Single top electron+jets CC Selection

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CC Cuts

DataQuality for EMQCD
Cut Duplicate Events
D0Trigger for EMQCD
obj Cut_TopAnalyzeDQ

Abs(Delta_z(d0reco PV, d0root PV)) <5 cm
Abs PV Z position<60 cm
N tracks to PV >2

Pt_electron >15 GeV
|eta| <1.1
EMF>0.9
HMX7<50.0
Iso<0.15
Spatial Trk Chi2 !=-1
Lhood>0.2 for ePT>30
Lhood>0.85 for ePT <30

DeltaZ(PV, electron)<1.0cm
electron Track pT>10 GeV

>=2 good_jet
<=4 good_jet
<3 badjet

obj LeadingJetCuts passLeadingJetCuts(25.0, 2.5)
obj TriangleCuts passTriangleJetMET(1.5, 0.0, 35.0, 0.0)
obj TriangleCuts passTriangleElectronMET(0.0, 1.5, 0.0, 35.0)
obj TriangleCuts passTriangleElectronMET(0.0, 1.1, 0.0, 80.0)

JesMet>15.0
MET>15.0
MET<200

0 muon with:DeltaR>0.5,nseg=3,isMedium=1

Data and MC Samples

Data

Integrated Lum:
360 pb

triggers:

V 8-11: EM15_2JT15
V12-13: E1_SHT15_2J20

Signal

NLO, TuneA,
SingleTop generator based on CompHEP
Mtop=175 GeV

Backgrounds

ttbar

ttbar->Lepton+Jets,
ttbar-->DiLeptons+Jets
LO,TuneA, ALPGEN
Mtop=175 GeV

W+Jets

Wjj(Wcc,..), Wbb
LO, TuneA, ALPGEN

DiBosons

WW- >lnujj, WZ->lnujj
LO ALPGEN

Data and MC Samples

SIngle top:

generated with the SingleTop generator, based on Comphep.

both top and antitop contributions, included in equal parts.

The top quarks decay to Wb and the W bosons decay to e and τ or to μ and τ .

The τ 's decay to either e or μ with PDB 2002 branching fractions.

No parton-level cuts

The CTEQ6M PDF set was used.

The scales for production: Q2 = M2 top for the s-channel

Q2 = (Mtop=2)2 for the t-channel

These choices correspond to where the LO and NLO cross section calculations are equal.

Mtop = 175 GeV

pythia adds the following things to the simulation:

(i) underlying event with Rick Field's Tune A parameters;

(ii) initial-state and nal-state radiated gluons;

(iii) showering of the nal state partons into jets; and it calls

(iv) tauola to decay the s, and

(v) evtgen to decay the B hadrons. pythia version 6.203 was used, with CTEQ5L for the scales of the underlying event and showering.

Data and MC Samples

ttbar samples:

Generated with alpgen v.1.3.
The top quarks decay to Wb, the W bosons decay either to quark-antiquark pairs or to e, μ, and τ , and the τ 's decay to anything
No parton-level cuts

Mtop = 175 GeV and sqrt(s) = 1:96 TeV.

pythia adds the following things to the simulation:

(i) underlying event with Rick Field's Tune A parameters;
(ii) initial-state and nal-state radiated gluons;
(iii) showering of the nal state partons into jets; and it calls
(iv) tauola to decay the s, and
(v) evtgen to decay the B hadrons. pythia version 6.203 was used, with CTEQ5L for the scales of the underlying event and showering.

Data and MC Samples

Wjj and Wbb MC (Higgs Group):

The Wjj one includes Wcj and Wcc; the c is massless

Generated with alpgen

Parton-level cuts:

pT (j; c; b) > 8 GeV, jj(j; c; b) < 3, and R(j; j; j; c; c; c; b; b) > 0:4.

The events were then processed through pythia for ISR, FSR, addition of the underlying event, hadronization of the partons into jets, and decay of the b's and c's.

Pythia allowed gluons to split into cc and bb, which filled in the low pT and low Del R regions not included at the Alpgen stage. More

The Monte Carlo Event Sets

Event Type	Cross Section [pb]	Branching Fraction	Number of Events	Int. Lum. [fb^{-1}]
Signals				
$tb \to e$+jets	0.88 ± 0.14	0.1309 ± 0.0026	32,500	278
$tqb \to e$+jets	1.98 ± 0.30	0.1309 ± 0.0026	33,000	125
Backgrounds				
$t\bar{t} \to l$+jets	6.77 ± 1.22	0.4444 ± 0.0089	191300	64
$t\bar{t} \to ll$	6.77 ± 1.22	0.1111 ± 0.0089	97750	131
Wbb	3.35 ± 0.60	0.1309 ± 0.0026	99,500	227
Wjj	287.0 ± 51.7	0.1309 ± 0.0026	189,500	5
$WW \to l\nu jj$	2.67 ± 0.06	0.3928 ± 0.0079	23,000	22
$WZ \to l\nu jj$	0.82 ± 0.73	0.3928 ± 0.0079	23,000	71

CC Cuts & Scale Factors

ε_{SIGNAL}

```
abs(det_eta) < 1.1)
 if e_pt < 30
      epsilon_signal = 0.838;
      epsilon_signal_error = 0.02
  else
      epsilon_signal = 0.970;
      epsilon_signal_error = 0.01
```

ε_{QCD}

```
abs(det_eta) < 1.1

    trigger list v12-13
    run>=178722
            if e_pt <30.0
            epsilon_qcd = 0.14
            else
            epsilon_qcd = 0.35

    epsilon_qcd_error = 0.06

      trigger list v8-11
      run<178722
        if  e_pt <30.0
       epsilon_qcd =0.0966
       else
       epsilon_qcd = 0.246

      epsilon_qcd_error = 0.05
```

CC Cuts & Scale Factors

QCD SCALE FACTORS

factor = (N_fake_loose / N_QCD_Orthogonal)* eps_QCD

if run>=178722
  if e_pt <30.0 factor = 1819.0/4171.0 * eps_QCD
  if e_pt >=30.0 factor = 1872.42/8206.0 * eps_QCD

if run<178722
  if e_pt <30.0 factor = 1451.0/3170.0 * eps_QCD
  if e_pt >=30.0 factor = 1270.89/6234.0 * eps_QCD

Wjj, Wbb FACTORS

Wjj (higgs) = 1.192
wbb (higgs) = 1.192

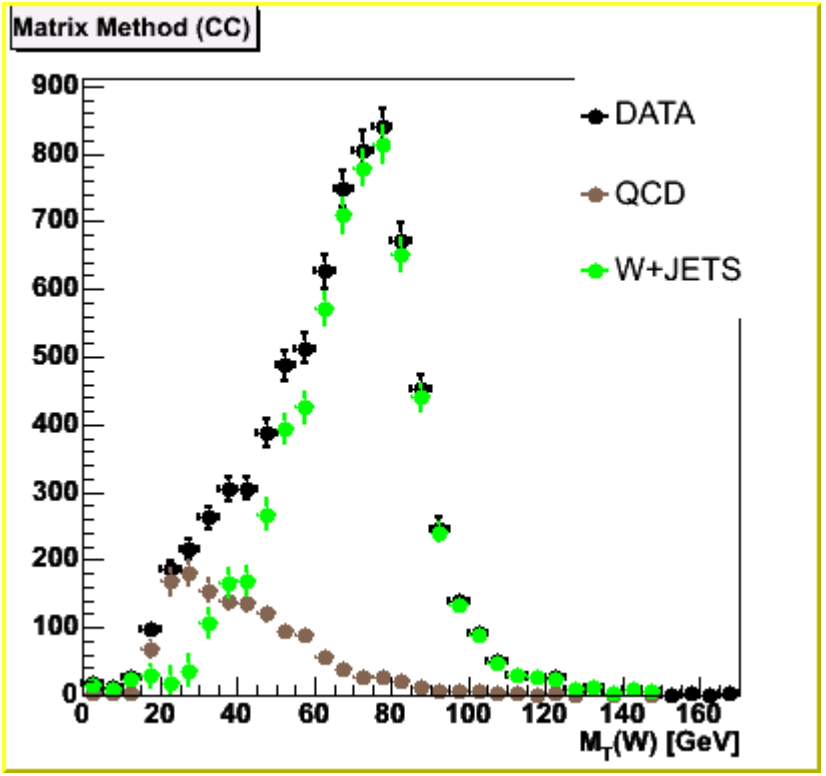
Matrix Method

Used Matrix method to estimate background from fake electrons.

Number of data events after selection = 7623

Number of events with fake electrons = 1364.8

Number of W+jets events = 6258.2



Event yield & Acceptance

Luminosity: ***366 pb*** $^{-1}$

Sample	Pretag	=1 tag	=2 tag,=2 Jets	=2tag,>2jets
tb	9.147	3.532	0.889	0.281
QCD	1359.794	39.210	0.742	1.688
Wbb	75.367	25.920	4.744	1.405
Wjj	5993.851	125.400	2.99	1.51
WWlnjj	43.634	2.209	0.019	0.005
WZlnjj	6.942	0.822	0.192	0.03
tt_lepjets	112.996	43.080	0.894	13.97
tt_dilep	28.180	11.160	2.099	1.705
tqb	20.351	6.640	0.205	0.549
Sum	7639.08*	254.5	11.89	20.86
observed	6723	228	11	35
acceptance	2.84%	1.1%	0.28%	0.09%

* Difference in expected and observed in the pre-tag sample comes from QCD