TPC cells fixed threshold study

sPHENIX simulation meeting

07/11/2017

Sourav Tarafdar

On behalf of sPHENIX tracking group

Code snippet for change in TPC clusterizer code

Constant factor threshold

13 simulation/g4simulation/g4hough/PHG4TPCClusterizer.C

View

```diff
@@ -153,7 +153,8 @@ void PHG4TPCClusterizer::fit(int pbin, int zbin, int& nhits_tot) {
        std::cout << Form("%.2f | ",fAmps[bin]);
        if(ip==fFitRangeP) std::cout << std::endl;
       }
-      if(fAmps[bin] < fFitEnergyThreshold*peak) continue; // skip small (include empty)

       used = true;
       nphis++;
       float ee = fAmps[bin];
@@ -250,9 +251,15 @@ int PHG4TPCClusterizer::process_event(PHCompositeNode* topNode) {
   }
   PHG4CylinderCellGeomContainer* geom_container =
     findNode::getClass<PHG4CylinderCellGeomContainer>(topNode,"CYLINDERCELLGEOM_SVTX");
-  if (!geom_container) return Fun4AllReturnCodes::ABORTRUN;

   PHG4CellContainer* cells =  findNode::getClass<PHG4CellContainer>(dstNode,"G4CELL_SVTX");
-  if (!cells) return Fun4AllReturnCodes::ABORTRUN;

   // ==> making layer_sorted
   std::vector<std::vector<const SvtxHit*> > layer_sorted;
```

- Currently exist in nightly build

Hard threshold

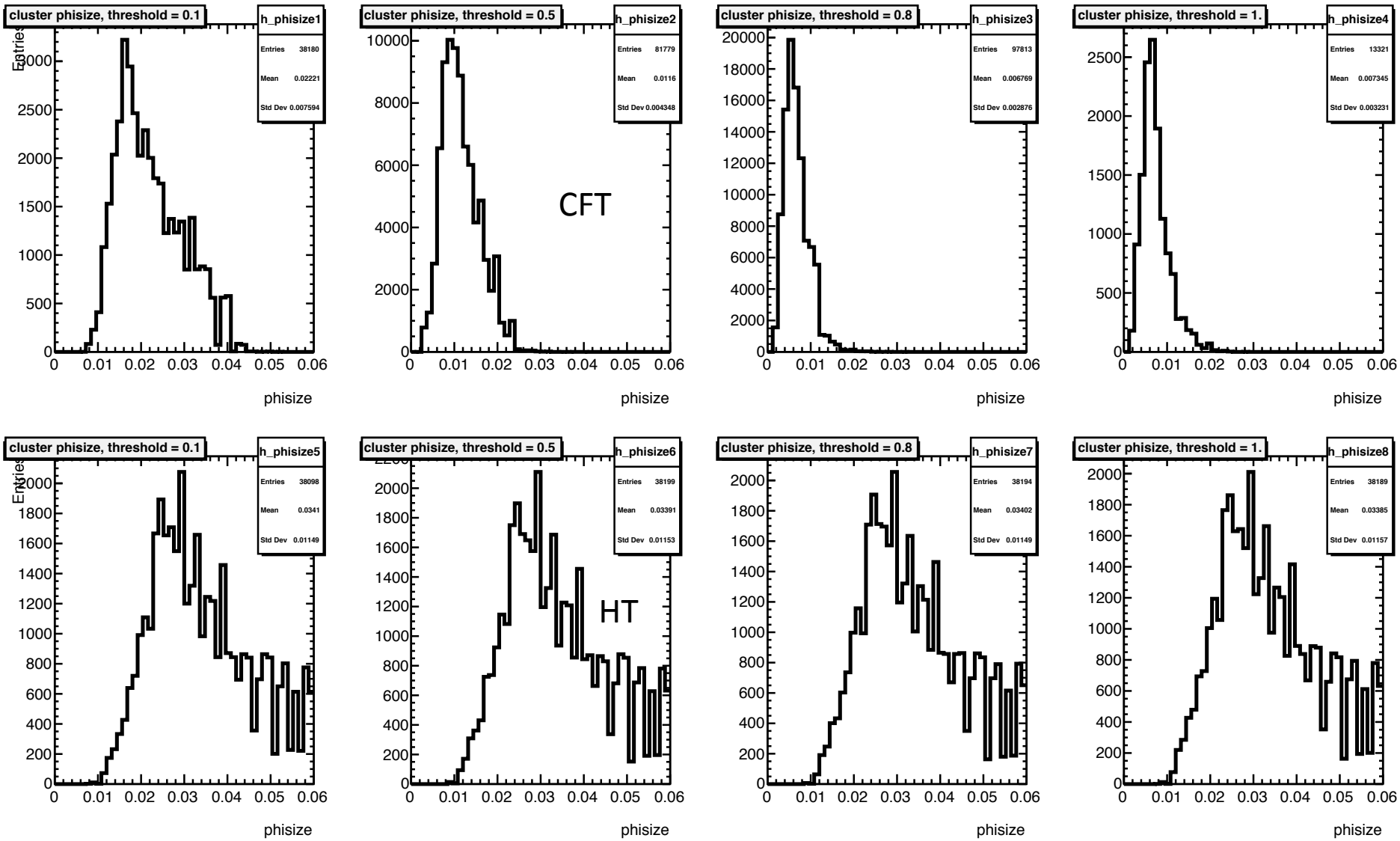
```diff
        std::cout << Form("%.2f | ",fAmps[bin]);
        if(ip==fFitRangeP) std::cout << std::endl;
       }
+      //if(fAmps[bin] < fFitEnergyThreshold*peak) continue; // skip small (include empty)
+      if(fAmps[bin] < fFitEnergyThreshold) continue; // skip small (include empty)
       used = true;
       nphis++;
       float ee = fAmps[bin];
   }
   PHG4CylinderCellGeomContainer* geom_container =
     findNode::getClass<PHG4CylinderCellGeomContainer>(topNode,"CYLINDERCELLGEOM_SVTX");
+  if (!geom_container) {
+    std::cout << PHWHERE << "ERROR: Can't find node CYLINDERCELLGEOM_SVTX" << std::endl;
+    return Fun4AllReturnCodes::ABORTRUN;
+  }
   PHG4CellContainer* cells =  findNode::getClass<PHG4CellContainer>(dstNode,"G4CELL_SVTX");
+  if (!cells) {
+    std::cout << PHWHERE << "ERROR: Can't find node G4CELL_SVTX" << std::endl;
+    return Fun4AllReturnCodes::ABORTRUN;
+  }

   // ==> making layer_sorted
   std::vector<std::vector<const SvtxHit*> > layer_sorted;
```

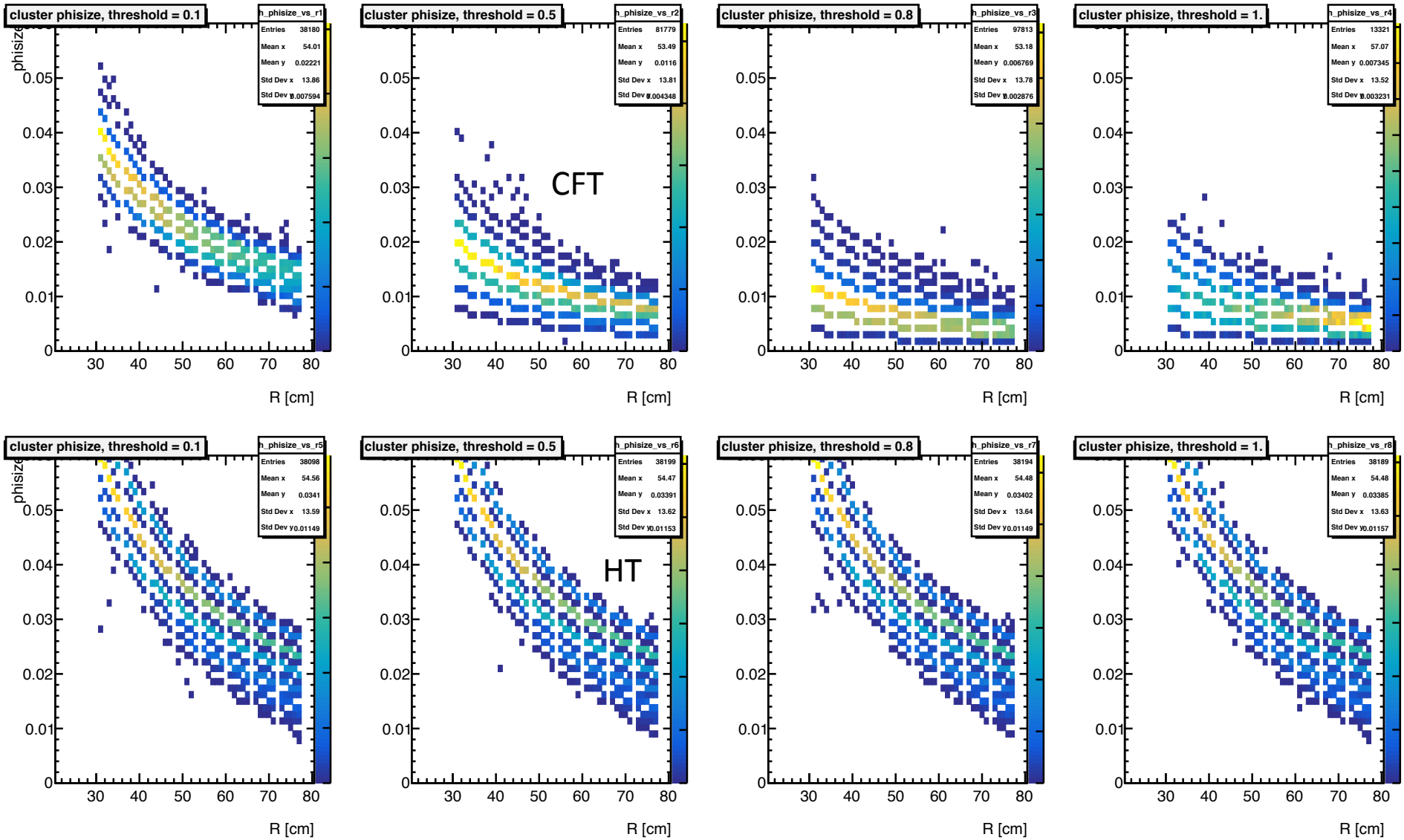
- Suggested by Christoff during tracking workfest.
- Version exist in SBU github. No pull request made yet.

- Study is to show the effect of change in TPC cells energy threshold on clusterizer and tracking performance.
- muons , 100 muons per event, 1. < pt < 50 GeV, |eta| < 1.1, |z_vertex| < 5.

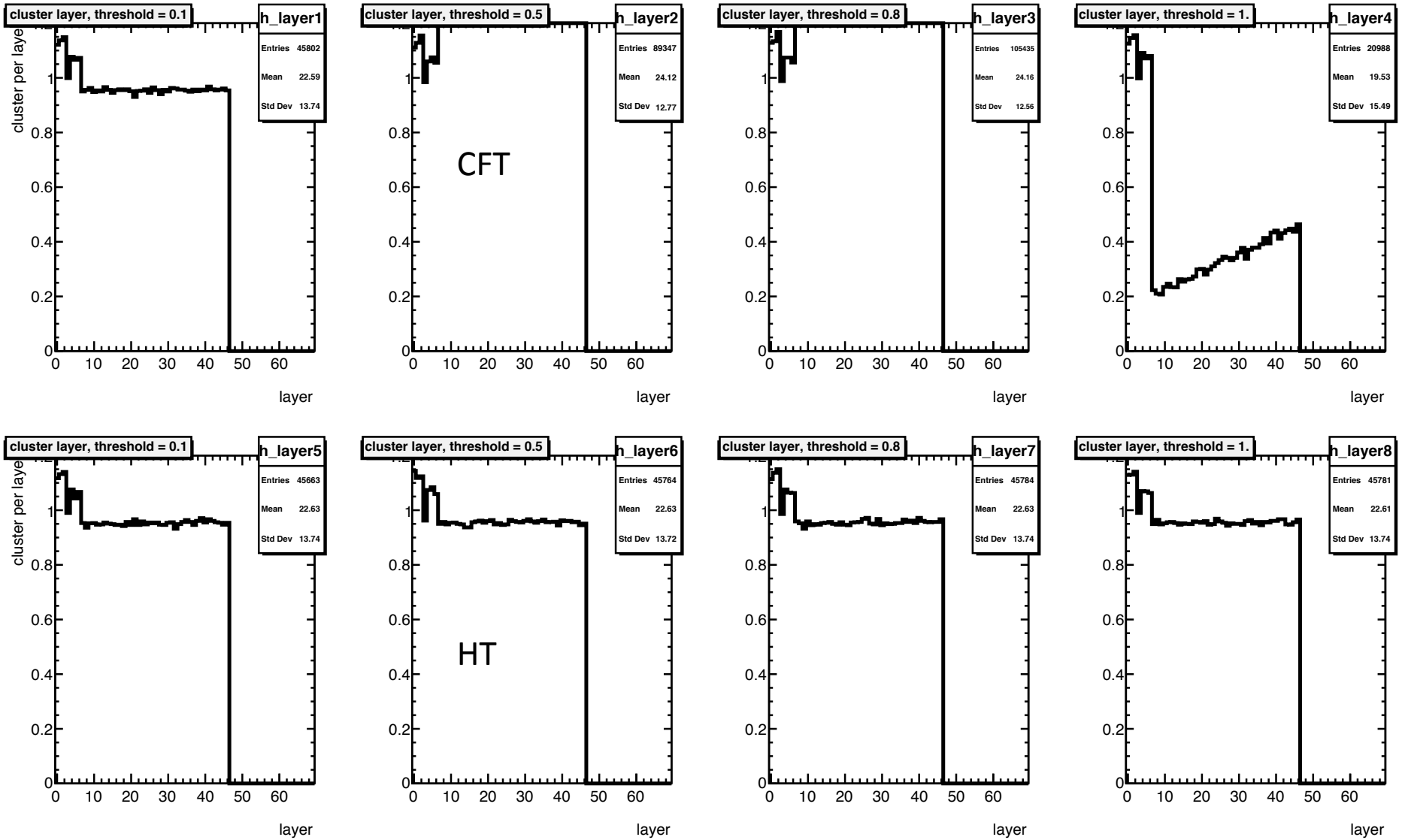
Ntp_cluster ->Draw (“phisize”, “layer > 6”)



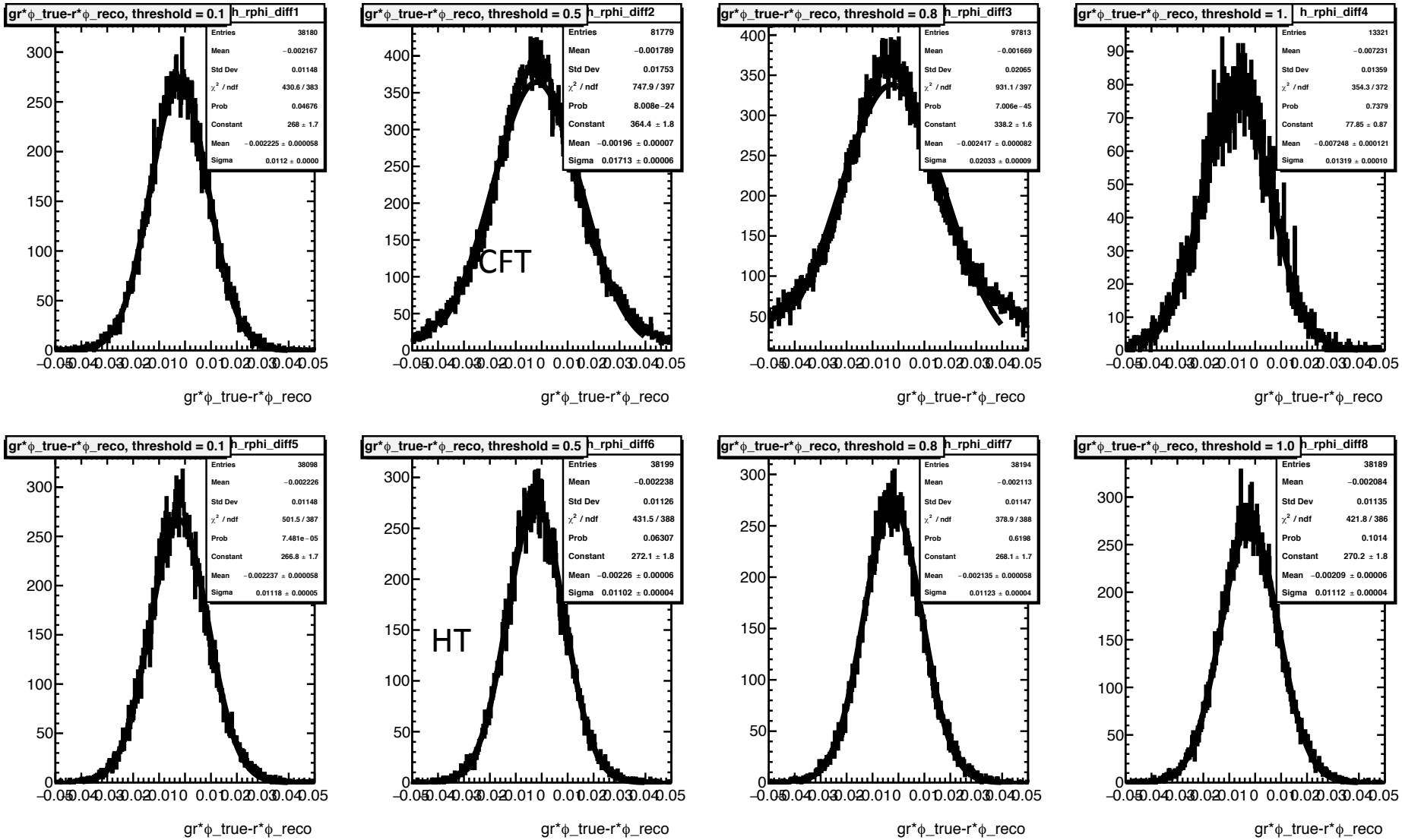
Cluster Phisize vs r



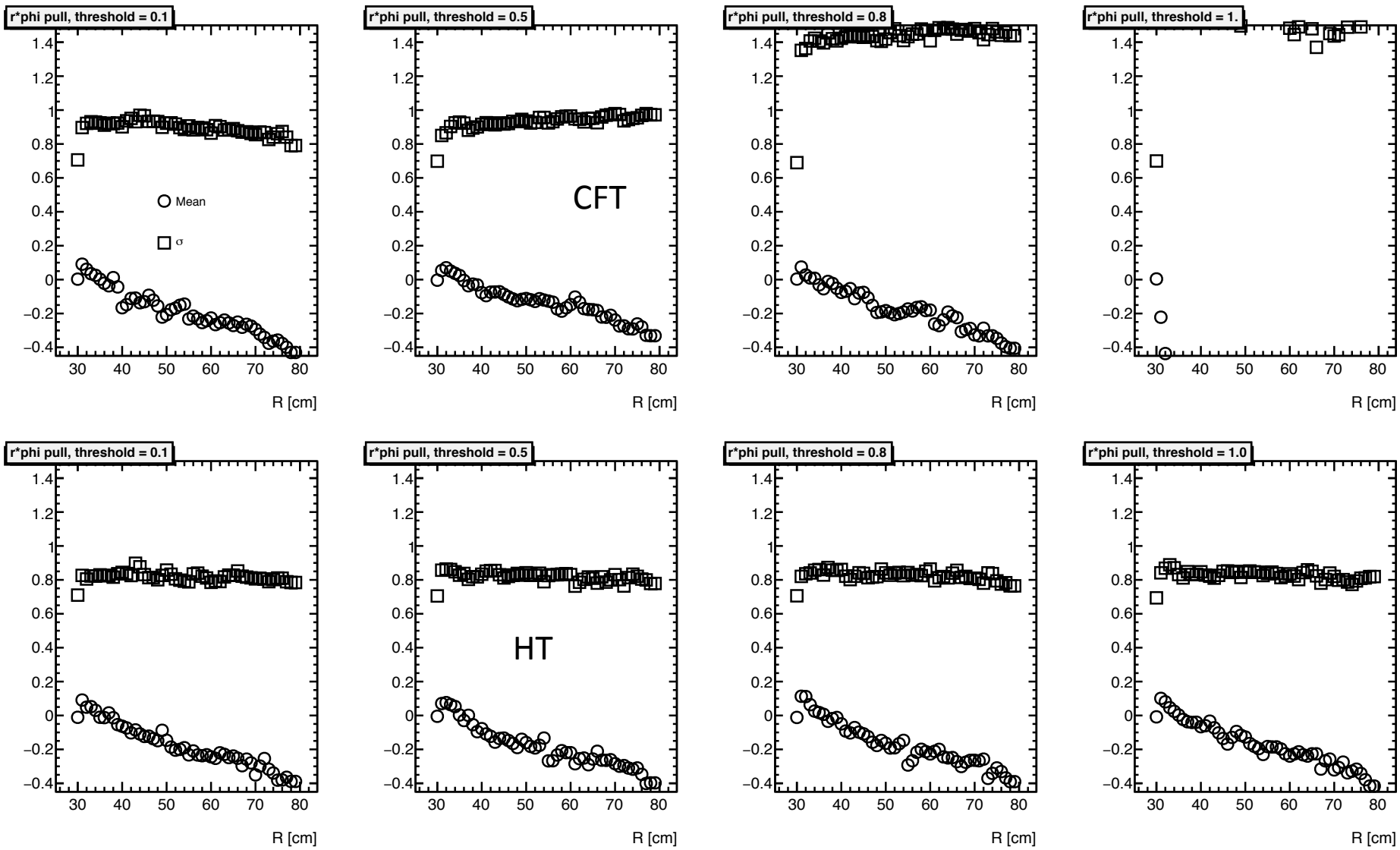
Ntp_cluster->Draw("layer") normalized by total number of true tracks in "ntp_gtrack"



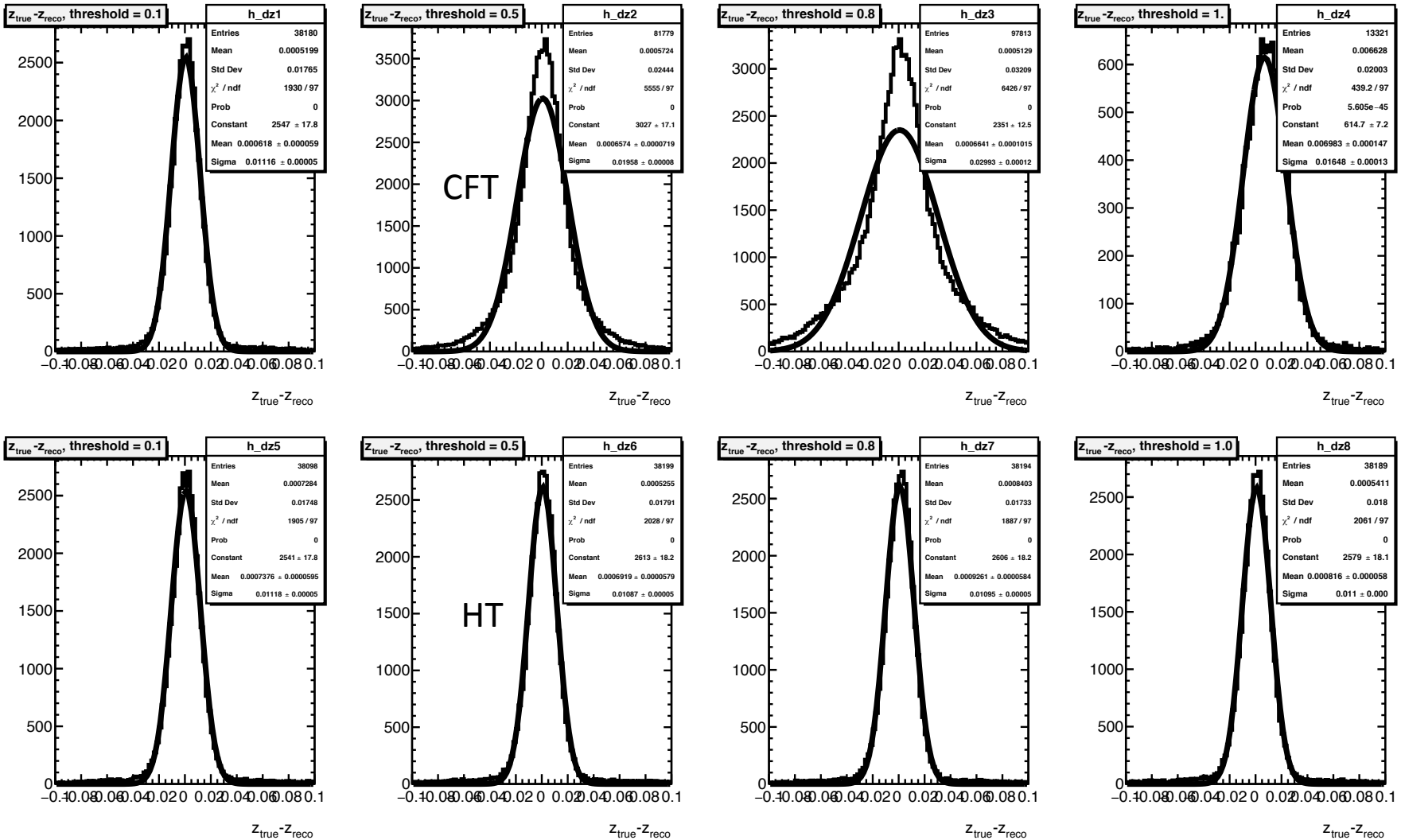
Cluster gr*phi_true – r*phi for TPC



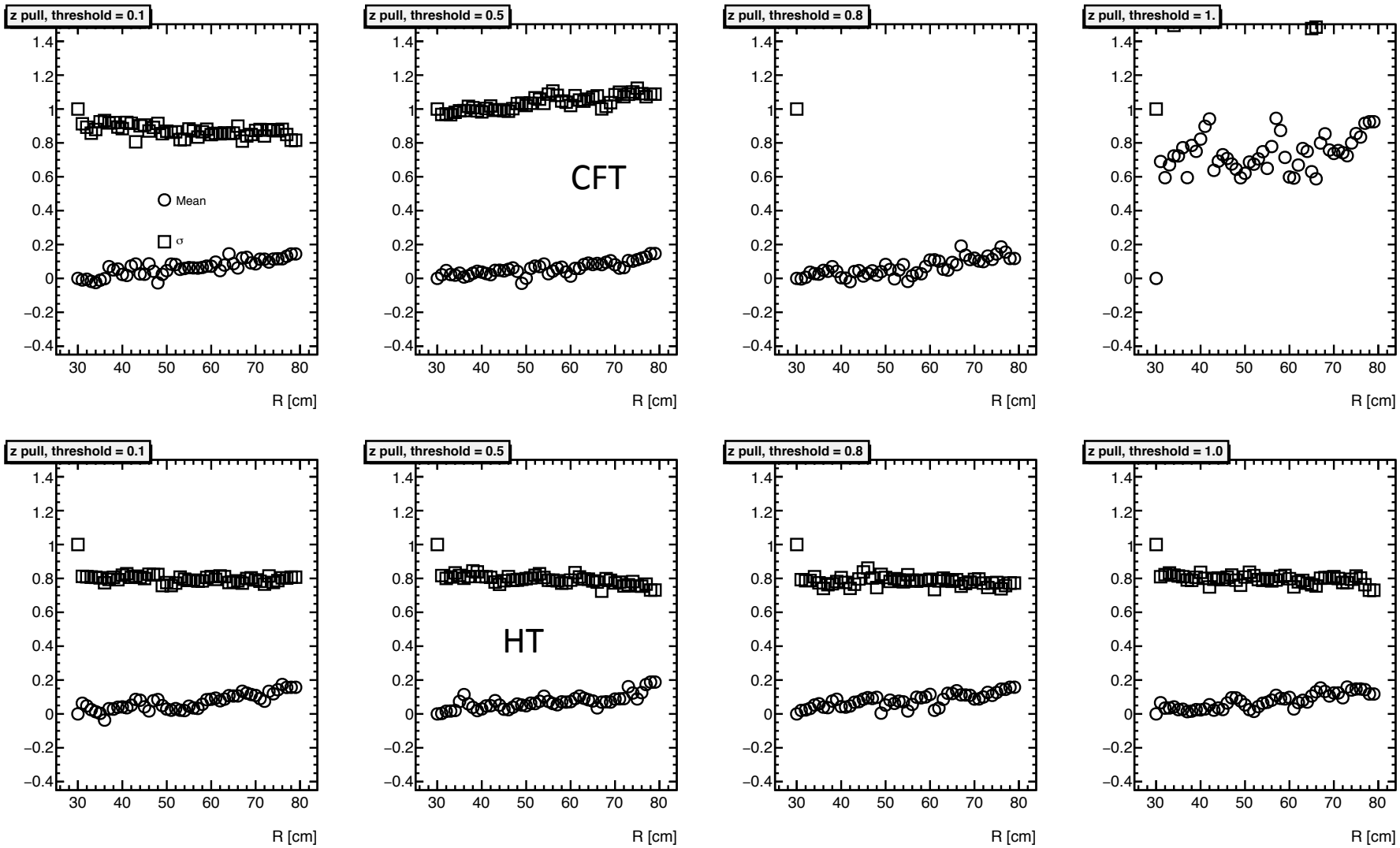
Cluster R*phi pull



Cluster z_true – z_reco for TPC

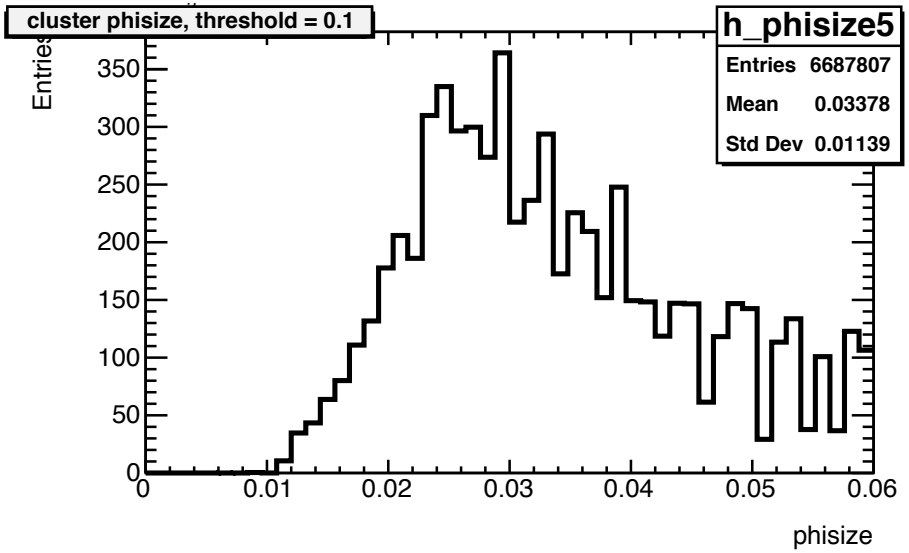


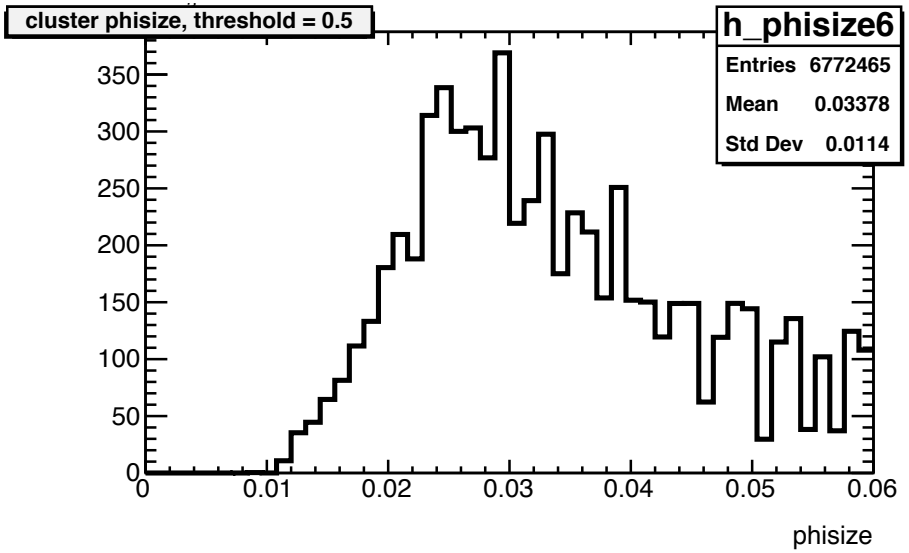
Cluster z pull

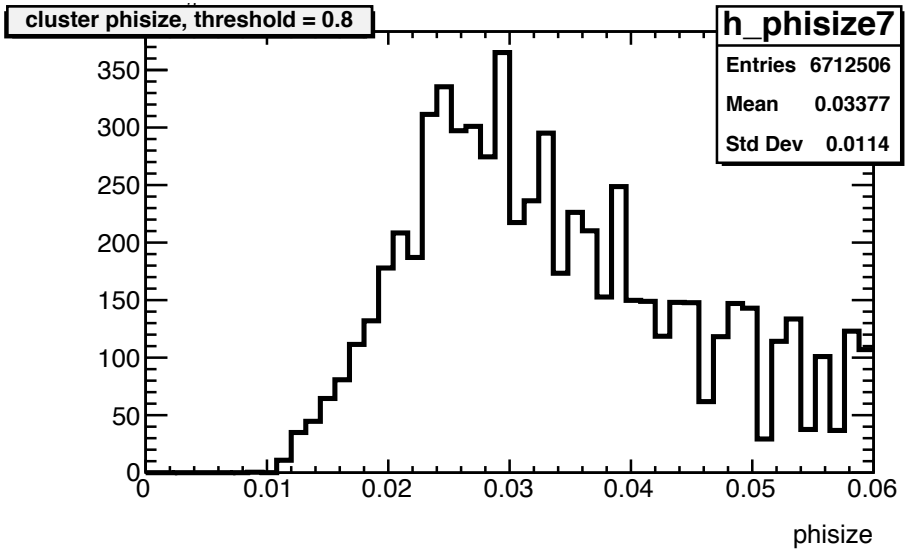


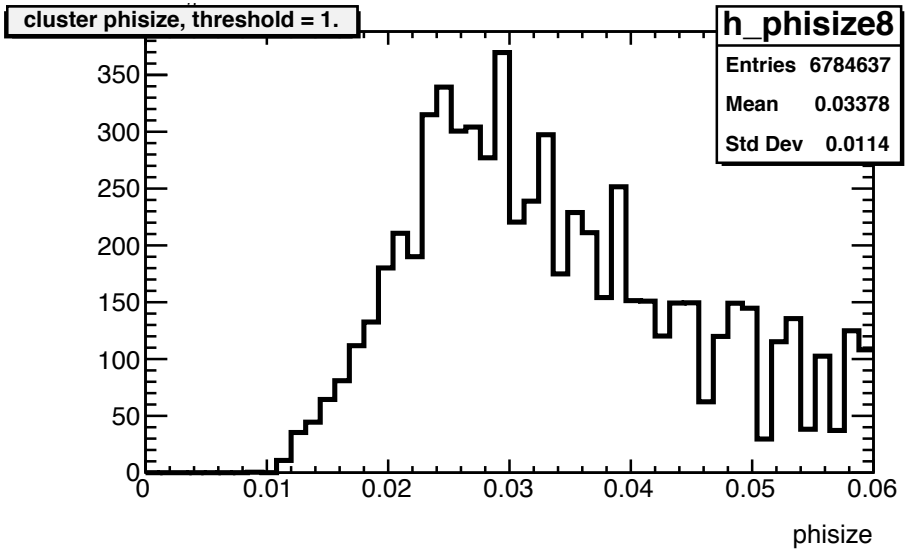
- 100 muons per event embedded in mid central Hijing events
- Phase space of muons are the same as pure muons quoted on slide #2
- Only plots with different values of Hard threshold in TPC clusterizer are shown here

Ntp_cluster ->Draw (“phisize”, “layer > 6”)

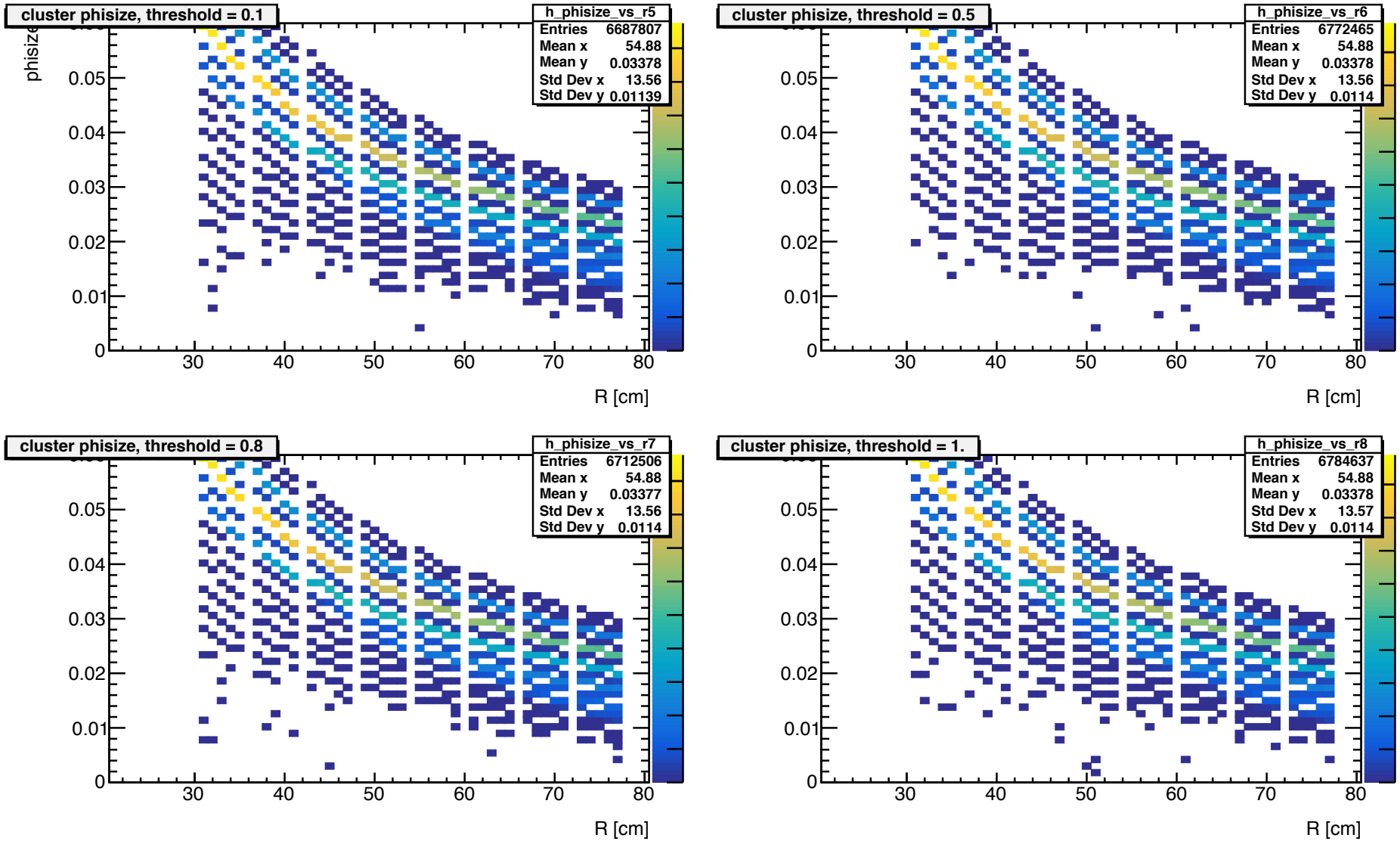




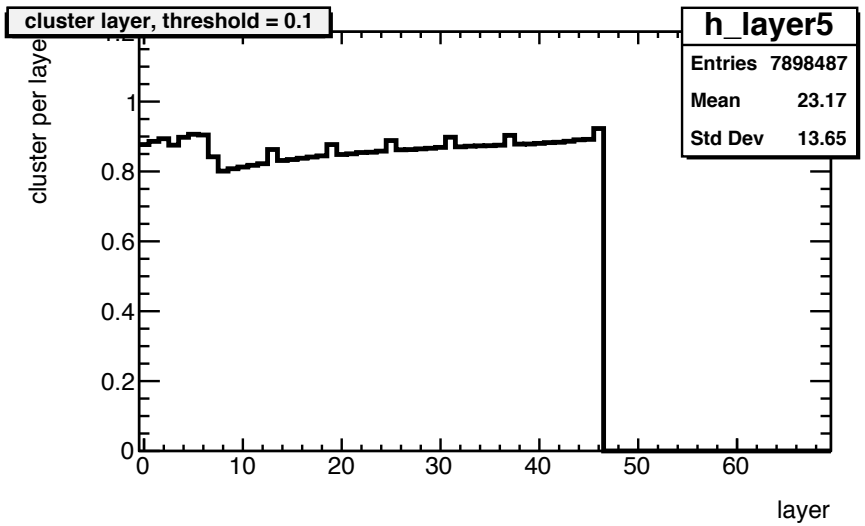


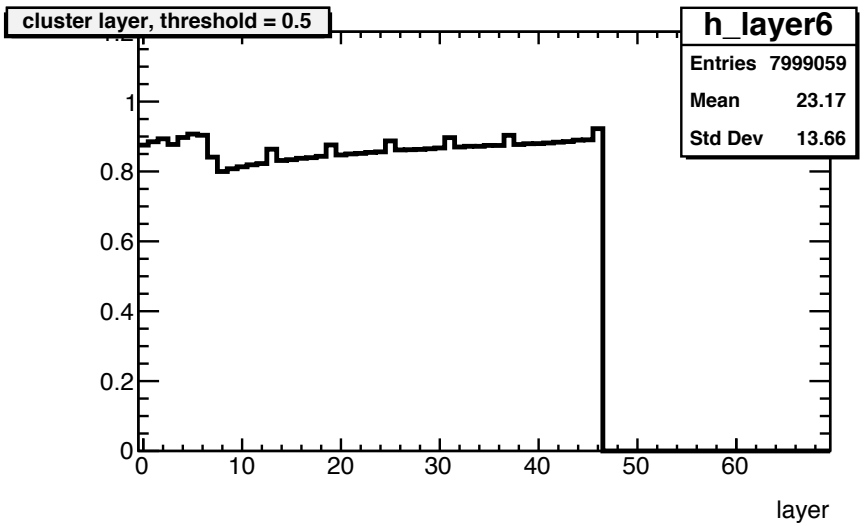


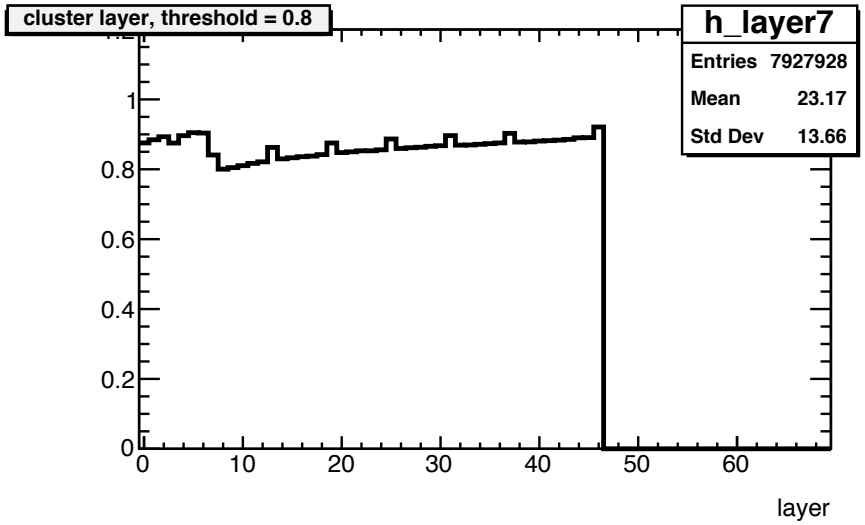
Cluster Phisize vs r

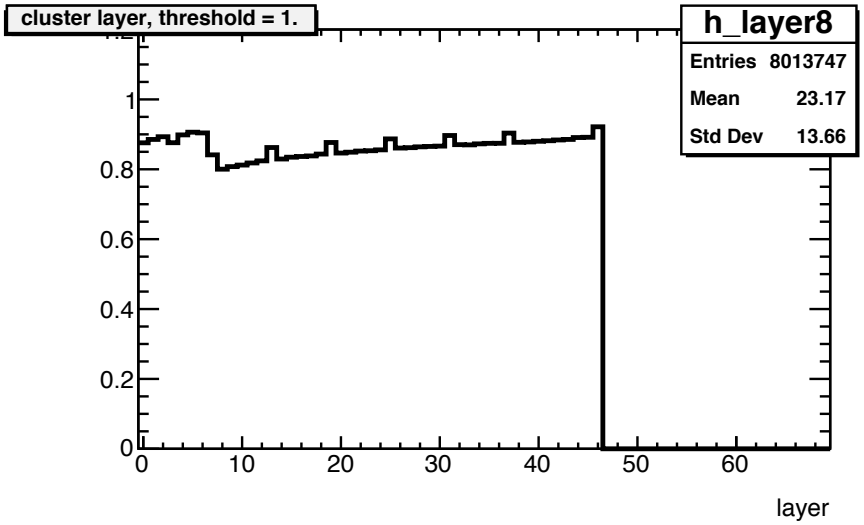


Ntp_cluster->Draw("layer") normalized by total number of true tracks in "ntp_gtrack"

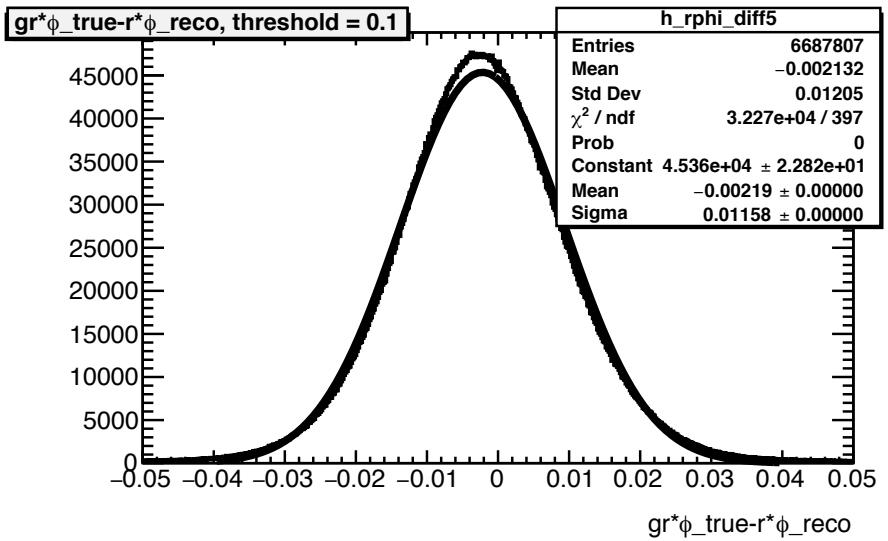


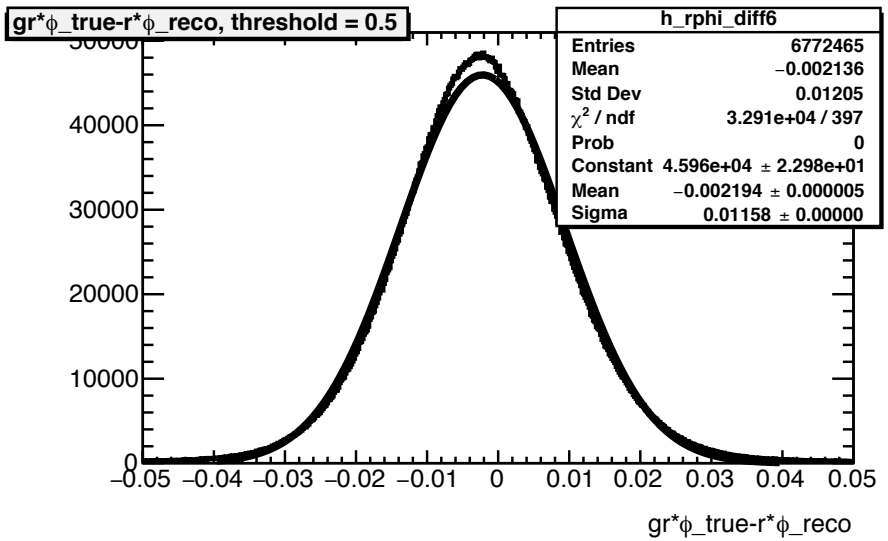


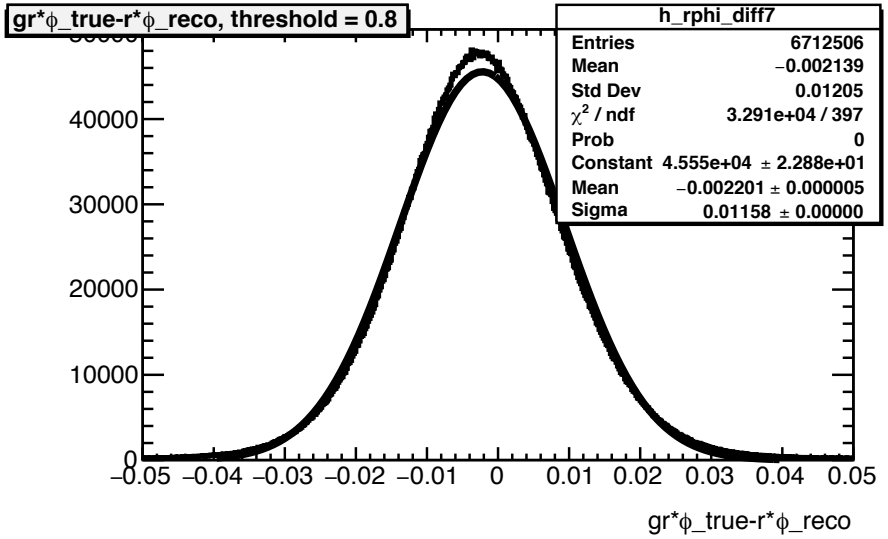


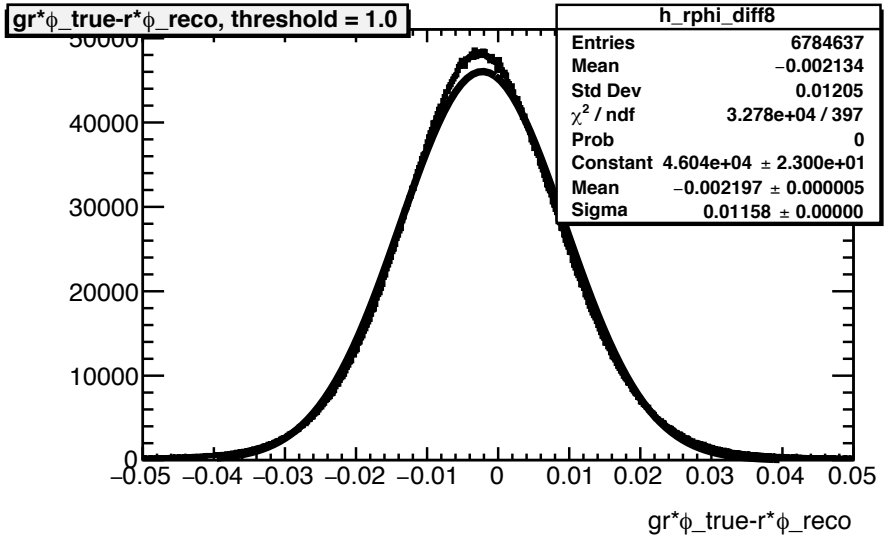


Cluster gr*phi_true – r*phi for TPC

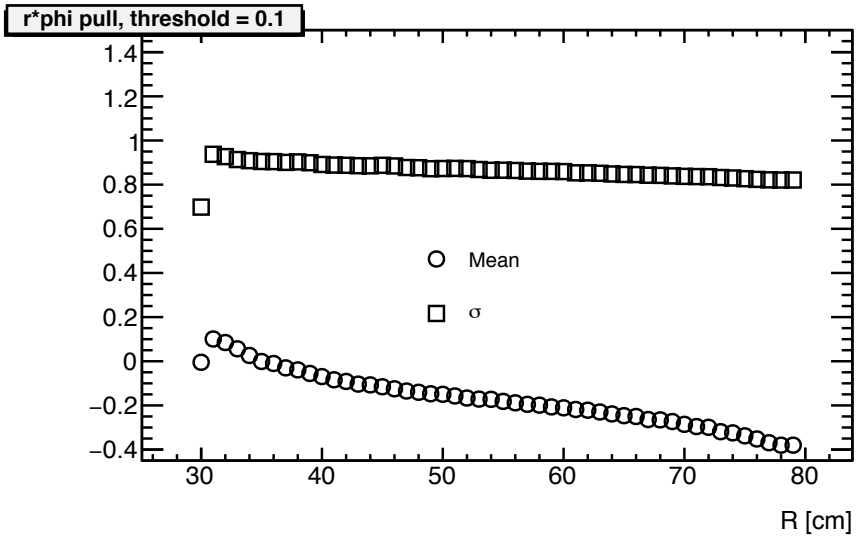


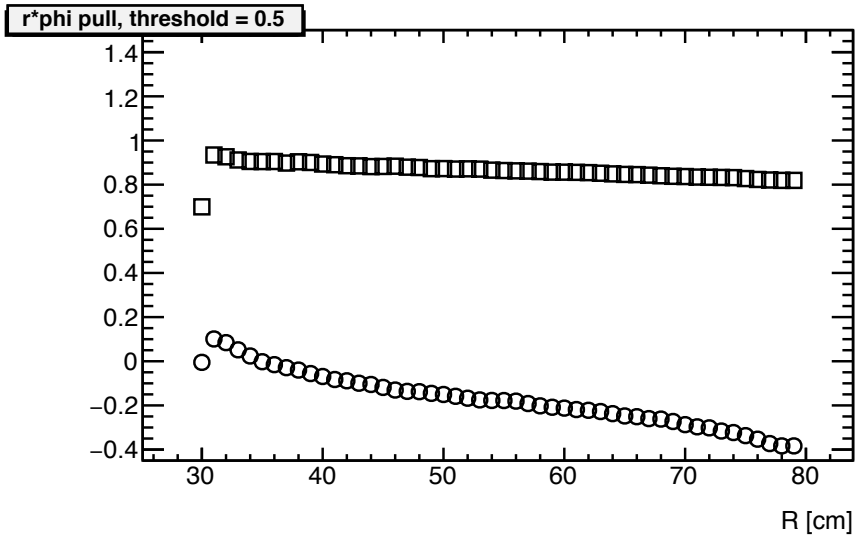


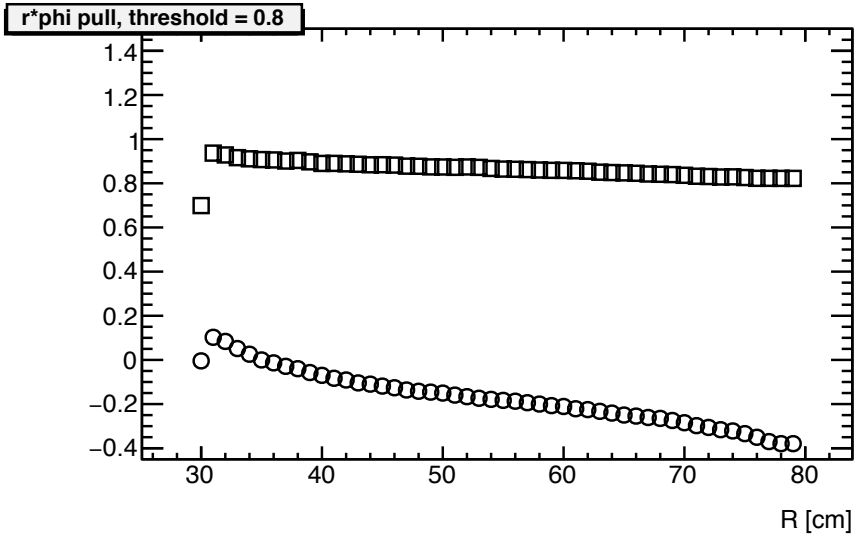


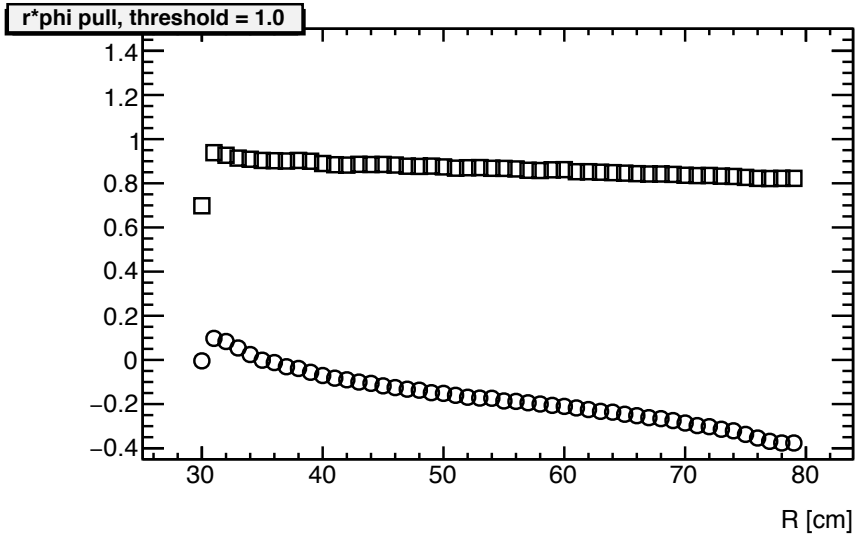


Cluster R*phi pull

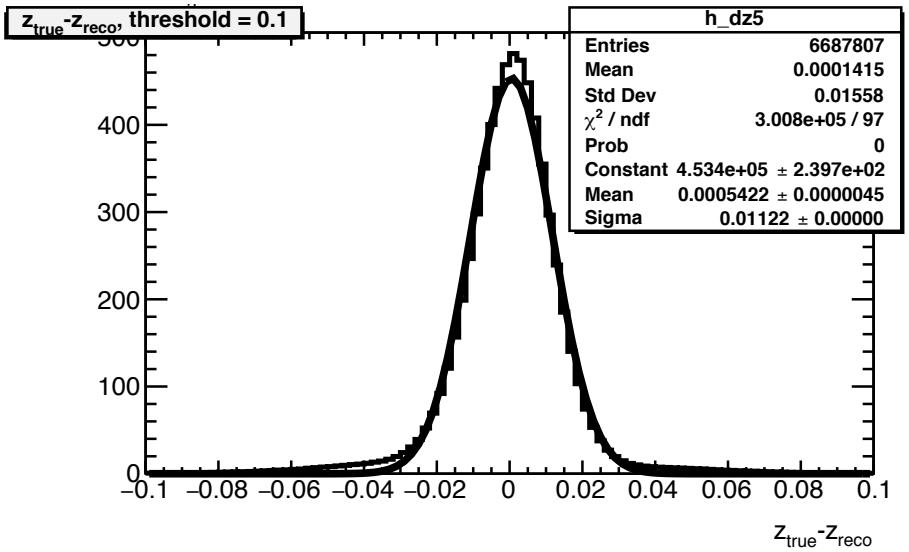


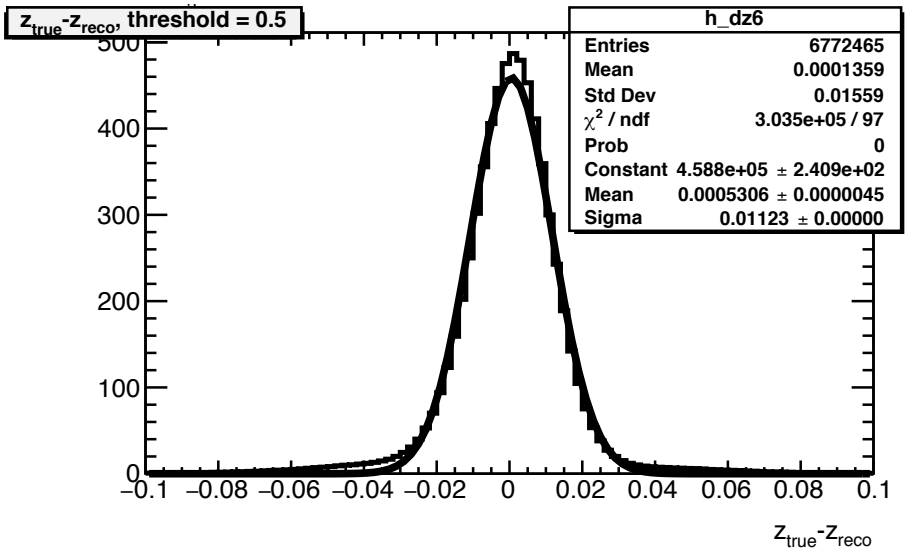


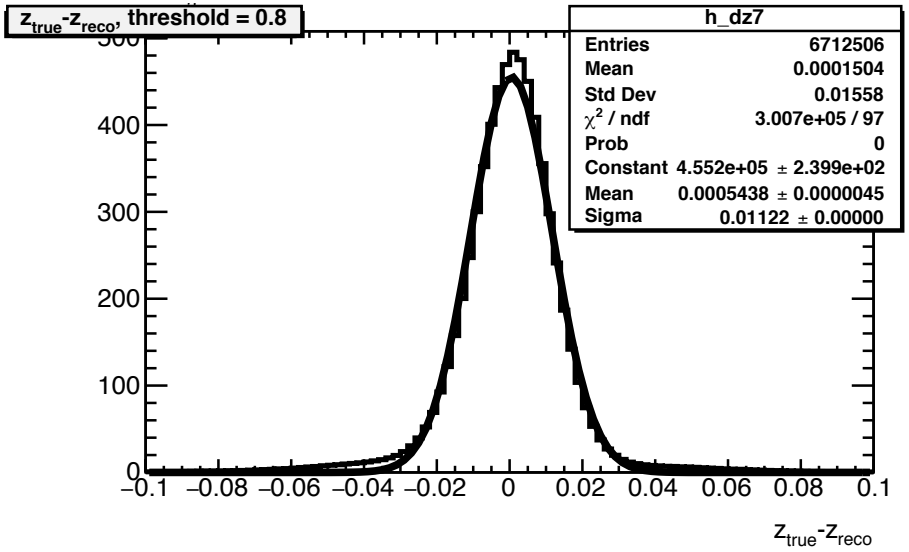


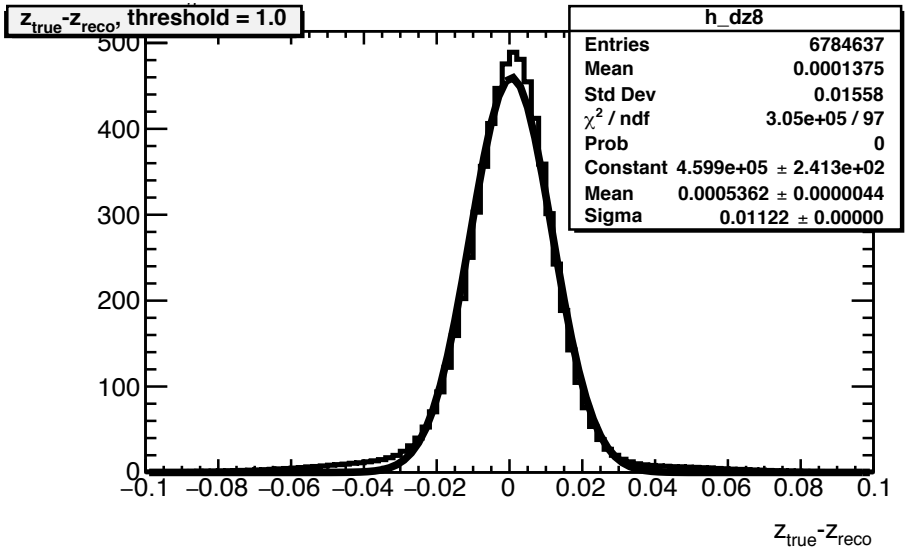


Cluster z_true – z_reco for TPC

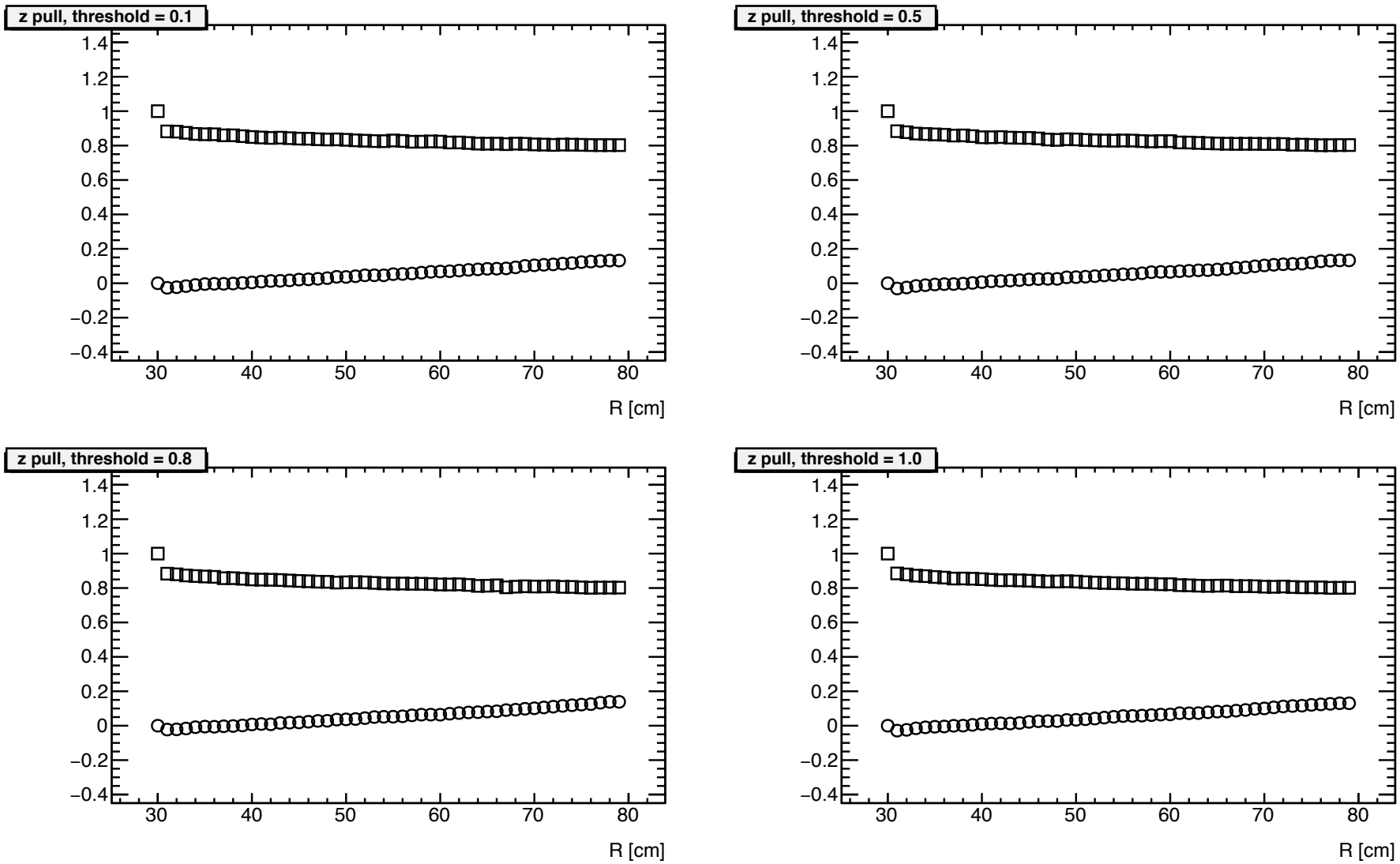


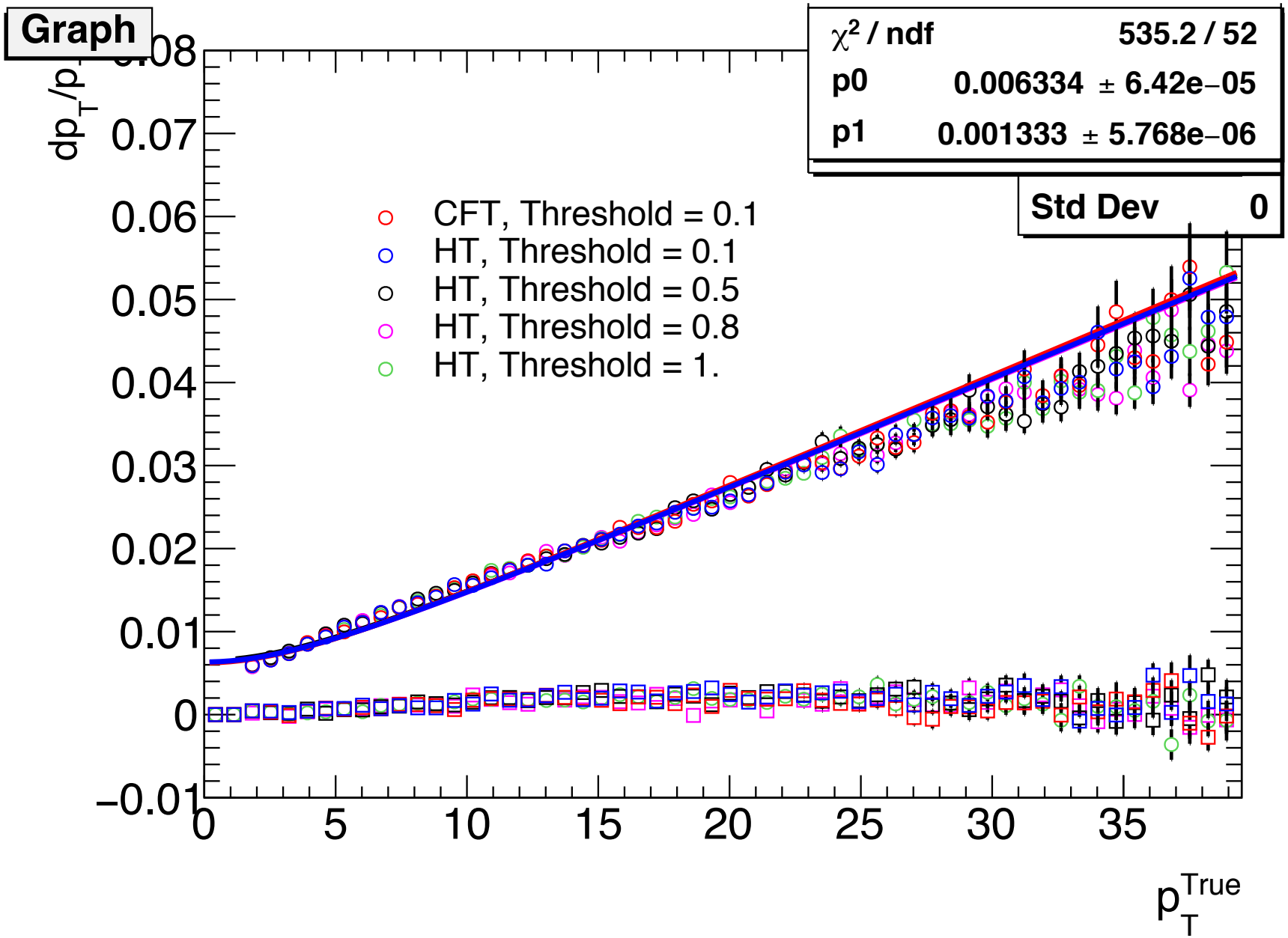


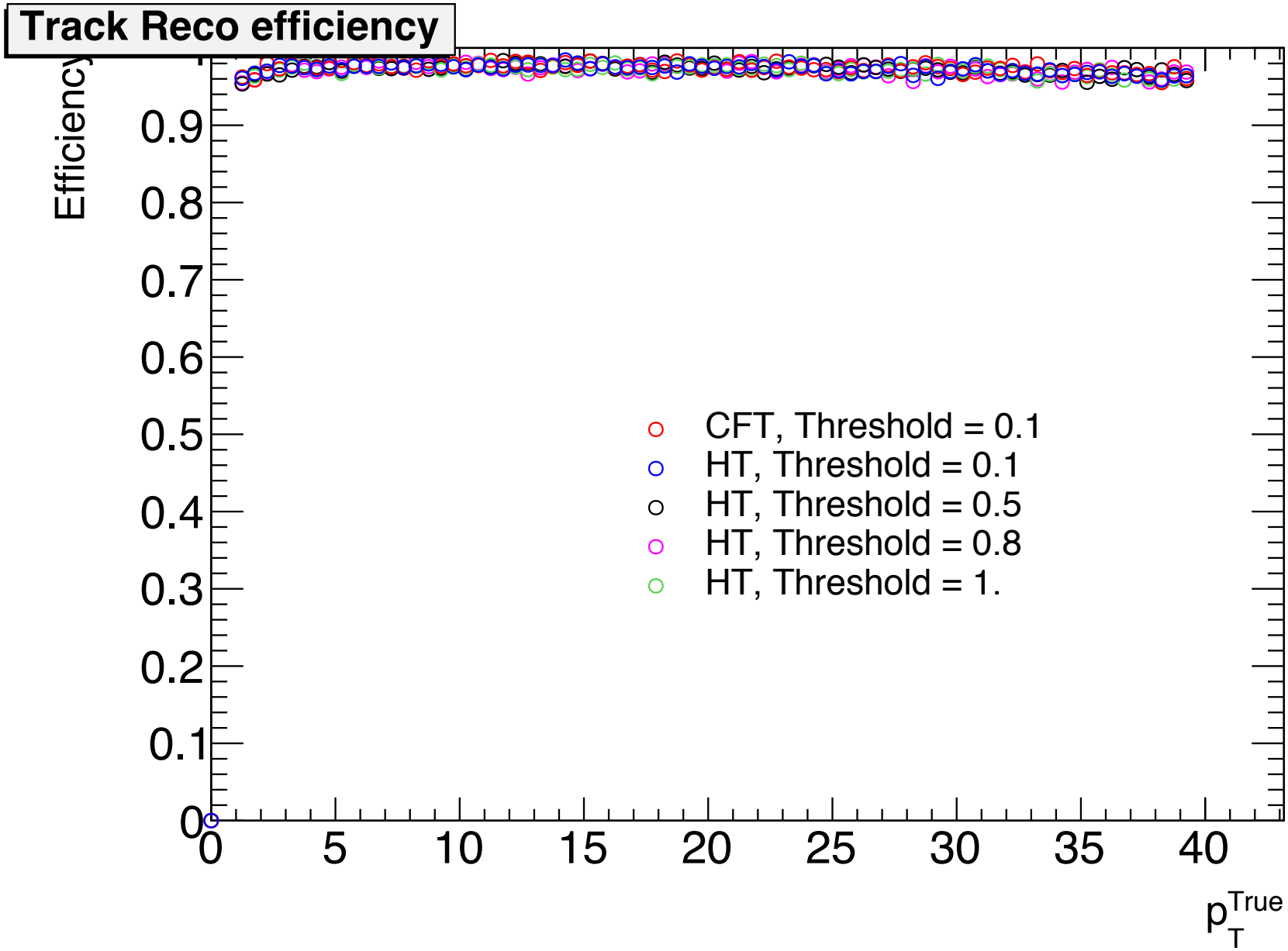


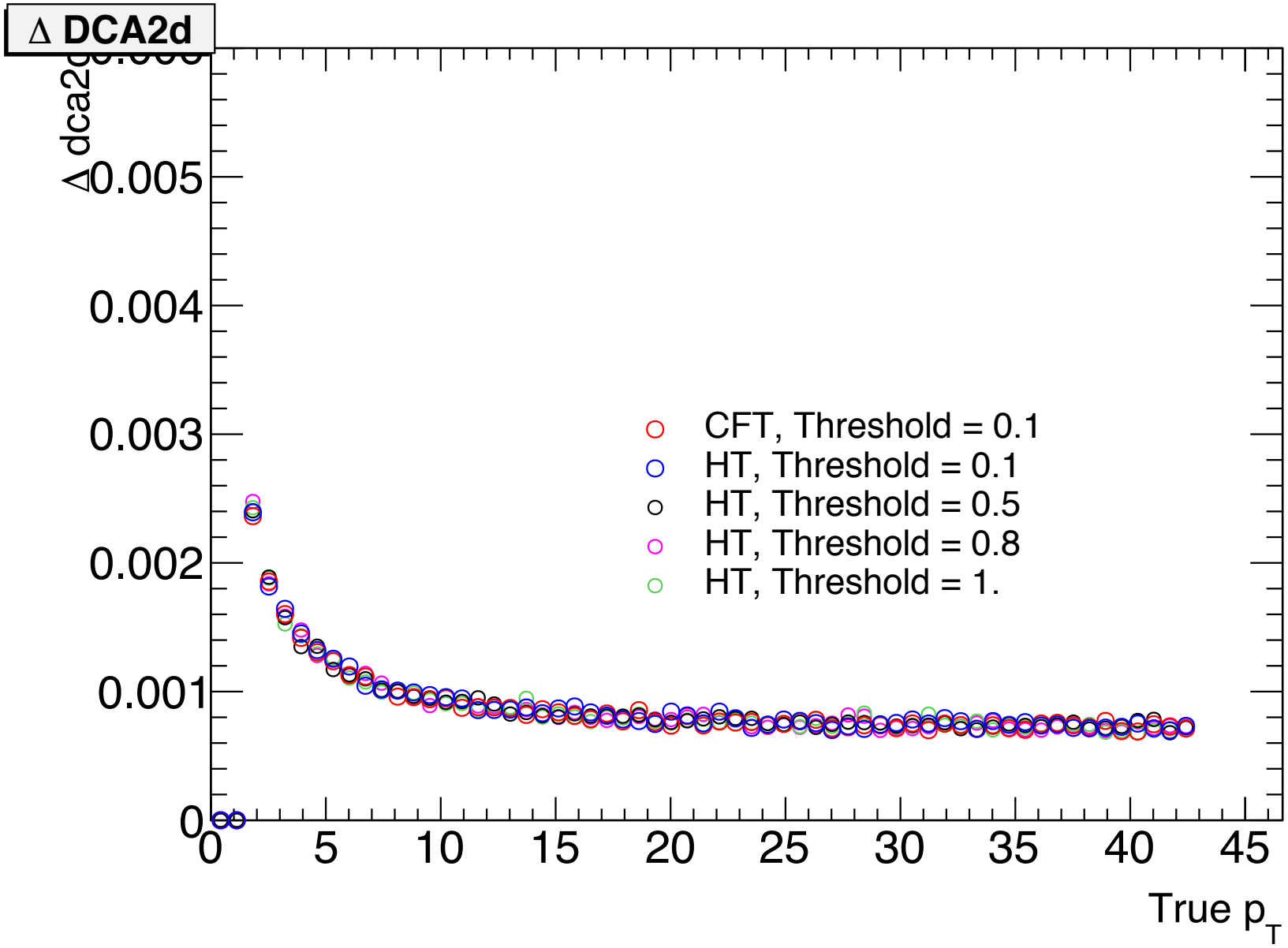


Cluster z pull




Graph
χ^2 / ndf 535.2 / 52
p0 0.006334 ± 6.42e−05
p1 0.001333 ± 5.768e−06
Std Dev 0
CFT, Threshold = 0.1
HT, Threshold = 0.1
HT, Threshold = 0.5
HT, Threshold = 0.8
HT, Threshold = 1.
dp_T/p_T
p_T^{True}
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
0
5
10
15
20
25
30
35

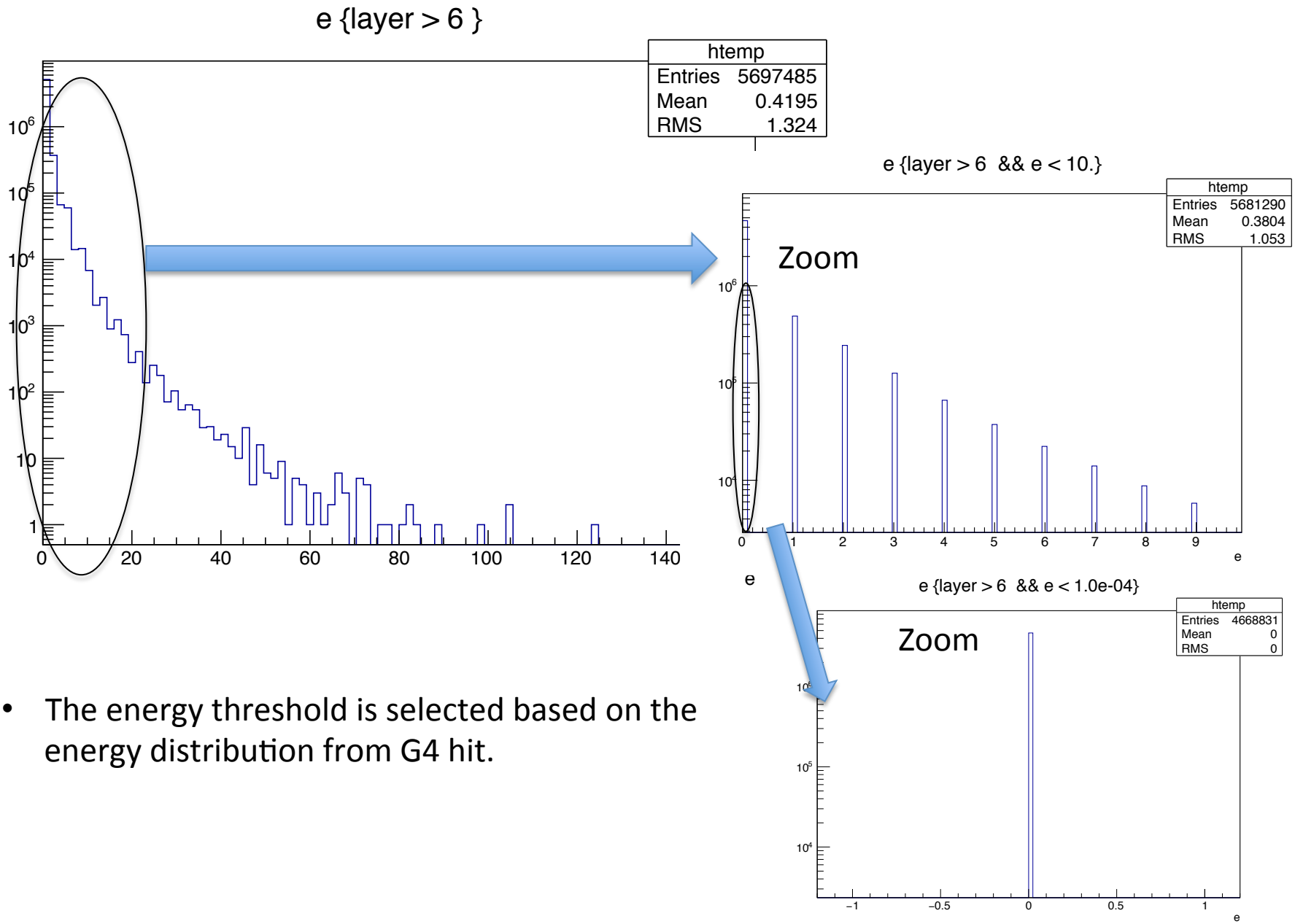

Track Reco efficiency
Efficiency
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
30
35
40
p_T^{True}
CFT, Threshold = 0.1
HT, Threshold = 0.1
HT, Threshold = 0.5
HT, Threshold = 0.8
HT, Threshold = 1.


Δ DCA2d
Δ dca2d
0.005
0.004
0.003
0.002
0.001
0
0
5
10
15
20
25
30
35
40
45
True p_T
CFT, Threshold = 0.1
HT, Threshold = 0.1
HT, Threshold = 0.5
HT, Threshold = 0.8
HT, Threshold = 1.

Backup

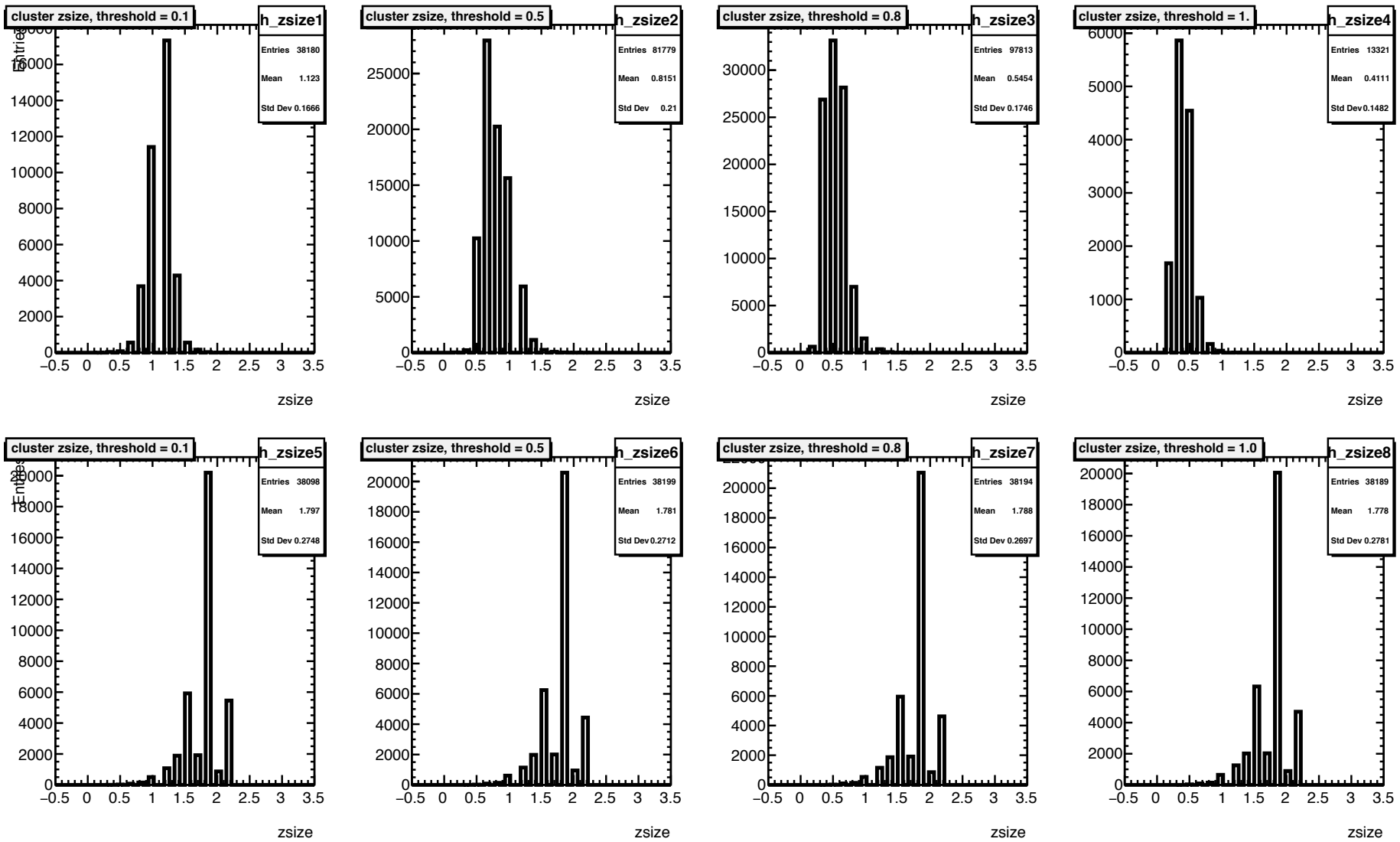
40 layers TPC

ntp_hit->Draw("e", "layer >6 && [e range condition]") , nightly build, energy threshold = 0.01,

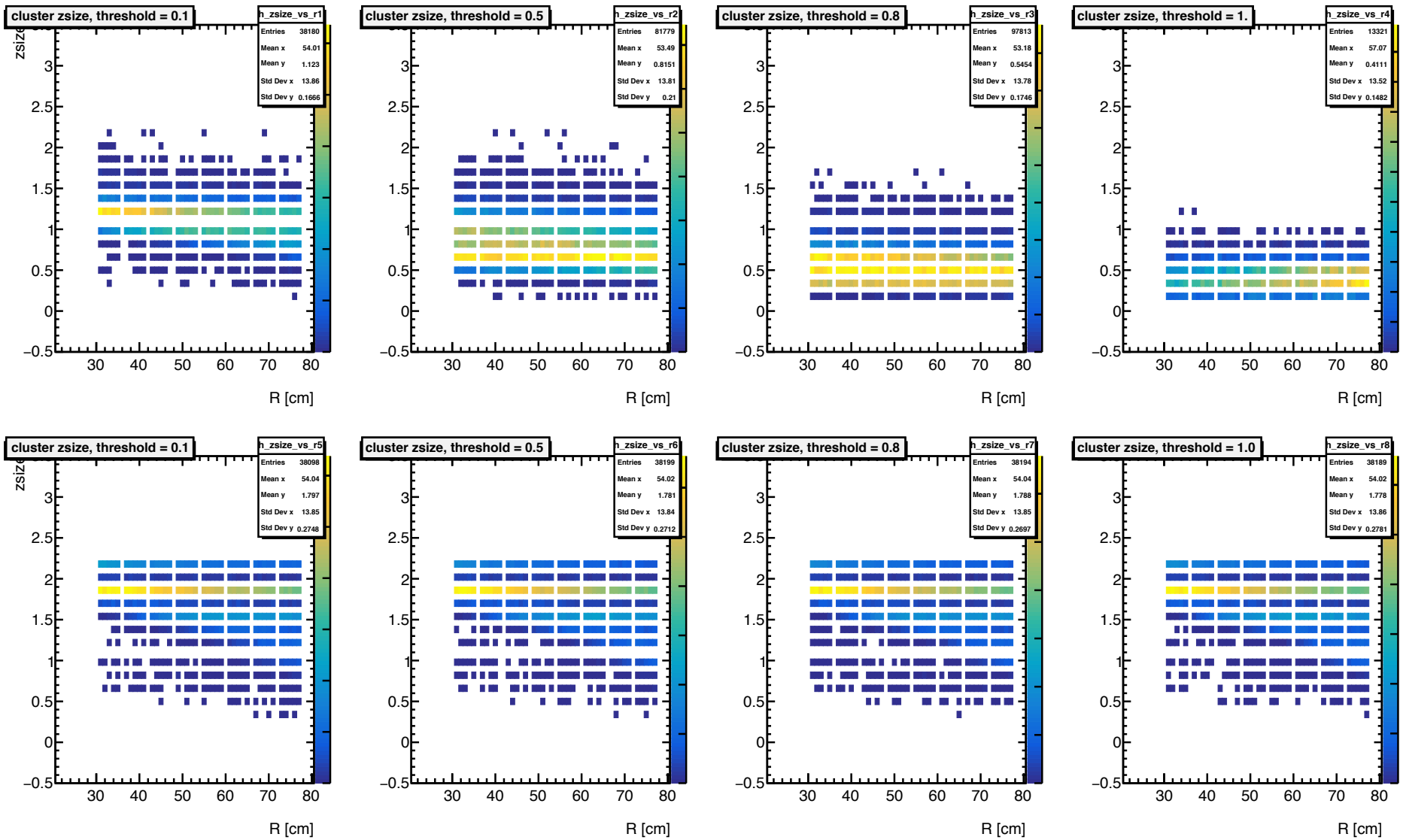


- The energy threshold is selected based on the energy distribution from G4 hit.

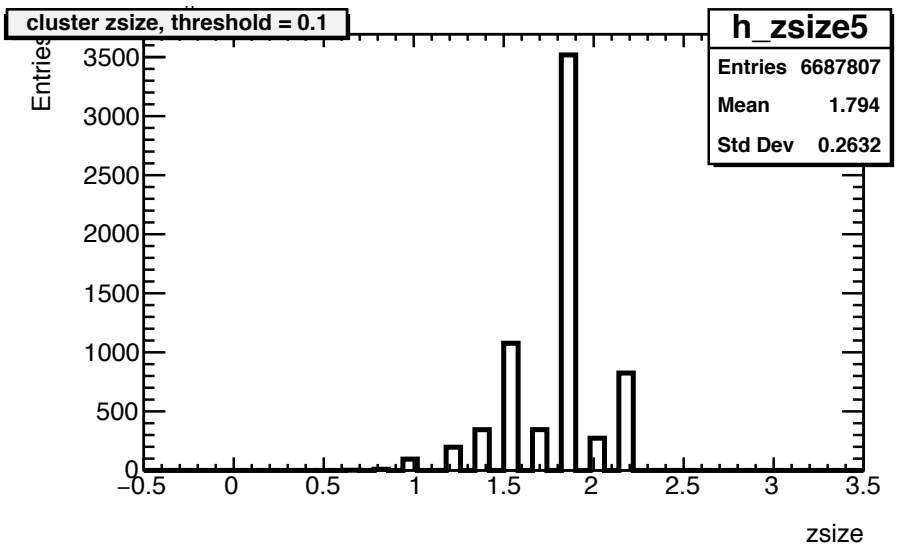
Ntp_cluster ->Draw (“zsize”, “layer > 6”)

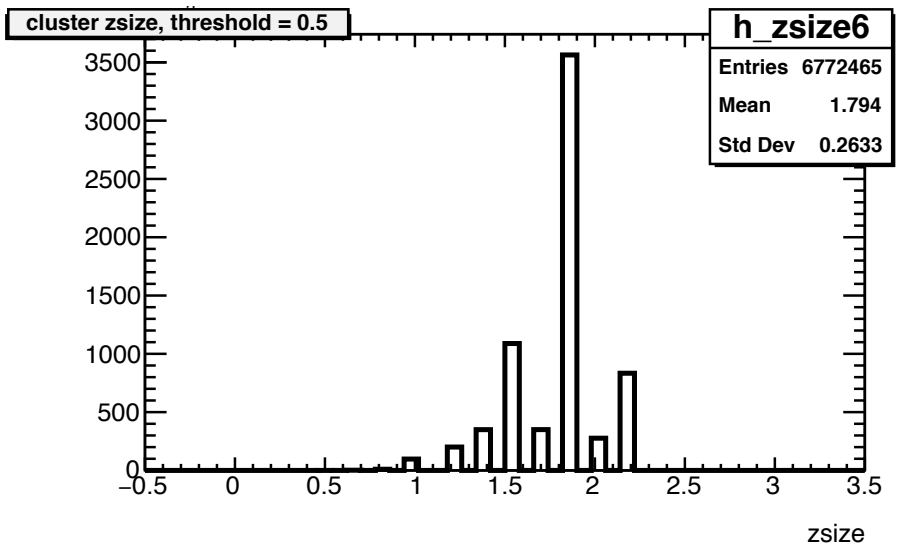


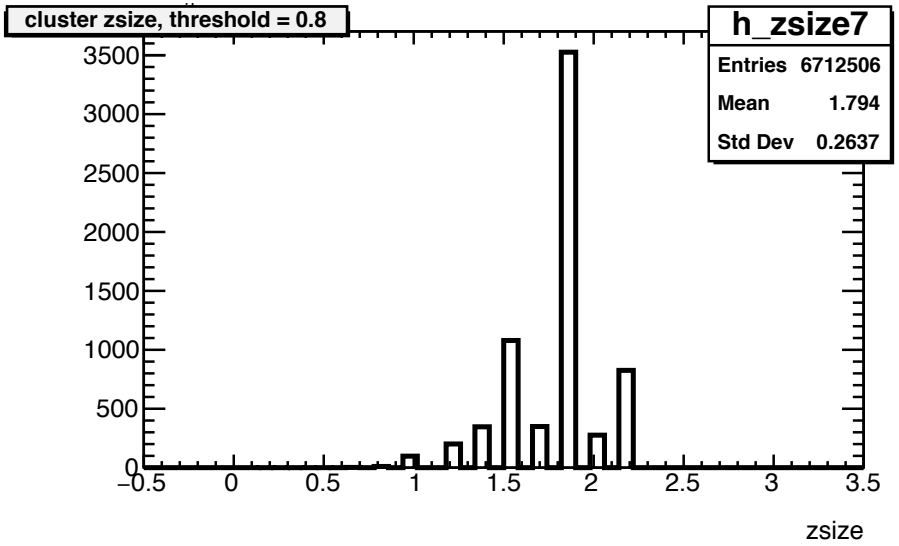
Cluster zsize vs r

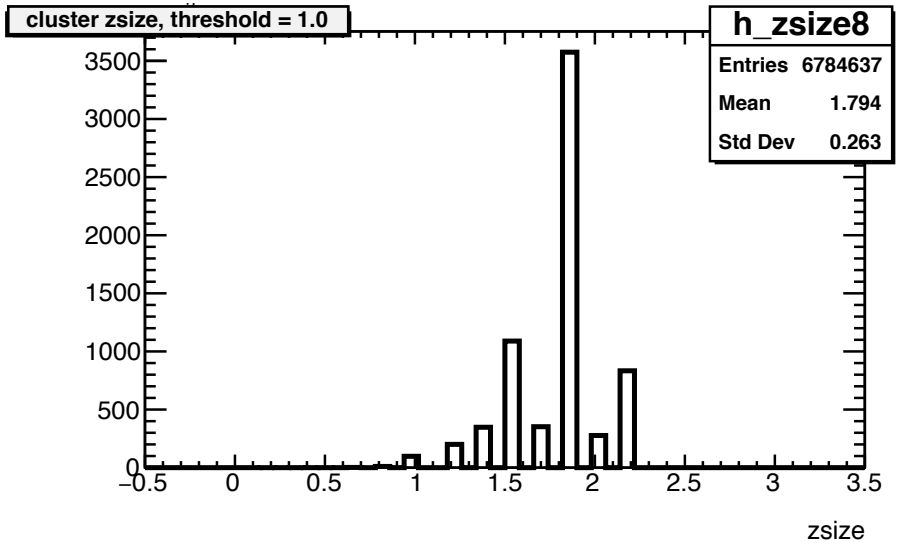
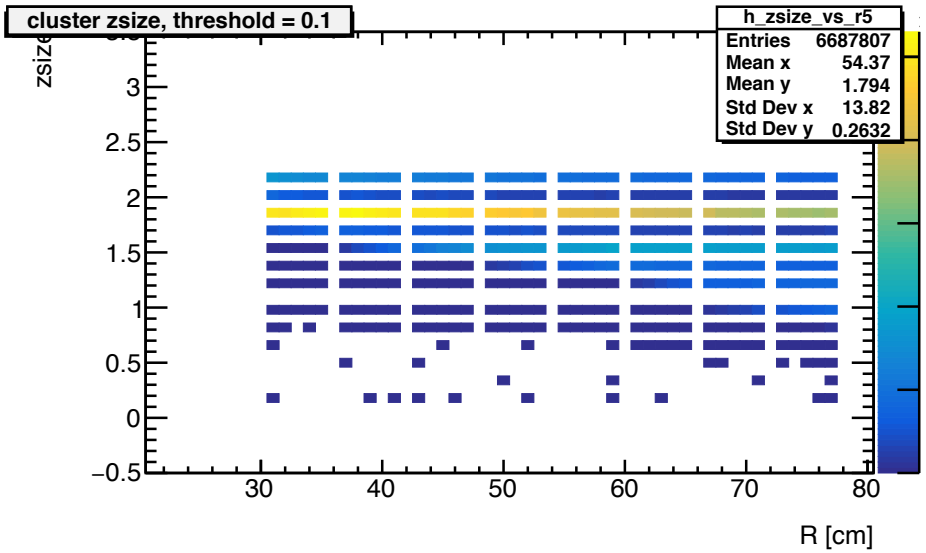
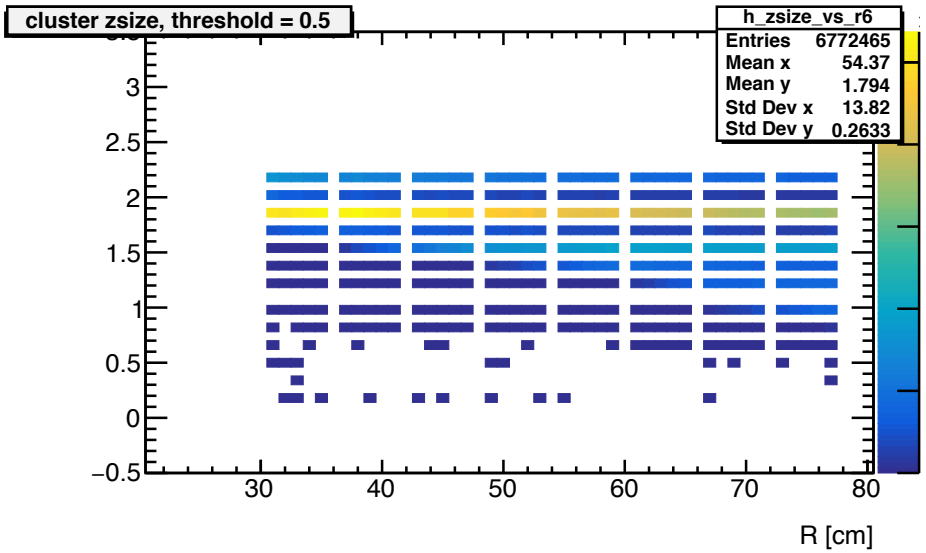
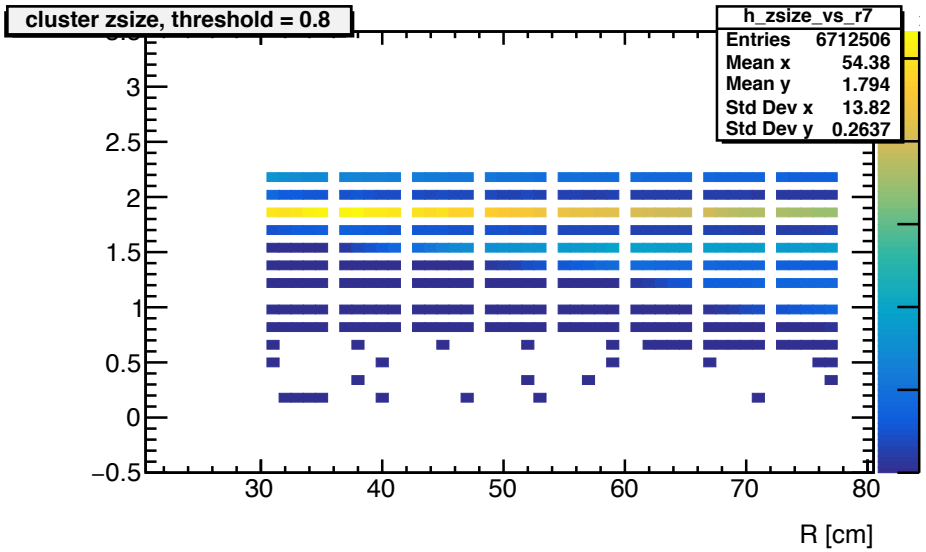
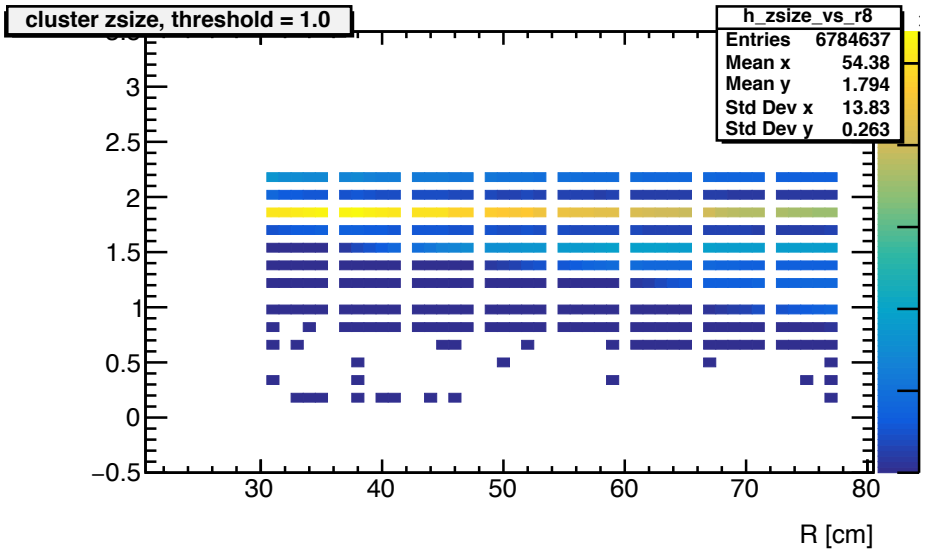


Ntp_cluster ->Draw (“zsize”, “layer > 6”), Mid central Hijing embedded muons









Cluster zsize vs r