



## tau + lepton selection status

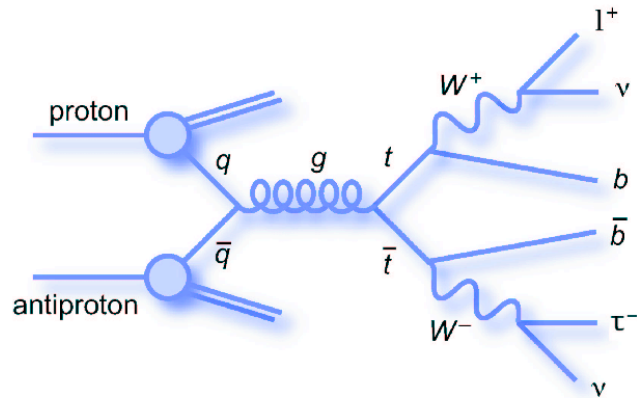
F. Badaud, P. Gris, J. Jammes  
LPC Clermont-Fd

Mai, 4 2010

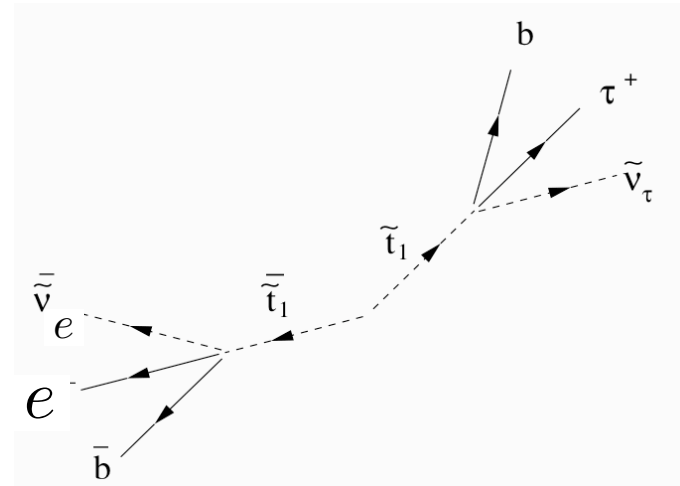
- 
- General framework
  - electron + jet + tau channel
  - muon + jet + tau channel
  - Plans

# General remark

ttbar : Jerome, Frederique



stop search : Philippe



same final state :

lepton (electron or muon)

+ tau

+ jets

+ MET

Philippe has produced the Trees: DATA + Monte Carlo  
DATASET : summer09extended.

# Old General Framework

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```
p21.13.00 vjets_03.04.00
addpkg tmb_tree p21-br-61
addpkg jetcorr p21-br-12
addpkg cafe p21-br-28
addpkg cafe_sam p21-br-06
addpkg caf_util p21-br-112
addpkg tau_tmb p21-br-01 # Tau ID
addpkg tmb2ttau v00-00-02
addpkg caf_mc_util p21-br-133
addpkg emid_cuts p21-br-22
addpkg met_util p21-br-01 # MET tools
addpkg eff_utils p21addpkg btags_cert v08-00-06
addpkg btags_cert_caf v00-09-00
addpkg d0root_analysis v00-09-89
addpkg d0root_sltnn v00-00-04
addpkg d0root_jlip v00-02-02
addpkg d0root_nnbttag v00-01-02
addpkg d0root_mva_btagger v00-00-06
addpkg d0root_tmbtree v00-10-31-br-24
addpkg d0root_jlip v00-02-02
addpkg d0root_nnbttag v00-01-02
addpkg d0root_mva_btagger v00-00-06
addpkg d0root_tmbtree v00-10-31

addpkg caf_eff_utils p21-br-14
addpkg caf_trigger p21-br-74
addpkg lumi_profiles v2009-07-16 # standard luminosity profiles
addpkg beamposition v2009-06-24 #
addpkg emid_eff v7-preliminary-37 # electron efficiencies
addpkg muid_eff v04-04-00 # muons efficiencies
addpkg jetid_eff v03-01-03 # jet efficiencies
addpkg taid_eff v00-01-02 # tau id efficiencies
addpkg dq_defs v2009-06-13
addpkg caf_dq p21-br-03
addpkg dq_util p21-br-05
addpkg btags_cert v08-00-06
addpkg btags_cert_caf v00-09-00
addpkg d0root_analysis v00-09-89
addpkg d0root_sltnn v00-00-04
addpkg d0root_jlip v00-02-02
addpkg d0root_nnbttag v00-01-02
addpkg d0root_mva_btagger v00-00-06
addpkg d0root_tmbtree v00-10-31
```

But the trees will be reproduced, with  
vjets\_cafe for Summer 2010 (Release p21.18.00, vjets\_cafe v05-00-00)

# electron+jets preselection

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- triggers (SuperOR)
- at least 1 isolated electron
- 2 jets (GoodJCCB) of  $p_T > 20$  GeV/c, 30 GeV/c for the leading jet
- vertex requirements  $z_{PV} < 60$ cm,  $N_{trksPV} \geq 3$ ,  $dz(\text{lepton}, PV) < 1$  cm
- $W$   $p_T$  reweighting,  $Z$   $p_T$  reweighting
- data\_quality
- beam reweighting, lumi RW

- **One 15GeV tight electron :**

- **Loose electrons 'Toploose'**

1. particle  $|ID|$  10 or 11
2. high energy fraction in the EM part of the calorimeter  $f_{EM} > 0.9$
3. isolated EM cluster  $f_{iso} < 0.15$
4. shower shape cut  $\chi_{Hmax7}^2 < 50$
5. one track matched with  $E/p$  requiring  $p_{\chi_{trk}^2} > 0$  and track  $p_T > 5$  GeV
6. Central calorimeter ( $|\eta| < 1.1$ )

- **Tight electrons 'Toptight'**

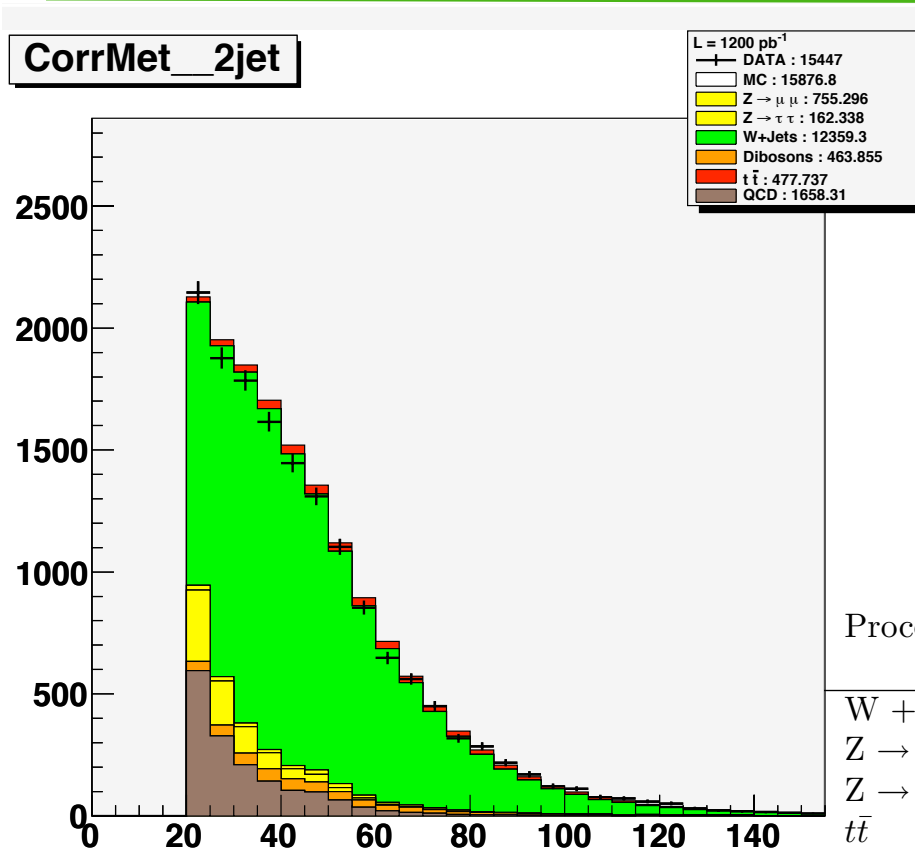
1. Passes loose electron criteria
2. Likelihood  $> 0.85$

**DATASET, first RunIIb 1.2 fb-1**

- veto muon
- $\Delta\phi(e, MET) > 2.2 - 0.045 * MET$
- **MET > 20 GeV**

F. Badaud, 4 mail 0

# electron+jets preselection with QCD estimation

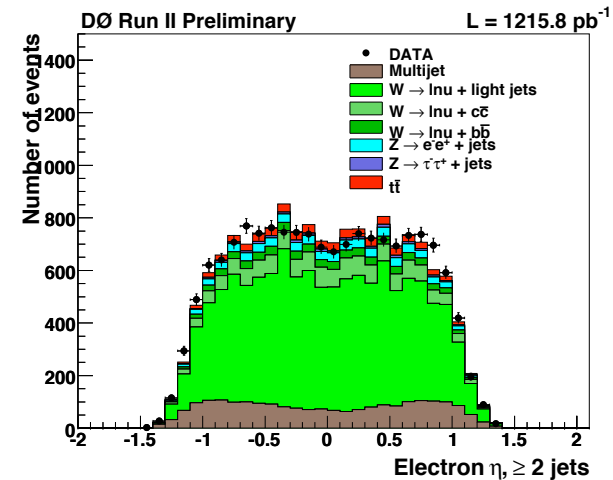
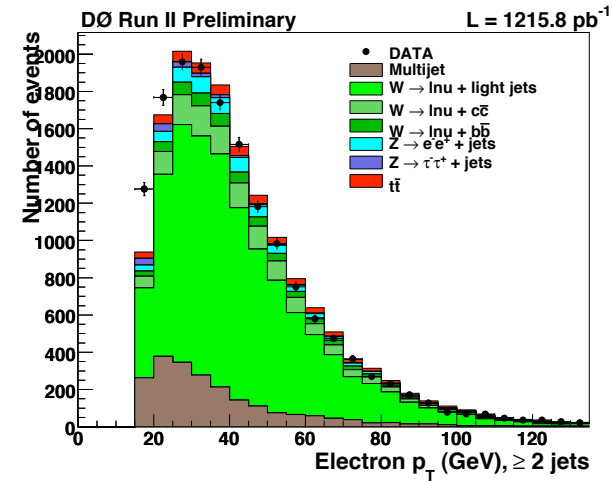
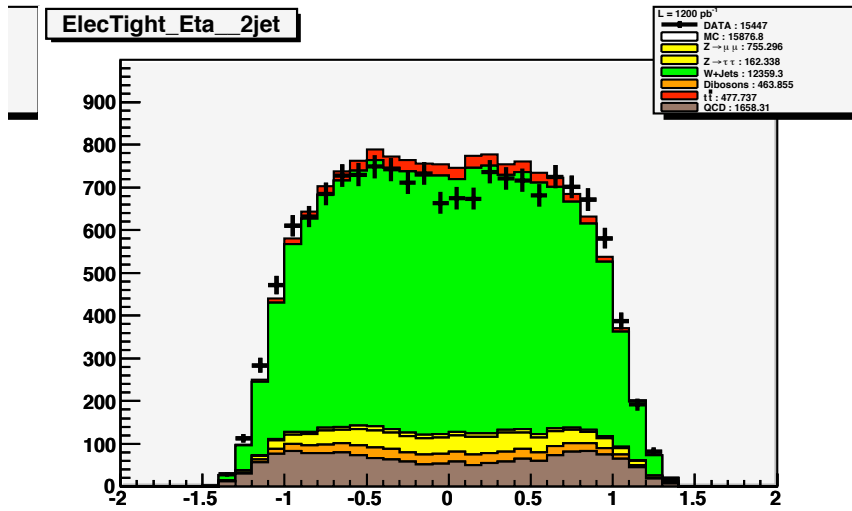
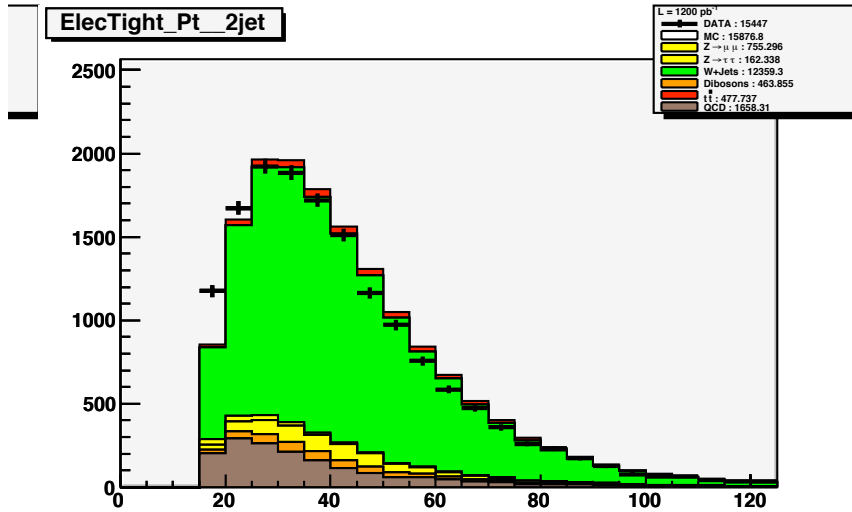


W scale factor : 1.26

Processus	preliminary results note 08 1200 pb <sup>-1</sup>	1200 pb <sup>-1</sup>
W + jets	12321.8	12359.3
Z → ee	723.6	755.3
Z → ττ	185.8	162.3
t $\bar{t}$	580.8 (170 GeV)	477.7 (172 GeV)
dibosons	X	463.9
multijets	1900.9	1658.3
Total bkg wo dibosons	15712.9	
DATA wo dibosons	15804	
Total bkg w dibosons		15876.8
DATA w dibosons		15447

# electron+jets preselection with QCD estimation

old note 2008



## electron + jets + tau events selection

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- $E_T > 10/10/10$  GeV for type 1/2/3 (note 08: 10/5/10)
- $\text{trk } p_T > 7/5/5$  and for type 3  $\sum p_T > 7$  GeV/c
- $|\eta| < 1.0$
- tau is separated from the lepton by requiring the lepton's track and tau's leading track to be separated by  $\Delta R(\tau, \text{lepton}) > 0.5$ , and not sharing the same track
- the tau's charge is opposite that of the lepton's charge.
- $p_{20} \text{ NN} > 0.8$  for all types.

then

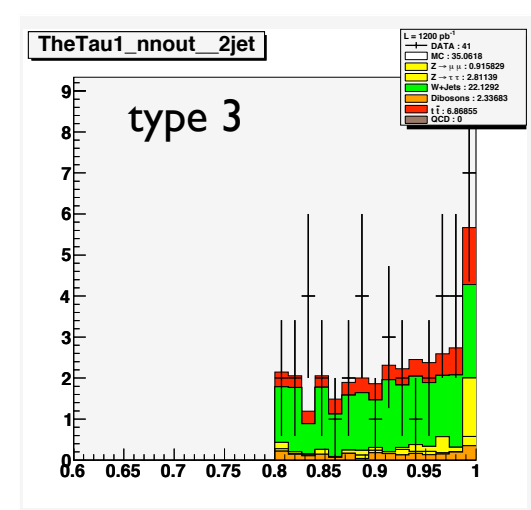
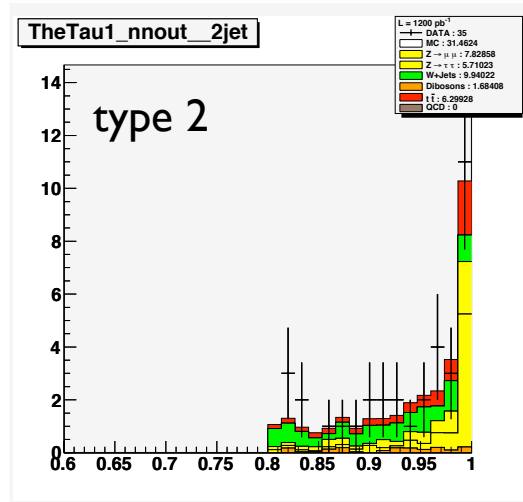
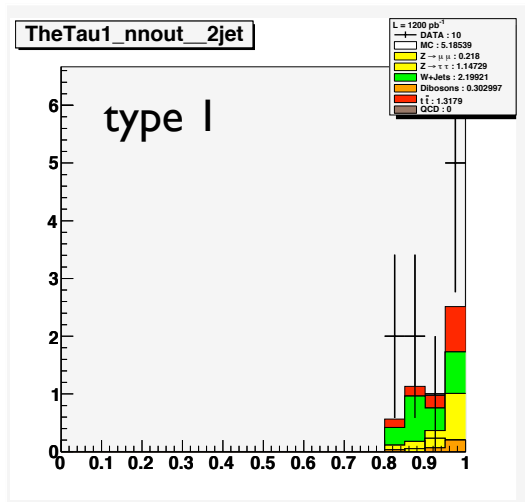
- the jet multiplicity is recounted. A jet is considered to be the same object as the tau candidate if it is separated from the tau candidate by a distance less than 0.5
- the  $\cancel{E}_T$  is recomputed with propagation of the tau energy scale of the selected tau  $\cancel{E}_T^\tau > 15$  GeV (muon) or 20 GeV (electron)

- the multijet BKG is re-estimated (not yet done for the electron channel)

$$N_{QCD}^{OS} = N_{QCD}^{SS} = N_{DATA}^{SS} - N_{W+jets}^{SS} - N_{t\bar{t}}^{SS} - N_{Z/\gamma^*+jets}^{SS} - N_{diboson}^{SS} - N_{singletop}^{SS}$$

# electron+jets + tau selection : PRELIMINARY

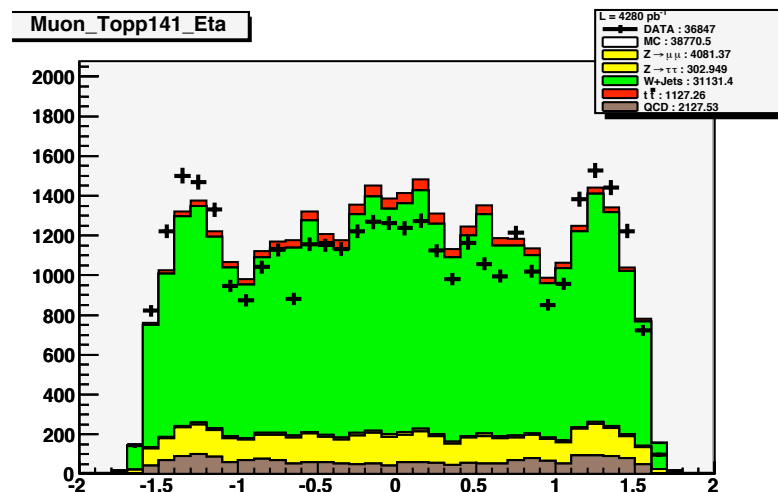
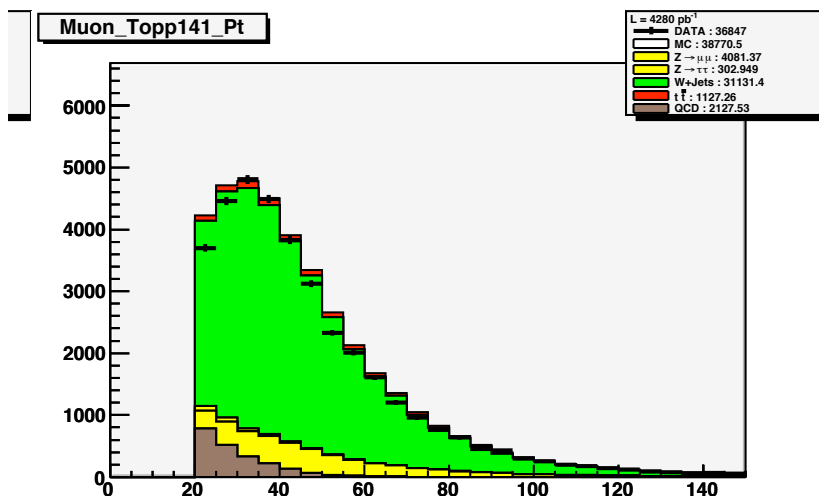
Processus	note 08 type 1	note08 type 2	note 08 type 3	note08 all types	this result type 1	this result type 2	this result type 3	this resu all type
W + jets	2.5	8.5	33.8	44.8	2.2	9.9	22.1	34.2
Z → ee	0.2	1.5	5.8	7.5	0.22	7.8	0.9	8.97
Z → ττ	1.9	6.6	6.2	14.8	1.1	5.7	2.8	9.7
t $\bar{t}$	1.36	9.44	16.96	27.76	1.3	6.3	6.86	14.46
dibosons	0.16	0.61	2.92	3.70	0.3	1.7	2.3	4.3
single top								
multijets								
Total background	6.12	26.61	65.68	98.39	5.12	31.4	34.96	71.63
DATA	10	22	62	94	10	35	41	86

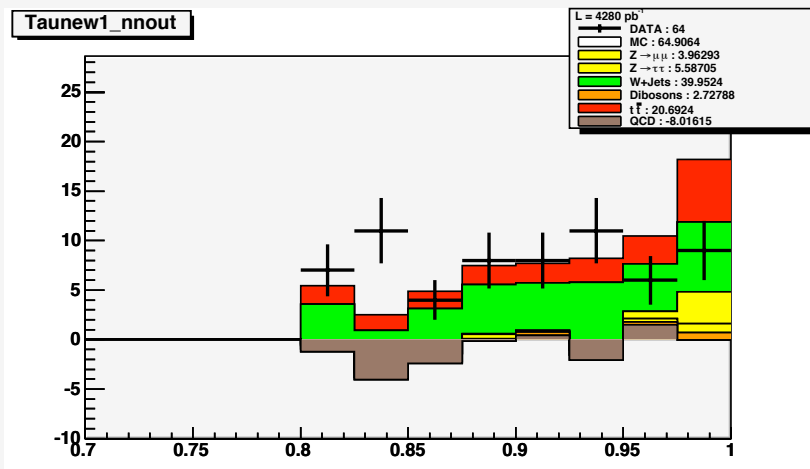
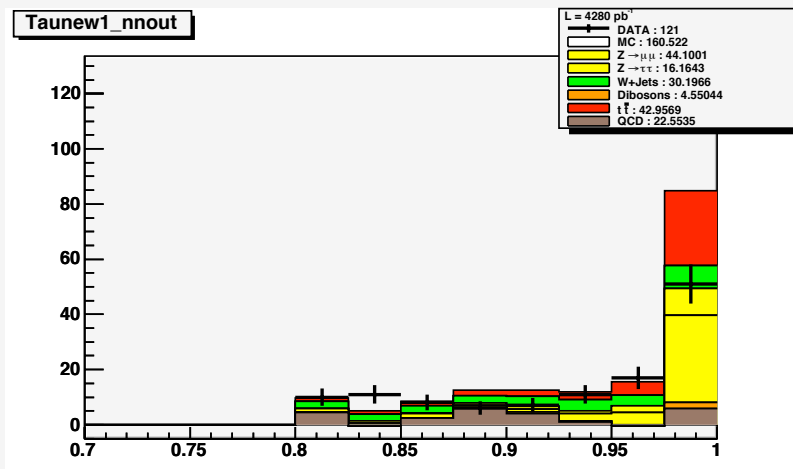
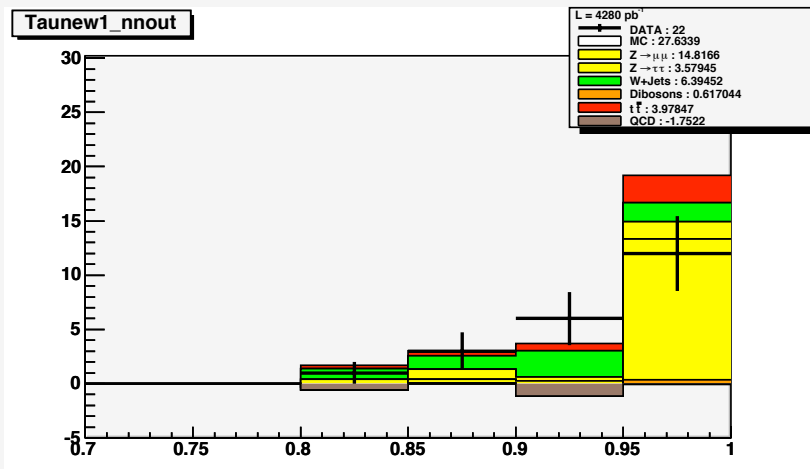
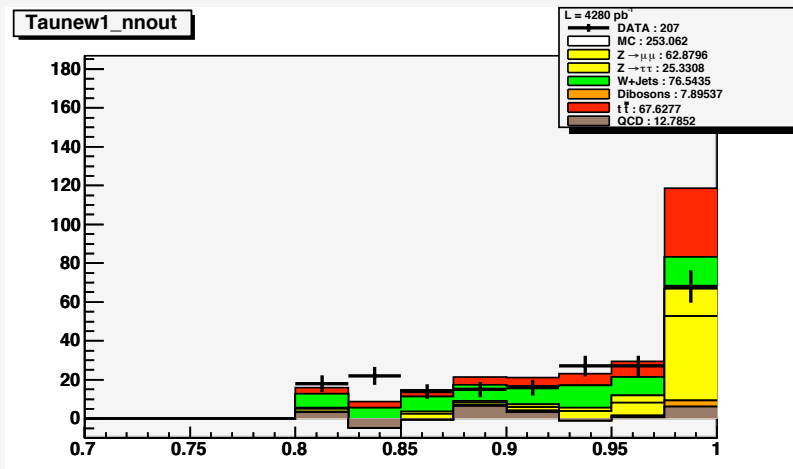




## Nombre d'évènements attendus à l'étape de la préselection mu+jets et de la sélection mu+jets+tau

	$\mu$ +jets presel.	type 1	type 2	type 3	all types
$W \rightarrow l\nu$	$31131.40 \pm 174.31$	$6.39 \pm 2.52$	$30.19 \pm 5.49$	$39.95 \pm 6.32$	$76.54 \pm 8.74$
$Z \rightarrow \mu\mu$	$4081.37 \pm 62.00$	$14.81 \pm 3.84$	$44.10 \pm 6.63$	$3.96 \pm 1.99$	$62.87 \pm 7.92$
$Z \rightarrow \tau\tau$	$302.94 \pm 17.37$	$3.57 \pm 1.89$	$16.16 \pm 4.01$	$5.58 \pm 2.36$	$25.33 \pm 5.03$
$t\bar{t}$	$1127.26 \pm 31.91$	$3.97 \pm 1.99$	$42.95 \pm 6.51$	$20.69 \pm 4.54$	$67.62 \pm 8.17$
dibosons	$999.16 \pm 31.37$	$0.61 \pm 0.78$	$4.55 \pm 2.13$	$2.72 \pm 1.65$	$7.89 \pm 2.80$
QCD	$2127.53 \pm 78.61$	$-1.75 \pm 2.78$	$22.55 \pm 9.13$	$-8.01 \pm 8.48$	$12.78 \pm 12.77$
Back woQCD/wdib	$37642.13 \pm 191.13$	X	X	X	X
Back wQCD/wodib	$38770.50 \pm 204.27$	X	X	X	X
Back wQCD/wdib	$39769.66 \pm 206.66$	$27.63 \pm 6.09$	$160.52 \pm 14.86$	$64.90 \pm 12.03$	$253.06 \pm 20.06$
DATA	36847	22	121	64	207





# Plans

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- CHECKS CHECKS CHECKS
- then apply b-tagged
- cross section extraction

we are still working with an old release

impossible to be ready for end of may

**BACK-UP SLIDES**

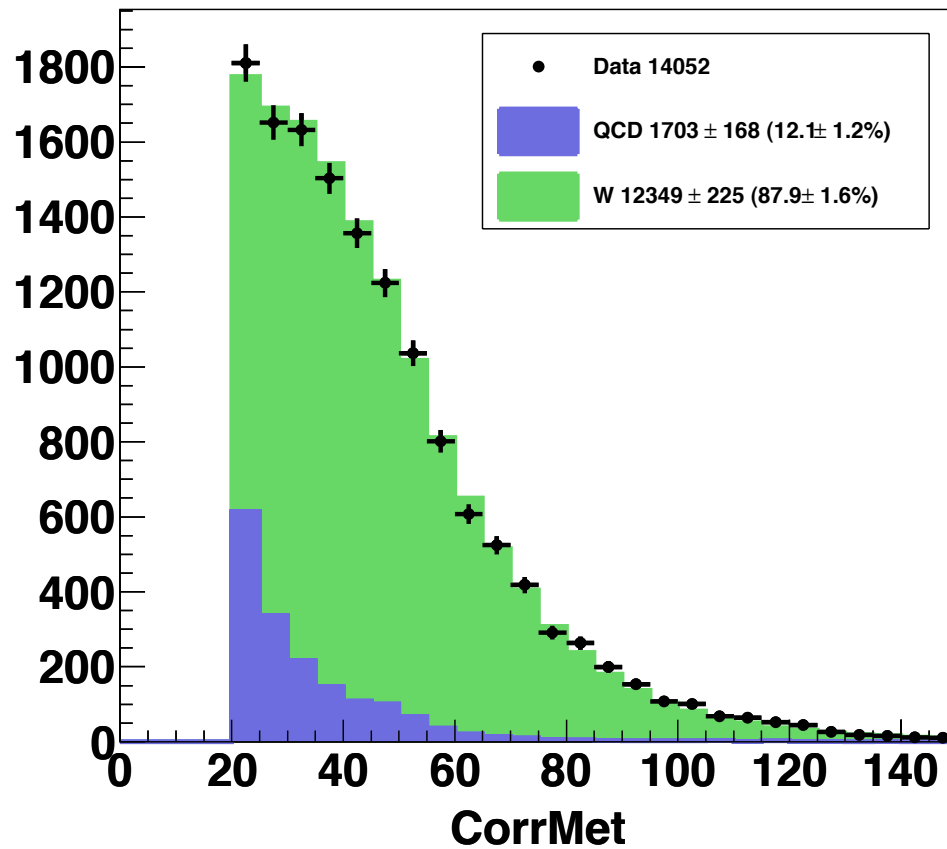
# multijet BKG estimation and normalisation of $W$ +jets

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- lepton + jets preselection : estimation of multijet BKG and Normalisation of  $W$ +jets BKG:
  - a fit of the distributions of the  $W$ +jets and multijets BKG to the data at the preselection level is performed.
  - DATA : the known BKG ( $t\bar{t}$  and  $Z$ +jets) are subtracted from the DATA sample
  - $W$ +jets template : given by the MC distribution
  - Multijet template : derived by using DATA events with non-isolated leptons : electron loosely isolated but which fails the tight isolation. The contribution of  $W$ +jets events passing these conditions are subtracted to the multijet template .
  - an iterative fit is performed: the results of the  $W$  normalisation is propagated to the MC until a stable factor is obtained.
  - distribution : transverse mass of the lepton + MET or MET

# multijet BKG estimation and normalisation of $W$ +jets

## CorrMet (2 jet inclusive multi.)



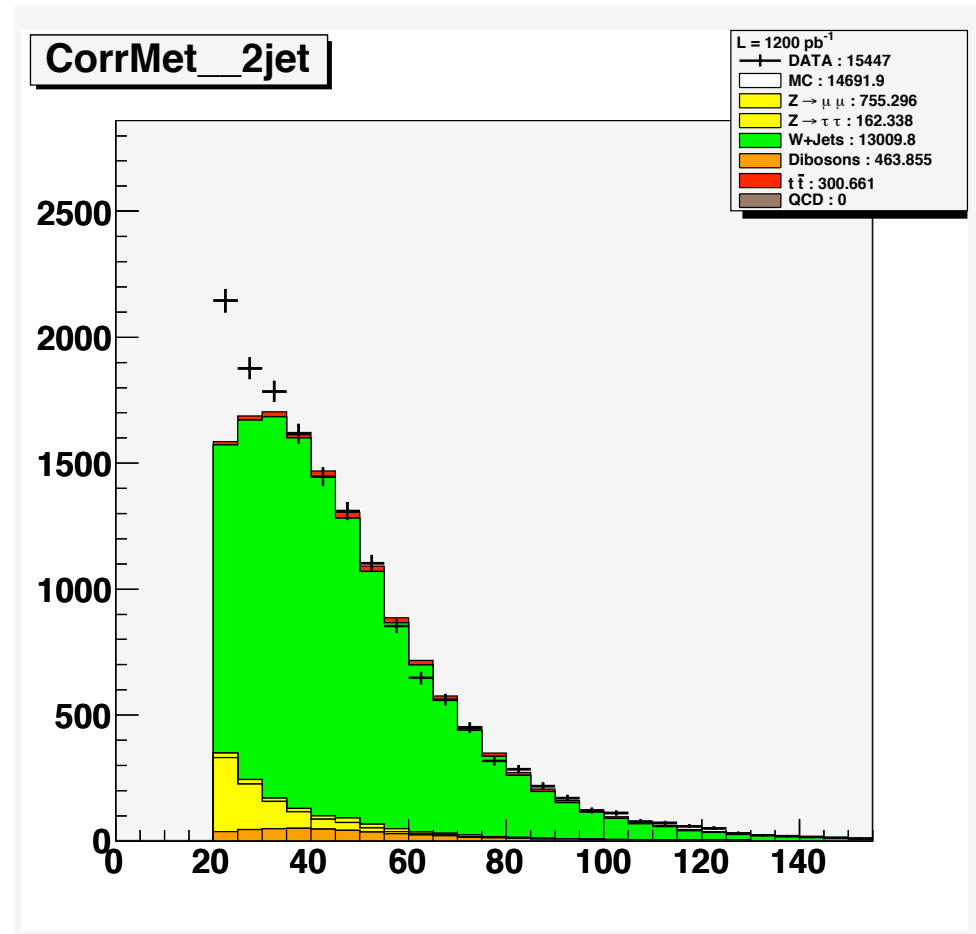
result of the fit:

W scale factor : 1.254  
QCD scale factor : 0.14

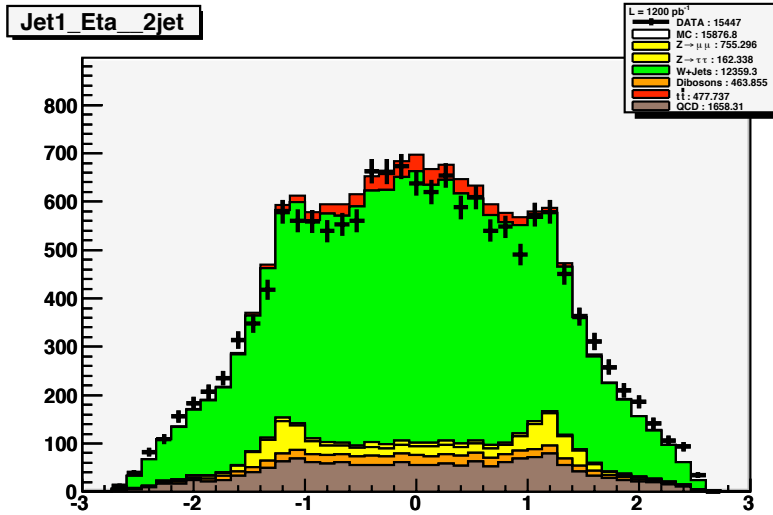
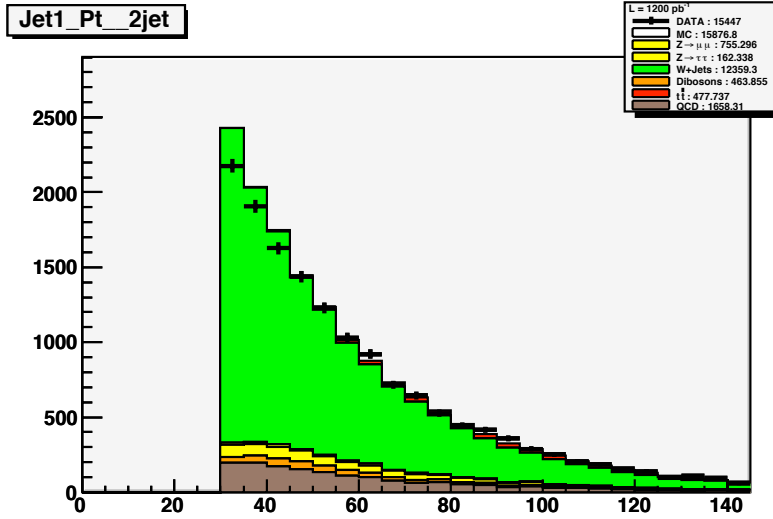
# electron+jets preselection

Result of the preselection without QCD estimation

W scale factor : 1.32

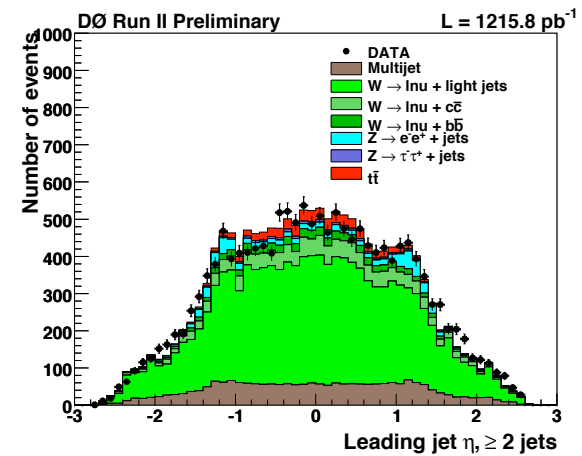
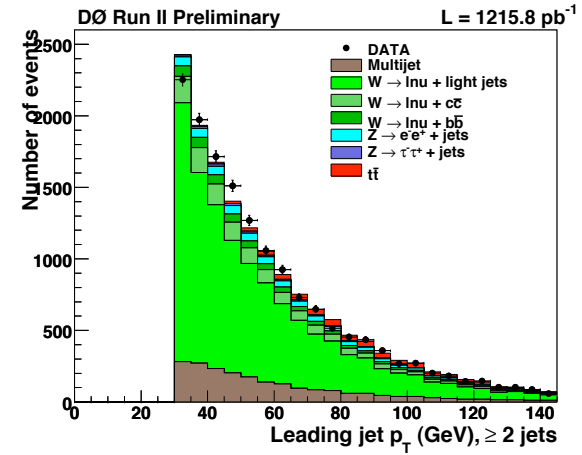


# electron+jets preselection with QCD estimation



F. Badaud, 29 april 10

## old note 2008





## electron + jets + tau events selection

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- $E_T > 10/10/10$  GeV for type 1/2/3 (note 08: 10/5/10)
- $\text{trk } p_T > 7/5/5$  and for type 3  $\sum p_T > 7$  GeV/c
- $|\eta| < 1.0$
- tau is separated from the lepton by requiring the lepton's track and tau's leading track to be separated by  $\Delta R(\tau, \text{lepton}) > 0.5$ , and not sharing the same track
- the tau's charge is opposite that of the lepton's charge.
- $p_{20} \text{ NN} > 0.8$  for all types.

then

- the jet multiplicity is recounted. A jet is considered to be the same object as the tau candidate if it is separated from the tau candidate by a distance less than 0.5
- the  $\cancel{E}_T$  is recomputed with propagation of the tau energy scale of the selected tau  $\cancel{E}_T^\tau > 15$  GeV (muon) or 20 GeV (electron)
- **the multijet BKG is re-estimated**

the lepton+jets+tau sample is divided into 2 disjoint samples. The first sample contains lepton-tau pairs with opposite charge sign (OS). The second sample contains the lepton-tau pairs which have same-sign charge (SS). the SS sample is used to estimate the contribution of multijet processes in the OS sample.

$$N_{QCD}^{OS} = N_{QCD}^{SS} = N_{DATA}^{SS} - N_{W+jets}^{SS} - N_{t\bar{t}}^{SS} - N_{Z/\gamma^*+jets}^{SS} - N_{diboson}^{SS} - N_{singletop}^{SS}$$