BIC Meeting, Mar 29, 2024

Simulations
Impact of AstroPix Coverage

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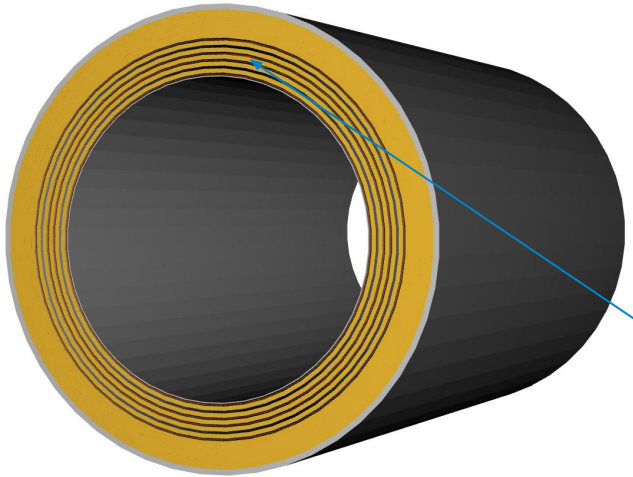
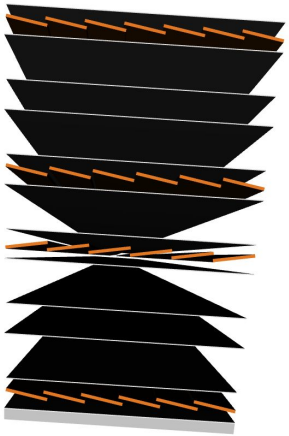
Geometries

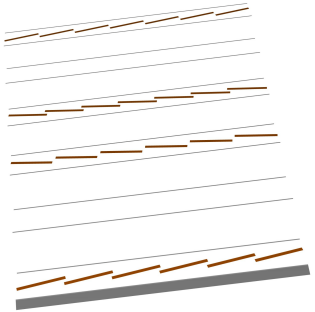


AstroPix layers



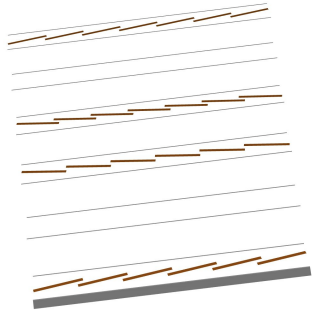
Hit threshold: 20 keV

Sparse Geometry

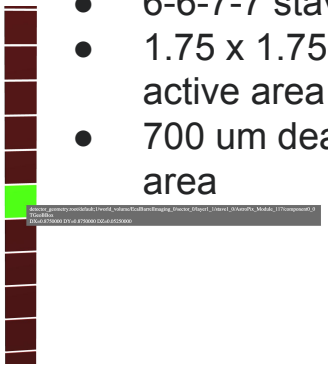


- 6-6-7-7 staves
- 1.75 x 1.75 cm active area
- 700 um dead area

Full Geometry

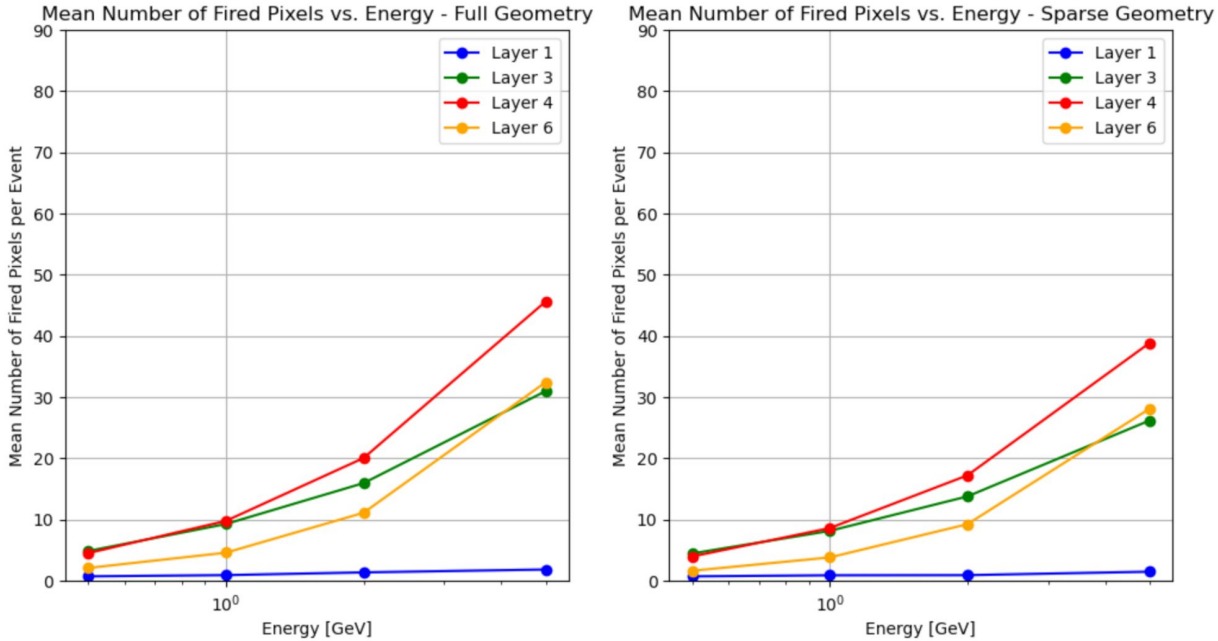


- 6-6-7-7 staves
- 2 x 2 cm active area
- 200 um dead area



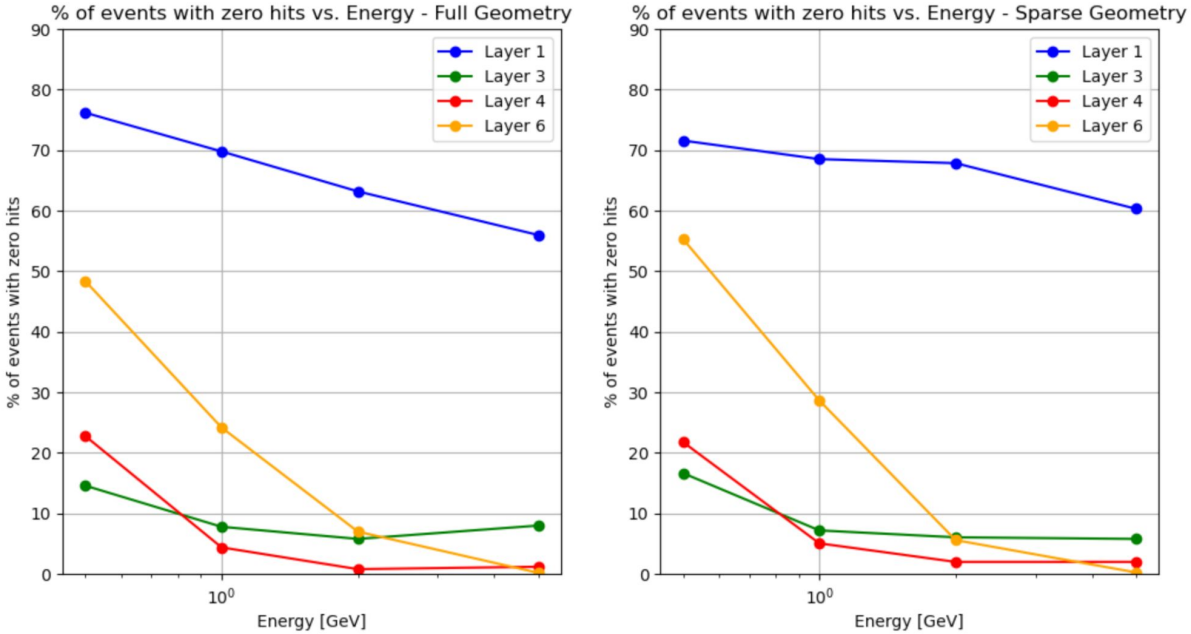
Number of fired pixels

Sparse and Full Geo, Photons, η = (-0.88, 0.88)



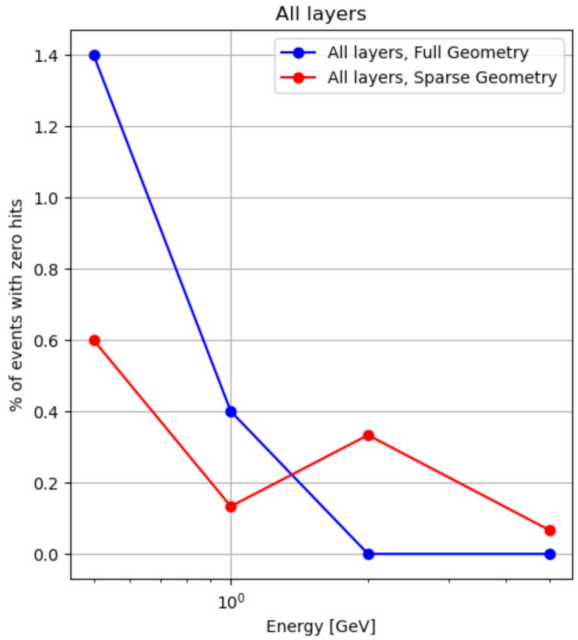
Number of zero hits per event

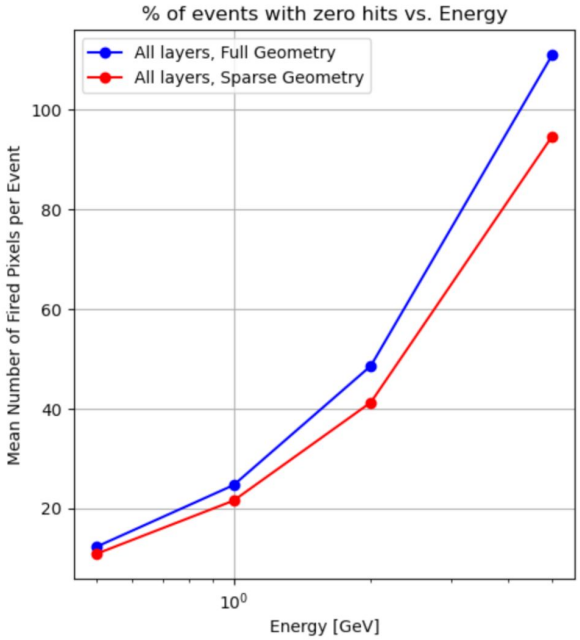
Sparse and Full Geo, Photons, η = (-0.88, 0.88)



Number of zero hits and nb of hits per event

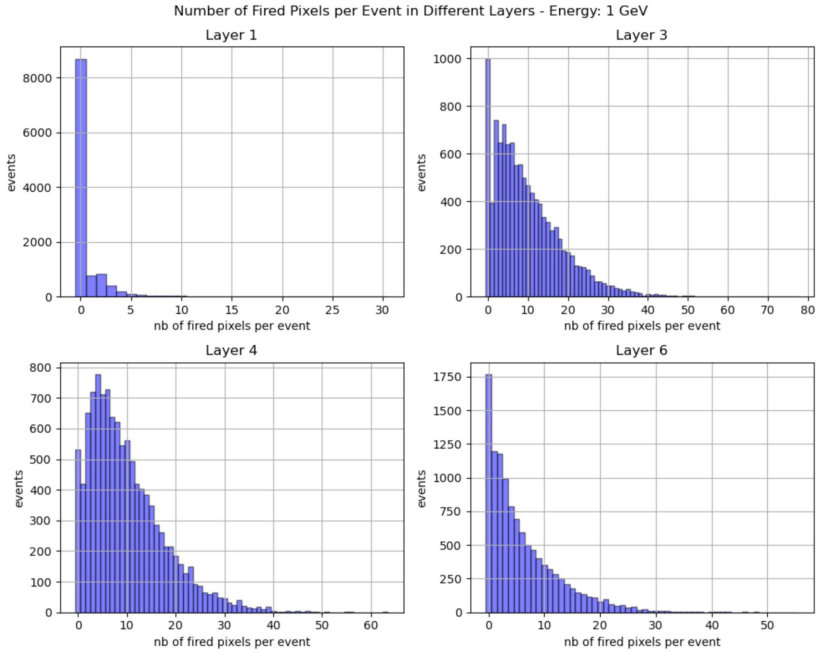
Sparse and Full Geo, Photons, η = (-0.88, 0.88)

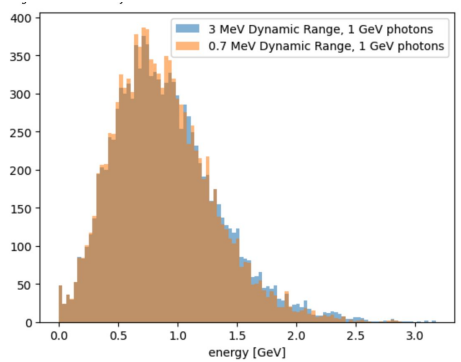




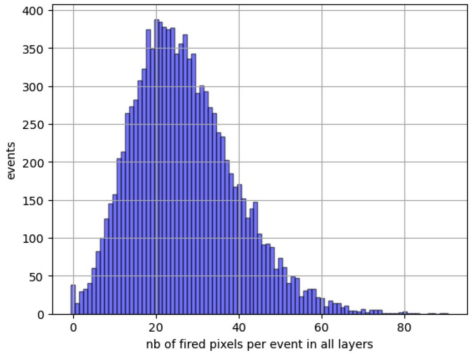
Example Distributions, 1 GeV

Full Geo, Photons, η = (-0.88, 0.88)



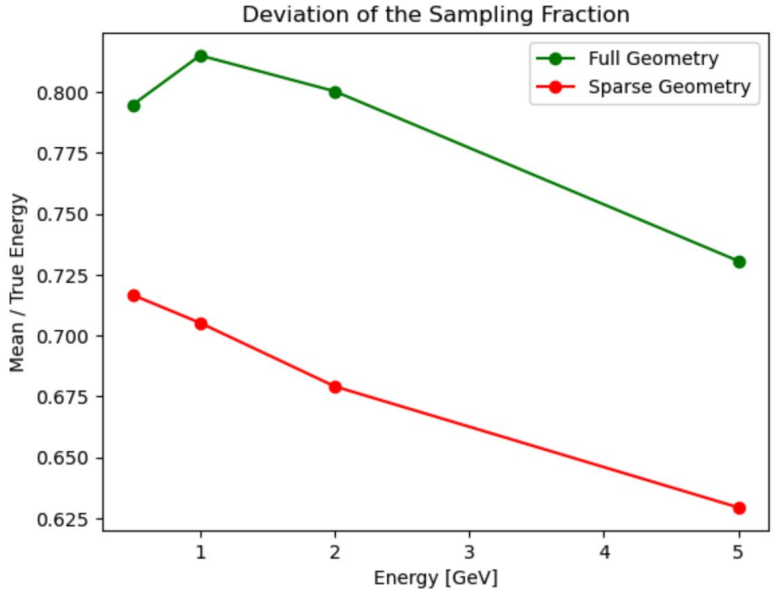


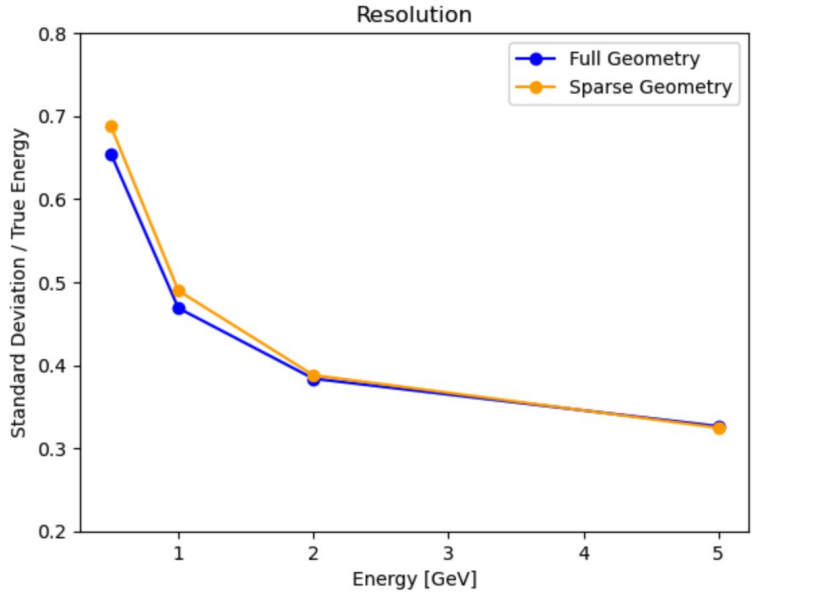
Original Mean: 0.90 GeV
Modified Mean: 0.88 GeV



Sampling fraction and Energy Resolution

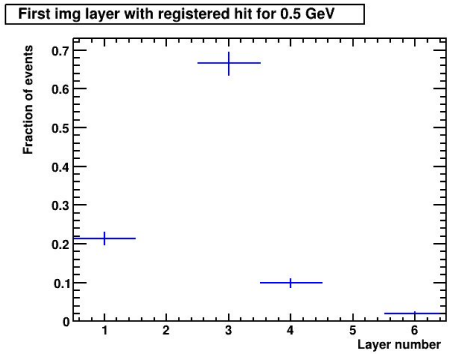
Full and Sparse Geo, Photons, η = (-0.88, 0.88)

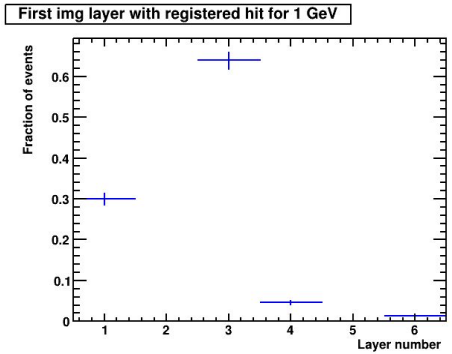


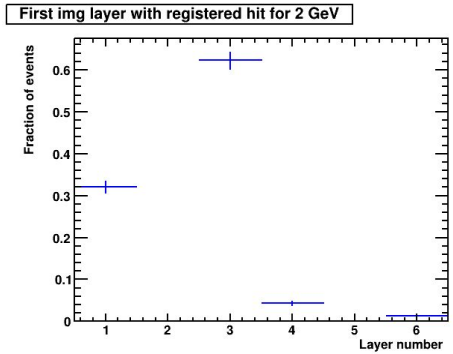


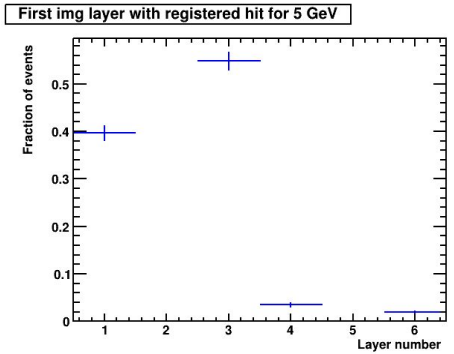
First Layer with registered hit

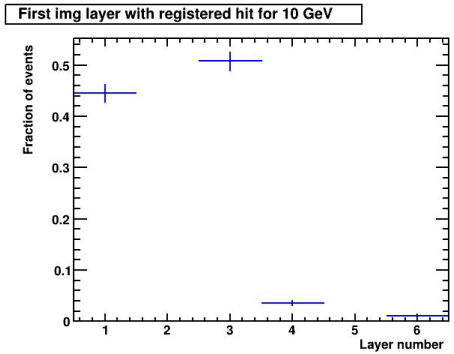
Sparse Geometry, Photons







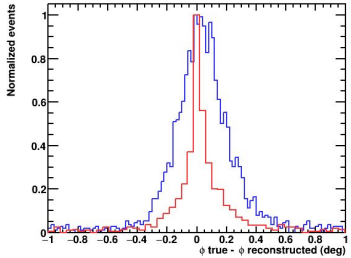


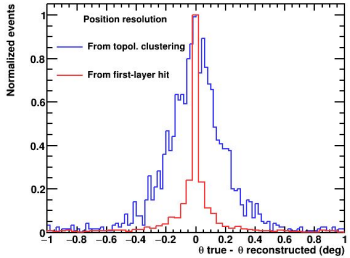


- The higher the energy, the higher the probability of leaving a hit in the first layer
- In general, probability of leaving hit in the first layer is low: 0.2 - 0.45
- Since only the 3rd layer is filled (no 2nd layer), in general position resolution is worse than for 6 layers

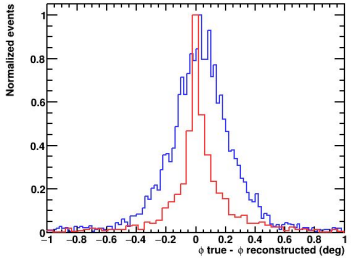
Angular Resolution

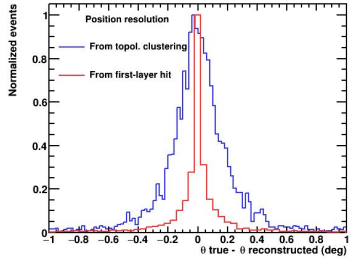
10 and 5 GeV photon



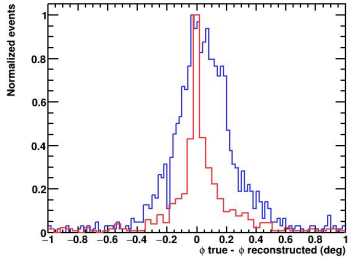


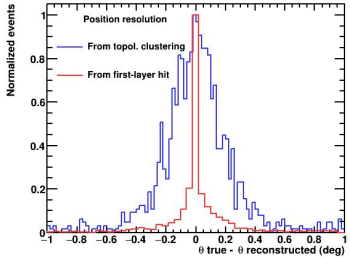
10 GeV, photon, full geometry



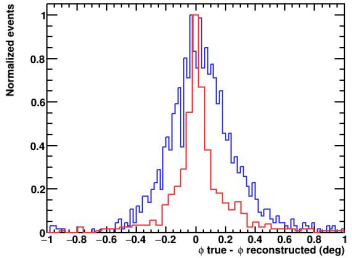


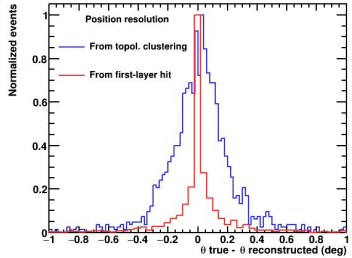
5 GeV, photon, full geometry





10 GeV, photon, sparse geometry

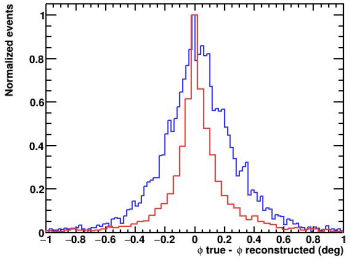


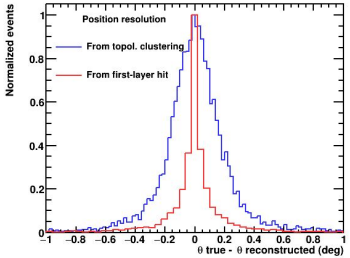


5 GeV, photon, sparse geometry

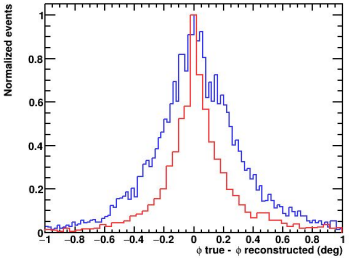
Angular Resolution

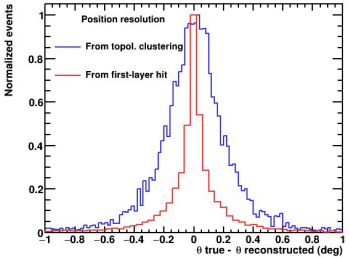
2 and 1 GeV photon



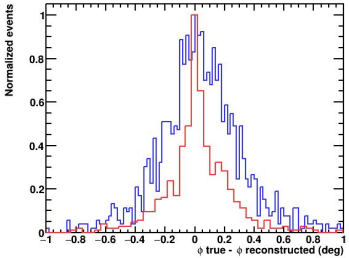


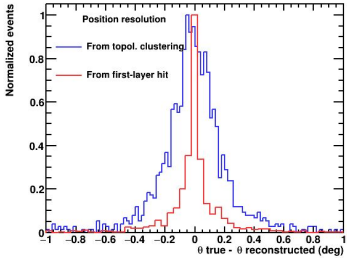
2 GeV, photon, full geometry



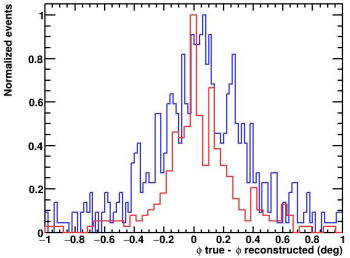


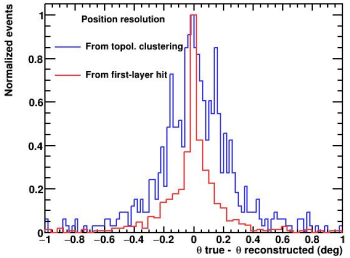
1 GeV, photon, full geometry





2 GeV, photon, sparse geometry

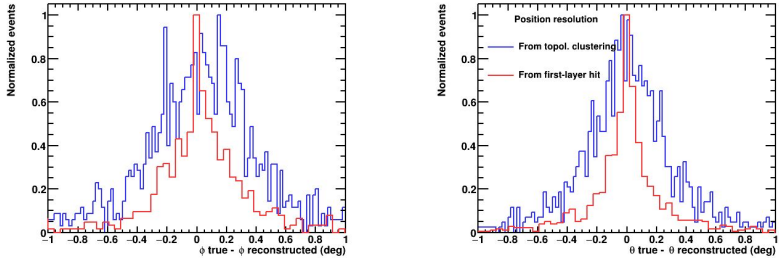




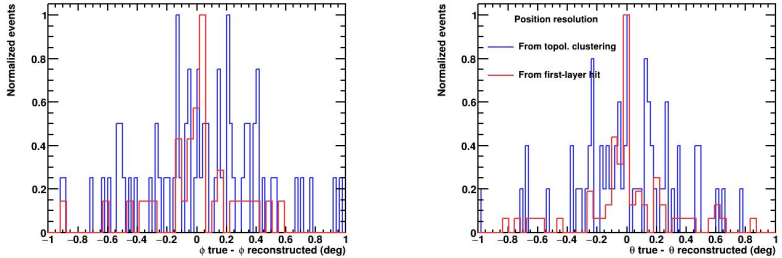
1 GeV, photon, sparse geometry

Angular Resolution

0.5 photon



0.5 GeV, photon, full geometry



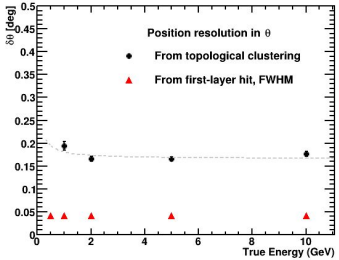
0.5 GeV, photon, sparse geometry

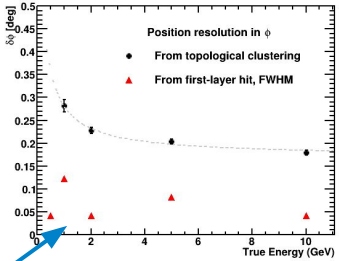
- Pardon the 0.5 GeV statistics (clustering inefficiencies)
- Al low energy there could be the effect of survivor bias of events that had a well reconstructed cluster
- Overall the change is not dramatic
- Resolutions still well below 1 deg

Angular Resolution

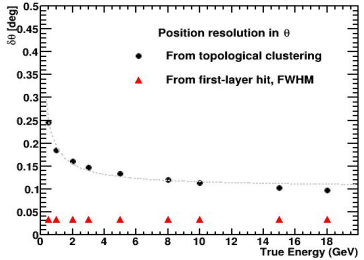
Summary of position reconstruction, photon

ePIC Simulation (Craterlake)

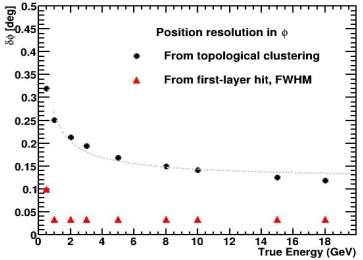




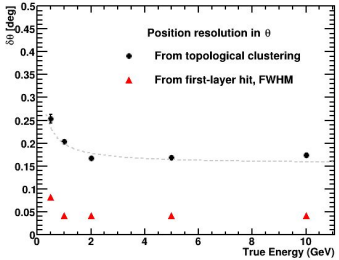
Full geometry

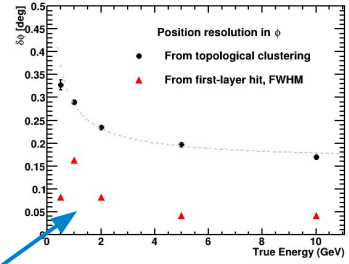


ePIC Simulation (BryceCanyon)



Full geometry, 6 layers





Sparse geometry

Sparse geometry affected wrt to full, especially in phi
Worse, but effect is not dramatic

The main jump, between 6 and 4 layers

Summary and points to discussion

Impact seems not dramatic

- Energy Resolutions are anyhow bad
- Position Resolution affected but not significantly

Note: those investigations do not include the impact on the tracking for DIRC (this refers to the 1st layer, that is mostly the tracker layer)

Discussion:

Any other checks? Geometry?