Energy Flow Studies

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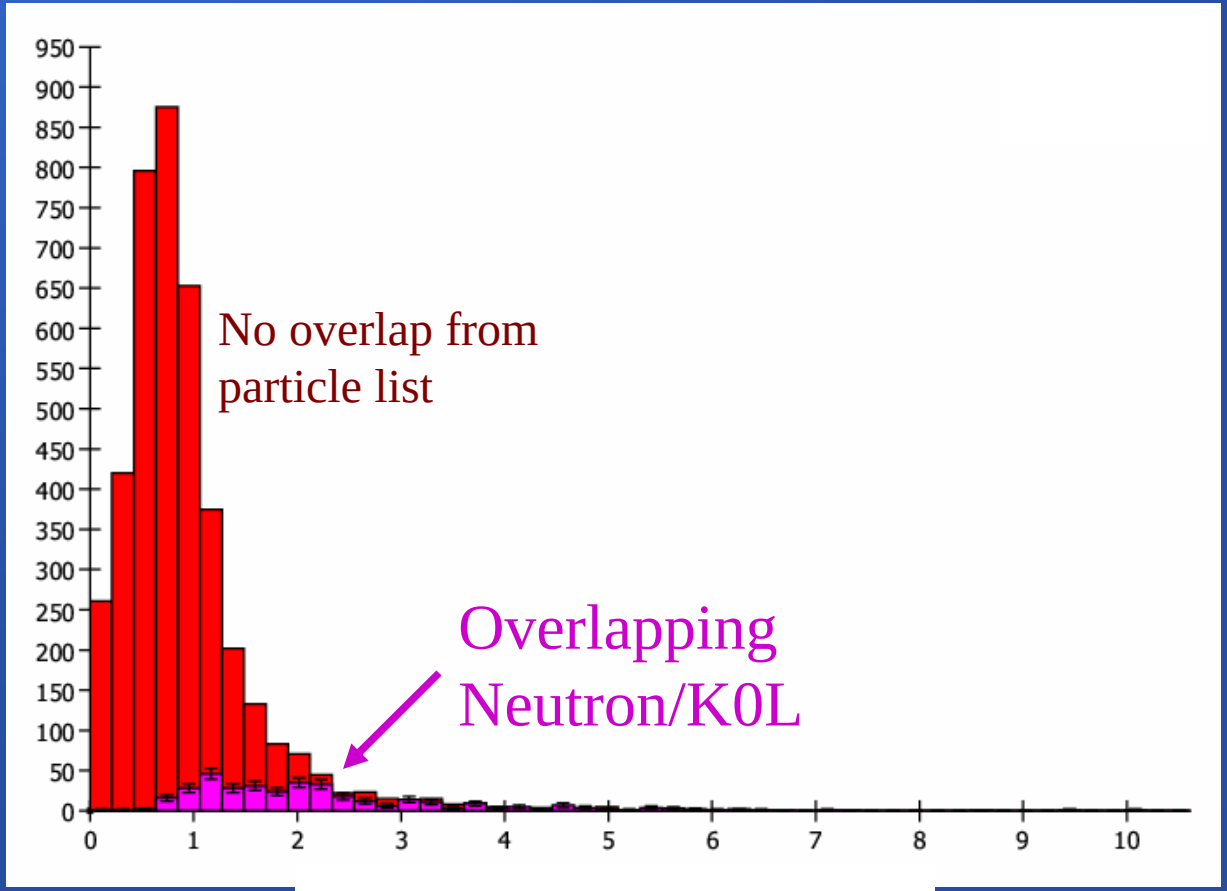
Energy Flow Studies

Ended the Cornell meeting starting the study of Track/Neutron overlaps…

Select Charged Pions isolated from other tracks in Z Decays, look for Neutron Overlap



Two approaches being investigated:

1) Put calorimeter and track properties into neural net.

List of calorimeter variables put into ClusterID Net:

15 Discriminators

- 3 normalized energy tensor eigenvalues, ne1,ne2,ne3.
- ne1/ne2, ne2/ne3.
- First layer hit, last layer hit, length of cluster, (firstL+1)/length.
- Angular separation between e1-axis and IP.
- Energy in first 5 layers.
- Nhits in first 2 layers.
- z-coordinate of center of energy.
- Nhits
- Measured cluster energy.

Tesla TDR approach

2) Careful removal of track depositions from Calorimeter. Used in European package called "Snark". Results similar to Tesla TDR, but larger resolution tails.

Two approaches being investigated:

2) Careful removal of track depositions from Calorimeter. Used in European package called "Snark". Results similar to Tesla TDR, but larger resolution tails.

Decide to pursue this one first and plot:

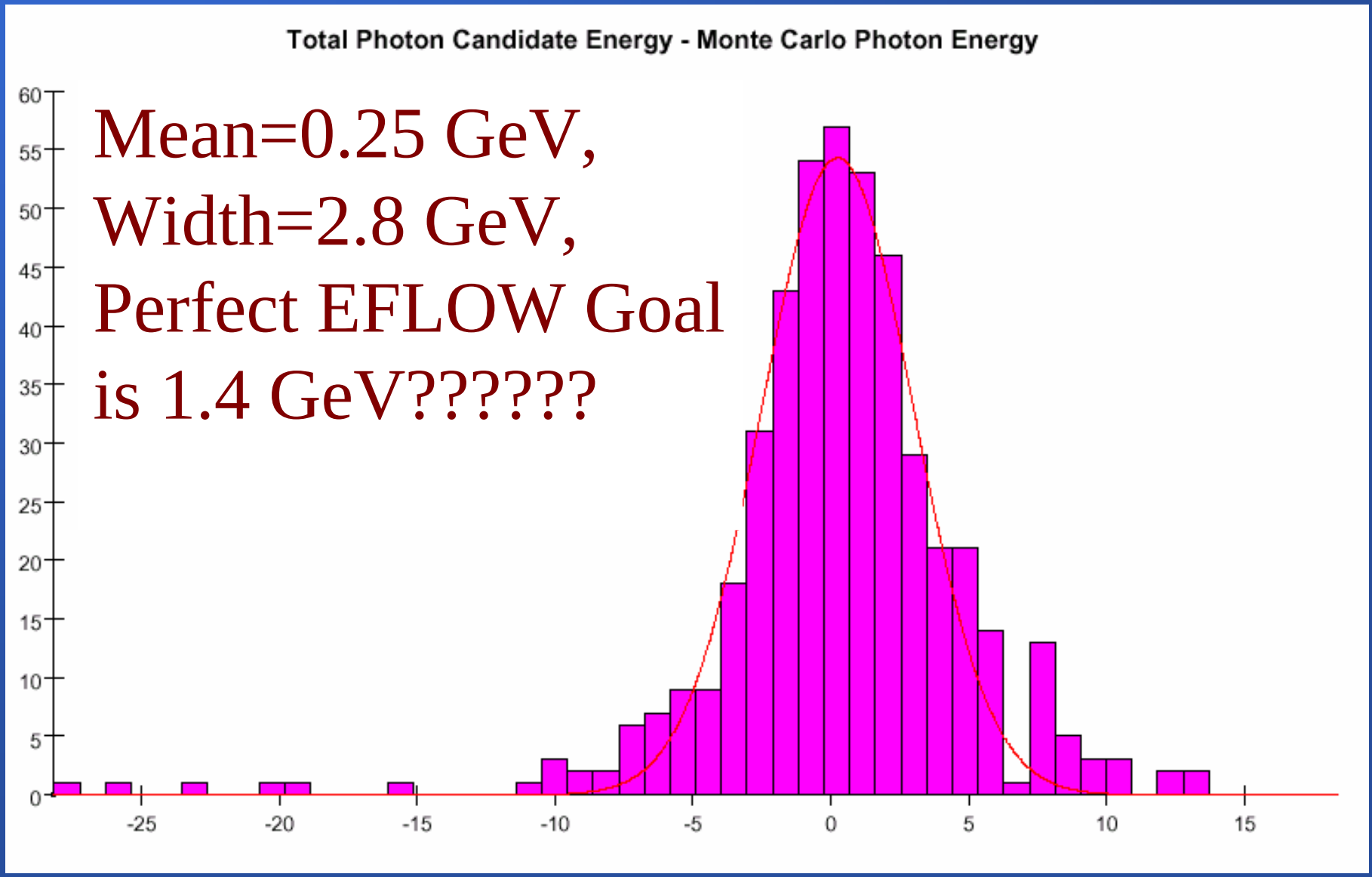
ETOT – Photon Candidates – Track Estimate vs MC Neutrons

Tune the Track Estimate until this plot makes sense…

Decide to use Cluster Cheater for Photons until more sophisticated photon finder is in place.

This drove us a few steps backward!

Hadronic Z Decays at $\sqrt{s}$ = 91 GeV



Total Photon Energy - Total Monte Carlo Photons (GeV)

1.4 GeV for Perfect EFlow Photons?

This number was estimated in Prague, during the theory talks, and we're not sure how.

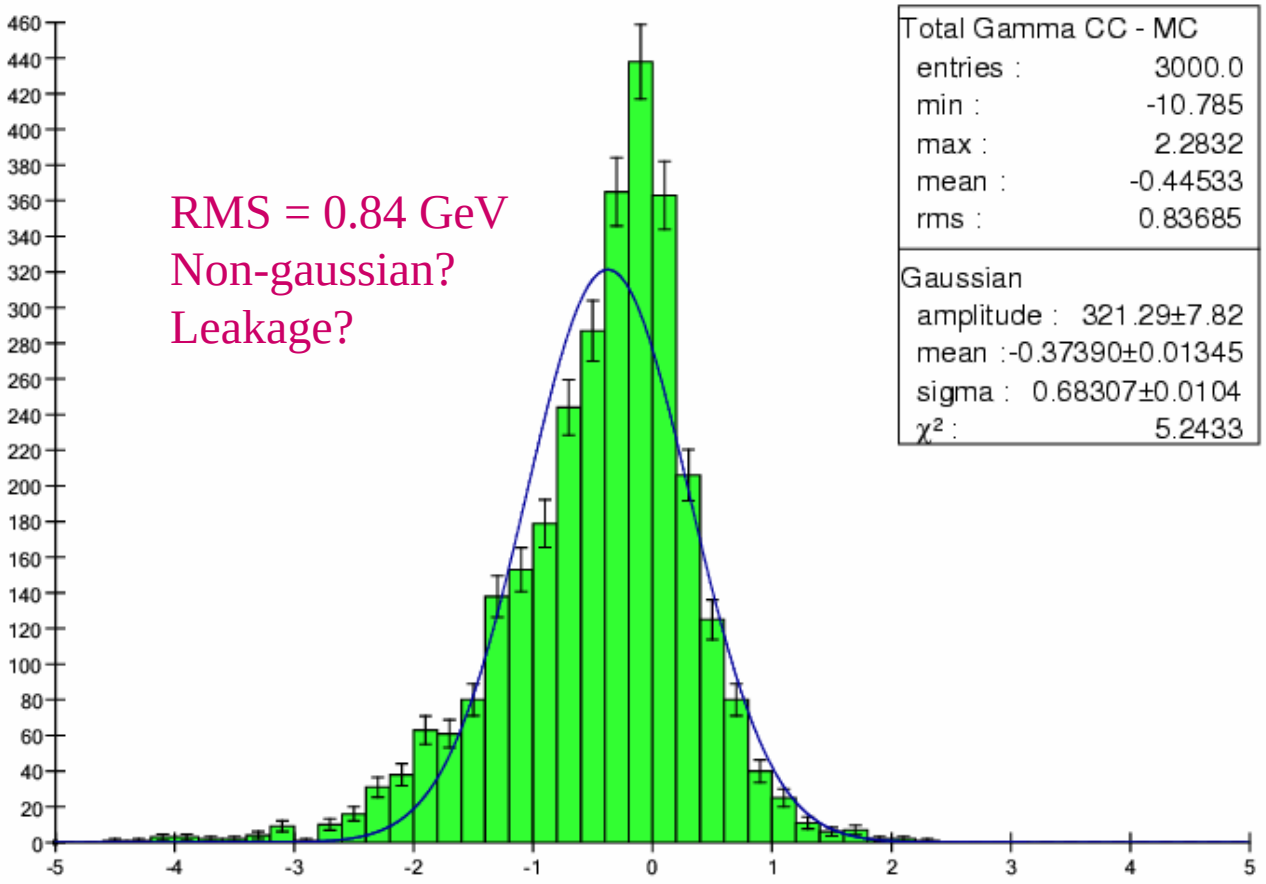
Most likely simply scaling up from discussions with Brient where he quoted 0.9 GeV.

Scaling by the ratio of SD/Tesla EM resolutions (18%/12%) gives 1.4 GeV.

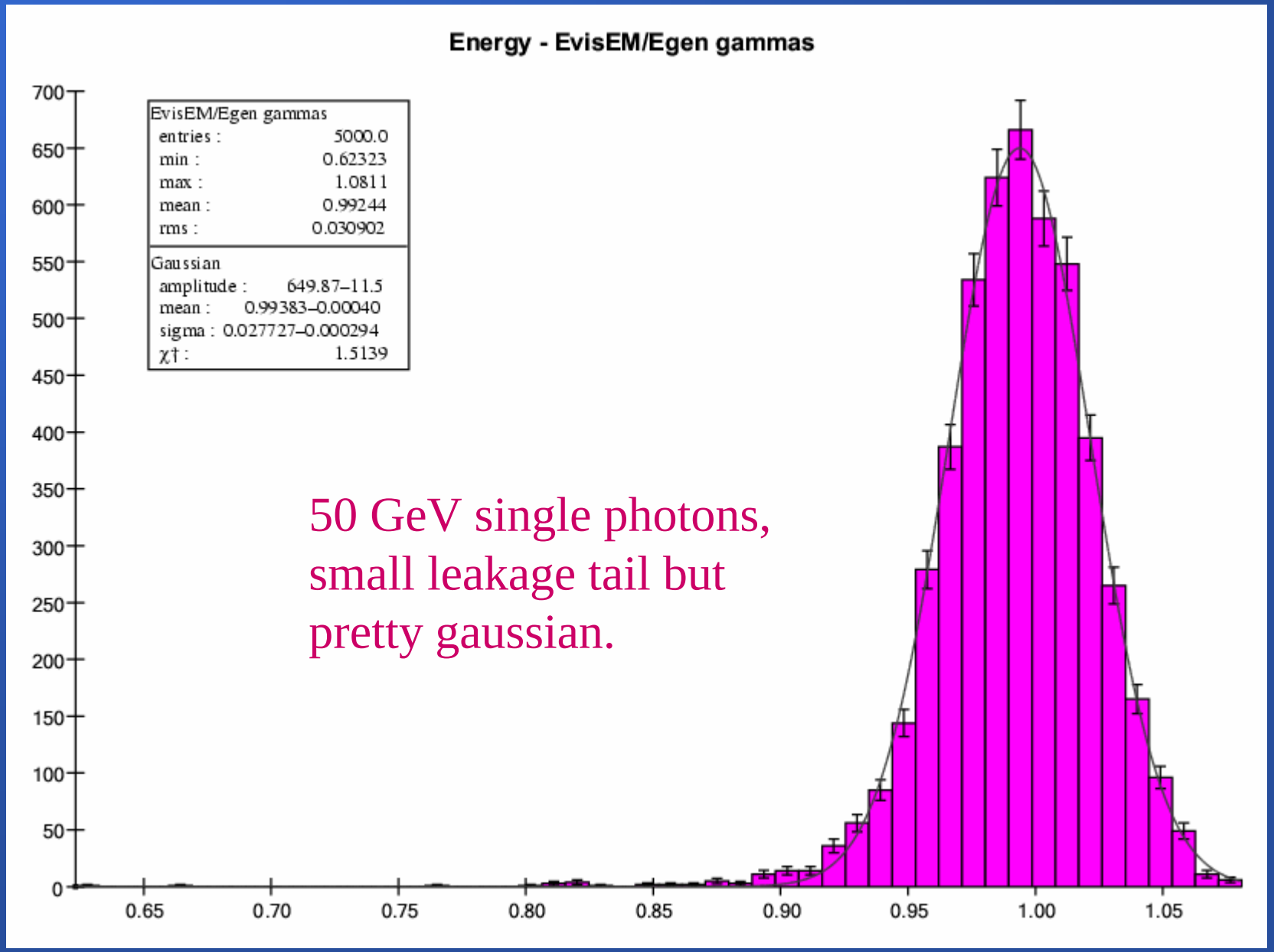
(remember Tesla has 20 layers of 0.4 X0 + 20 layers of 1.2 X0, while "standard" SD has 30 layers of 2/3 X0)

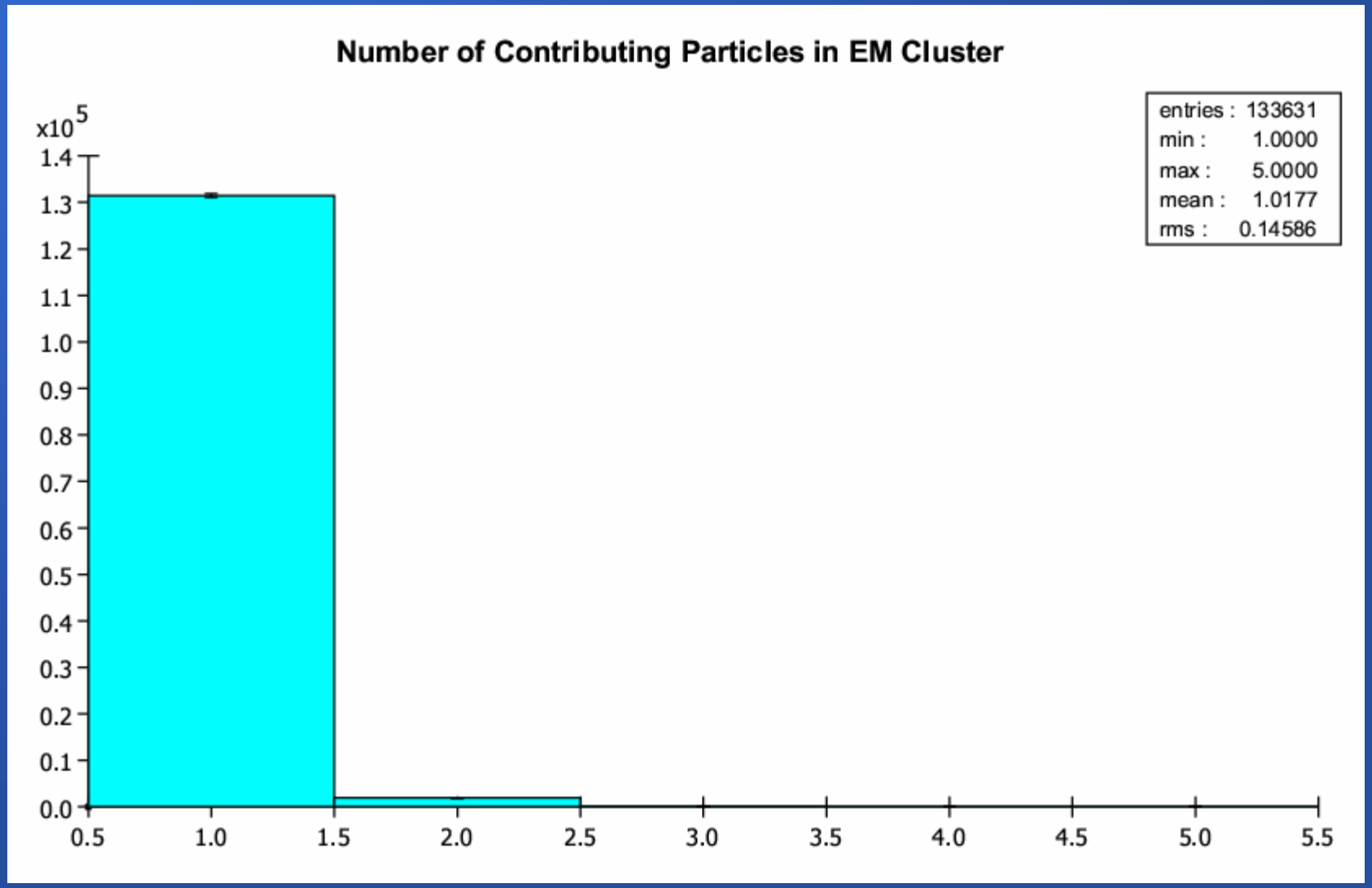
Hadronic Z Decays at √s = 91 GeV

Cluster Cheater Photons, > 0 GeV, costheta<0.8, only 1 MC particle contributing to cluster



Measured – MC True Photon Energy (GeV)

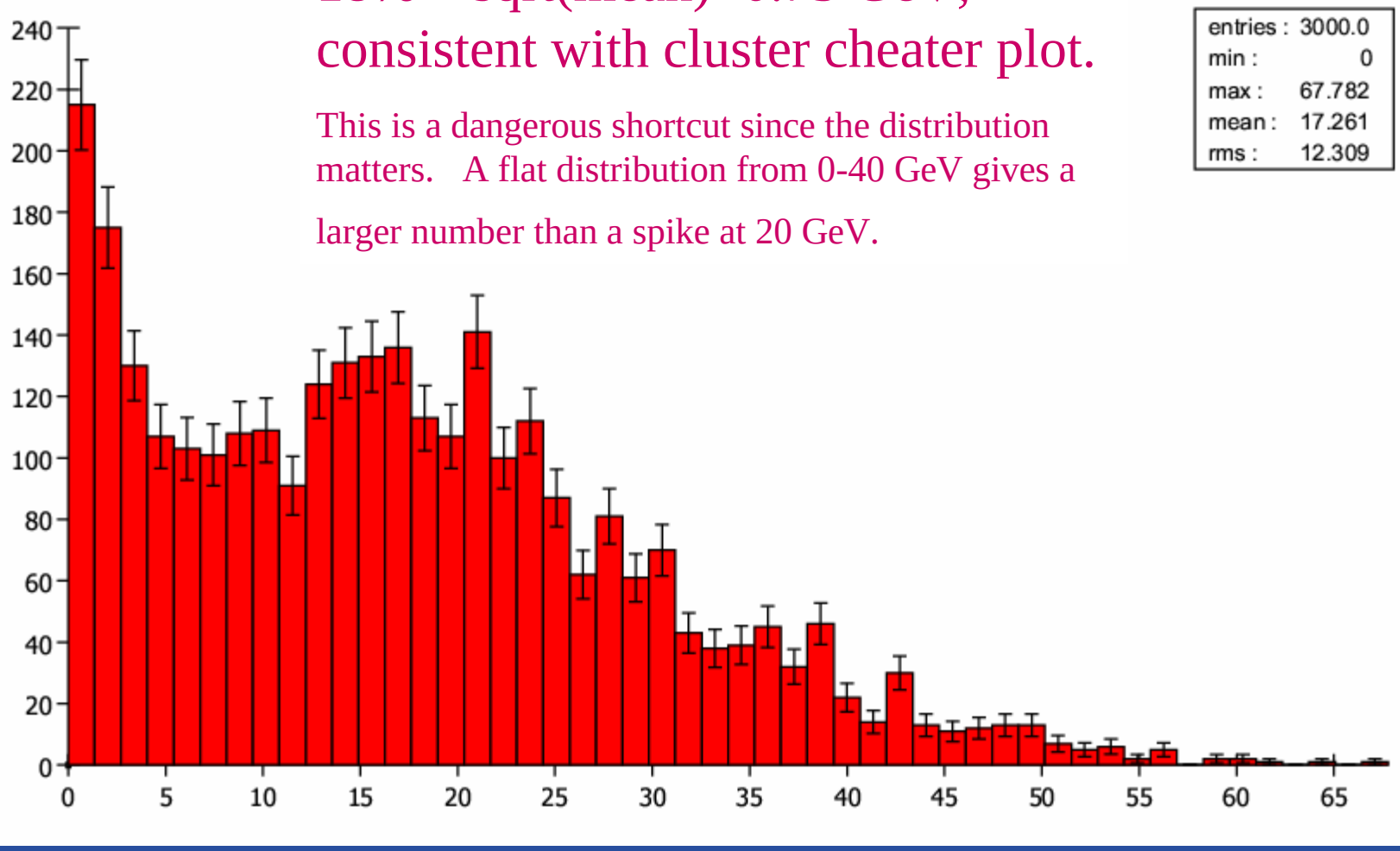

Energy - EvisEM/Egen gammas
EvisEM/Egen gammas
entries : 5000.0
min : 0.62323
max : 1.0811
mean : 0.99244
rms : 0.030902
Gaussian
amplitude : 649.87–11.5
mean : 0.99383–0.00040
sigma : 0.027727–0.000294
χ† : 1.5139
50 GeV single photons,
small leakage tail but
pretty gaussian.
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
0.65
0.70
0.75
0.80
0.85
0.90
0.95
1.00
1.05


Number of Contributing Particles in EM Cluster
entries : 133631
min : 1.0000
max : 5.0000
mean : 1.0177
rms : 0.14586
x10^5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5

Hadronic Z Decays at √s = 91 GeV

18% * sqrt(mean)=0.75 GeV, consistent with cluster cheater plot.

This is a dangerous shortcut since the distribution matters. A flat distribution from 0-40 GeV gives a larger number than a spike at 20 GeV.



Total Photon Energy (GeV)

Conclusion

Will quote 0.8 GeV for
Perfect EFlow Photons from
Hadronic Z decays at rest in the SD
detector from now on.

Have started on the neutron/track
study using cluster cheater photons…