Log Aug 2004

– new version with refined cuts and Pythia input data finally renconciled with CompHEP for process **379**

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Outline

- $\sqrt{s} = 800$ GeV

- $\sqrt{s} = 1000$ GeV

Input data used for signal (not Bgr.) calculation in Pythia and CompHEP at $\sqrt{s} = 800, 1000, 1500$ GeV:

$EE = 0.314398$ (Pythia average at 1500 GeV)

MW = 80.423

MZ = 91.1876

From those above follow these here (calculated in our model with a Mathematica program)

g = 0.6673

g' = 0.3564

v = 241.071

$s_w^2 = 1 - \frac{MW^2}{MZ^2} = 0.222162$

$\boxed{\sqrt{s} = 800 \text{ GeV}}$

Clean events only

Cuts:

$500 < m_{tt} < 750$ GeV

$p_T(tt) > 15$ GeV, $p_T(tt) < 300$ GeV

$E_t, E_{\bar{t}} < 380$ GeV

$M_{rec} > 50$ GeV

$|\cos\theta_{t,\bar{t}}| < 0.8$

$20 < p_T(t), p_T(\bar{t}) < 330$ GeV

no central γ: $E_\gamma > 50$ GeV, $|\cos\theta_\gamma| < 0.99$

$E_{miss} > 90$ GeV

$|\cos\theta_{miss}| < 0.984$ (0.96)

Detector angle : $\cos\theta = 0.99$ (8 degrees)

Signal **379**: $M_\rho = 700$ GeV, $b_2 = 0.08, g'' = 20, \lambda_2 = 0.04, \Gamma_\rho = 12.5 GeV$

Background **1+85**

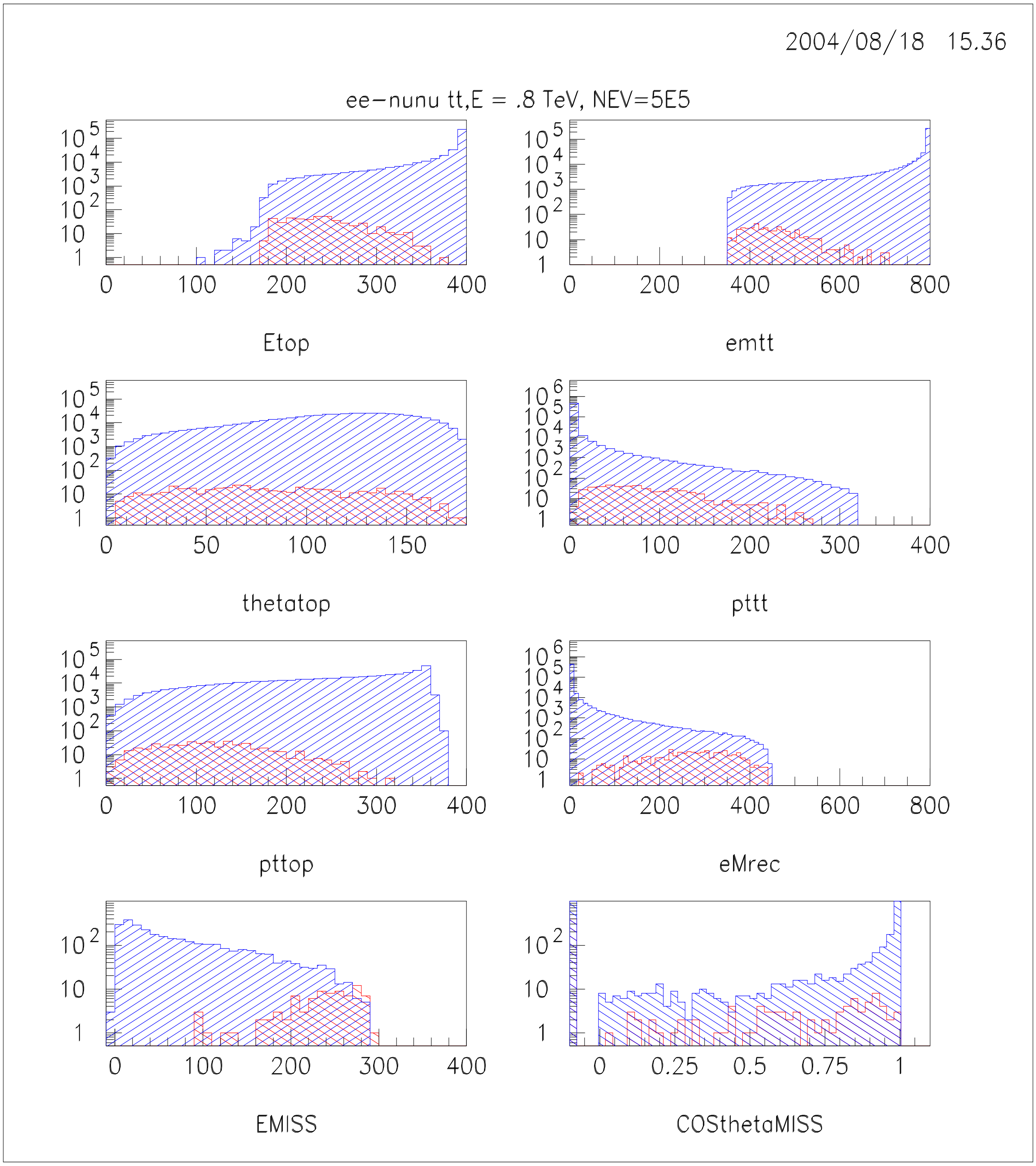
I show figures and numbers based on 5×10^5 (487 signal, the rest bgr.) events

Fig.1: - **379** consists of all generated 487 events for 1st six distributions and of just 84 events which survive standard cuts for E_{miss} and $cos\theta_{miss}$ distributions

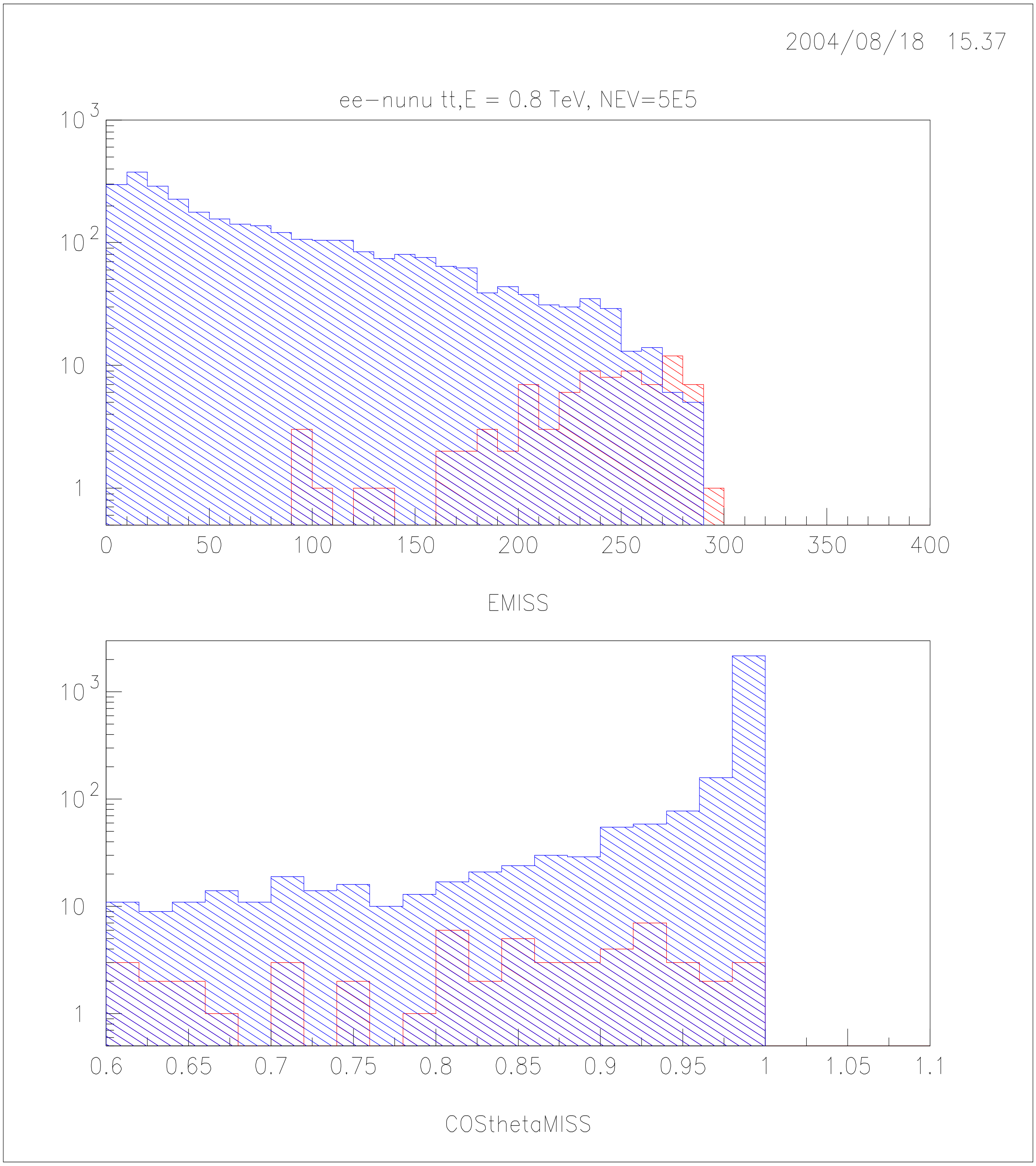
Bgr.**1+85** shown in blue

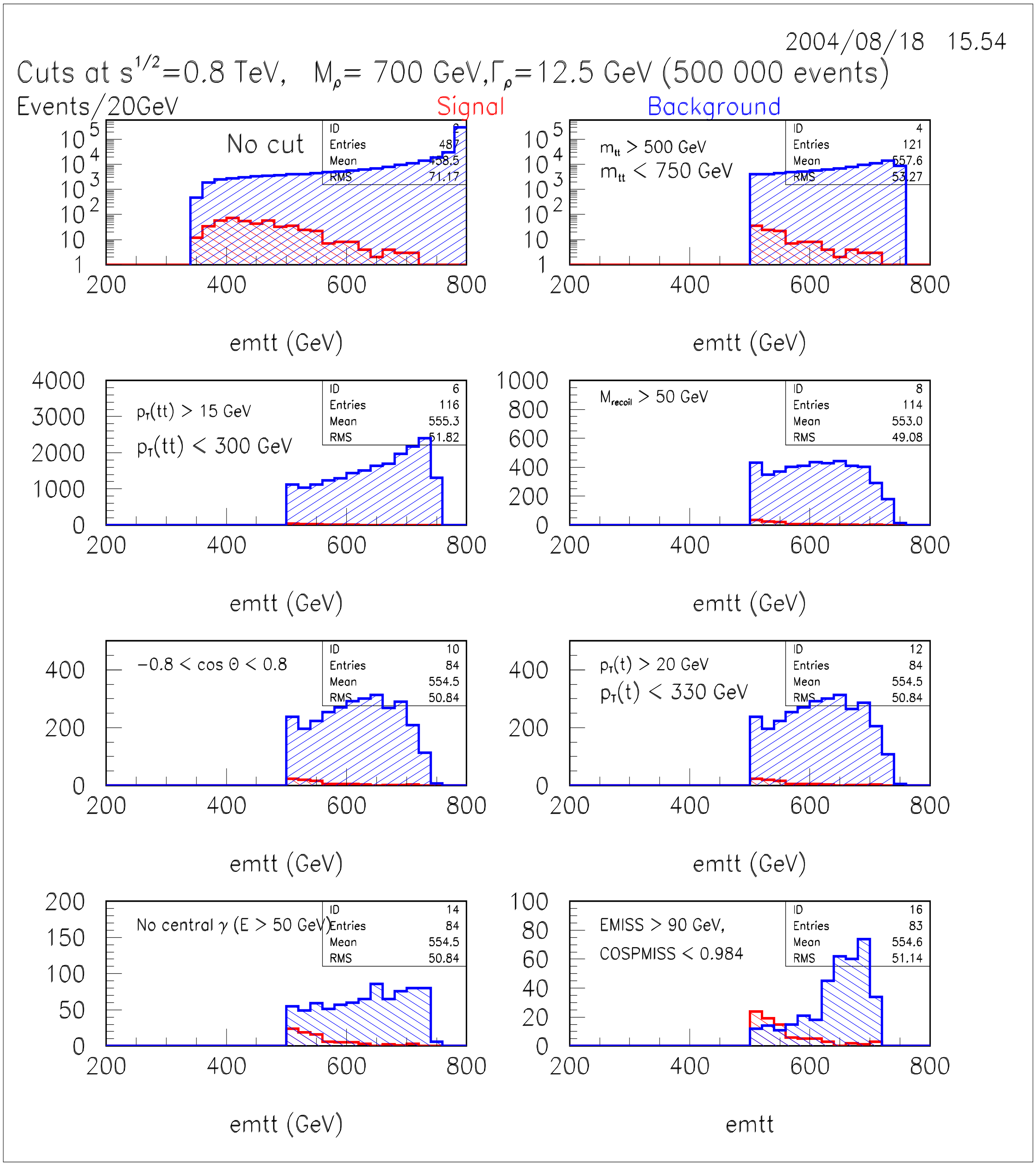
Fig.2: - detailed view of E_{miss} and $cos\theta_{miss}$ distrib. from Fig. 1

Fig.3: - m_{tt} distrib. show how signal and bgr. change as more and more cuts are applied. 'Entries' show signal numbers. $\cos\theta_{miss} = 0.984$



2004/08/18 15.36
ee−nunu tt,E = .8 TeV, NEV=5E5
Etop
emtt
thetatop
pttt
pttop
eMrec
EMISS
COSthetaMISS


2004/08/18 15.37
ee−nunu tt,E = 0.8 TeV, NEV=5E5
10^3
10^2
10
1
0
50
100
150
200
250
300
350
400
EMISS
10^3
10^2
10
1
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
1.05
1.1
COSthetaMISS


2004/08/18 15.54
Cuts at $s^{1/2}$=0.8 TeV, M_ρ= 700 GeV,Γ_ρ=12.5 GeV (500 000 events)
Events/20GeV
Signal
Background
No cut
ID 2
Entries 487
Mean 458.5
RMS 71.17
emtt (GeV)
m_{tt} > 500 GeV
m_{tt} < 750 GeV
ID 4
Entries 121
Mean 557.6
RMS 53.27
emtt (GeV)
$p_T(tt)$ > 15 GeV
$p_T(tt)$ < 300 GeV
ID 6
Entries 116
Mean 555.3
RMS 51.82
emtt (GeV)
M_{recoil} > 50 GeV
ID 8
Entries 114
Mean 553.0
RMS 49.08
emtt (GeV)
−0.8 < cos Θ < 0.8
ID 10
Entries 84
Mean 554.5
RMS 50.84
emtt (GeV)
$p_T(t)$ > 20 GeV
$p_T(t)$ < 330 GeV
ID 12
Entries 84
Mean 554.5
RMS 50.84
emtt (GeV)
No central γ (E > 50 GeV)
ID 14
Entries 84
Mean 554.5
RMS 50.84
emtt (GeV)
EMISS > 90 GeV,
COSPMISS < 0.984
ID 16
Entries 83
Mean 554.6
RMS 51.14
emtt

$\sqrt{s} = 800$ GeV Summary

C: clean $\quad |\cos\theta_{miss}| < 0.984$ (0.96)

- $\sigma(\mathbf{1+85}) = (300.3 + 1.3)$ fb $= 301.6$ fb

C: $\quad 499\,513 \longrightarrow 2959 \xrightarrow{E_\gamma} 789 \xrightarrow{E_{miss},\theta_{P_{miss}}} 366$ (221)

- $\sigma(\mathbf{379}) = 0.31$ fb versus 0.66 fb in CompHEP

C: $\quad 487 \longrightarrow 84 \xrightarrow{E_\gamma} 84 \xrightarrow{E_{miss},\theta_{P_{miss}}} 83$ (79)

After cuts:

$\sigma(\mathbf{1+85}) = 0.22$ (0.13) fb

$\sigma(\mathbf{379}) = 0.053$ (0.050) fb (Pythia)

$\sigma(\mathbf{379}) = 0.20$ fb (CompHEP without E_γ but with E_{miss}, θ_{miss} cuts)

$\boxed{\sqrt{s} = 1000 \text{ GeV}}$

Clean events only

Cuts:

$500 < m_{tt} < 900$ GeV

$p_T(tt) > 15$ GeV, $p_T(tt) < 400$ GeV

$E_t, E_{\bar{t}} < 480$ GeV

$M_{rec} > 150$ GeV

$|\cos\theta_{t,\bar{t}}| < 0.8$

$20 < p_t, p_{\bar{t}} < 420$ GeV

no central γ: $E_\gamma > 50$ GeV, $|\cos\theta_\gamma| < 0.99$

$E_{miss} > 100$ GeV

$|\cos\theta_{miss}| < 0.984$ (0.96)

Detector angle : $\cos\theta = 0.99$ (8 degrees)

Signal **379**: $M_\rho = 700$ GeV, $b_2 = 0.08, g'' = 20, \lambda_2 = 0.04, \Gamma_\rho = 12.5 GeV$

Background **1+85**

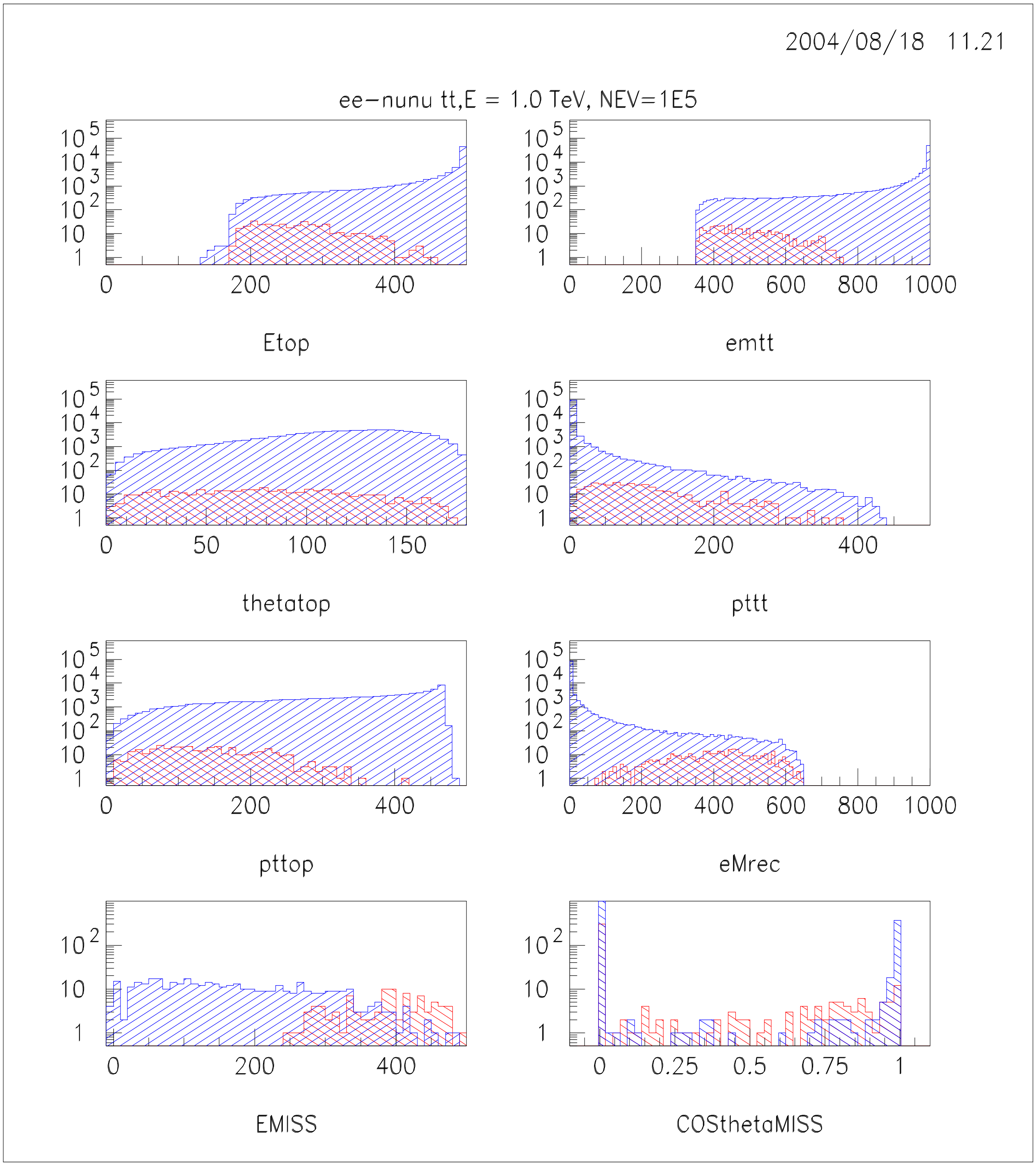
I show figures and numbers based on 1×10^5 (395 signal, the rest bgr.) events

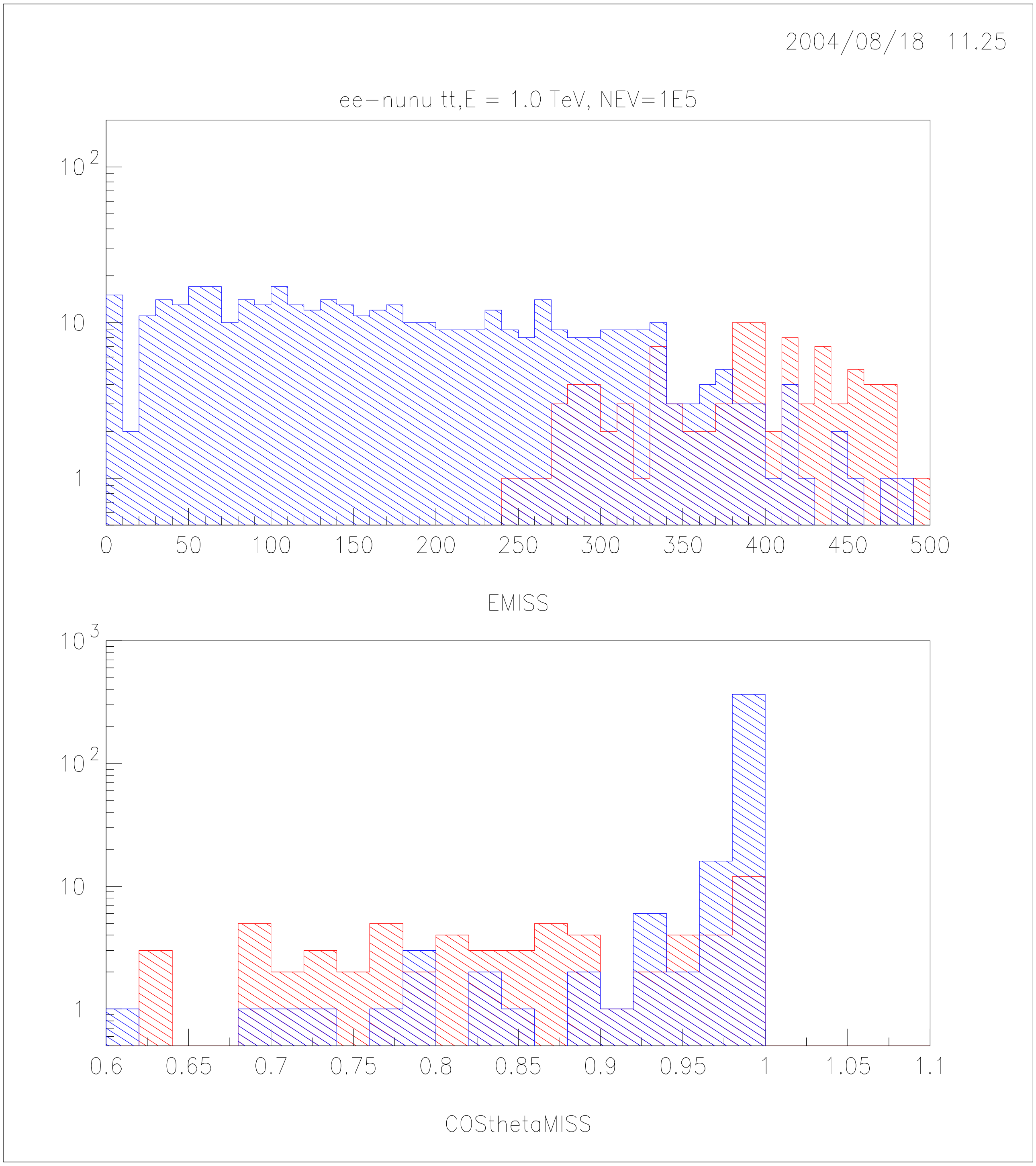
Fig.1: - **379** consists of all generated 395 events for 1st six distributions and of just 94 events which survive standard cuts for E_{miss} and $cos\theta_{miss}$ distributions

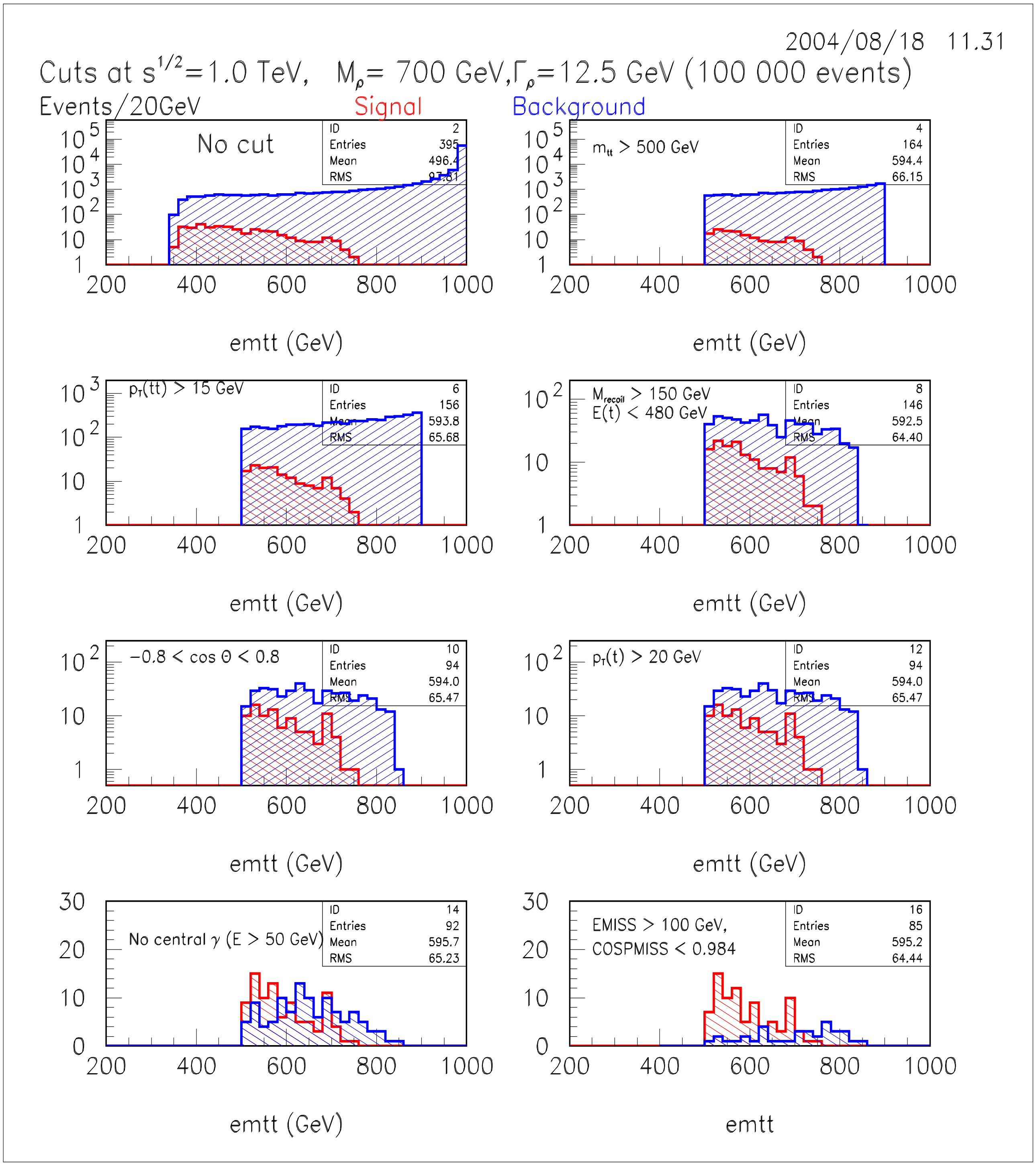
Bgr.**1+85** shown in blue

Fig.2: - detailed view of E_{miss} and $cos\theta_{miss}$ distrib. from Fig. 1

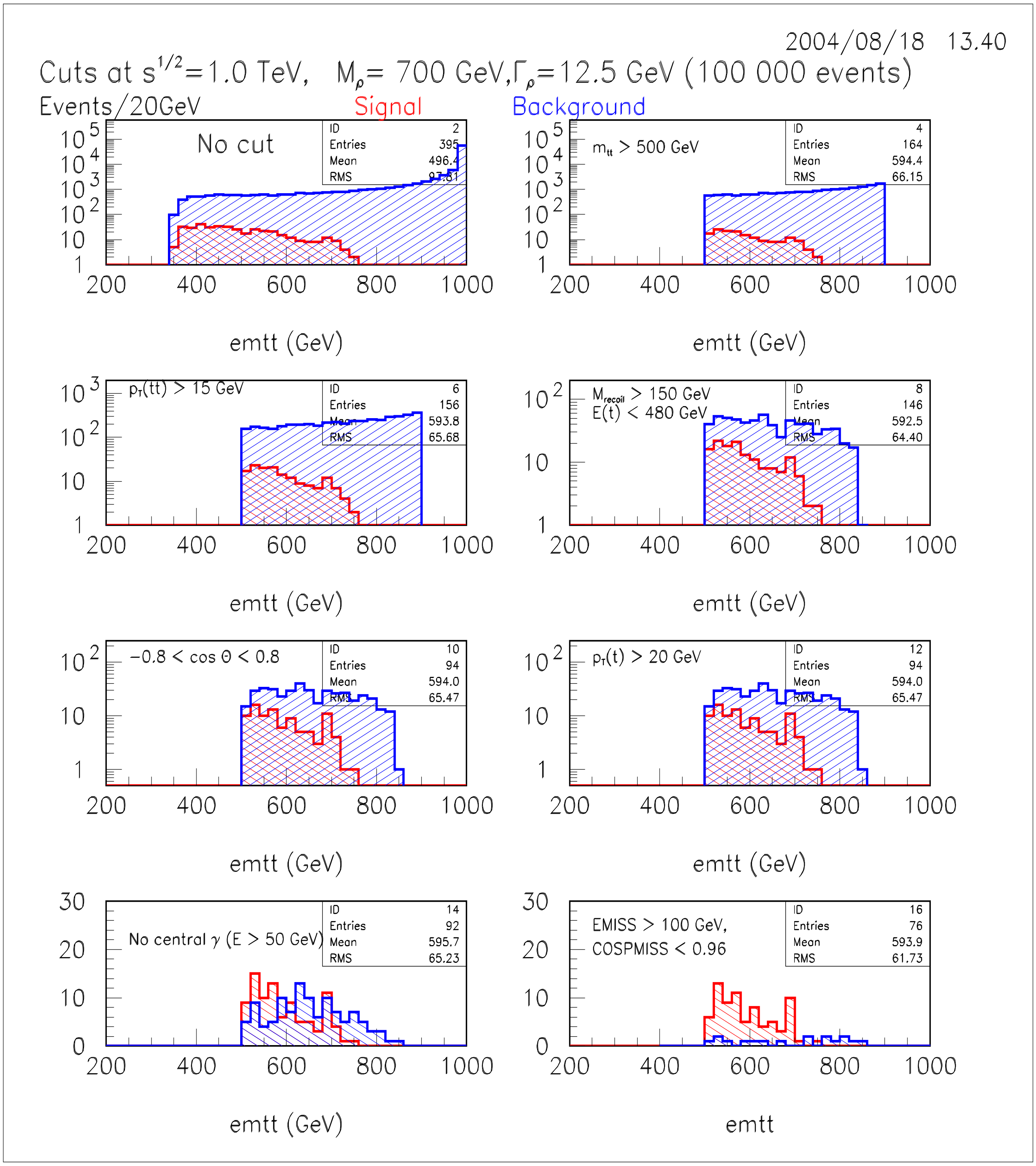
Fig.3,4: - m_{tt} distrib. show how signal and bgr. change as more and more cuts are applied. 'Entries' show signal numbers.$\cos\theta_{miss} = 0.984$ (Fig.3) and $\cos\theta_{miss} = 0.96$, our choice (Fig.4)


2004/08/18 11.21
ee−nunu tt,E = 1.0 TeV, NEV=1E5
Etop
emtt
thetatop
pttt
pttop
eMrec
EMISS
COSthetaMISS


2004/08/18 11.25
ee−nunu tt,E = 1.0 TeV, NEV=1E5
EMISS
COSthetaMISS



2004/08/18 11.31
Cuts at $s^{1/2}$=1.0 TeV, M_ρ= 700 GeV,Γ_ρ=12.5 GeV (100 000 events)
Events/20GeV
Signal
Background
No cut
m_{tt} > 500 GeV
$p_T(tt)$ > 15 GeV
M_{recoil} > 150 GeV
E(t) < 480 GeV
−0.8 < cos Θ < 0.8
$p_T(t)$ > 20 GeV
No central γ (E > 50 GeV)
EMISS > 100 GeV,
COSPMISS < 0.984
emtt (GeV)
emtt



2004/08/18 13.40
Cuts at s^1/2=1.0 TeV, M_ρ= 700 GeV,Γ_ρ=12.5 GeV (100 000 events)
Events/20GeV
Signal
Background
No cut
ID 2
Entries 395
Mean 496.4
RMS 97.81
emtt (GeV)
m_tt > 500 GeV
ID 4
Entries 164
Mean 594.4
RMS 66.15
emtt (GeV)
p_T(tt) > 15 GeV
ID 6
Entries 156
Mean 593.8
RMS 65.68
emtt (GeV)
M_recoil > 150 GeV
E(t) < 480 GeV
ID 8
Entries 146
Mean 592.5
RMS 64.40
emtt (GeV)
−0.8 < cos Θ < 0.8
ID 10
Entries 94
Mean 594.0
RMS 65.47
emtt (GeV)
p_T(t) > 20 GeV
ID 12
Entries 94
Mean 594.0
RMS 65.47
emtt (GeV)
No central γ (E > 50 GeV)
ID 14
Entries 92
Mean 595.7
RMS 65.23
emtt (GeV)
EMISS > 100 GeV,
COSPMISS < 0.96
ID 16
Entries 76
Mean 593.9
RMS 61.73
emtt

$\sqrt{s} = 1000$ GeV summary

C: clean $\quad |\cos\theta_{miss}| < 0.984$ (0.96)

- $\sigma(\mathbf{1+85}) = (204.9 + 2.4)$ fb $= 207.3$ fb

C: $\quad 99\,605 \longrightarrow 419 \xrightarrow{E_\gamma} 111 \xrightarrow{E_{miss},\theta_{P_{miss}}} 36$ (17)

- $\sigma(\mathbf{379}) = 0.81$ fb versus CompHEP 1.16 fb

C: $\quad 395 \longrightarrow 94 \xrightarrow{E_\gamma} 92 \xrightarrow{E_{miss},\theta_{P_{miss}}} 85$ (76)

After cuts:

$\sigma(\mathbf{1+85}) = 0.075$ (0.035) fb

$\sigma(\mathbf{379}) = 0.17$ (0.156) fb (Pythia)

$\sigma(\mathbf{379}) = 0.158$ fb (CompHEP without E_γ but with E_{miss}, θ_{miss} cuts)