Top Mass analysis in lepton + jets channel with b-tagging (status report)

Robert Harrington

Outline

- data-MC for μ+jets
- Conclusion/To Do List

Changes

Changes since last time:

- Fixed bug in normalization
- Added MC samples with W(bb) and W(cc) events

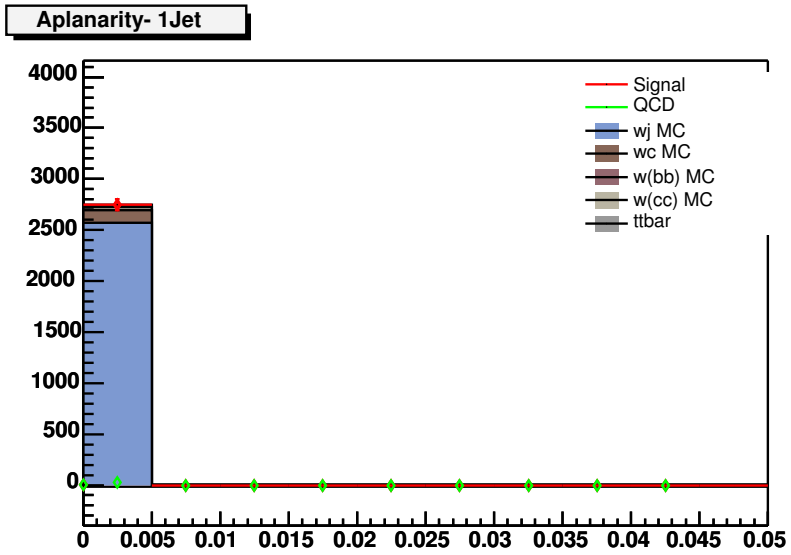
Pre-selection Cuts

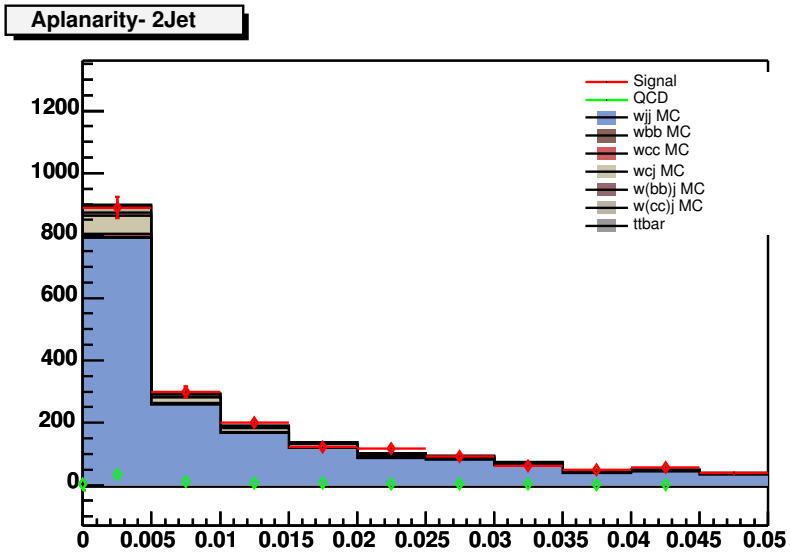
- 1 medium muon with:
  $p_T \geq 20$ GeV
  $|\text{NSeg}| = 3$
  dRjet ≥ 0.5
  central track match
  DCA significance < 3.0
  cosmic cuts
  isolation cut
  high p_T muon cuts
- ≥ 1 jet with $p_T > 15$ GeV, $|\eta| < 2.5$
- triangular MET cuts
- Primary vertex cuts
- Removal of b-tagged events
  (isSVXTagged with dls $= 7.0$)

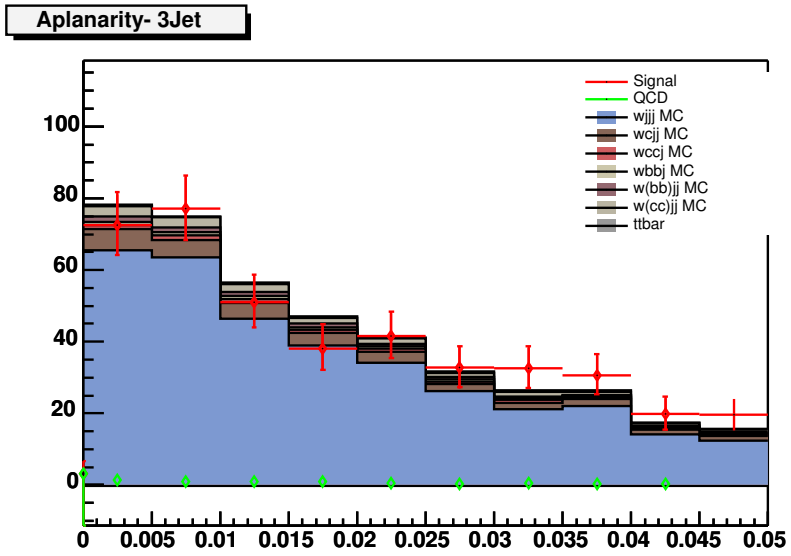
preselected - no b tag				
# jets	1	2	3	$\geq$4
tight	5581	2233	559	127
loose	10504	4955	1497	406

preselected - with btag				
# jets	1	2	3	$\geq$4
tight	61	67	48	16
loose	208	196	106	49

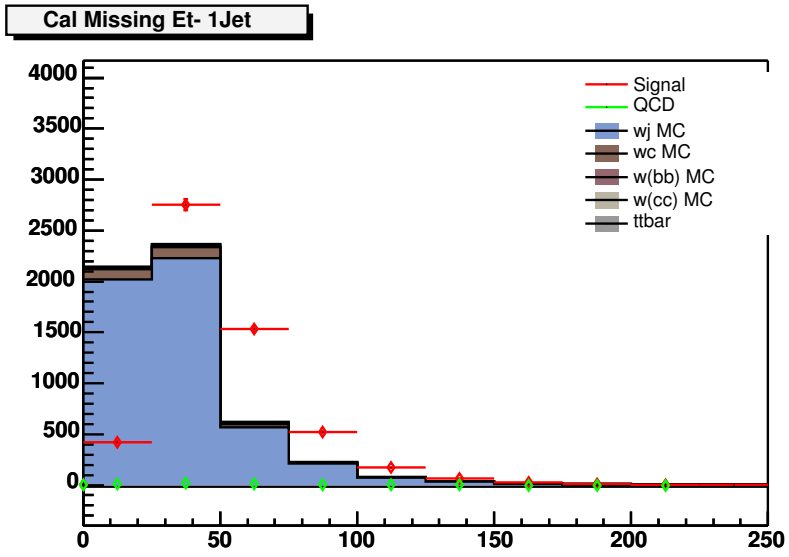
No b-tagging

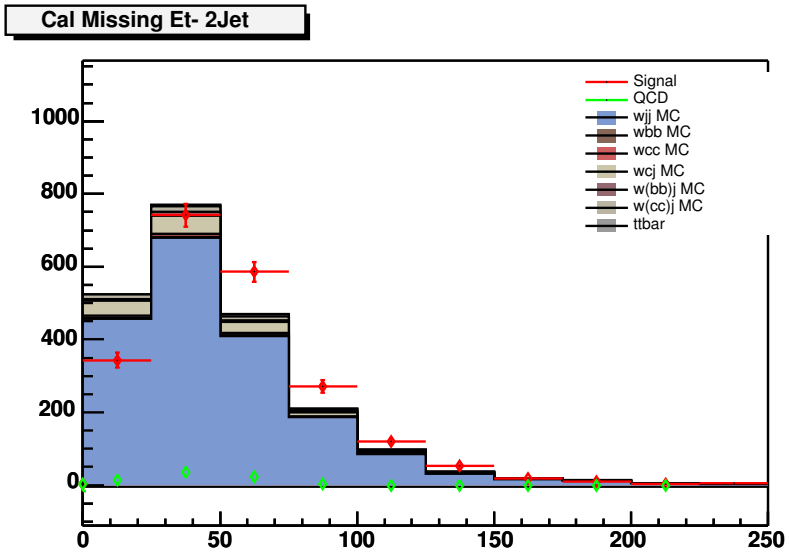

Aplanarity- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar
4000
3500
3000
2500
2000
1500
1000
500
0
0 0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04 0.045 0.05

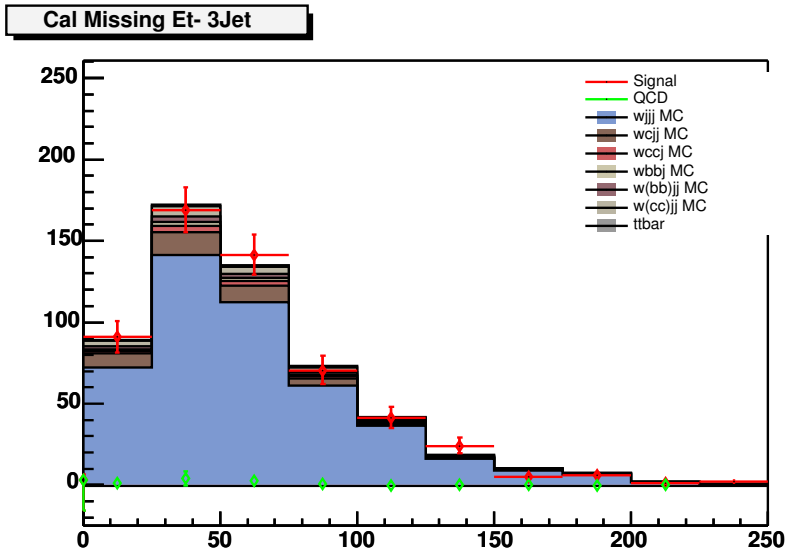

Aplanarity- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar
1200
1000
800
600
400
200
0
0 0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04 0.045 0.05


Aplanarity- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar
100
80
60
40
20
0
0 0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04 0.045 0.05

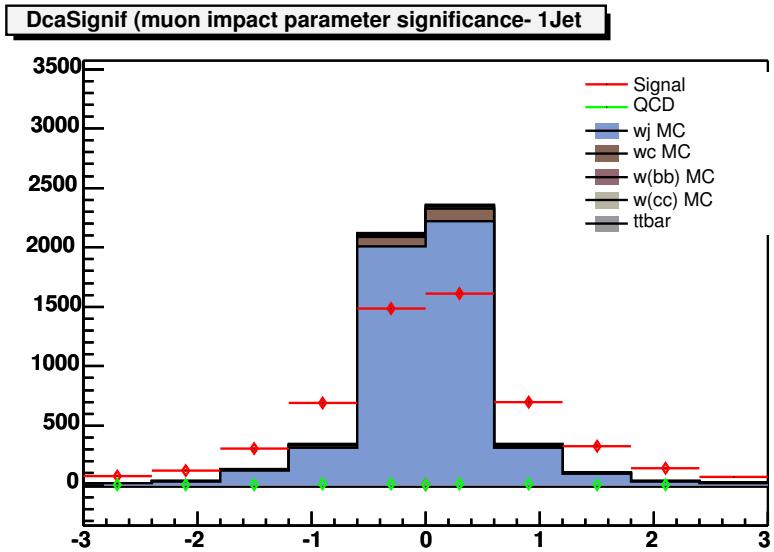
No b-tagging

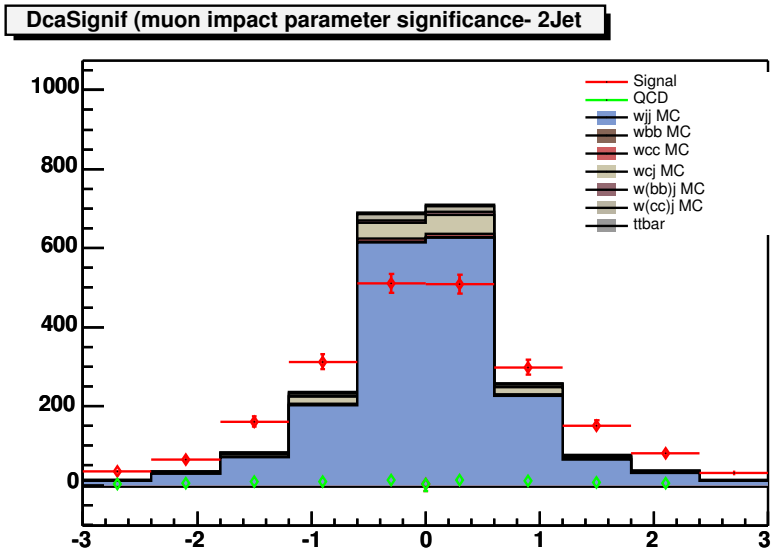

Cal Missing Et- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

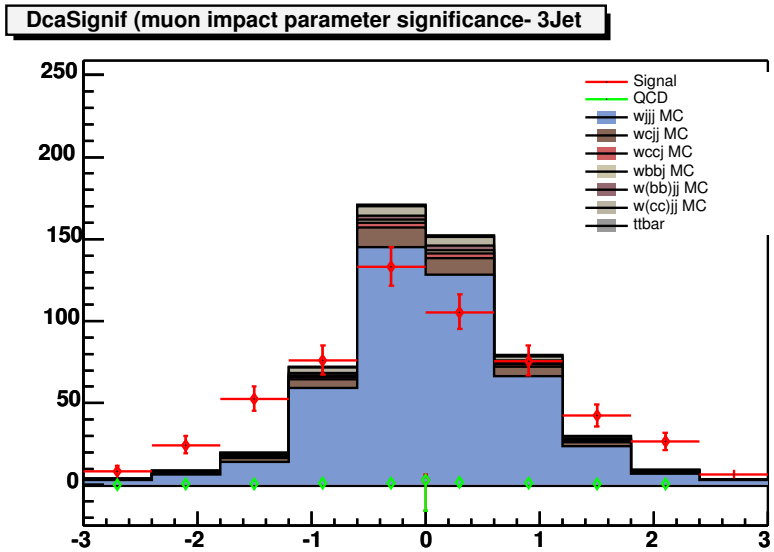

Cal Missing Et- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


Cal Missing Et- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

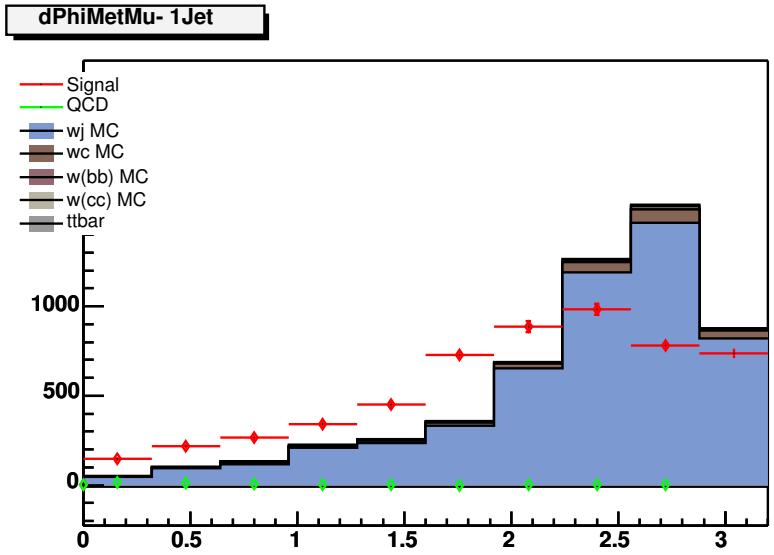
No b-tagging

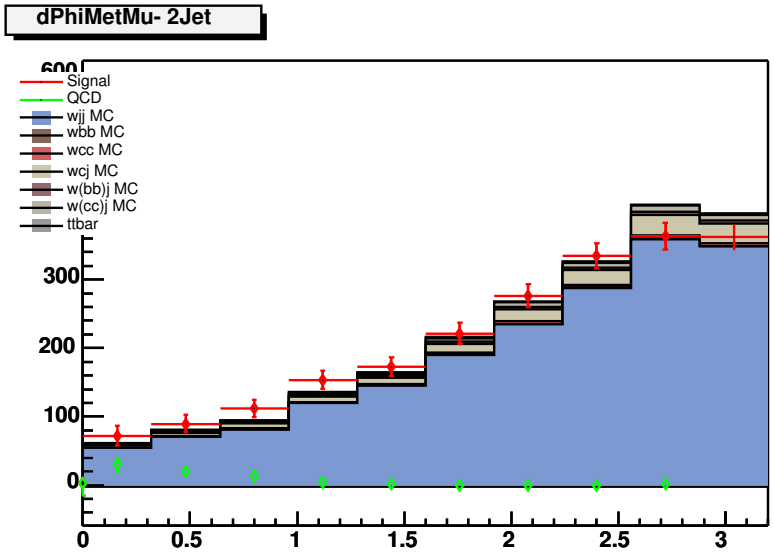

DcaSignif (muon impact parameter significance- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

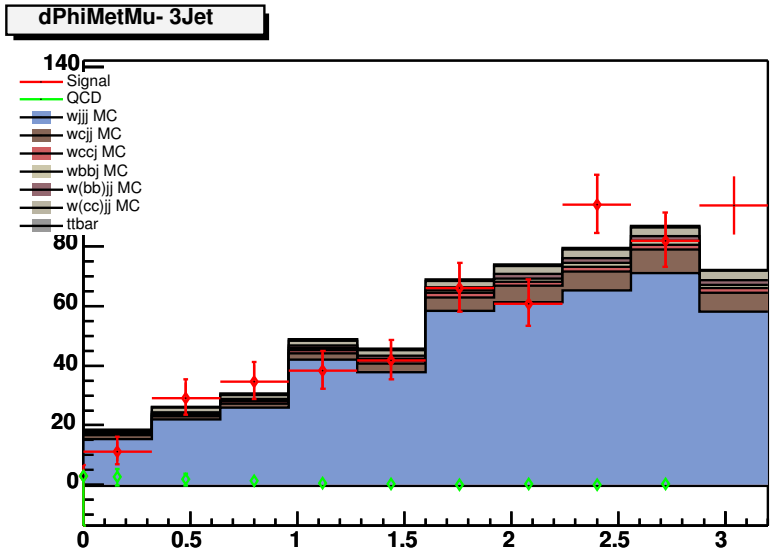

DcaSignif (muon impact parameter significance- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


DcaSignif (muon impact parameter significance- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

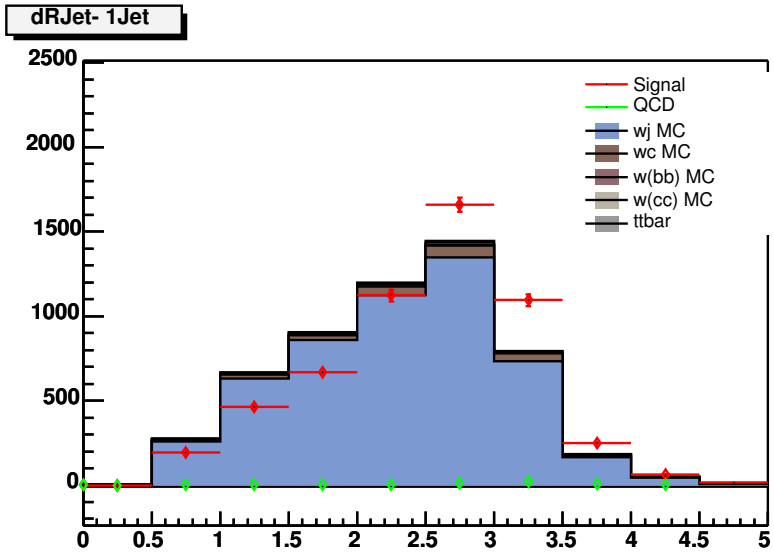
No b-tagging

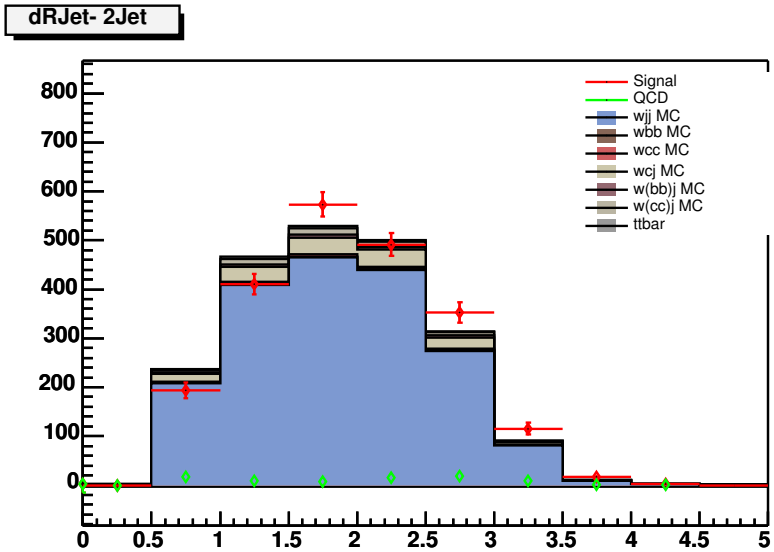

dPhiMetMu- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar
1000
500
0
0
0.5
1
1.5
2
2.5
3

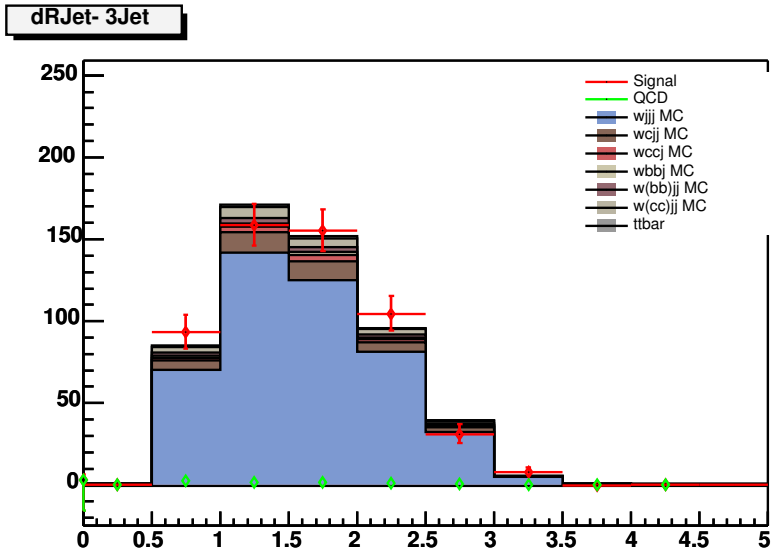

dPhiMetMu- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar
300
200
100
0
0
0.5
1
1.5
2
2.5
3


dPhiMetMu- 3Jet
140
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar
80
60
40
20
0
0
0.5
1
1.5
2
2.5
3

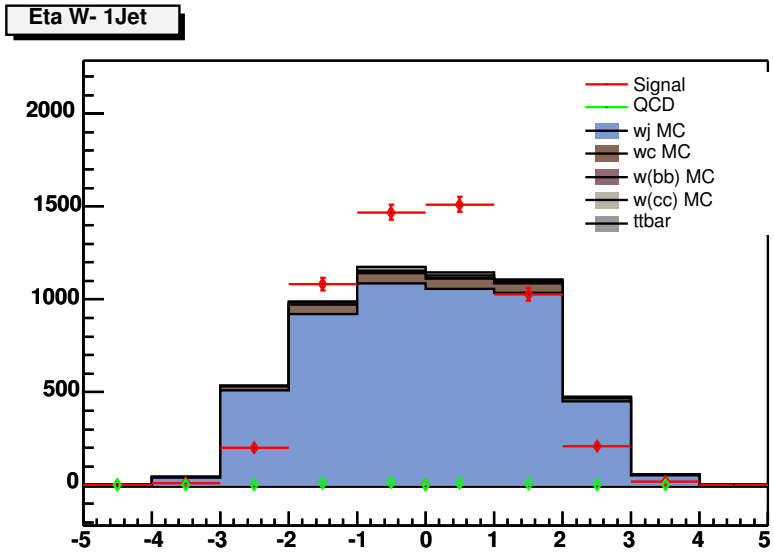
No b-tagging

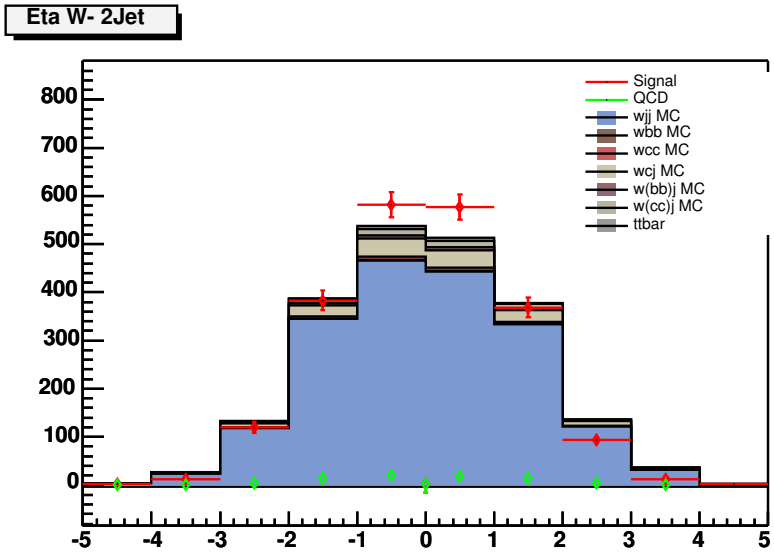

dRJet- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

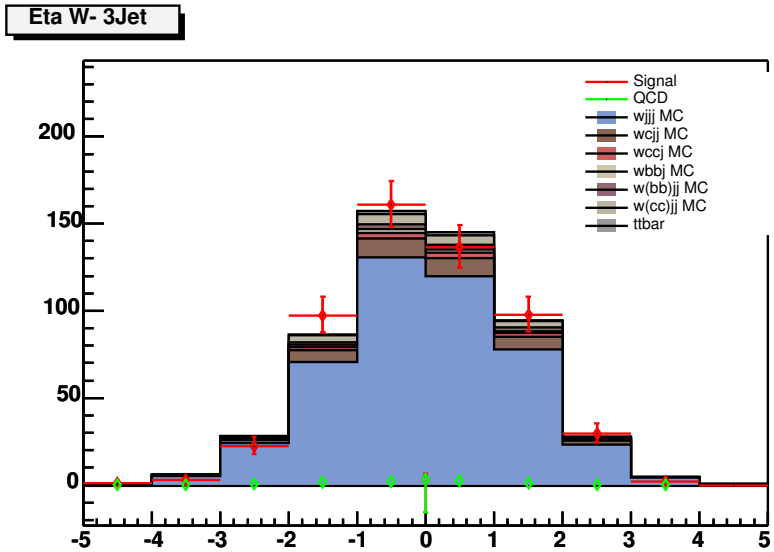

dRJet- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


dRJet- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

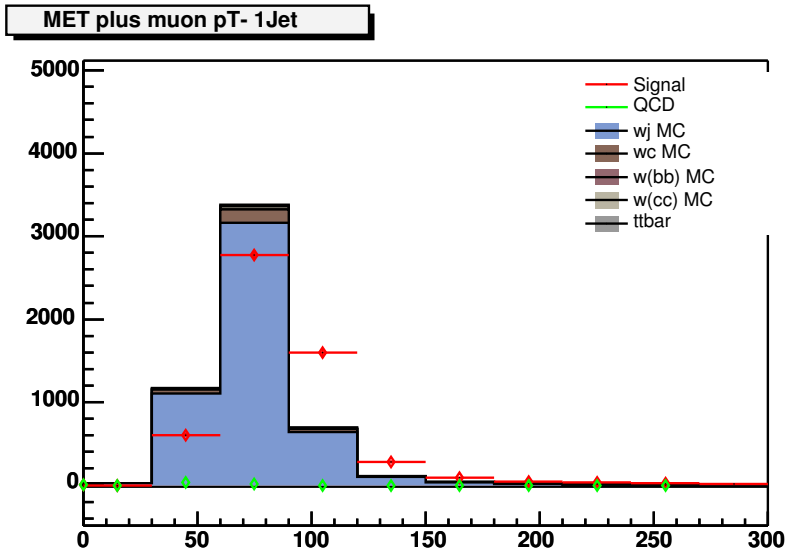
No b-tagging

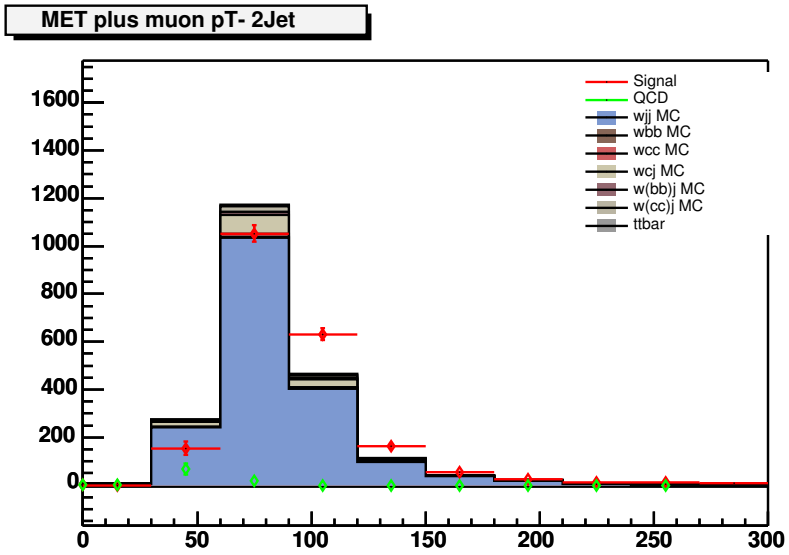

Eta W- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

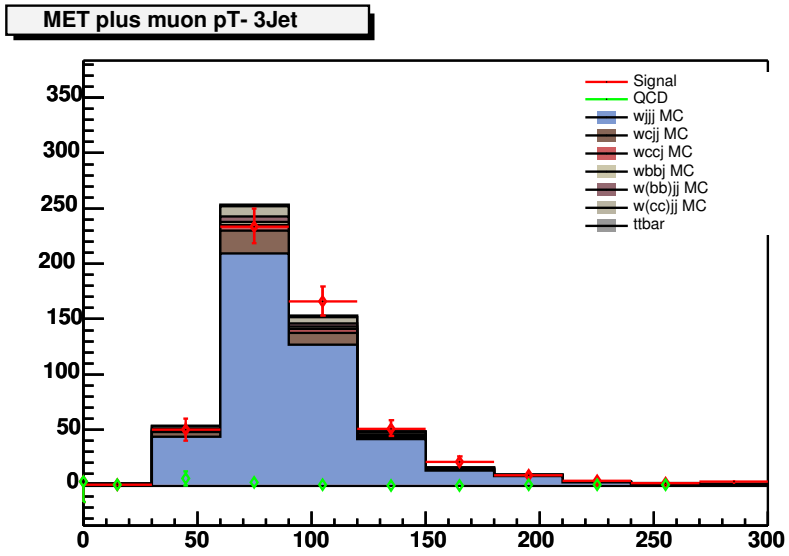

Eta W- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


Eta W- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

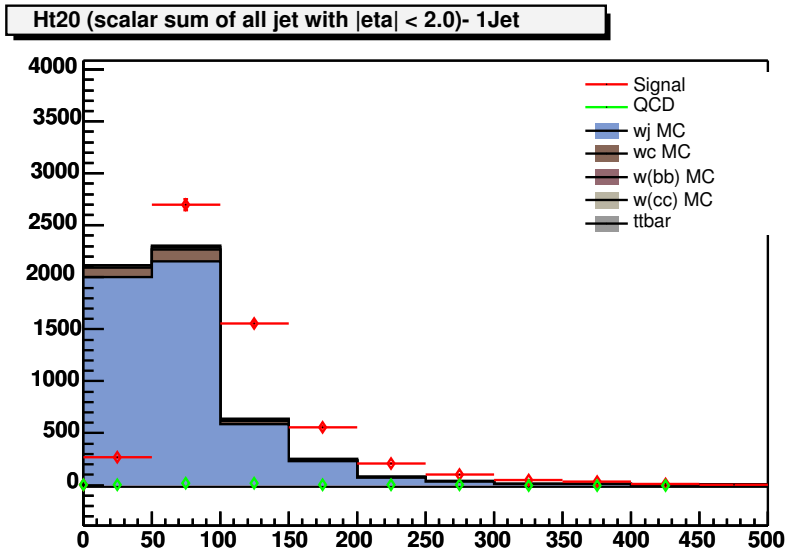
No b-tagging

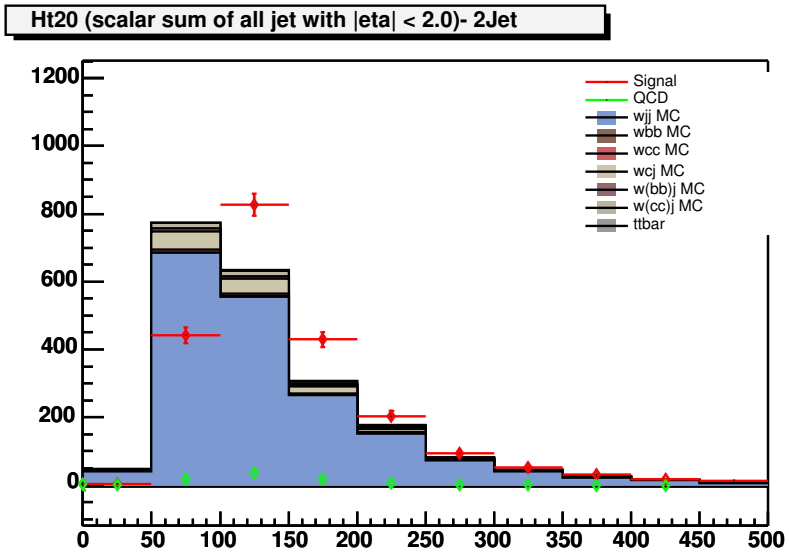

MET plus muon pT- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar
5000
4000
3000
2000
1000
0
0
50
100
150
200
250
300

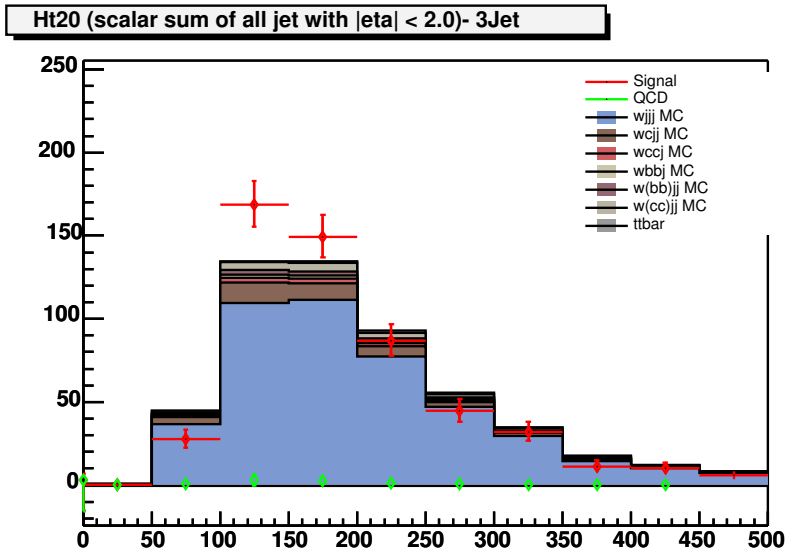

MET plus muon pT- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar
1600
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300


MET plus muon pT- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300

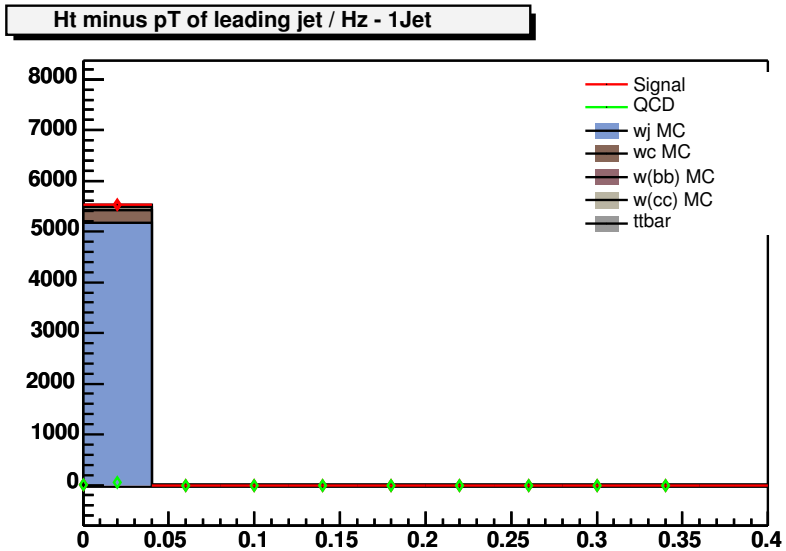
No b-tagging

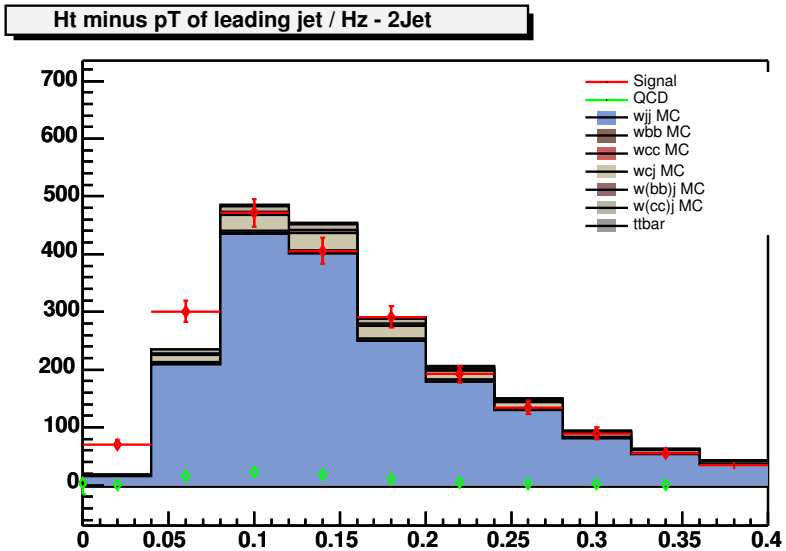

Ht20 (scalar sum of all jet with |eta| < 2.0)- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

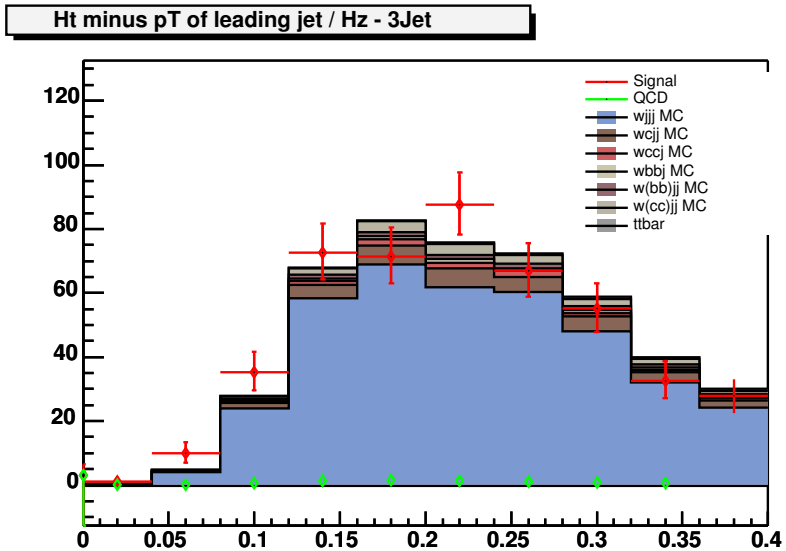

Ht20 (scalar sum of all jet with |eta| < 2.0)- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


Ht20 (scalar sum of all jet with |eta| < 2.0)- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

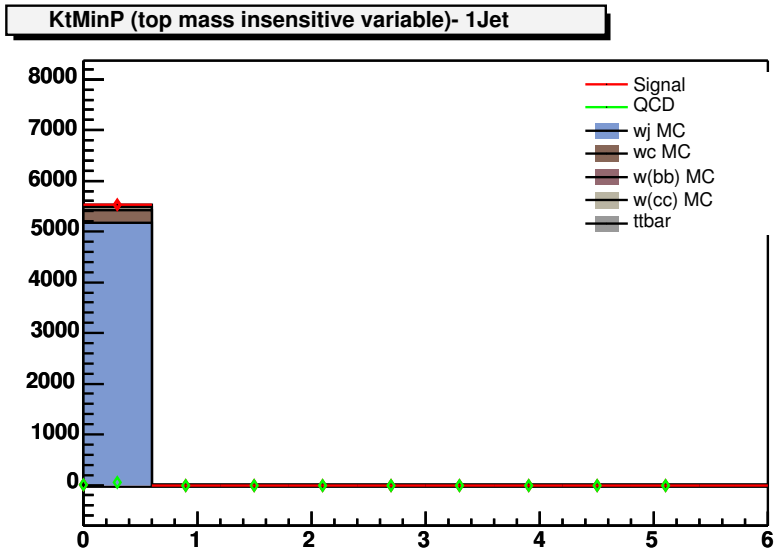
No b-tagging

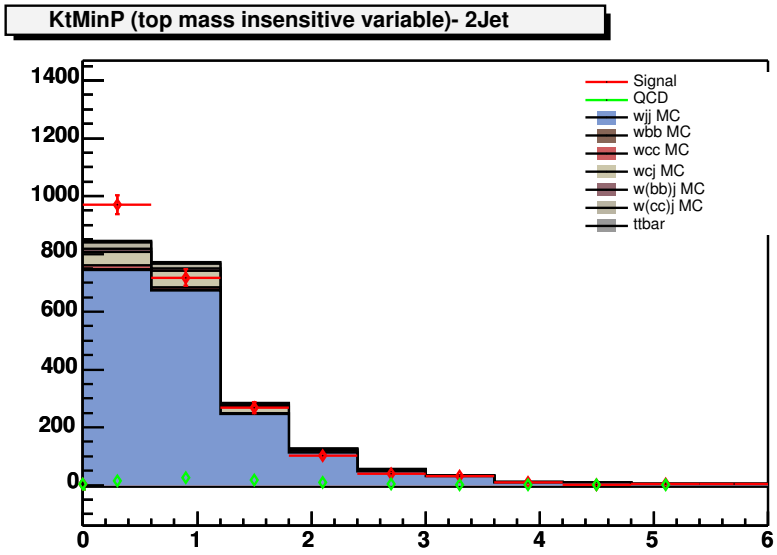

Ht minus pT of leading jet / Hz - 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar
8000
7000
6000
5000
4000
3000
2000
1000
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

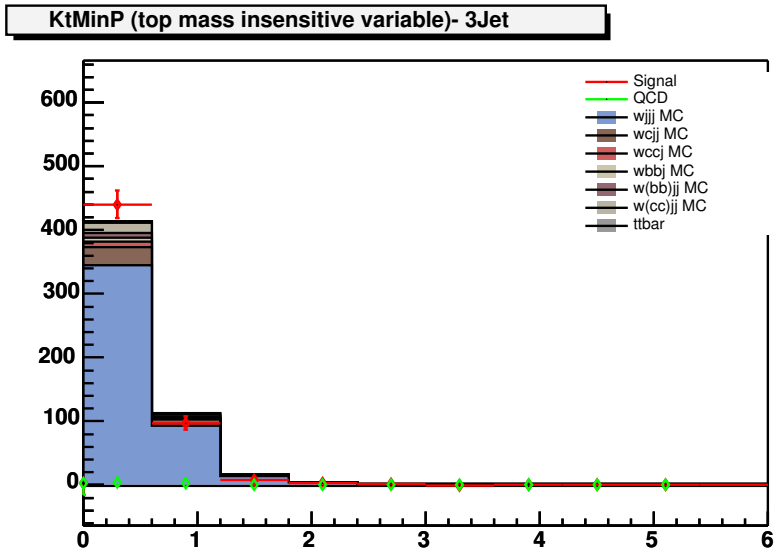

Ht minus pT of leading jet / Hz - 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar
700
600
500
400
300
200
100
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4


Ht minus pT of leading jet / Hz - 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar
120
100
80
60
40
20
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4

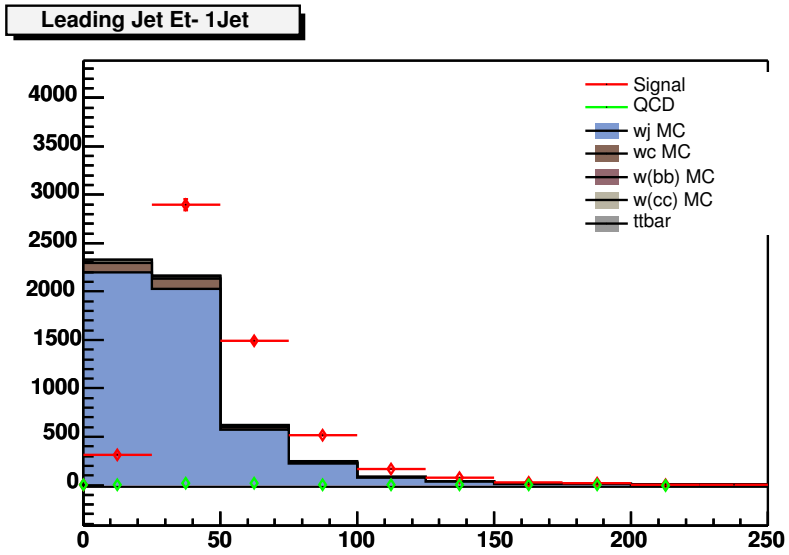
No b-tagging

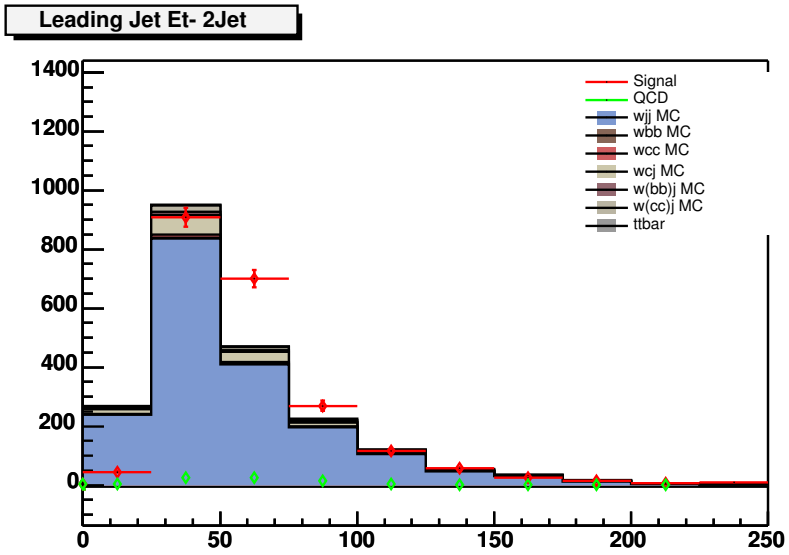

KtMinP (top mass insensitive variable)- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

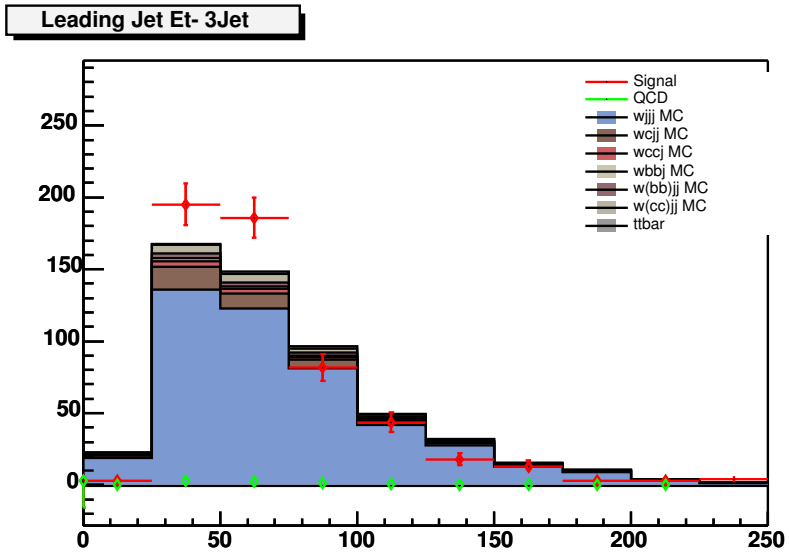

KtMinP (top mass insensitive variable)- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


KtMinP (top mass insensitive variable)- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

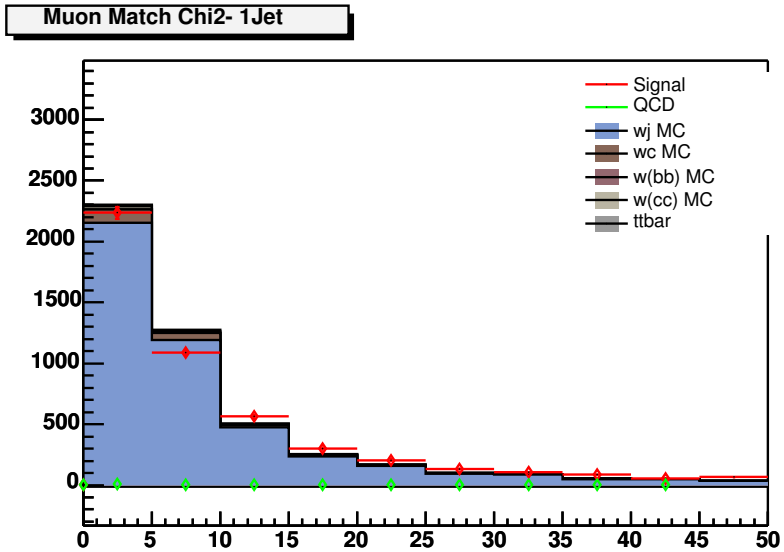
No b-tagging

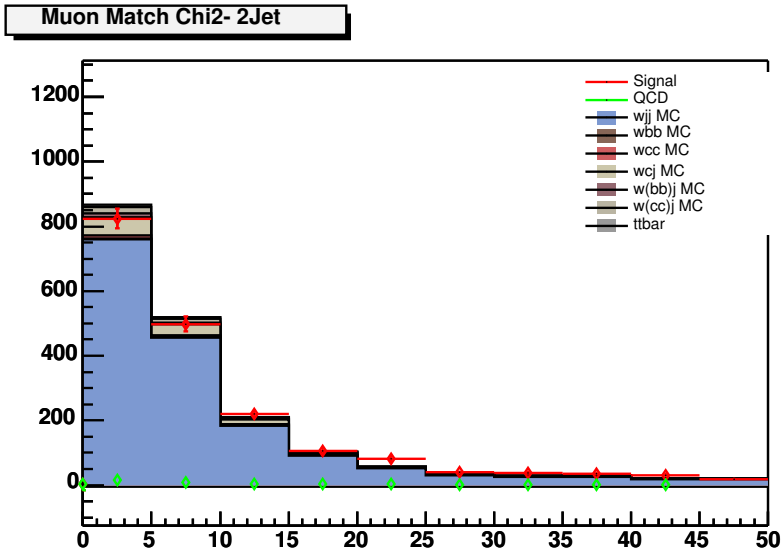

Leading Jet Et- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar
4000
3500
3000
2500
2000
1500
1000
500
0
0
50
100
150
200
250

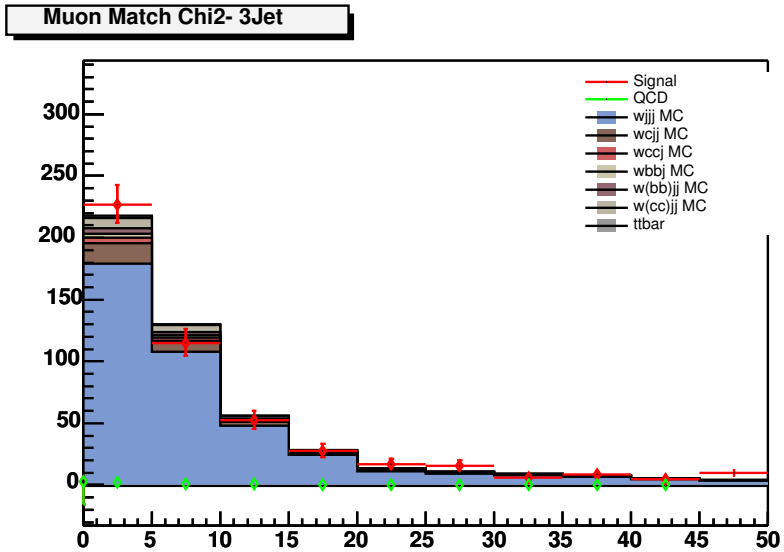

Leading Jet Et- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250


Leading Jet Et- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar
250
200
150
100
50
0
0
50
100
150
200
250

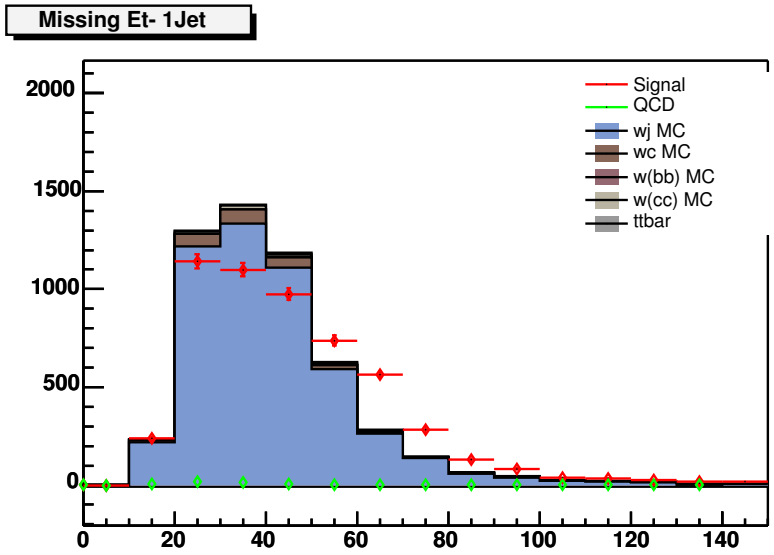
No b-tagging

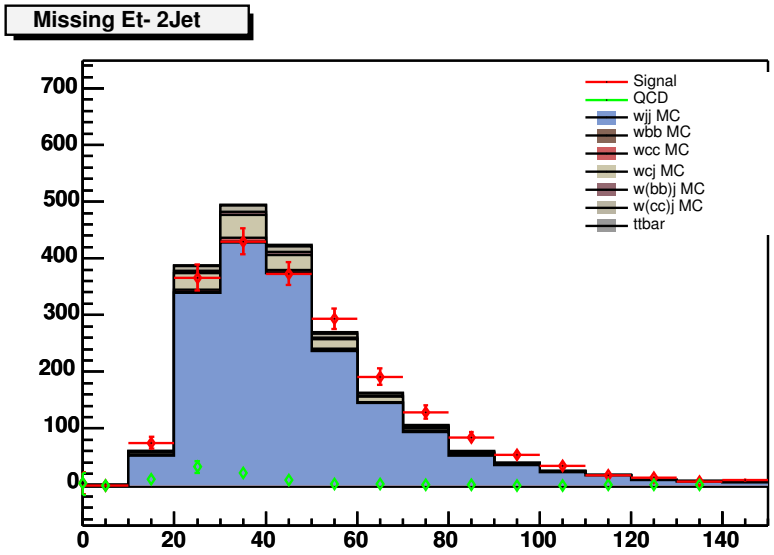

Muon Match Chi2- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

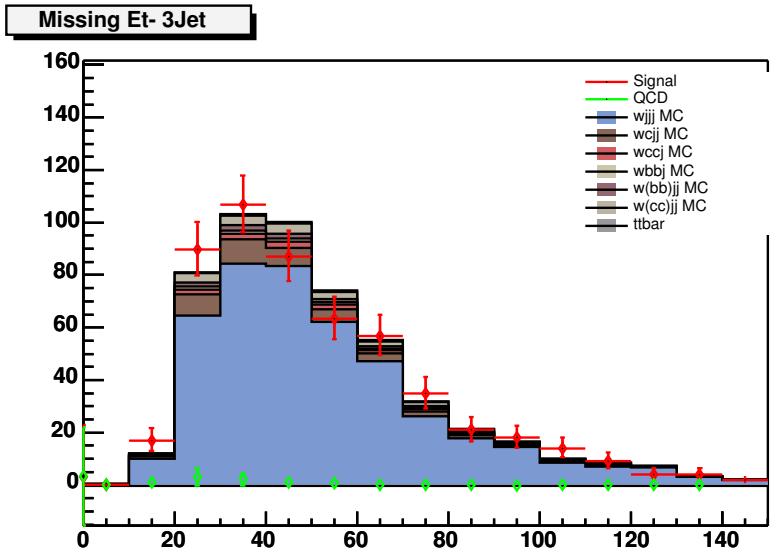

Muon Match Chi2- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


Muon Match Chi2- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

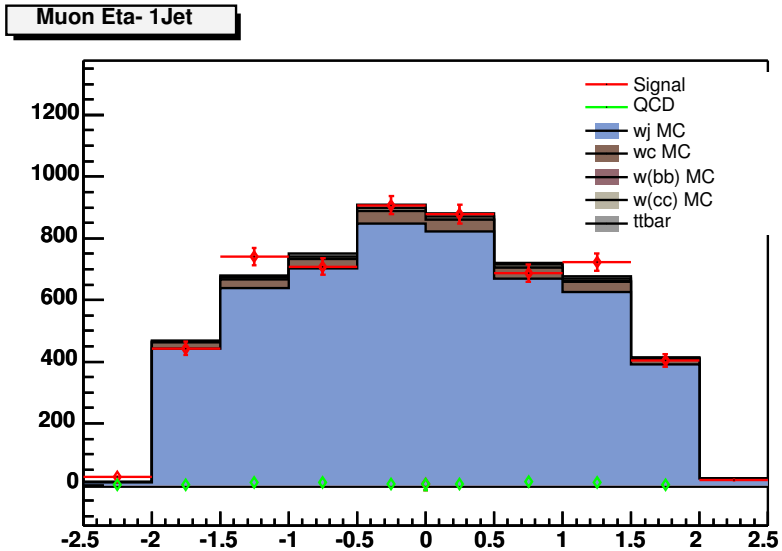
No b-tagging

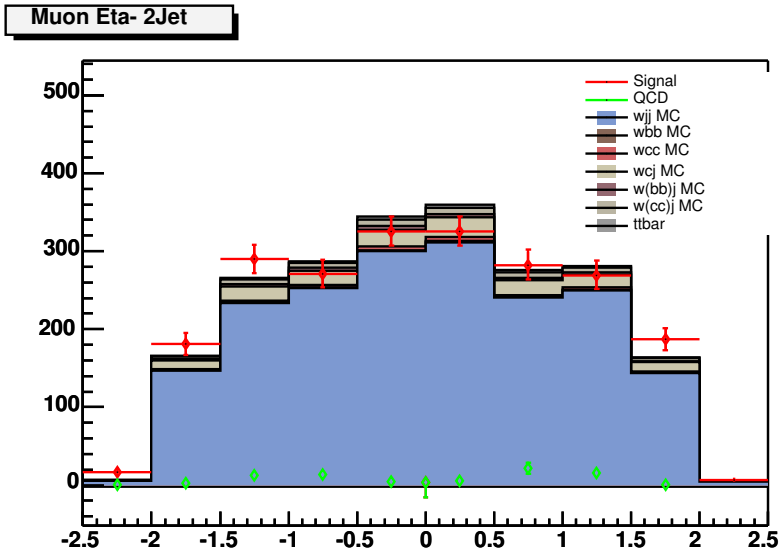

Missing Et- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

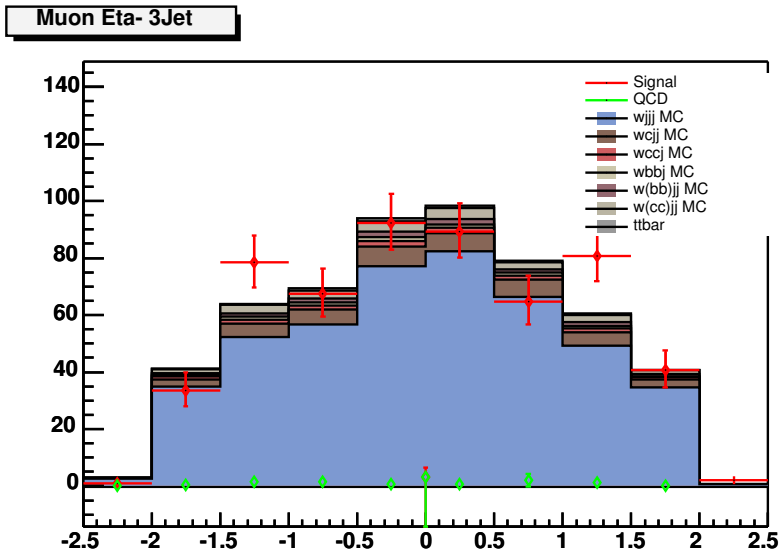

Missing Et- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


Missing Et- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

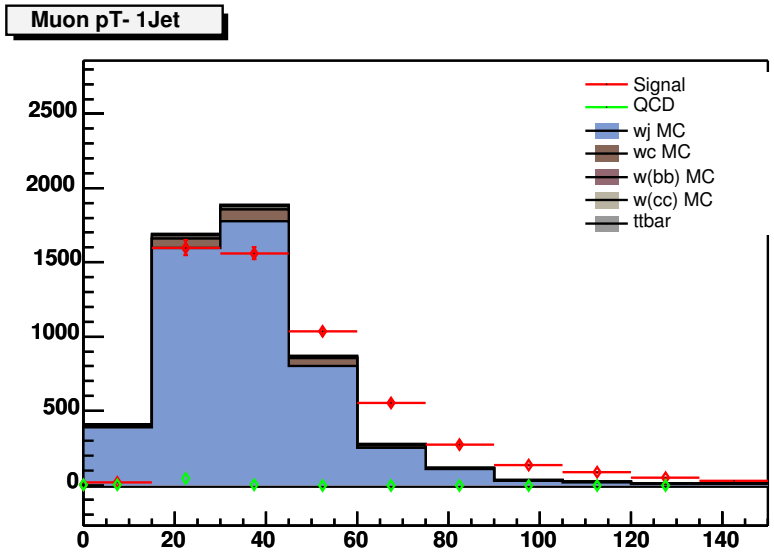
No b-tagging

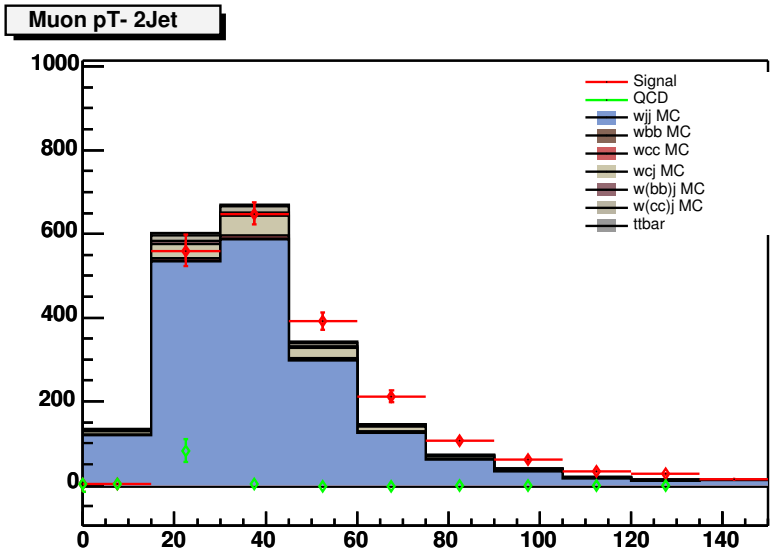

Muon Eta- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

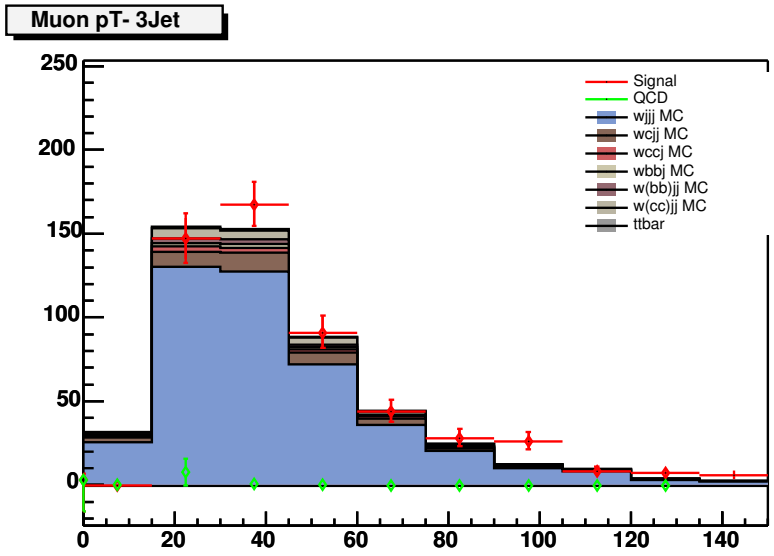

Muon Eta- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


Muon Eta- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

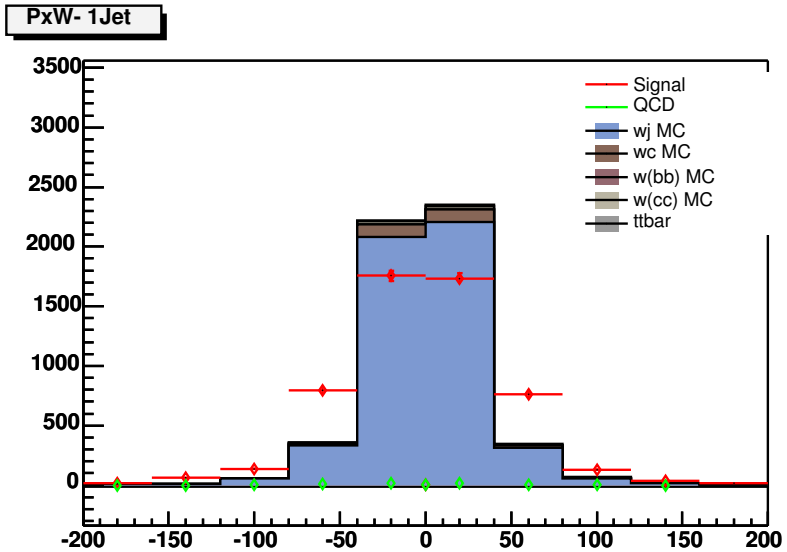
No b-tagging

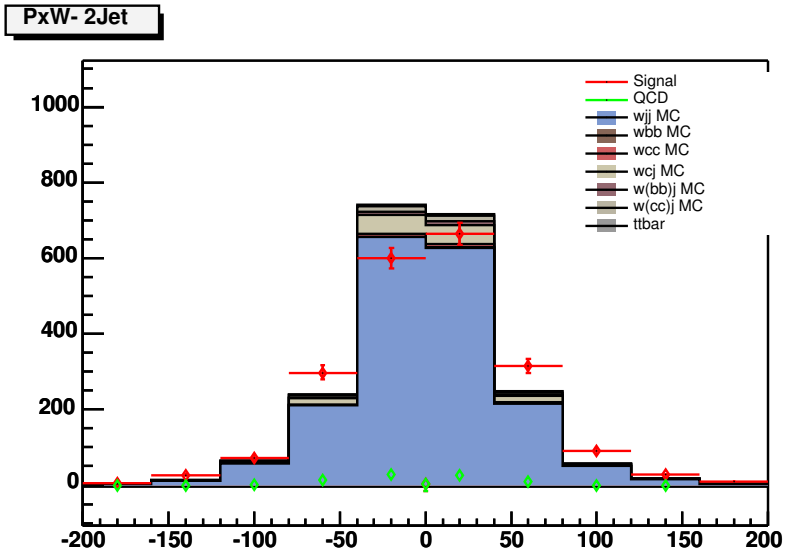

Muon pT- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar
0
500
1000
1500
2000
2500
0
20
40
60
80
100
120
140

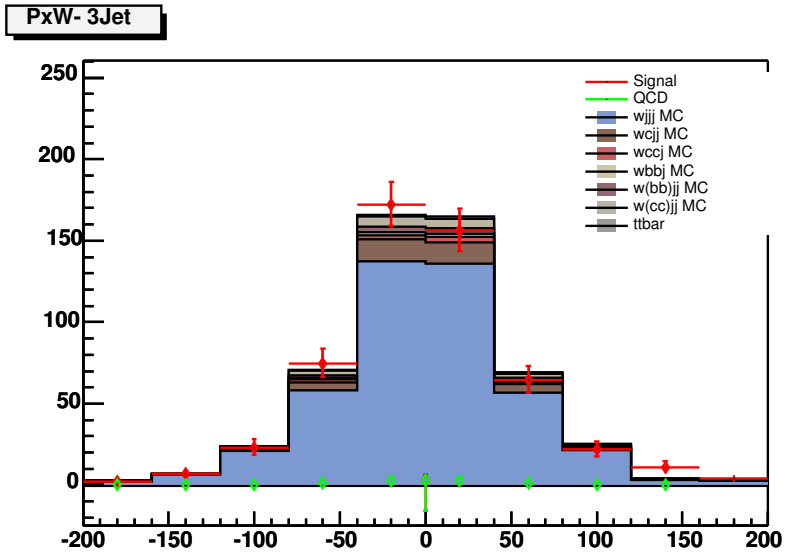

Muon pT- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar
0
200
400
600
800
1000
0
20
40
60
80
100
120
140


Muon pT- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar
0
50
100
150
200
250
0
20
40
60
80
100
120
140

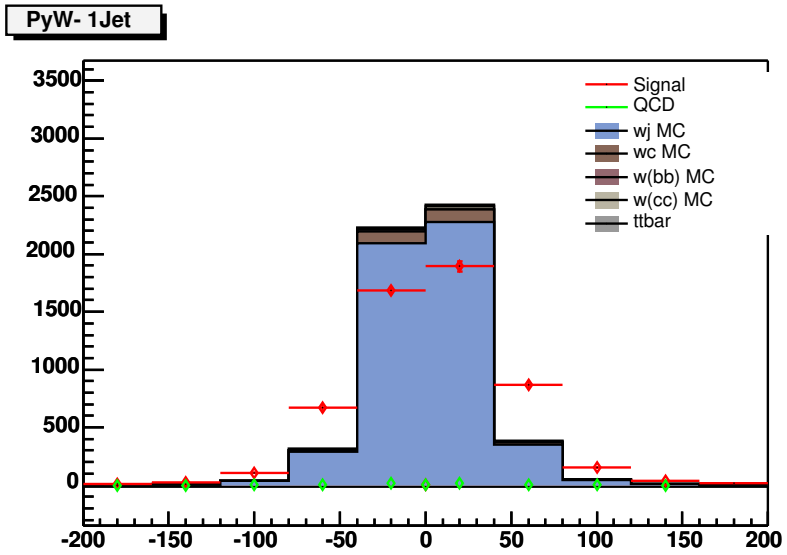
No b-tagging

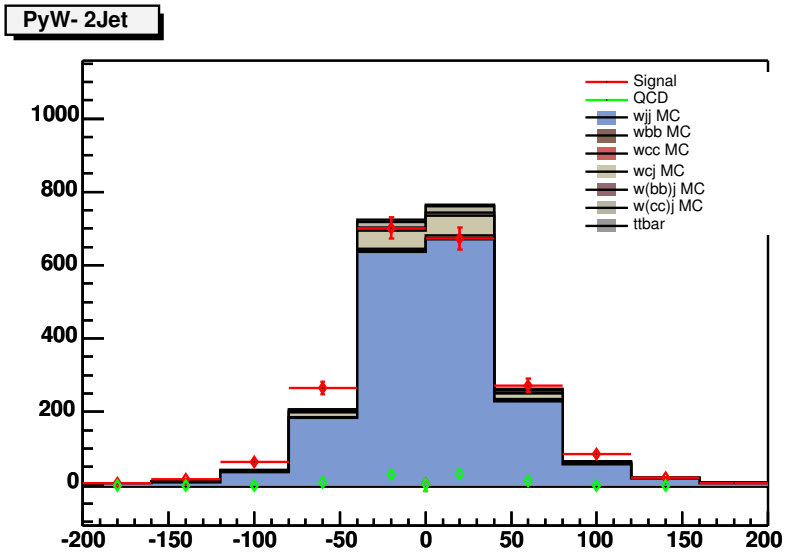

PxW- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

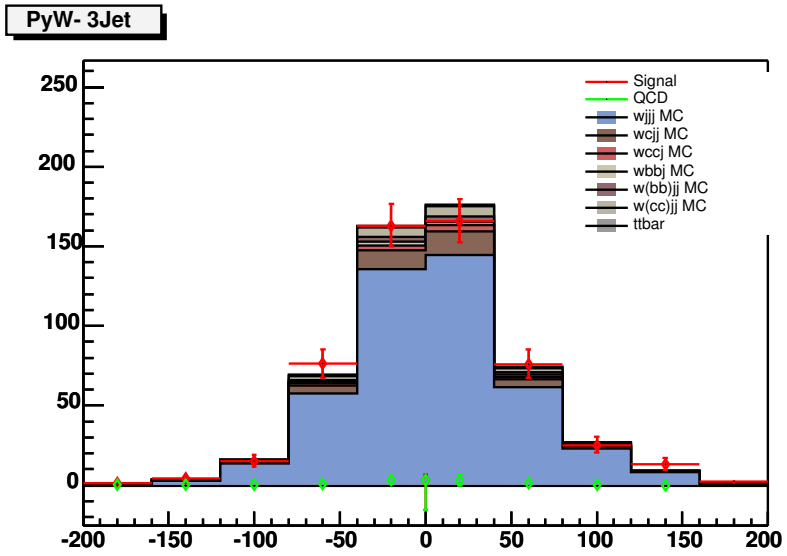

PxW- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


PxW- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

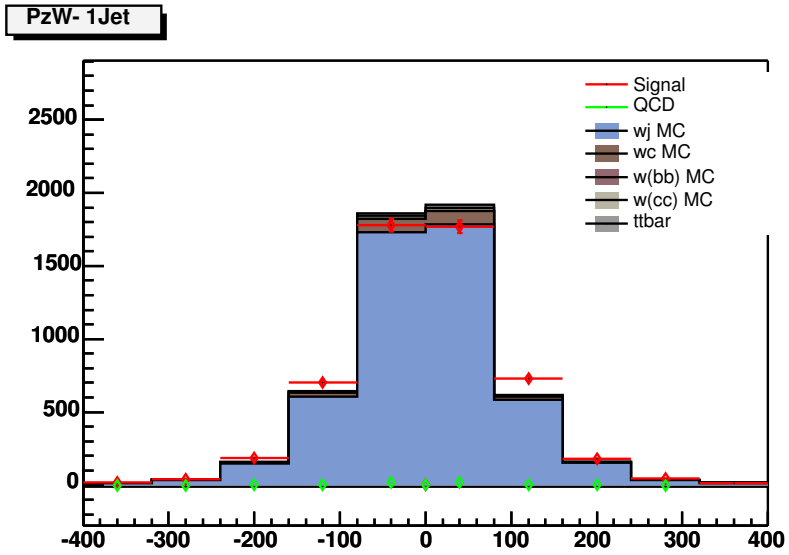
No b-tagging

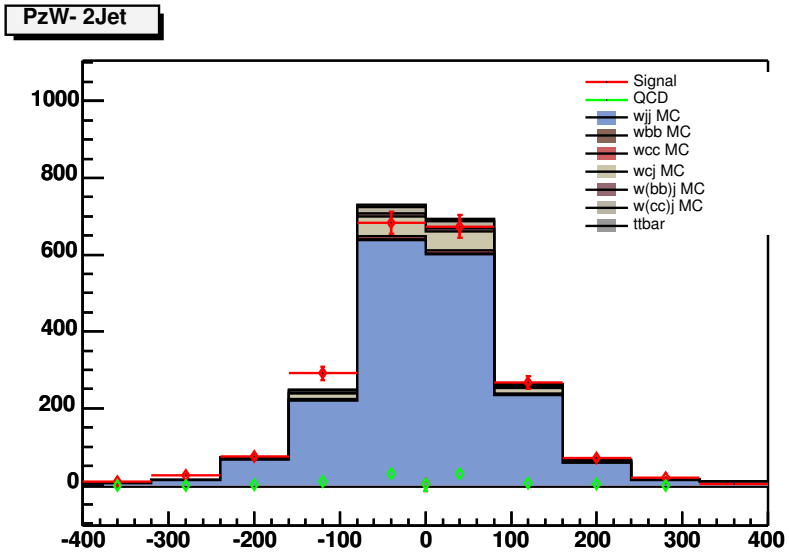

PyW- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

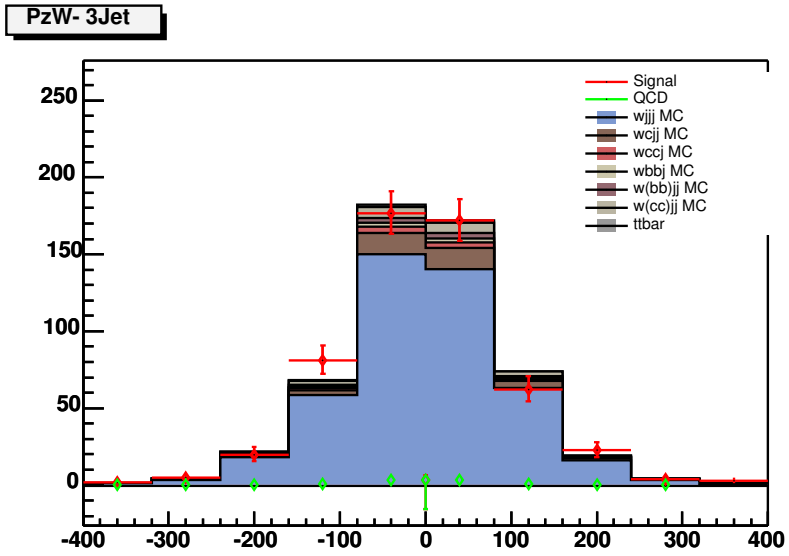

PyW- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


PyW- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

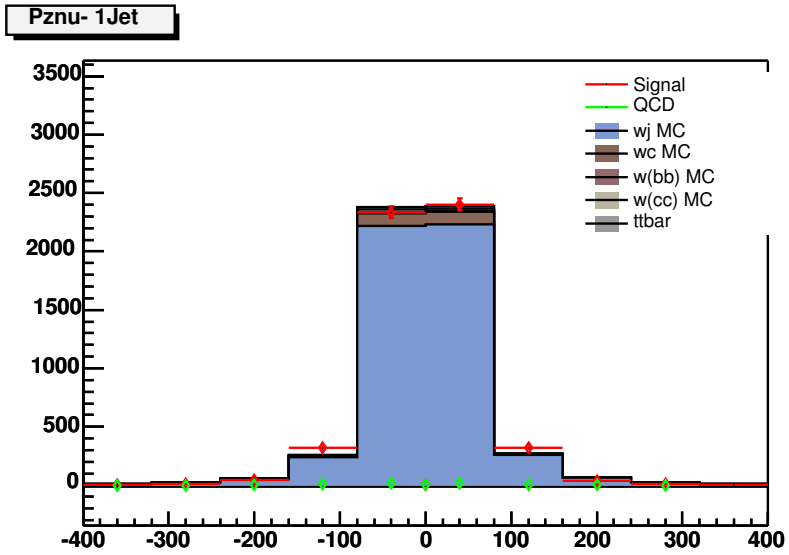
No b-tagging

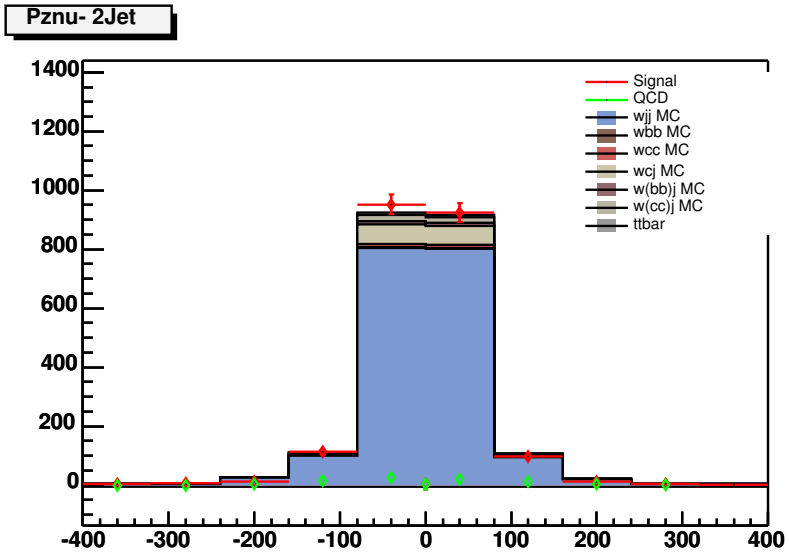

PzW- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar
2500
2000
1500
1000
500
0
-400
-300
-200
-100
0
100
200
300
400

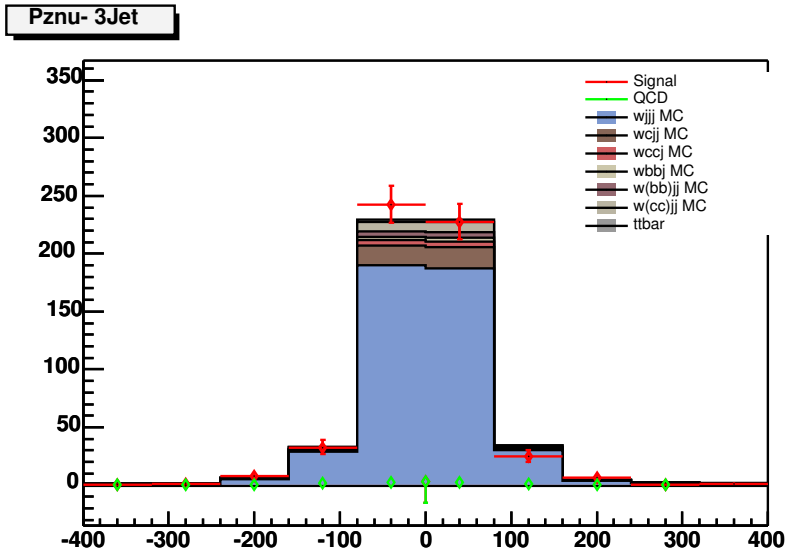

PzW- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar
1000
800
600
400
200
0
-400
-300
-200
-100
0
100
200
300
400


PzW- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar
250
200
150
100
50
0
-400
-300
-200
-100
0
100
200
300
400

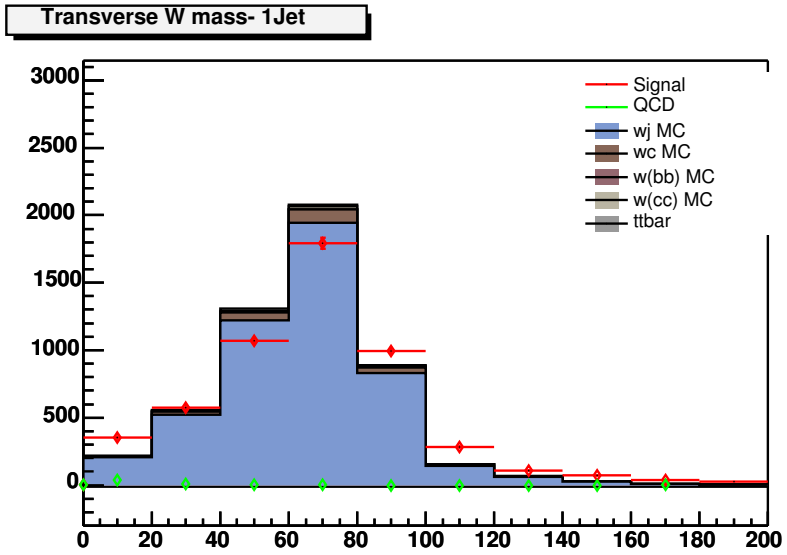
No b-tagging

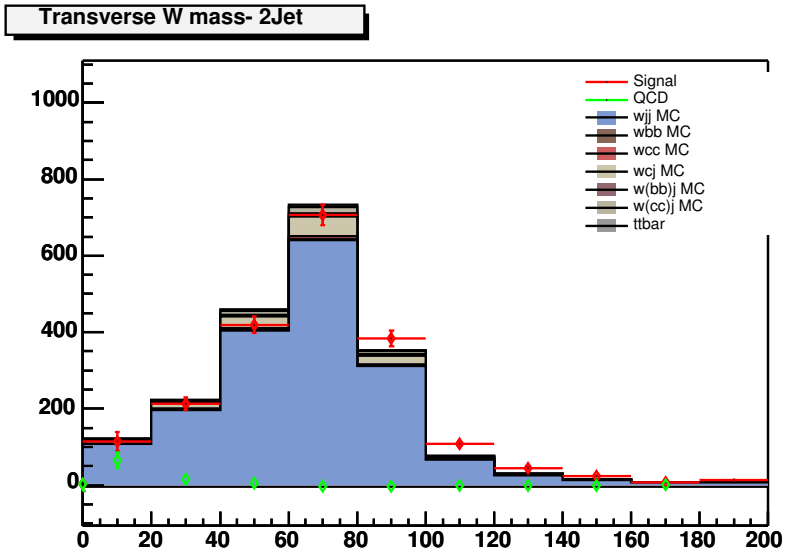

Pznu- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

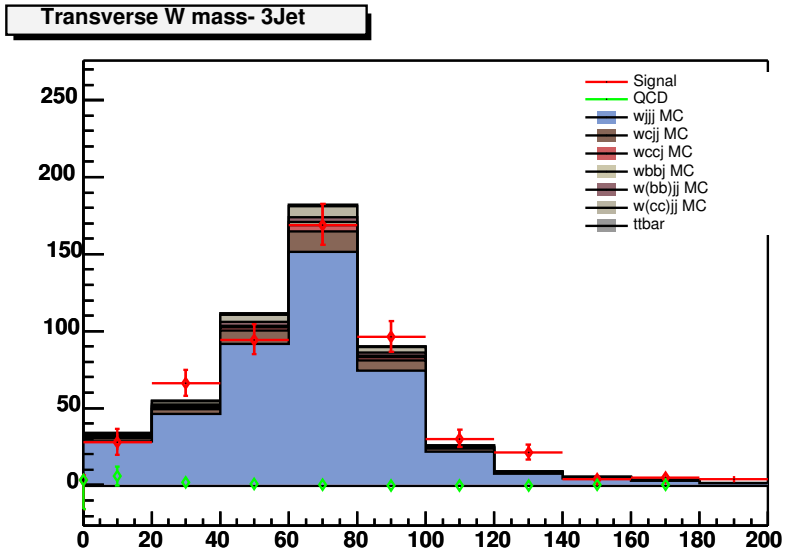

Pznu- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


Pznu- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

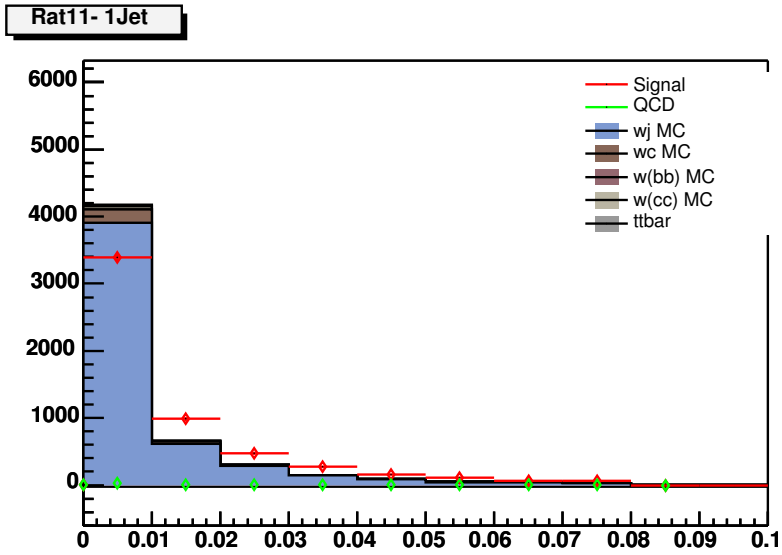
No b-tagging

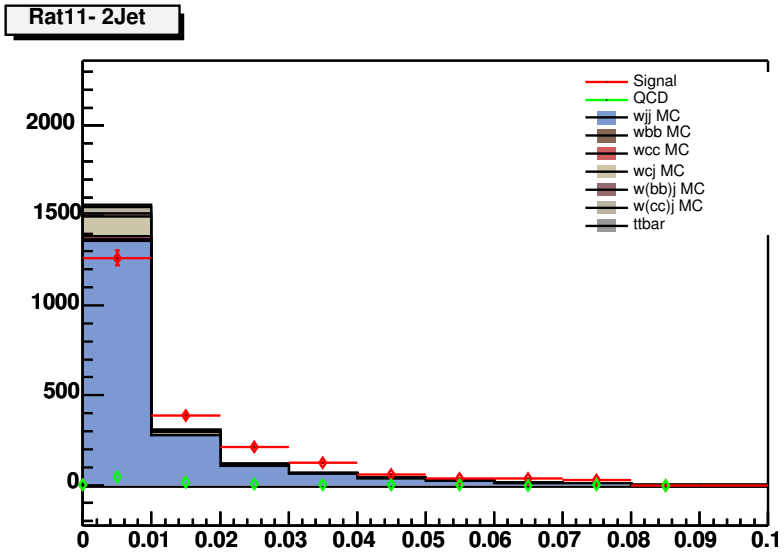

Transverse W mass- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar

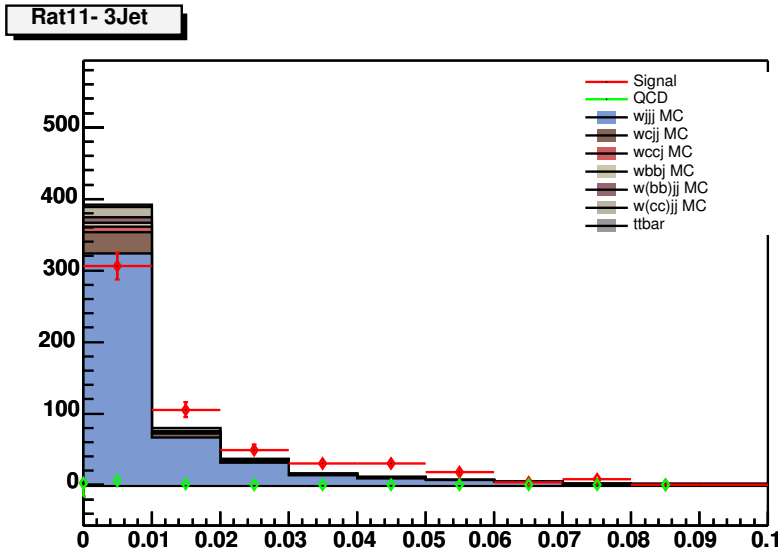

Transverse W mass- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar


Transverse W mass- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar

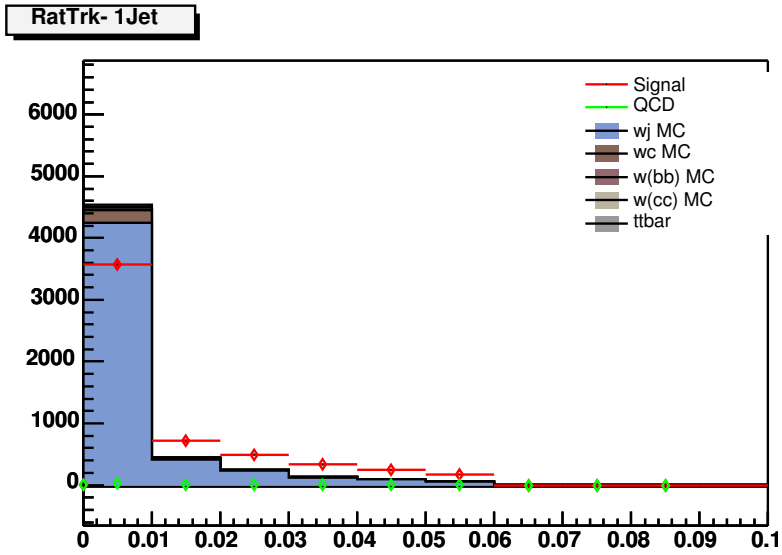
No b-tagging

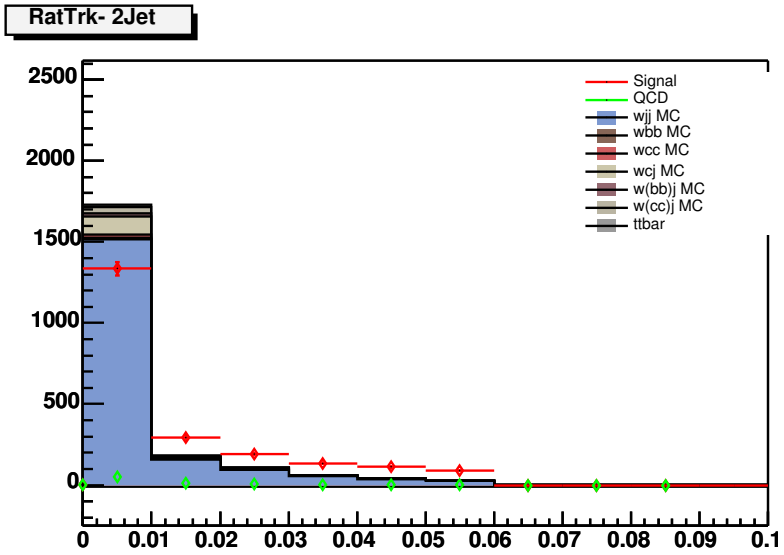

Rat11- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar
6000
5000
4000
3000
2000
1000
0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1

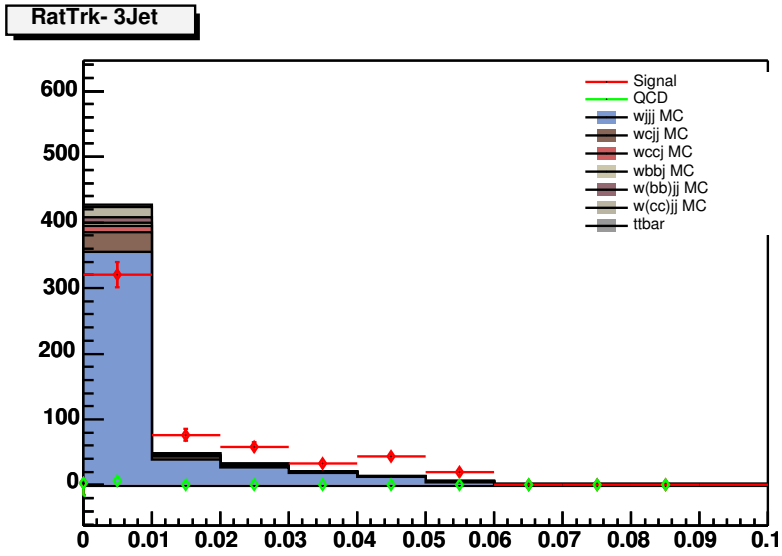

Rat11- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar
2000
1500
1000
500
0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1


Rat11- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar
500
400
300
200
100
0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1

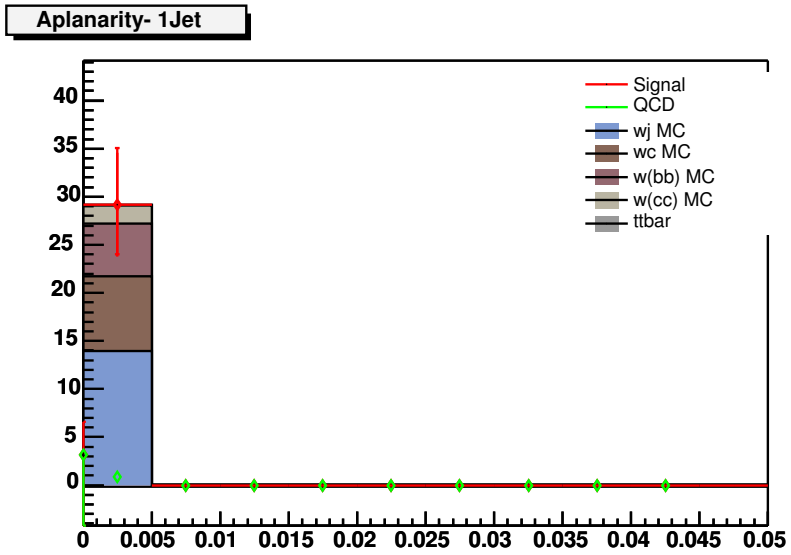
No b-tagging

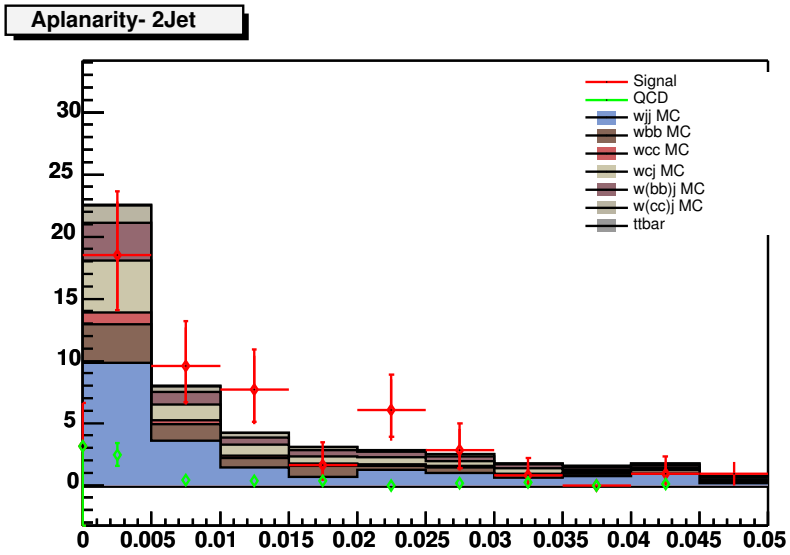

RatTrk- 1Jet
Signal
QCD
wj MC
wc MC
w(bb) MC
w(cc) MC
ttbar
6000
5000
4000
3000
2000
1000
0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1

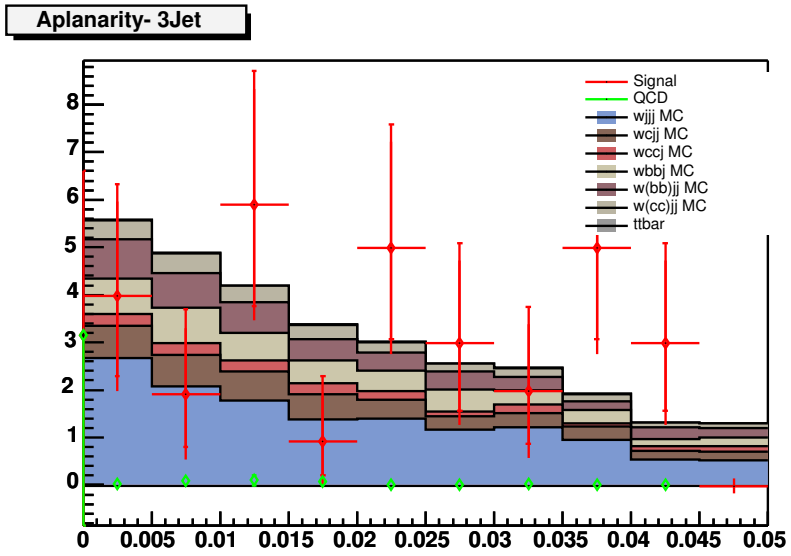

RatTrk- 2Jet
Signal
QCD
wjj MC
wbb MC
wcc MC
wcj MC
w(bb)j MC
w(cc)j MC
ttbar
2500
2000
1500
1000
500
0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1


RatTrk- 3Jet
Signal
QCD
wjjj MC
wcjj MC
wccj MC
wbbj MC
w(bb)jj MC
w(cc)jj MC
ttbar
600
500
400
300
200
100
0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1

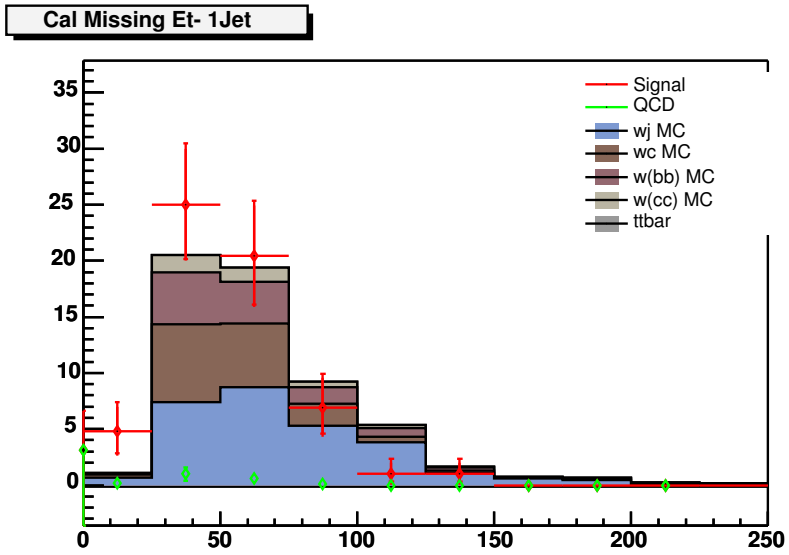
With b-tagging

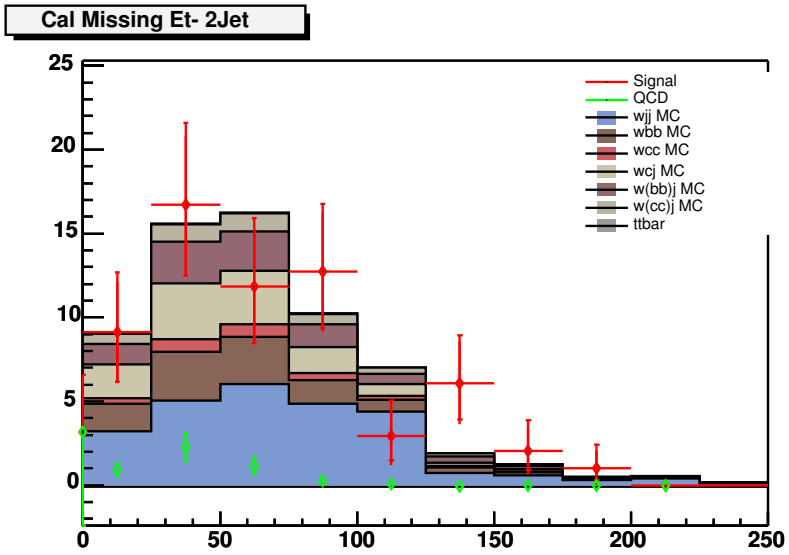


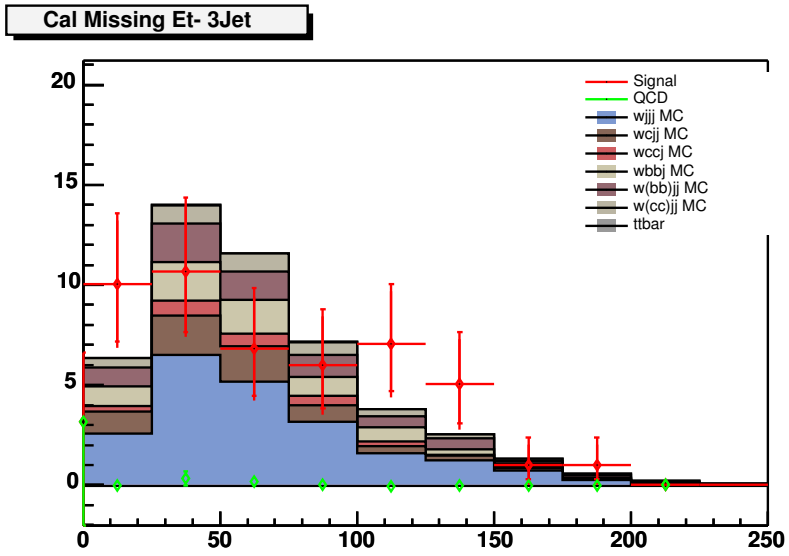




With b-tagging

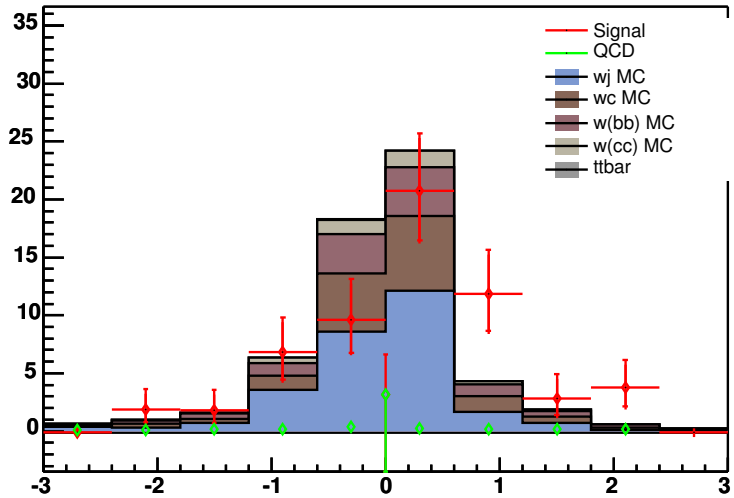




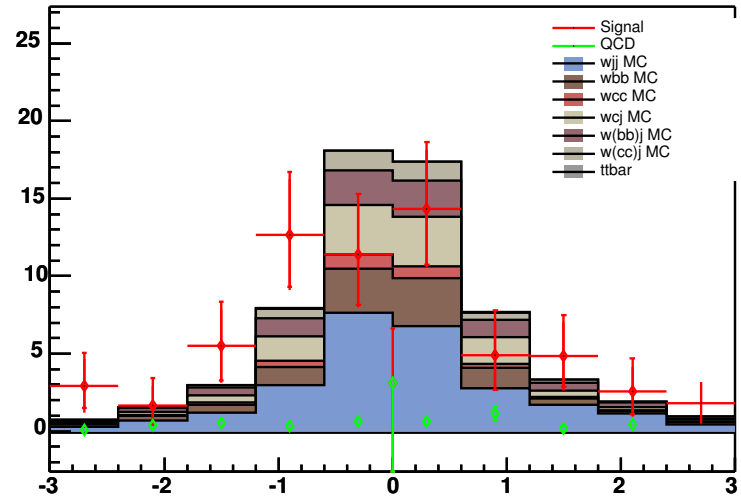


With b-tagging

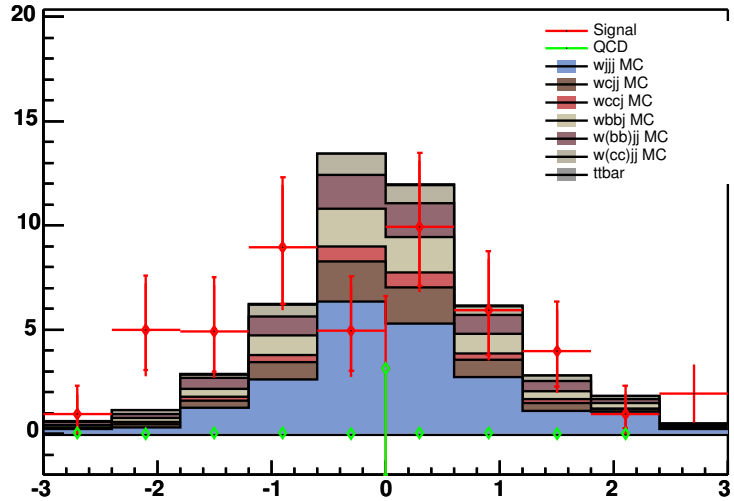
DcaSignif (muon impact parameter significance- 1Jet



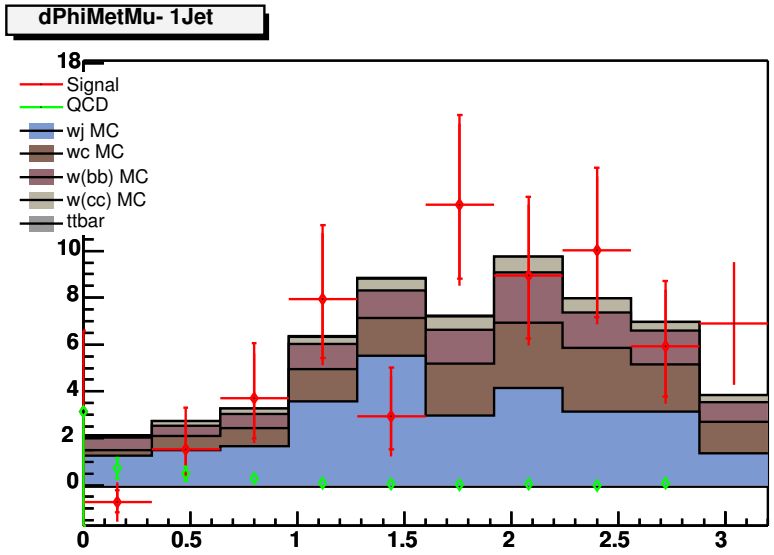
DcaSignif (muon impact parameter significance- 2Jet

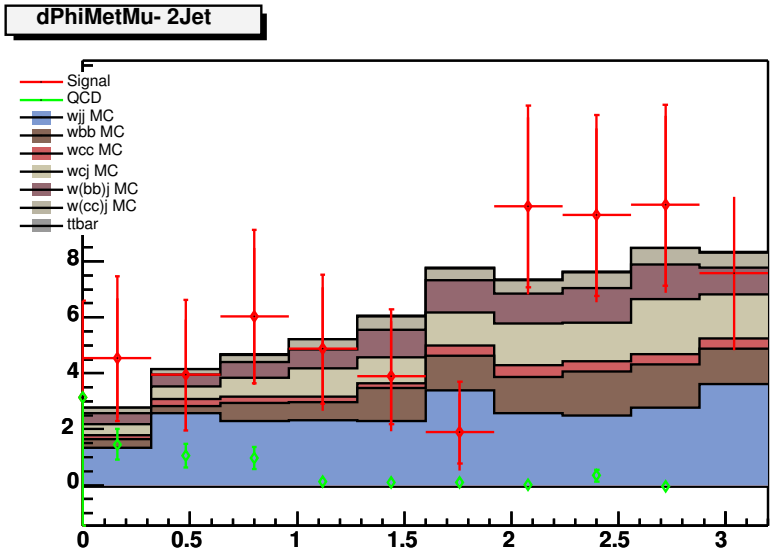


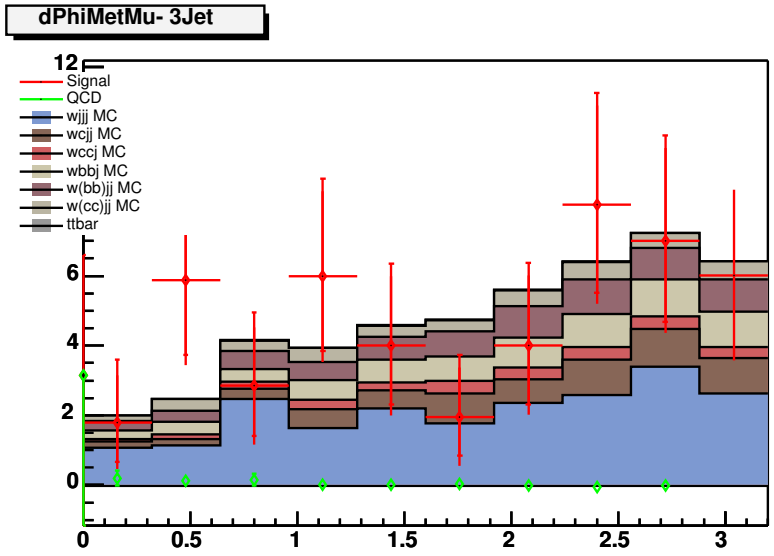
DcaSignif (muon impact parameter significance- 3Jet



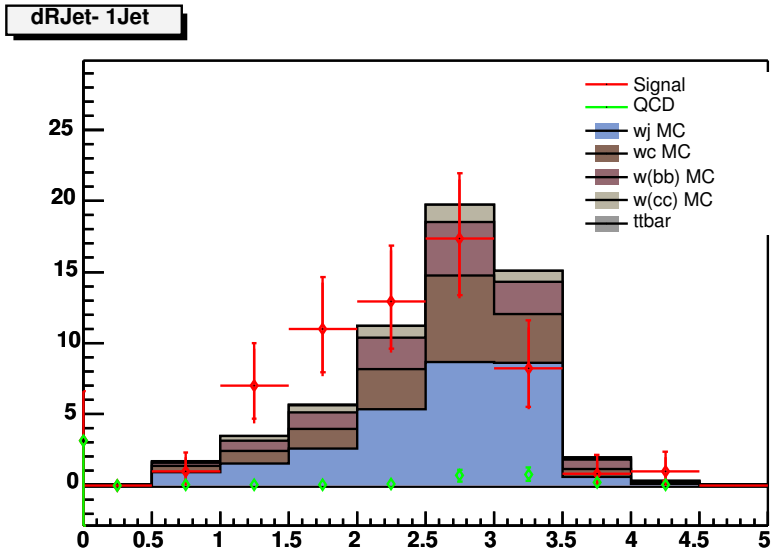
With b-tagging

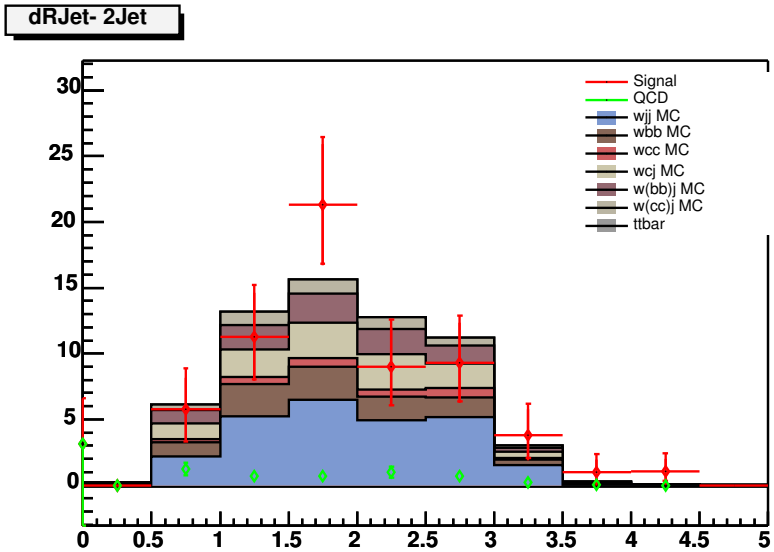


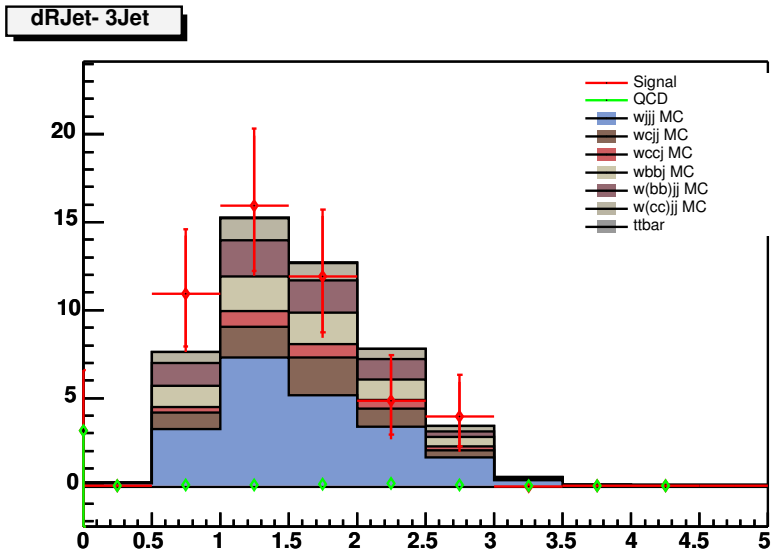




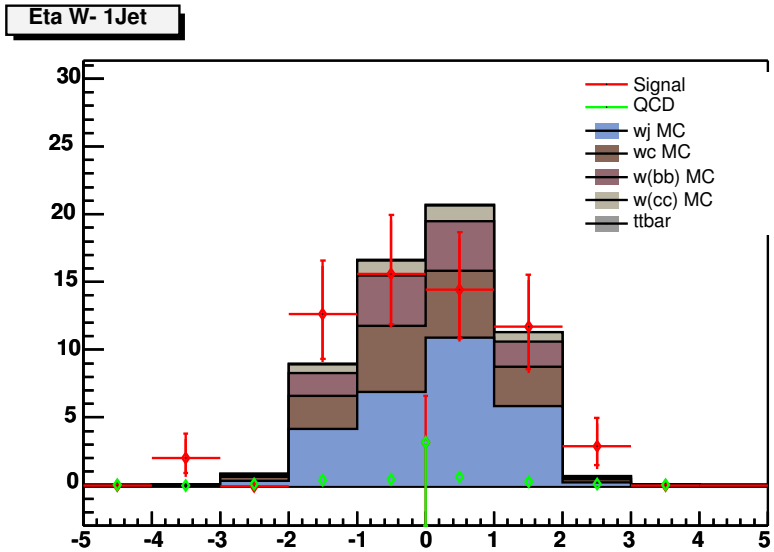
With b-tagging

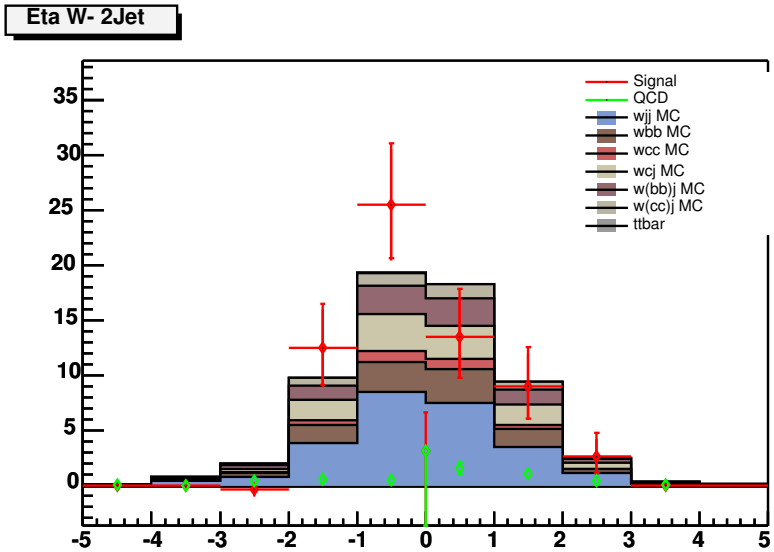


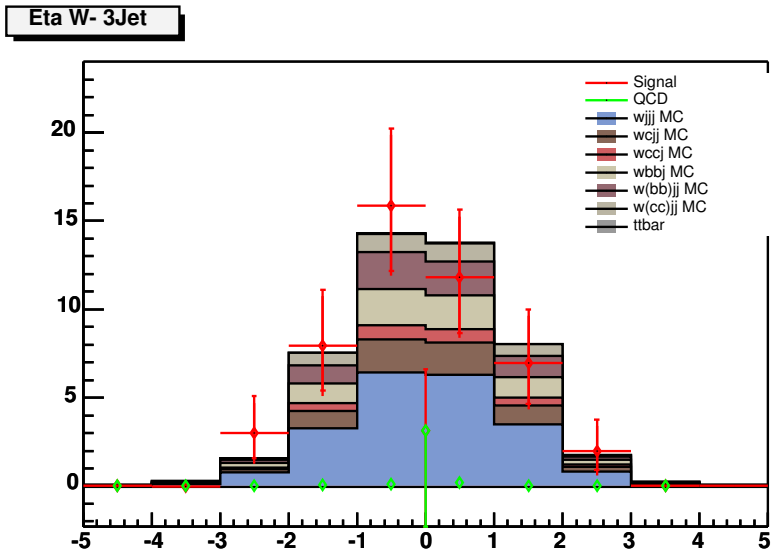




With b-tagging







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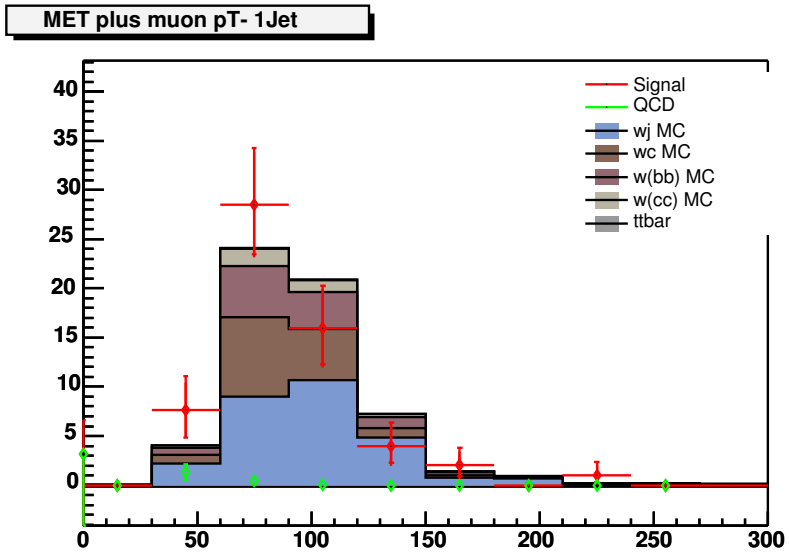

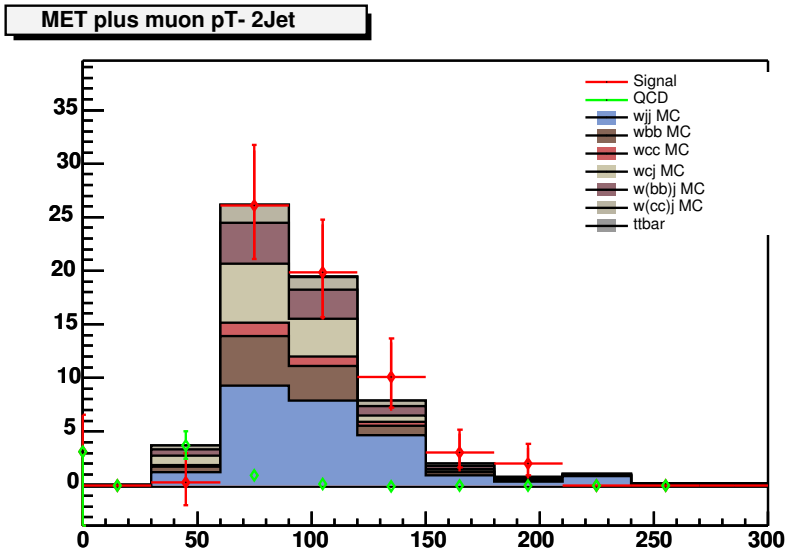

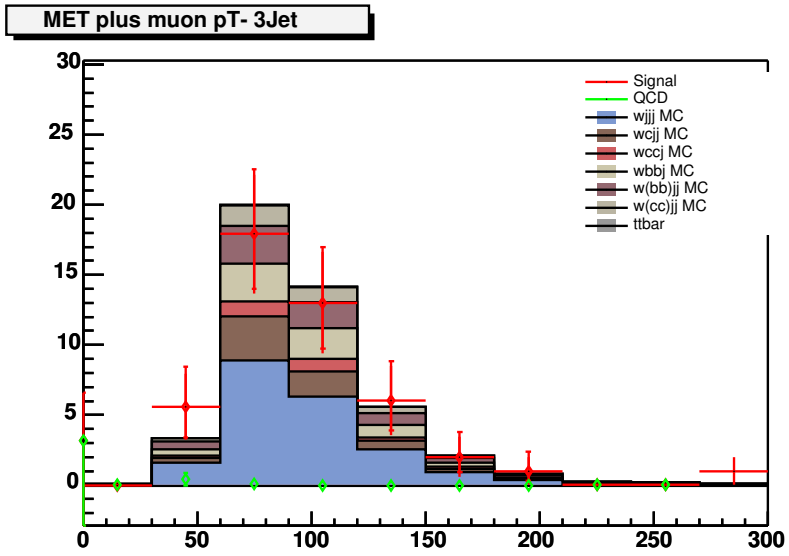

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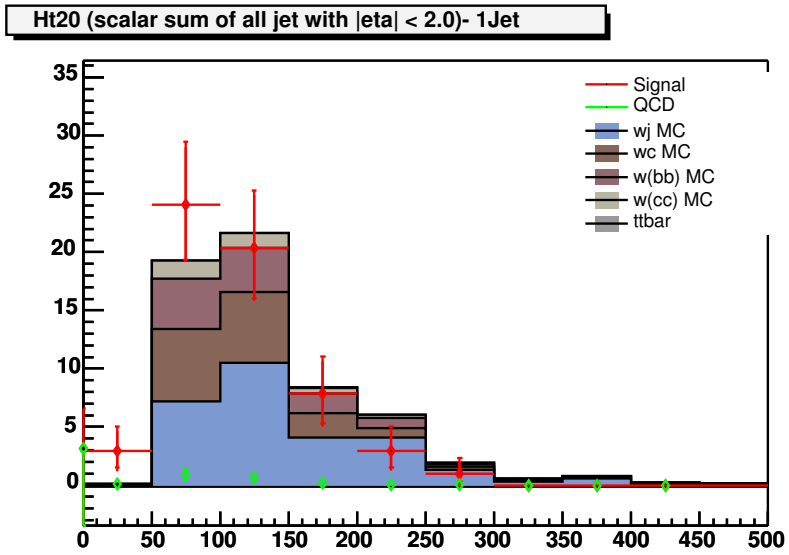

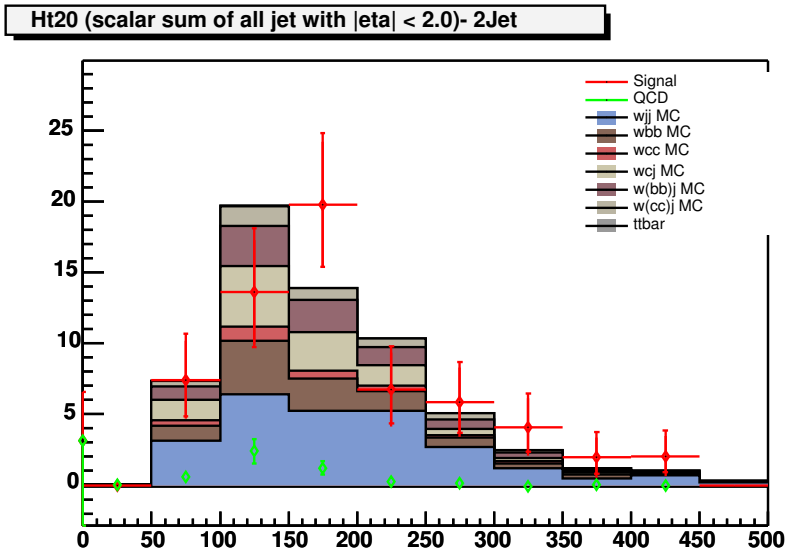

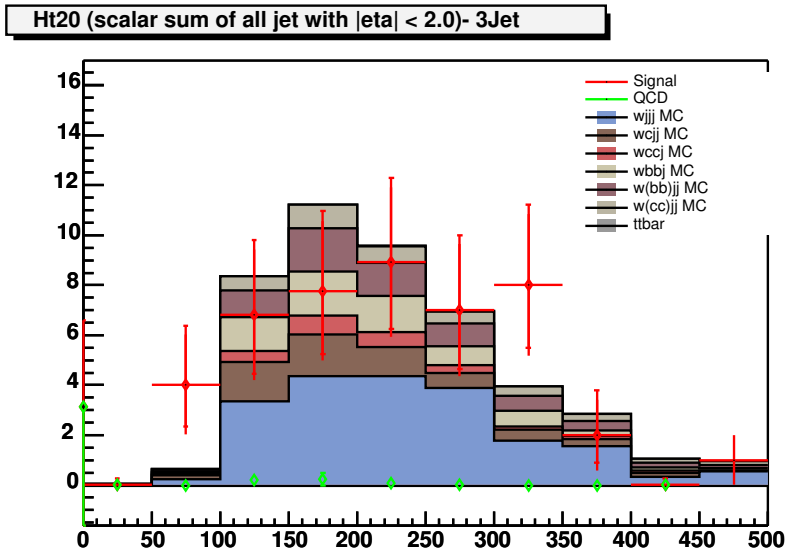

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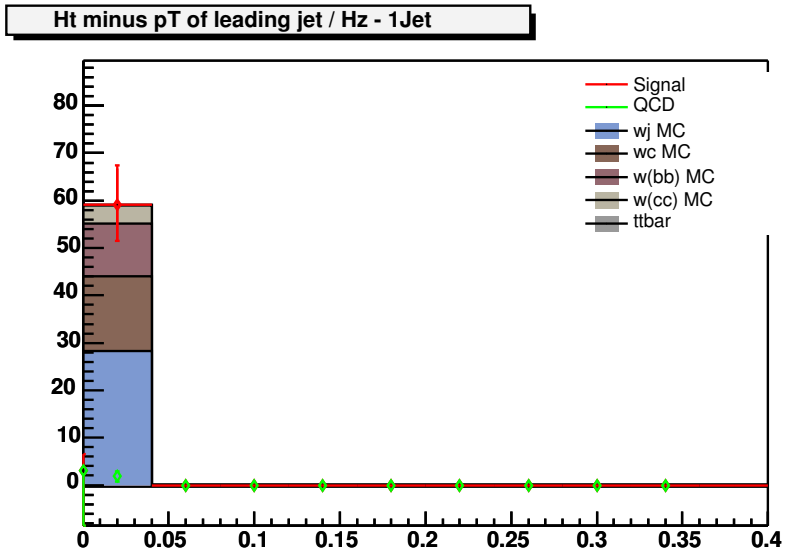

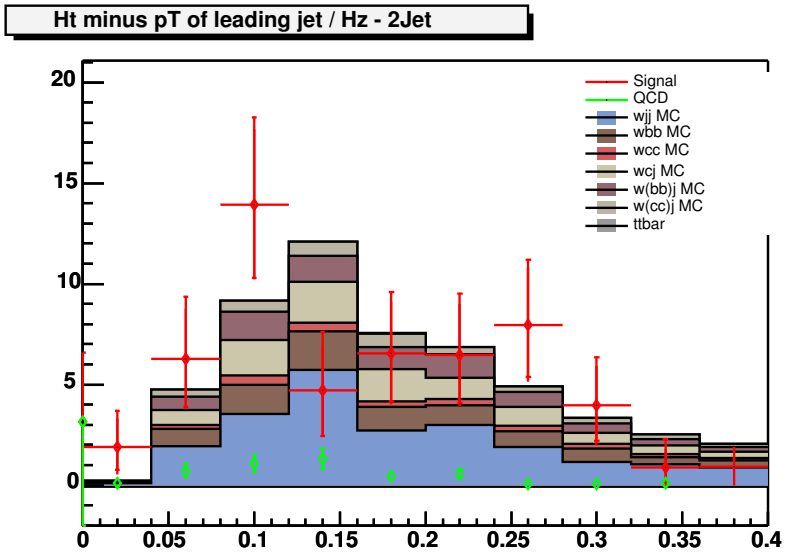

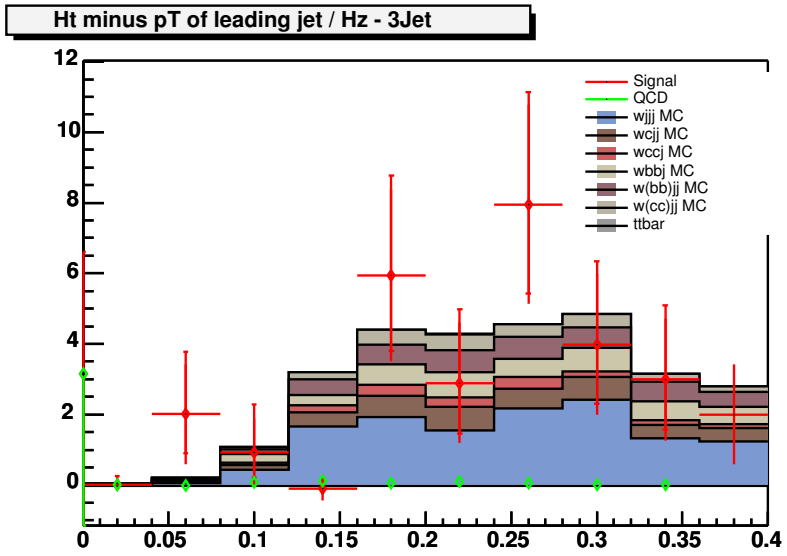

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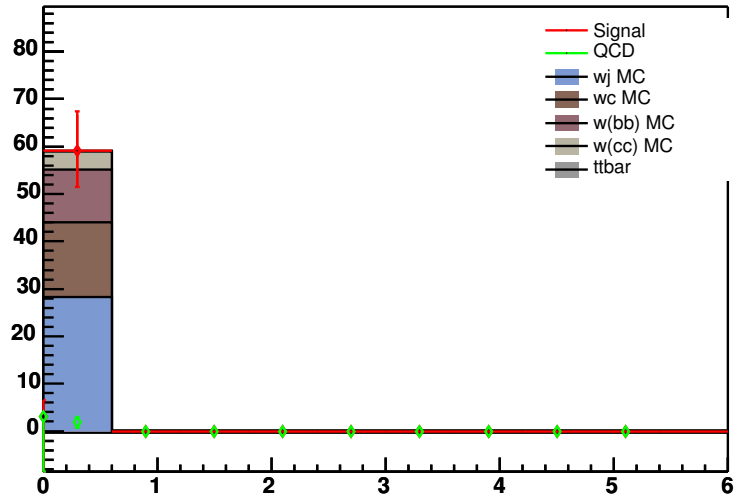
KtMinP (top mass insensitive variable)- 1Jet



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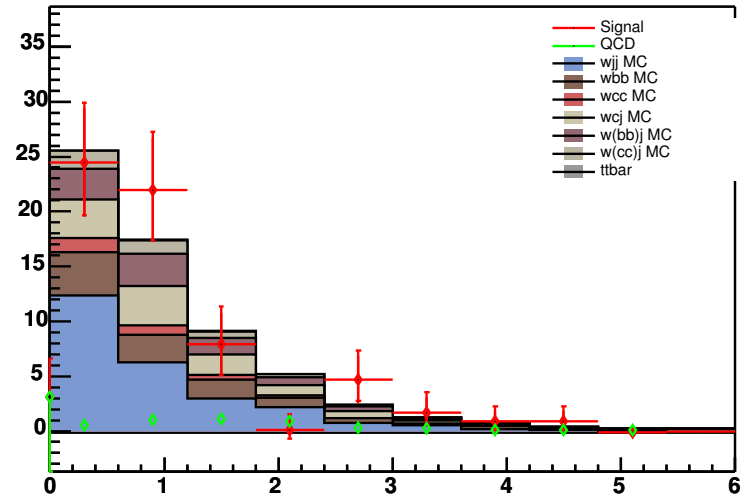

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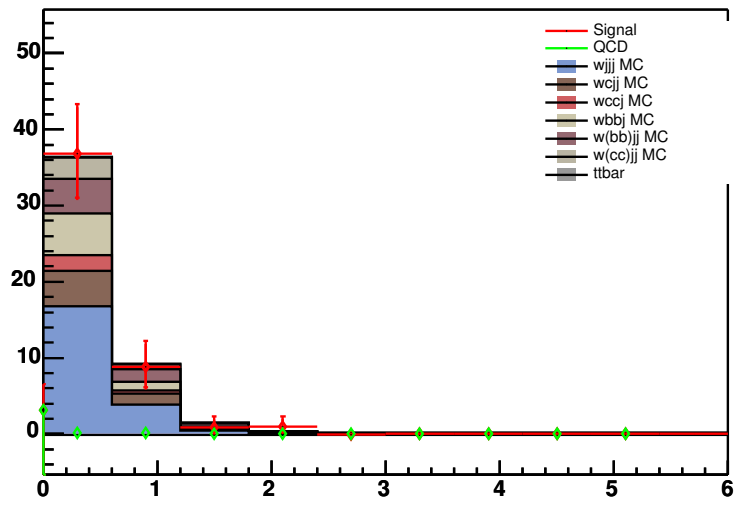

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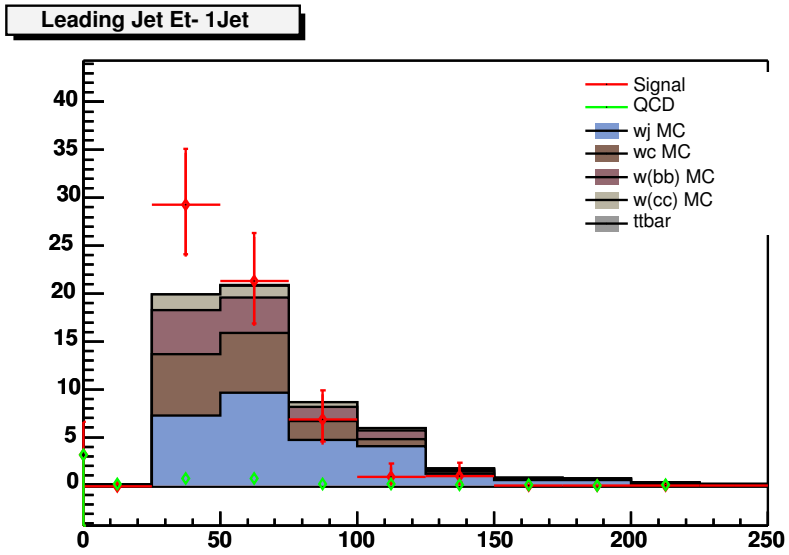

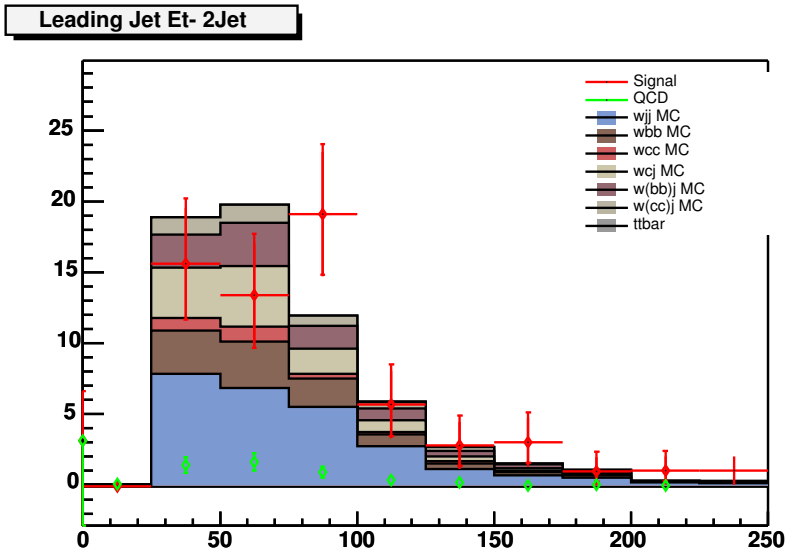

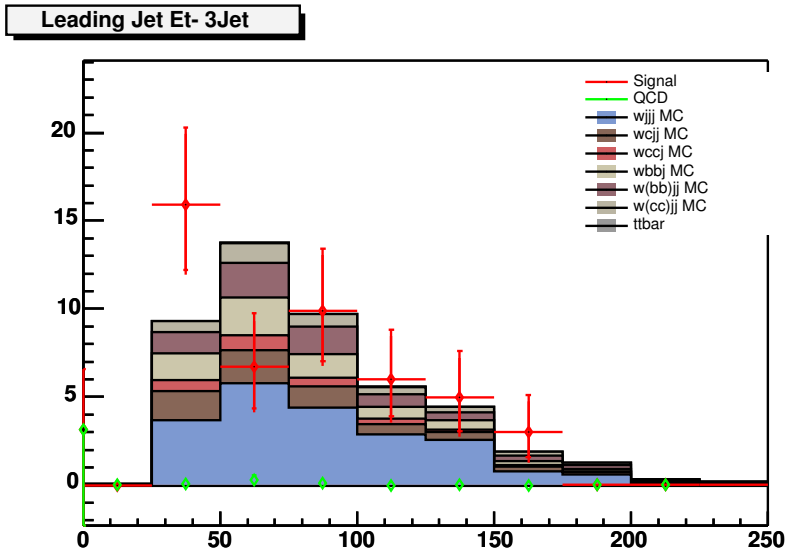

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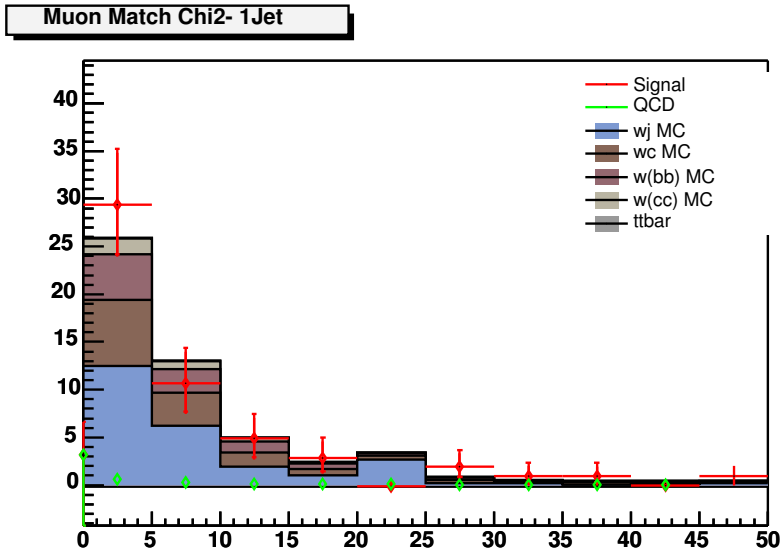

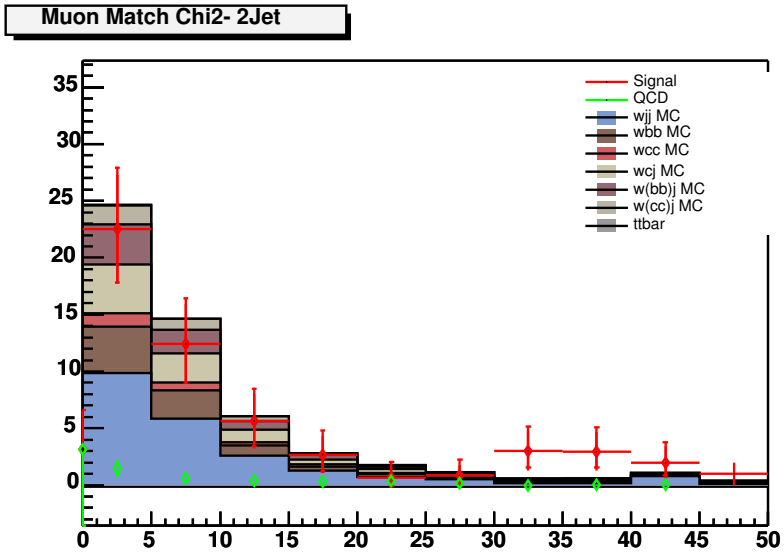

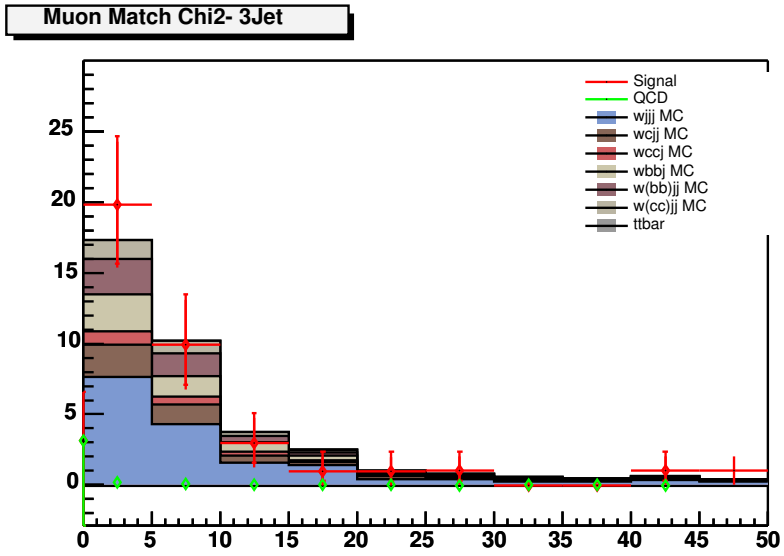

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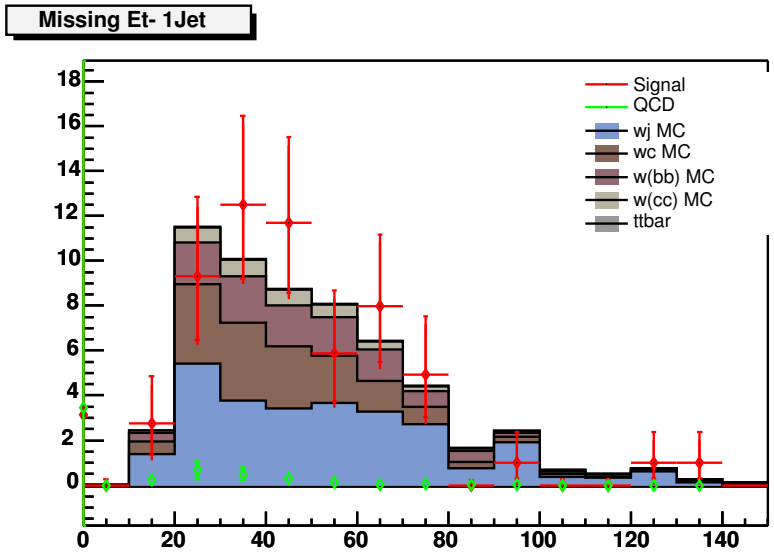

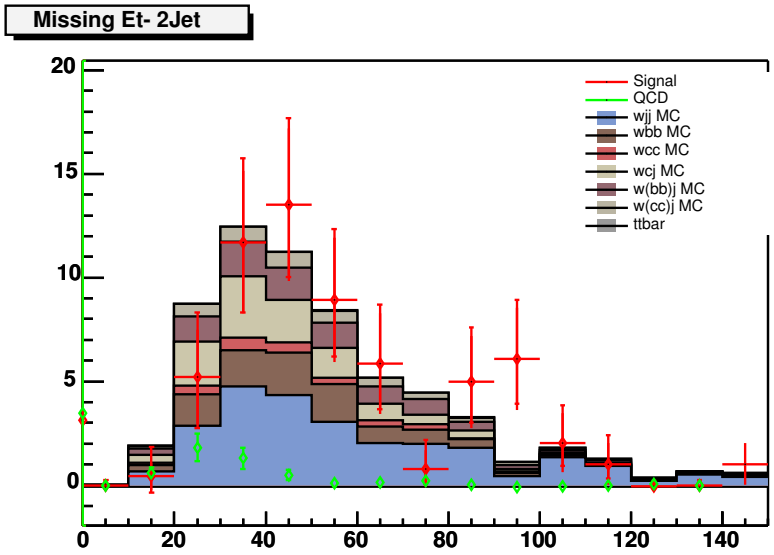

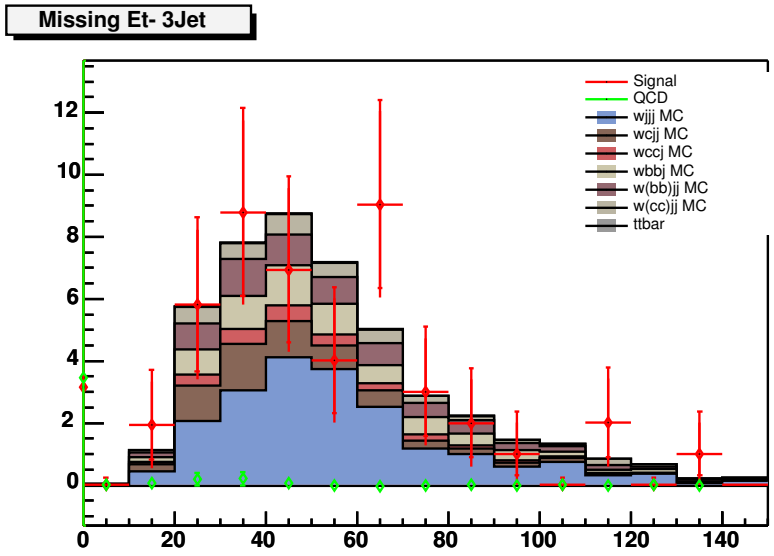

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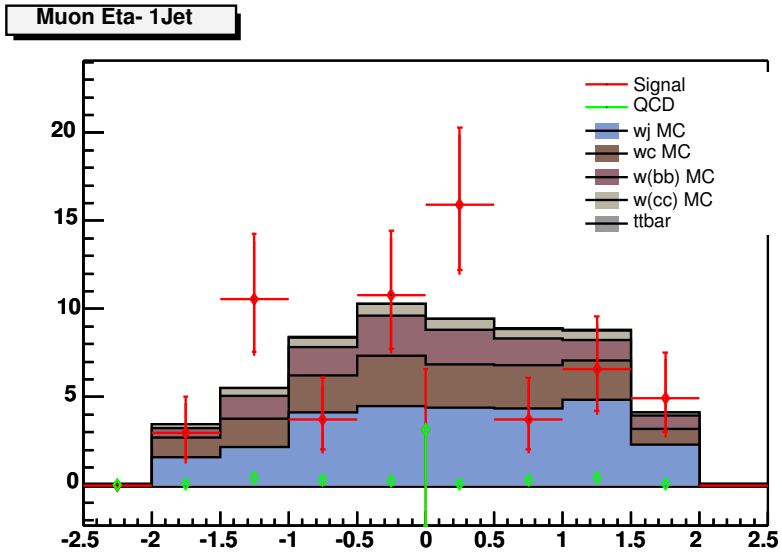

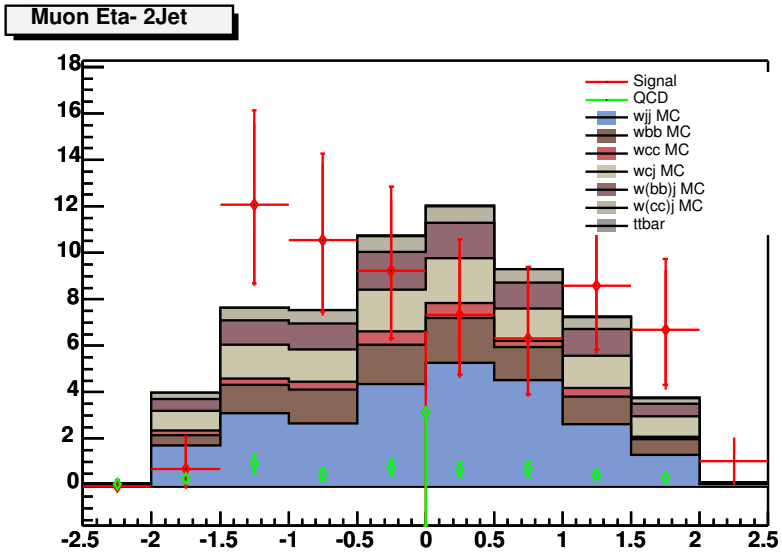

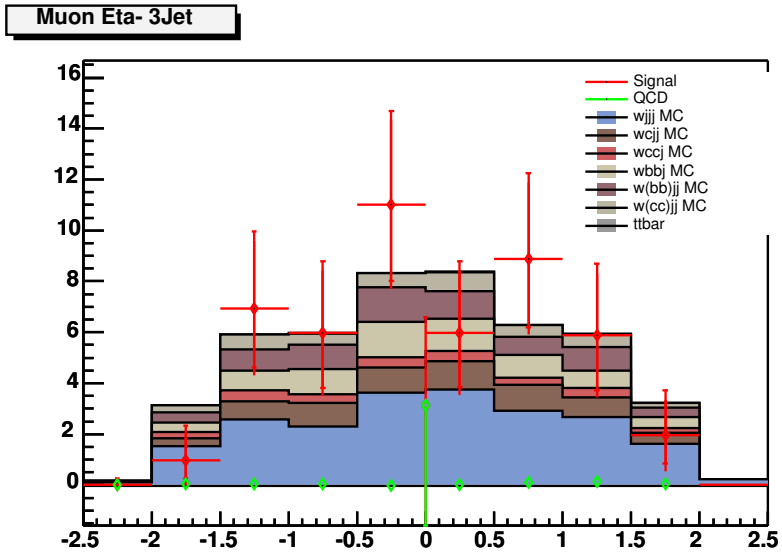

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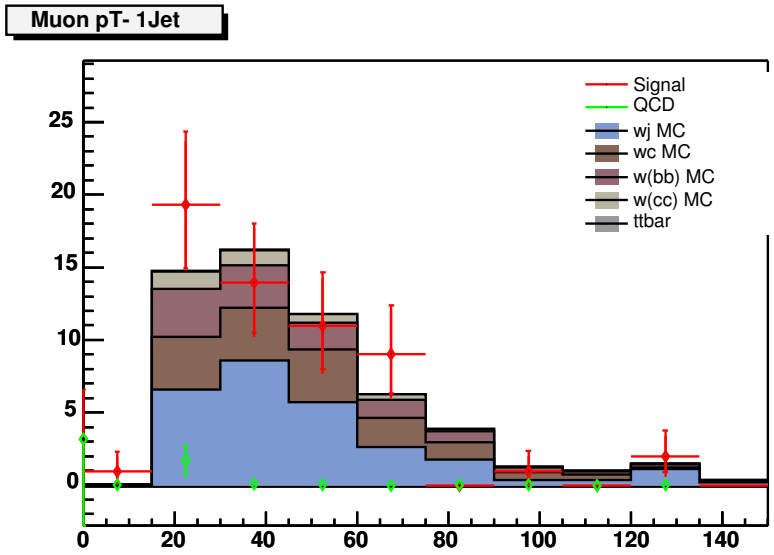

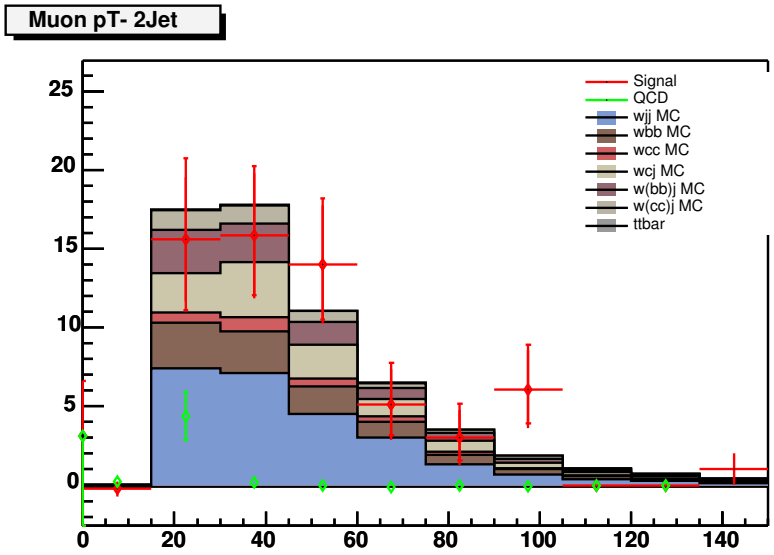

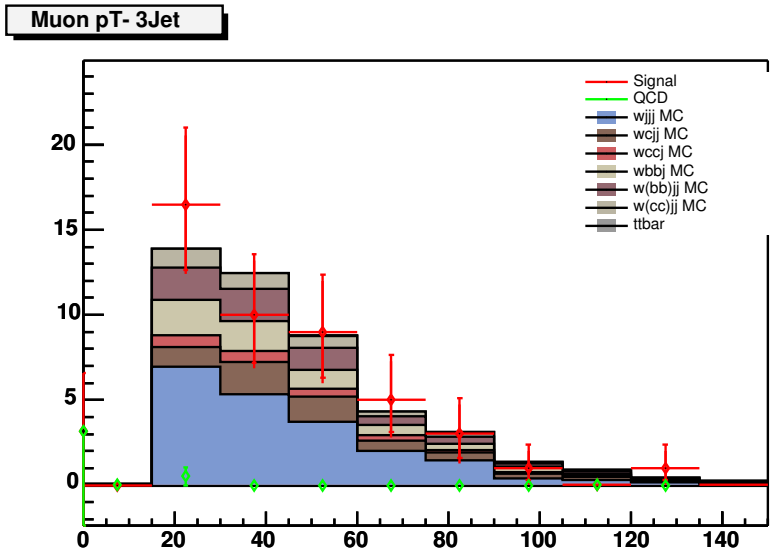

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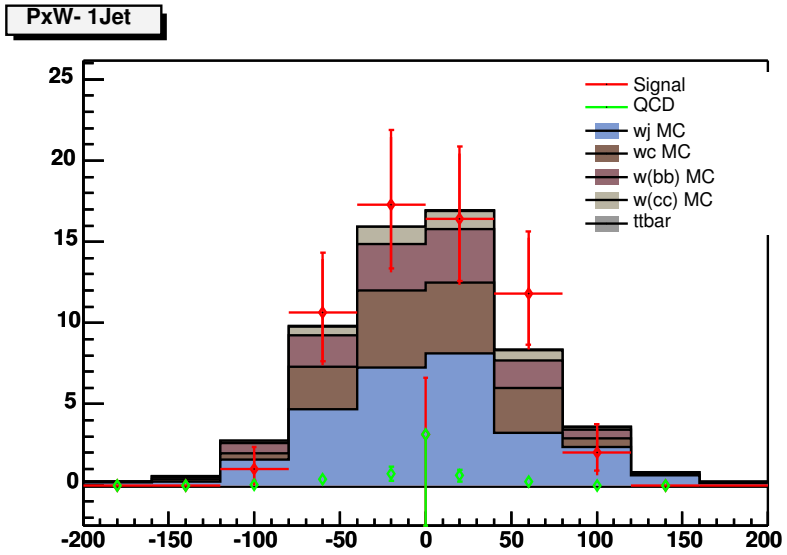

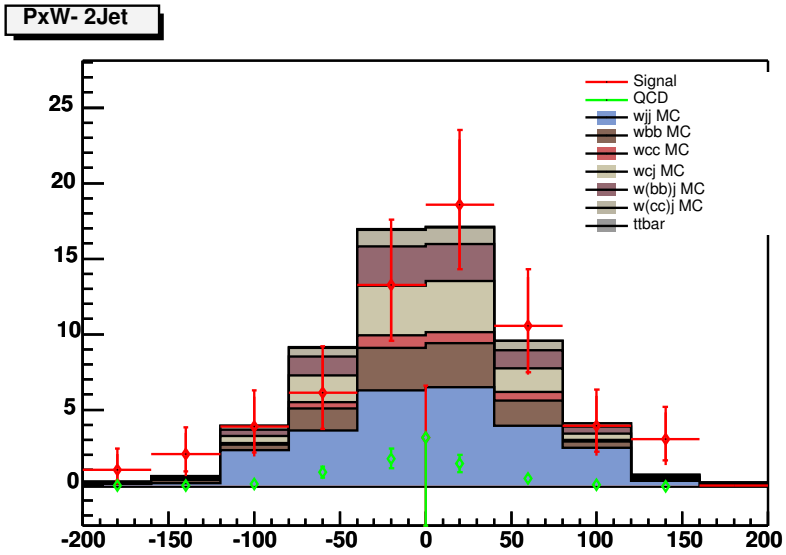

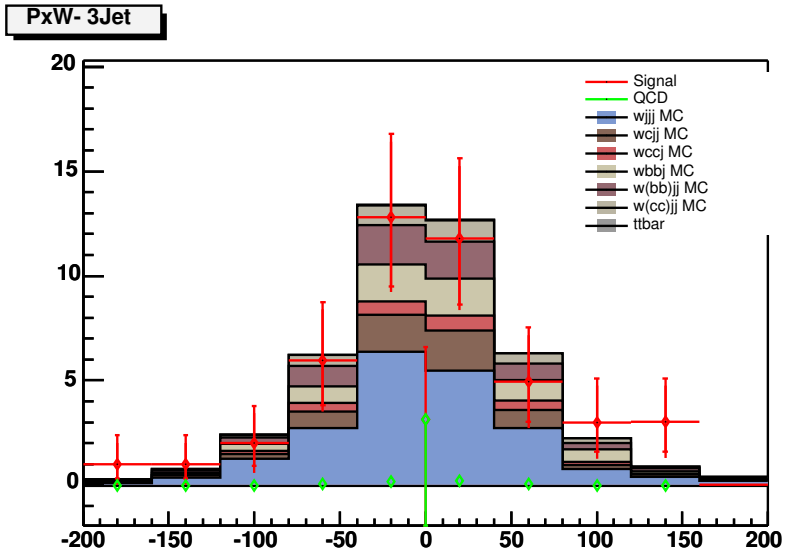

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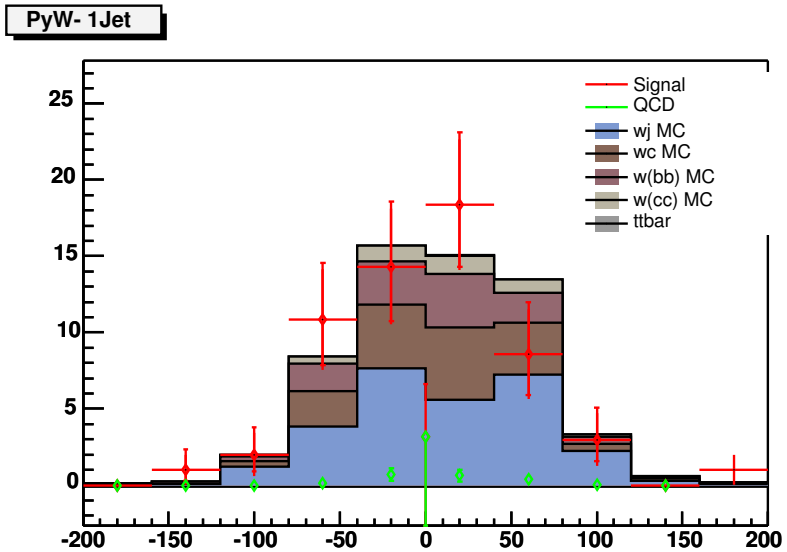

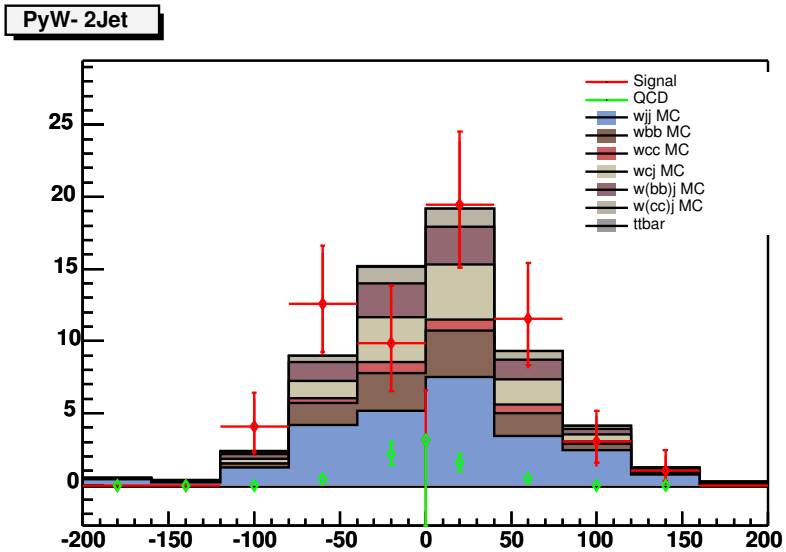

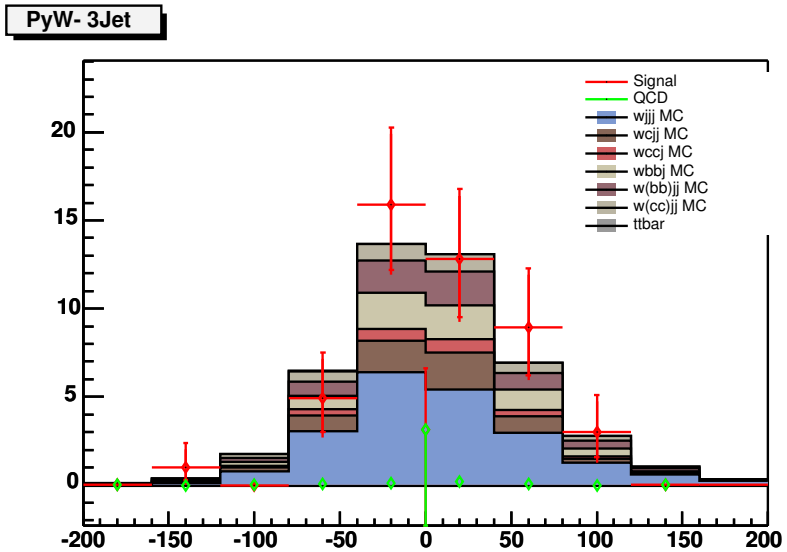

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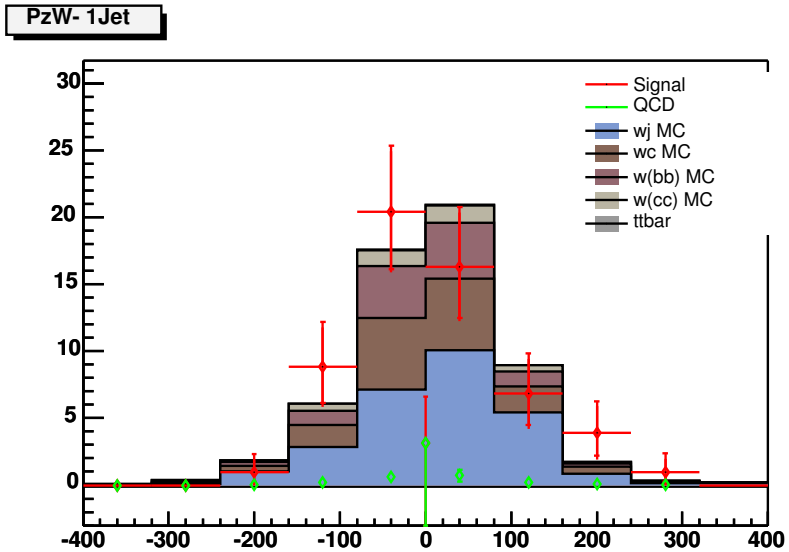

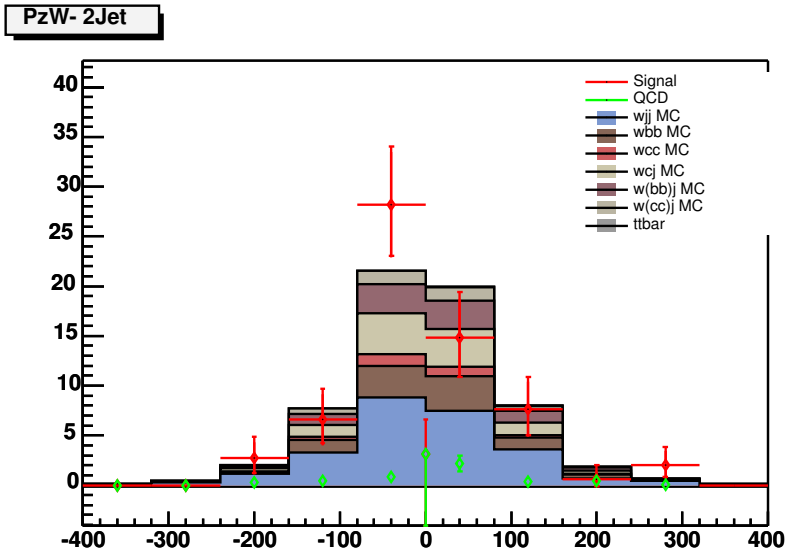

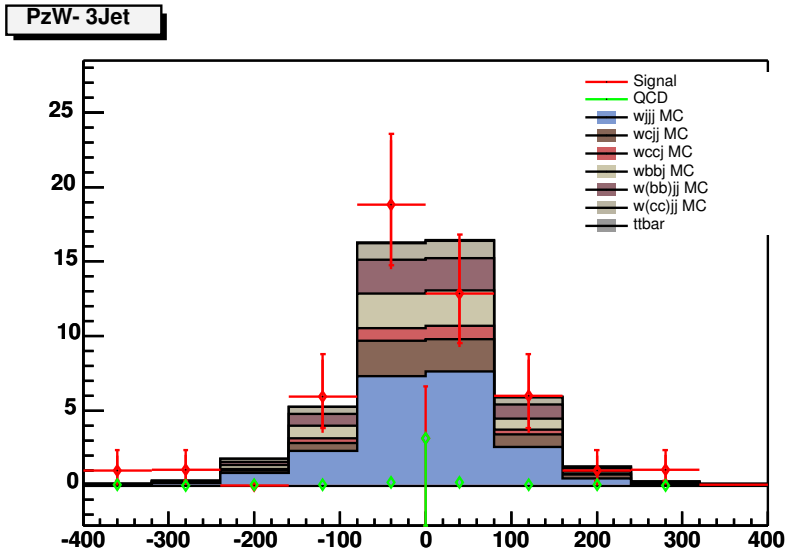

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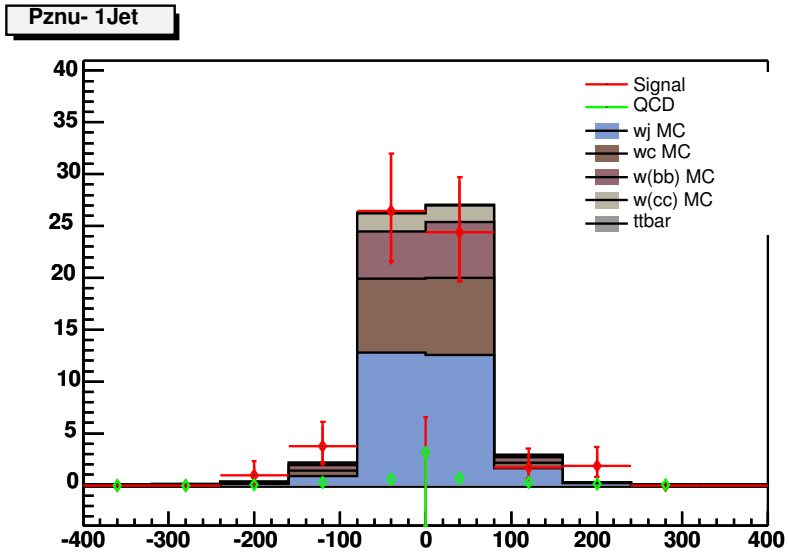

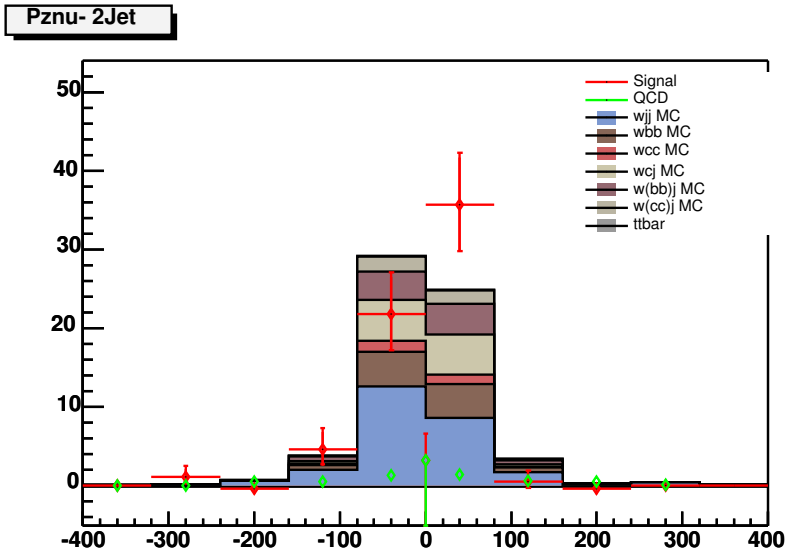

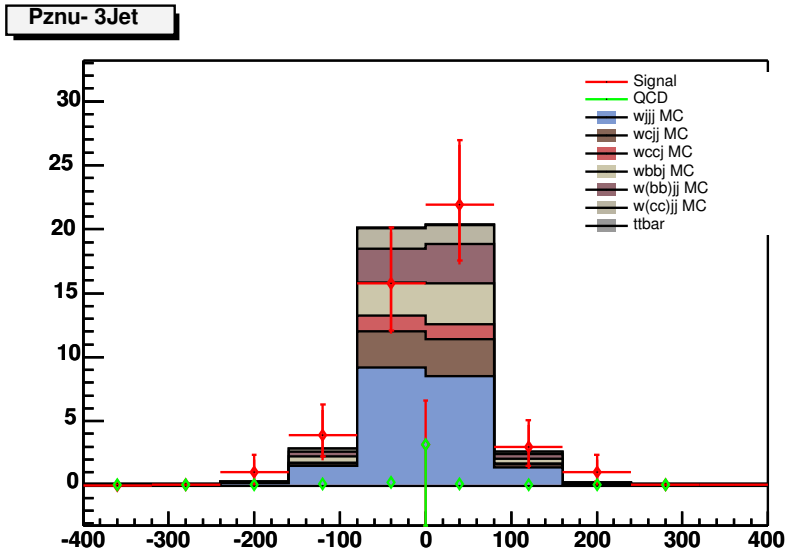

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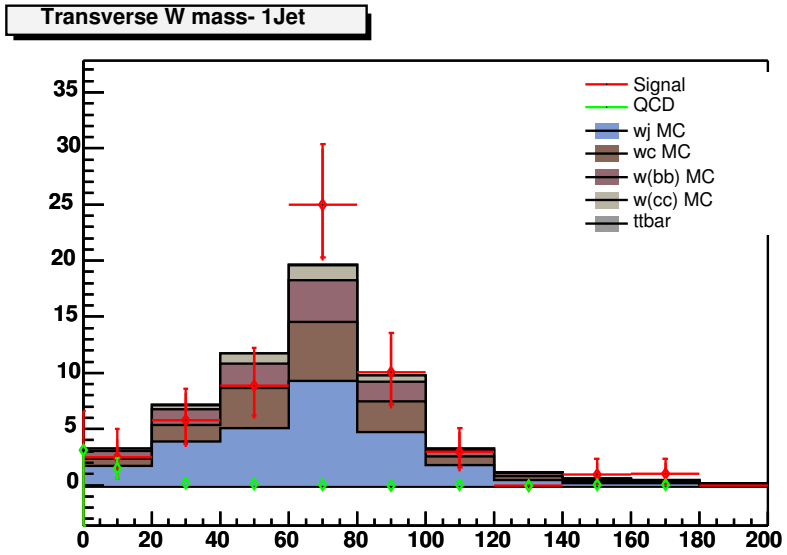

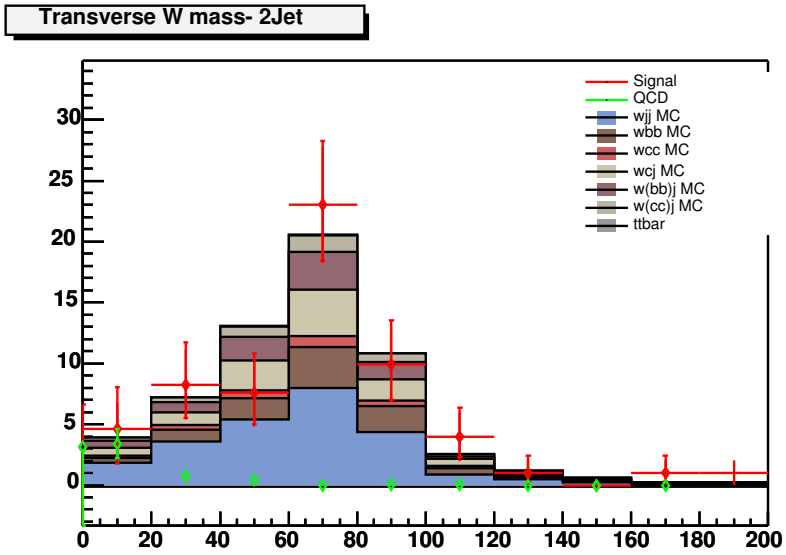

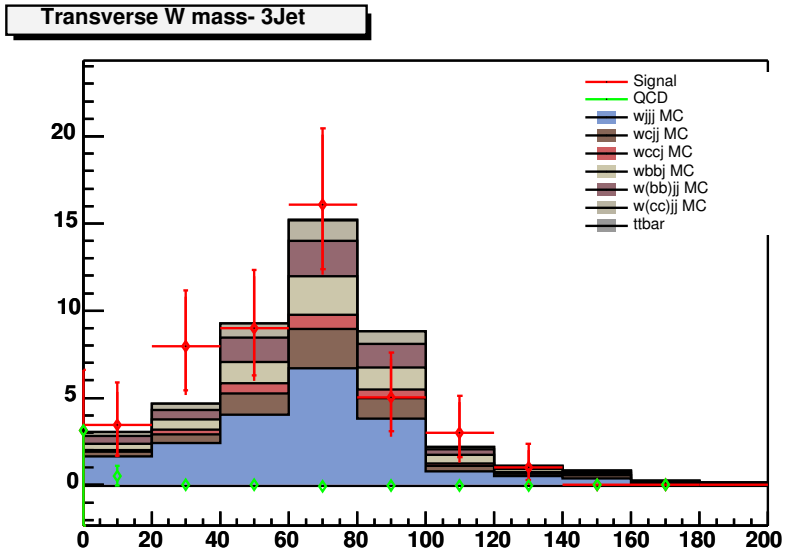

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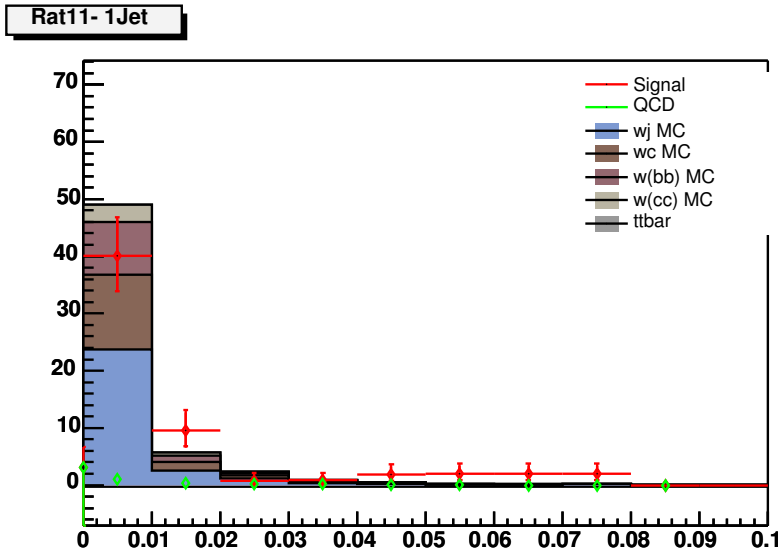

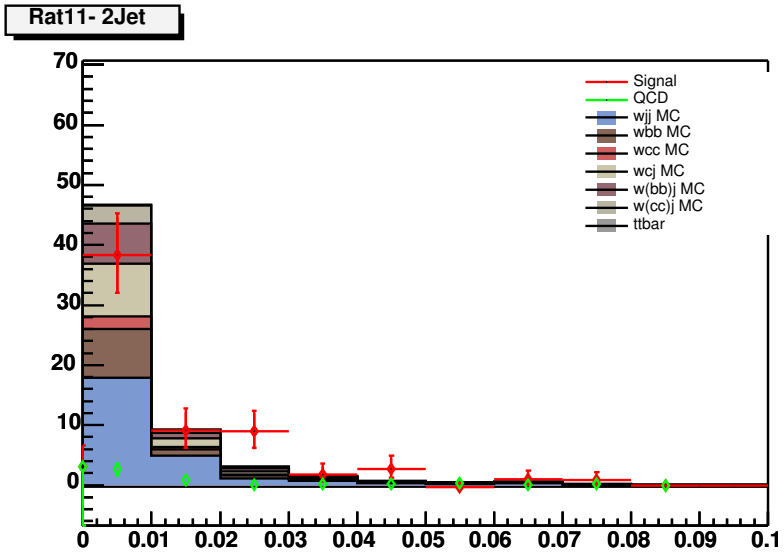

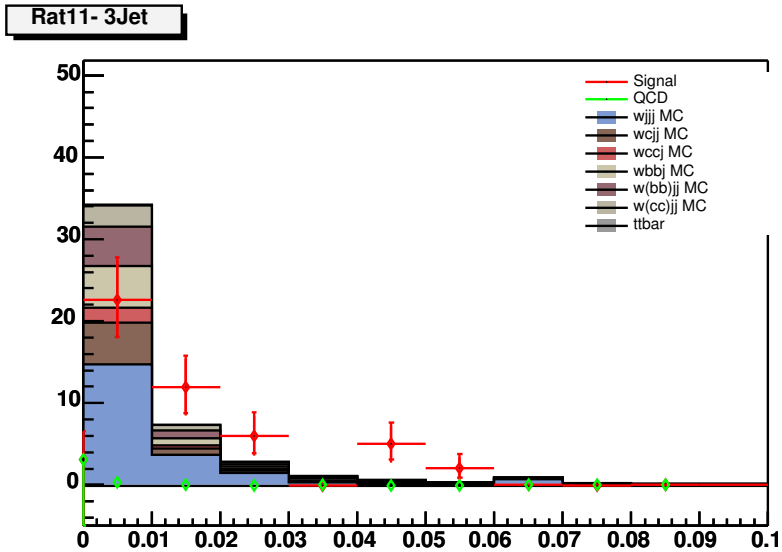

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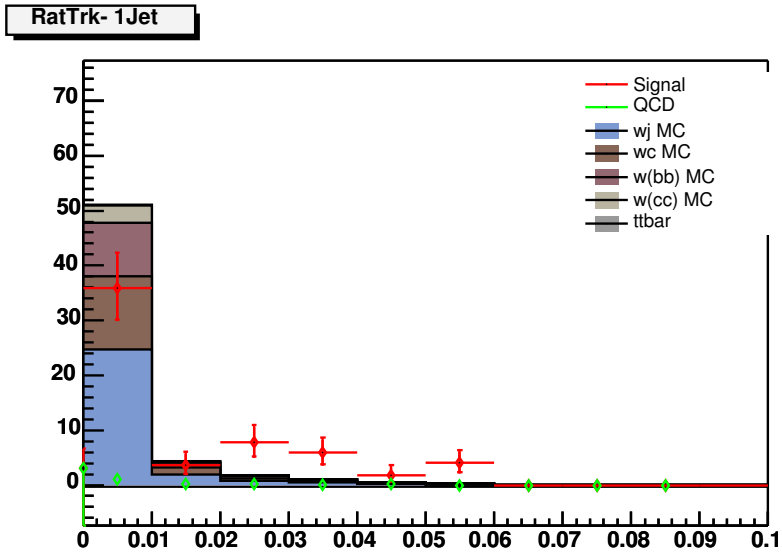

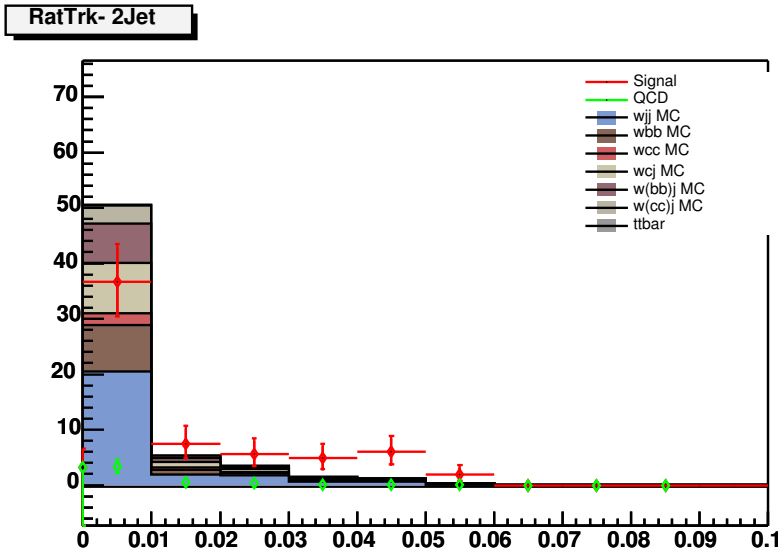

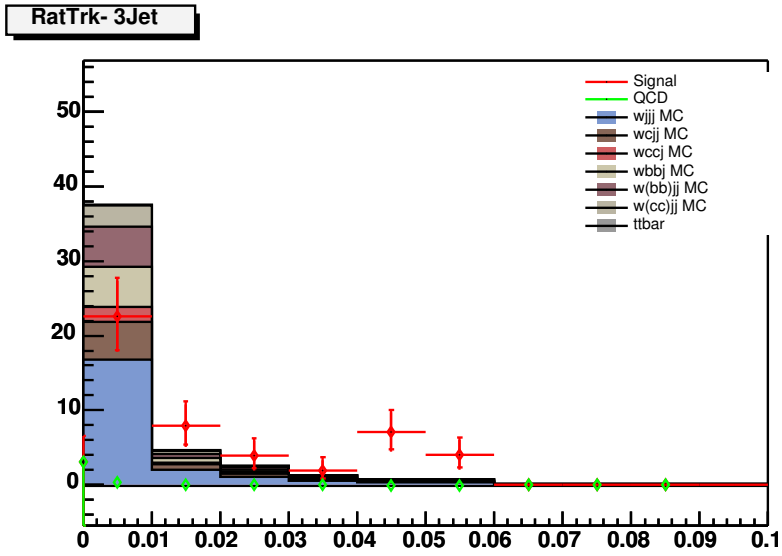

Conclusions

- Normalizations look good

To Do

- Investigate ϵ_{QCD} dependence on tagging
- Check consistency with cross-section results
- Combine with electron channel