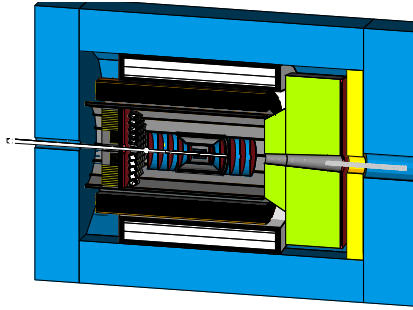


# DETECTOR GEOMETRY – EM BARREL CAL

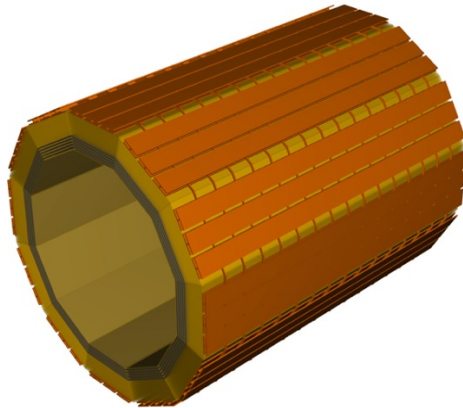
## With Input Distribution



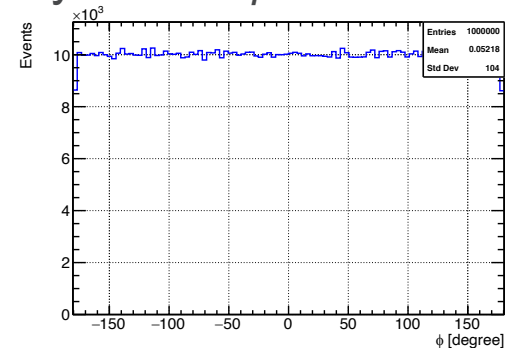
◀ ATHENA  
Central  
Detector

Hybrid Barrel ▶  
Calorimeter Concept

- Silicon (AstroPix)  
Imaging layers
- SciFi layers



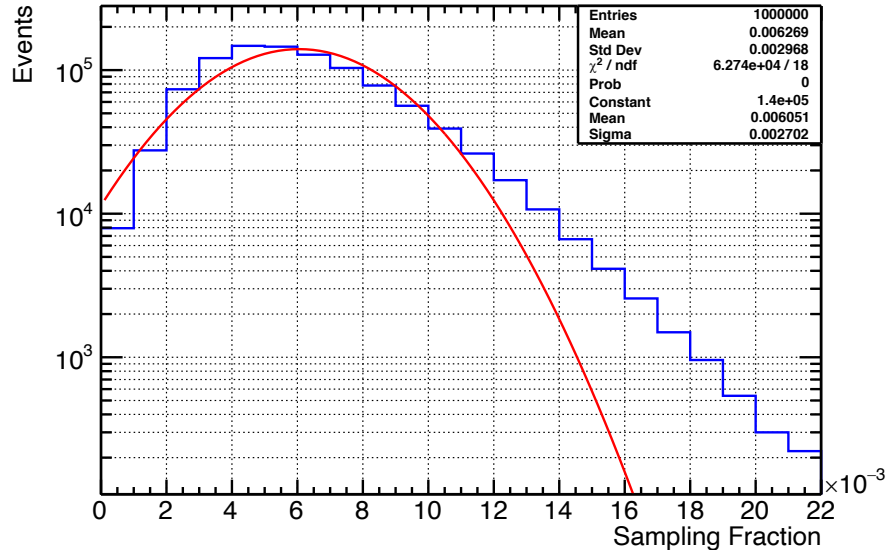
- Single gamma and  $\pi^0$  set
- Generate uniformly distributed incoming particle on surface of momentum sphere in a given momentum
- Polar angle:  $45^\circ < \theta < 135^\circ$
- Pseudo-rapidity:  $-1.0 < \eta < 1.0$
- Azimuthal angle:  
 $0 < \phi < 2\pi$



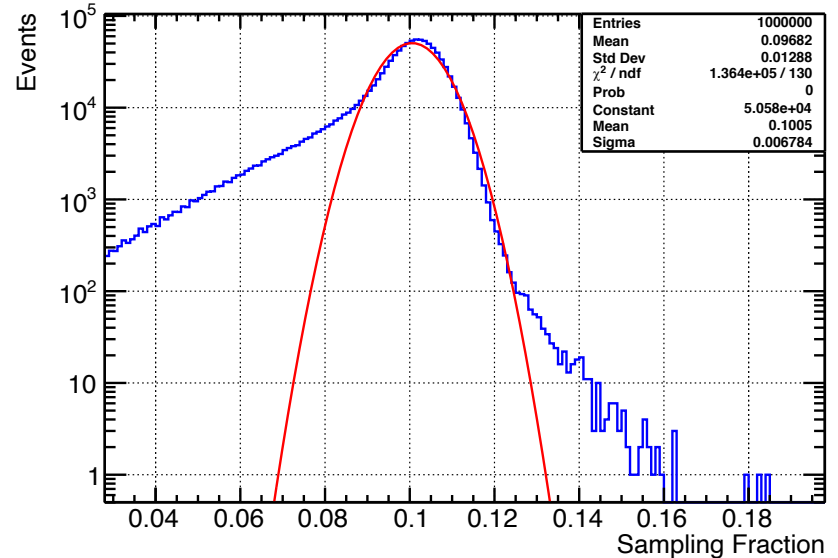
# SAMPLING FRACTION

## Energy Loss in EM Barrel Calorimeter

Imaging Layers  
Sampling Fraction  $\sim 0.6\%$



SciFi Layers  
Sampling Fraction  $\sim 10\%$

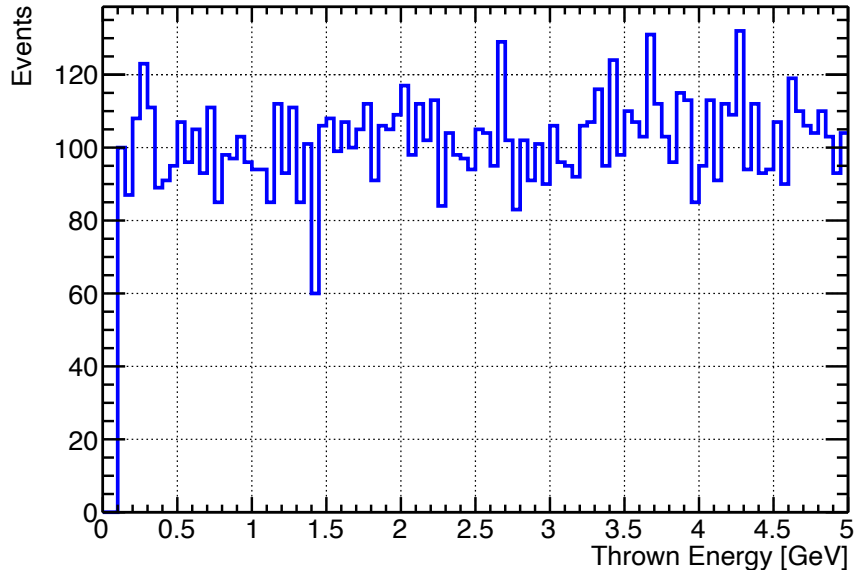
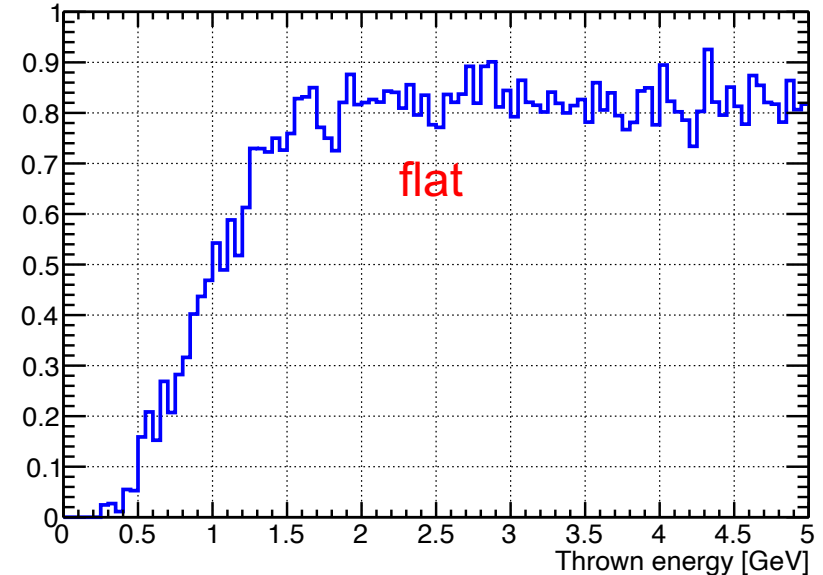


Using only imaging layers

# THRESHOLD ENERGY

## What energy be able to reach to EM Barrel Calorimeter

Input energy distribution

 $\gamma$ s reach and shower at barrel calorimeter

Using only imaging layers

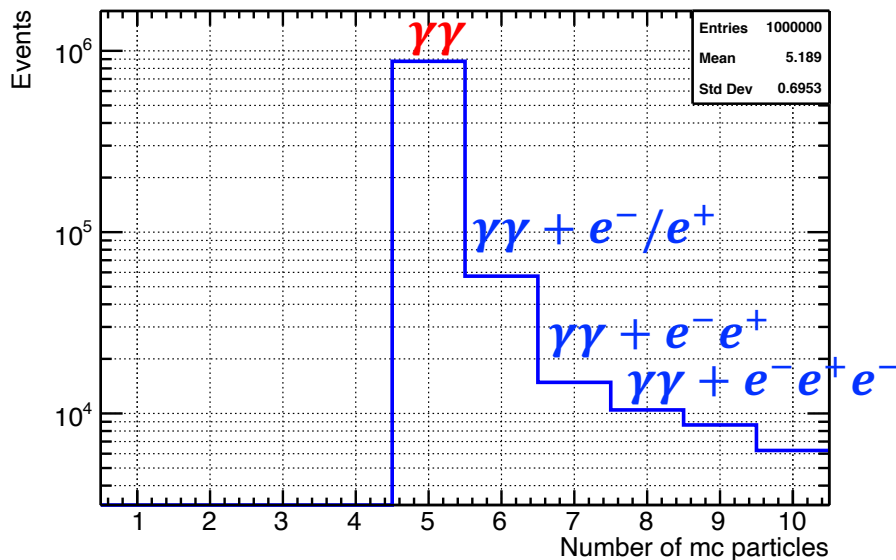
# MONTE CALO PARTICLE INFO

## 5 GeV $\pi^0 \rightarrow \gamma\gamma$ events

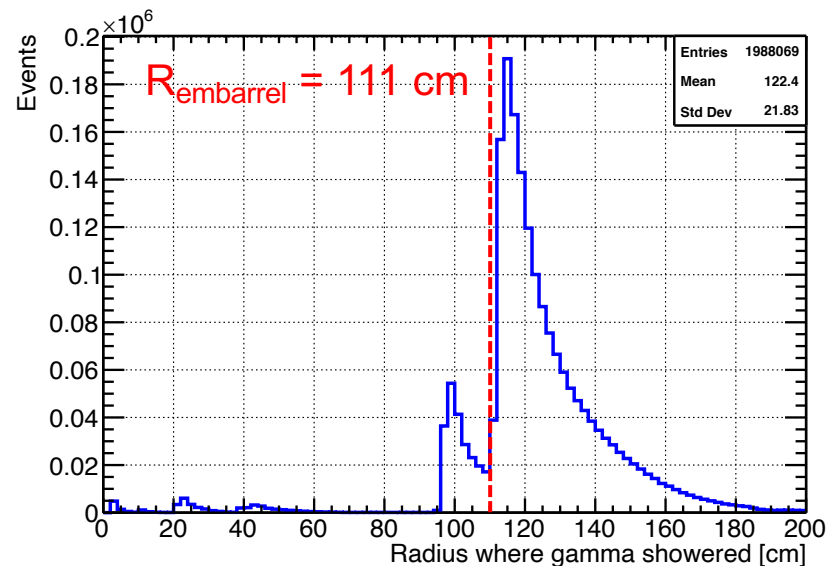
Cuts on clustering algorithm

- Min nhits = 15
- Min cluster edep = 0.5 MeV

Total number of MC particles including beam particles ( $e + p$ ) +  $\pi^0$



Radius where true  $\gamma$ s showered



Using only imaging layers

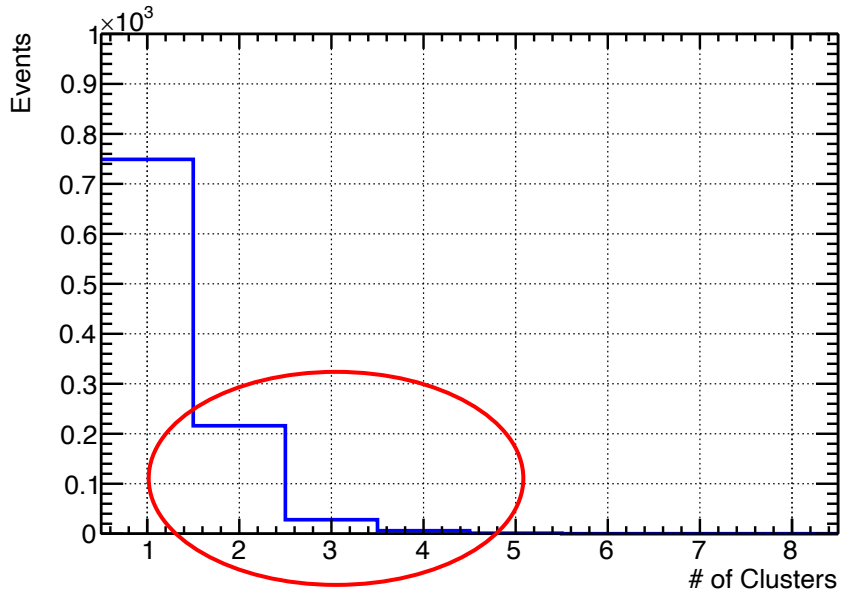
# NUMBER OF CLUSTERS

## Single 5 GeV $\gamma$ data set

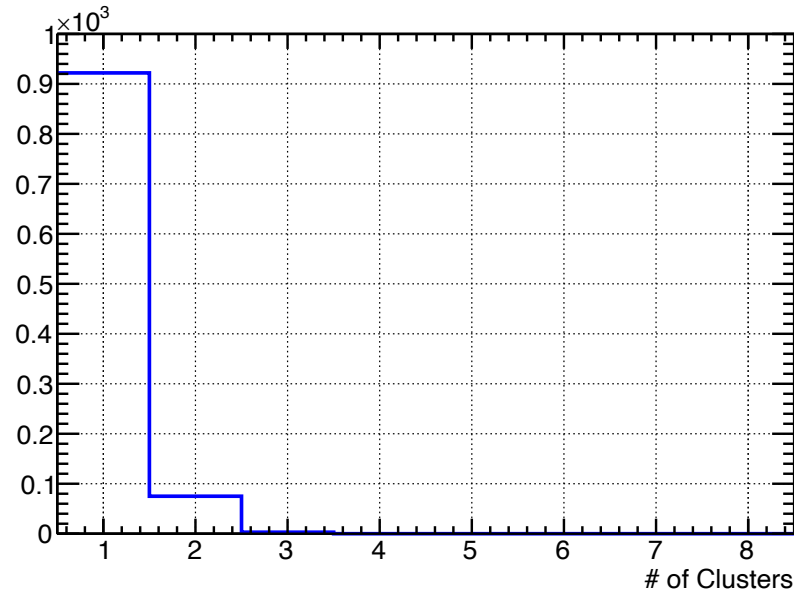
Cuts on clustering algorithm

- Min nhits = 15
- Min cluster edep = 0.5 MeV

Min number of hits = 10



Min number of hits = 15



Using only imaging layers

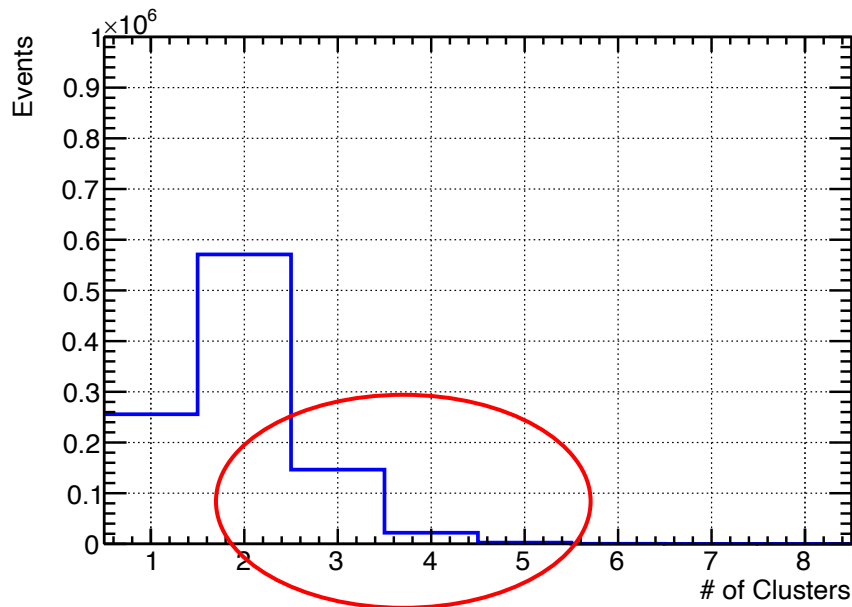
# NUMBER OF CLUSTERS

## Single 5 GeV $\pi^0$ data set

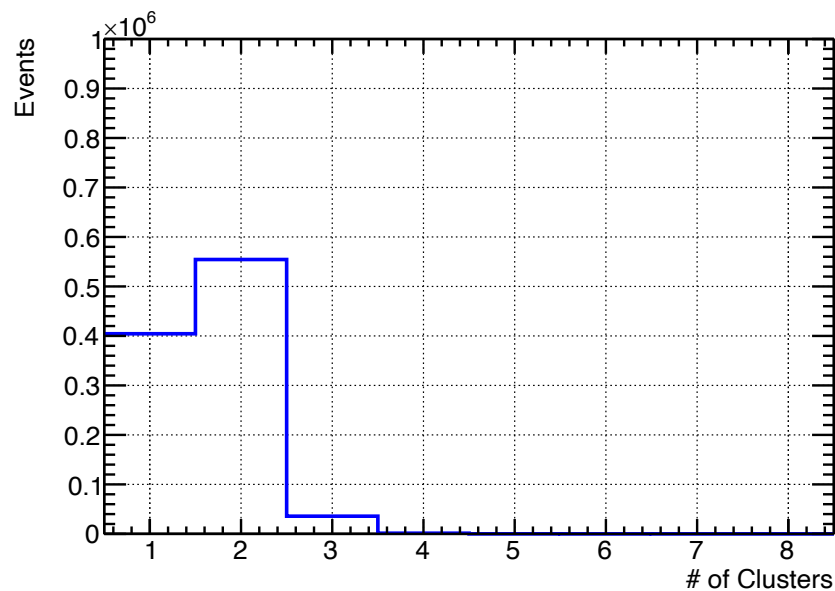
Cuts on clustering algorithm

- Min nhits = 15
- Min cluster edep = 0.5 MeV

Min number of hits = 10



Min number of hits = 15



Using only imaging layers

# EVENT DISPLAY

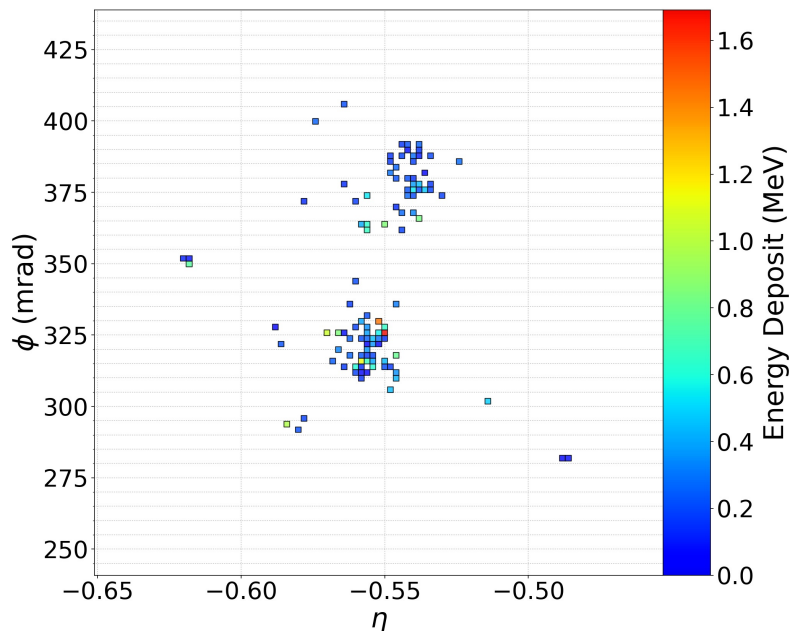
## 5 GeV $\pi^0 \rightarrow \gamma\gamma$ events

$E_{\text{cluster \#1}} = 3.23 \text{ GeV}$   
 $E_{\text{cluster \#2}} = 1.94 \text{ GeV}$   
Total  $E_{\text{rec}} = 5.17 \text{ GeV}$

Cuts on clustering algorithm

- Min nhits = 15
- Min cluster edep = 0.5 MeV

Using all reconstructed hits



Using hits forming clusters

