

Backward Hadronic Calorimeter update

Clustering study

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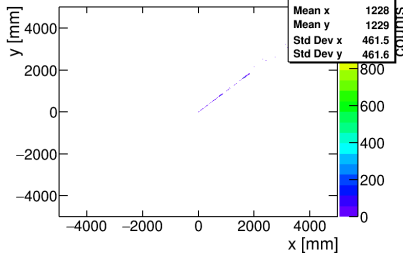
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- 1 Simulation setup
- 2 MC particles
- 3 Hits
- 4 Reconstructed clusters
- 5 MC truth clusters
- 6 Cluster distance Reco vs. MC
- 7 Summary

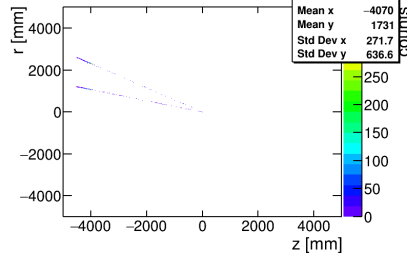
- 5K events
- 10 GeV neutron at $\phi = 45^\circ$, $\theta = 150^\circ$
- 10 GeV pion at $\phi = 45^\circ$, $\theta = 165^\circ$
- nHCal only geometry+collar, oculus and flux return
- No magnetic field
- Changed clustering distance for hits
 - $\Delta_x < 15 \text{ cm}$ to $\Delta_x < 10 \text{ cm}$
 - $\Delta_y < 15 \text{ cm}$ to $\Delta_y < 10 \text{ cm}$
- Check high energy hadronic showers
 - Should be easier to understand

Endpoints

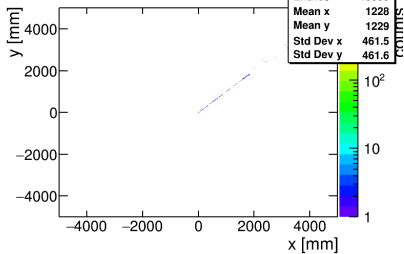
MC particle endpoint position x,y



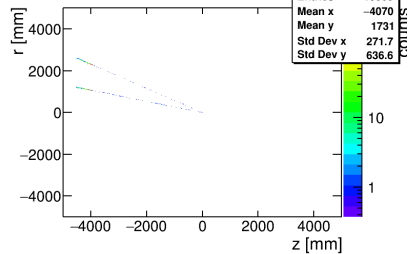
MC particle endpoint position z,r



MC particle endpoint position x,y

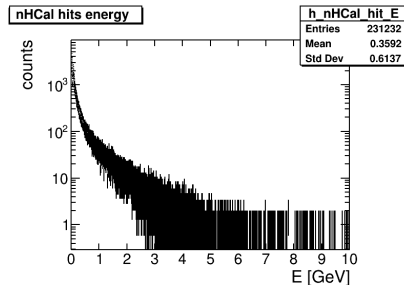
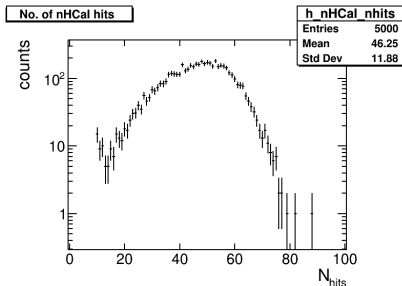
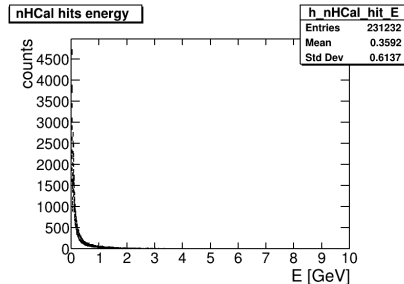
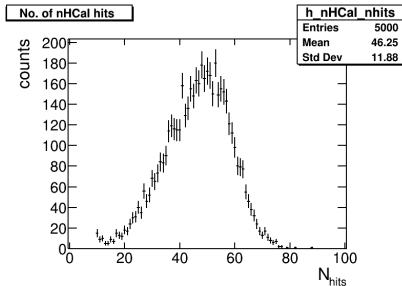


MC particle endpoint position z,r



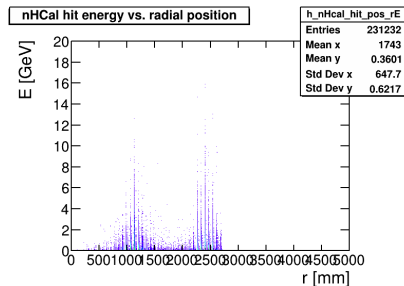
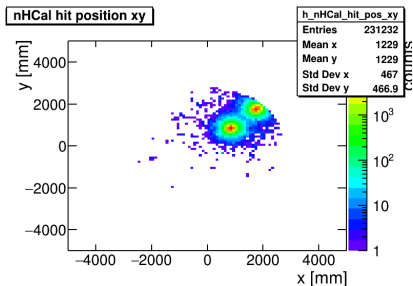
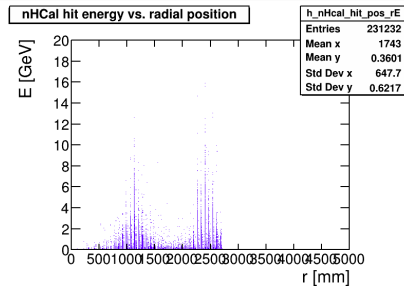
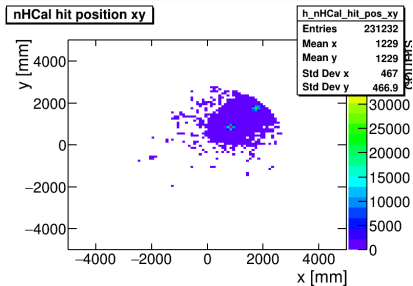
- MCparticle endpoints z , R and x , y
- Interactions with air visible along the particle path

Reconstructed hits



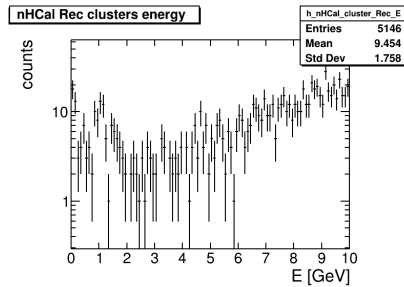
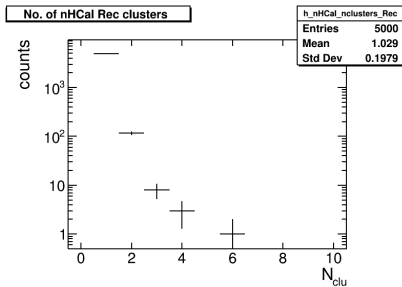
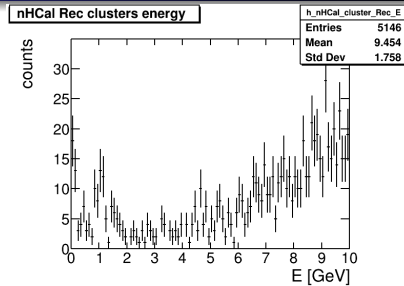
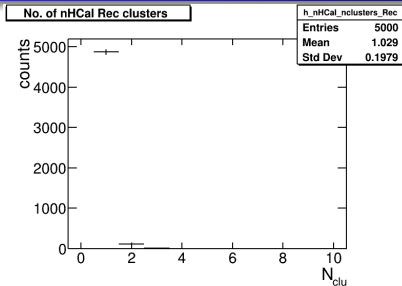
- Number of hits $\sim 6\times$ larger at 10 GeV than at 1 GeV

Reconstructed hits



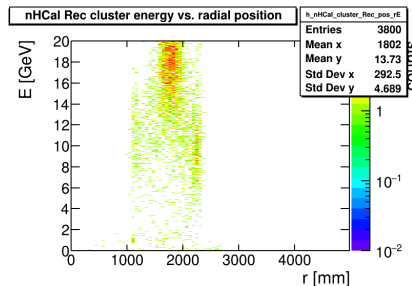
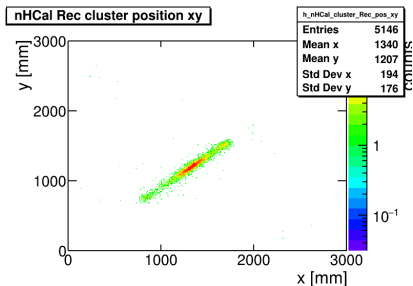
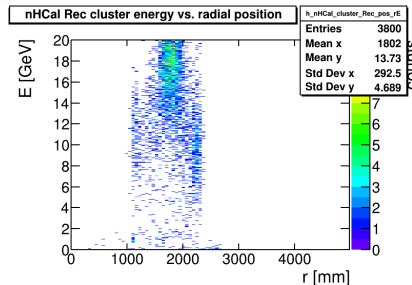
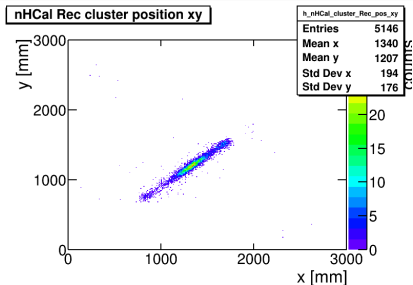
- Hits are very well separated

Reconstructed clusters



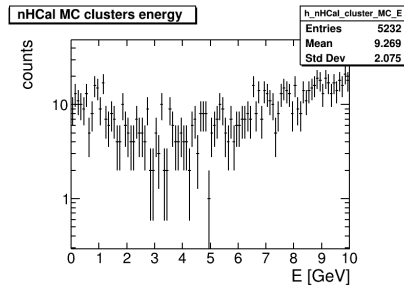
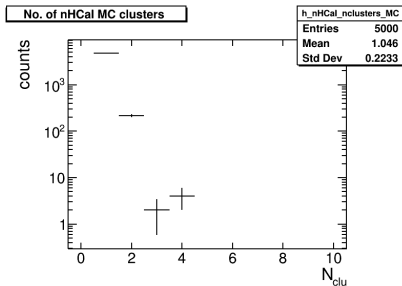
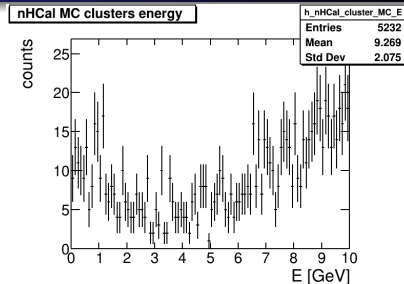
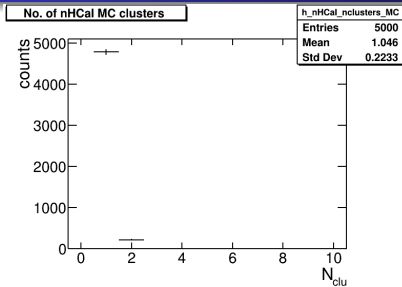
- Mostly 1 cluster per event
- Doesn't make sense!

Reconstructed clusters



- Clusters get merged despite ~ 1 m separation

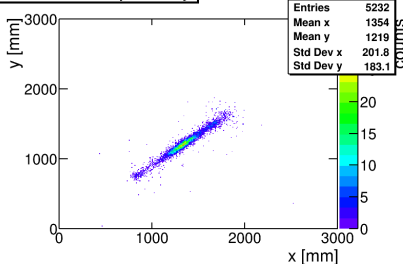
MC truth clusters



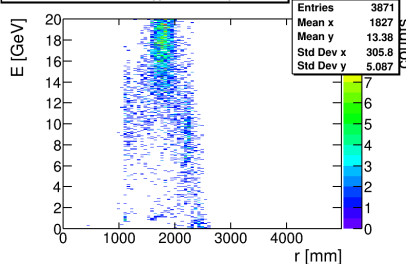
- Single MC truth cluster reconstructed in most events
- That's even more surprising! MC clusters should use MC information to distinguish them.

MC truth clusters

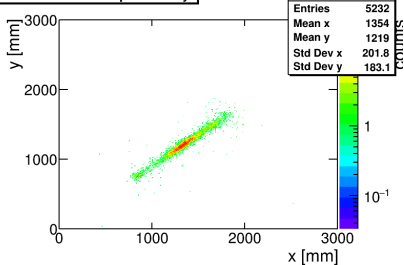
nHCal MC cluster position xy



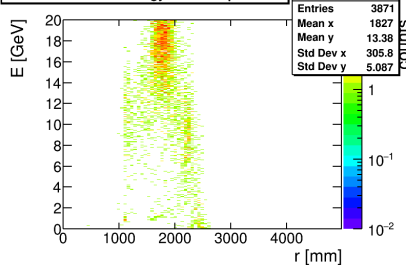
nHCal MC cluster energy vs. radial position



nHCal MC cluster position xy

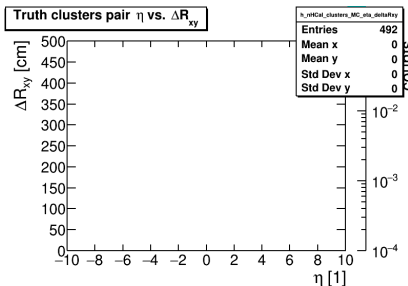
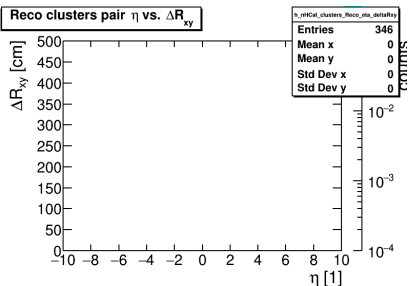
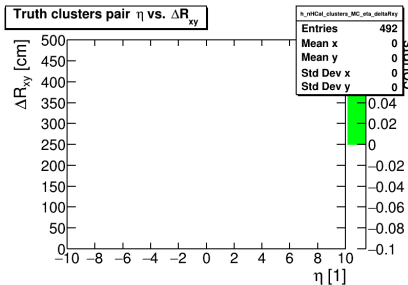
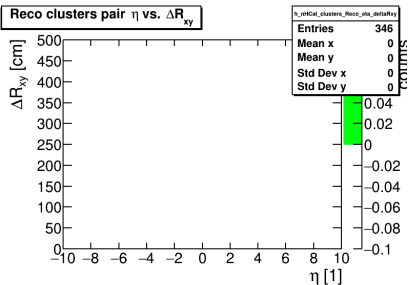


nHCal MC cluster energy vs. radial position



- Even MC truth clusters get merged.
- Clustering basically doesn't work properl.

Cluster distance Reco vs. MC



- clusters

Conclusions

- Clustering doesn't work properly
- Even far away hits are merged into clusters
- Major issues with clustering

BACKUP