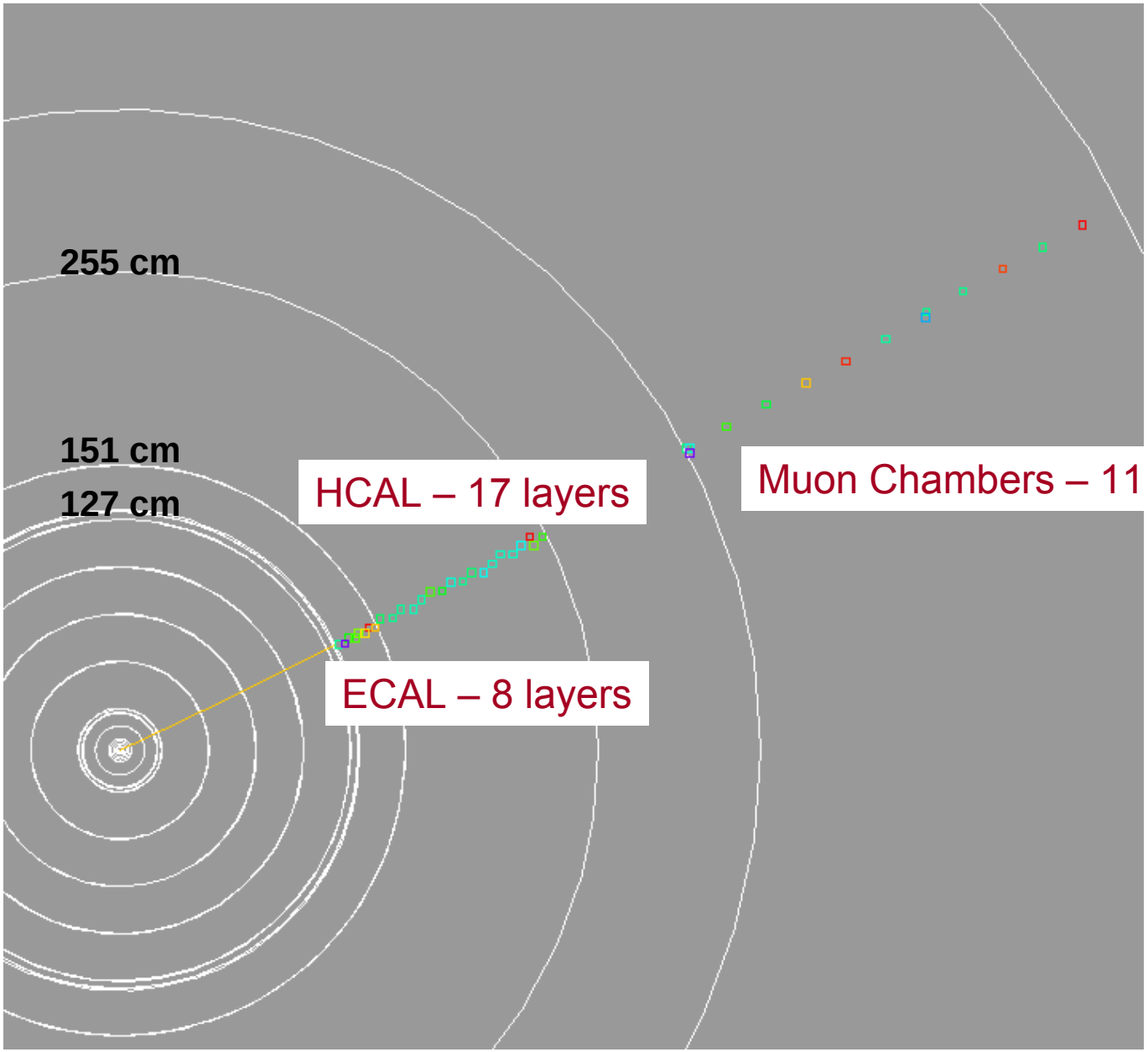
Dual Readout Clustering and Jet Finding

Dual Readout Calorimeter *[in SiD02 Shell]*

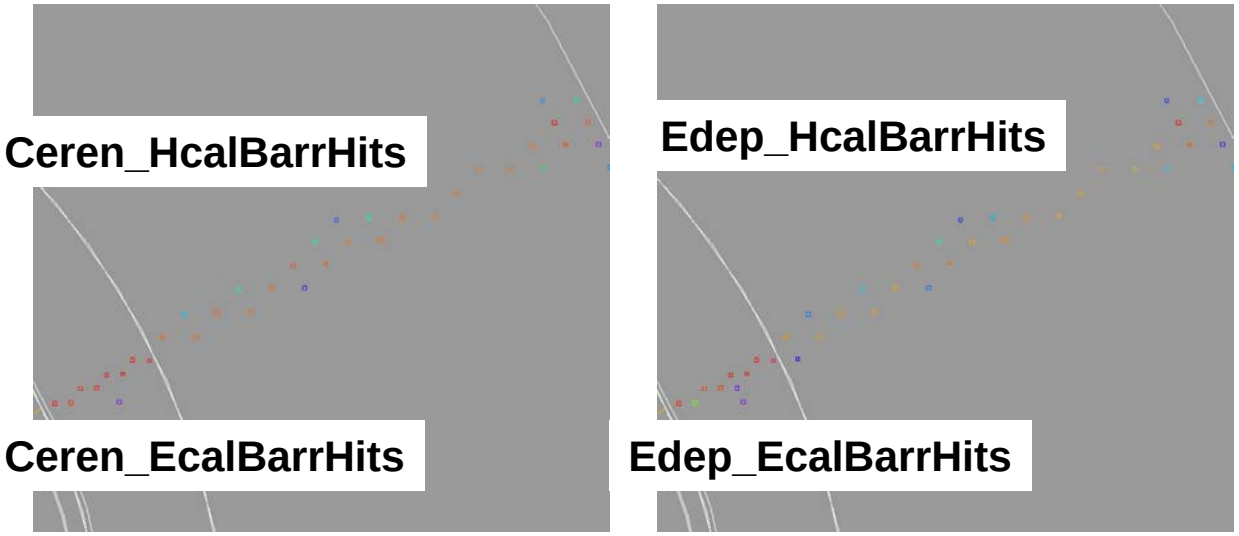
DR ECAL	DR HCAL
3 cm x 3 cm x 3 cm BGO	6 cm x 6 cm x 6 cm BGO
8 layers – 21.4 X_0 (1.1 λ_I)	17 layers – 4.6 λI
127 cm IR – 151 cm OR	151 cm IR – 253 cm OR
Scin/Ceren analog hits	Scin/Ceren analog hits

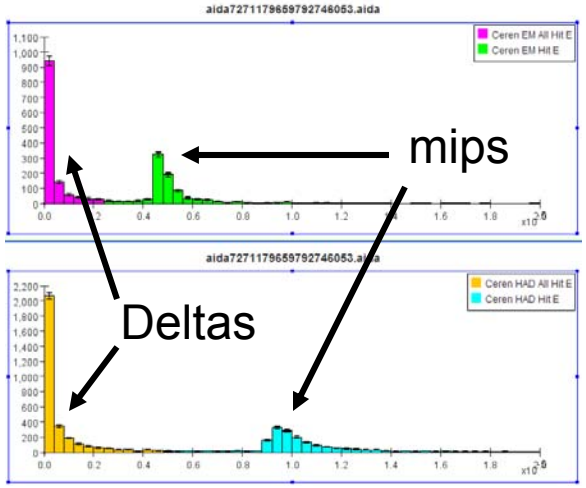
Dual Readout Detector Geometry



Cerenkov Collections

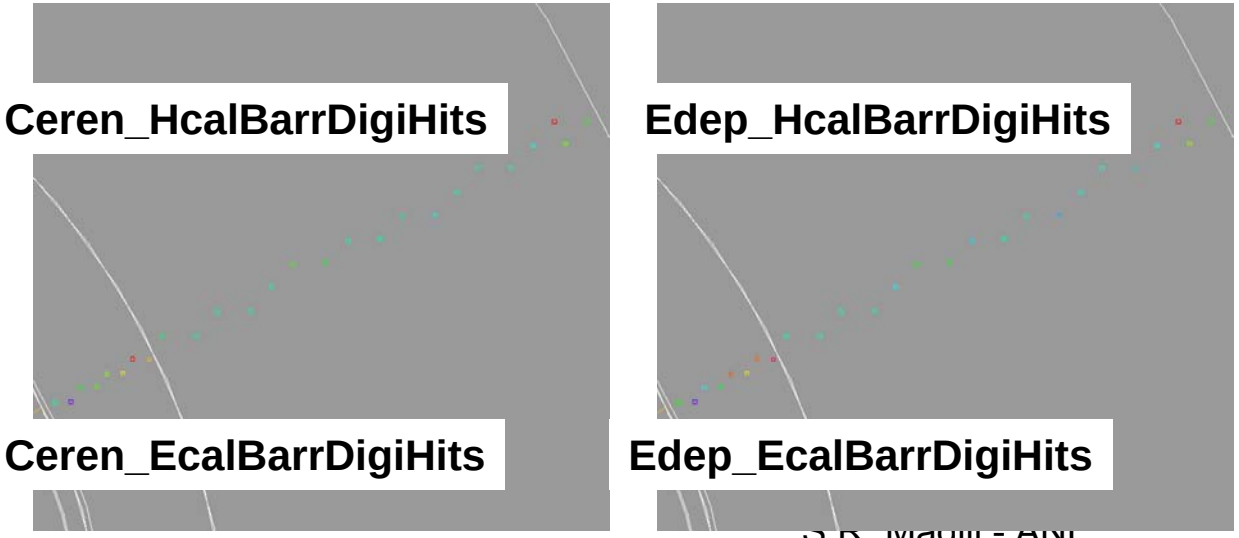
Scintillator Collections

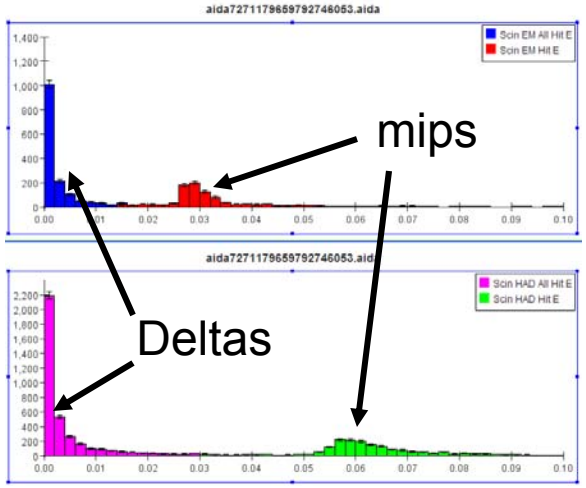




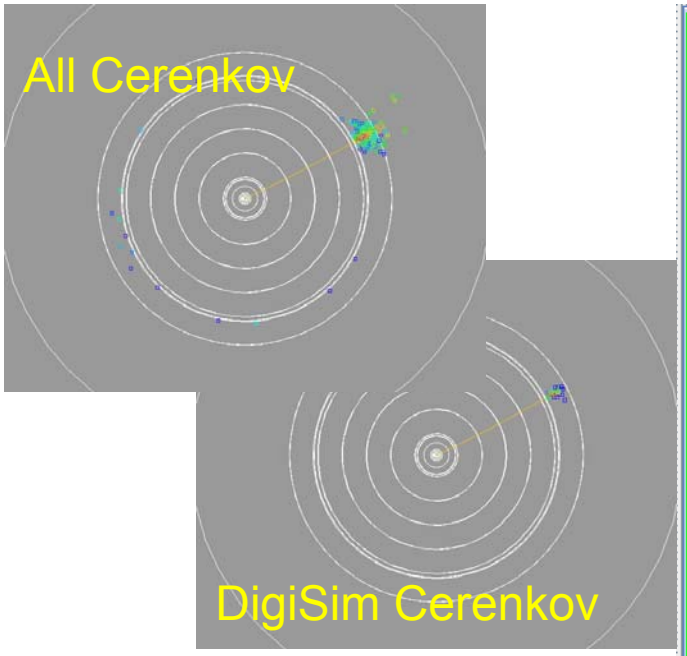
DigiSim - ½ mip threshold, 50 ns timing cut

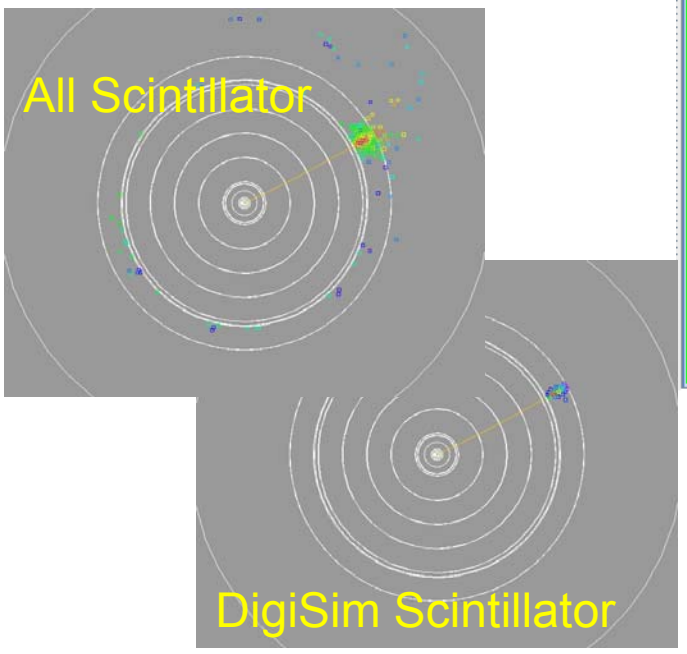
dE/dx ~ 27 MeV
3 cm of BGO

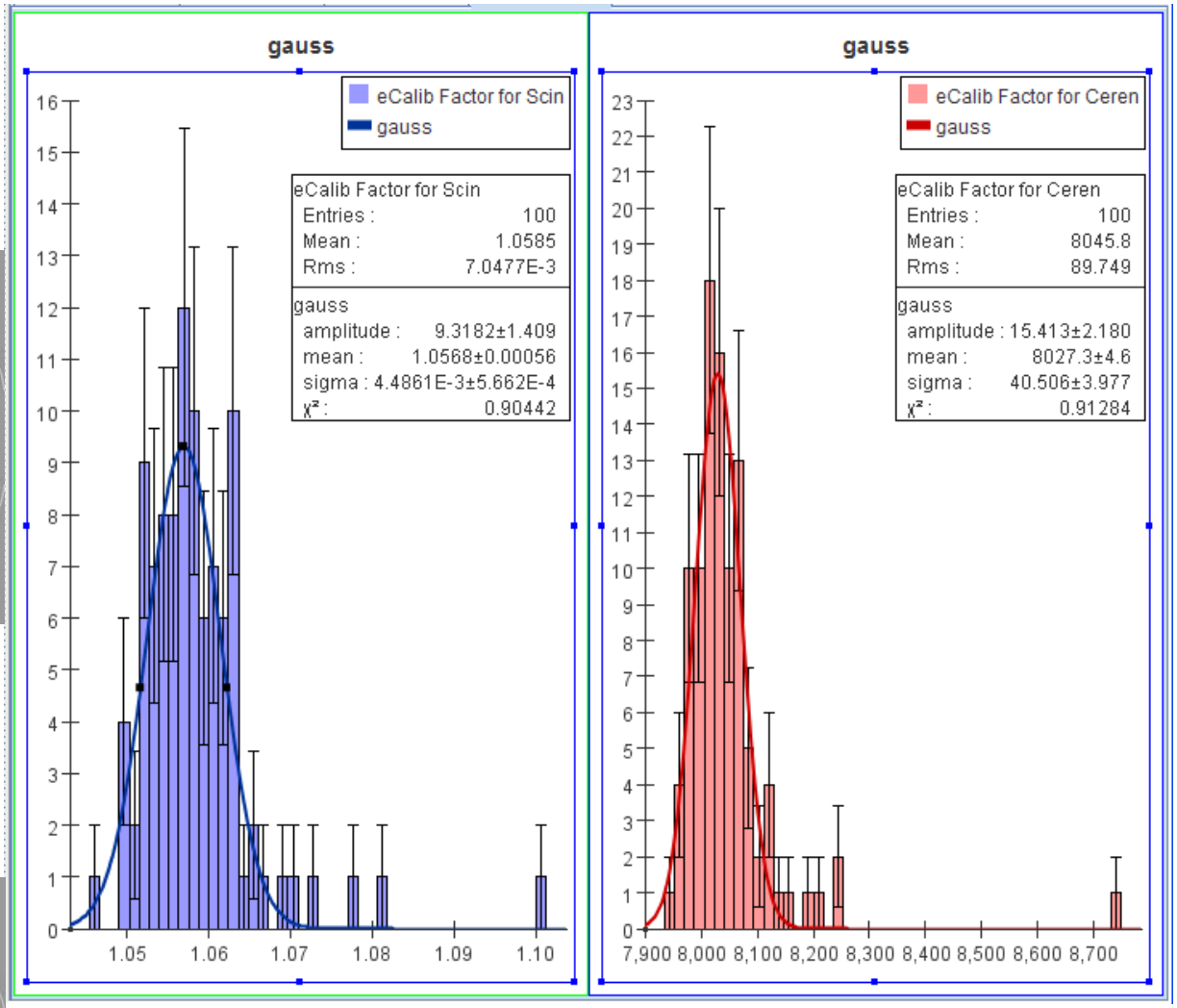




Electron Calibration for Scintillator, Cerenkov

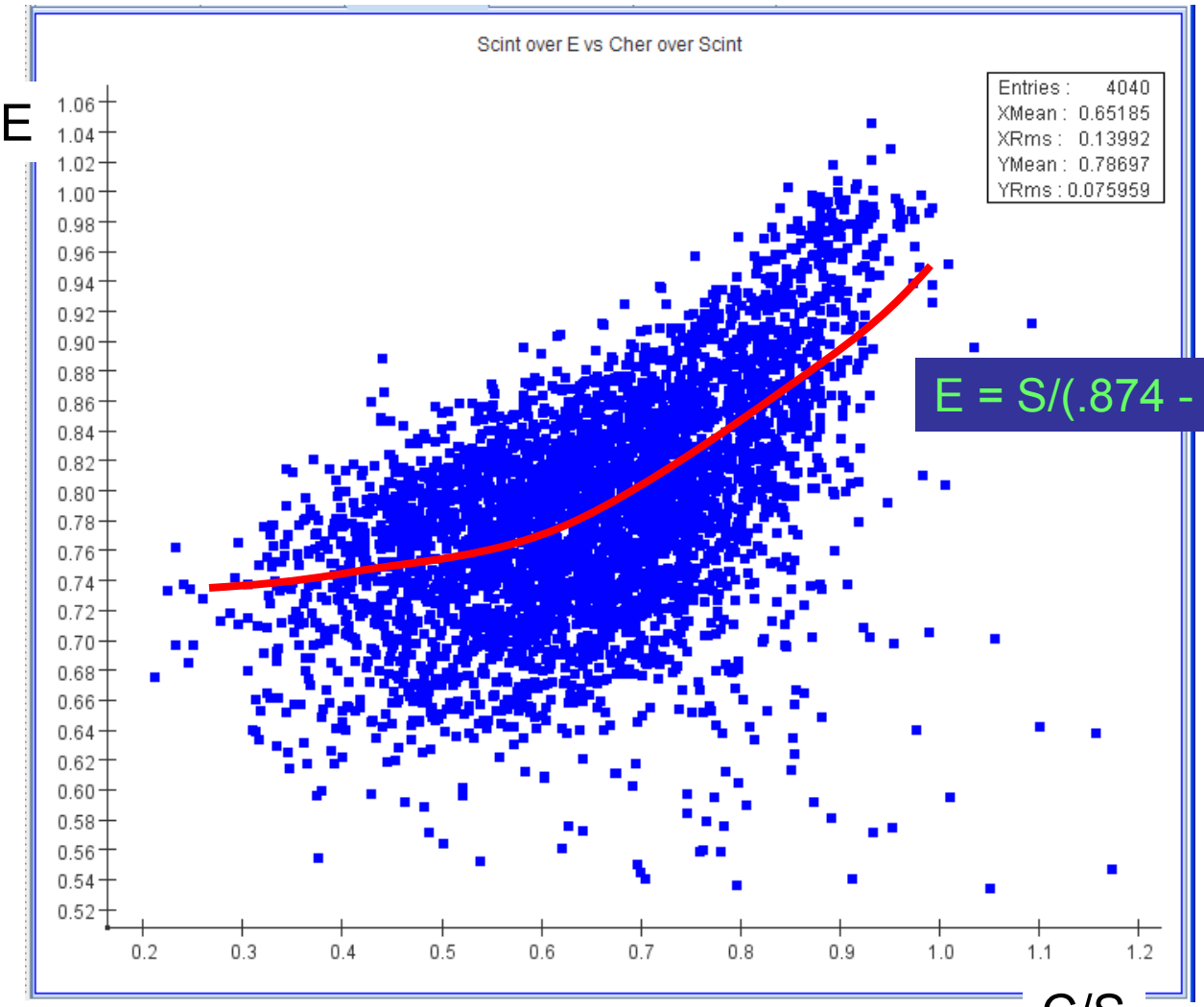






$S = 1.06 \times s_{raw}$ $C = 8046 \times c_{raw}$

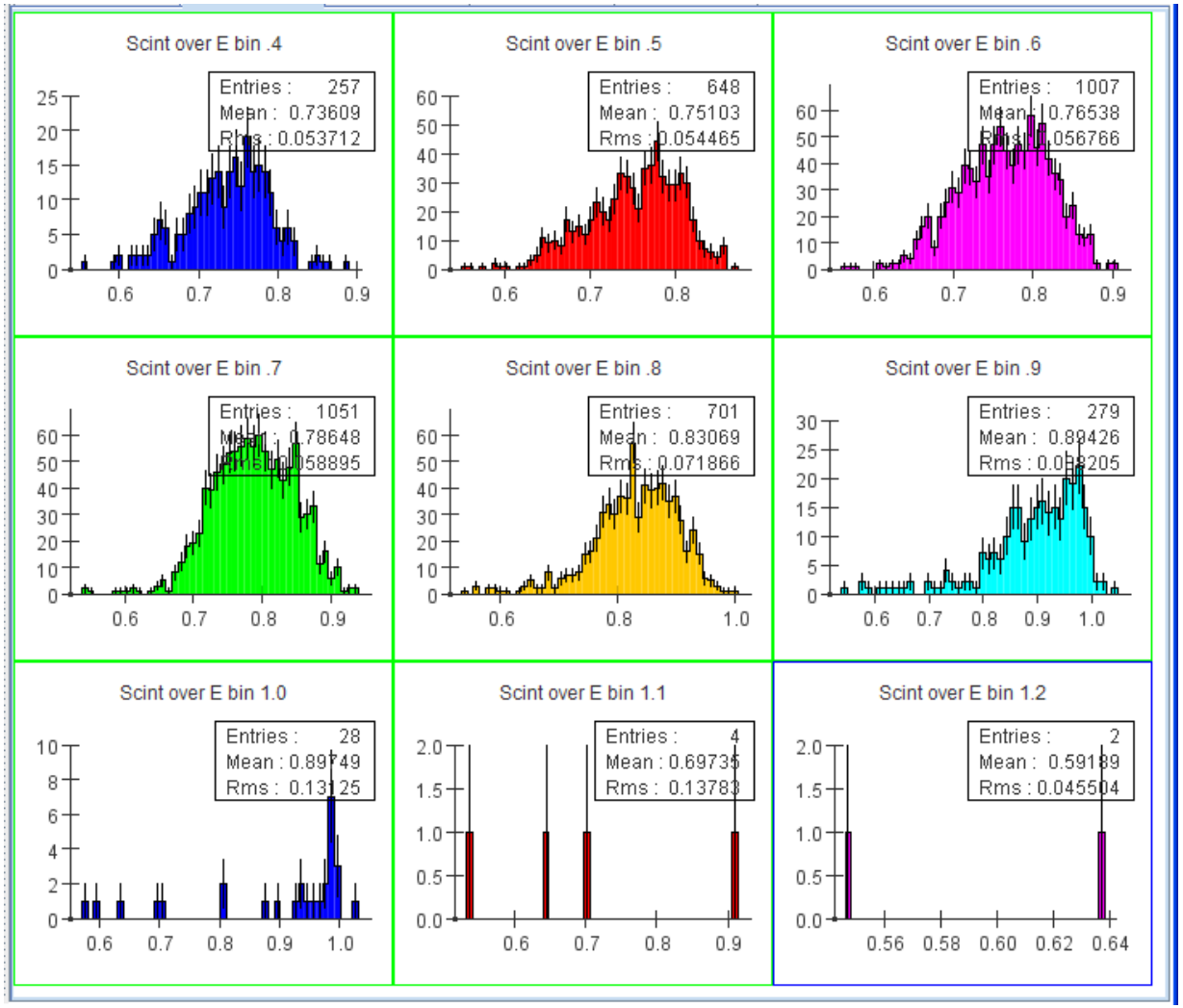
Determination of Correction Polynomial (from older design)



$E = S/(.874 - .594\ (C/S) + .680\ (C/S)^2)$

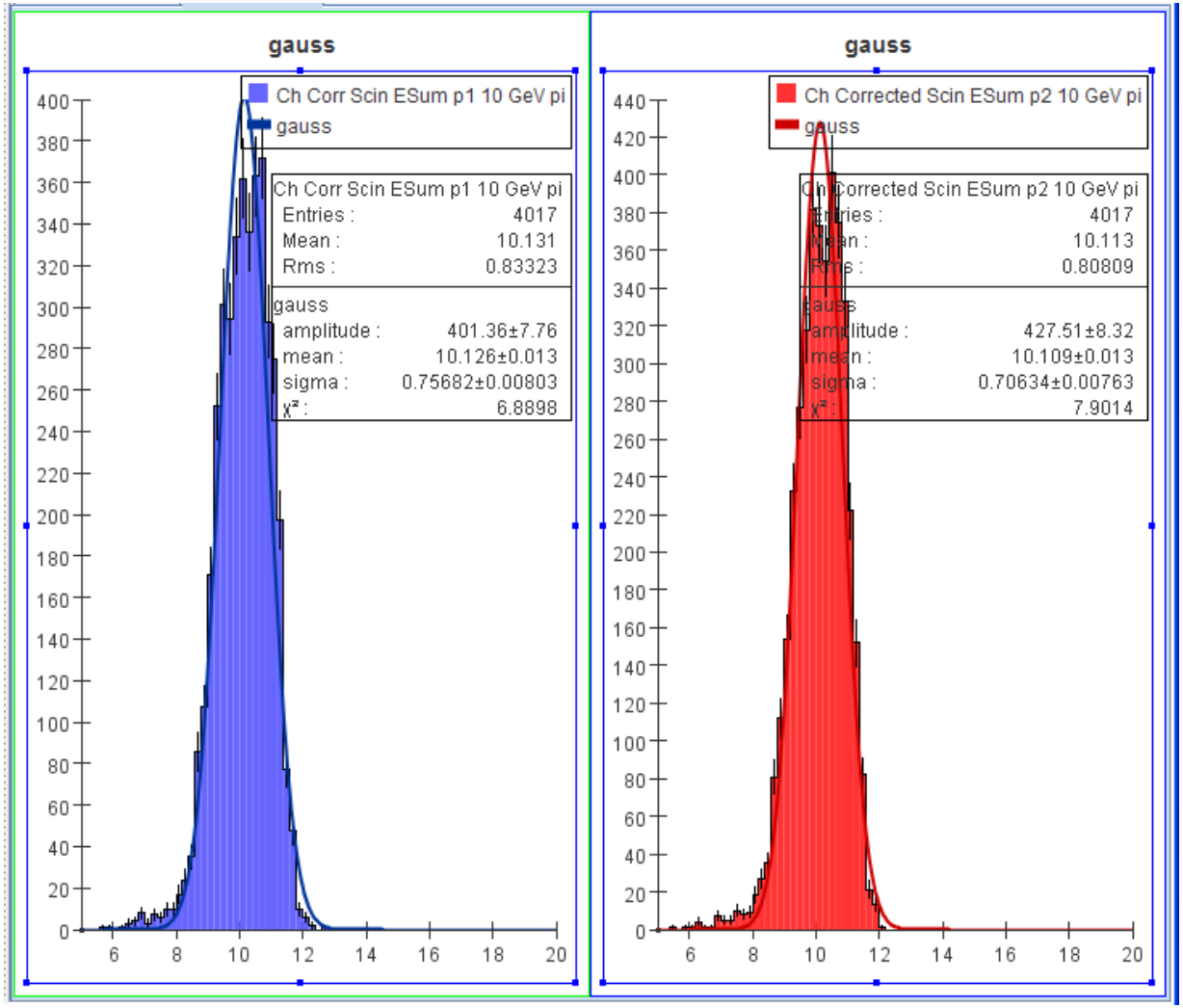
Also, straight-line fit :

$E = S/(.560 + .350\ (C/S))$



S/E in bins of C/S

Application of Correction Polynomial



10 GeV pion

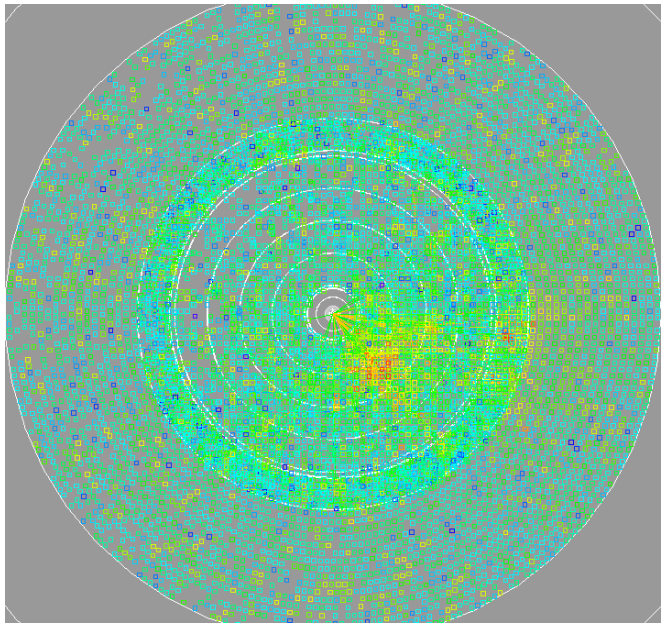
P1 resolution :

$\sigma/E = .76/10$
-> 24%/√E

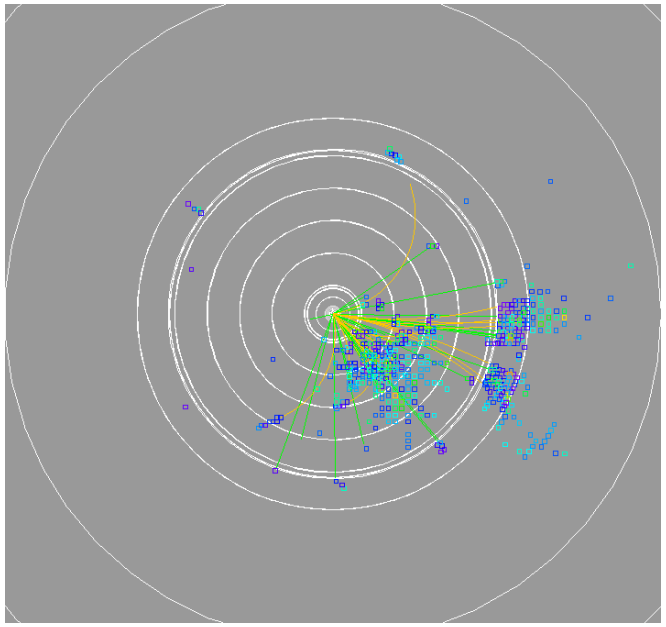
P2 resolution :

$\sigma/E = .71/10$
-> 22%/√E

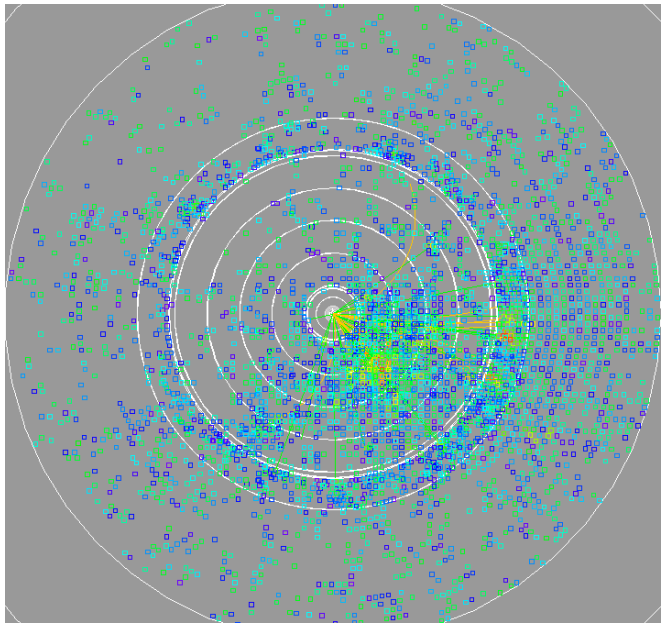
e+e- -> ZZ -> ννqq @ 500 GeV



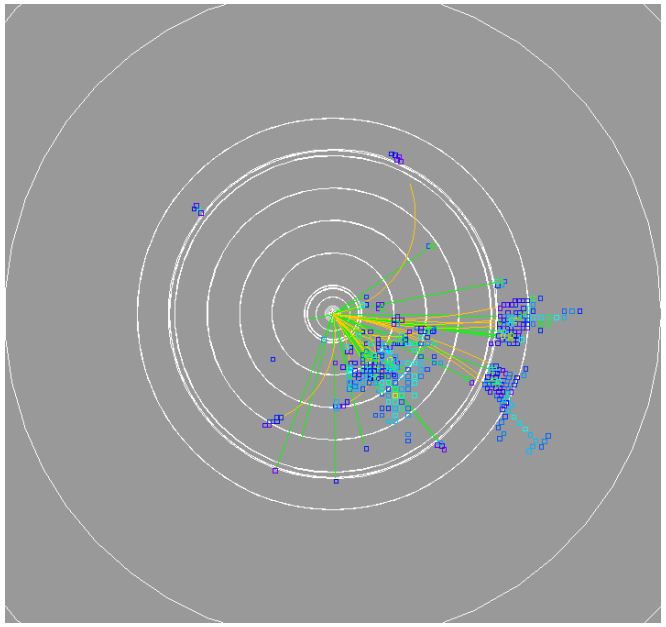
Scintillator Hits



DigiSim



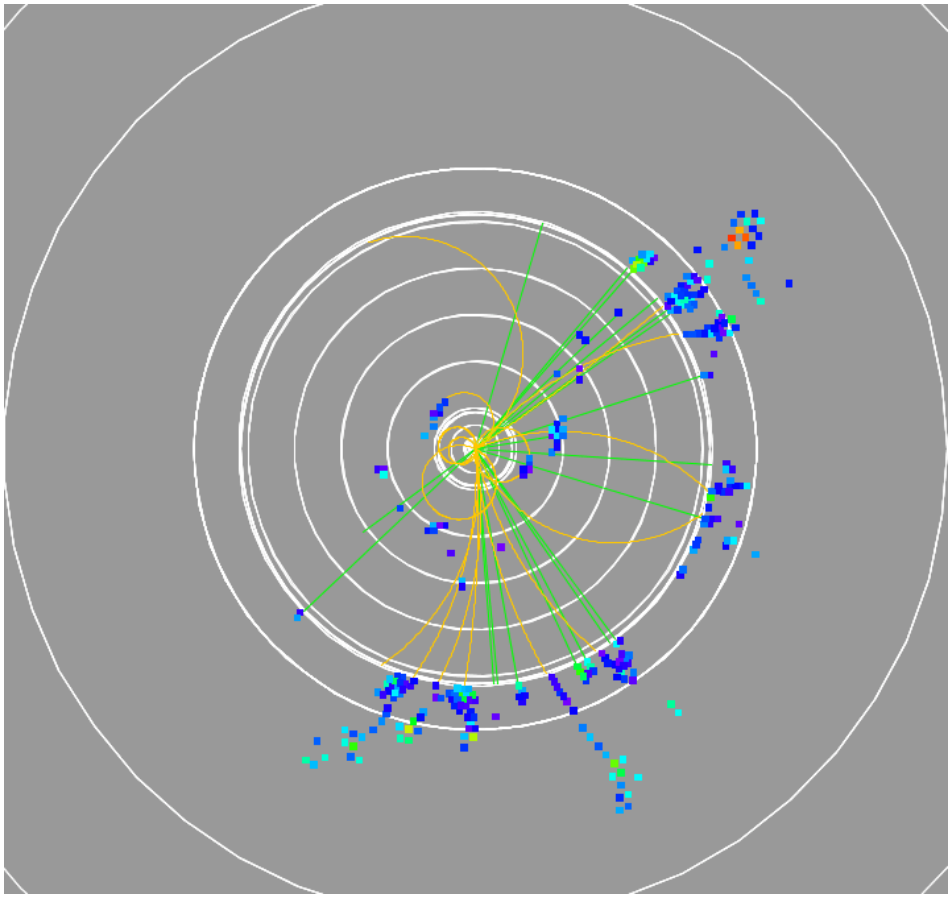
Cerenkov Hits



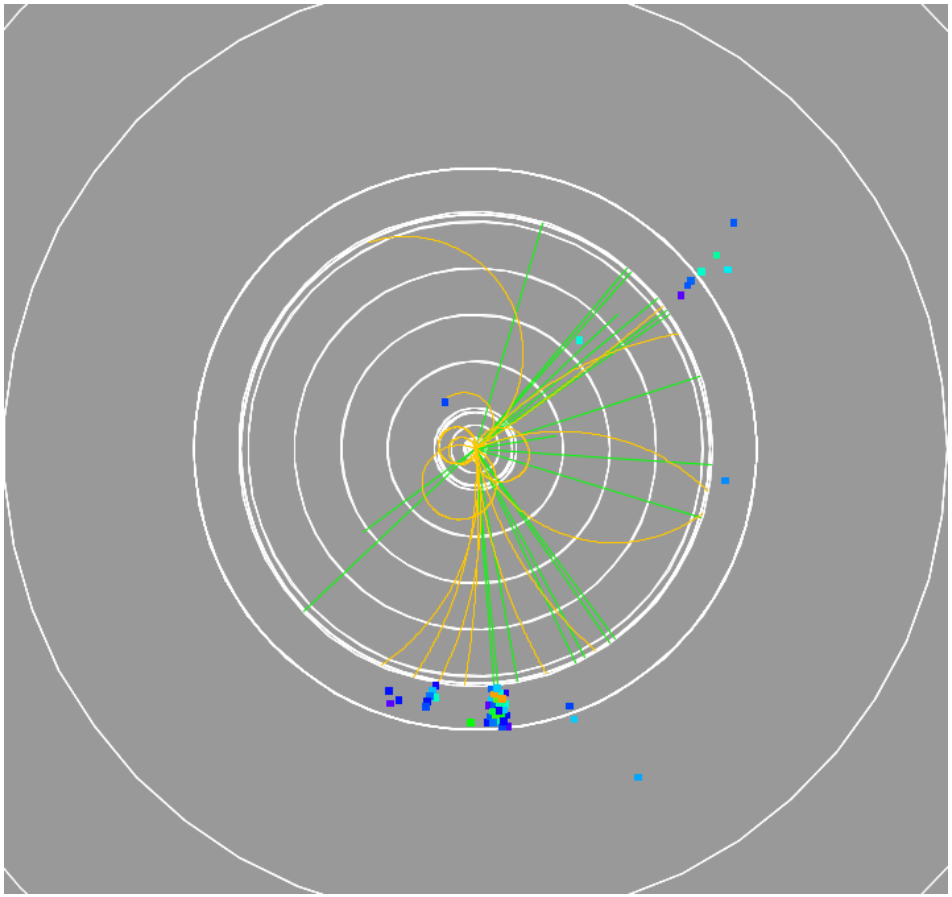
S.R. Magill - ANL

MC Particle Contribution to Cal Cells

Scintillator Hit Collections

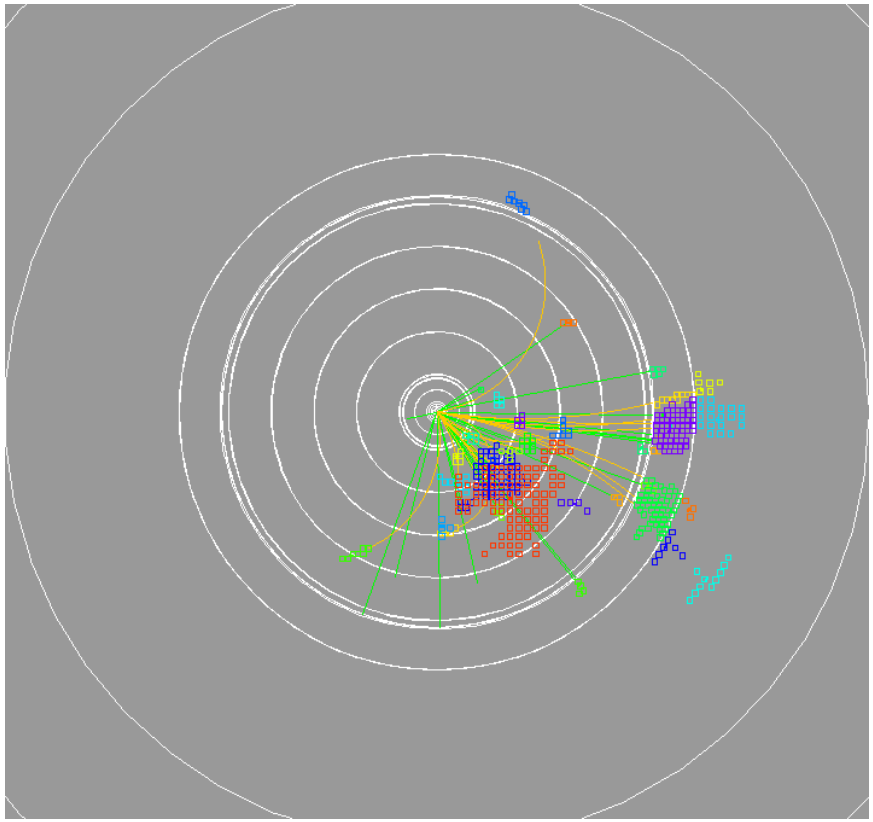


Single Particle

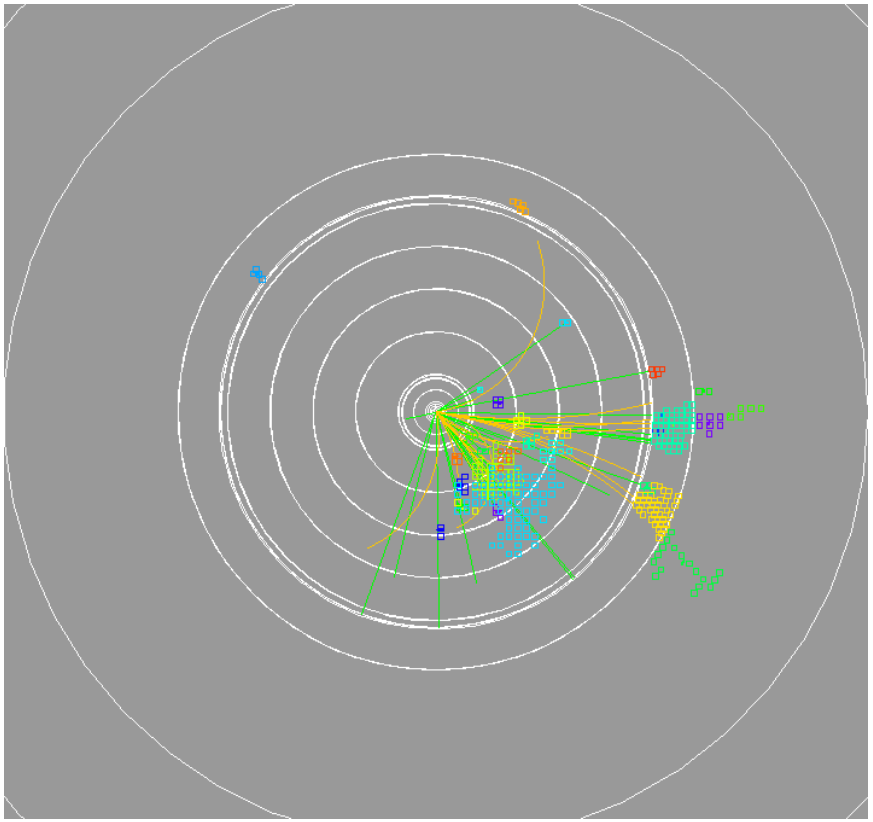


Multiple Particles

Nearest Neighbor Clustering

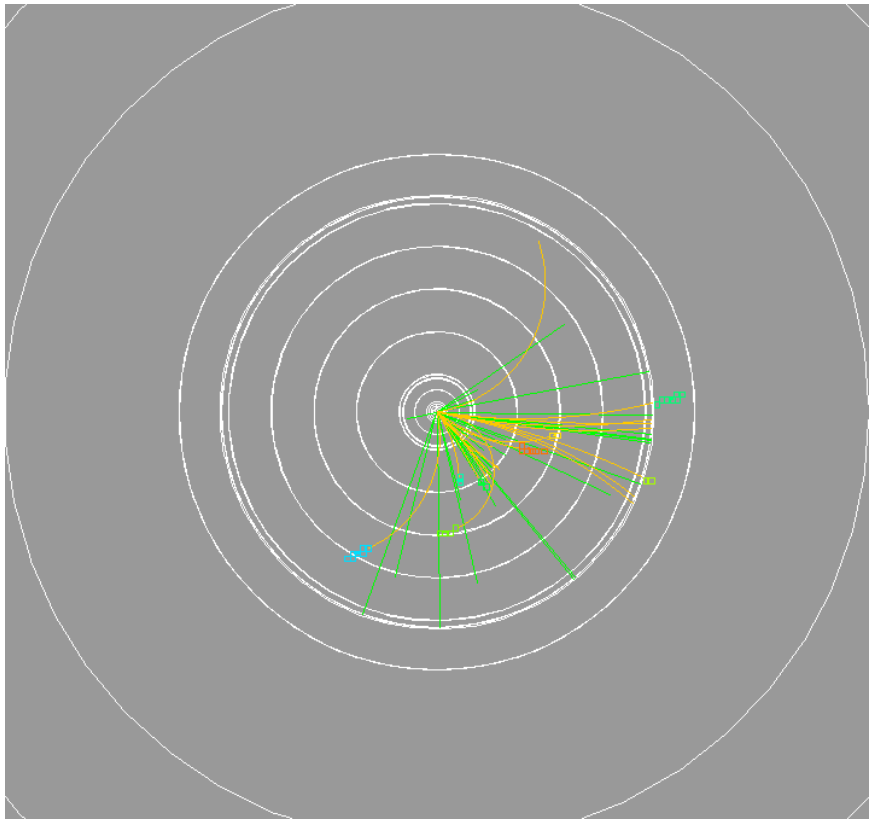


Scintillator Clusters

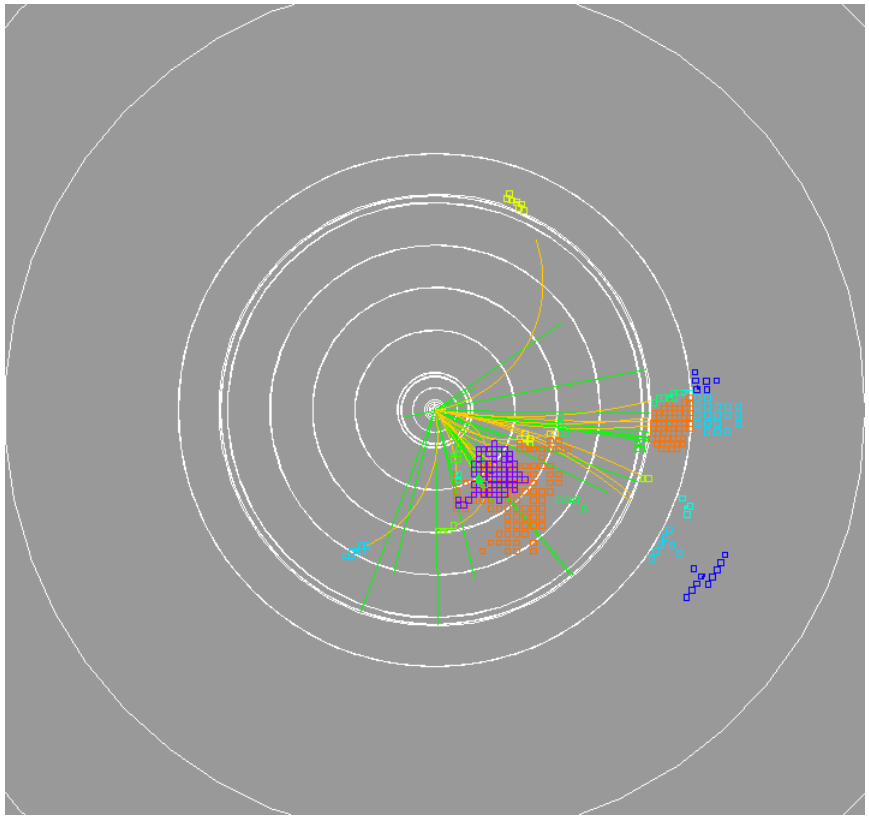


Cerenkov Clusters

Clusters Associated with Charged Particles (Tracks)

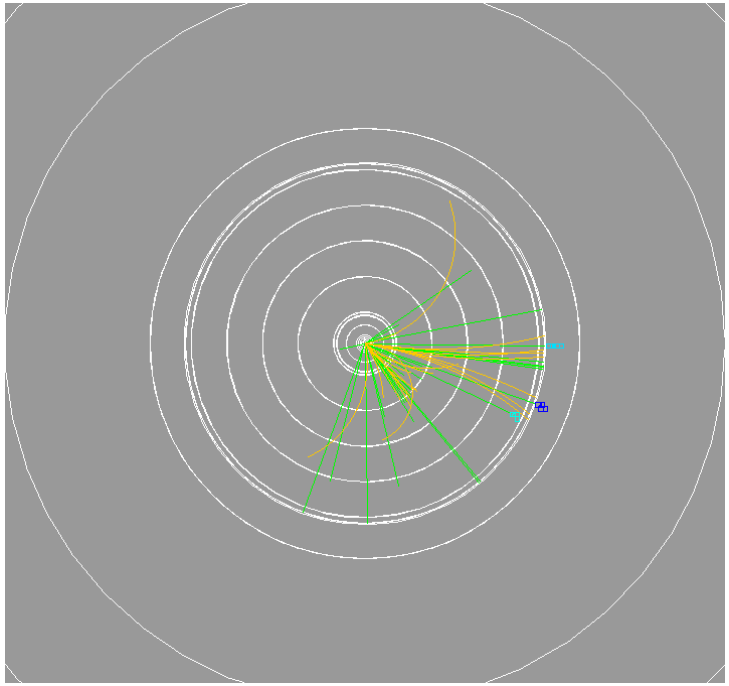


Mip clusters

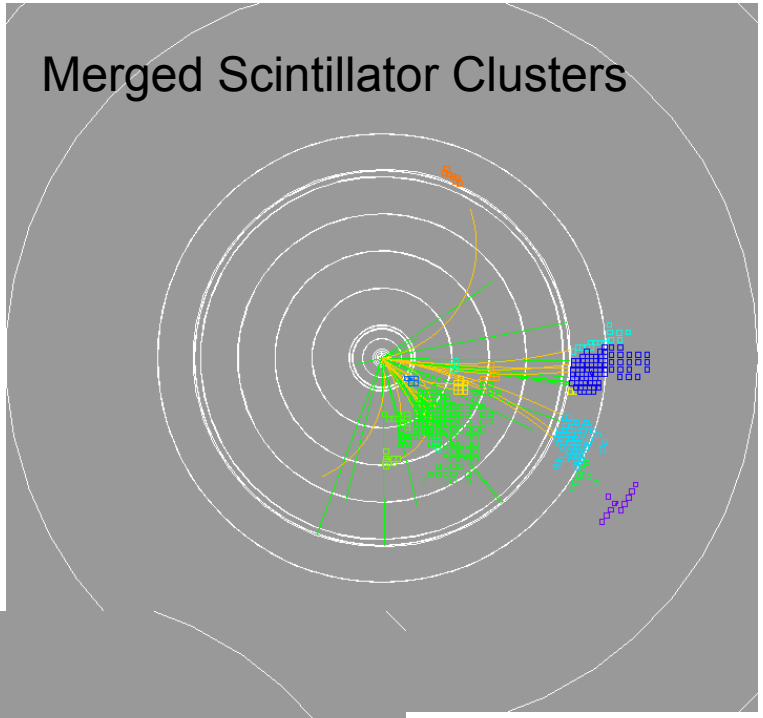


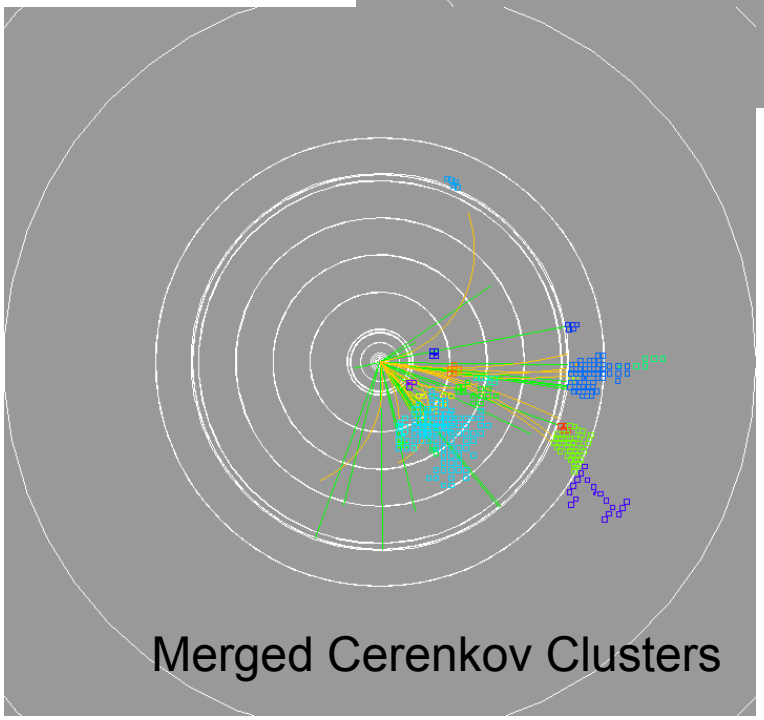
Track-associated clusters

Photon Clusters and Merged Clusters



Photon Clusters

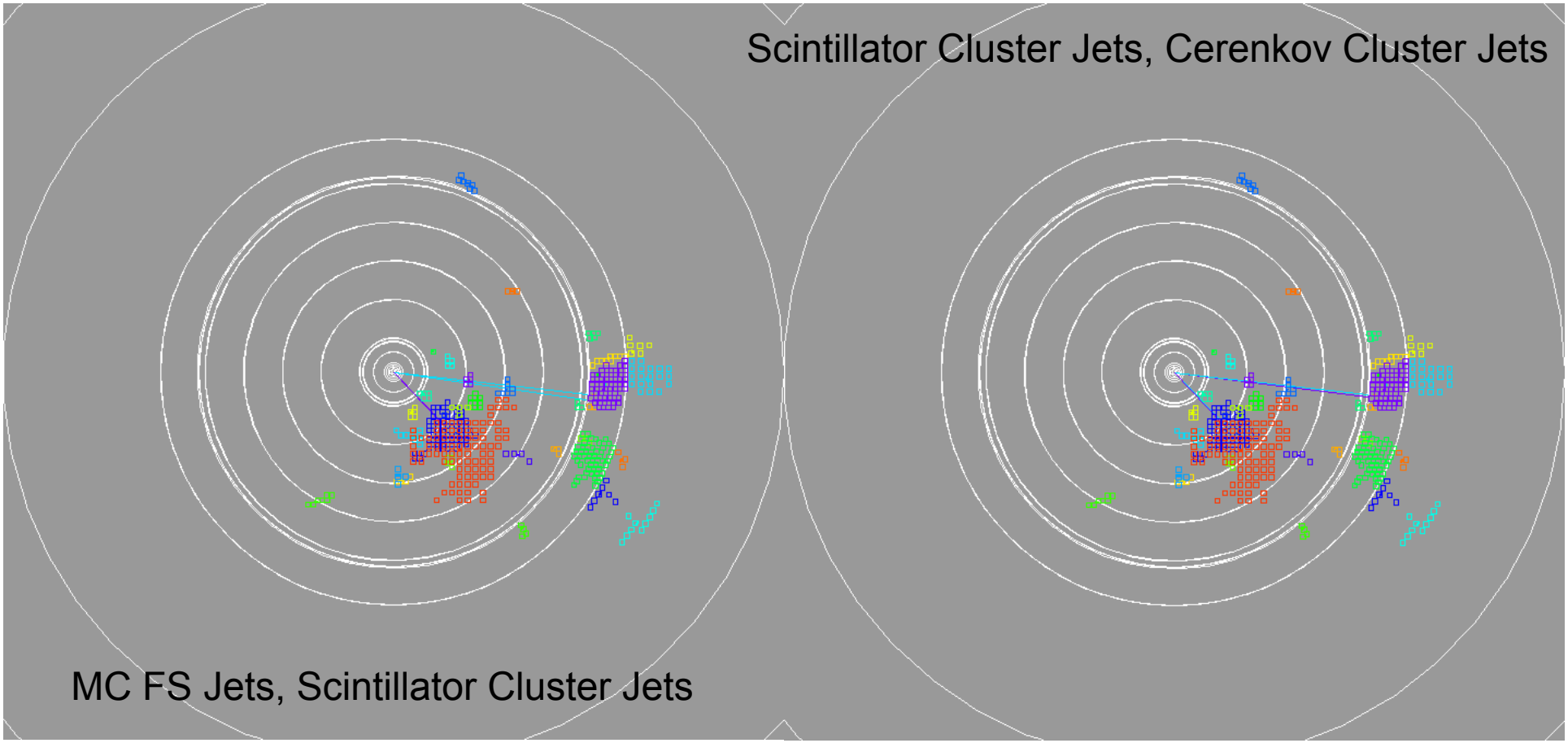




Cluster correction – use merged cerenkov clusters linked with merged scintillator clusters to apply polynomial correction

Jets

Jet finding with kT algorithm – 2 jet mode



Jet correction – use cerenkov jets linked to scintillator jets to apply polynomial correction – compare to result with cluster correction