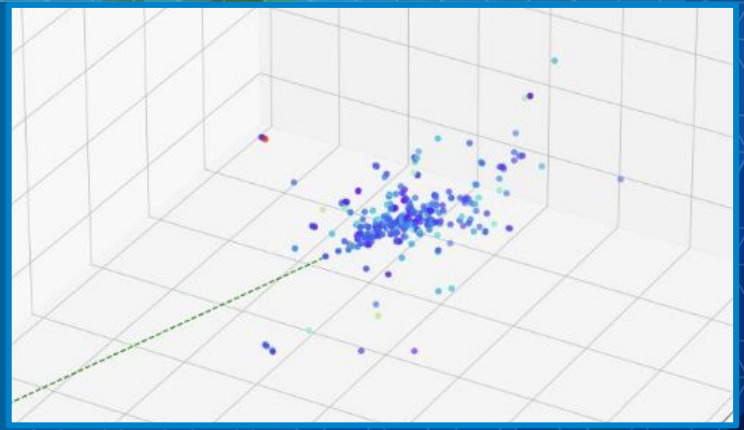
November 09, 2022

IMAGING EM BARREL CALORIMETER
Single particle simulation



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U.S. DEPARTMENT OF ENERGY
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Samples

Single particle simulations
eictest/EPIC/RECO/22.11.0/epic_brycecanyon/SINGLE/

In angular range: 45 - 135 deg

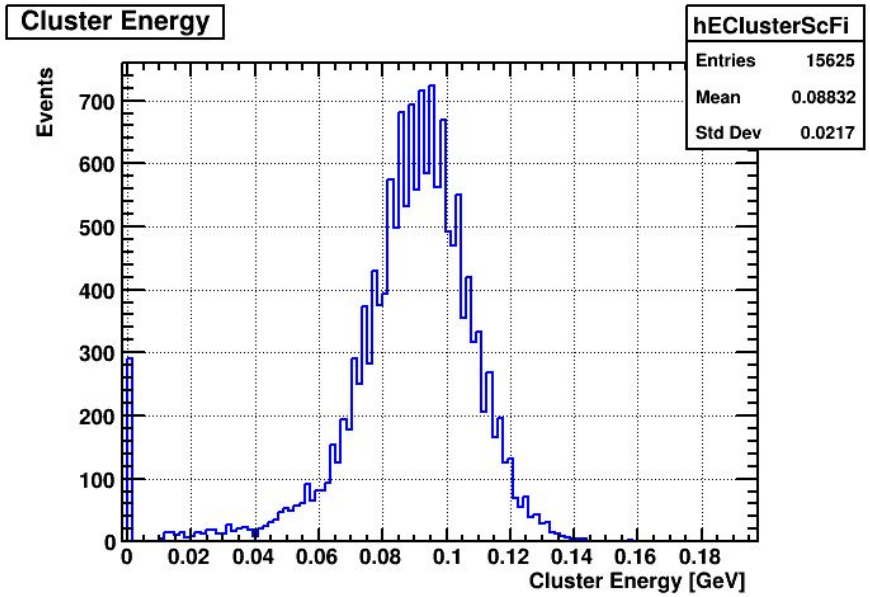
Immediate observation:
Raw and Reco hits and clusters available for SciFi layers
Raw and Reco hits available for Imaging layers, there is **no clusters reconstructed for imaging layers**
There are no truth clusters neither for SciFi nor for Imaging layers

Img clusters not needed for energy reconstruction or particle ID (classification), but needed for the **position/direction information** required for cluster matching. I do not see how the phi and eta info can be taken.

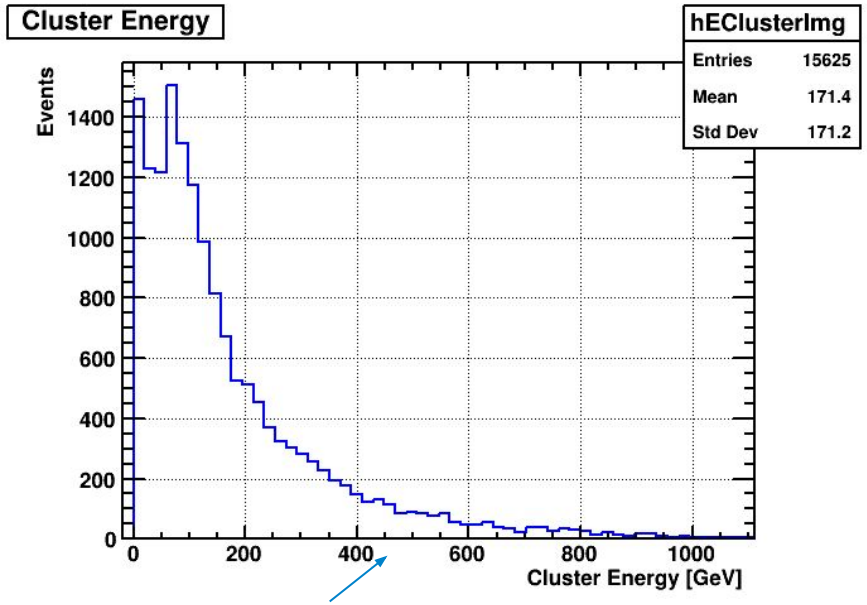
Issues with reconstruction

Example of 0.1 GeV gammas

Energy of SciFi Clusters



Energy of All Reco Imaging hits



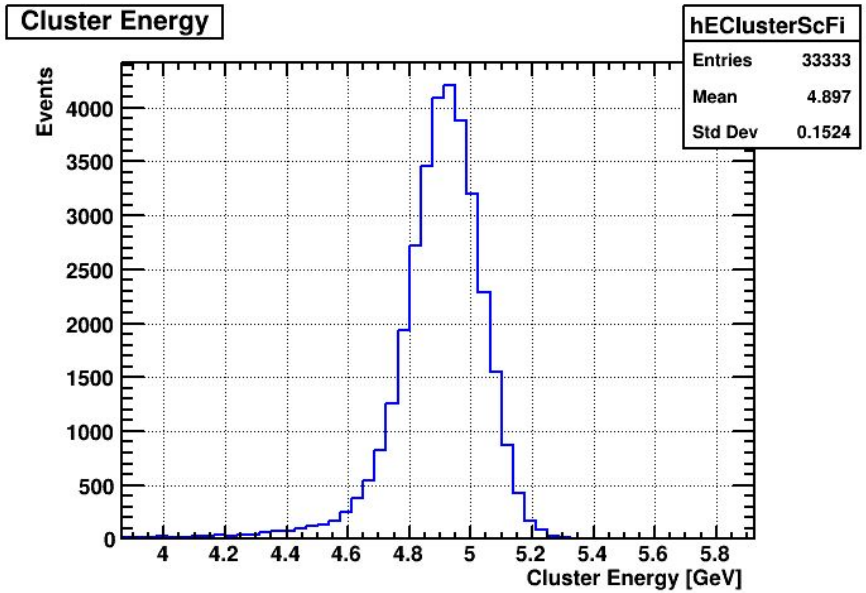
Something is completely wrong with fsam correction?

Issues with reconstruction

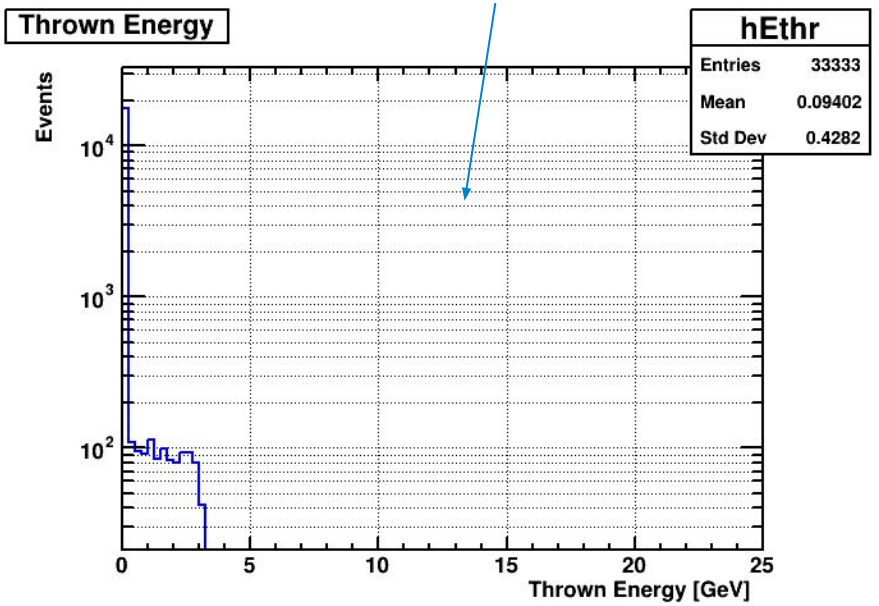
```
auto energy =
TMath::Sqrt(p.momentum.x *
p.momentum.x + p.momentum.y *
p.momentum.y + p.momentum.z *
p.momentum.z + p.mass * p.mass);
```

Example of 5 GeV gammas

Energy of SciFi Clusters



Thrown energy???

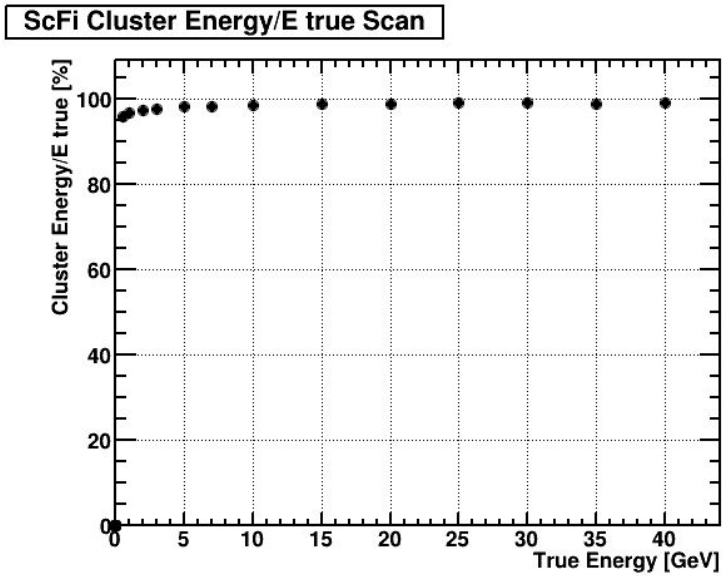


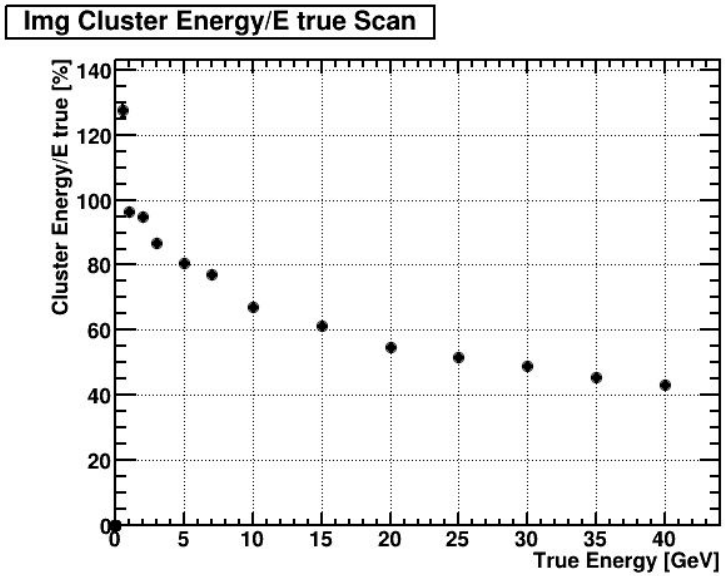
Energy of All Reco Imaging hits, also completely out of range

Energy resolution studies
Juggler reconstruction

Sampling Fraction - after clustering

Sampling fraction = $\Sigma E_{cluster}$ / $\mathbf{E_{thrown}}$

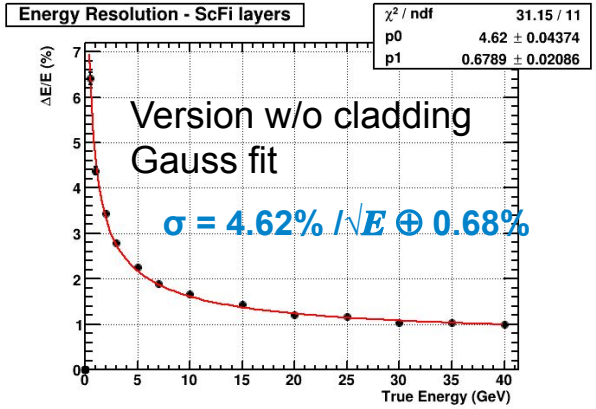


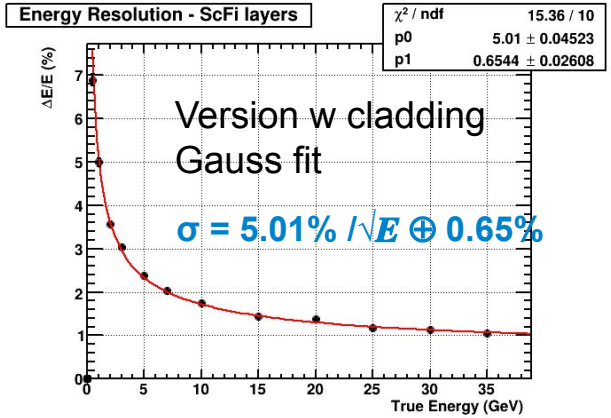


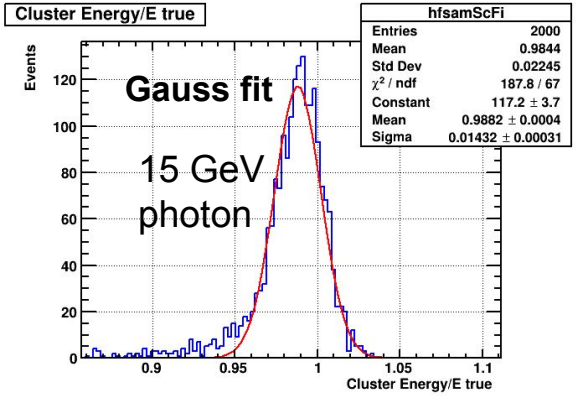
- Plots are corrected already with flat sampling fraction for 5 GeV photons.

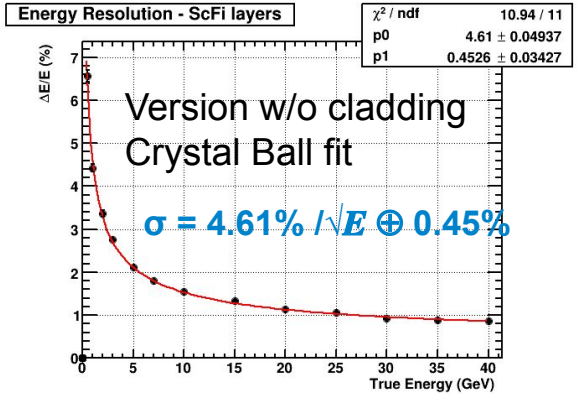
With the new material: clear “leakage” seen by the drop of the sampling fraction

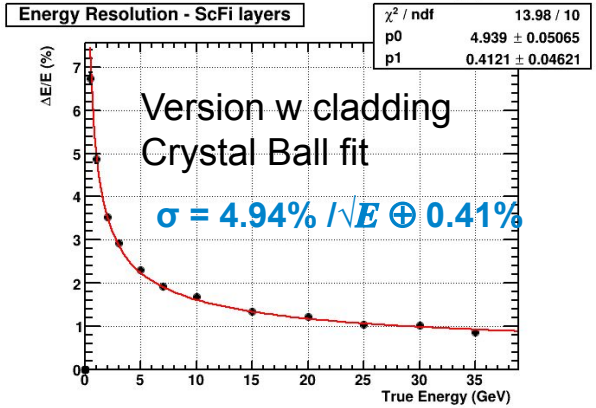
Energy resolution - SciFi/Pb detector

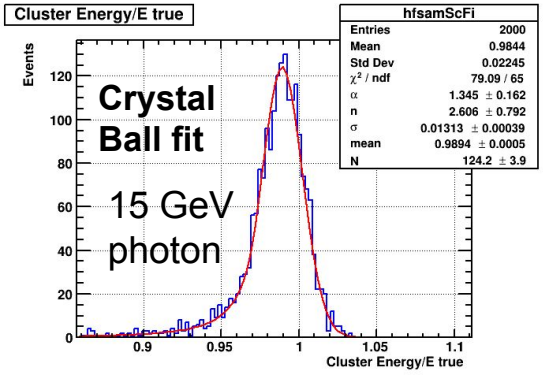






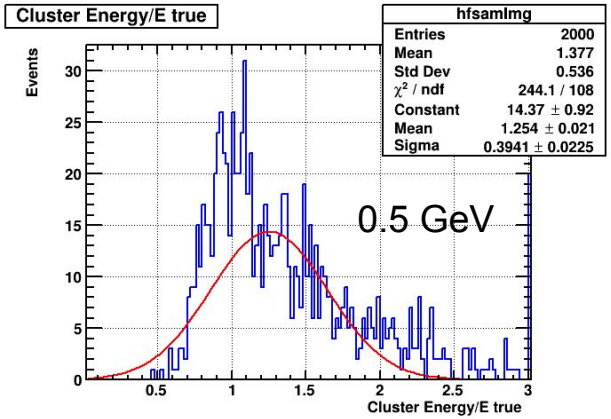


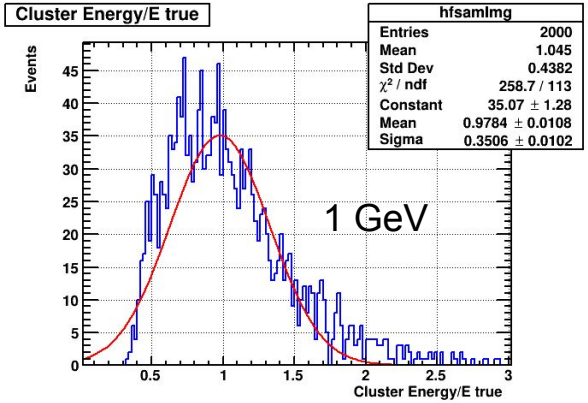


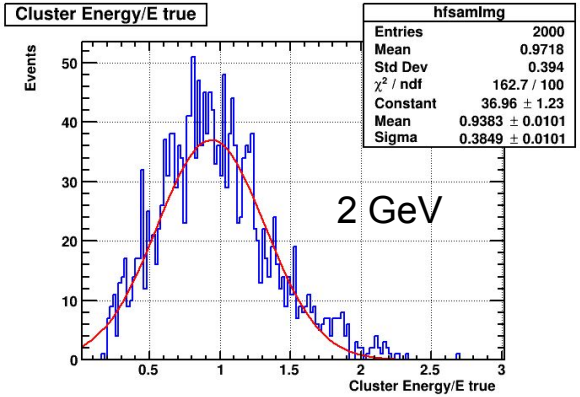


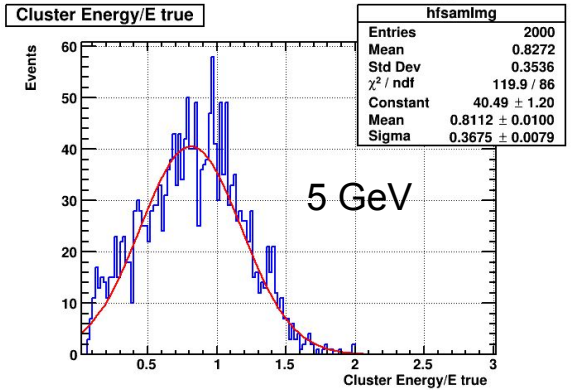
Energy resolution considerations - Img layers

Sum of cluster energy/E thrown for imaging layers







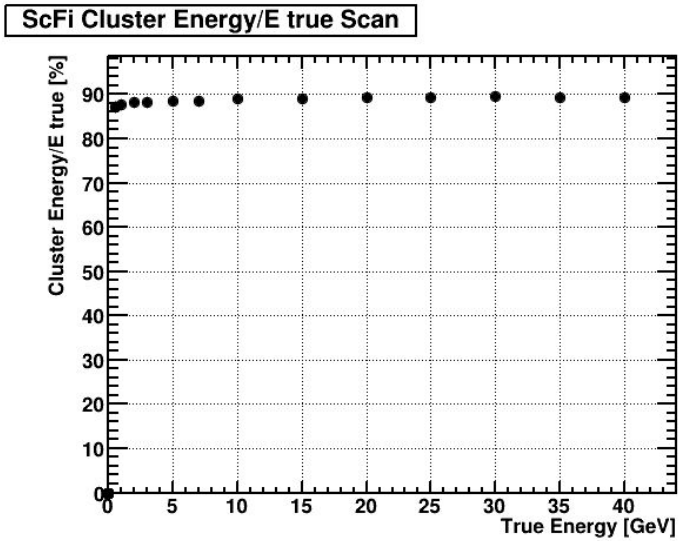


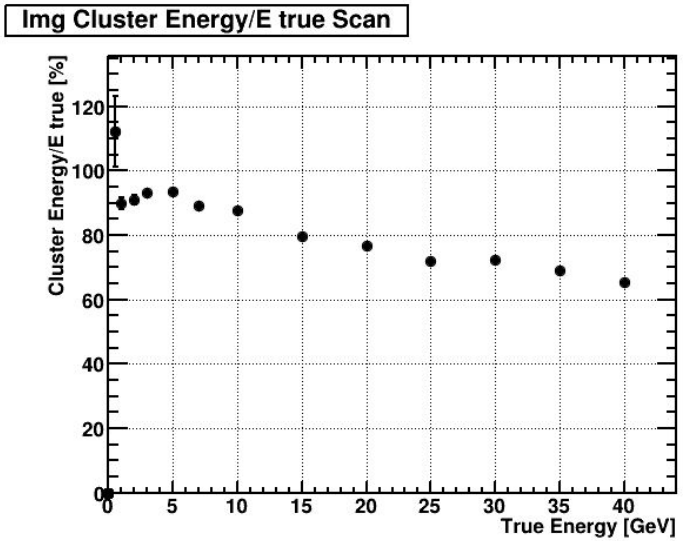
- Plots are corrected with flat 0.45% sampling fraction only.
- This sampling fraction is for 5 GeV photons (too low for lower energies, because of the leakage).
- Low energies show (much) larger reco energies than thrown, but also weird shape.

Sampling Fraction - after clustering

5 layers of 1.22 mm*16 + 11*16*1.22 mm chunk

Sampling fraction = $\Sigma E_{cluster}$ / $\mathbf{E_{thrown}}$



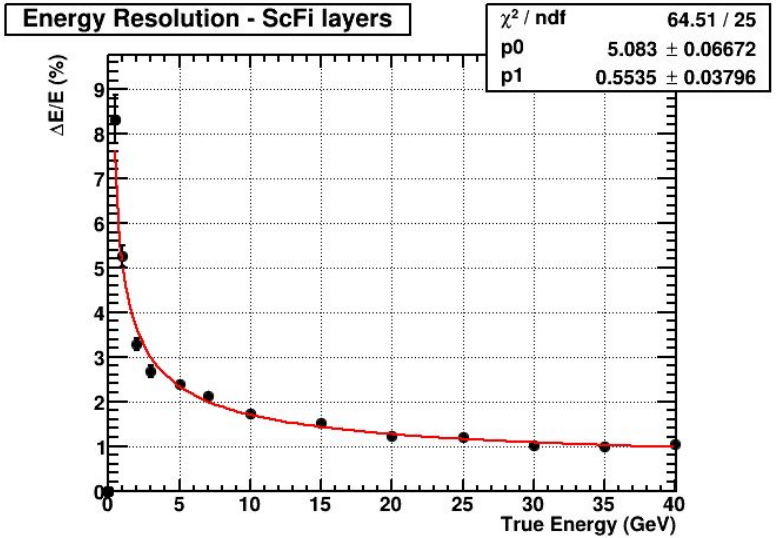


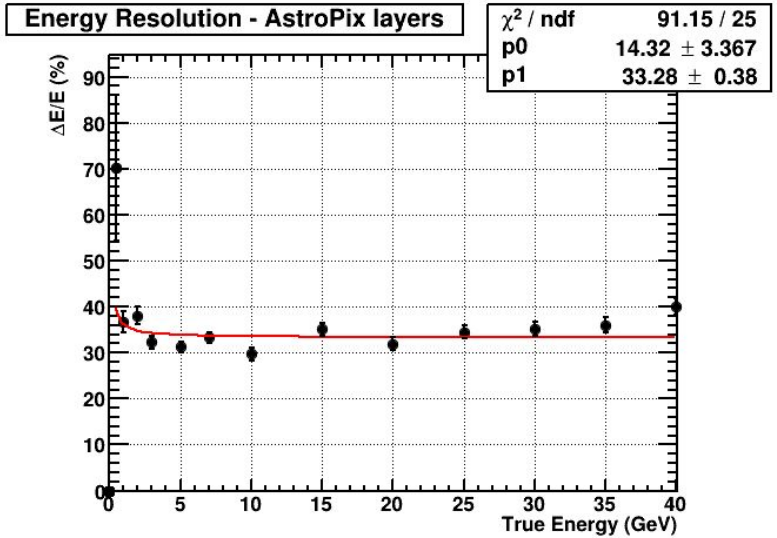
- Plots are corrected already with flat sampling fraction for 5 GeV photons.

Energy resolution

5 layers of 1.22 mm*16 + 11*16*1.22 mm chunk

Sampling fraction = $\Sigma E_{cluster}$ / $\mathbf{E_{thrown}}$





- Plots are corrected already with flat sampling fraction for 5 GeV photons.