ALCPG

ILC – The International Linear Collider Project

Energy Cluster Determination

with

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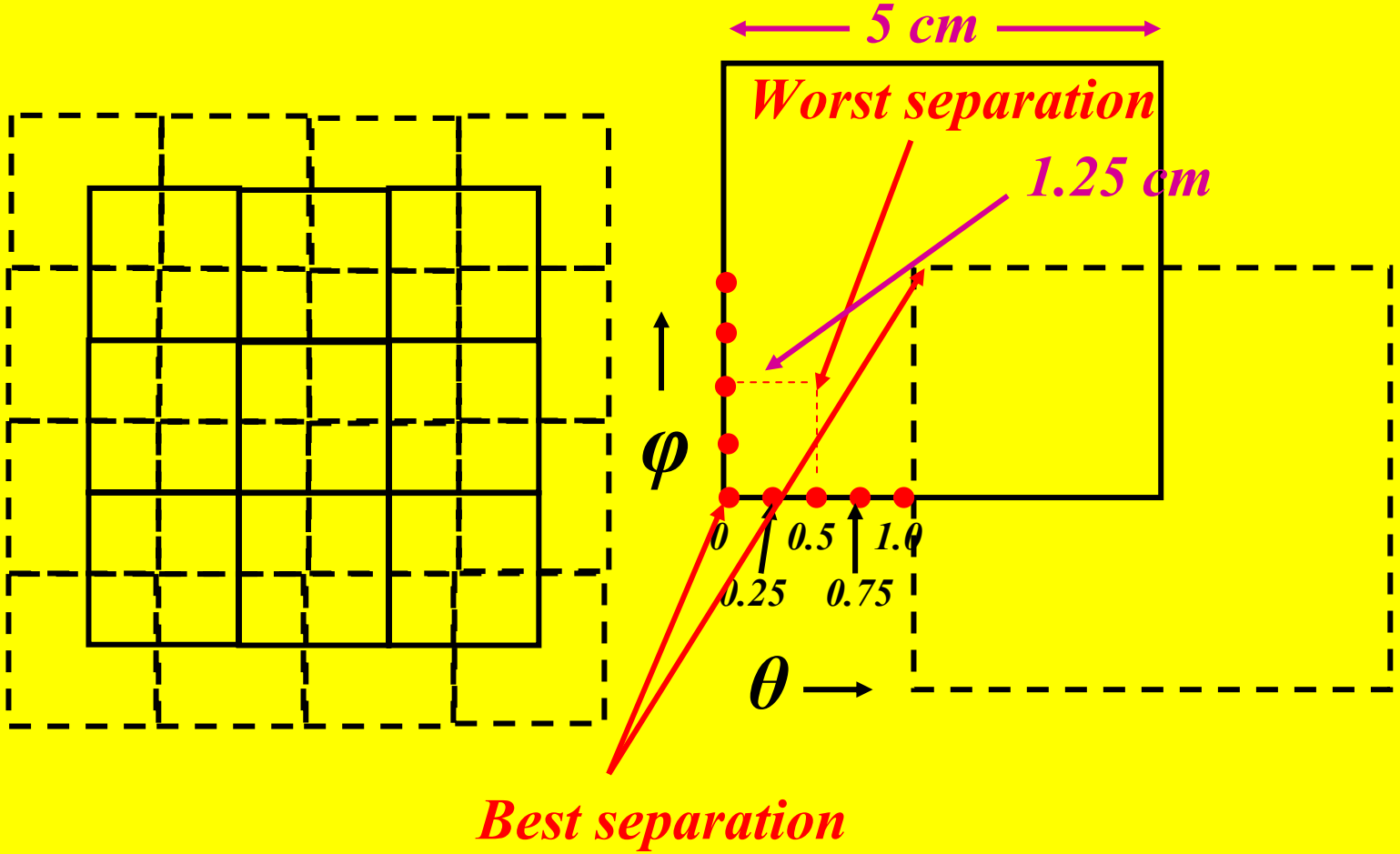

5 cm
Worst separation
1.25 cm
φ
0
0.25
0.5
0.75
1.0
θ
Best separation

The Chi-Square Structure

μ_i = average photon energy deposited in ith tile

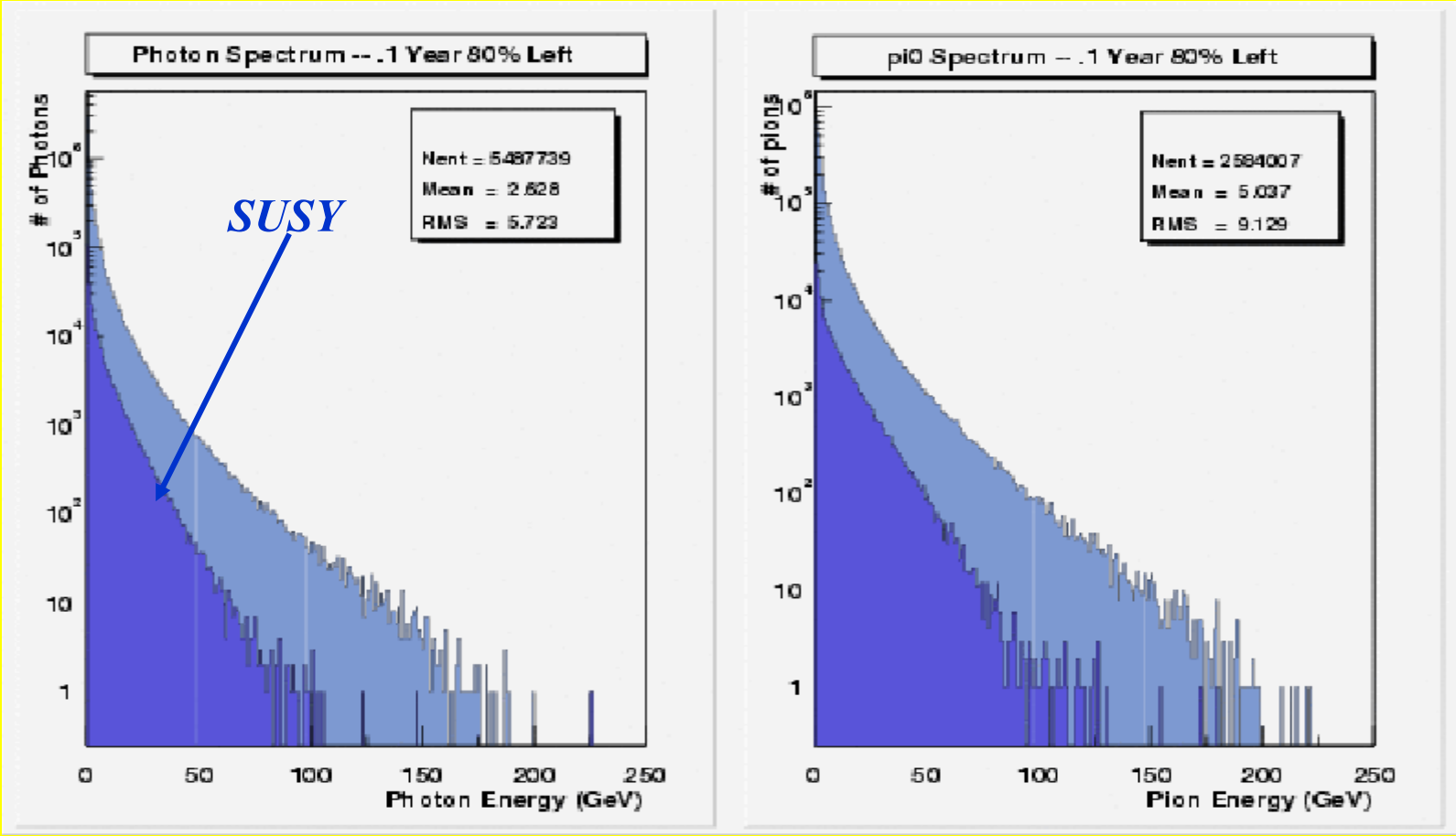
σ_i = standard deviation in the energy deposition

$H_{ij} = \sigma_i \sigma_j$

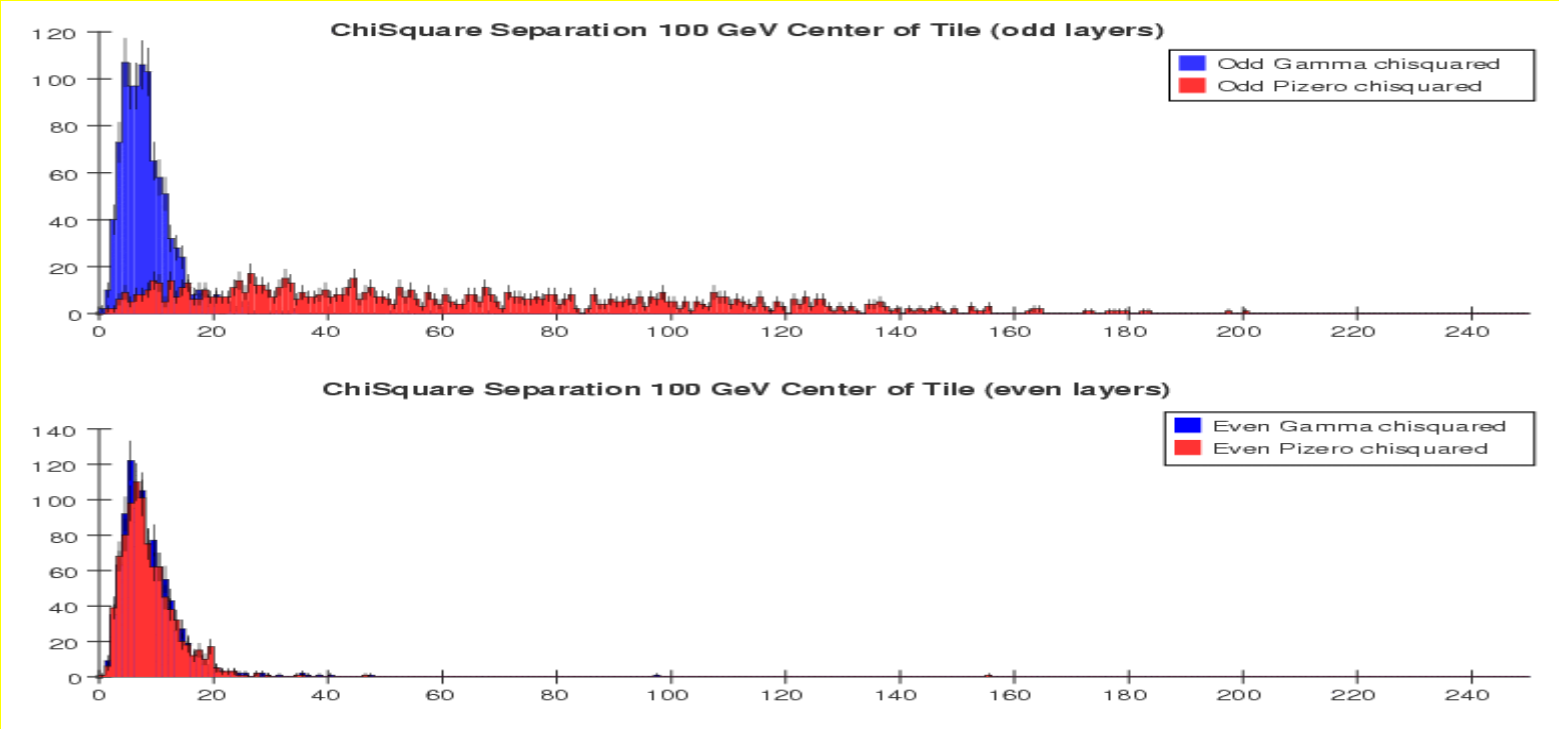
$$\chi^2 = \sum_{i,j=1}^{9} (x_i - \mu_i) H_{ij}^{-1} (x_j - \mu_j)$$

where x_i is the energy deposited by the shower being tested in the ith tile.

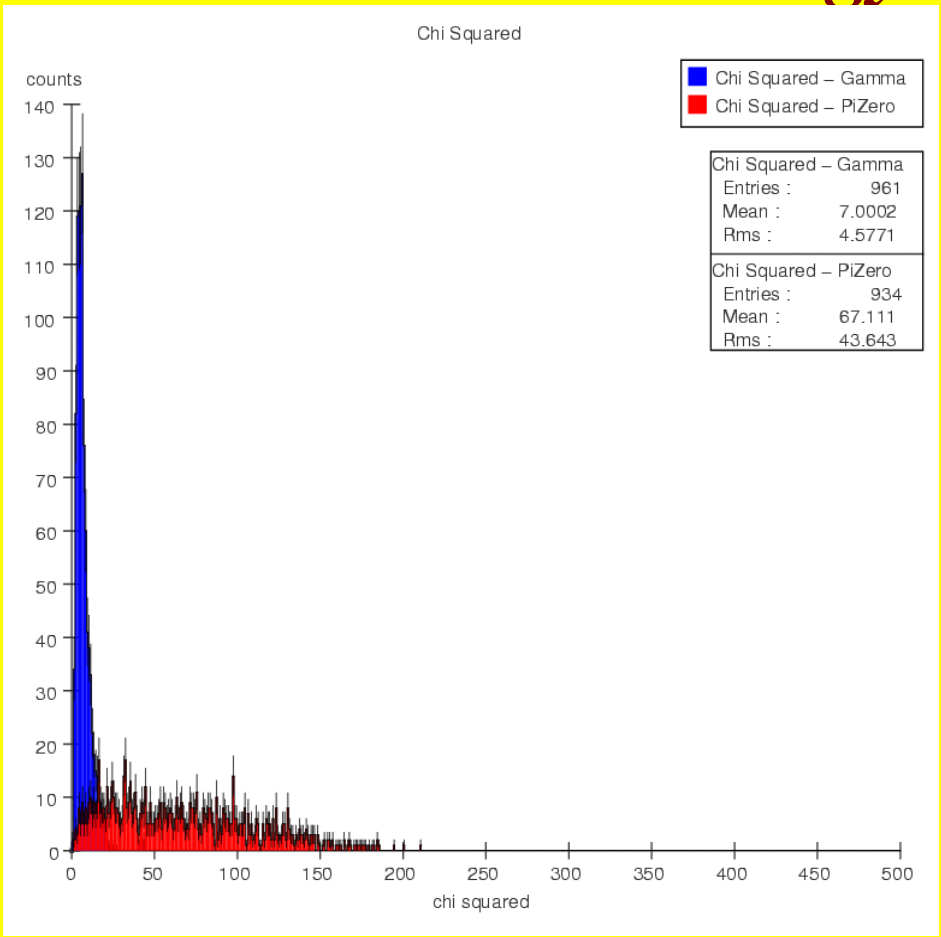
Typical Photon and π^0 Energy Spectra SUSY, SM

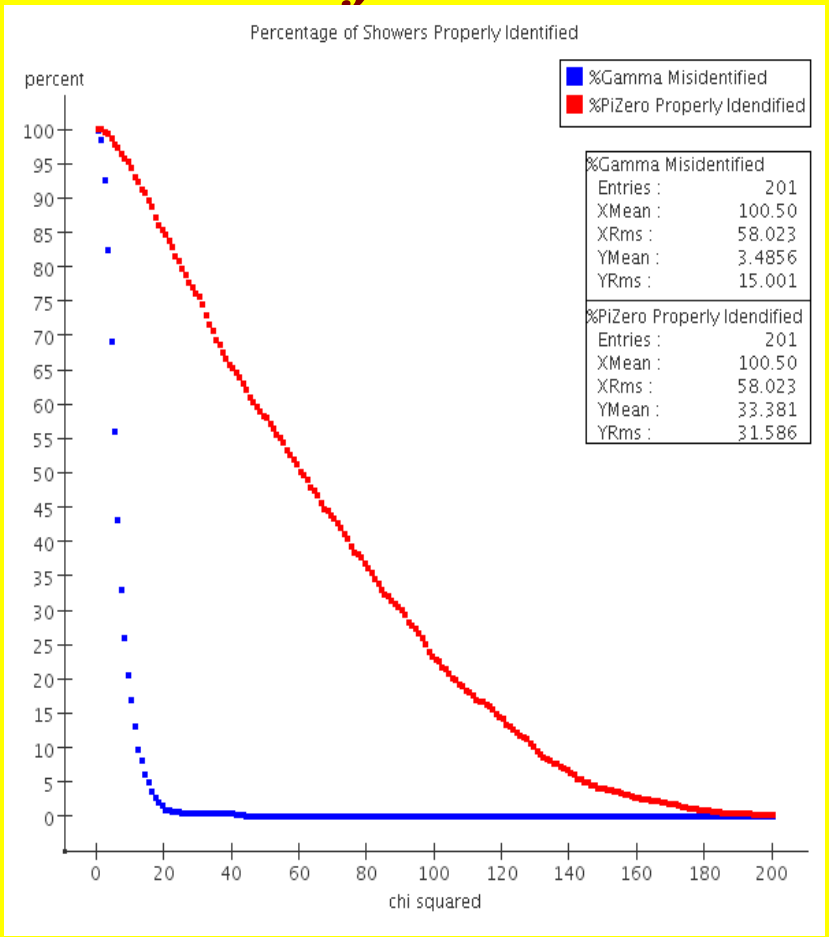


Separation of Even and Odd Layers in Chi-Square Studies of Separation



100 GeV Energy at Corner of Tile



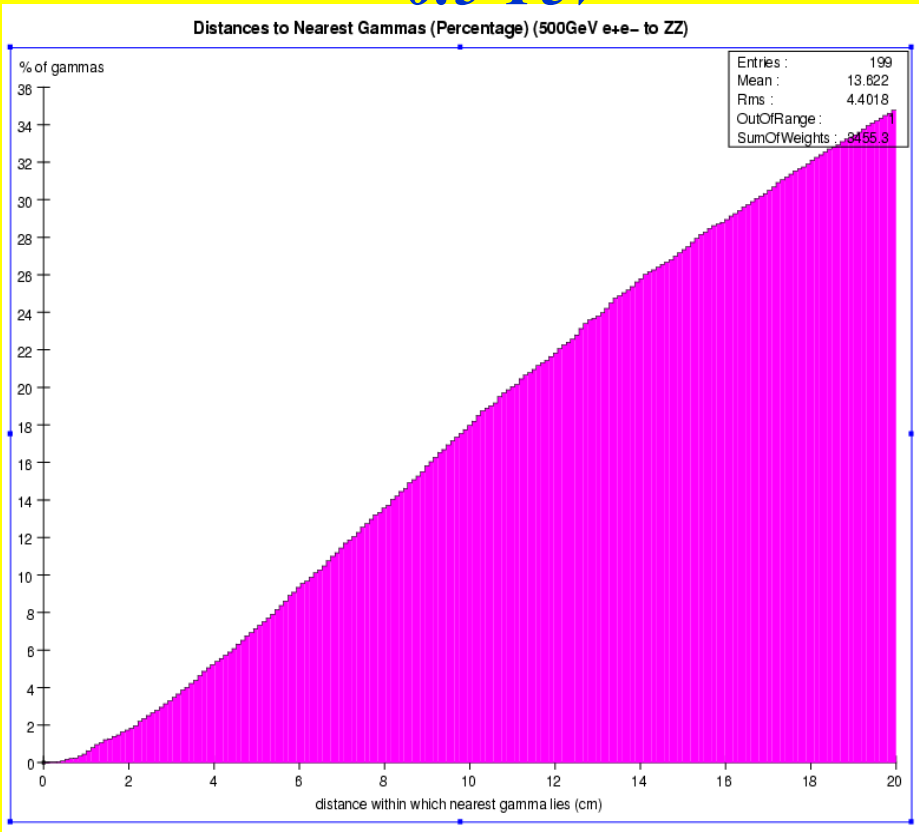


Issues to Work On

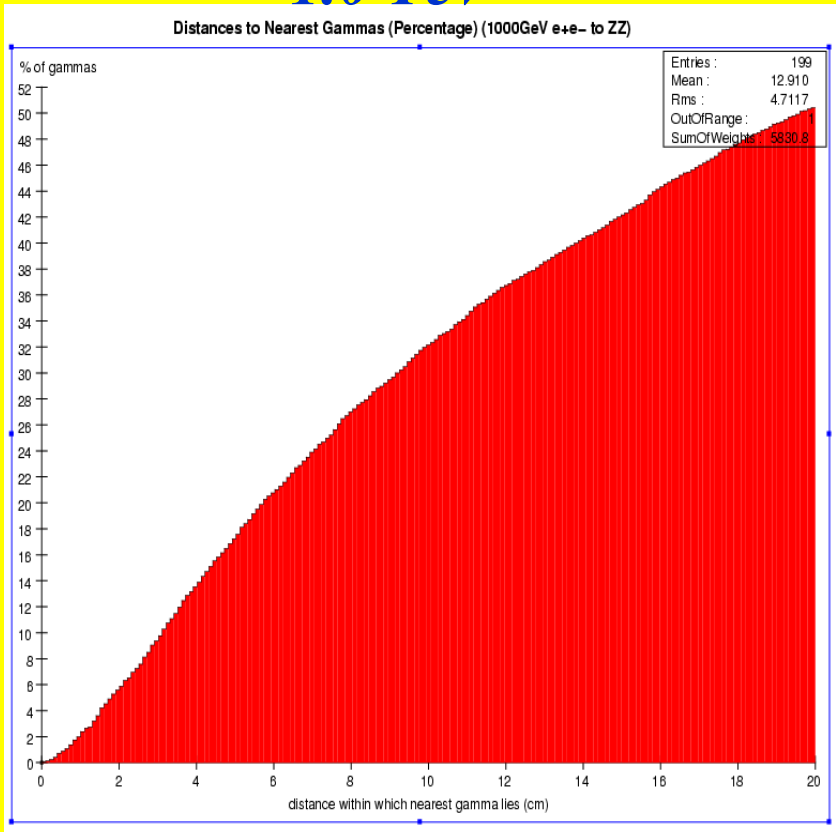
We need to study the separation all across a 5 x 5 cm^2 area. This requires us to interpolate between our various training sets. We have a bug that we need to fix before we know how good the average efficiency is. We are working on this.

Distance Between Unrelated γs at R=1.75 m

0.5 TeV

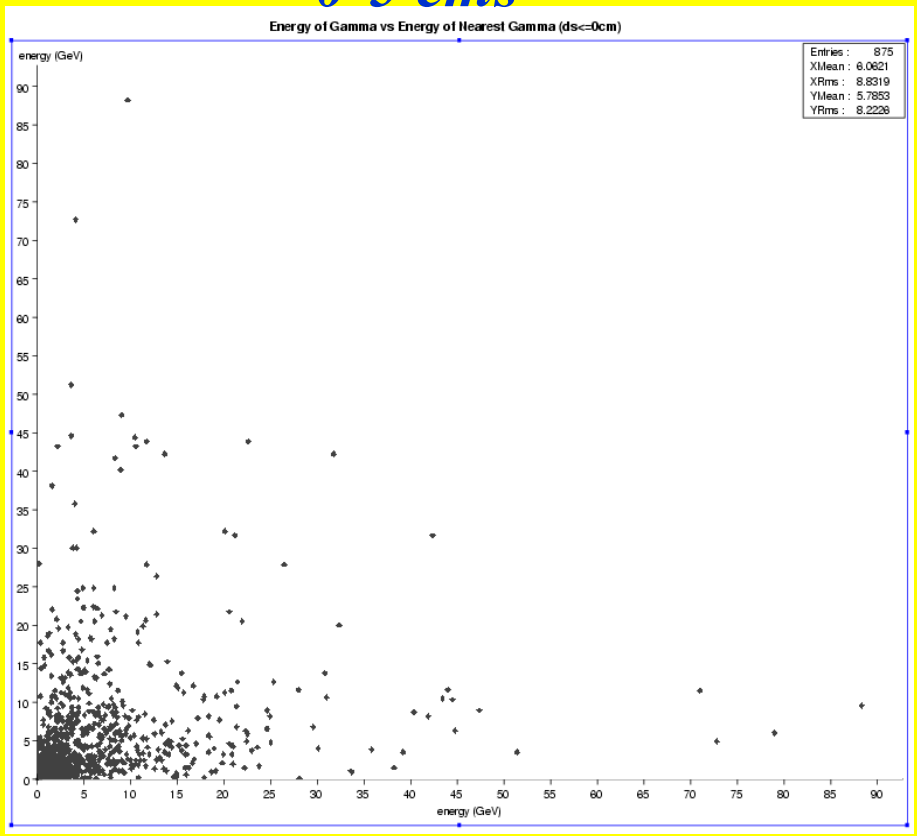


1.0 TeV

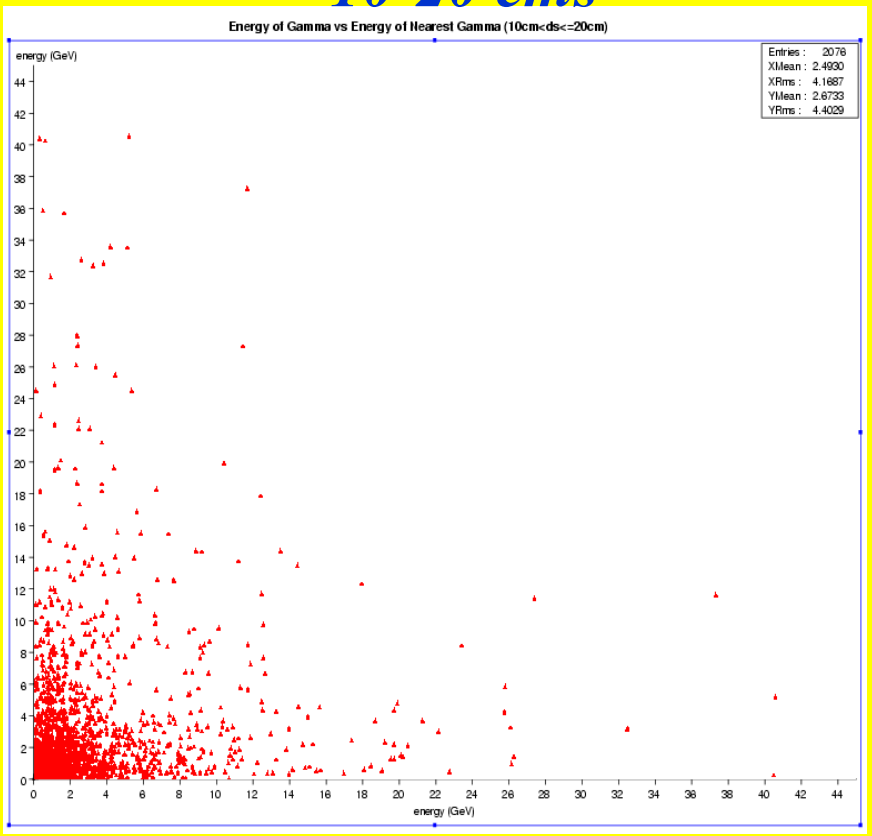


Energy of Overlapping γs

0-5 cms



10-20 cms



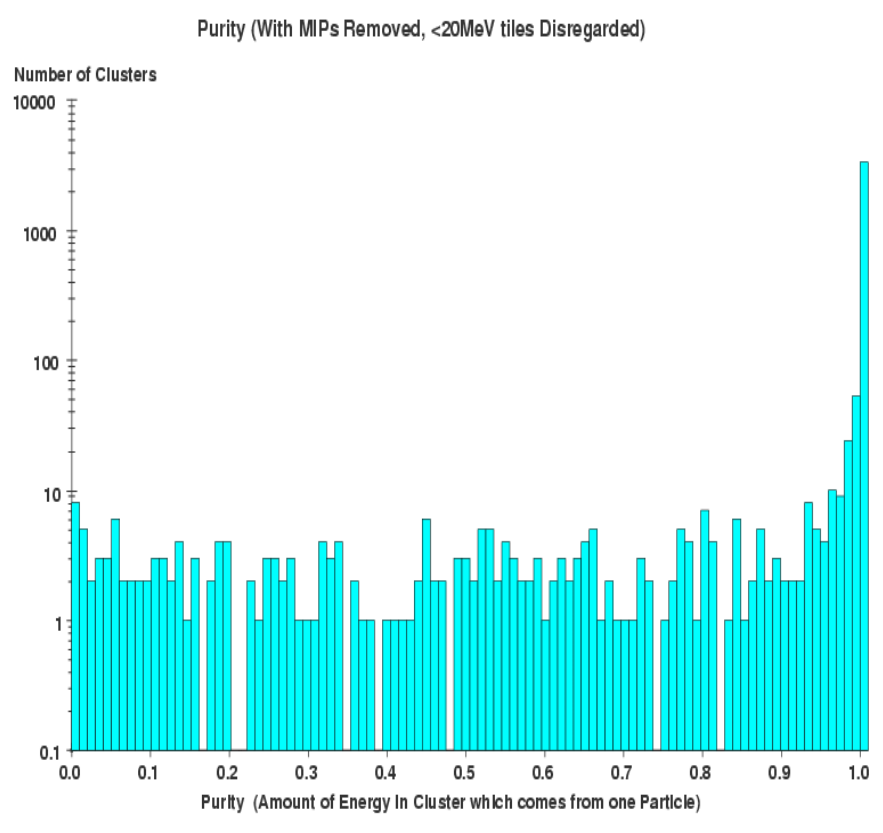
Definition of Terms

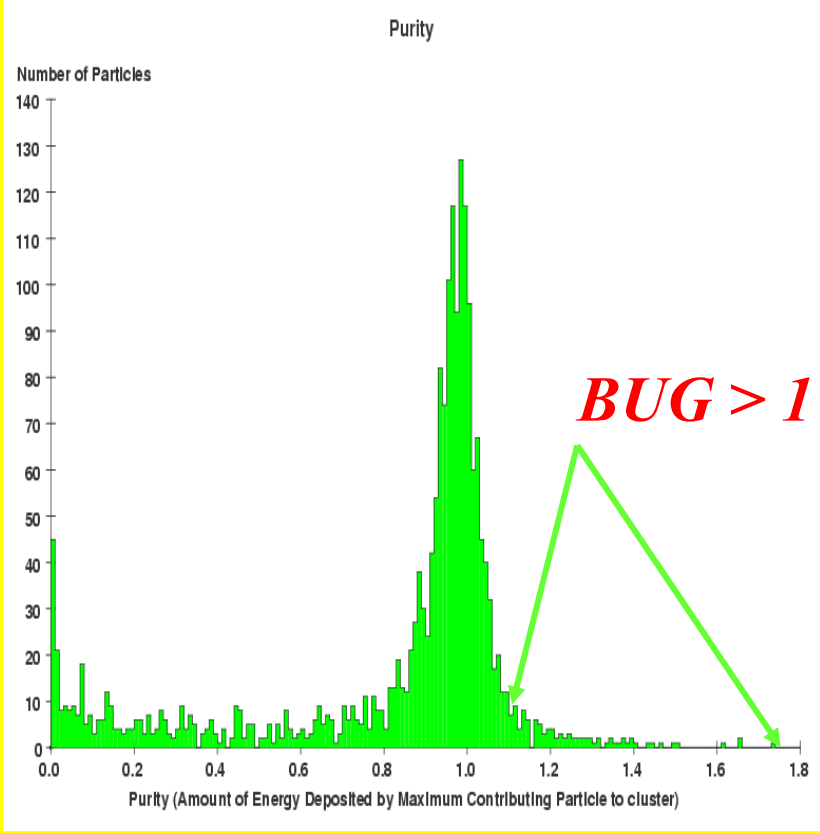
Purity = % of the energy in the cluster that comes from one γ

Efficiency = % of the energy of one γ in that cluster

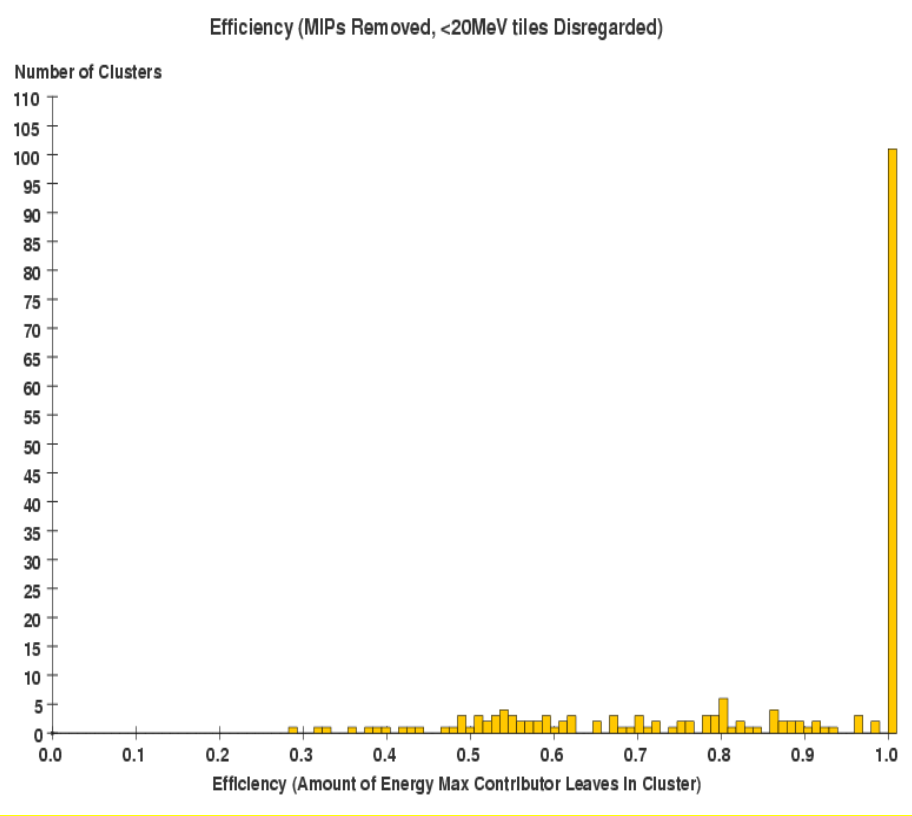
Study of these done after removal of charged hadronic hits in the calorimeter but not secondaries from Interactions.

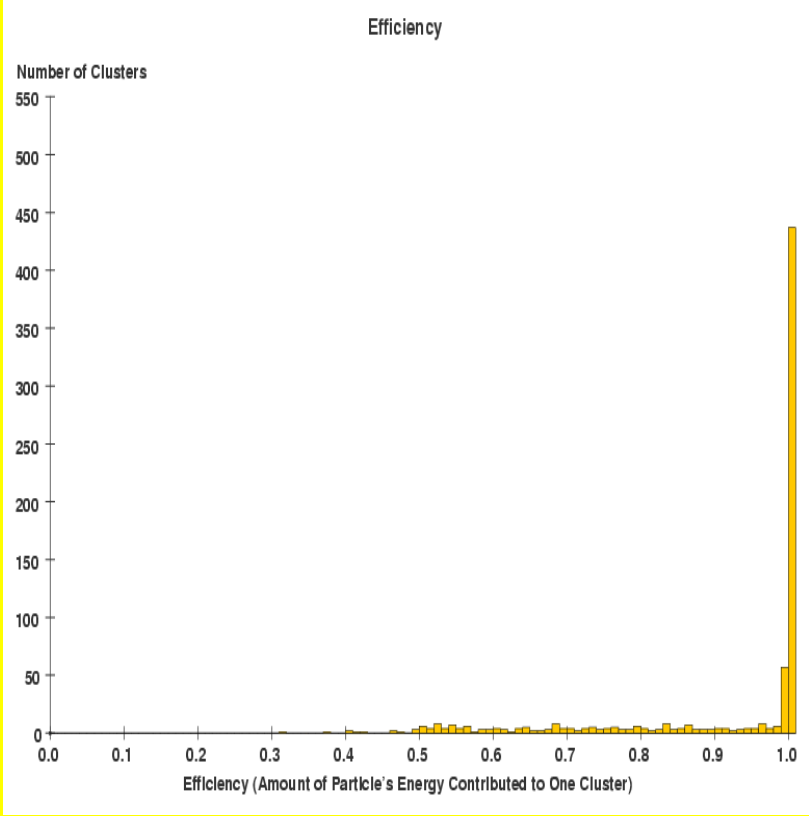
Purity of Energy Clusters in Pattern Recognition





Efficiency in Cluster Association





Problems

We can not use GEANT information to determine when a hadron has interacted in the calorimeter.

Discussion.

Where do we go from here

We need to remove the showers from secondary Interactions to reduce confusion.

We need to integrate all these processes to get to the mass determination.

Where do we go from here

- Lower the bias voltage on the SiPD to get the noise rate down to room temp rate to see if the increase in pulse height is above noise.
- Study the new SiPDs which are supposed to have much lower noise rates (X10 lower) to see if this is the problem.
- Use our 2 mm. scintillator array to study how many p.e. we get from m.i.p.s. and from γ component in the cosmic ray spectrum.

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