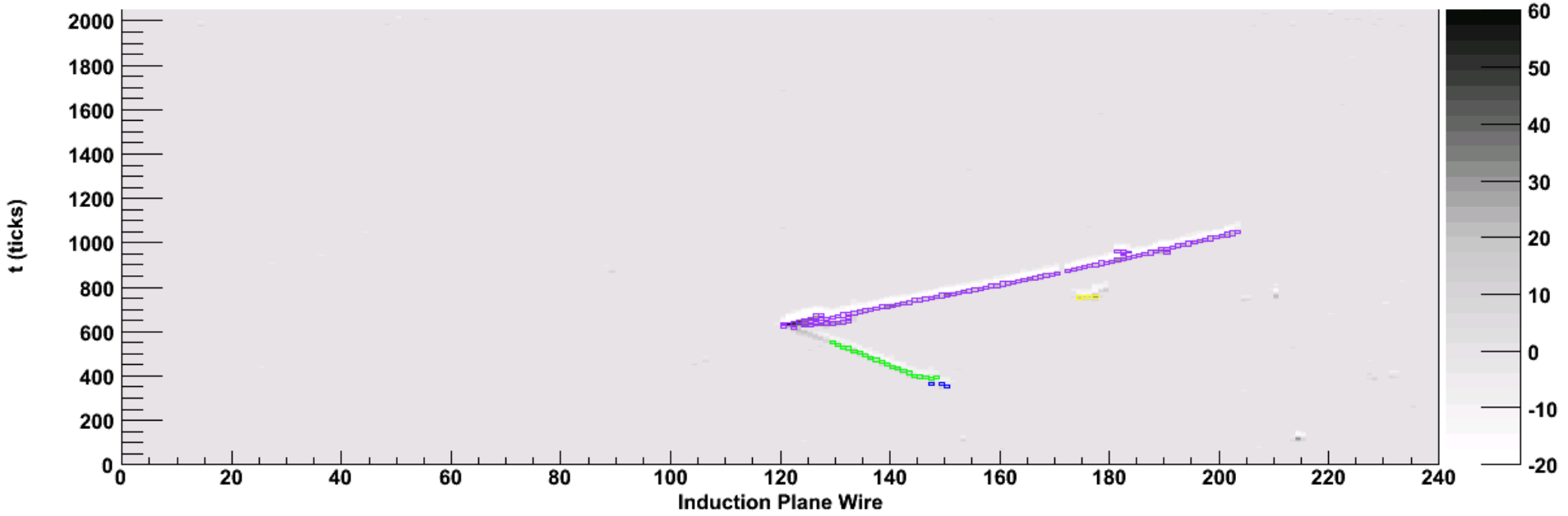
Eps & MinPts

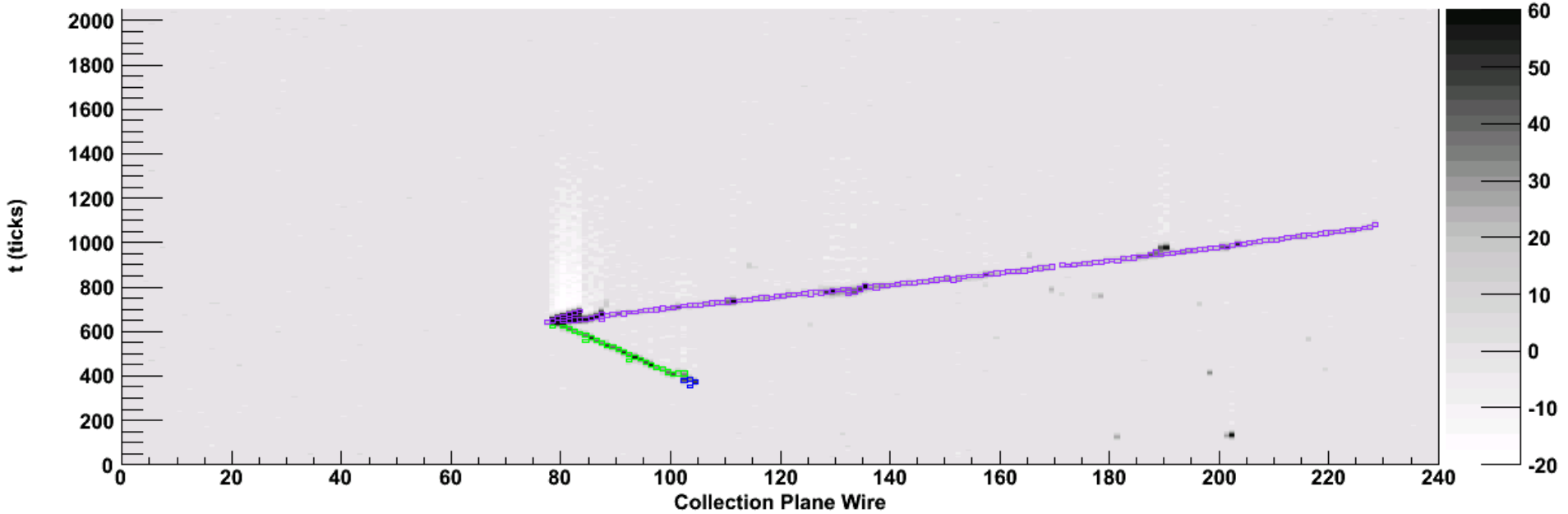
Eps & Eps2 & MinPts




t (ticks)
Induction Plane Wire
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
20
40
60
80
100
120
140
160
180
200
220
240
60
50
40
30
20
10
0
-10
-20


t (ticks)
Collection Plane Wire
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
20
40
60
80
100
120
140
160
180
200
220
240
60
50
40
30
20
10
0
-10
-20

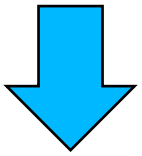

t (ticks)
Induction Plane Wire
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
20
40
60
80
100
120
140
160
180
200
220
240
60
50
40
30
20
10
0
-10
-20


t (ticks)
Collection Plane Wire
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
20
40
60
80
100
120
140
160
180
200
220
240
60
50
40
30
20
10
0
-10
-20

- Answer: what eps, eps2 & MinPts do we need in order to:

  - have the least number of different particles in each cluster

  - don’t lose too much energy

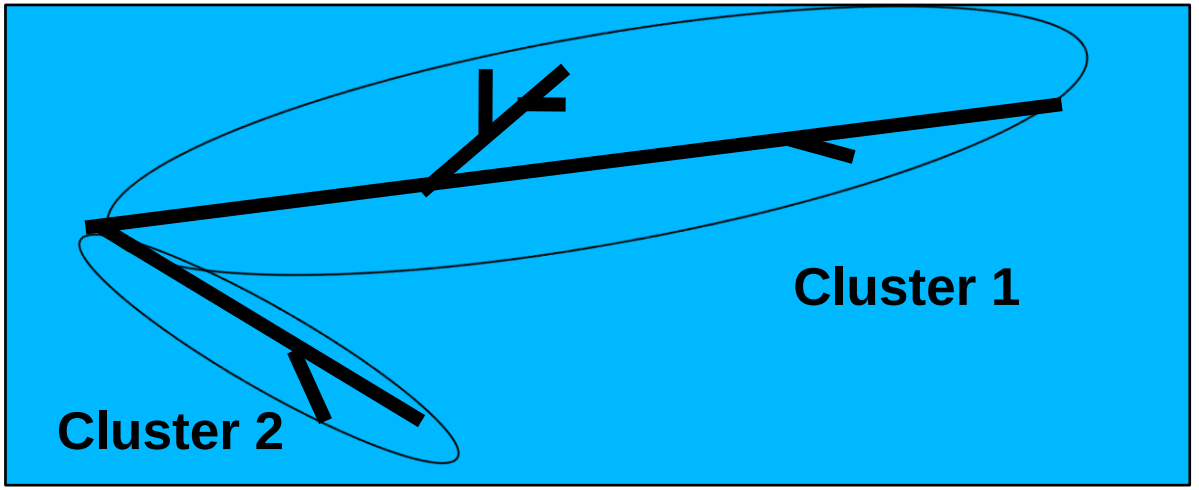


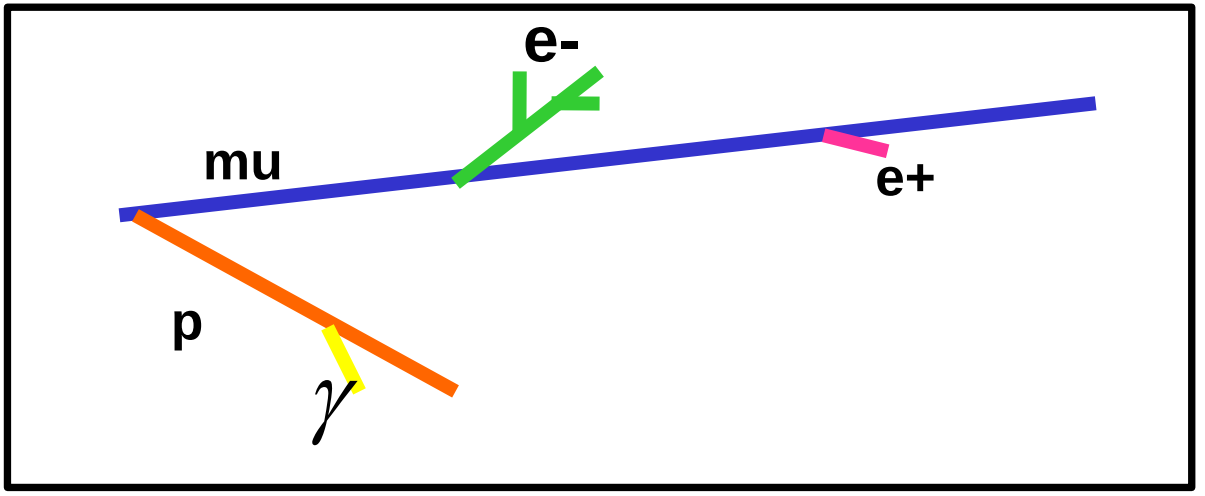
Find good balance

- Check how well it works for different particles (mu,pi+,pi-,p0,p….)

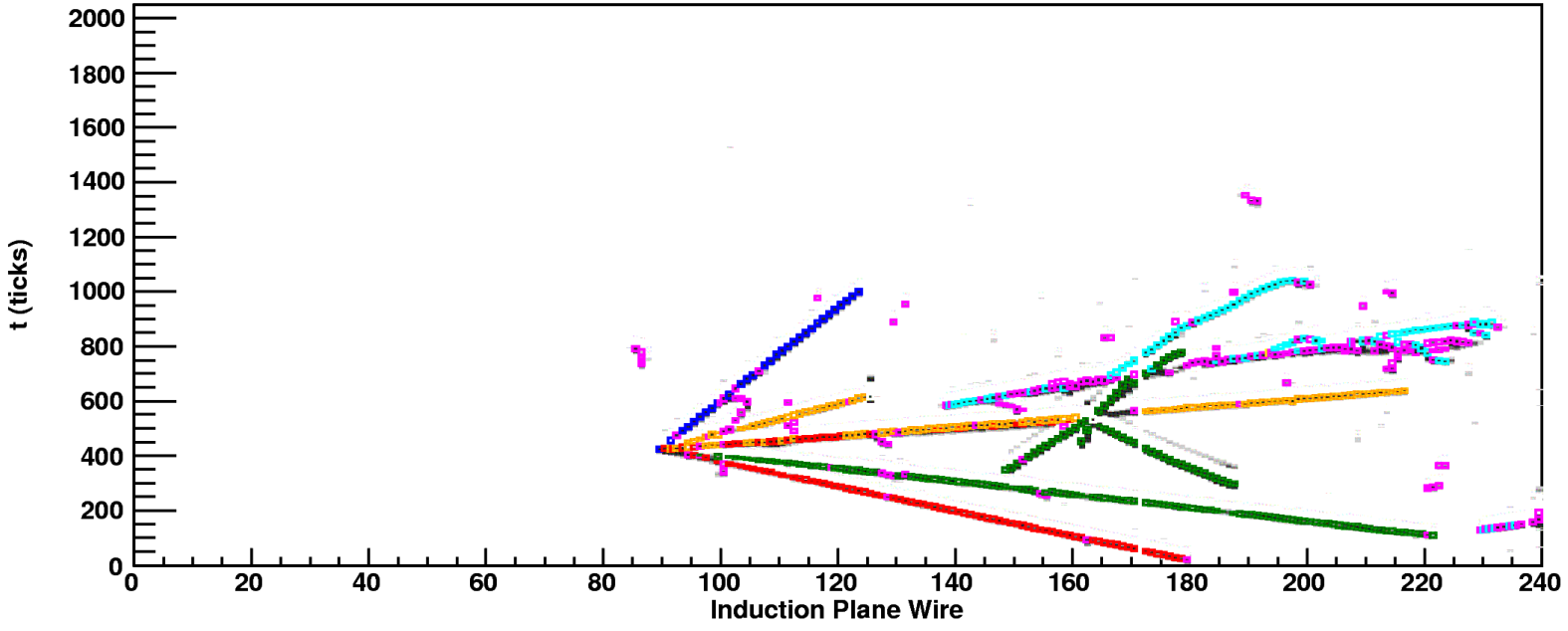
BackTracking the Simulation

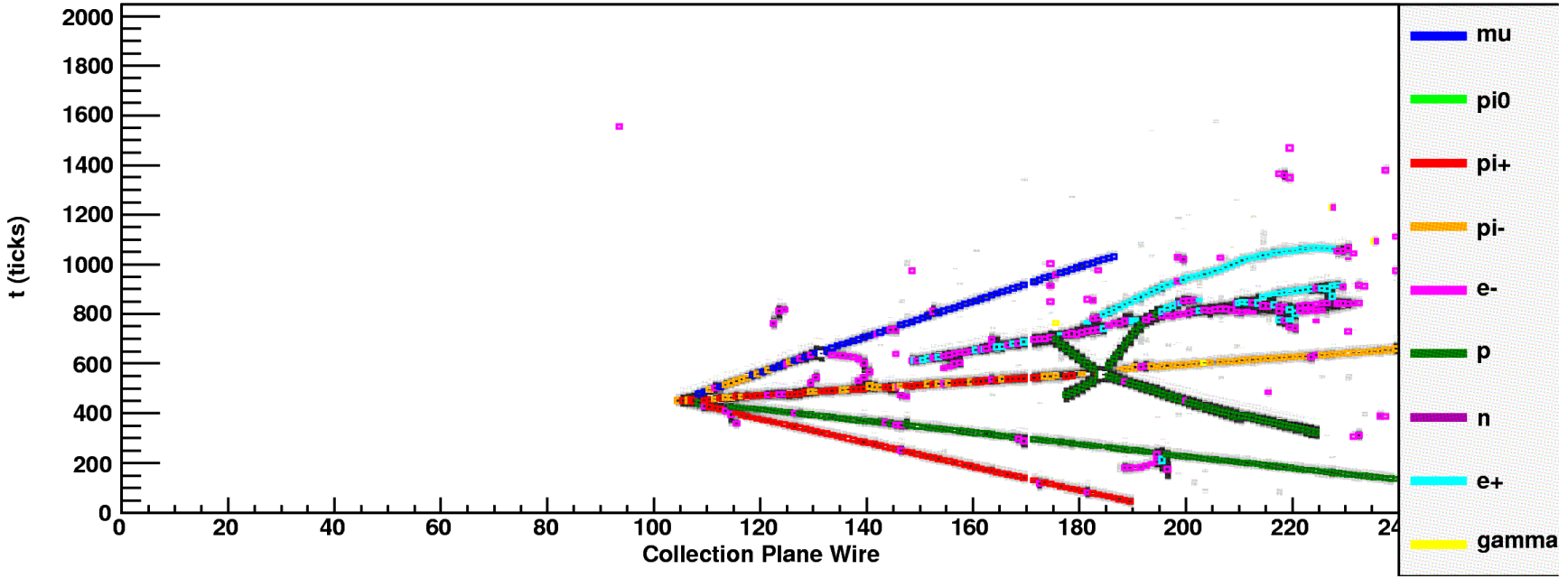
- Load clusters
- Hit-> Digit->Electrons-> Voxels-> Particles



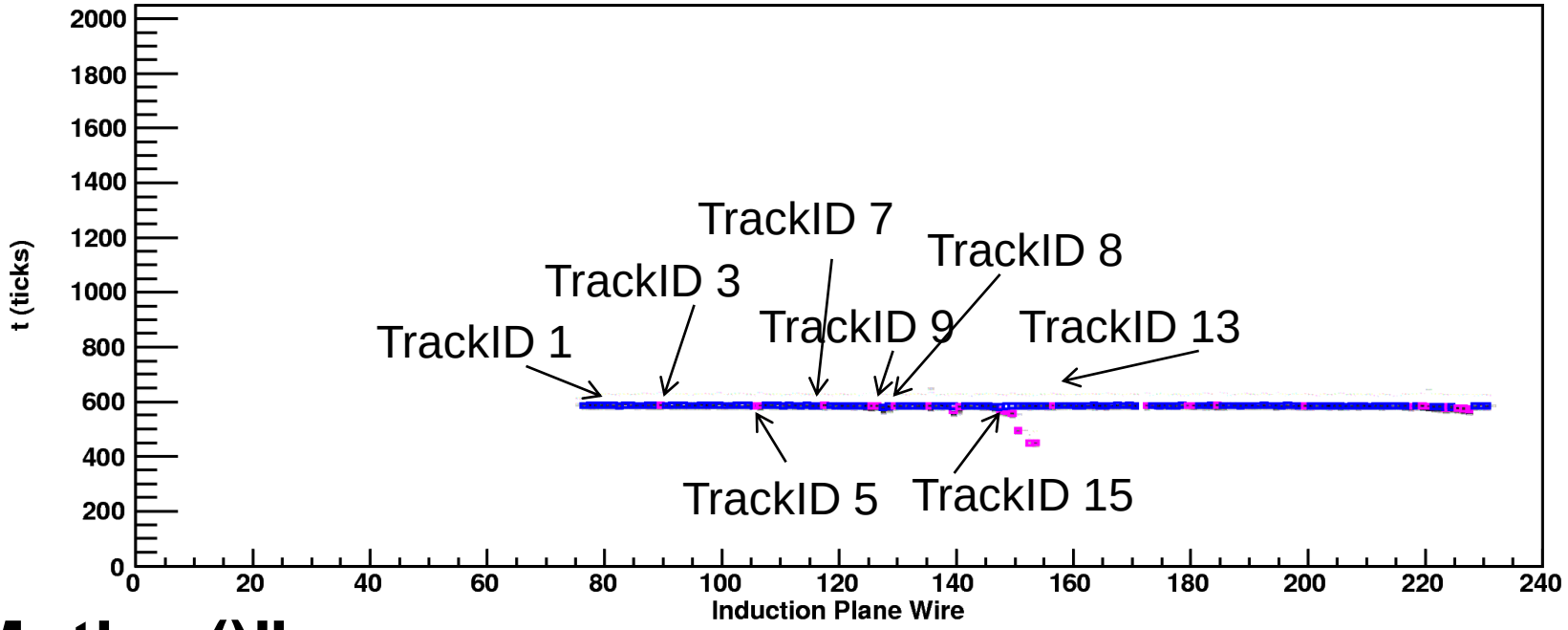


PdgHit

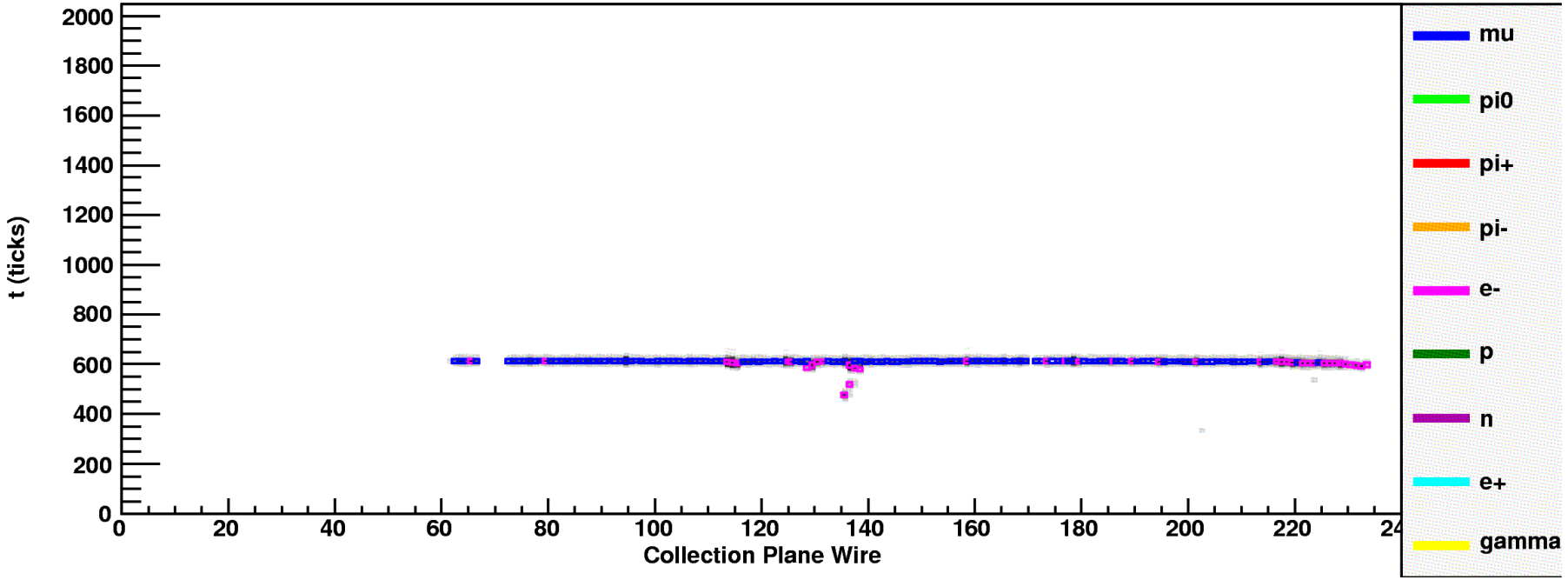

t (ticks)
Induction Plane Wire


t (ticks)
Collection Plane Wire
mu
pi0
pi+
pi-
e-
p
n
e+
gamma

PdgHit: MC muon

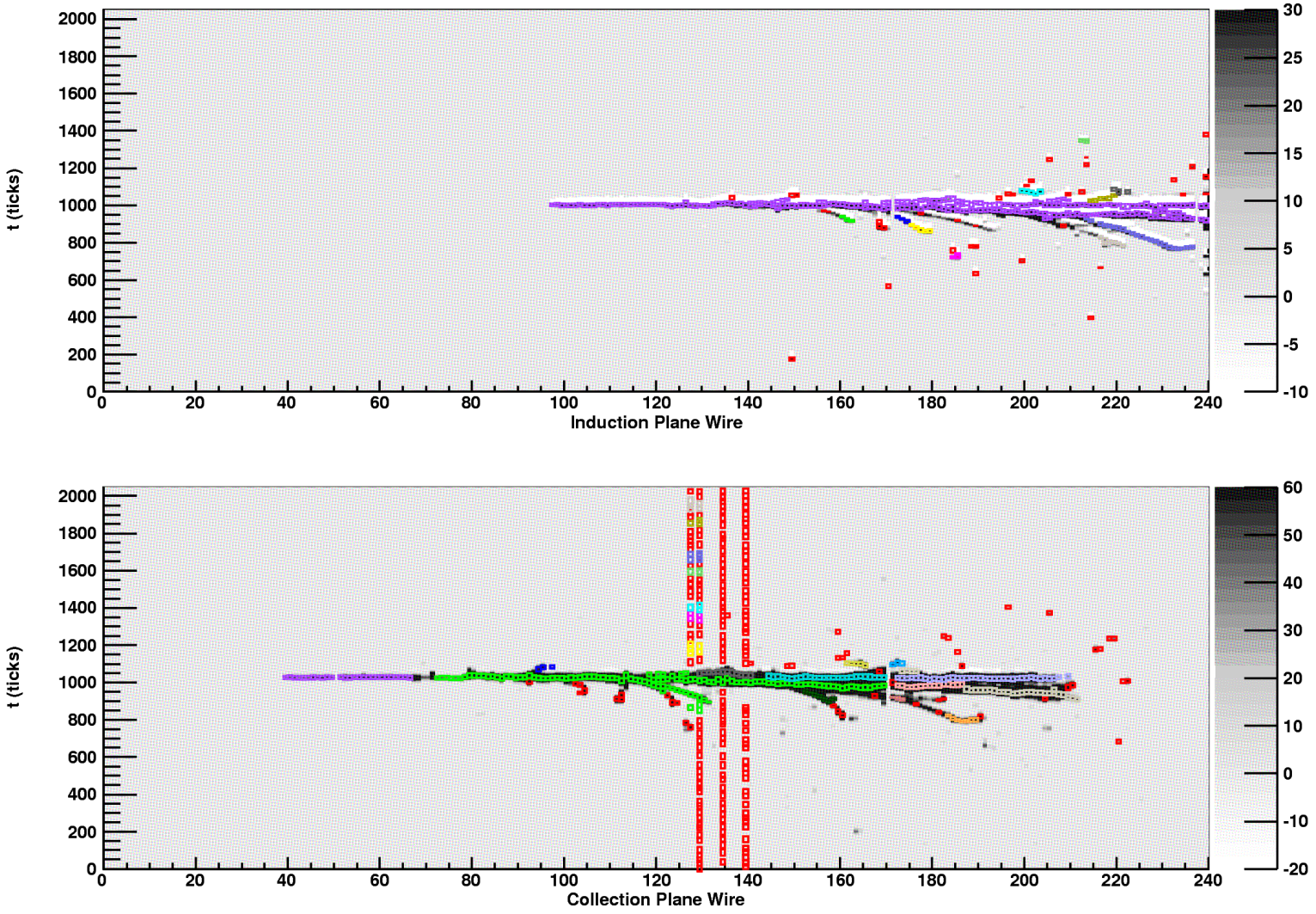


Use “Mother()”

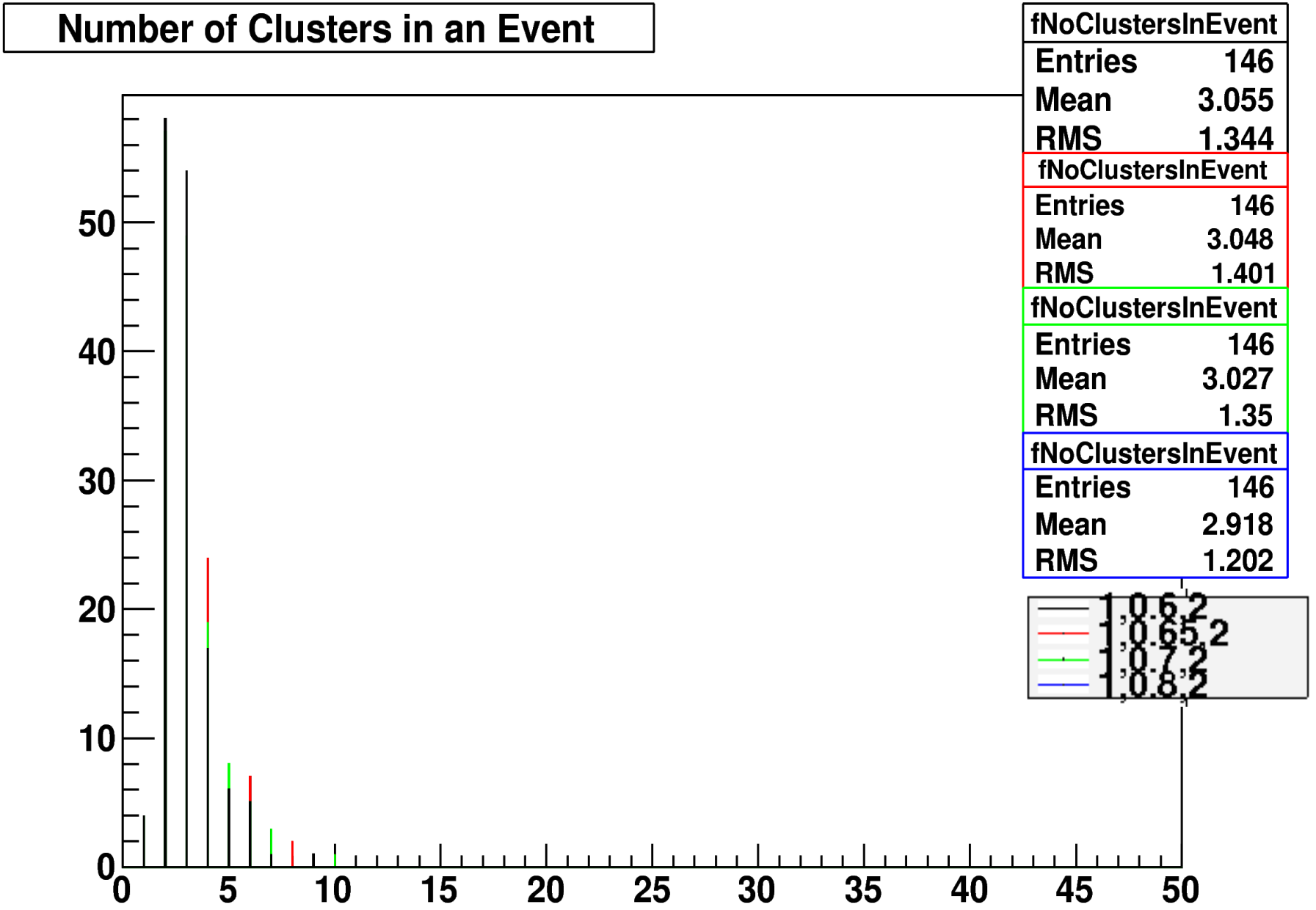


Analysis as of today

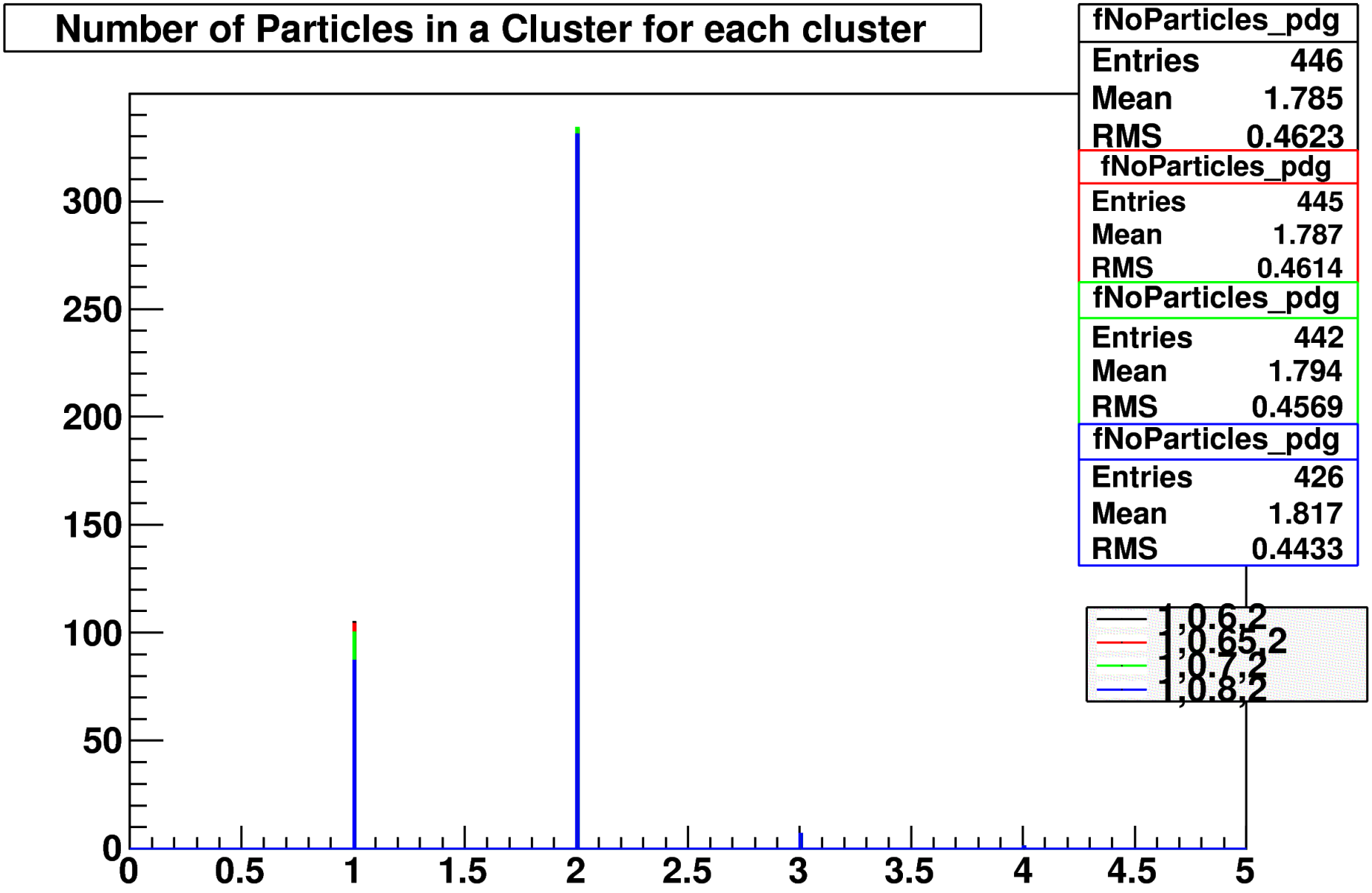
- Muons only ⟹ problem with ffthitfinder



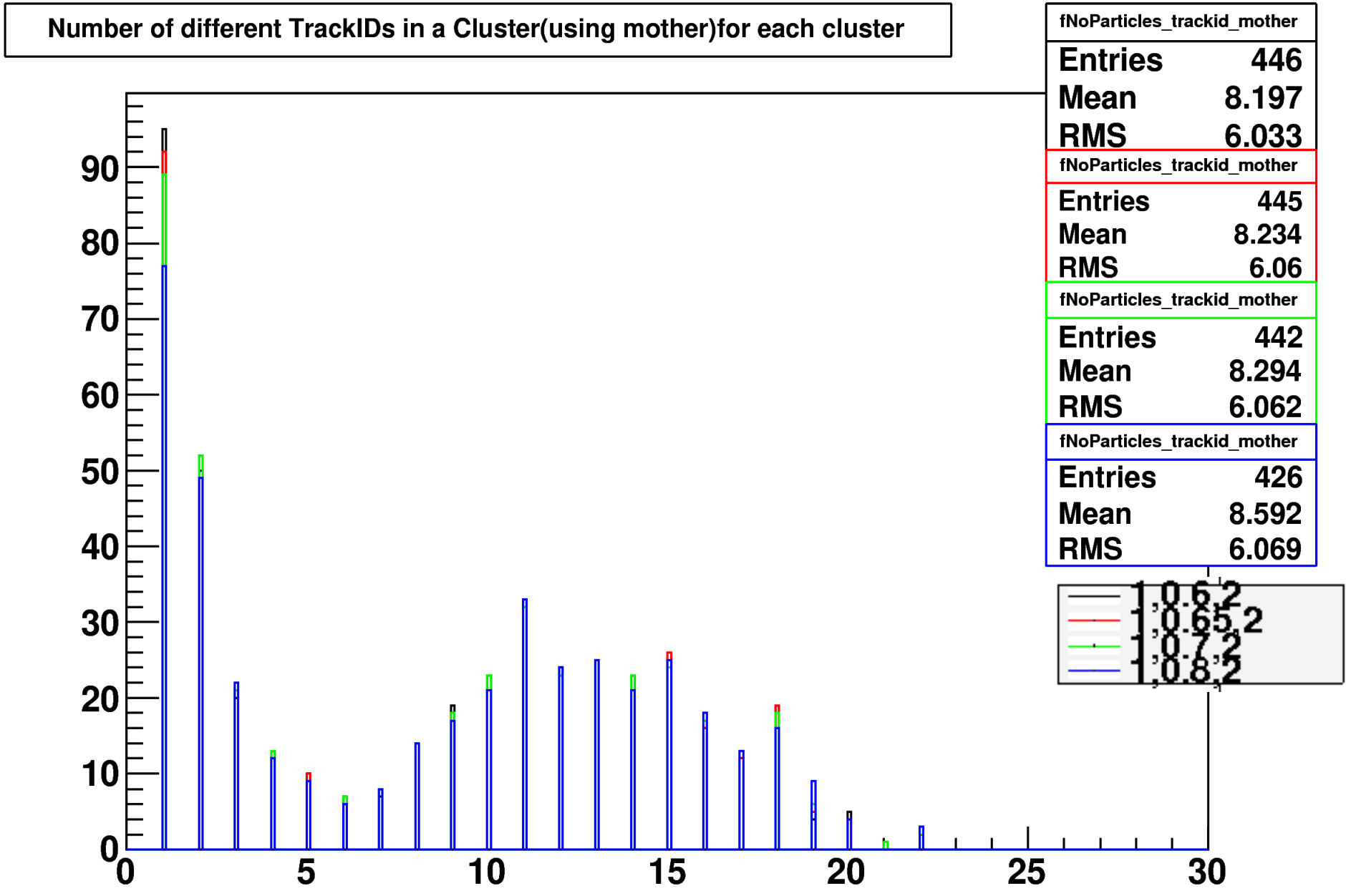
How many clusters in each event for MC muons?



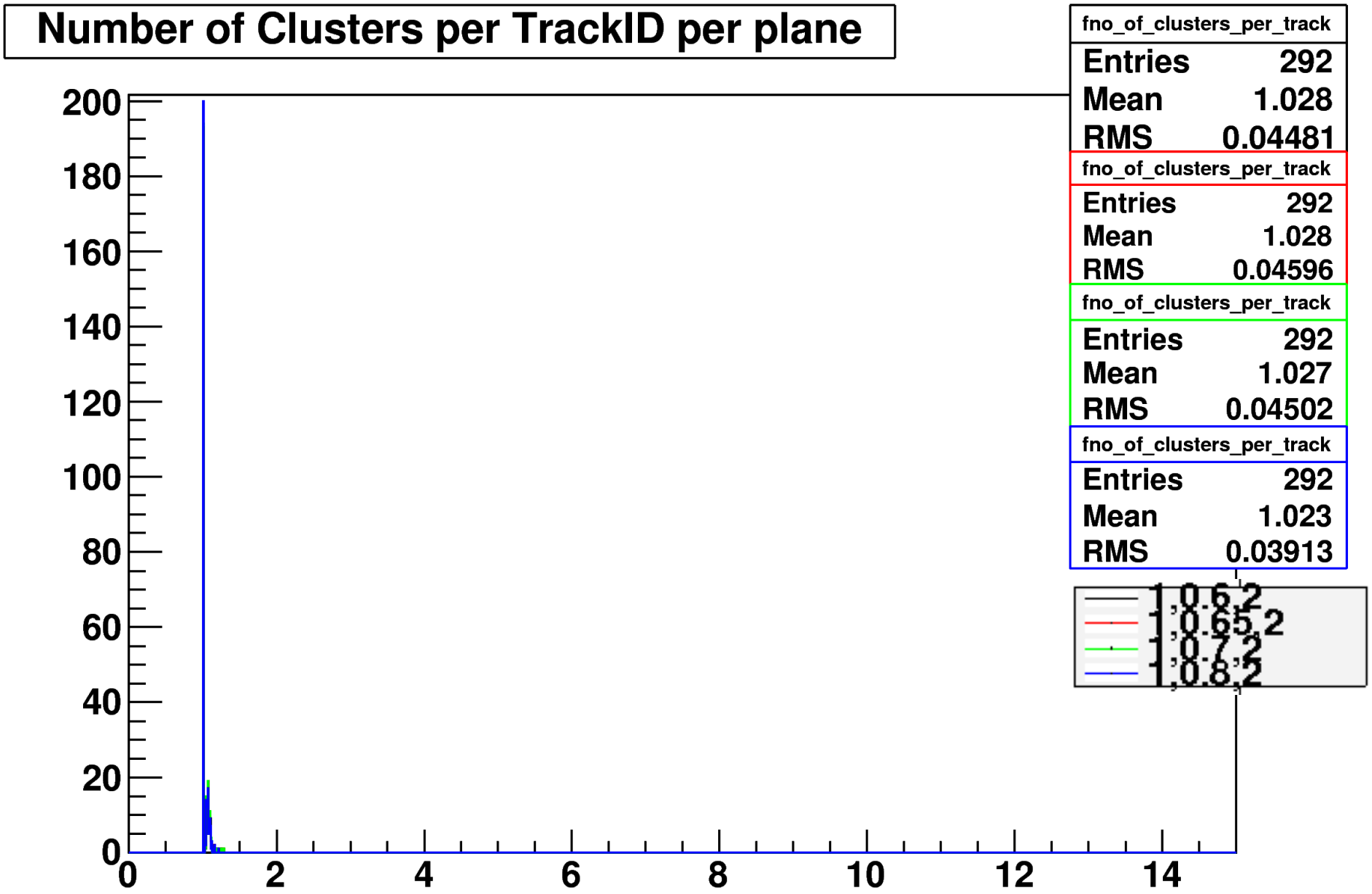
Counting PDG codes

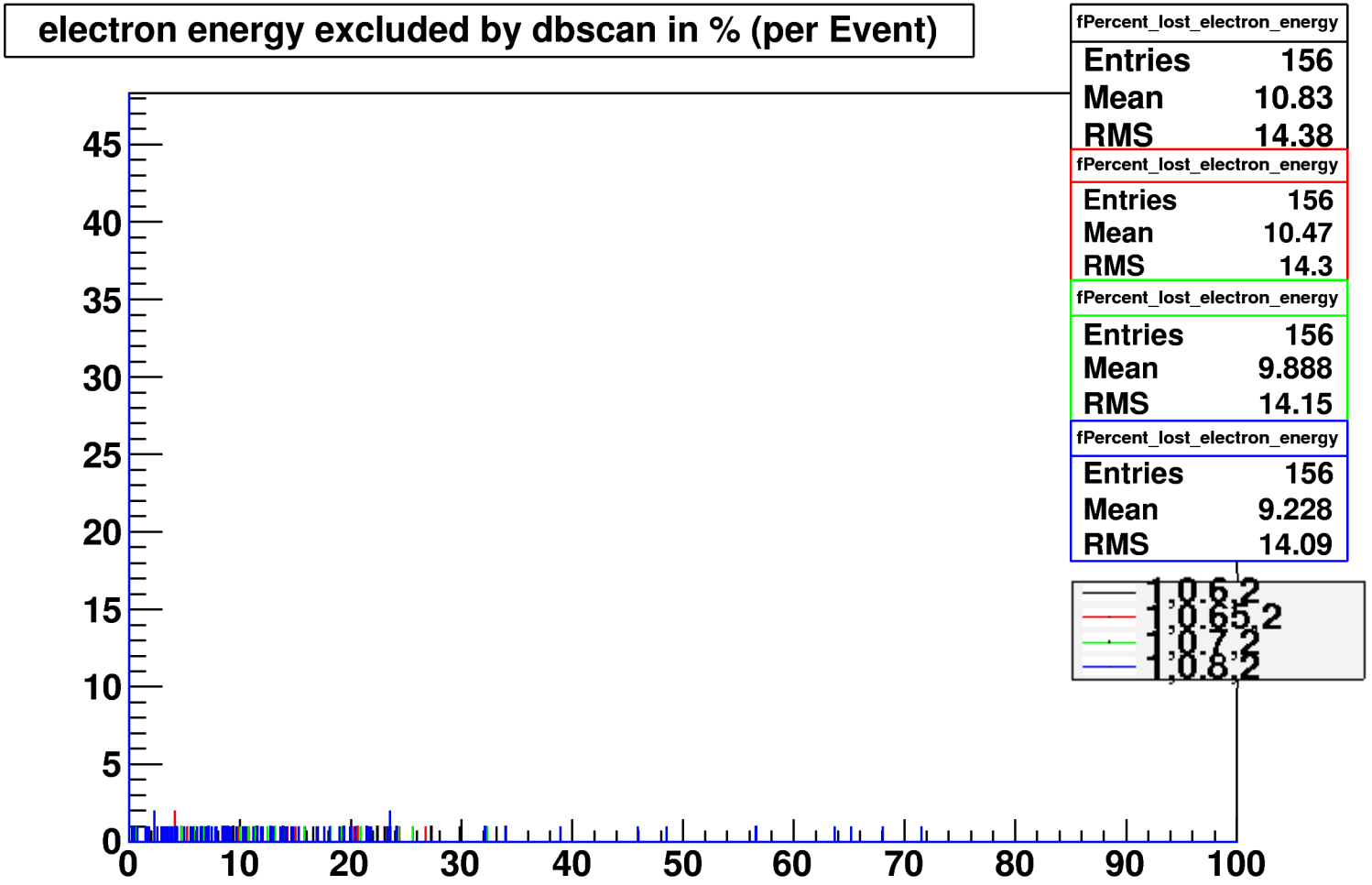


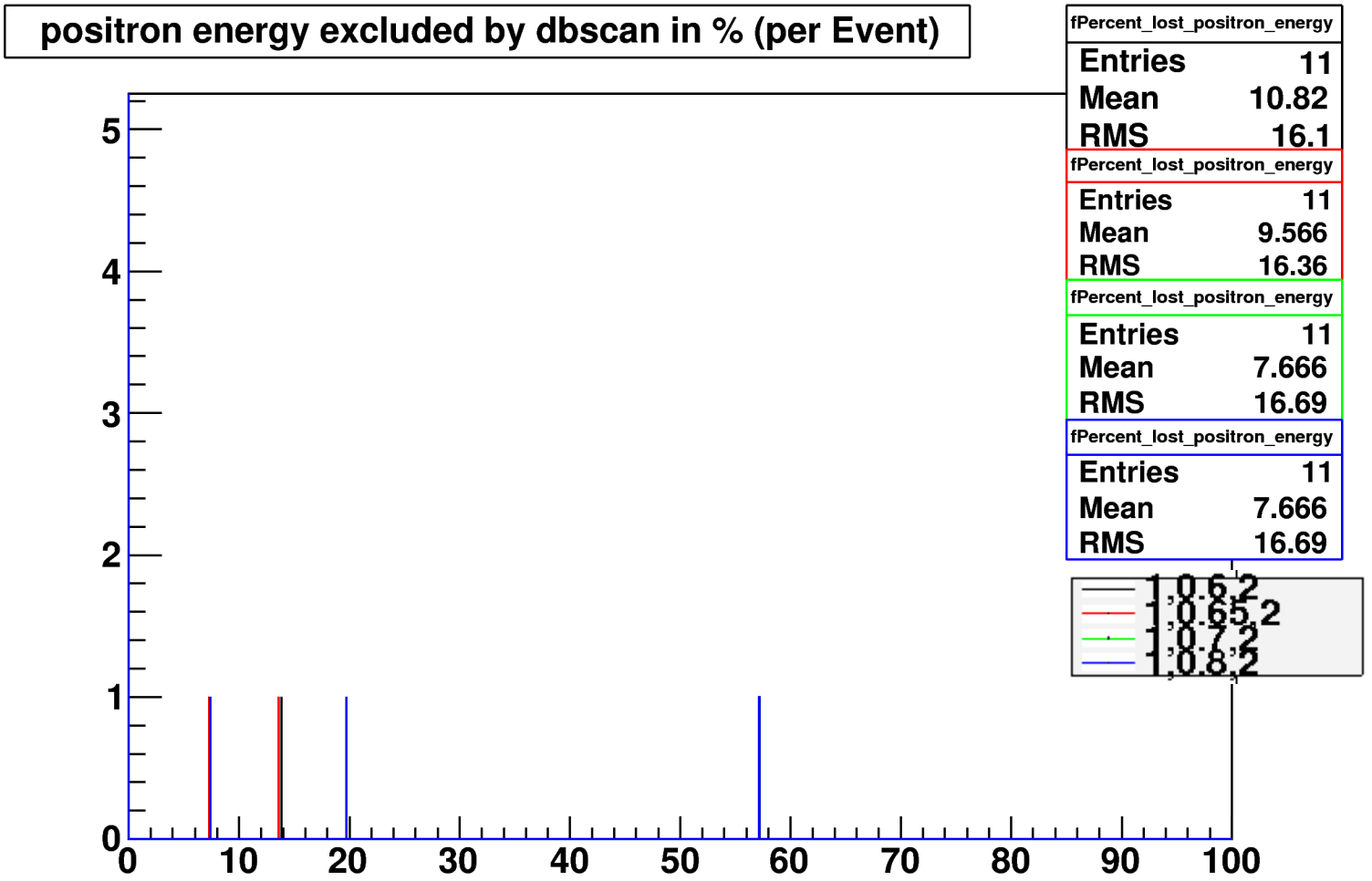
Counting TrackIDs

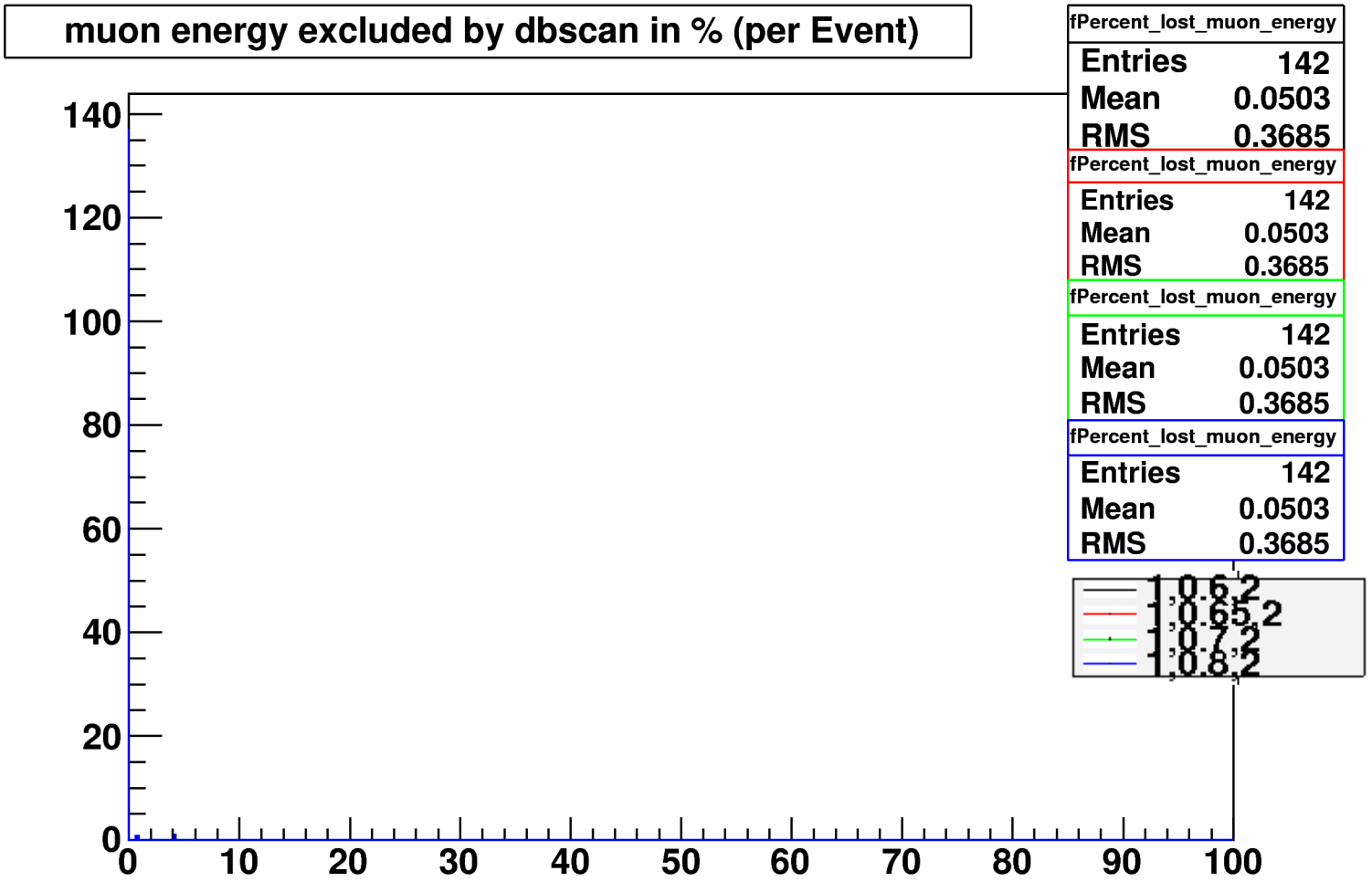


Does it split Tracks?




electron energy excluded by dbscan in % (per Event)
fPercent_lost_electron_energy
Entries 156
Mean 10.83
RMS 14.38
fPercent_lost_electron_energy
Entries 156
Mean 10.47
RMS 14.3
fPercent_lost_electron_energy
Entries 156
Mean 9.888
RMS 14.15
fPercent_lost_electron_energy
Entries 156
Mean 9.228
RMS 14.09
0.6.2
0.65.2
0.7.2
0.8.2
0
5
10
15
20
25
30
35
40
45
0
10
20
30
40
50
60
70
80
90
100


positron energy excluded by dbscan in % (per Event)
fPercent_lost_positron_energy
Entries 11
Mean 10.82
RMS 16.1
fPercent_lost_positron_energy
Entries 11
Mean 9.566
RMS 16.36
fPercent_lost_positron_energy
Entries 11
Mean 7.666
RMS 16.69
fPercent_lost_positron_energy
Entries 11
Mean 7.666
RMS 16.69
0.6.2
0.65.2
0.7.2
0.8.2
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80
90
100


muon energy excluded by dbscan in % (per Event)
fPercent_lost_muon_energy
Entries 142
Mean 0.0503
RMS 0.3685
fPercent_lost_muon_energy
Entries 142
Mean 0.0503
RMS 0.3685
fPercent_lost_muon_energy
Entries 142
Mean 0.0503
RMS 0.3685
fPercent_lost_muon_energy
Entries 142
Mean 0.0503
RMS 0.3685
0.6.2
0.65.2
0.7.2
0.8.2
0
20
40
60
80
100
120
140
0
10
20
30
40
50
60
70
80
90
100

Conclusion

- Virtually no muon energy is lost by clustering and the % loss is independent of the dbscan parameters
- Lose less e- and e+ energy as eps2 increases
- Each TrackID's energy contained in one cluster (no splitting)
- To do:

--fix ffthitfinder on MC in order to continue the study on other particles

--run together with HoughLineFinder

possibility: increase eps2 to contain more energy and use HoughLineFinder to separate merged tracks (see slide 3 & 4)