Correcting the MET for Mass Analyses

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MET in Mass fit

The hypothesis of standard model $t\bar{t}$ implies the production process

$$p\bar{p} \to t + \bar{t} + X,$$

followed by top decays. For the case in which one top decays leptonically, have

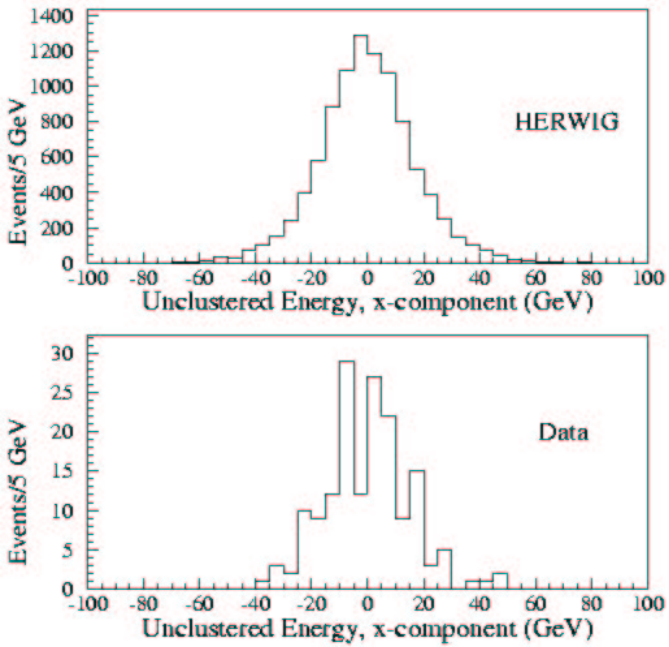
$$\begin{aligned} t &\to W^+ + b, \\ \bar{t} &\to W^- + \bar{b}, \\ W^\pm &\to \ell^\pm + \nu, \\ W^\mp &\to q + \bar{q}'. \end{aligned}$$

X_T is the measured quantity necessary for E−P Conservation in these equations.

How to correct X_T

$$\vec{X}_T = \vec{U}_T + \sum_{i=5}^{N_{jets}} \vec{E}_T(jet)$$

$$-\vec{\not{E}}_T = \vec{E}_T(lepton) + \sum_{i=1}^{4} \vec{E}_T(jet) + \vec{X}_T$$



Tried 4 methods in Run I (CDF 2547)

Why?
Need generic jet corrections (UE, OC) as well as AA corrections

$X_T = U_T * (sf)$ + Jets(5−N) corrected

The 4 methods gave masses that differed at most 1−1.5 GeV. Chose line 3.

−UE	+OC	no AA	AA
Y	Y	X	MET
Y	Y	MET	X
N	N	X	MET
N	N	MET	X

Unclustered energyCorrection(1)

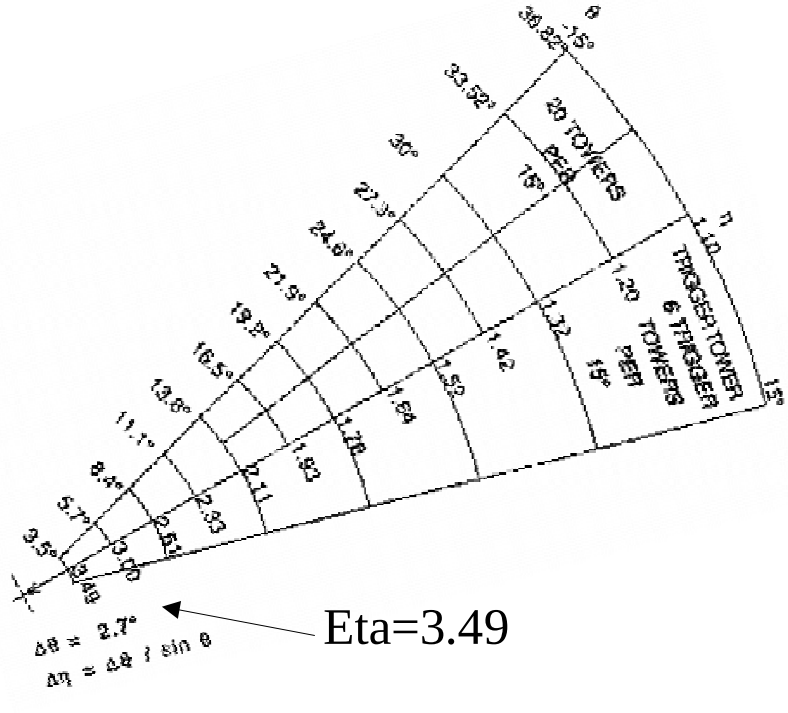
Unclustered energy :

Transverse energy left over after leptons and all jets are removed

1. how far do jets get? What is the lowest E_T and the largest eta we can go to in Run II?

	Jet E_T	eta
Run I	> 8 GeV	<3.4
Run II	> 8 GeV	< 3.0

for R=0.4, smaller for i cones



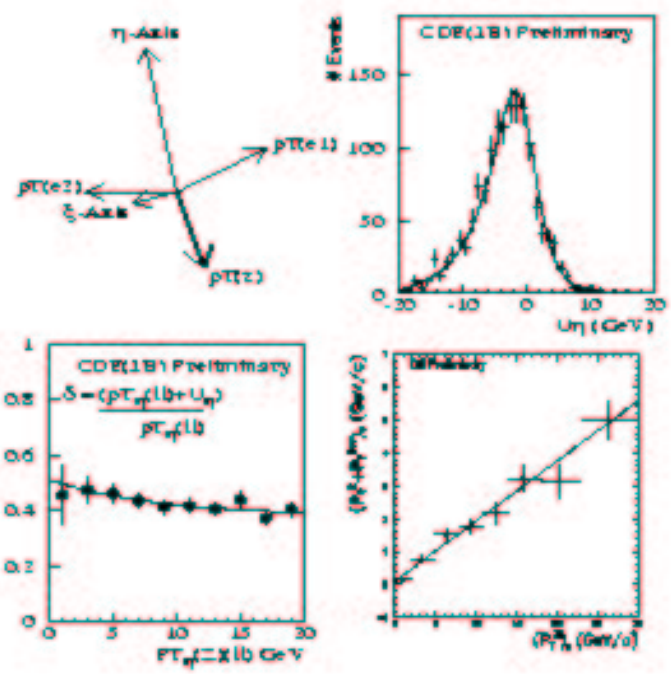
Both need studies:

Charles on eta

Jean−Francois on low jet ET

Unclustered energy correction(2)

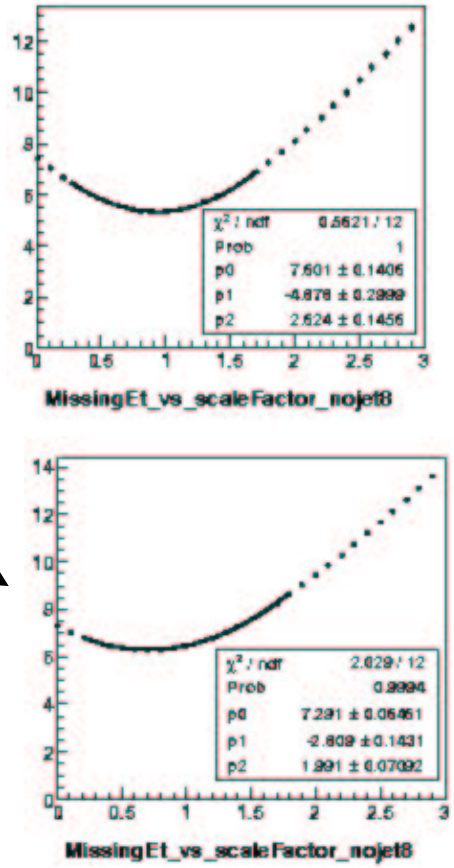
W mass group (Mark Lancaster , 1997) finds about 50% of the energy is detected. $Z \rightarrow ll$ channels are used. Bisector method



sf=2

Run II Z+jets (YKK+ Erik)

Sf = 1−1.2



Not a big effect on the mass now (< 1 GeV) . For better precision (3 GeV), we need to understand this. Less cracks in new calorimeter?

Conclusion

Many ways to correct the X_T and the MET

Basic corrections to U_T and the jets need to be done

More sofisticated corrections (including the AA corrections) lead to ambiguities: effects of the order of 1 GeV on the mass

In the fitters the MET is calculated after the value of X_T has been chosen.

MINUIT : you recalculate the MET after the X_T has been modified by the fit (searching for the min. χ^2)

SQUAW: it is one of the unknowns of the fit. Uses the initial entry as a starting point for the fit