# PFA Status – SiD Workshop April 9, 2007

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*Standard Detector Model Tools*
*Calibration*
*Perfect PFA*

*Photon Finding*

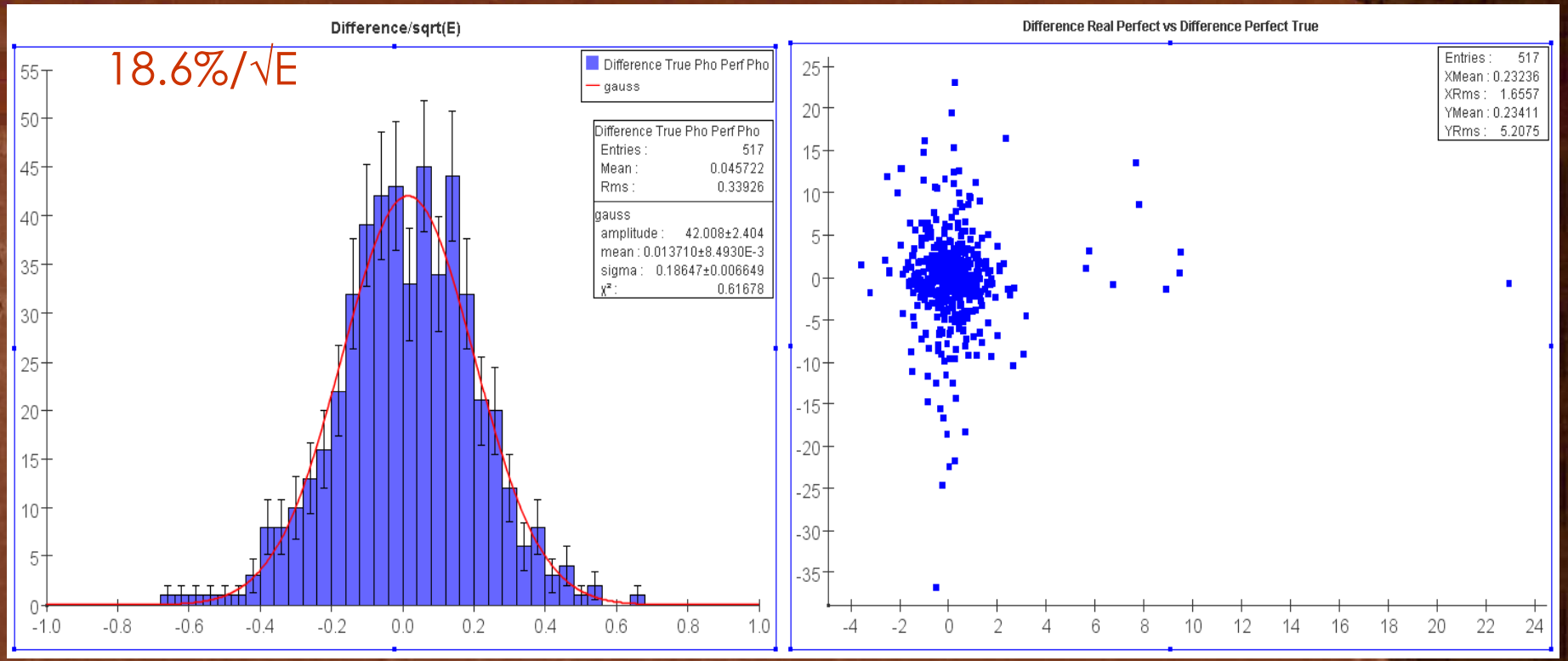
*Pictorial PFA – Dijets at 500 GeV*

# Standard Detector Model Tools

## Calorimeter Calibration

- Essential for PFA development, detector model comparison
- Method developed by R. Cassell
- Standard calibrations for at least 4 detector models

### EM Calibration



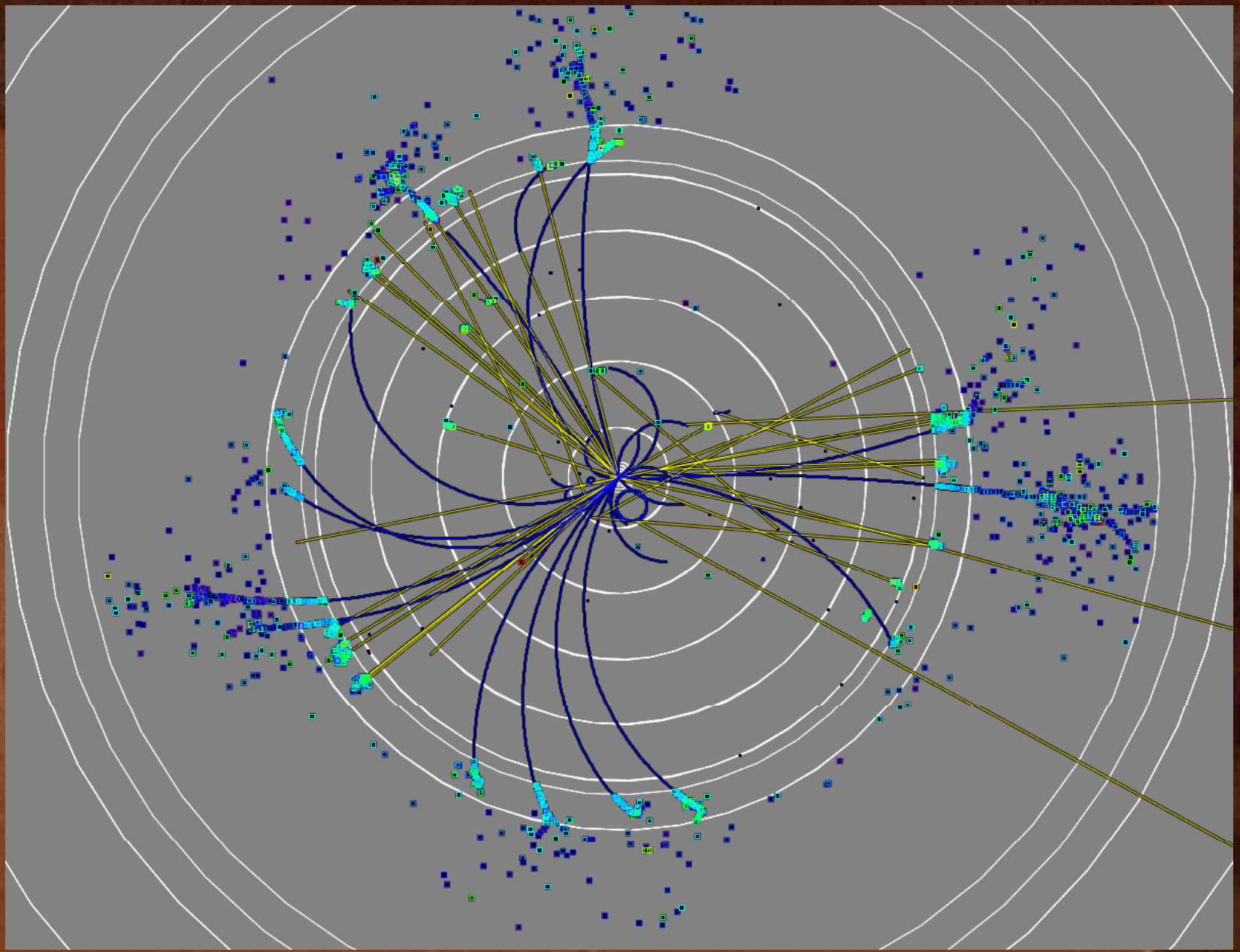
# Perfect PFA

## Perfect PFA Definition

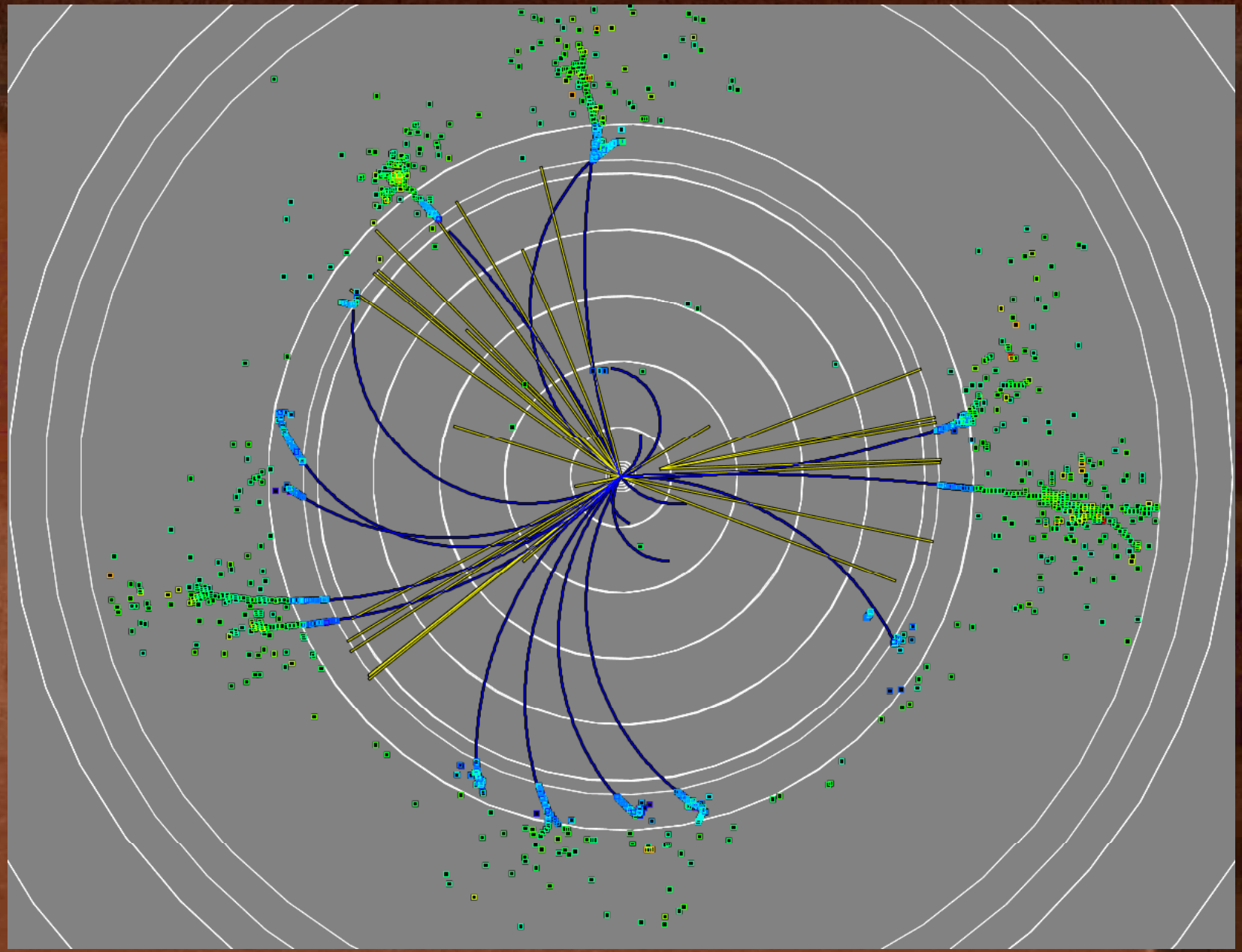
- Essential for PFA development, useful for detector model comparisons
- Based on Generator or Simulated Particles?
- Standard cheated tracks, cheated clusters

```
// Set up the MC list for perfect PFA
double rcut = 400.;  //  Bruce said 400 mm at meeting March 13
double zcut = 400.;
//   CreateFinalStateMCParticleList mcListMakerGen = new CreateFinalStateMCParticleList("Gen");
CreateFinalStateMCParticleList mcListMakerSim = new CreateFinalStateMCParticleList("Sim");
mcListMakerSim.setRadiusCut(rcut);
mcListMakerSim.setZCut(zcut);
//   add(mcListMakerGen);
add(mcListMakerSim);
//   String mcListGen = "GenFinalStateParticles";
String mcListSim = "SimFinalStateParticles";
String mcList = mcListSim; // Can choose the Gen or Sim list here

String Tname = "RefinedCheatTracks";
add(new CheatTrackDriver());

String Cname = "PerfectCheatClusters";
String[] collections = {"EcalBarrDigiHits","EcalEndcapDigiHits","HcalBarrDigiHits","HcalEndcapDigiHits"};
add (new CheatClusterDriver(collections,Cname));

String CRPname = "CheatReconstructedParticles";
CheatParticleDriver cpd = new CheatParticleDriver(Cname,Tname,mcList);
//  Inputs Cheated Tracks, Cheated Clusters, and MC particle list to create Cheated Particles
cpd.setOutputName(CRPname);
add(cpd);

// now make (more realistic) cheat tracks, etc with PPR driver
String outName = "PerfectRecoParticles";
int minT = 0;
int minC = 0;
PPRParticleDriver d = new PPRParticleDriver(CRPname, outName);
d.setMinTrackerHits(minT);
d.setMinCalorimeterHits(minC);
add(d);

//  this makes perfect tracks from the perfect particles
PerfectTrackDriver perftrk = new PerfectTrackDriver();
perftrk.setParticleNames(outName);
perftrk.setTrackNames("PerfectTracks");
add(perftrk);
```

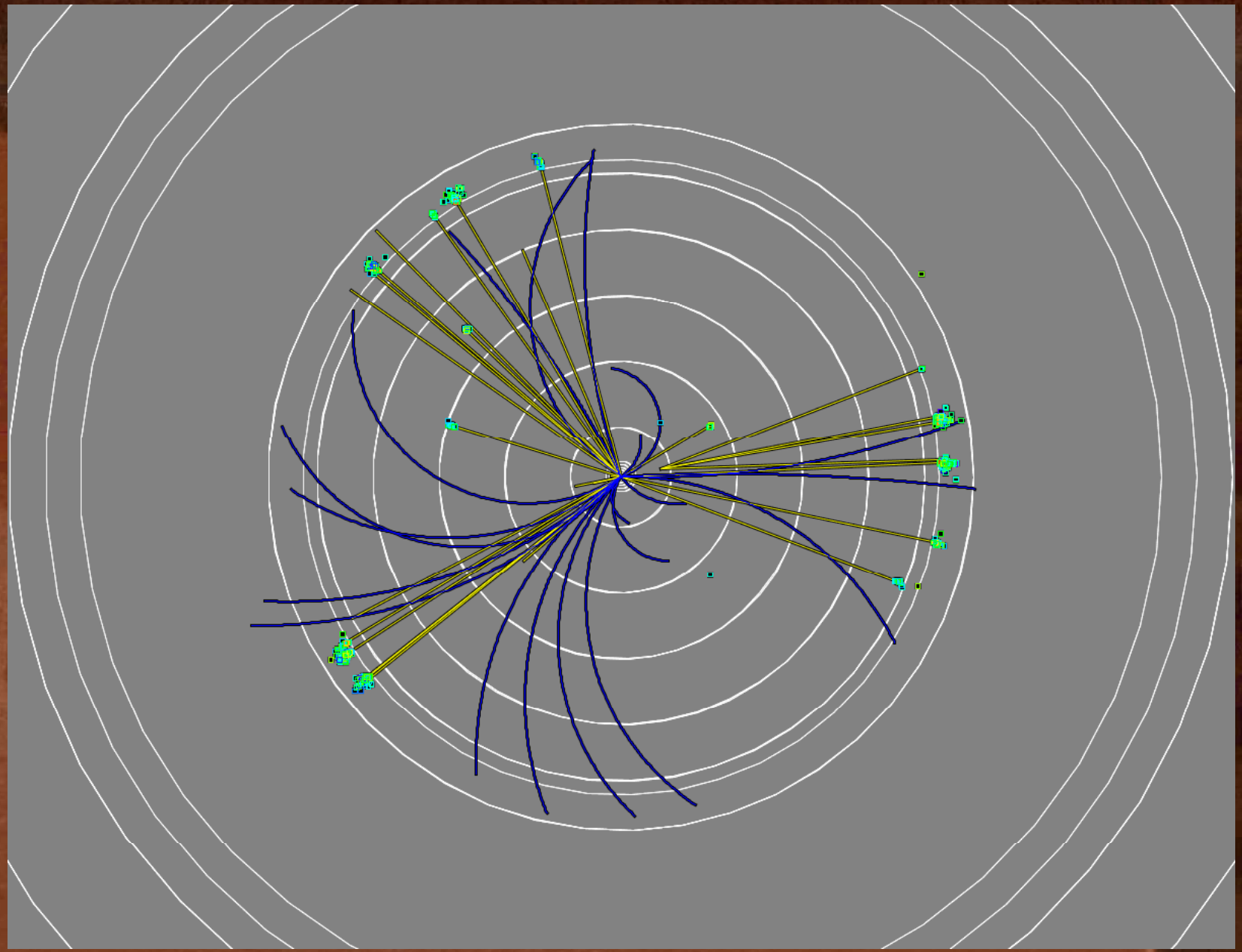
# Perfect PFA Definition, ZPole event, all MC Particles, all DigiSim hits



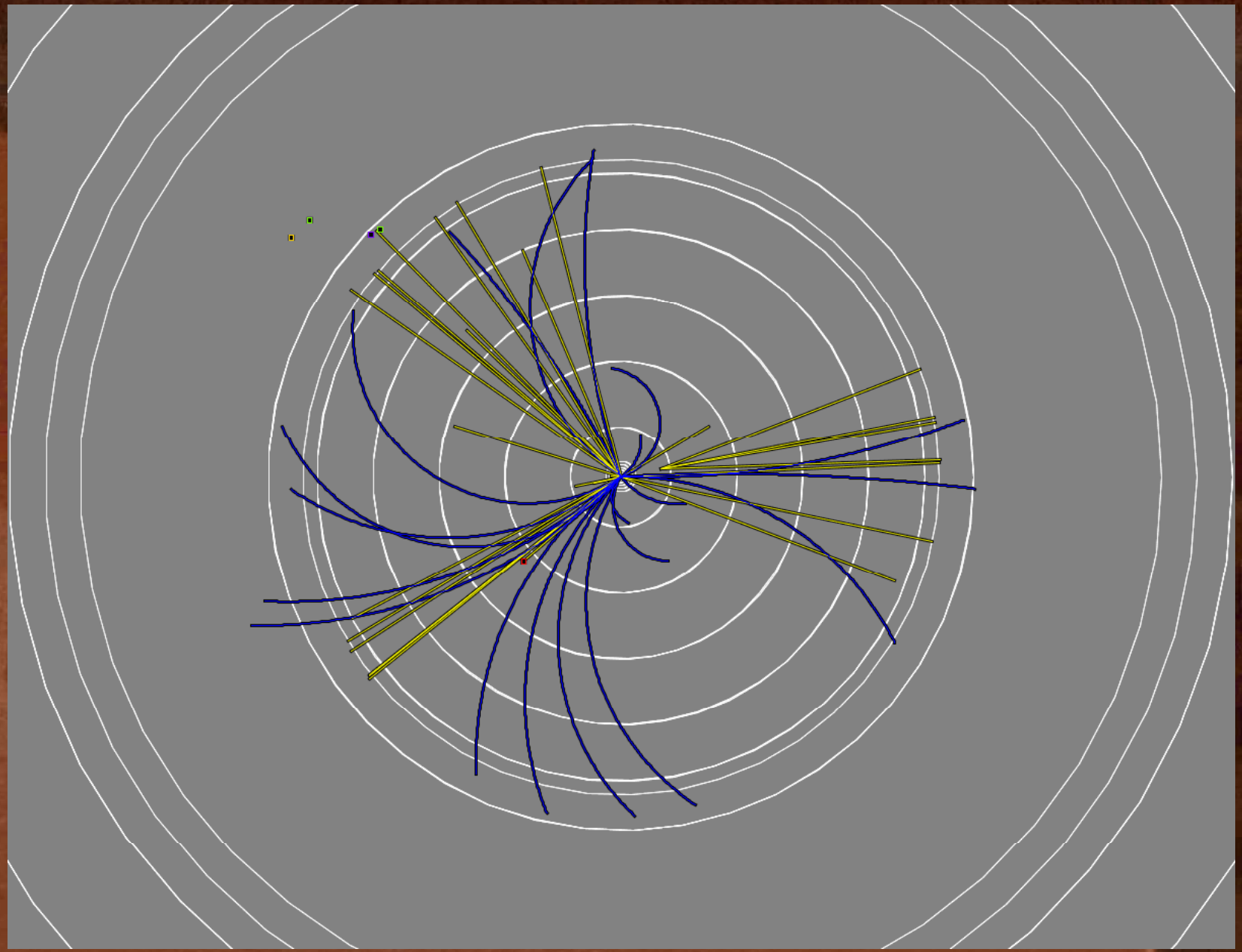
# ZPole event, Perfect PFA Particles, Perfect Charged Particle Hits



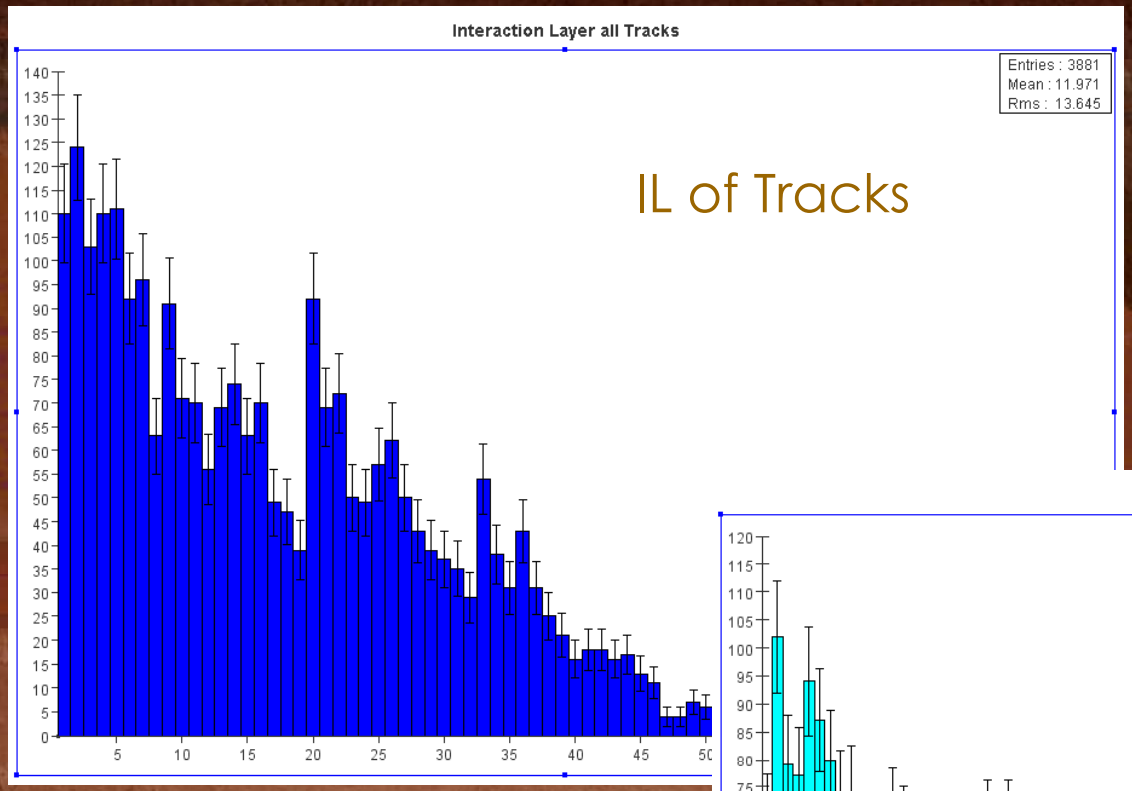
# ZPole event, all MC Particles, Perfect Photons hits



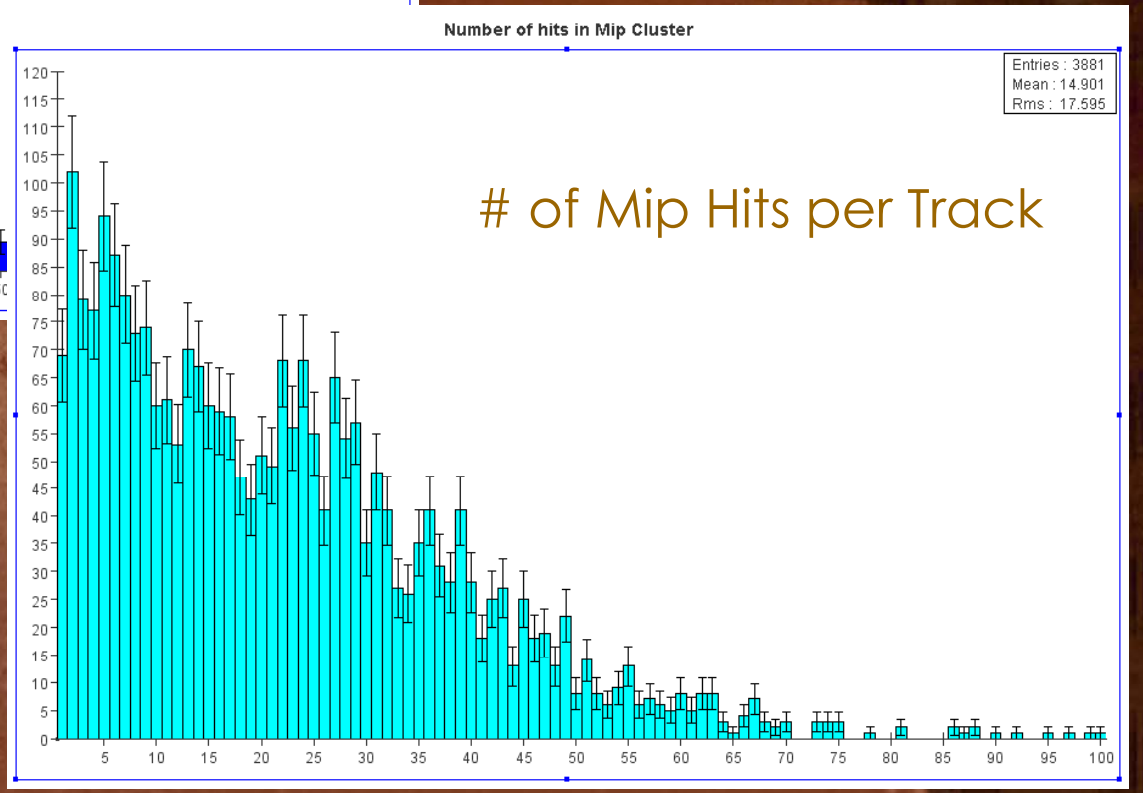
# ZPole event, all MC Particles, Perfect Neutral Had hits



# Mip Finding at ZPole



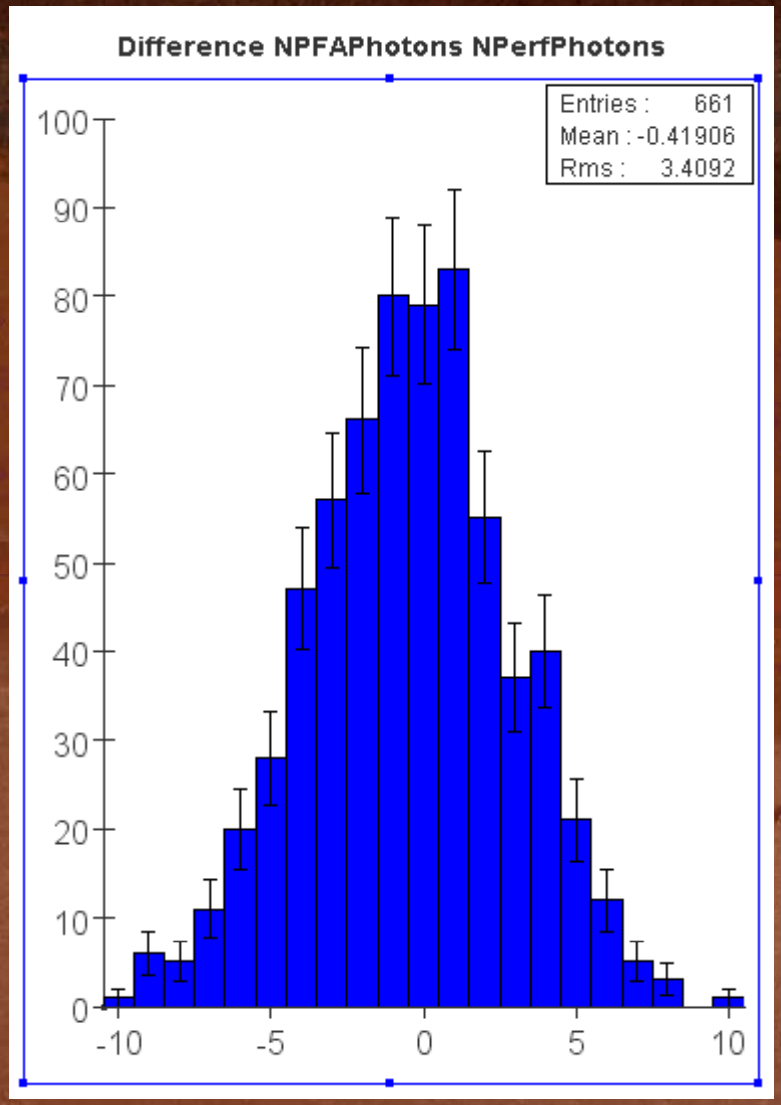

IL of Tracks

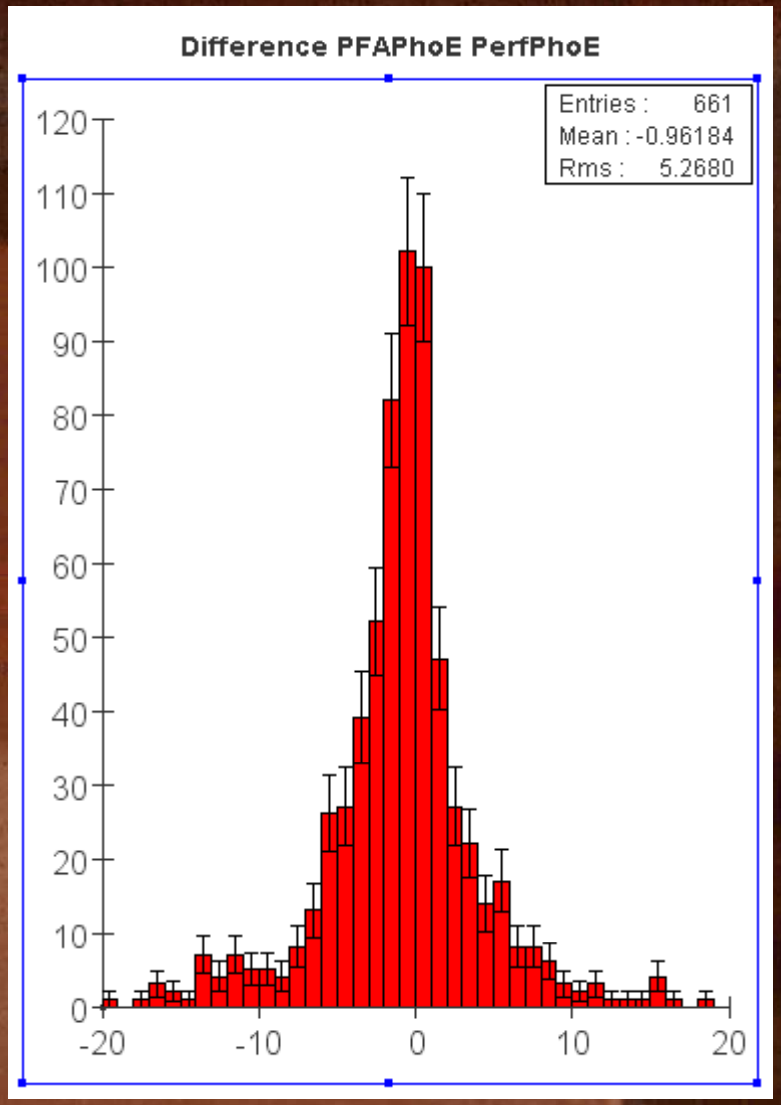



# of Mip Hits per Track

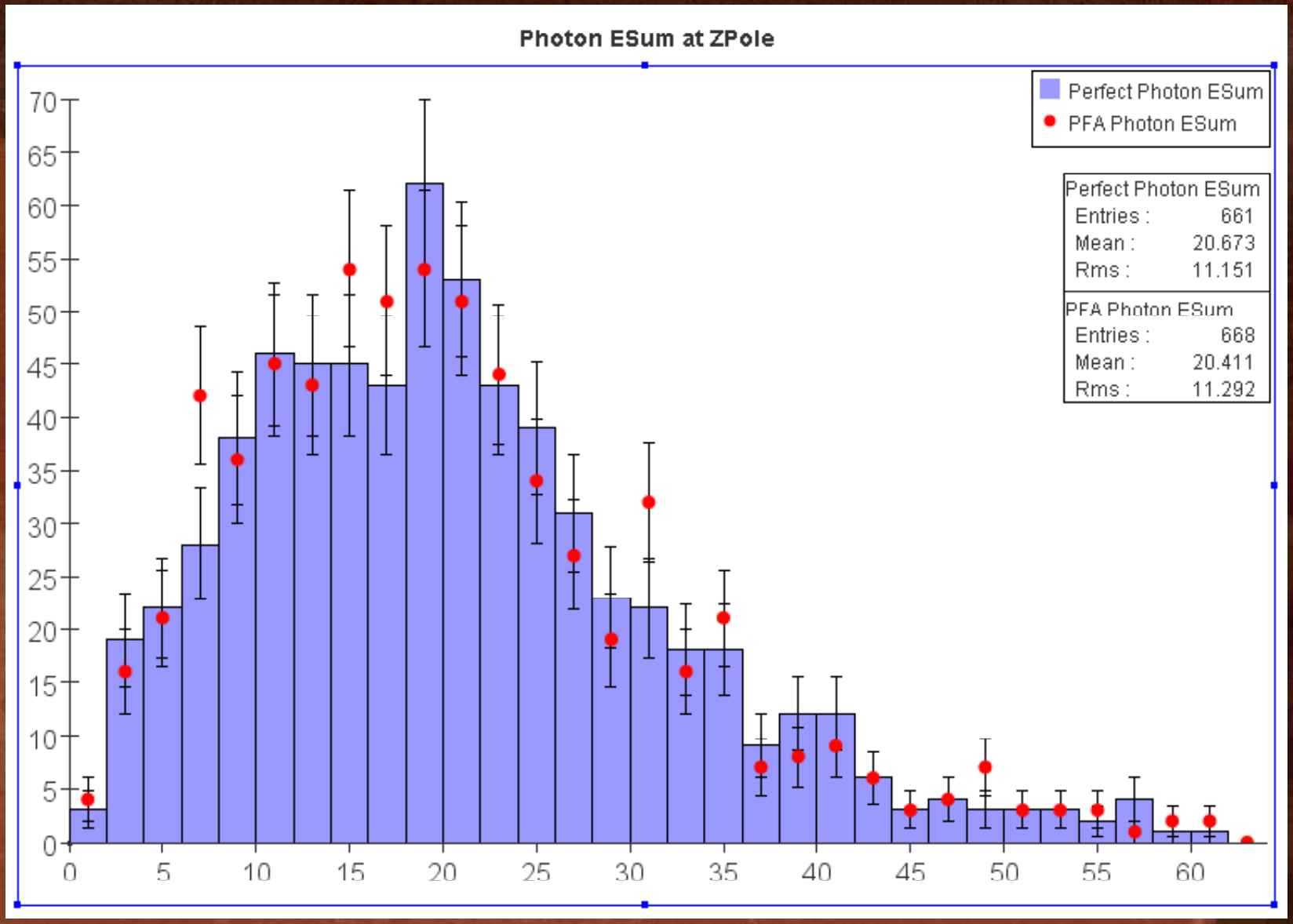
Tuned with 1-10 GeV muons
4-176 degrees in theta

# Photon-Finding at ZPole



# Photon-Finding at ZPole



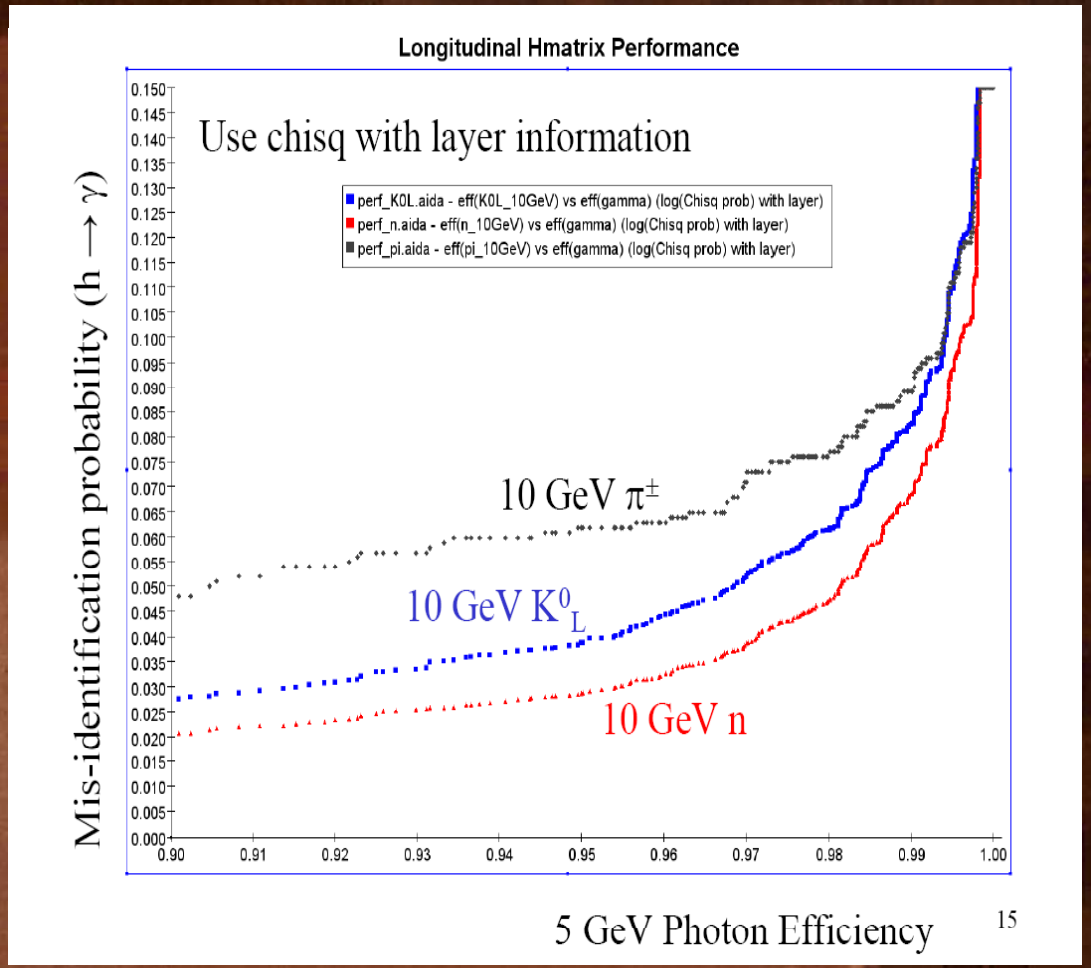
# Photon-Finding Optimization

Update on Photon ID using a Longitudinal H-Matrix

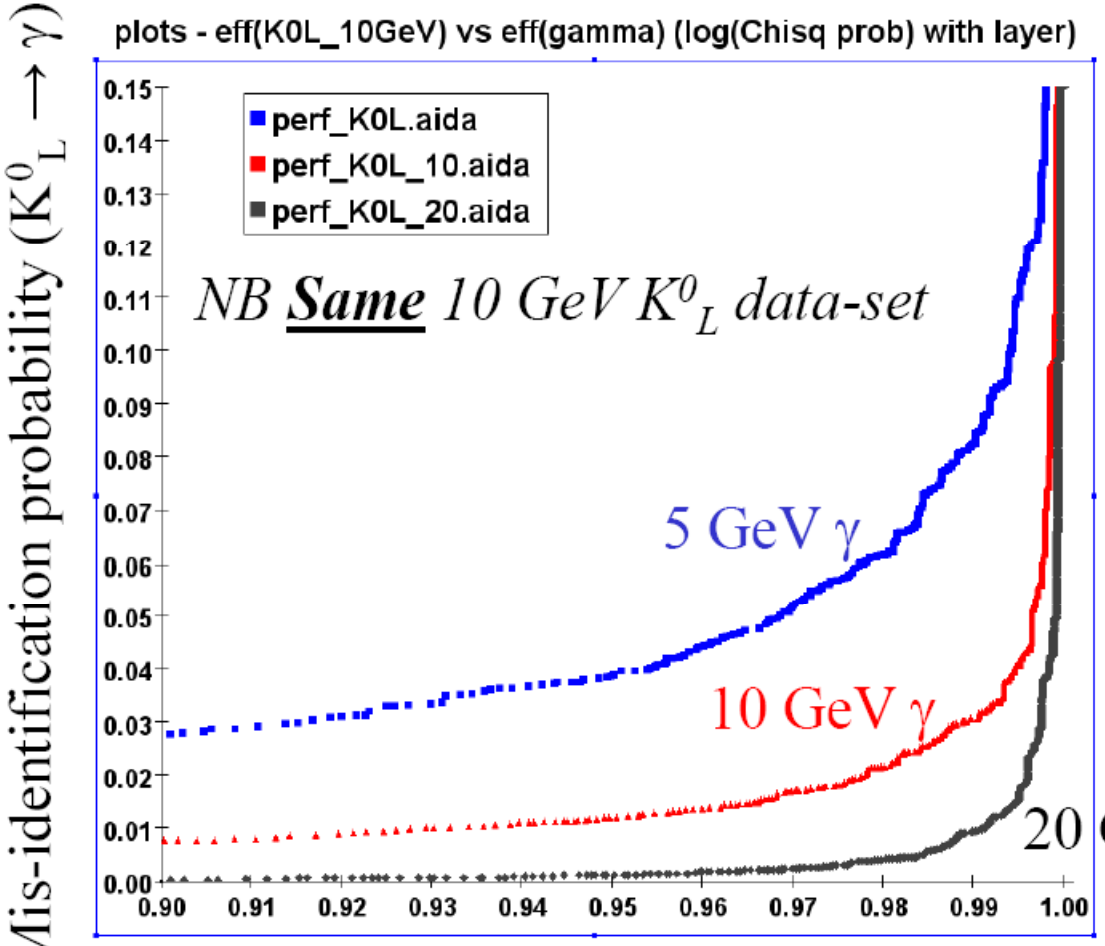
Graham W. Wilson
Univ. of Kansas
April 3rd 2007

Further H-matrix studies (with Eric Benavidez).

See Sept 19th 2006 for previous report



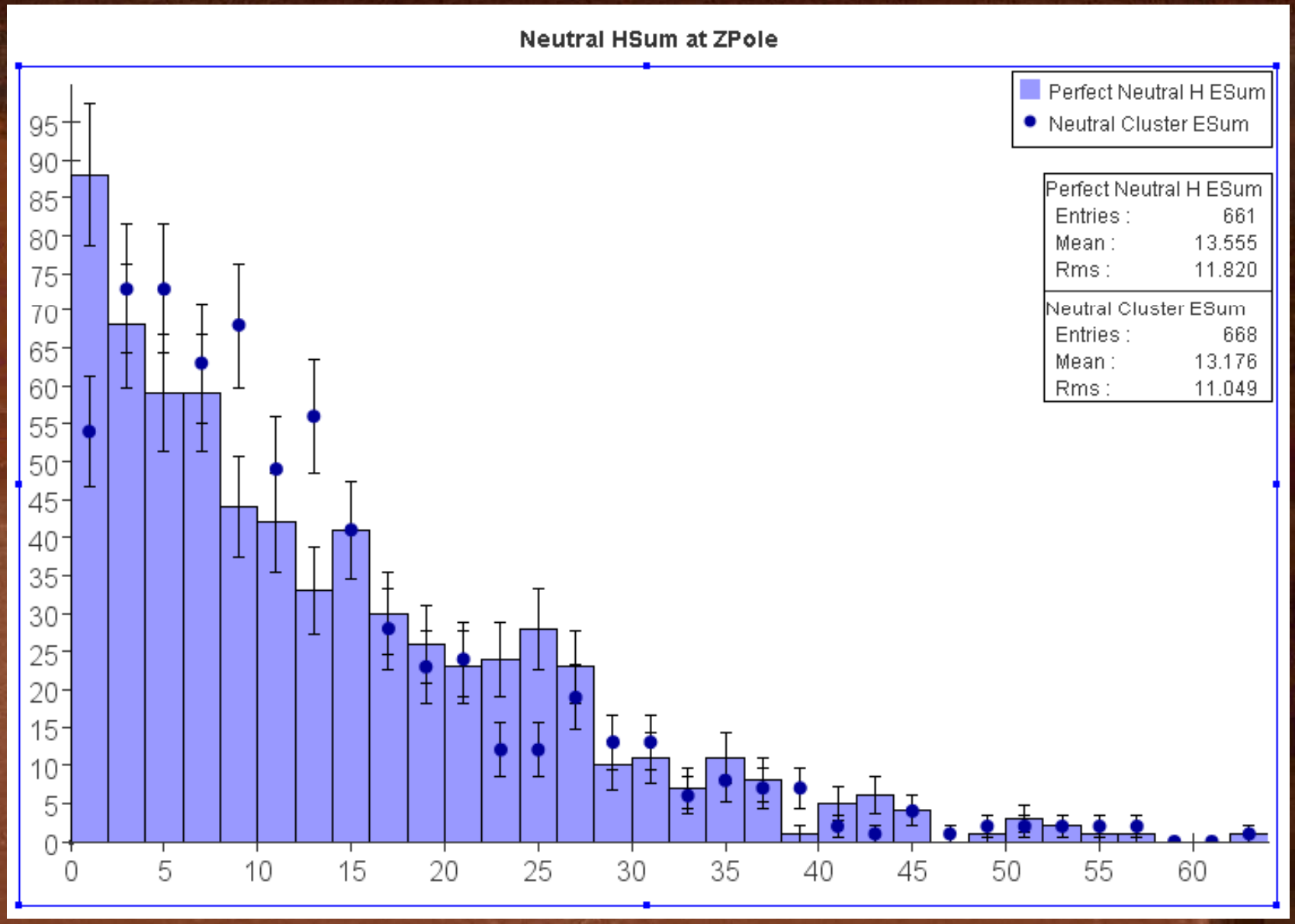
# 10 GeV $K^0_L$ analyzed with 5 GeV, 10 GeV, 20 GeV photon H-matrices



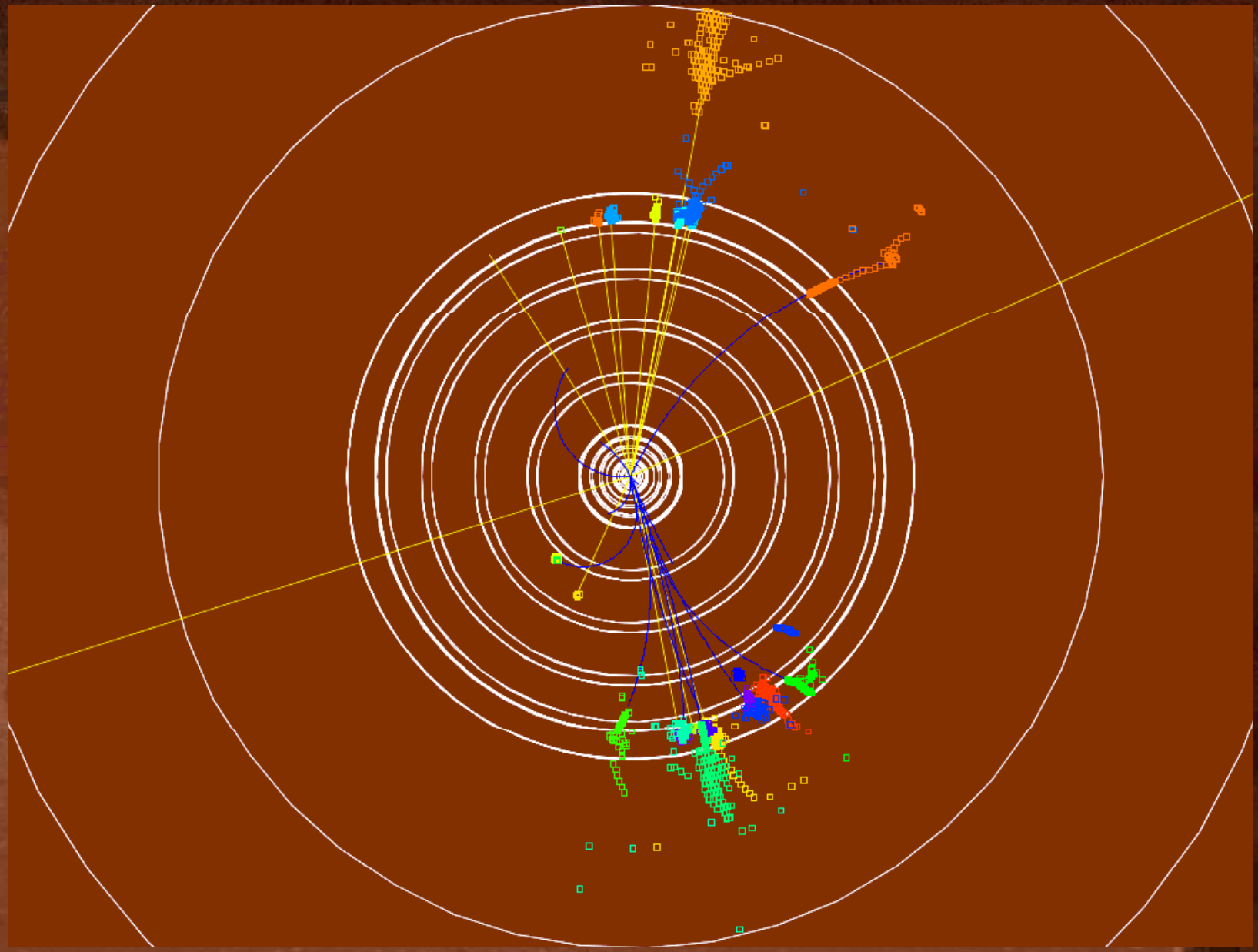

Photon Efficiency measured with photons of same energy as the H-matrix

Conclusion: H-matrix performance is highly energy dependent. The fractional fluctuations decrease at high energy for photons, giving more discrimination

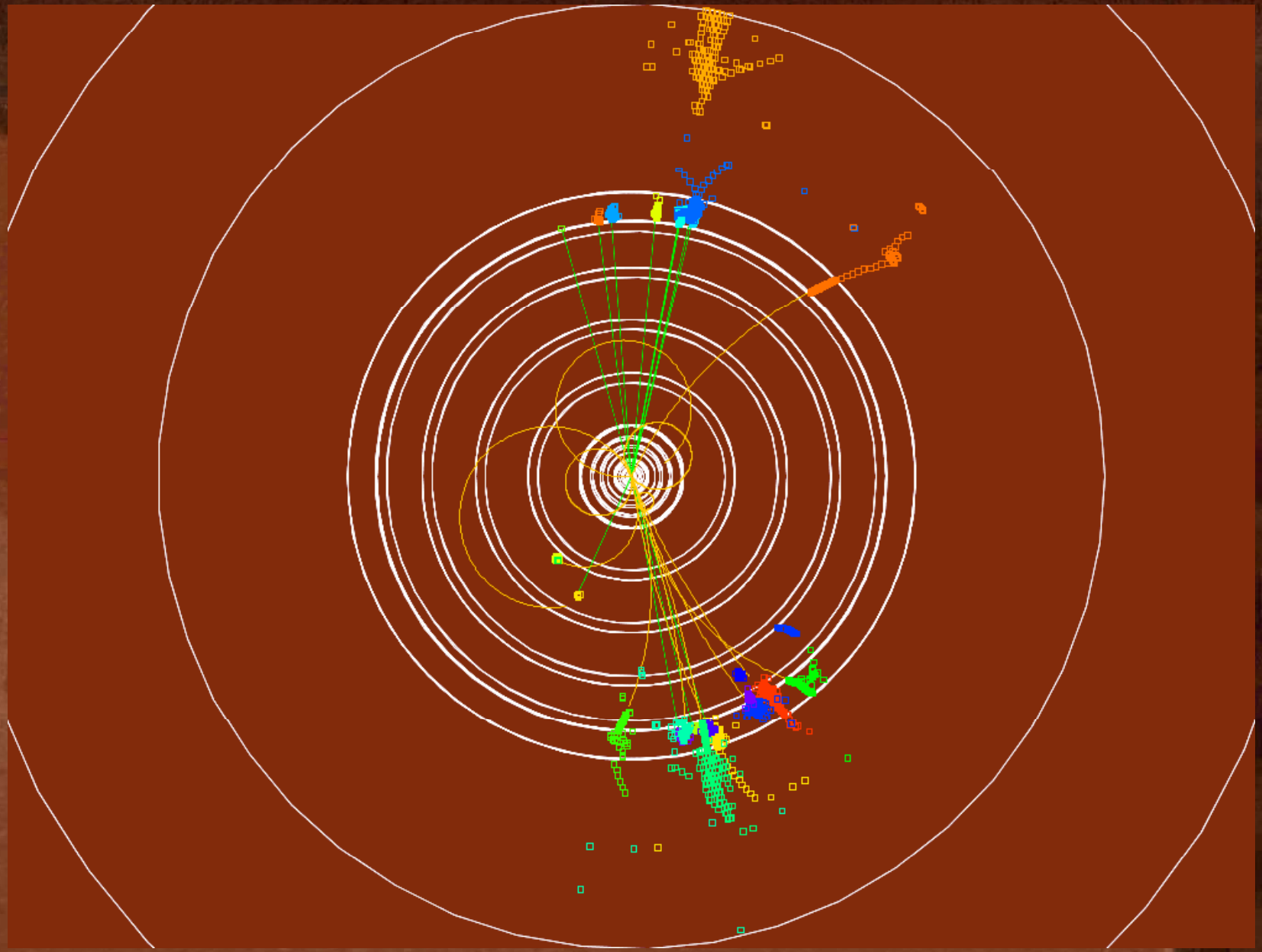
# Neutral Hadrons at ZPole



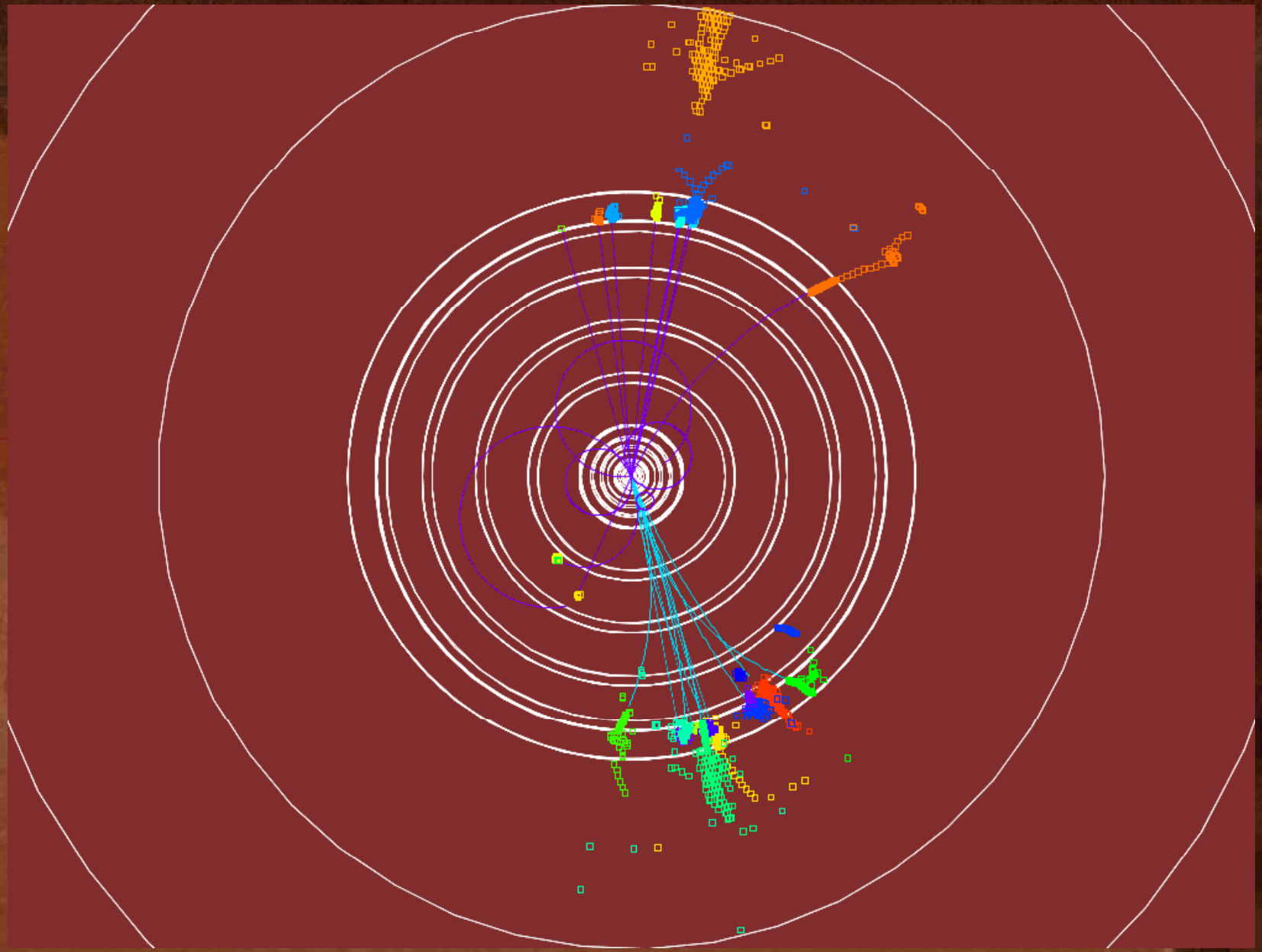
# ZZ event, Sim MC Particles, Perfect CAL Clusters



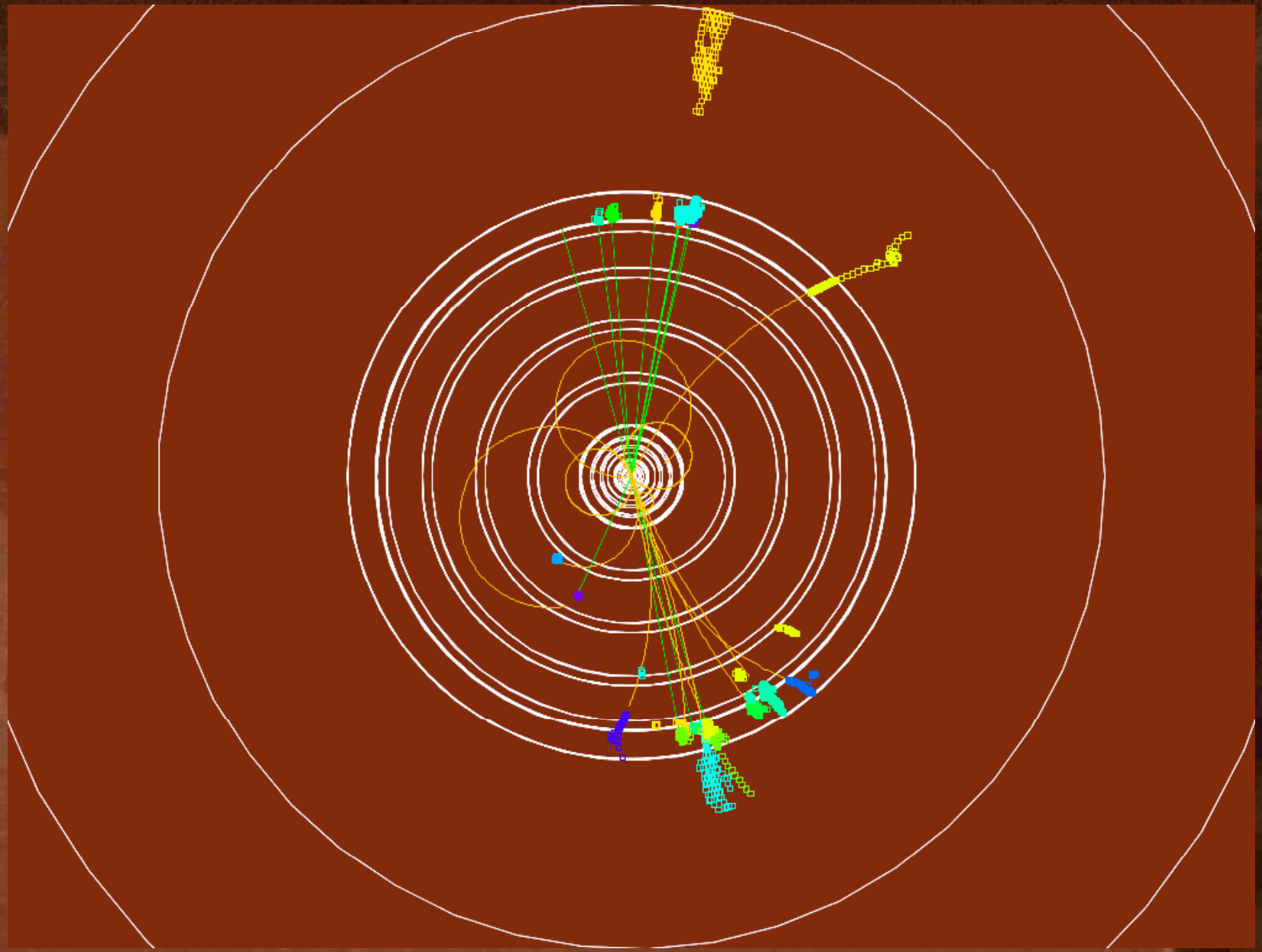
# ZZ event, Perfect ReconstructedParticles, Perfect CAL Clusters



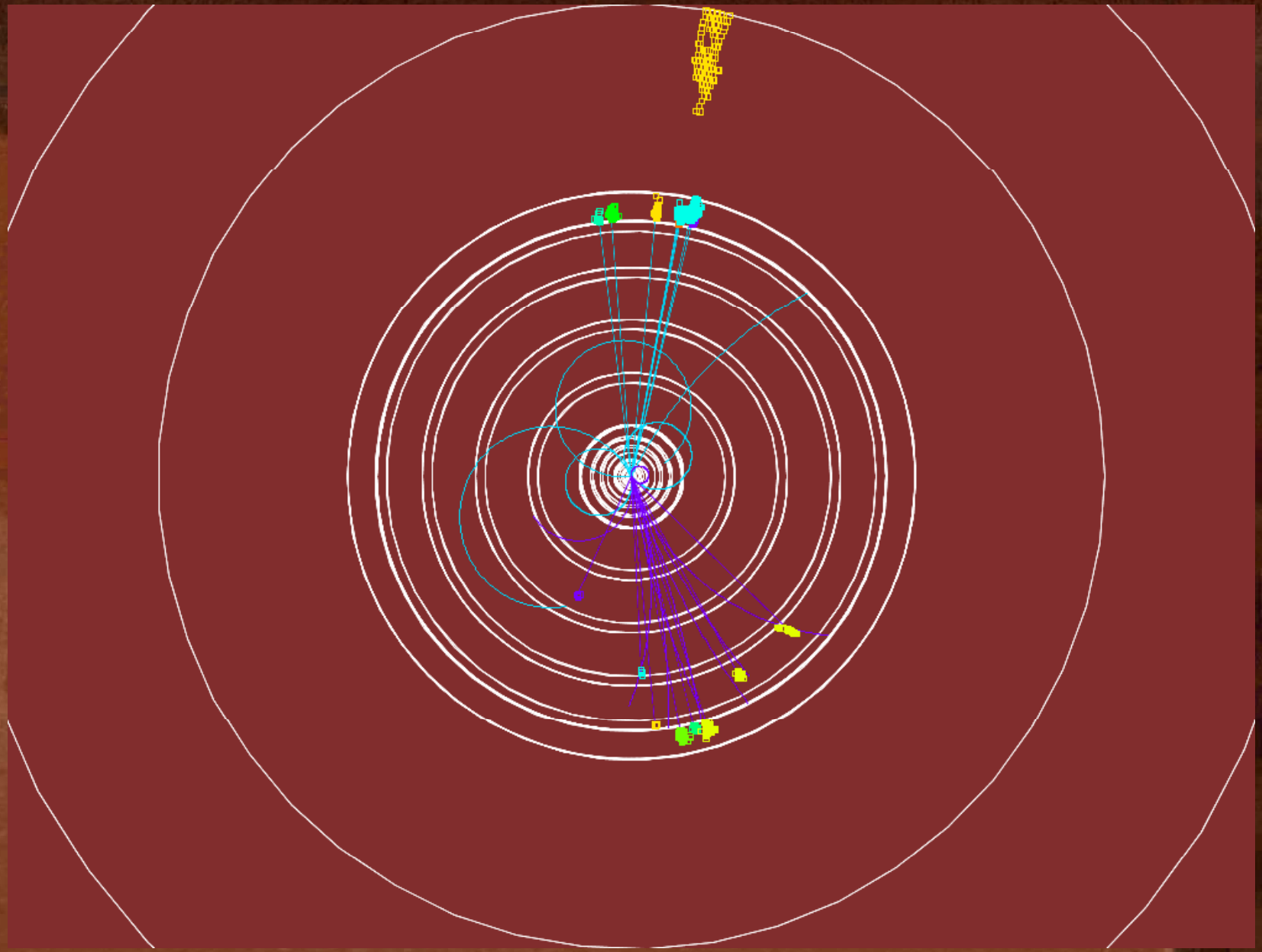
# ZZ event, Perfect Jets, Perfect CAL Clusters



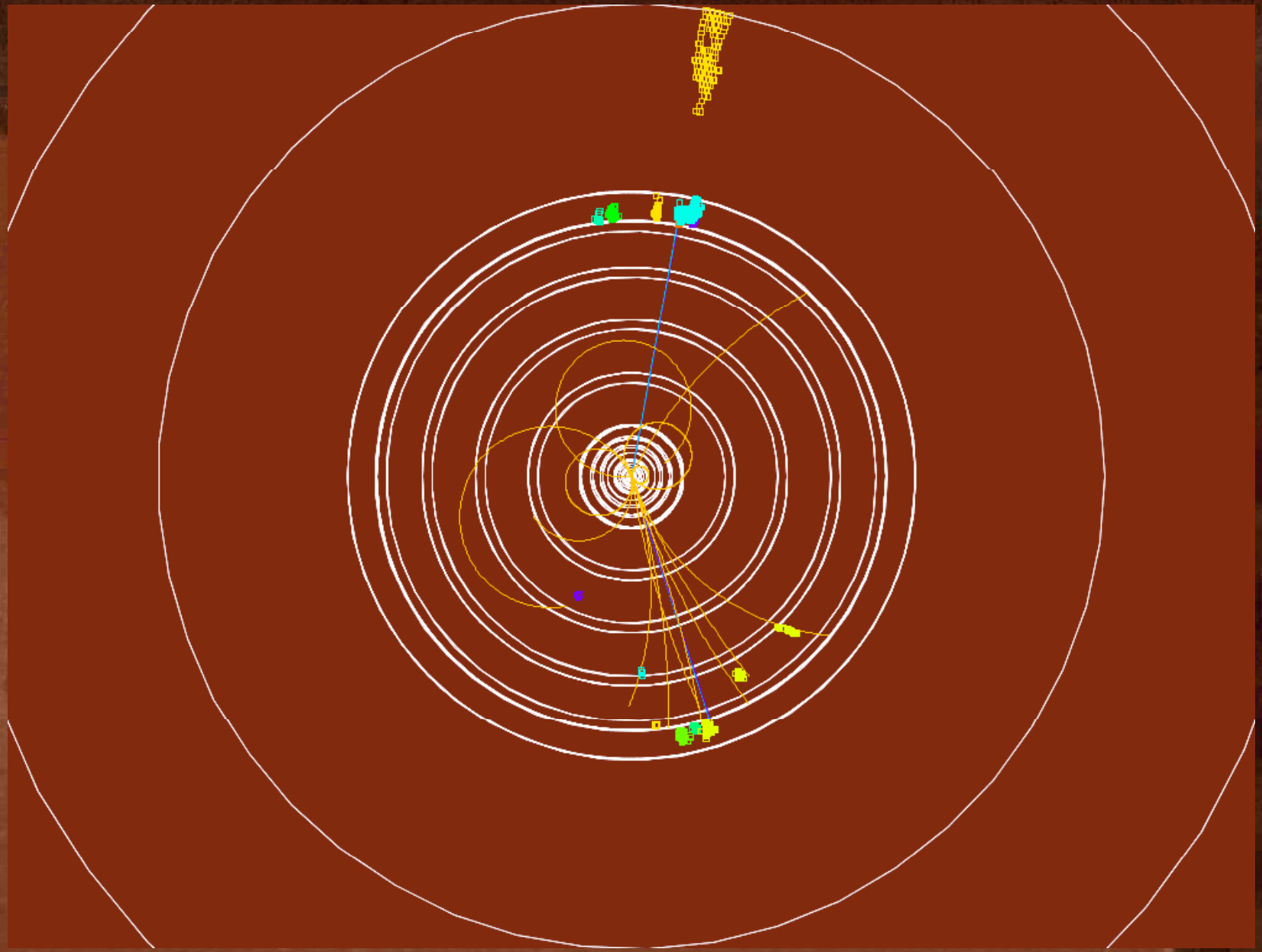
# ZZ event, PFA Results



# ZZ event, PFA Jets



# ZZ event, PFA Particles, Comparison of Jets



## Summary

Finished move to PFA Template

Finishing definition, development of common Perfect PFA/Track cheater package

Tuning PFA analysis modules to single particles

PFA development emphasis on DiJets at 500 GeV CM

Comparing ZPole to ZZ per template analysis module

# *Plans for PFA Development*

e+e- -> ZZ -> qq + νν @ 500 GeV

- Development of PFAs on ~120 GeV jets
- Unambiguous dijet mass allows PFA performance to be evaluated w/o jet combination confusion

e+e- -> ZZ -> qqqq @ 500 GeV

- Same jet E, but filling more of detector
- Use for detector parameter evalutions (B-field, IR, granularity, etc.)

E+e- -> tt @ 500 GeV

- Lower E jets, but 6 – full detector

e+e- -> qq @ 500 GeV

- 250 GeV jets – challenge for PFA, not physics