Calorimetry only Resolutions

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Topics

- Reconstruction
- Jet Finding
- Resolutions

Reconstruction

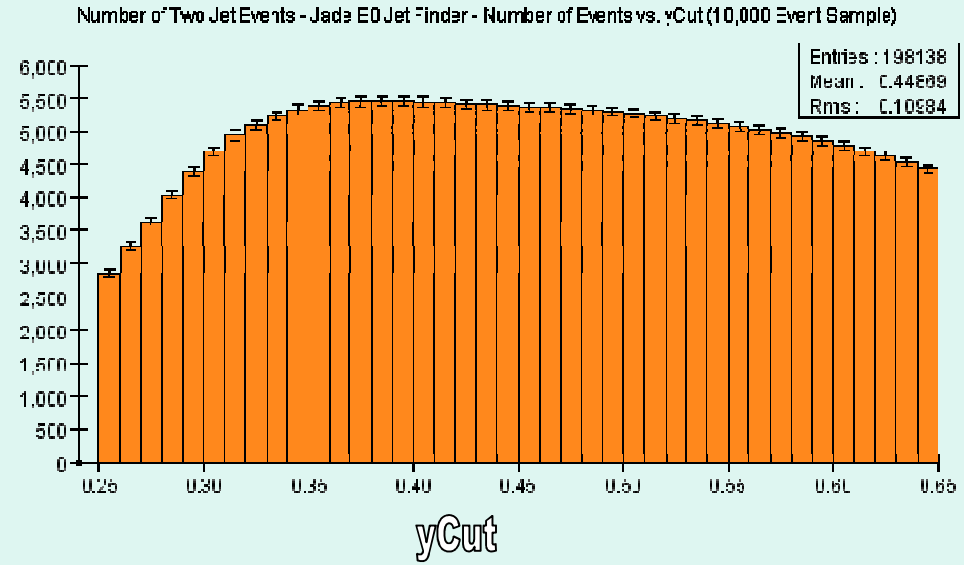
- Perfect ReconstructedParticles: Use the final state MCParticles with no errors for the ReconstructedParticles
- Standard ReconstructedParticles: Use the UI PFA.
- Cluster ReconstructedParticles: No tracking. Use DT clusterer, make cores from clusters >=10 hits, add energy of clusters < 10 hits to nearest core, add muon hits to nearest core, make massless particles from cores.

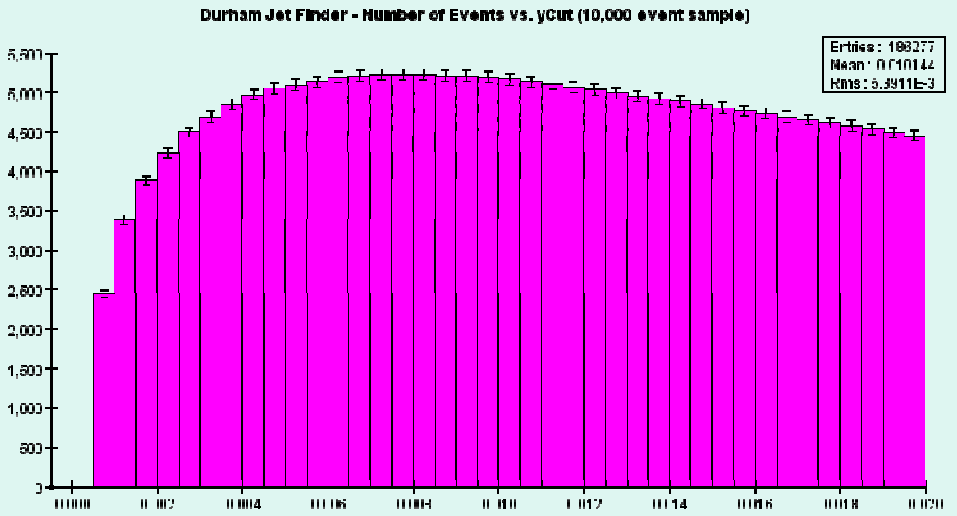
Jet finding

- Used ZZ->qqnunu events @ 500 GeV Ecm in sid02
- Optimized ycut maximizing # of 2 jet events with perfect reconstruction
- Compared PFA and Cluster recon with perfect recon.

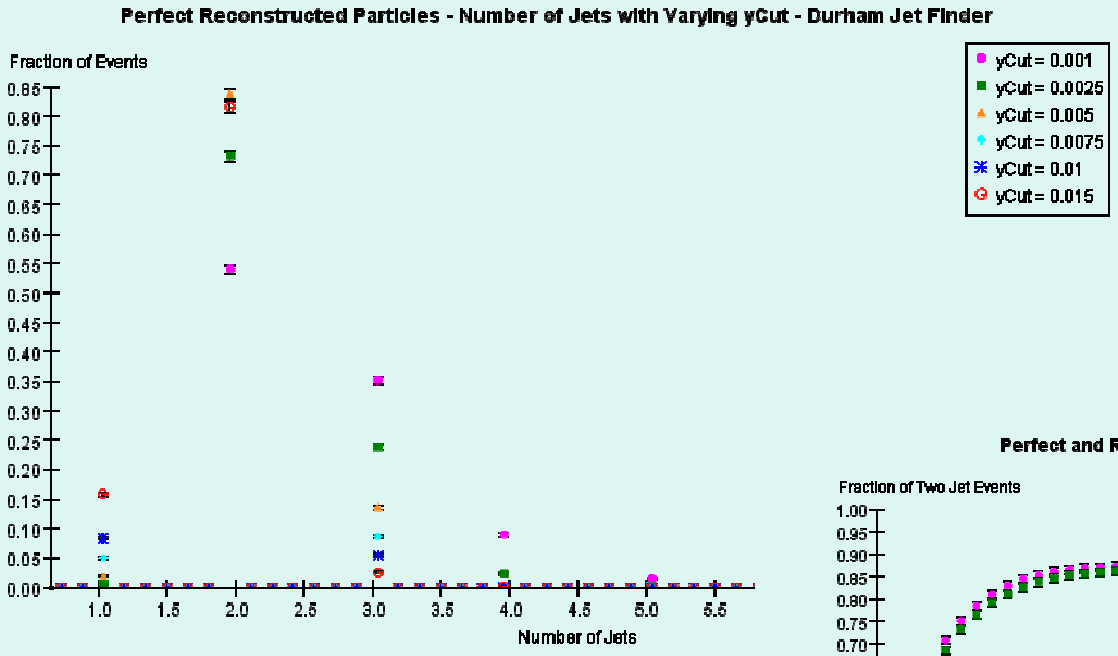
Jet Finders

- I attempted to figure out what the best yCut was in order to return the highest number of cases with two jets. I had expected this number to be relatively similar regardless of the jet finder I was using. It wasn't even close.

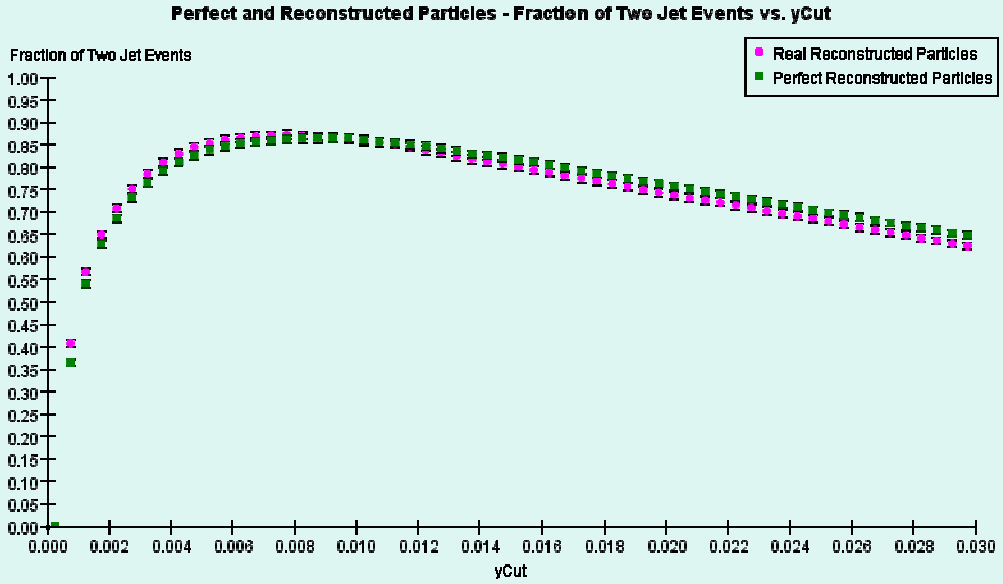




Jet Finders



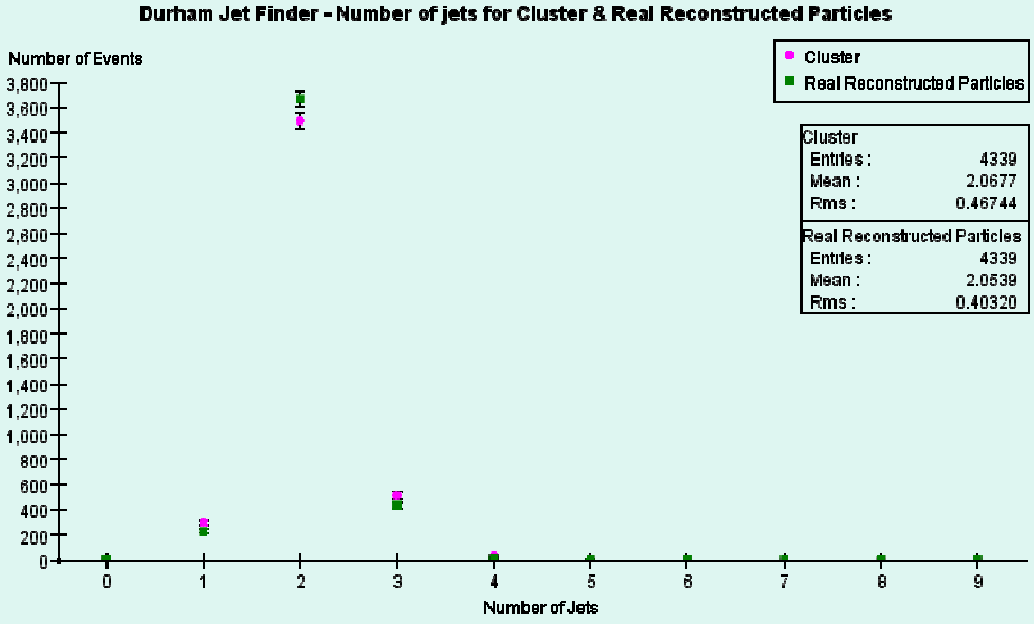
I chose 0.0075 as the optimum yCut.



Clusters

- The jet finders work remarkably well on just the calorimeter data. Although the PFA has less of a tail than the cluster algorithm, they are very close. This shows that the jet finding algorithm is relatively good.

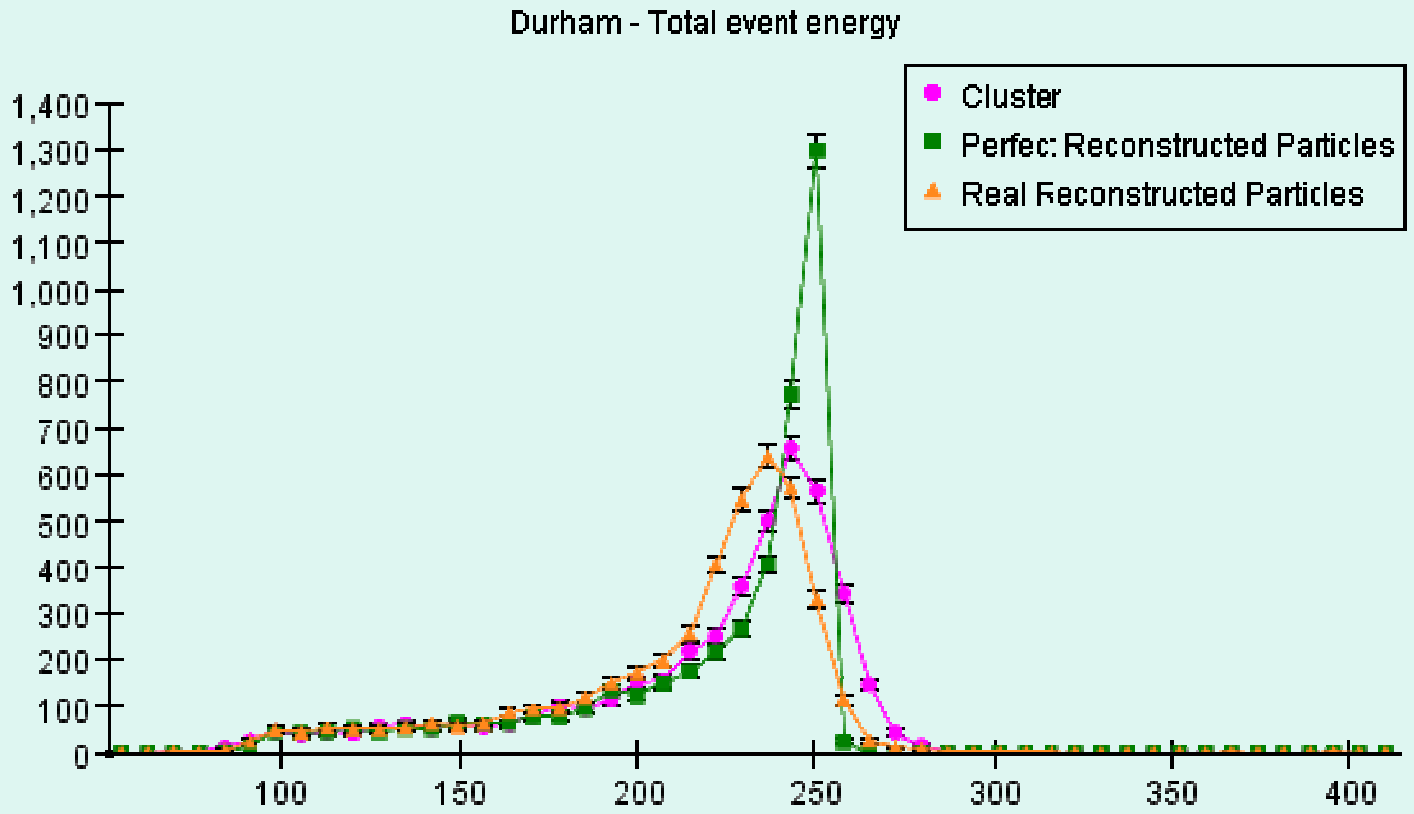
This plot uses yCut = 0.0075, and even with clusters, finds mainly two jets.



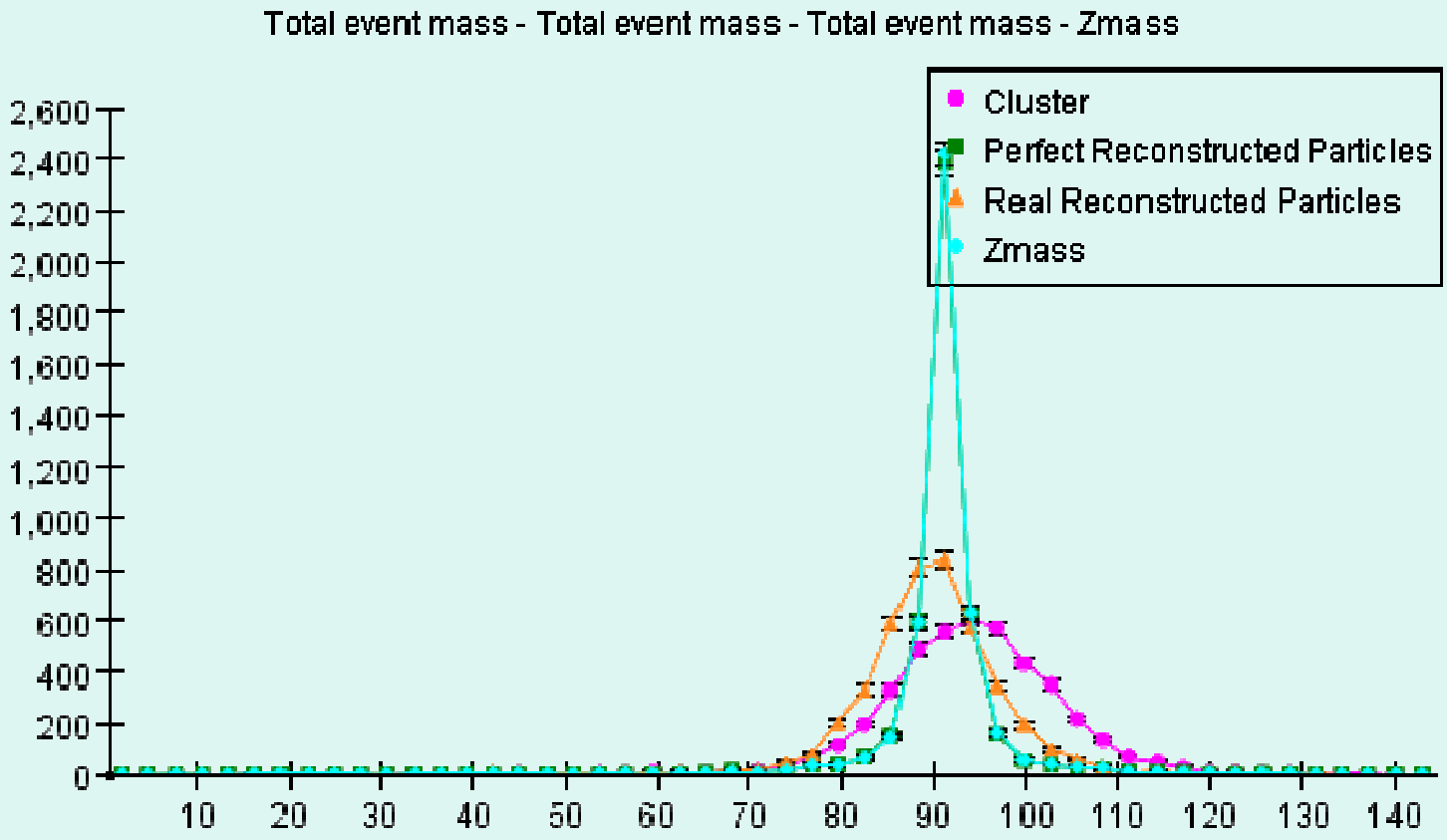
Resolutions

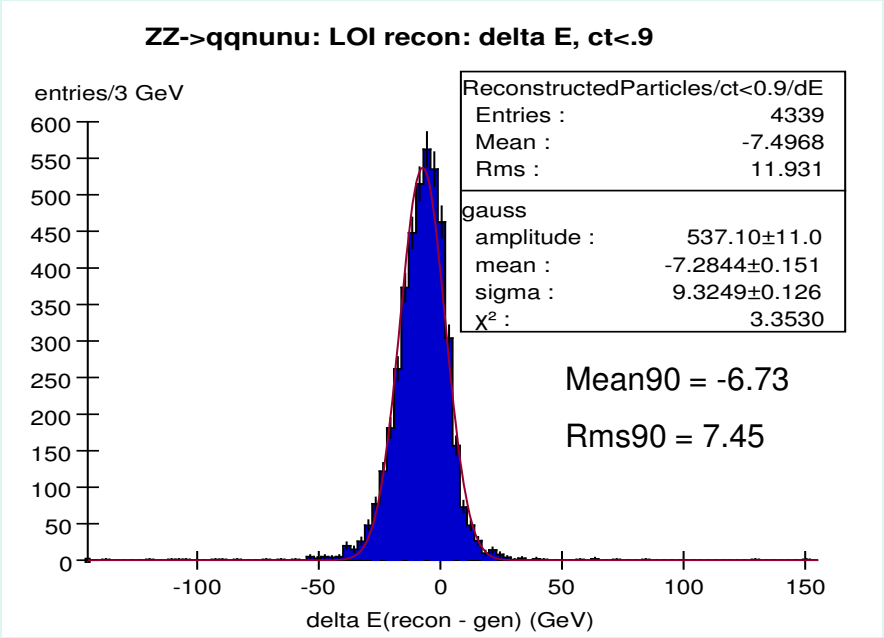
- Used ZZ->qqnunu events @ 500 GeV Ecm in sid02.
- Cut out events containing a q with $|\cos(\theta)| > 0.9$
- Compare energy and mass resolutions

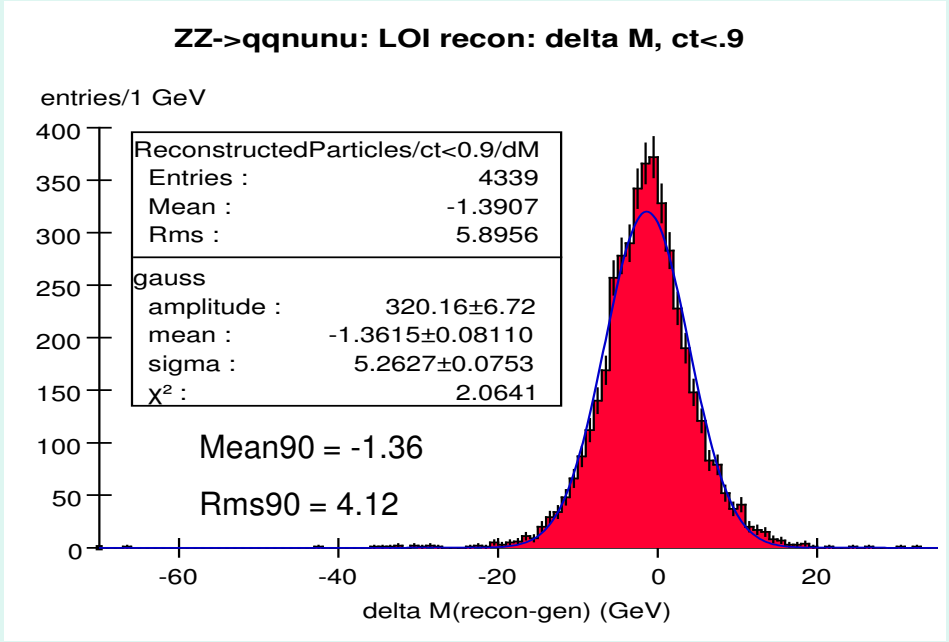
Comparisons

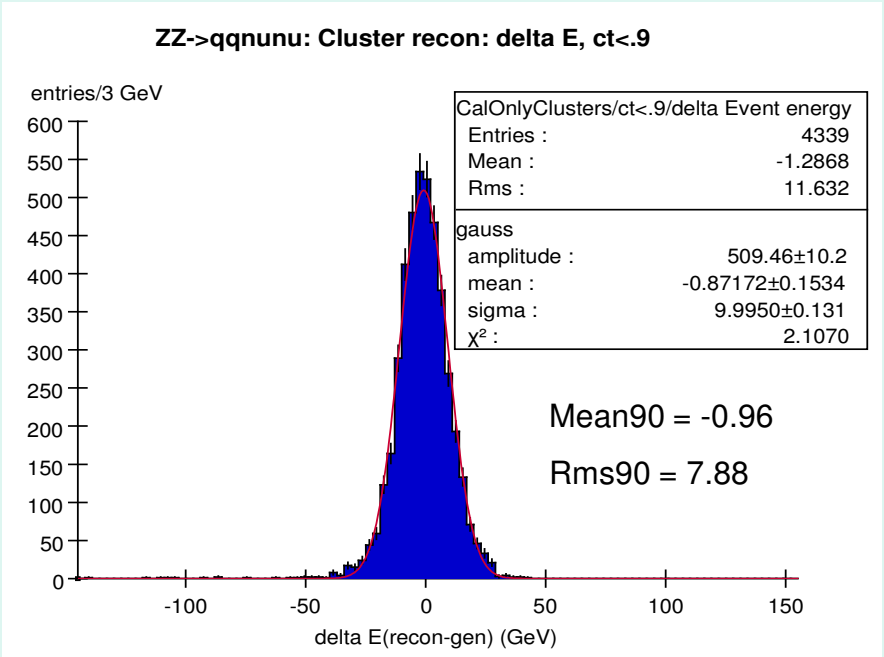


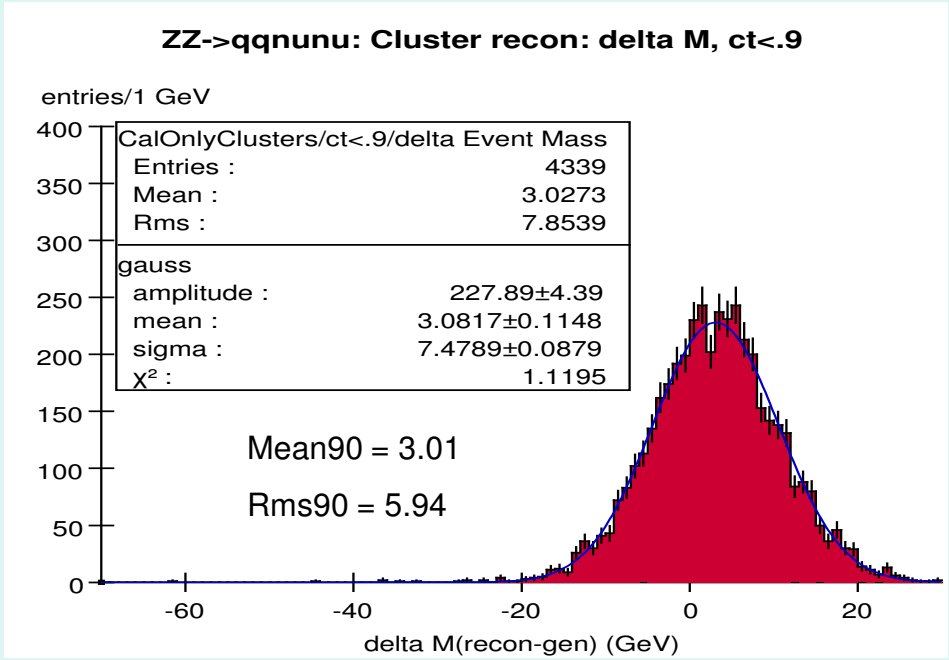
Comparisons




ZZ->qqnunu: LOI recon: delta E, ct<.9
entries/3 GeV
ReconstructedParticles/ct<0.9/dE
Entries : 4339
Mean : -7.4968
Rms : 11.931
gauss
amplitude : 537.10±11.0
mean : -7.2844±0.151
sigma : 9.3249±0.126
χ² : 3.3530
Mean90 = -6.73
Rms90 = 7.45
delta E(recon - gen) (GeV)


ZZ->qqnunu: LOI recon: delta M, ct<.9
entries/1 GeV
ReconstructedParticles/ct<0.9/dM
Entries : 4339
Mean : -1.3907
Rms : 5.8956
gauss
amplitude : 320.16±6.72
mean : -1.3615±0.08110
sigma : 5.2627±0.0753
χ² : 2.0641
Mean90 = -1.36
Rms90 = 4.12
delta M(recon-gen) (GeV)


ZZ->qqnunu: Cluster recon: delta E, ct<.9
entries/3 GeV
CalOnlyClusters/ct<.9/delta Event energy
Entries : 4339
Mean : -1.2868
Rms : 11.632
gauss
amplitude : 509.46±10.2
mean : -0.87172±0.1534
sigma : 9.9950±0.131
χ² : 2.1070
Mean90 = -0.96
Rms90 = 7.88
delta E(recon-gen) (GeV)


ZZ->qqnunu: Cluster recon: delta M, ct<.9
entries/1 GeV
CalOnlyClusters/ct<.9/delta Event Mass
Entries : 4339
Mean : 3.0273
Rms : 7.8539
gauss
amplitude : 227.89±4.39
mean : 3.0817±0.1148
sigma : 7.4789±0.0879
χ² : 1.1195
Mean90 = 3.01
Rms90 = 5.94
delta M(recon-gen) (GeV)

Observations(from Lauren)

- I wish I had more time in order to study this – I am just reaching the point where I can do useful things.
- There is a steep learning curve, and way too many APIs. The tutorials are helpful, but only cover the very basics.
- I've learned a lot – I am not entirely sure that I've done anything particularly useful to the collaboration, but it's certainly been useful & informative for me.

Onward

- Jet finding: correlate with hard gluon radiation, reconstruction errors?
- Extend to 4,6 jet events
- Using Cal only reconstruction, how much of the dijet mass broadening is due to the field, clustering procedure, other? How much can be corrected?
- What happens with sid02_scint?