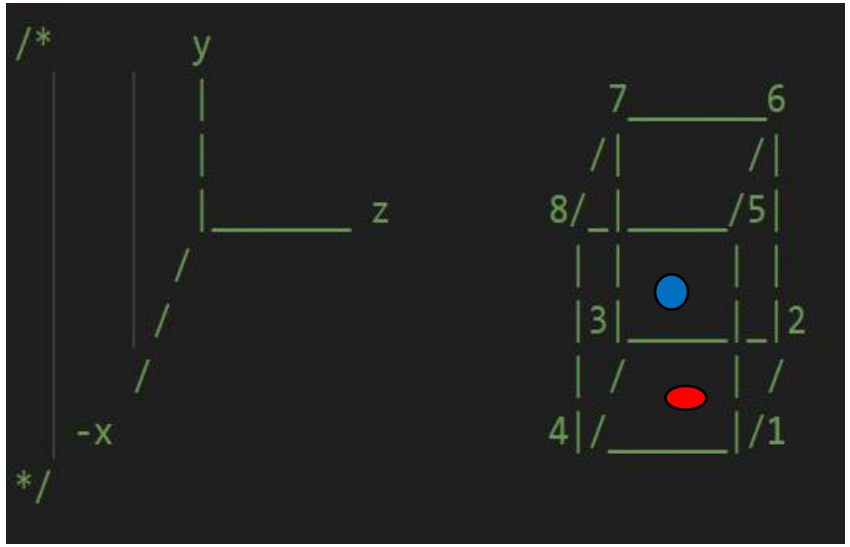
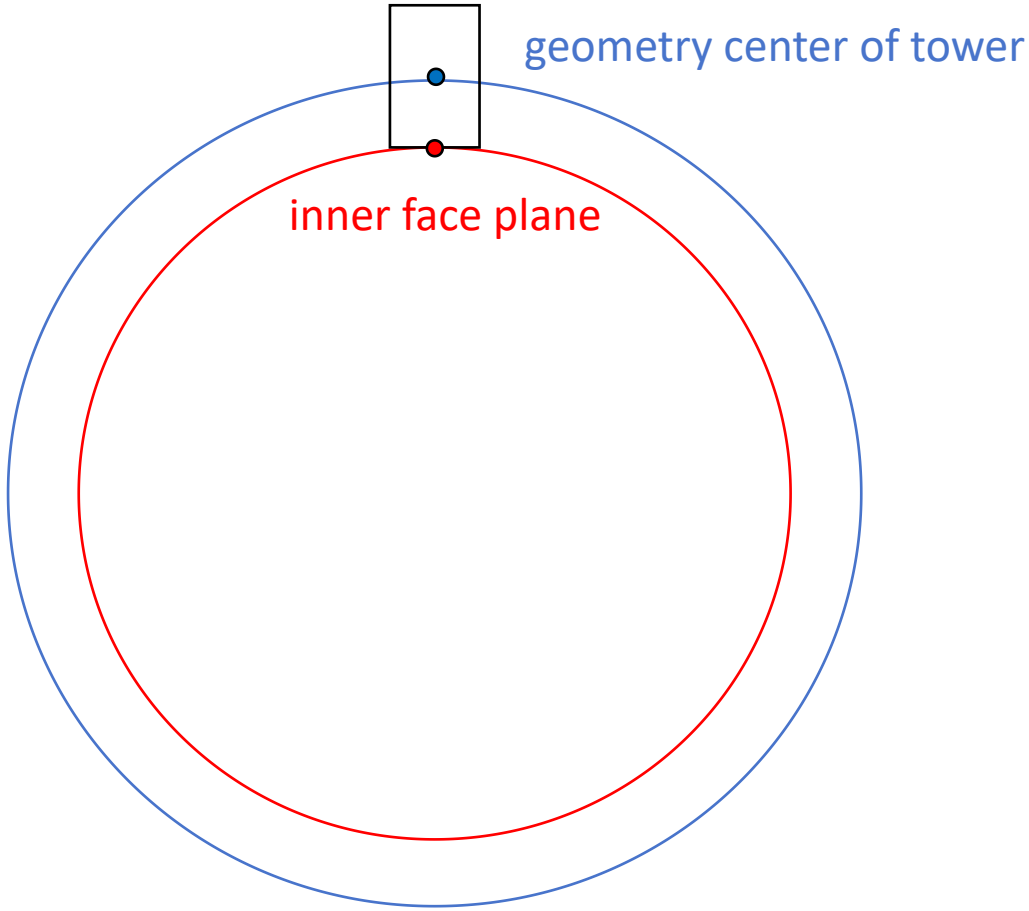
EMC pos reco

Jingyu

Tower geom

Reference code: RawTowerGeomv5 , CaloGeomMappingv2





New geom:
8 vertex to describe tower geometry
we get innerface center （center of 1234） &
geomery center (center of 12345678)

EMC cluster geom

Reference code: RawClusterBuilderTemplate , G4_CEmc_Spacal

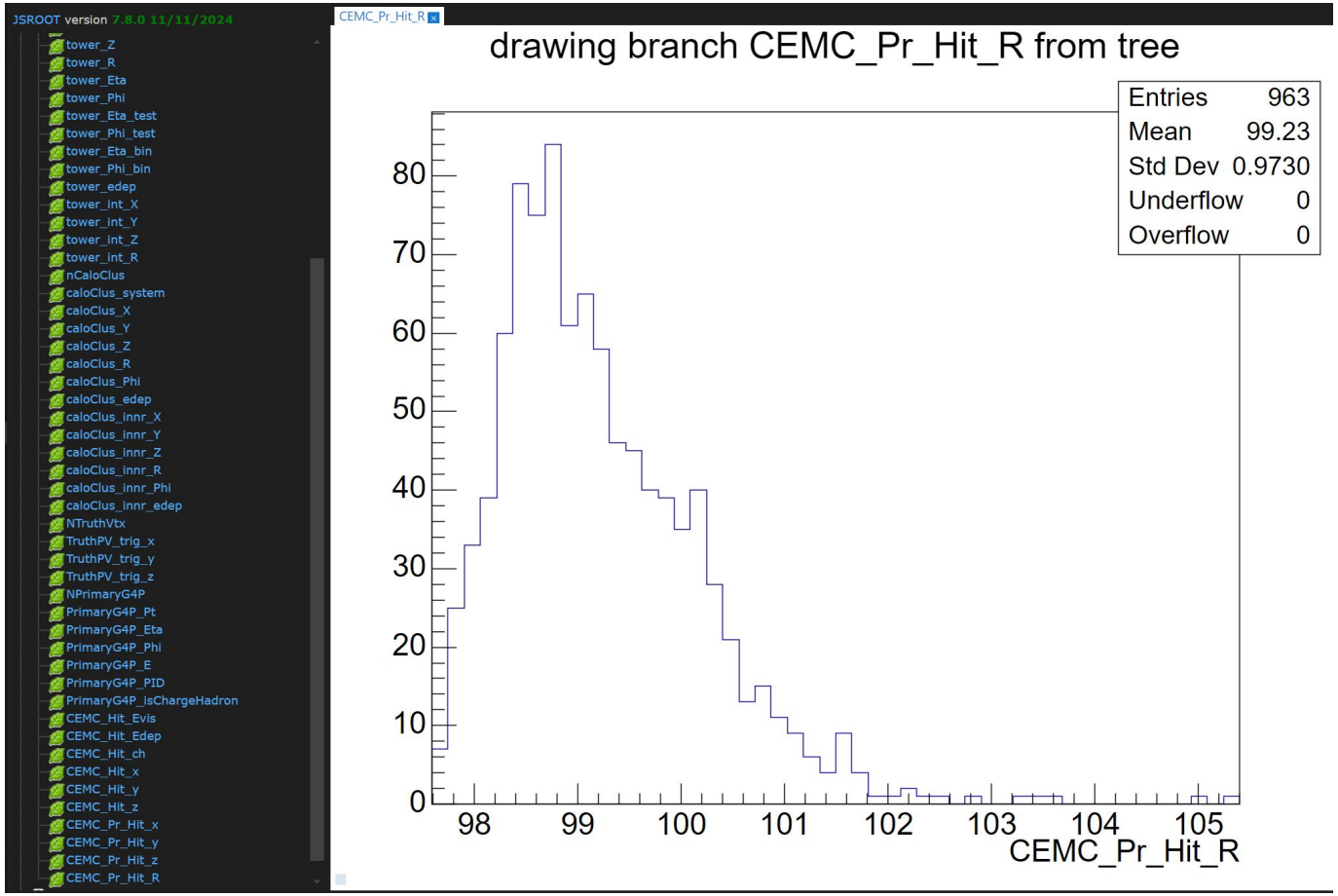
```
void setUseRawTowerGeomv5( bool flag = true) { m_use_RawTowerGeomv5 = flag; }
void setProjectToInnerSurface( bool flag = true ) { m_project_tower_innersurface = flag; }
```

I modified the tower geometry used in cluster reconstruction, and you can set the cluster geometry through these two interfaces.

```
363  // JingyuM
364  void CEMC_Clusters()
365  {
366    int verbosity = std::max(Enable::VERBOSITY, Enable::CEMC_VERBOSITY);
367
368    Fun4AllServer *se = Fun4AllServer::instance();
369
370    if (G4CEMC::Cemc_clusterizer == G4CEMC::kCemcTemplateClusterizer)
371    {
372      RawClusterBuilderTemplate *ClusterBuilder1 = new RawClusterBuilderTemplate("EmcRawClusterBuilderTemplate1");
373      ClusterBuilder1->Detector("CEMC");
374      ClusterBuilder1->setUseRawTowerGeomv5(true);
375      ClusterBuilder1->setProjectToInnerSurface(false);
376      ClusterBuilder1->Verbosity(verbosity);
377      ClusterBuilder1->set_threshold_energy(0.030);  // This threshold should be the same as in CEMCprof_Thresh**.root file below
378      std::string emc_prof = getenv("CALIBRATIONROOT");
379      emc_prof += "/EmcProfile/CEMCprof_Thresh30MeV.root";
380      ClusterBuilder1->LoadProfile(emc_prof);
381      if (!Enable::CEMC_G4Hit) ClusterBuilder1->set_UseTowerInfo(1);  // just use towerinfo
382      //    ClusterBuilder1->set_UseTowerInfo(1); // to use towerinfo objects rather than old RawTower
383      se->registerSubsystem(ClusterBuilder1);
384
385      RawClusterBuilderTemplate *ClusterBuilder2 = new RawClusterBuilderTemplate("EmcRawClusterBuilderTemplate2");
386      ClusterBuilder2->Detector("CEMC");
387      ClusterBuilder2->setUseRawTowerGeomv5(true);
388      ClusterBuilder2->setProjectToInnerSurface(true);
389      ClusterBuilder2->Verbosity(verbosity);
390      ClusterBuilder2->set_threshold_energy(0.030);  // This threshold should be the same as in CEMCprof_Thresh**.root file below
391      // std::string emc_prof2 = getenv("CALIBRATIONROOT");
392      // emc_prof2 += "/EmcProfile/CEMCprof_Thresh30MeV.root";
393      ClusterBuilder2->LoadProfile(emc_prof);
394      if (!Enable::CEMC_G4Hit) ClusterBuilder2->set_UseTowerInfo(1);  // just use towerinfo
395      //    ClusterBuilder2->set_UseTowerInfo(1); // to use towerinfo objects rather than old RawTower
396      se->registerSubsystem(ClusterBuilder2);
397    }
398    else if (G4CEMC::Cemc_clusterizer == G4CEMC::kCemcGraphClusterizer)
399    {
400      RawClusterBuilderGraph *ClusterBuilder = new RawClusterBuilderGraph("EmcRawClusterBuilderGraph");
401      ClusterBuilder->Detector("CEMC");
402      ClusterBuilder->Verbosity(verbosity);
403      se->registerSubsystem(ClusterBuilder);
404    }
```

Modify the CEMC_Clusters() function defined in G4_CEmc_Spacal.C;
currently, both the geometry center and the innerface center are being obtained.

position information



what we can get position information are
Truth level:
Primary electron hit on CEMC innerface
Shower g4hit on CEMC

Reco level:
Tower(be hitted) innerface center
Tower(be hitted) geometry center

EMC cluster reco by tower innerface center with energy weight
EMC cluster reco by tower geometry center with energy weight

Plan

- Compare truth and reco information
- Get position resolution verse energy