Status of Particle Flow with PandoraPFA

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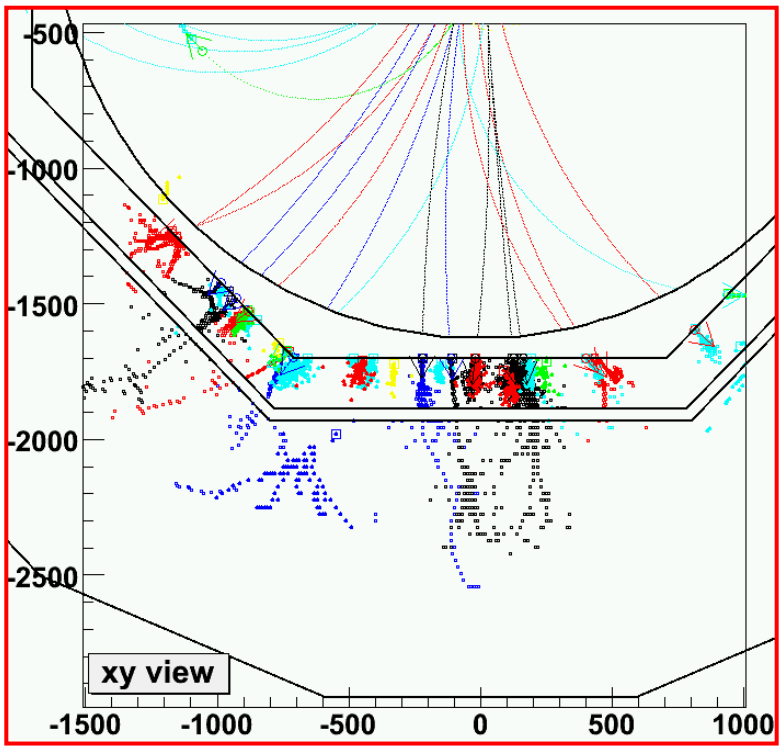


This Talk:

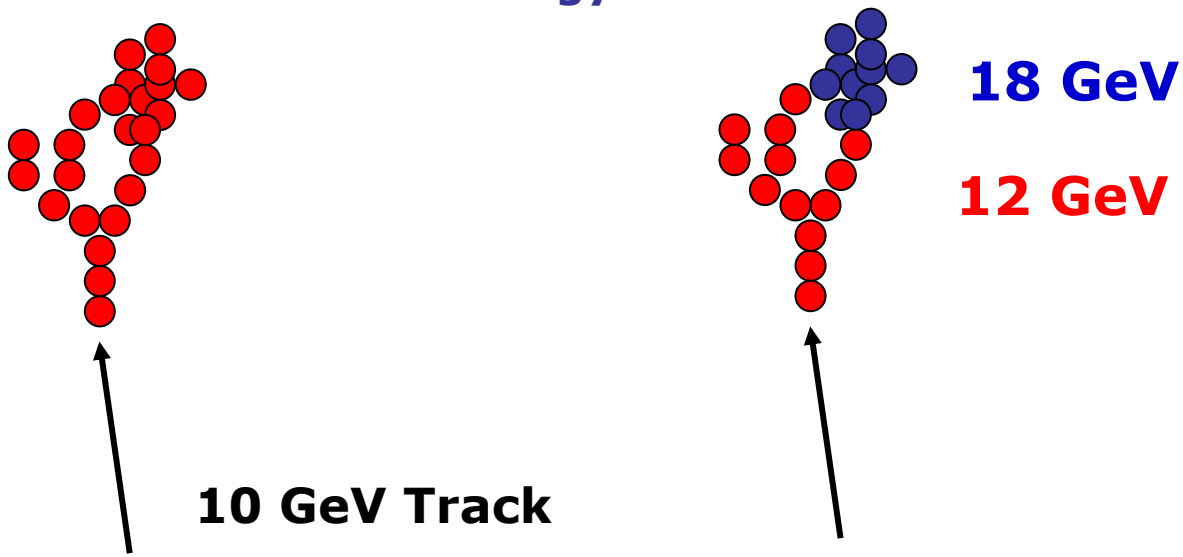
❶ **What's new**
❷ **Release Plans**
❸ **Current Performance**

❶ What's New

i) Improvments to reclustering

★ If track momentum and cluster energy inconsistent : RECLUSTER

e.g.



Change clustering parameters until split cluster + get sensible track-cluster match

NOTE: THIS IS NO LONGER "FULL PFA" as clustering is driven by track momentum

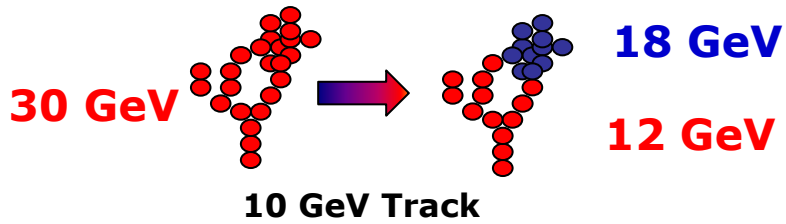
★ If can't find a sensible reclustering use the **ultimate sanction** i.e. do not use track information

Iterative Reclusting

❶ Cluster splitting

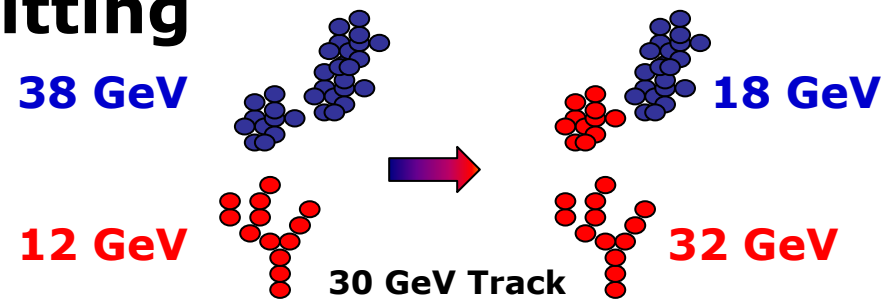
Reapply entire clustering algorithm to hits in "dubious" cluster. Iteratively reduce cone angle until cluster splits to give acceptable energy match to track

★ Could plug in alternative clustering



❷ Cluster merging with splitting

Look for clusters to add to a track to get sensible energy association. If necessary iteratively split up clusters to get good match.



❸ Track association ambiguities

In dense enviroment may have multiple tracks matched to same cluster. Apply above techniques to get a good energy match.

❸ "Nuclear Option"

★ If none of above works – kill track and rely on clusters alone

ii) Optimisation

★ Major effort to optimise performance
- Sequentially switched off various parts of code
- Re-evaluated performance at $\sqrt{s}$=91, 200, 500 GeV

★ Conclusions:
- Performance at 91 GeV very robust !
  - All that really matters is being careful
- At higher energies "Reclustering" is very important
- No significant improvements found!

iii) Calibration

★ Fixed "feature"
- Single hits corresponding to > 1 GeV were being set to 1 GeV.
- Makes sense for hadronic showers but not for high energy EM showers.
- Threshold now only applied to calculation of hadronic energy.

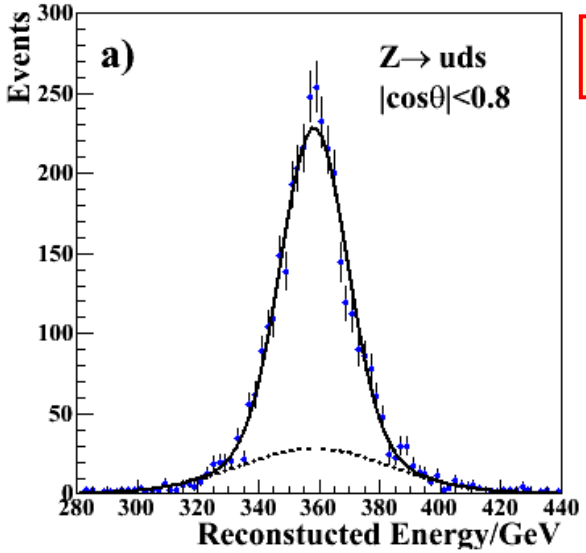
iv) Code Improvement

- ★ Effort to tidy up code (not finished)
  - Remove obsolete/redundant methods
  - Careful testing of each part of the code – some minor bugs fixed.
  - Strip out some monitoring of performance used in development.

❷ Release Plans

- ★ Pre-release .tar file made available to a "select few"
- ★ Intend to release beta version next week
- ★ Code available from
  http://www.hep.phy.cam.ac.uk/~thomson/pandoraPFA
- ★ Current performance in LCWS06 contribution
  available as **physics/060726**

❸ Current Performance (as of 28/7/06)



Figures of Merit:

rms_{90}

- ★Find smallest region containing 90 % of events
- ★Determine rms in this region

σ_{75}

- ★Fit sum of two Gaussians with same mean. The narrower one is constrained to contain 75% of events
- ★Quote σ of narrow Gaussian

It is found that $rms_{90} \approx \sigma_{75}$

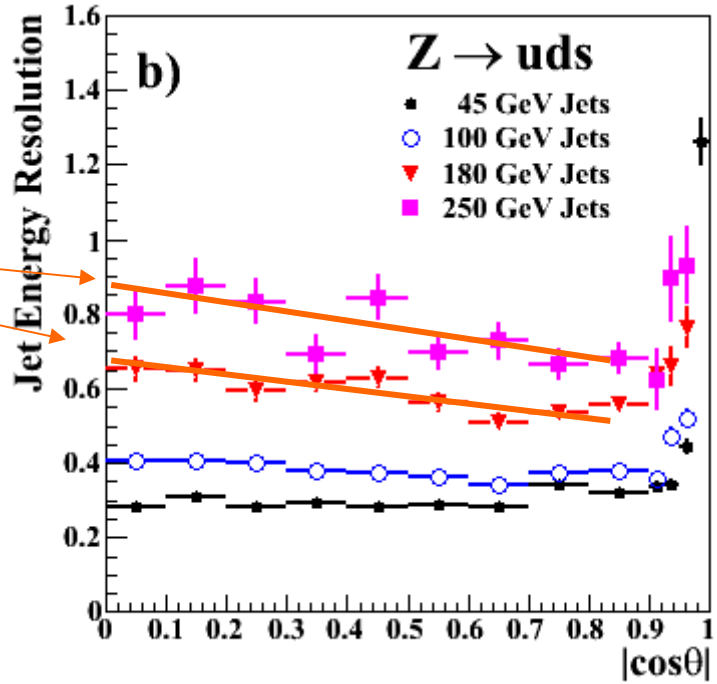
E_{JET}	$\sigma_E/E = \alpha\sqrt{(E/GeV)}$ $\lvert\cos\theta\rvert<0.8$
45 GeV	0.30
100 GeV	0.37
180 GeV	0.57
250 GeV	0.75

Empirically:

$$\frac{\sigma_E}{E} = \frac{0.265}{\sqrt{E(\mathrm{GeV})}} + 1.2 \times 10^{-4} E(\mathrm{GeV})$$

Comment

Some evidence for degradation of performance due to HCAL leakage….



That's all for today….