

# FULL SIMULATION RESULTS PART I

## LEPTON RECONSTRUCTION

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# Outline

- Electron Reconstruction
- Muon Reconstruction
- Di-Lepton Edge
- Tau Reconstruction and Mass Edge
- b-tagging in SUSY events

# Electron Reconstruction

$$\text{Plot } \int_{R_{e,MC}}^{\text{inf}} dR' \frac{dN}{dR'} (e_{\text{reco}} - e_{\text{MC}})$$

## Fake Electrons

Match Reconstructed  $e$  to Closest MC  $e$

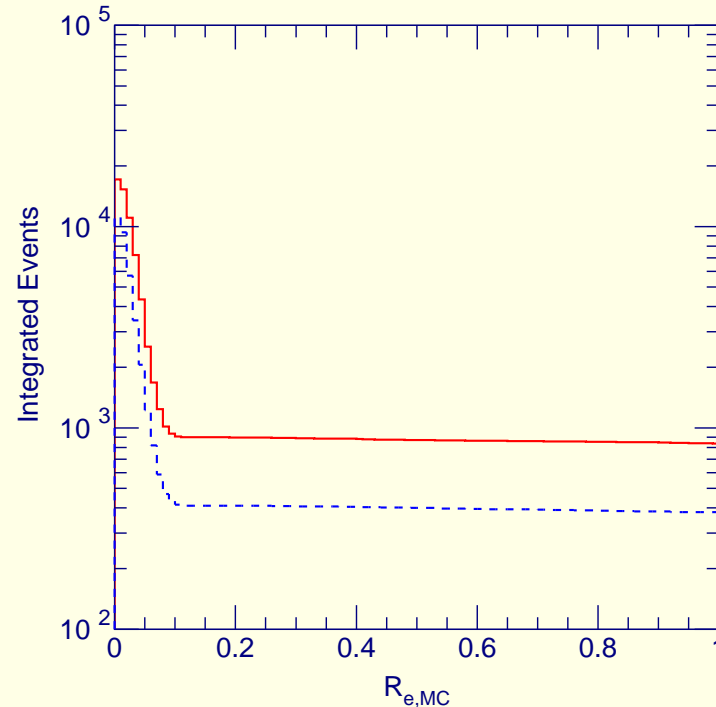
Mostly  $\Delta r < 0.1$ , but  $\approx 4\%$  fakes

If fakes are from jets, have 6.3 jets and 0.16 electrons per event, so fake  $e/j$  rate is  $\sim 10^{-3}$ .

No cut applied on TRT

Fake  $e$  at  $\eta=1.1$  (TileCal gap)

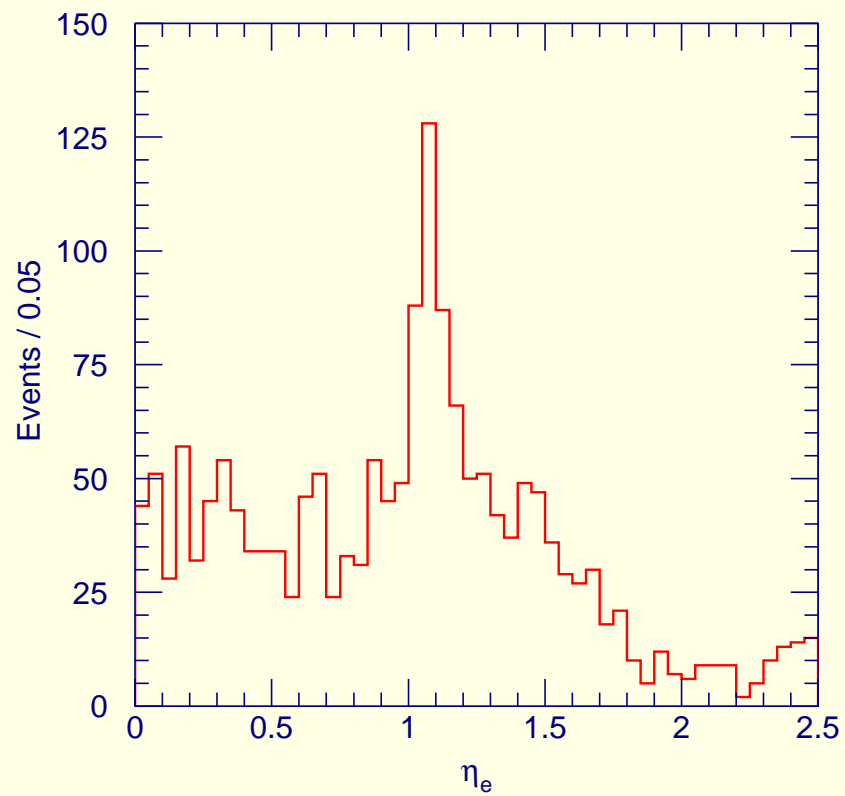
Fake  $e$  from hadronic  $\tau$ 's



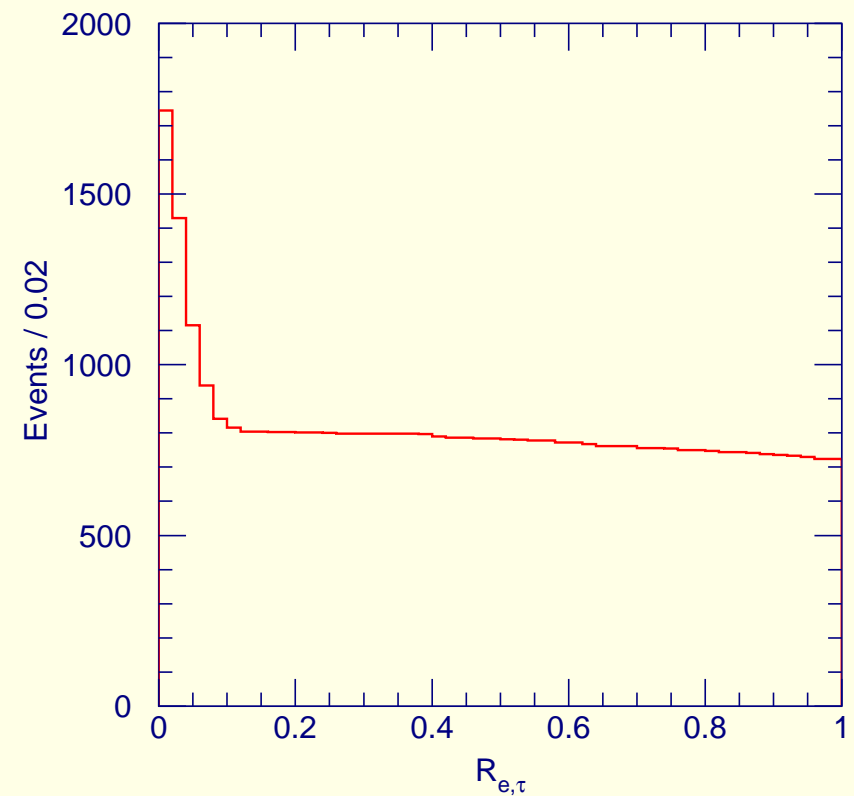
Red: Electrons with  $P_T > 10\text{GeV}$

Blue: Electrons with  $P_T > 25\text{GeV}$

## Electron Reconstruction (2)



Fake  $e$  at  $\eta=1.1$  (TileCal gap)



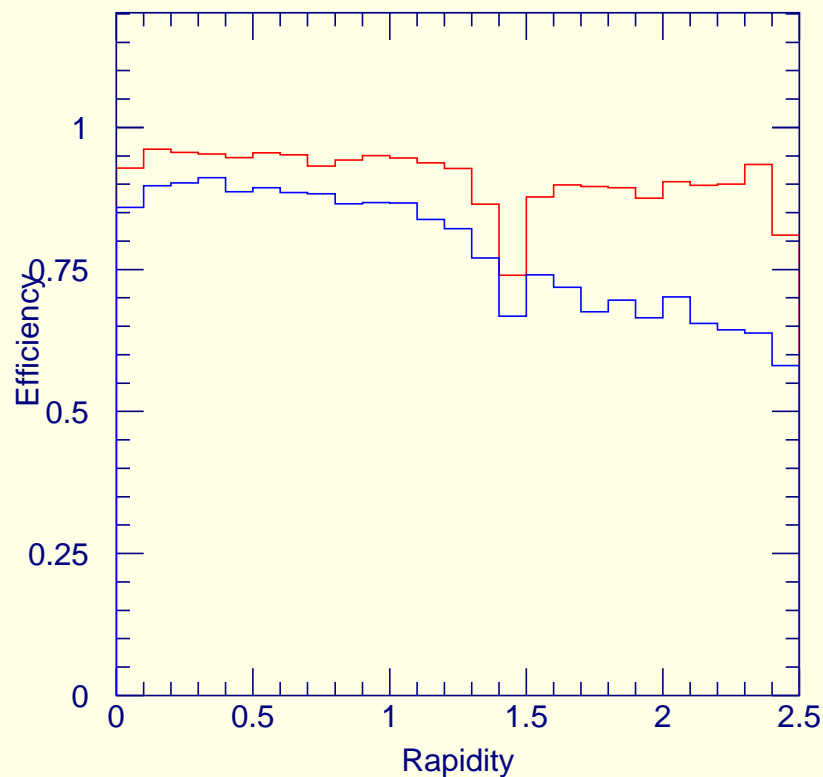
Fake  $e$  from hadronic  $\tau$ 's

# Electron Reconstruction (3)

## Electron Efficiency:

Match MC  $e$  to Reconstructed Electron

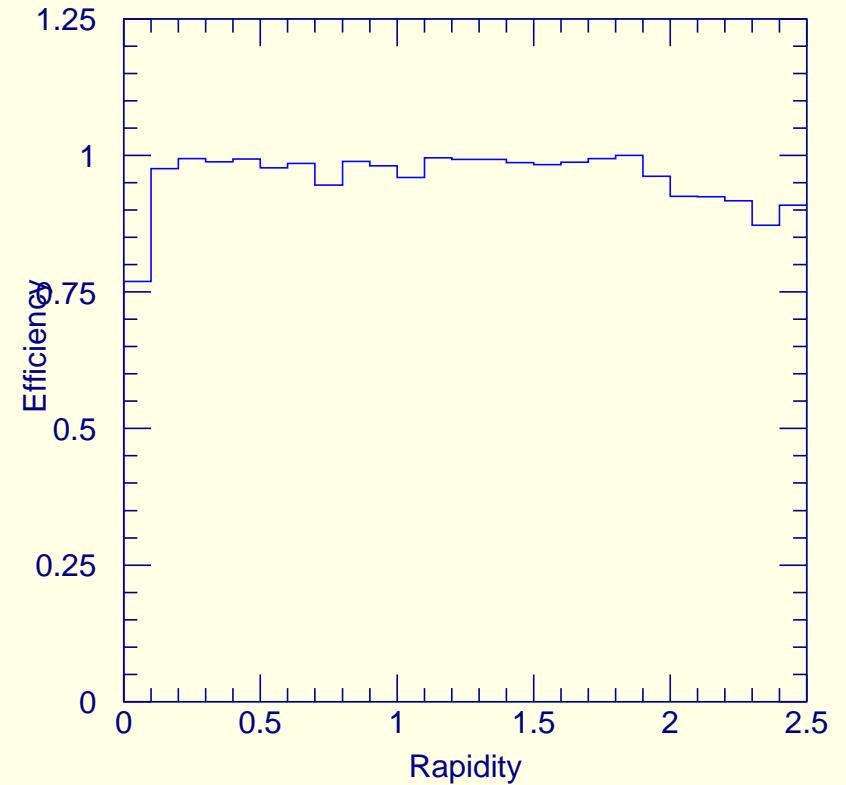
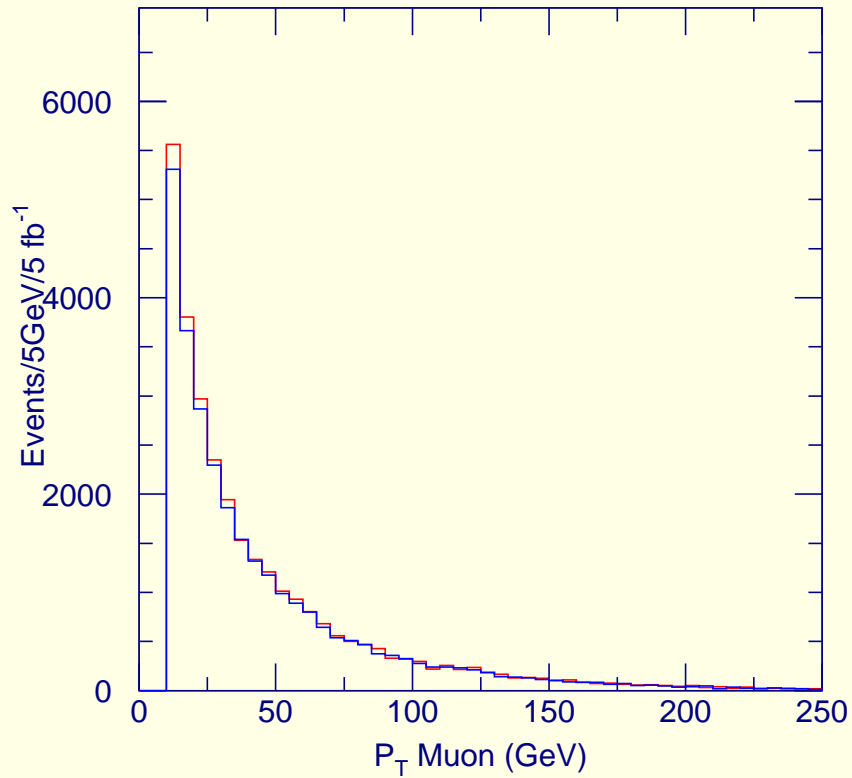
Require isolated MC  $e$  ( $< 5$  GeV within  $\Delta R < 0.2$  of the electron)



Track Match : xKalman (red),  
Ipatrec (blue)

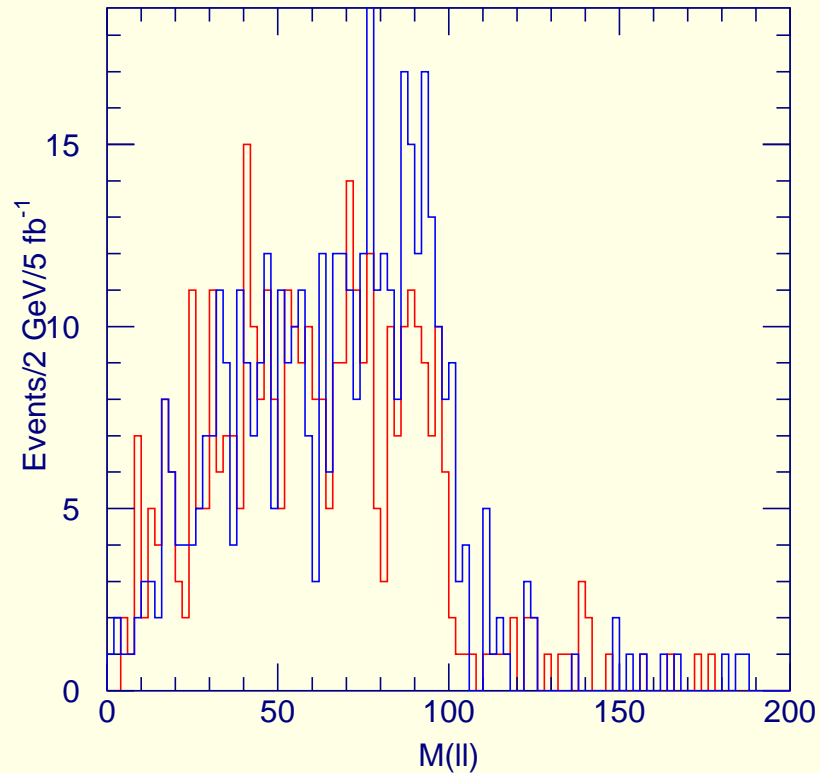
# Muon Reconstruction

MuonBox  $P_T$  of the track at the vertex, Moore  $P_T$  at the spectrometer (MuID not ready when we reconstructed the events)

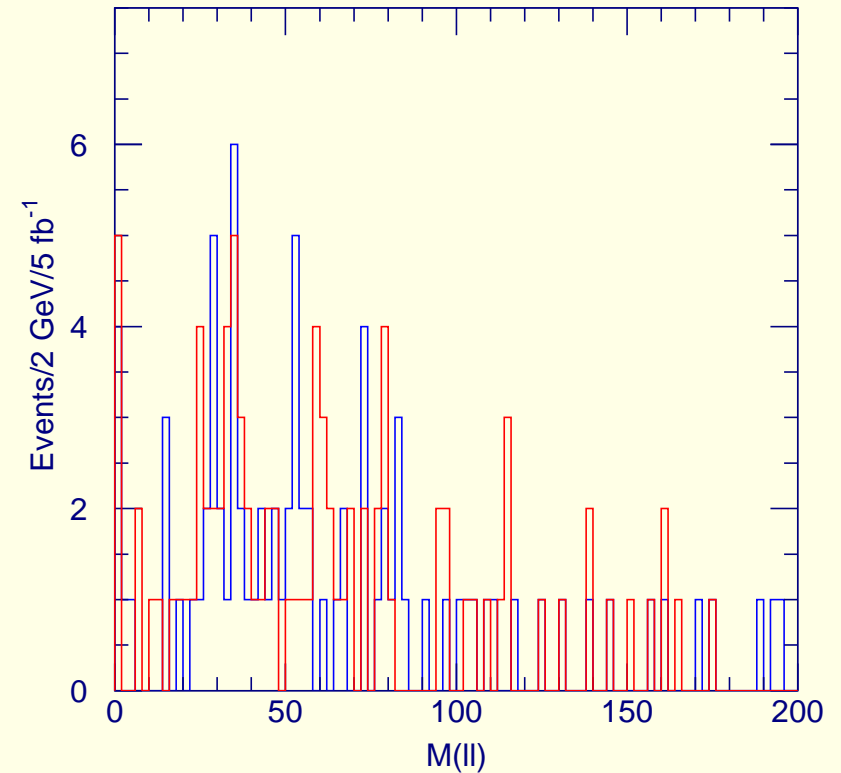


# Di-Lepton Edge

Di-Lepton mass expected to have an Edge at 100.16 GeV:  
Rescale Electron  $P_T$  by 1.016



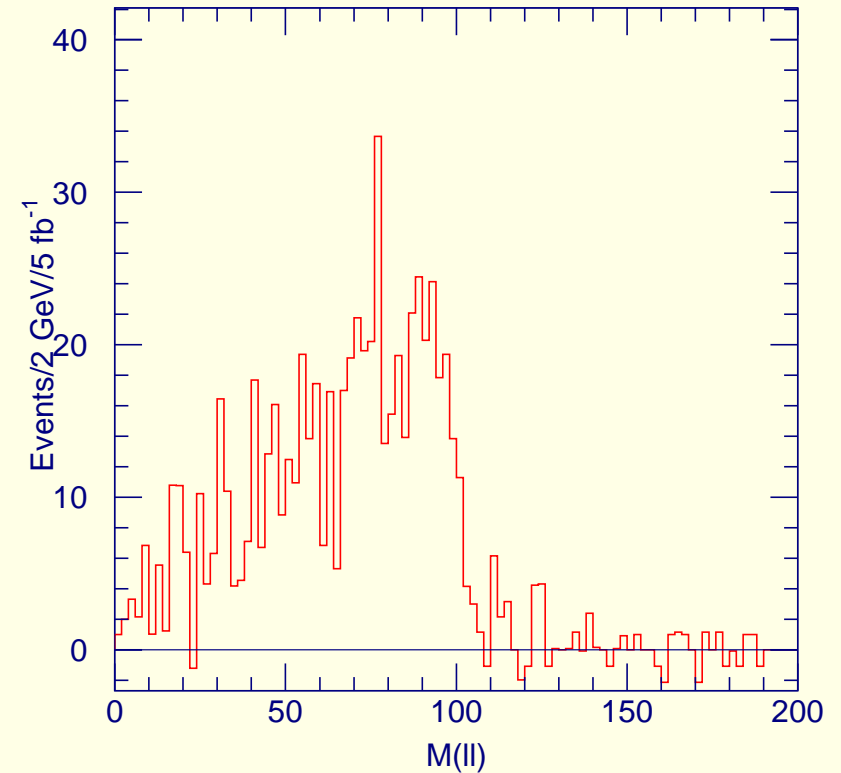
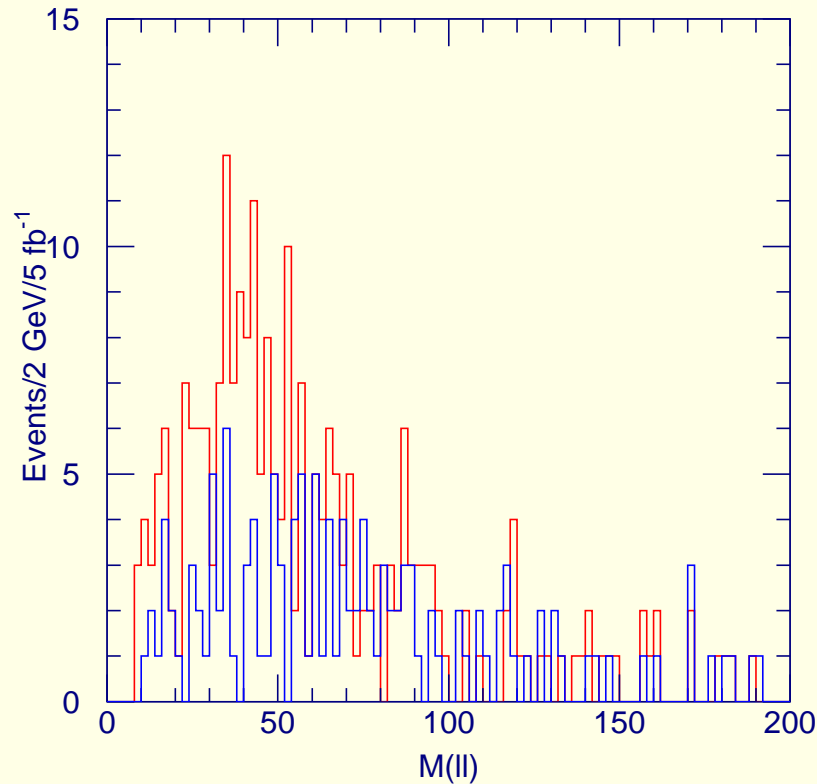
Same-Flavor/ Other-Sign Lep.



Same-Flavor/ Same-Sign Lep.

# Subtracted Mass Distribution

Subtract the OF-OS Mass Distribution. (Remove the  $\tau\tau$  events)  
Apply an efficiency correction of 1.16 for Electrons



Other-Flavor Leptons

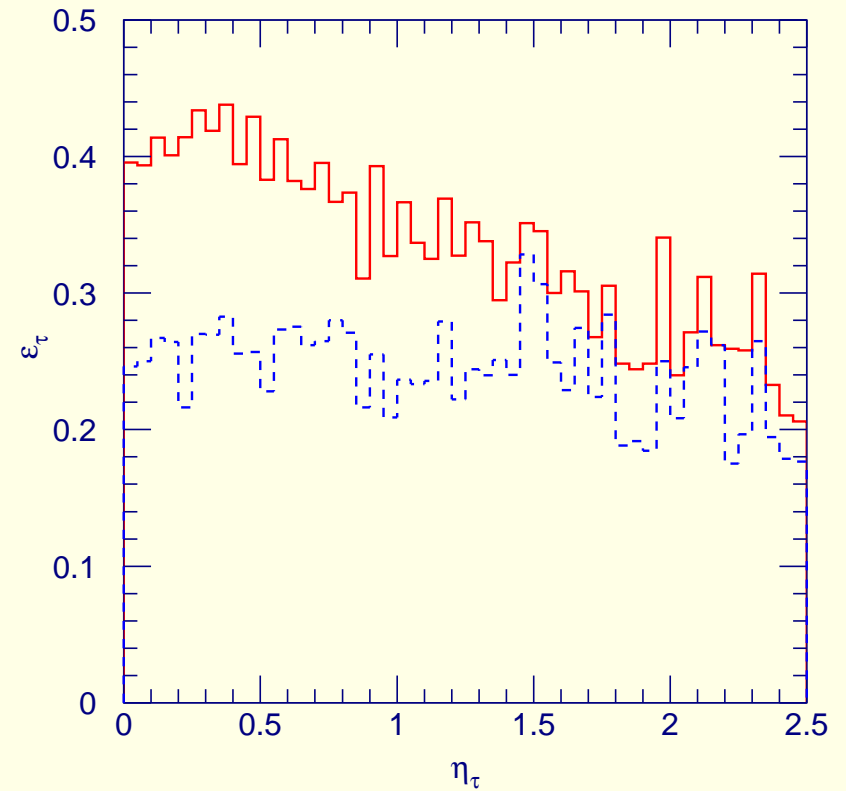
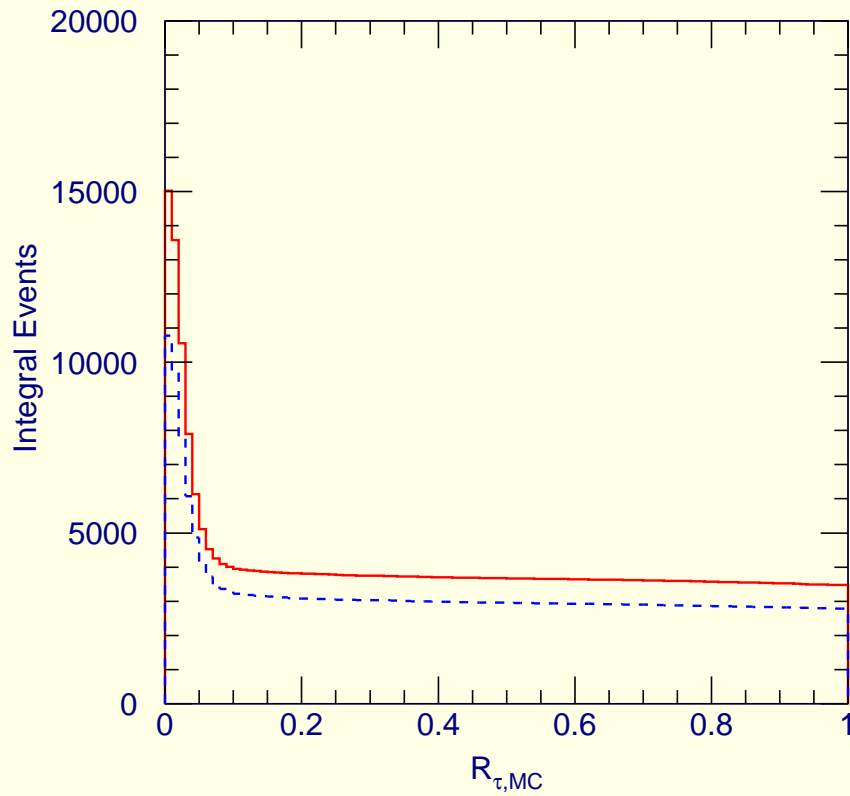
$$(e^+e^-) + (\mu^+\mu^-) - (e^+\mu^-) - \dots$$

# Tau Reconstruction

Require  $L_\tau > 0.5$  (new Tau-Likelihood)

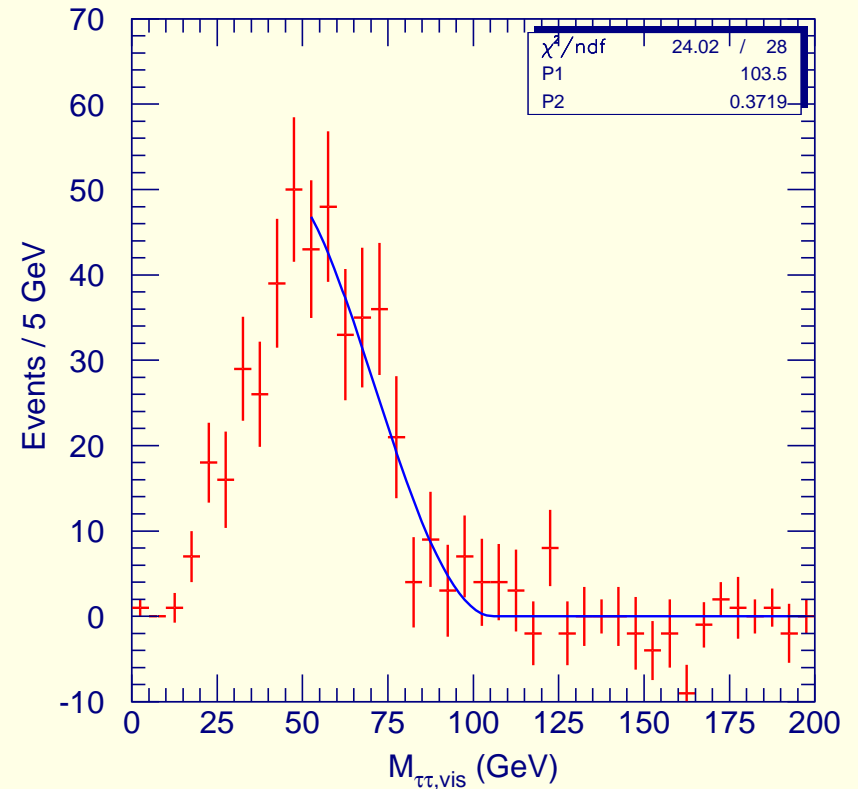
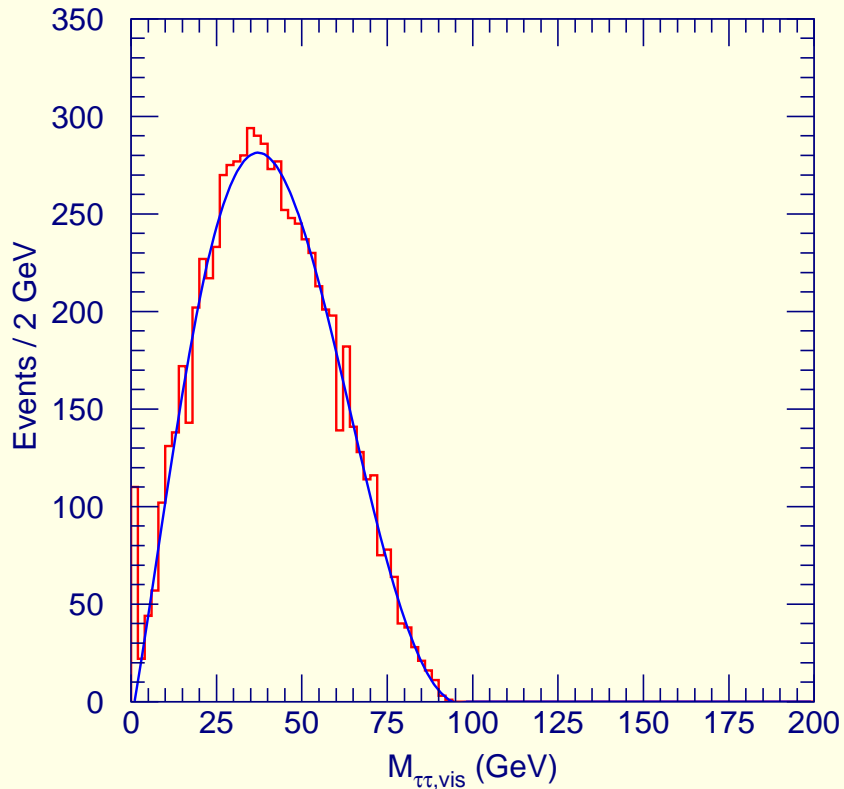
1 track with  $p_T > 2 \text{ GeV}$ , and hadronic energy.

Tau's reconstruction with noise (and pile-up) needs optimization



# Tau-Tau Invariant mass

Use all Monte Carlo  $\tilde{\chi}_2^0 \rightarrow \tilde{\tau}_1^\pm \tau^\mp$  events to determine  $M_{\tau\tau,\text{vis}}$  distribution. Fit this shape to reconstructed  $\tau^+\tau^- - \tau^\pm\tau^\pm$  mass to find endpoint and normalization:



Fit,  $103.5 \pm 4.9 \text{ GeV}$  is consistent with true value. Sensitive to fit range.

# $b$ -tagging in SUSY events

$b$ -jets from  $\tilde{b}$  decays  
used to Reconstruct initial state  
(see next talk)

Jet weight defined with 2-3 tracks  
passing quality cuts per jet

Readapt the code on the  $b$ -tag  
group web page (1999)

Use 3D  $b$ -tagging in the last week

MC Truth: A jet is from  $b$  if a  
 $B$  hadron is present in the jet cone



# $b$ -tagging in SUSY events

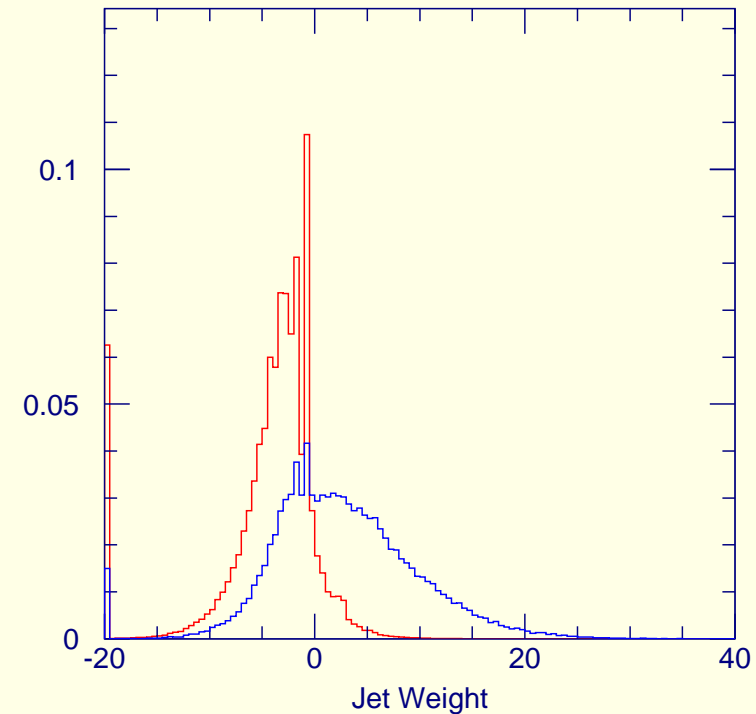
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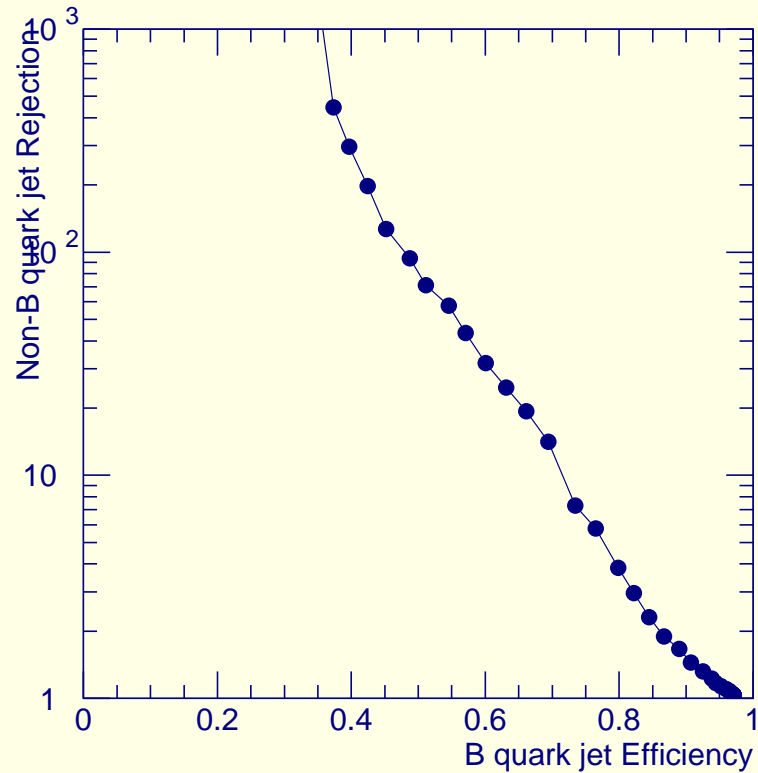
MC Truth: A jet is from  $b$  if a  
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# Efficiency for 3D $b$ -tagging

Use 25% of  $WH$ ,  $H \rightarrow b\bar{b}$   
as Cross-Check

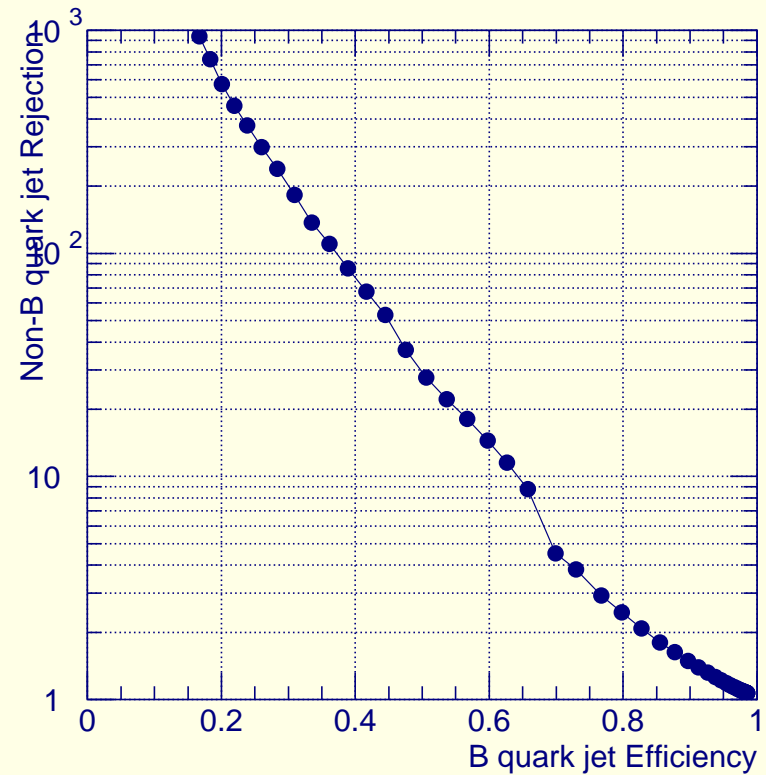
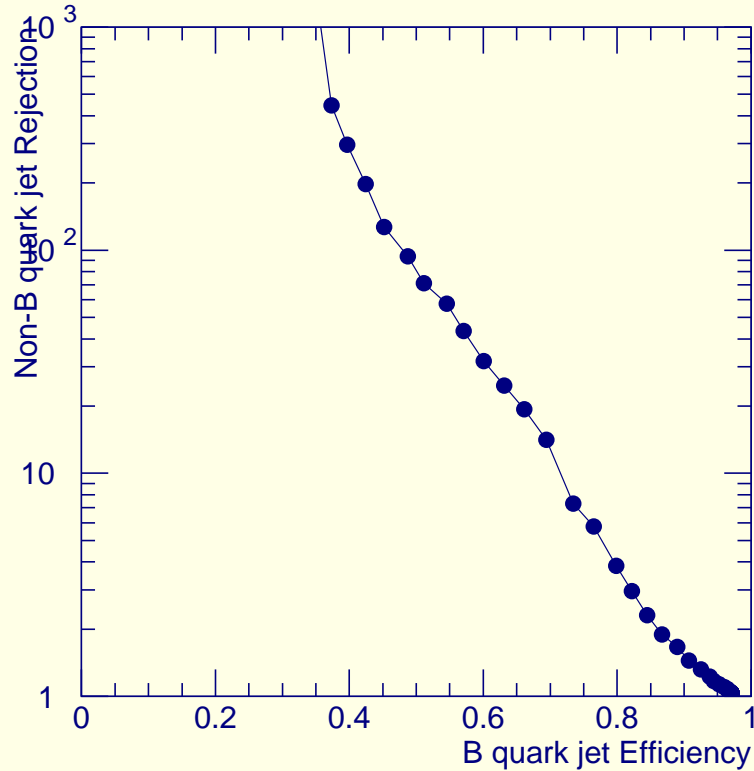
Result on SUSY events:



# Efficiency for 3D $b$ -tagging

Use 25% of  $WH$ ,  $H \rightarrow b\bar{b}$   
as Cross-Check

Result on SUSY events:



Jet multiplicity is higher  
events are less "simple" than  $H \rightarrow b\bar{b}$