

MET Significance

Xin Shi (Cornell)

March 27, 2009

Input Objects in MHT

• "Selected Layer1" Jets, Electrons, and Muons from PAT

with additional cuts:

- Jets : $p_T > 20 \text{ GeV}$, $|\eta| < 5.0$, EMFraction < 0.9
- Electrons : $p_T > 10 \text{ GeV}$, $|\eta| < 3.0$
- Muons : $p_T > 10 \text{ GeV}$, $|\eta| < 2.5$

If user changes the selection cuts in the "Selected Layer1" config file, it will affect these objects.

• Objects resolutions taken from formula inside PATMHTProducer

For jets, the fractional E_T resolution is written as an expansion

in $1/\sqrt{E_T}$ of the reconstructed jet

$$\left(\frac{\sigma_{E_T}}{E_T}\right)^2 = \left(\frac{a}{E_T}\right)^2 + \left(\frac{b}{\sqrt{E_T}}\right)^2 + c^2$$

with $a = 5.6$, $b = 1.25$, and $c = 0.033$ as given in Physics TDR (Ch. 11.4)

Check those numbers
with Marek Zielwinski

MET Significance

Xin Shi (Cornell)

March 27, 2009

SUSY All Hadronic Analysis (CMS CR 2007/053)

Datasets

/SUSY.LM1-sftsh/Summer08/IDEAL.V11_redigi.v1/GEN-SIM-RECO
/TTJets-madgraph/Fall08/IDEAL.V11_redigi.v10/GEN-SIM-RECO

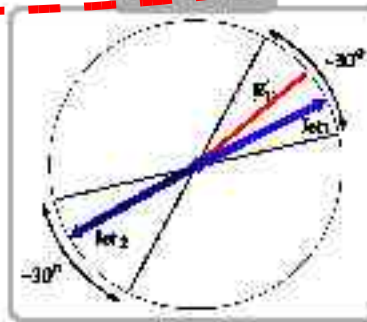
Source Code

- SusyAnalysis/EventSelector V01-02-01 *
 - SusyAnalysis/AnalysisSkeleton V01-01-01
- * Need to create MHTEventSelector.

Events Selection

- Num of jets ≥ 3
- jet 0 ET > 180 GeV, jet 1 ET > 110 GeV, jet 2 ET > 30 GeV
- $R1 > 0.5$, $R2 > 0.5$ where
$$R_{1(2)} = \sqrt{\tilde{m}_{\tilde{g}\tilde{t}_1}^2 + (\pi - \tilde{\phi}_{\tilde{g}\tilde{t}_1}^2)^2}$$
$$\tilde{\phi}_1 = |\phi_{j_1} - \phi(E_T^{miss})|, \tilde{\phi}_2 = |\phi_{j_2} - \phi(E_T^{miss})|$$
- EM Fraction > 0.1

R1 & R2



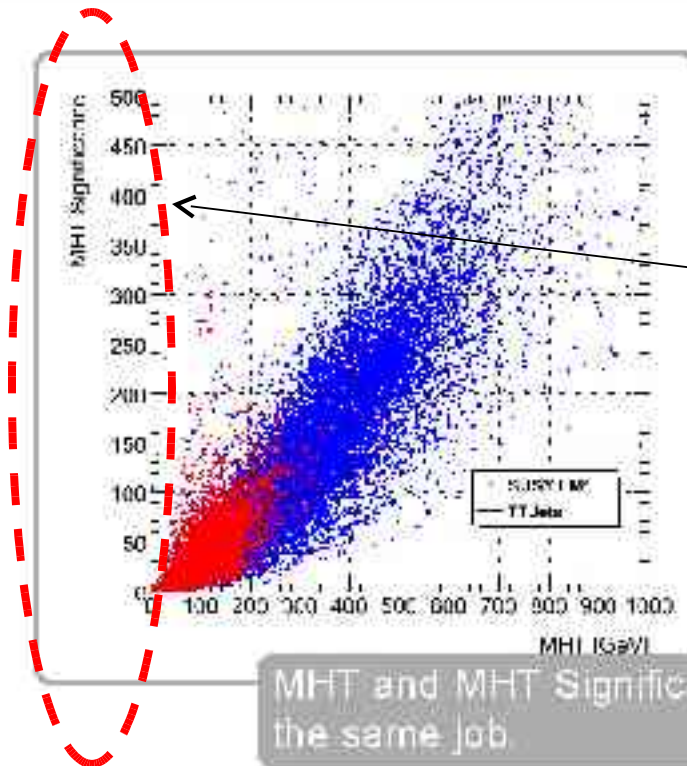
What if version 2 is used?

MET Significance

Xin Shi (Cornell)

March 27, 2009

MHT vs. MHT Significance (SUSY LM1 and TTJets)



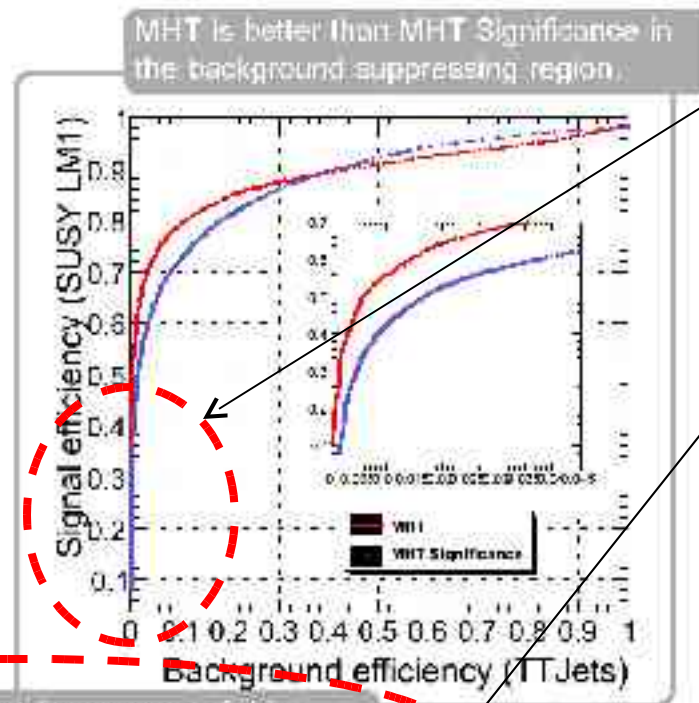
Why cannot we define the MET significance like “3 as 3sigma”?

MET Significance

Xin Shi (Cornell)

March 27, 2009

Signal Efficiency vs. Background Efficiency



The Significance might not be very useful in large MET case.

- 1) Can you re-plot in log-log scales? Many SUSY analyses ended up with Eff $\sim 1-10\%$. So we should check the range.
- 2) Have you applied for a veto on leptons? In other words, $t\bar{t}b\bar{b}$ events with large MET significance are mostly due to leptonic decay of W in $t\bar{t}b\bar{b}$?