

Gamma jet balancing

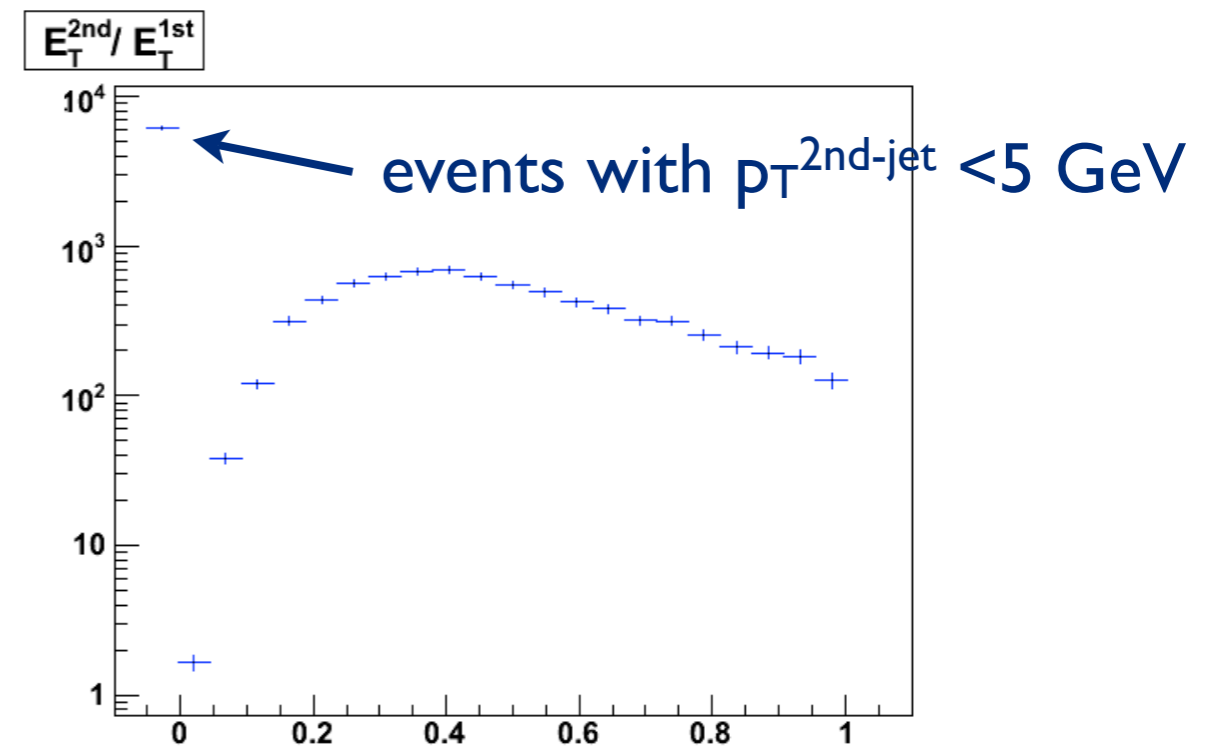
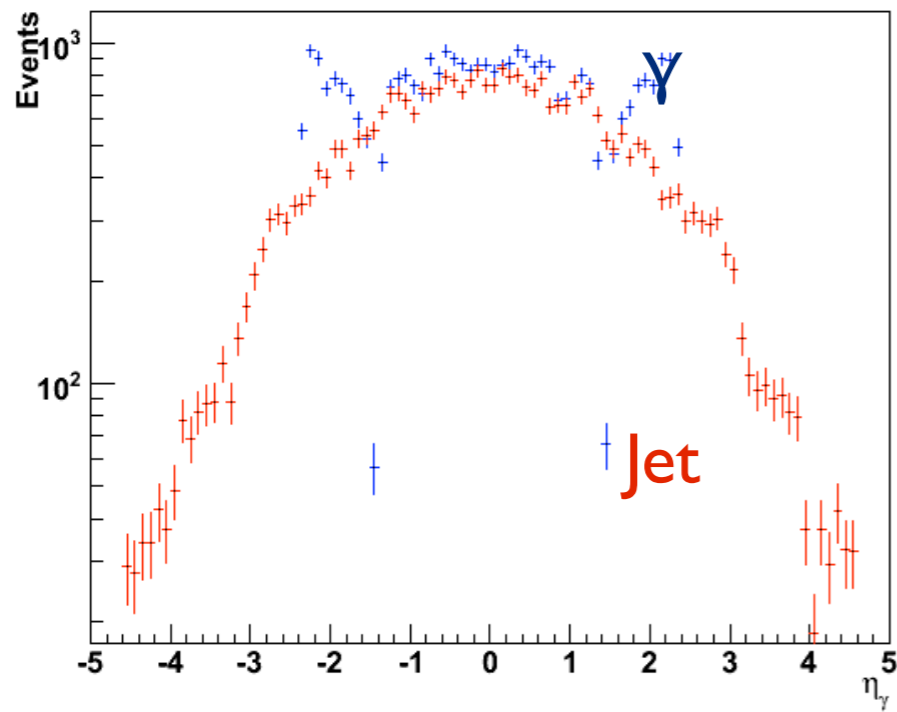
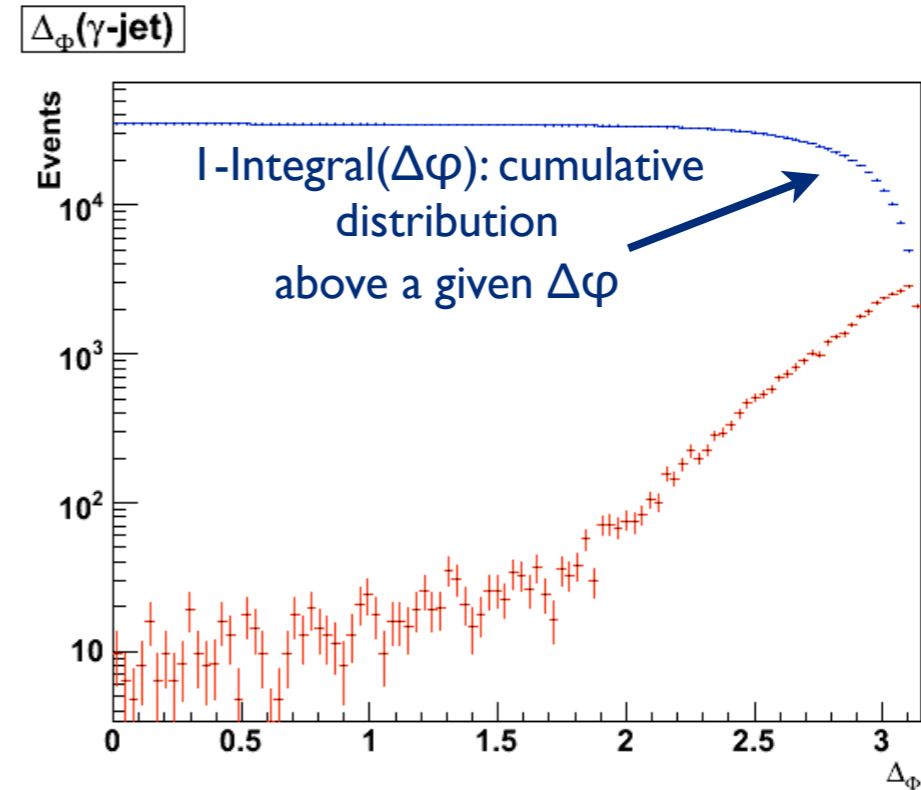
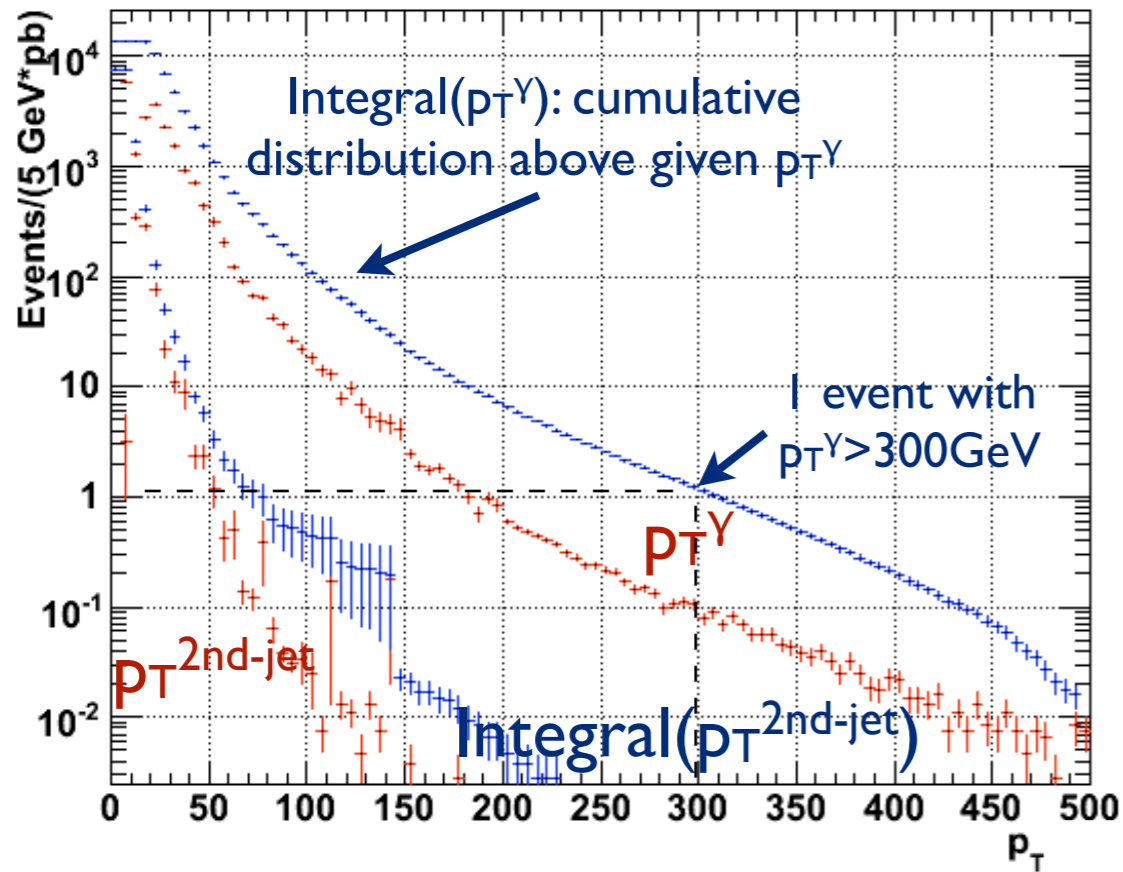
Andrea Messina

Outline

- characterization of the event sample
- balancing procedure
- Energy flow
- DPD skimming

Event Sample

- group08.PerfJets.mc08.10800x.PythiaPhotonJetX.recon.DPD_NOSKIM.e344_s456_r545_DPDMaker000157_p1 (X=1,4)

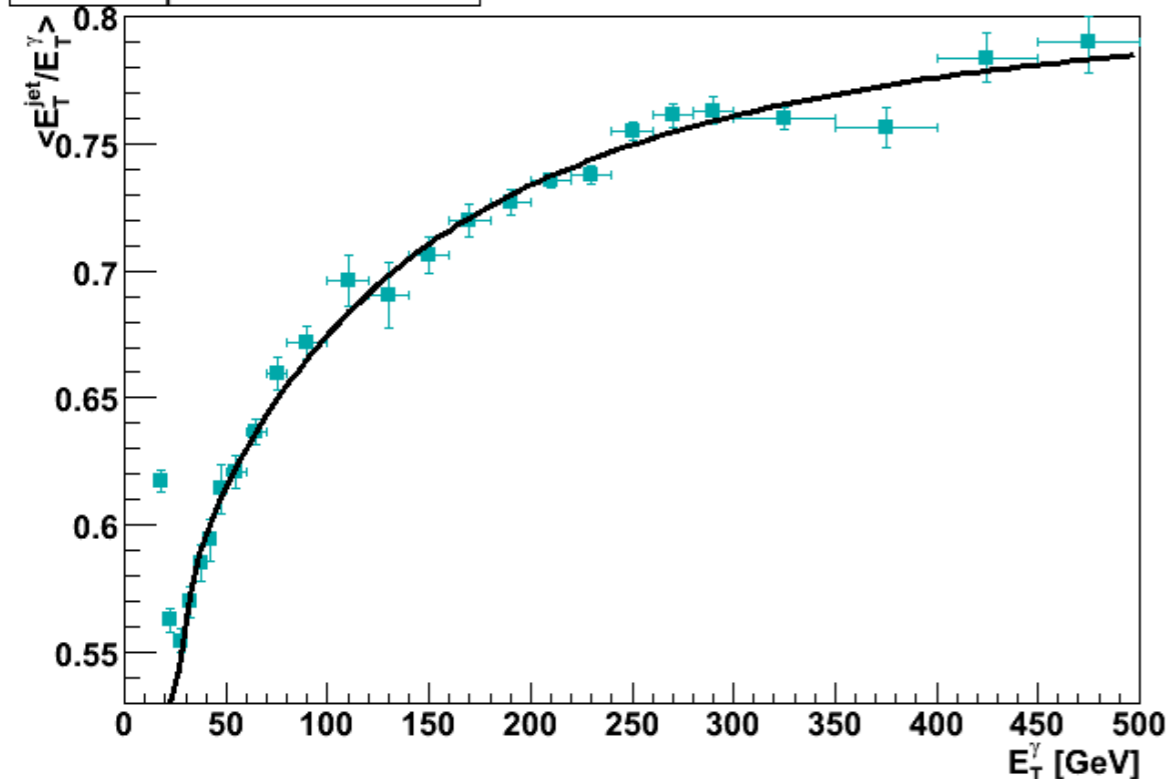


Balancing procedure

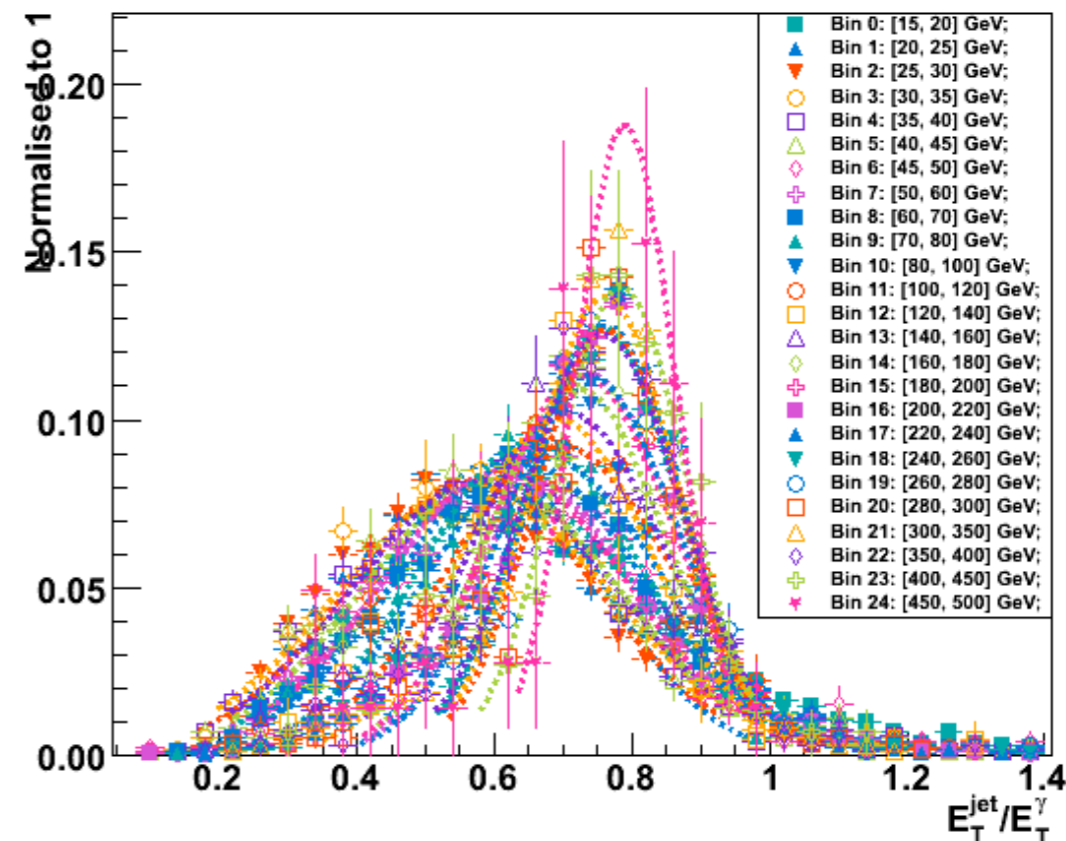
- AntiKt6; TopoCluster; EM scale
- $E_T(\gamma) > 20\text{GeV}; |\eta_{\text{jet}/\gamma}| < 2.5; \Delta\varphi_{\text{jet}-\gamma} > 2.9$
- $E_T^{\text{Corr}} = \text{Corr}(E_T^{\text{Meas}}) * E_T^{\text{Meas}}$
- $\text{Corr}(E_T) = \sum_{i=0,4} P_i / [\text{Log}(E_T)]^i$; with P_i fitted to $B(E_T)$
- $B(E_T^\gamma) = \langle E_T^{\text{jet}}/E_T^\gamma \rangle (E_T^\gamma) \Rightarrow B(E_T^{\text{jet}}) = B(E_T^\gamma * \text{Corr}(E_T^\gamma))$; (where “(x)” means function of x)
- $\langle x \rangle$ corresponds to the mean μ of gaussian fit of x in the region $\mu \mp 2\sigma \Rightarrow$ it is important that it does not have big tails

EM Scale balance

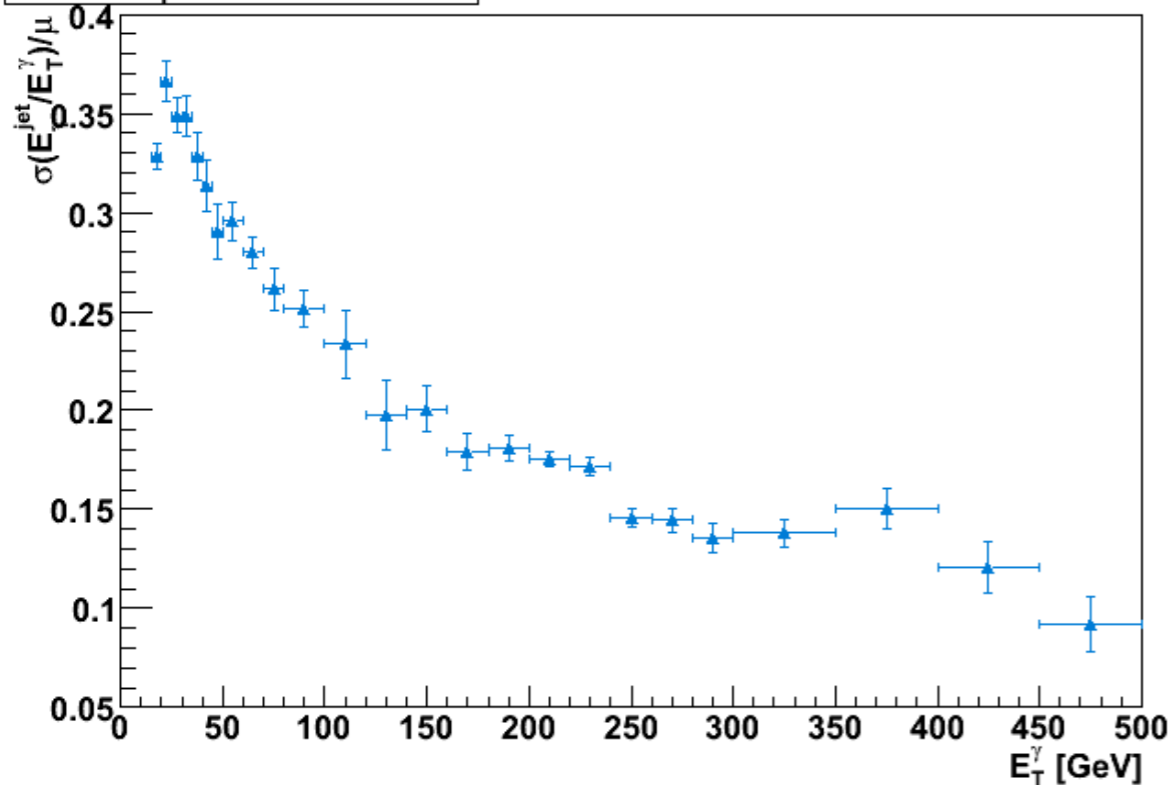
γ - jet E_T Balance Vs E_T^γ



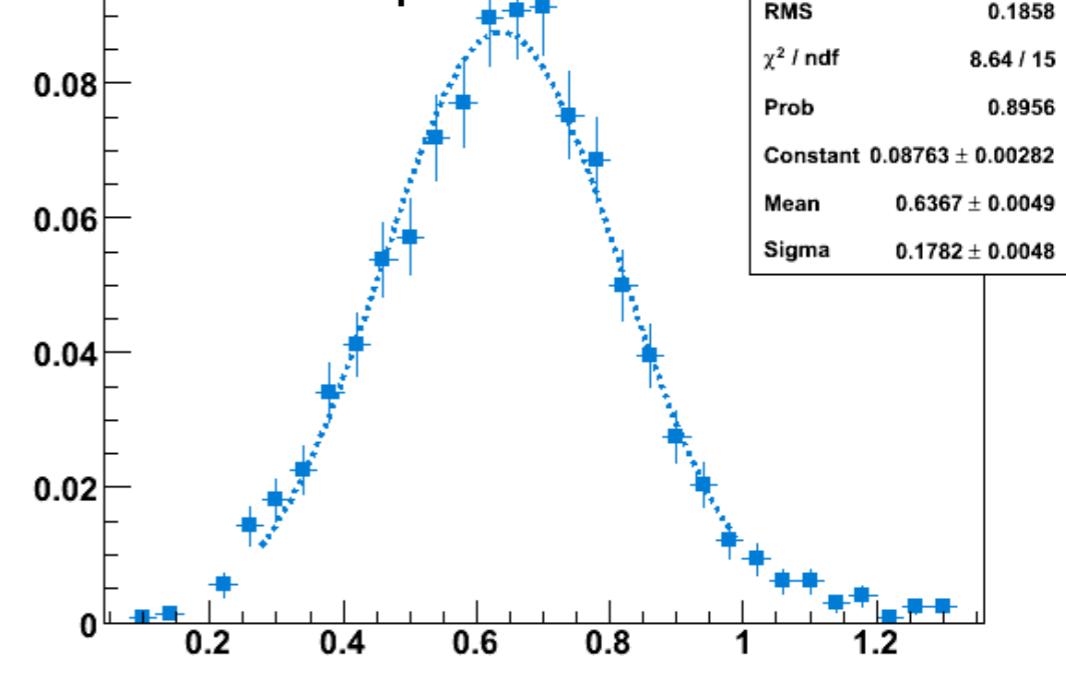
γ - jet E_T Balance



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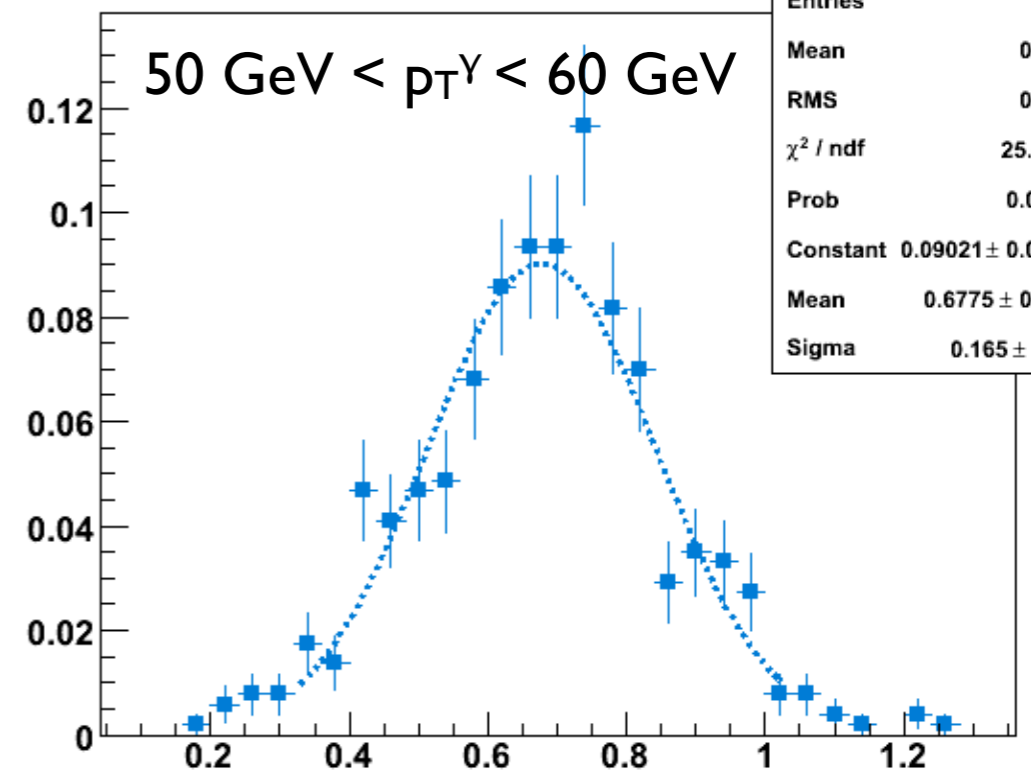
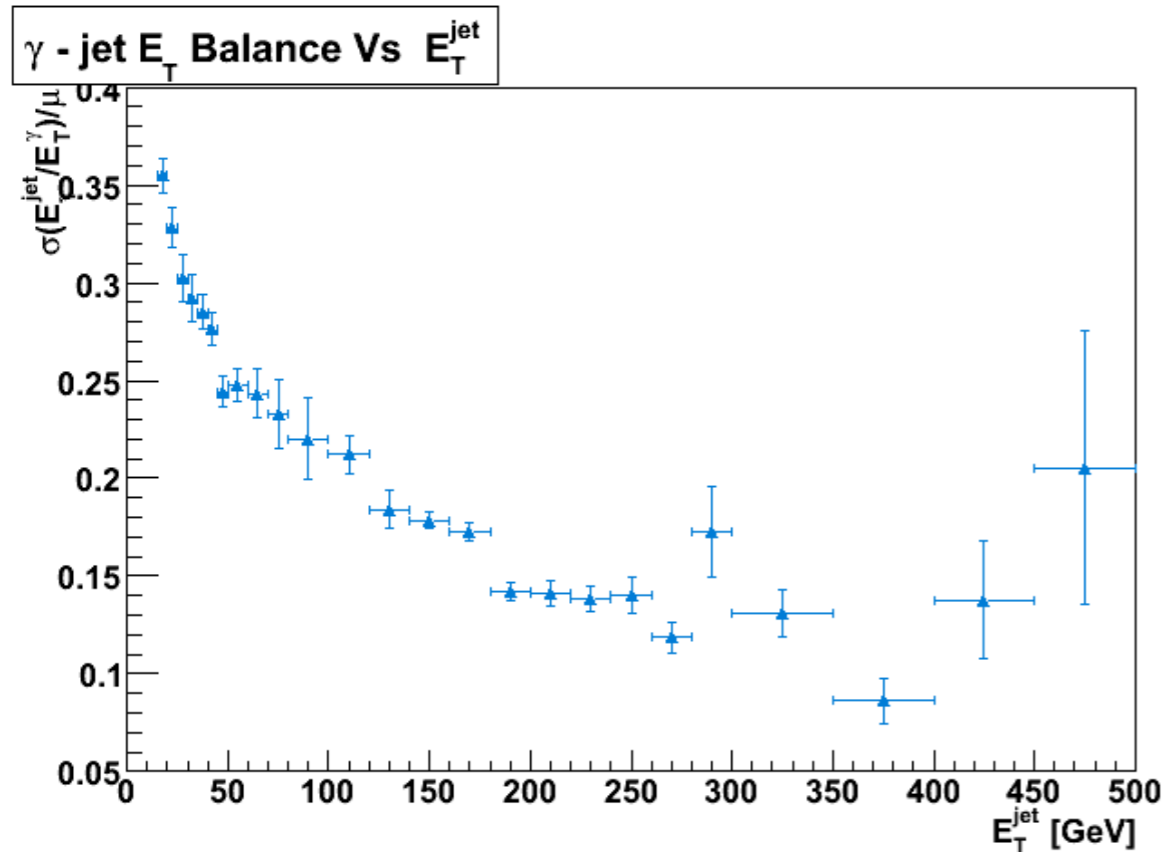
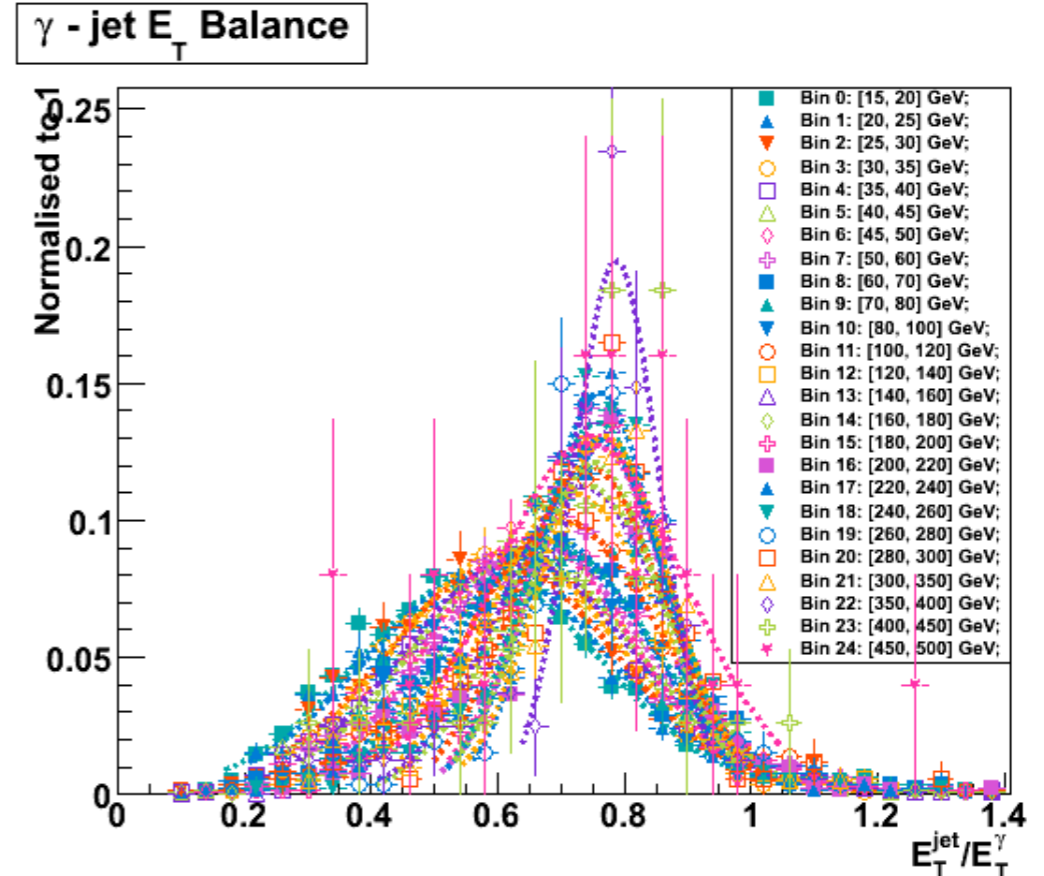
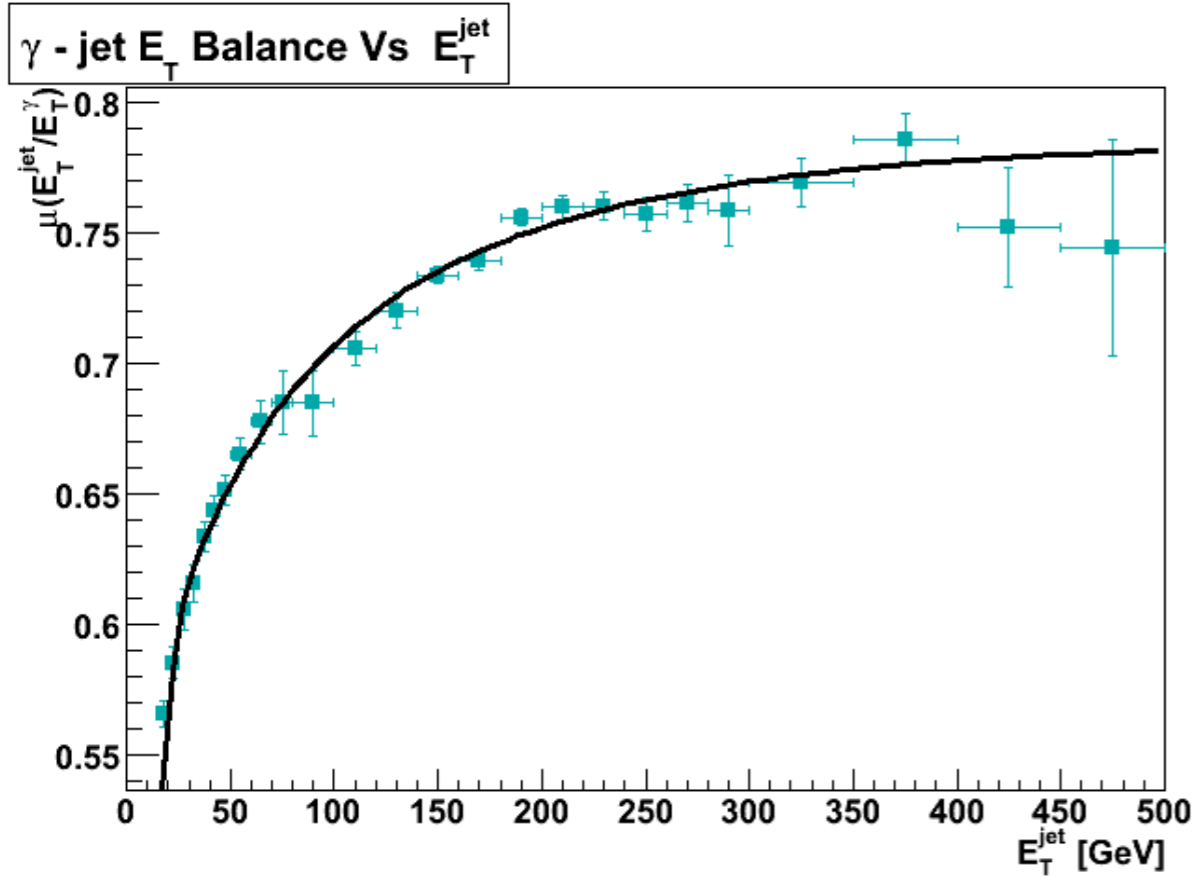


50 GeV < p_{T^γ} < 60 GeV



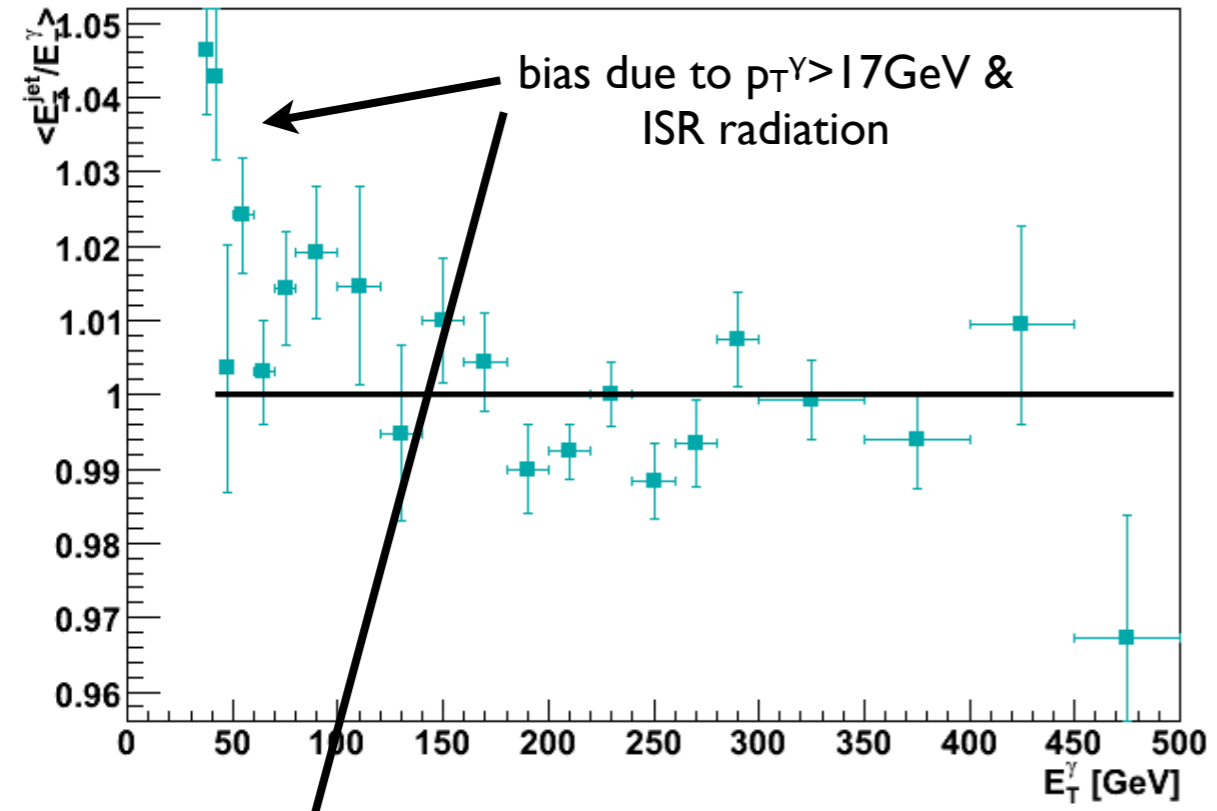
_py_8	
Entries	1819
Mean	0.6442
RMS	0.1858
χ^2 / ndf	8.64 / 15
Prob	0.8956
Constant	0.08763 ± 0.00282
Mean	0.6367 ± 0.0049
Sigma	0.1782 ± 0.0048

Numerical inversion

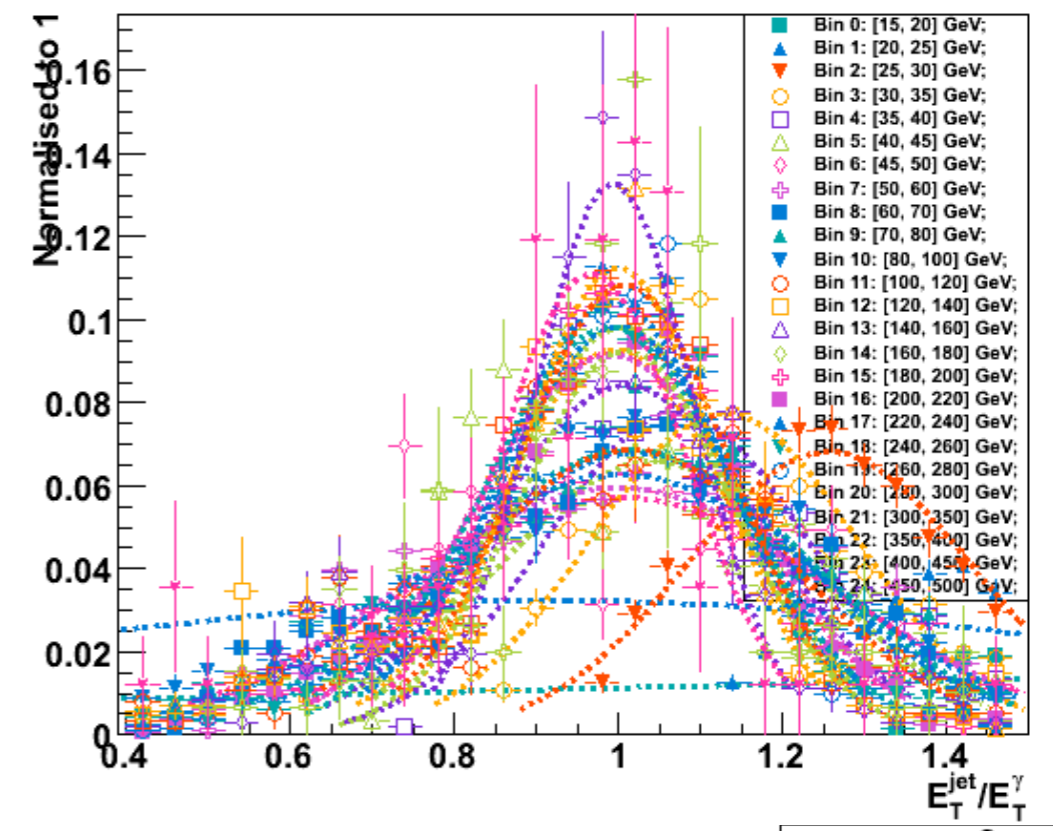


Corrected balance

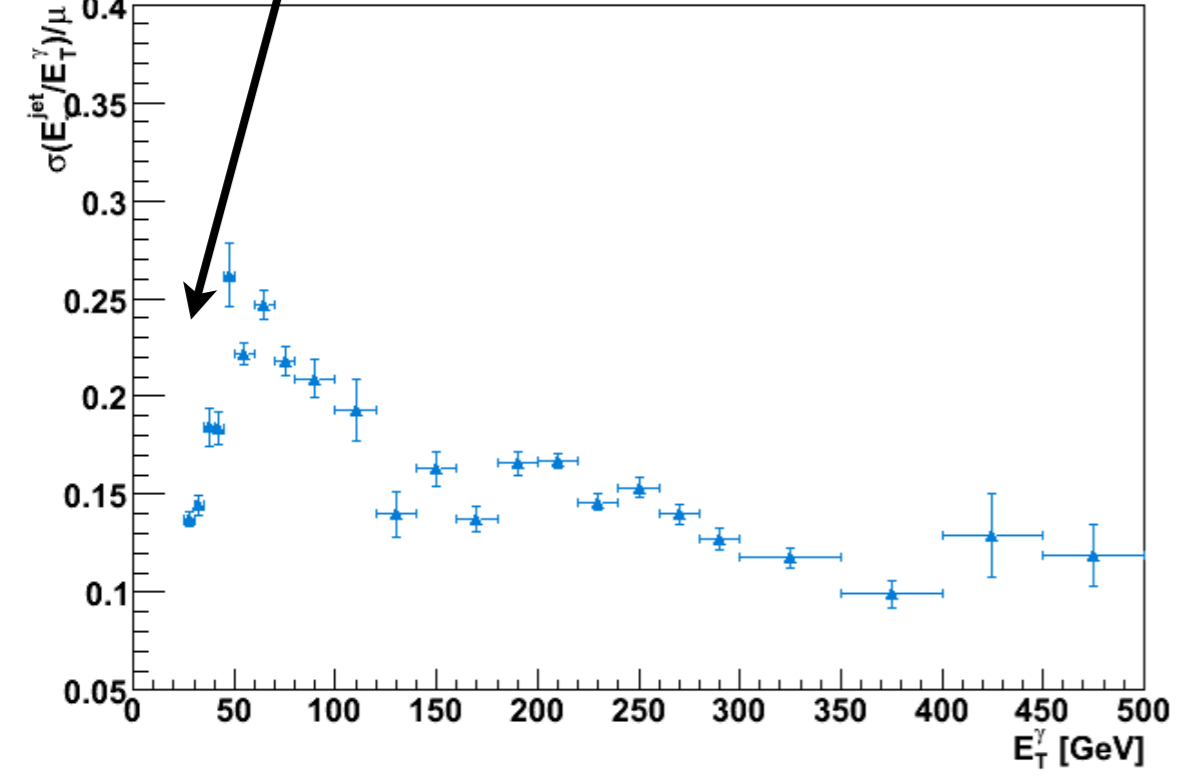
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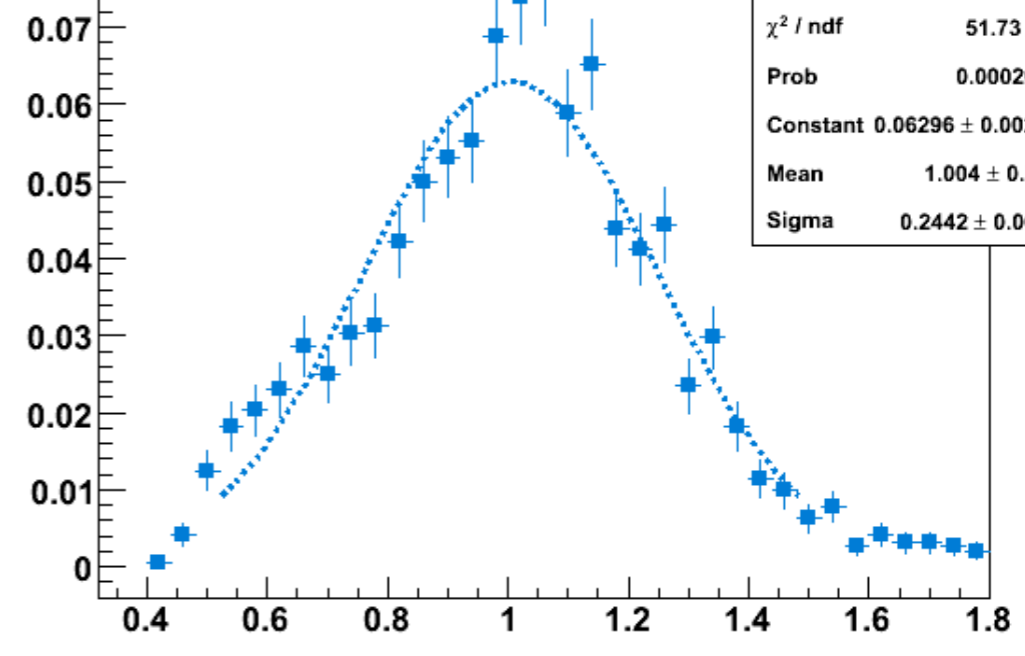
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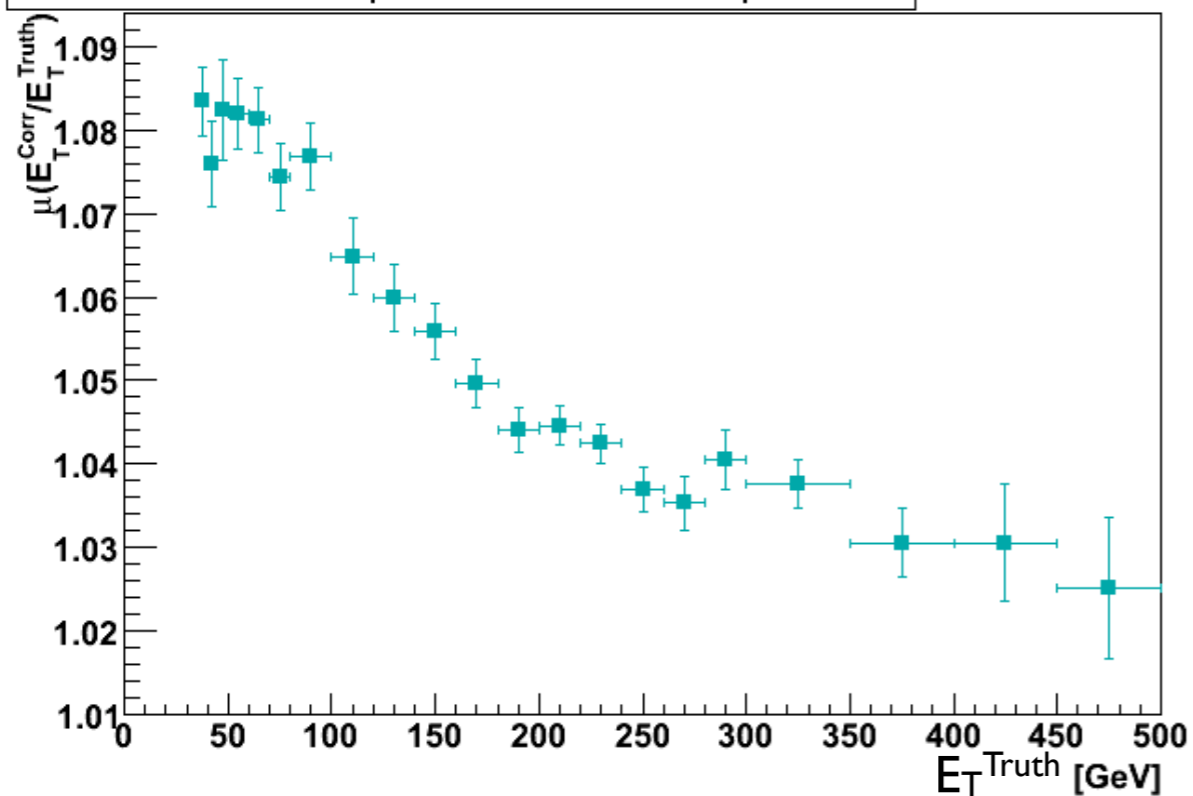
50 GeV < p_{T^γ} < 60 GeV



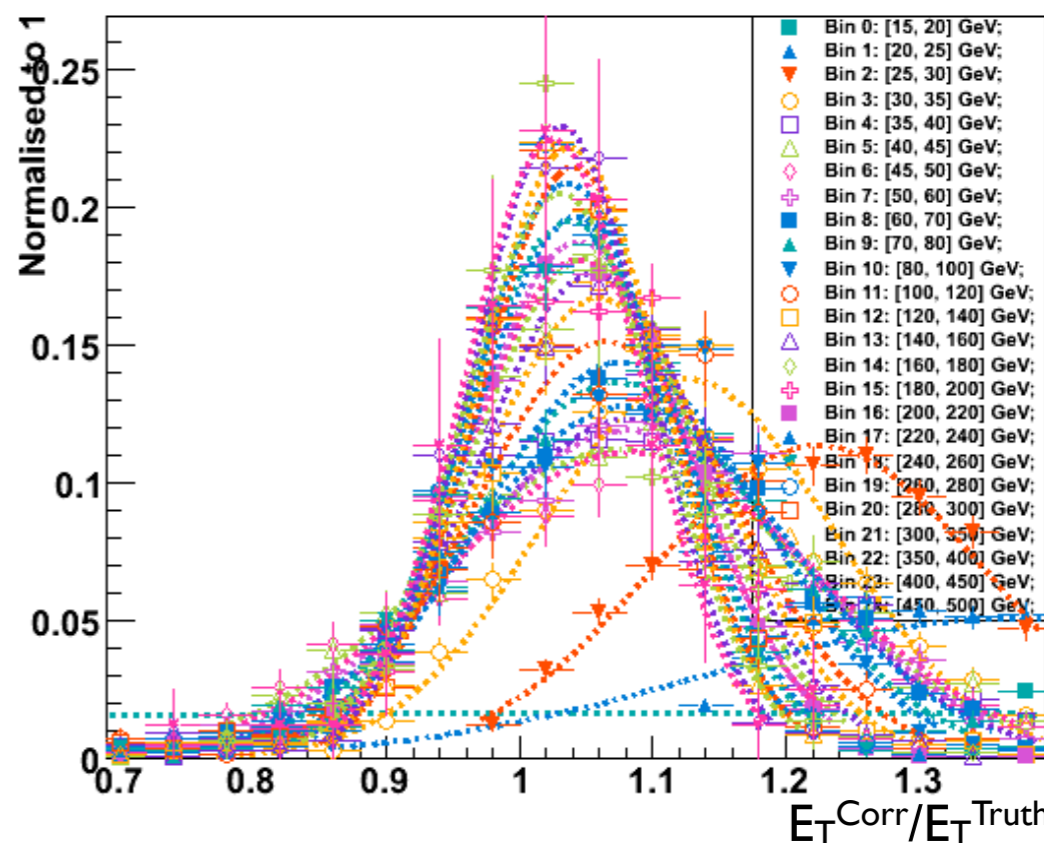
<u>_py_8</u>	
Entries	1918
Mean	1.011
RMS	0.2463
χ^2 / ndf	51.73 / 21
Prob	0.0002089
Constant	0.06296 ± 0.00209
Mean	1.004 ± 0.007
Sigma	0.2442 ± 0.0074

Truth balance

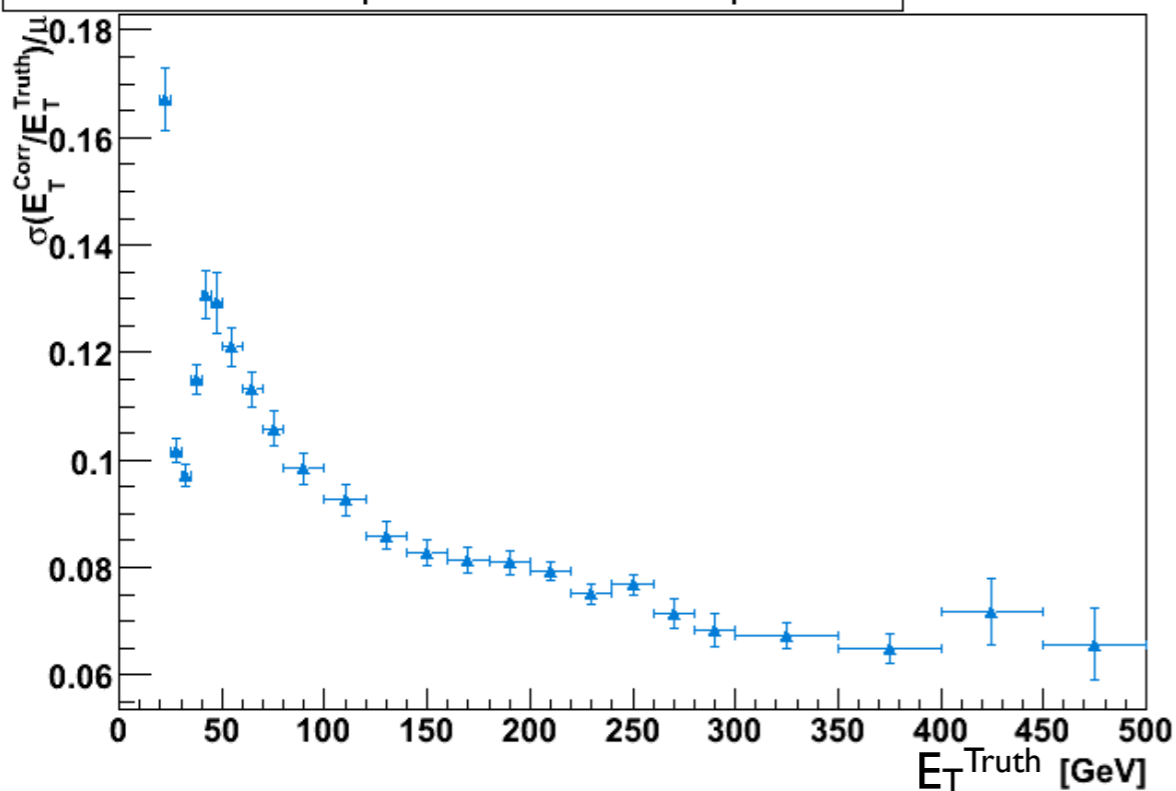
Jet E_T (Truth) - jet E_T (Corr) Balance Vs $E_T^{\text{jet}}(\text{Truth})$



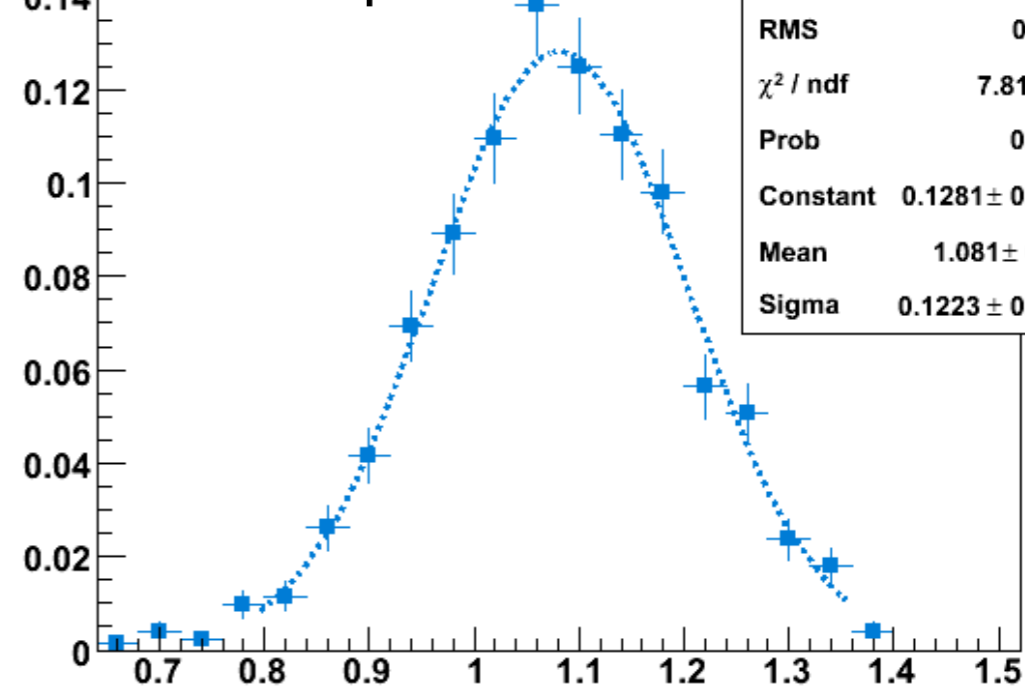
γ - jet E_T Balance



Jet E_T (Truth) - jet E_T (Corr) Balance Vs $E_T^{\text{jet}}(\text{Truth})$



$50 \text{ GeV} < p_T^{\text{truth}} < 60 \text{ GeV}$

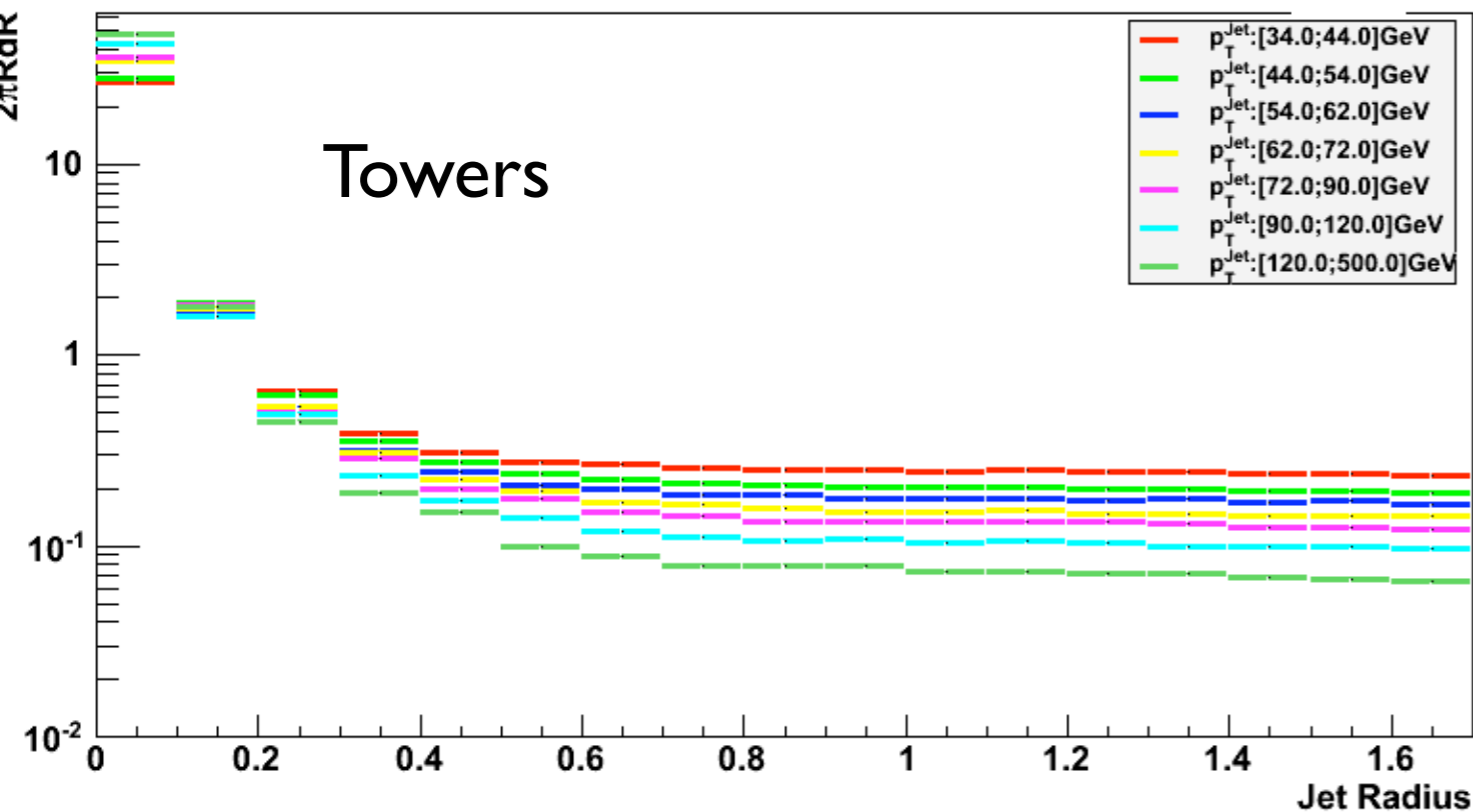
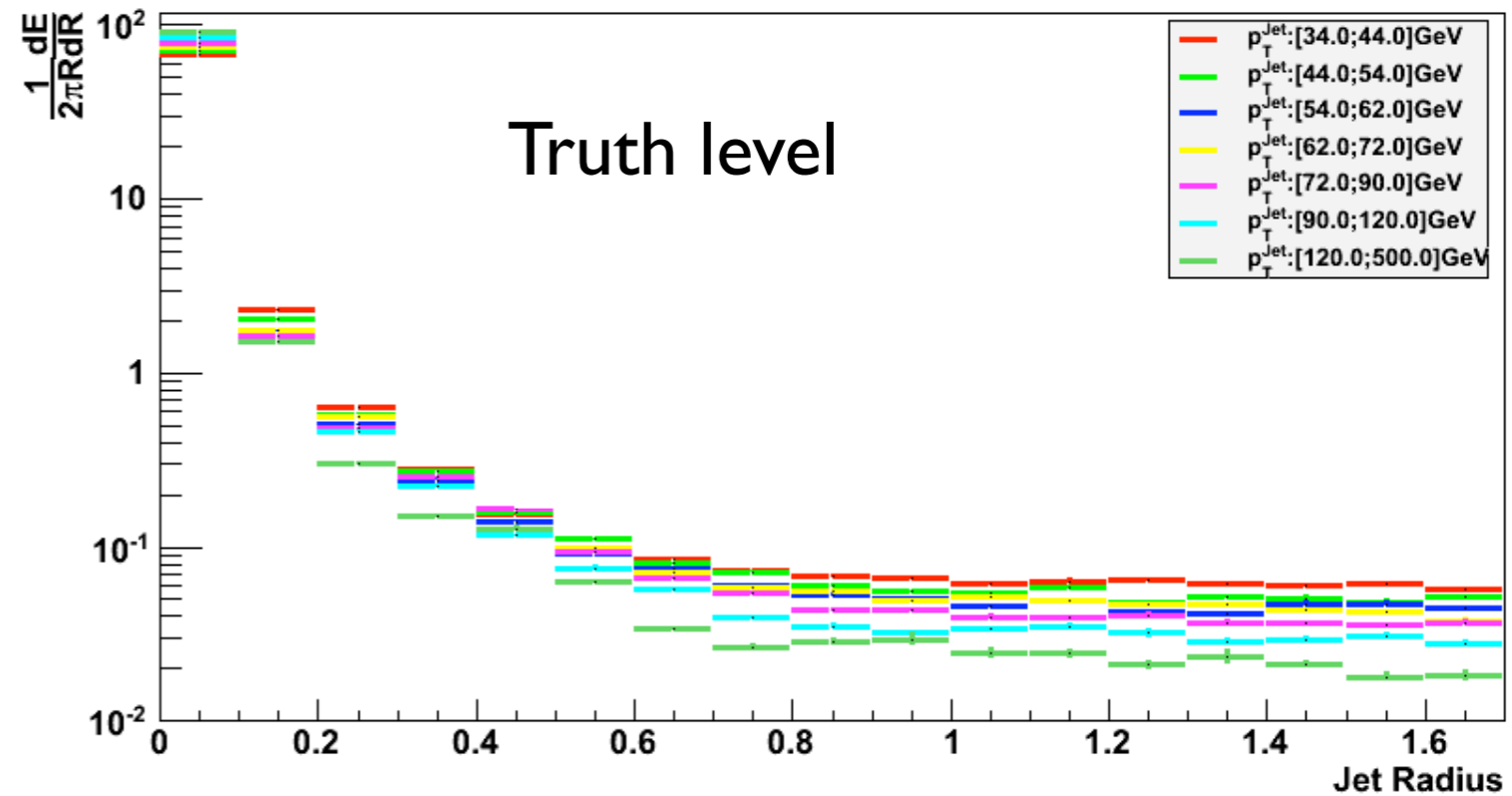


_py_8	
Entries	1224
Mean	1.077
RMS	0.1232
χ^2 / ndf	7.817 / 11
Prob	0.7296
Constant	0.1281 ± 0.0048
Mean	1.081 ± 0.004
Sigma	0.1223 ± 0.0034

Energy density vs R

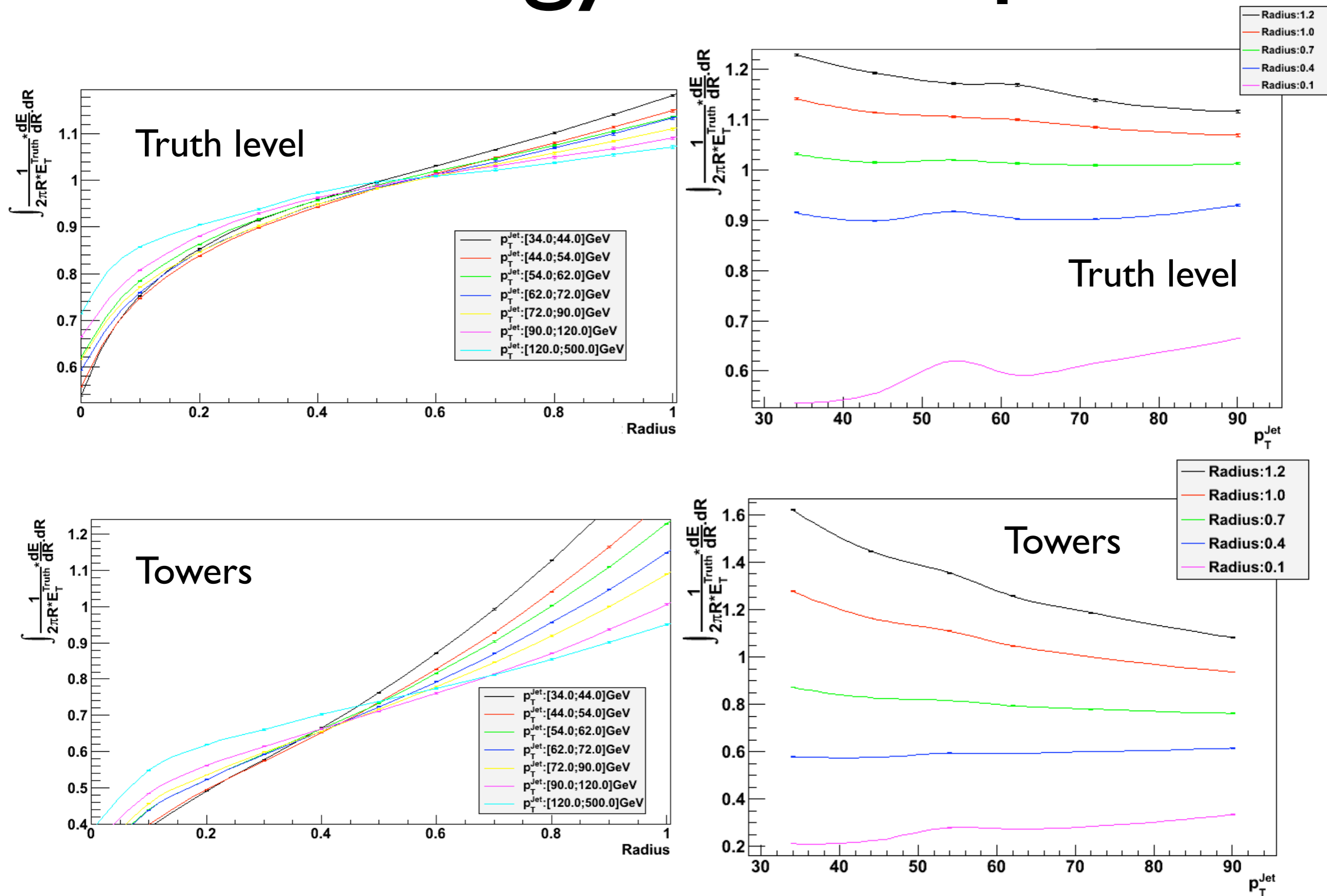
Energy density [GeV/(unit $\eta\phi$)]
as a function of the radial
distance from the jet axis

It is important to measure the
detail of the energy distribution
around the jet axis to have the
soft-physics under control

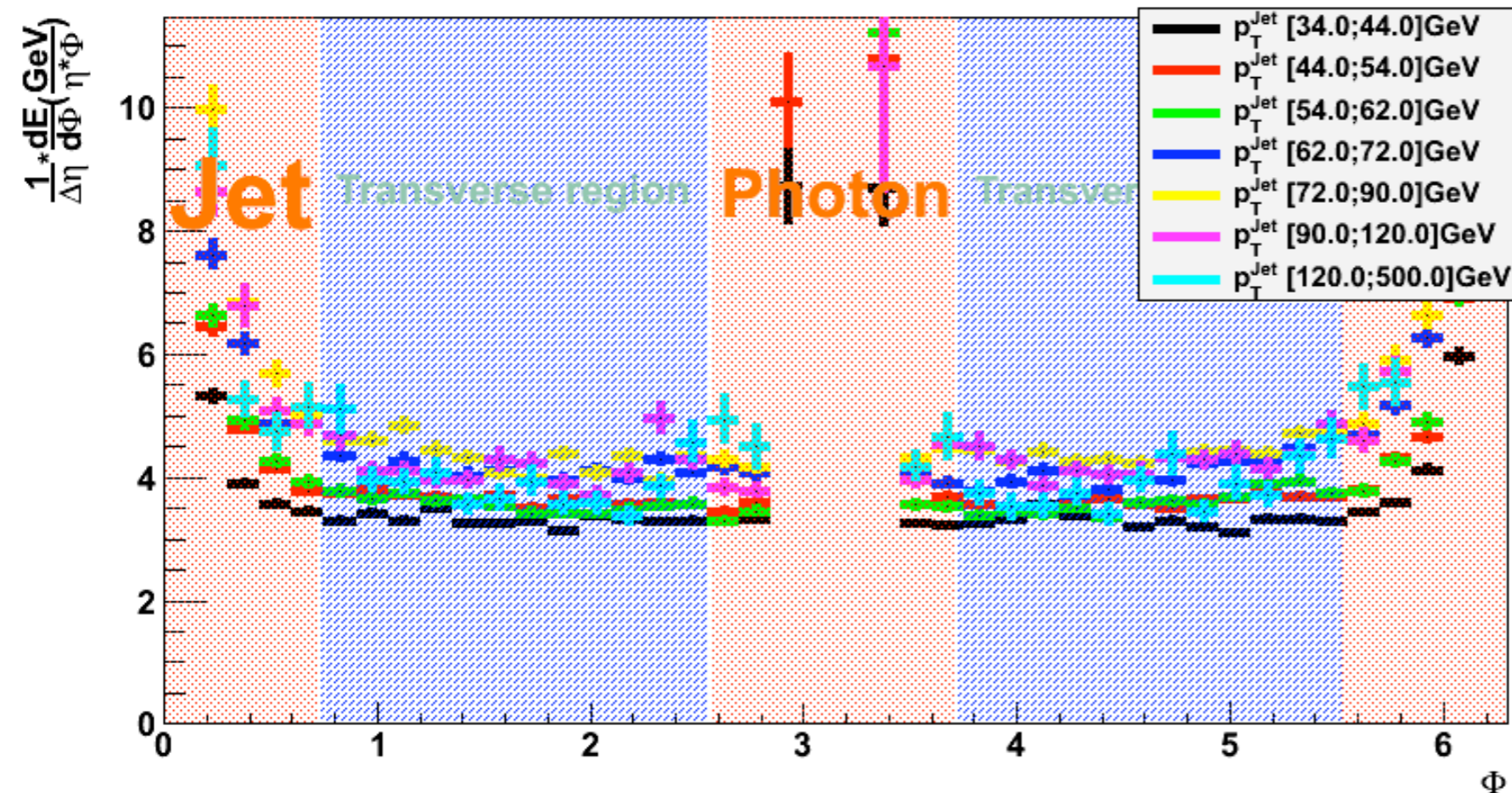


This variable can be used to
check the MC description of
data (systematics); and to derive
an out of cone energy correction

Energy vs R & p_T

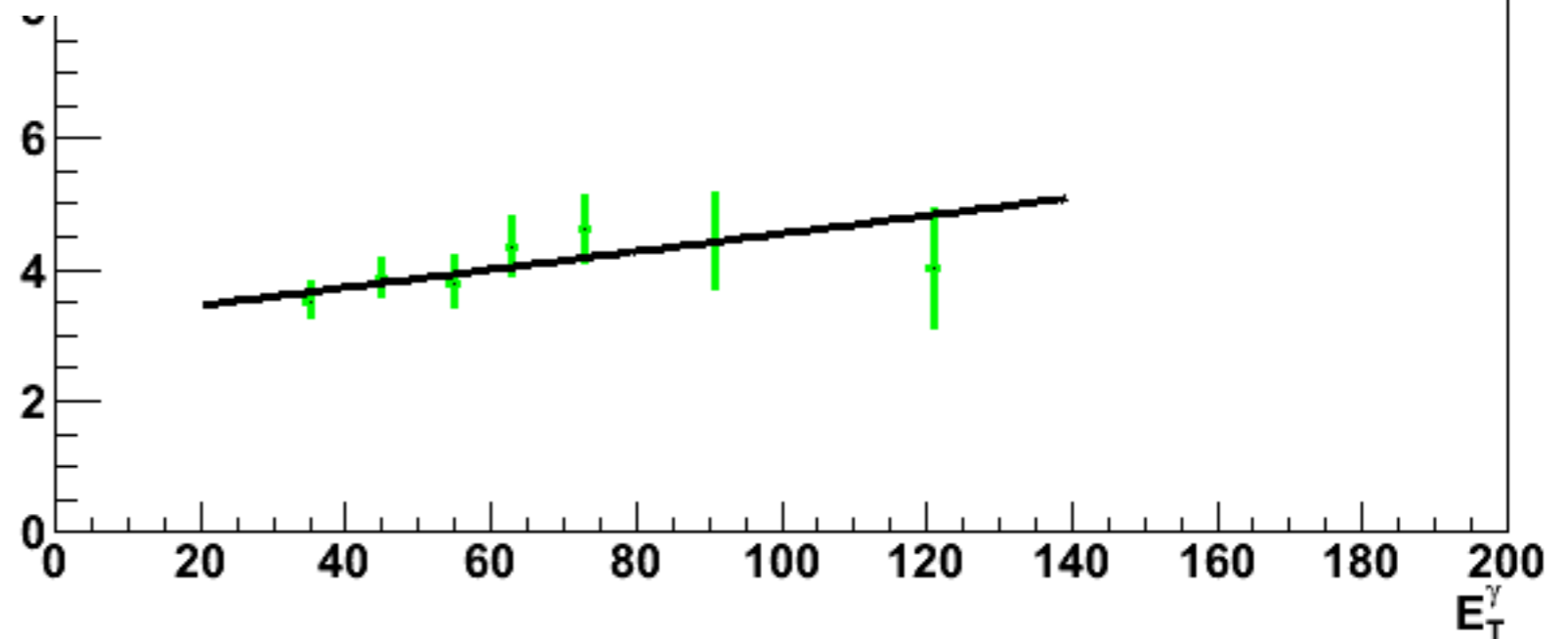


Energy density vs φ



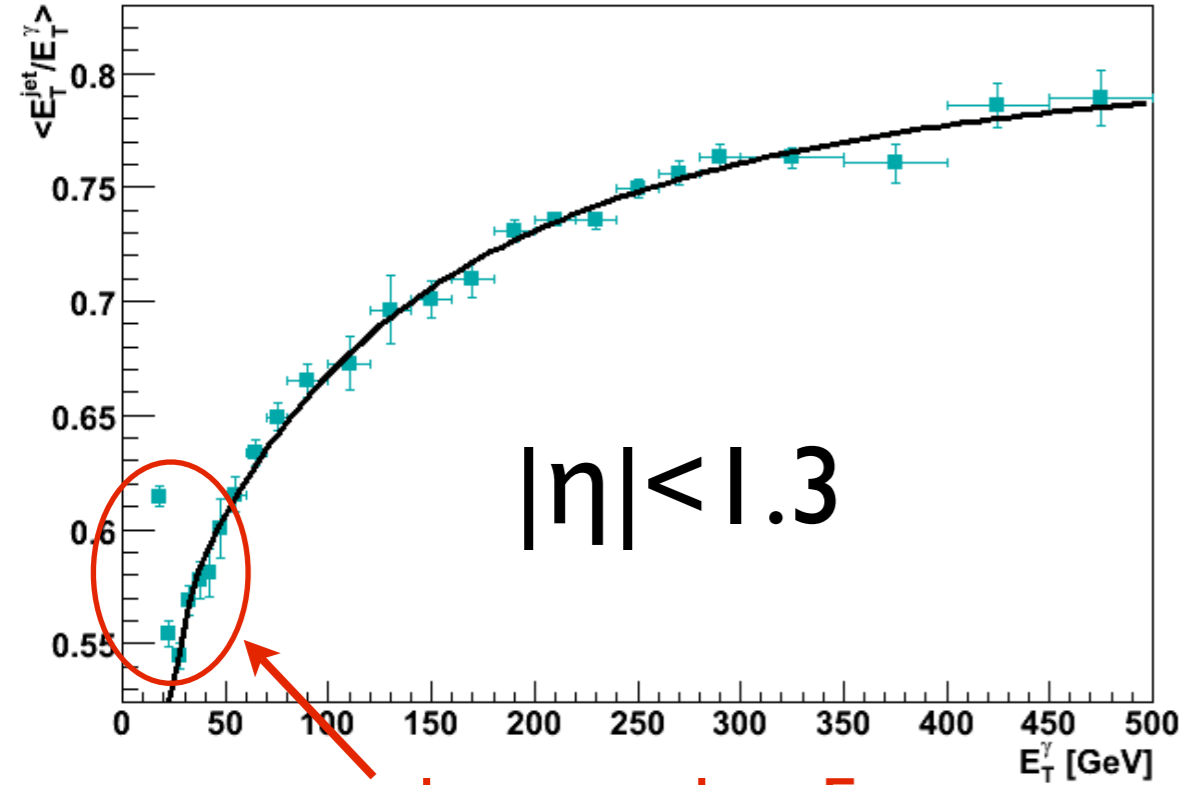
h3	
Entries	7
Mean	70.15
RMS	26.61
χ^2 / ndf	2.192 / 5
Prob	0.822
p0	3.184 ± 0.470
p1	0.01367 ± 0.00839

This variable can be used to check the MC description of data (systematics); and to estimate the contribution of the underlying event

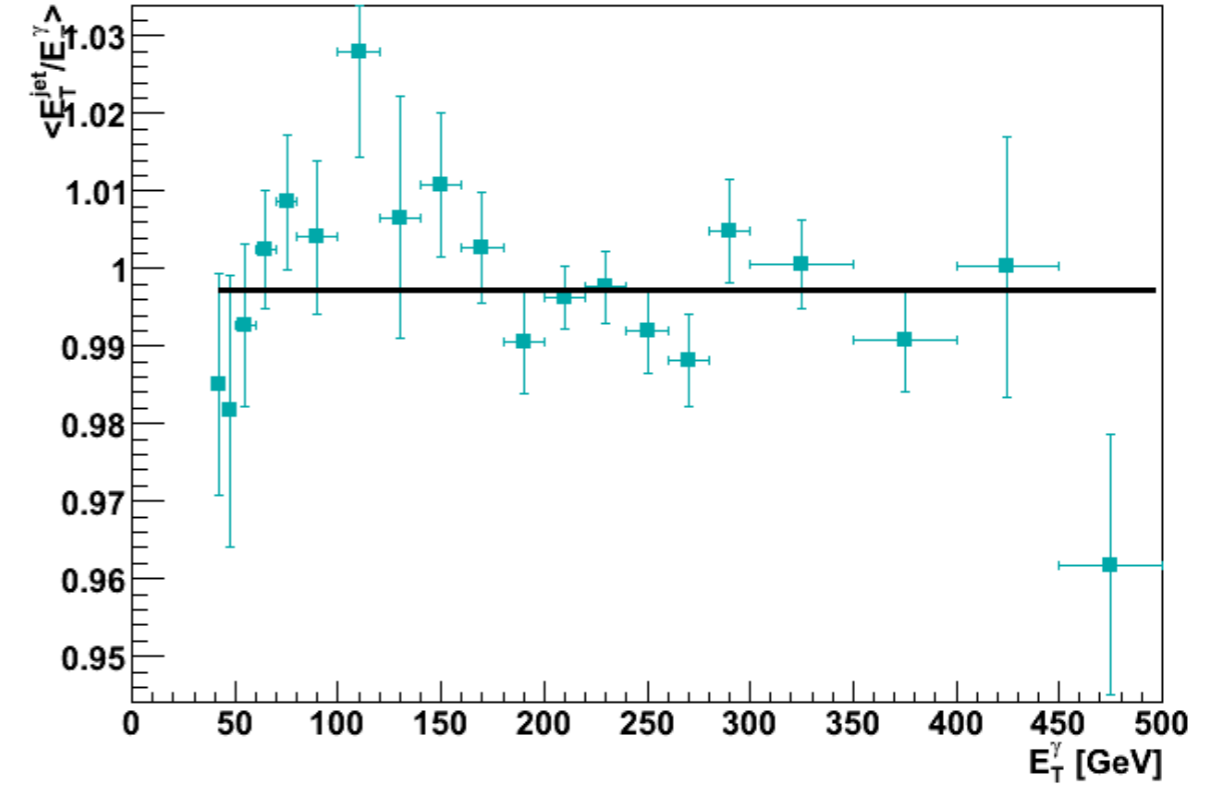


Balance versus η

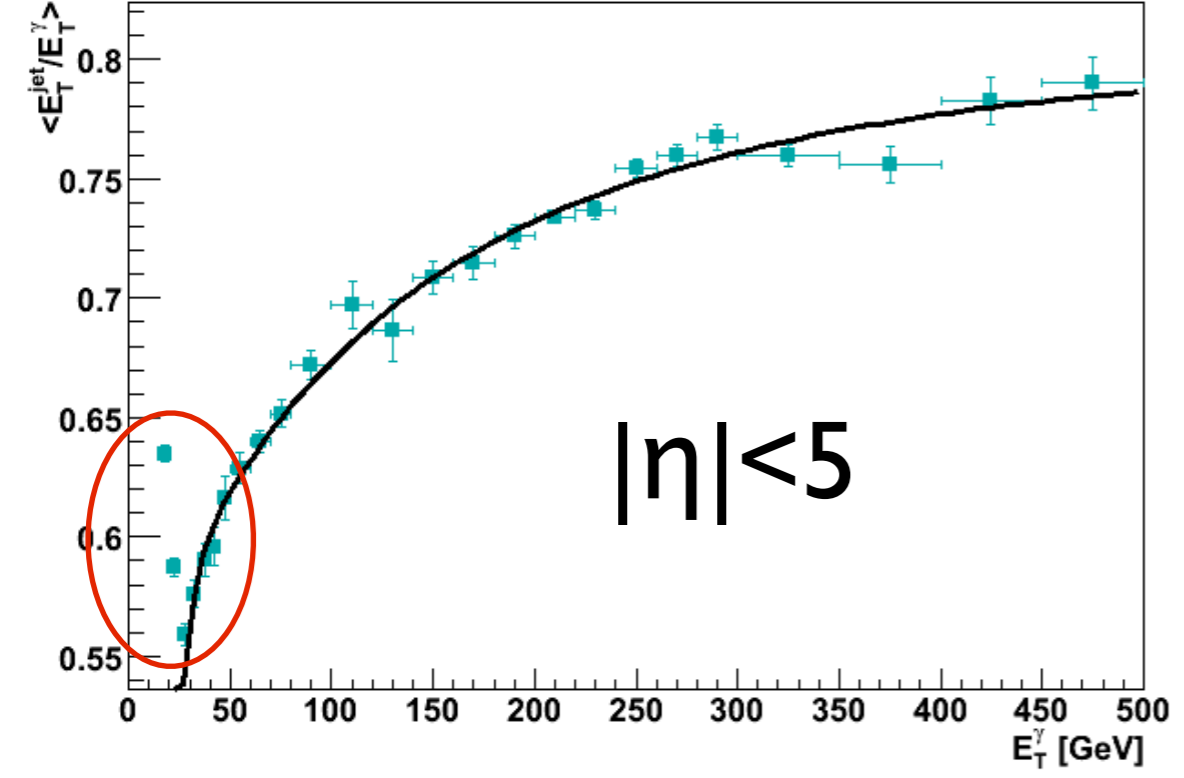
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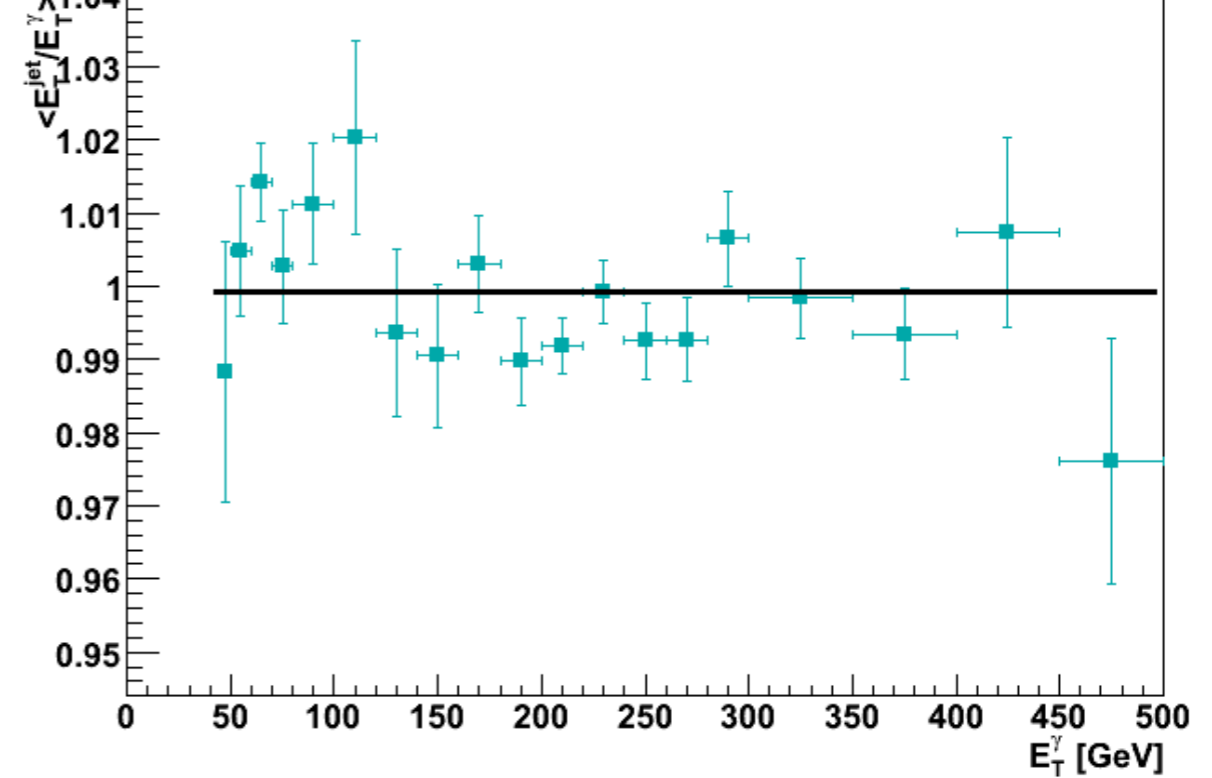
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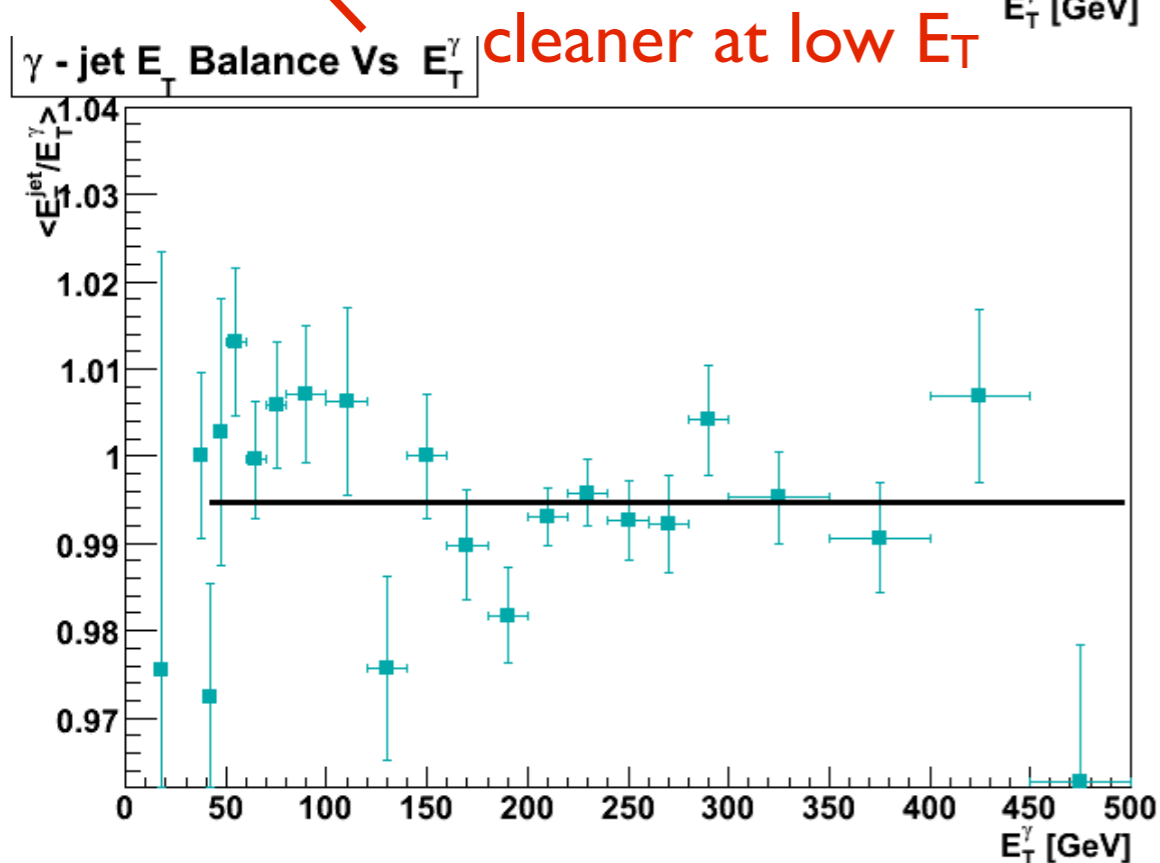
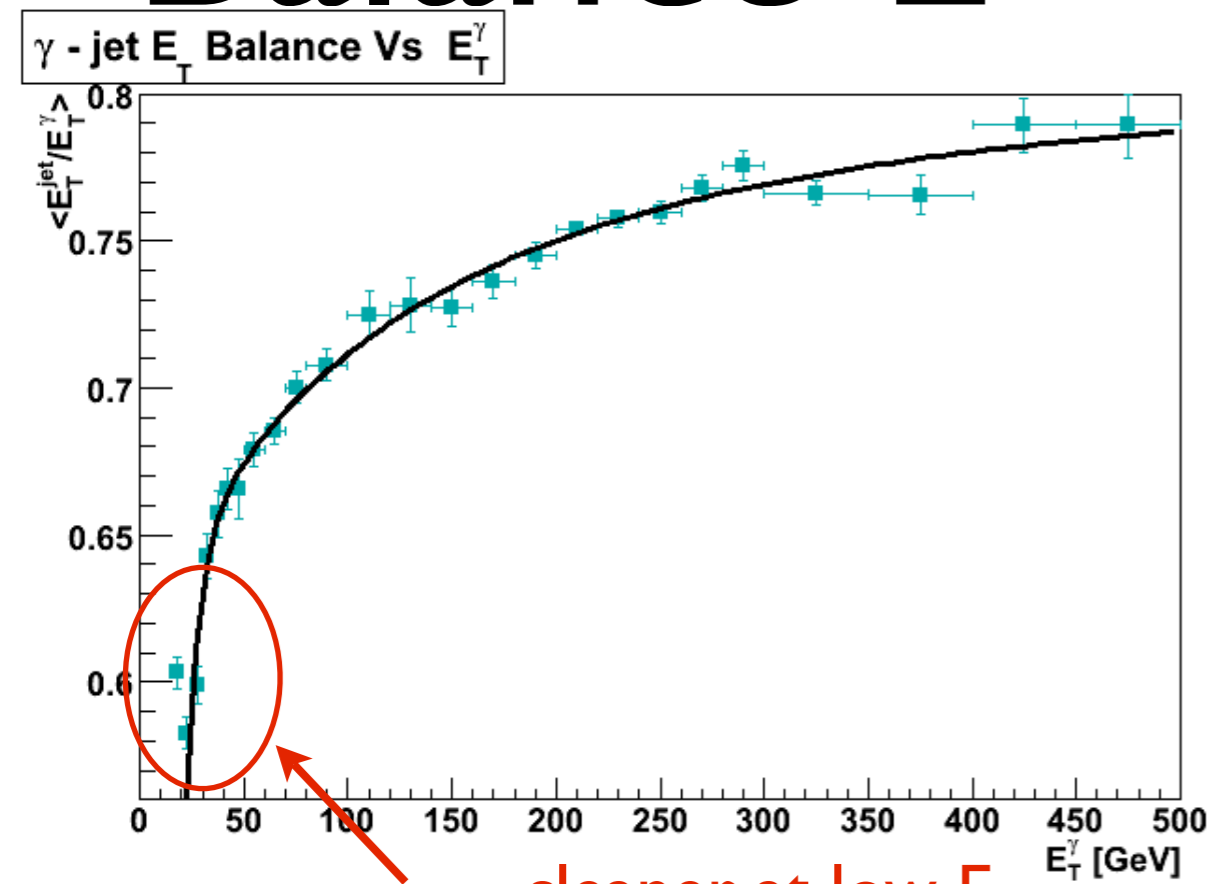


γ - jet E_T Balance Vs E_T^γ

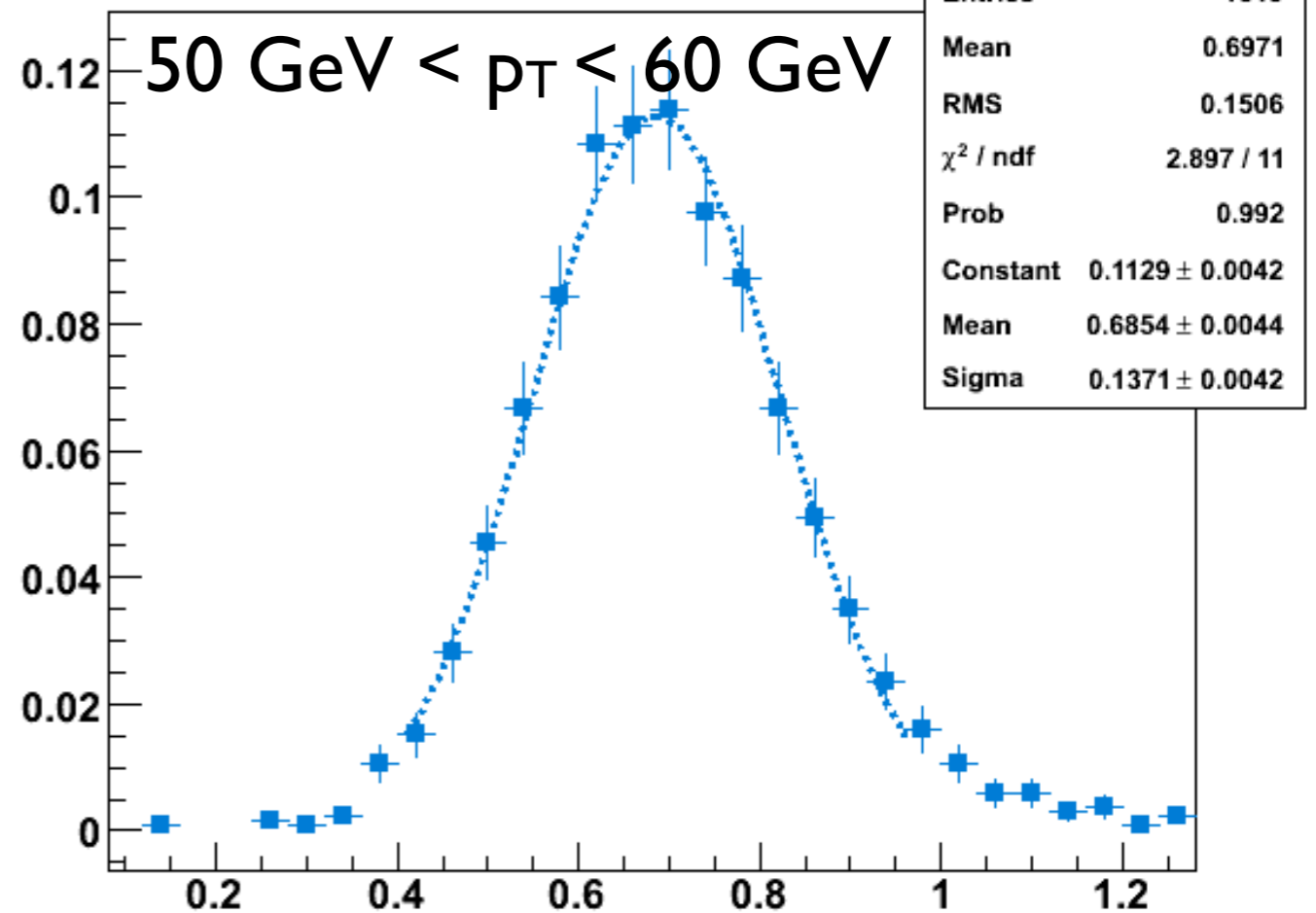


cleaner at low E_T

Balance $E_T^{2nd} / E_T^{1st} < 30\%$



EtBalancing vs Et gamma



Conclusions

- balancing using the numerical inversion method gives a linear result as a function of p_T with a spread of few %
- it is preferable a D2PD skimming procedure based on prescales. Selecting on E_T jet is biasing the results
- The event selection in $|\eta|$ and p_T of the second jet is not critical, but helps having a better control at low E_T
- the “out-of-cone”/ “underlying-event” energy is at the level of 10% @ 30 GeV and 5% @ 200 GeV (for AntiKt6HI topo), we need to be able to model it
- tower’s energy distribution as a function of ΔR and $\Delta\varphi$ gives a handle to correct for the soft physics

DPD skim strategy

