Status of the W→τν Analysis: new event selection & comparison data/MC

Lidia

Introduction

Last time (8th March) I talked about:
✓ the aim of the W→τν analysis, signal and background characteristics
✓ the status of the (to become) INT Note @ 10 TeV
✓ the D3PDs production and validation (D3PDs are now used to do most of the analysis)
✓ the initial steps in the optimization of the cut flow for the analysis on 7 TeV data

In the meantime:
✓ we have finalized the cut flow at 7 TeV
✓ the tau ID community has swithched from Cone4H1TopoJets to AntiKt4H1TopoJets for the jet algorithm used to seed a tau: I have compared the samples with the two different algorithms.

Today I will show you:
✓ some brand new results on the optimization of the cut flow, using the significance of missing transverse energy
✓ the possibility of having a W→τν candidate already with 10 nb^{-1}
✓ a comparison between data and MonteCarlo
✓ our ideas about joining th effort for a CONF Note on tau reconstruction
✓ the outilne of what comes next

MET Significance

✓To start the comparison between data and MC we are loosening our selection cuts, in particular lowering MET cut from 35 GeV to 20 GeV.

✓ In this situation we are overwhelmed by QCD di-jets background events.

✓ My main goal was to find a good tool to reject QCD di-jets and being able to see W→τν asap.

✓The idea is to exploit the fact that for QCD di-jet events the missing transverse energy is fake.

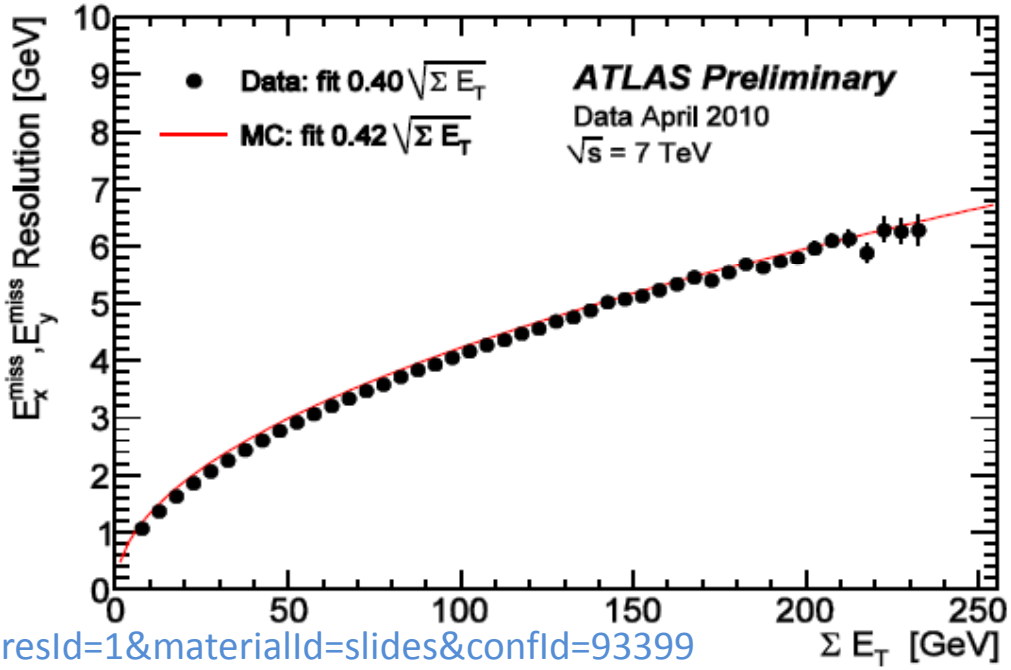
✓ We can use missing transverse energy significance.

$$\frac{E_T^{miss}\,(GeV)}{0.5\sqrt{\sum E_T\,(GeV)}}$$

✓ If we can get rid of QCD by cutting on MET significance, we can relax other cuts, such as MET cut.

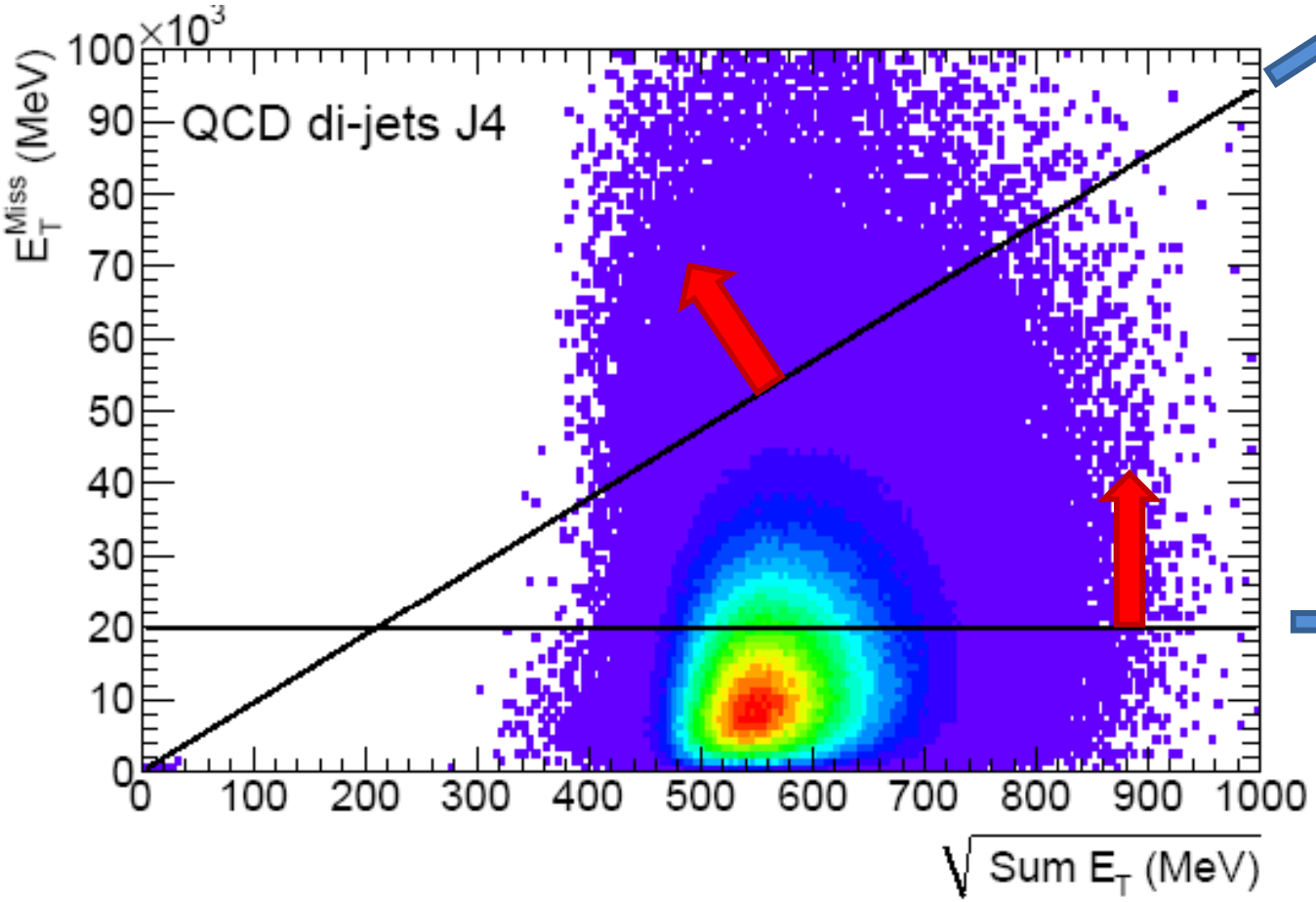
✓ MET rsolution studies are ongoing.

✓ Still some discrepancies, but hope to get a clear picture soon, as we are getting enough data.



http://indico.cern.ch/getFile.py/access?contribId=3&resId=1&materialId=slides&confId=93399

MET Significance Cut



This is the new proposed cut:

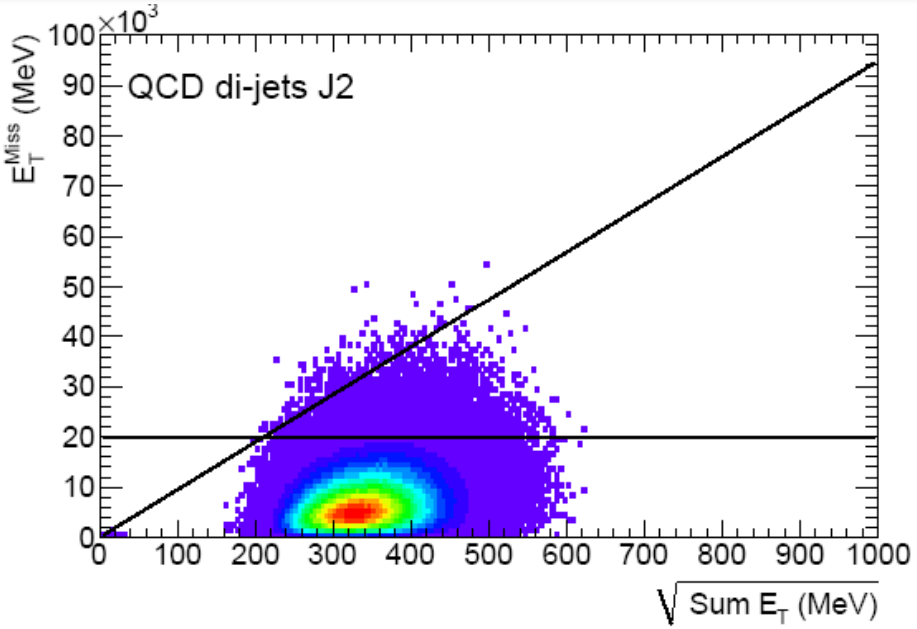
$$\frac{E_T^{miss}(GeV)}{0.5\sqrt{\sum E_T(GeV)}} > 6$$

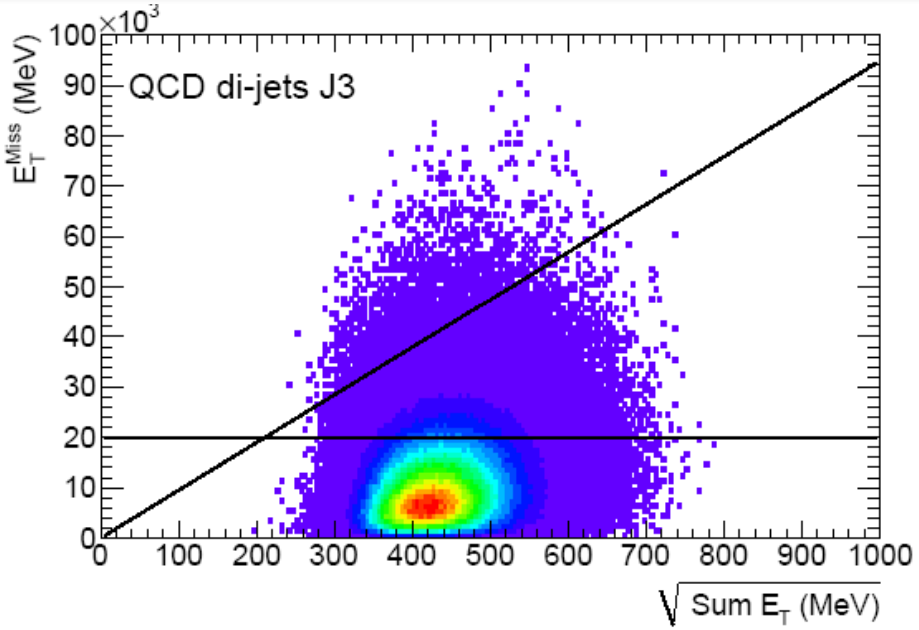
The optimization of the value of MET significance to cut on has been optimized on the "standard" cut flow.

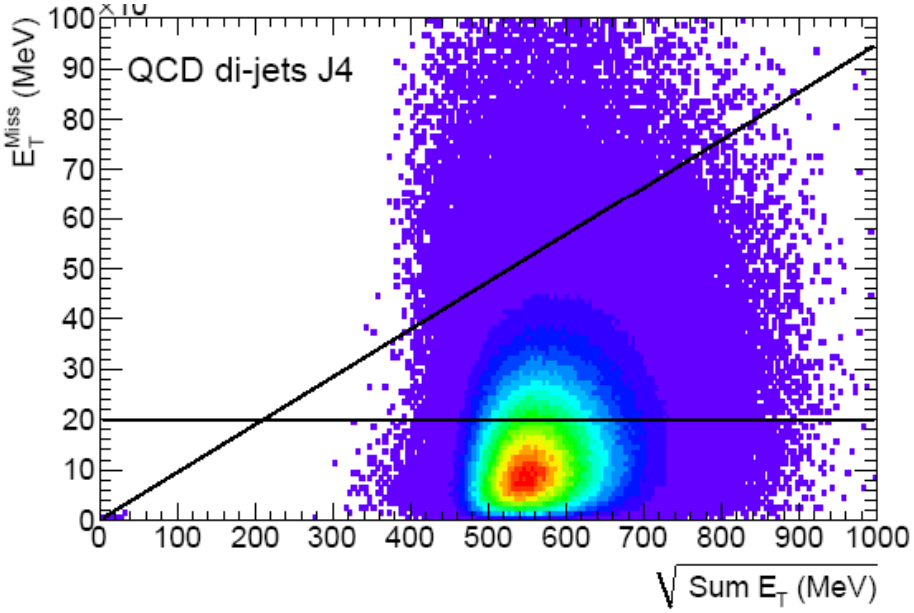
Now, in our relaxed cuts with first data, we are cutting in this way:

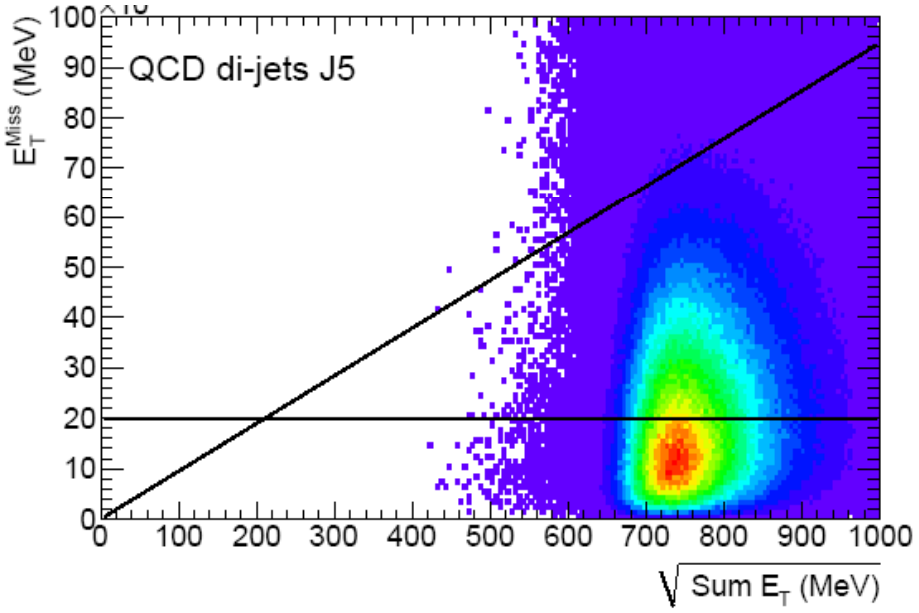
$$E_T^{miss} > 20GeV$$

QCD di-jets – events before any cut

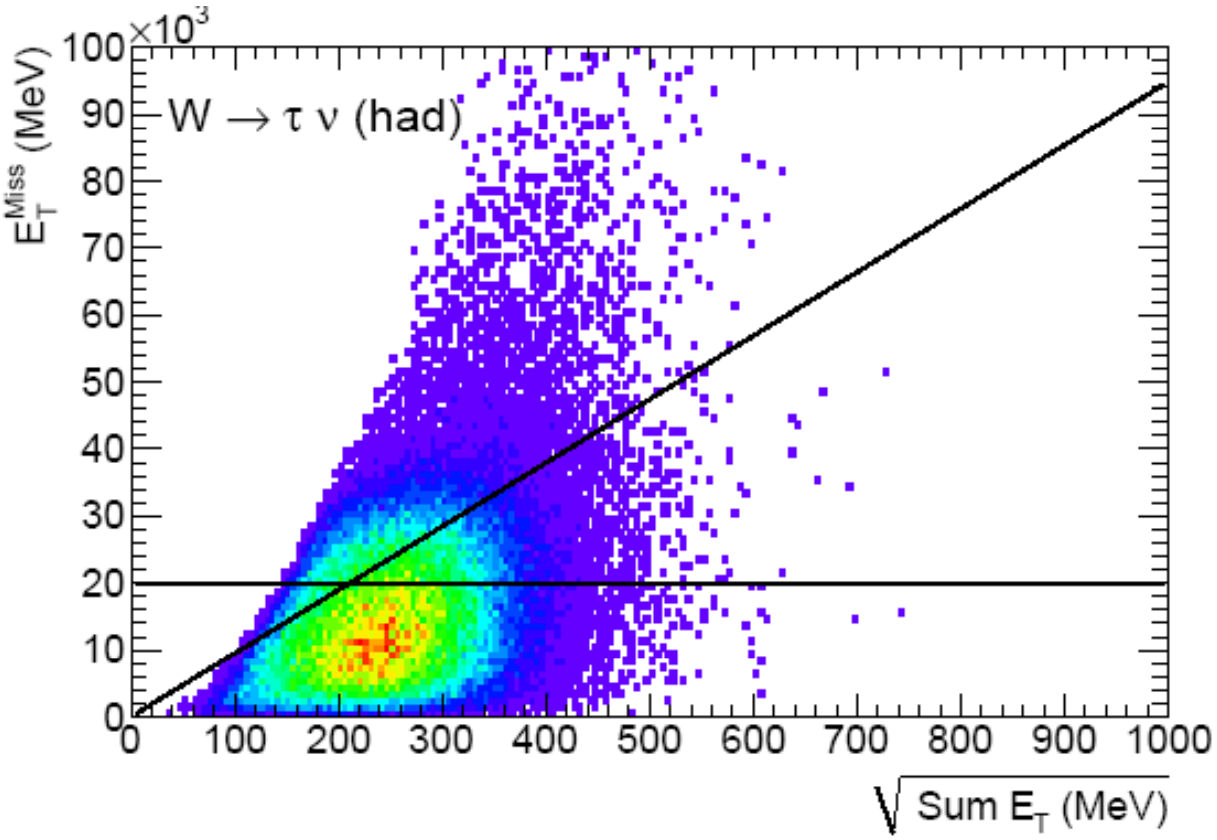


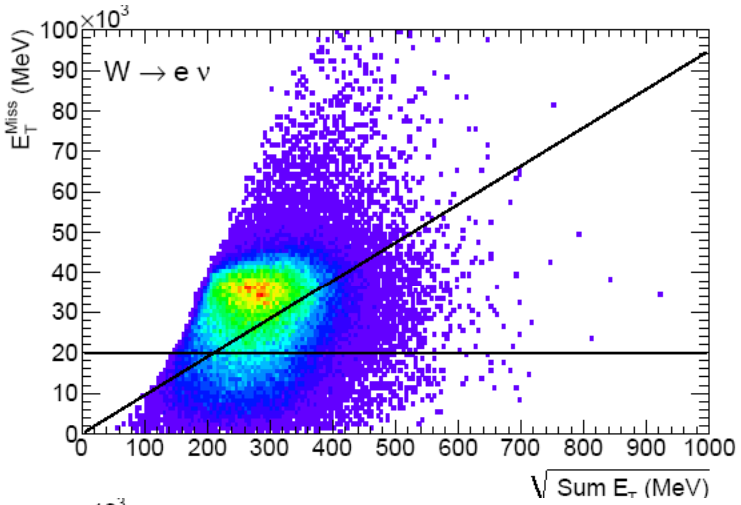


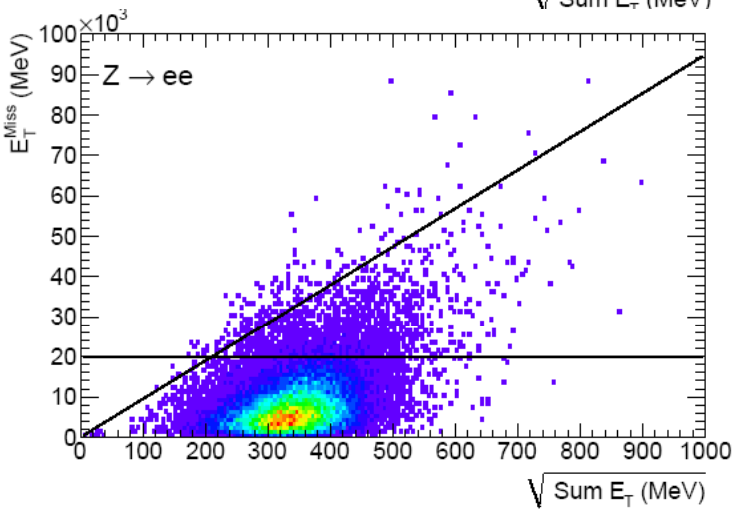




Signal & EW backgrounds







NB This new cut doesn't intend to cut EW background! These plots are shown just for reference.

All EW backgrounds in backup slides

CutFlow – which value?

W→τν Event Selection
- ✓ Trigger: EF_tau12_loose_xe20 (10,15,20)
- ✓ Missing E_T: MET_Final > 35 GeV
- ✓ Missing E_T significance > XX
- ✓ Tau identification:
  - ✓ only one tau reco by both the reconstruction algorithms (calorimeter and tracking based) and which passes safe tight cuts
  - ✓ 20 GeV < E_T < 60 GeV
  - ✓ not in 1.3<|η|<1.7
  - ✓ ElectronVetoTight and MuonVeto
- ✓ Veto leptons in the event:
  - ✓ Electron: loose and author!=8 ant pT>5GeV
  - ✓ Muon: STACO and isCombinedMuon and pT>5GeV
- ✓ Veto jets with pT > 20 GeV and 1.3<|η|<1.7.
- ✓ Topological cut: Δϕ(τ, MET) > 2.5

✓ Cut optimization done on "base cut flow" on 100 pb^{-1}

✓Cutting at 6, we start loosing some QCD

✓ To be safer, a cut at 7 would help. But we start loosing much signal.

✓ A cut at 8 would be the safest to reject QCD.

✓ More tables in backup slides.

→ I will use 6 in the following

Sample	Whtaunu	Wenu	Wmunu	Wtaunu	Zee	Zmunu	Ztautau	J0	J1	J2	J3	J4	J5	J6	S/B	S/sqrt(S+B)
No cut	5213	223	81	57	0	2	217	0	0	0	611	206	19	1	3.68	64.02
MET_sign>5	5150	219	79	57	0	2	214	0	0	0	611	77	8	0	4.06	64.28
MET_sign>6	4753	201	71	55	0	2	192	0	0	0	0	77	7	0	7.87	64.94
MET_sign>7	3772	163	57	50	0	2	145	0	0	0	0	26	5	0	8.40	58.06
MET_sign>8	2582	128	46	42	0	1	95	0	0	0	0	0	4	0	8.17	47.96
MET_sign>9	1556	79	33	32	0	0	54	0	0	0	0	0	2	0	7.78	37.13
MET_sign>10	795	47	16	20	0	0	24	0	0	0	0	0	2	0	7.24	26.43
MET_sign>11	301	26	11	11	0	0	8	0	0	0	0	0	1	0	5.22	15.90
MET_sign>12	78	10	7	5	0	0	2	0	0	0	0	0	1	0	2.97	7.66
MET_sign>13	22	5	5	3	0	0	1	0	0	0	0	0	1	0	1.56	3.68
MET_sign>14	5	2	3	2	0	0	0	0	0	0	0	0	1	0	0.63	1.38

CutFlow comparison

✓ 100 pb^{-1}

✓ No Cut

Sample	Whtaunu	Wenu	Wmunu	Wtaunu	Zee	Zmunu	Ztautau	J0	J1	J2	J3	J4	J5	J6
Events	579300	776100	776100	276400	81500	81500	84900	9.83E+11	6.81E+10	4.09E+09	2.20E+08	8.73E+06	2.33E+05	3.30E+03
Trigger	68196	443787	19514	21854	5547	1749	7453	0.00E+00	1.15E+07	3.34E+07	1.45E+07	1.38E+06	4.57E+04	6.48E+02
METcut	34611	294834	12717	10066	227	351	2576	0	171697	273199	542114	164587	13486	349
SafeAndOne	12907	240571	3003	5950	108	96	1134	0	171697	52538	58673	13988	1217	36
Et_cut	10759	228605	2059	4384	56	59	818	0	0	31523	29337	4946	385	11
eta_cut	9450	197025	1751	3771	48	51	715	0	0	21015	27503	4019	336	10
LeptFlag	8008	865	1234	189	3	30	474	0	0	21015	24447	3452	288	8
LeptVeto	7341	318	119	79	1	4	342	0	0	21015	19558	2653	200	6
JetVeto	6938	303	113	74	1	3	313	0	0	21015	12835	1726	109	4
DeltaPhi	5213	223	81	57	0	2	217	0	0	0	611	206	19	1

✓ MET significance > 6

Sample	Whtaunu	Wenu	Wmunu	Wtaunu	Zee	Zmunu	Ztautau	J0	J1	J2	J3	J4	J5	J6
Events	579300	776100	776100	276400	81500	81500	84900	9.83E+11	6.81E+10	4.09E+09	2.20E+08	8.73E+06	2.33E+05	3.30E+03
Trigger	68196	443787	19514	21854	5547	1749	7453	0.00E+00	1.15E+07	3.34E+07	1.45E+07	1.38E+06	4.57E+04	6.48E+02
METcut	34611	294834	12717	10066	227	351	2576	0	171697	273199	542114	164587	13486	349
METSign	30302	265462	11659	8950	70	308	2022	0	171697	126092	102067	26328	2152	66
SafeAndOne	11398	217993	2764	5237	36	84	897	0	171697	31523	14057	2885	188	7
Et_cut	9516	209450	1897	3825	21	54	655	0	0	21015	7334	1108	53	2
eta_cut	8354	180328	1618	3283	17	46	573	0	0	10508	6723	927	48	2
LeptFlag	7070	734	1146	172	1	28	382	0	0	10508	6112	747	42	1
LeptVeto	6514	280	108	74	1	3	280	0	0	10508	4889	438	29	1
JetVeto	6189	268	103	70	1	3	261	0	0	10508	3056	283	22	1
DeltaPhi	4753	201	71	55	0	2	192	0	0	0	0	77	7	0

Cuf flow for first data

W→τν Event Selection

- ✓ GRL selection
- ✓ Collision candidate cleaning
- ✓ Trigger: L1_J5
- ✓ Jet cleaning
- ✓ Missing E_T: MET_Topo > 20 GeV
- ✓ Missing E_T significance > 6
- ✓ Tau identification:
  - ✓ only one tau reco by both the reconstruction algorithms (calorimeter and tracking based) and which passes safe tight cuts
  - ✓ 20 GeV < E_T < 60 GeV
  - ✓ not in 1.3<|η|<1.7
  - ✓ ElectronVetoTight and MuonVeto
- ✓ Veto leptons in the event:
  - ✓ Electron: loose and author!=8 ant pT>5GeV
  - ✓ Muon: STACO and isCombinedMuon and pT>5GeV
- ✓ Veto jets with pT > 20 GeV and 1.3<|η|<1.7.
- ✓ Topological cut: Δϕ(τ, MET) > 2.5

✓ Data (April reprocessing): D3PDs from L1Calo Stream (DESD_MET).
Total lumi: 3.21 nb^{-1}
✓ MC (April reprocessing): D3PDs without DESD_MET skimming.
✓ see backup slides for all the details

NOTE:
✓ Applied cuts overcome the DESD_MET skimming (both trigger and MET/tau selection).
✓Collision candidate and jet cleaning applied also to MC.

MC: events expected in 3.21 nb^{-1}

Sample	Whtaunu	Wenu	Wmunu	Wtaunu	Zee	Zmunu	Ztautau	J0	J1	J2	J3	J4	J5	J6
Events	18.54	24.84	24.84	8.84	2.61	2.61	2.72	3.14E+07	2.18E+06	1.31E+05	7.04E+03	2.79E+02	7.46E+00	1.06E-01
GRL	18.54	24.84	24.84	8.84	2.61	2.61	2.72	3.14E+07	2.18E+06	1.31E+05	7.04E+03	2.79E+02	7.46E+00	1.06E-01
CollCand	18.49	24.77	24.78	8.82	2.60	2.61	2.71	3.14E+07	2.18E+06	1.31E+05	7039	279	7.43	0.10
Trigger	11.41	23.33	5.77	3.94	2.56	0.71	2.09	1280509	829968	119915	7029	279	7.43	0.10
JetClean	11.39	23.33	5.74	3.94	2.56	0.71	2.09	1279857	829765	119905	7028	279	7.43	0.10
METcut	5.09	18.89	3.04	1.69	0.18	0.35	0.51	225	848	1462	712	91	4.33	0.08
METSign	2.73	13.87	2.02	0.99	0.02	0.23	0.23	0.00	11.27	23.04	15.81	3.76	0.34	0.01
SafeAndOne	0.69	9.92	0.14	0.36	0.01	0.02	0.07	0.00	0.00	3.86	2.04	0.24	0.02	0.00
Et_cut	0.55	9.42	0.08	0.26	0.00	0.01	0.06	0.00	0.00	1.50	1.27	0.09	0.01	0.00
eta_cut	0.49	8.07	0.06	0.23	0.00	0.01	0.05	0.00	0.00	1.03	1.08	0.08	0.00	0.00
LeptFlag	0.41	0.05	0.04	0.01	0.00	0.01	0.03	0.00	0.00	0.75	0.92	0.07	0.00	0.00
LeptVeto	0.39	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.19	0.32	0.03	0.00	0.00
JetVeto	0.38	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.19	0.28	0.02	0.00	0.00
DeltaPhi	0.33	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00

Signal expected in 3.21 nb^{-1}

Background expected in 3.21 nb^{-1}

→ S/B = 8

Data-MC comparison

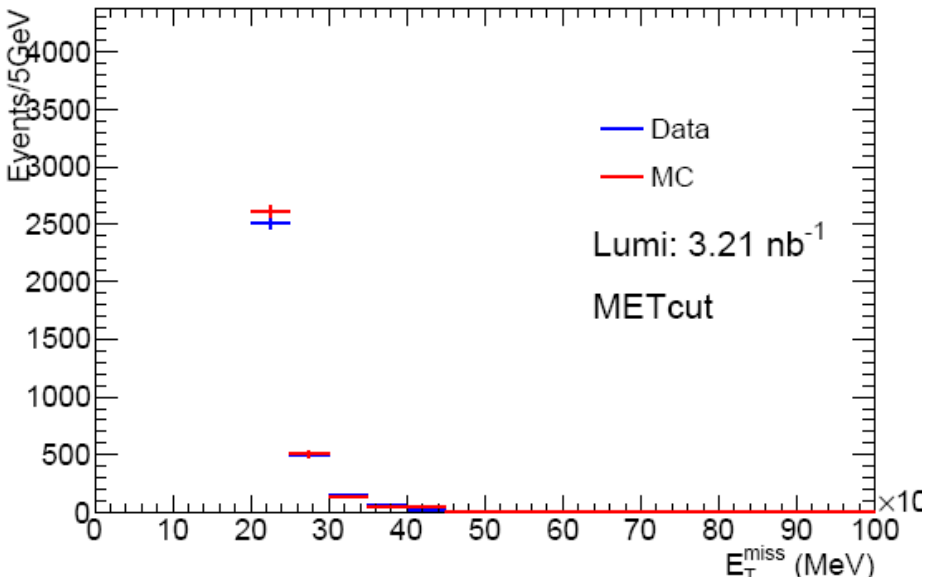
Due to DESD skimming, it is not posible to compare data-MC at this stage of the cut flow!

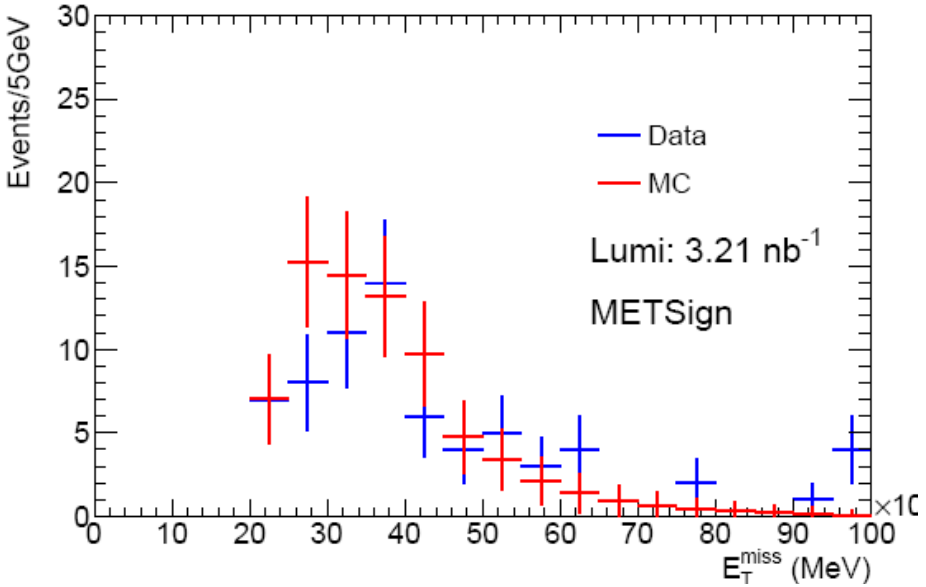
Sample	MC Signal	MC Background	DATA
Events	18.54	33765085	1096791
GRL	18.54	33765085	908581
CollCand	18.49	33750202	904519
Trigger	11.41	2237746	627133
JetClean	11.39	2236881	625217
METcut	5.09	3367	3271
METSign	2.73	71.58	69
SafeAndOne	0.69	16.67	14
Et_cut	0.55	12.71	13
eta_cut	0.49	10.63	10
LeptFlag	0.41	1.88	2
LeptVeto	0.39	0.58	1
JetVeto	0.38	0.53	1
DeltaPhi	0.33	0.04	1

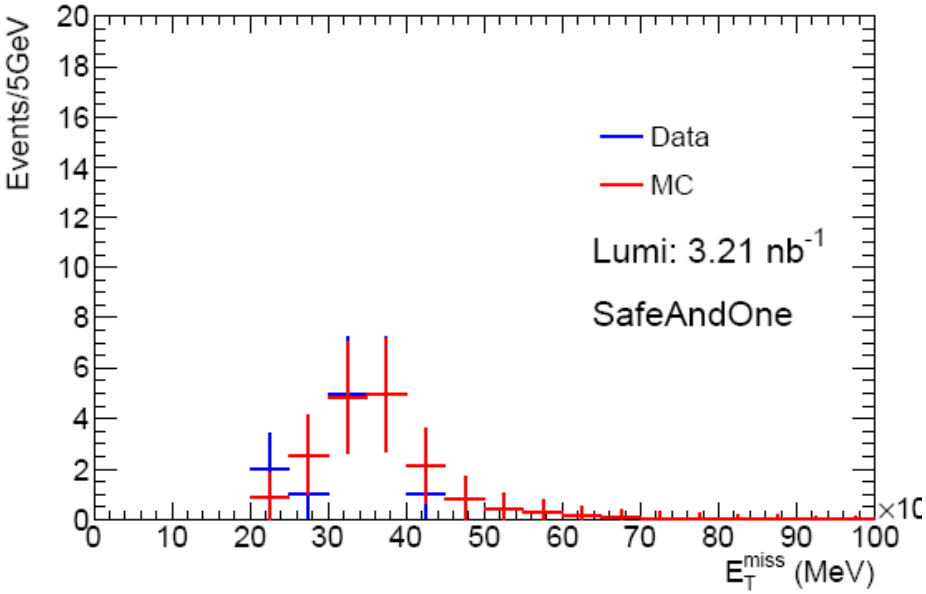
See following slides!

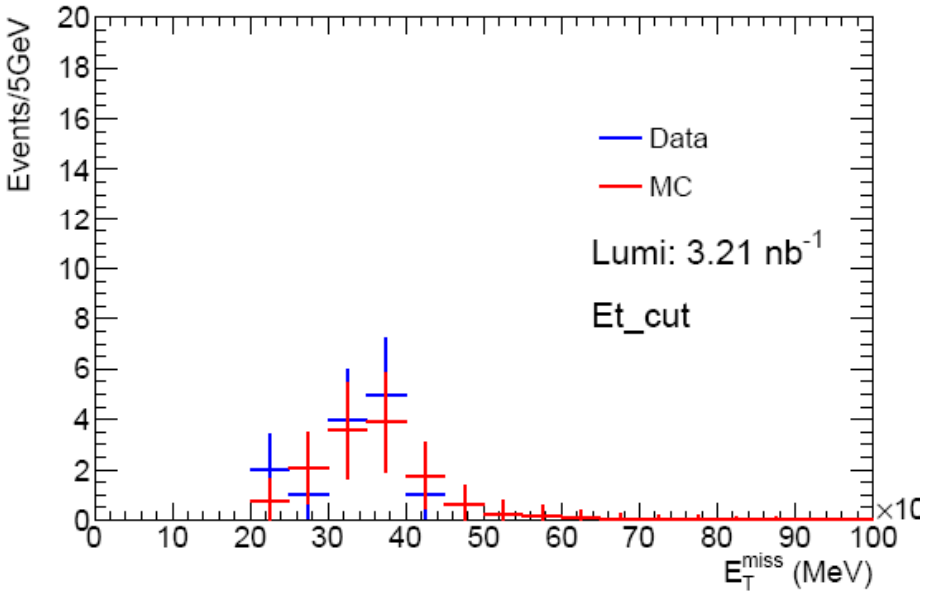
Very good agreement on the number of expected events data-MC!

Data-MC comparison: MET

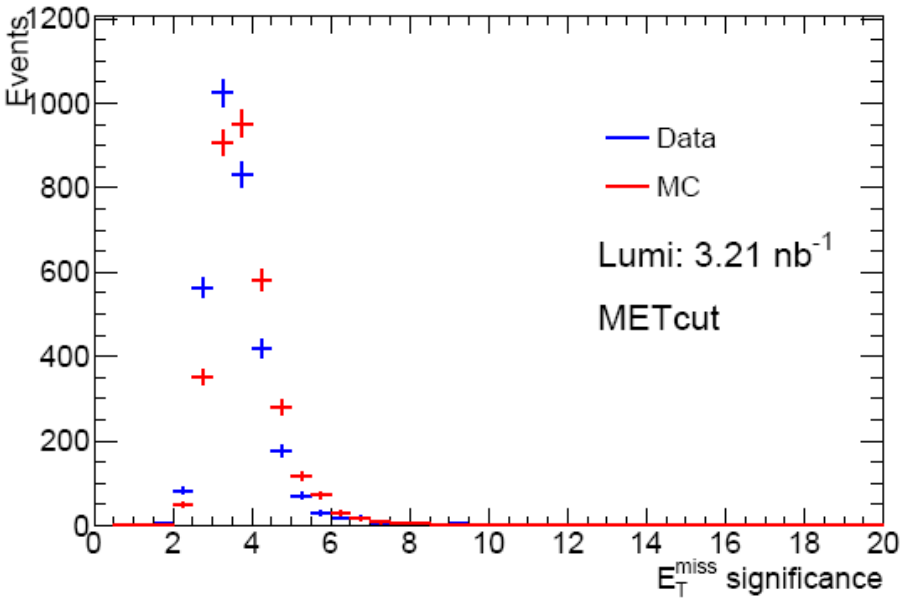


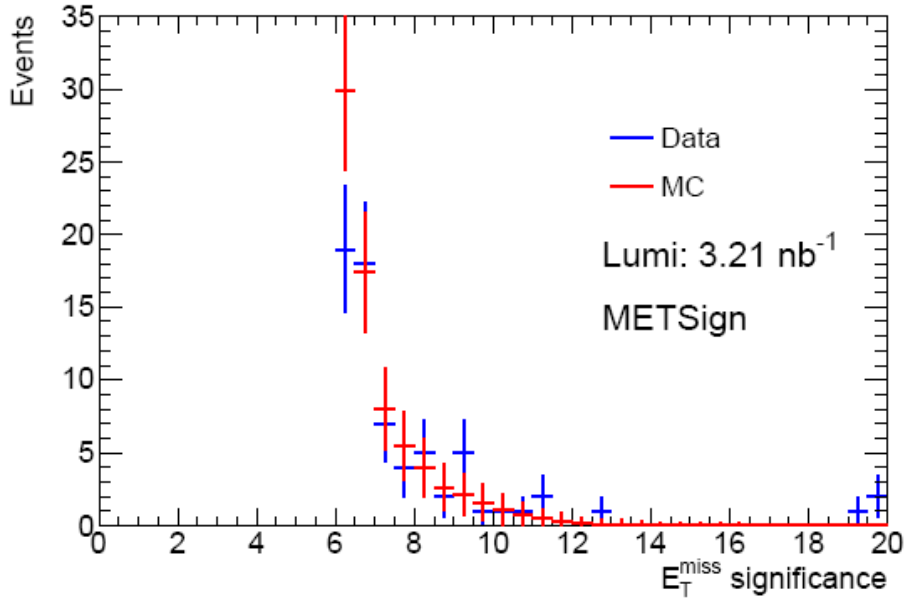


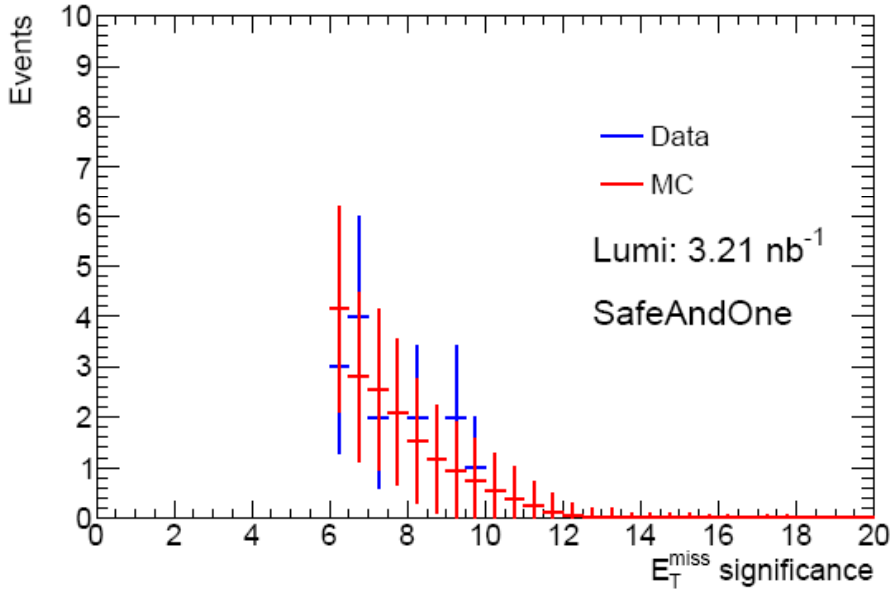


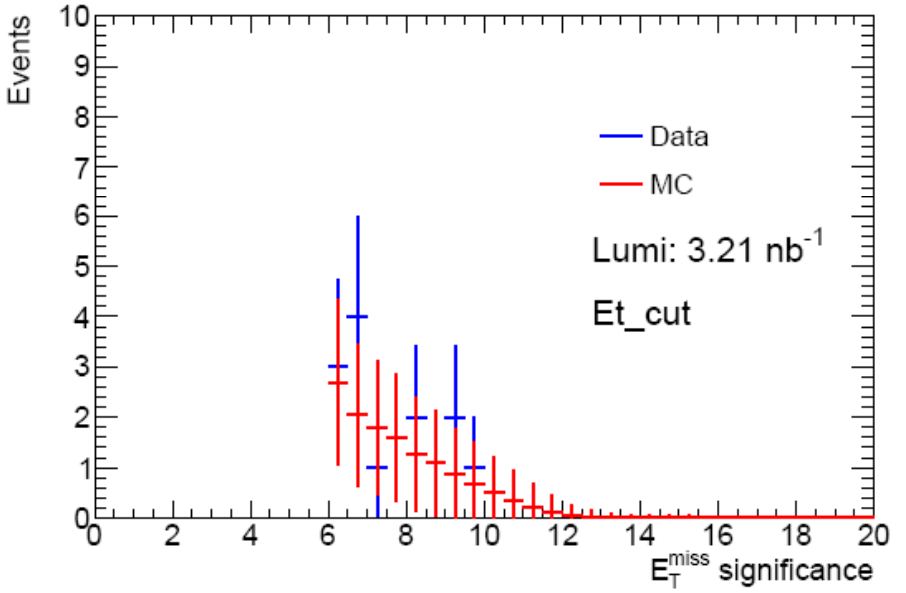


Data-MC comparison: MET signif.

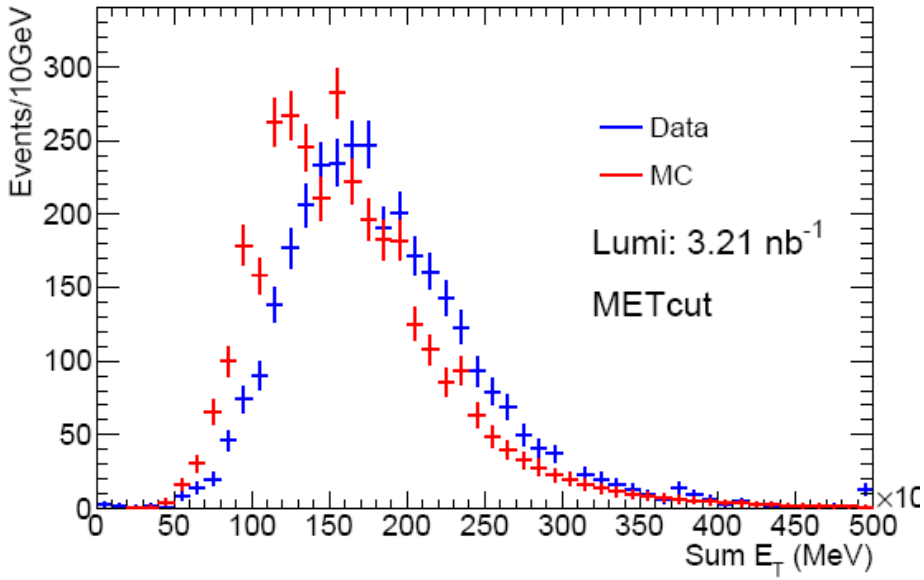


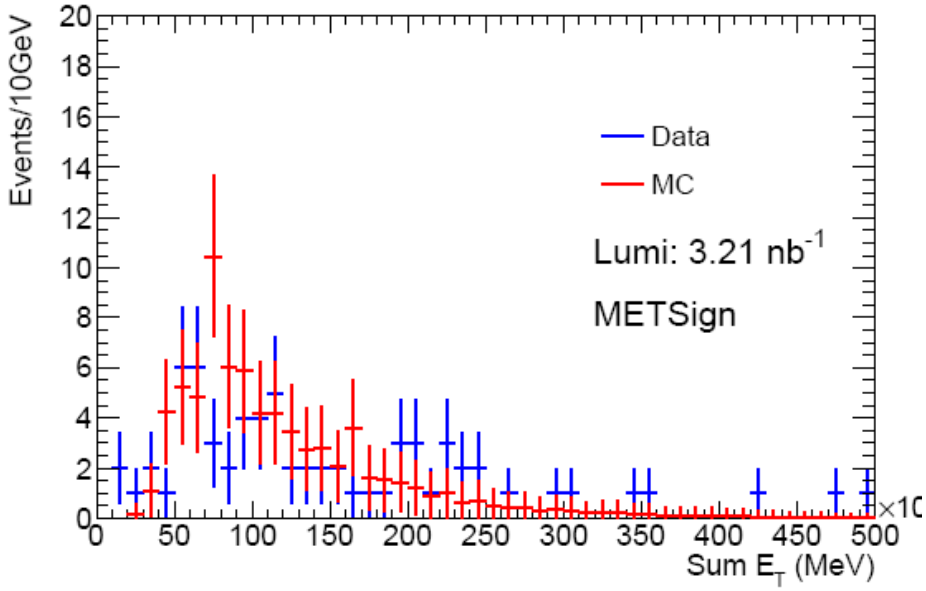


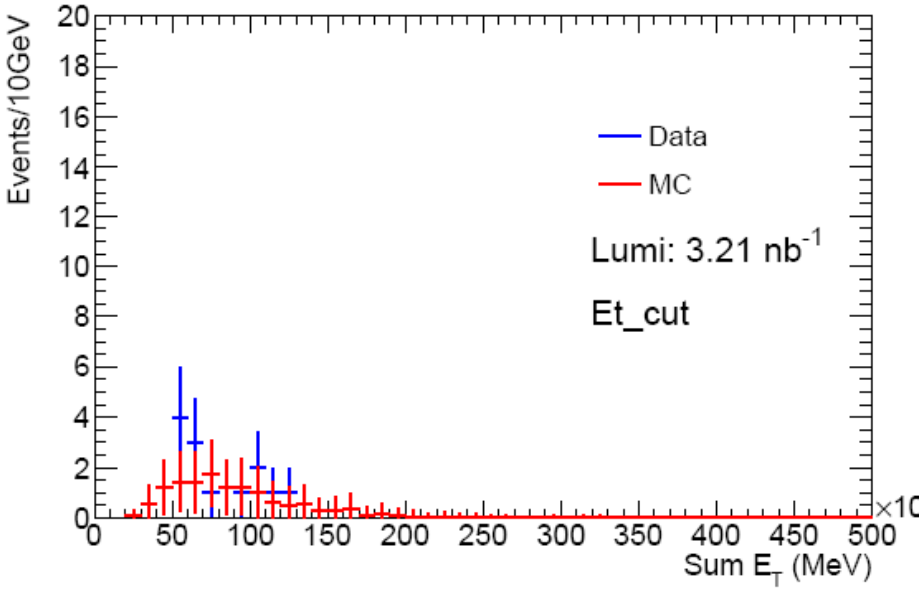


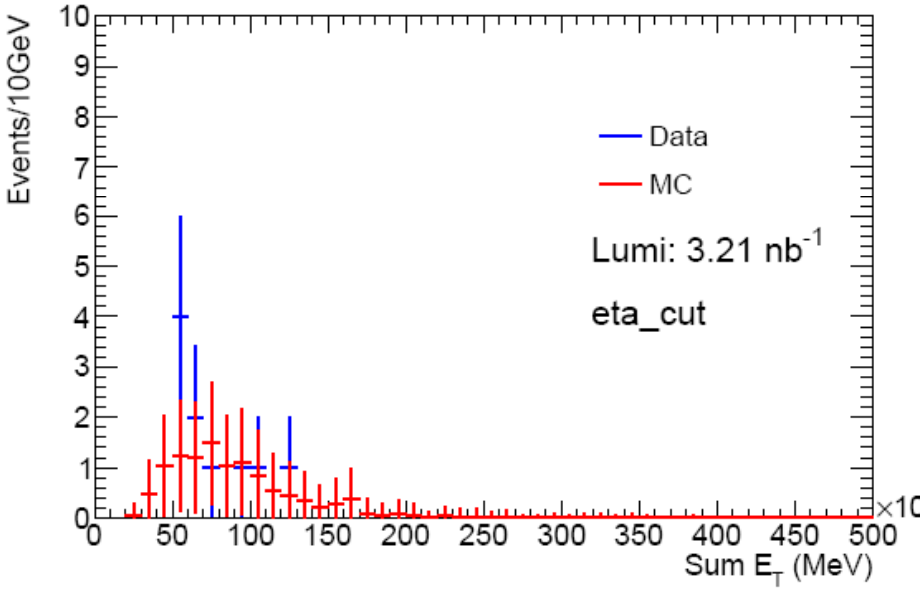


Data-MC comparison: ΣE_T









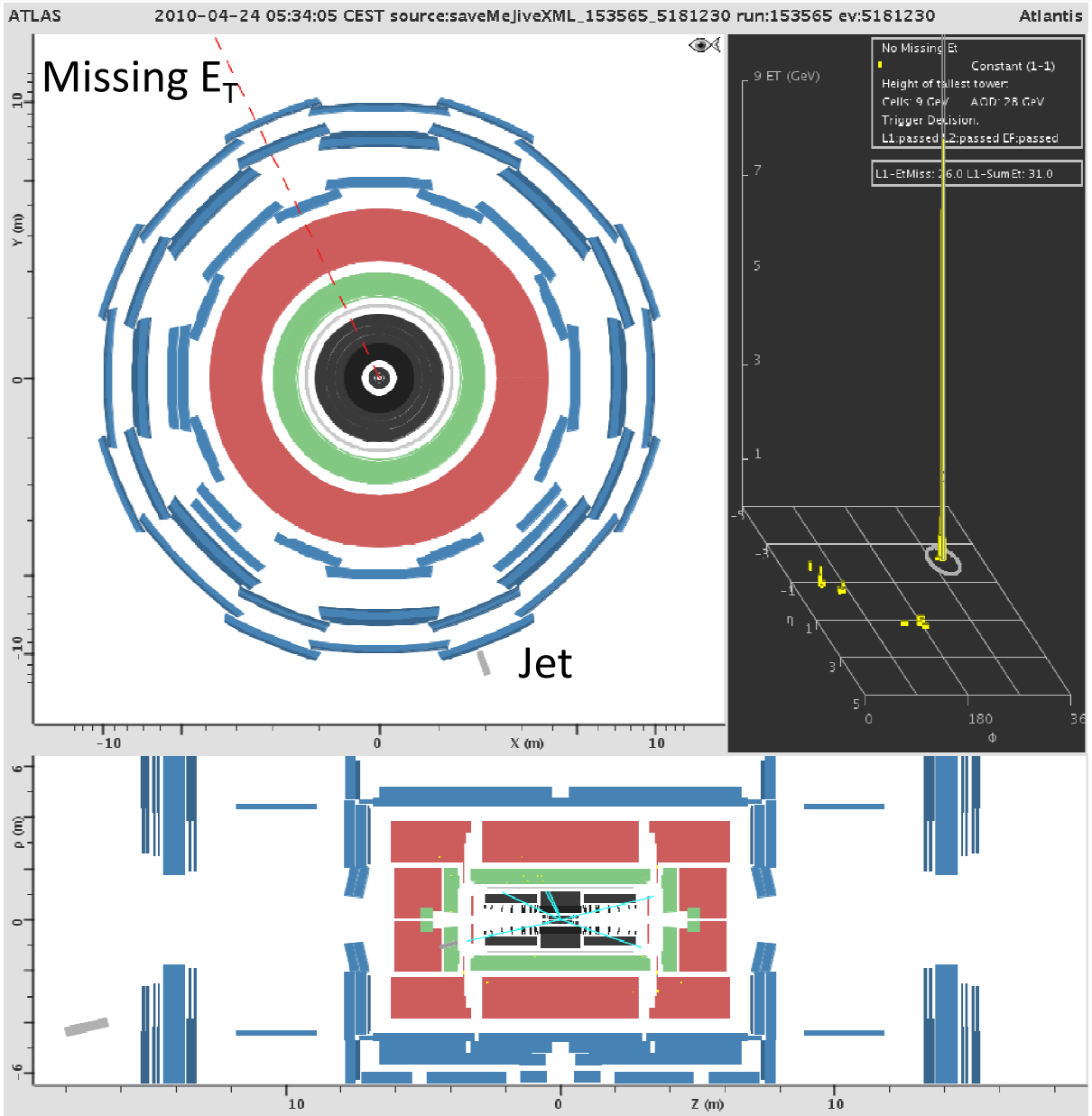
The first candidate

RunNumber: 153565
EventNumber: 5181230
LB: 318

Triggers:
L1_TAU5 1
L1_TAU6 1
L1_TAU6_XE10 1
L2_tau12_loose 1
L2_tau12_loose_xe20 1
L2_tau16_loose 1
L2_tau16_loose_xe20 1
EF_tau12_loose 1
EF_tau12_loose_xe20 1
EF_tau16_loose 1
EF_tau16_loose_xe20 1

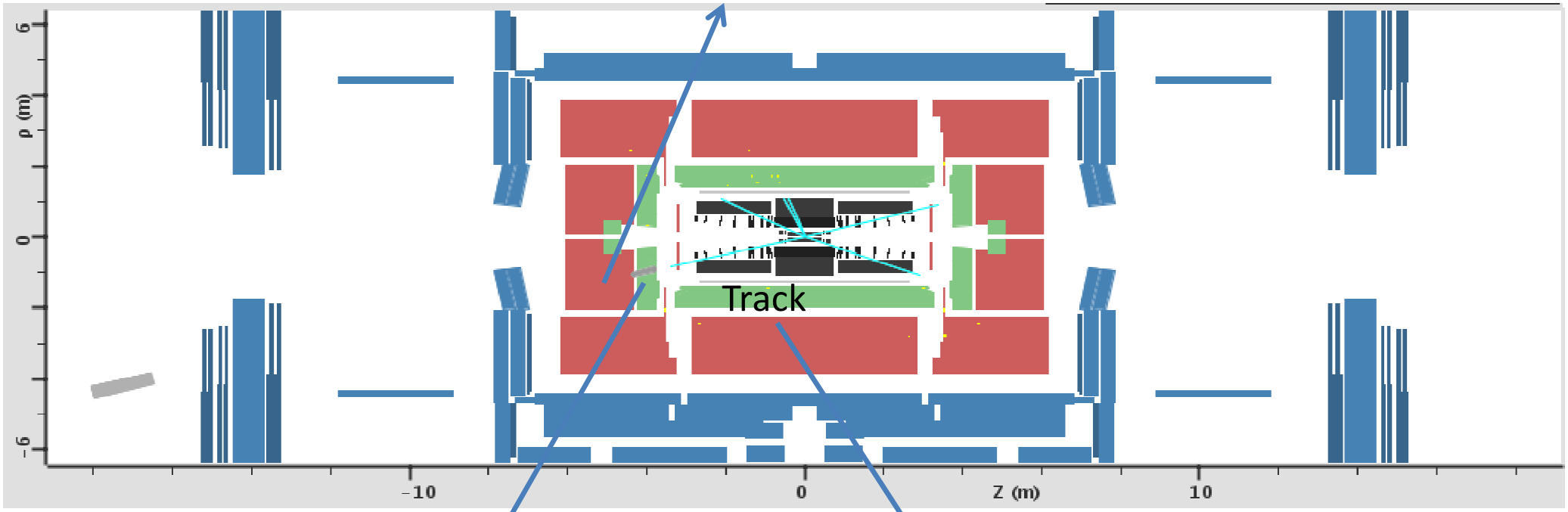
MET_Topo: 31098.7 MeV

Taus in the event: 1 SafeTight
η: -2.13043
ϕ: -1.23067
E_T: 37542.8 MeV



The first candidate

Nothing in the hadronic calorimeter…



Cluster (id: 1 index: 0)
storegate key: egClusterCollection
ET = 28.353 GeV
E = 120.325 GeV
η = -2.124
Φ = 290.248° (5.066 rad)

InDetTrack (id: 0 index: 0)
storegate key: TrackParticleCandidate
d0 = -0.011 ± 0.002 cm
z0 = 0.786 ± 0.018 cm
|z0-zVtx| = 0.339 cm
phi0 = 289.510 ± 0.019° (5.053 ± 0.000 rad)
η = -2.130 ± 0.001
tL = -4.148 ± 0.002
pT = -20.06 GeV ± 0.781 GeV
p = -85.60 GeV
chi2/numDoF = 2.7686727

Sounds like a W→eν event…

TauReconstruction CONF Note

✓ For this CONF Note, a set of standard plot on ID variables will be shown.
✓ Our idea is to produce the very same plots with their same selection + the selection of missing transverse energy, to show which are the performance for our analysis.
✓ We will also produce some other plots of variables which are strictly connetcted to our analysis: lepton vetos, MET distribution, MET significance, MT…

✓ We (me&Guilherme) have now agreed on the samples, on the cut flow (the official will be sent out today).

(Our) Event Selection
✓ GRL selection
✓ (Trigger: L1_J5)
✓ Jet cleaning
✓ Missing E_T: MET_Topo > 20 GeV
✓Tau selection (without ID!!):
- ✓ leading of the taus reco by both the reconstruction algorithms (calorimeter and tracking based)
- ✓ 20 GeV < E_T < 60 GeV
- ✓ not in 1.3<|η|<1.7

ToDoList

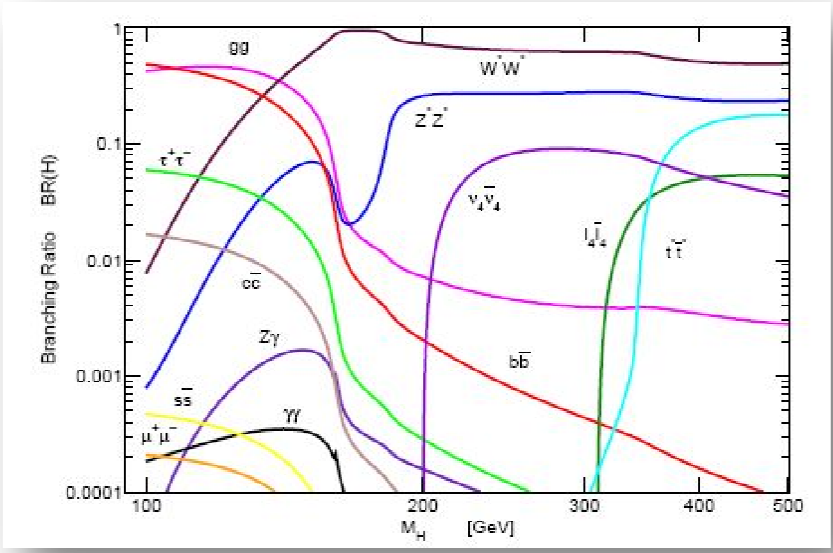
- ✓ I will rerun the analysis on the full statistics available:
  - ✓ use May reprocessing
  - ✓ have to wait for D3PDs production
  - ✓ will have to run on the grid as bringing all the datasets to Milano is getting painful
- ✓ We should also keep an eye to pileup, as it will become important soon. (Small) datasets for pileup studies are available.
- ✓ Also the trigger is crucial. Soon our full trigger will be in the menu, so we should keep on checking that it is selecting our candidates.
- ✓ I will try to find another smart cut to suppress the W→ev background, which is now the most problematic one
  - ✓ see what people from the W→ev are doing
  - ✓ try to understand if it is possible to cut on “no electron candidate in the event” (overlap removal?)
- ✓ I will also contribute the the tau Reco CONF note, which is also useful for my thesis.
- ✓ I have to start writing first the index and then also the thesis!!

Back up

Motivation to W→τν analysis

- ✓ Taus are interesting objects because:
  - ✓ the τ leptons in the final state are important signature for Higgs boson and SUSY searches – as the heaviest lepton, they have the largest coupling to the Higgs boson both in the Standard Model and in the MSSM.
- ✓ BUT hadronically decaying taus are difficult to identify in hadron collision, due to the overwhelming QCD background.

understand τ_{had} reconstruction and identification is essential and challenging



- ✓ Main processes with τ_{had} final states:
  - ✓ ttbar $\sigma = 3.74 \times 10^2$ pb (@10TeV)
  - ✓ $Z \rightarrow \tau\tau$ $\sigma = 1.13 \times 10^3$ pb (@10TeV)
- ✓ W→τν is an interesting channel to study taus:
  - ✓ it is the most abundant source of τ leptons with $\sigma = 7.69 \times 10^3$ pb @10TeV
  - ✓ it will be possible to study this channel only with the very first data at low luminosity (10^{31} - 10^{32} $cm^{-2}s^{-1}$), due to the QCD background rate
- ✓ There are some interesting measurements that can be done with 100 pb^{-1} of data:
  - ✓ cross section
  - ✓ BR(W→τν)/BR(W→eν) ratio

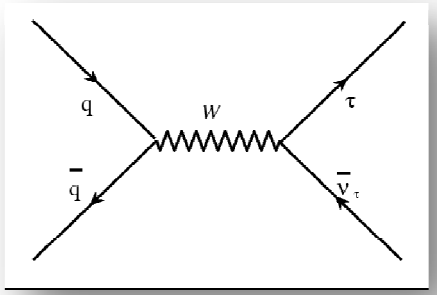
Status of the analysis in ATLAS

✓ 14 TeV analysis – documented in a note (ATL-PHYS-INT-2009-011) by Y.Coadou, P.Malecki and E.Richter-Was

✓ 10 TeV analysis – documented in a note (ATL-COM-PHYS-2010-067) G.Nunes-Hanninger, L.Dell'Asta, A.Andreazza, D.Casadei, Y.Coadou, J.Dingfelder, O.Igonkina, J.Kroseberg, P.Malecki, M.Neubauer, E.Richter-Was and A.Sfyrla.
✓ For the moment it is just a communication. We have been assigned a rewier (S.Demers, Yale) and answered to all the comments. It still has to become an INT note.

✓ 7 TeV analysis – documented on a dedicated twiki page.
✓ Cut flow has been optimized and the standard cut flow foresees 50 events/pb-1
✓ Cut flow has also been adapted for very first data analysis, loosening both the trigger and the missing transverse energy selection

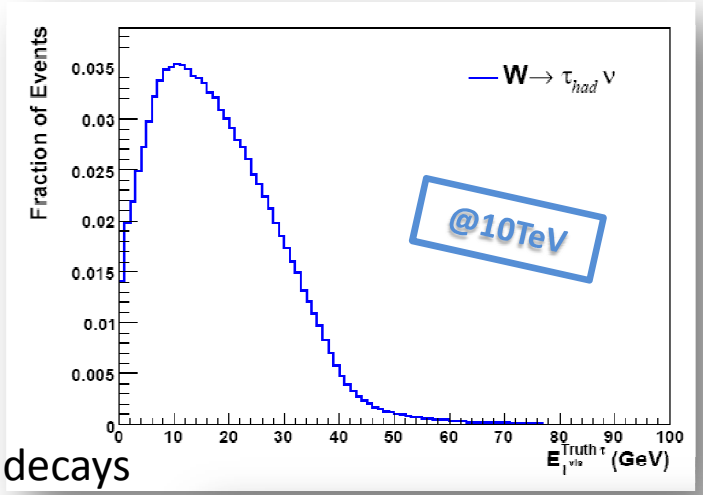
W→τν – signal



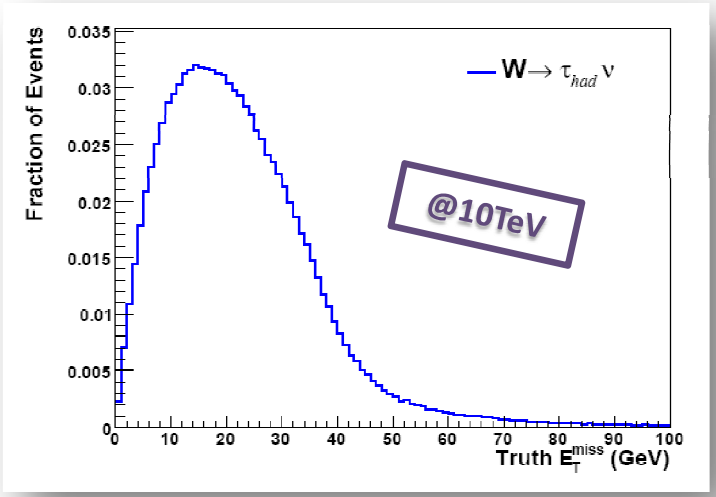
Signature:

- ✓ τ lepton
- ✓ missing transverse energy

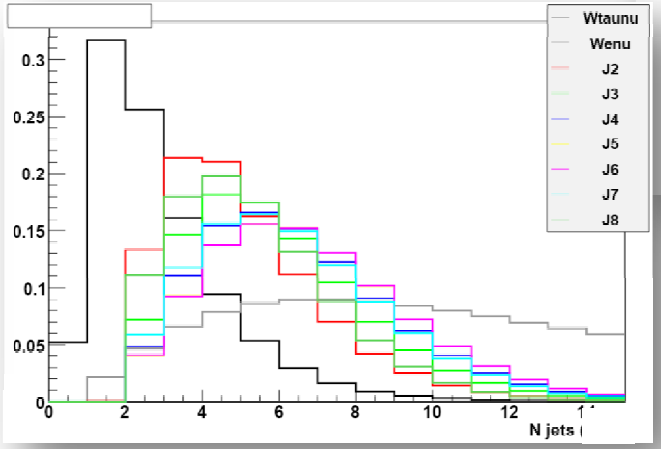
Soft τ lepton with $20<p^{\tau}_{T}<40$ GeV

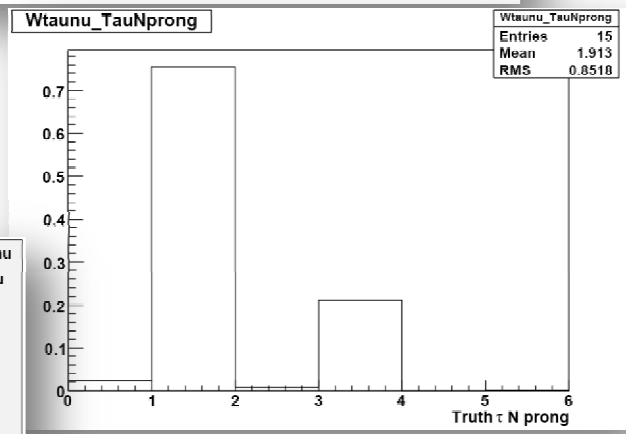


Relative low missing transverse energy, tipically in the range from 10 GeV to 40 GeV (+ a long tail)



When the τ lepton decays hadronically, we have an hadronic jet which is well collimated and has few charged particles.





W→τν – backgrounds

W→eν / W→μν
- the electron (muon) from the W decay is identified as a single-prong hadronic τ decay
- the electron (muon) is lost and a fake τ is reconstructed from the initial state QCD radiation

ttbar
- one of the W decays into a τ lepton and the other decays into a pair of quarks, or electron or muon which are not reconstructed

signal	cross section
W→τν (τ→had)	7.69 x 10^3 pb
background	**cross section**
W→τν (τ→lep)	4.18 x 10^3 pb
W→eν	1.176 x 10^4 pb
W→μν	1.176 x 10^4 pb
Z→ττ	1.128 x 10^3 pb
Z→ee	1.144 x 10^3 pb
Z→μμ	1.144 x 10^3 pb
ttbar	3.7 x 10^2 pb
QCD di-jets	10^{10} pb

Z→ee / Z→μμ
- one electon (muon) is wrongly identifed as hadronic τ and the other is lost or ouside the geometrical acceptance

Z→ττ
- one τ is identified as an hadronic τ decay and the other one is lost, i.e. neither reconstructed as second hadronic τ nor as electron or muon

QCD di-jet
- cross section ~6 order of magnitude higher
- one jet is wrongly identifed as a τ

The background can be taken under control and the signal extracted:
- ✓ using the proper trigger
- ✓ applying some specific cuts on cinematic variables:
  - missing E_T
  - tau p_T
- ✓ using some algorithms that help in the particle identification, such as the electron/muon veto
- ✓ applying topological cuts.

The cut flow must be tuned to maximize the S/B ratio.

W→τν Event Selection

✓ Trigger: combined trigger which asks for a certain amount of missinig E_T and for an isolated τ with a minimum p_T of 16 GeV → EF_tau16i_loose_xe(15,15,25)
✓ Missinig E_T: the offline reconstructed missing E_T must be higher than 40 GeV (now using MET_RefFinal, has to move to MET_Final for first data)
✓ Tau identification: there must be only one τ which passes certain selection cuts, both on identification and on momentum. The τ has to have been reconstructed by both the reconstruction algorithms (calorimeter and tracking based), the identification must satisfy the safe tight cuts, the energy must be 20 GeV < E_T < 60 GeV, $|\eta|<2.4$ and not $1.3<|\eta|<1.4$. Finally the τ candidate must not be flagged as an electron or a muon.
✓ Veto leptons in the event. If in the event there is an electron identified as a loose electron or a muon (STACO muon) the event is rejected.
✓ Veto jets in the crack region.
✓ Topological cut: $\Delta\phi(\tau, \text{MET}) > 2.5$

Cut flow @10TeV

W→τν Event Selection (100 pb^{-1})

Cut	$W \to \tau_{had}\nu$	$W \to \tau_{lep}\nu$	$W \to e\nu$	$W \to \mu\nu$	$t\bar{t}$
Total Events	769000	364008	1035285	1035285	37360
Trigger	85304 (313)	22576 (122)	463936 (235)	18687 (63)	10943 (13)
$E_T^{miss} > 40\,\text{GeV}$	25861 (179)	6618 (68)	147299 (165)	10334 (47)	7477 (11)
τ_{had} Selection	5617 (85)	1735 (35)	74444 (122)	1223 (16)	1657 (6)
τ Lepton Flag	5341 (82)	166 (11)	2845 (25)	1049 (15)	450 (3)
Lepton Veto	3914 (71)	35 (5)	384 (9)	75 (4)	98 (2)
Veto Jet in Crack Region	3451 (66)	29 (5)	345 (9)	67 (4)	51 (1)
$\Delta\phi_{(\tau_{had}, E_T^{miss})} > 2.5$	2273 (54)	22 (4)	281 (8)	52 (3)	6.0 (4)

Cut flow @10TeV

$$s/\sqrt{s+b} = 39$$

Cut	$Z \to \tau\tau$	$Z \to ee$	$Z \to \mu\mu$	QCD di-jet	
Total Events	112837	98381	98381	1.26×10^{12}	
Trigger	9211 (31)	3262 (8)	1546 (6)	–	–
$E_T^{miss} > 40\,\text{GeV}$	2231 (16)	21 (1)	280 (2)	132(5) $\times 10^5$	95(5) $\times 10^5$
τ_{had} Selection	534 (8)	3.4 (3)	35 (1)	49(5) $\times 10^3$	24(5) $\times 10^3$
τ Lepton Flag	378 (7)	0.32 (8)	28 (1)	43 (4) $\times 10^3$	20 (4) $\times 10^3$
Lepton Veto	183 (5)	0.04 (3)	1.9 (2)	20 (3) $\times 10^3$	10 (3) $\times 10^3$
Veto Jet in Crack Region	152 (4)	0.04 (3)	1.6 (2)	96 (10) $\times 10^2$	34 (5) $\times 10^2$
$\Delta\phi_{(\tau_{had}, E_T^{miss})} > 2.5$	82 (3)	0.04 (3)	1.1 (2)	15 (4) $\times 10^2$	7 (3) $\times 10^2$

CutFlow: cut optimization

- ✓ 100 pb^{-1}
- ✓ MET significance > 5

Sample	Whtaunu	Wenu	Wmunu	Wtaunu	Zee	Zmunu	Ztautau	J0	J1	J2	J3	J4	J5	J6
Events	579300	776100	776100	276400	81500	81500	84900	9.83E+11	6.81E+10	4.09E+09	2.20E+08	8.73E+06	2.33E+05	3.30E+03
Trigger	68196	443787	19514	21854	5547	1749	7453	0.00E+00	1.15E+07	3.34E+07	1.45E+07	1.38E+06	4.57E+04	6.48E+02
METcut	34611	294834	12717	10066	227	351	2576	0	171697	273199	542114	164587	13486	349
METSign	33796	289757	12465	9877	126	335	2420	0	171697	231168	219413	45983	3209	90
SafeAndOne	12630	236866	2951	5837	61	92	1069	0	171697	52538	25669	4534	281	9
Et_cut	10552	226158	2022	4303	37	57	777	0	0	31523	14057	1468	82	3
eta_cut	9262	194886	1722	3701	31	49	679	0	0	21015	13446	1159	73	2
LeptFlag	7842	838	1215	187	2	29	450	0	0	21015	12224	979	61	2
LeptVeto	7198	311	117	79	1	4	327	0	0	21015	10390	618	38	1
JetVeto	6813	297	112	73	1	3	302	0	0	21015	7334	386	27	1
DeltaPhi	5150	219	79	57	0	2	214	0	0	0	611	77	8	0

- ✓ MET significance > 6

Sample	Whtaunu	Wenu	Wmunu	Wtaunu	Zee	Zmunu	Ztautau	J0	J1	J2	J3	J4	J5	J6
Events	579300	776100	776100	276400	81500	81500	84900	9.83E+11	6.81E+10	4.09E+09	2.20E+08	8.73E+06	2.33E+05	3.30E+03
Trigger	68196	443787	19514	21854	5547	1749	7453	0.00E+00	1.15E+07	3.34E+07	1.45E+07	1.38E+06	4.57E+04	6.48E+02
METcut	34611	294834	12717	10066	227	351	2576	0	171697	273199	542114	164587	13486	349
METSign	30302	265462	11659	8950	70	308	2022	0	171697	126092	102067	26328	2152	66
SafeAndOne	11398	217993	2764	5237	36	84	897	0	171697	31523	14057	2885	188	7
Et_cut	9516	209450	1897	3825	21	54	655	0	0	21015	7334	1108	53	2
eta_cut	8354	180328	1618	3283	17	46	573	0	0	10508	6723	927	48	2
LeptFlag	7070	734	1146	172	1	28	382	0	0	10508	6112	747	42	1
LeptVeto	6514	280	108	74	1	3	280	0	0	10508	4889	438	29	1
JetVeto	6189	268	103	70	1	3	261	0	0	10508	3056	283	22	1
DeltaPhi	4753	201	71	55	0	2	192	0	0	0	0	77	7	0

CutFlow: cut optimization

- ✓ 100 pb^{-1}
- ✓ MET significance > 7

Sample	Whtaunu	Wenu	Wmunu	Wtaunu	Zee	Zmunu	Ztautau	J0	J1	J2	J3	J4	J5	J6
Events	579300	776100	776100	276400	81500	81500	84900	9.83E+11	6.81E+10	4.09E+09	2.20E+08	8.73E+06	2.33E+05	3.30E+03
Trigger	68196	443787	19514	21854	5547	1749	7453	0.00E+00	1.15E+07	3.34E+07	1.45E+07	1.38E+06	4.57E+04	6.48E+02
METcut	34611	294834	12717	10066	227	351	2576	0	171697	273199	542114	164587	13486	349
METSign	24025	216036	10228	7331	36	266	1478	0	171697	52538	47061	15534	1500	51
SafeAndOne	9066	178288	2396	4171	17	72	657	0	171697	10508	7945	1829	132	5
Et_cut	7473	171722	1630	2971	9	47	478	0	0	0	4278	644	38	1
eta_cut	6570	147506	1391	2548	8	40	418	0	0	0	4278	567	34	1
LeptFlag	5560	563	987	146	1	23	278	0	0	0	3667	464	30	1
LeptVeto	5130	214	85	64	1	3	207	0	0	0	3667	232	21	1
JetVeto	4883	205	82	61	1	3	193	0	0	0	1834	155	17	0
DeltaPhi	3772	163	57	50	0	2	145	0	0	0	0	26	5	0

- ✓ MET significance > 8

Sample	Whtaunu	Wenu	Wmunu	Wtaunu	Zee	Zmunu	Ztautau	J0	J1	J2	J3	J4	J5	J6
Events	579300	776100	776100	276400	81500	81500	84900	9.83E+11	6.81E+10	4.09E+09	2.20E+08	8.73E+06	2.33E+05	3.30E+03
Trigger	68196	443787	19514	21854	5547	1749	7453	0.00E+00	1.15E+07	3.34E+07	1.45E+07	1.38E+06	4.57E+04	6.48E+02
METcut	34611	294834	12717	10066	227	351	2576	0	171697	273199	542114	164587	13486	349
METSign	17036	155800	8471	5543	18	213	988	0	0	31523	25058	9403	1039	40
SafeAndOne	6385	129251	1931	3008	6	57	439	0	0	0	4278	1030	95	4
Et_cut	5132	124254	1306	2054	3	37	314	0	0	0	2445	361	28	1
eta_cut	4518	106384	1119	1762	3	31	273	0	0	0	2445	309	25	1
LeptFlag	3825	418	798	120	1	18	179	0	0	0	1834	258	22	1
LeptVeto	3535	160	69	53	0	2	135	0	0	0	1834	180	14	0
JetVeto	3358	154	65	51	0	1	127	0	0	0	611	129	11	0
DeltaPhi	2582	128	46	42	0	1	95	0	0	0	0	0	4	0

MC D3PD – April reprocessing

r125X MC D3PD – TauD3PDMaker-00-05-00

Release details:

✓ release 15.6.9.3,AtlasProduction

✓ packages: see TauD3PDMaker twiki (https://twiki.cern.ch/twiki/bin/view/AtlasProtected/TauD3PDMaker)

Datasets:

✓ group10.perf-tau.mc09_7TeV.105009.J0_pythia_jetjet.recon.ESD.e468_s766_s767_r1251.v.00-05-00.tauPerfD3PD
✓ group10.perf-tau.mc09_7TeV.105010.J1_pythia_jetjet.recon.ESD.e468_s766_s767_r1251.v.00-05-00.tauPerfD3PD
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all datasets in container: group10.perf-tau.mc09_7TeV_r1250_fromESD.00-05-00.tauPerfD3PD/

Data D3PD – April reprocessing

- ✓ Used the latest runs from April reprocessing
- ✓ Total lumi: 3.21 nb^{-1}
- ✓ D3PDs from L1Calo Stream and DESD_MET samples
- ✓ Good run list selection
- ✓ Collision candidate cleaning
- ✓ Jets cleaning

Run	Dataset
152844	group10.perf-tau.data10_7TeV.00152844.L1Calo-DESD_MET.r1239_p134.00-05-00.tauPerfD3PD.1
152845	group10.perf-tau.data10_7TeV.00152845.L1Calo-DESD_MET.r1239_p134.00-05-00.tauPerfD3PD
152878	group10.perf-tau.data10_7TeV.00152878.L1Calo-DESD_MET.r1239_p134.00-05-00.tauPerfD3PD
152933	group10.perf-tau.data10_7TeV.00152933.L1Calo-DESD_MET.r1239_p134.00-05-00.tauPerfD3PD
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153159	group10.perf-tau.data10_7TeV.00153159.L1Calo-DESD_MET.r1239_p134.00-05-00.tauPerfD3PD
153200	group10.perf-tau.data10_7TeV.00153200.L1Calo-DESD_MET.r1239_p134.00-05-00.tauPerfD3PD
153565	group10.perf-tau.data10_7TeV.00153565.L1Calo-DESD_MET.f251_m467.00-05-00.tauPerfD3PD.1
154810	group10.perf-tau.data10_7TeV.00154810.L1Calo-DESD_MET.f255_m472.00-05-00.tauPerfD3PD
154813	group10.perf-tau.data10_7TeV.00154813.L1Calo-DESD_MET.f255_m472.00-05-00.tauPerfD3PD
154815	group10.perf-tau.data10_7TeV.00154815.L1Calo-DESD_MET.f255_m472.00-05-00.tauPerfD3PD
154817	group10.perf-tau.data10_7TeV.00154817.L1Calo-DESD_MET.f255_m472.00-05-00.tauPerfD3PD
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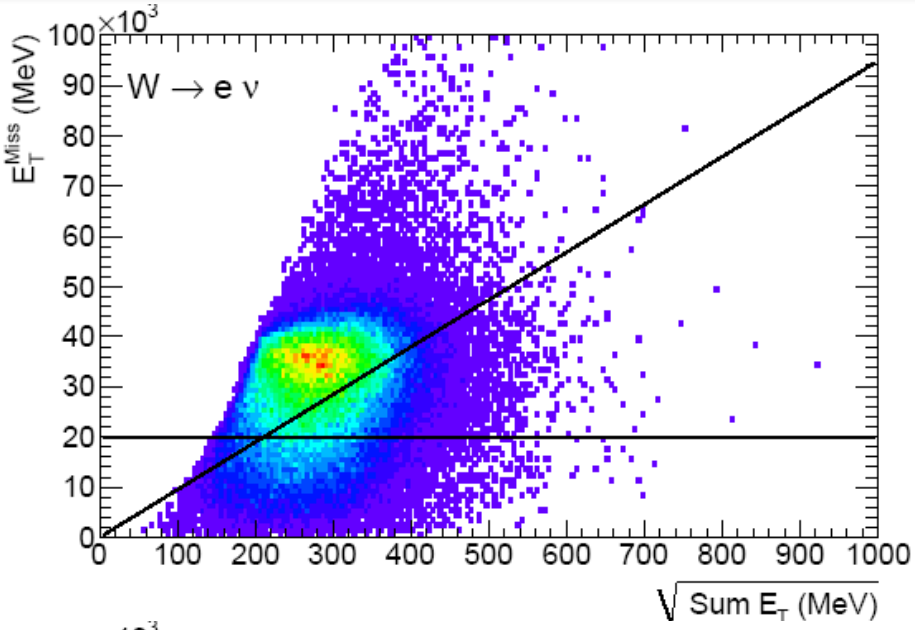
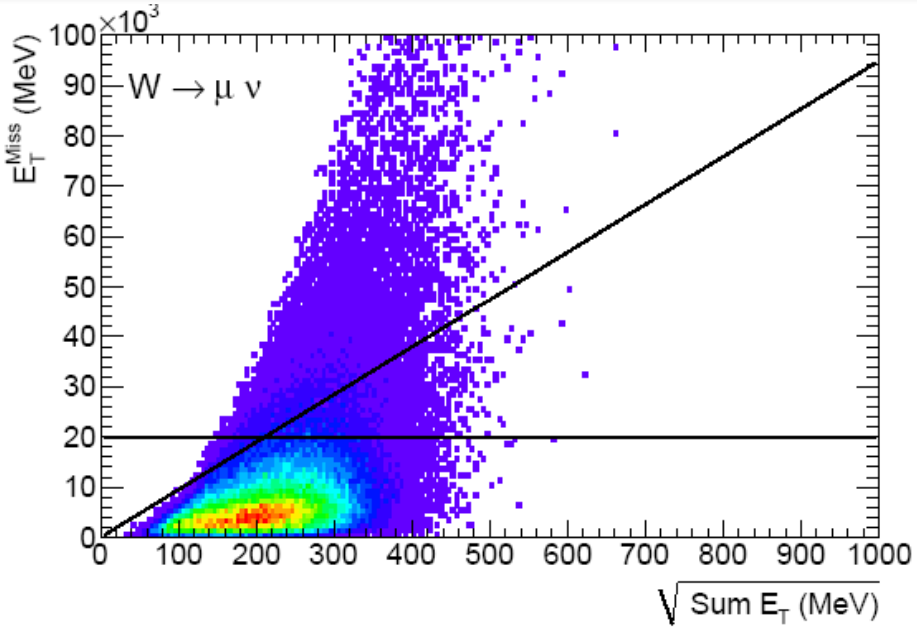
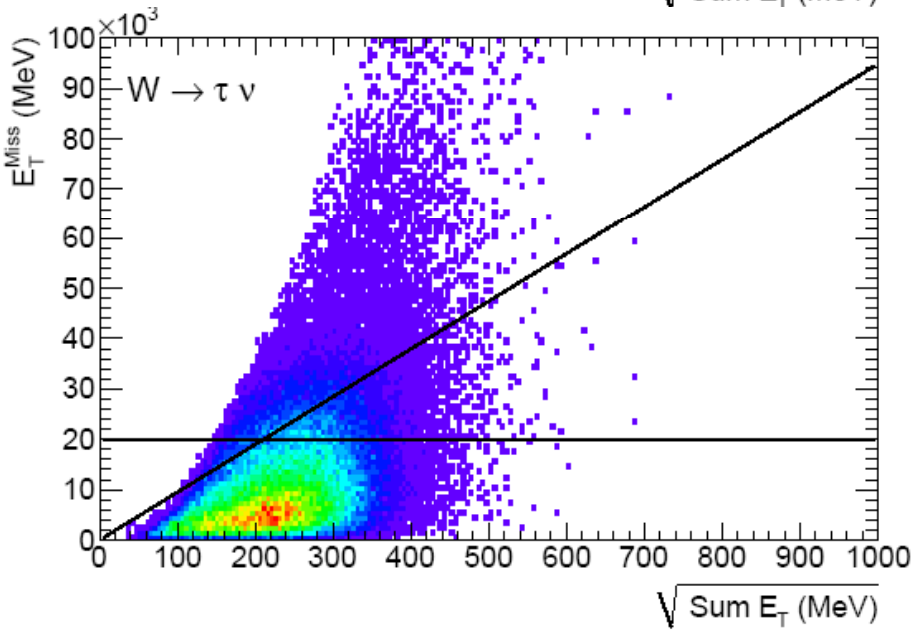
155160	group10.perf-tau.data10_7TeV.00155160.L1Calo-DESD_MET.f255_m472.00-05-00.tauPerfD3PD

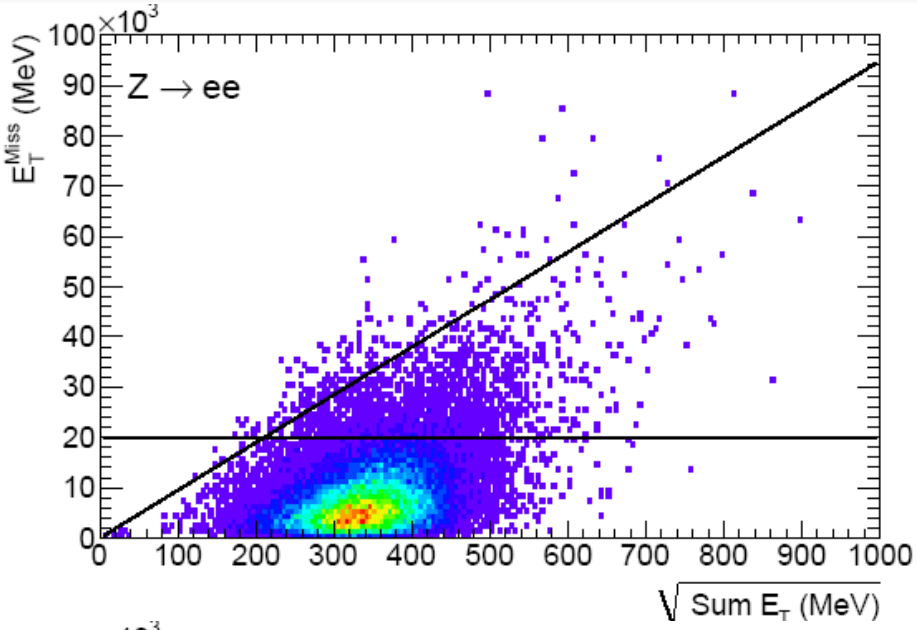
W backgrounds

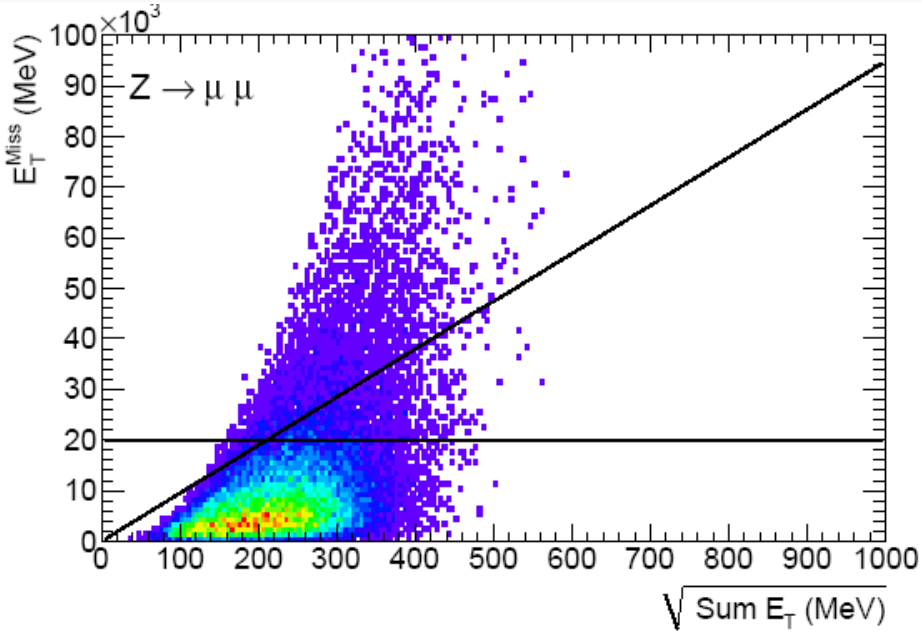


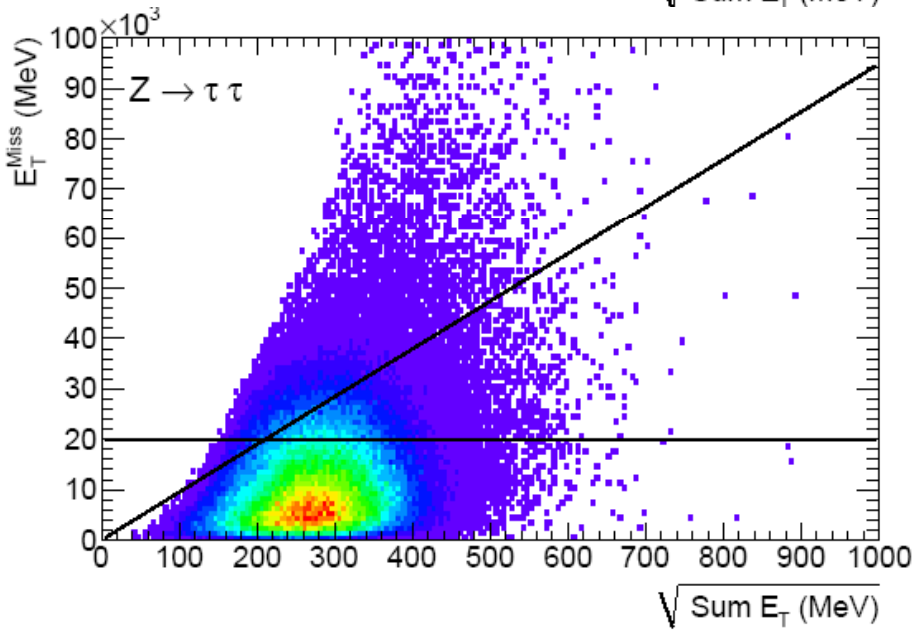




Z backgrounds







Other tests&results

✓ These results have been posted on the W→τν sharepoint and some useful discussion are onging.
✓ Tomorrow we will discuss these results in the W→τν informal meeting.
✓ On Wednesday I will present these results and the outcome of the discussion in the SM WZ Signatures meeting.

✓ Yann&Guilherme proposed:
- ✓ check if it possible to exploit better the cut on significance, using a different line
- ✓ check the analysis using also medium and loose taus, to see if the agreement in the cut flow is still fine