# *Progress on E/p for single hadrons in minimum bias*

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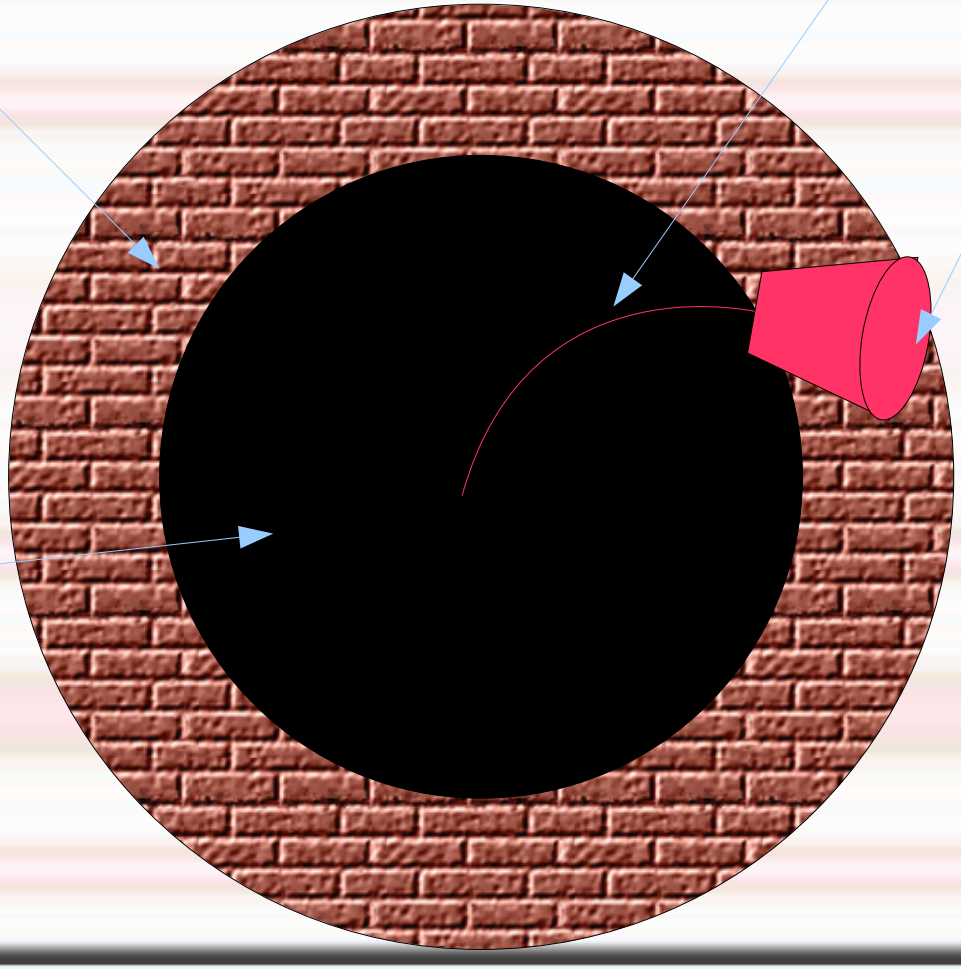
# E/p Method (Review)

calorimeter
(EM & Hadronic)

track with
momentum p

sum of cluster
energies within
ΔR of track
= E

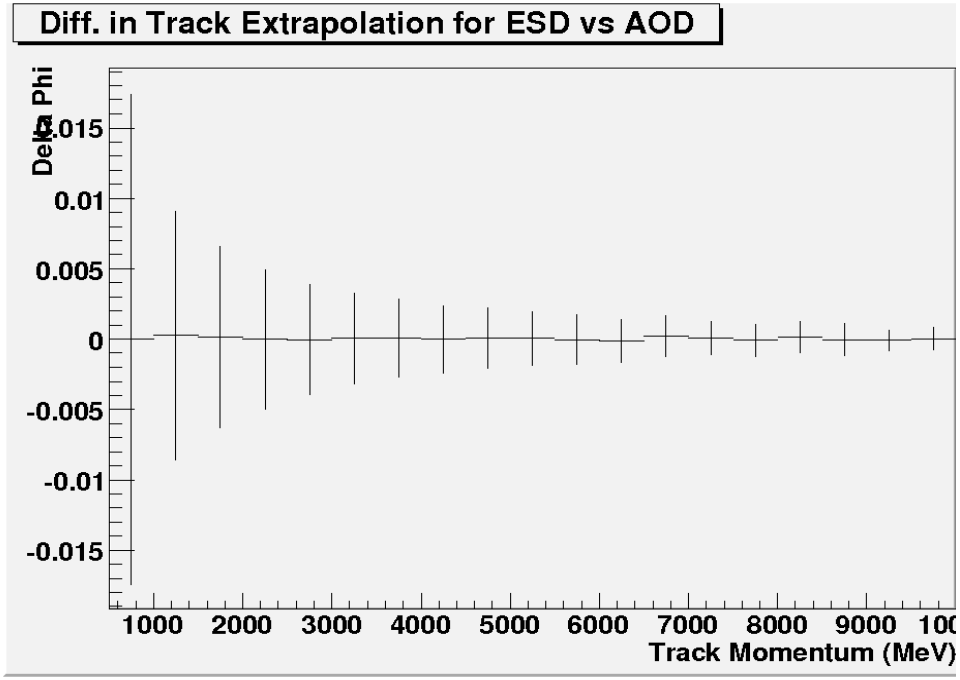


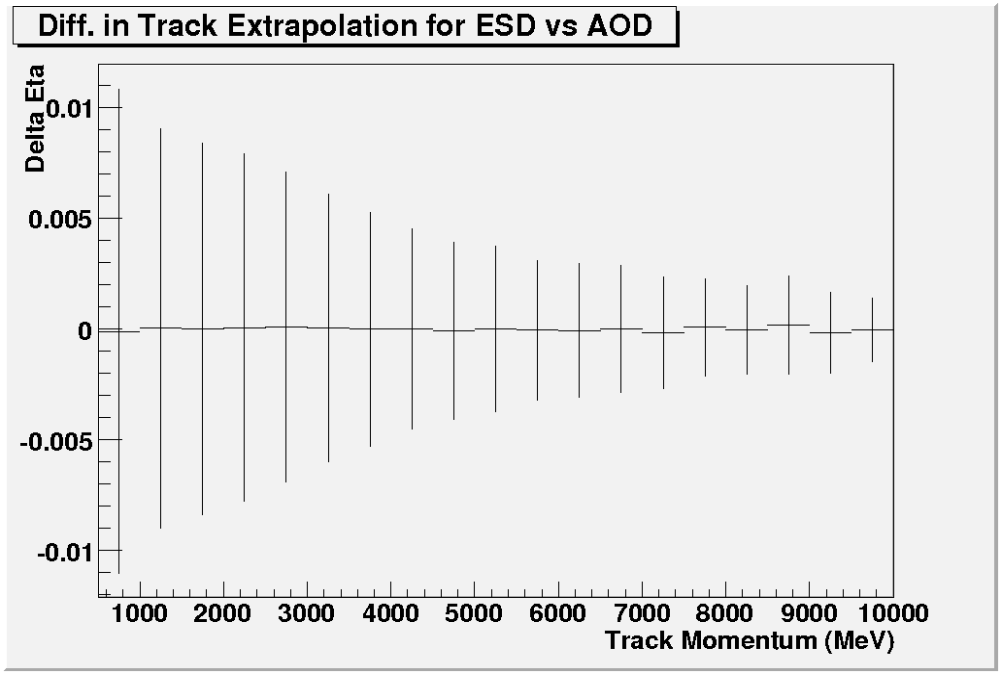
inner
detector

Calibration
check:
E/p =1 for
single isolated
hadrons

# Update on Data

- Now using csc data from Athena 11.0.5 which includes trigger simulation.
- 34,000 minimum bias events vs. 11,000 and 80,000 single 3GeV pions vs. 8,000.
- Only using the AODs now (instead of ESDs). Effects TrackToCaloExtrapolation:

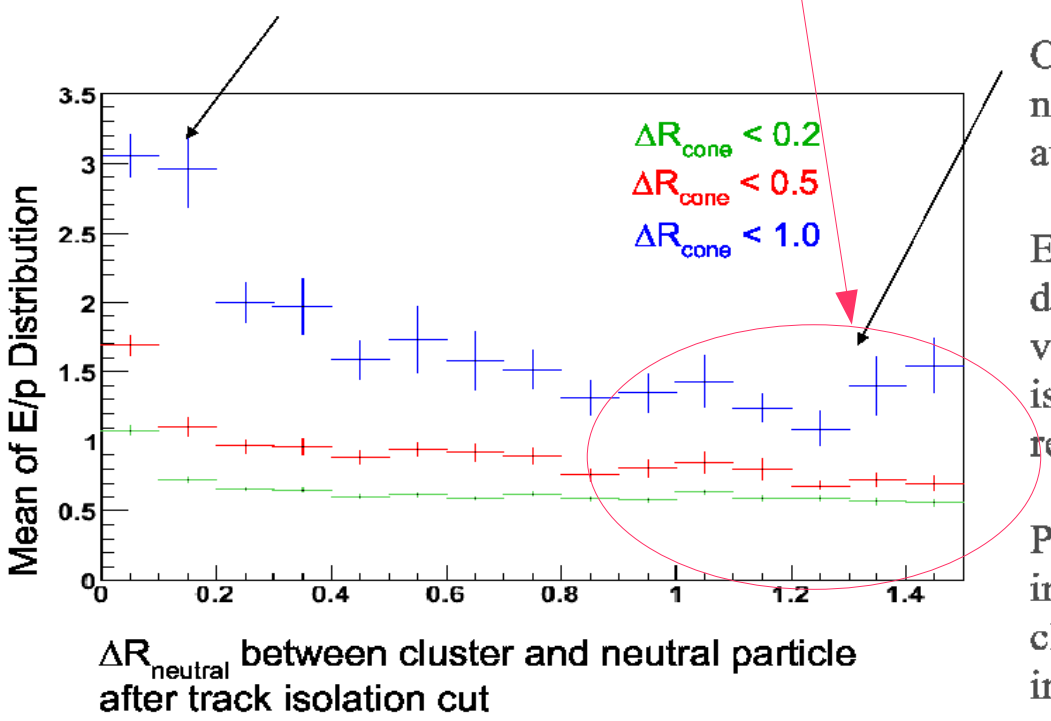


# From last time...

- Unexplained difference between E/p of different cone sizes after taking into account contamination from other particles in the event.

- For close neutrals, the E/p mean is biased high (as expected)



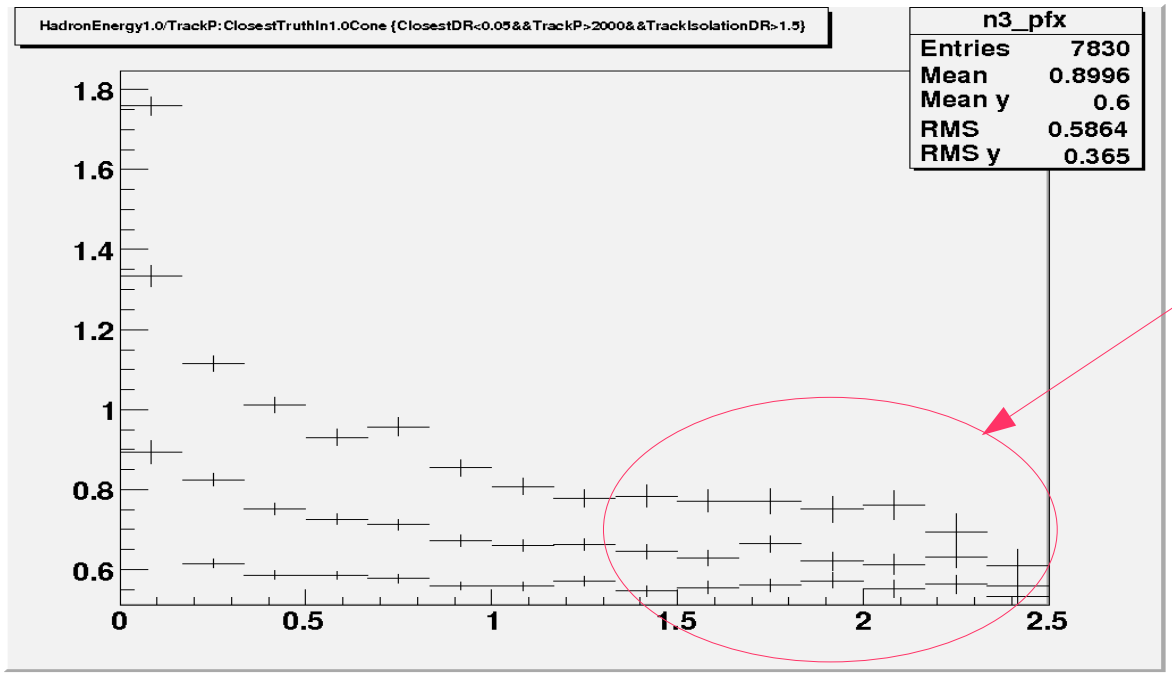

Of concern is when neutrals are further away.

E/p mean should not differ by so much for the various cone sizes. This is not consistent with result from single pions.

Potentially due to adding in extra background clusters. Need to investigate.

# ‘Over sights’ which contributed to this observation

- Clusters contained some contamination due to oversights:
  - Limit on track isolation cut over |eta|>2.5 resulted in Charged contamination for clusters |eta|>2.5. (large contribution
  - Phi was not handled as a periodic coordinate. (small)
- Fixed and replotted gives:



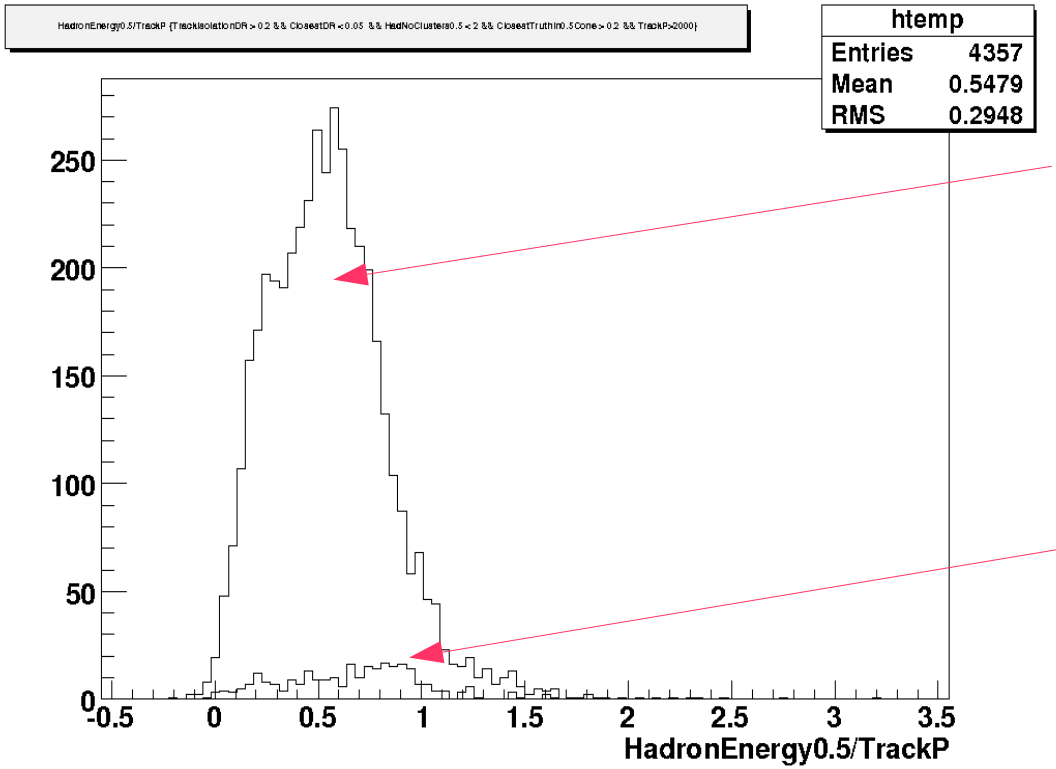

Difference is smaller but still present.

# Solutions

- Probably due to track reconstruction effeciency (order of 10% of charged pions at 3GeV leave no track)
- Neutral particles decaying into charged?
- Can check with truth data, but trouble is this type of contamination may look idential to my signal. So maybe difficult to determine cuts.
- Solutions:
  - Take ΔR = 0.2 Cone which has small charged contamination & look for ways to reduce the 0.05 neutral contamination. But smaller cone gives E 0.025 below full 3GeV single pions E (See last talk).
  - Take ΔR = 1.0 or 0.5 and only allow 1 cluster. But single cluster also gives a lower E/p for single pions (approx. 0.025) and maybe sensitive to the clustering algorithm and parameters.

# Solutions cont.

Result of single cluster requirement:




E/p 'signal' = 0.548
cf. 0.583

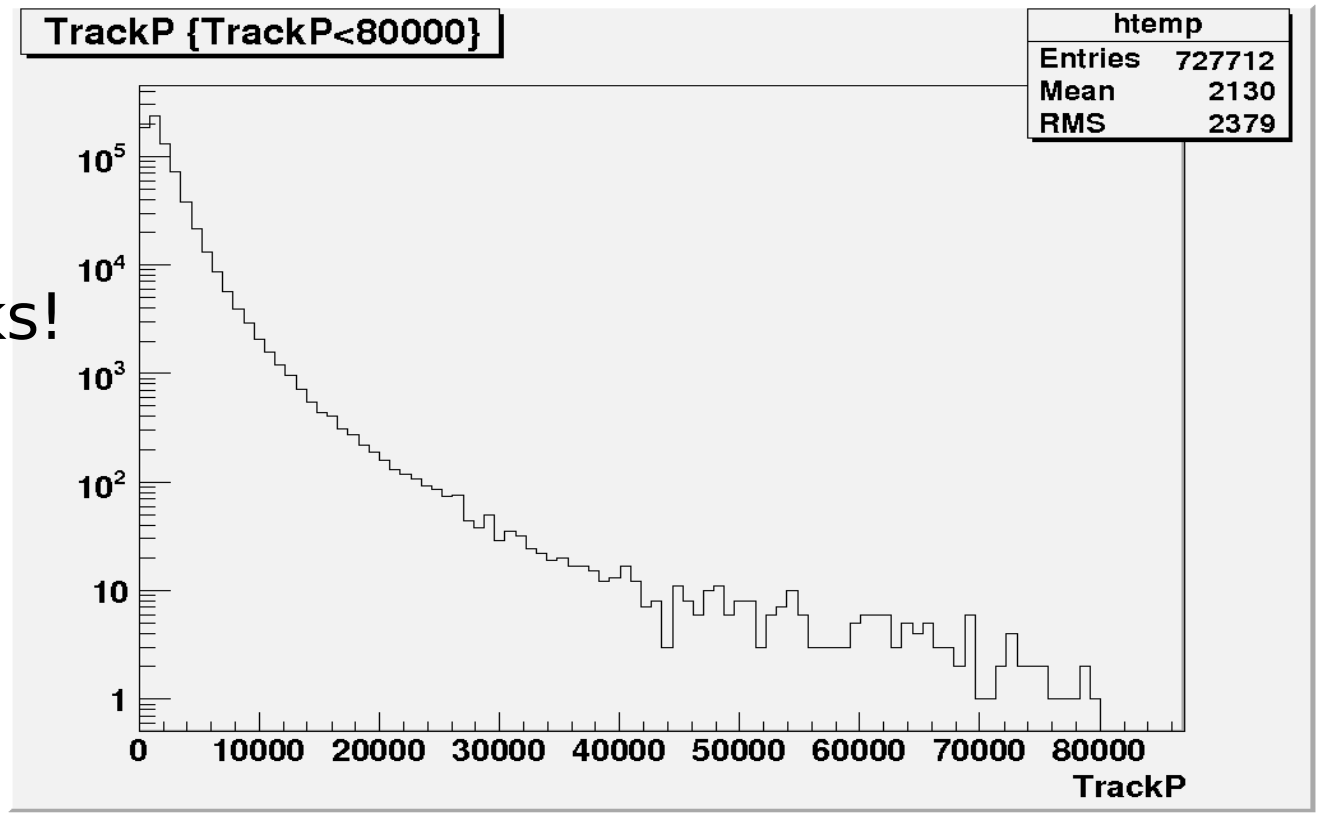
E/p neutral contam =0.68 (but biases total by < 0.01)

# A potential new approach

- From last week I've been investinging an approach to subtract the background rather just replying on cuts
- Constant background can be measured by calculating E/p for random calorimeter positions (weighted based on eta distribution of tracks). Varies with eta, but should increase linearly with cone area.
- This type of background does not account for the biases seen in previous plots. (less than 1/3 of bias due to this).
- Direction of contaminating particles is correlated with the direction of hadron. So background is also a function of $\Delta R$ from track center.
- By examining the energy distributions for various cone sizes, it maybe possible to estimate the background and subtract it. (If I'm luck).

# A final note

- Reach of tracks for minimum bias at full luminosity:




x$10^8$ tracks!

MeV