

$Z \rightarrow \mu\mu$ and $W \rightarrow \mu\nu$ Analyses in EWPA: Brief Status Report

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W/Z Analysis Phone Meeting
3 Marzo 2009



Studying the CSC selection on the mc08 sample (10 TeV)

- reference paper: “Electroweak Boson Cross-Section Measurements”

Samples analyzed:

Sample	Dataset	σ LO $\times \epsilon_{filter}$	Statistics
PythiaZmumu	106051	1100 pb	320k
PythiaWmumu	106021	12000 pb	355k
PythiaZtautau	106052	1500 pb	195k
T1_McAtNlo_Jimmy	105200	205.5 pb	32k
j4_pythia_jetjet	105013	152000 pb	393k

Study done within EWPA framework on D3PD obtained from AODs

Normalization to the number of events expected at 10pb^{-1}



Vector Boson Selections

$Z \rightarrow \mu\mu$

Acceptance	at least one muon within $ \eta < 2.8$ and $p_T > 5$ GeV
Trigger	mu10 EF trigger selection
TwoMuonsKine	at least two muons (Staco) within $ \eta < 2.5$ and $p_T > 20$ GeV
Charge	opposite charge
Isolation	ID isolation within a 0.5 cone ($\Sigma p_T < 5$ GeV, $\Sigma_{tracks} < 6$)
ZMass	± 20 GeV mass window

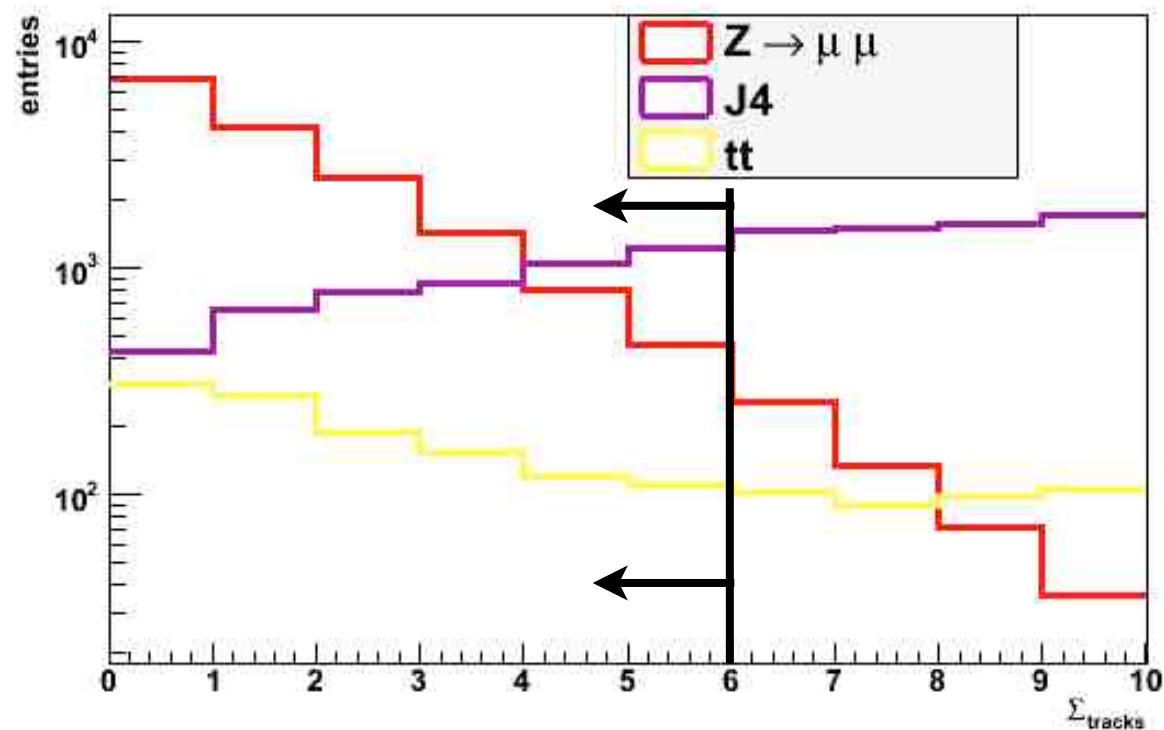
$W \rightarrow \mu\nu$

Acceptance	≥ 1 MC μ , $p_T > 5$ GeV, $ \eta < 2.8$
Trigger	$\mu 20$
OneMuon	1 STACO μ $p_T > 25$ GeV, $ \eta < 2.5$
Iso	$EM_{Et} < 5$ GeV
MET	$E_T^{miss} > 25$ GeV
MT	$M_T > 40$ GeV

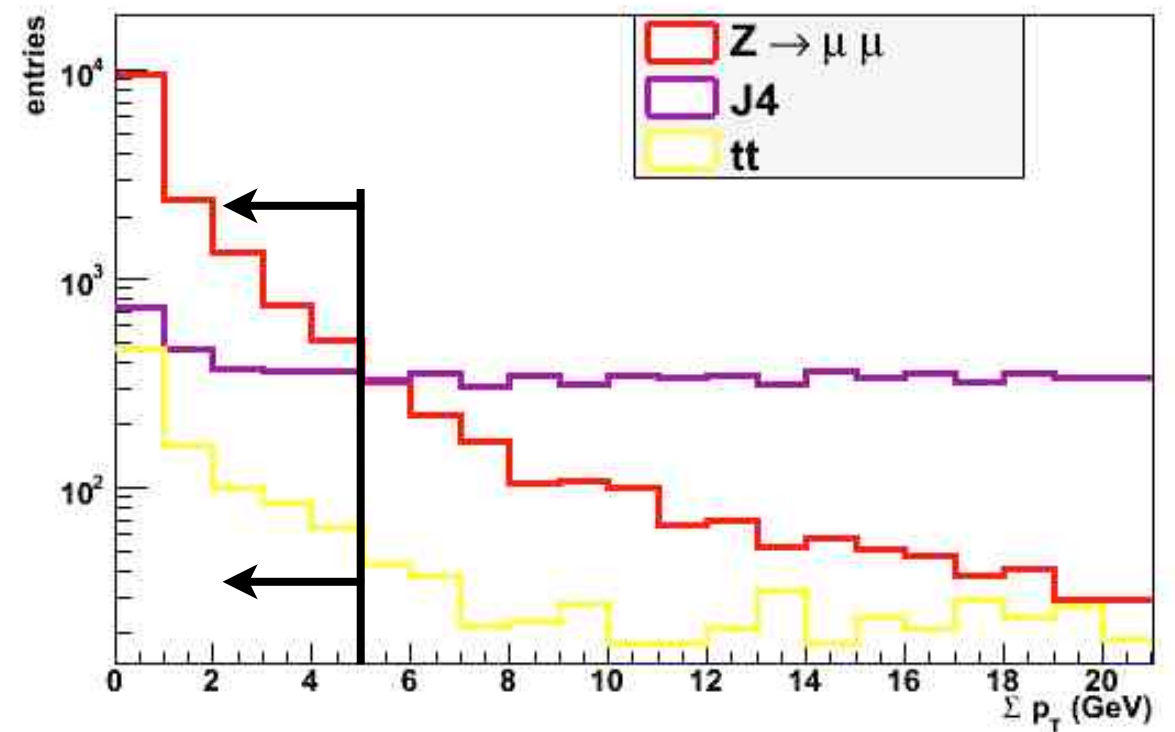


Isolation Variables

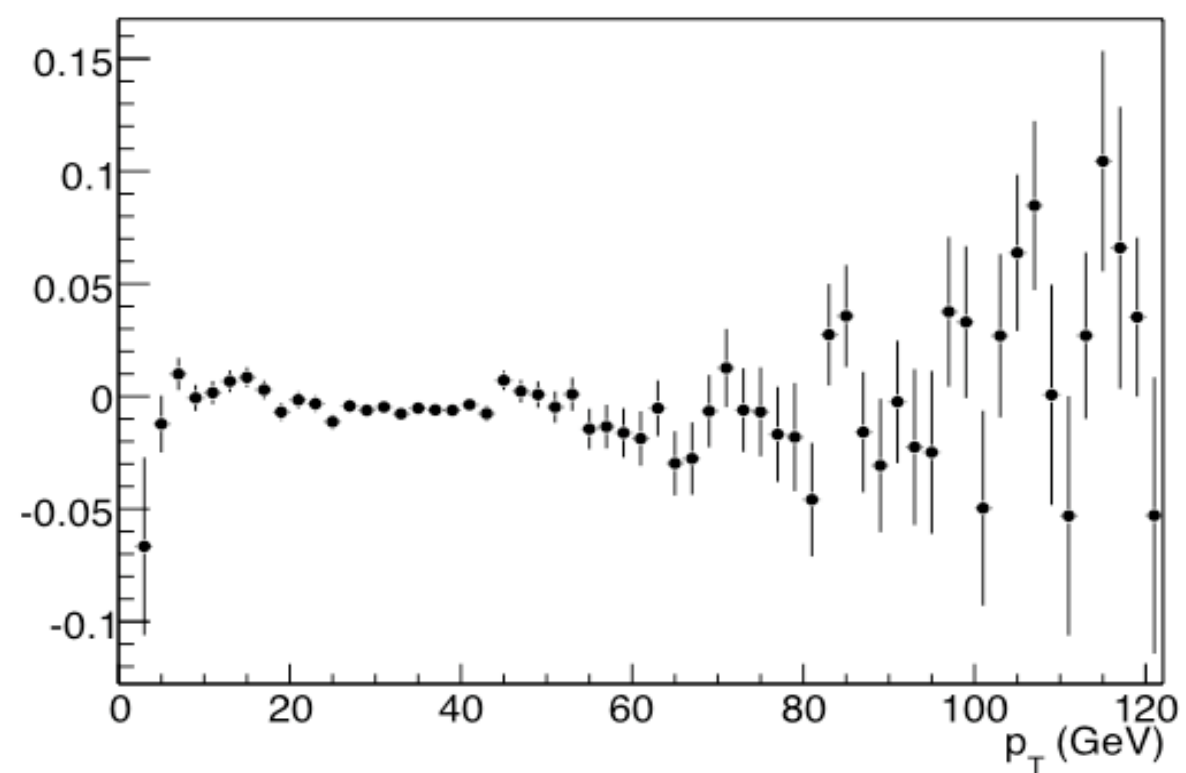
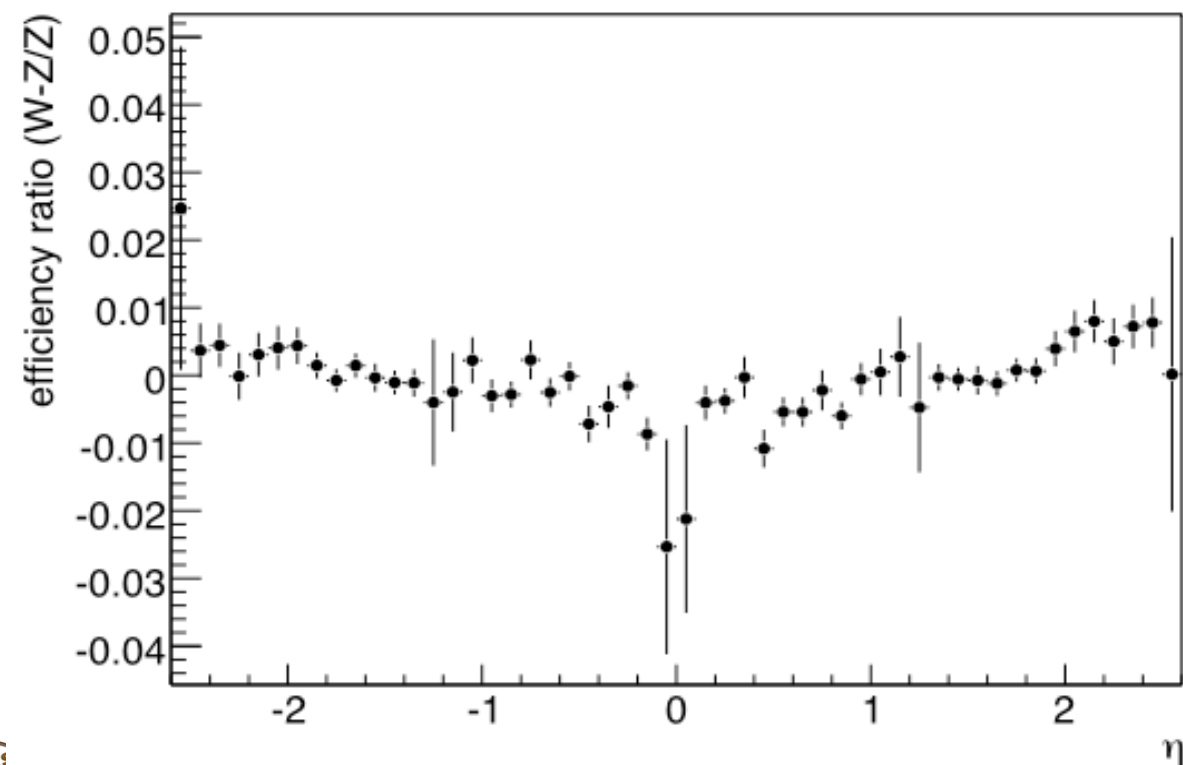
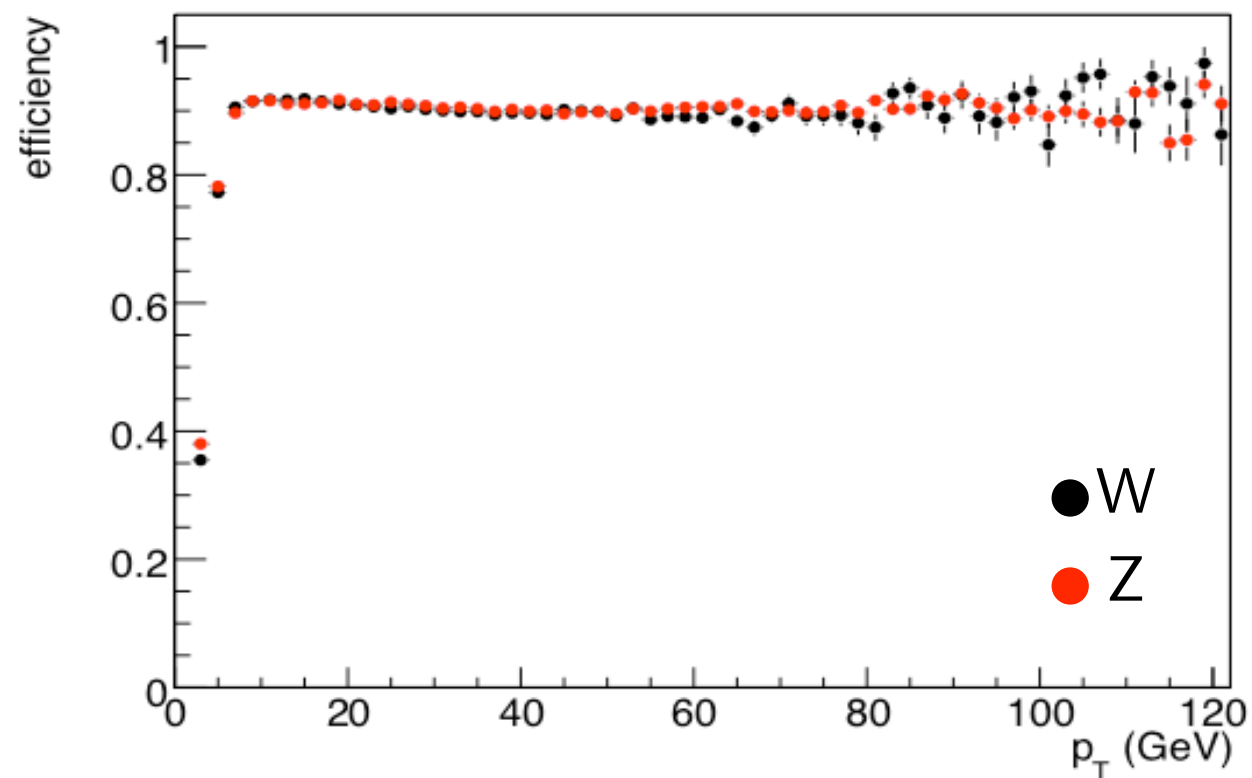
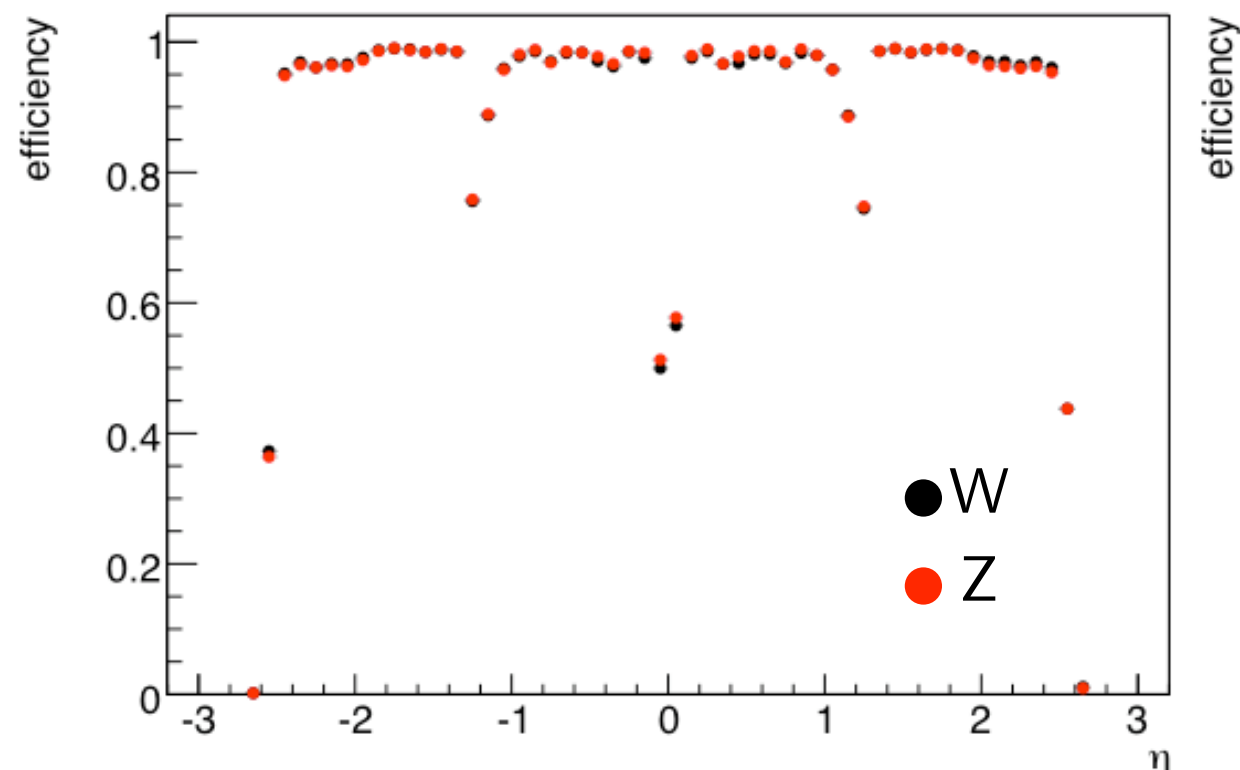
ID tracks in the 0.5 cone



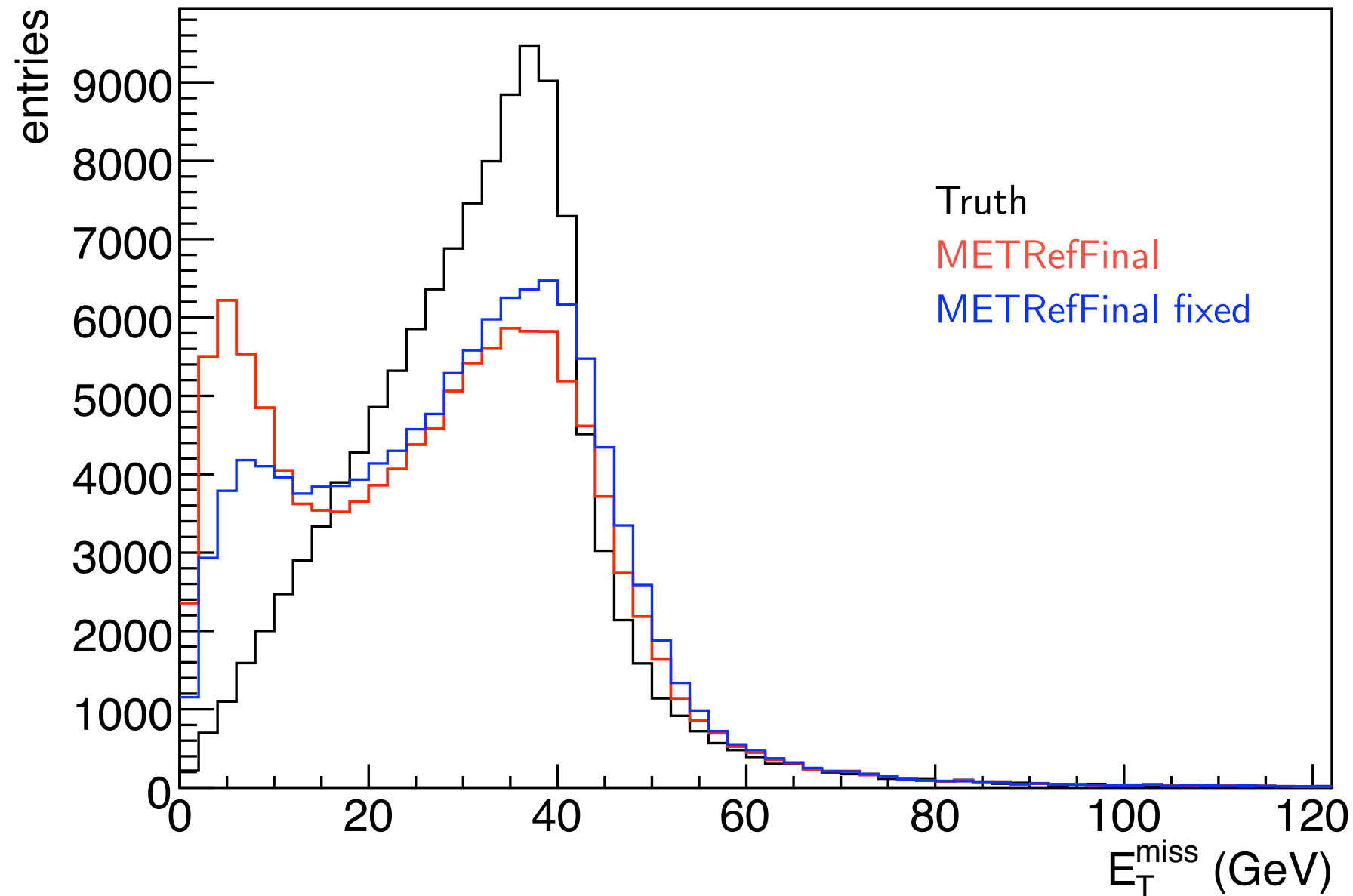
Sum of the pT of ID tracks



Muon Reconstruction Efficiency



MET Reconstruction



$\text{ExMiss_RefFinal_fix} = \text{ExMiss_RefFinal} - \text{ExMiss_MuonBoy} - \text{SumMupx}$
 $\text{EyMiss_RefFinal_fix} = \text{EyMiss_RefFinal} - \text{EyMiss_MuonBoy} - \text{SumMupy}$



Z Boson Cut Flow

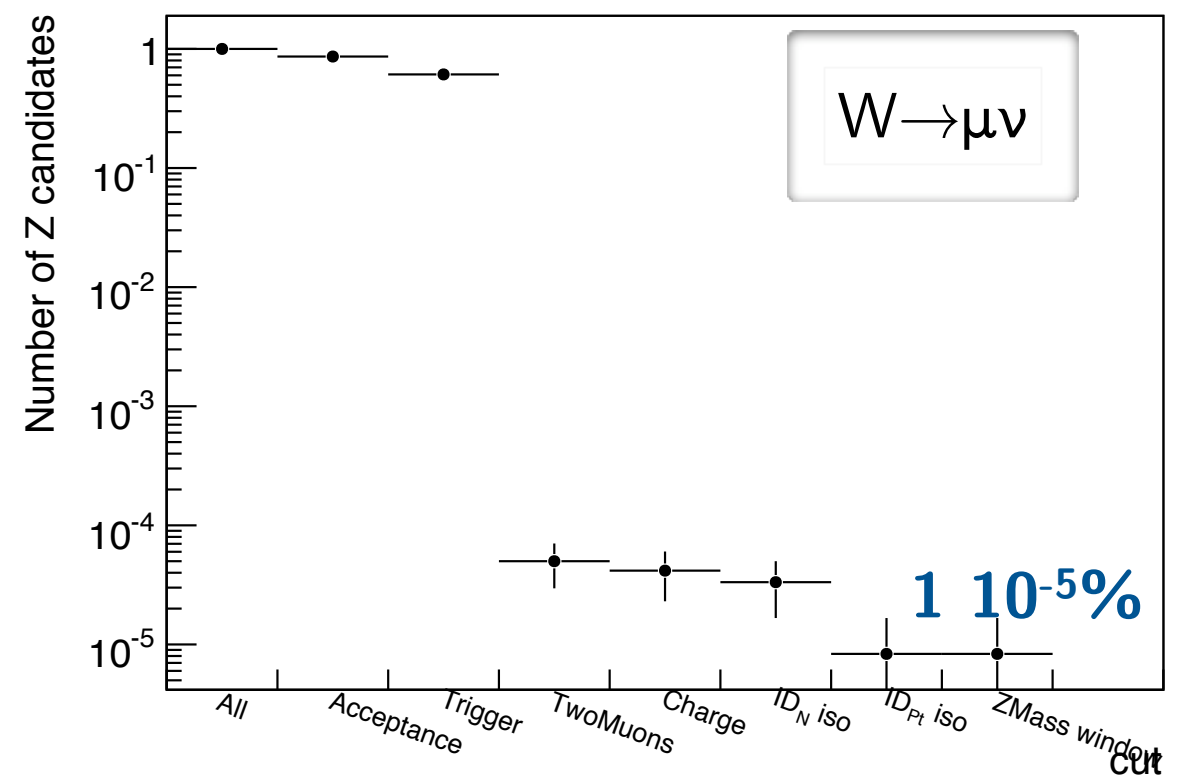
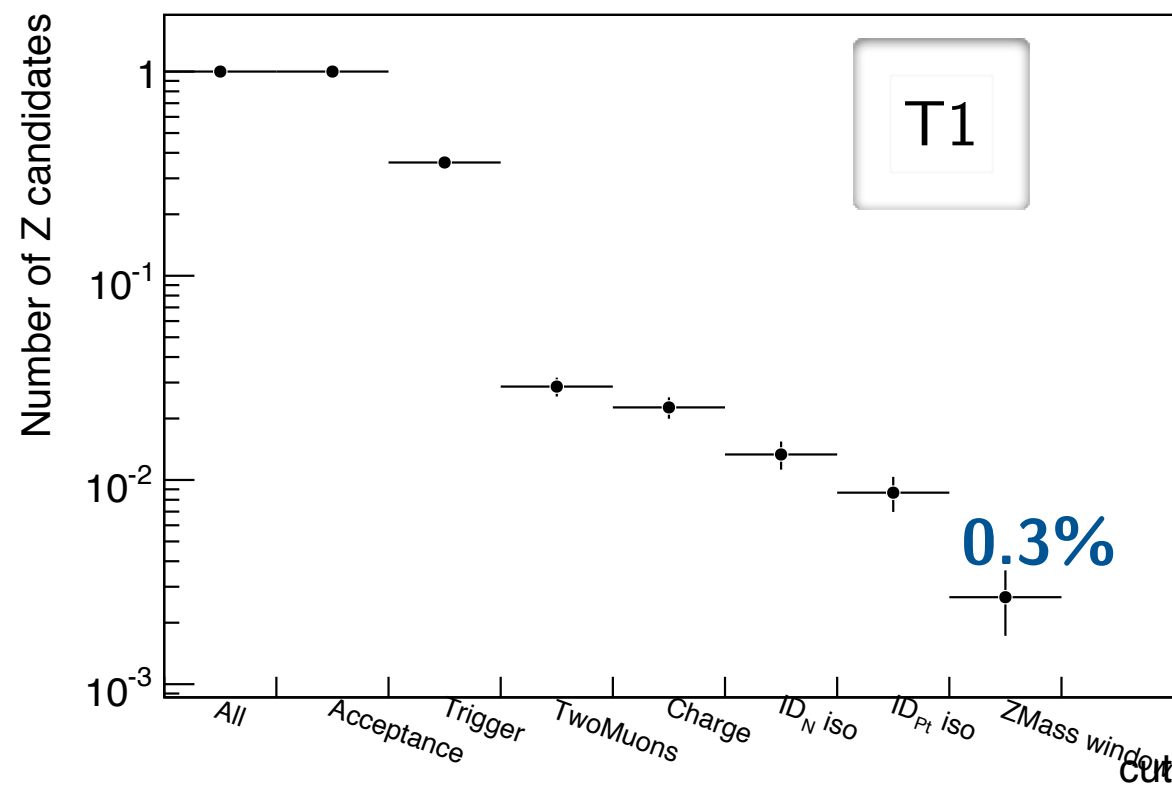
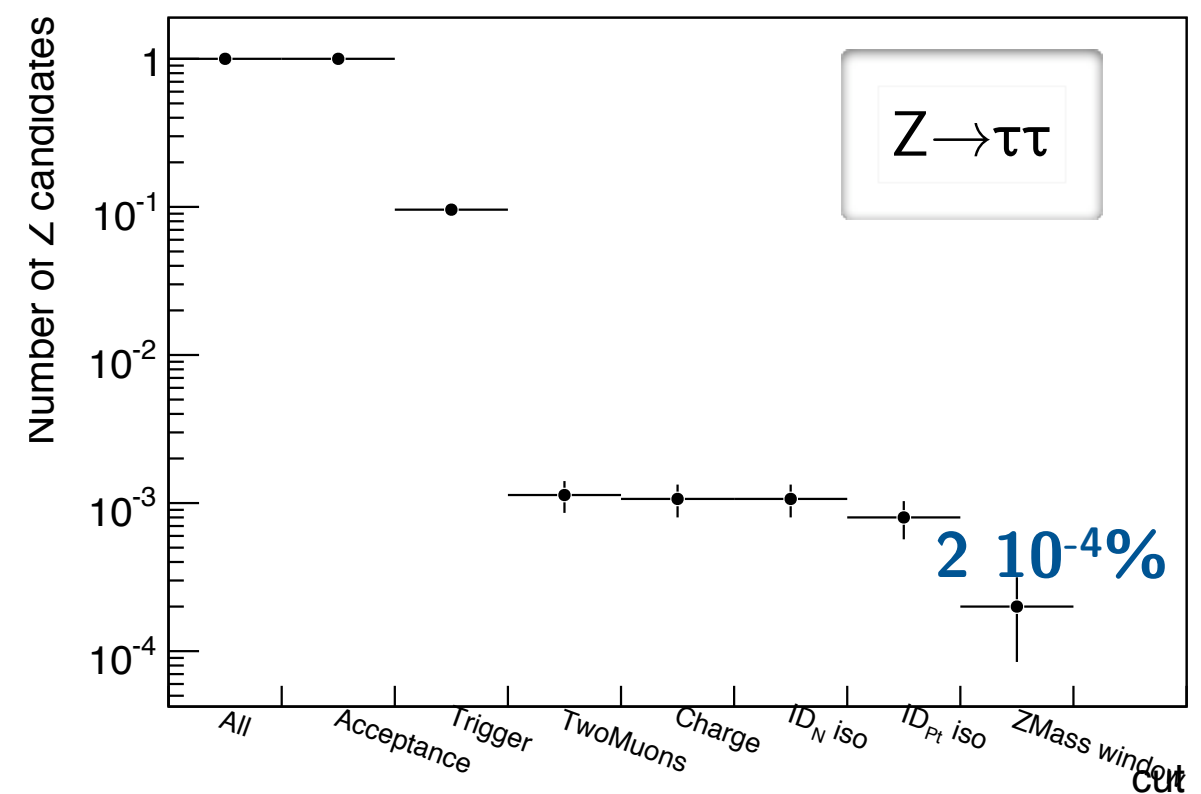
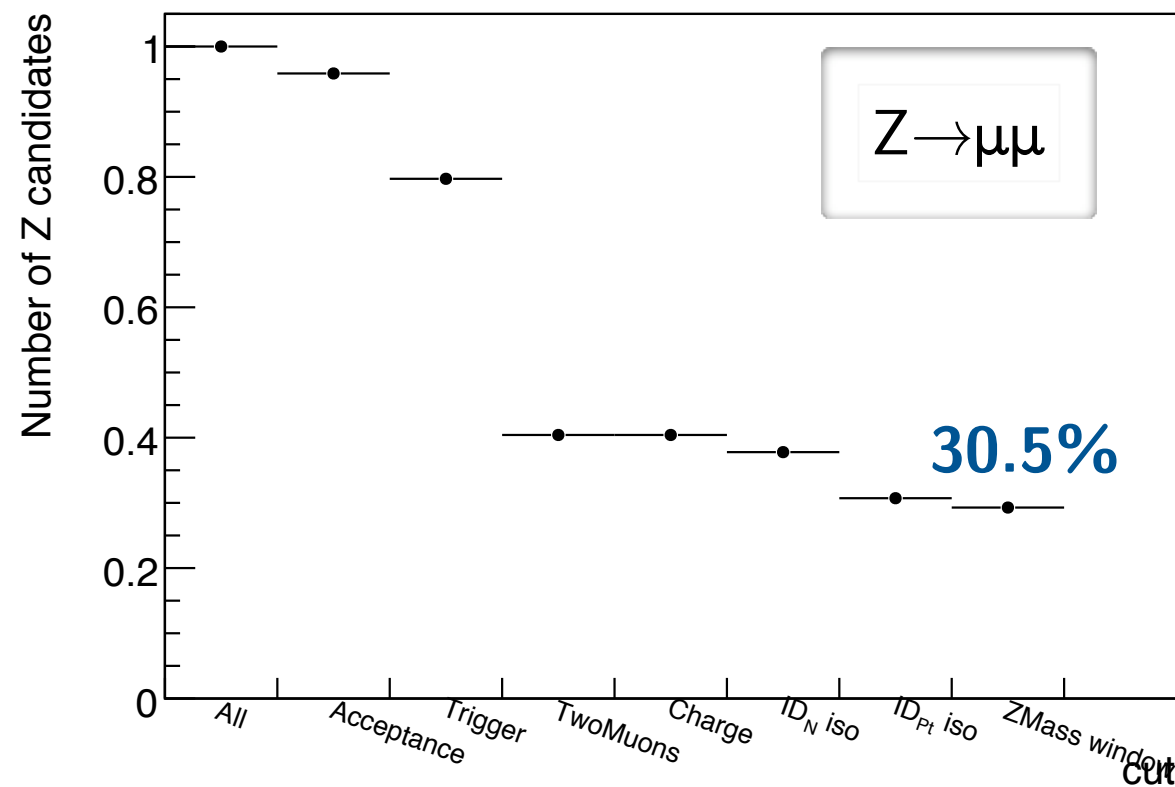
	$Z \rightarrow \mu\mu$	$W \rightarrow \mu\nu$	$t\bar{t}$	$Z \rightarrow \tau\tau$	j4
Total	12000	120000	3000	15000	393520
Acceptance	11504 (95.9%)	103563 (86.3%)	3000	15000	393520
Trigger	9565 (83.1%)	73298 (70.8%)	1076 (35.9%)	1437 (9.6)	6457 (1.6%)
TwoMuons	4850 (42.2%)	6 (0.0%)	86 (2.9%)	17 (0.1%)	64 (0.0%)
Charge	4850 (42.2%)	5 (0.0%)	68 (2.3%)	16 (0.1%)	41 (0.0%)
Isolation	3686 (32.0%)	1 (0.0%)	26 (0.9%)	12 (0.1%)	0.0 (0.0%)
ZMass	3514 (30.5%)	1 ($1 \cdot 10^{-5}\%$)	8 (0.3%)	3 ($2 \cdot 10^{-4}\%$)	0.0 (<8.9 events)

➤ Comparison to the CSC Note results, in terms of number of events, difficult because it is not clear which cross section they used

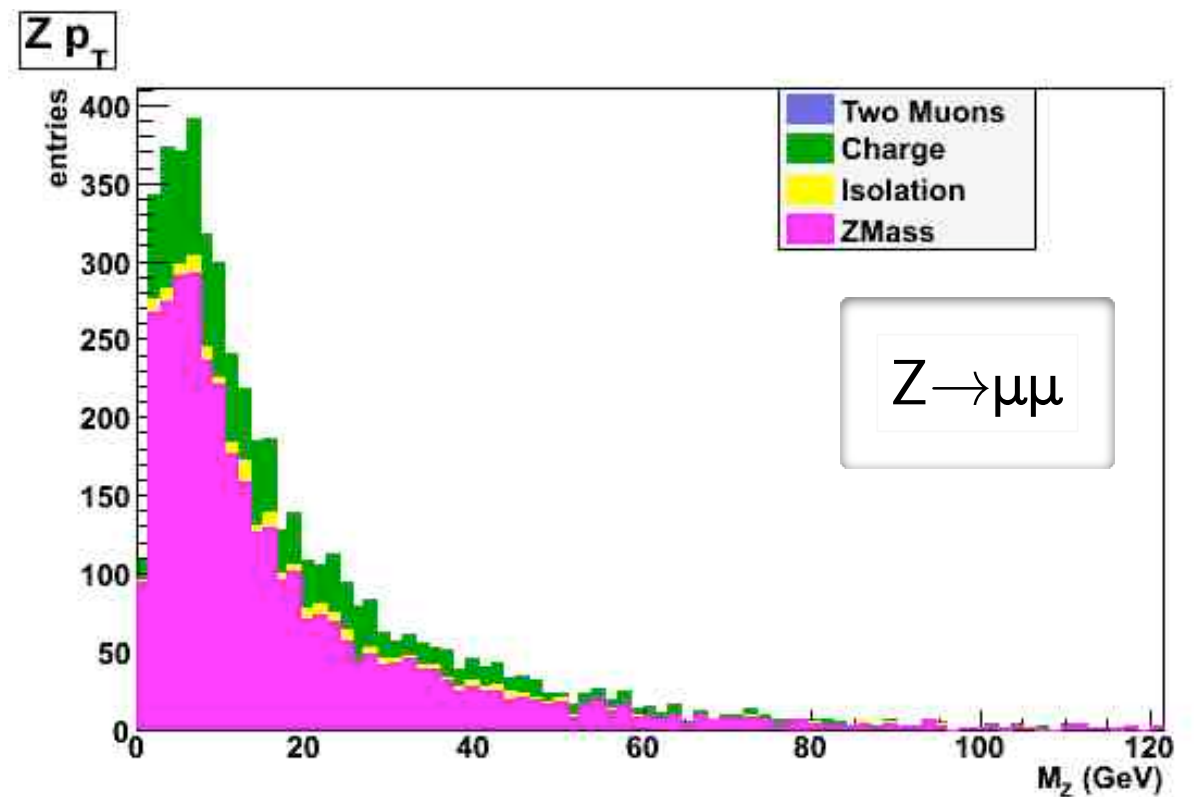
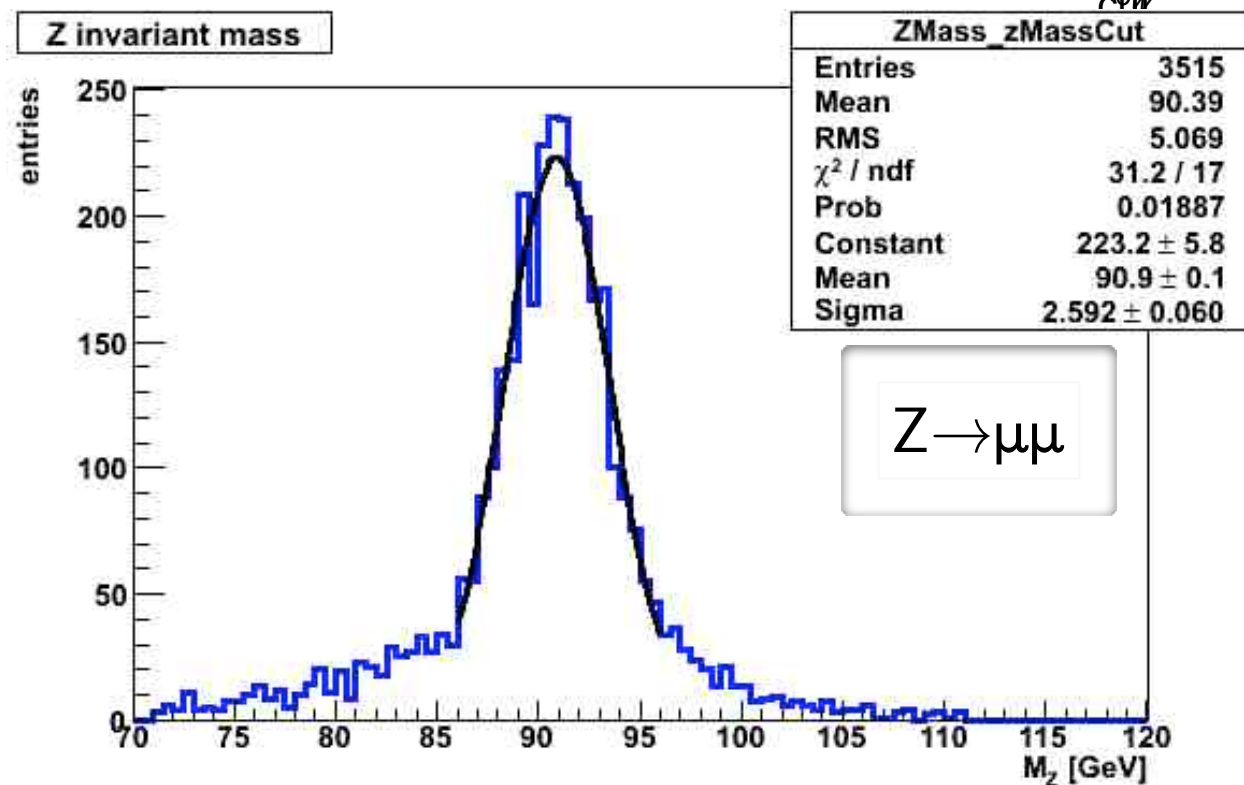
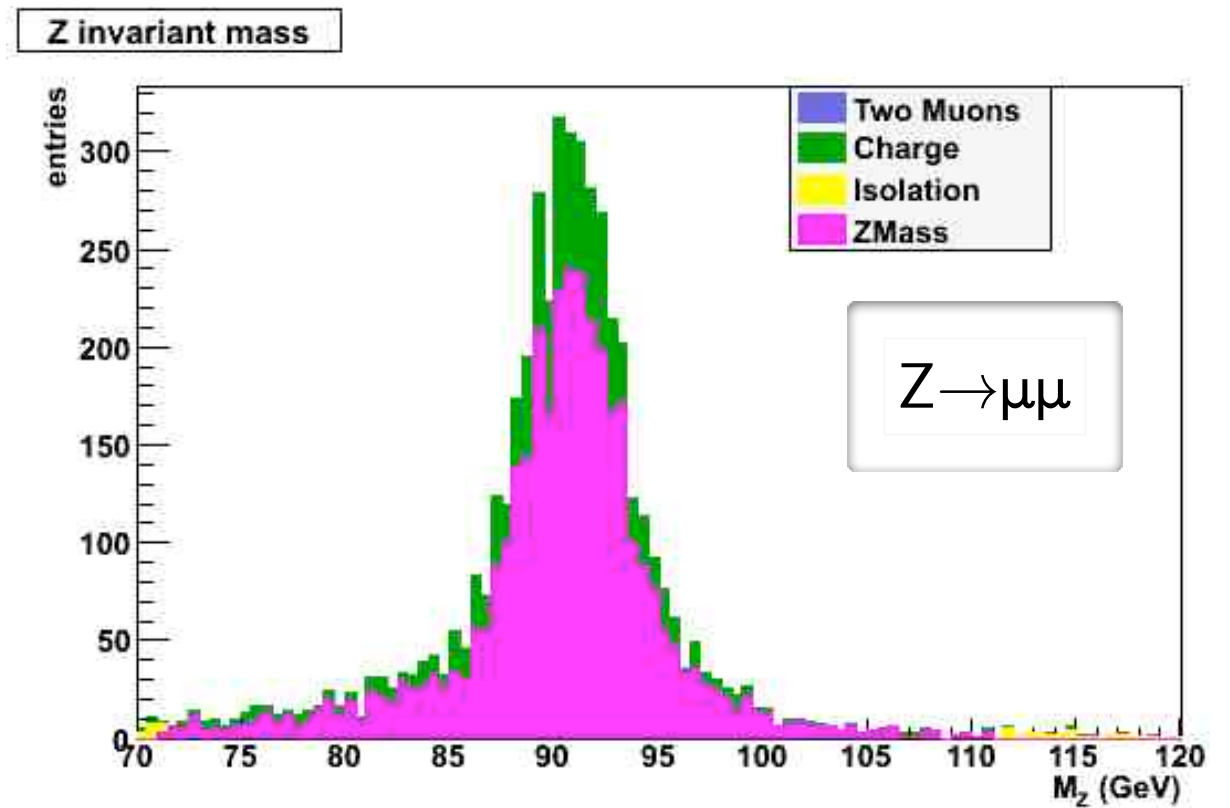
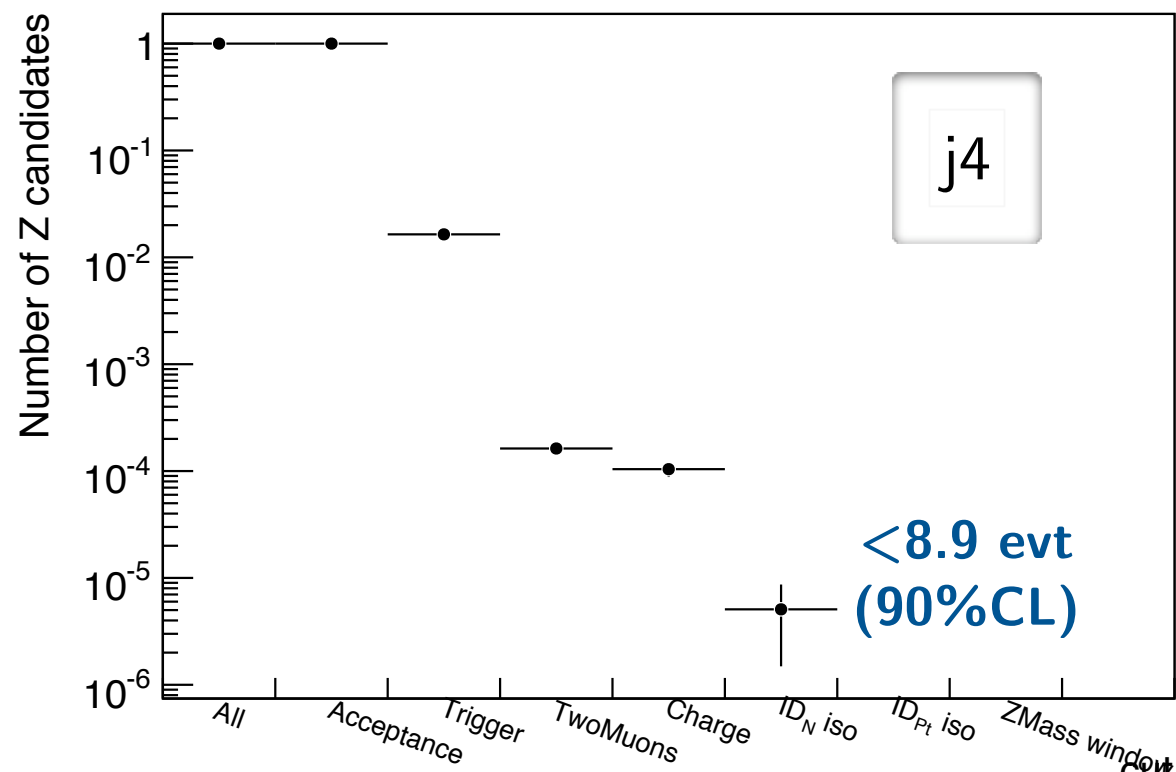
Comparison (or better, a strategy for comparison) still under investigation



Z Boson Cut Flow



Z Boson Cut Flow



W Boson Cut Flow

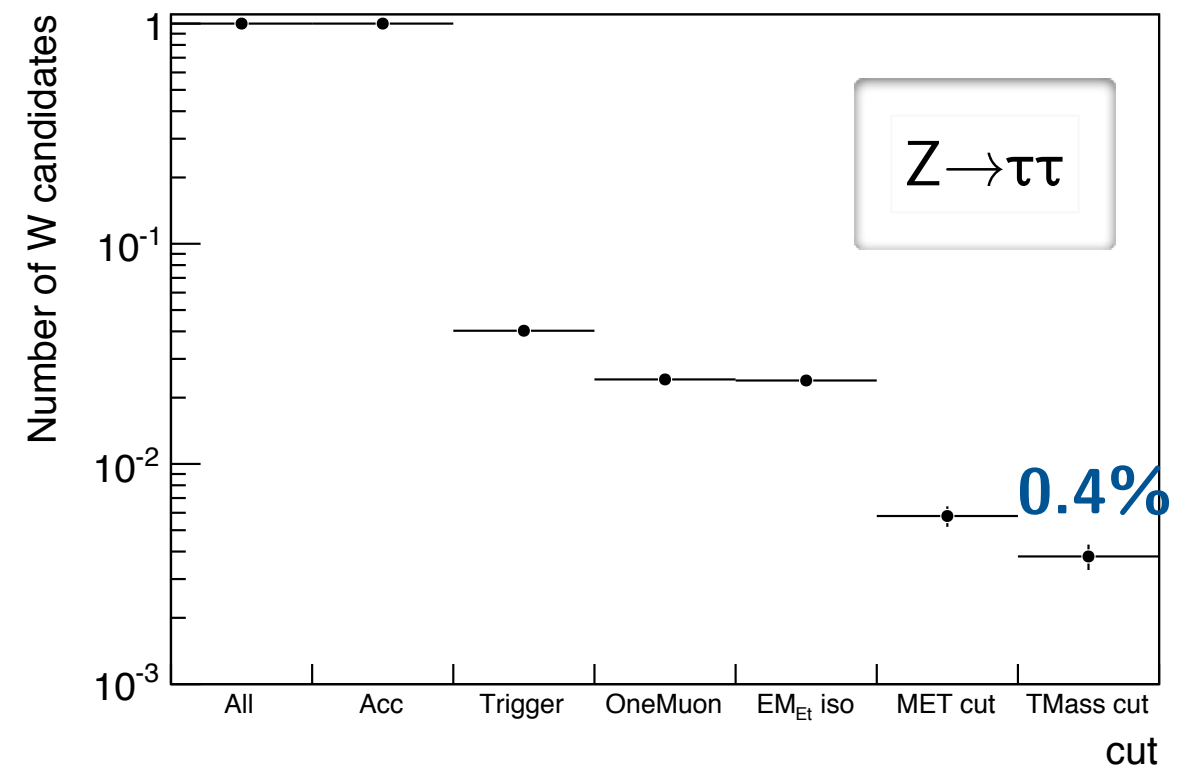
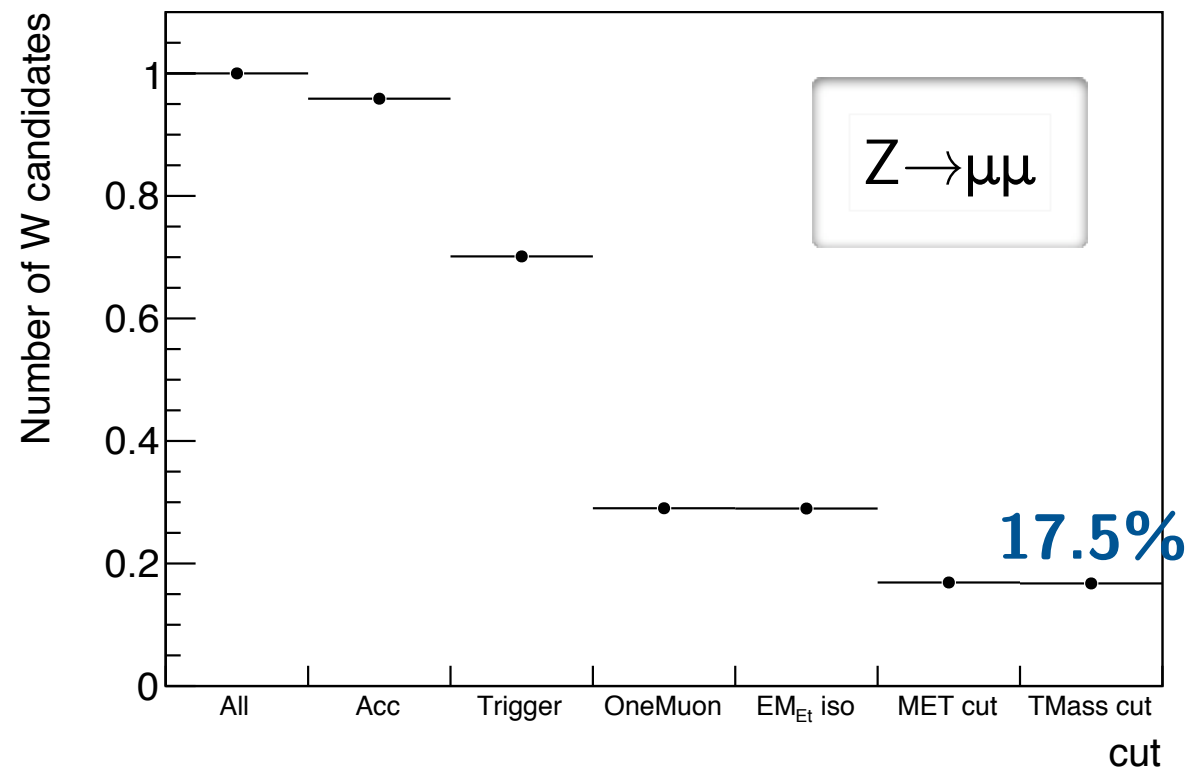
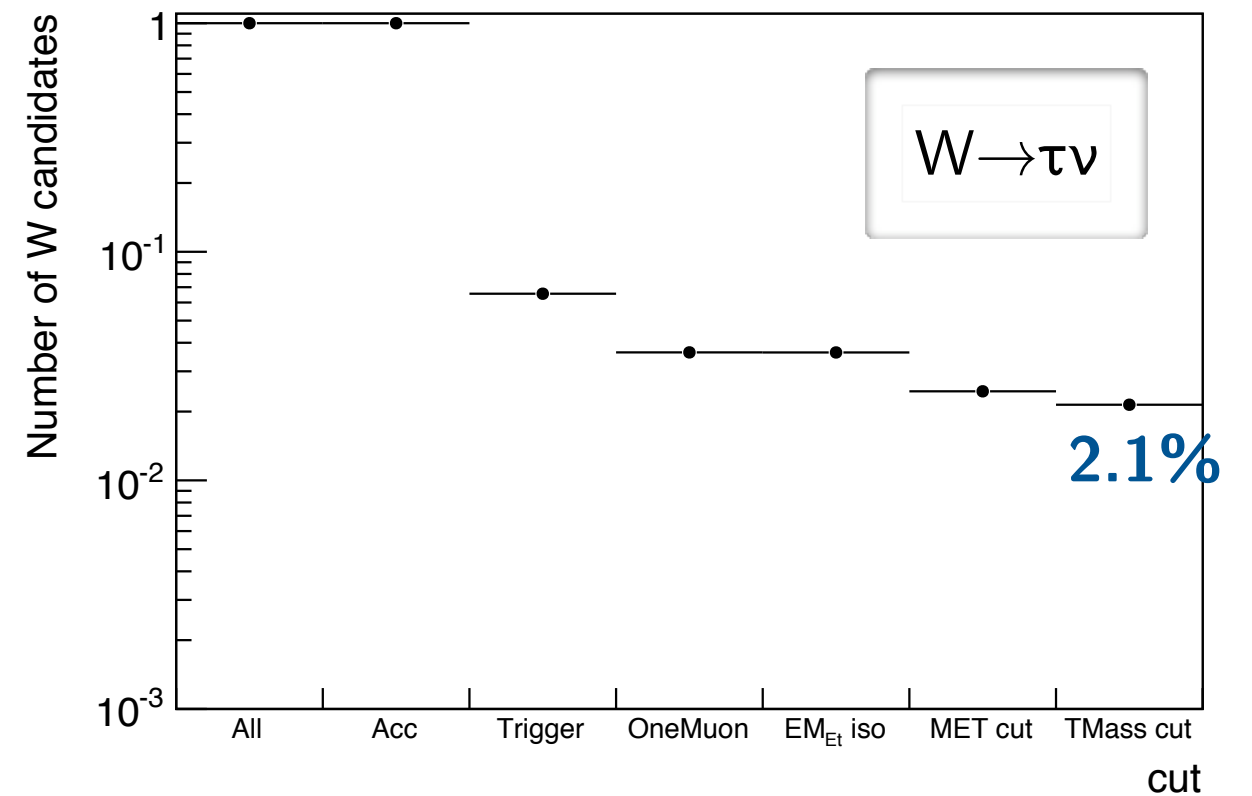
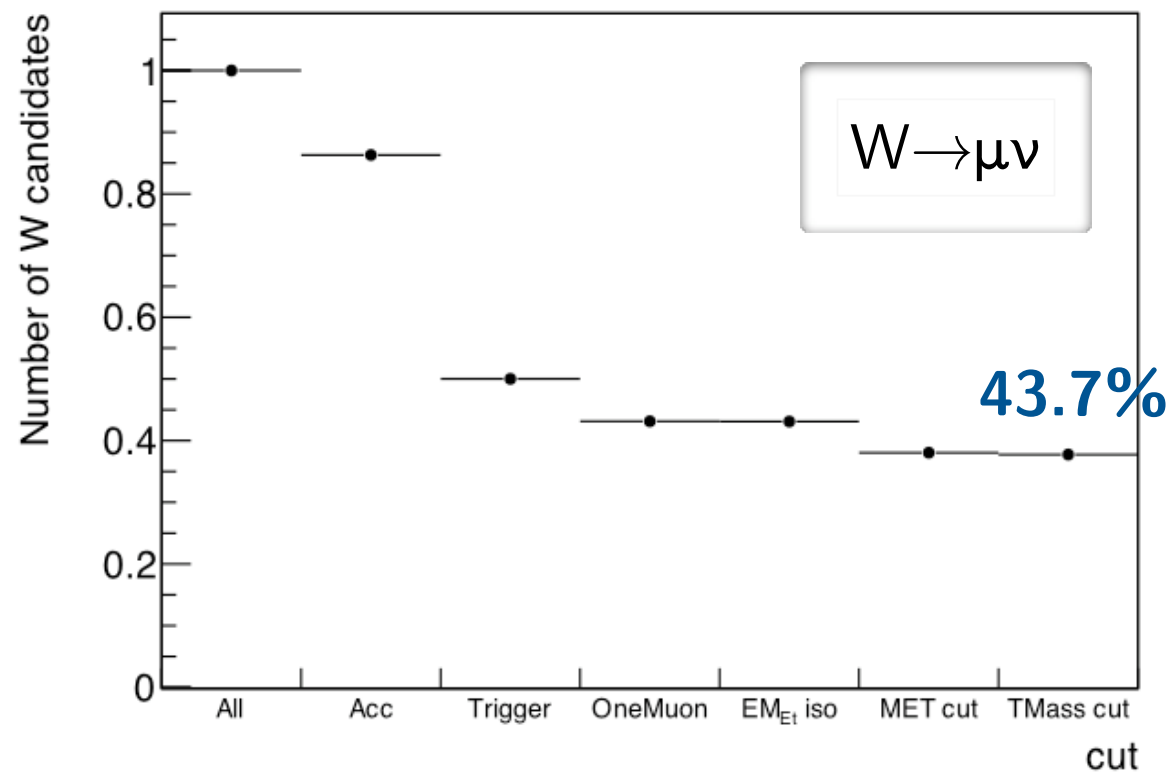
	$W \rightarrow \mu\nu$	$Z \rightarrow \mu\mu$	$W \rightarrow \tau\nu$	$Z \rightarrow \tau\tau$	$t\bar{t}$
Total	120000	11000	40000	15000	2055
Acceptance	103563 (86.3%)	10546 (95.9%)	-	-	-
Trigger	60012 (57.9%)	7714 (73.1%)	2622 (6.6%)	604 (4%)	566 (27.5%)
OneMuon	51764 (50.0%)	3192 (30.3%)	1452 (3.6%)	363 (2.4%)	475 (23.1%)
Iso	51717 (49.9%)	3187 (30.2%)	1451 (3.6%)	359 (2.4%)	438 (21.3%)
MET	45652 (44.1%)	1859 (17.6%)	981 (2.5%)	87 (0.6%)	381 (18.5%)
MT	45287 (43.7%)	1842 (17.5%)	857 (2.1%)	57 (0.4%)	302 (14.7%)

► Comparison to the CSC Note results

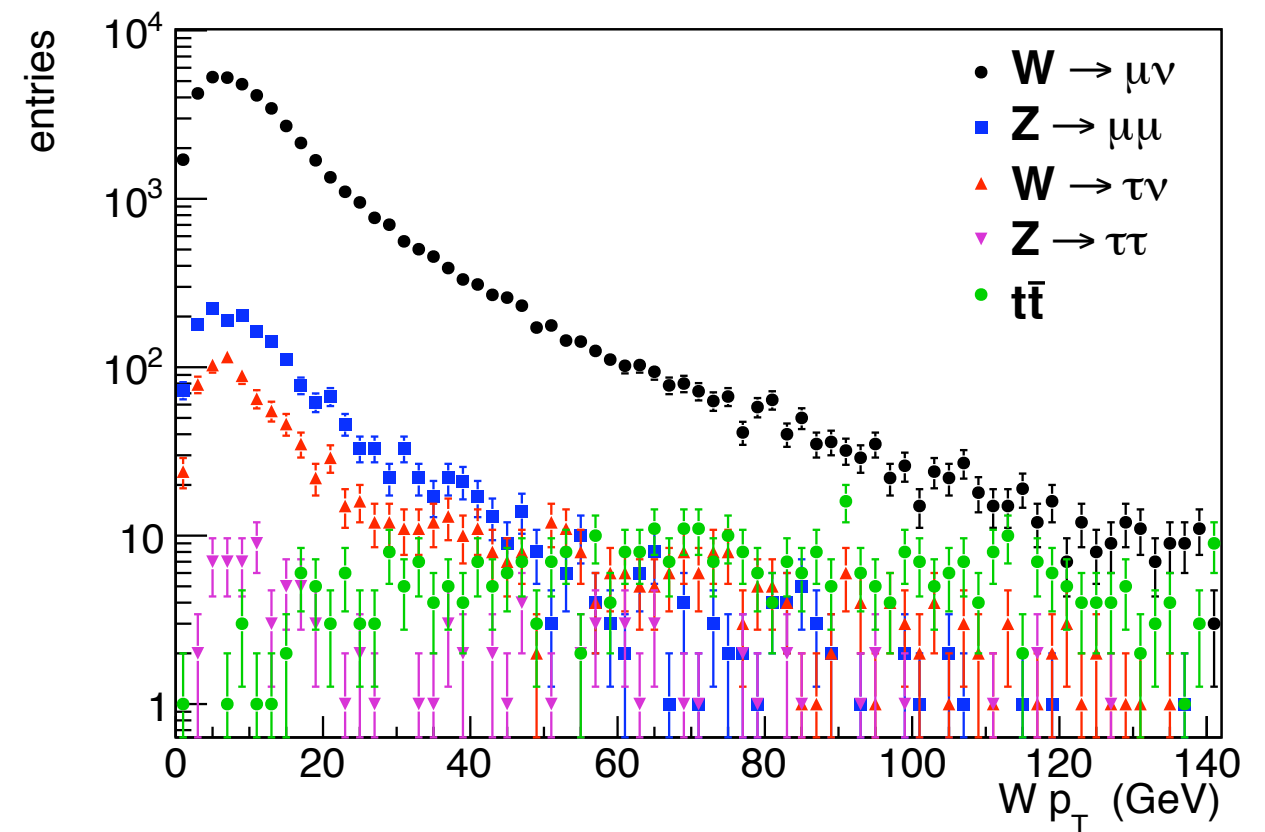
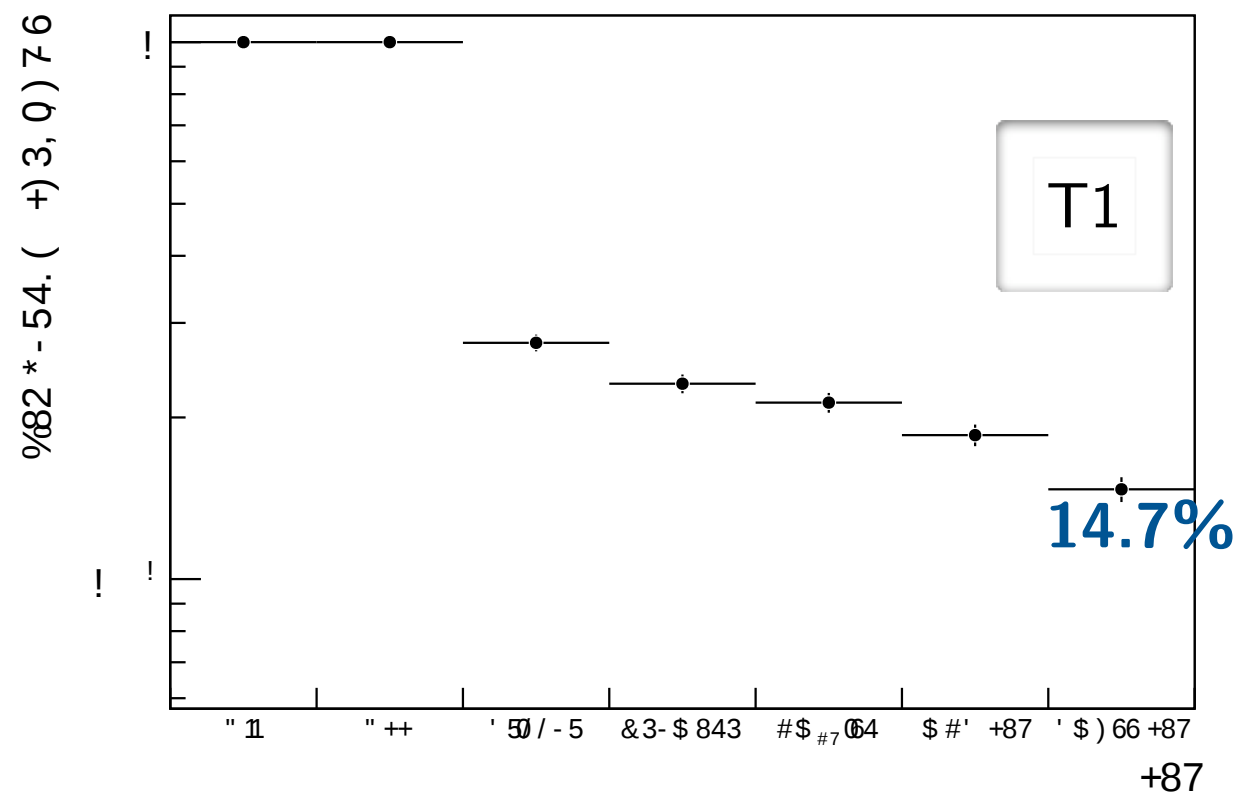
B/S (after all cuts)	$Z \rightarrow \mu\mu$	$W \rightarrow \tau\nu$	$Z \rightarrow \tau\tau$	$t\bar{t}$
MC08 (10 TeV) $\int \mathcal{L} = 10 \text{ pb}^{-1}$	4.1%	1.9%	0.13%	0.67%
CSC (14 TeV) $\int \mathcal{L} = 50 \text{ pb}^{-1}$	3.9%	2.0%	-	0.86%



W Boson Cut Flow



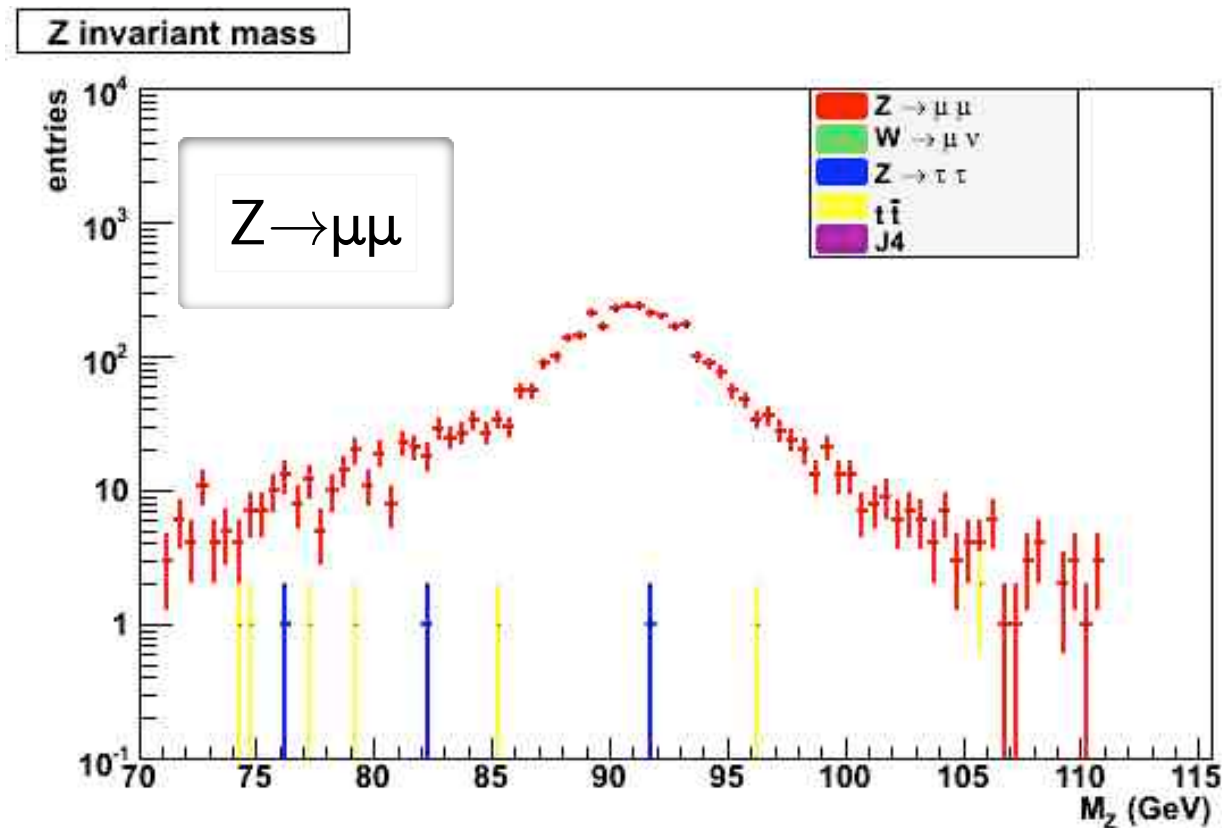
W Boson Cut Flow



$W p_T$ after all the selections
but the WT_{mass}



Invariant Mass and Transverse Mass



Z invariant mass after all the selections

W transverse mass and W pT after all the selections but the WTmass

