

# ePIC HCal Update

ePIC Calorimetry Meeting

November 9<sup>th</sup>, 2022

Derek Anderson

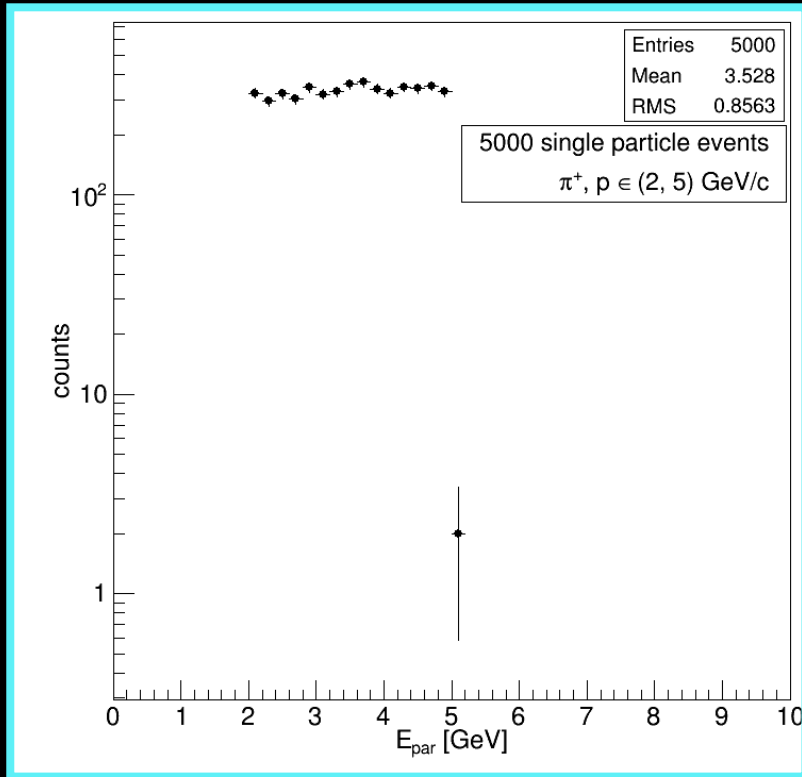


# ePIC HCal Update | some context

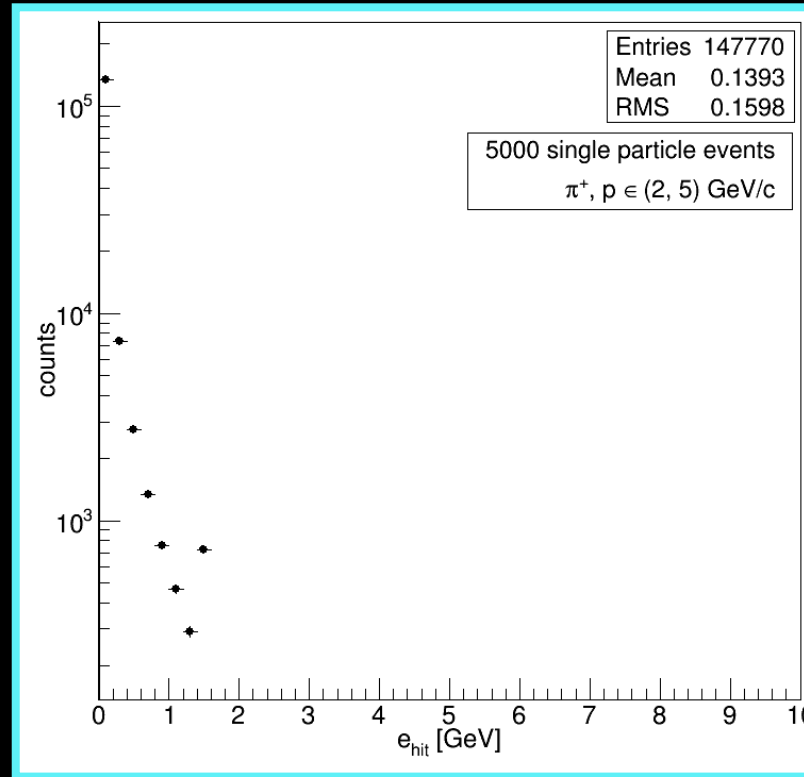
- John recently implemented sPHENIX Barrel HCal in ePIC simulation
  - ⇒ Working since then to check performance
- Made JANA plugin to compare reconstructed hits/clusters in HCal to simulated particles

- **Note:** recent single-particle files on S3 are eicrecon output
  - ⇒ Can't use JANA plugin
  - ∴ Used local sample of single  $\pi^+$  (parameters in backup)
  - Will transfer functionality to ROOT macro and analyze official single-particle files

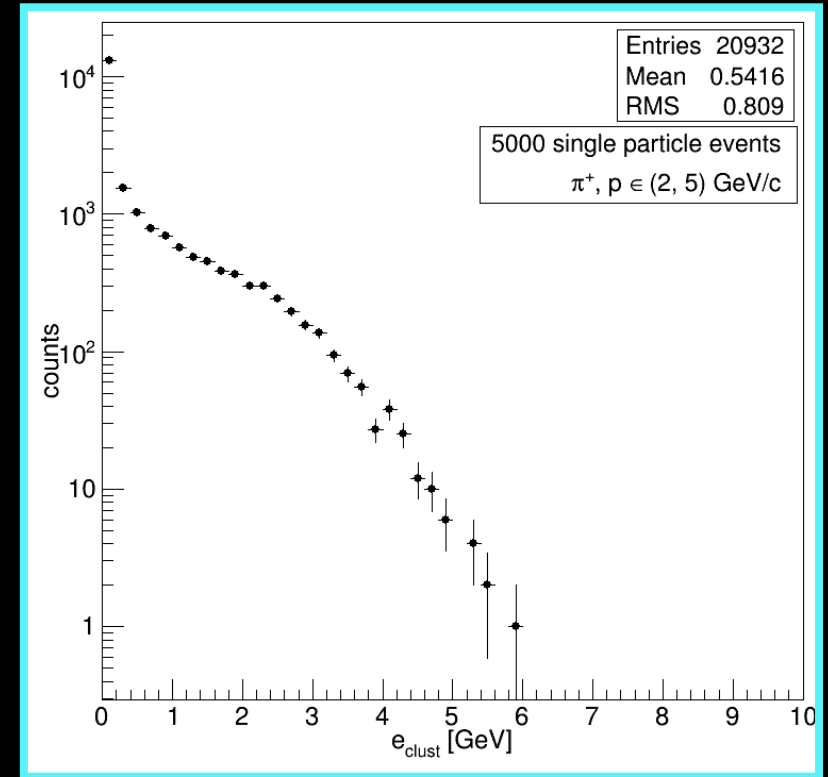
# ePIC HCal Update | energy spectra



MC Particles



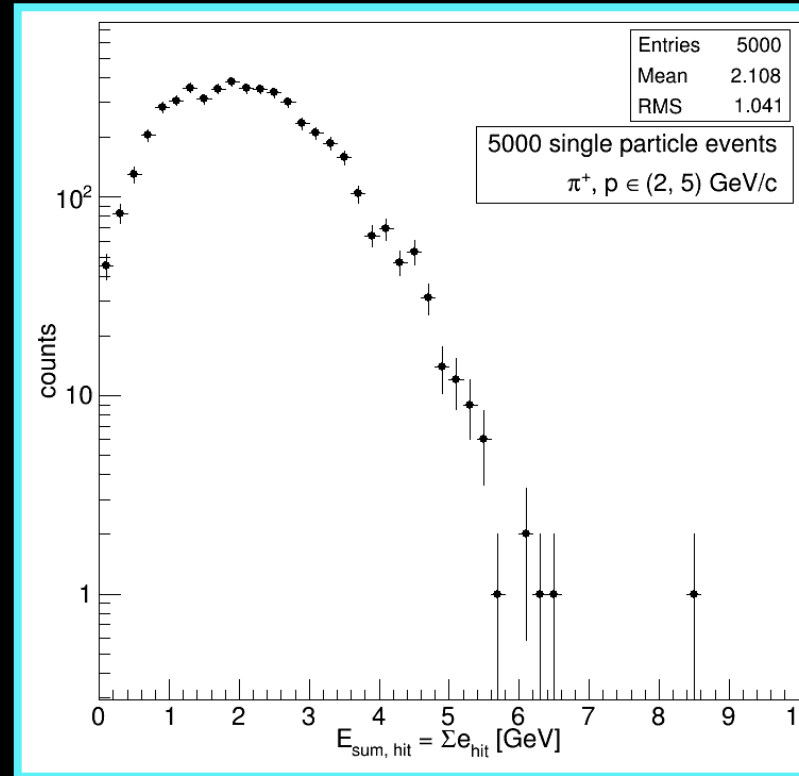
Reconstructed Hits



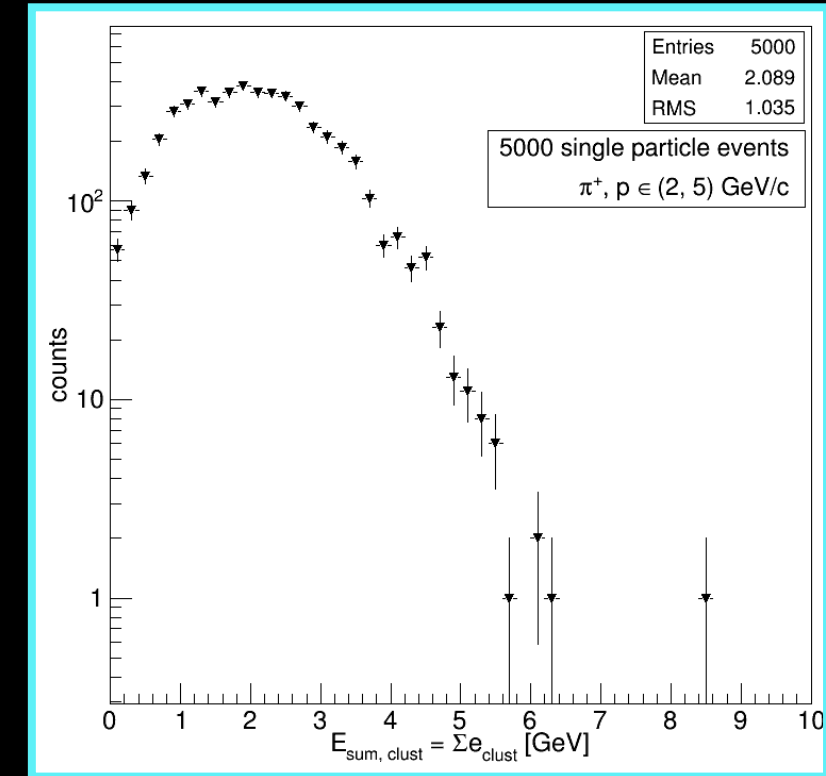
Clusters

# ePIC HCal Update | sum of hit/cluster energy

- Summed hit (**right**) and cluster (**left**) energies to compare against particle energy



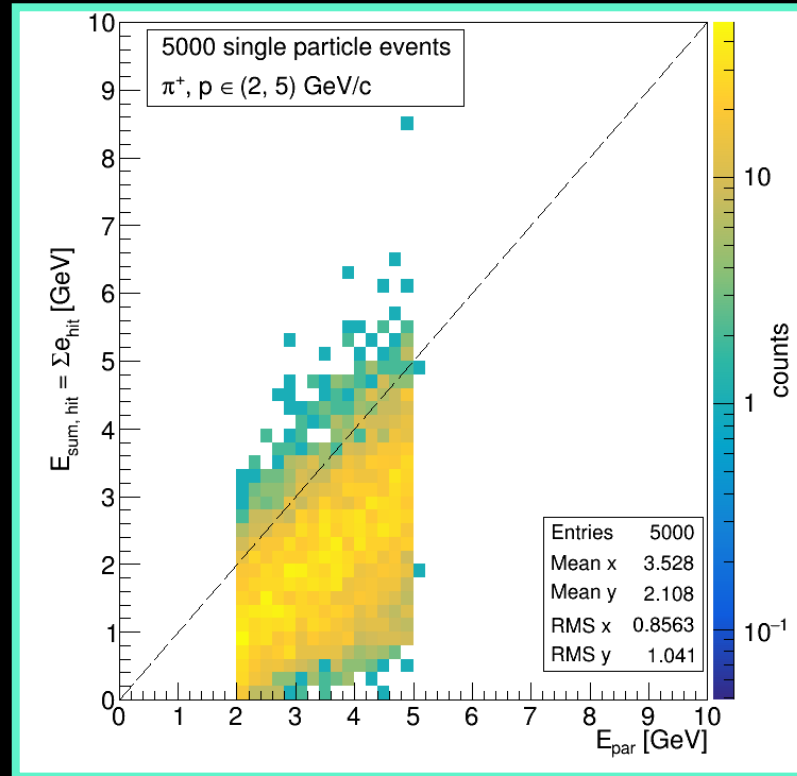
Reconstructed Hits



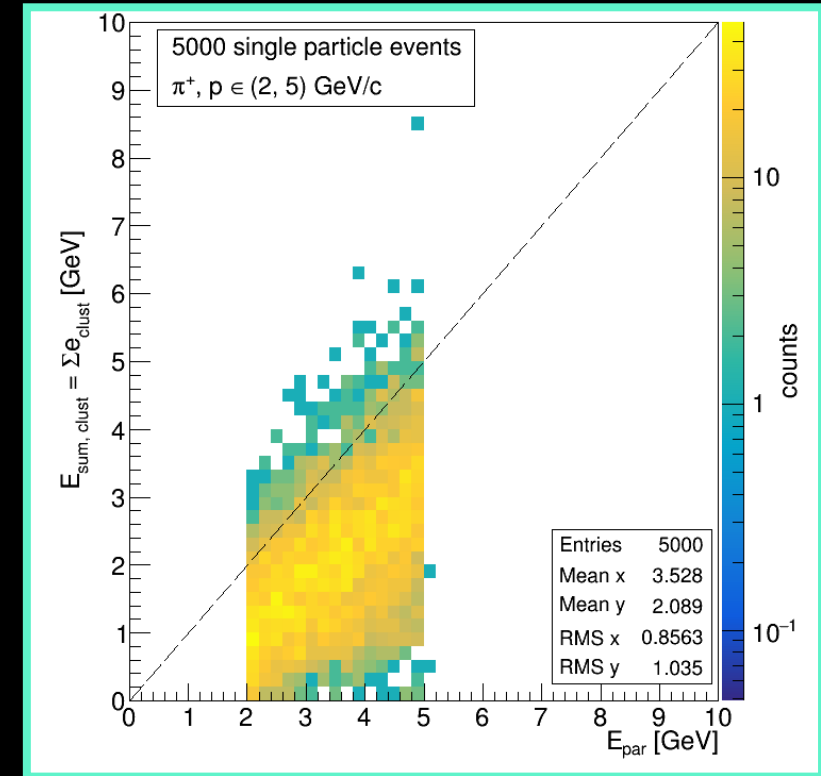
Clusters

# ePIC HCal Update | sum of hit/cluster energy vs. particle energy

- 2D distribution of particle (**x axis**) vs. summed hit/cluster energy (**y axis**)



Reconstructed Hits

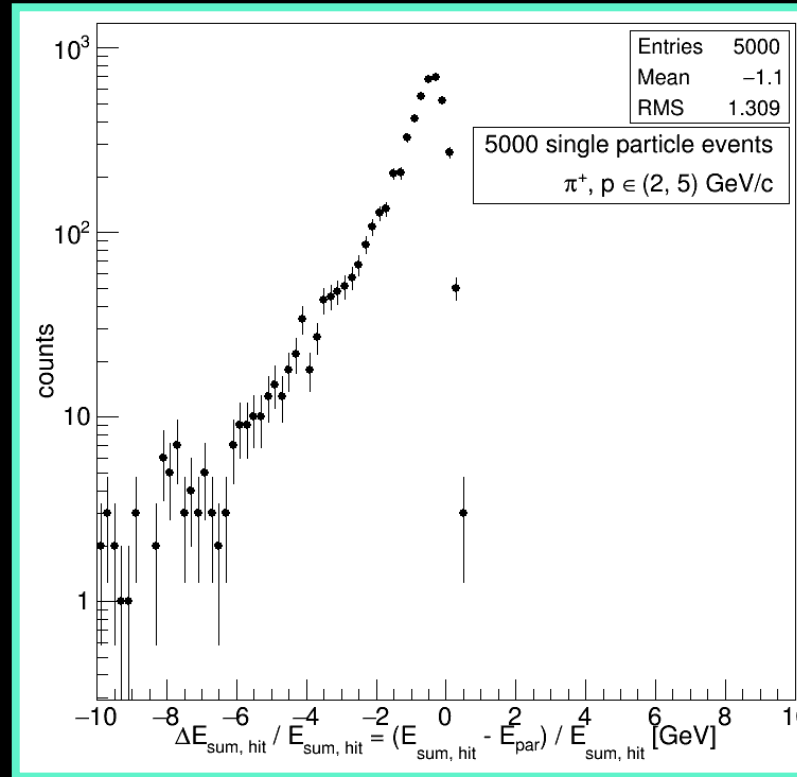


Clusters

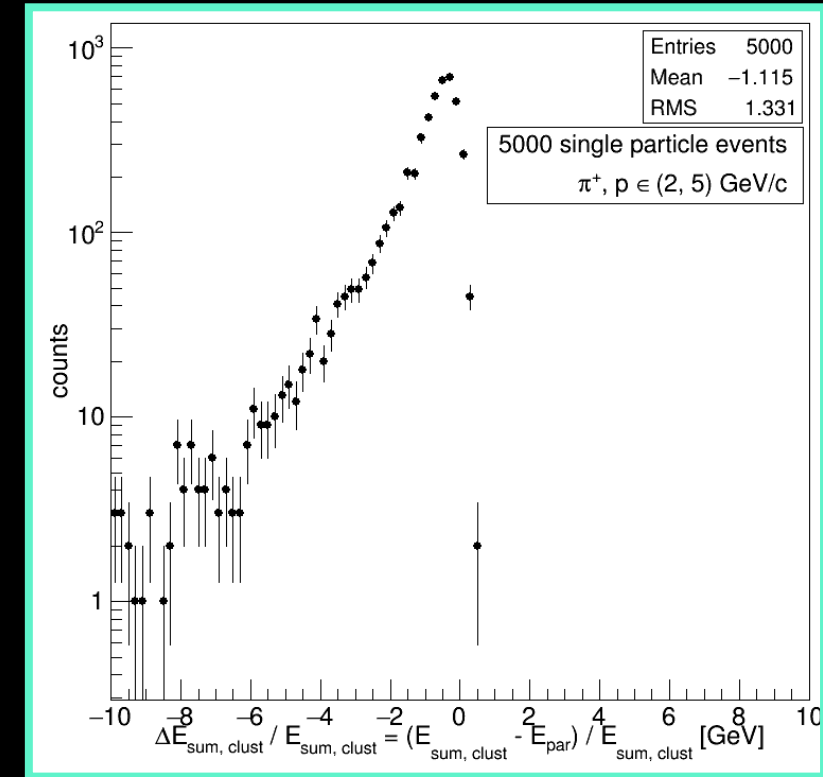
# ePIC HCal Update | sum of hit/cluster energy vs. particle energy

- Difference between summed hit/cluster energy and particle energy:

$$\frac{E_{sum,clust/hit} - E_{par}}{E_{sum,clust/hit}}$$

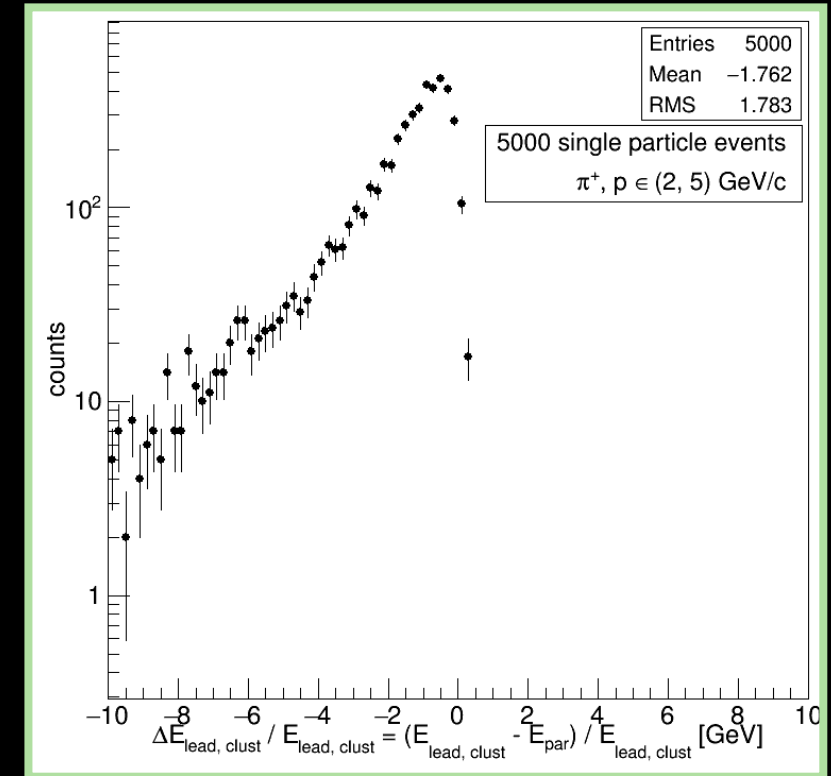
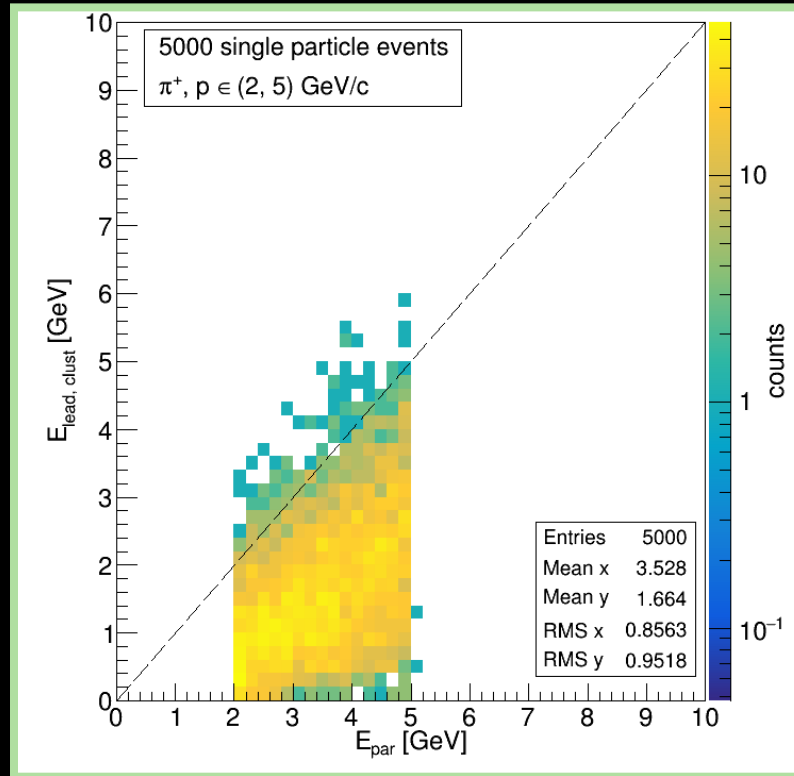
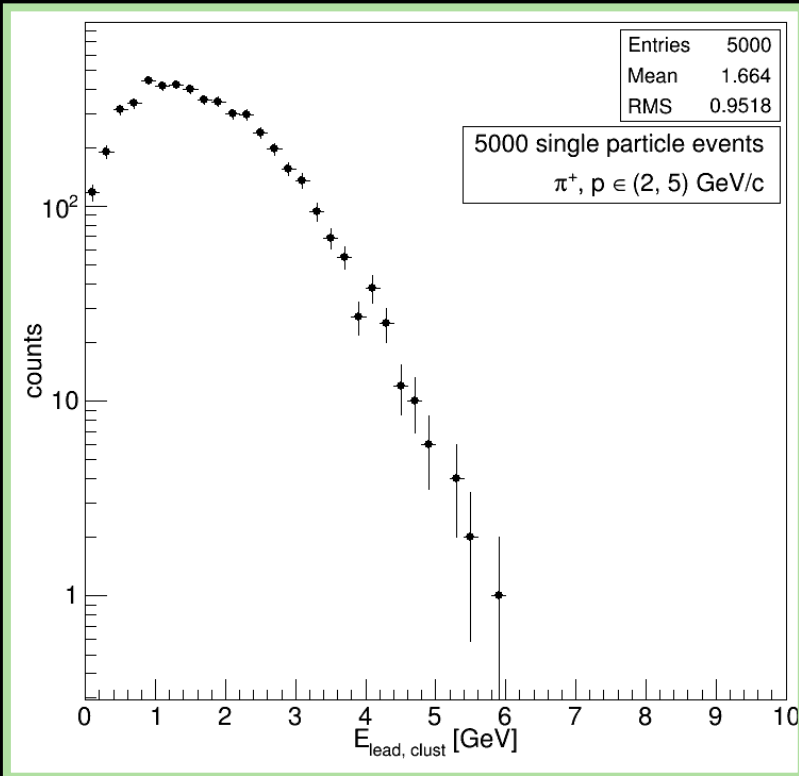


Reconstructed Hits



Clusters

# ePIC HCal Update | lead cluster vs. particles



○ Compared lead (**highest energy**) cluster against particle

# ePIC HCal Update | take-aways and next steps

- **Take-aways:**

- Hits look reasonable
- Sum of hit/cluster energies get close to particle energy
- ⇒ Current implementation will work for this simulation campaign

- **Next steps:**

- Implement calculation of energy resolution
- Analyze official single-particle files



Backup



# Backup | simulation parameters

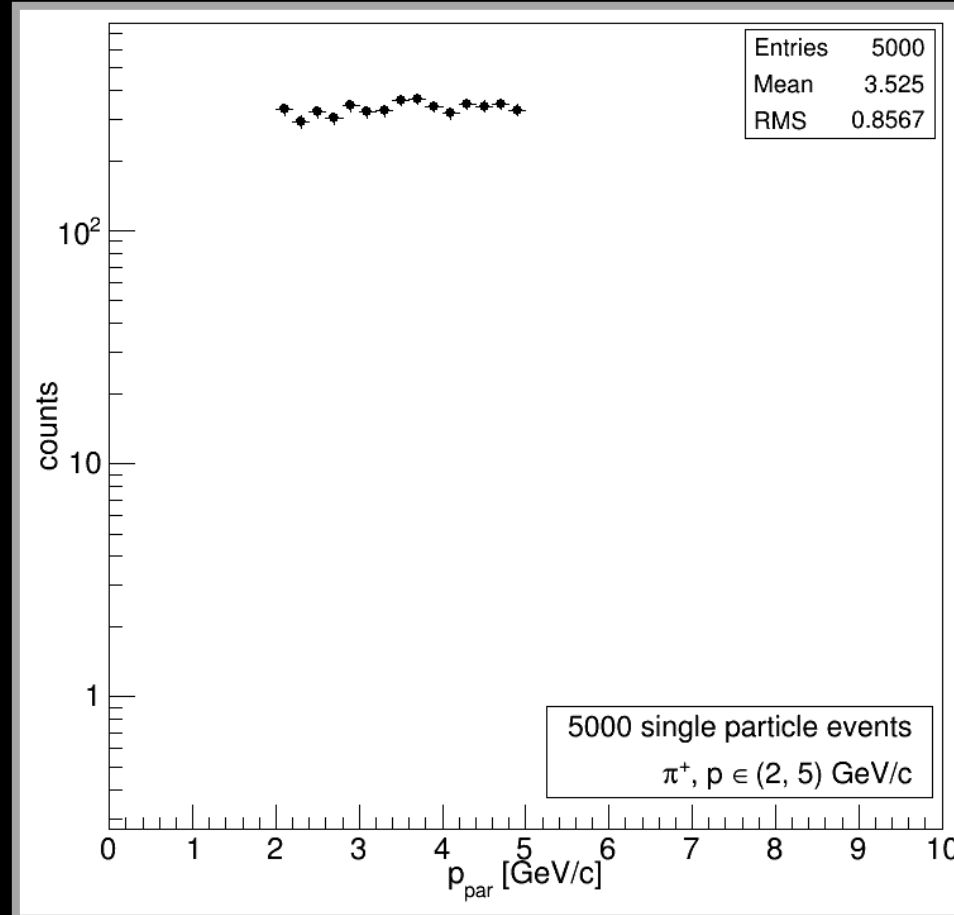
## Parameters for local simulation

- `gun.momentumMin = 2*GeV`
- `gun.momentumMax = 5*GeV`
- `gun.particle = "pi+"`
- `gun.distribution = "cos(theta)"`
- `gun.thetaMin = 45*degree`
- `gun.thetaMax = 135*degree`

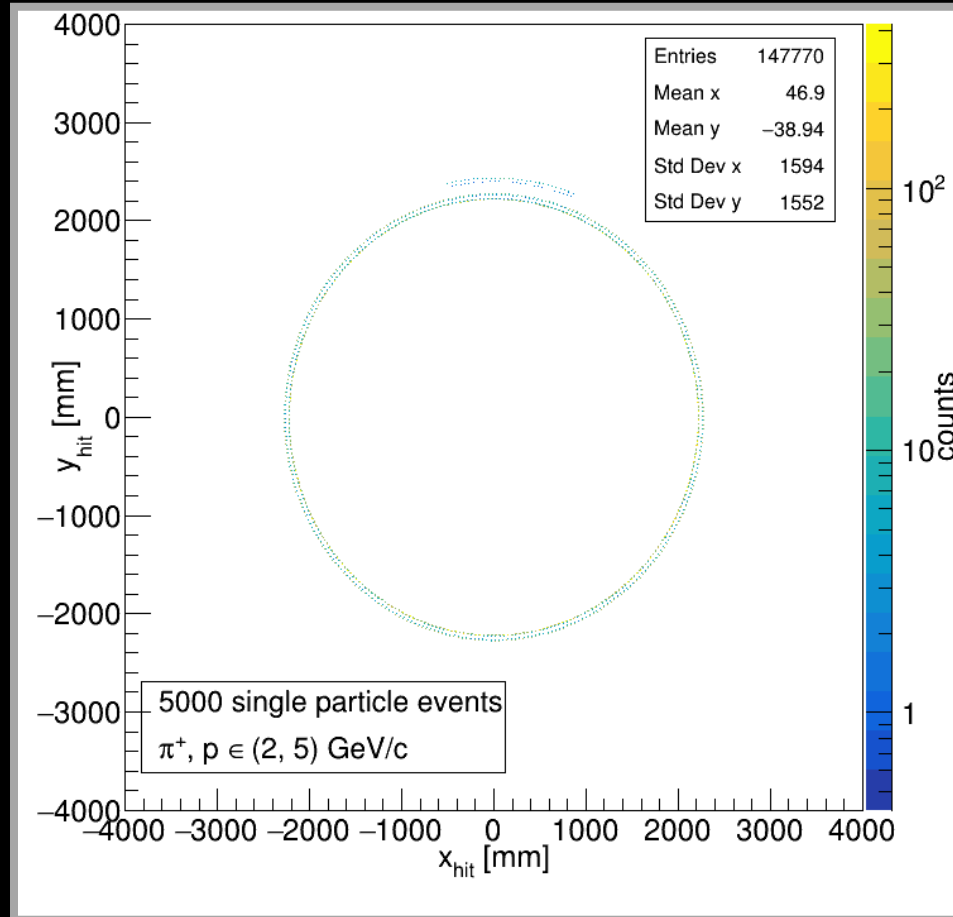
## Parameters for official files

- `gun.energy = 2*GeV (5*GeV, etc.)`
- `gun.particle = "pi+"`
- `gun.position = (0.0, 0.0, 0.0)`
- `gun.direction = (0.0, 0.0, 1.0)`
- `gun.distribution = "cos(theta)"`
- `gun.thetaMin = 45*degree`
- `gun.thetaMax = 135*degree`

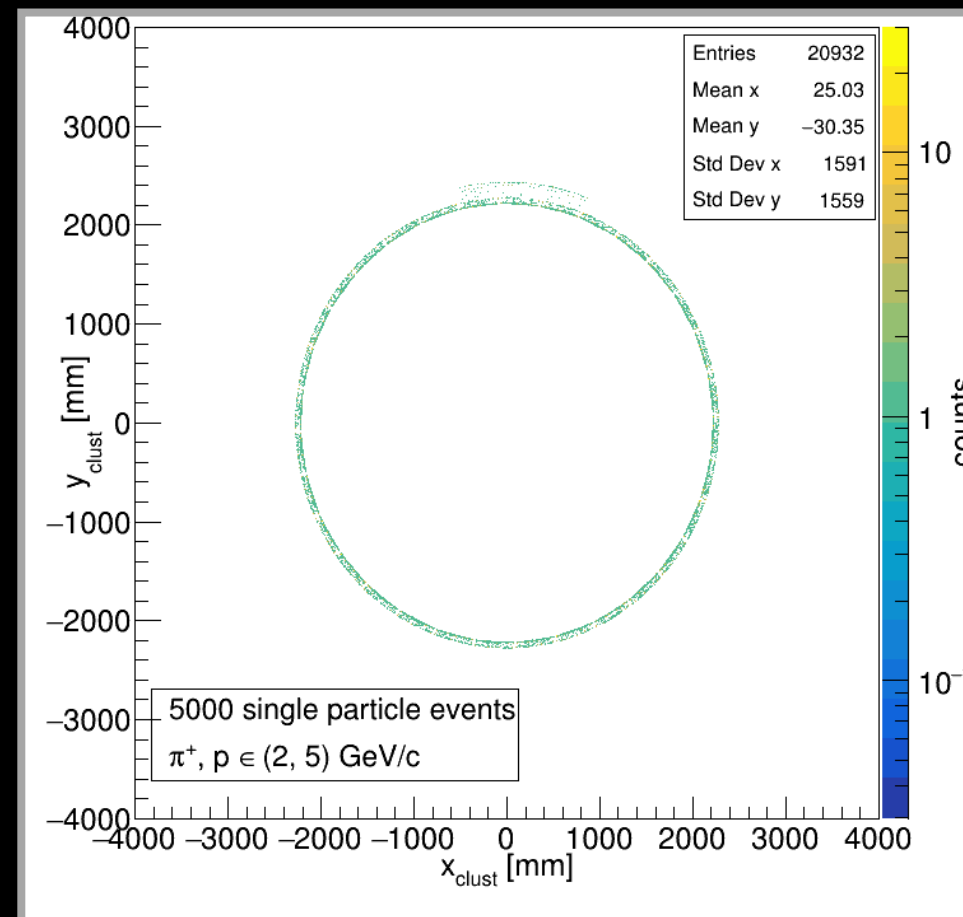
# Backup | particle momentum



# Backup | hit/cluster Y vs. X



Reconstructed Hits



Clusters