Test Pulser Data Merging

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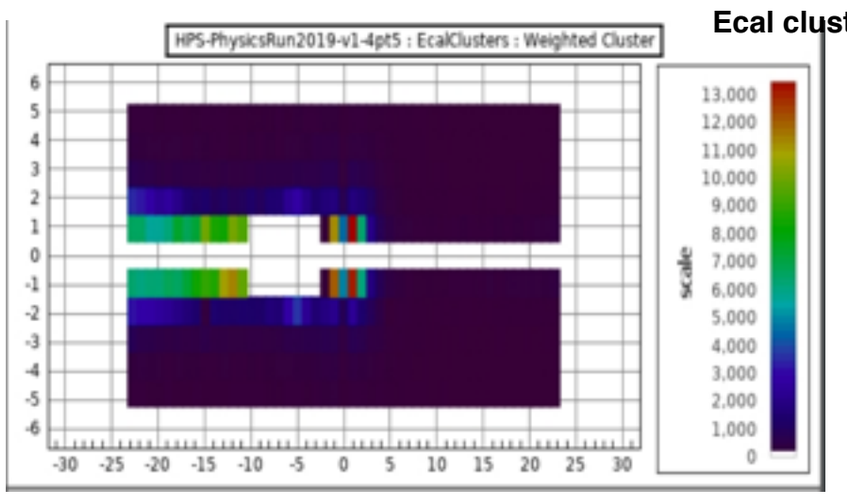
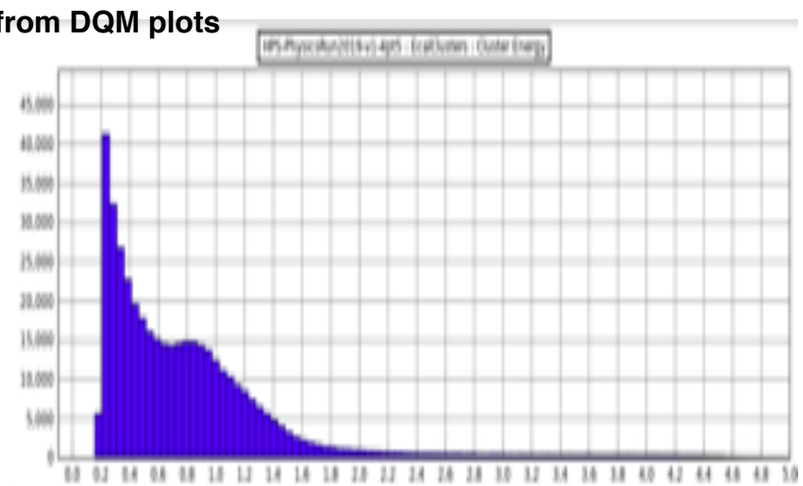
Introduction

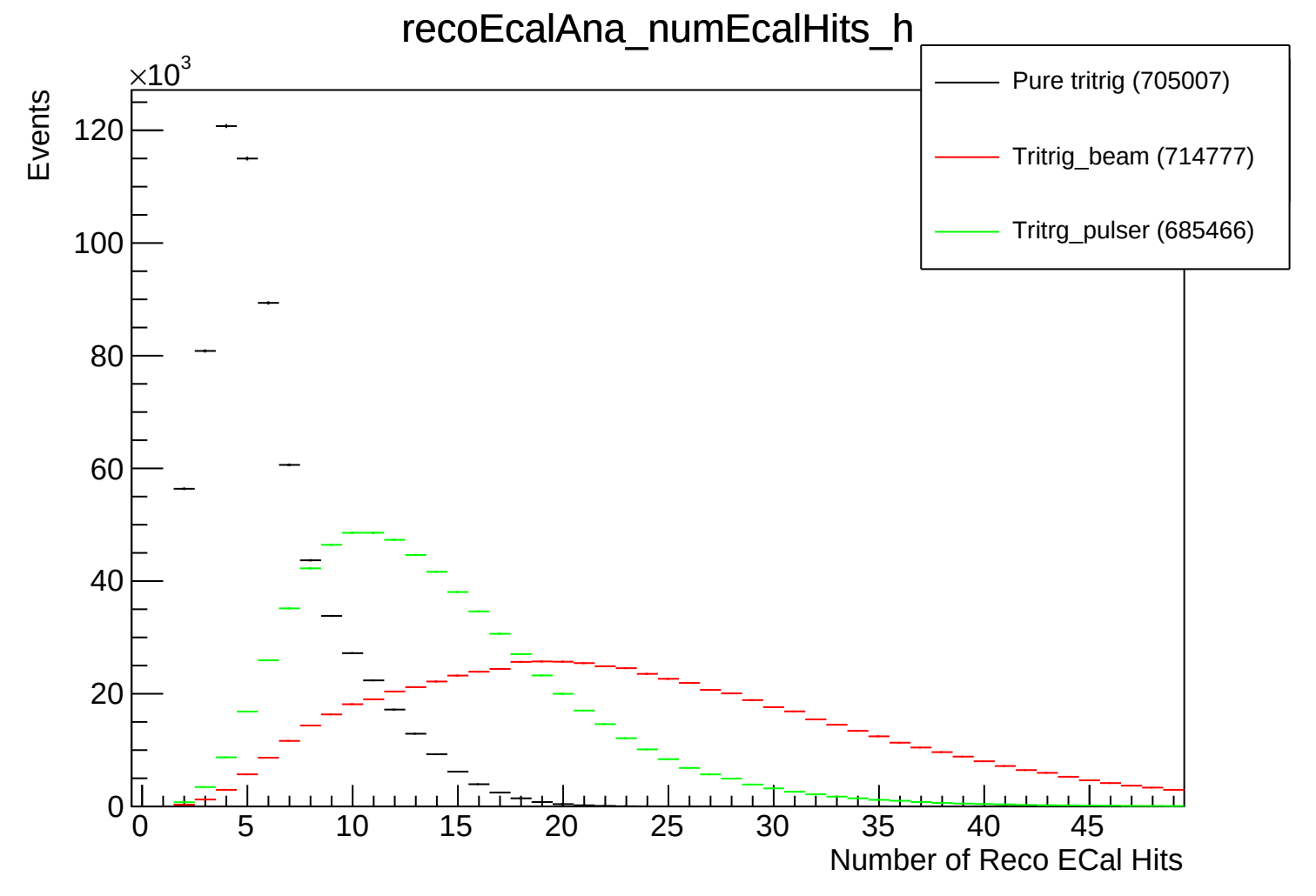
- To replace MC beam for background merging, real pulser data is applied. During digitization in the readout system, raw pulser data with ADC samples are merged with digitized signal hits. Then merged samples are applied into the trigger system, and are read out when events are triggered. Therefore, both triggers and output by the readout system are affected.
- To test pulser data merging, three type of samples, such as pure tritrig, tritrig_MCBeam, and tritrig_pulserData, are produced and compared.
    - To do fair comparison among samples, jobs with issues or bugs during MC production chain are eliminated.
    - The same tritrig events from generation are applied for the three types of samples. Totally, 7.5M tritrig events at the generation level are utilized.
- Single3 trigger is applied in readout.
- Data from random run 10646 is applied for pulser data merging.

Ecal clusters from DQM plots

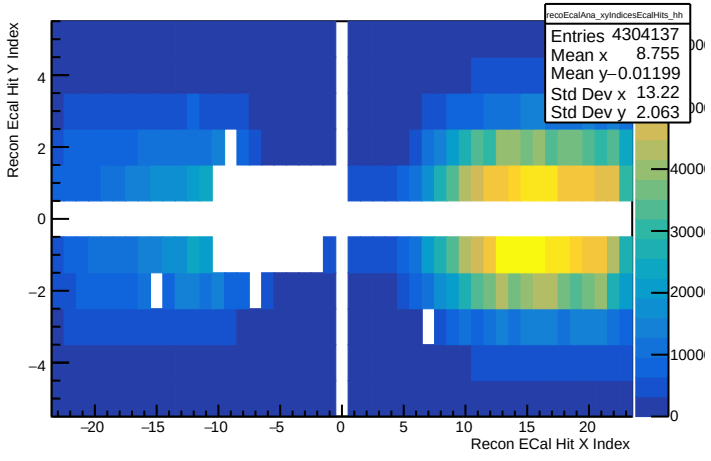




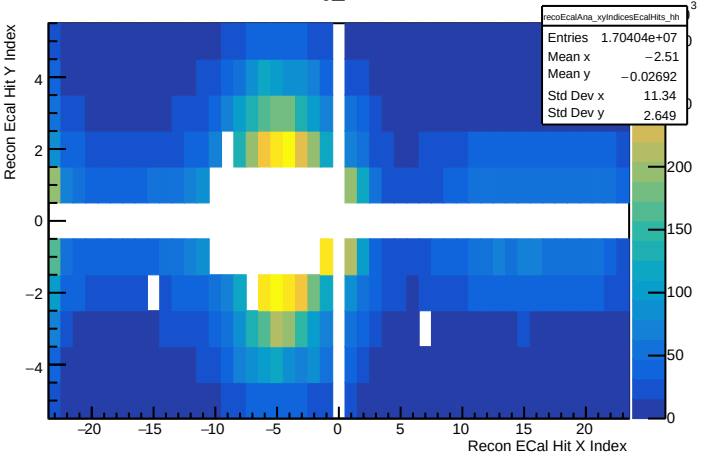
- Information for samples is at https://confluence.slac.stanford.edu/display/hpsg/Samples+for+Tests+of+Pulser+Data+Merging


recoEcalAna_numEcalHits_h
Pure tritrig (705007)
Tritrig_beam (714777)
Tritrg_pulser (685466)
Events
×10^3
120
100
80
60
40
20
0
0
5
10
15
20
25
30
35
40
45
Number of Reco ECal Hits

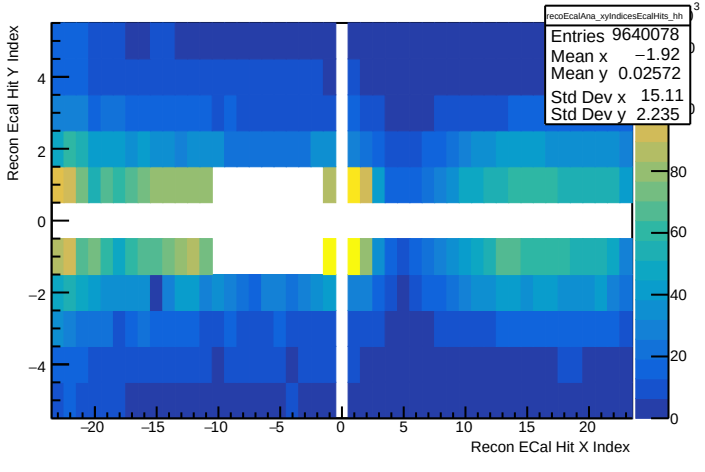
Pure tritrig

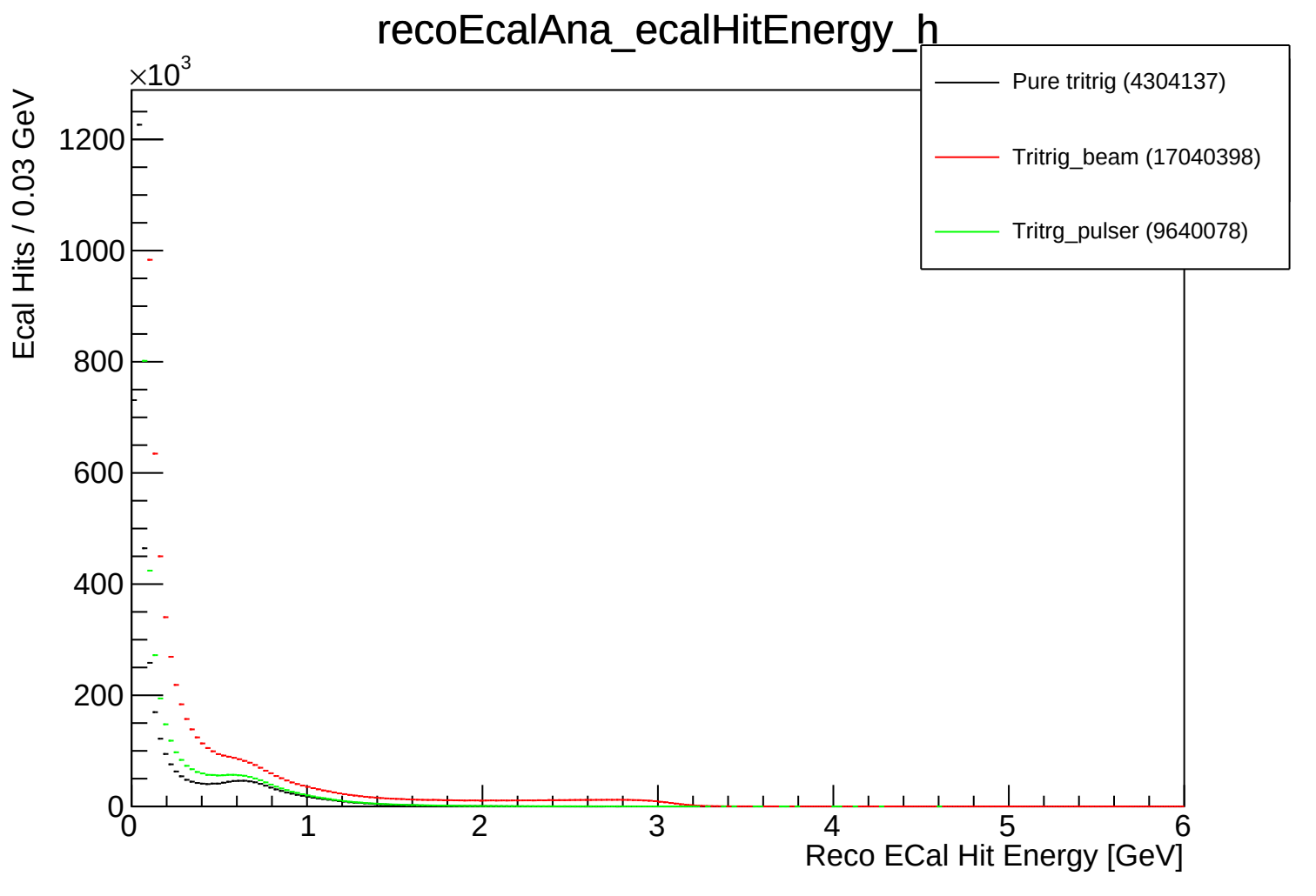


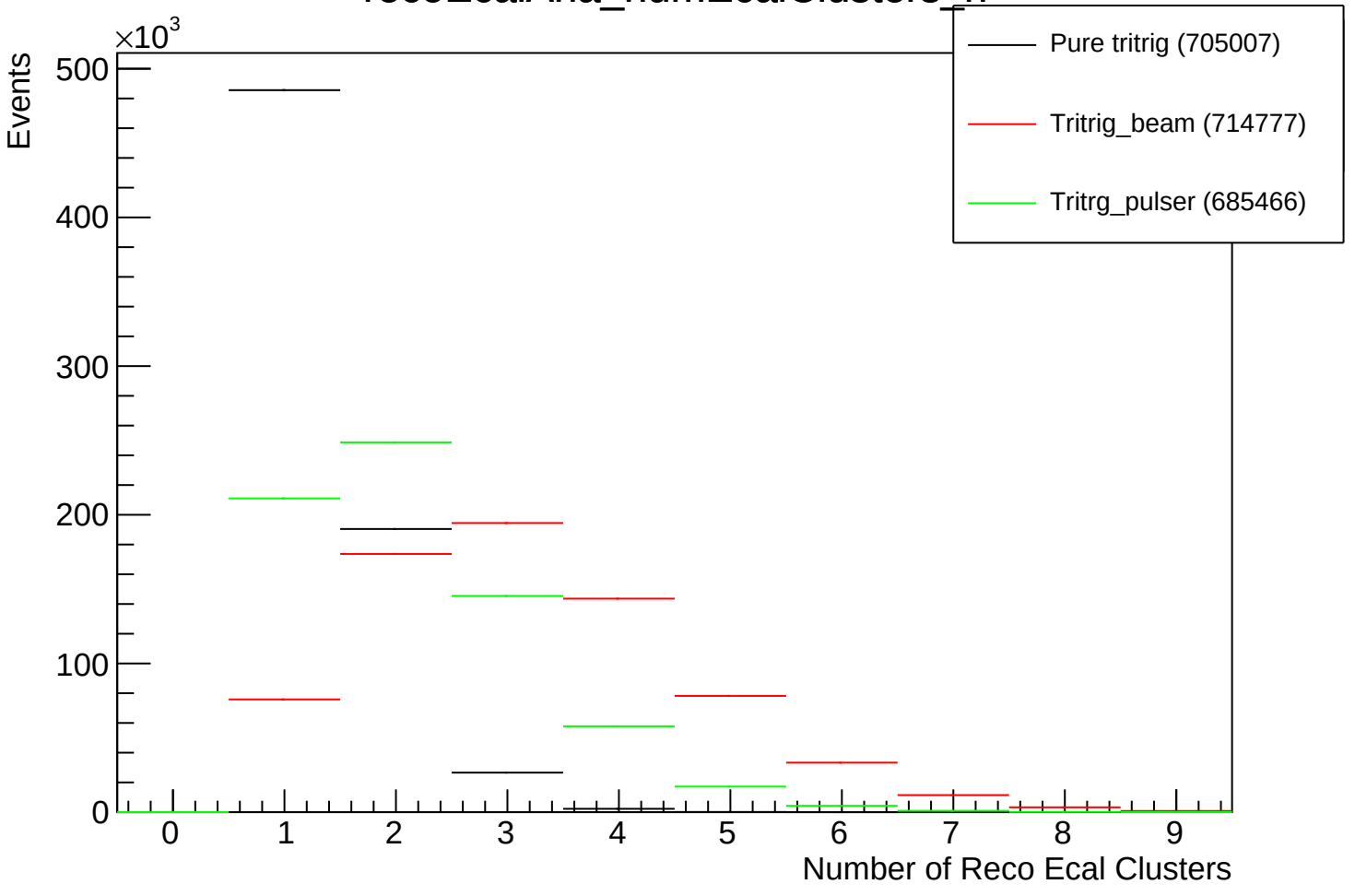
Tritrig_beam

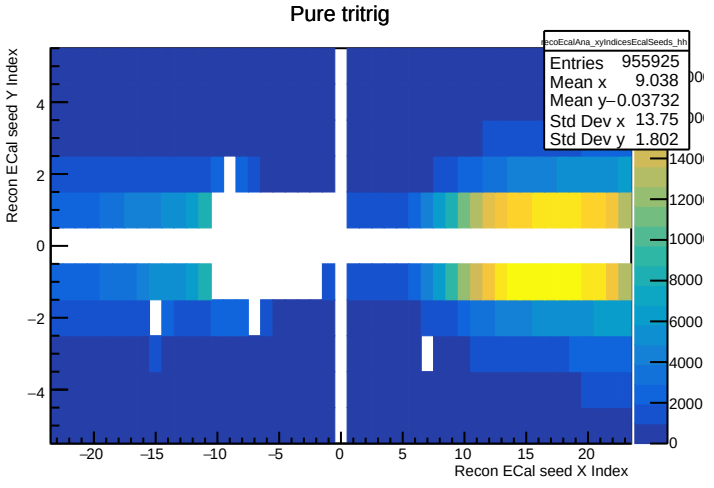


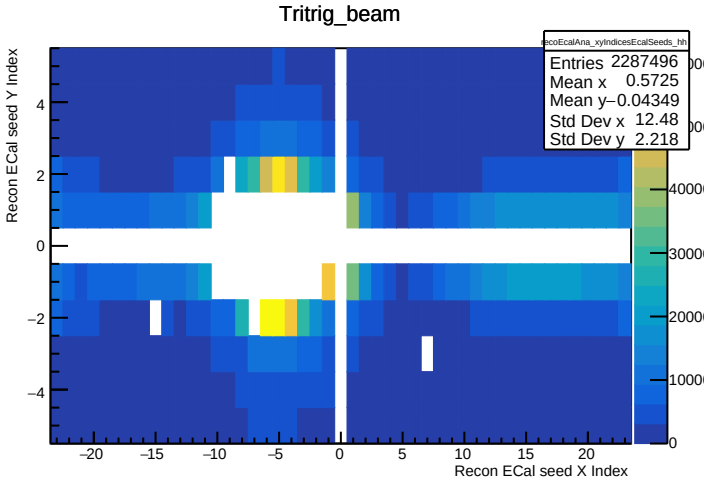
Tritrg_pulser

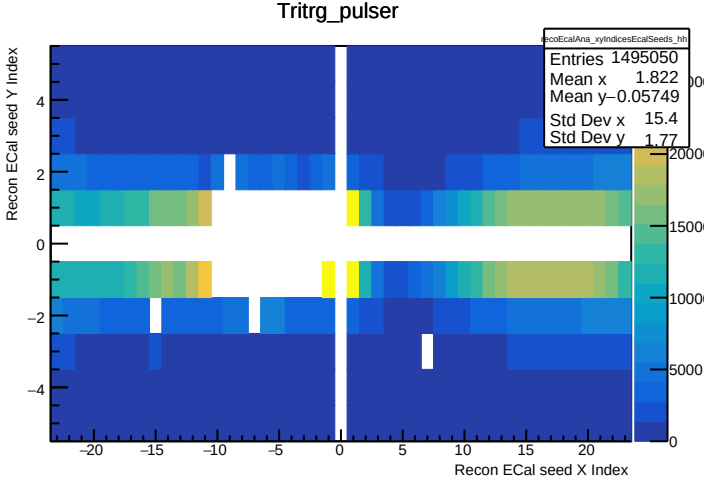


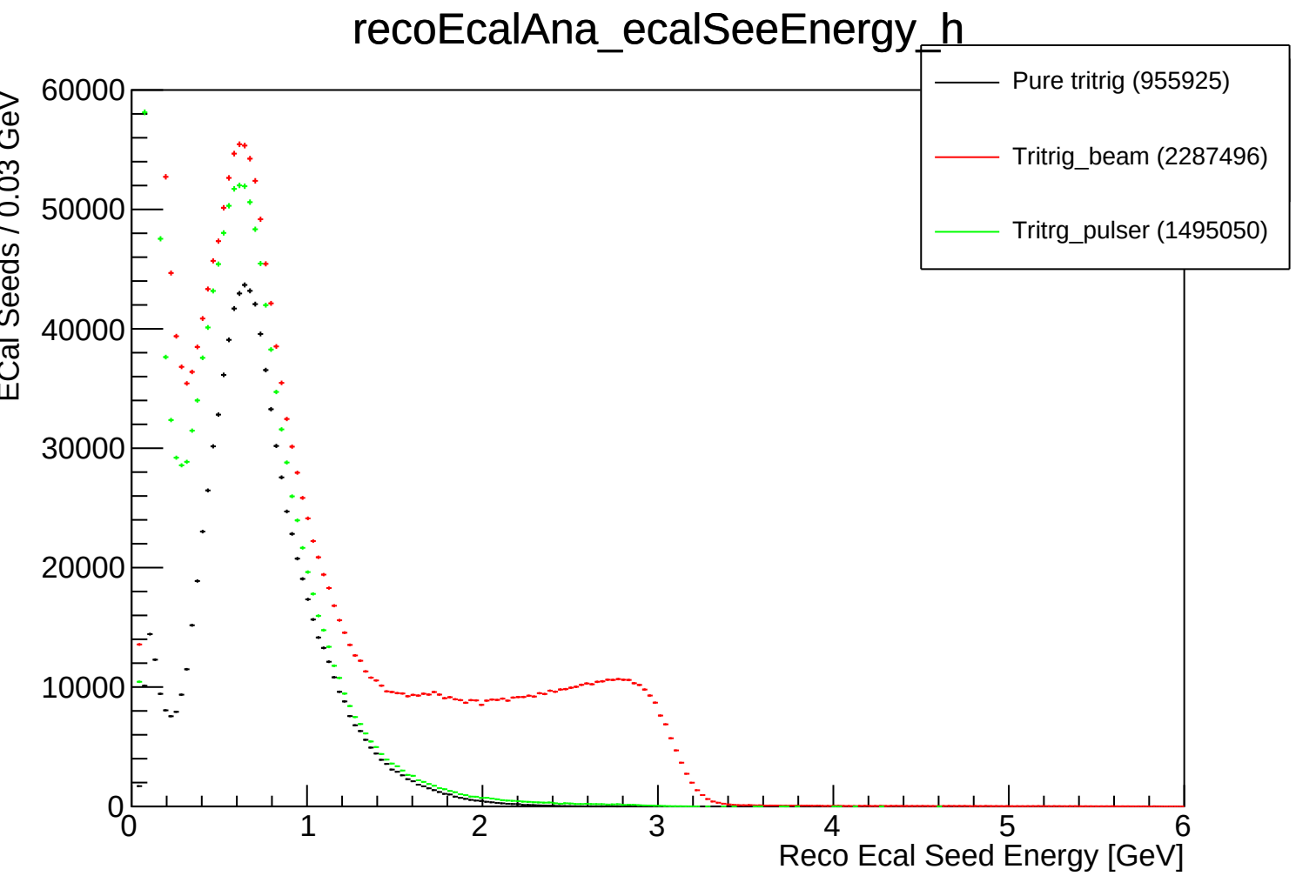

recoEcalAna_ecalHitEnergy_h
×10^3
Ecal Hits / 0.03 GeV
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
Reco ECal Hit Energy [GeV]
Pure tritrig (4304137)
Tritrig_beam (17040398)
Tritrg_pulser (9640078)

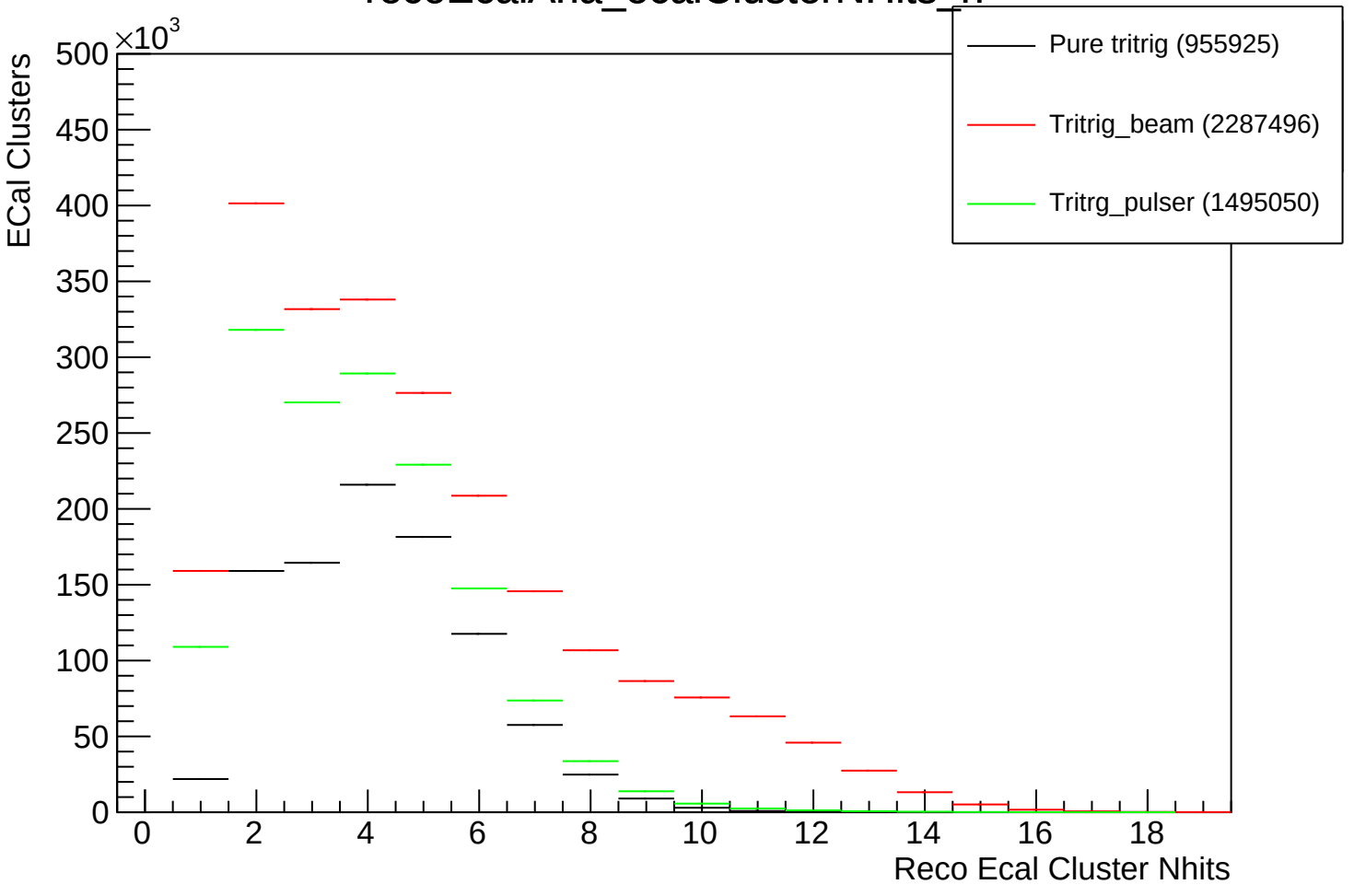

recoEcalAna_numEcalClusters_h
Pure tritrig (705007)
Tritrig_beam (714777)
Tritrg_pulser (685466)
Events
×10^3
500
400
300
200
100
0
0
1
2
3
4
5
6
7
8
9
Number of Reco Ecal Clusters

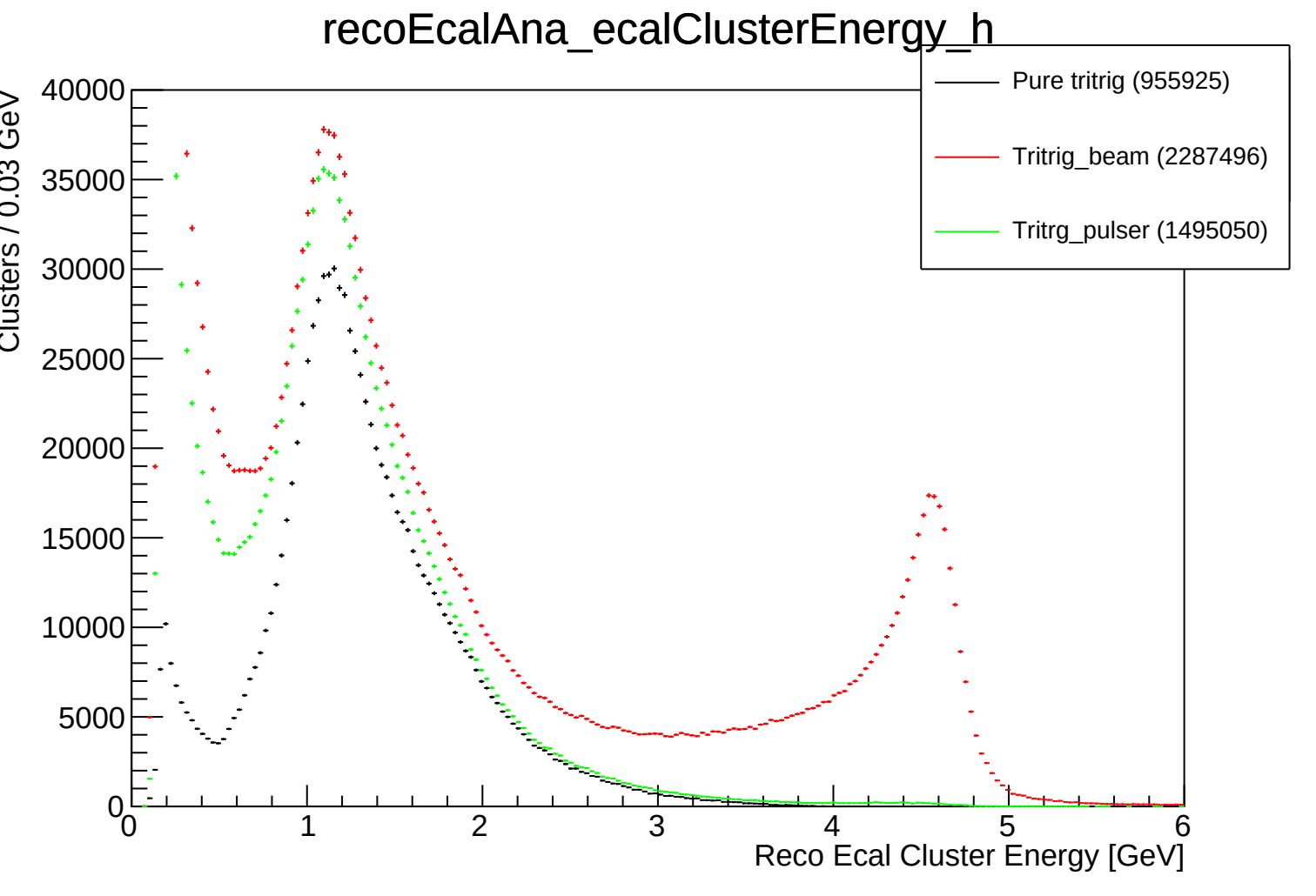

Pure tritrig
RecoEcalAna_xyIndicesEcalSeeds_hh
Entries 955925
Mean x 9.038
Mean y −0.03732
Std Dev x 13.75
Std Dev y 1.802
Recon ECal seed Y Index
Recon ECal seed X Index


Tritrig_beam
RecoEcalAna_xyIndicesEcalSeeds_hh
Entries 2287496
Mean x 0.5725
Mean y −0.04349
Std Dev x 12.48
Std Dev y 2.218
Recon ECal seed Y Index
Recon ECal seed X Index


Tritrg_pulser
RecoEcalAna_xyIndicesEcalSeeds_hh
Entries 1495050
Mean x 1.822
Mean y −0.05749
Std Dev x 15.4
Std Dev y 1.77
Recon ECal seed Y Index
Recon ECal seed X Index


recoEcalAna_ecalSeeEnergy_h
Pure tritrig (955925)
Tritrig_beam (2287496)
Tritrg_pulser (1495050)
ECal Seeds / 0.03 GeV
60000
50000
40000
30000
20000
10000
0
0
1
2
3
4
5
6
Reco Ecal Seed Energy [GeV]


recoEcalAna_ecalClusterNHits_h
Pure tritrig (955925)
Tritrig_beam (2287496)
Tritrg_pulser (1495050)
ECal Clusters
×10^3
500
450
400
350
300
250
200
150
100
50
0
0
2
4
6
8
10
12
14
16
18
Reco Ecal Cluster Nhits


recoEcalAna_ecalClusterEnergy_h
Pure tritrig (955925)
Tritrig_beam (2287496)
Tritrg_pulser (1495050)
Clusters / 0.03 GeV
40000
35000
30000
25000
20000
15000
10000
5000
0
0
1
2
3
4
5
6
Reco Ecal Cluster Energy [GeV]

Next

- Comparison of tracks and vertices is ongoing.
- Hodoscope reconstruction drivers work for real data, but do not work for MC. The main reason is that cell ids of Hodo. channels are geometry ids for MC from readout, while they are detector system ids for real data. The issue is being fixed.