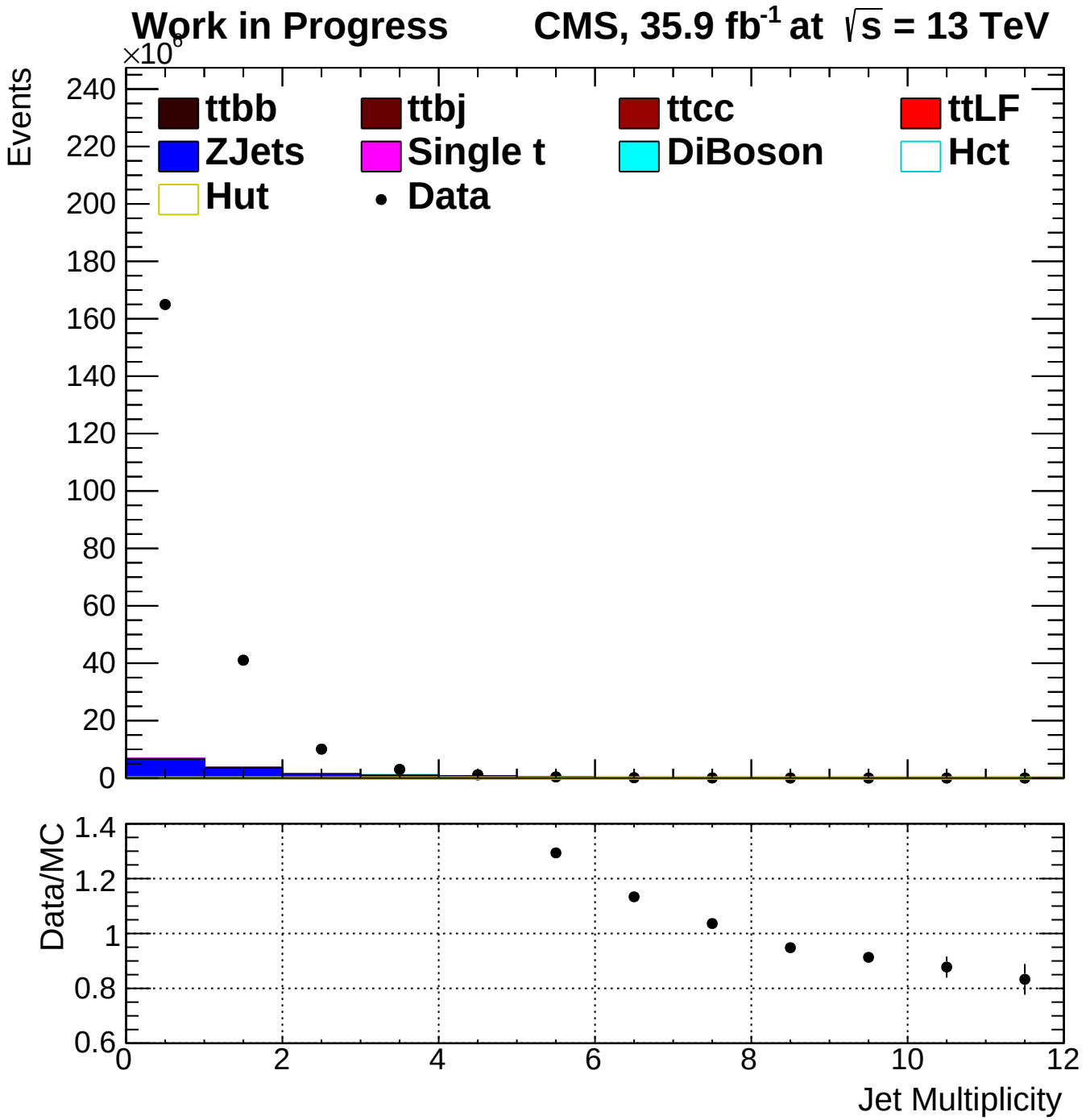
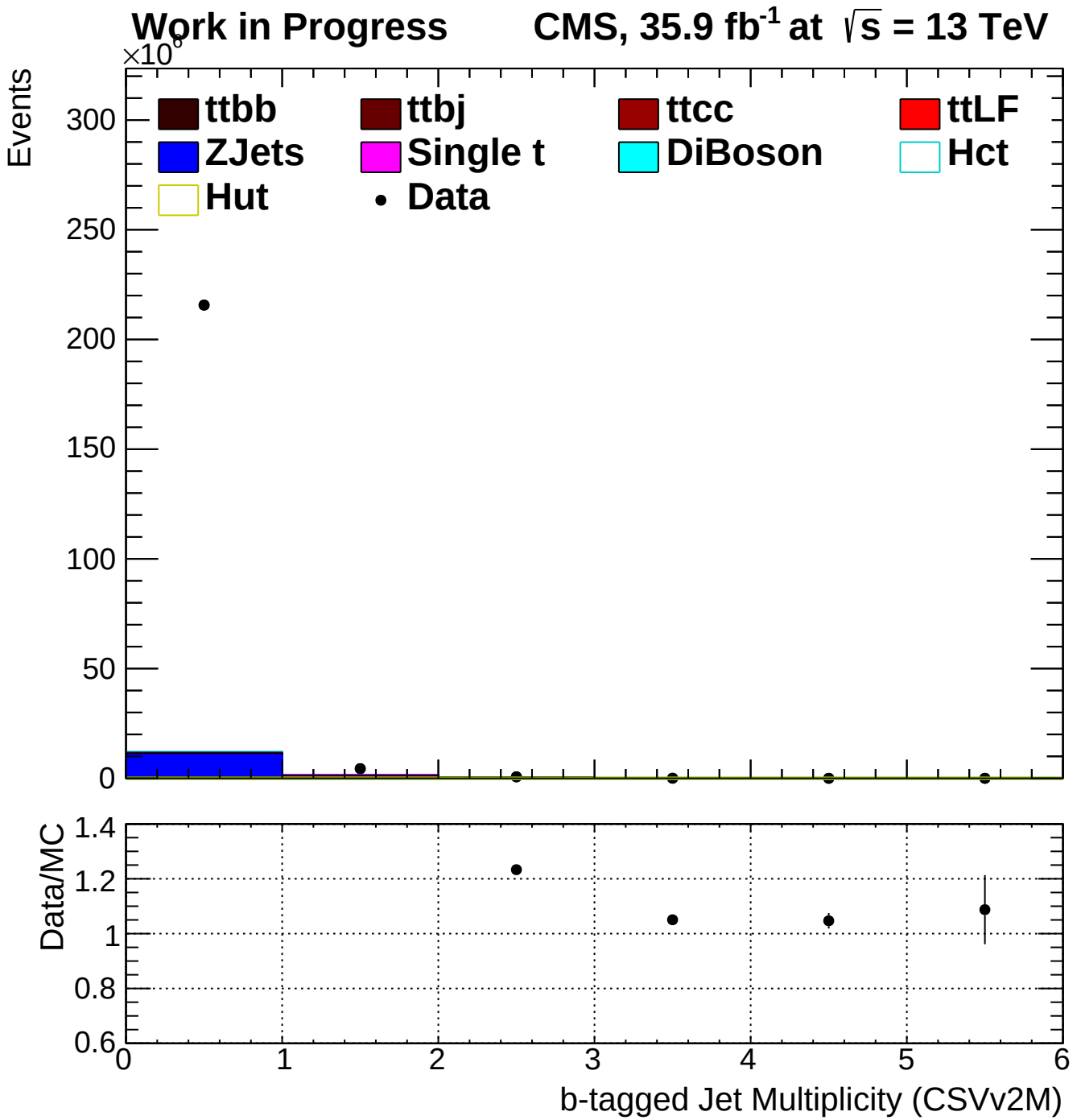
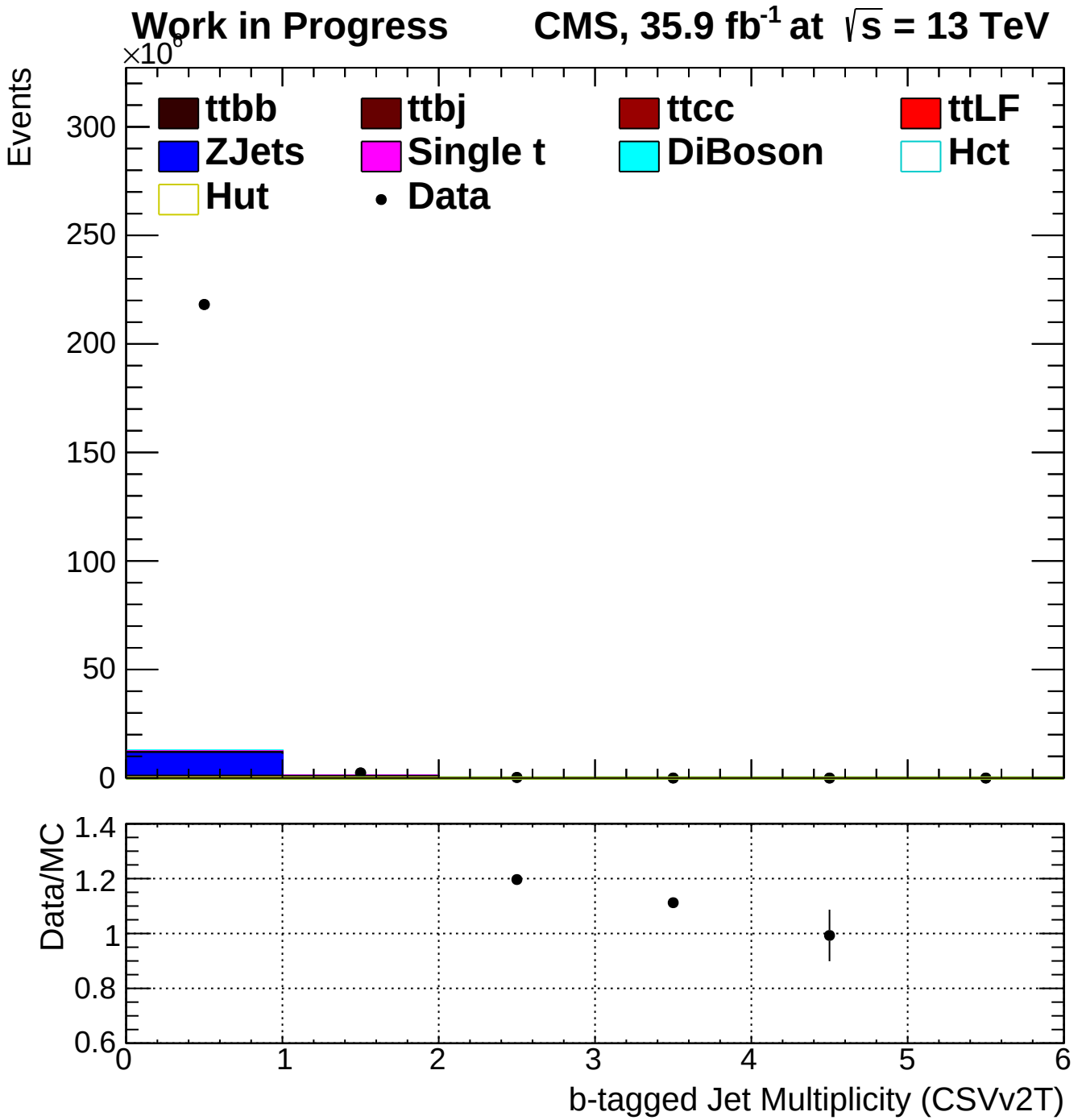
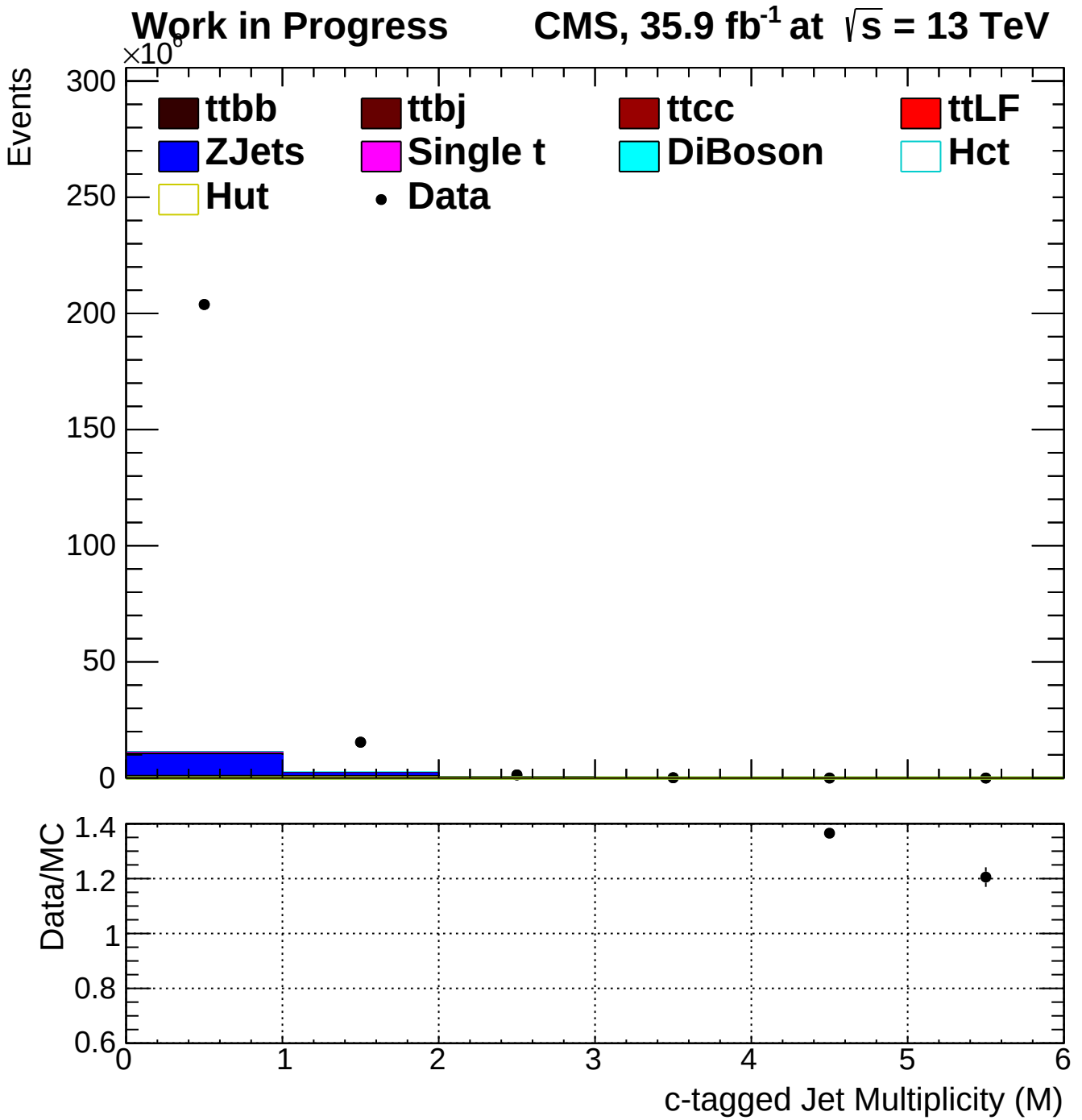
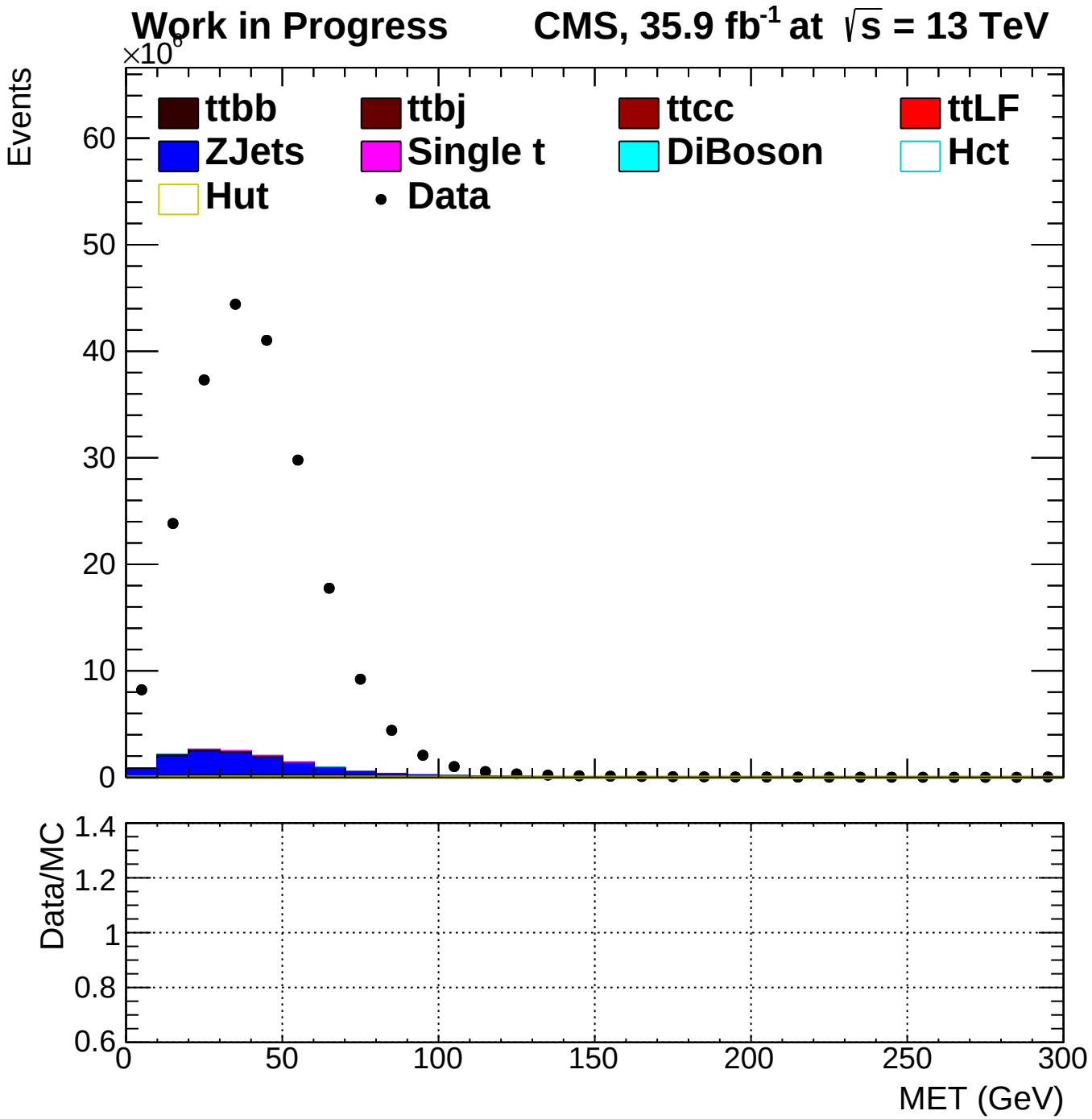
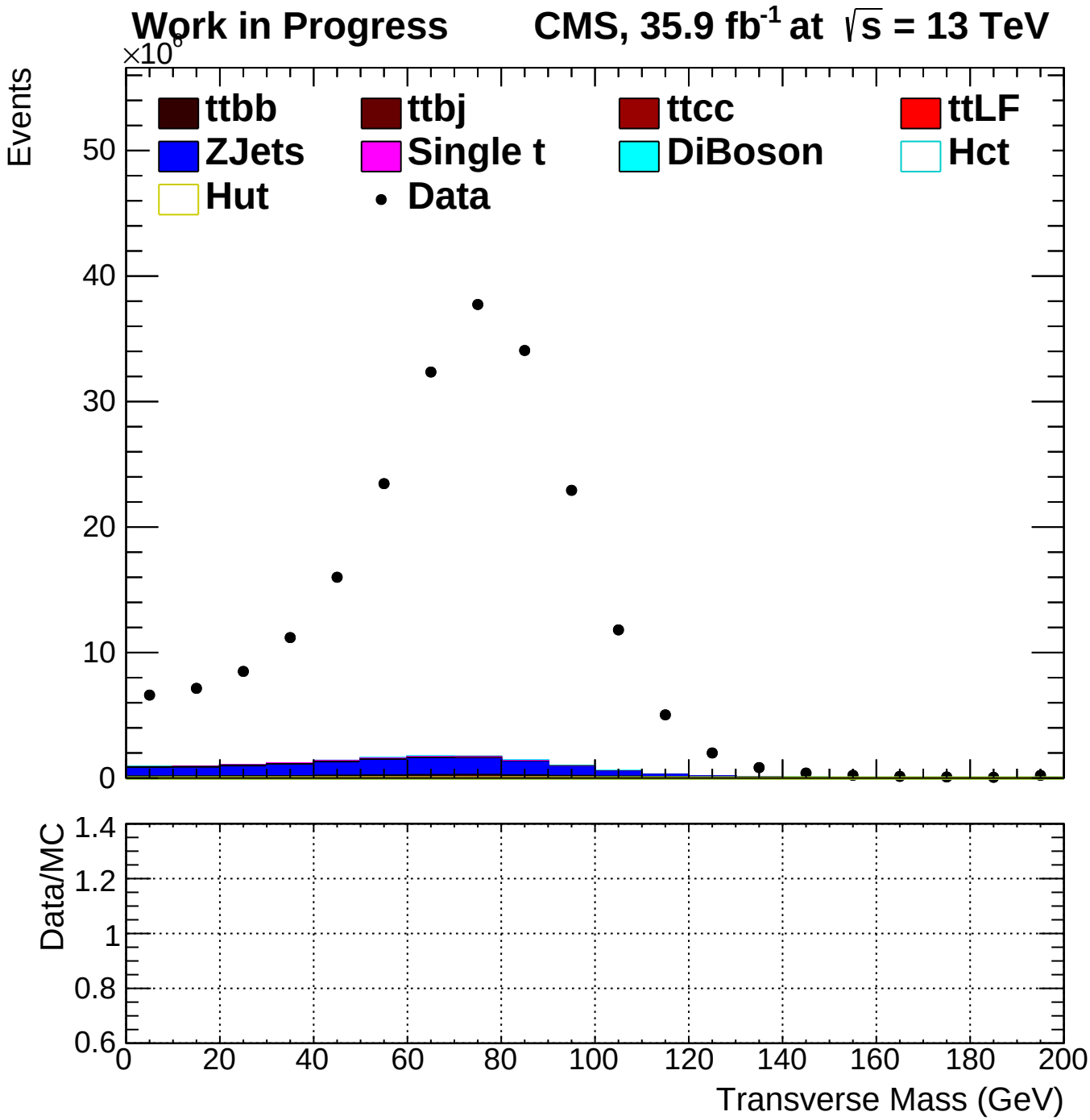

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

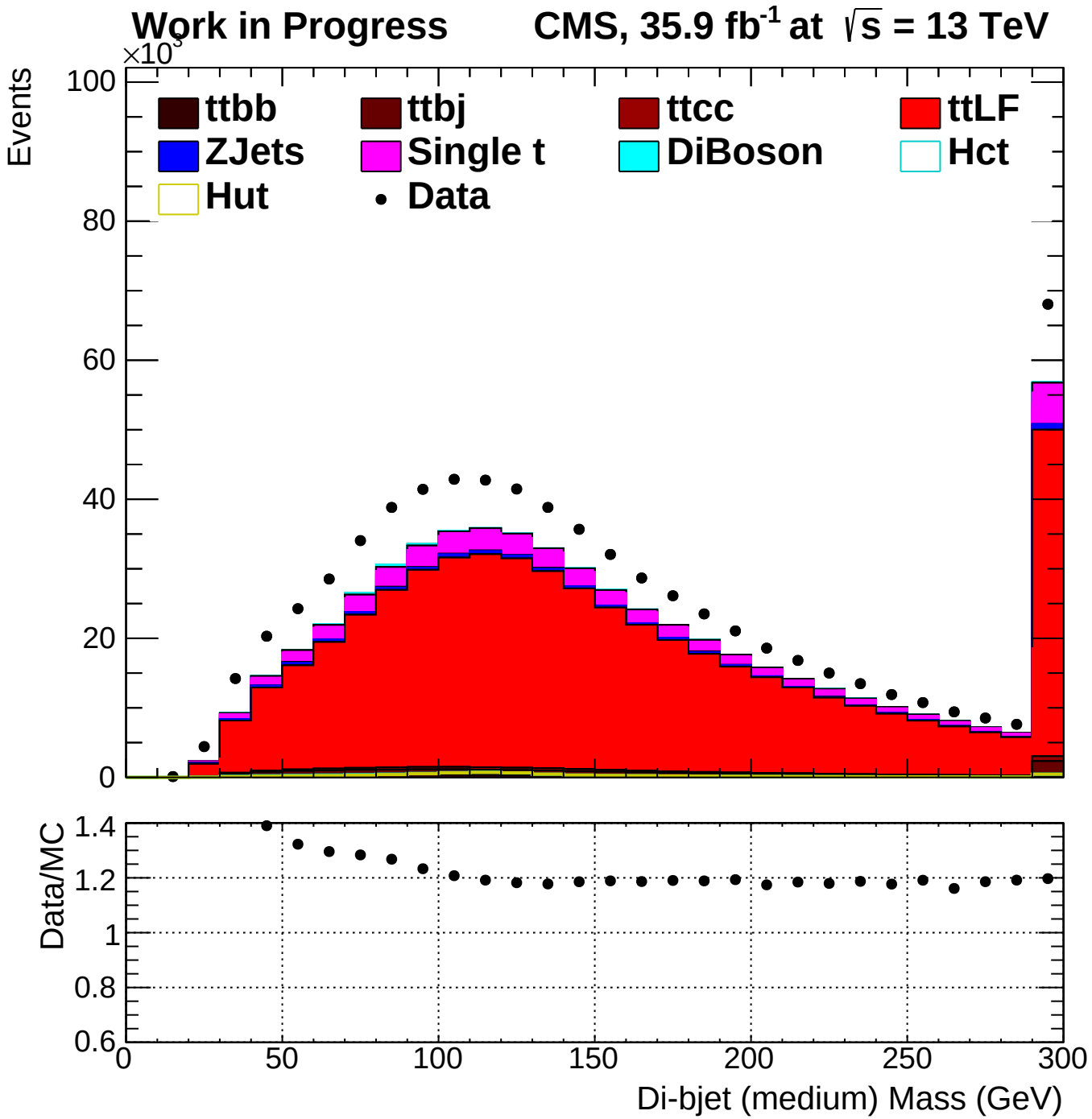

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

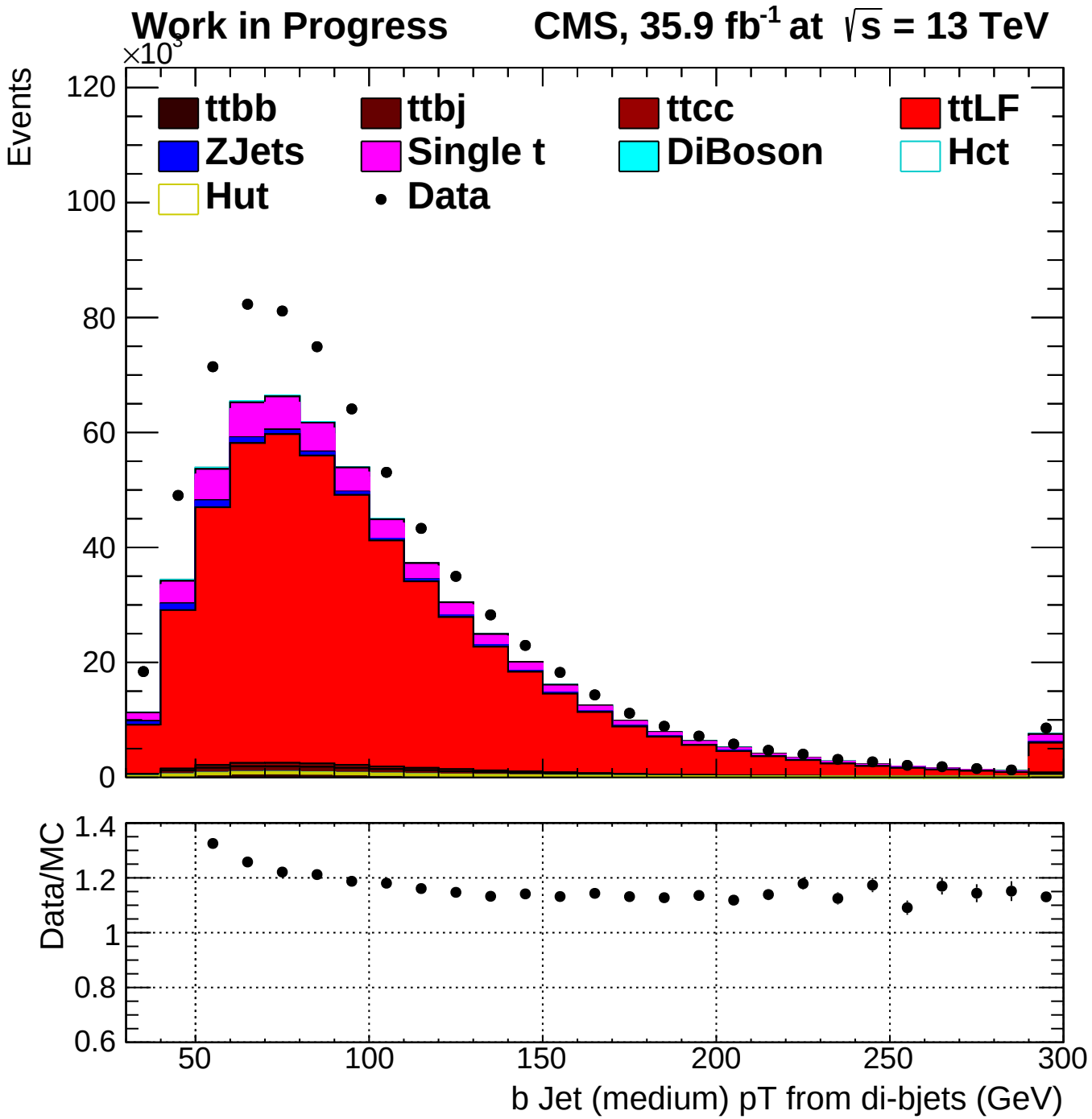

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

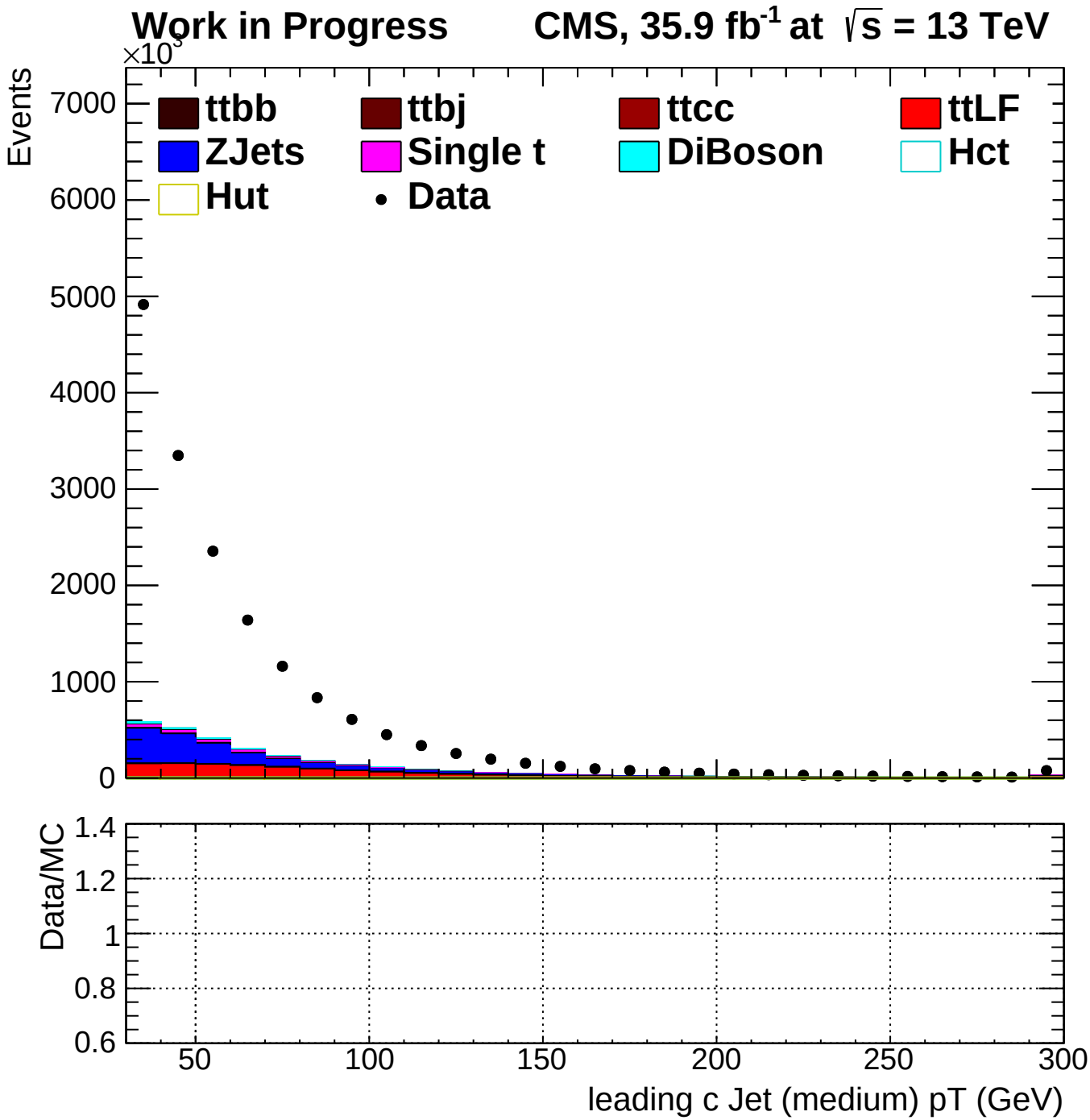

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

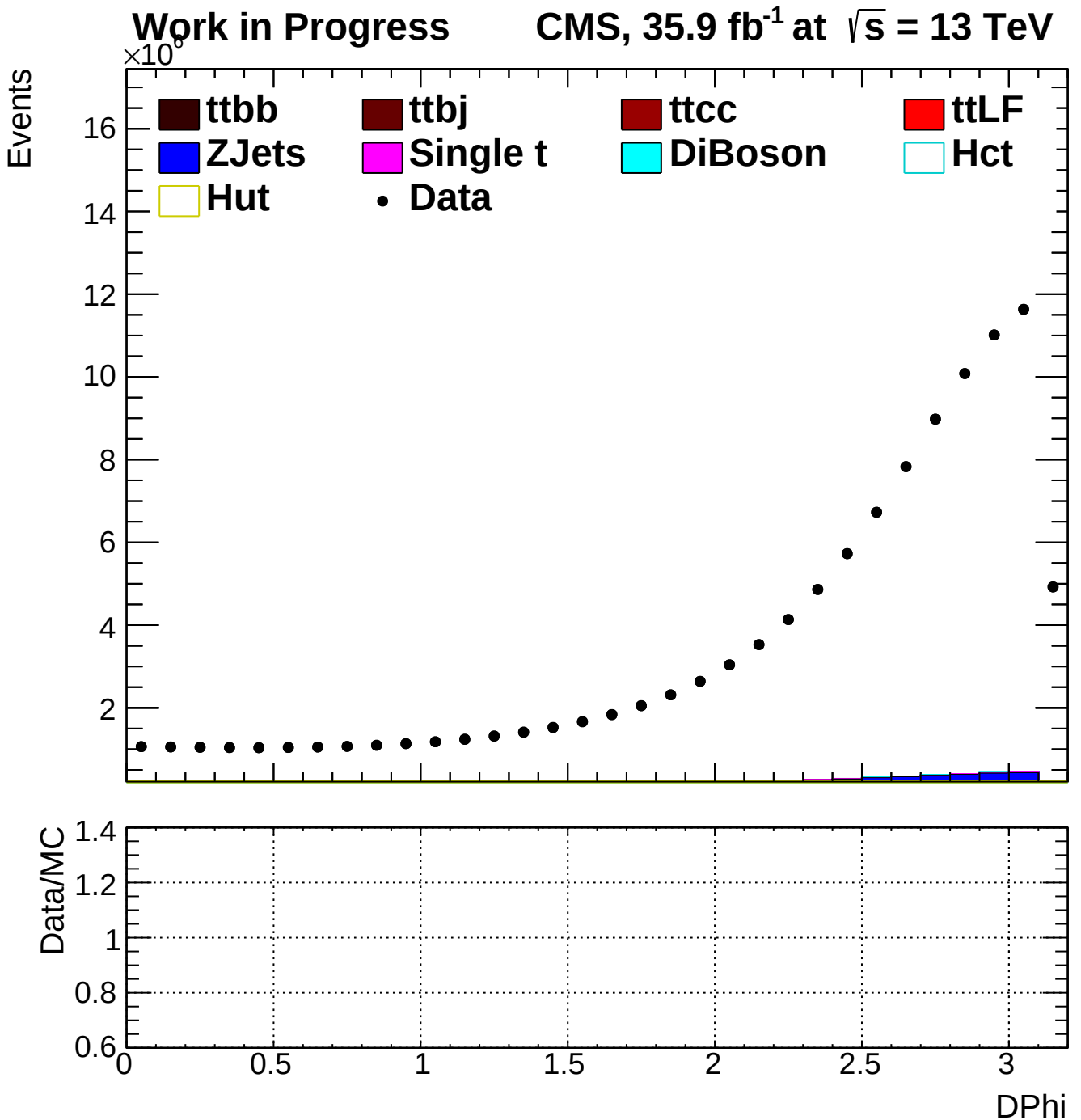

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60
50
40
30
20
10
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)

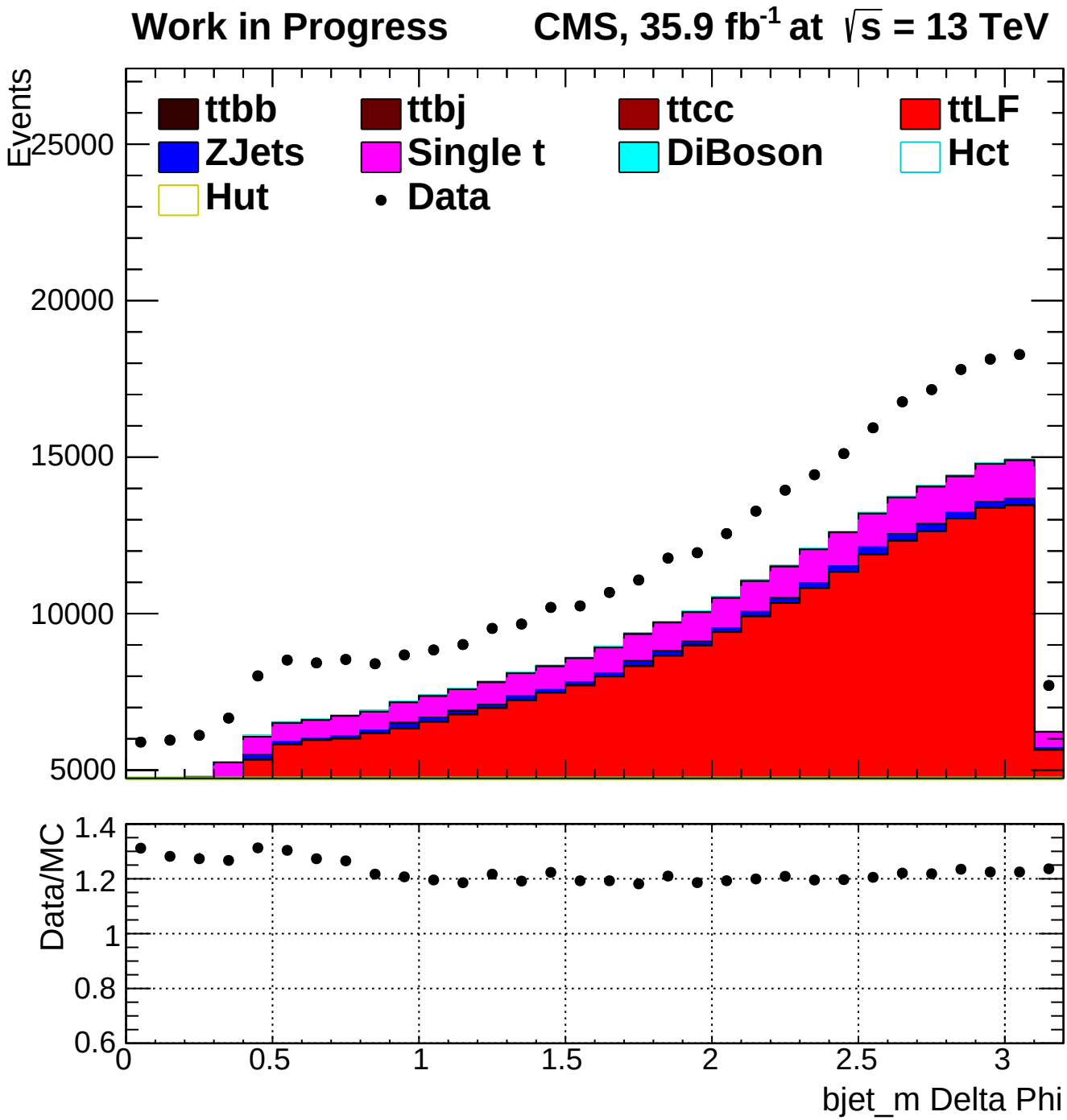

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^6
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

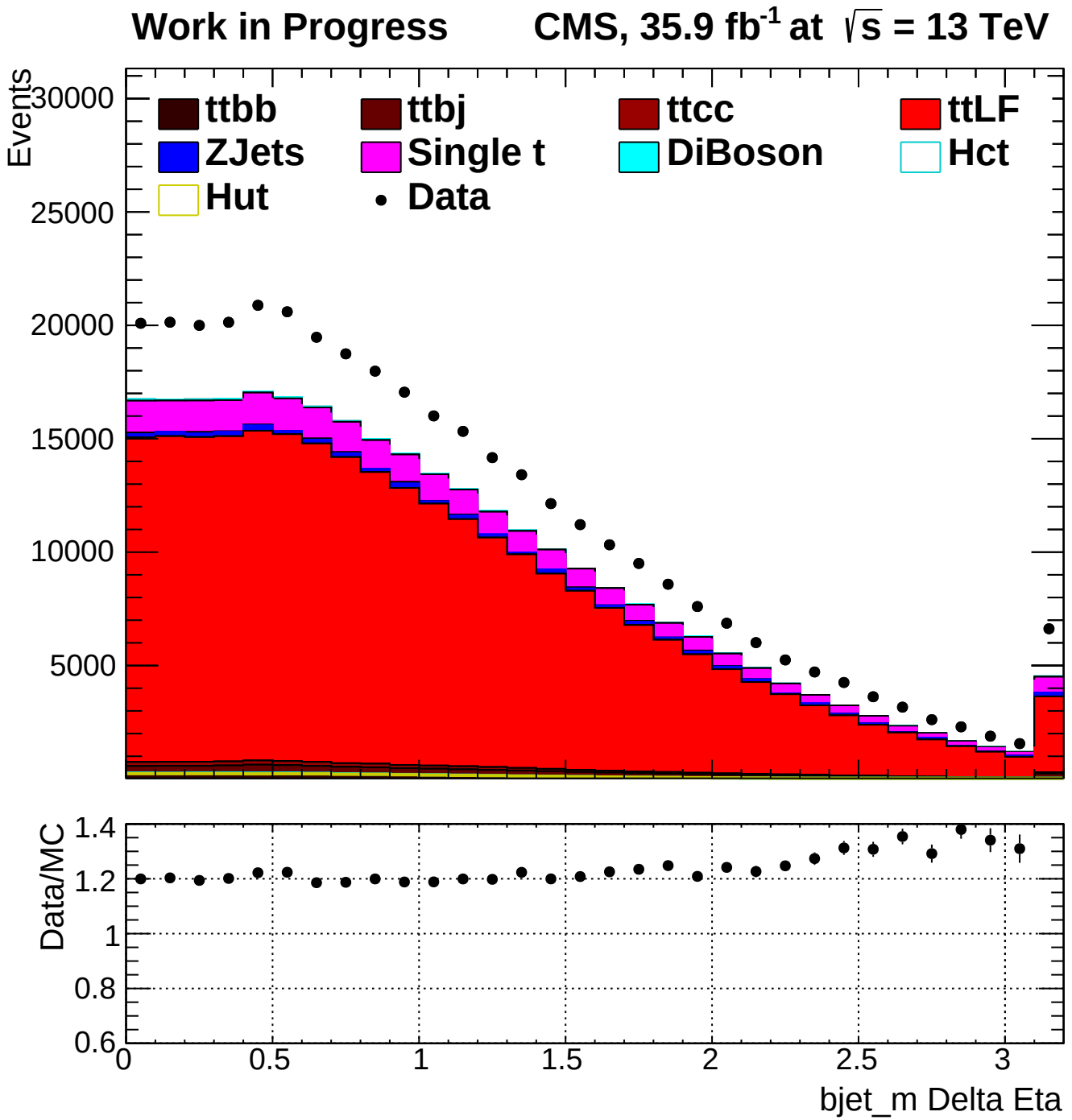

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)

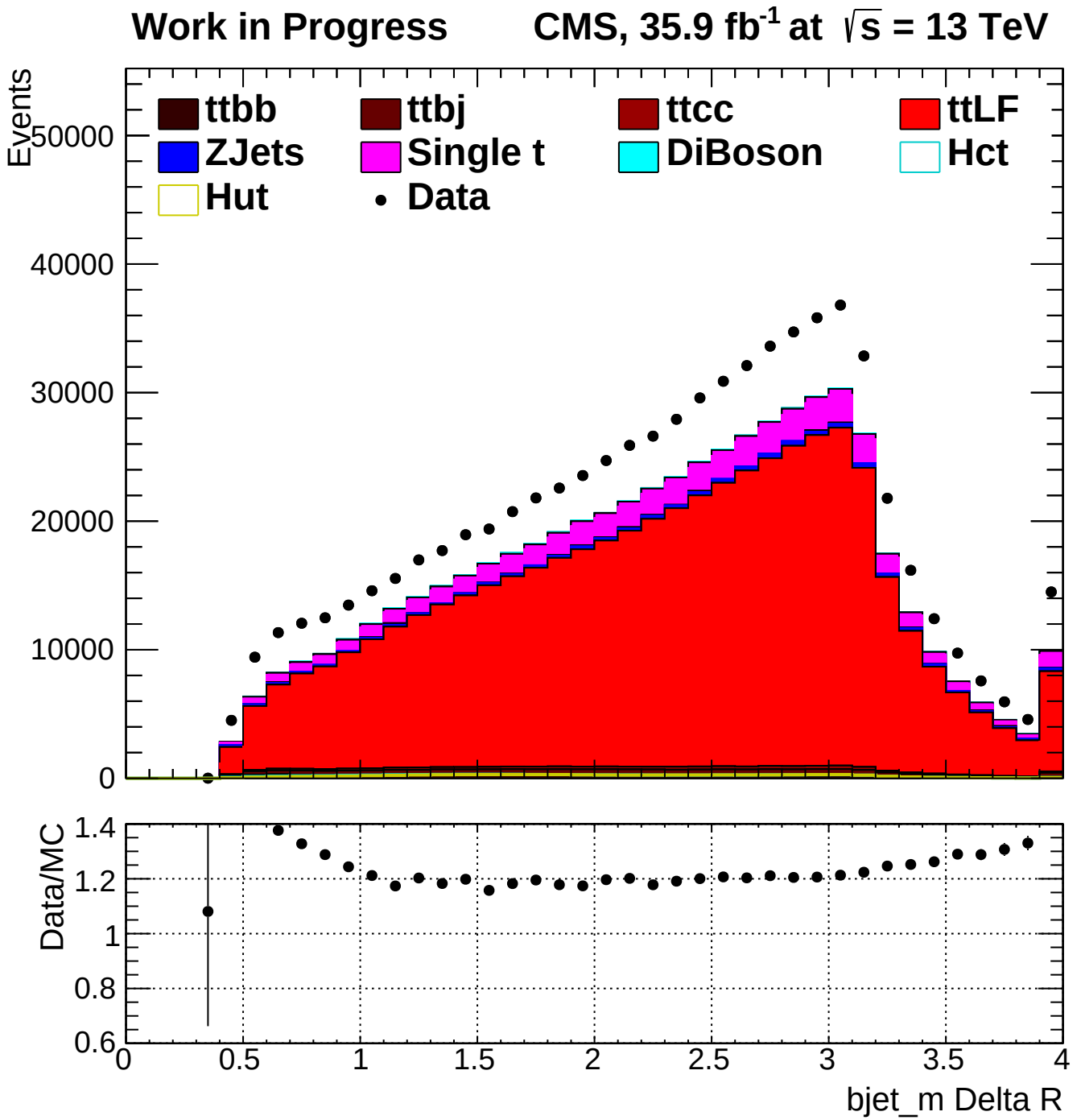

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)

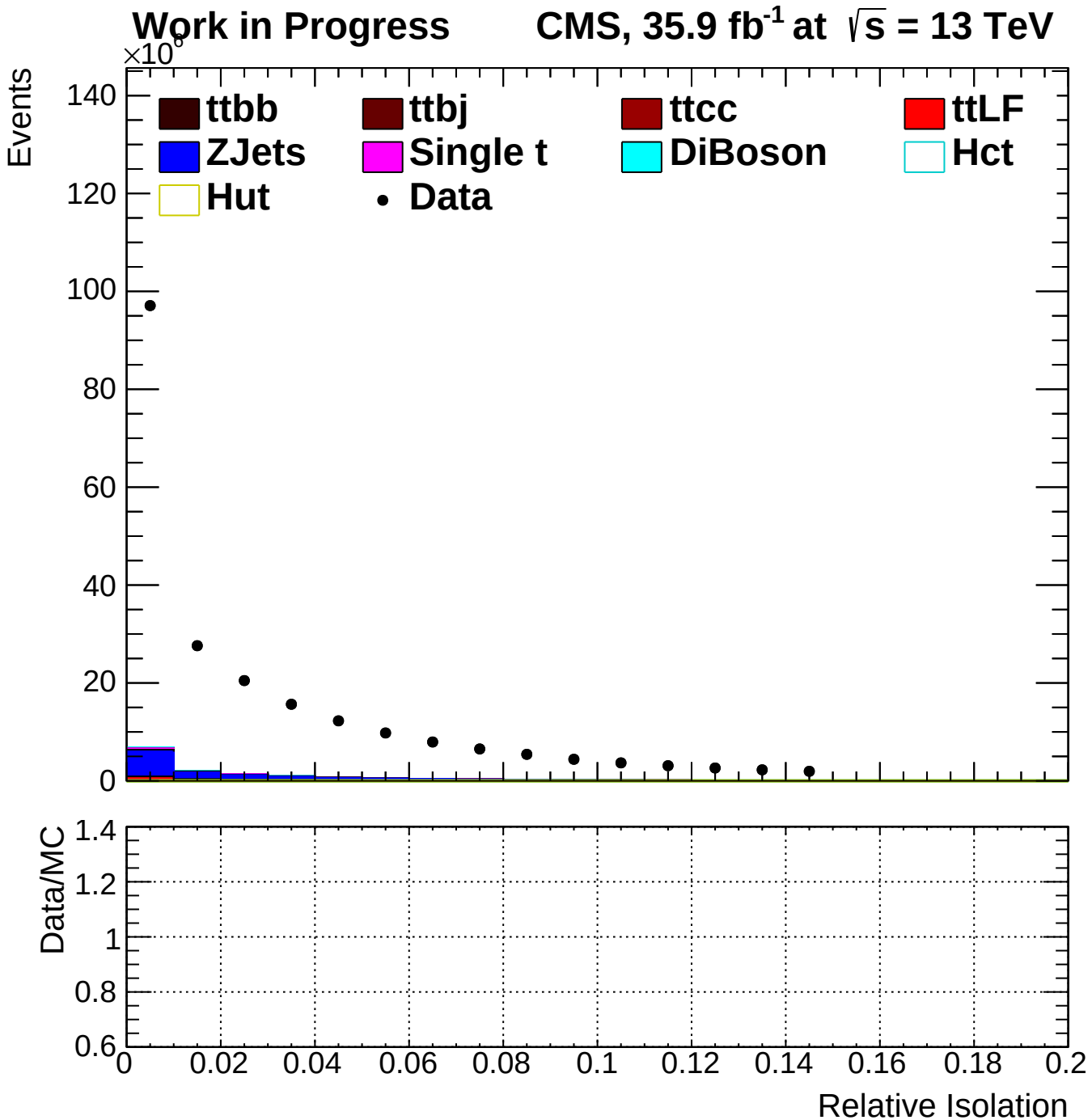

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
7000
6000
5000
4000
3000
2000
1000
0
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

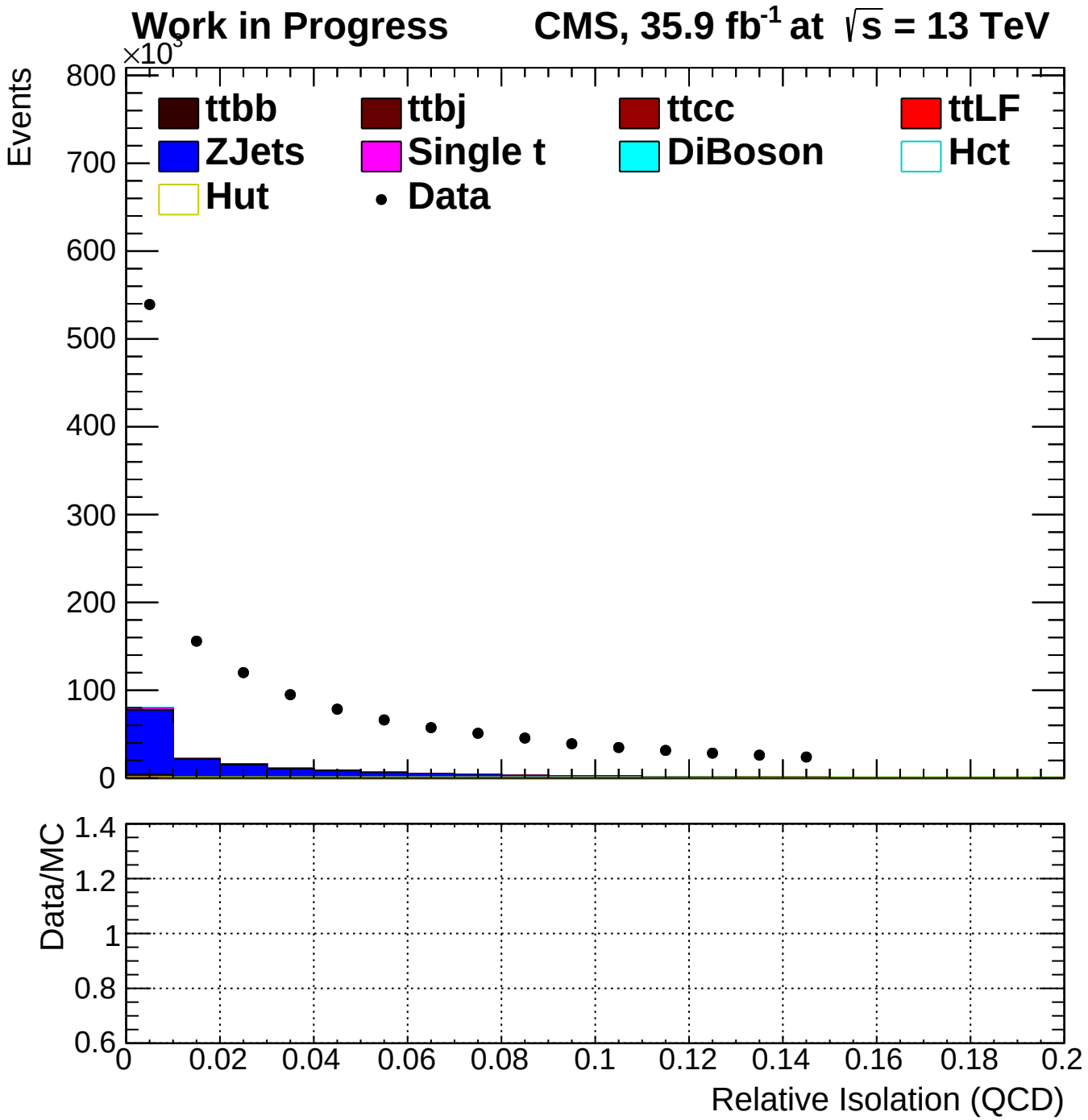

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16
14
12
10
8
6
4
2
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

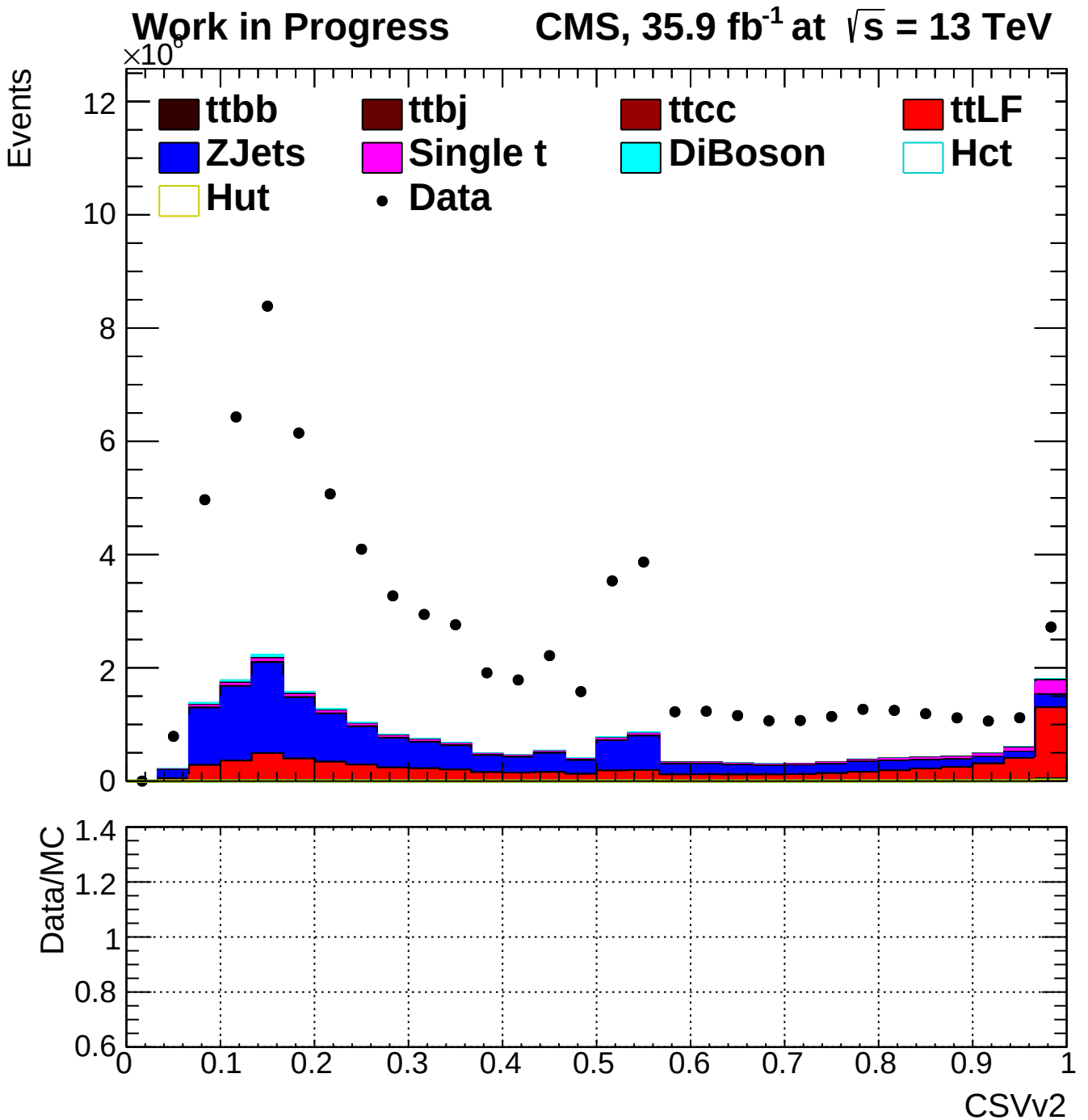

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

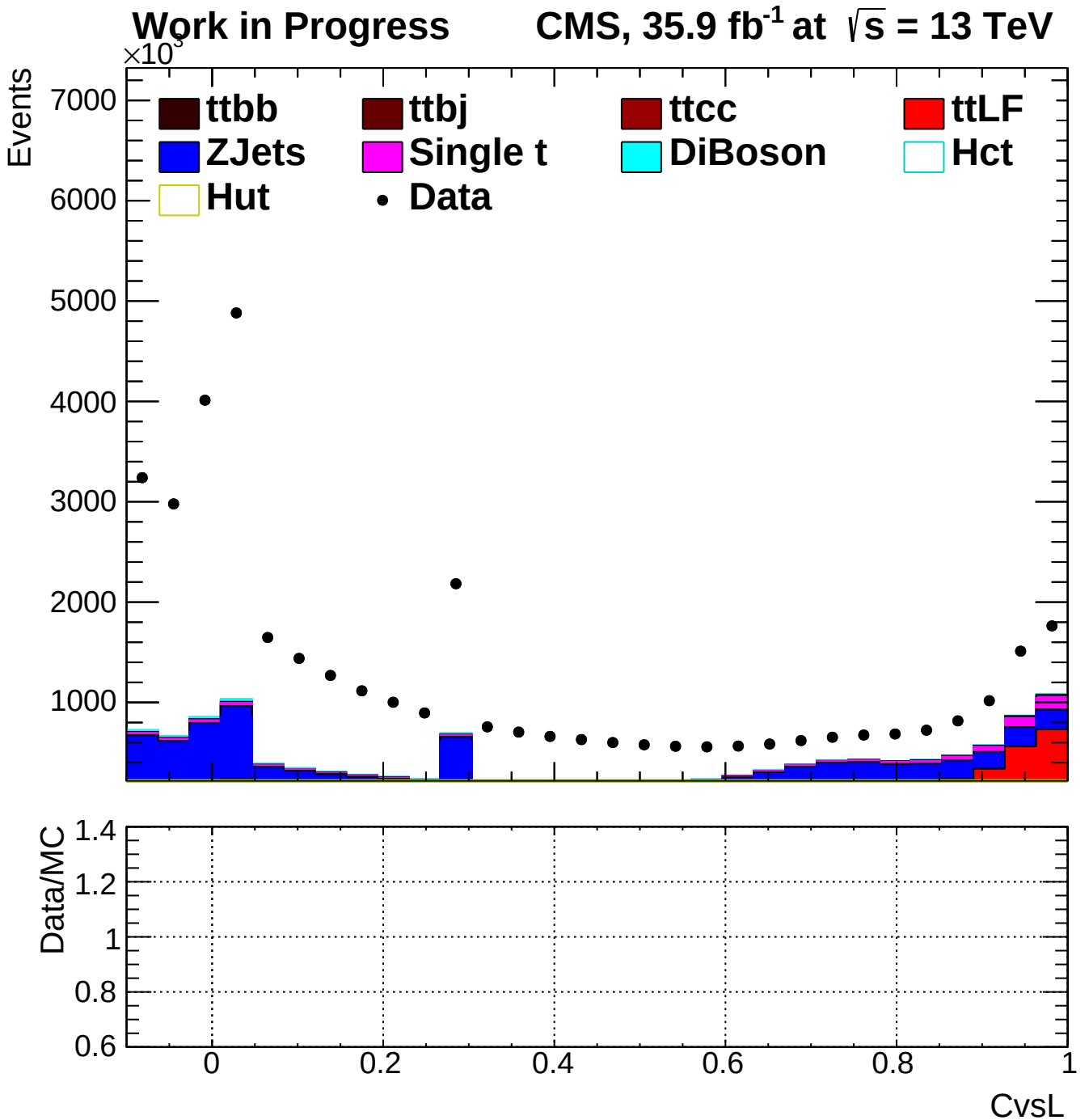

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

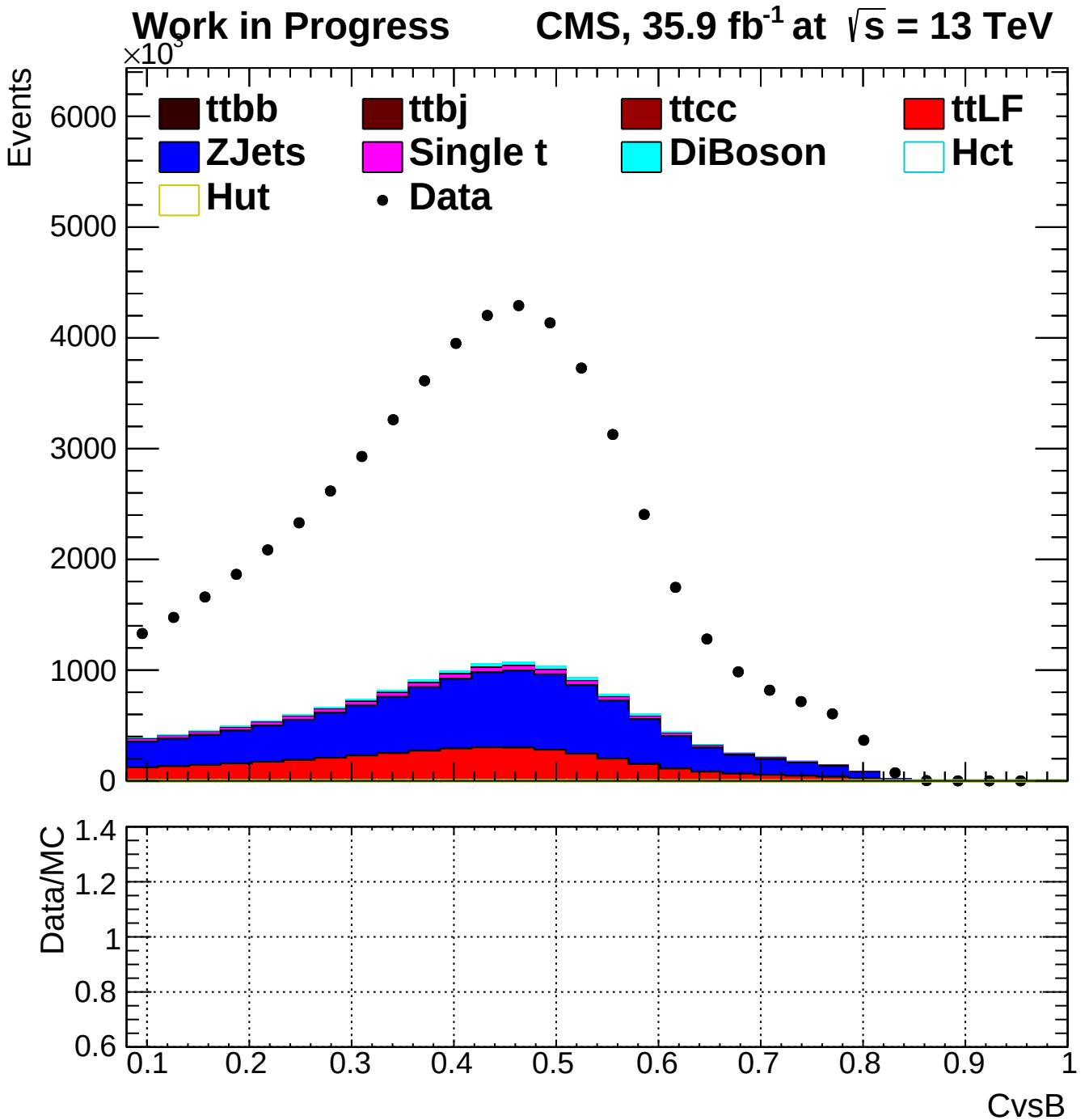

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

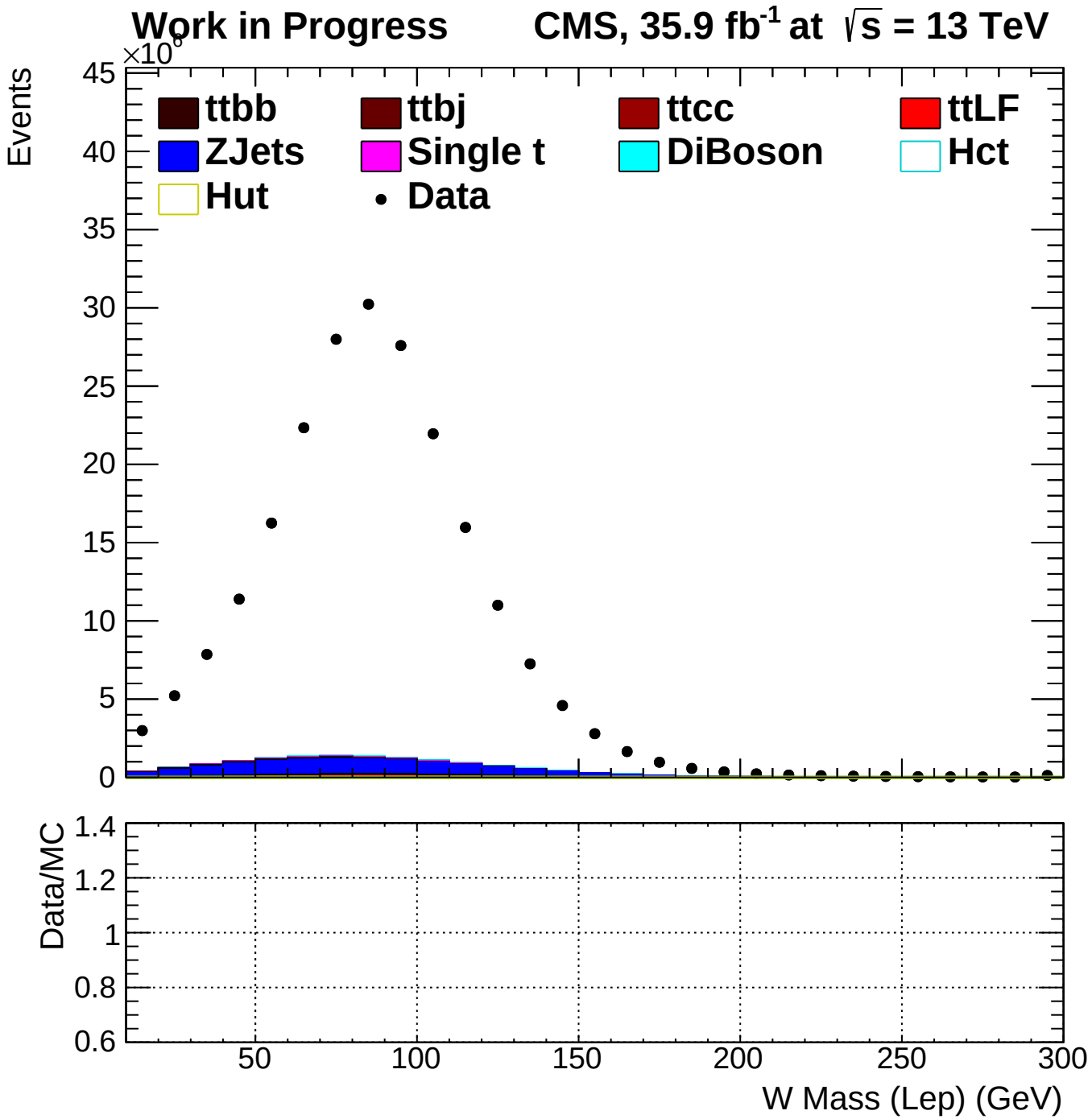

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
140
120
100
80
60
40
20
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

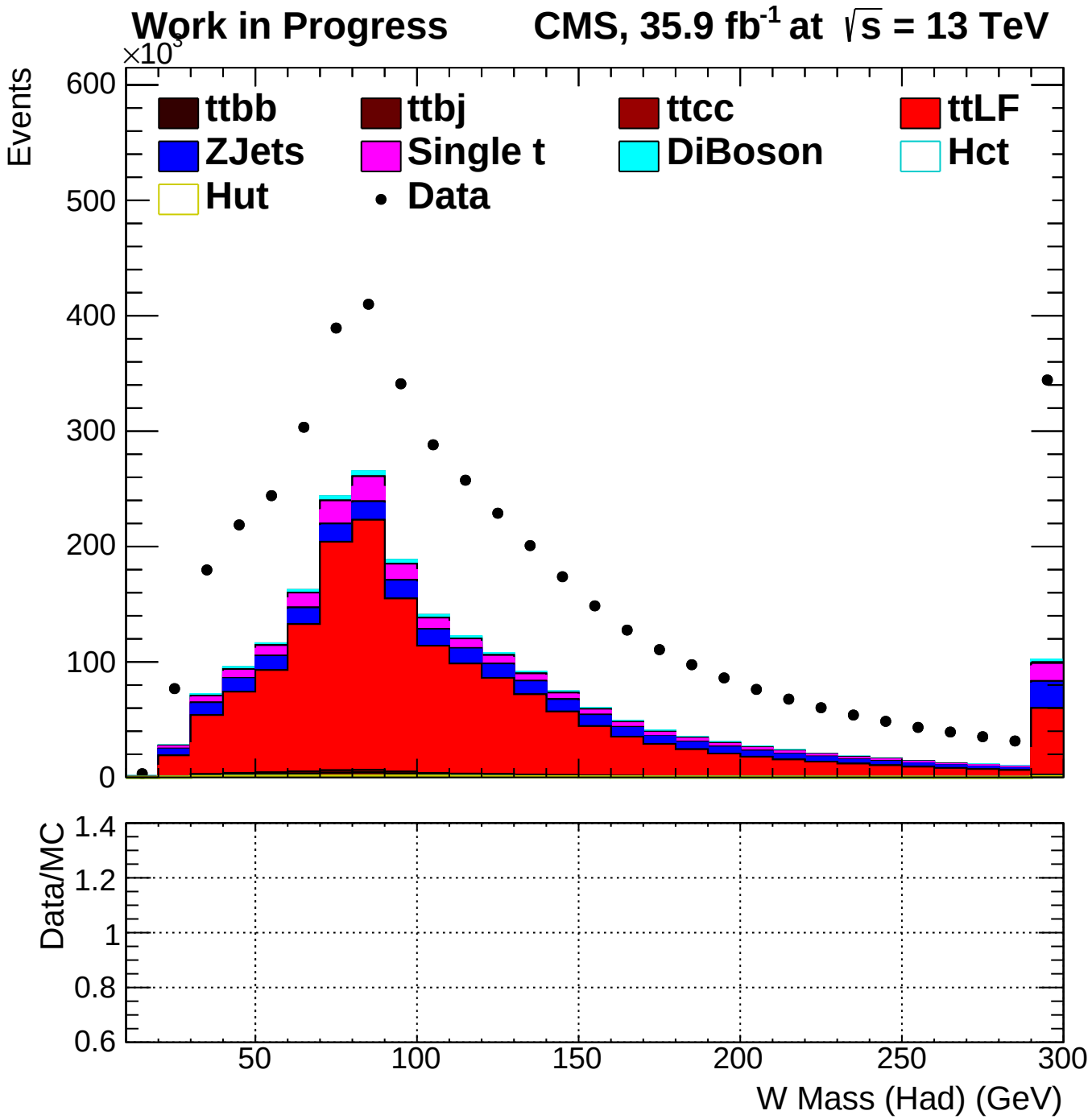

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

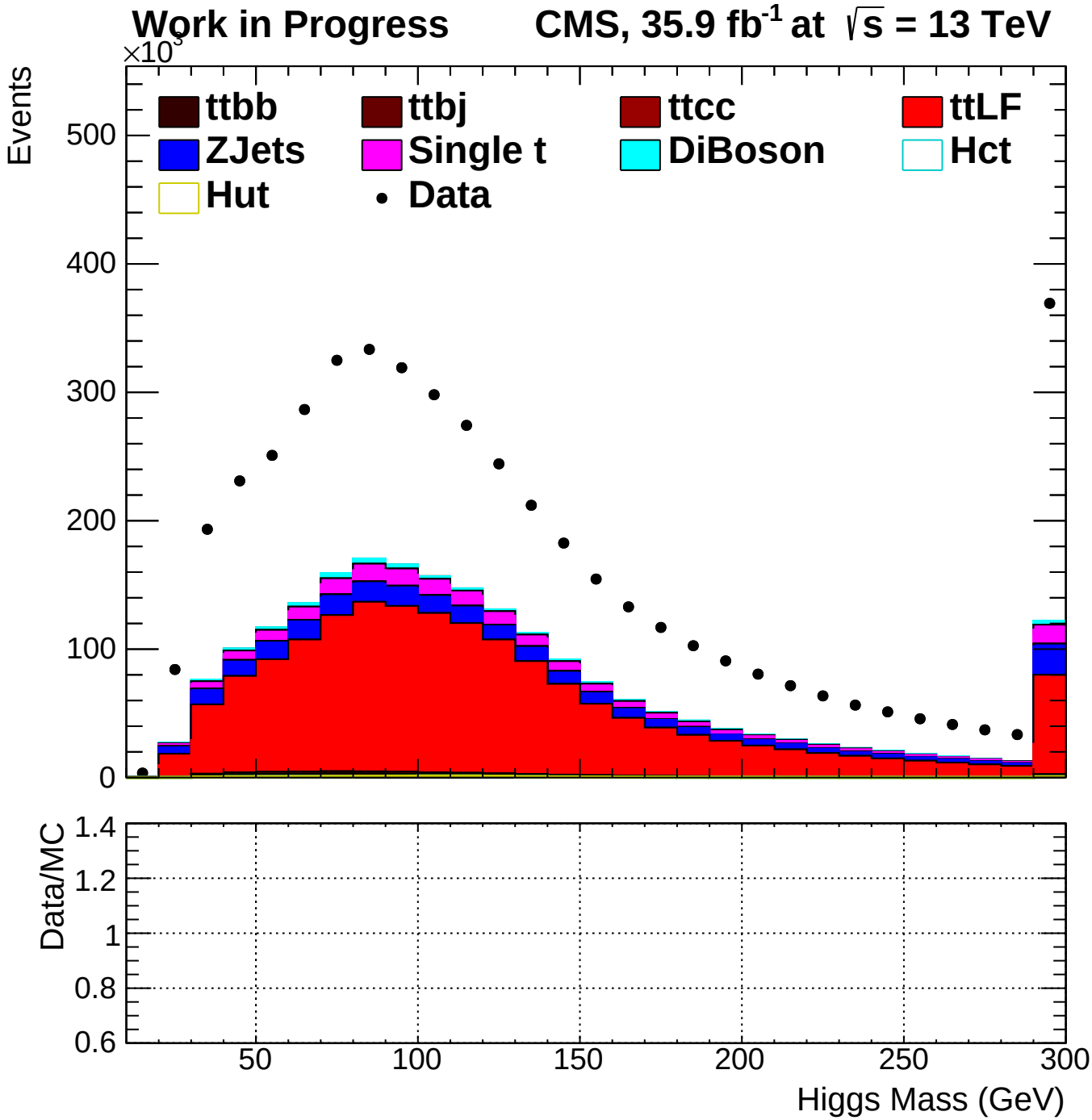

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2

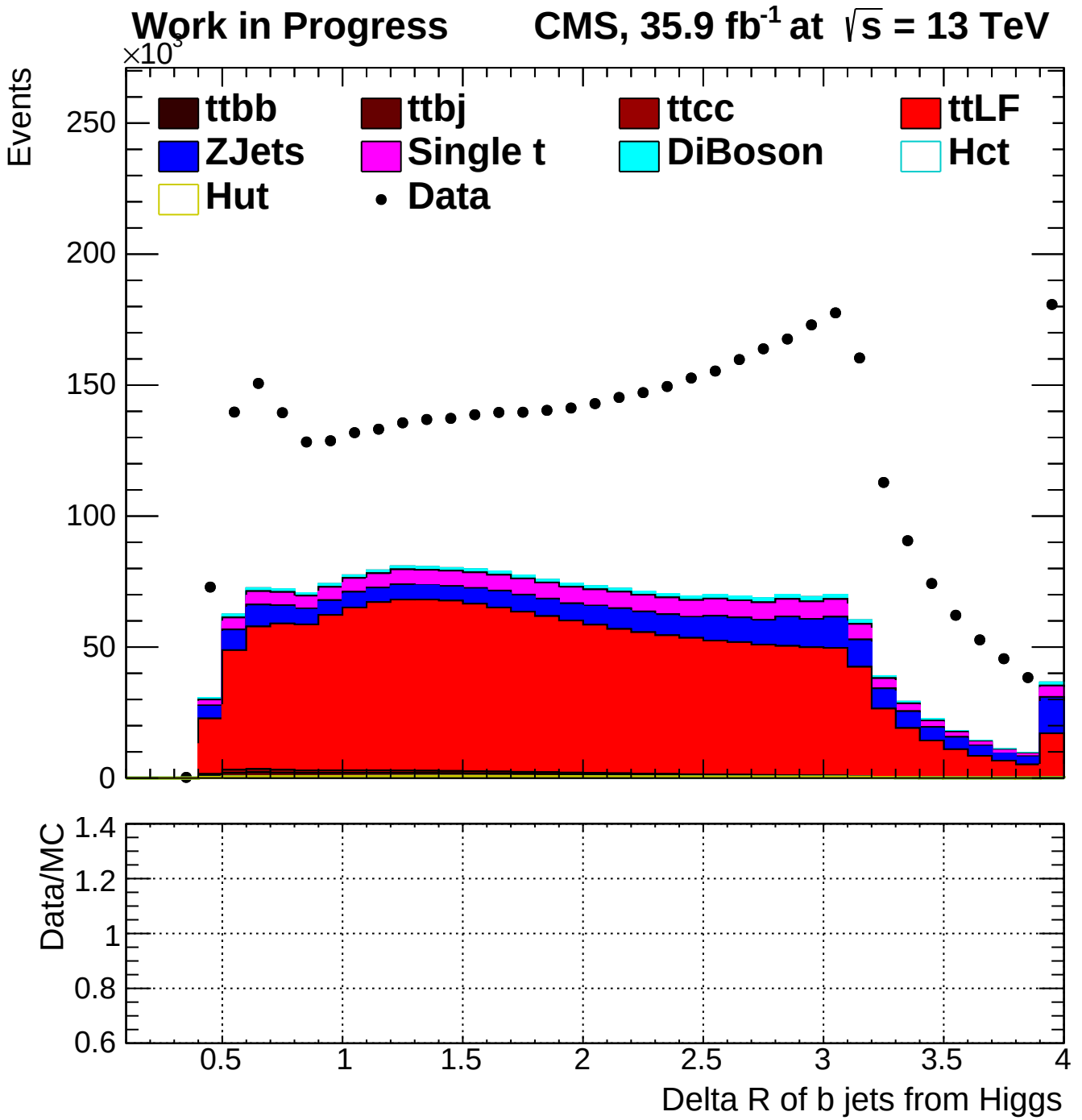

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
7000
6000
5000
4000
3000
2000
1000
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

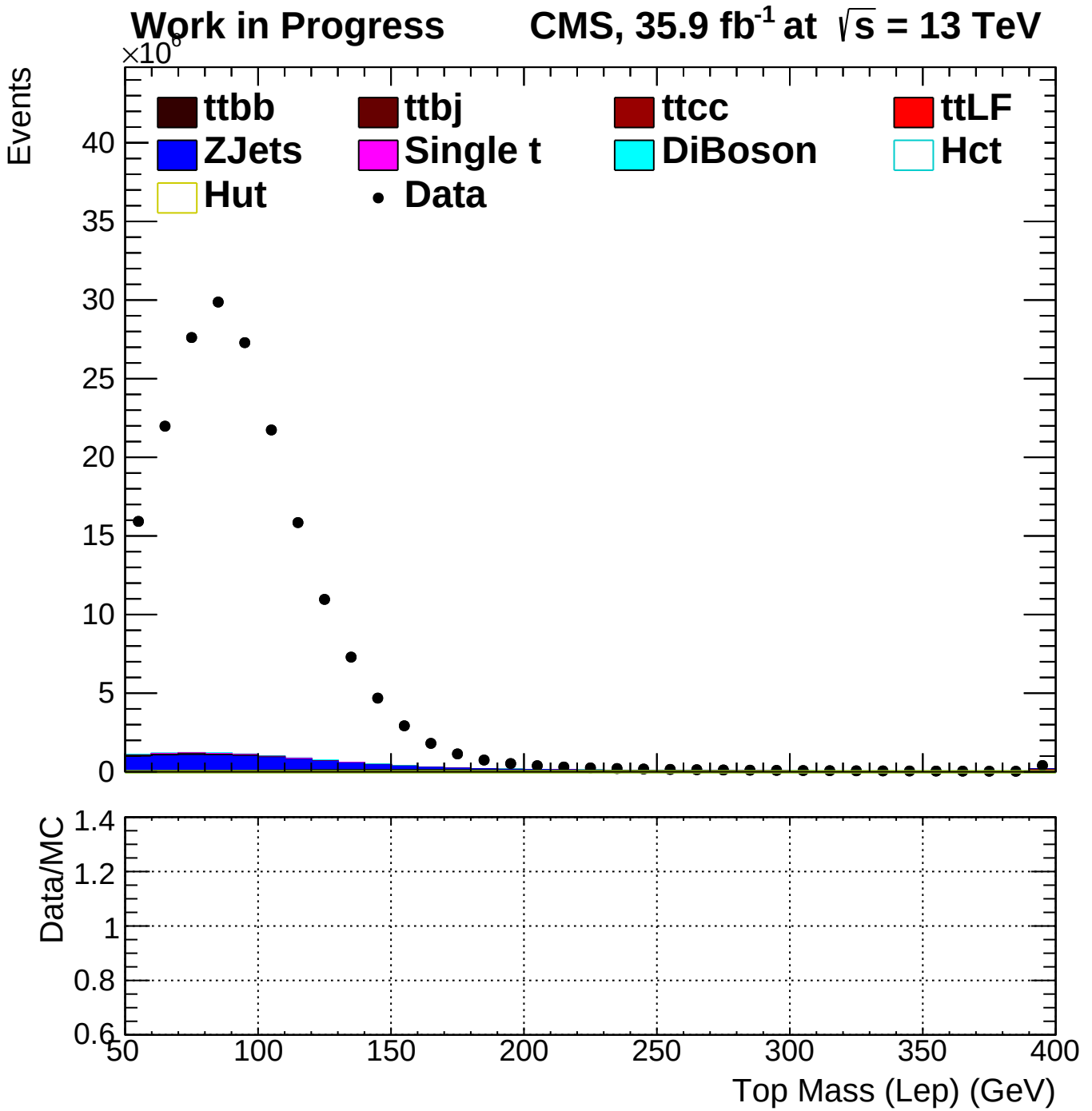

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

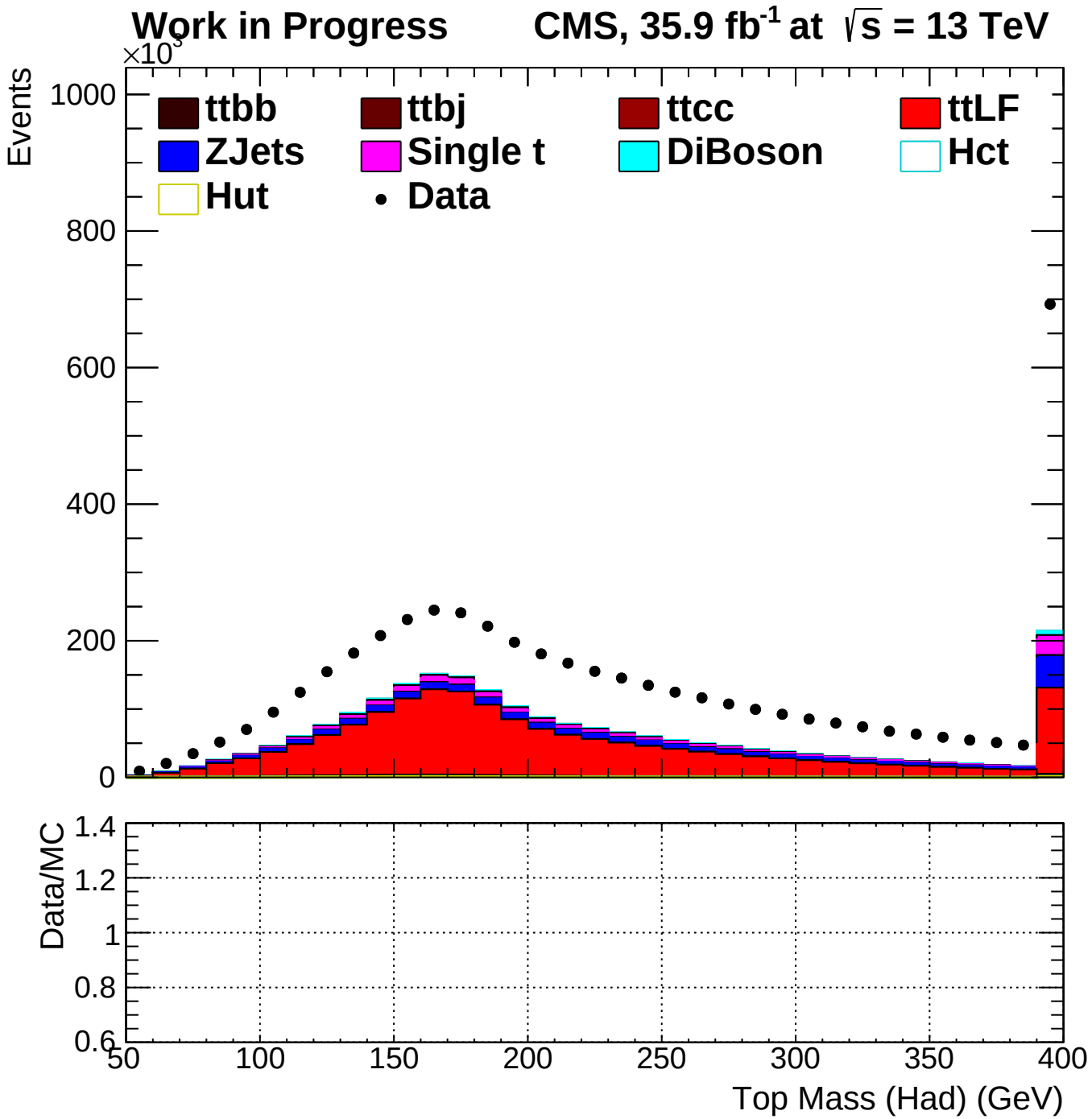

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^6
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

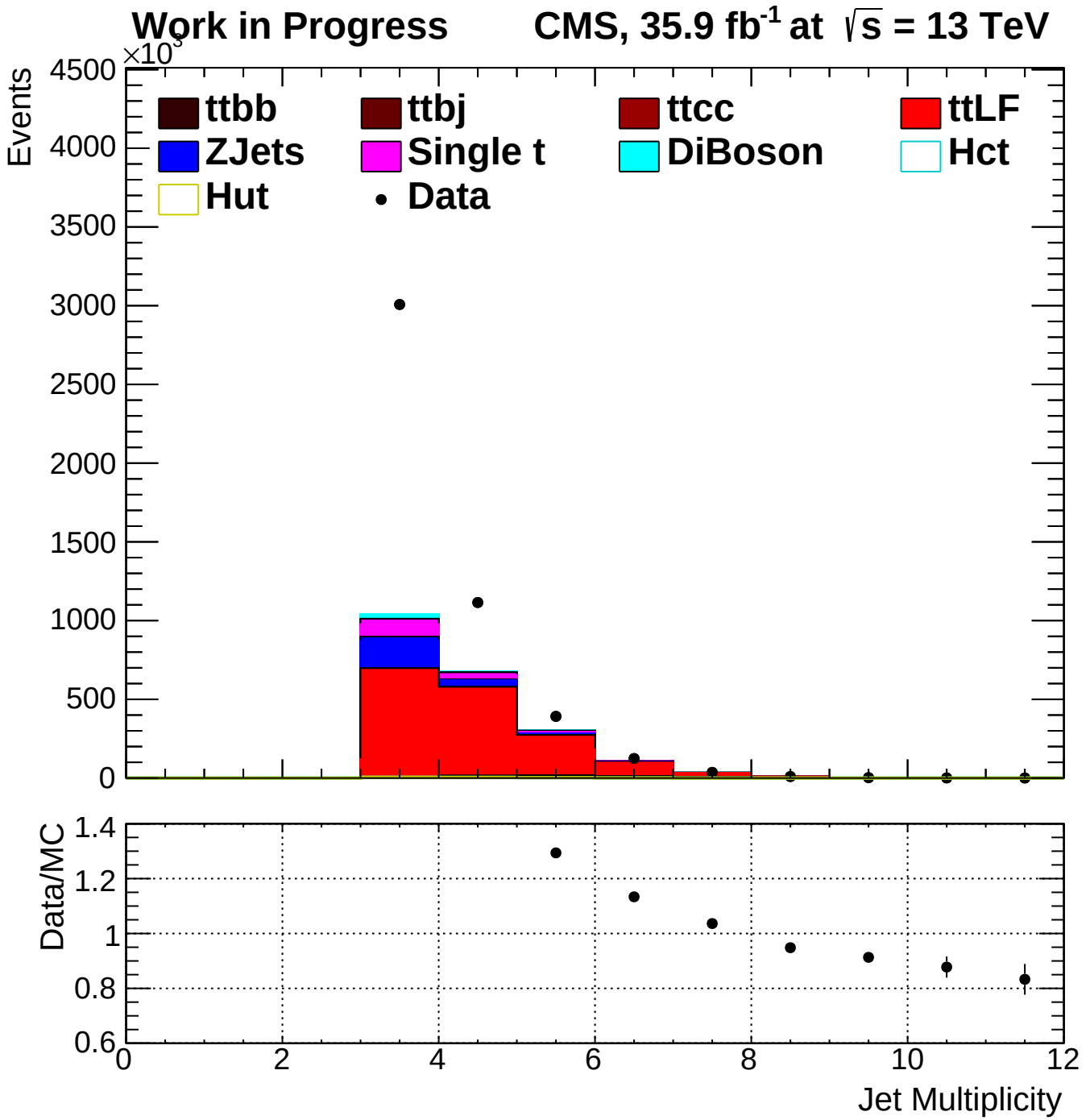

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

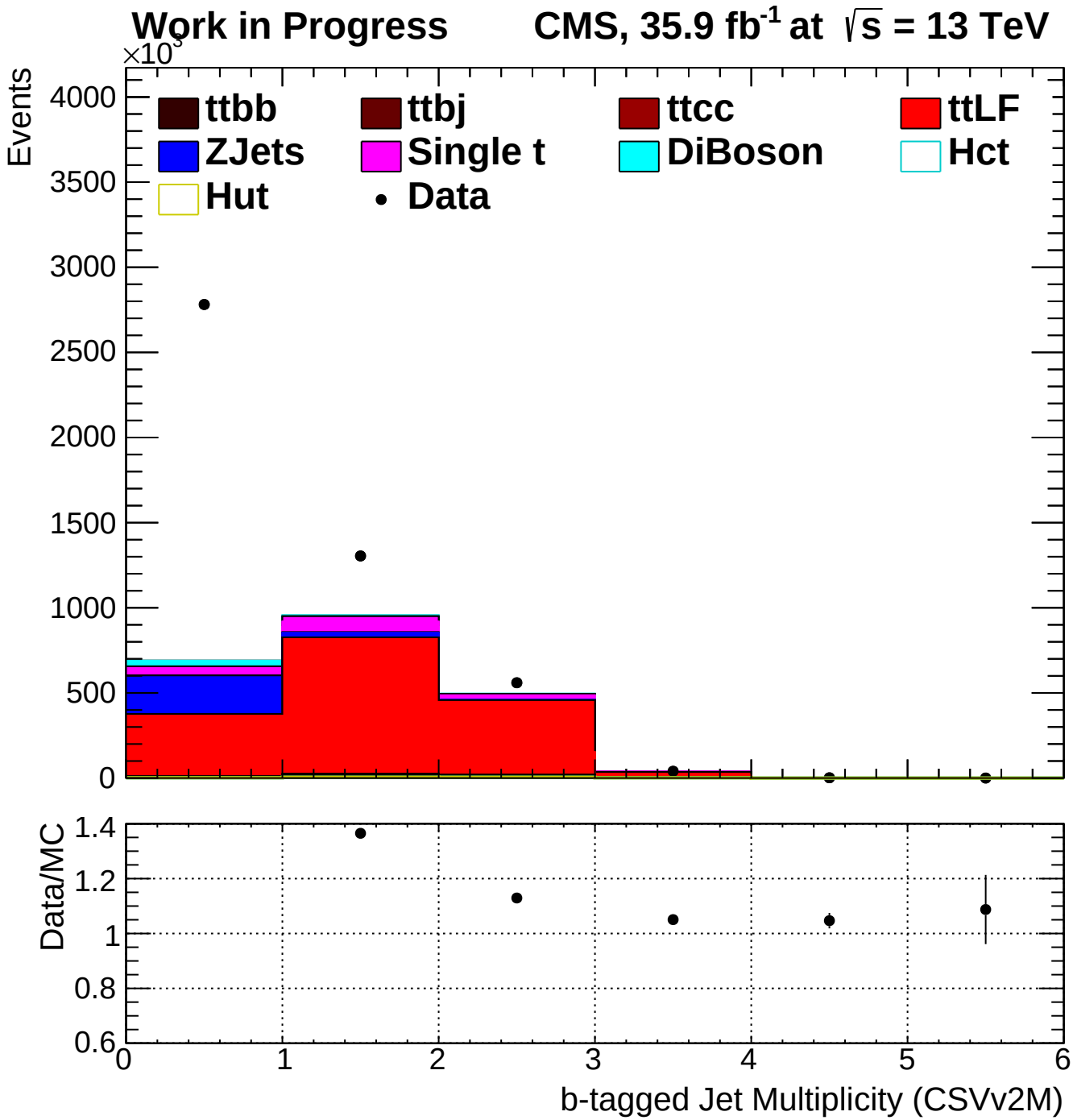

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

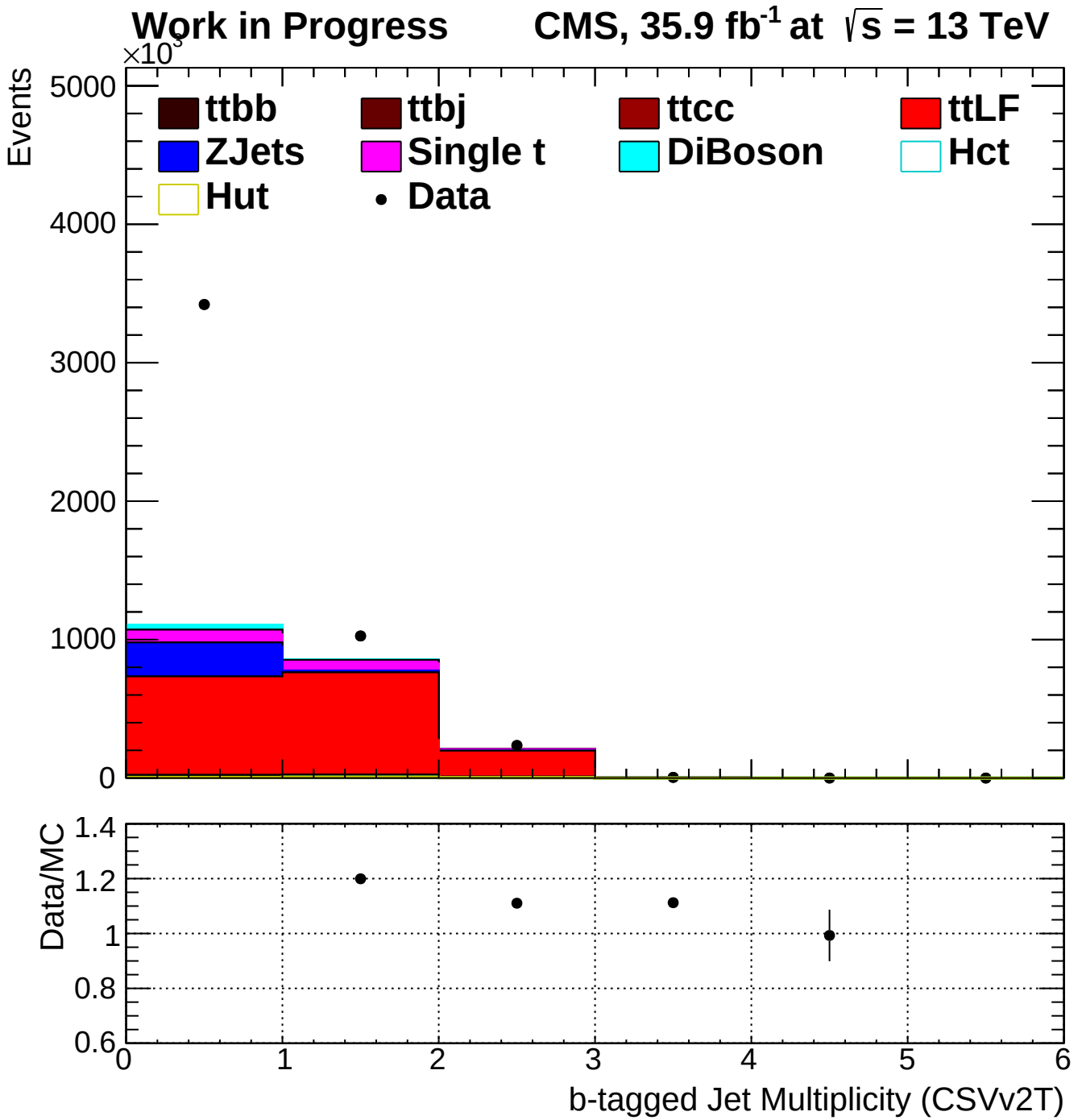

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs

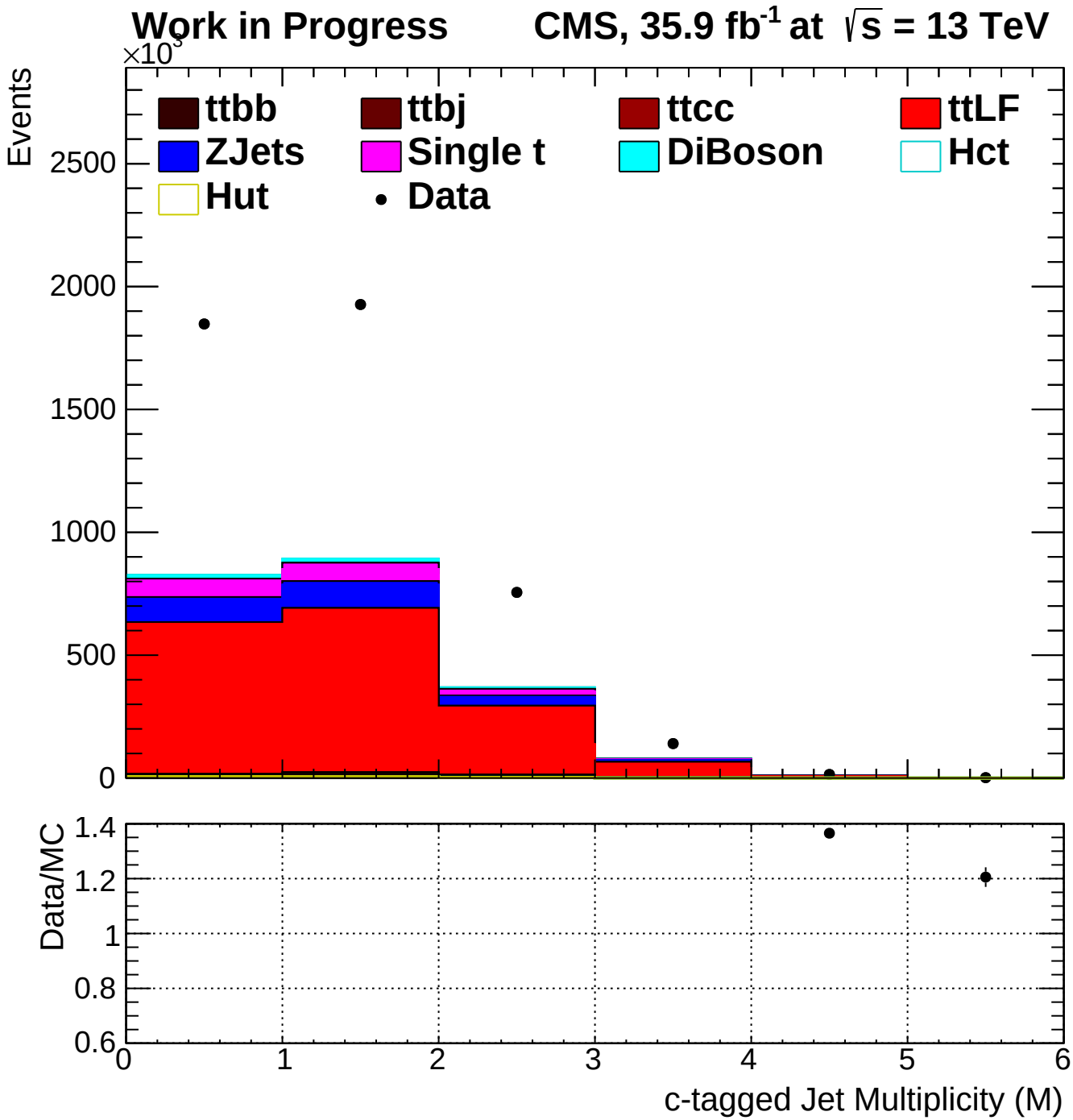

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^6
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)

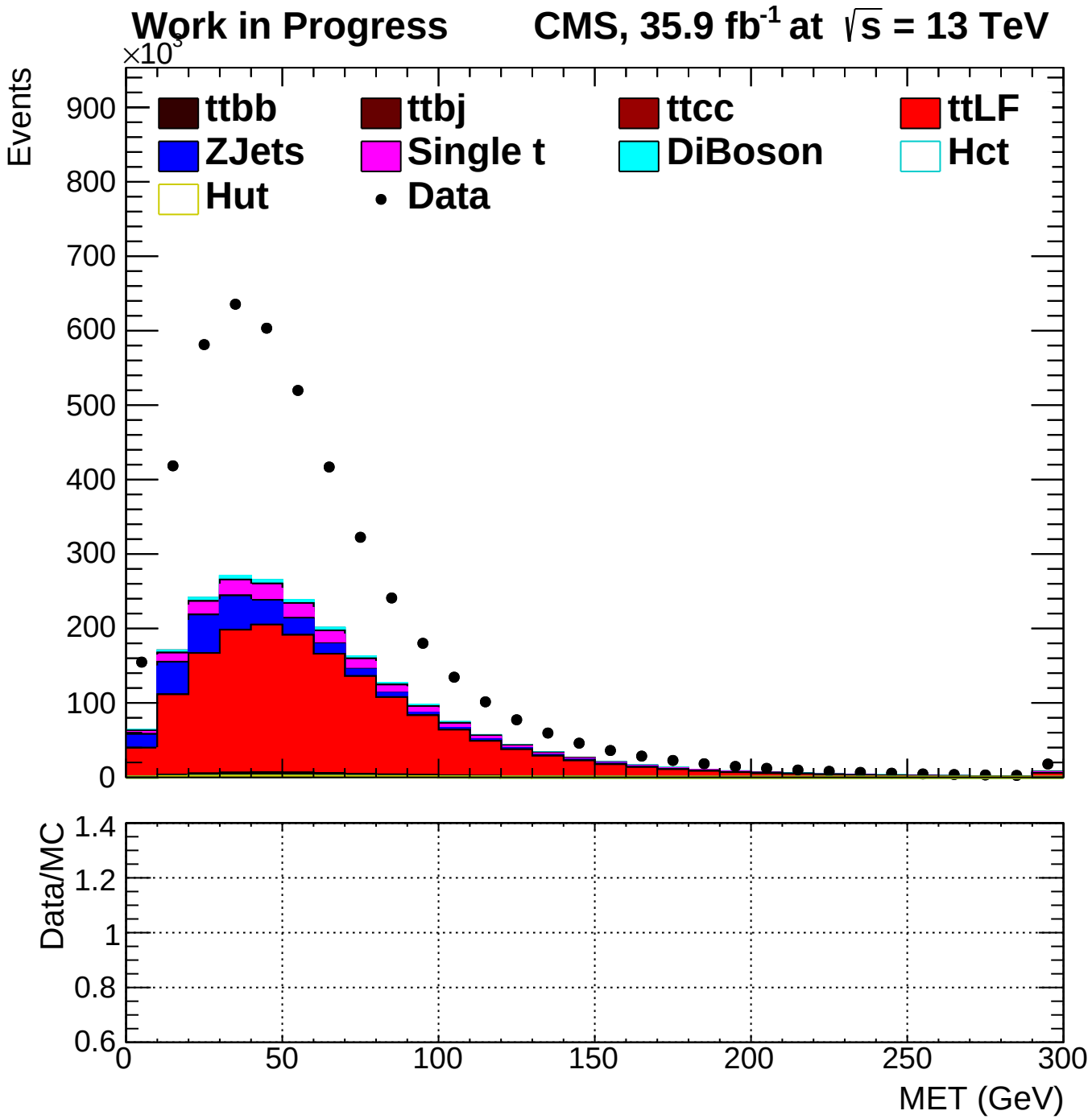

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

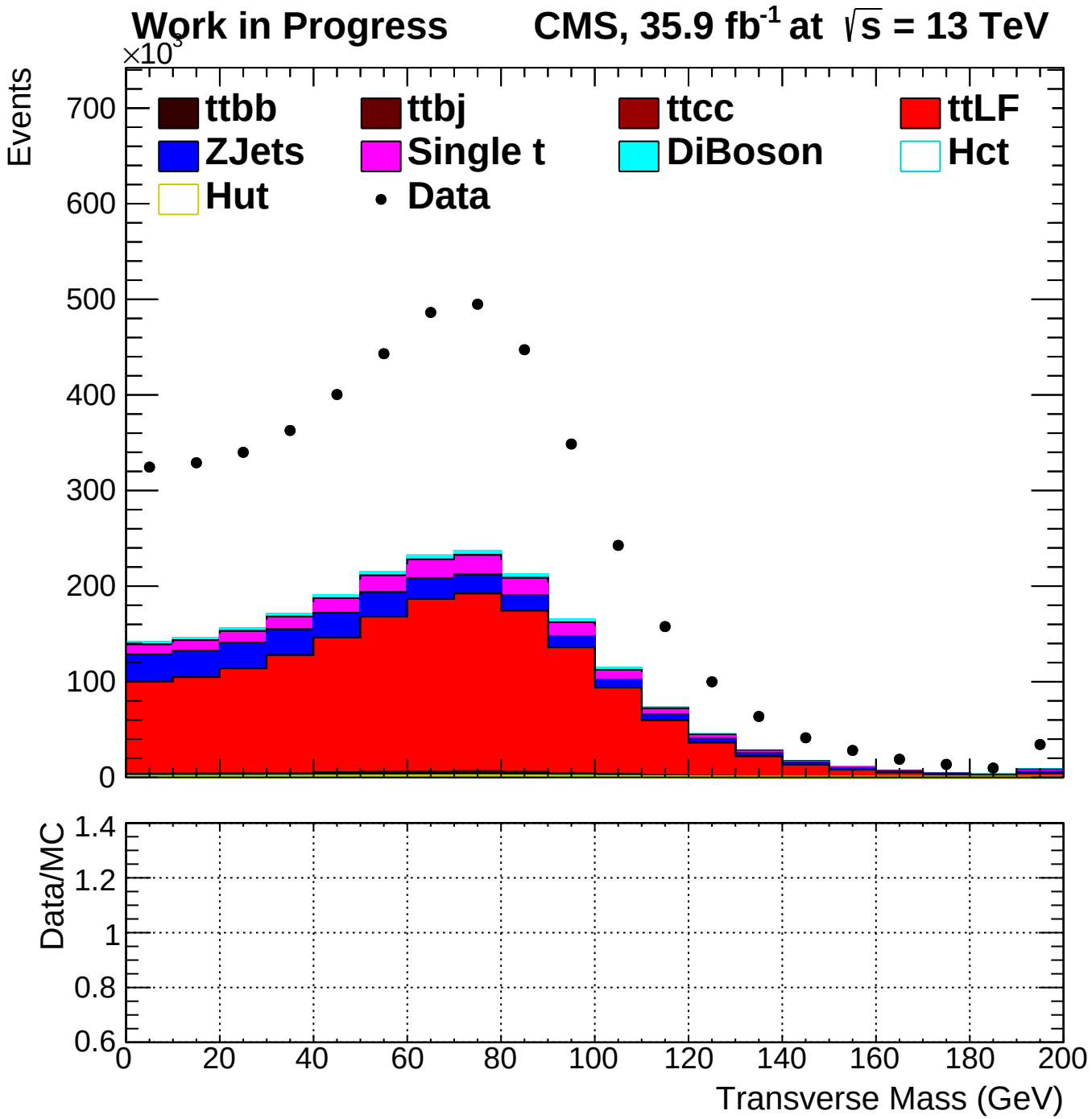

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

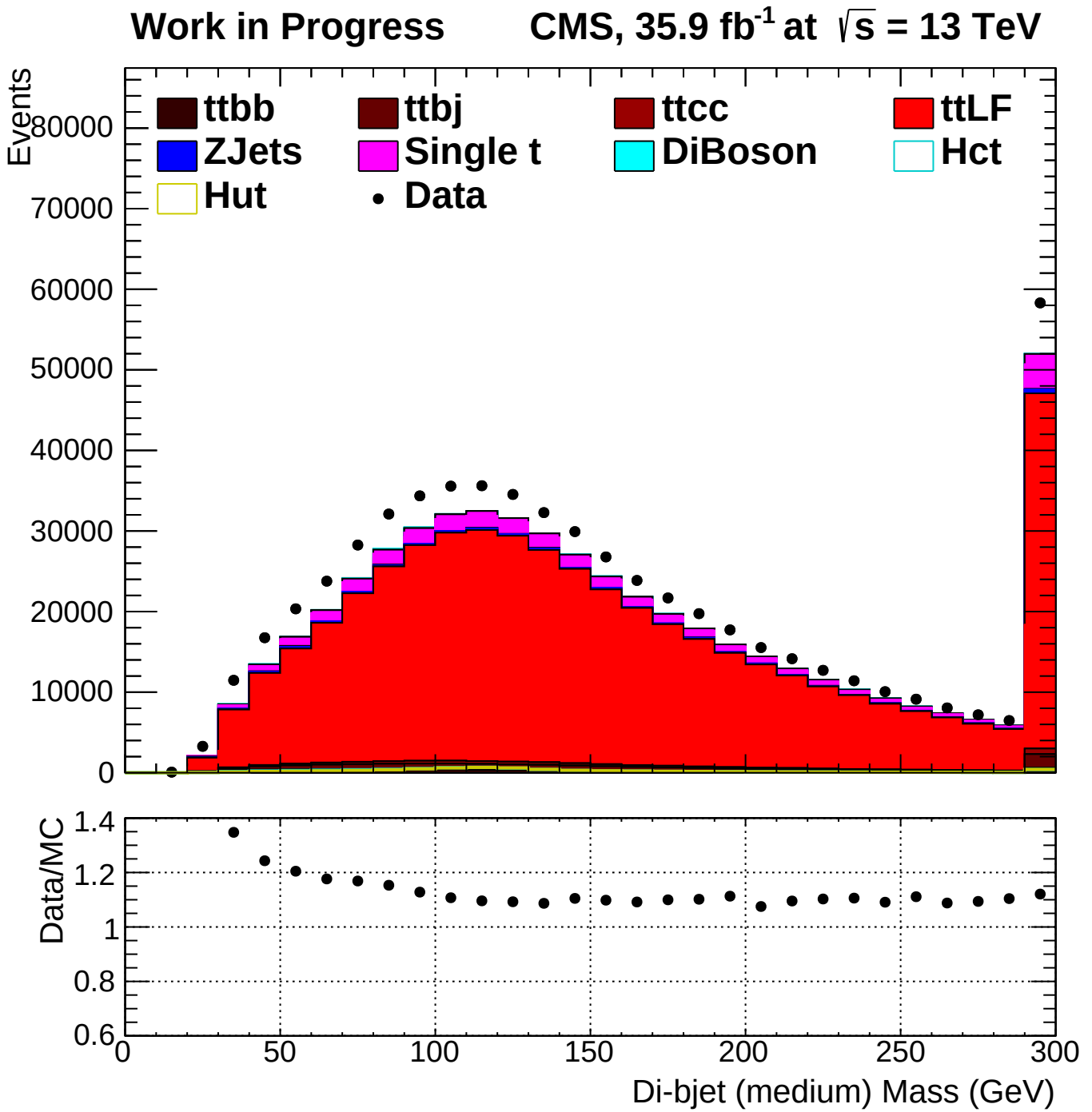

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

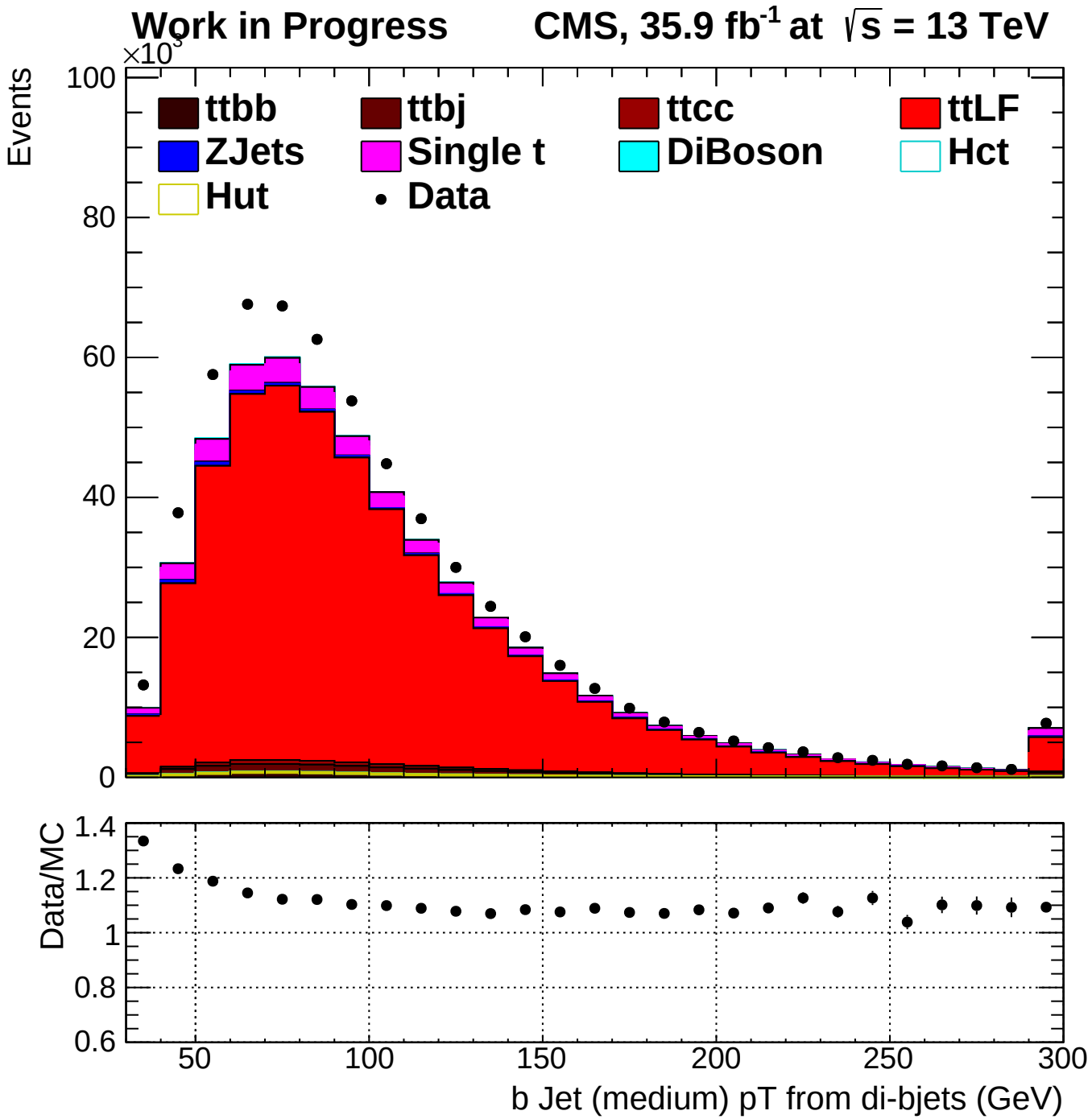

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

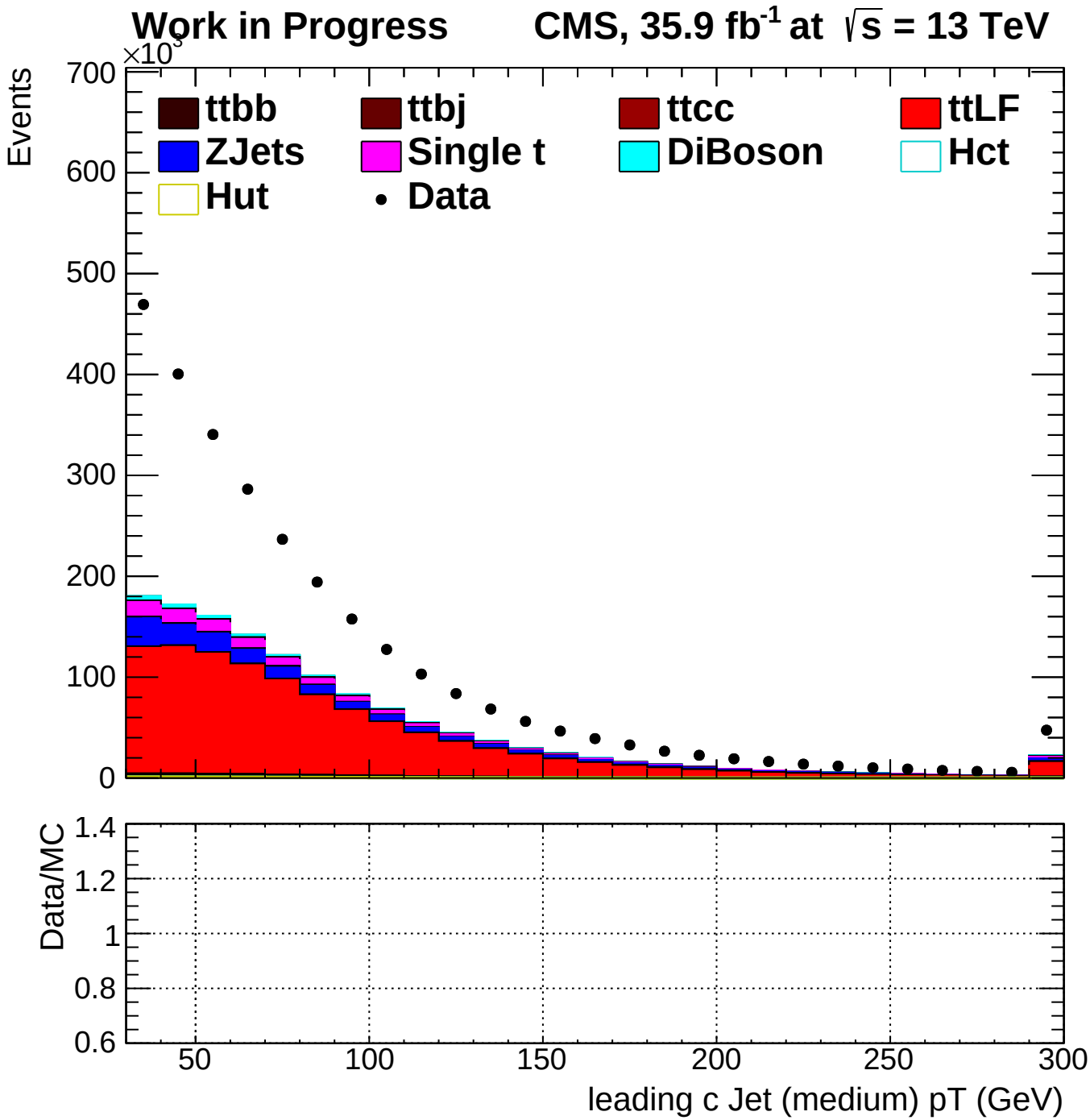

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)

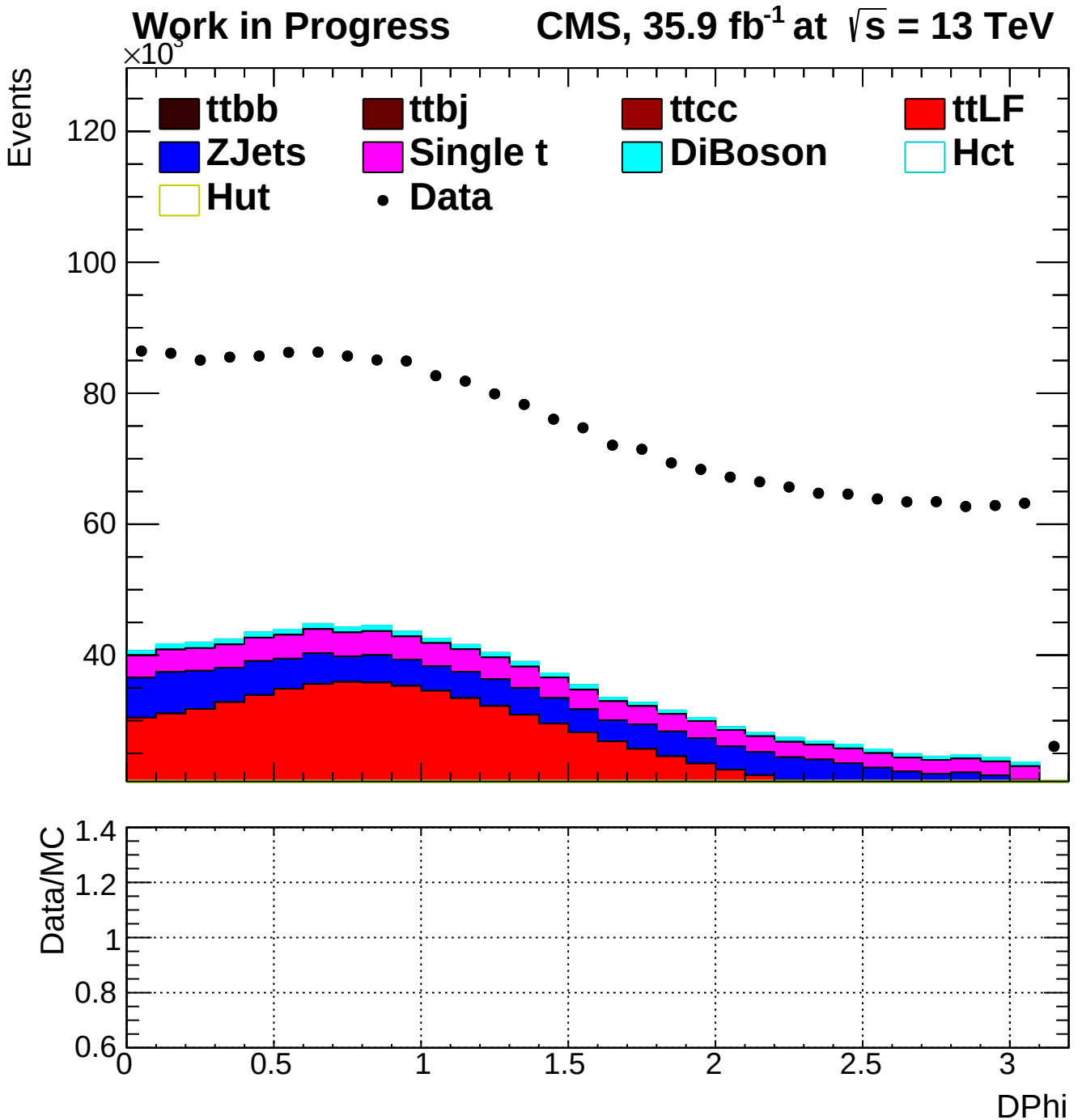

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
900
800
700
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)

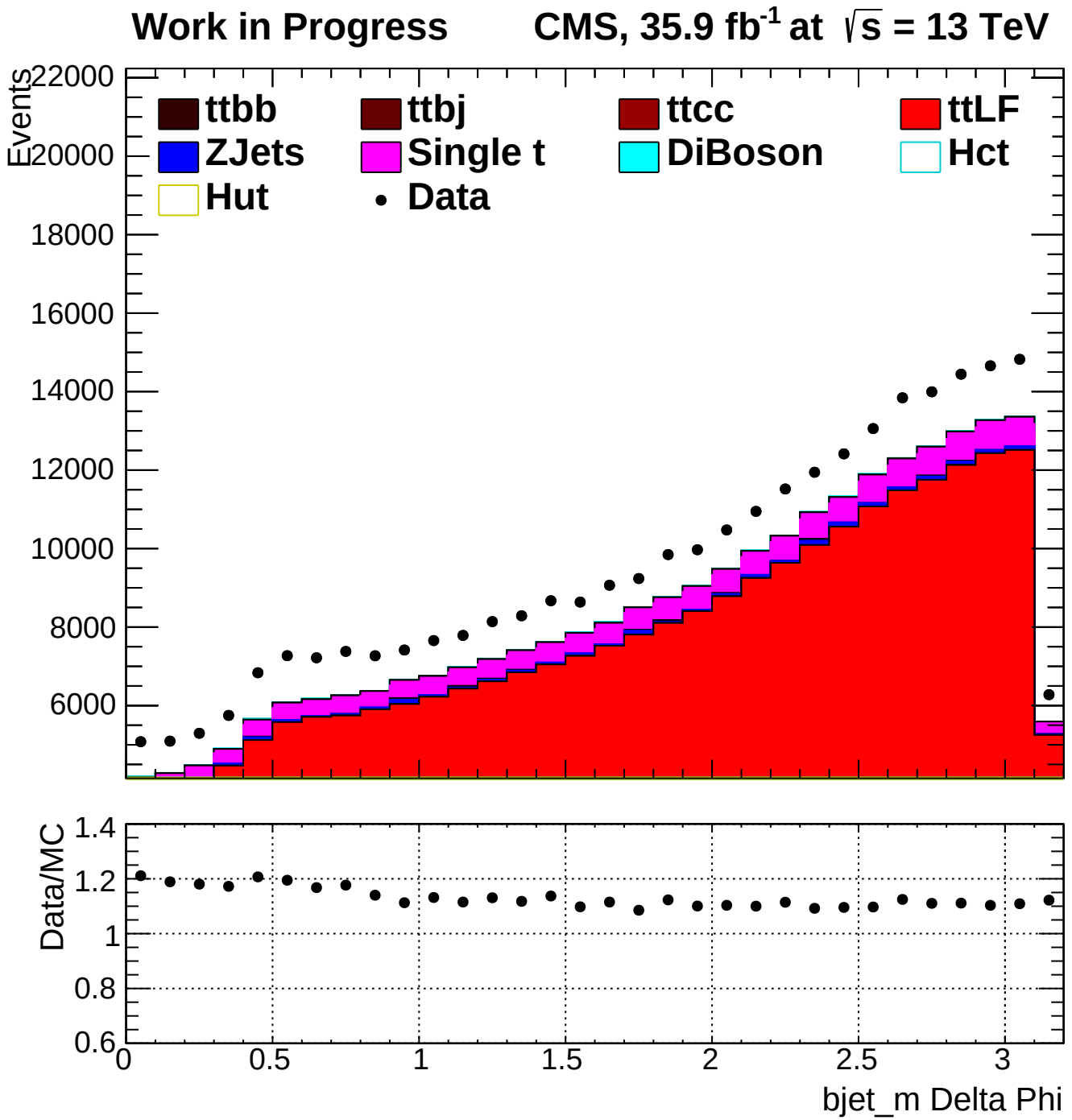

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

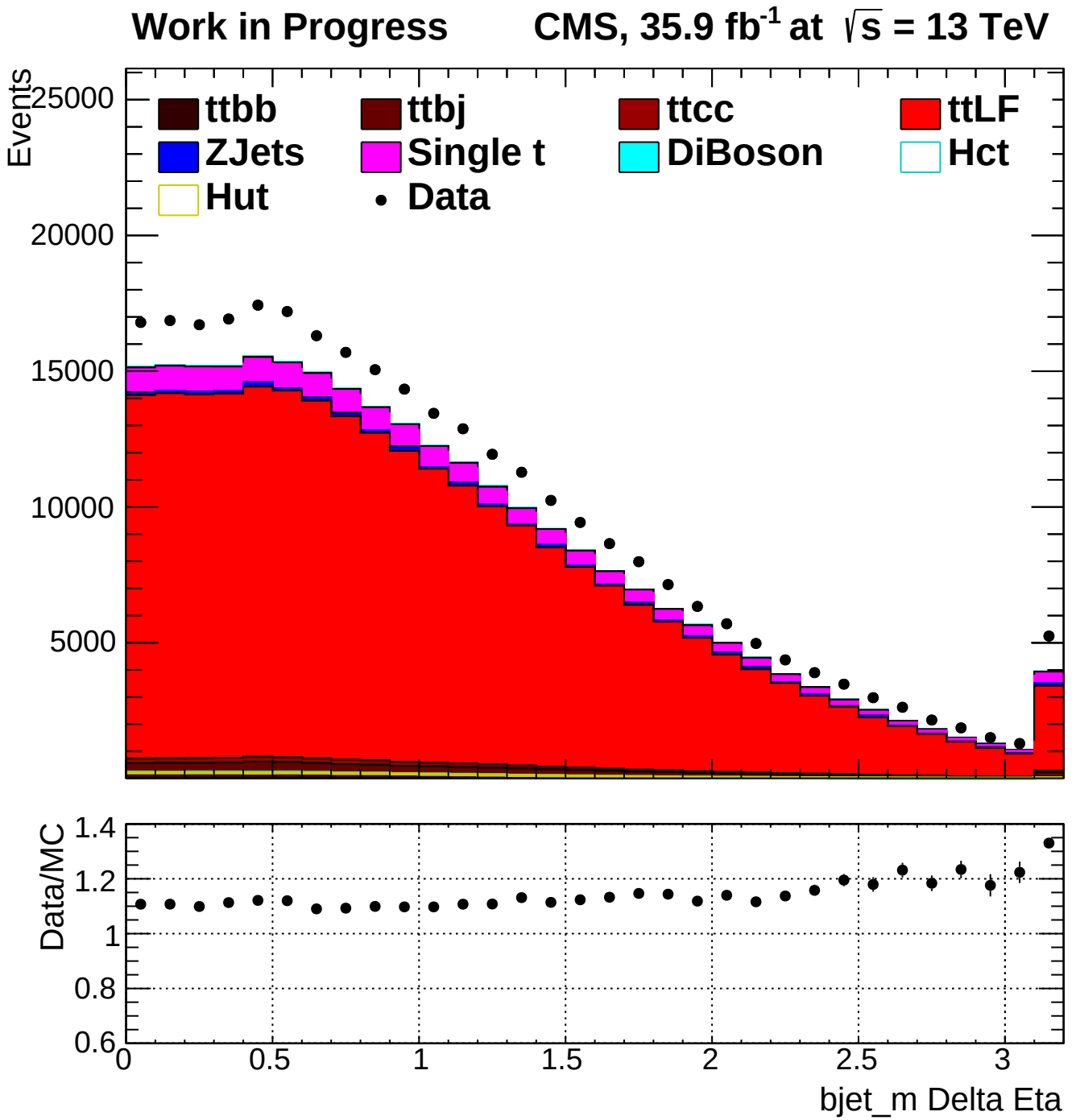

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

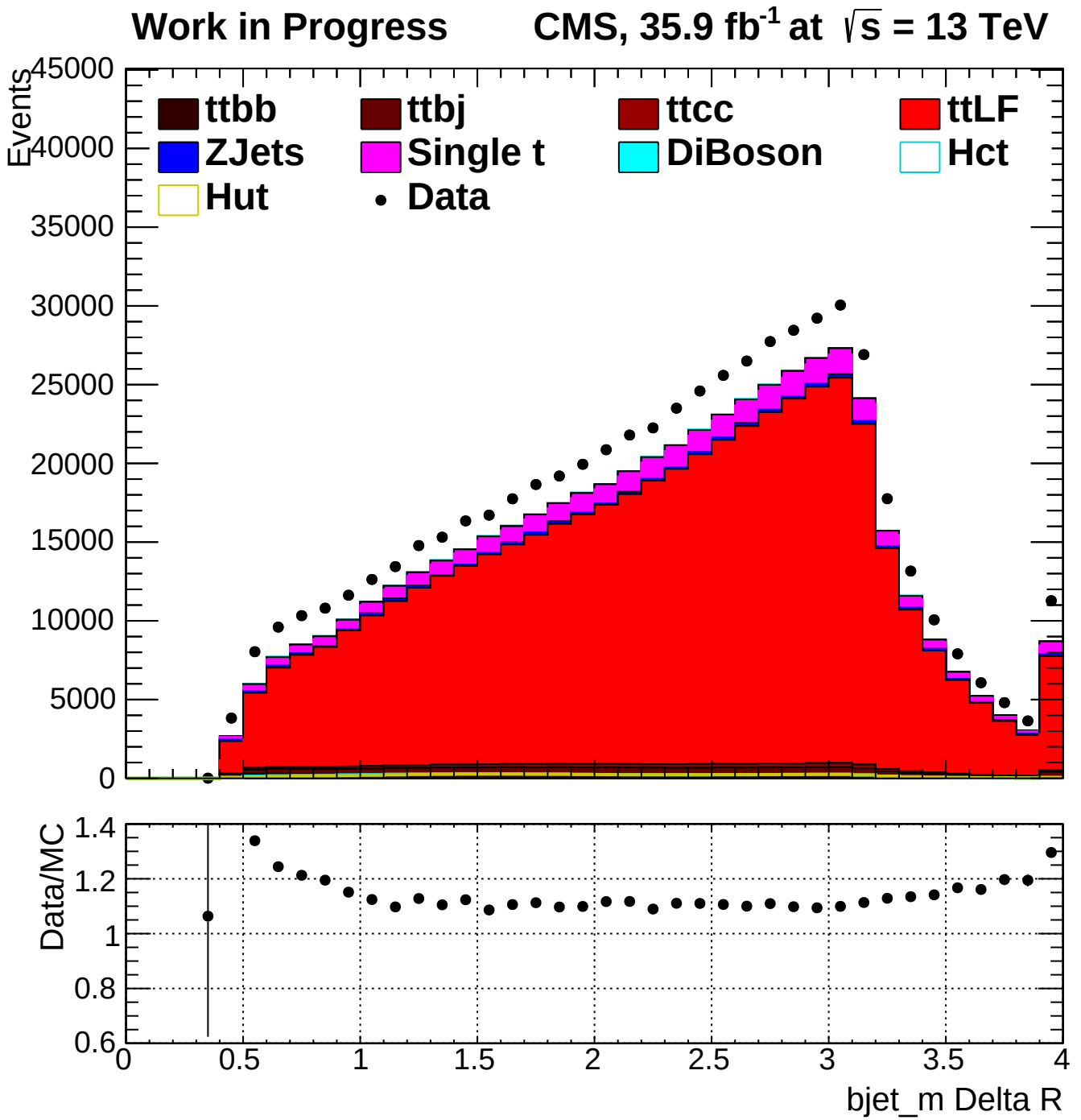

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)

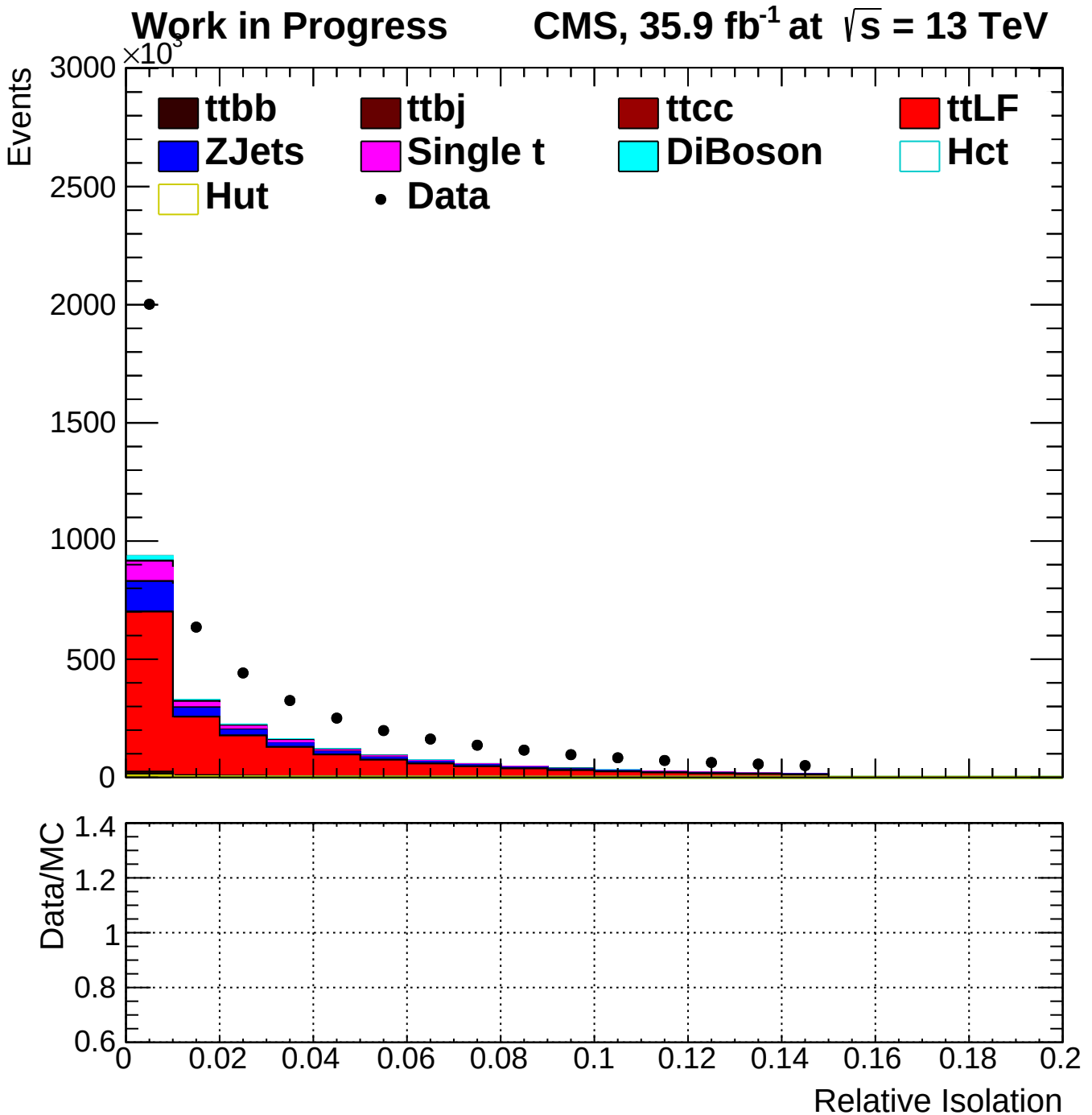

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

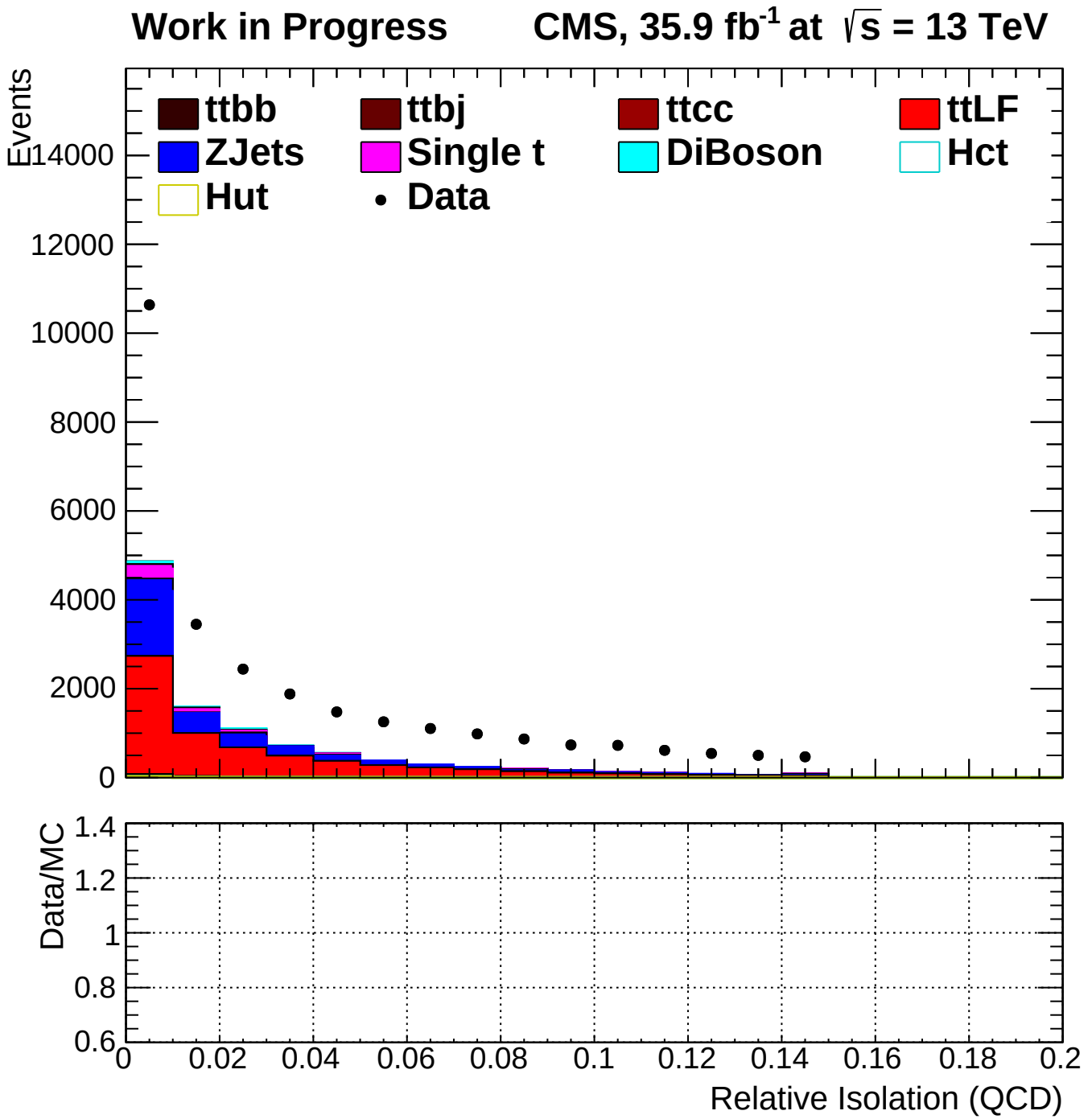

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
120
100
80
60
40
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

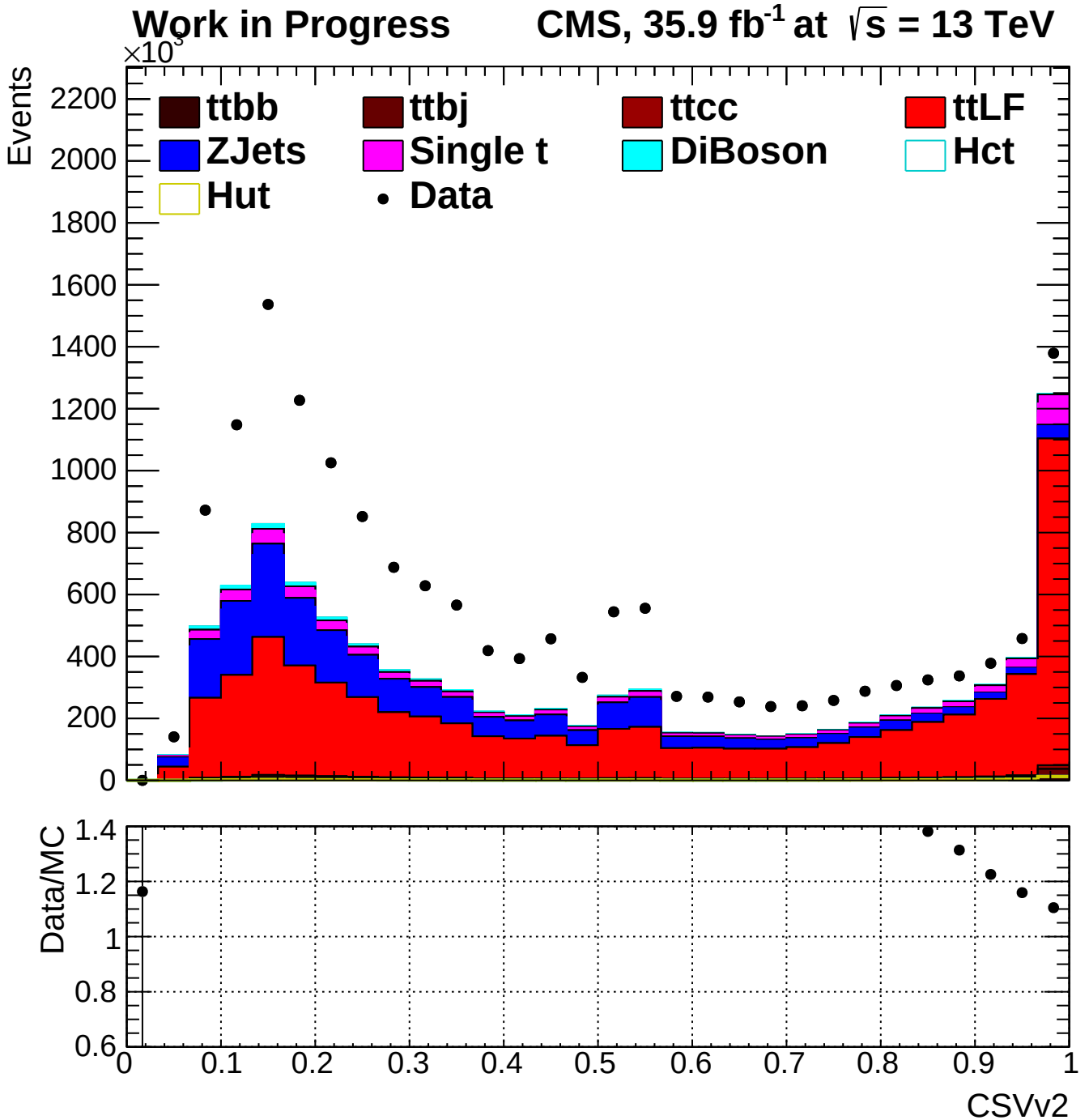

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
22000
20000
18000
16000
14000
12000
10000
8000
6000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

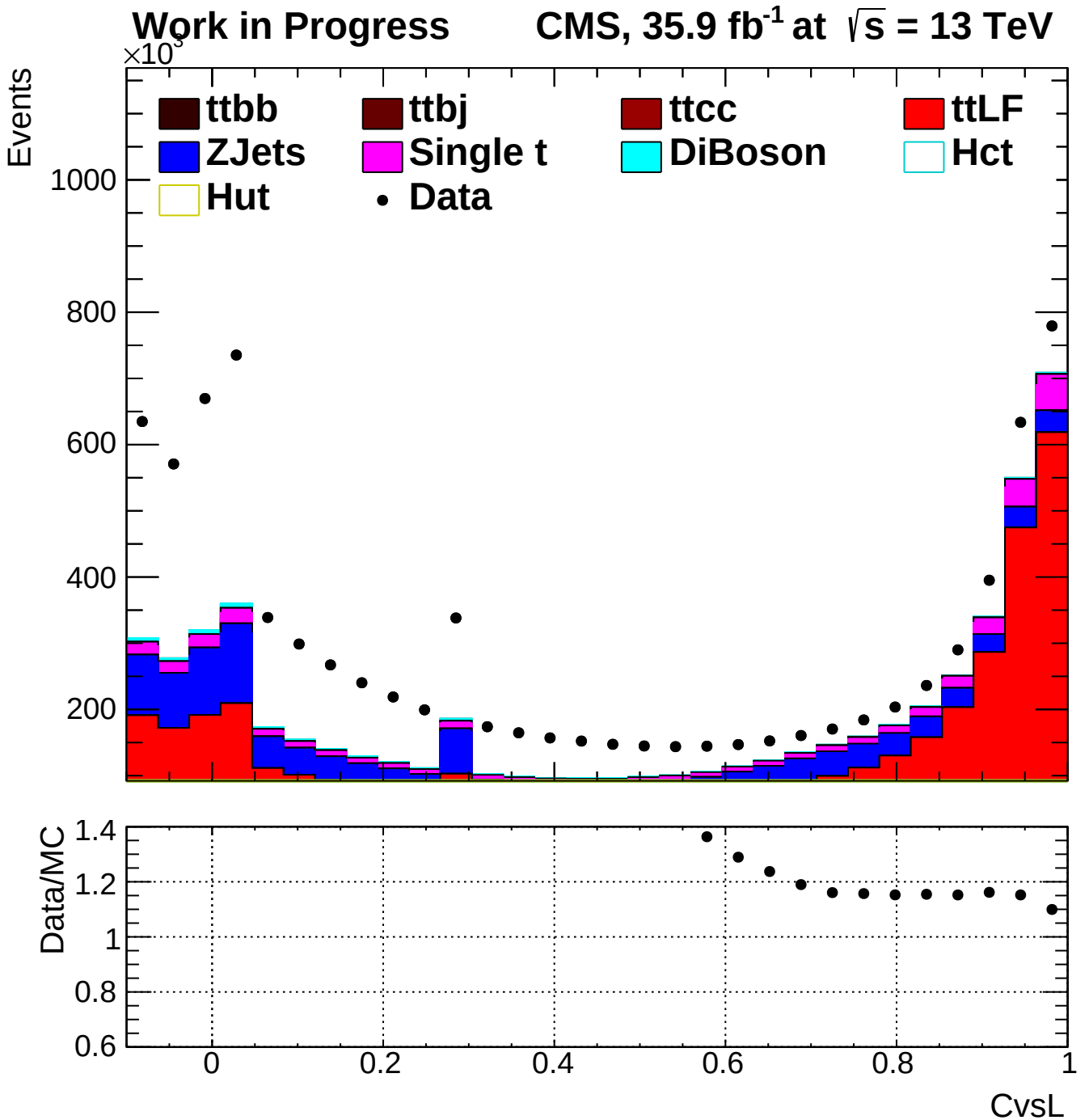

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

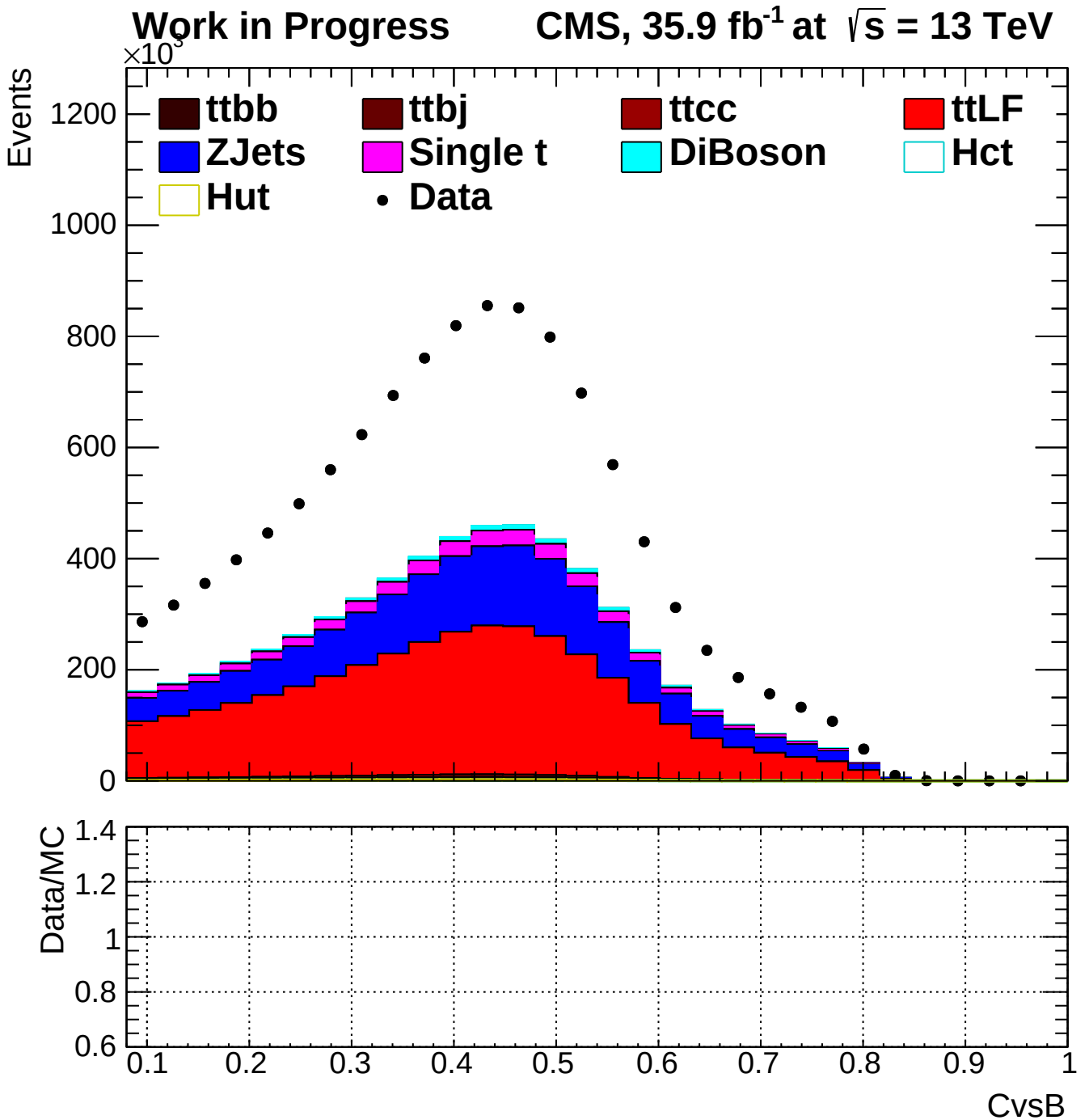

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R

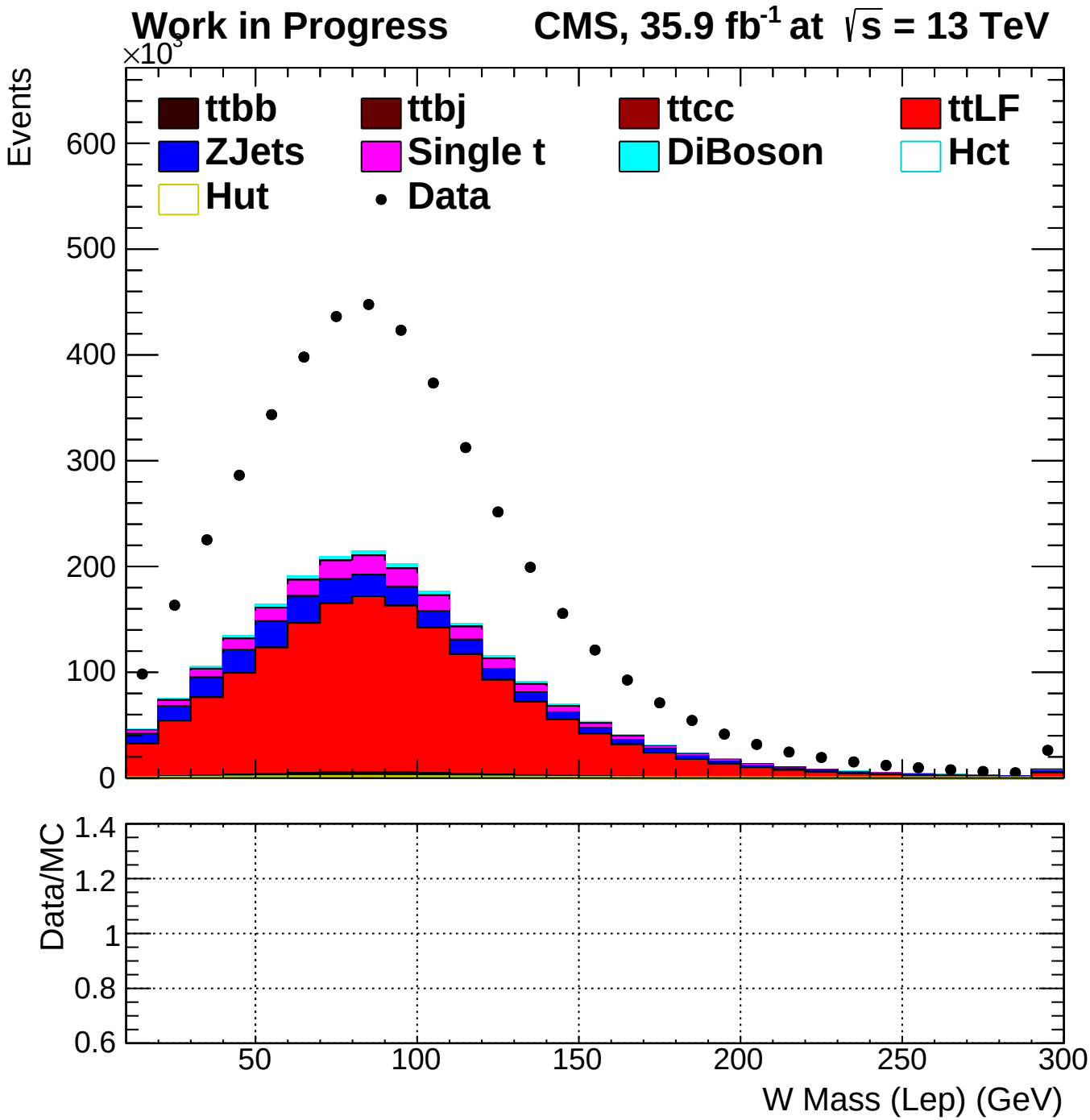

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation

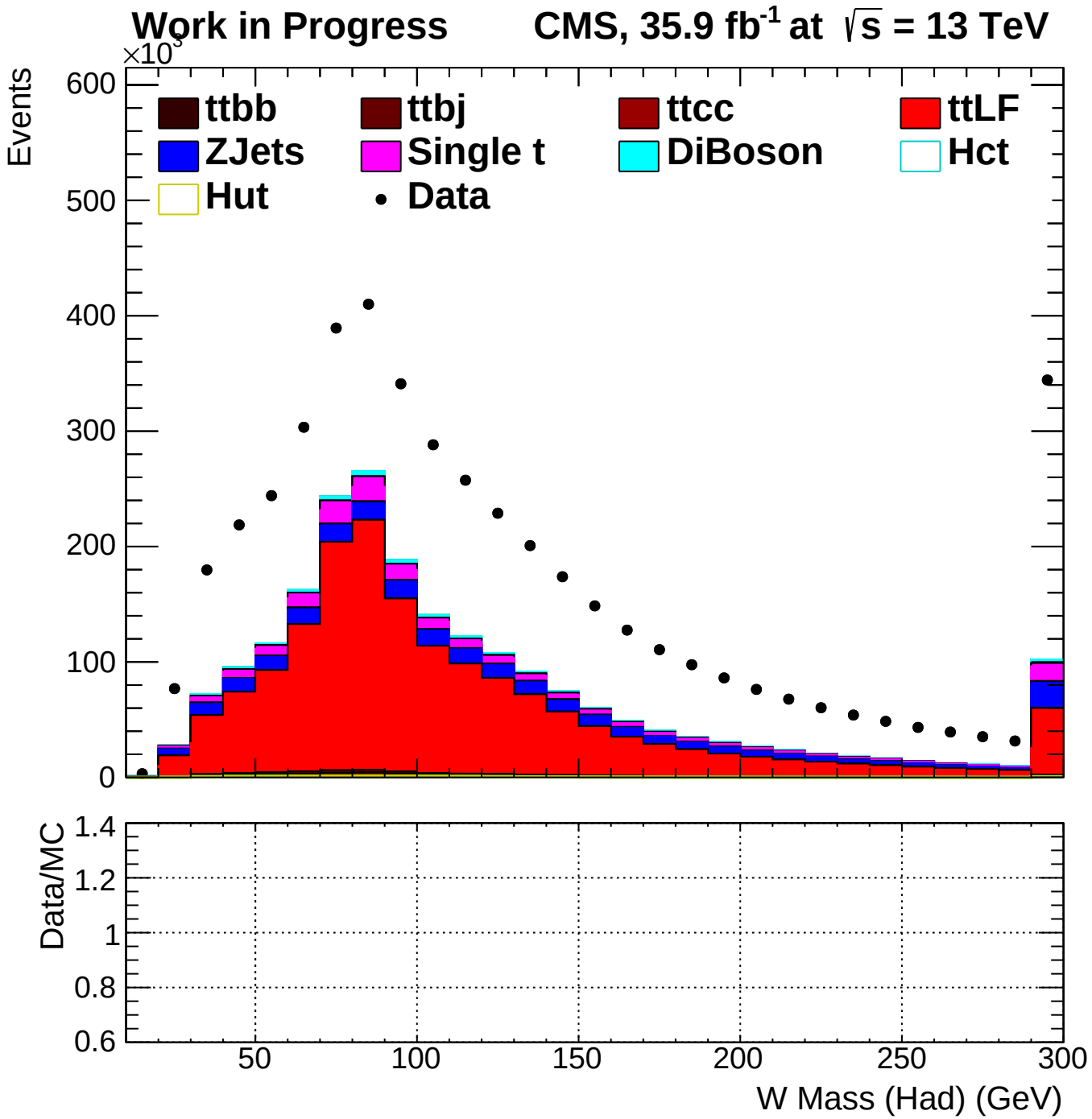

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

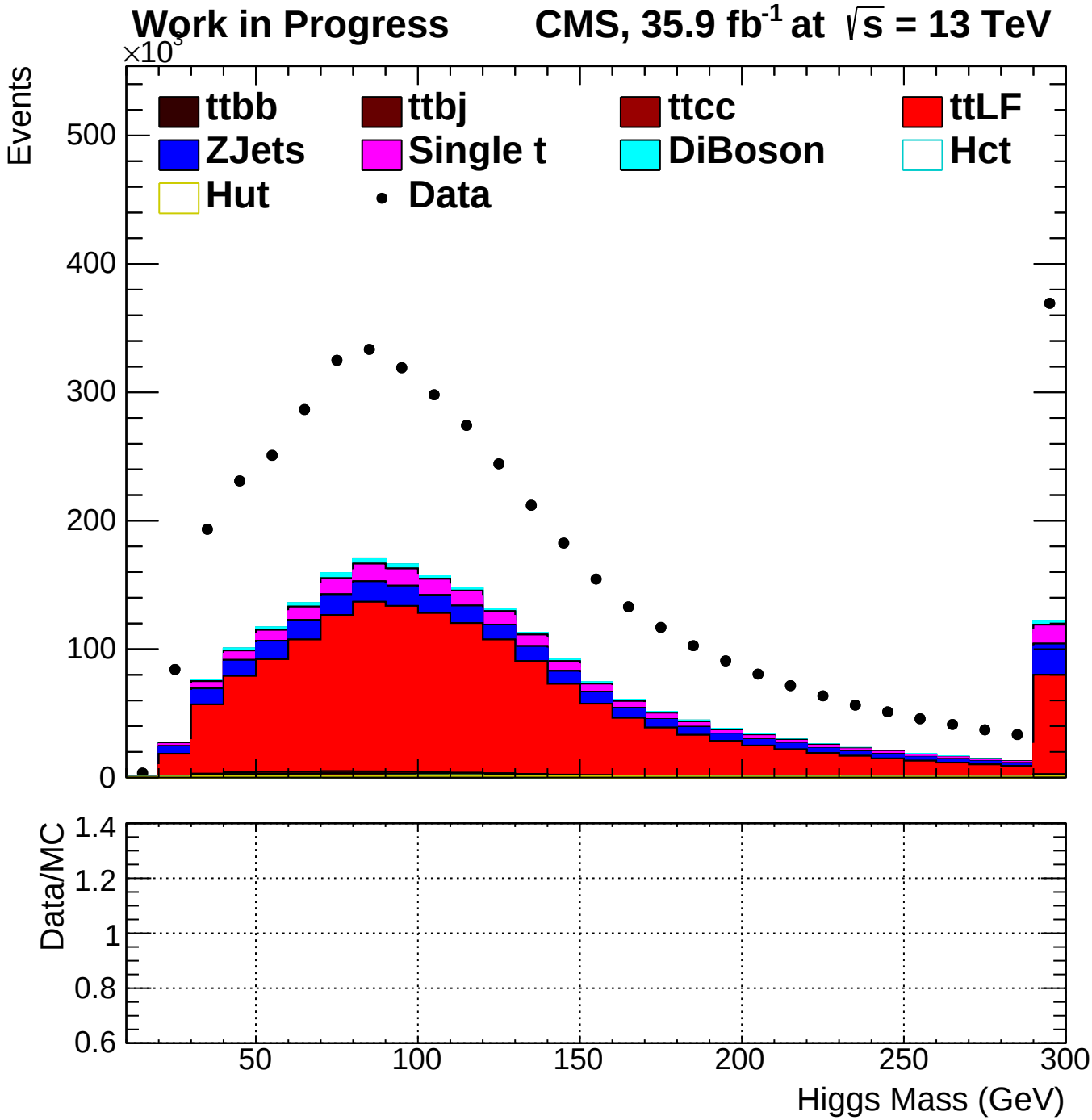

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2

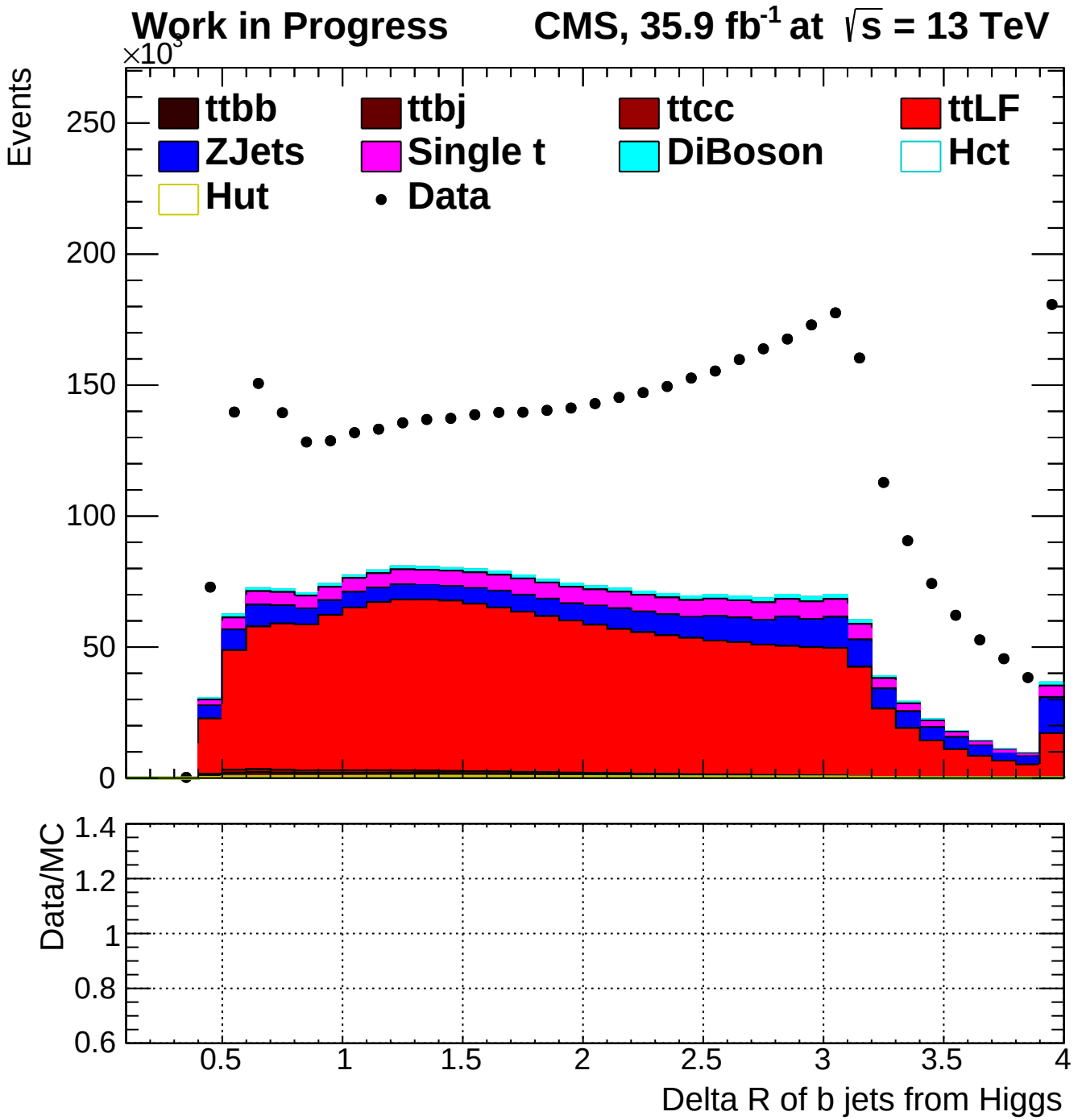

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

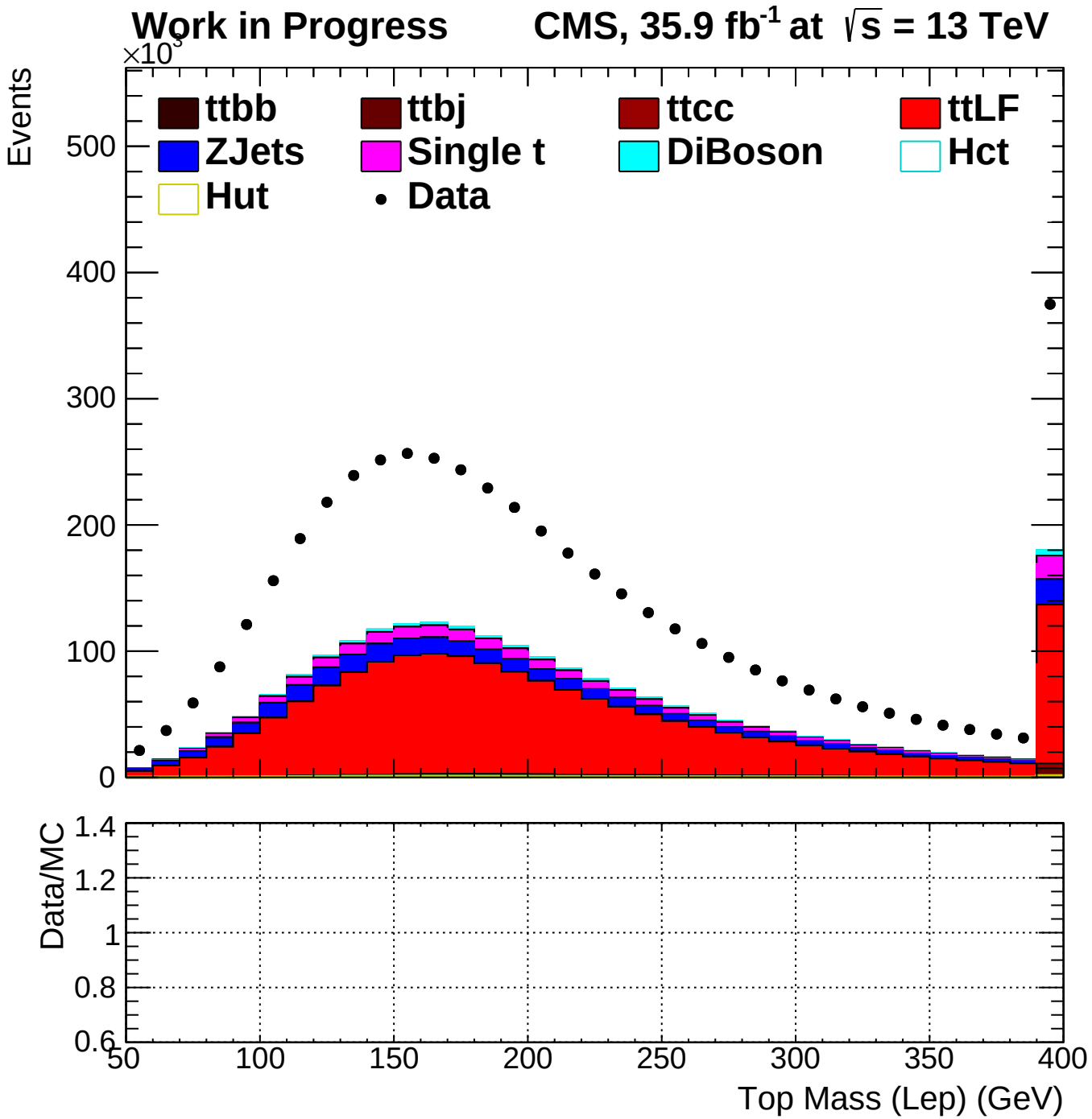

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB

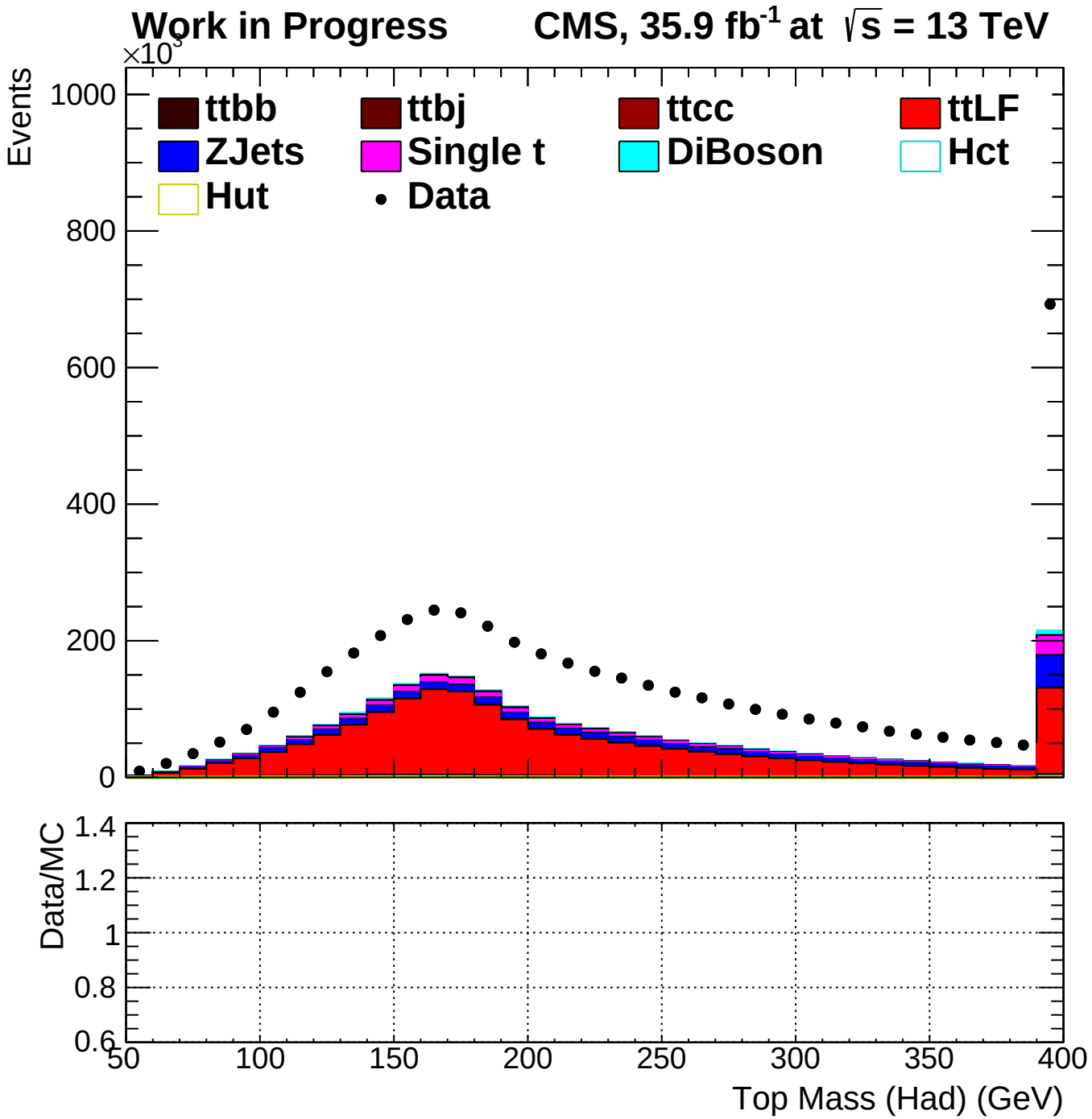

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

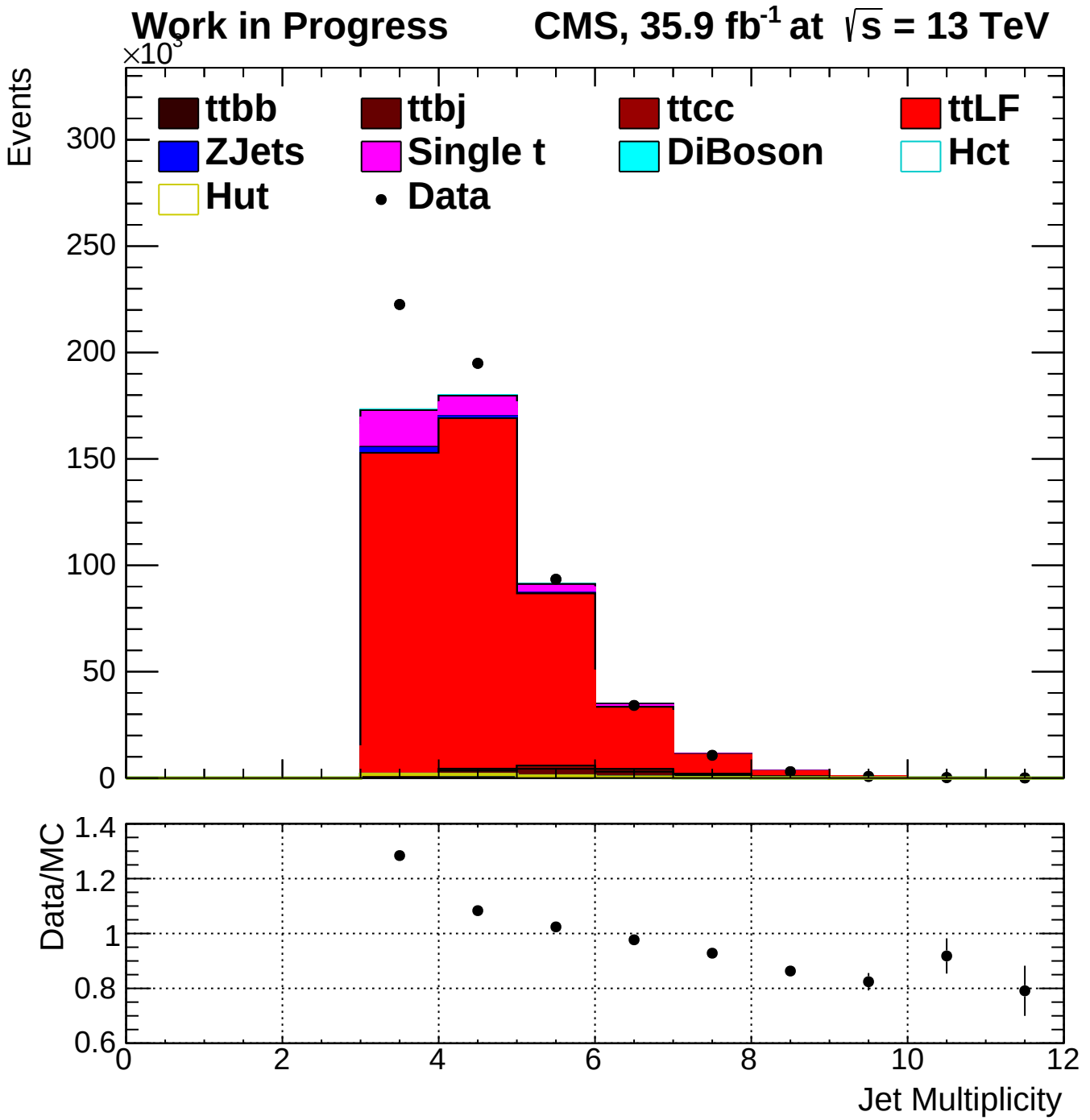

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

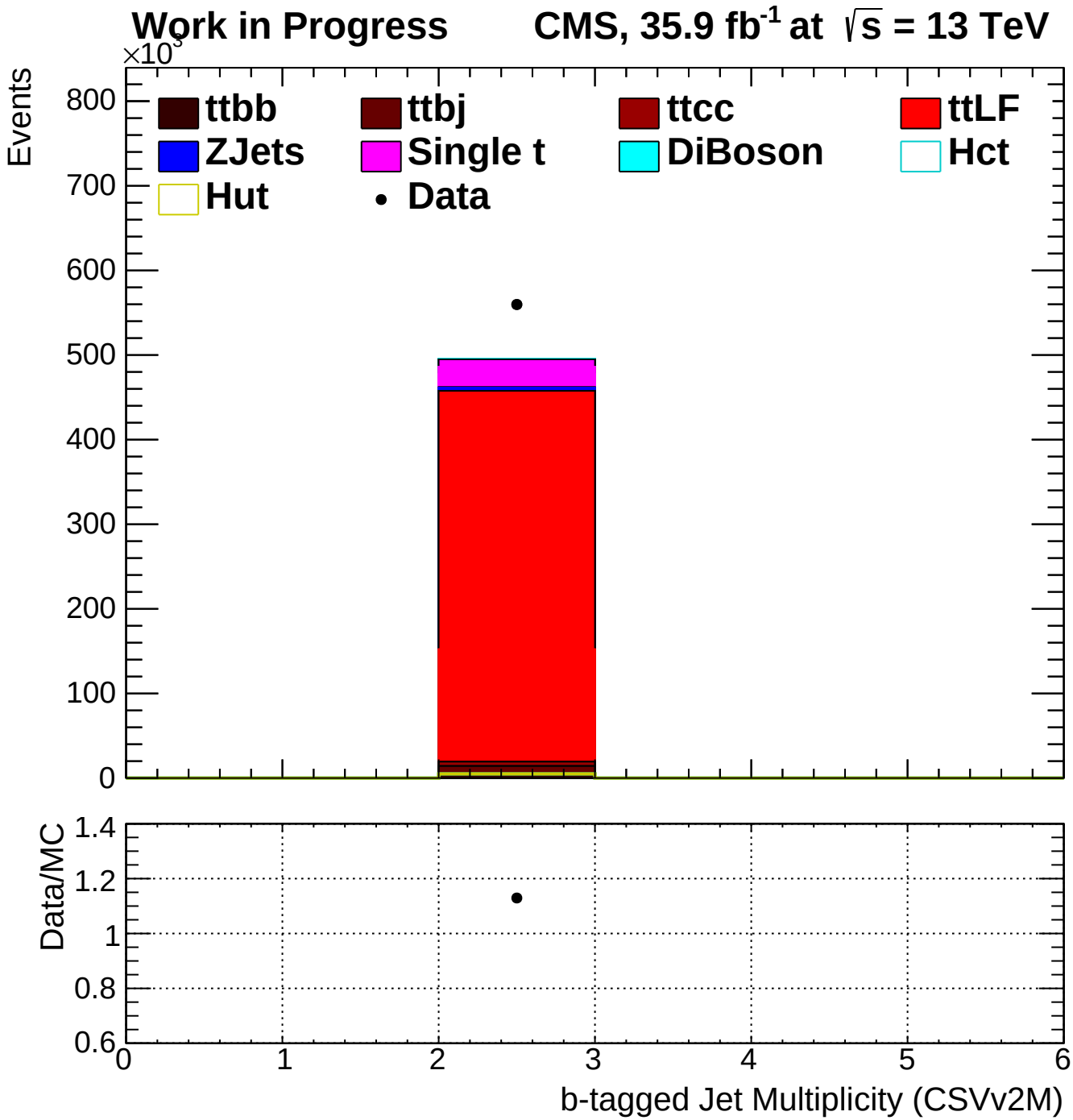

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

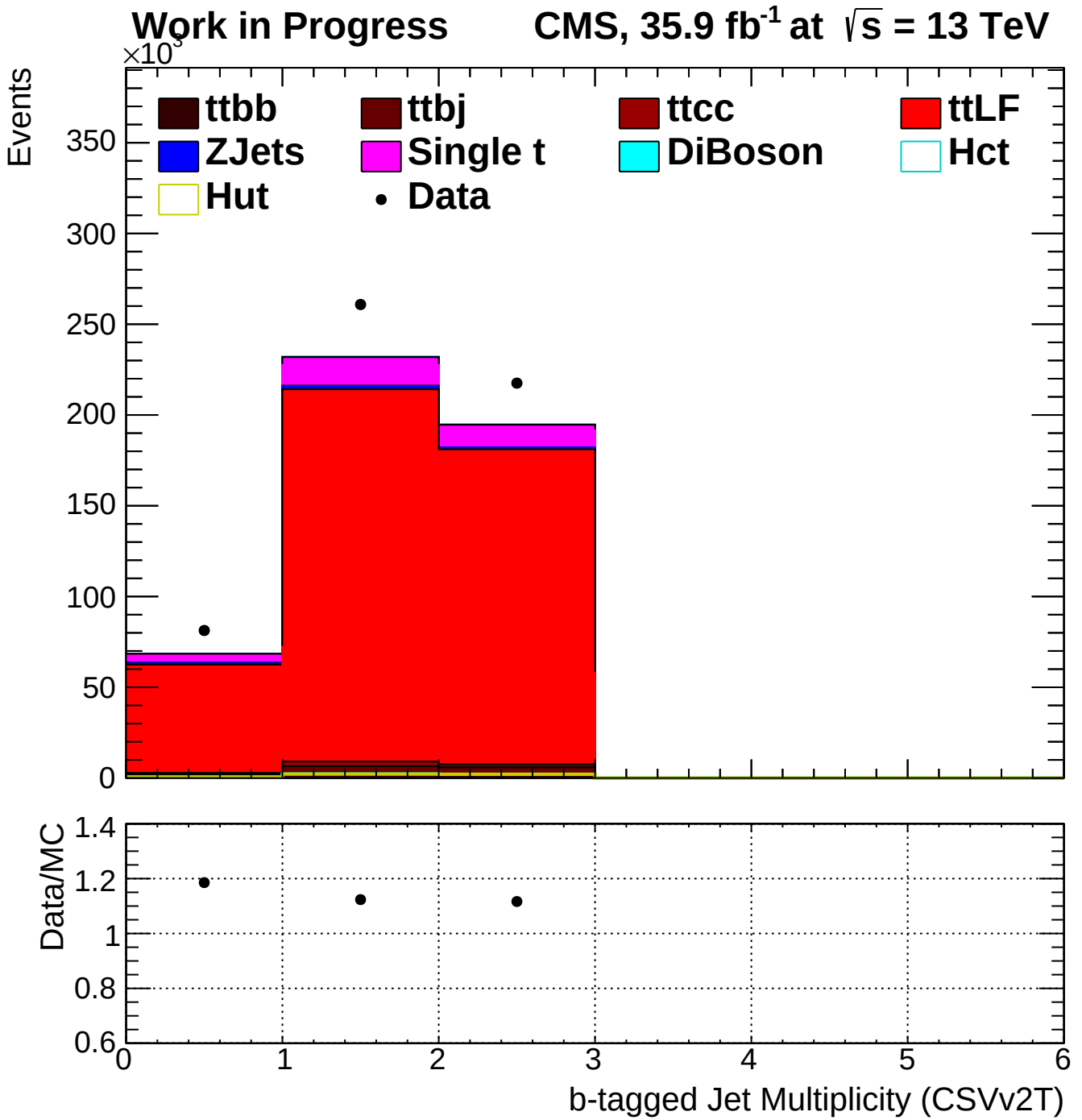

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs

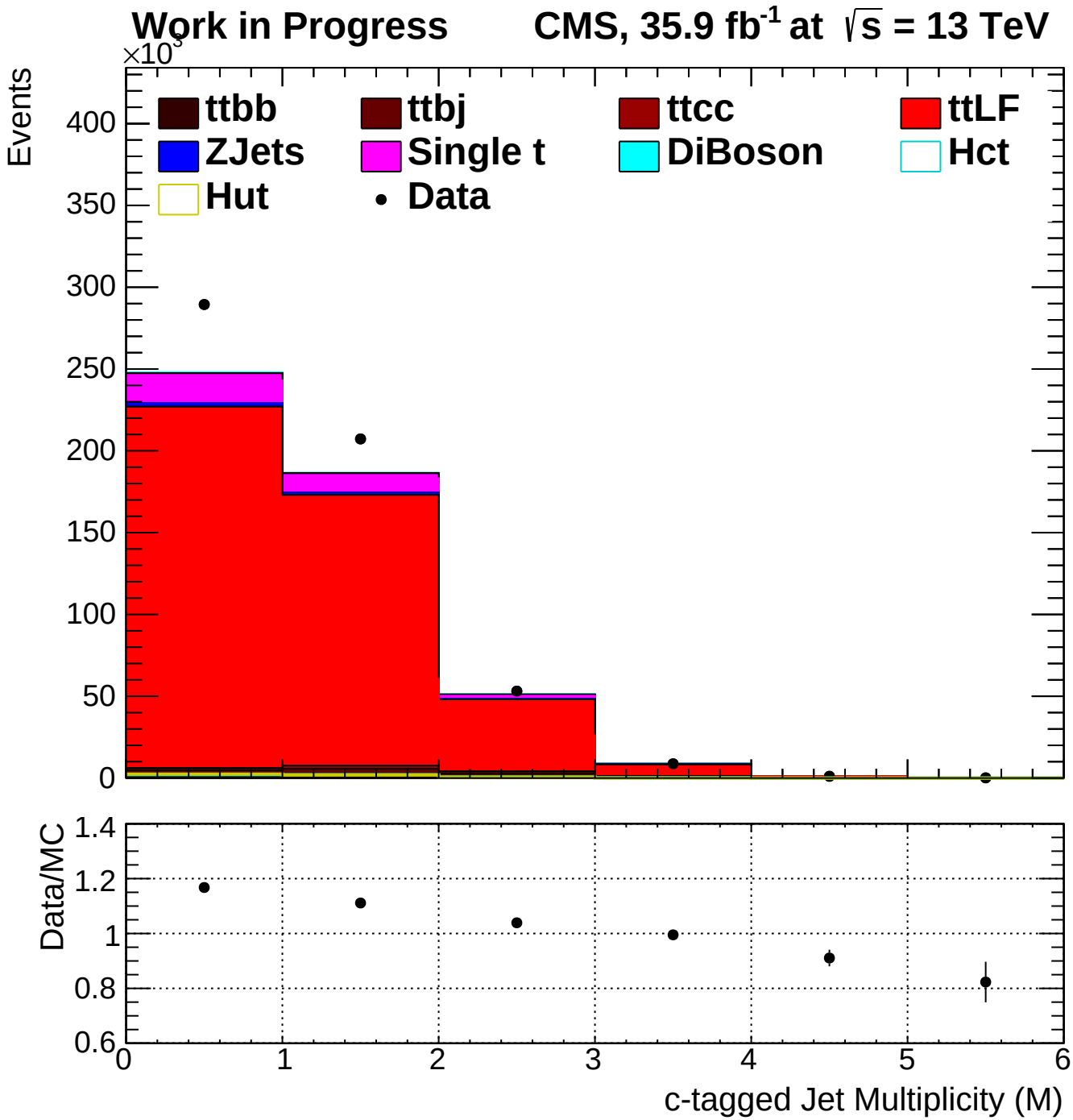

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)

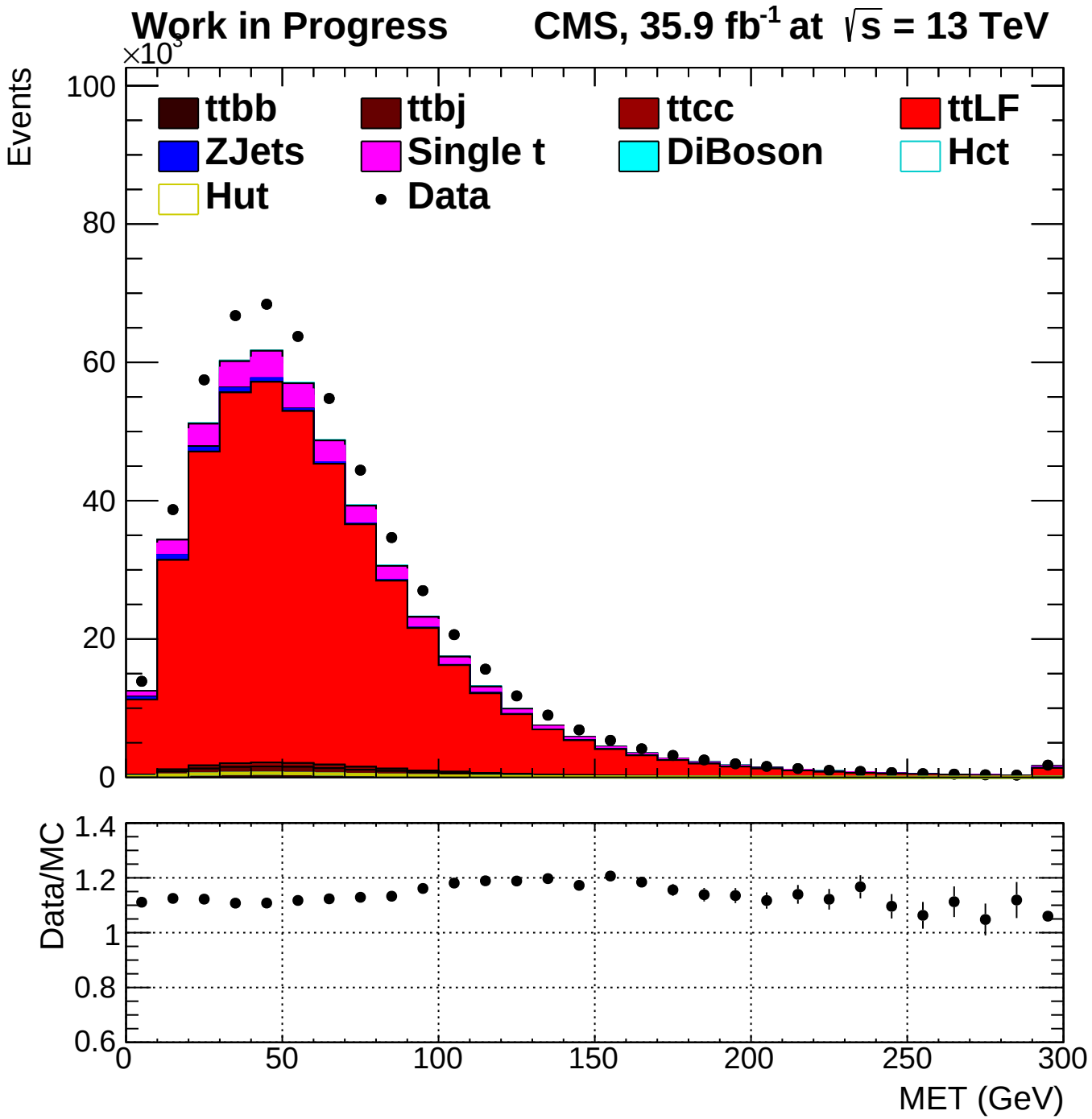

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

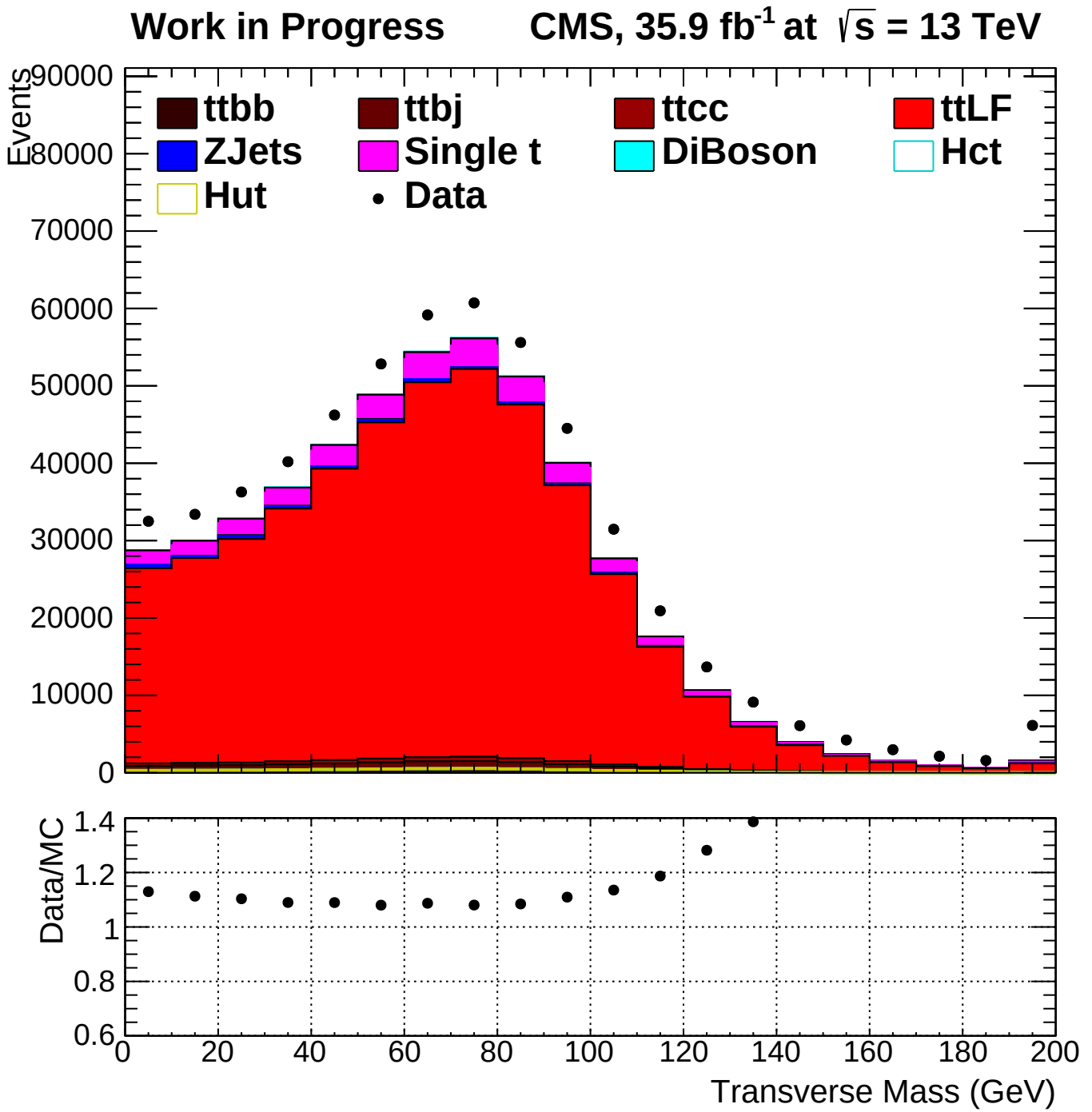

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity

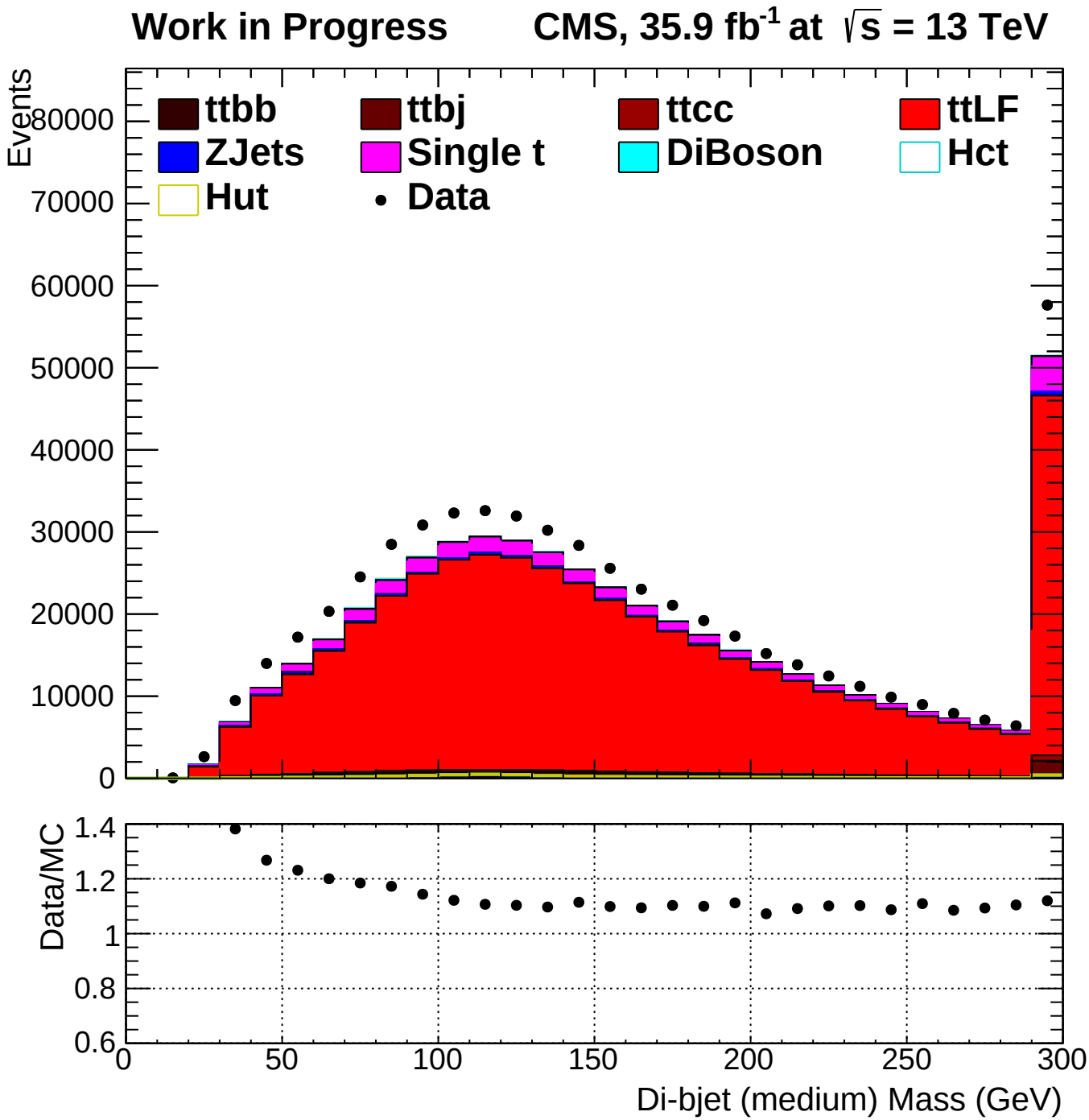

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
800
700
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

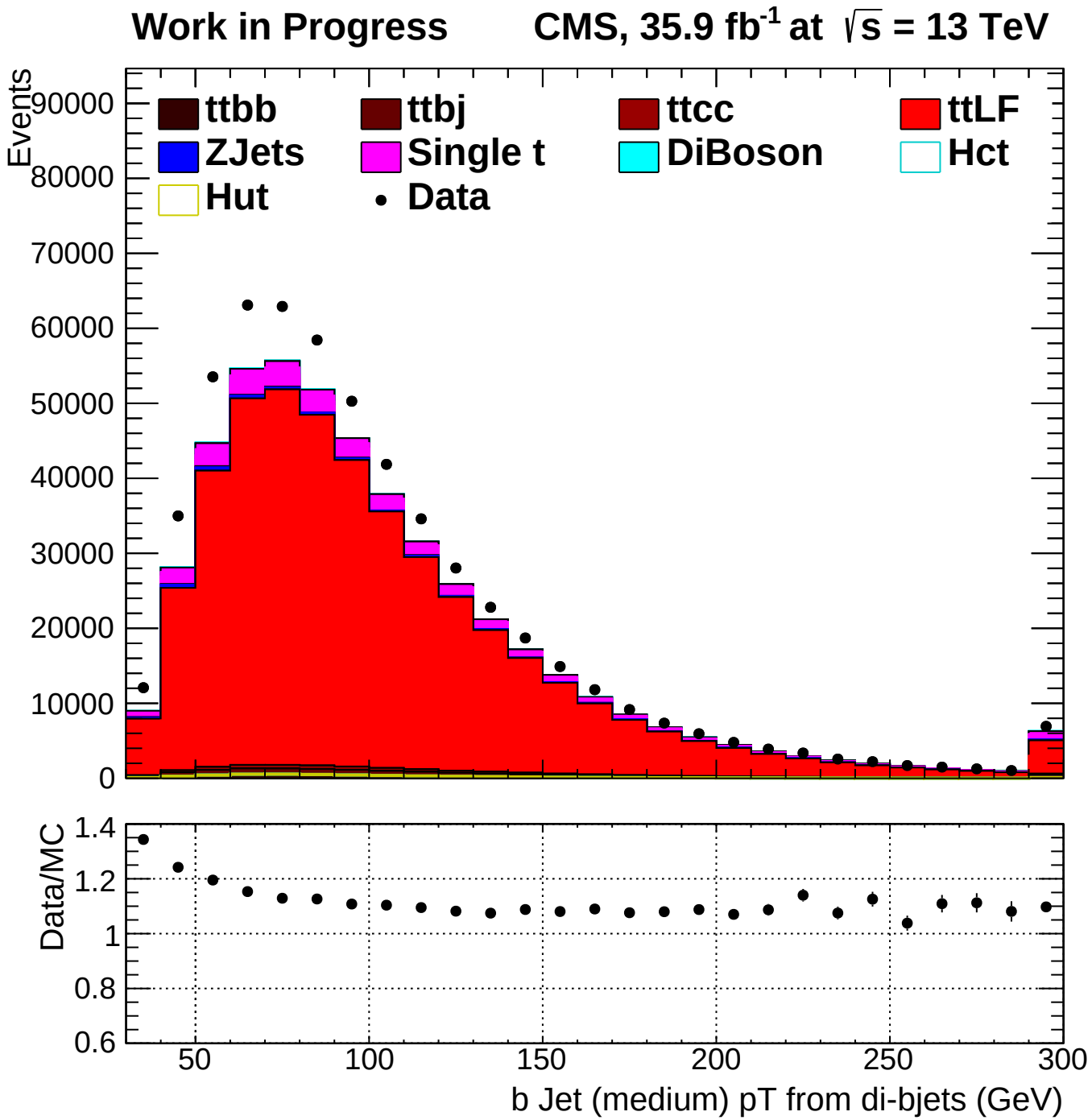

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
350
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

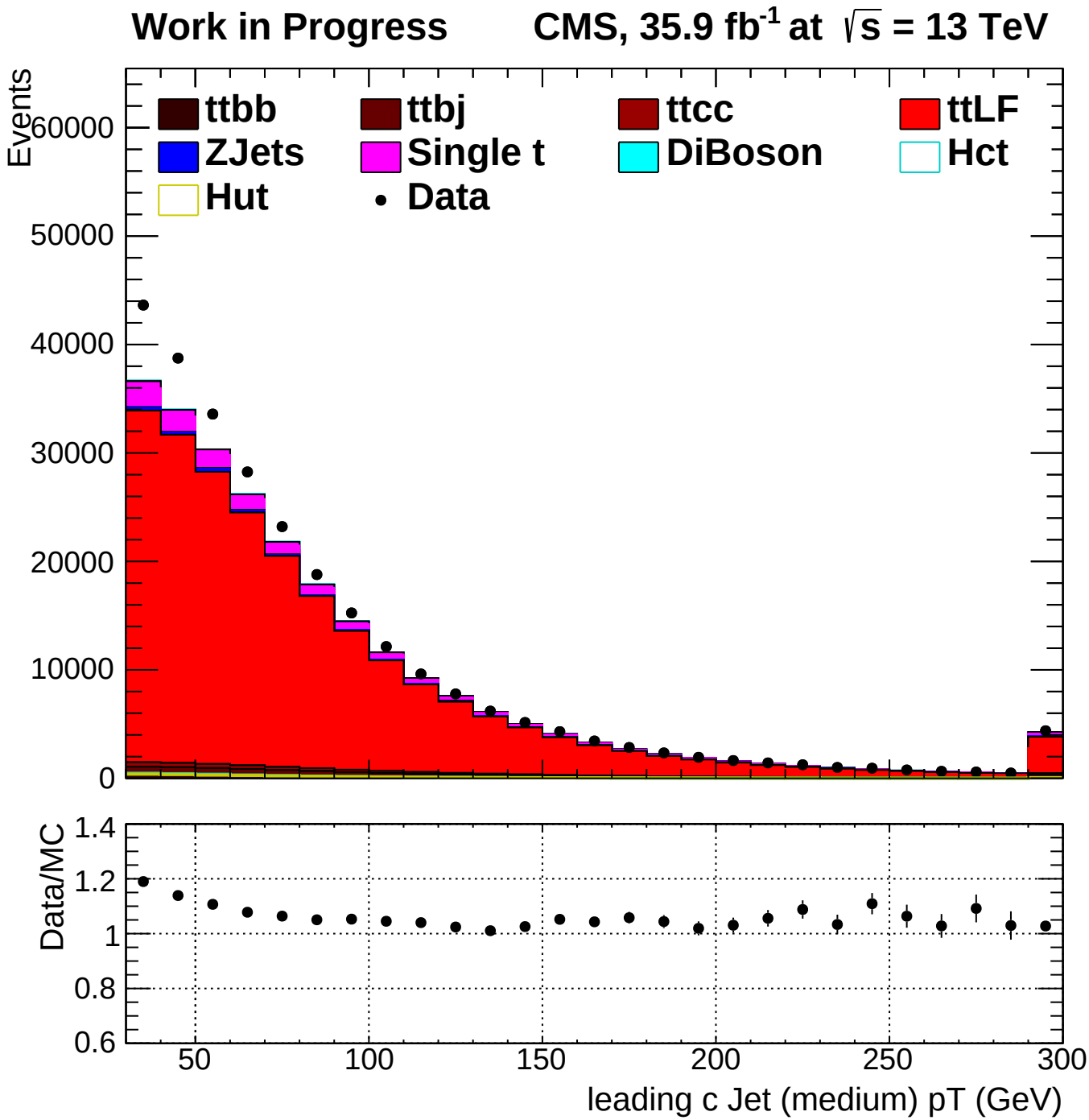

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
400
350
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

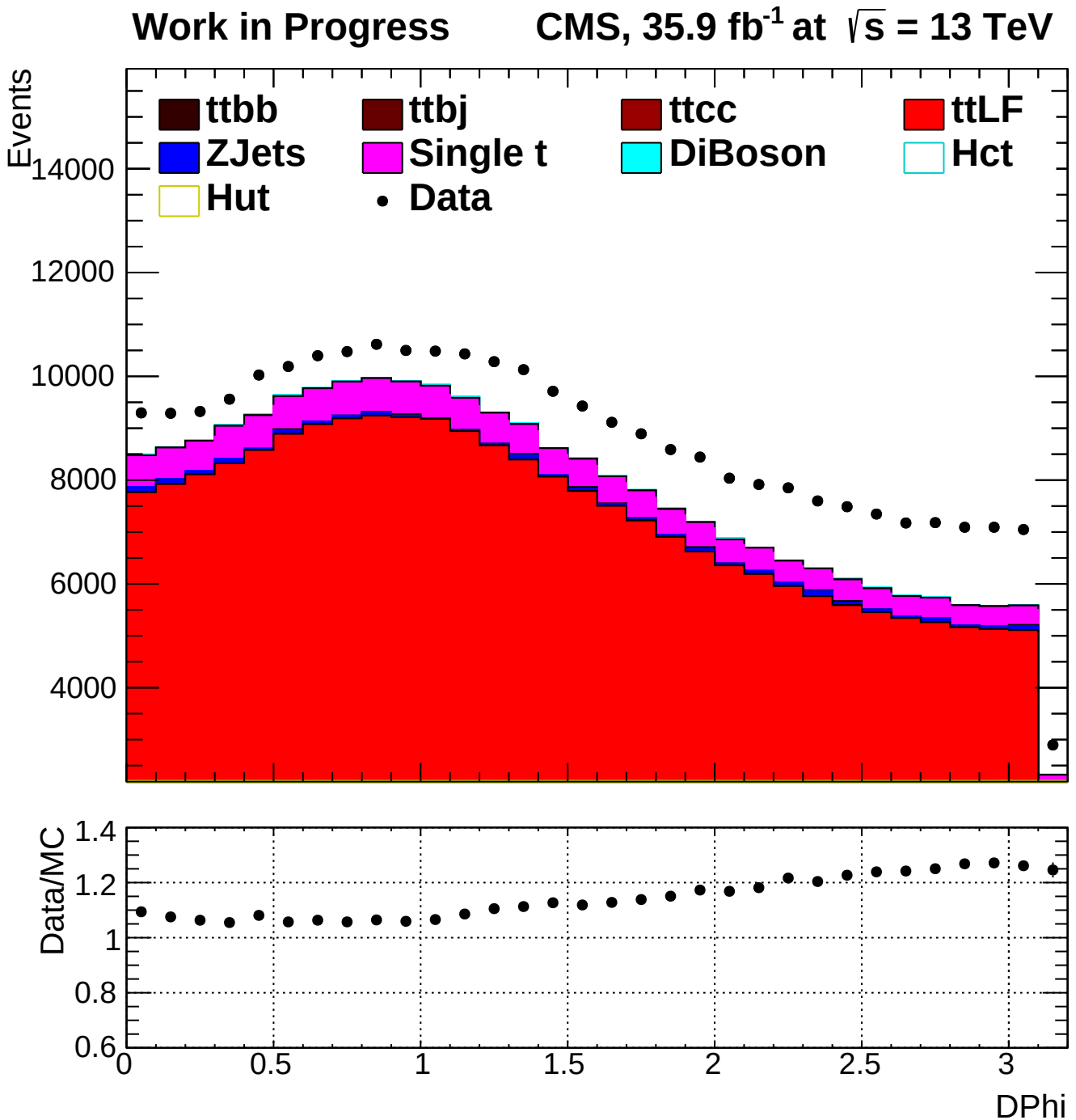

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

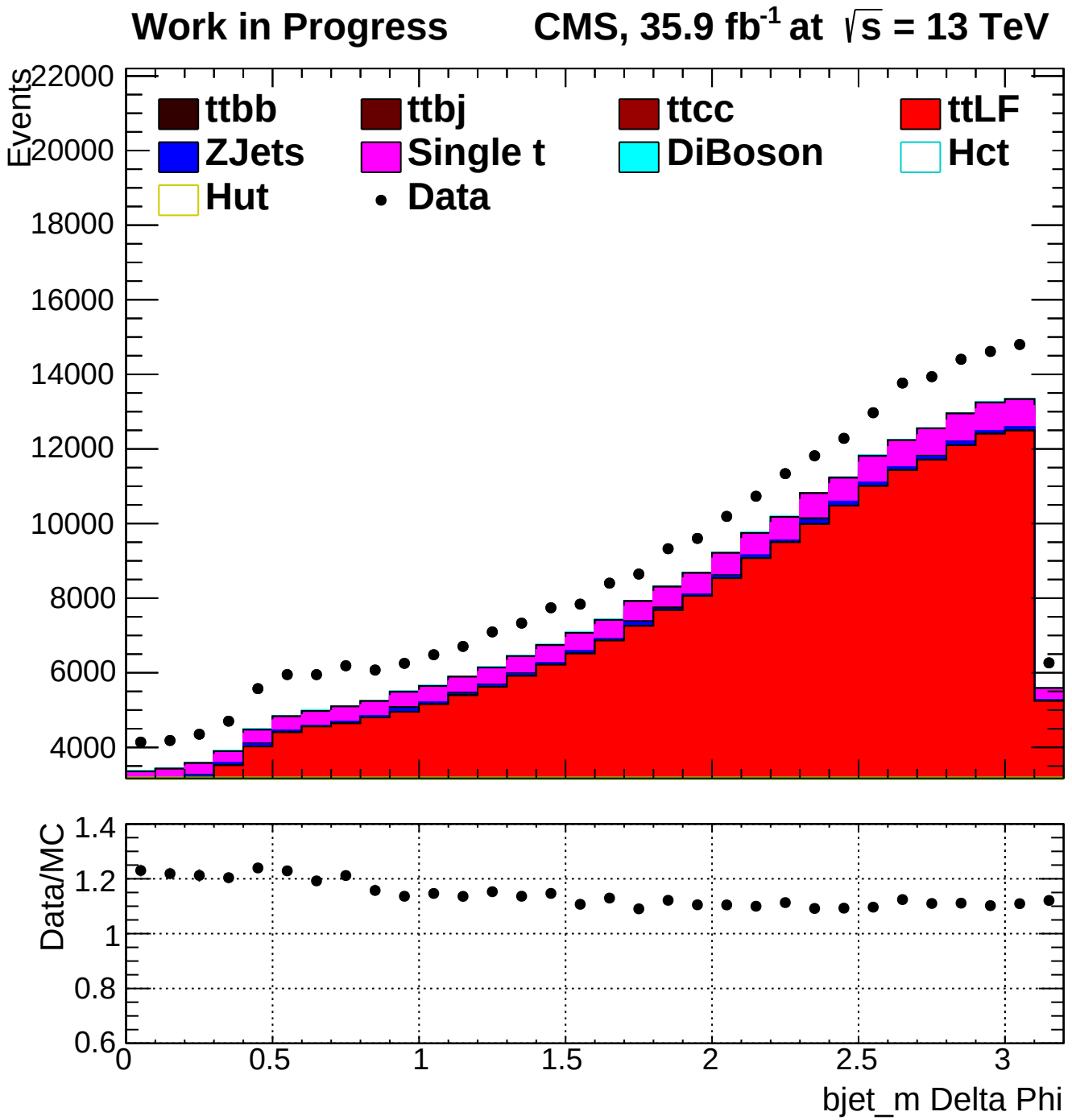

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

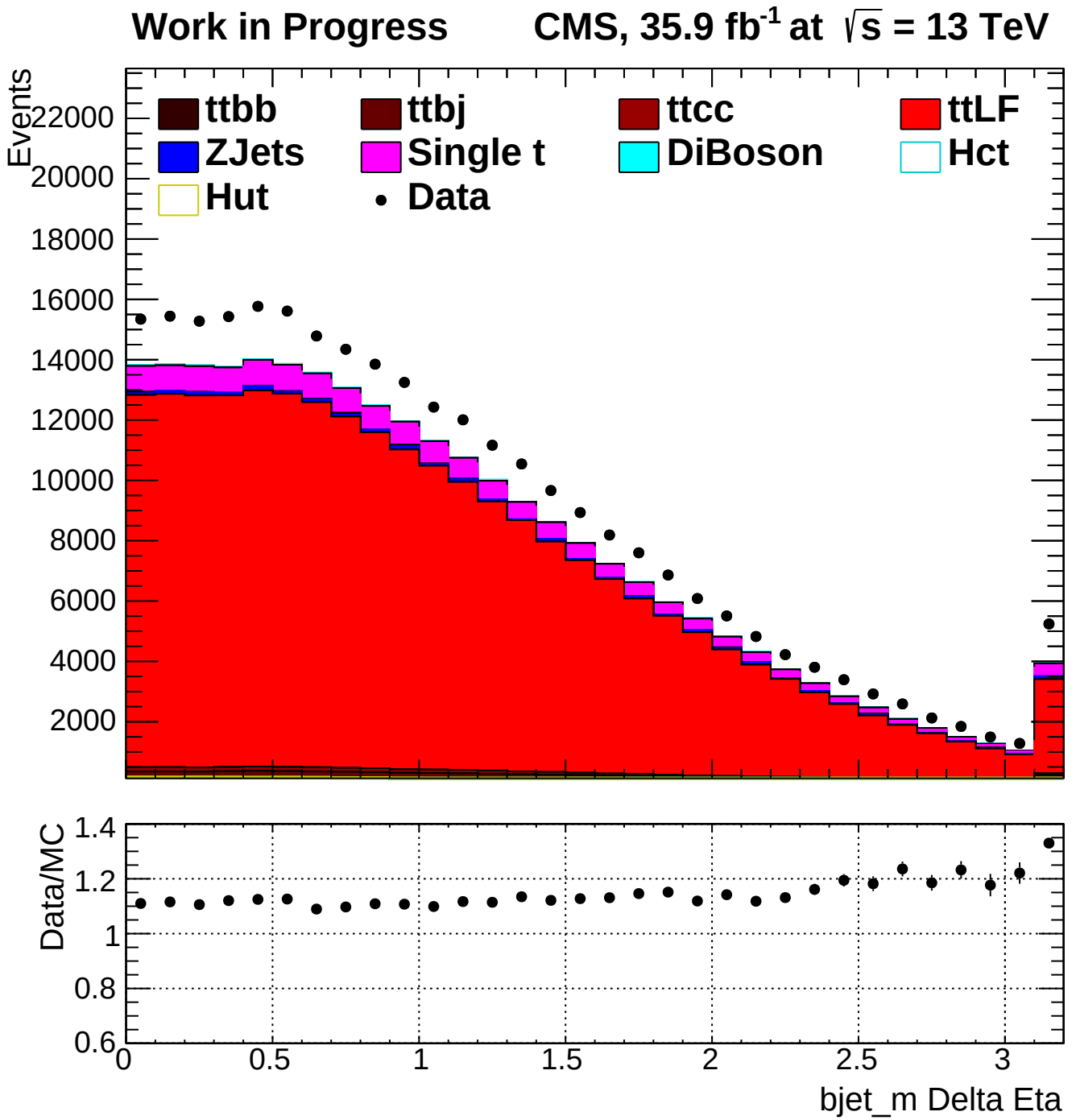

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

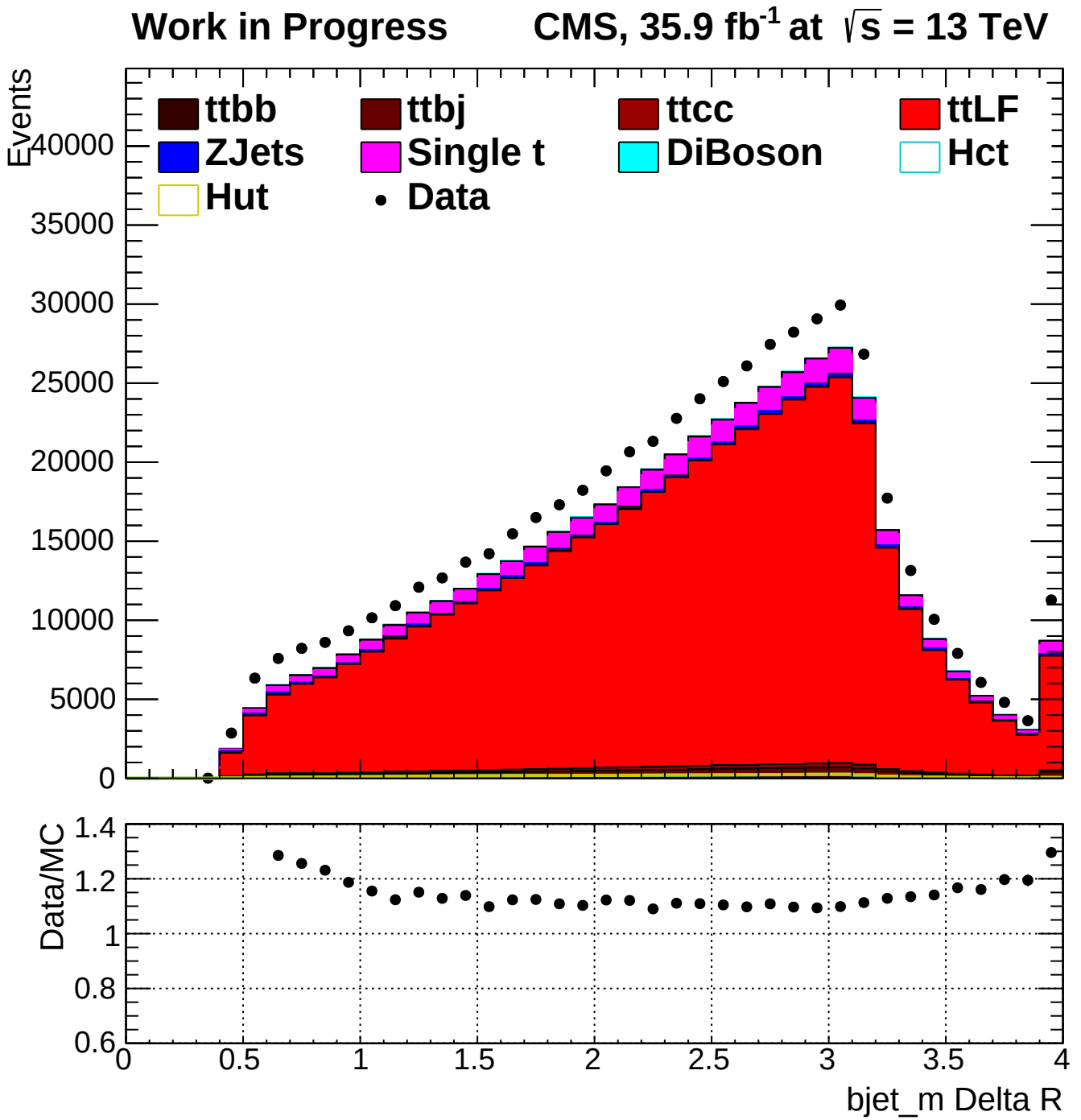

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

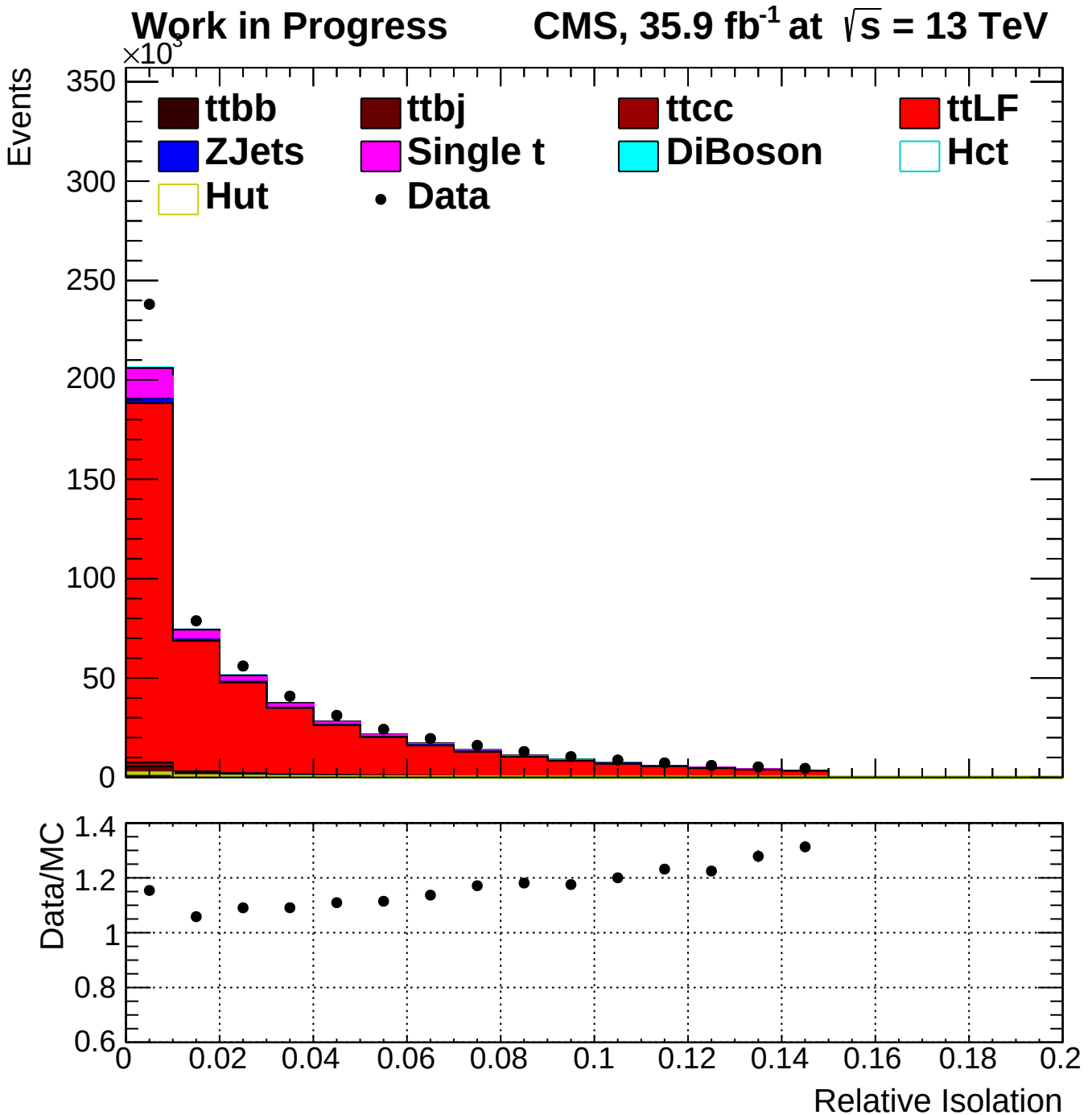

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

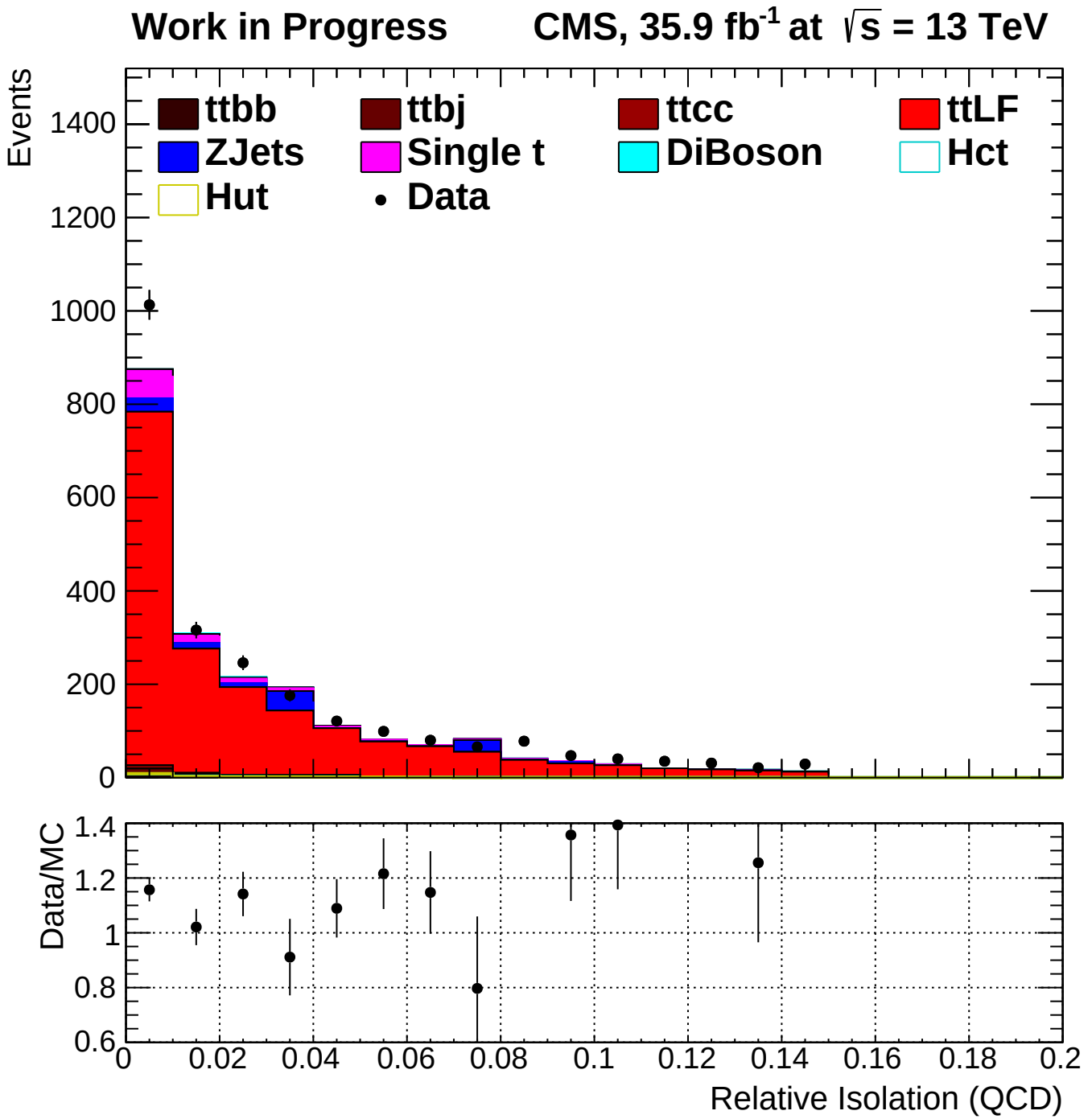

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
14000
12000
10000
8000
6000
4000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

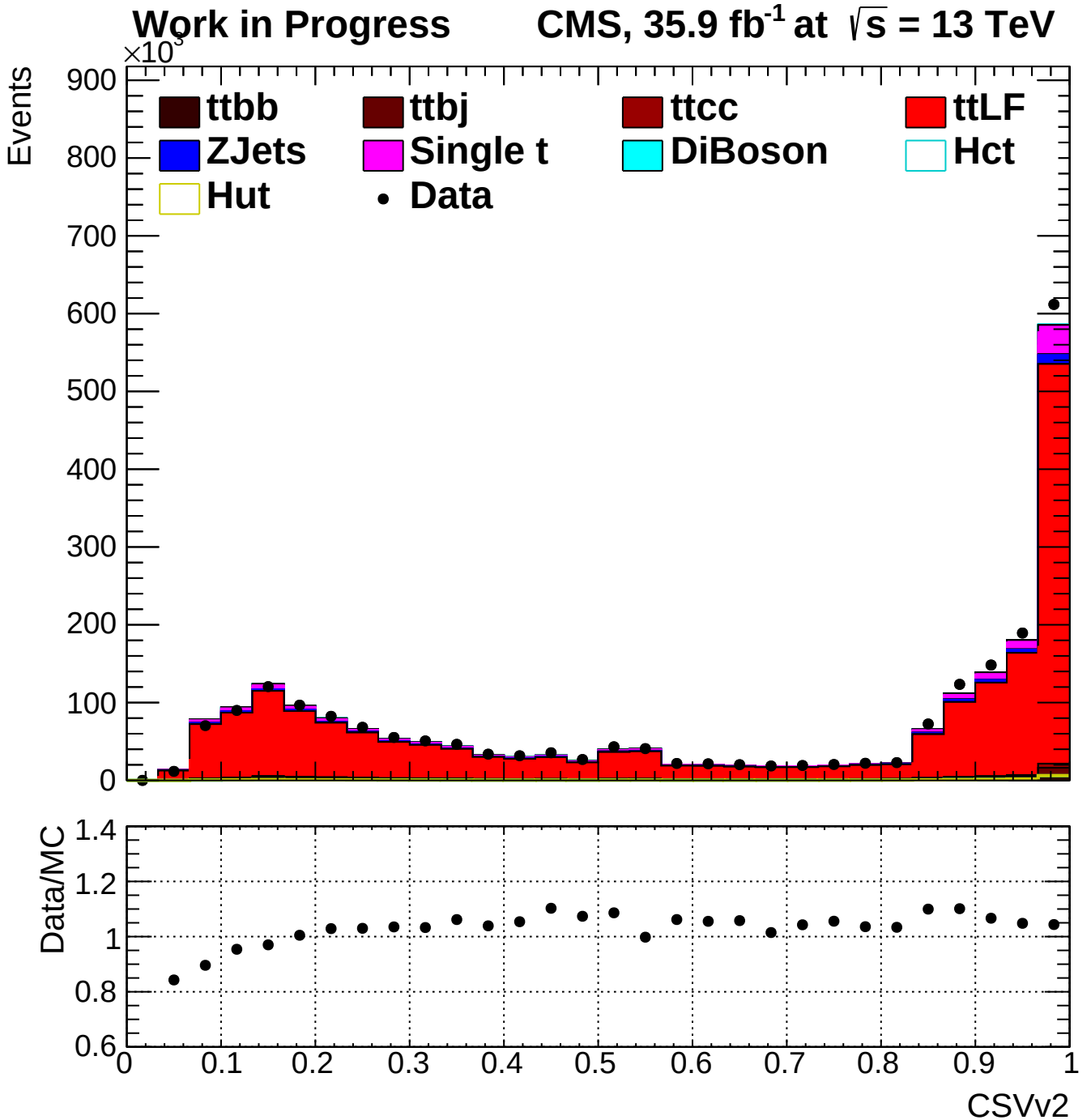

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

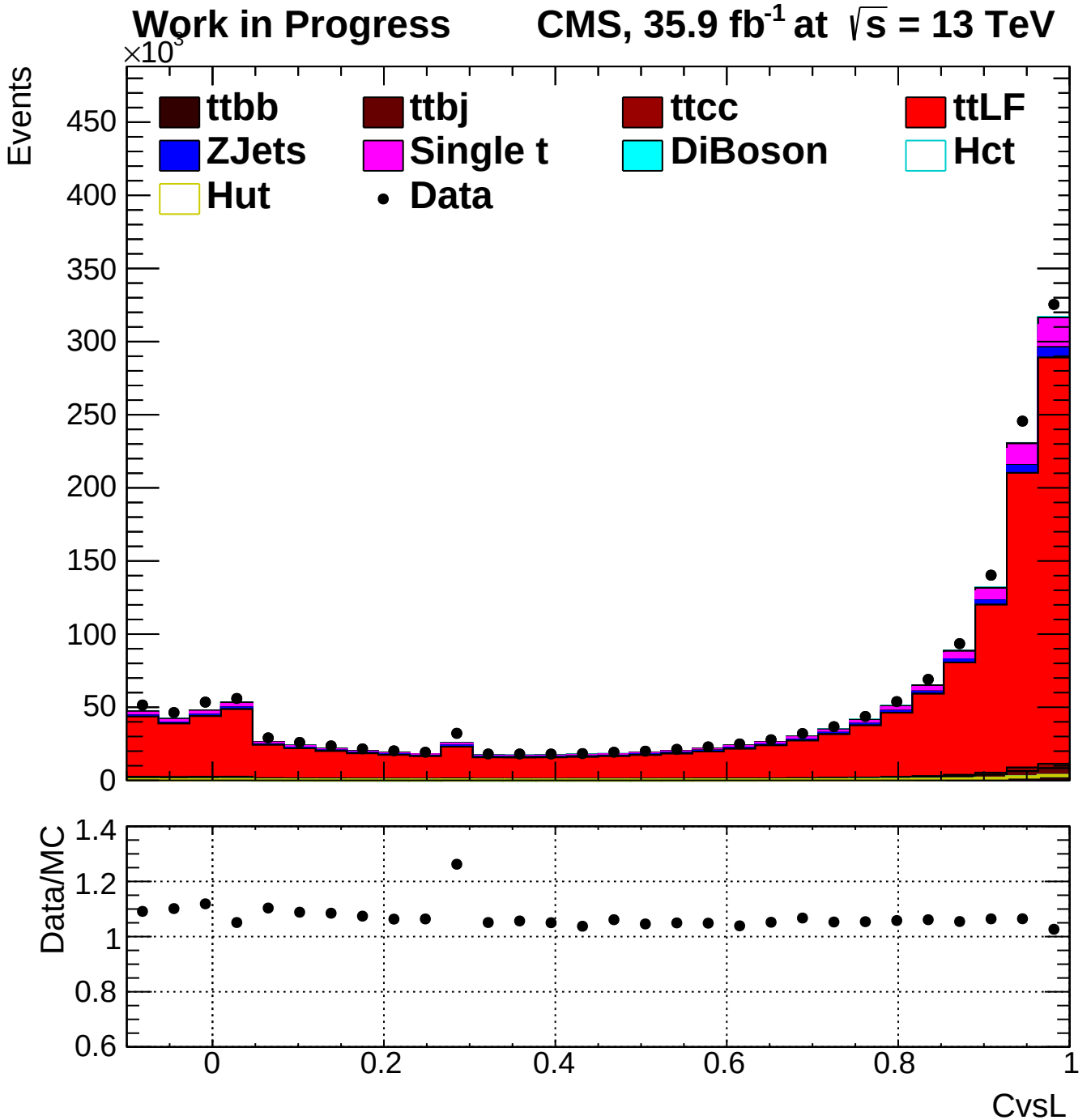

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

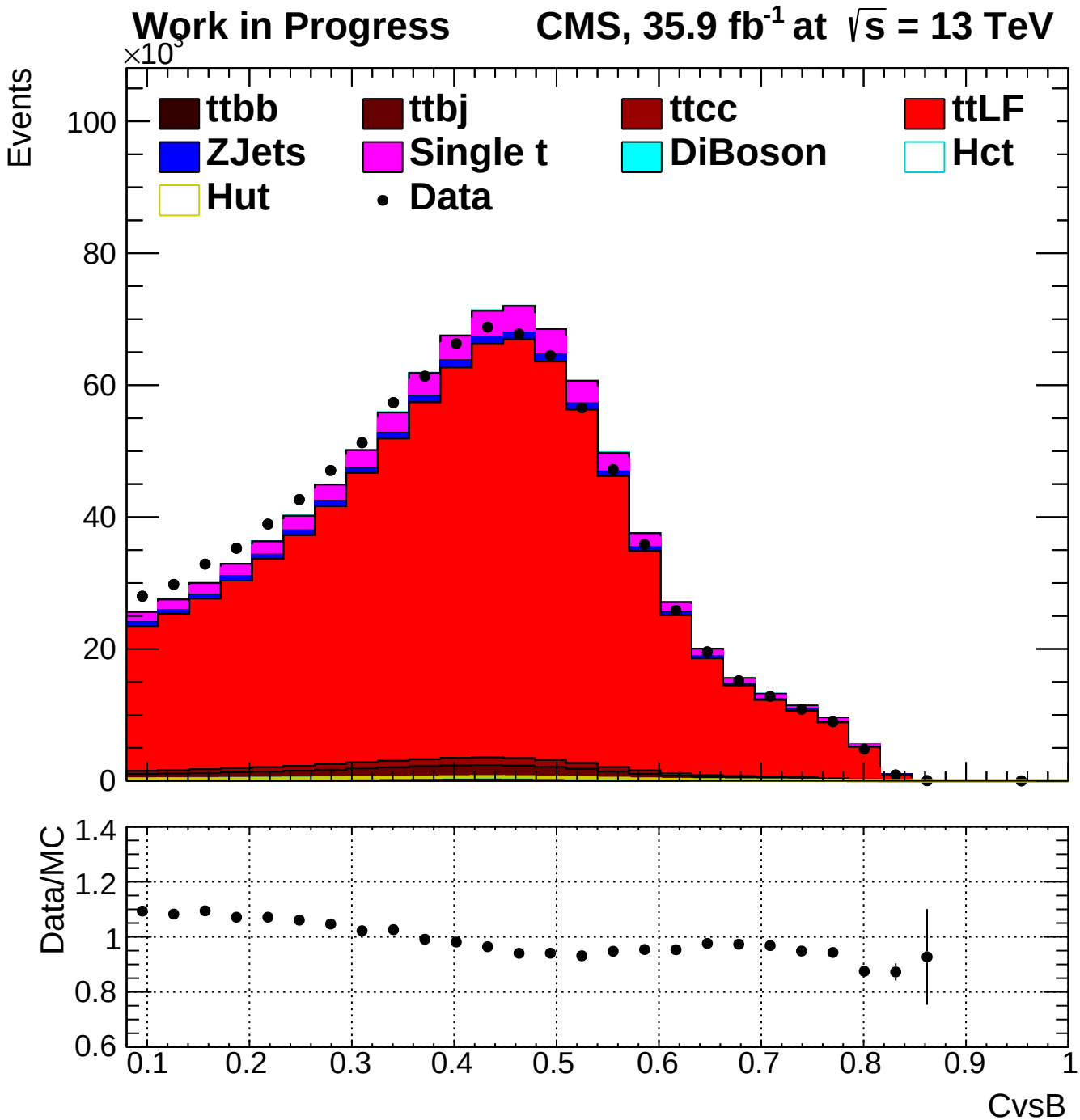

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

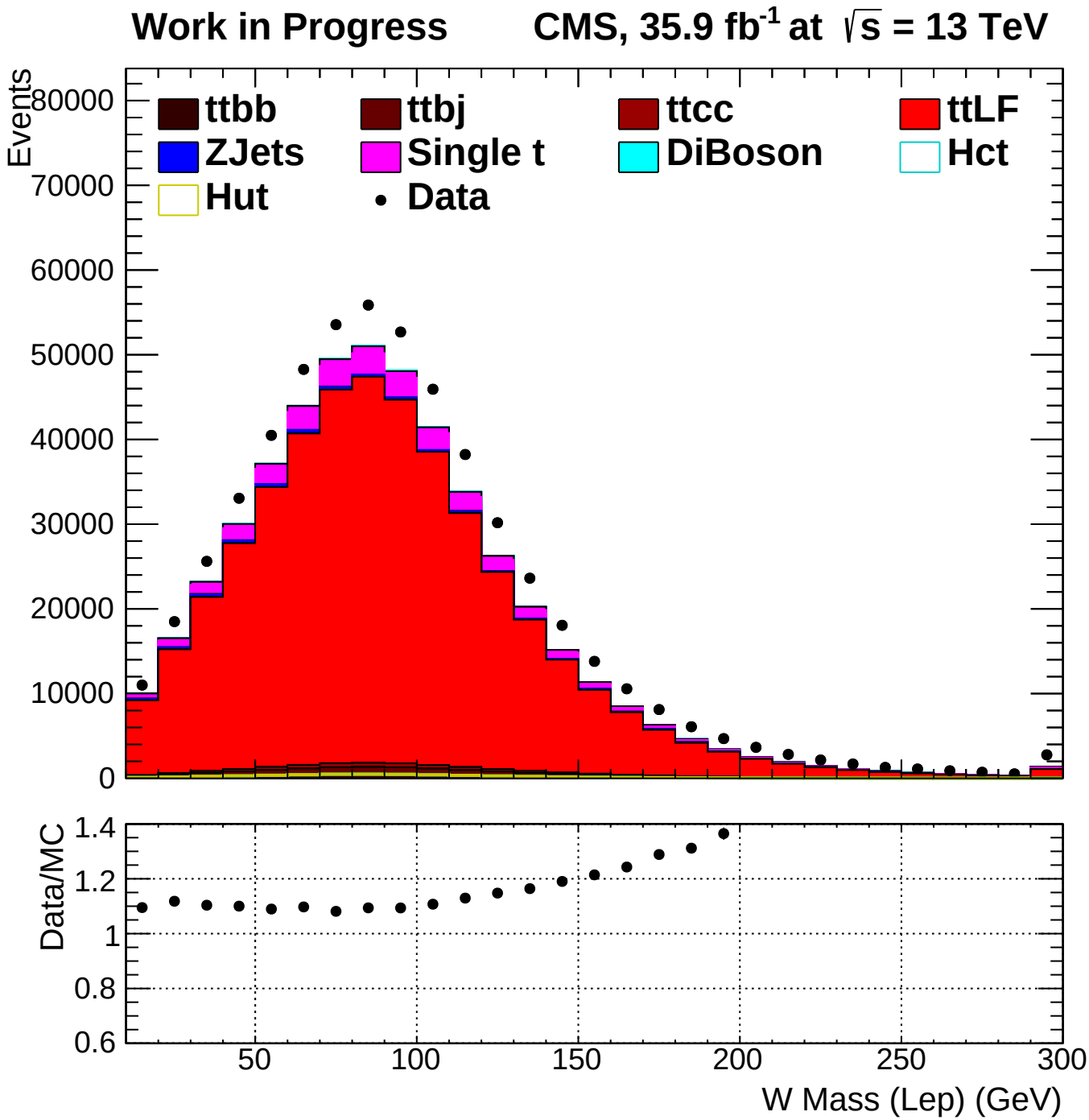

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation

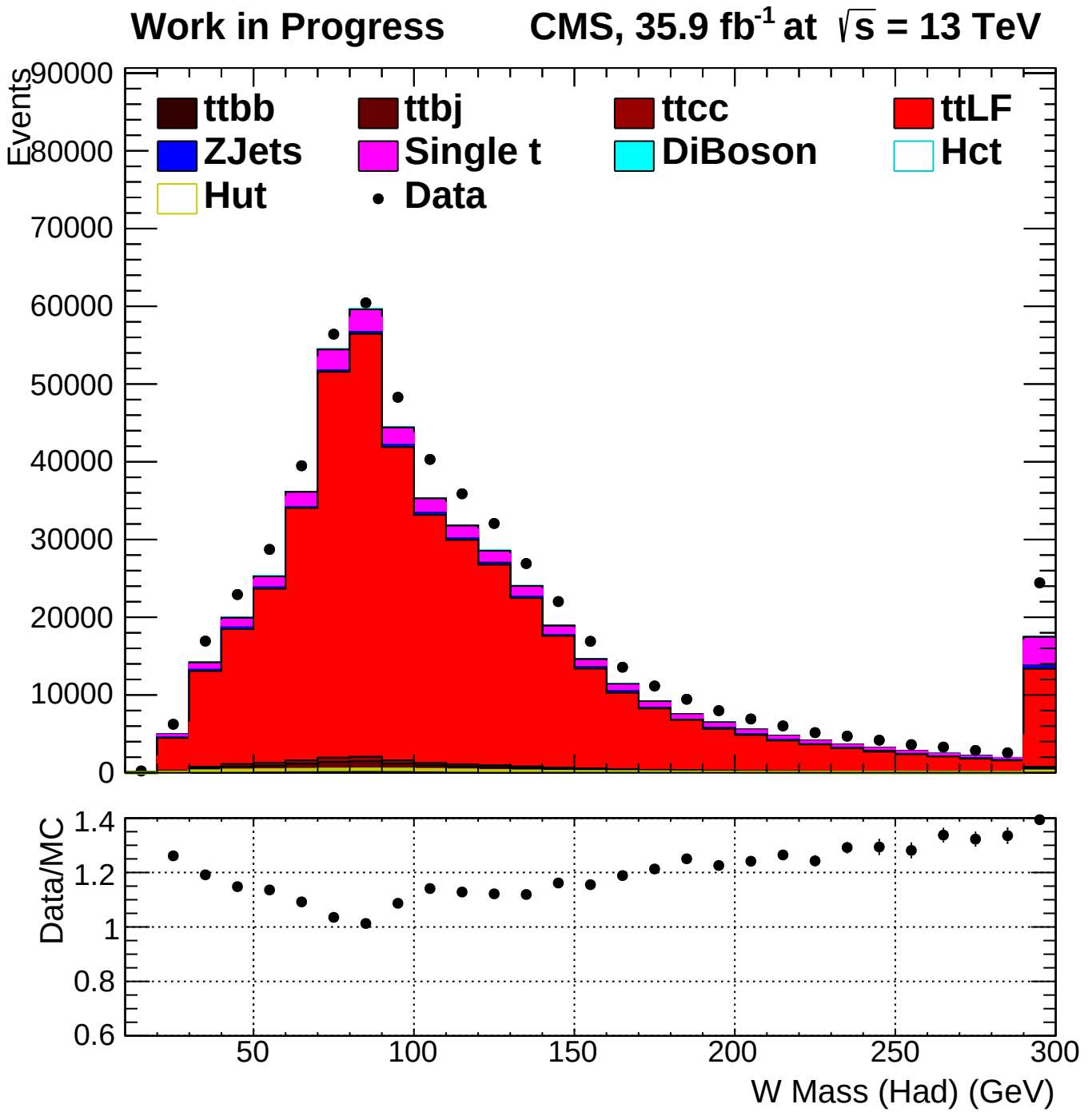

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

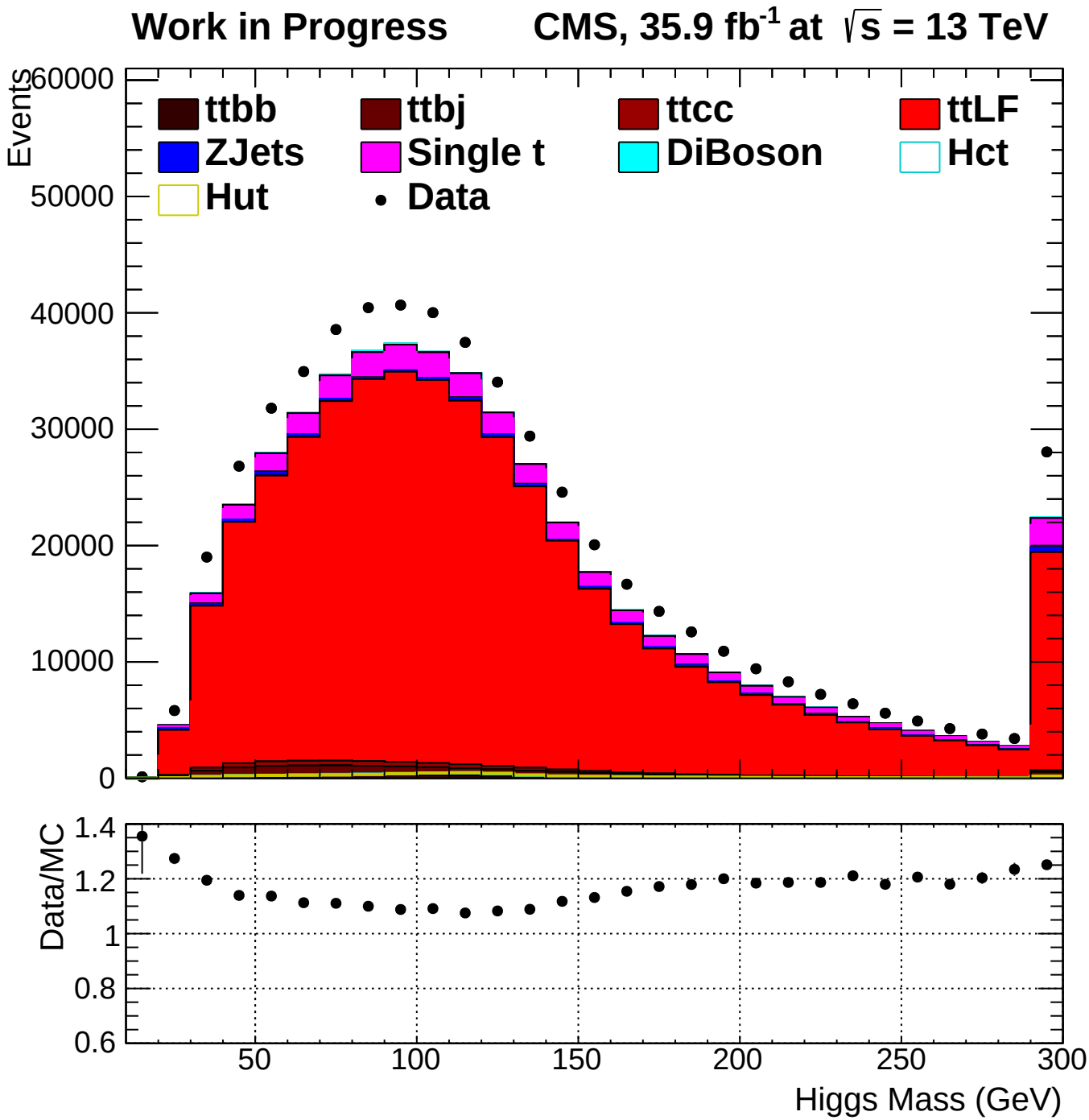

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2

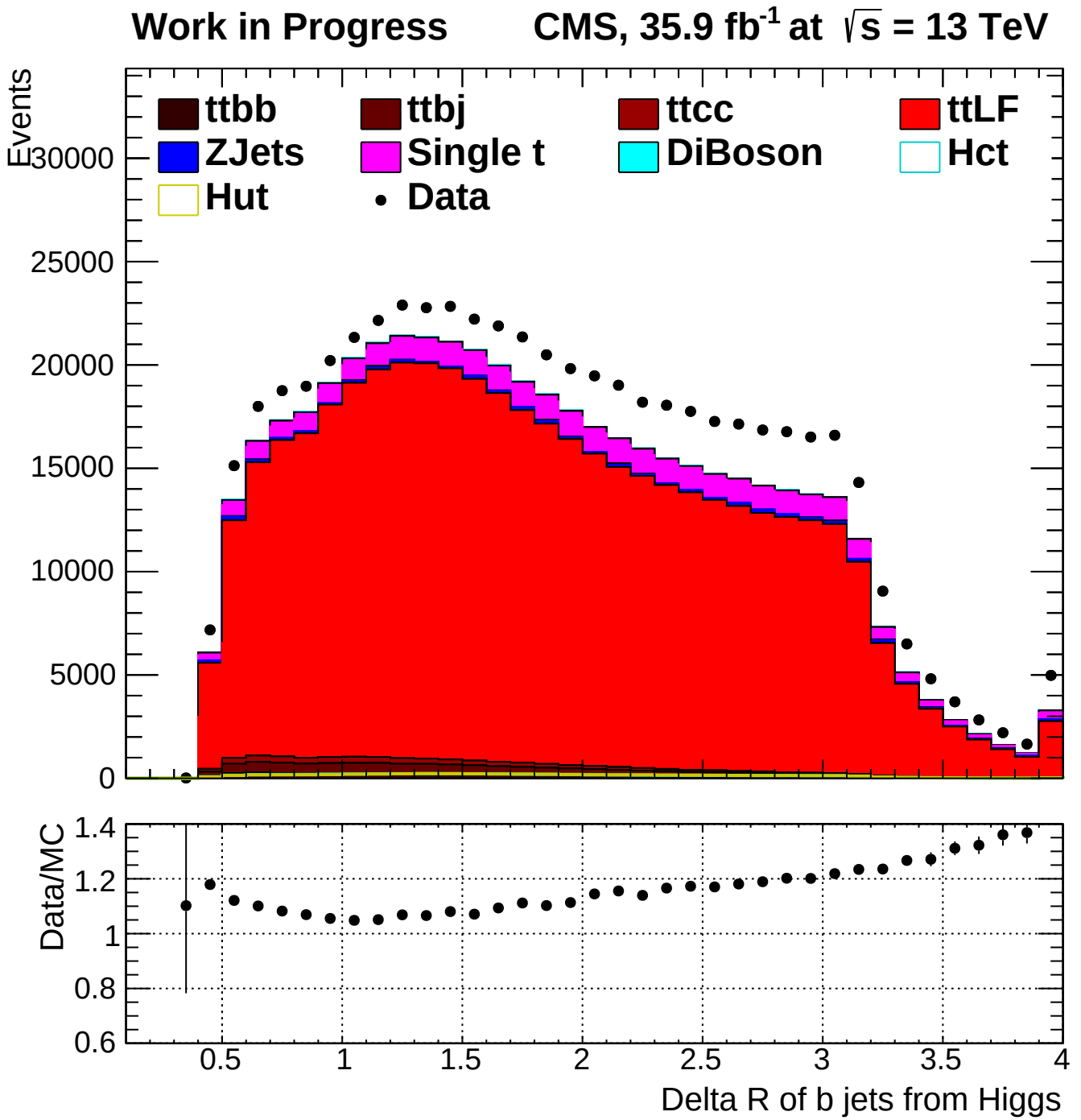

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
450
400
350
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

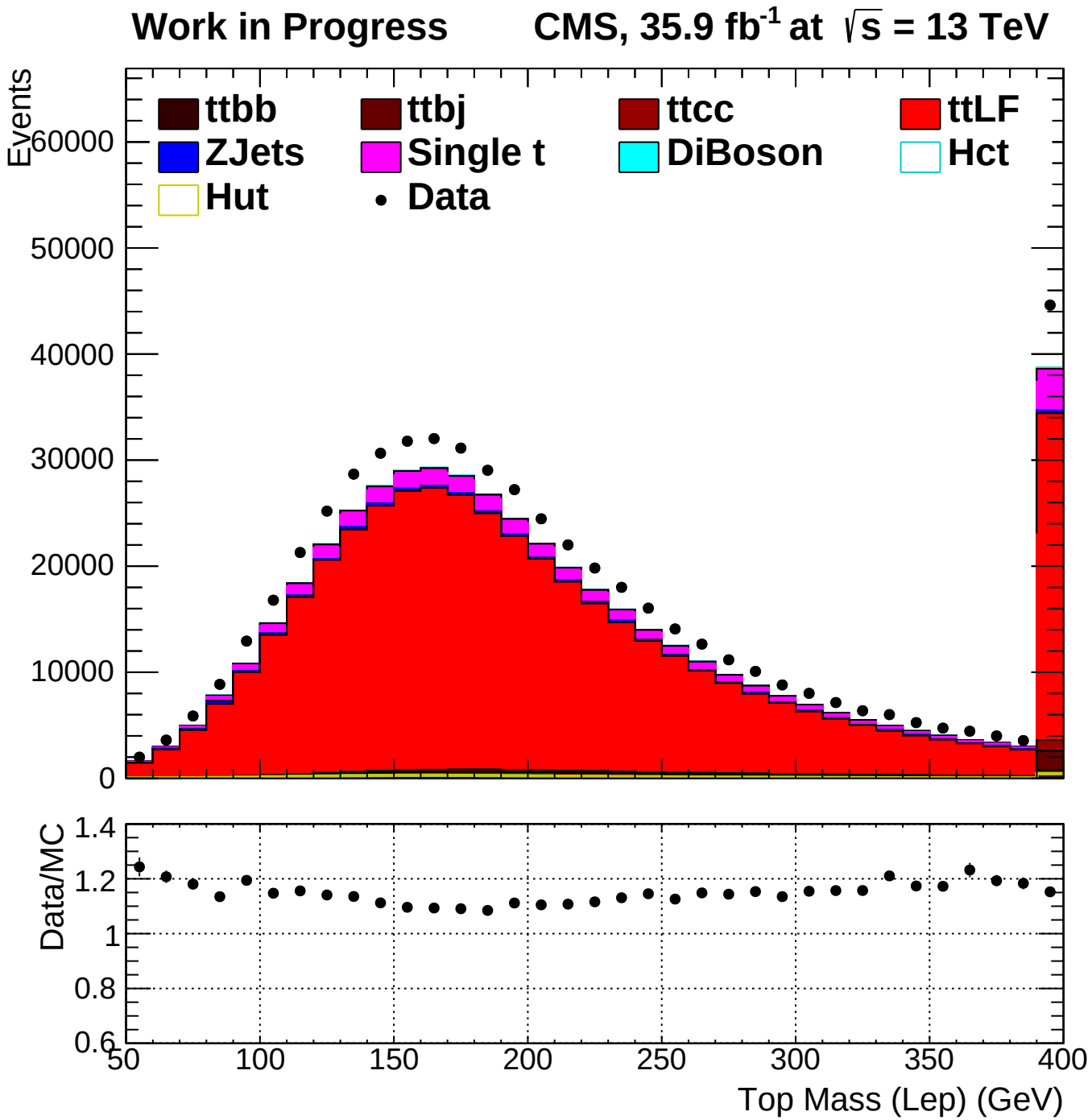

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB

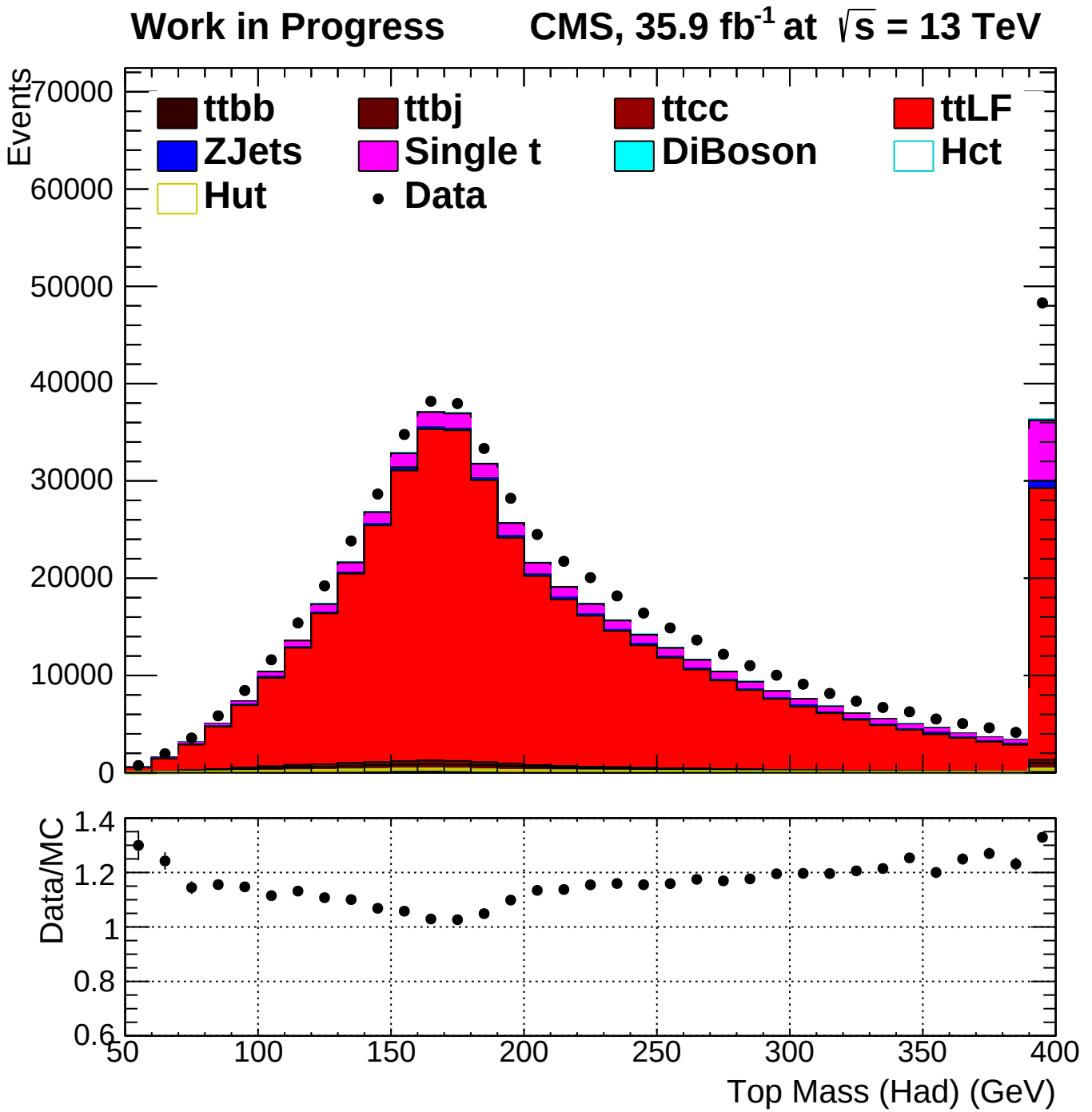

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)

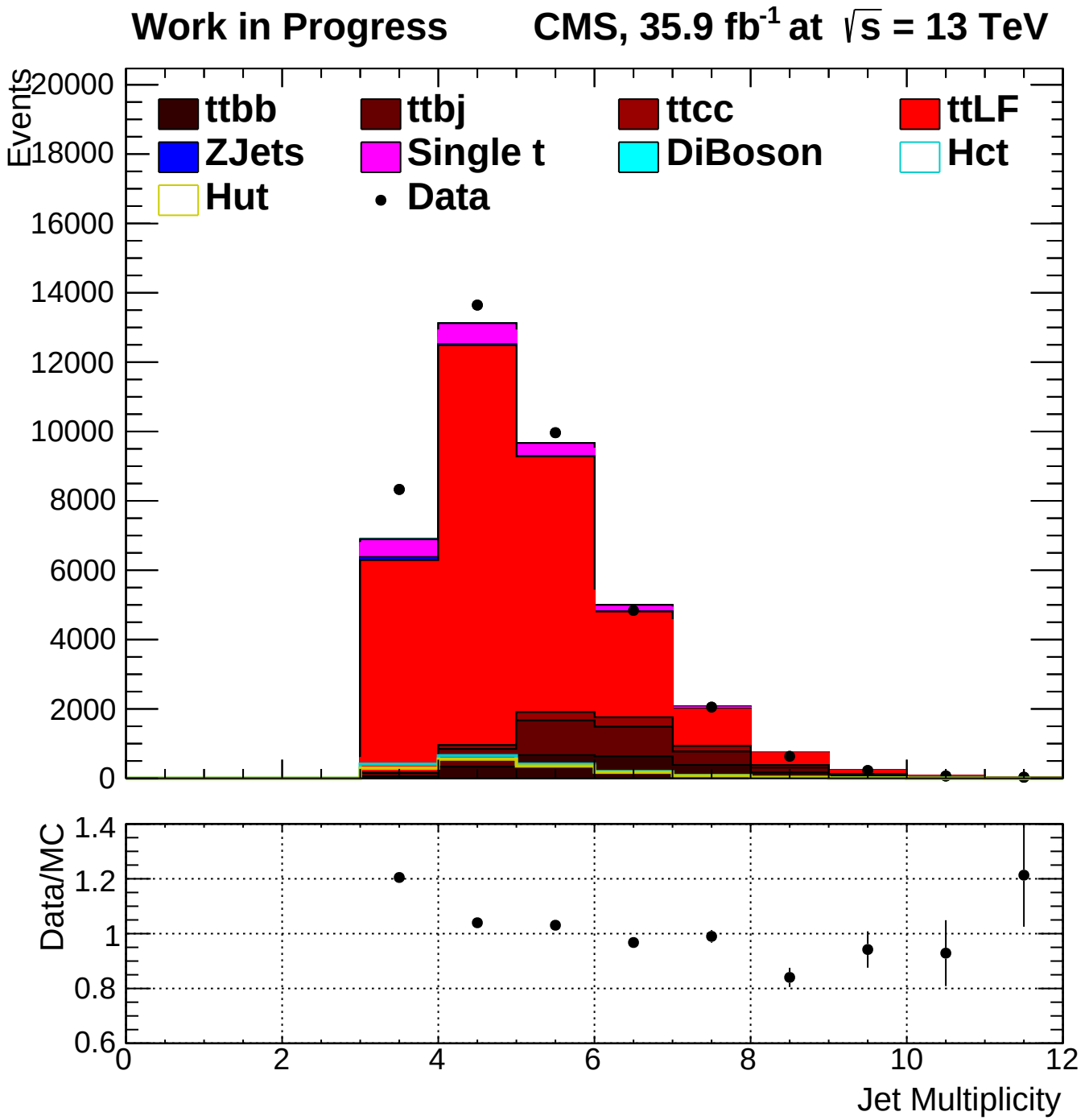

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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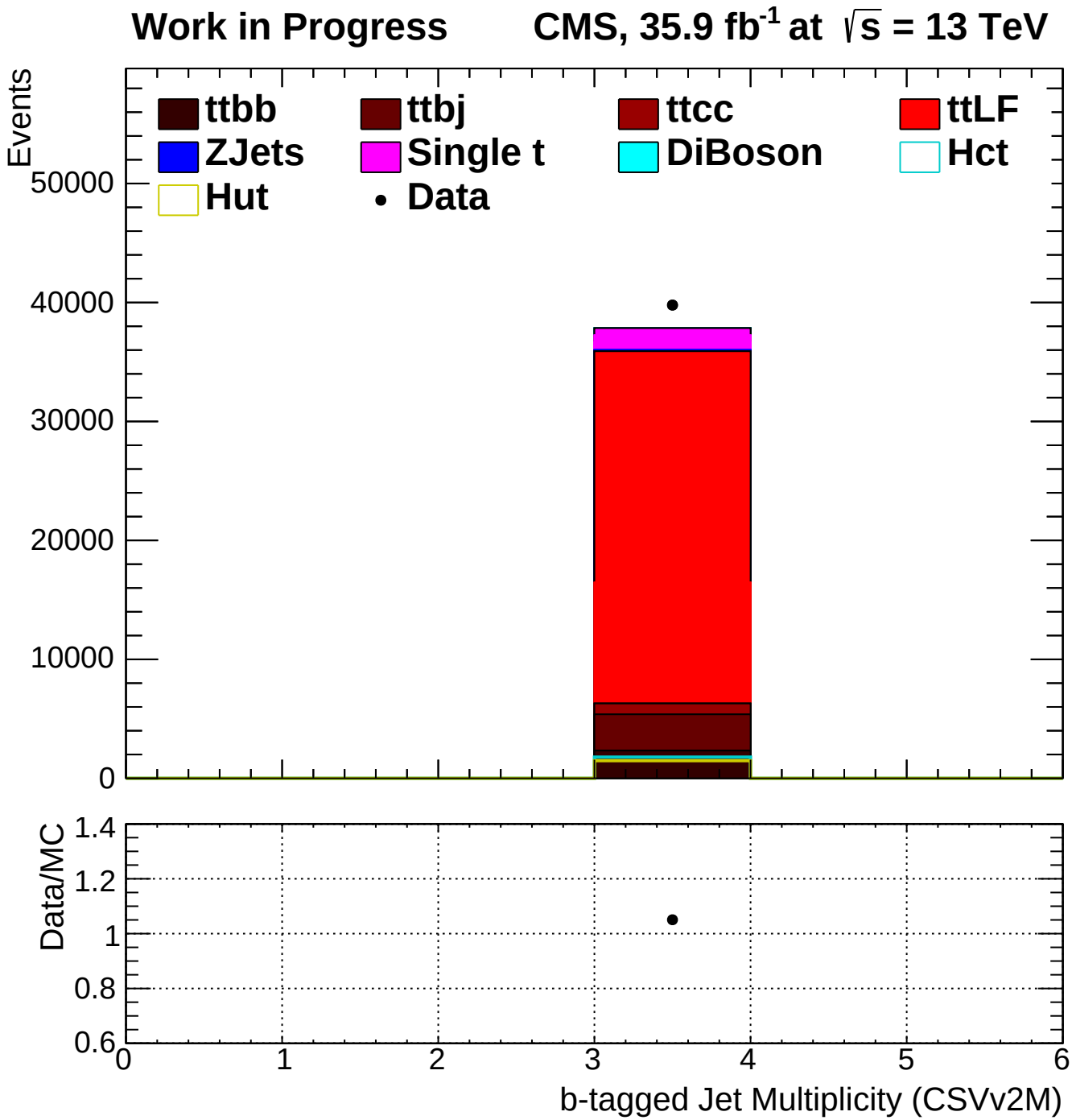
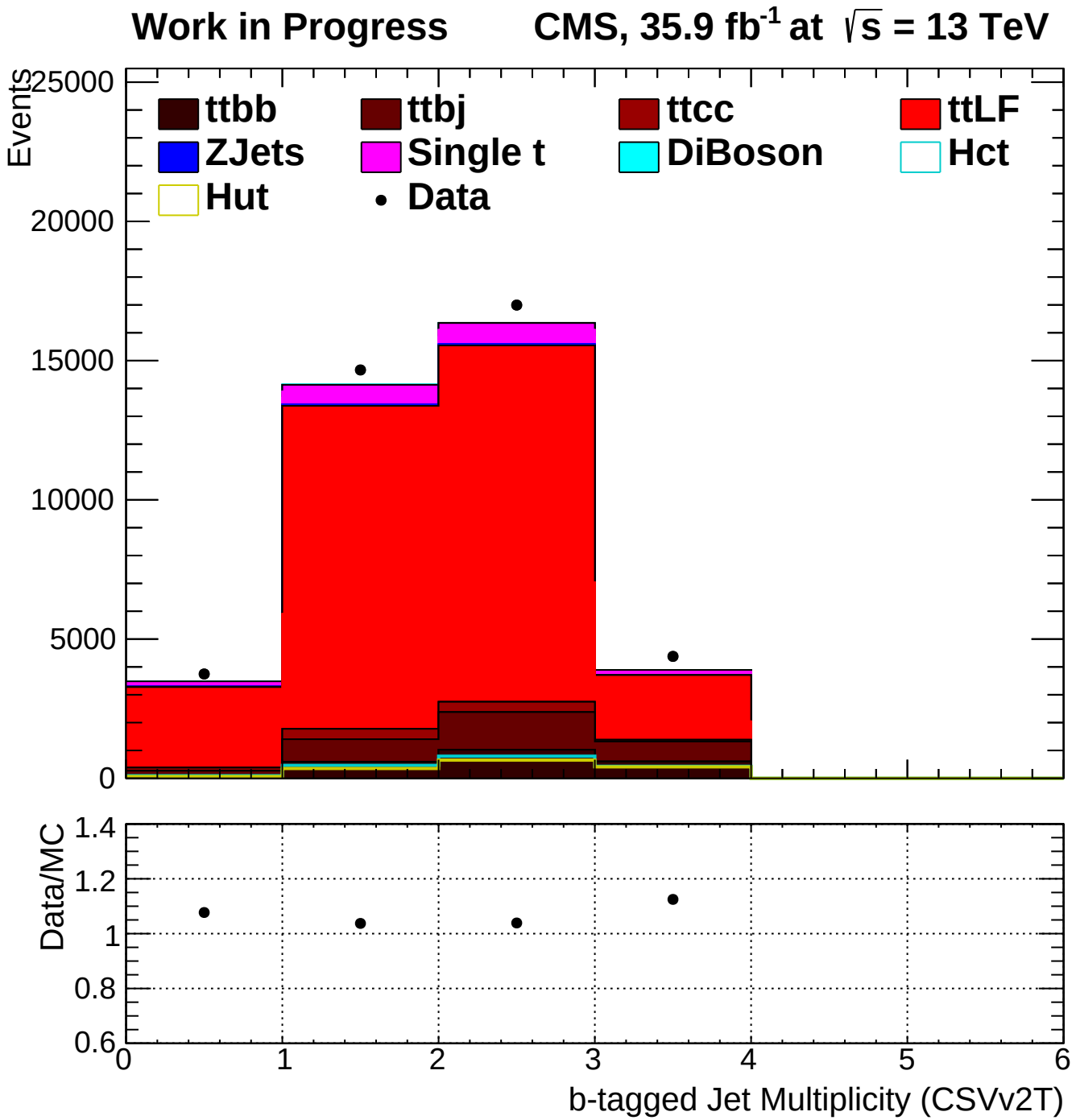
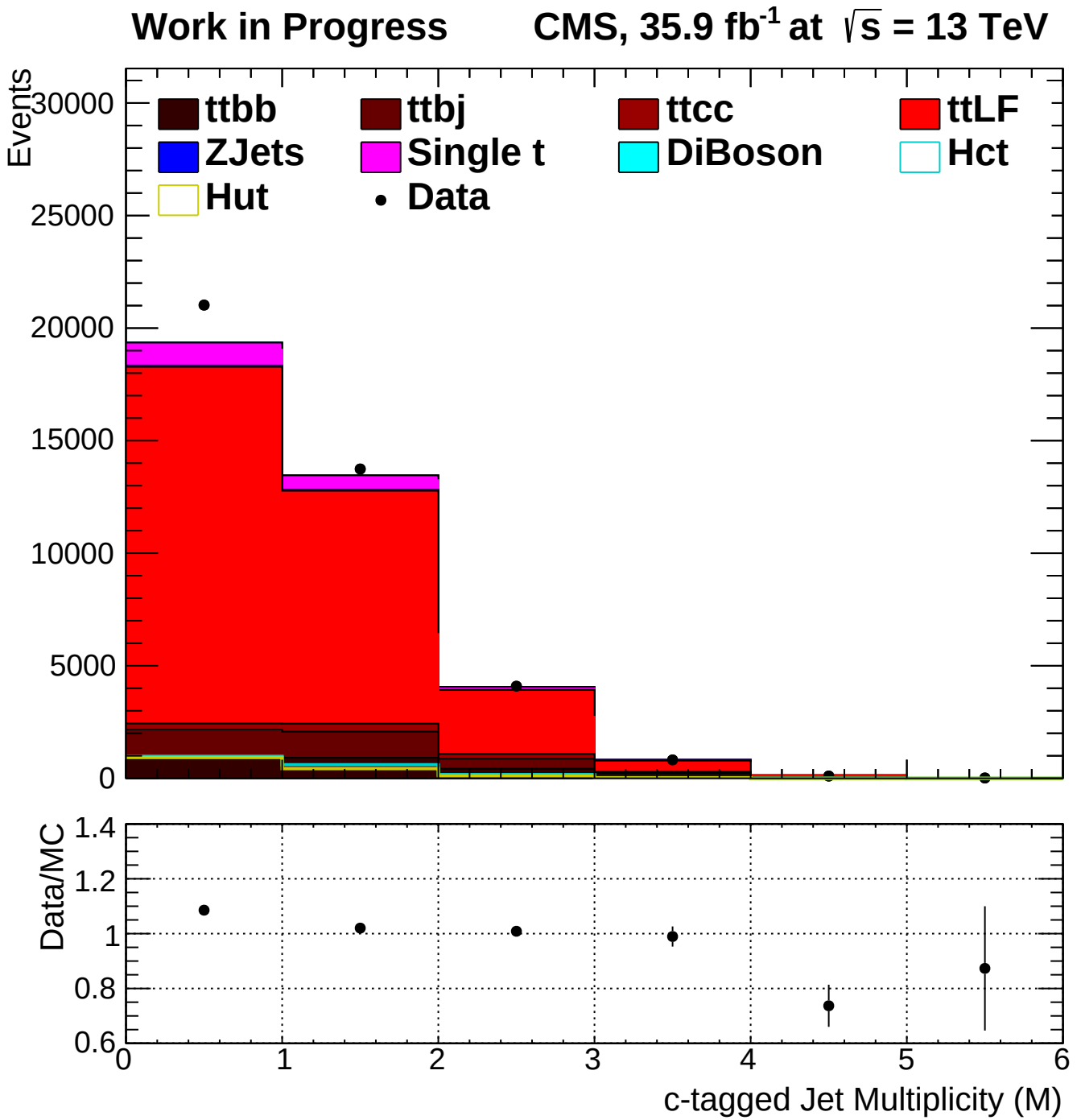
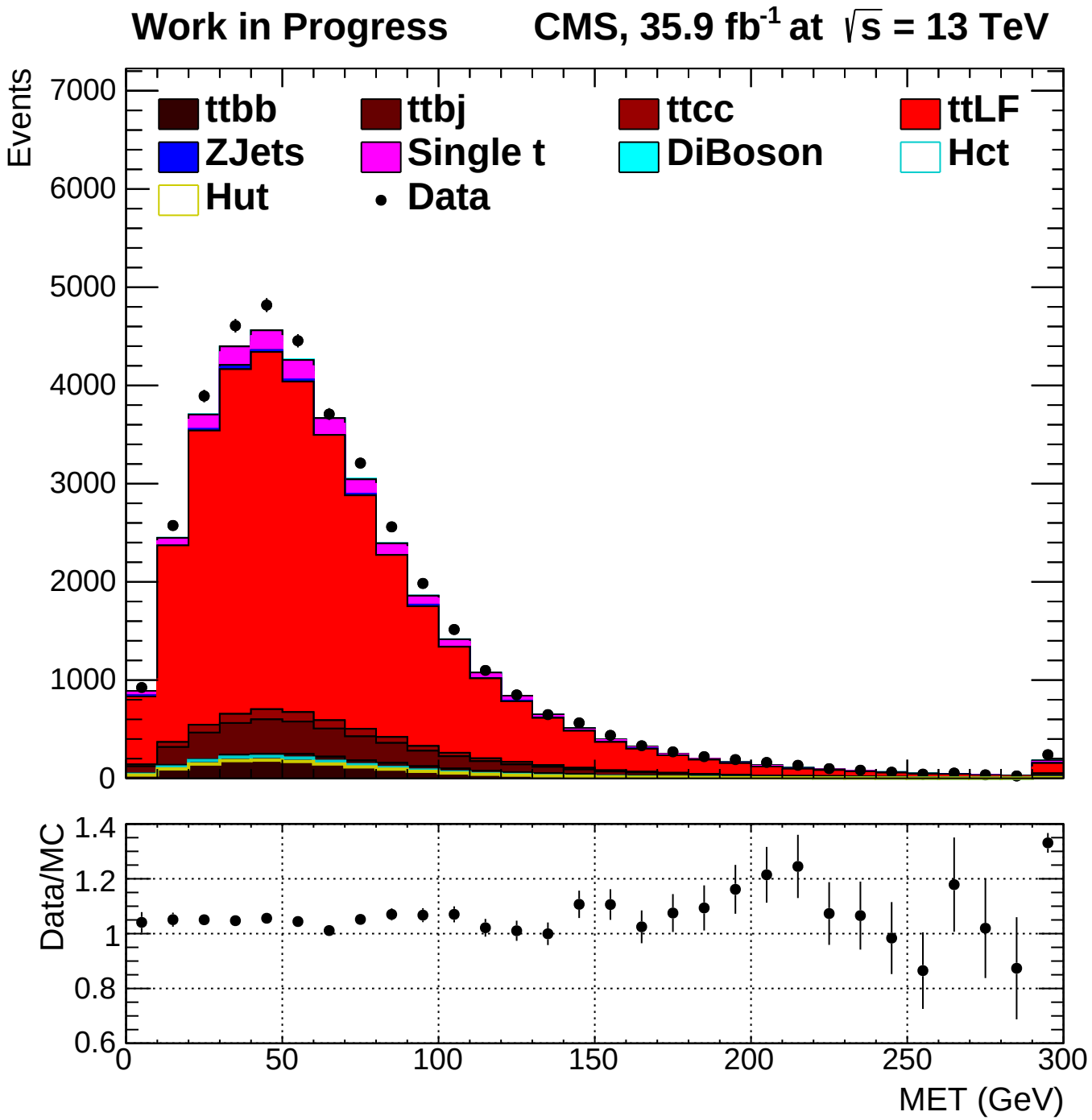
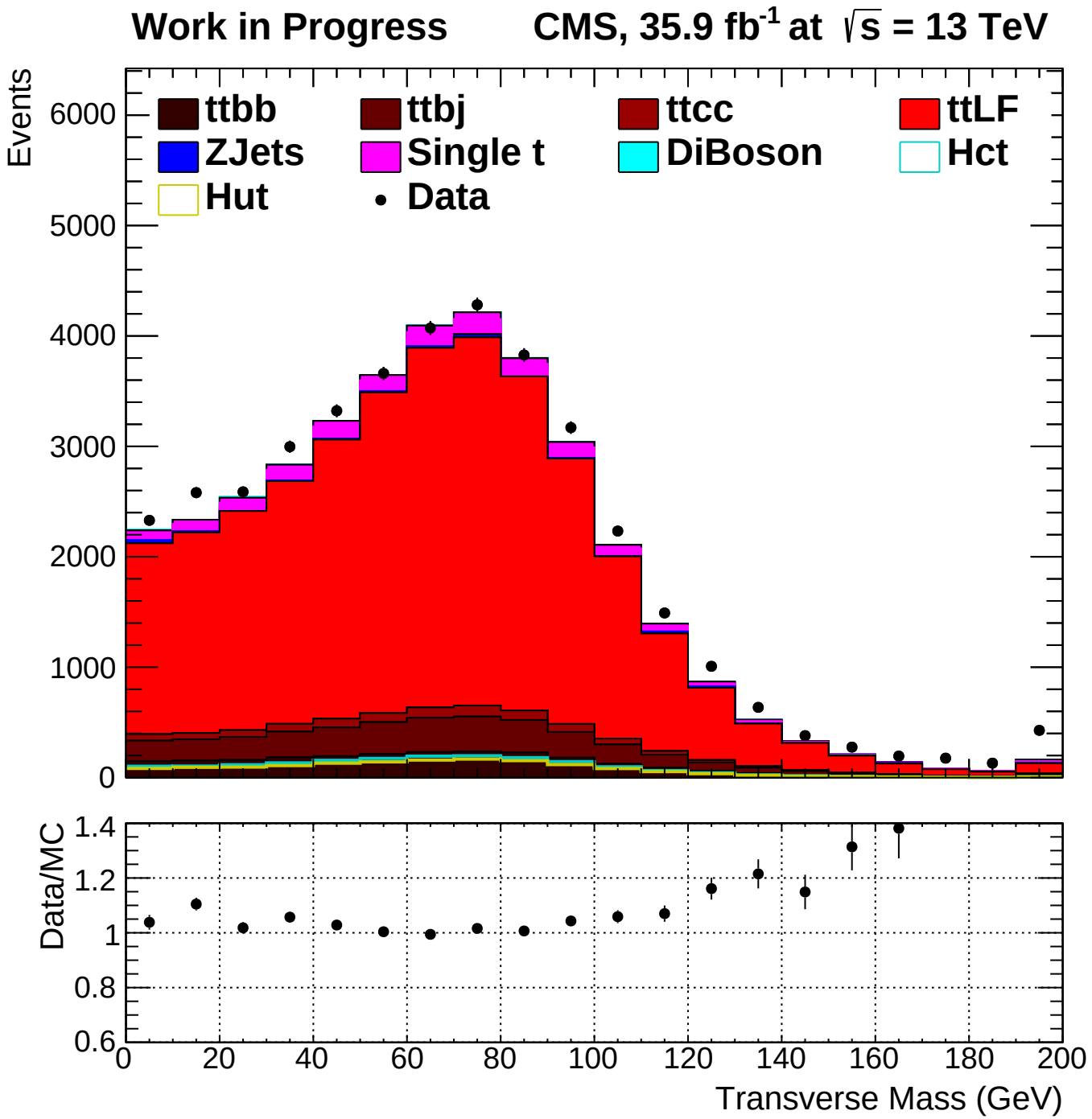
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

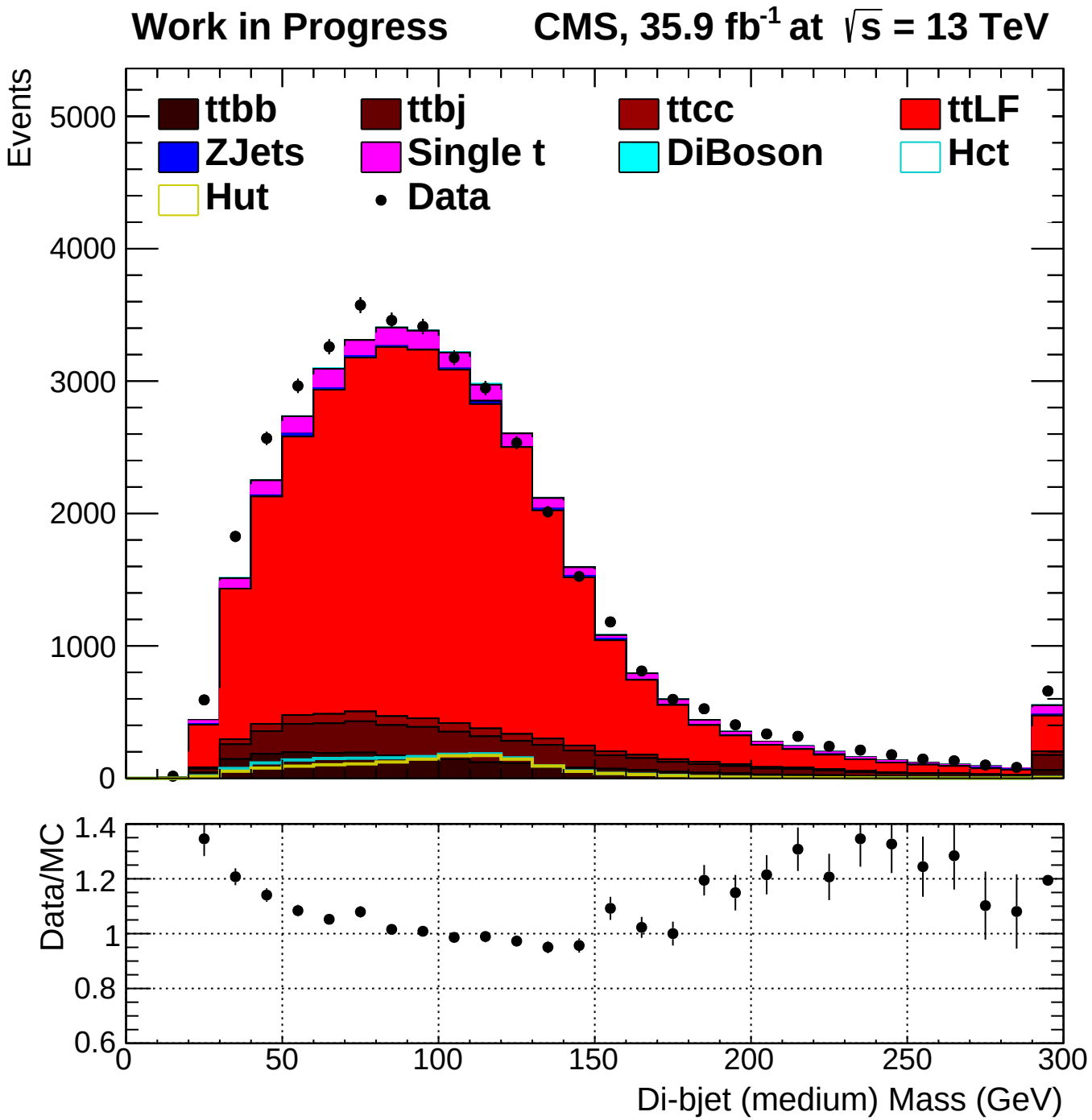

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

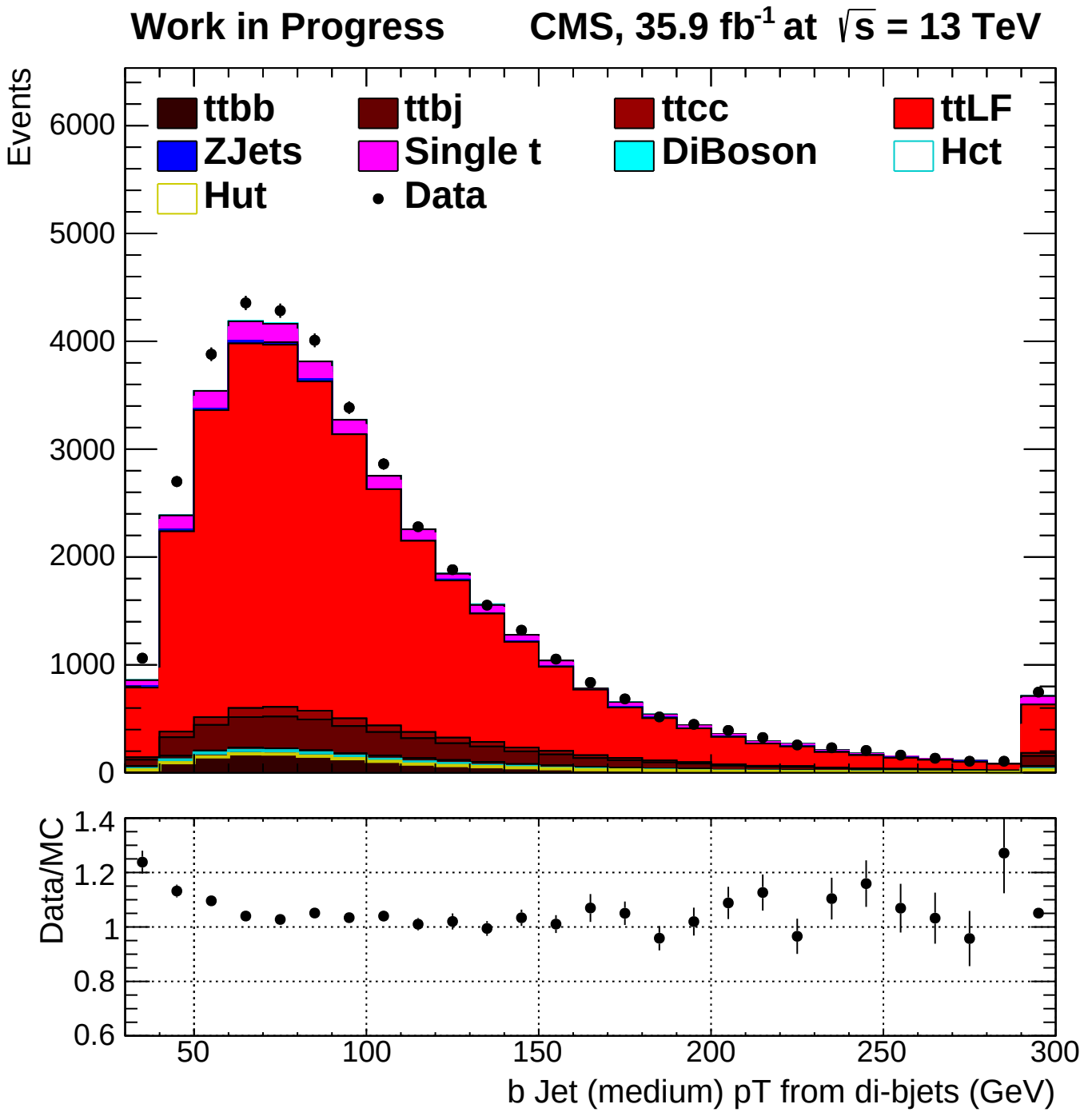

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

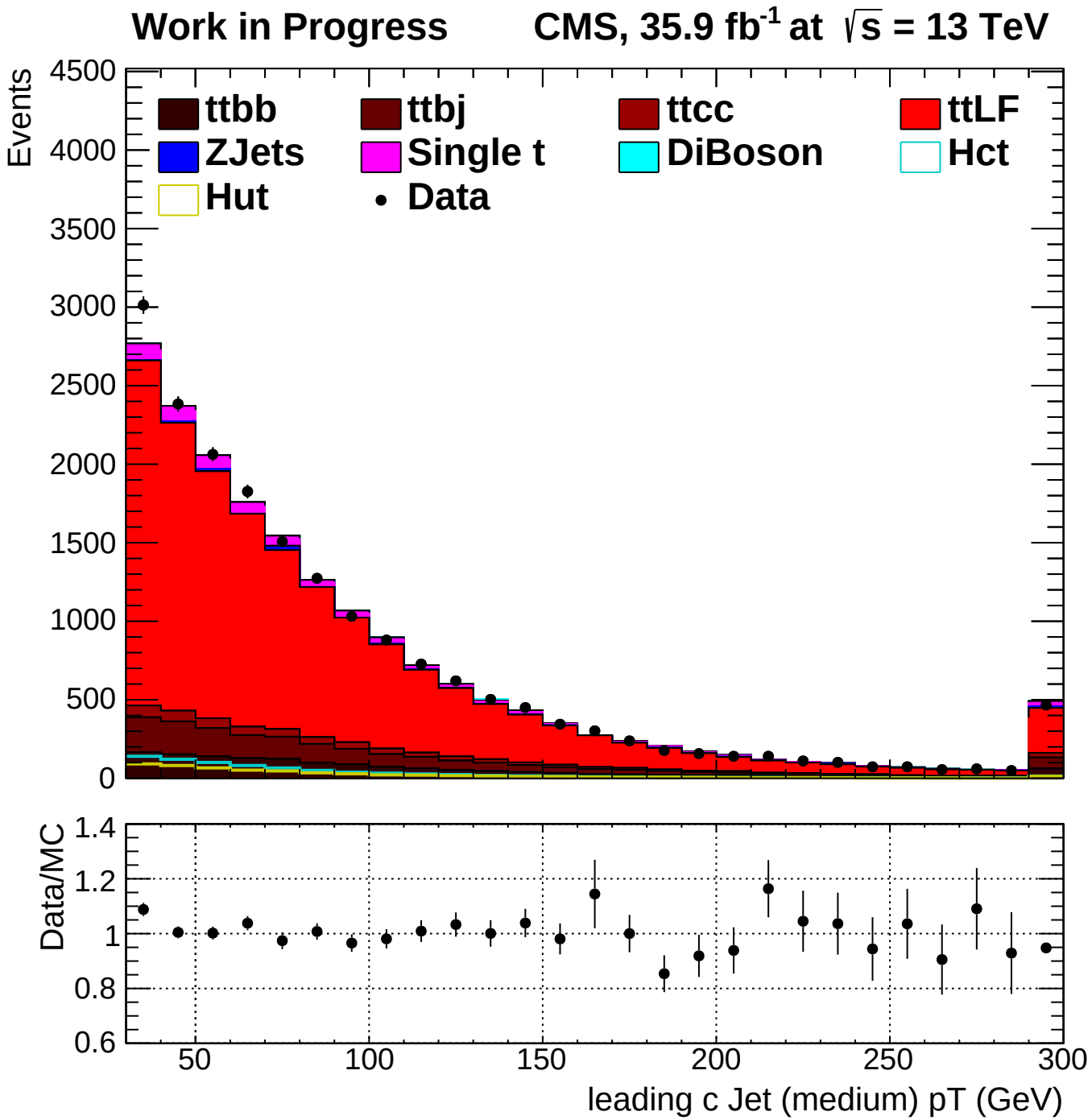

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

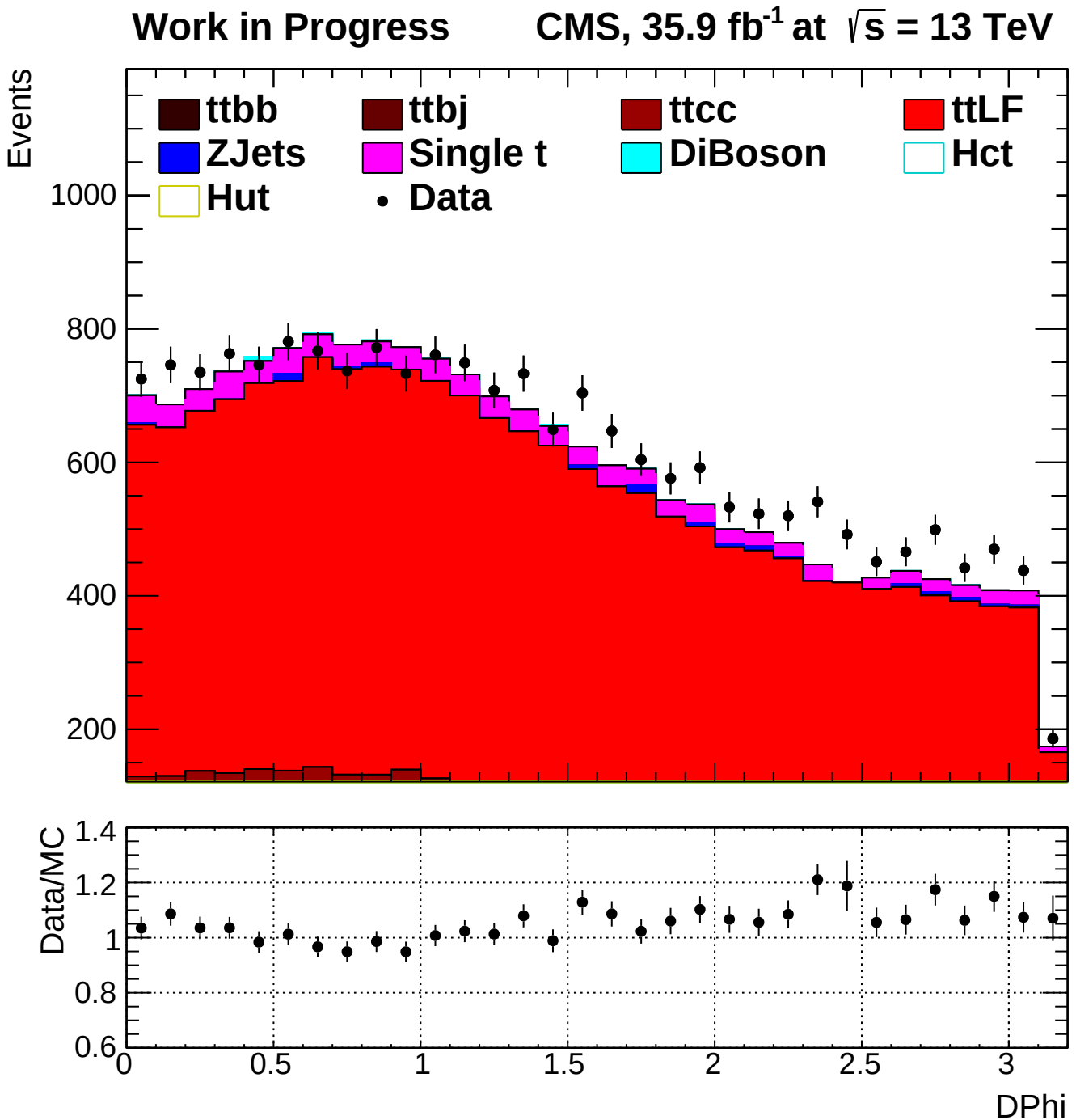

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

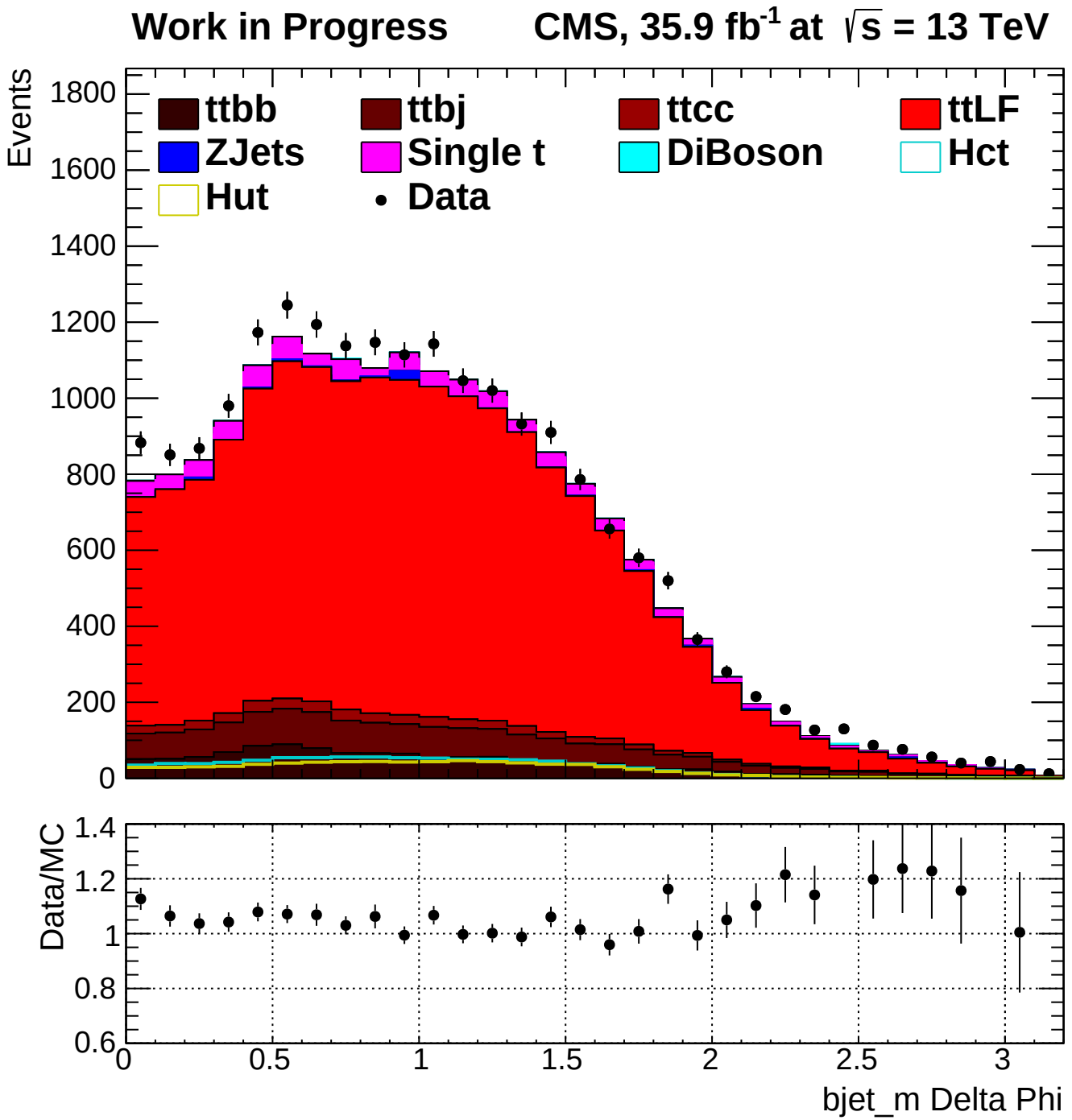

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

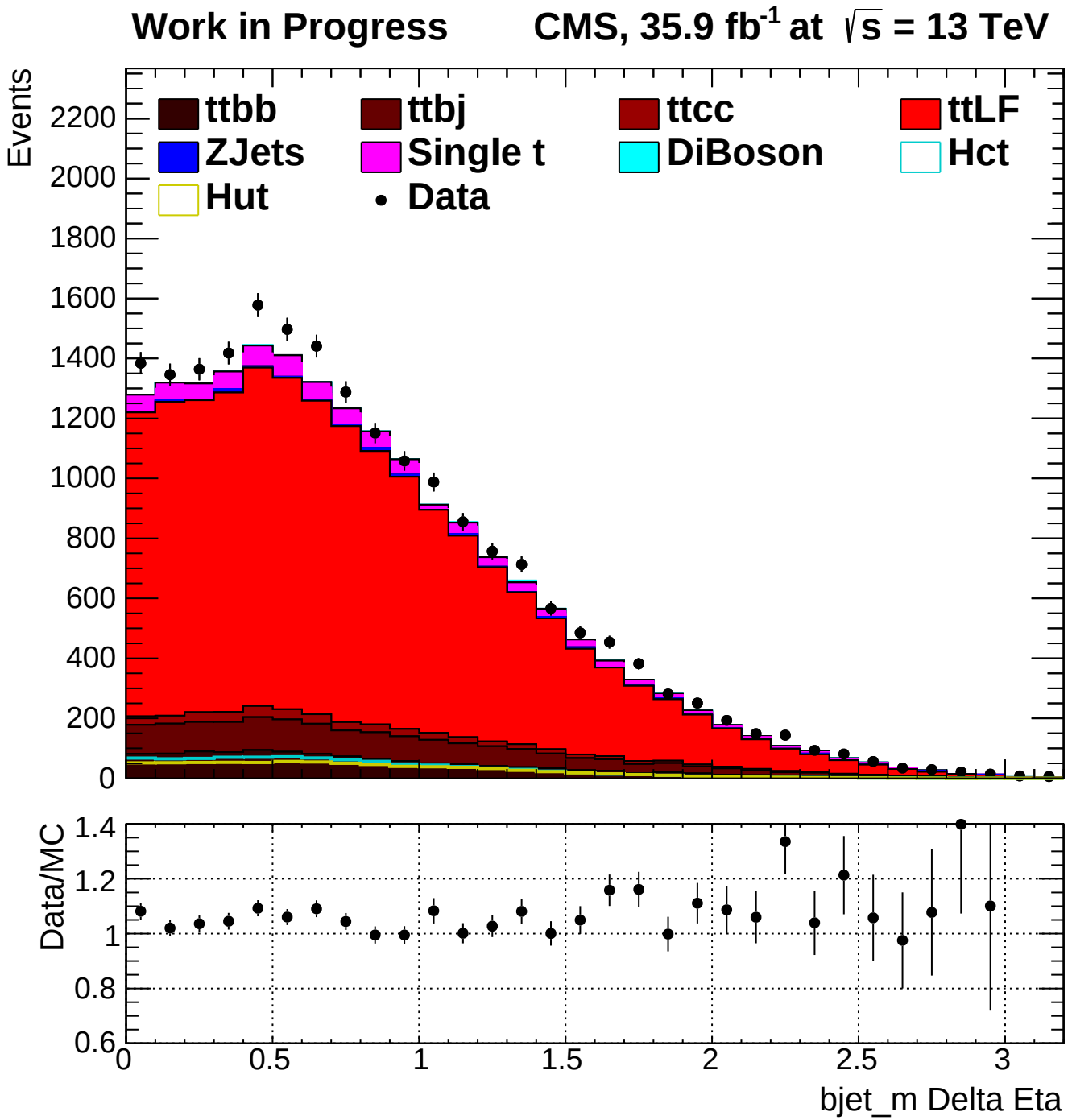

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

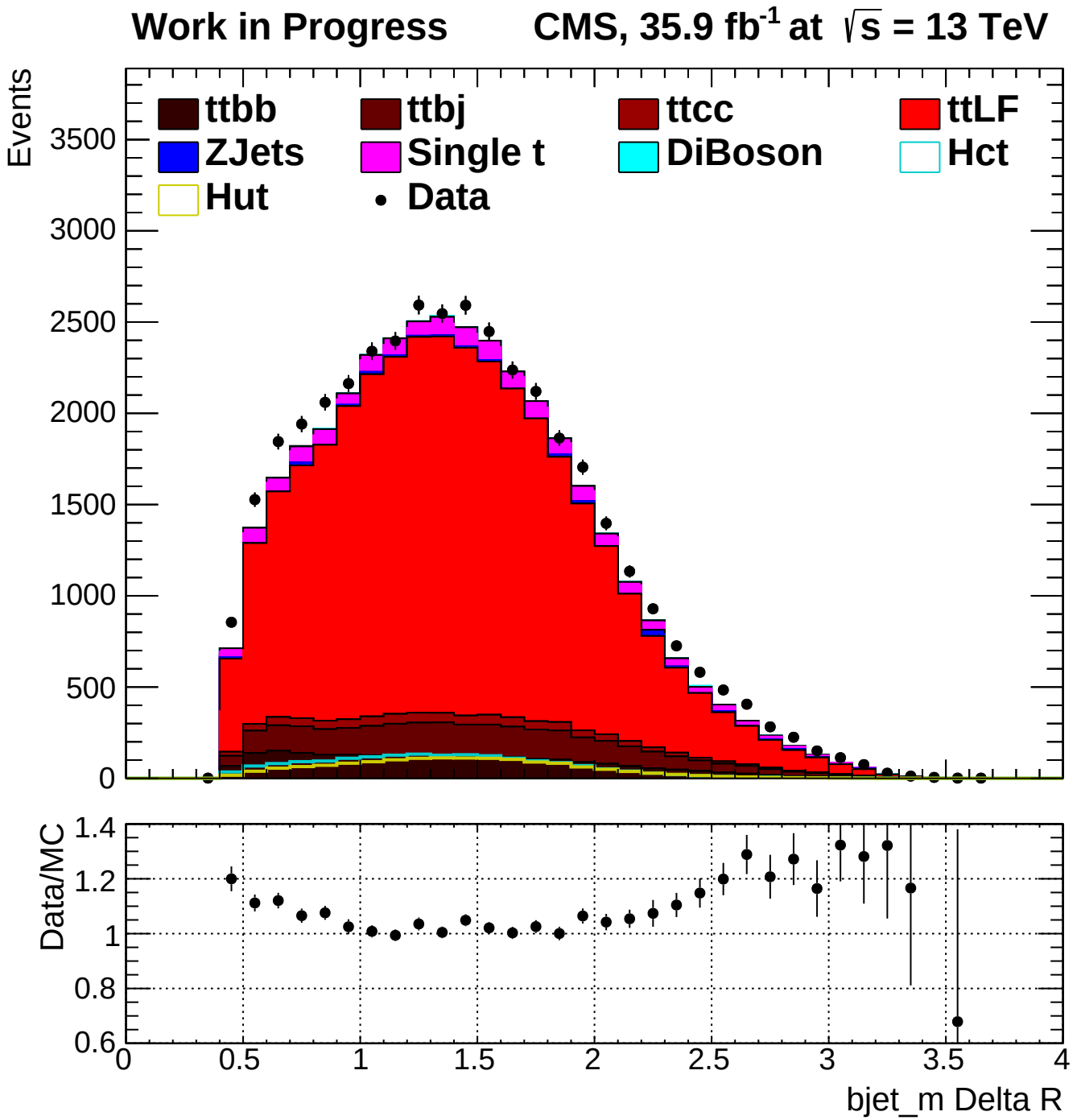

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

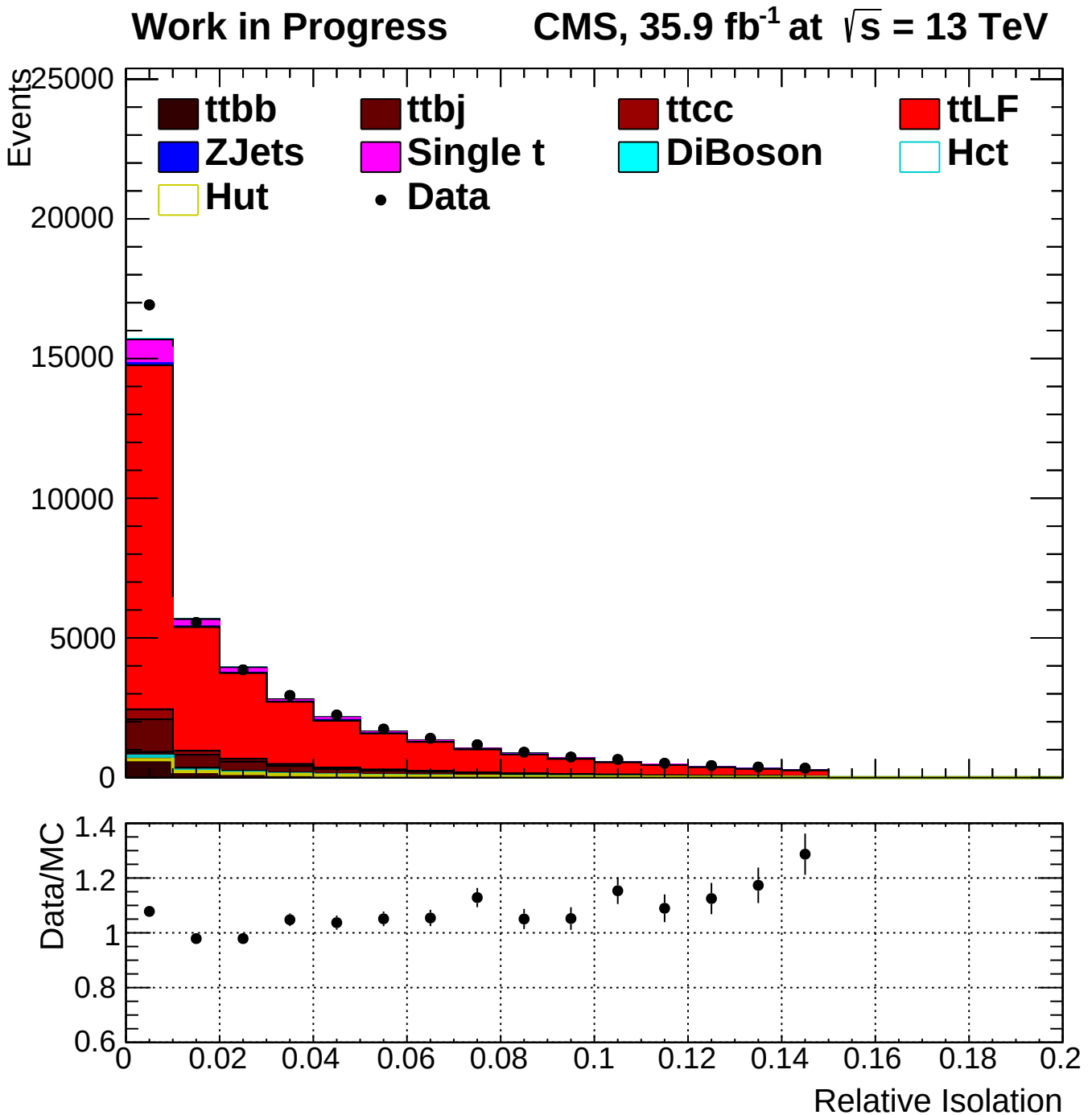

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

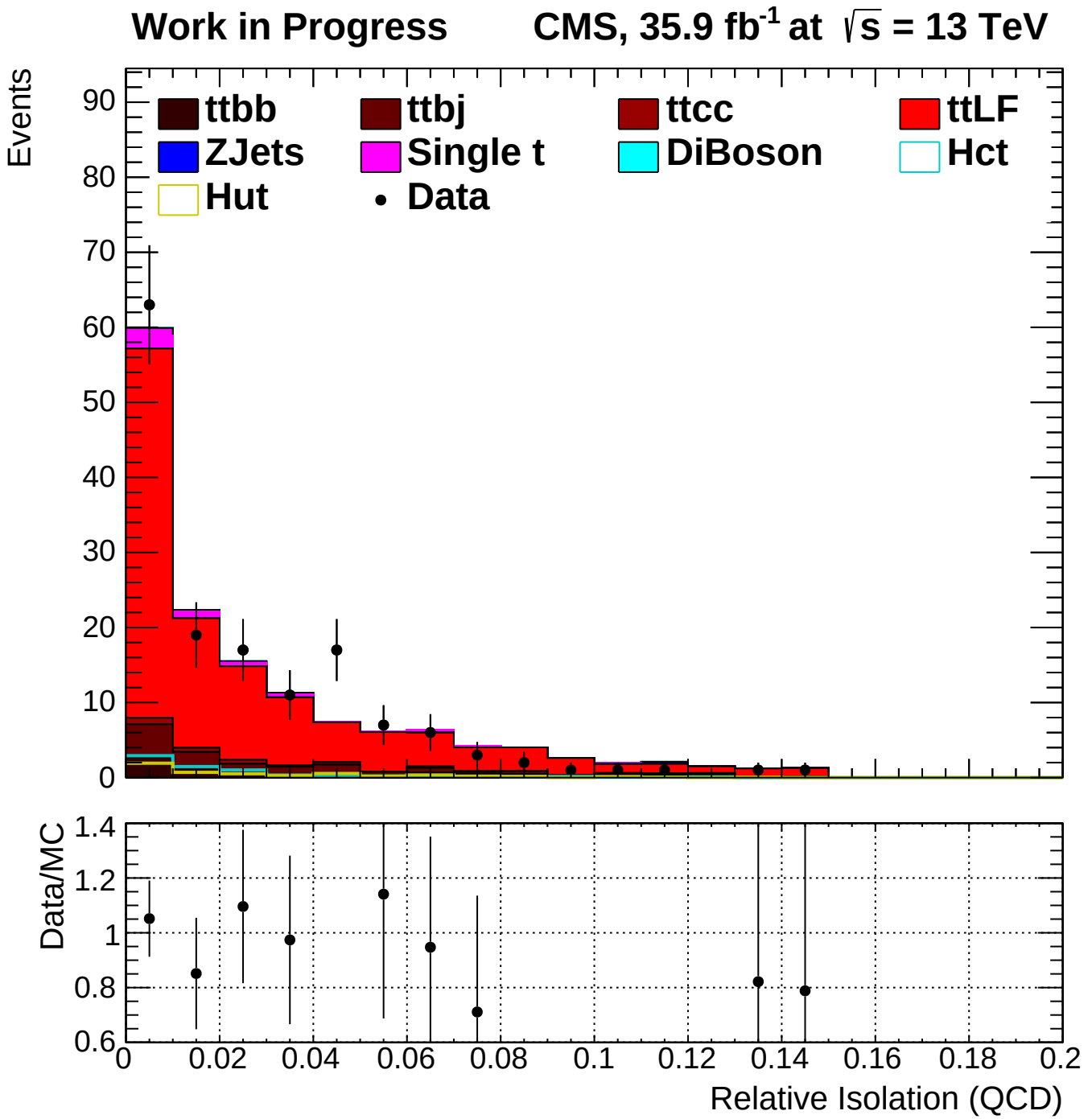

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

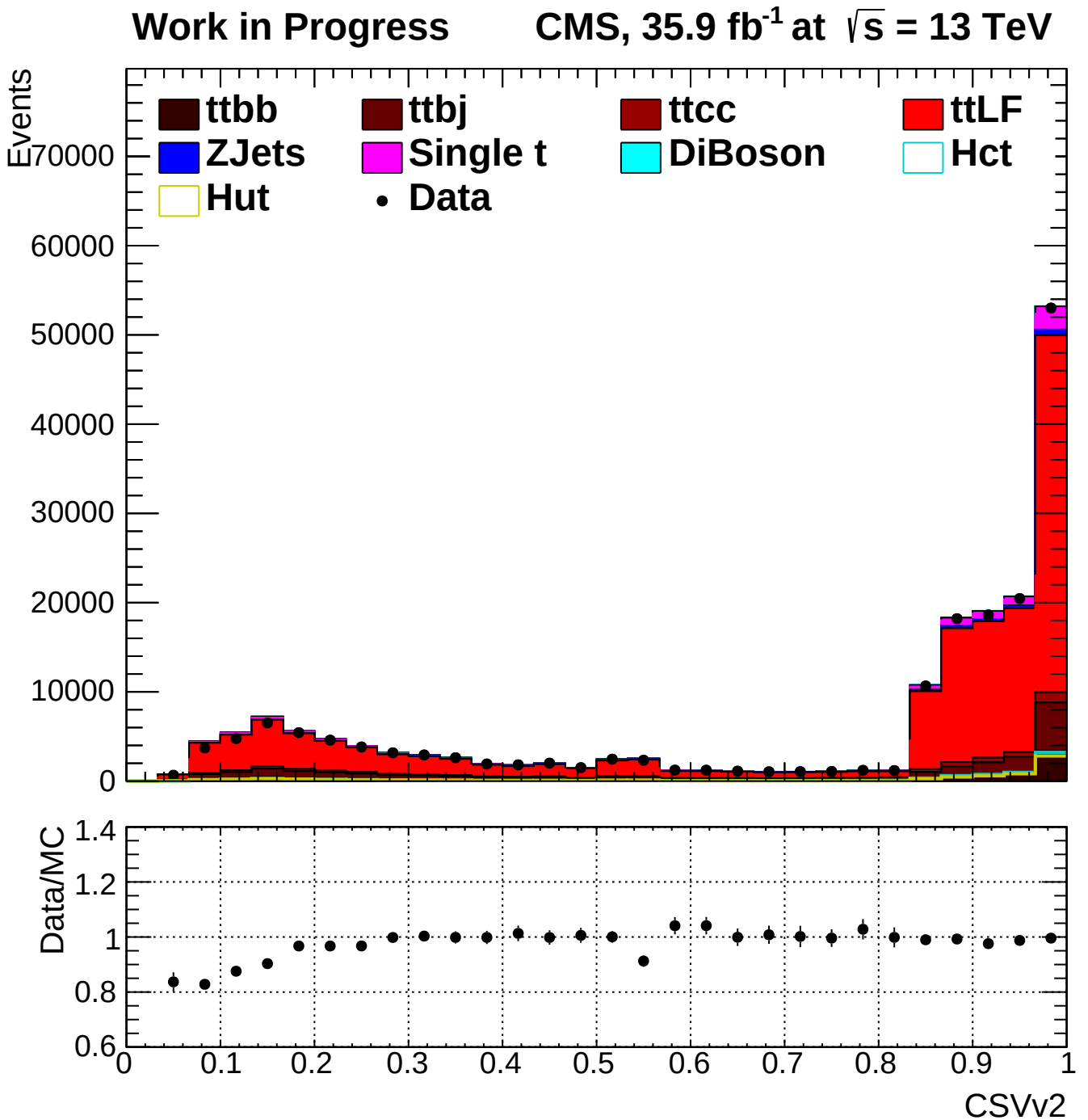

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi

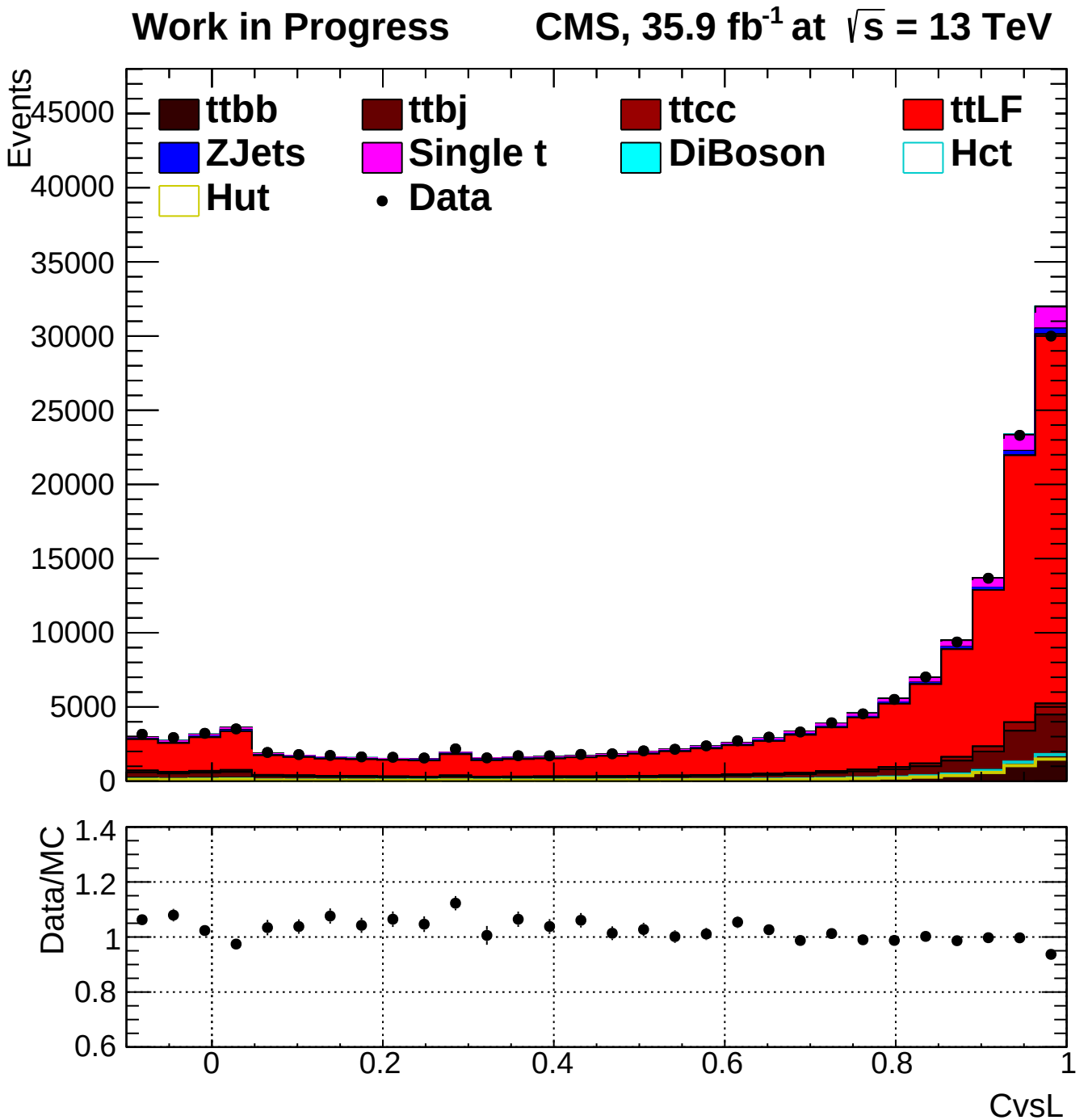

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta

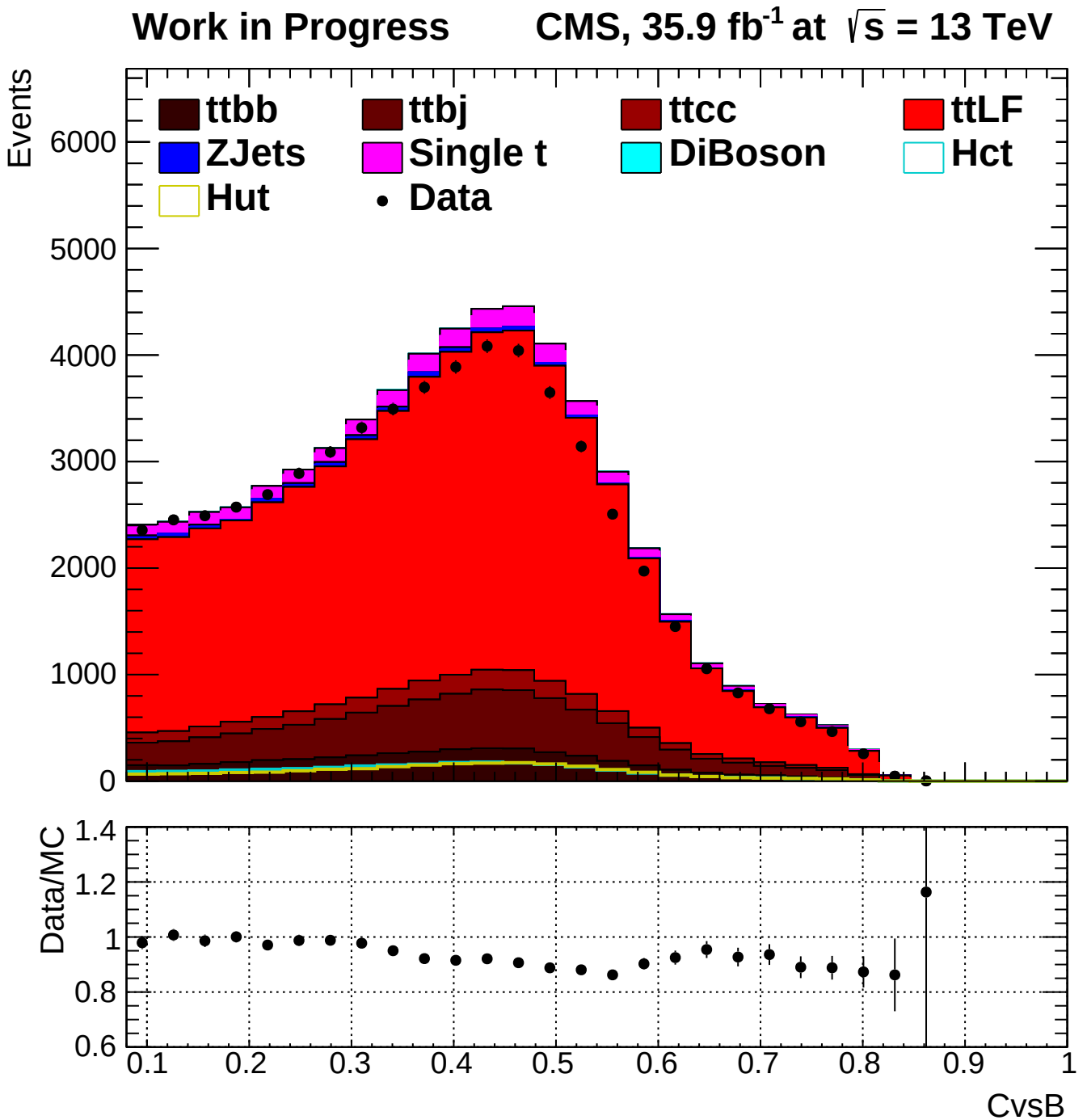

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3500
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

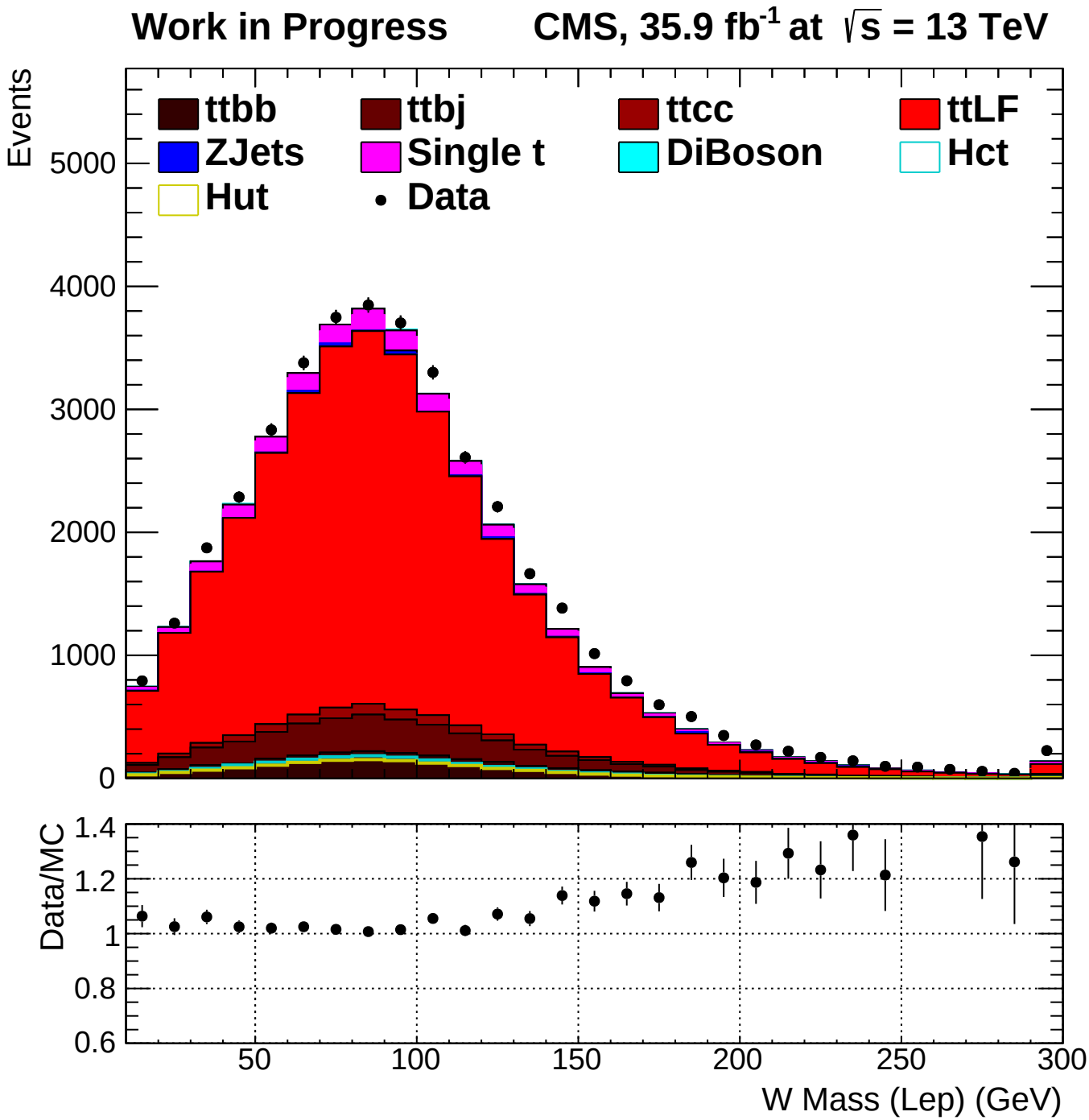

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

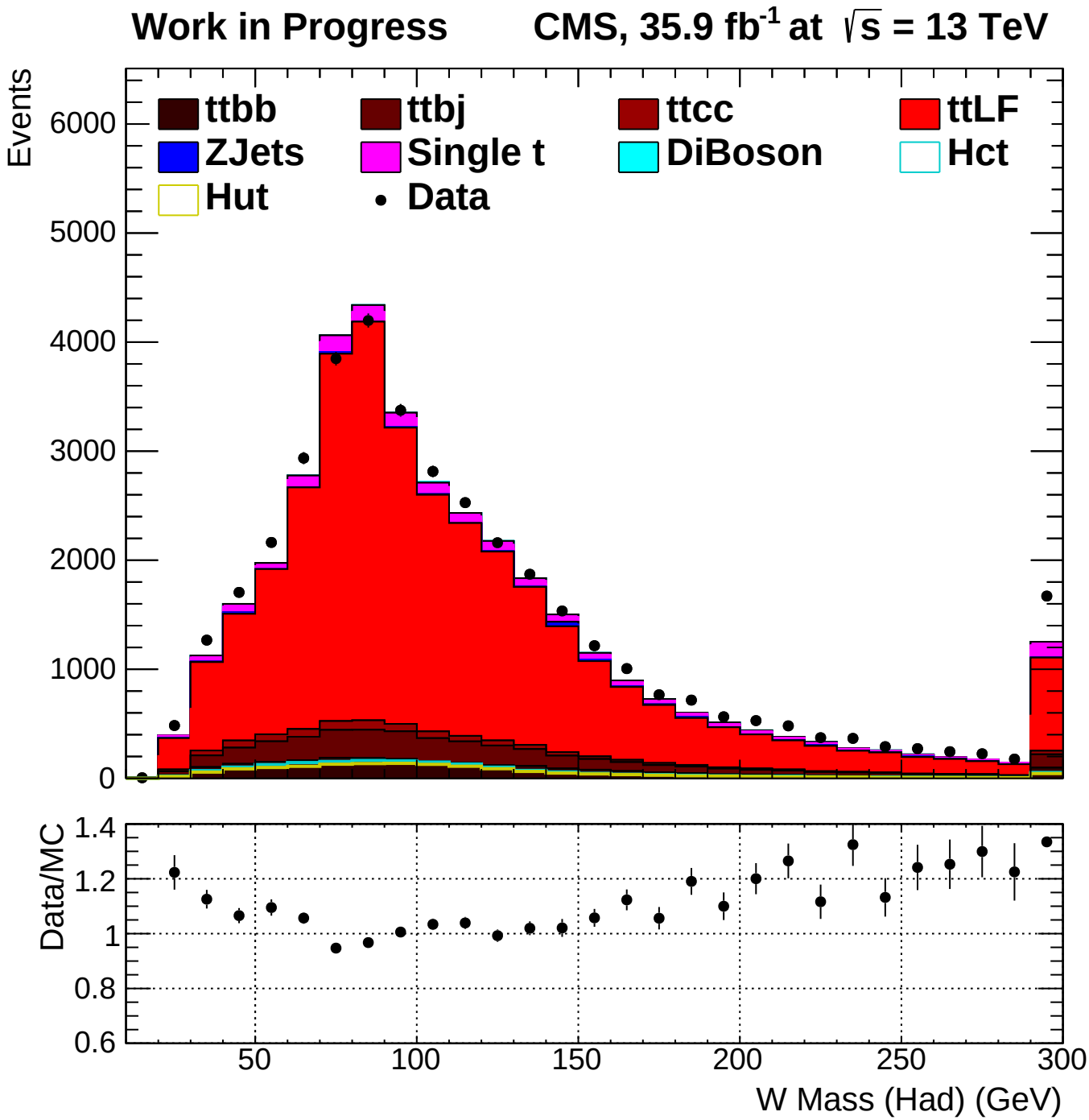

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

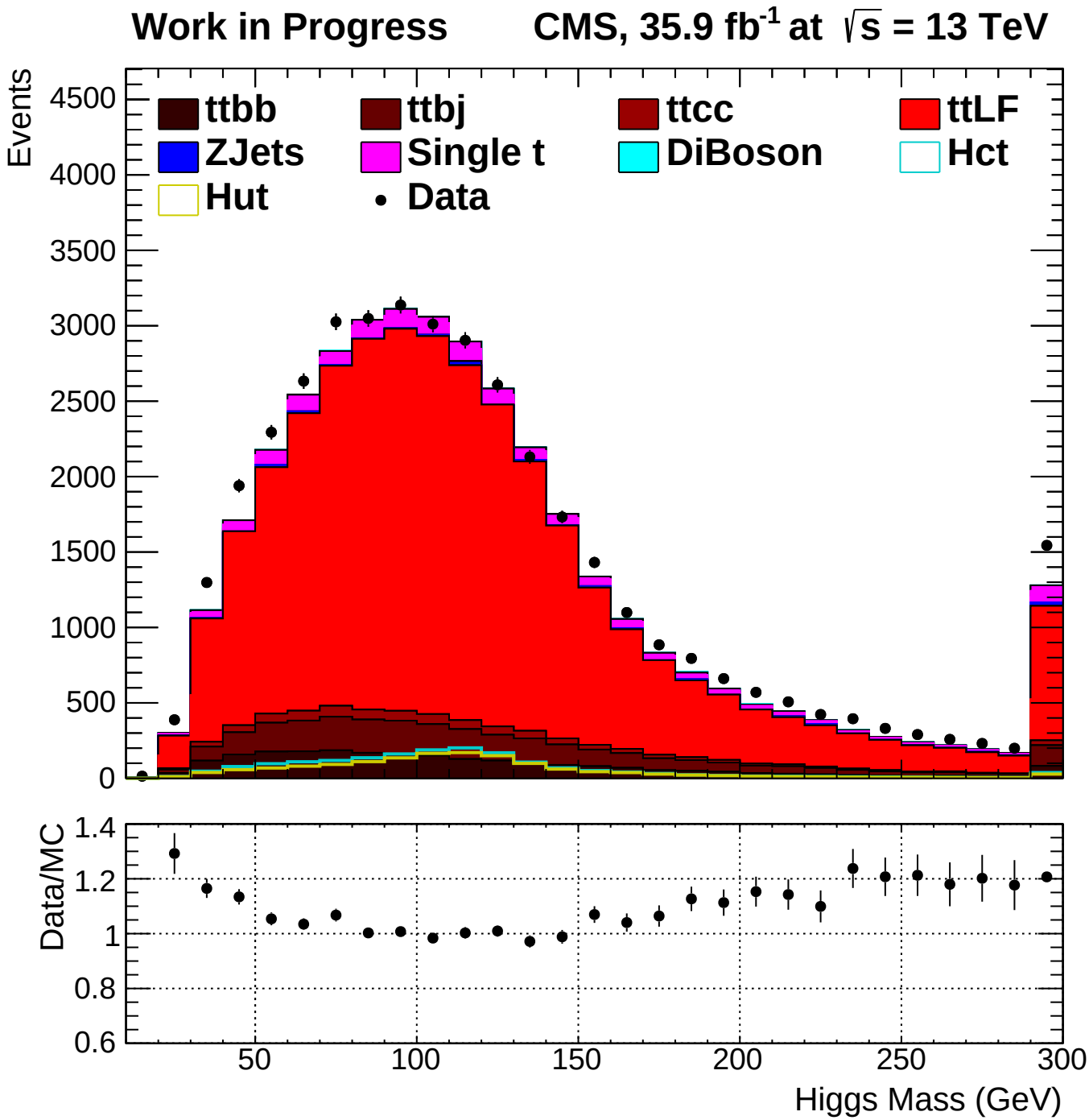

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

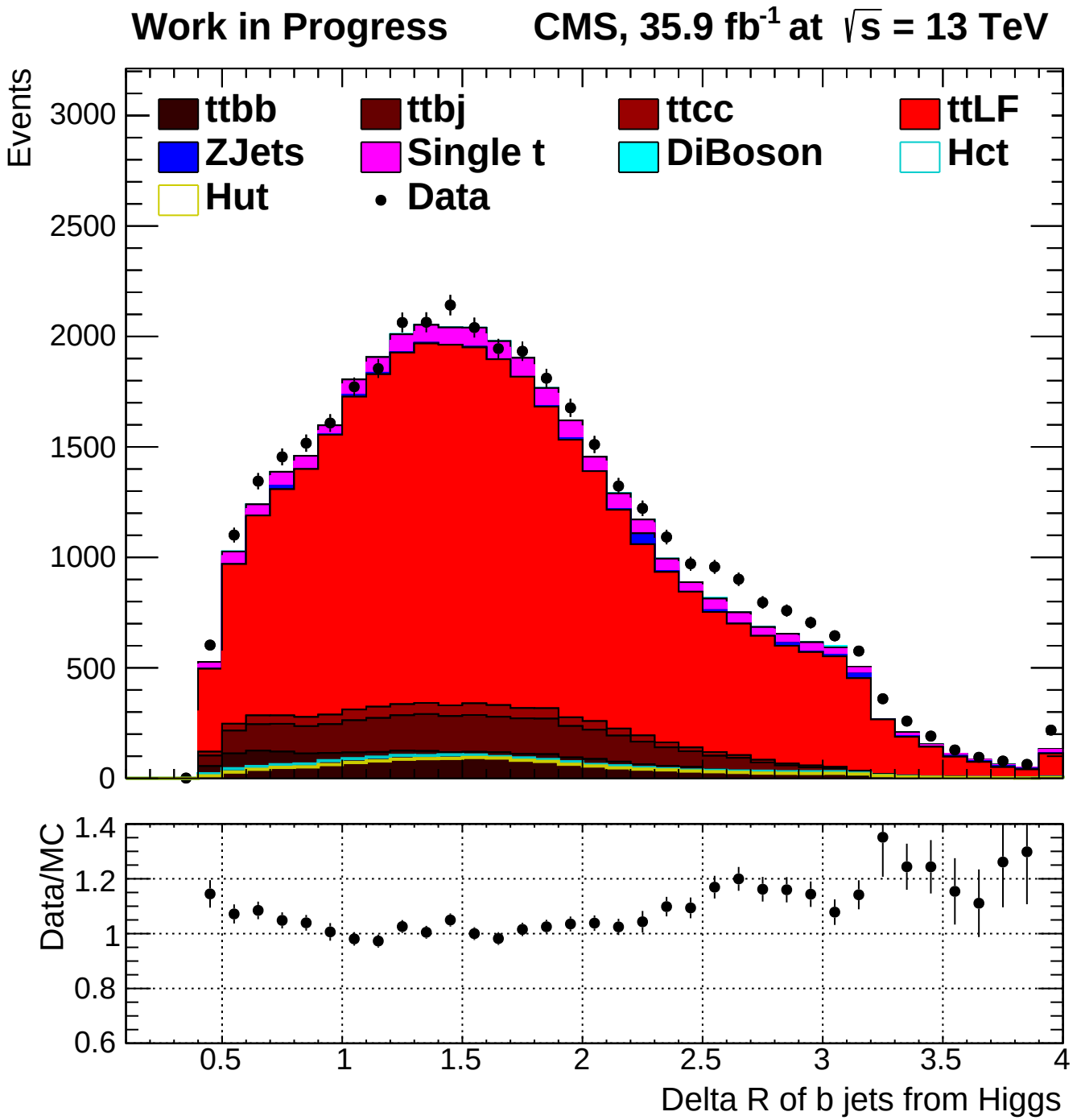

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

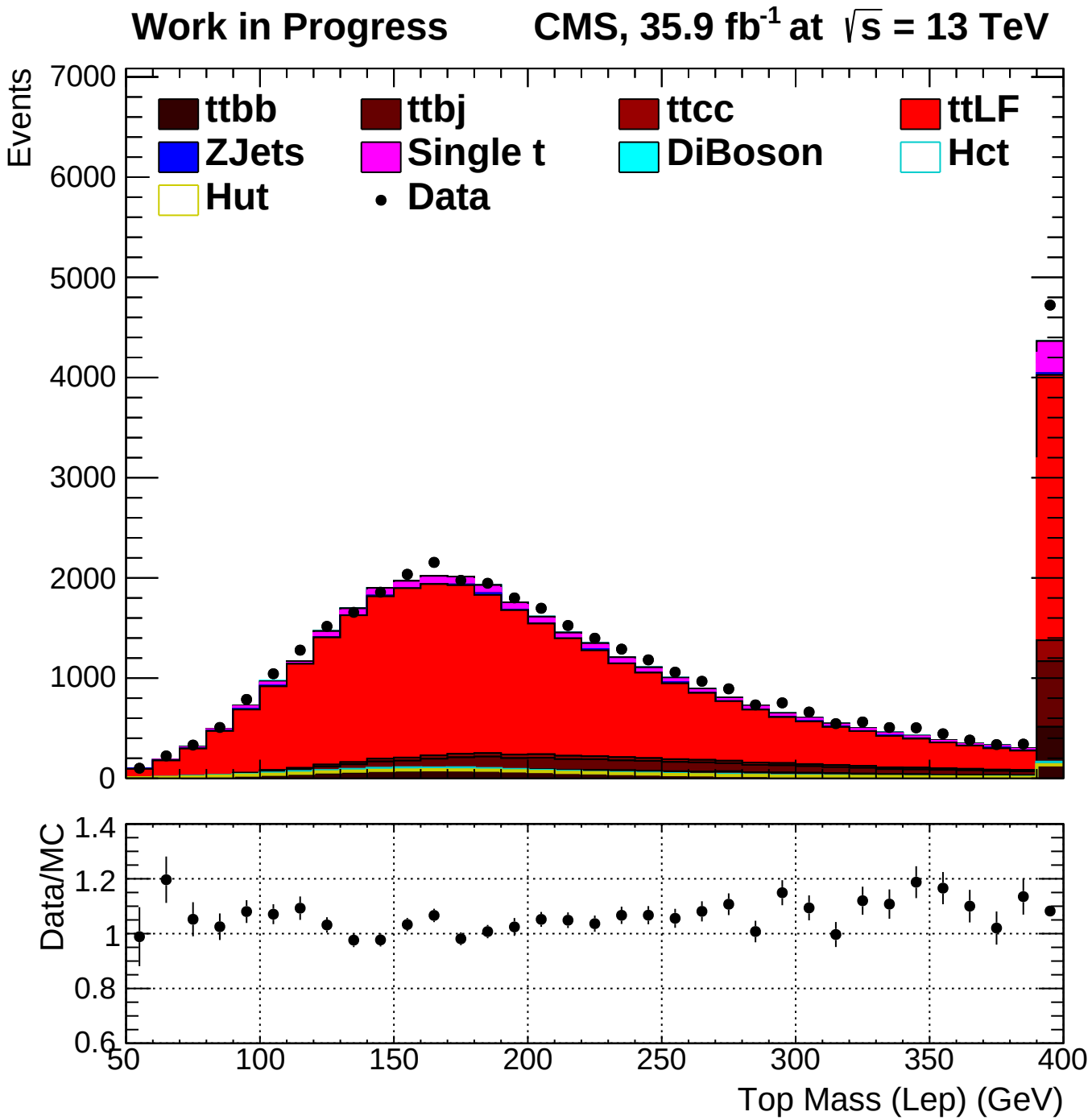

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

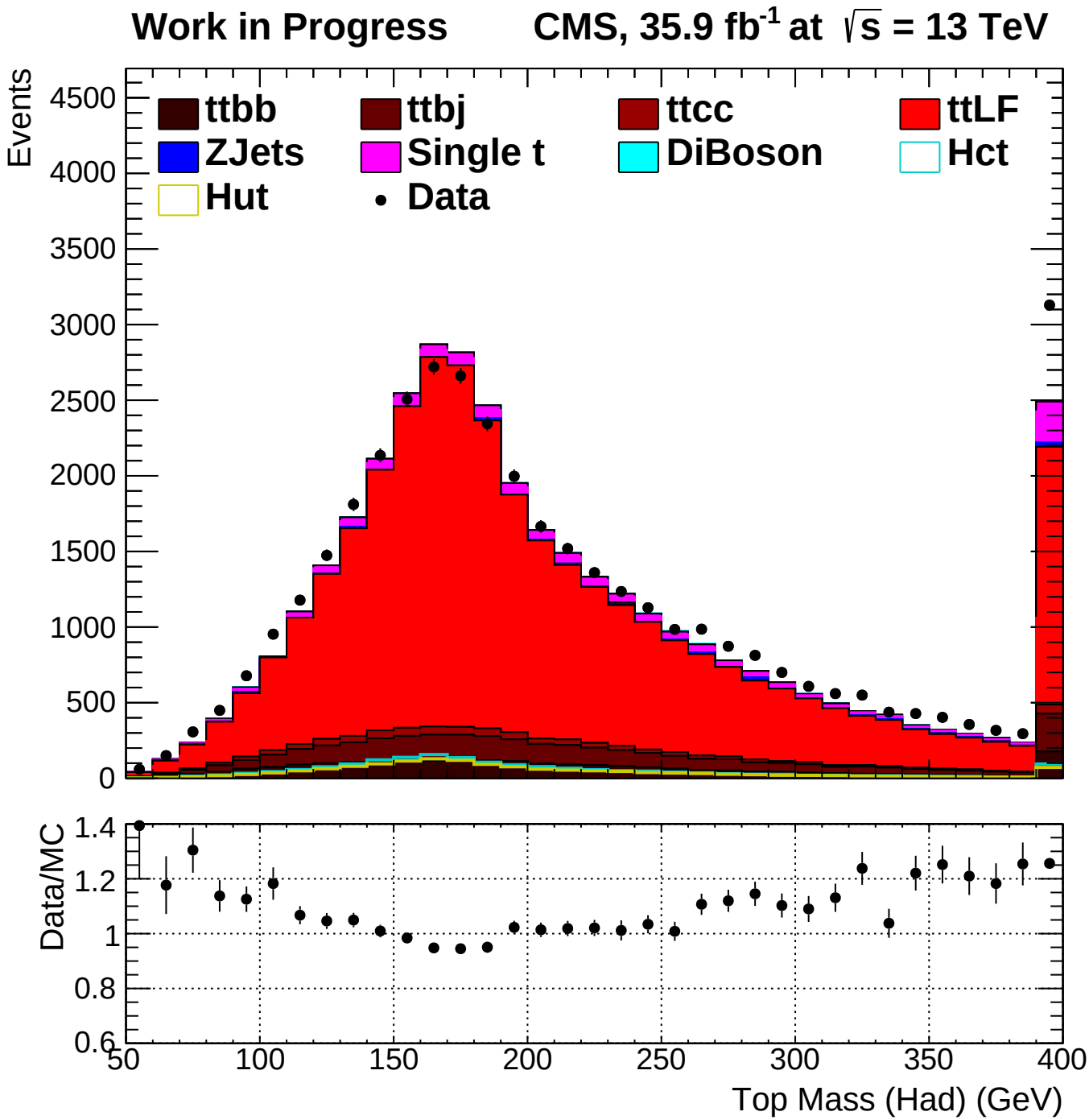

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)

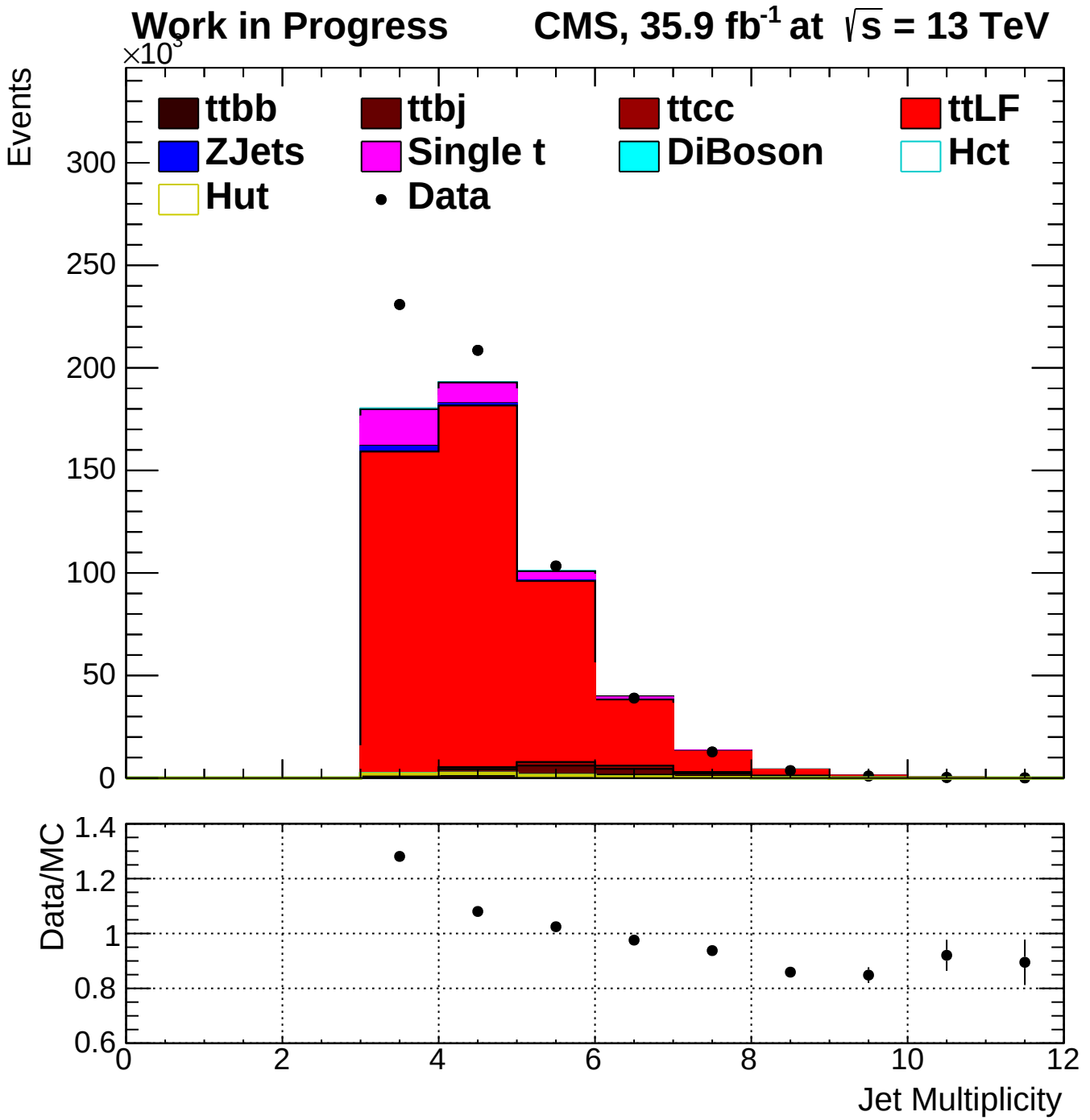

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

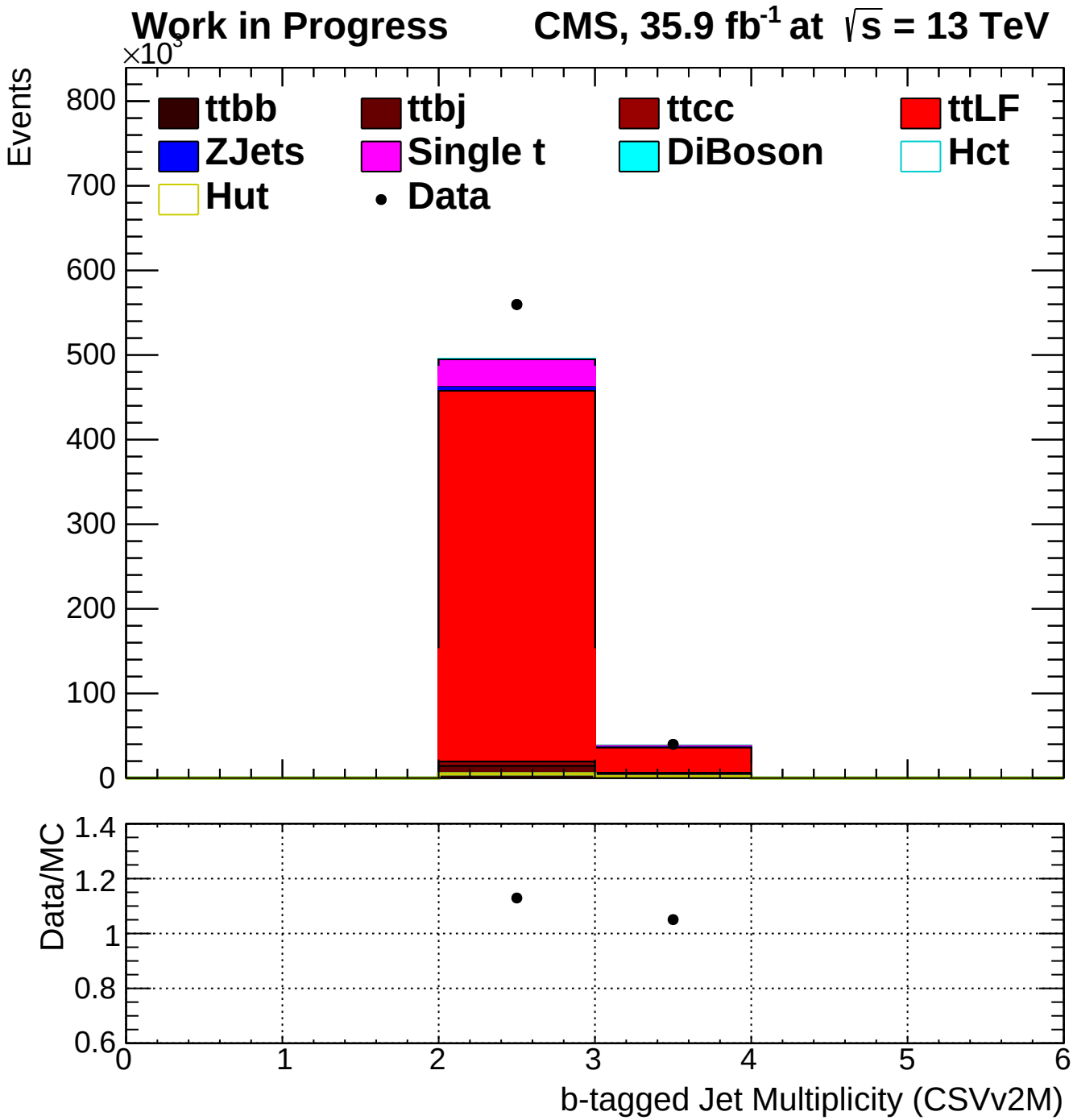

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

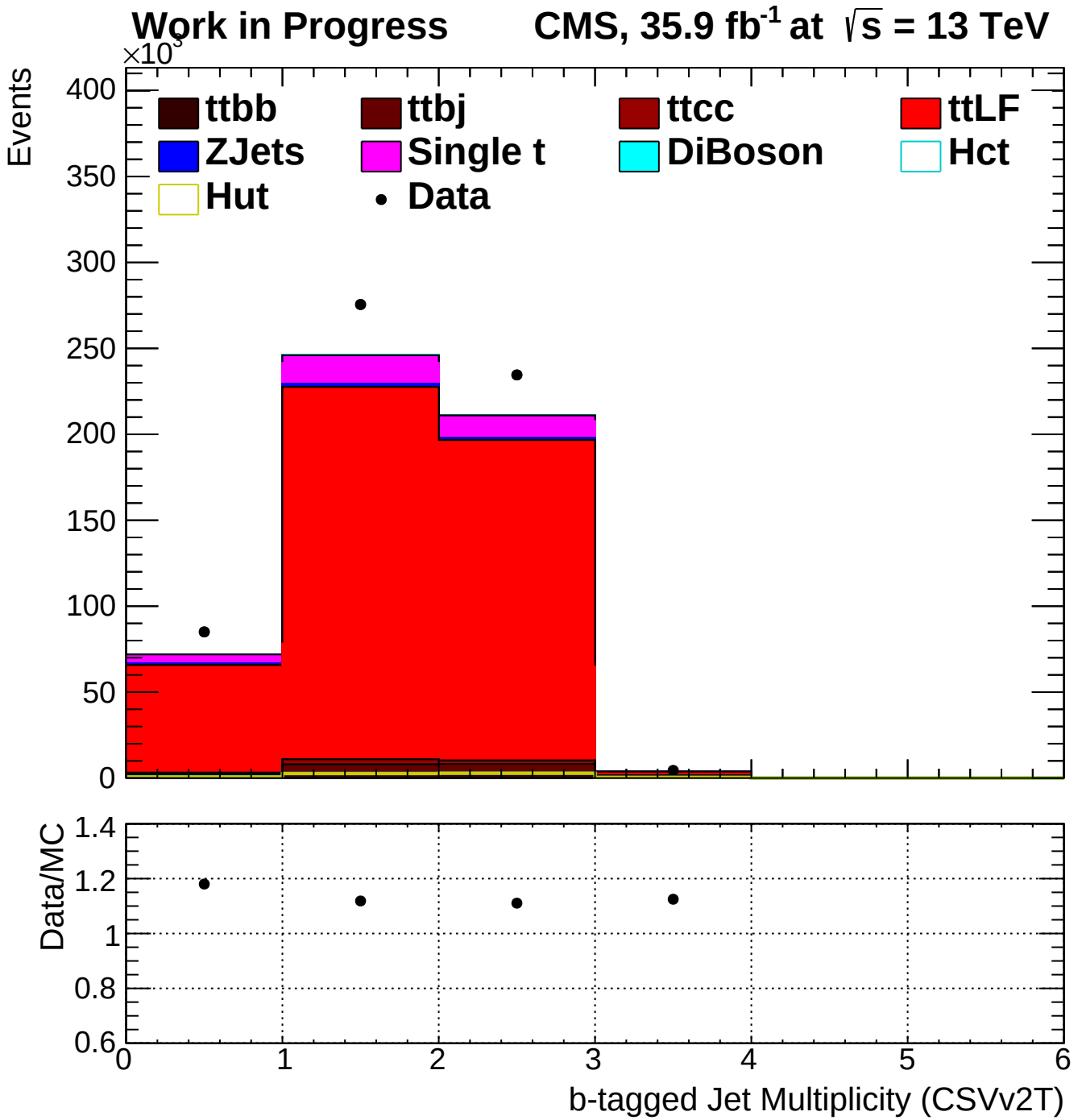

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

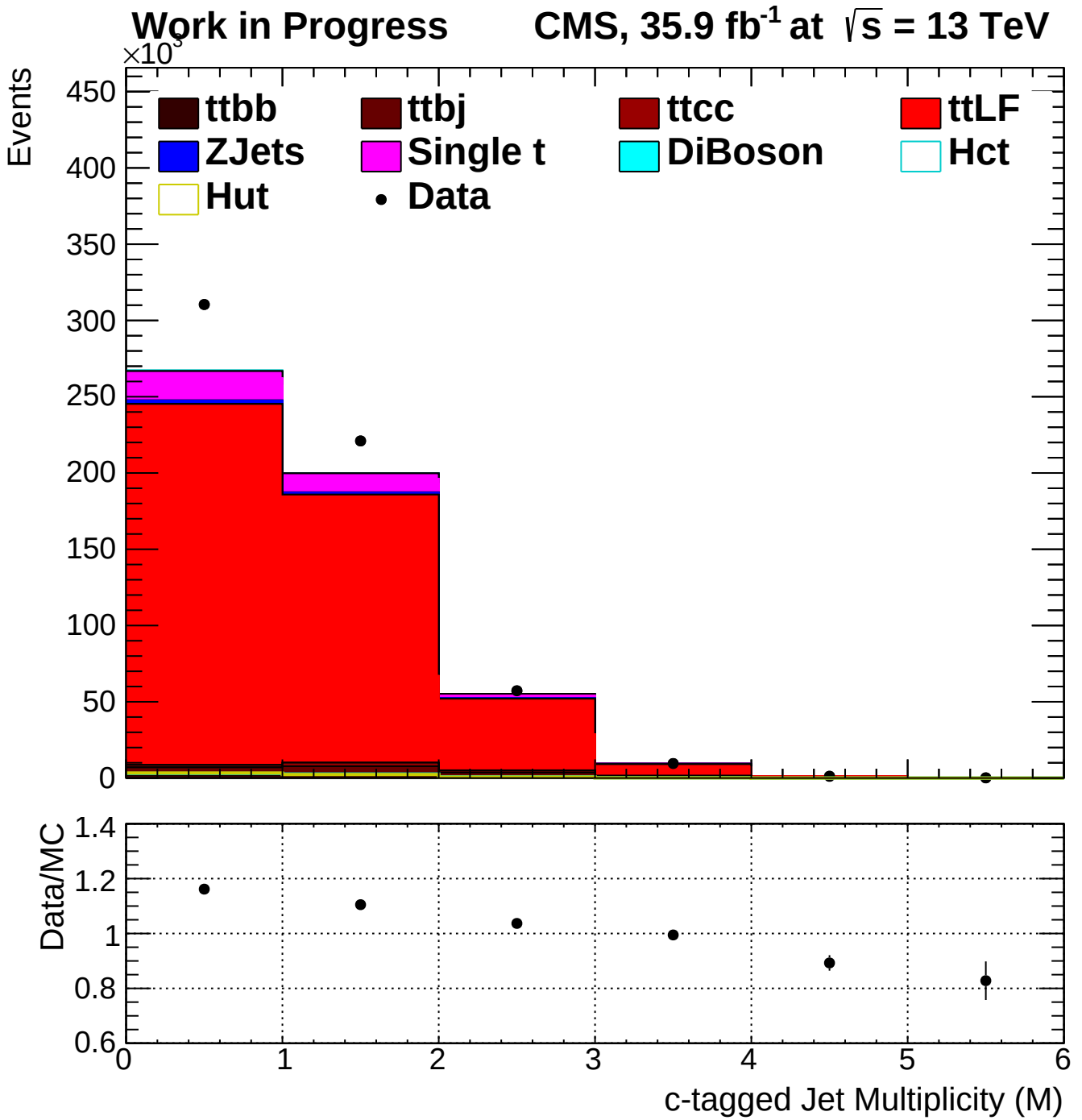

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)

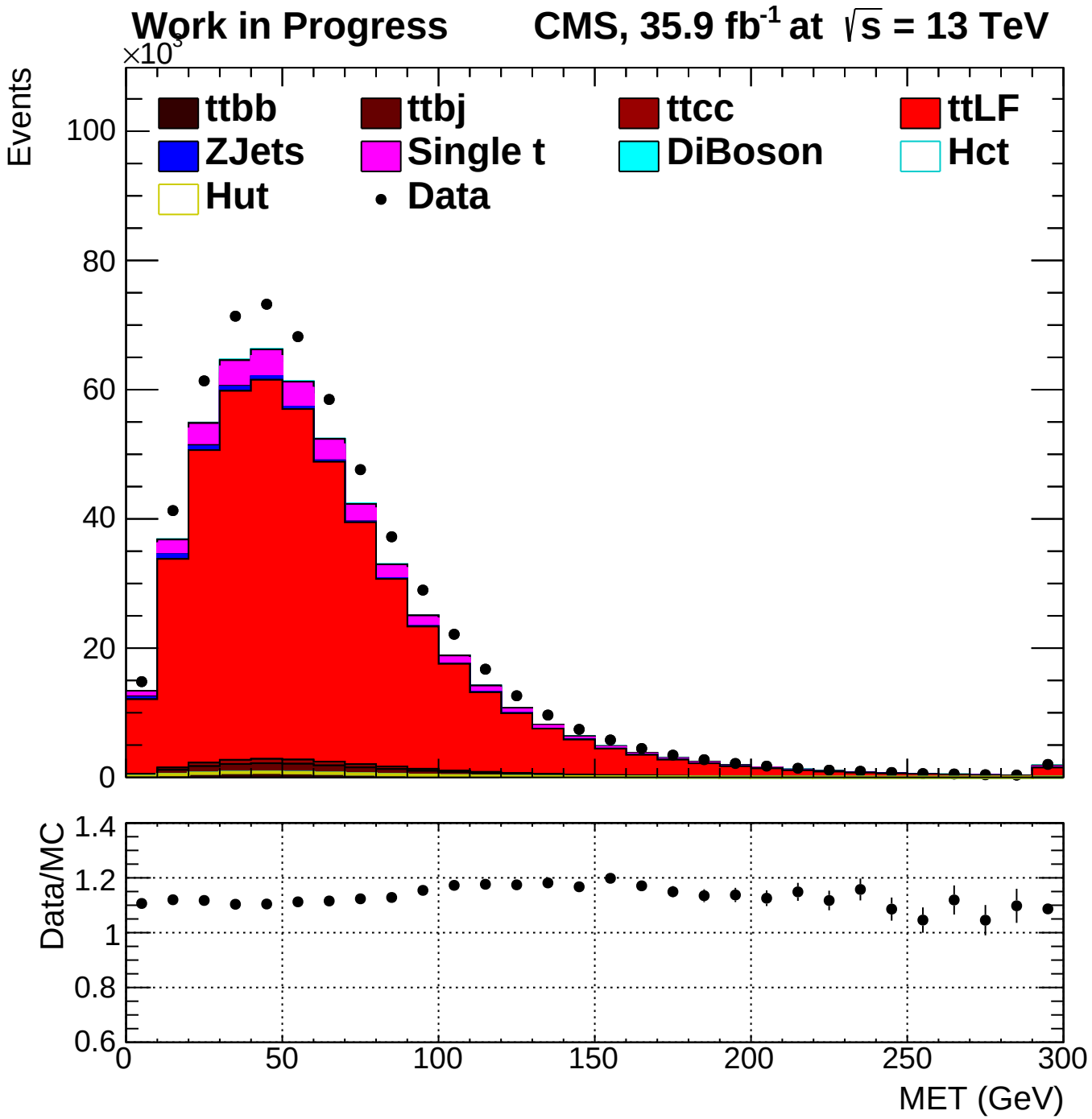

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

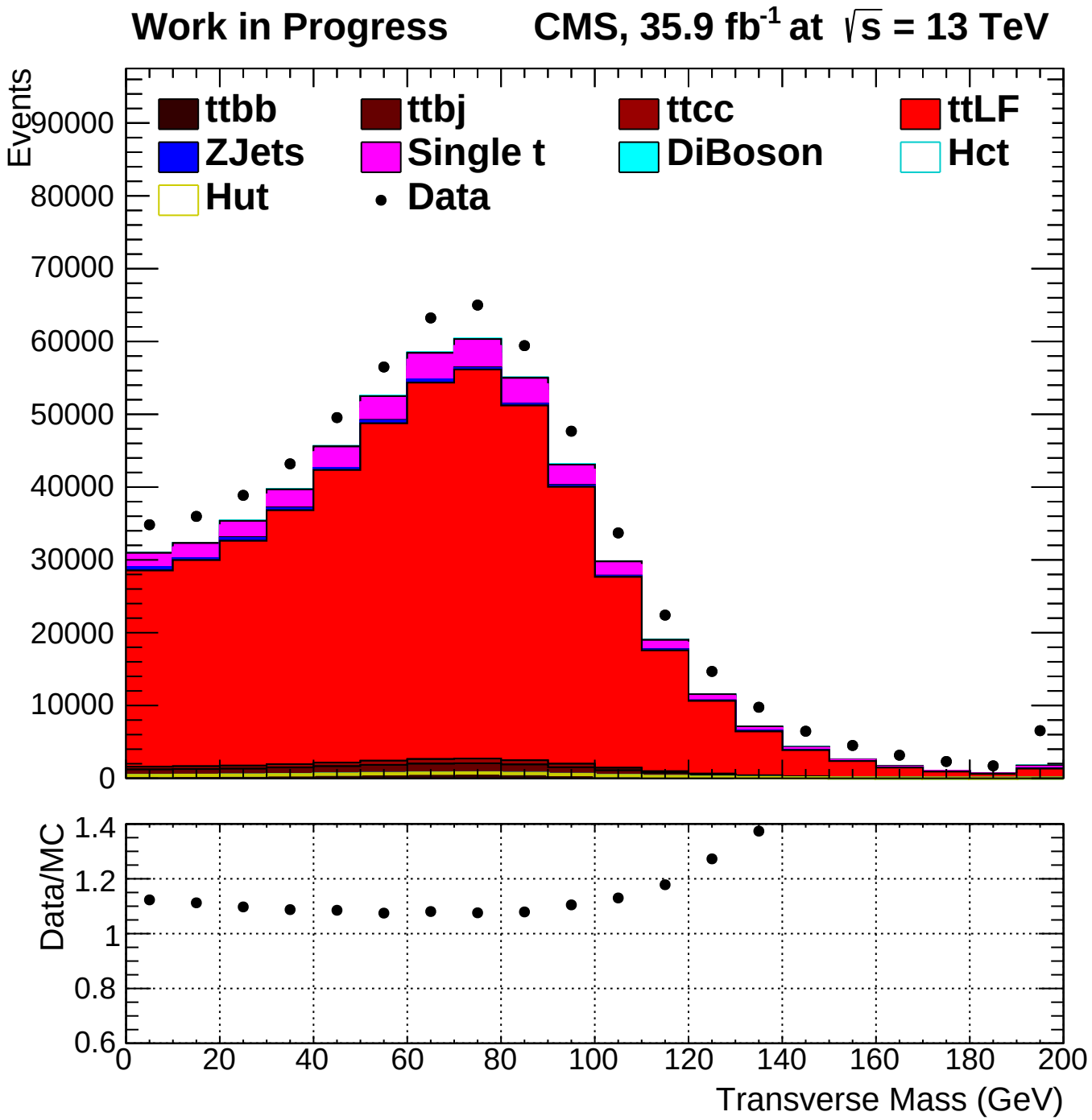

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity

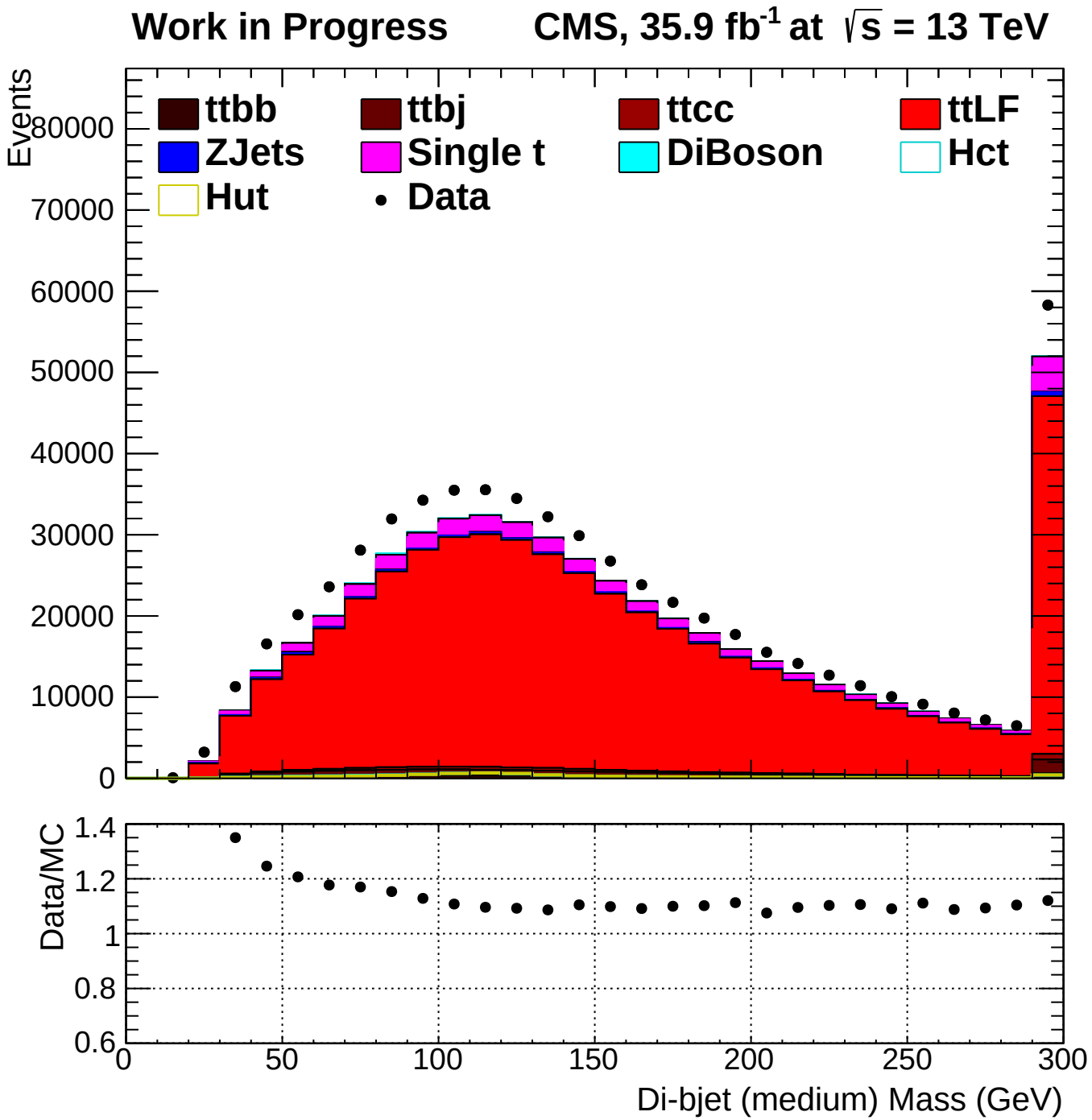

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
800
700
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

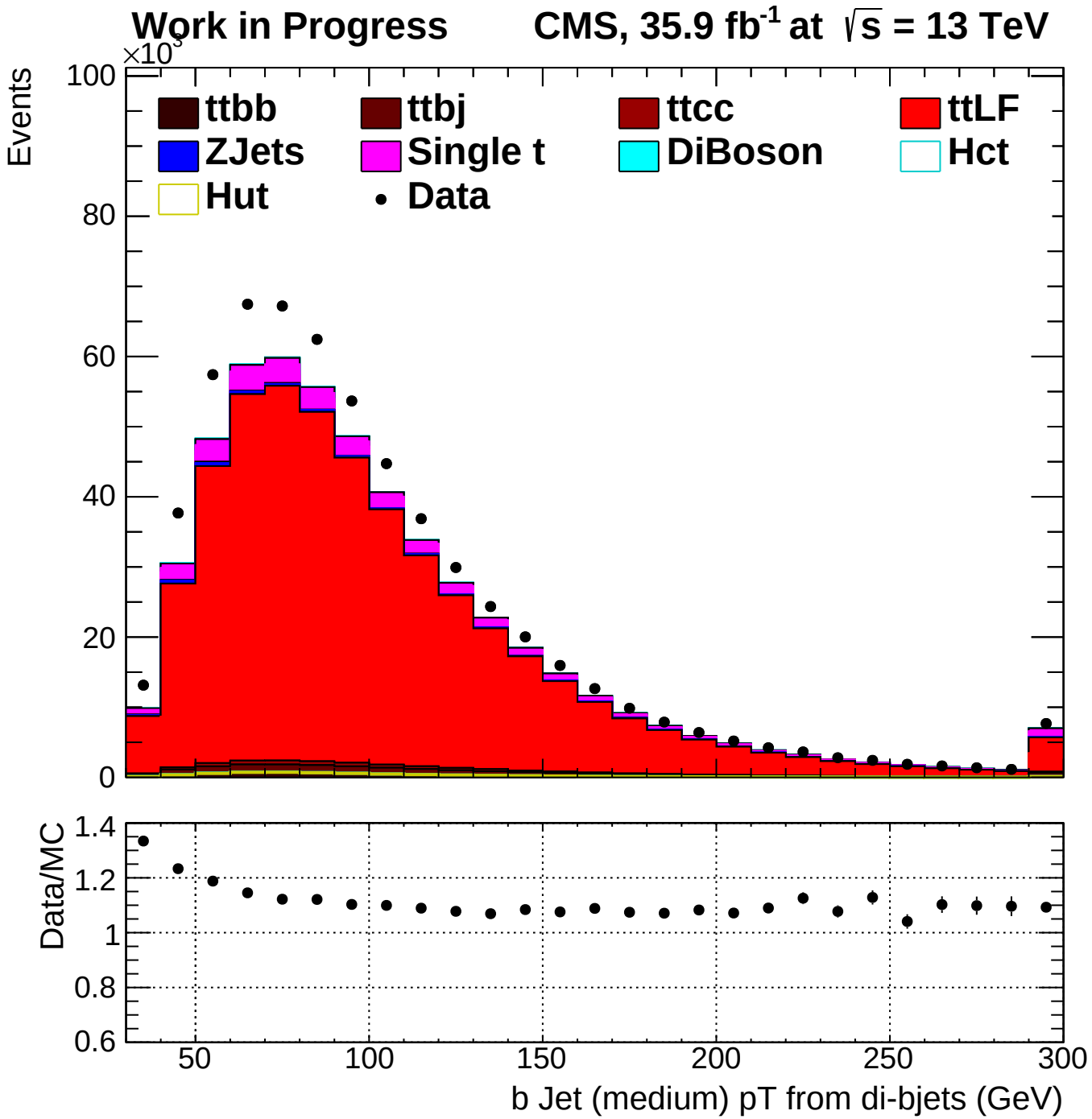

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
400
350
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

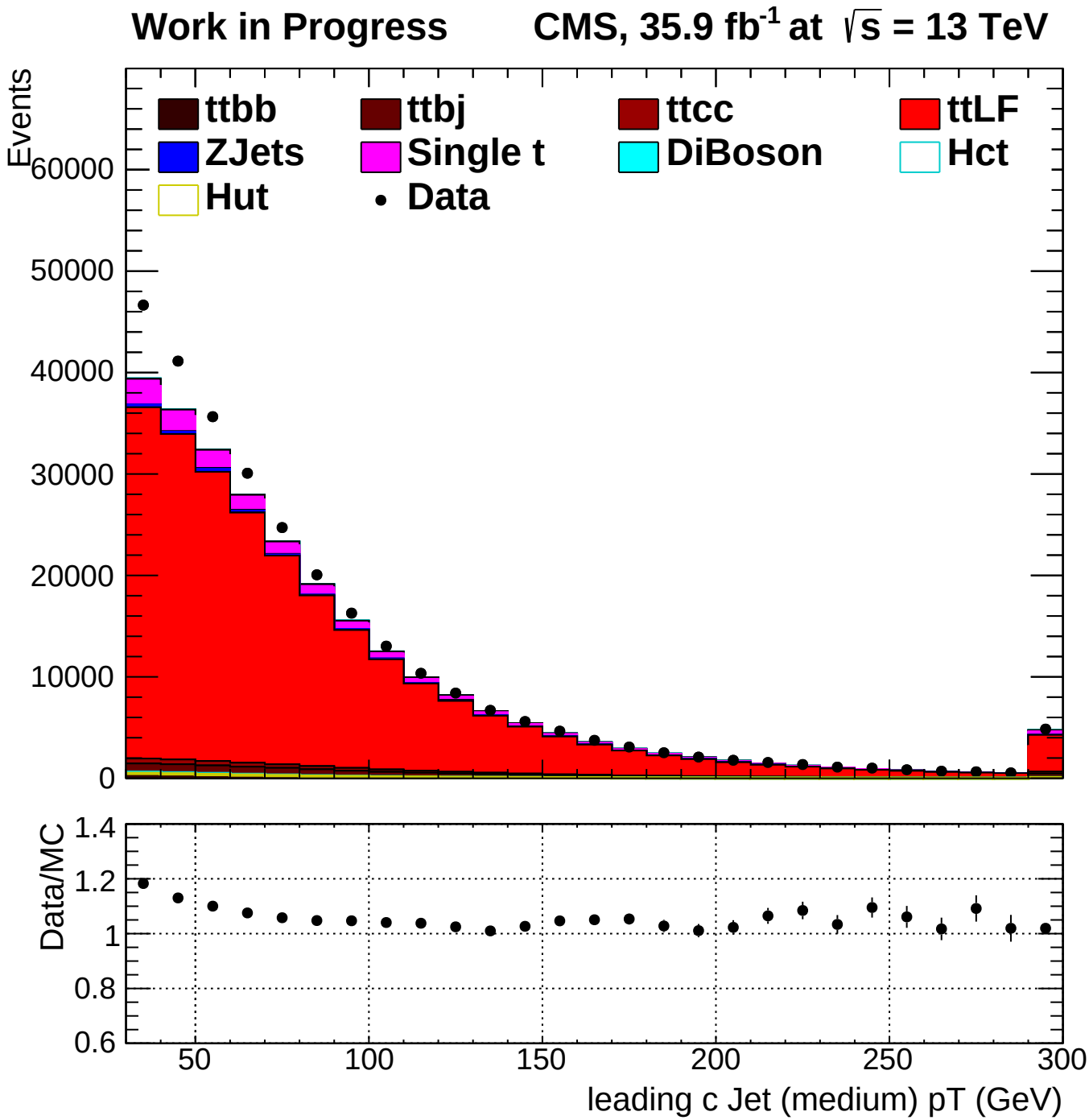

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)

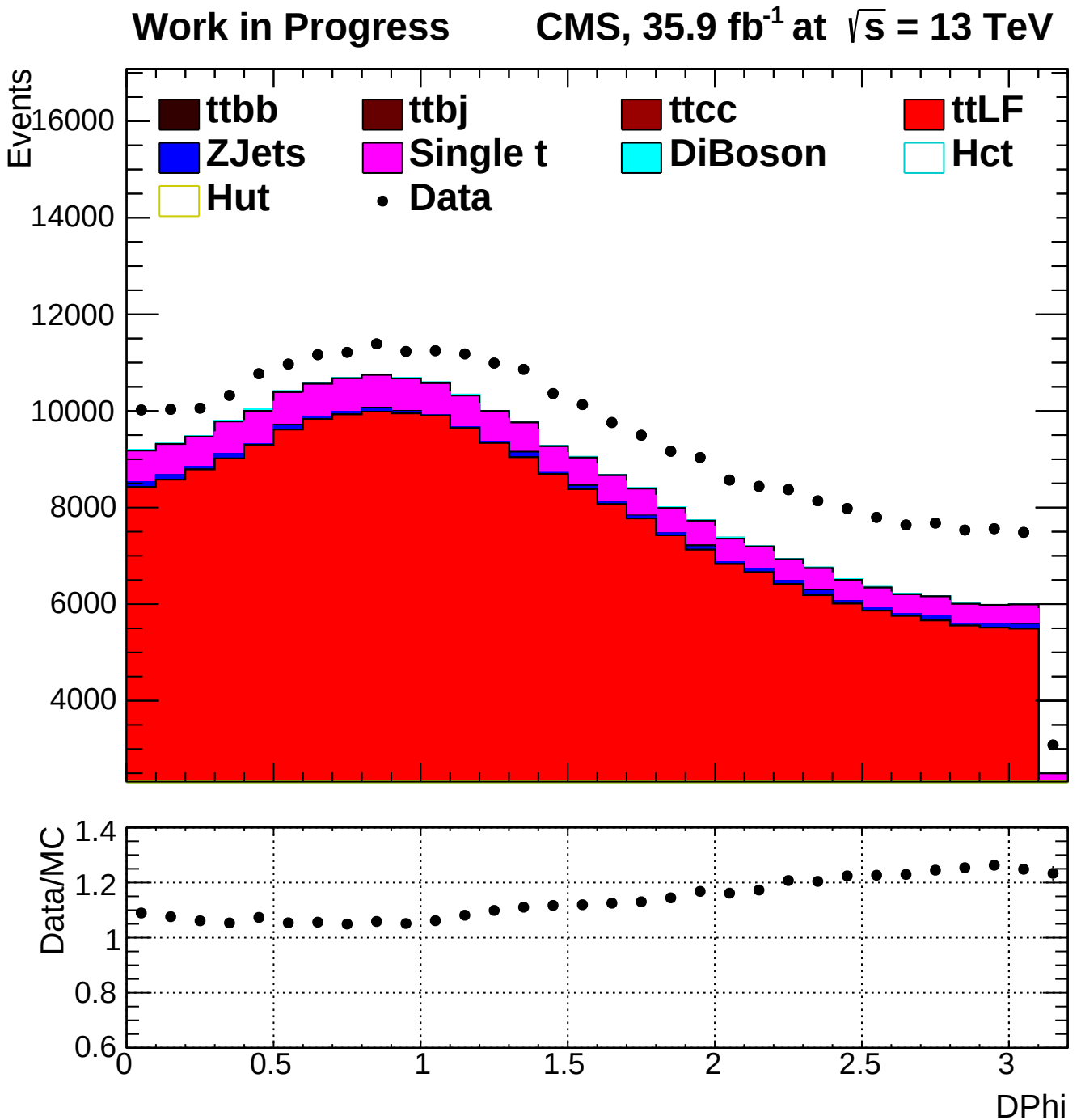

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
100
80
60
40
20
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)

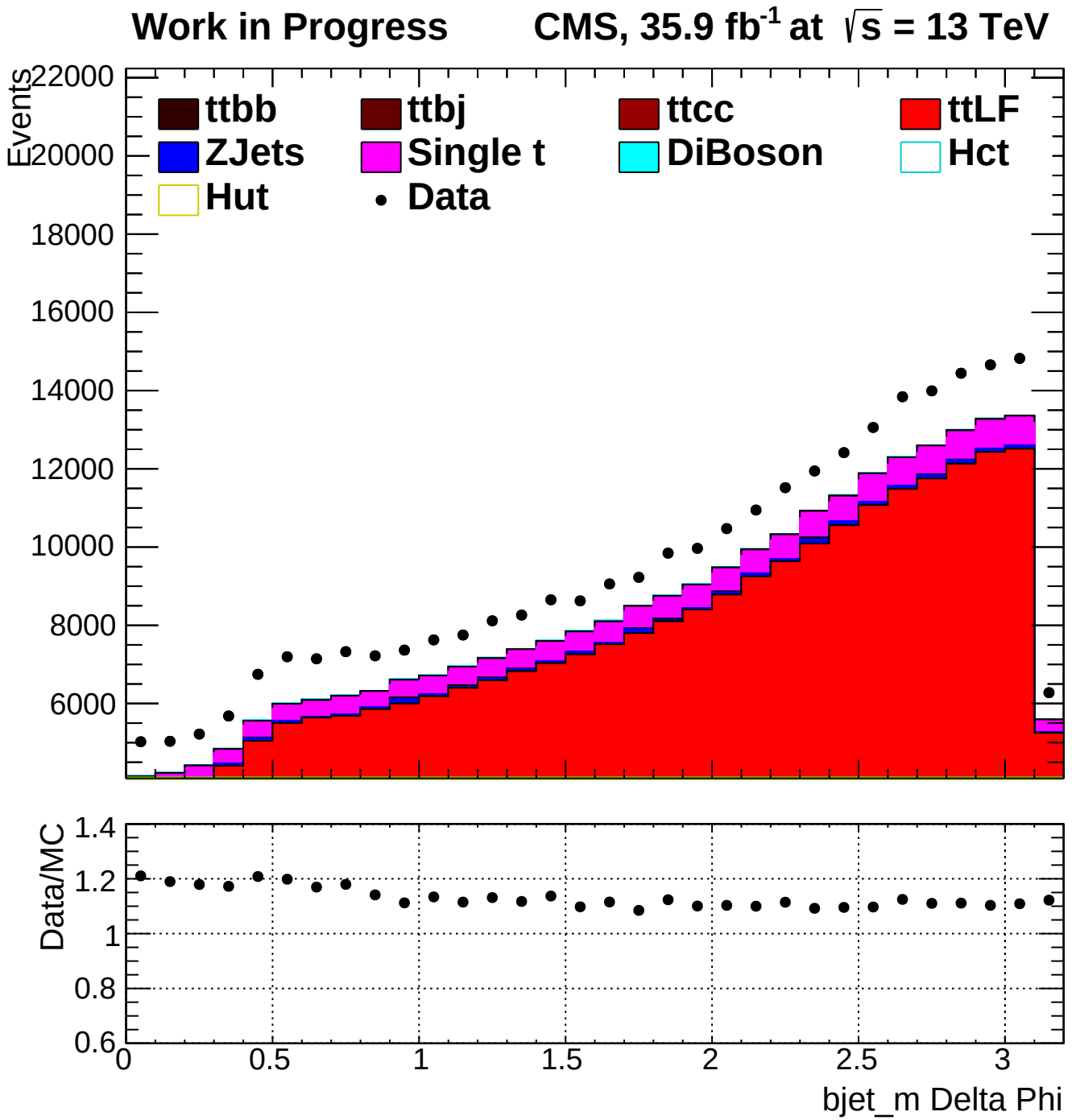

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

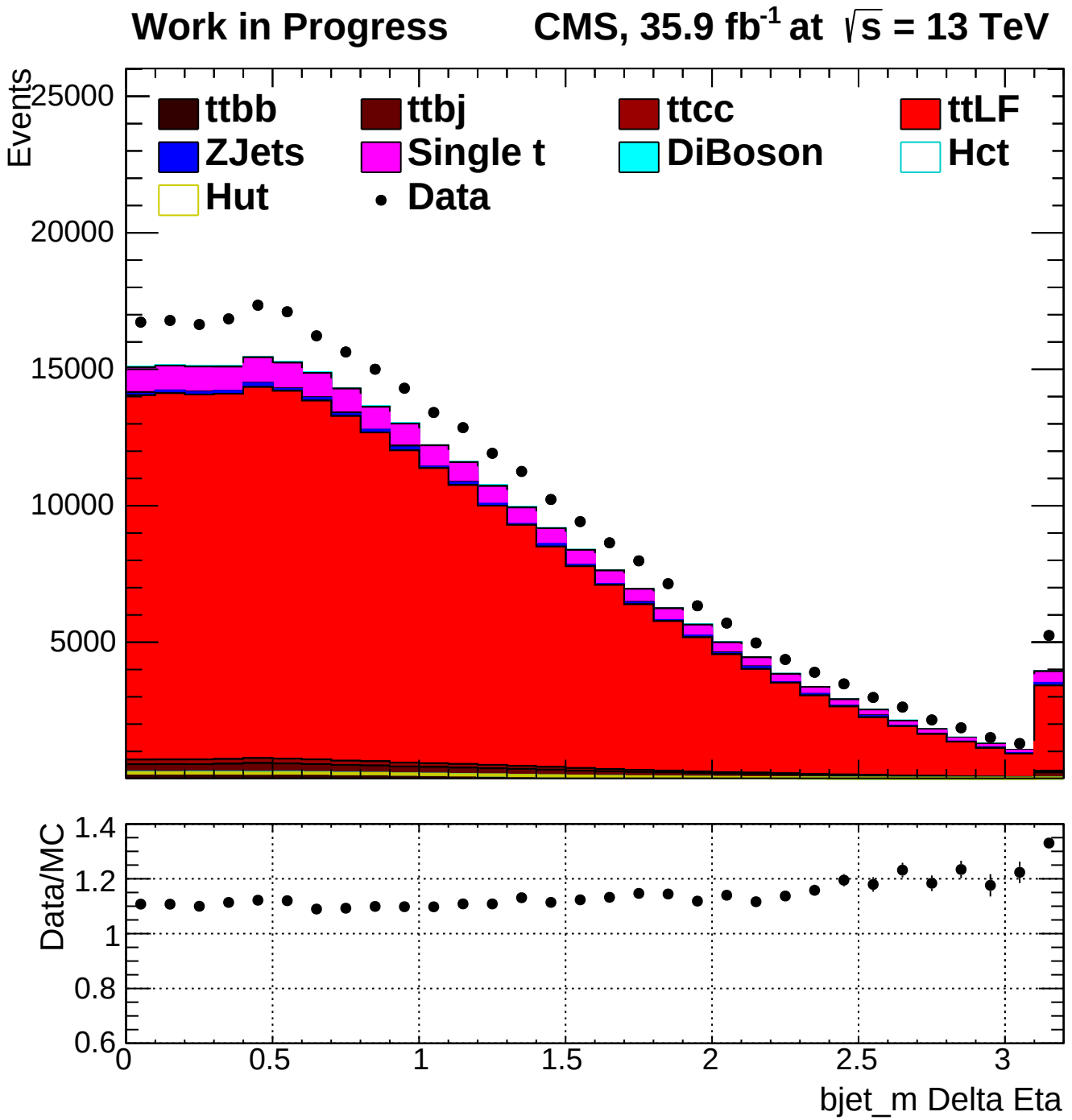

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

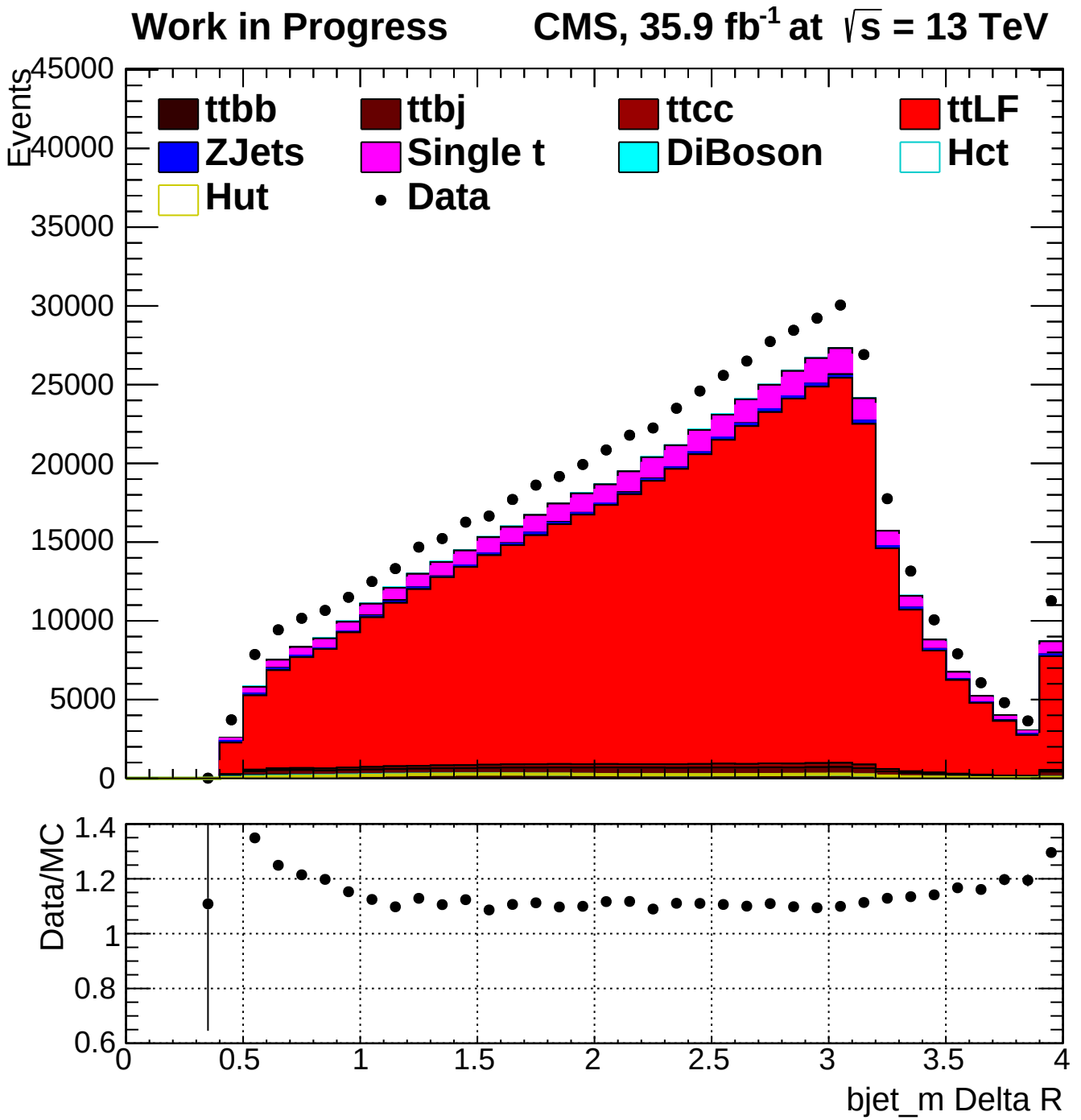

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)

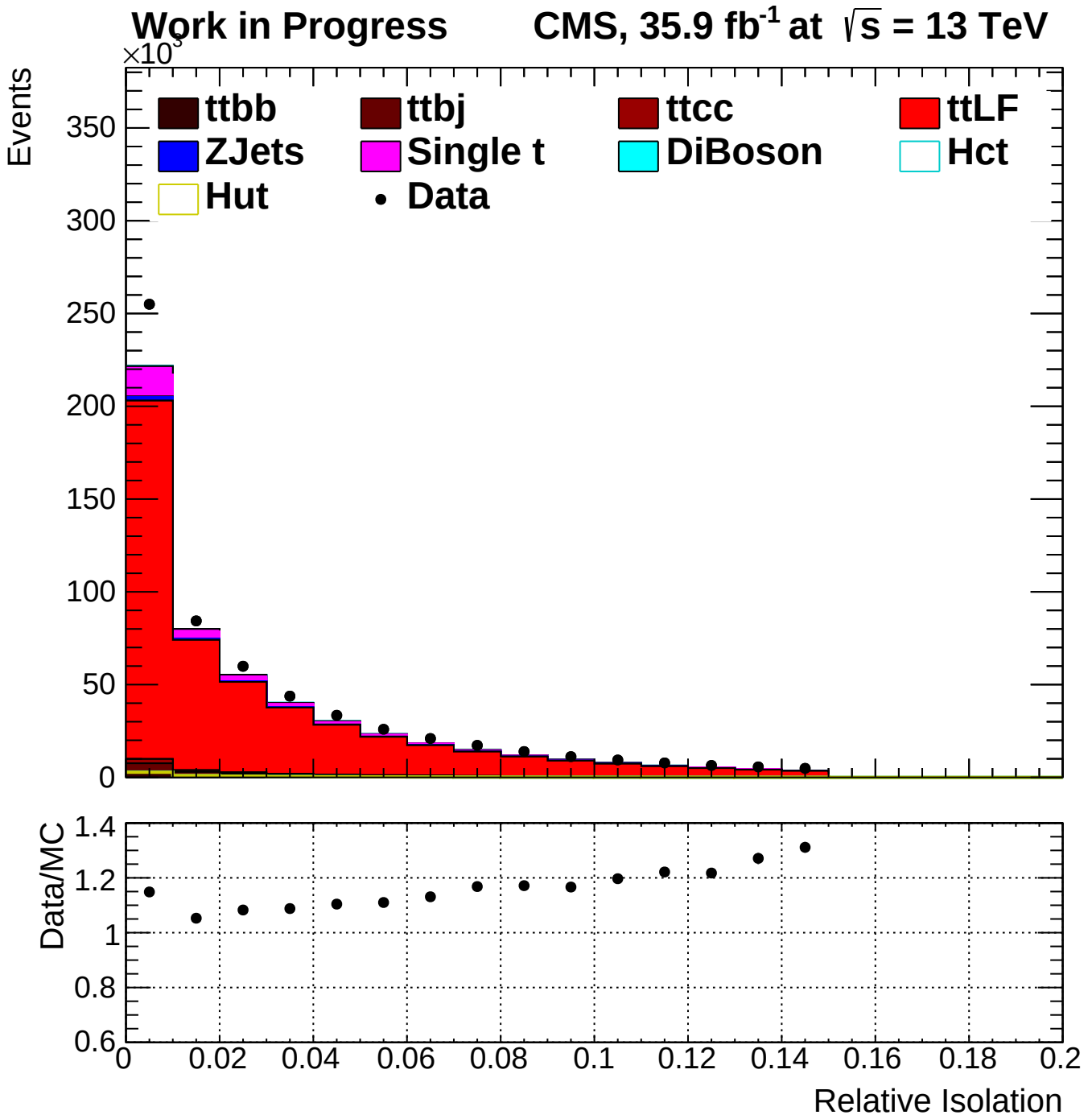

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

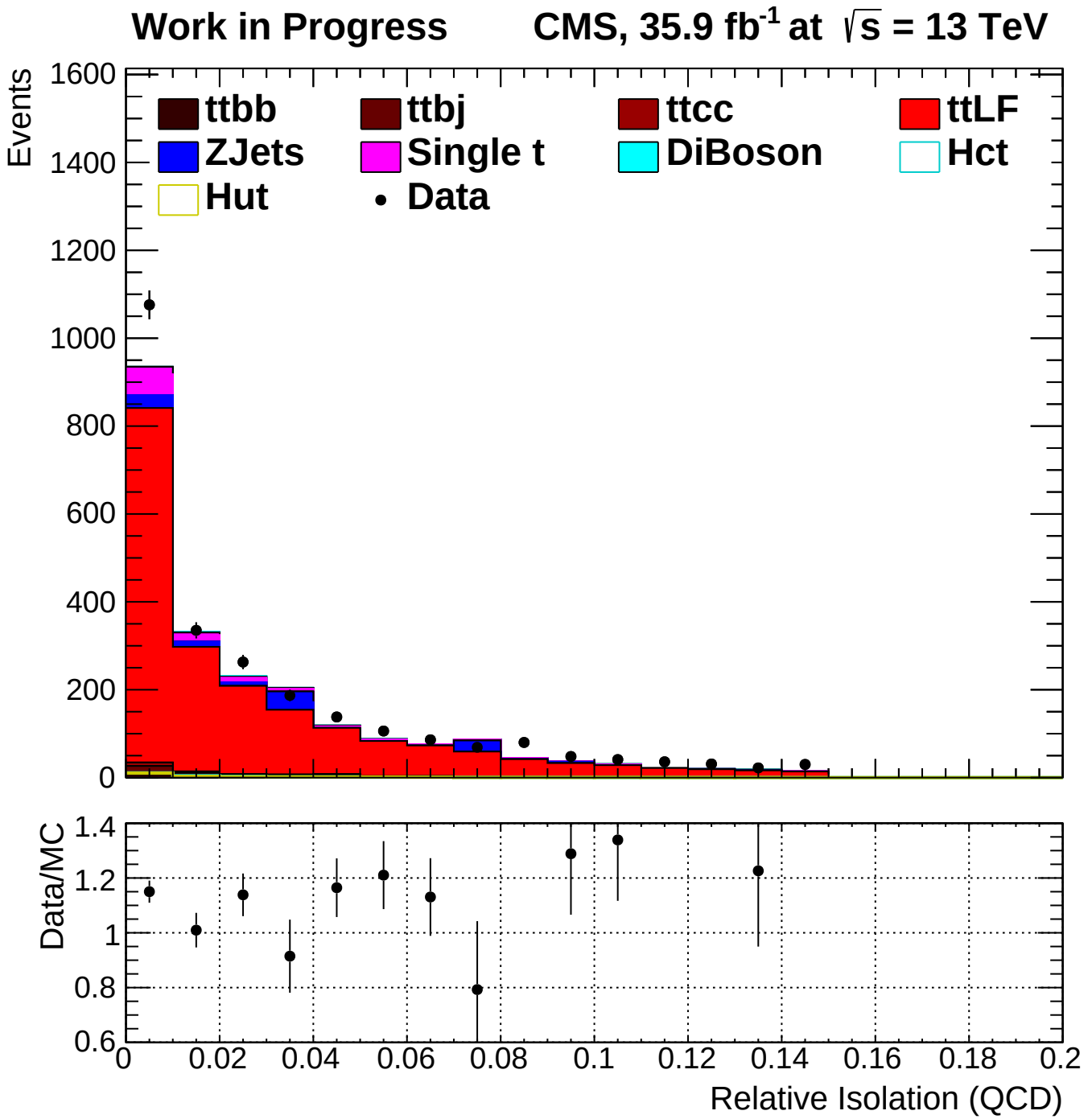

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16000
14000
12000
10000
8000
6000
4000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

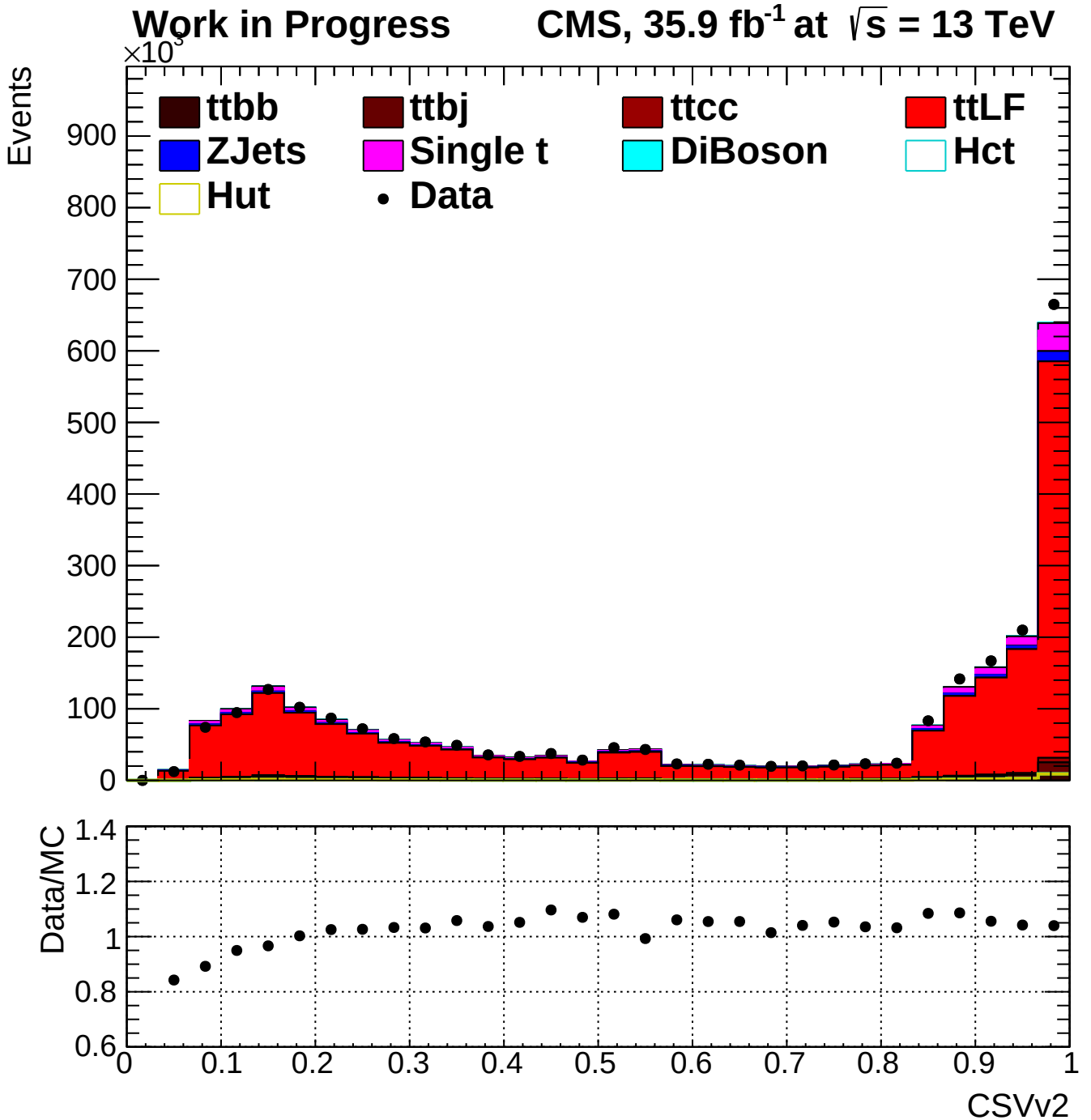

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
22000
20000
18000
16000
14000
12000
10000
8000
6000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

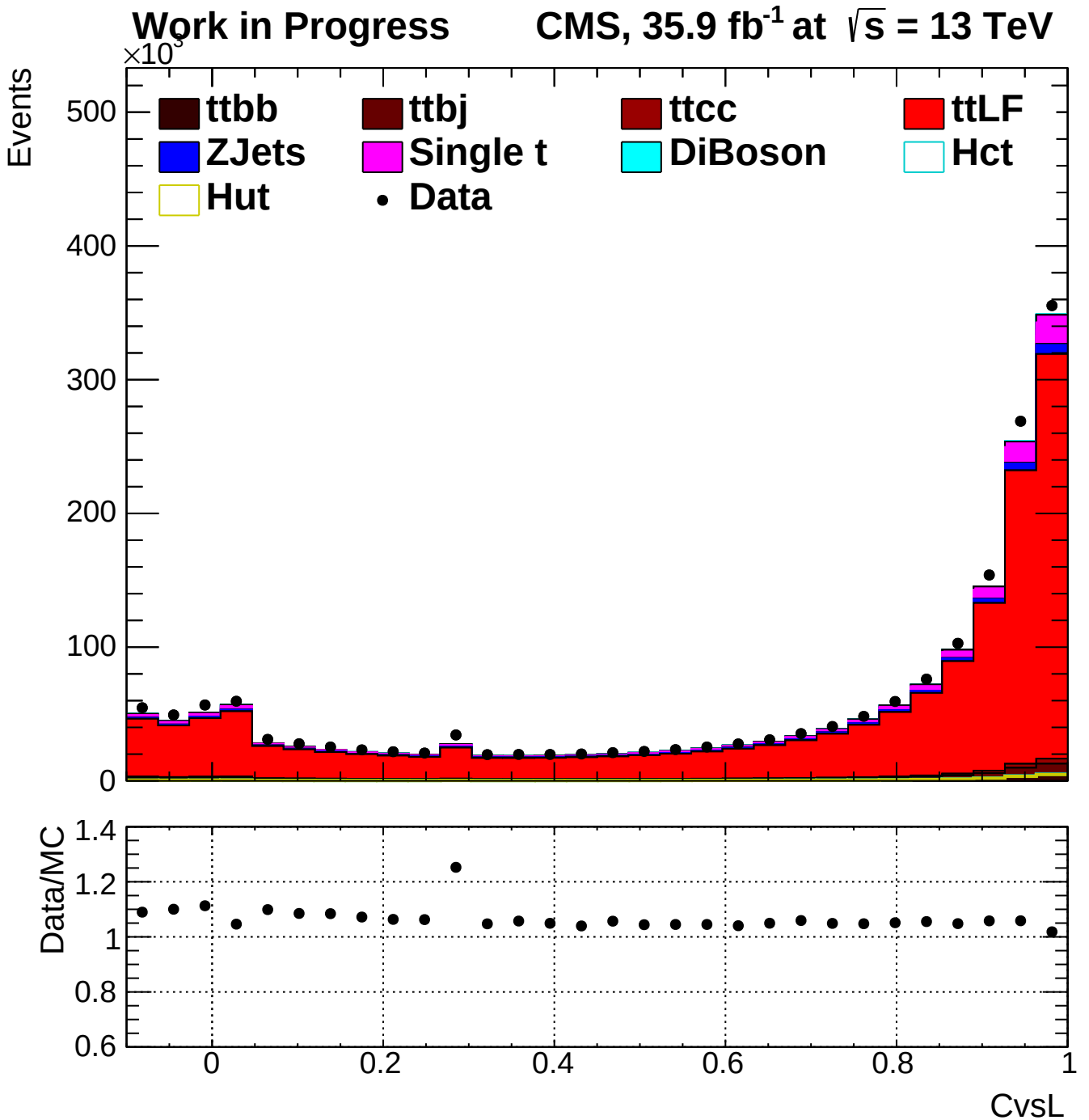

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

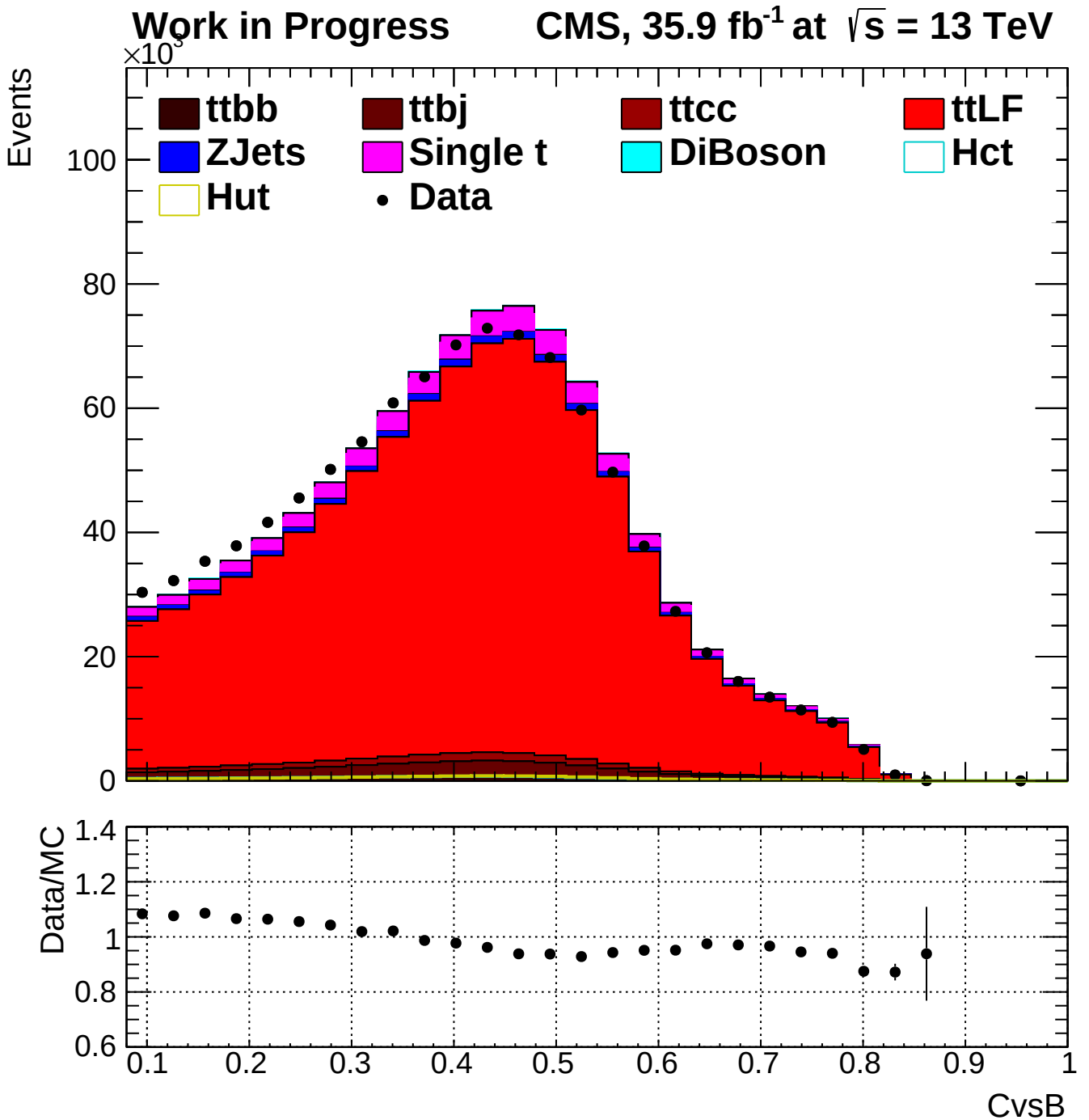

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R

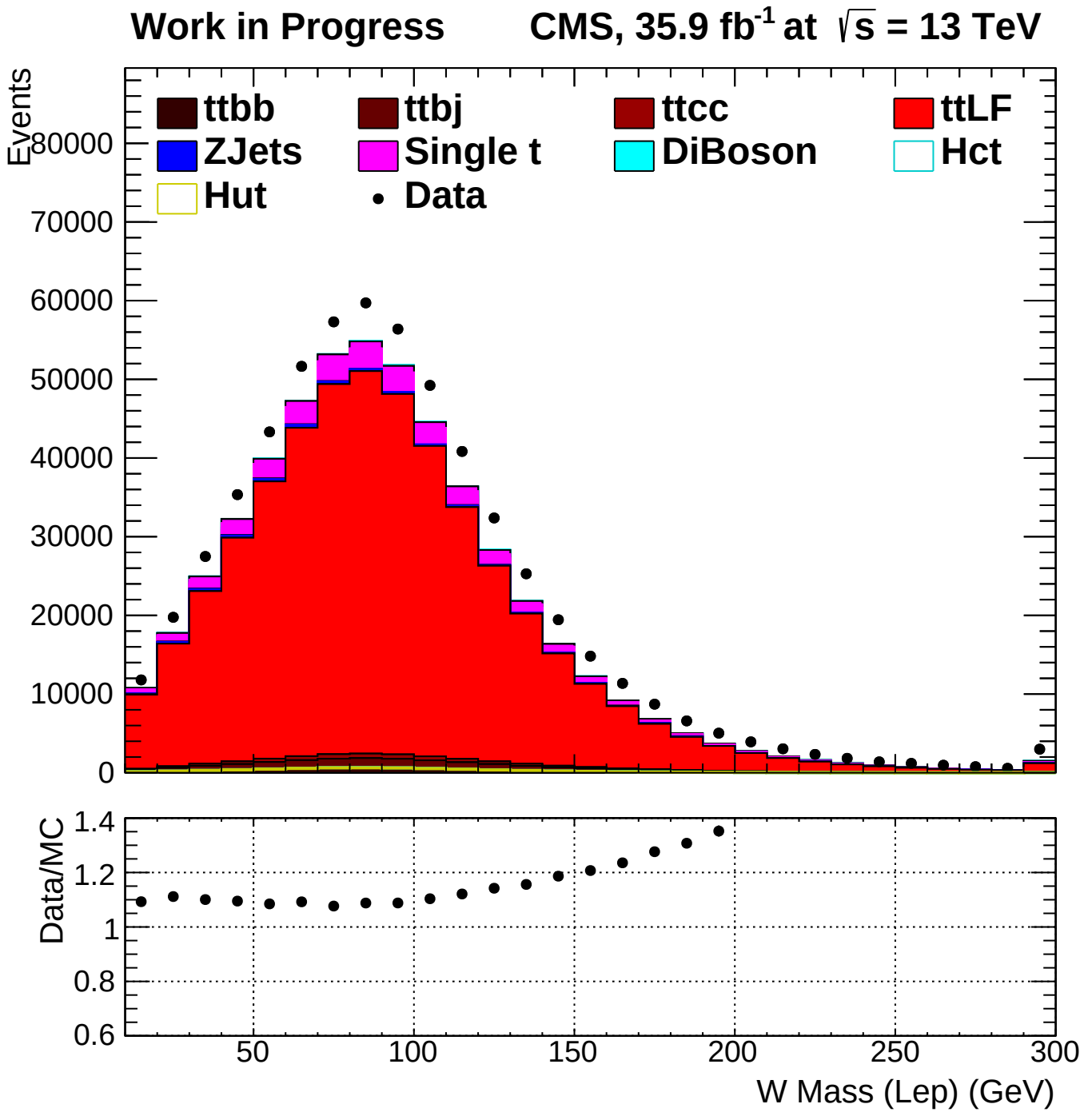

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
350
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

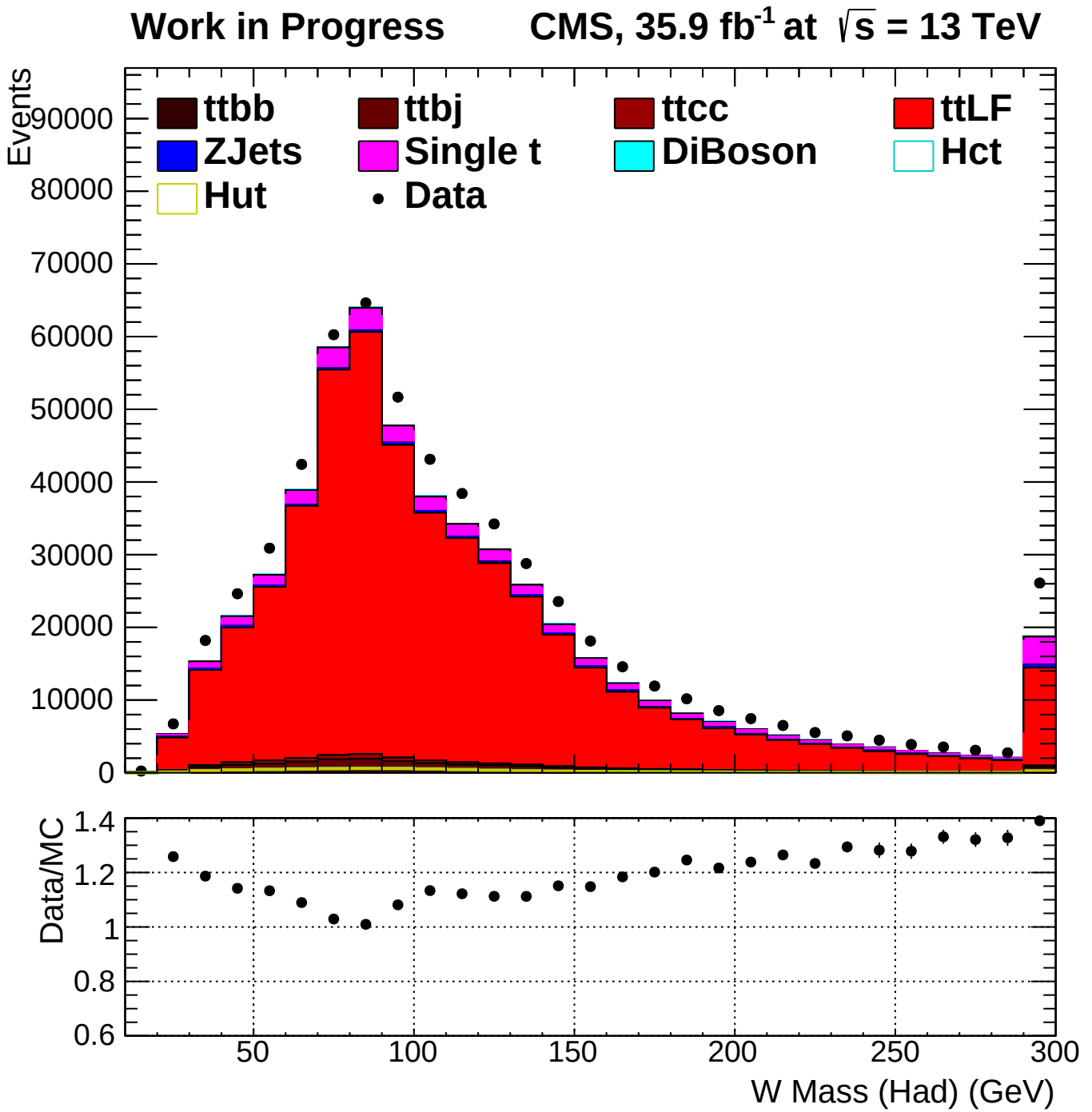

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

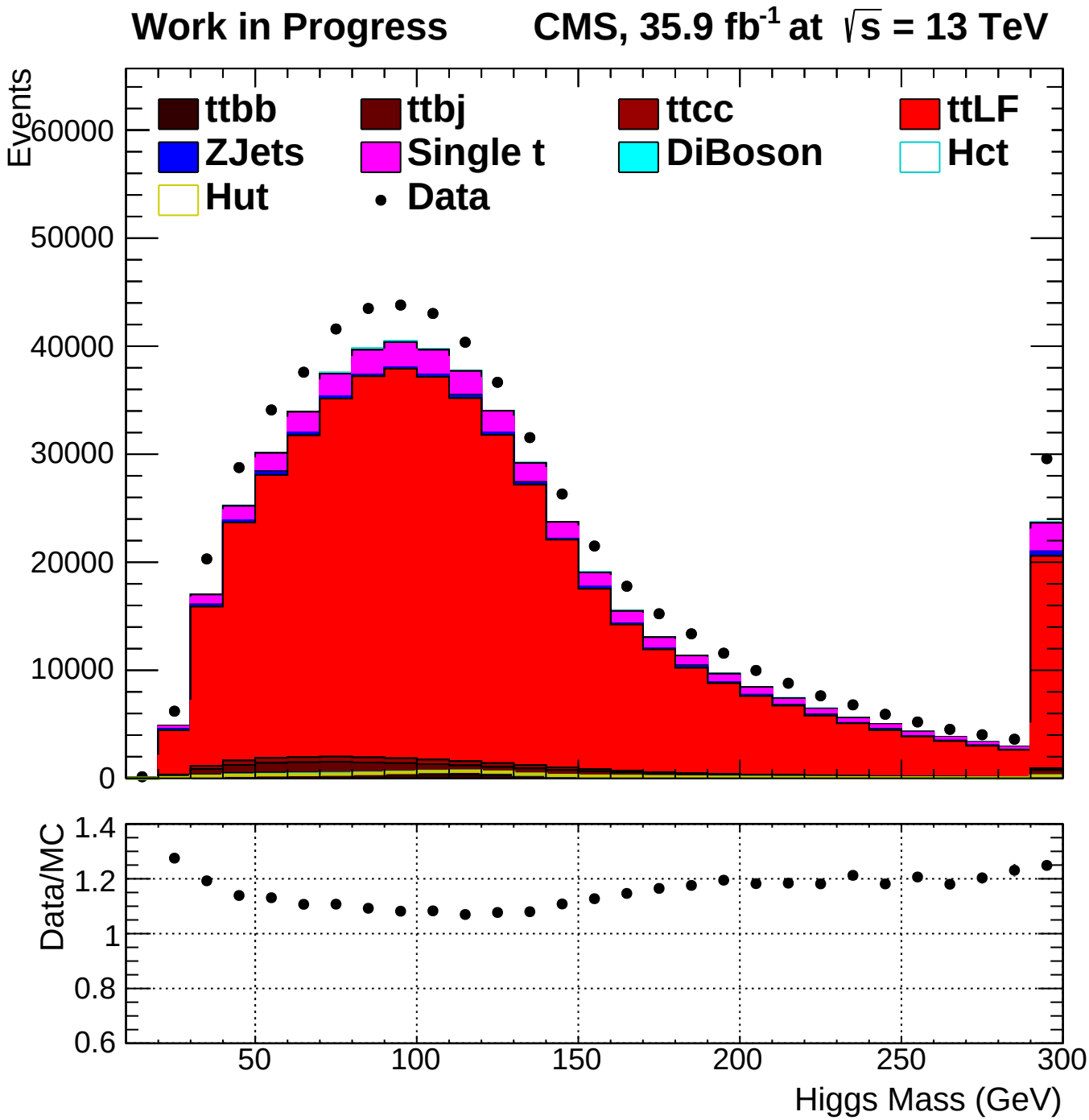

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
900
800
700
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

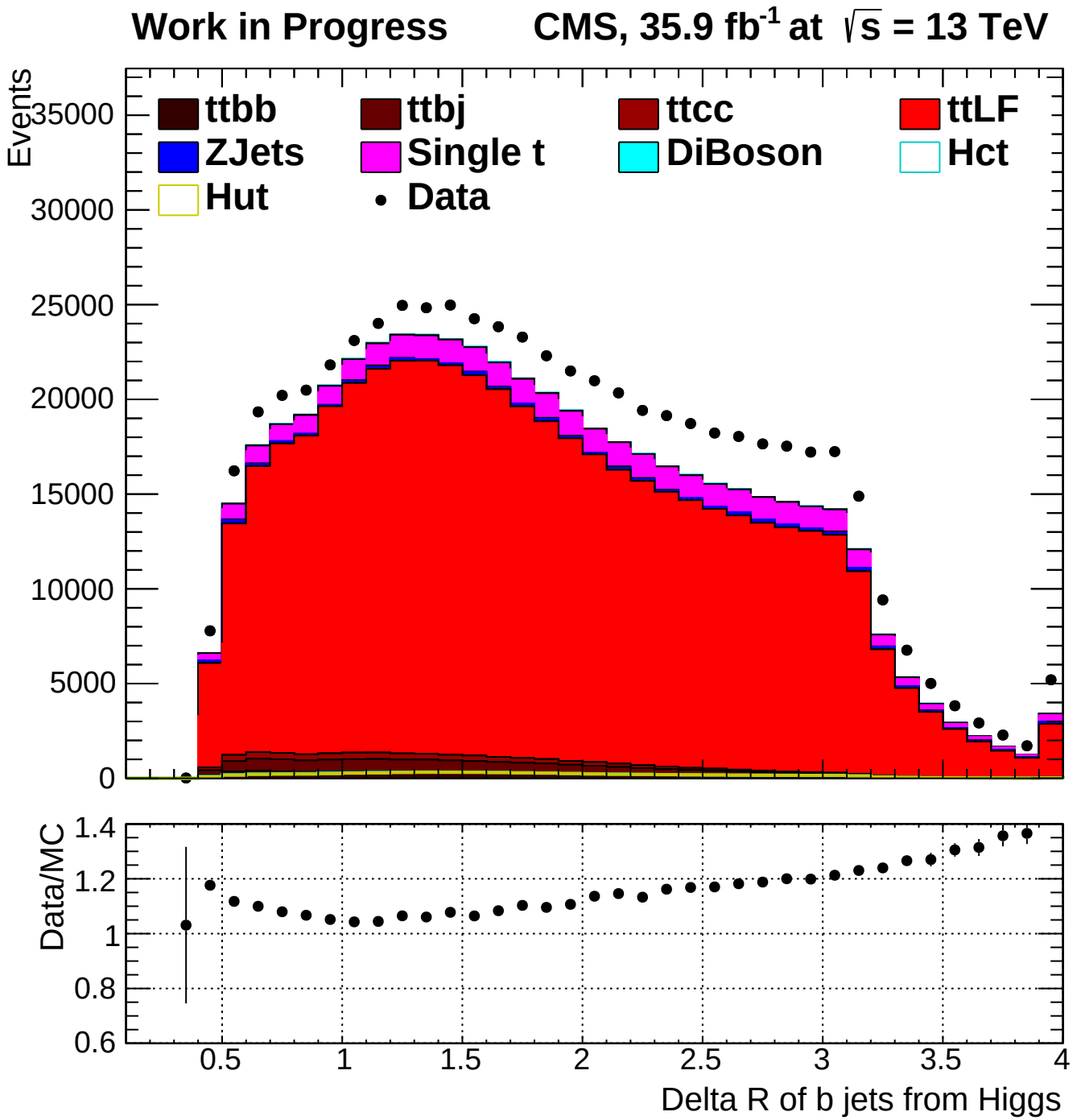

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsL

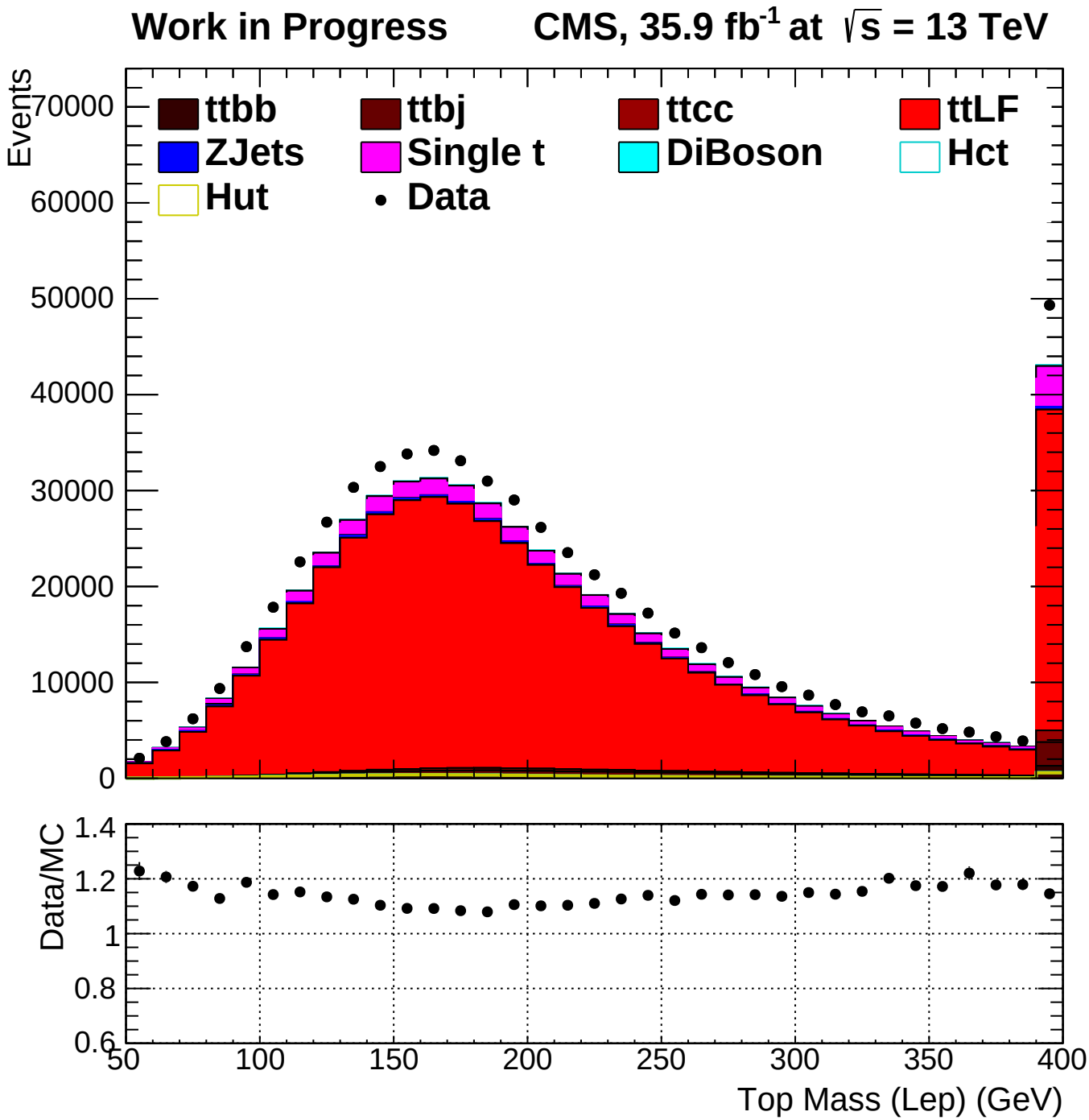

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB

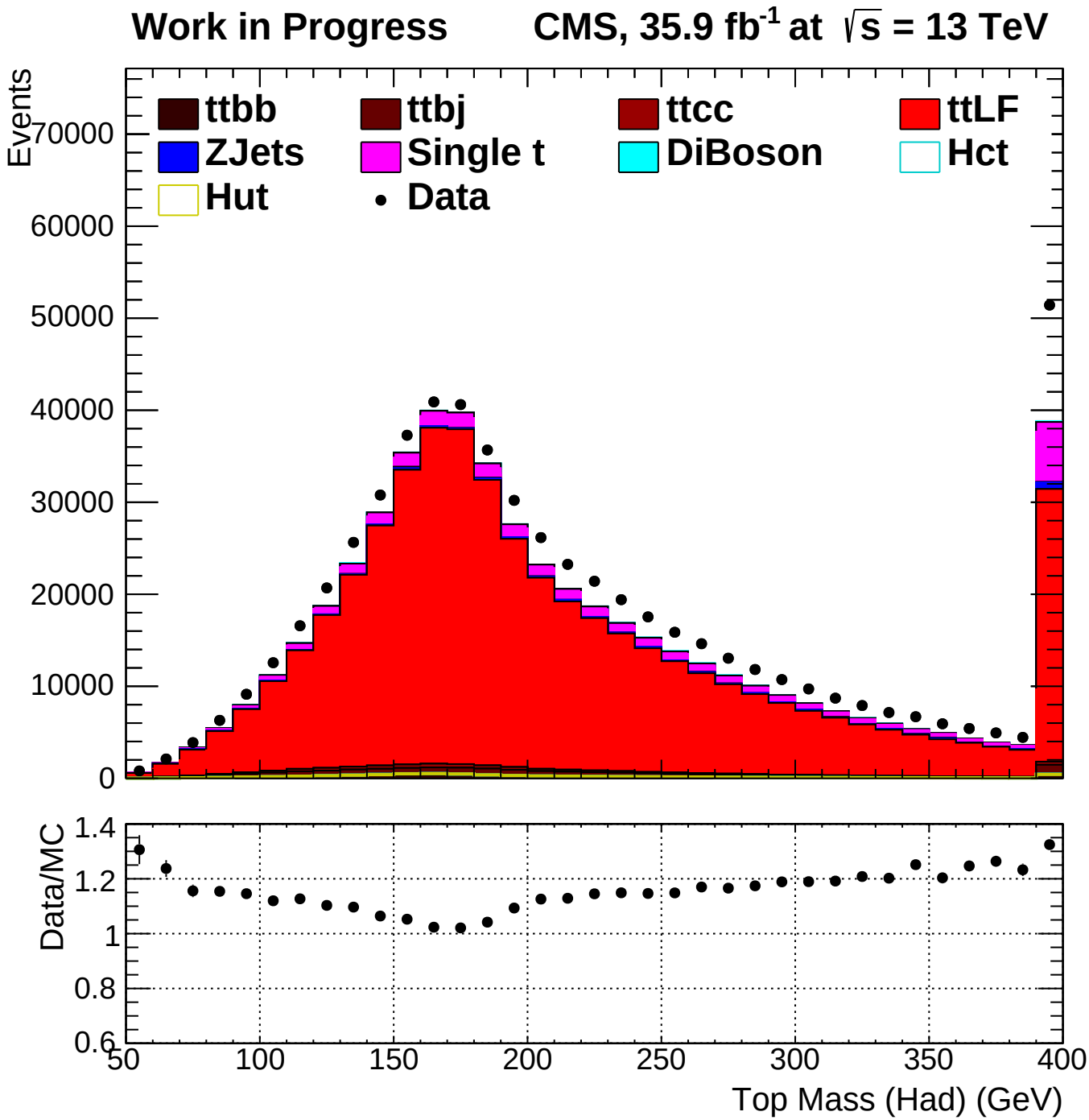

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)

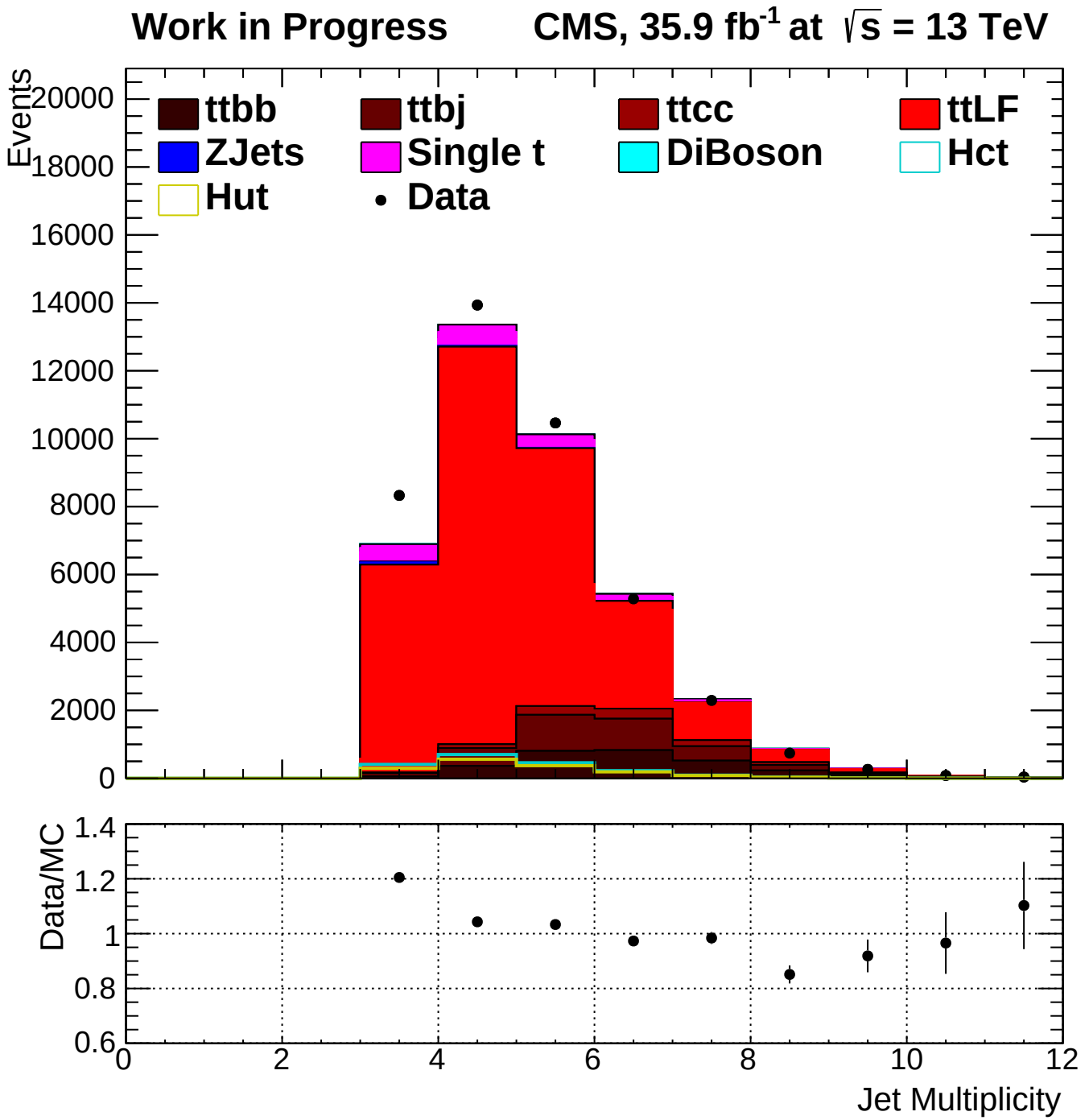

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)

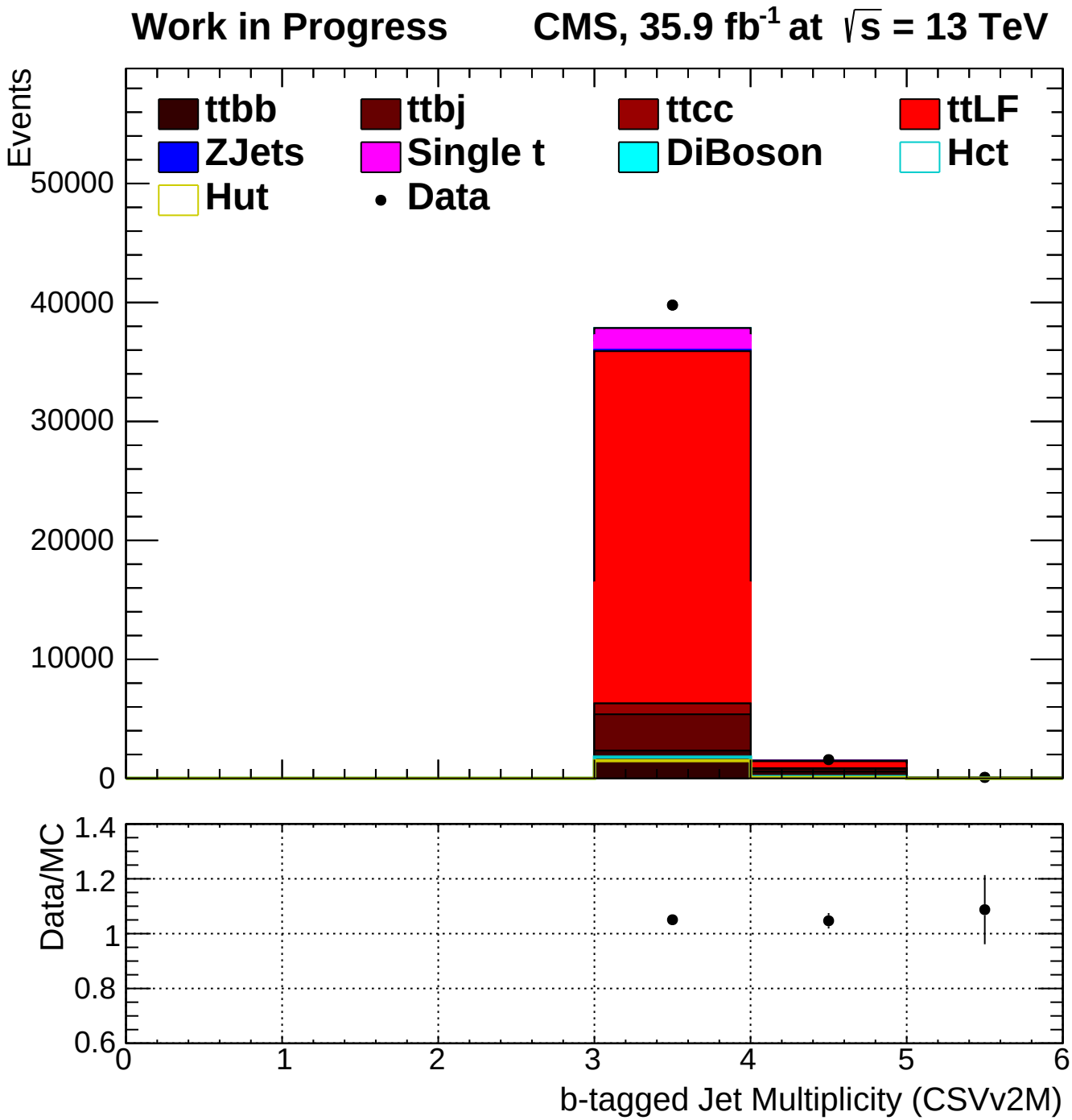

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
Higgs Mass (GeV)

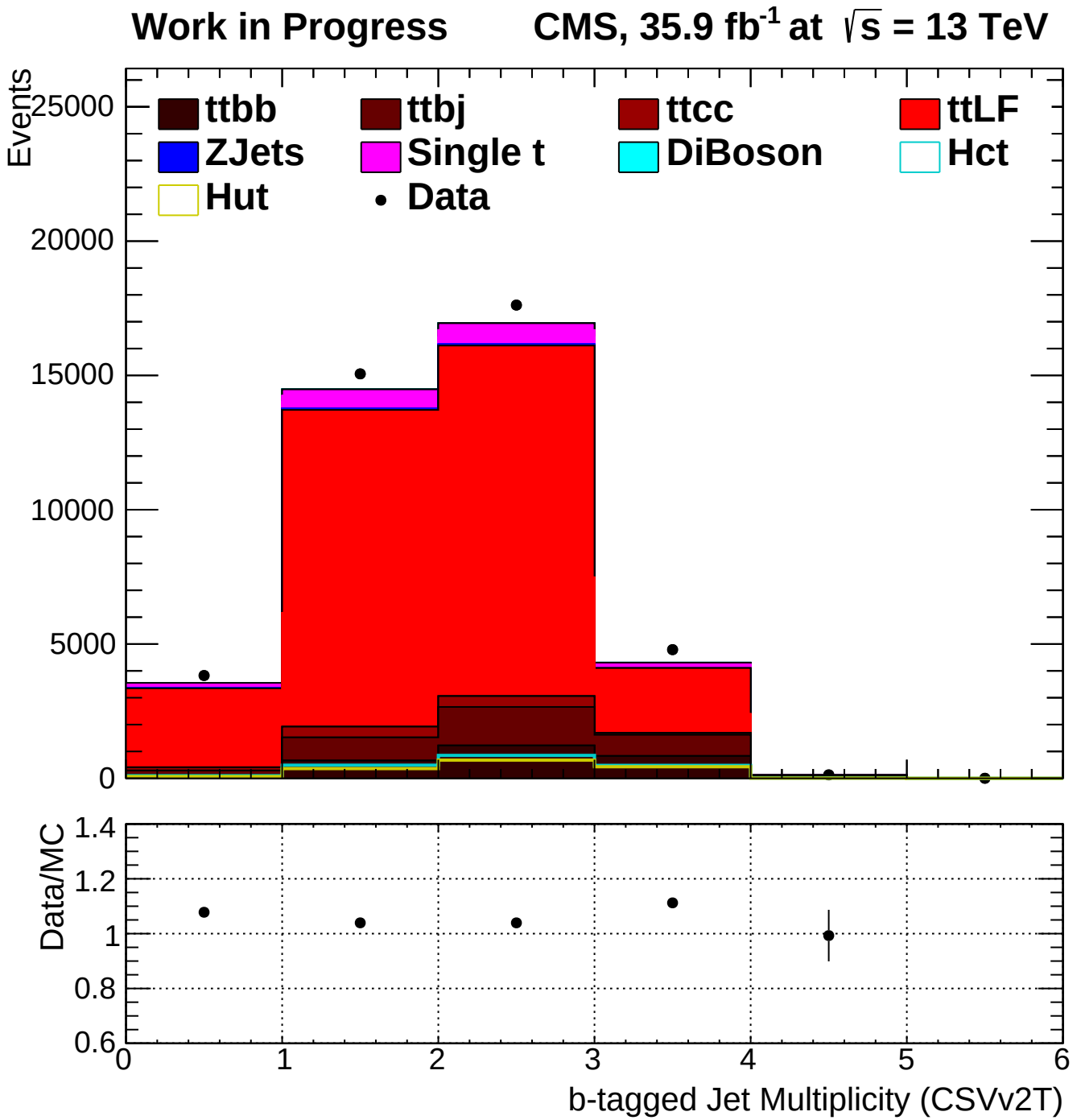

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs

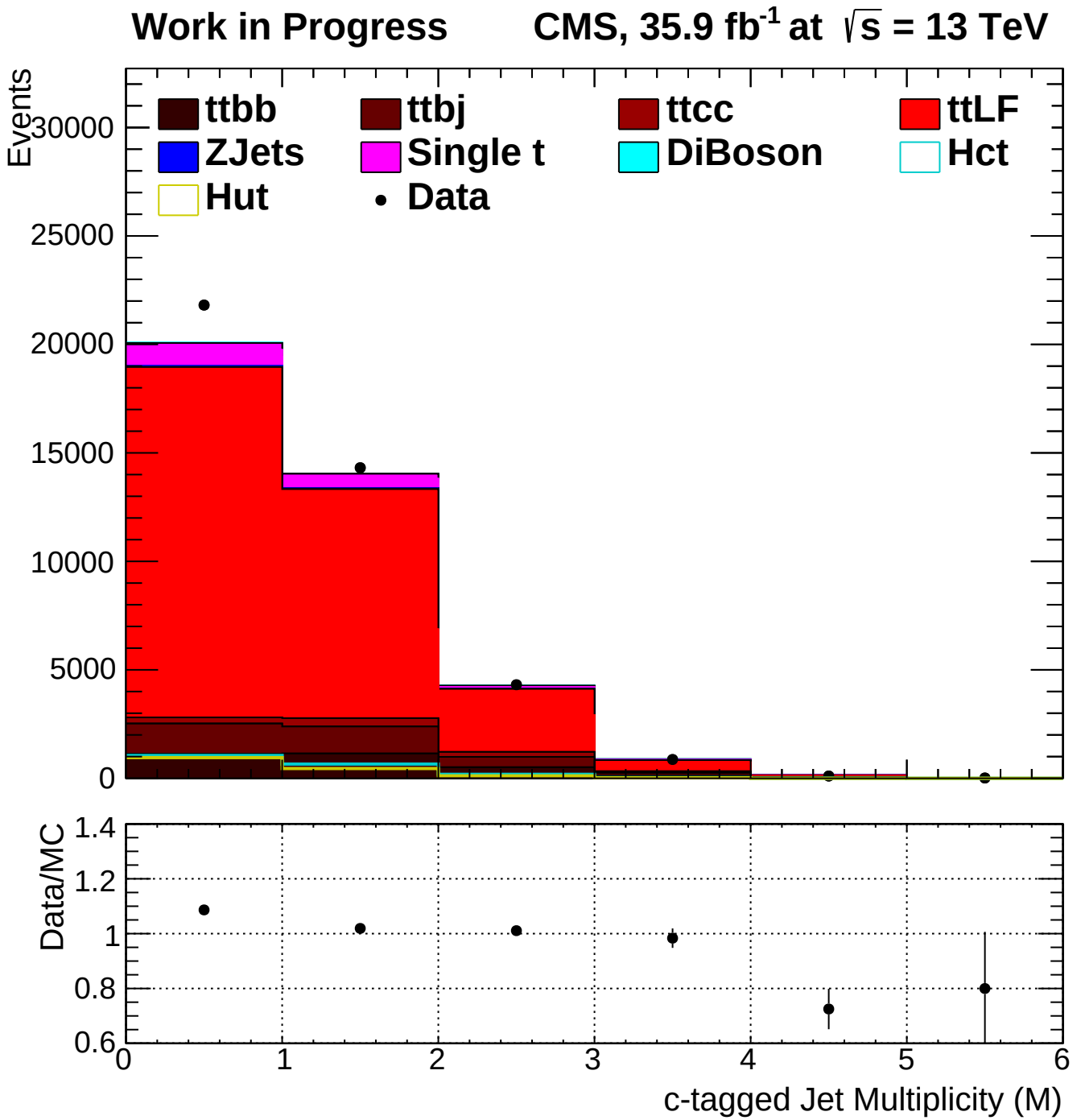

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)

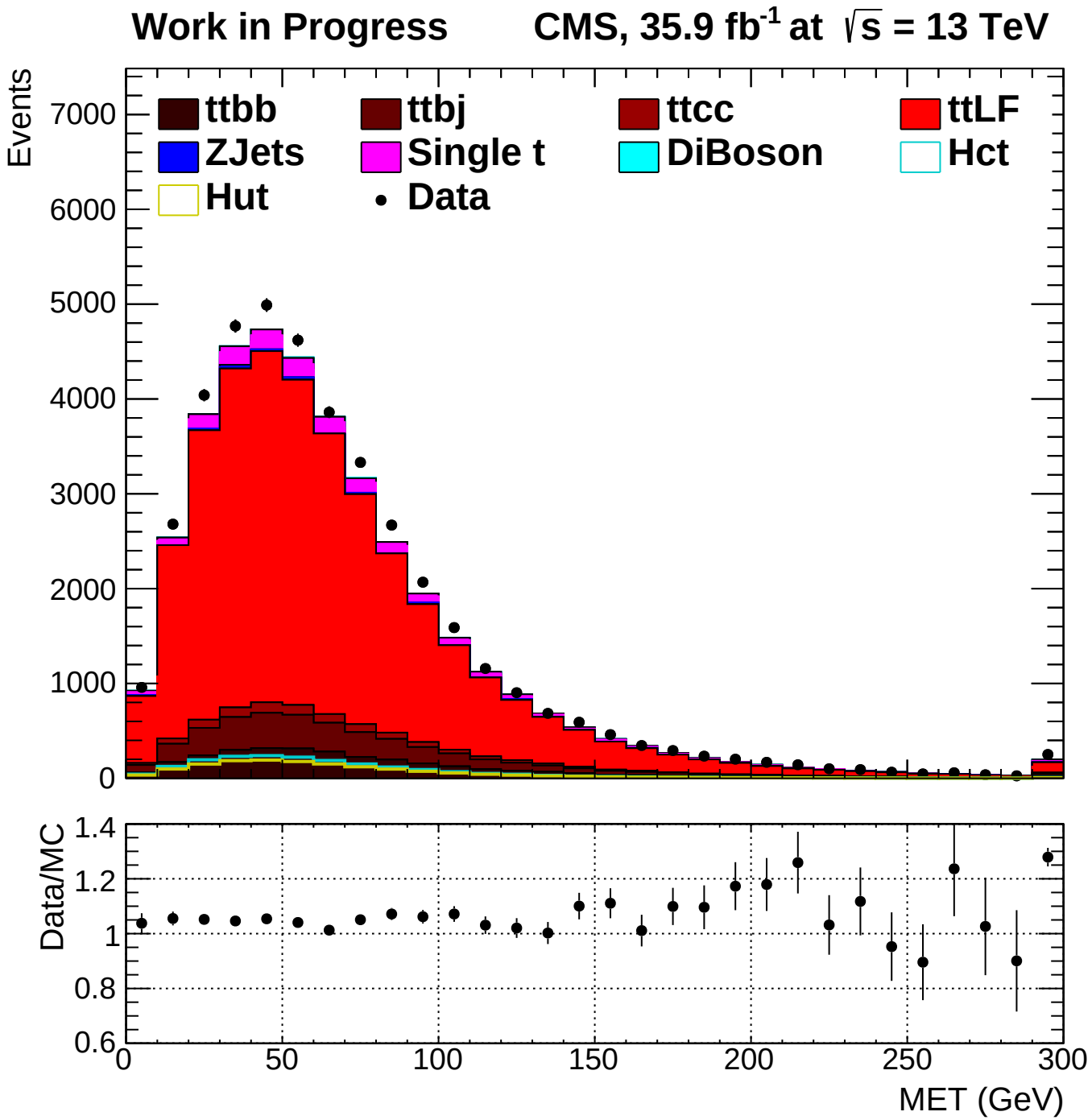

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Had) (GeV)

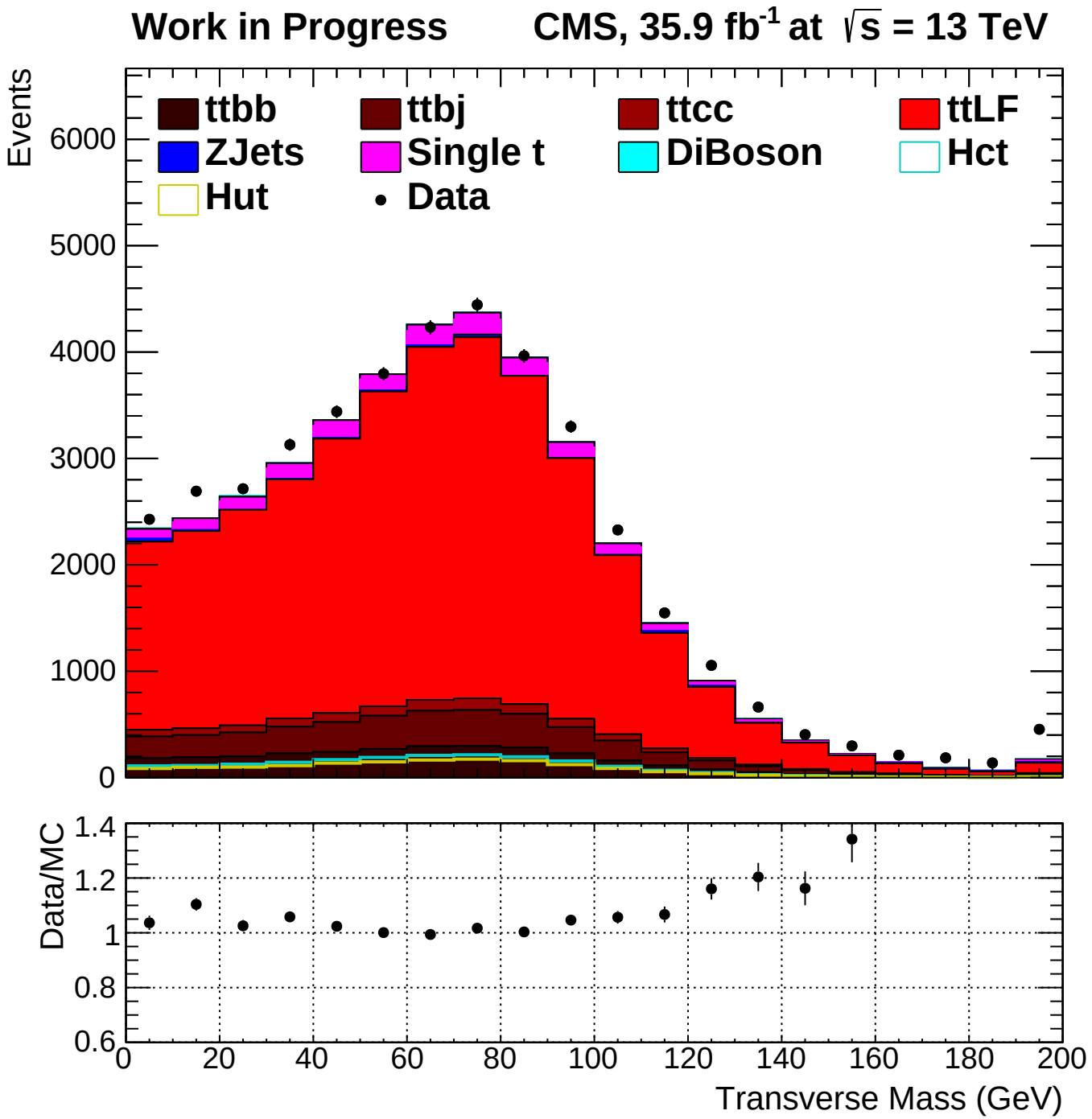

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

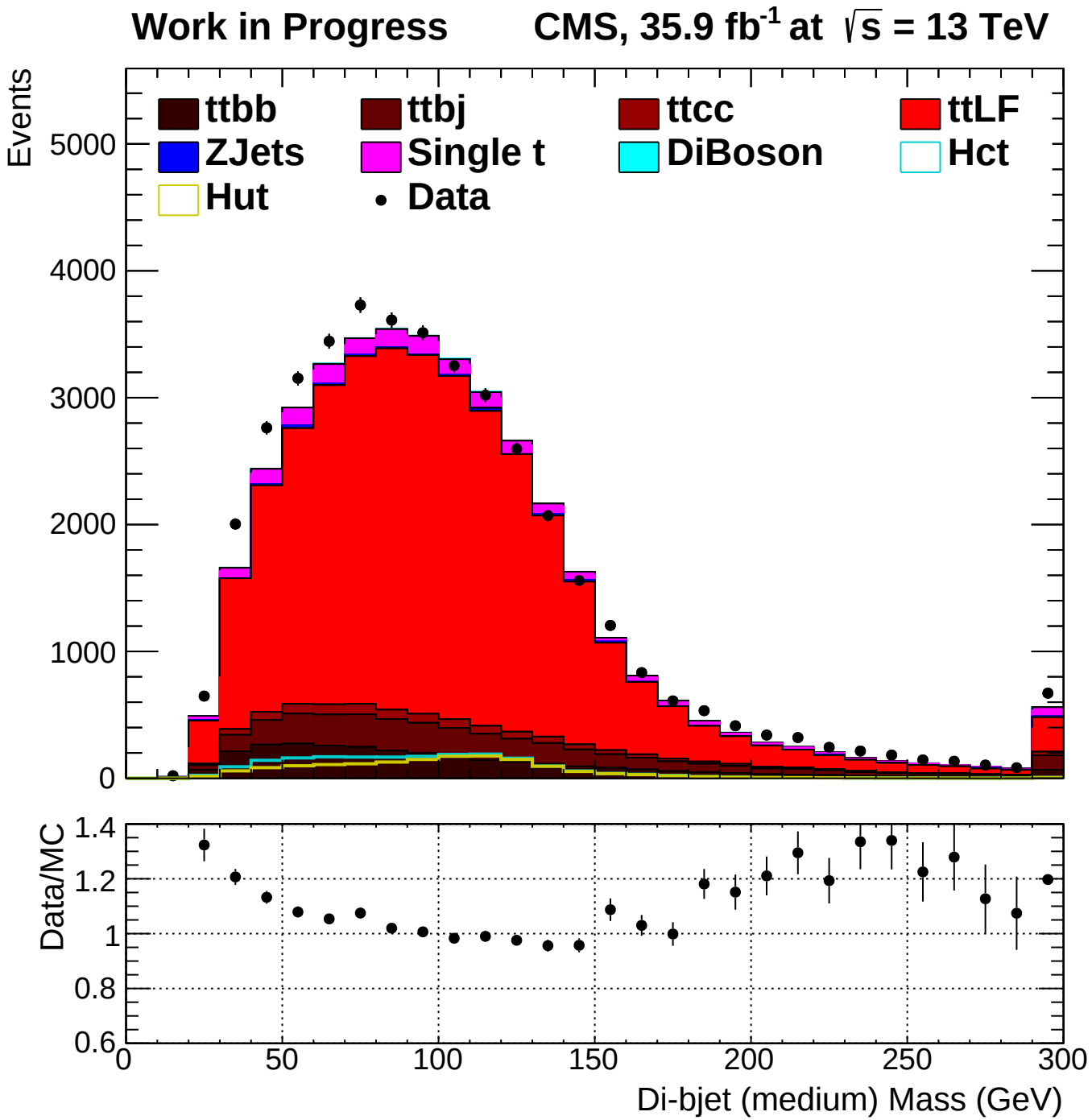

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

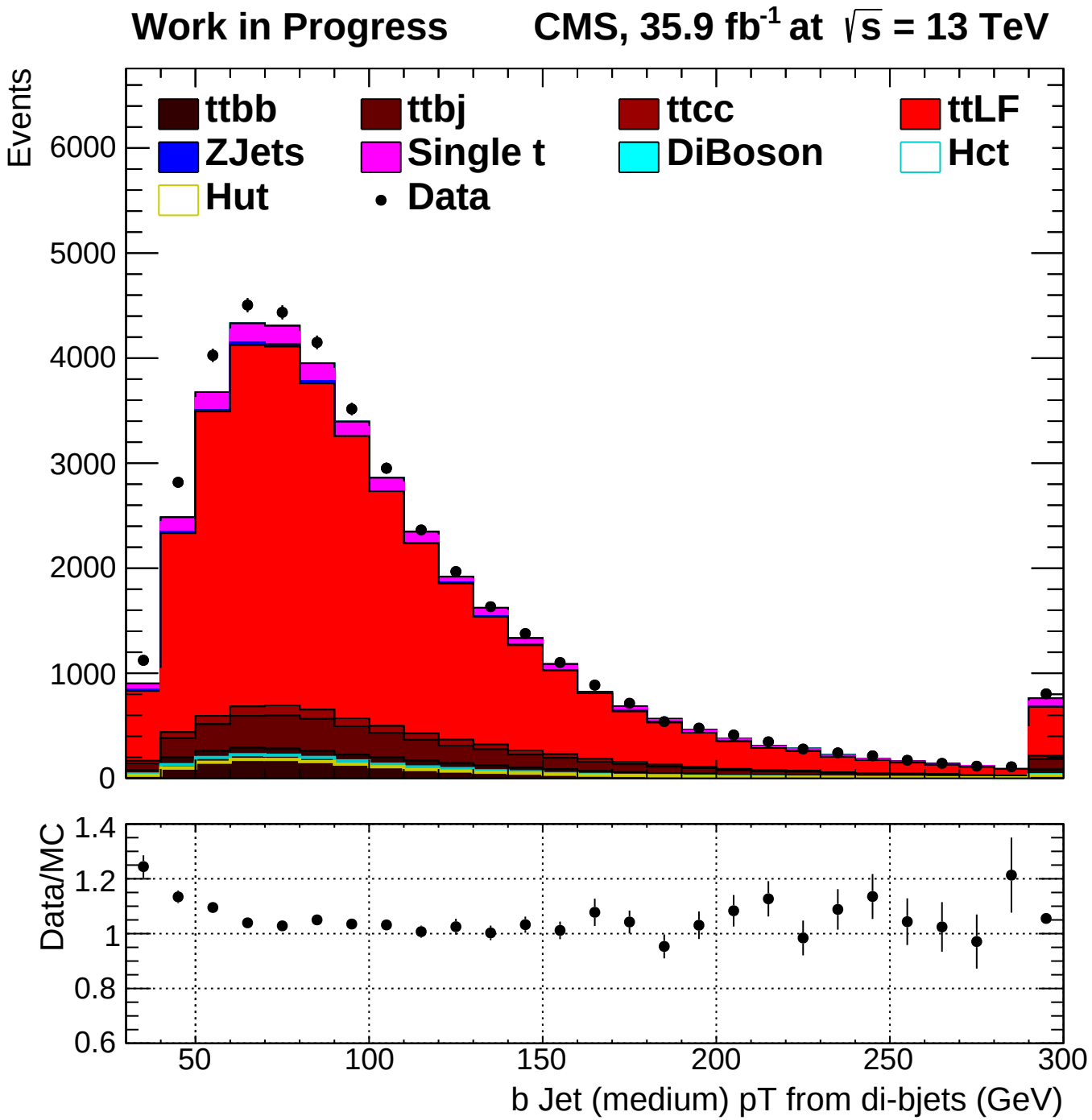

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

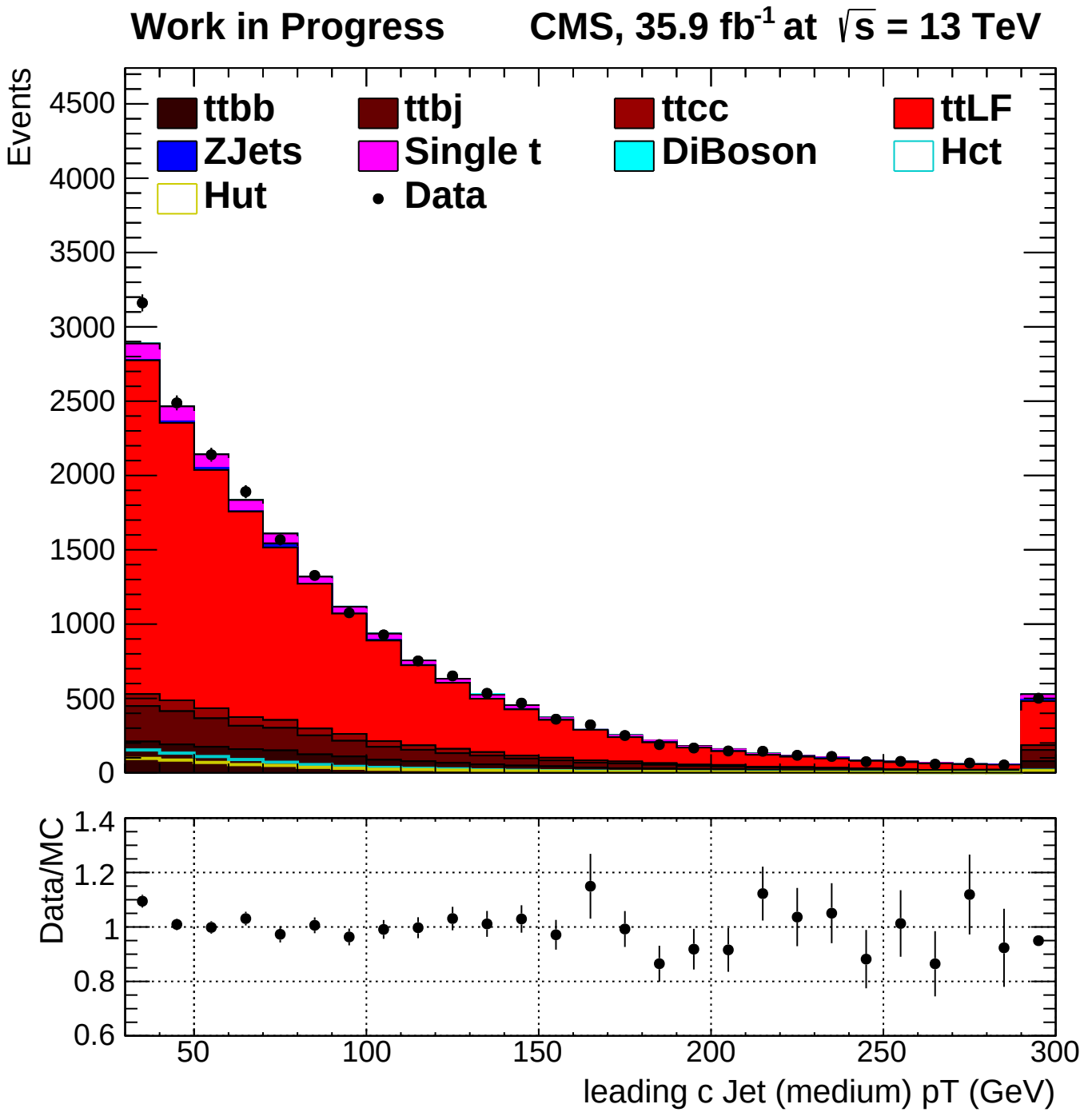

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

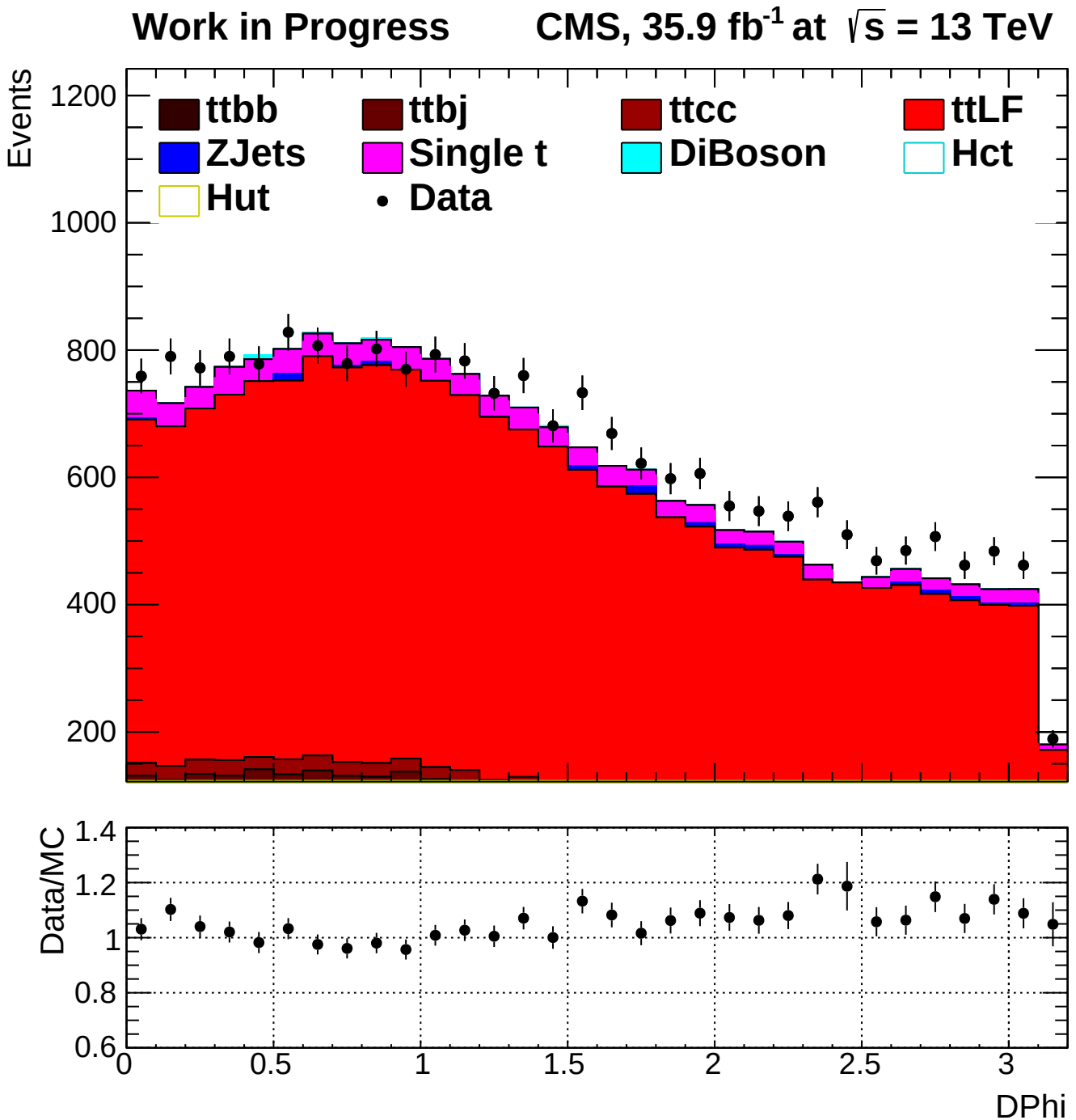

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

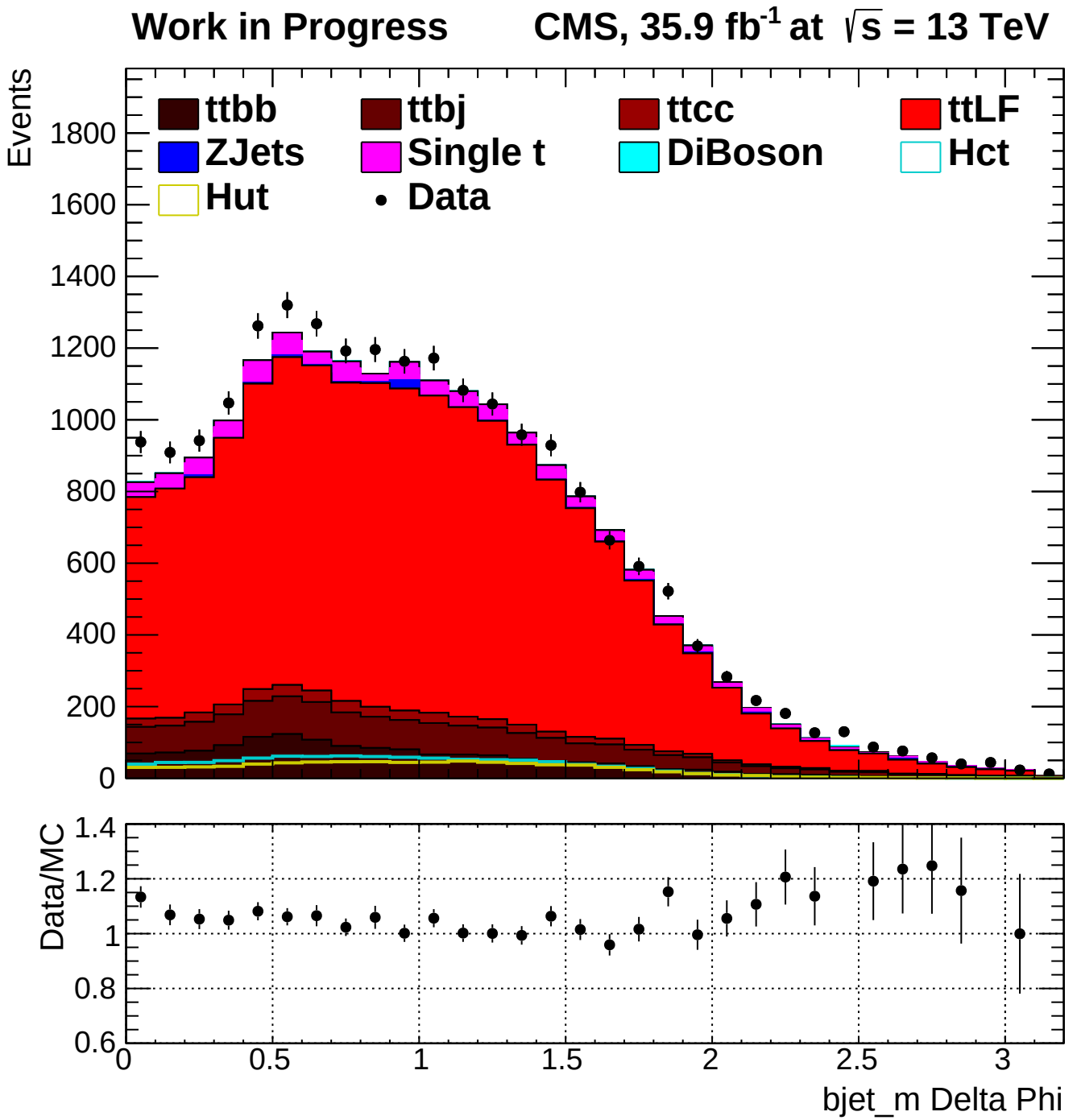

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

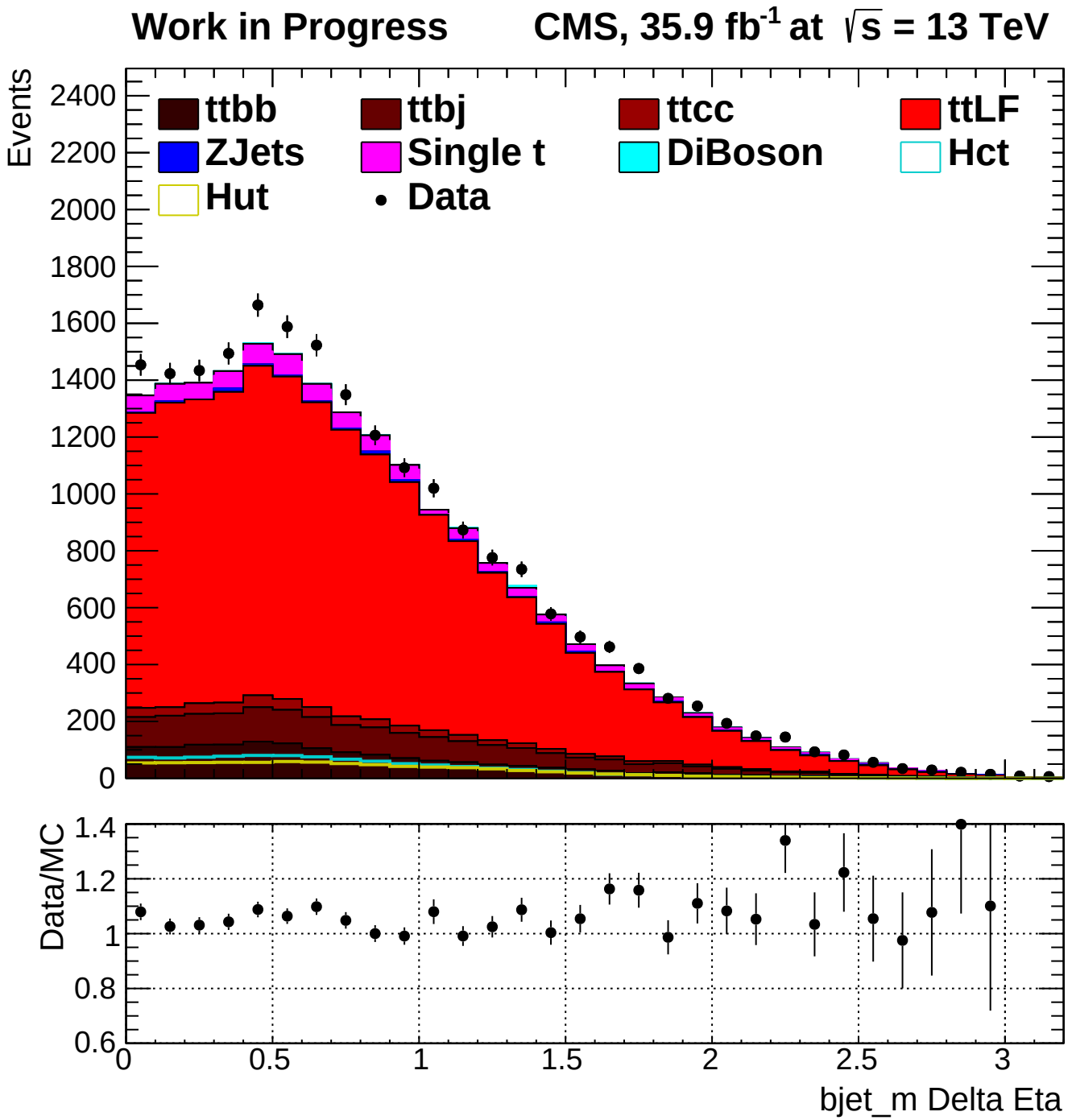

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

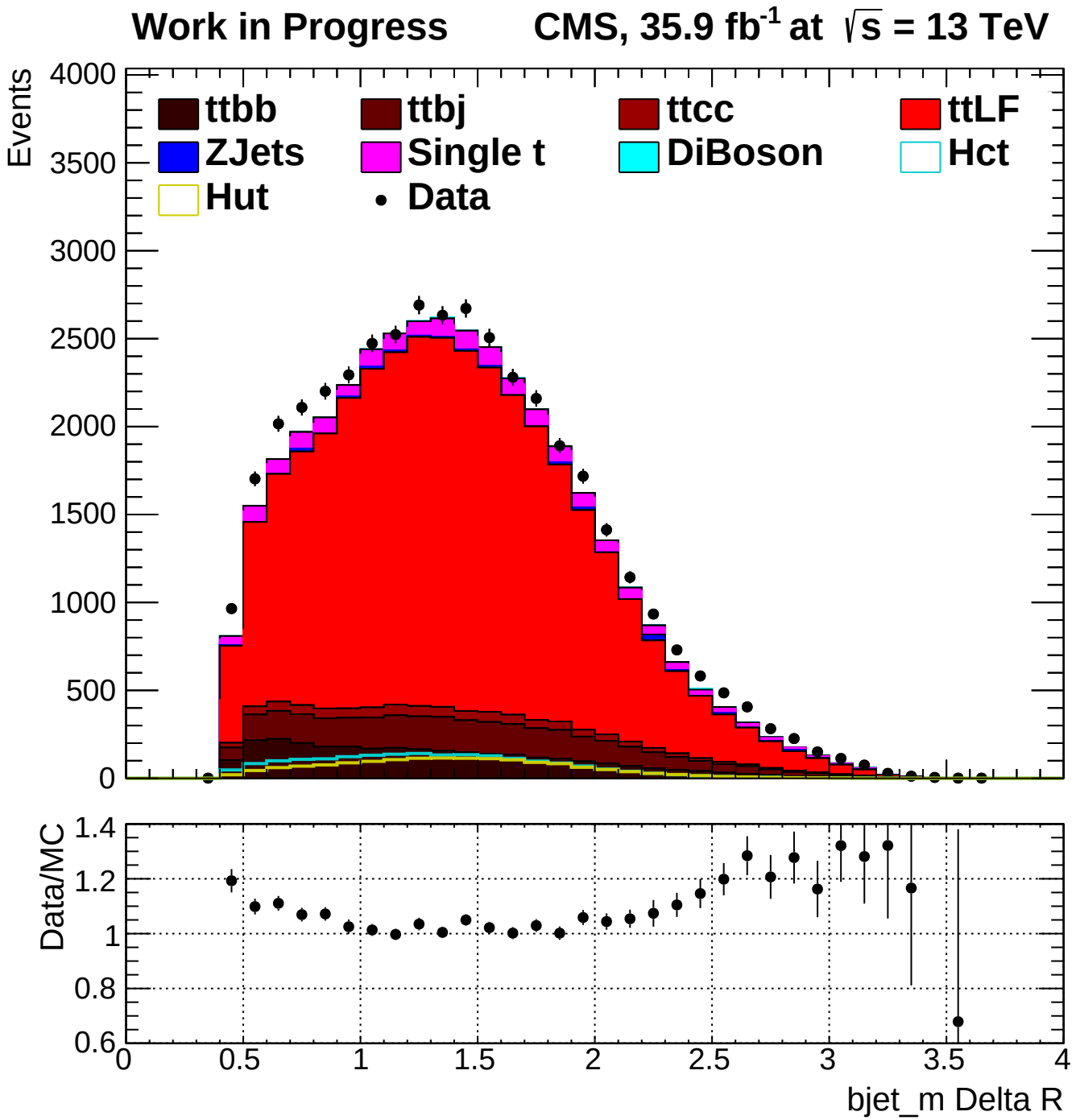

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

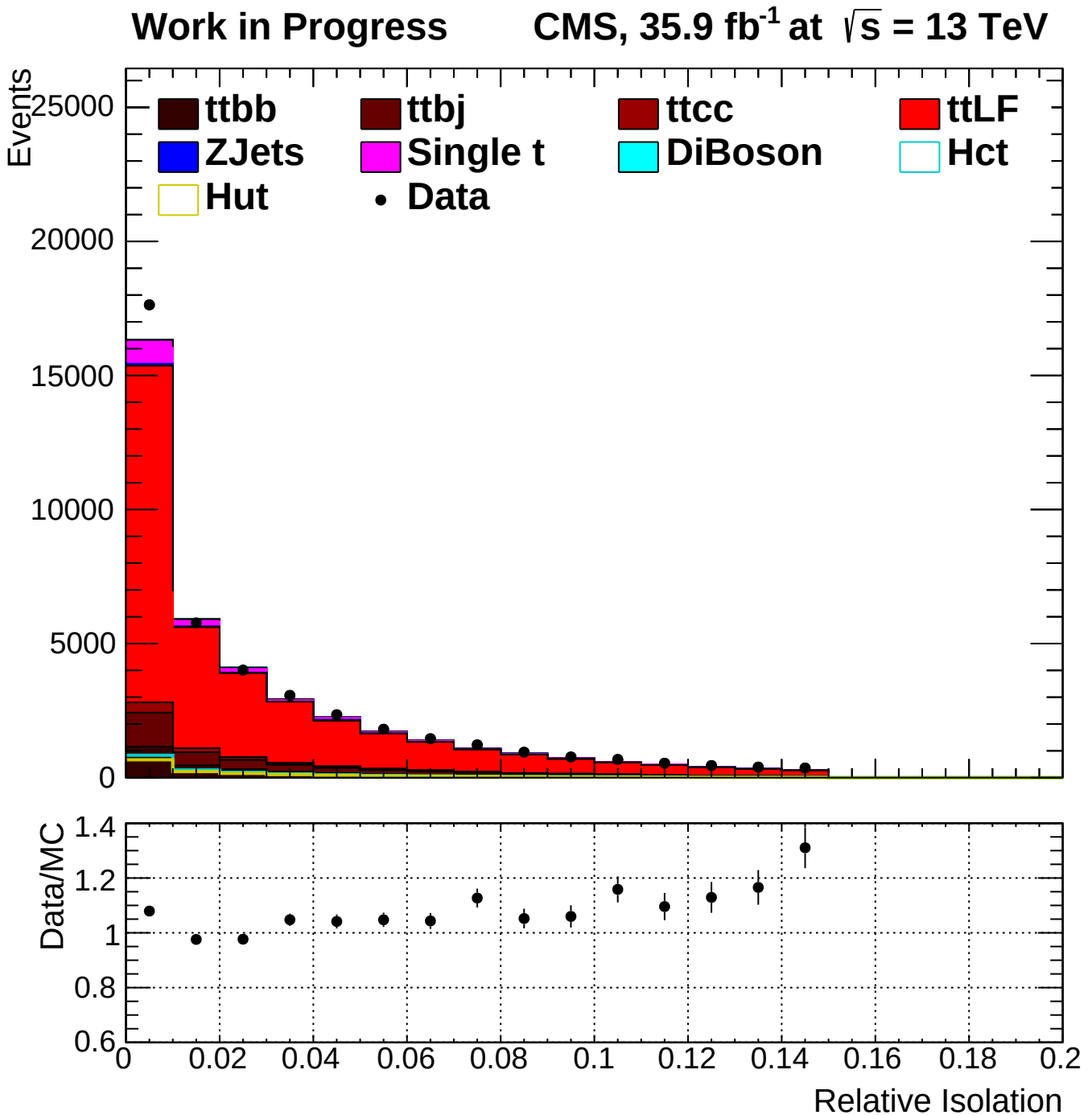

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

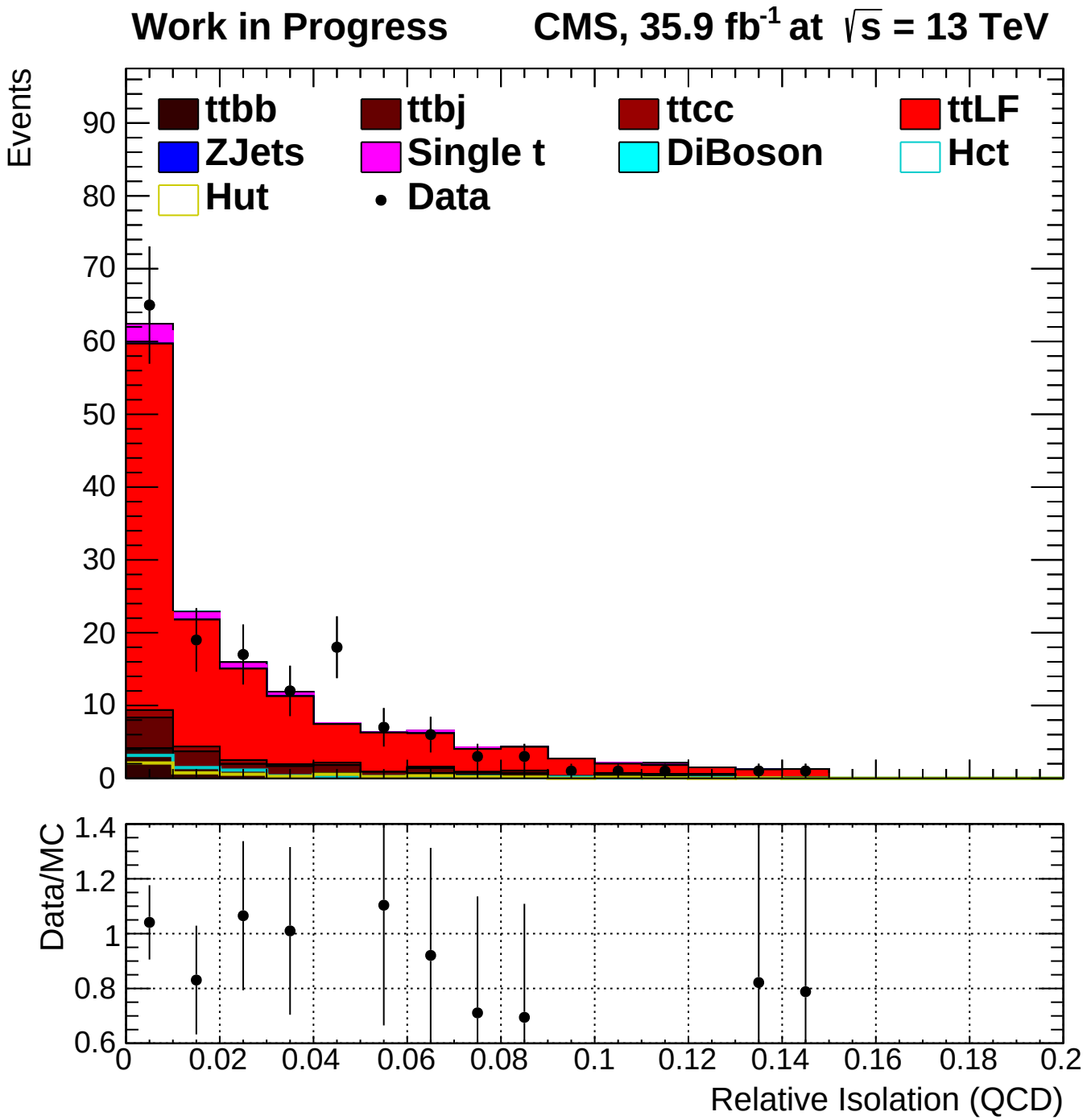

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1200
1000
800
600
400
200
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

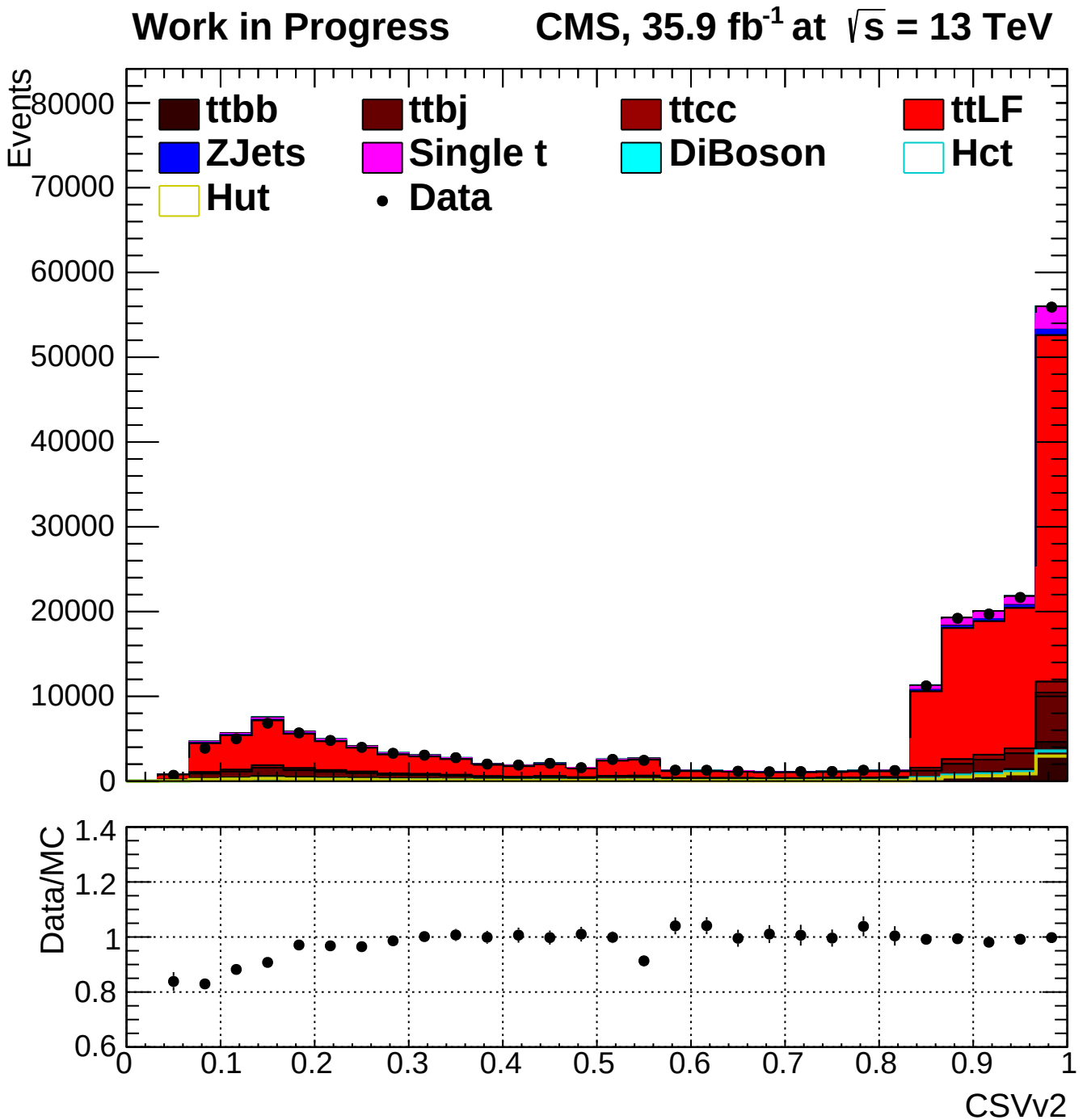

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi

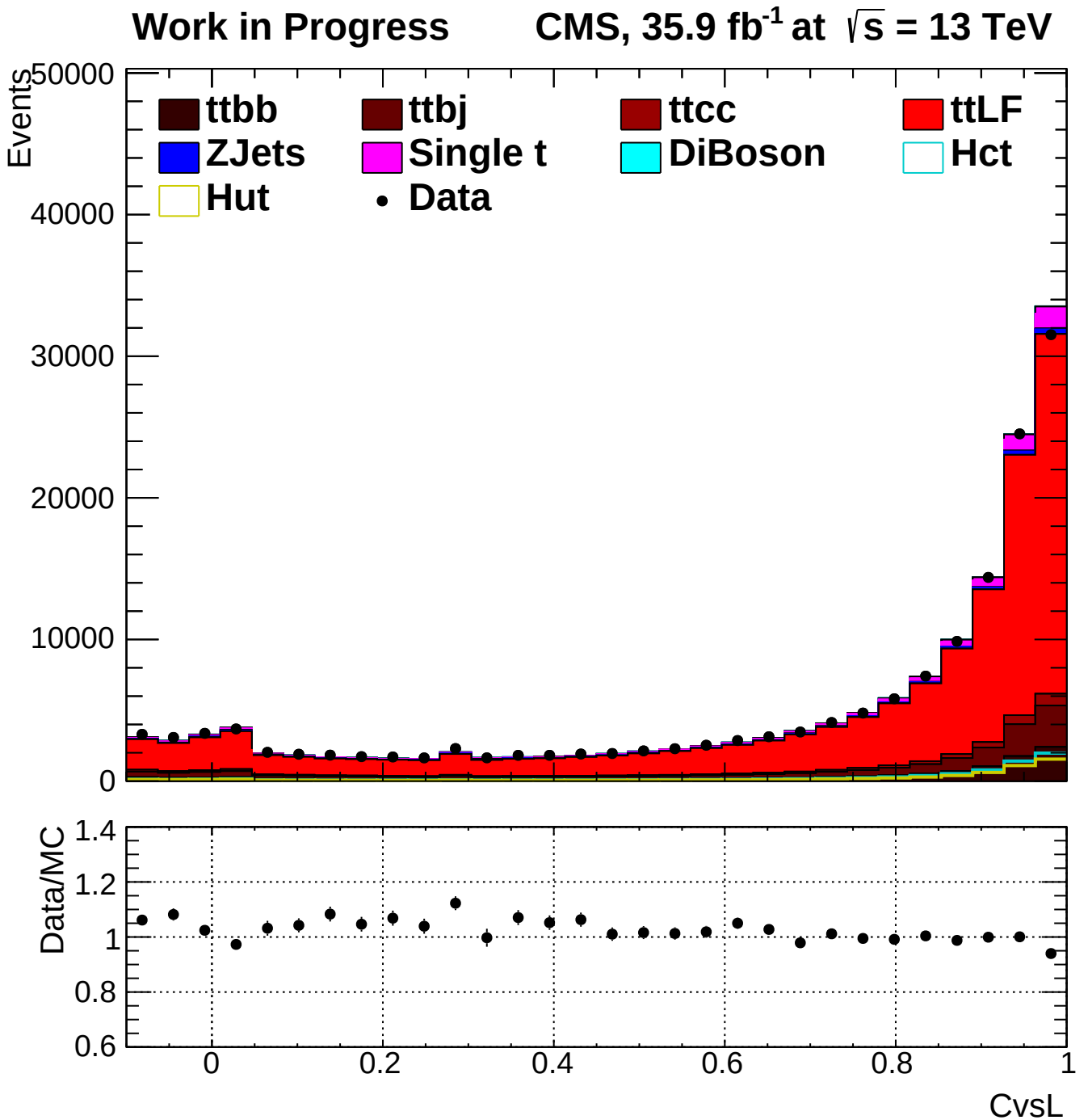

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta

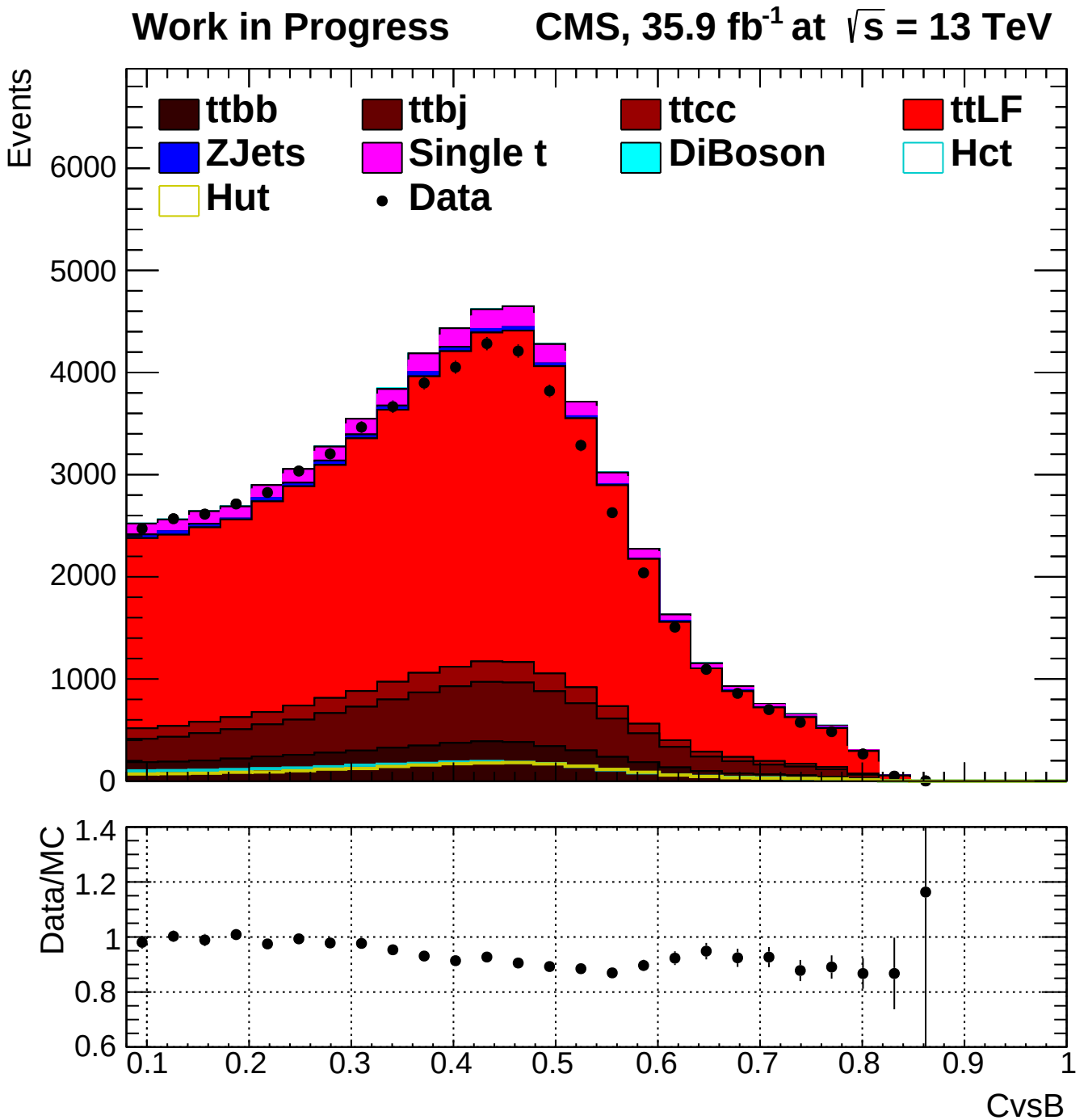

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R

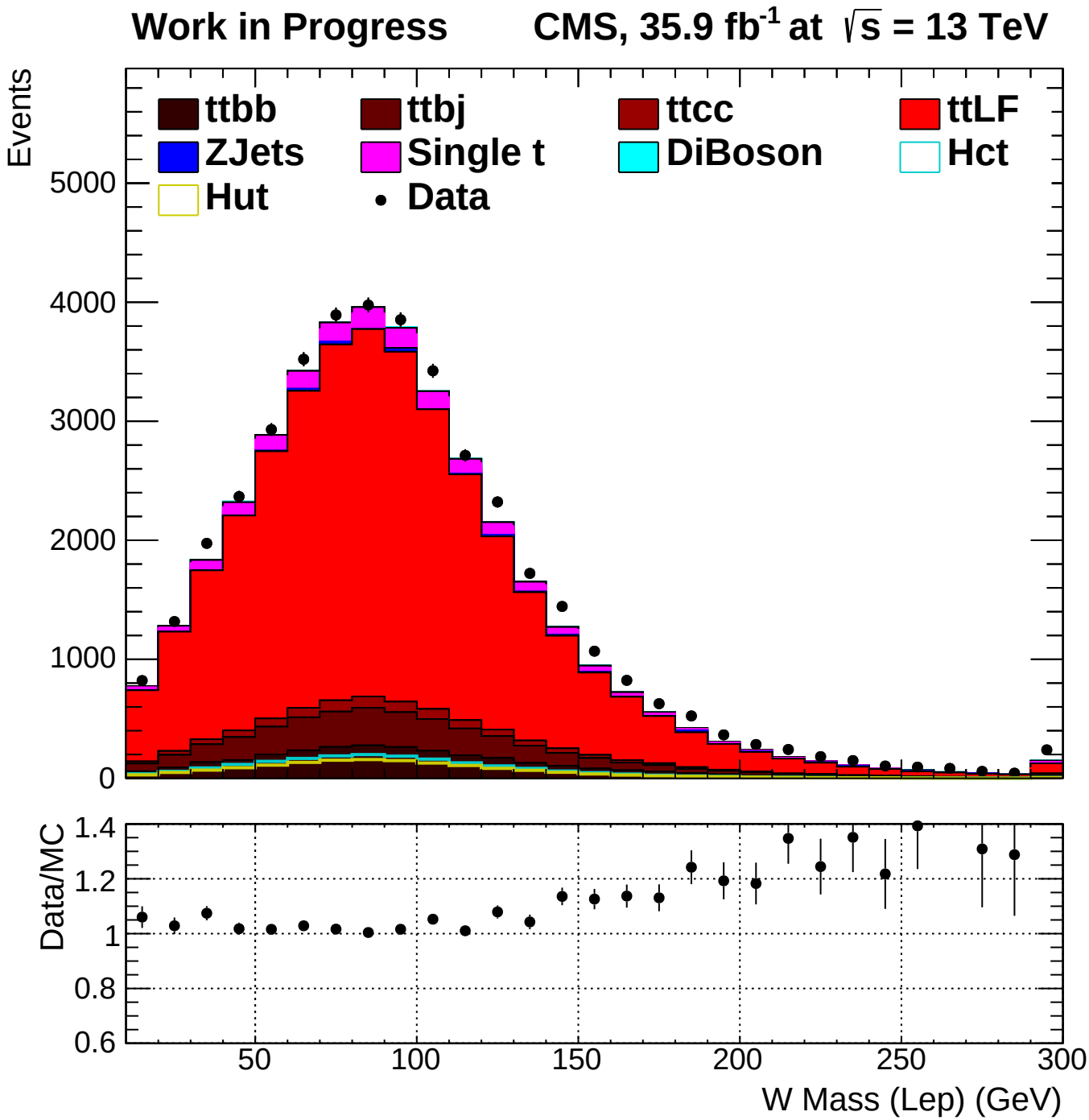

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

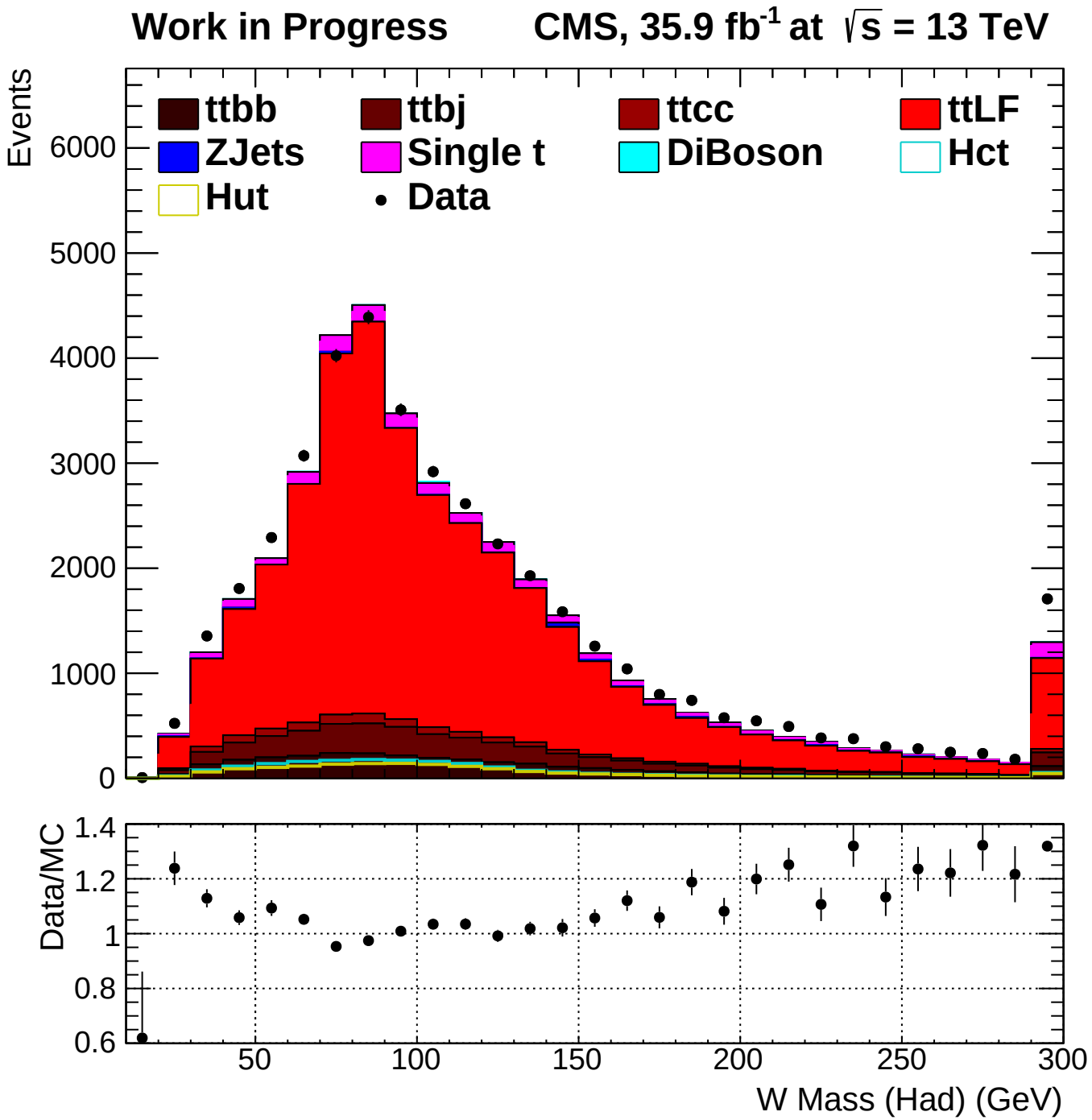

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

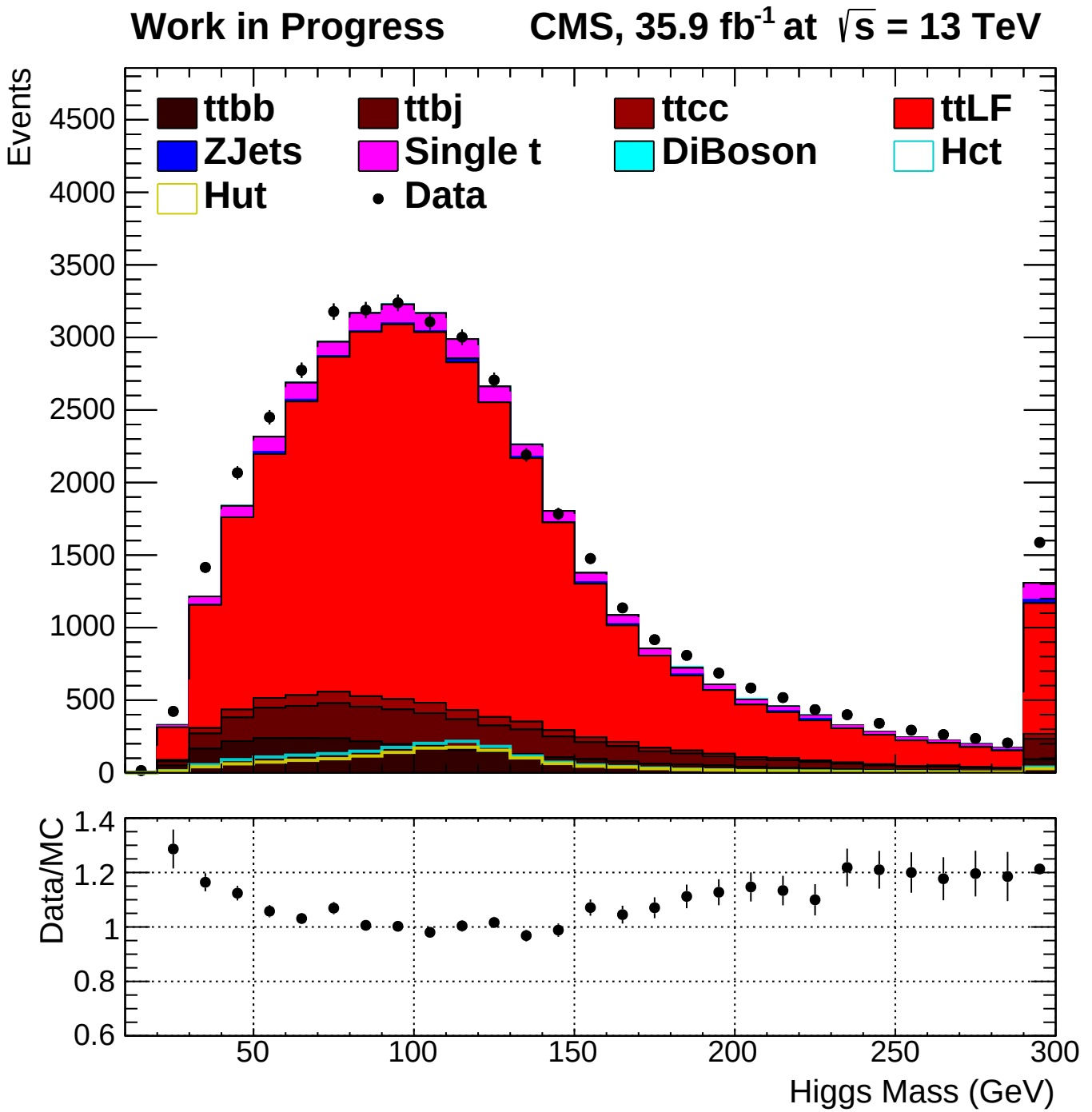

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

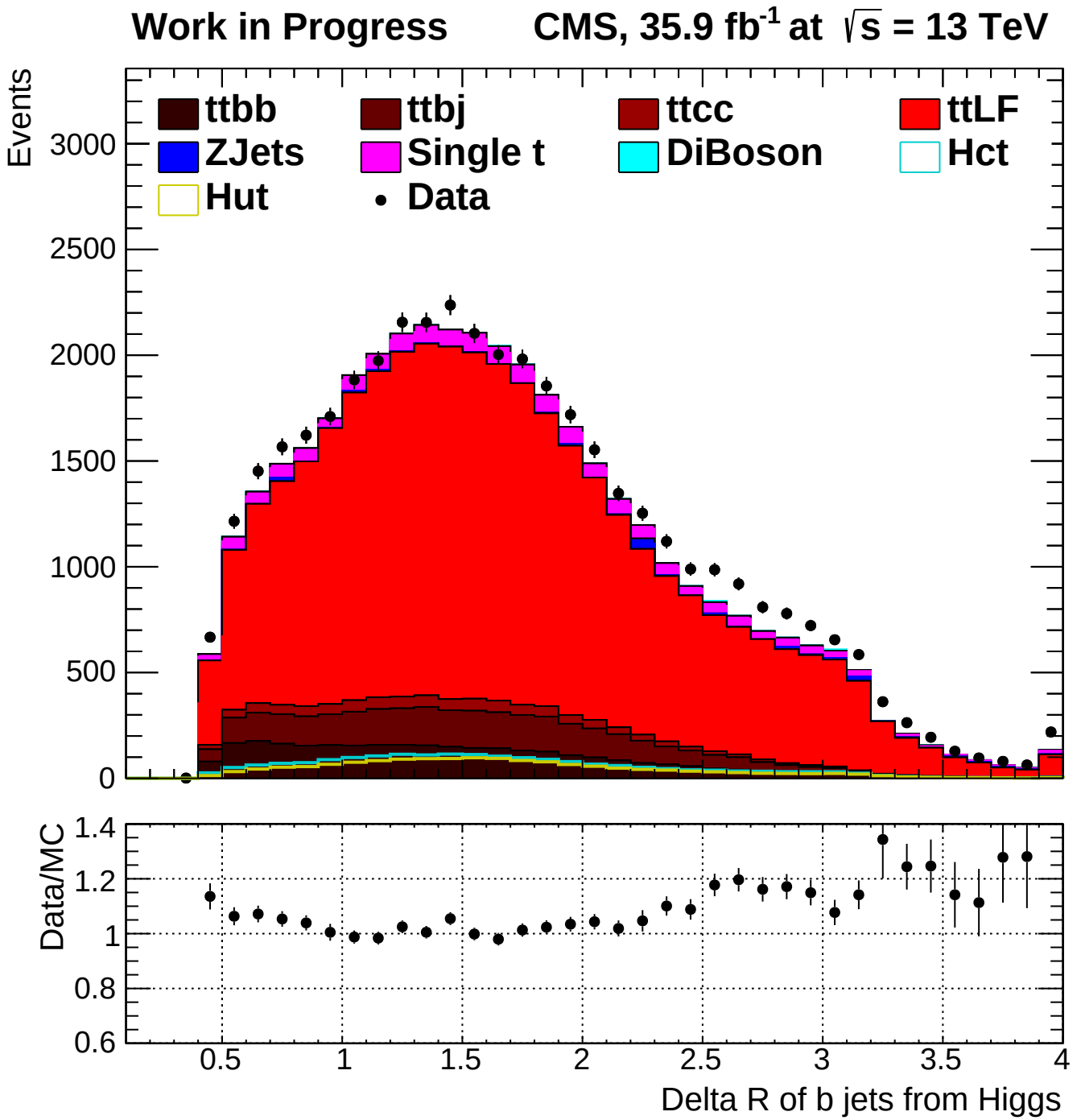

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

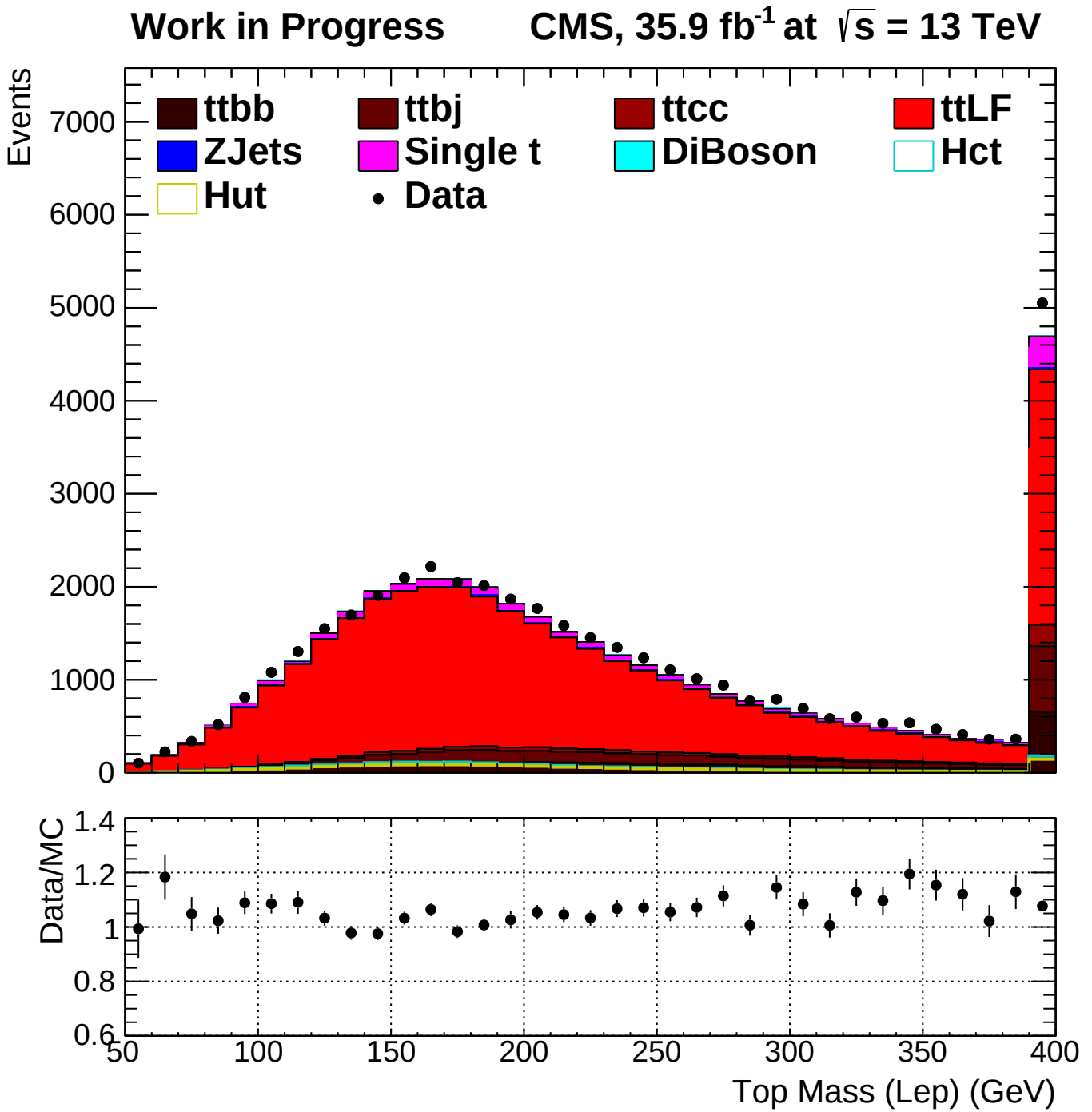

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

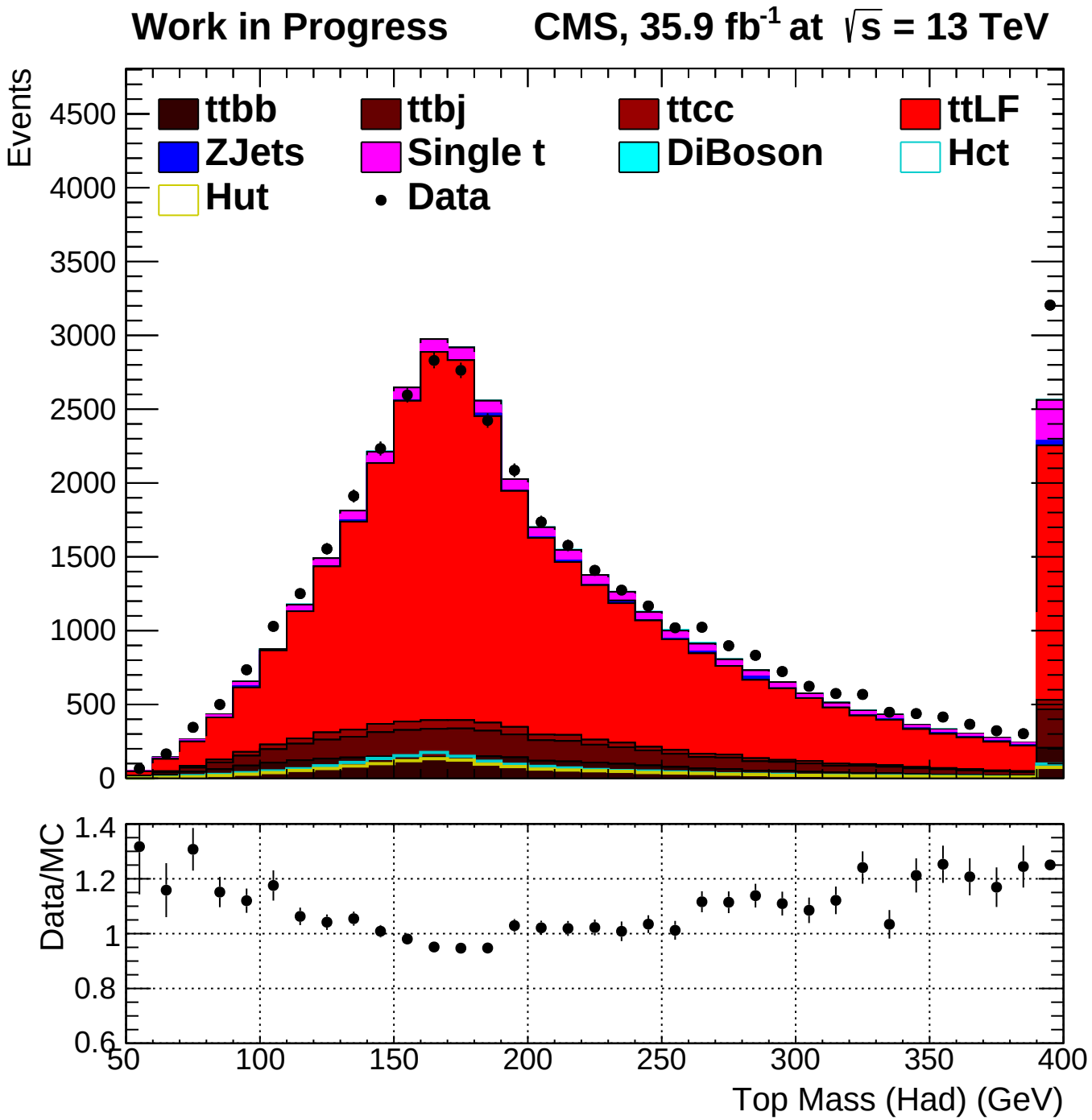

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)

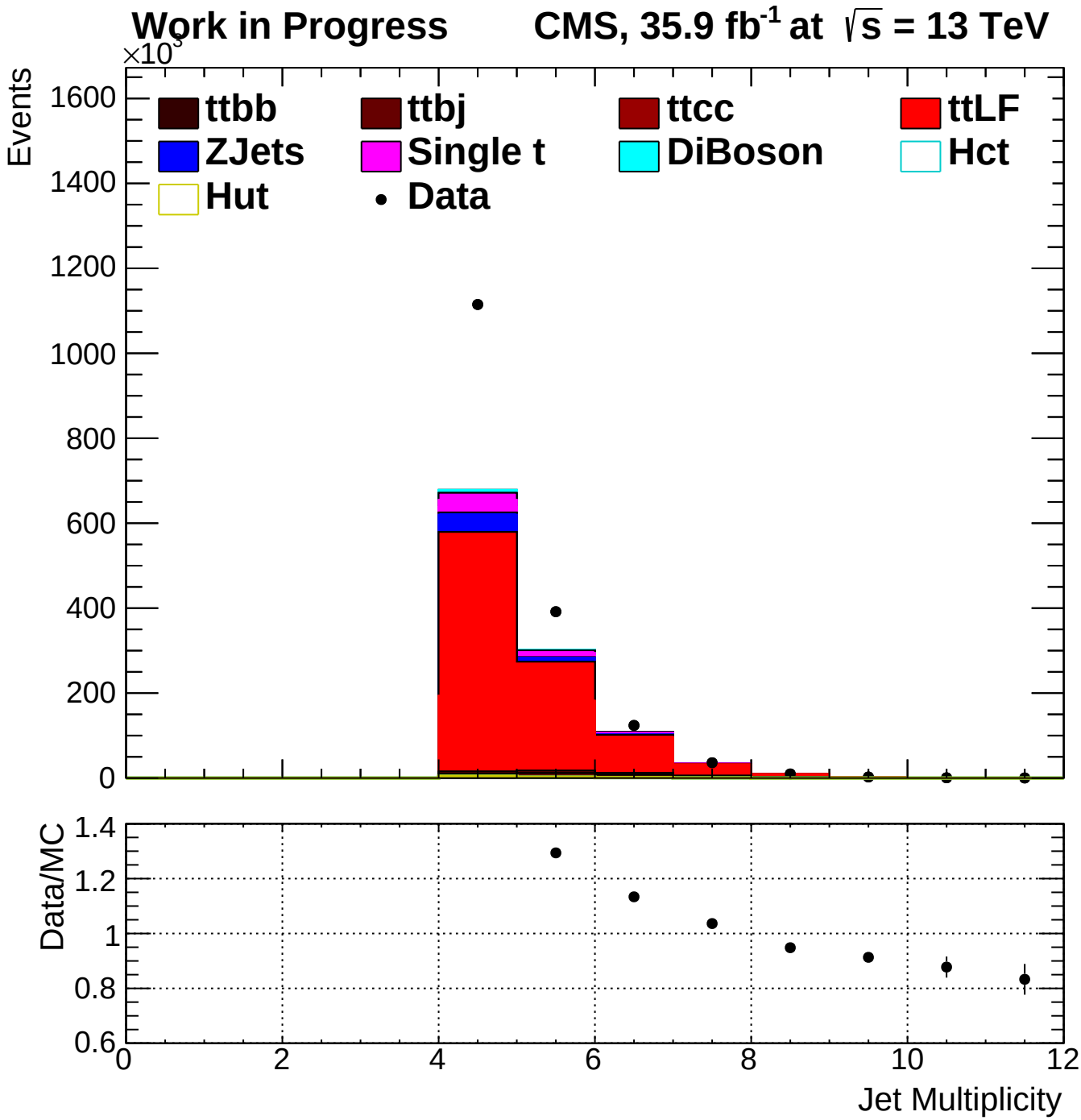

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)

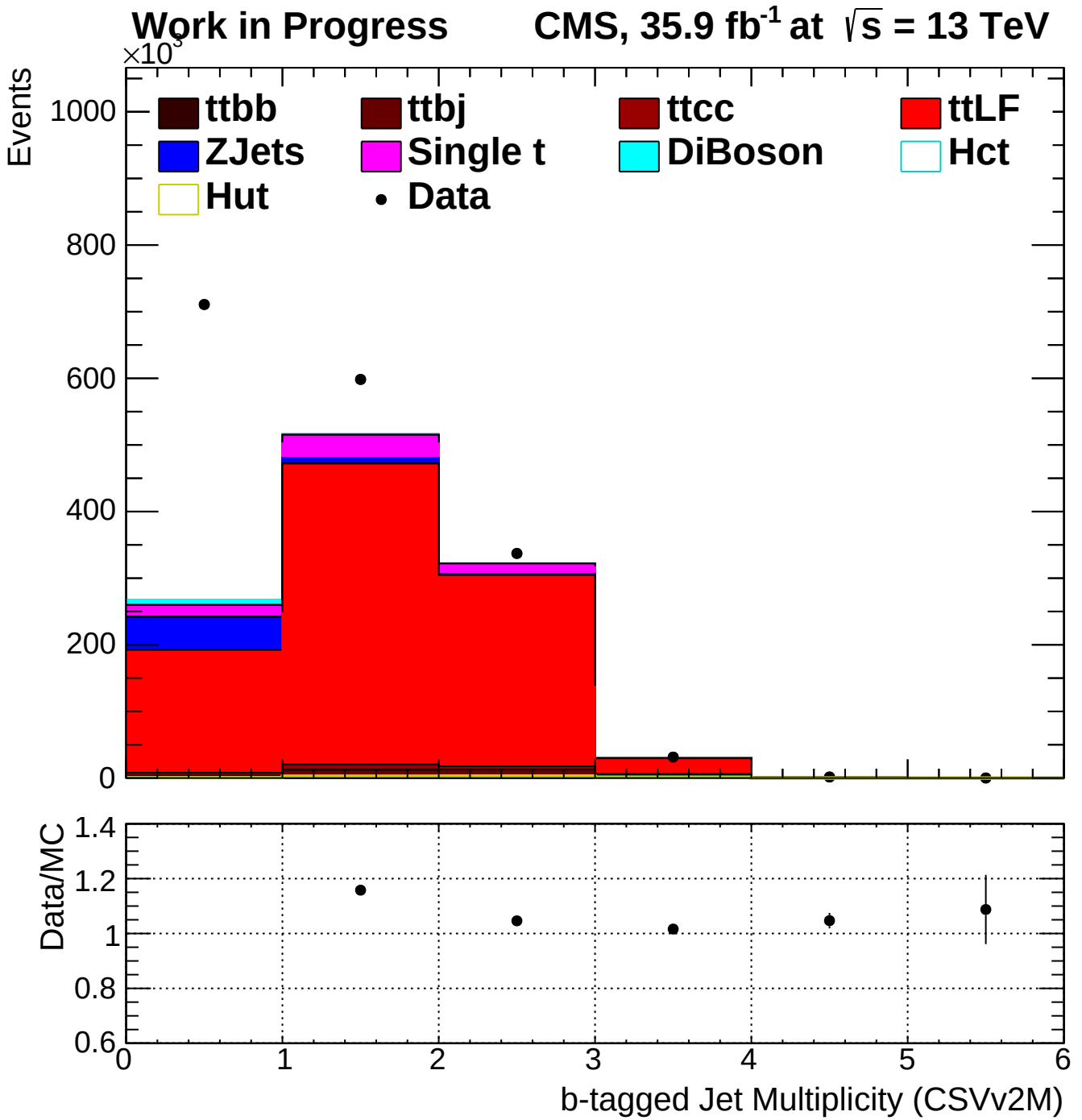

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

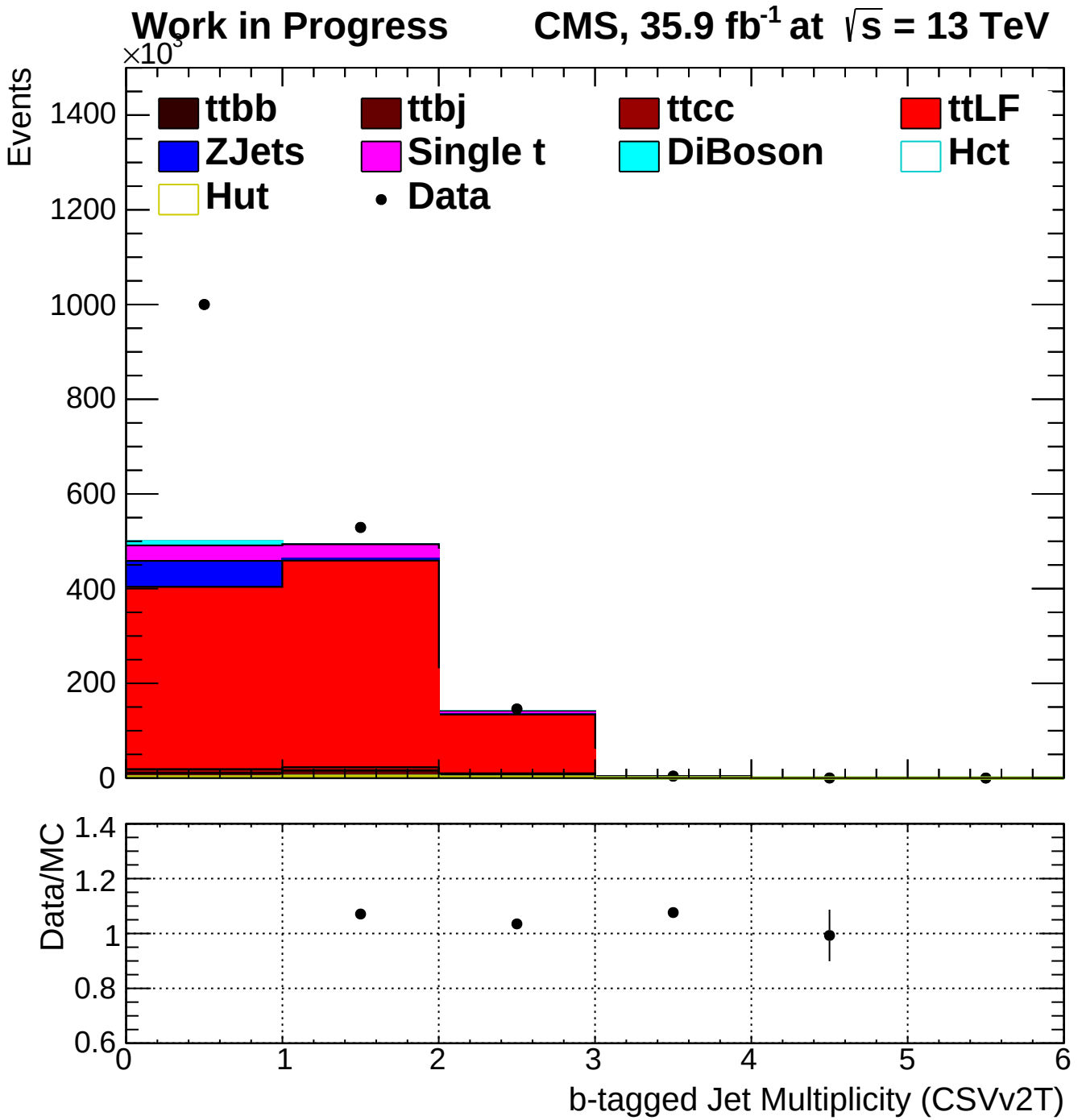

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs

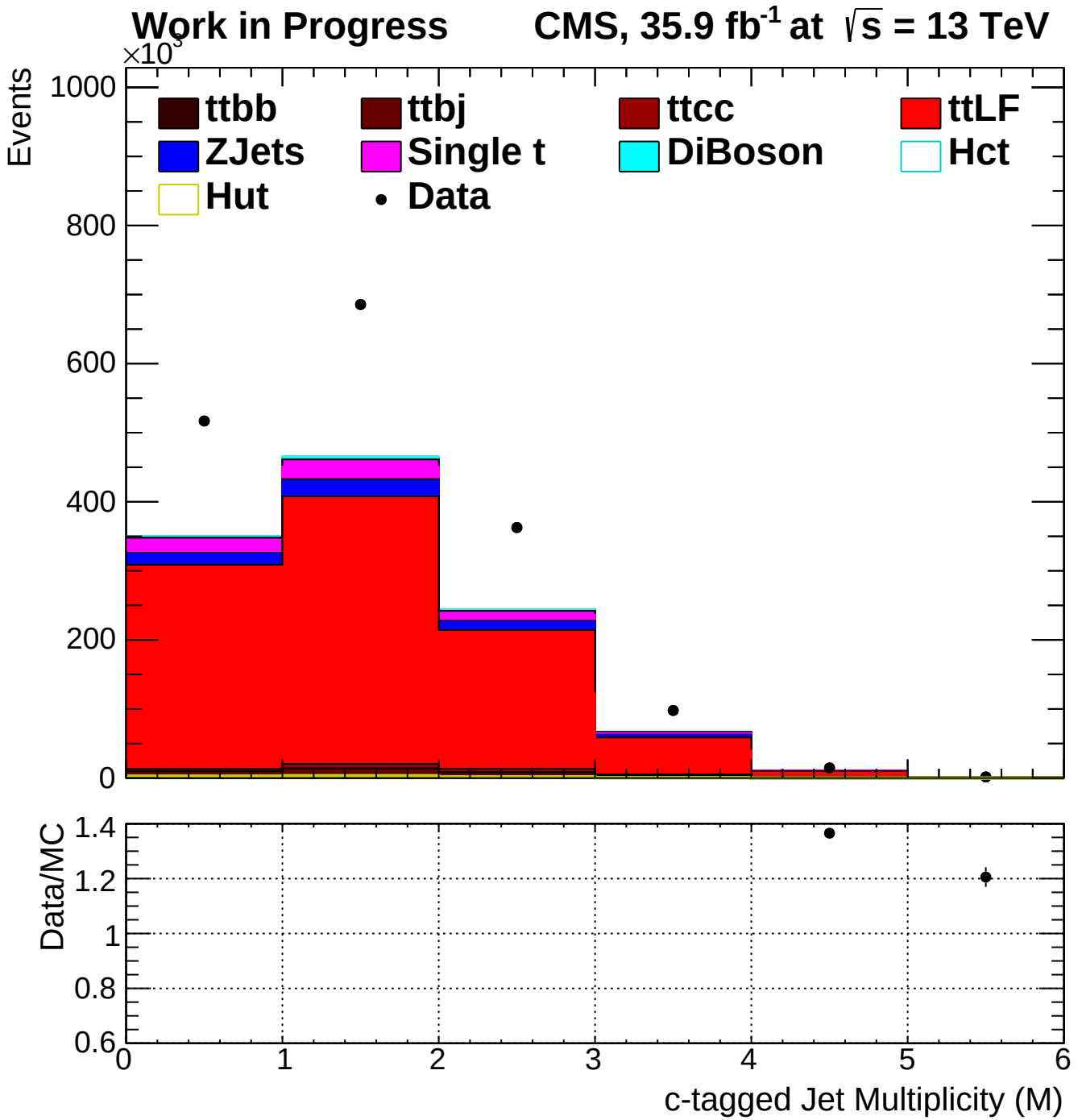

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
7000
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)

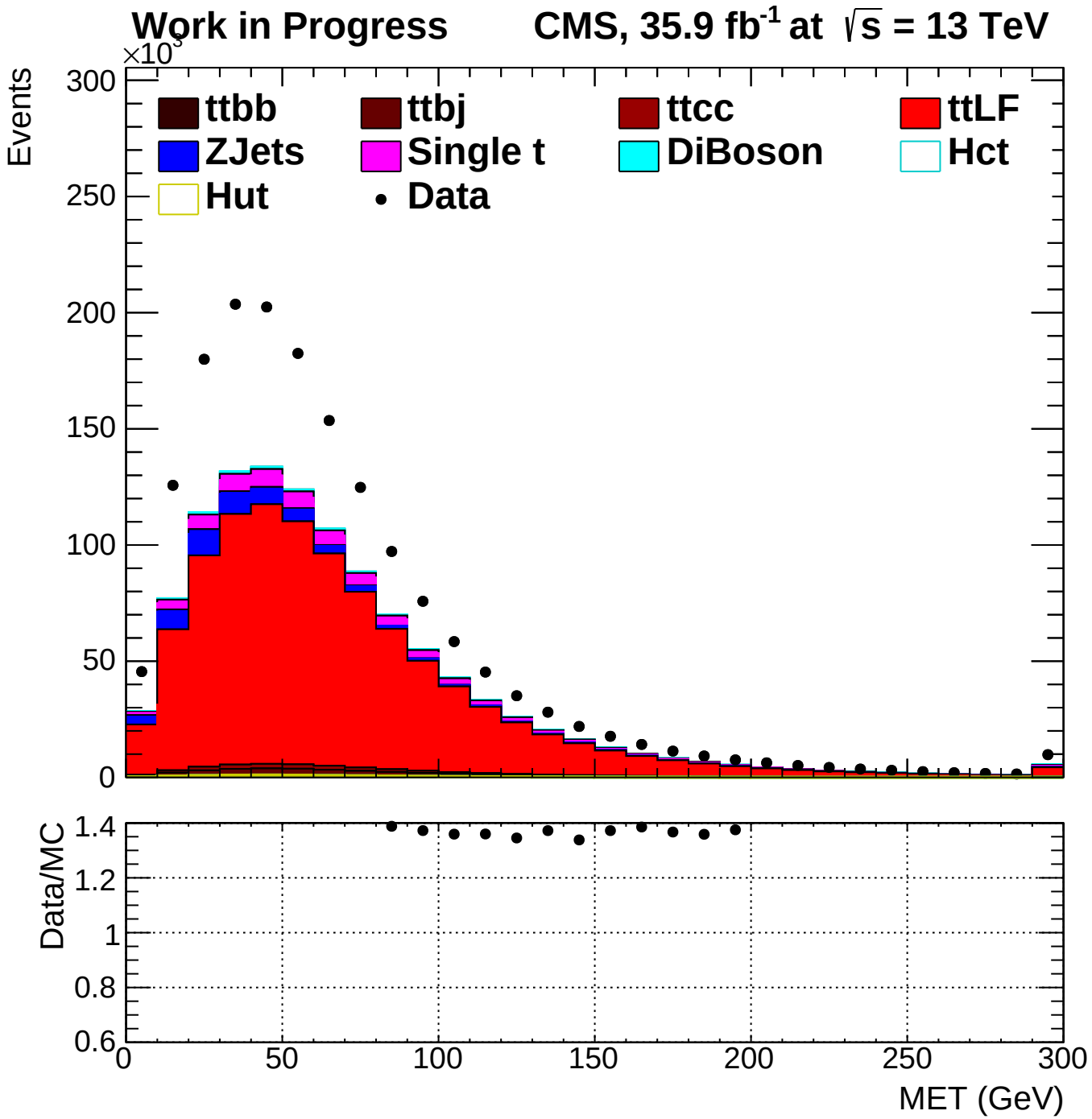

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

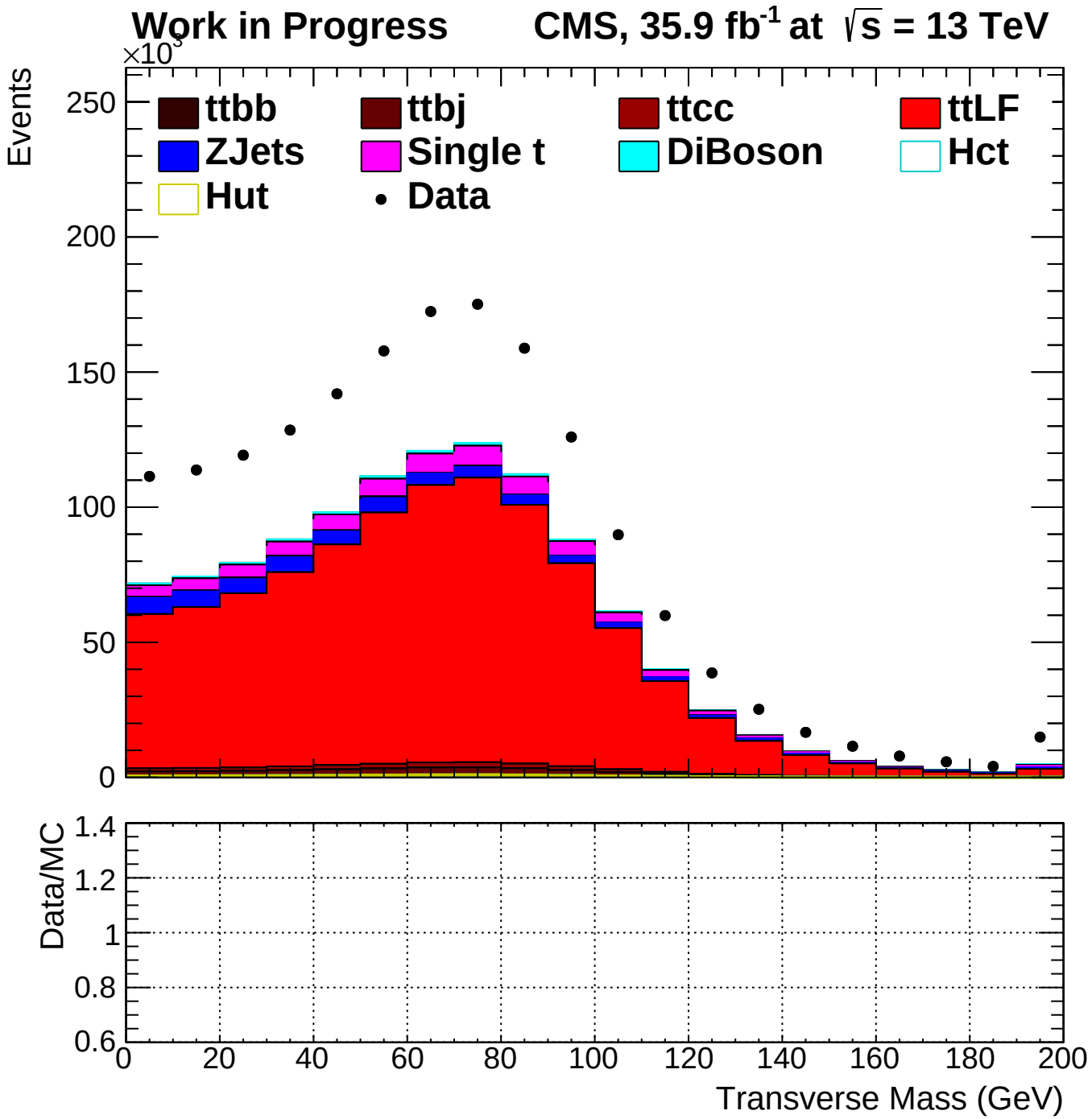

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1600
1400
1200
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity

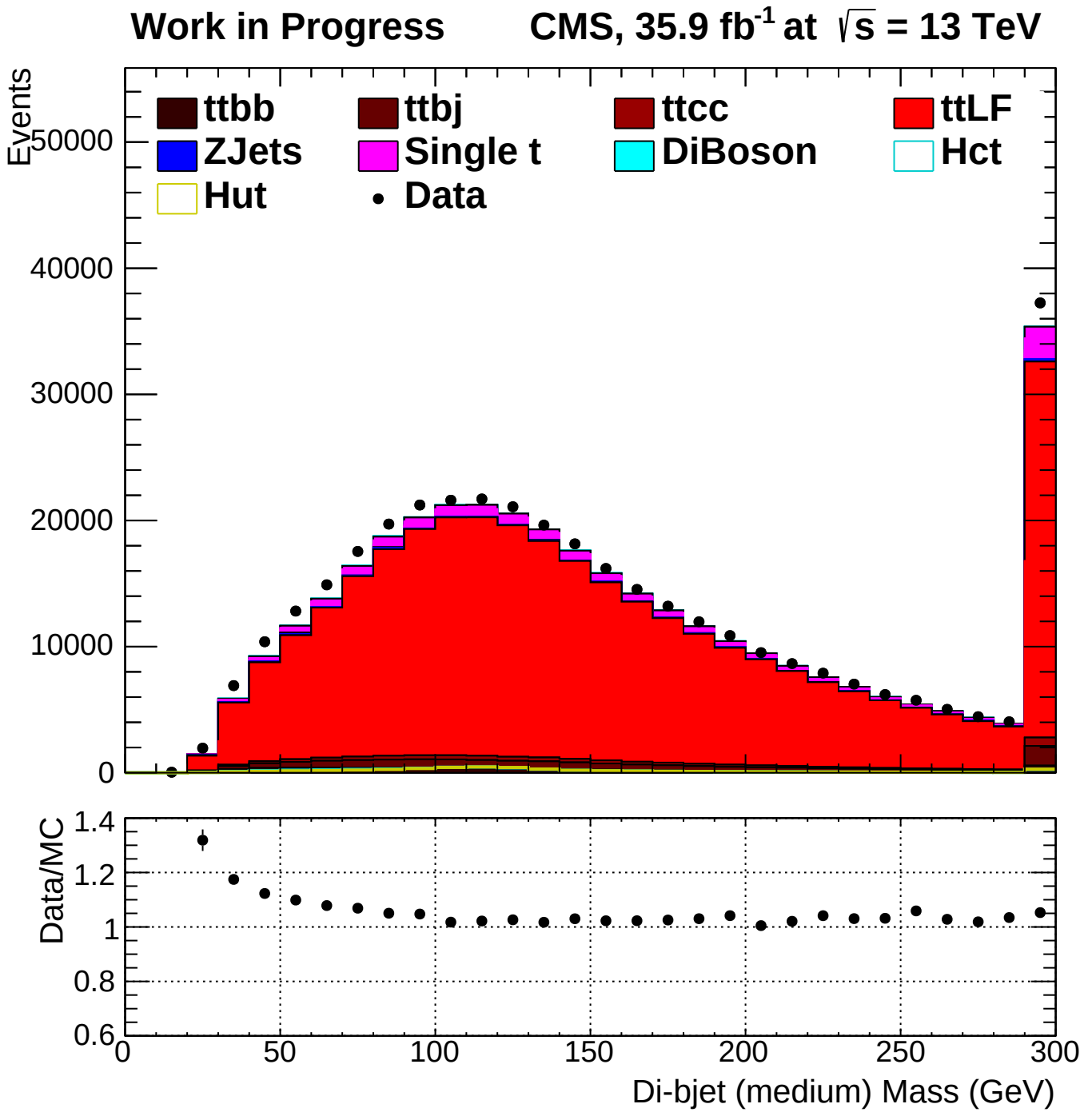

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

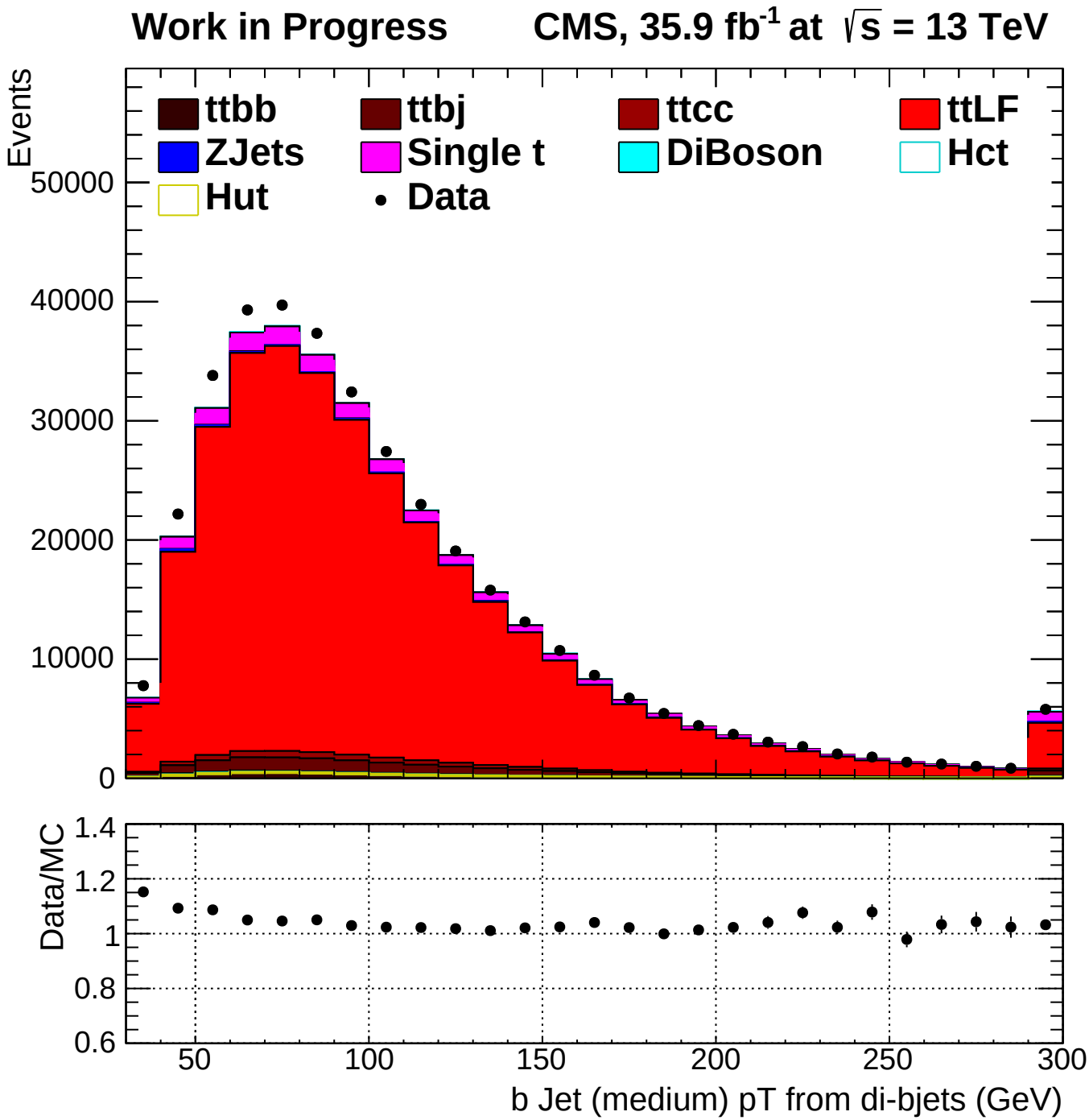

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1400
1200
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

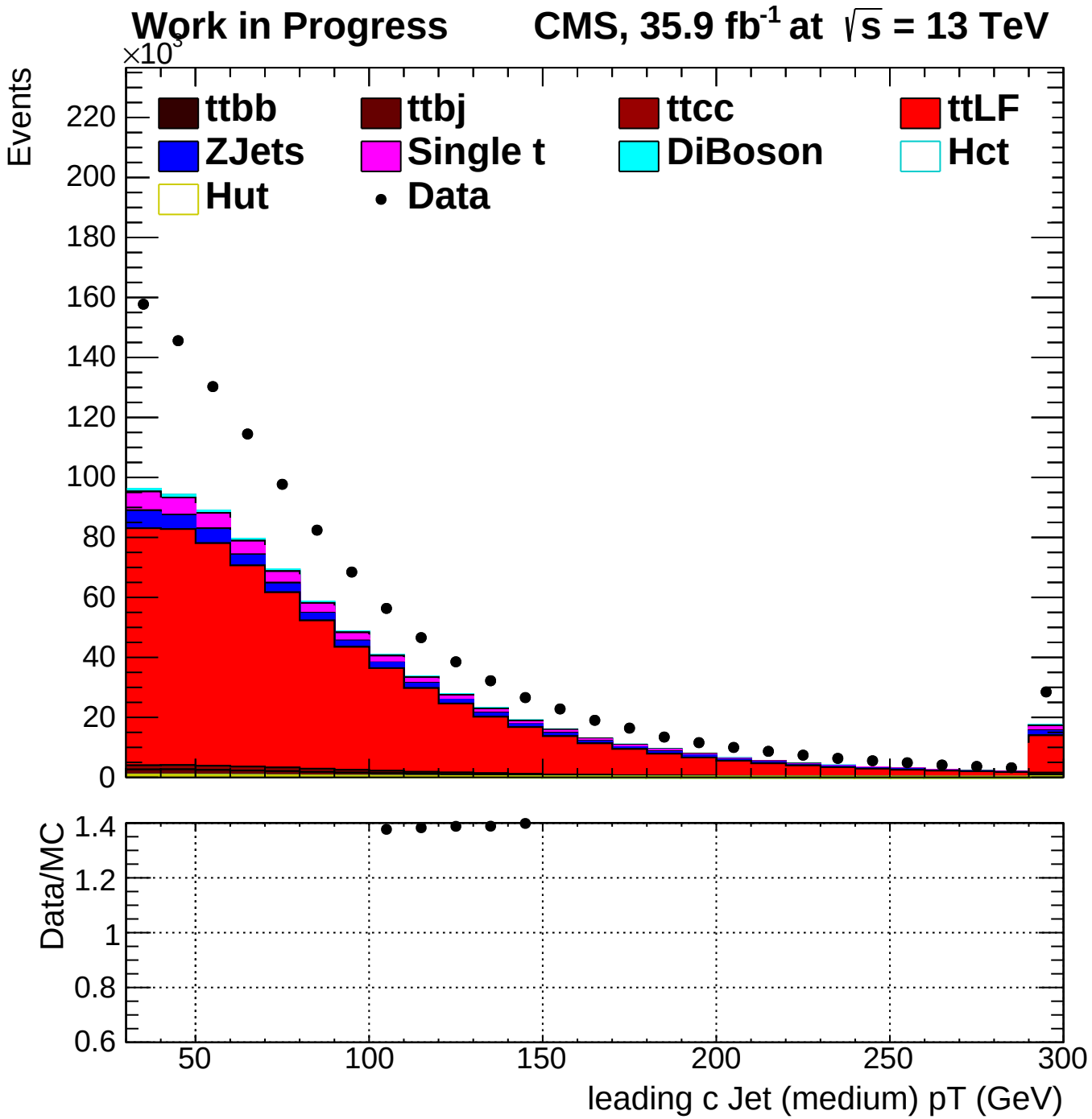

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
1000
800
600
400
200
0
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

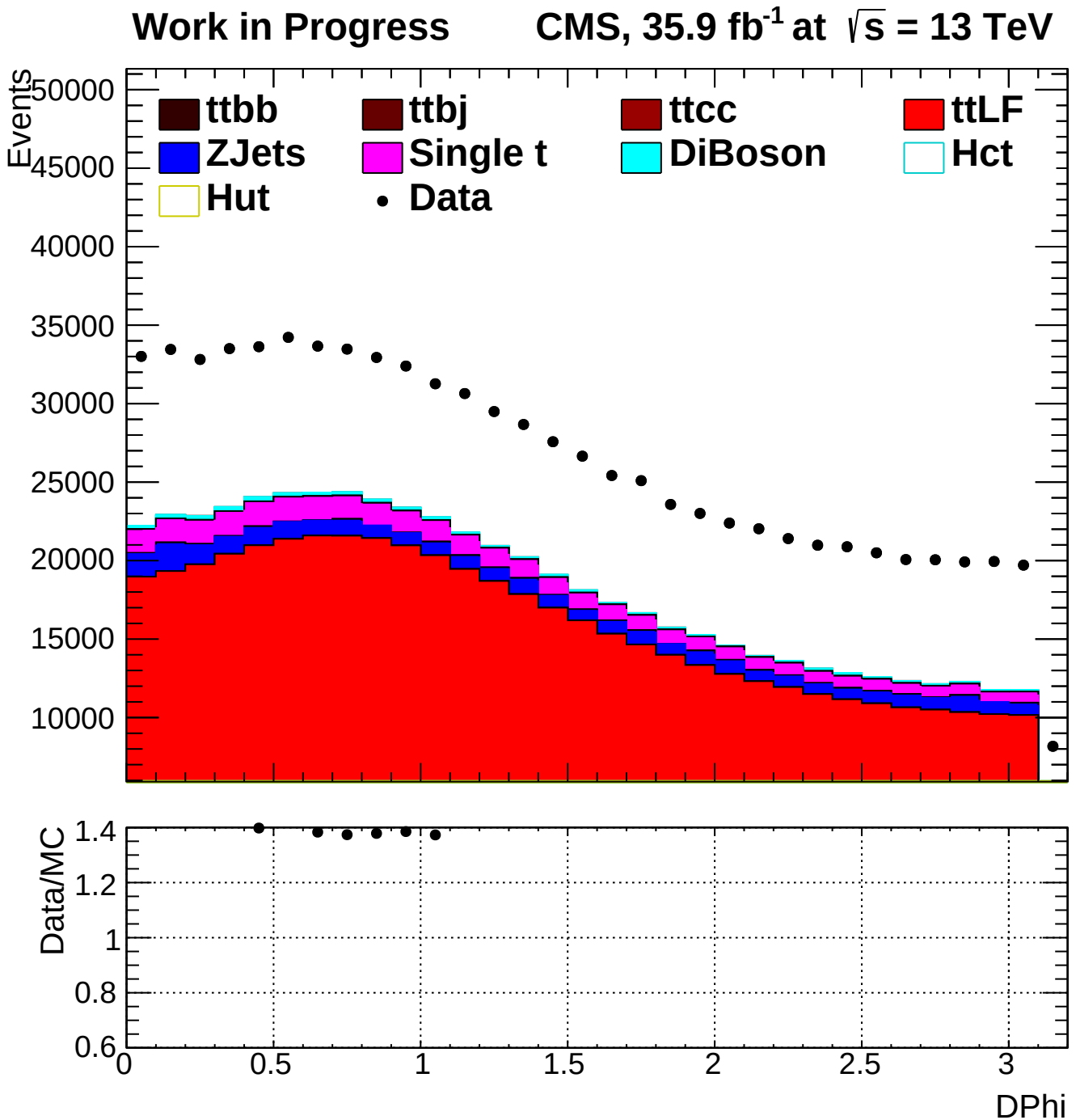

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

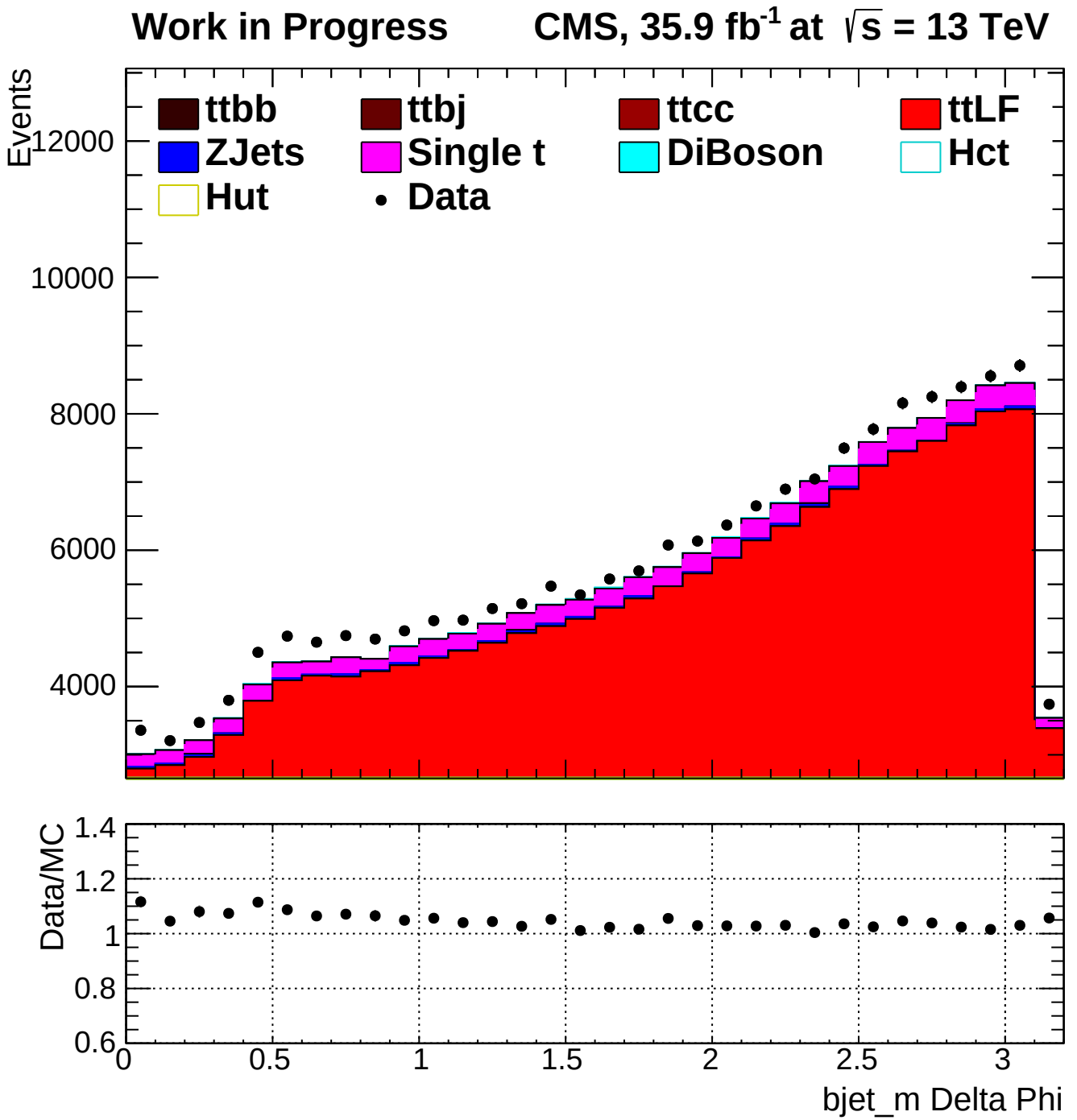

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

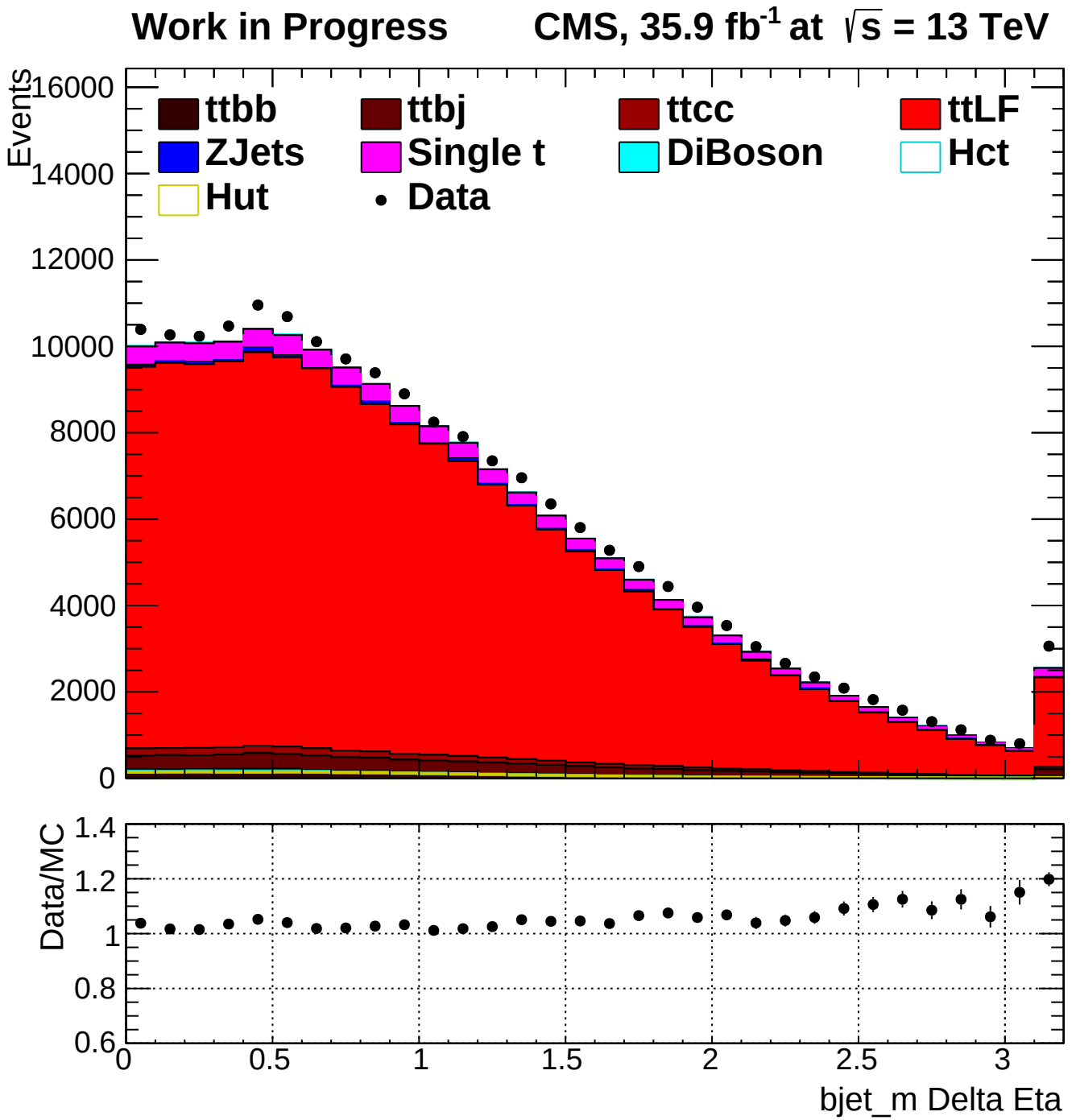

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

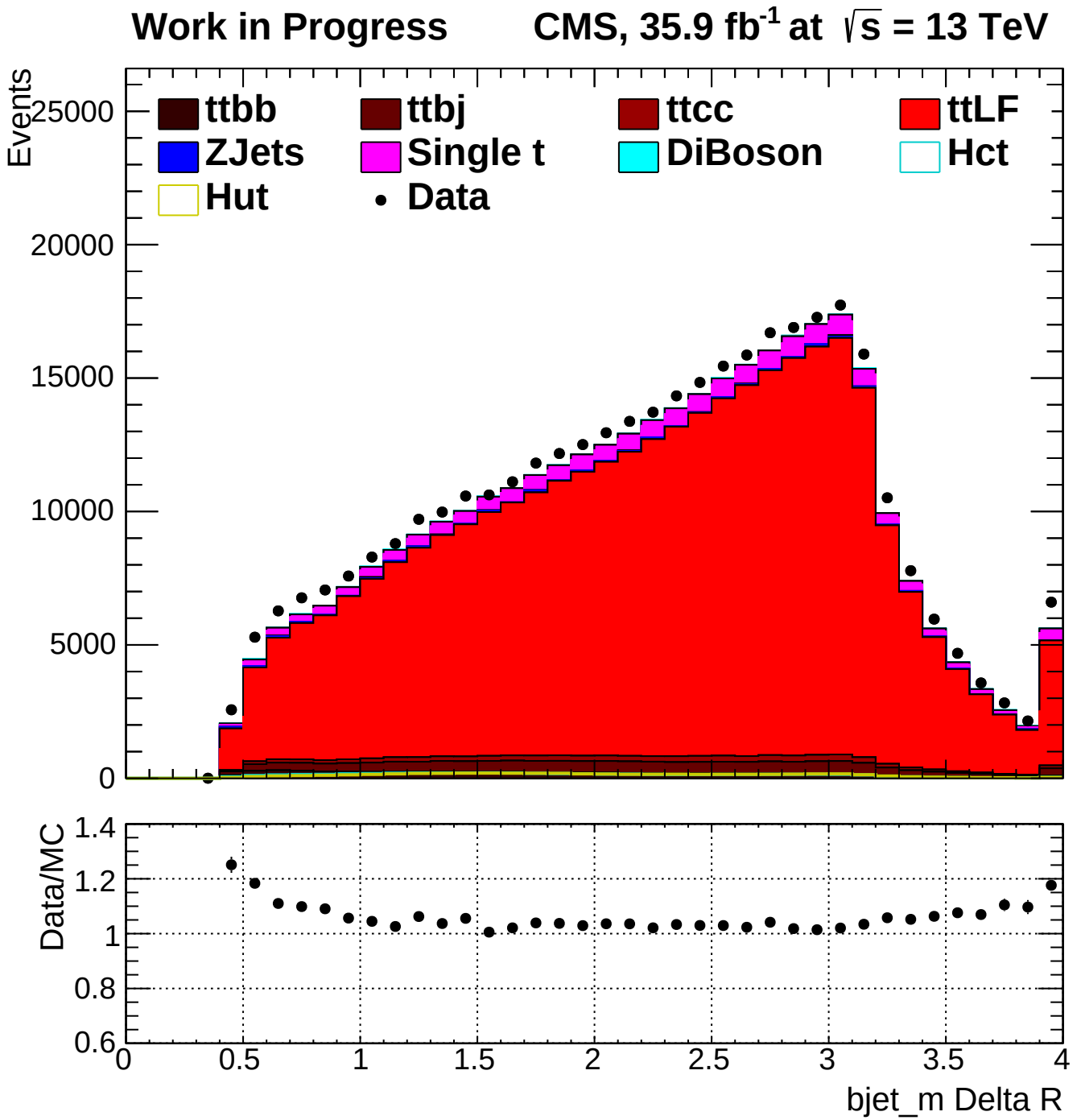

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

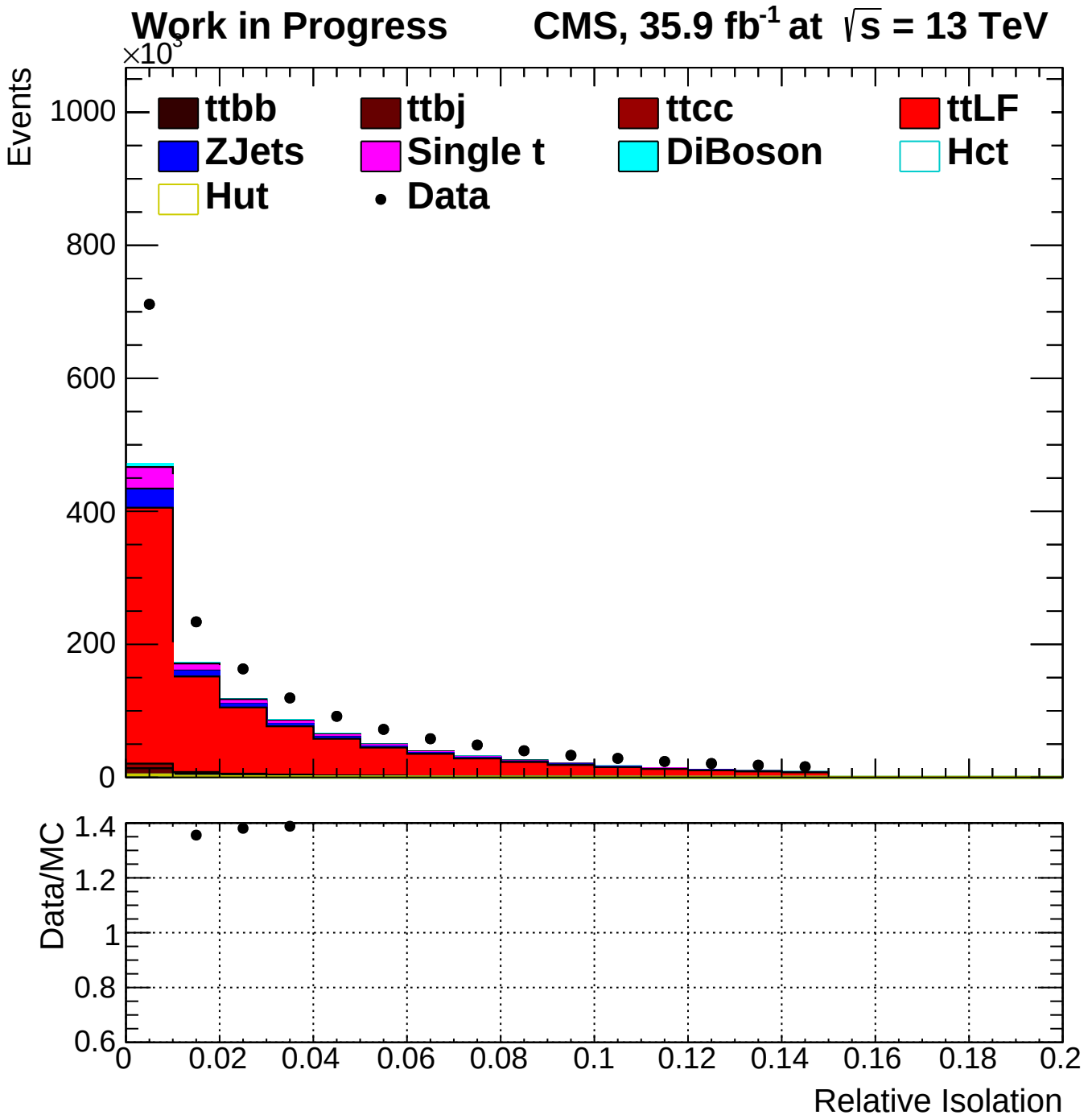

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

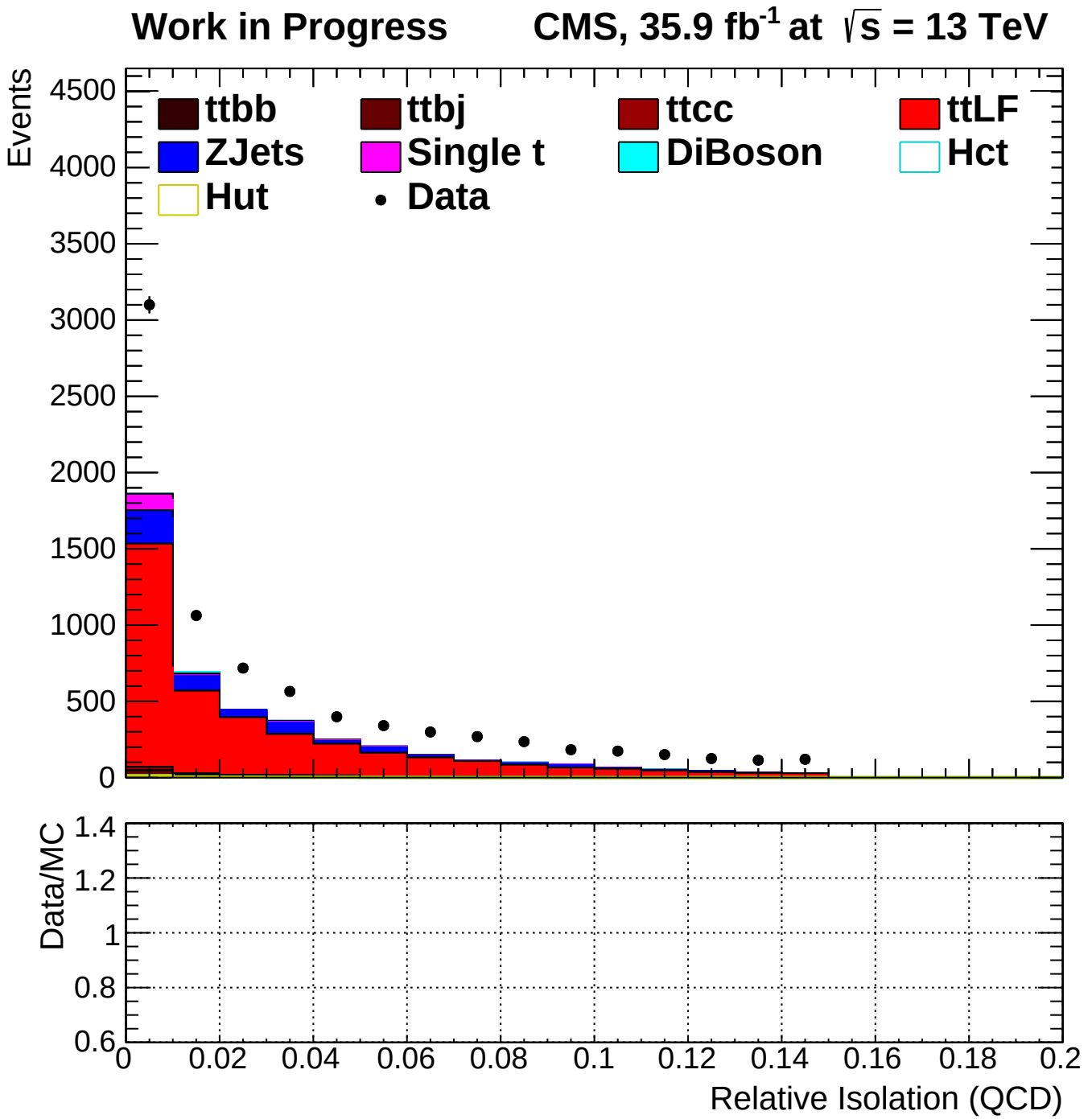

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
45000
40000
35000
30000
25000
20000
15000
10000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

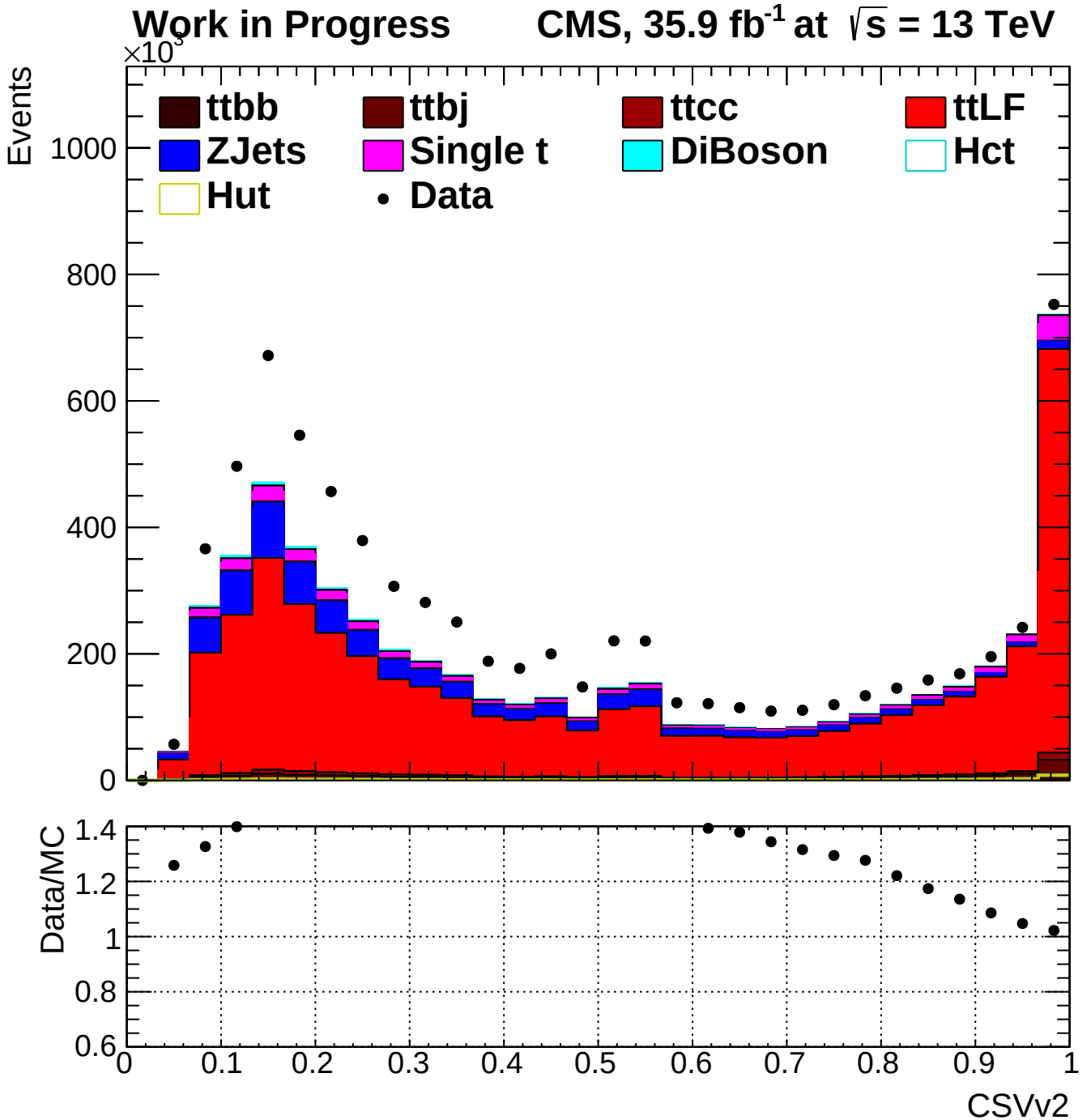

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
12000
10000
8000
6000
4000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

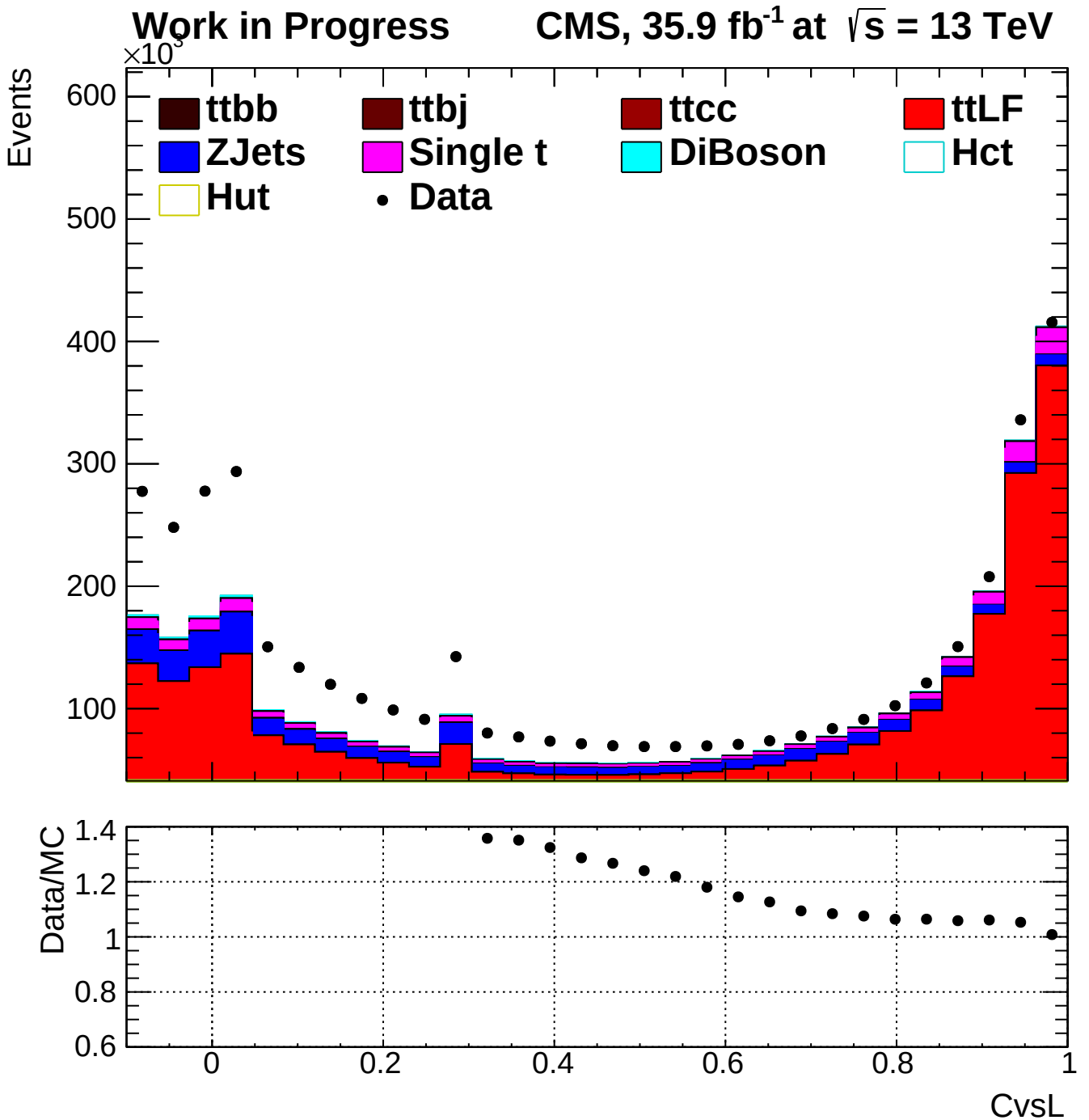

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16000
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

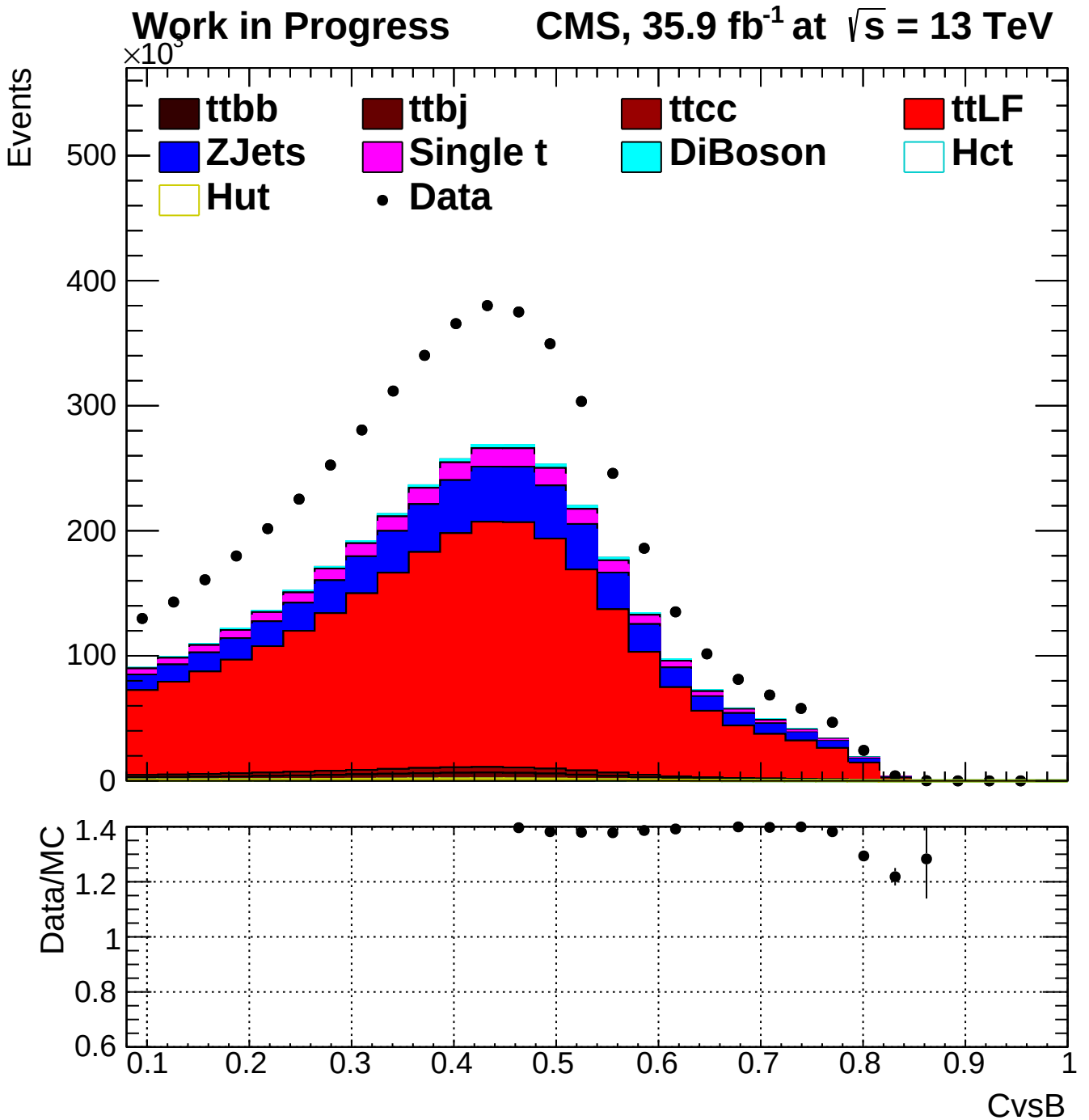

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

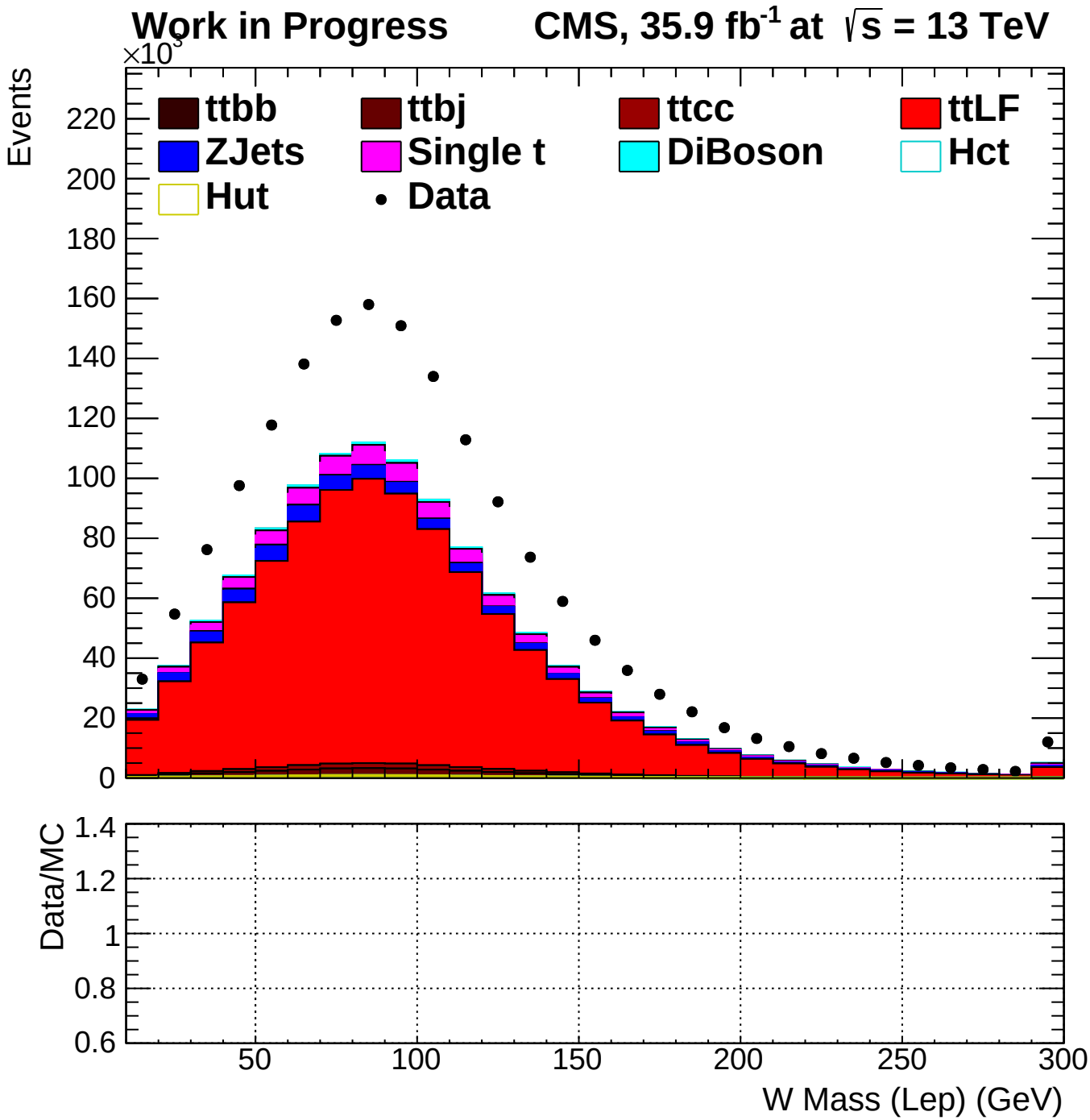

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

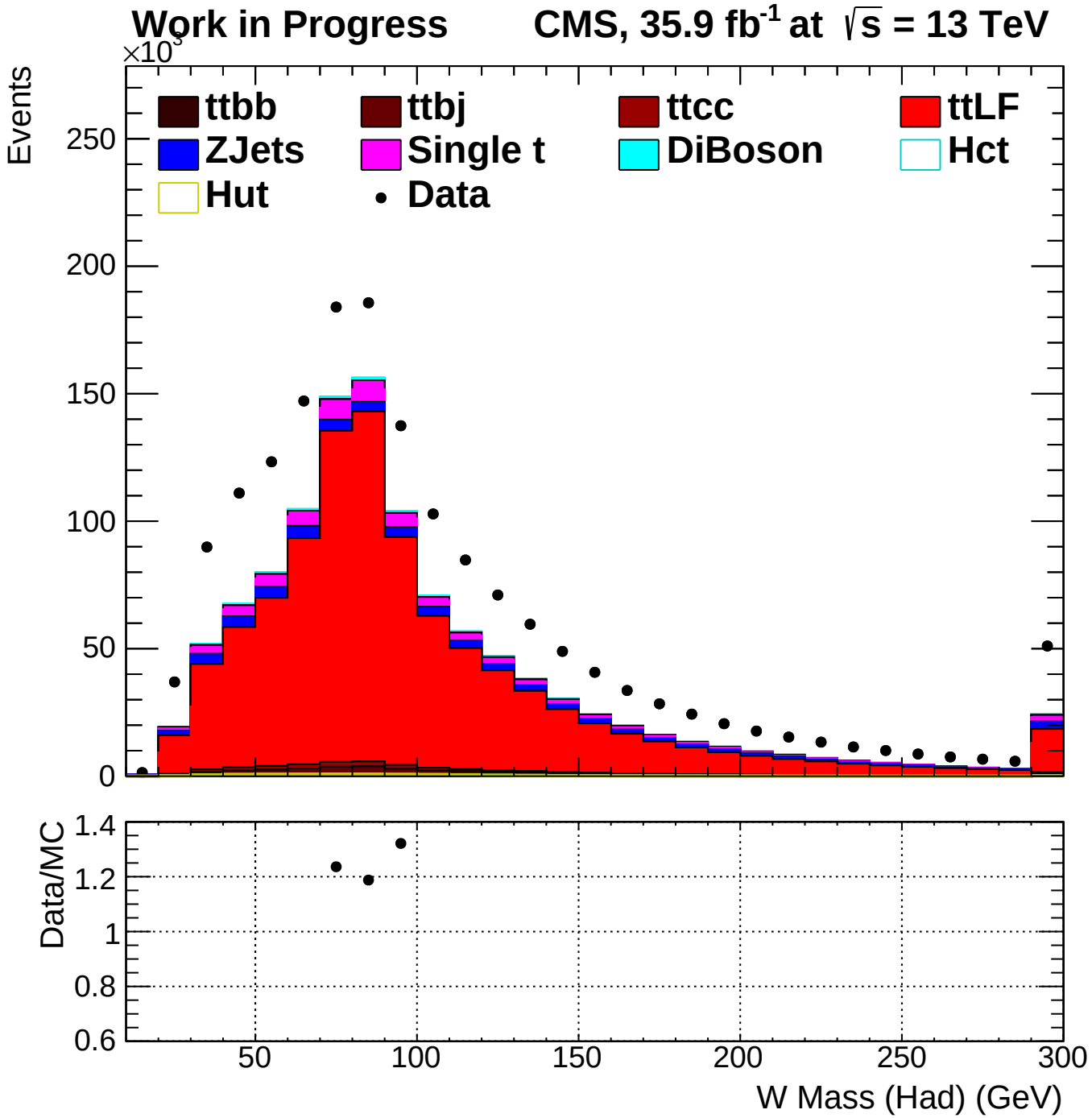

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

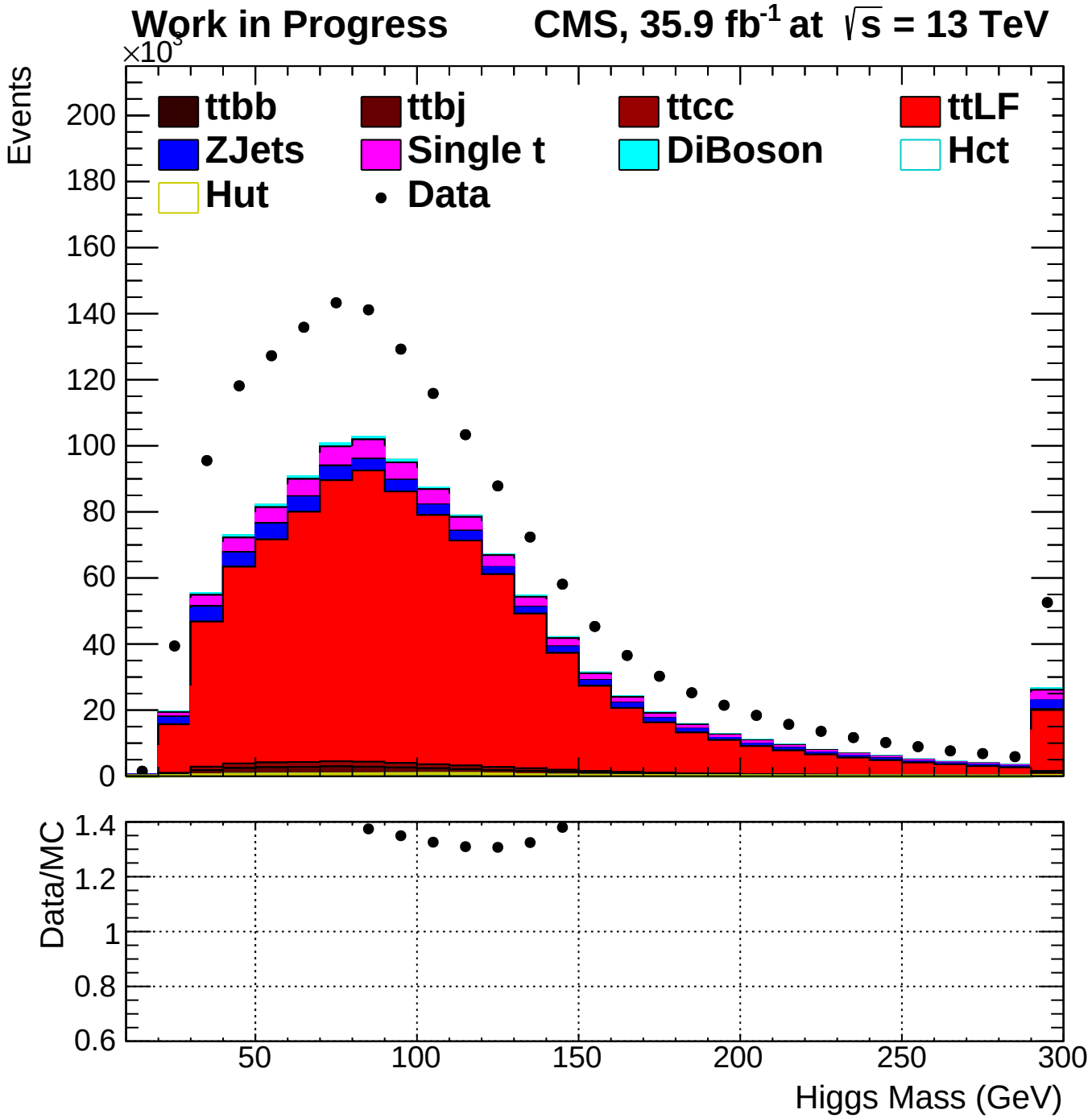

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

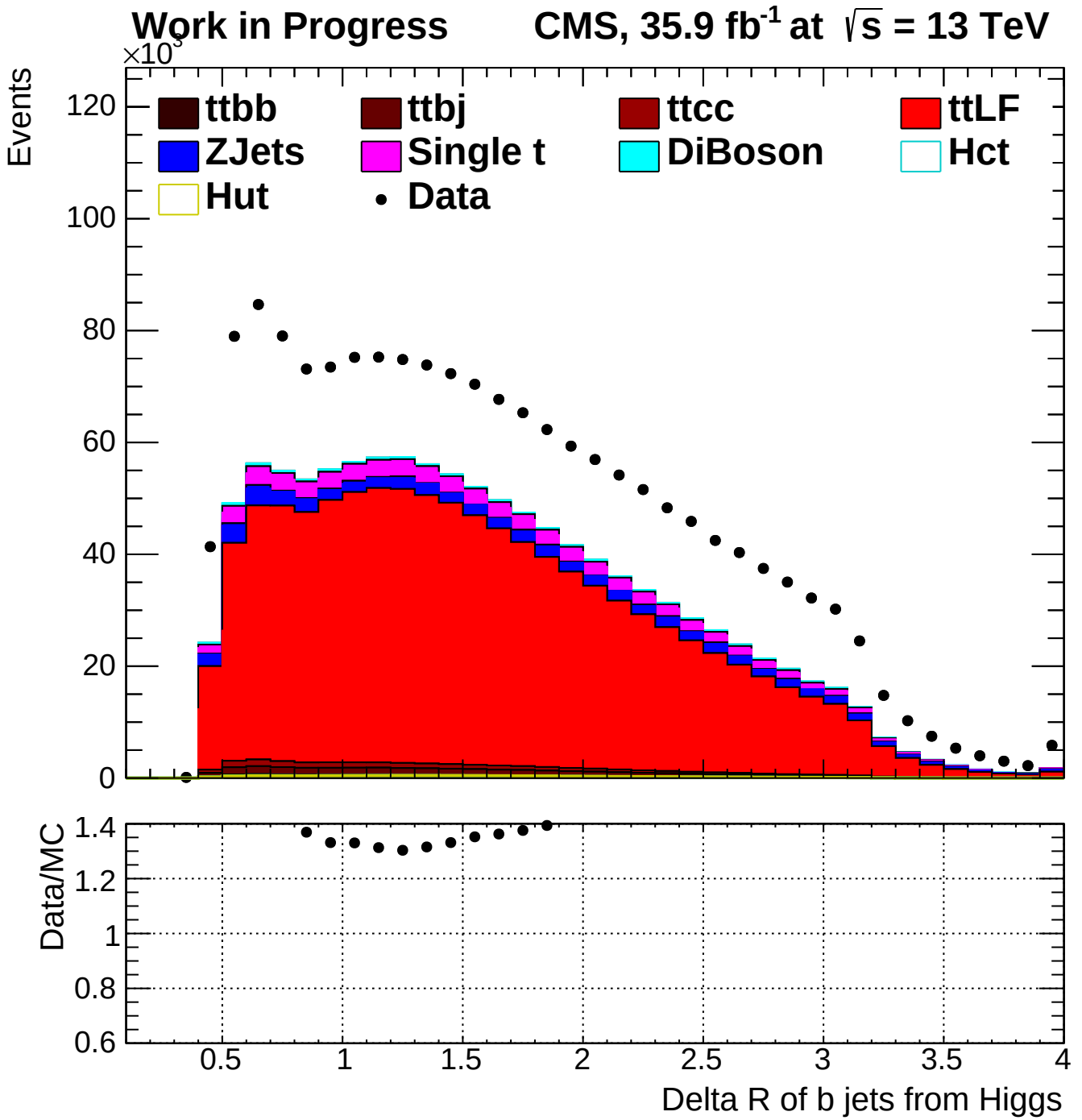

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
600
500
400
300
200
100
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

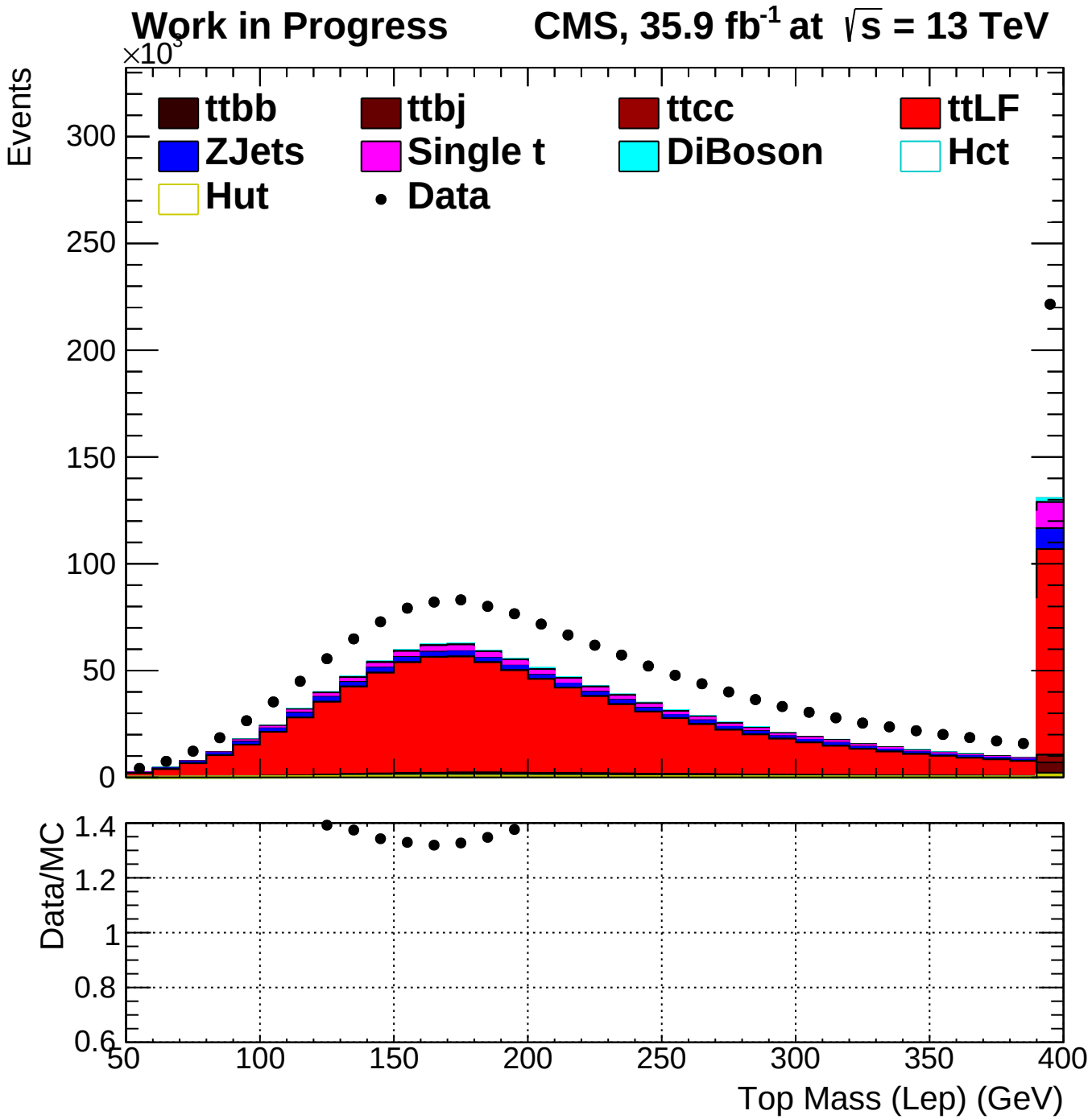

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

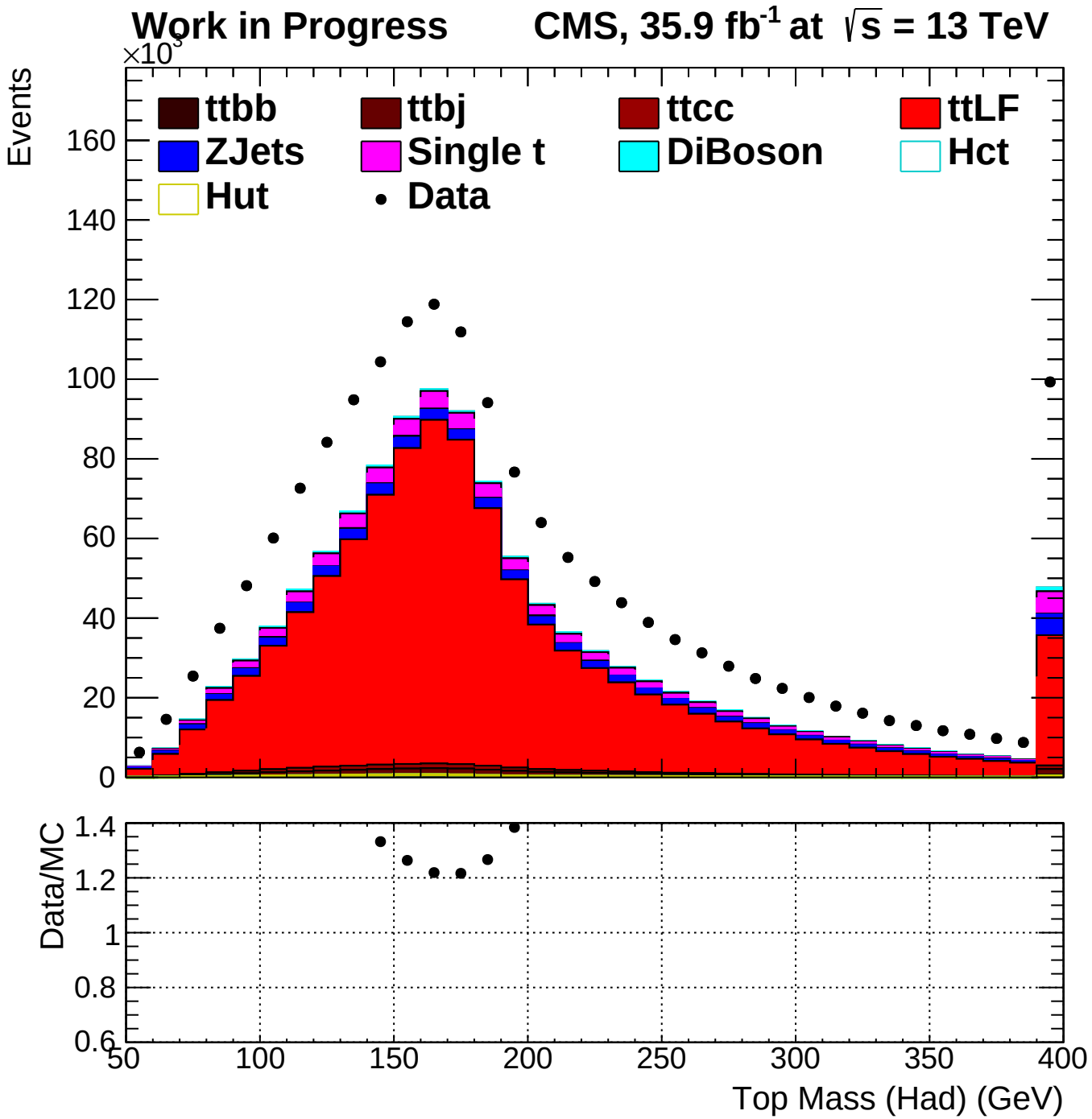

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

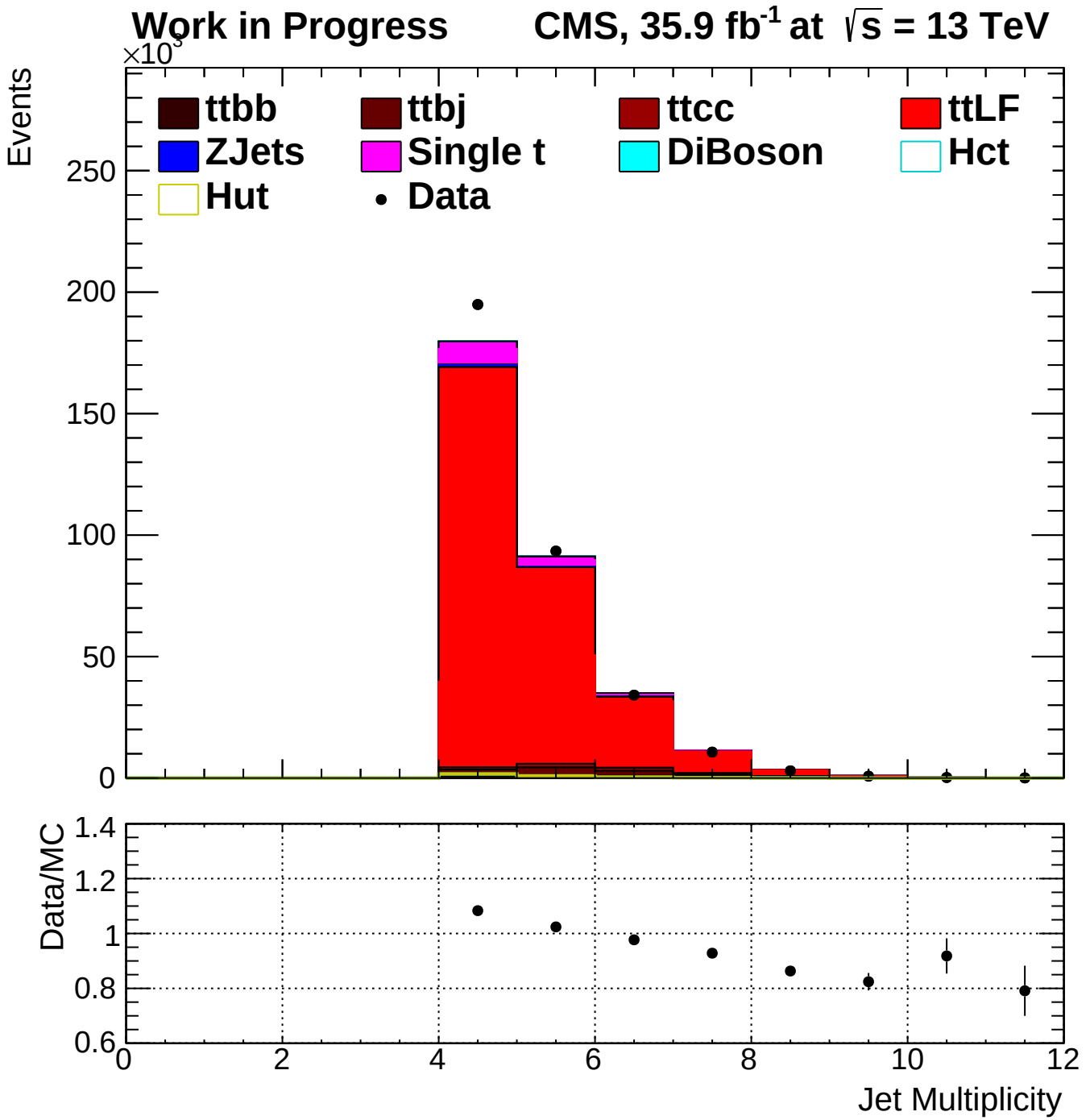

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

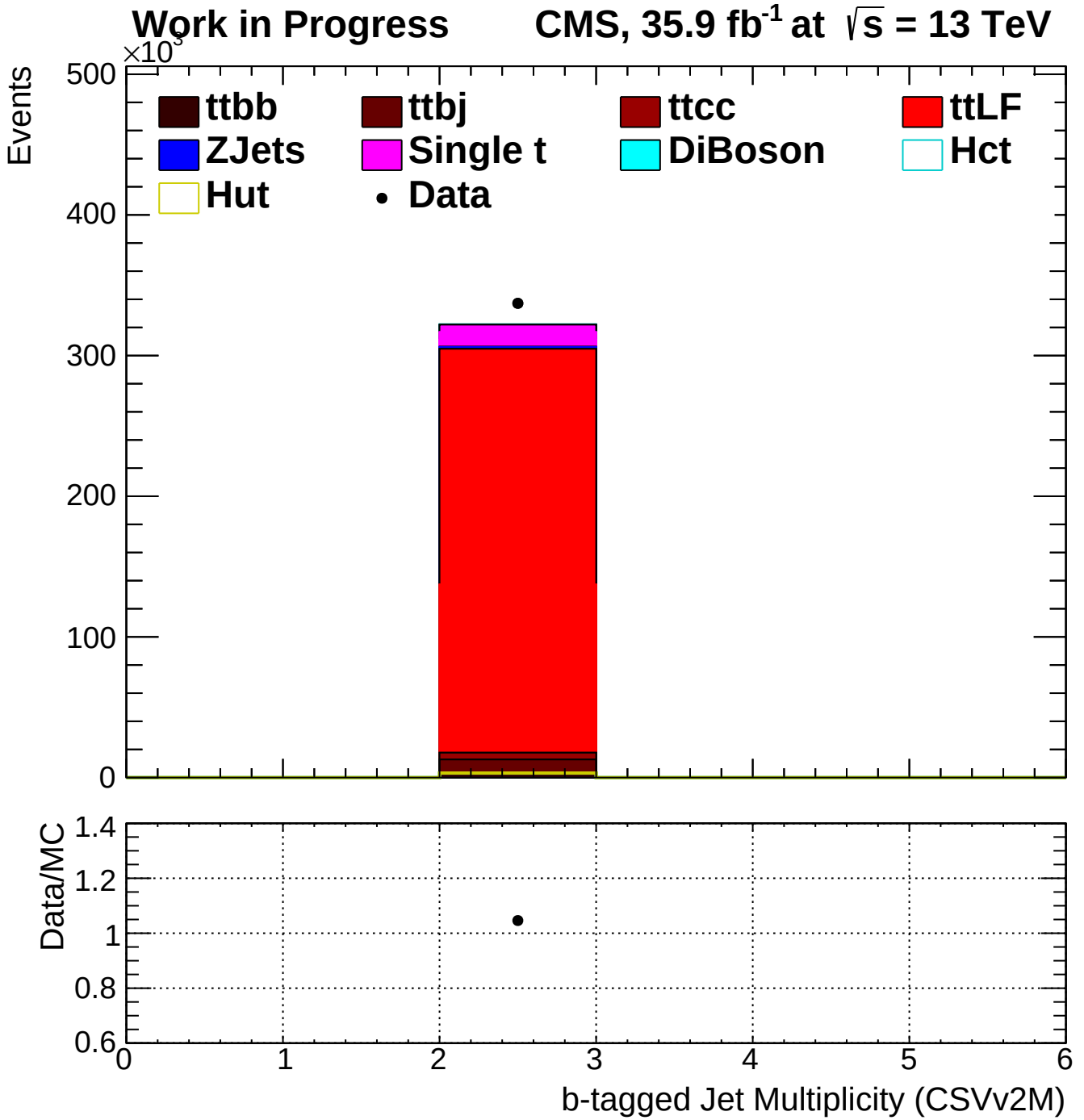

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

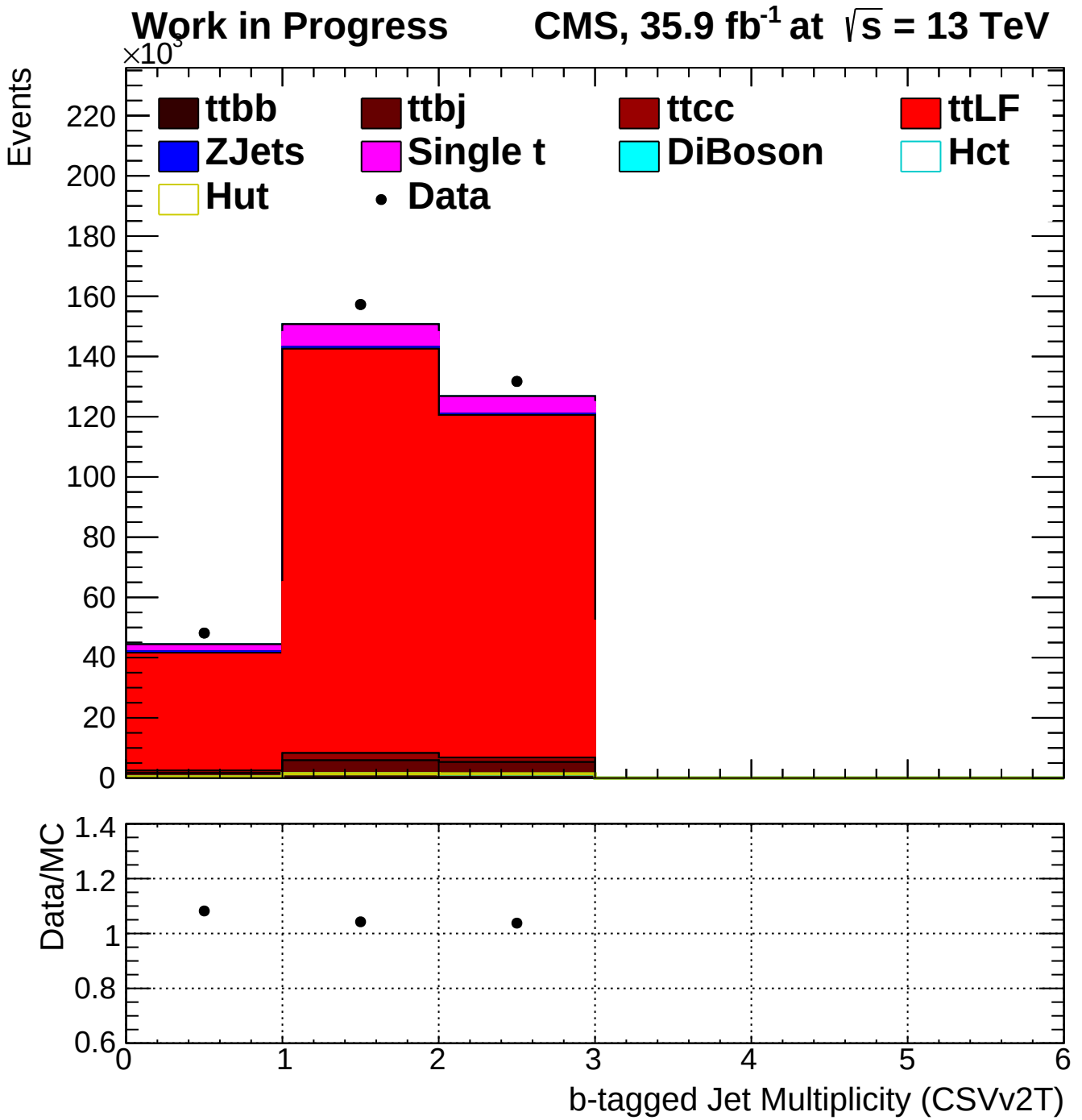

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

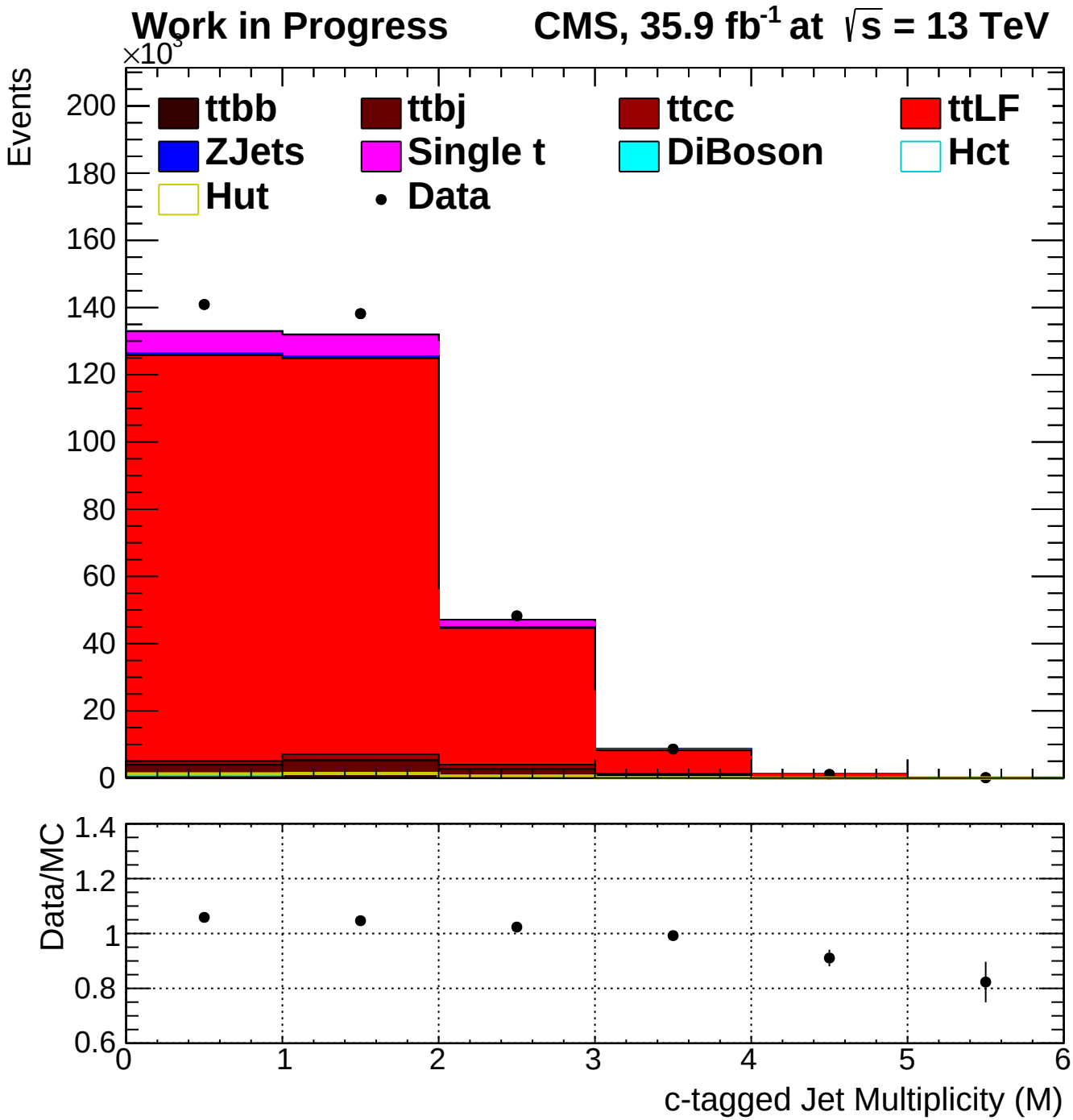

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
500
400
300
200
100
0
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
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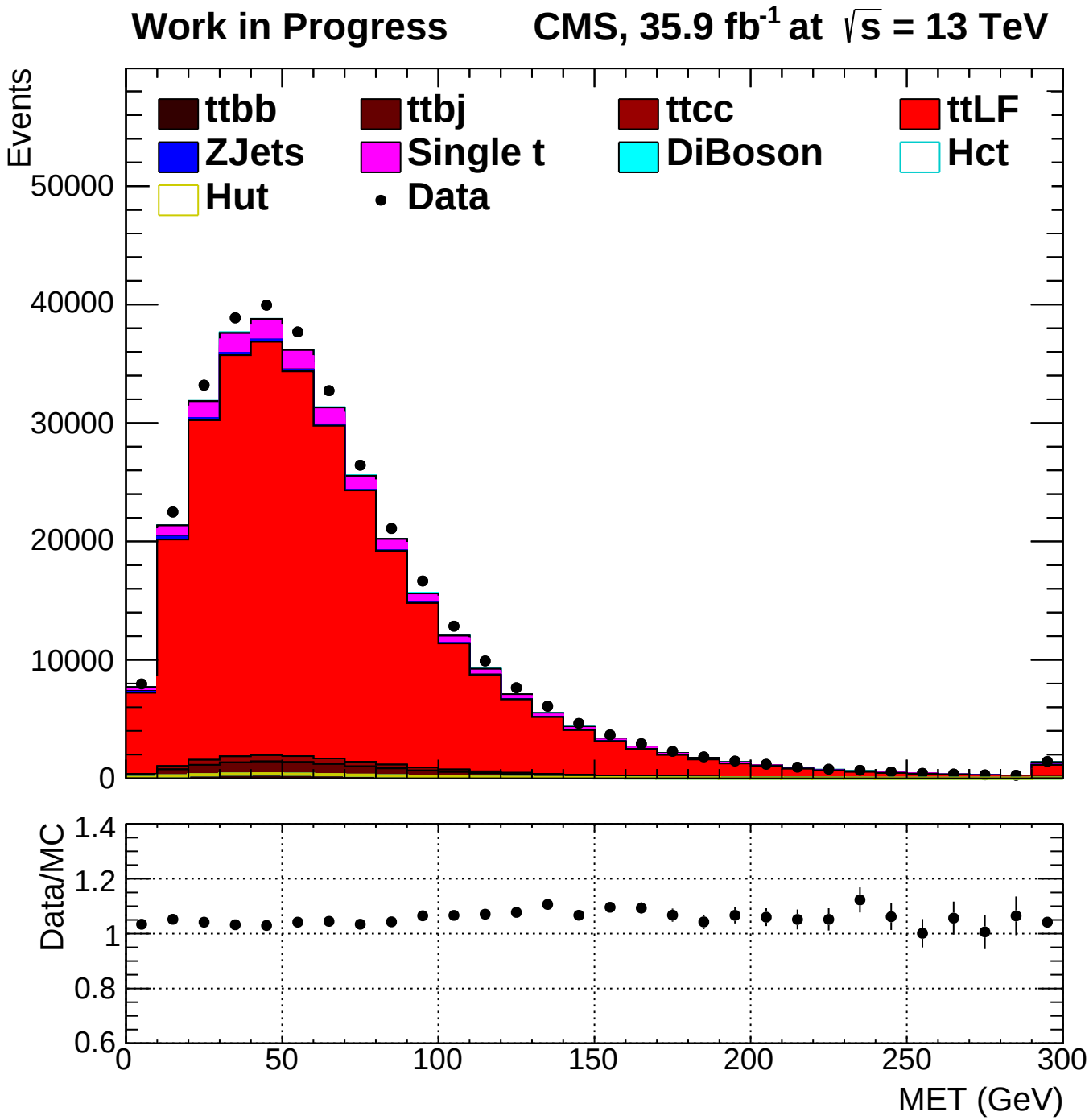
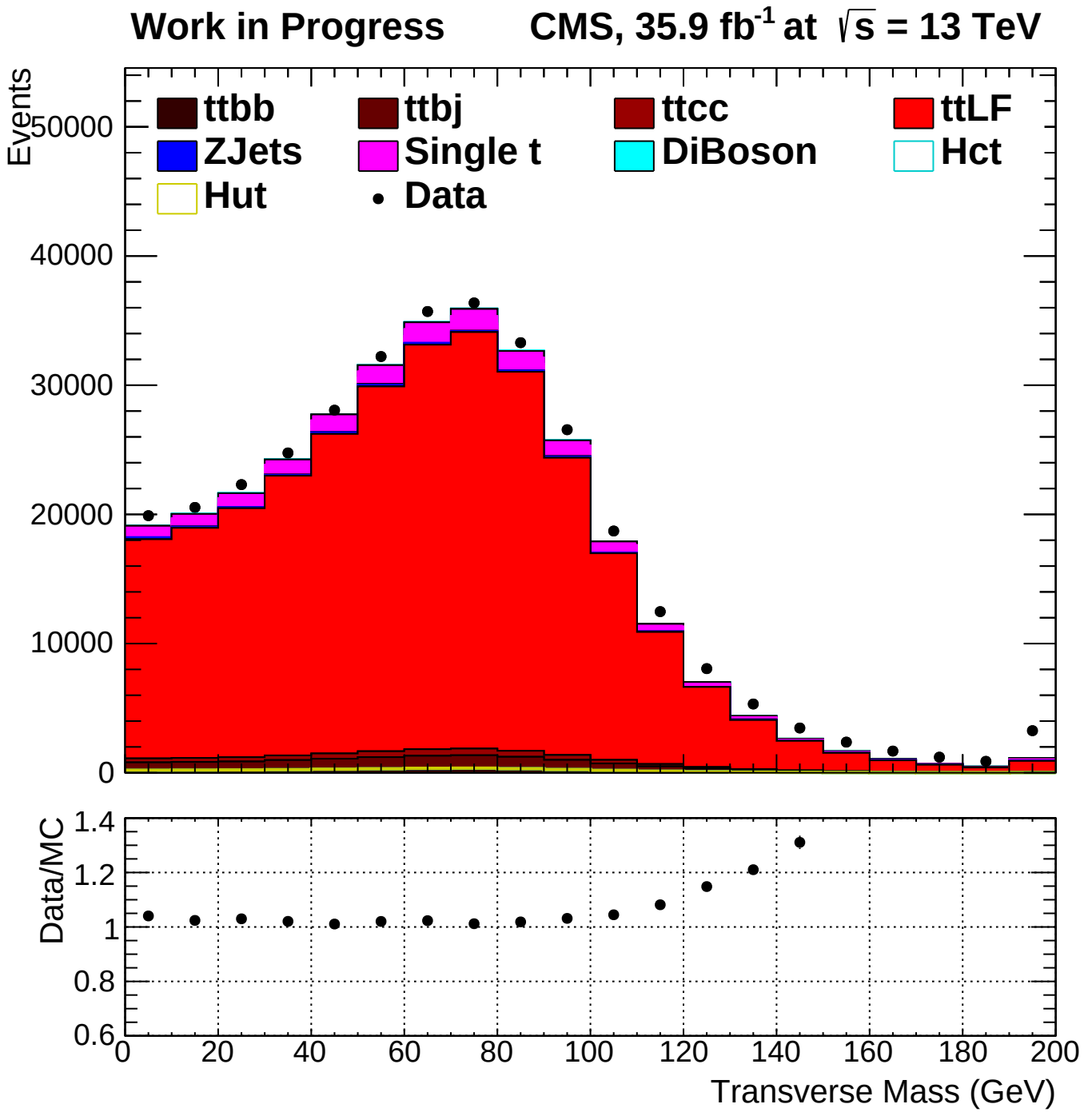
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
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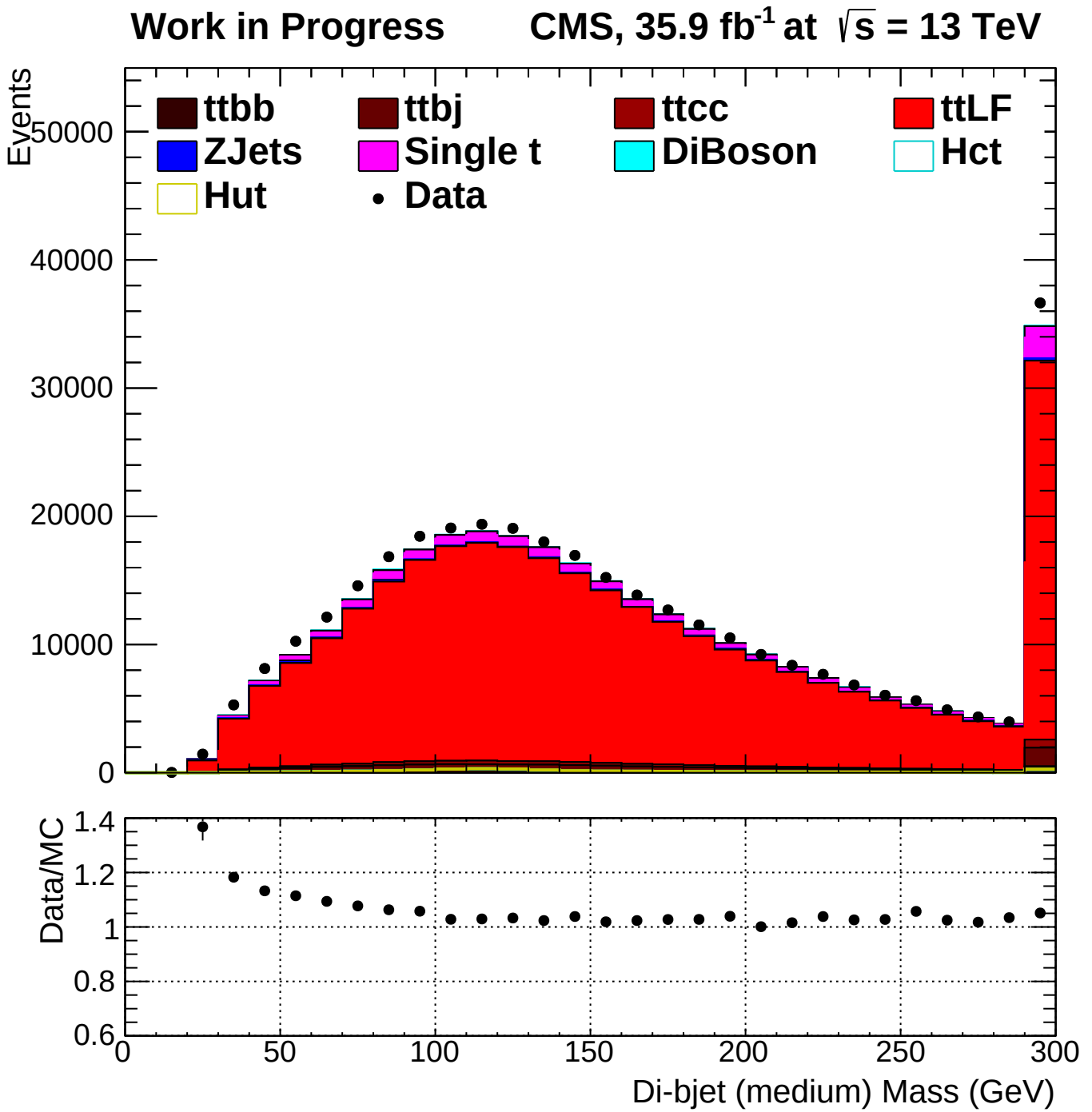
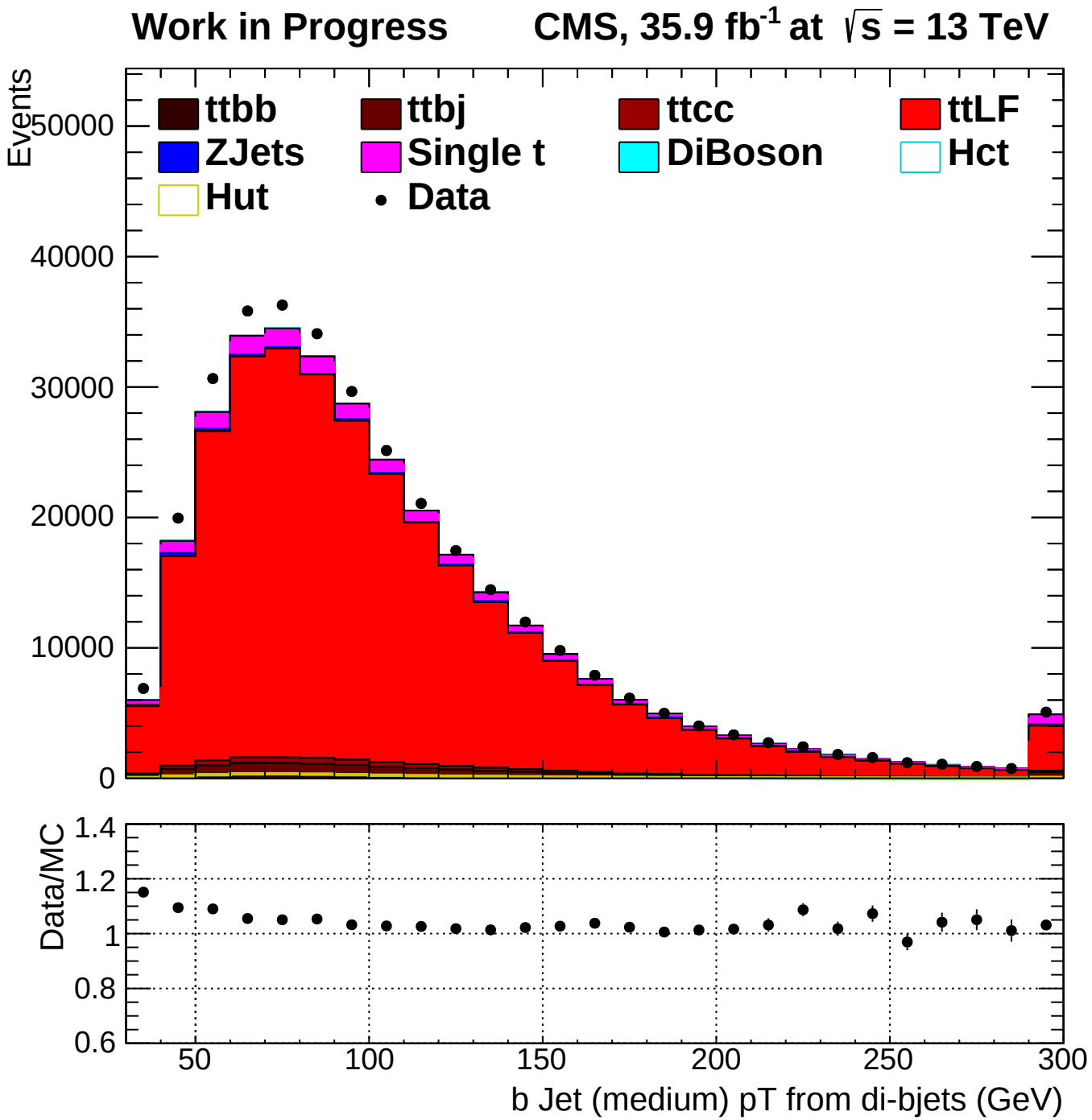
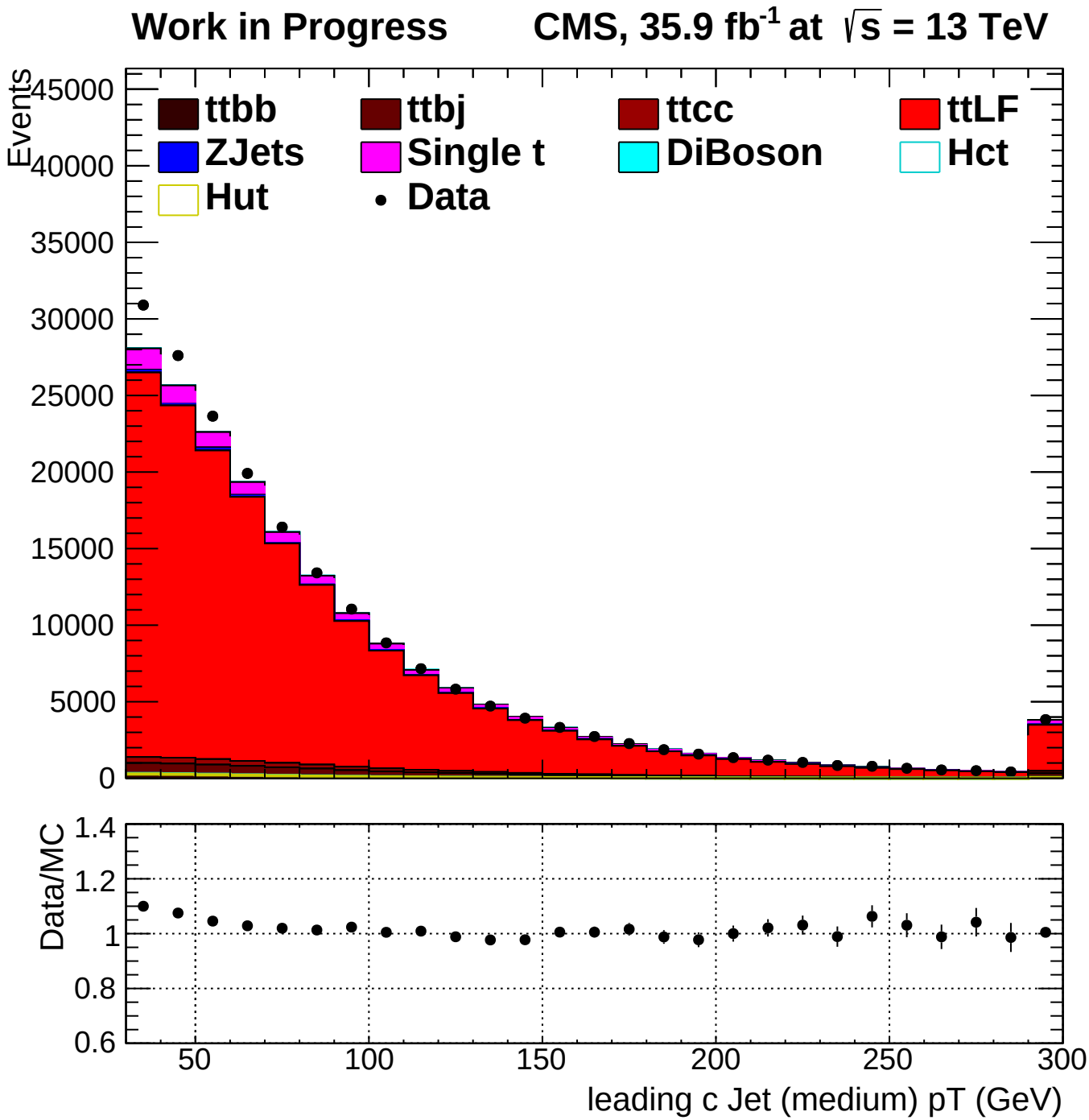
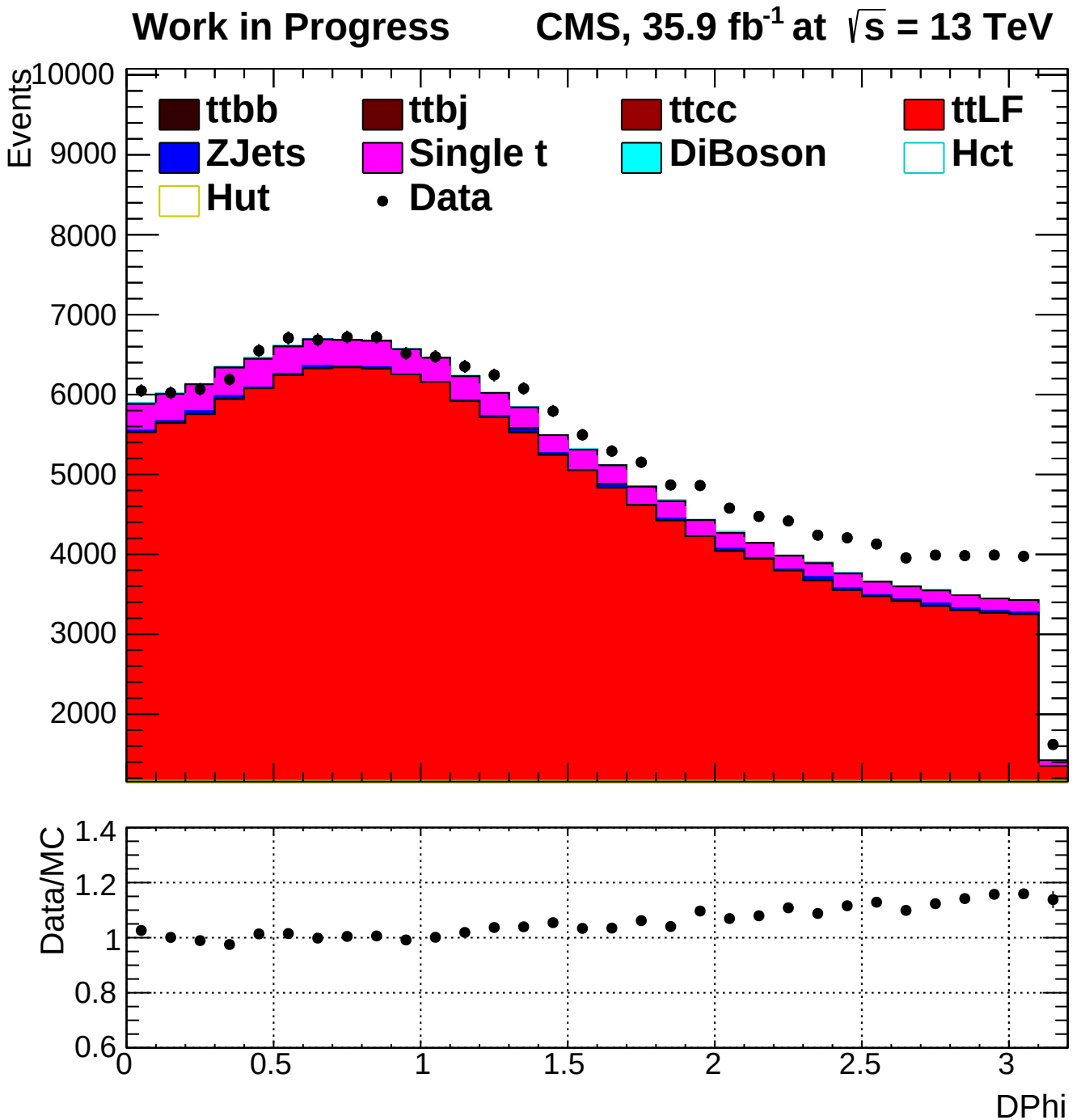
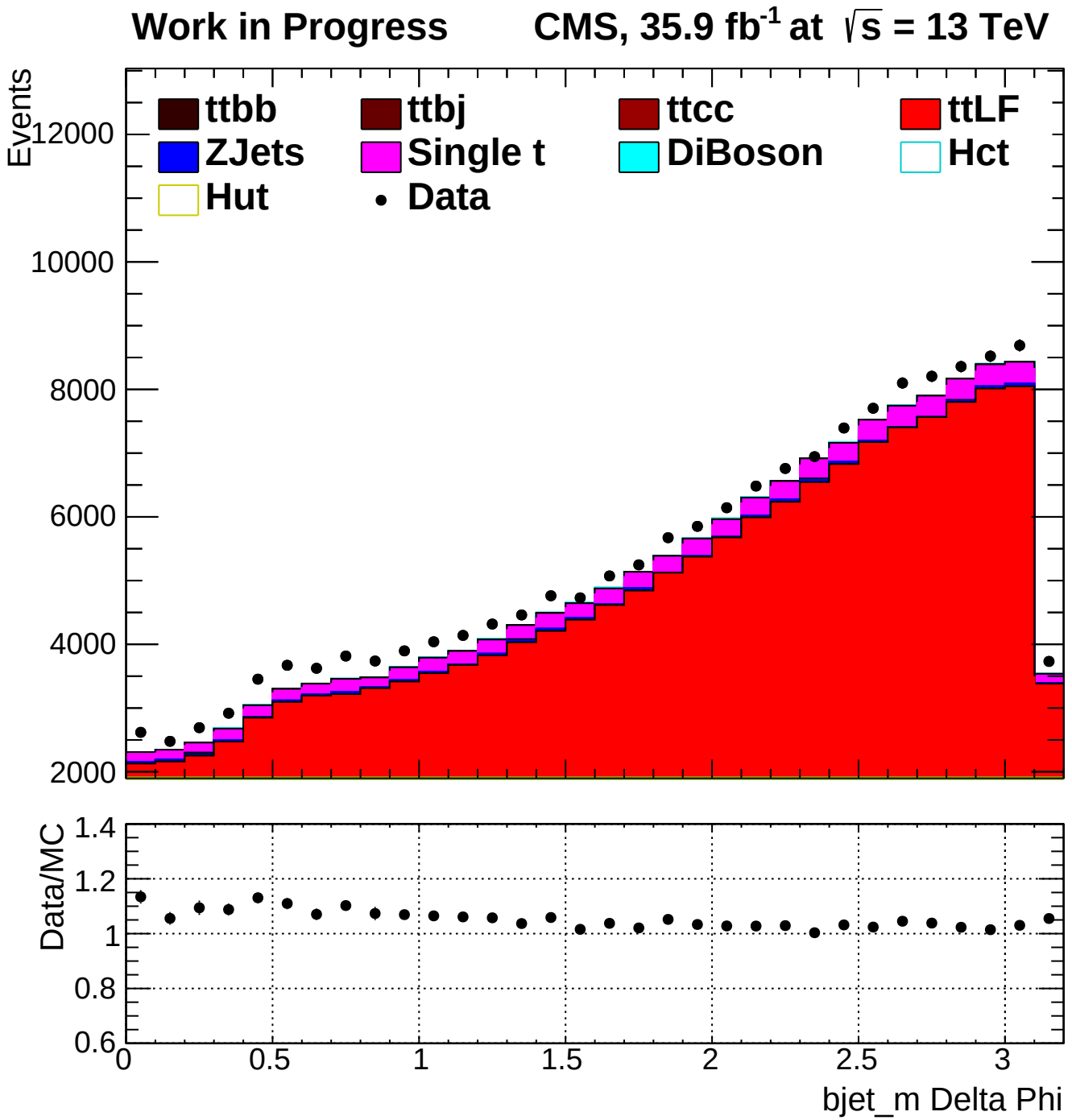
0.8
0.6
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

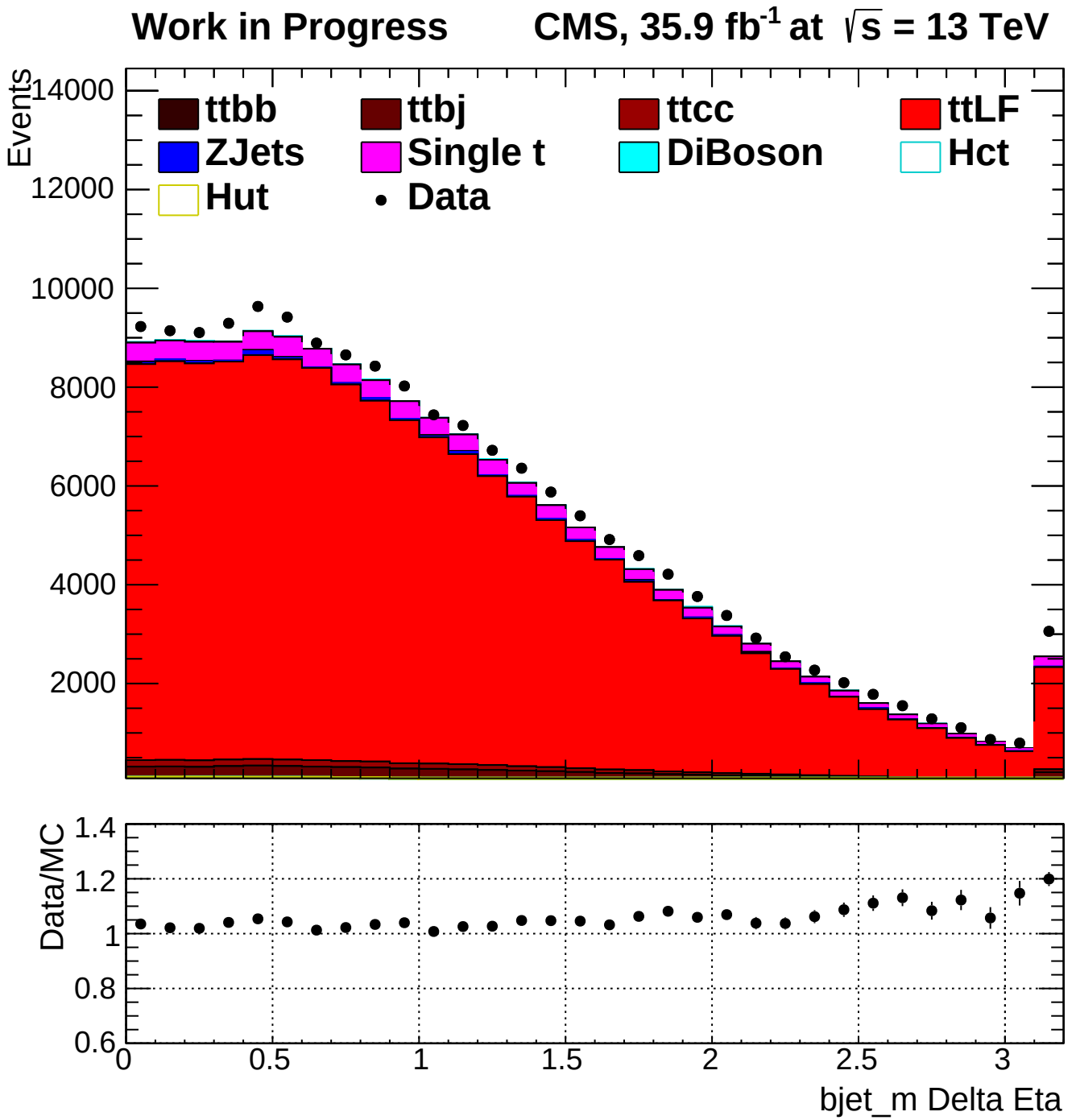

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

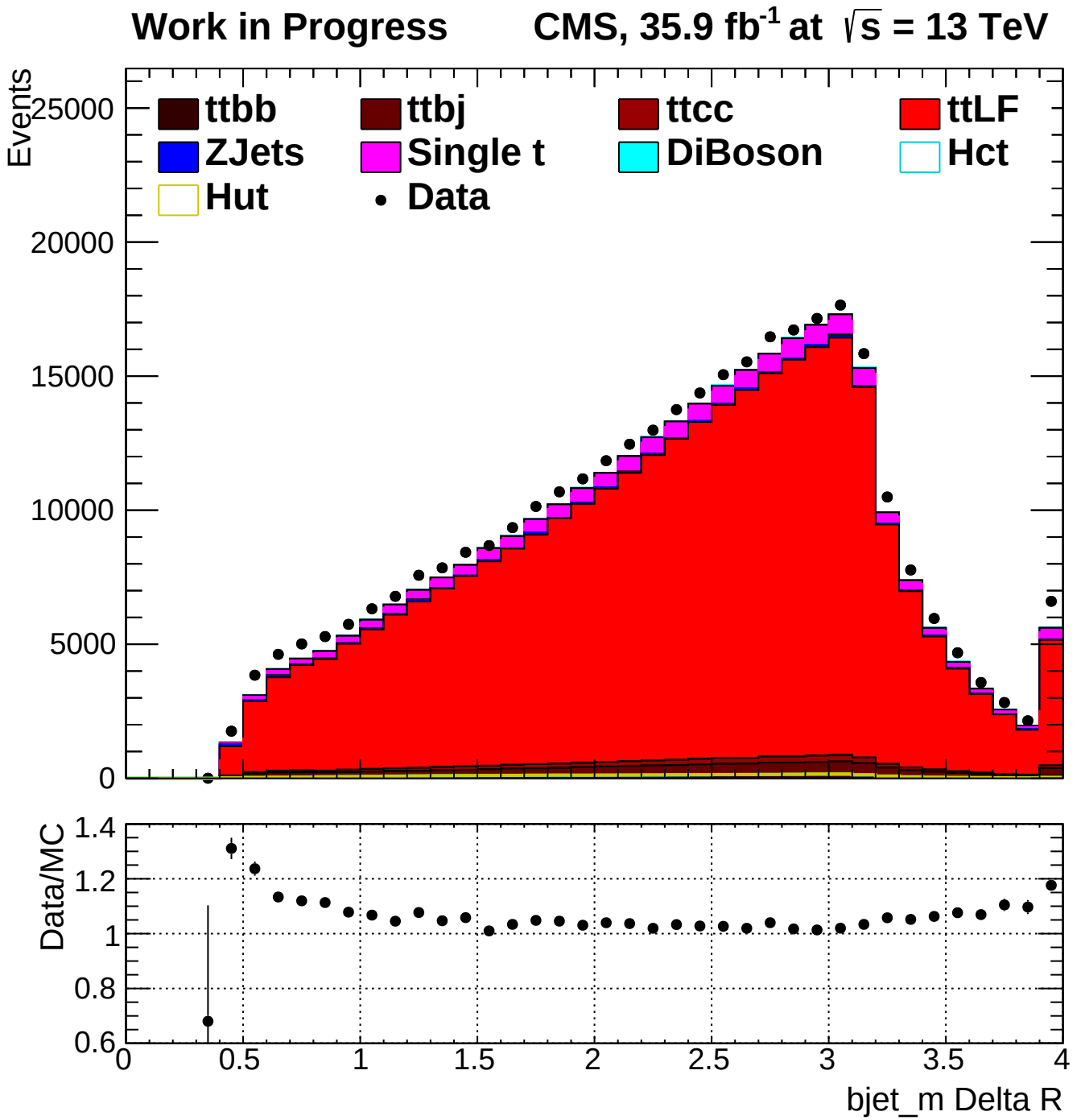

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

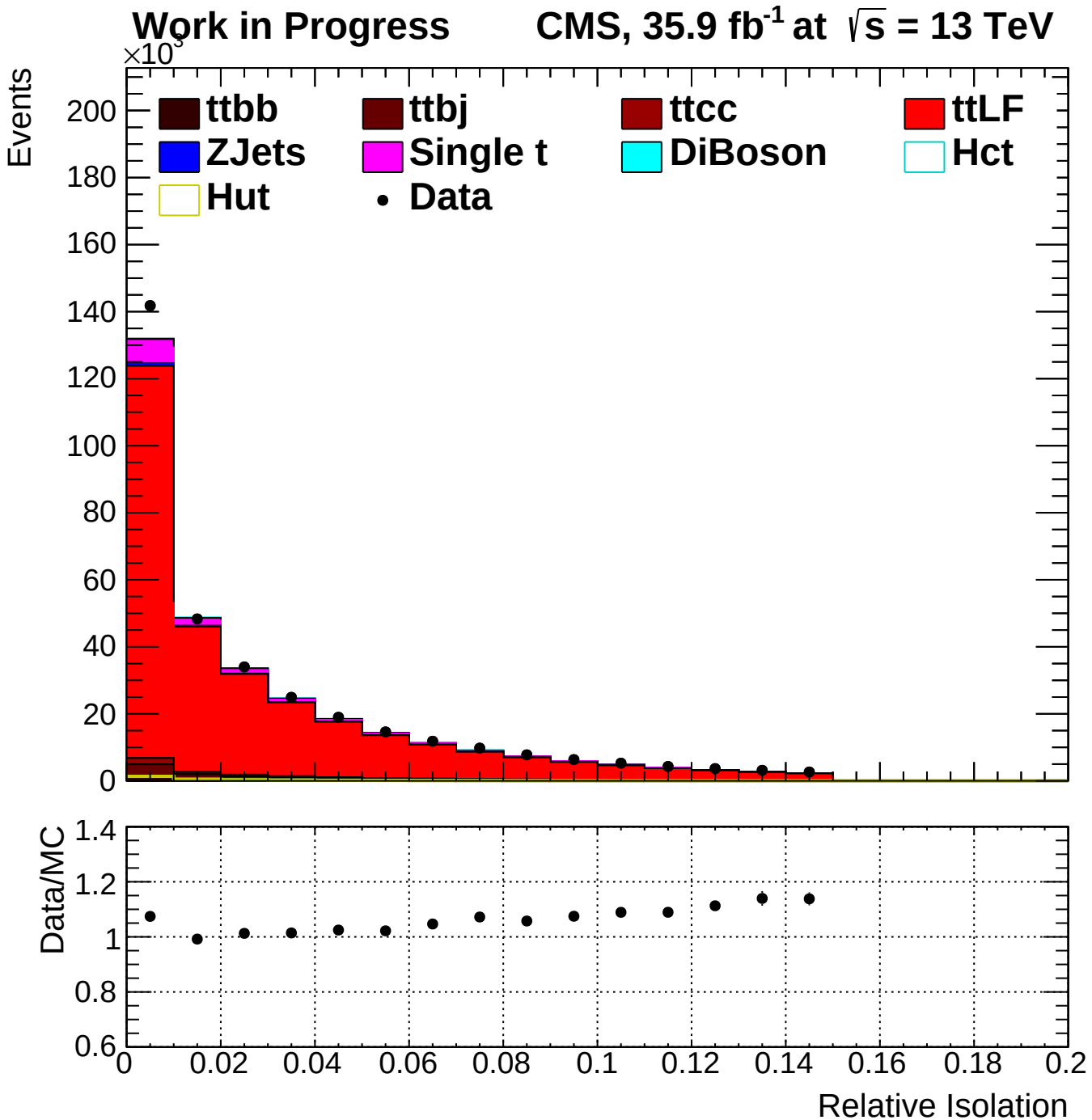

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

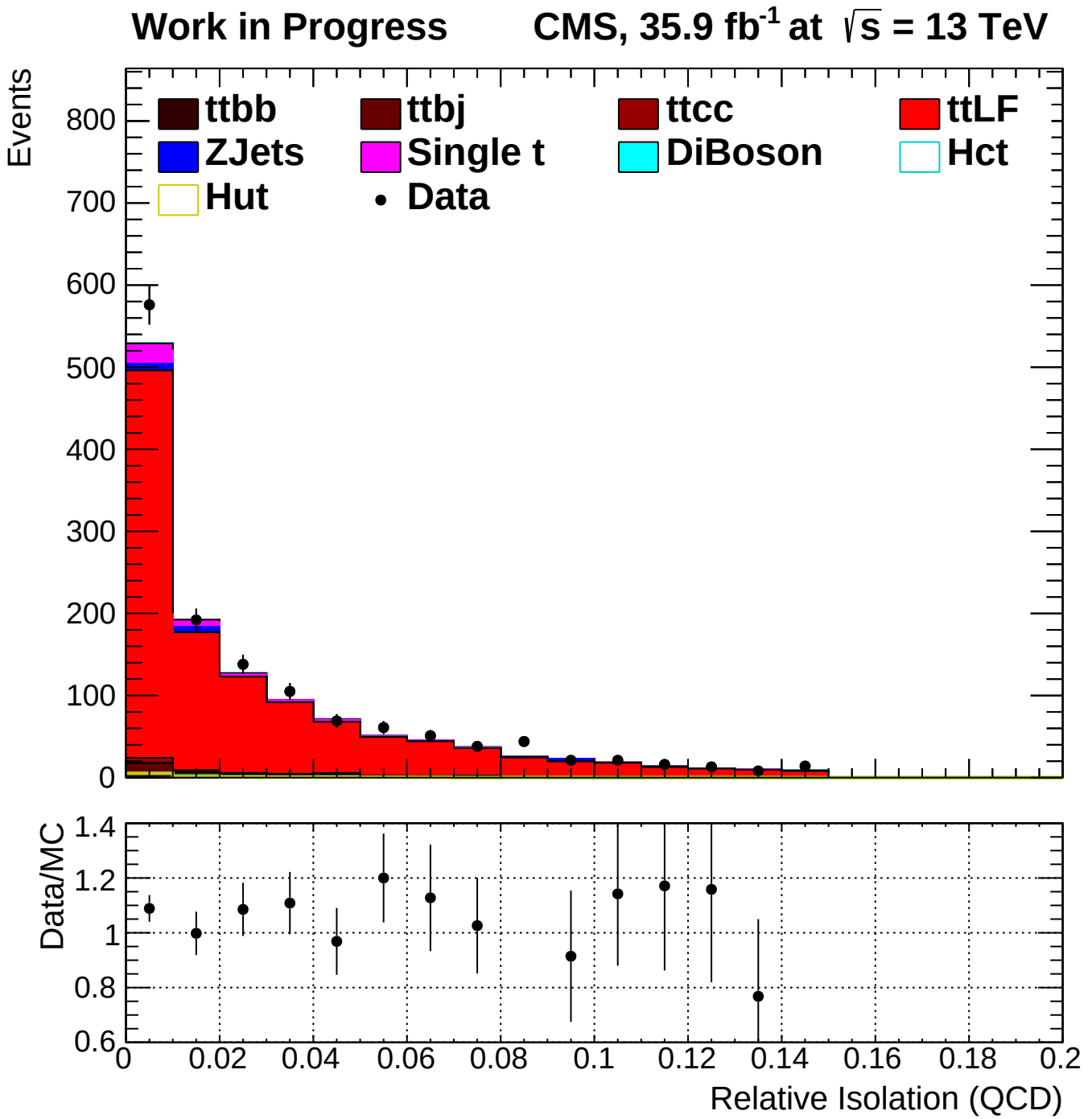

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
10000
9000
8000
7000
6000
5000
4000
3000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

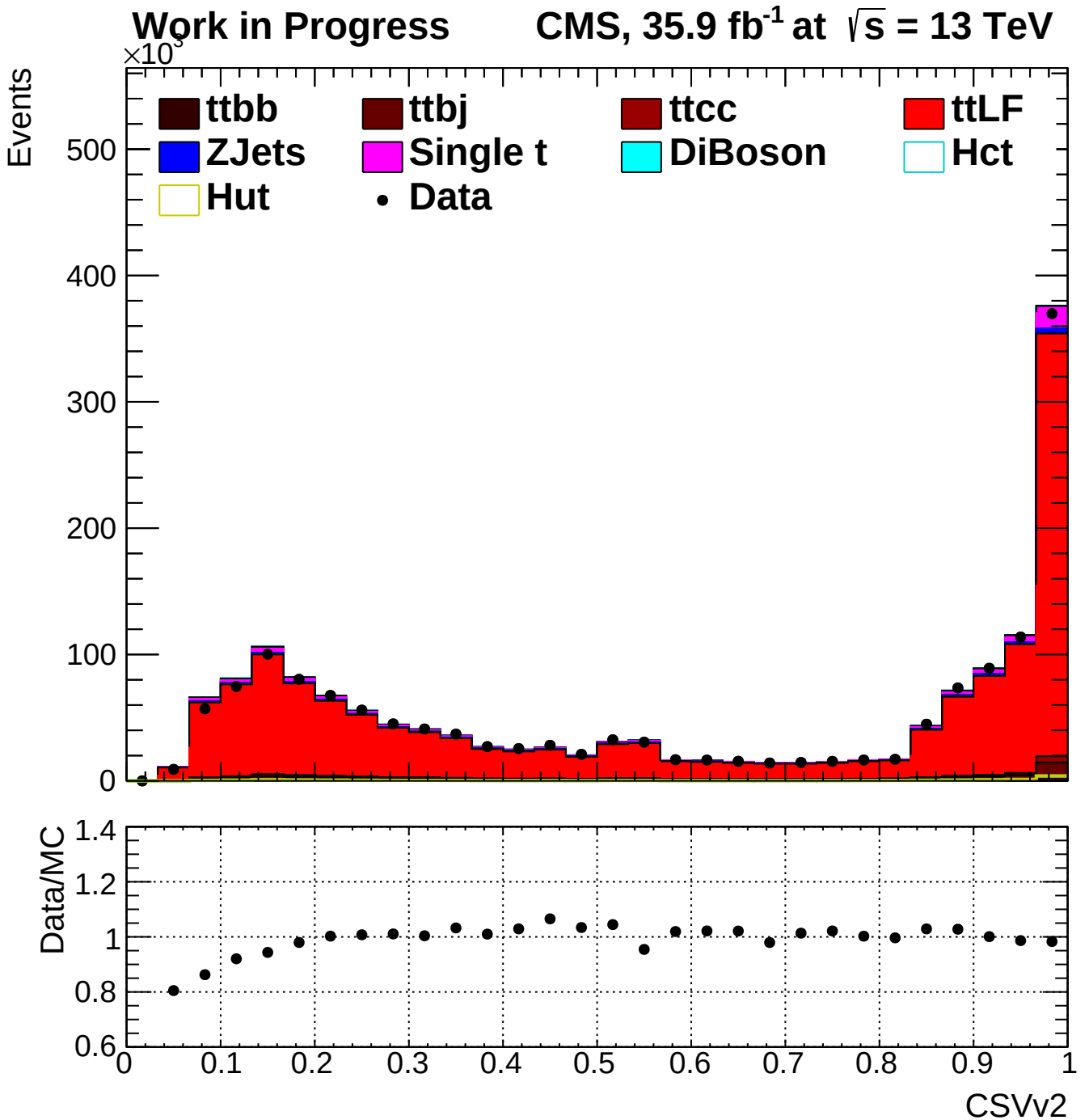

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
12000
10000
8000
6000
4000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
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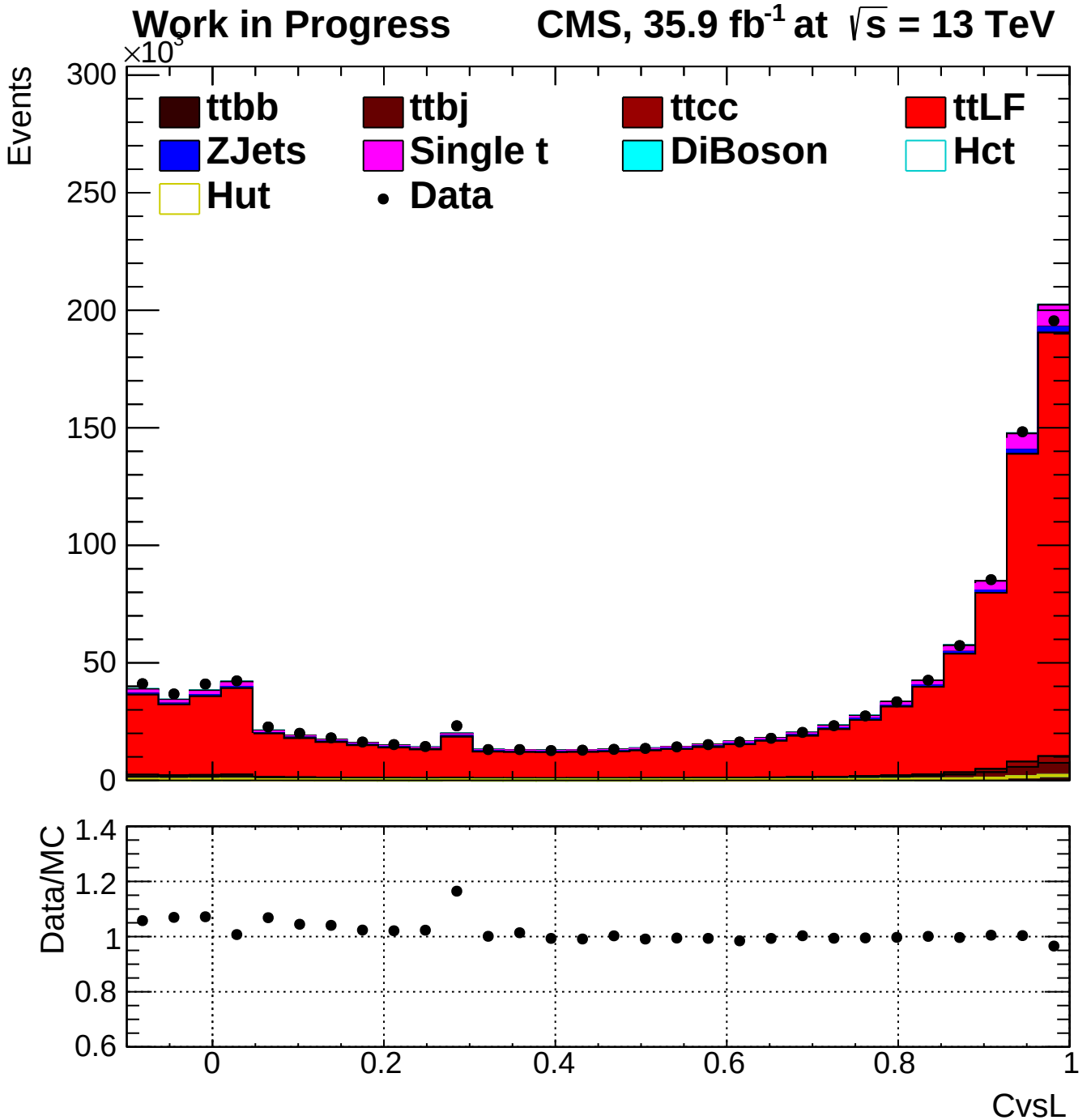
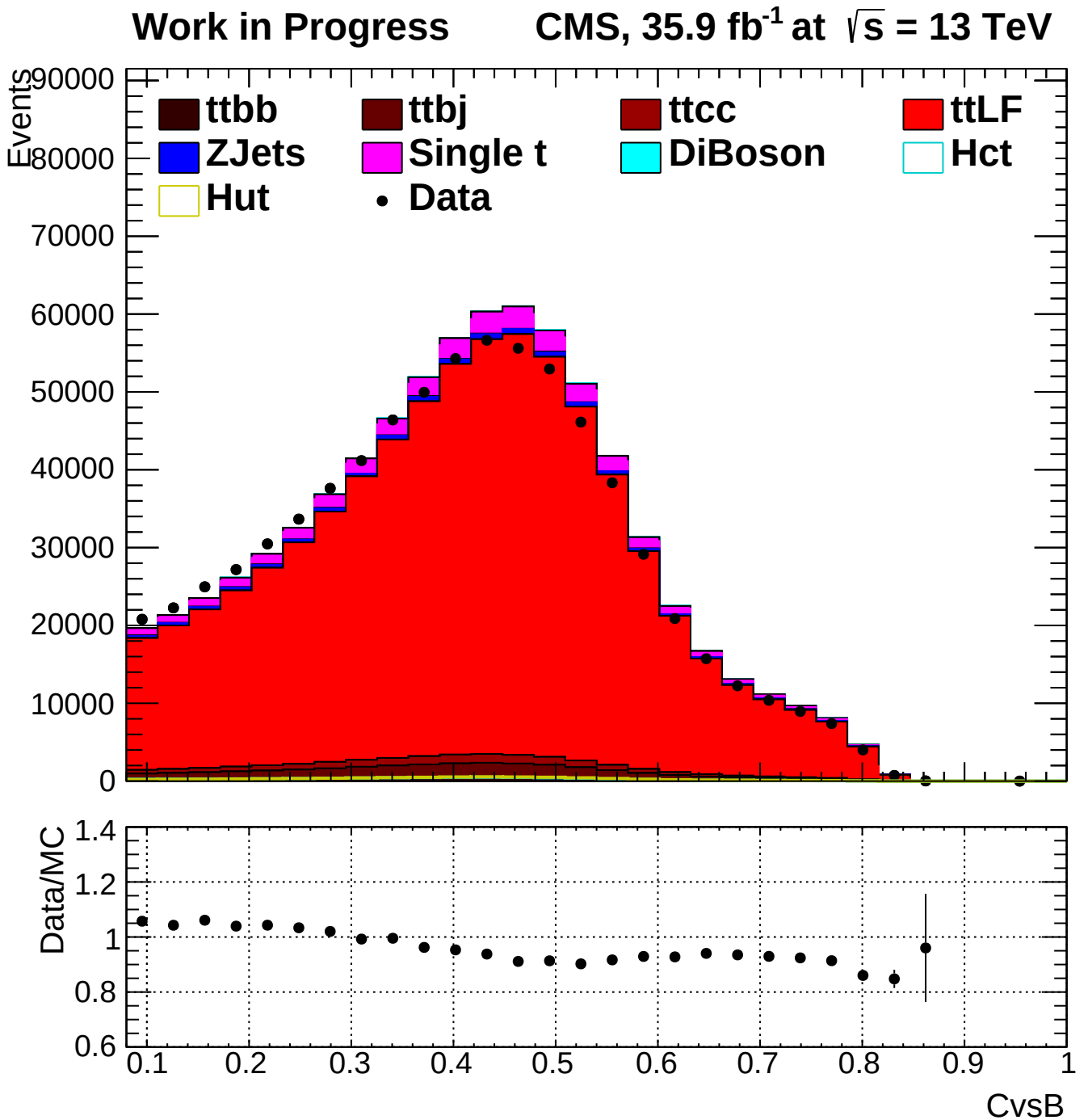
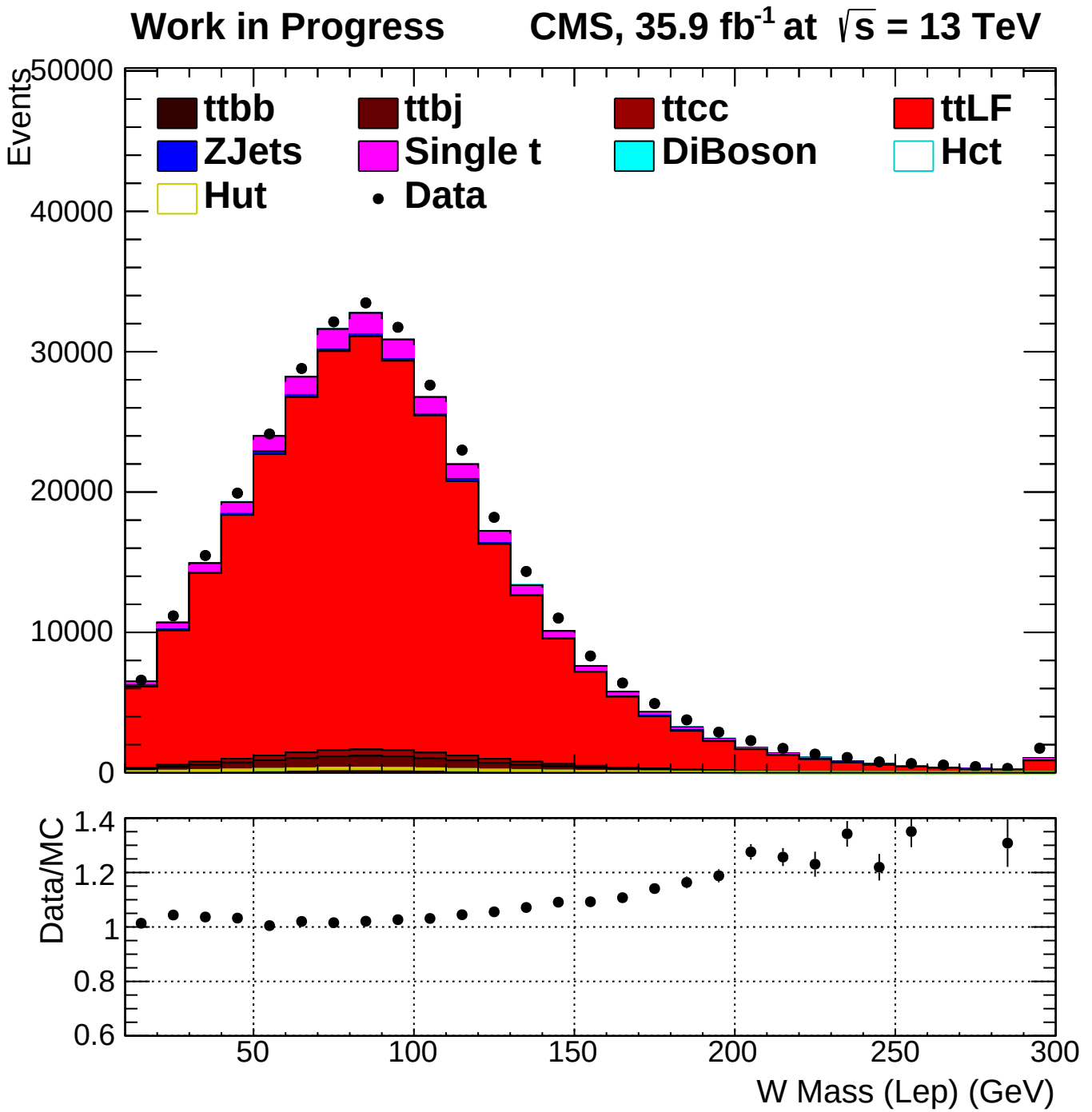
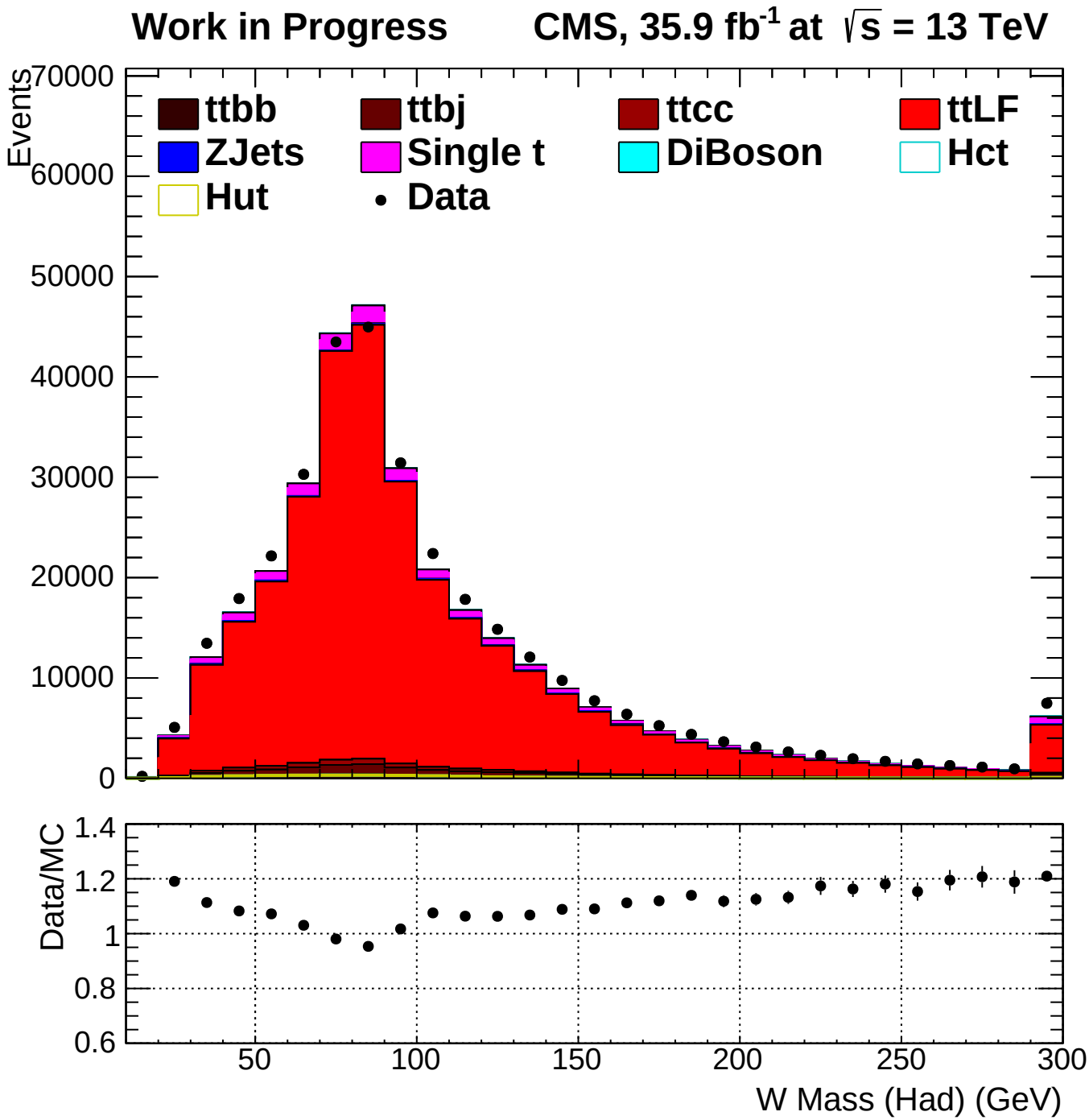
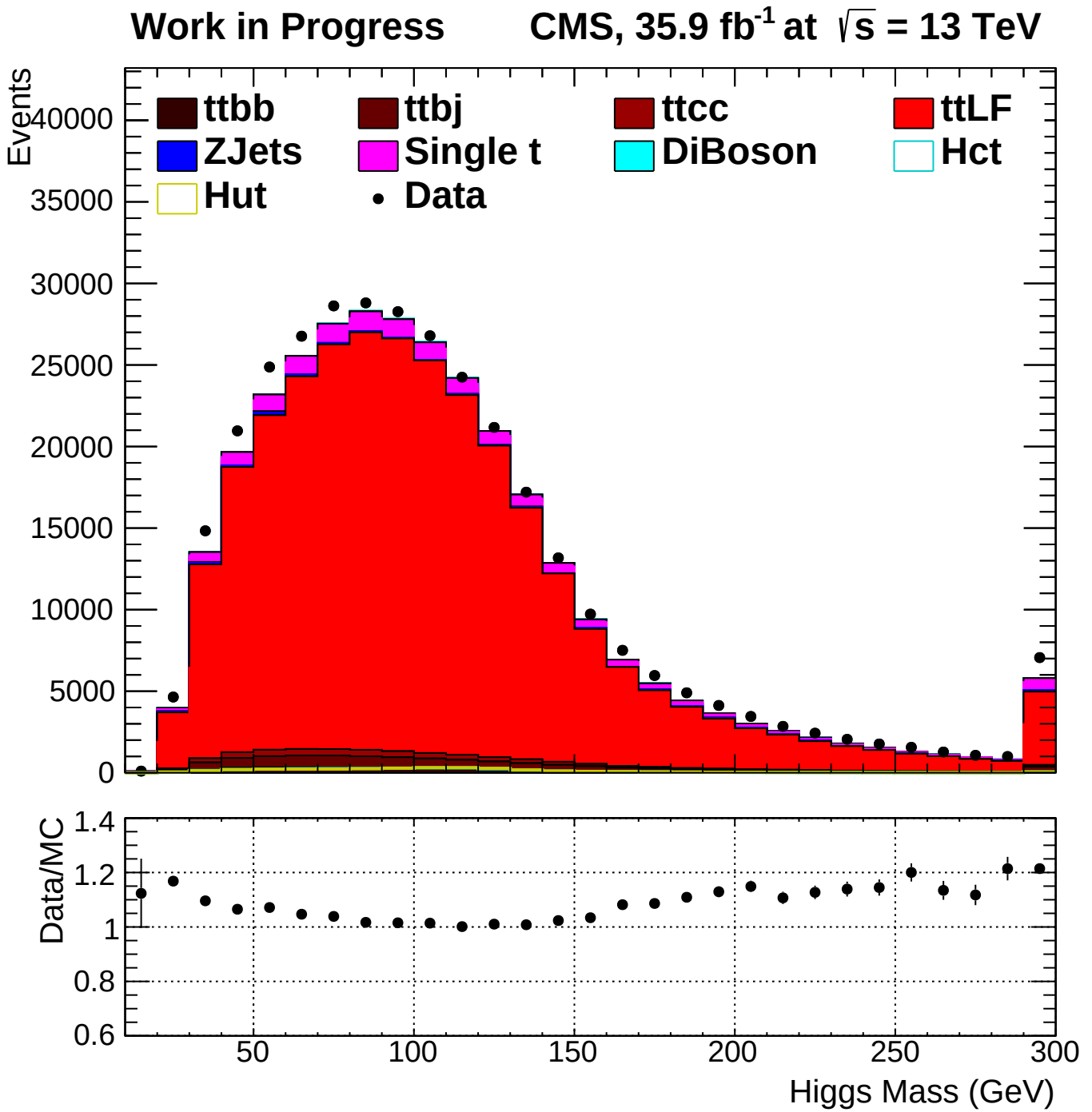
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2

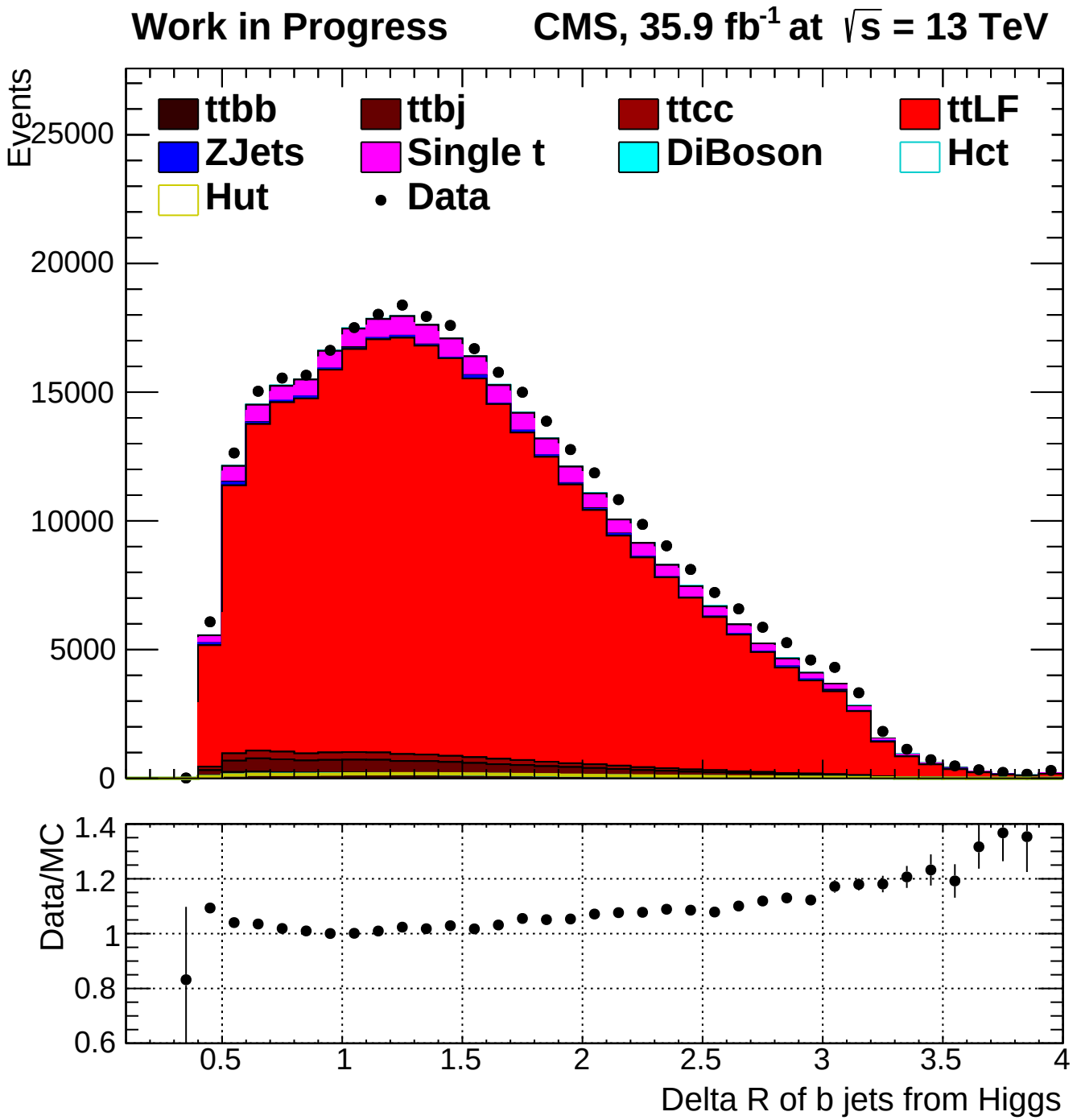

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsL

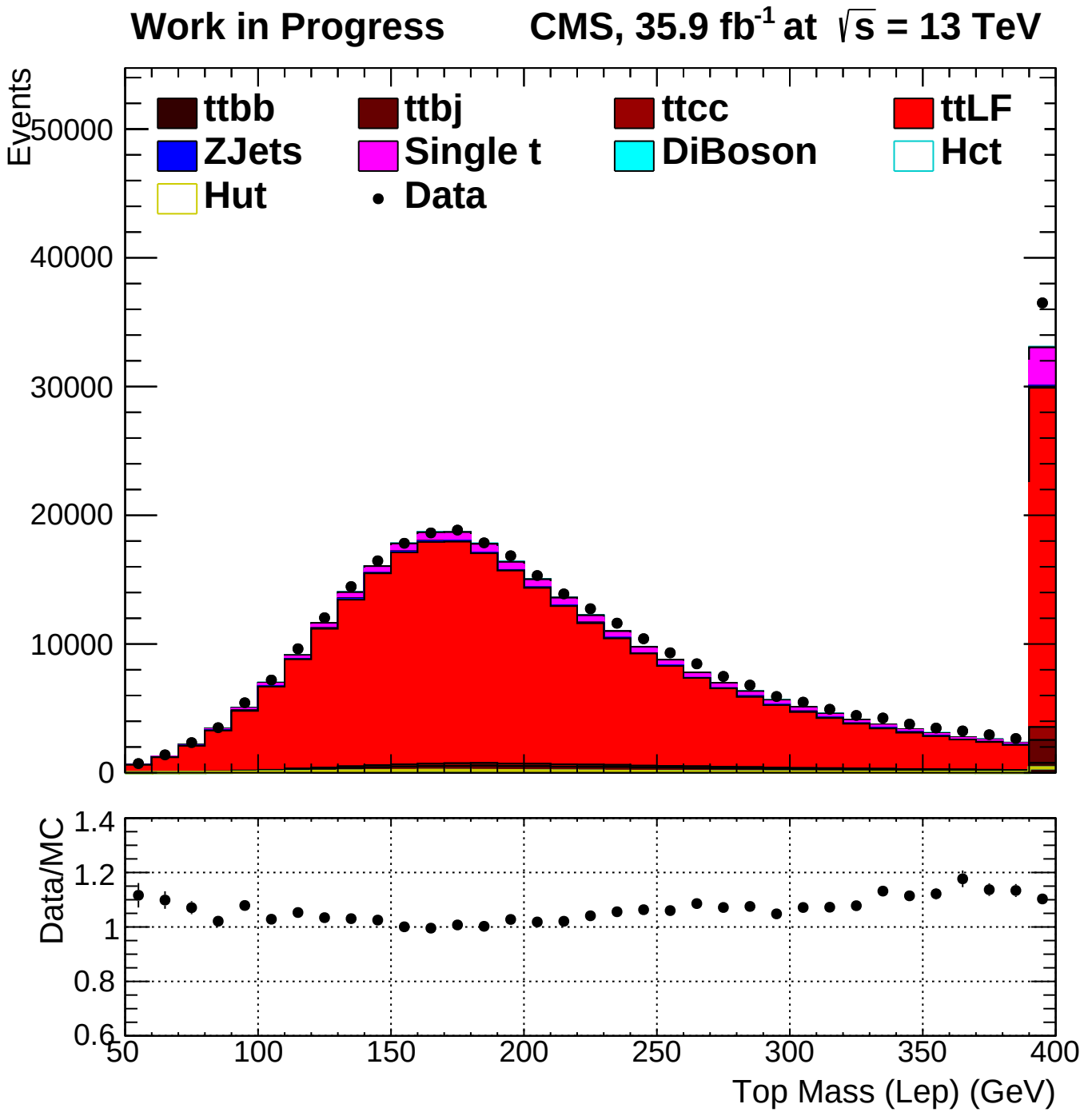

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

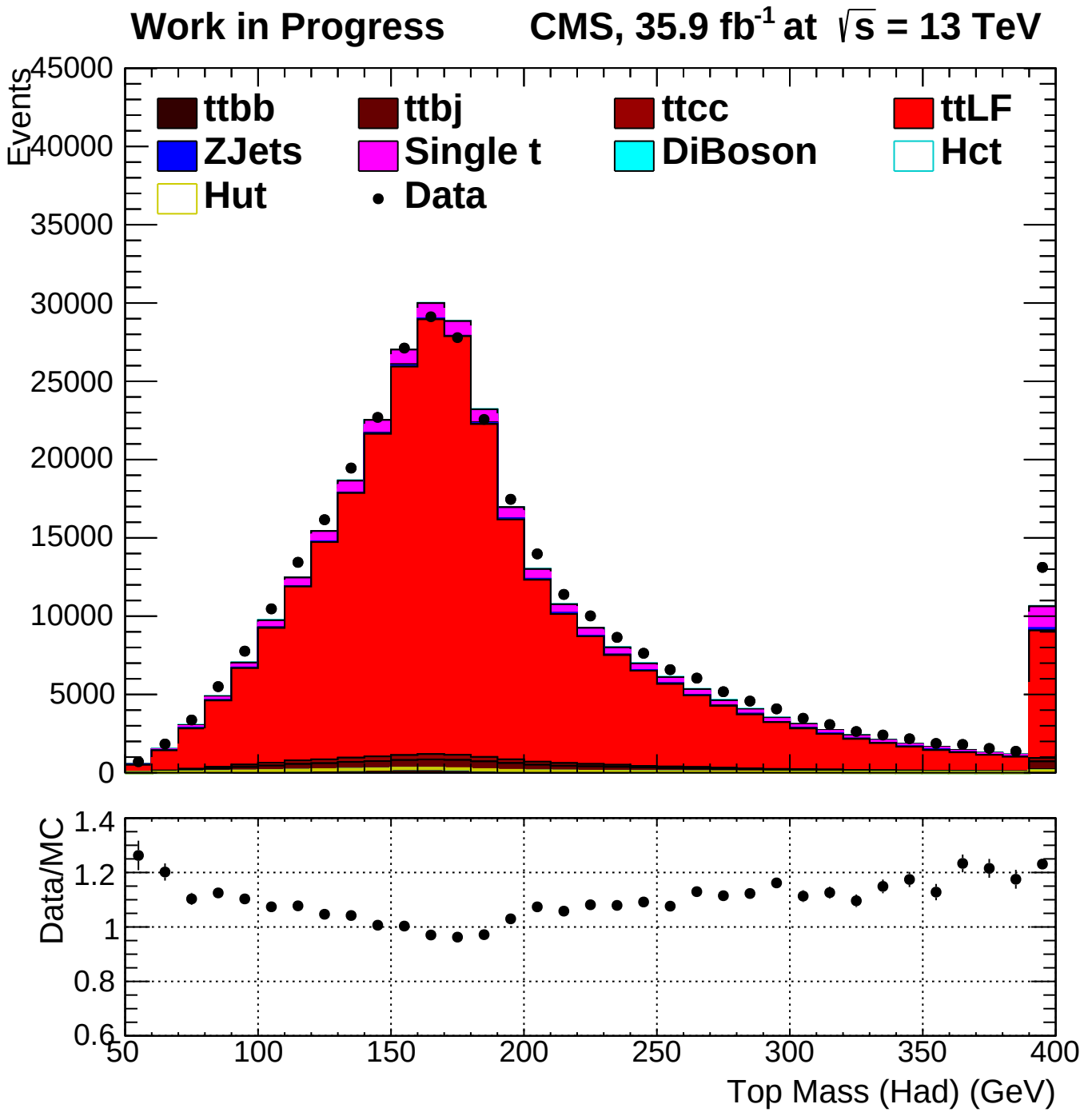

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)

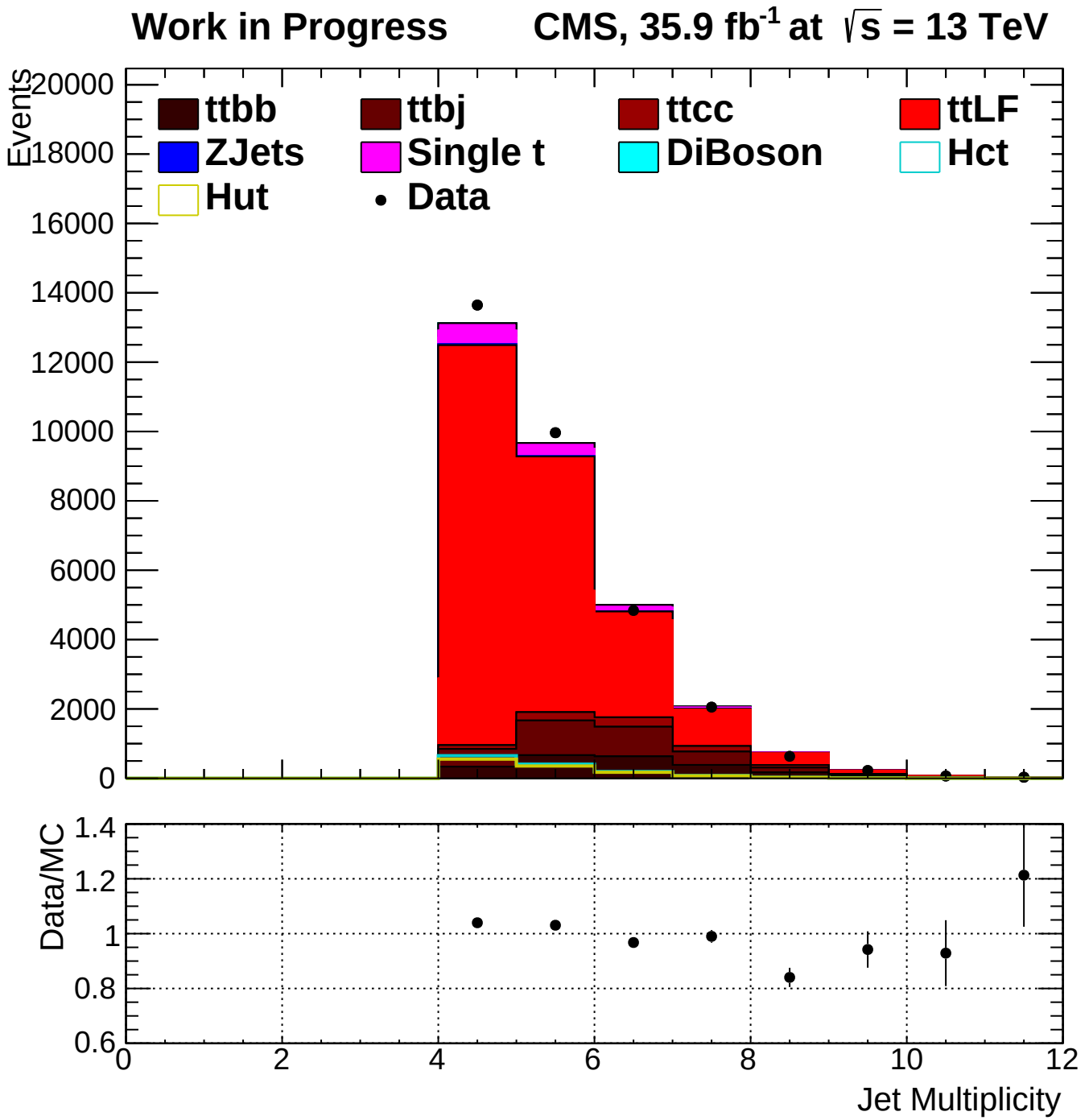

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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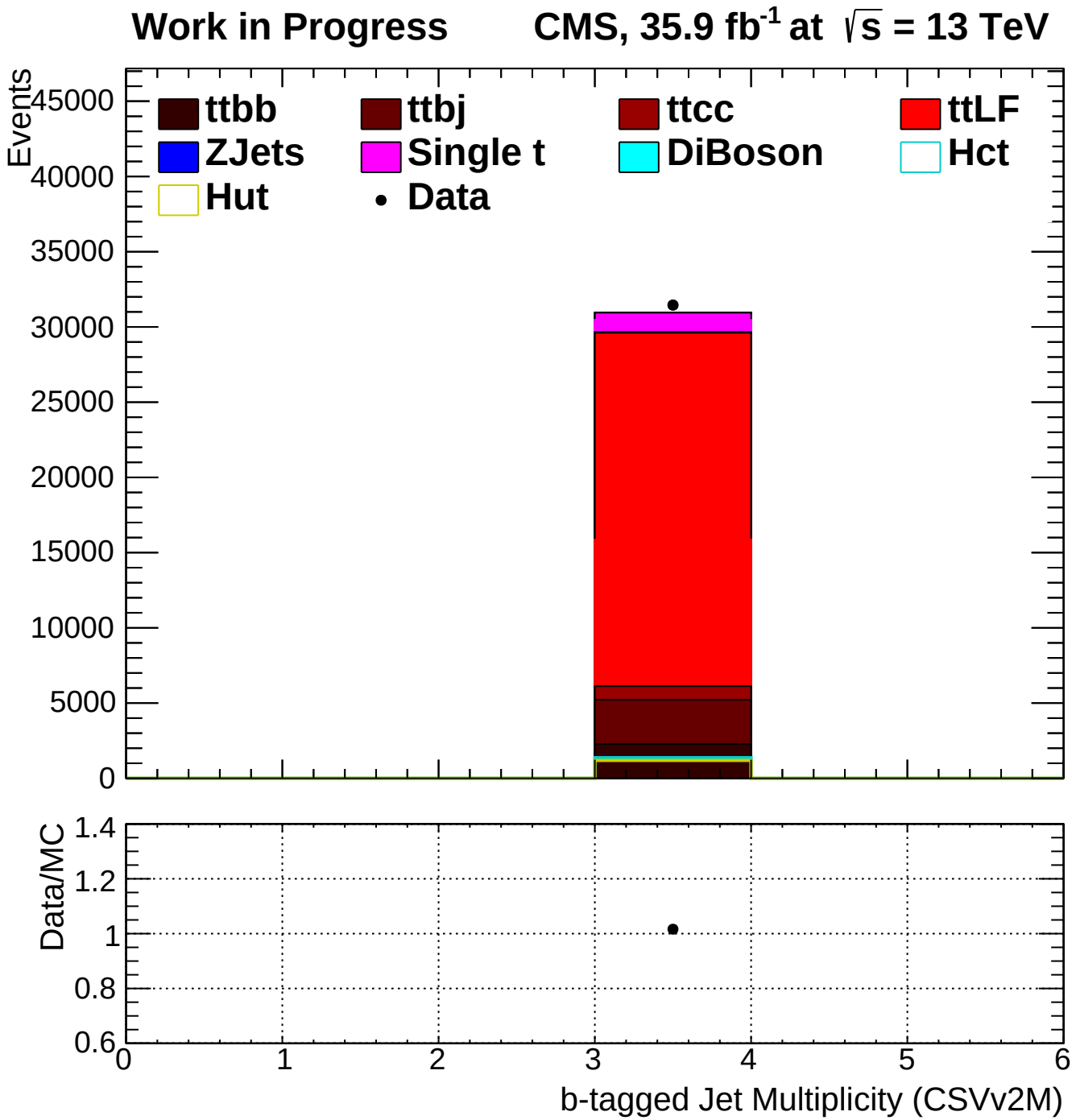
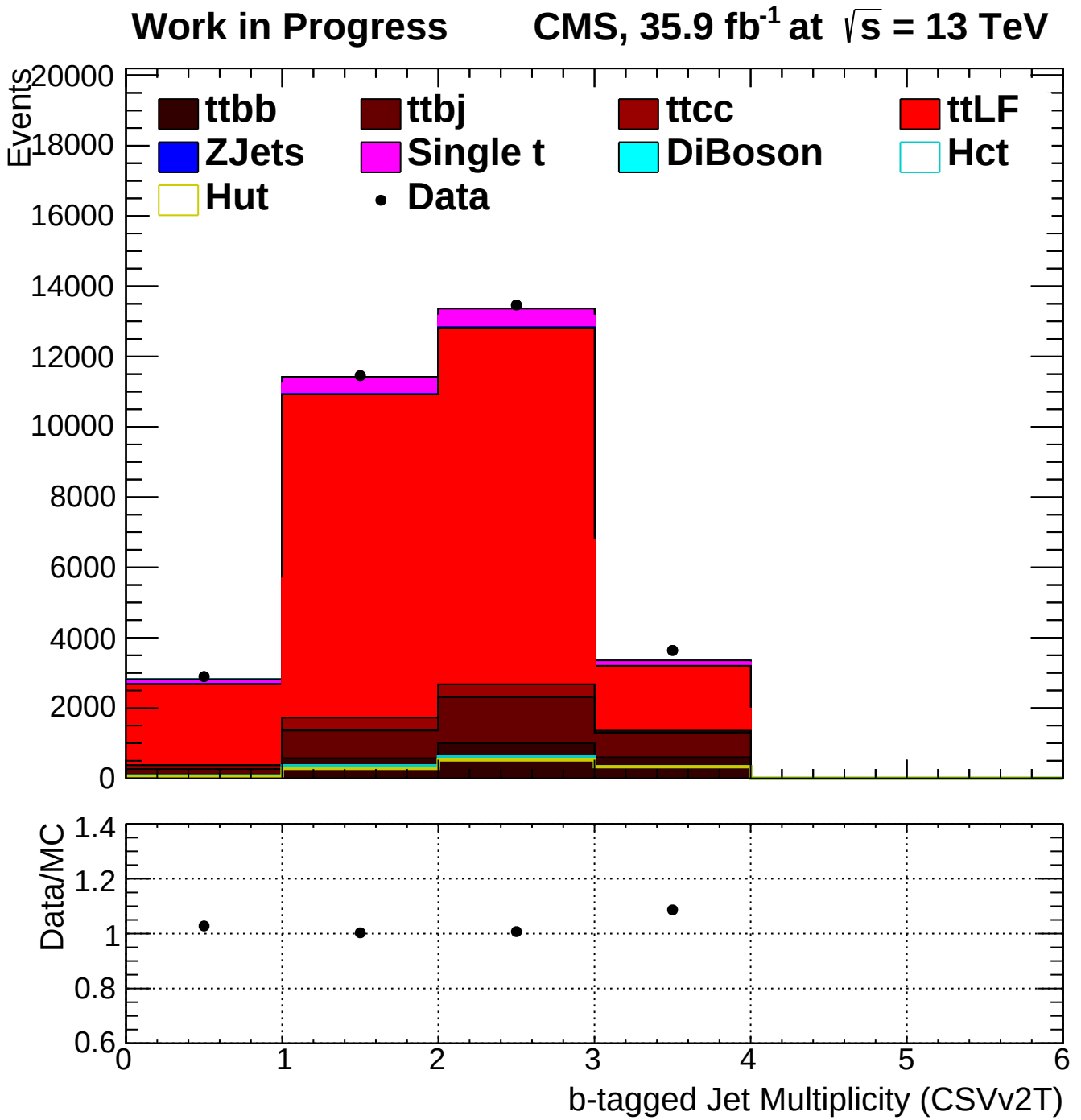
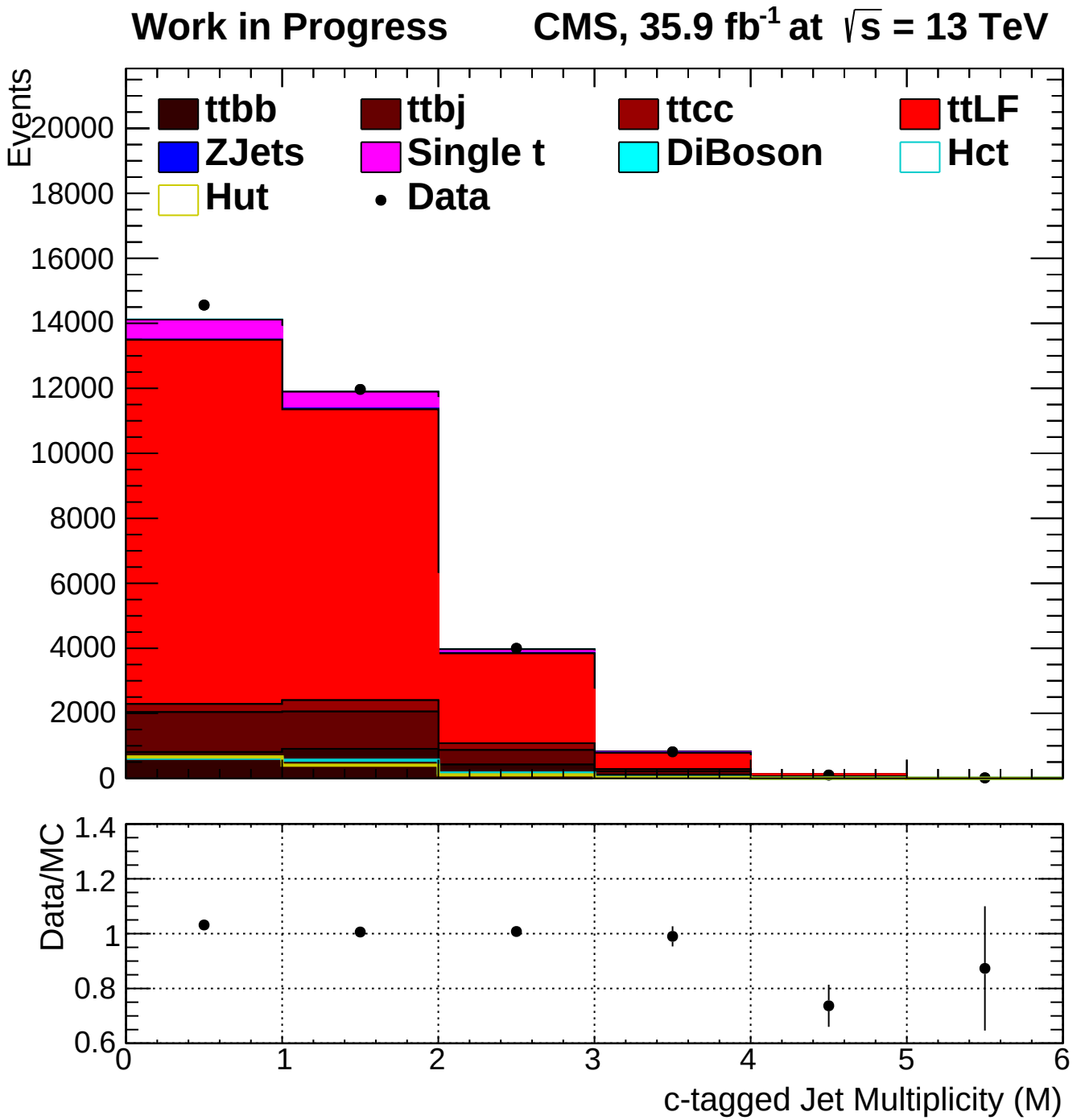
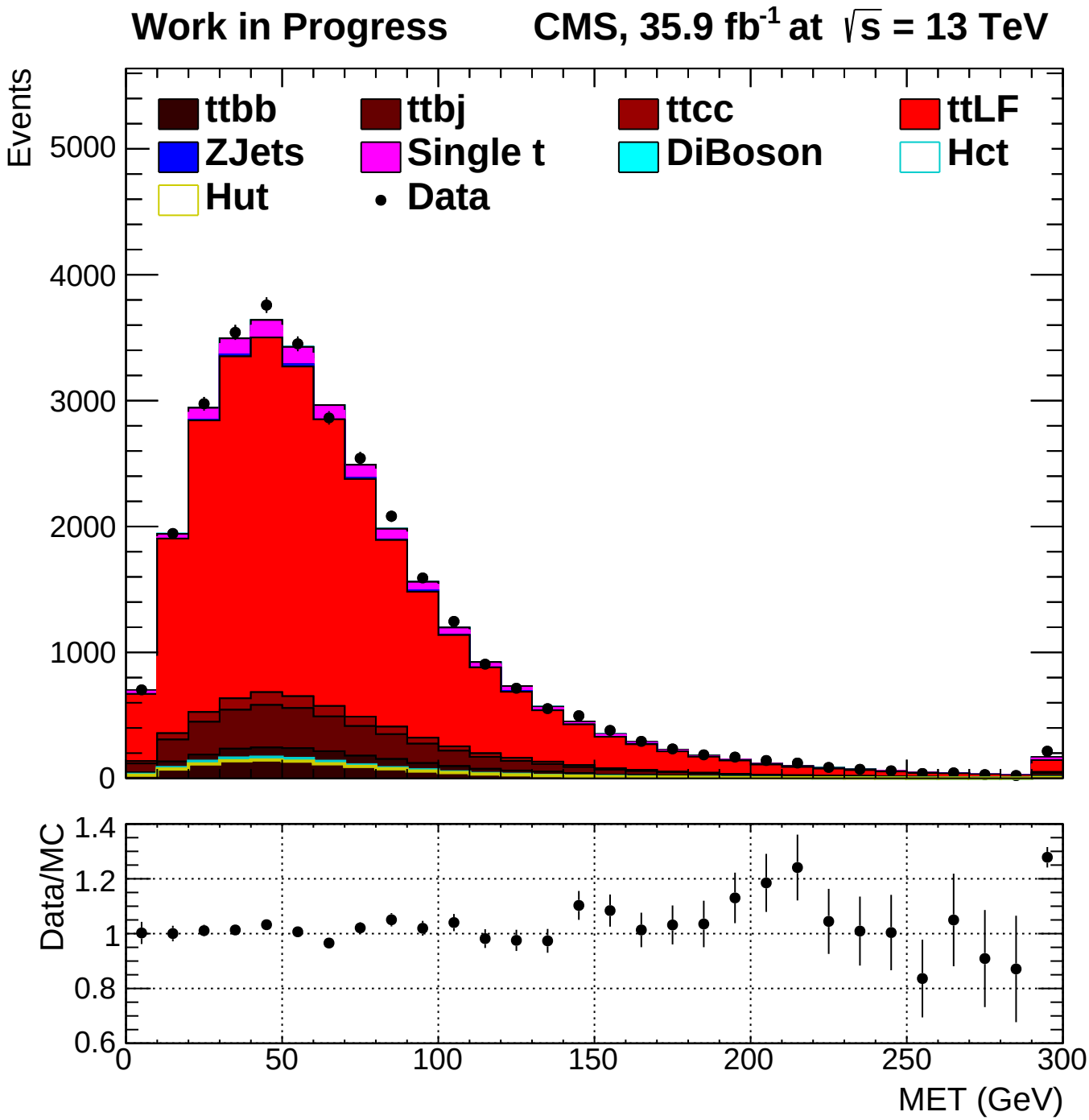
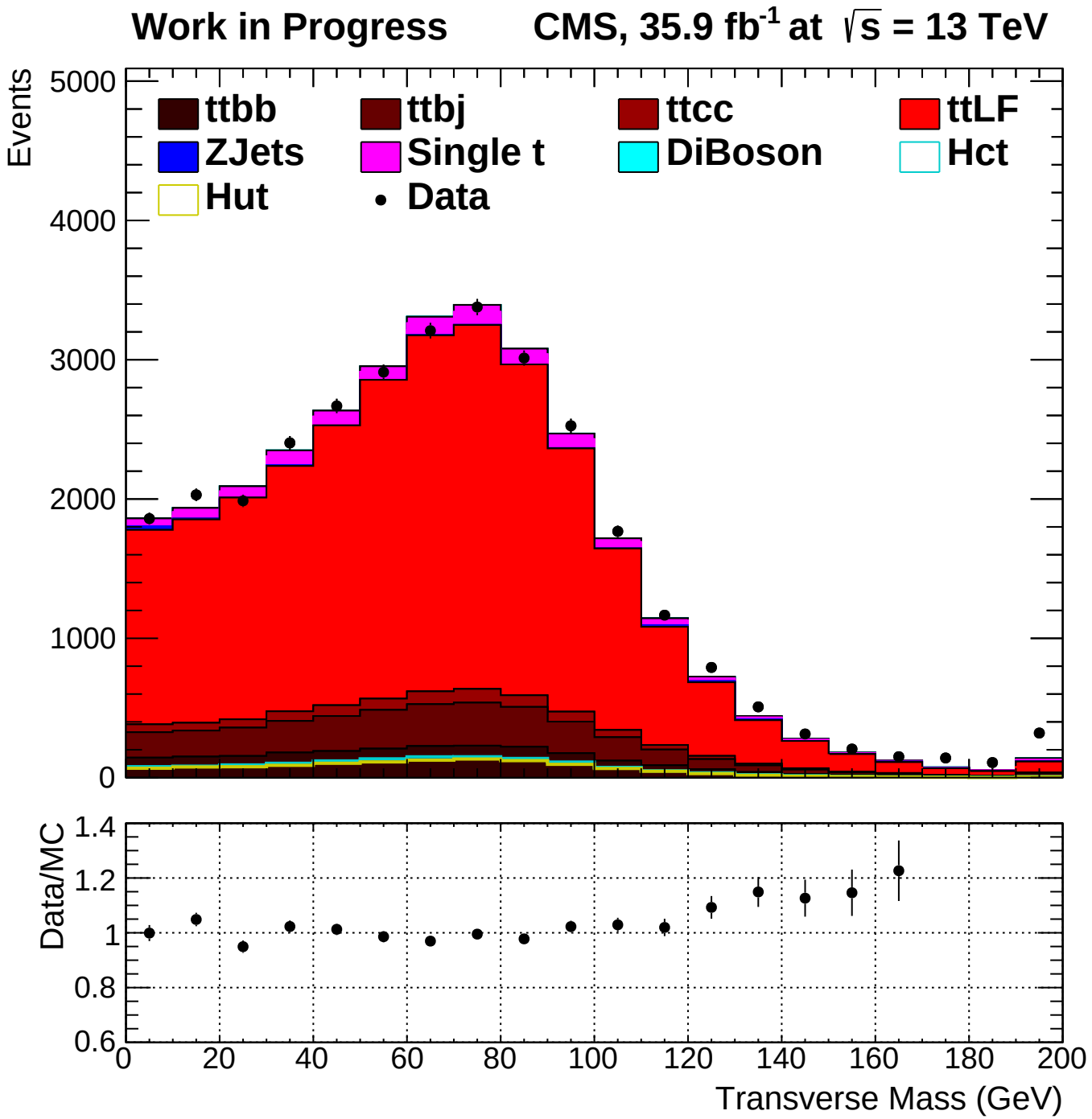
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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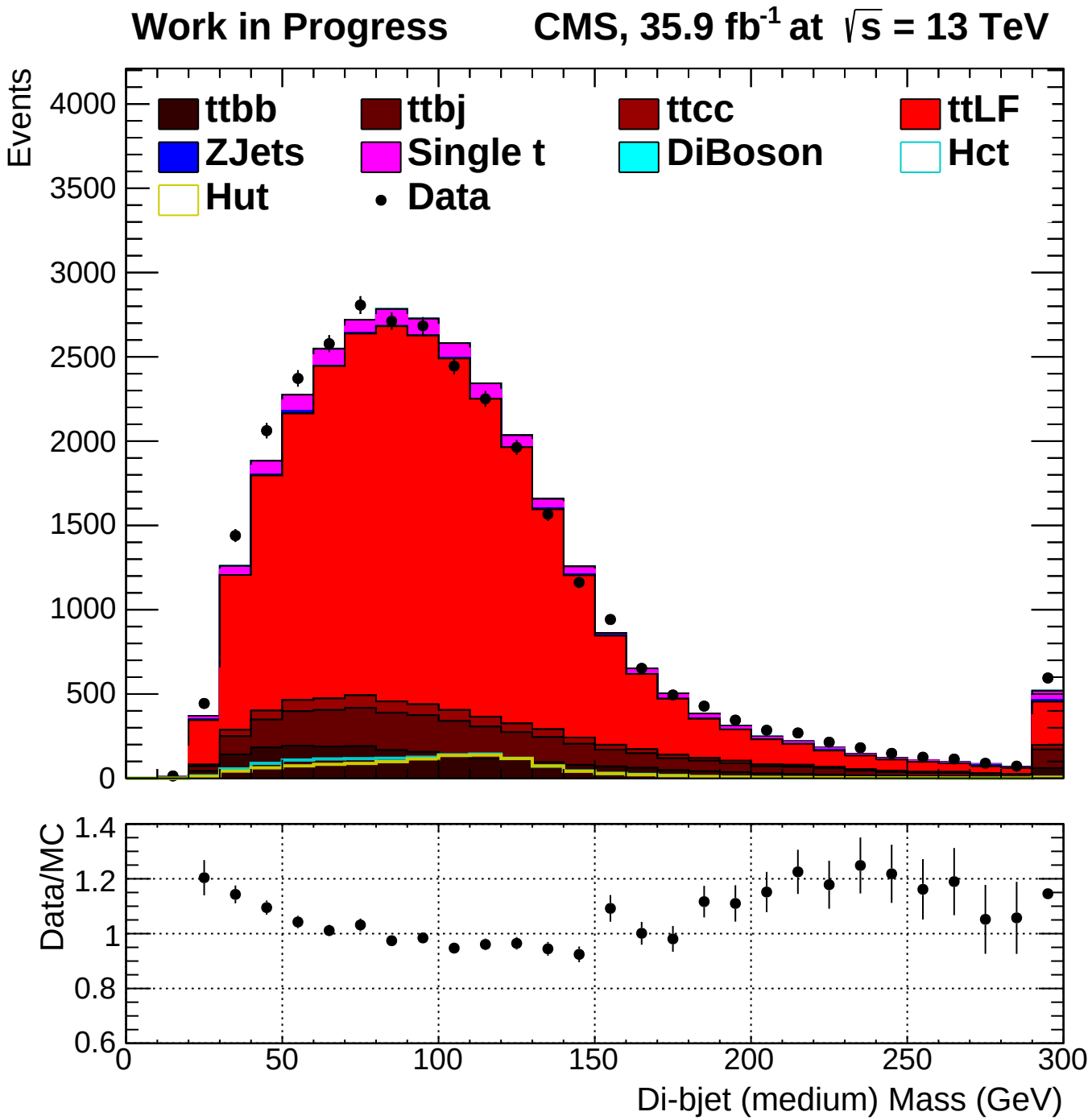
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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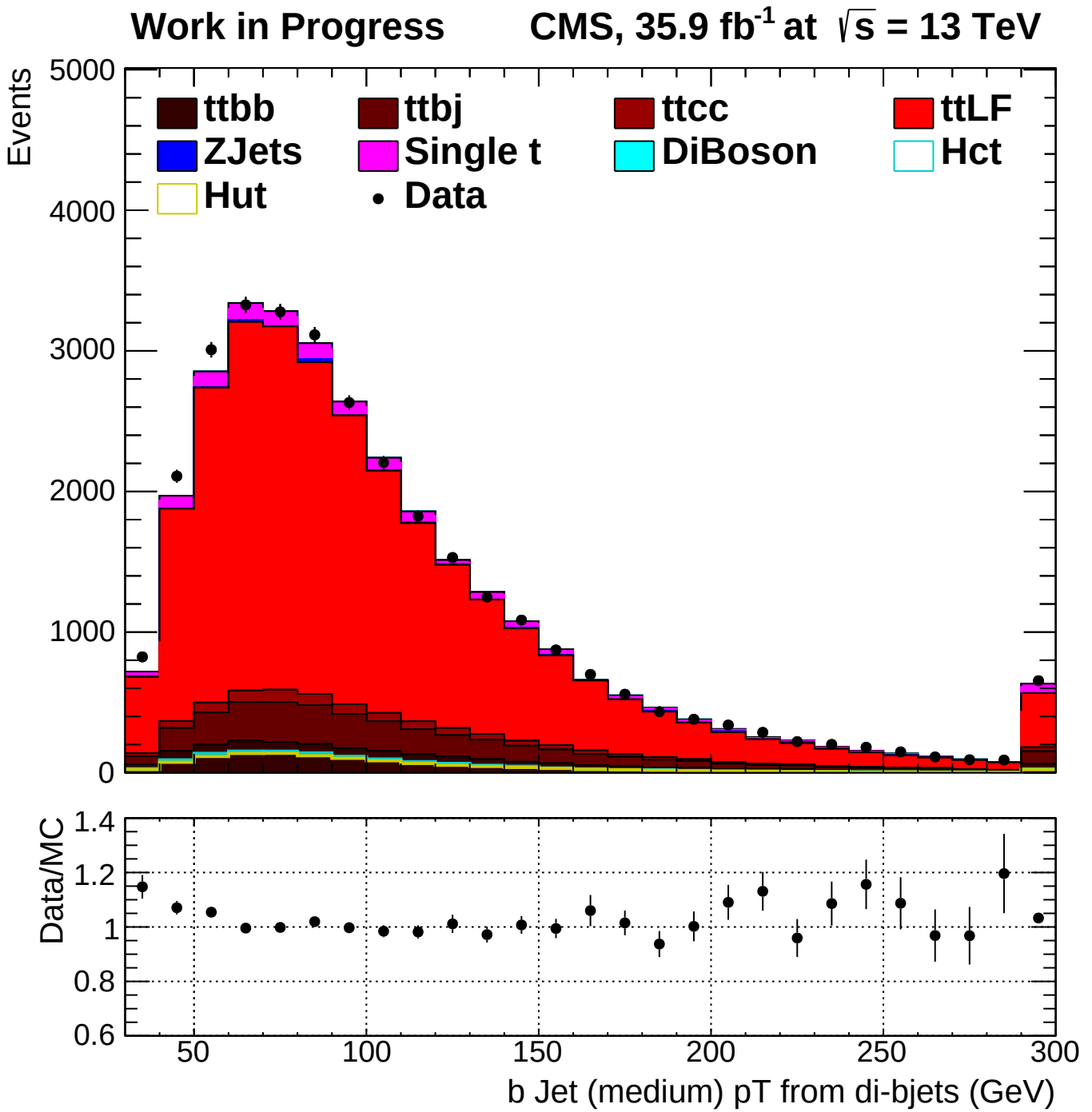
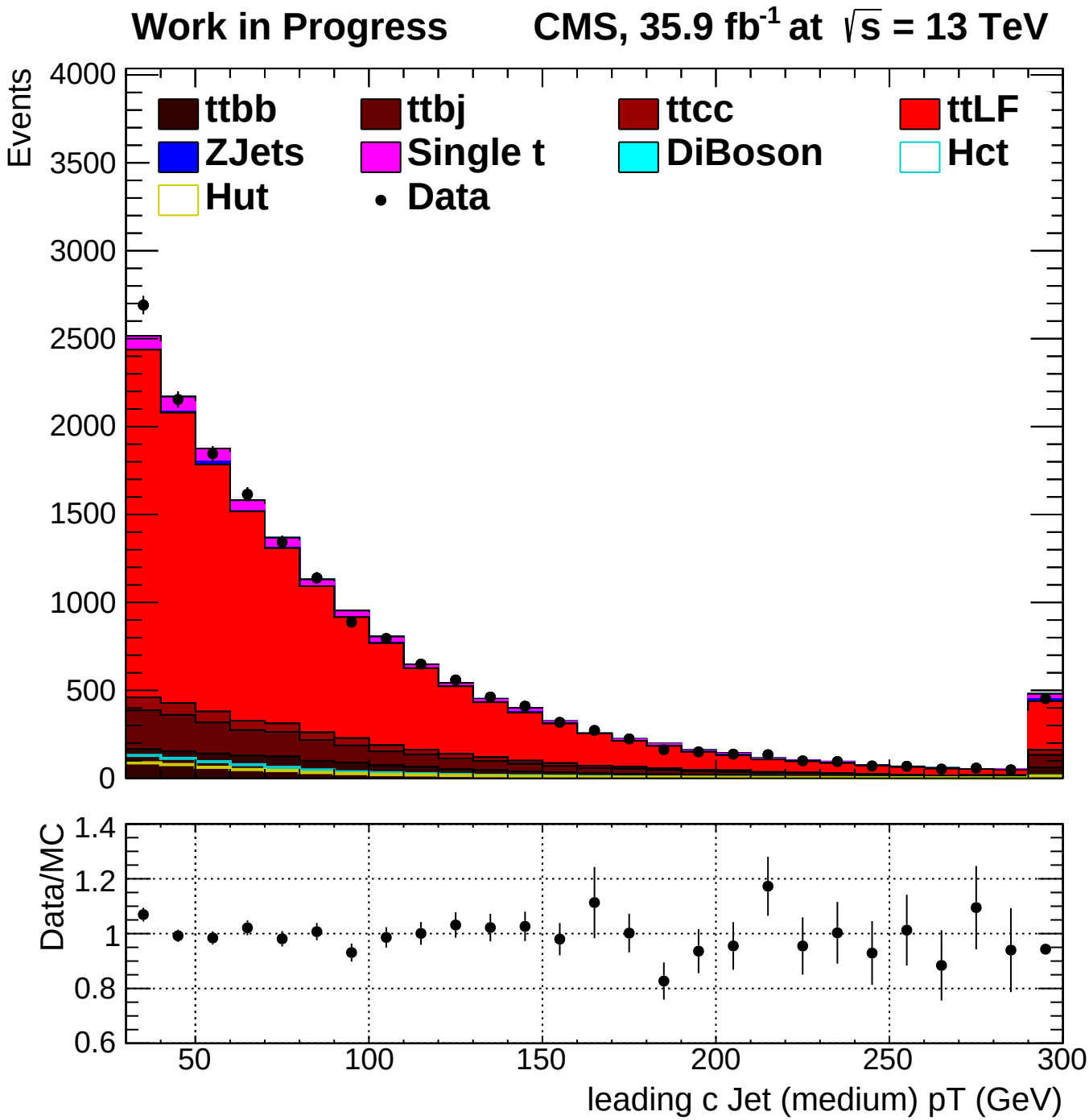
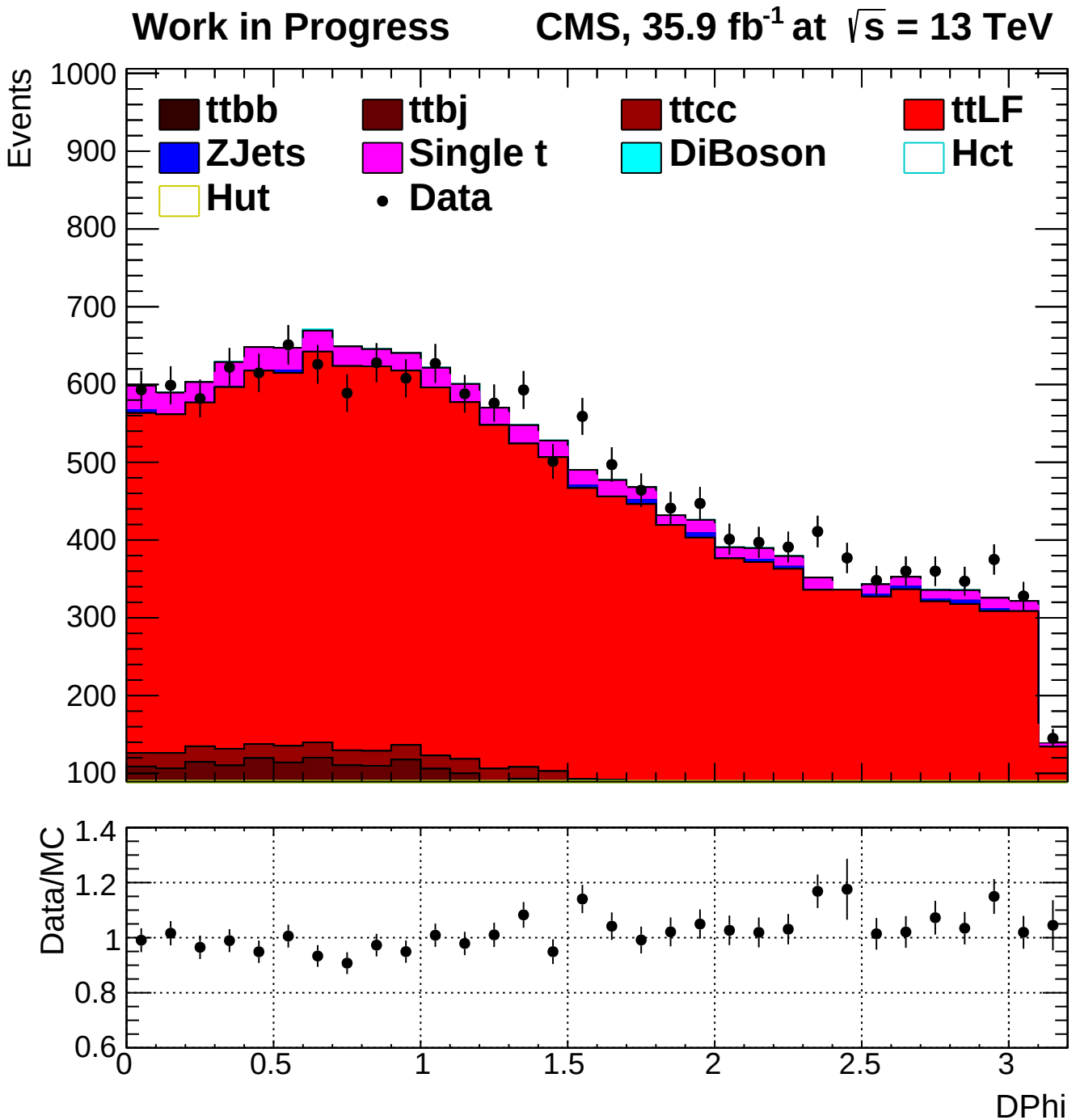
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
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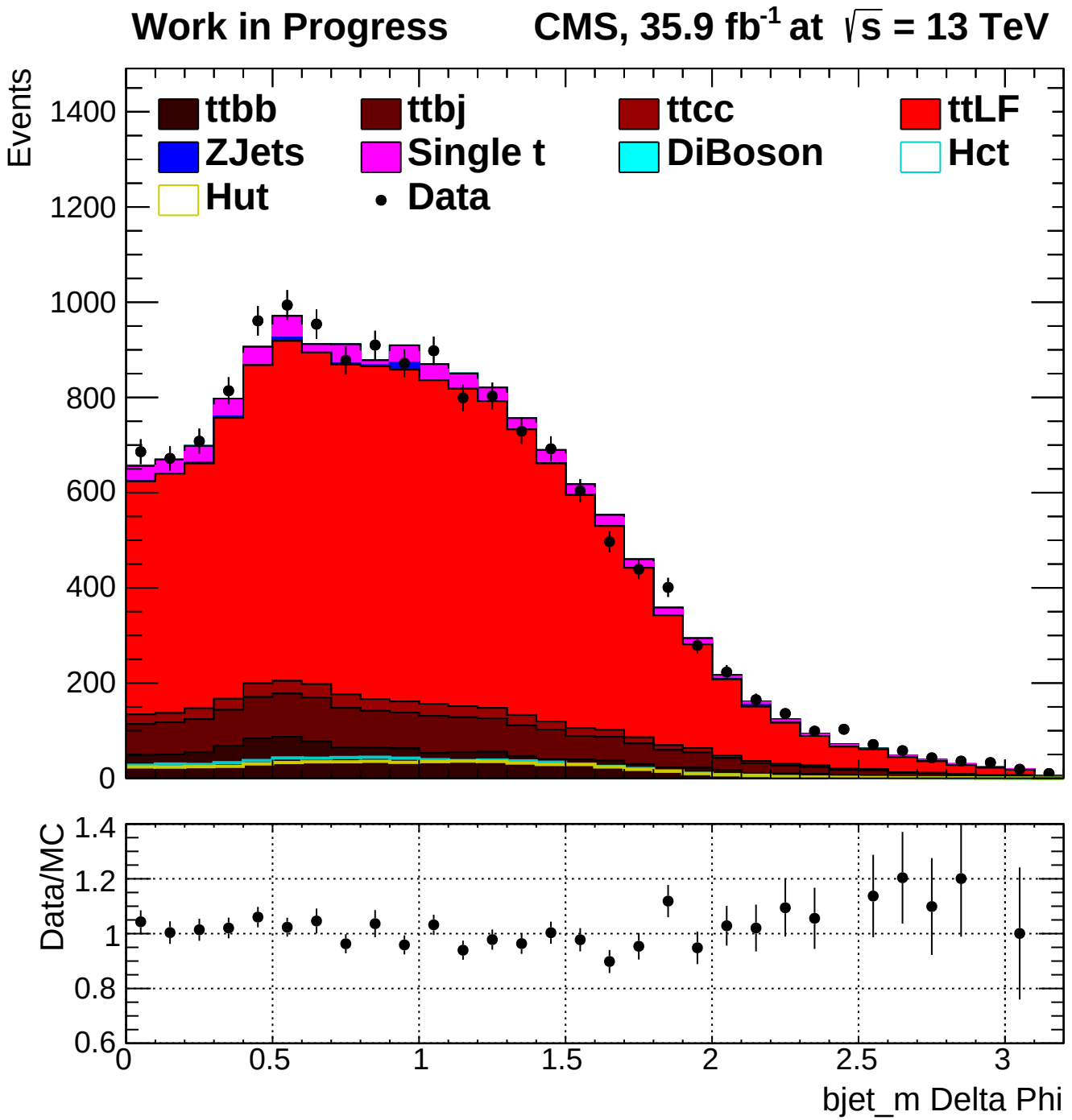
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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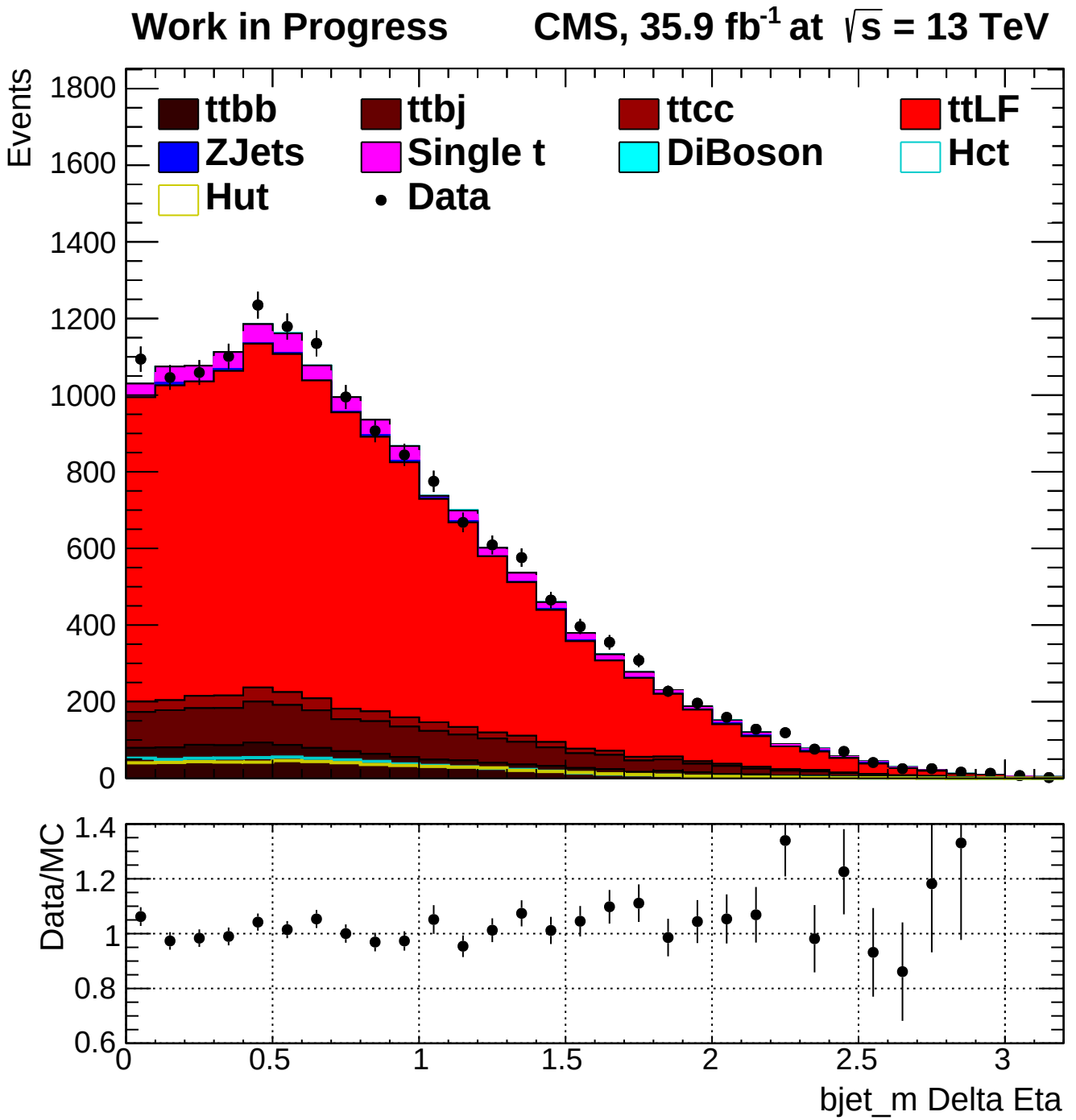
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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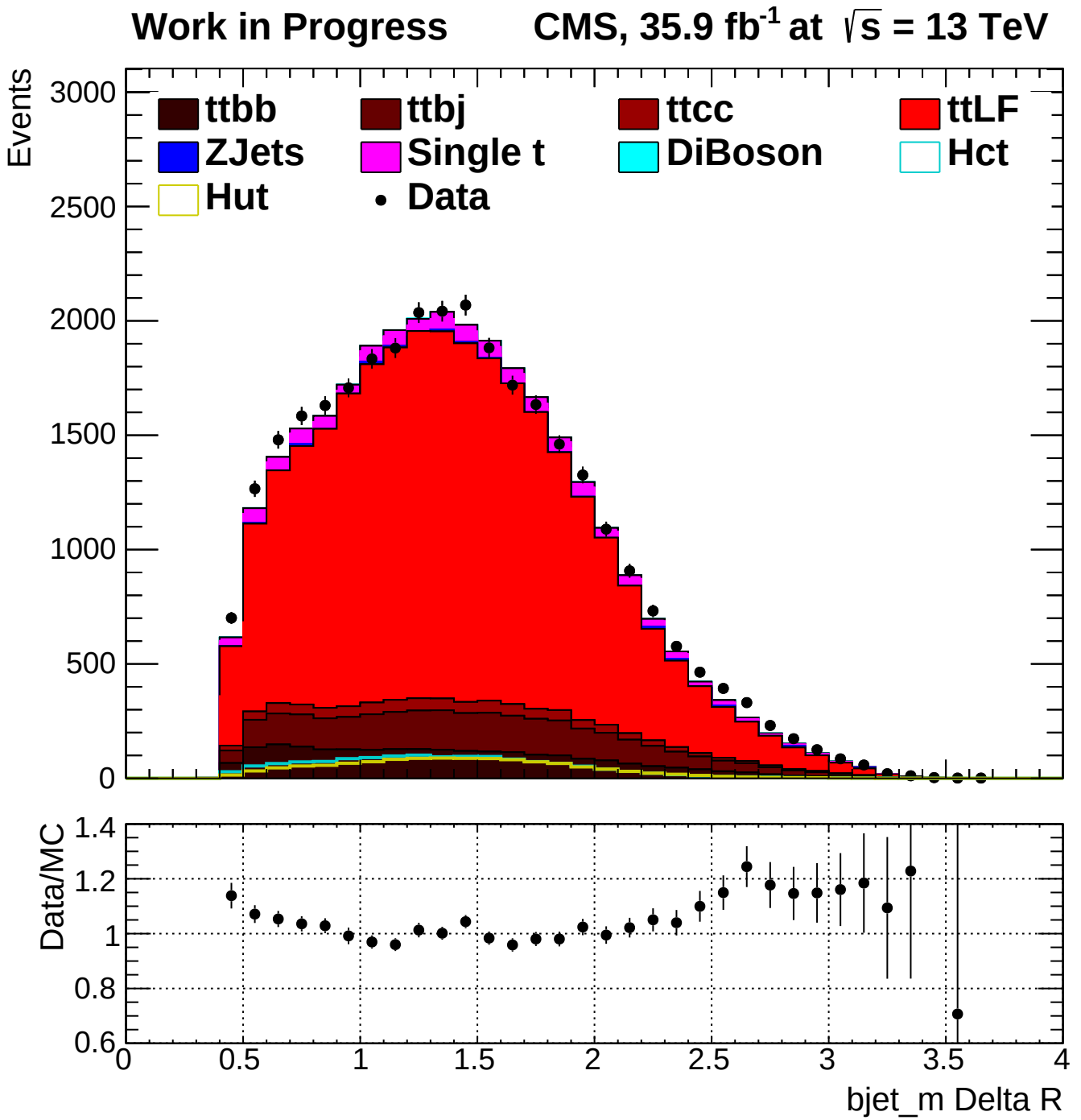
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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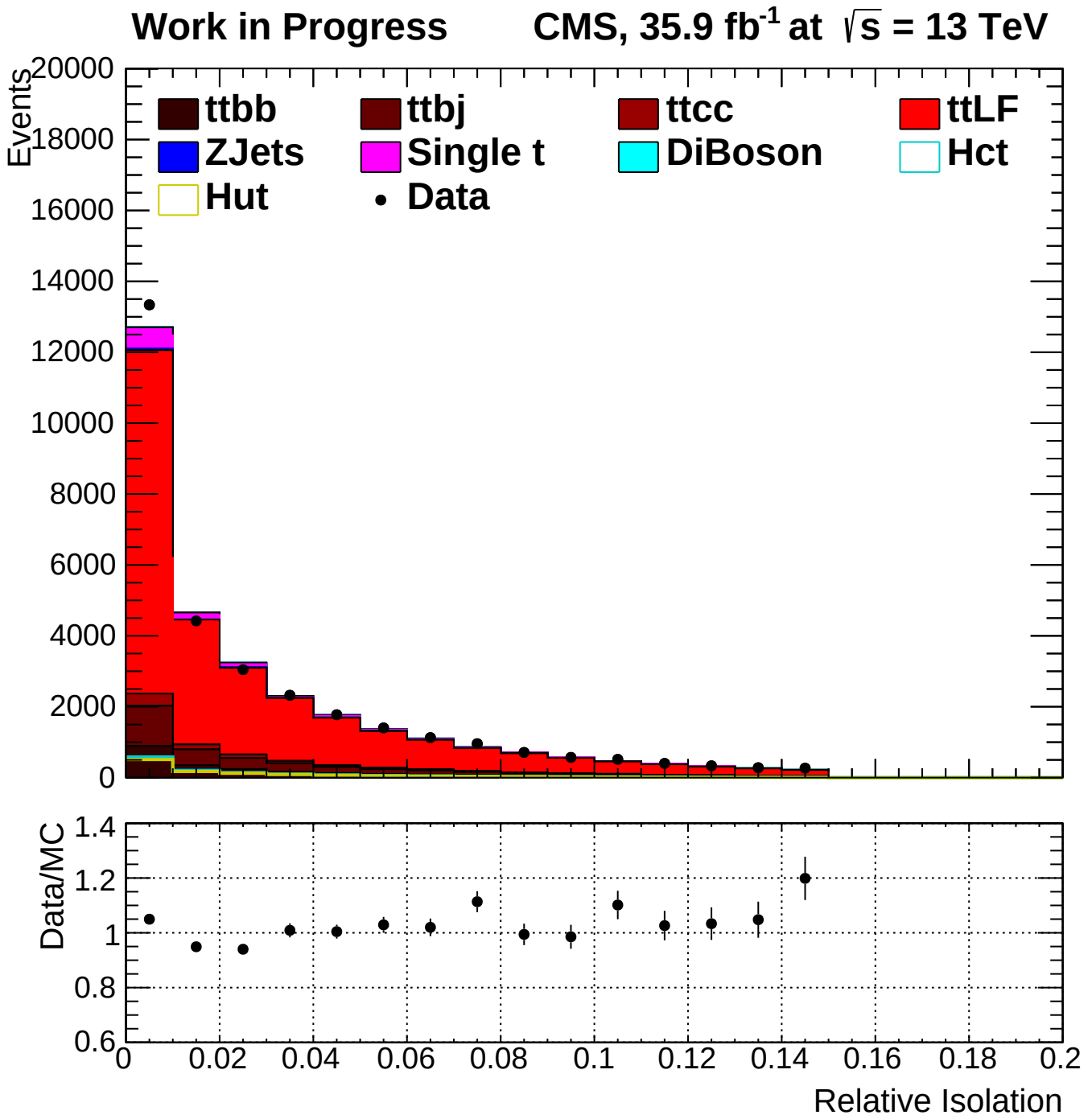
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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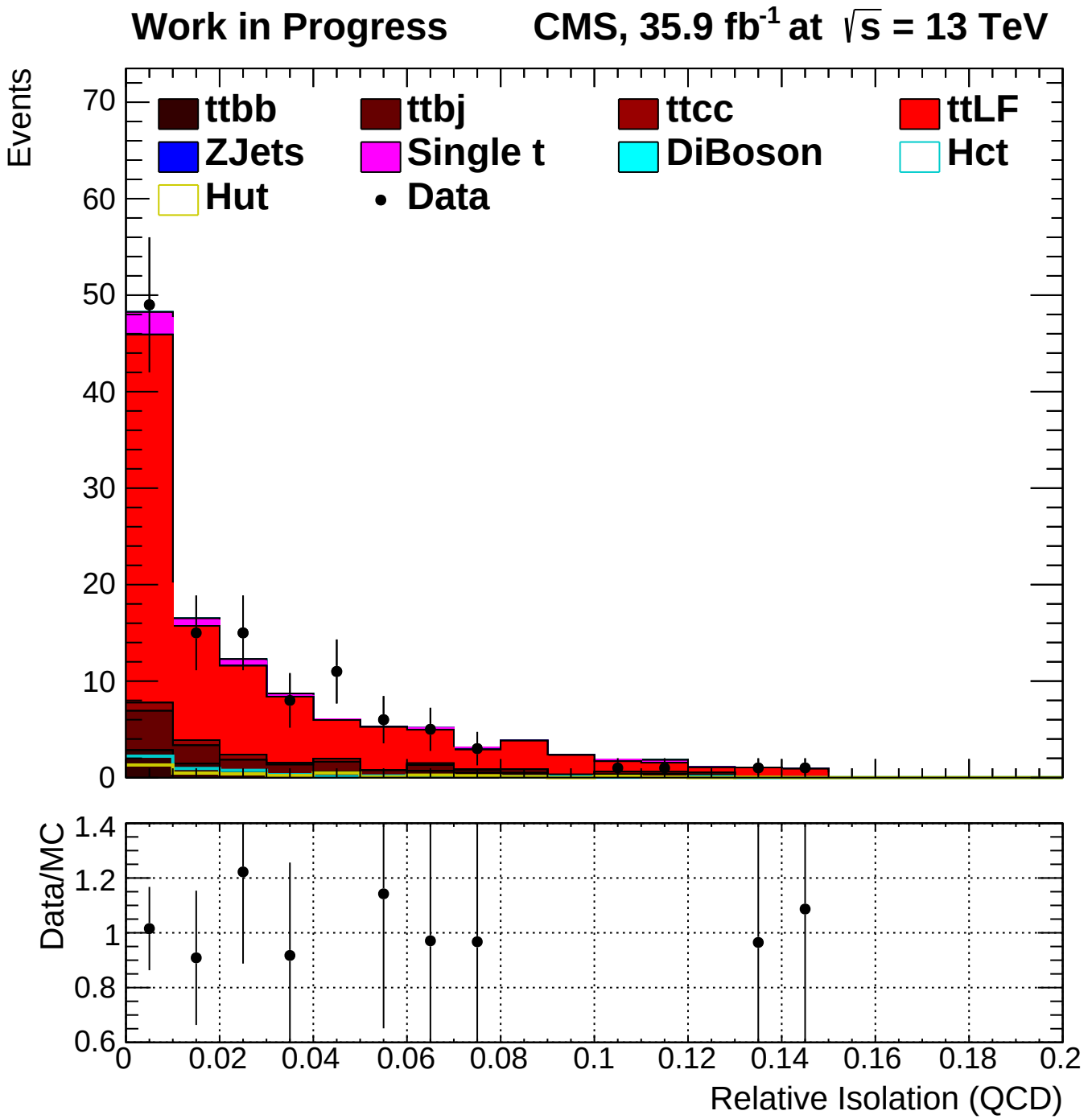
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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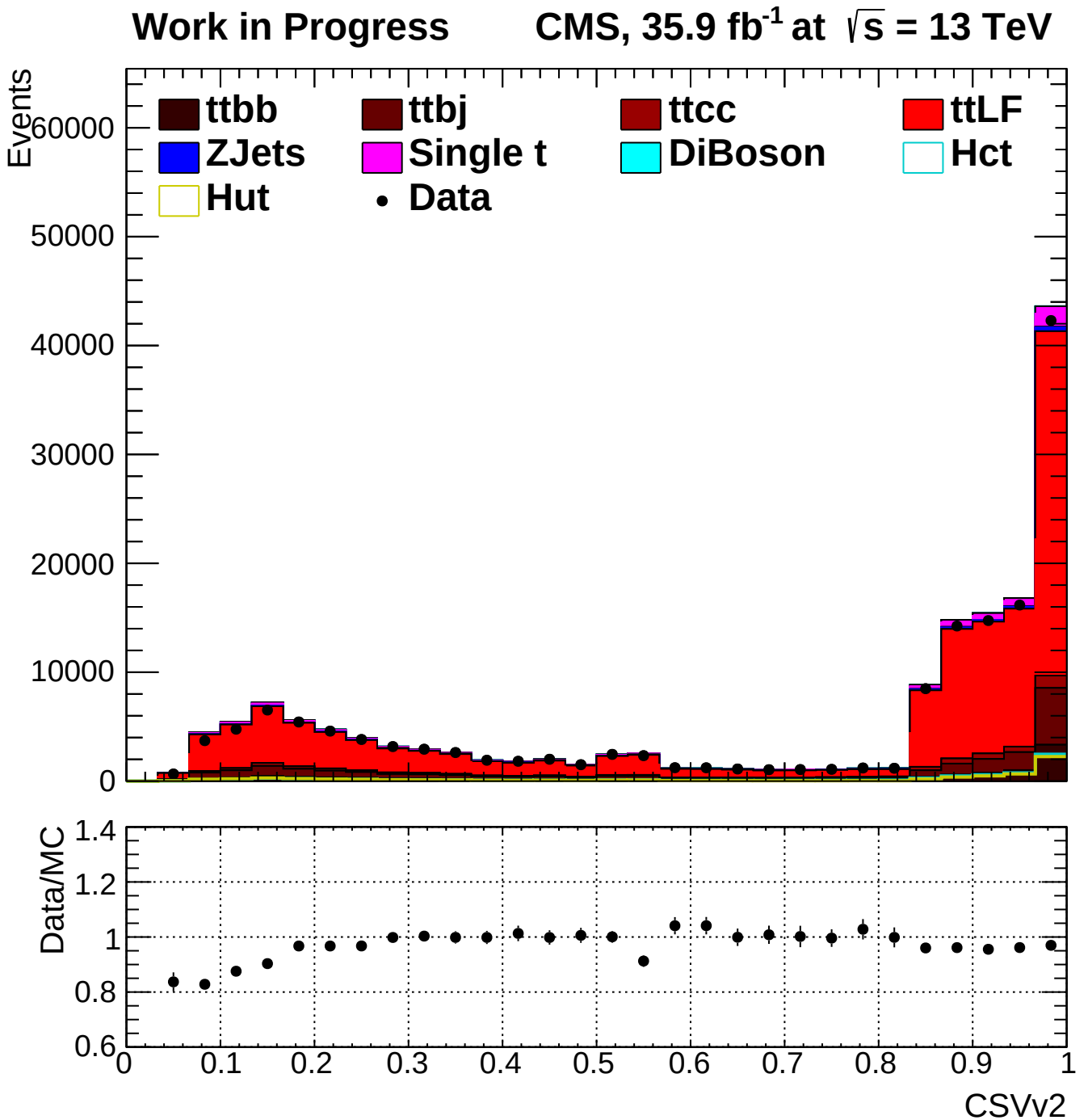
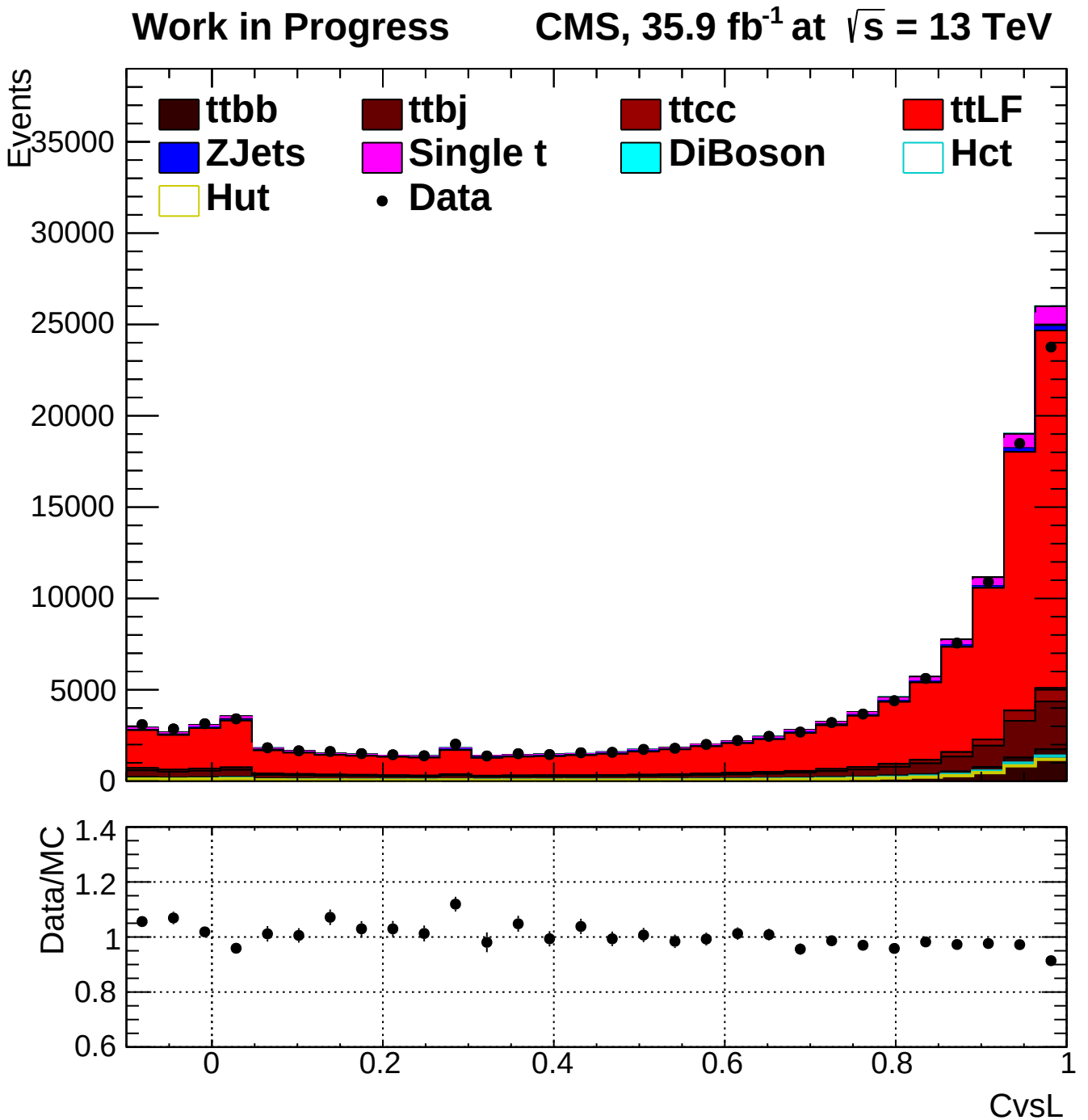
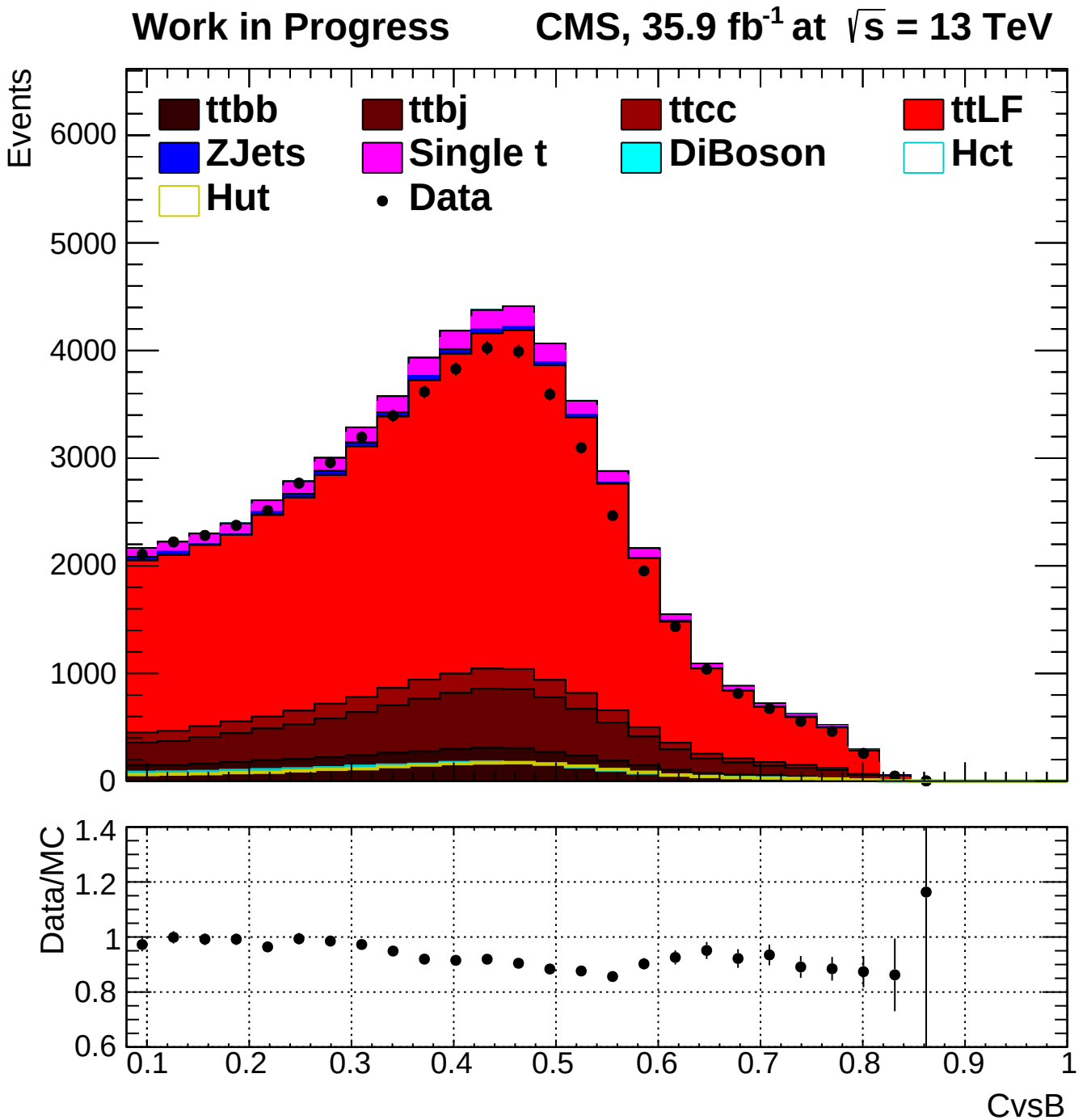
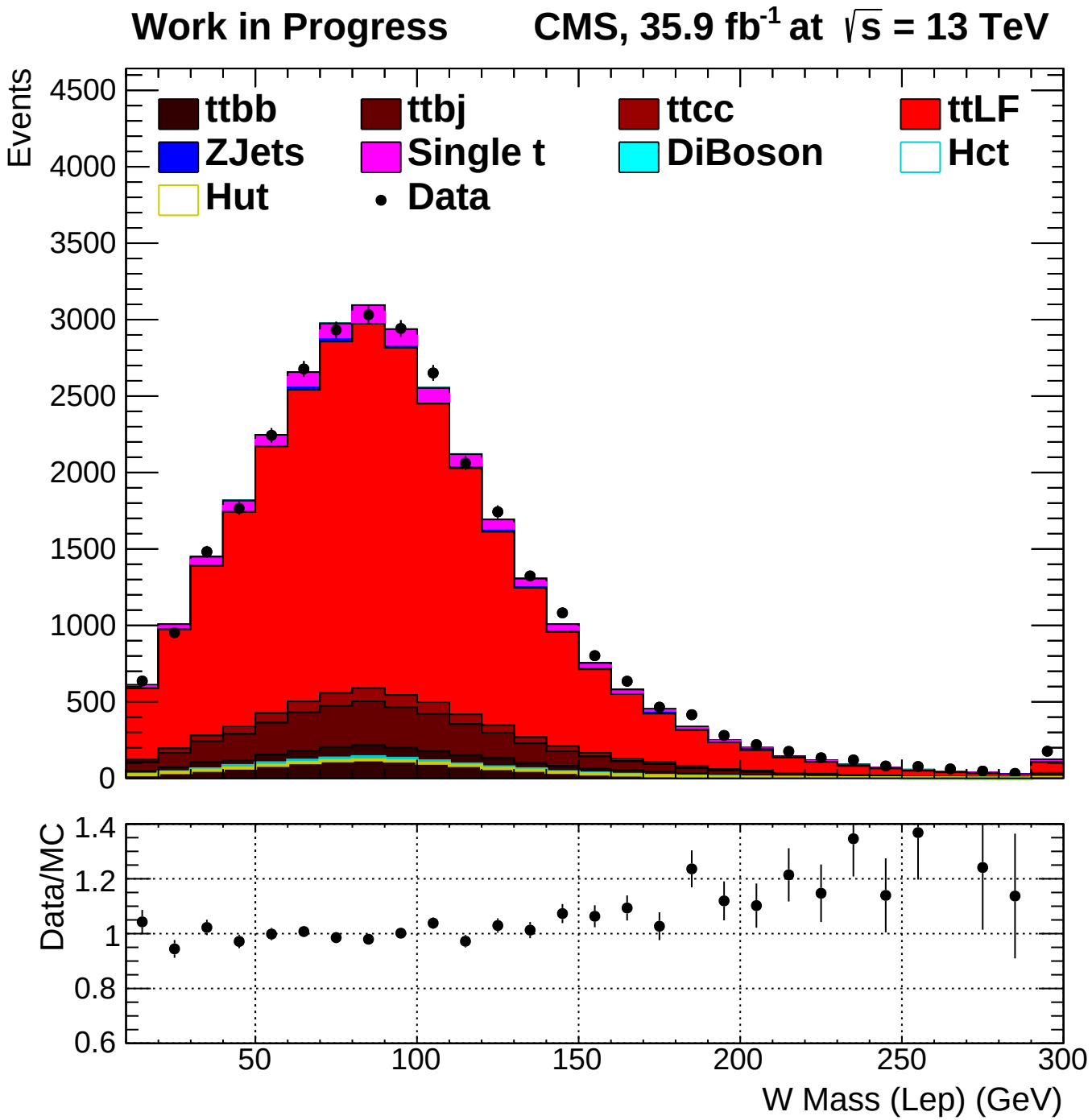
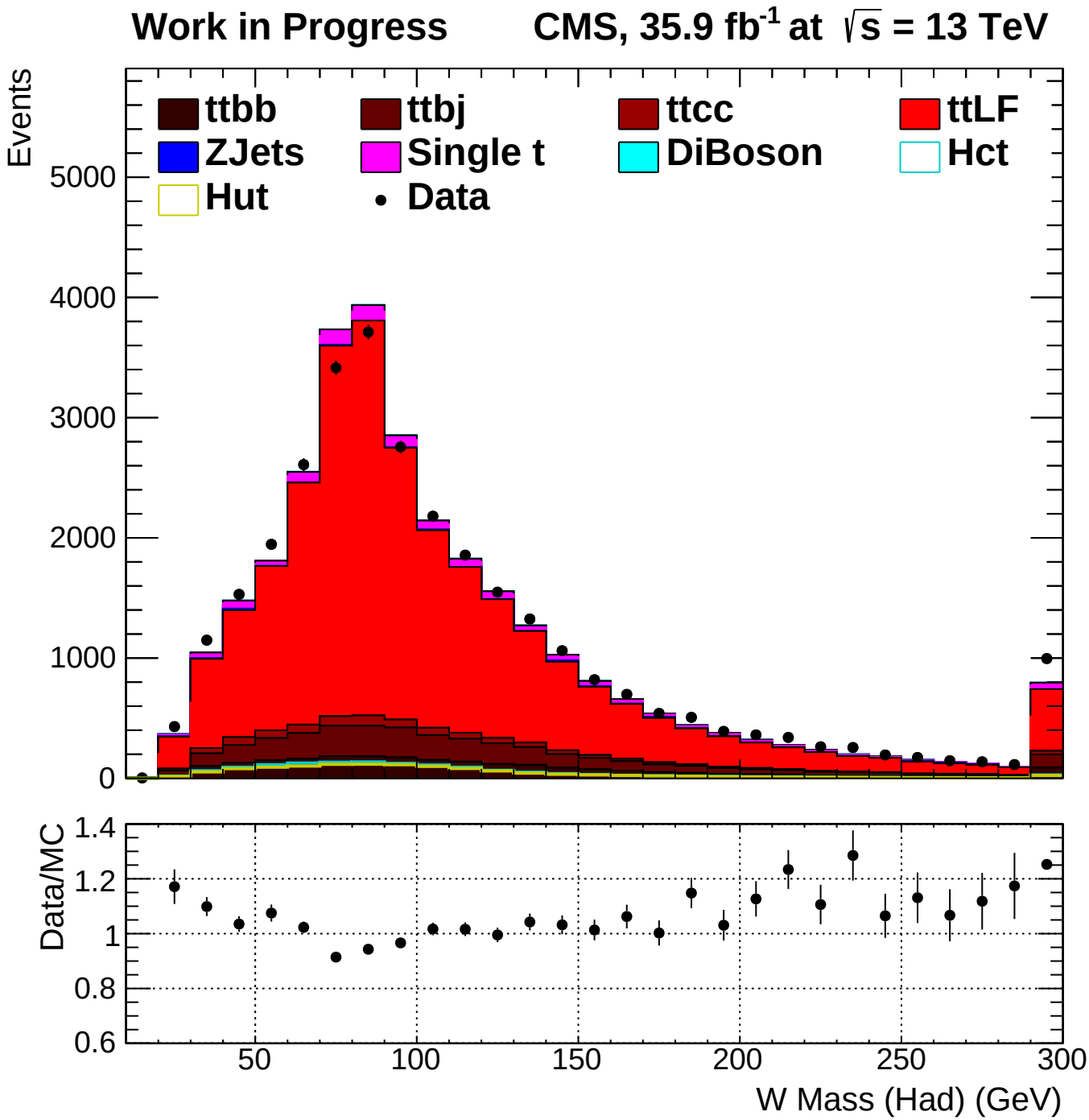
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

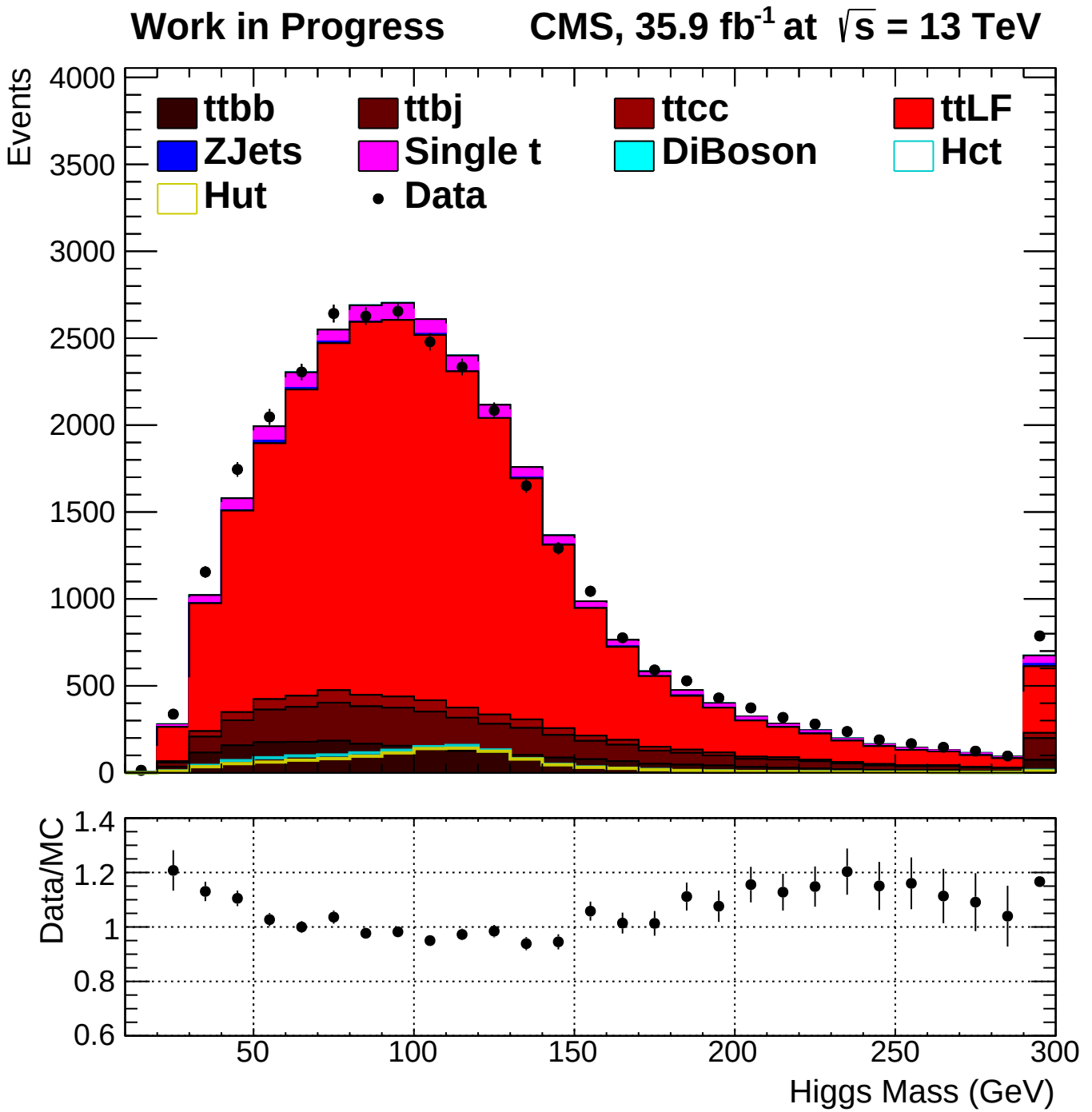

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

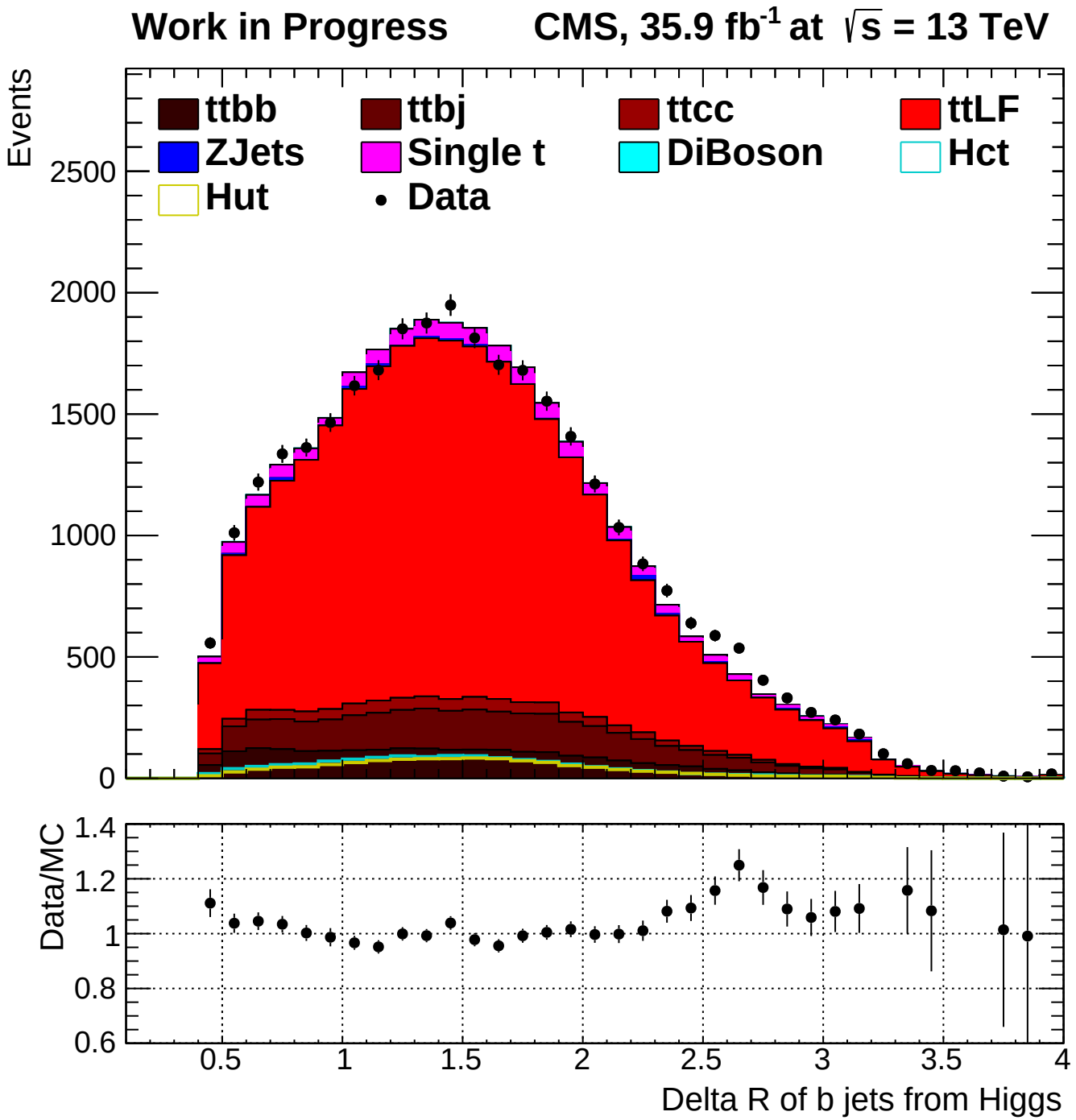

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

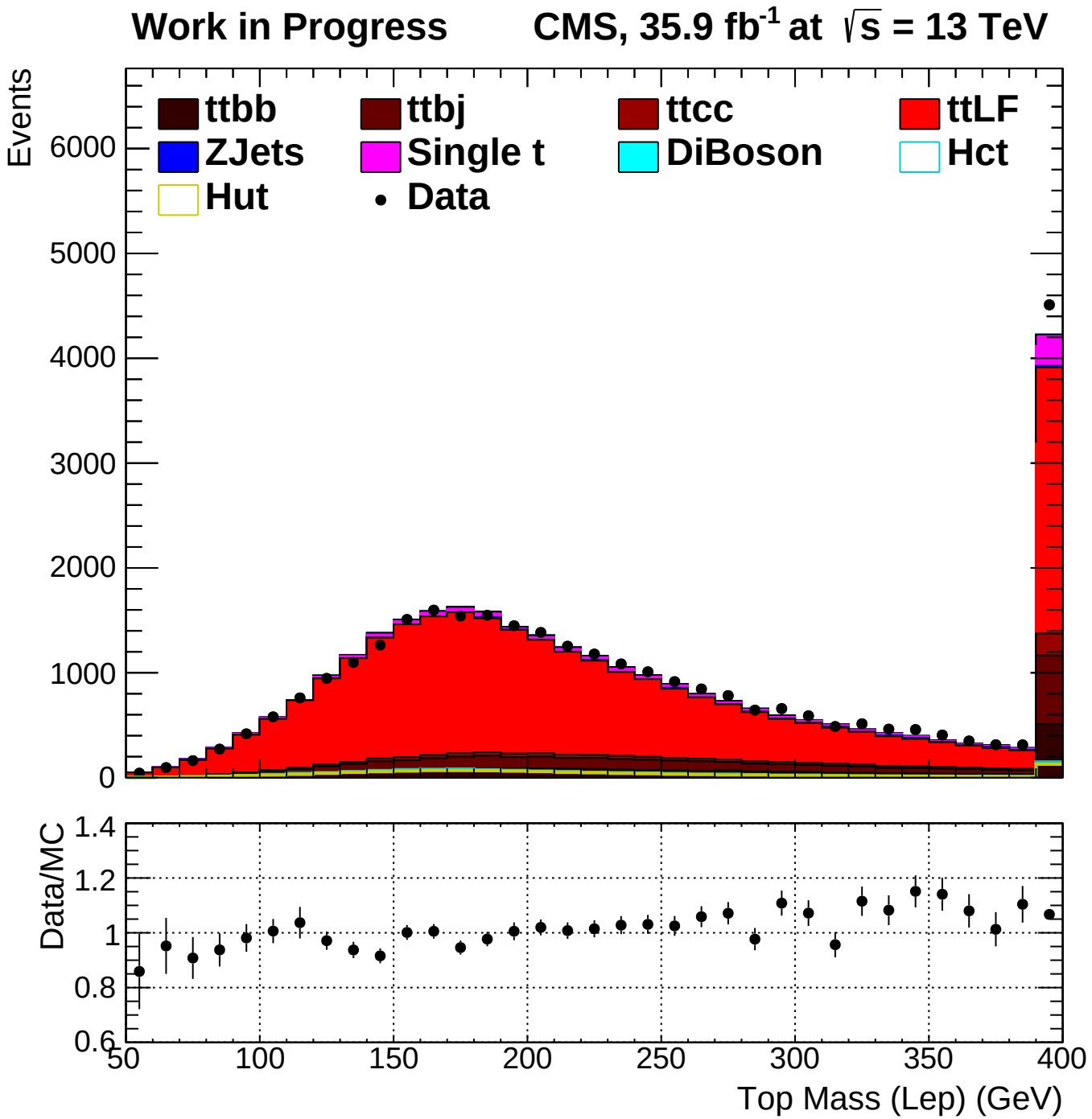

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

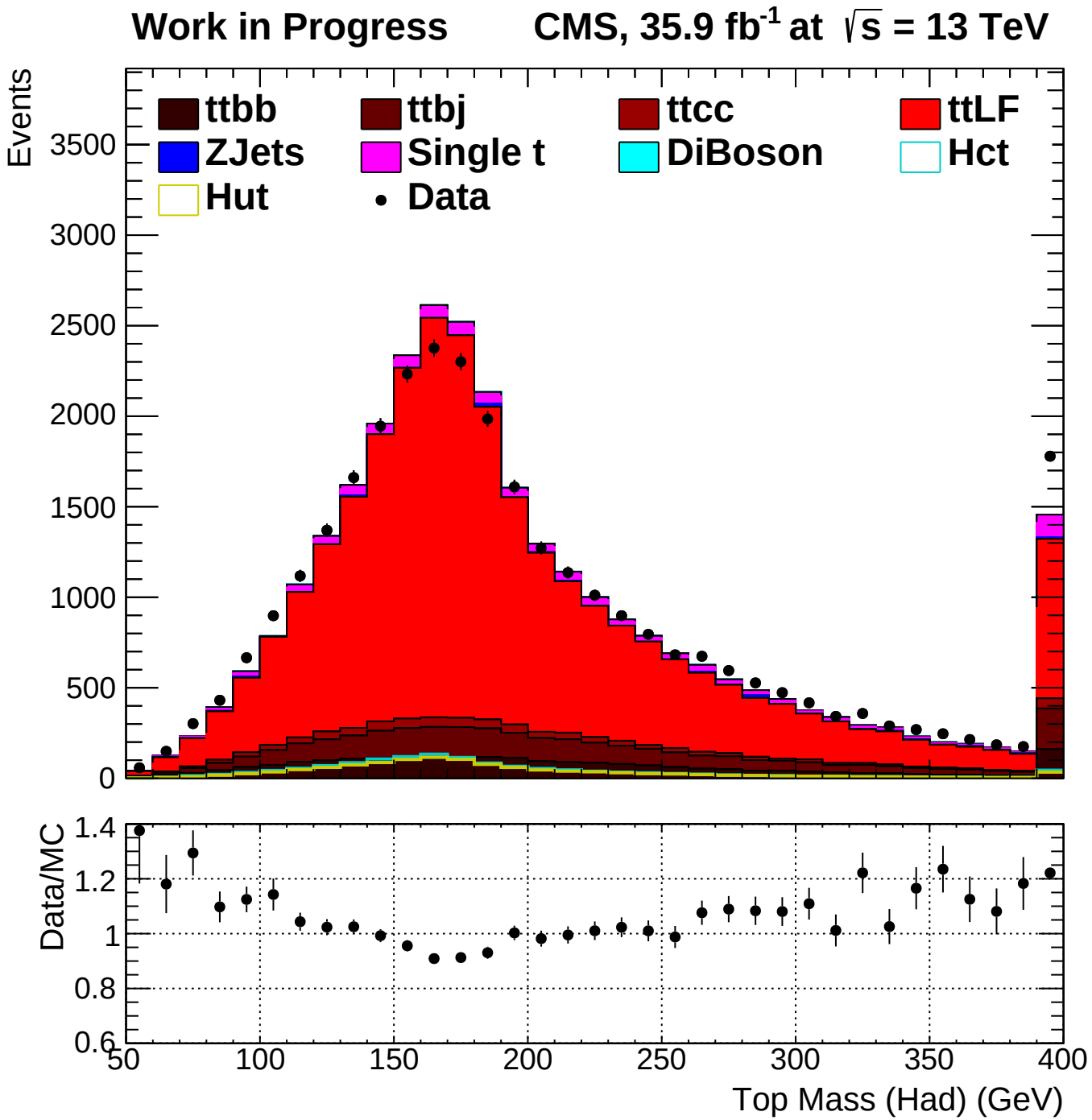

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

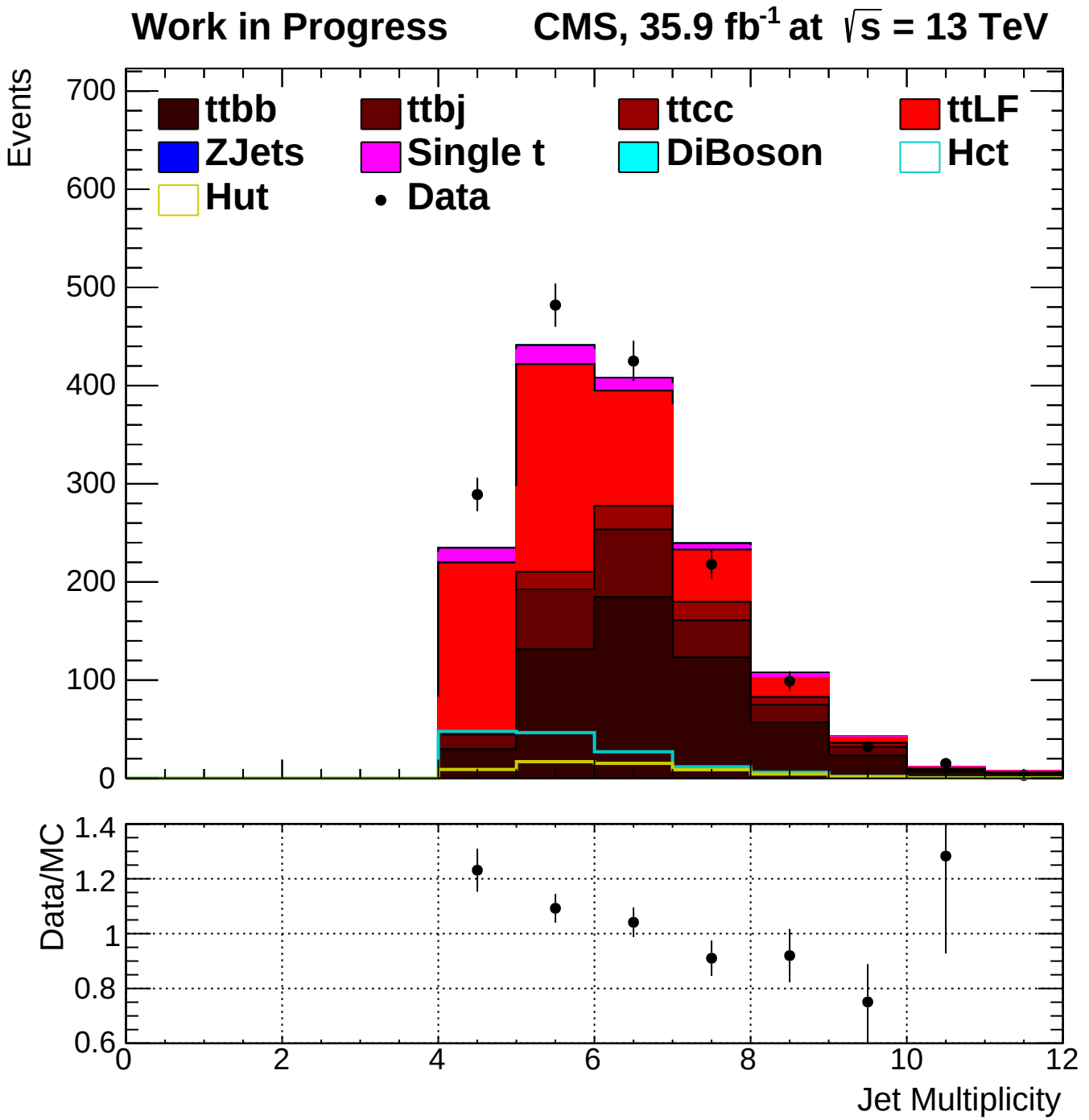

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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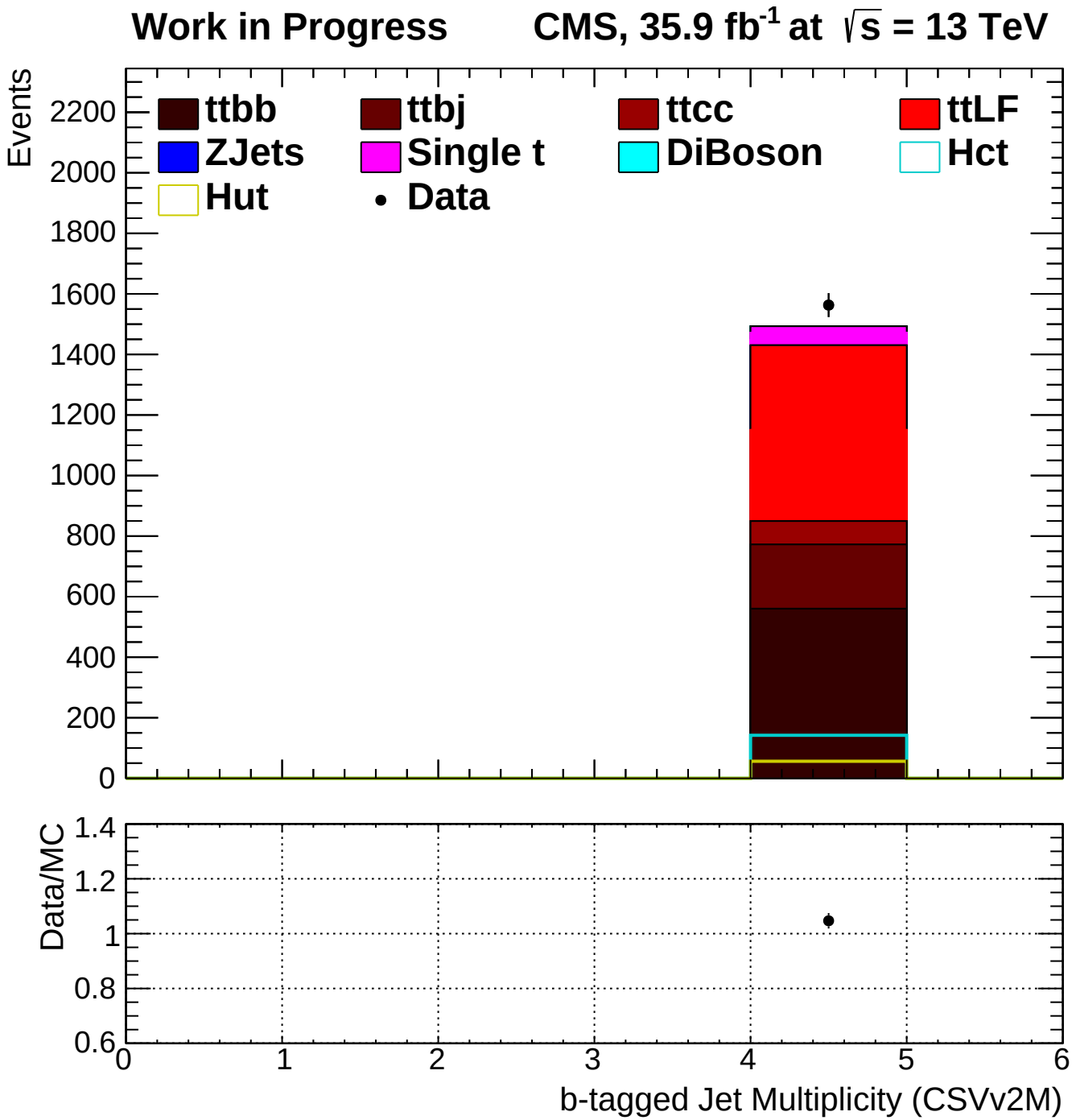
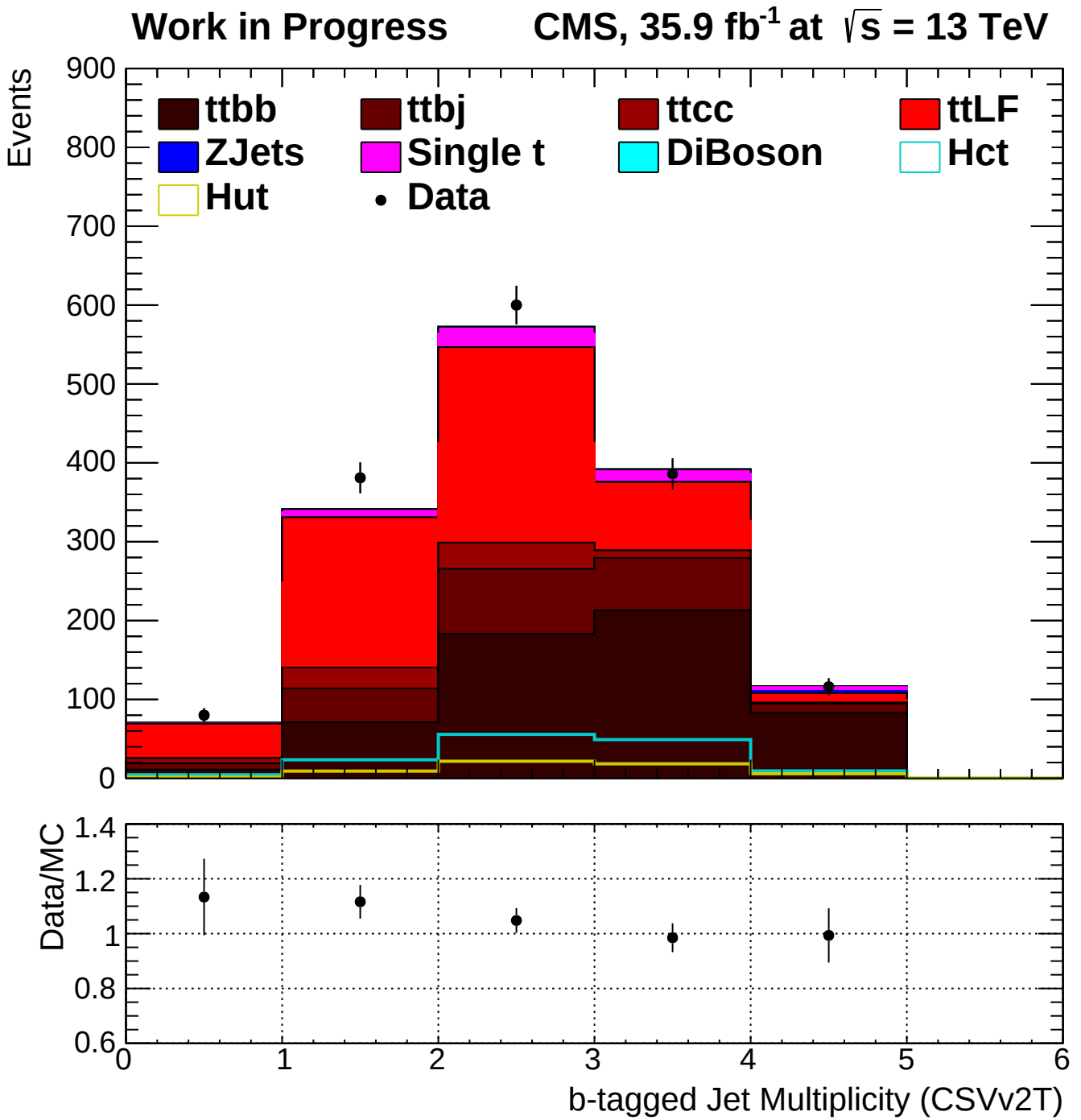
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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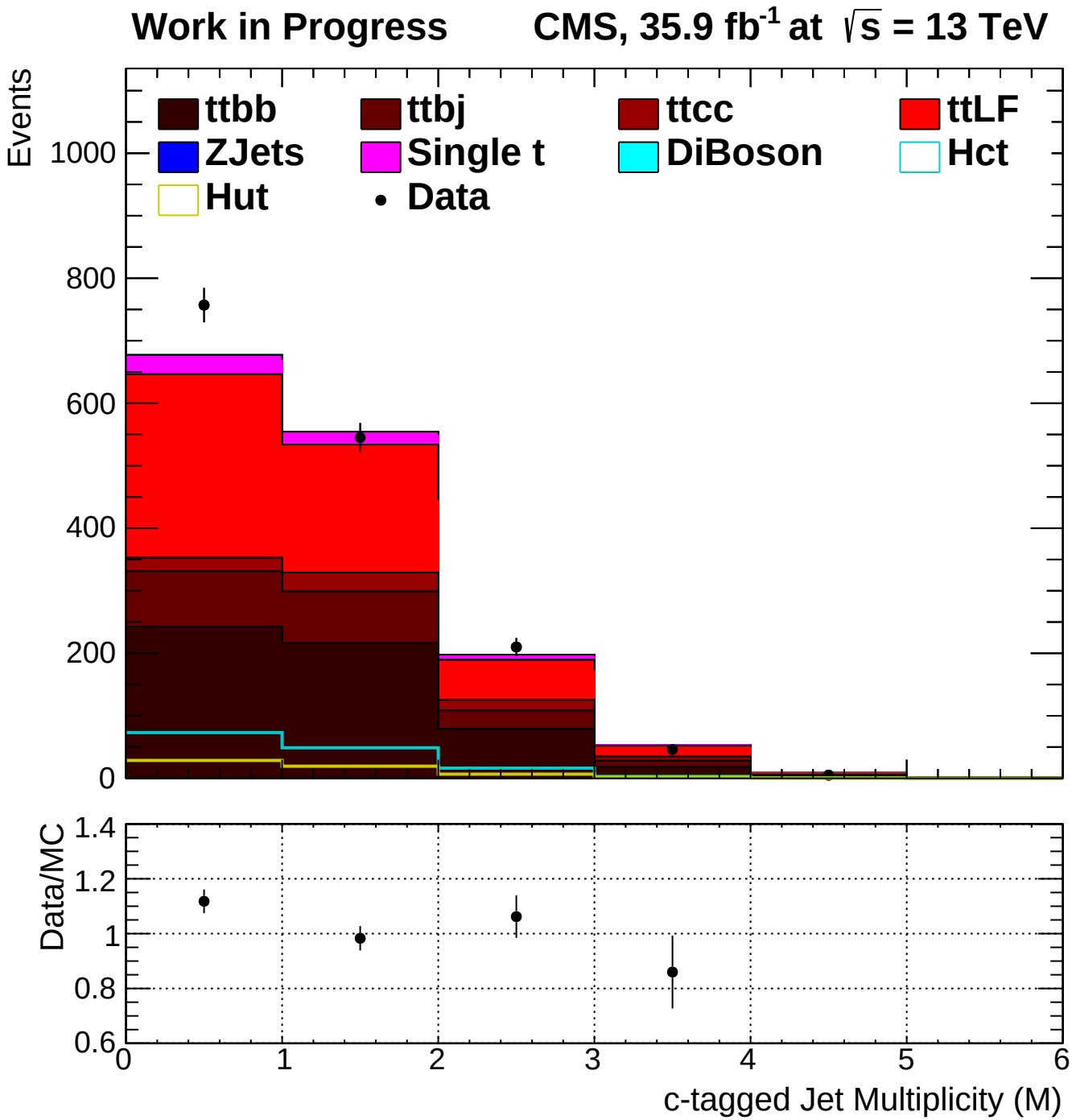
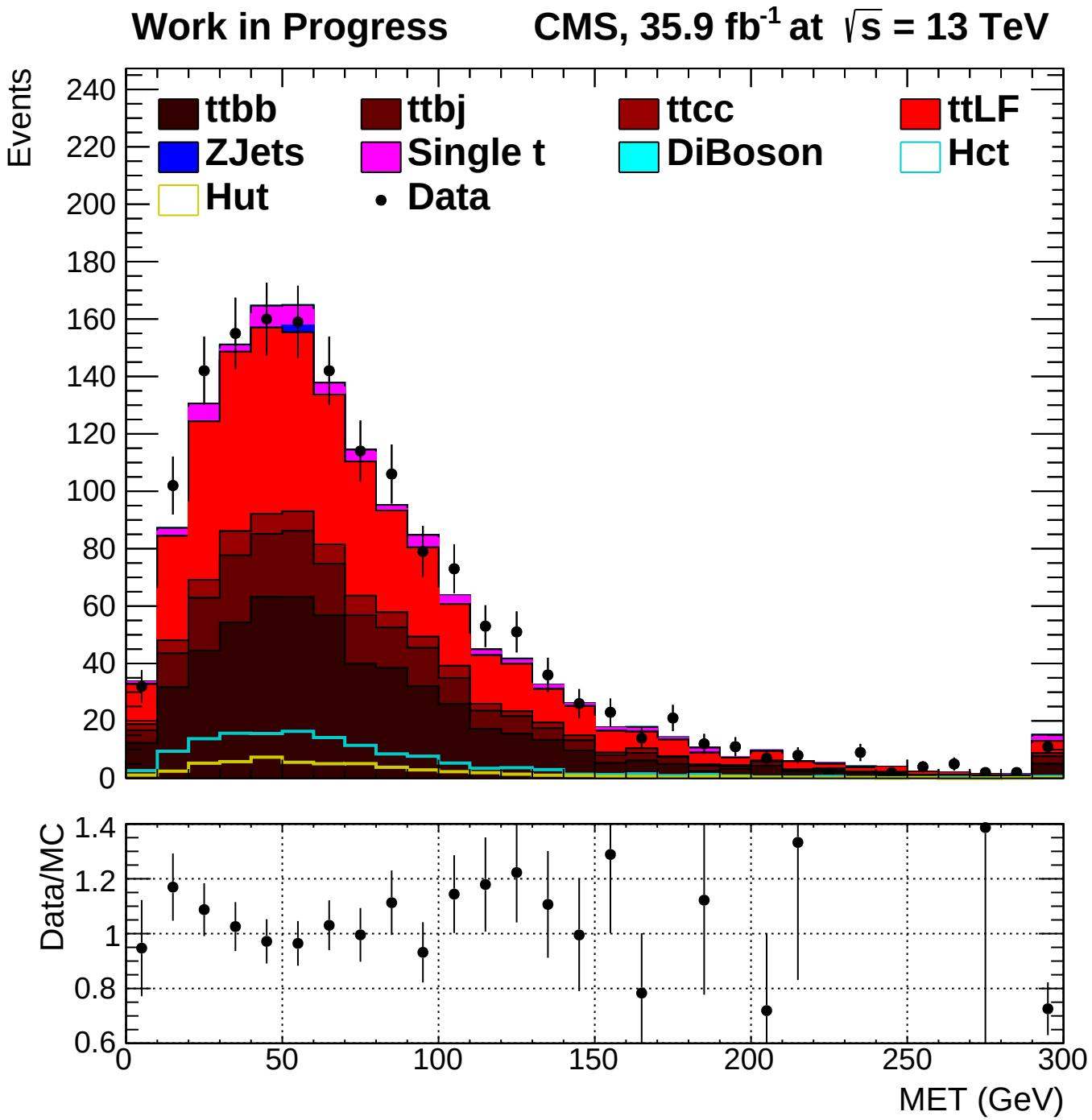
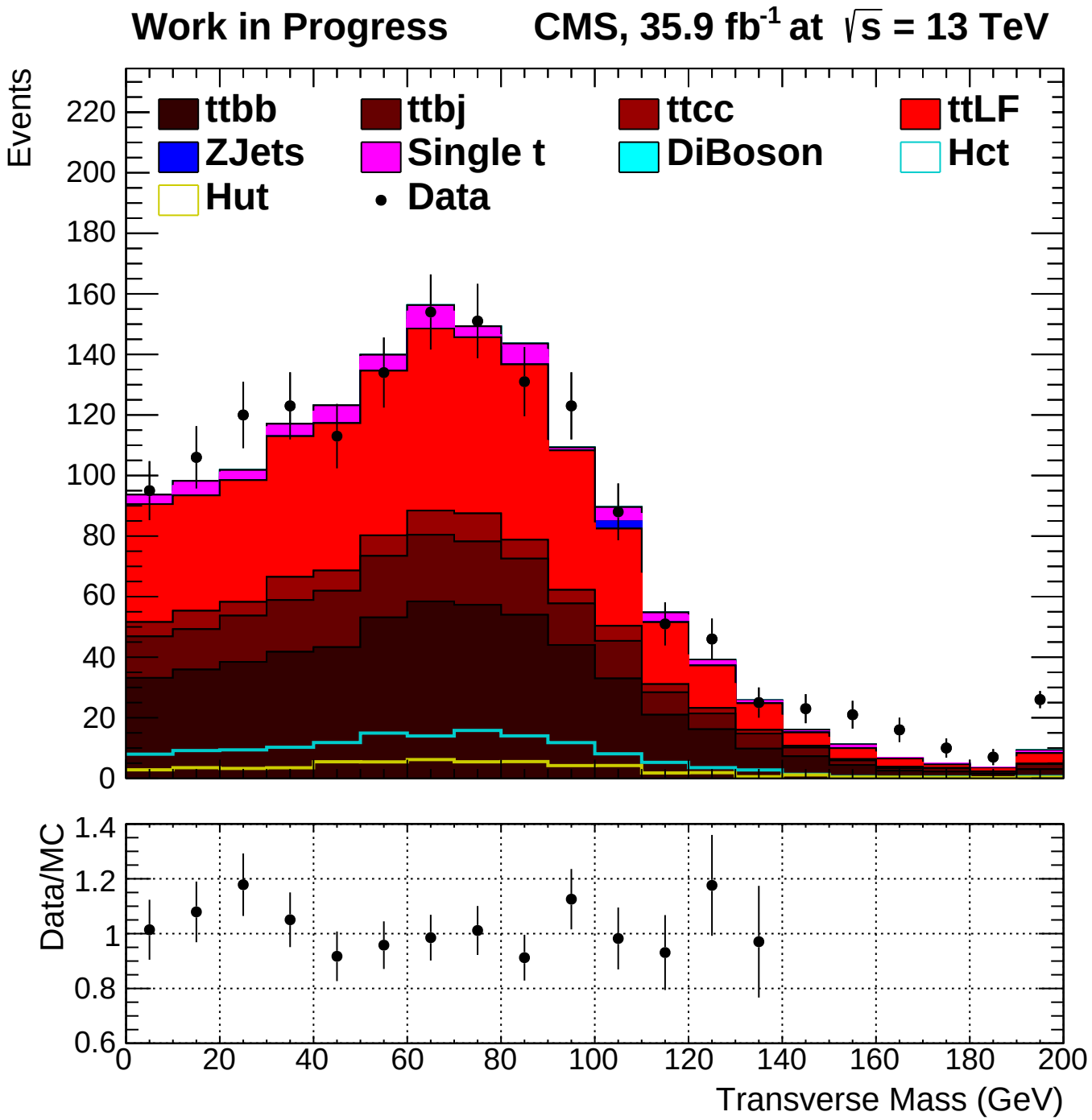
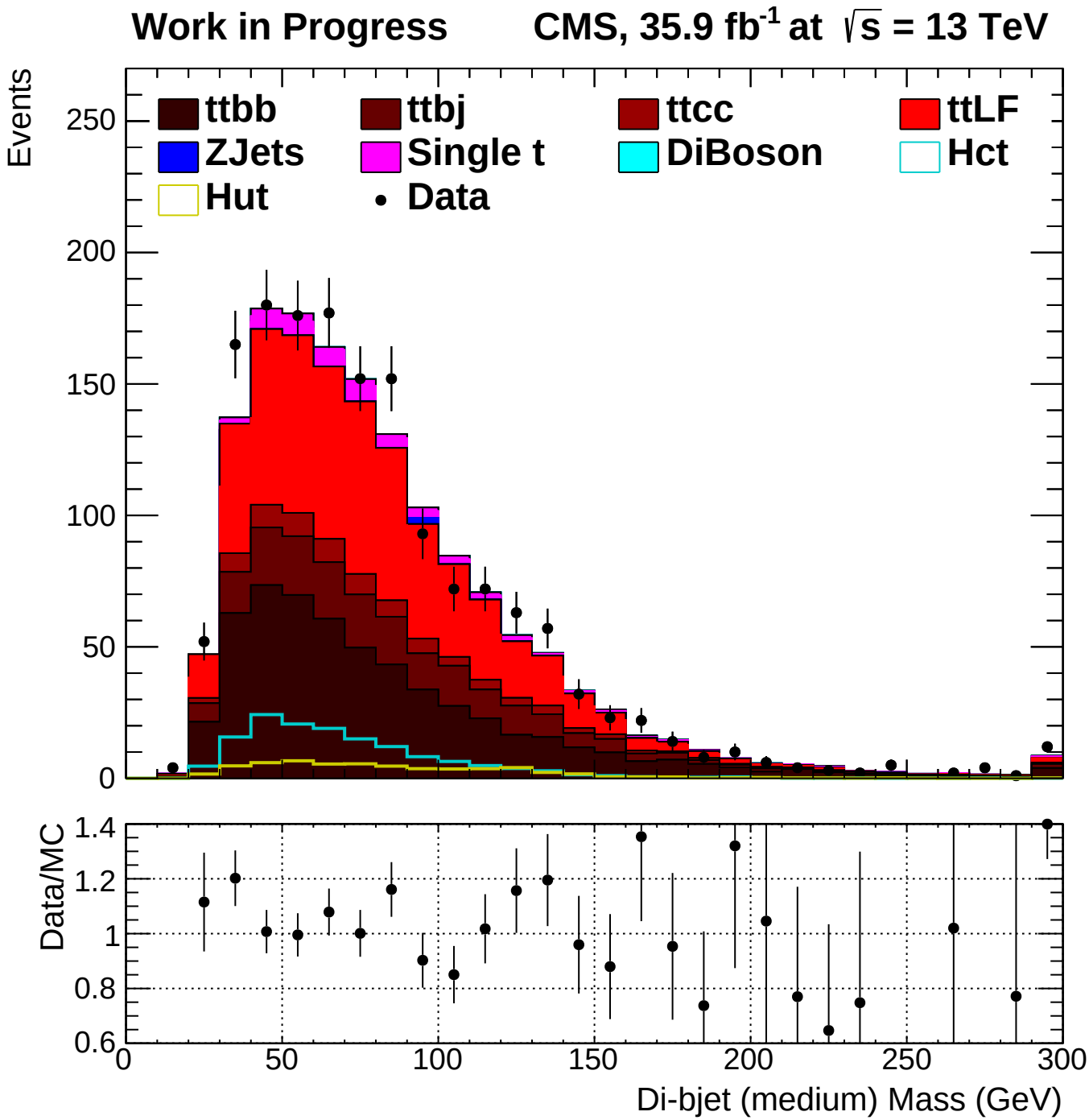
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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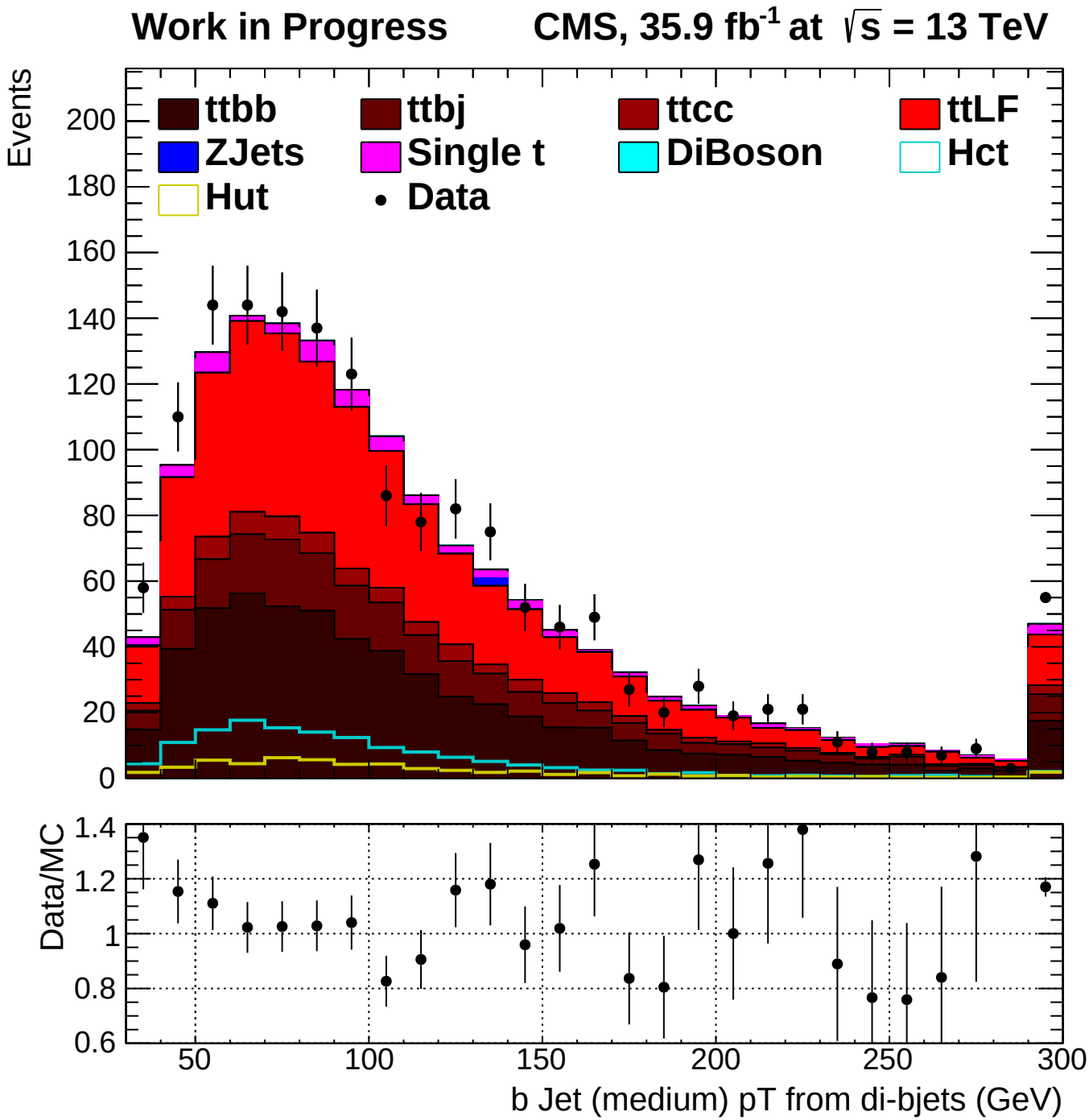
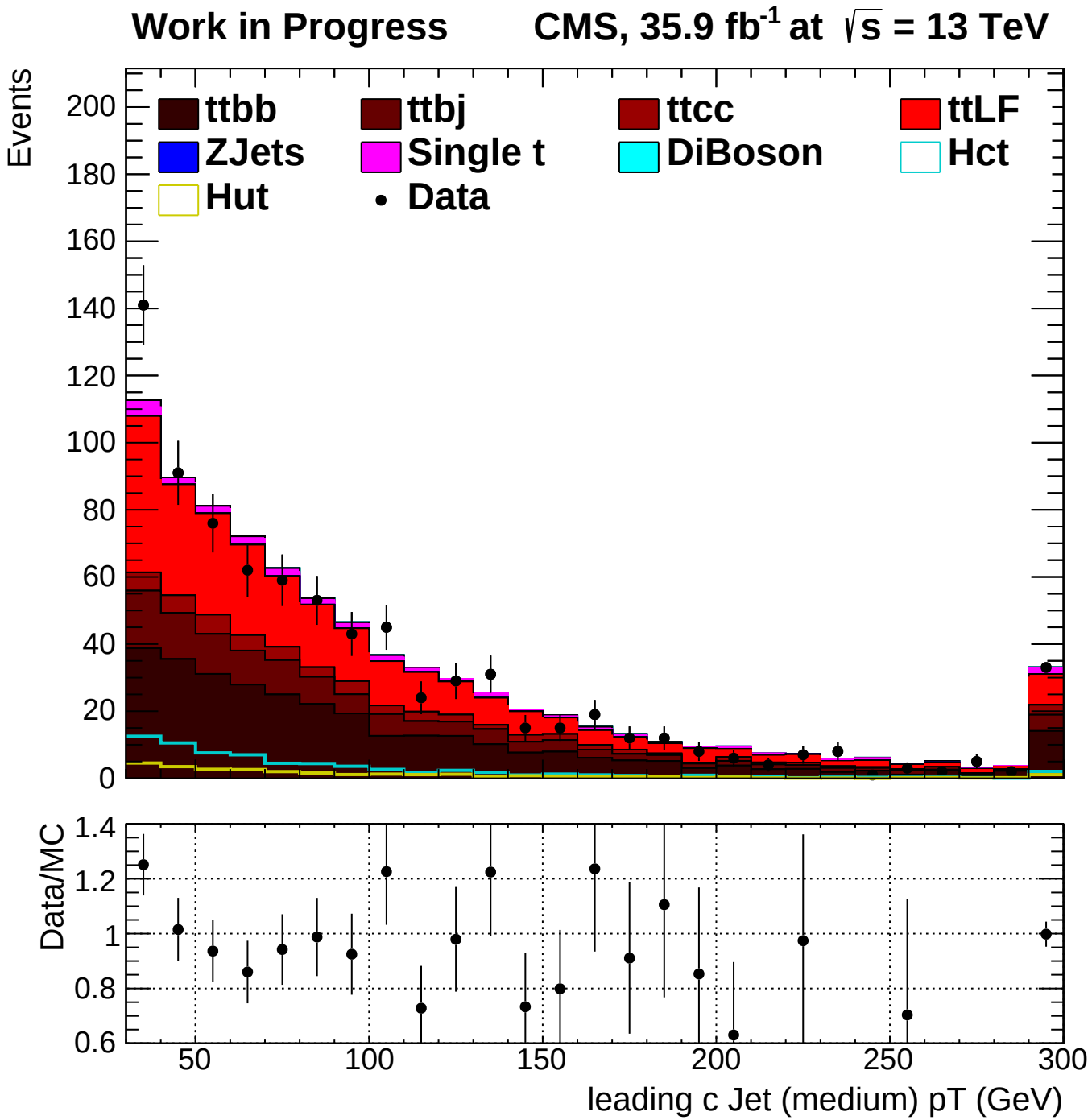
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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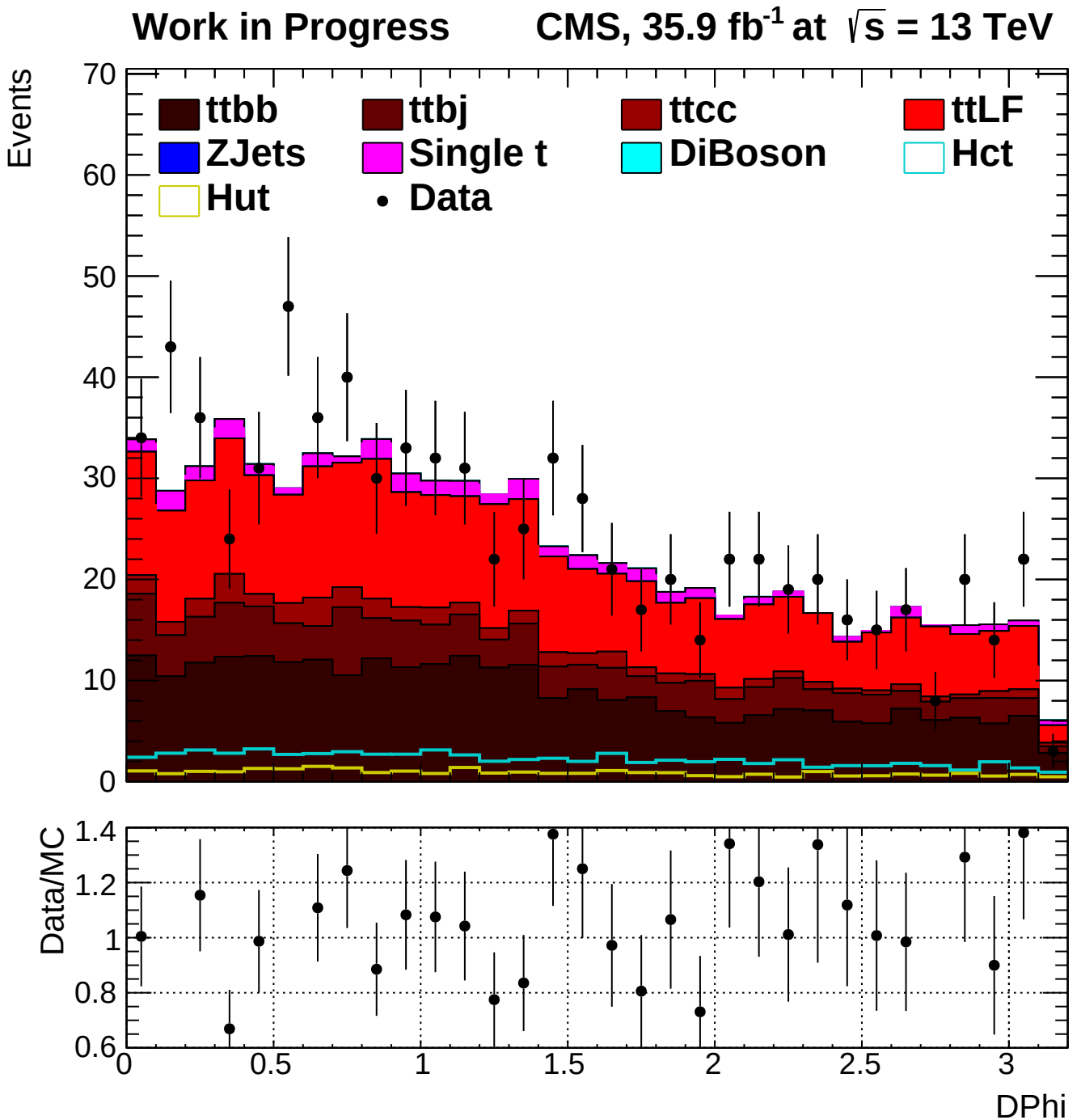
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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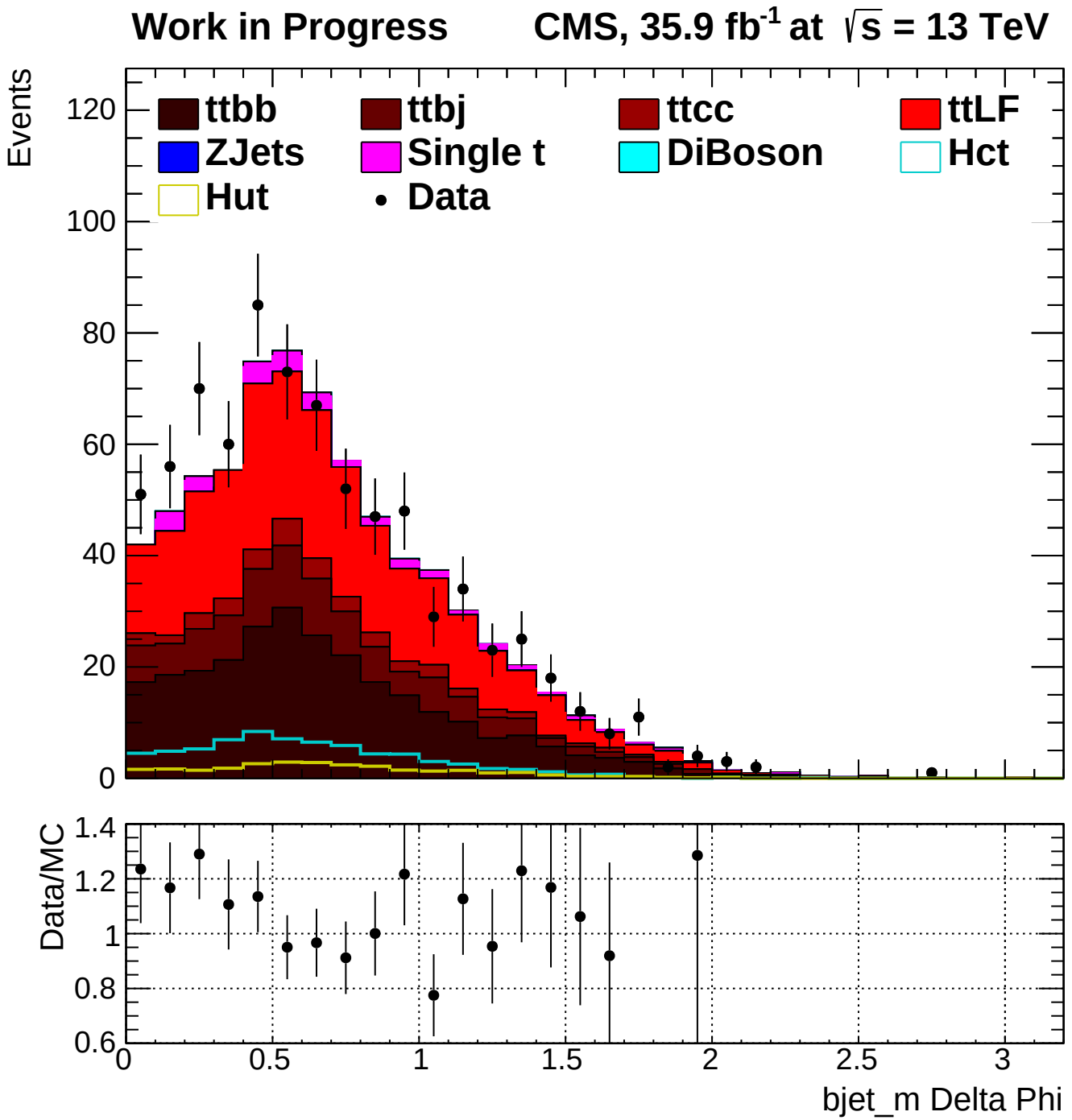
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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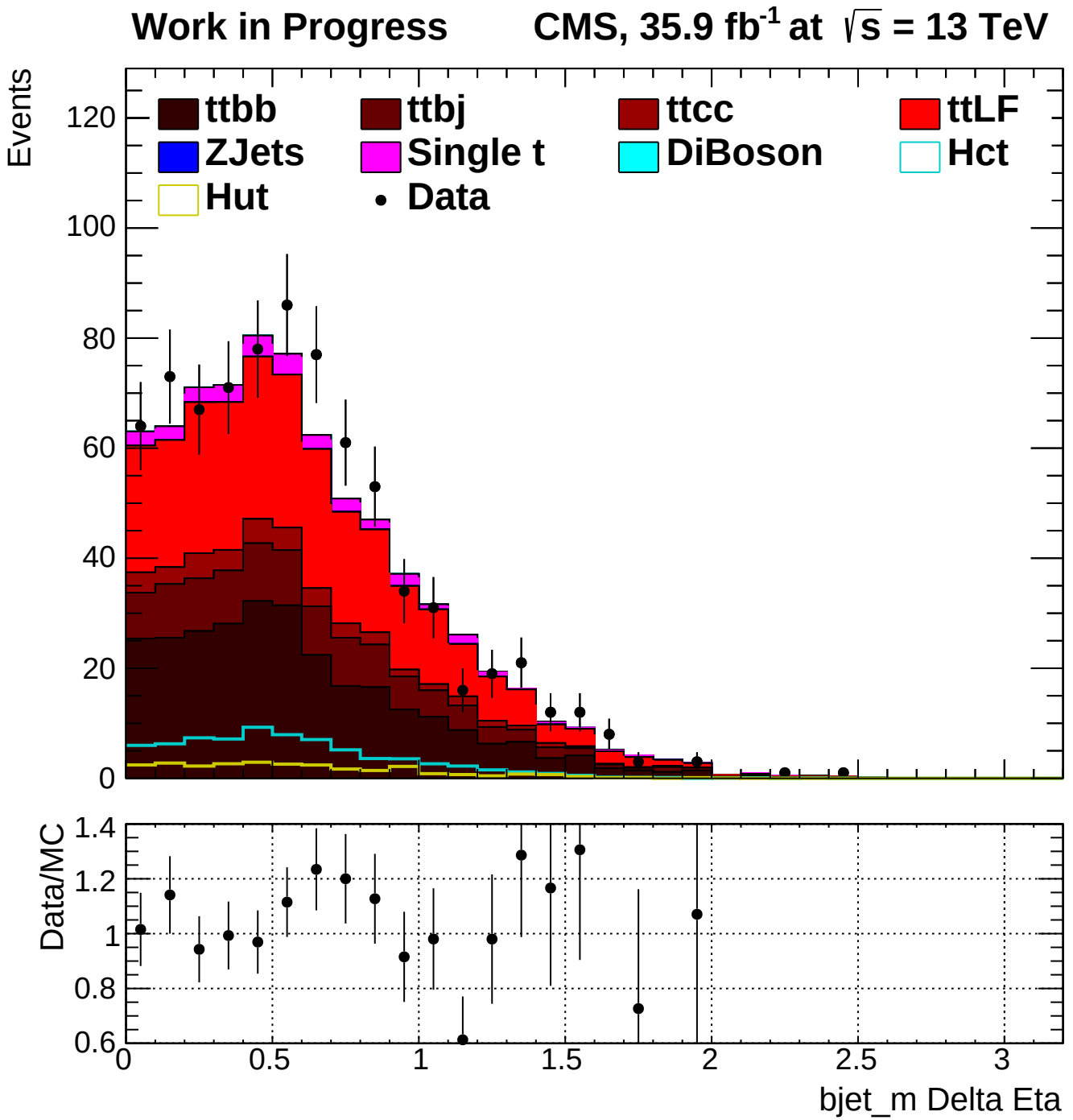
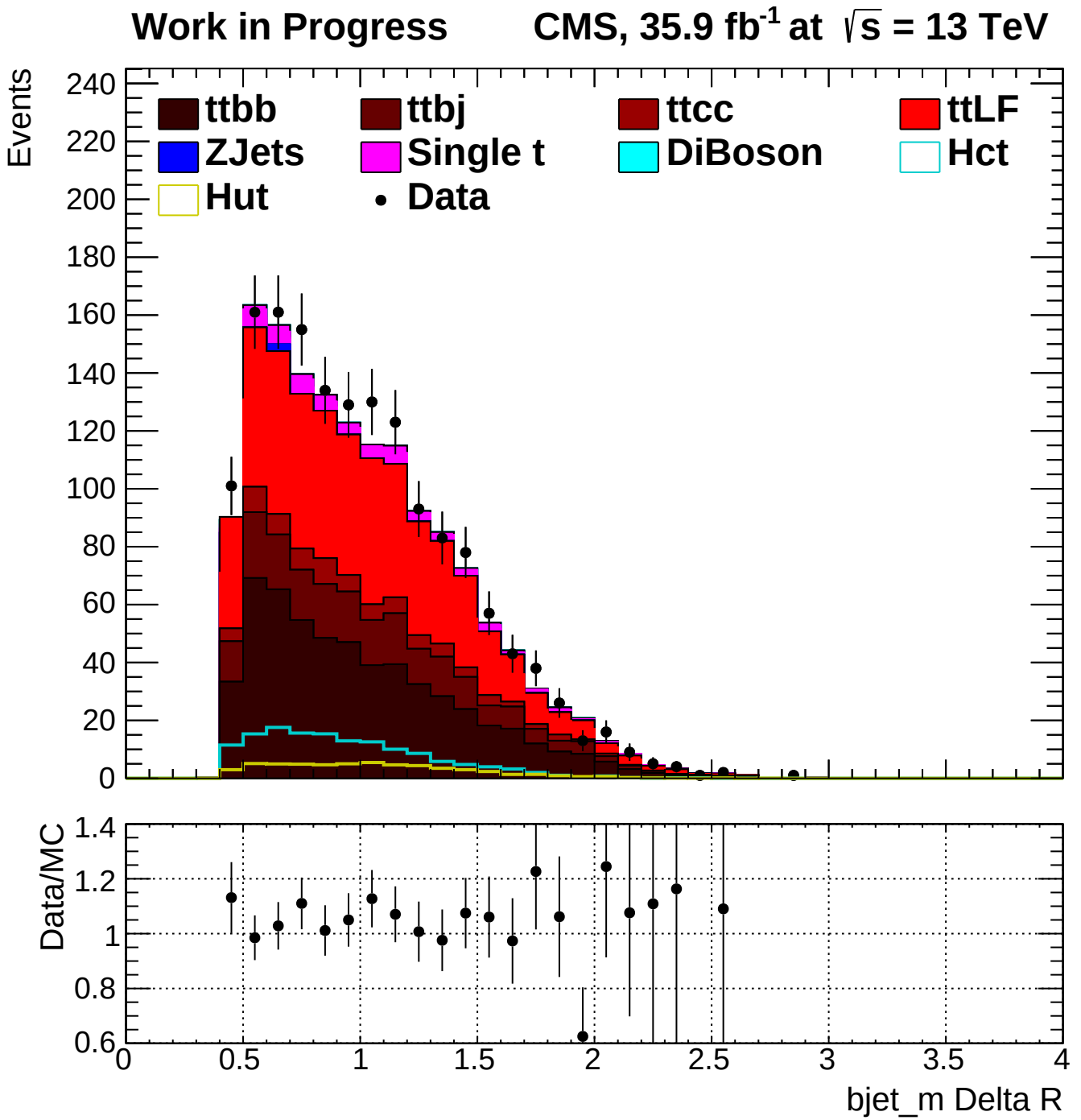
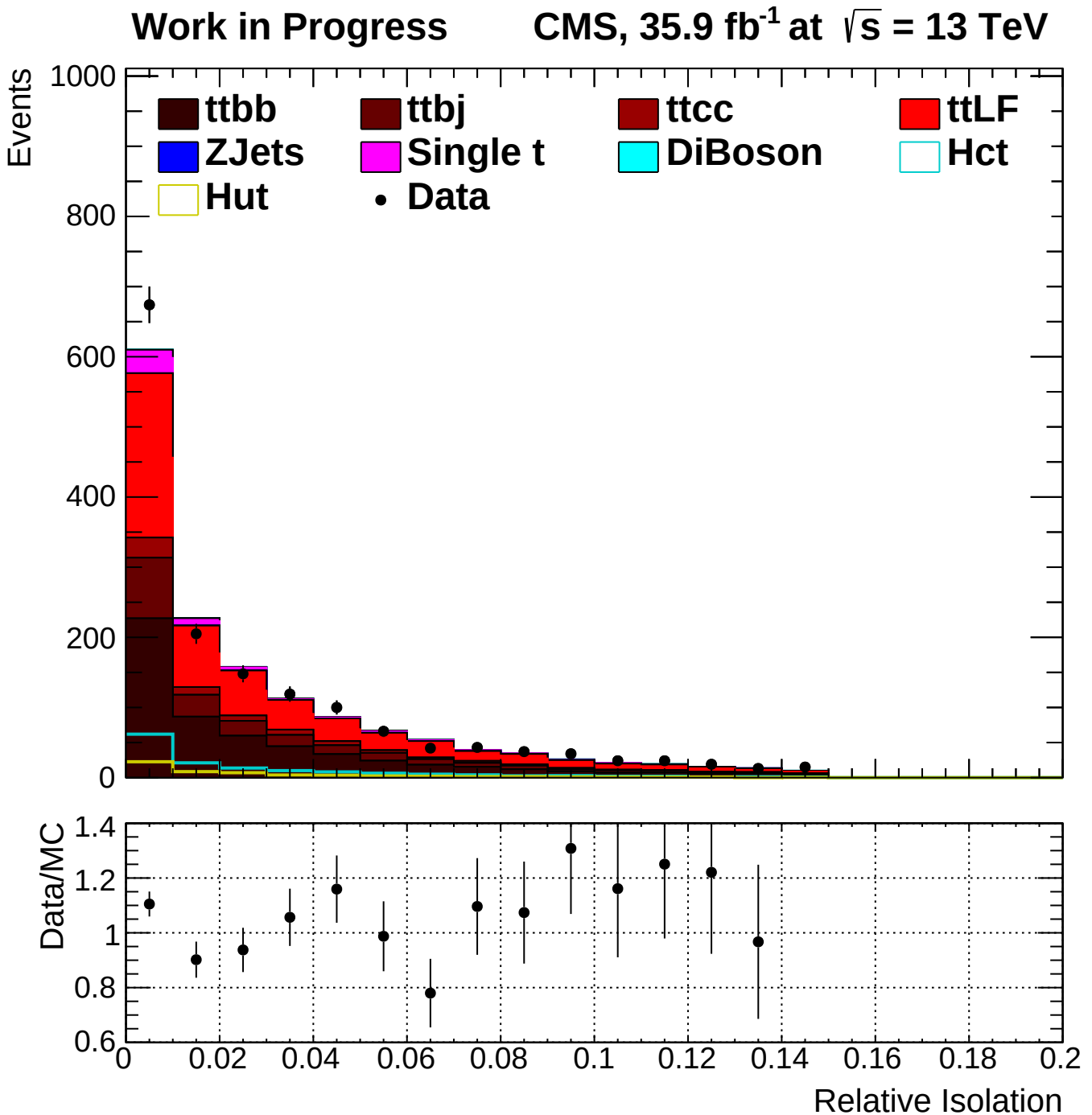
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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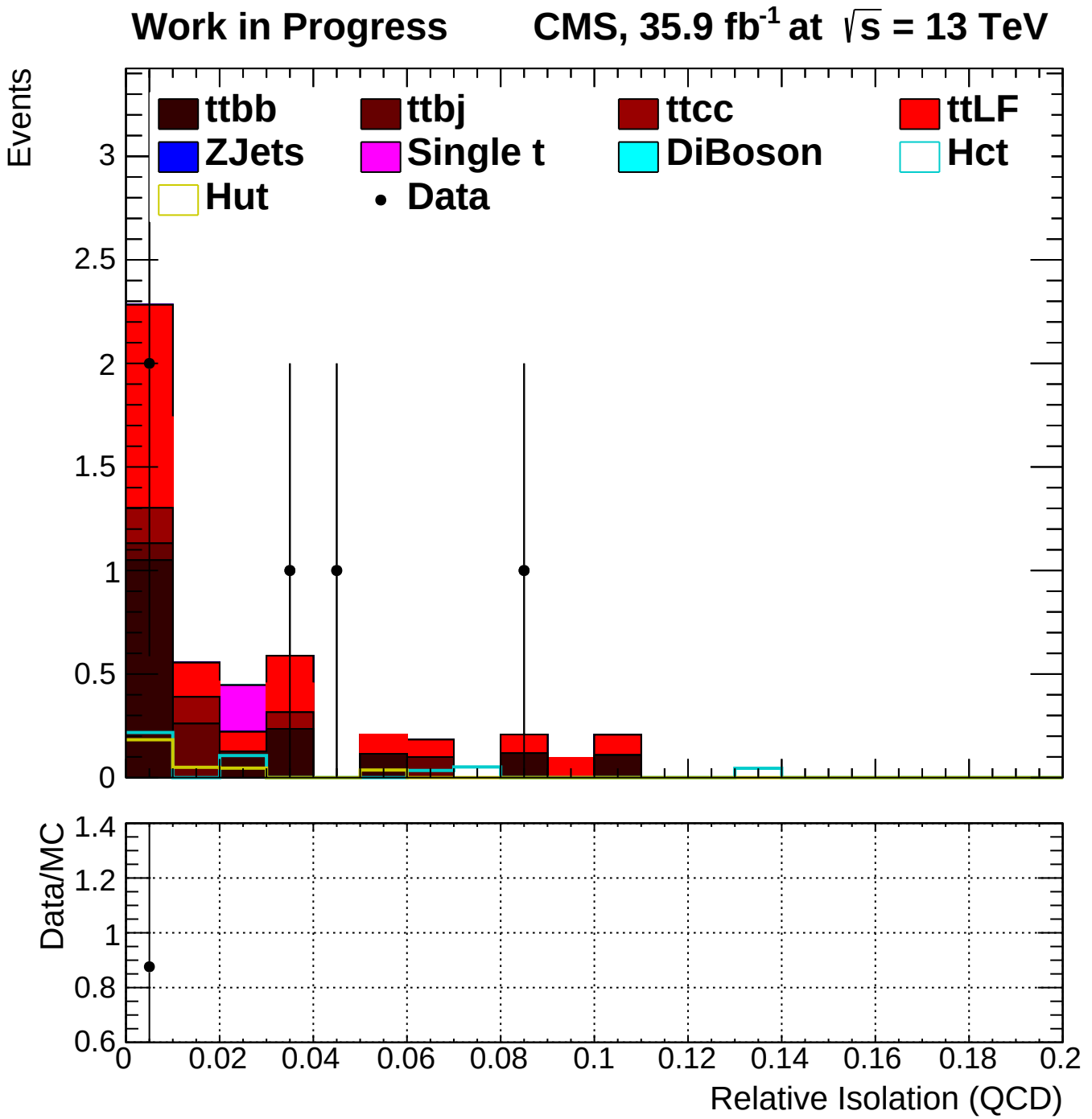
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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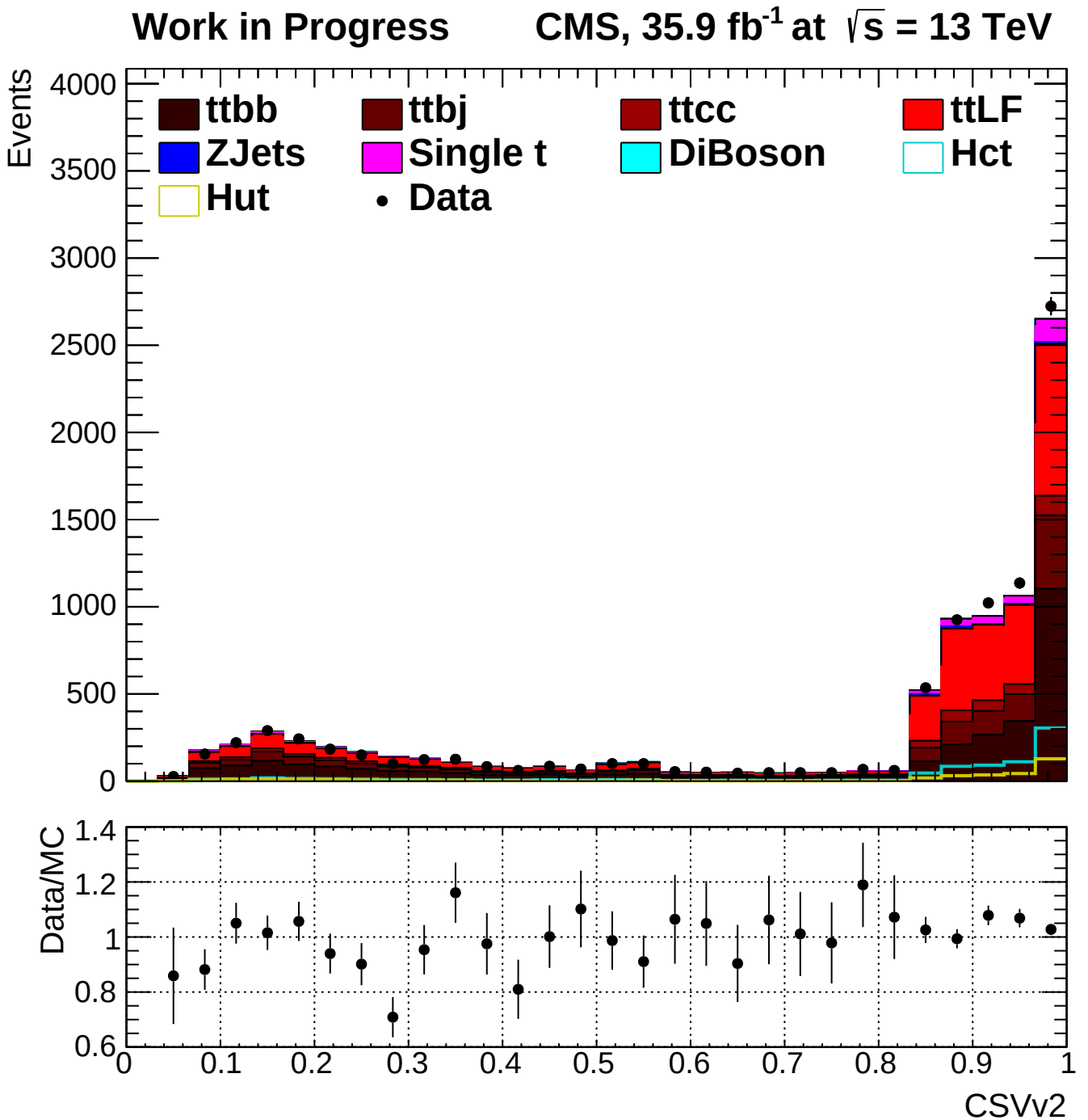
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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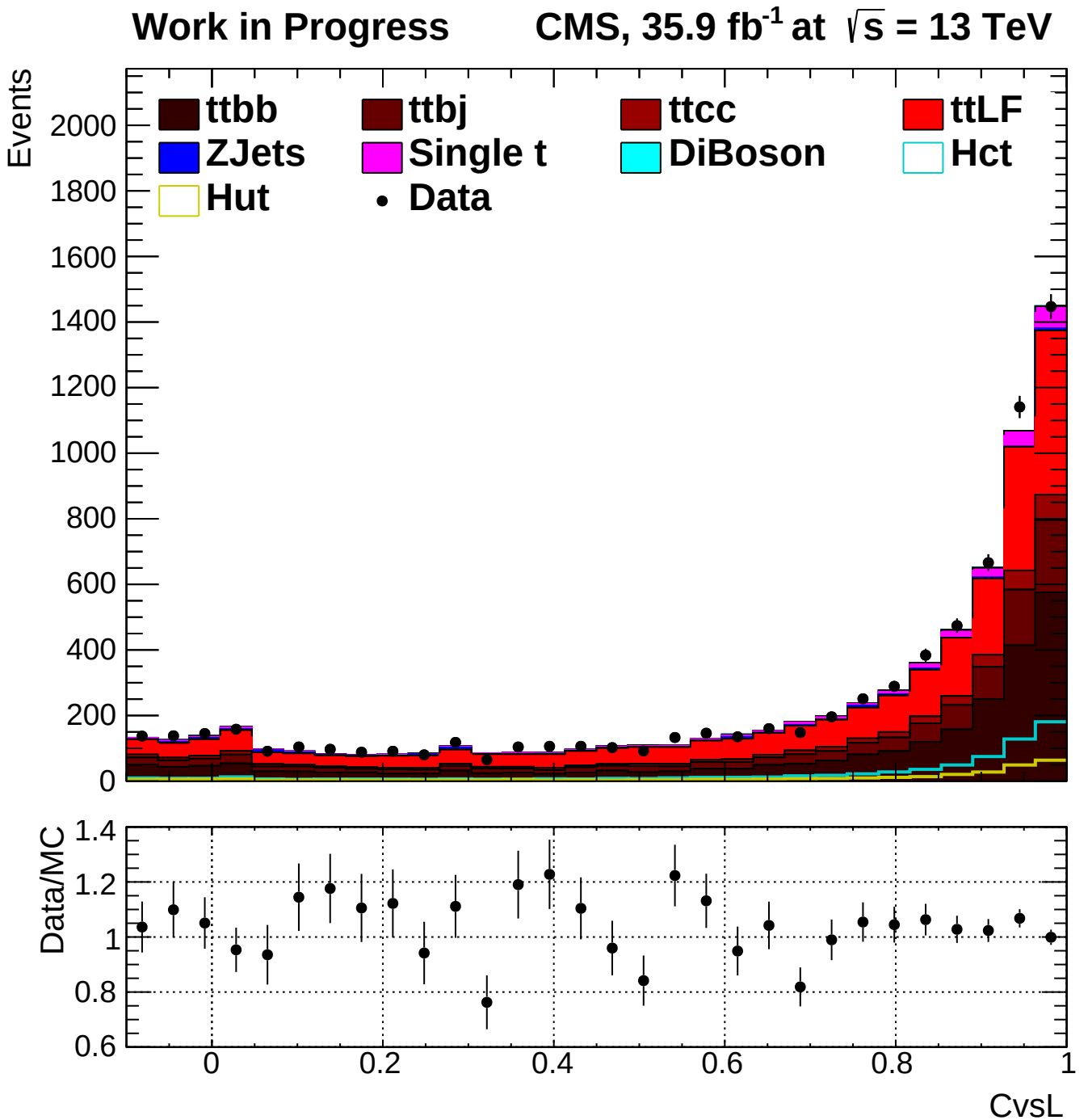
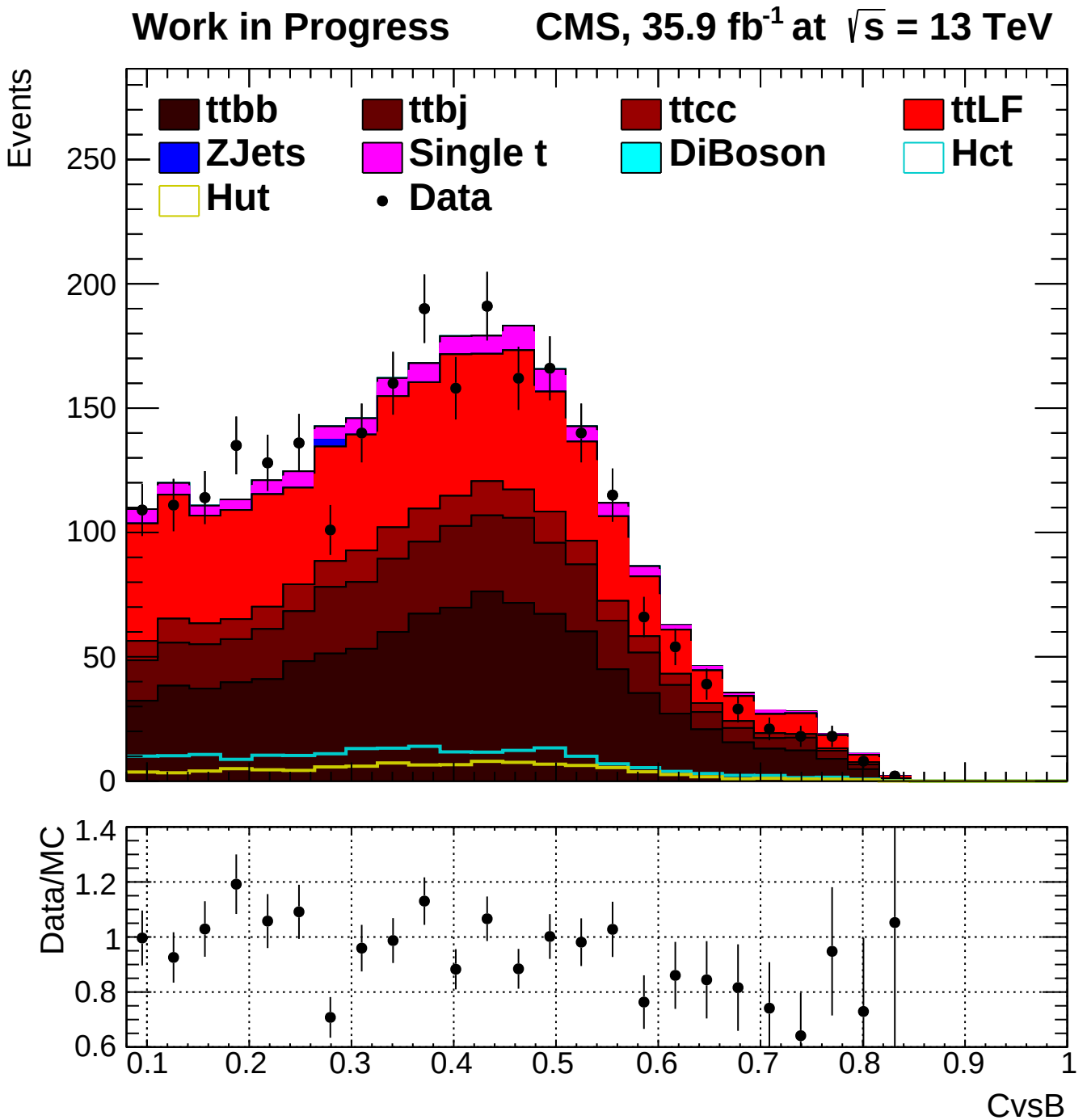
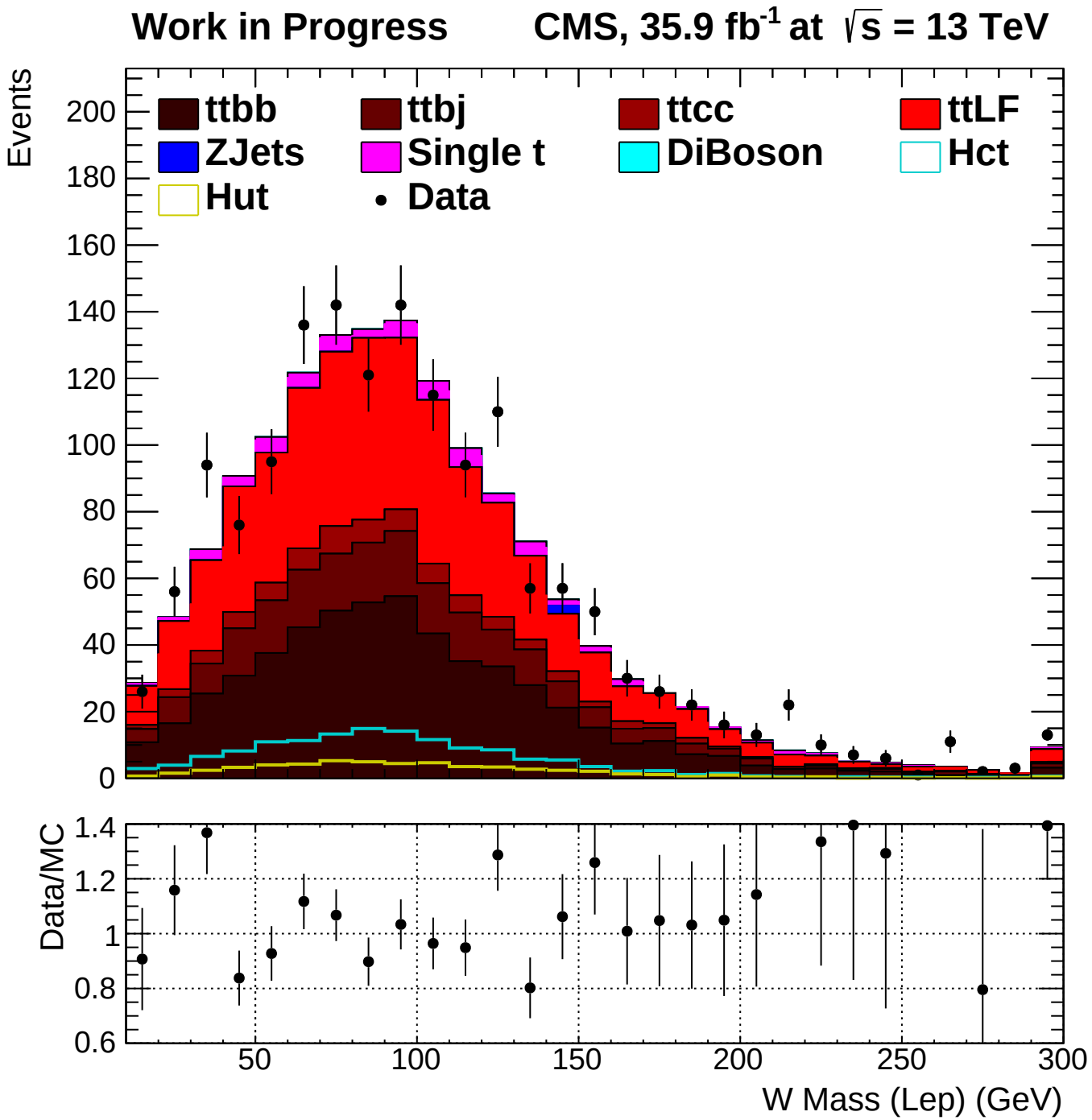
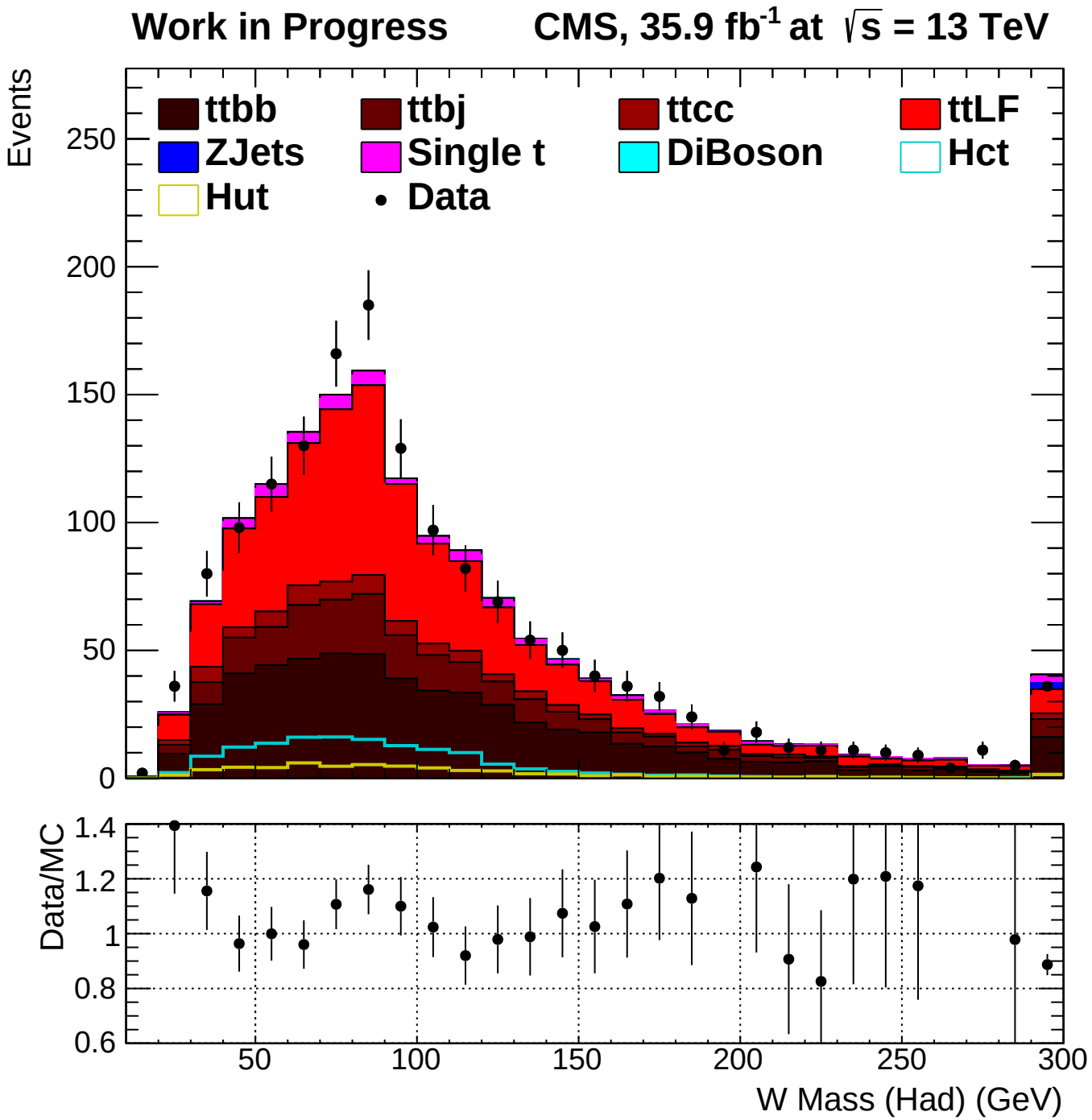
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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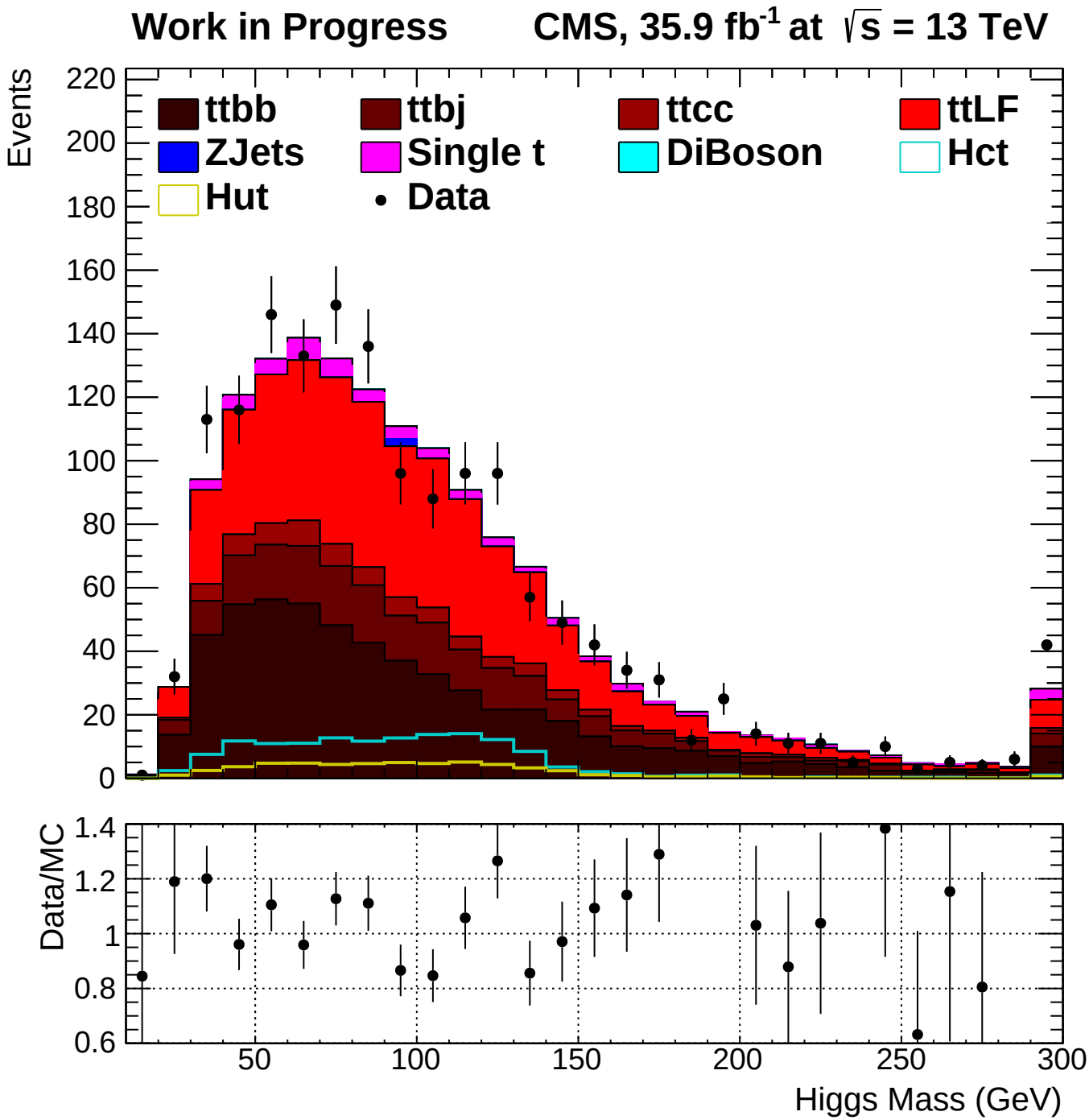
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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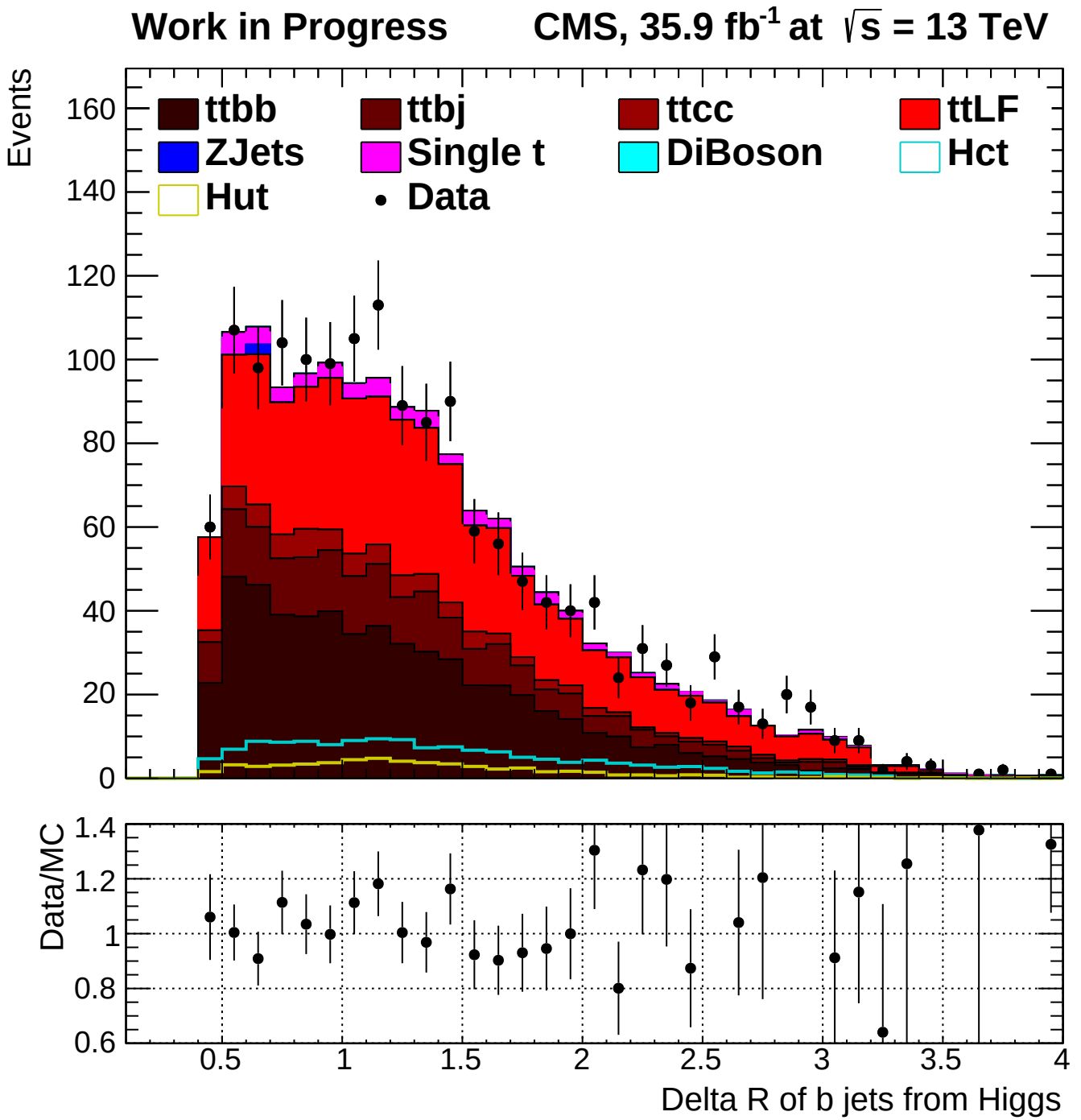
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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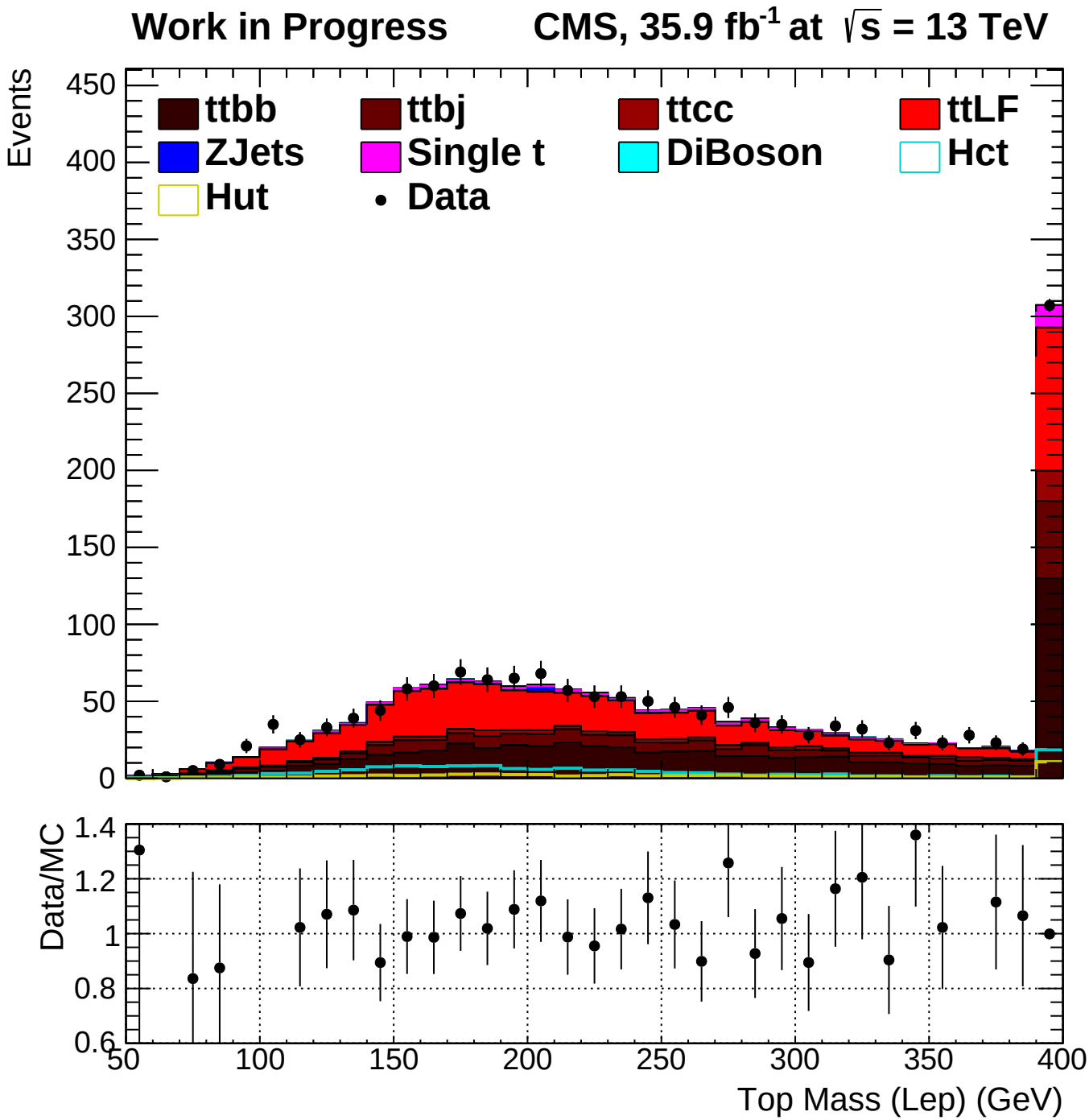
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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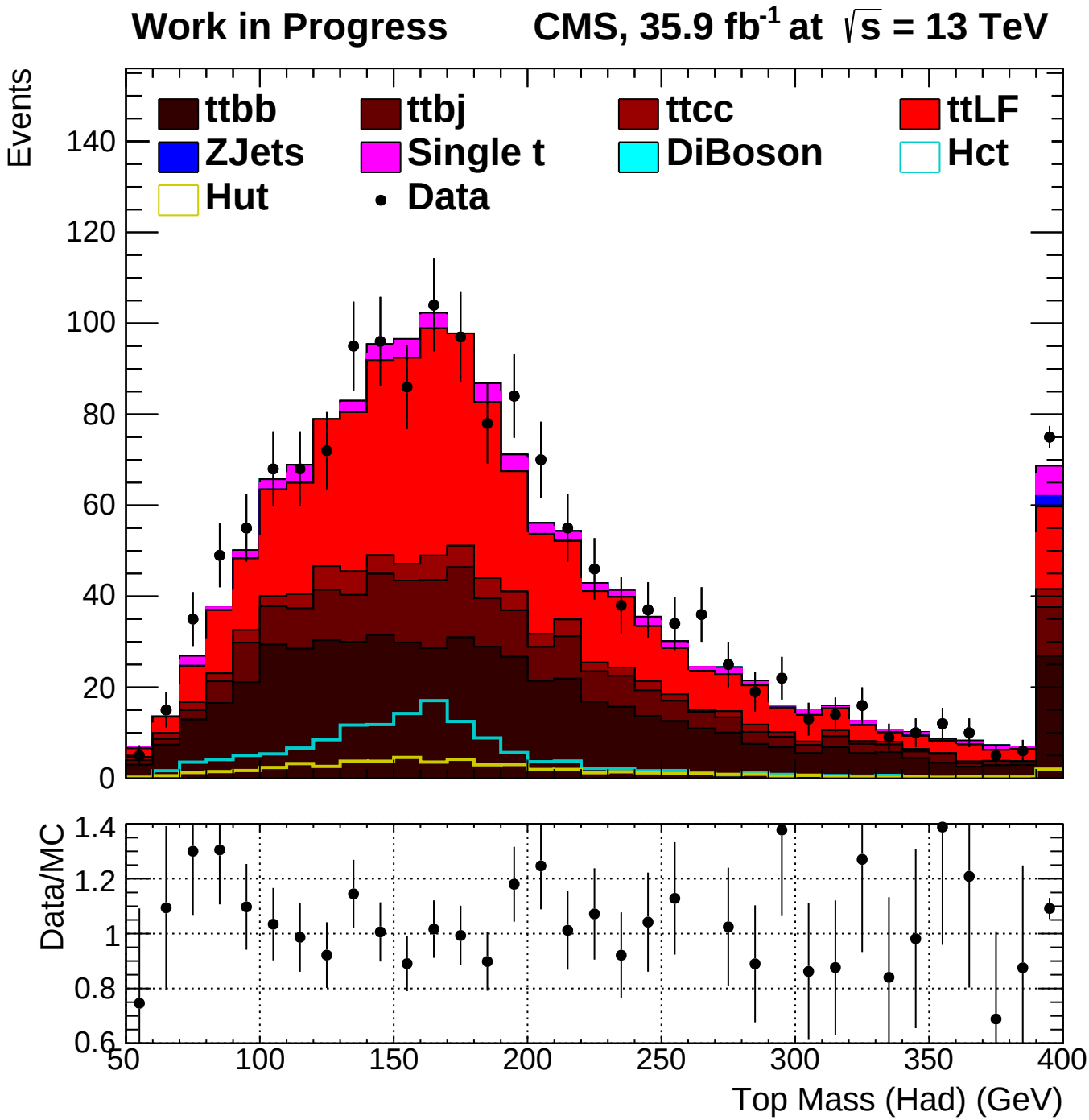
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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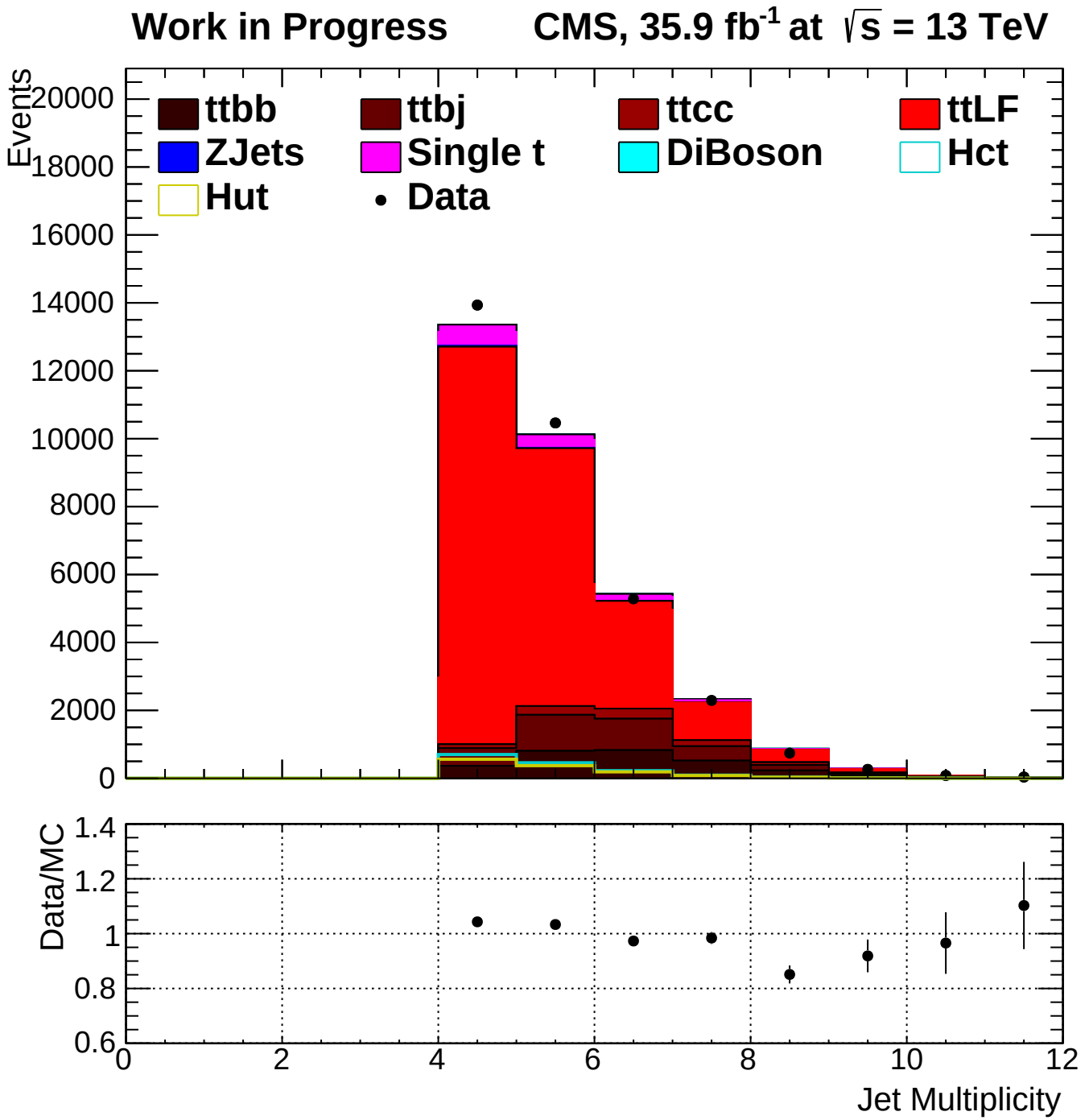
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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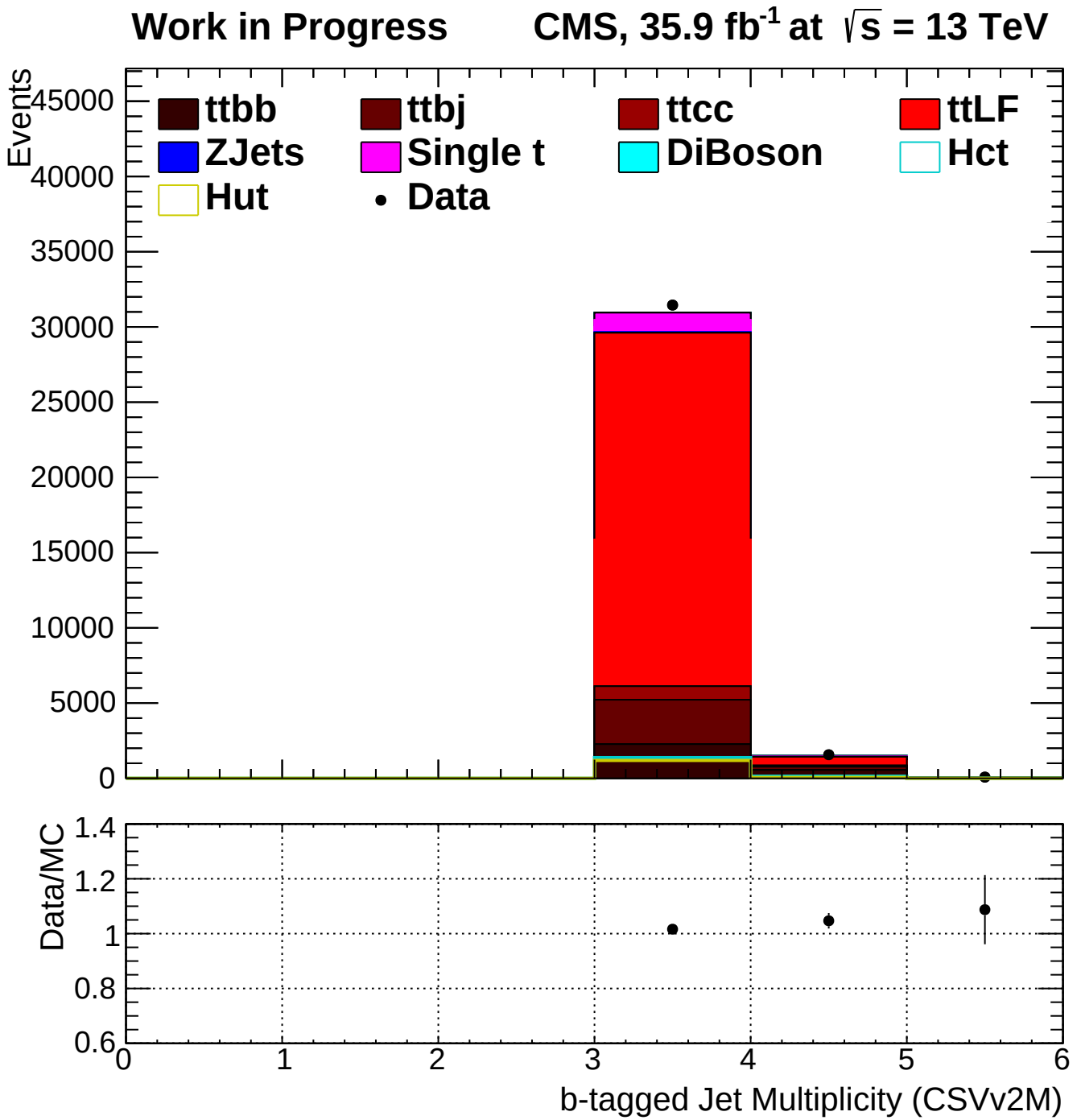
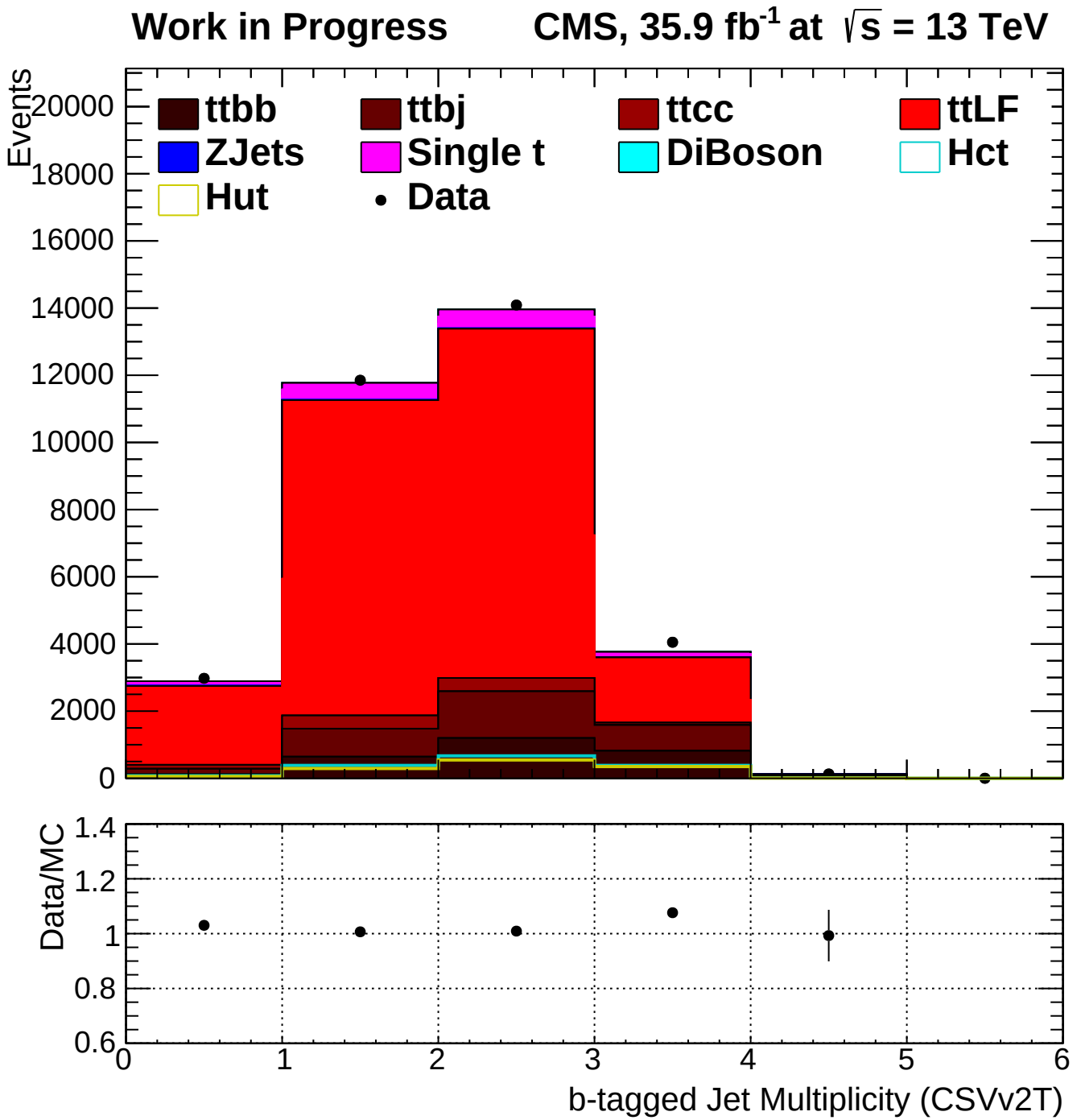
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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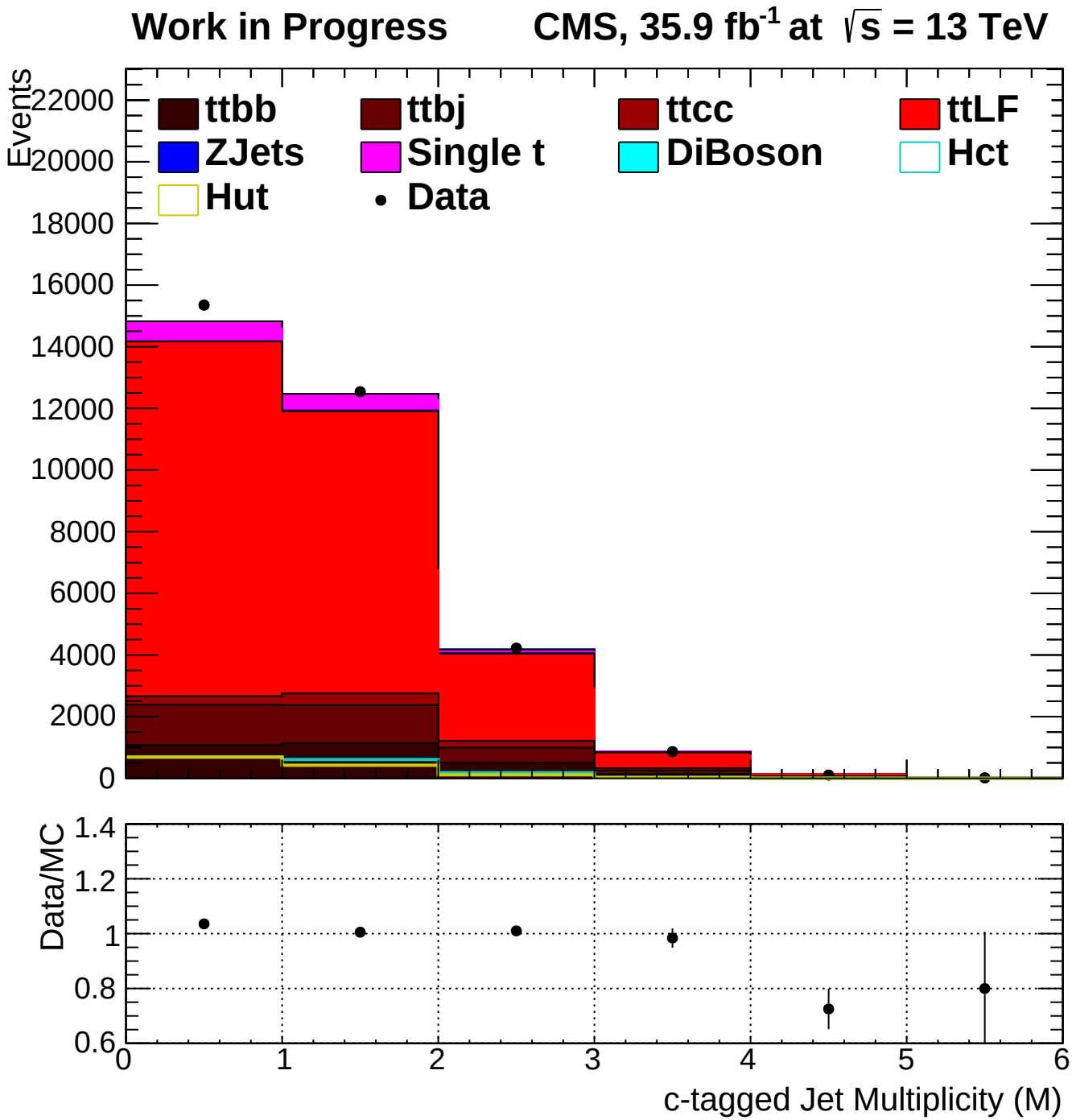
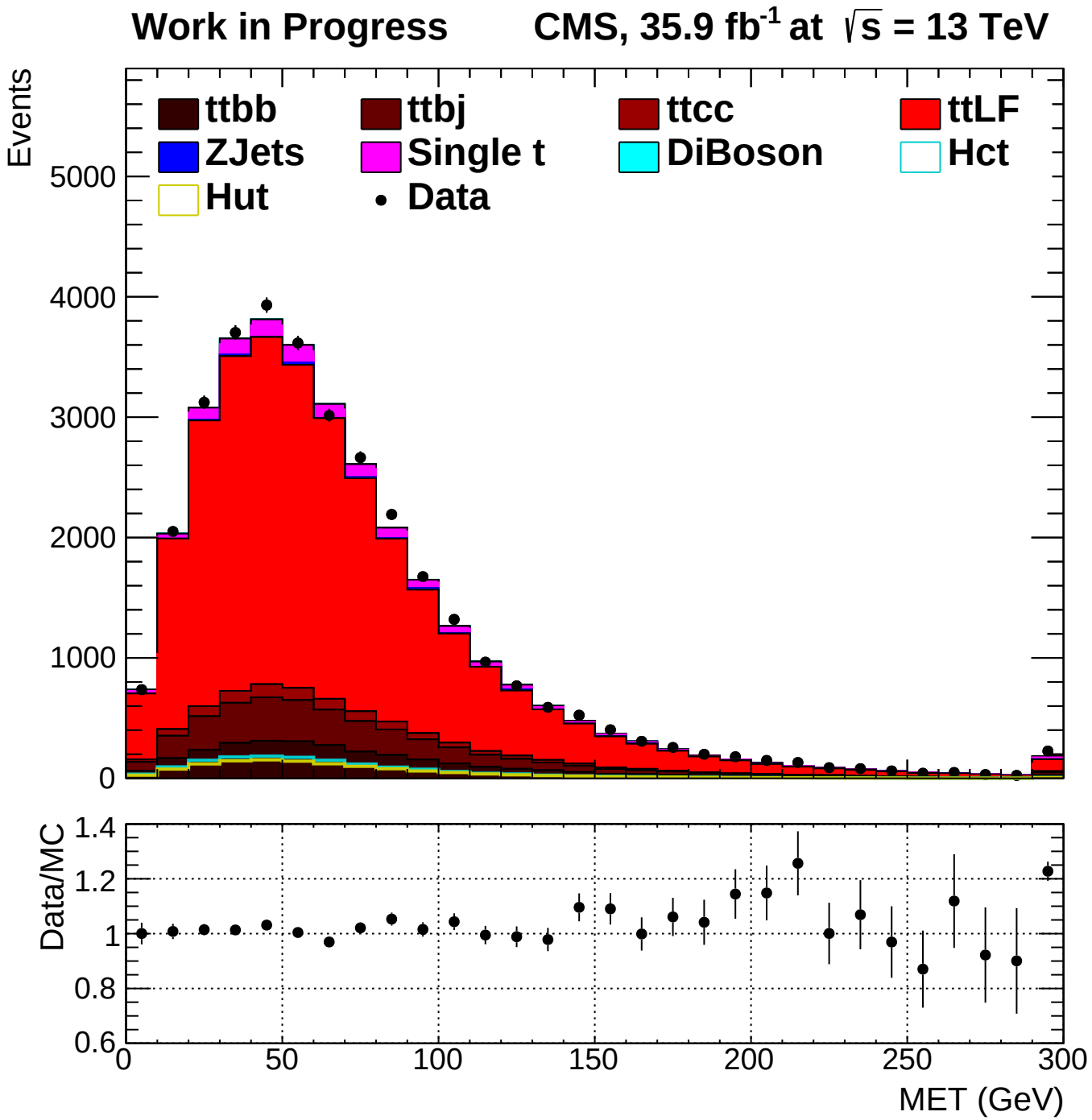
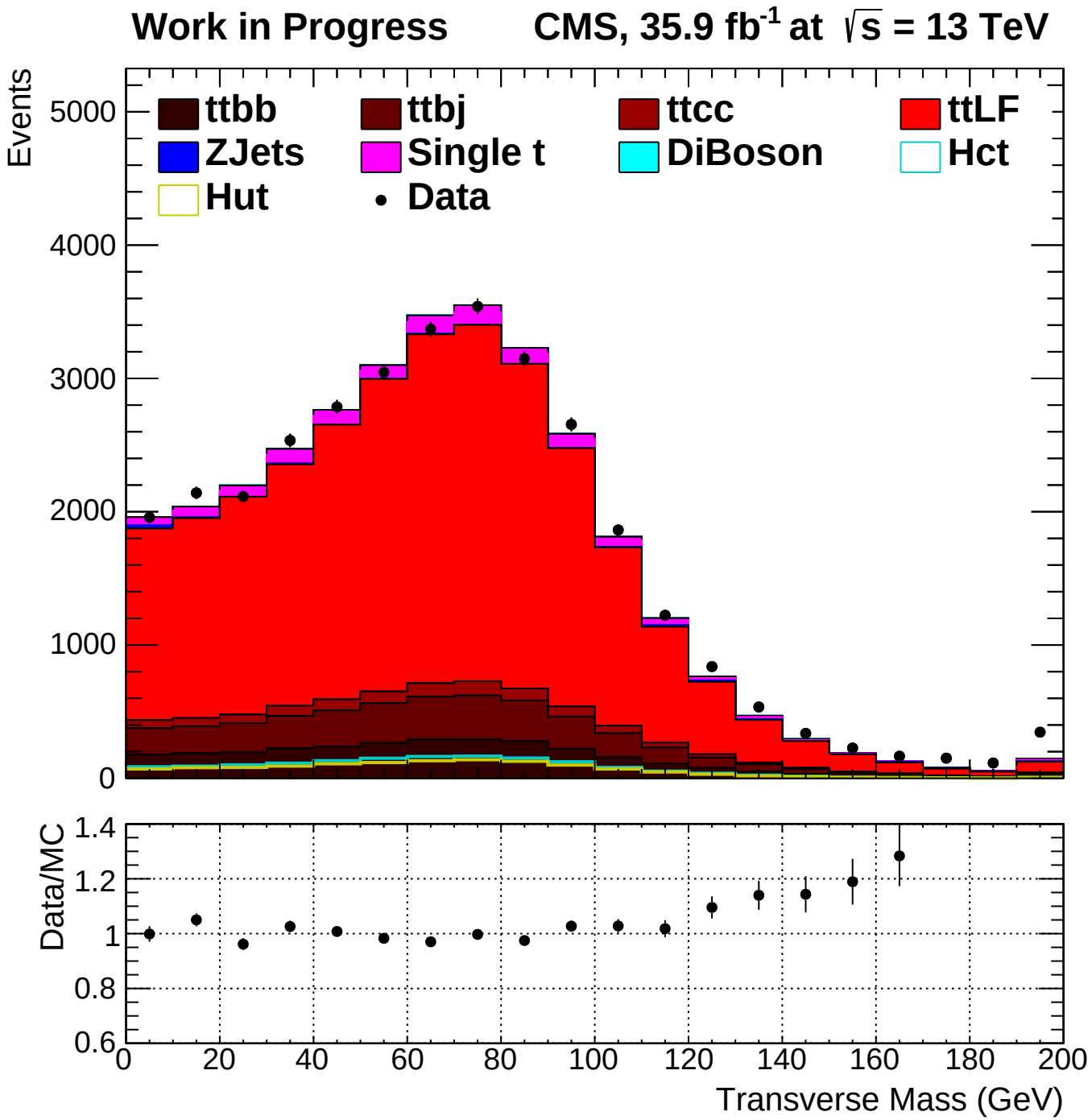
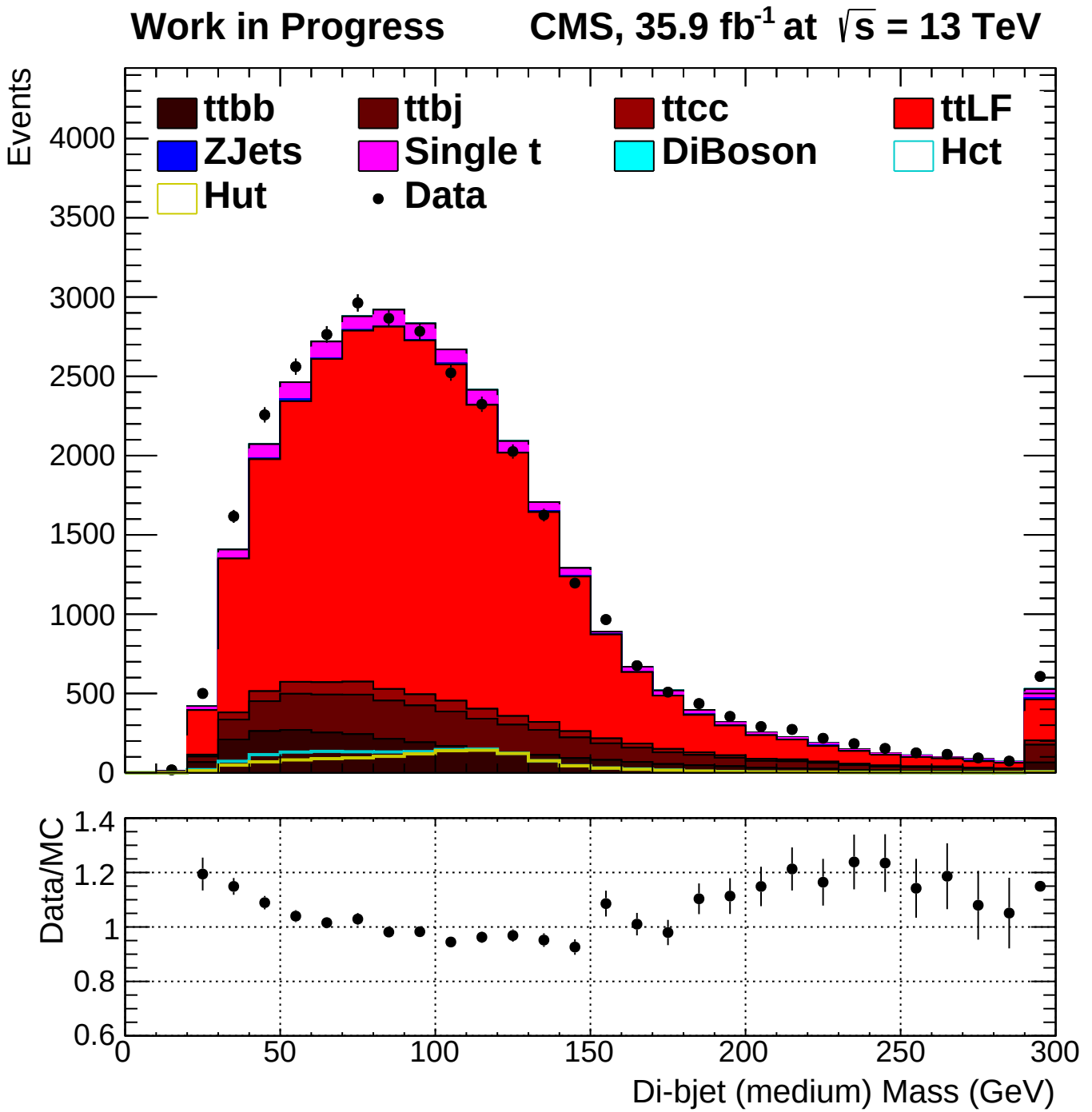
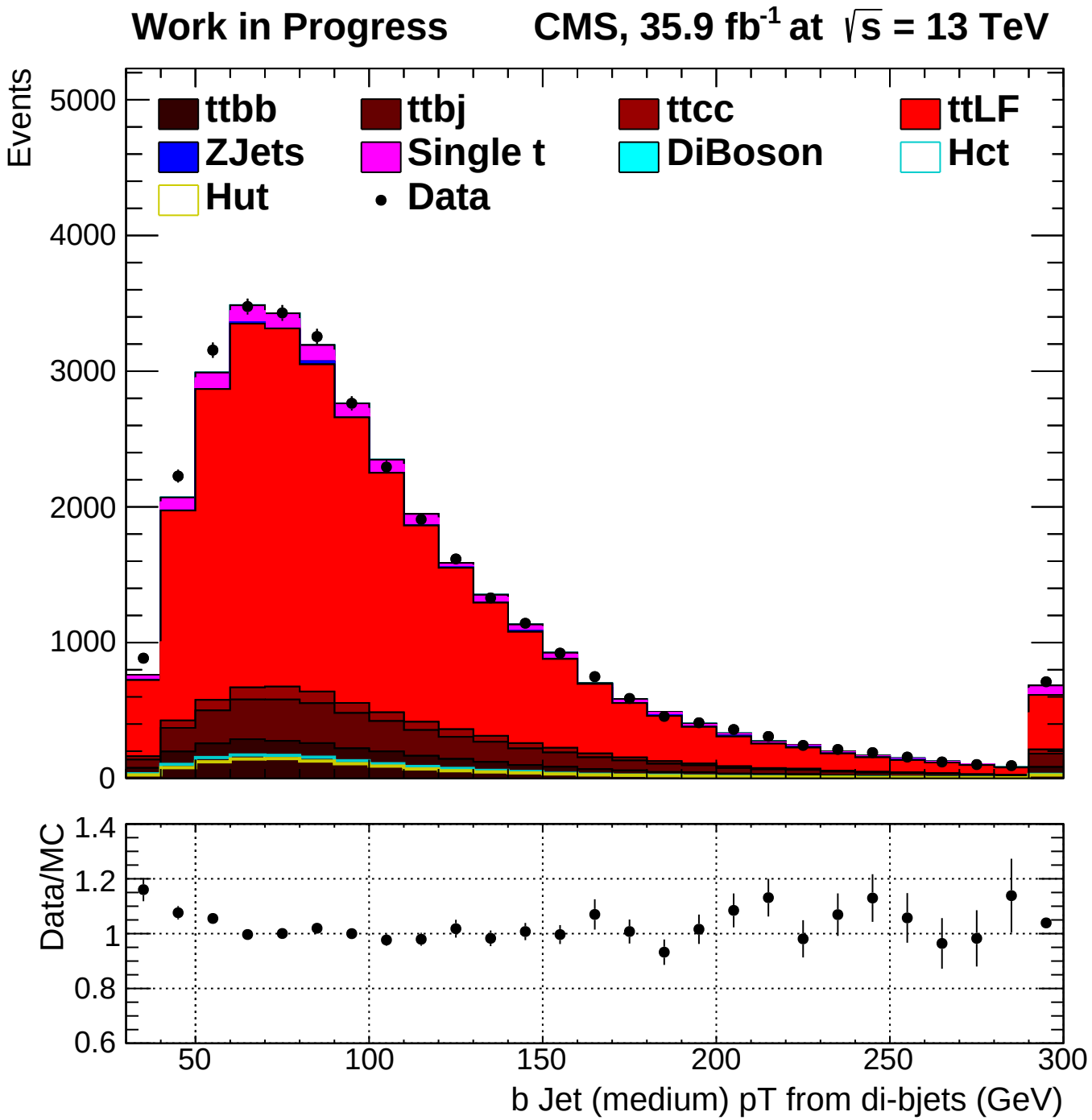
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

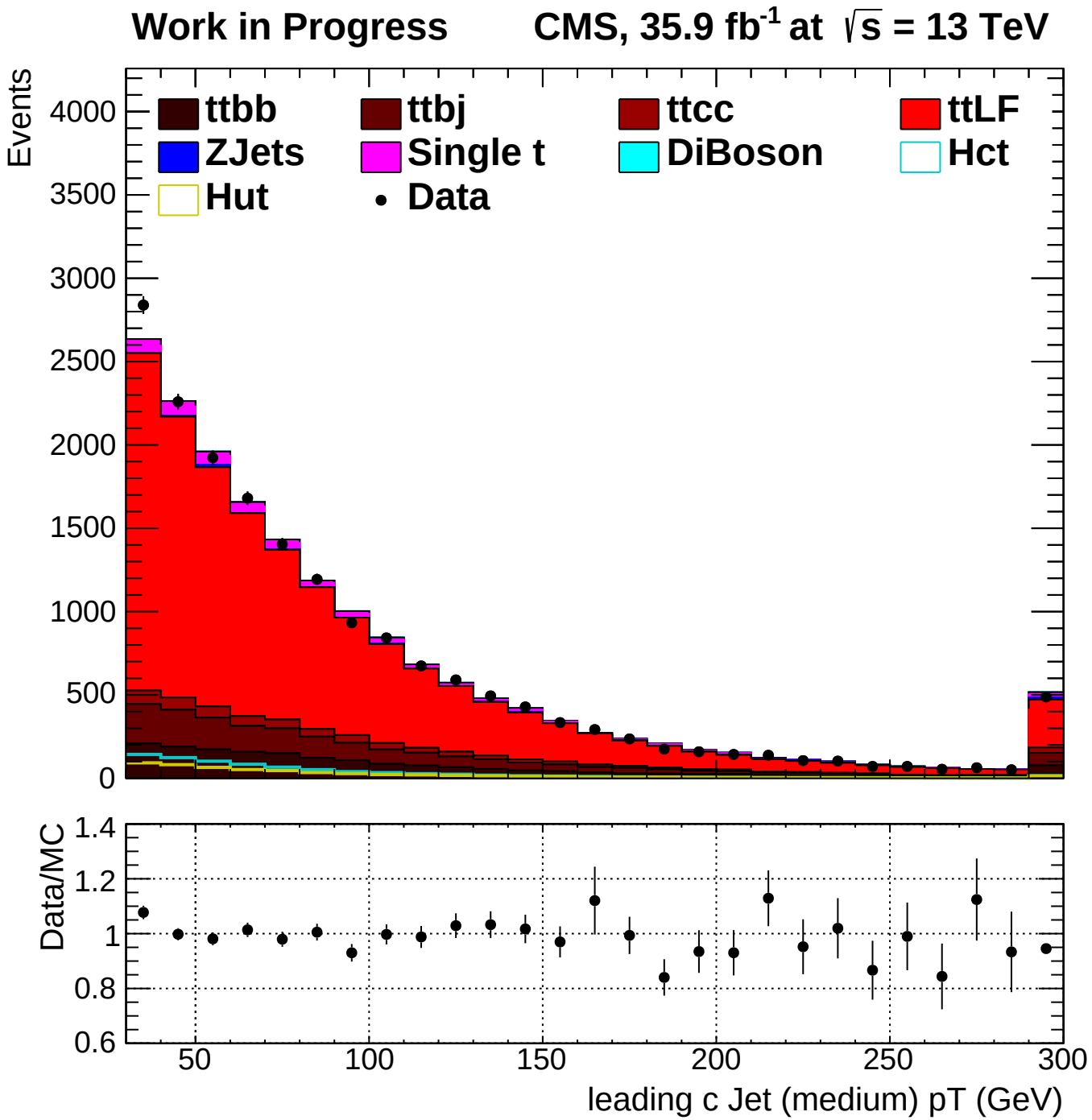

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

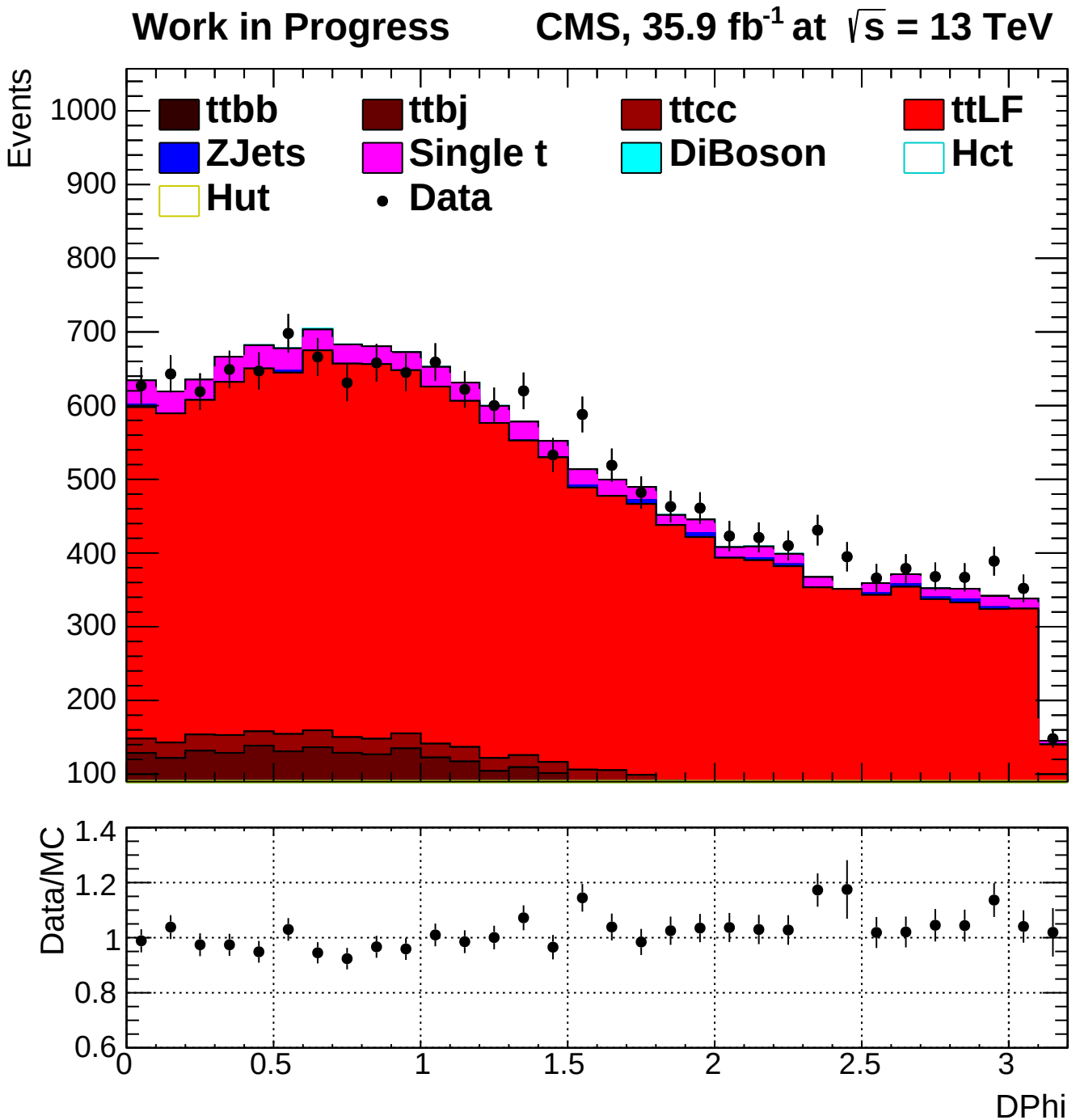

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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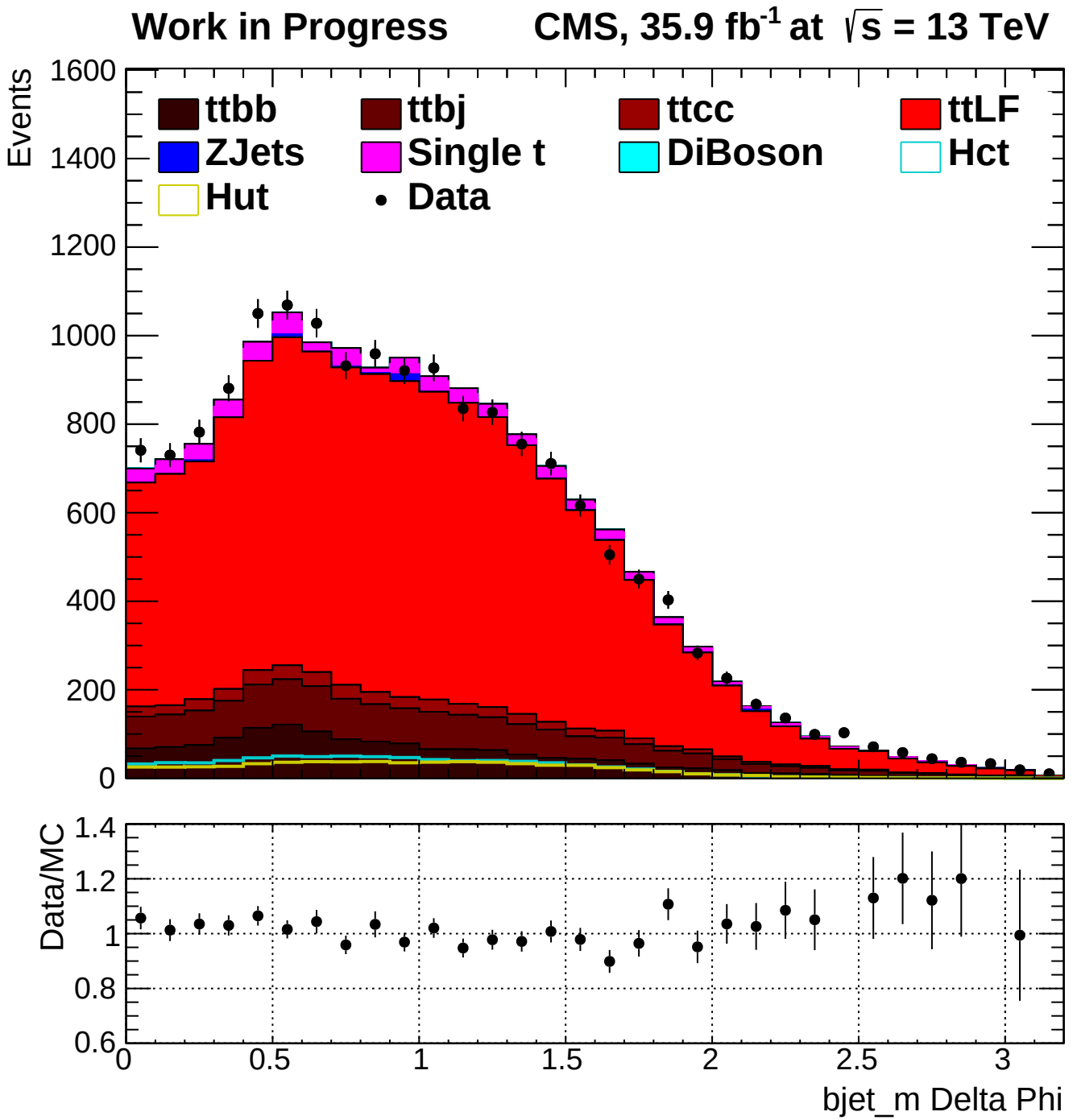
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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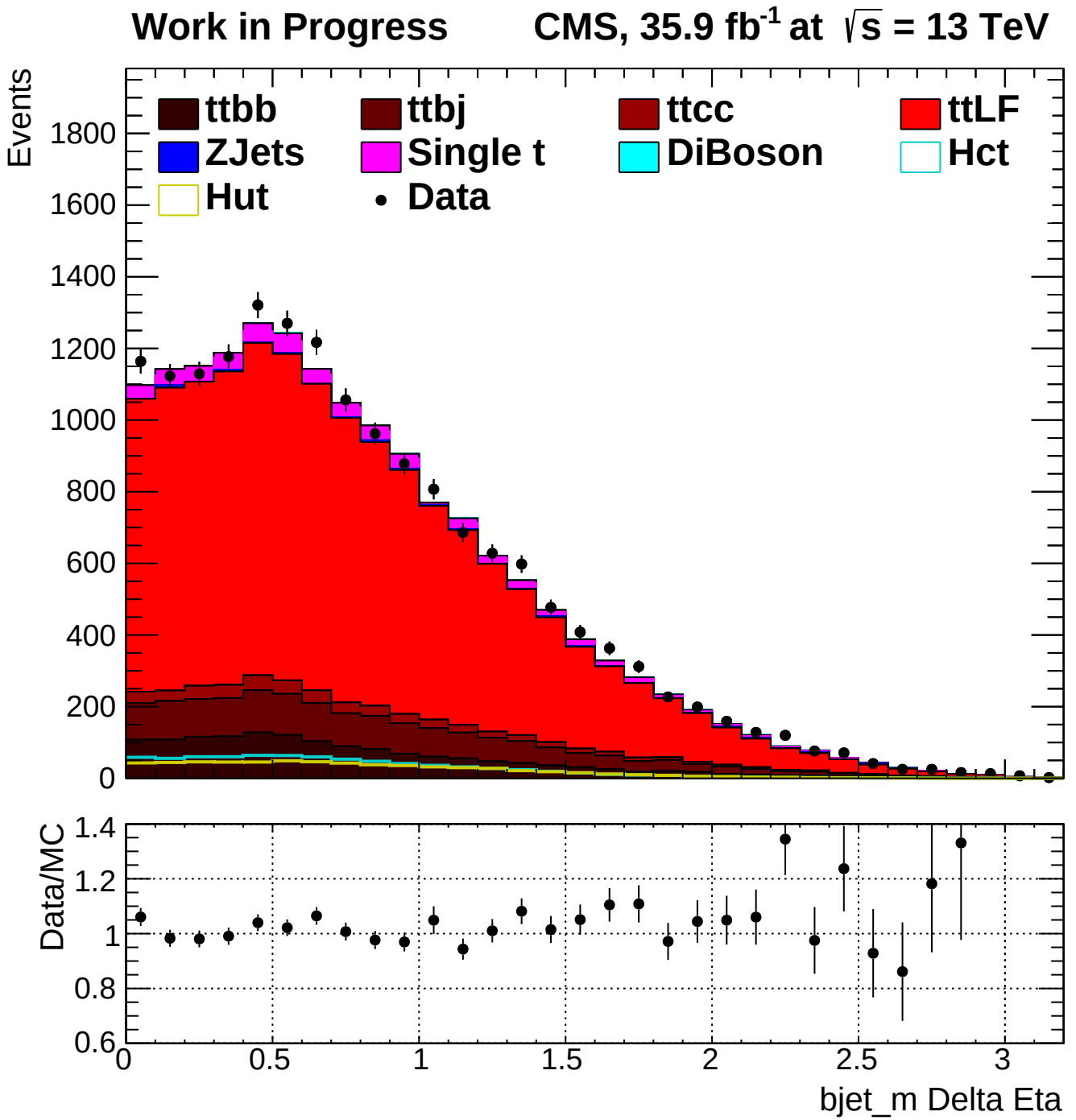
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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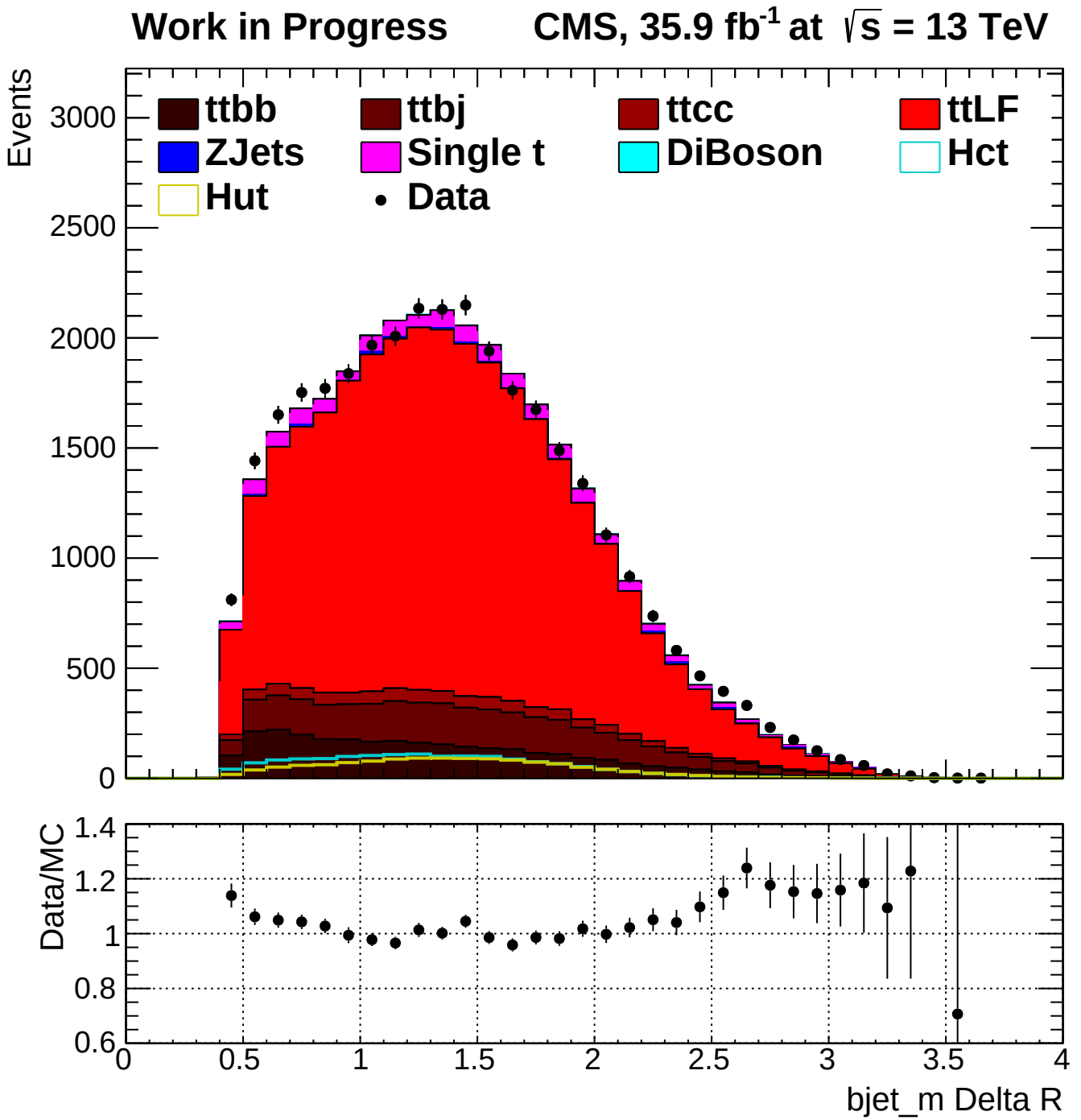
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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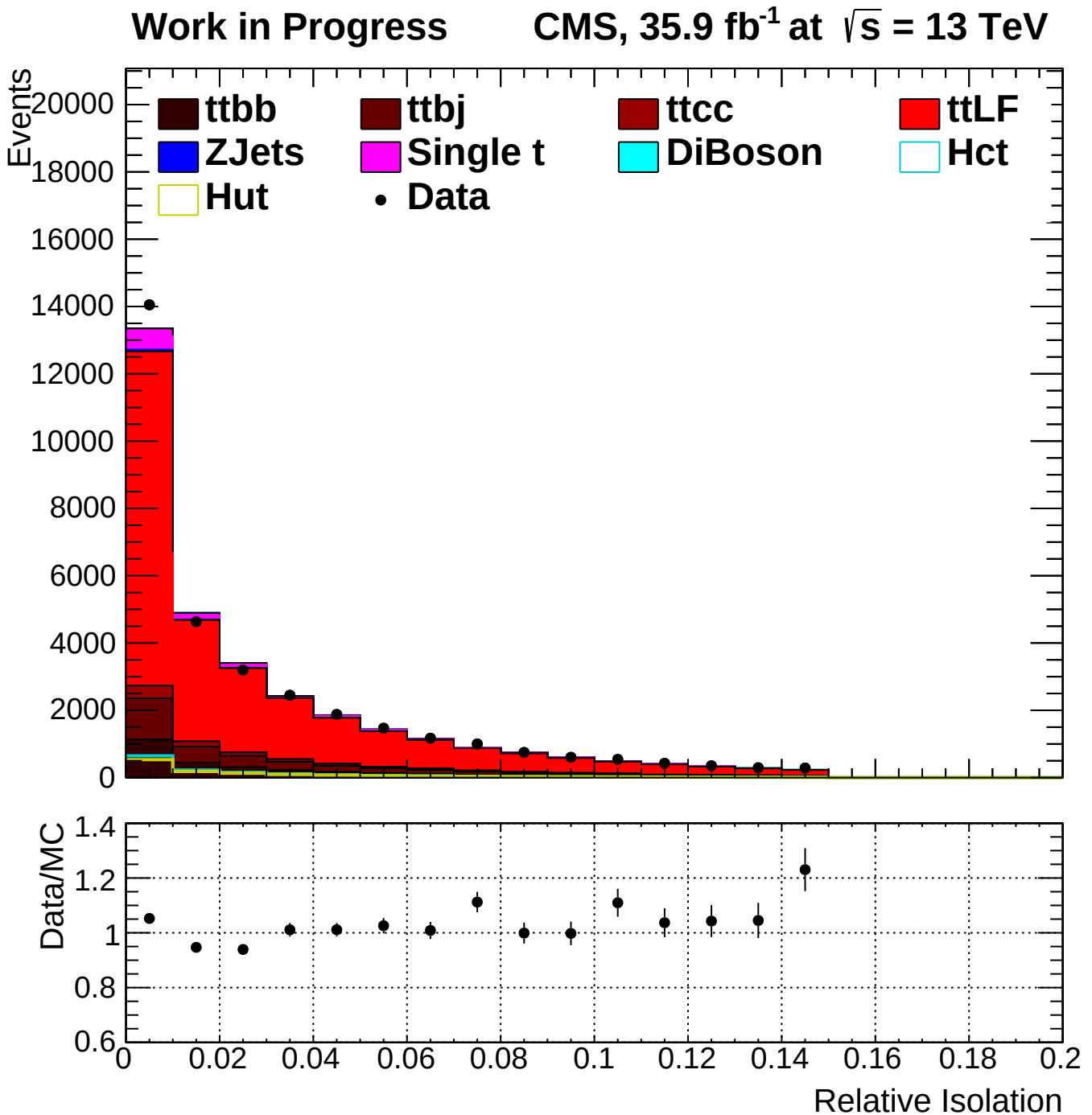
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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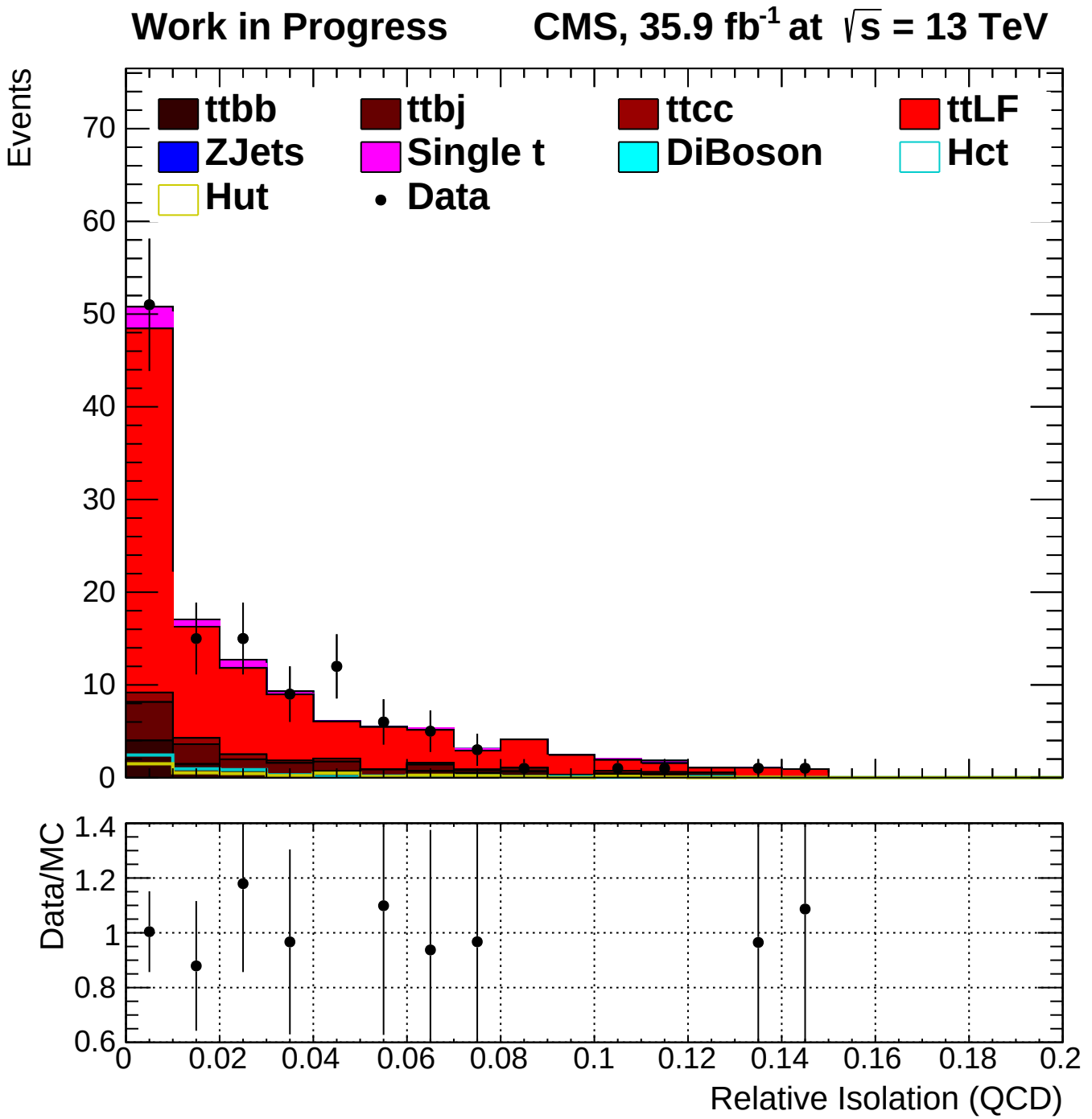
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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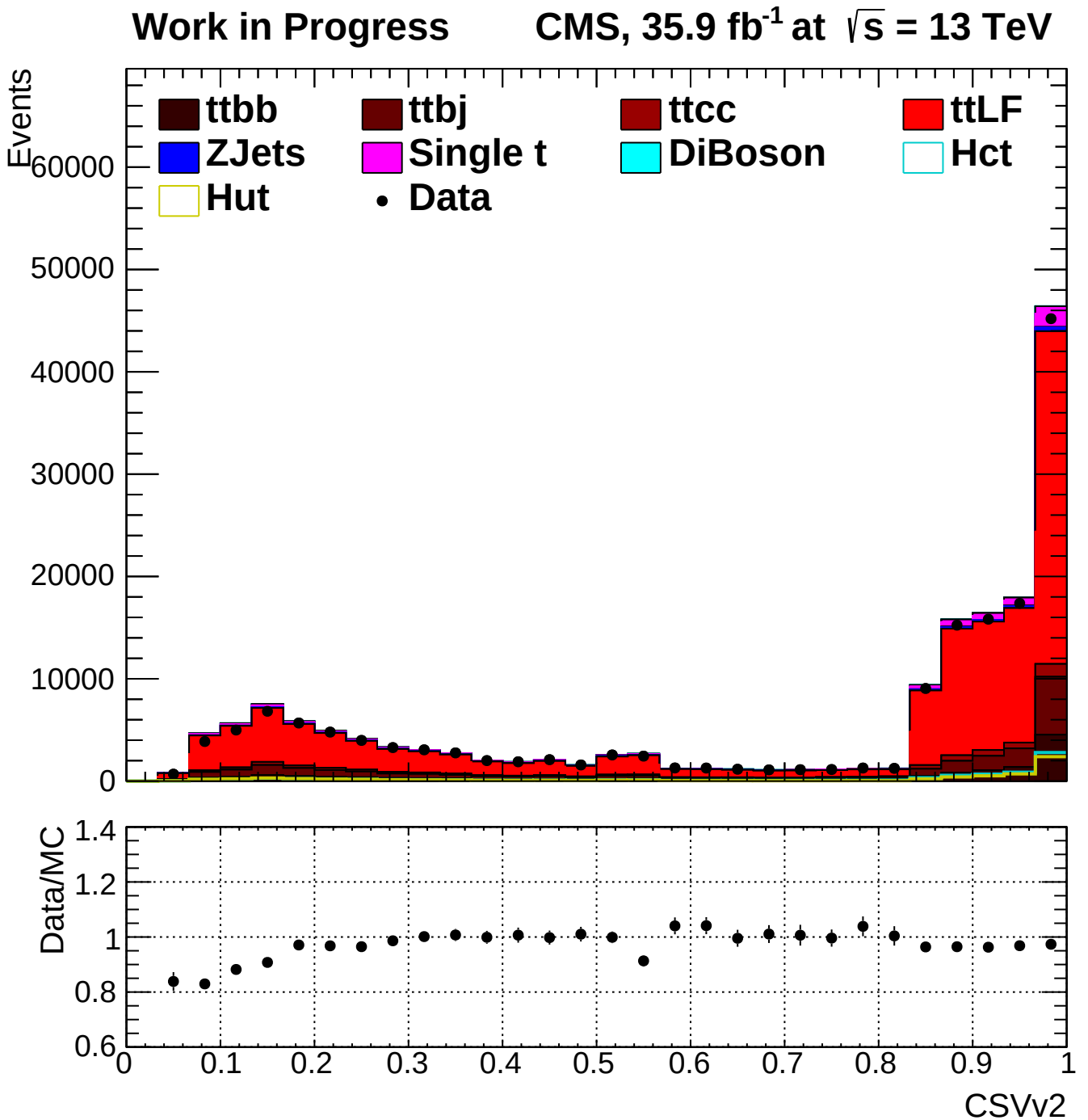
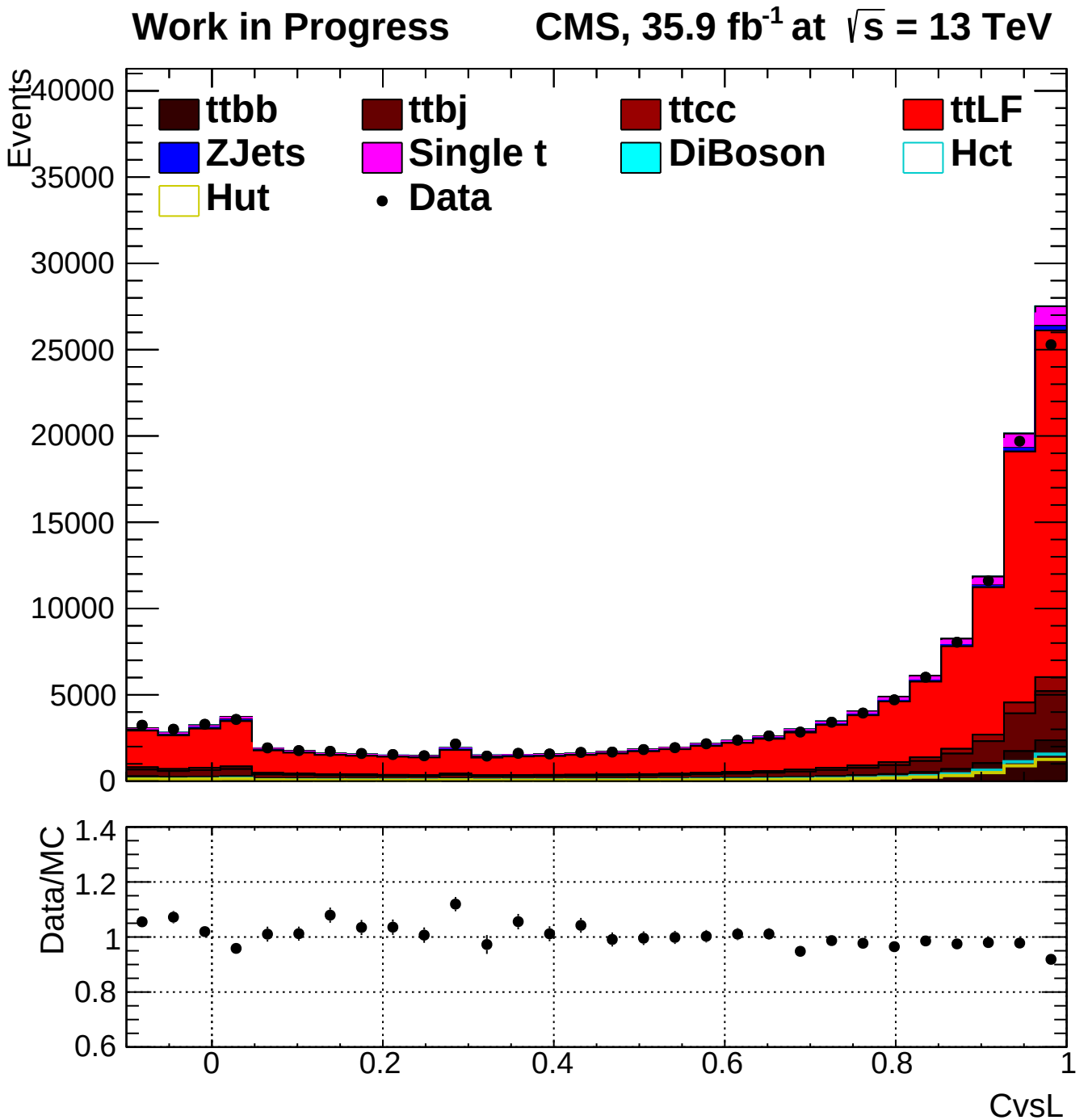
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
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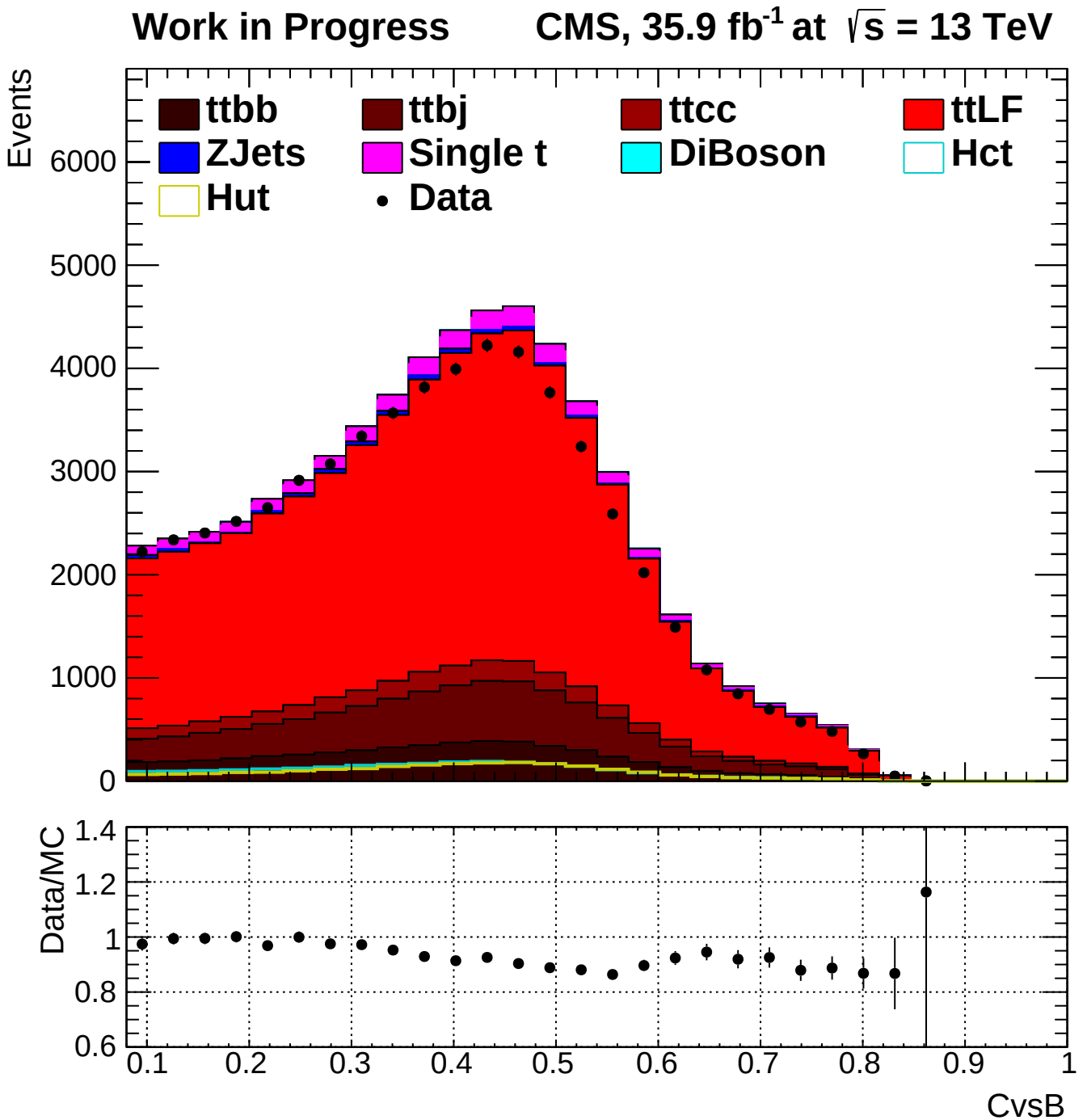
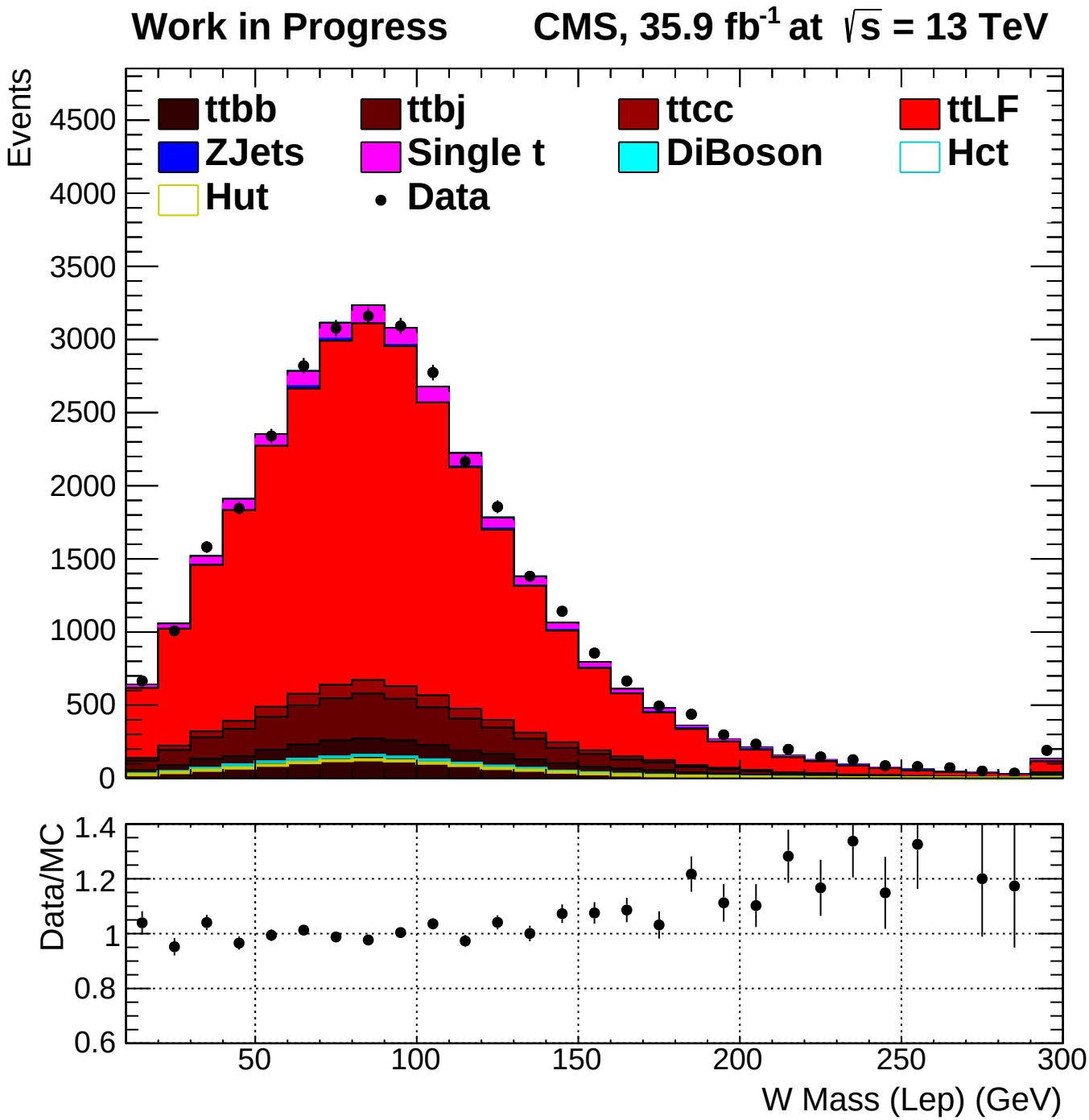
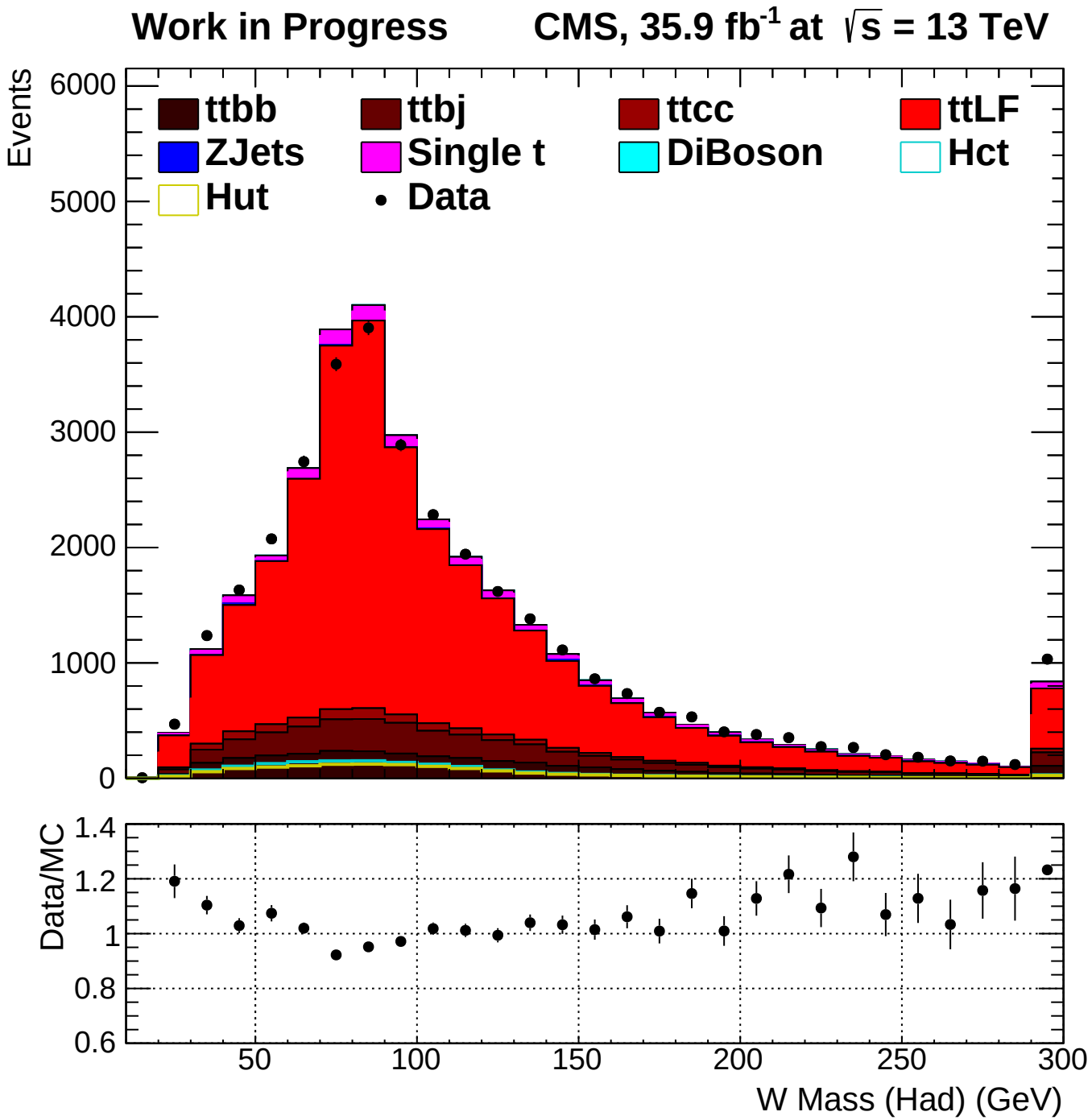
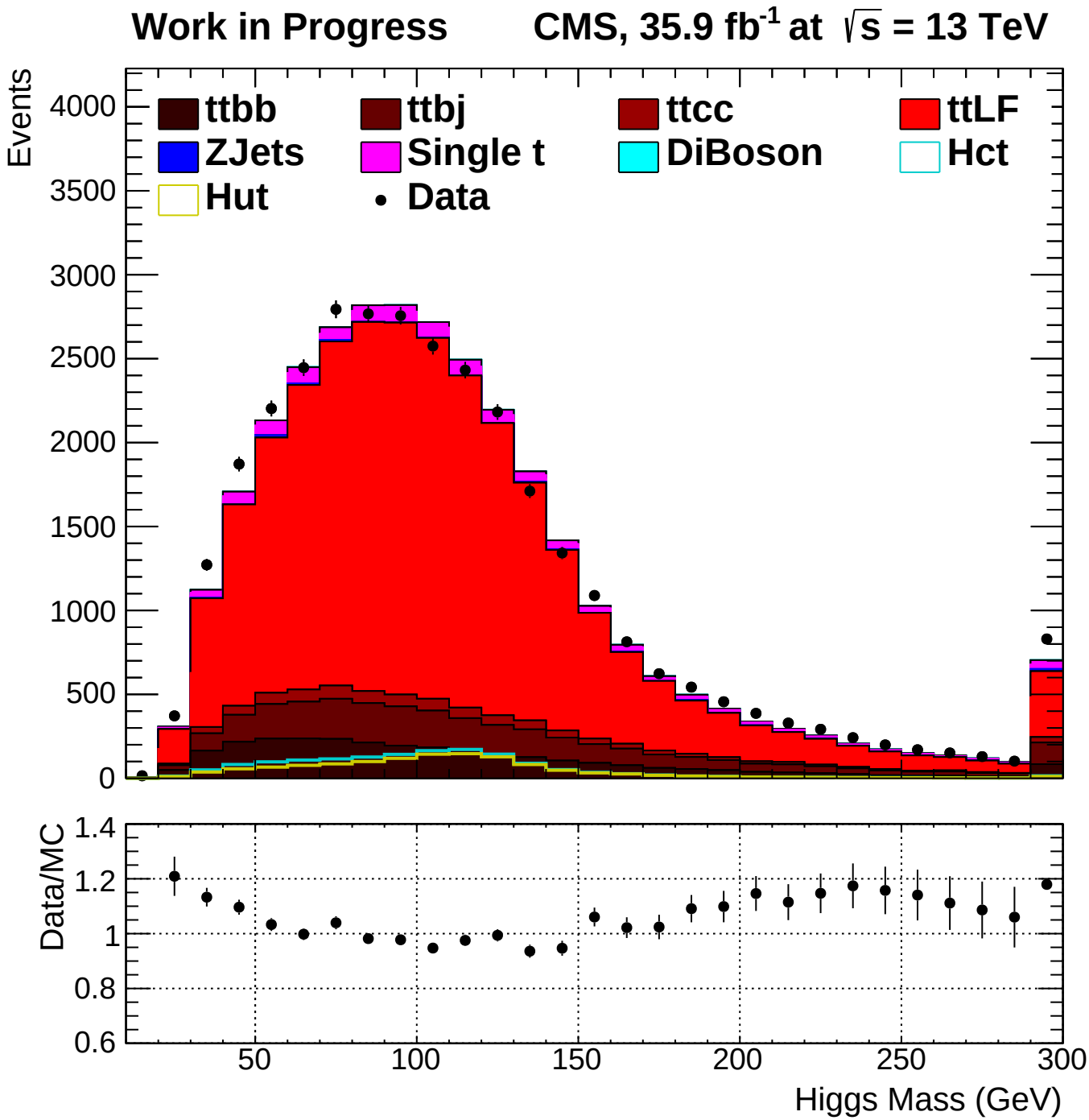
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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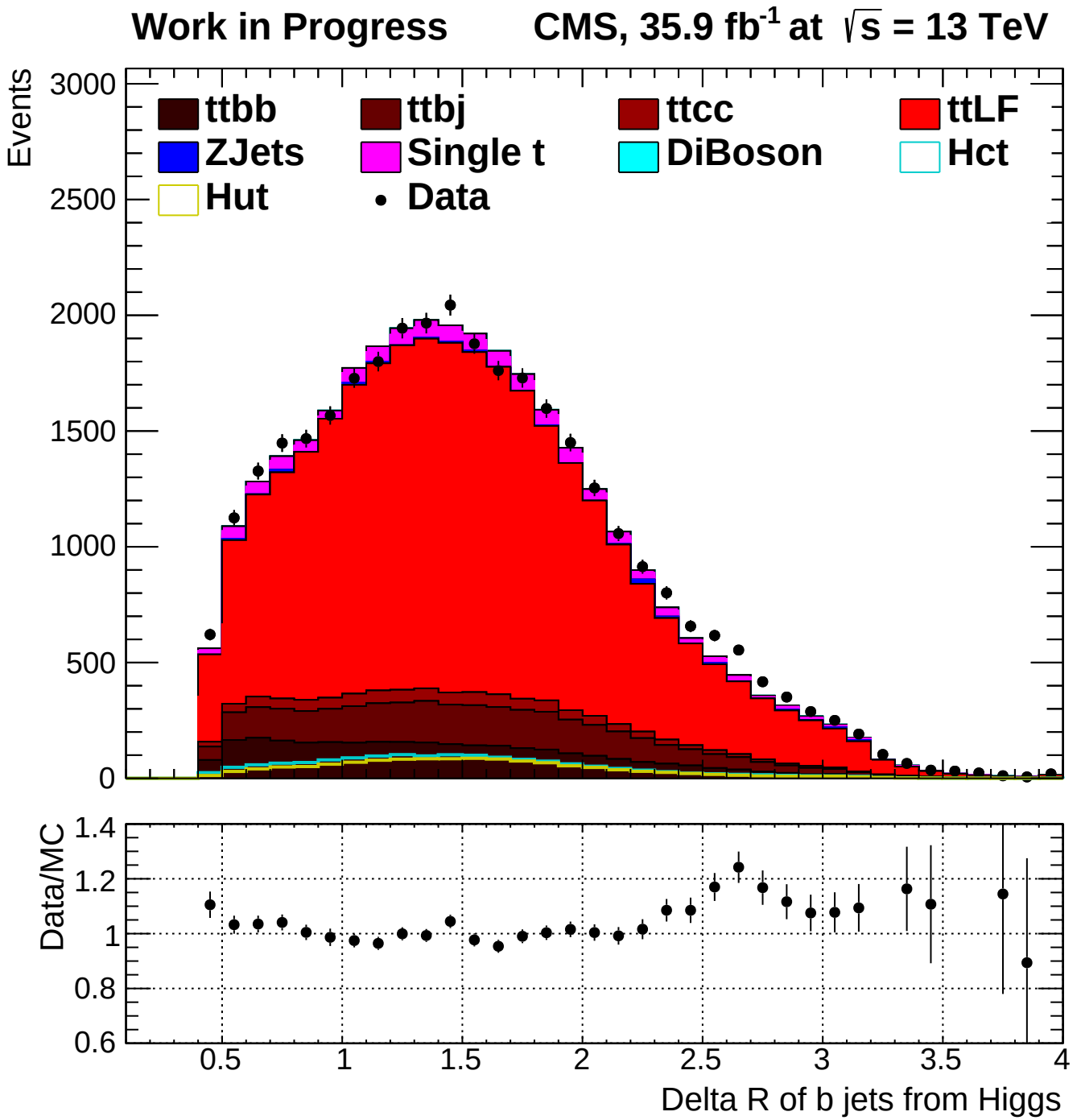
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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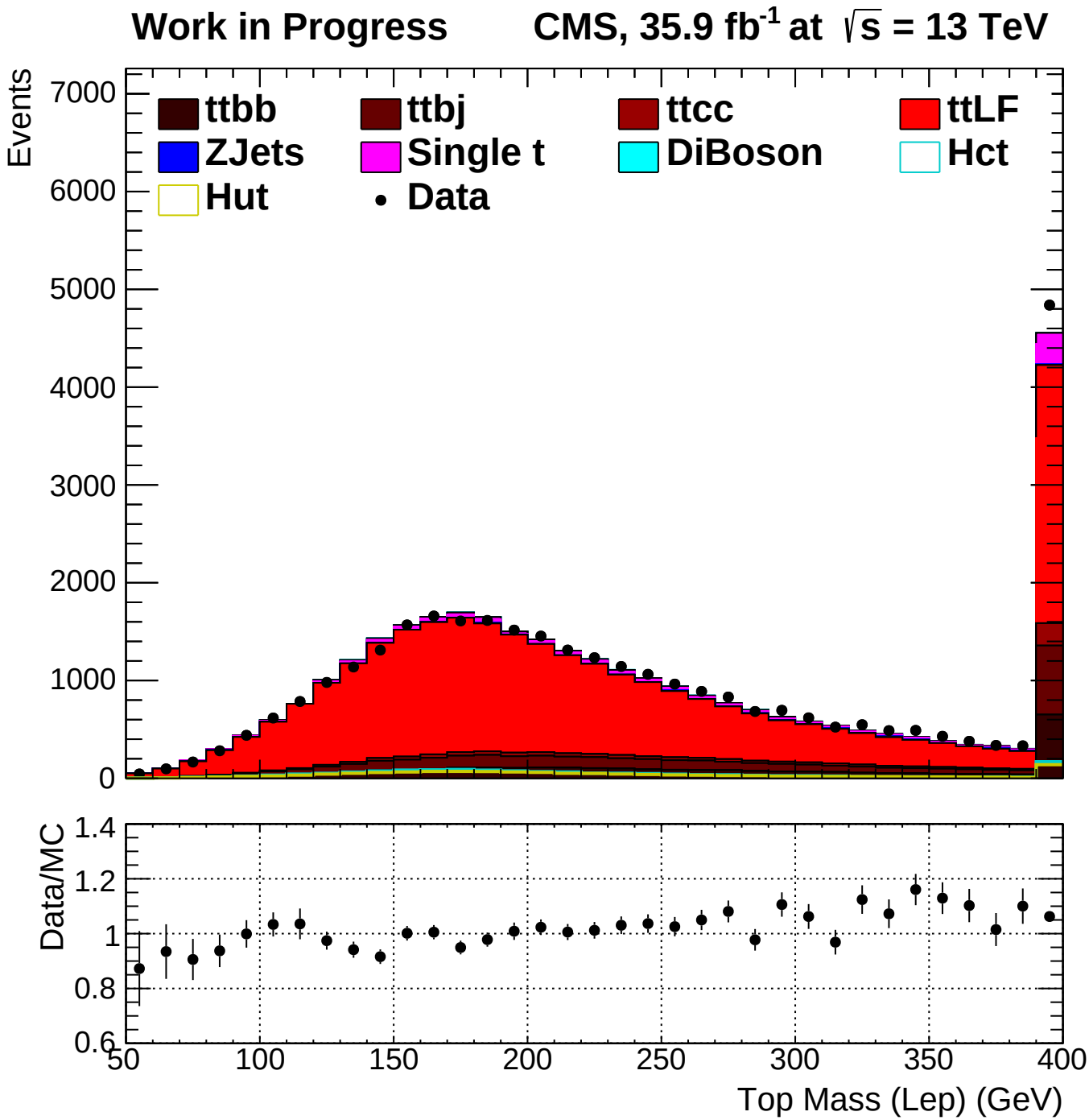
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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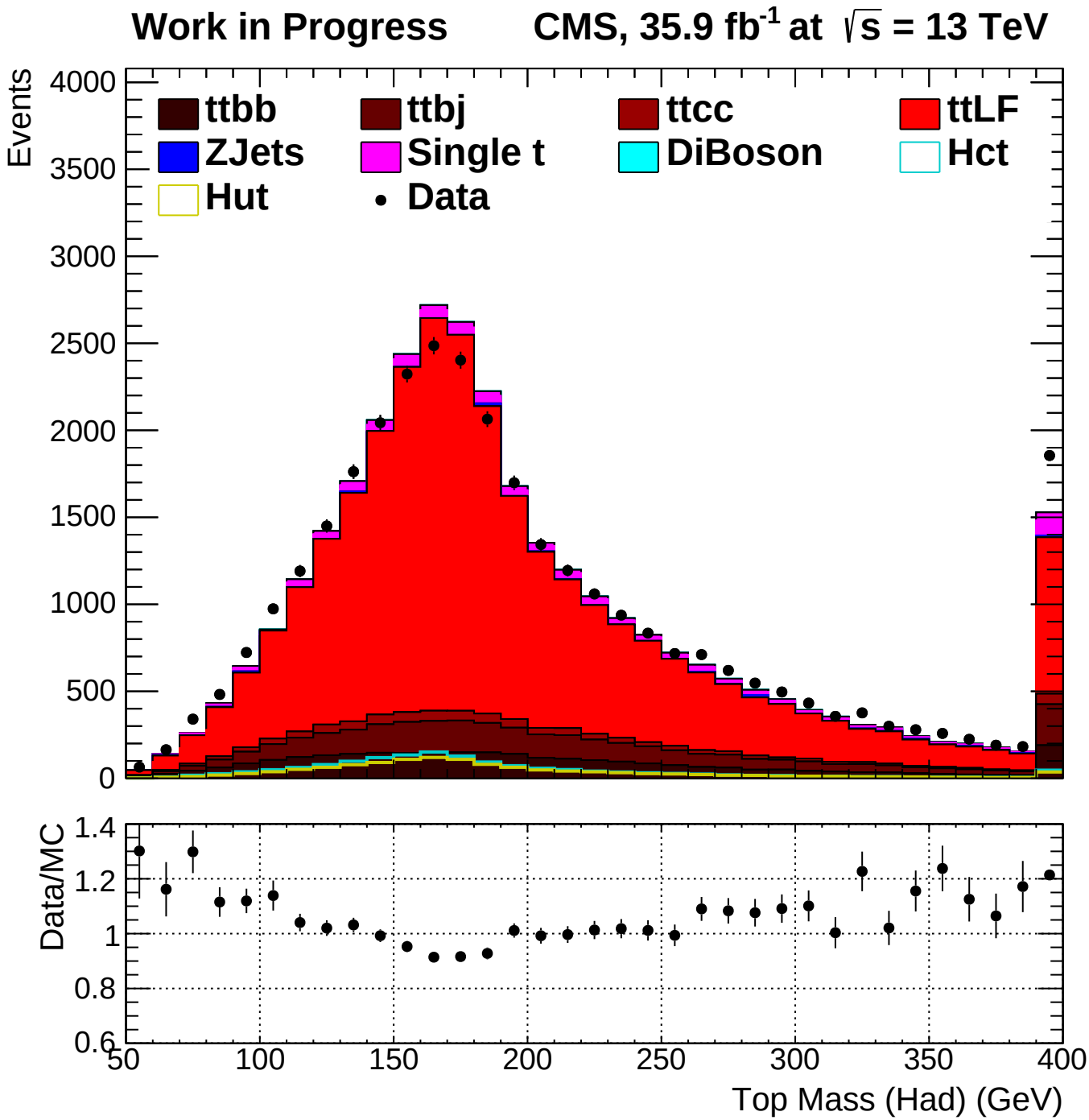
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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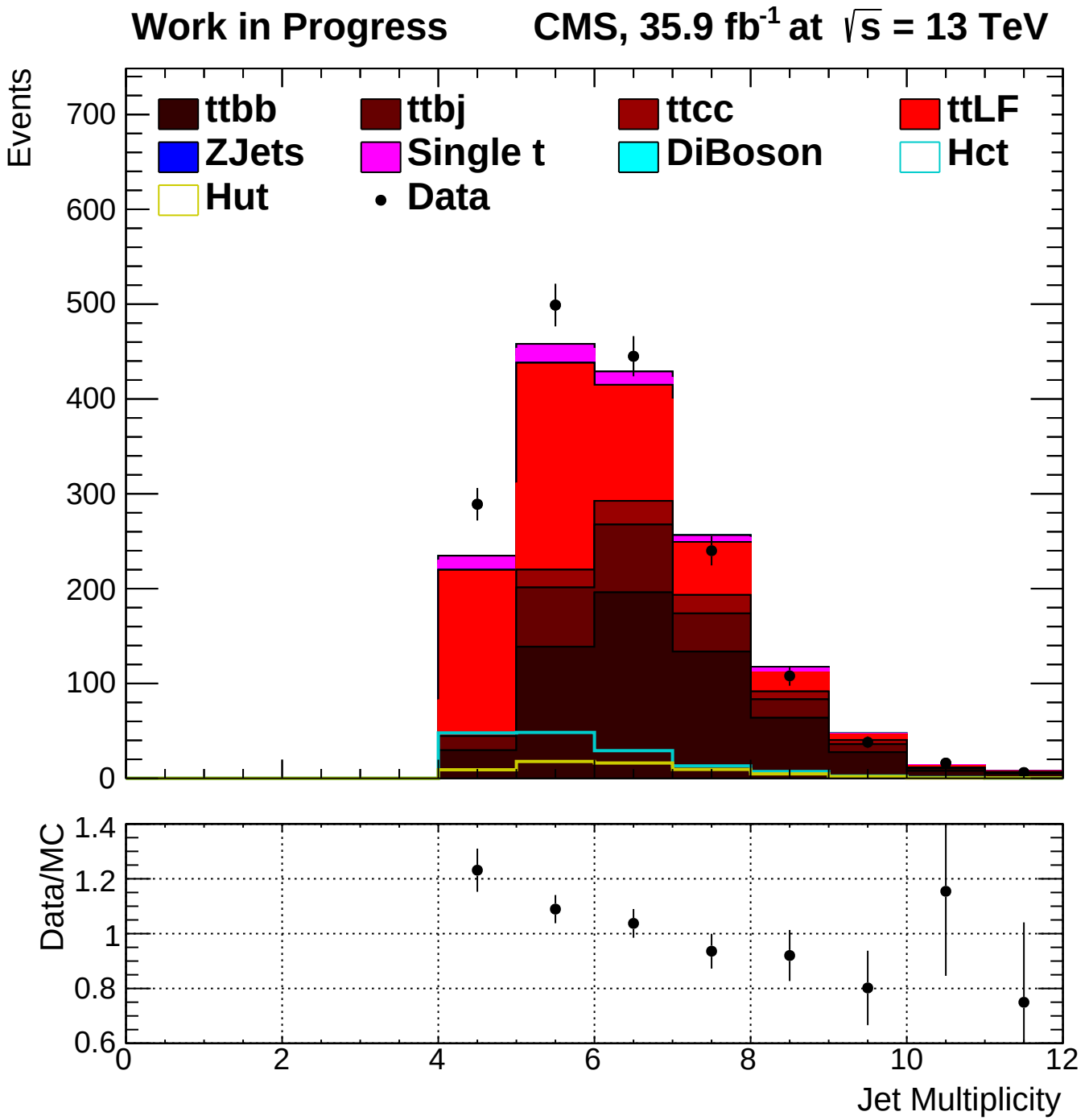
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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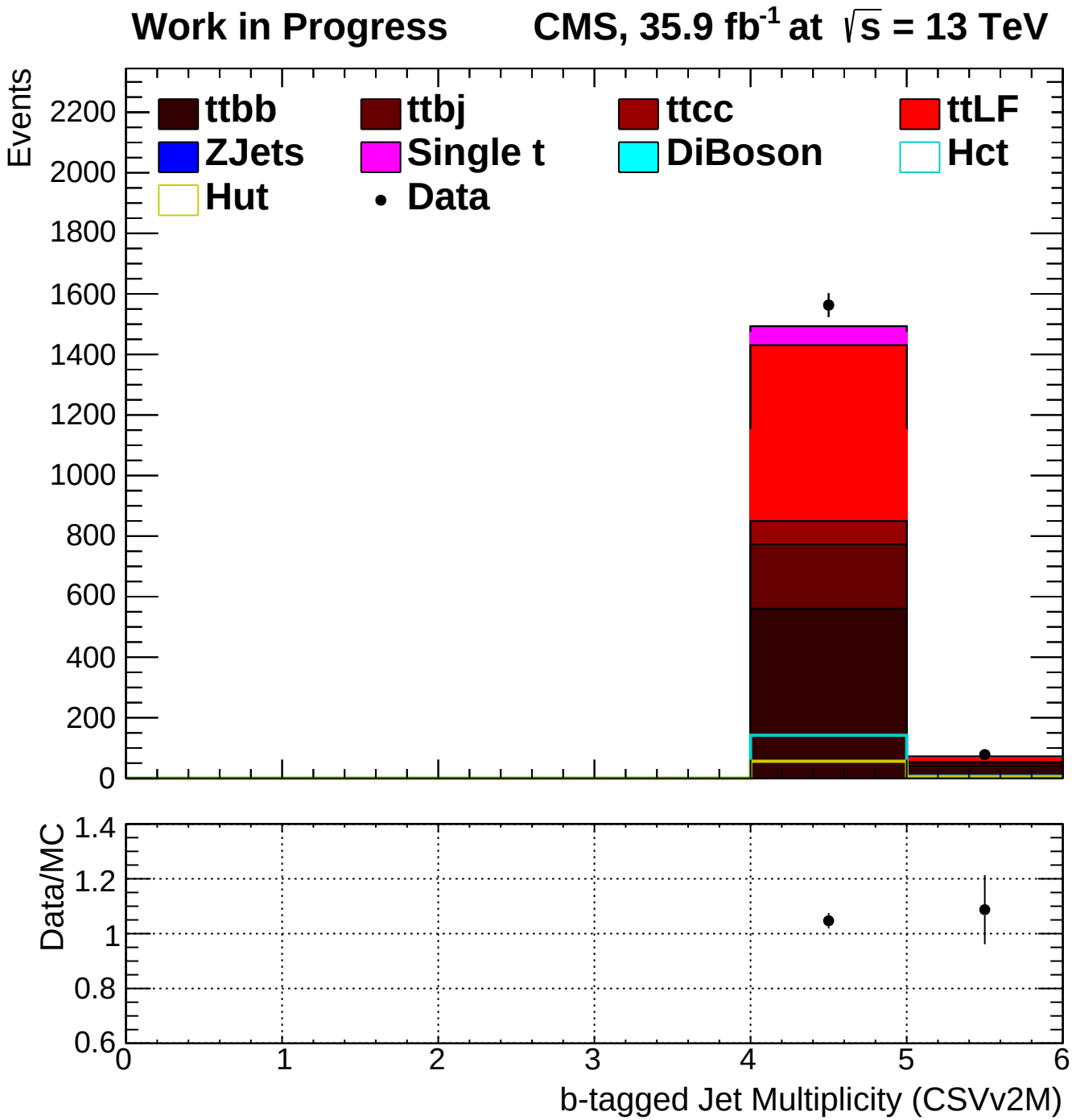
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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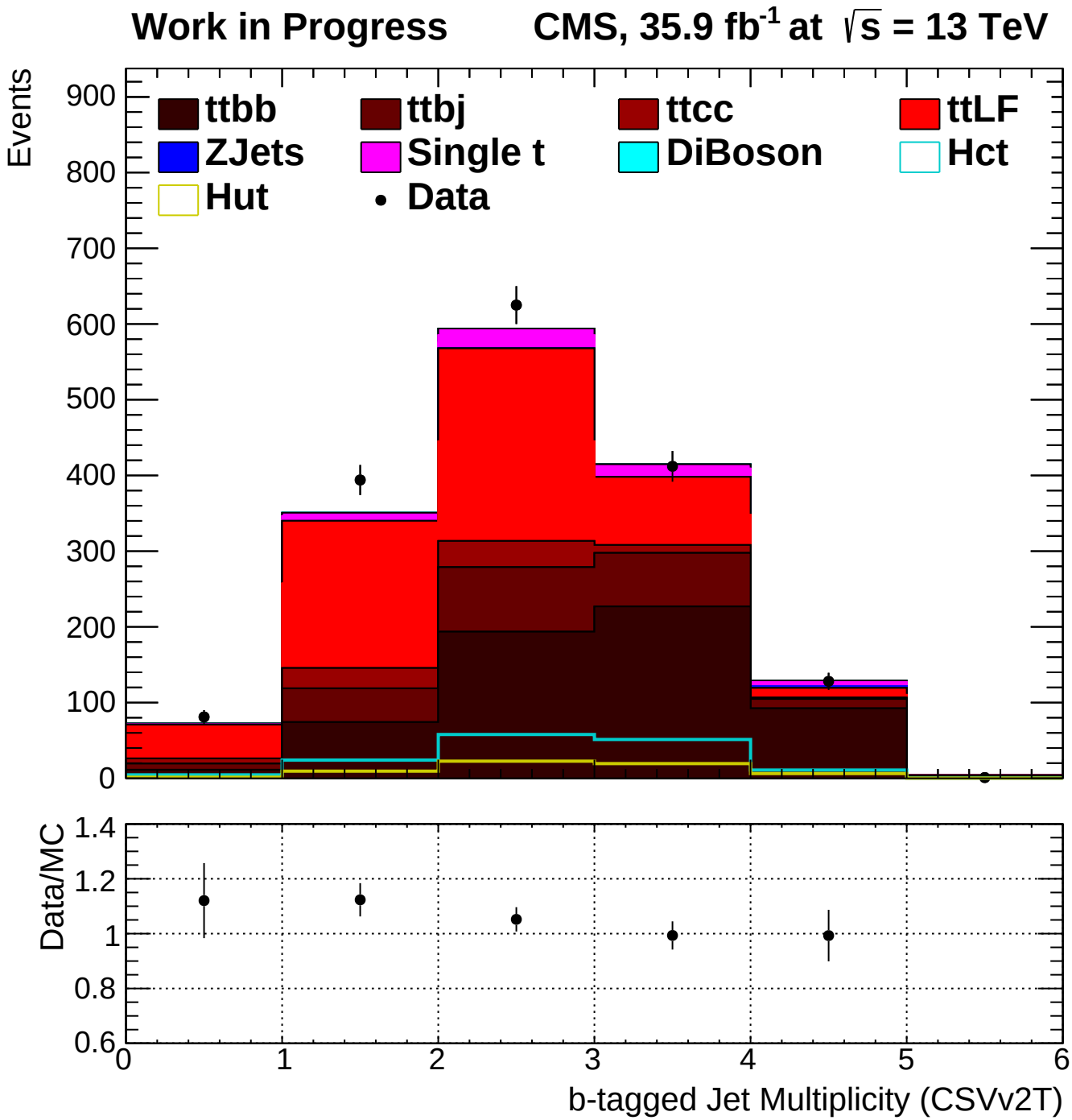
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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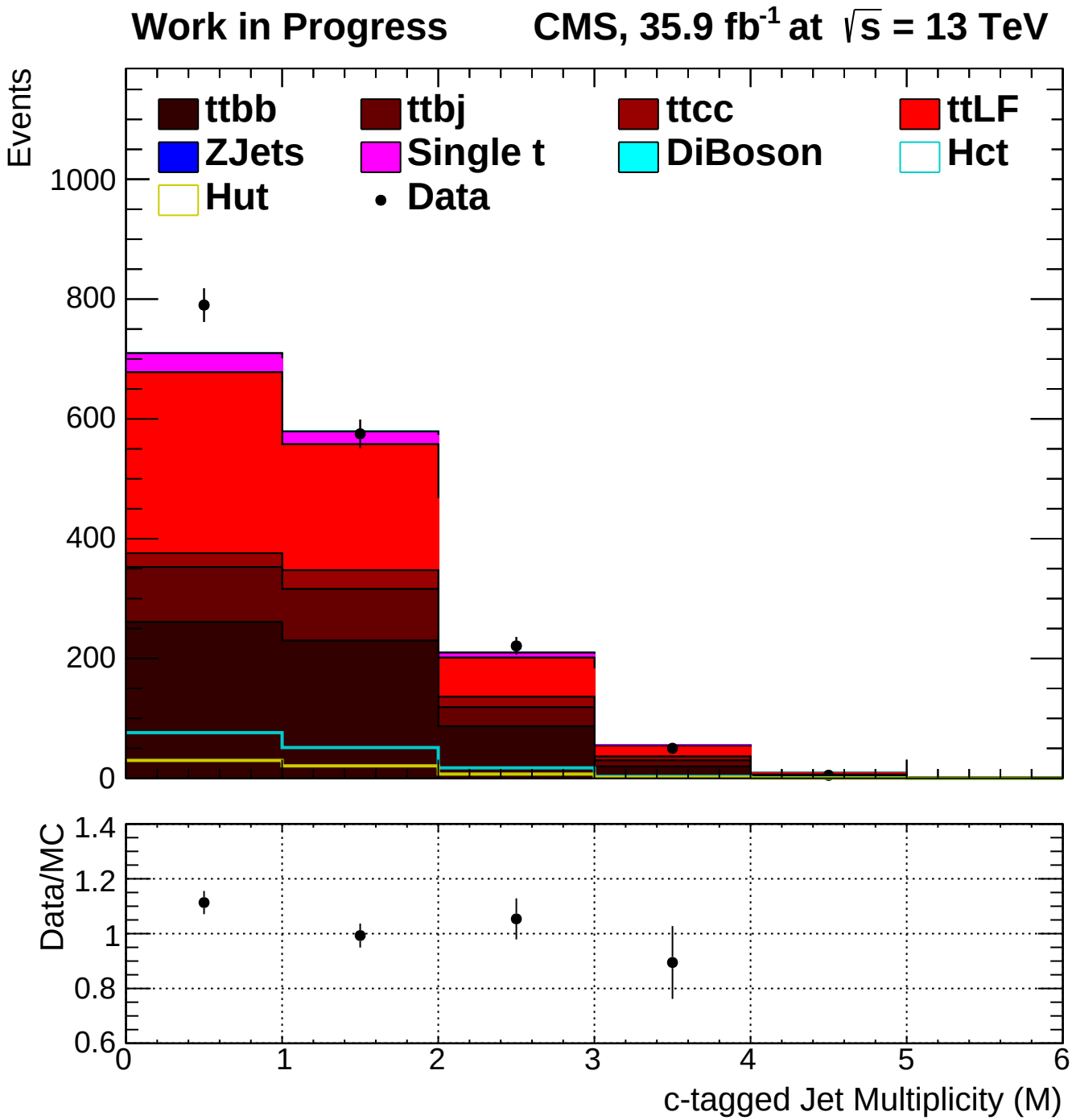
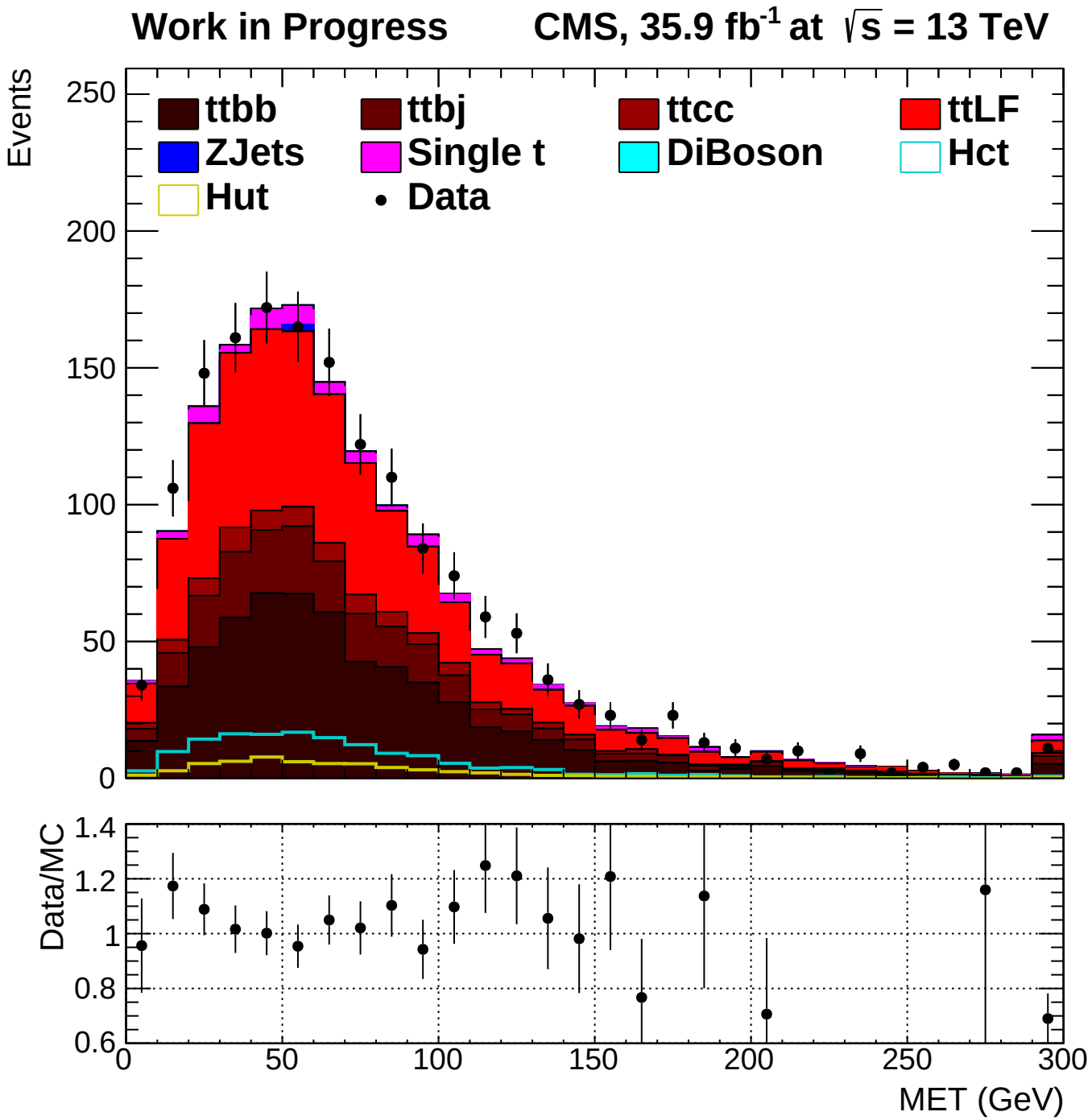
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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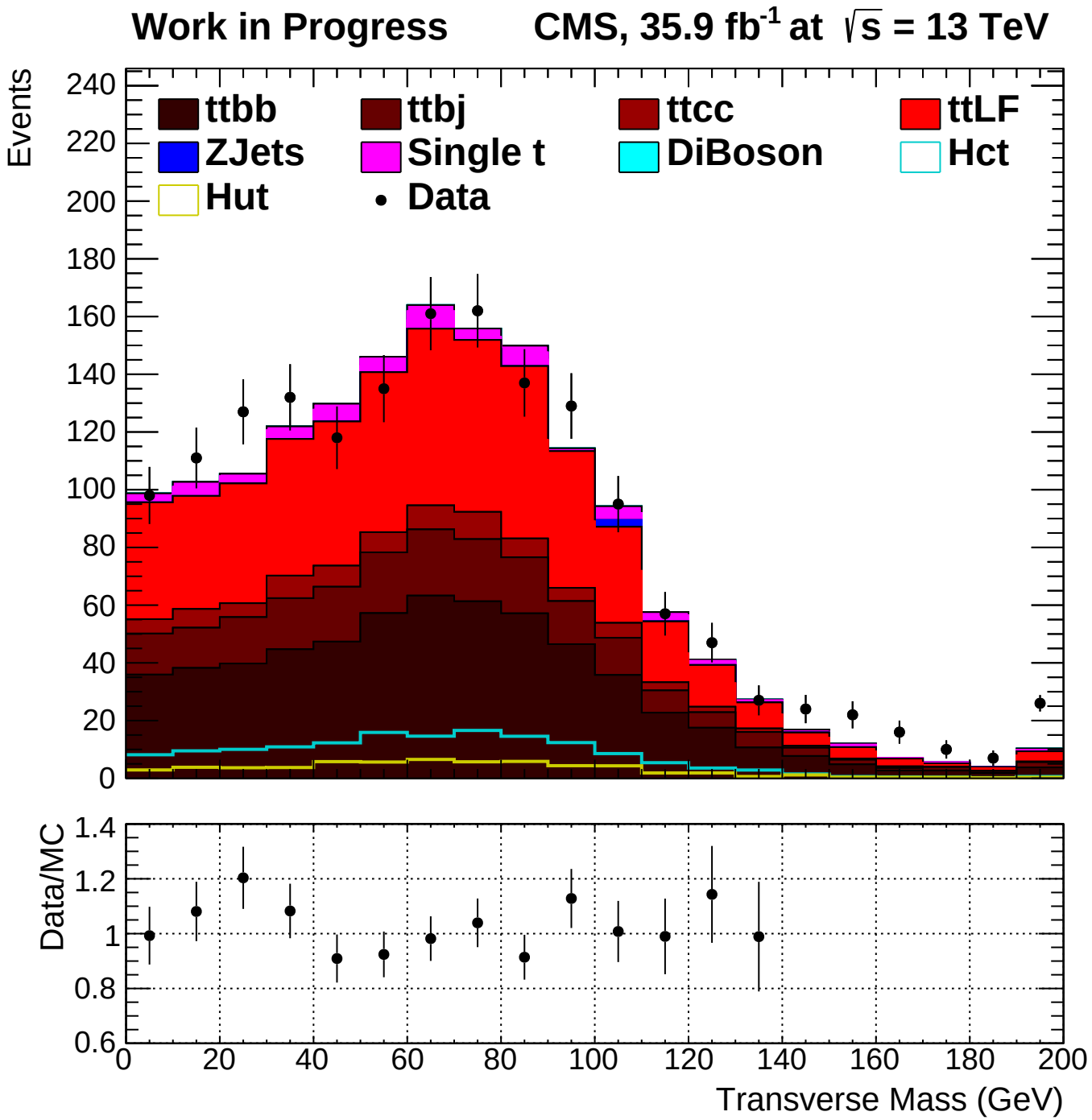
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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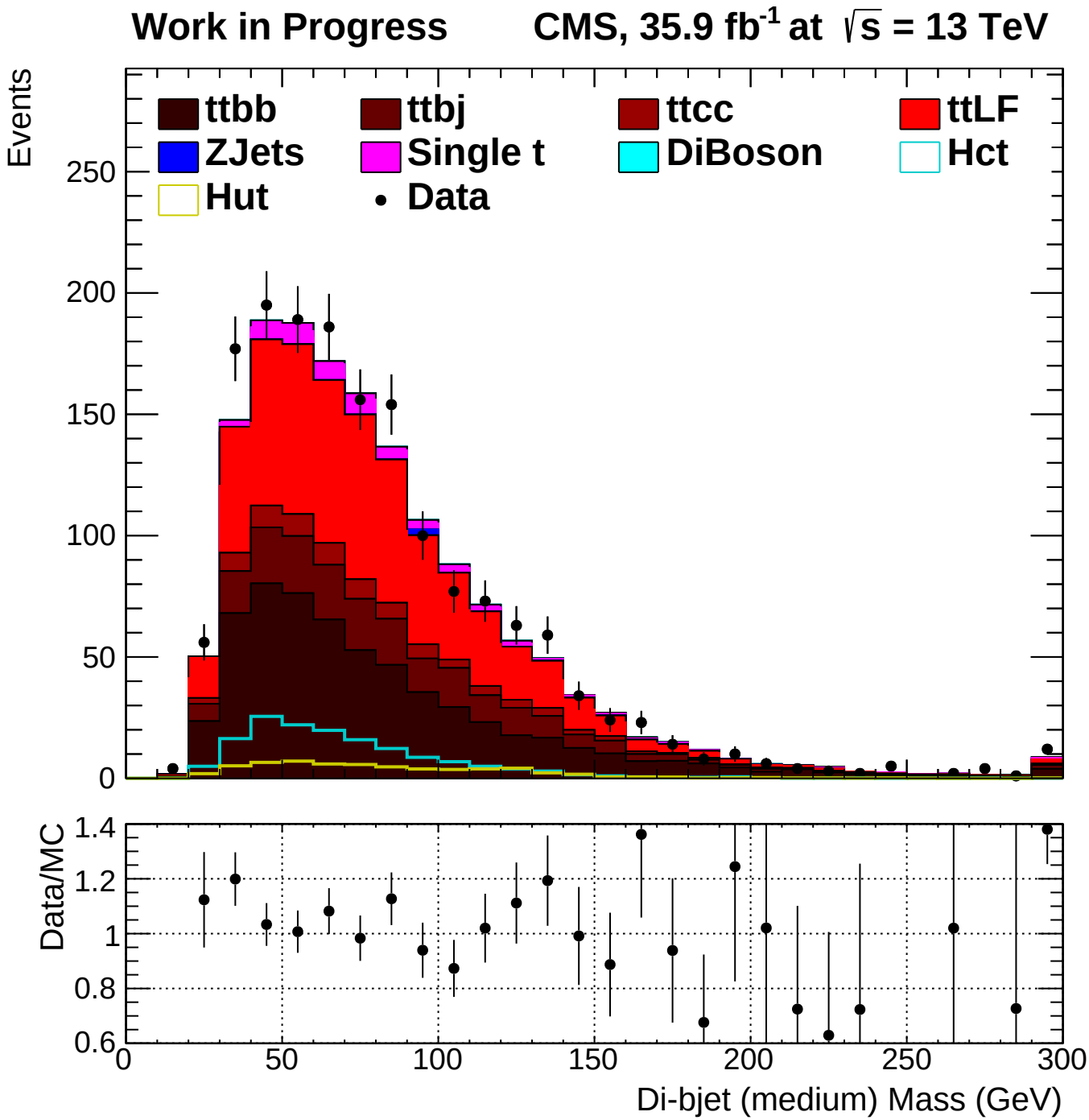
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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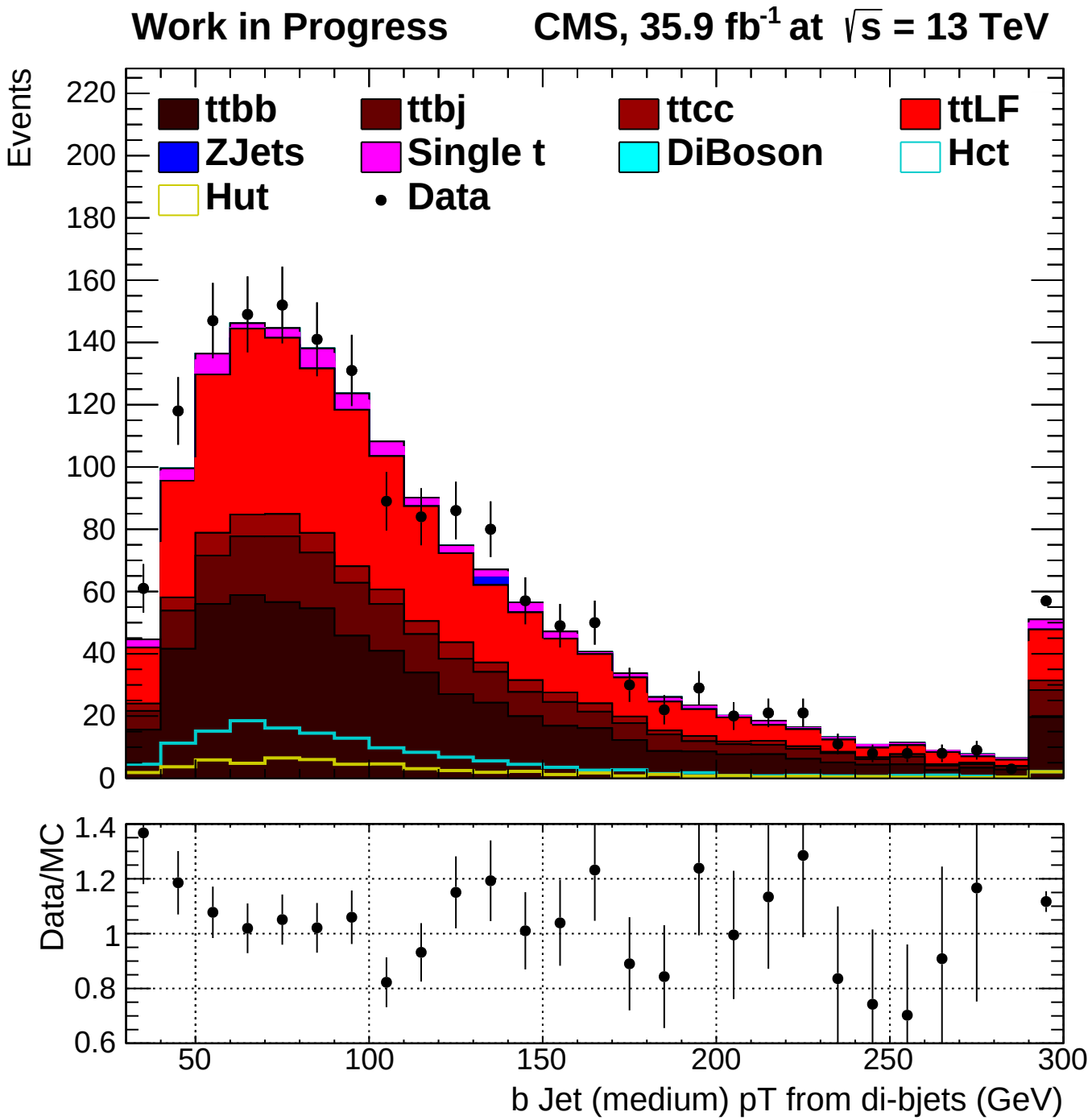
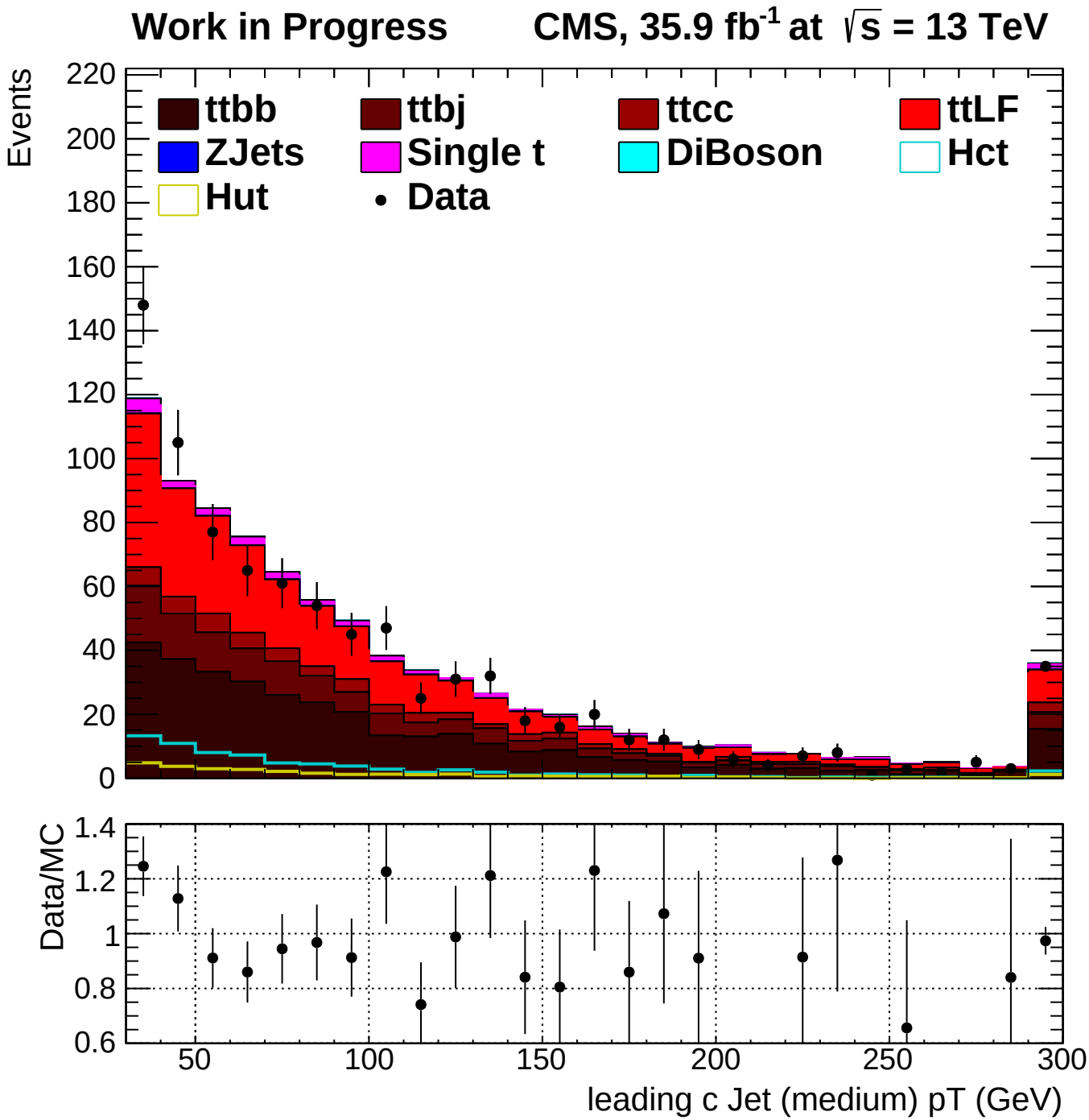
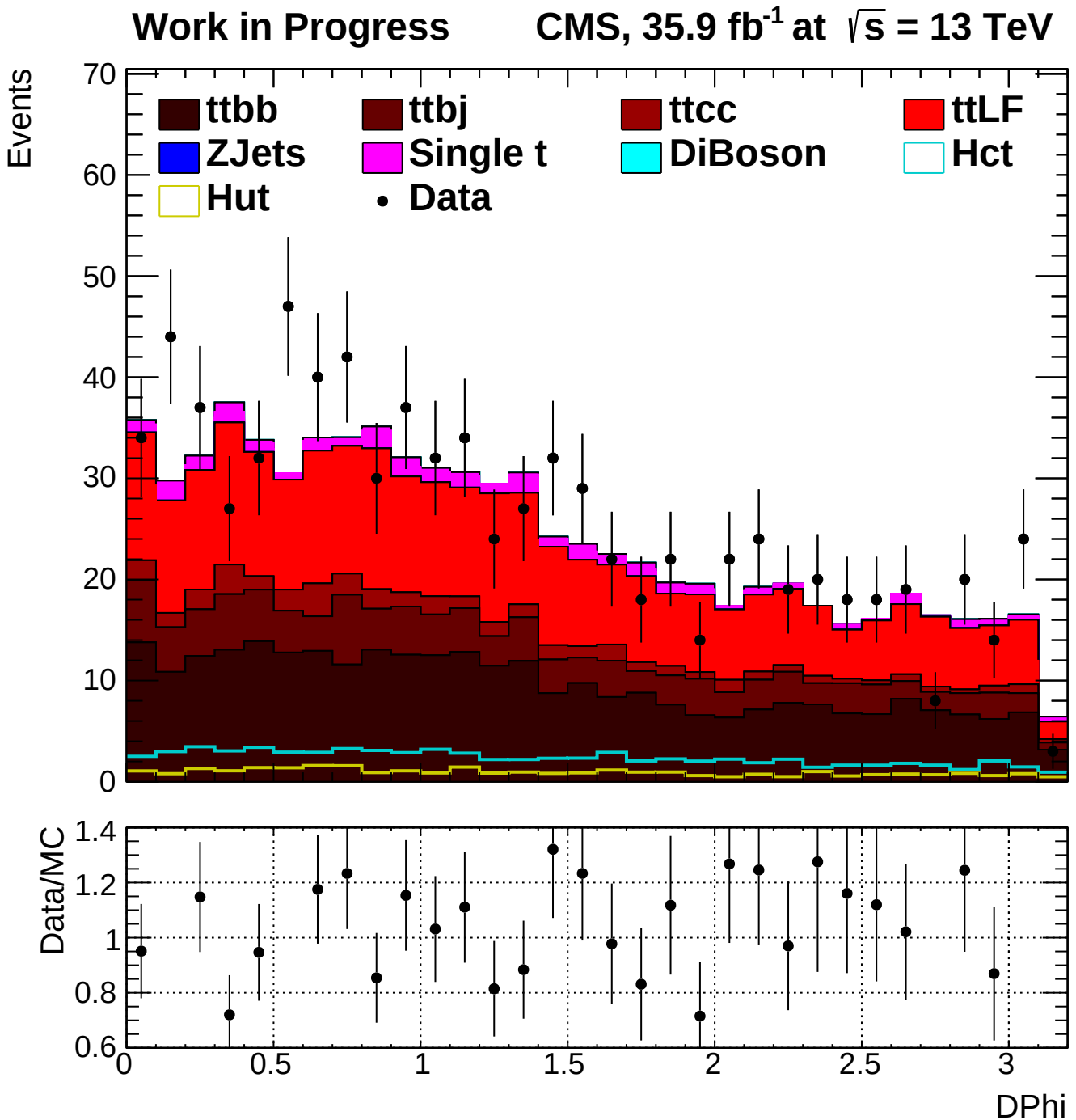
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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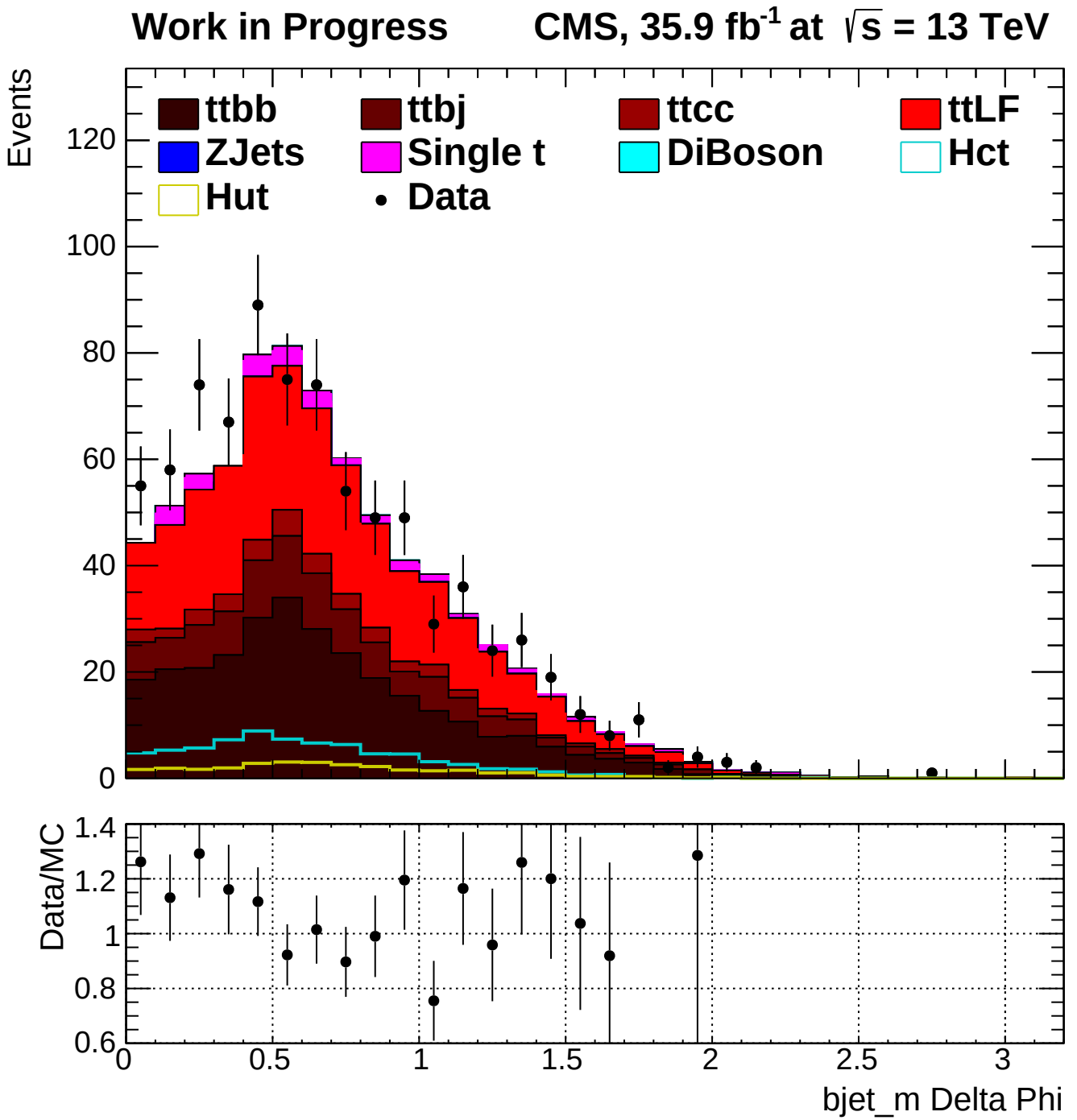
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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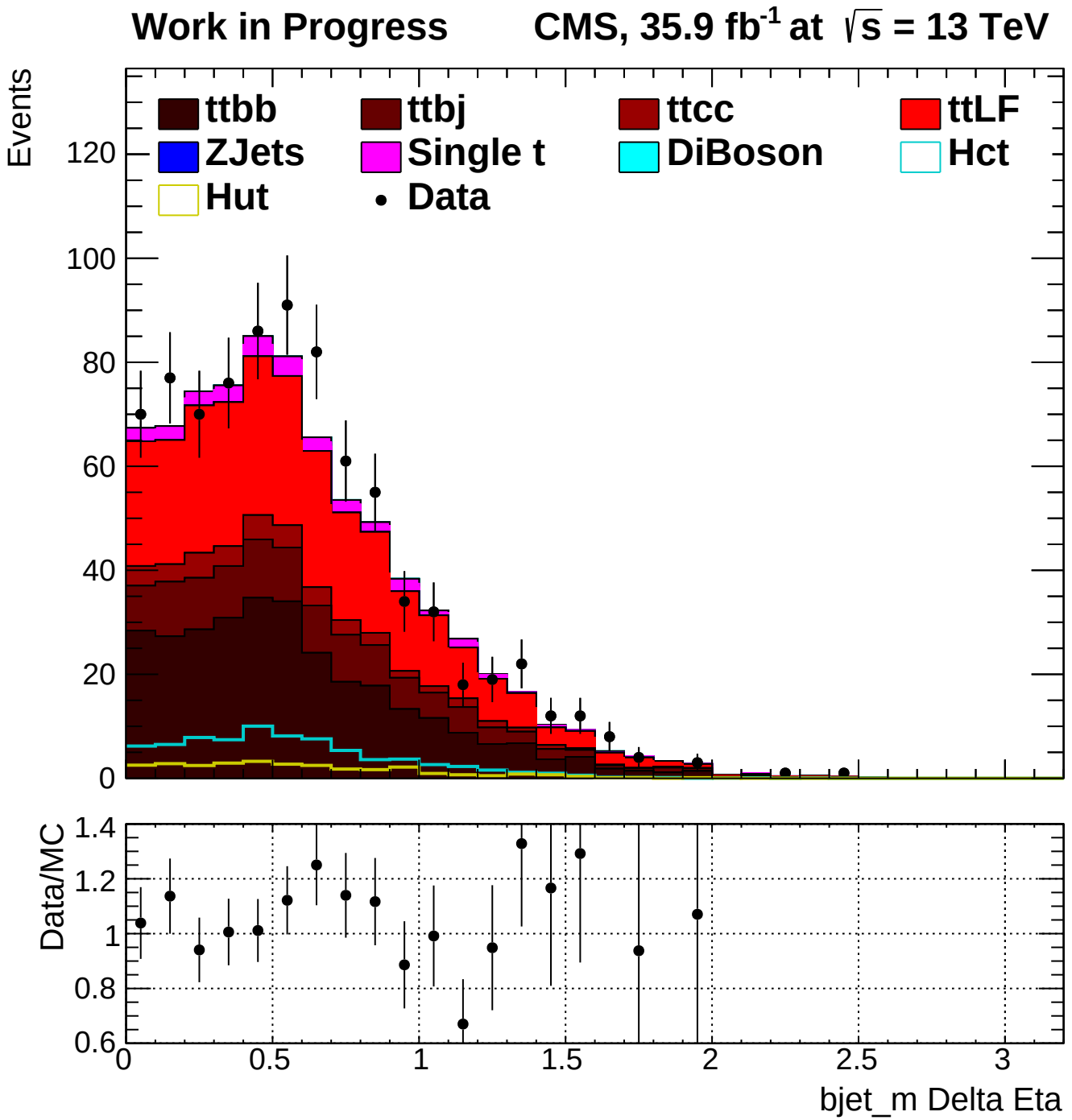
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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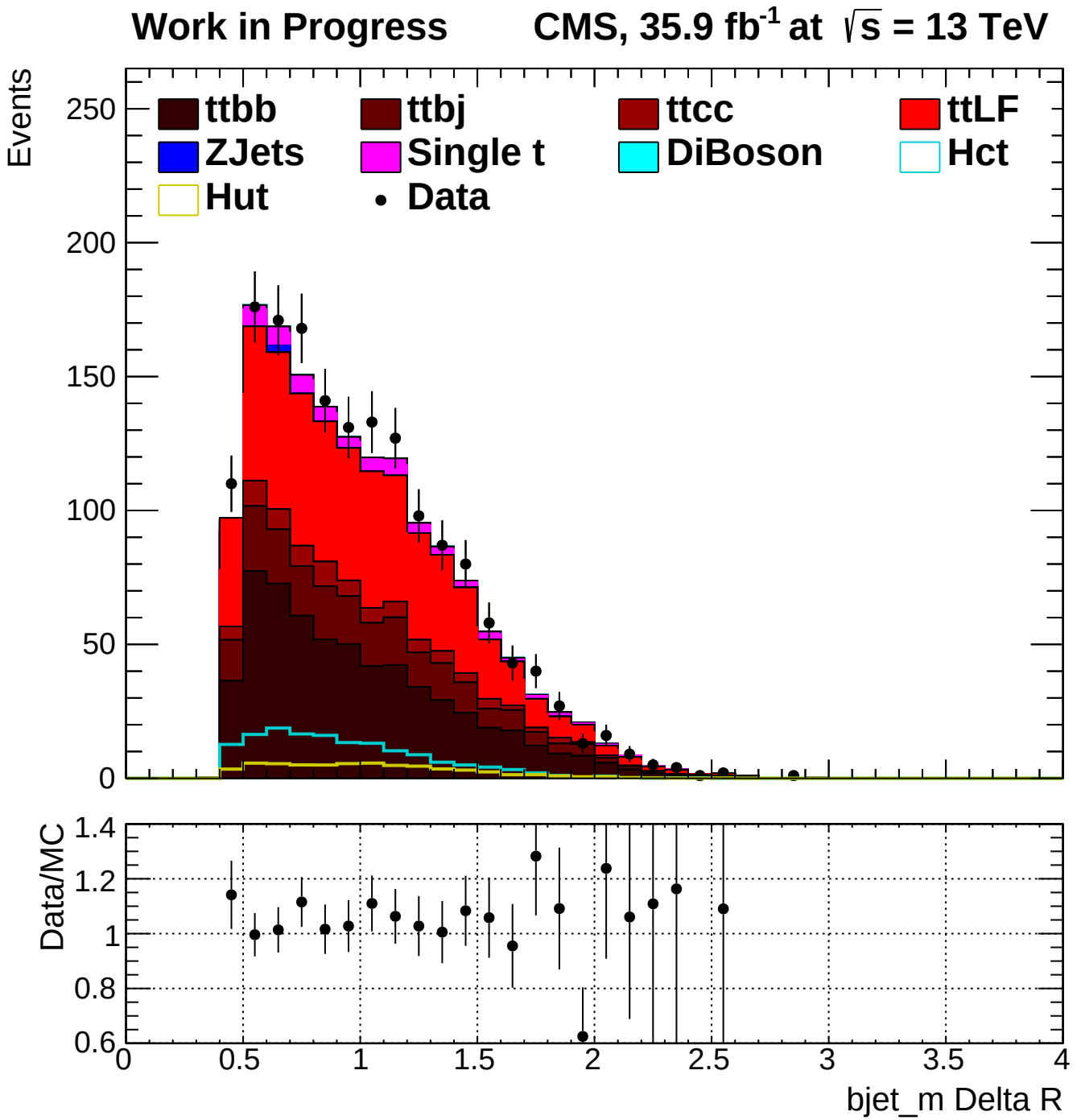
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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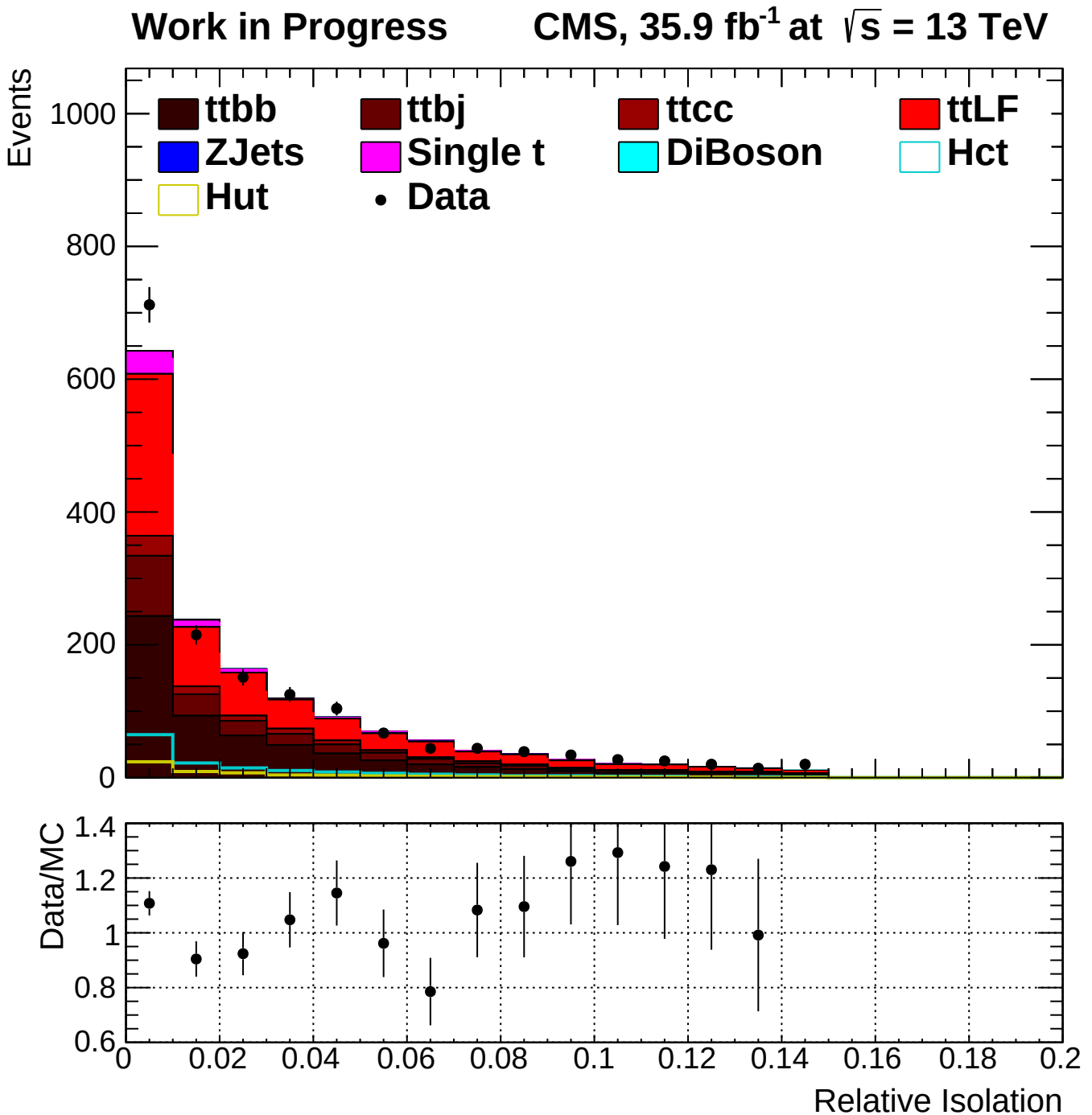
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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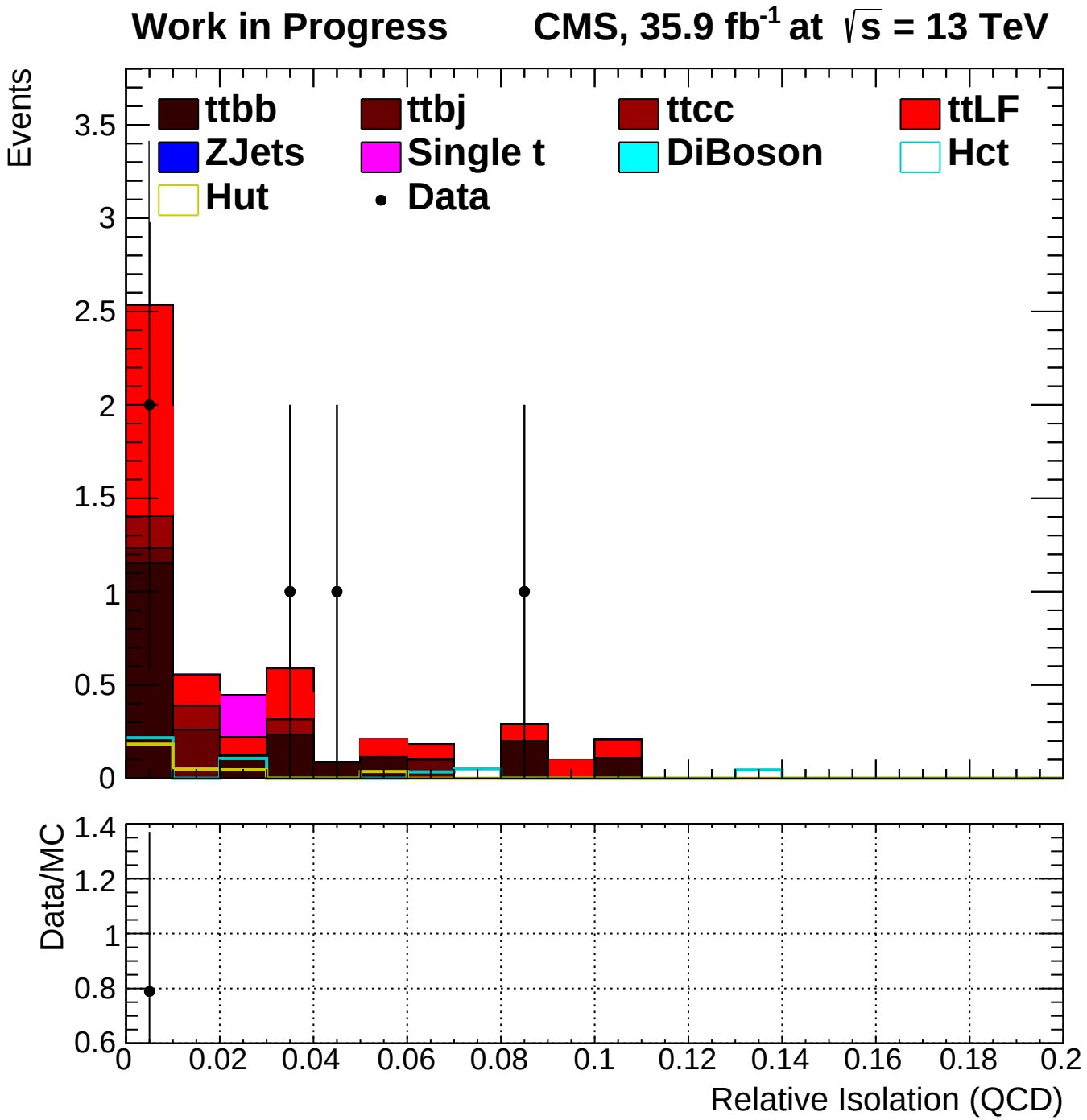
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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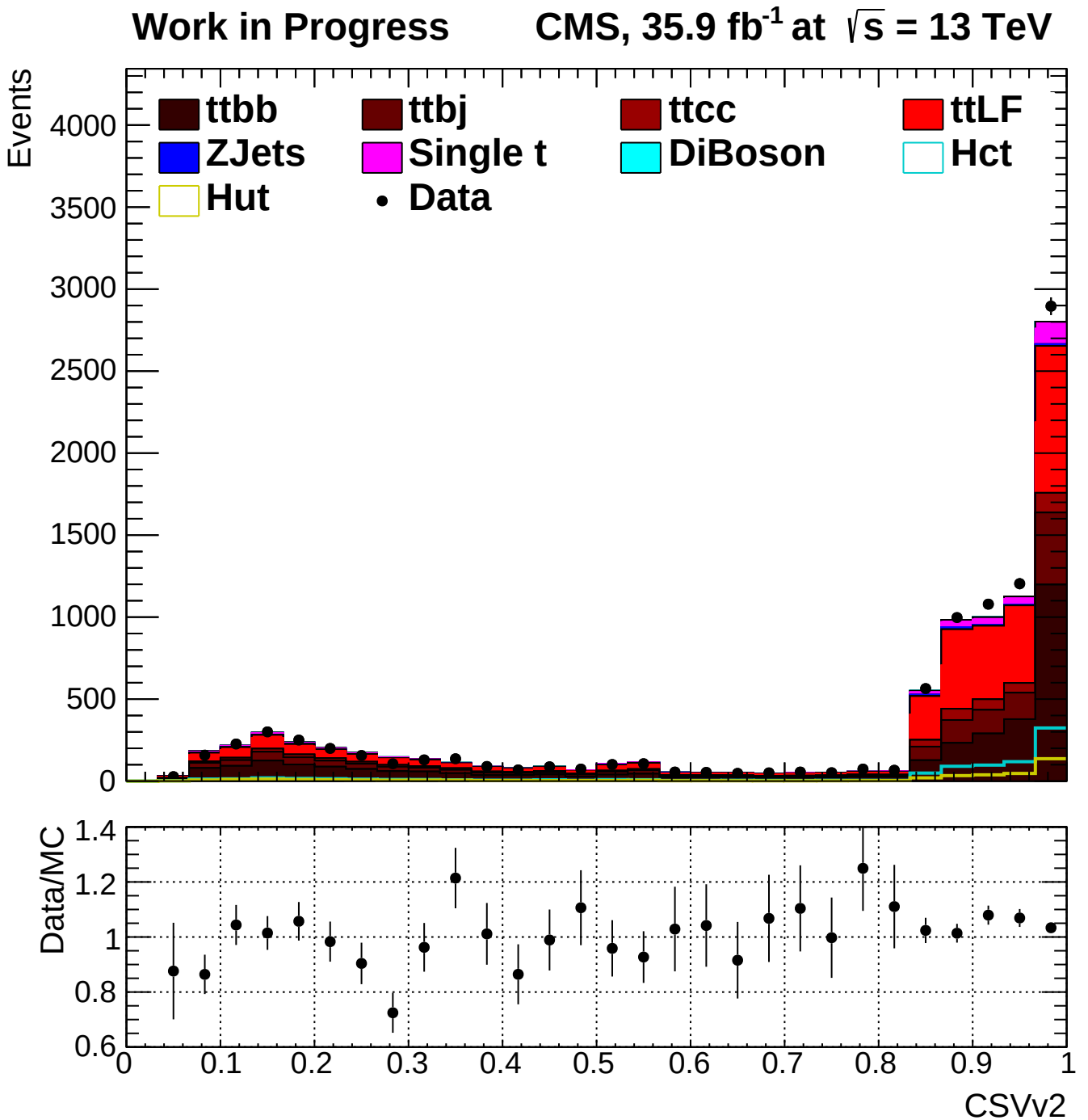
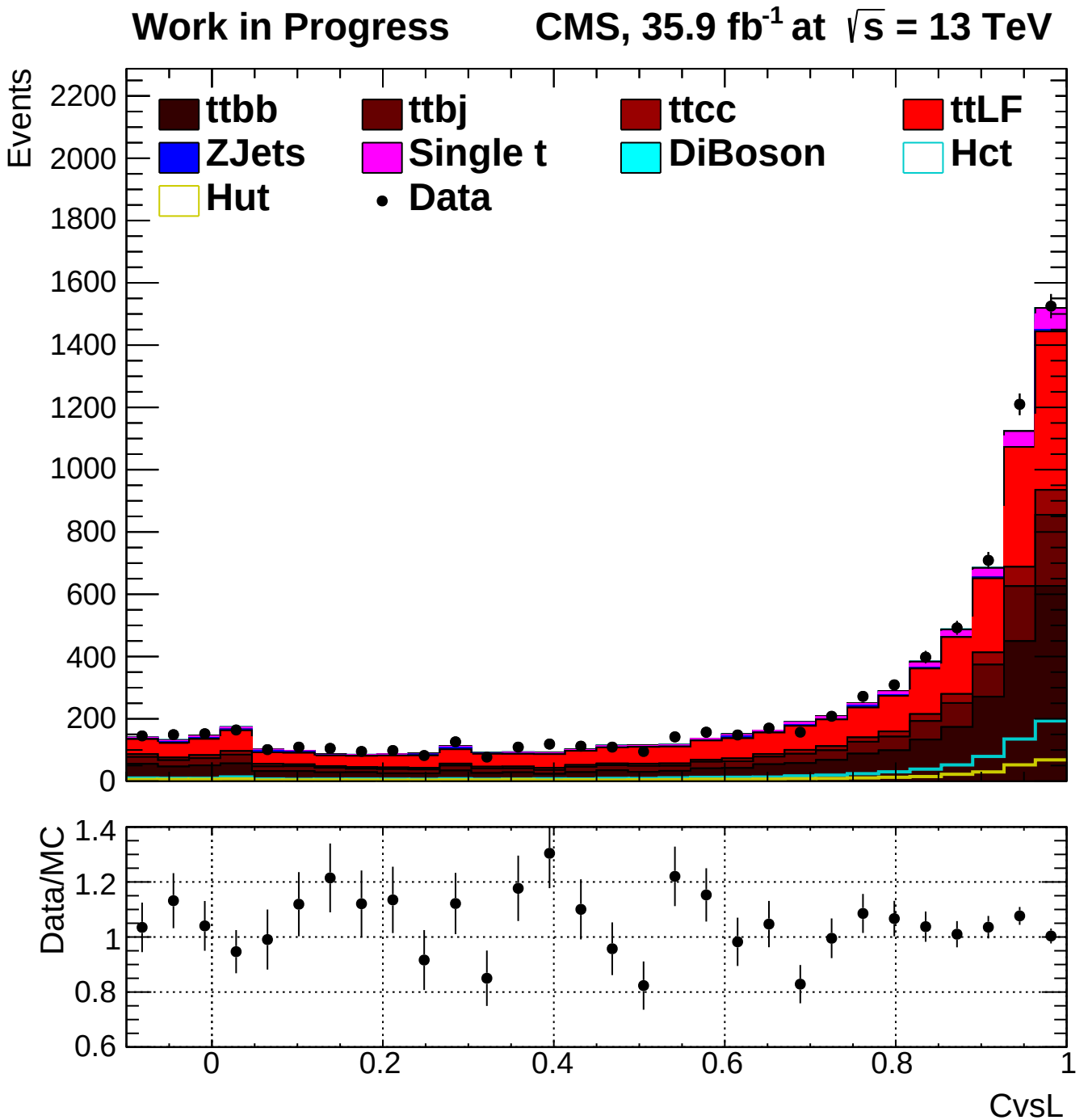
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
4000
3500
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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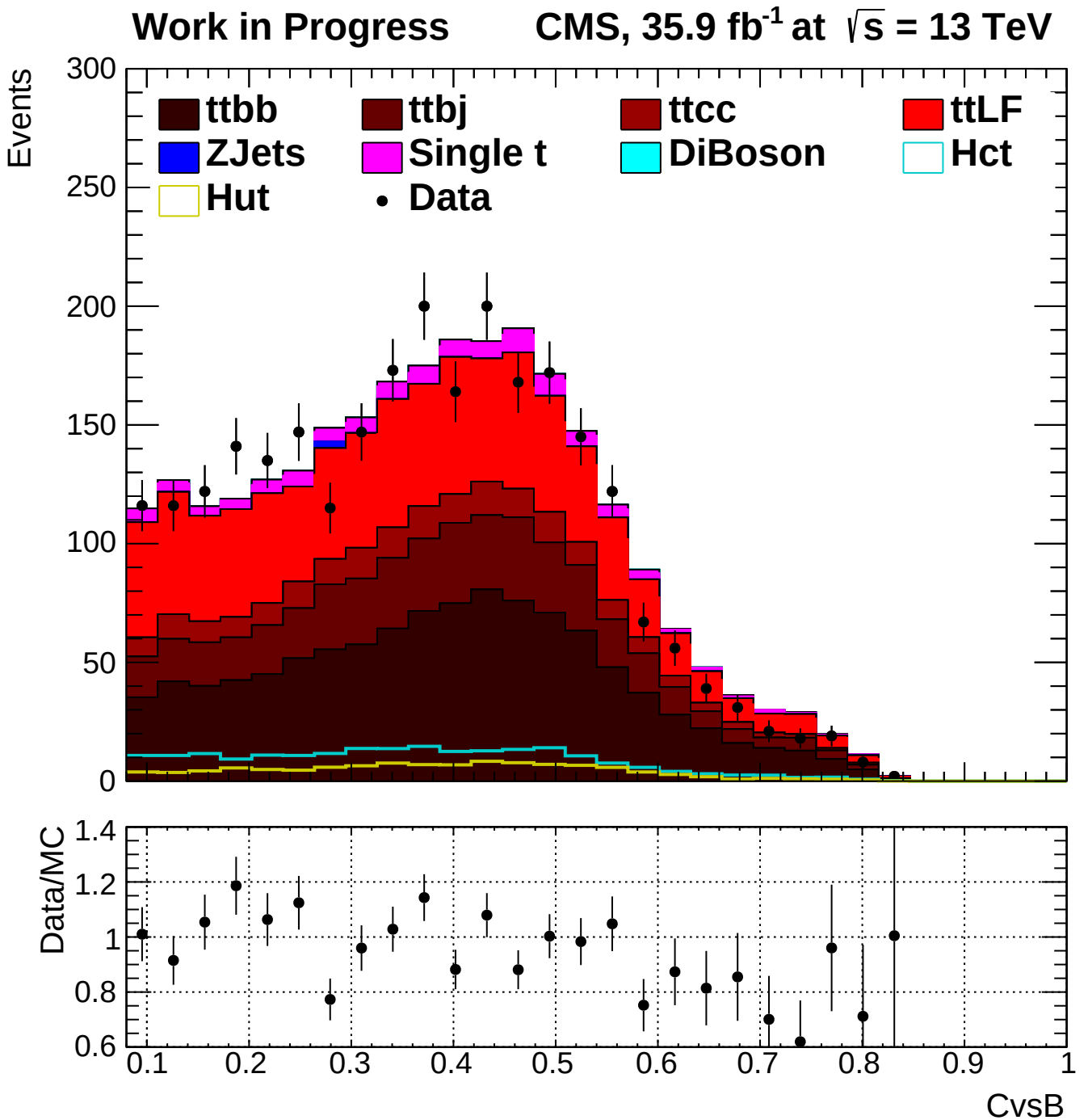
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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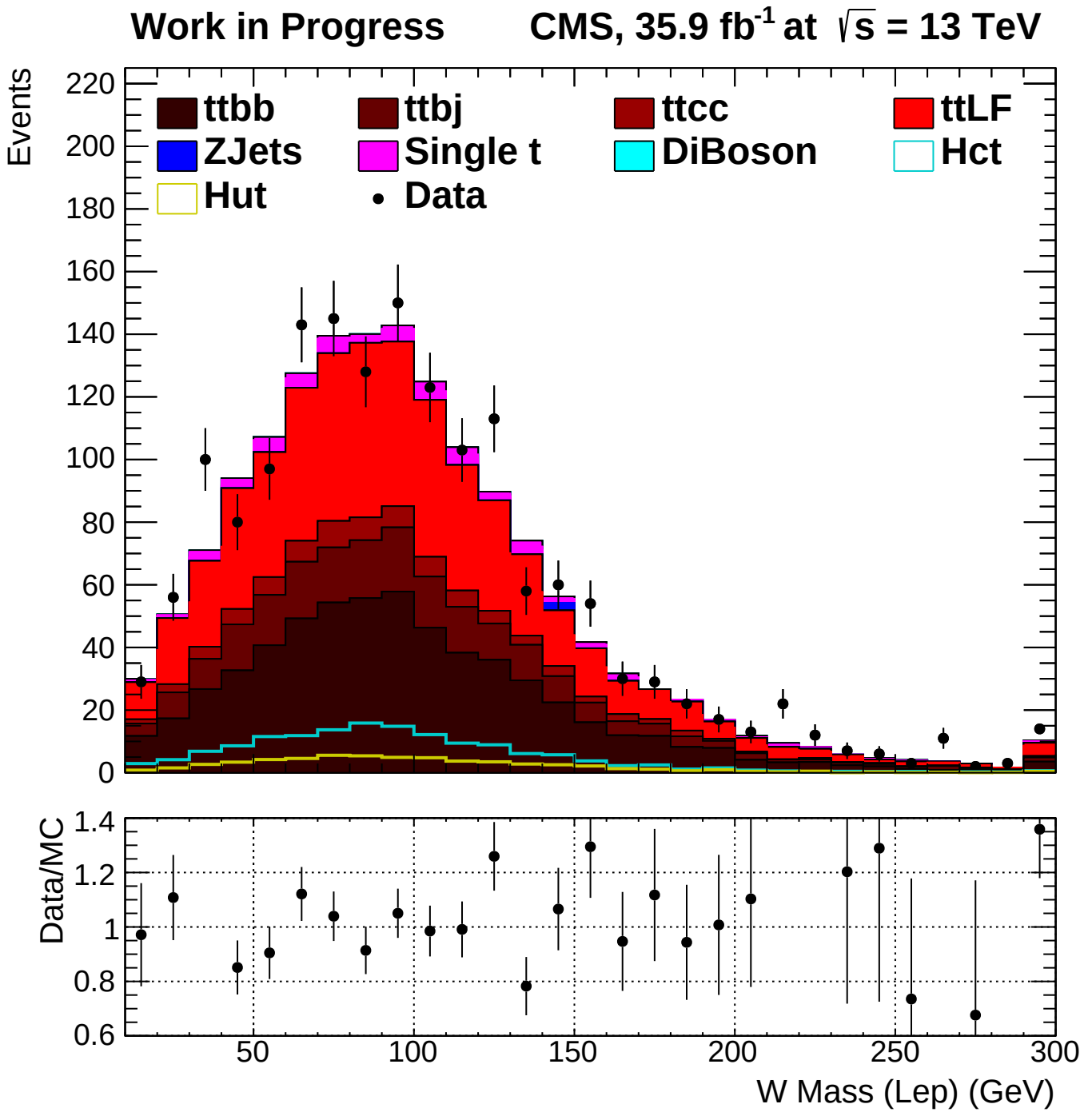
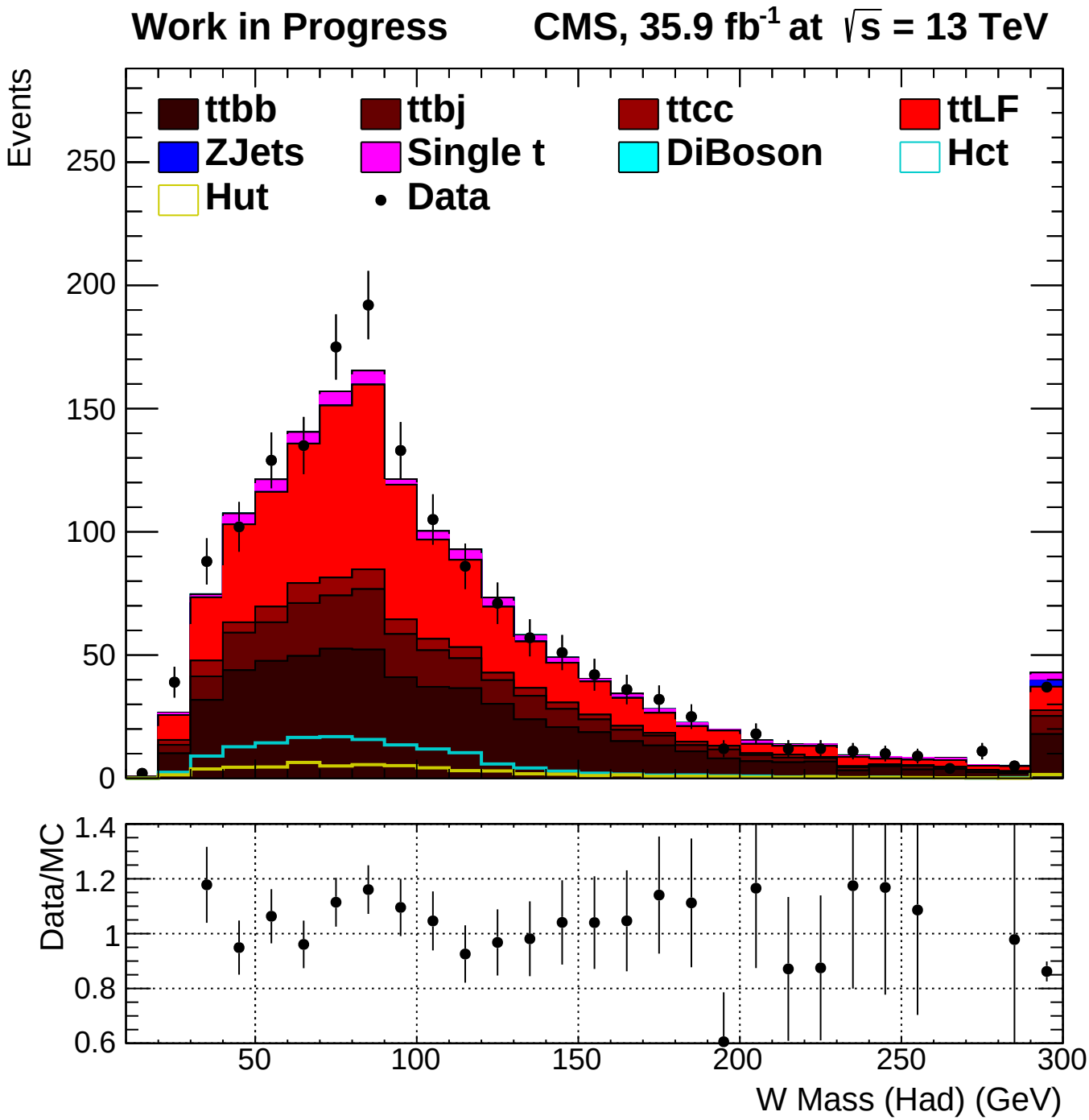
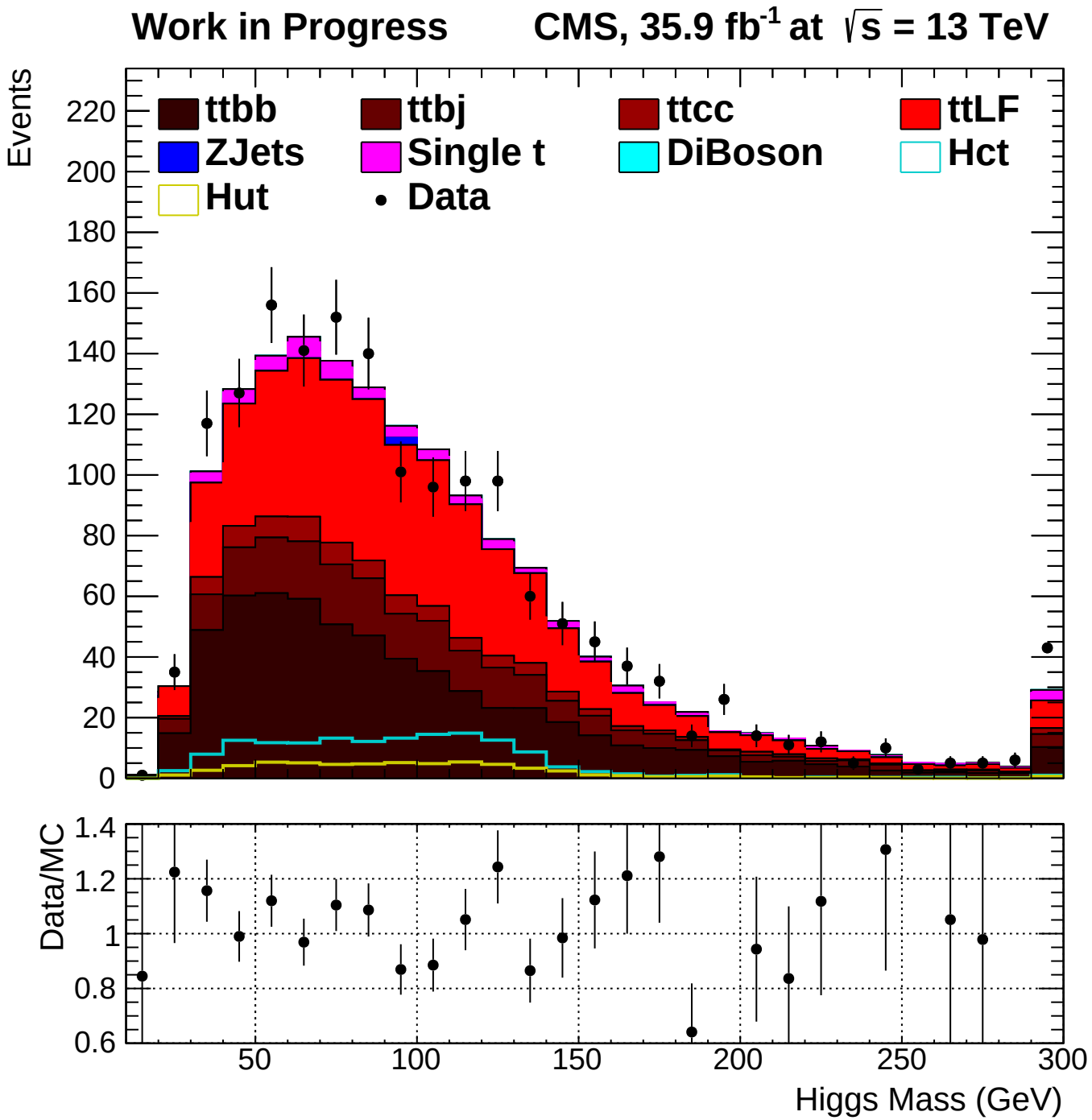
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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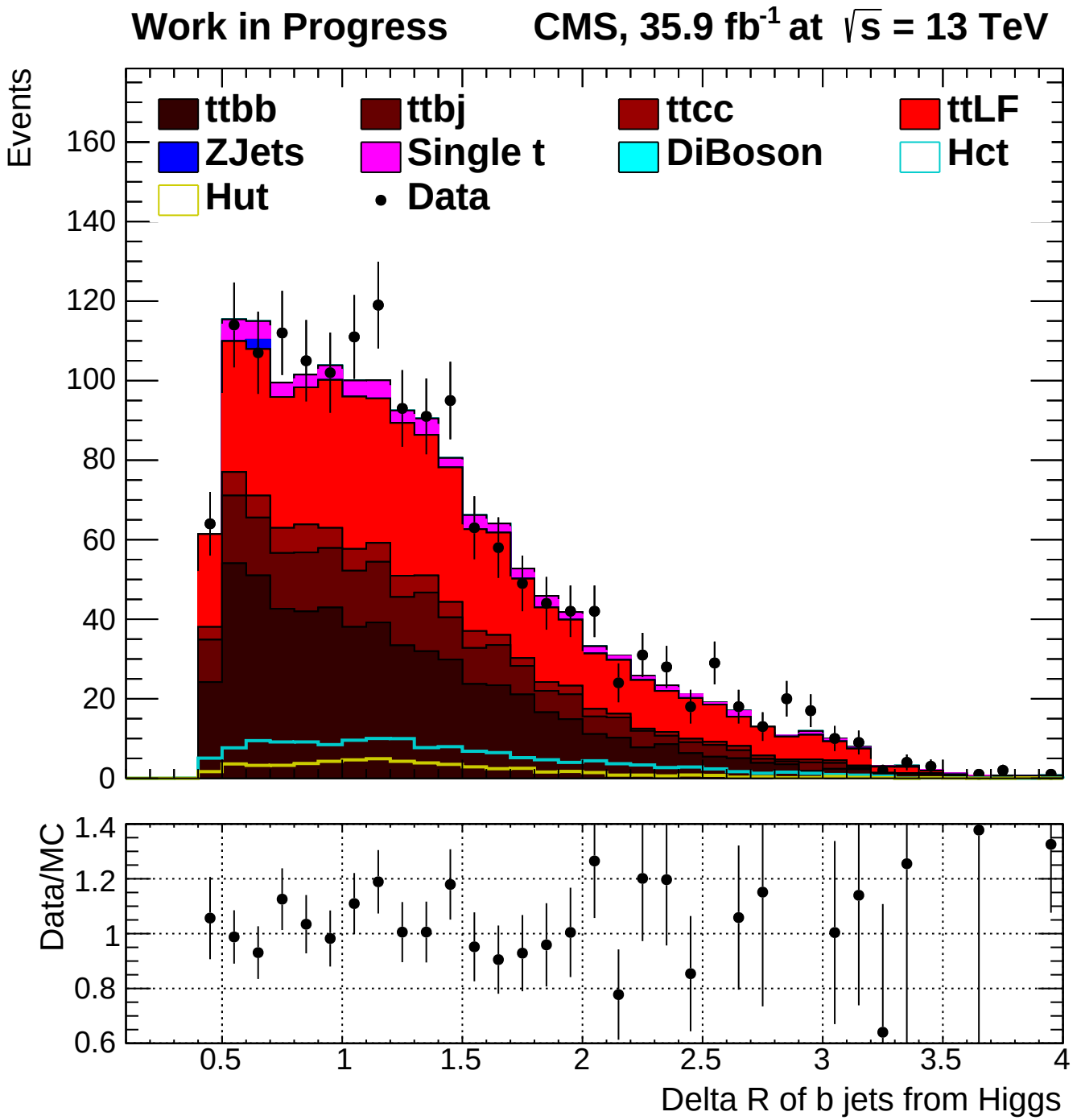
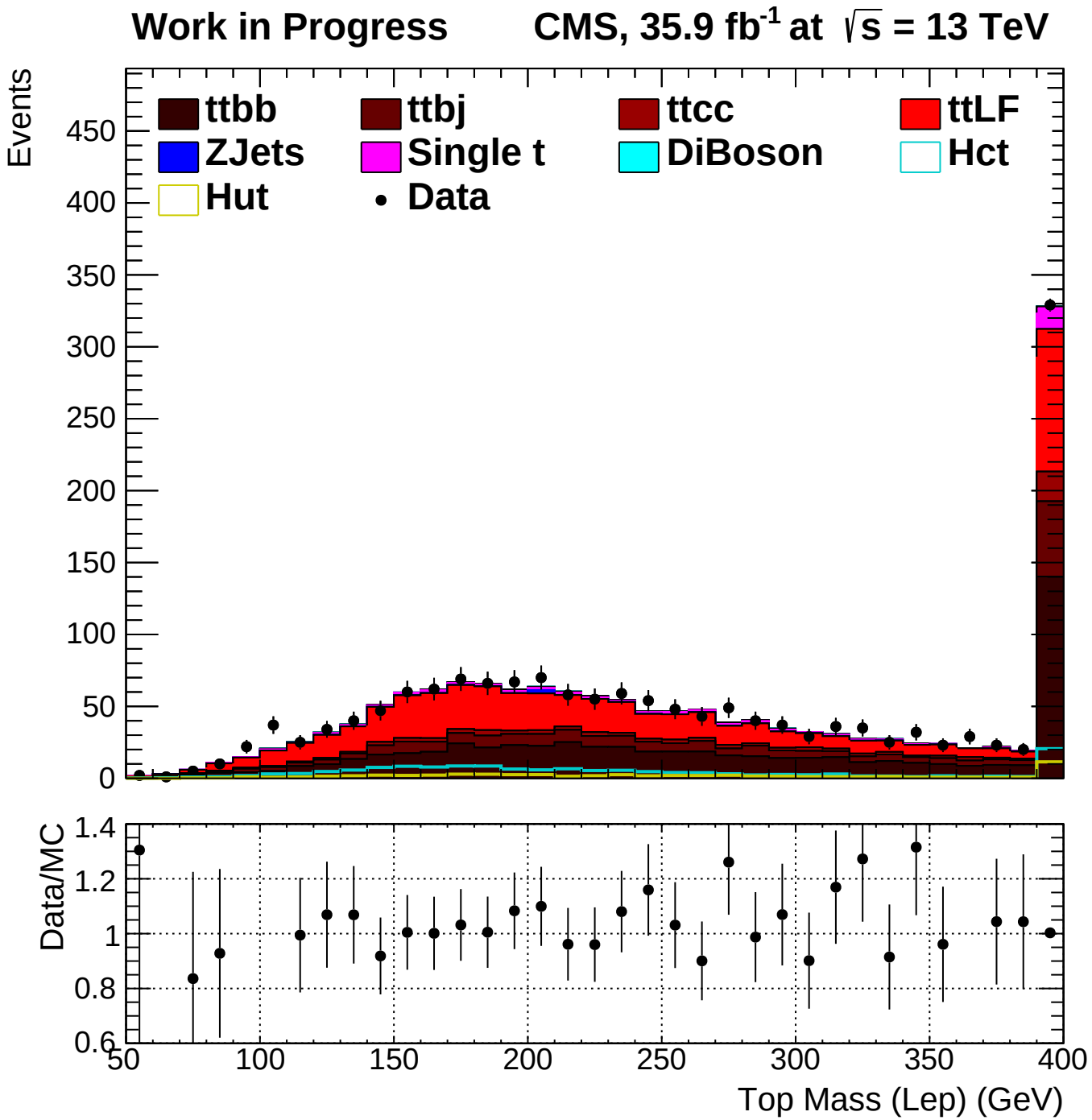
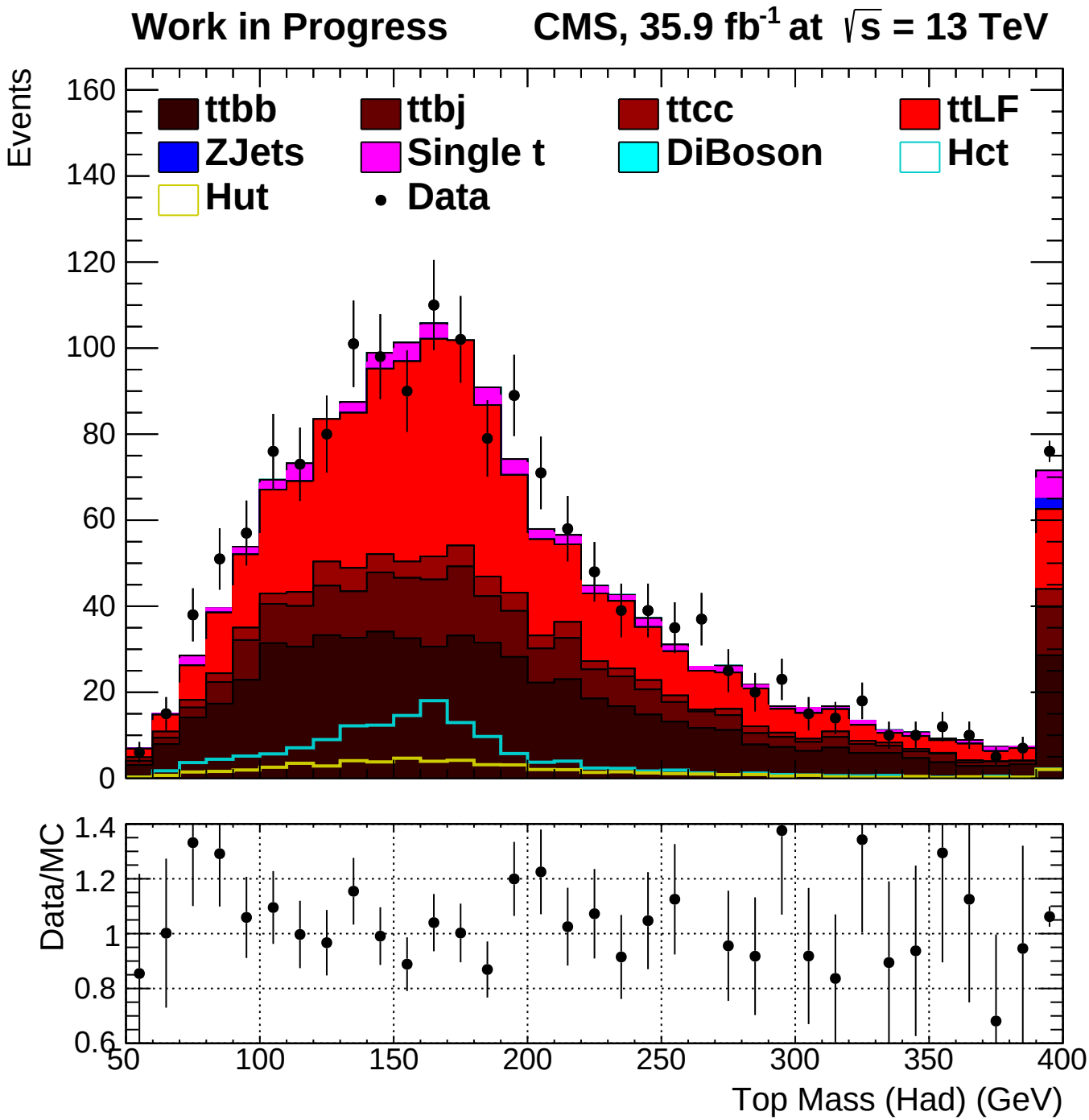
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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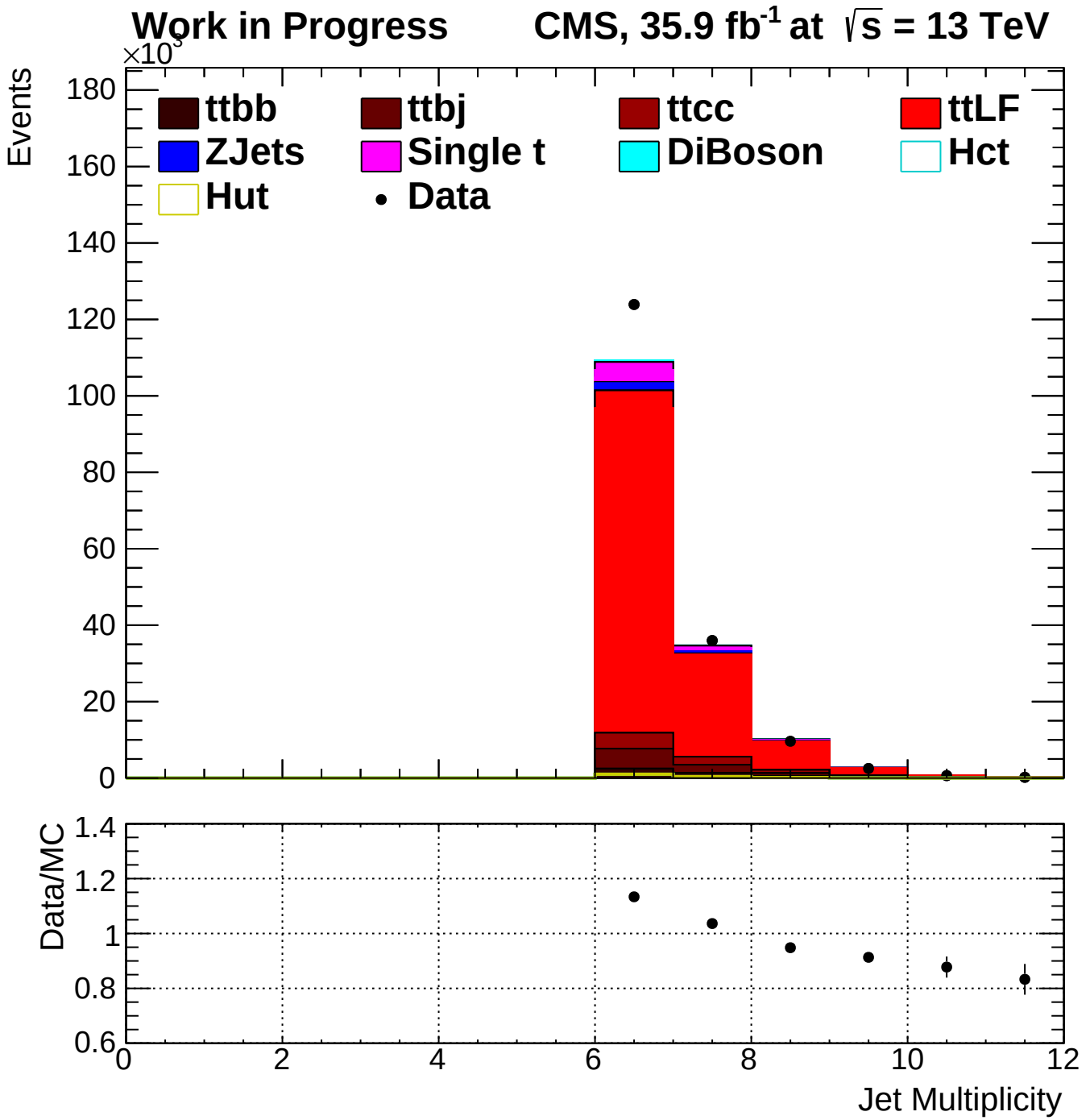
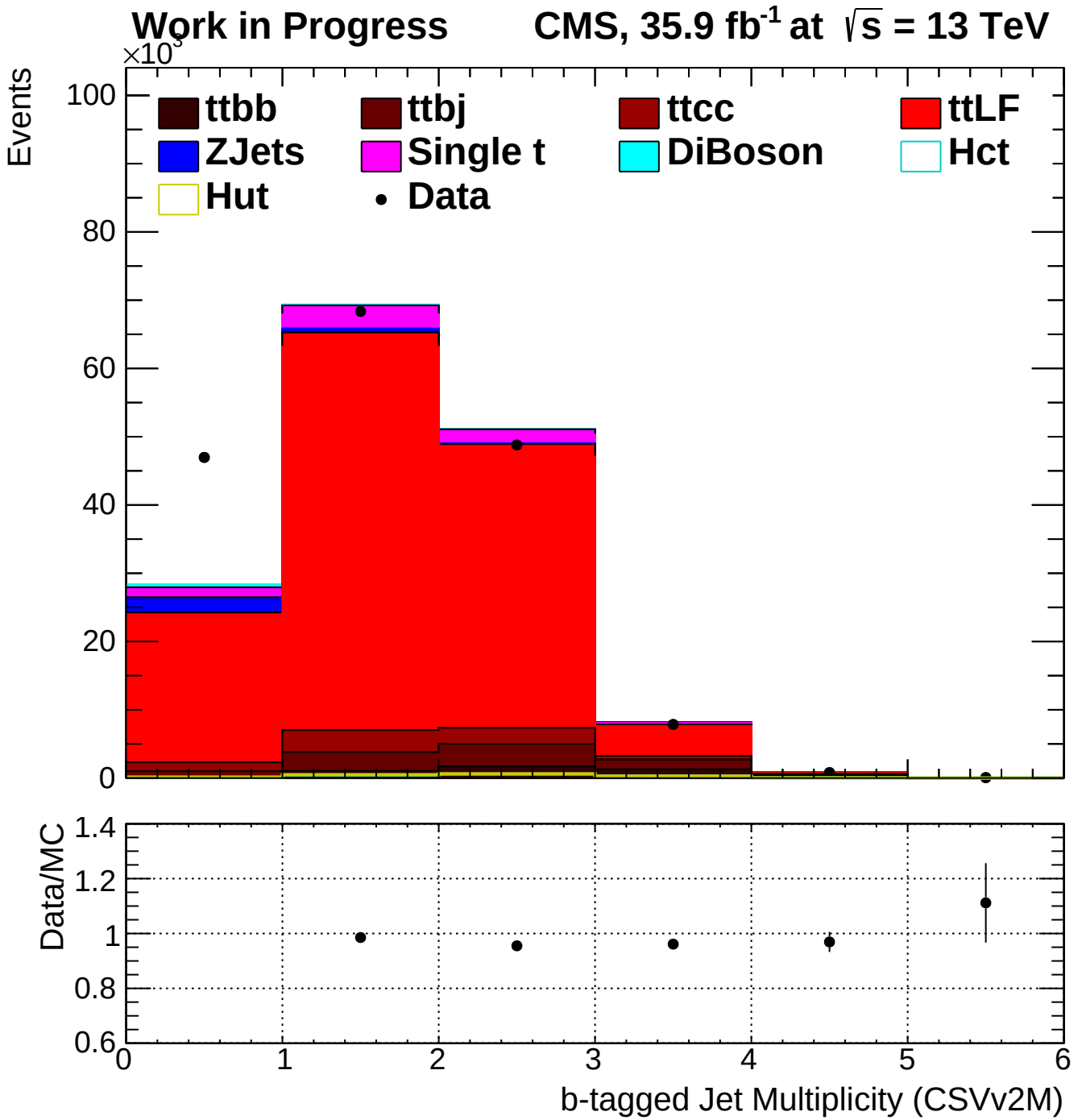
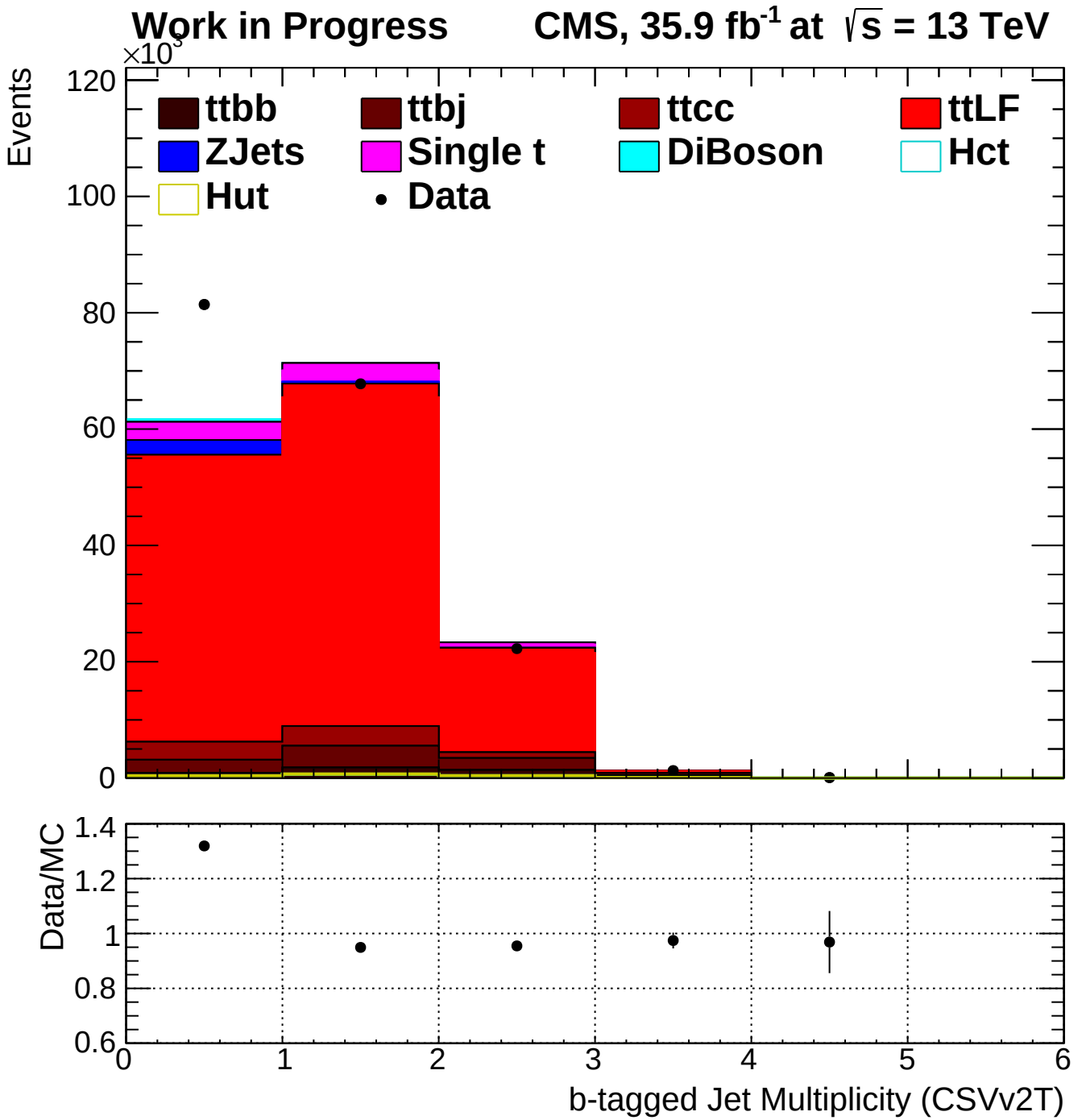
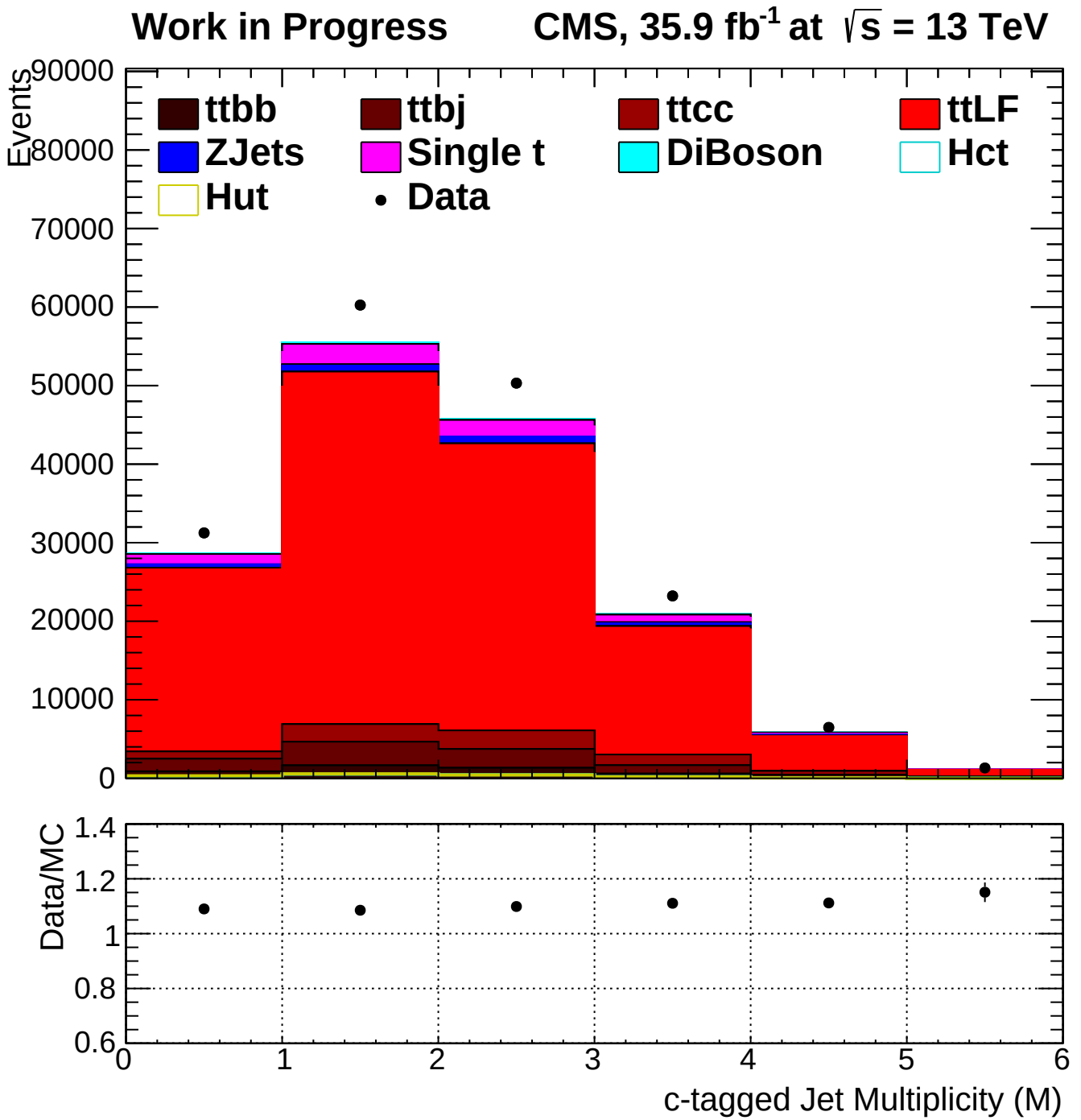
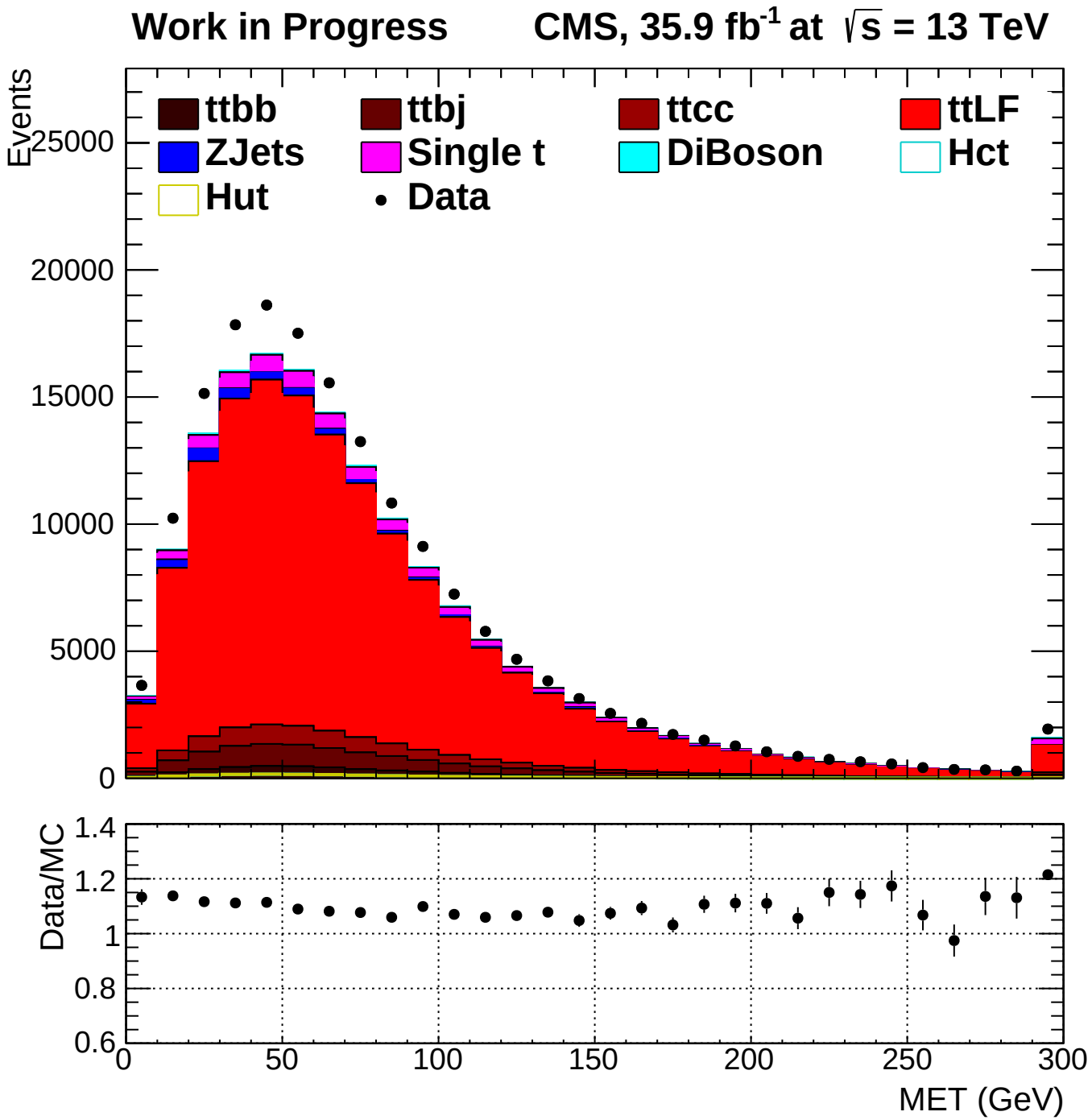
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

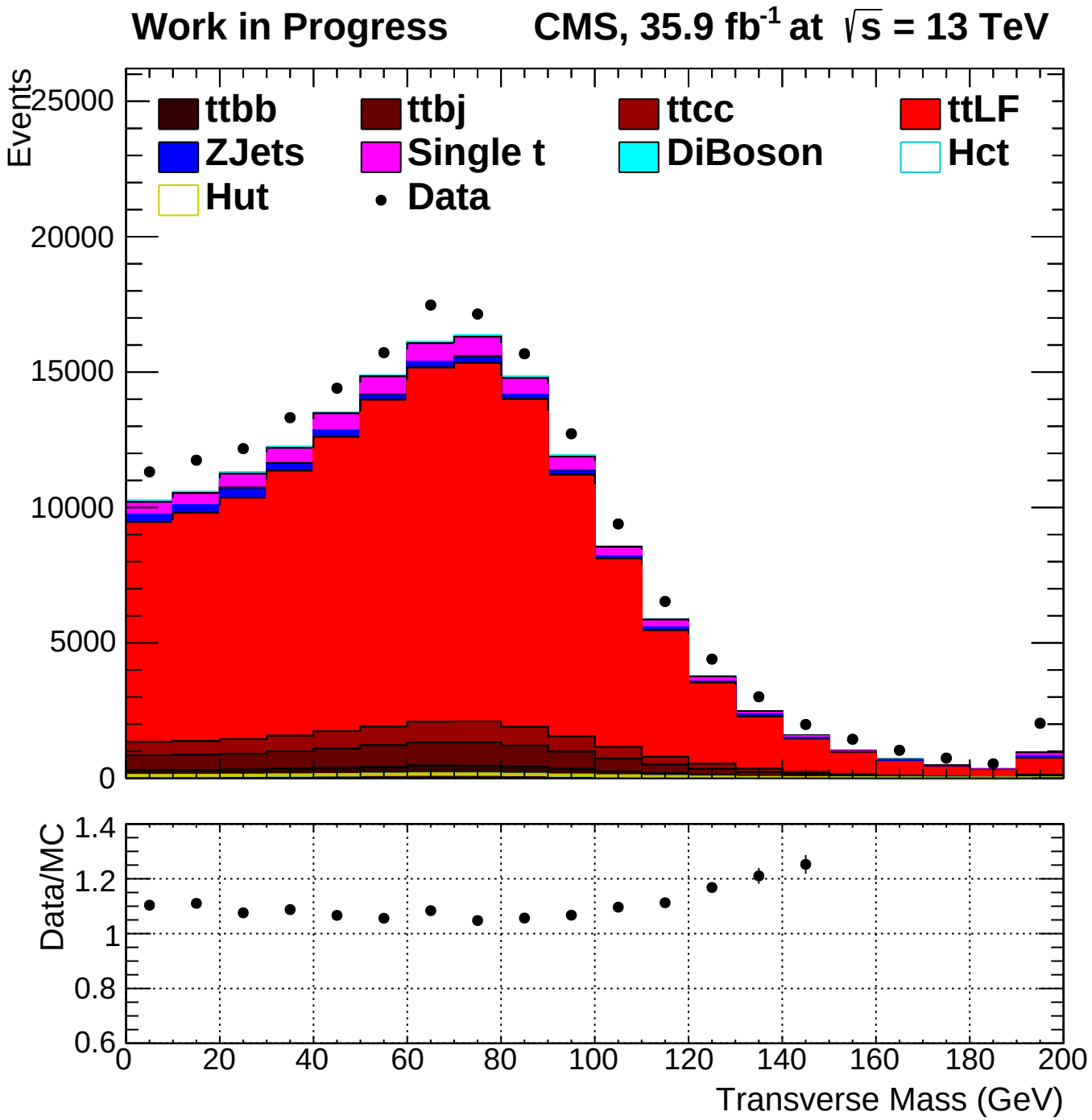

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

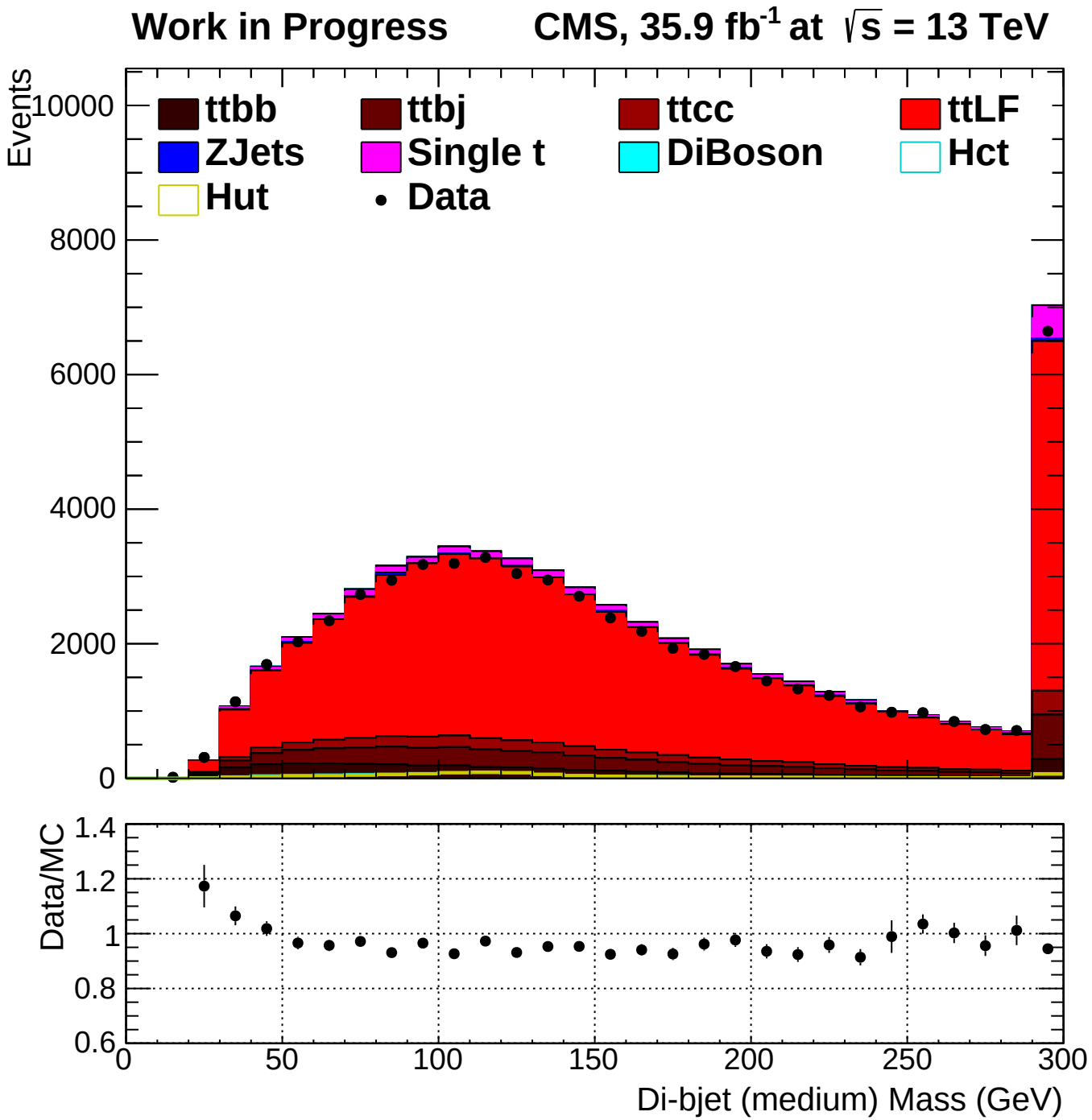

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

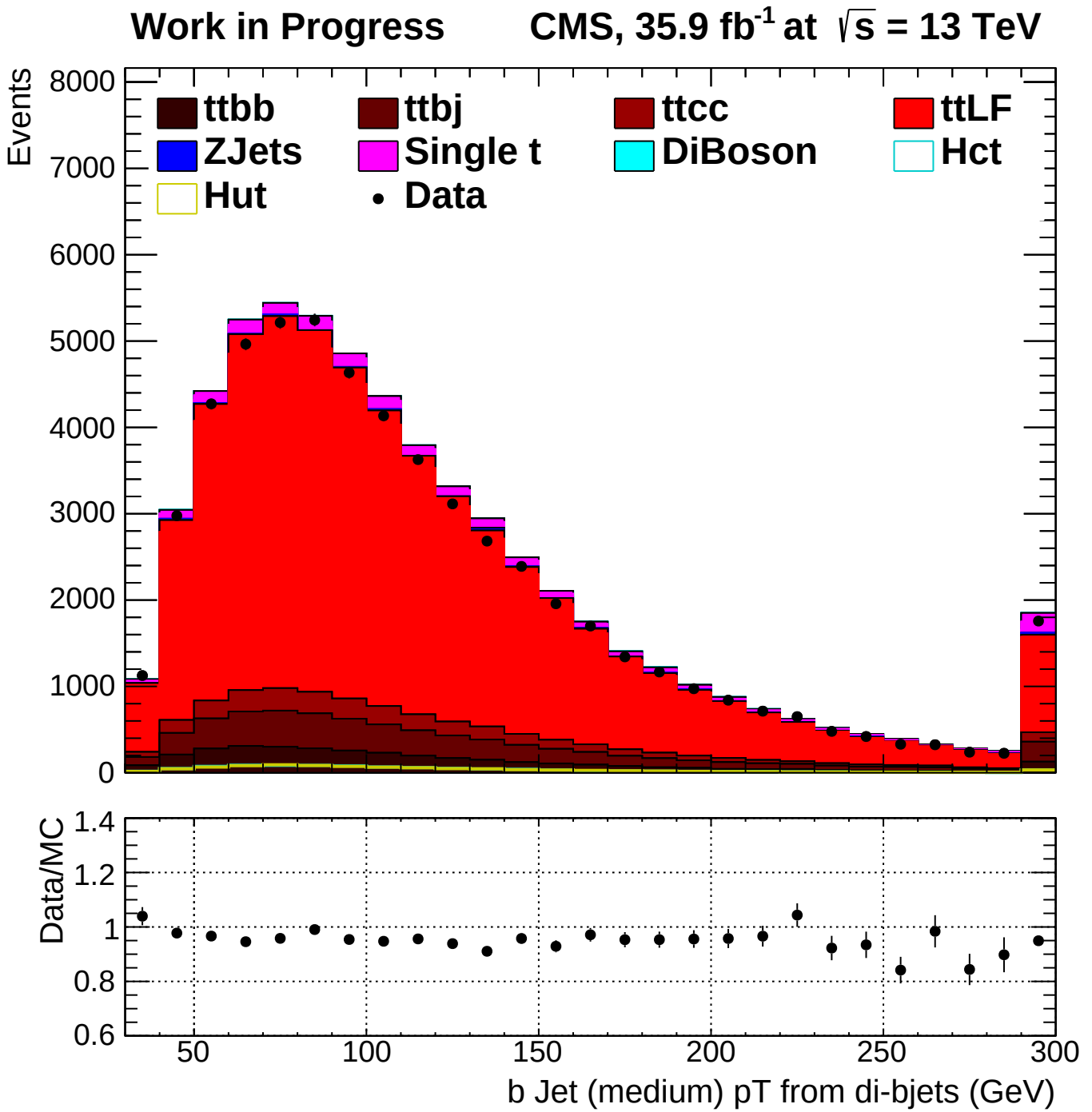

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

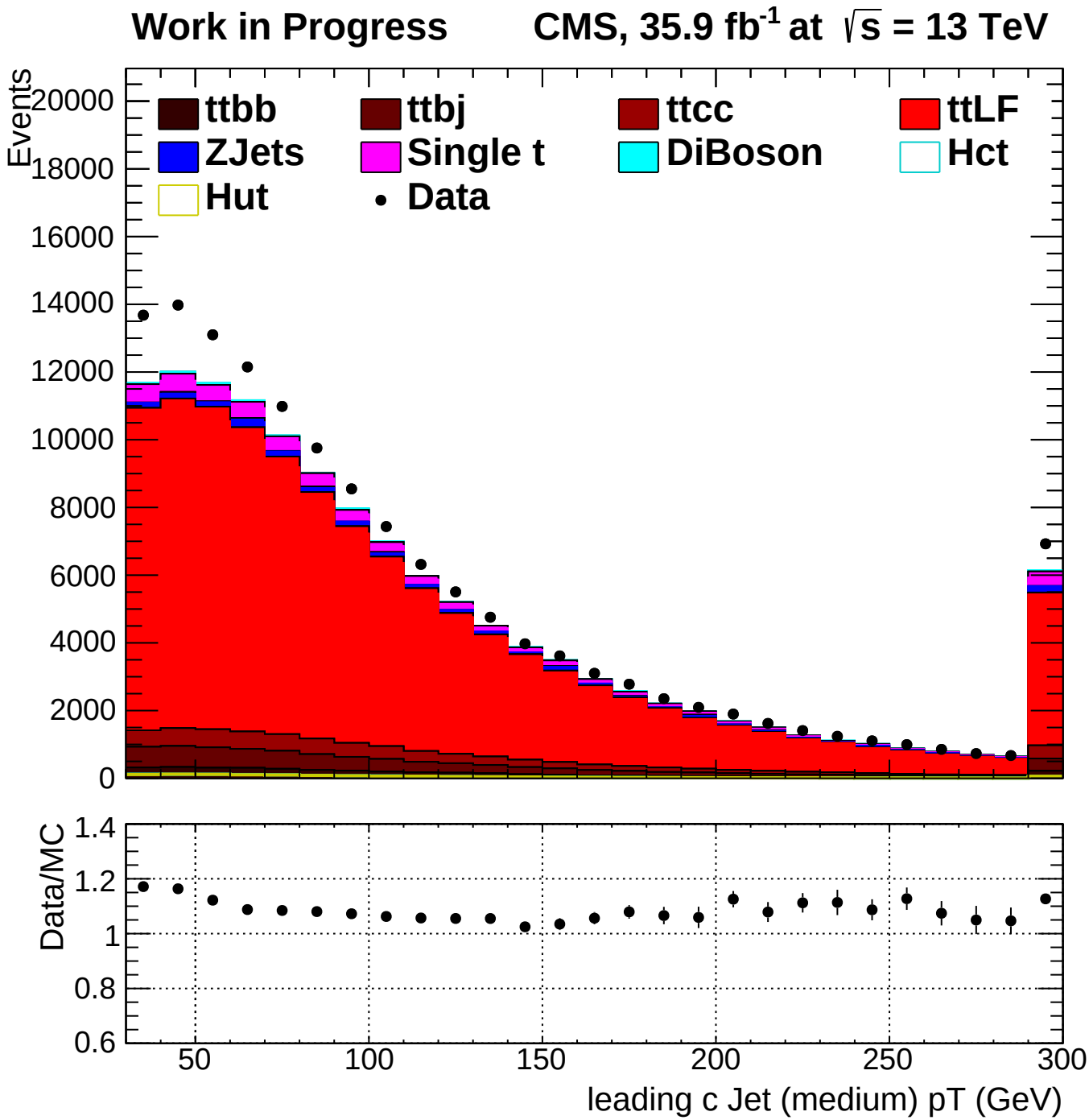

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

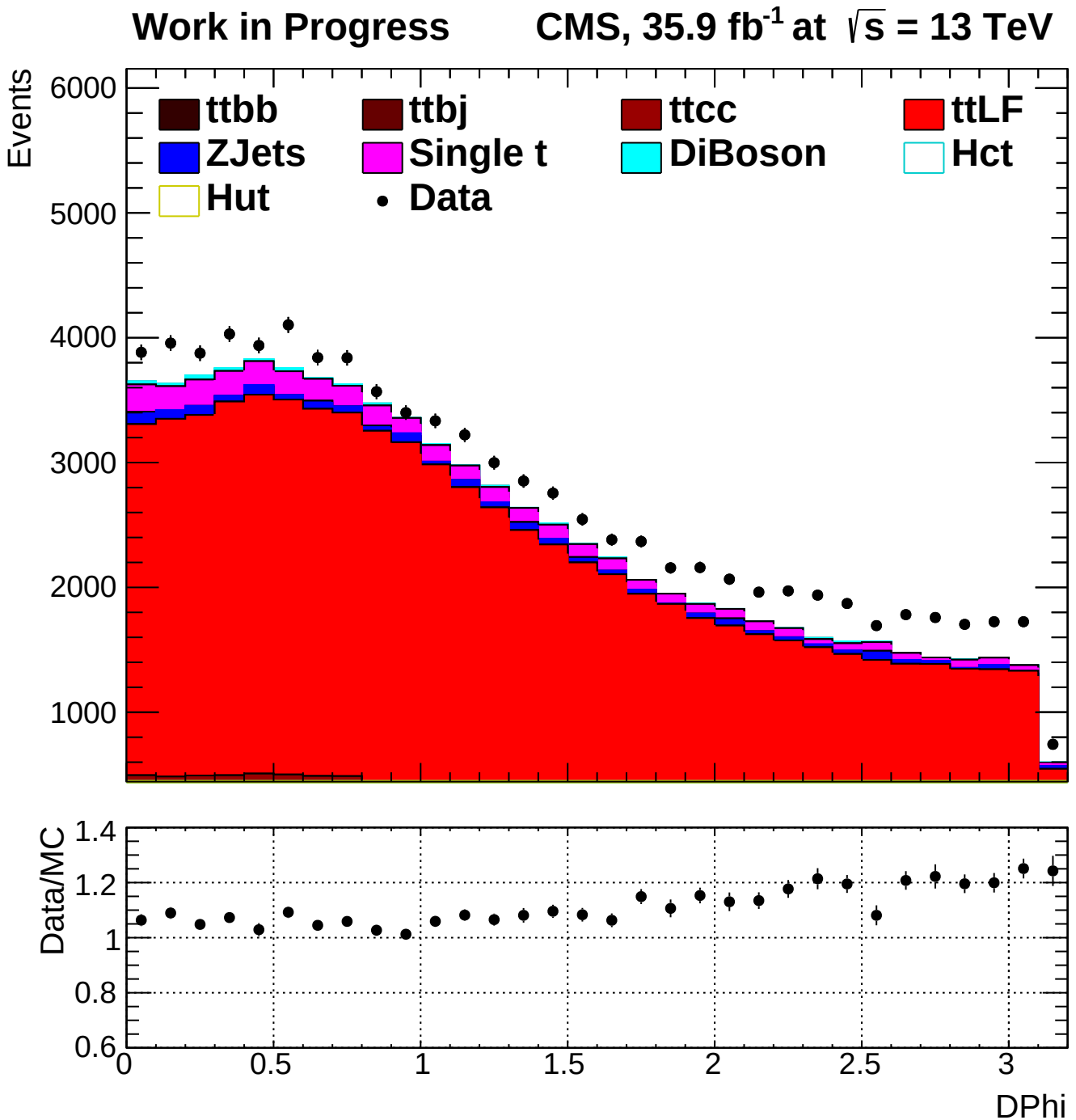

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)

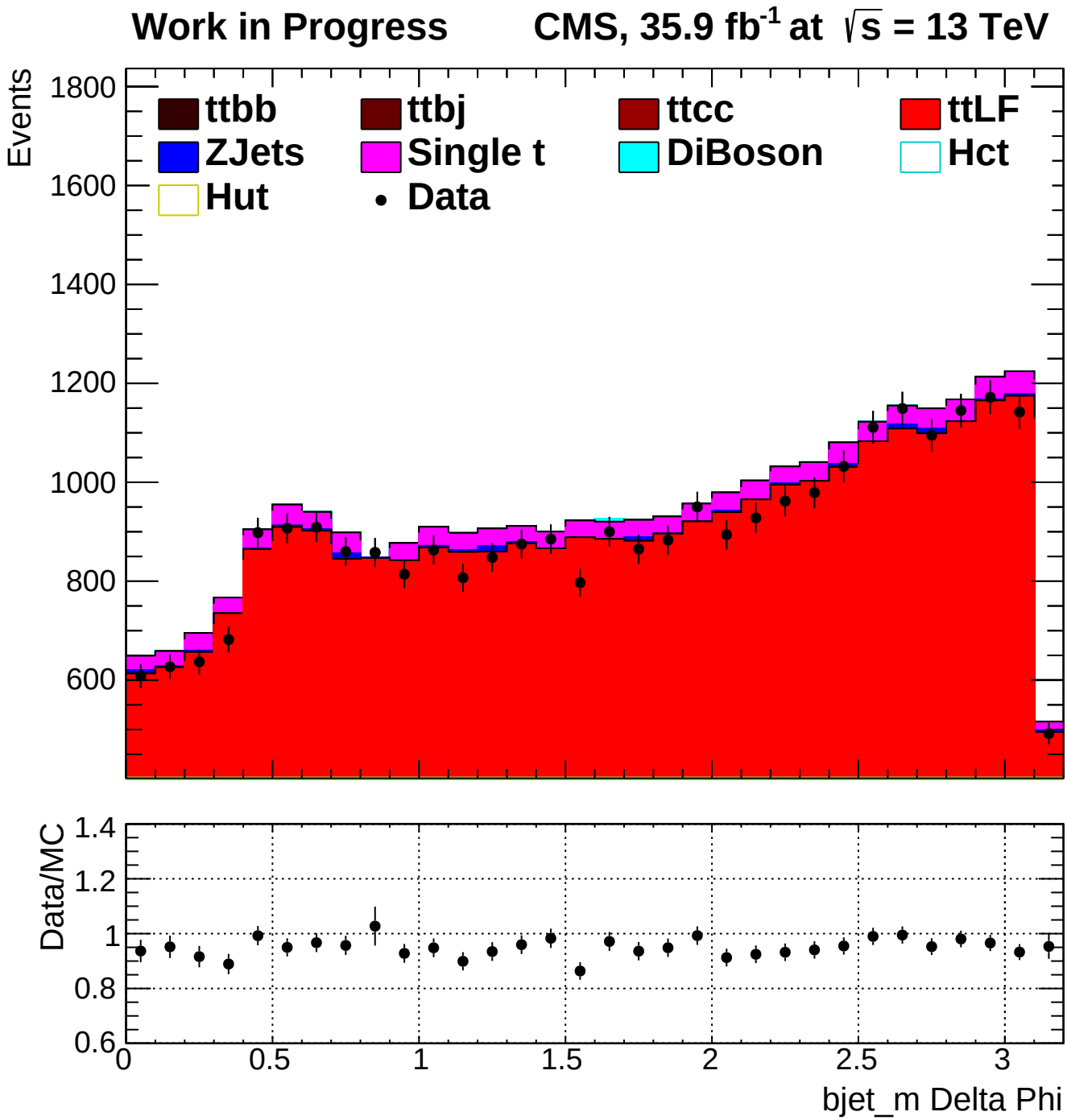

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

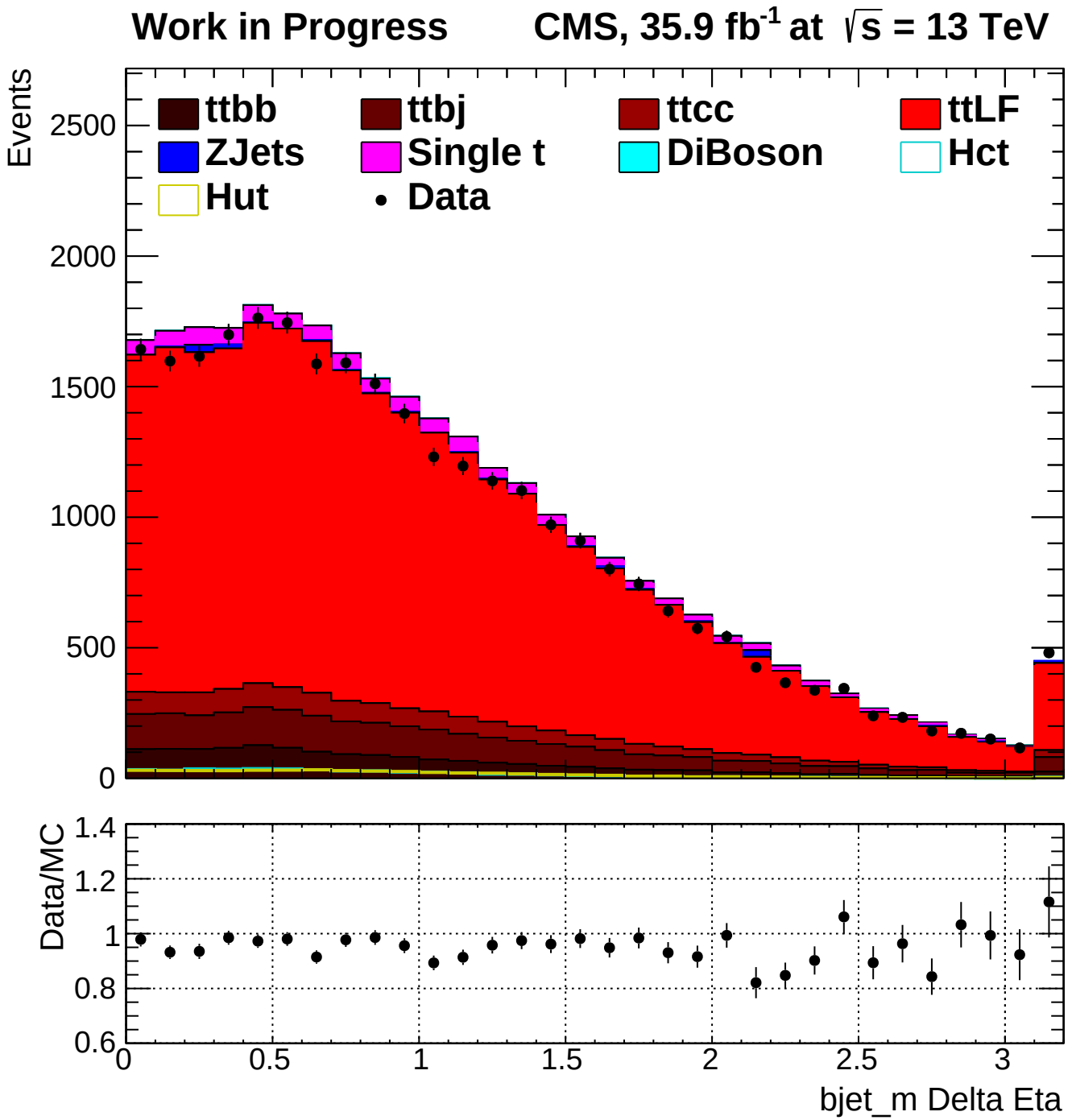

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

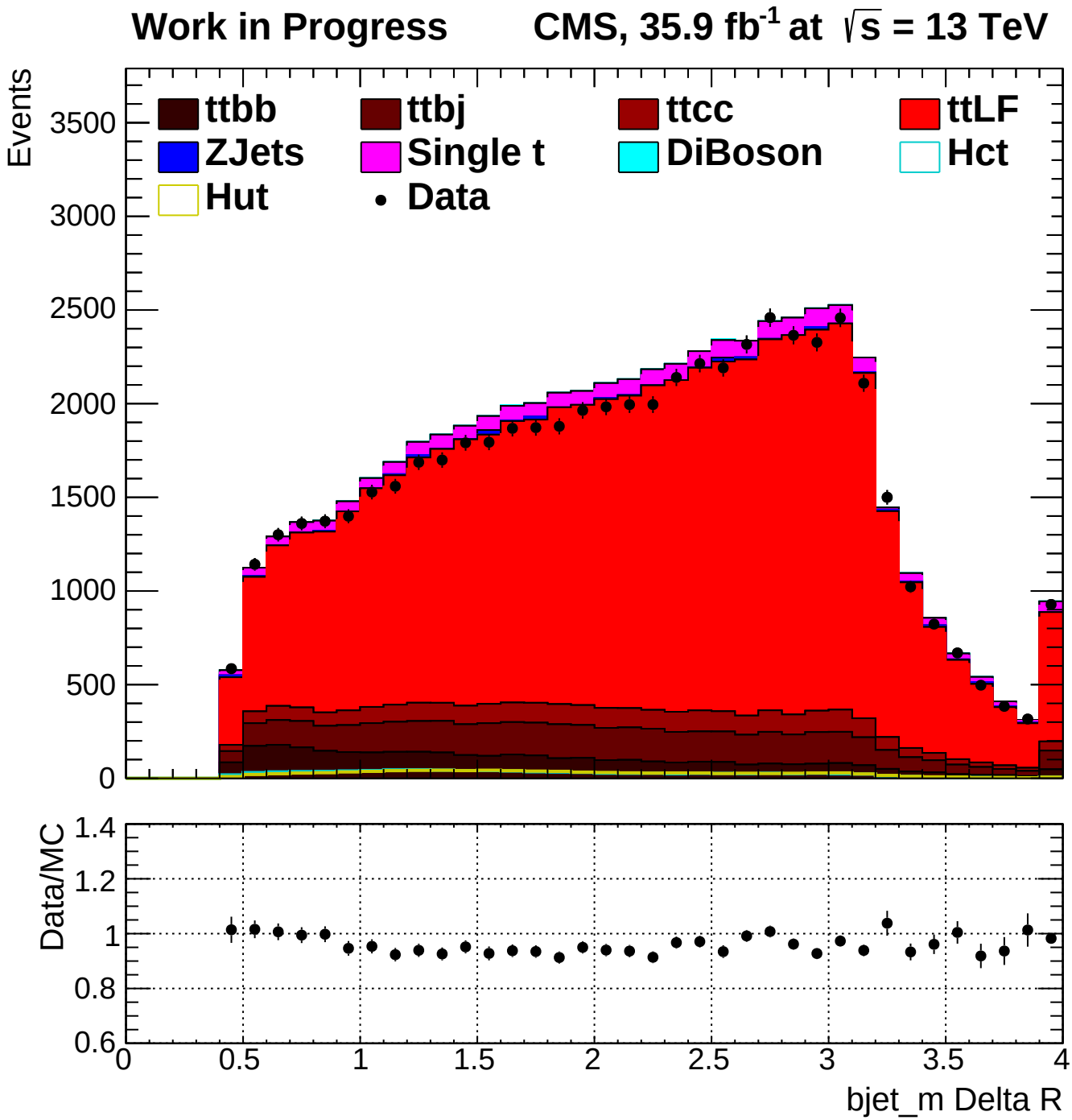

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)

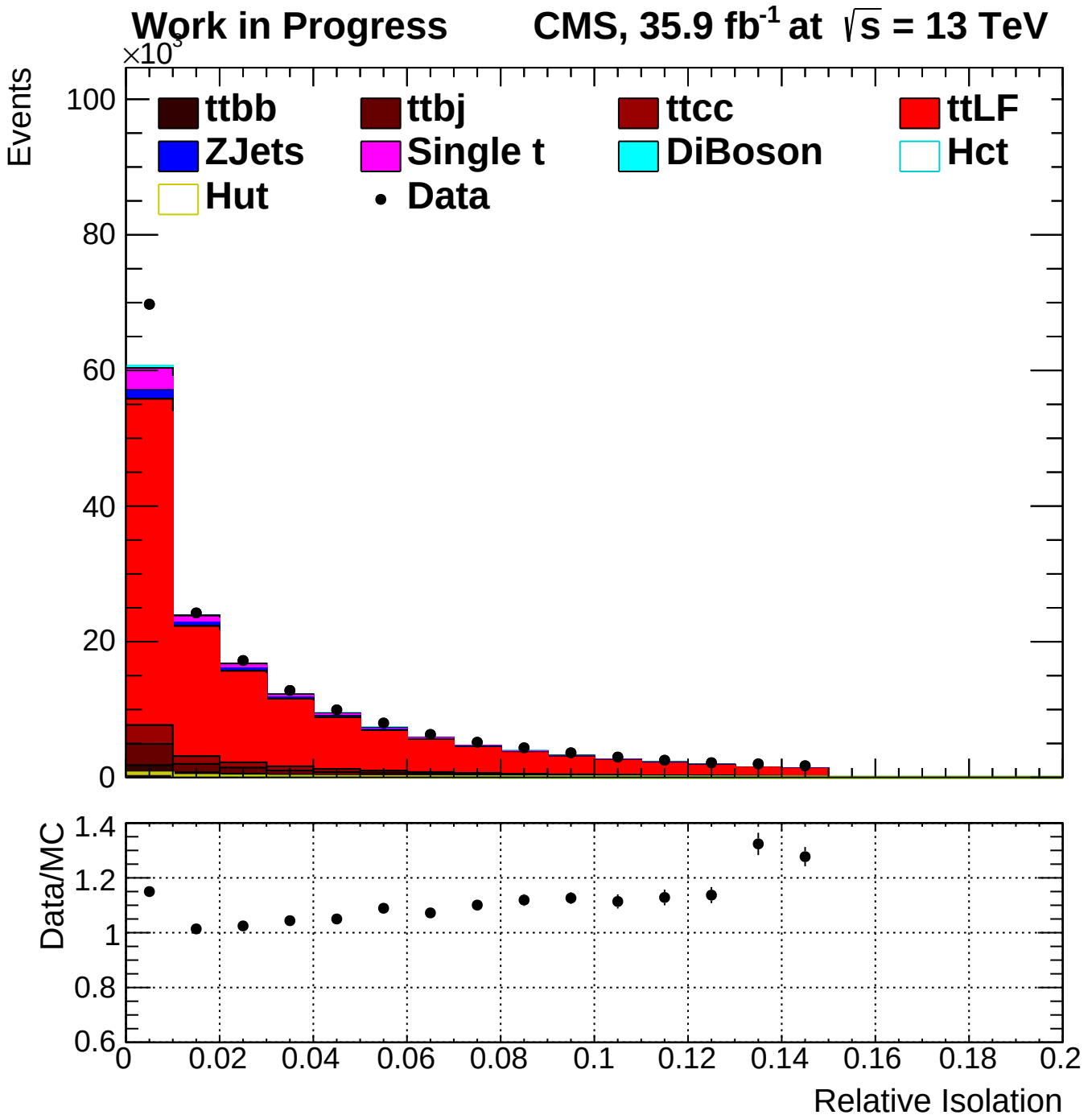

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

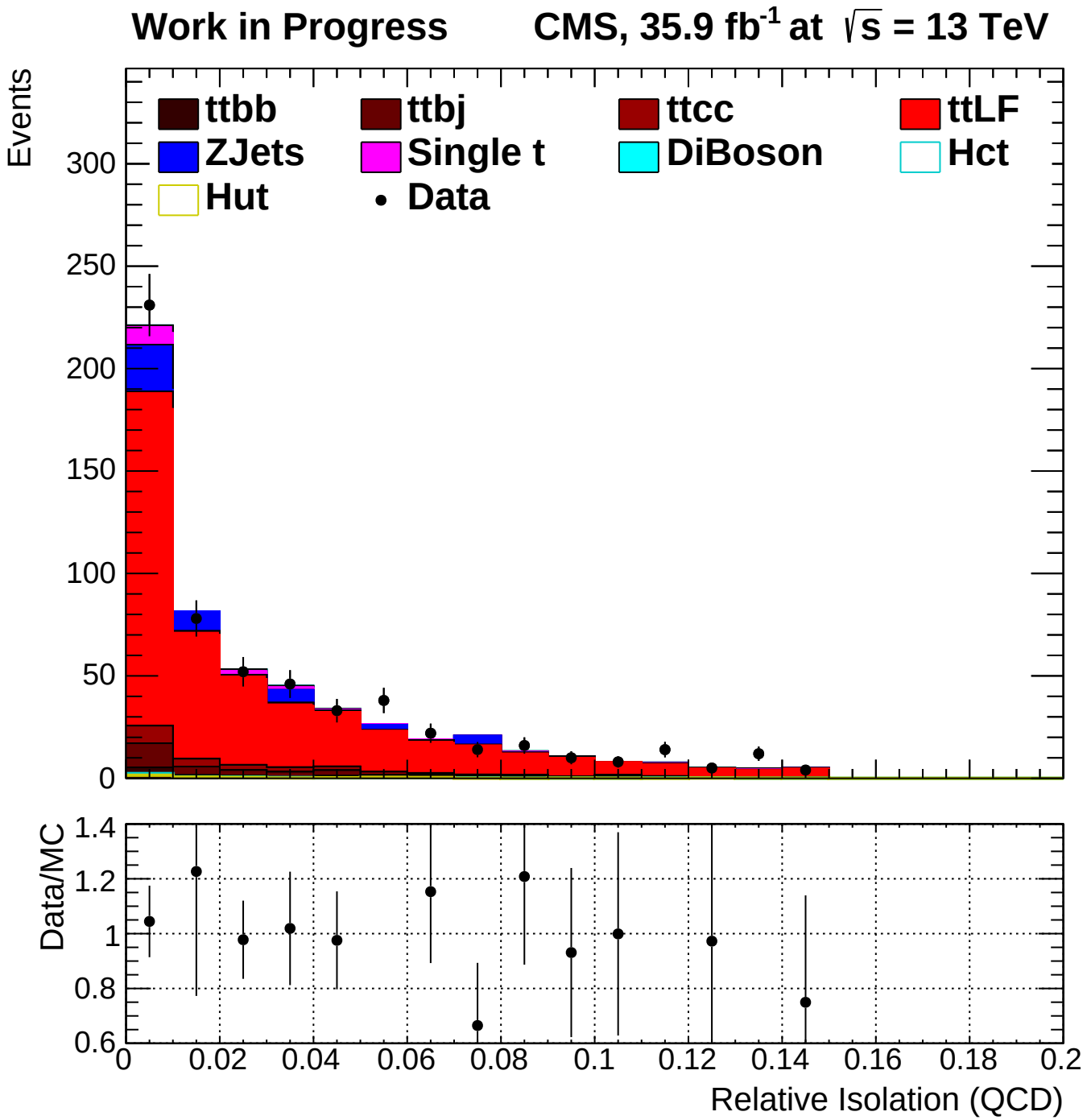

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

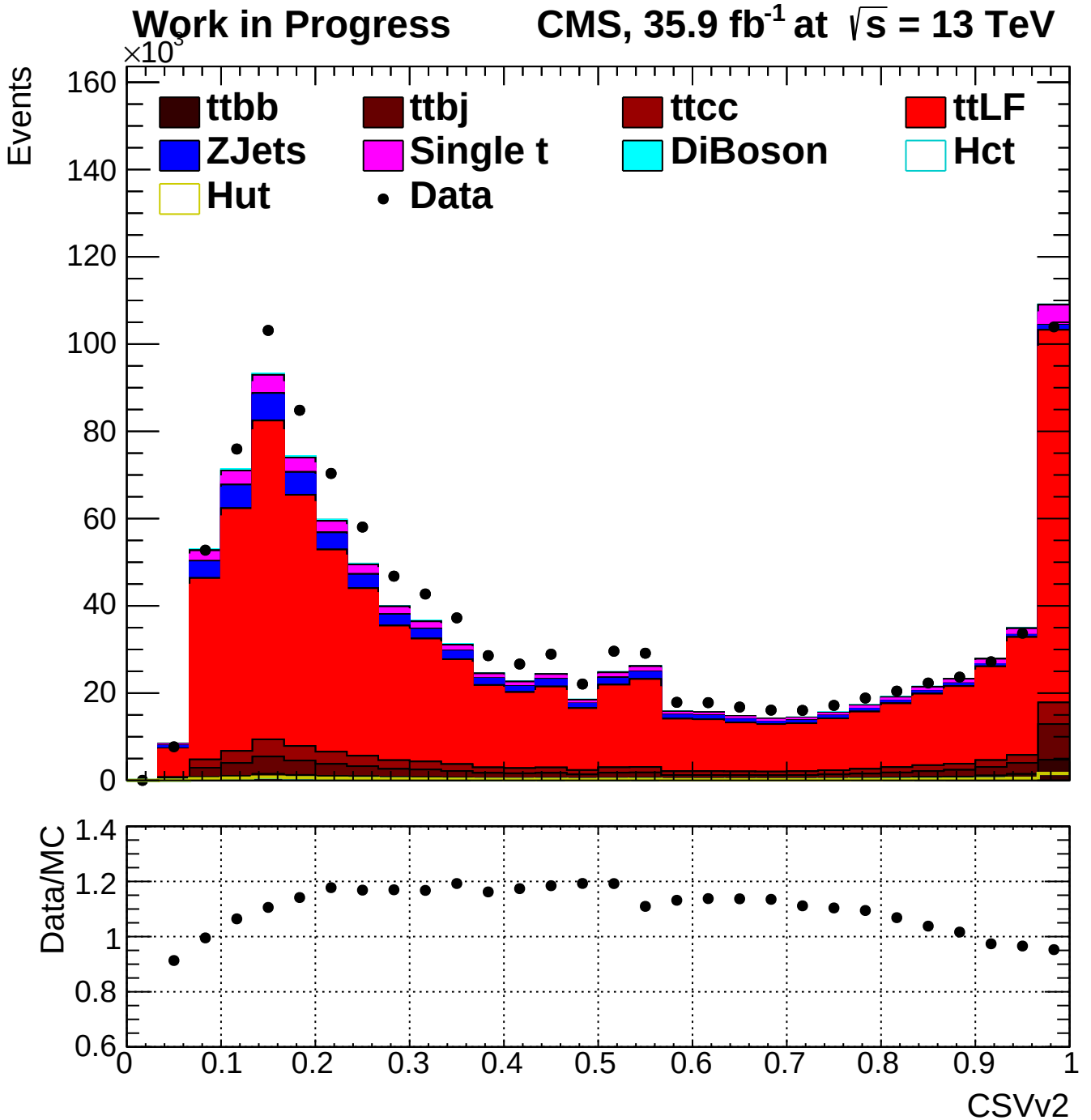

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1800
1600
1400
1200
1000
800
600
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

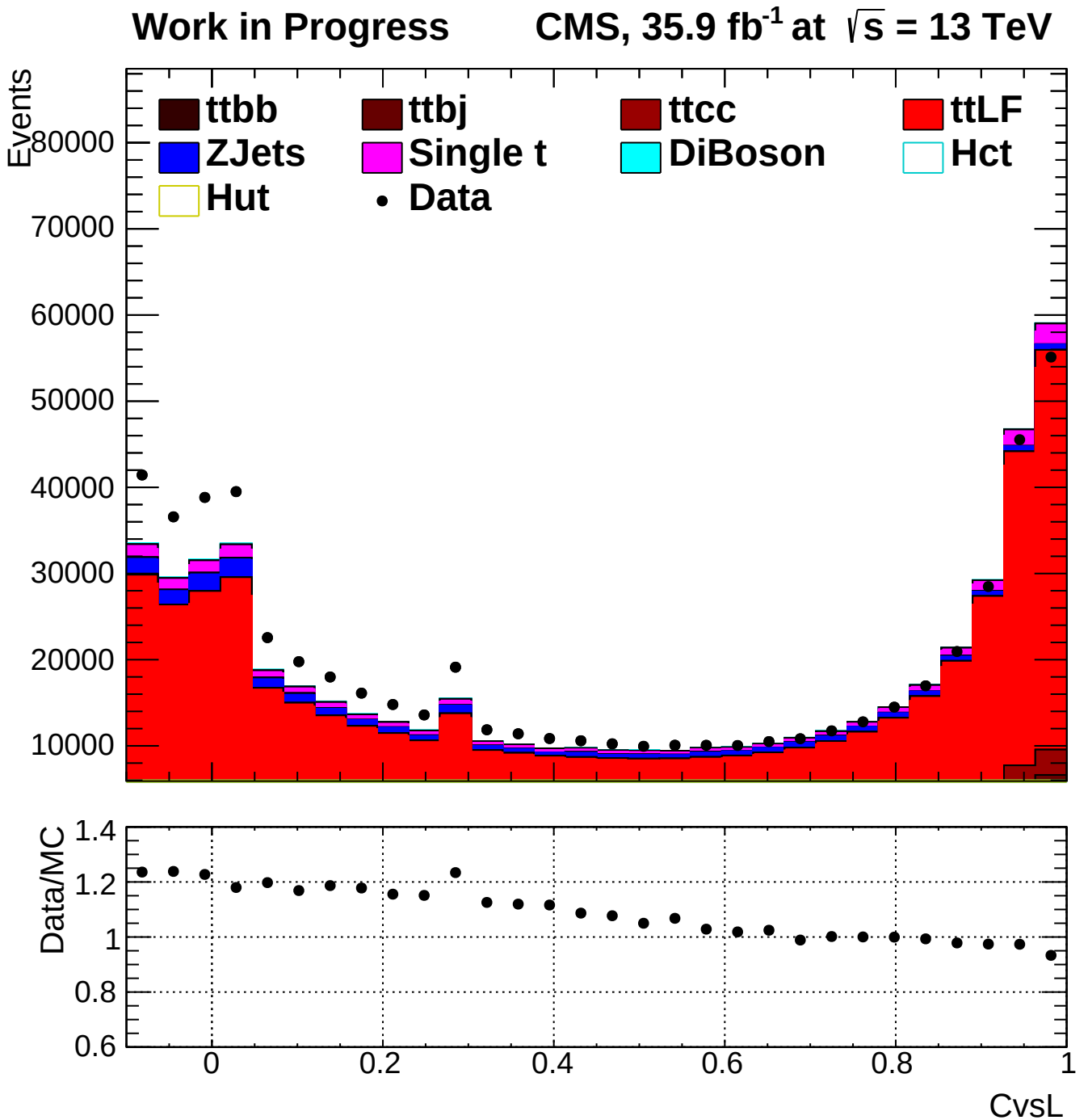

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

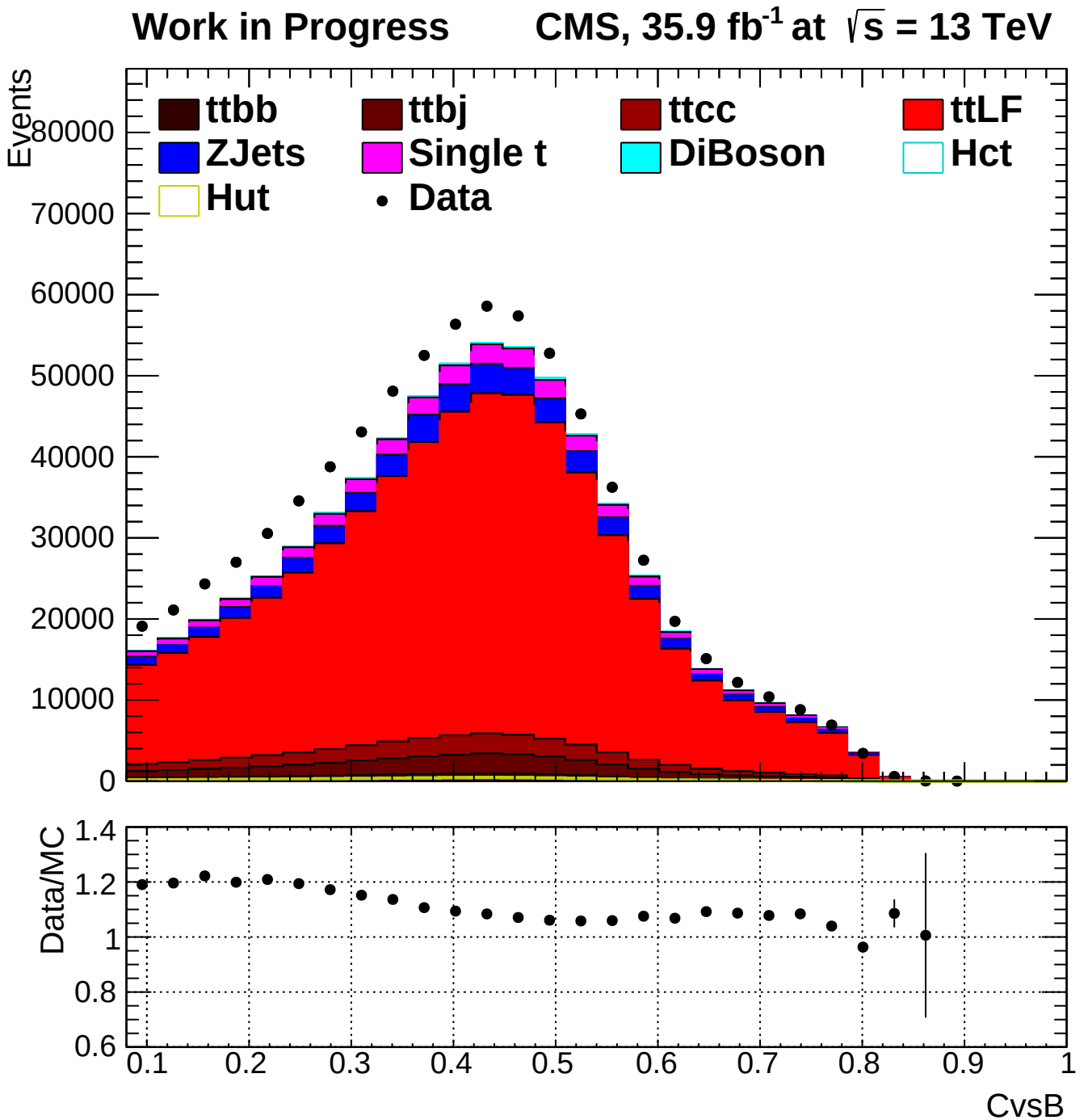

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R

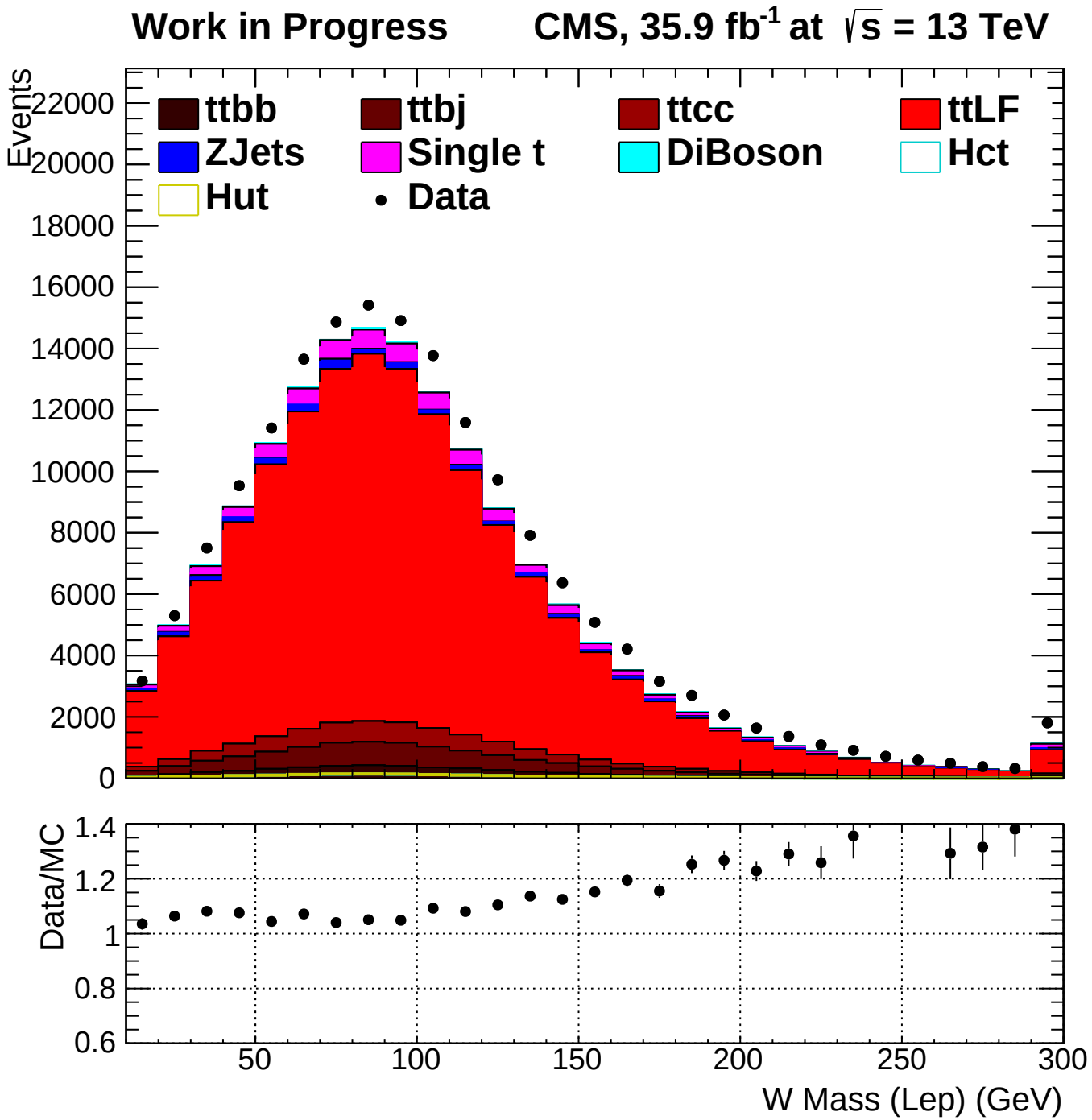

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation

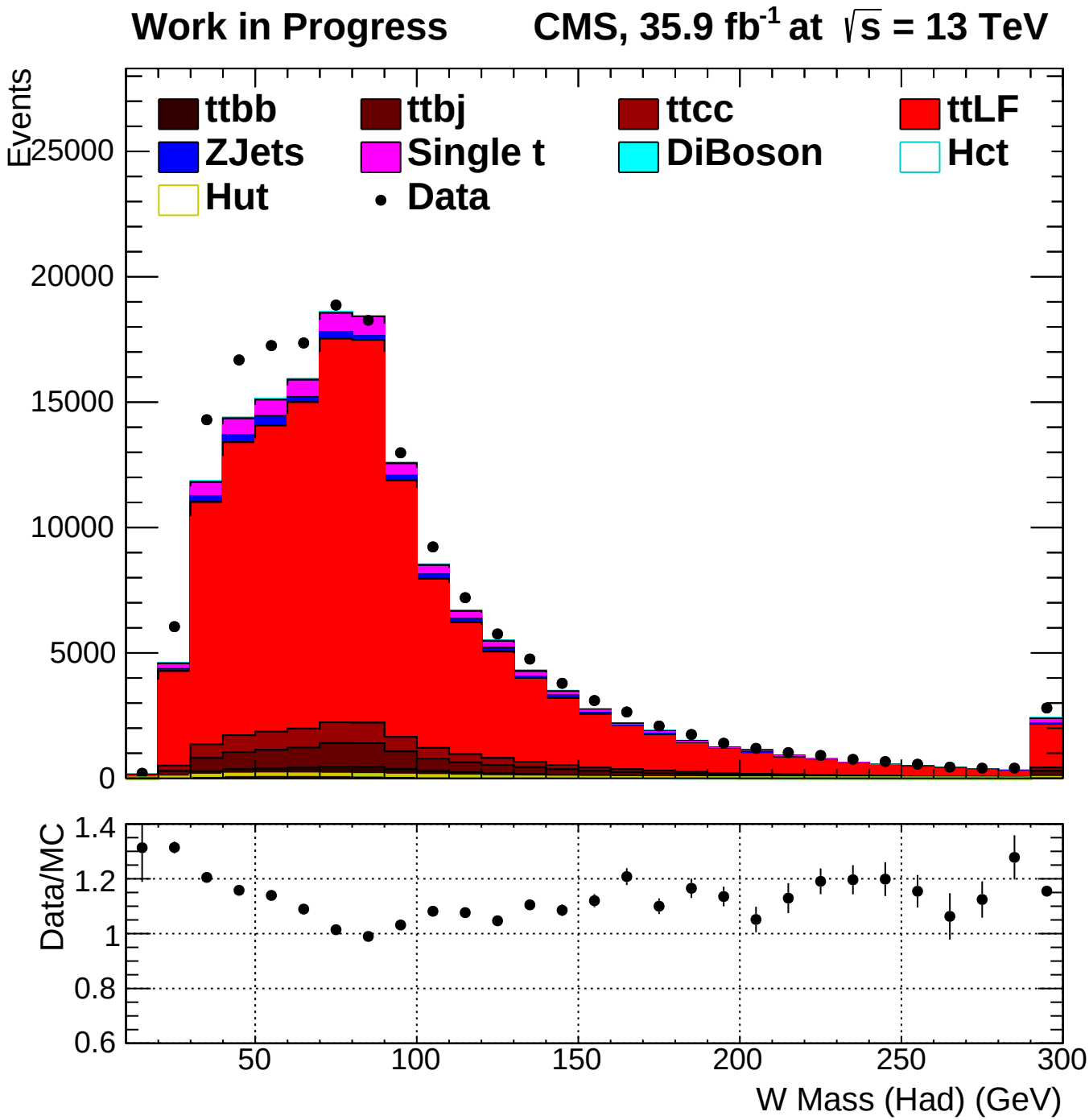

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

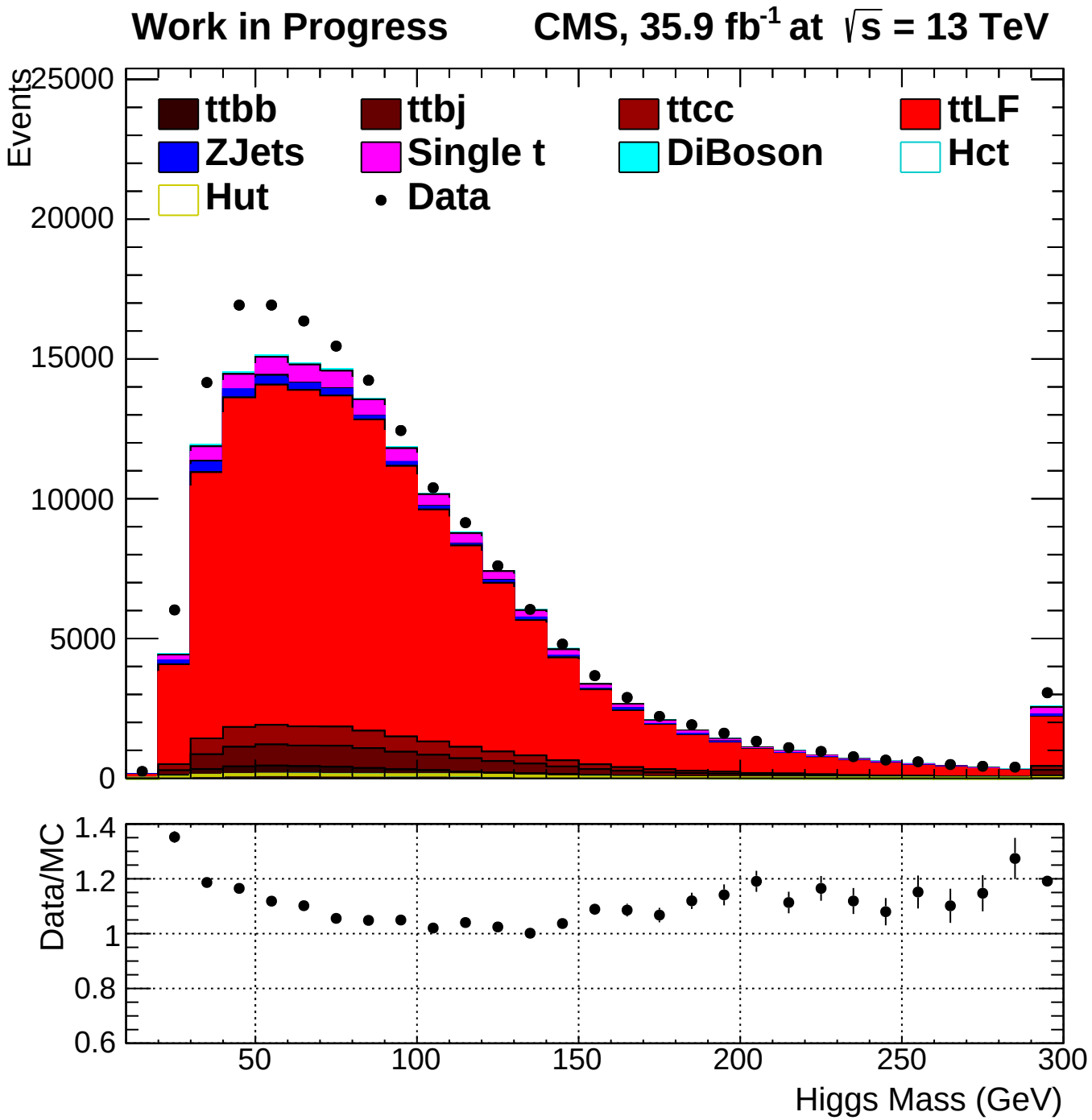

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2

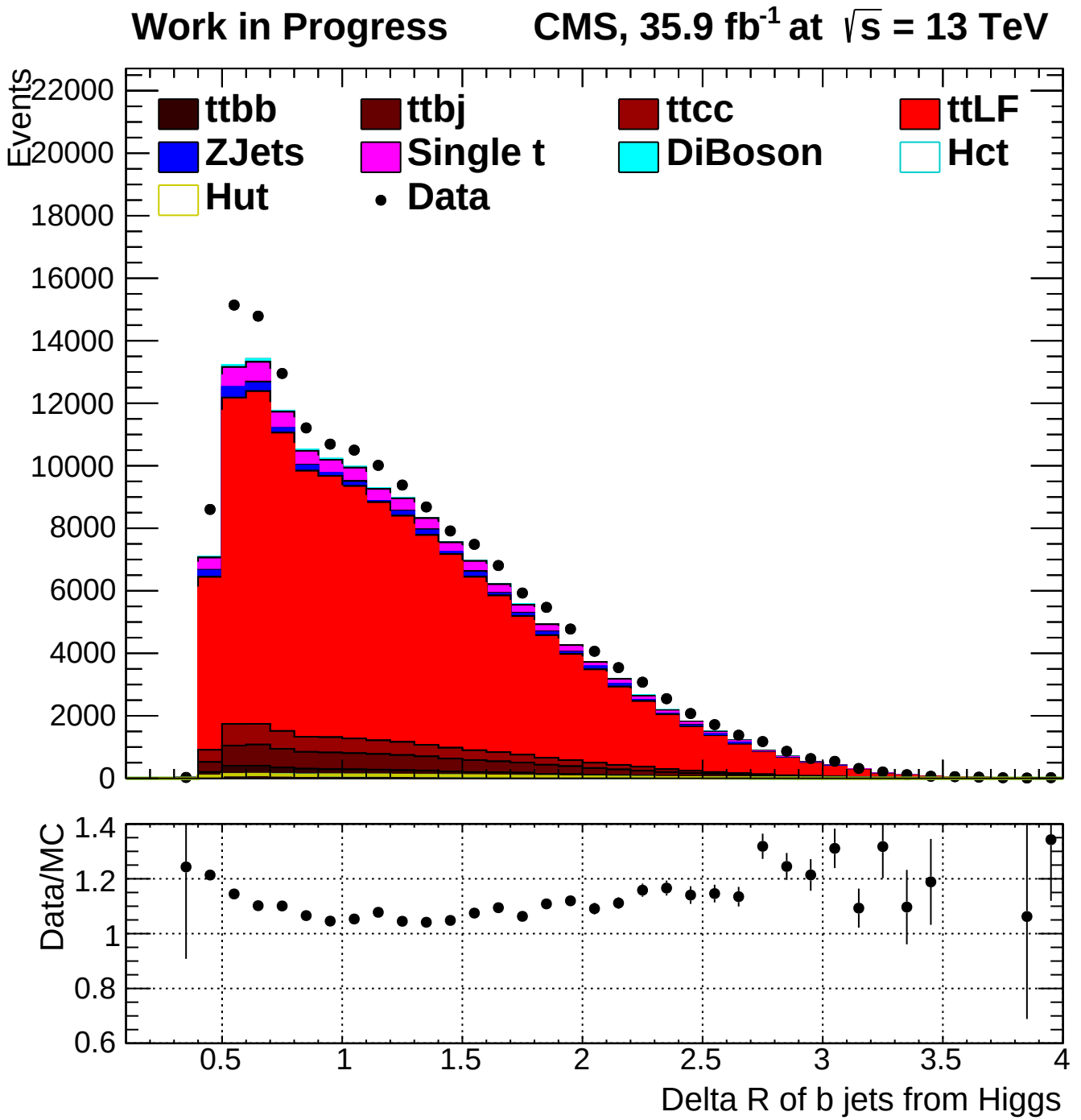

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

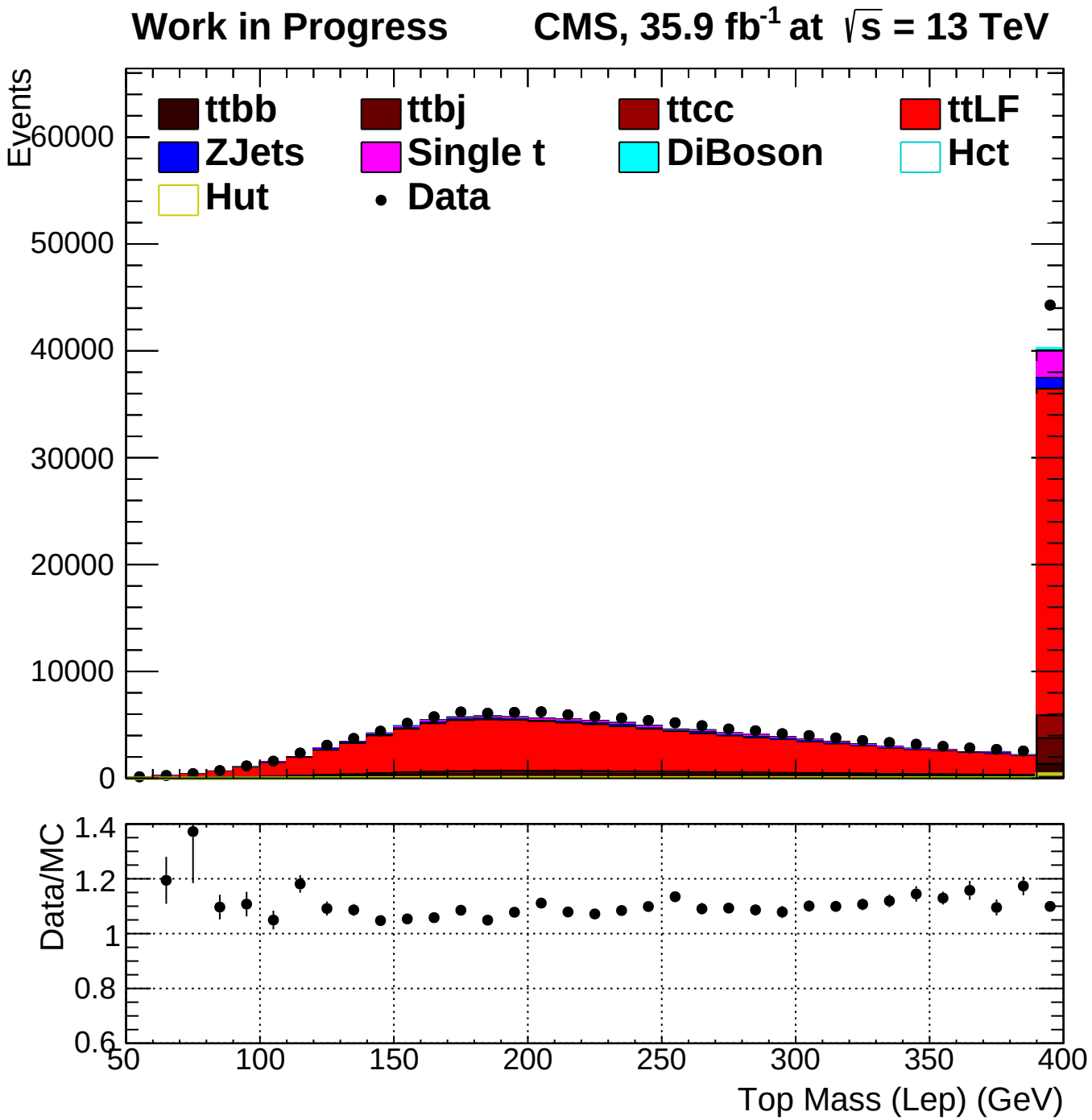

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

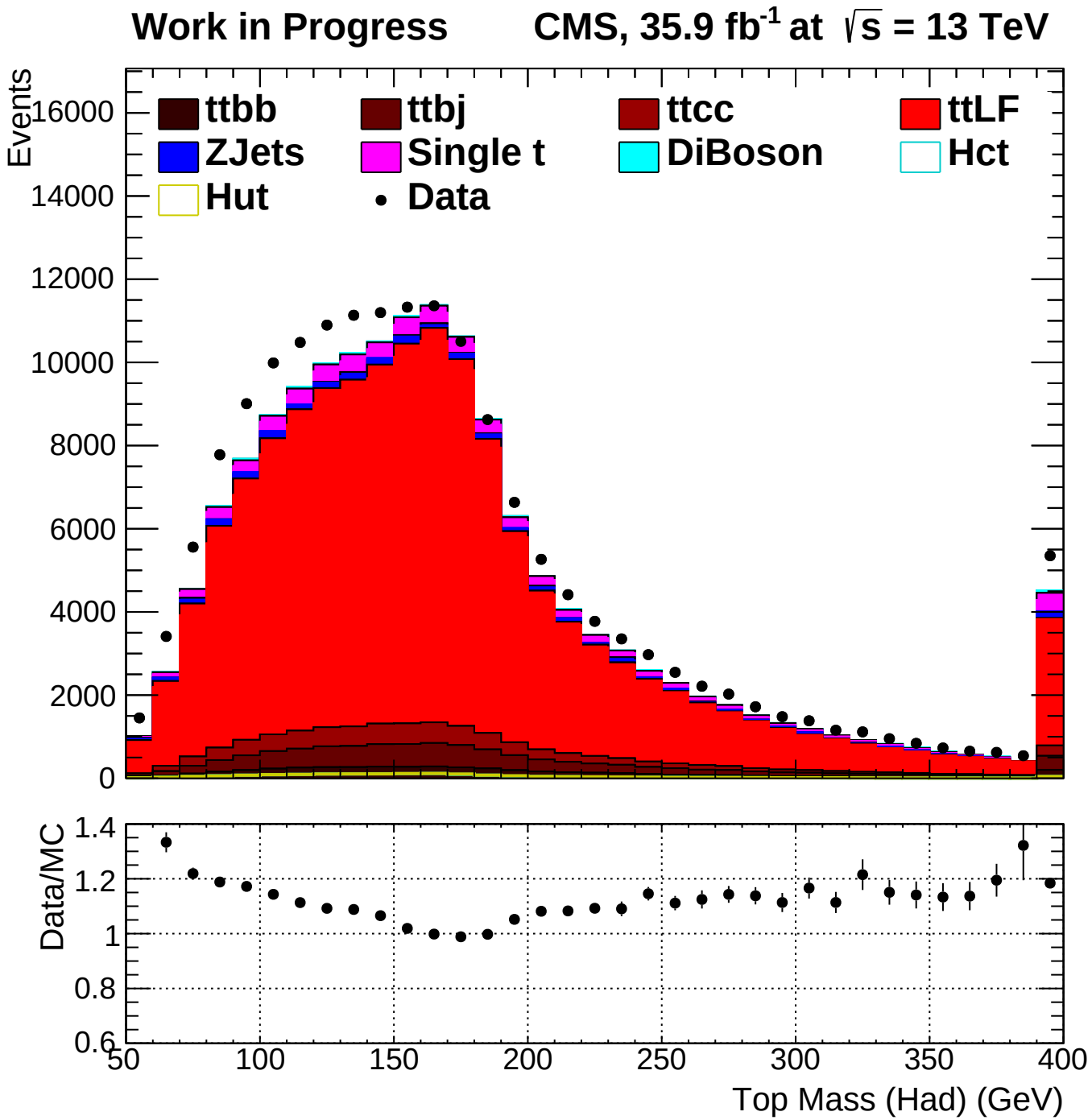

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

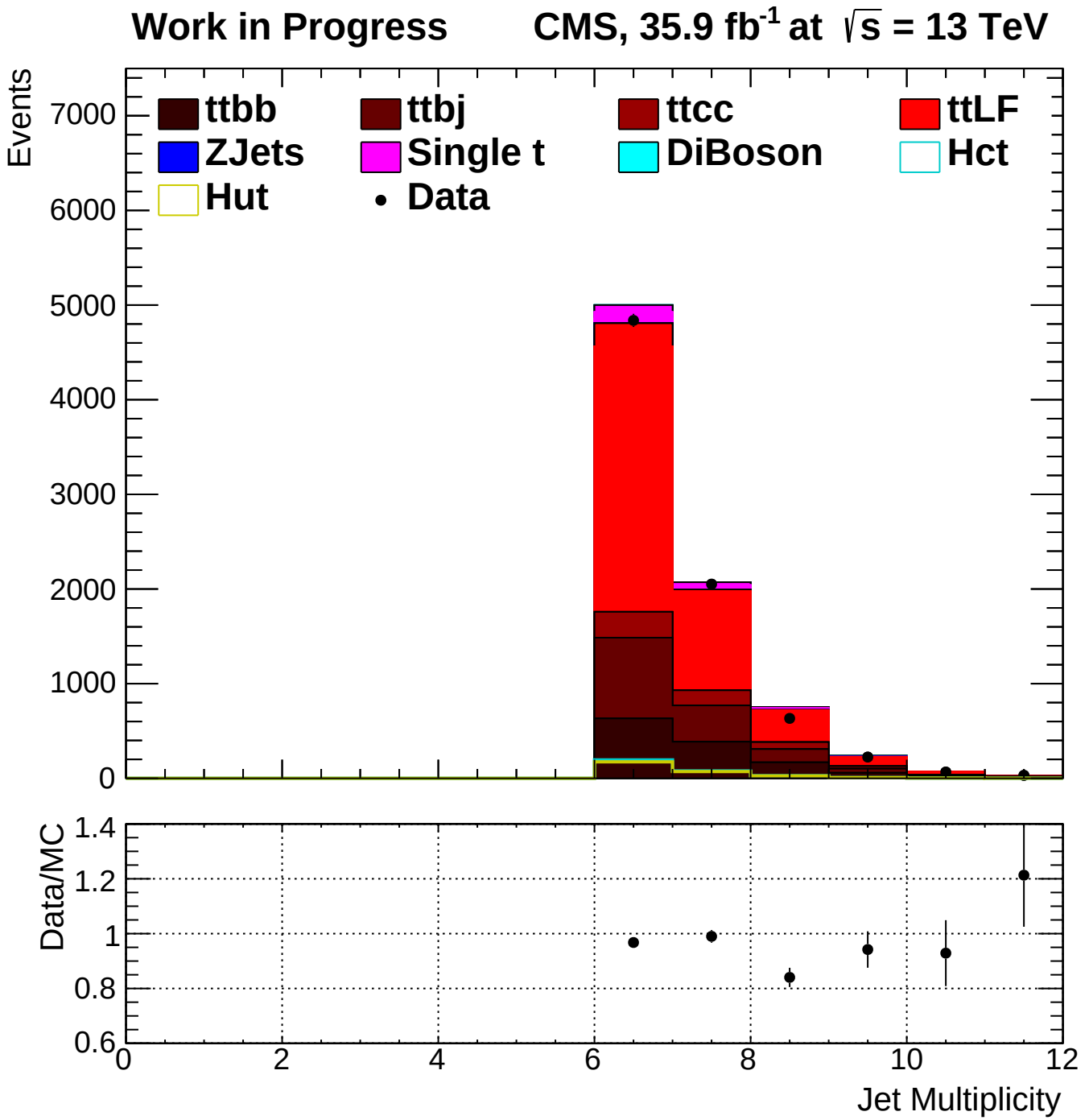

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)

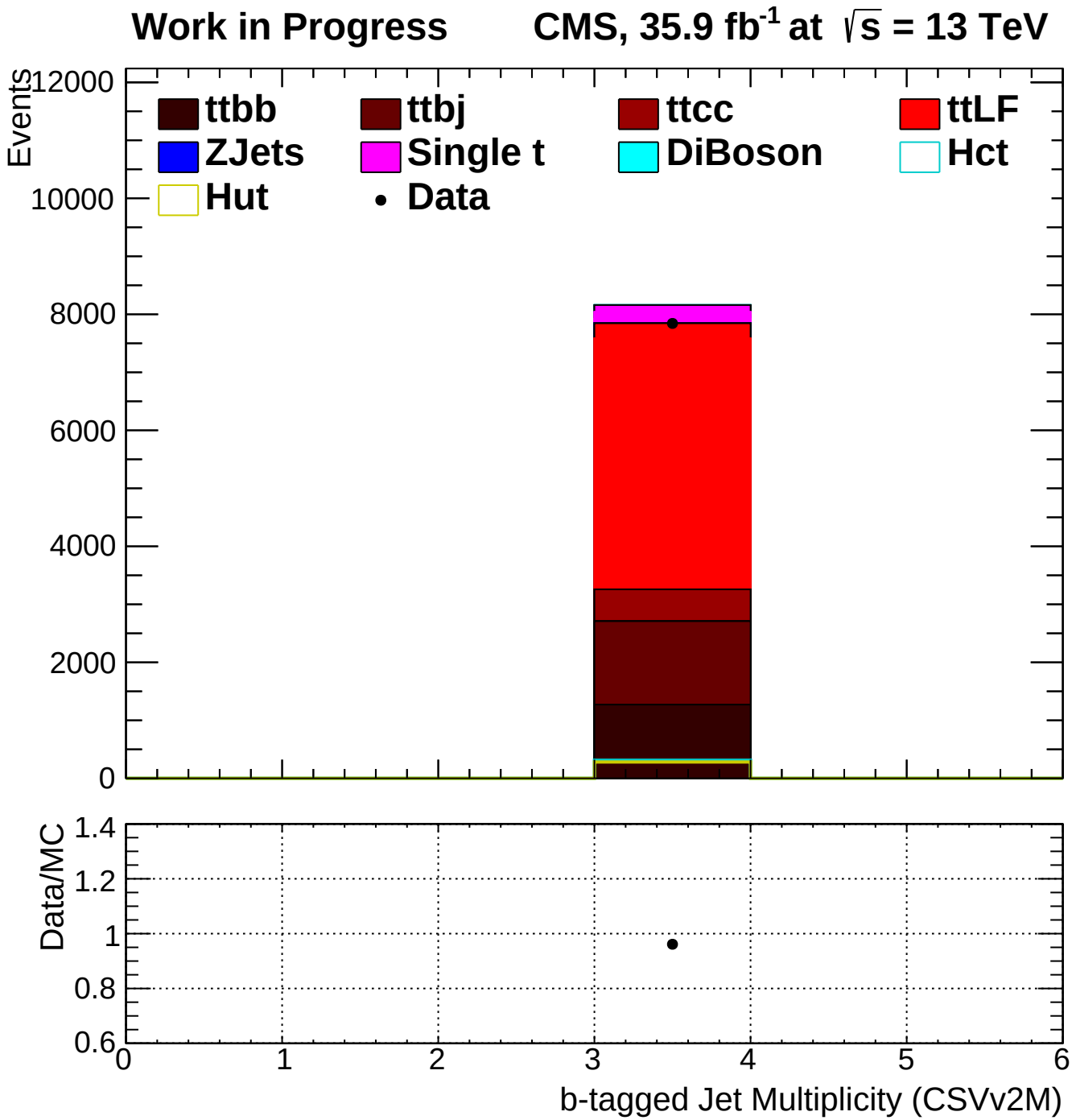

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
Higgs Mass (GeV)

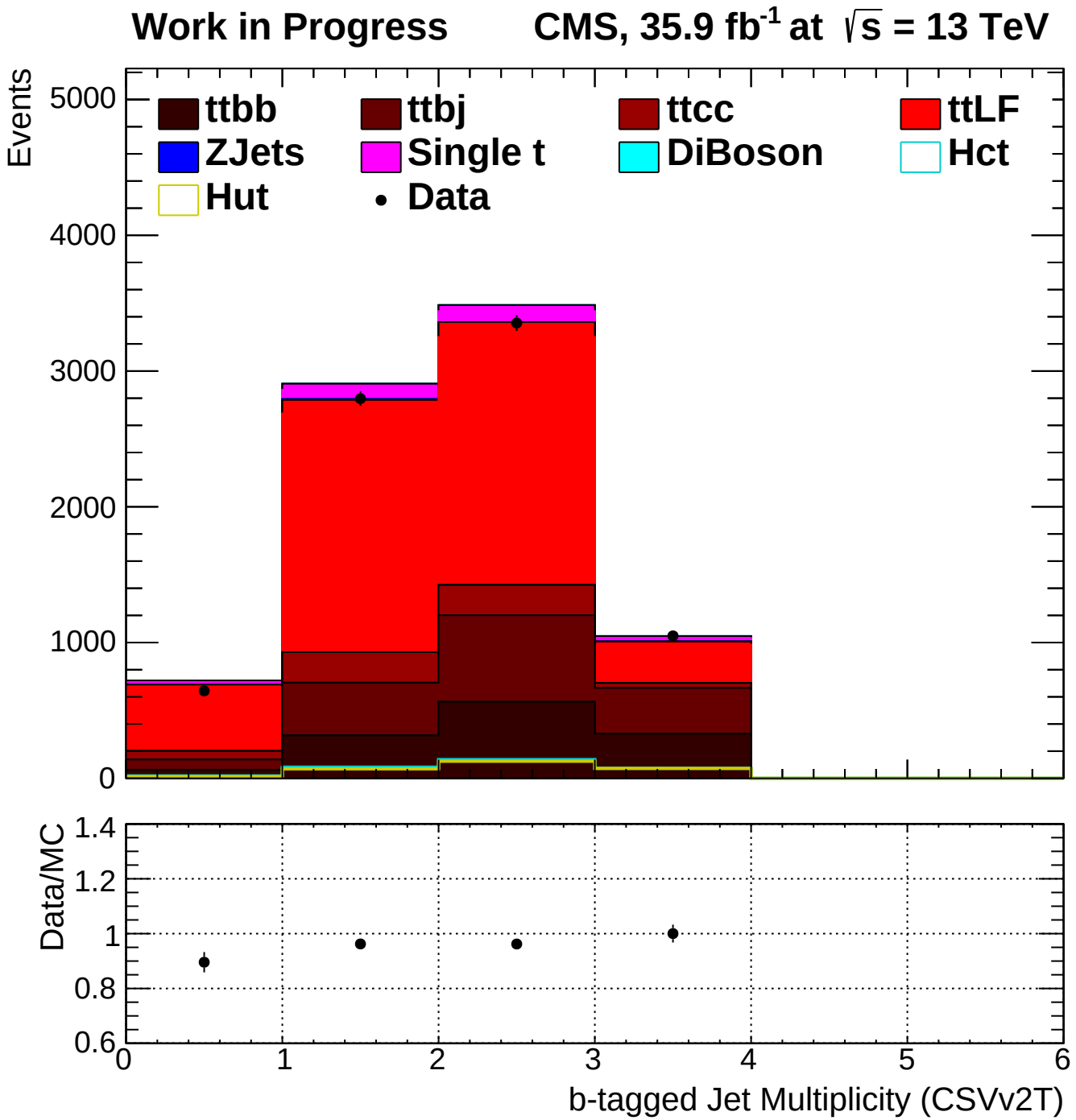

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

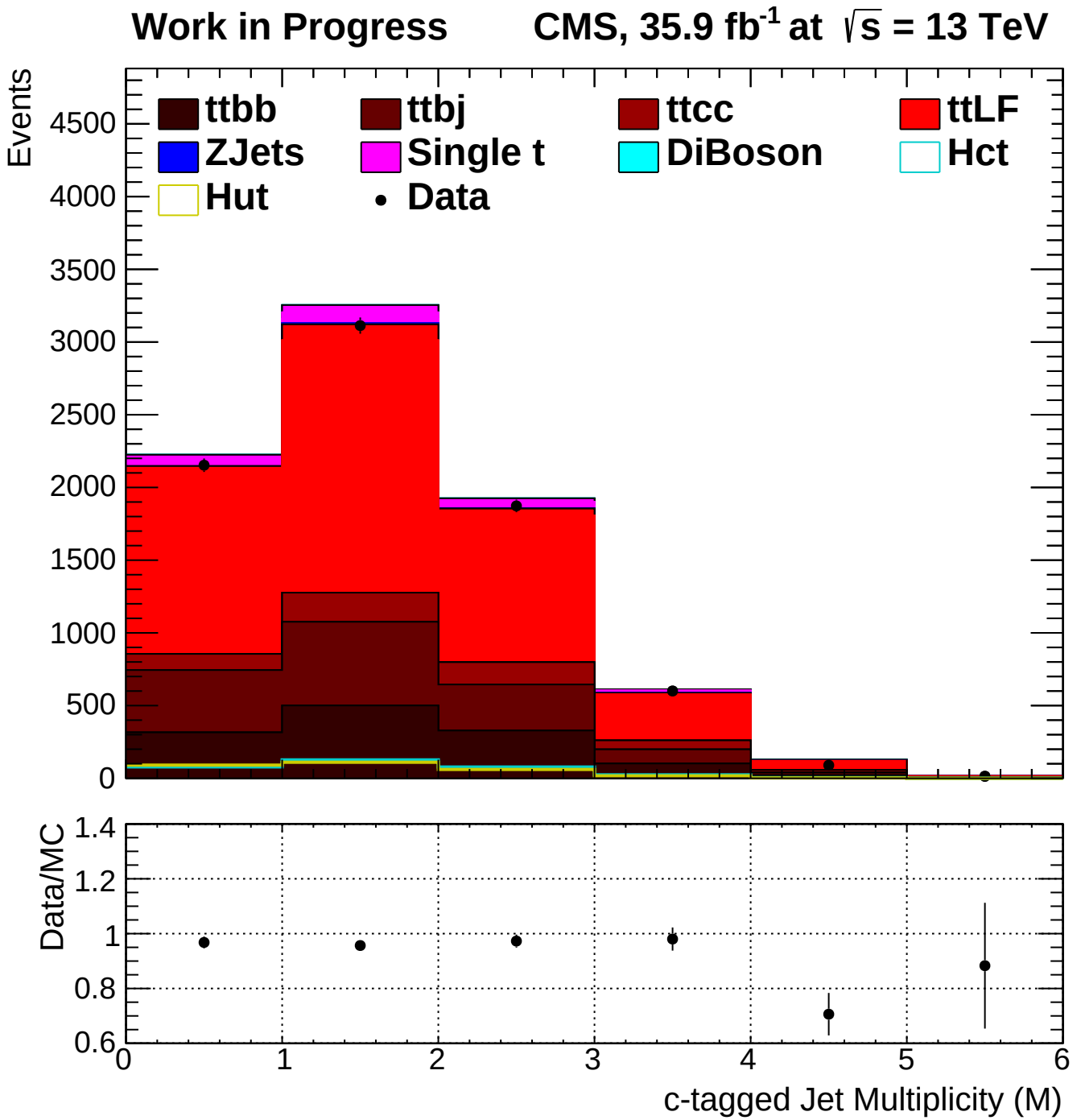

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)

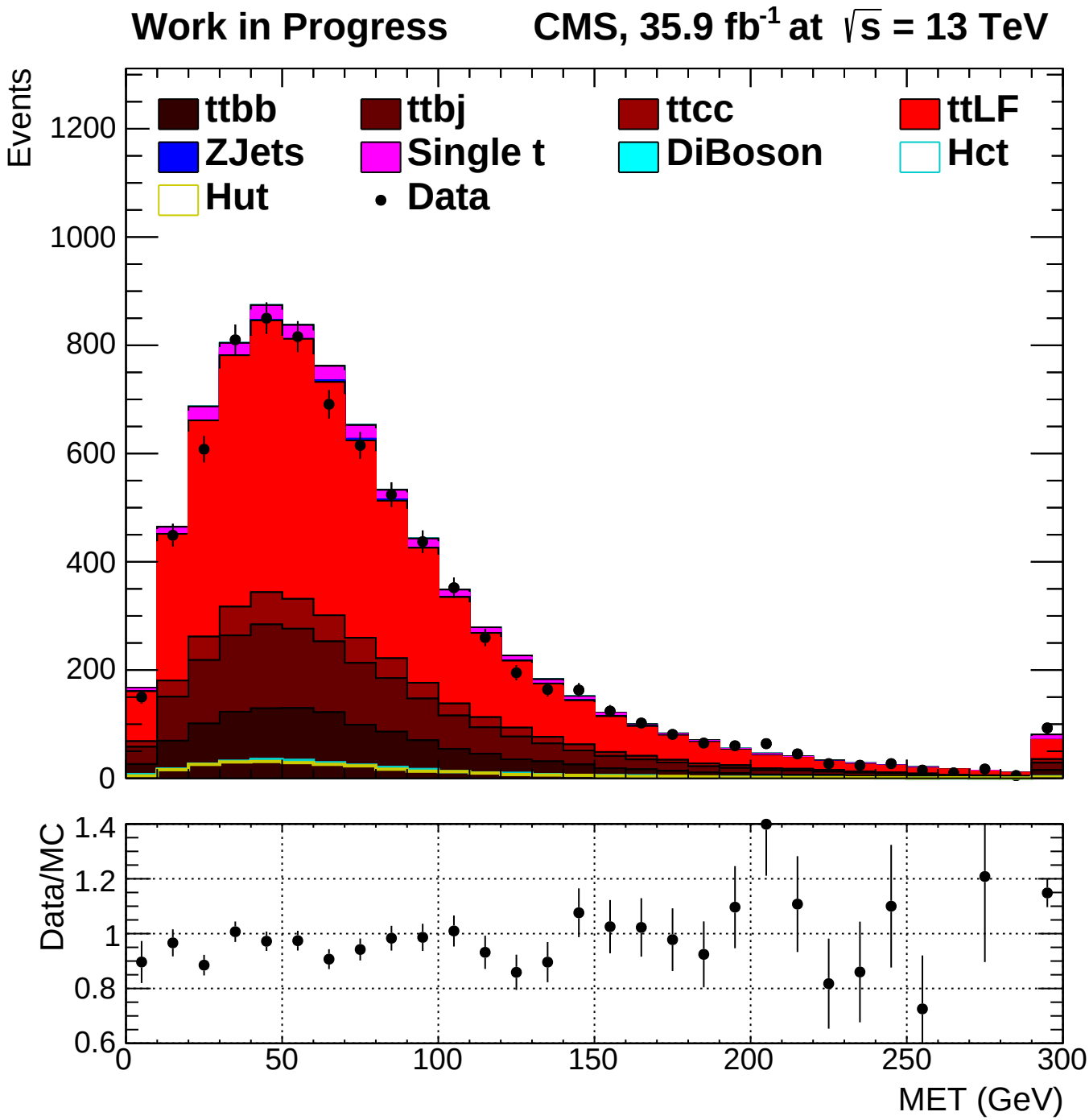

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

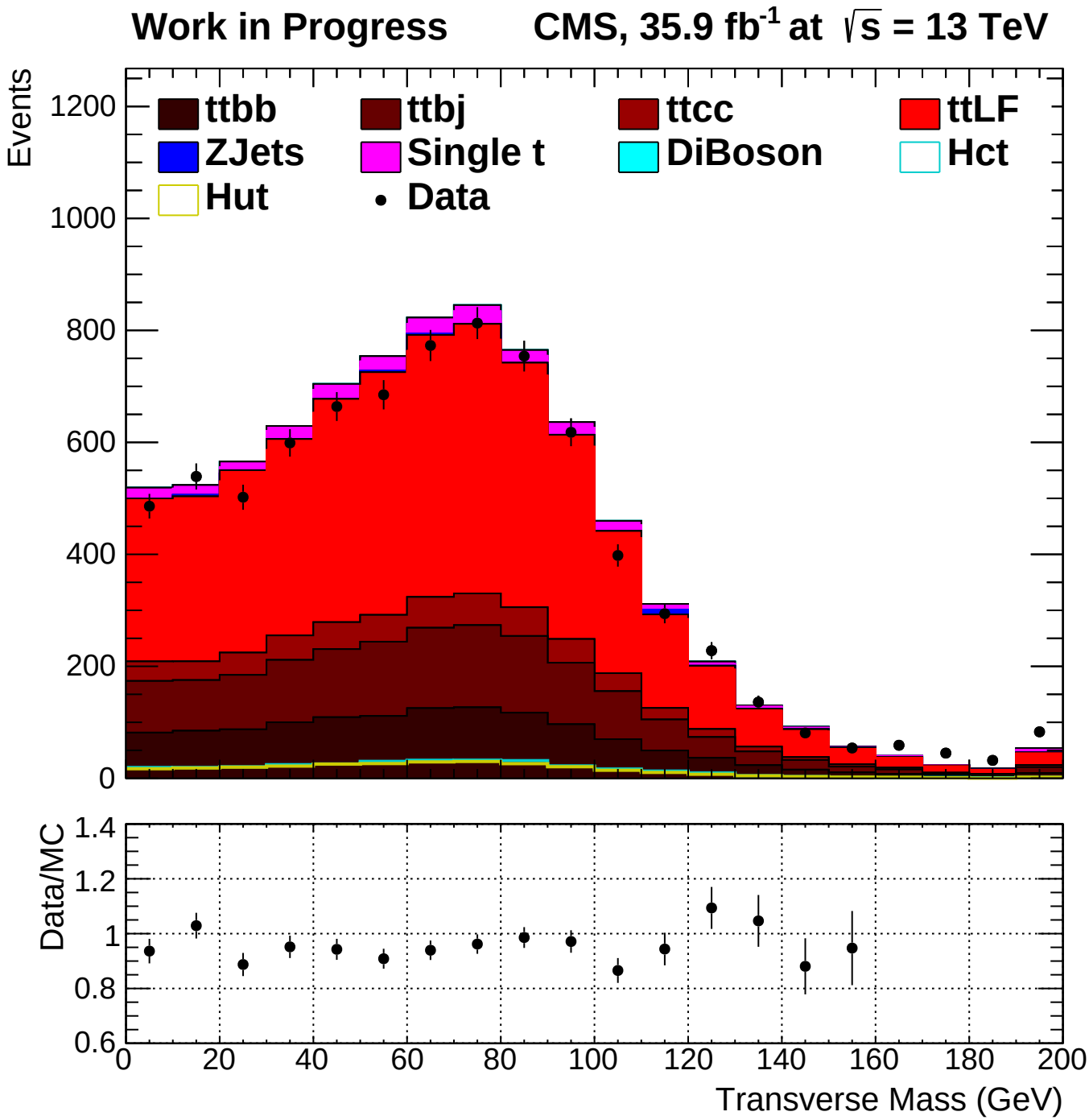

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
7000
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity

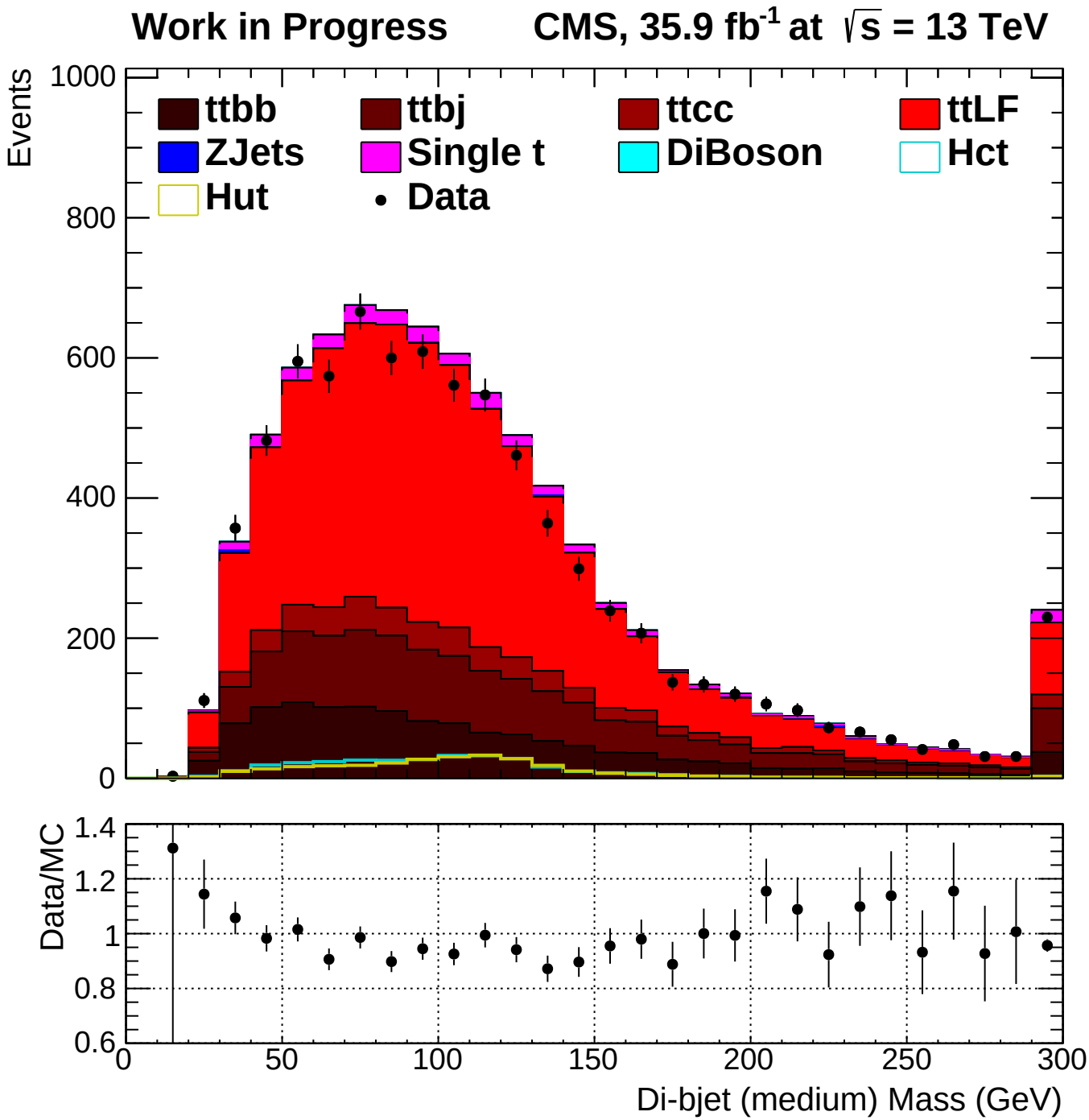

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

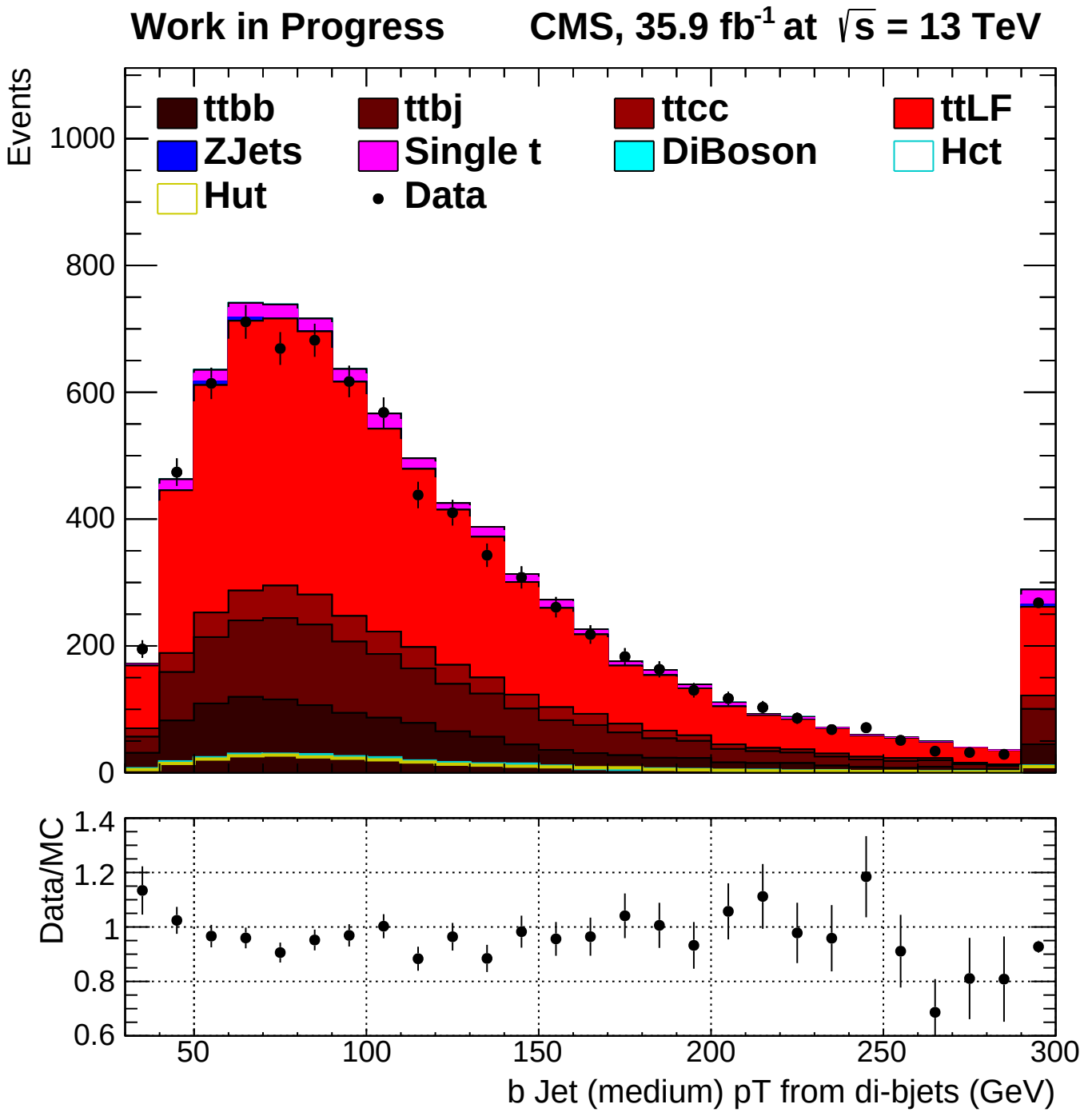

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

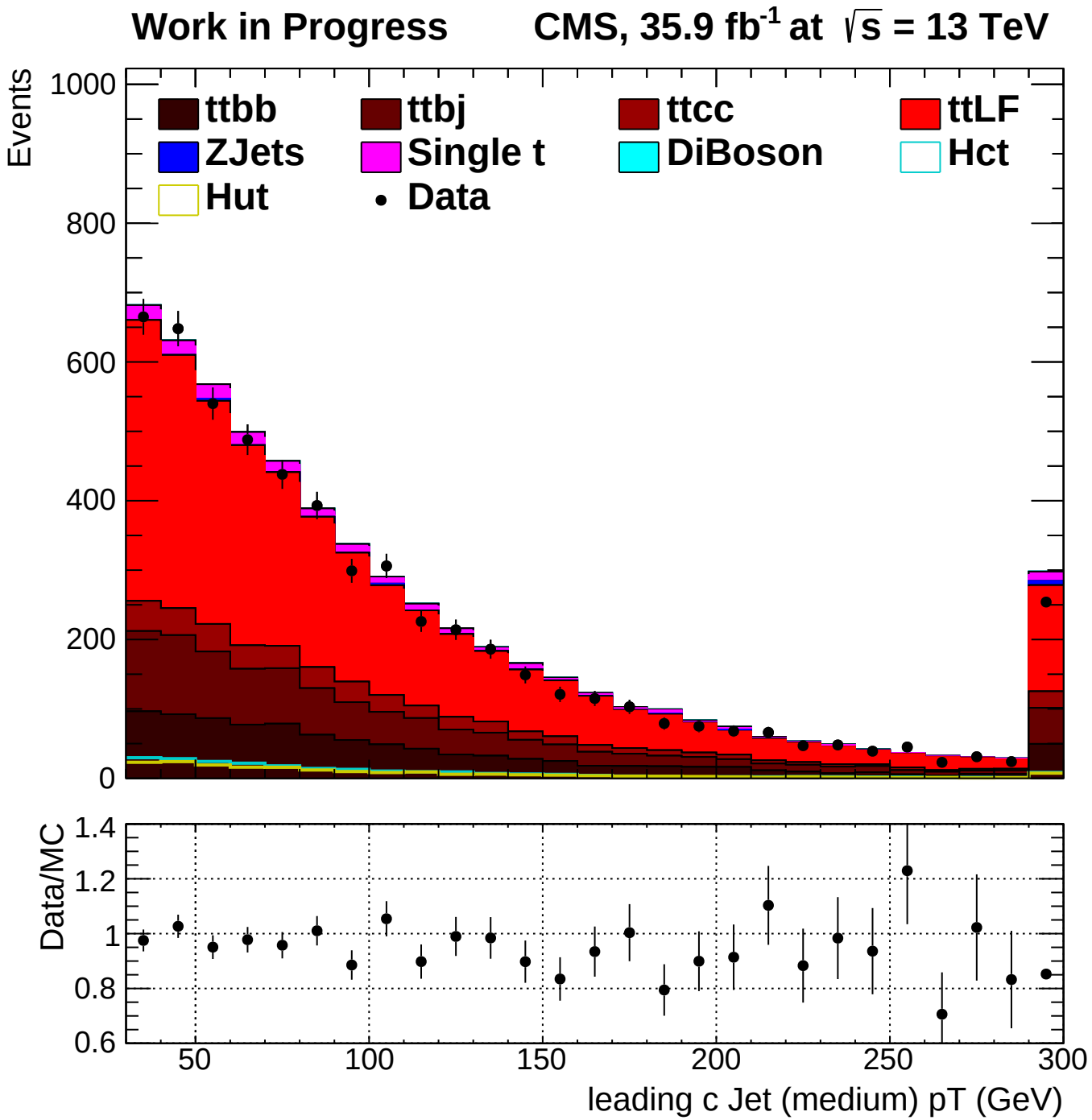

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

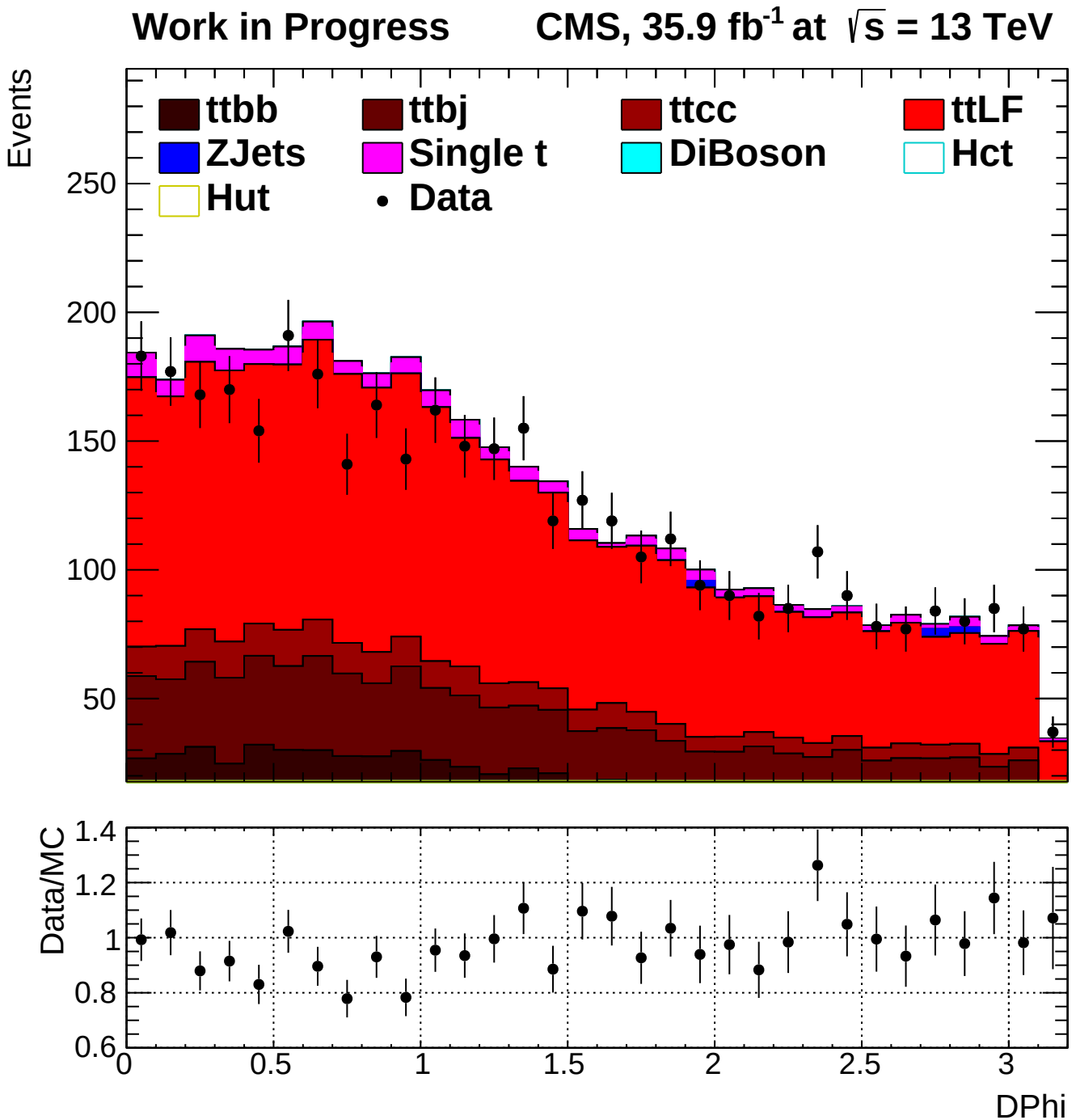

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

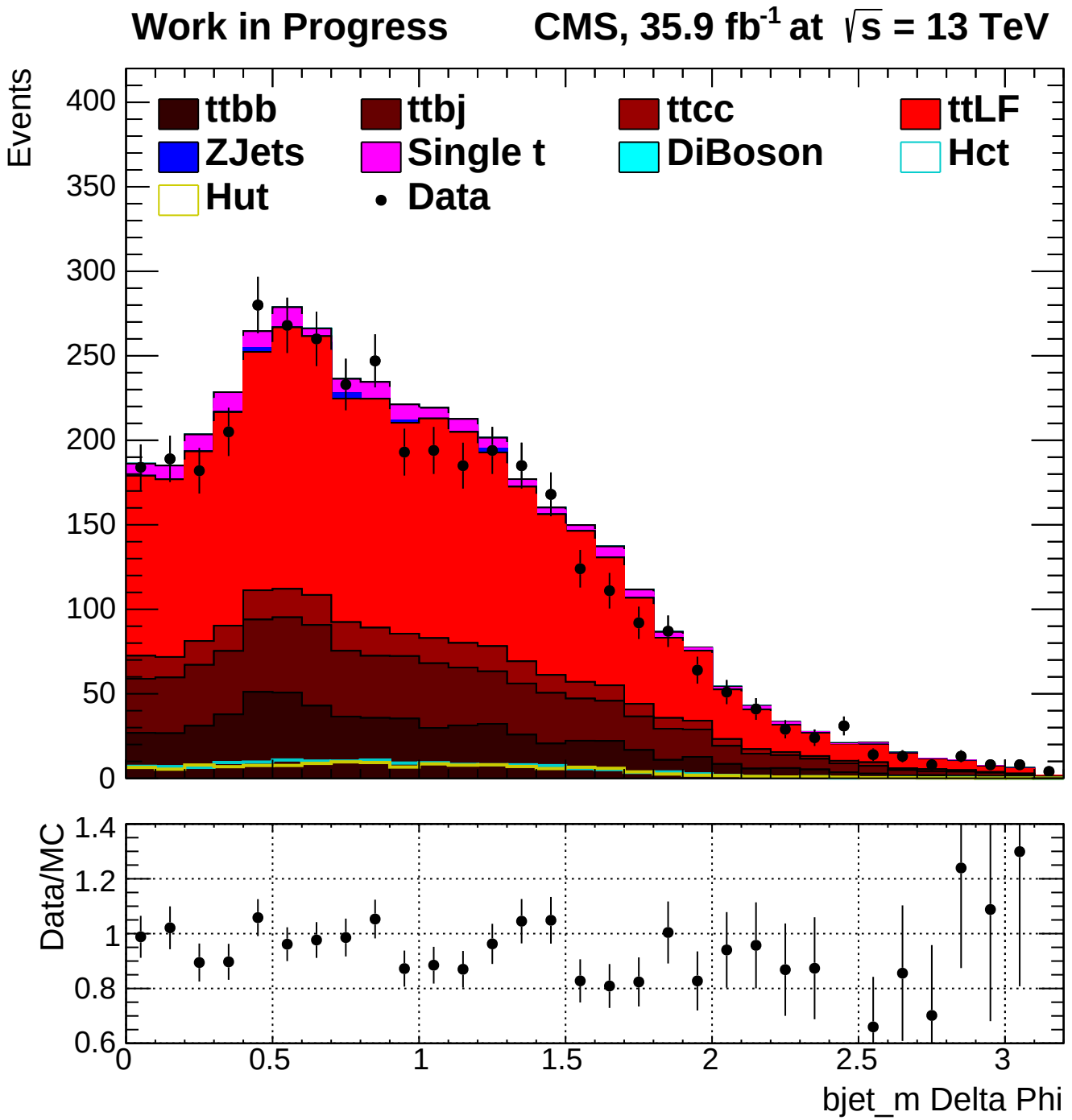

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

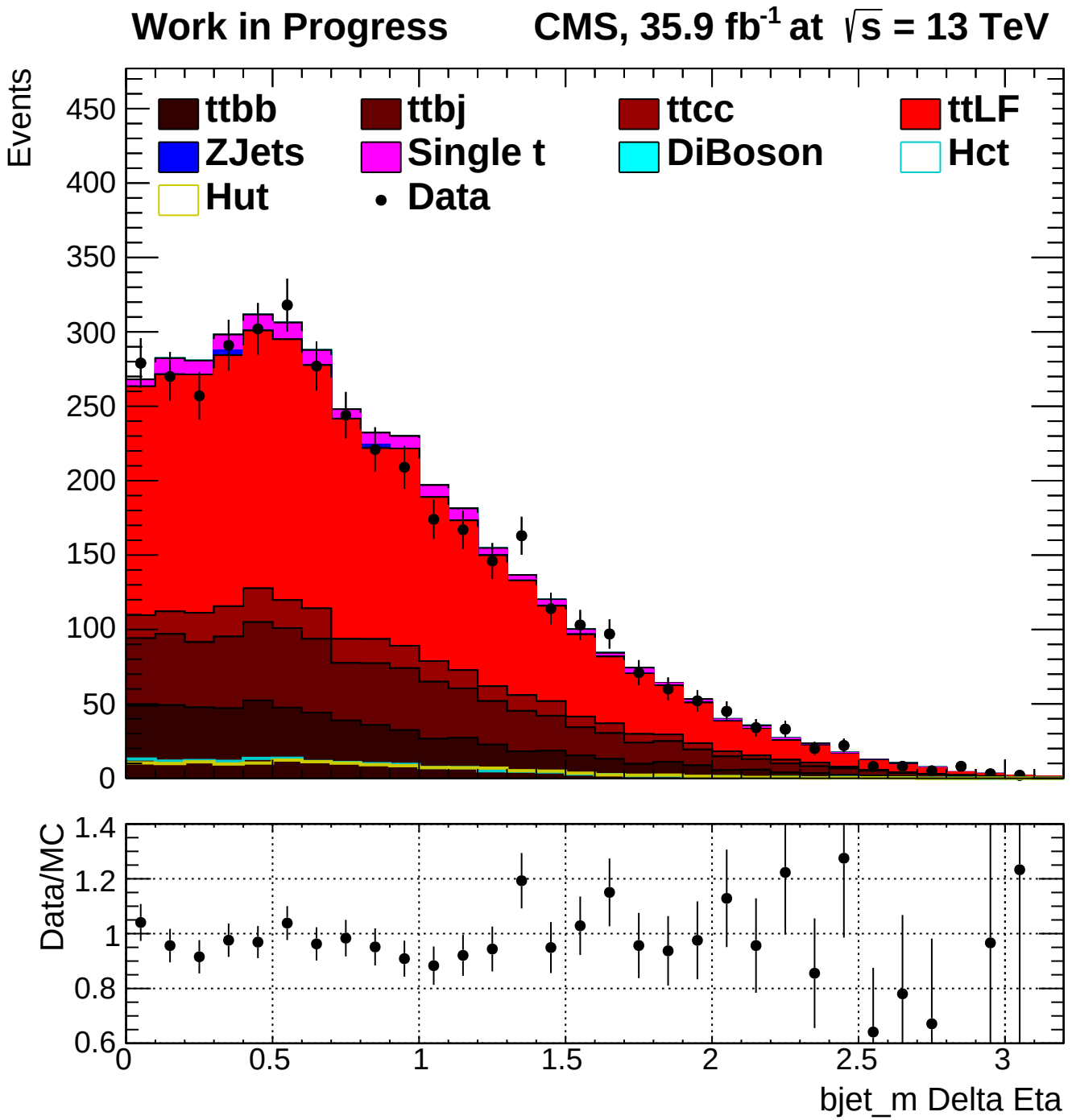

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)

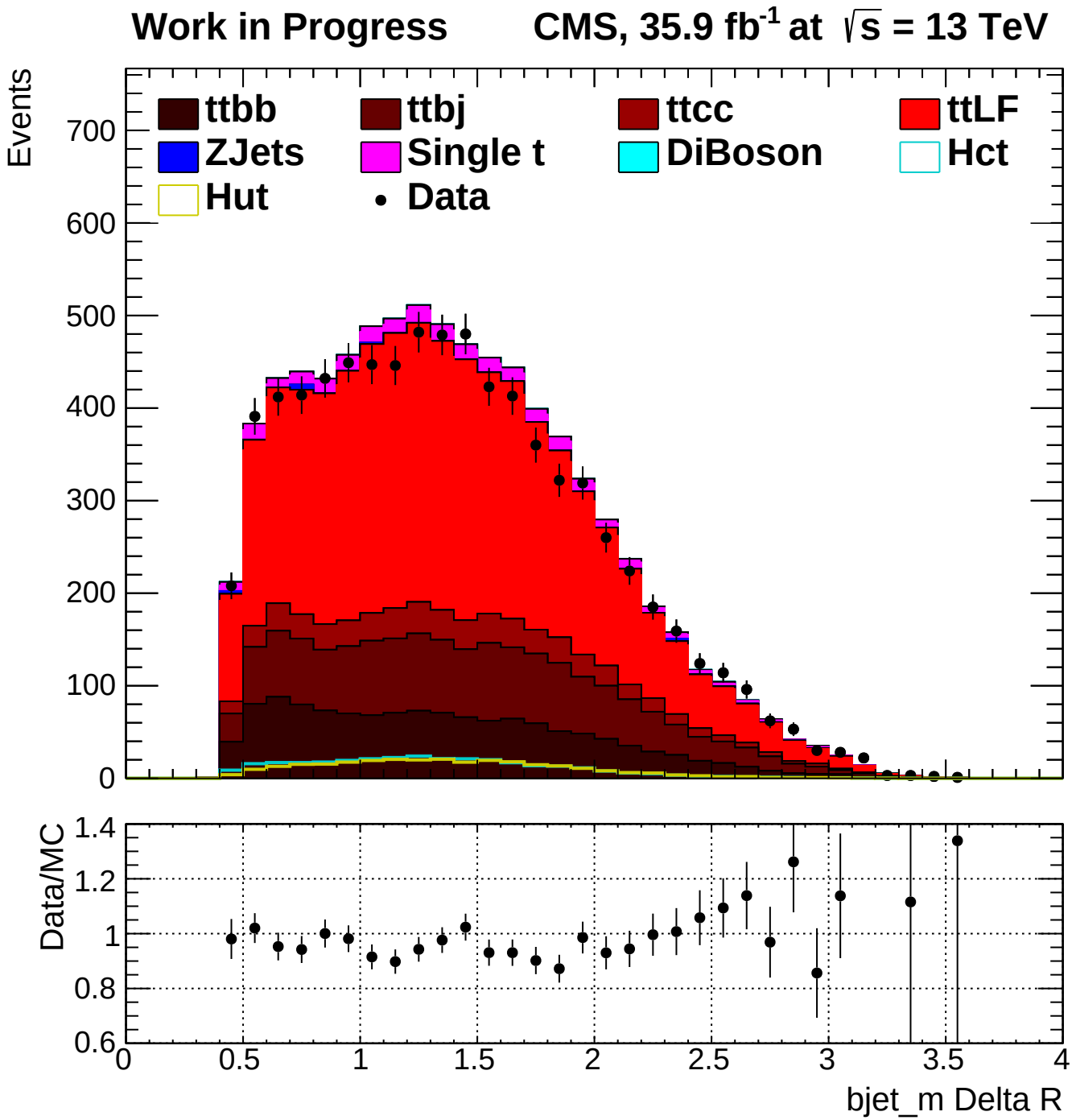

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)

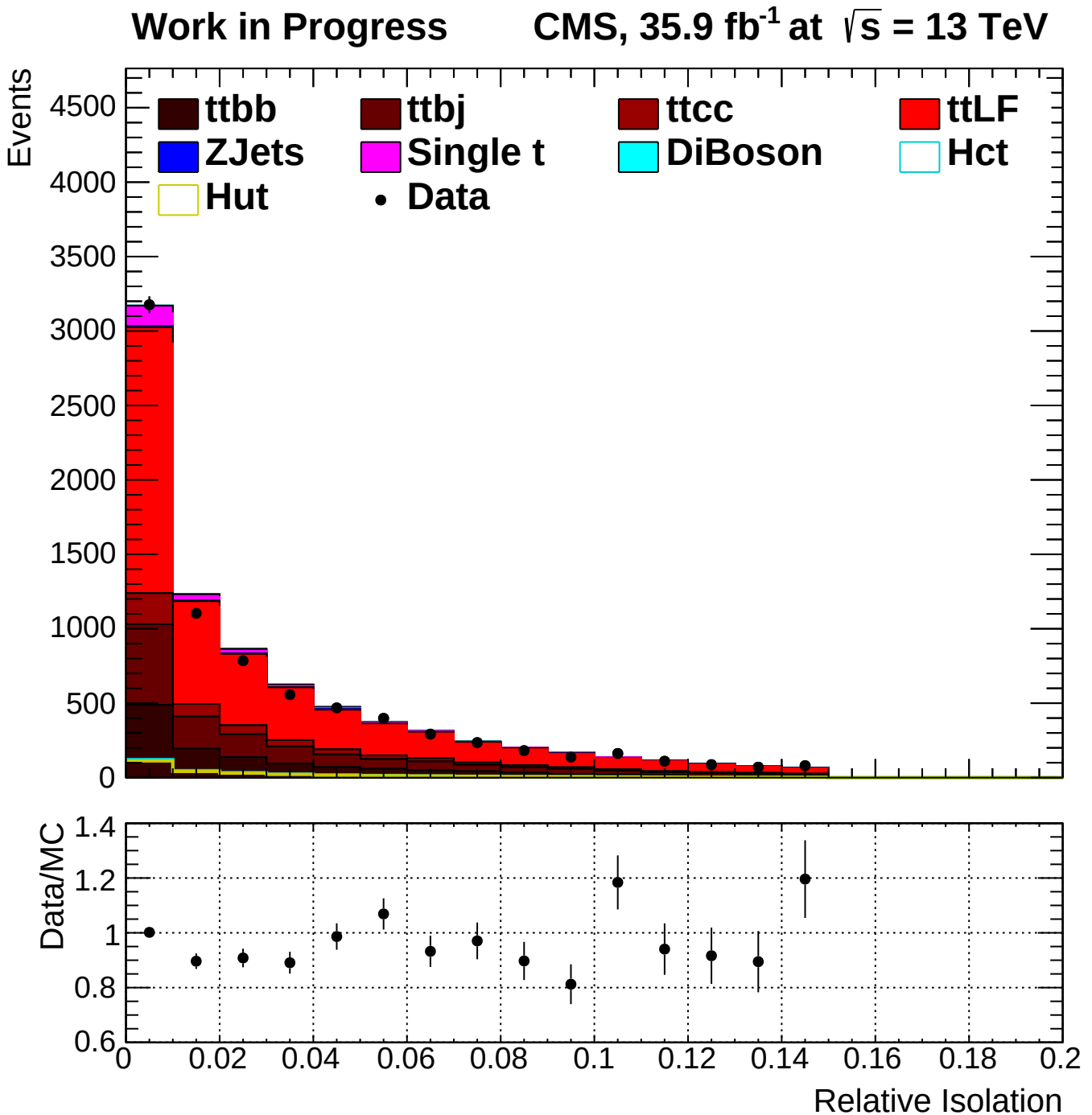

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

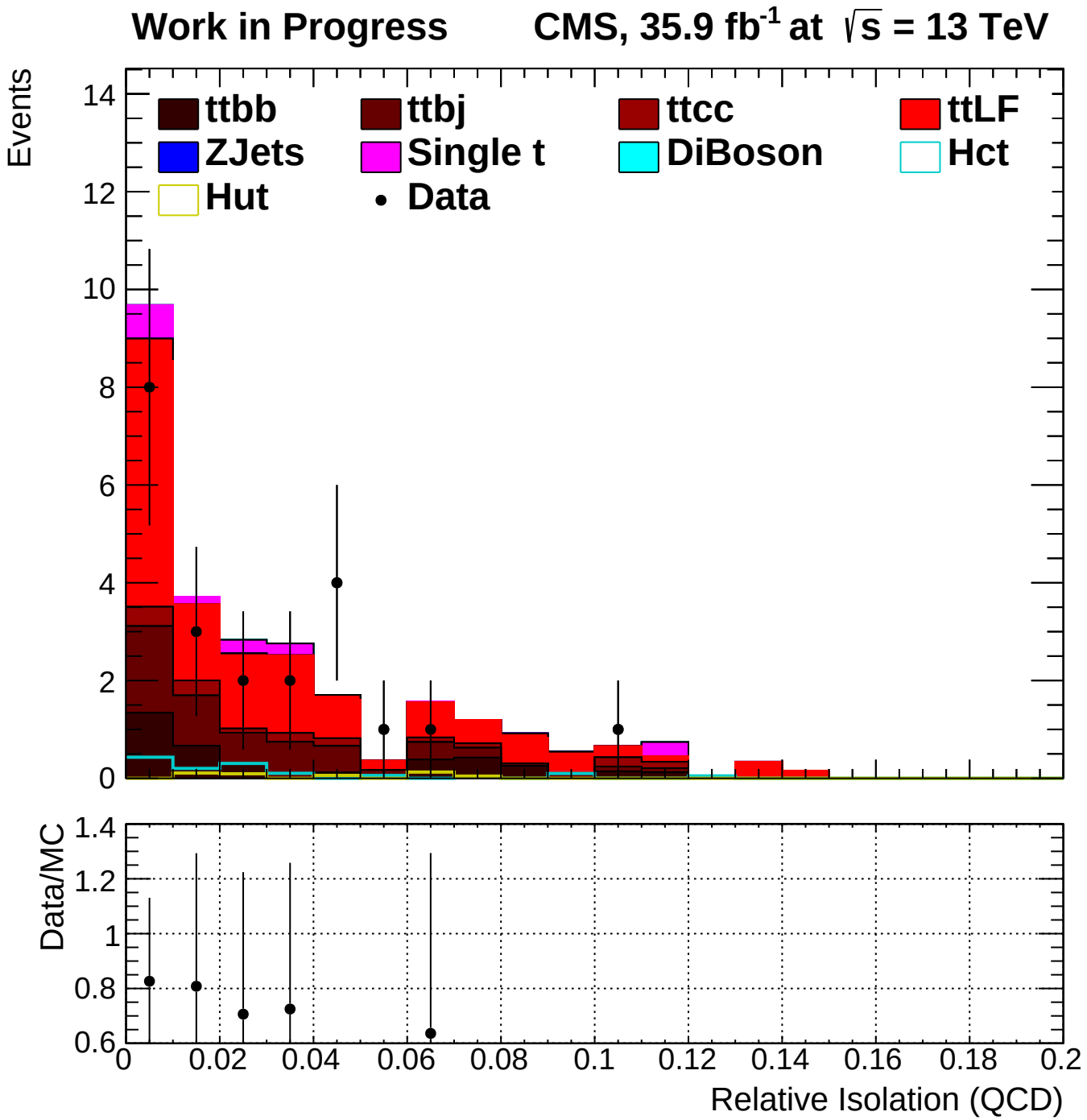

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
250
200
150
100
50
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

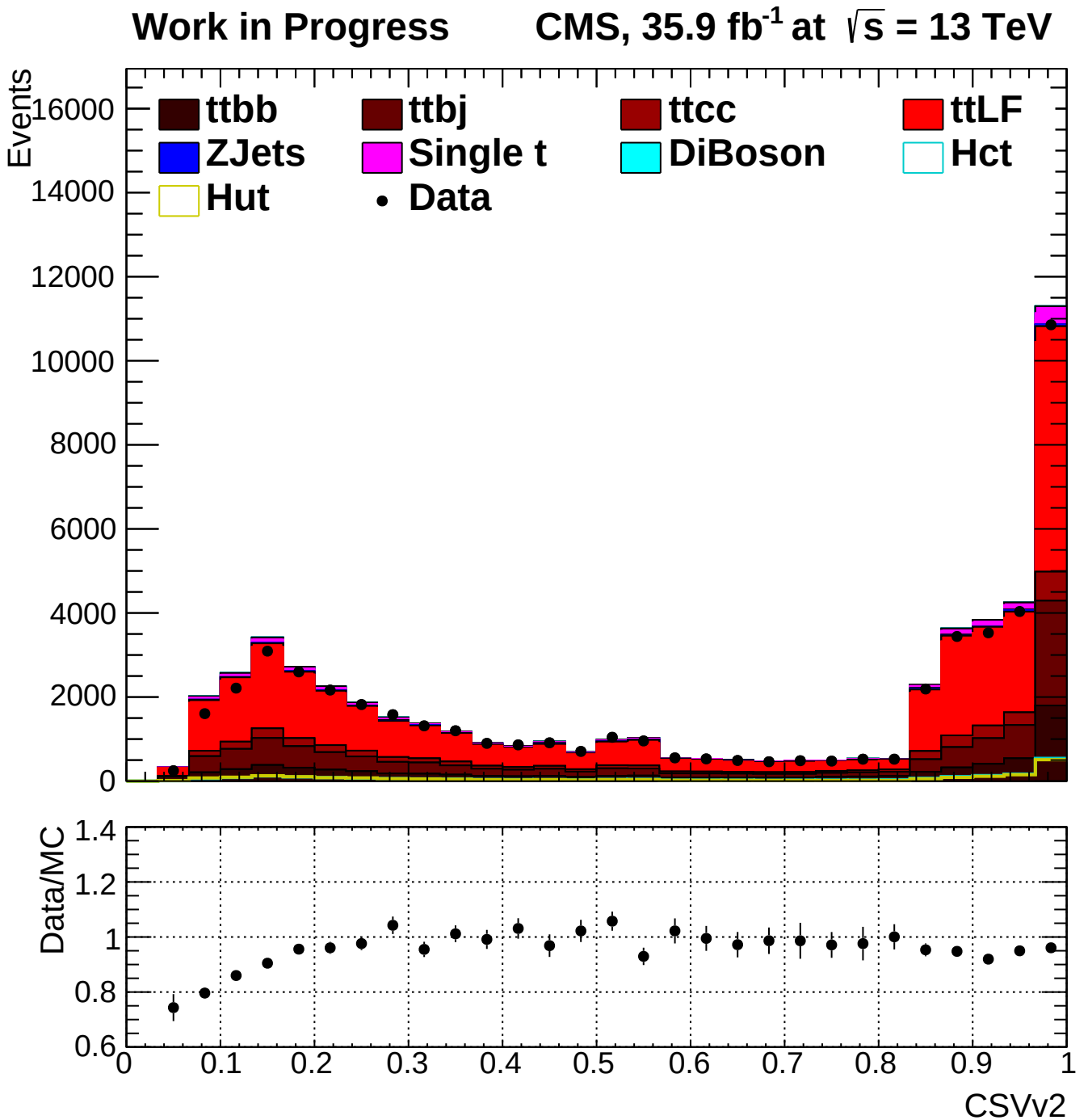

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi

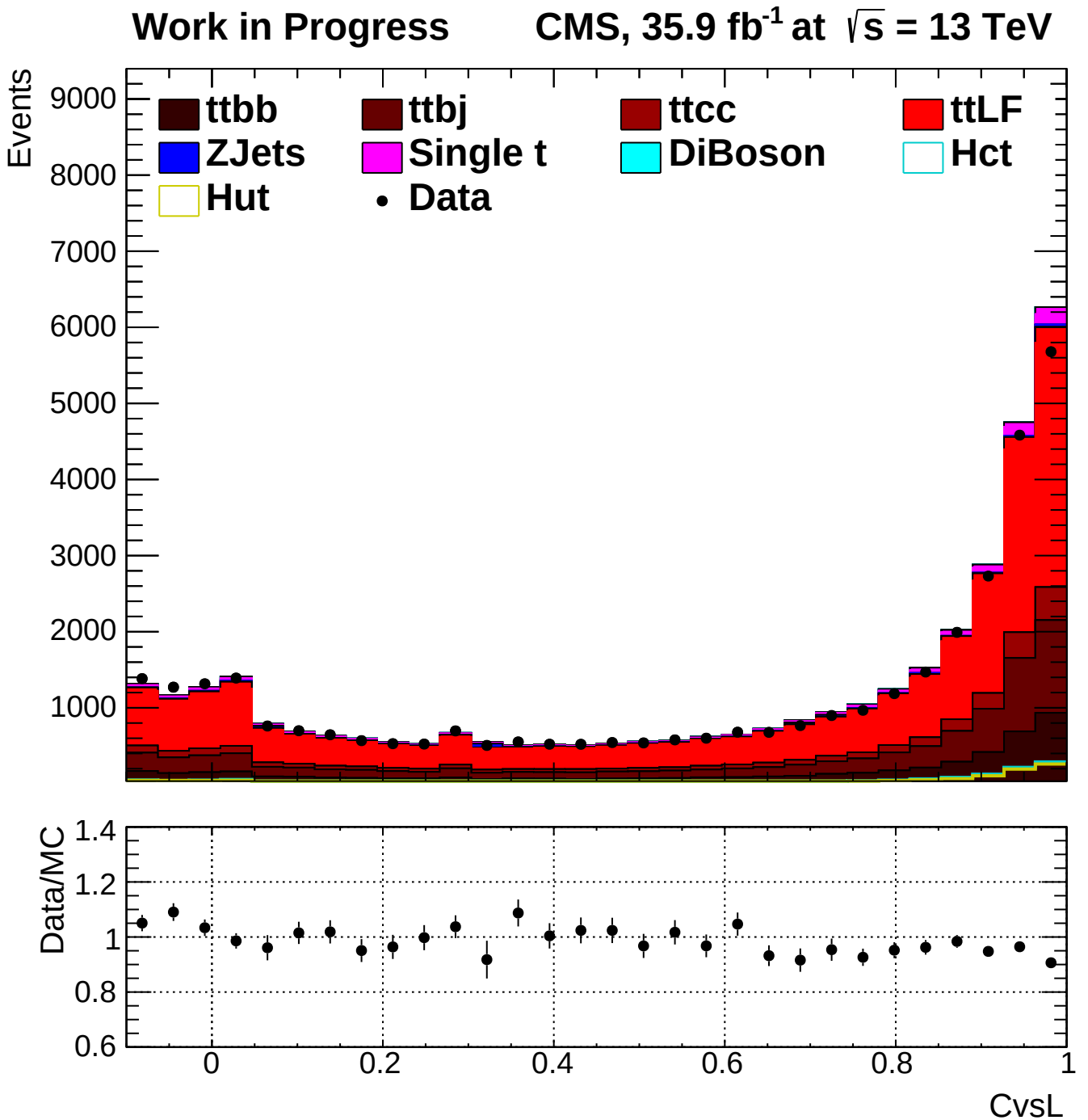

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta

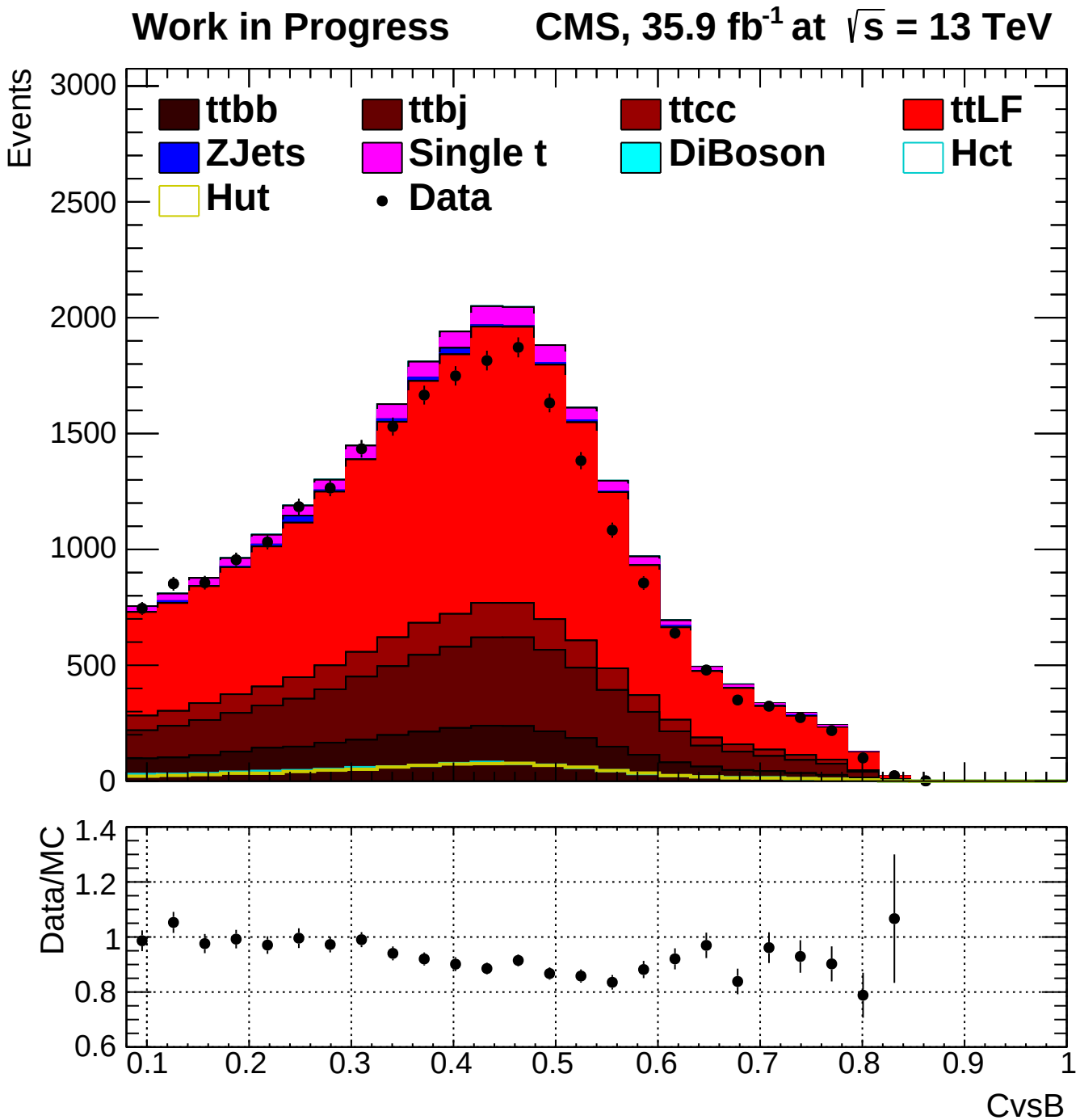

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R

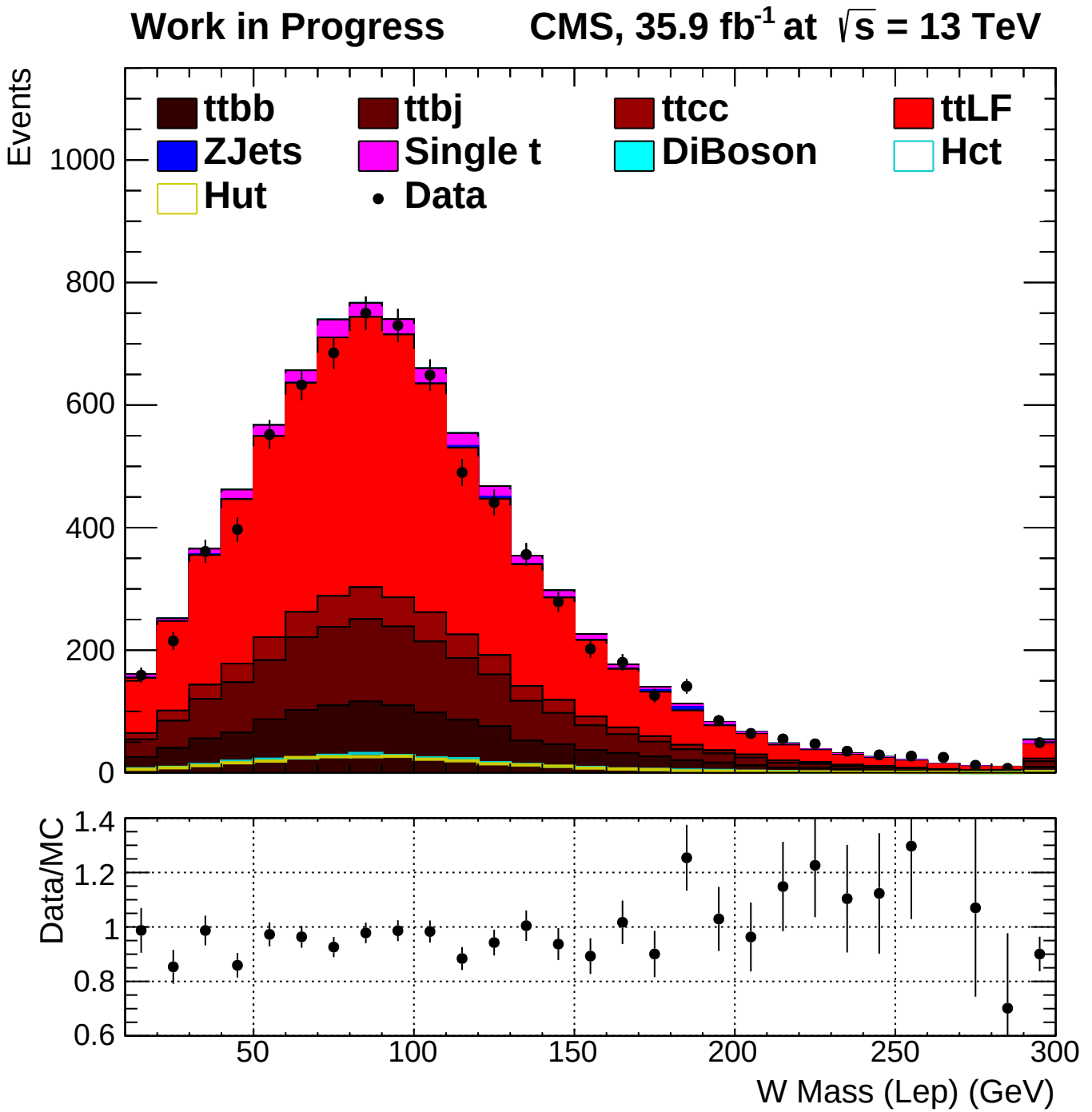

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation

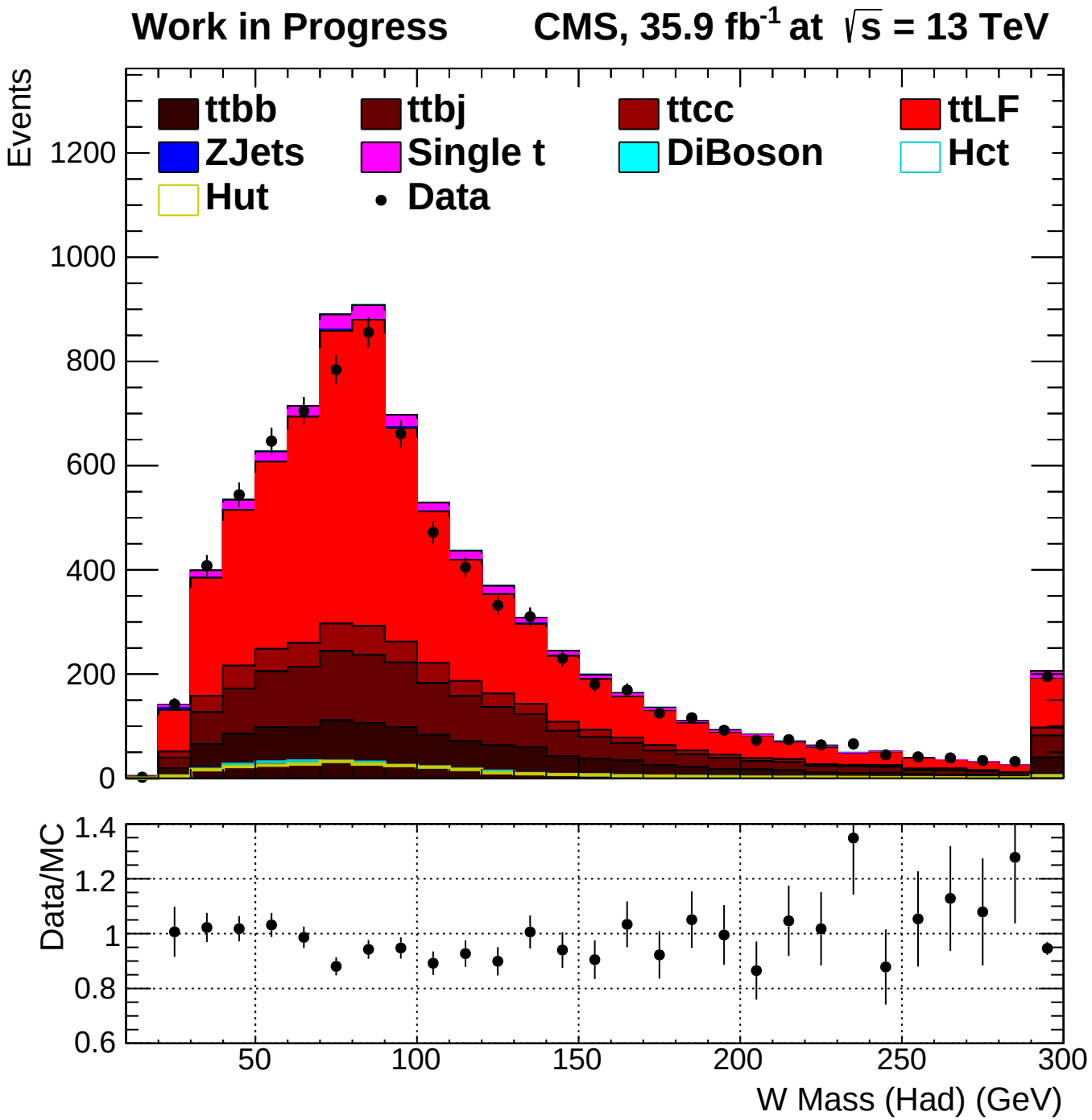

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

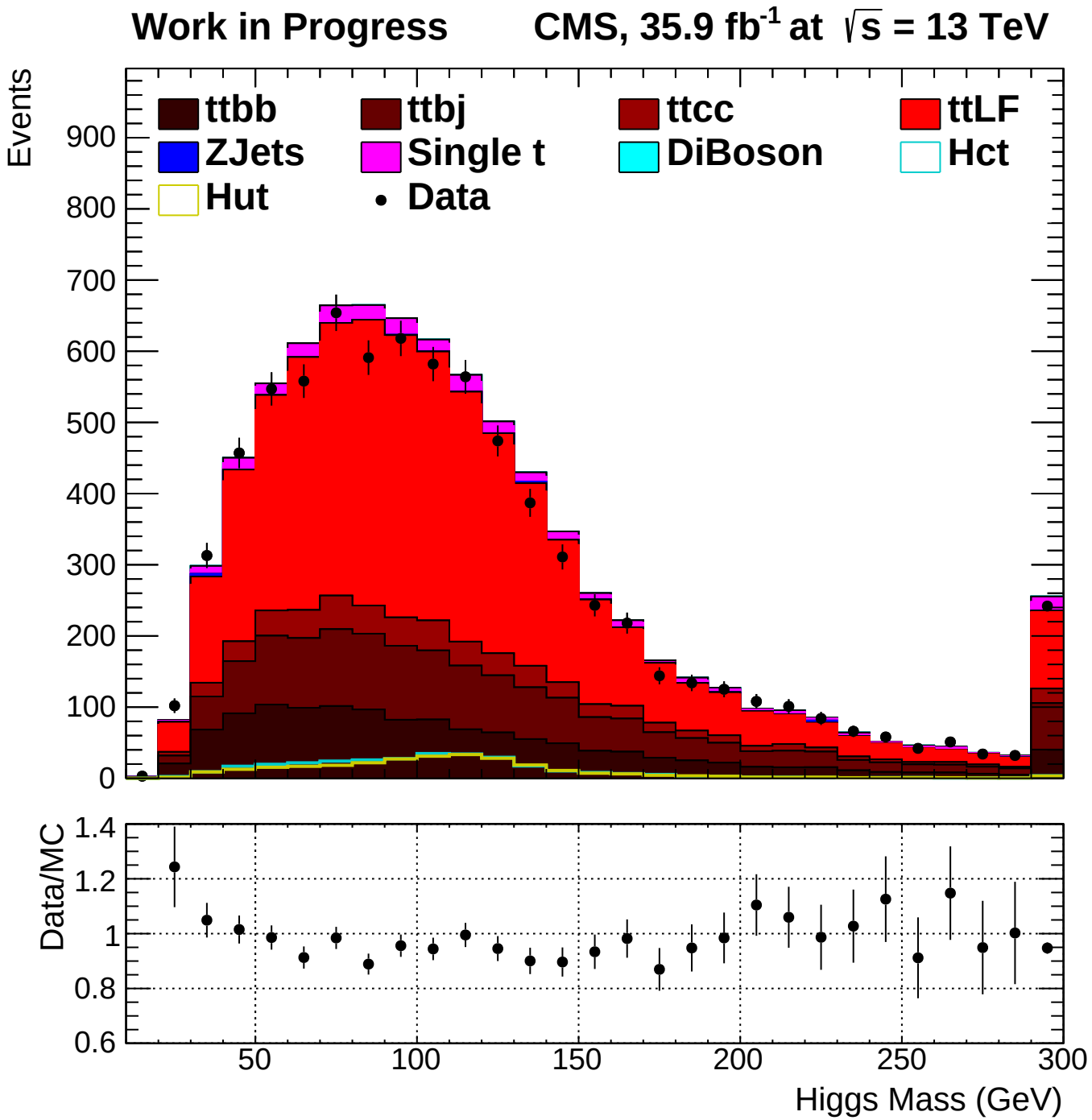

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16000
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
9000
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
0
200
400
600
800
1000
1200
Data/MC
0.6
0.8
1
1.2
1.4
50
100
150
200
250
300
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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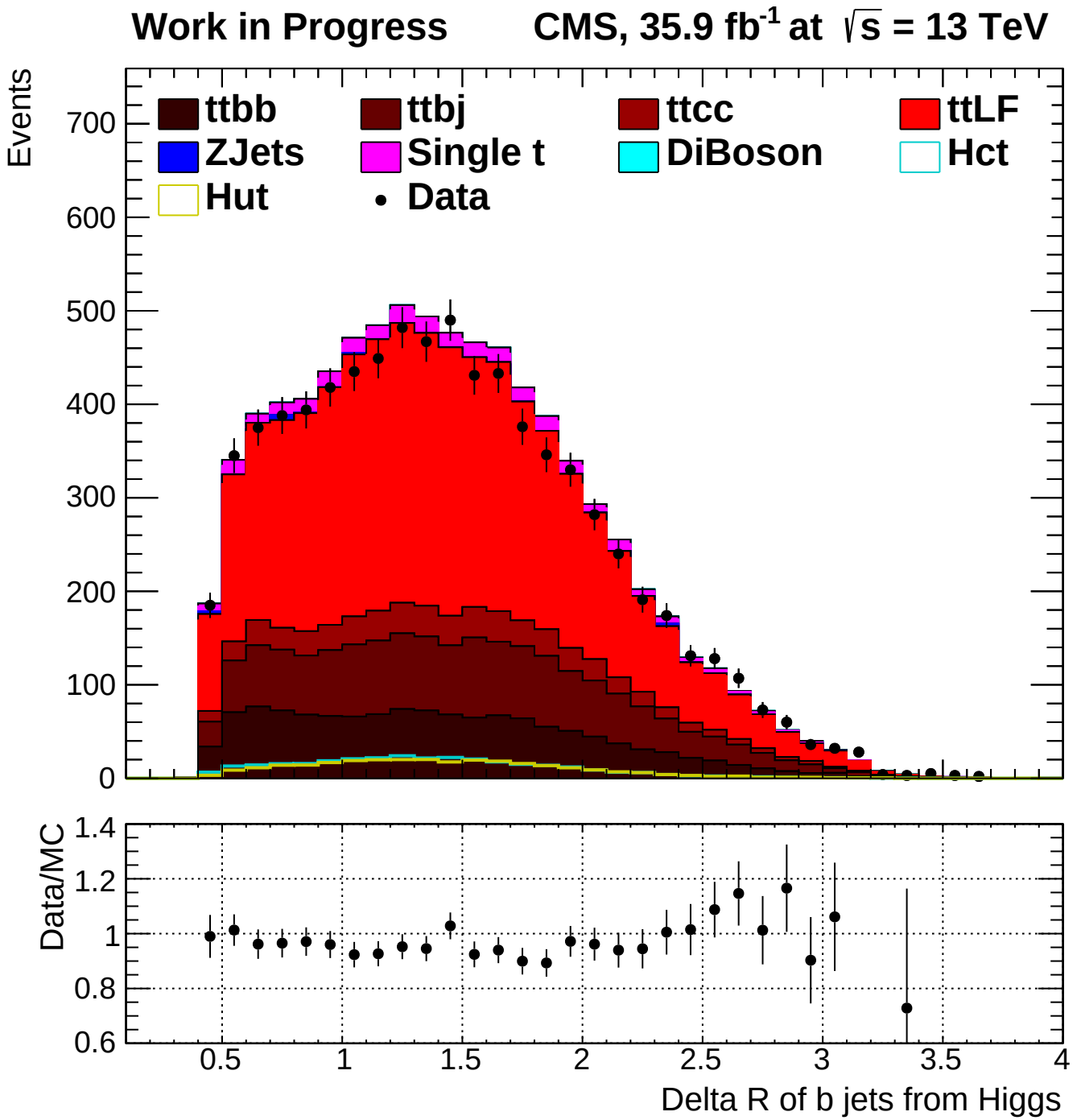
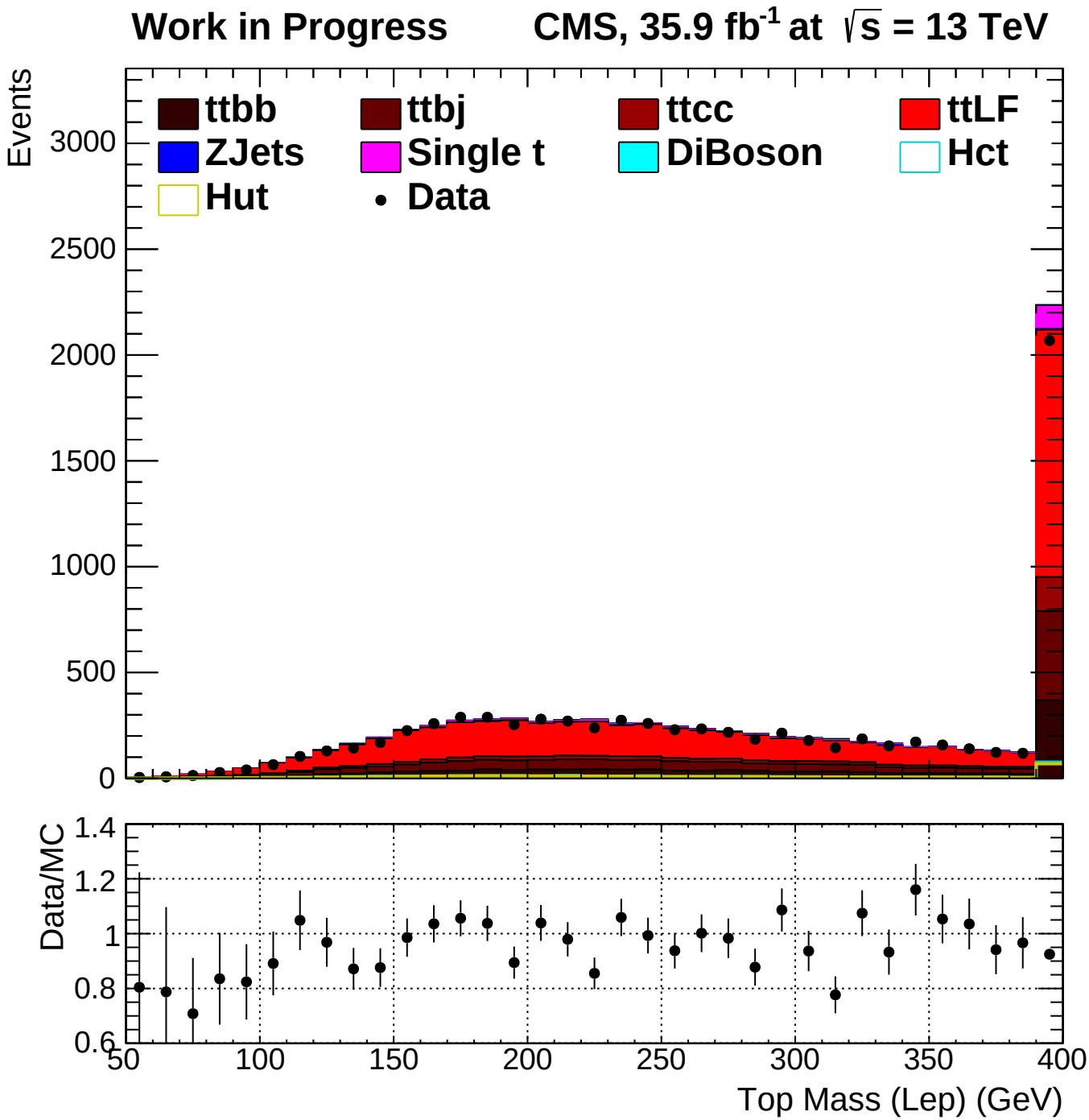
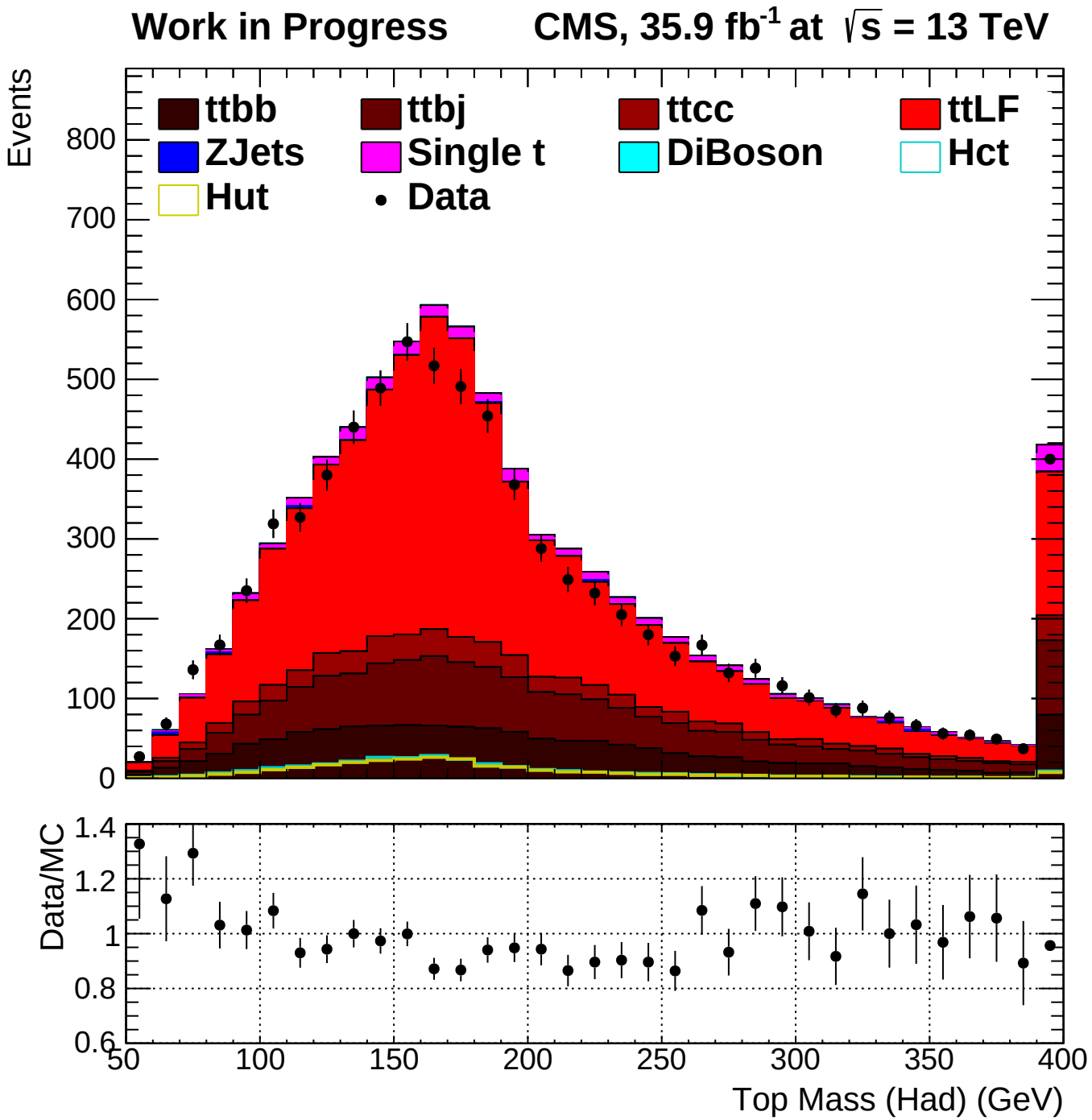
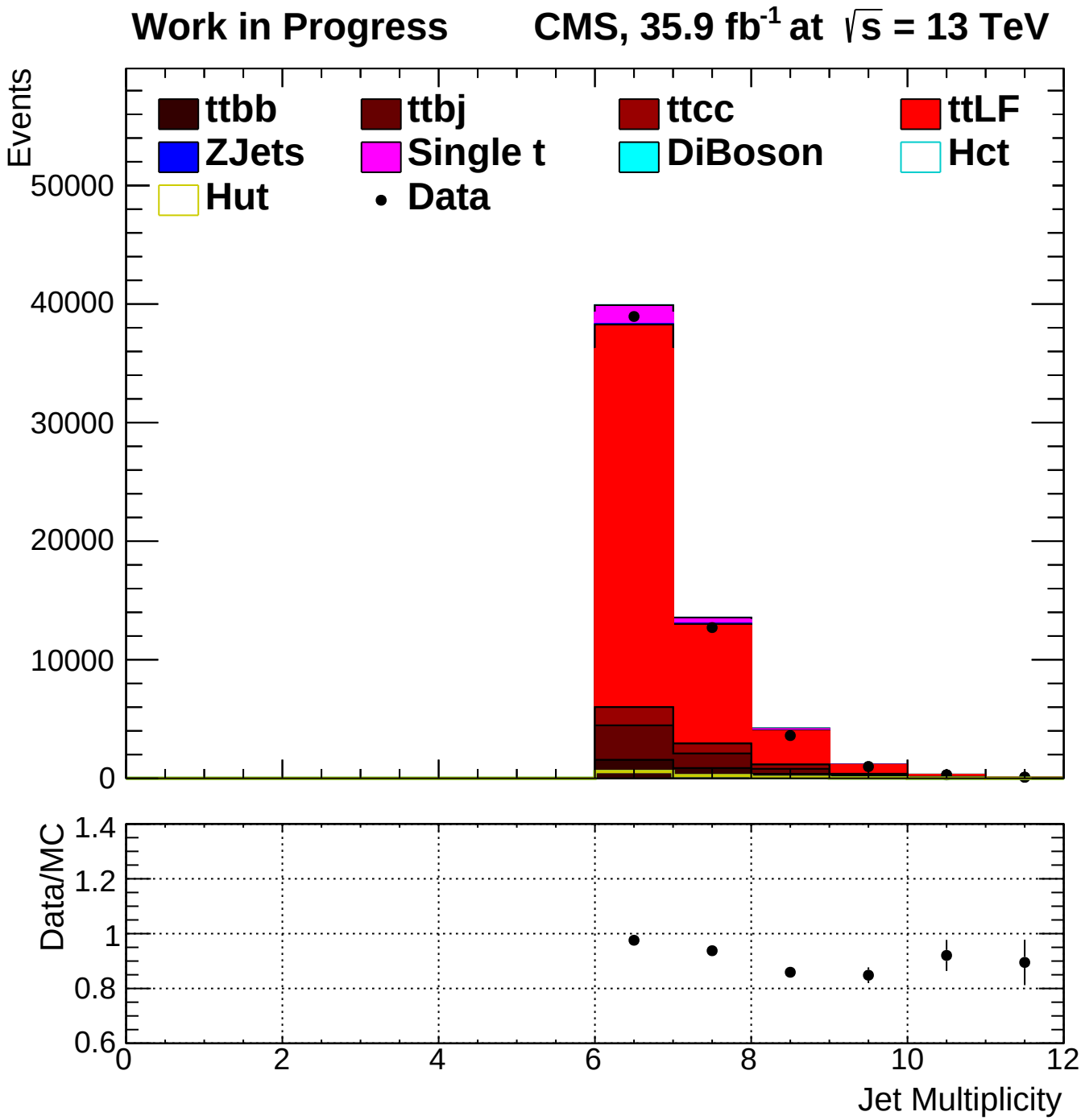
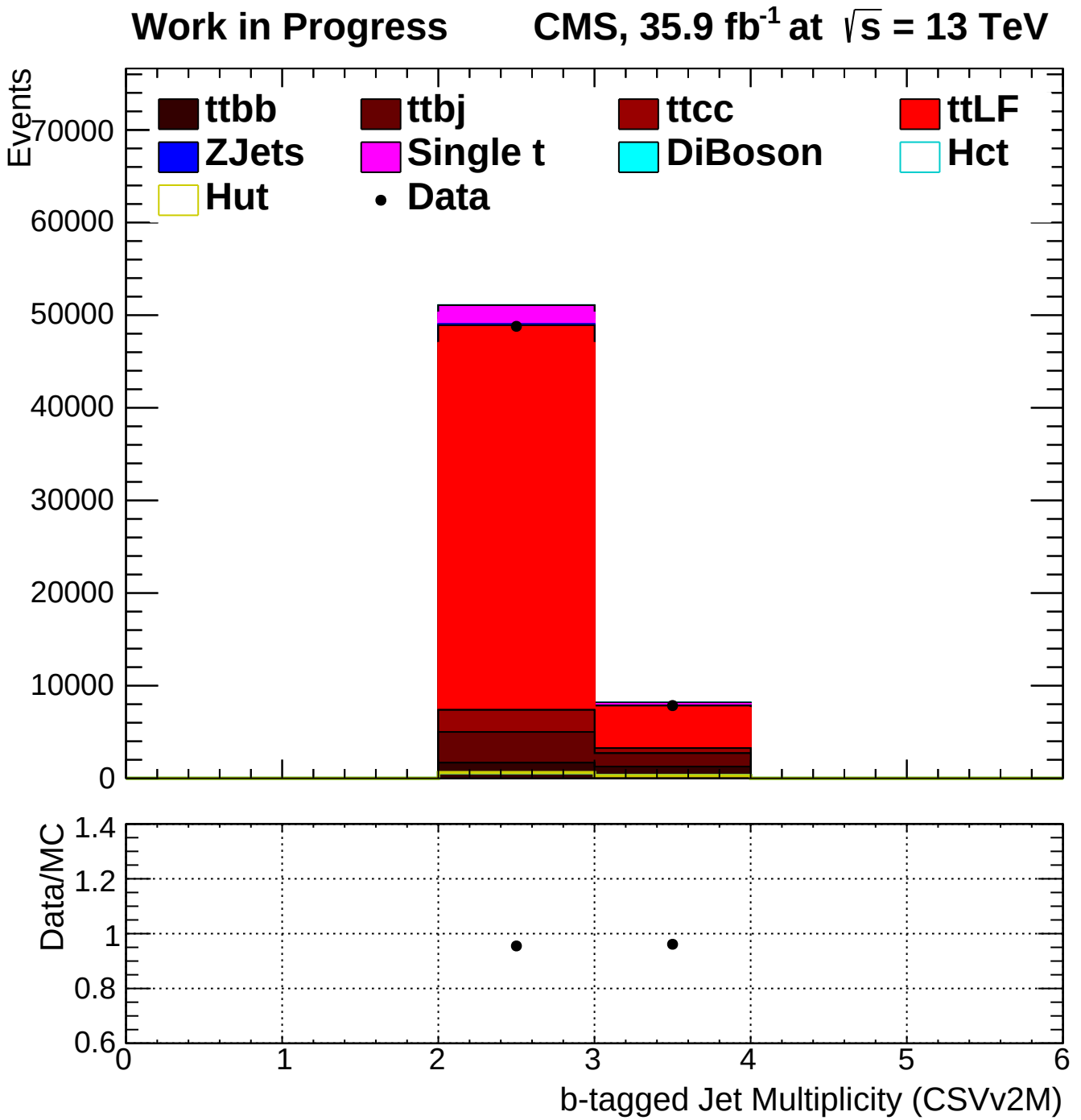
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

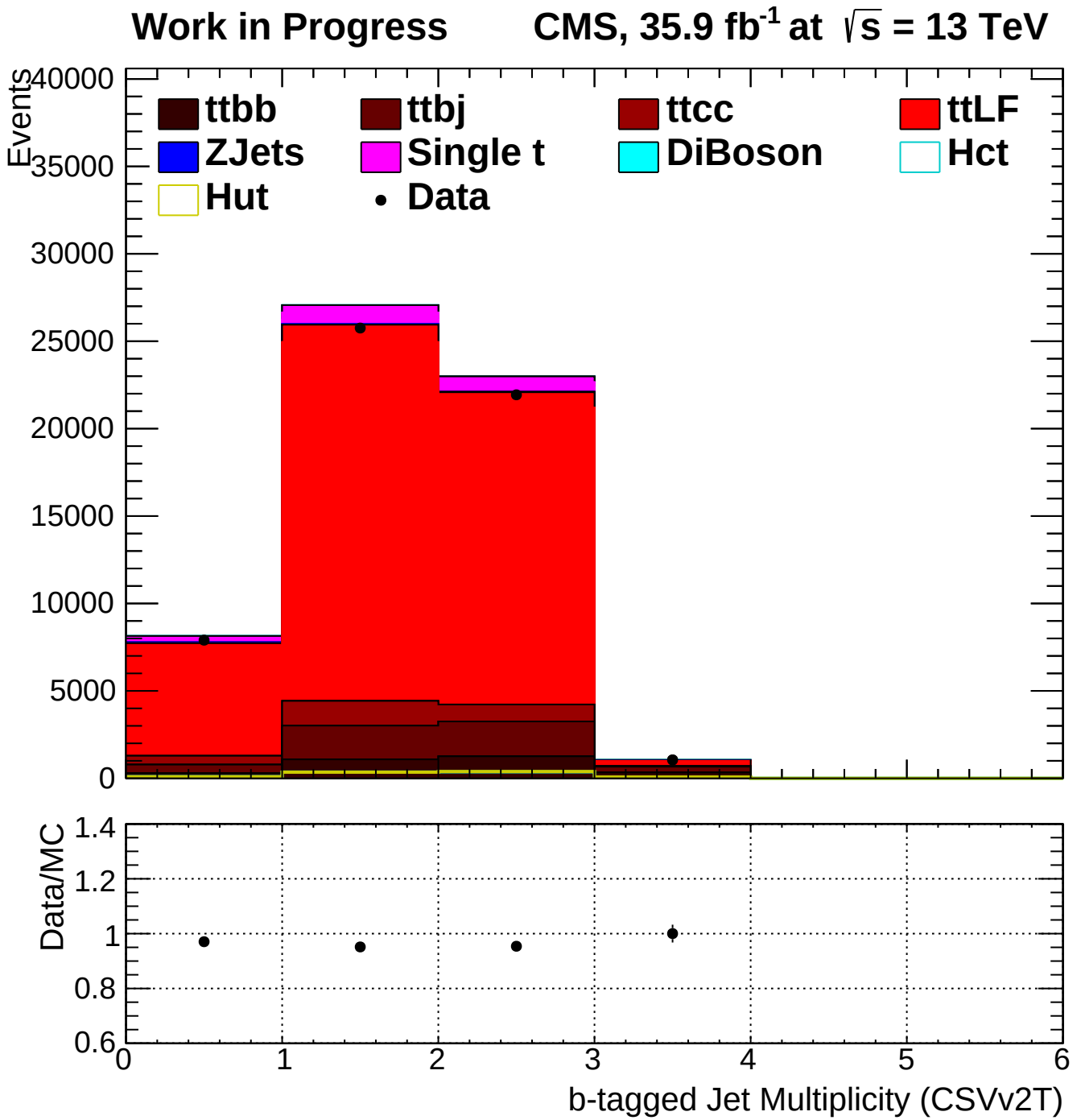

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

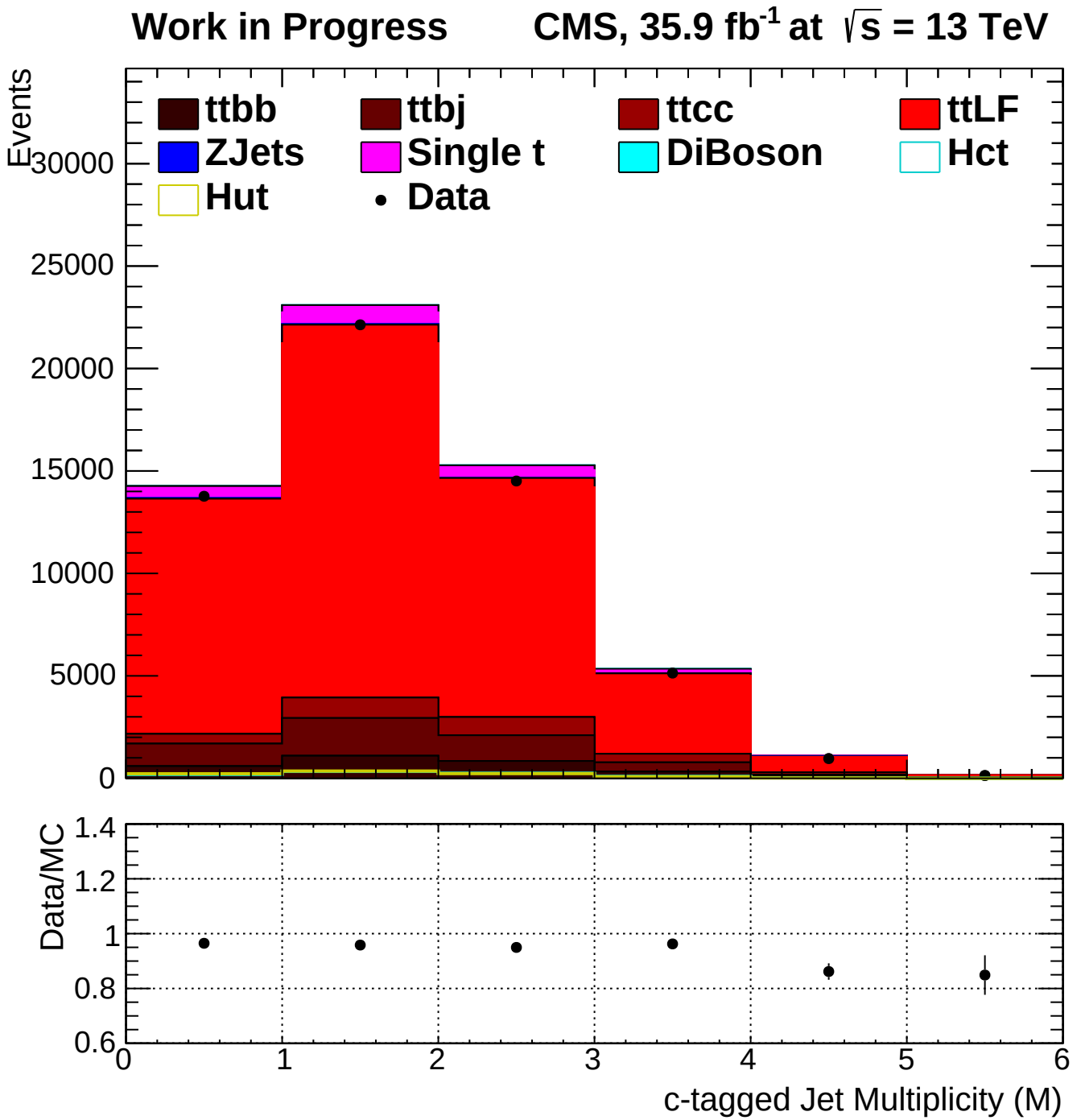

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)

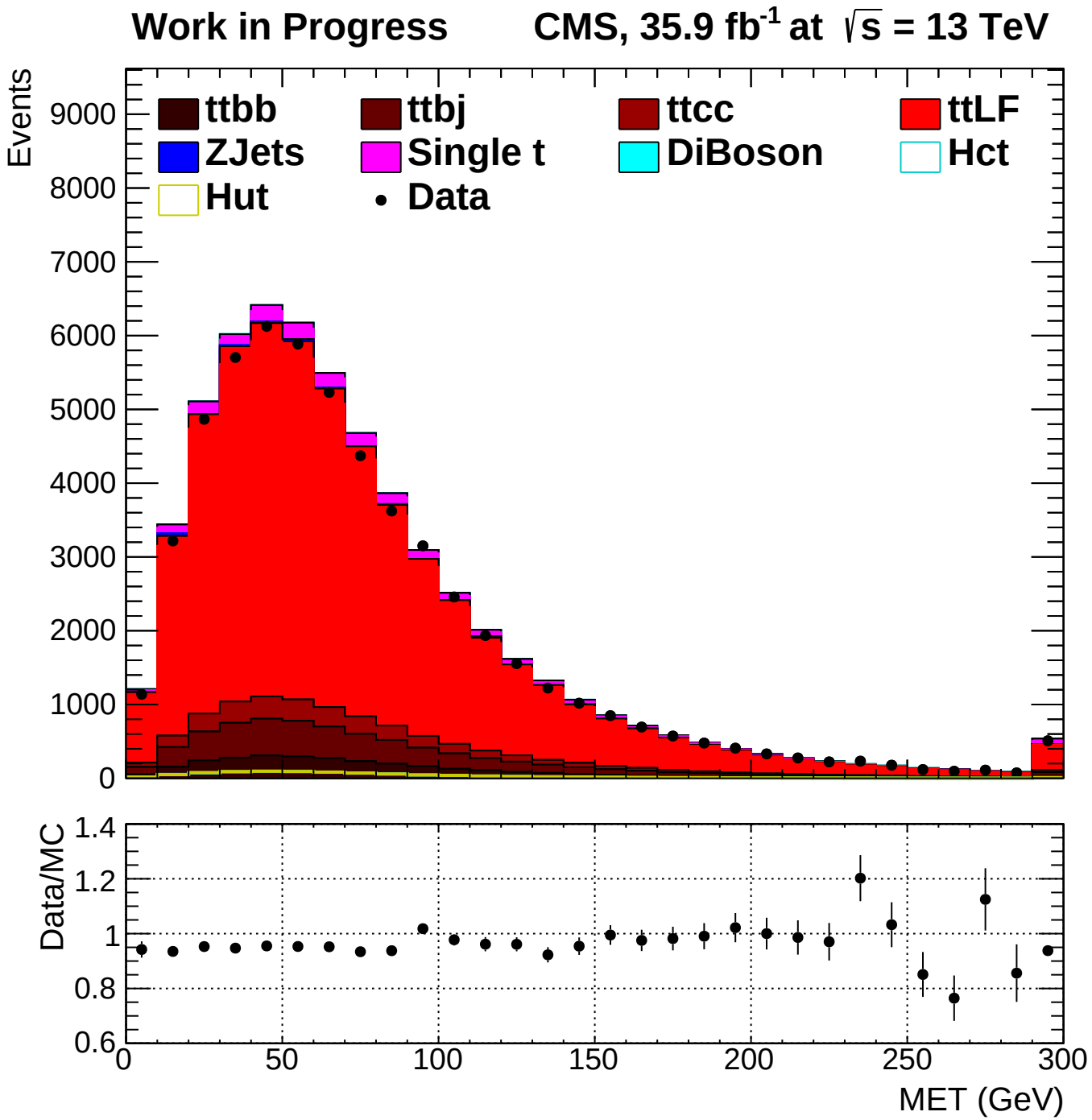

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

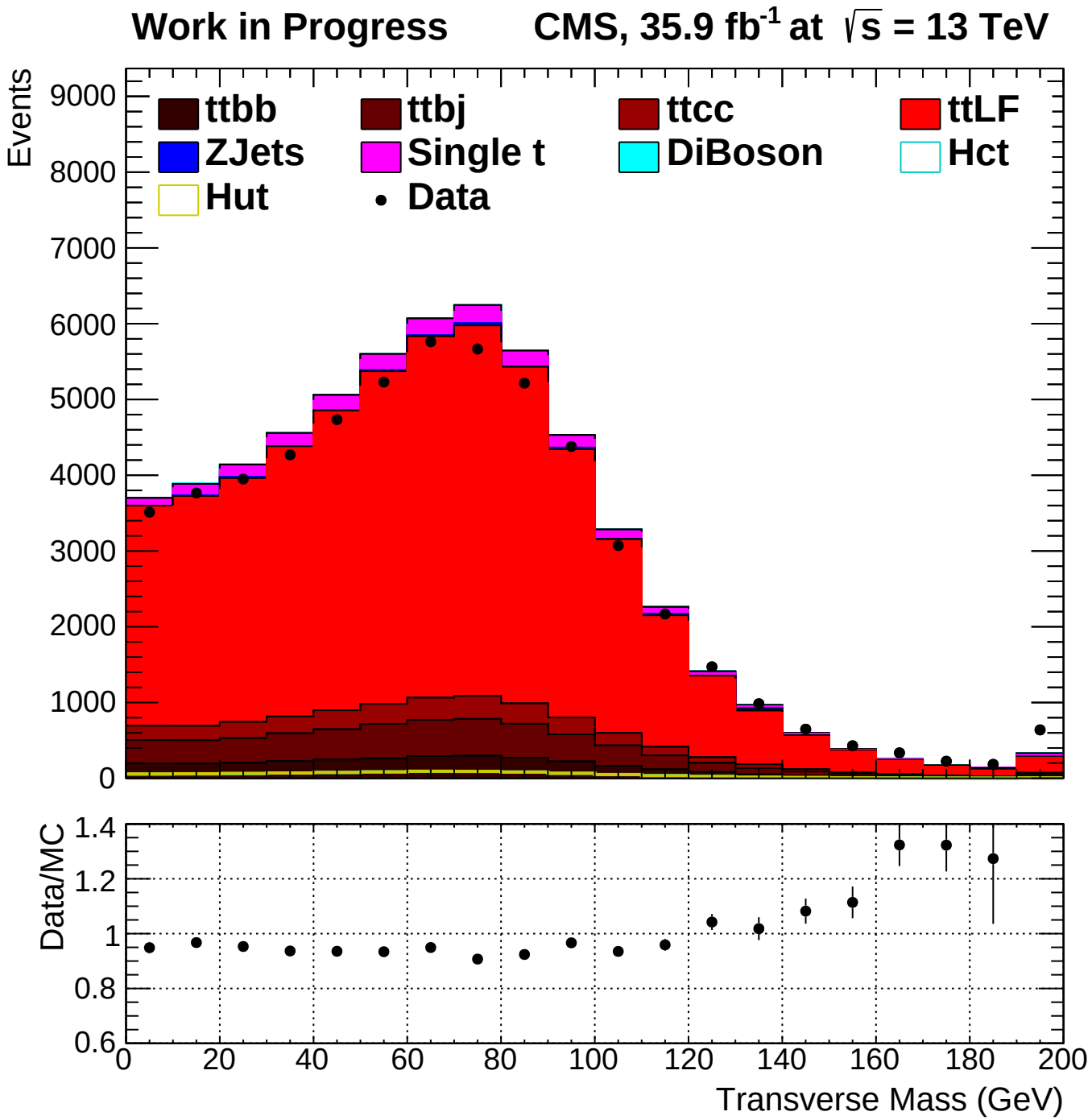

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity

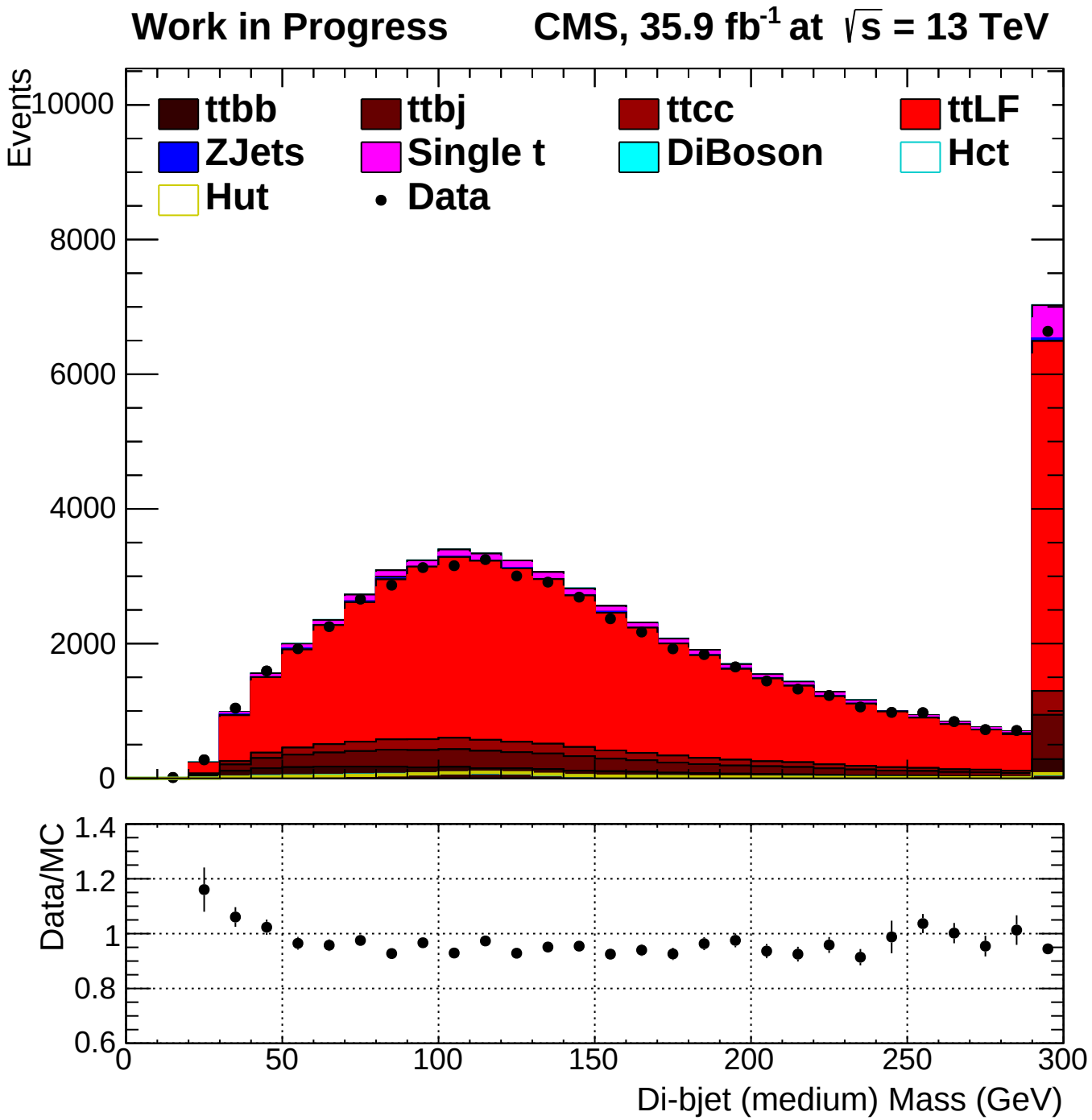

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

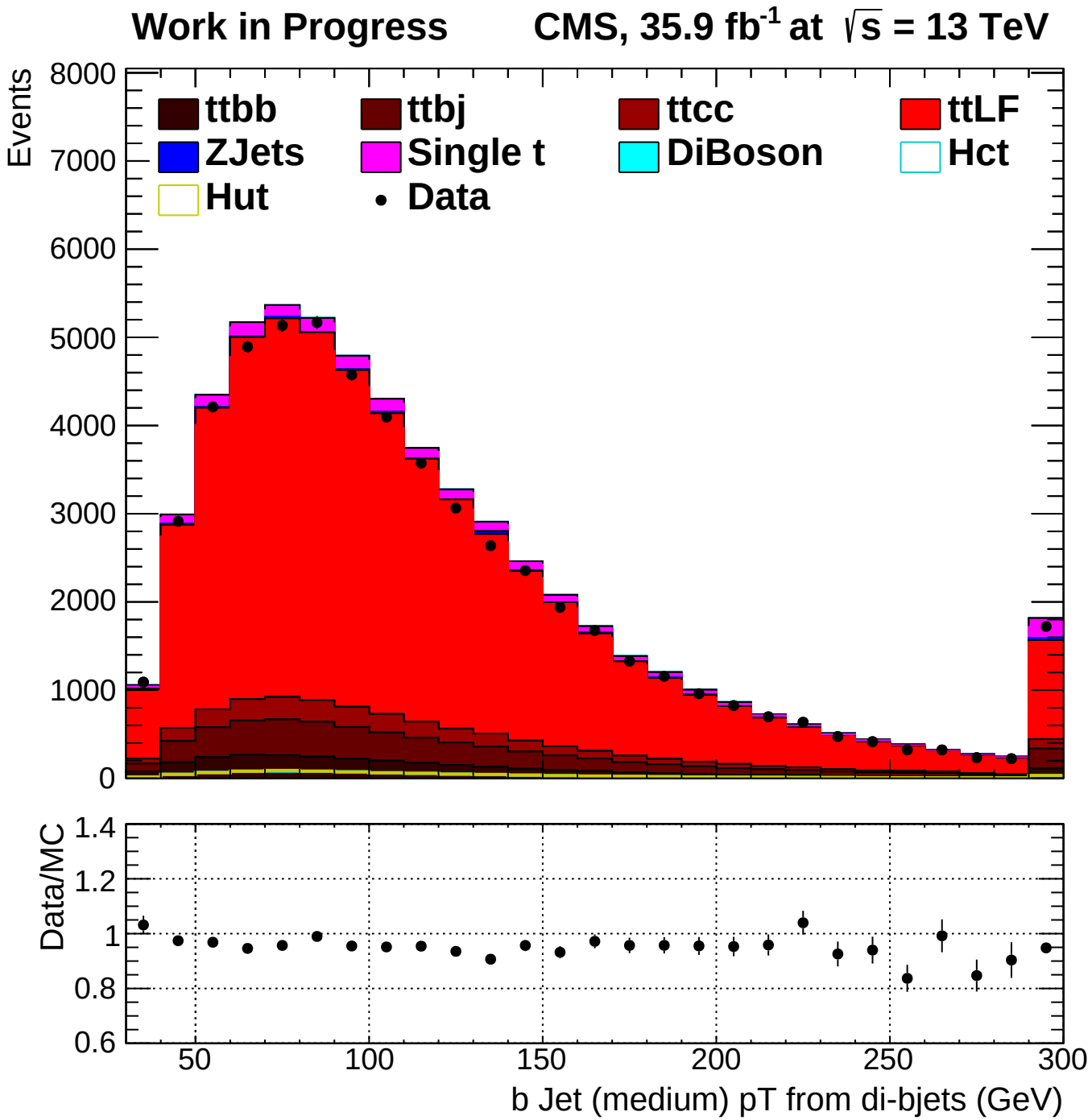

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

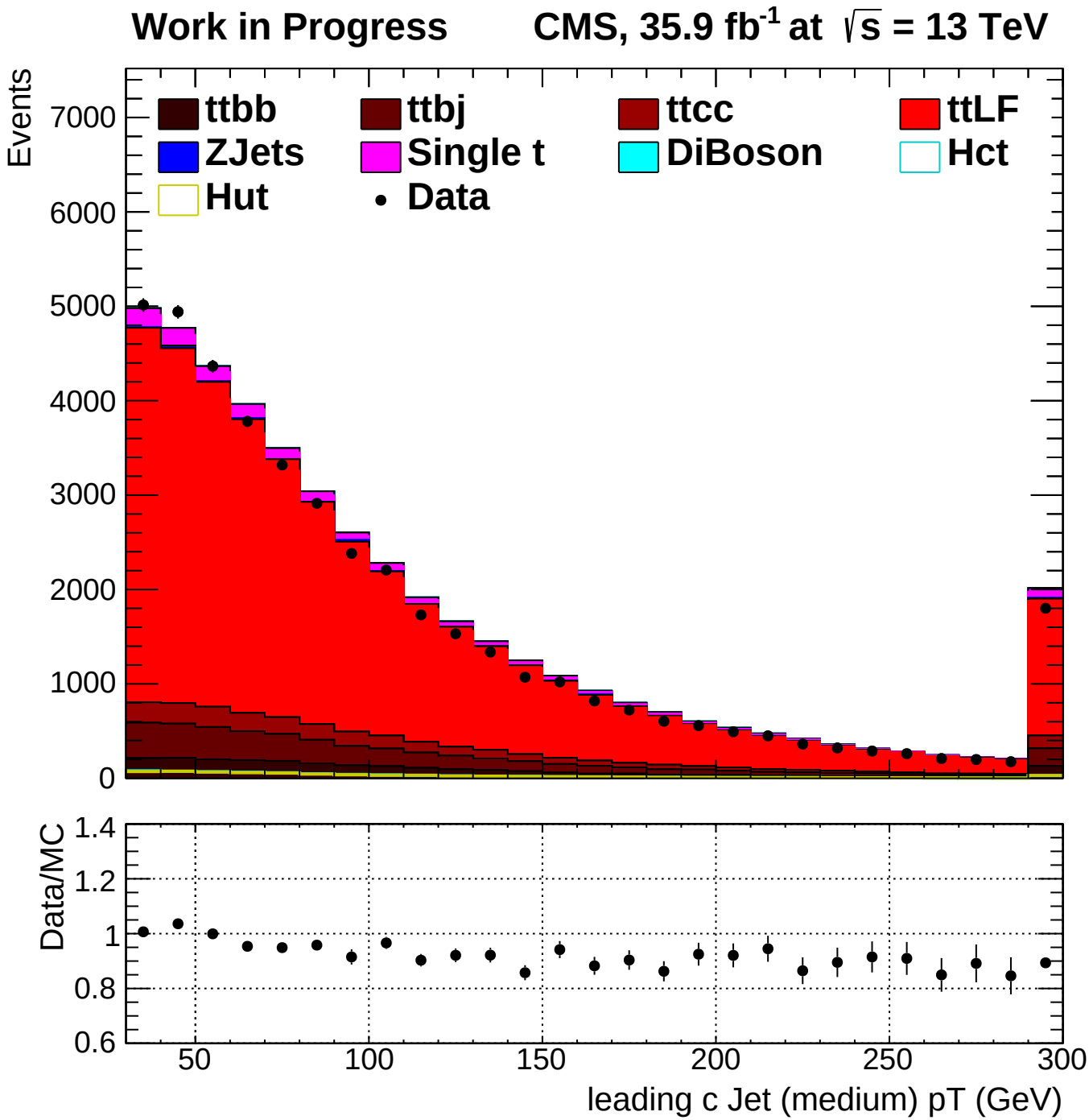

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

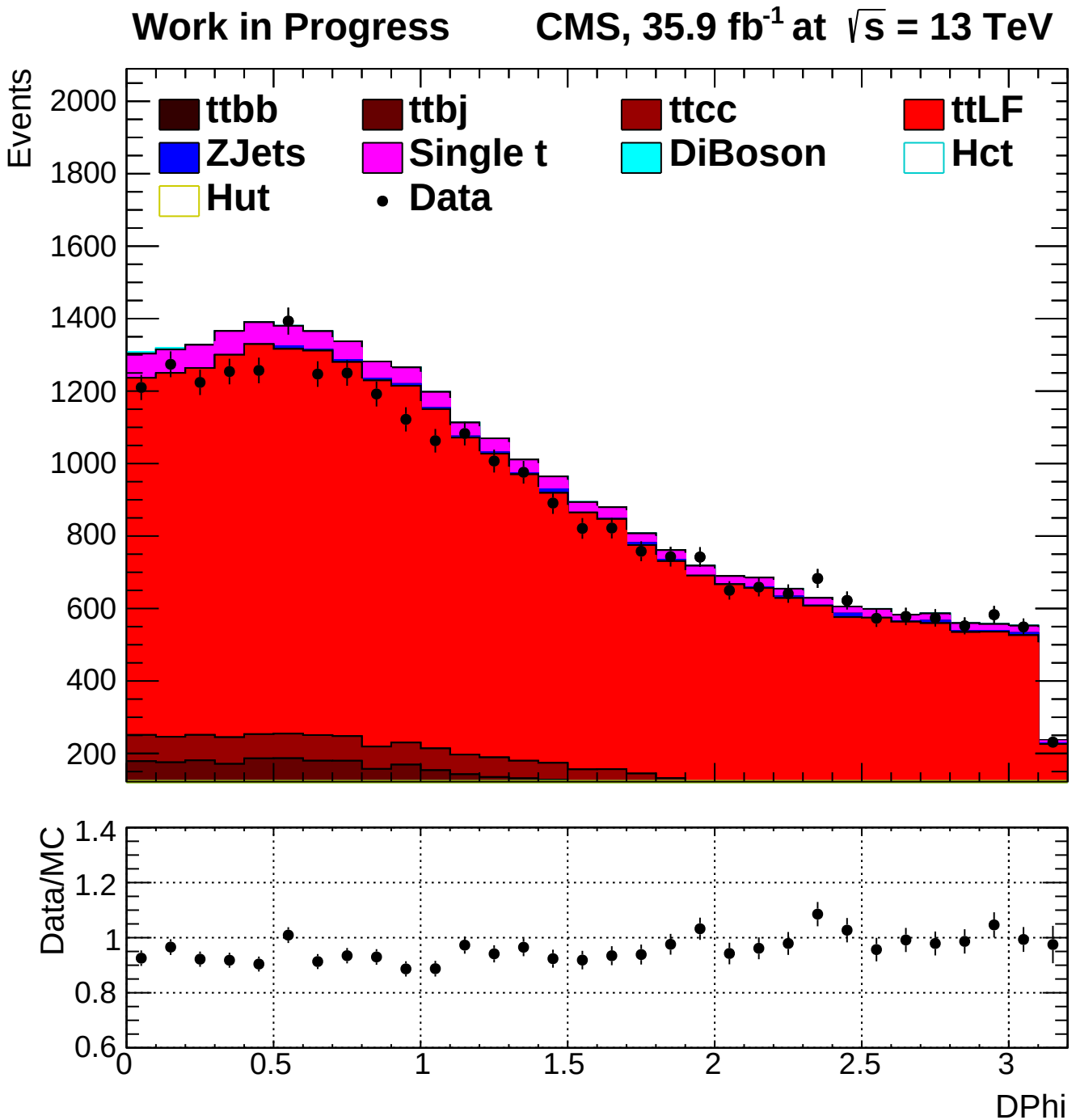

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

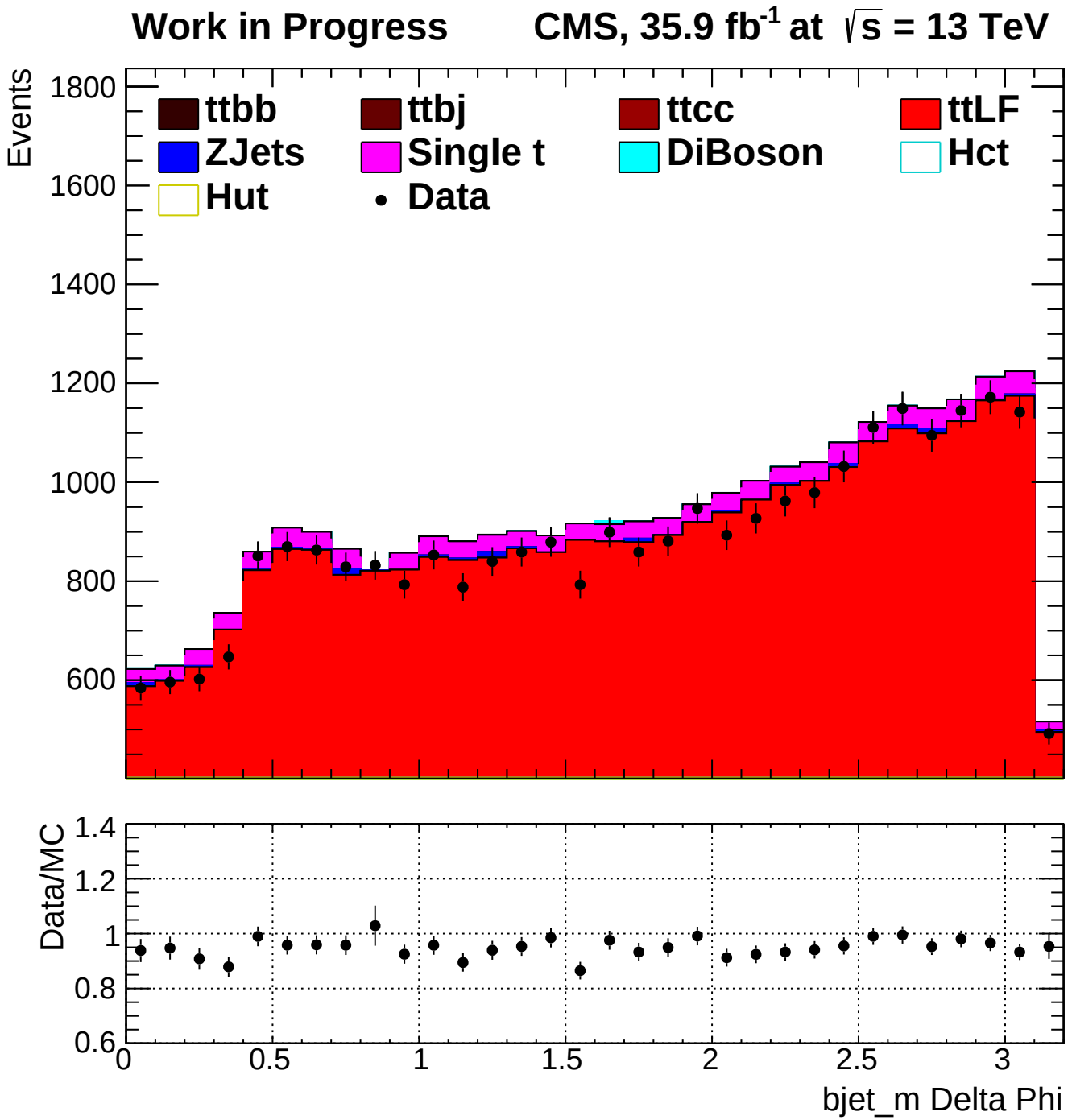

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

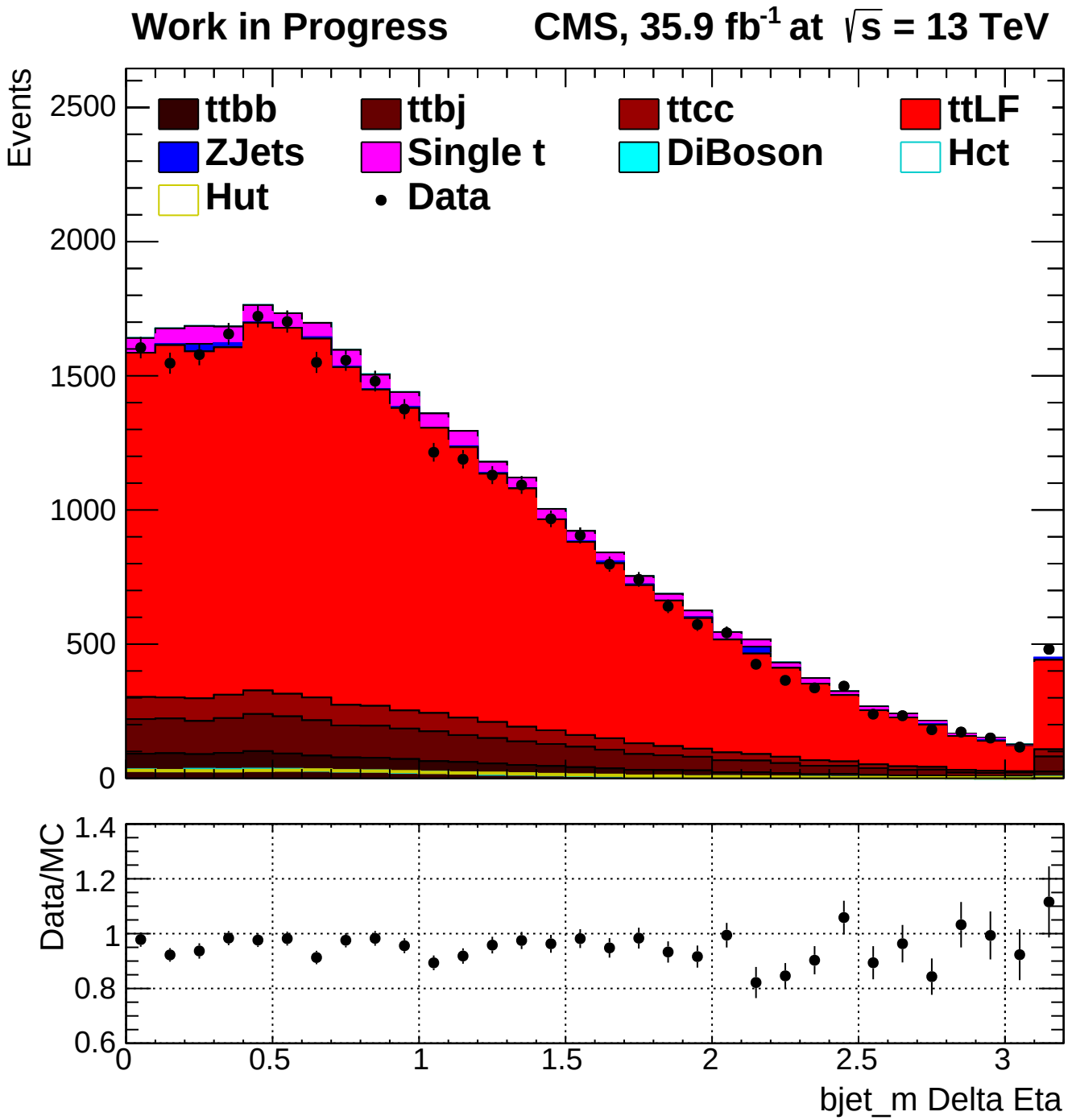

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)

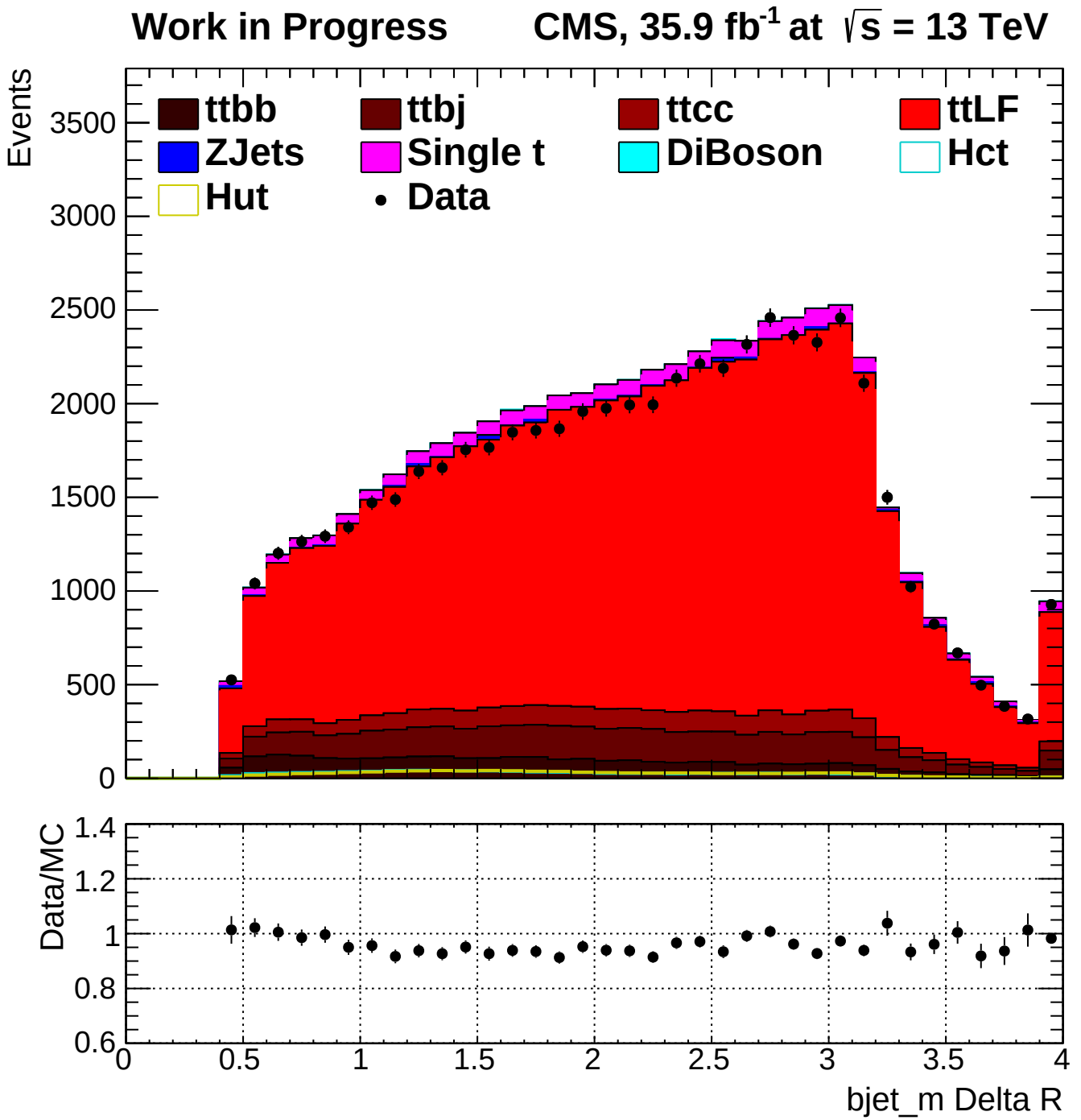

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
7000
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1800
1600
1400
1200
1000
800
600
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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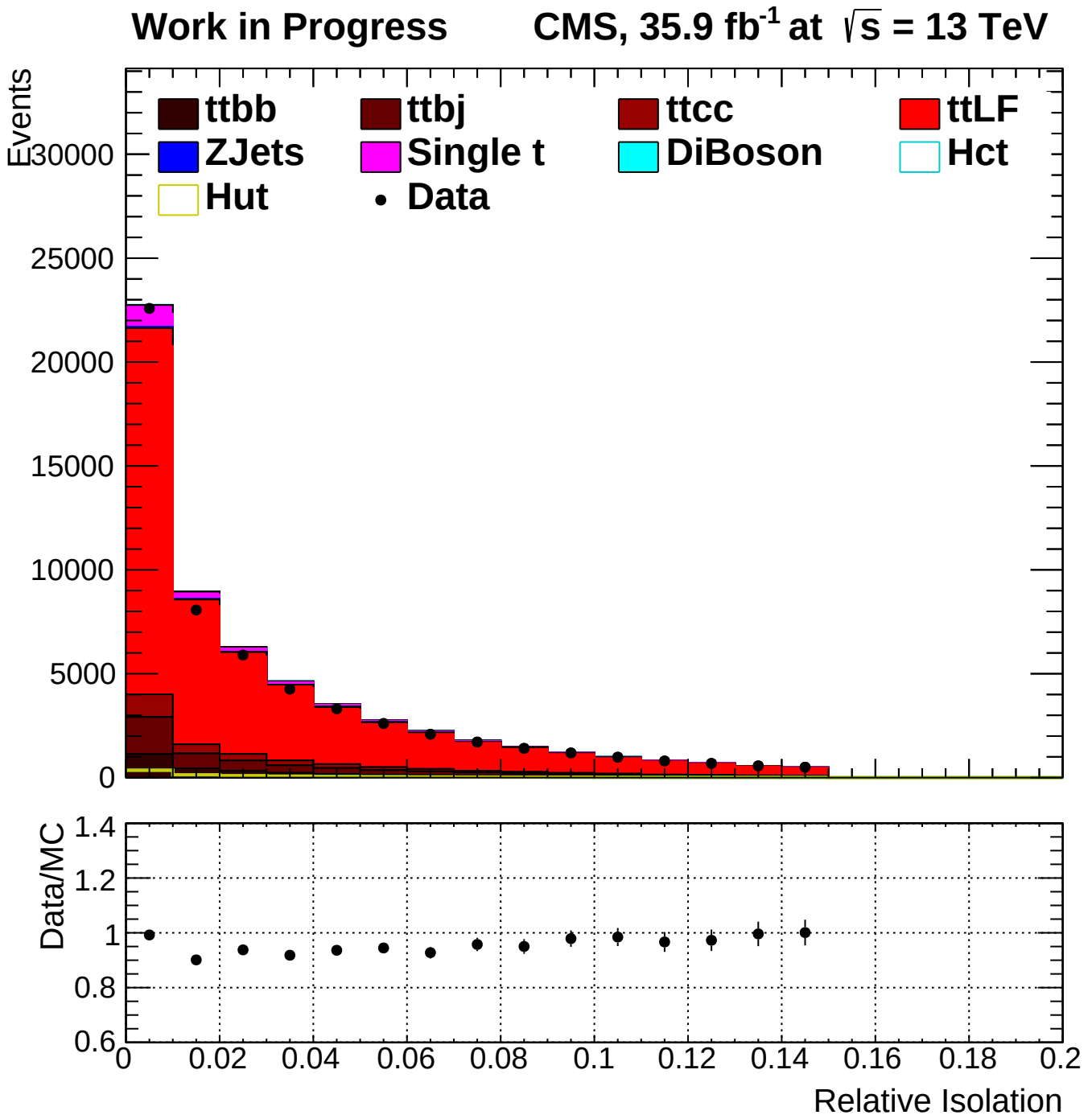
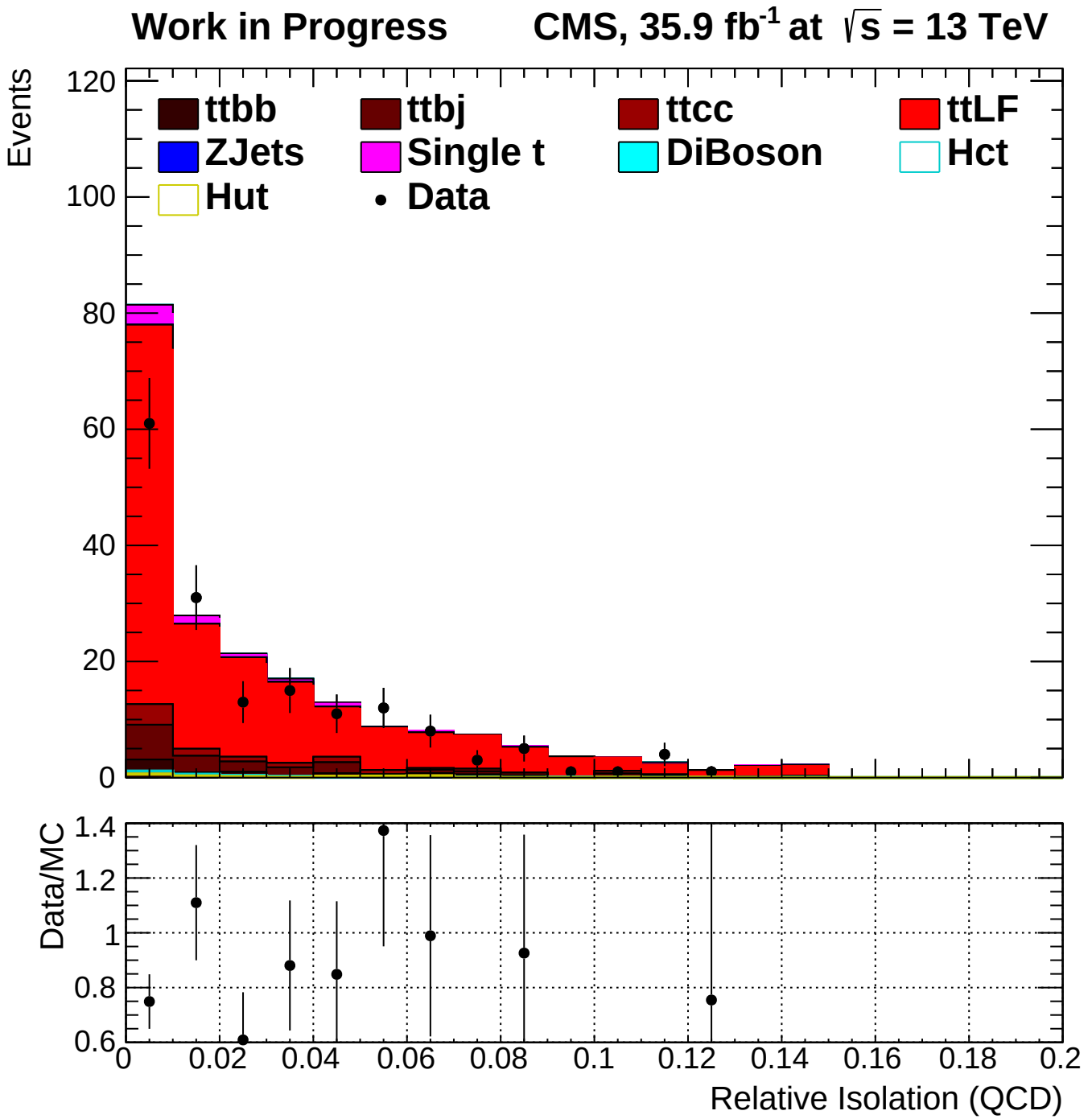
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
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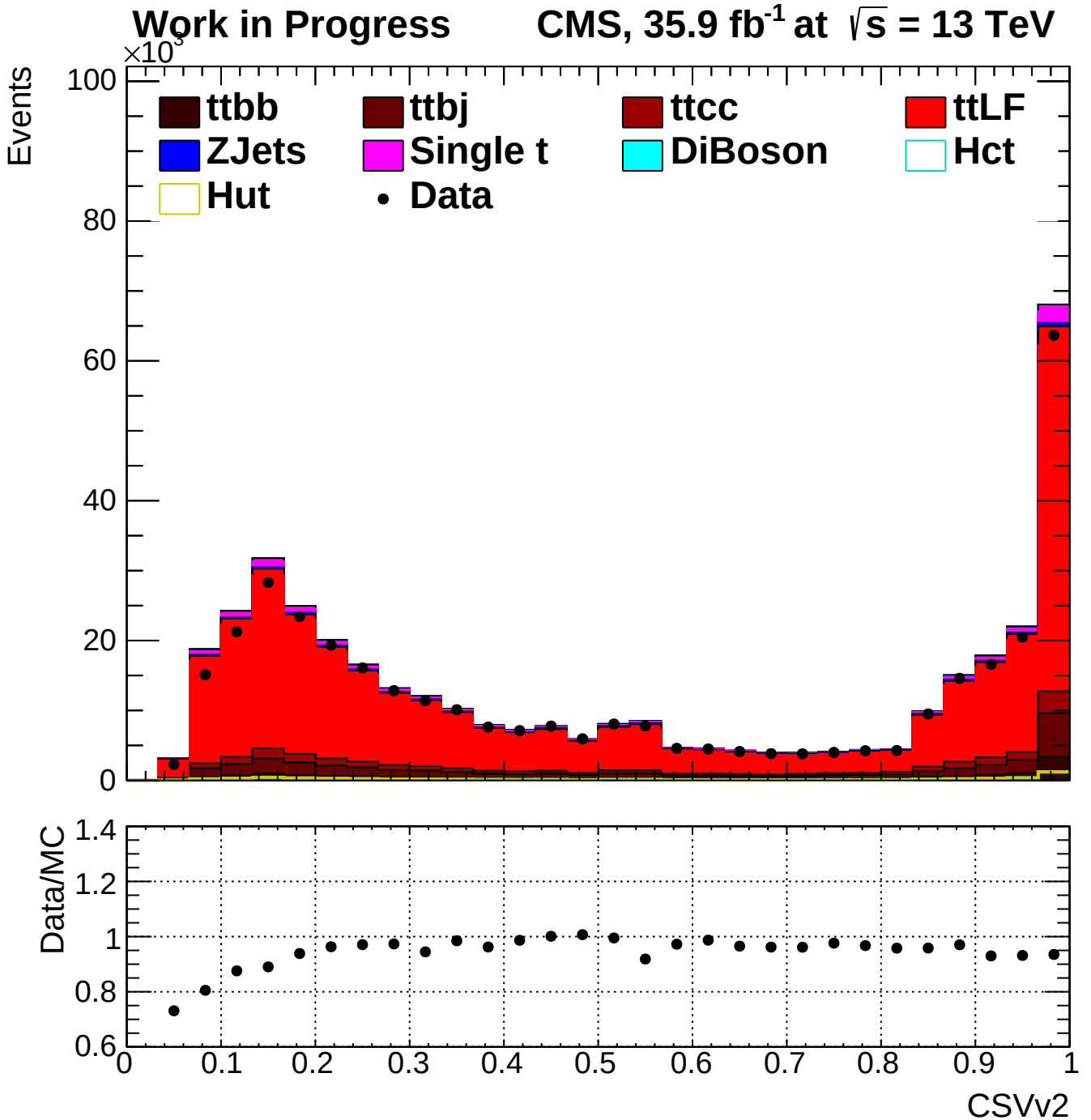
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
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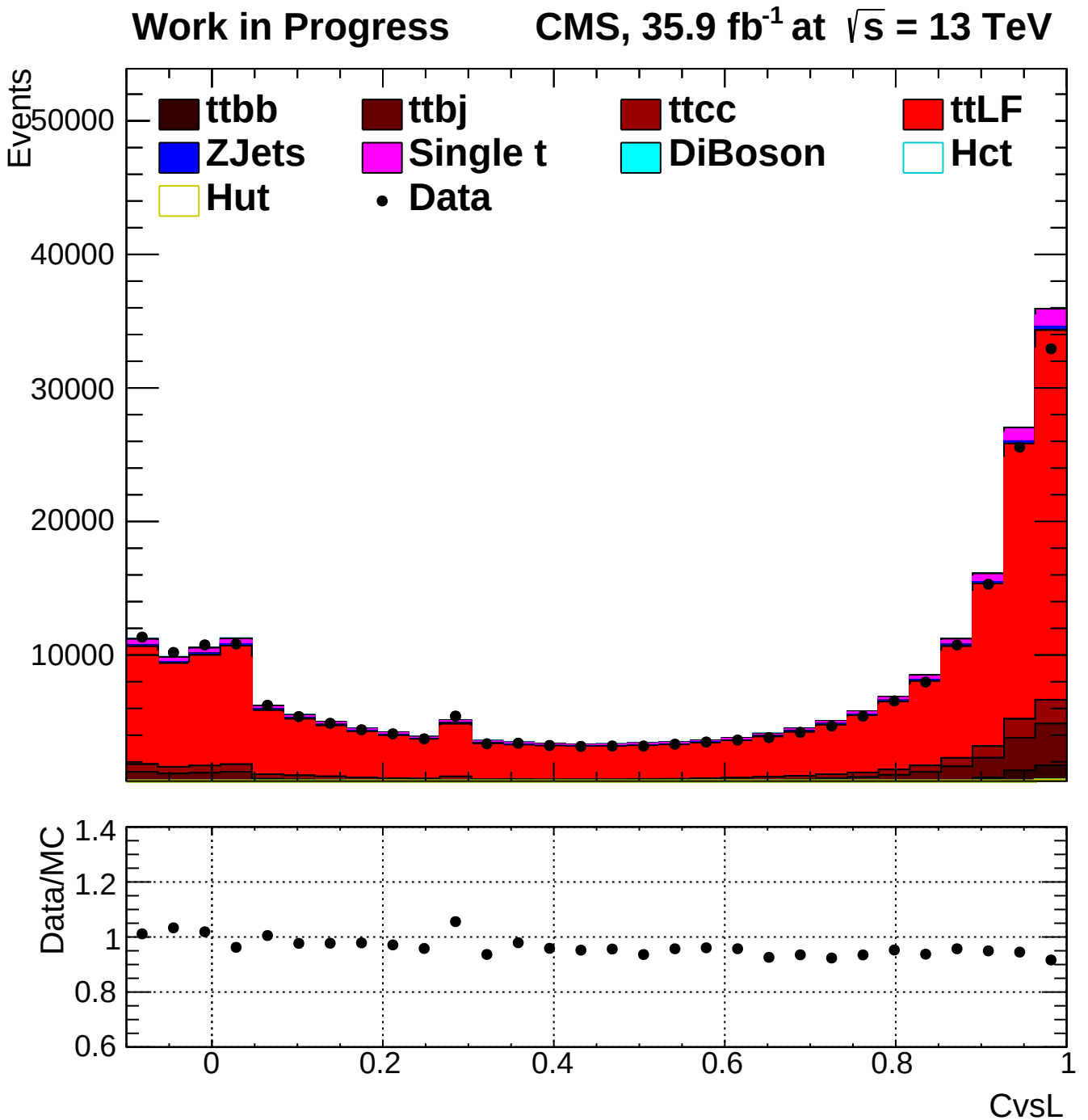
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
Data/MC
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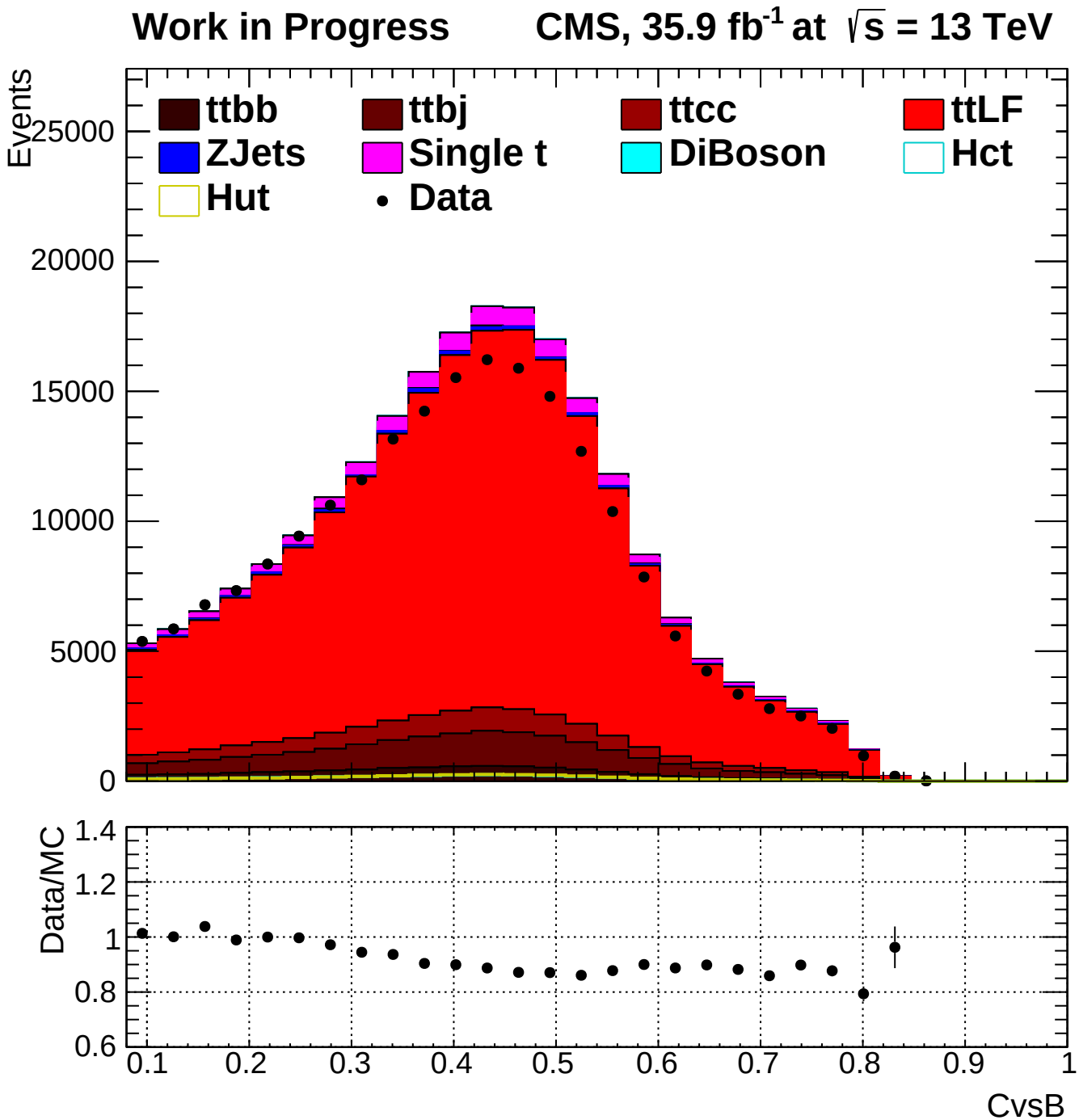
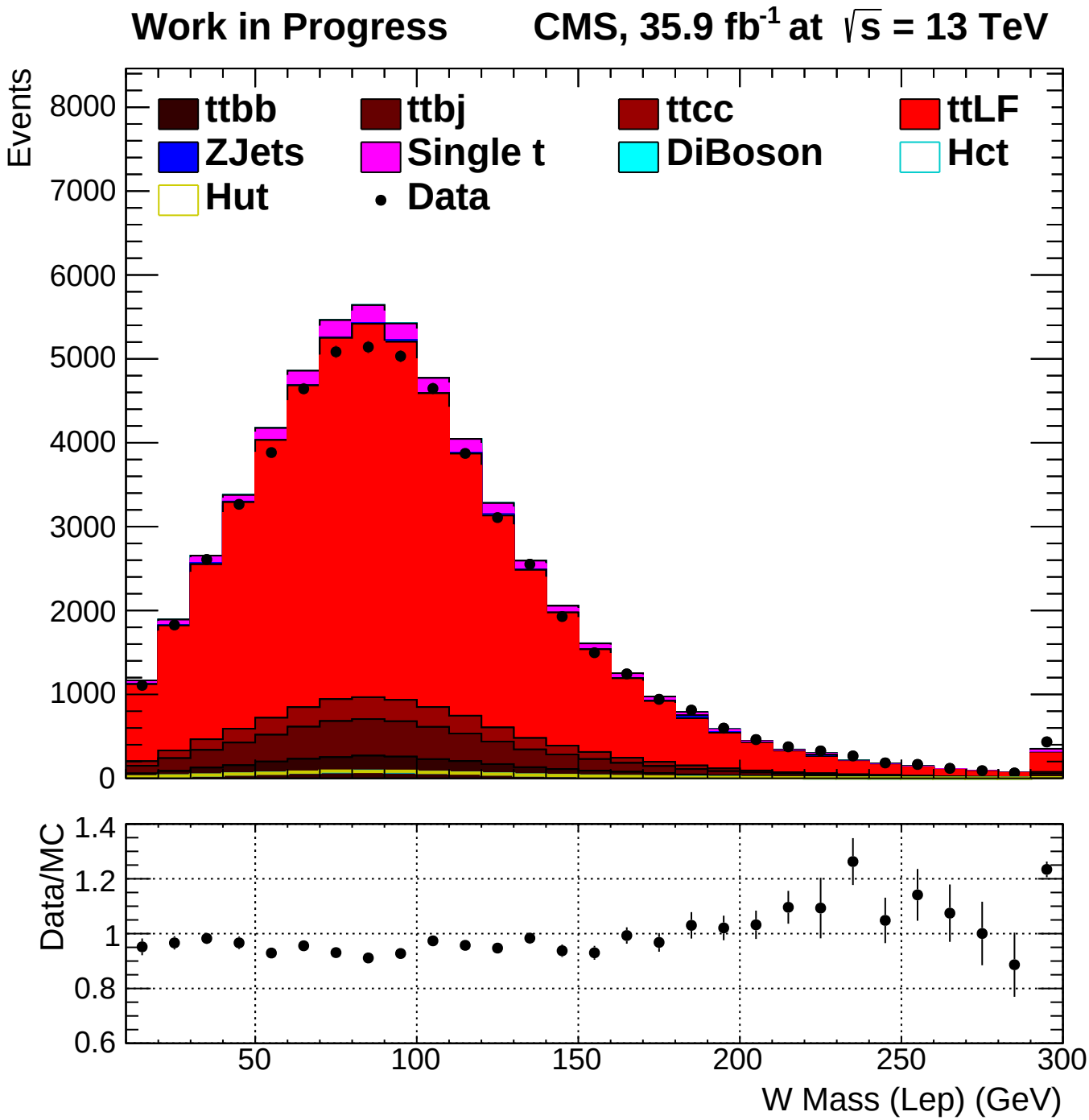
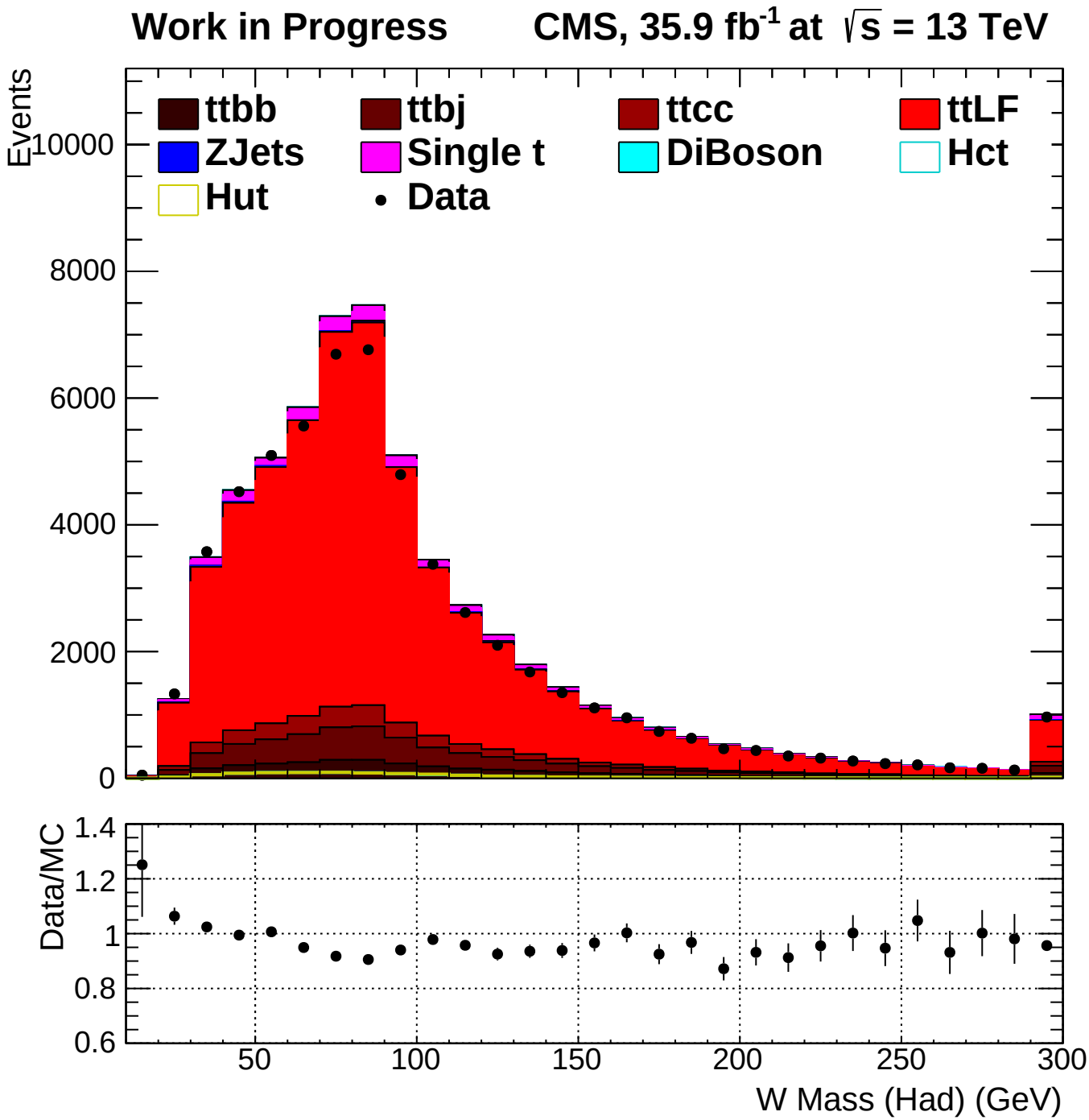
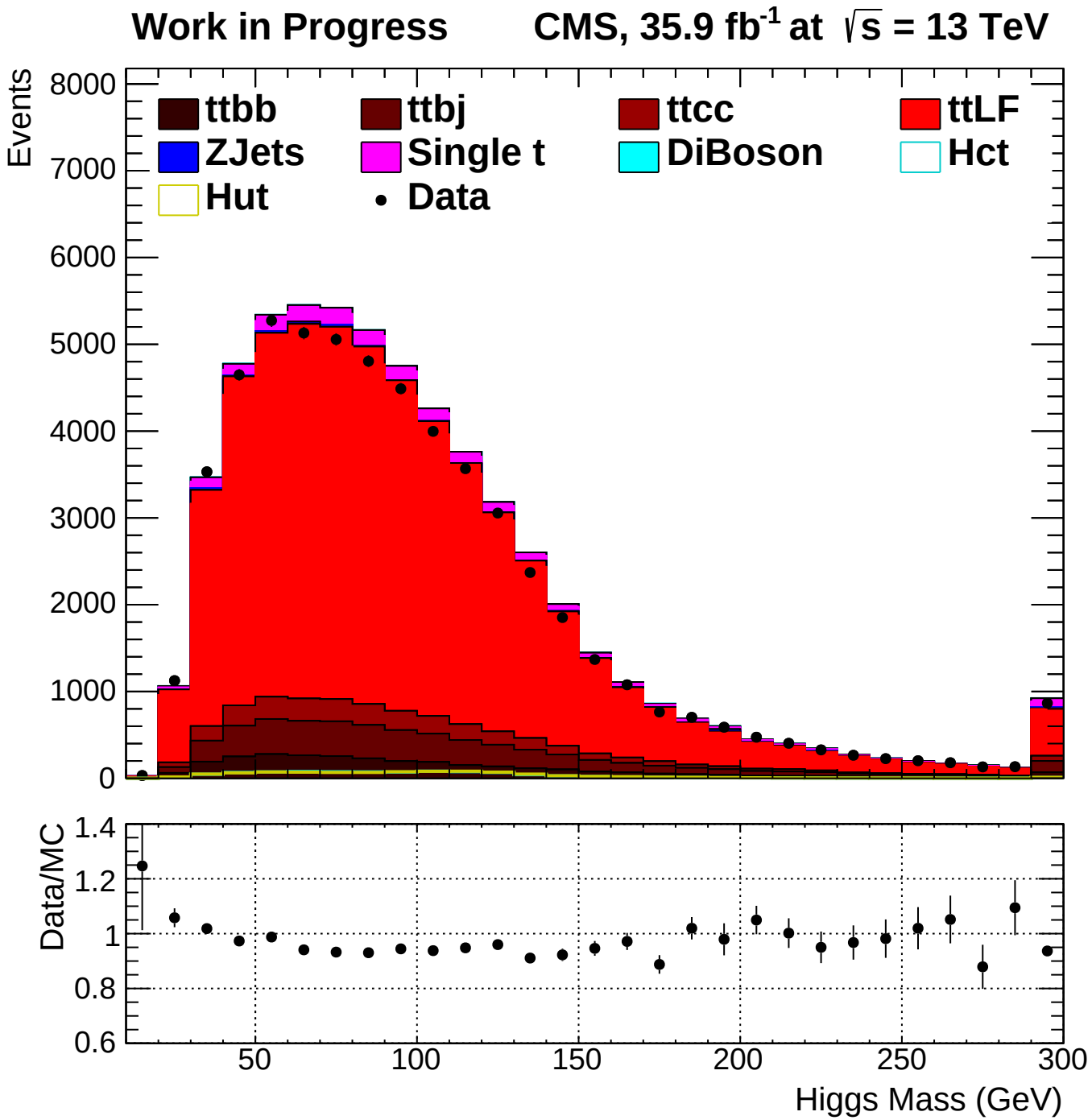
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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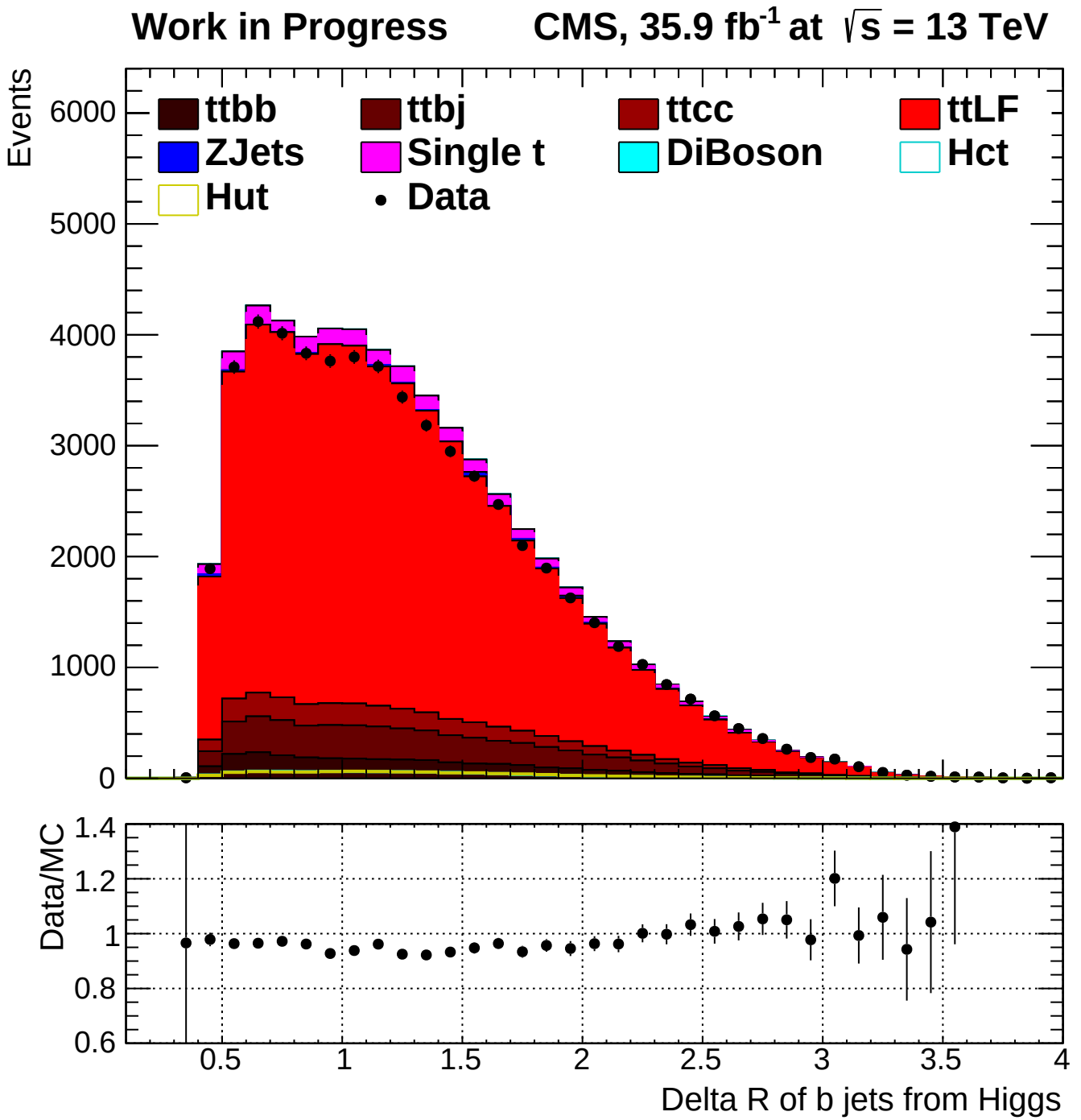
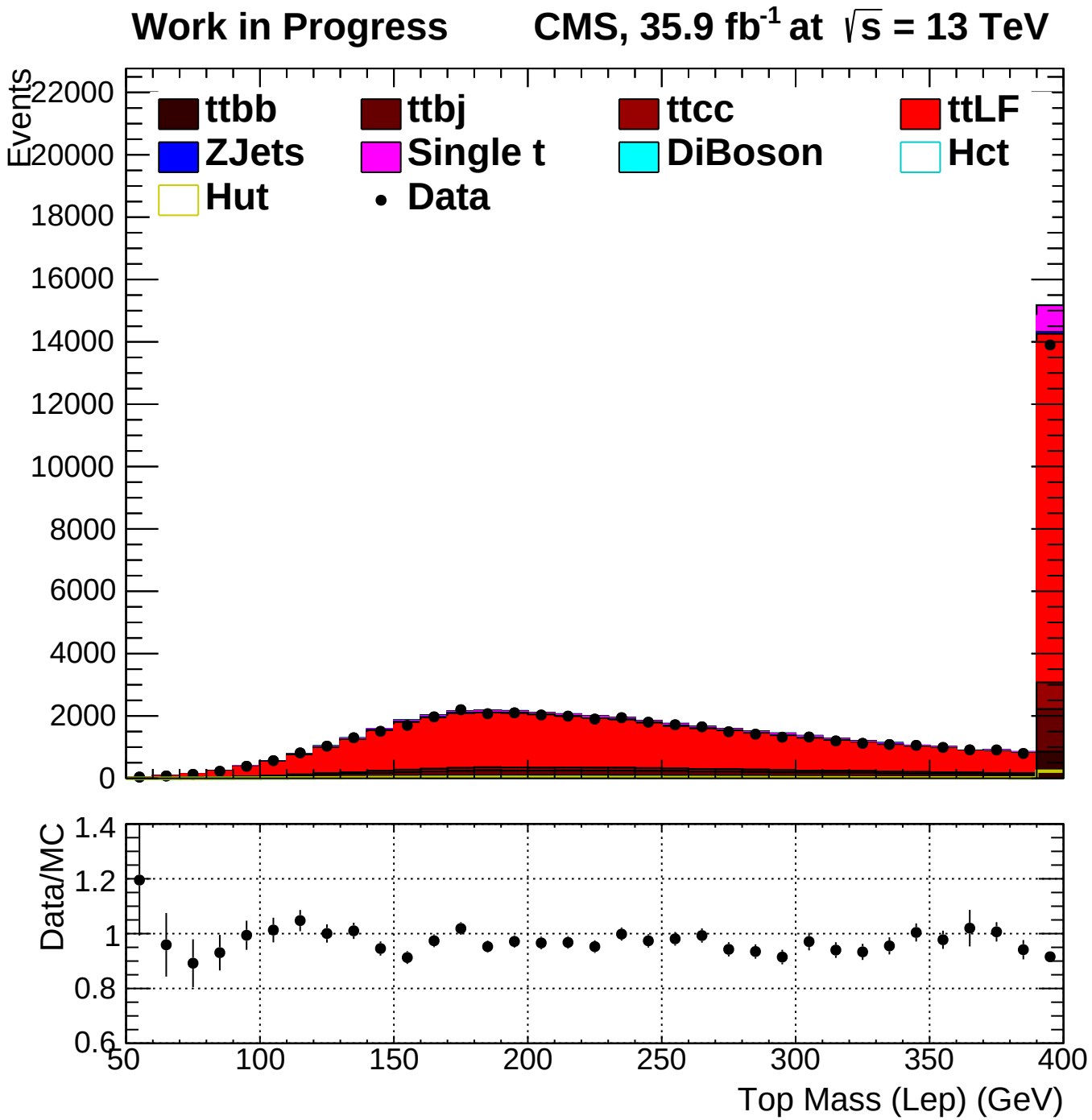
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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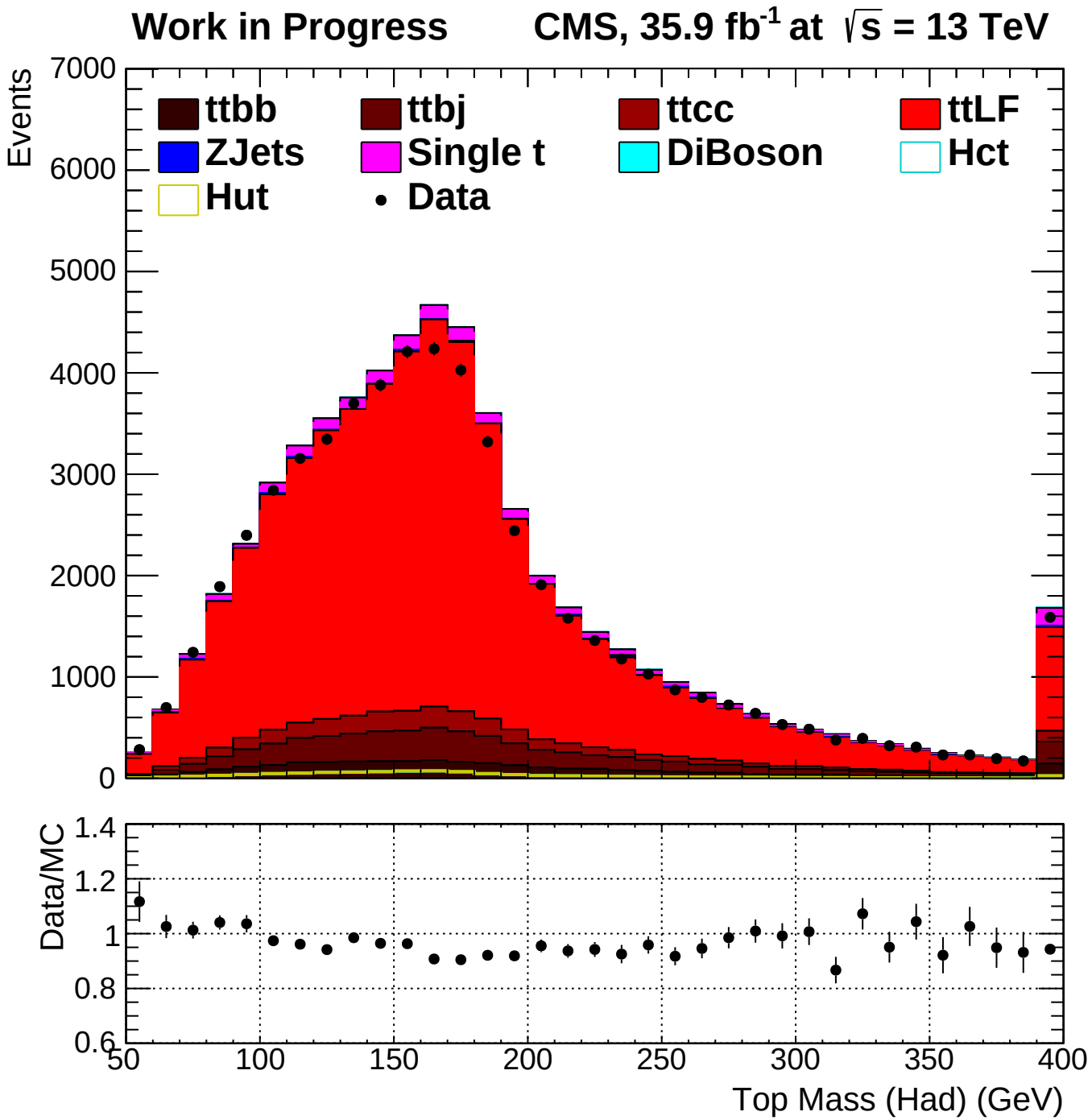
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
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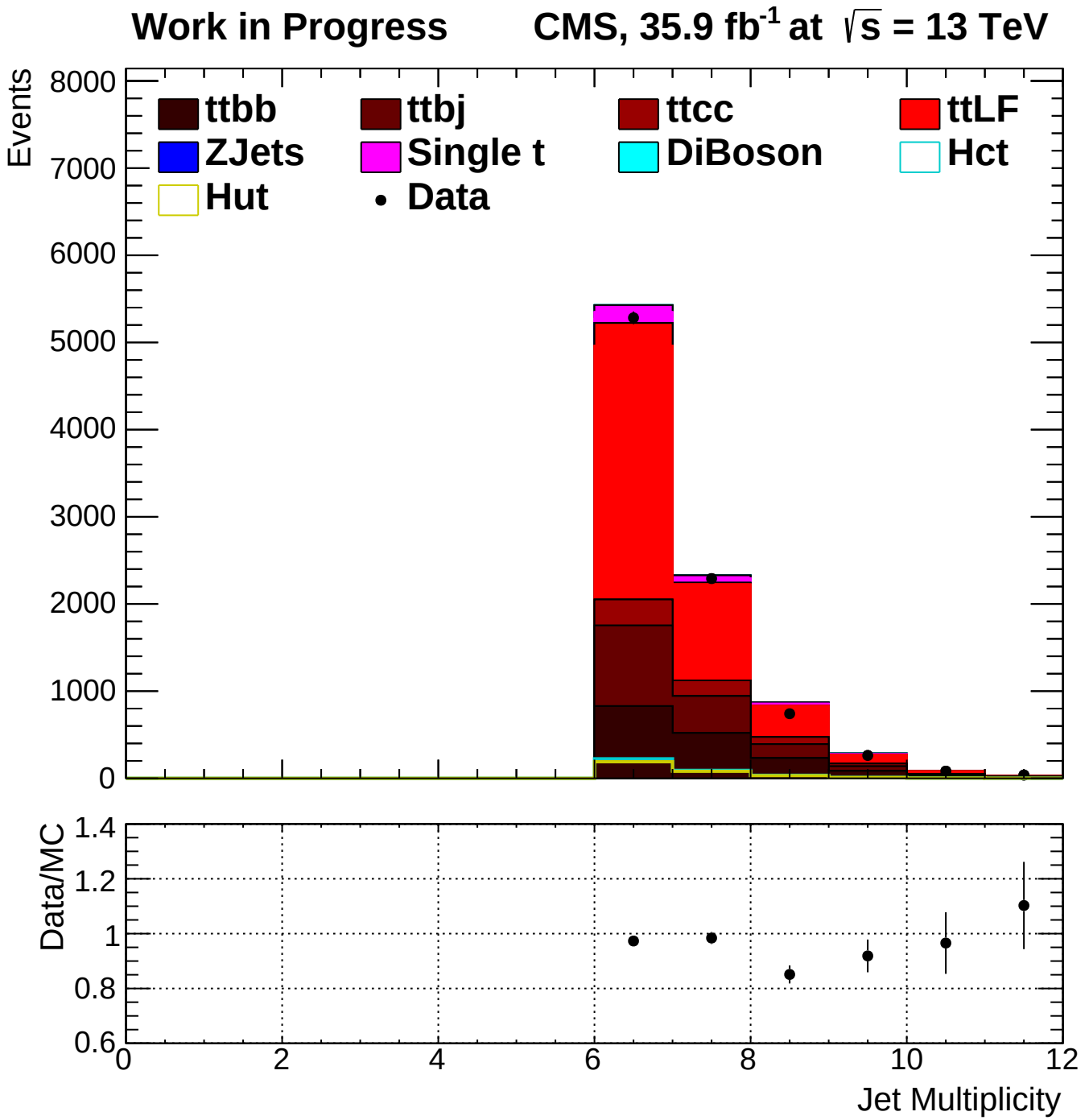
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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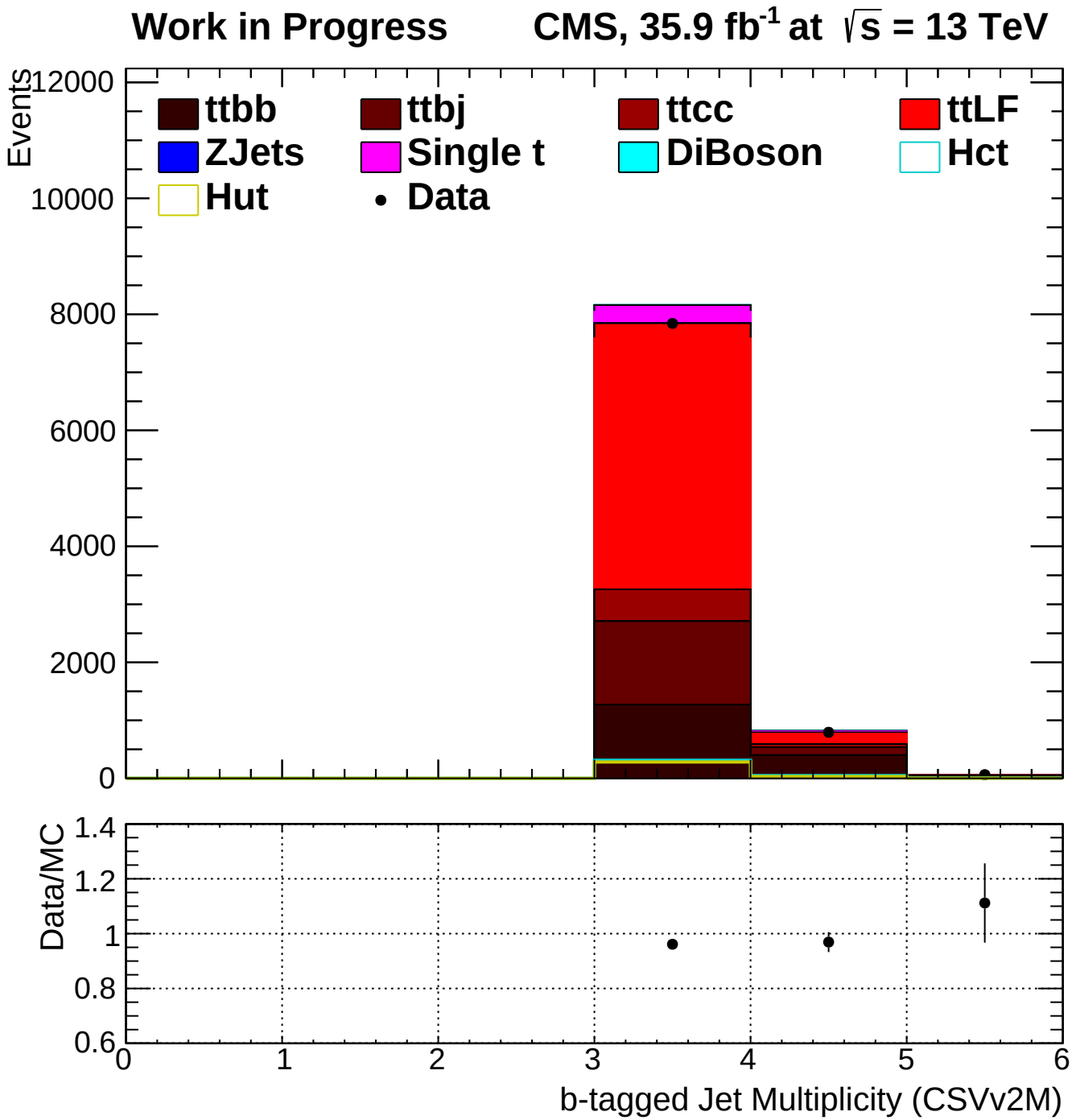
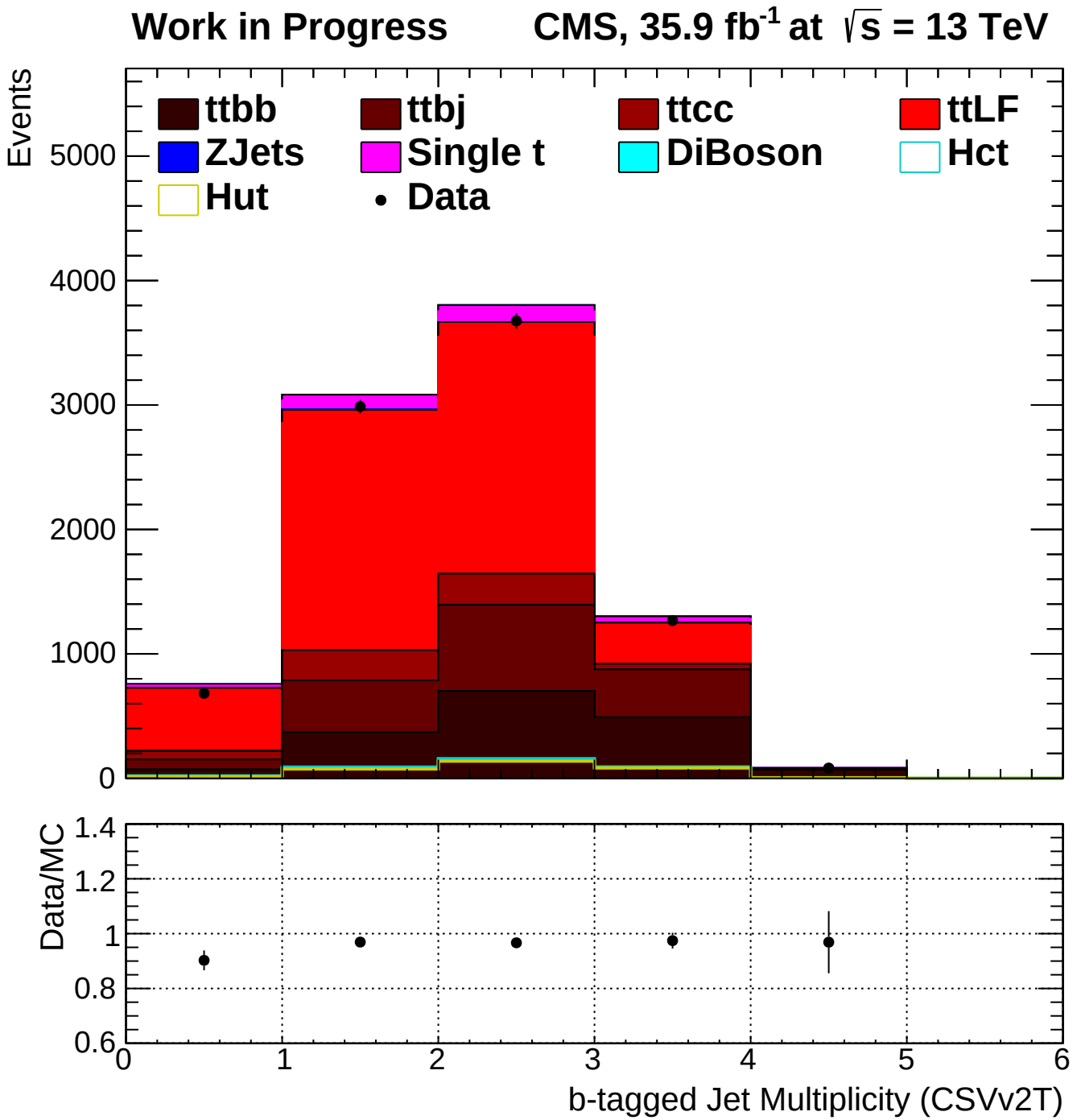
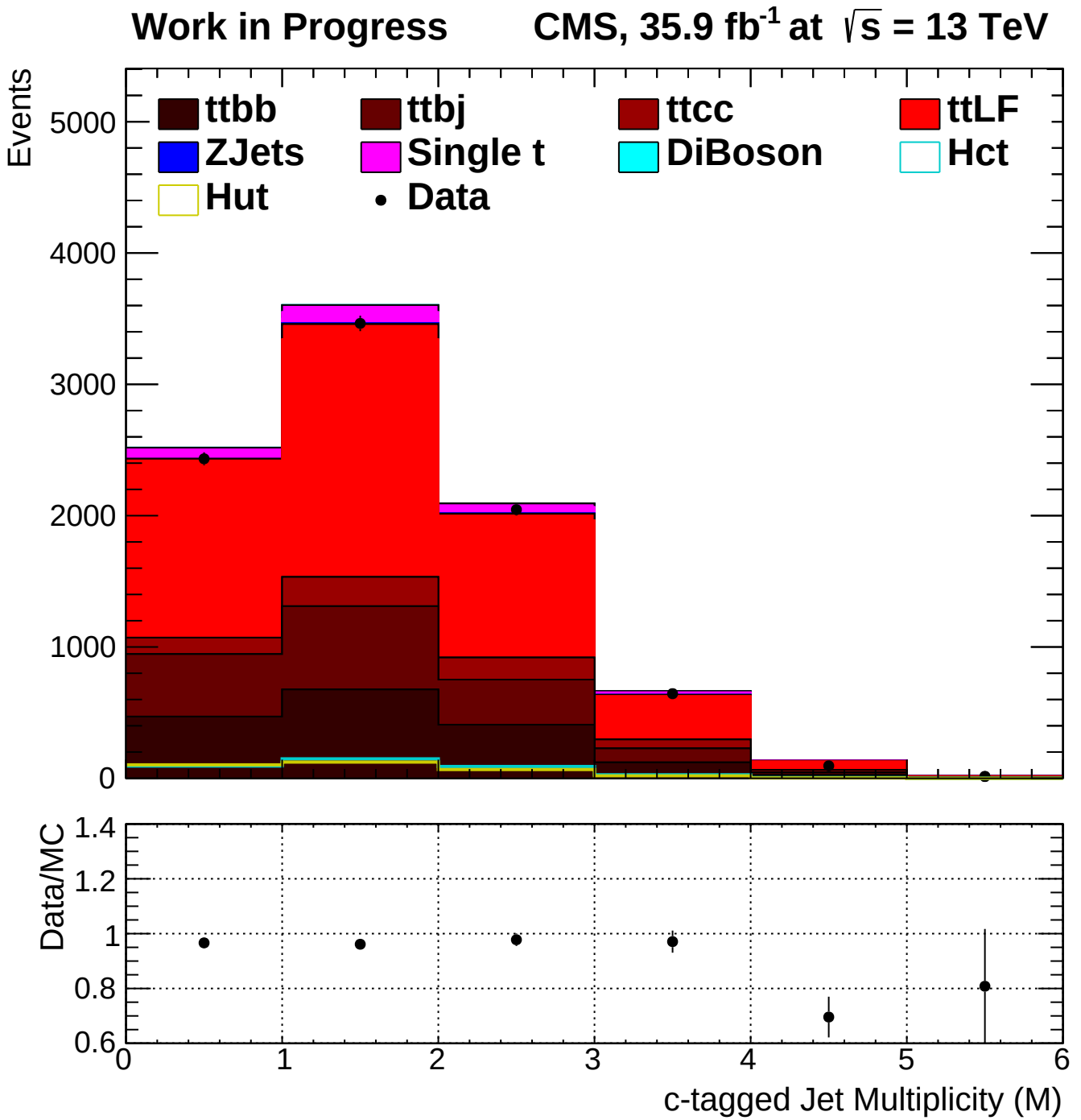
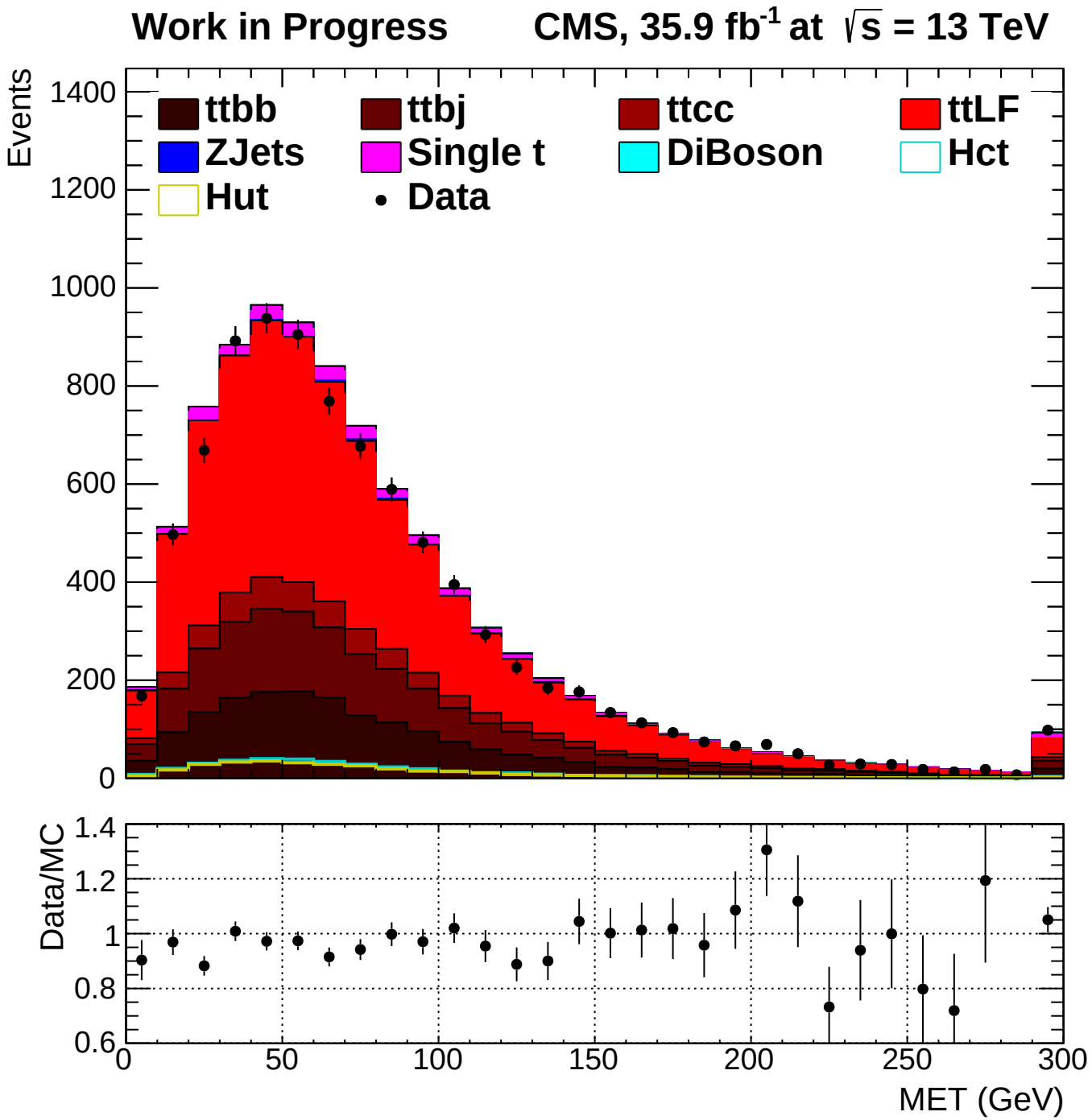
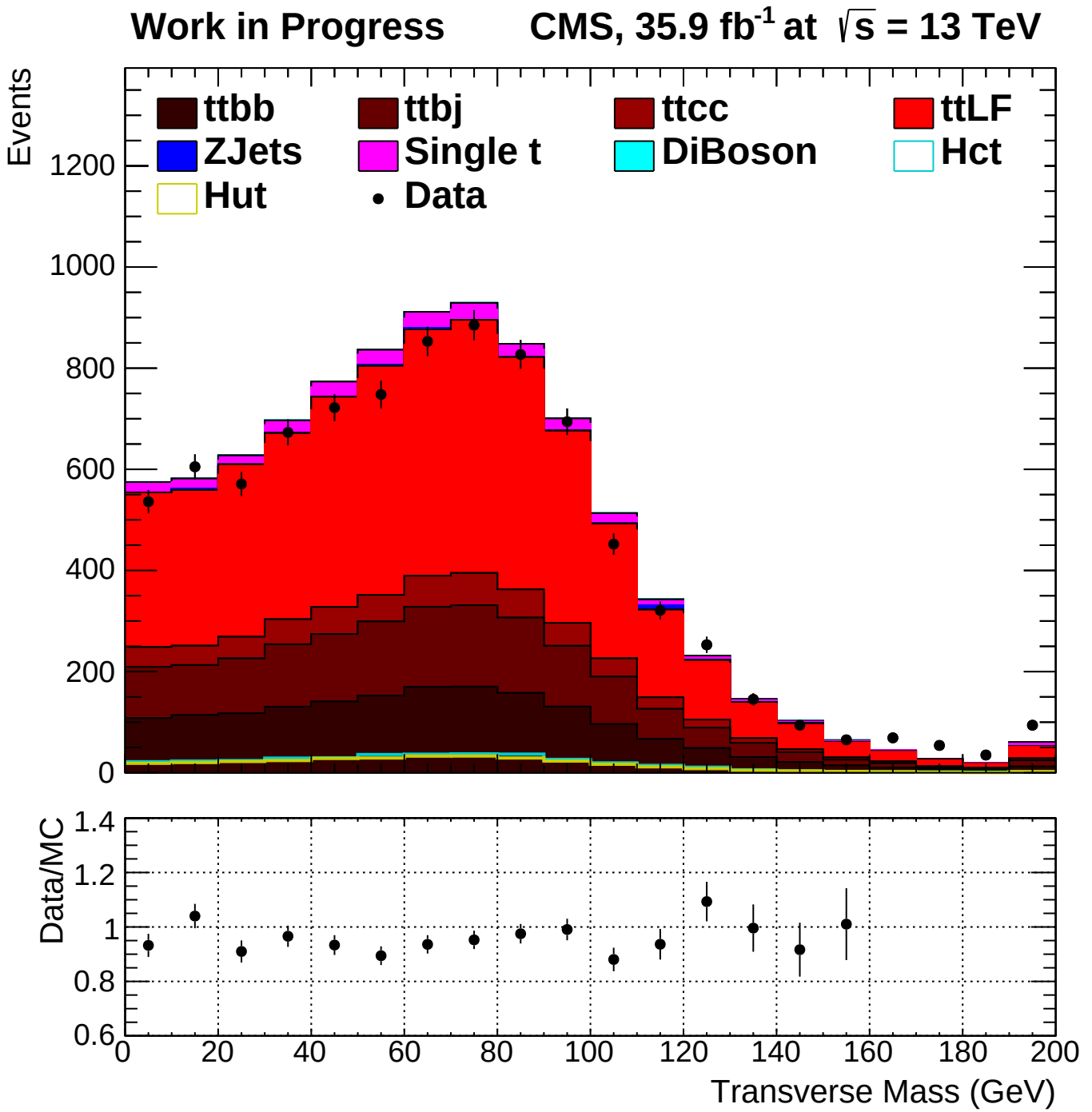
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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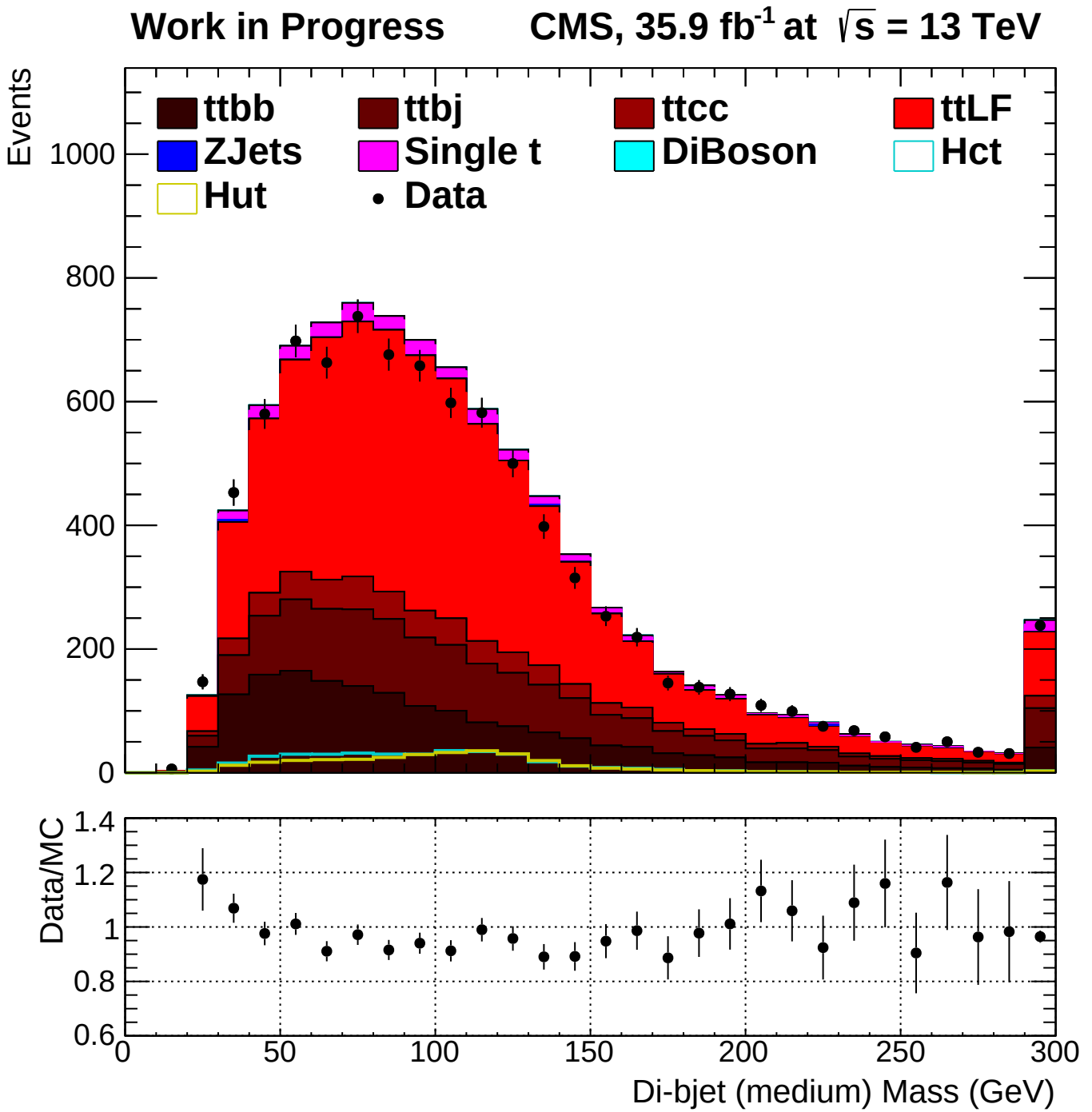
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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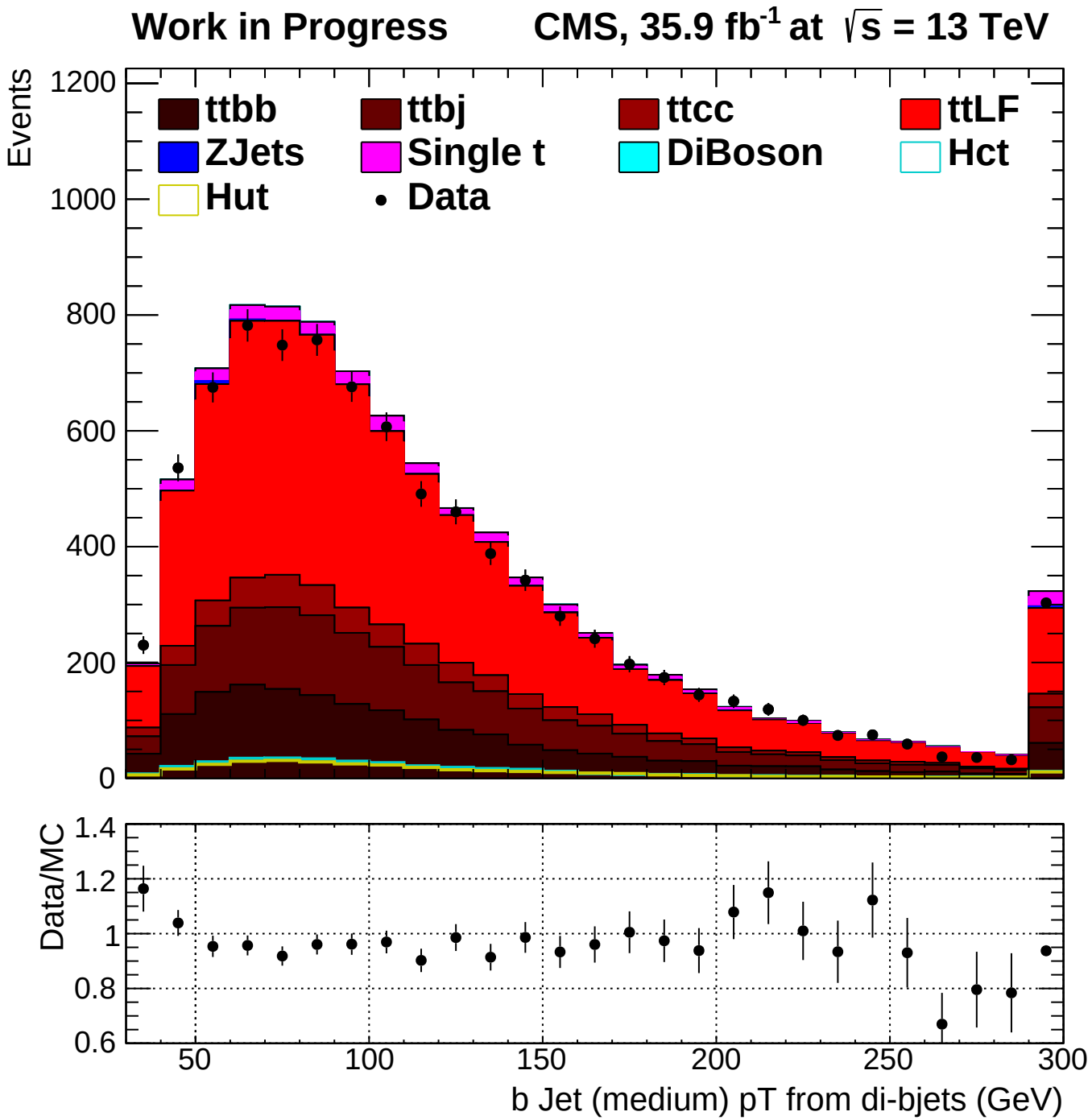
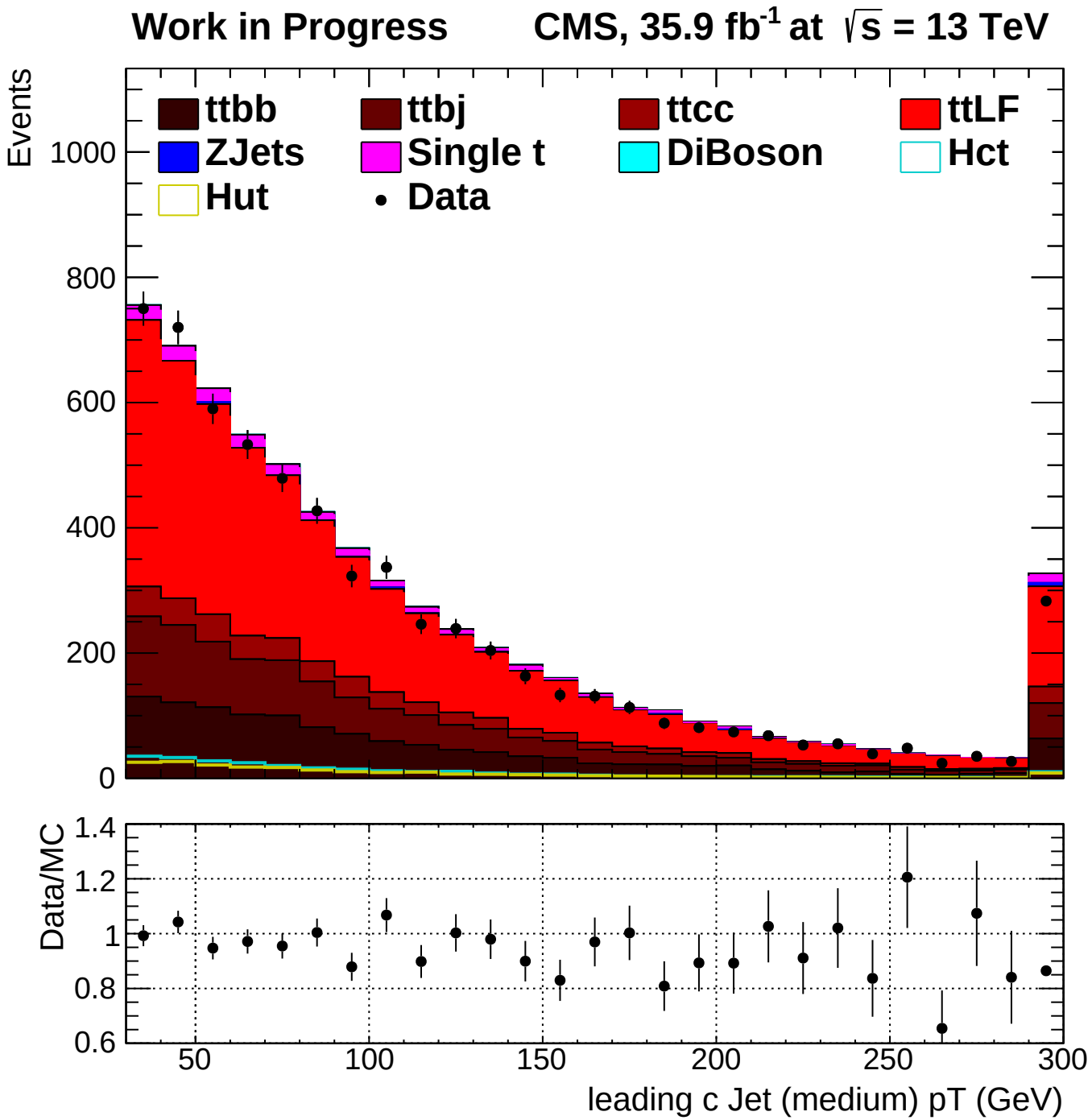
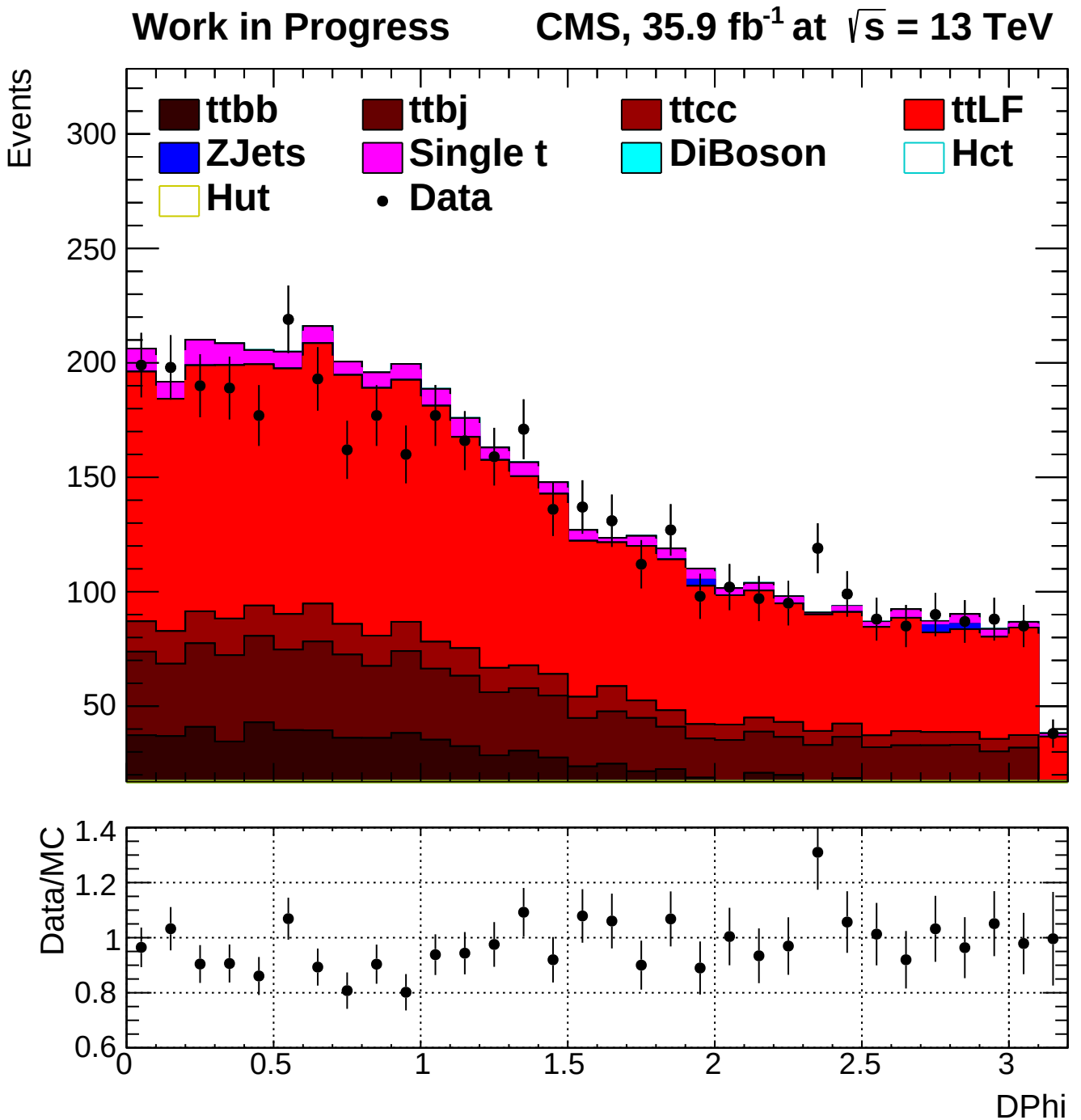
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
Data/MC
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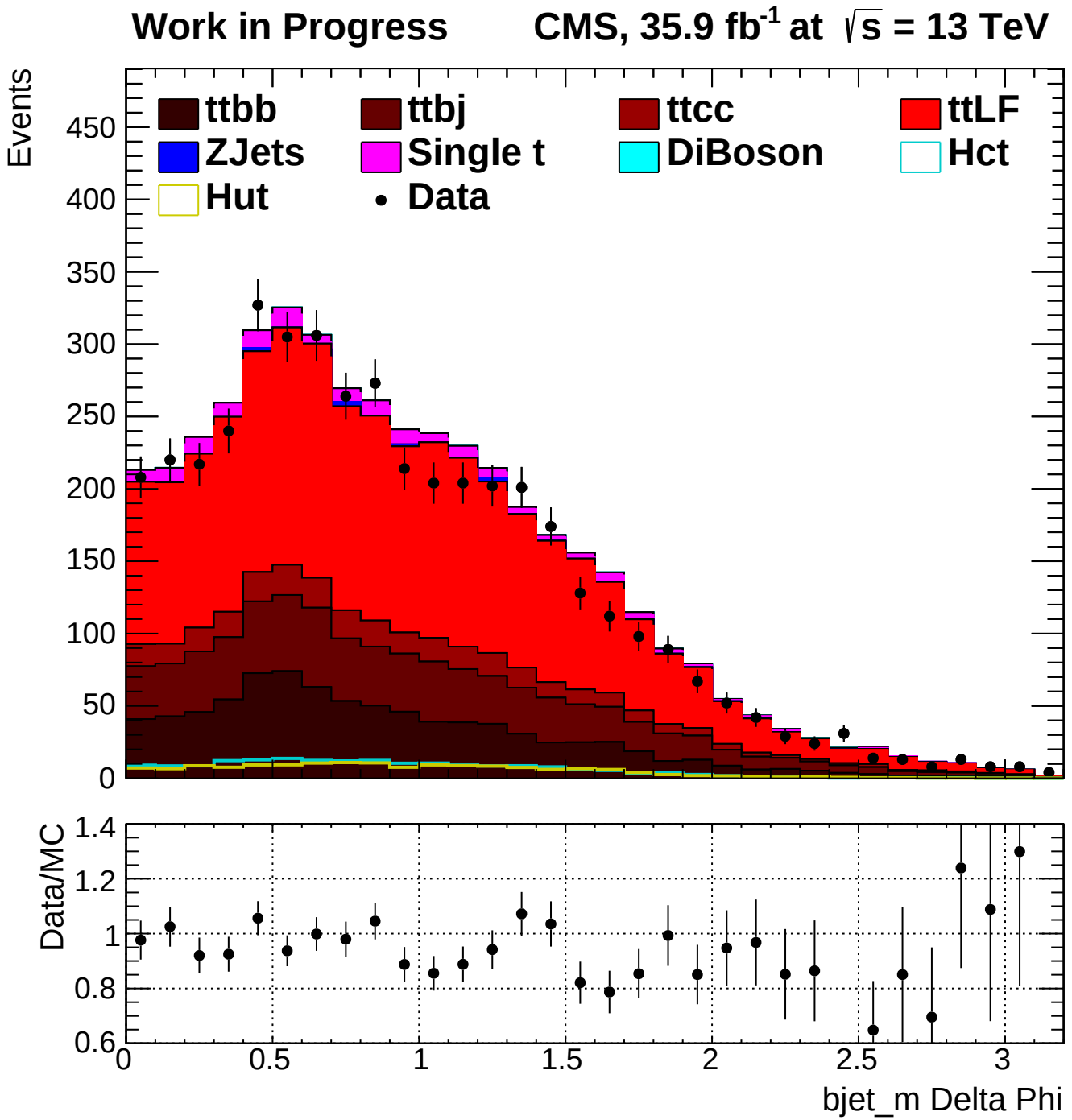
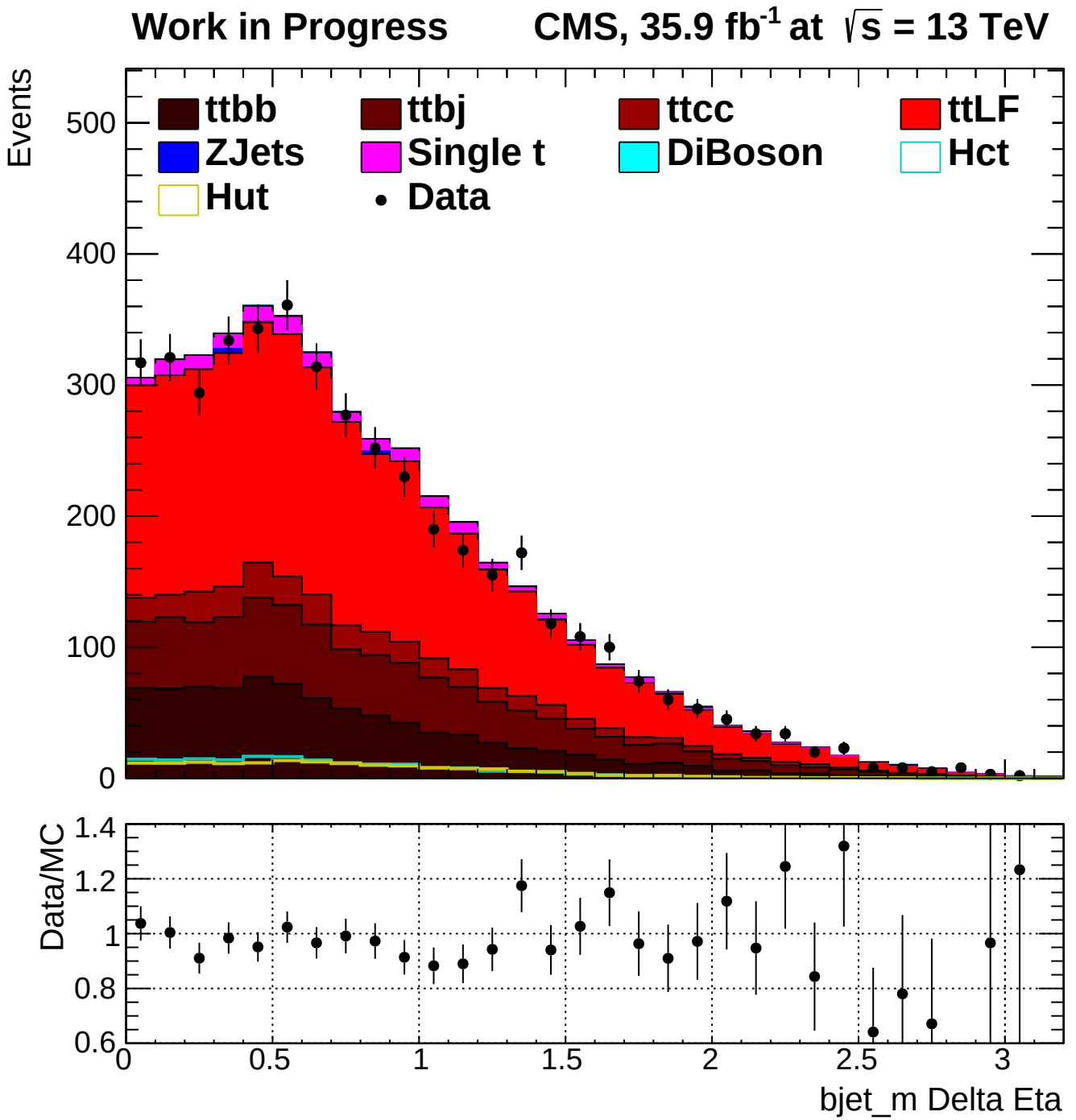
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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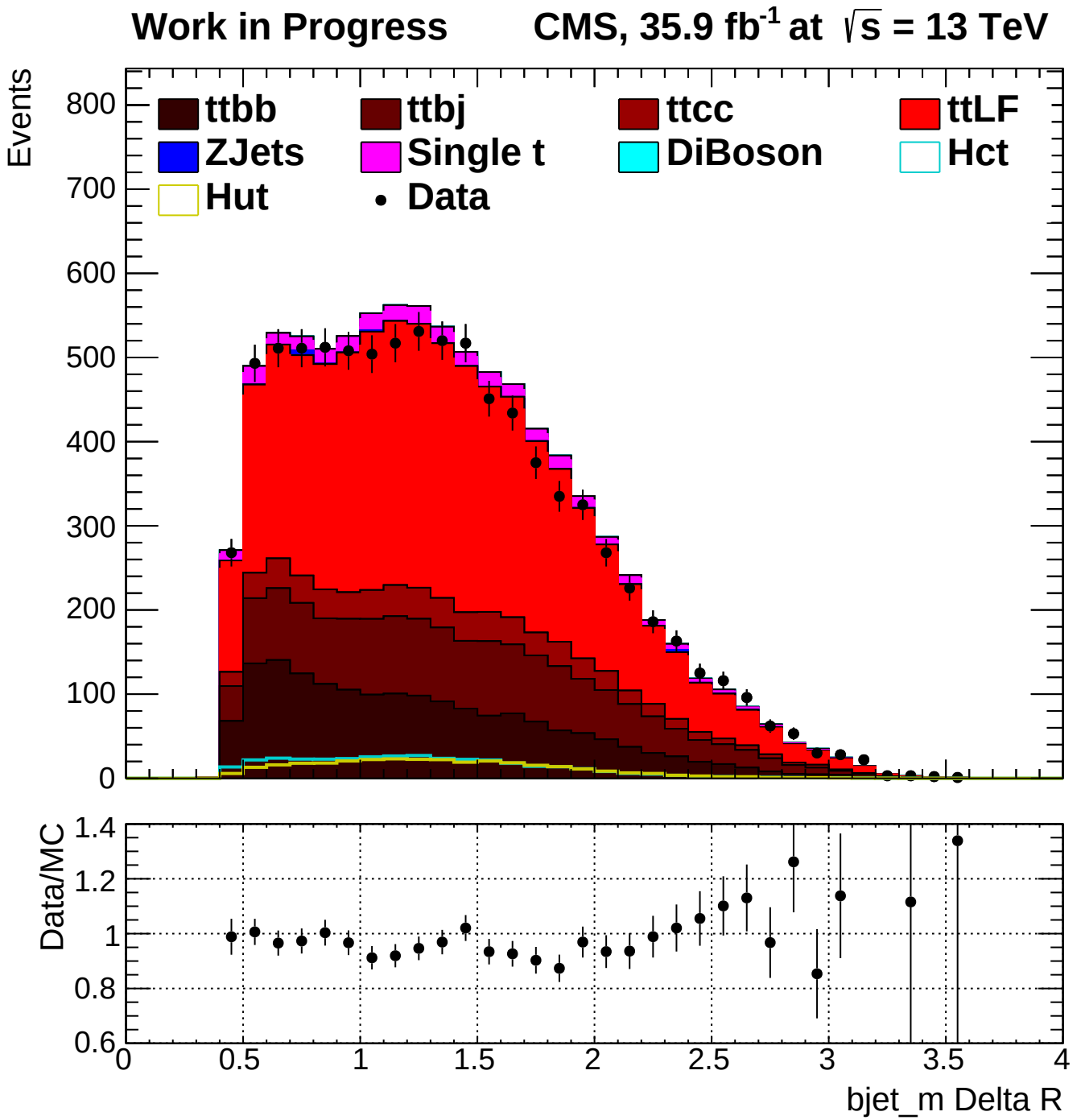
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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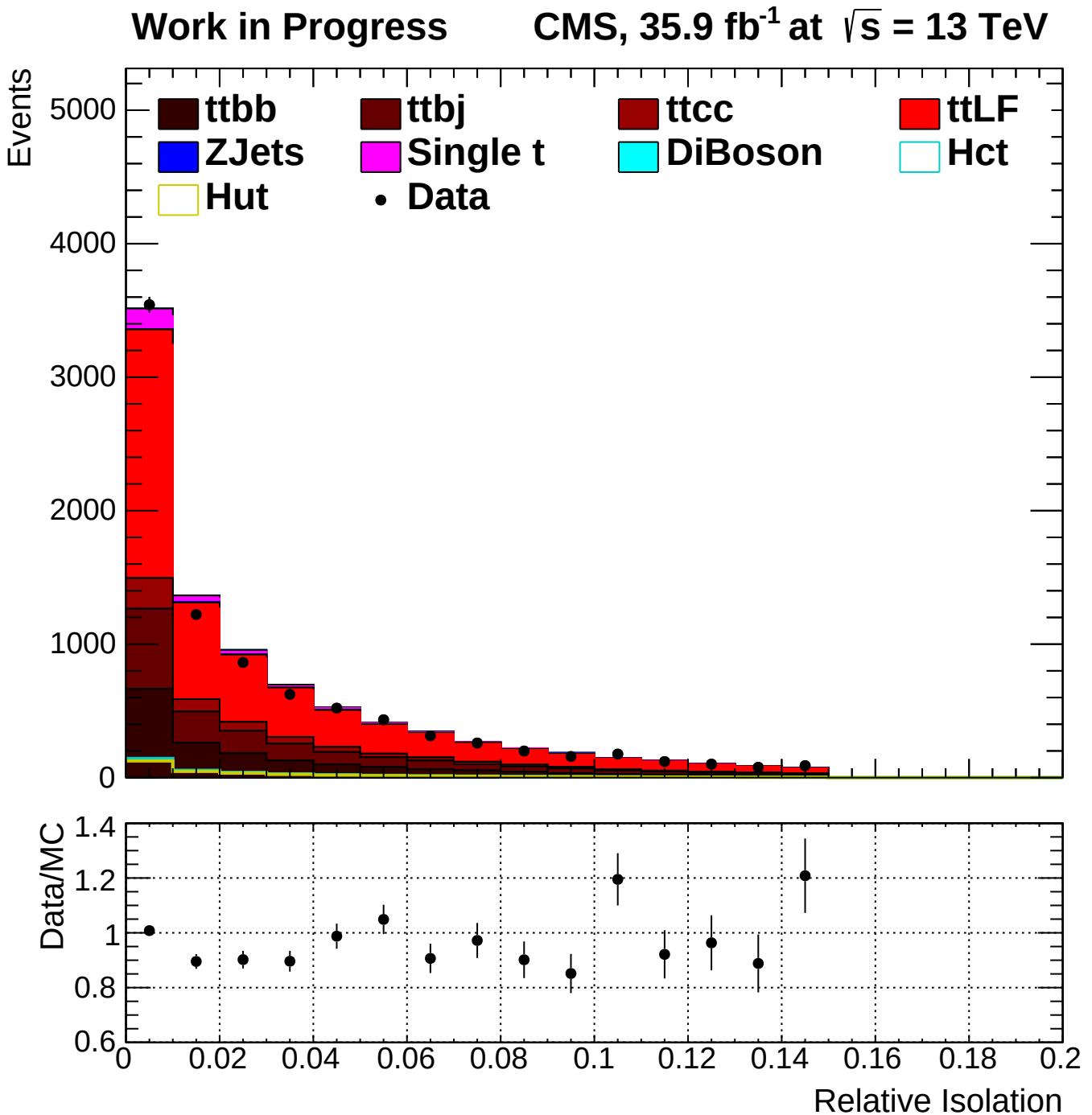
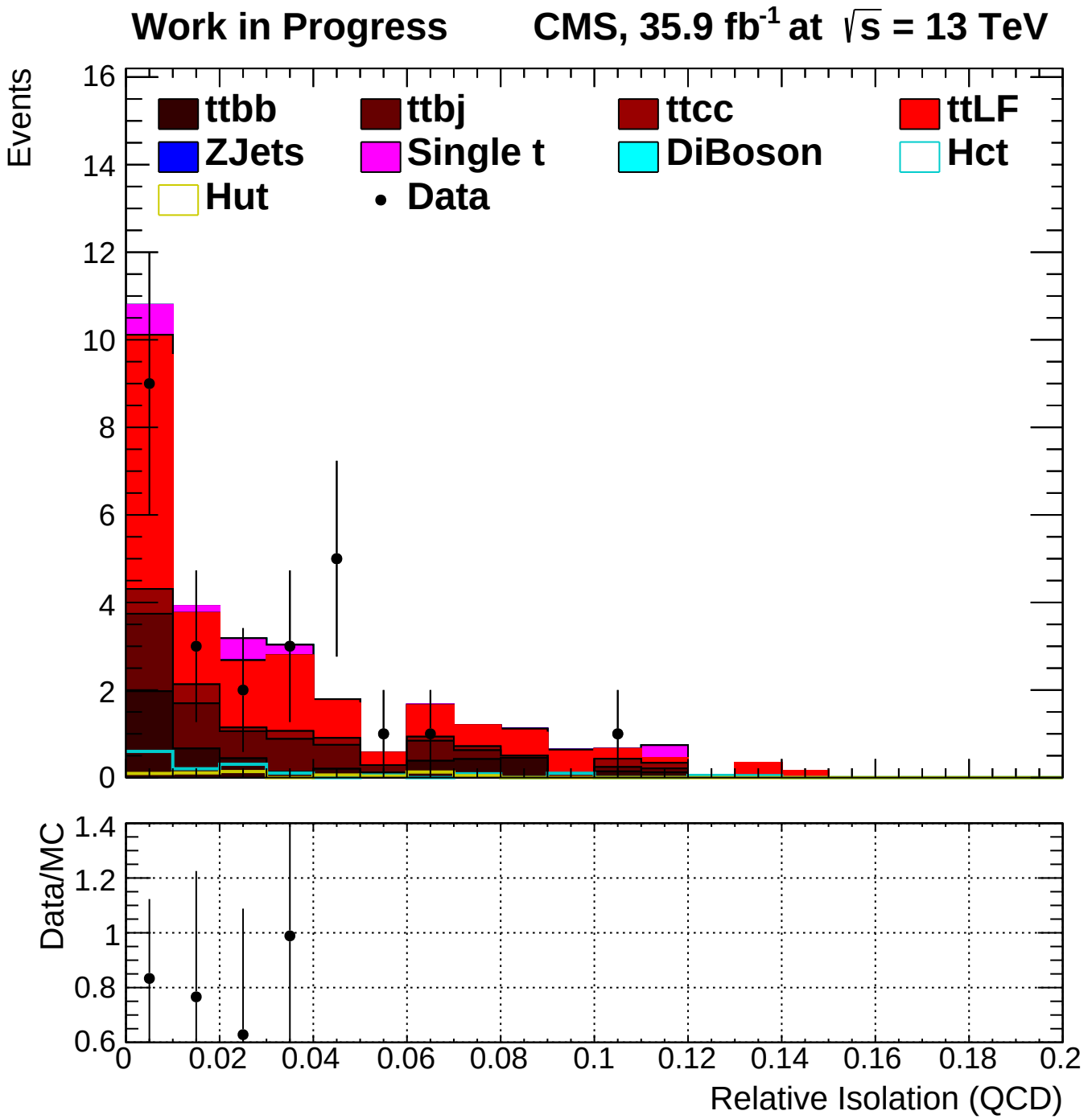
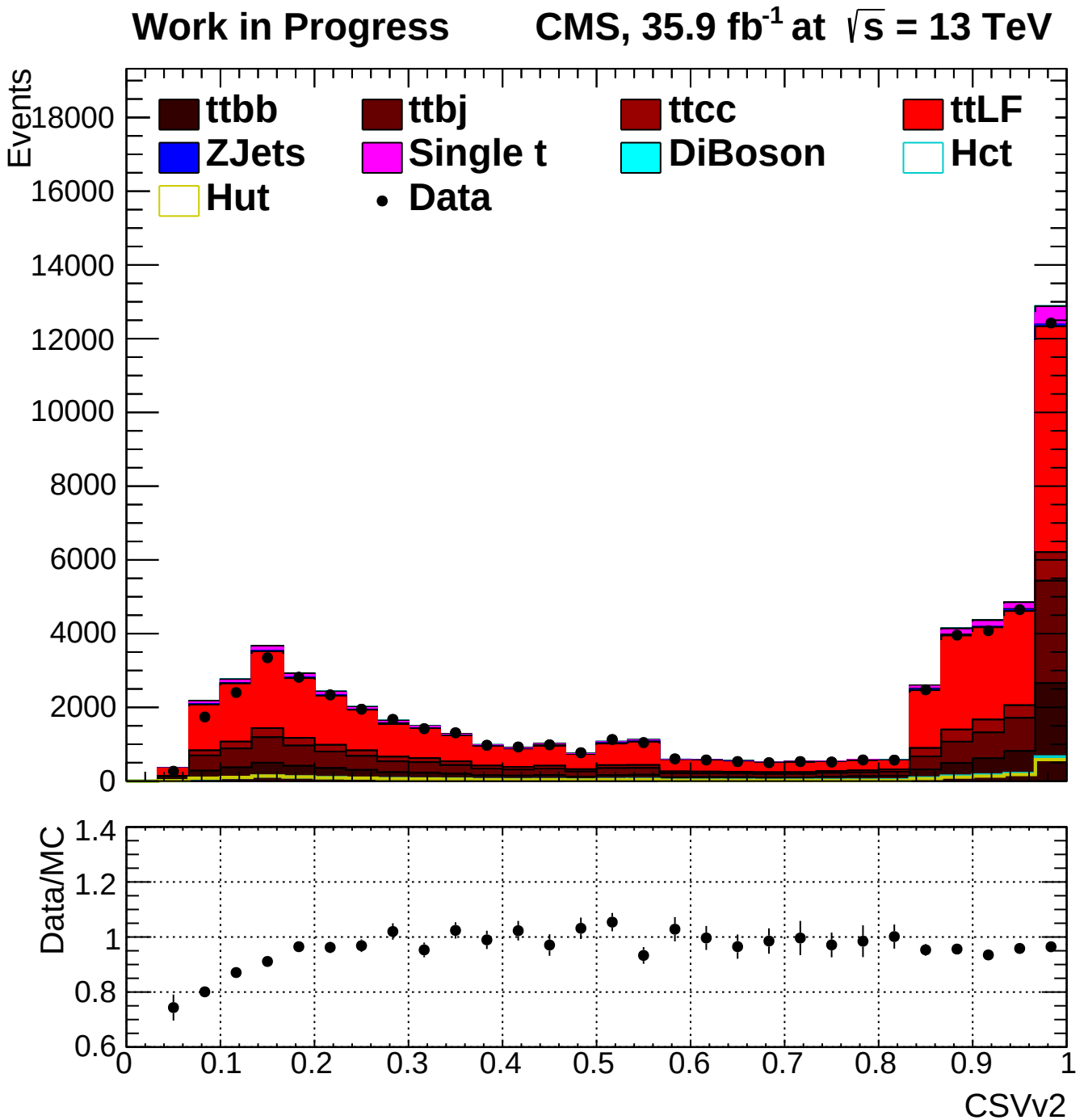
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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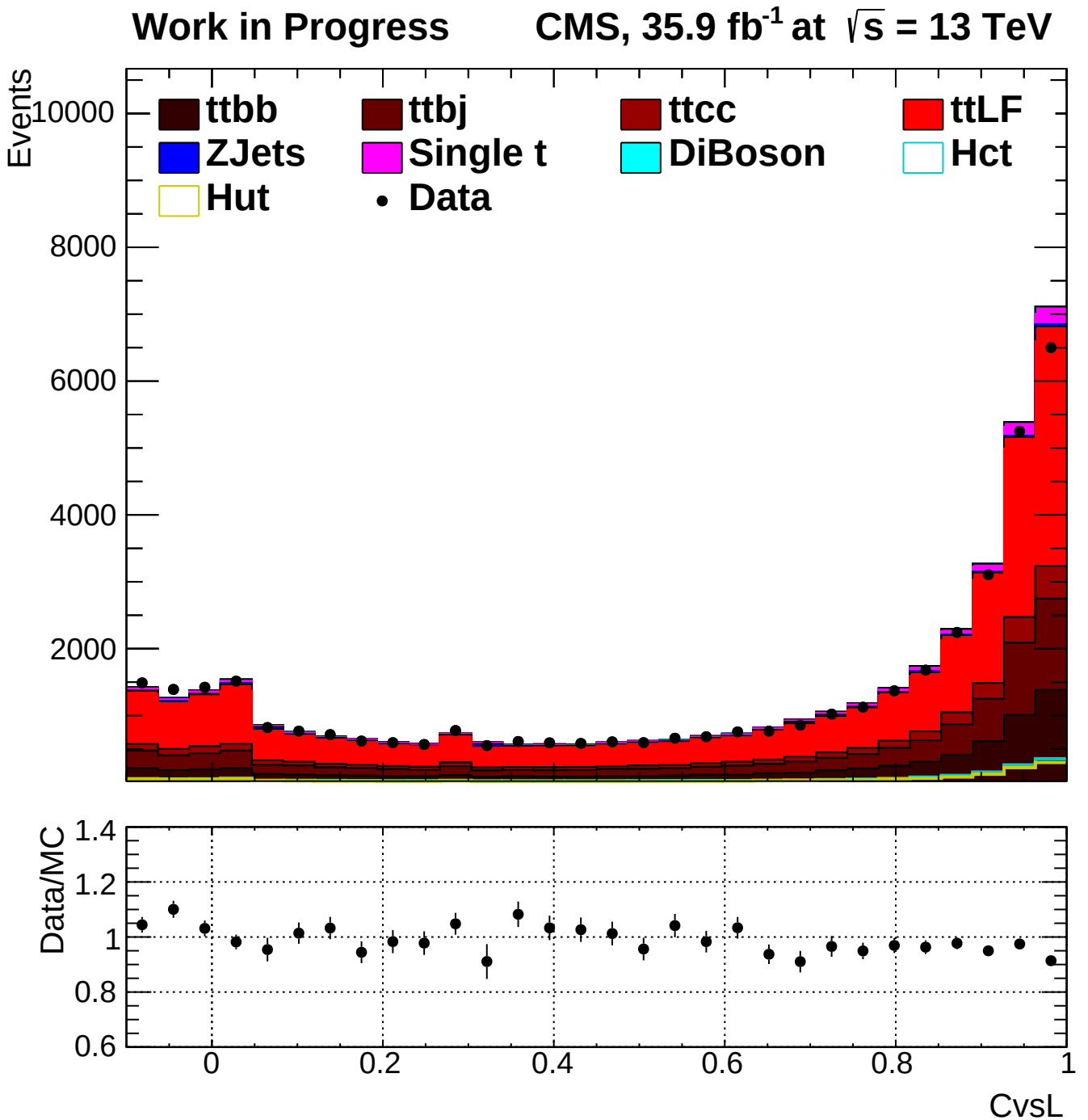
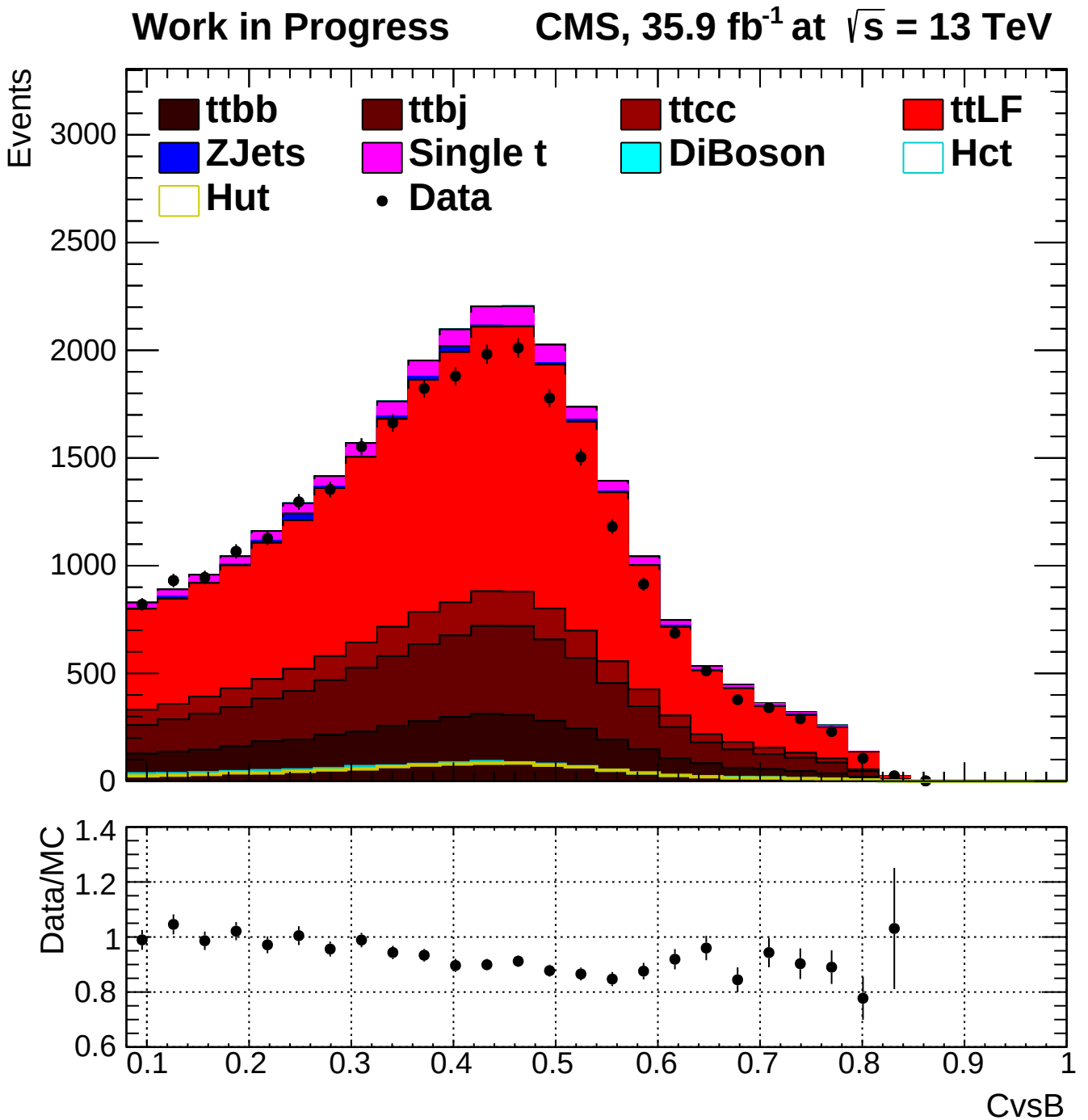
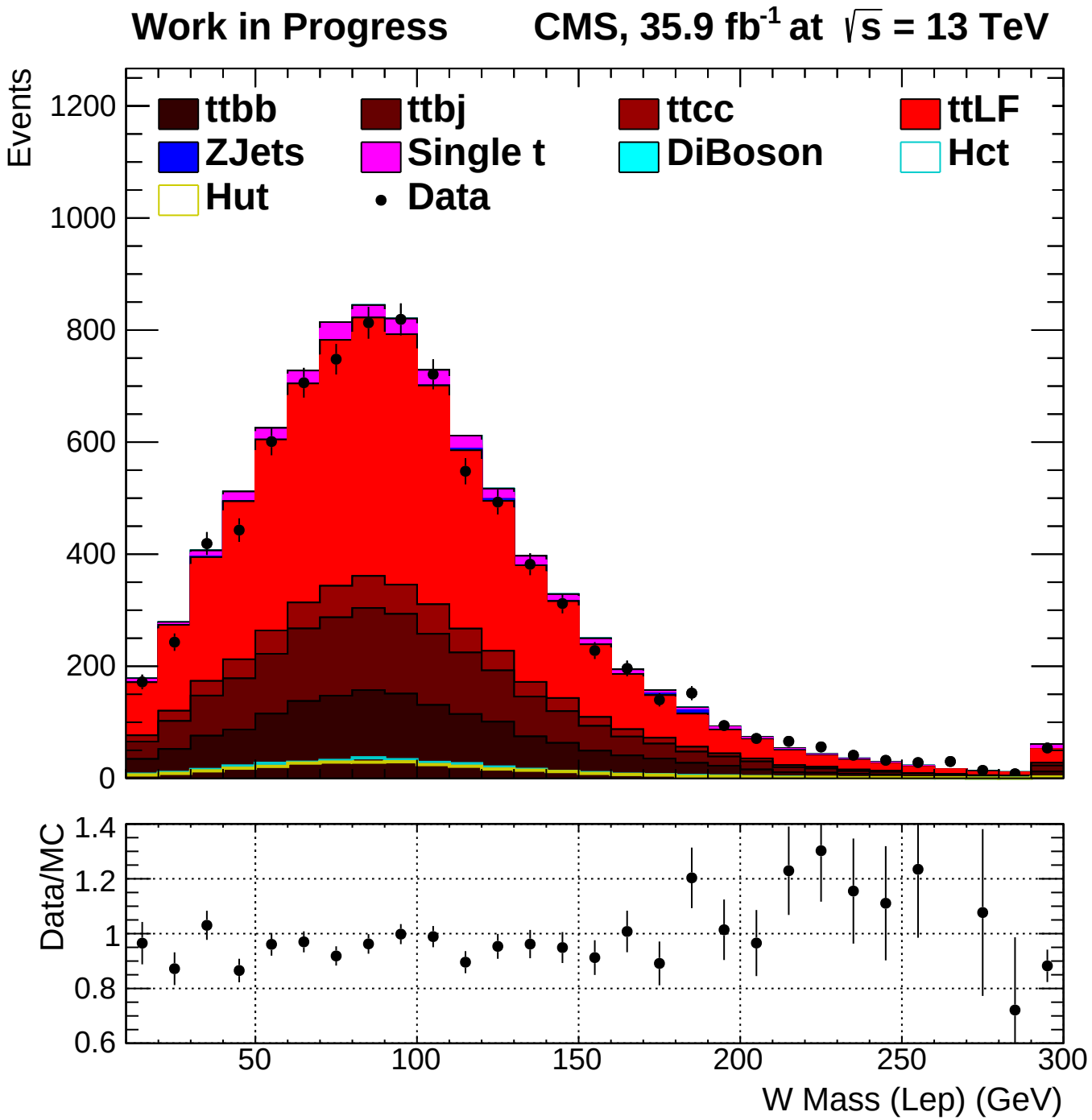
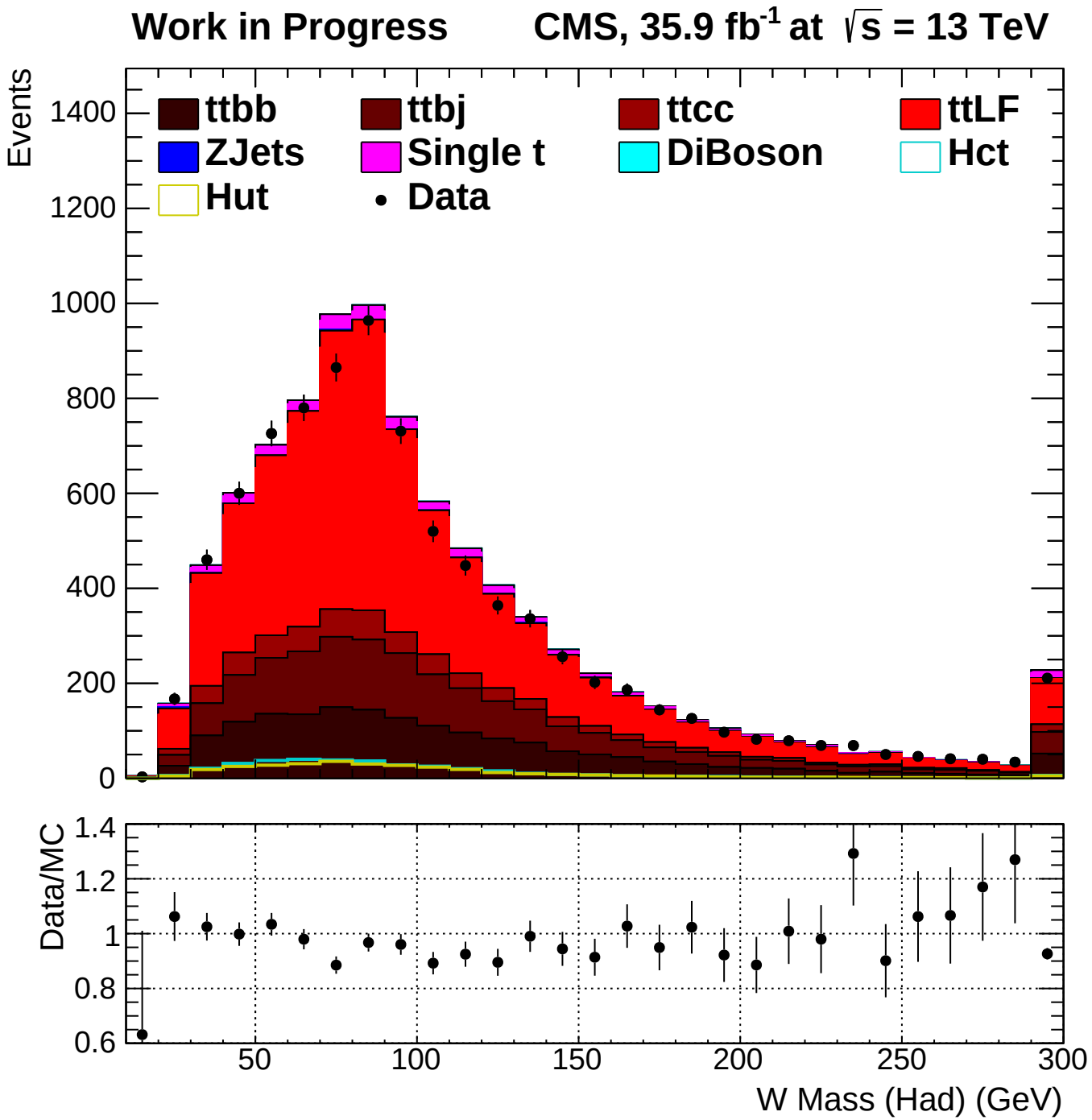
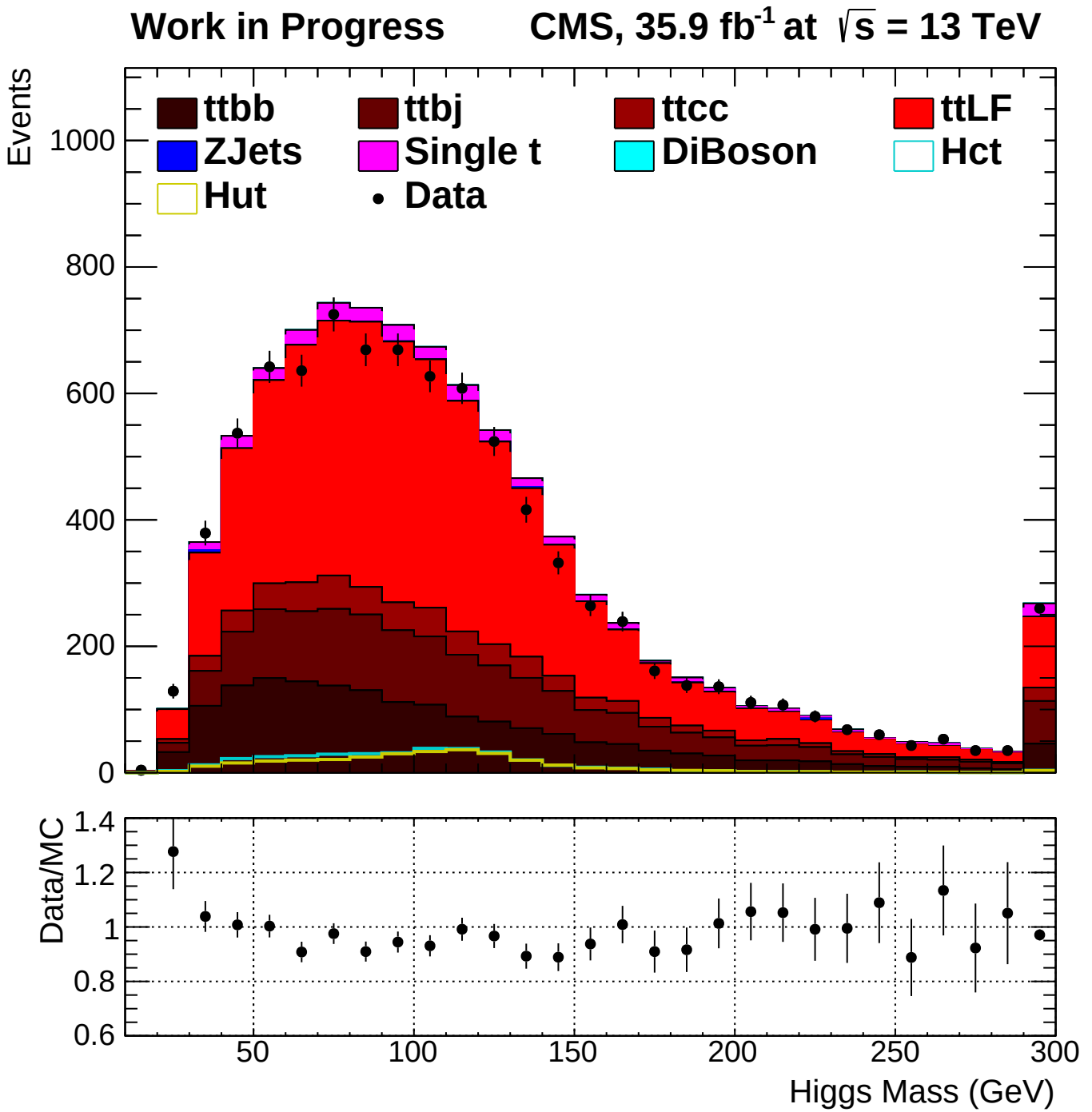
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2

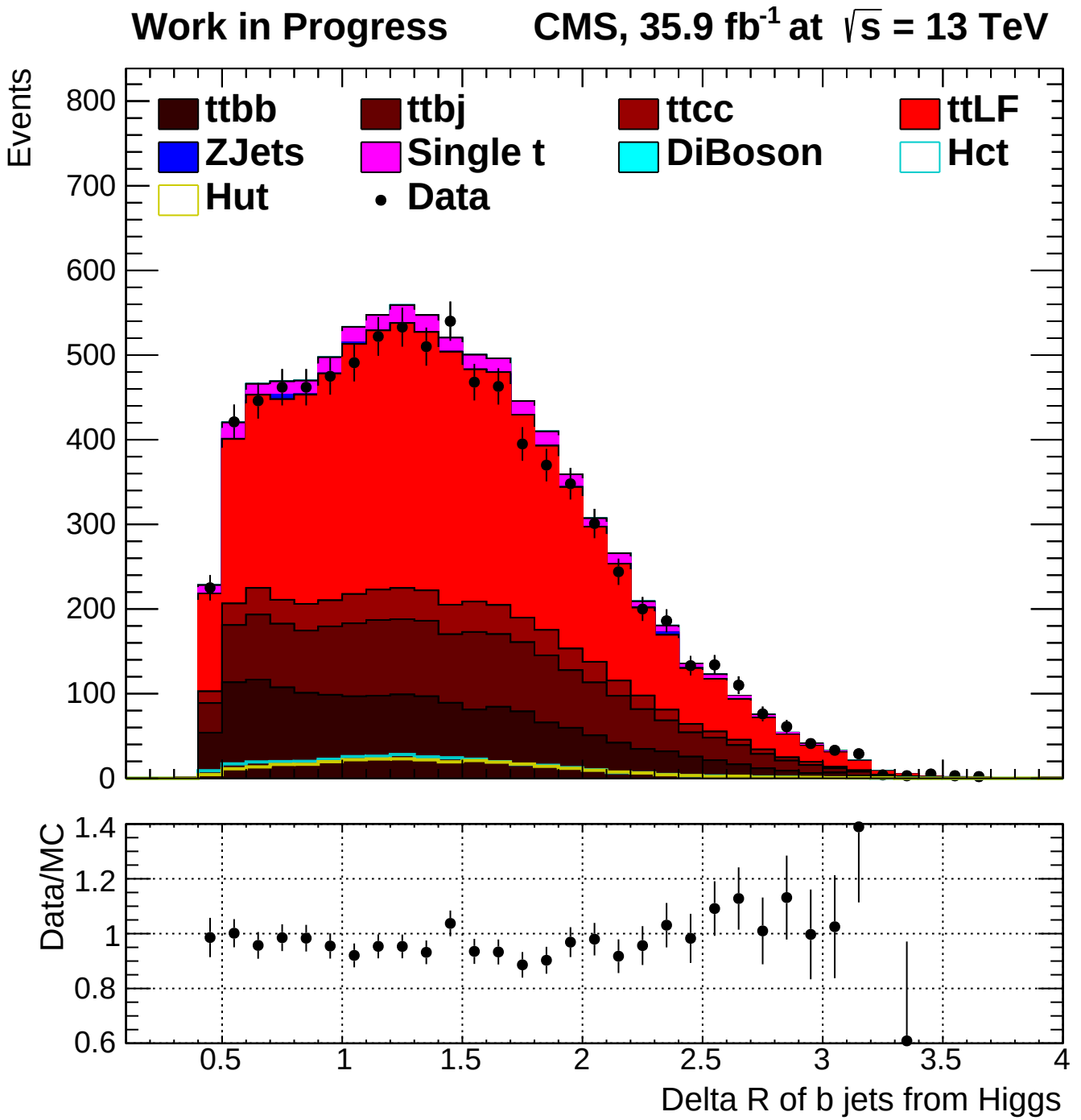

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
10000
8000
6000
4000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

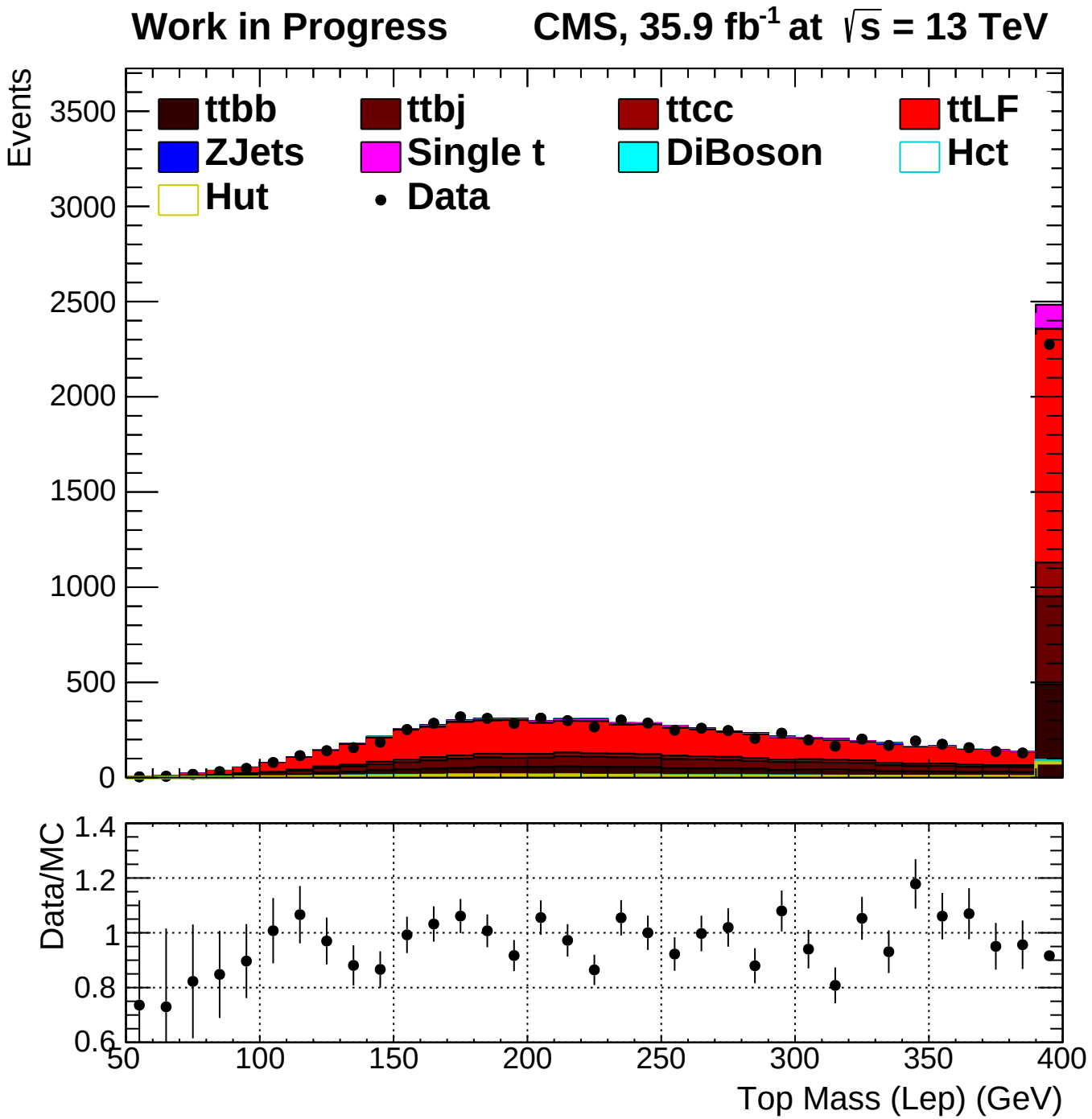

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

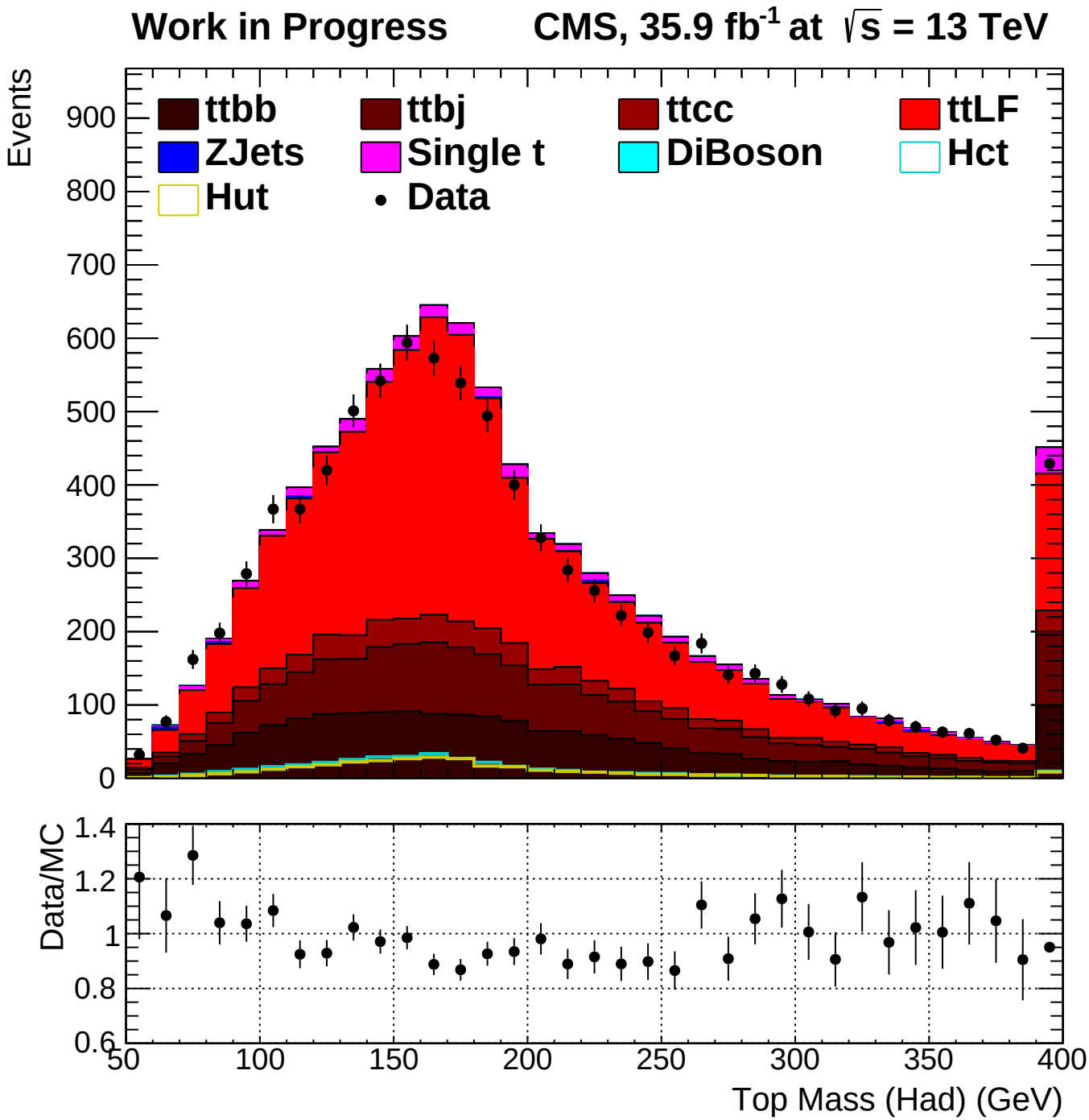

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

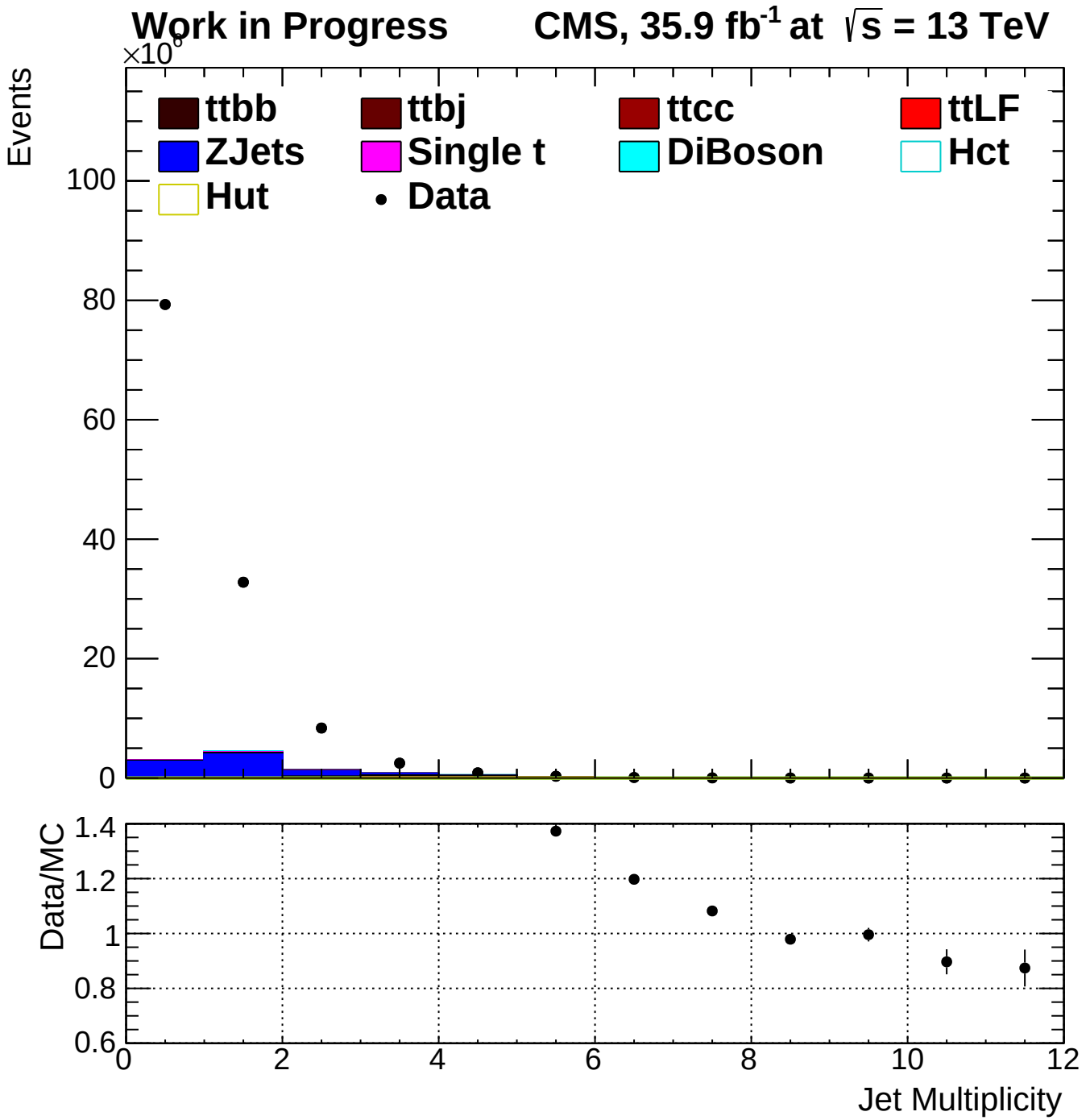

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

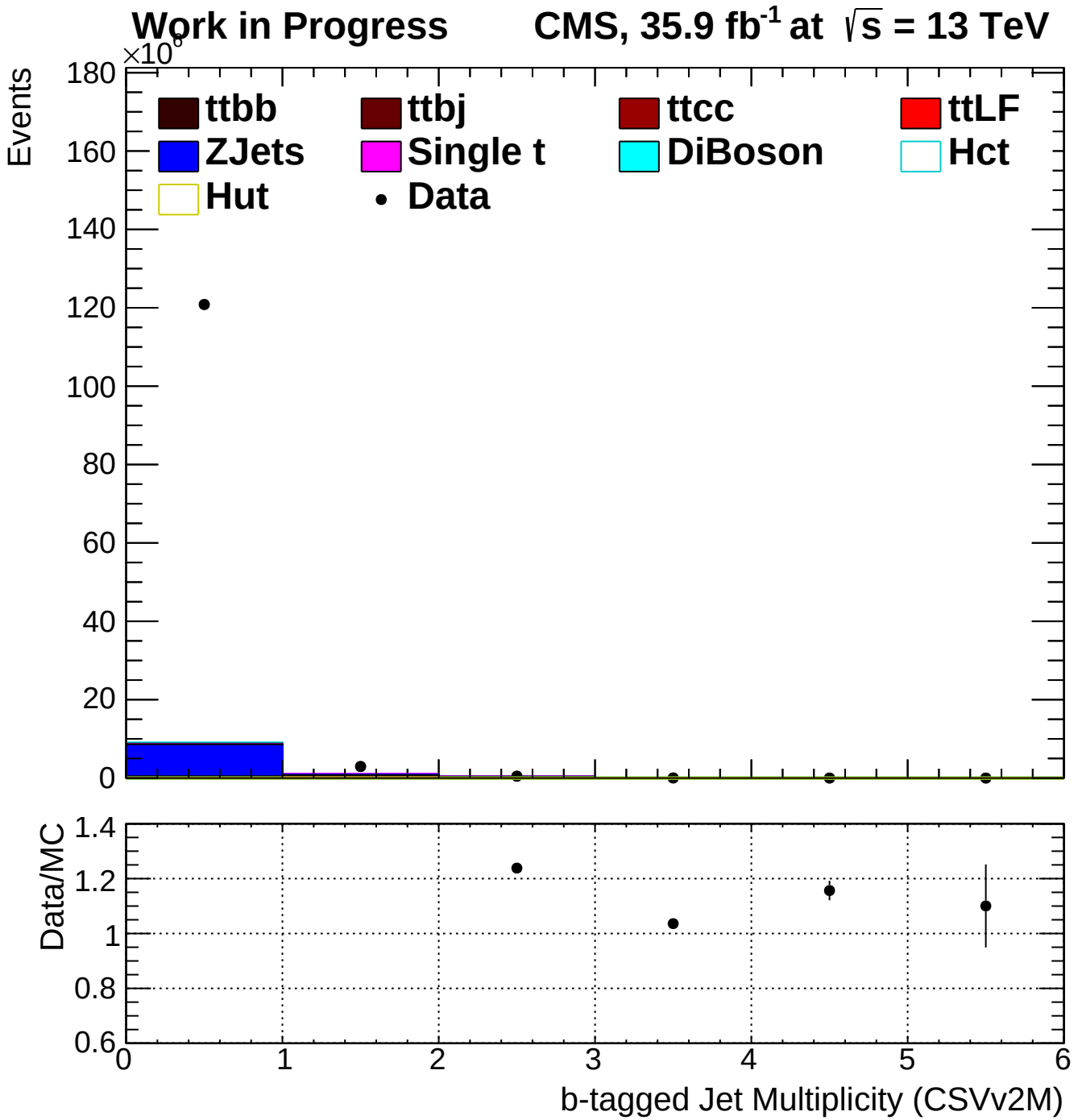

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

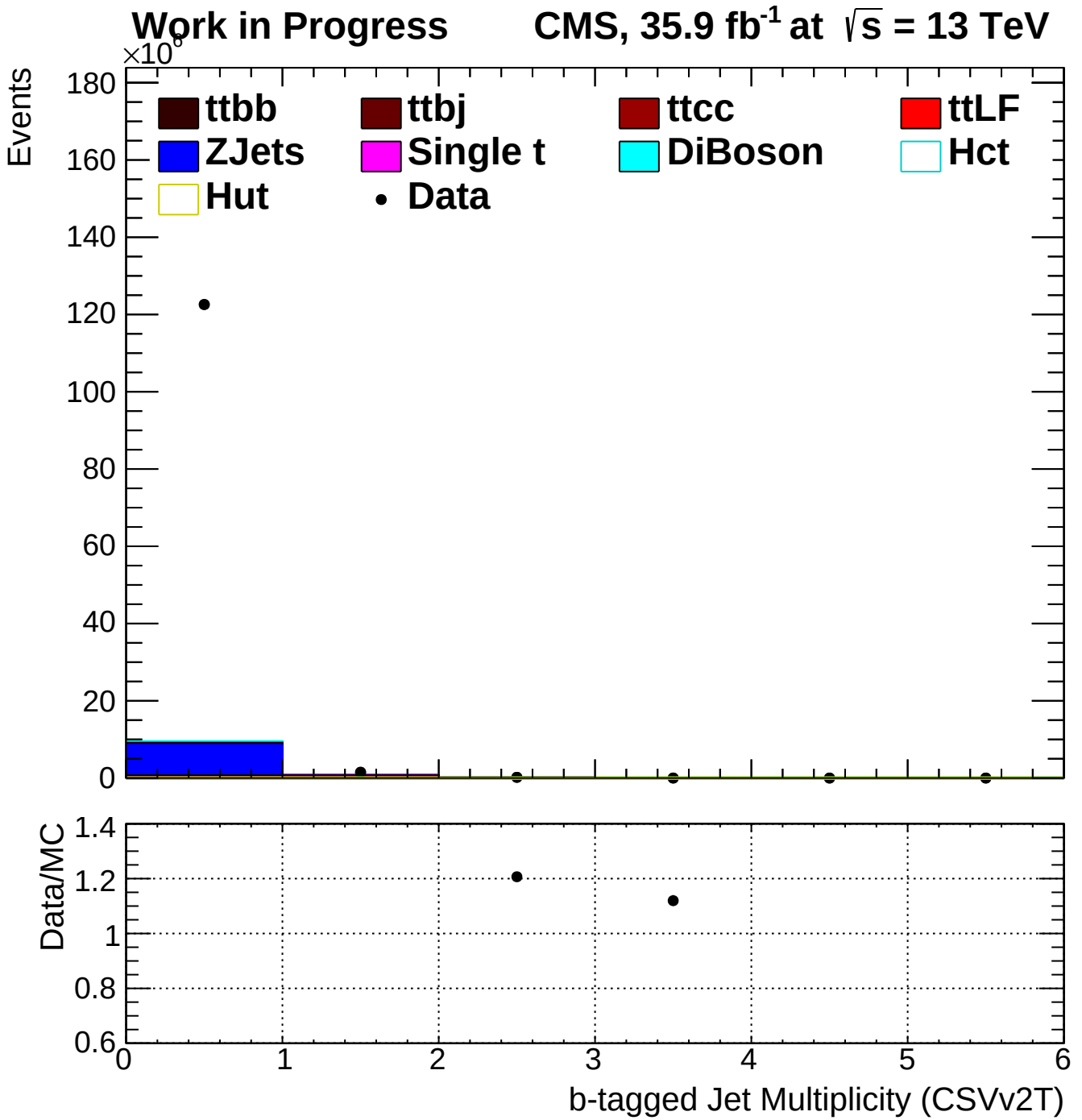

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

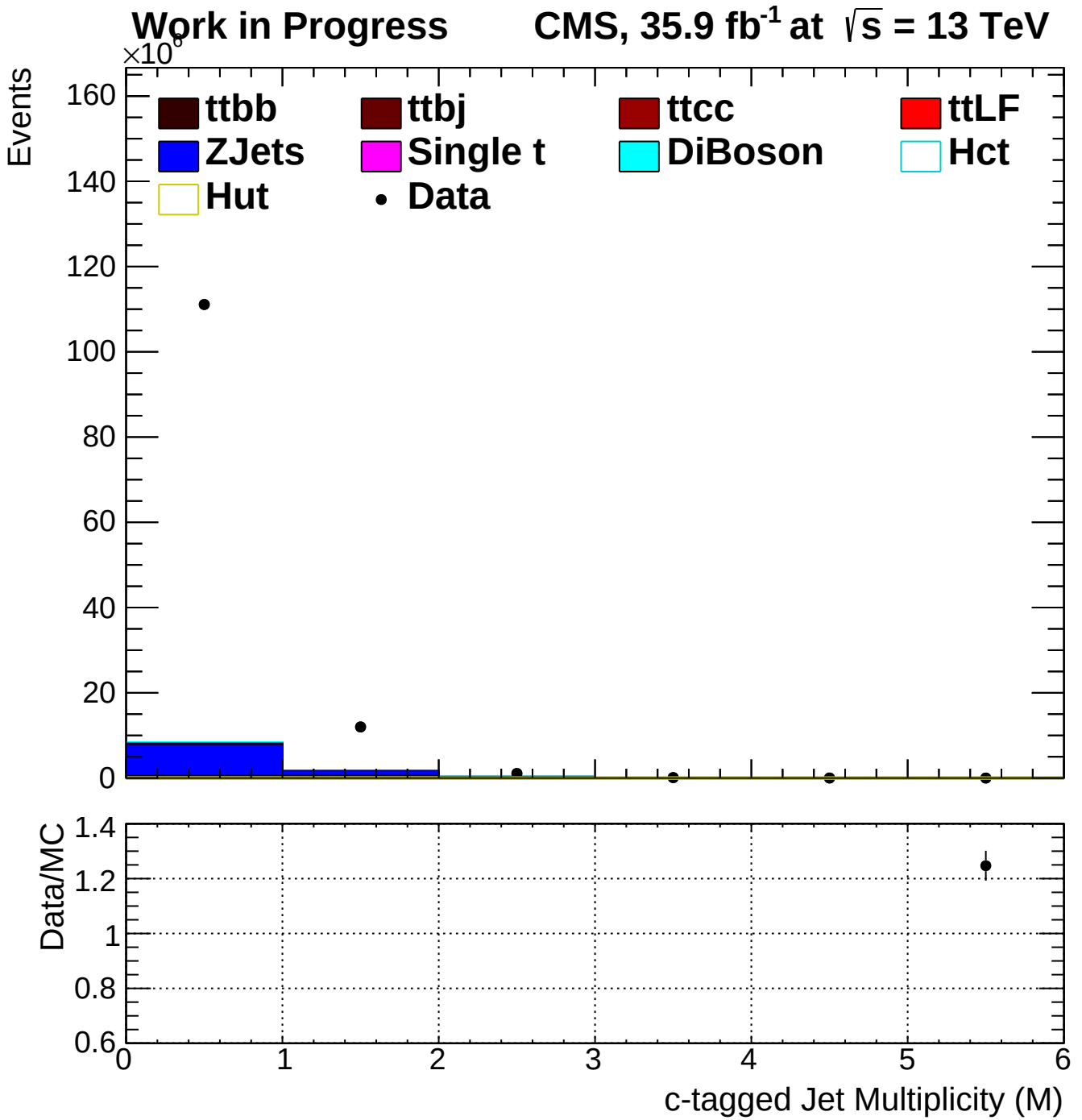

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)

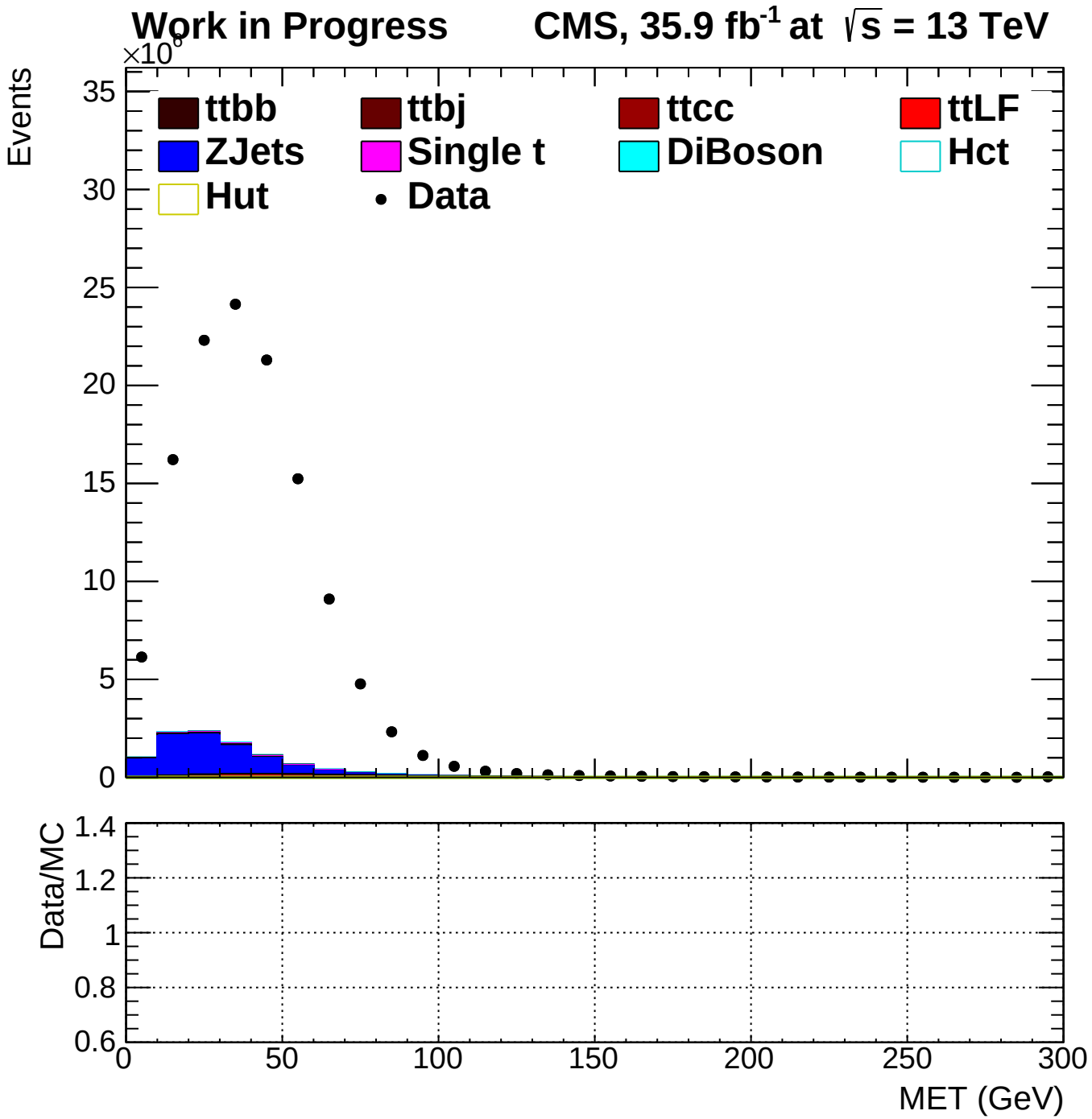

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

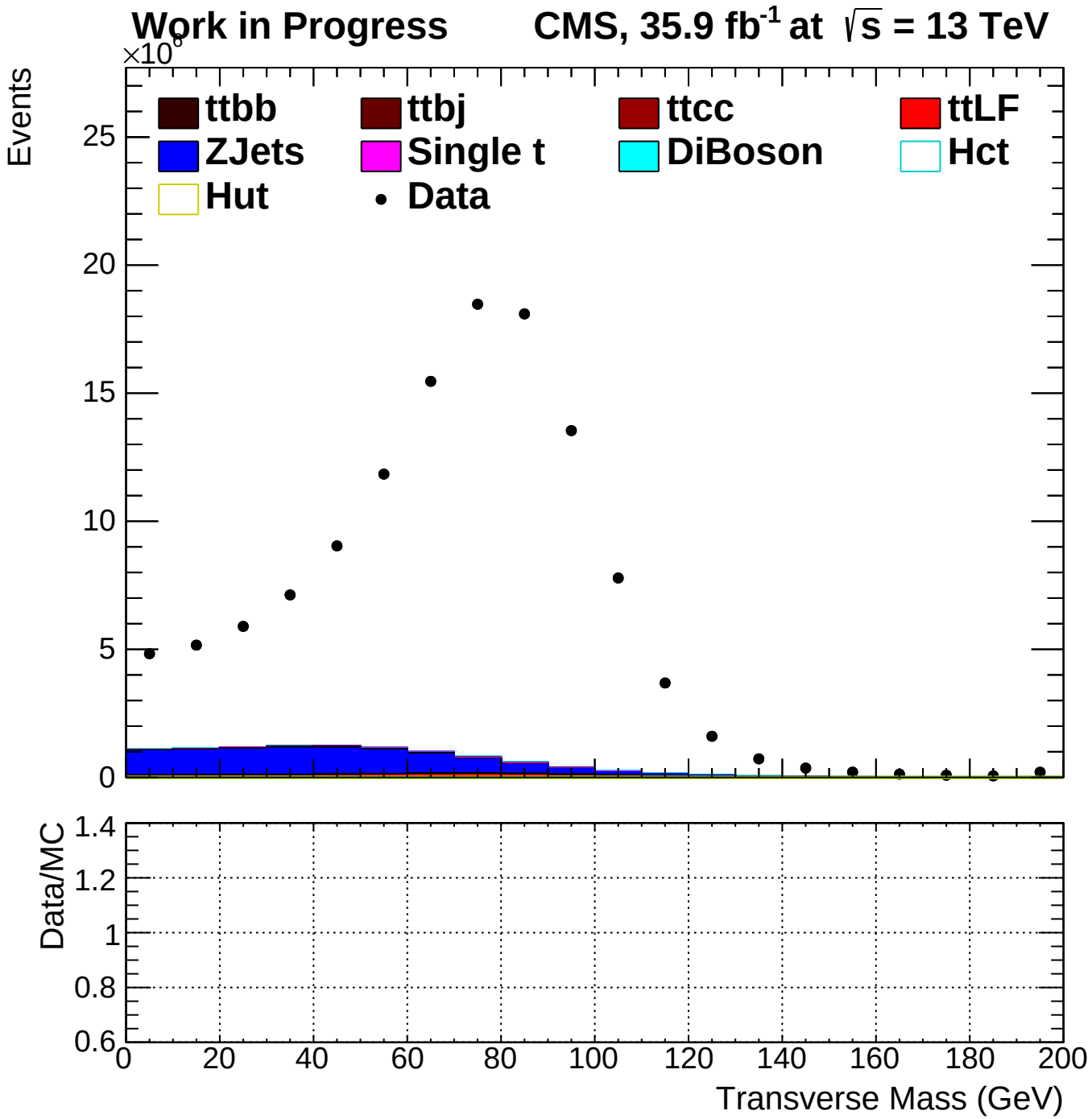

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^6
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

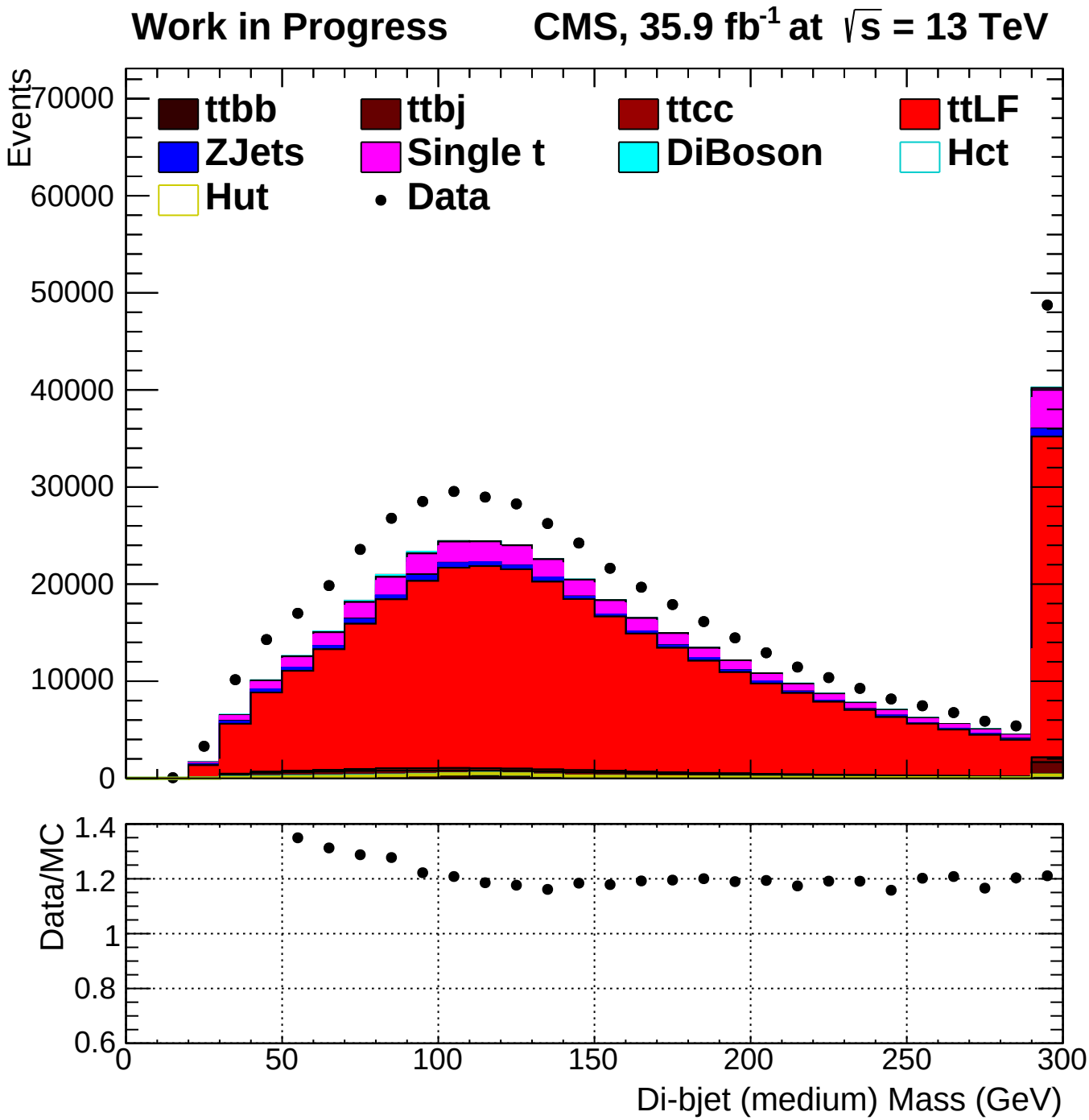

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10^6
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

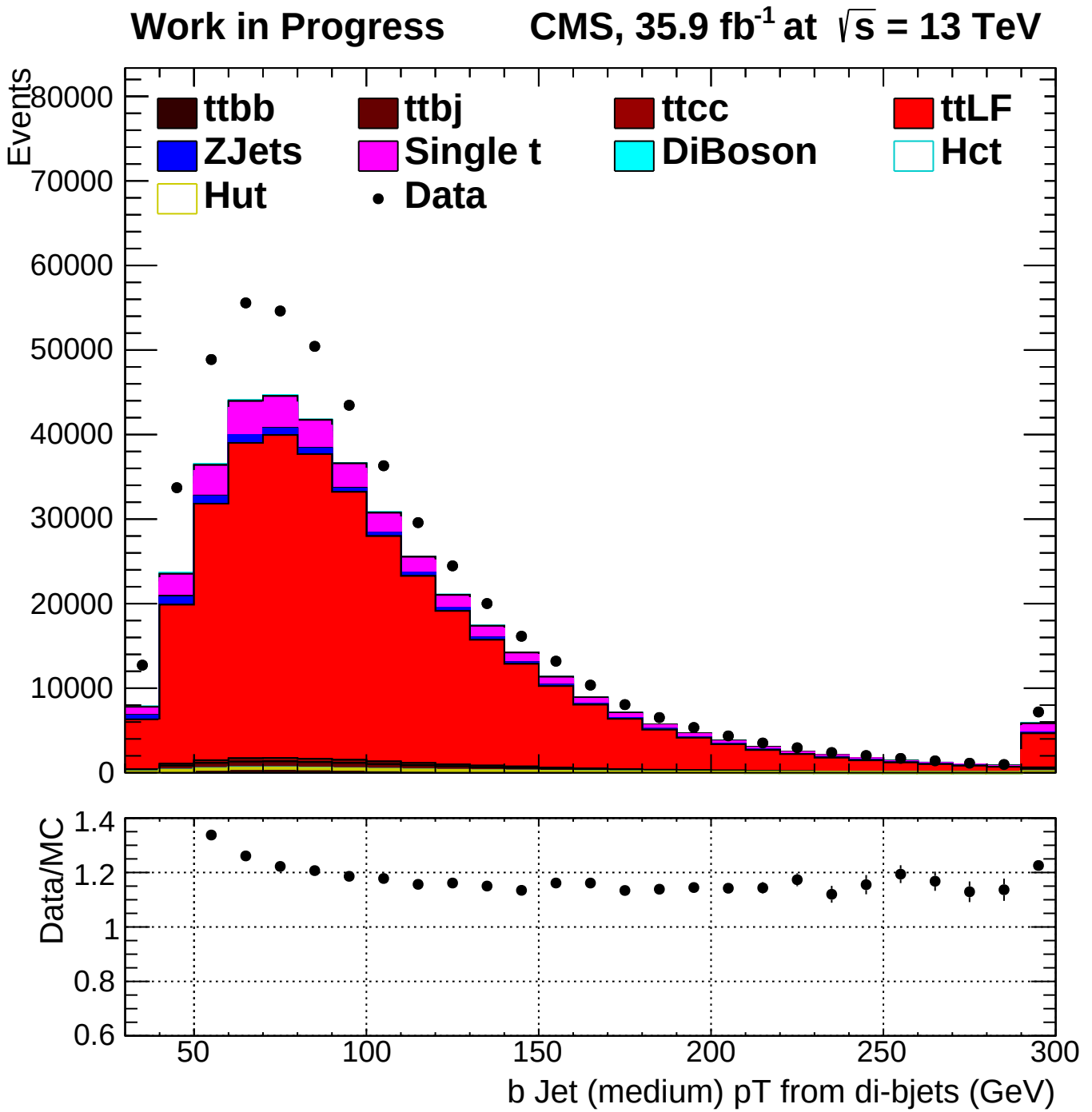

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

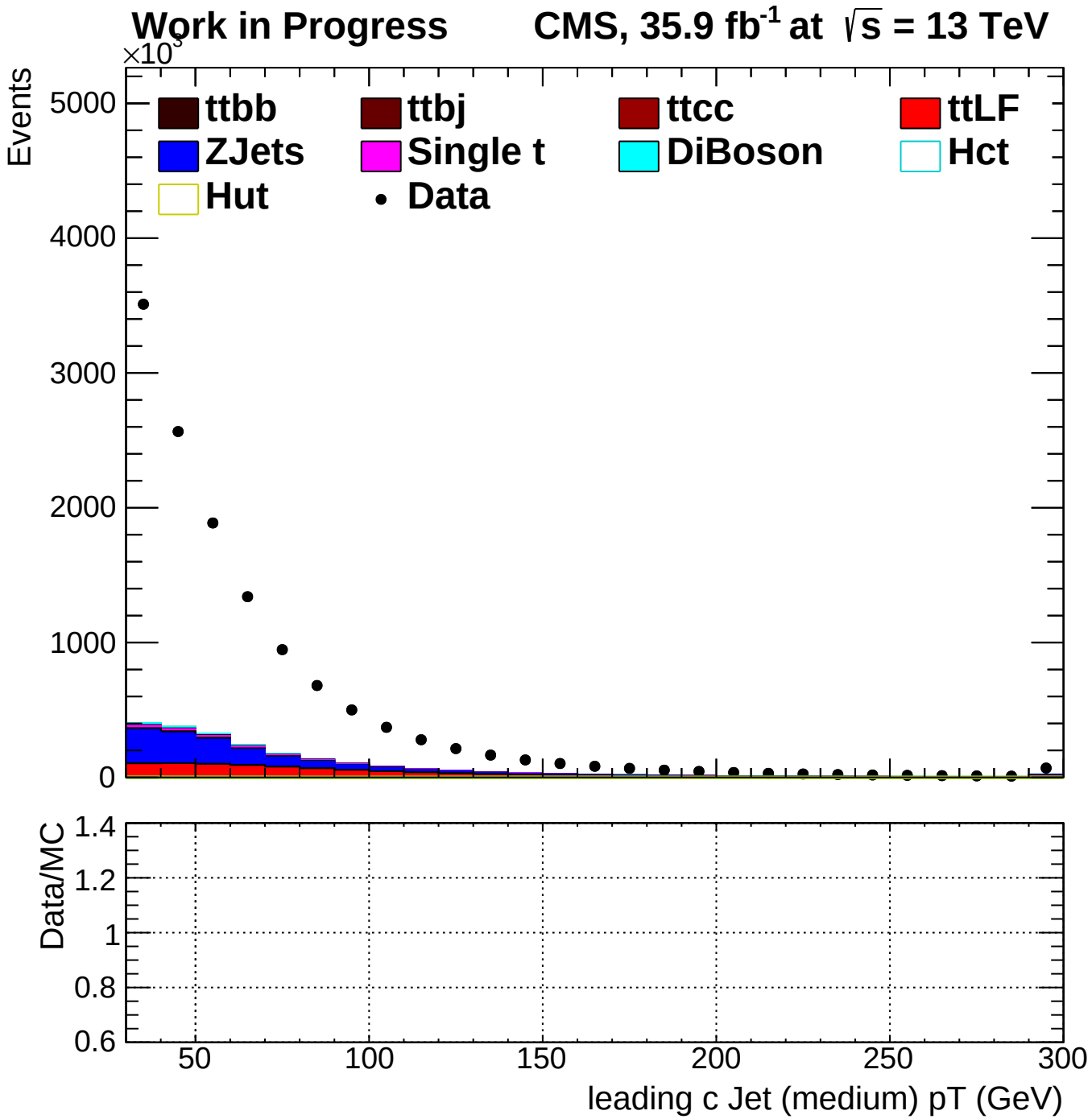

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)

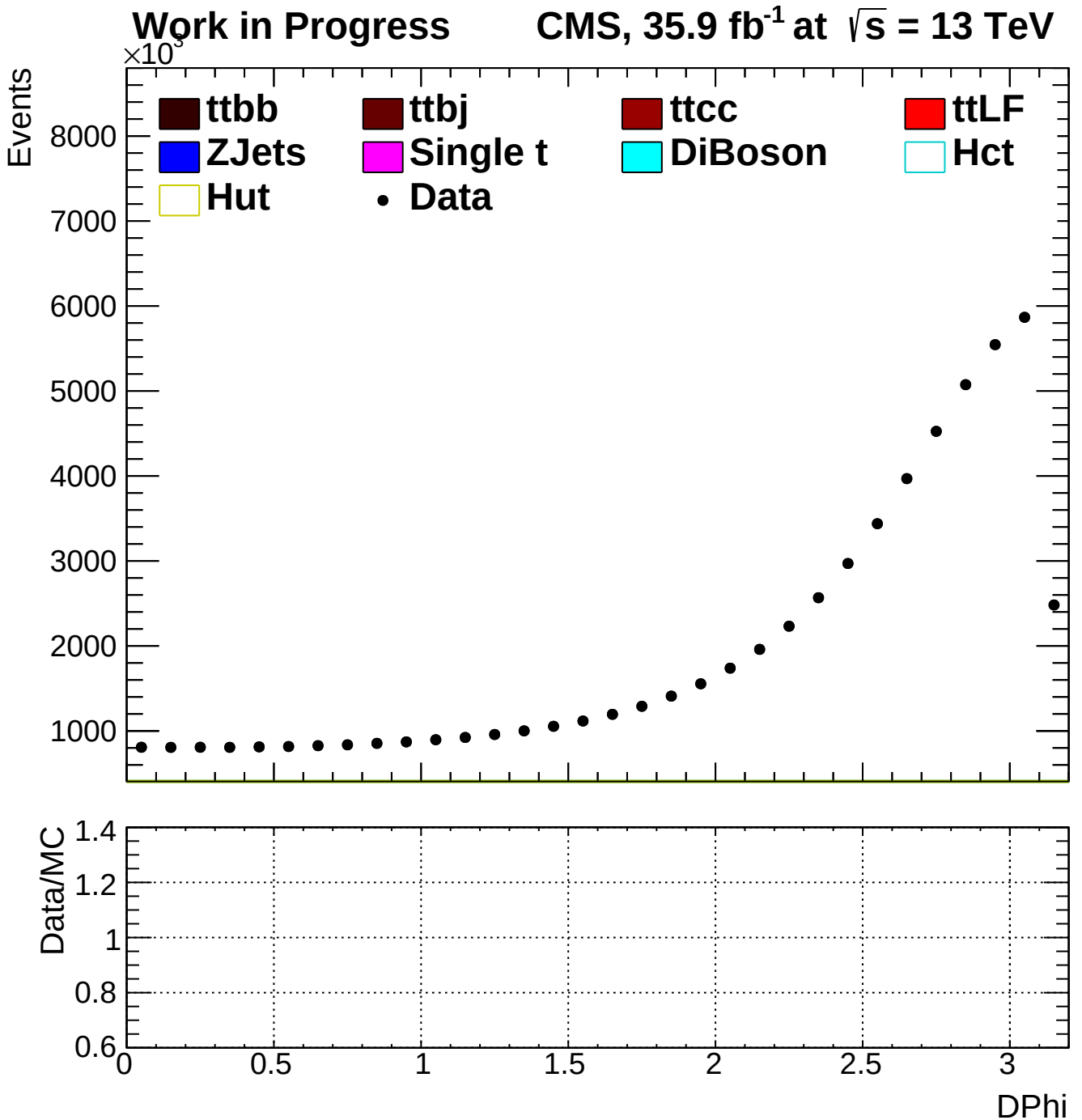

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

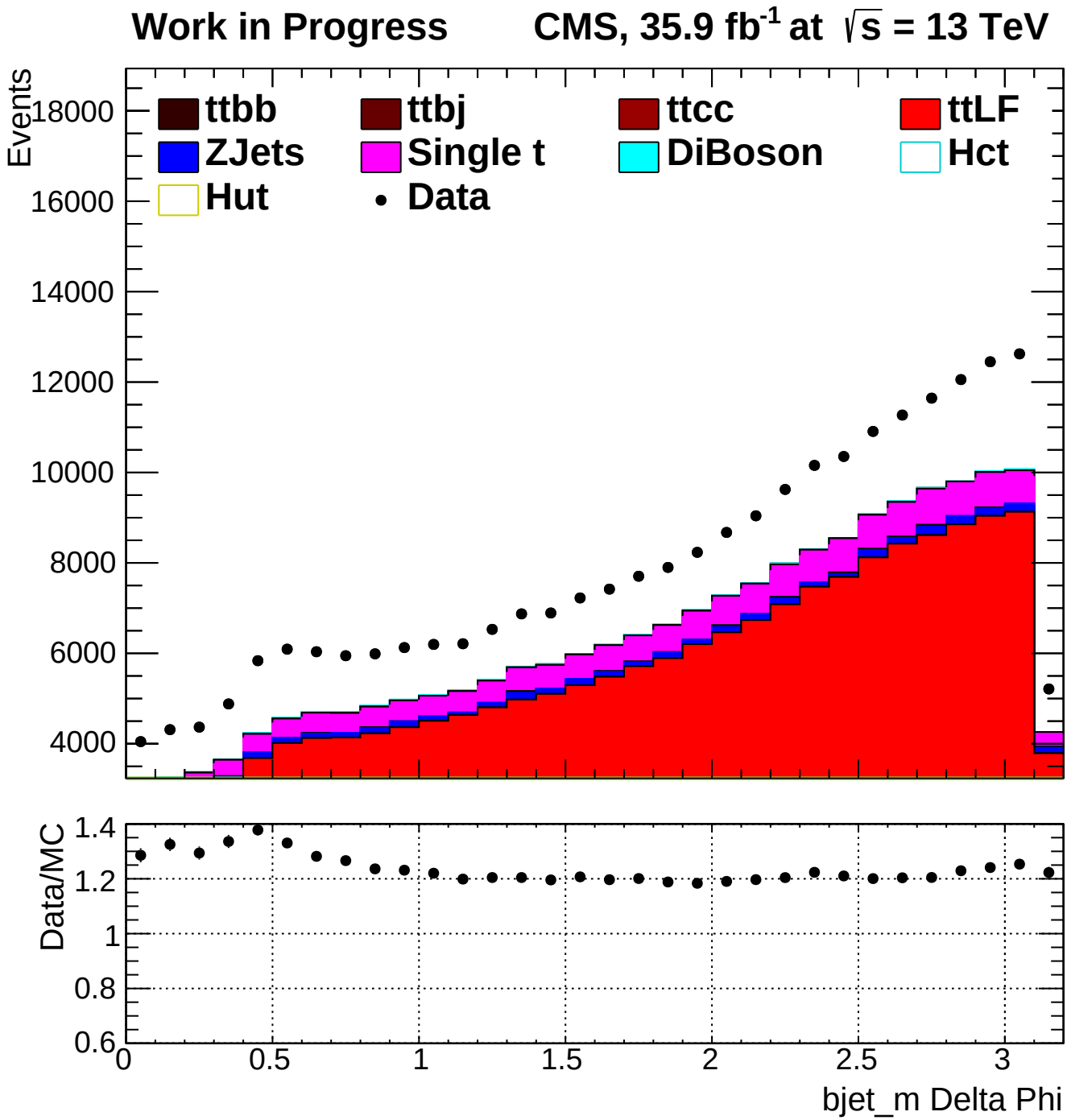

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25
20
15
10
5
0
Data/MC
1.4
1.2
1
0.8
0.6
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

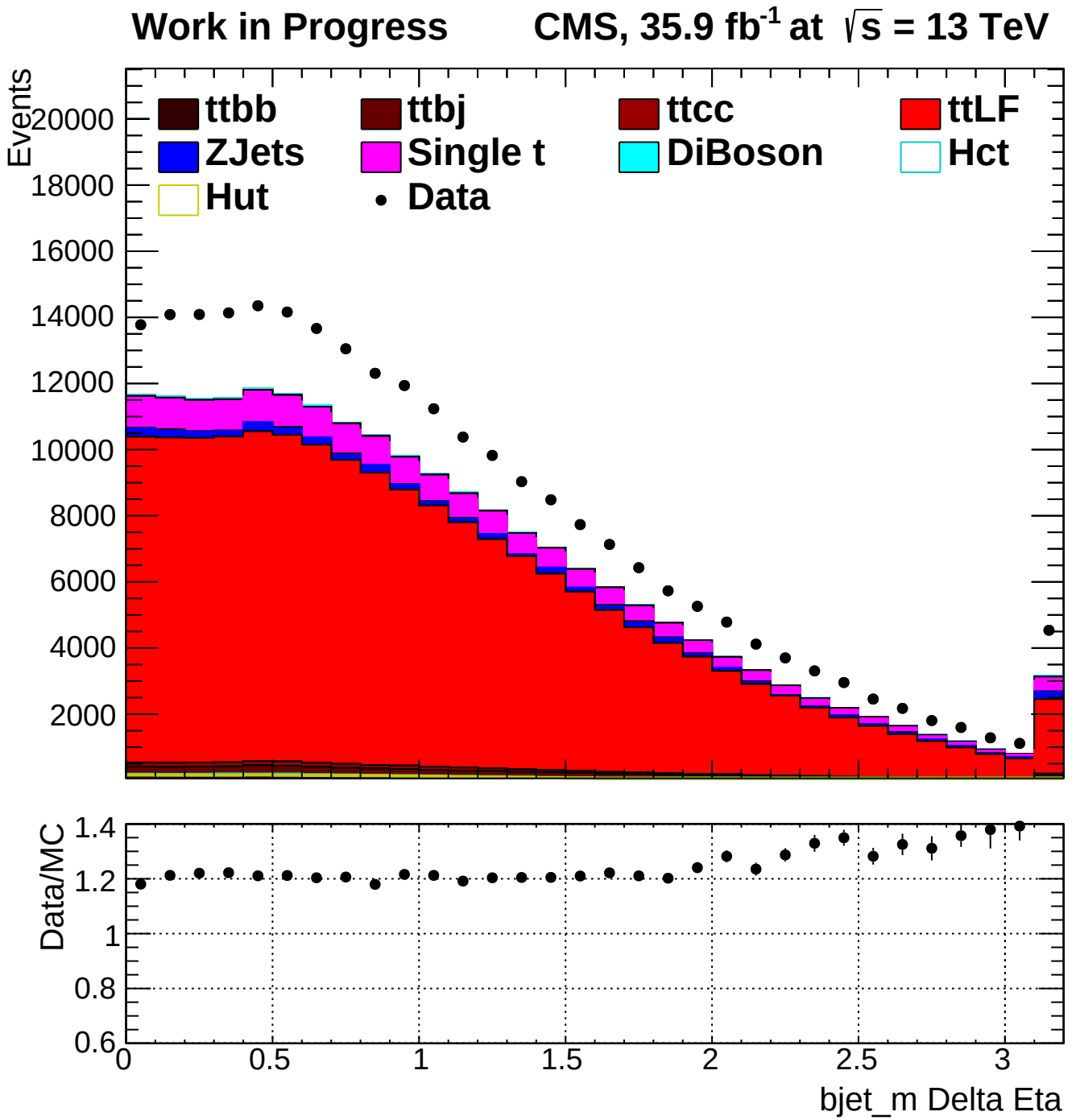

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

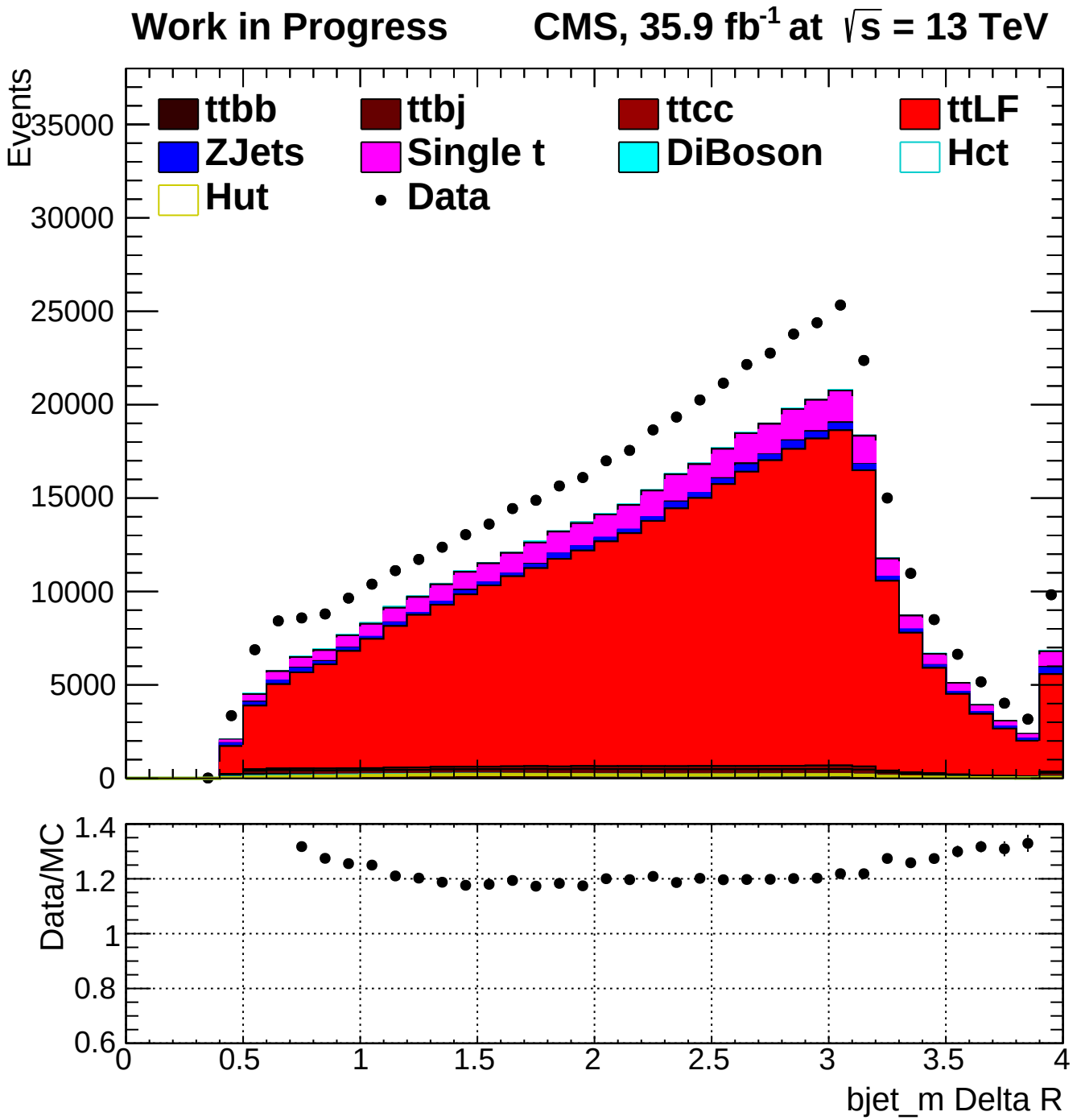

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

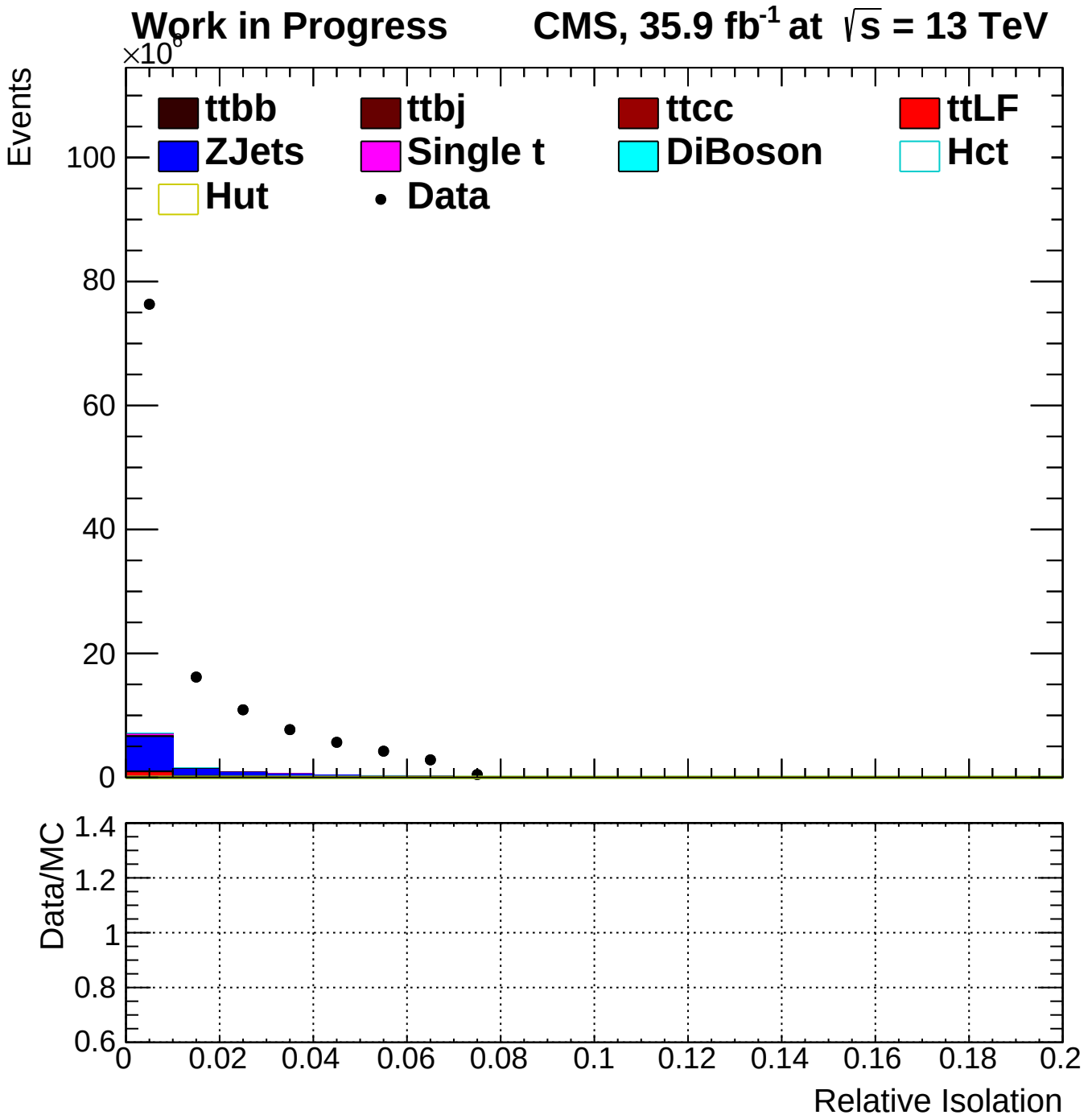

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
5000
4000
3000
2000
1000
0
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

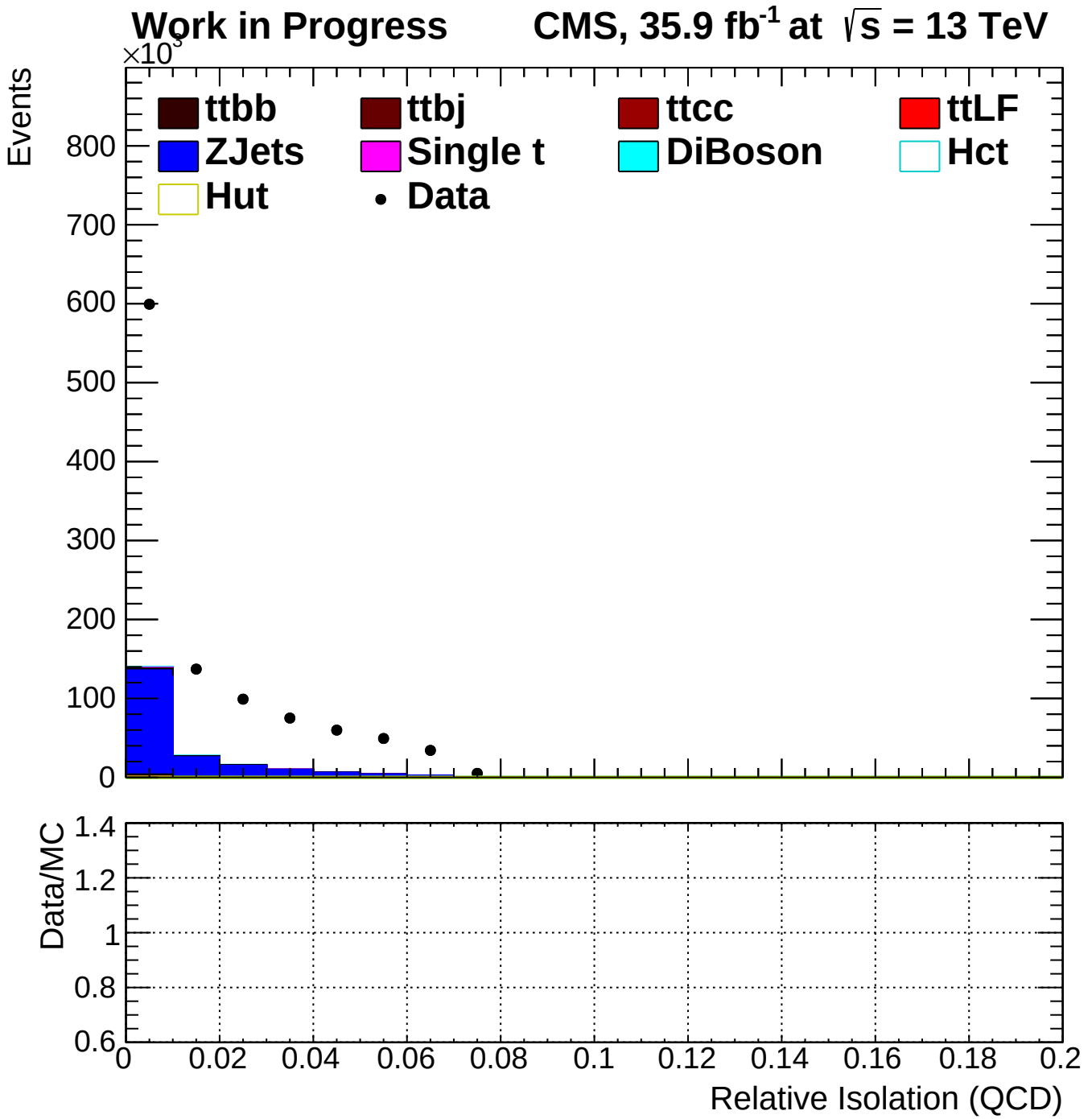

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

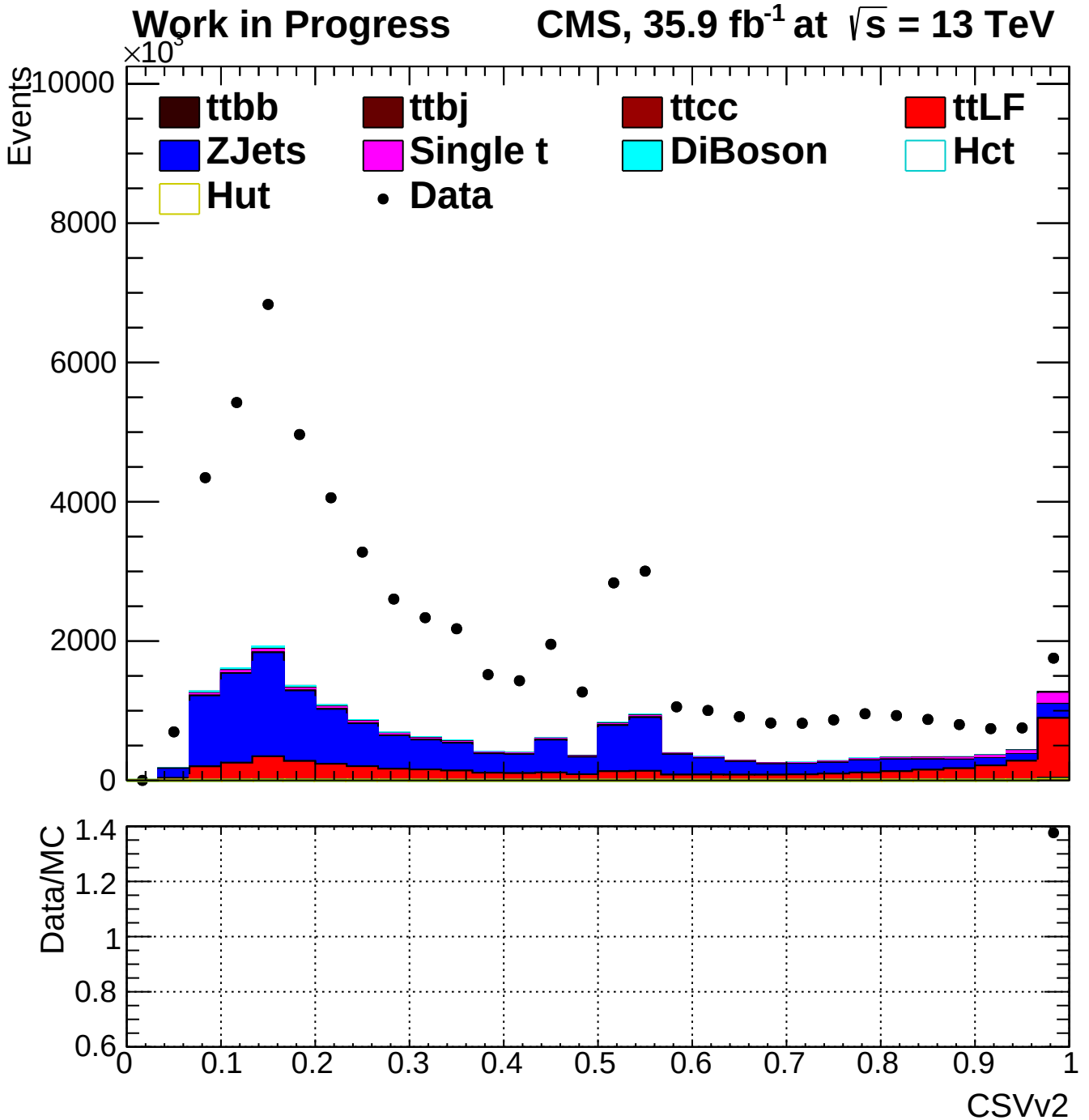

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
18000
16000
14000
12000
10000
8000
6000
4000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

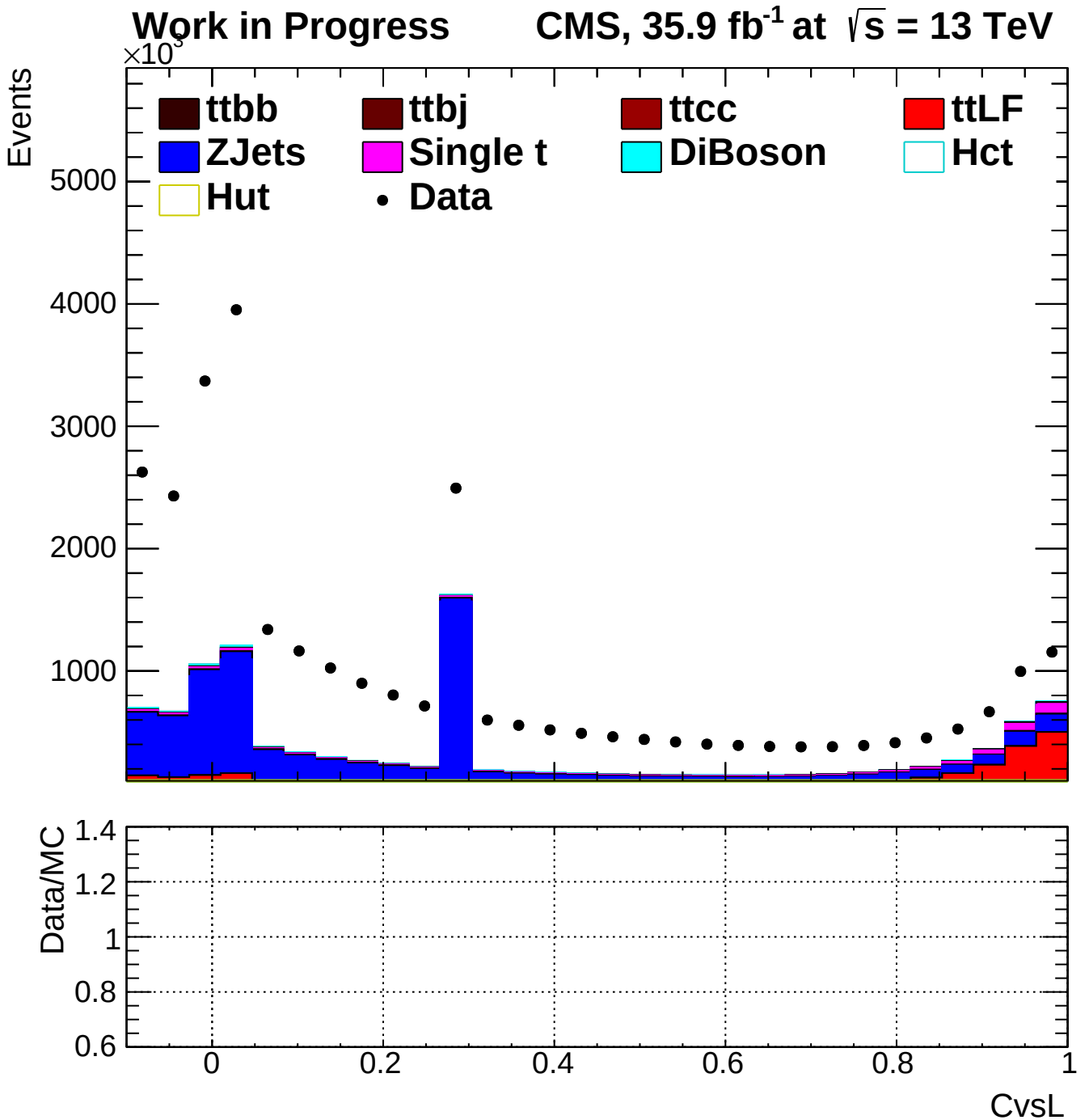

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

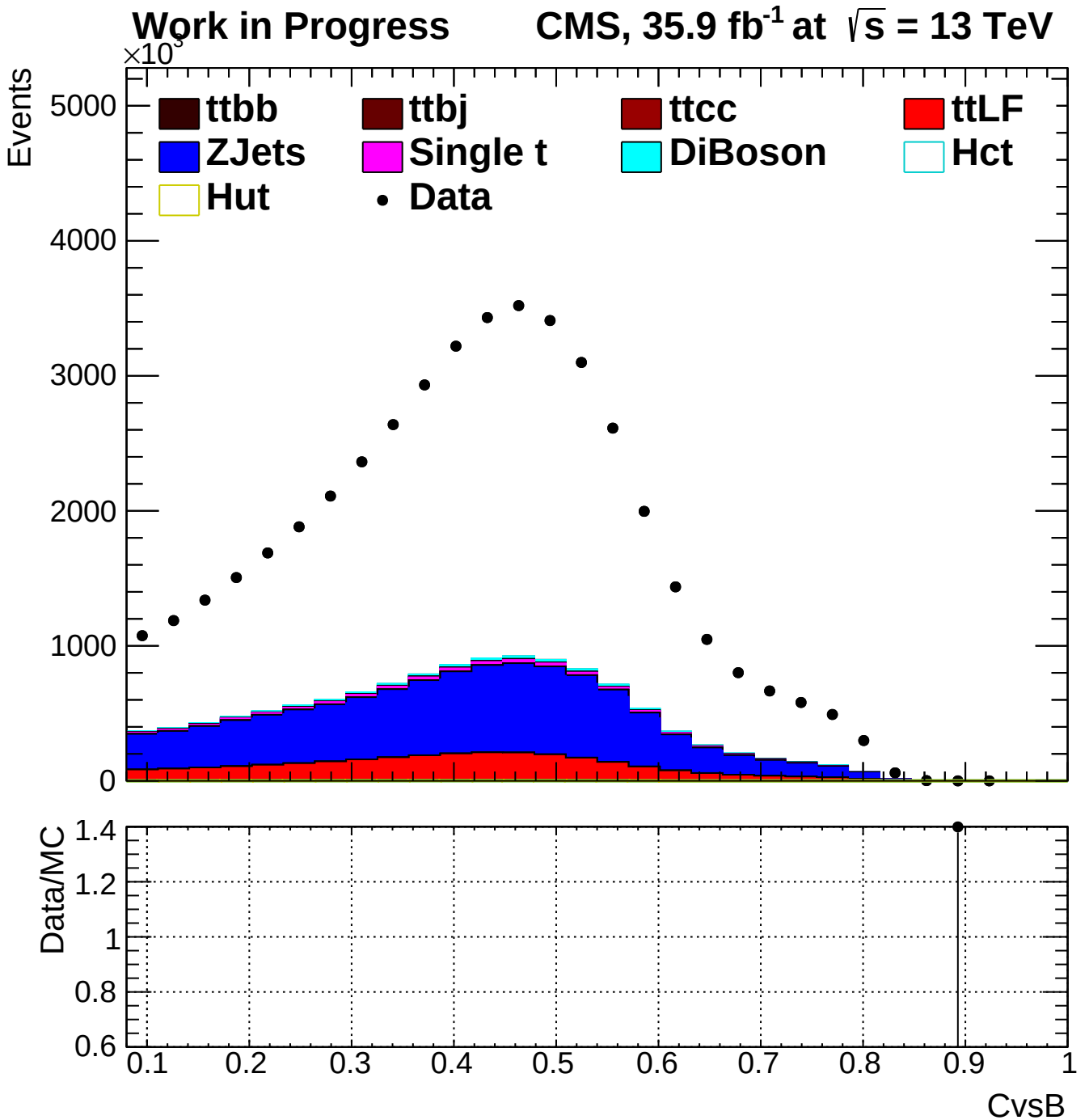

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

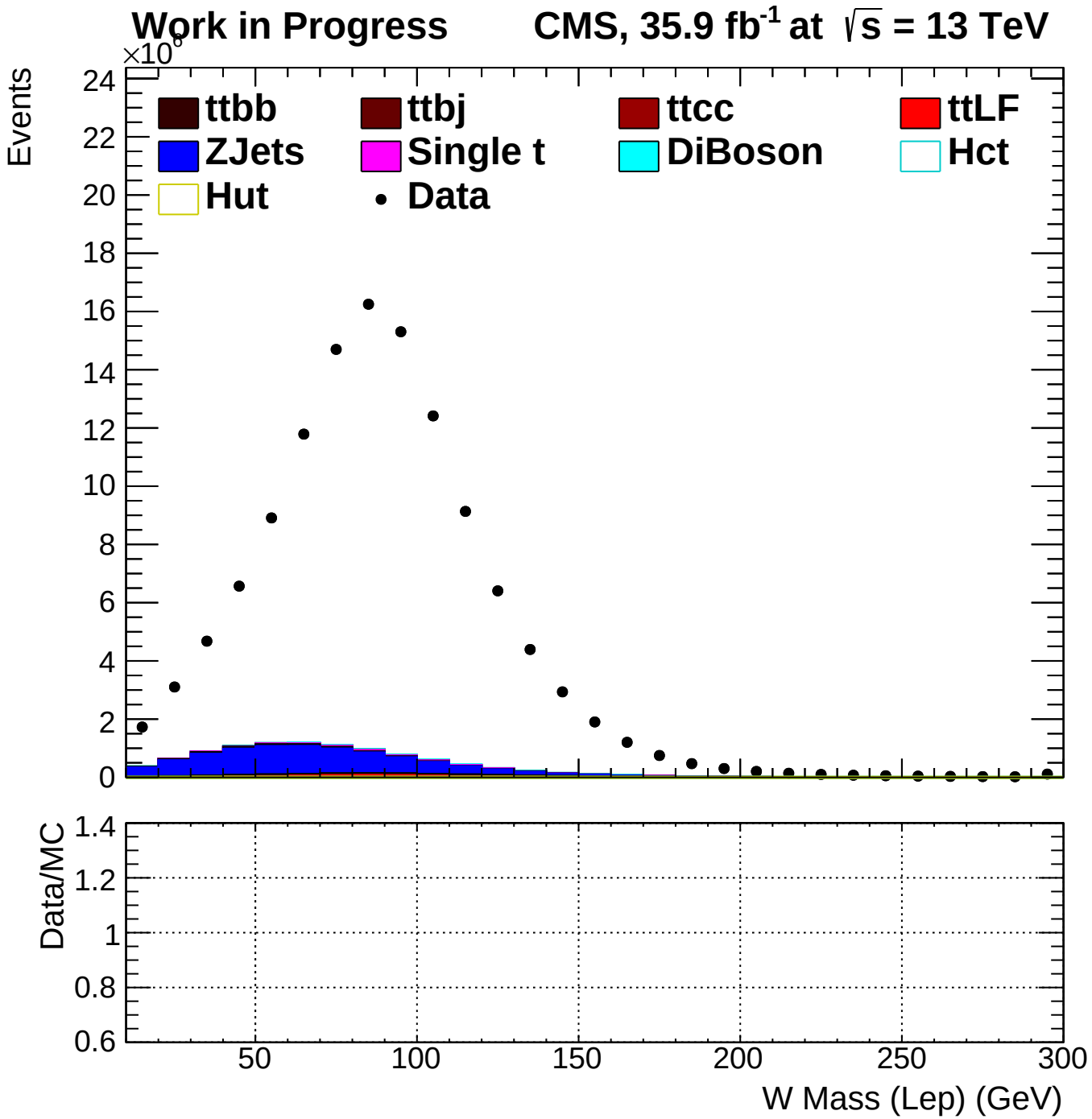

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10^6
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
100
80
60
40
20
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

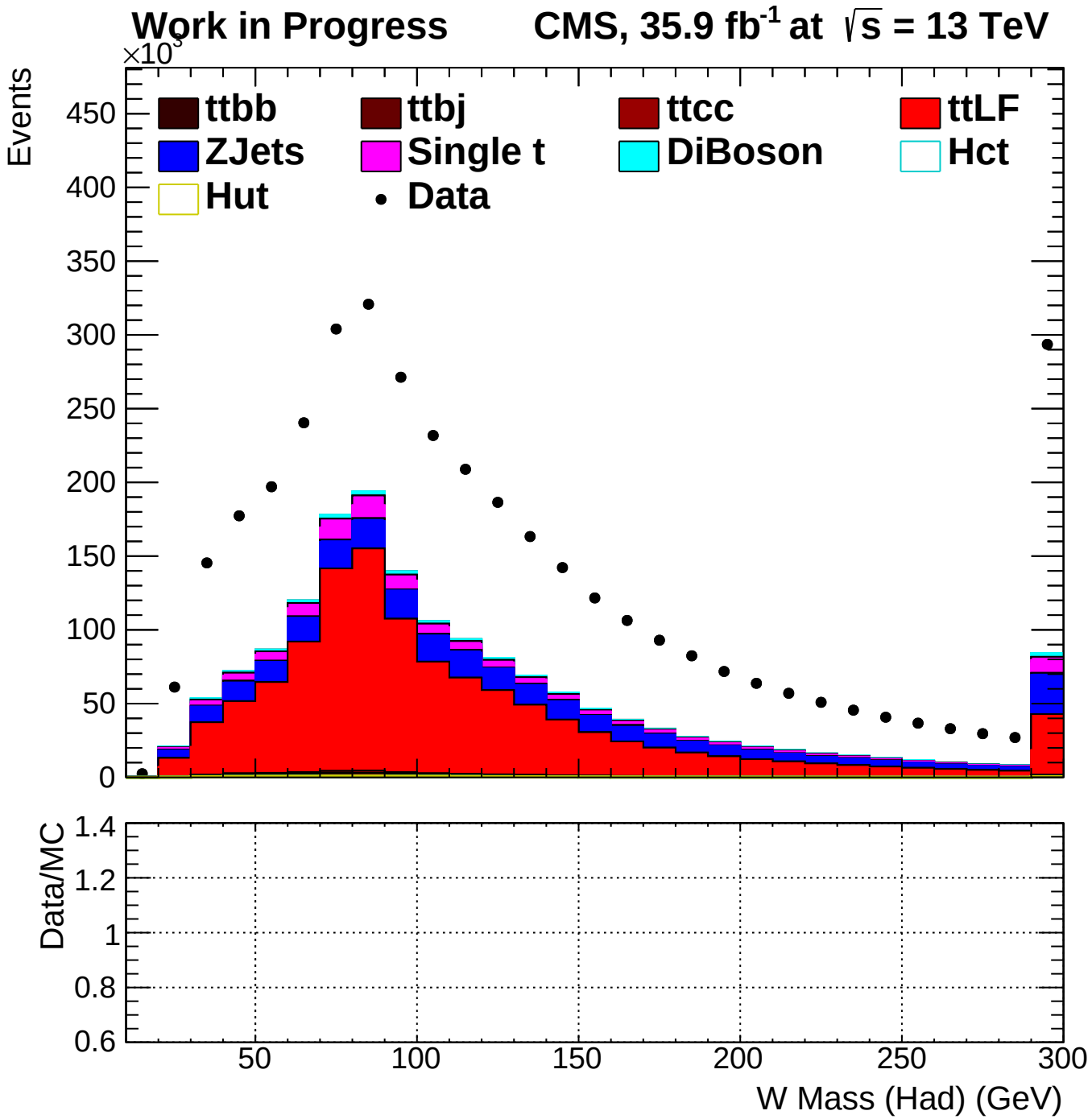

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
800
700
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

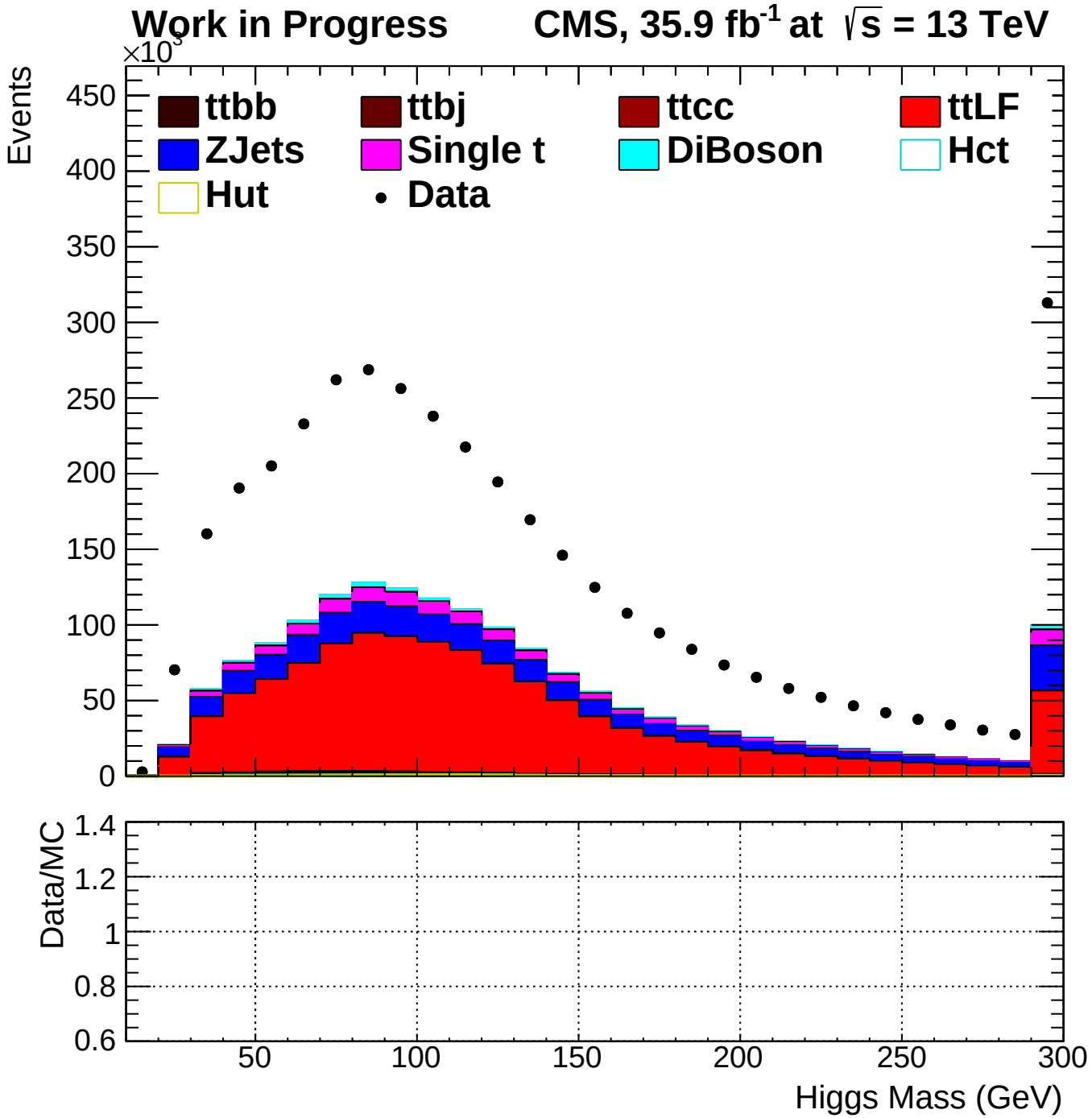

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

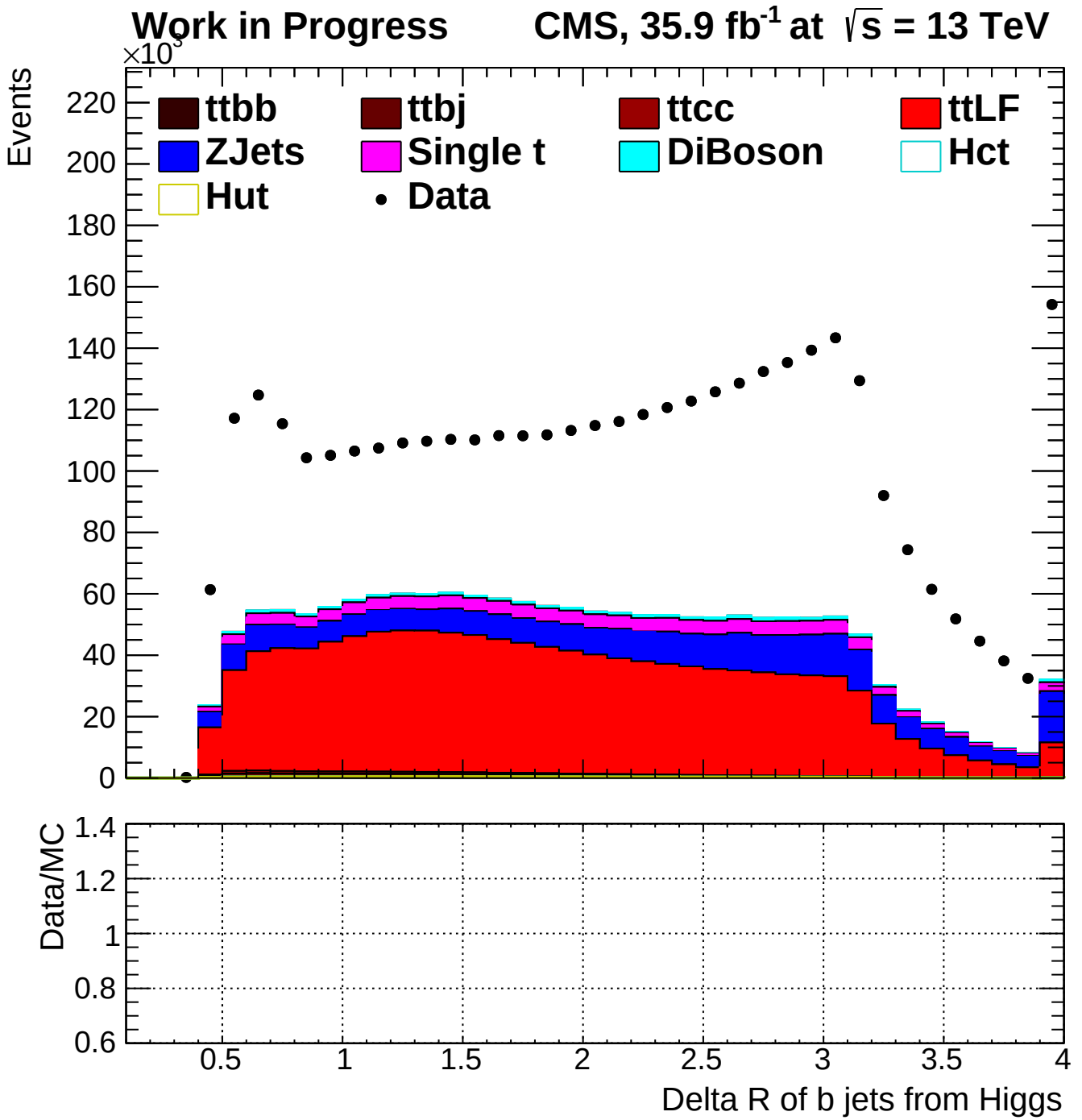

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

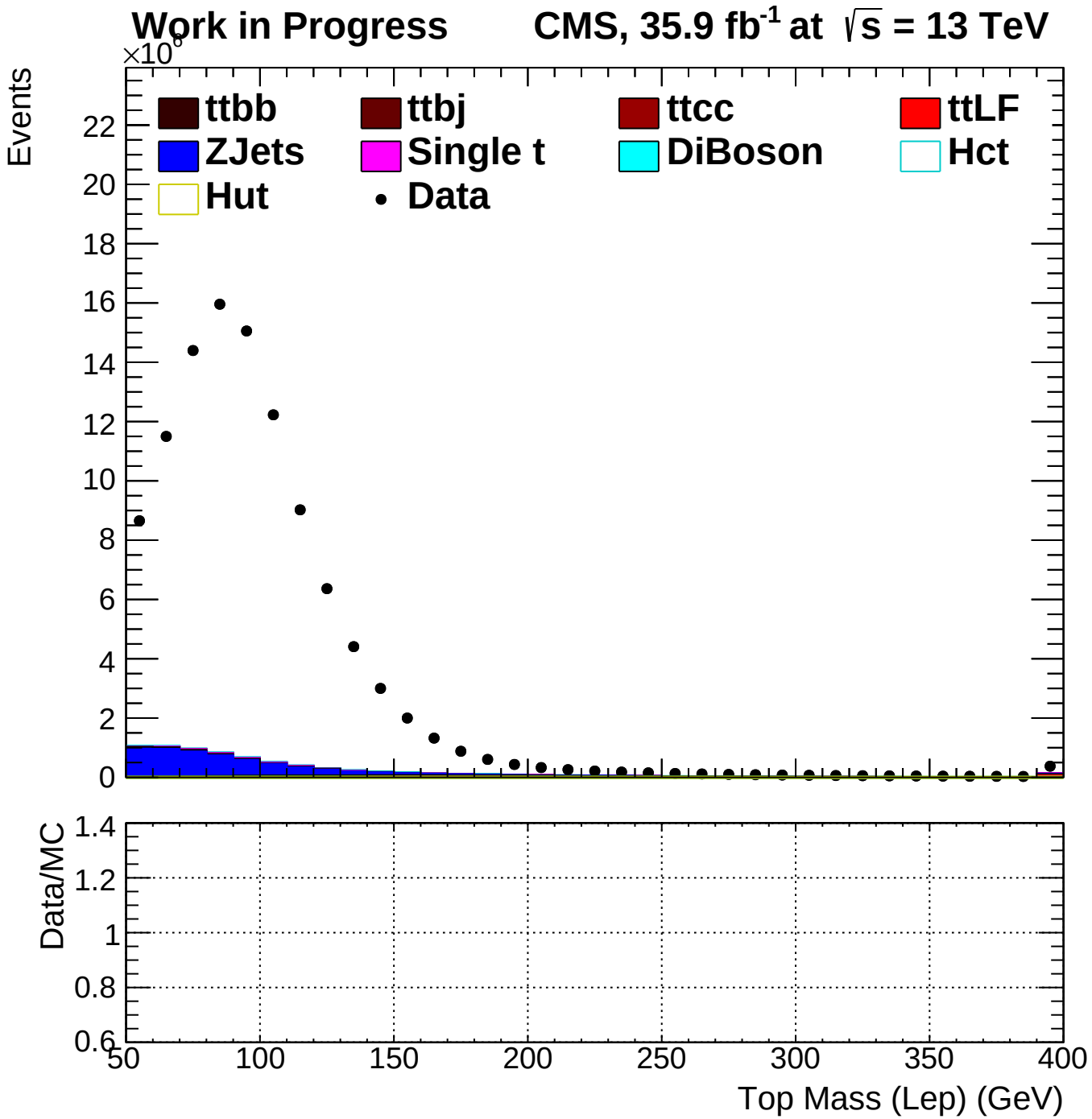

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
5000
4000
3000
2000
1000
0
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

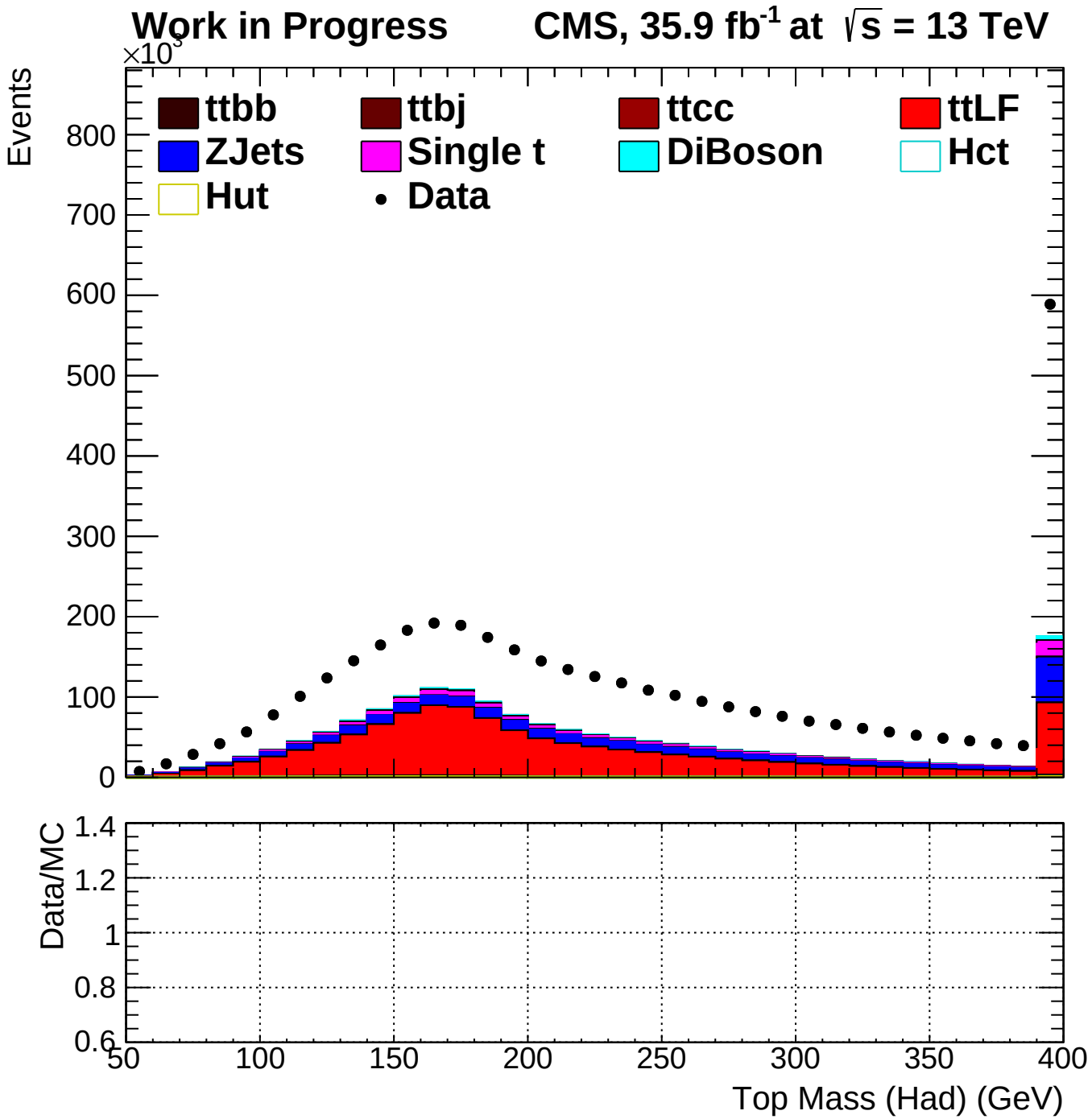

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^6
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

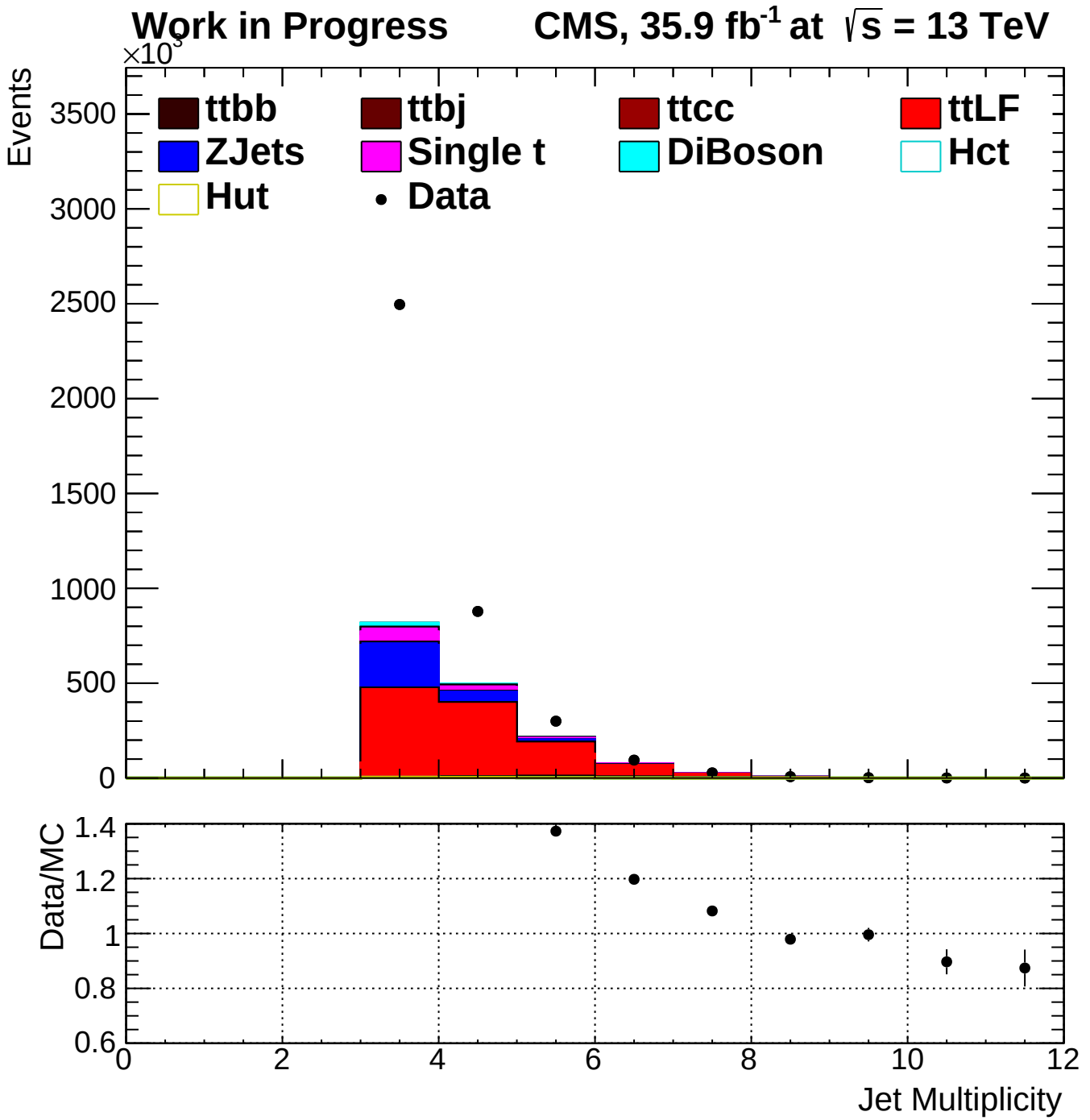

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

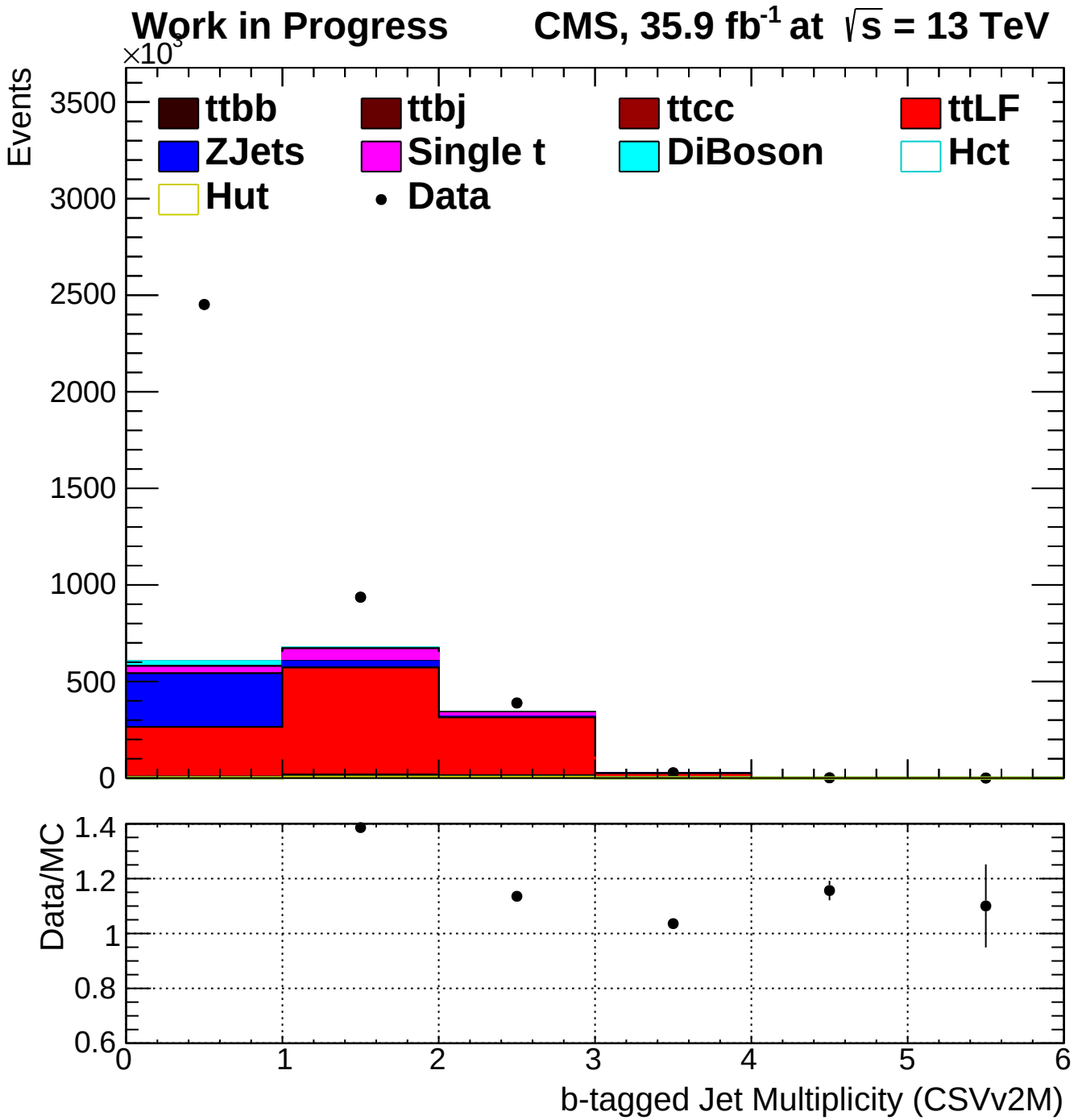

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

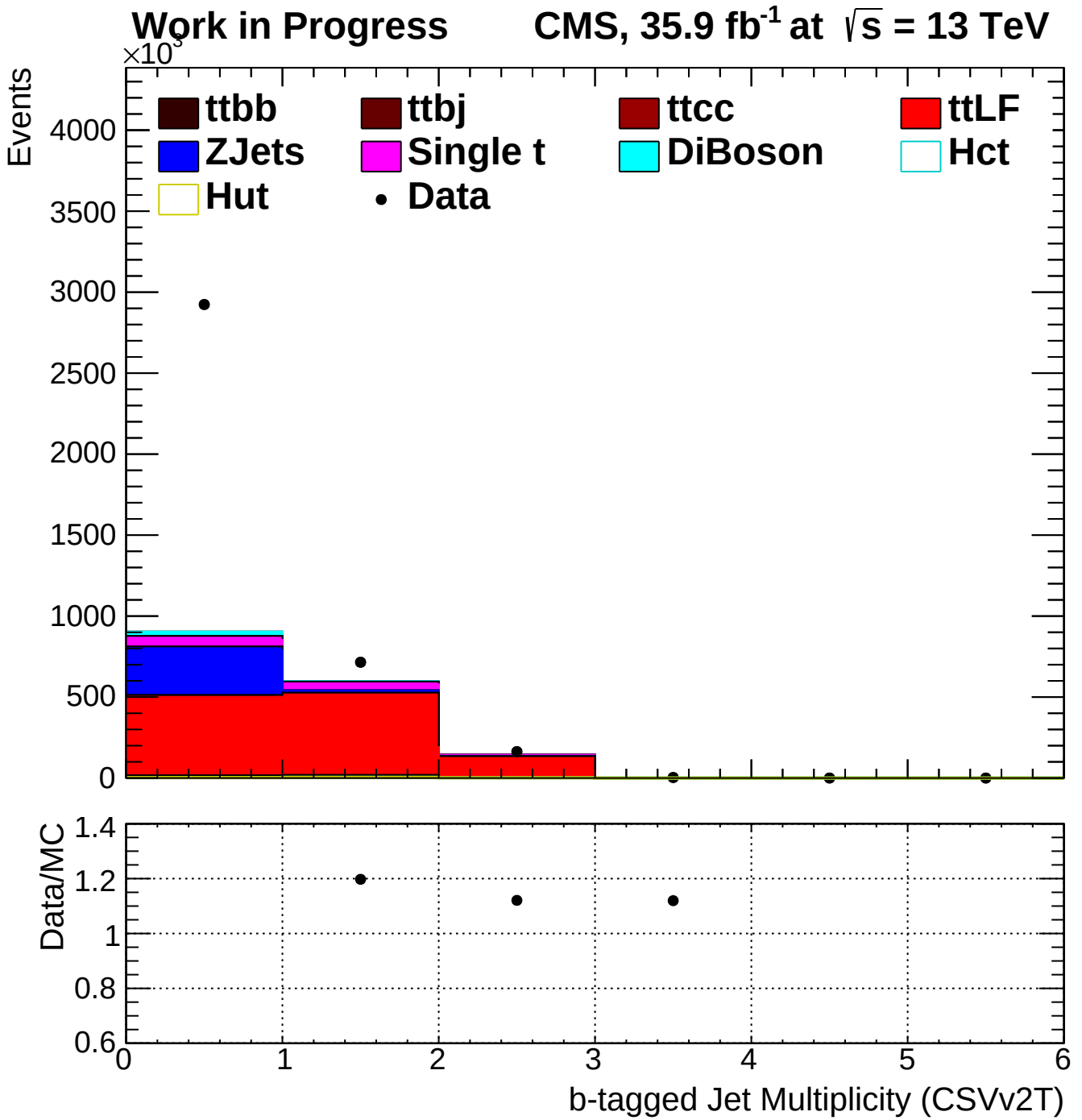

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

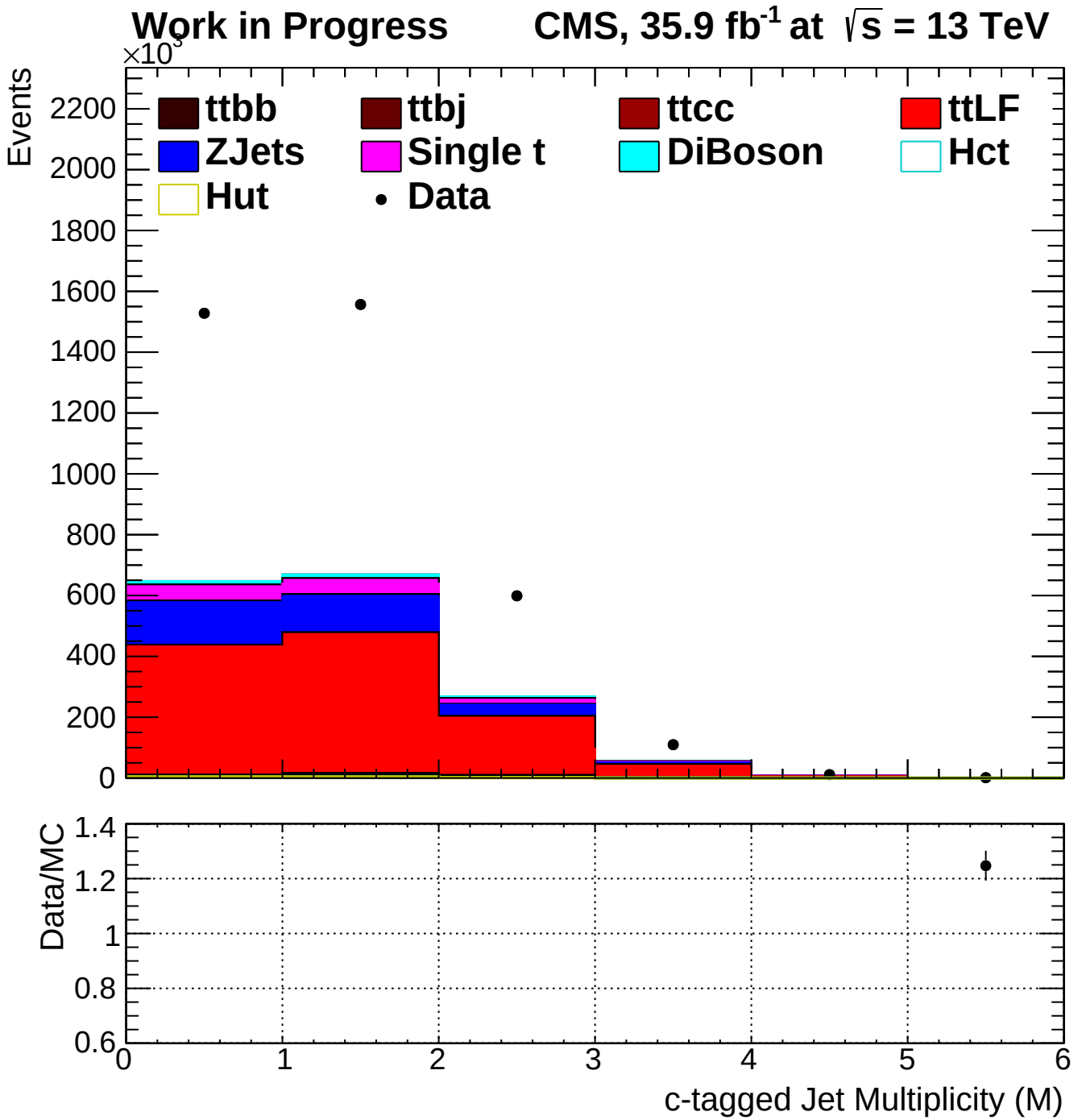

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^6
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)

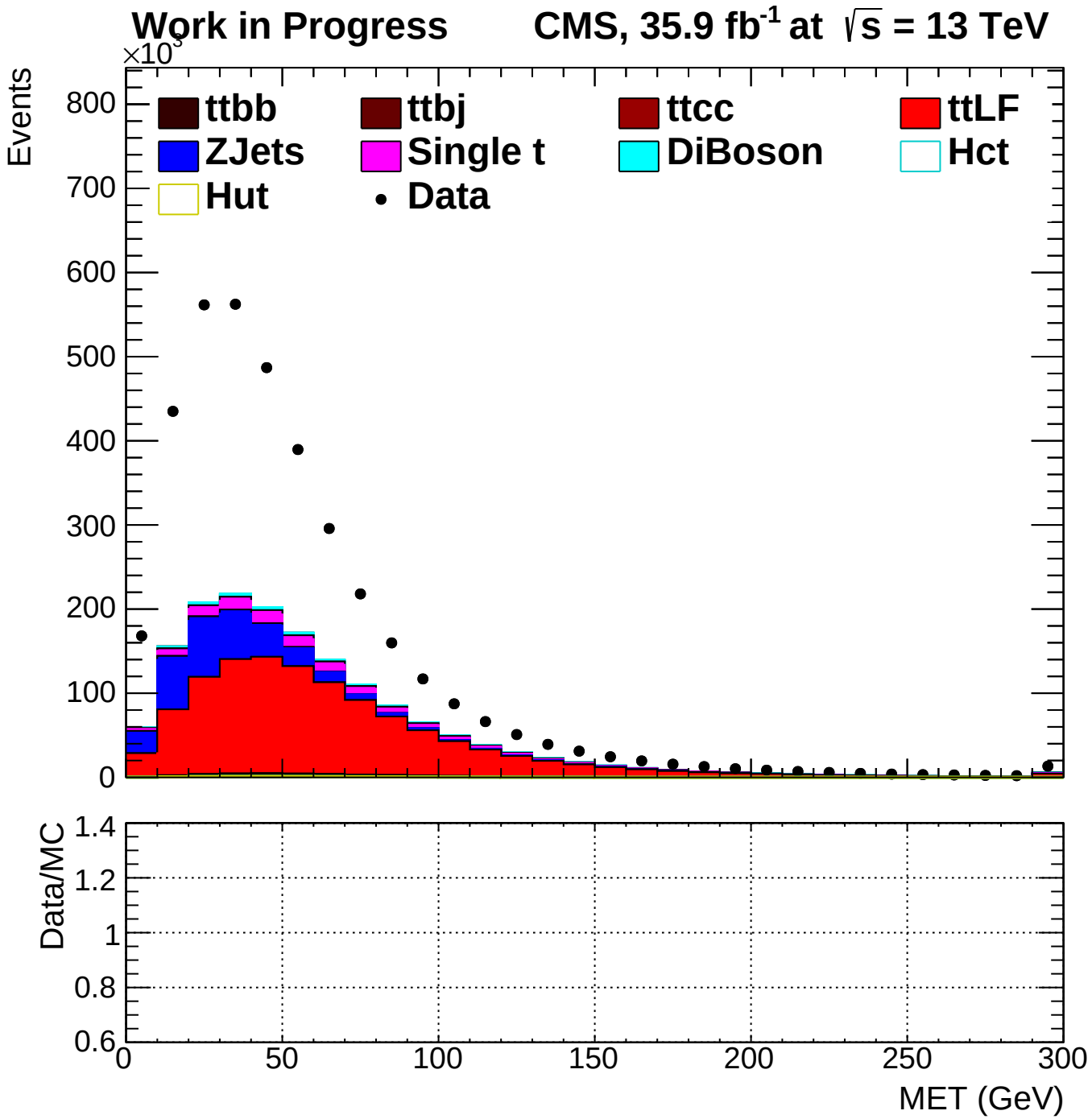

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

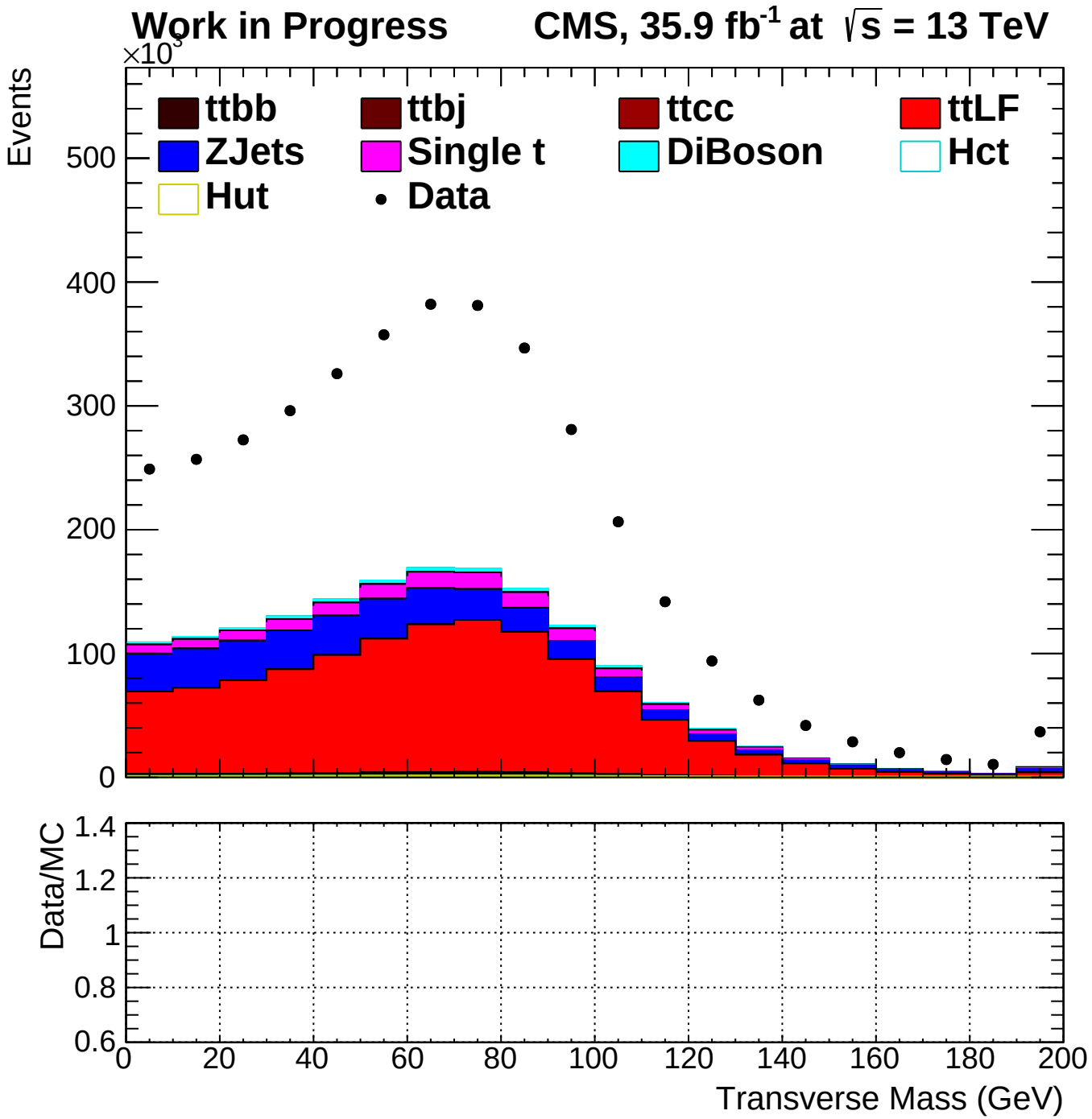

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

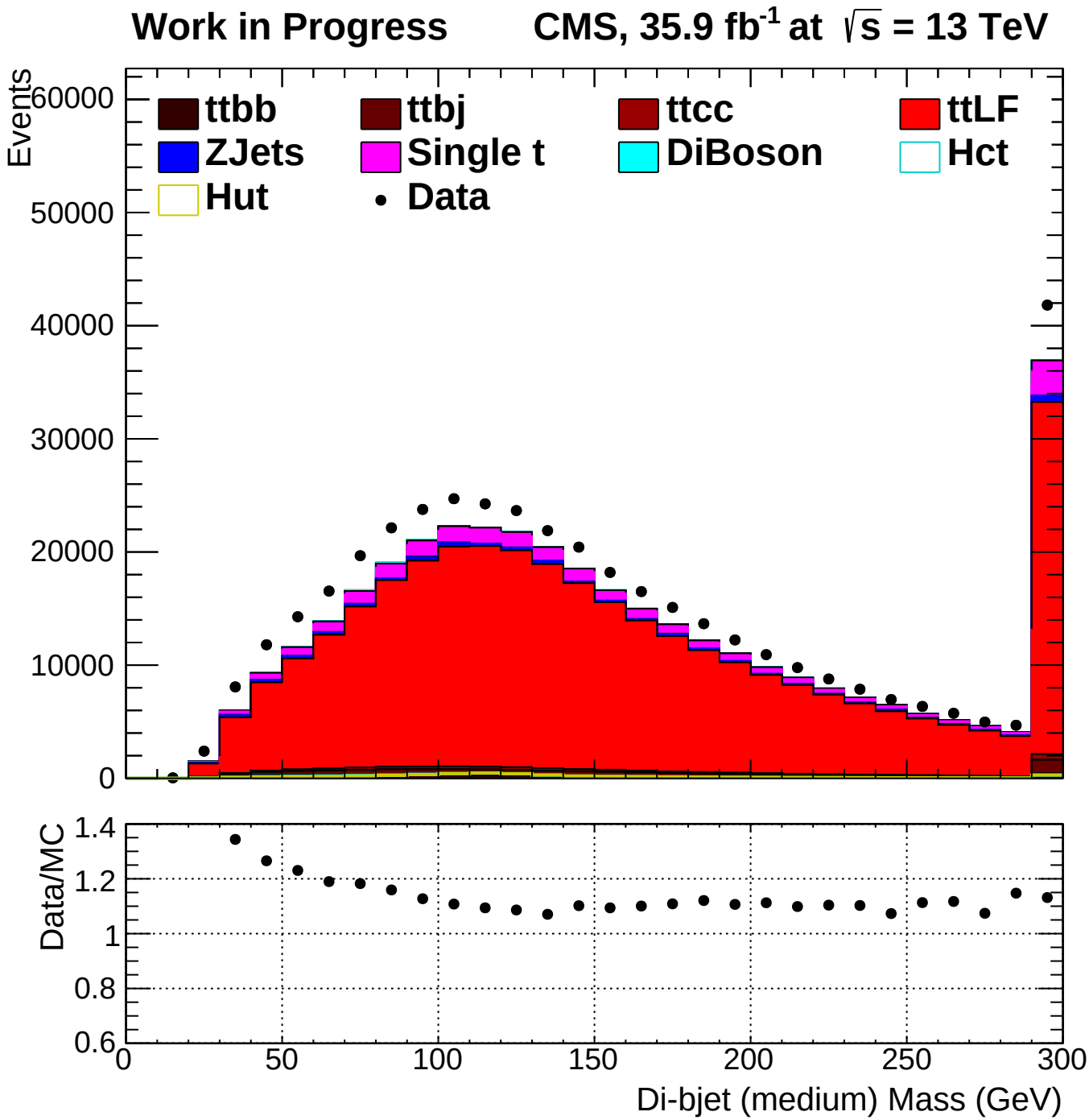

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3500
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

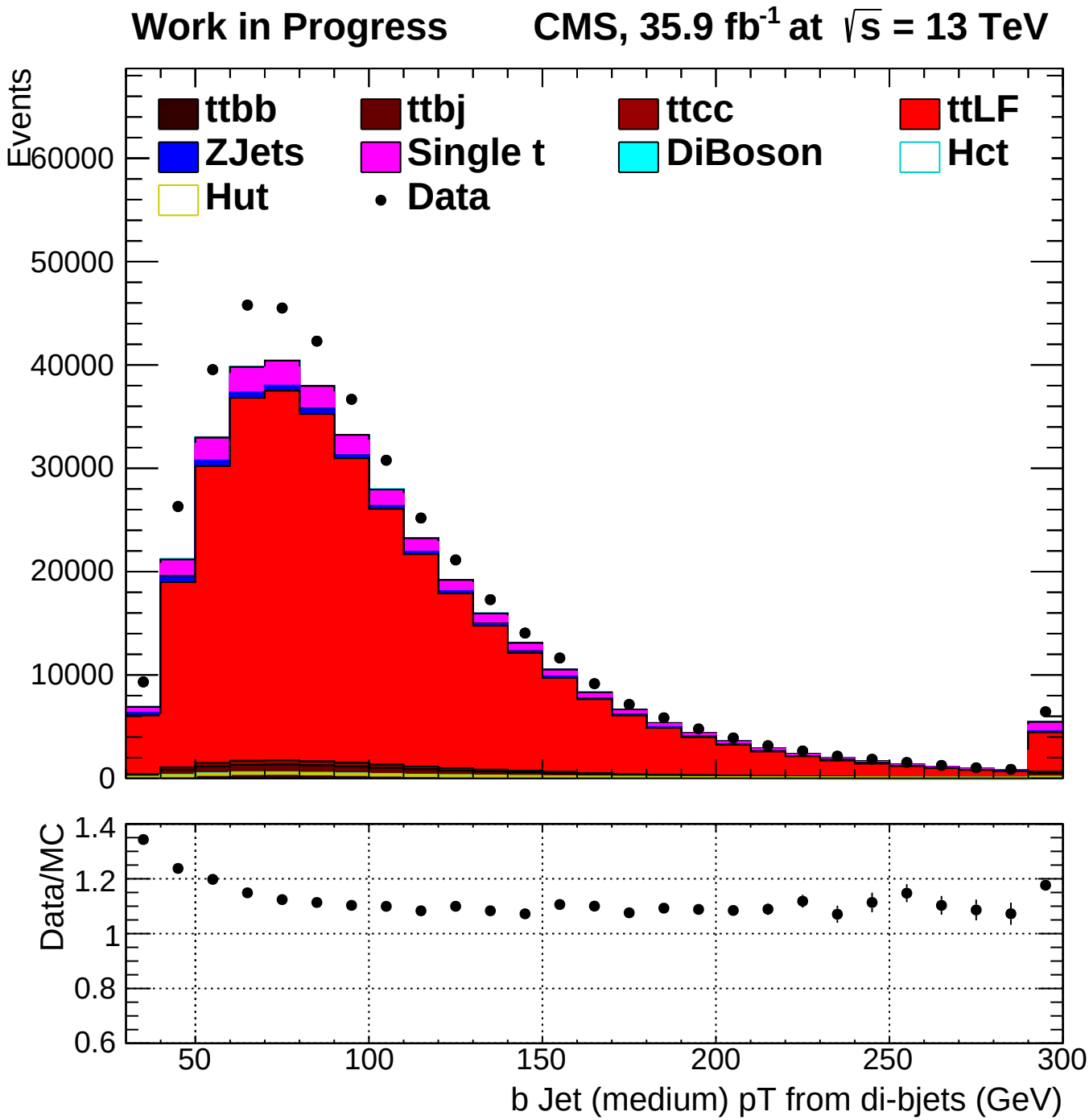

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
4000
3500
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

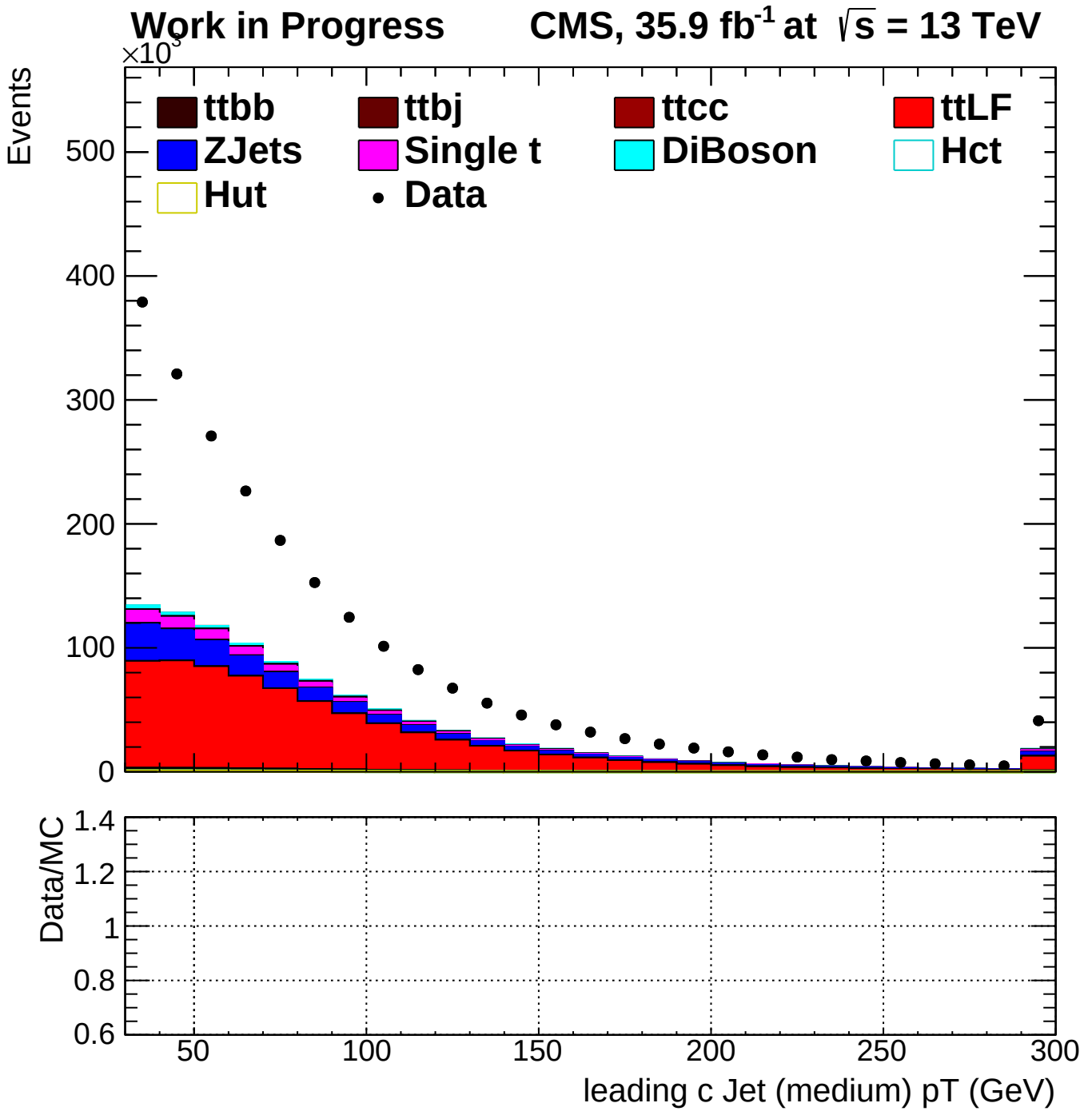

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)

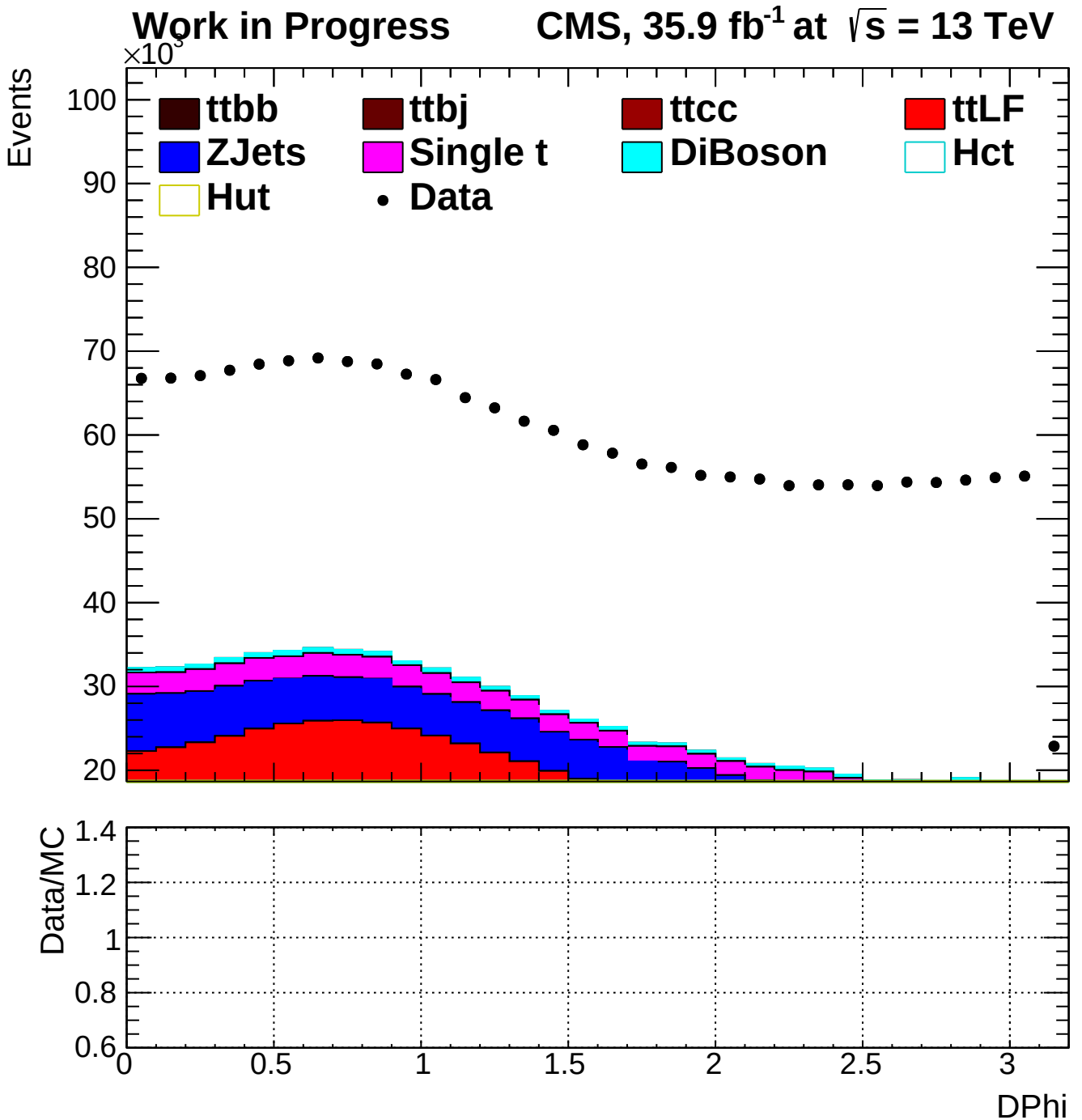

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
800
700
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)

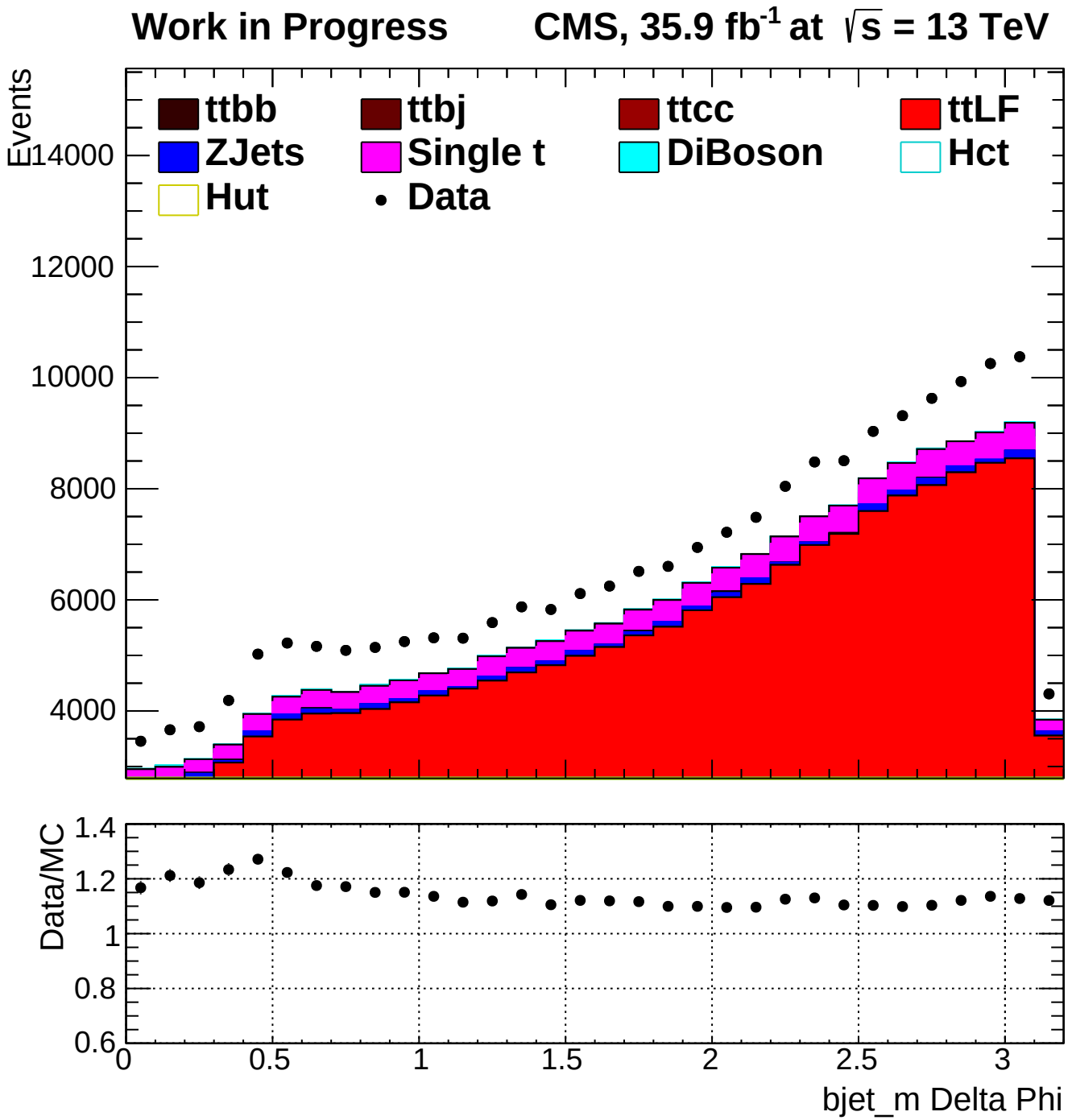

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

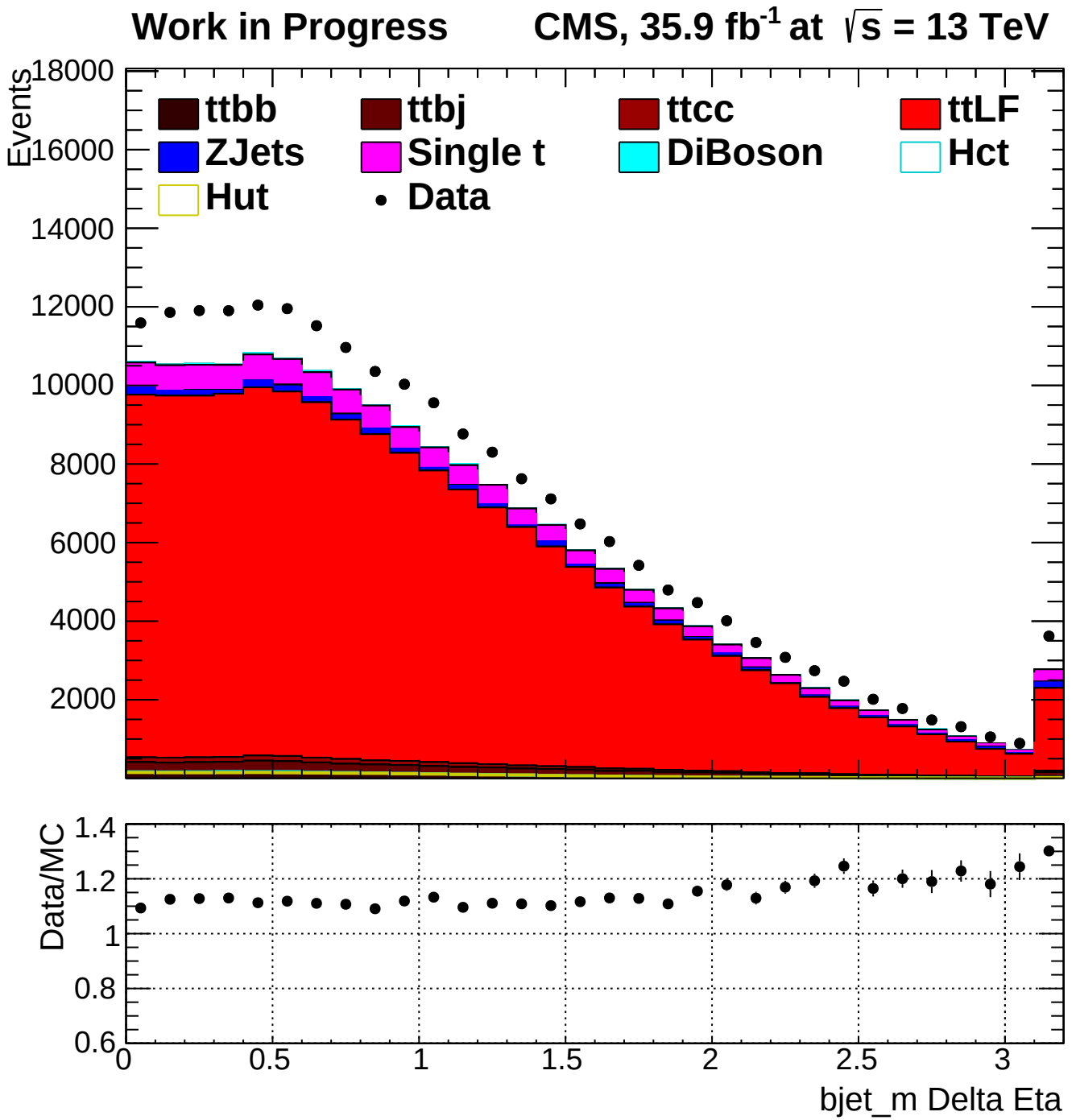

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)

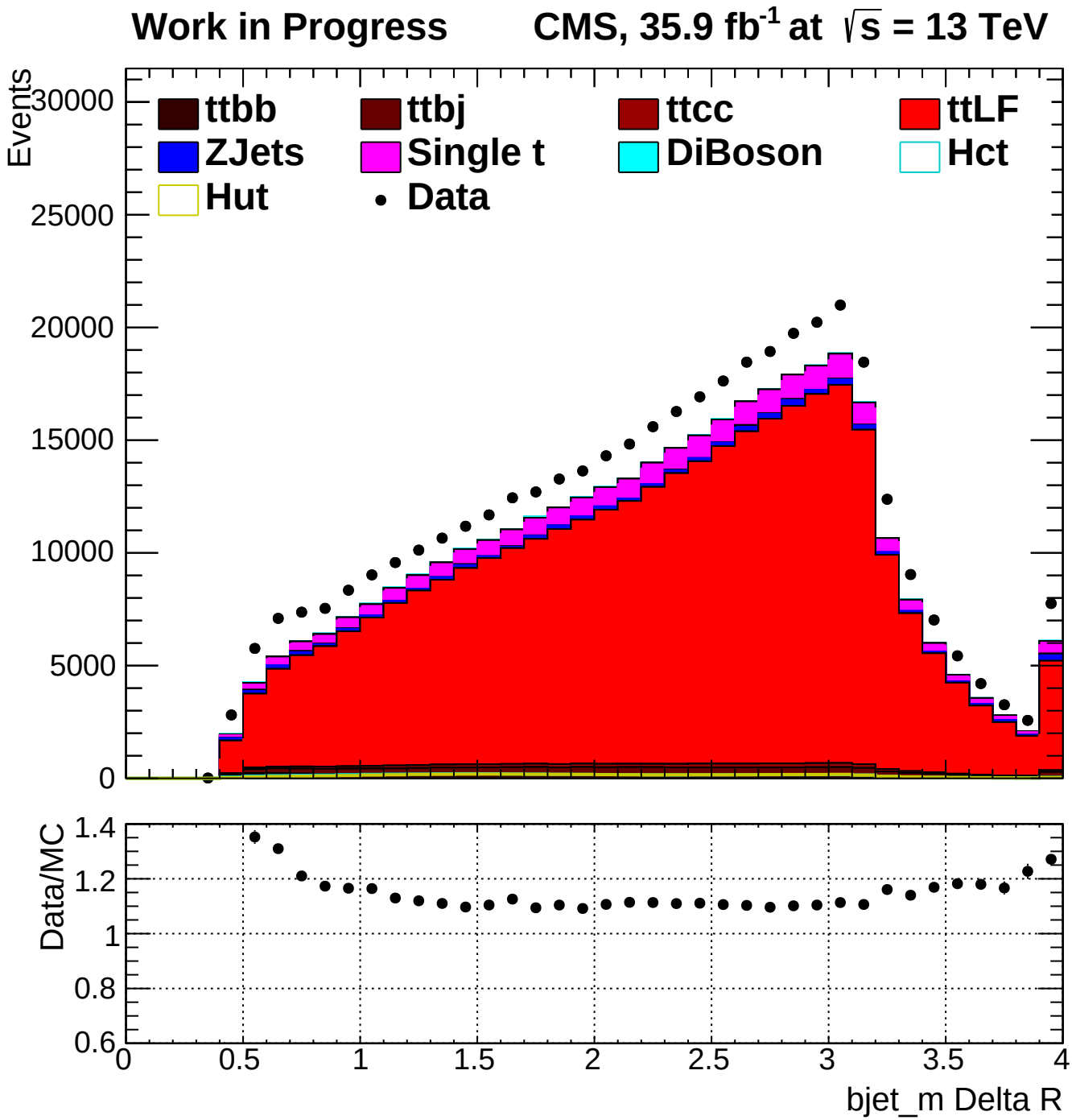

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

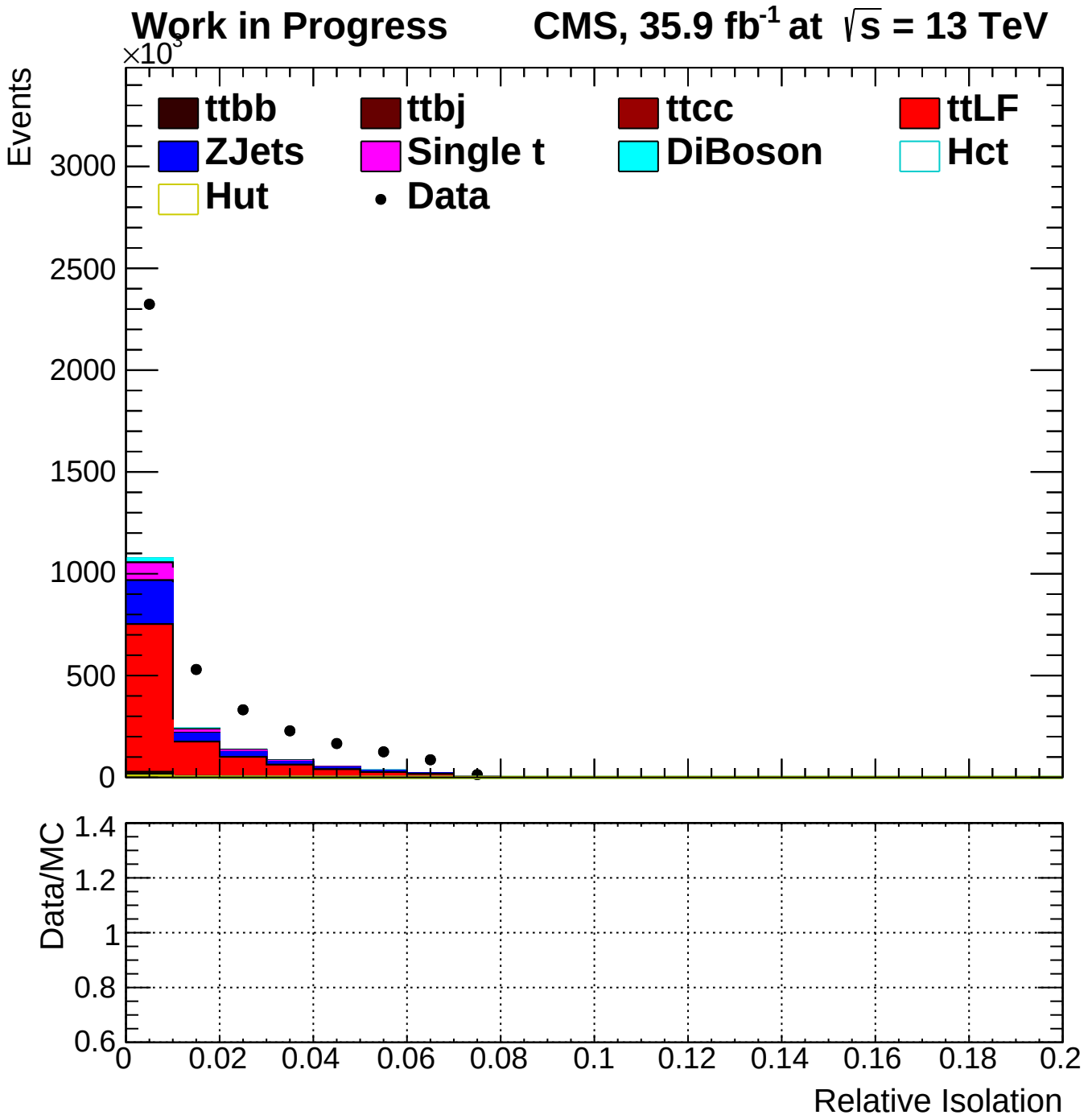

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

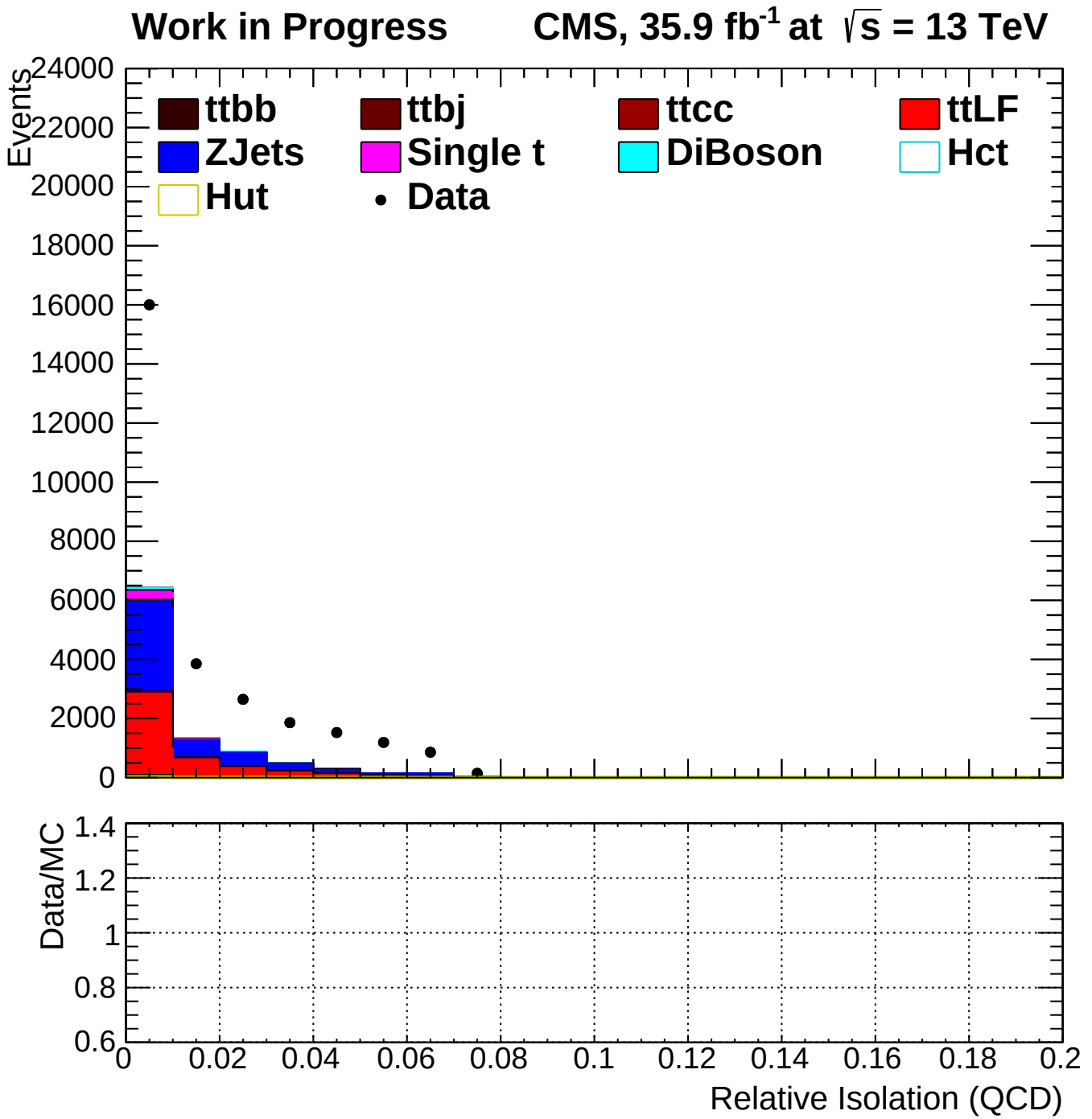

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
100
90
80
70
60
50
40
30
20
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

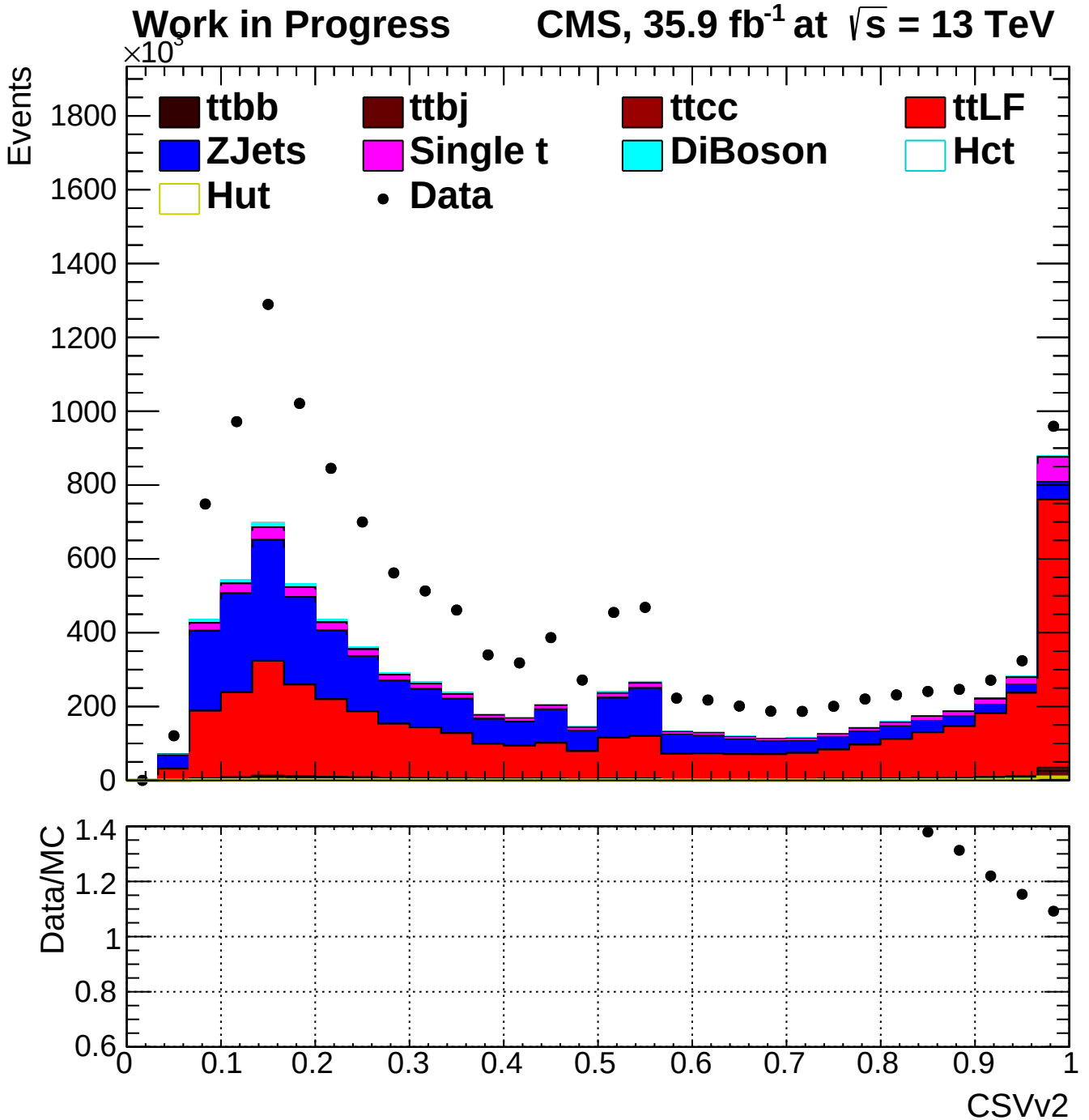

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
14000
12000
10000
8000
6000
4000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

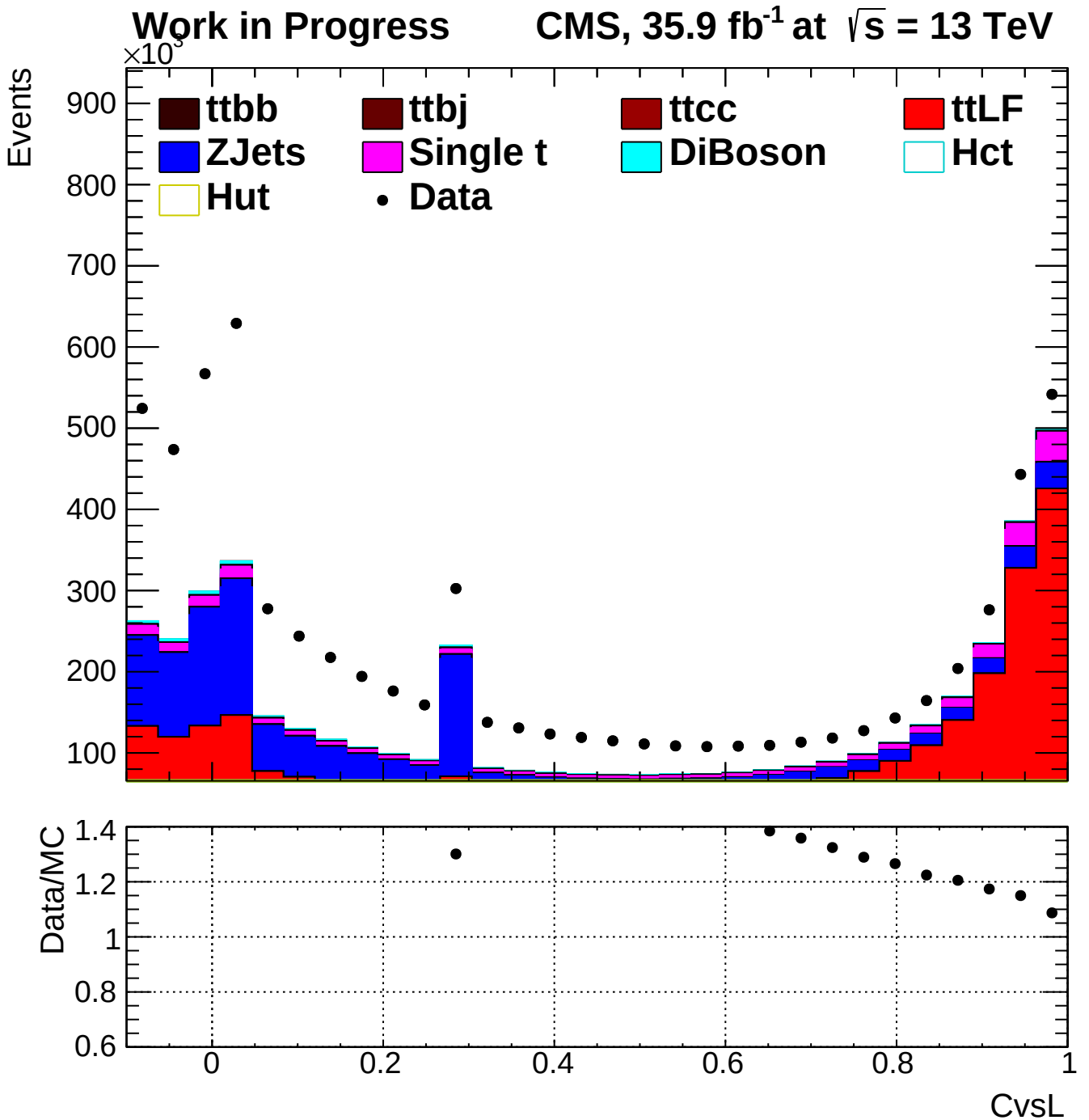

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta

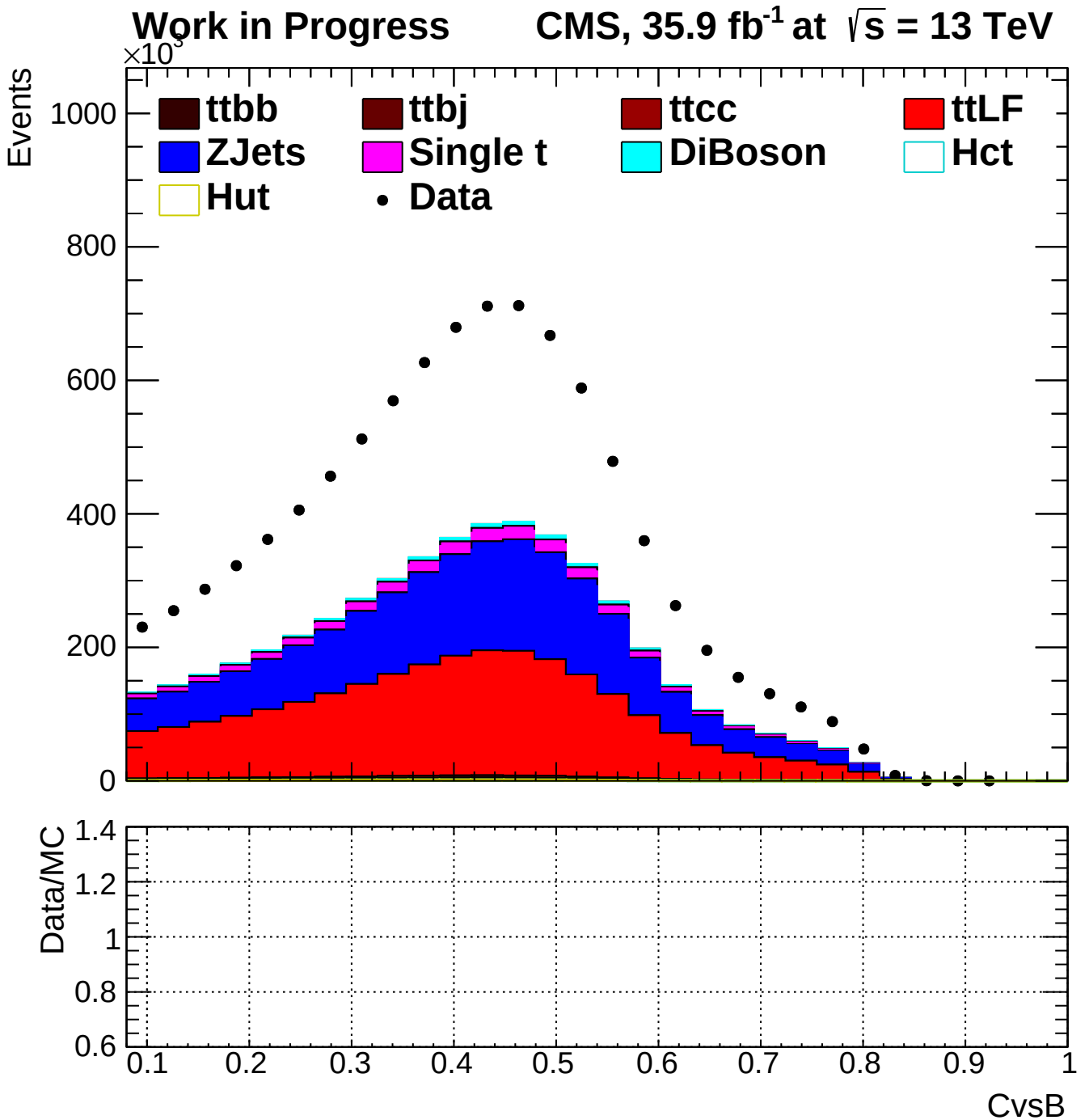

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

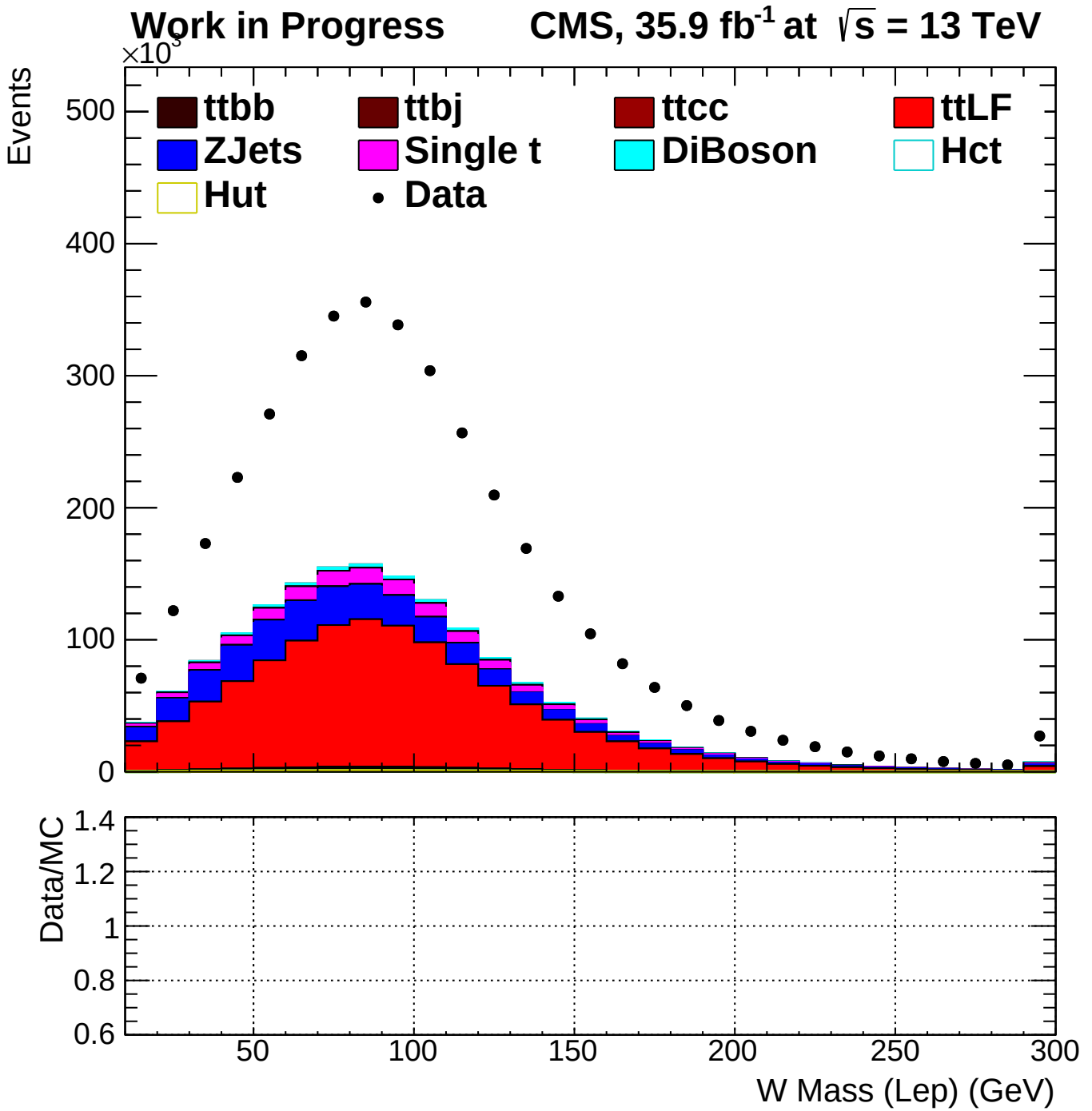

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

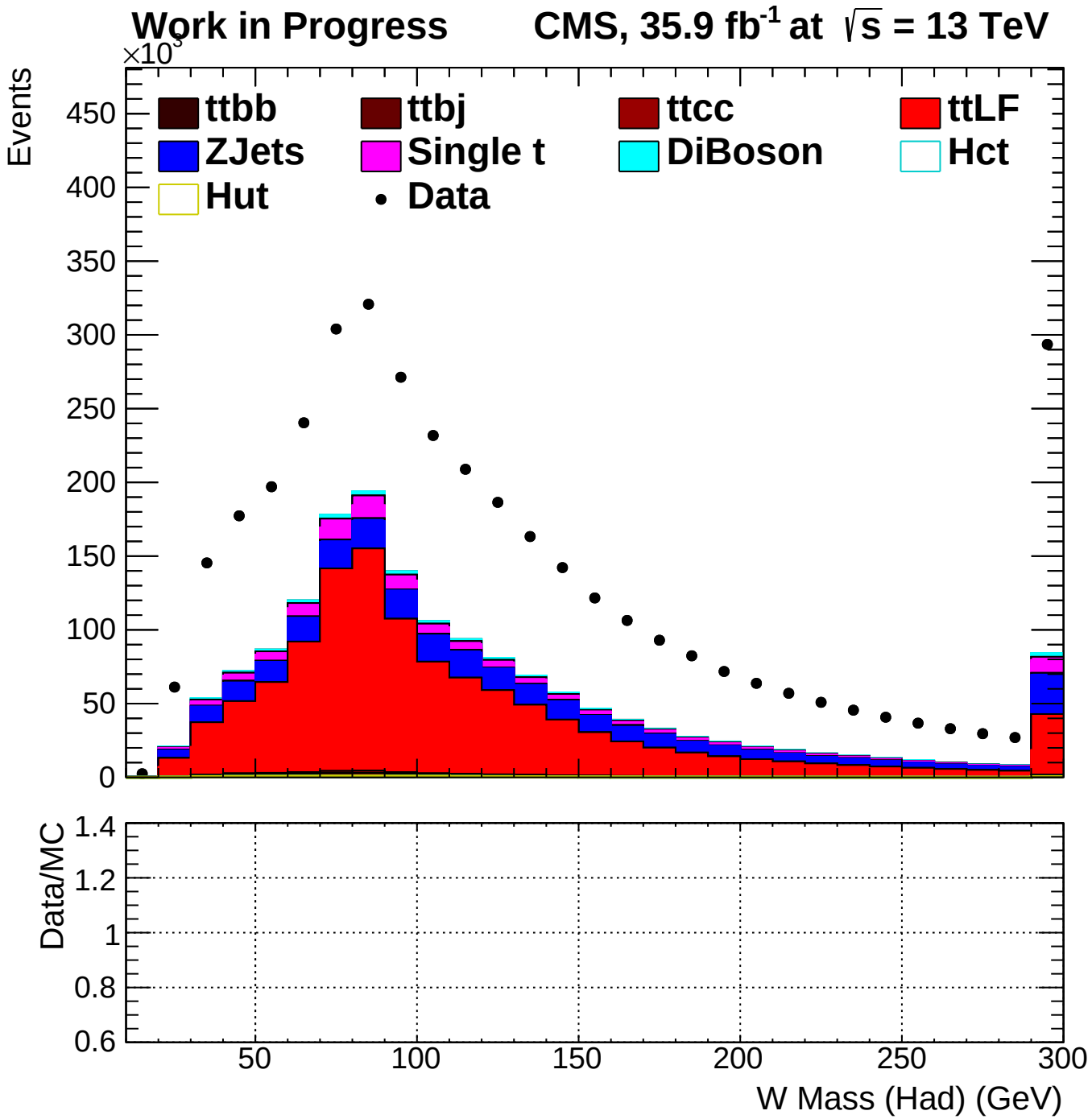

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

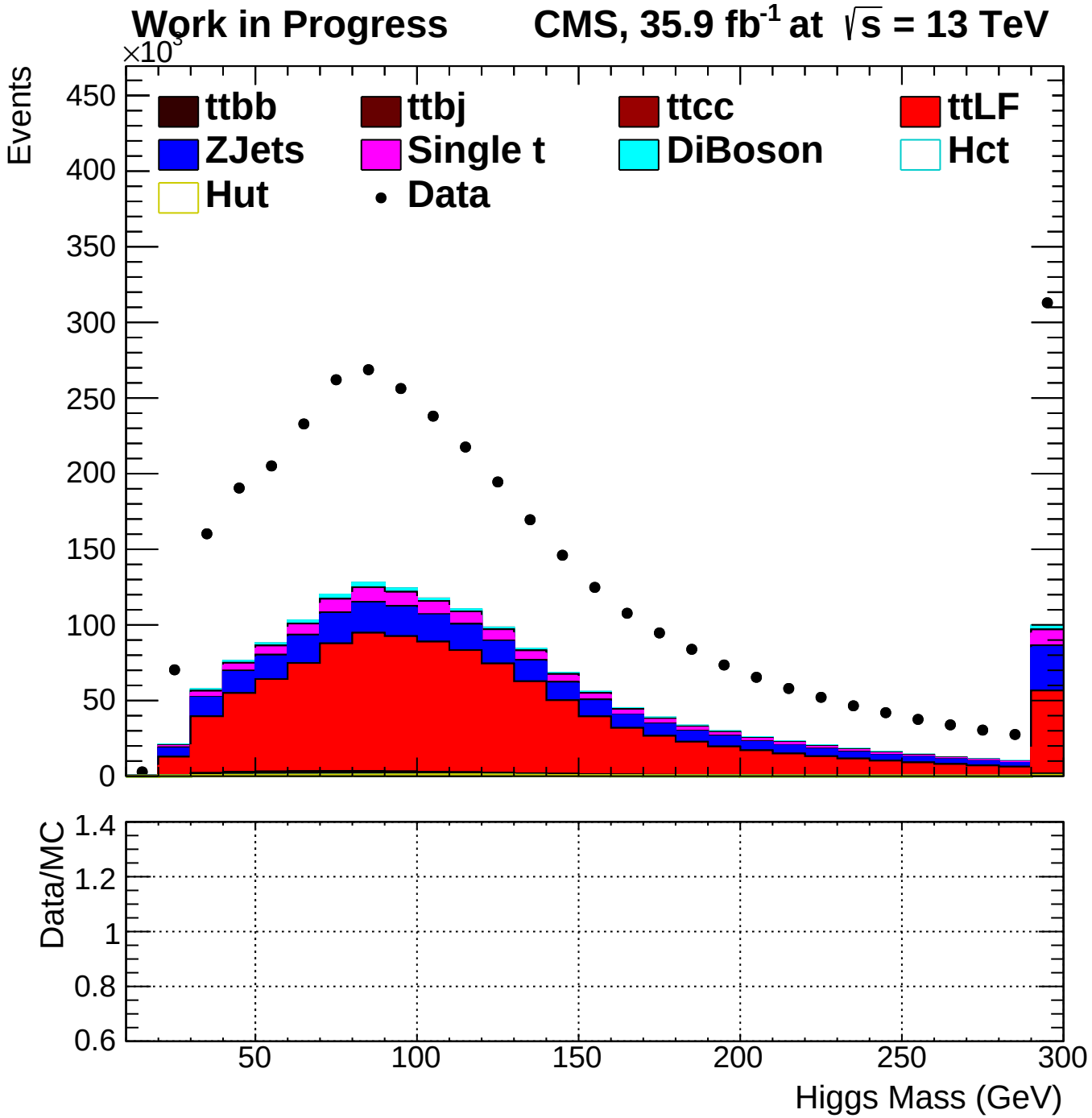

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1800
1600
1400
1200
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

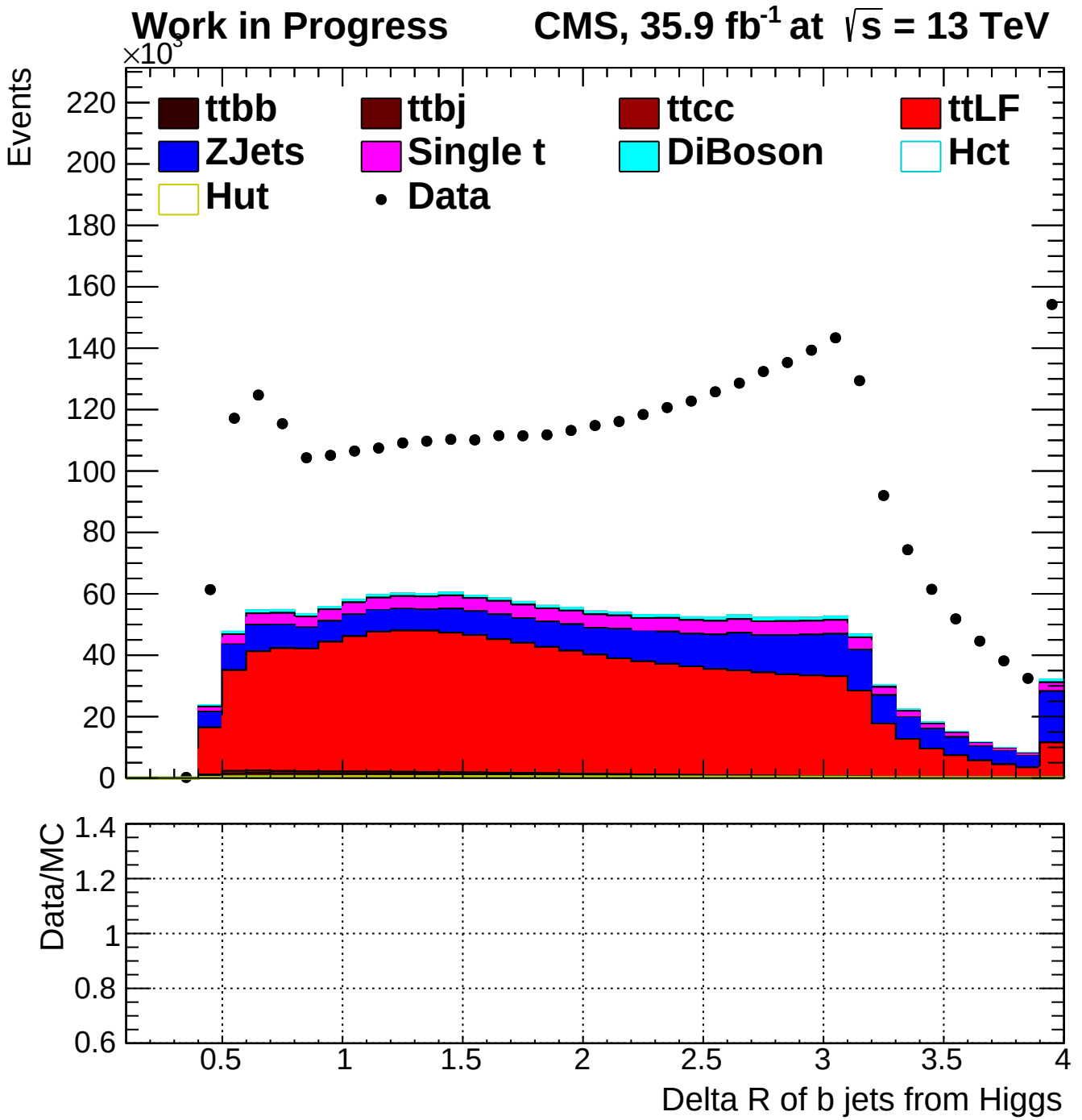

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsL

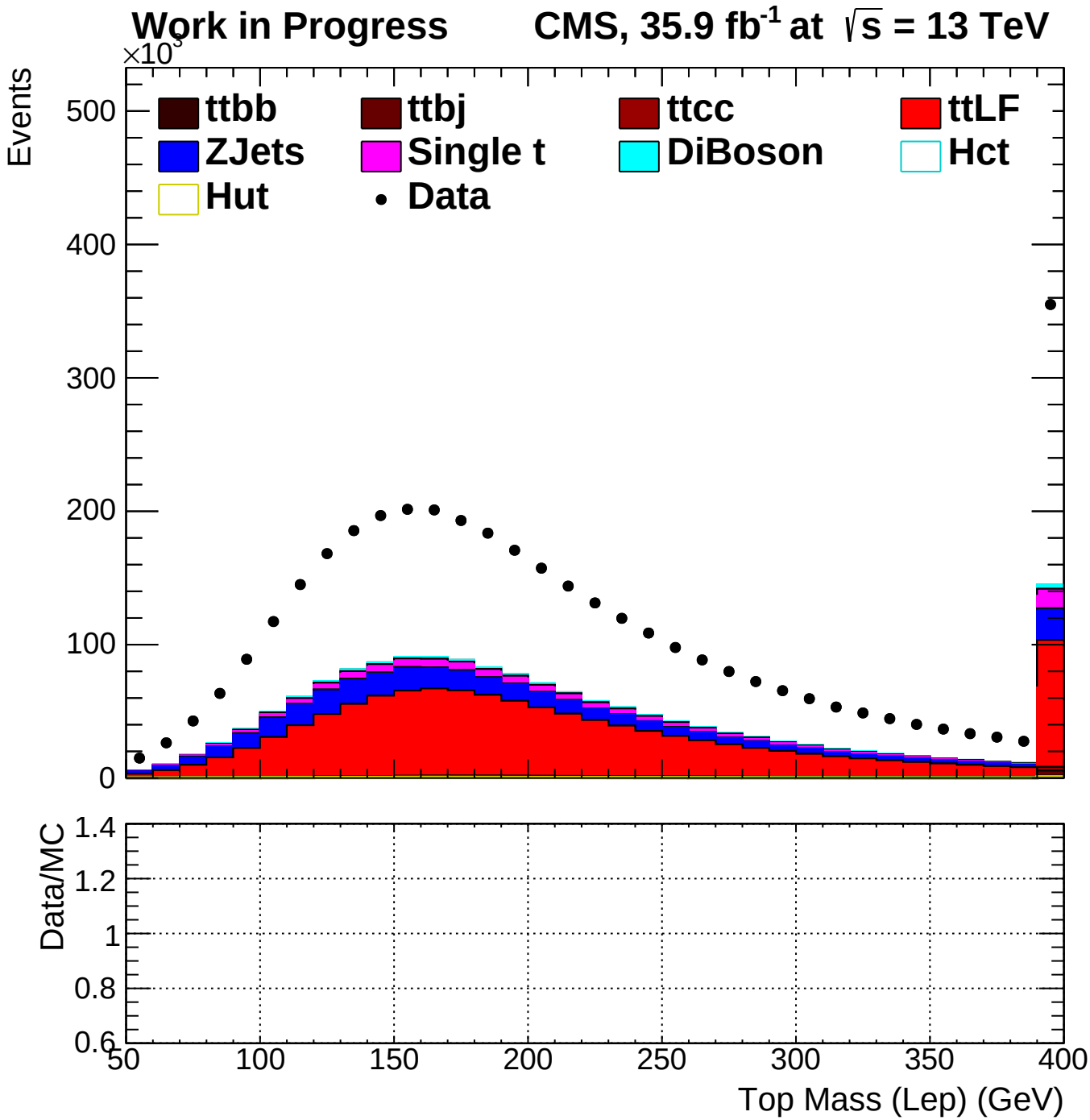

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

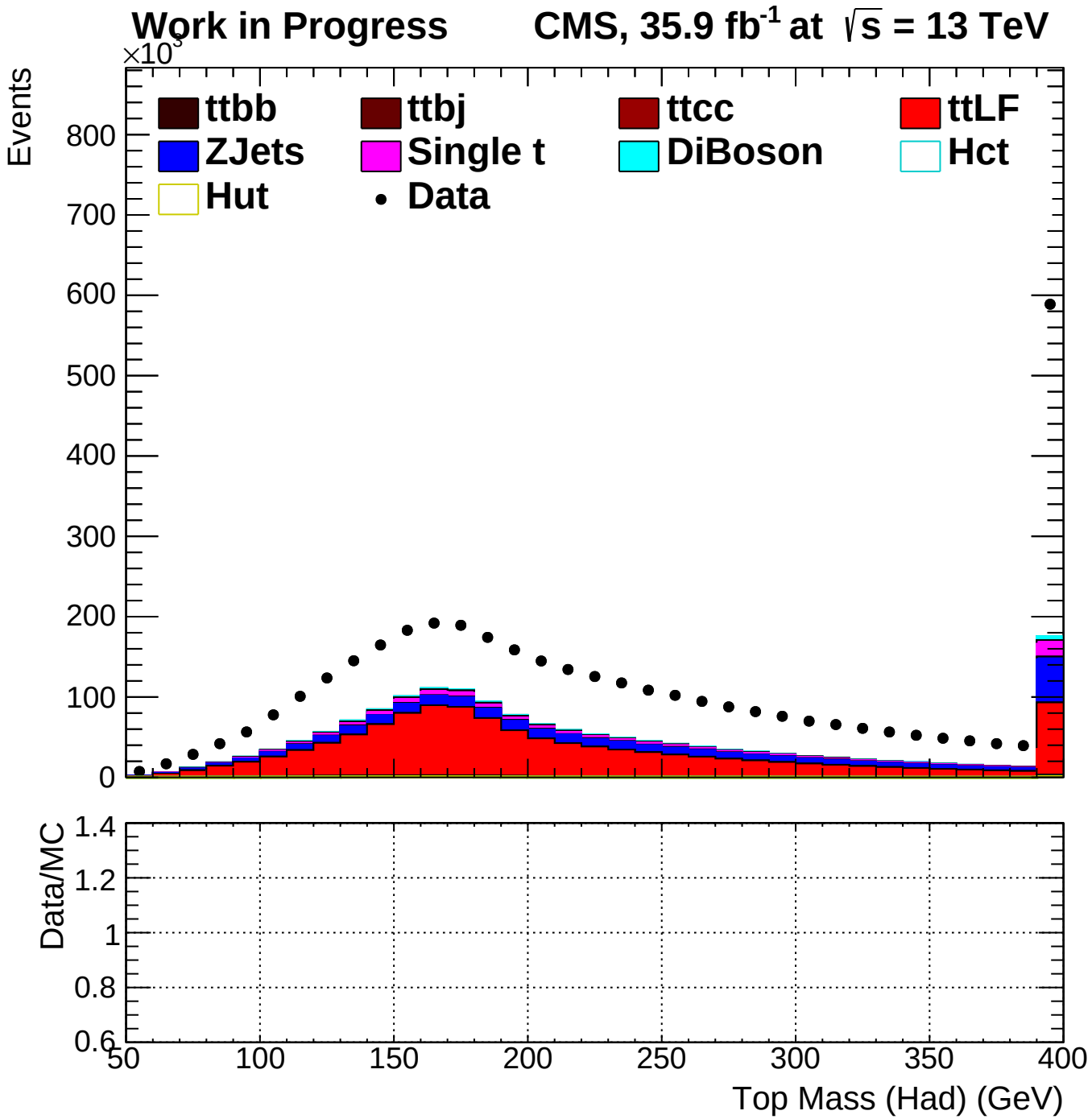

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

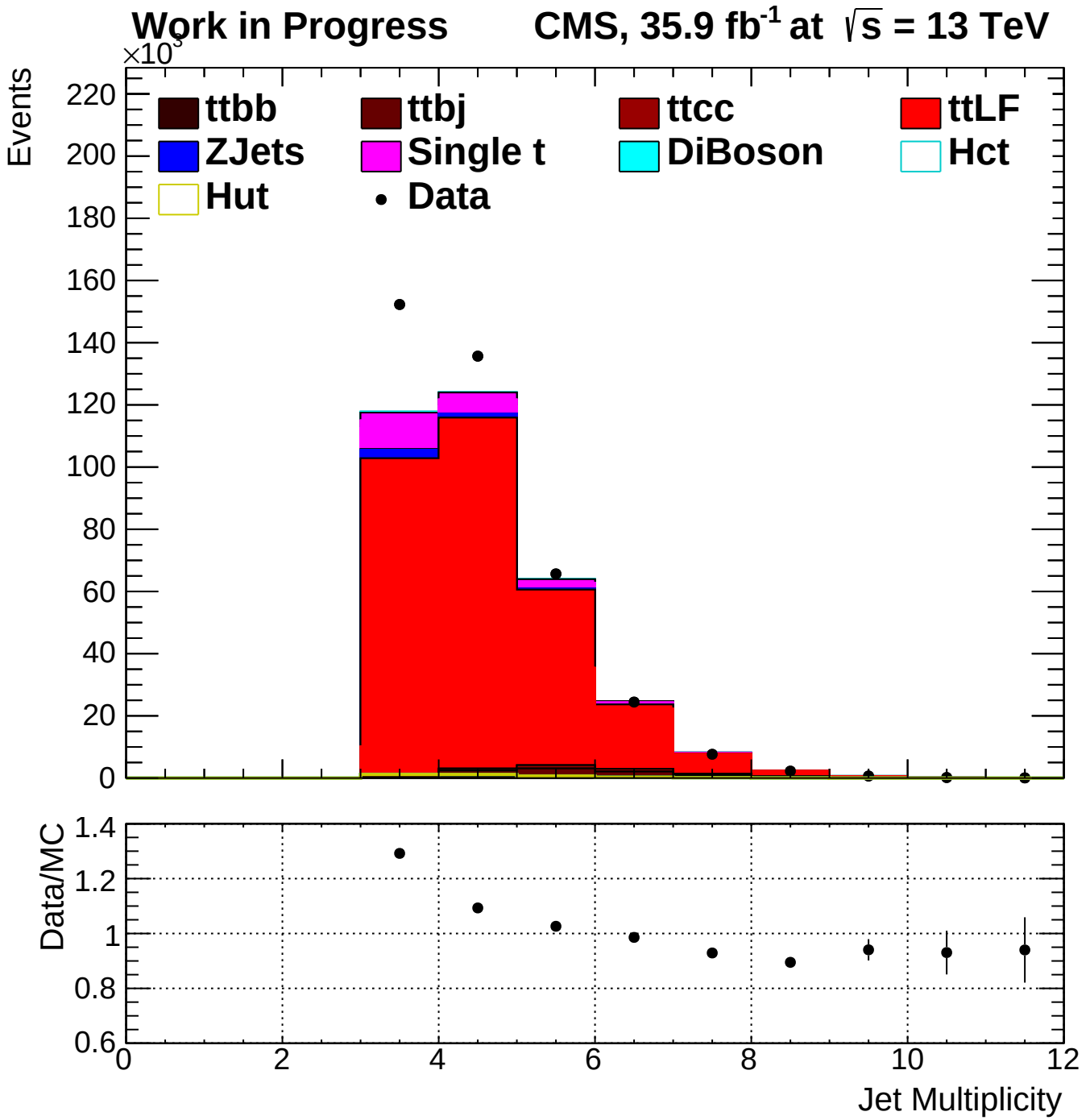

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

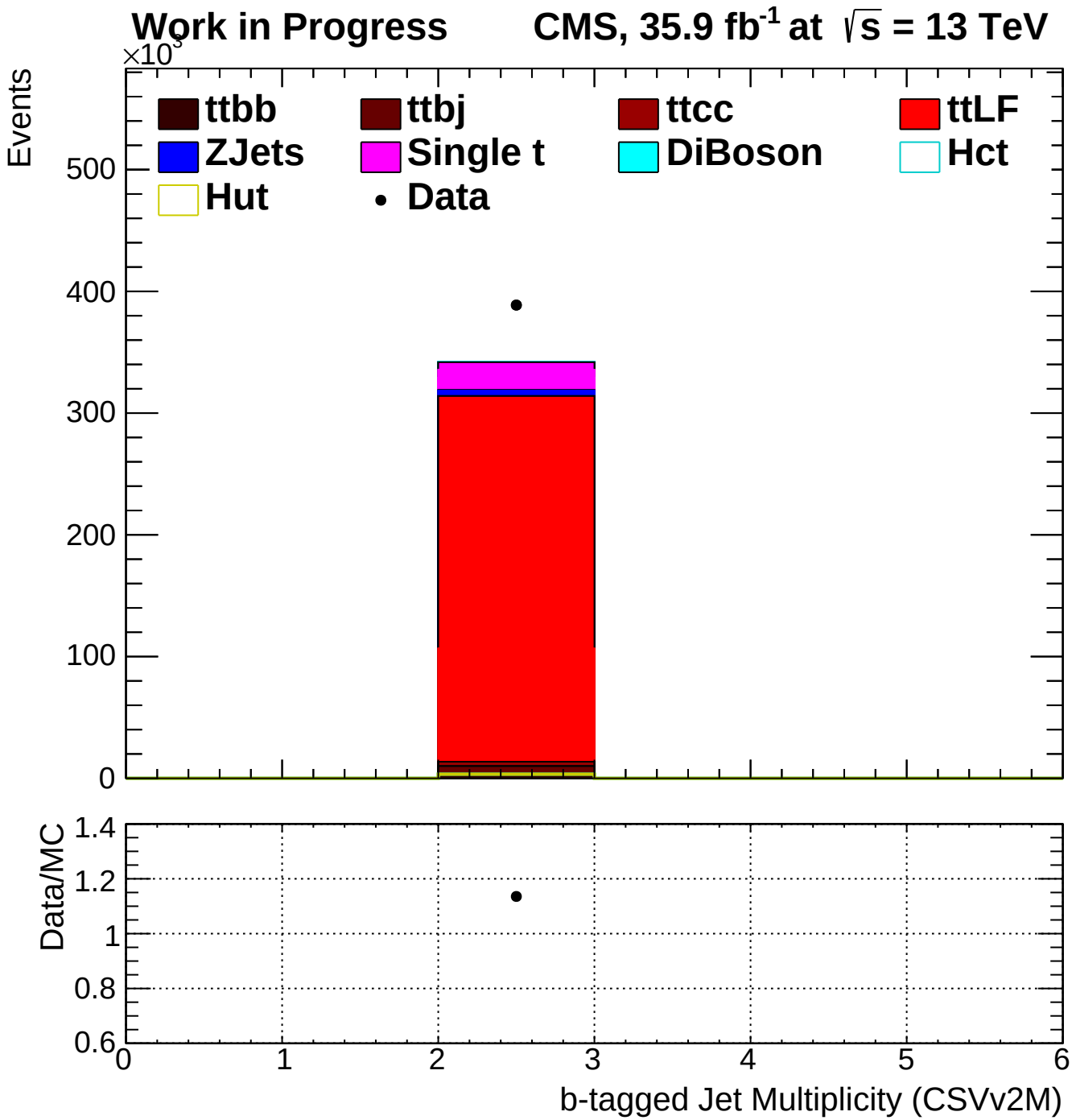

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

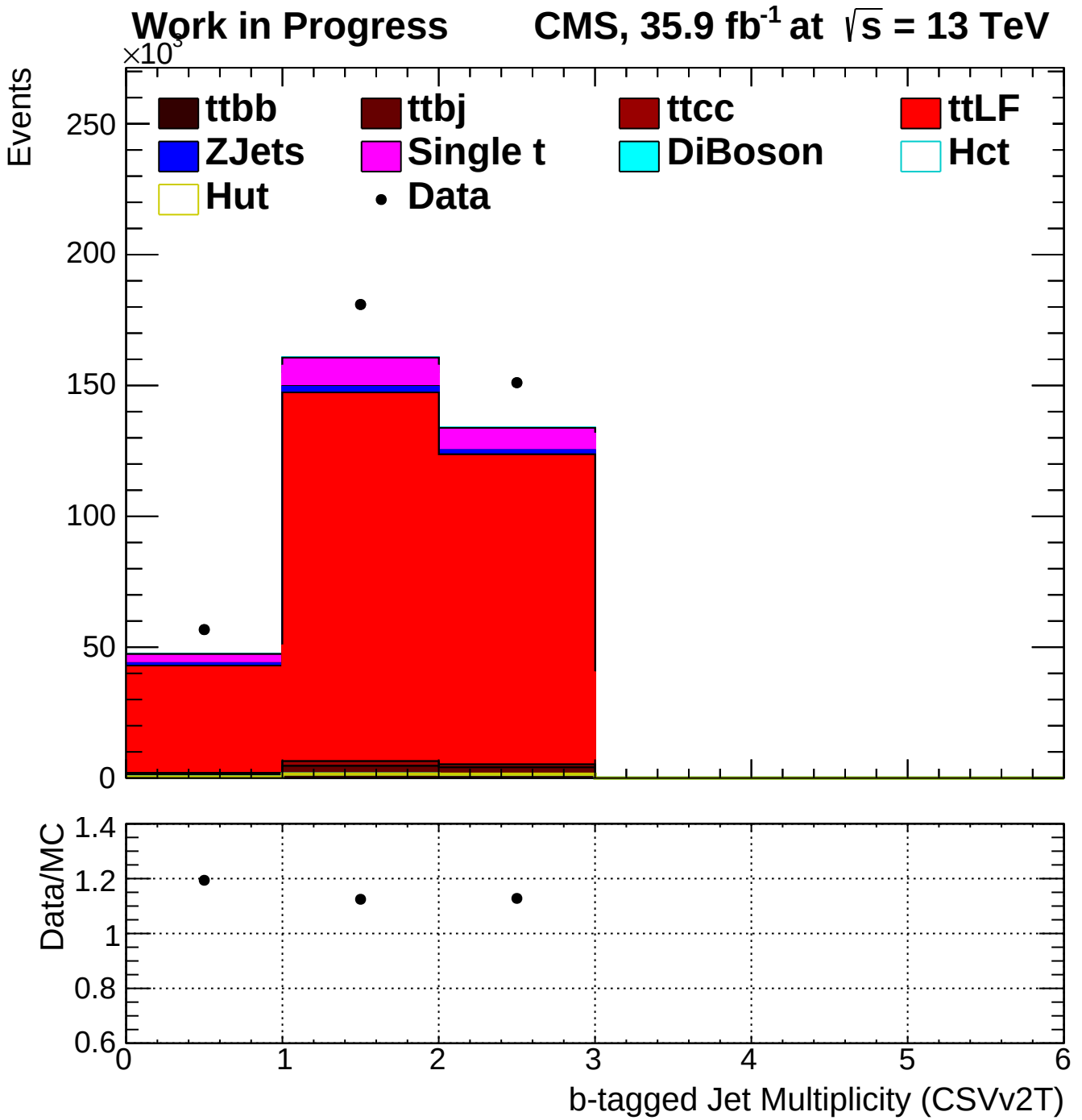

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

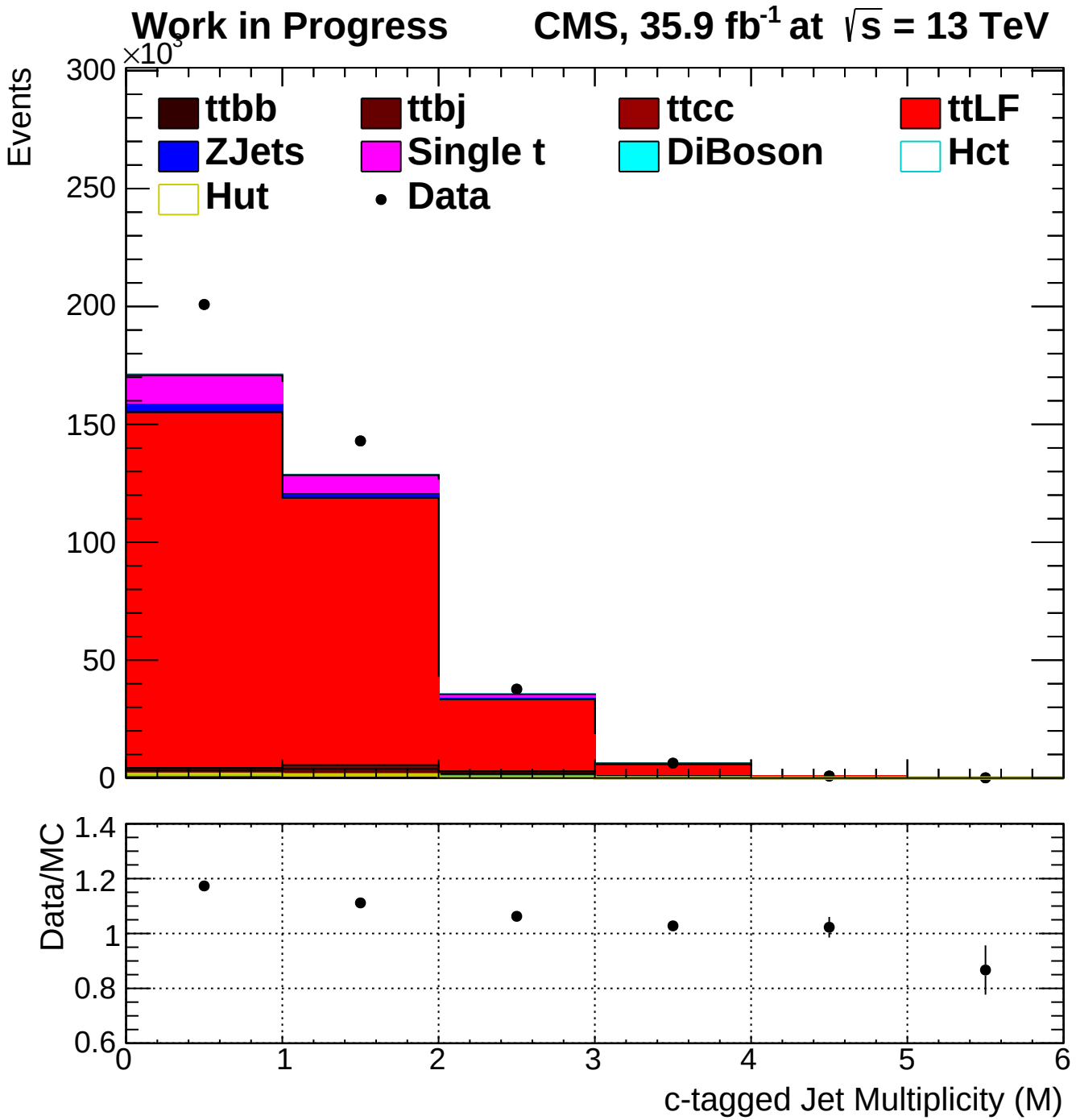

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)

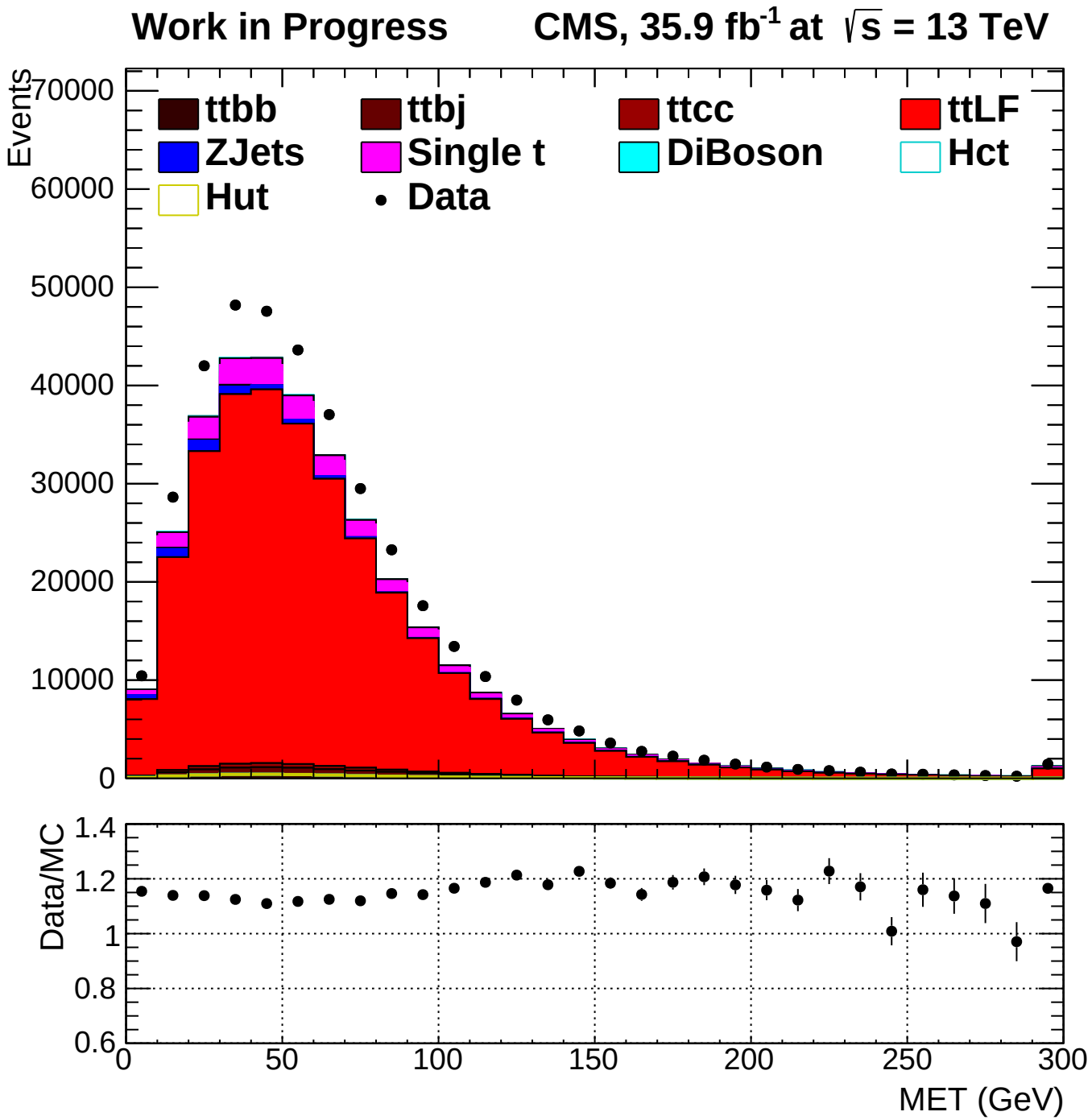

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

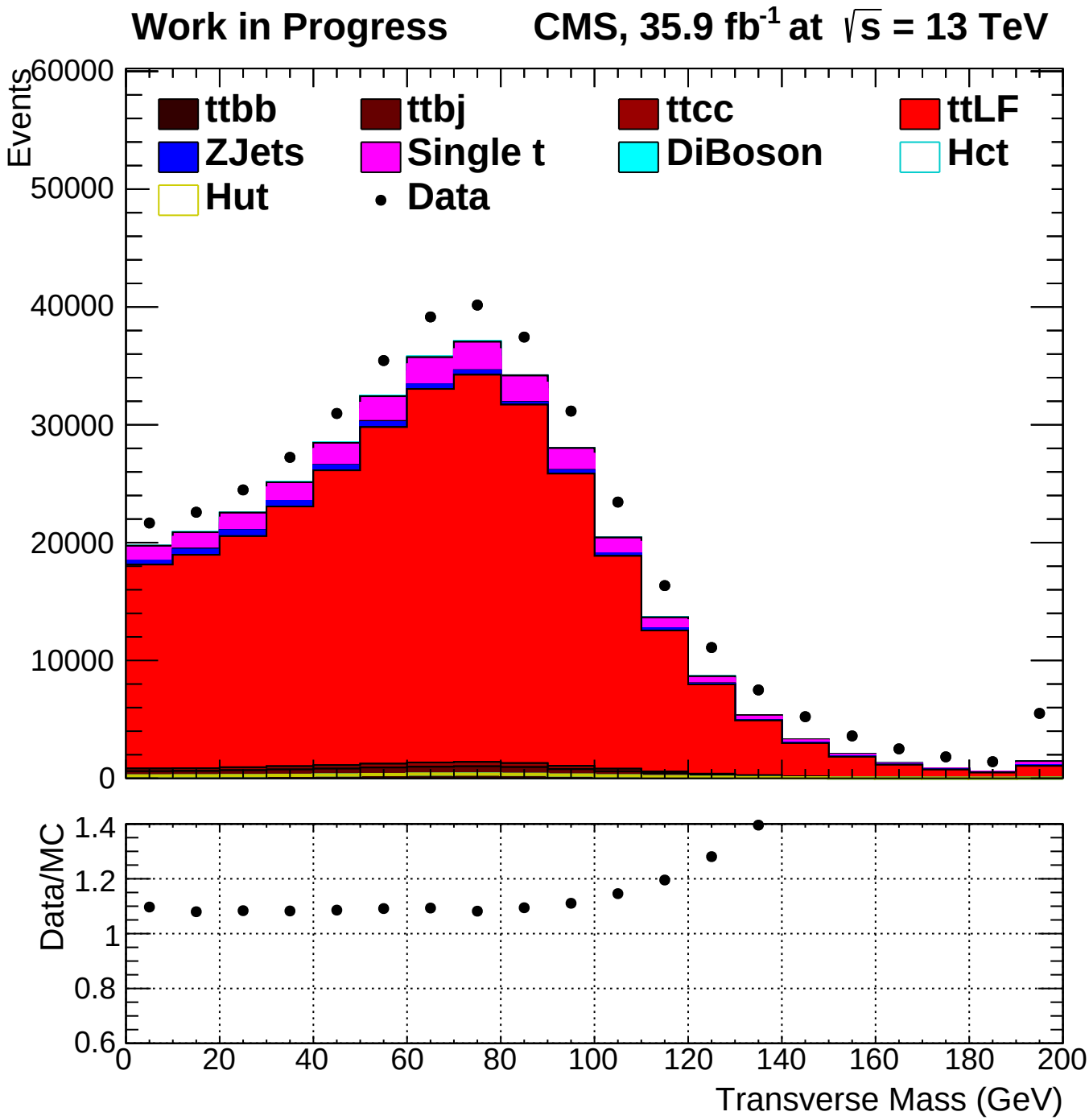

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

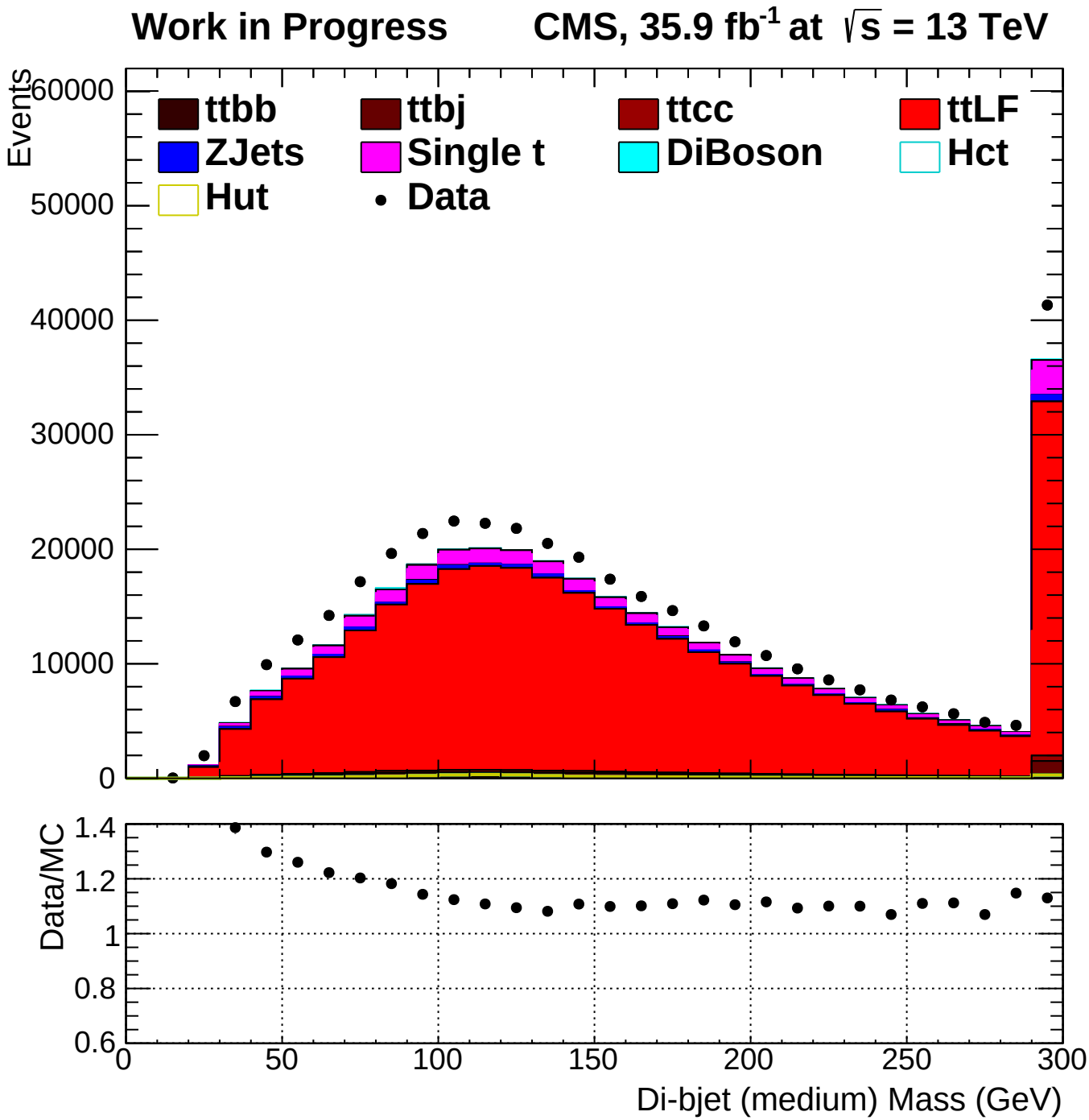

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

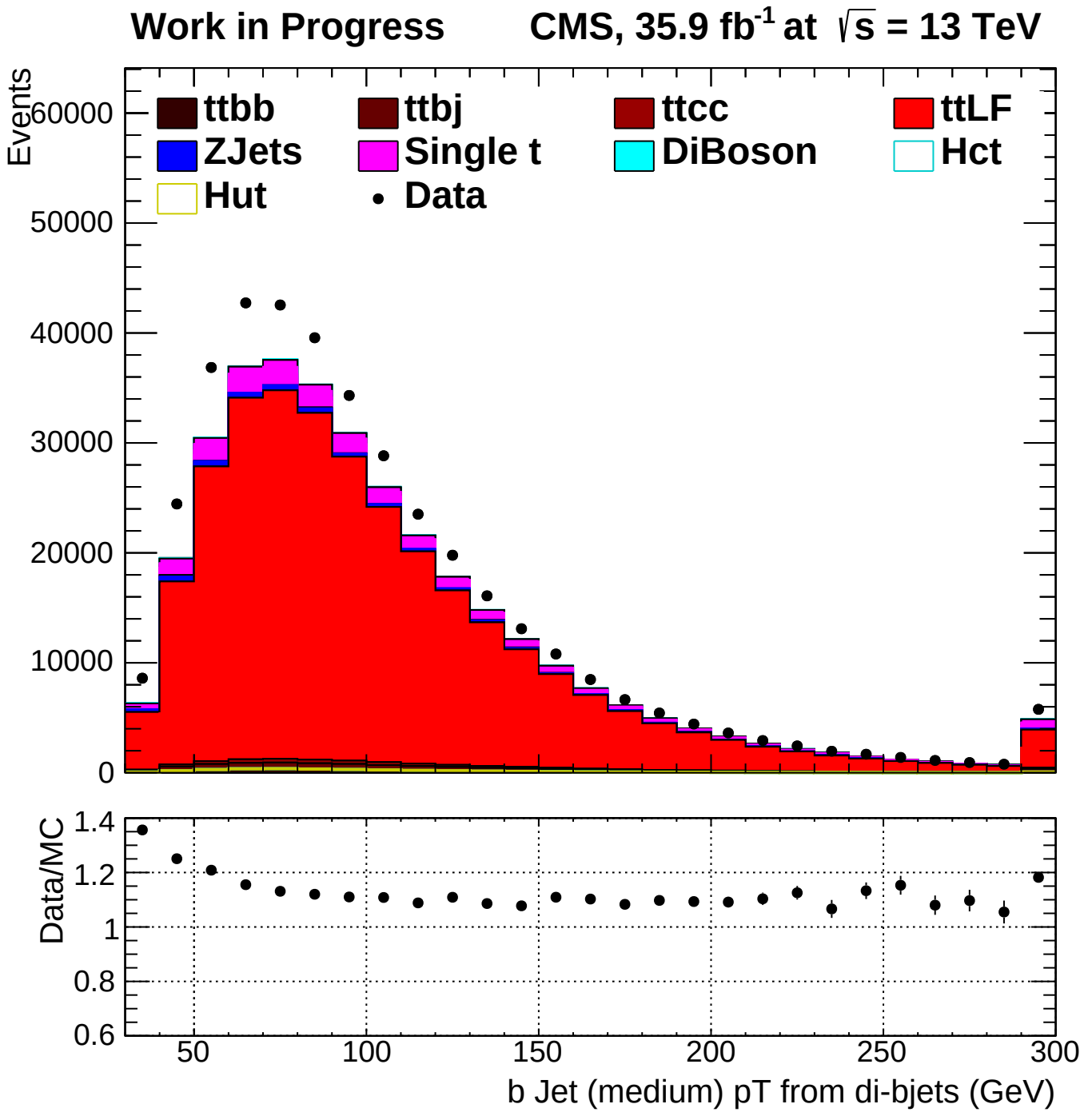

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

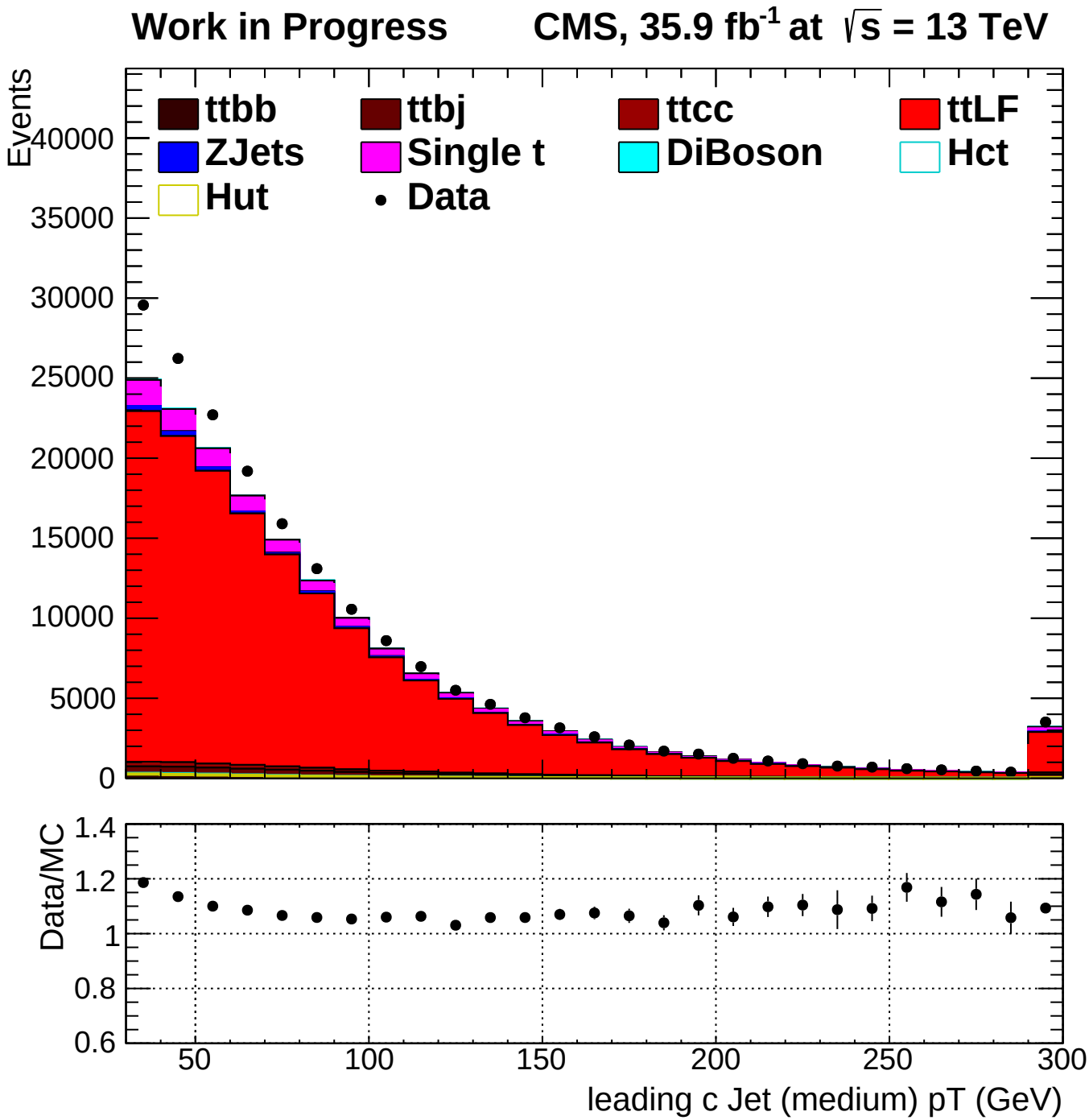

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)

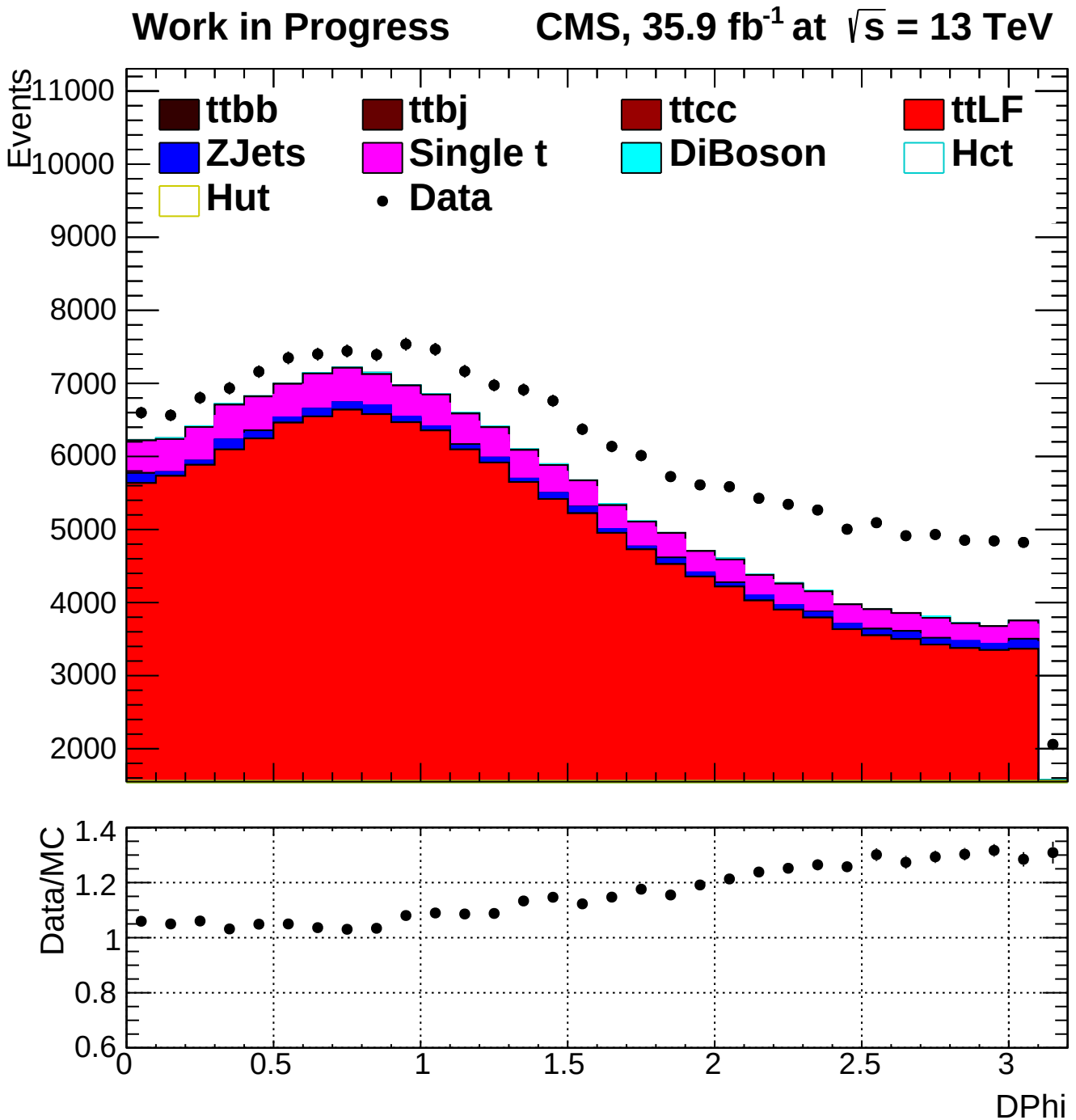

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)

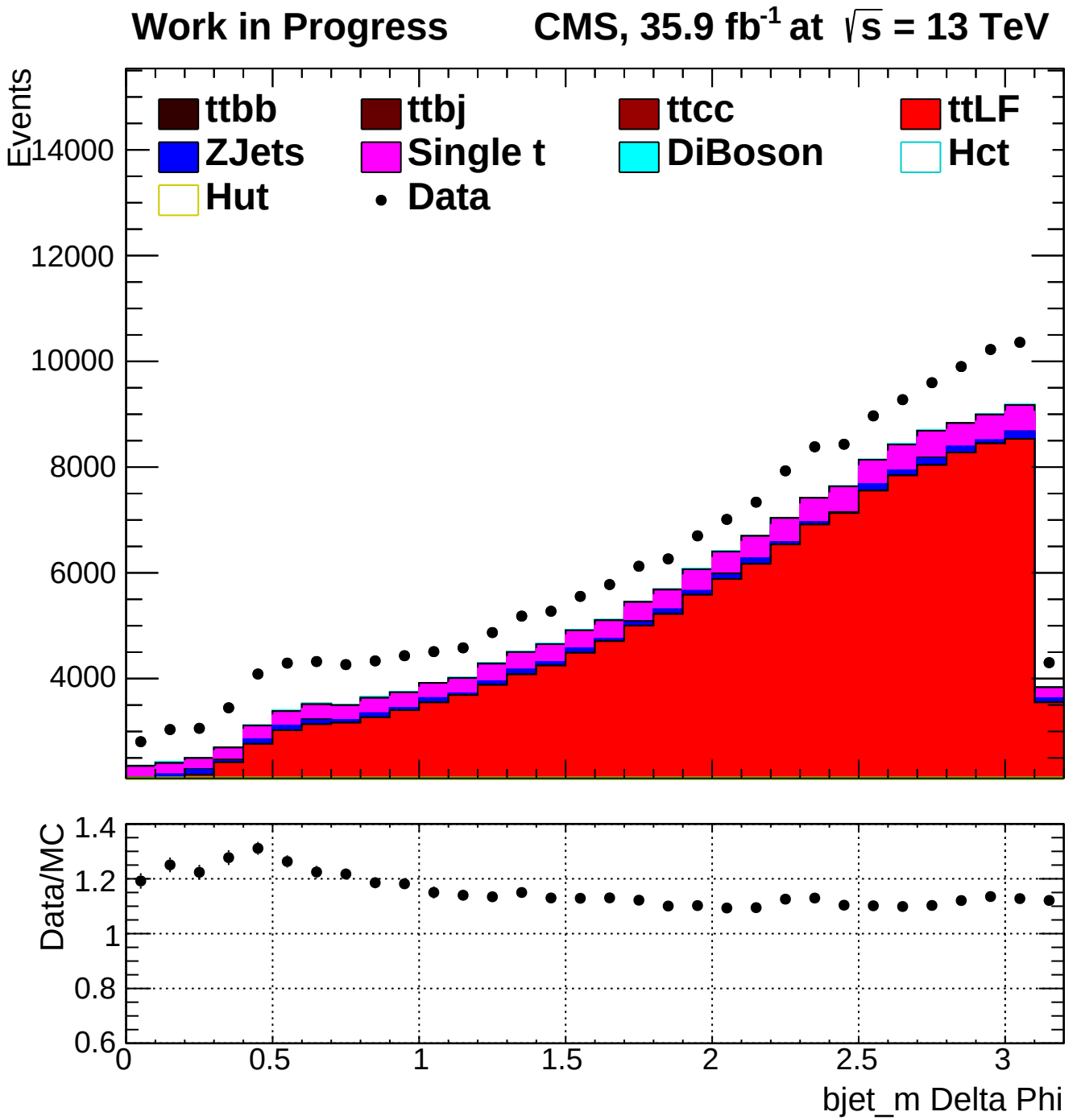

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

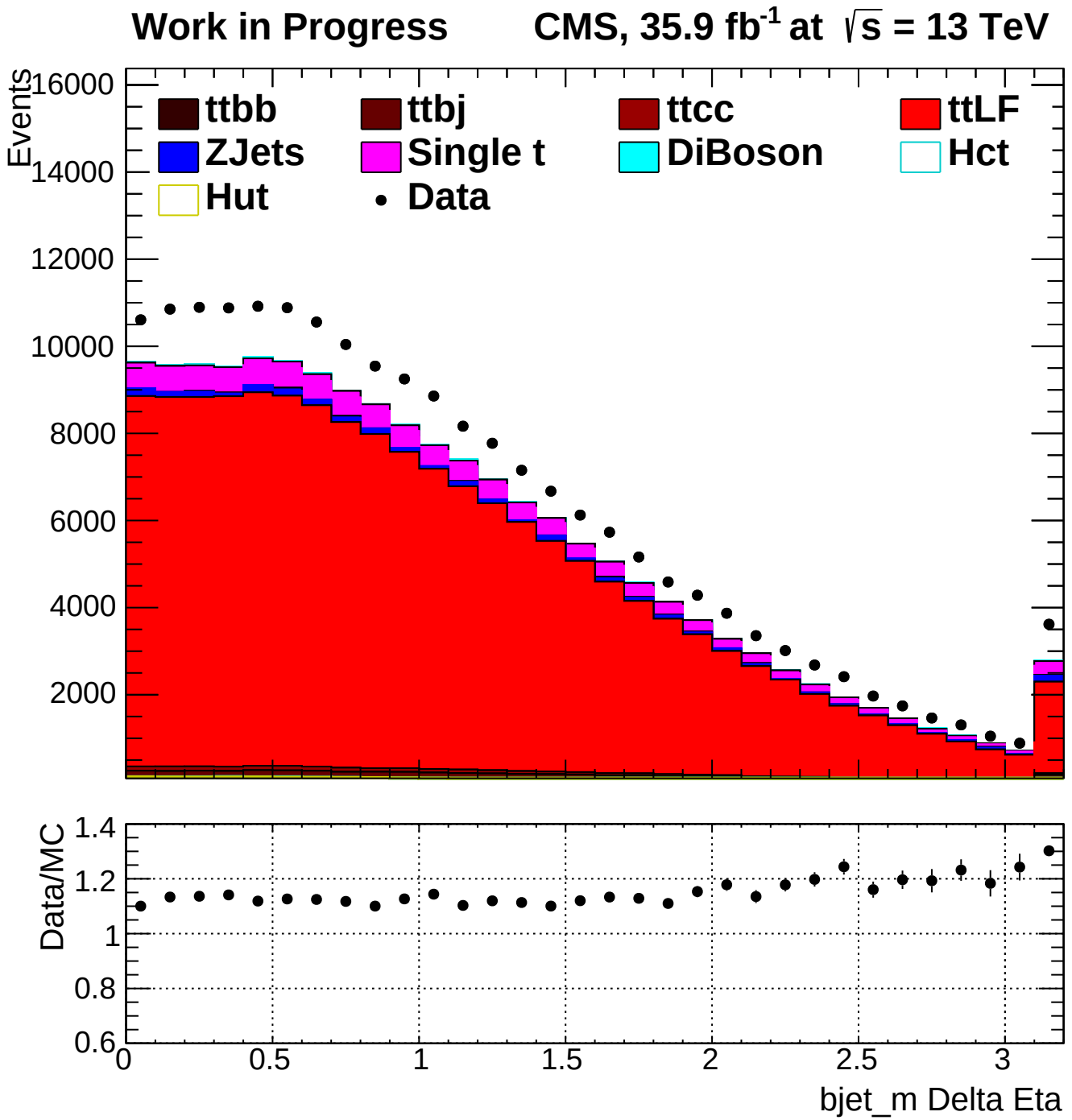

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

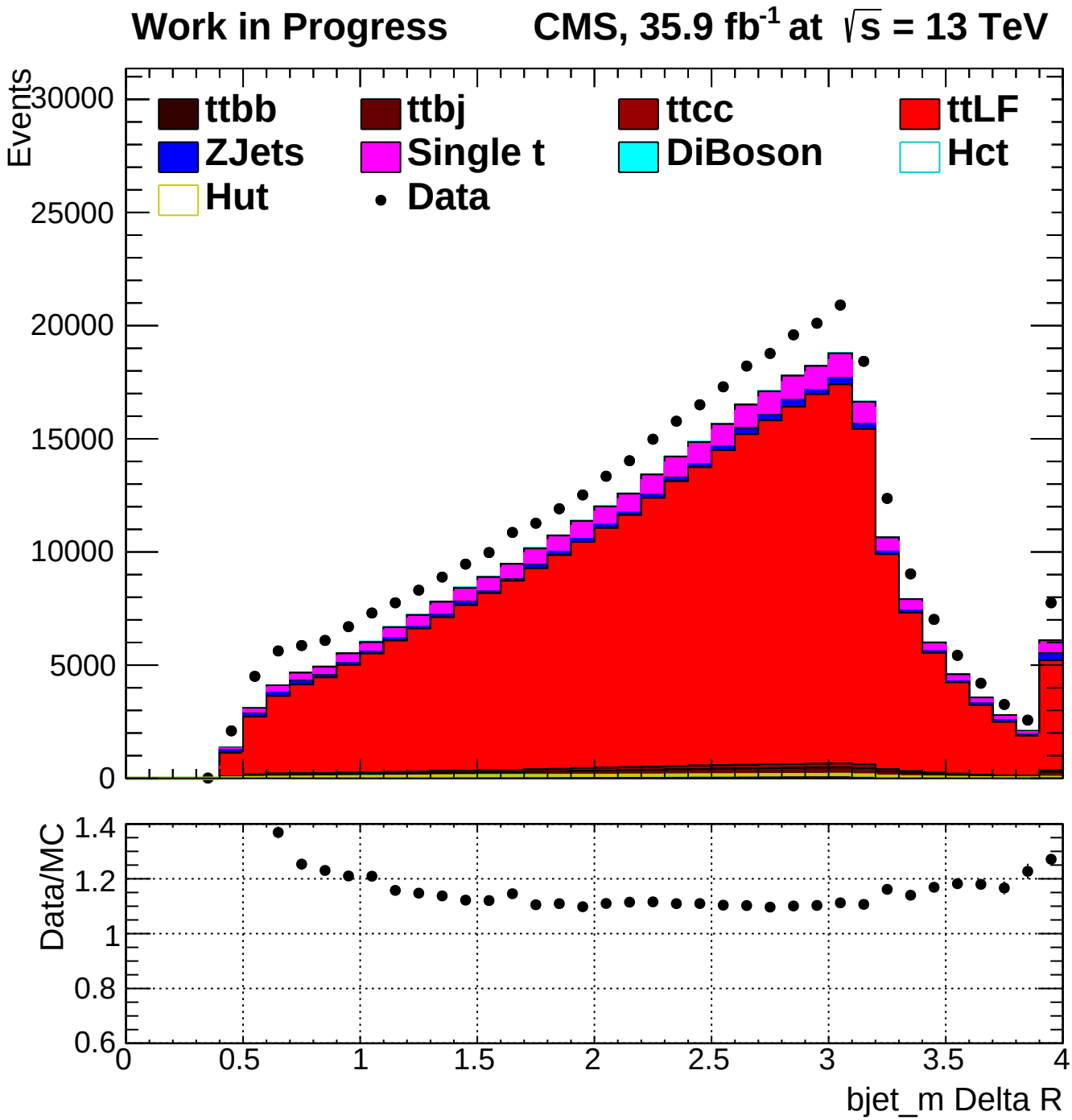

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

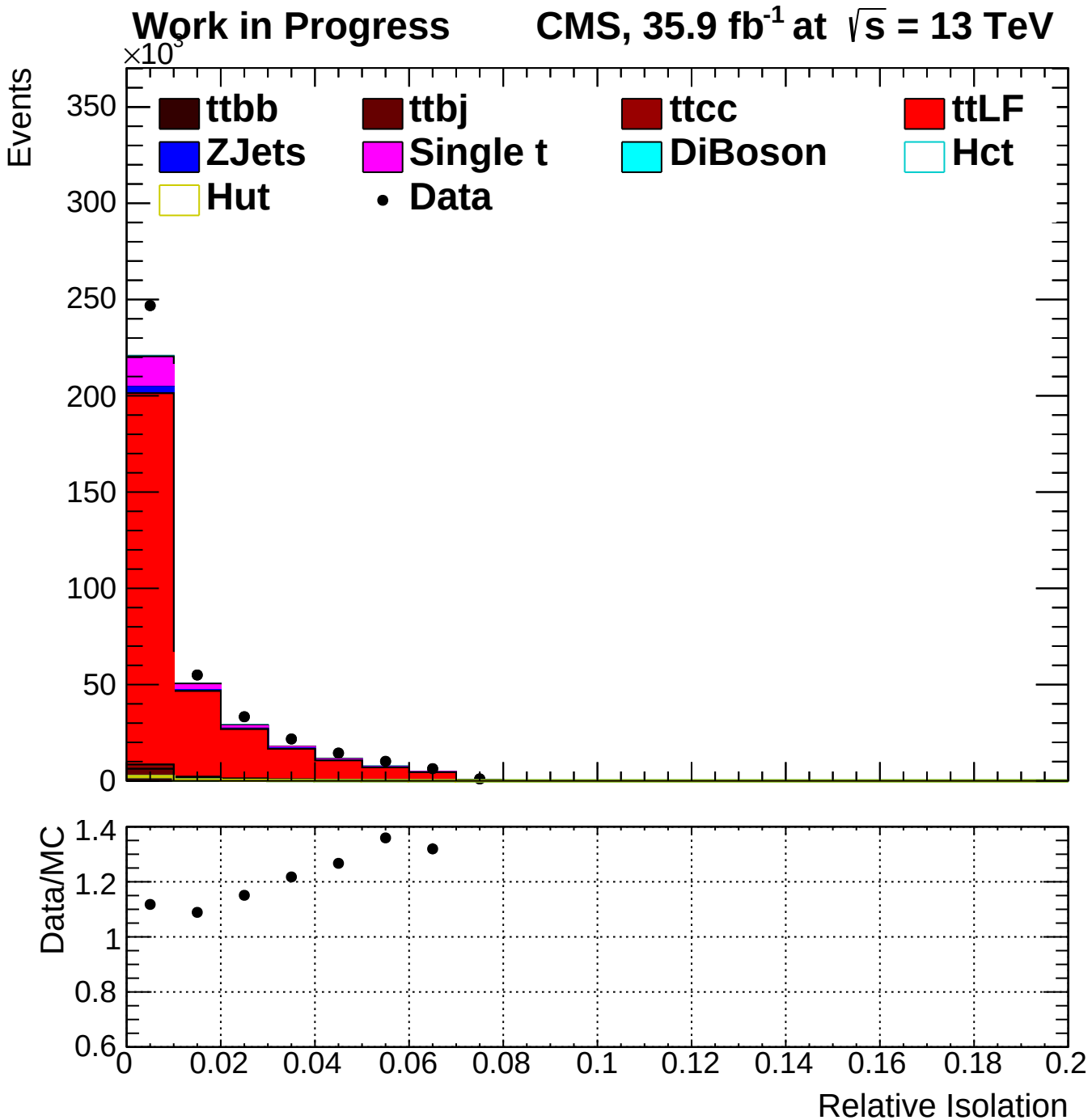

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

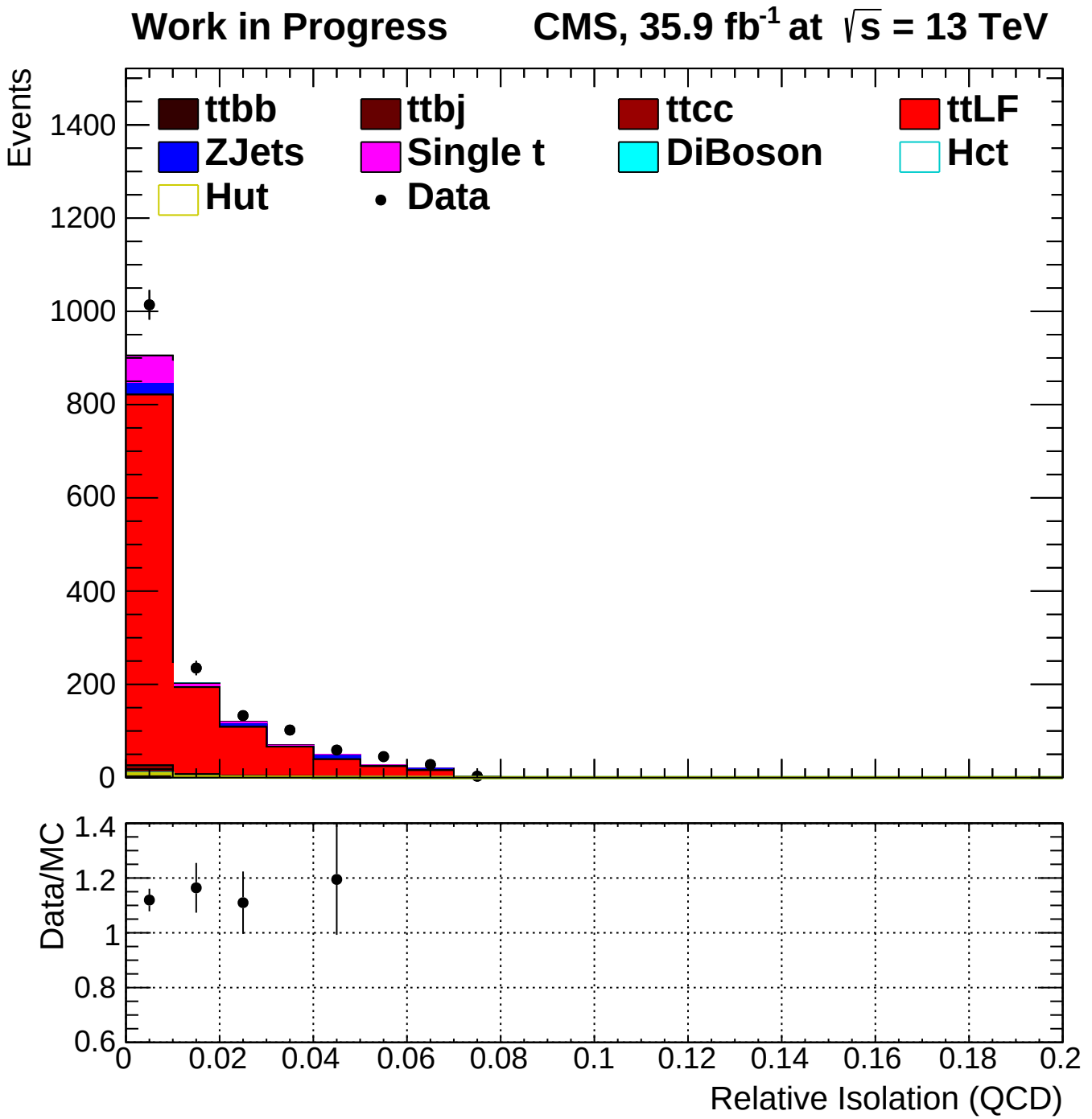

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

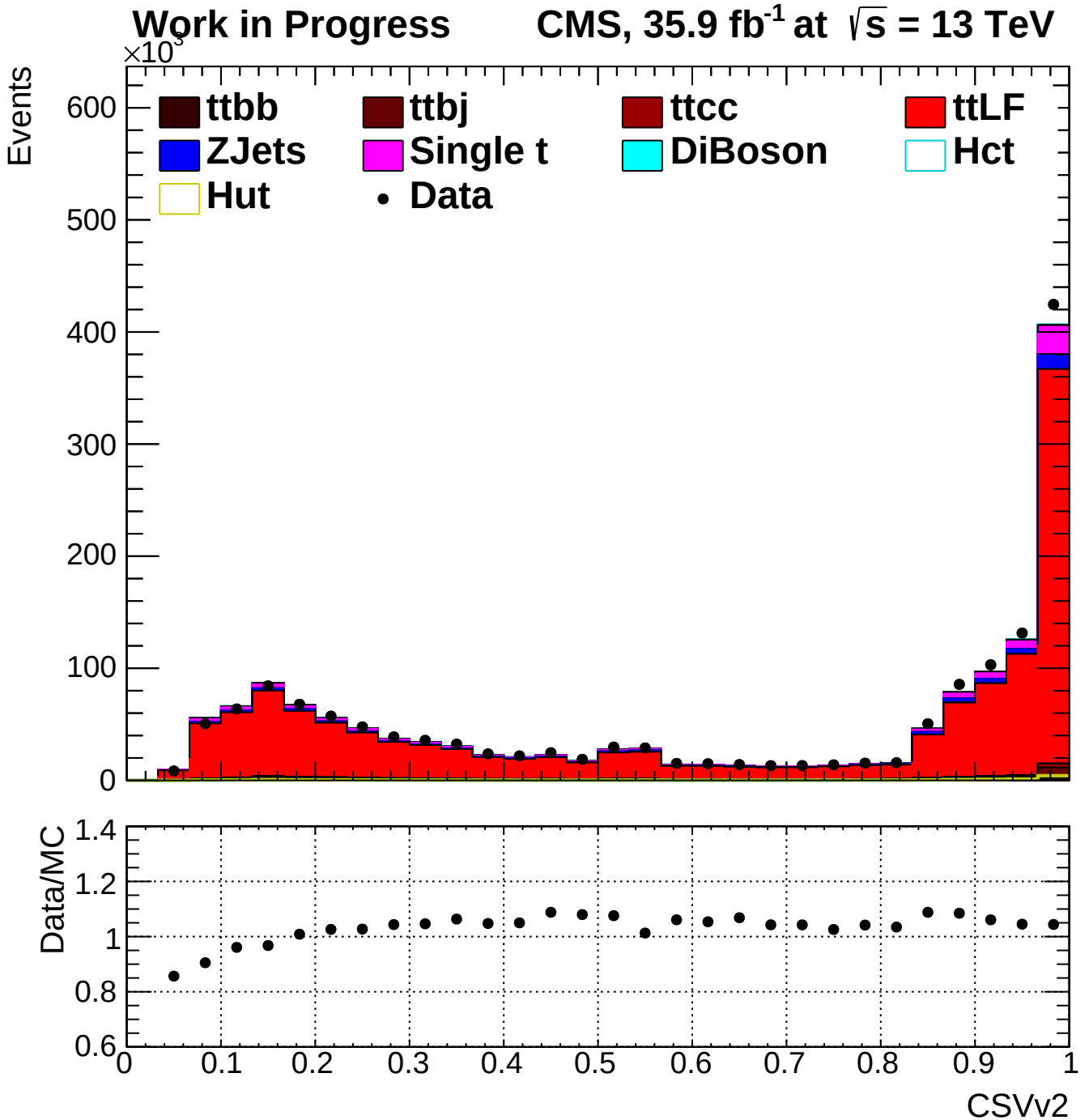

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
14000
12000
10000
8000
6000
4000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

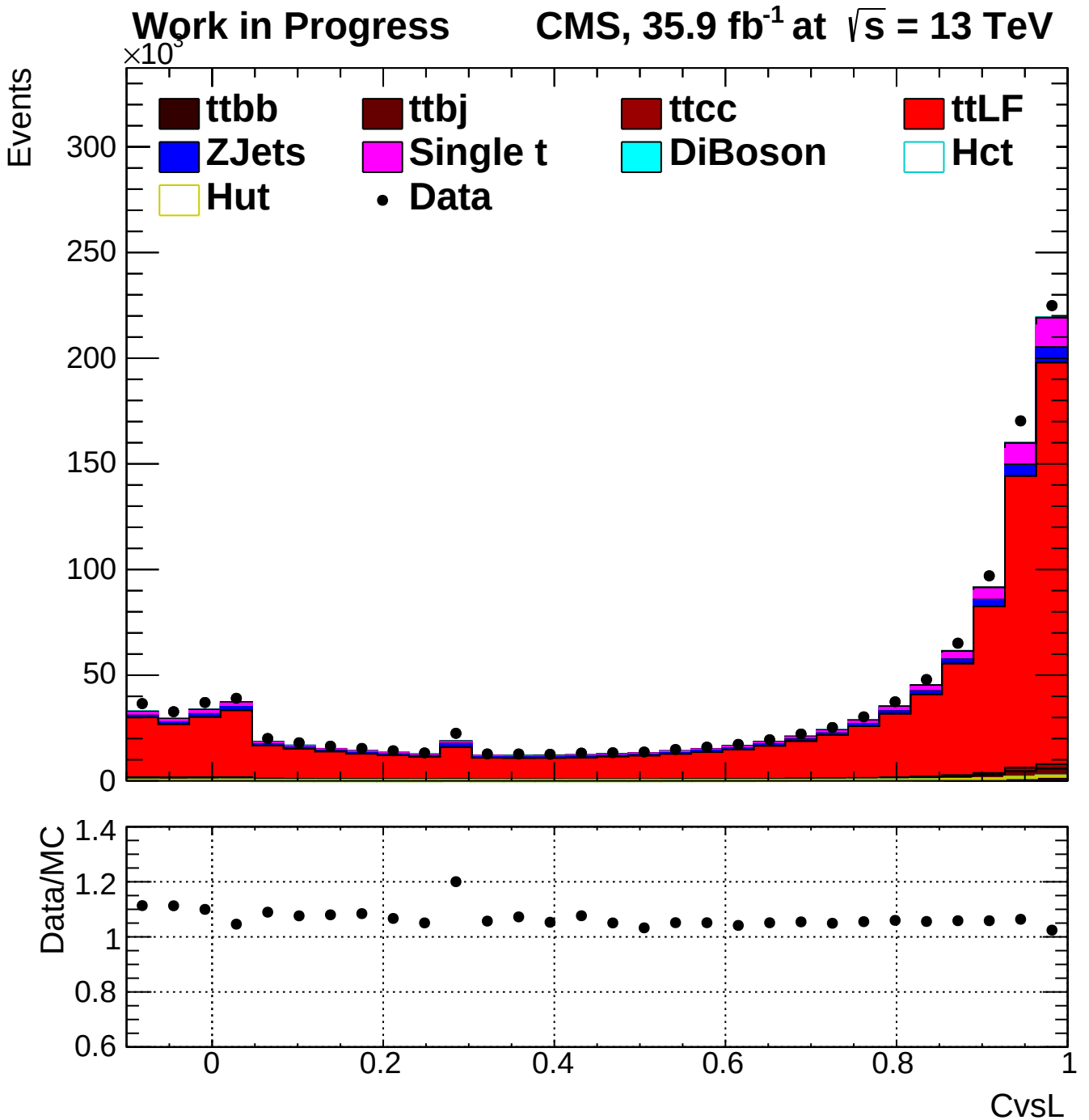

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

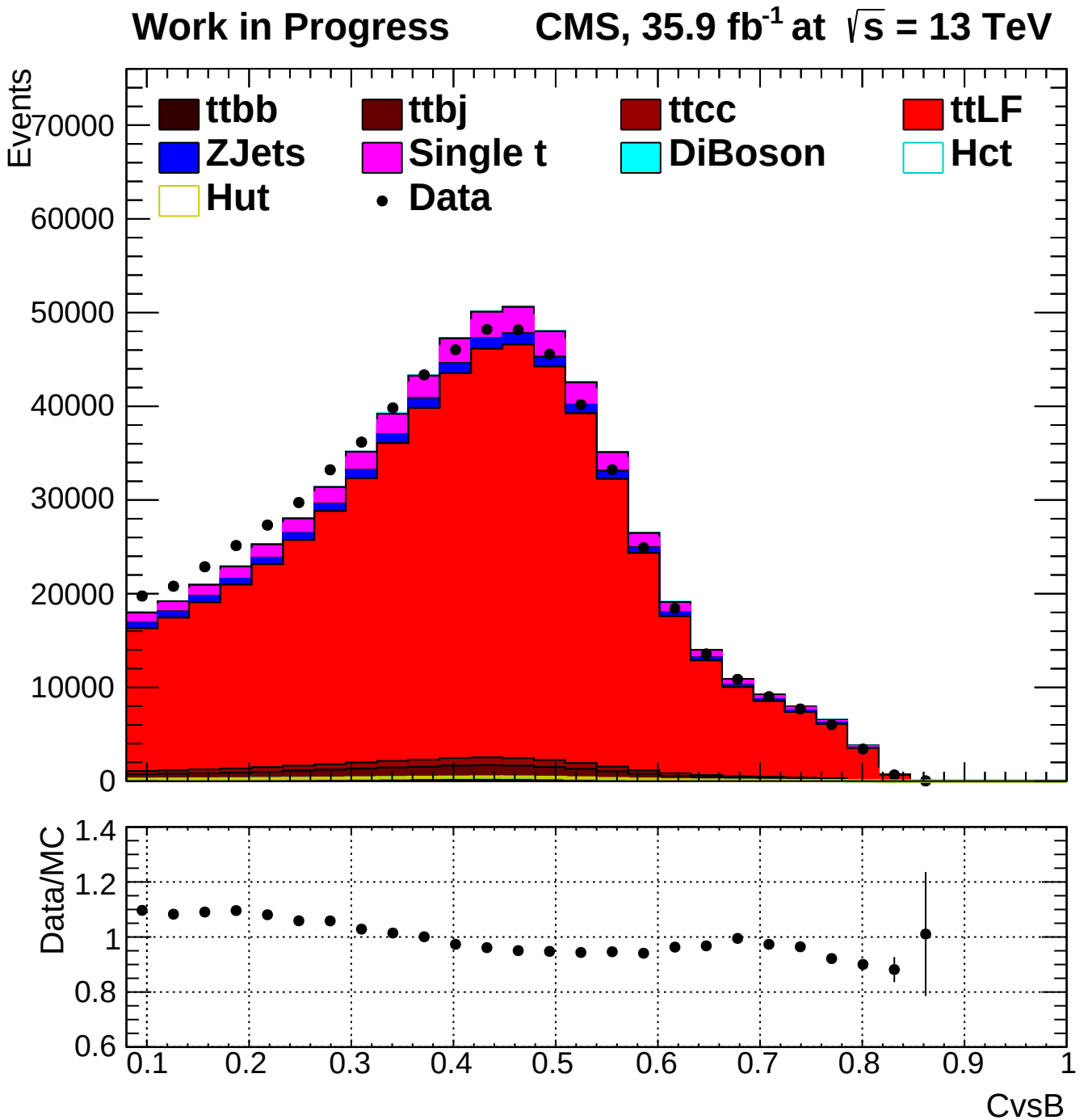

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

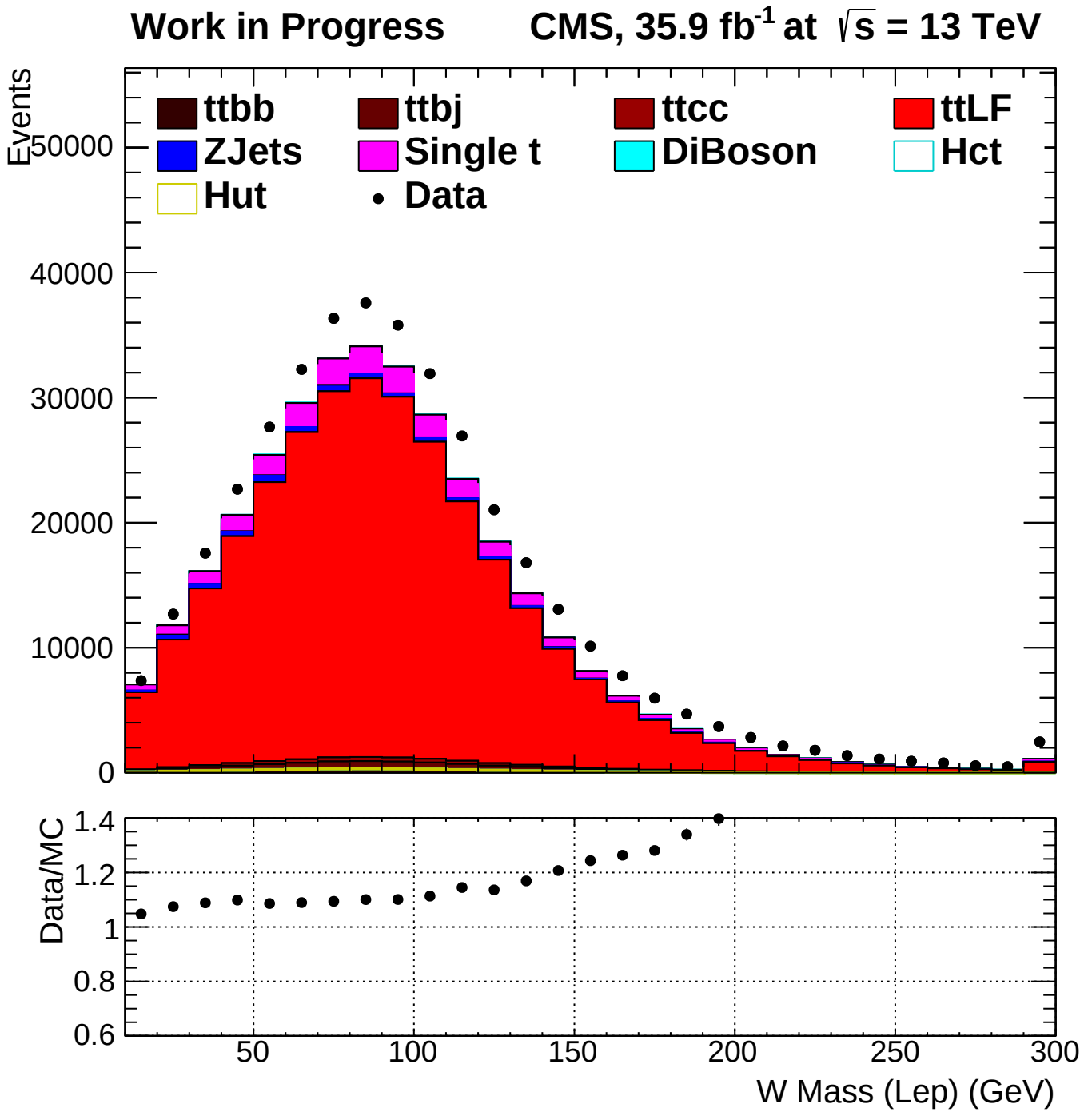

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
350
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

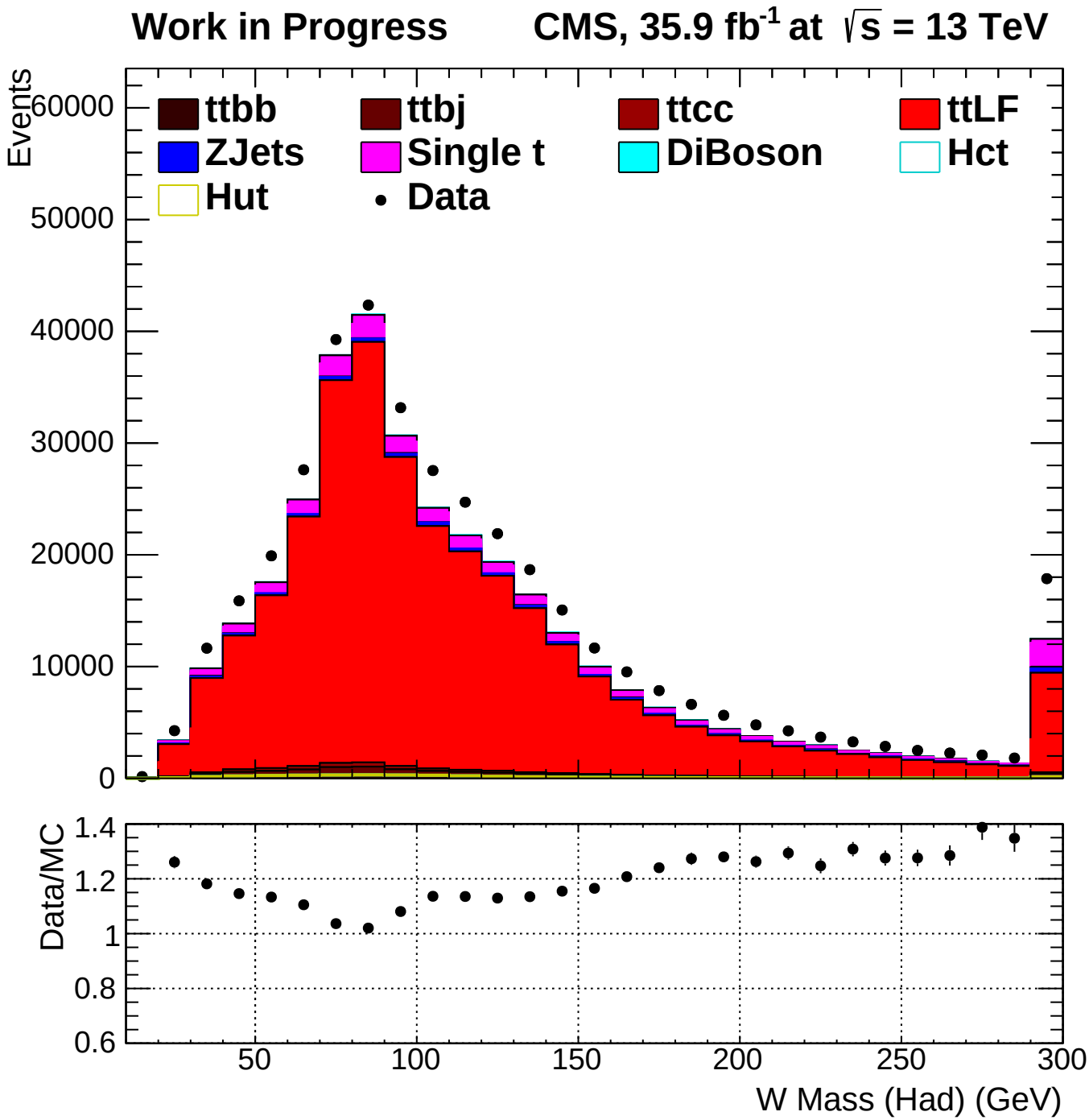

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

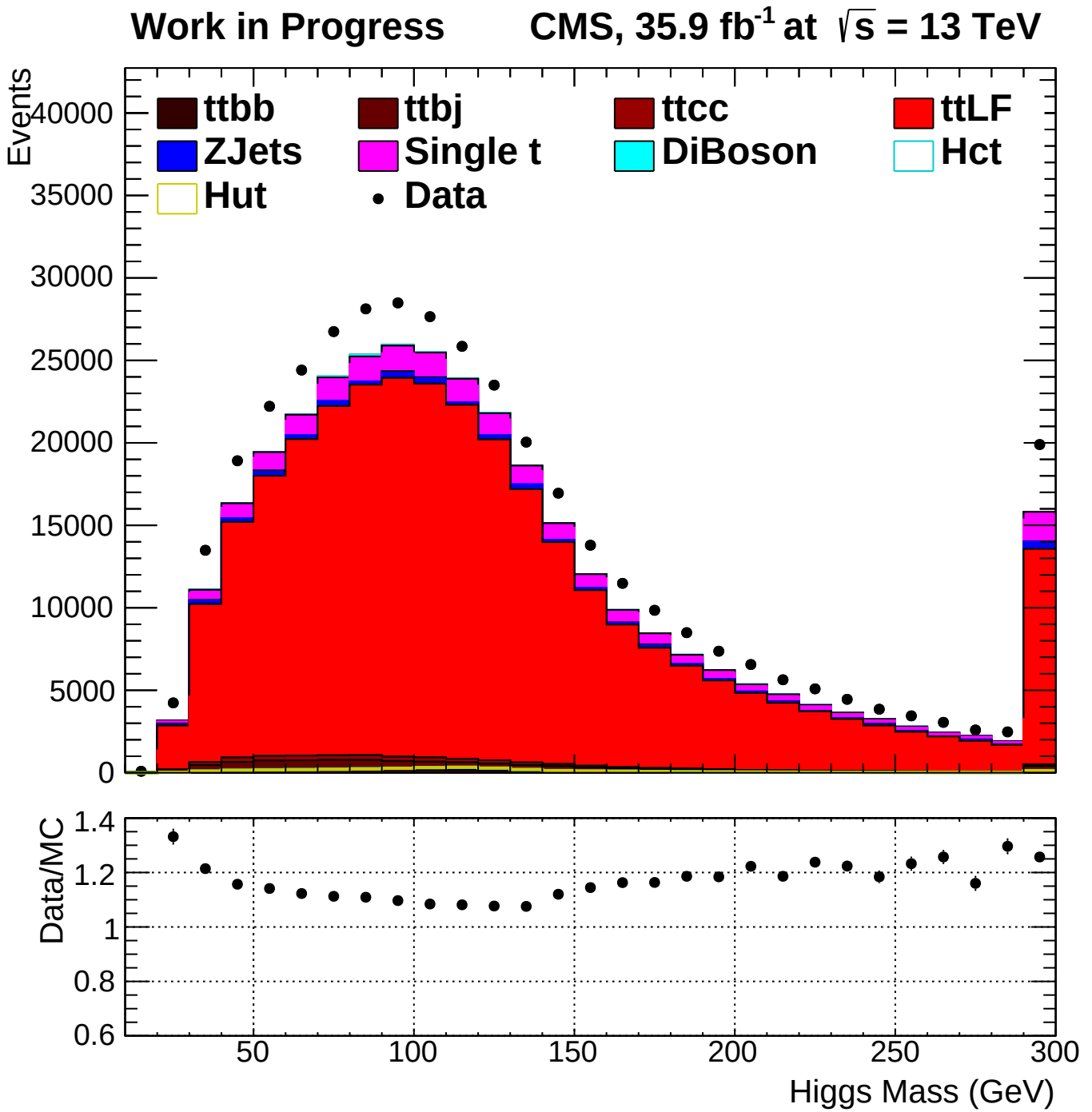

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

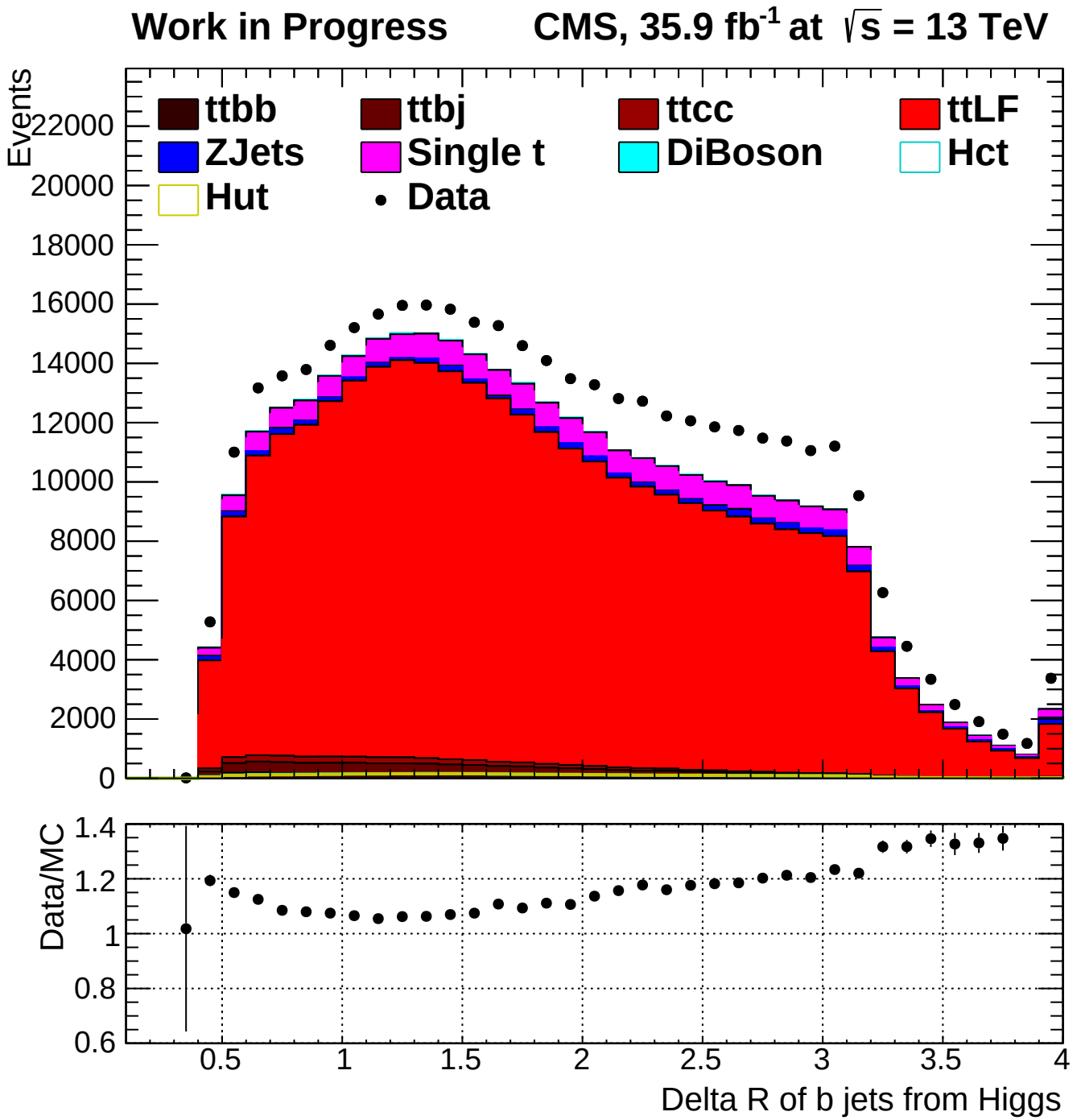

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

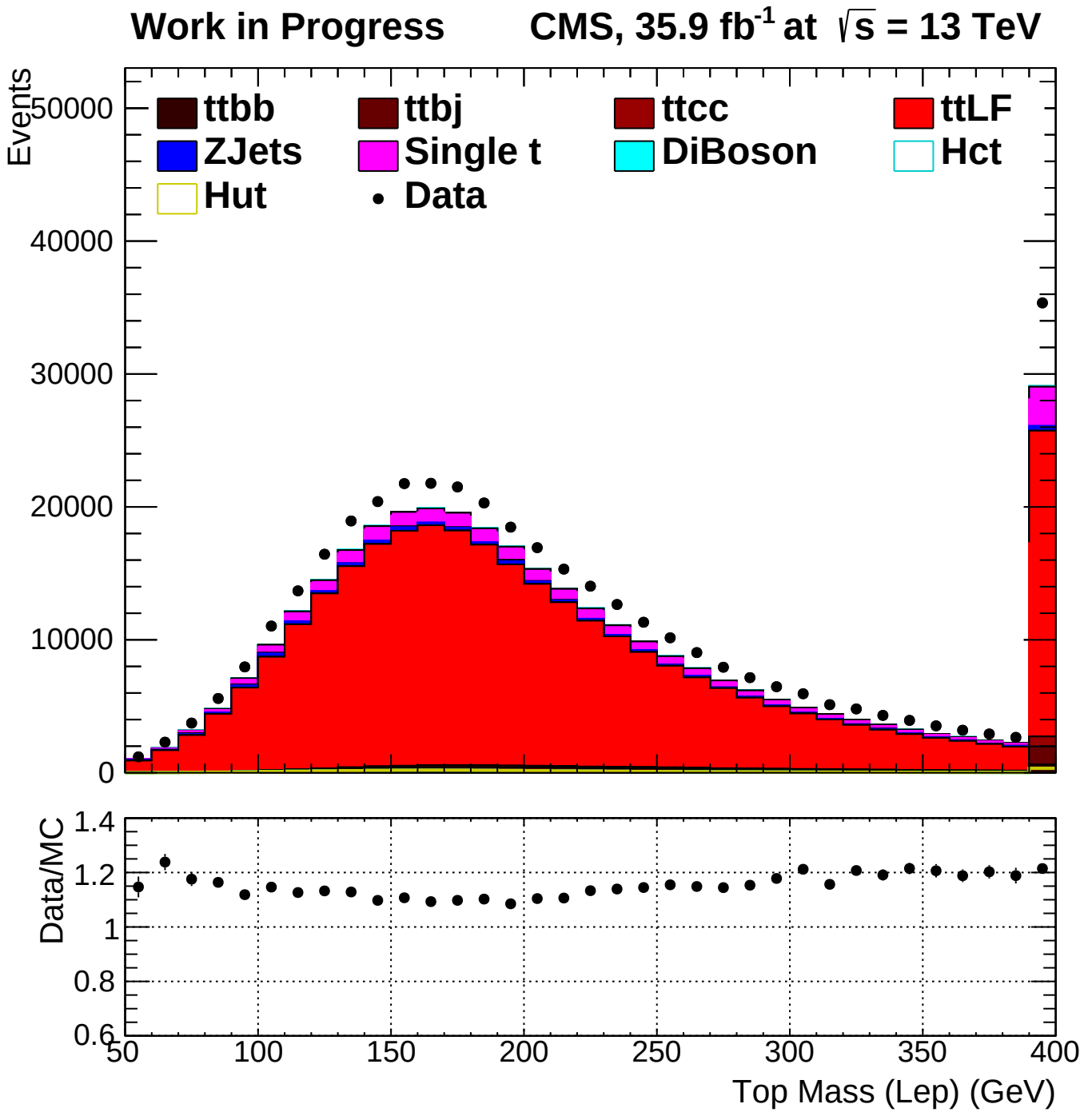

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

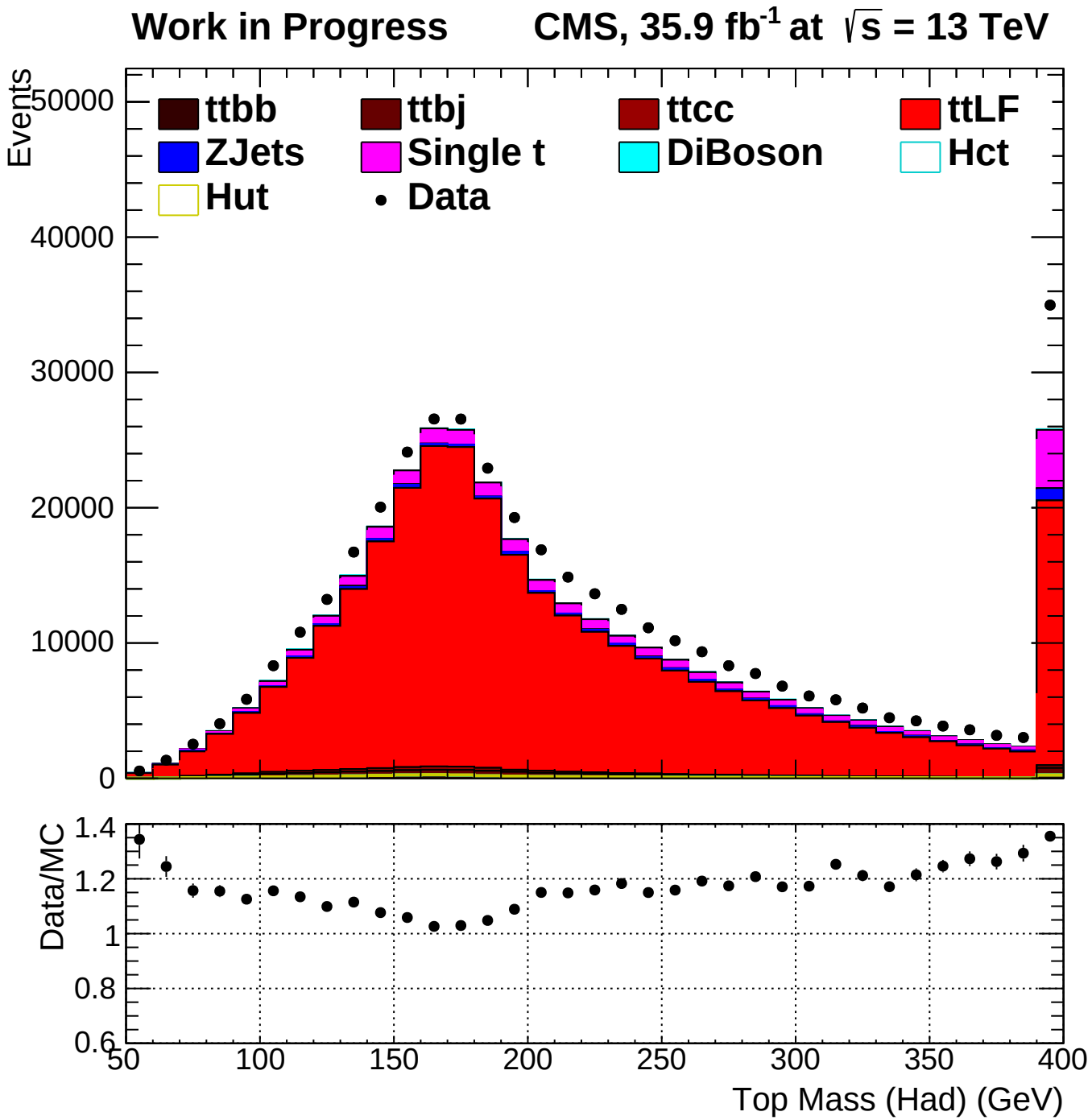

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)

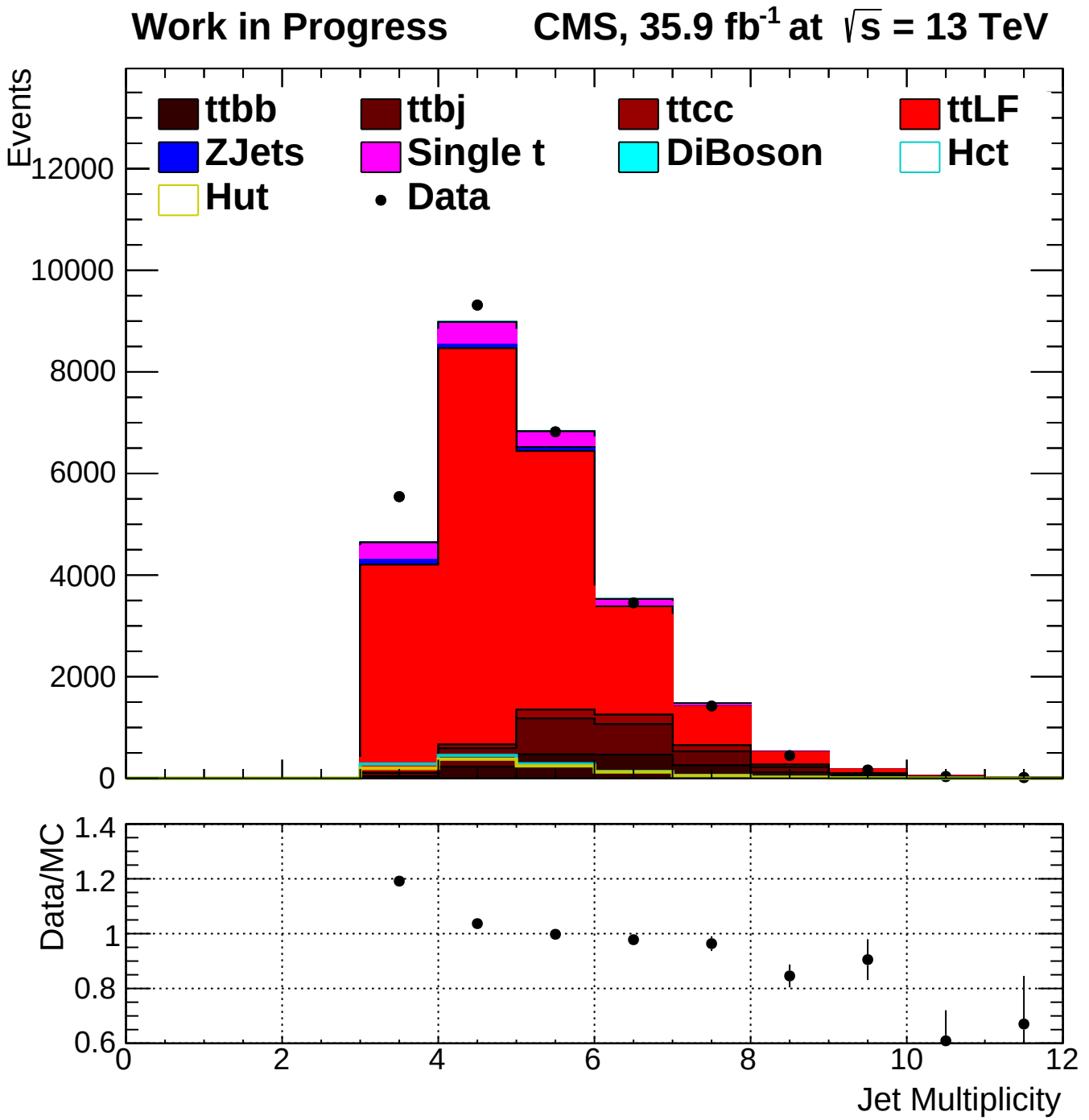

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)

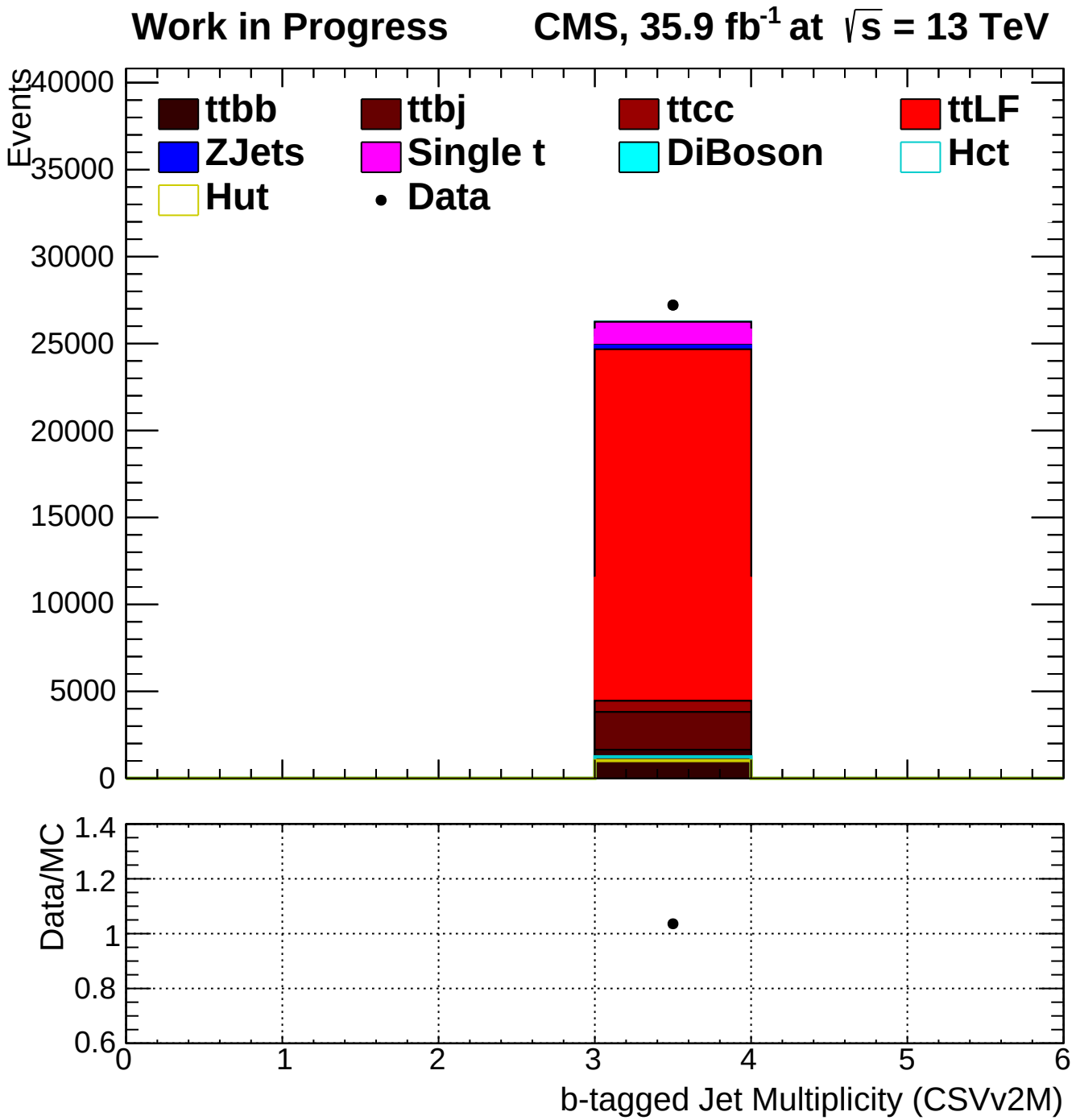

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

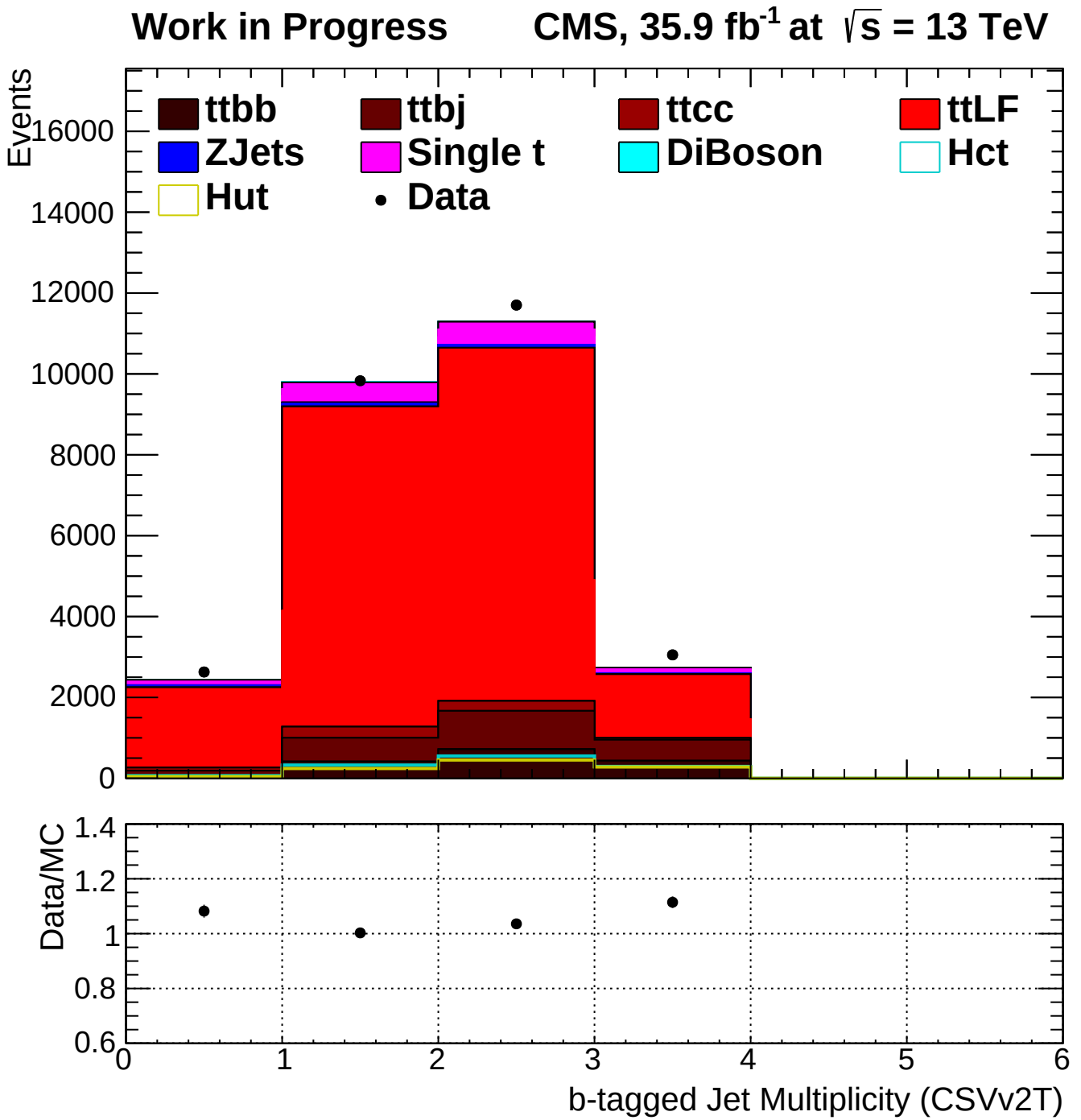

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

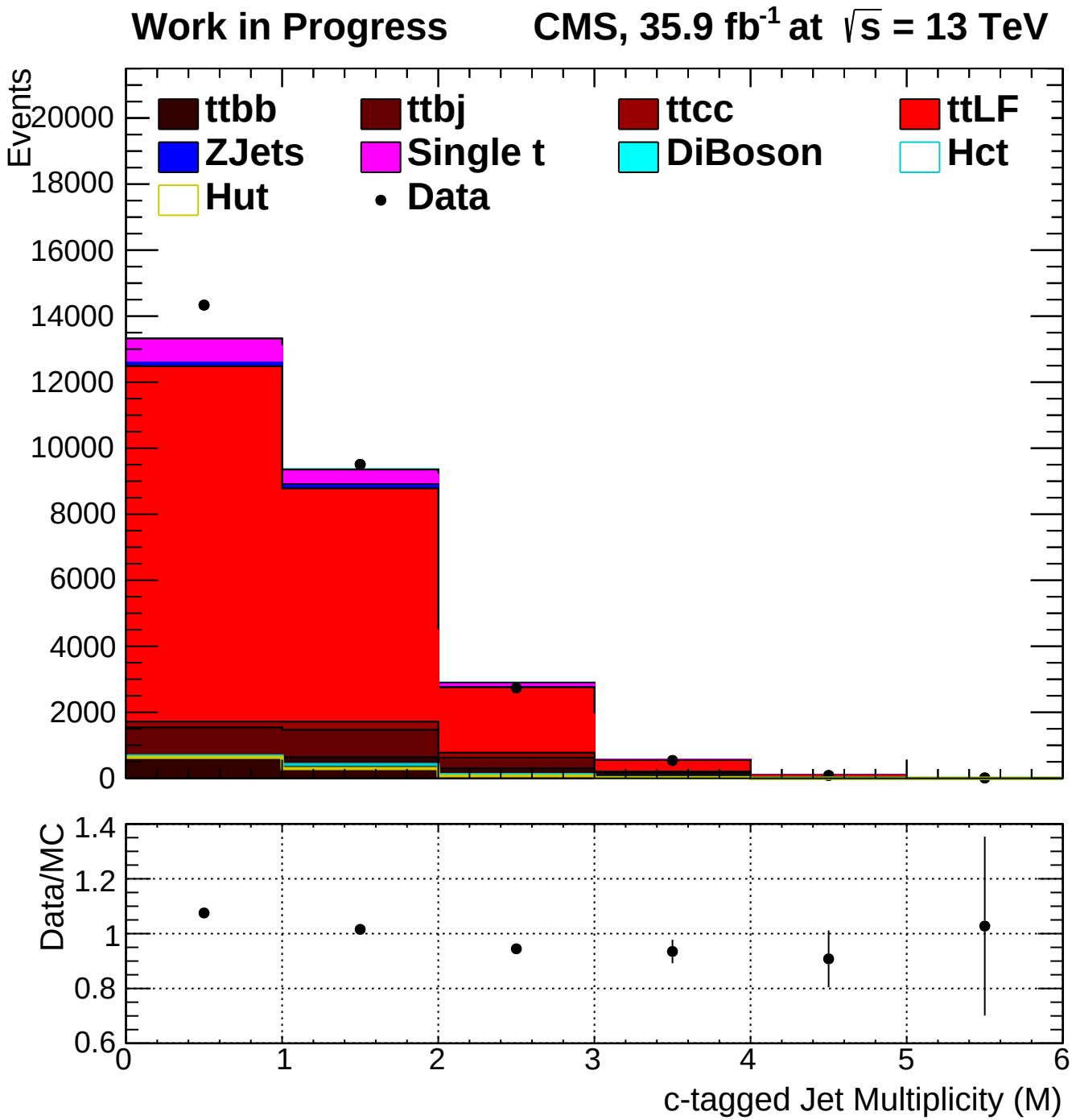

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)

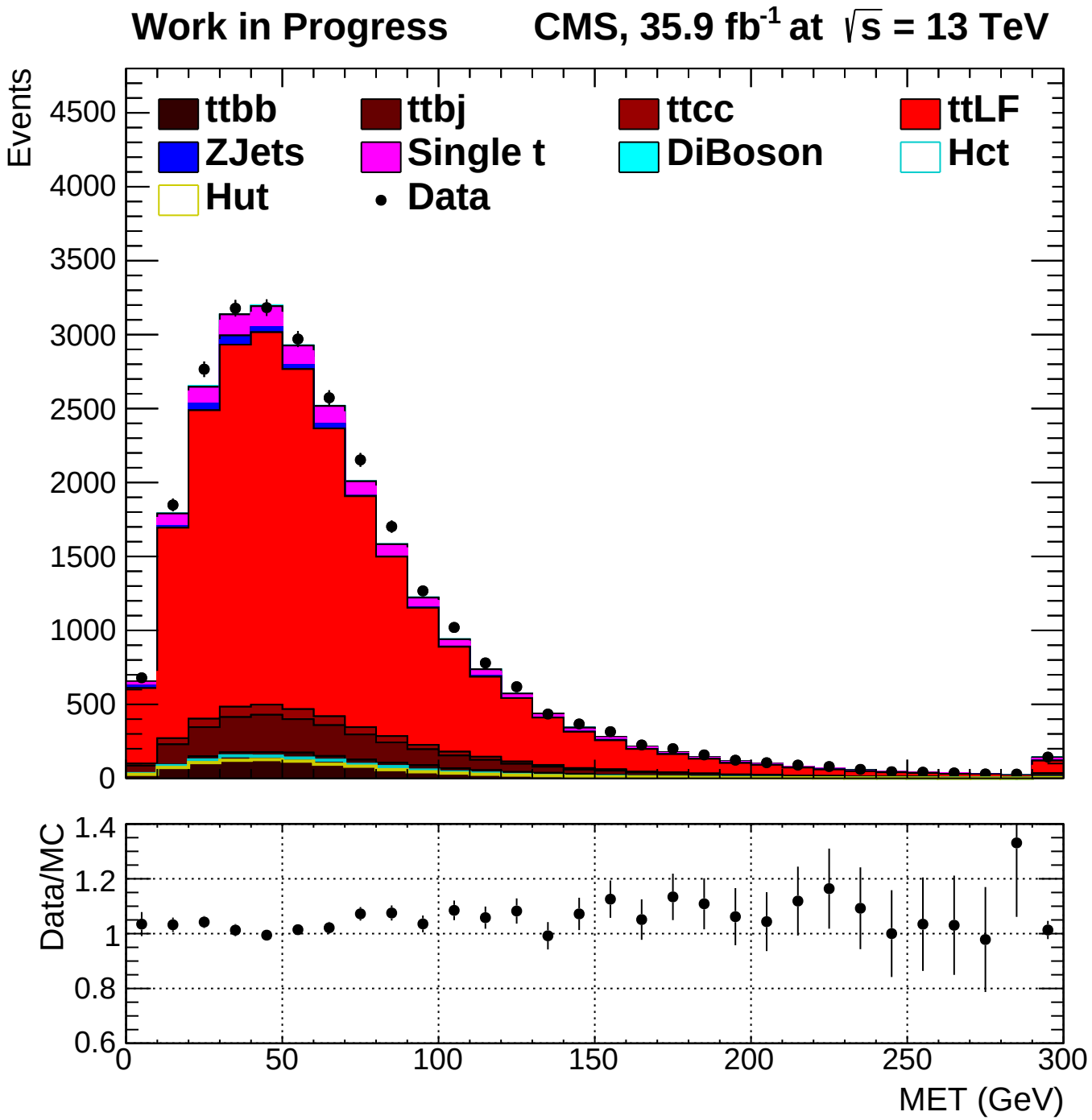

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Had) (GeV)

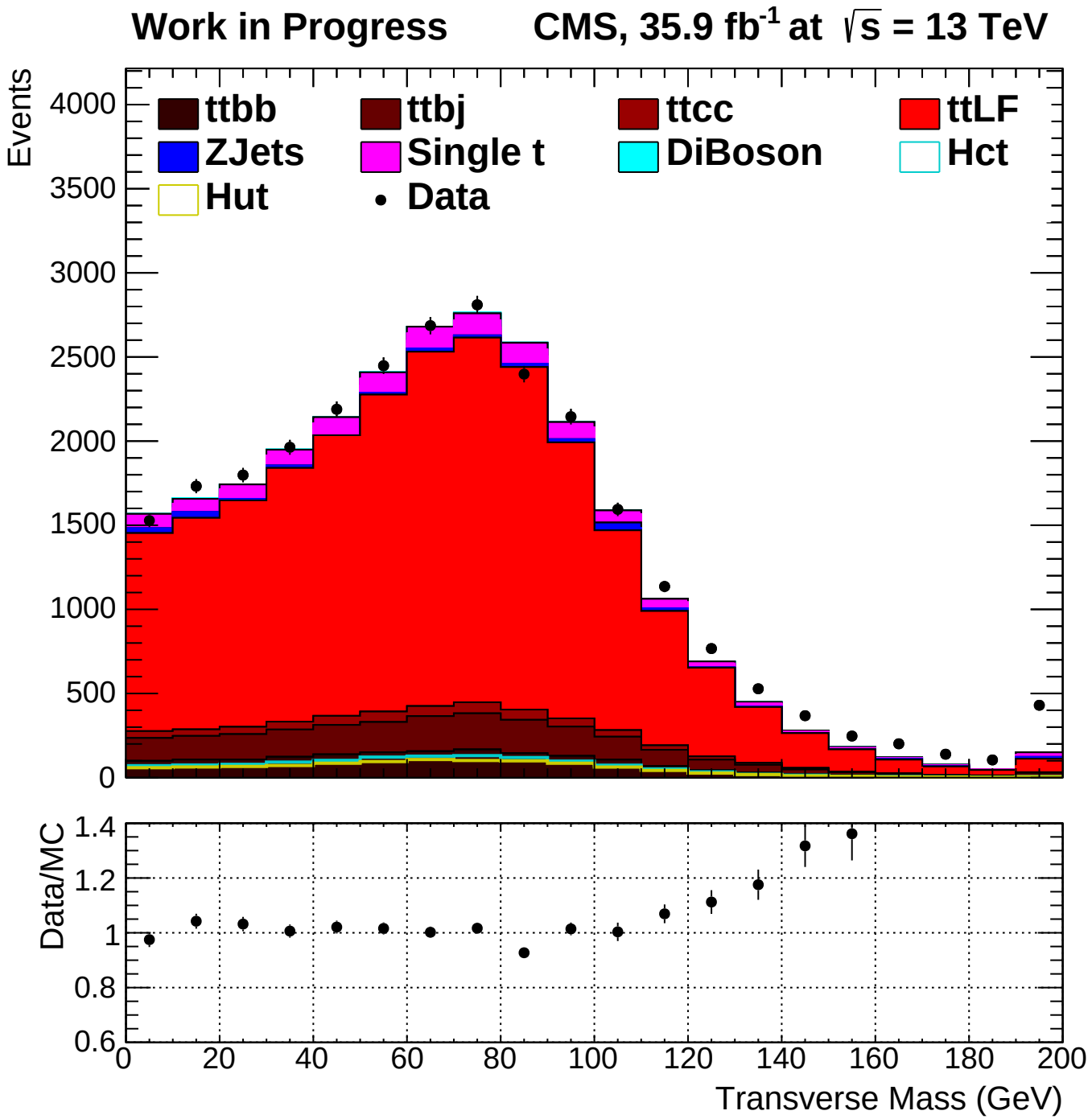

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity

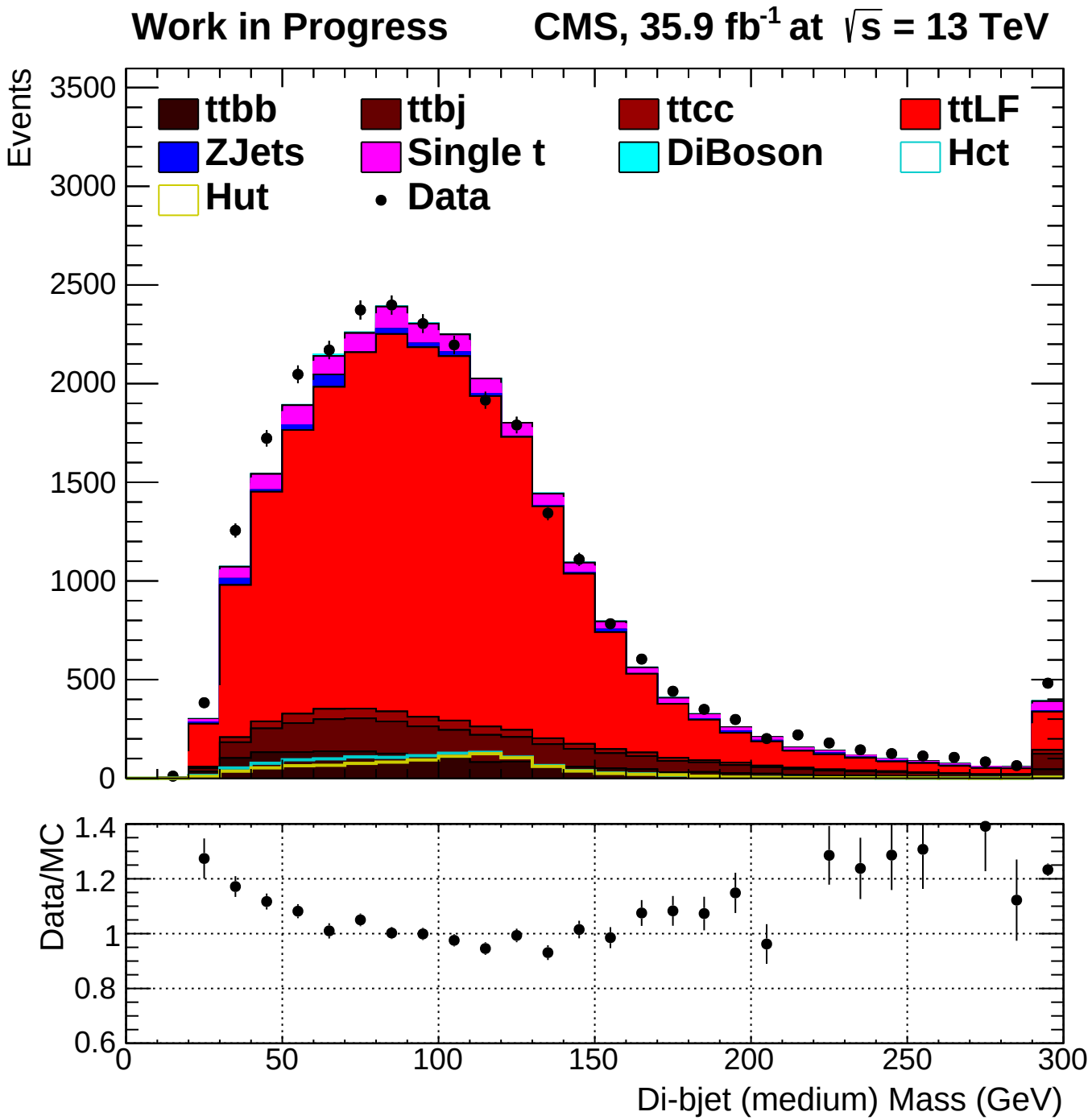

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

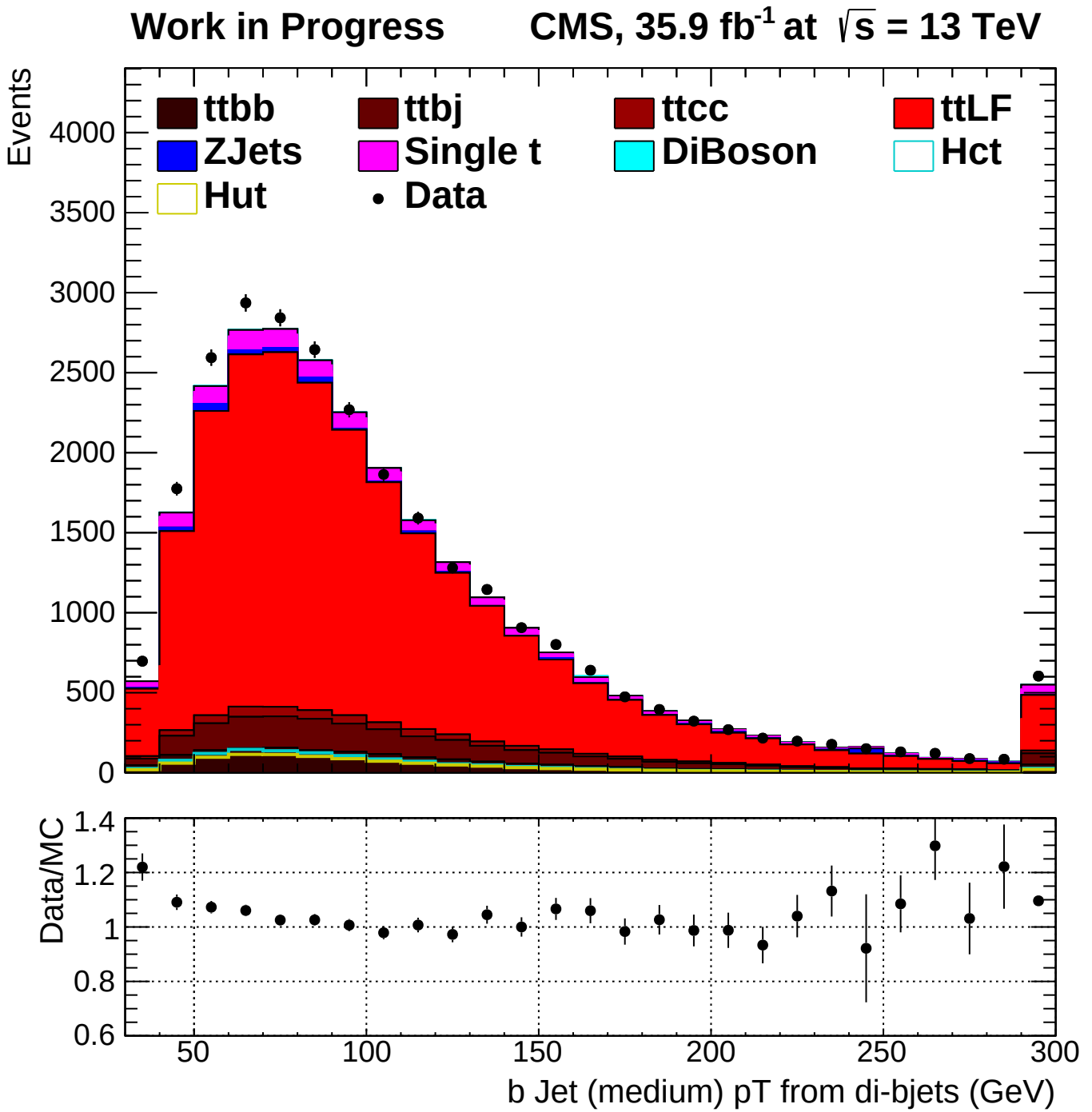

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16000
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

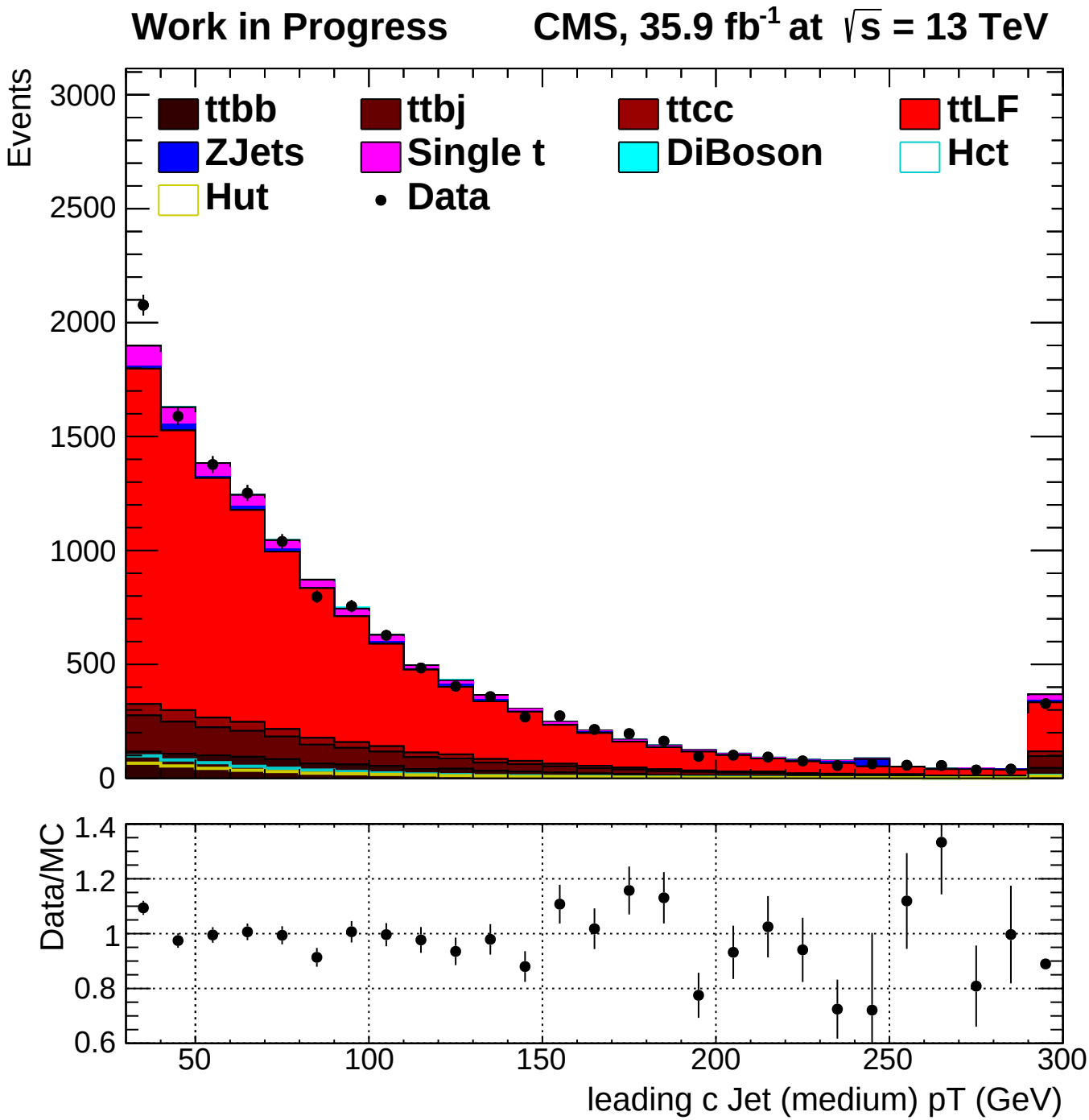

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)

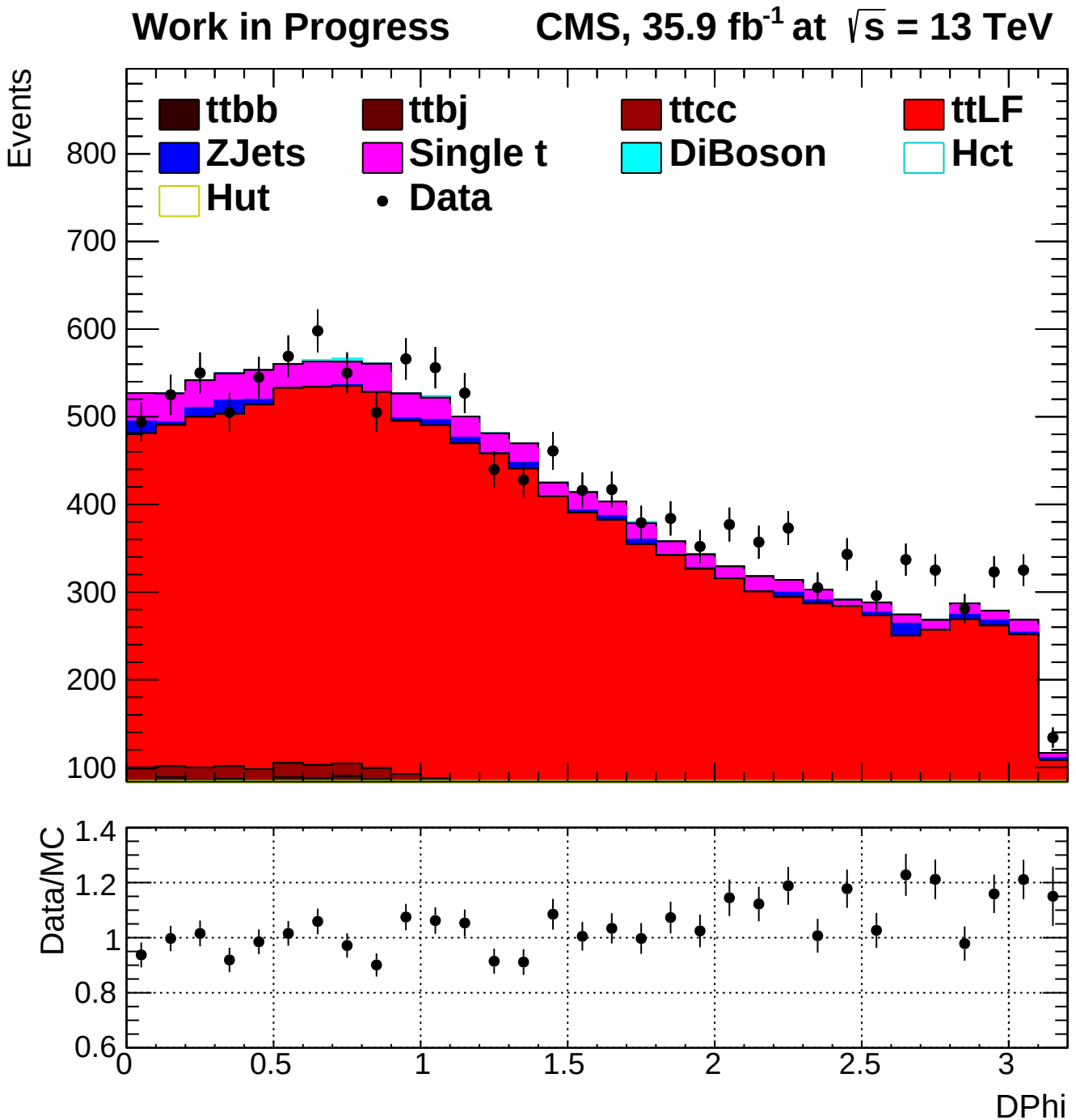

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

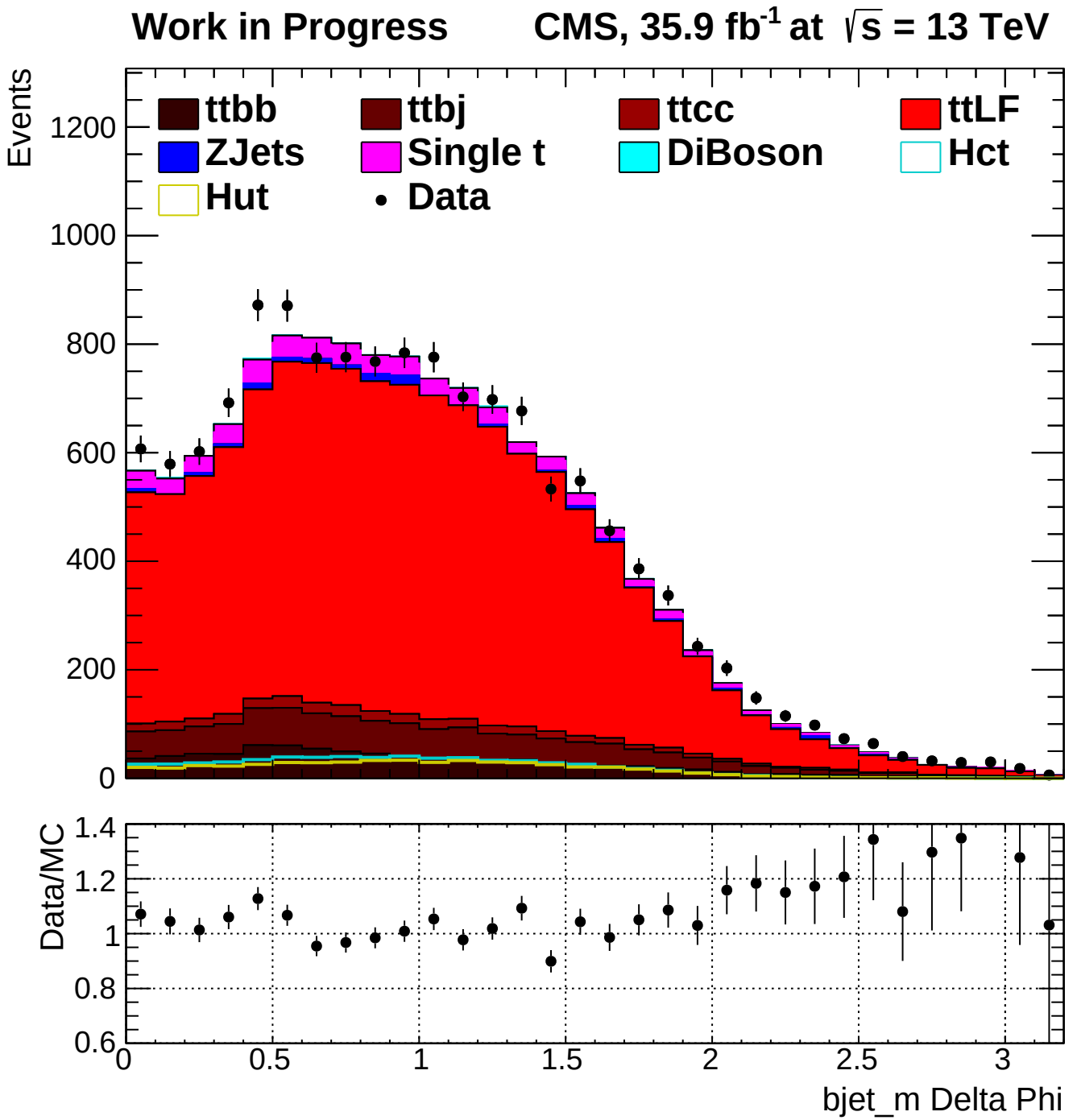

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

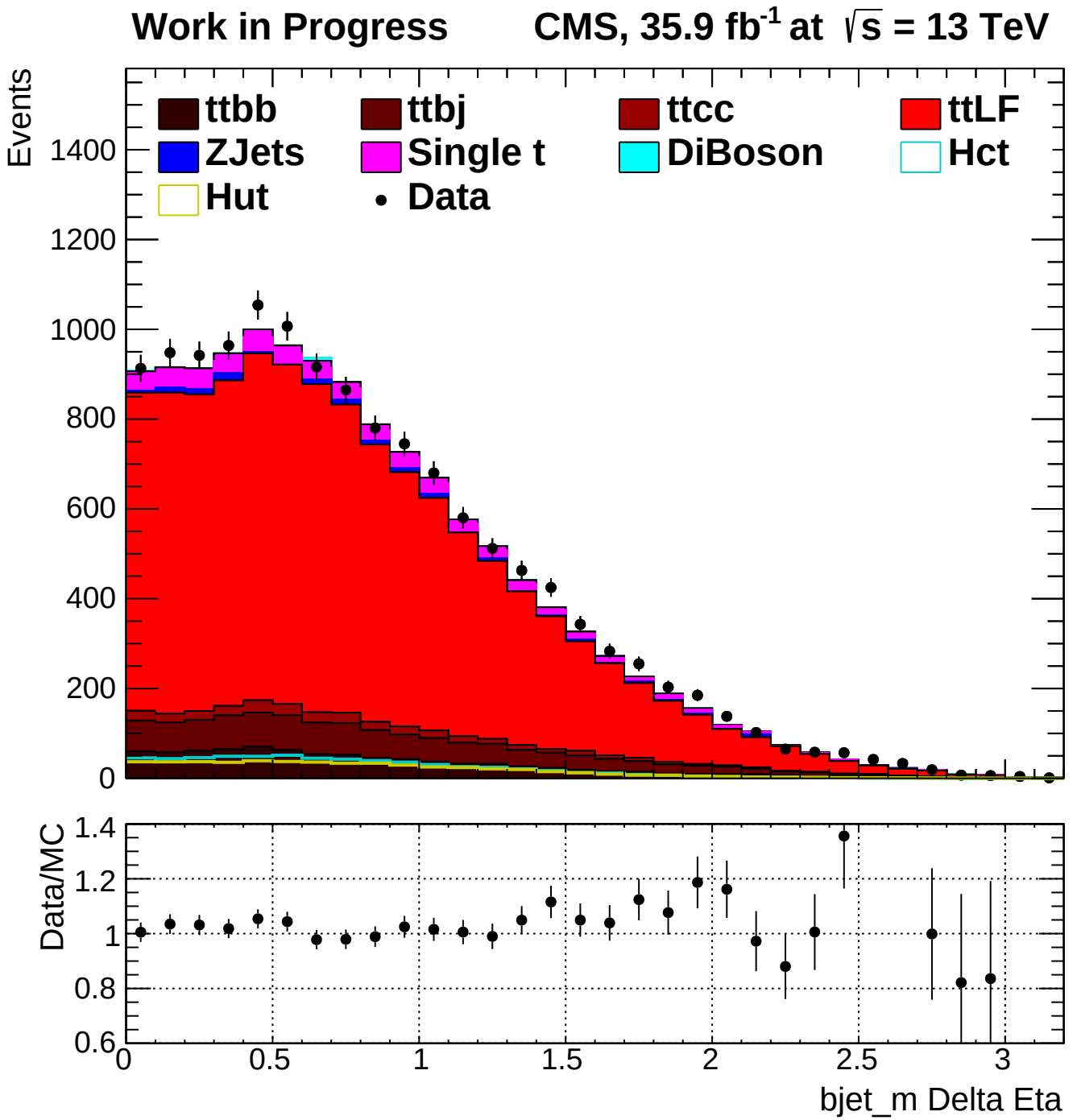

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)

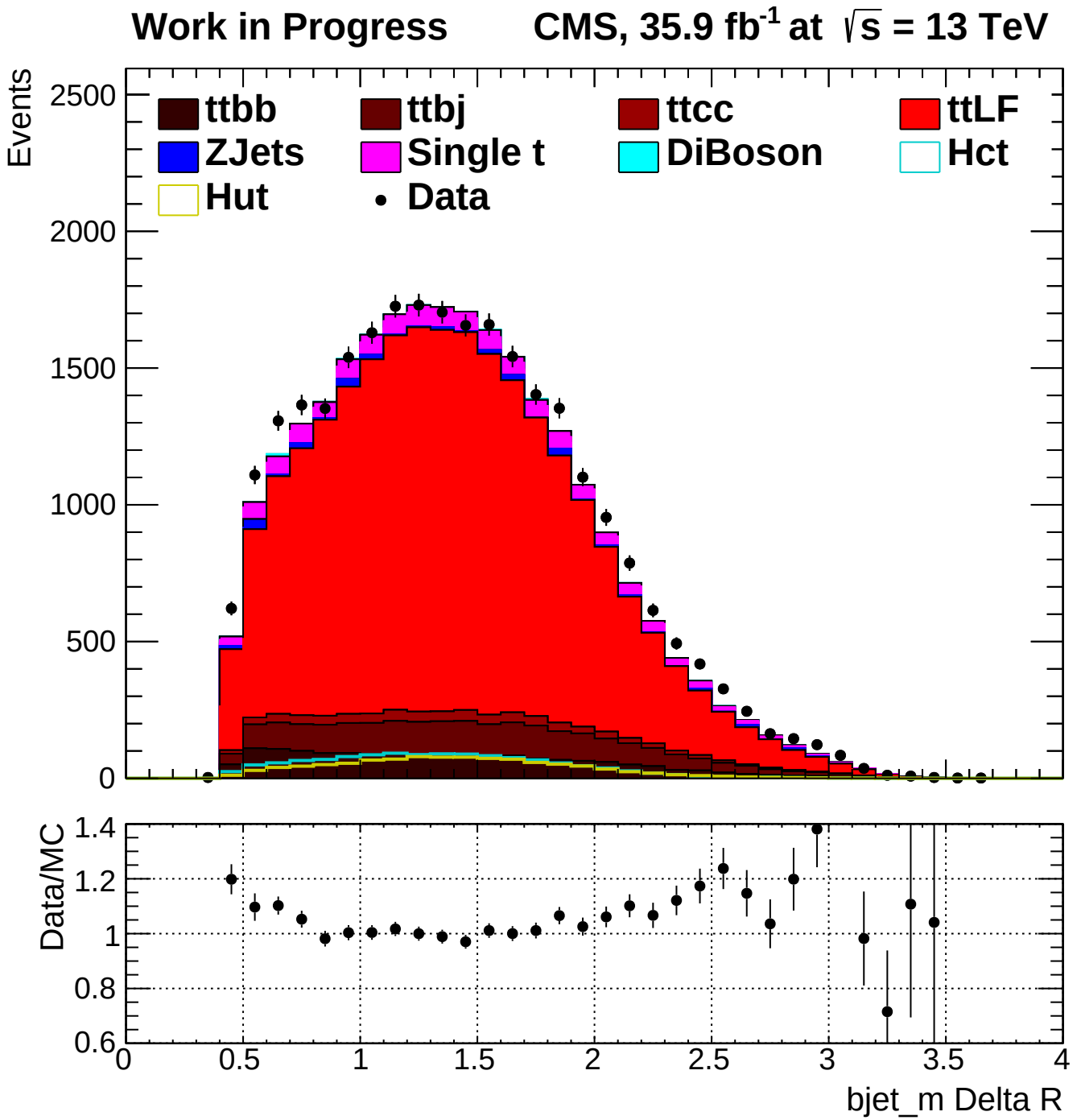

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)

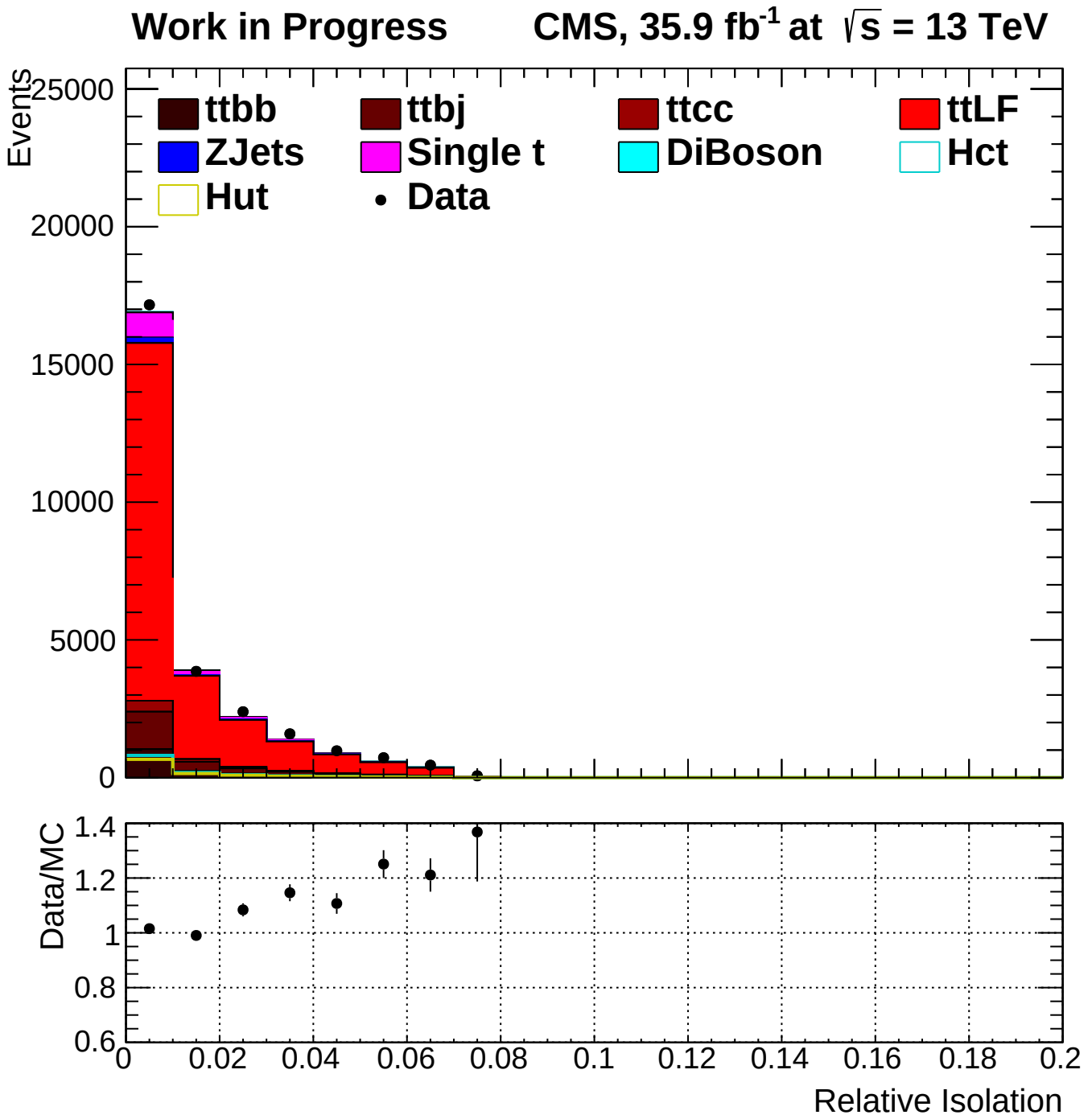

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

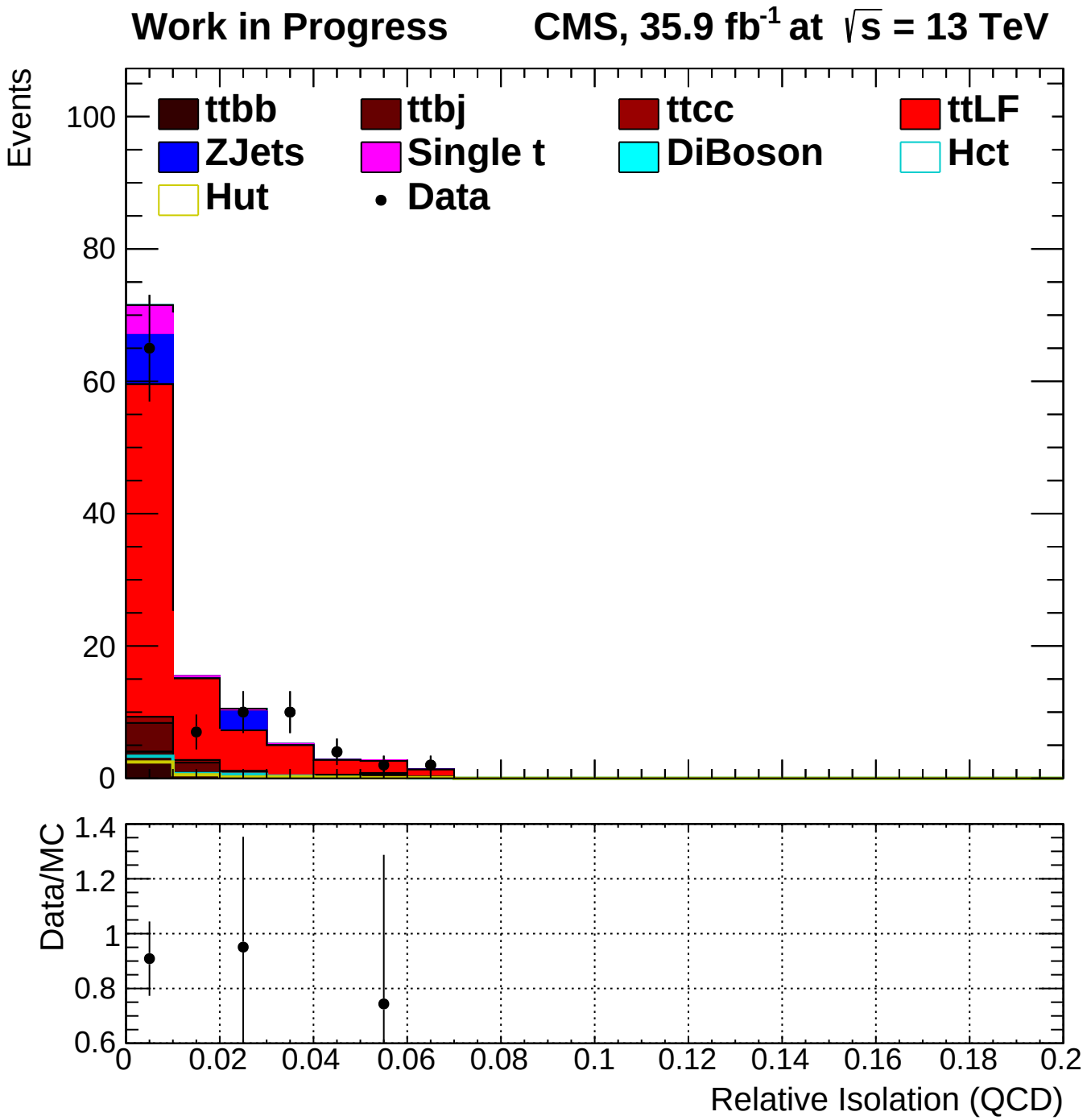

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
800
700
600
500
400
300
200
100
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

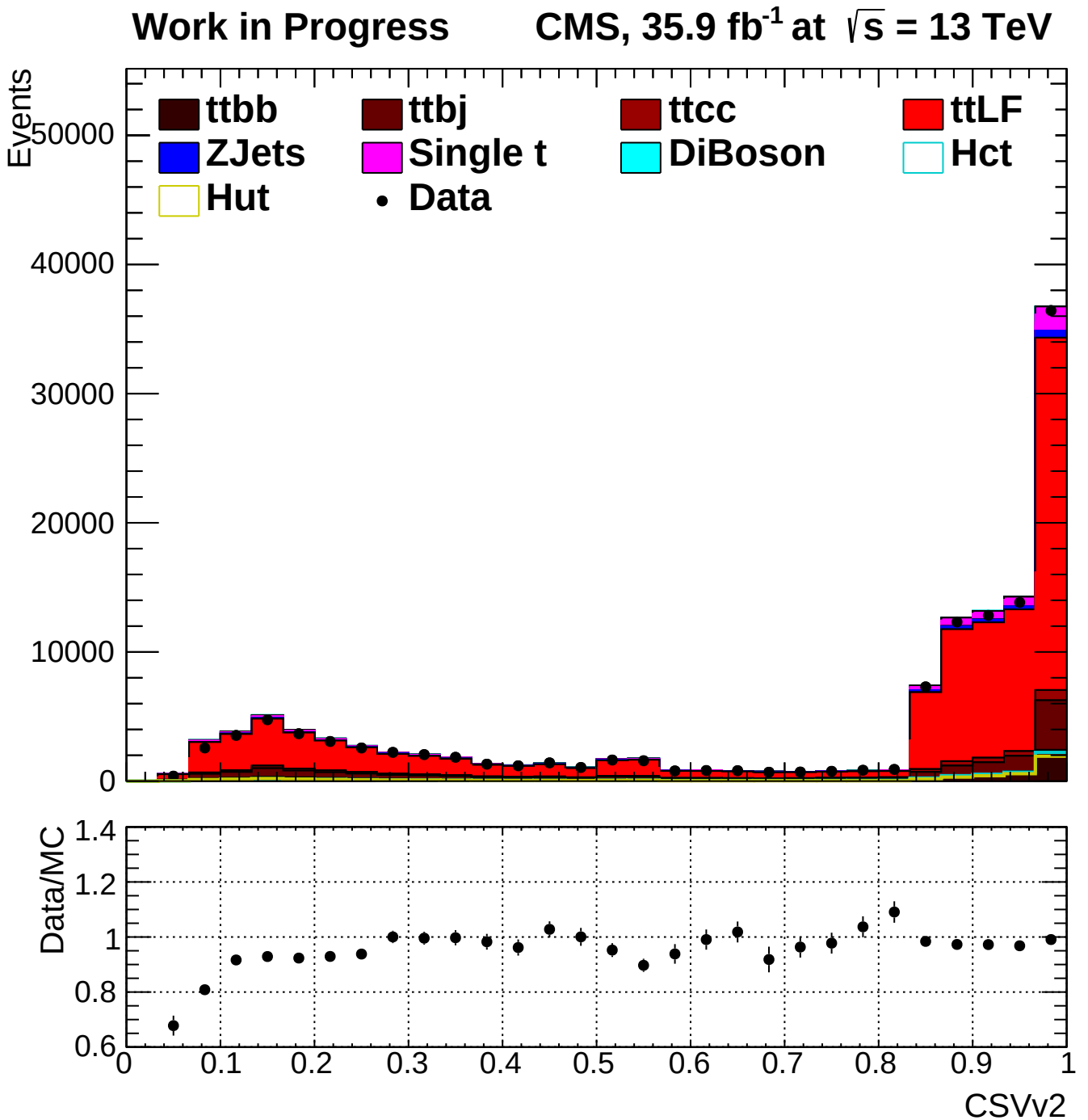

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi

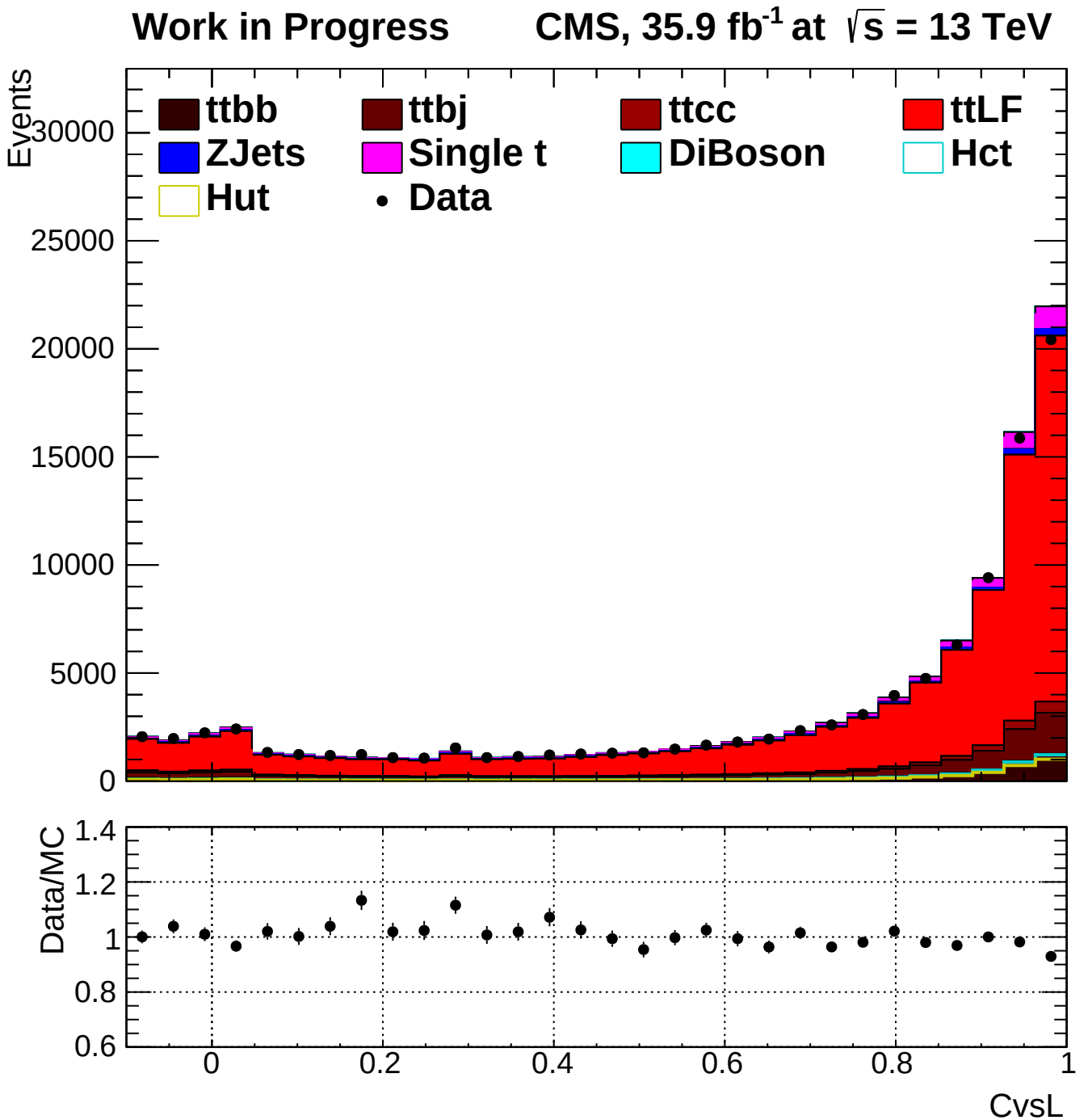

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta

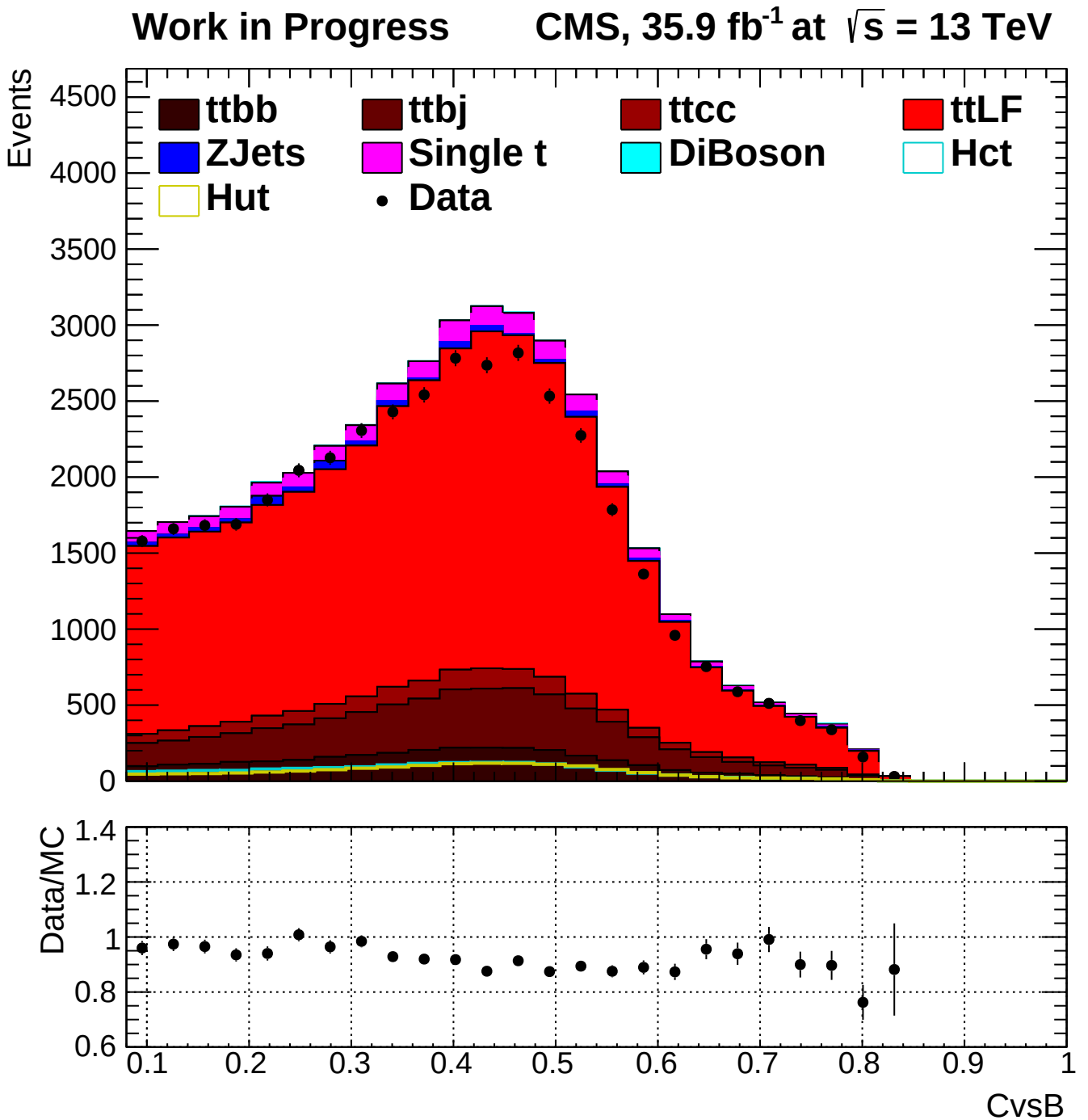

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

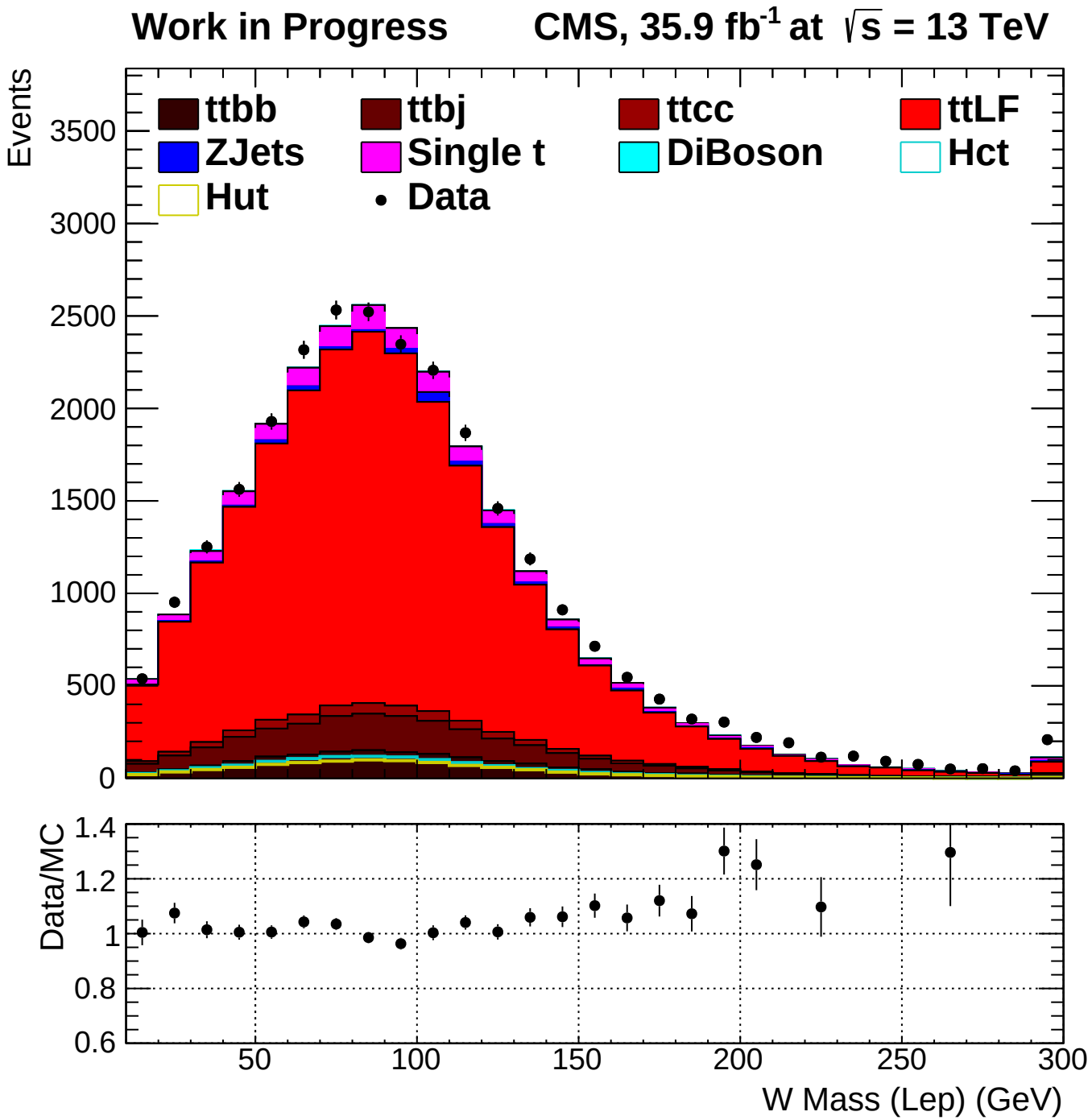

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

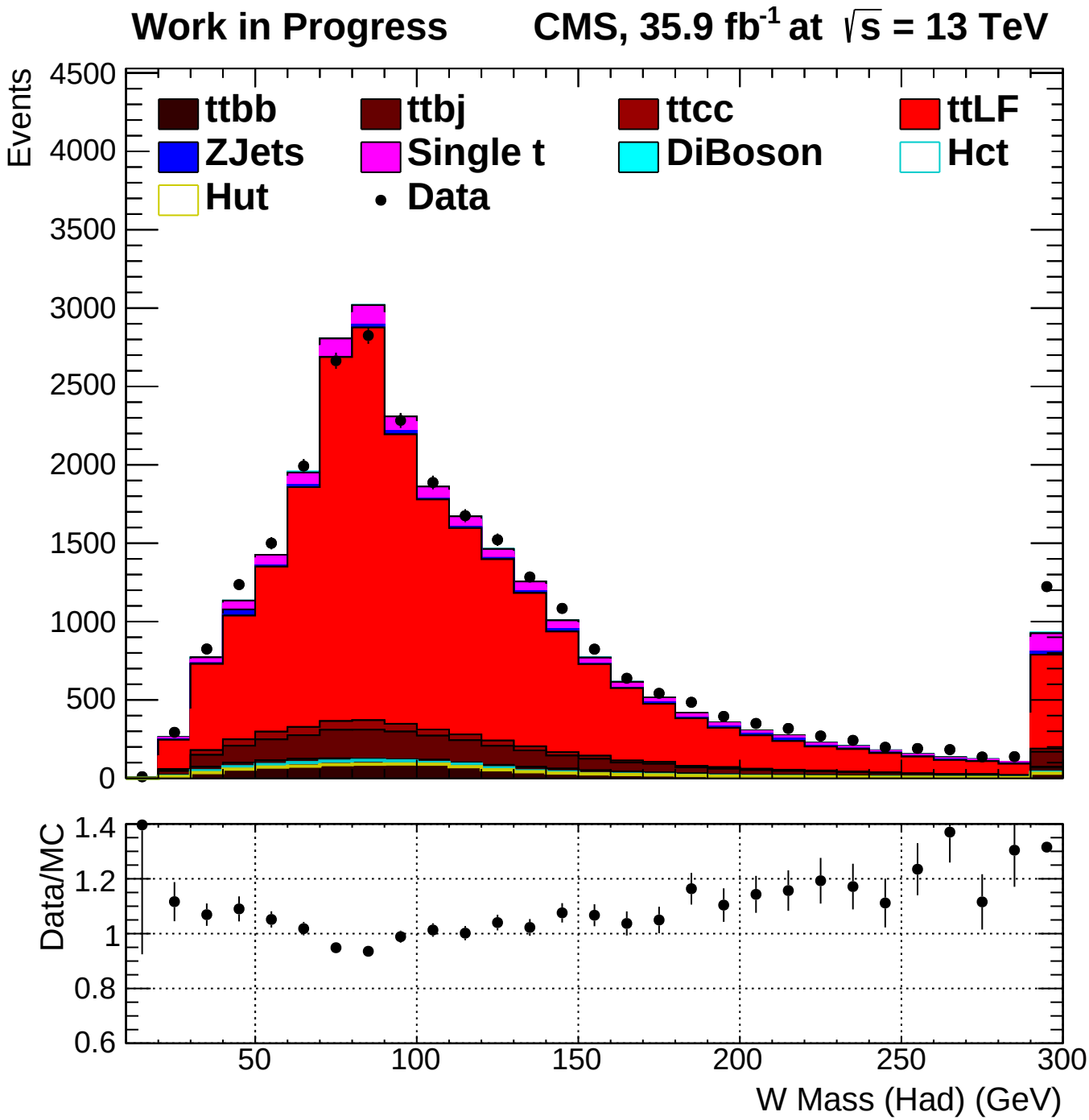

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

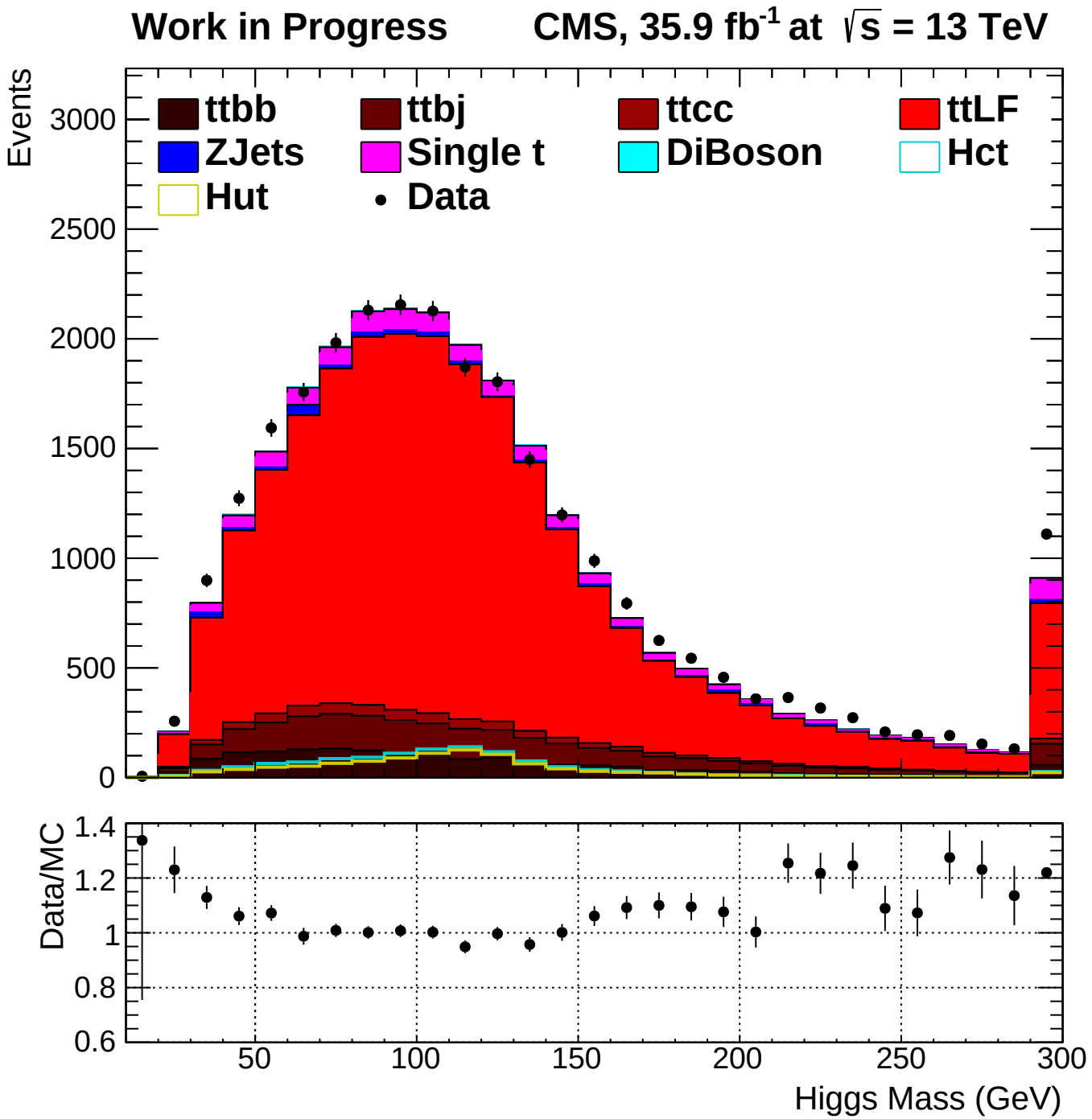

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

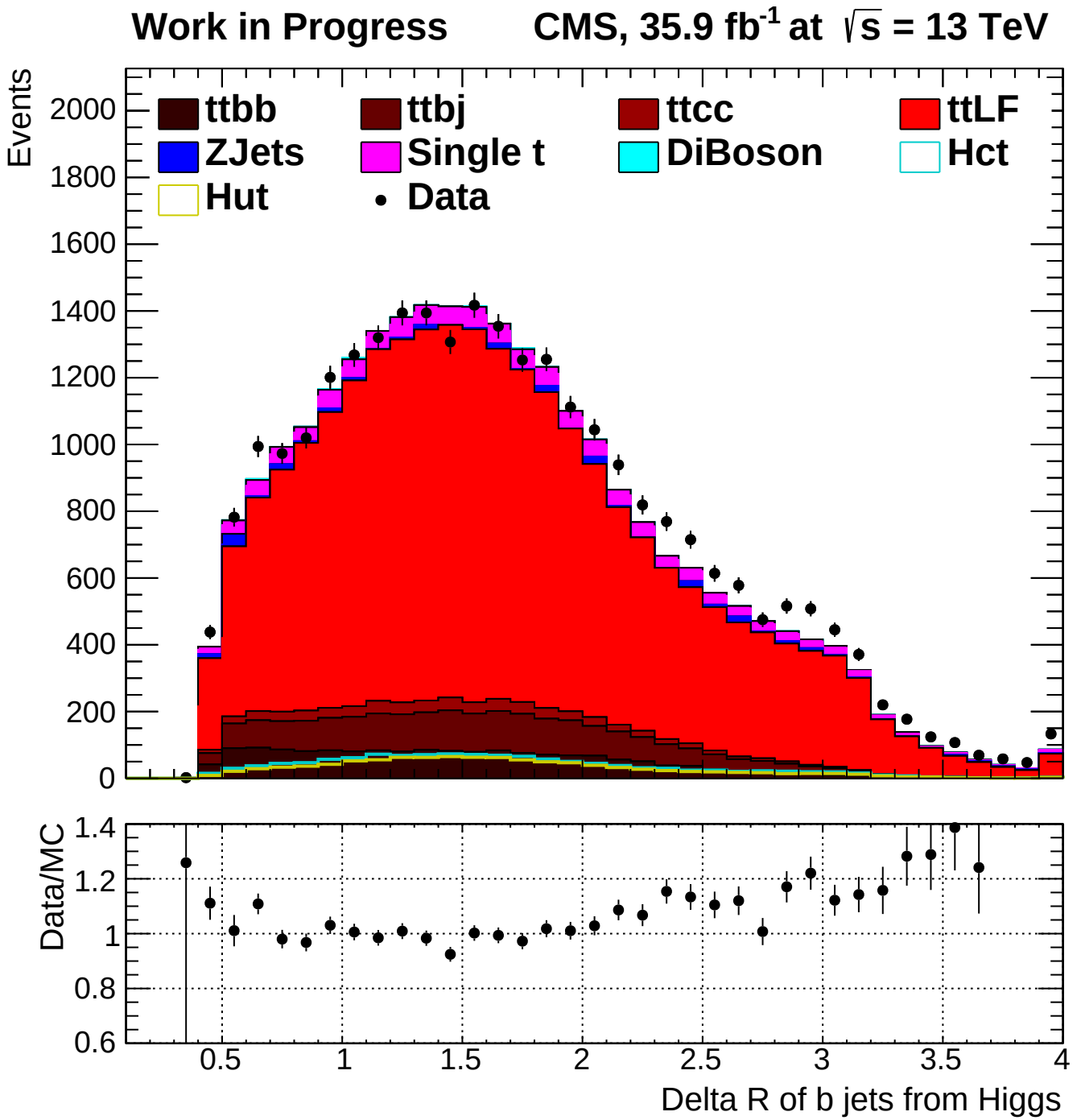

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

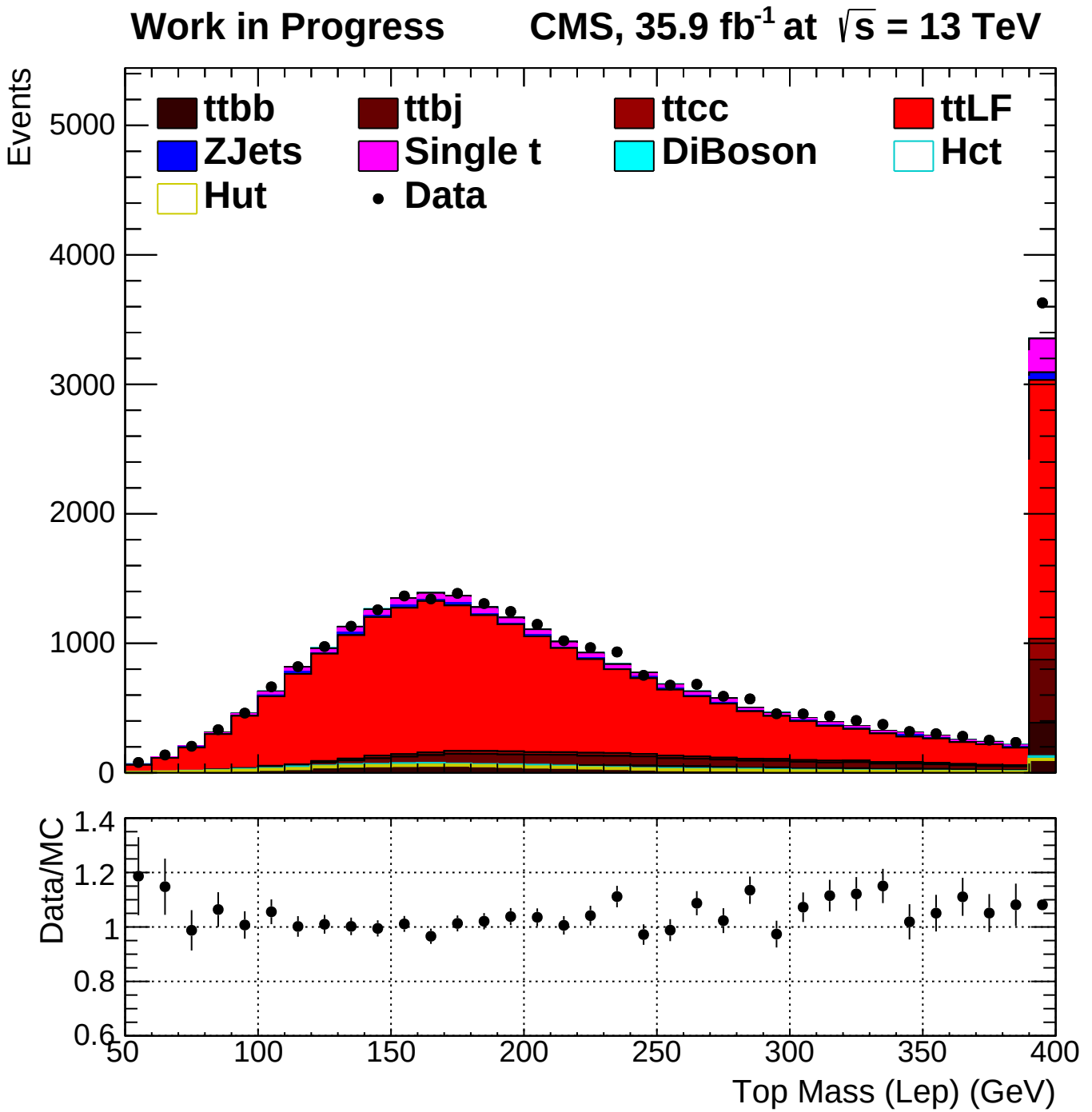

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB

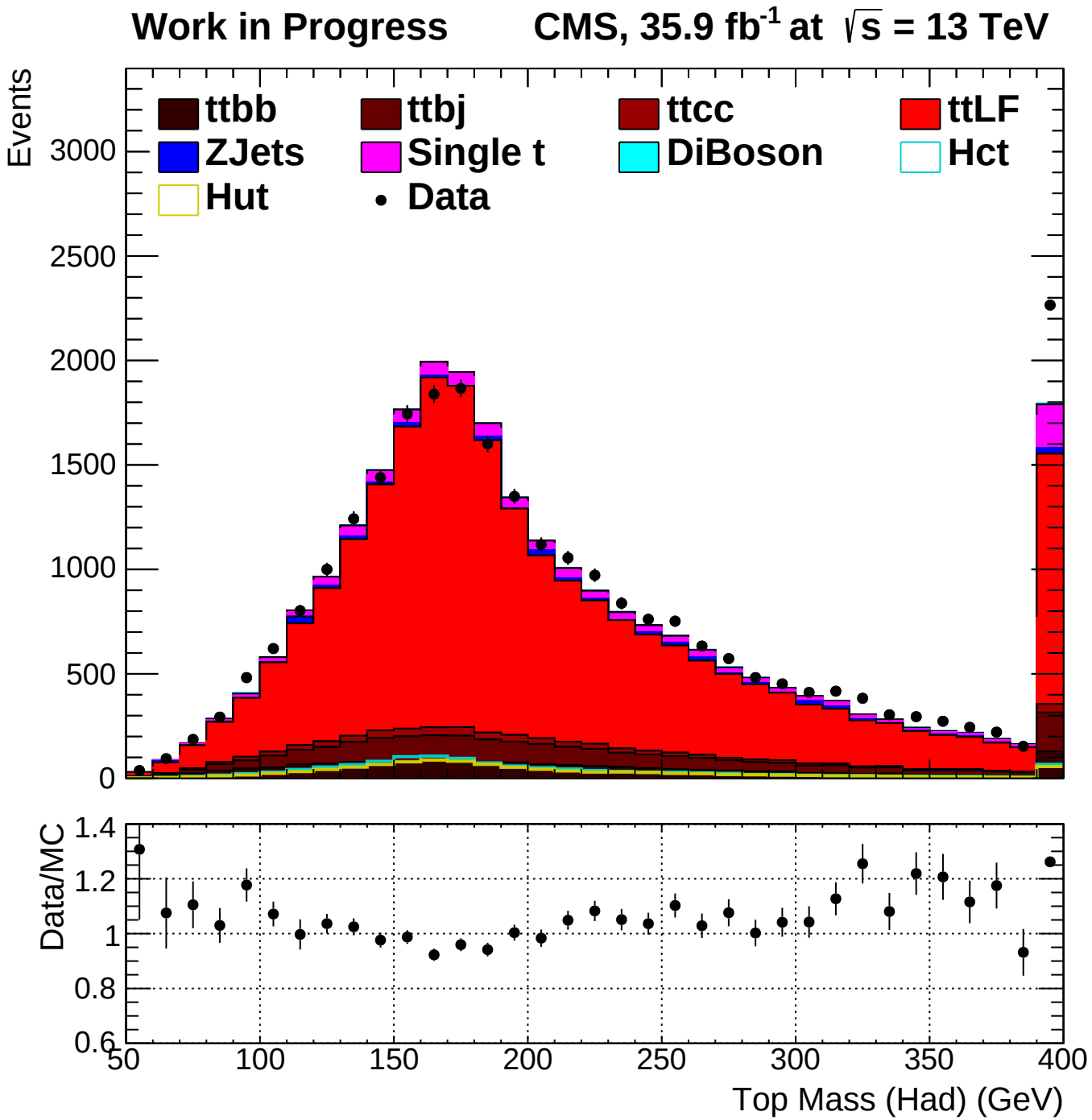

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

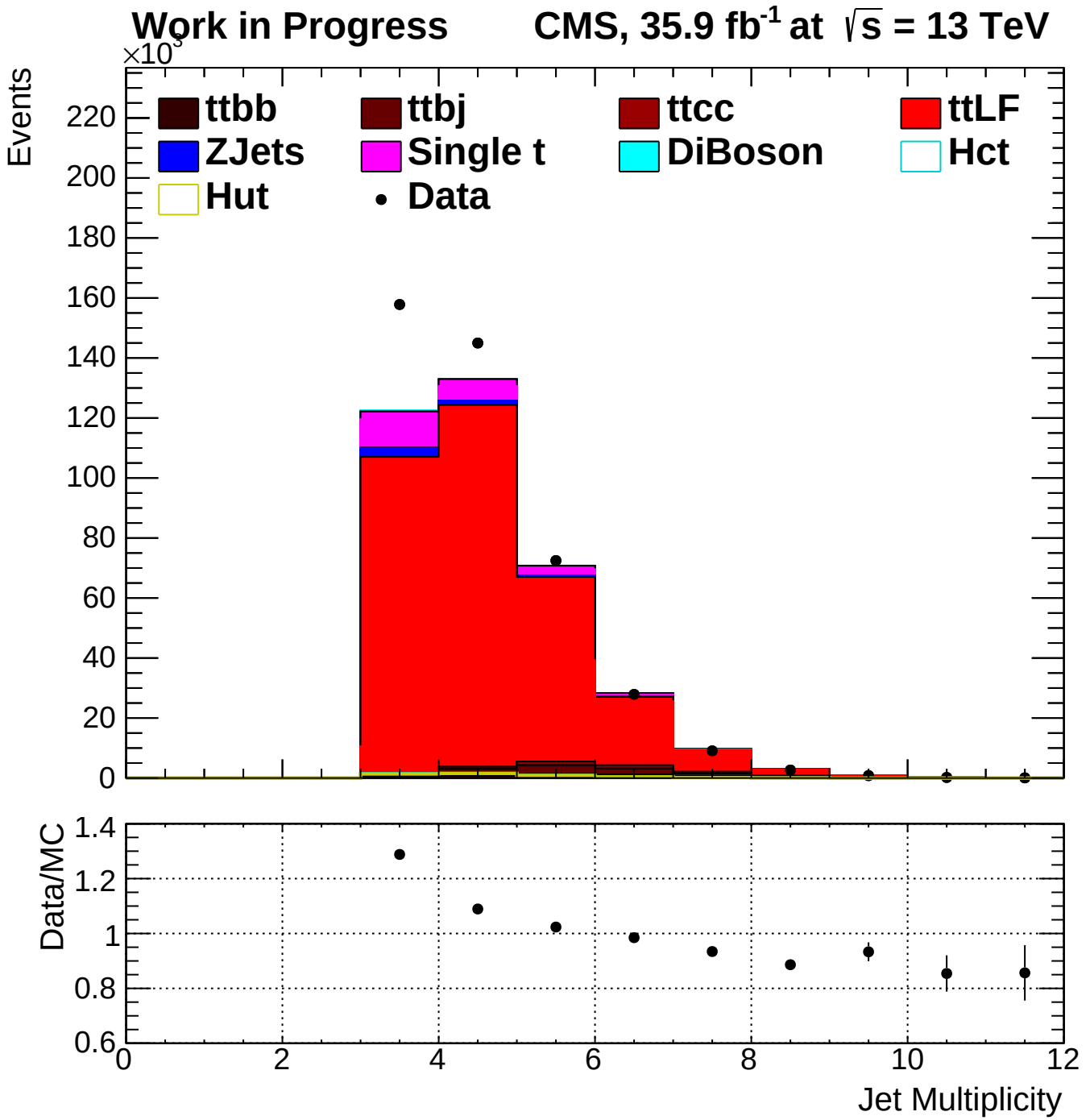

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

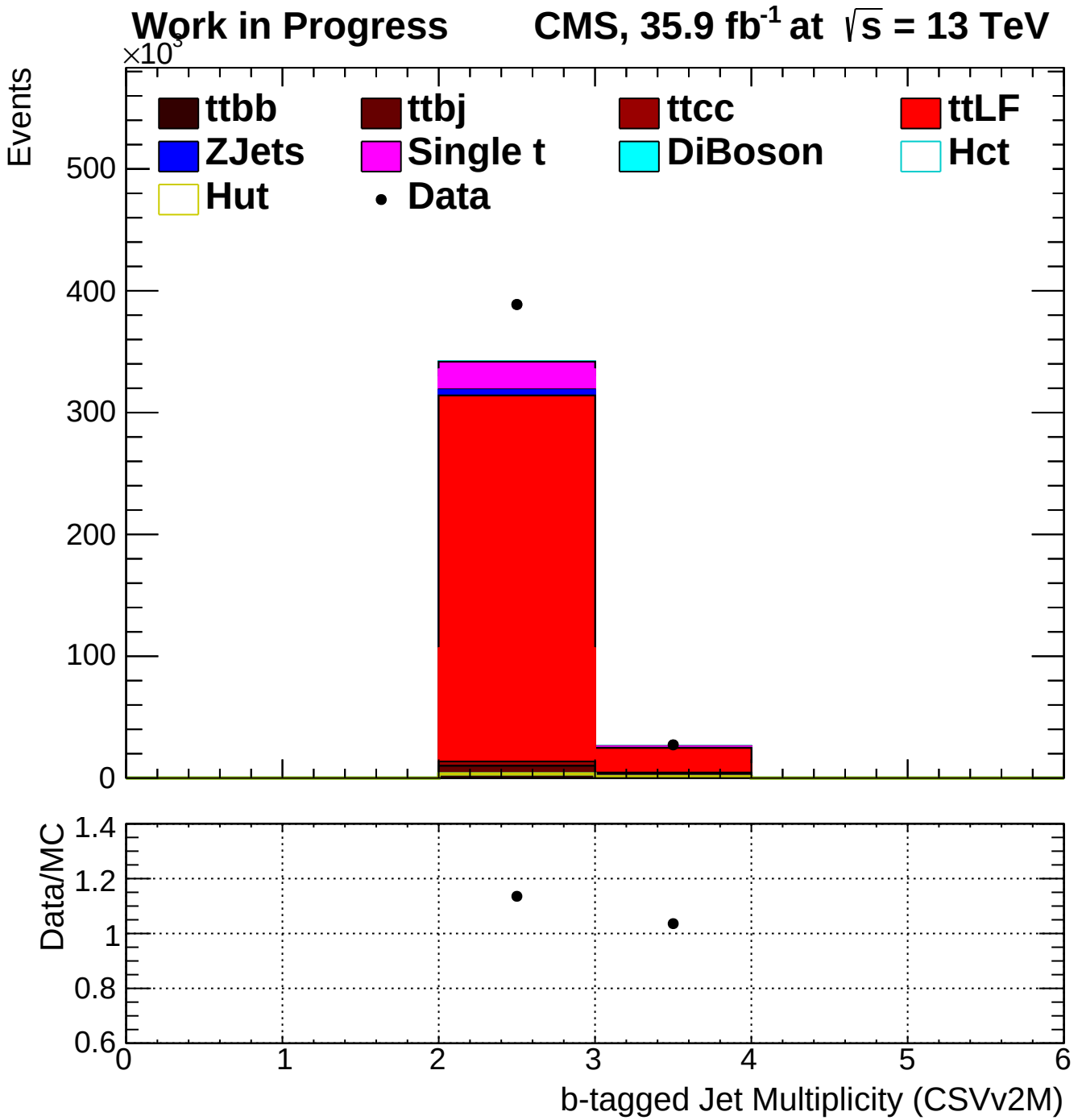

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

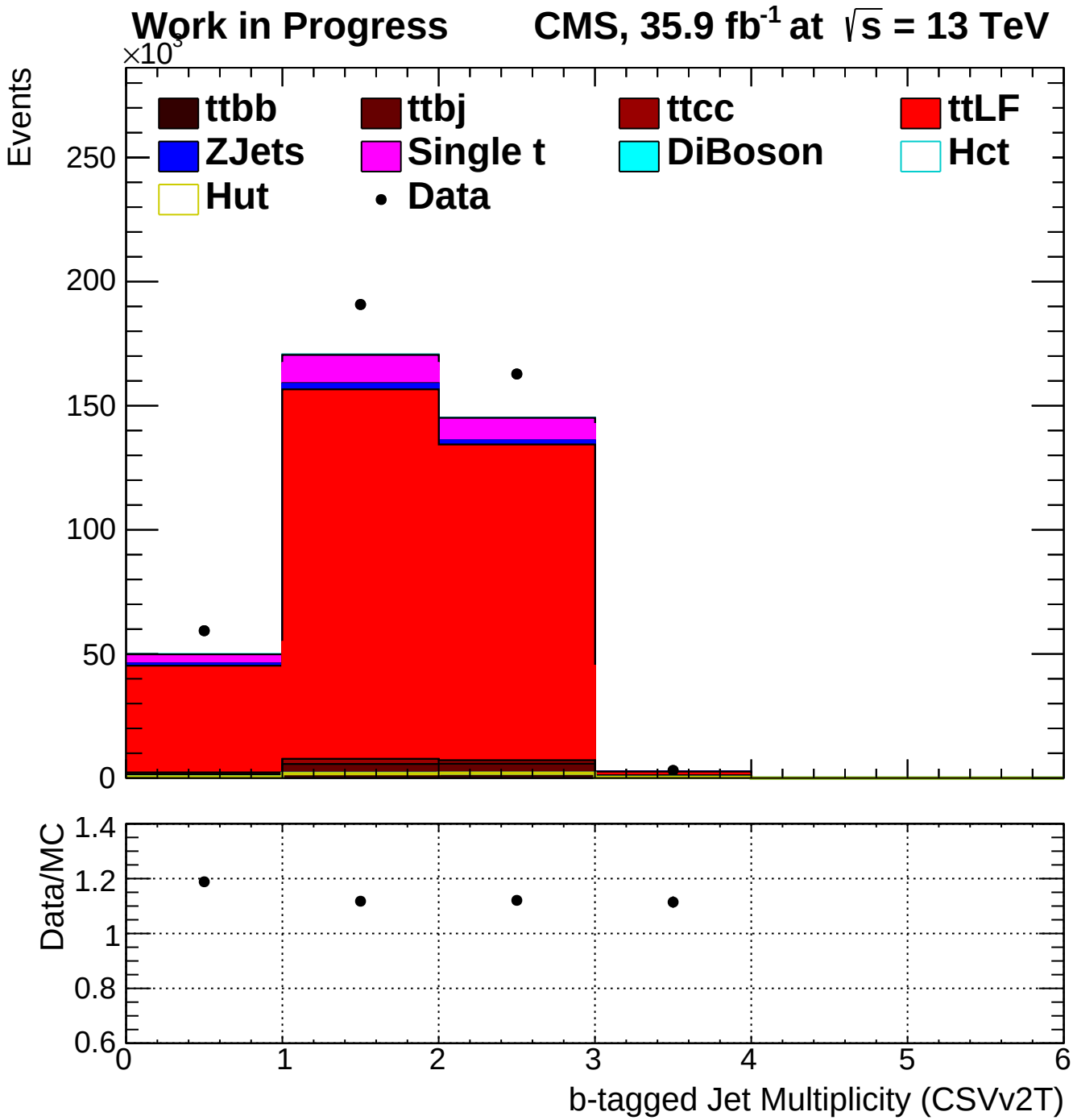

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

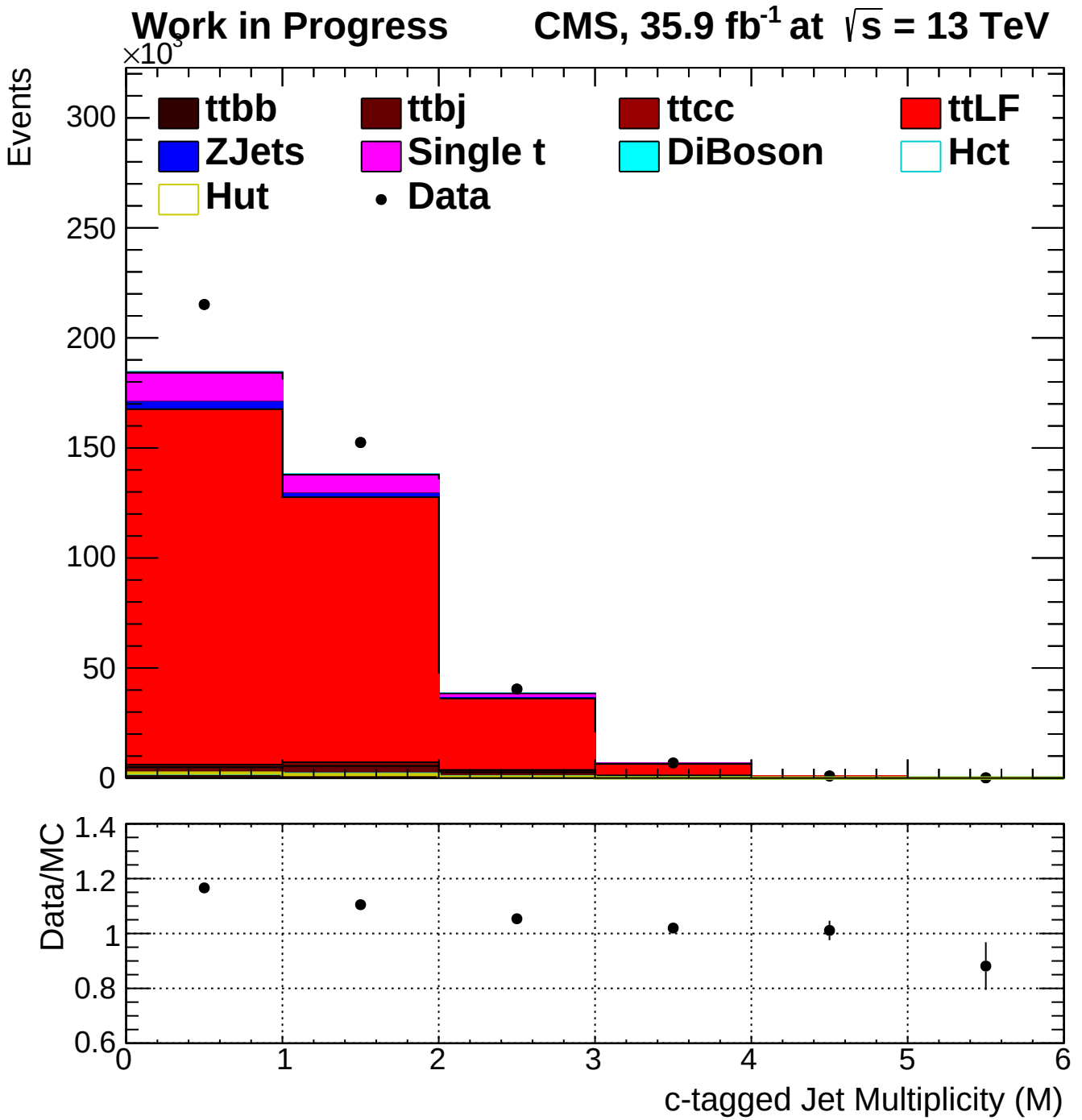

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)

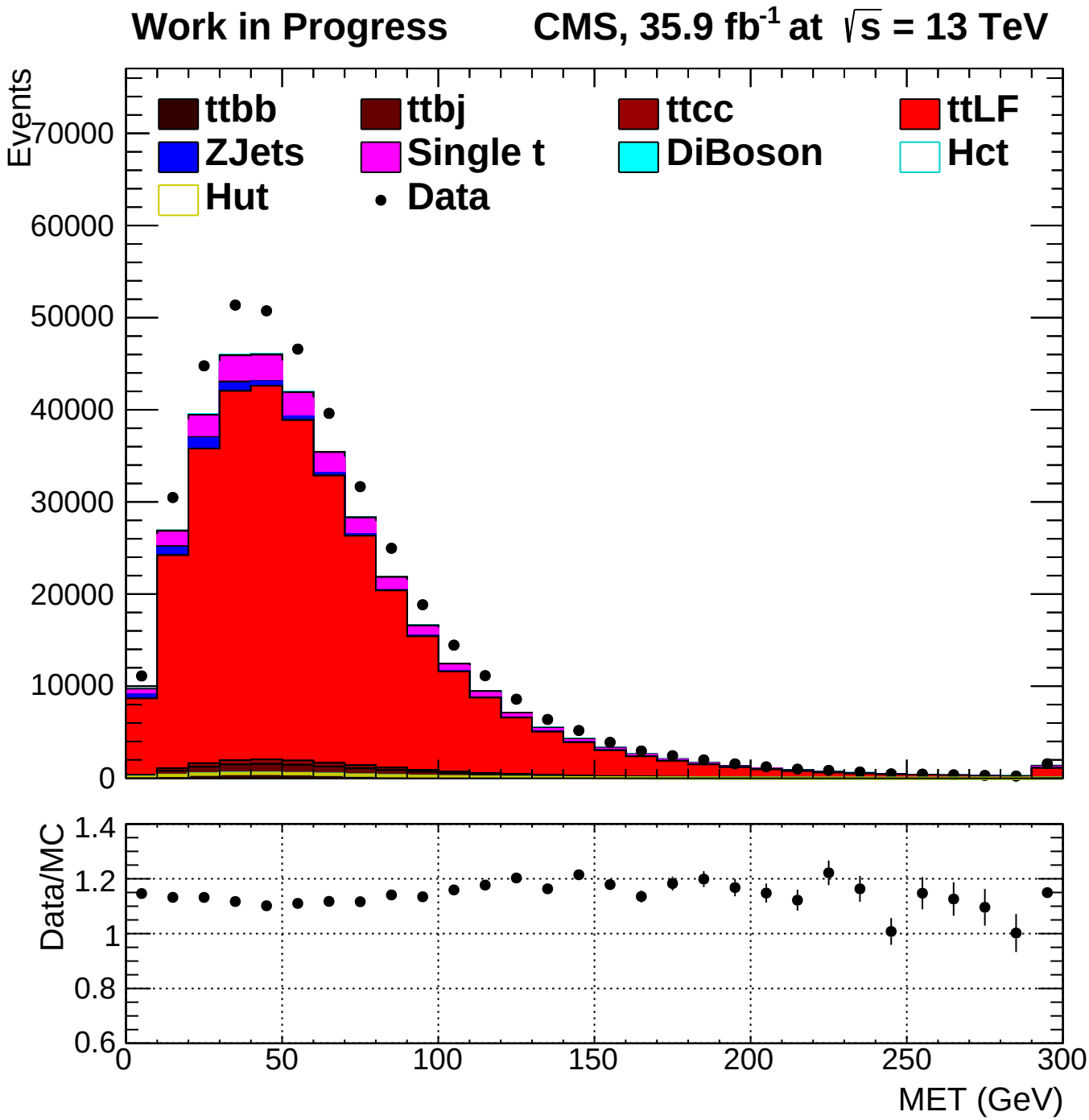

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

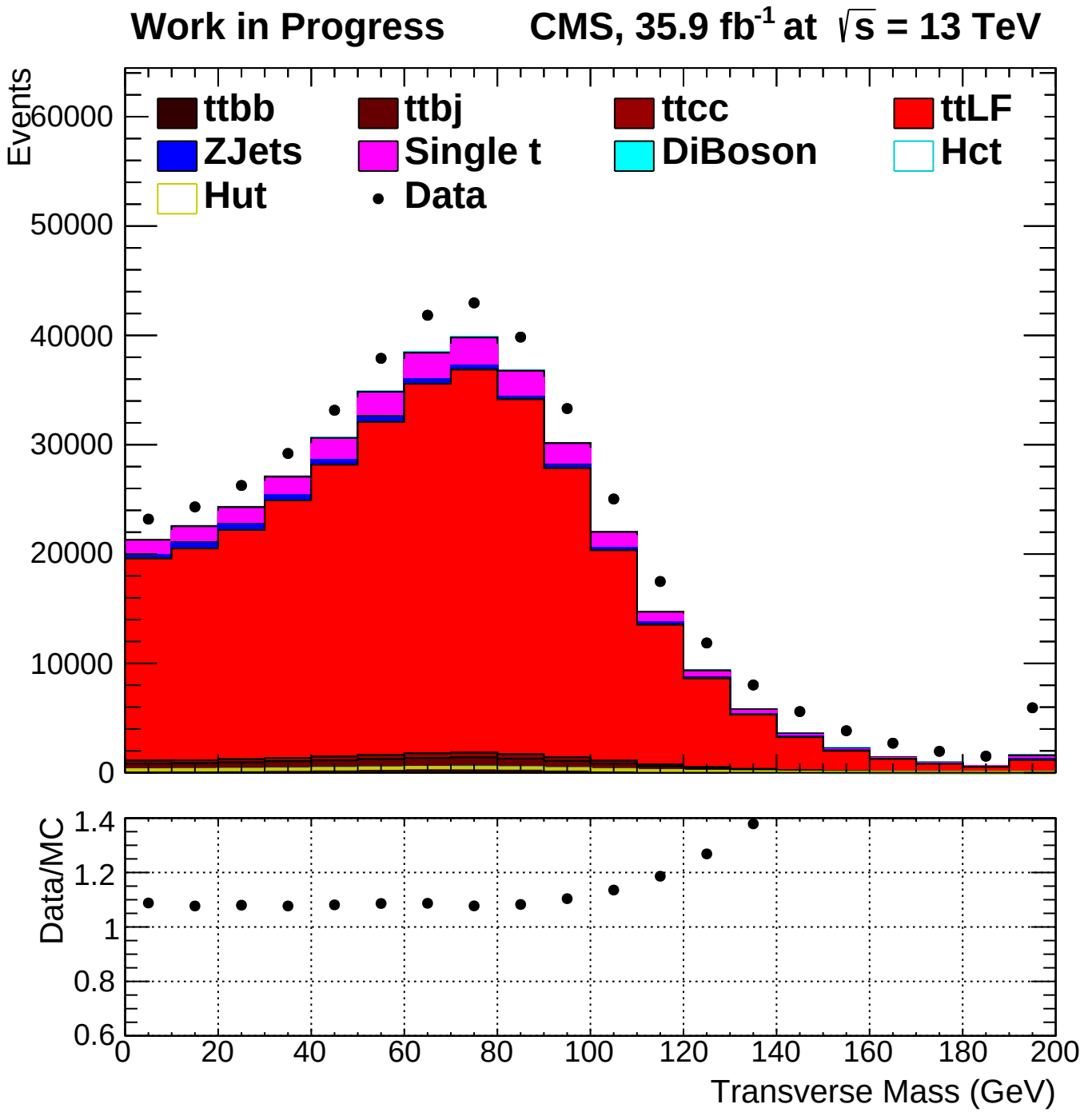

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

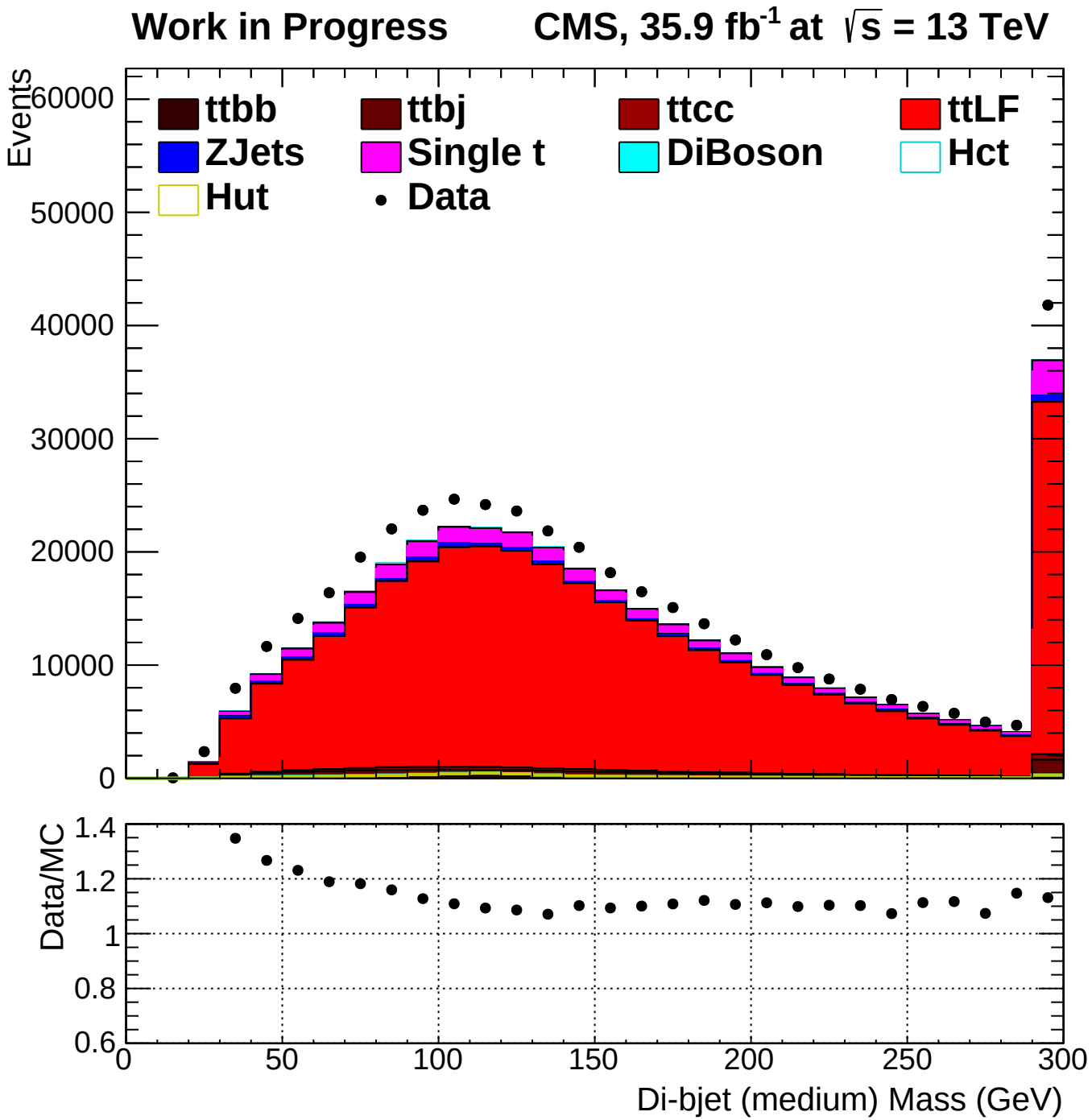

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

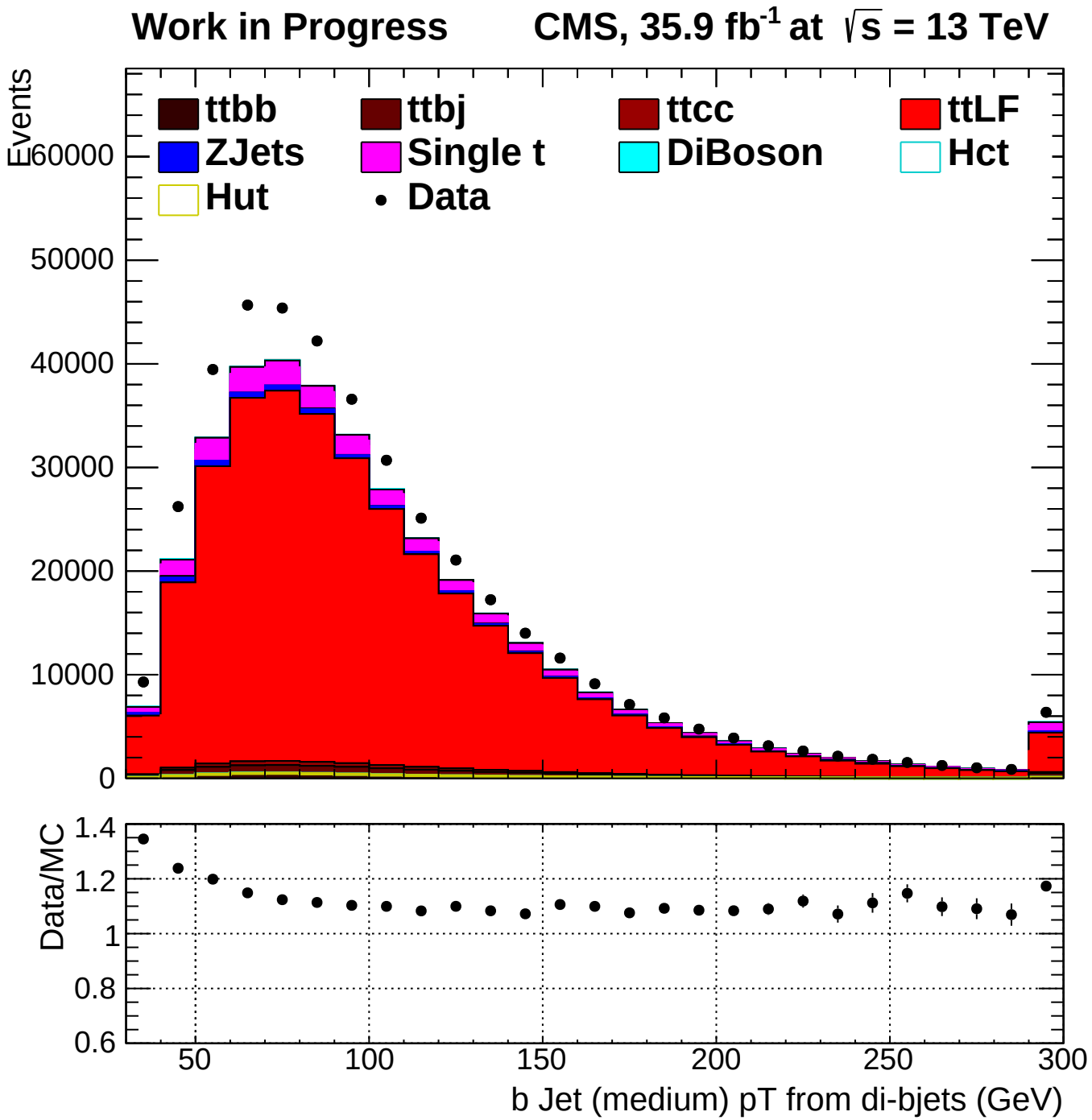

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

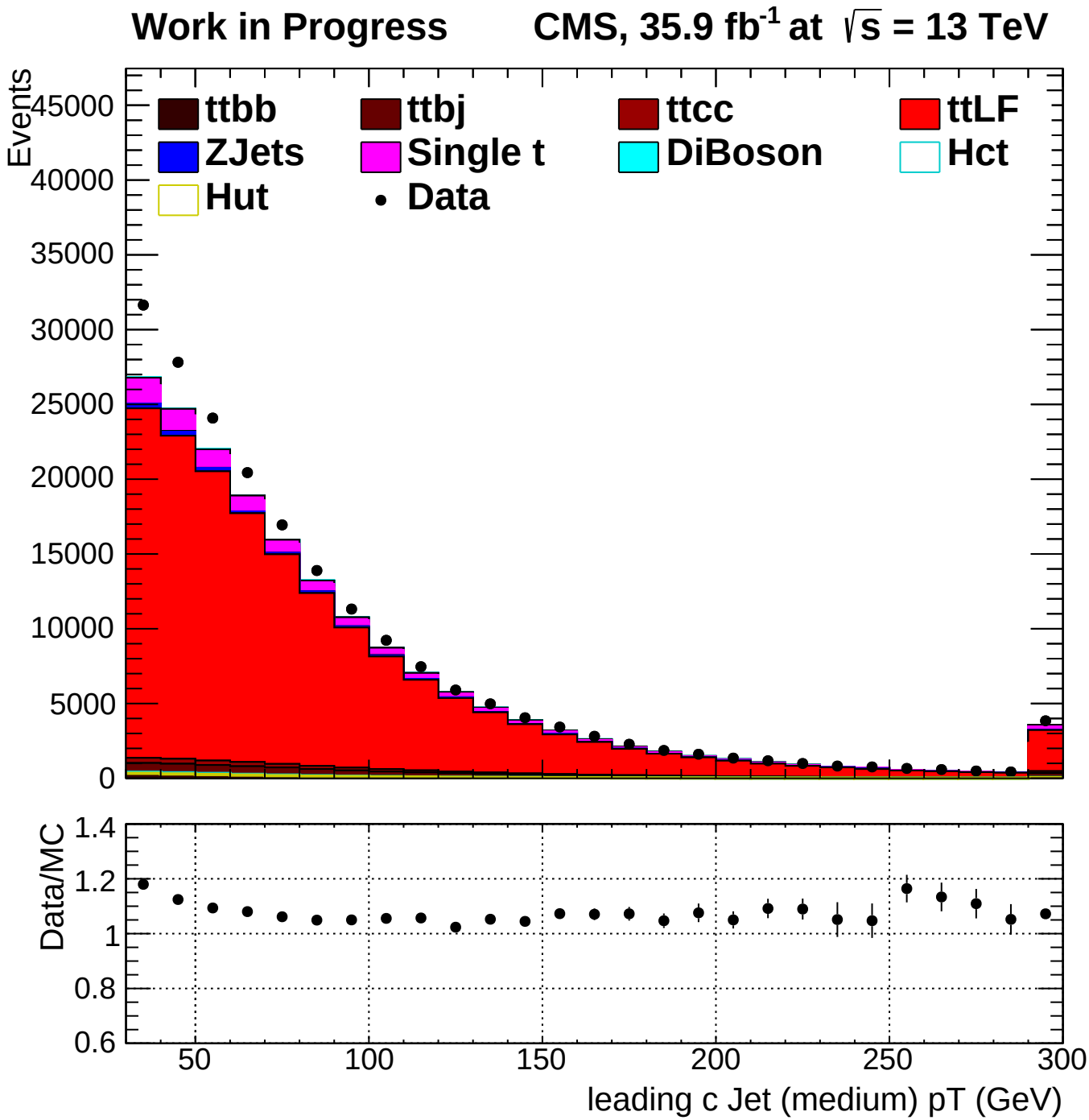

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

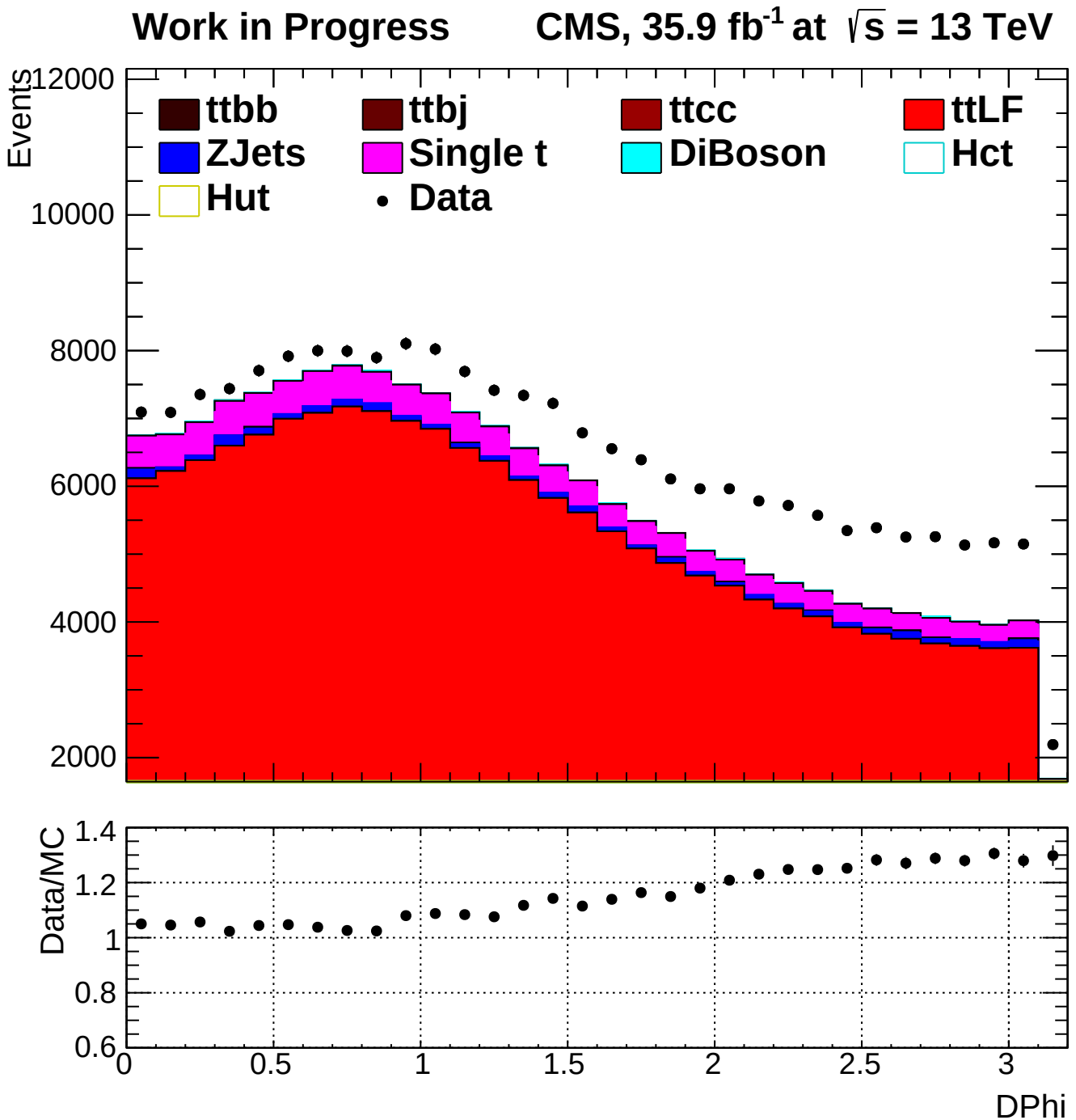

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)

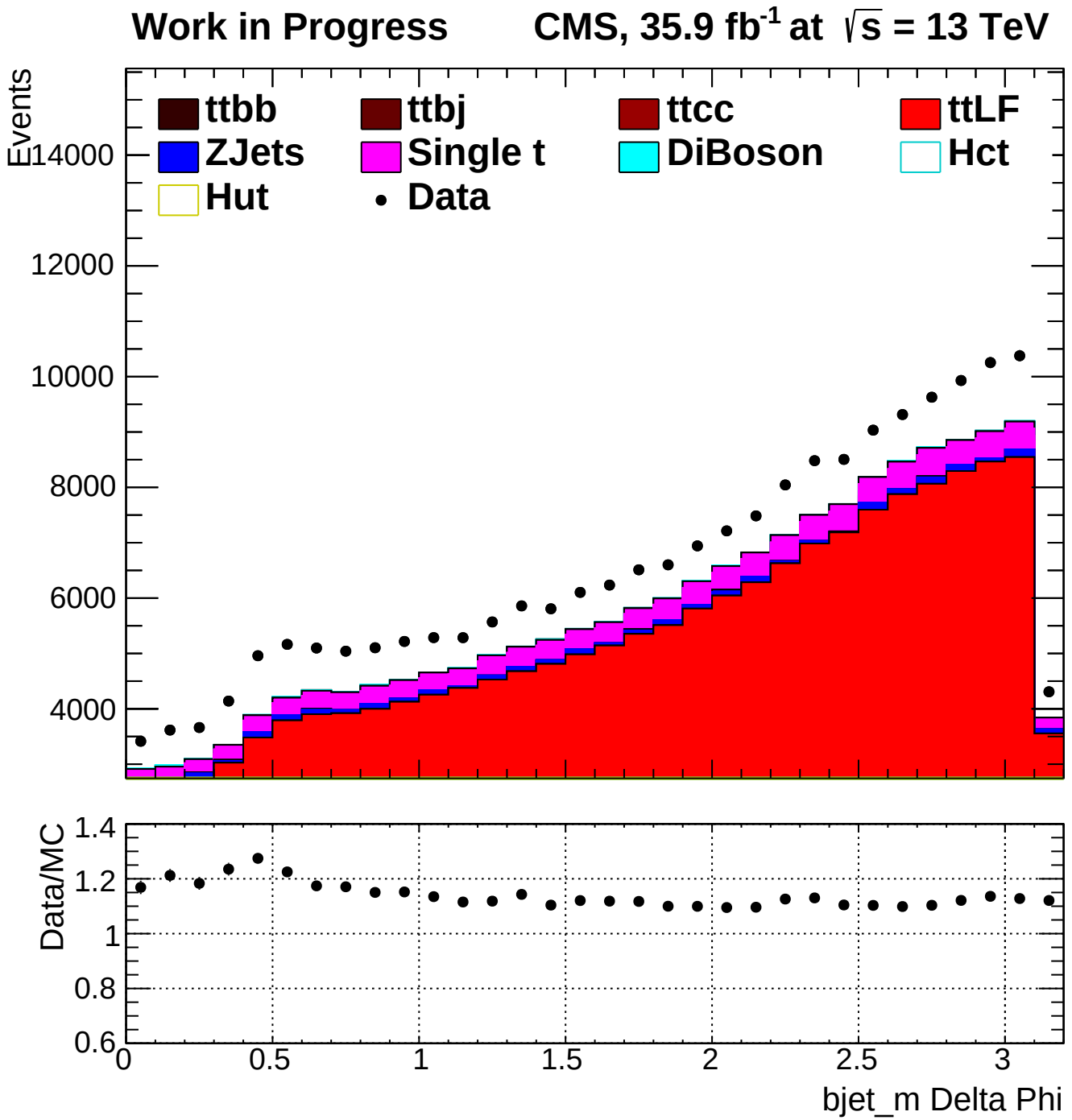

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

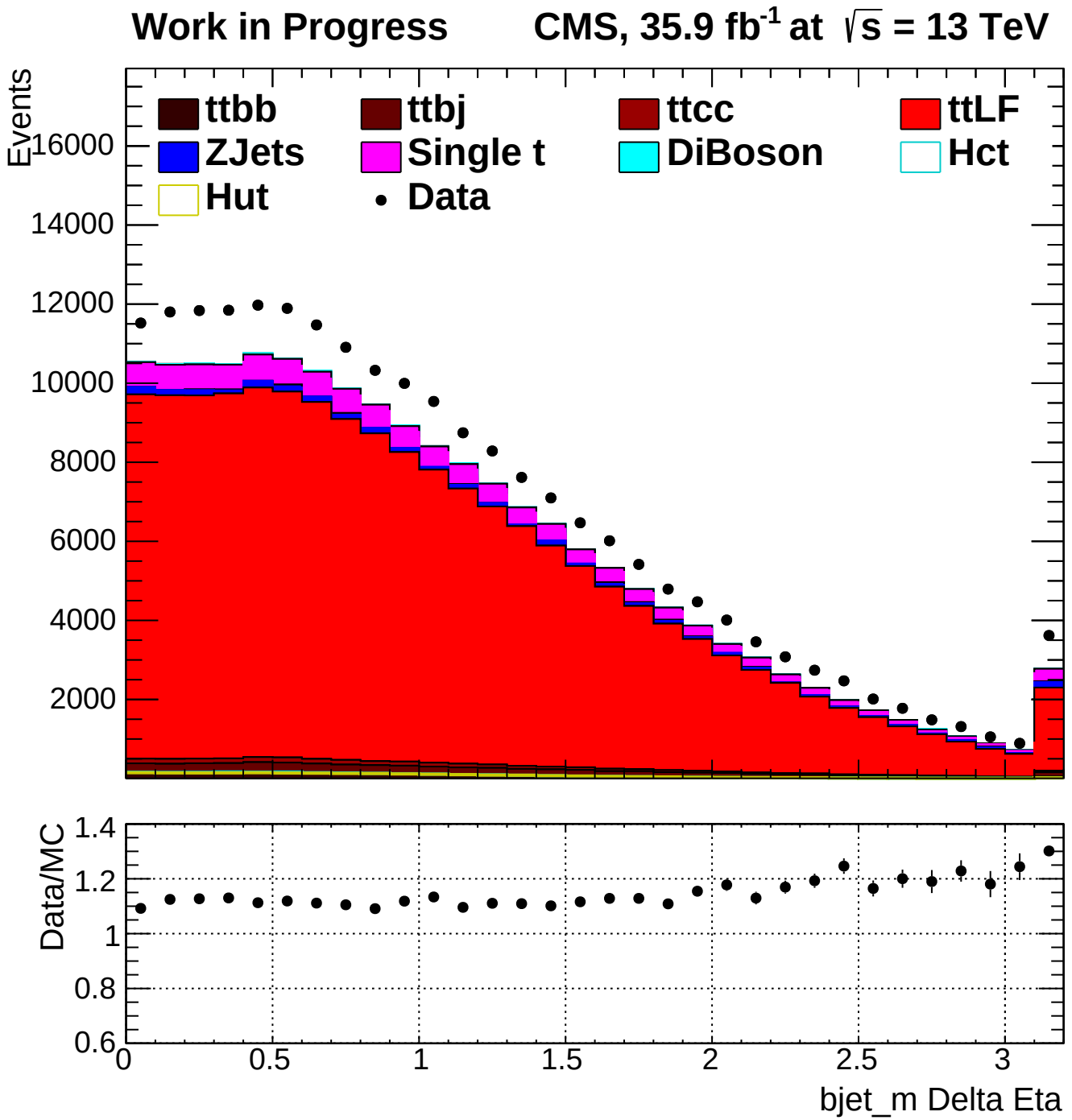

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)

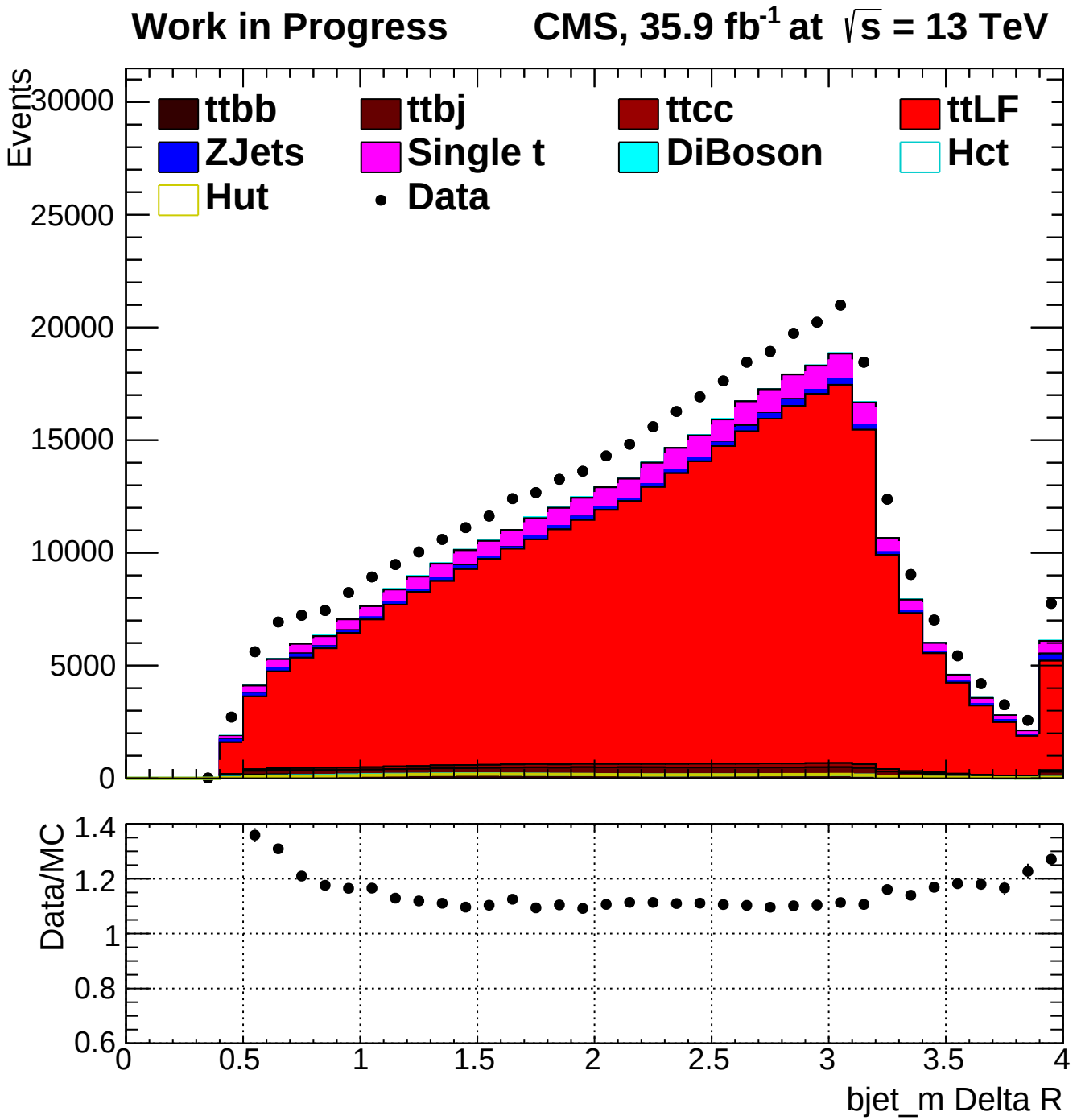

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

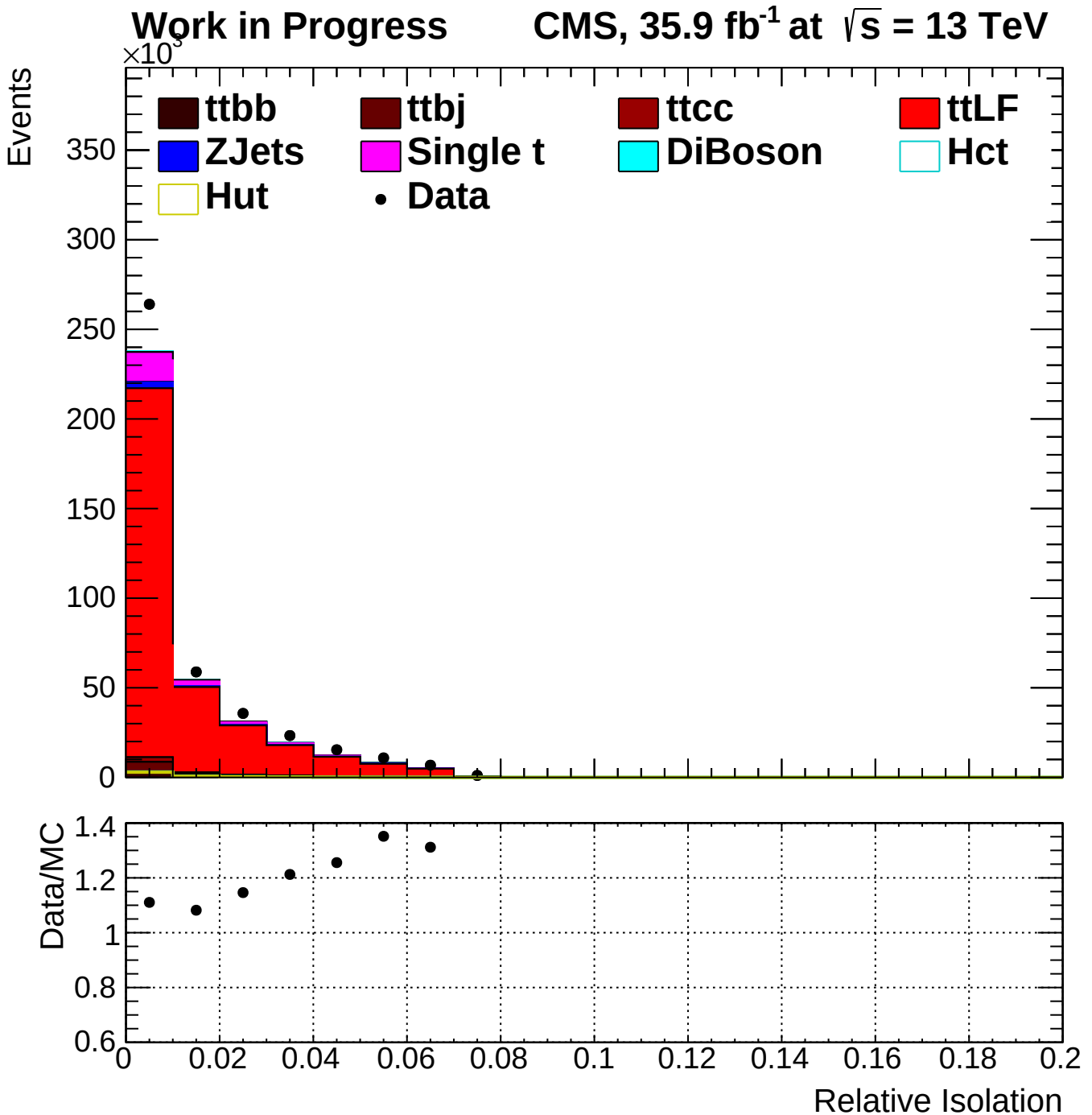

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

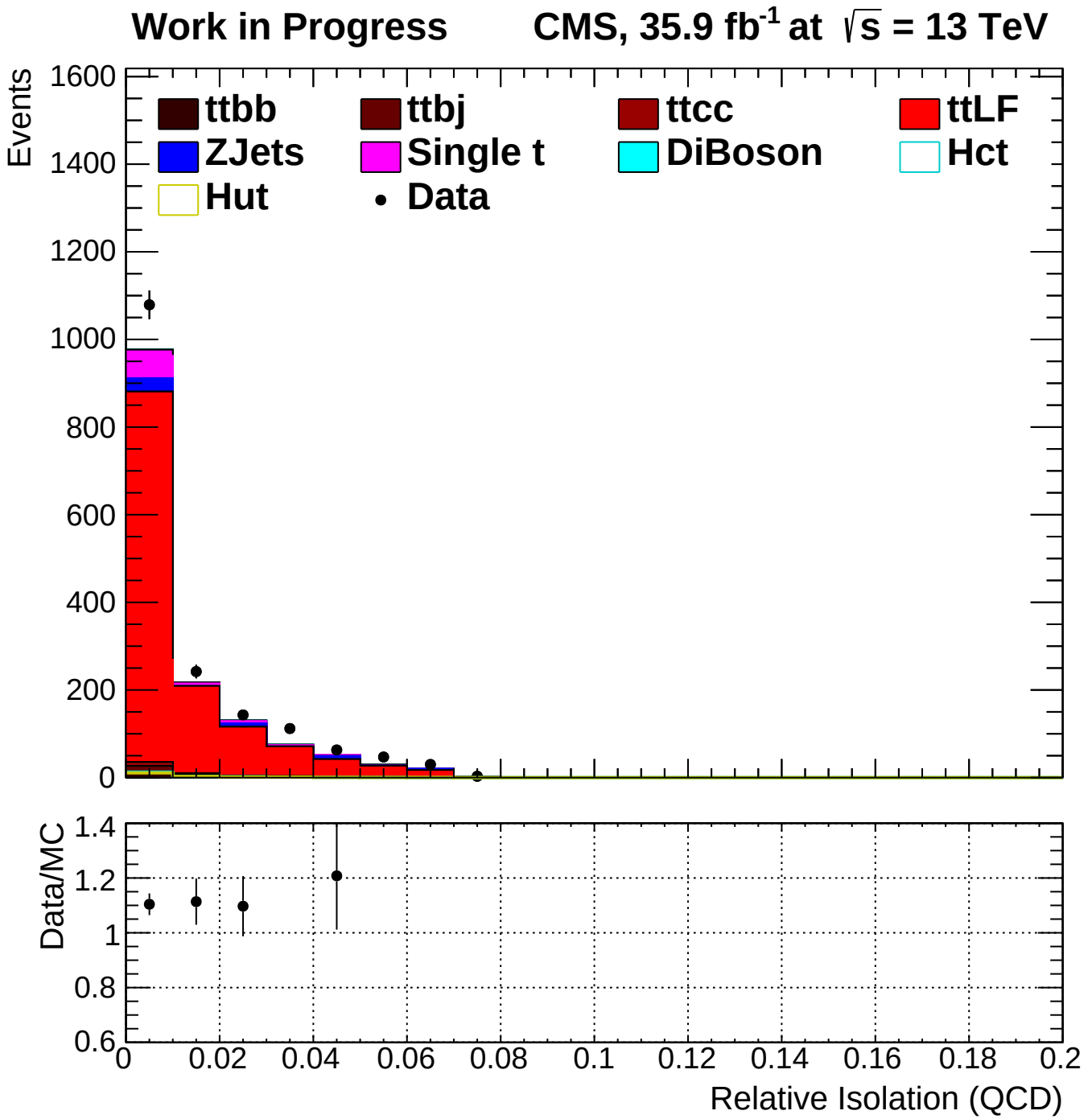

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
12000
10000
8000
6000
4000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

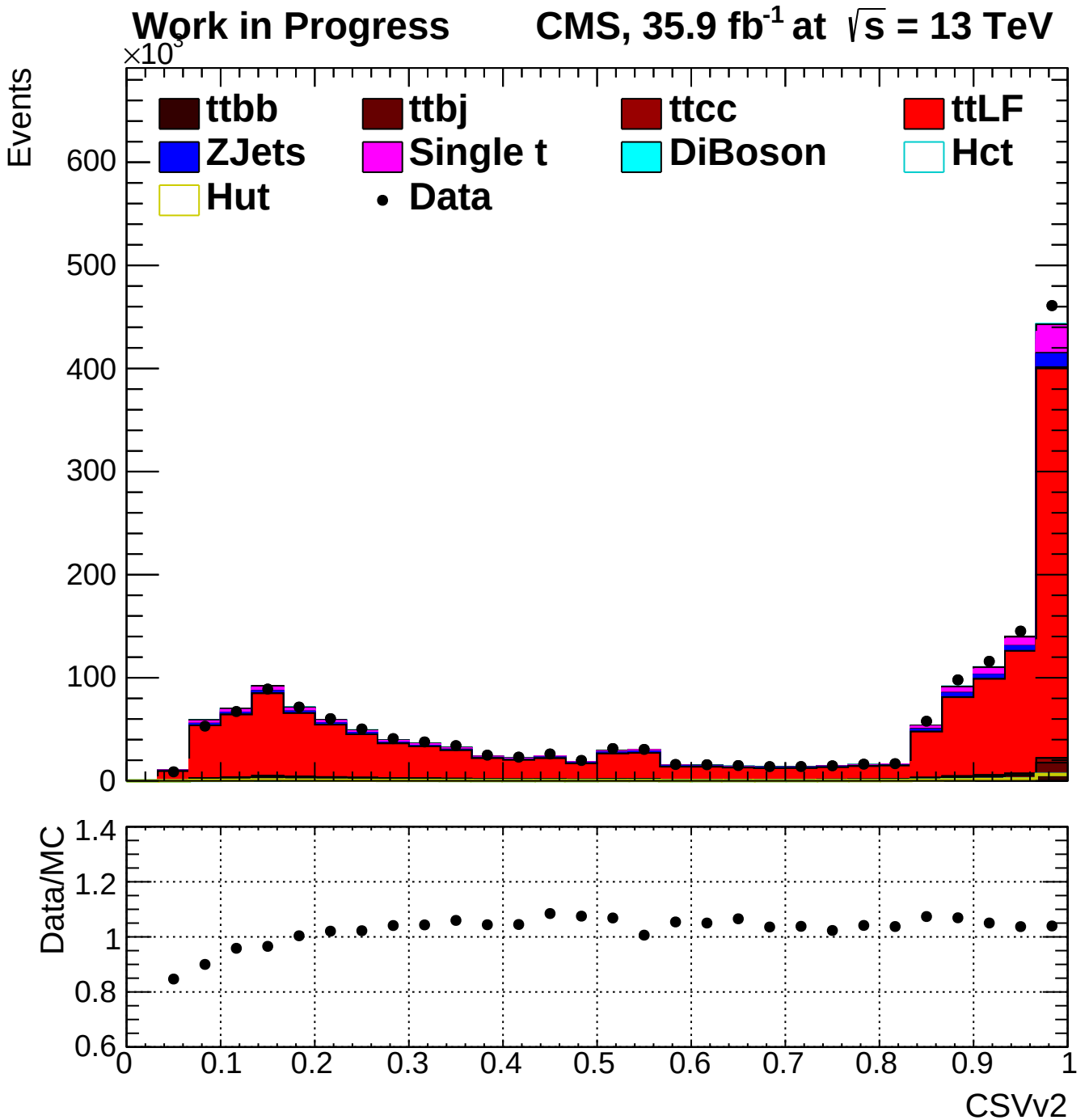

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
14000
12000
10000
8000
6000
4000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

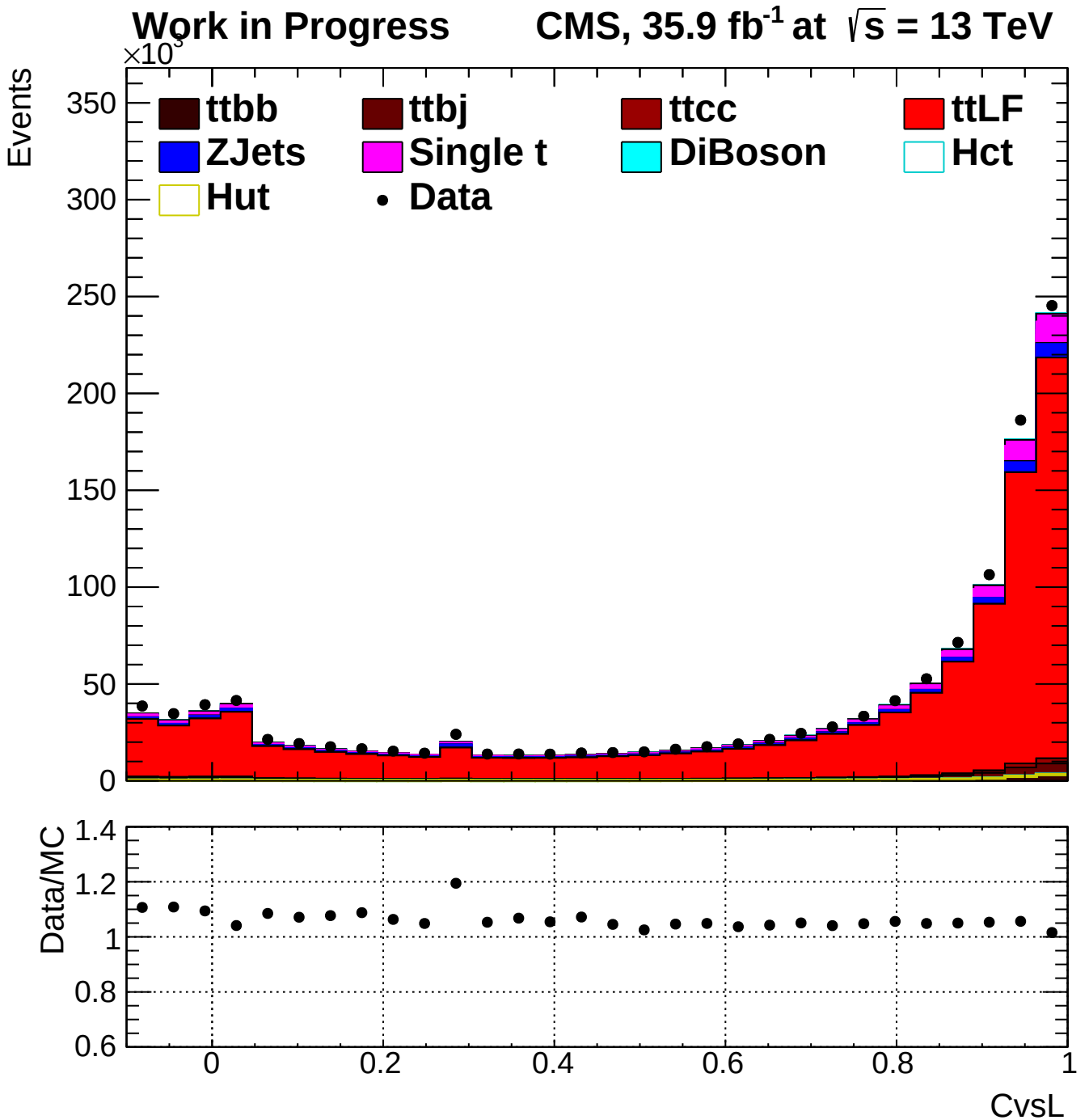

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

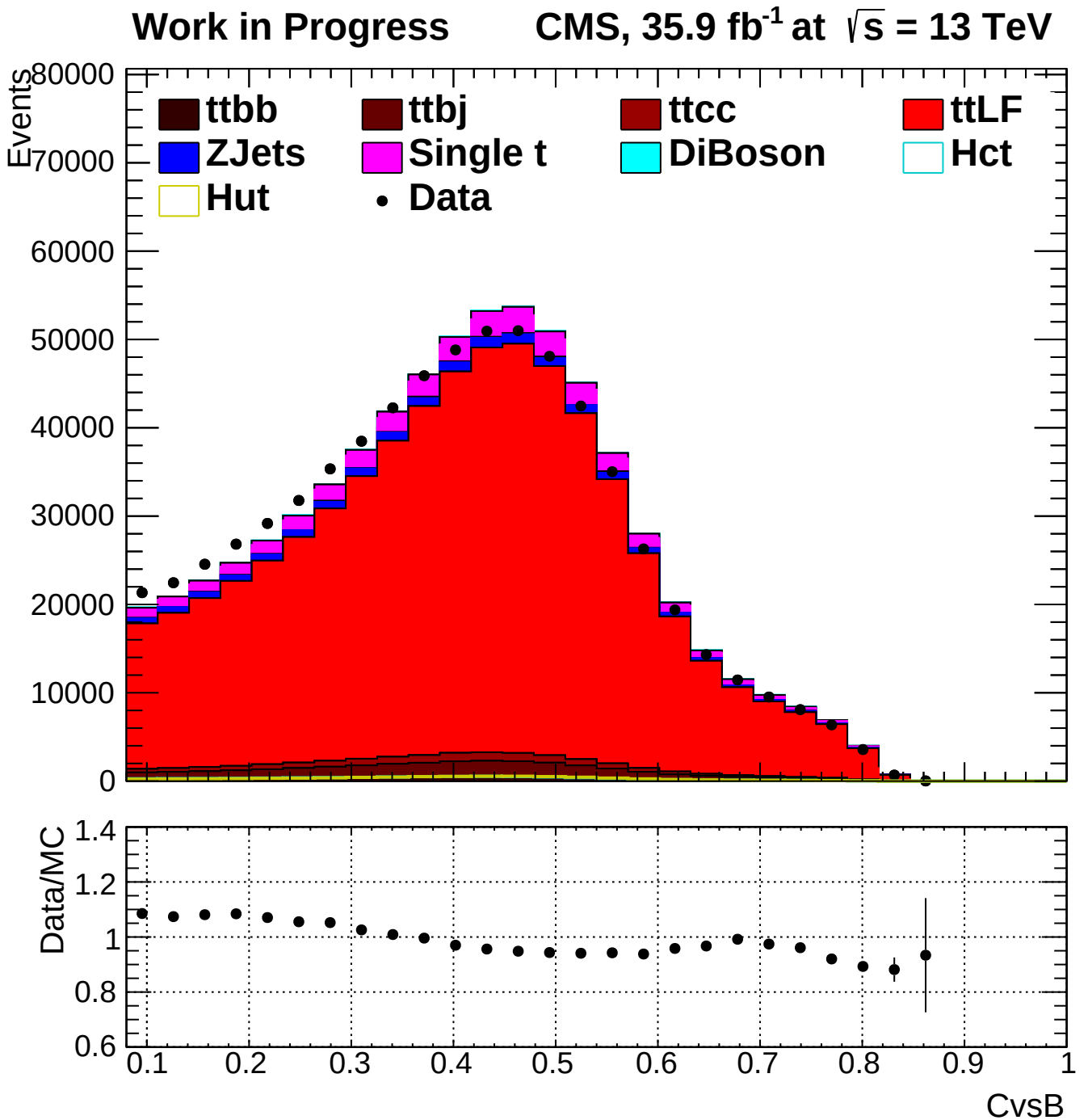

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

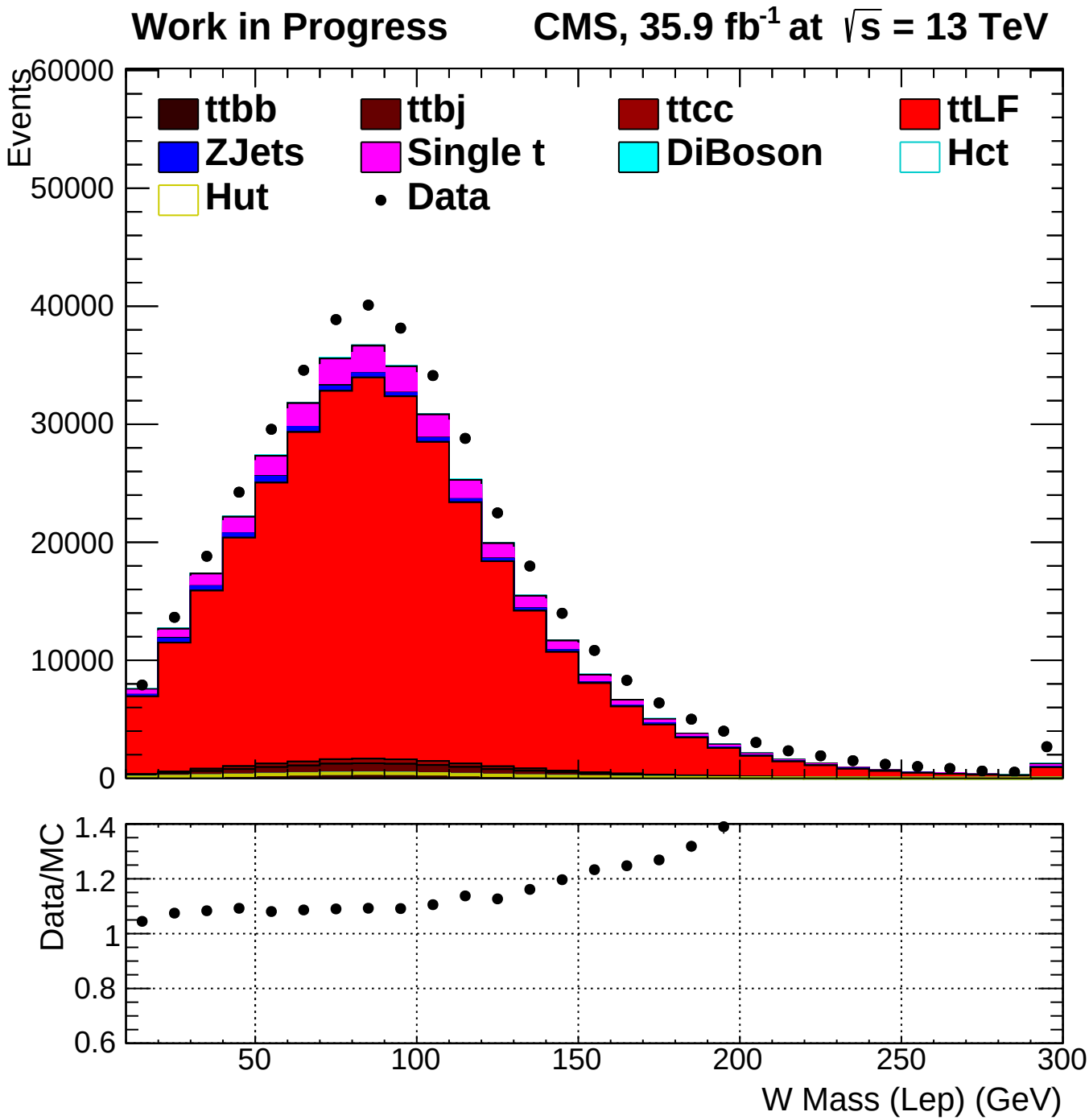

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
350
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

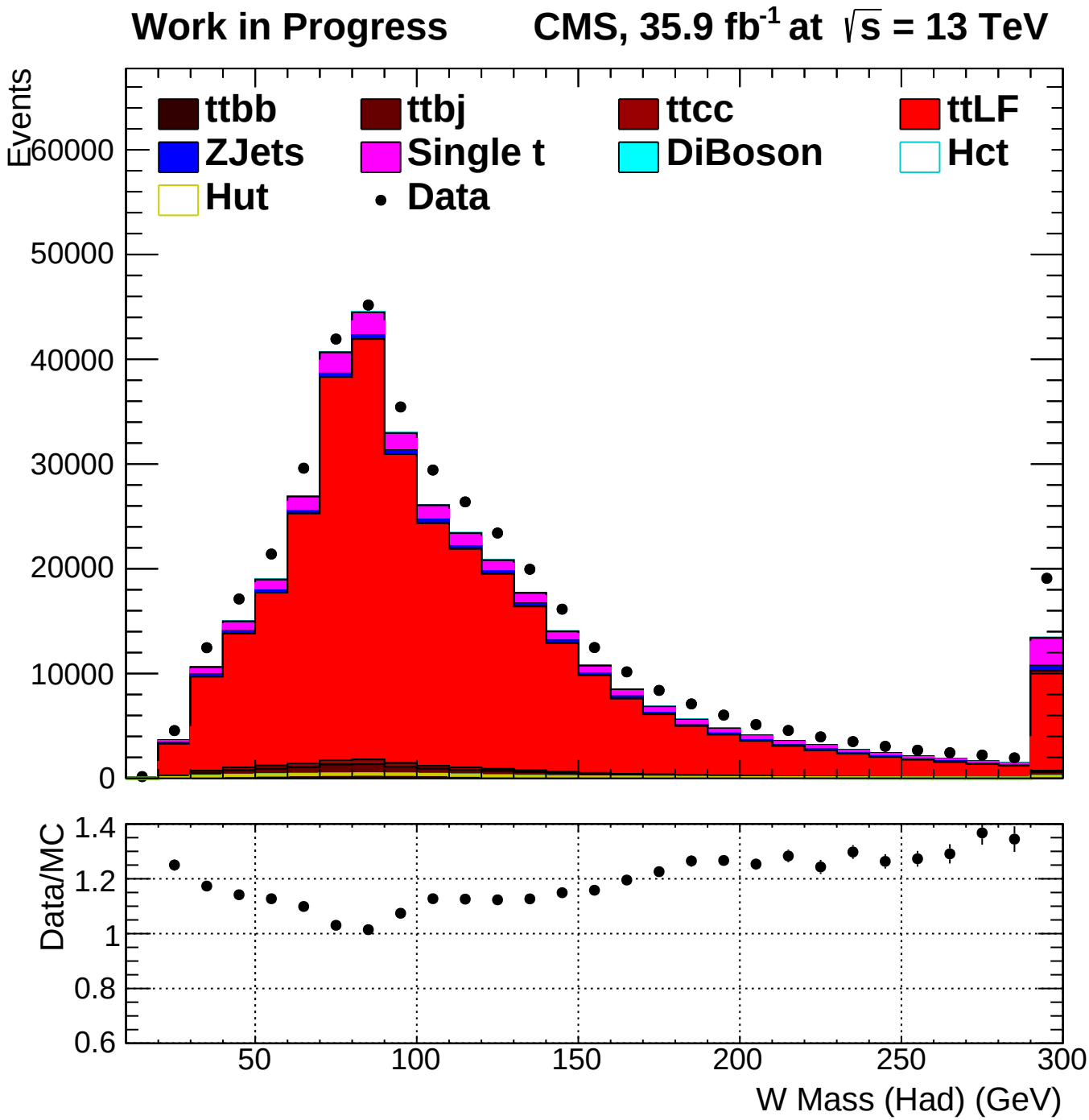

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

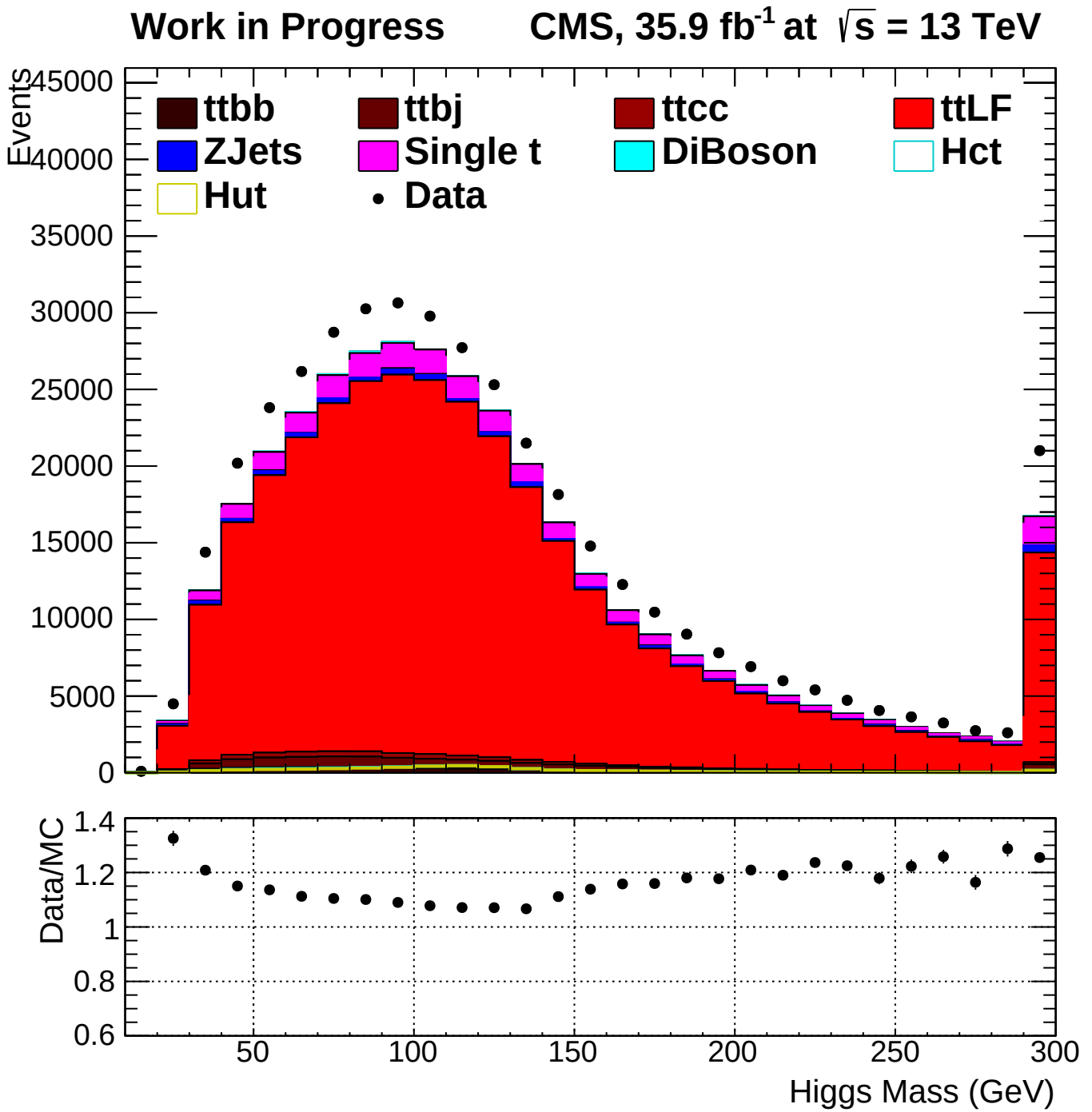

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

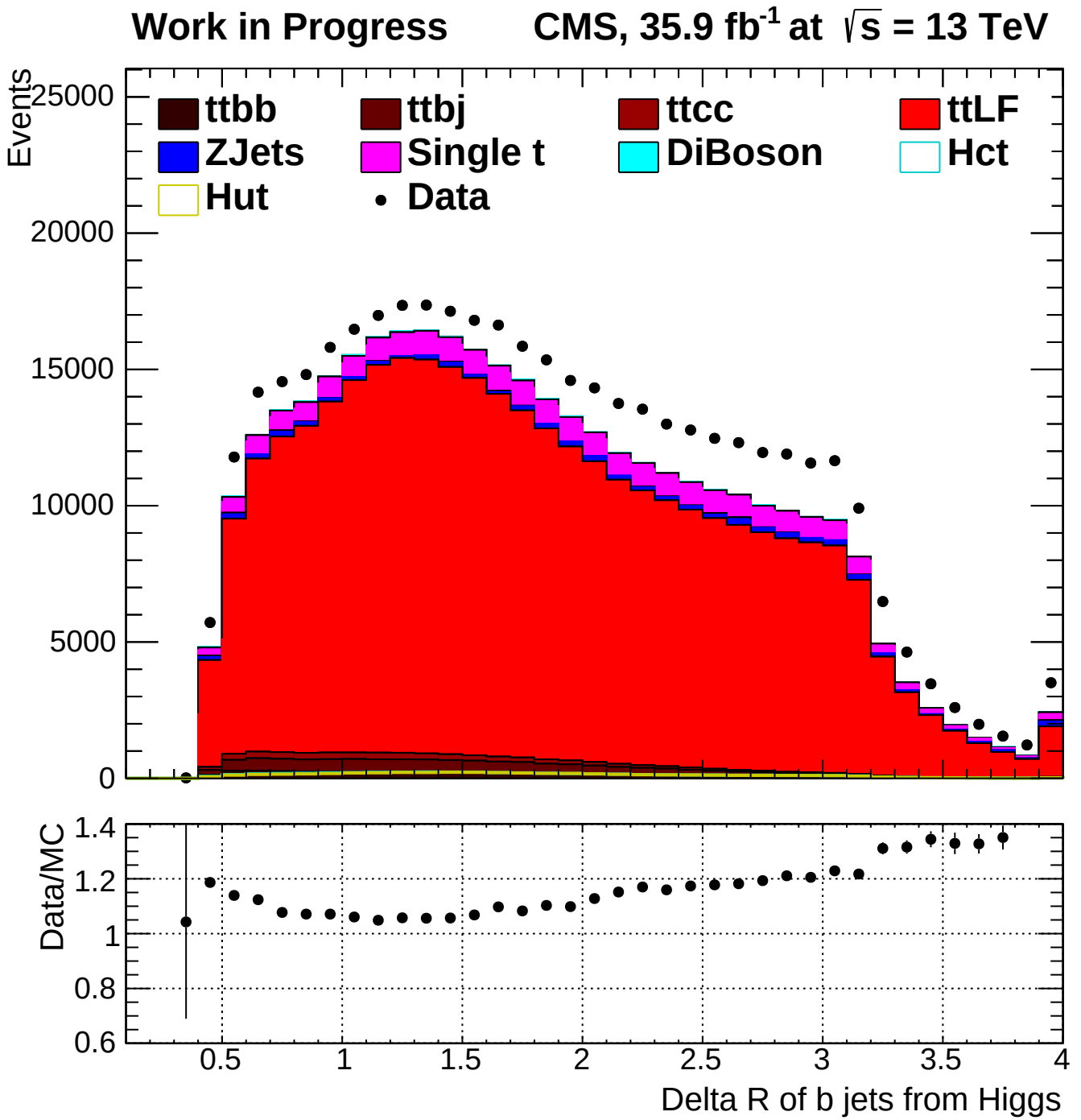

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
350
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

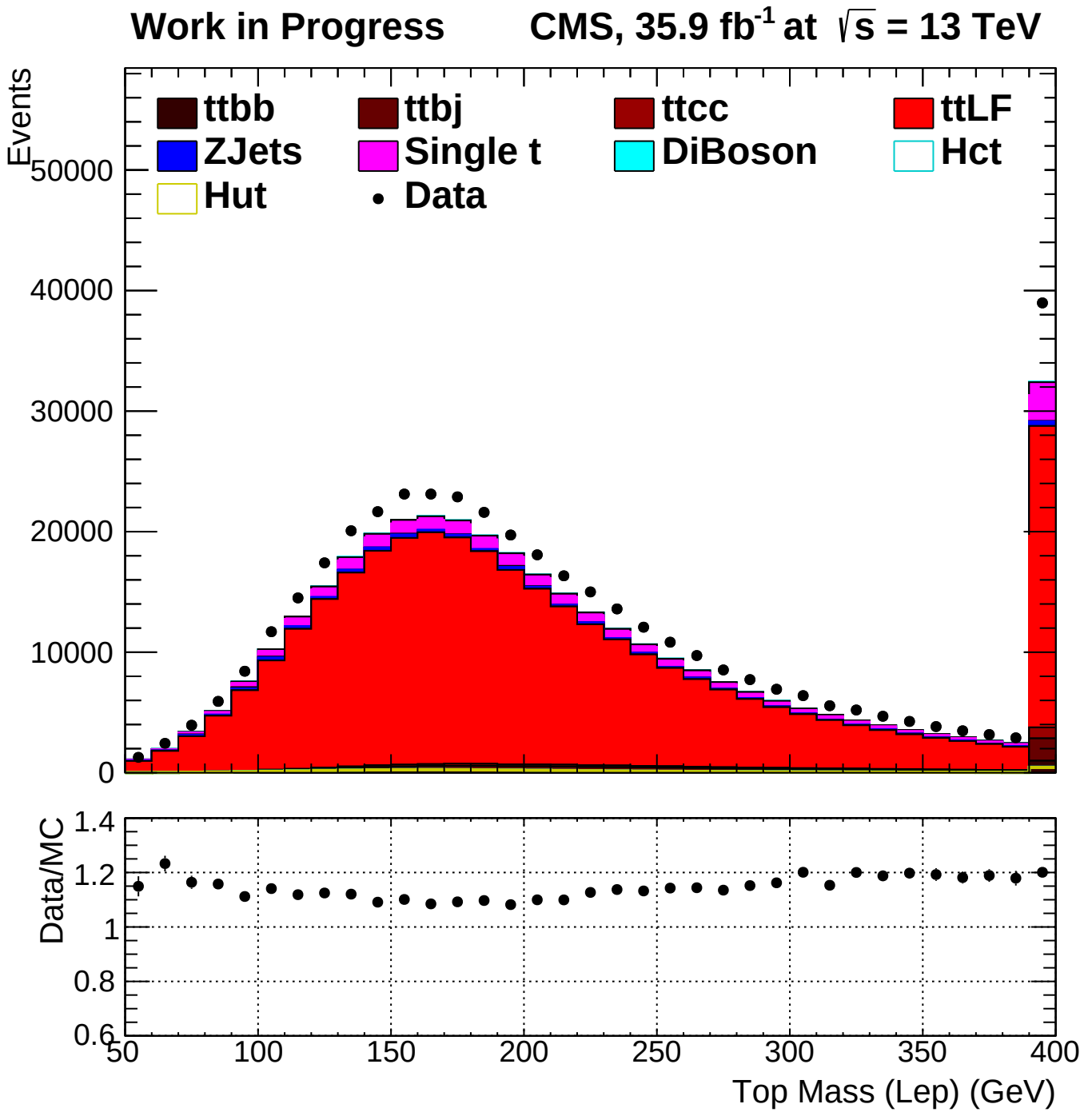

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

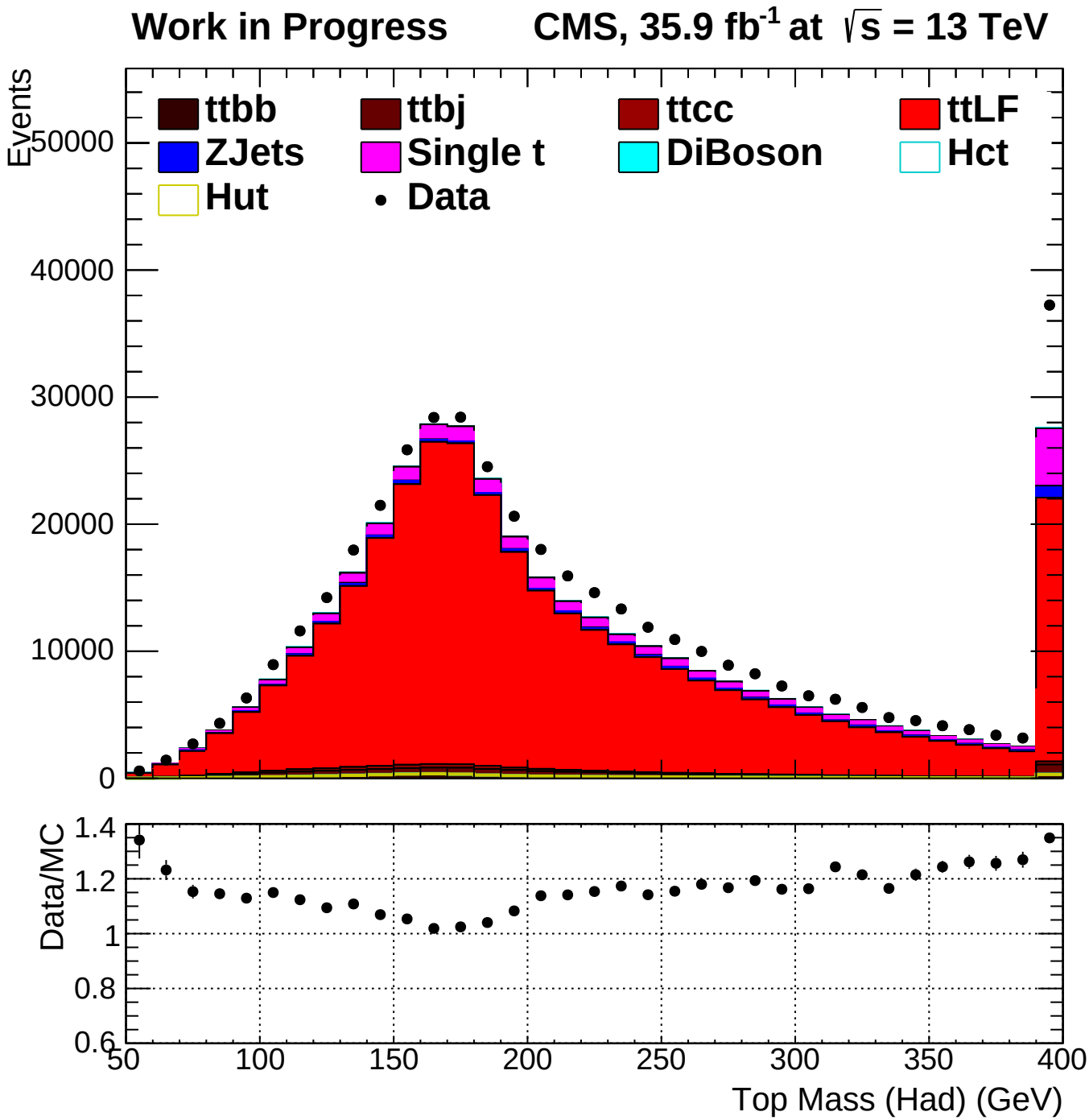

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)

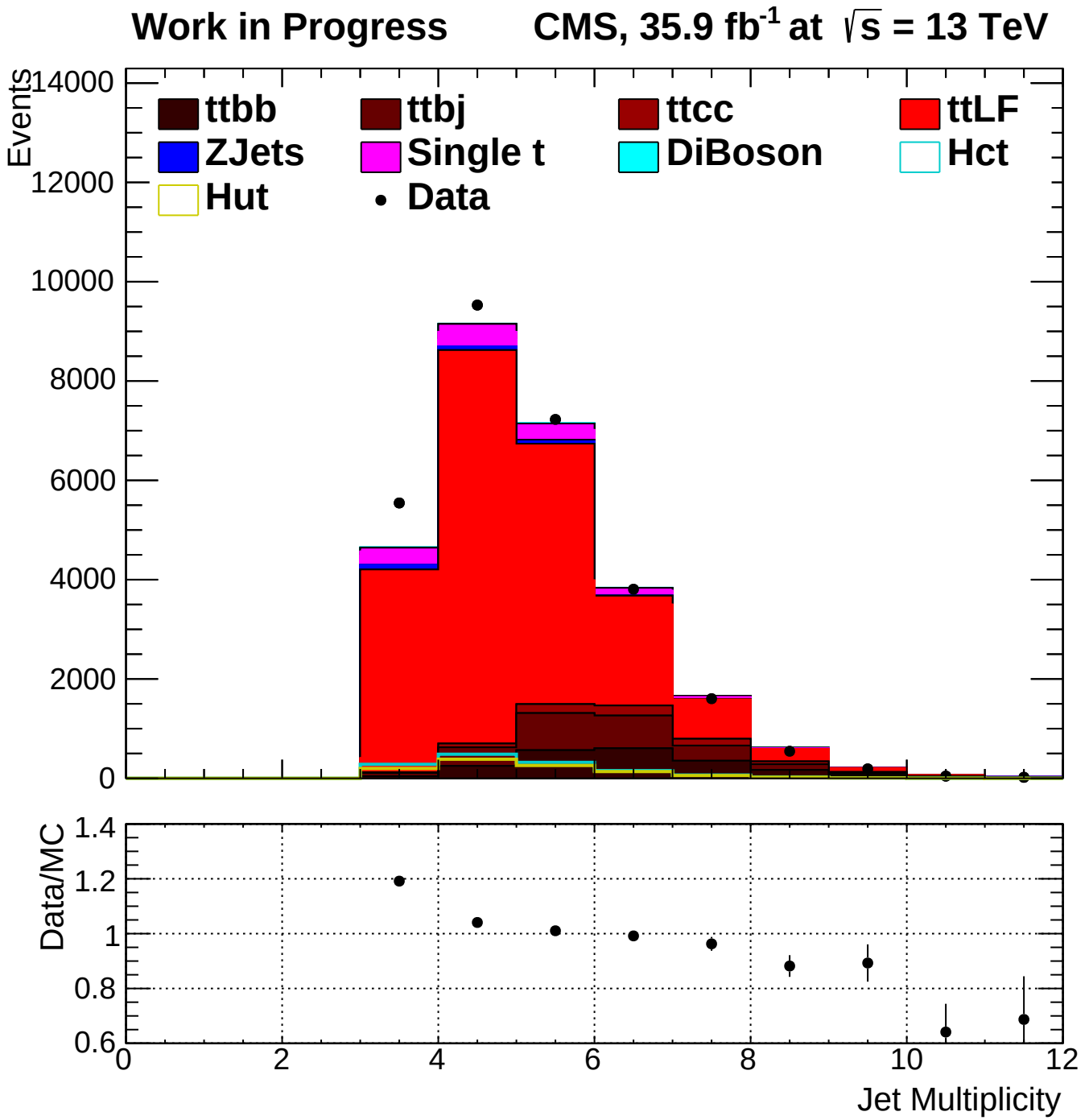

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)

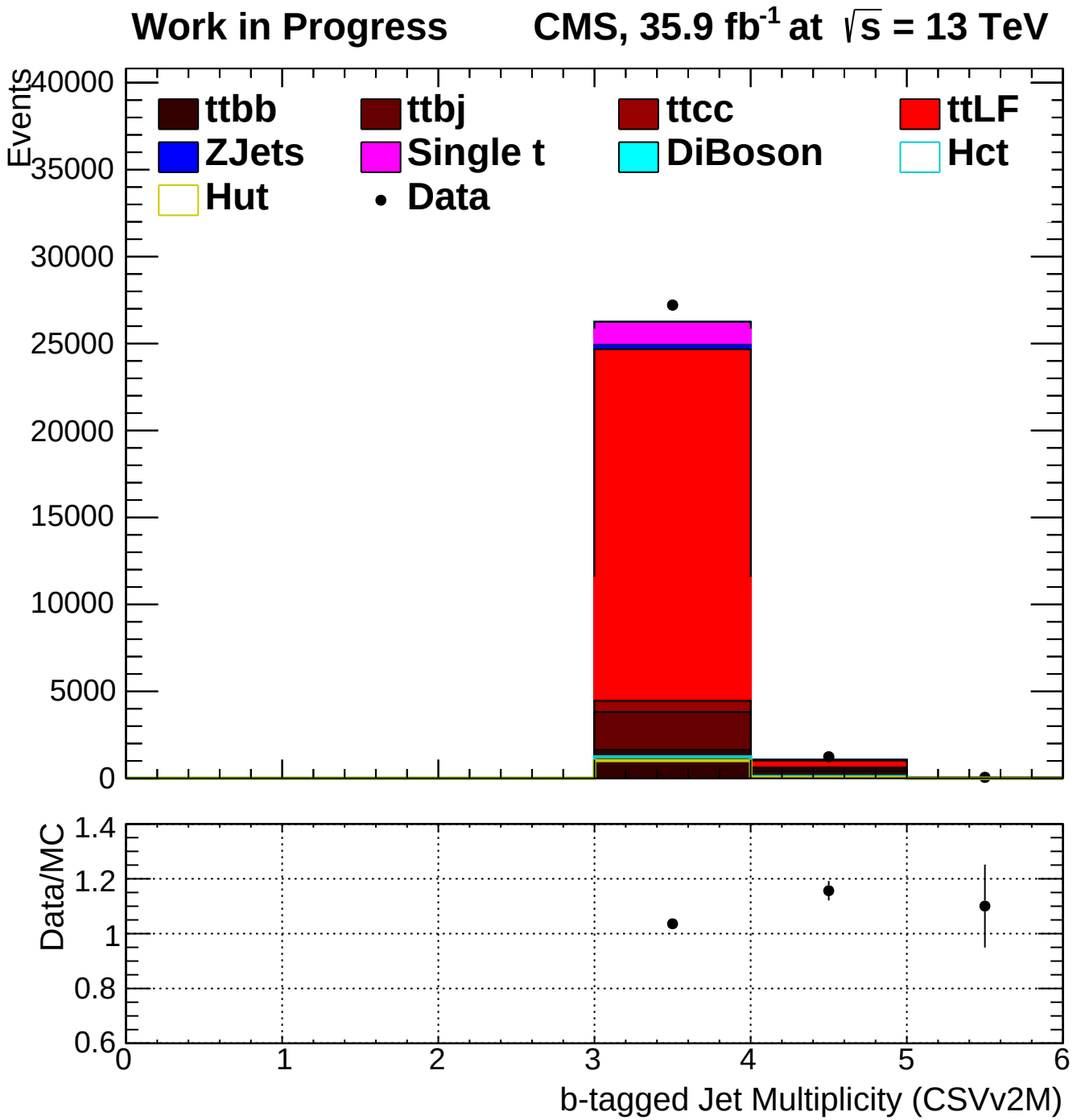

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

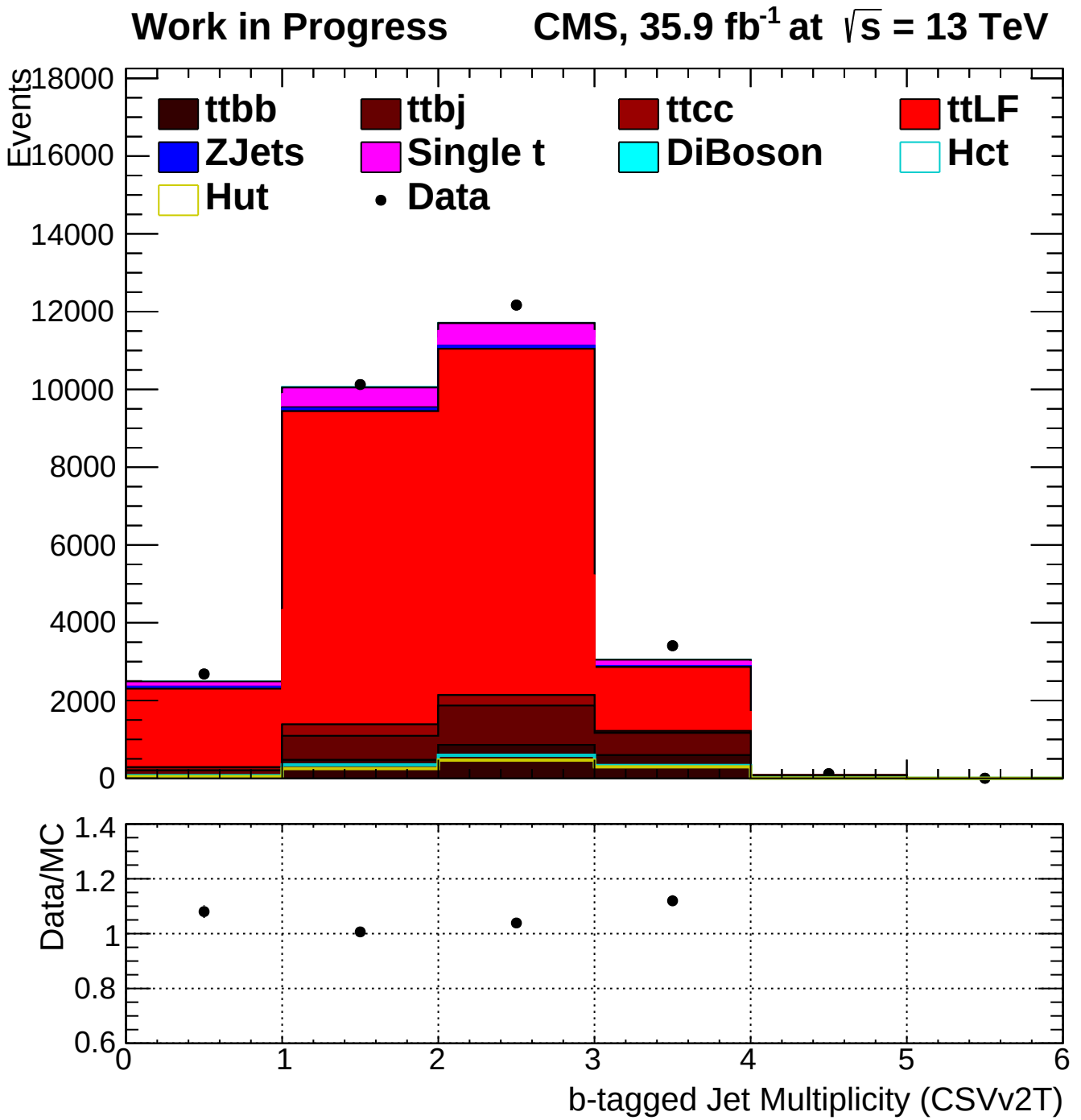

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs

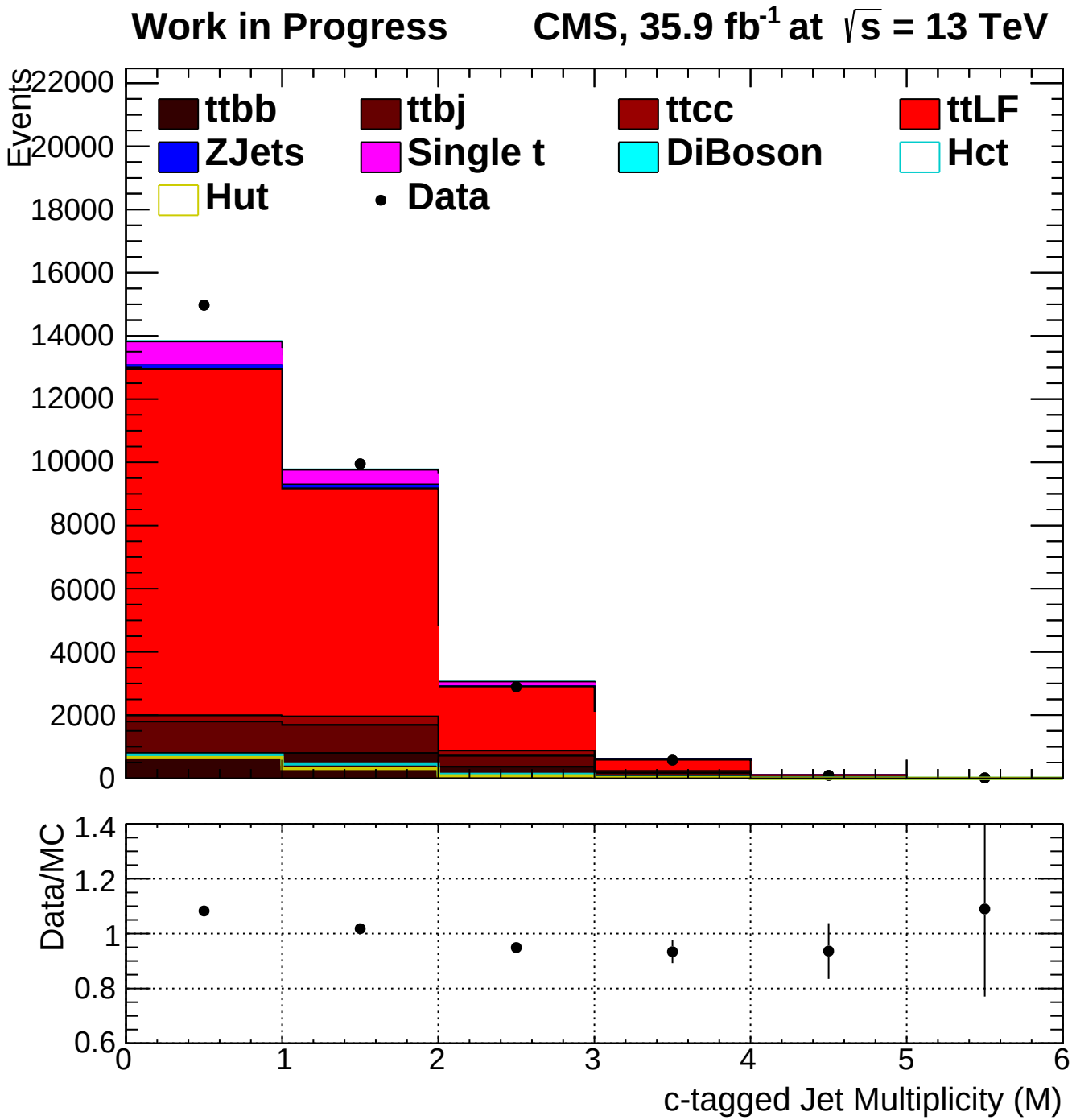

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)

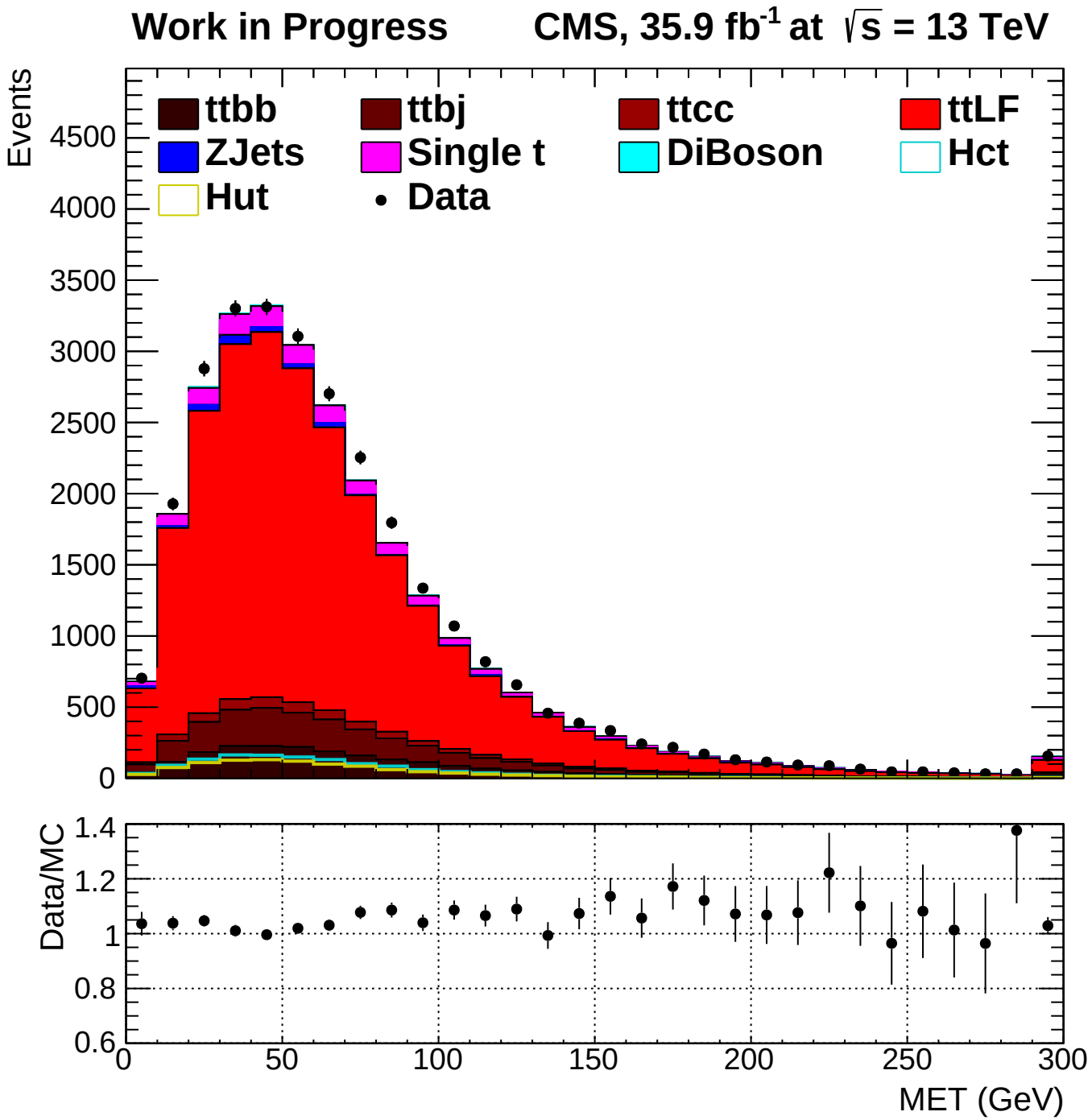

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Had) (GeV)

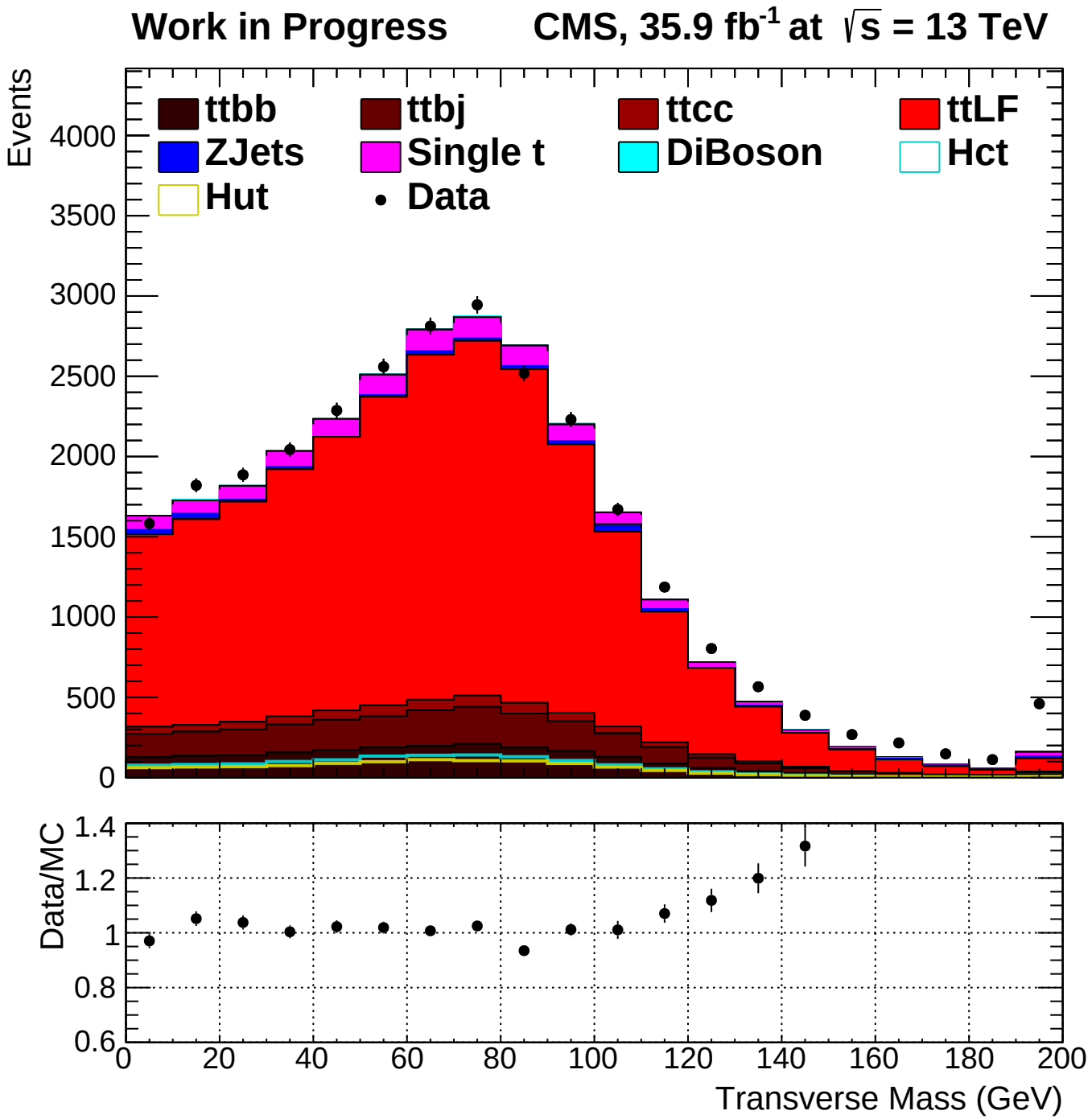

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

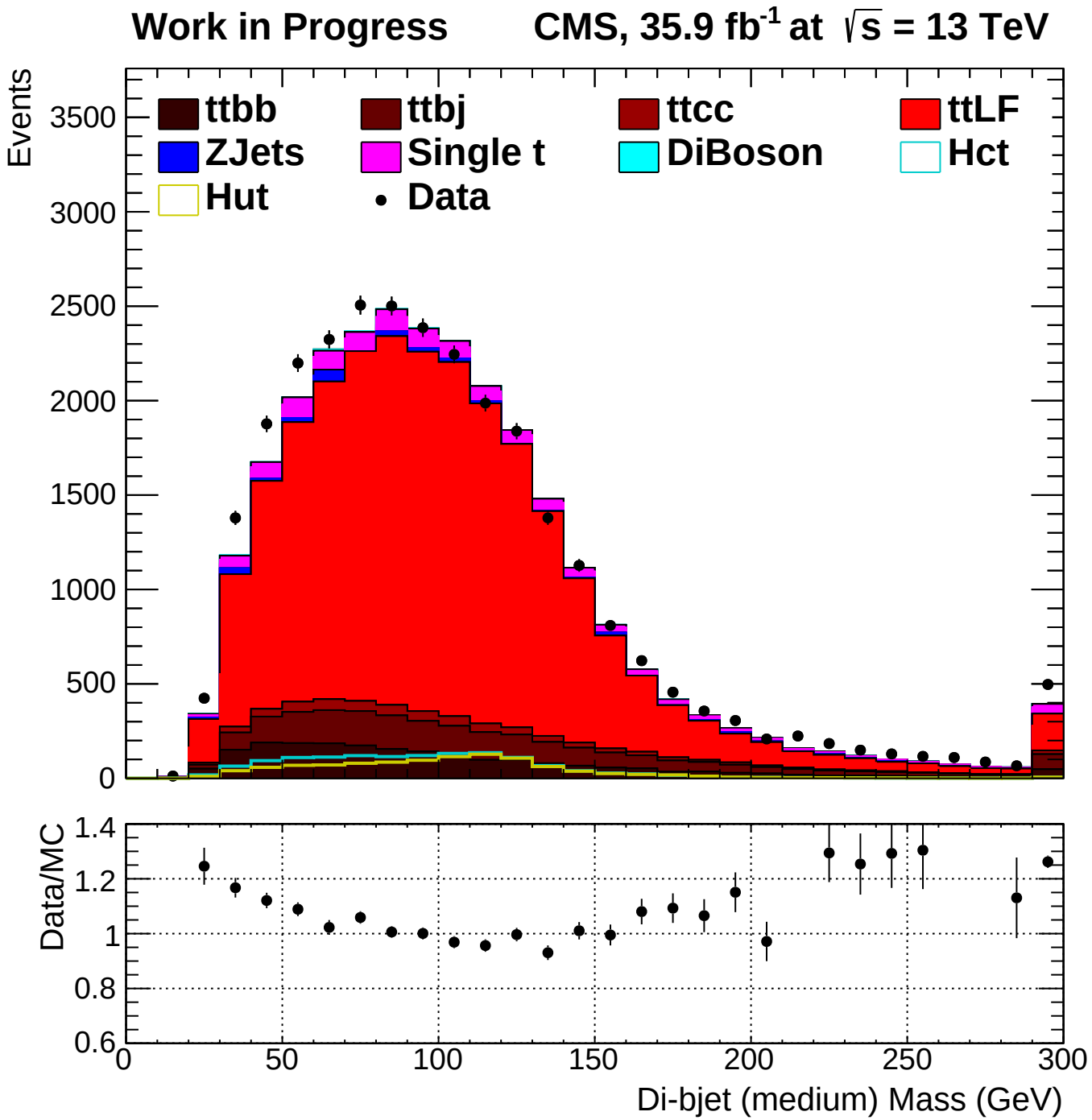

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

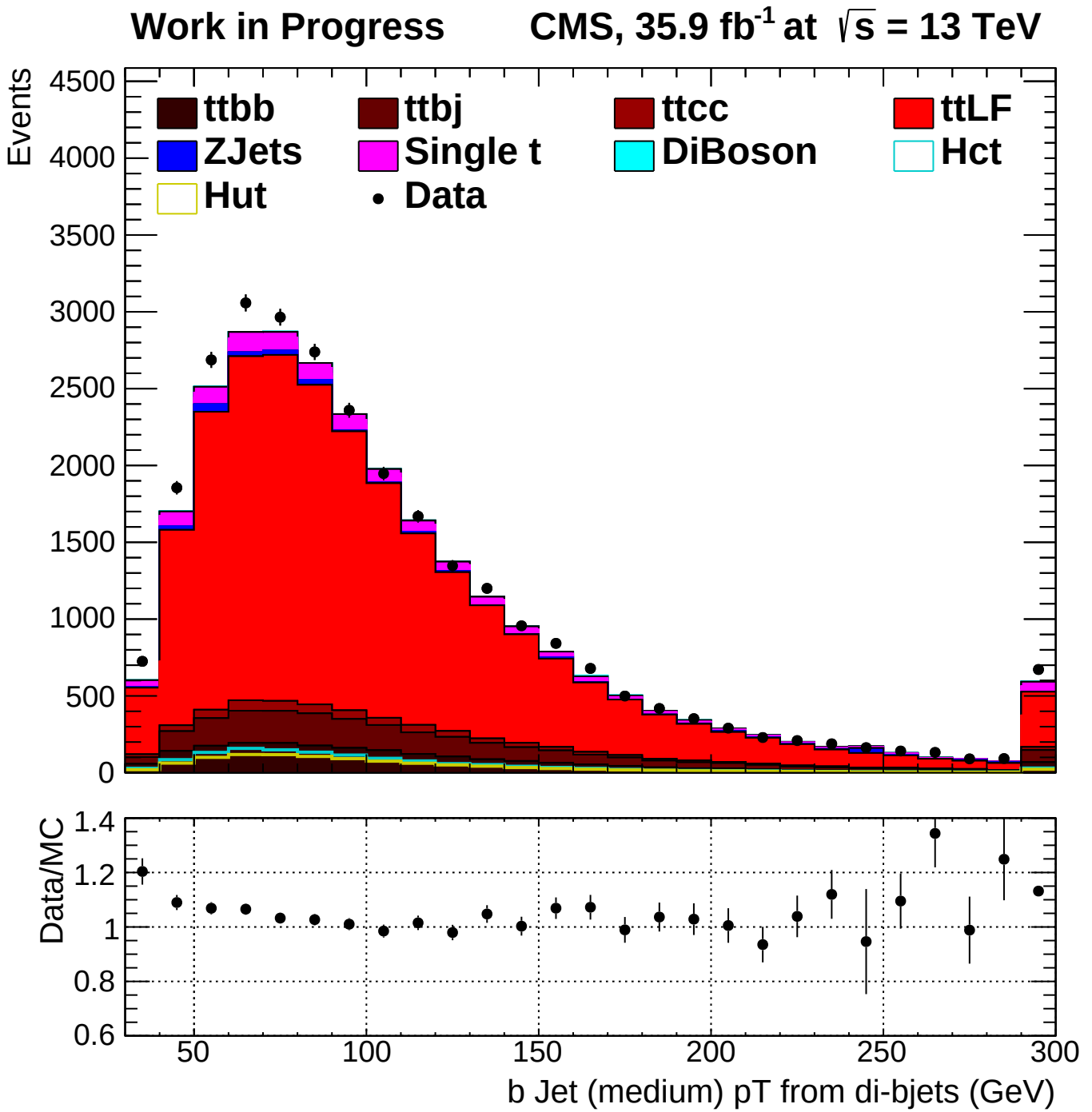

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

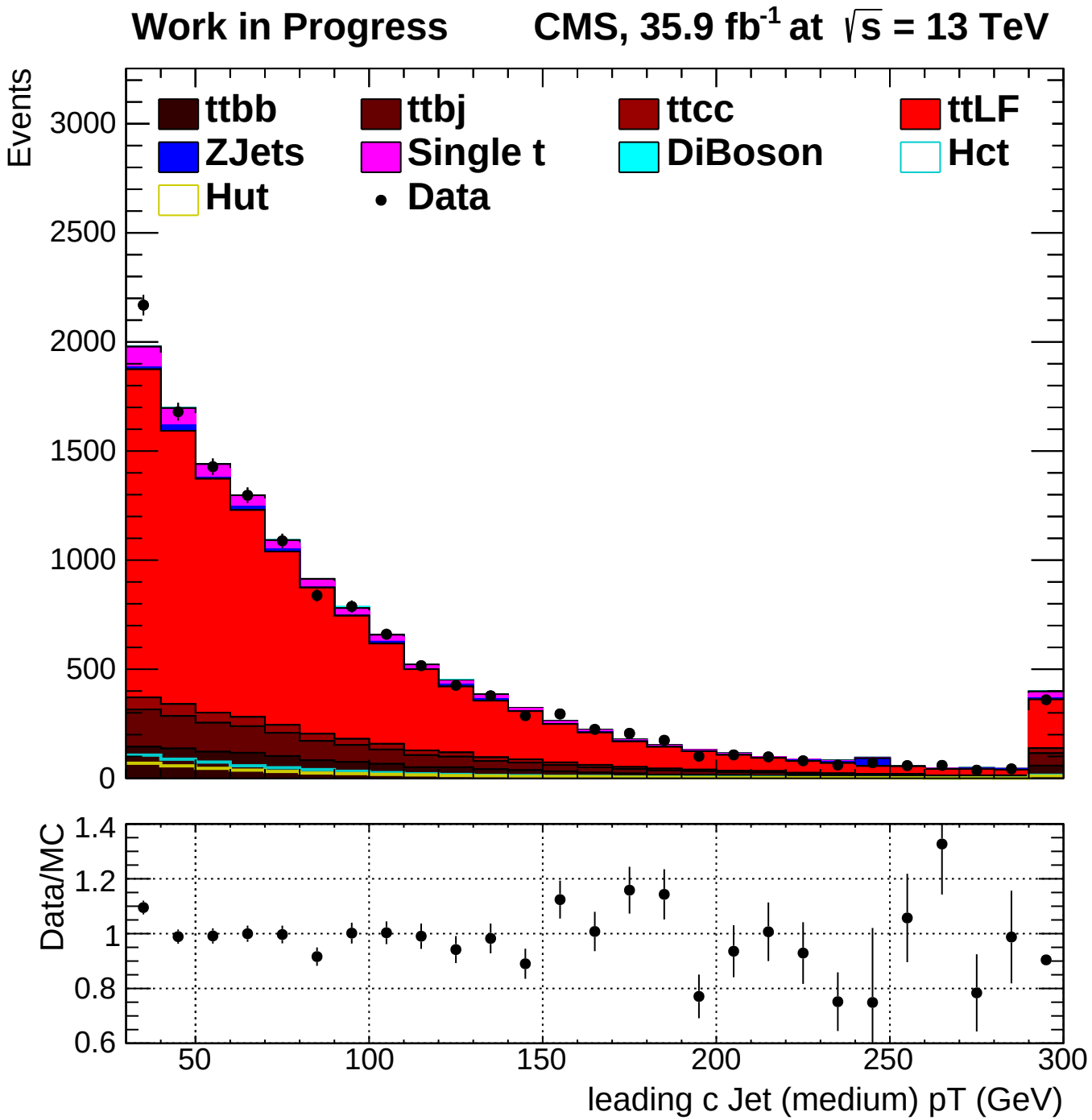

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)

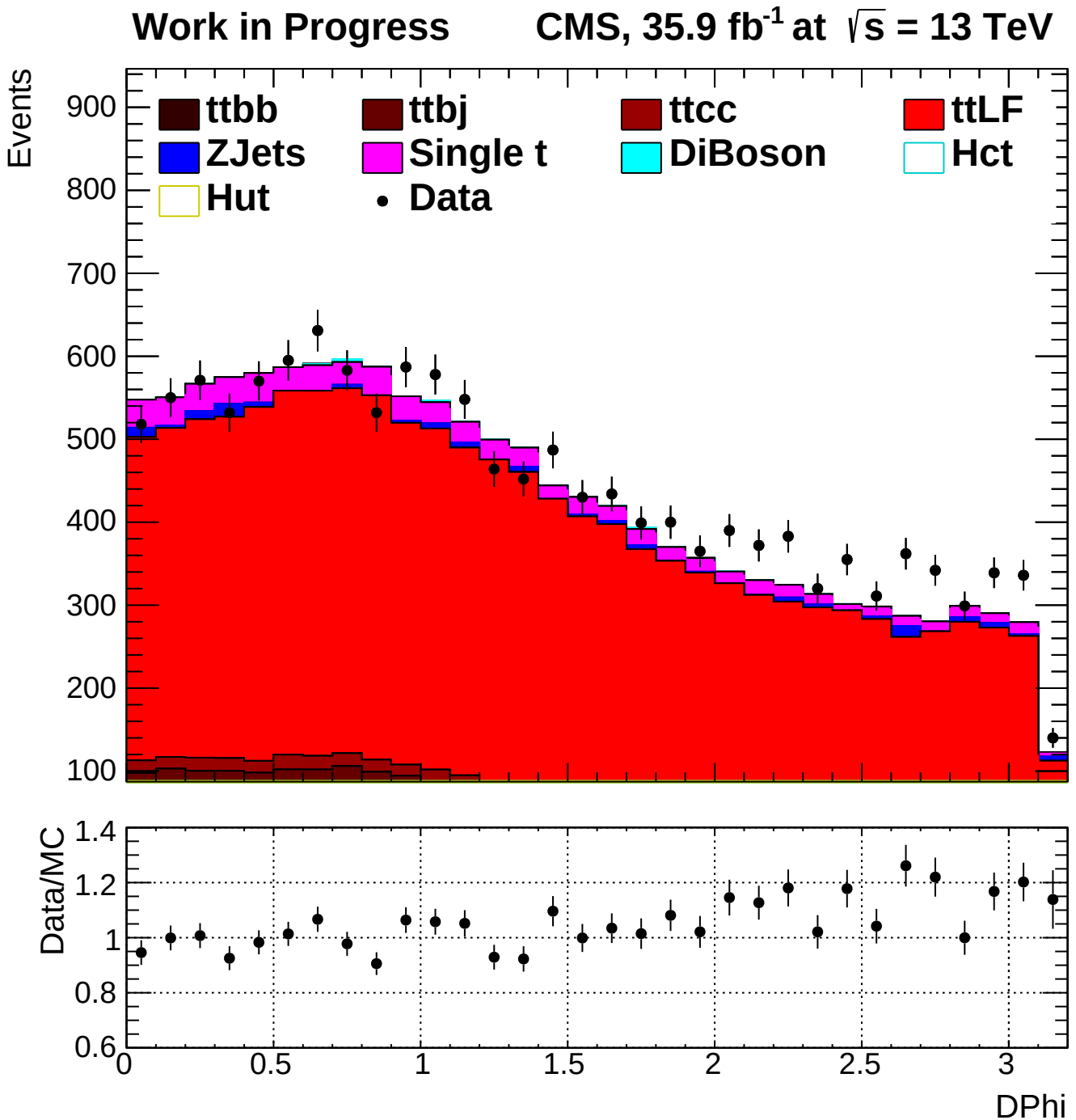

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

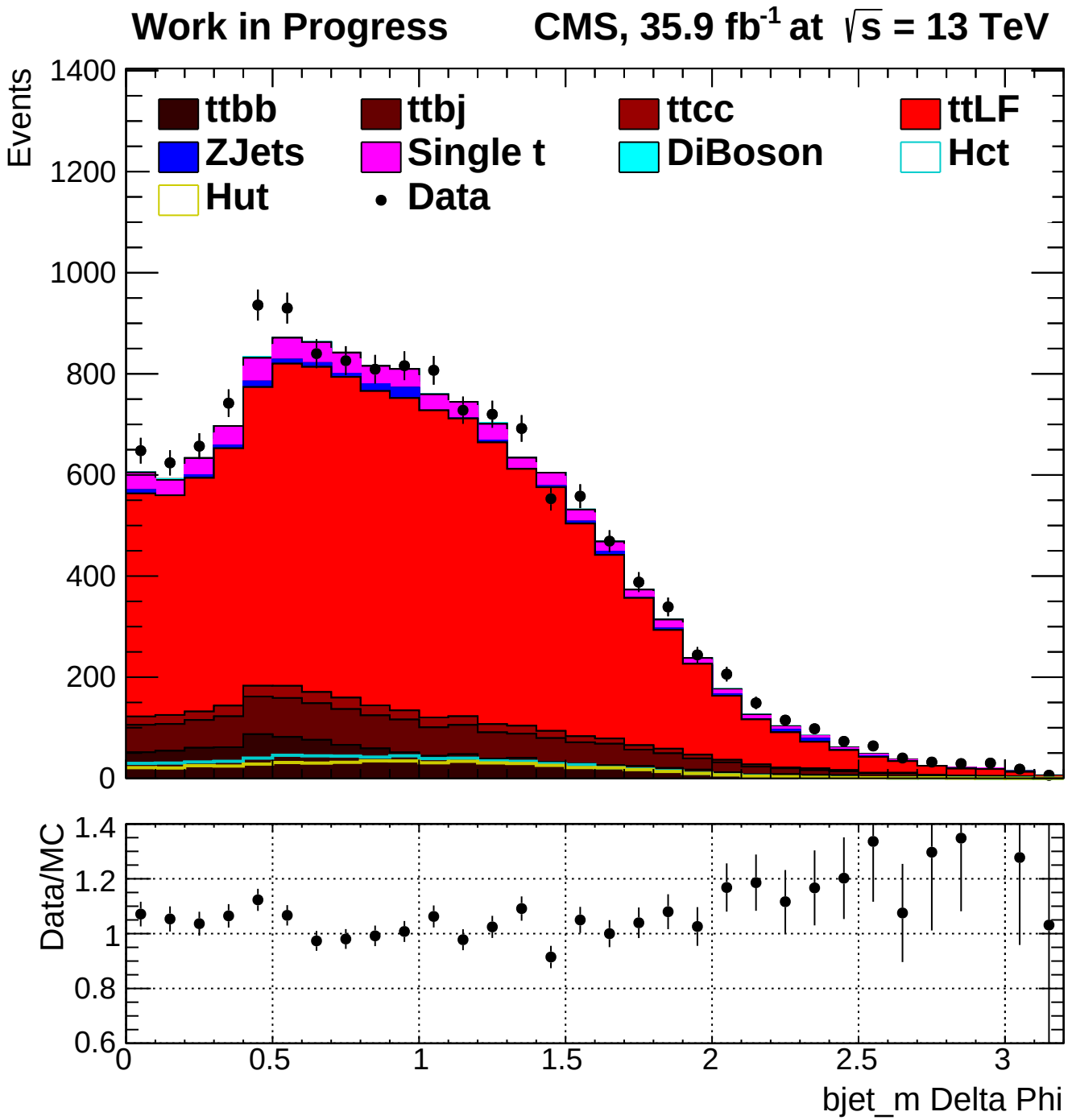

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

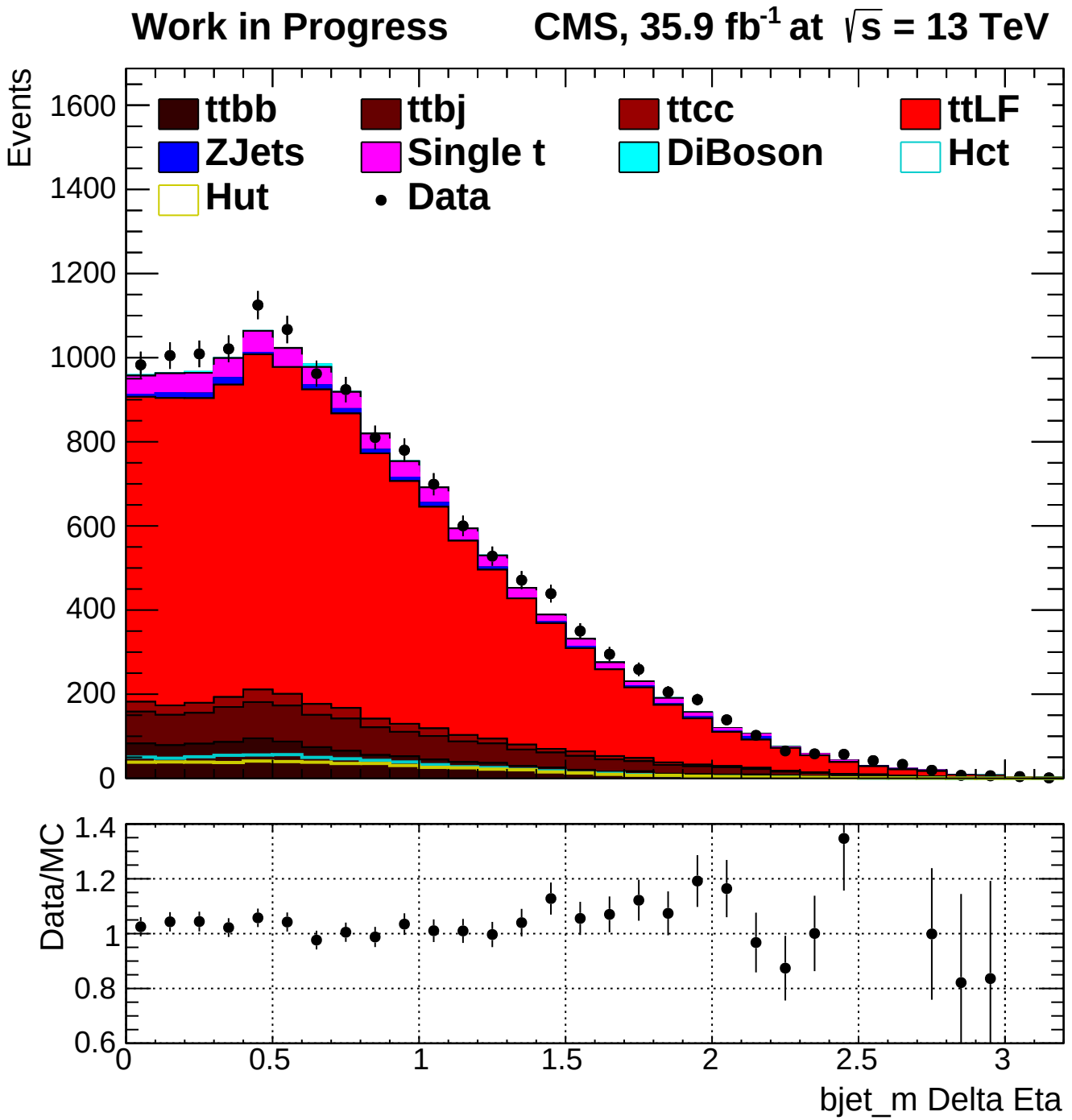

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
900
800
700
600
500
400
300
200
100
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
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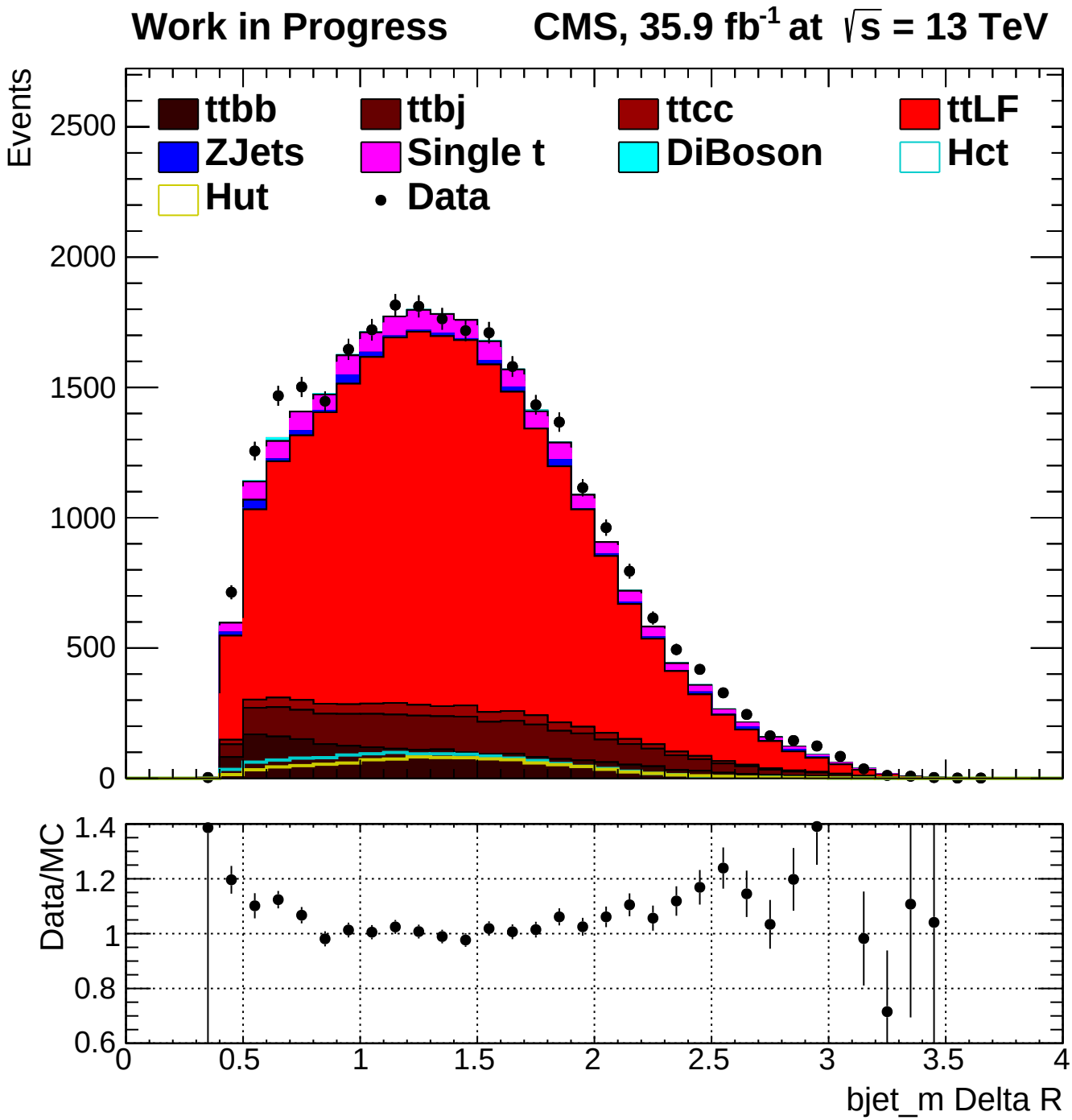
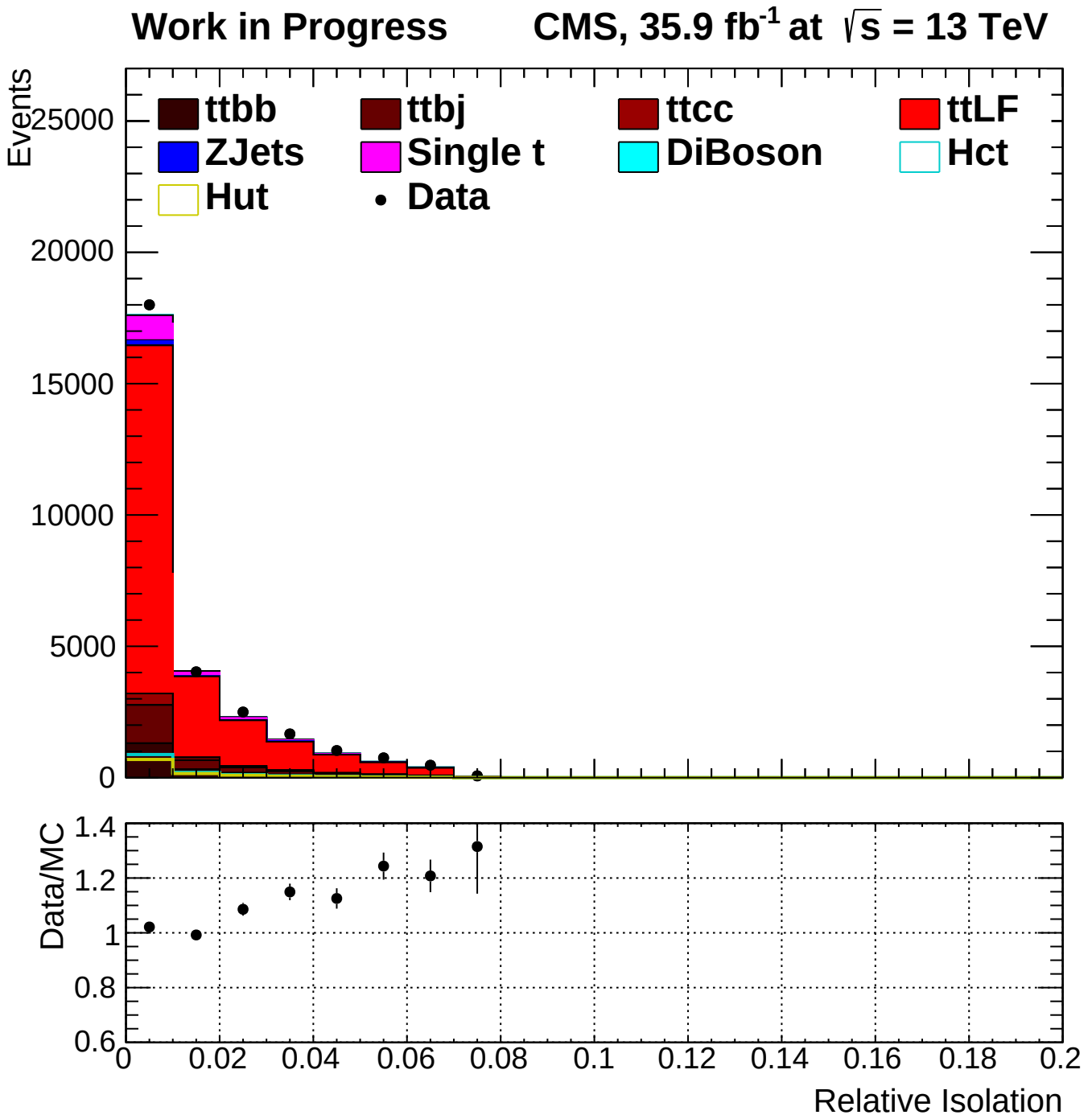
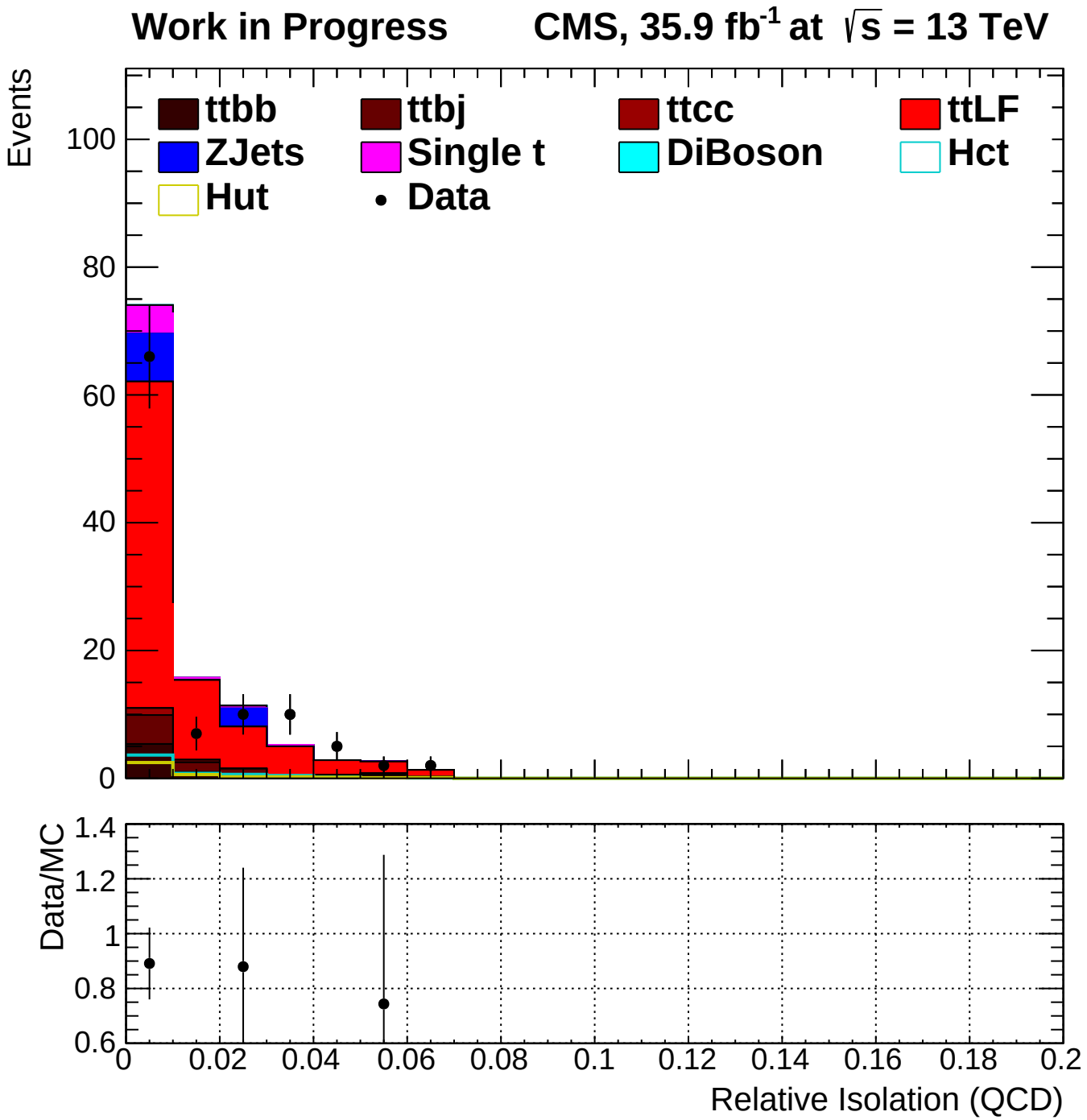
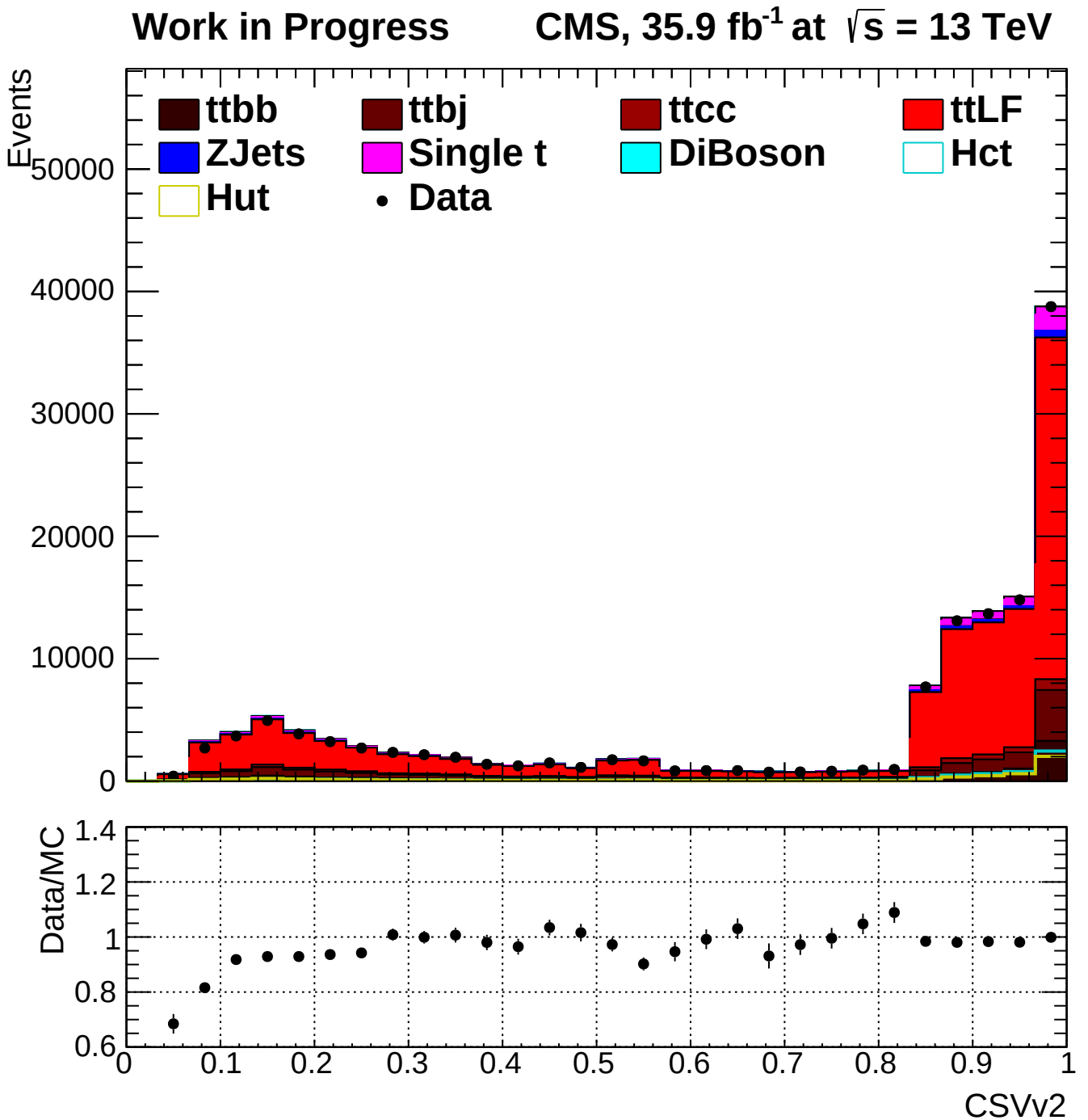
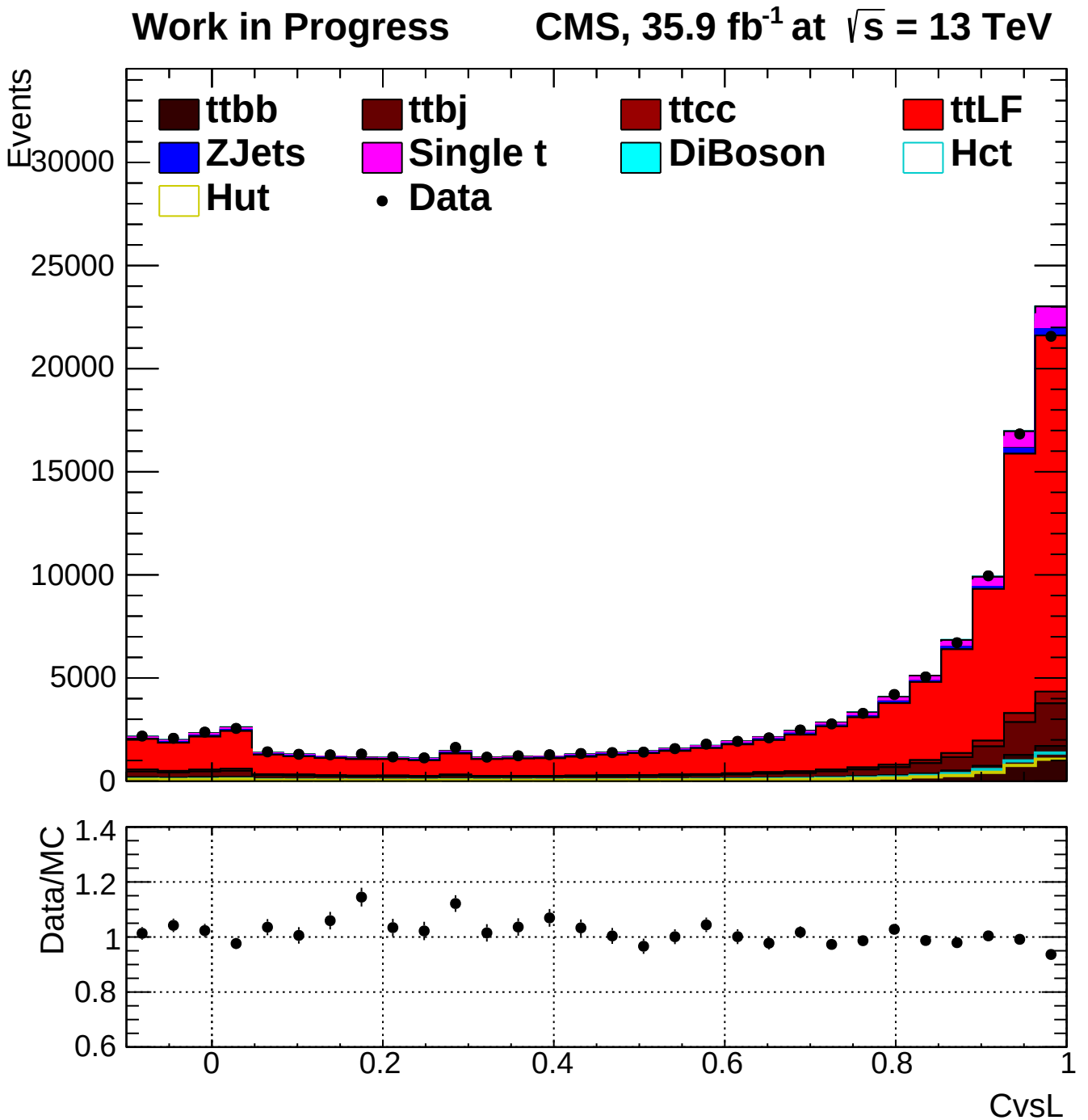
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
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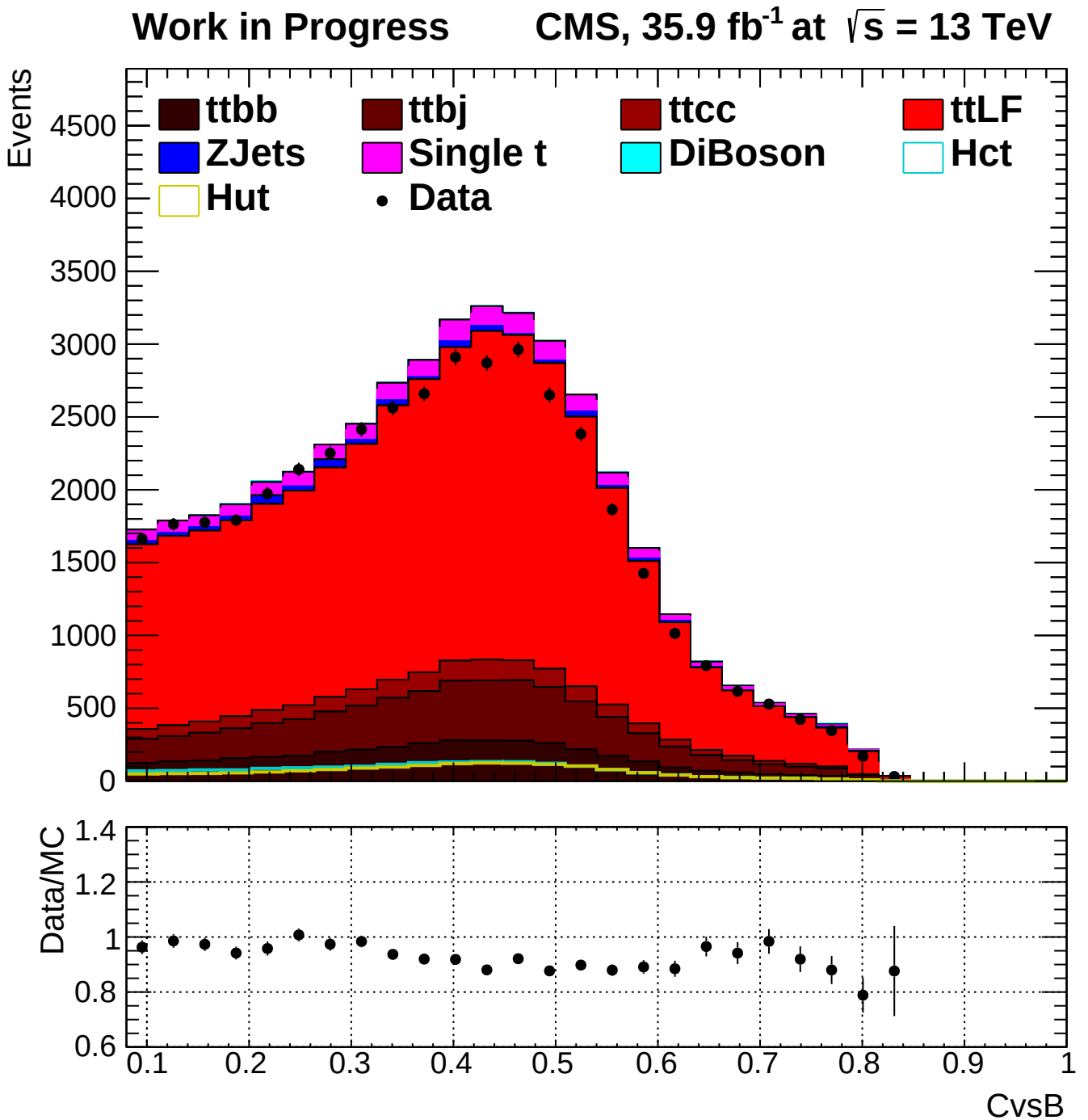
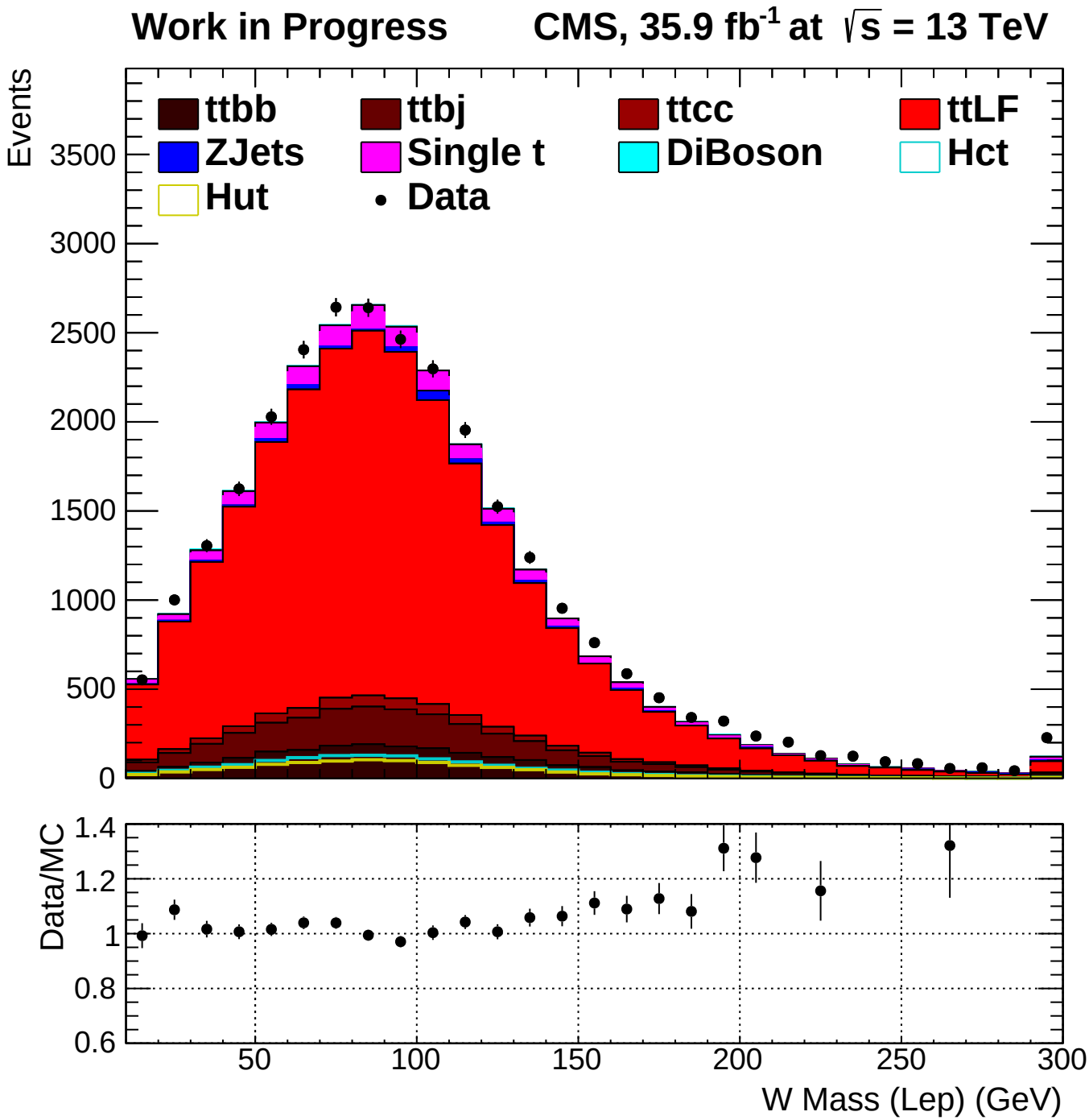
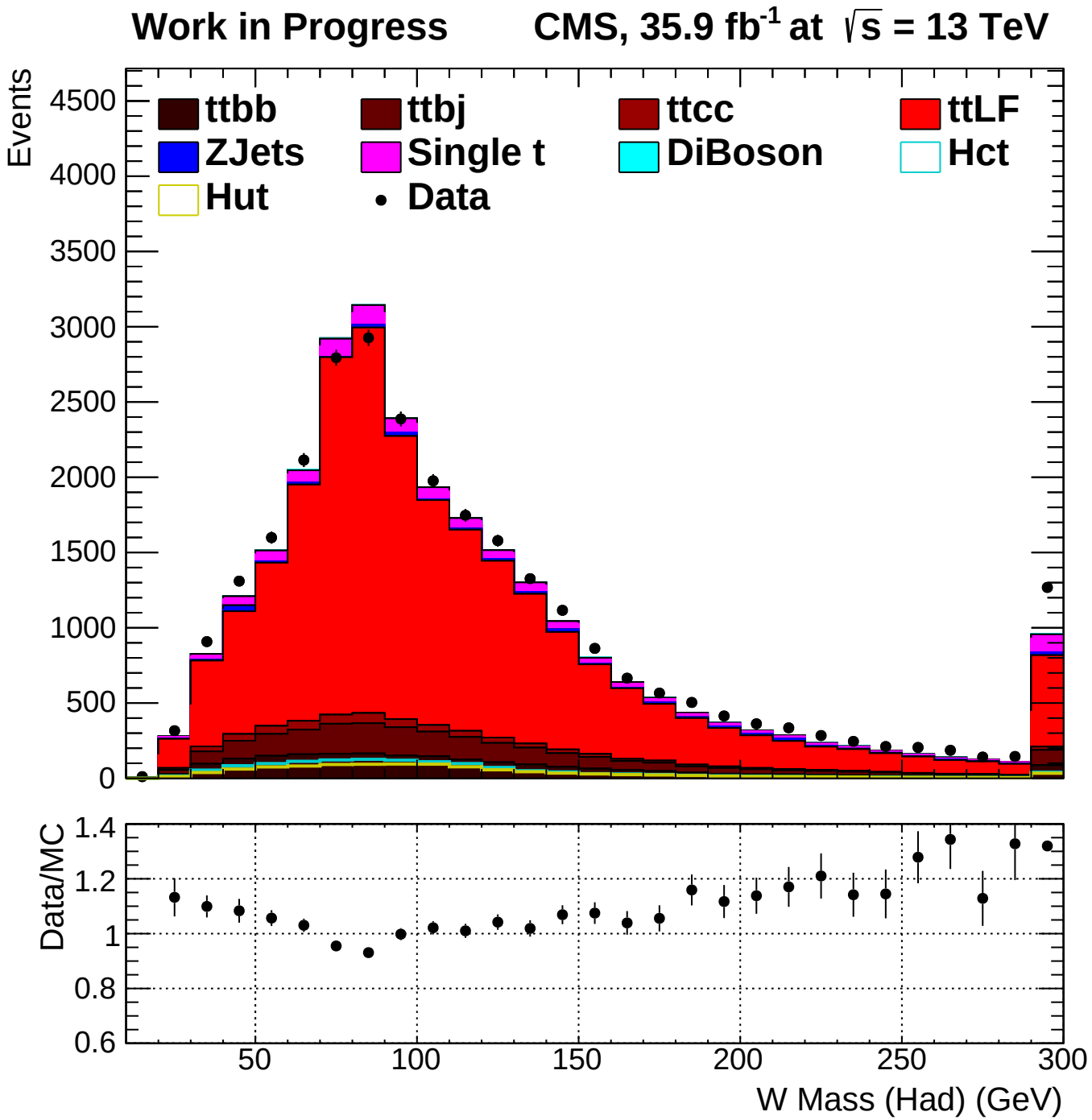
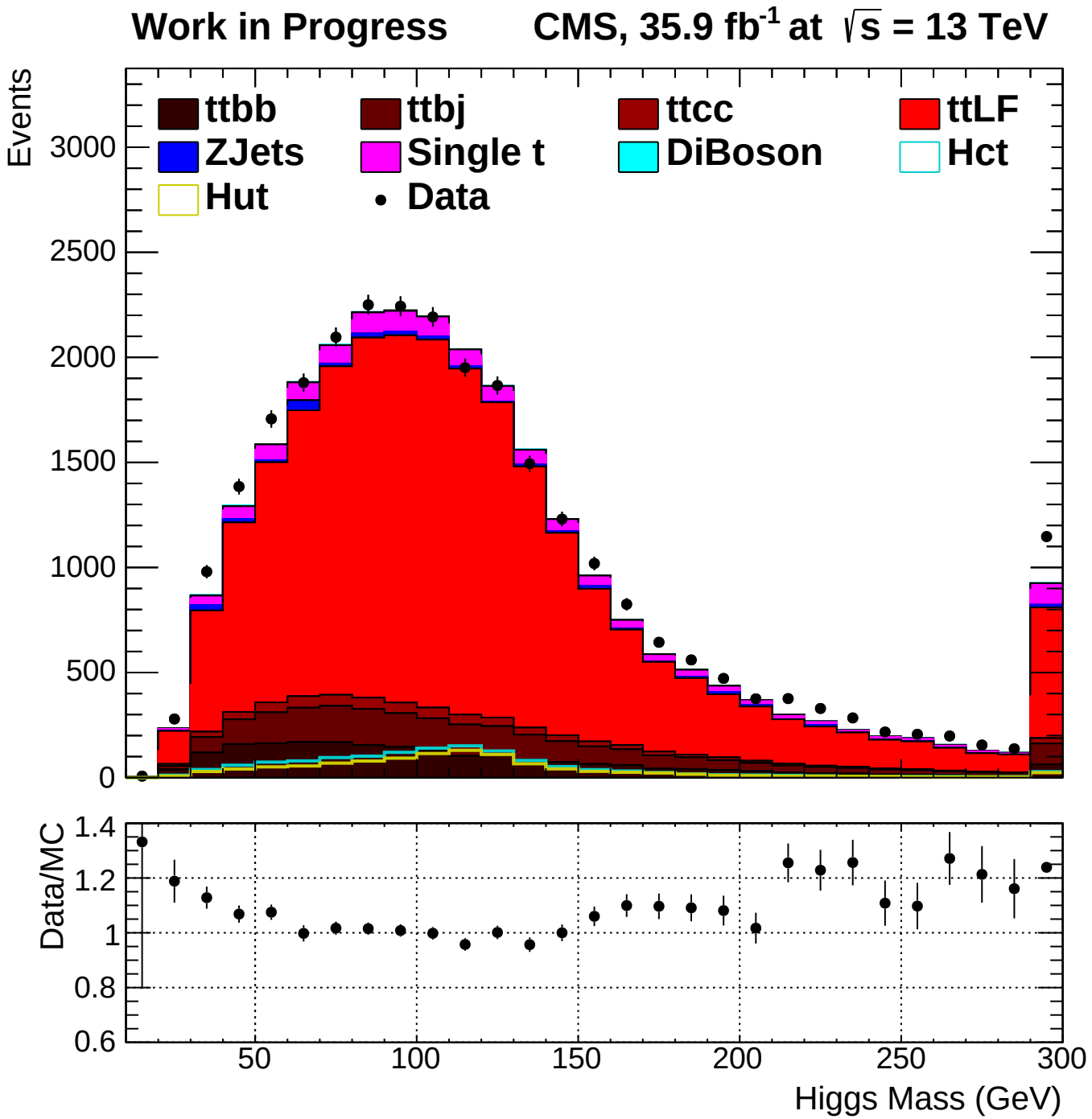
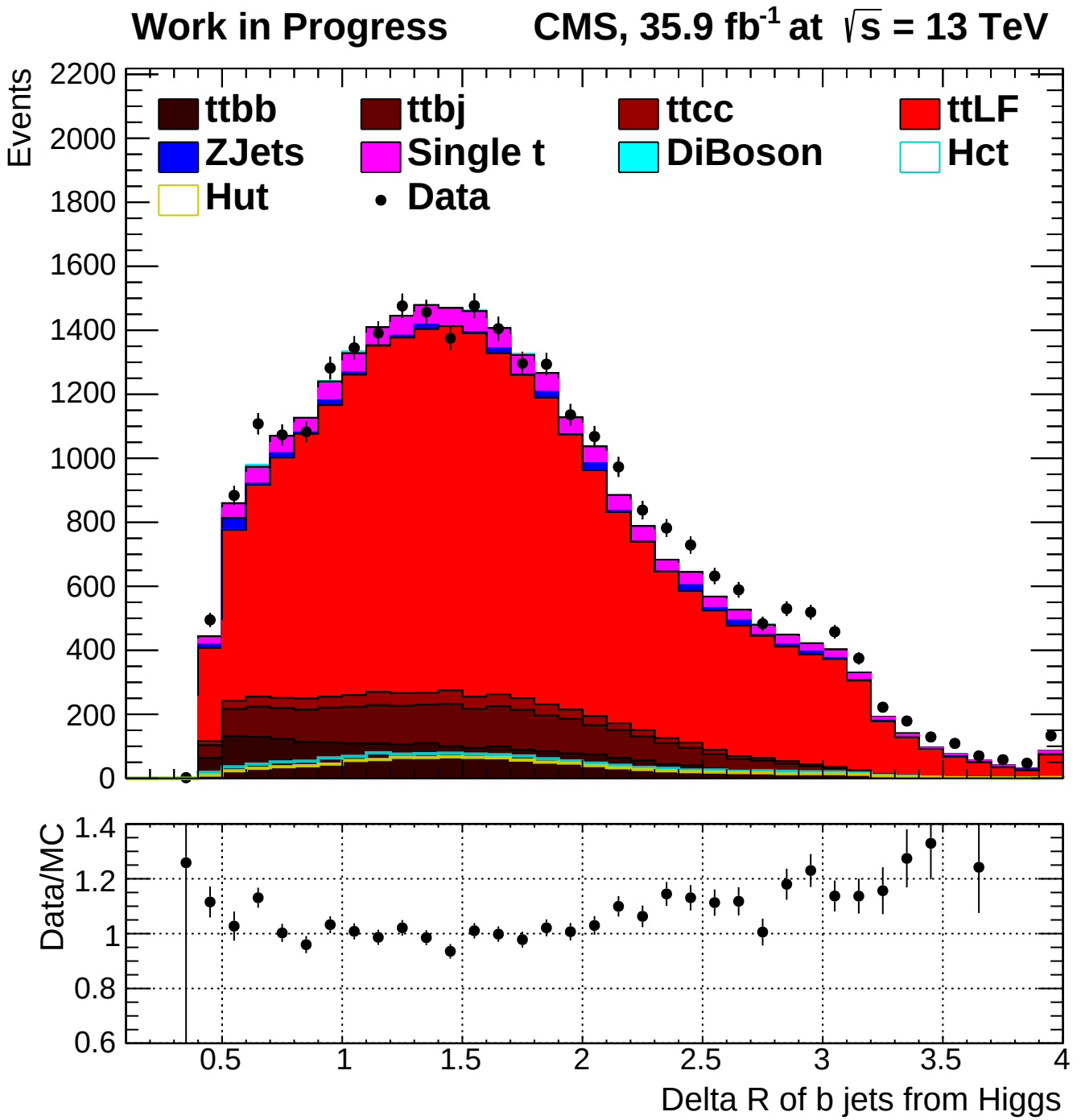
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

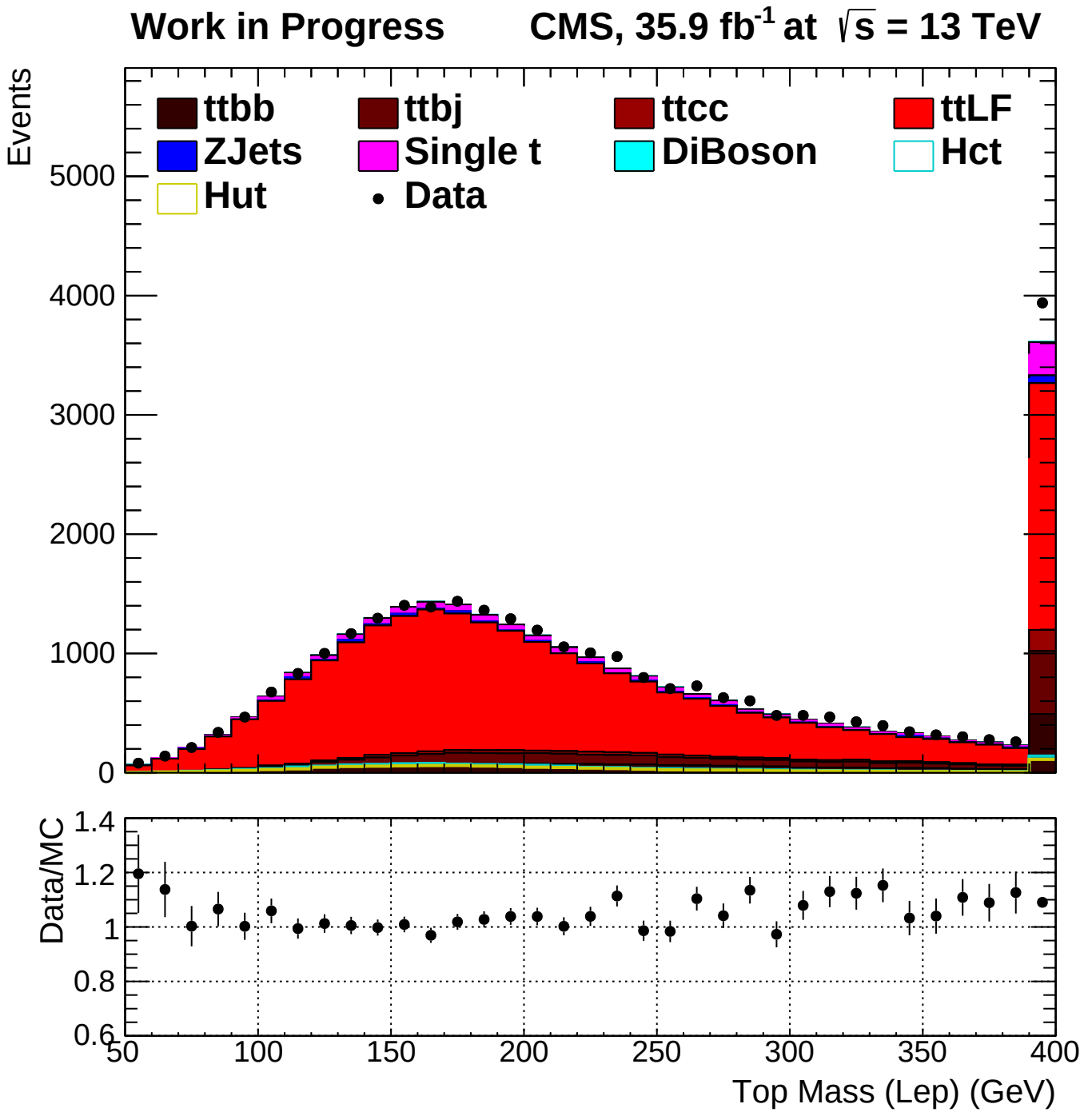

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

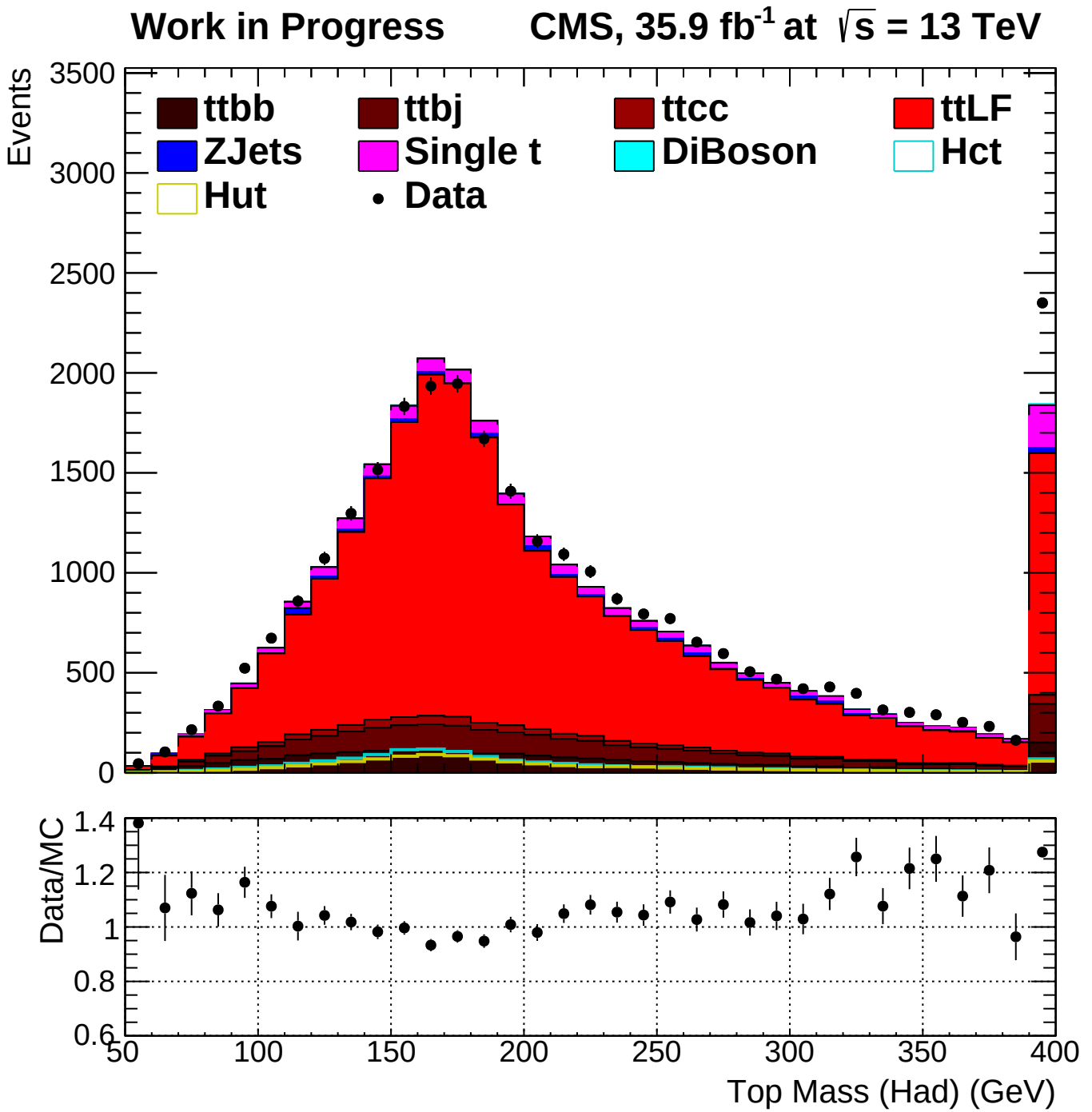

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3500
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)

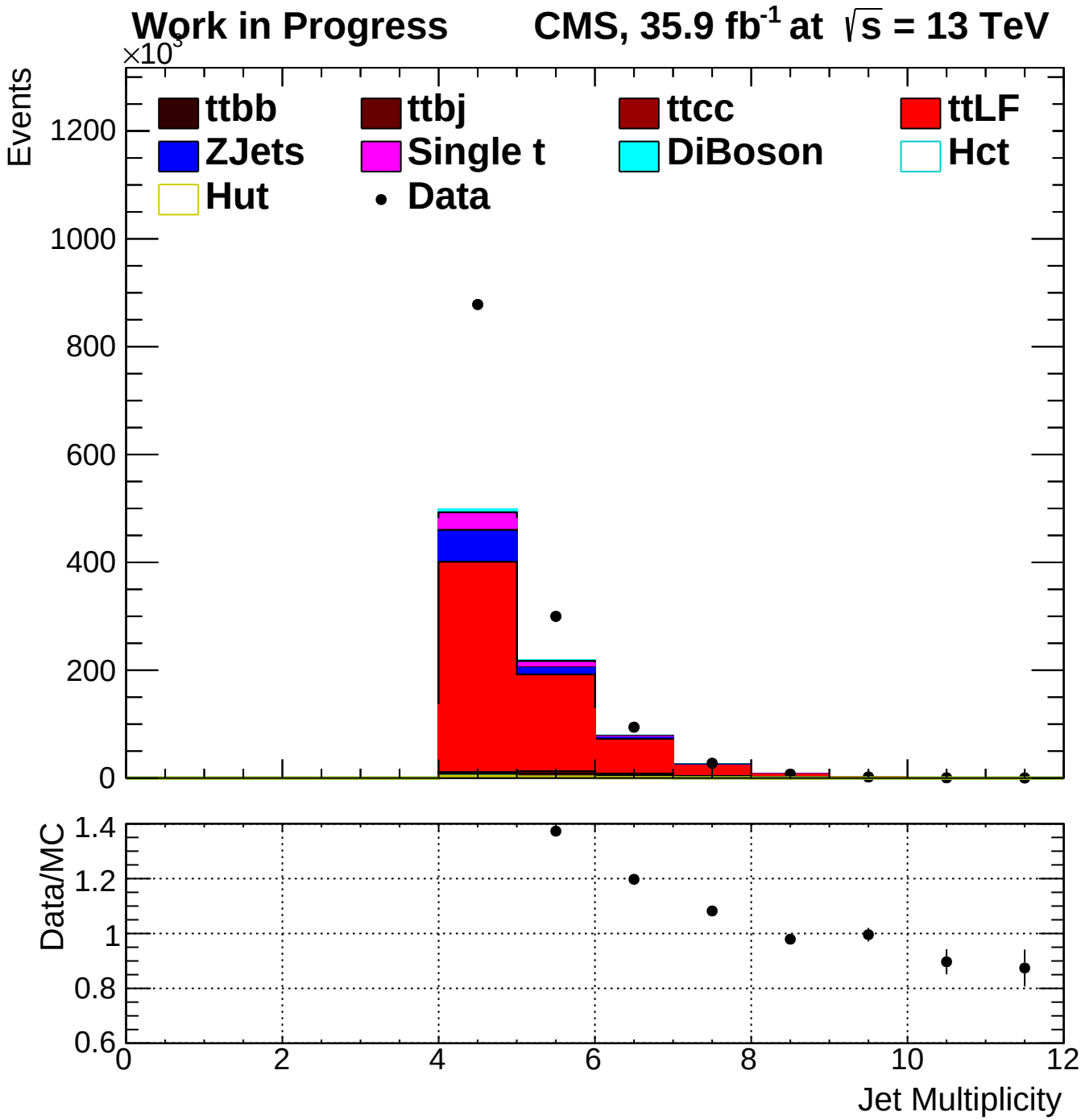

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

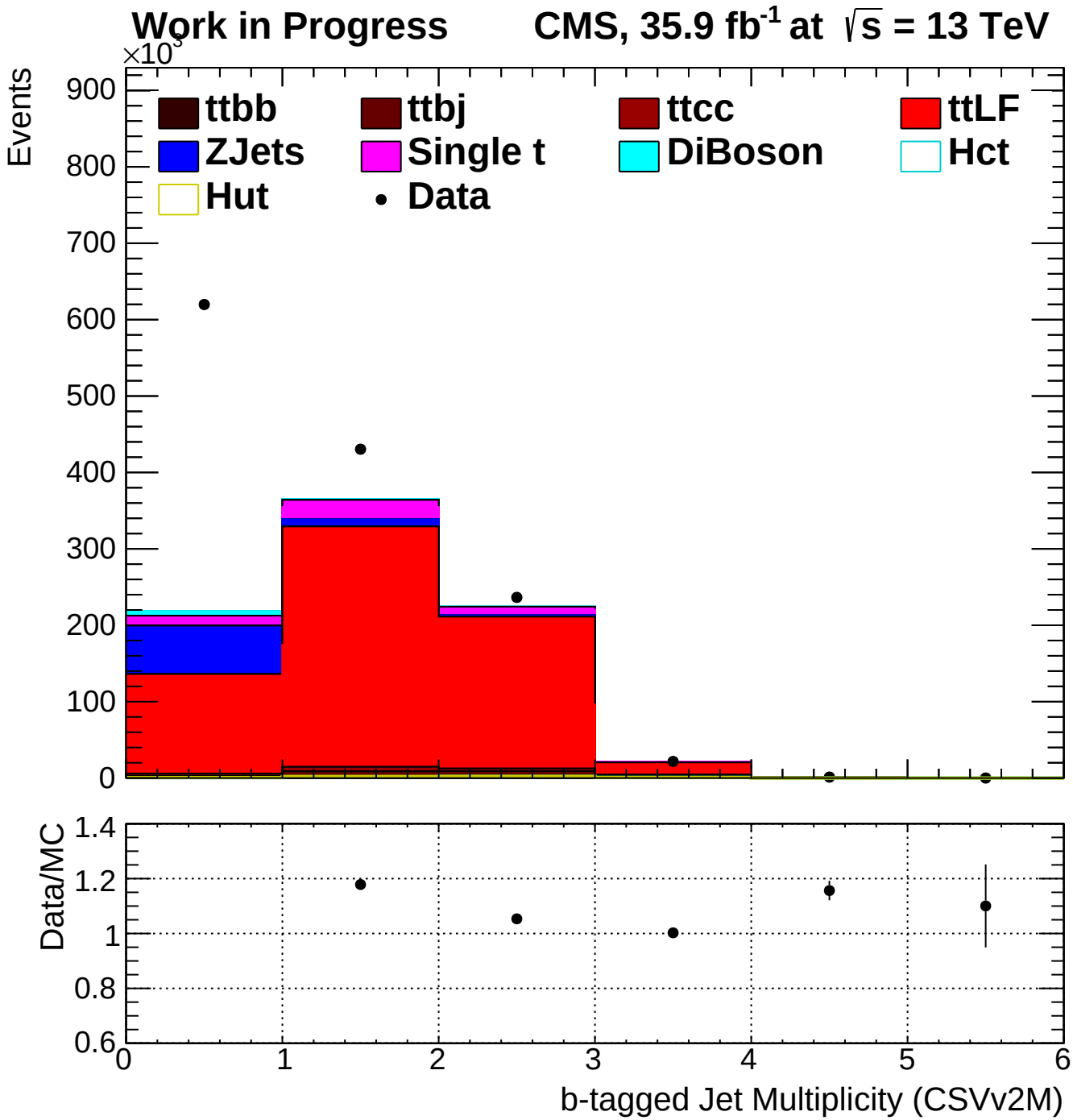

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
Higgs Mass (GeV)

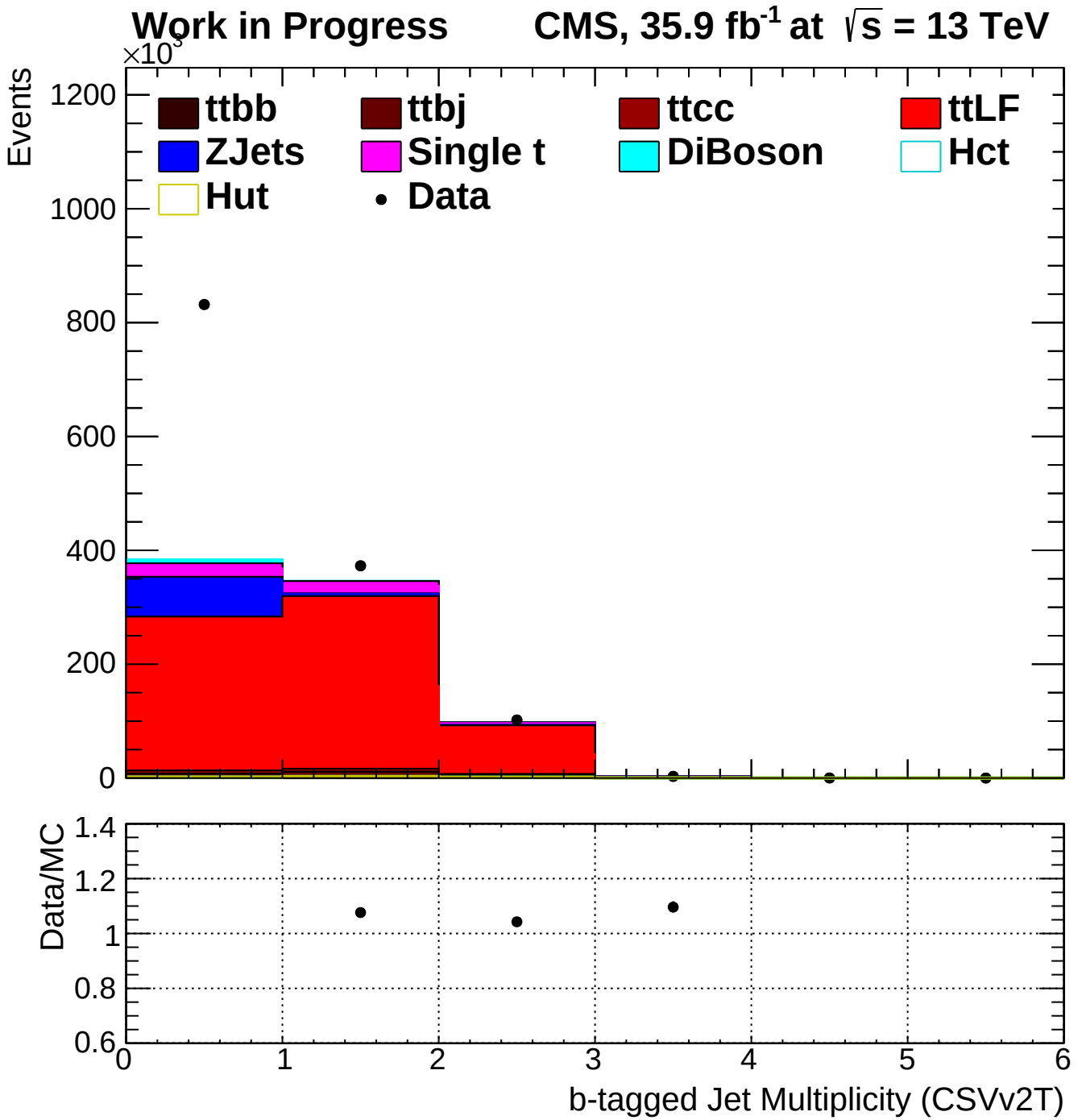

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

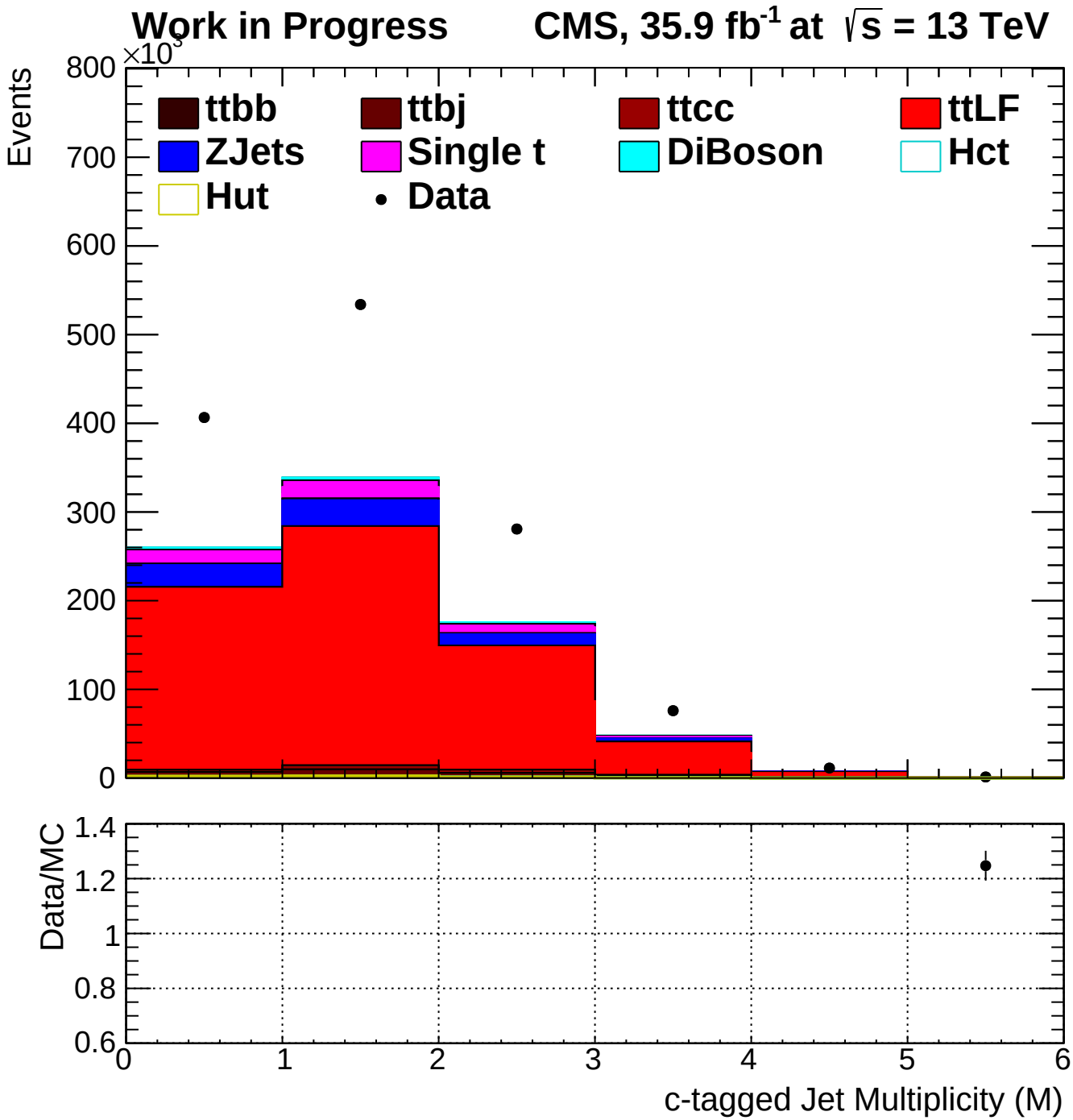

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)

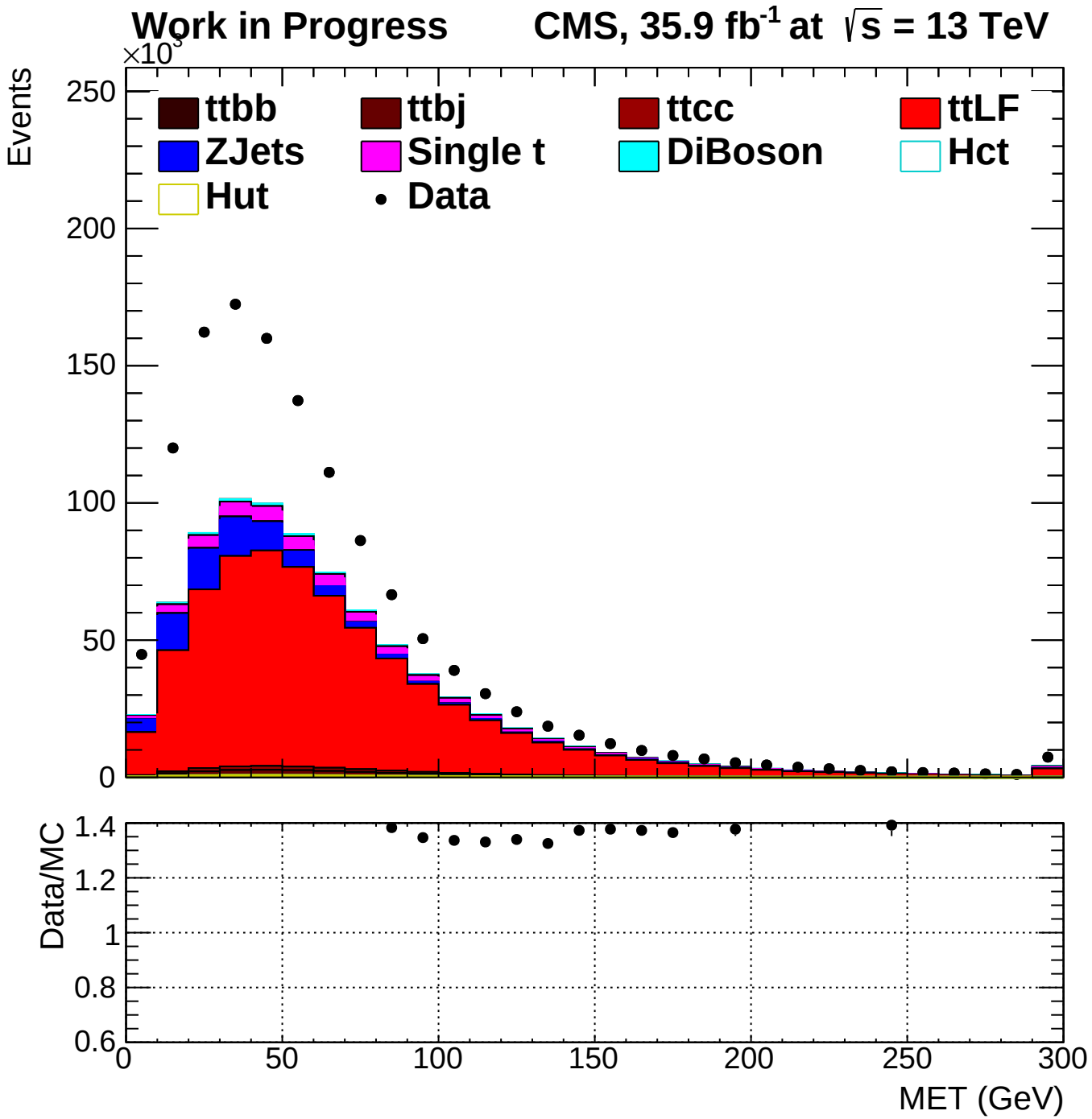

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

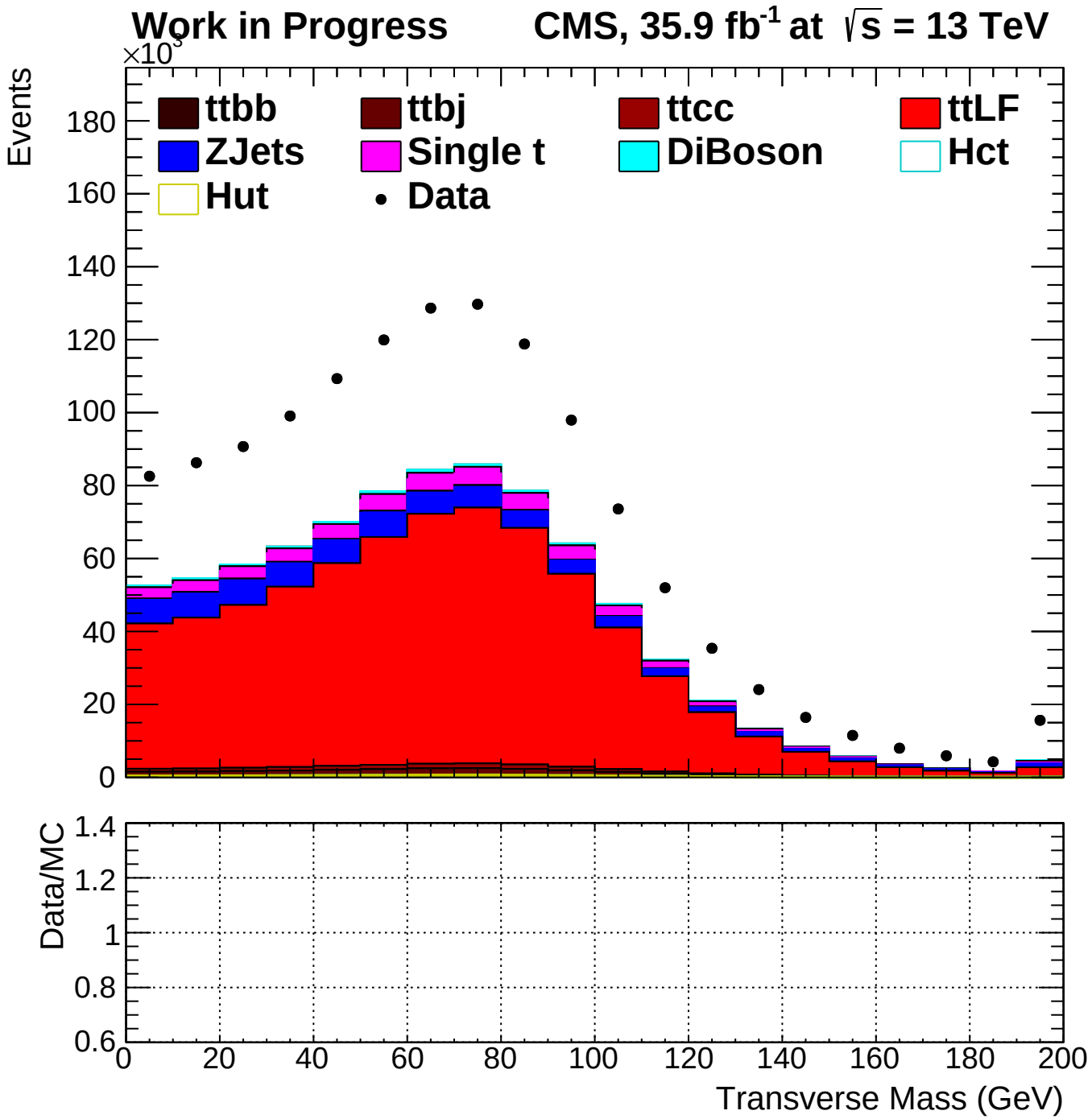

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

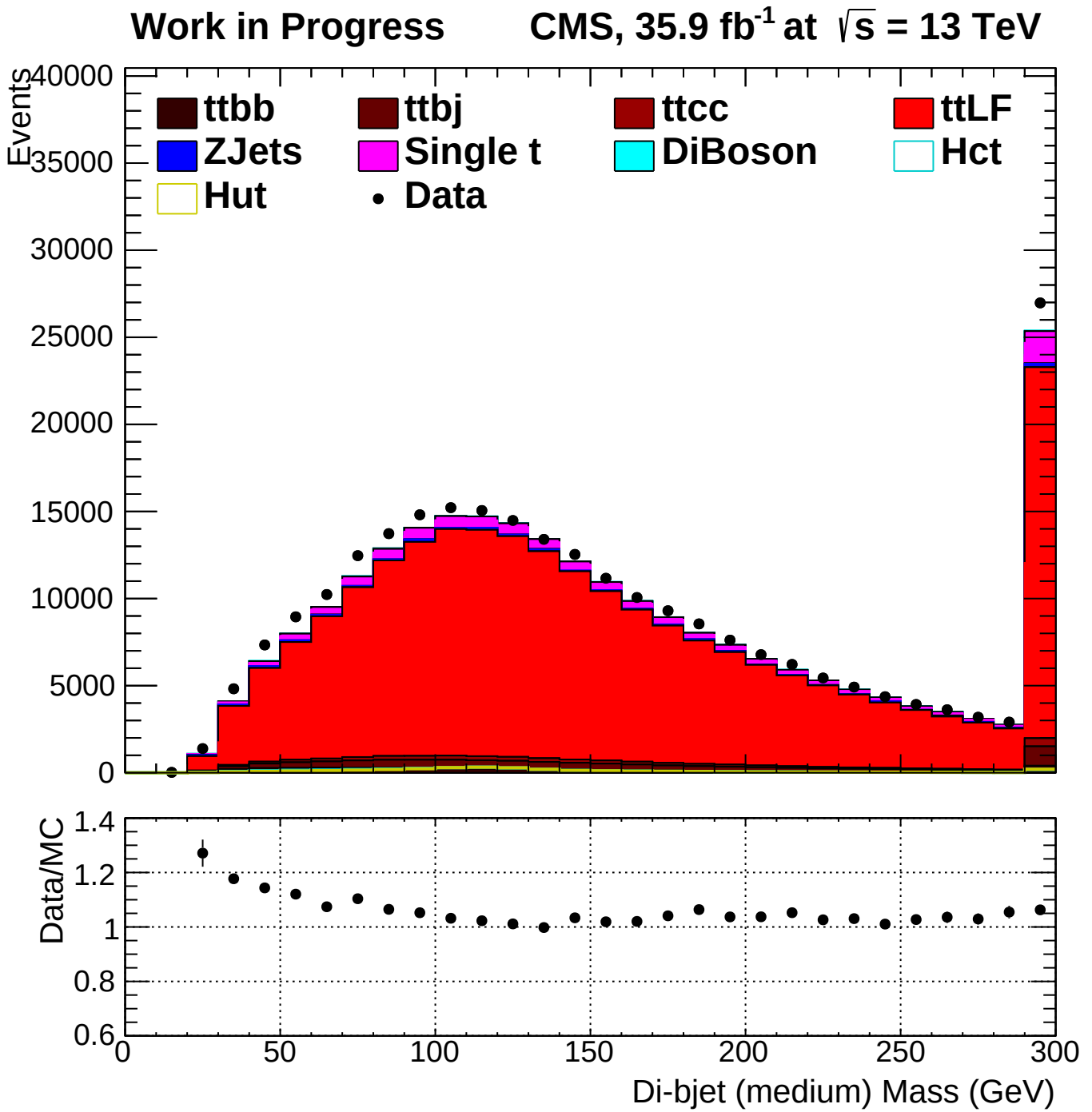

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

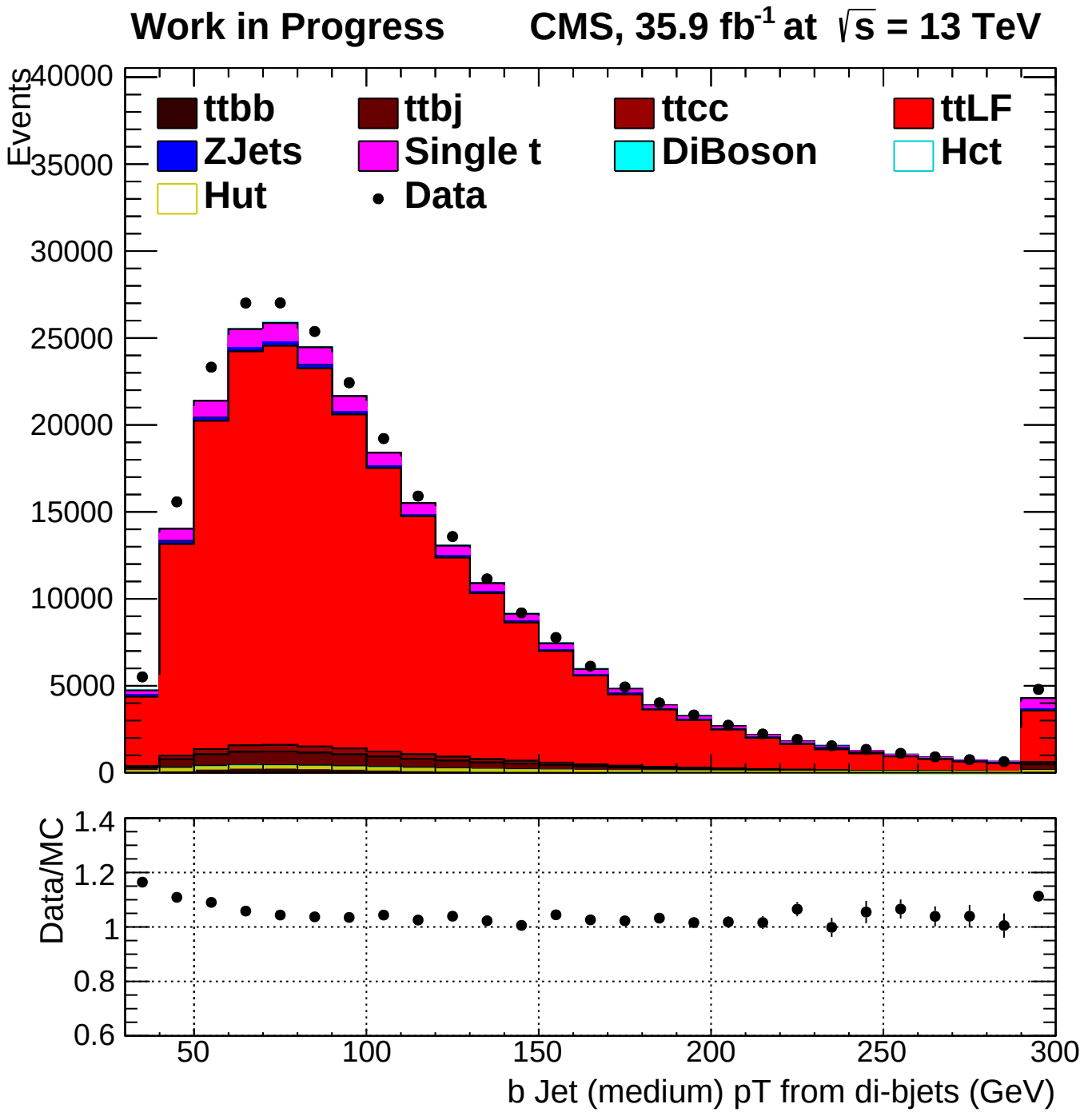

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

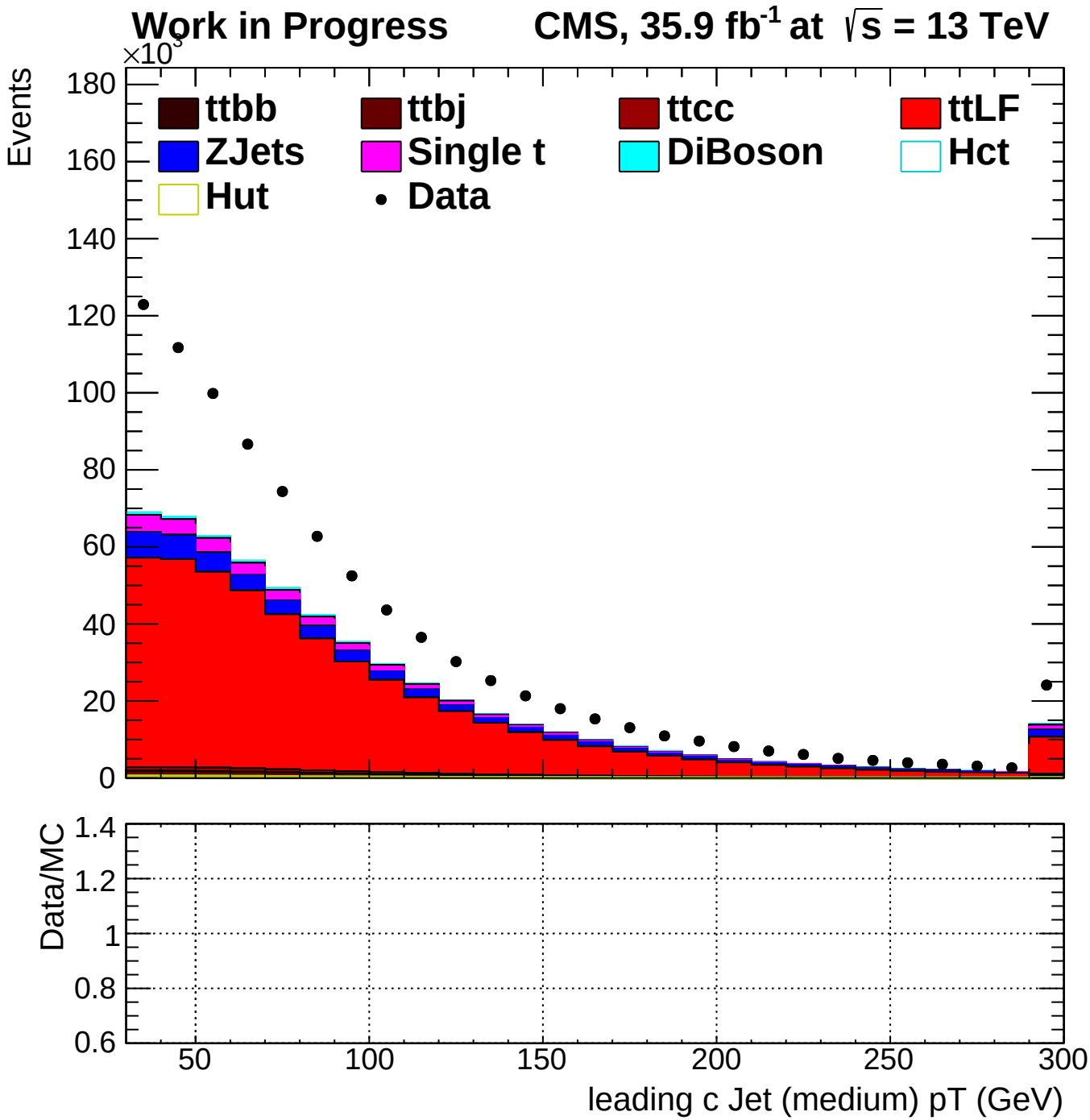

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
800
700
600
500
400
300
200
100
0
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

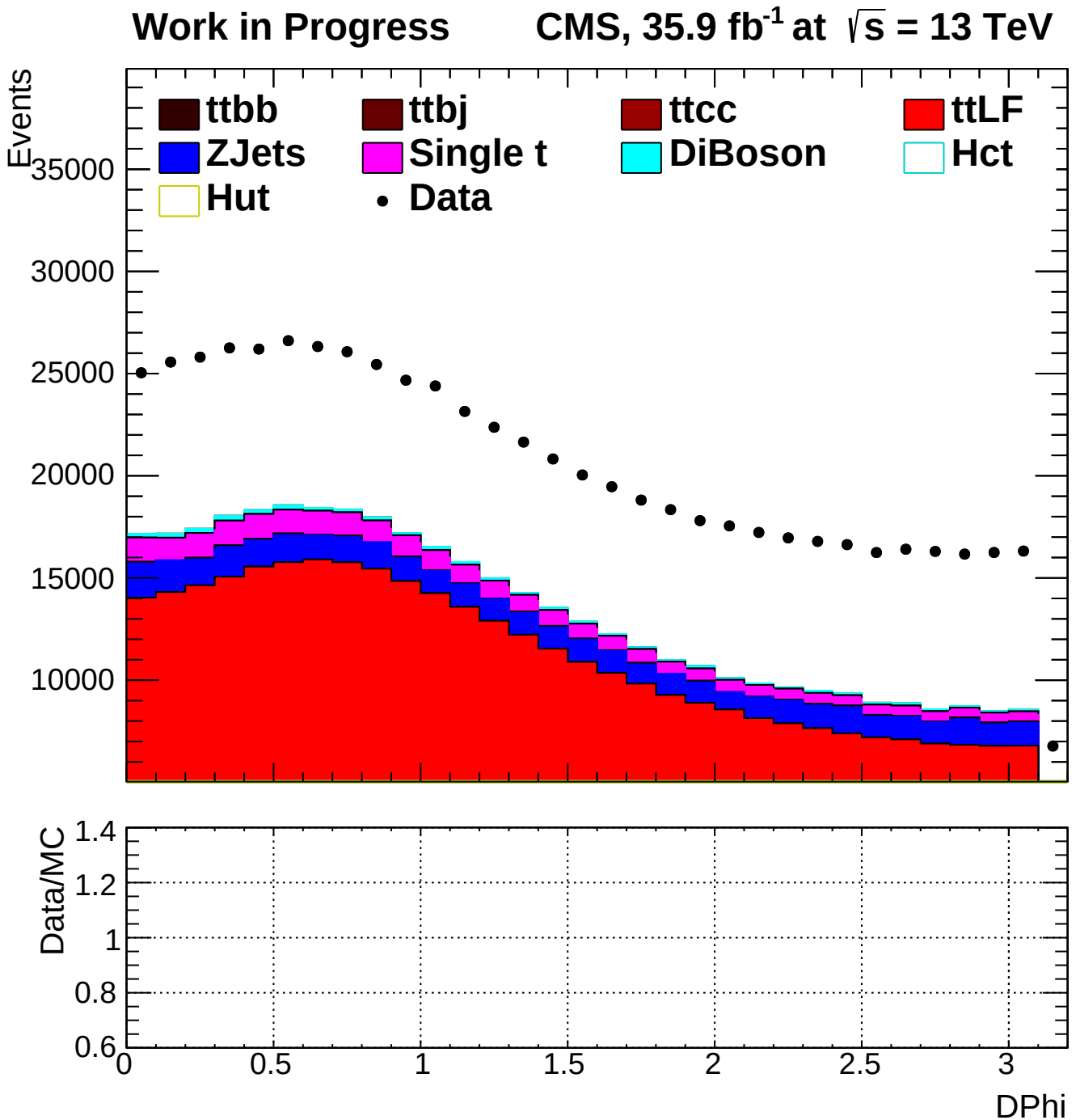

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

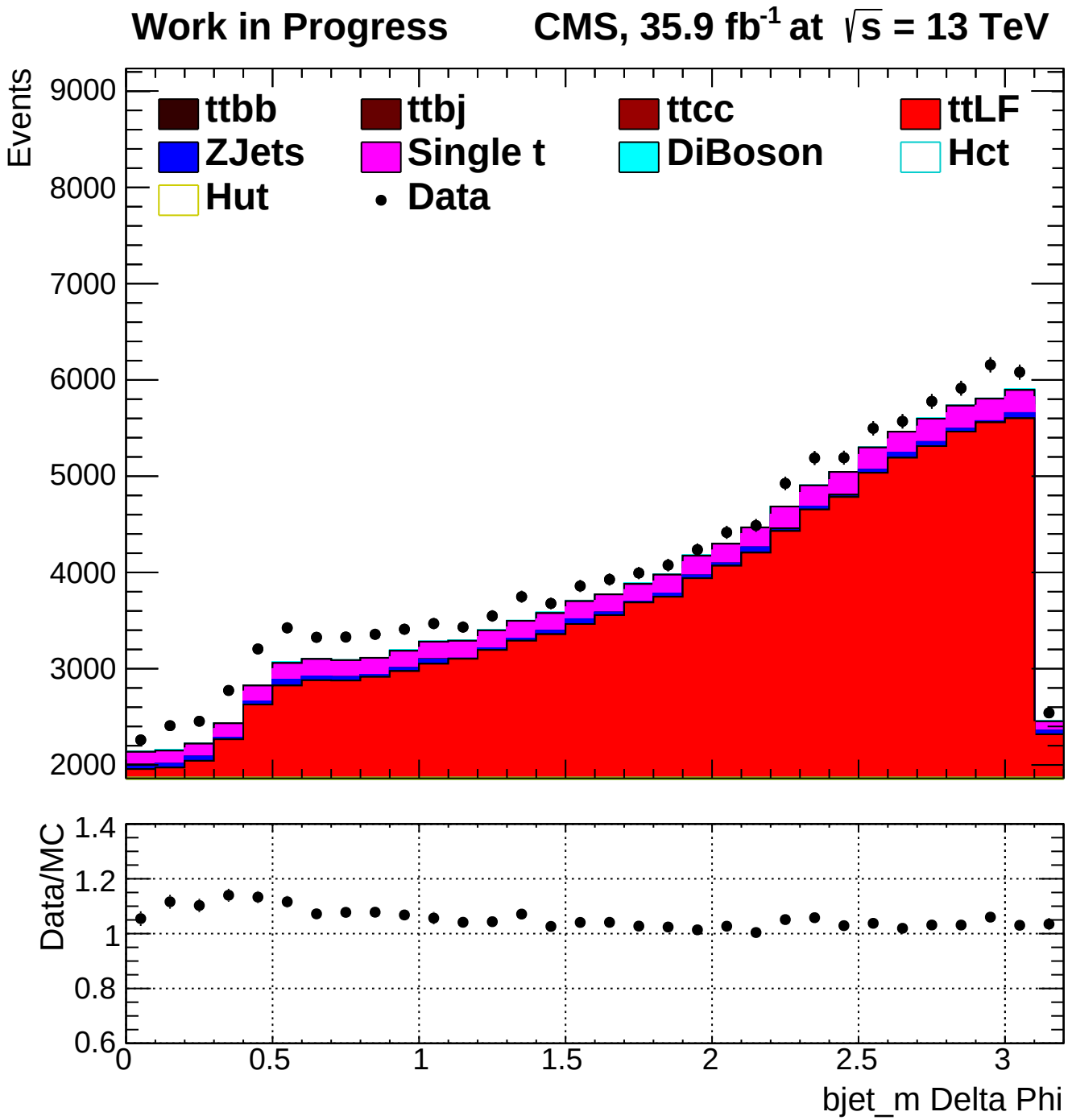

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

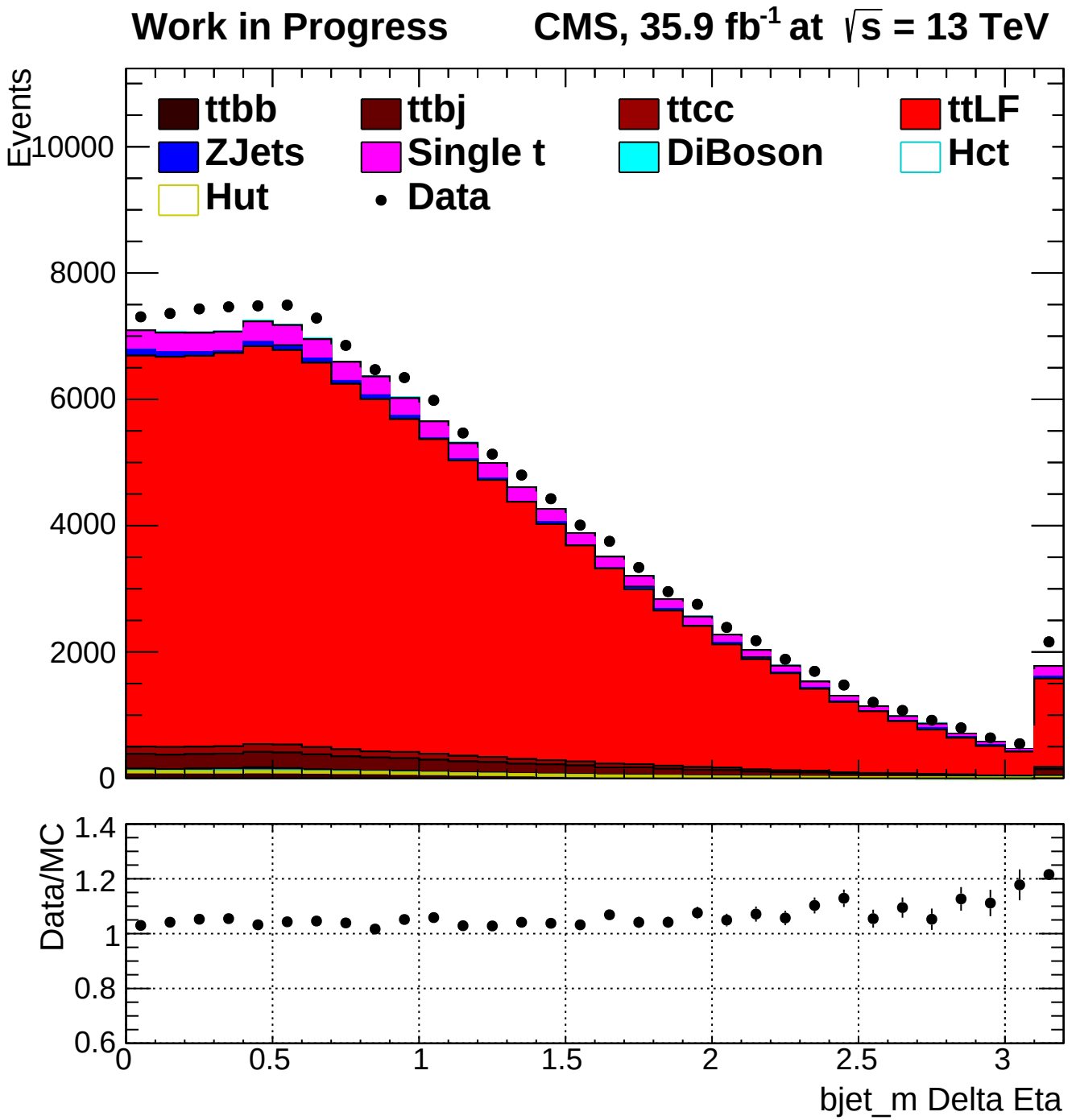

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)

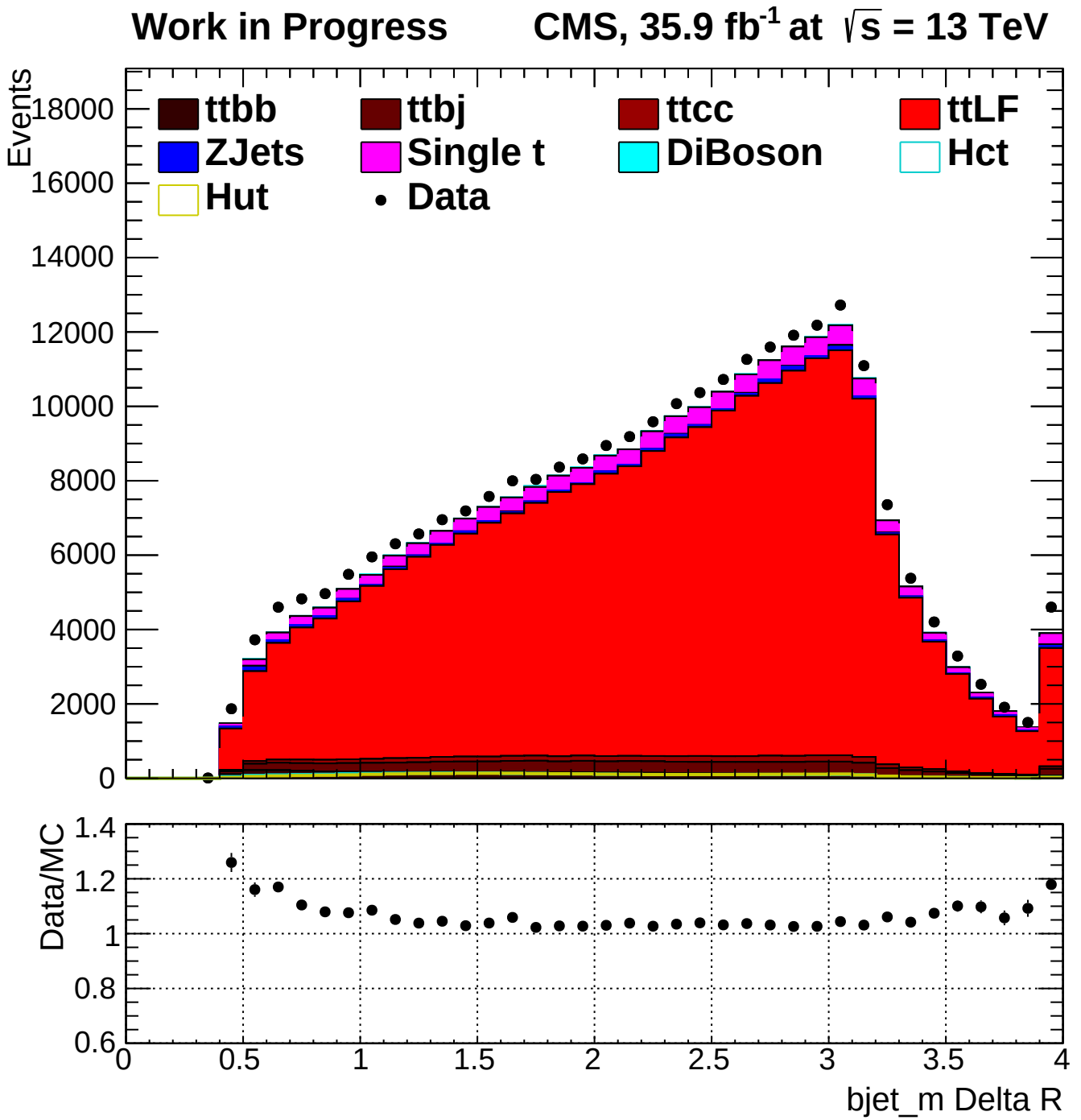

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)

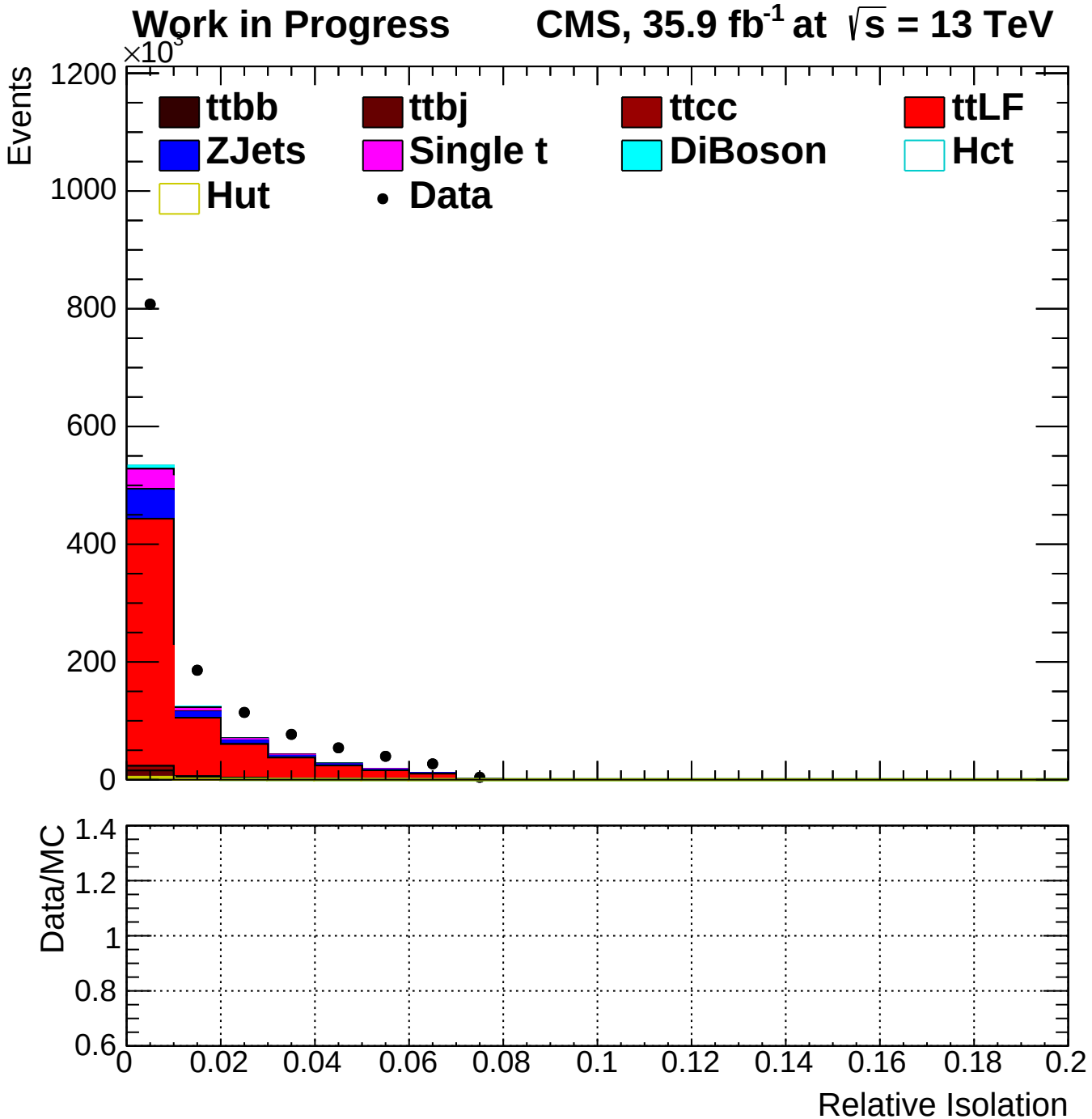

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

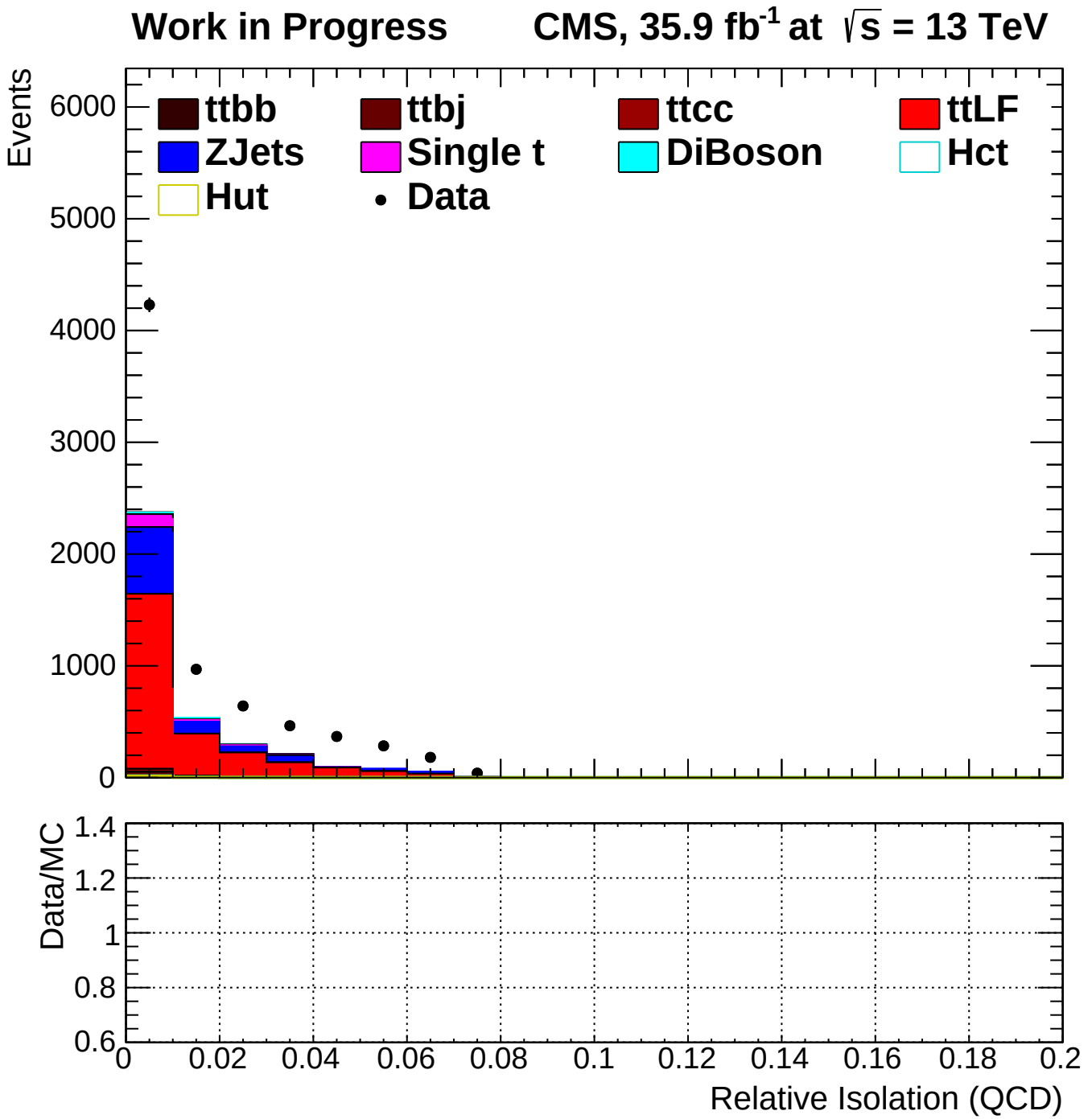

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
35000
30000
25000
20000
15000
10000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

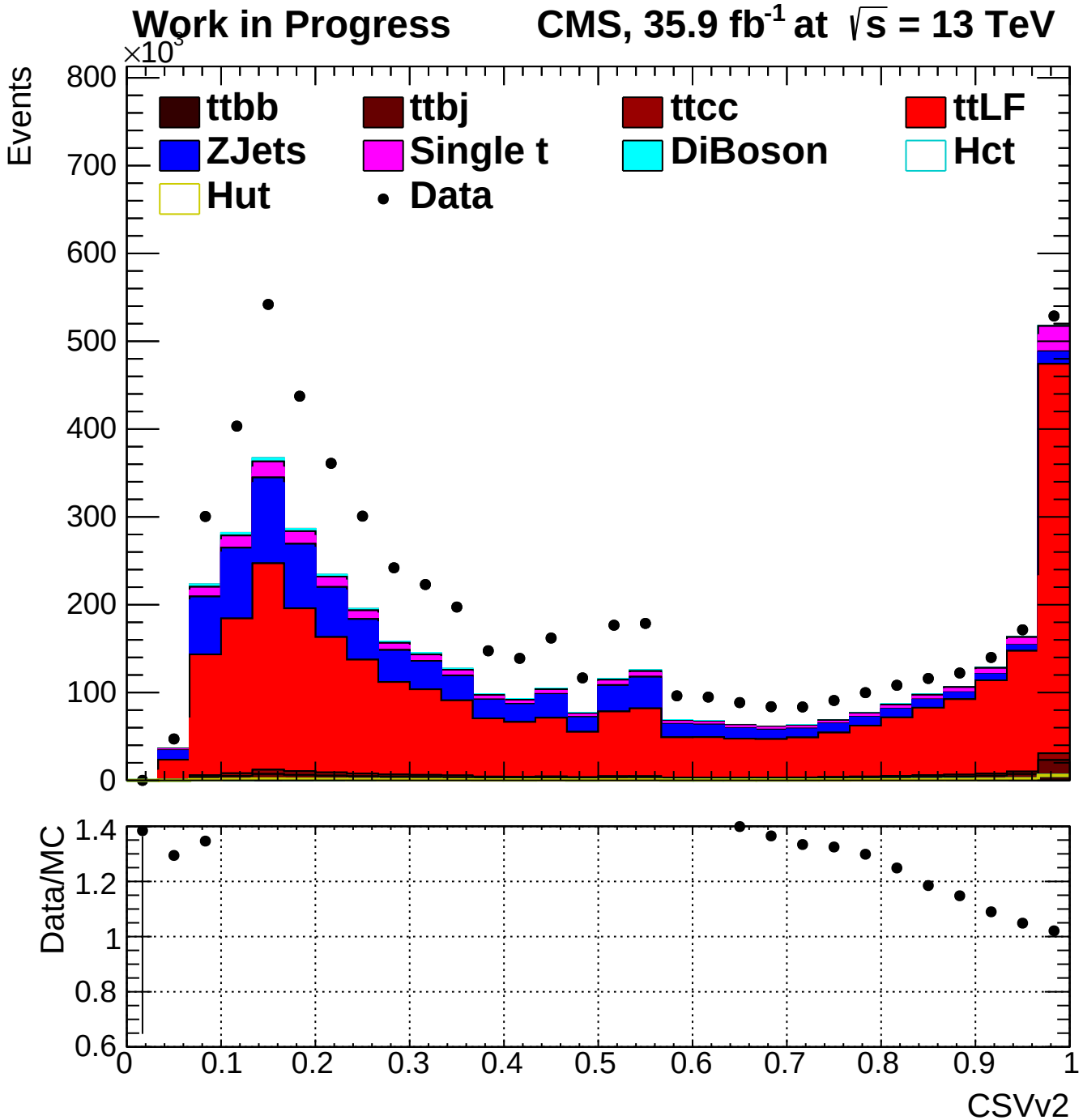

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
9000
8000
7000
6000
5000
4000
3000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

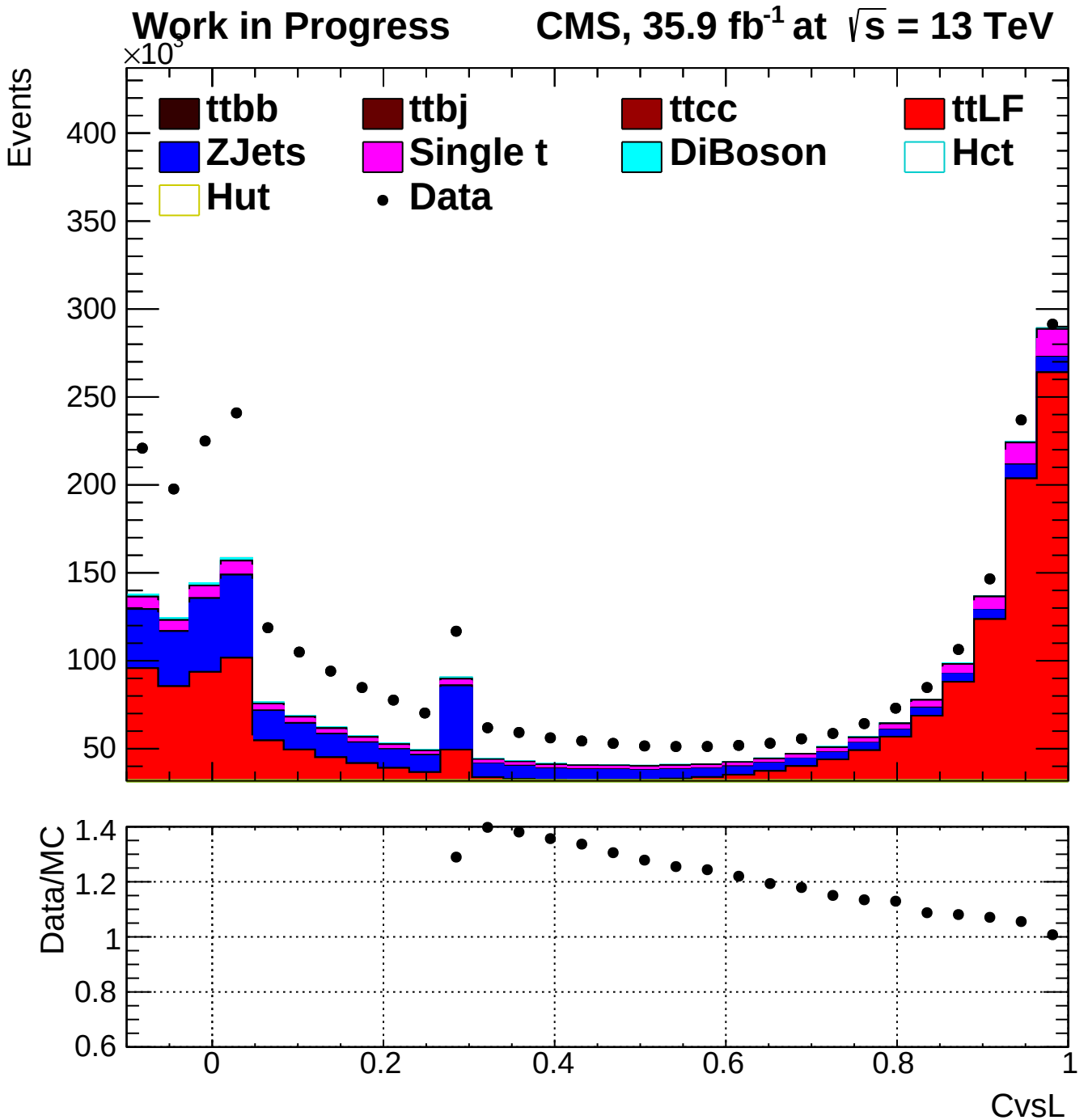

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

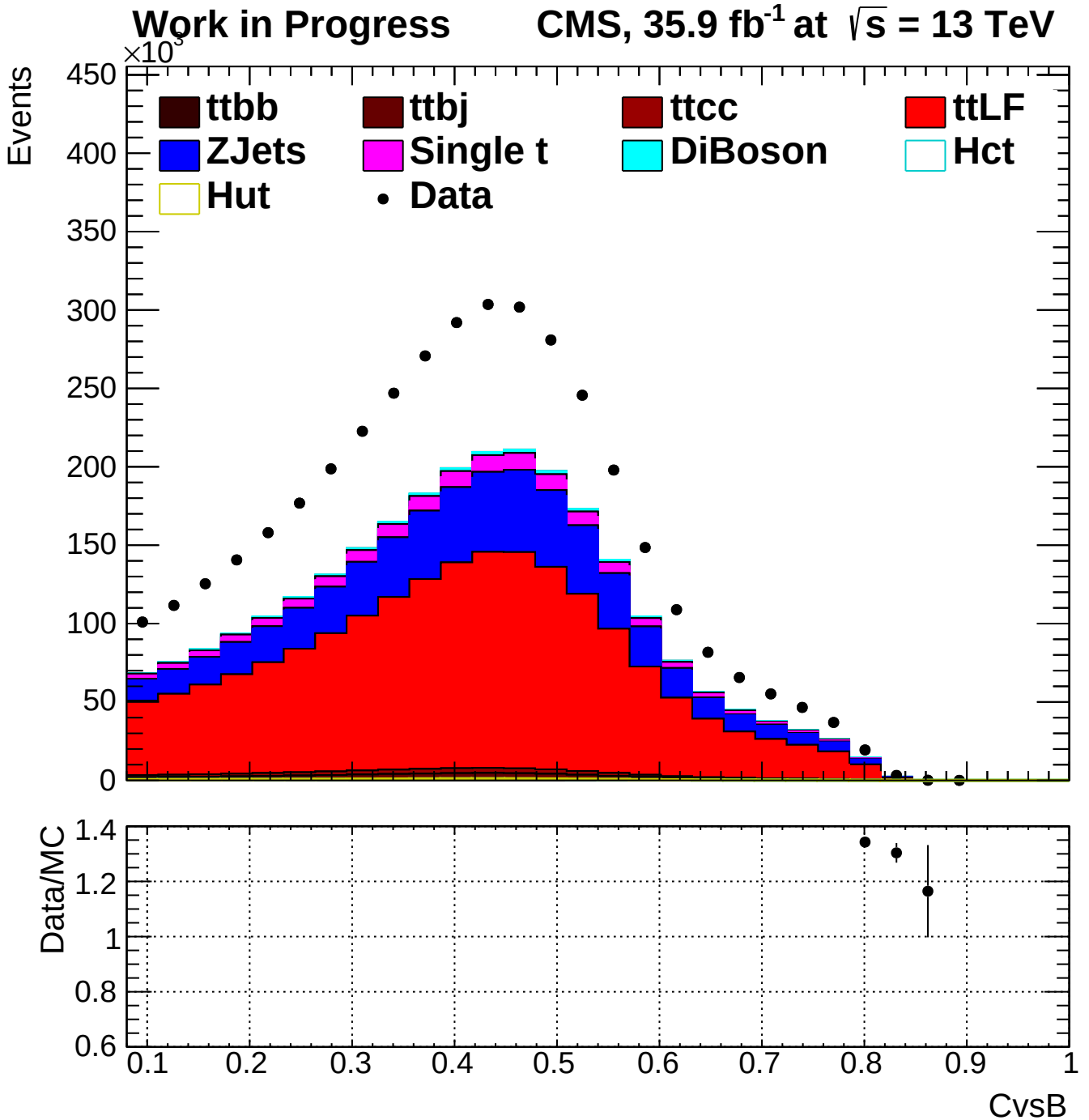

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R

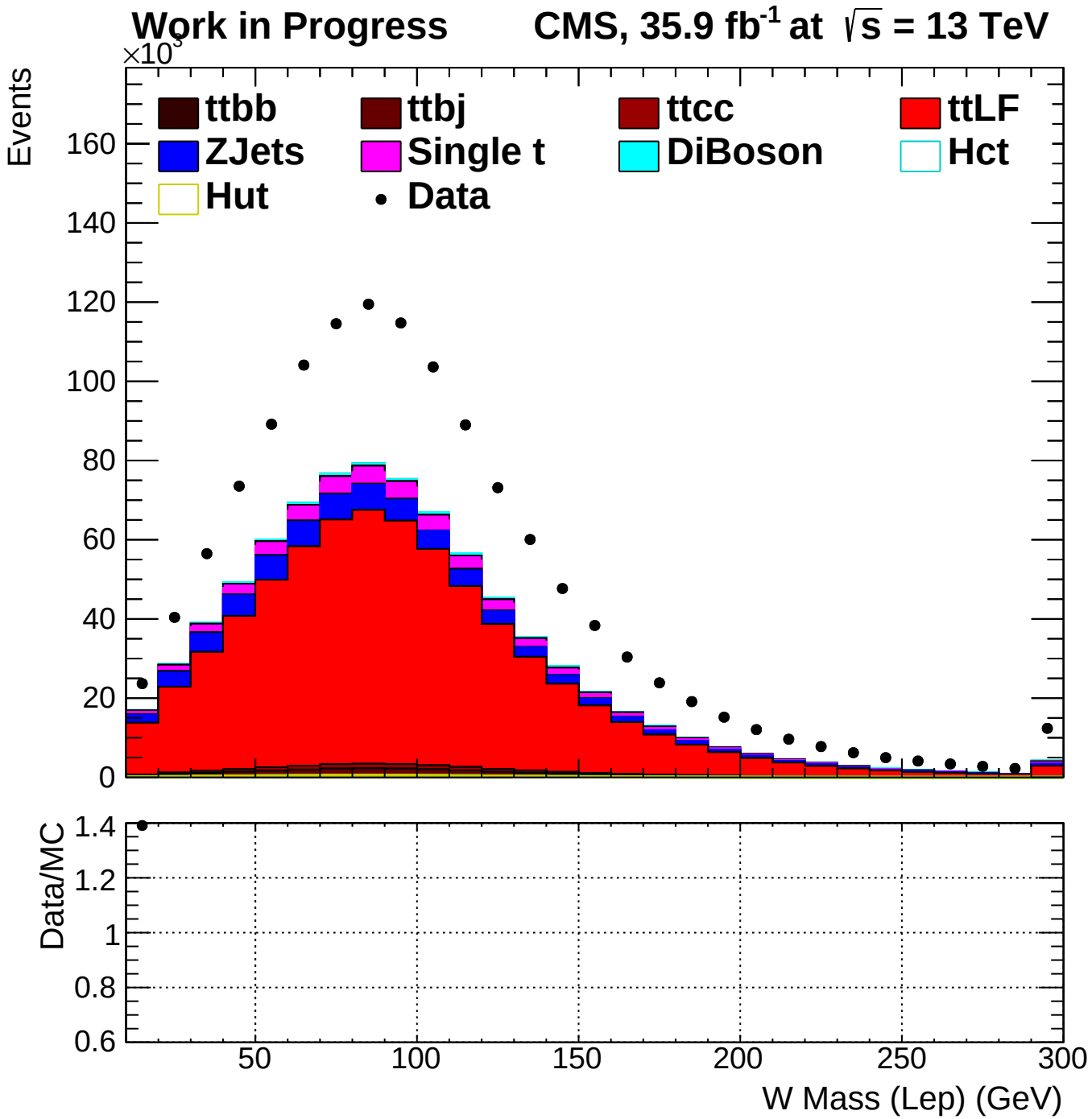

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation

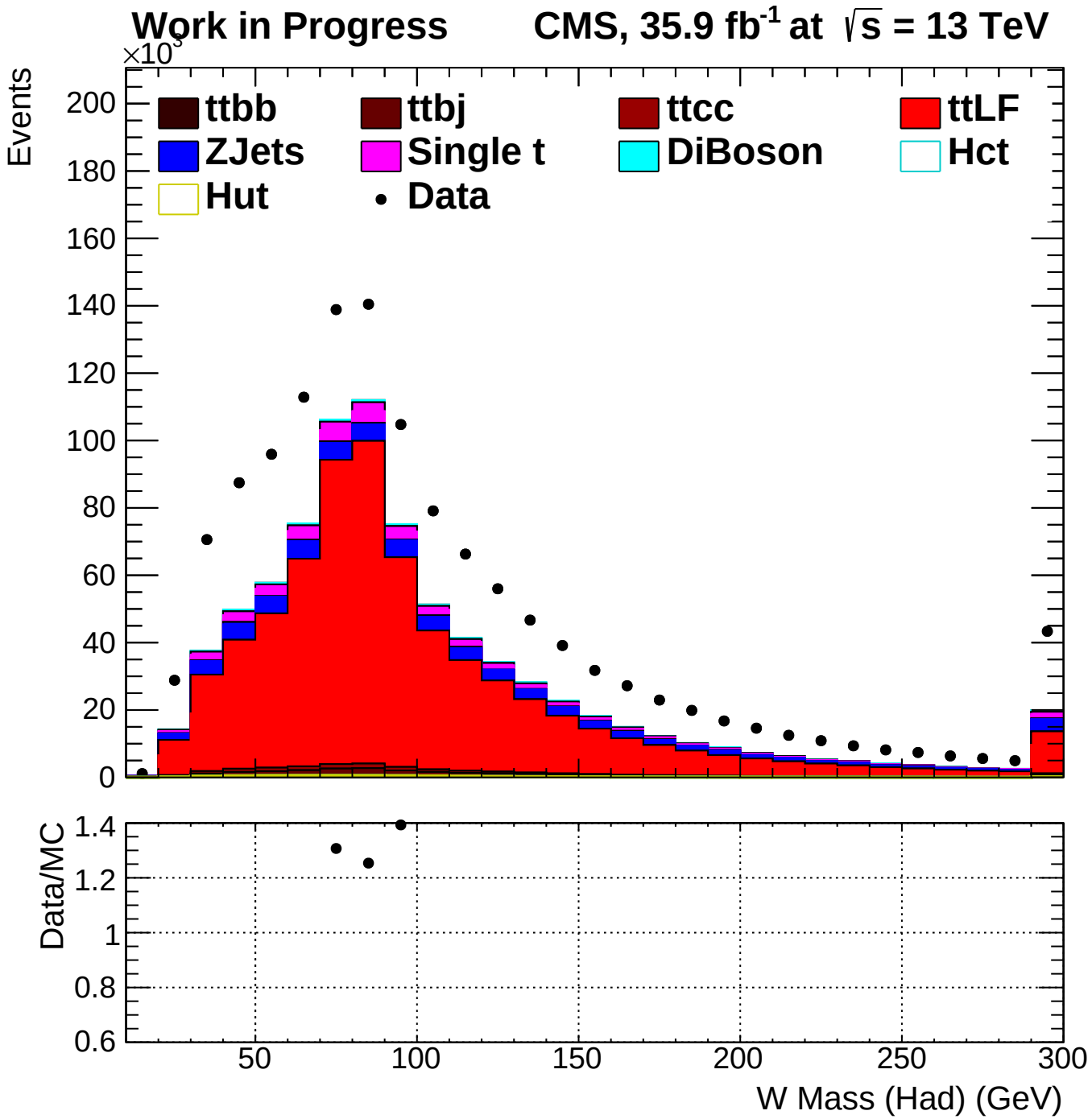

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

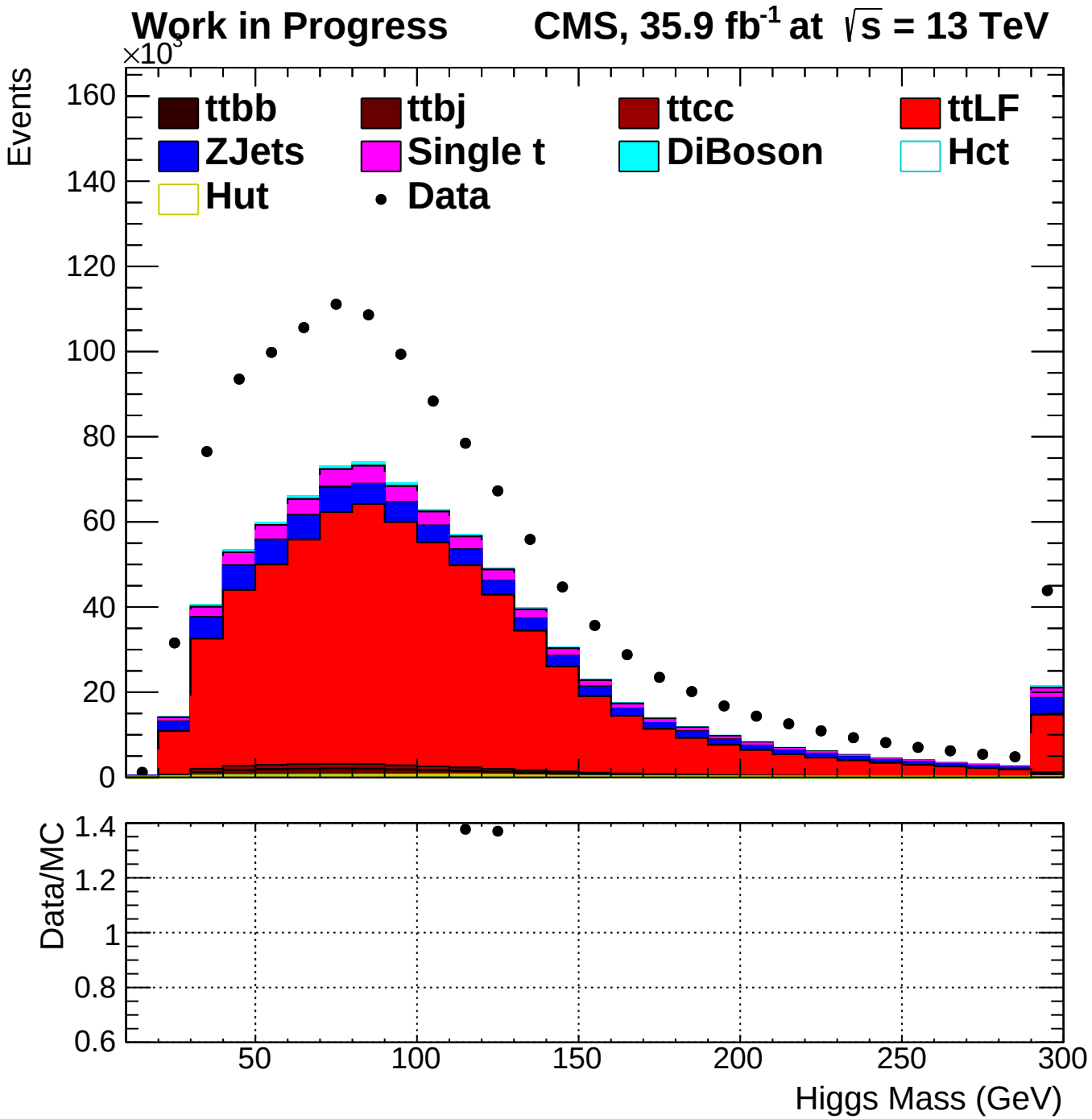

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2

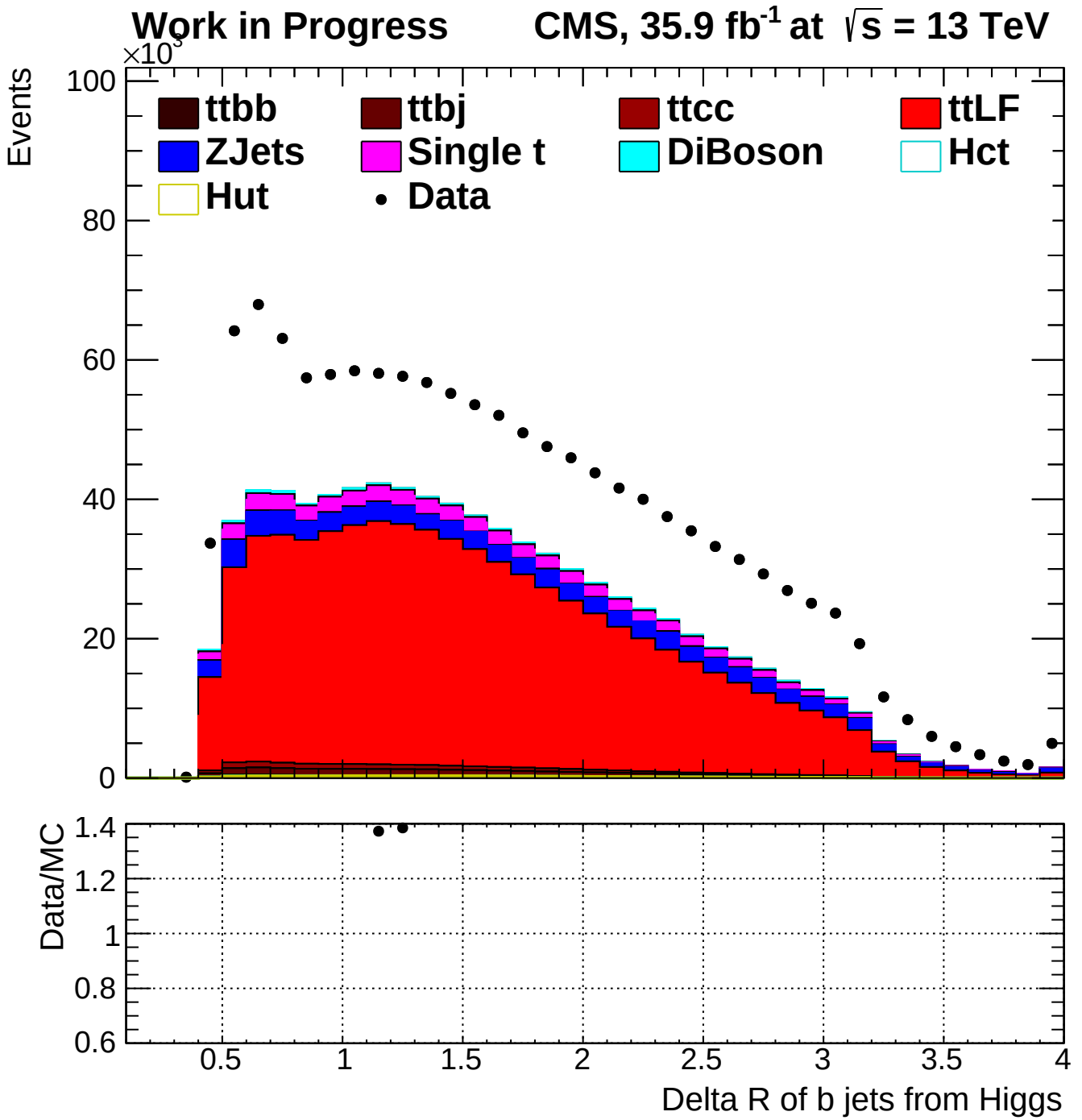

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
400
350
300
250
200
150
100
50
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

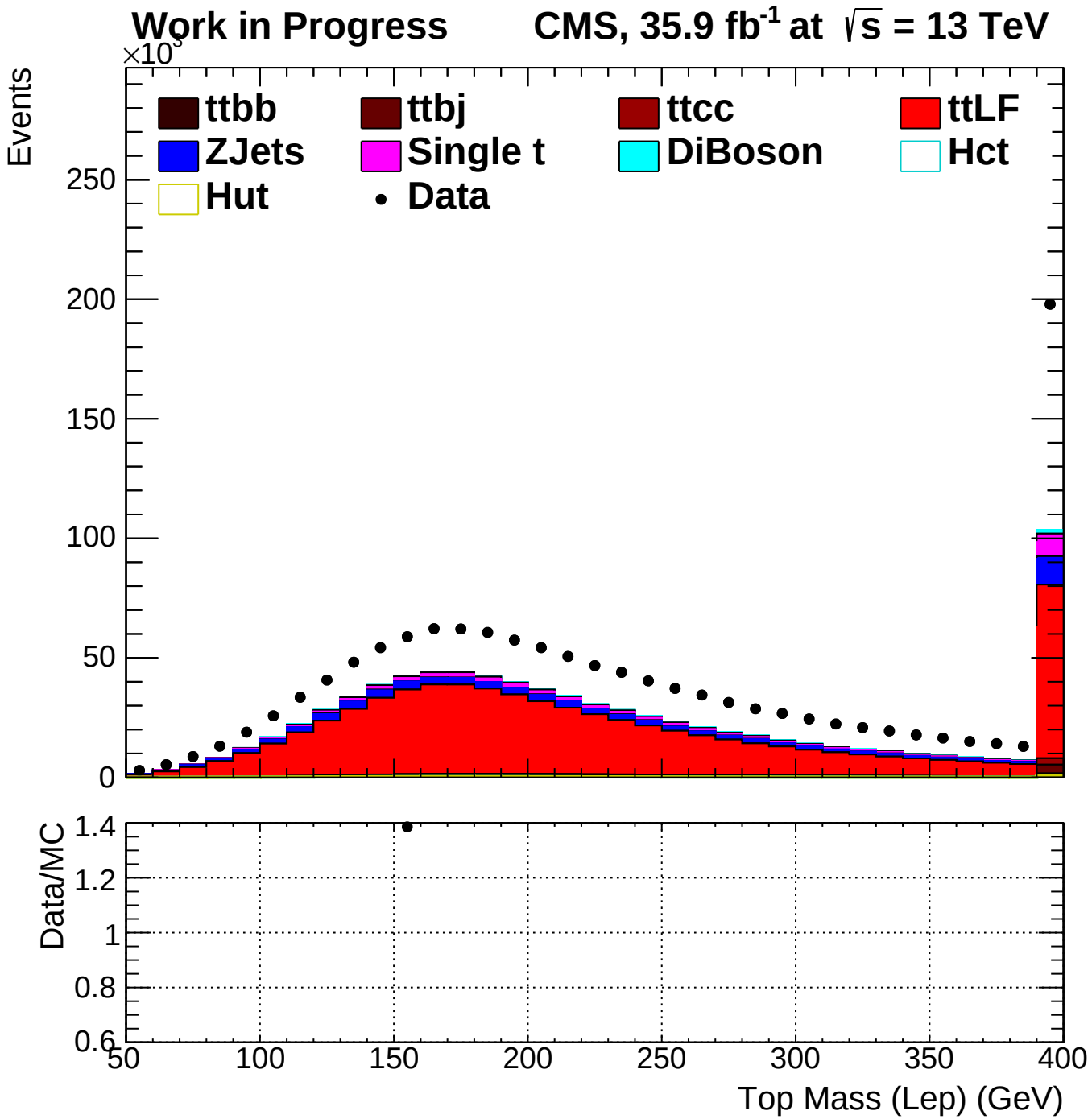

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB

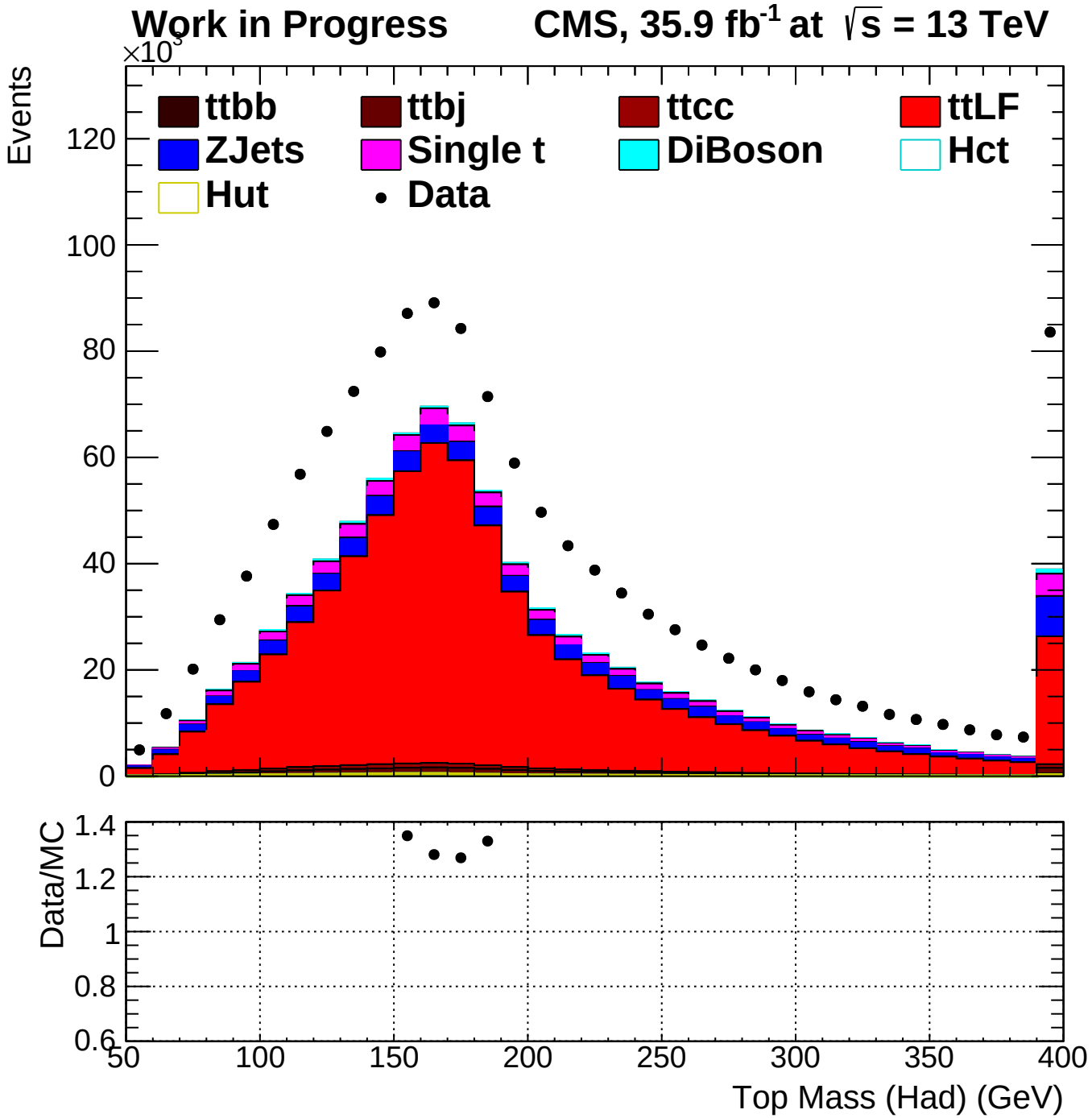

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

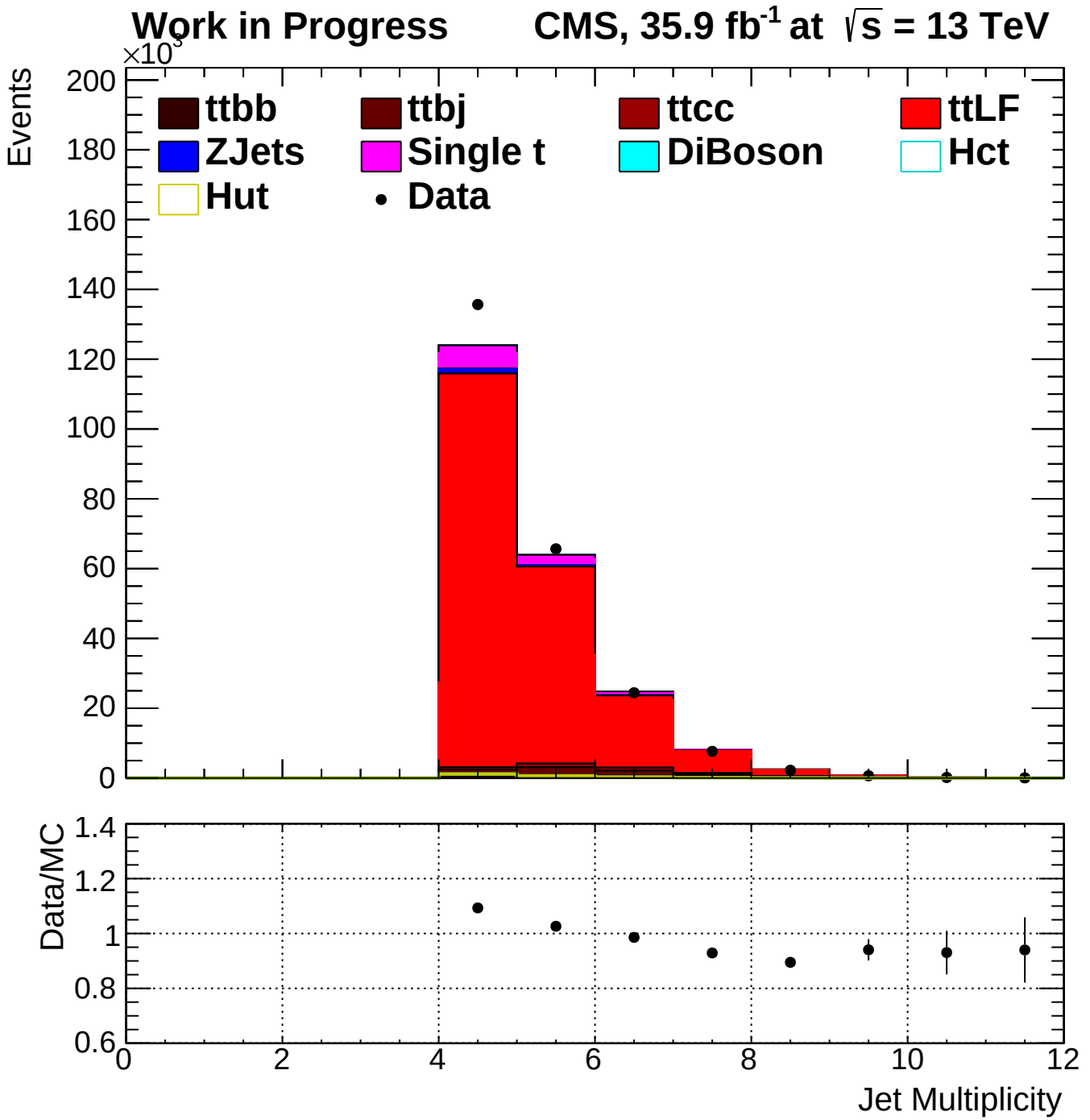

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

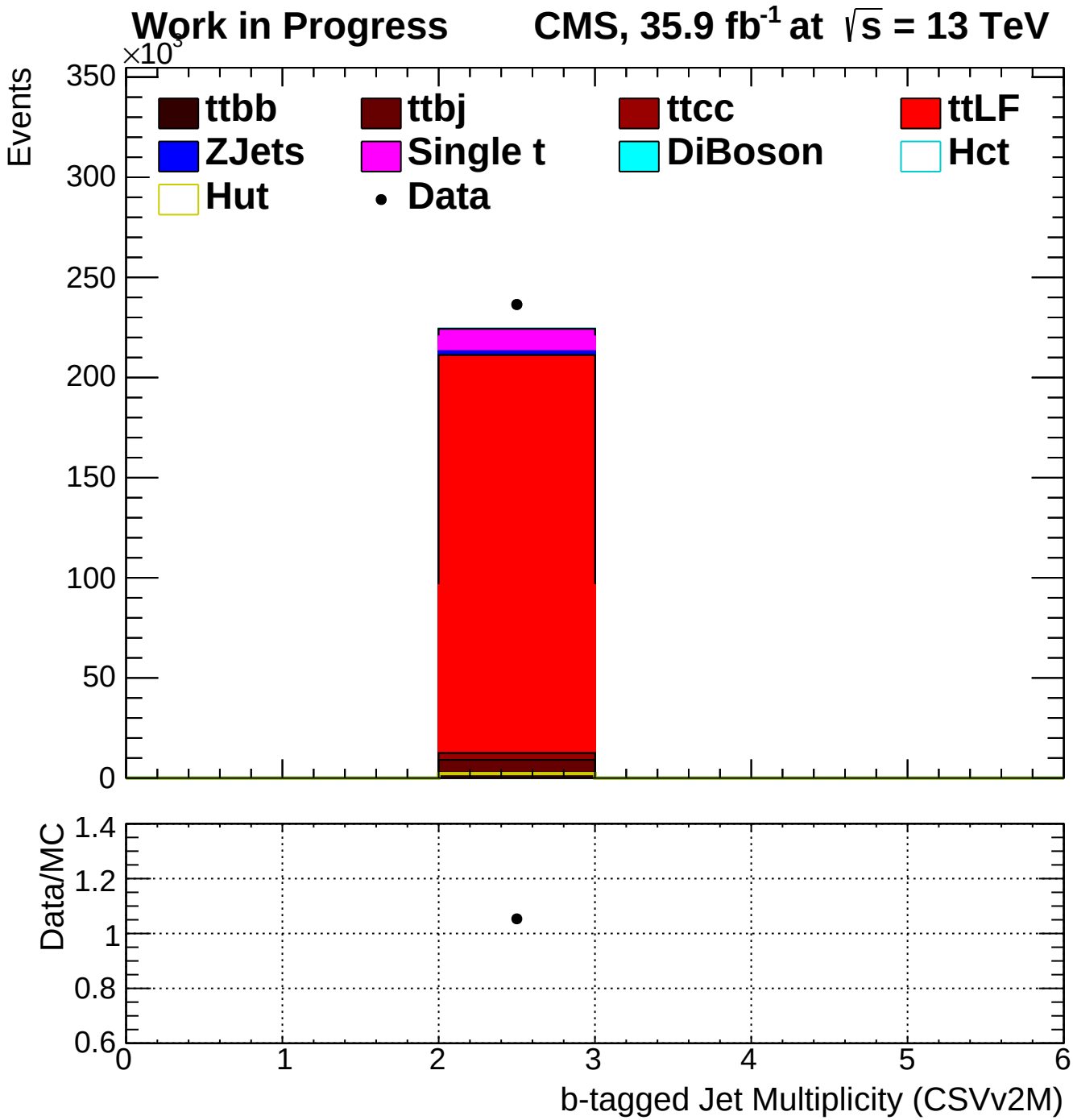

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

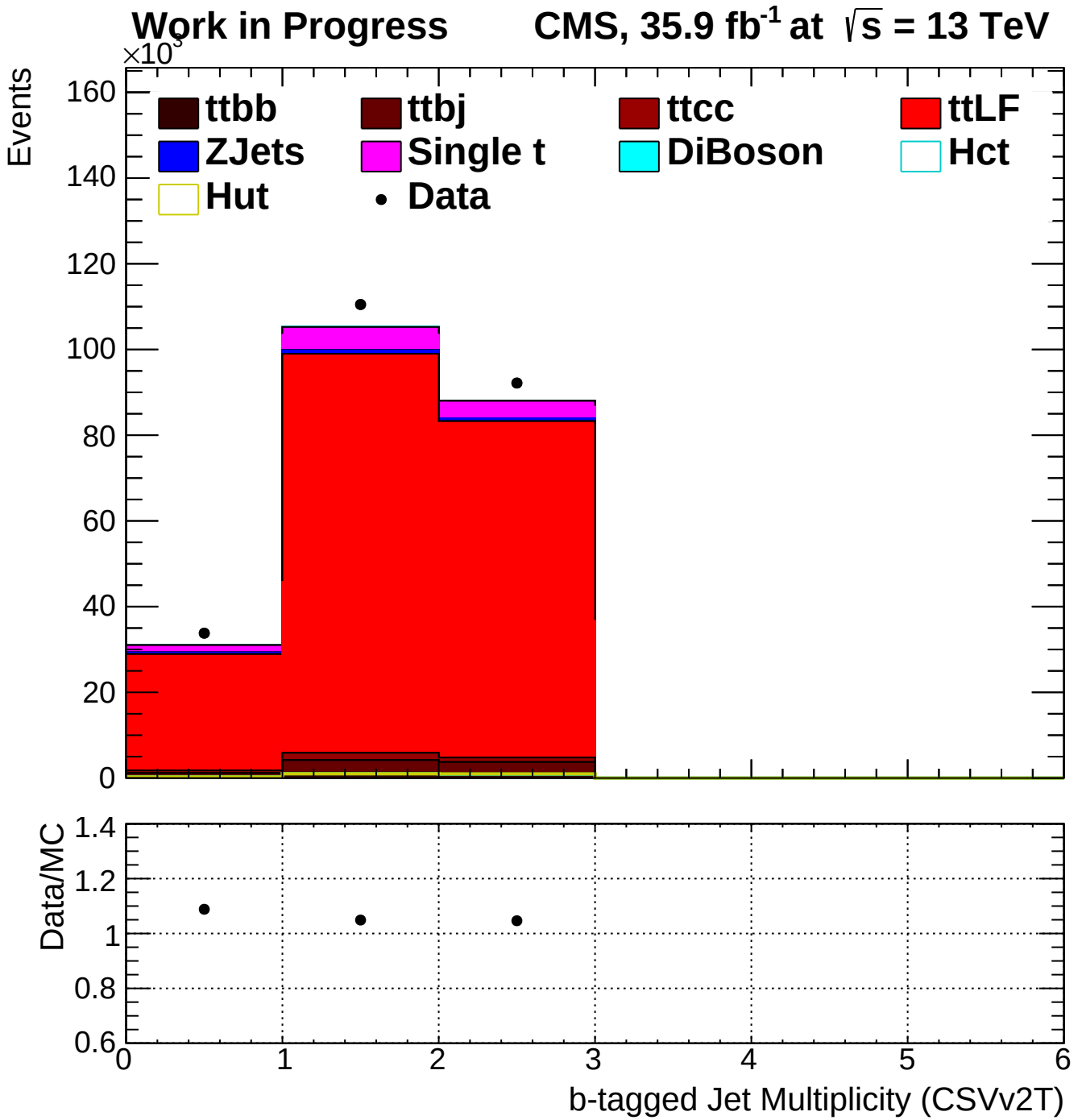

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

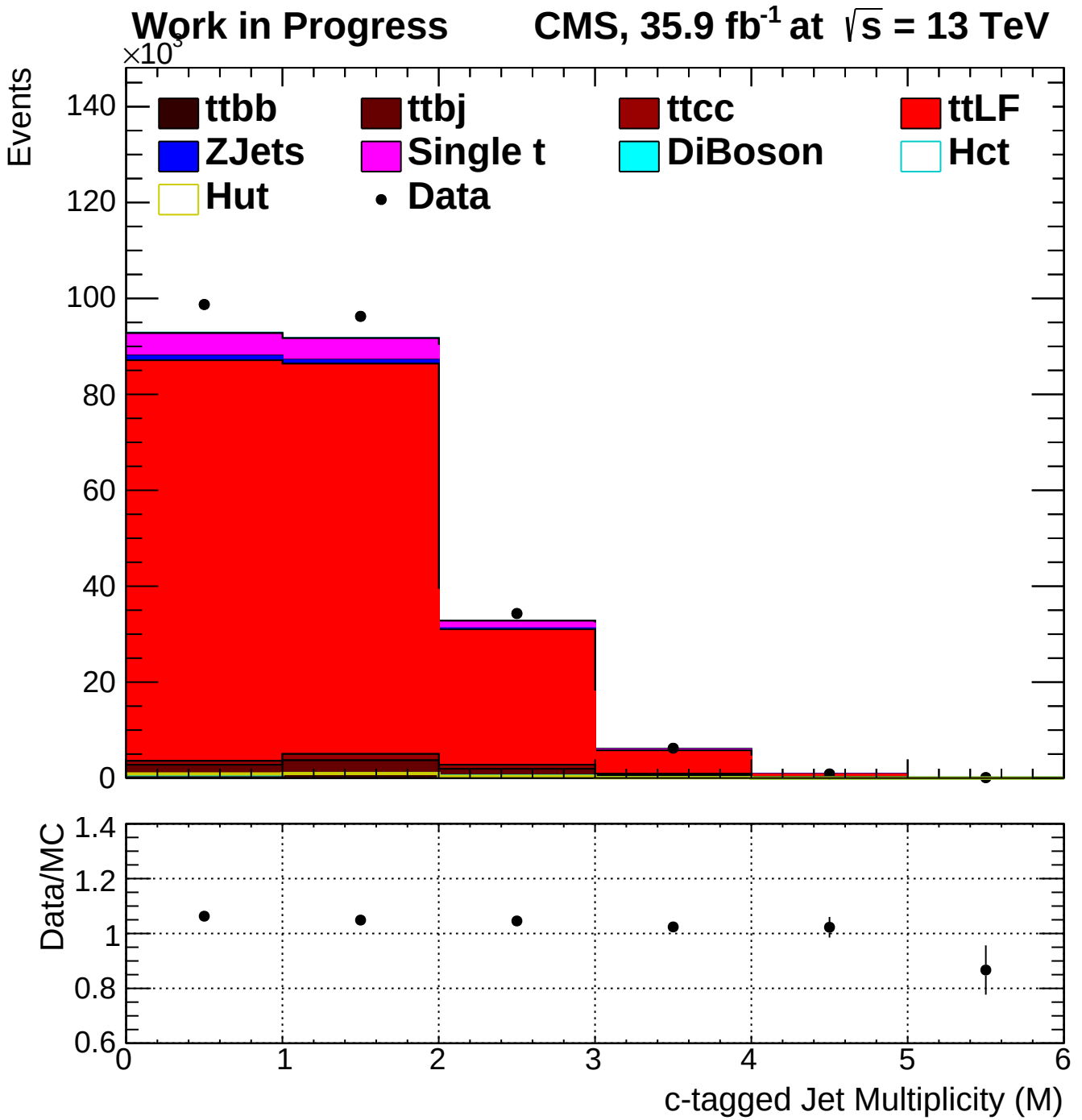

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)

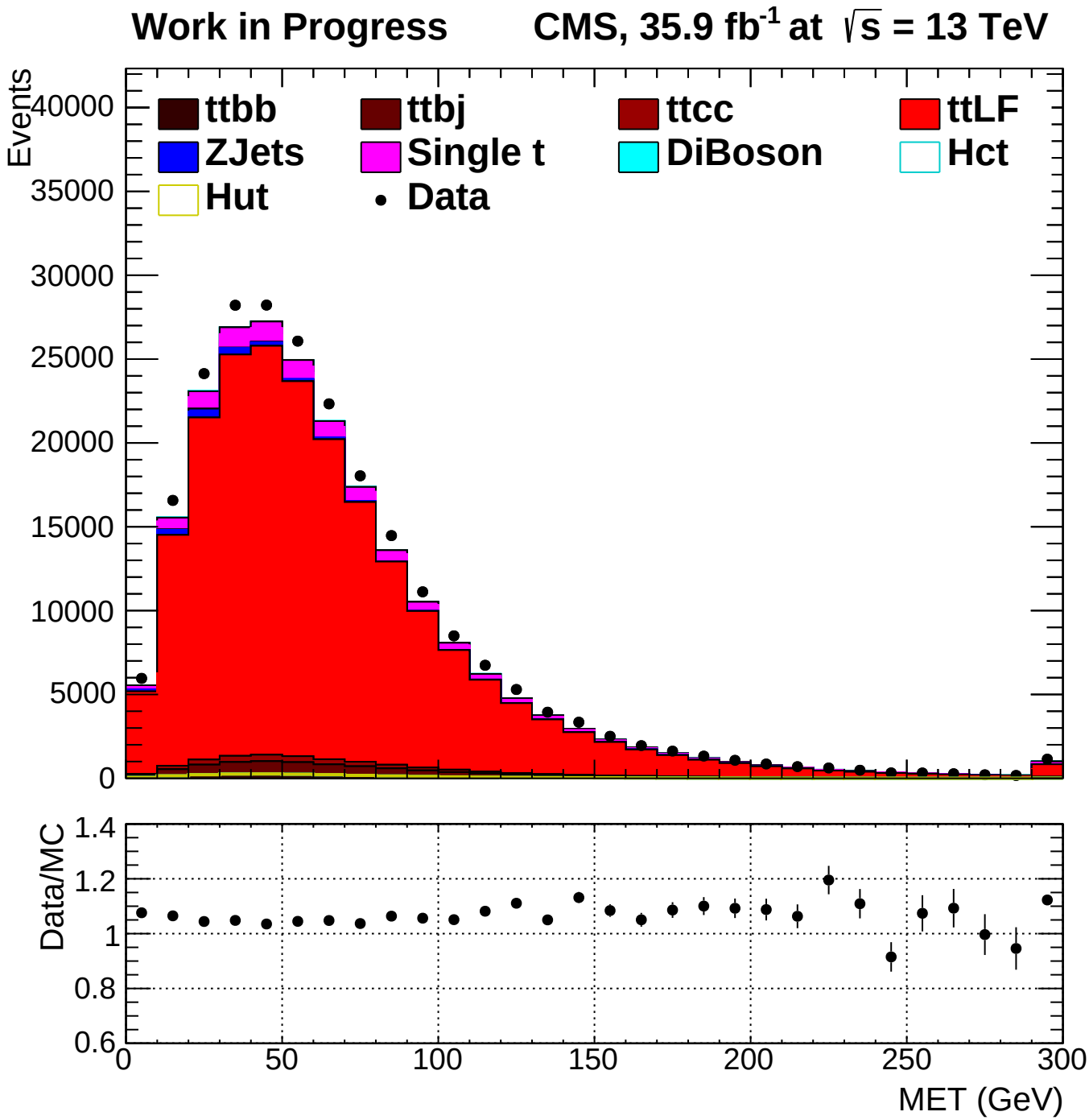

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

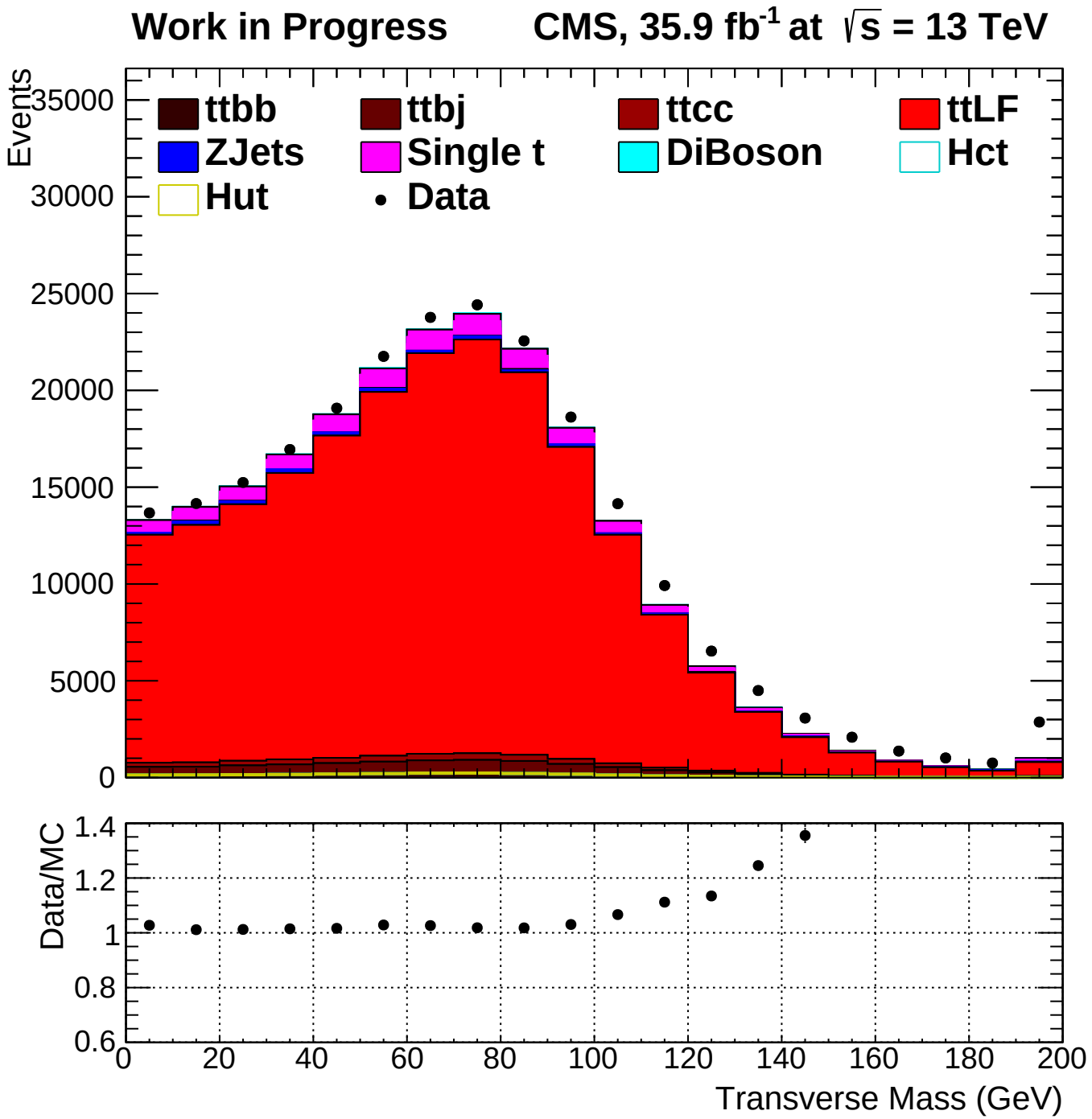

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

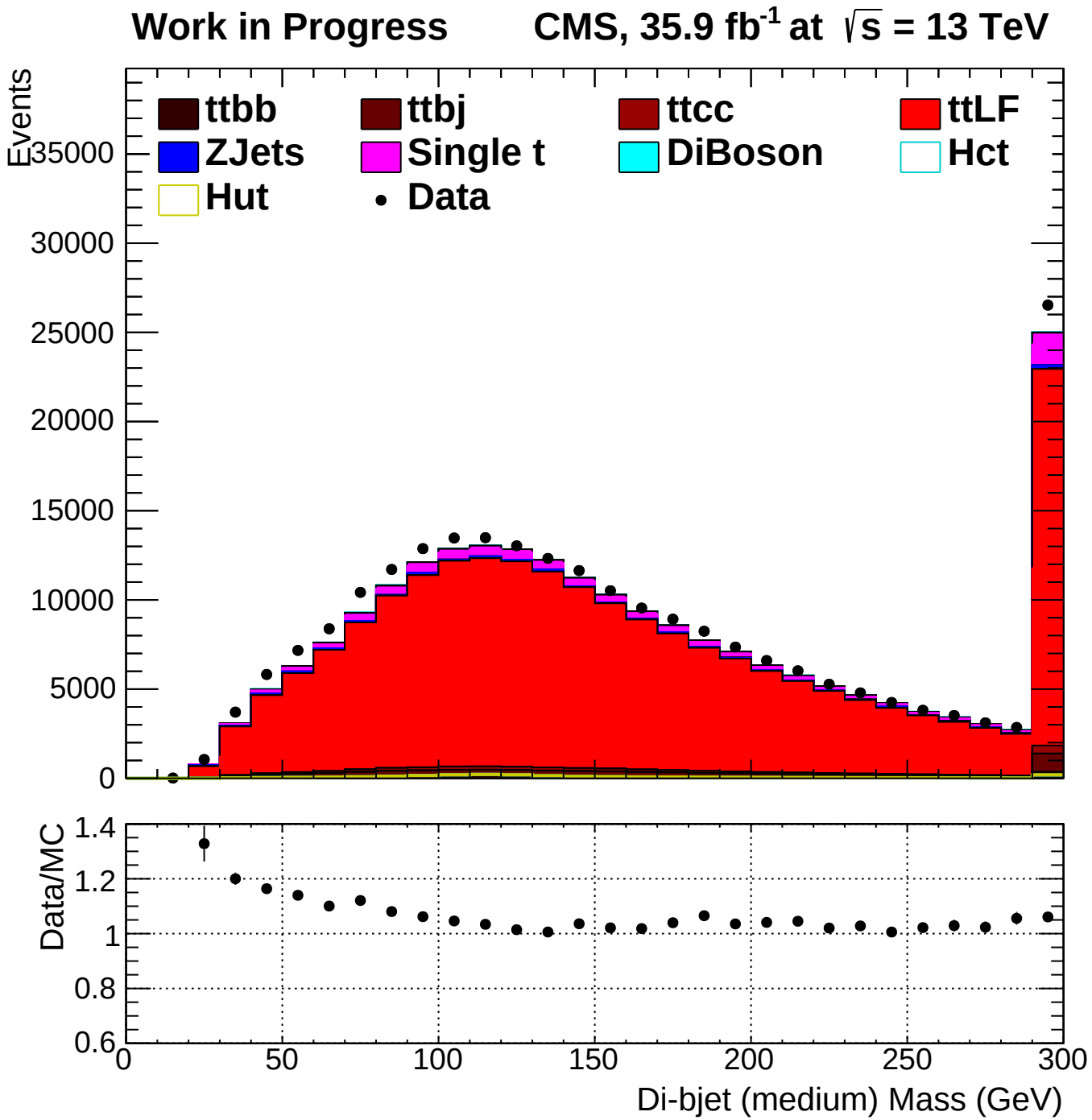

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

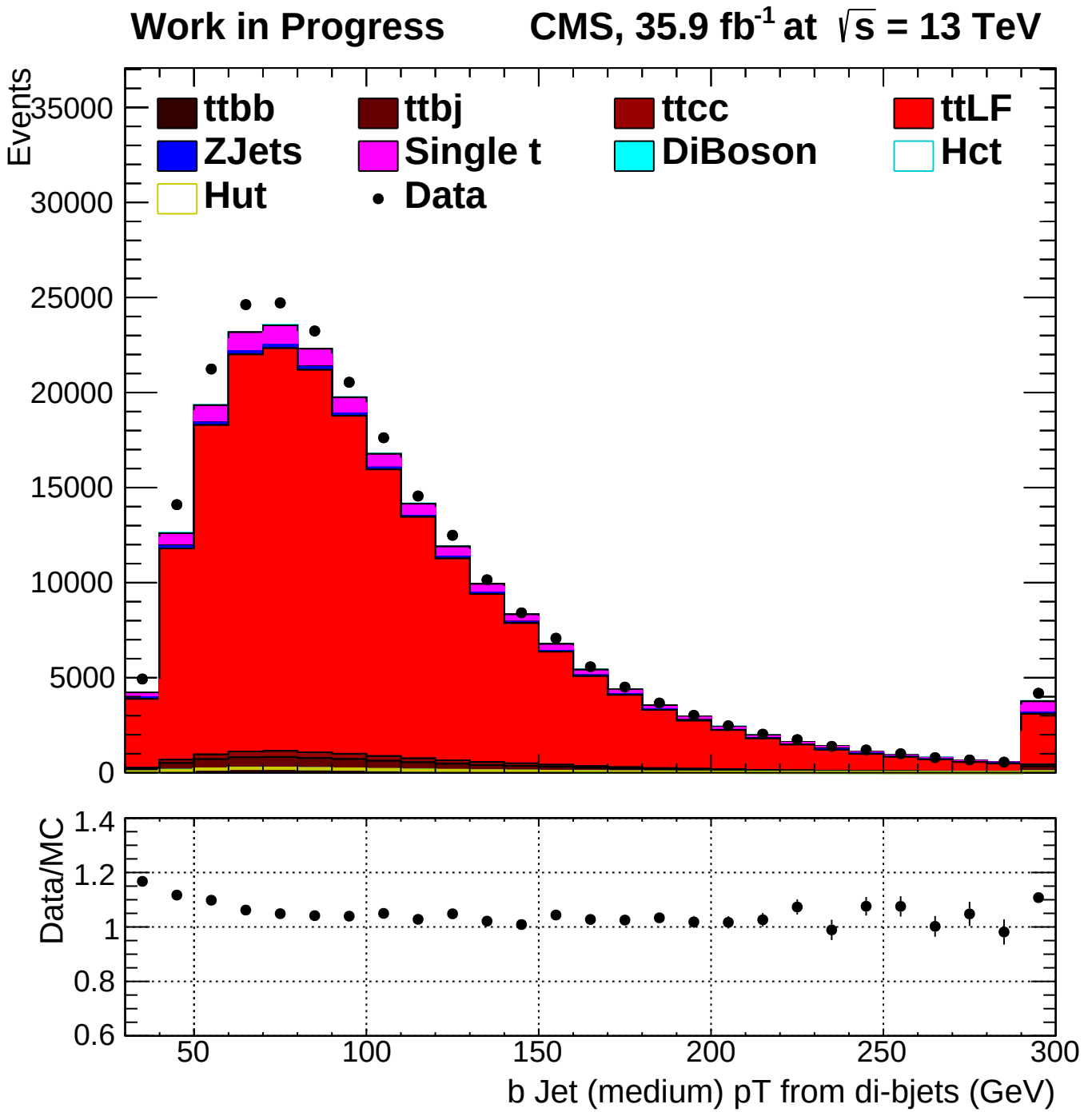

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

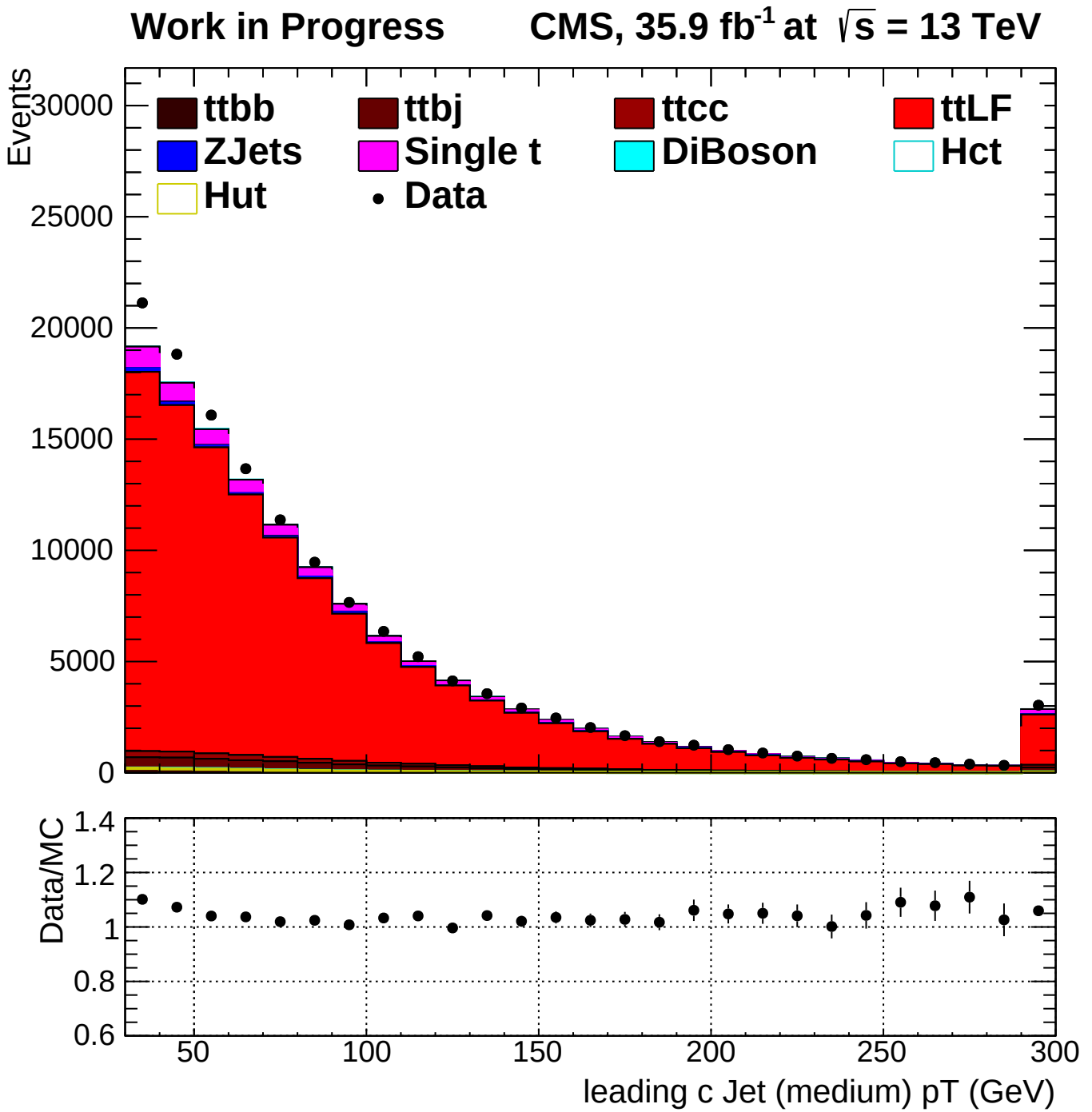

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)

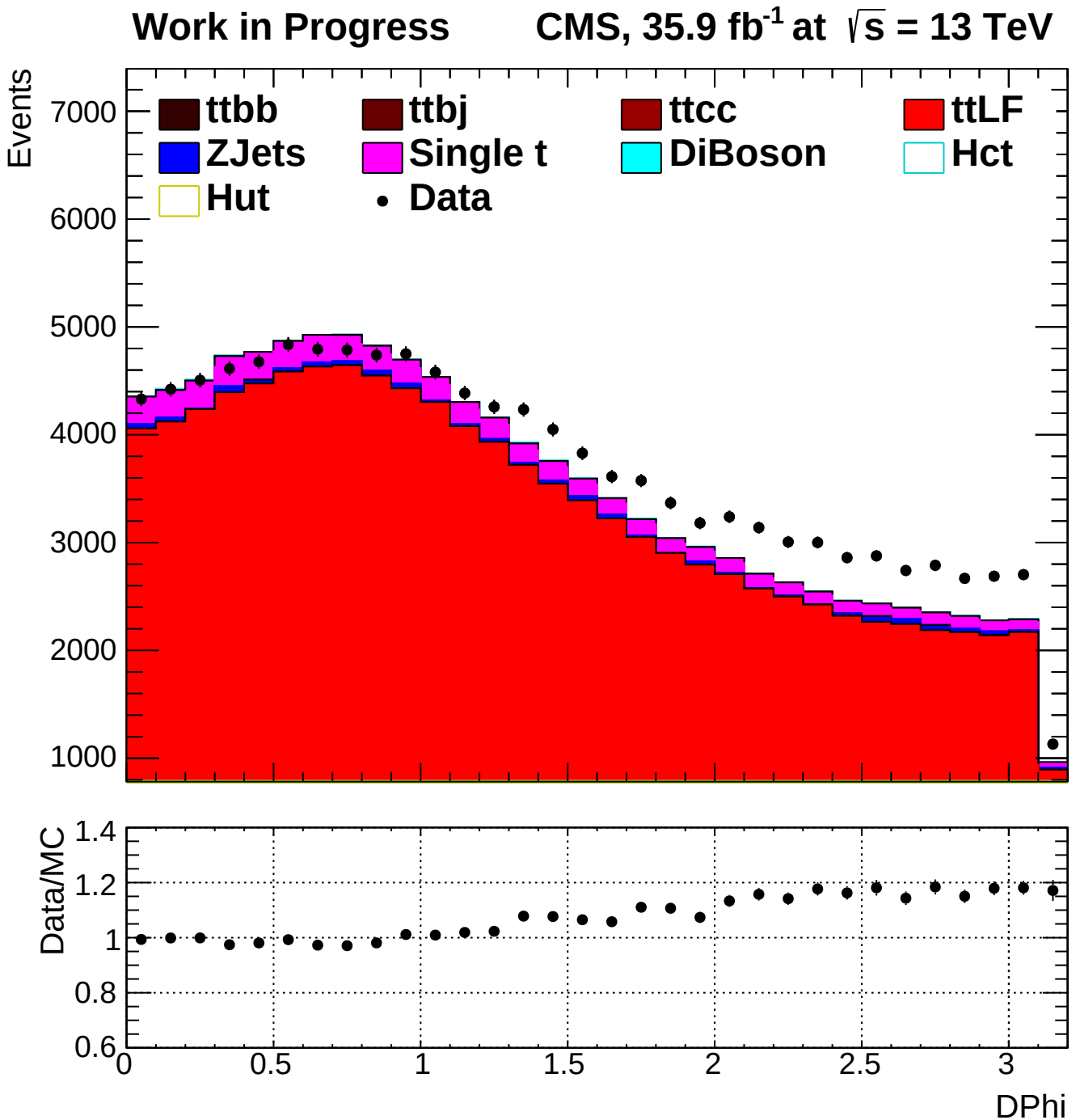

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

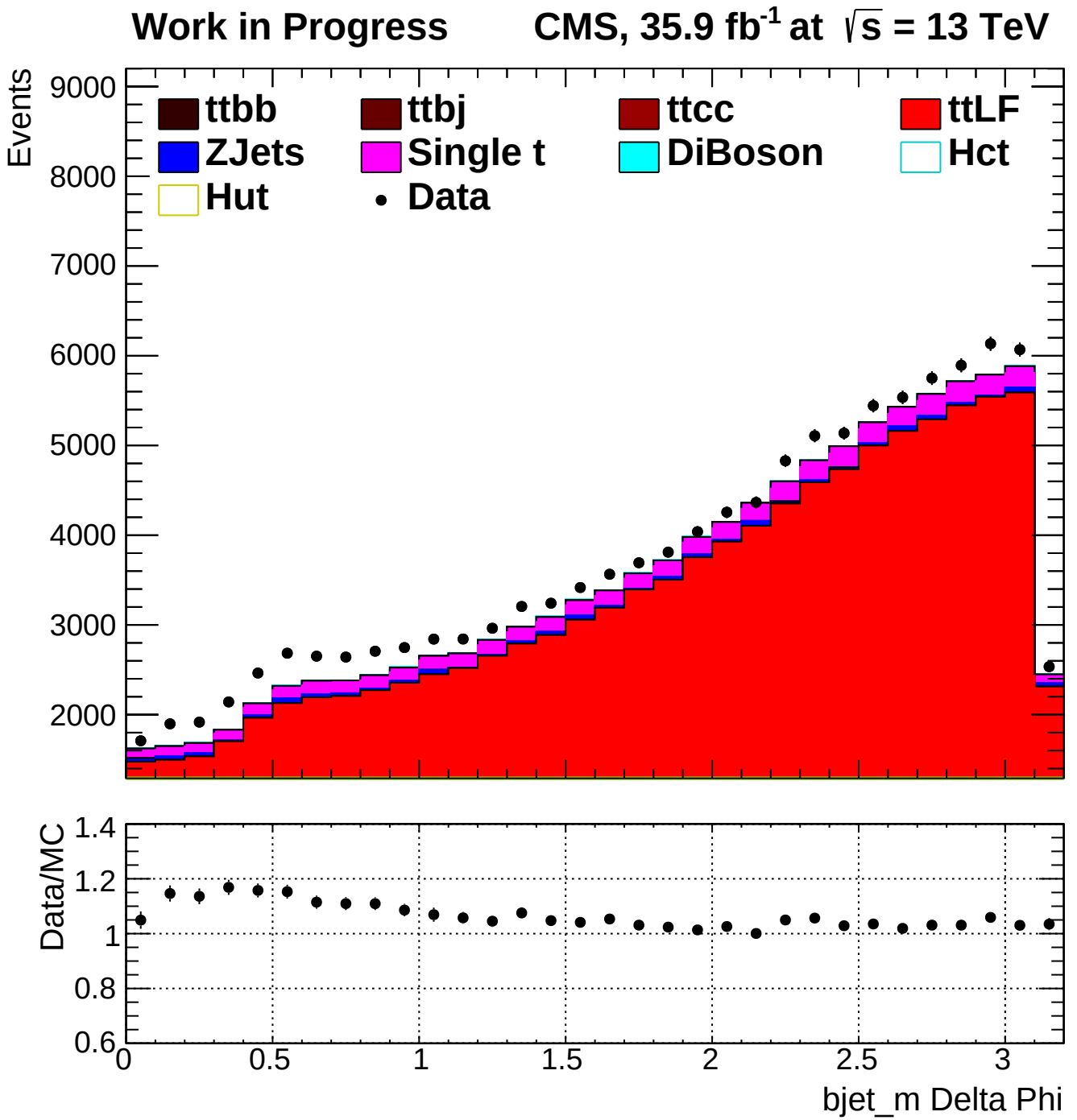

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

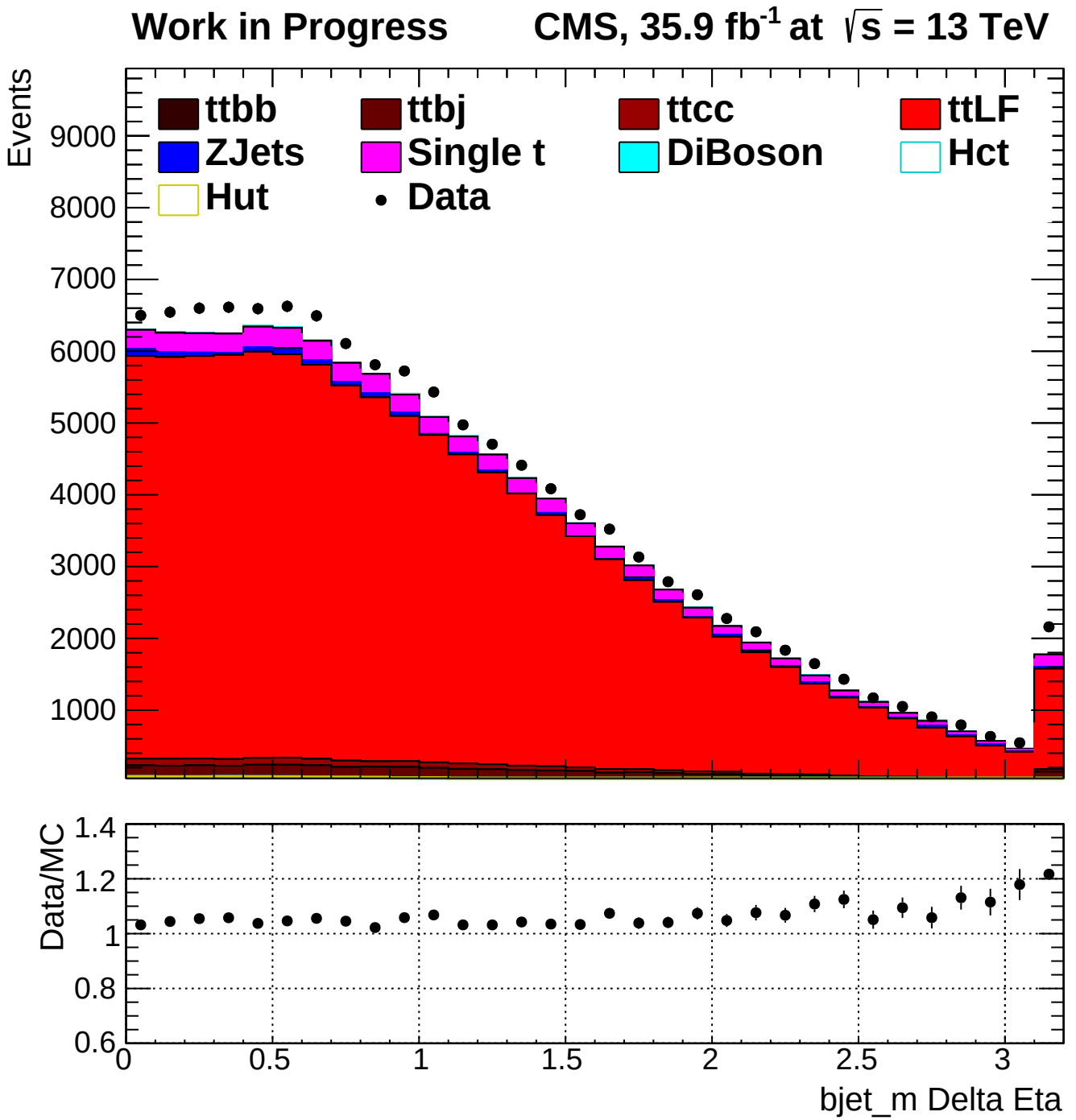

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

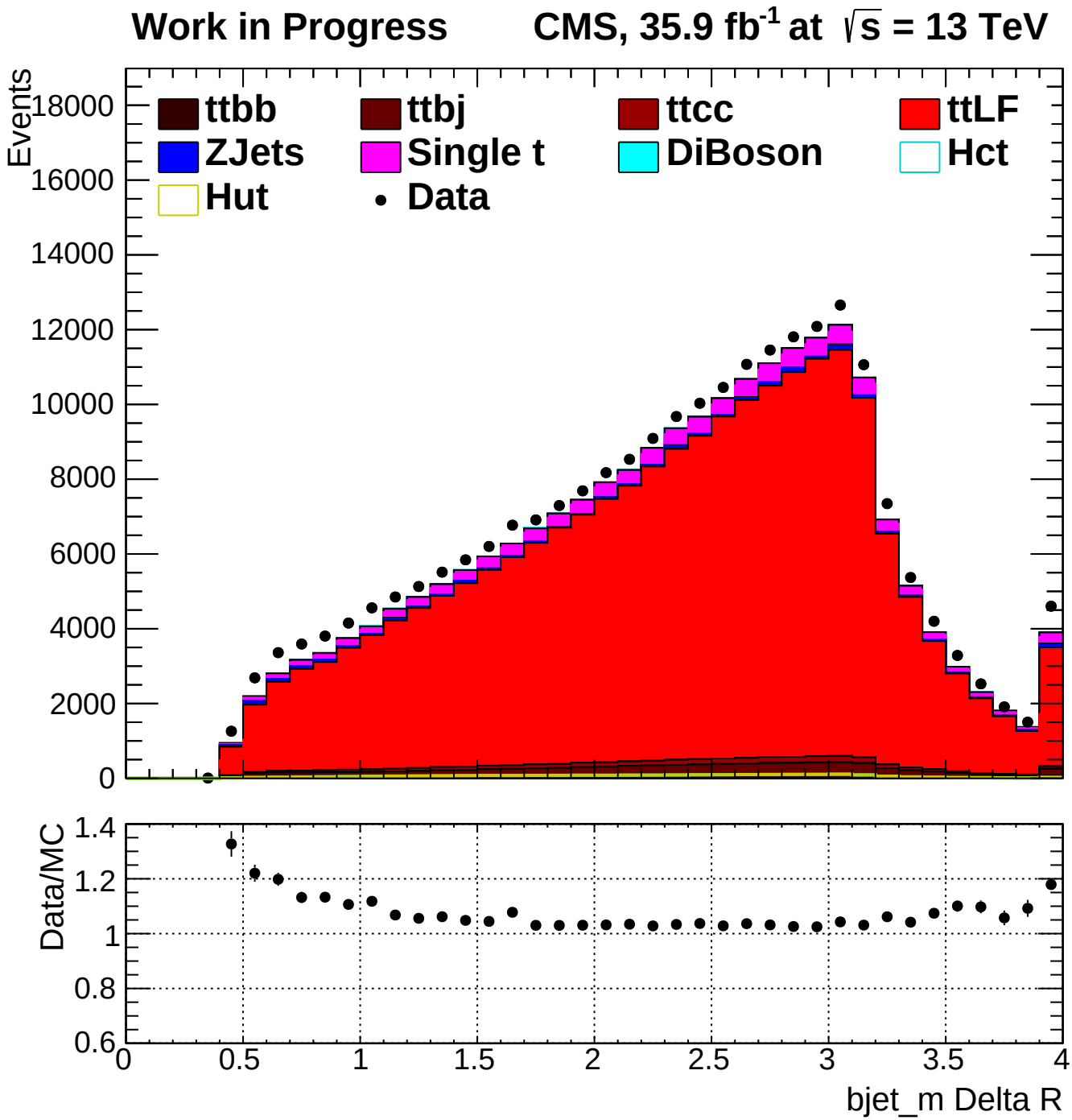

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

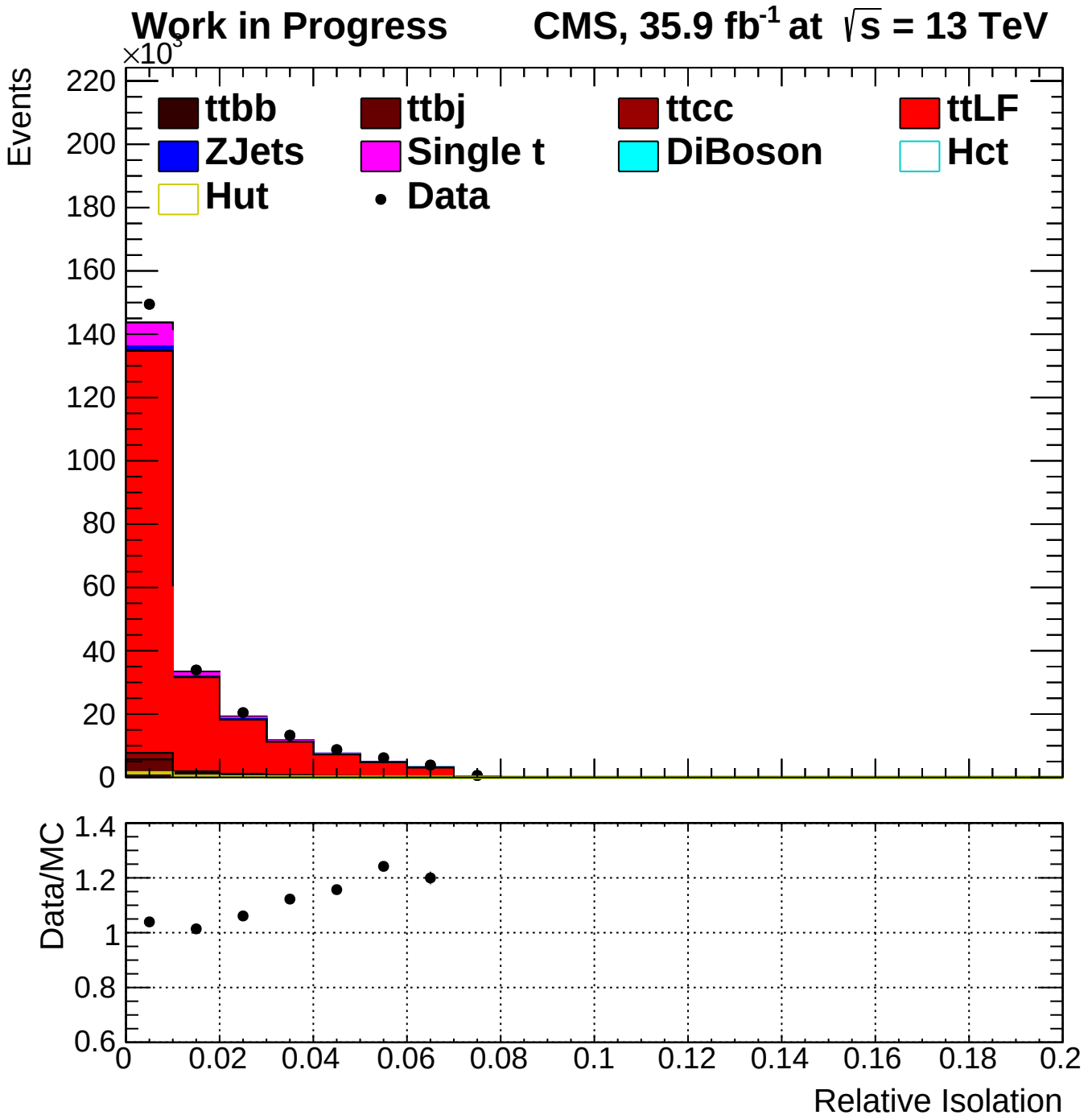

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

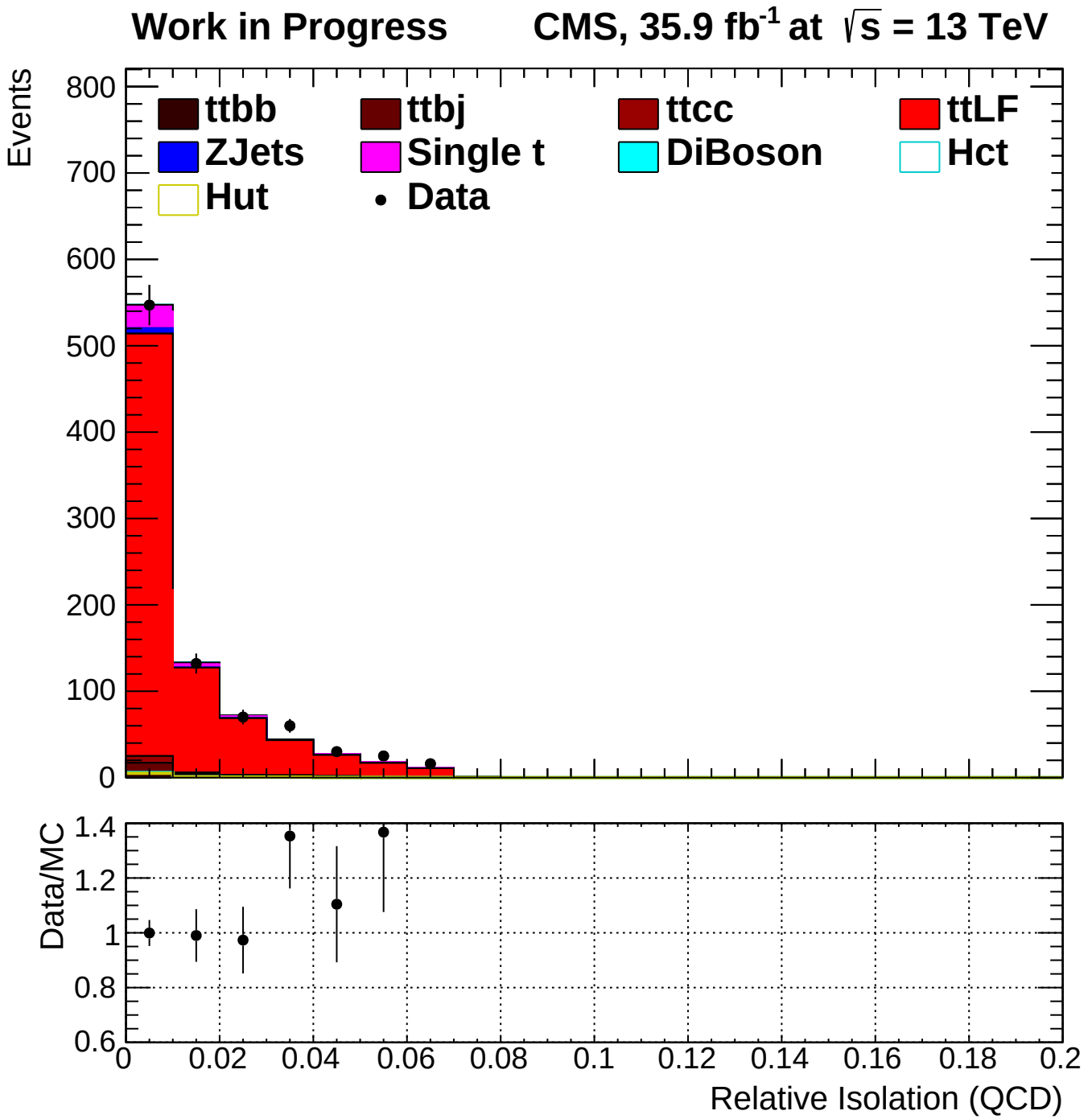

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

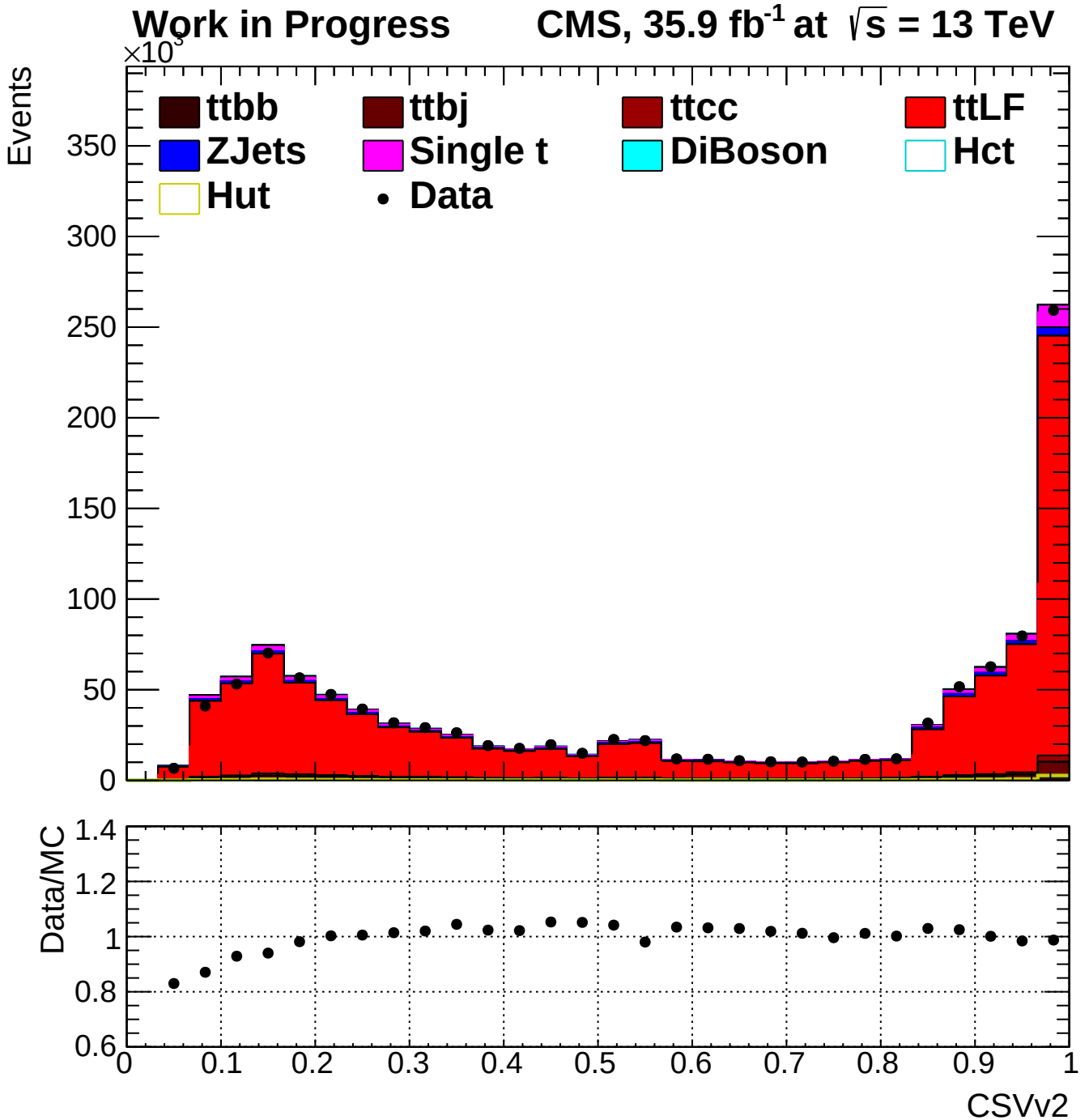

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
9000
8000
7000
6000
5000
4000
3000
2000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

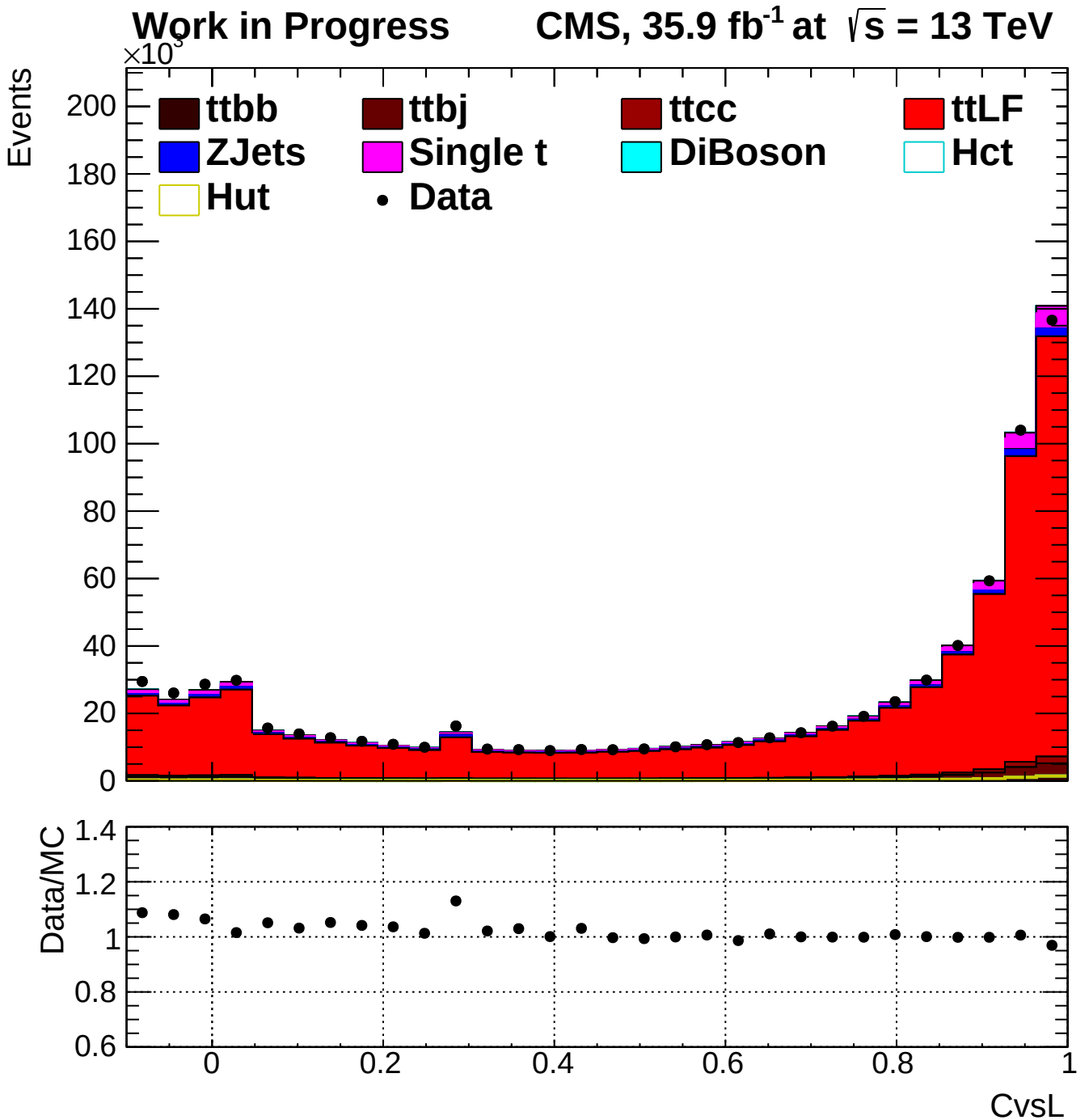

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
9000
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
×10^3
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
350
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
×10³
Events
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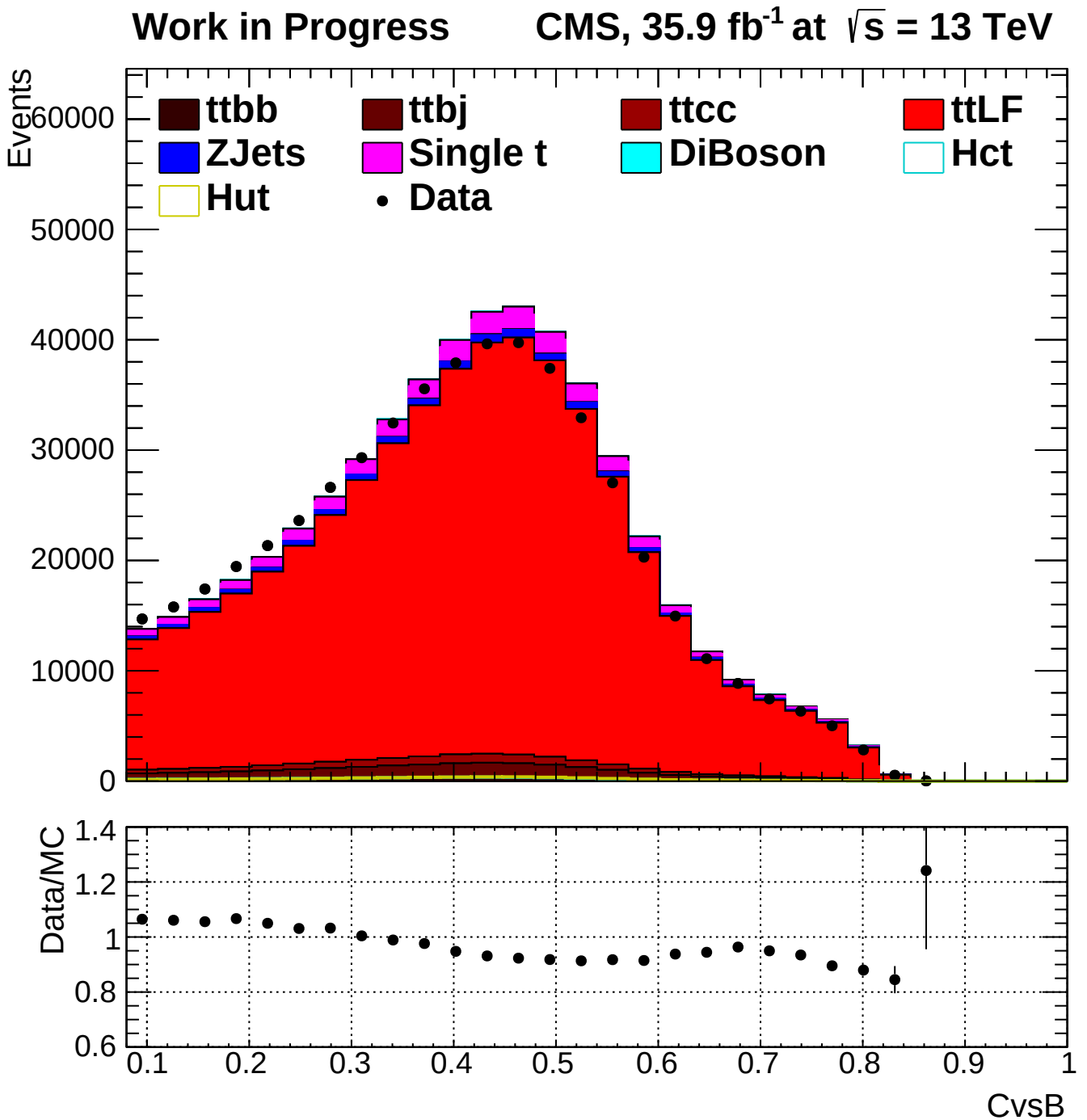
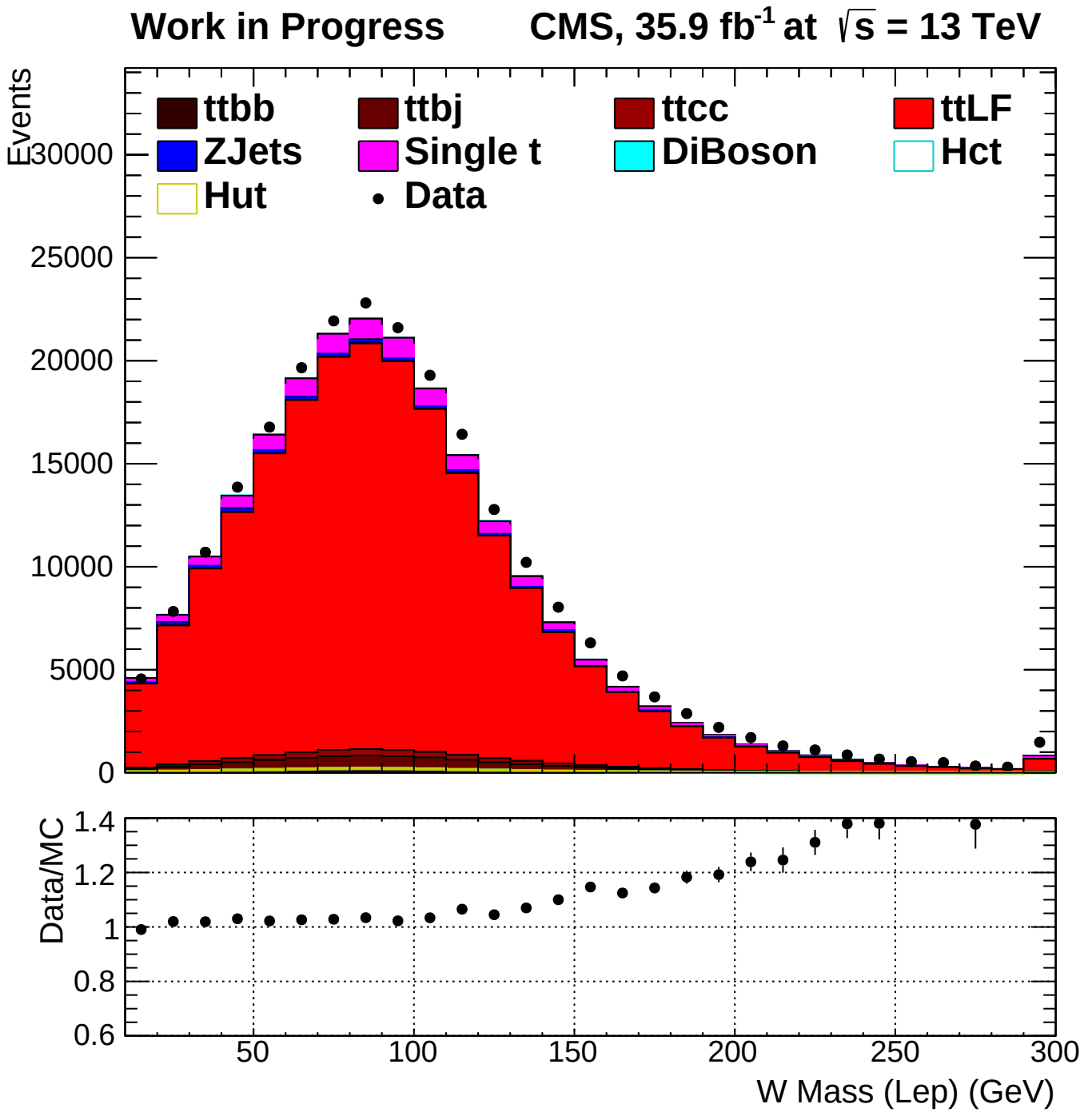
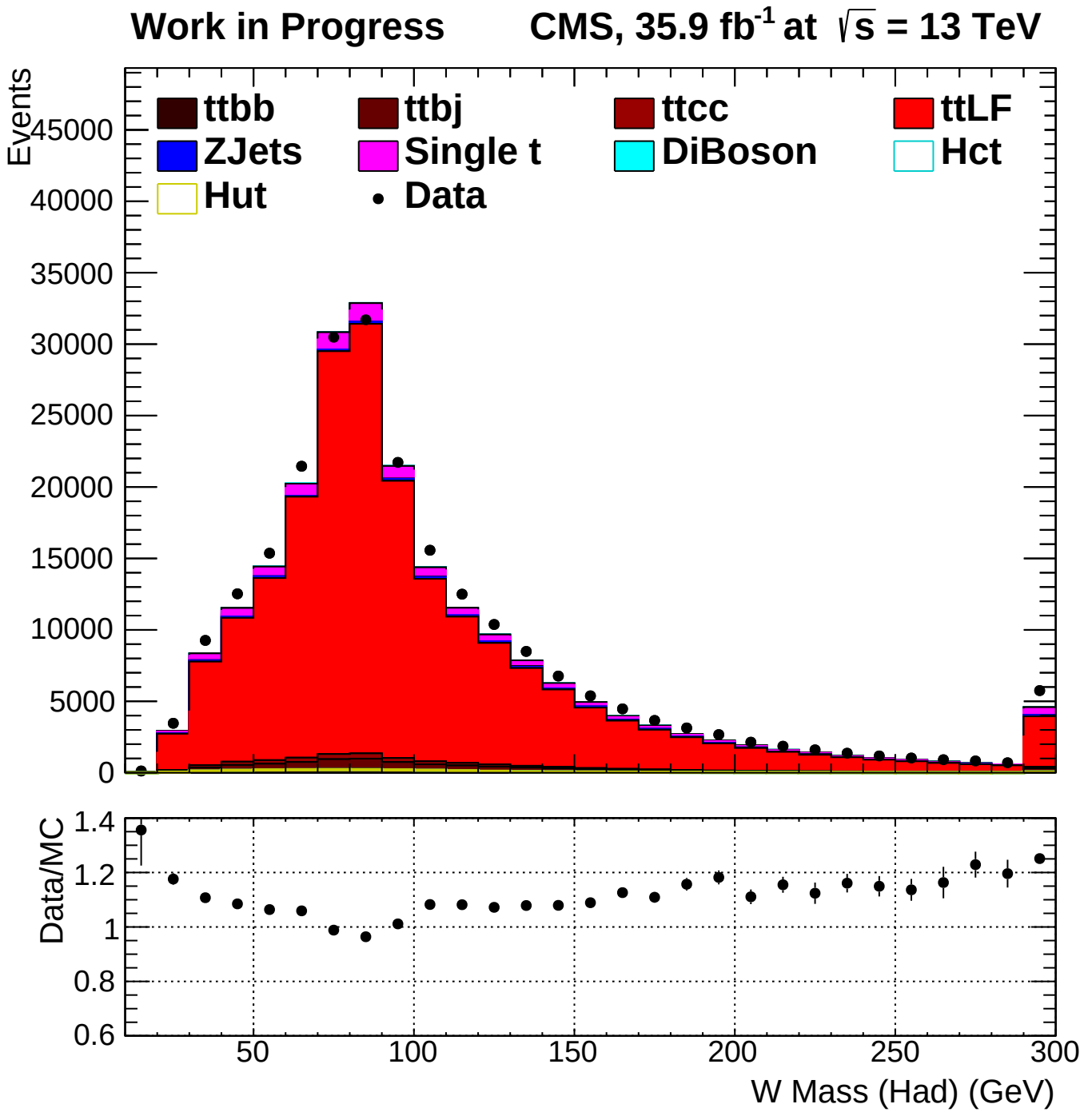
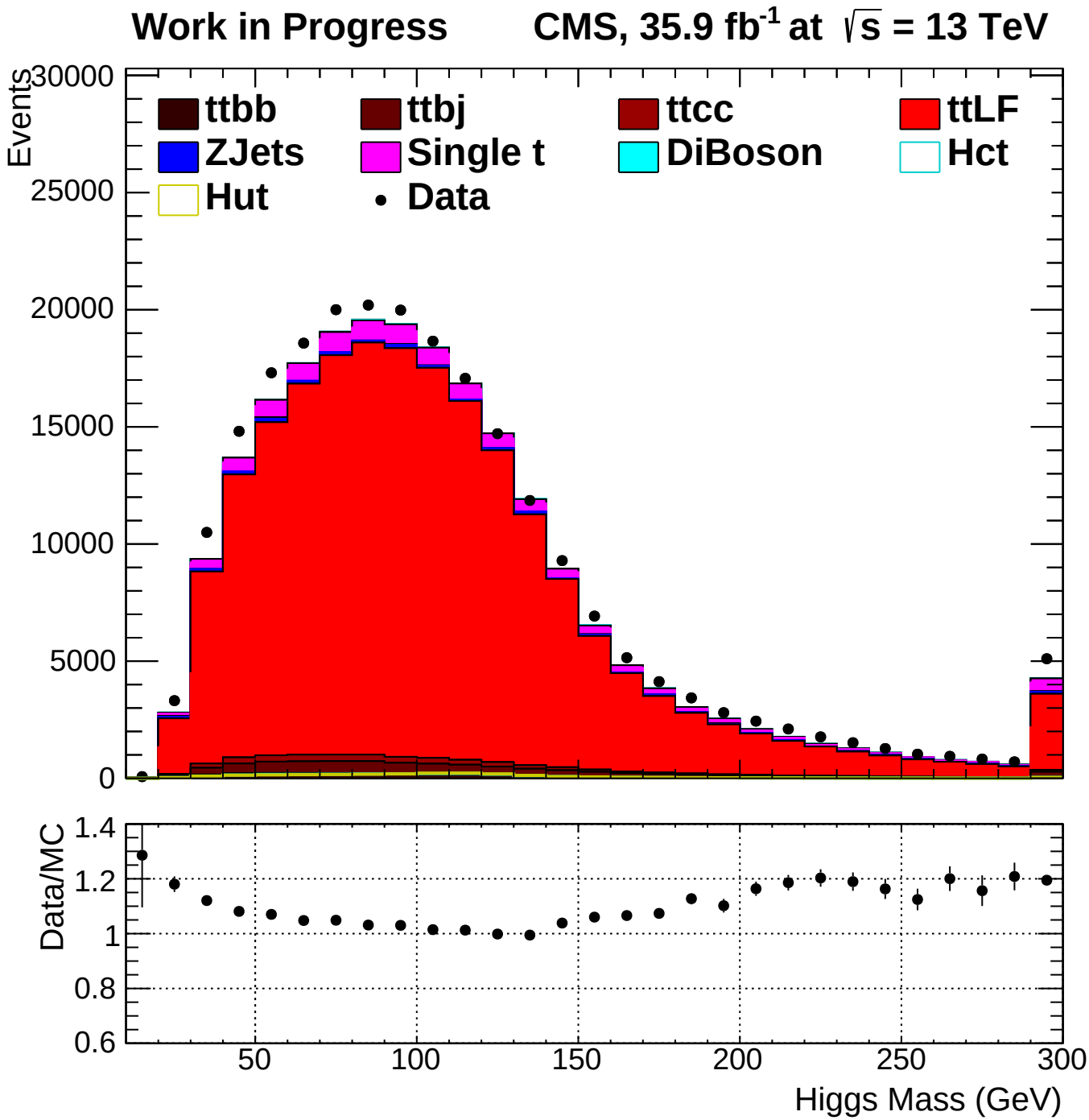
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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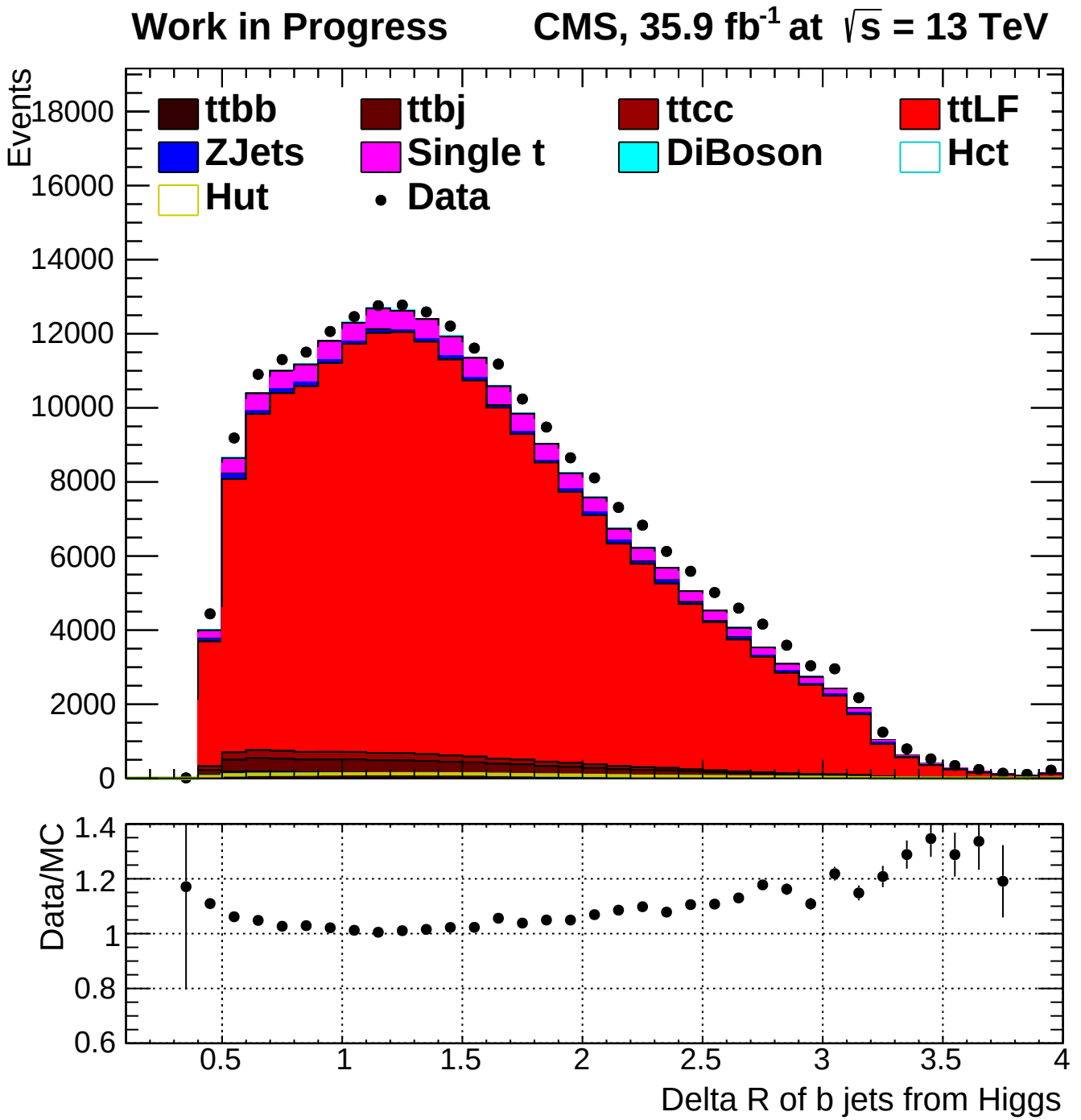
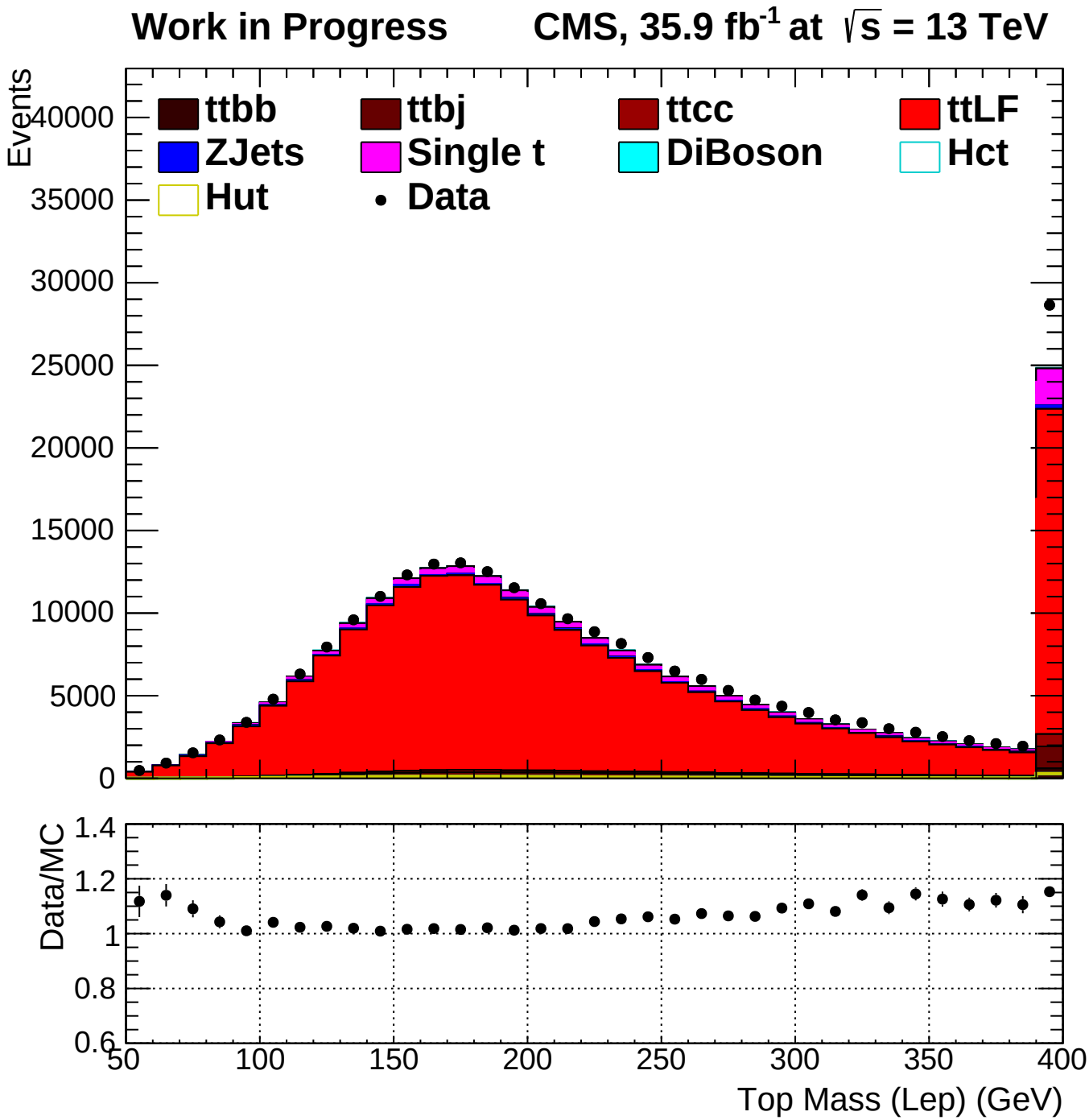
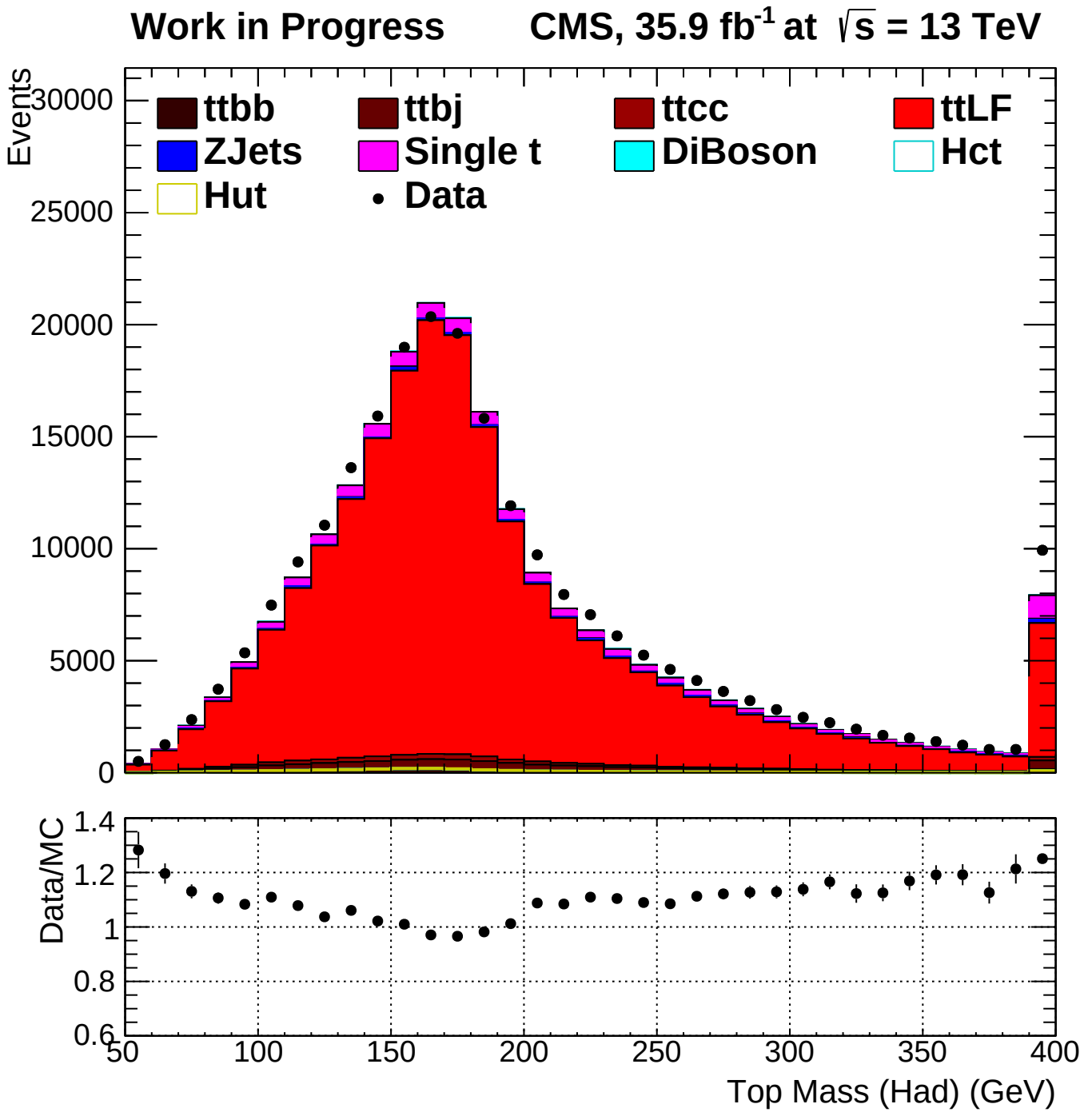
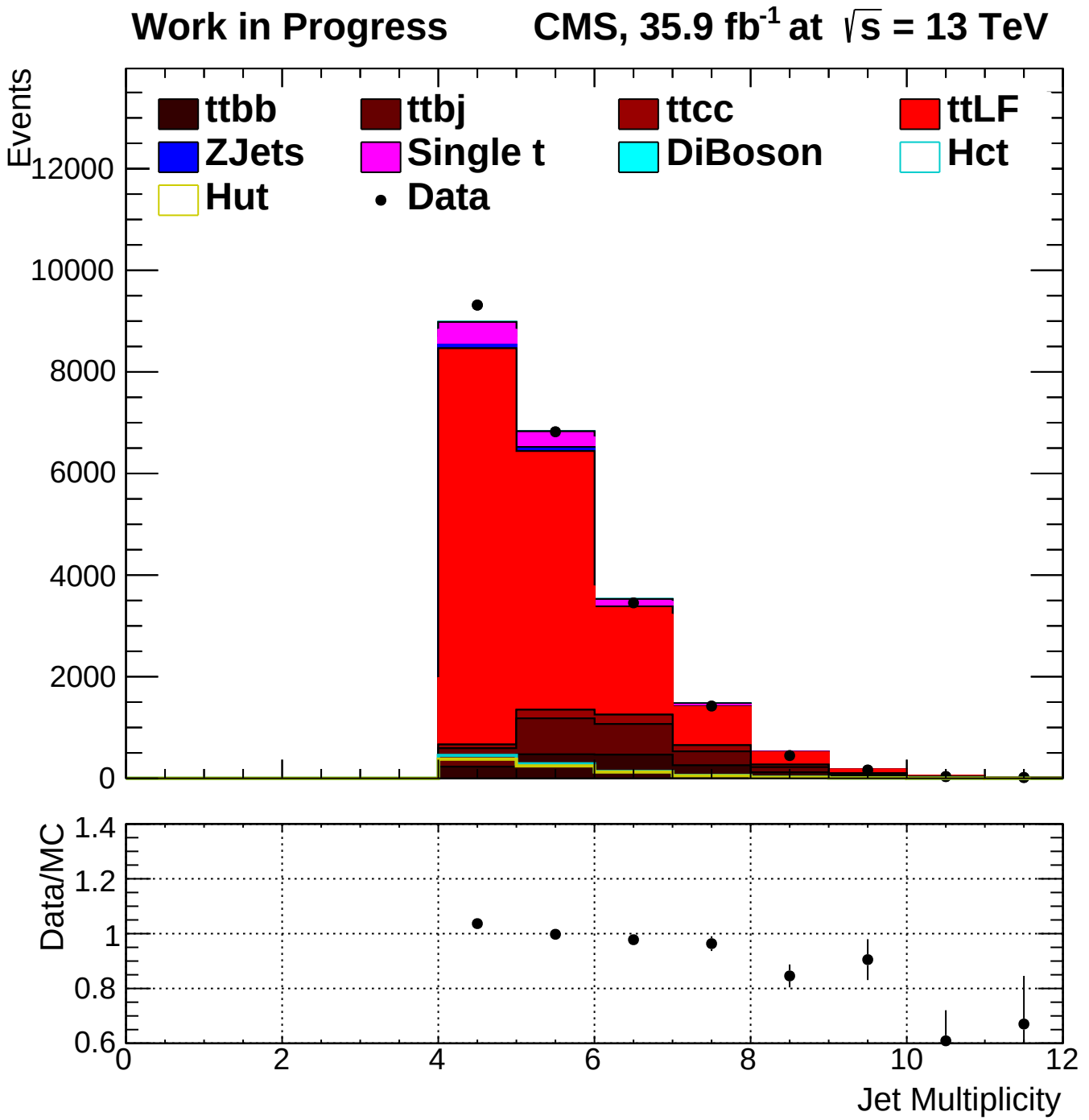
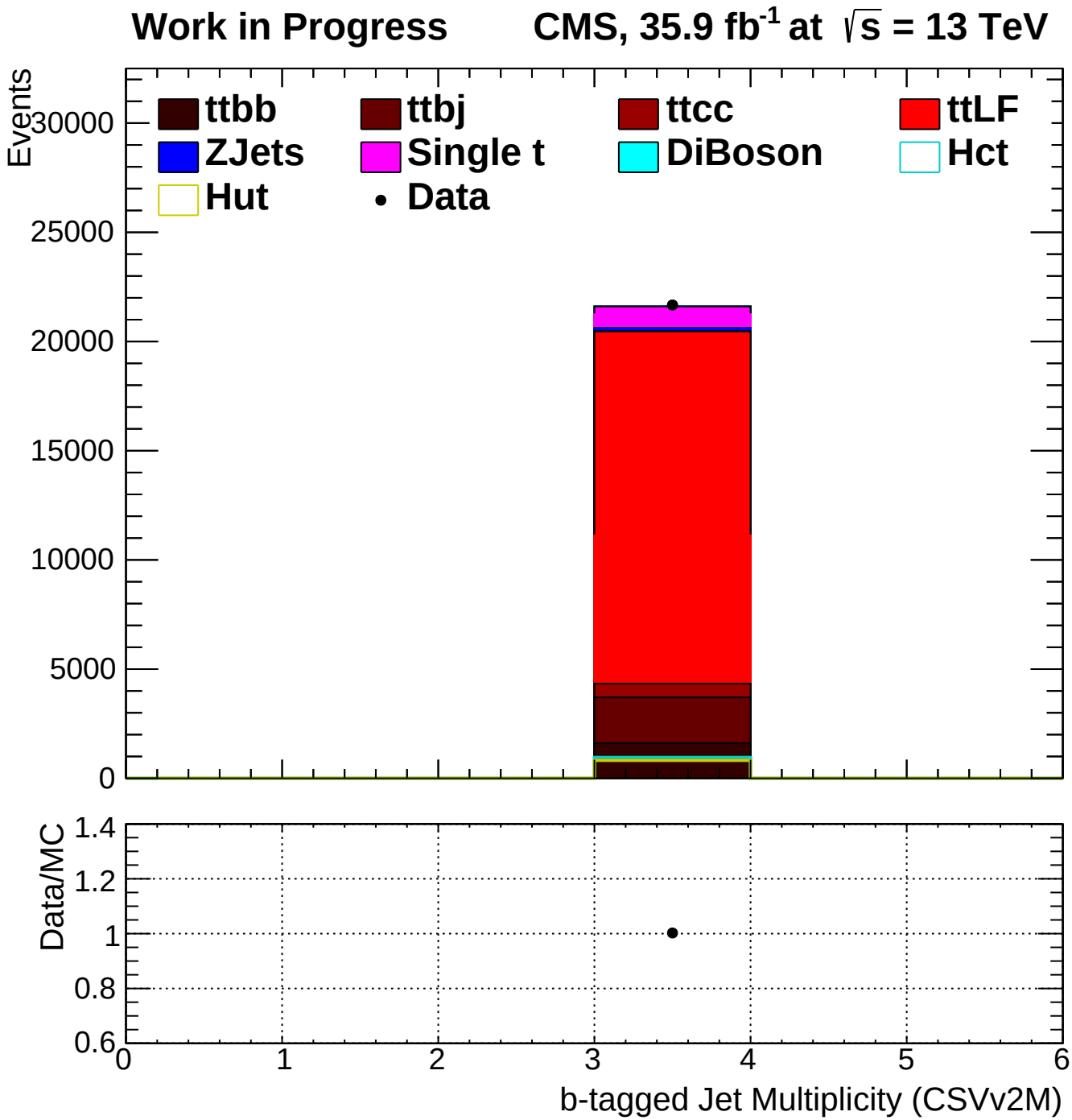
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

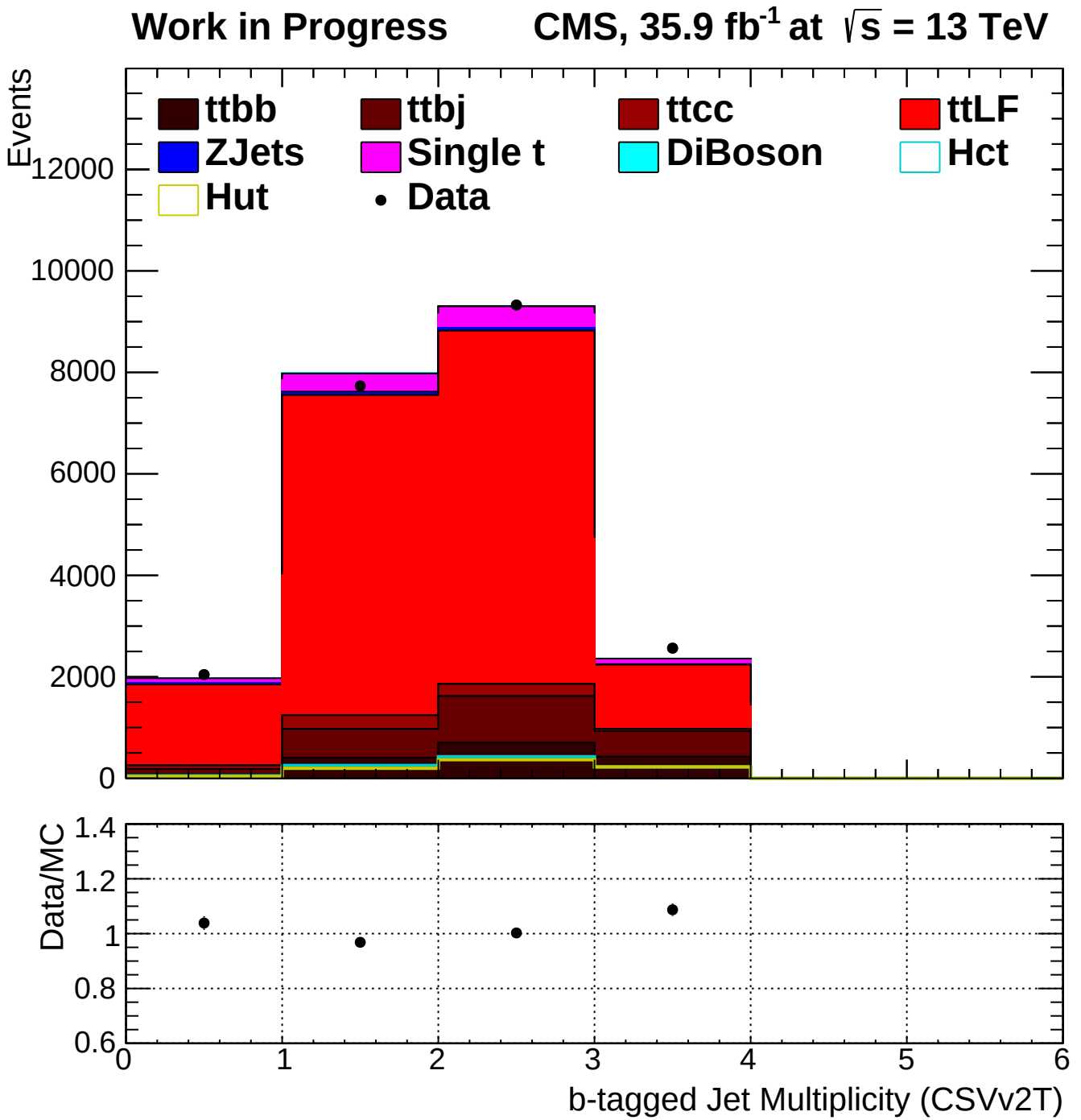

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

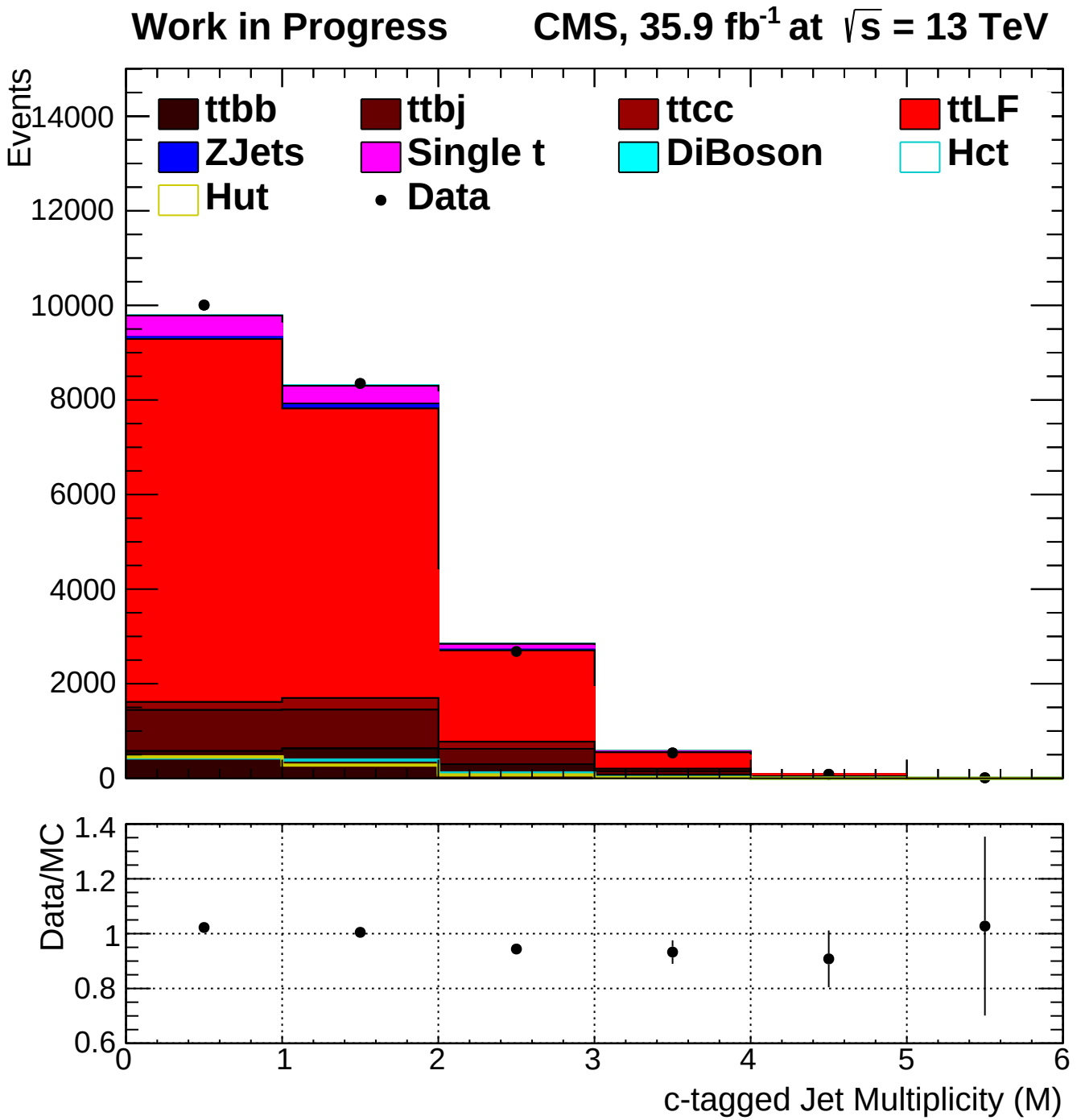

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)

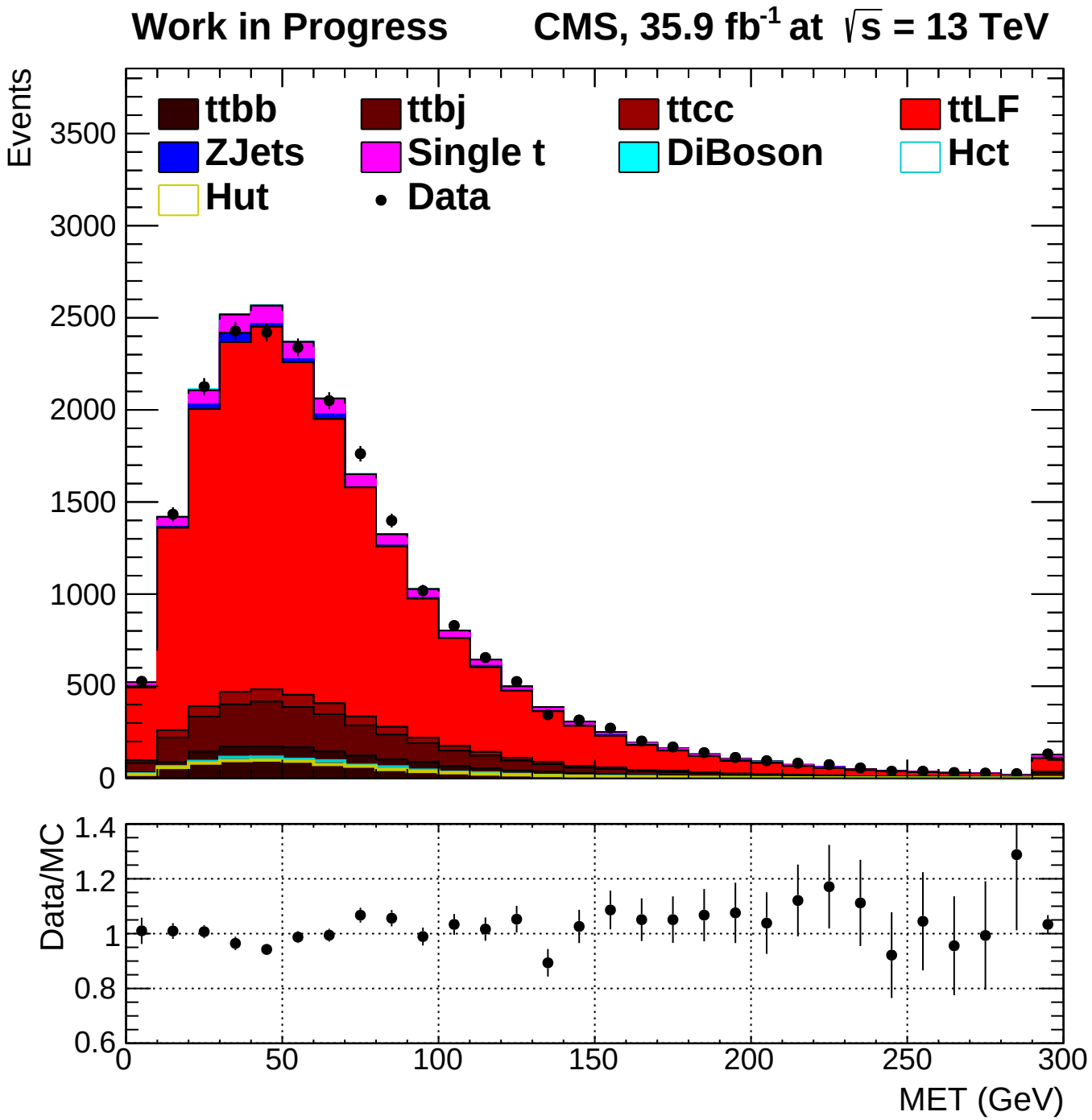

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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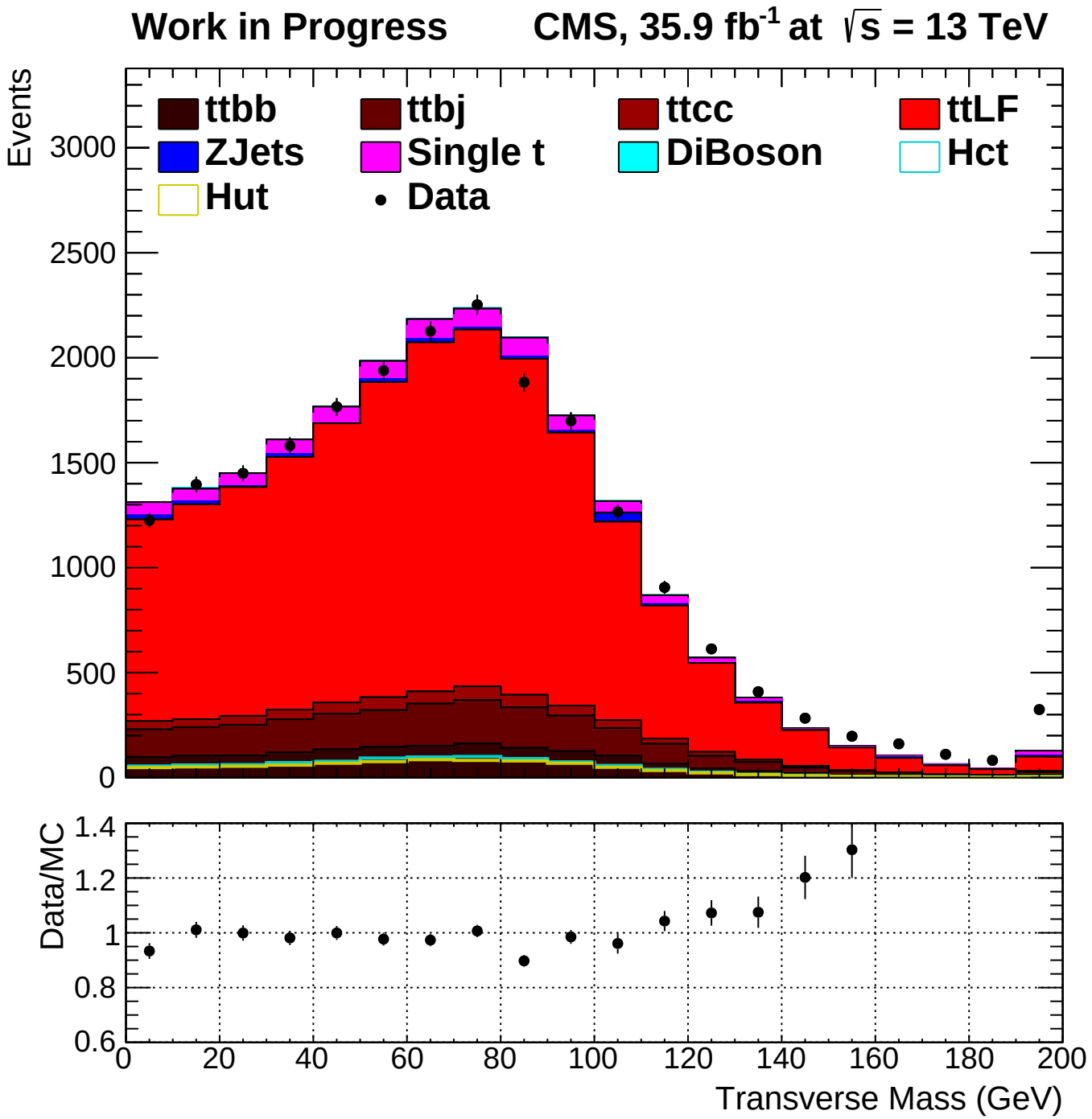
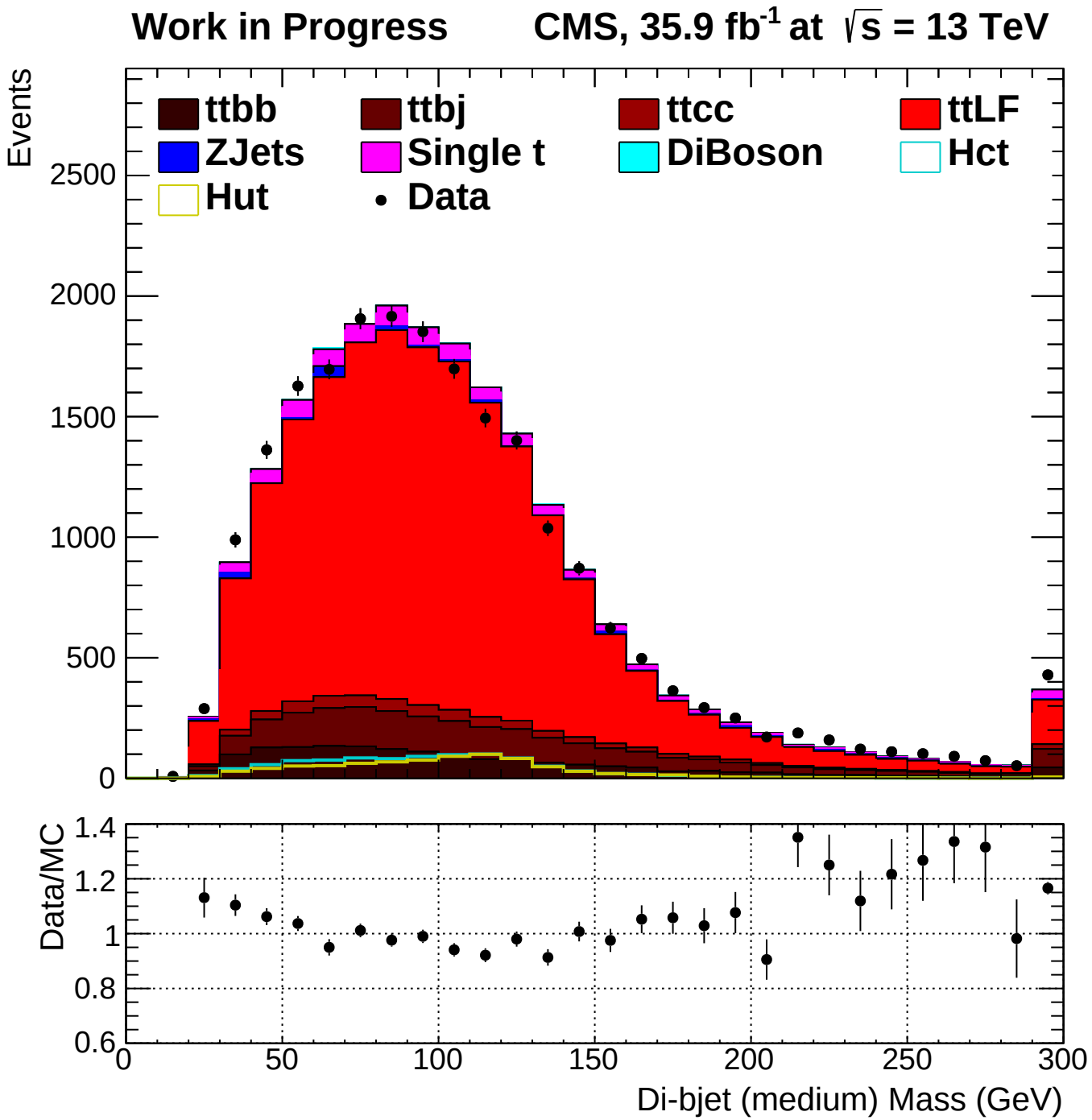
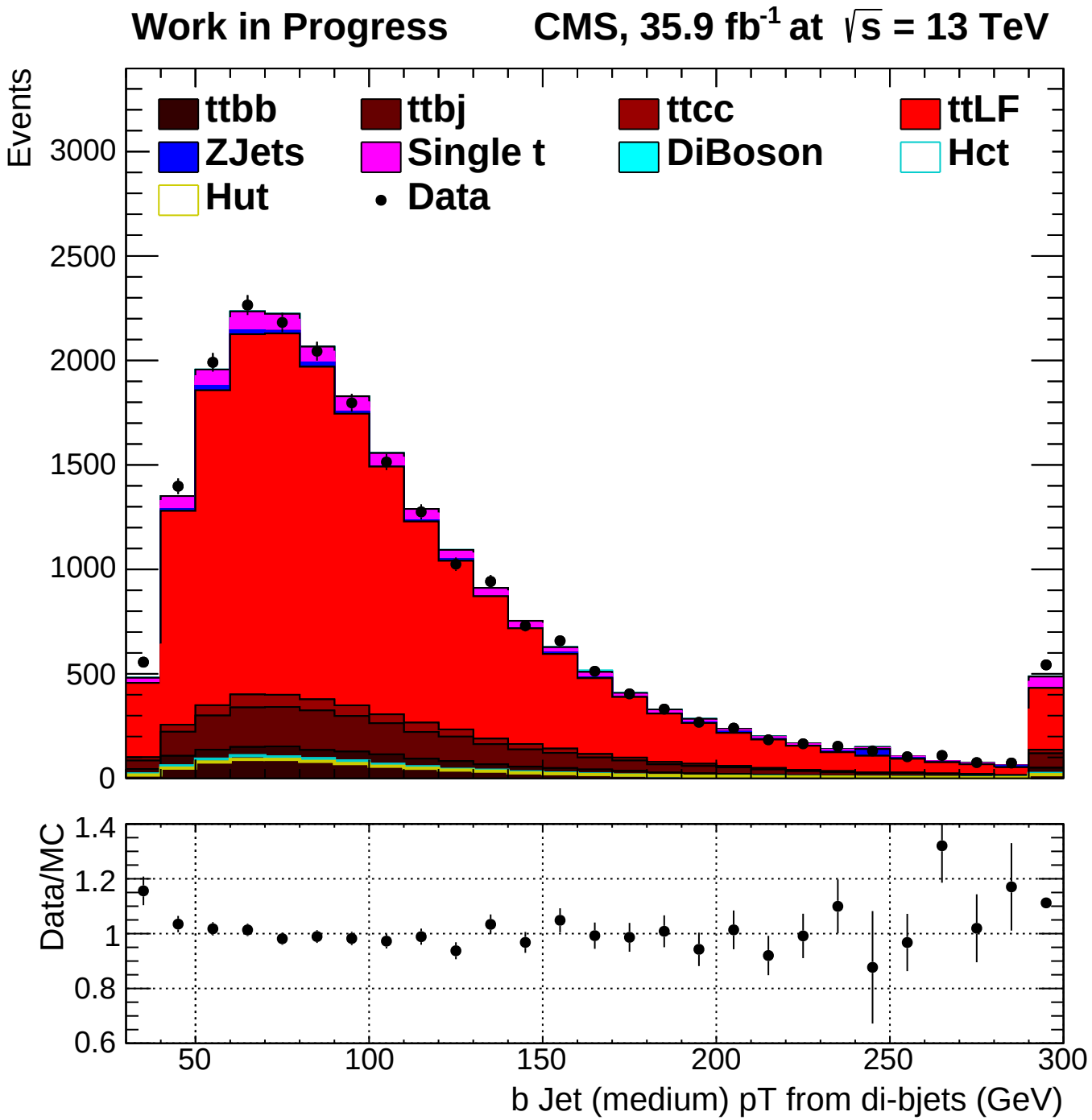
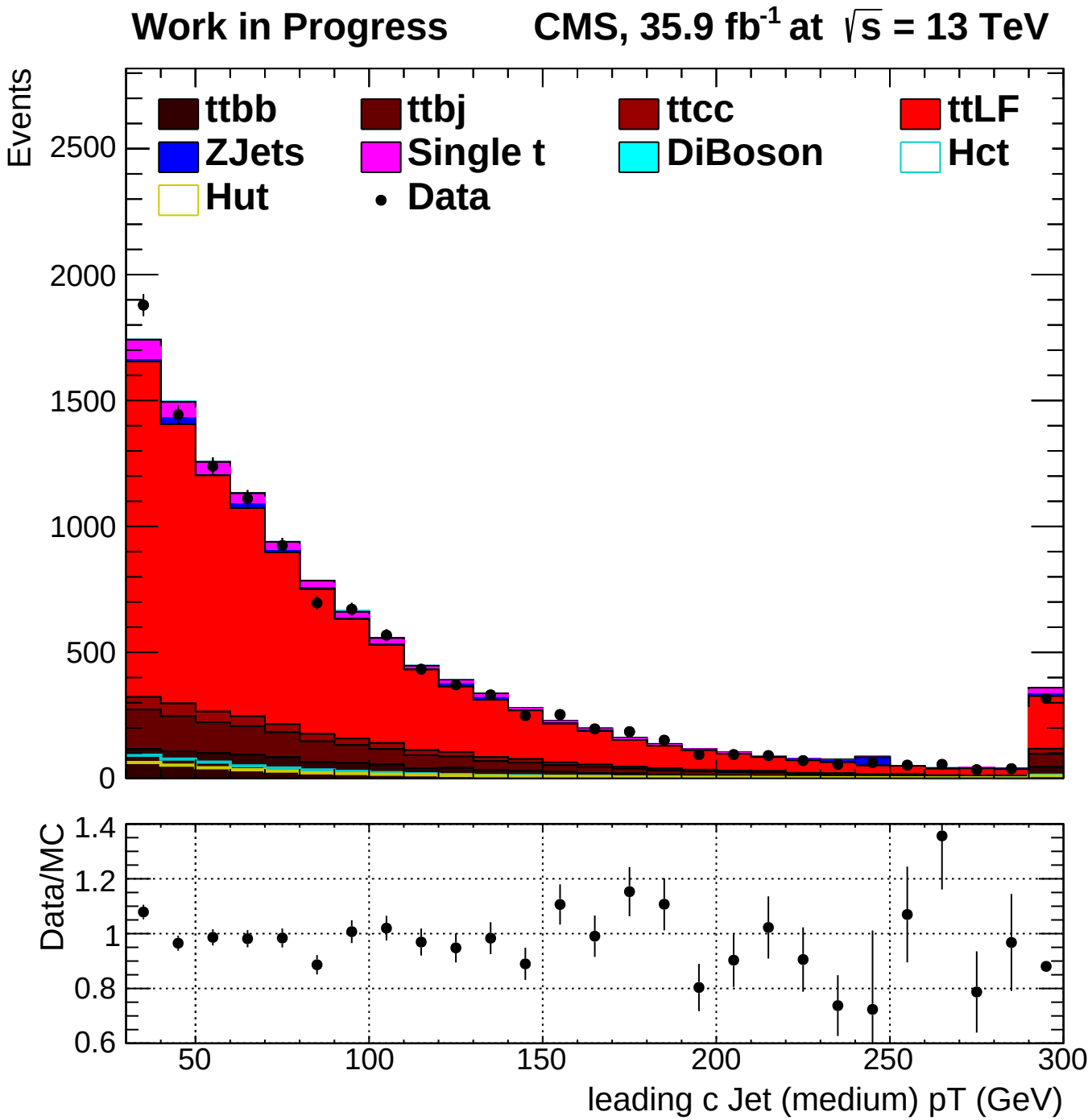
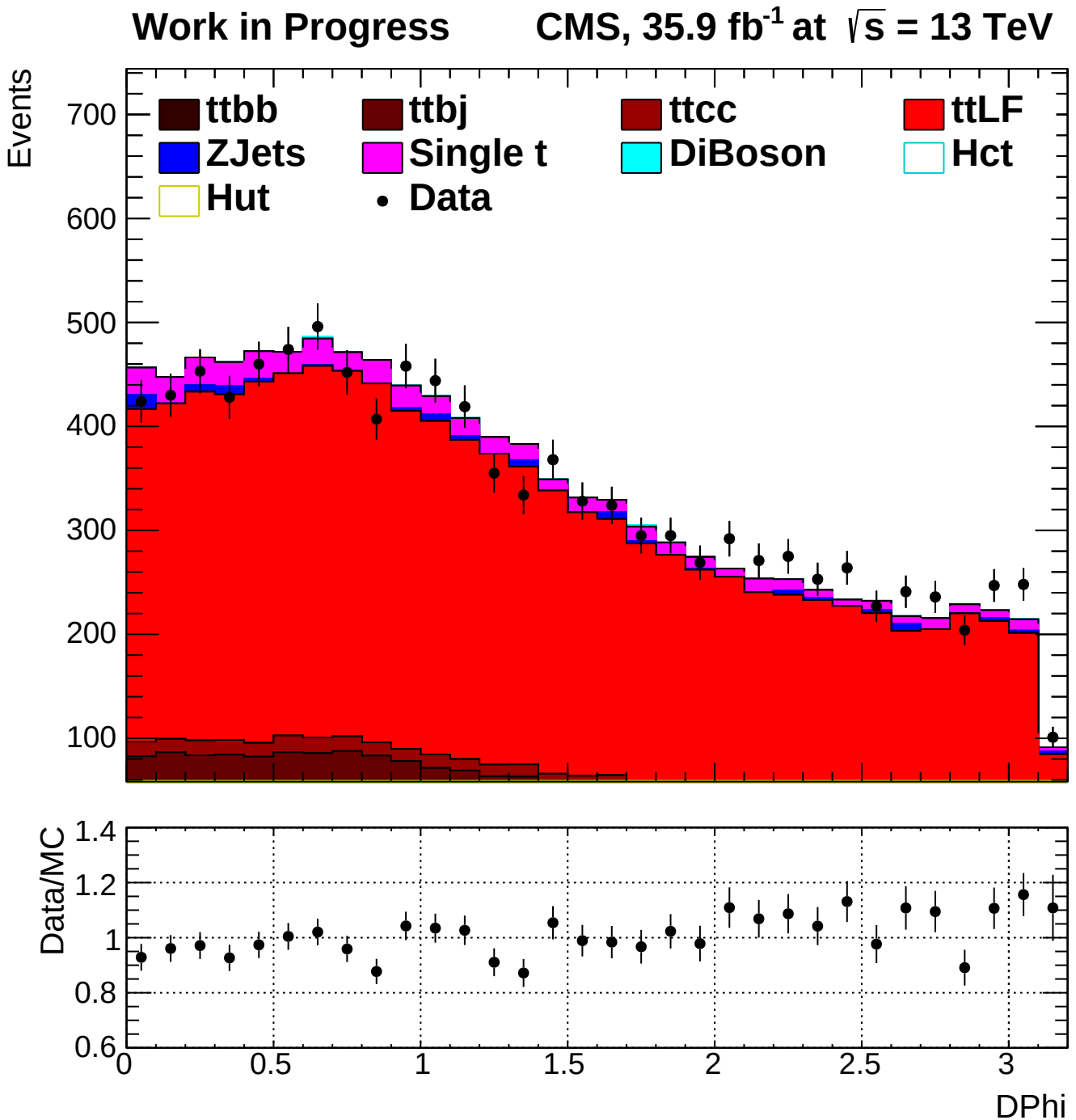
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

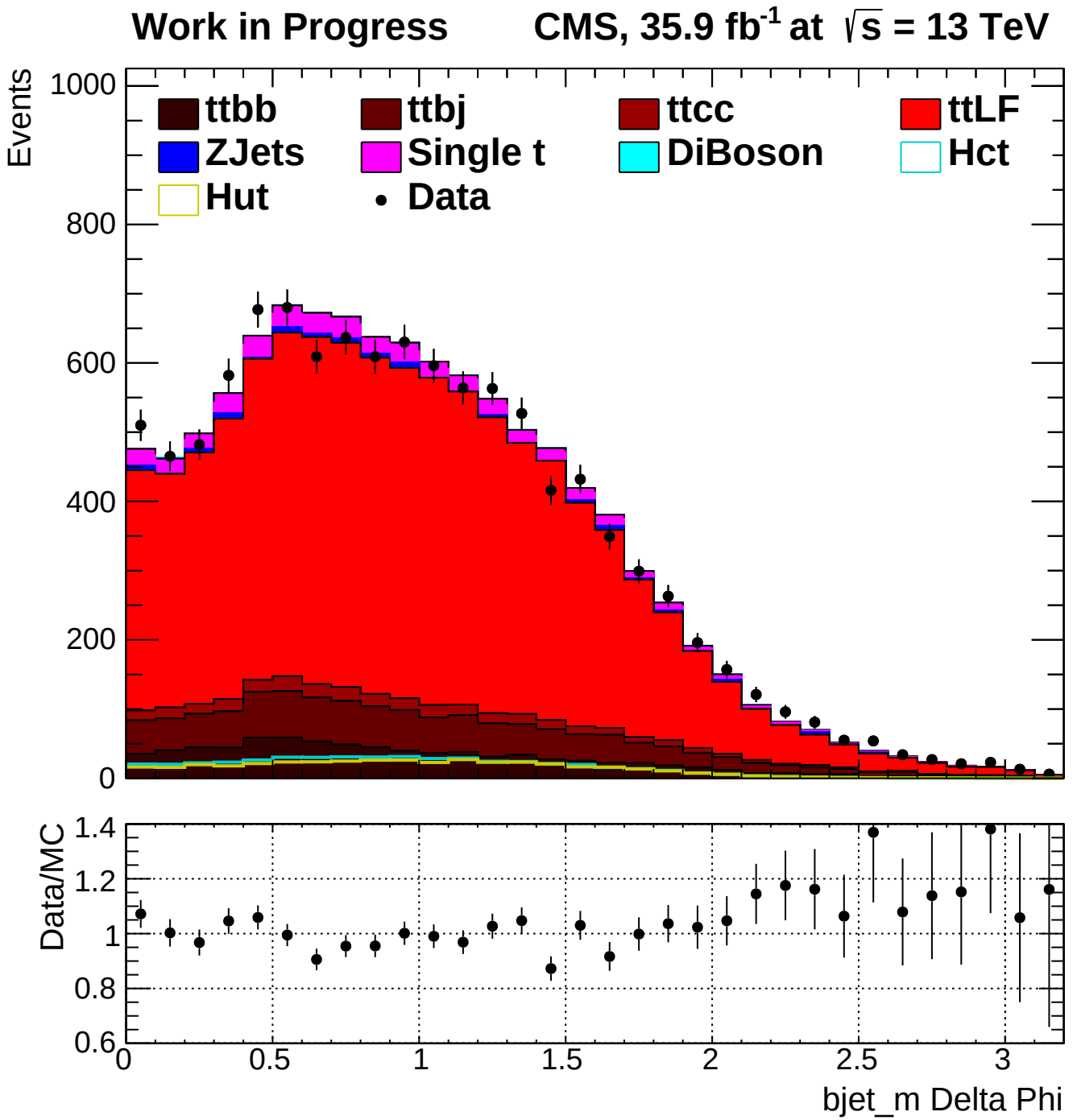

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

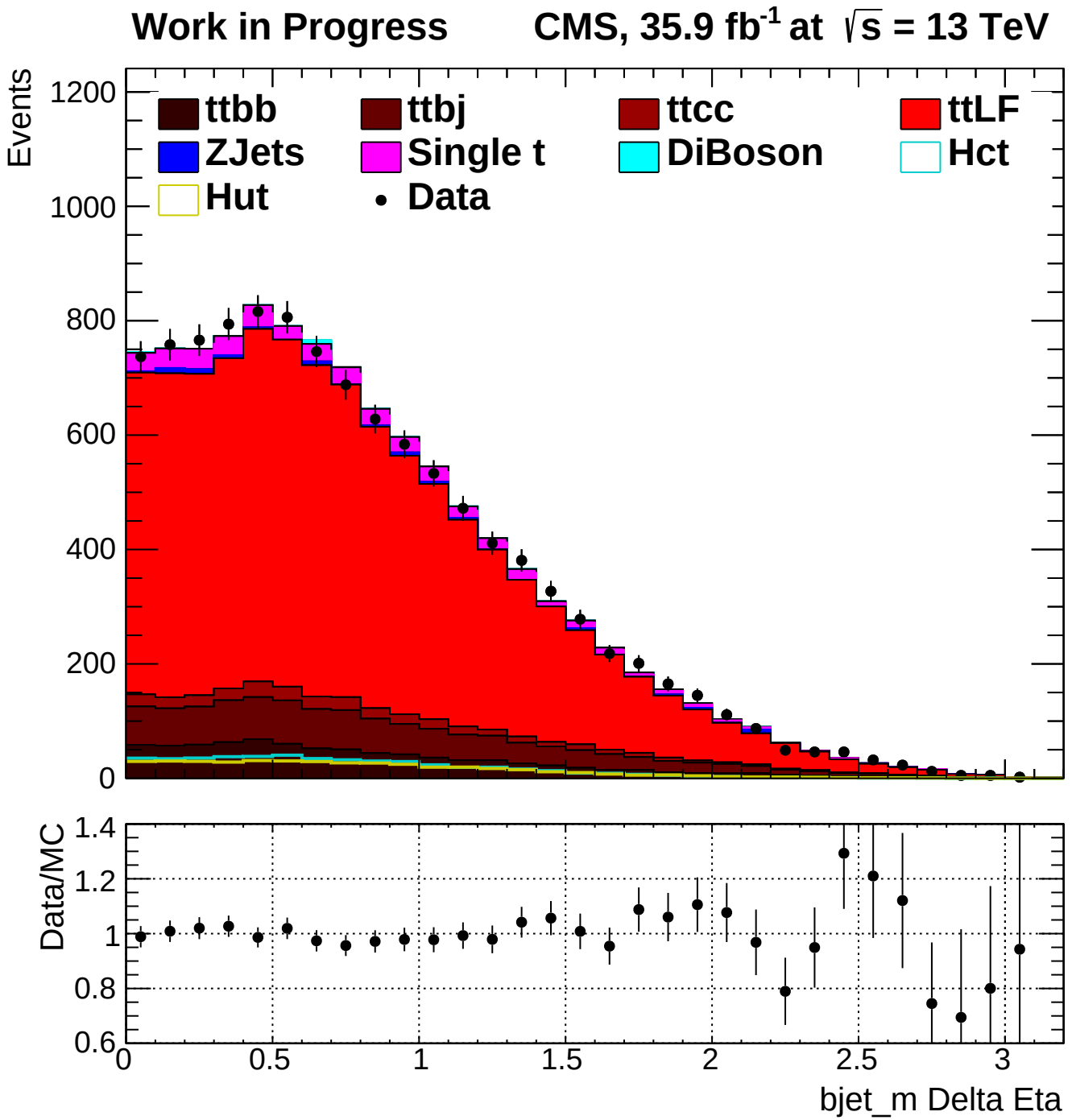

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

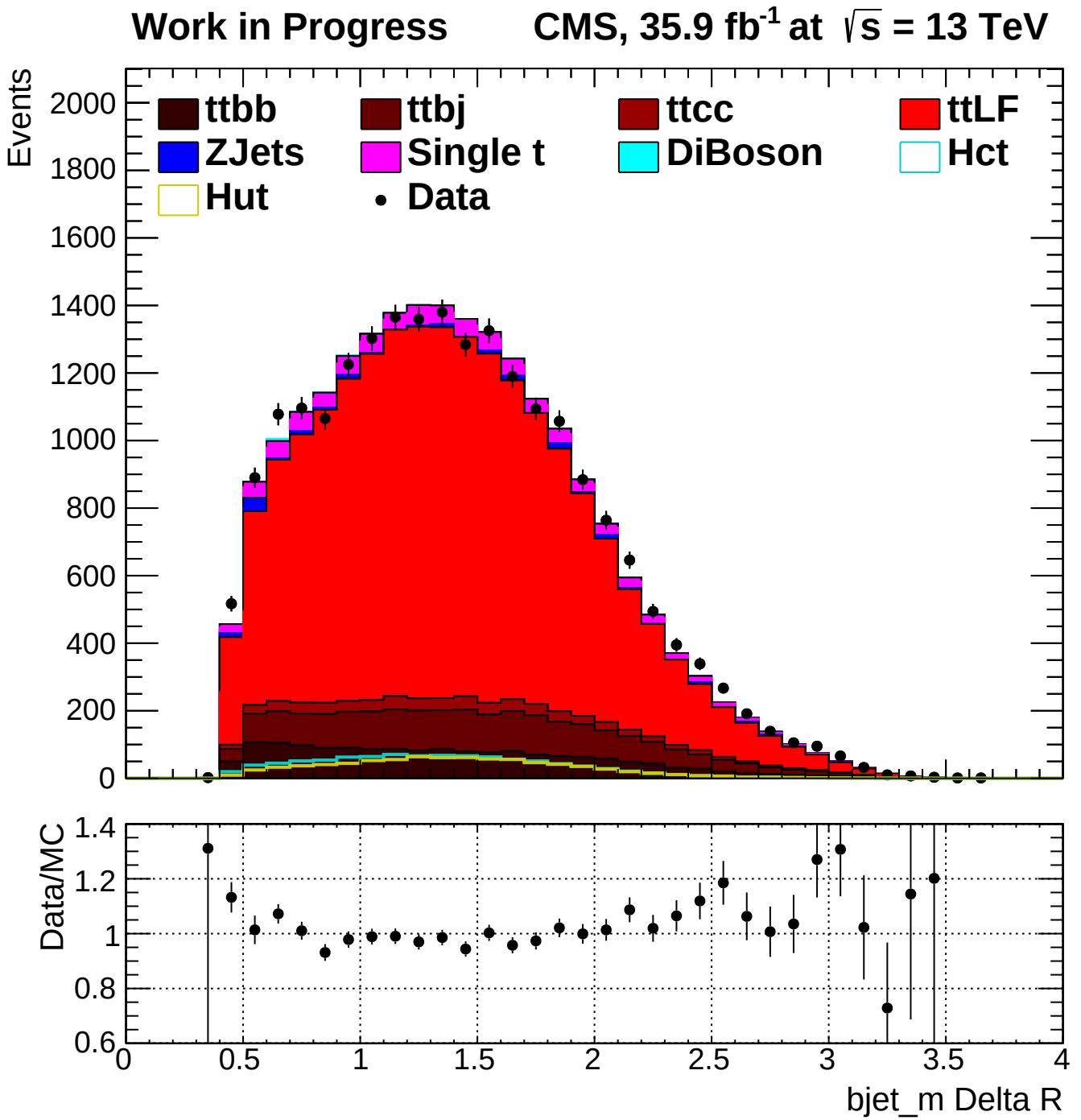

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)

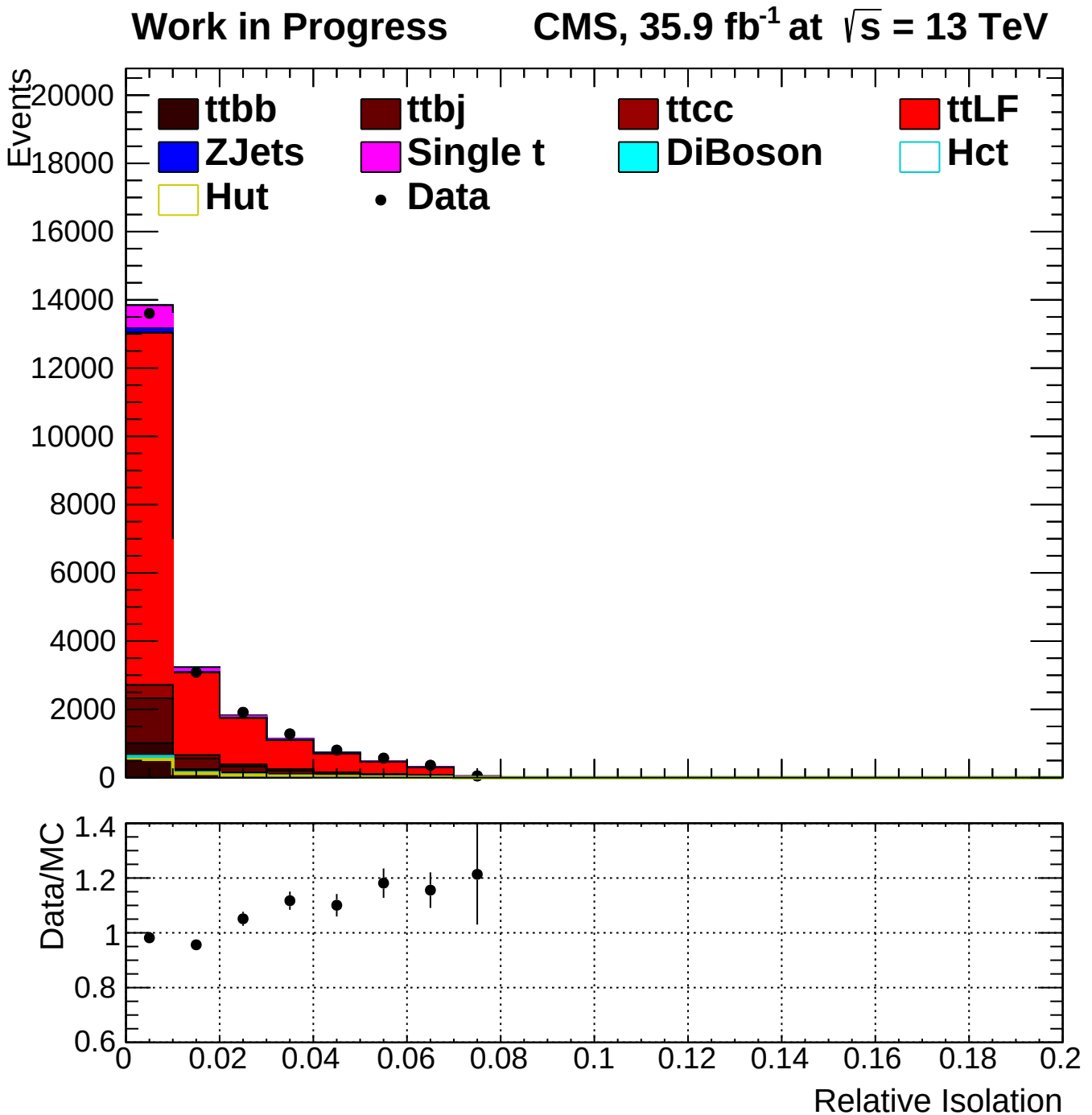

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

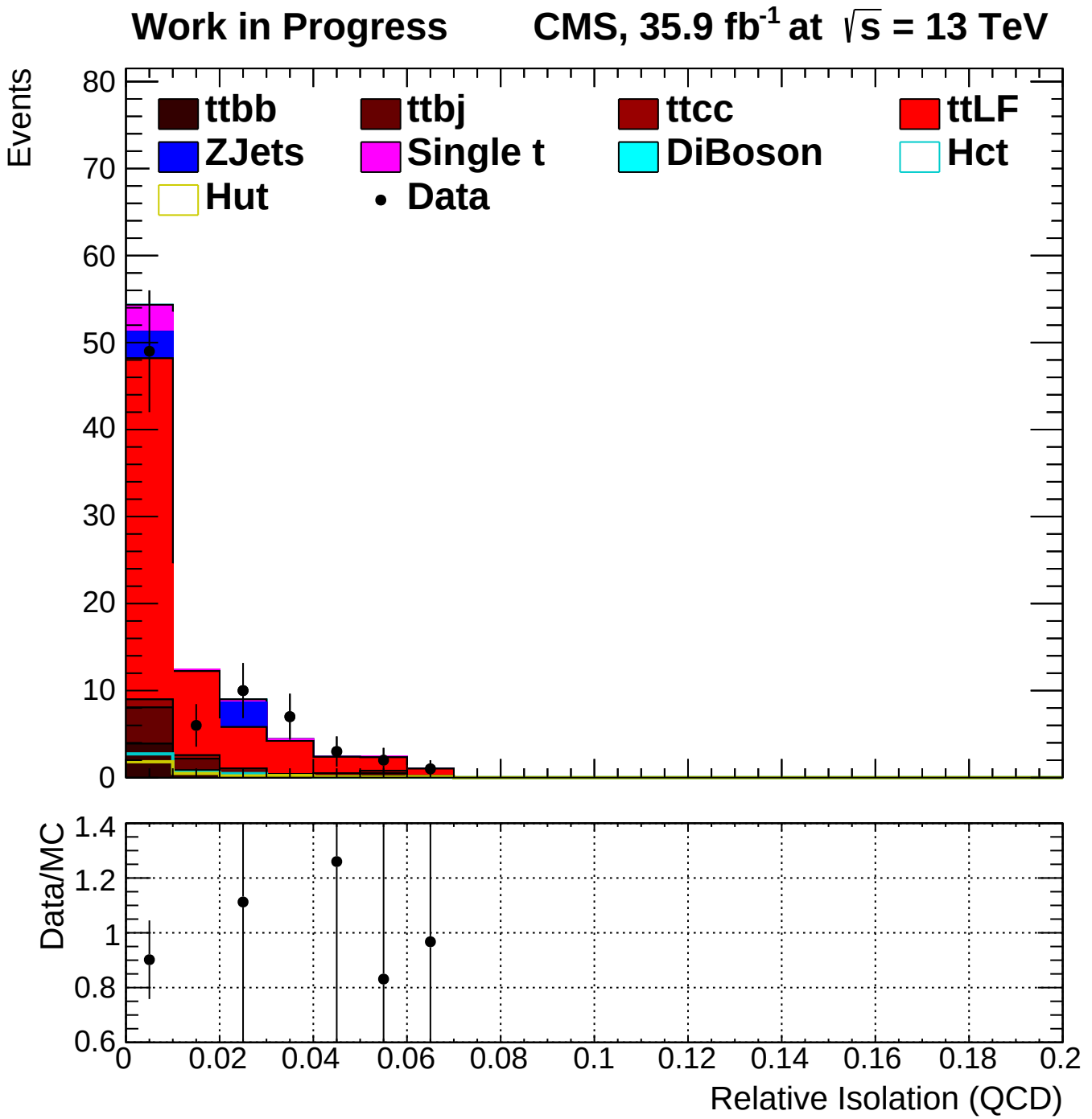

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
700
600
500
400
300
200
100
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

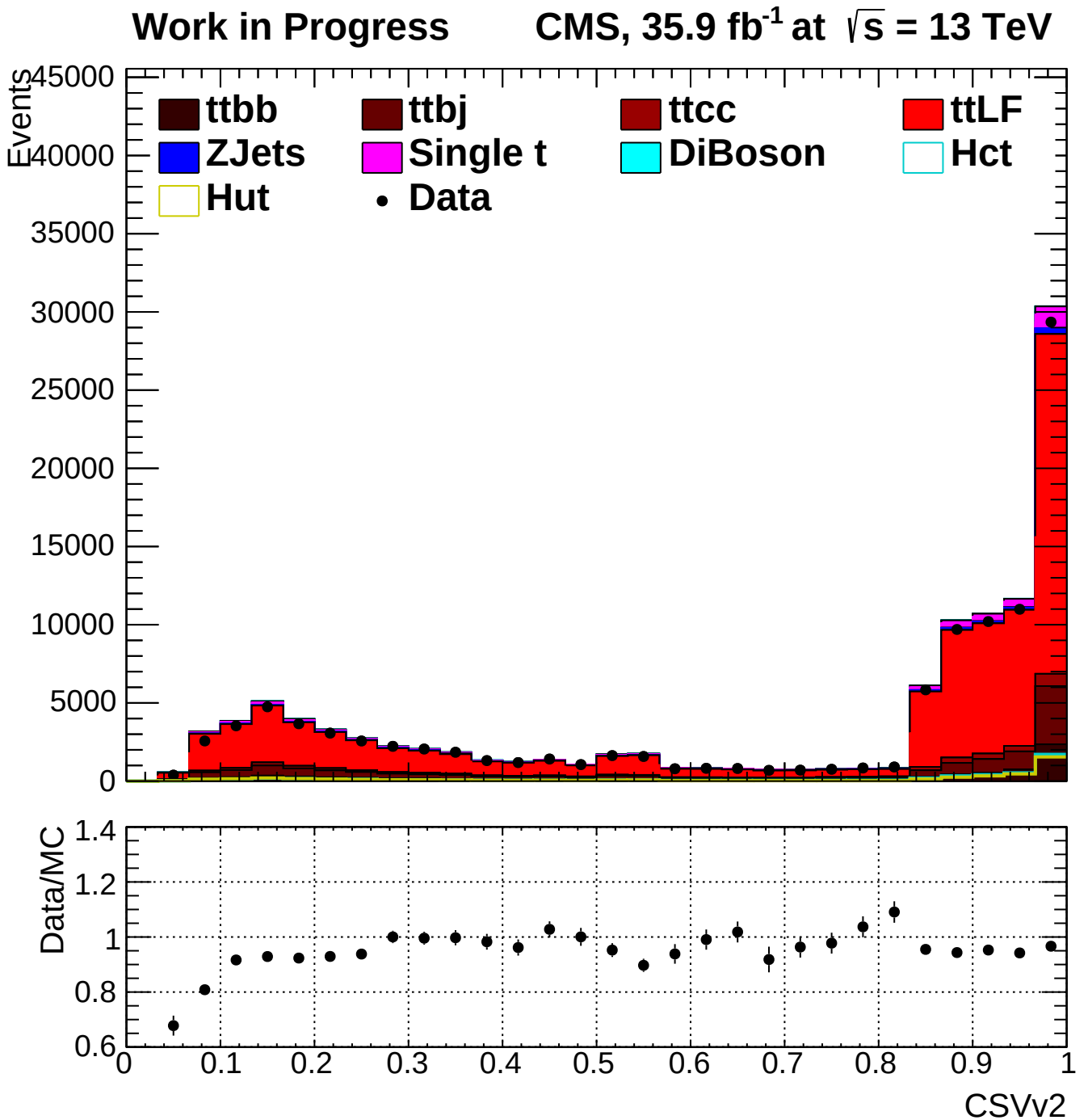

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi

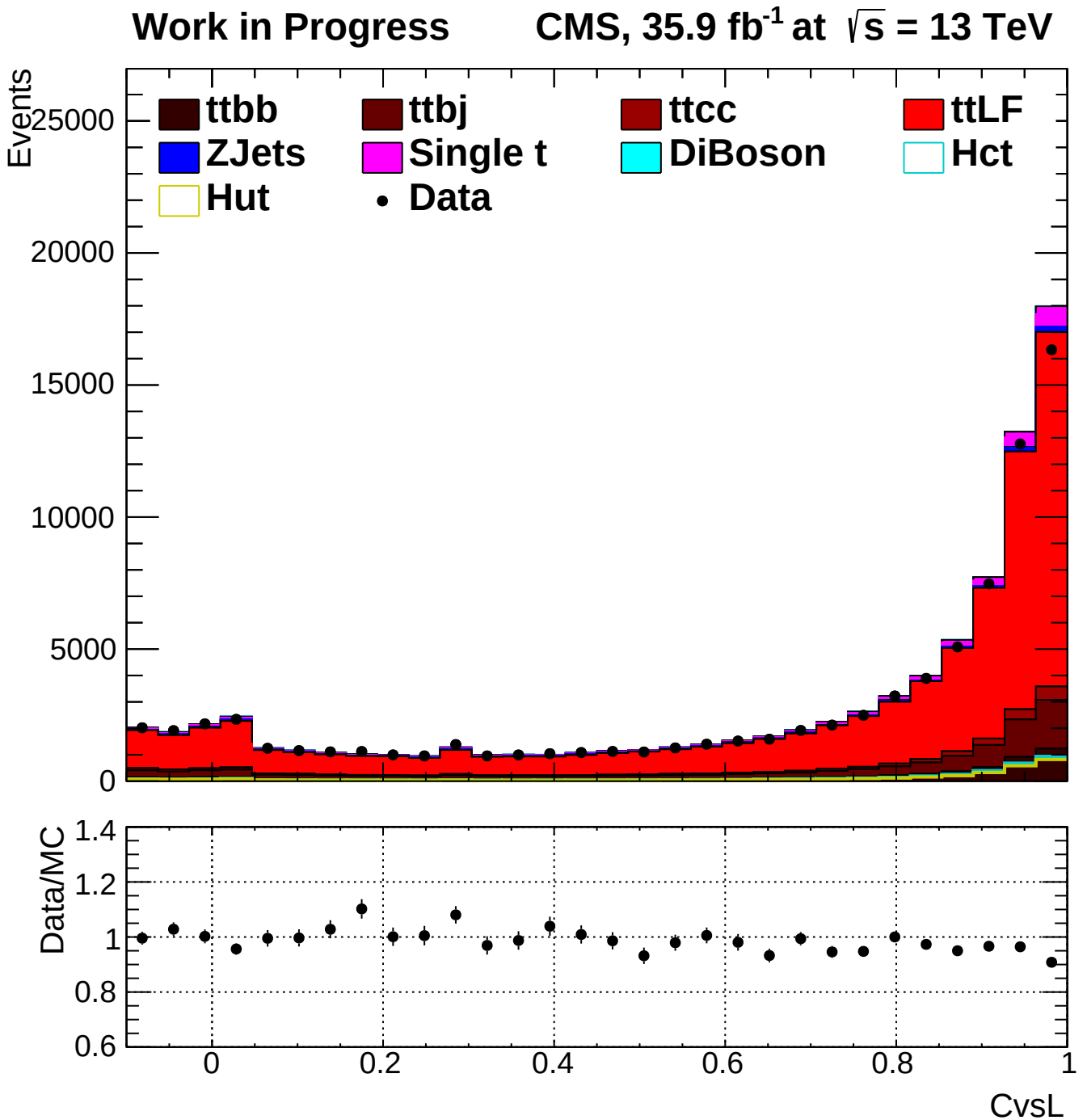

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta

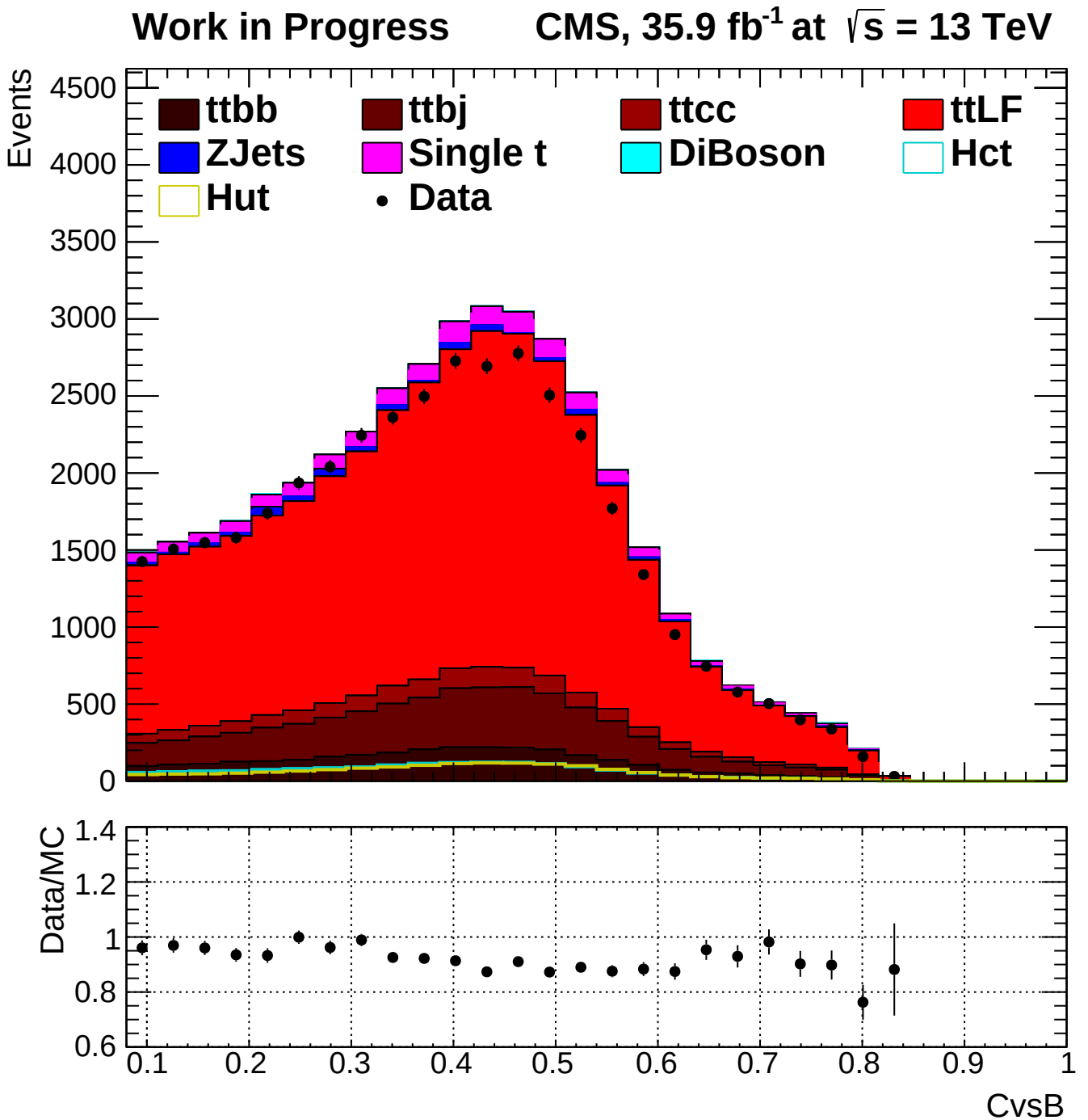

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R

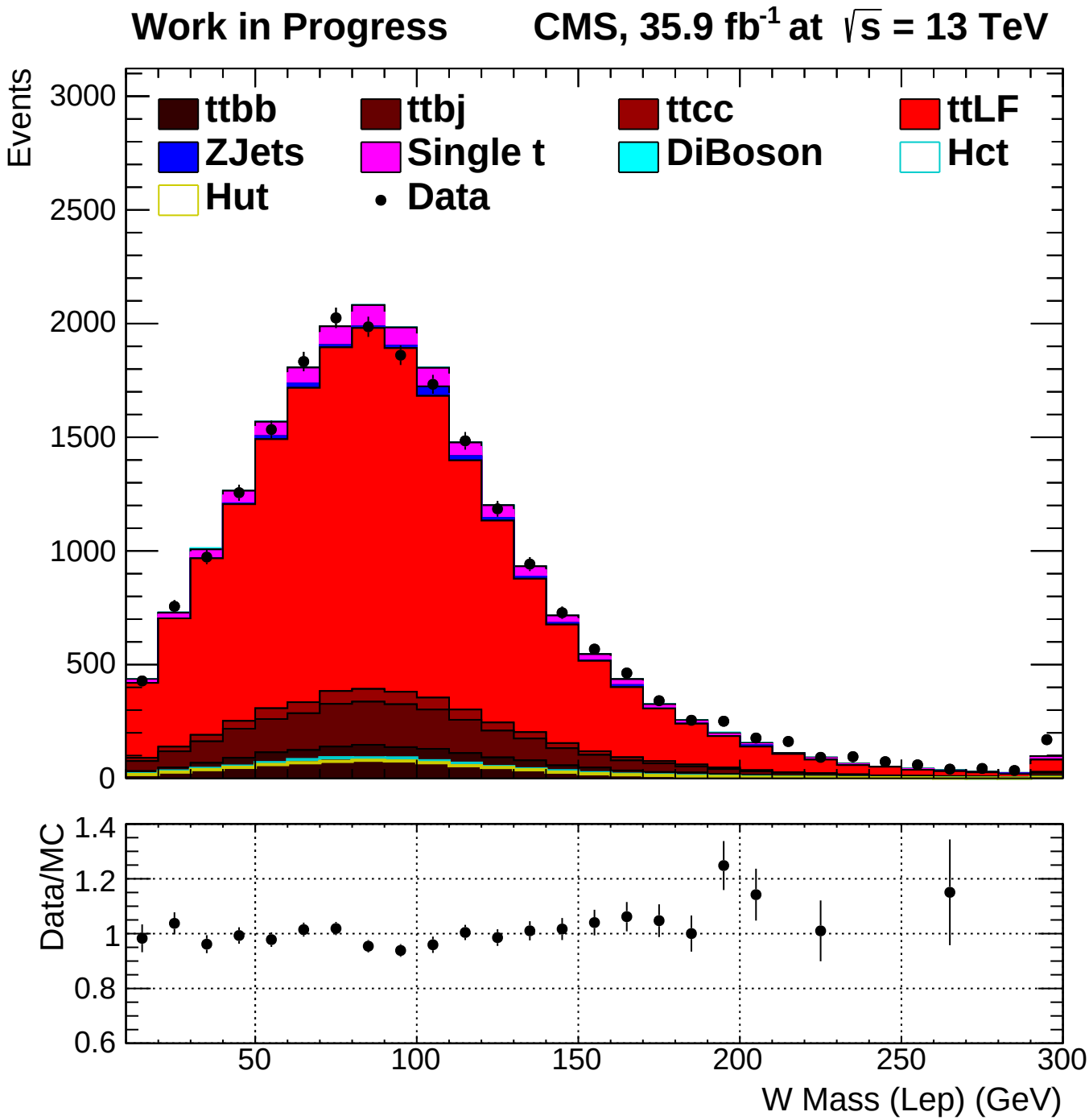

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation

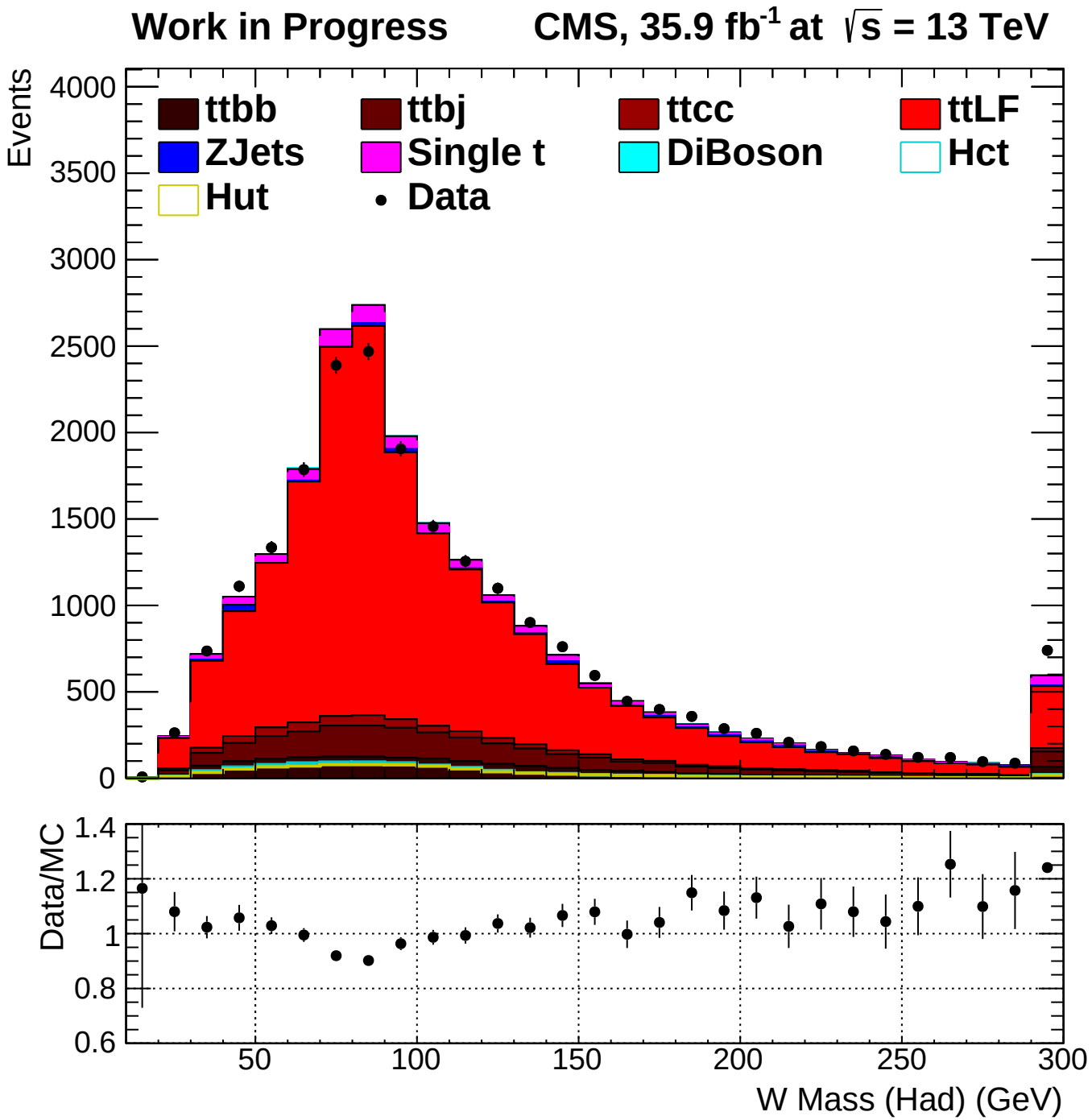

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

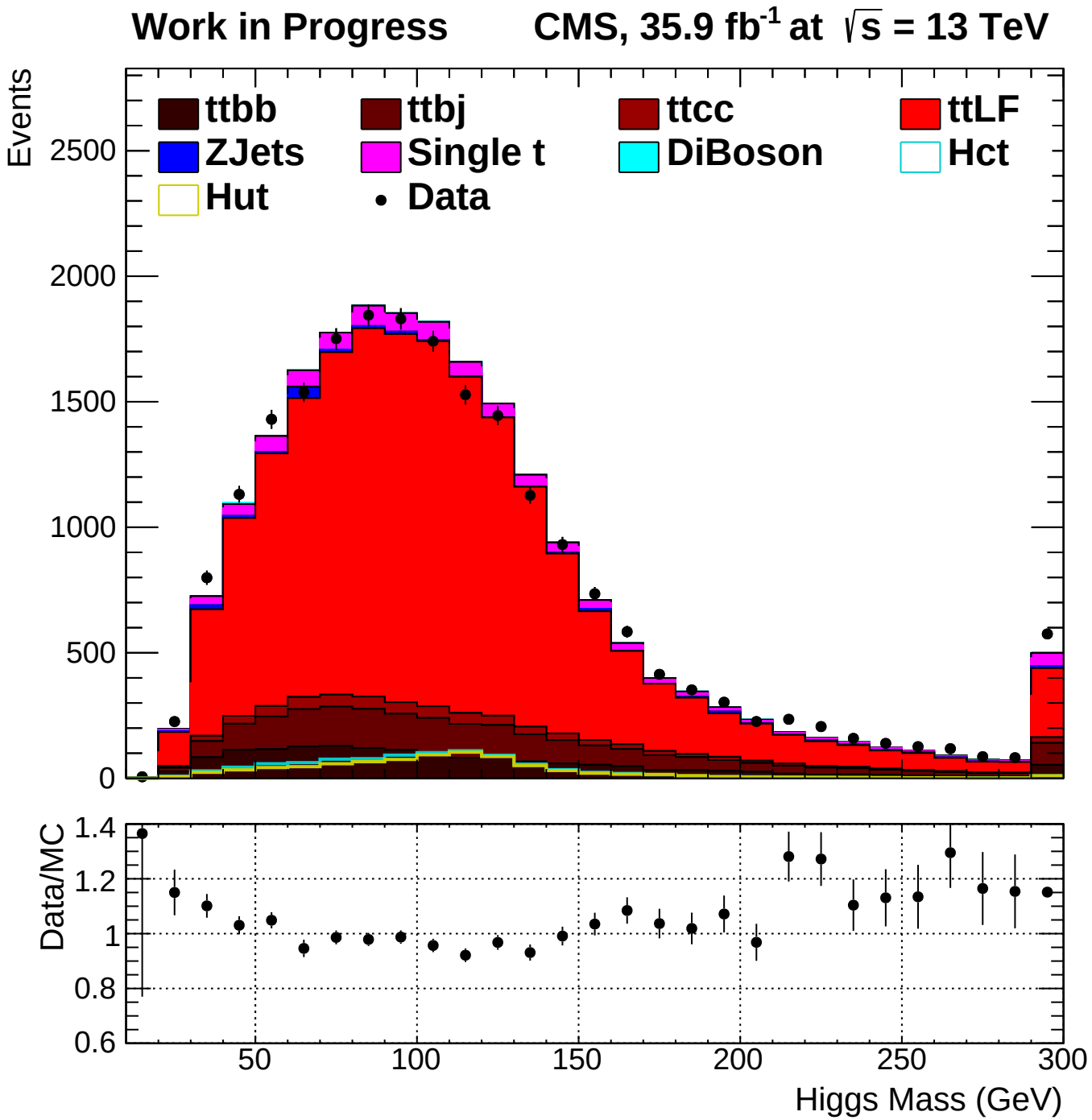

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2

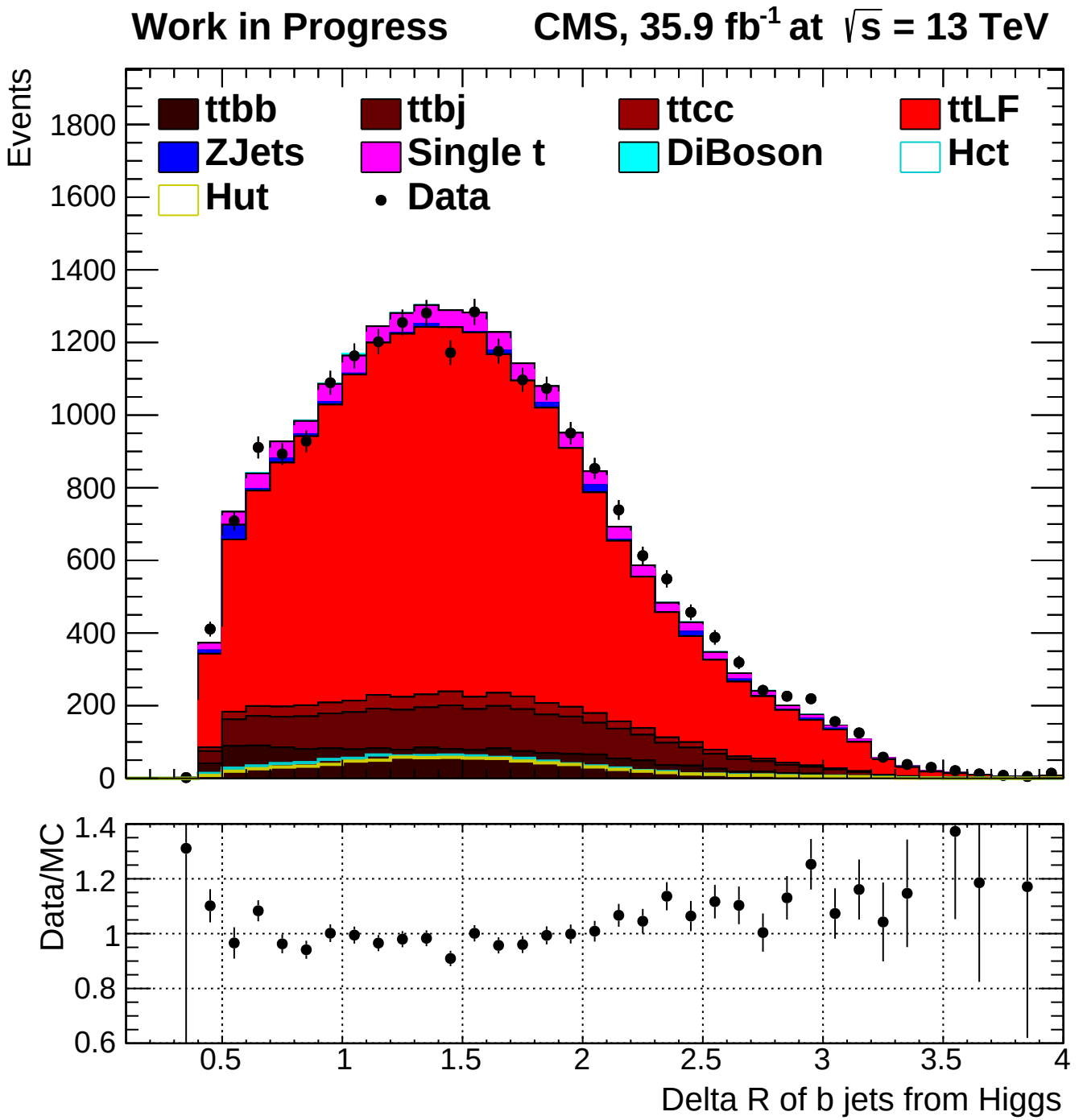

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
Higgs Mass (GeV)


Work in Progress
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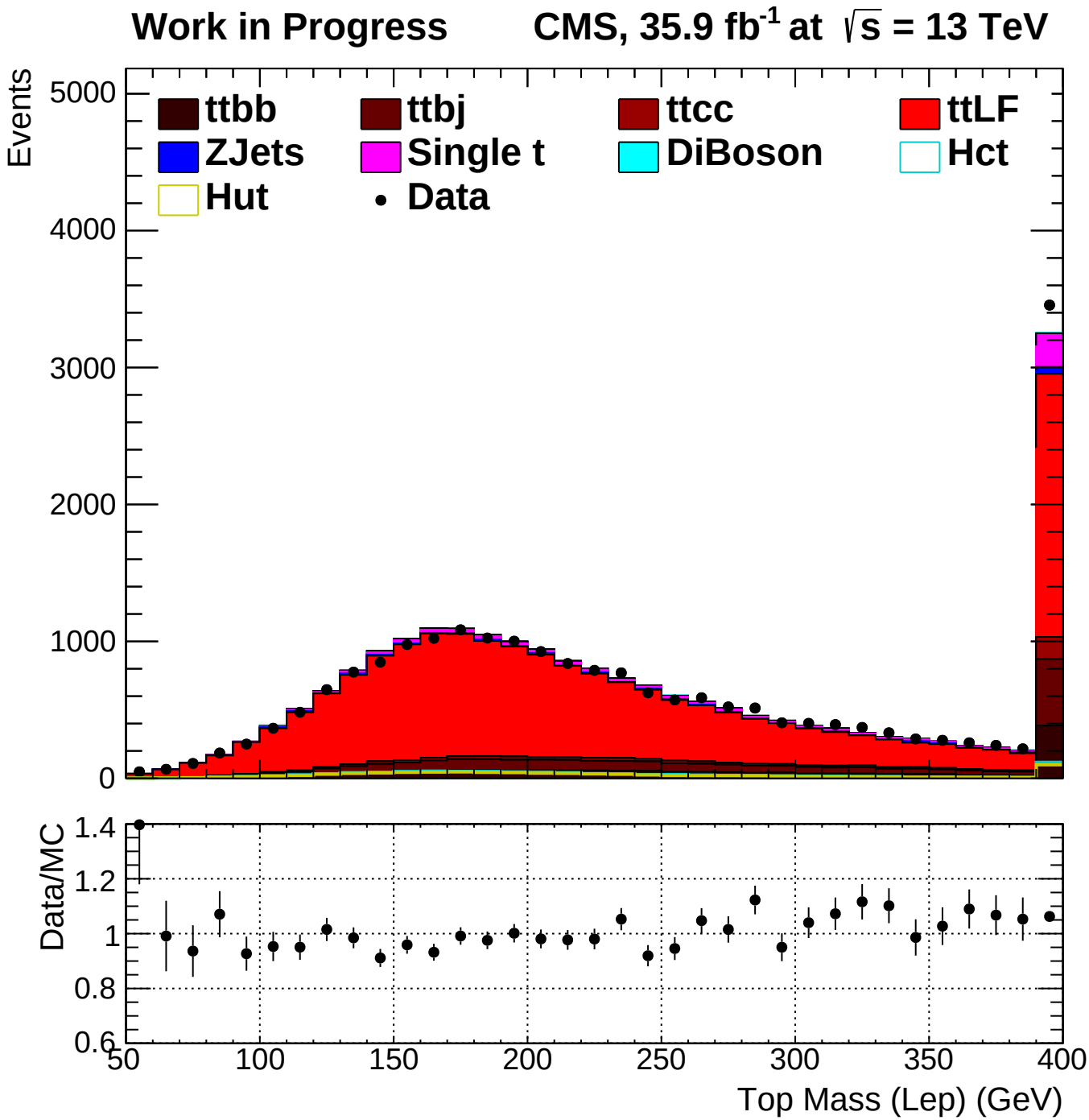
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs


Work in Progress
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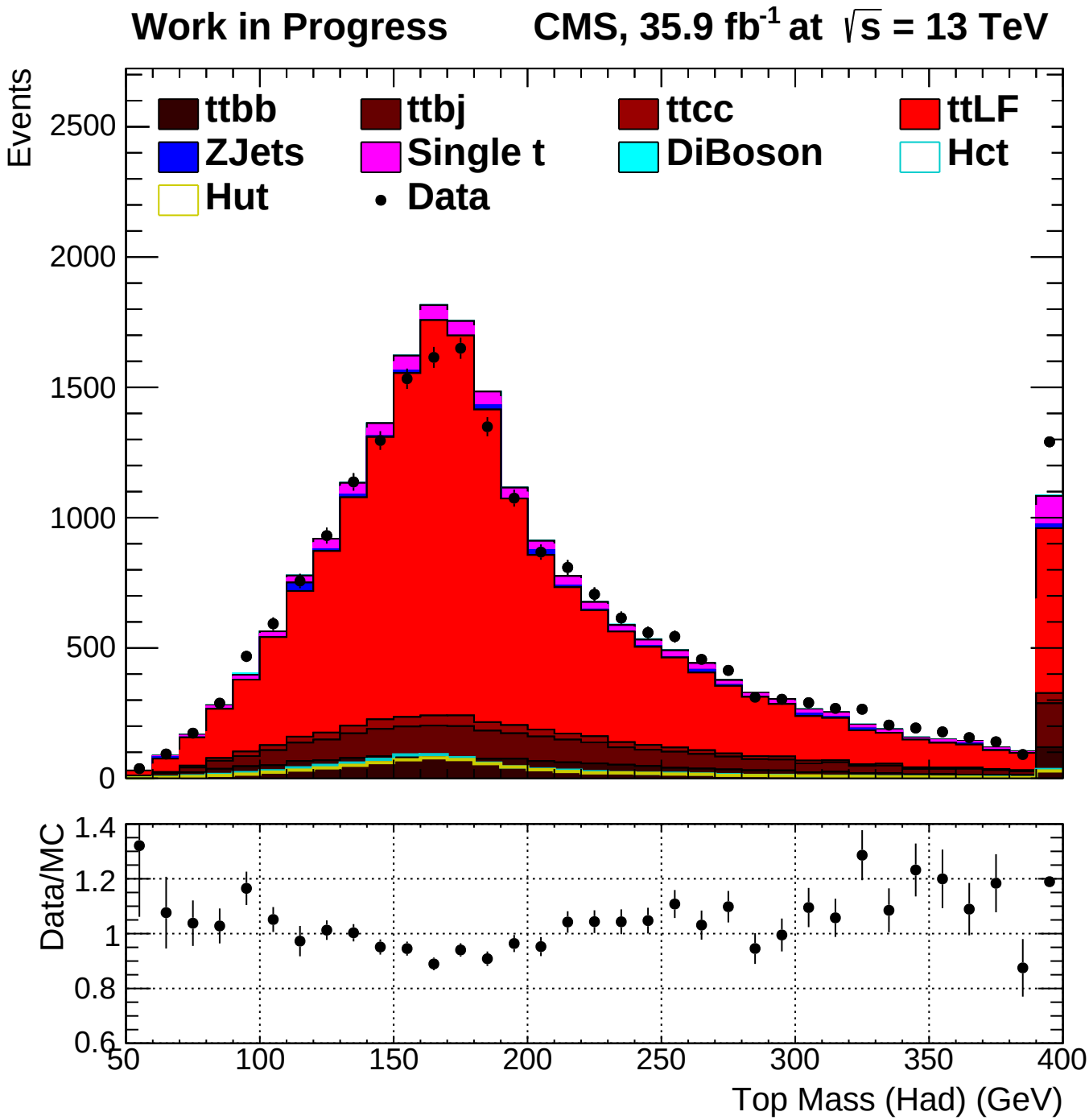
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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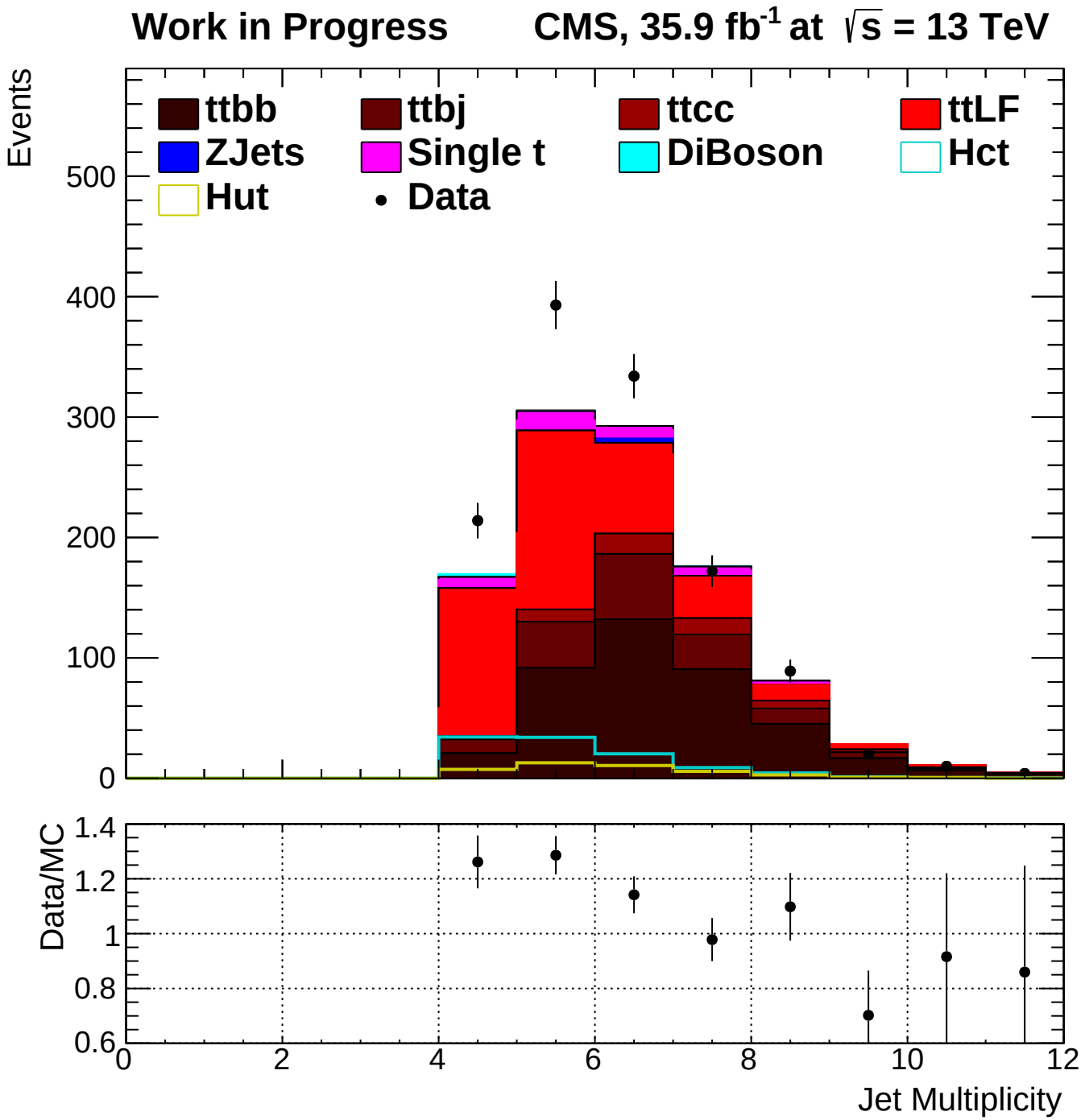
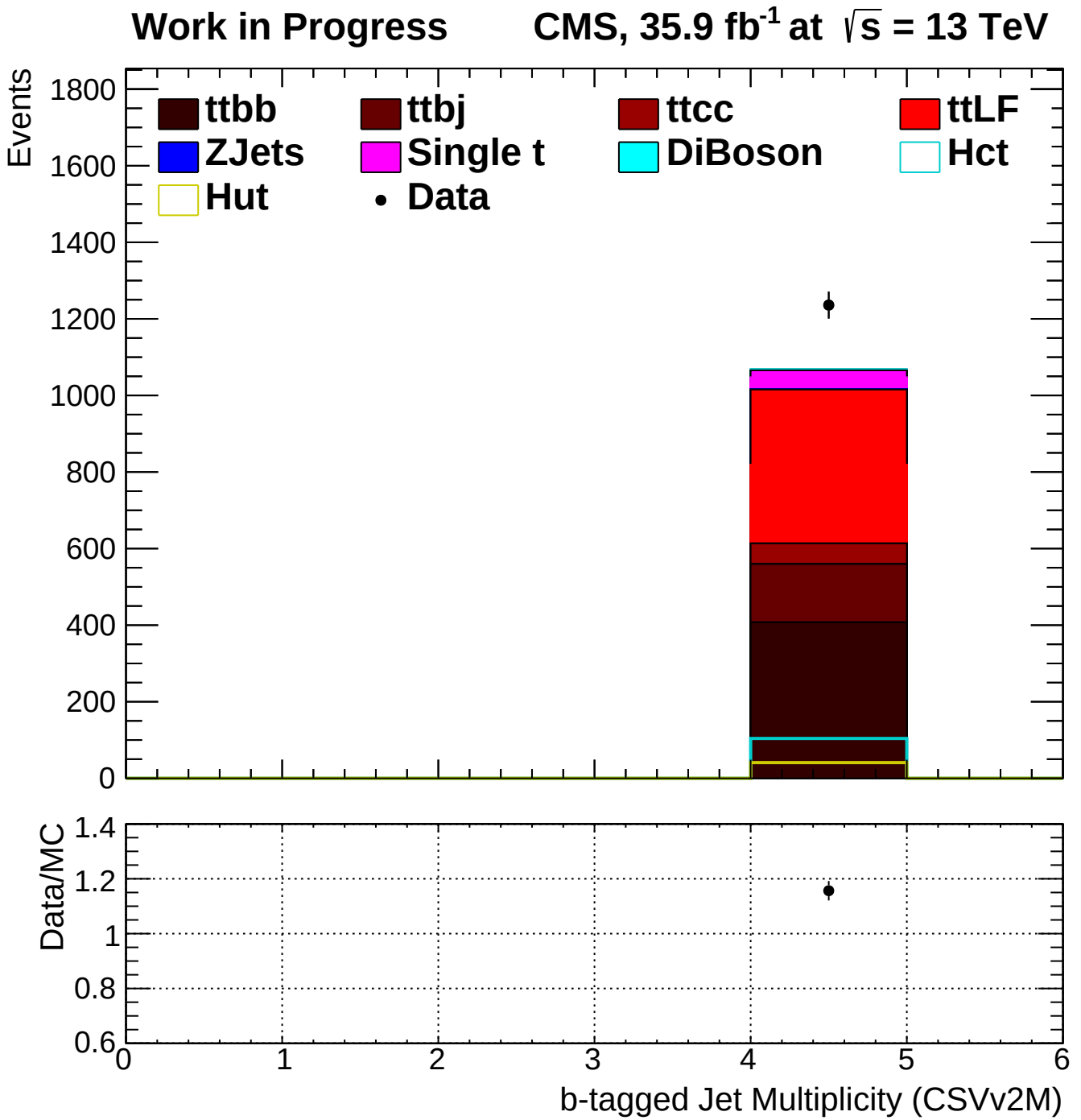
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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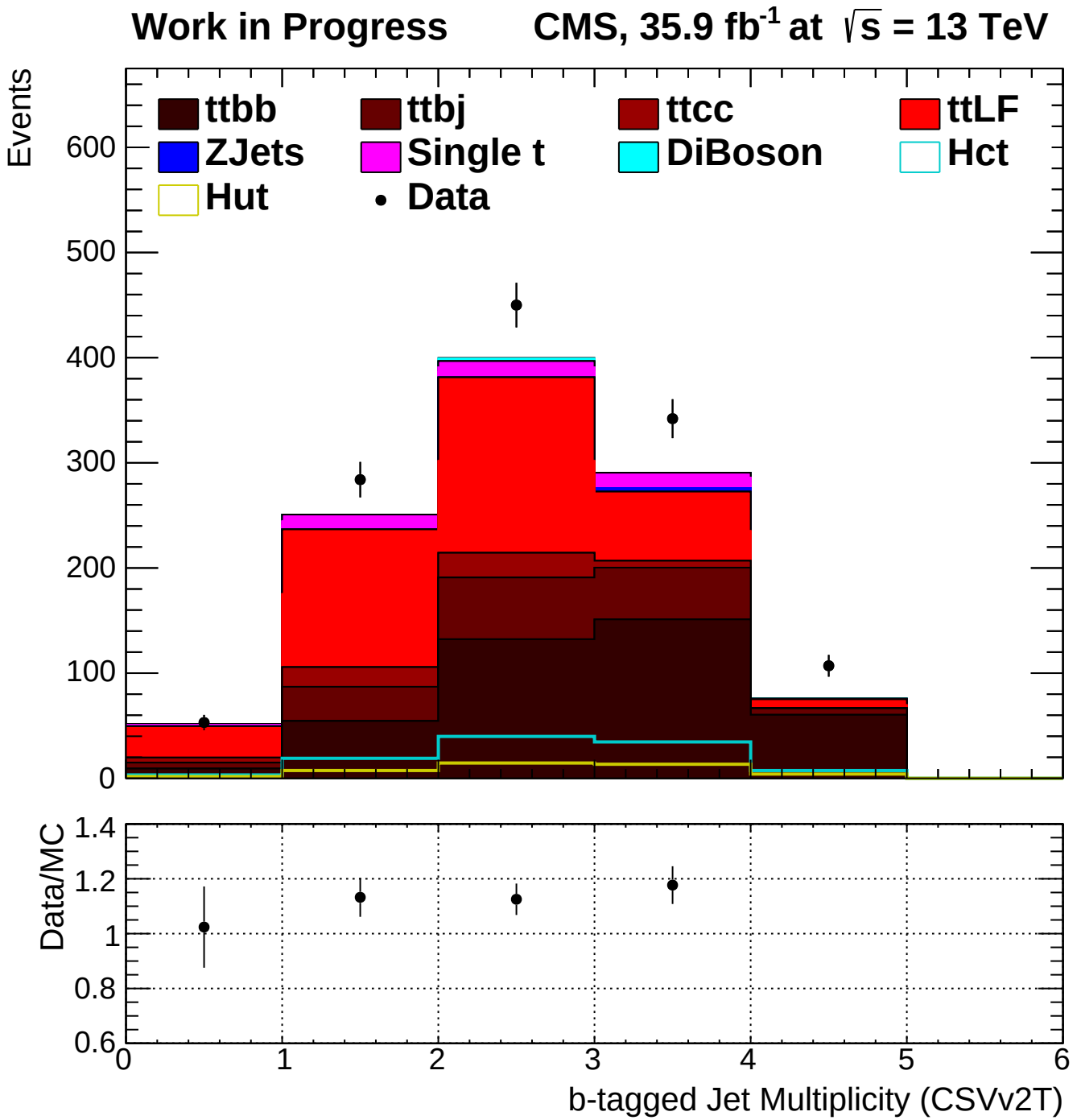
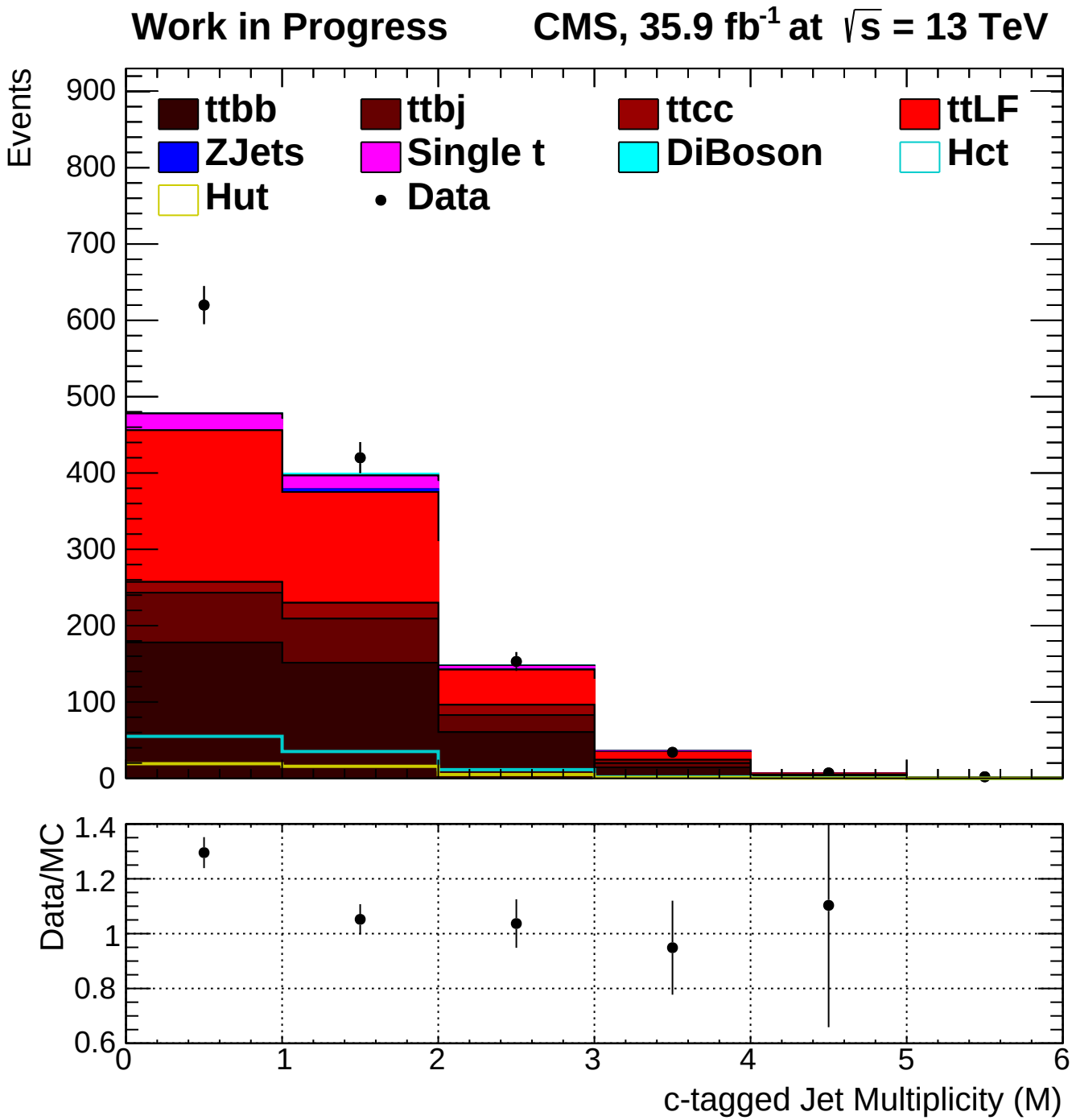
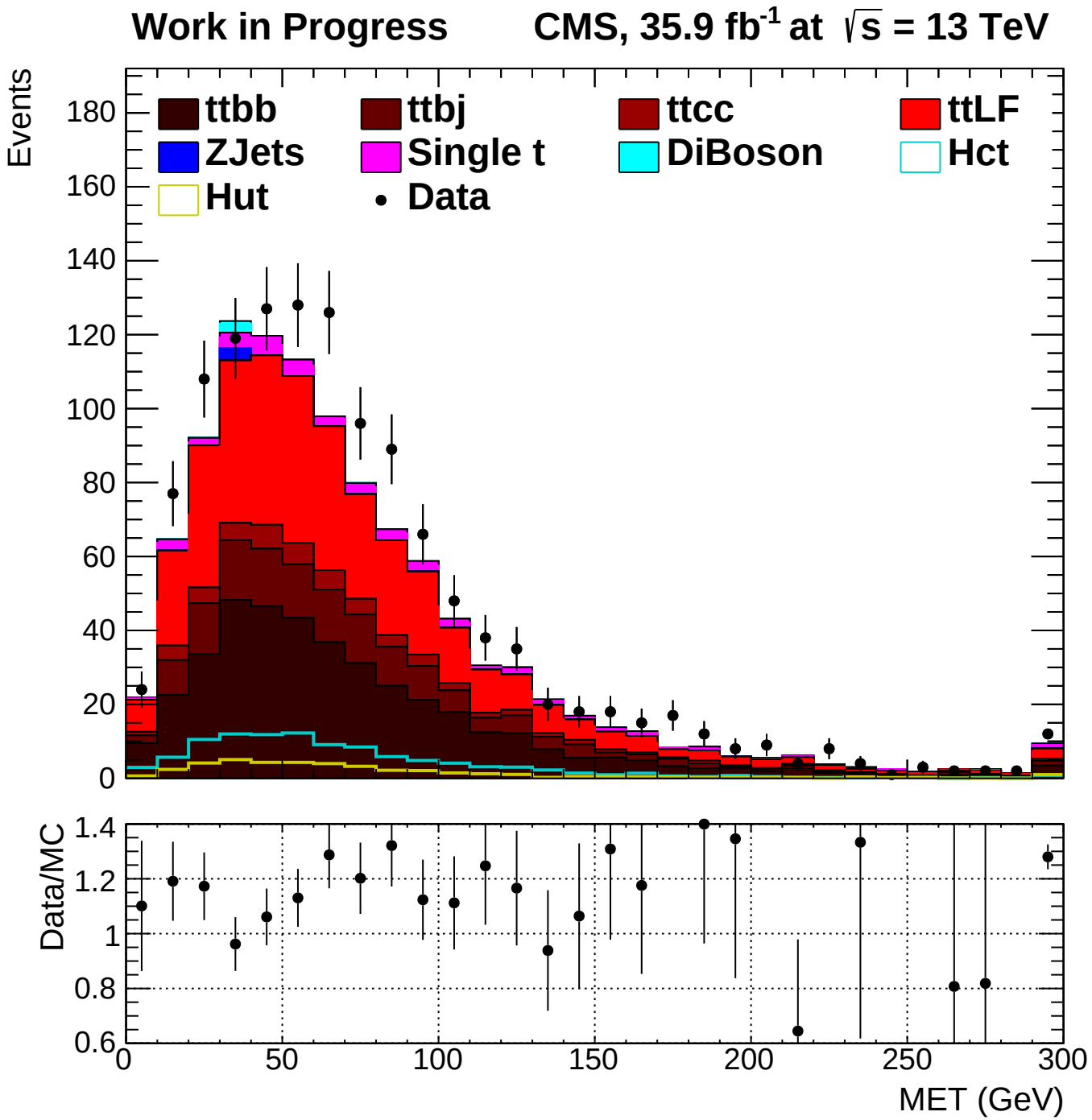
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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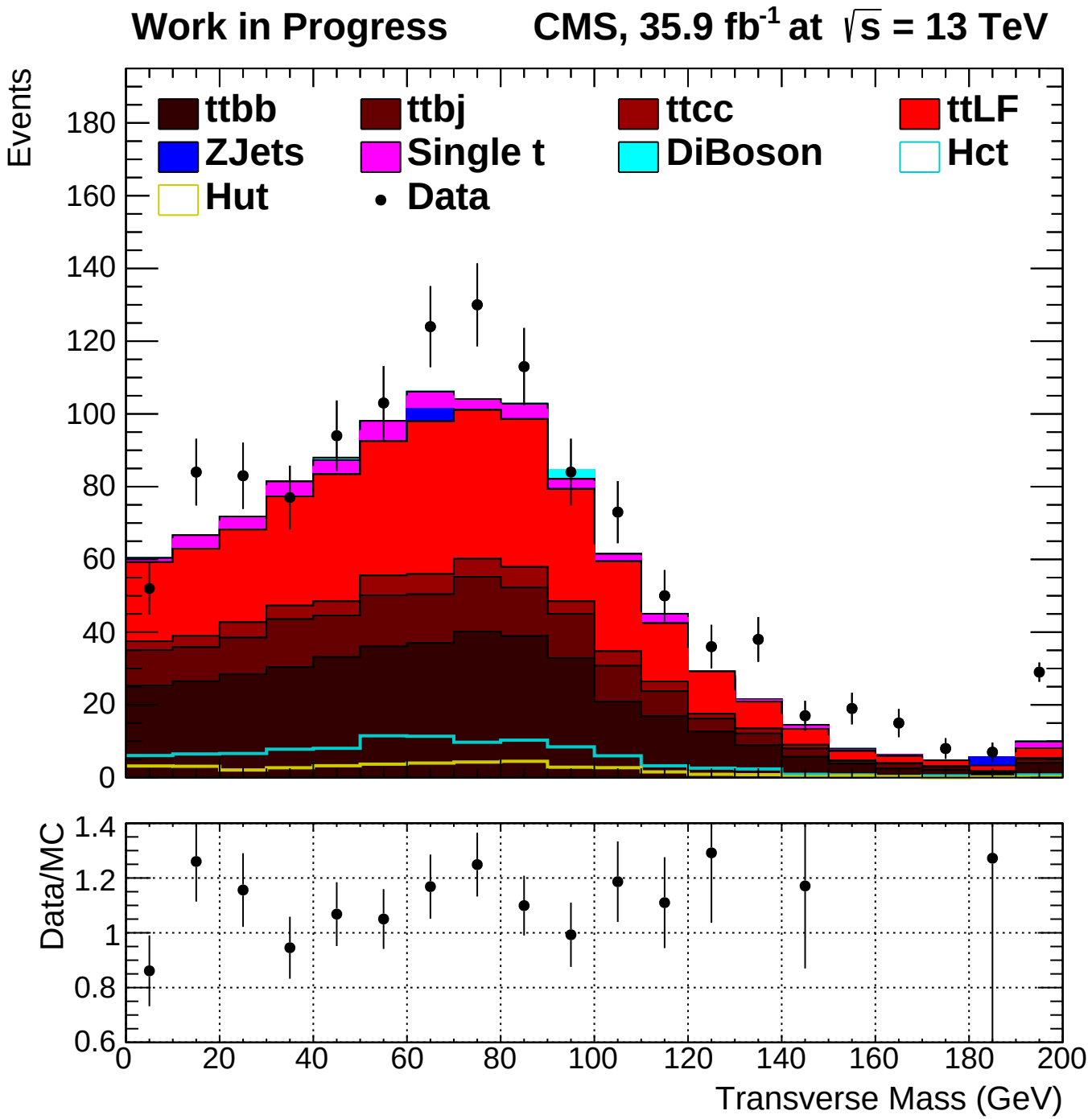
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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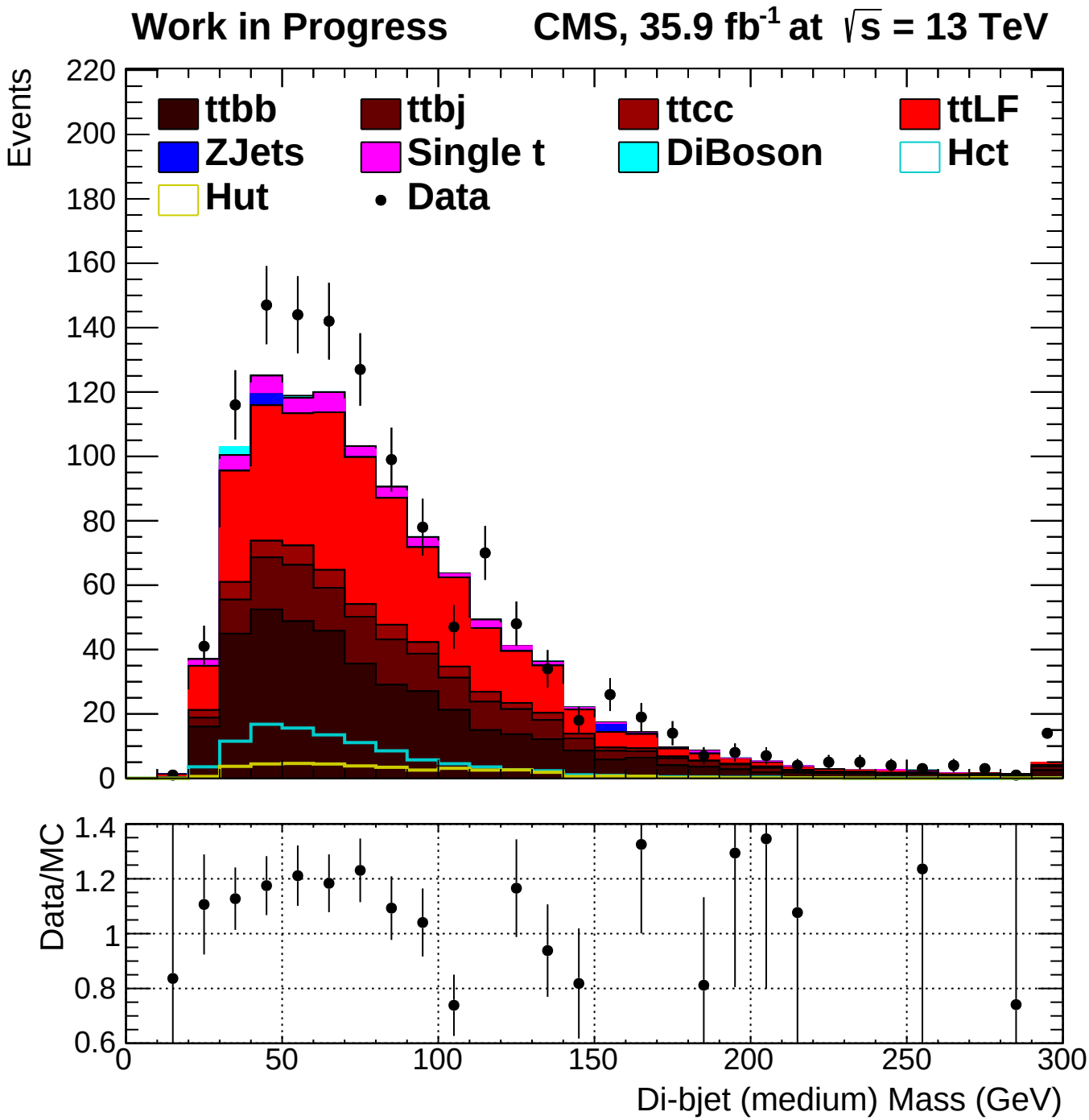
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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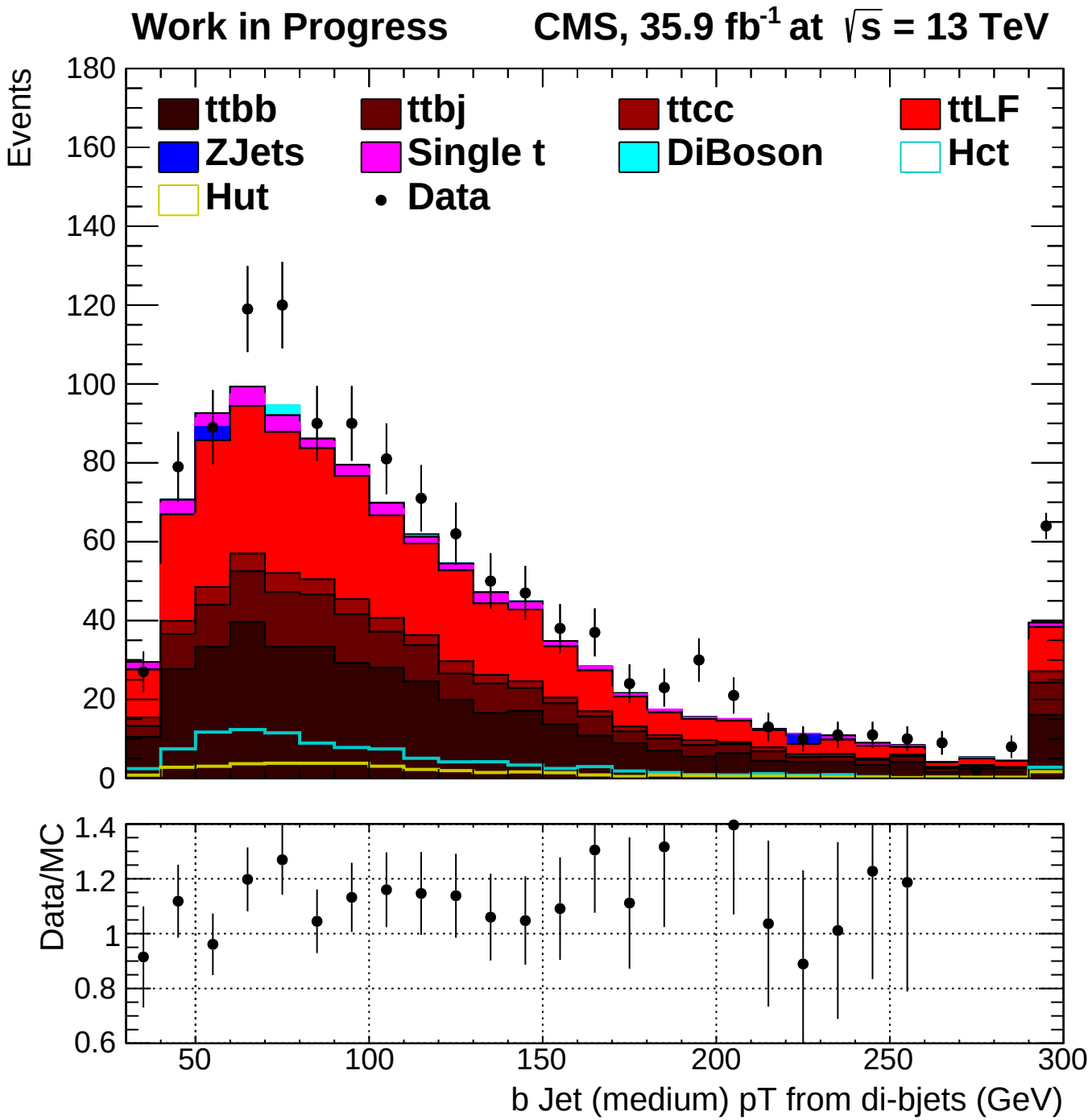
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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ttcc
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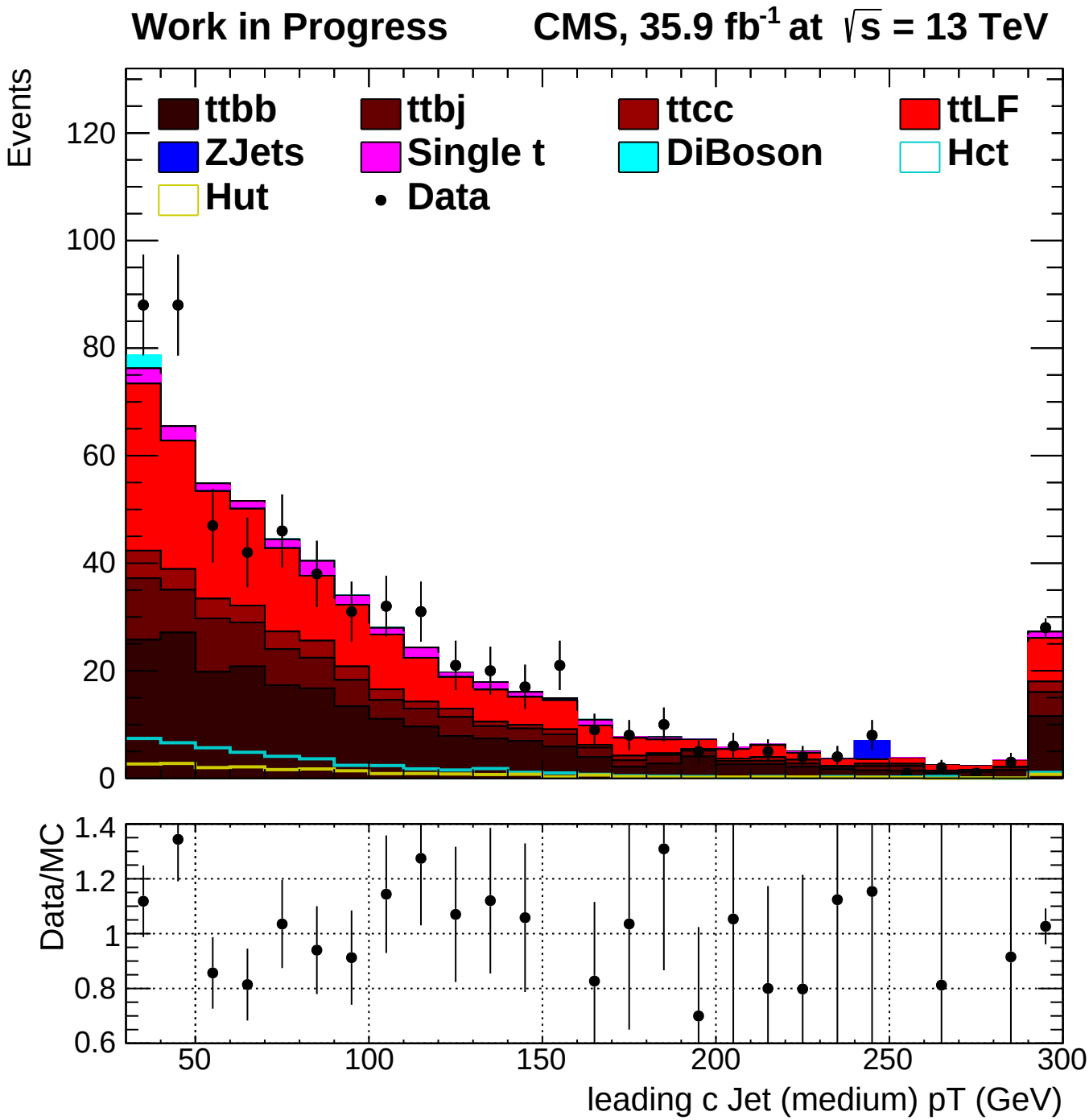
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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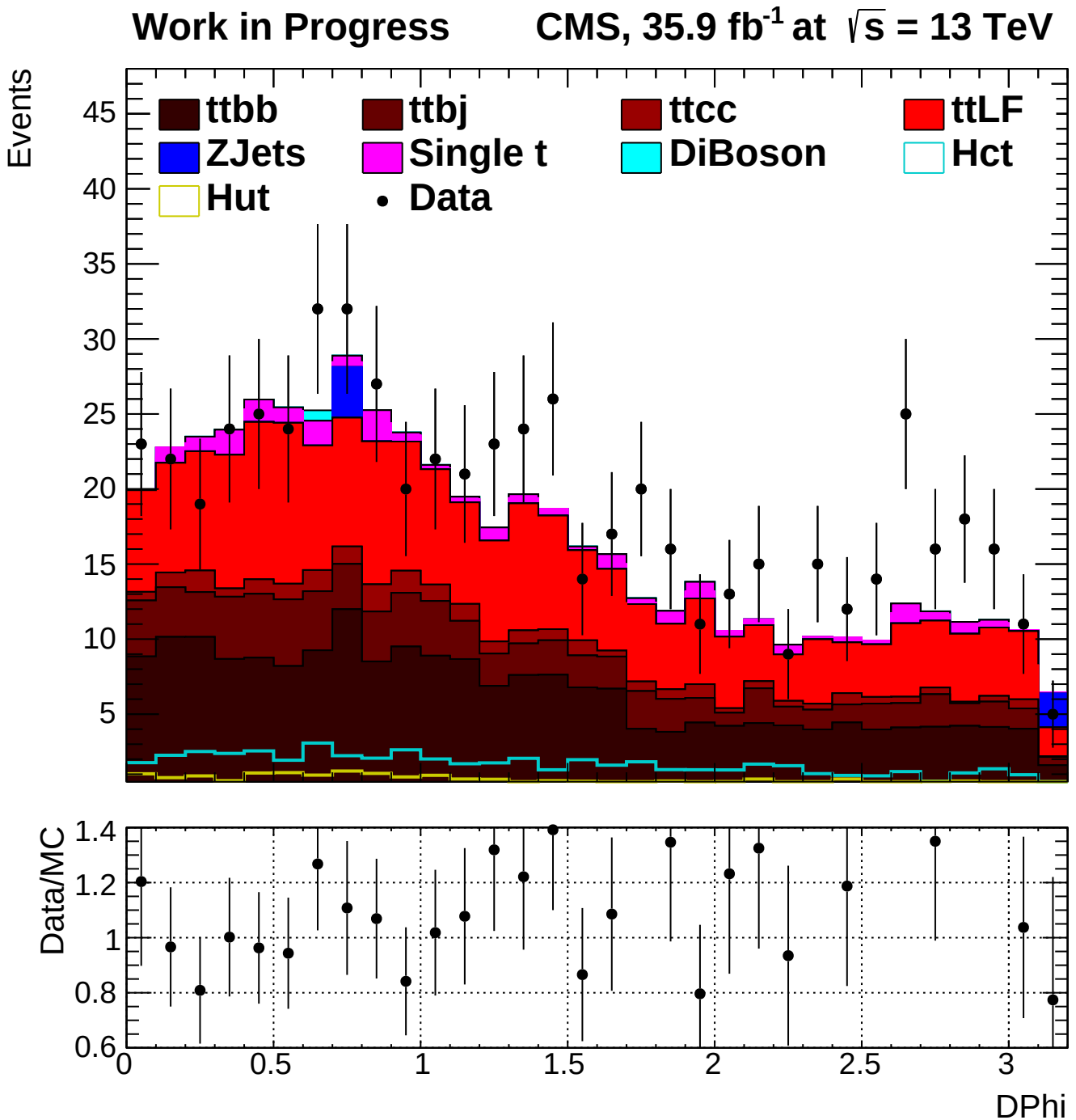
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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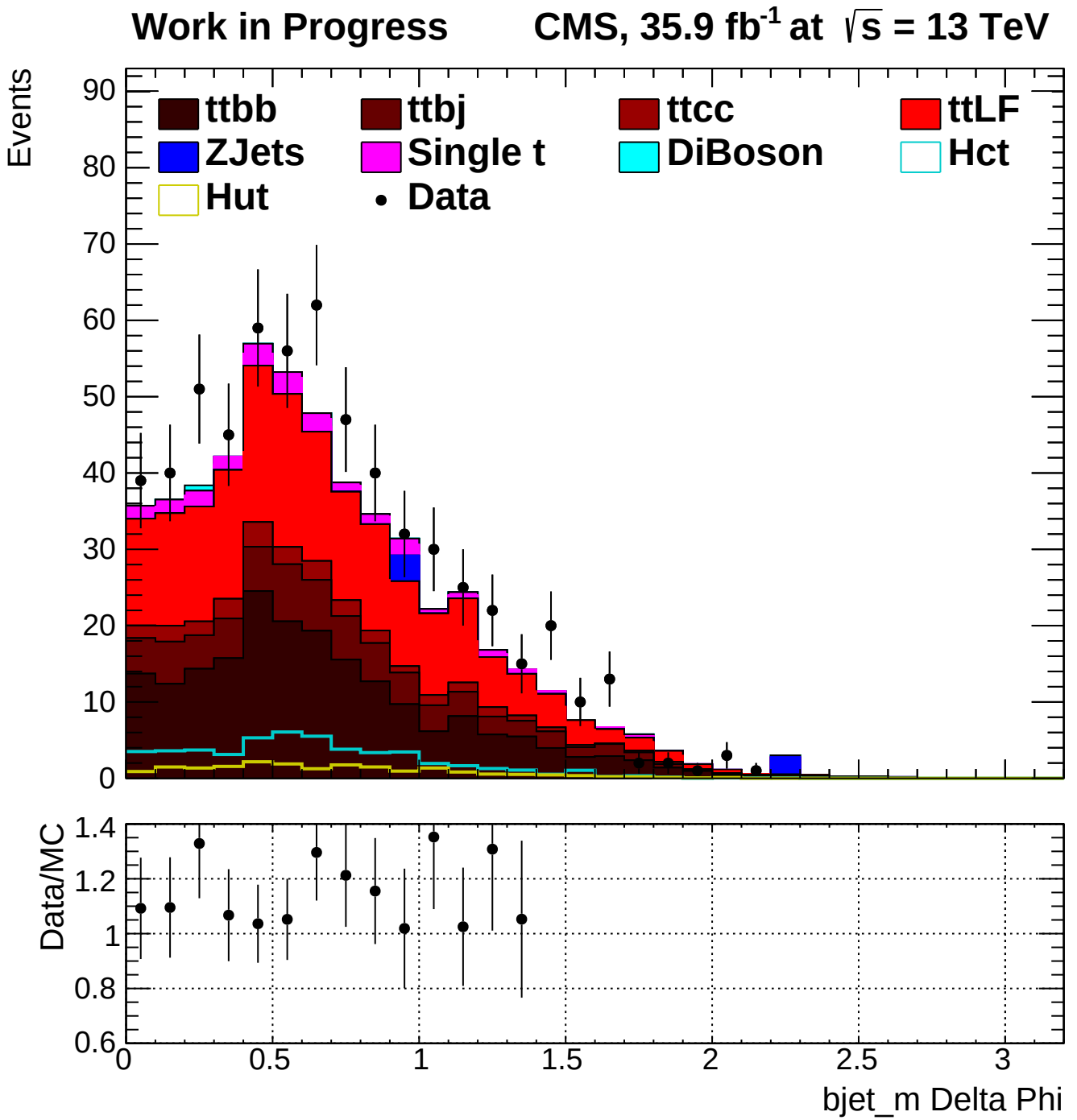
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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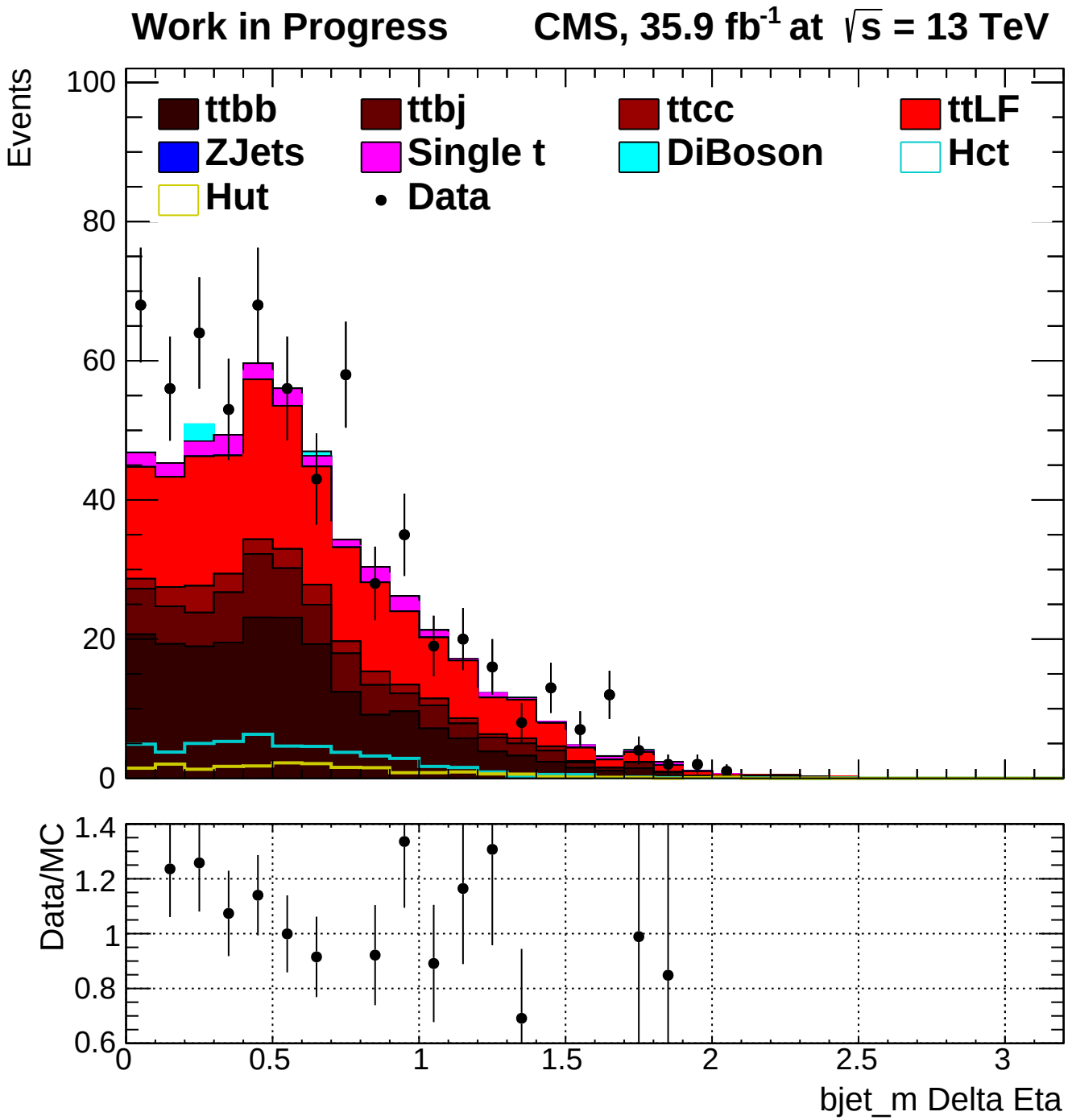
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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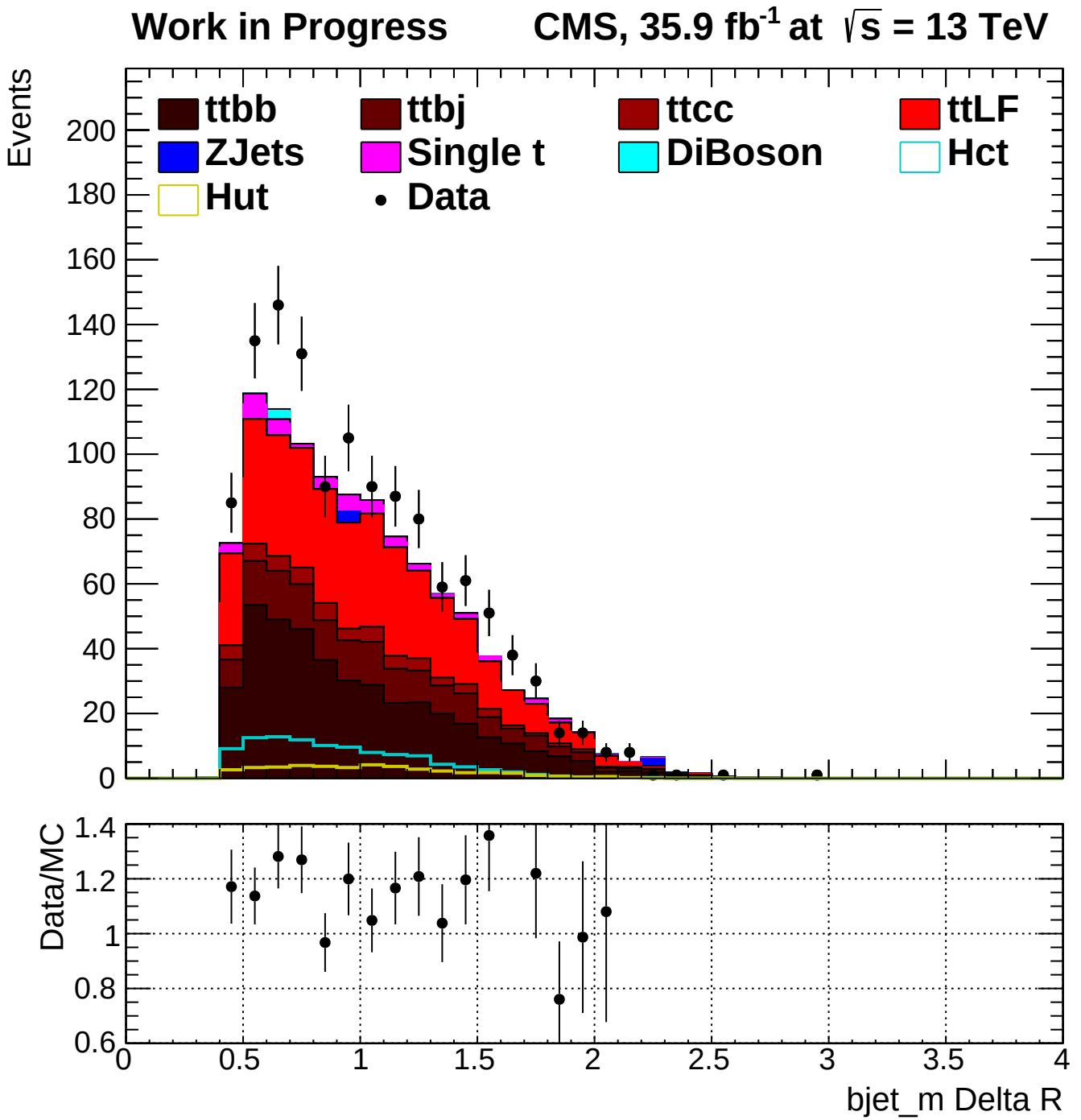
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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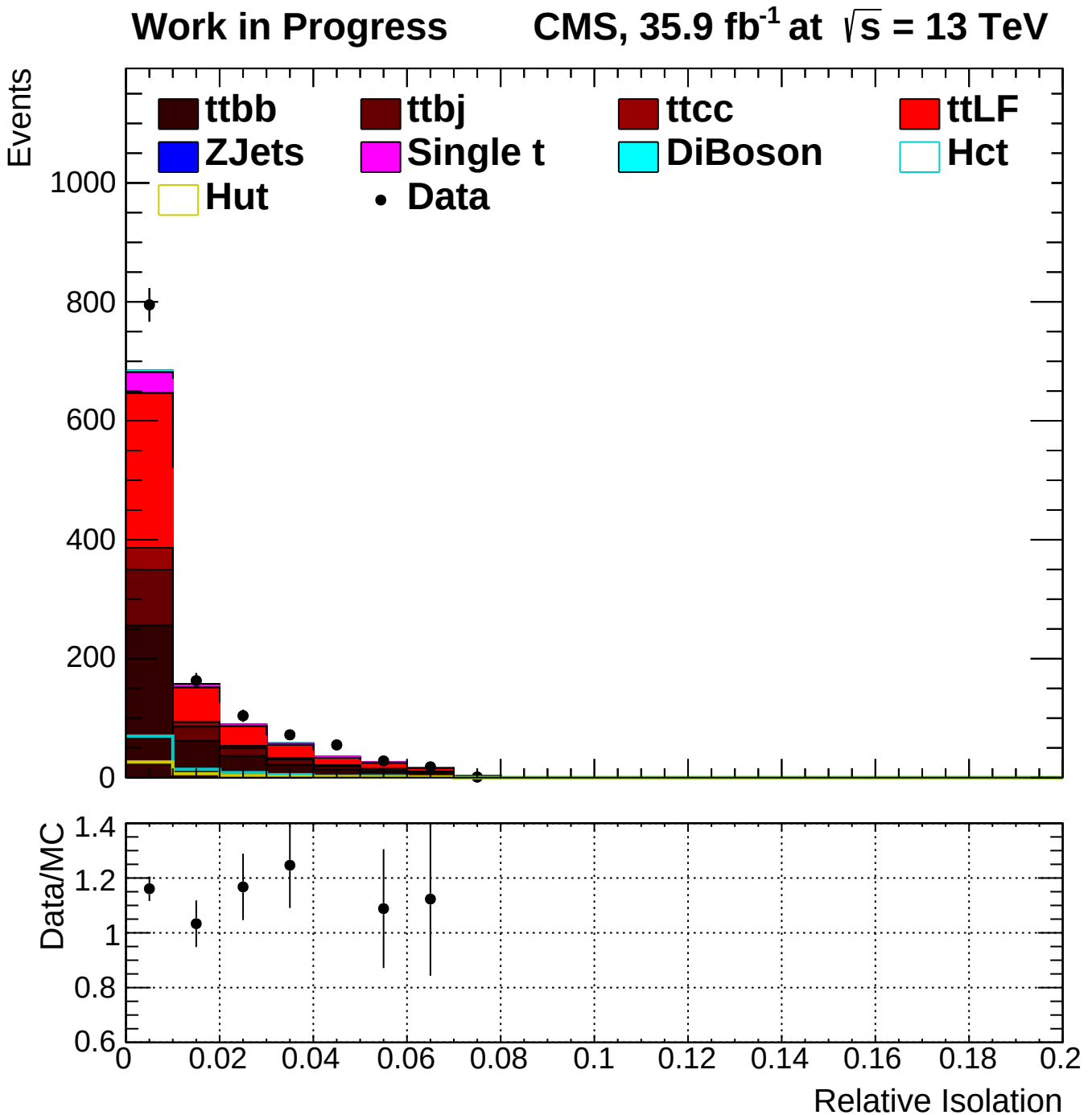
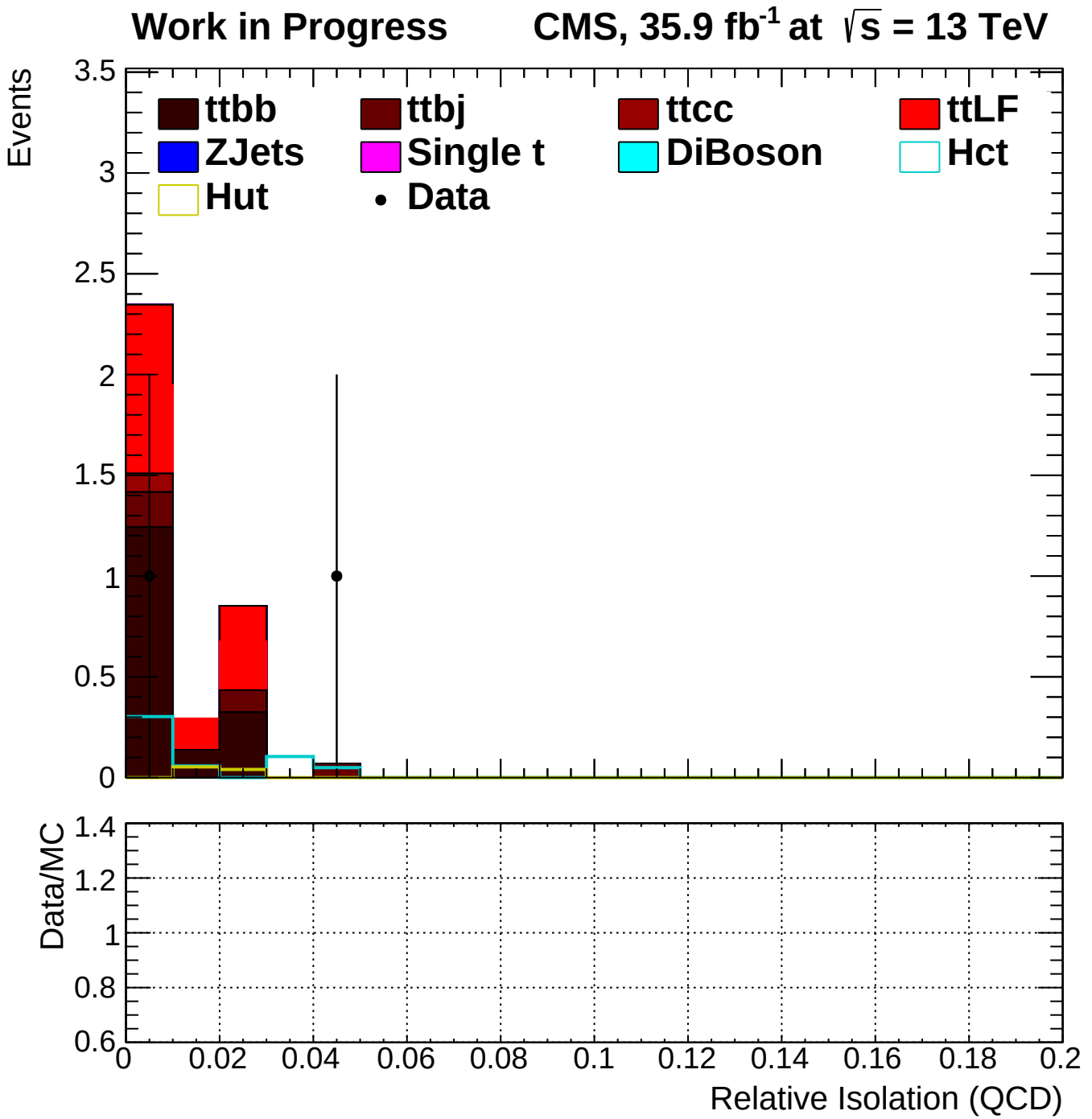
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1000
800
600
400
200
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
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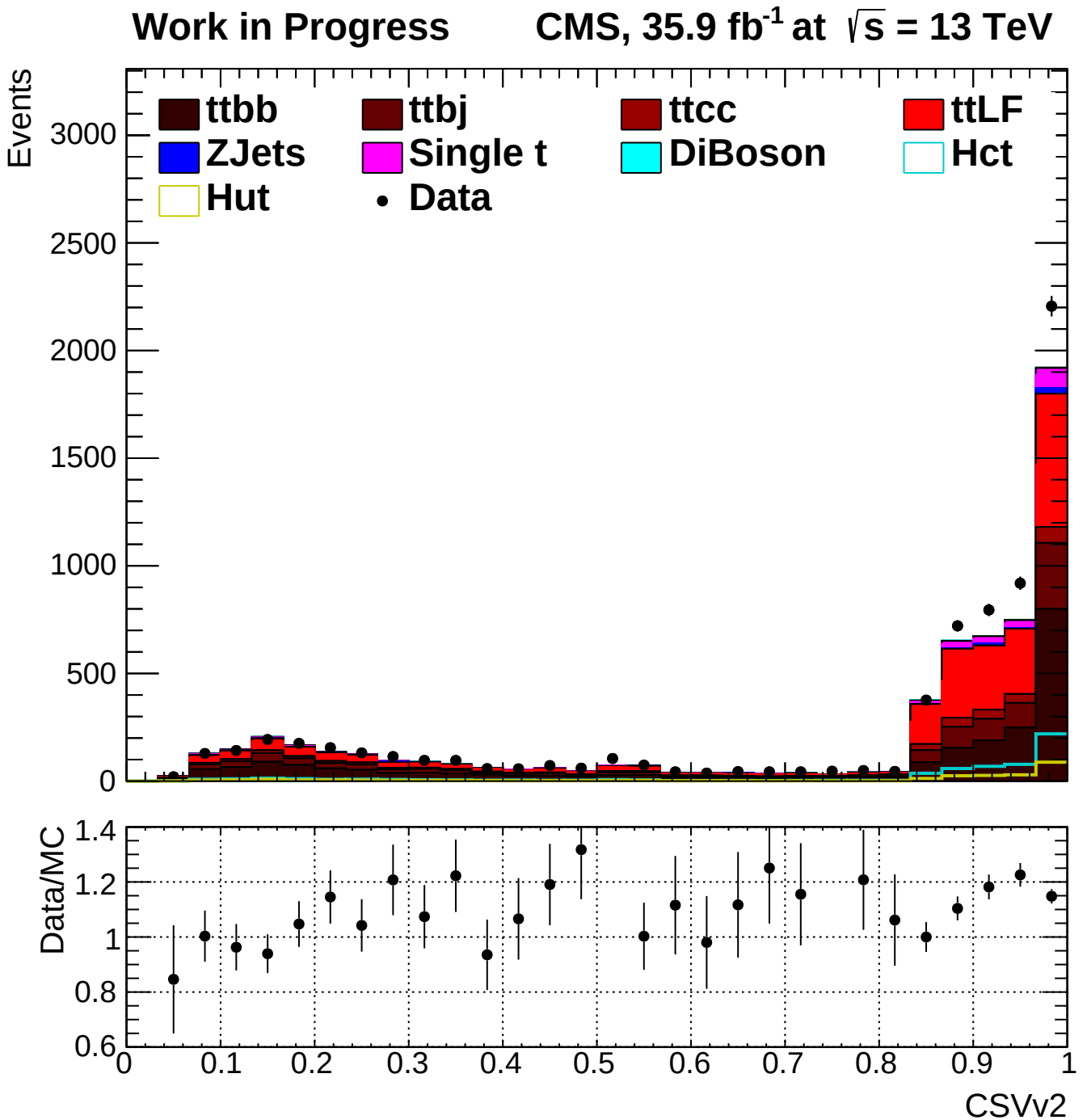
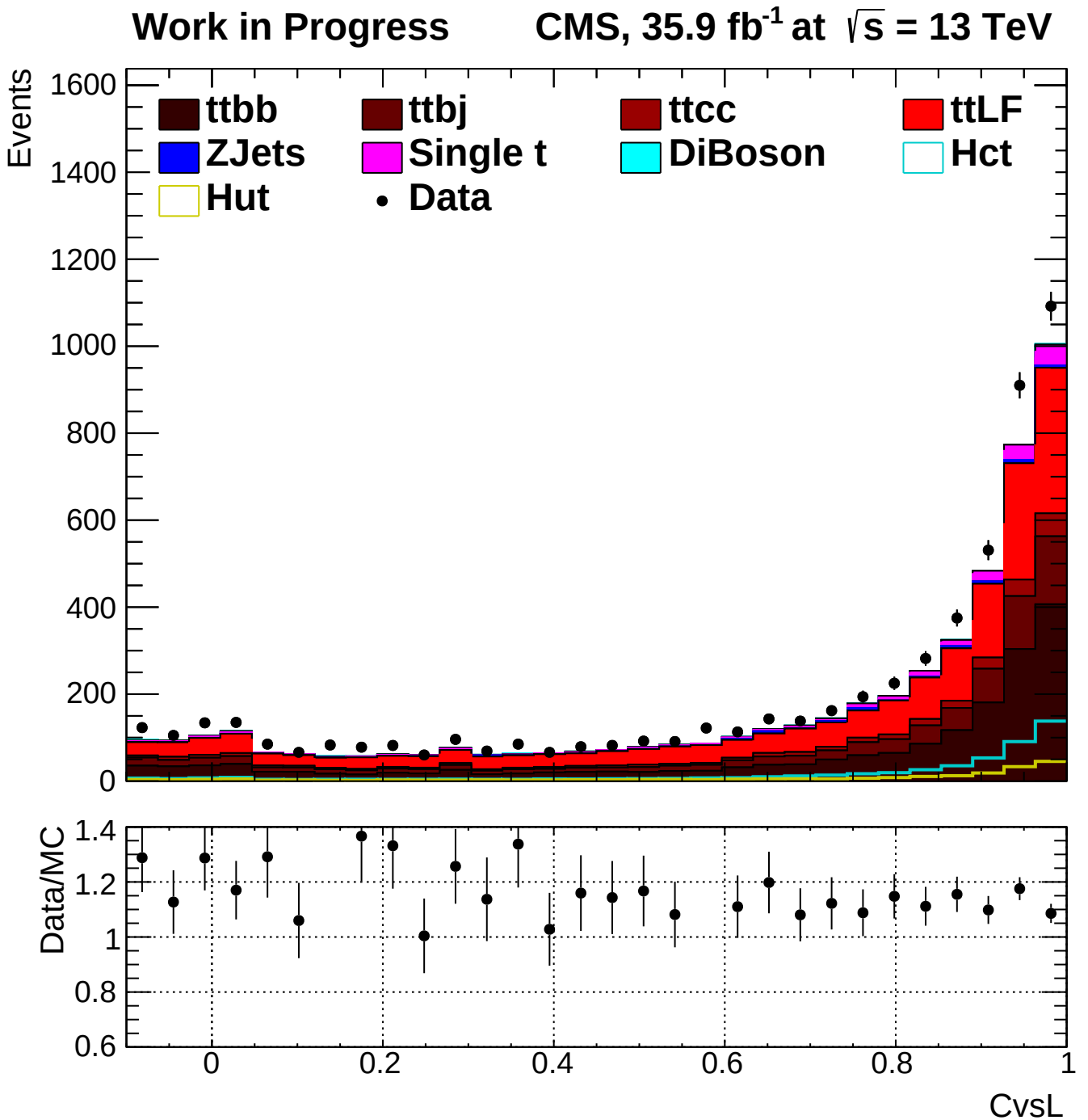
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
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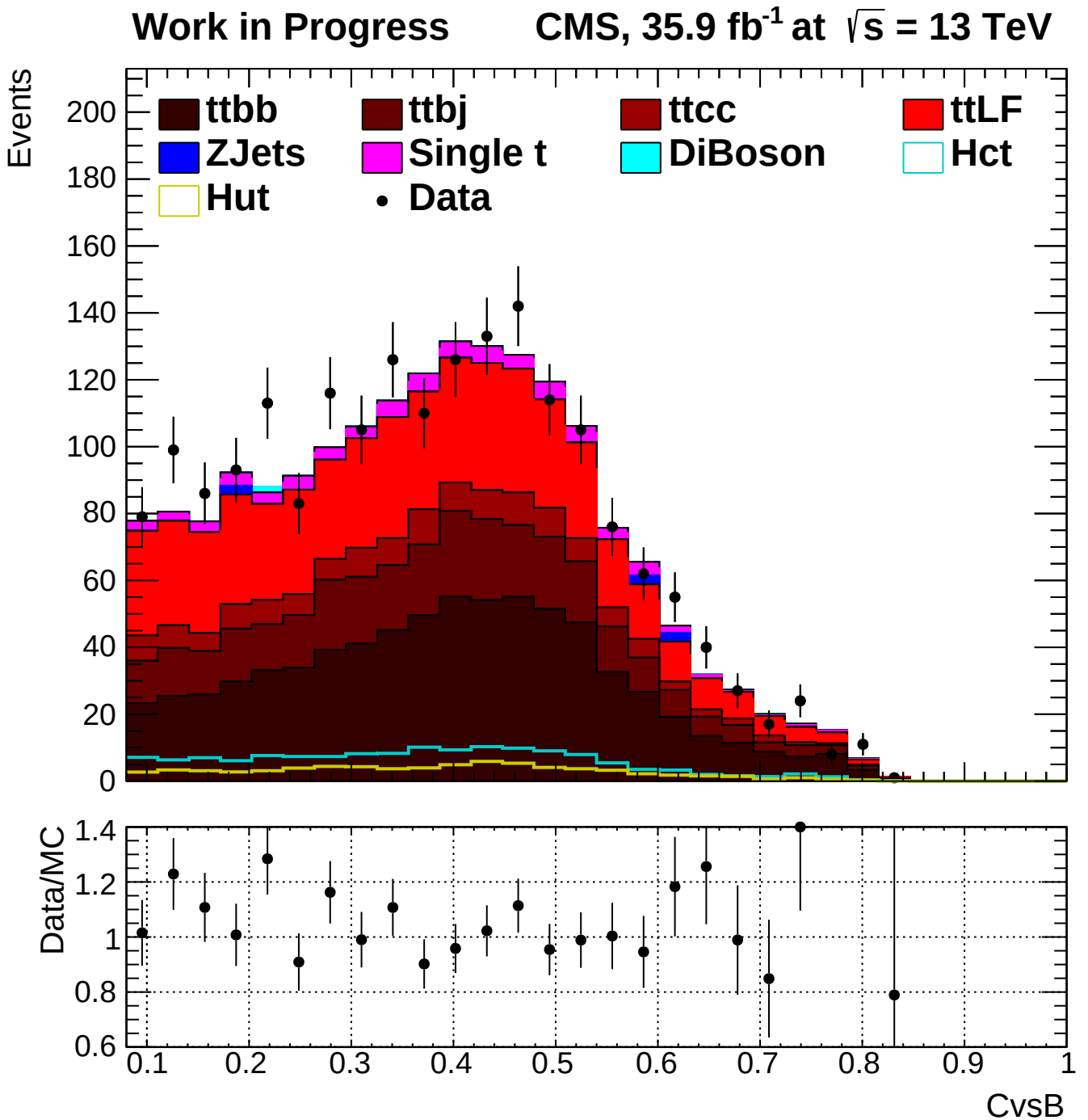
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
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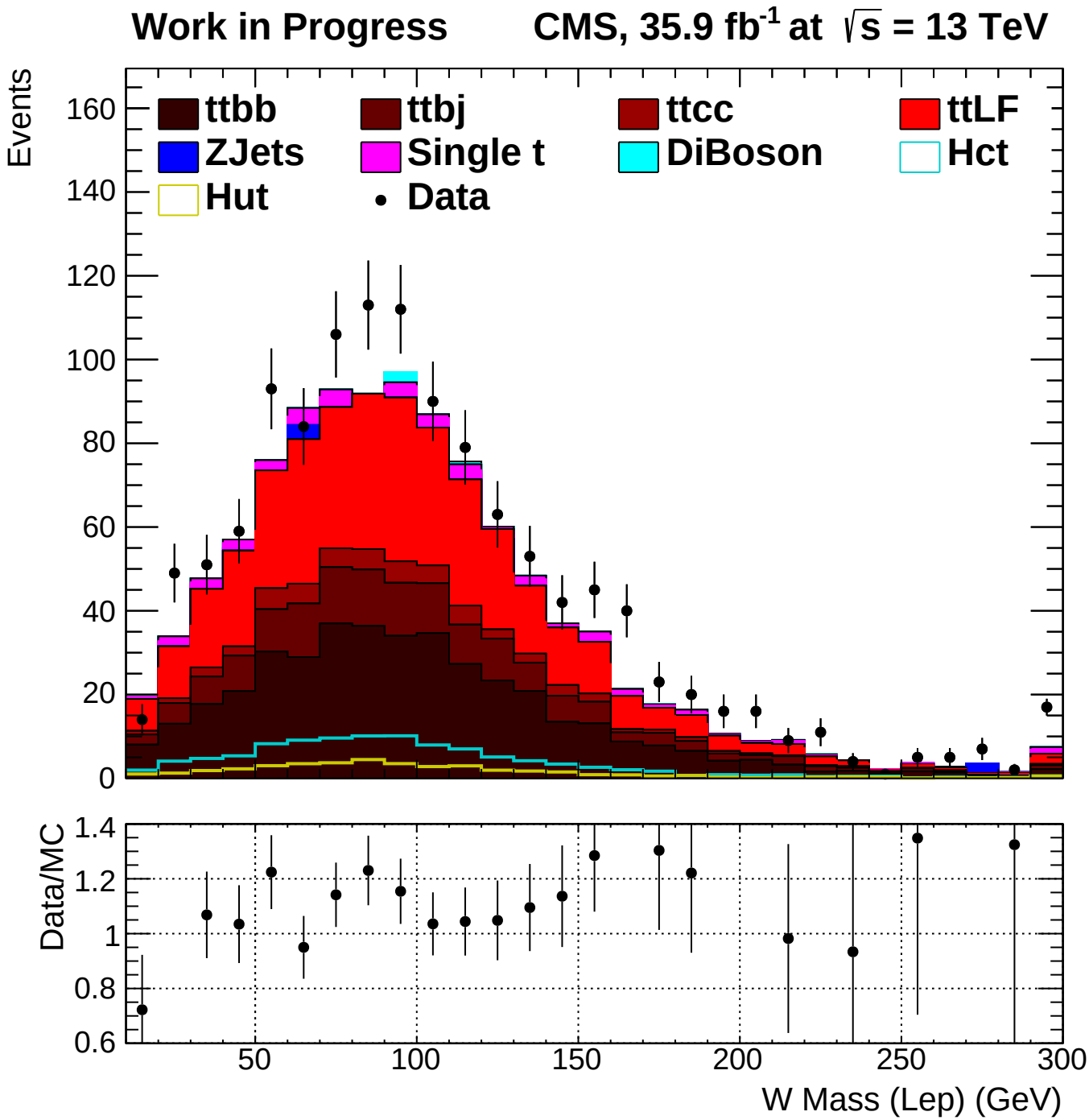
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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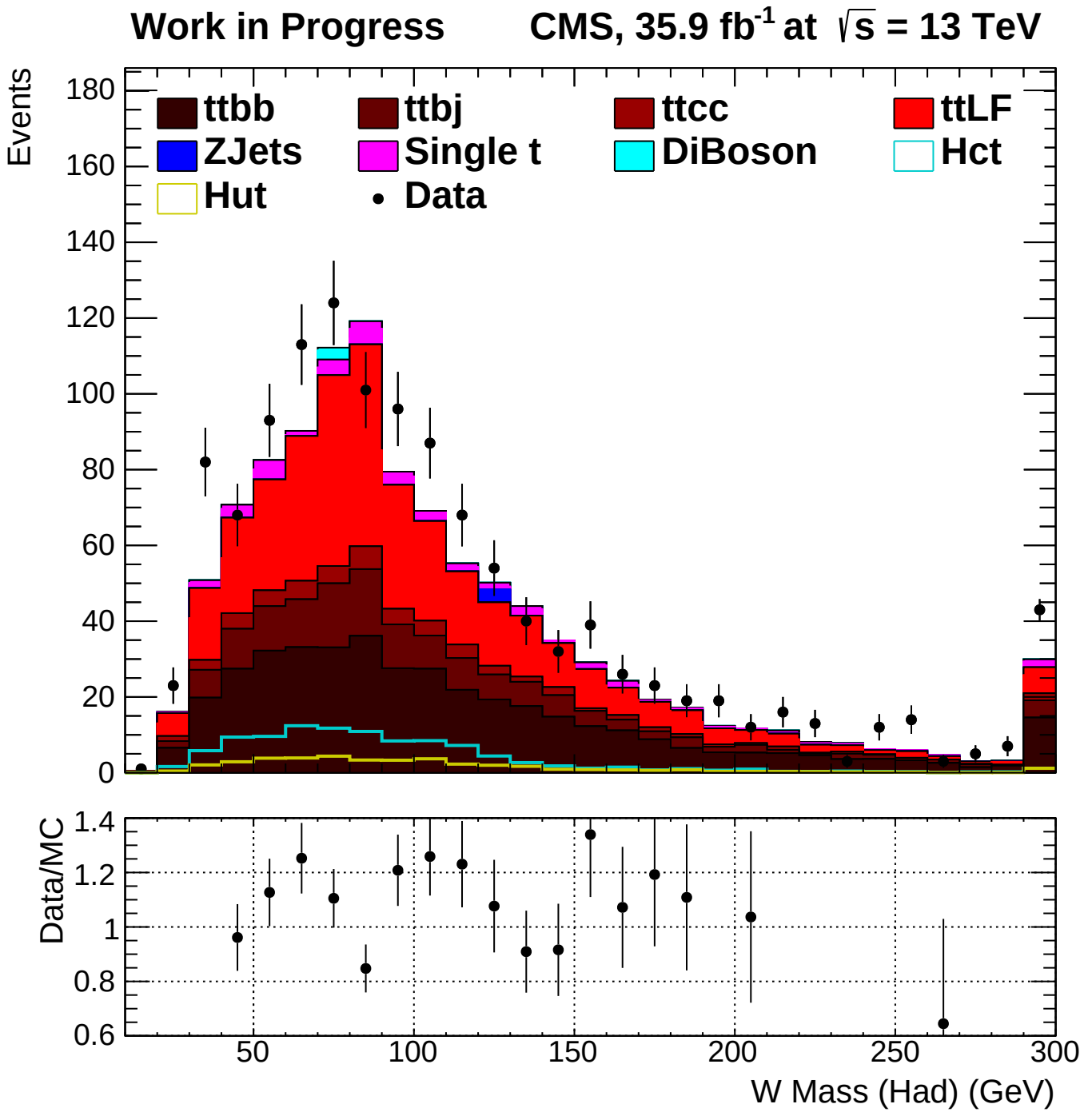
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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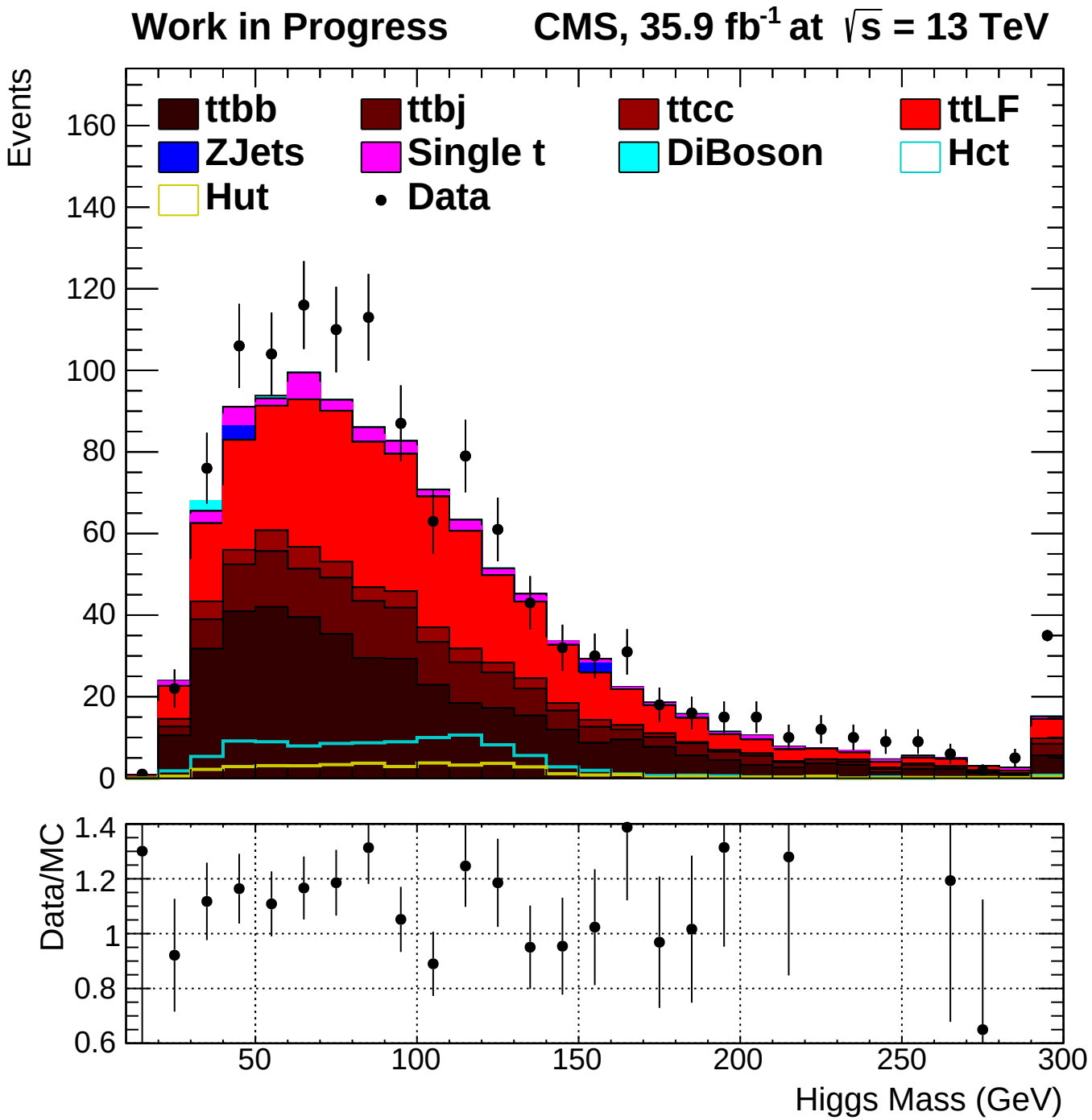
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
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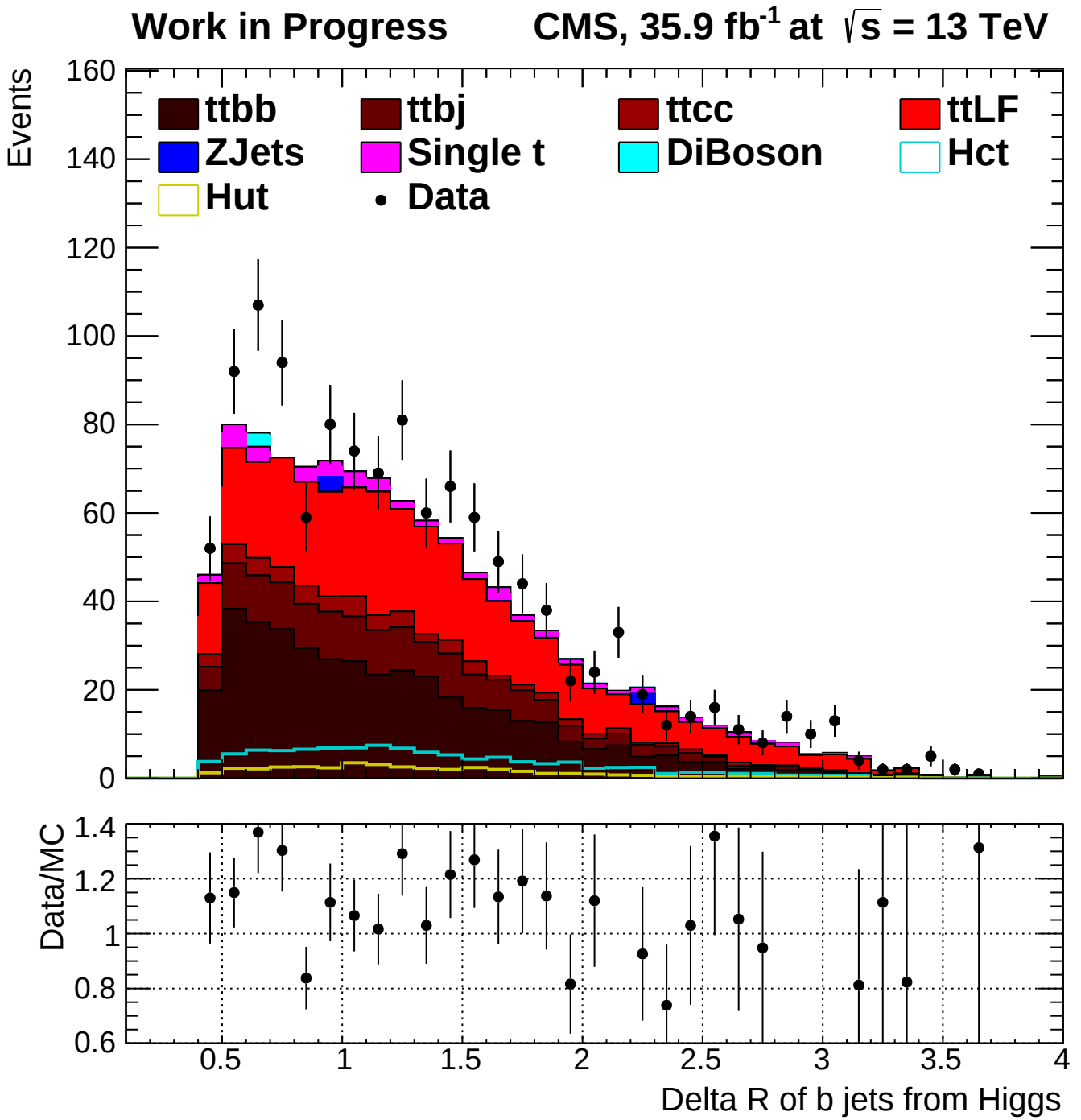
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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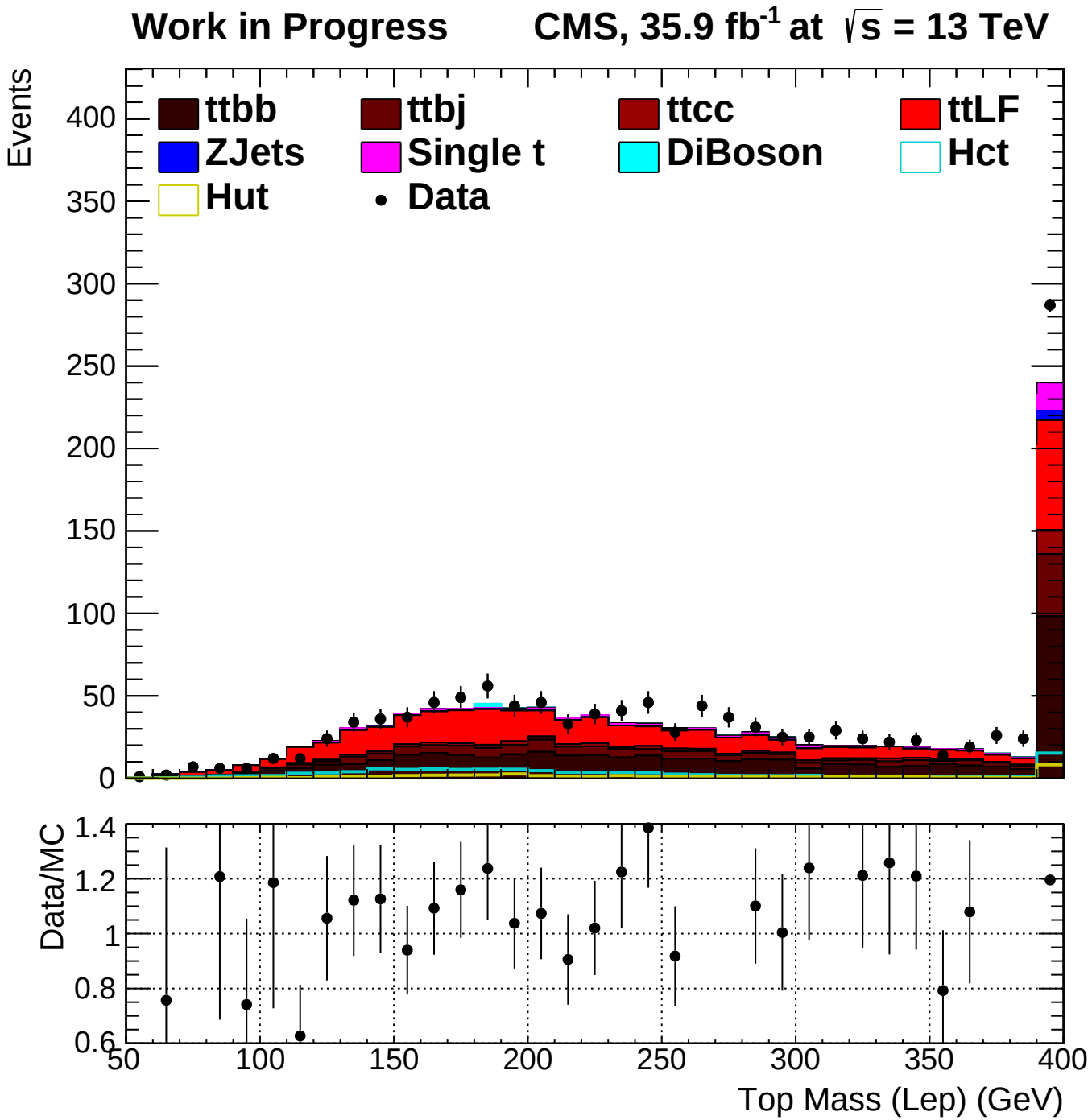
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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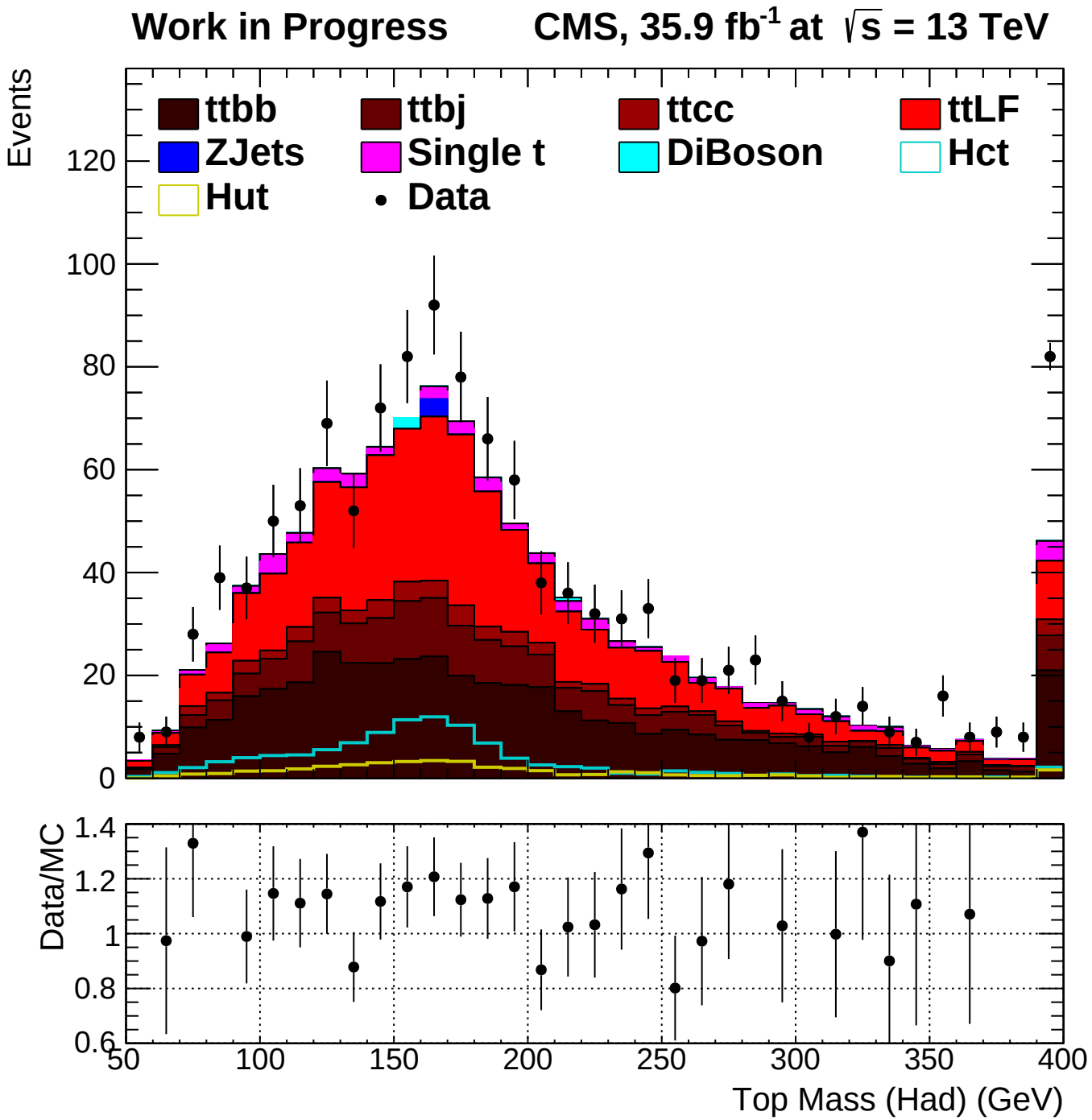
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
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ttcc
ttLF
ZJets
Single t
DiBoson
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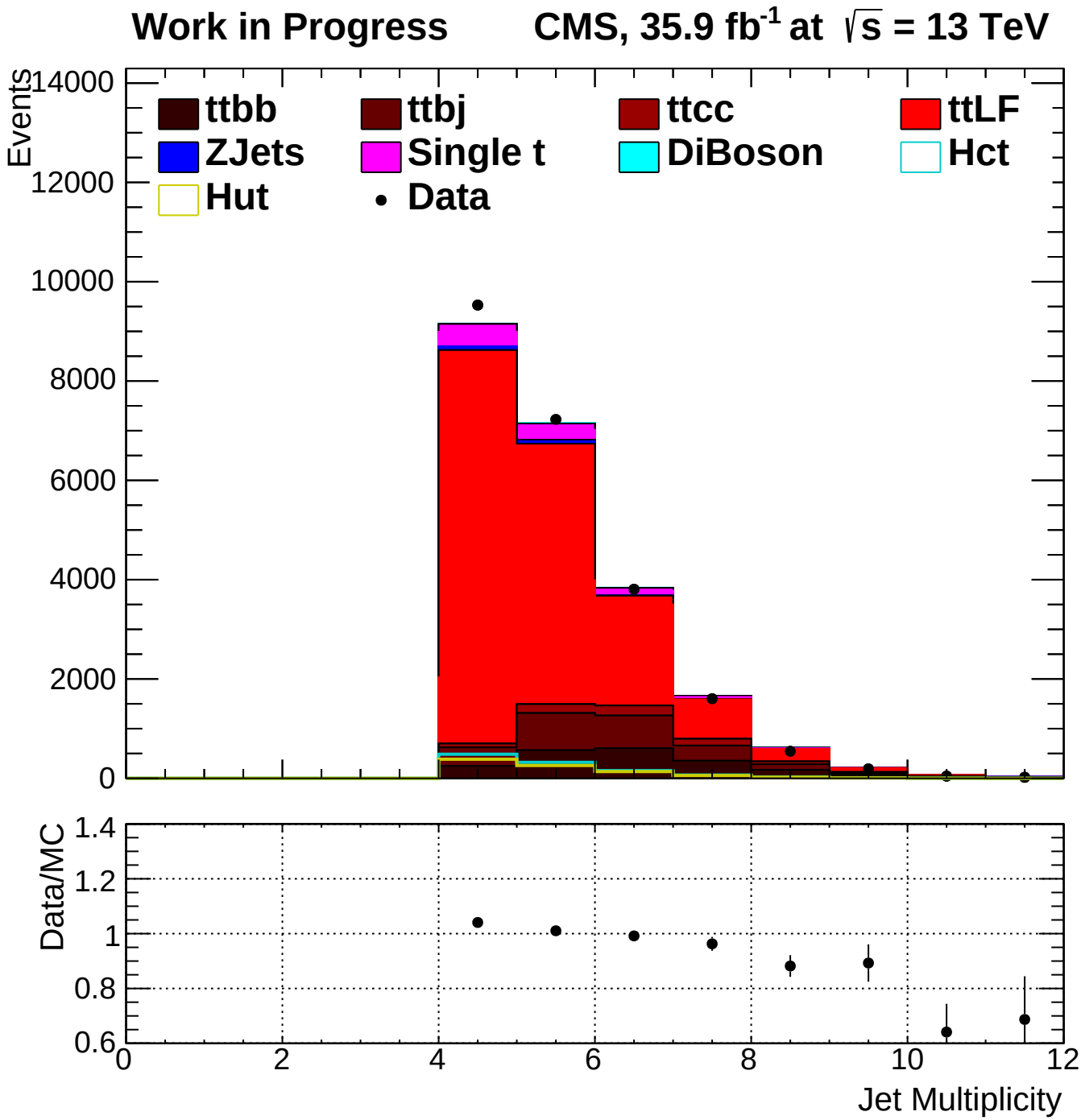
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
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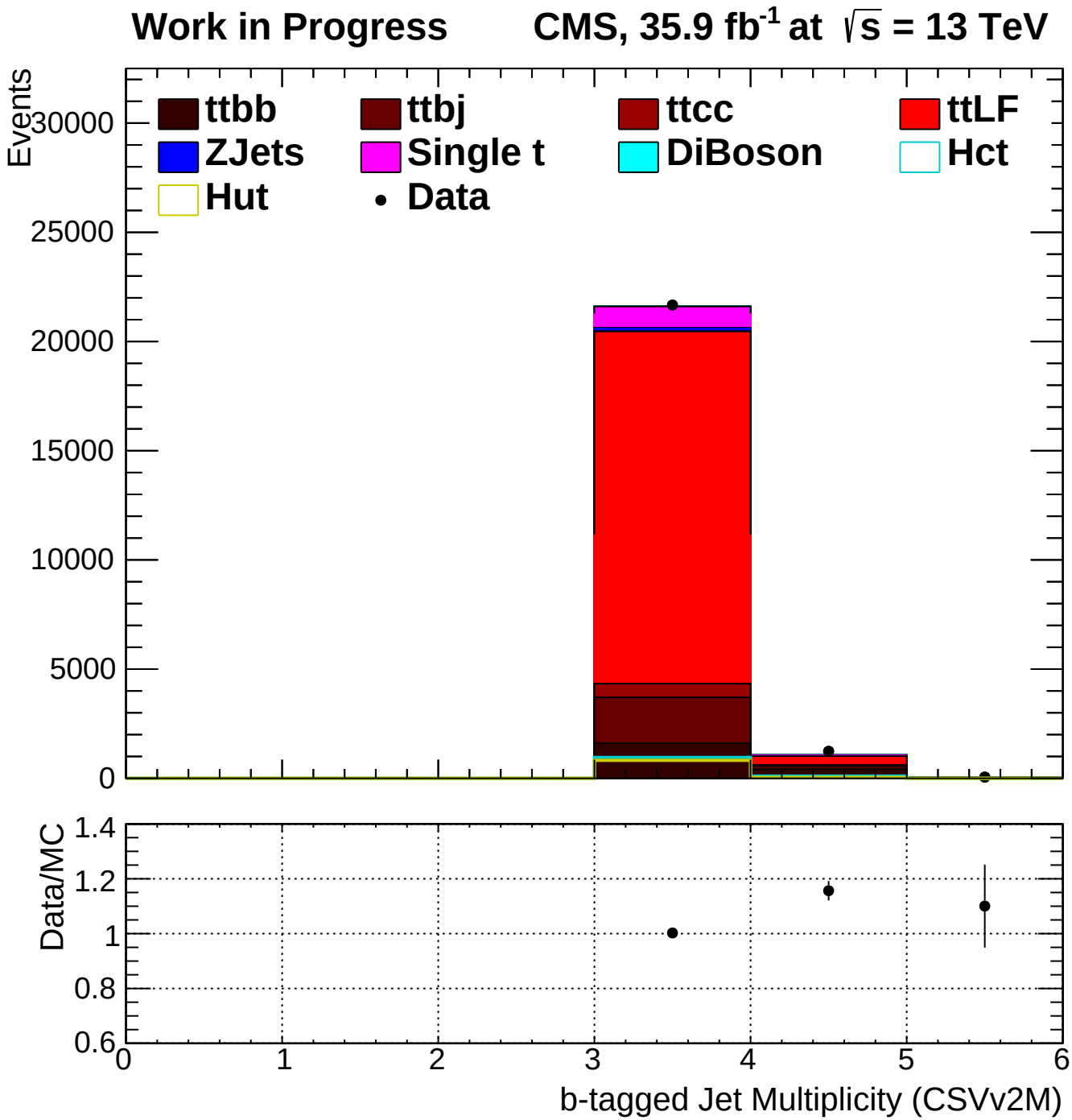
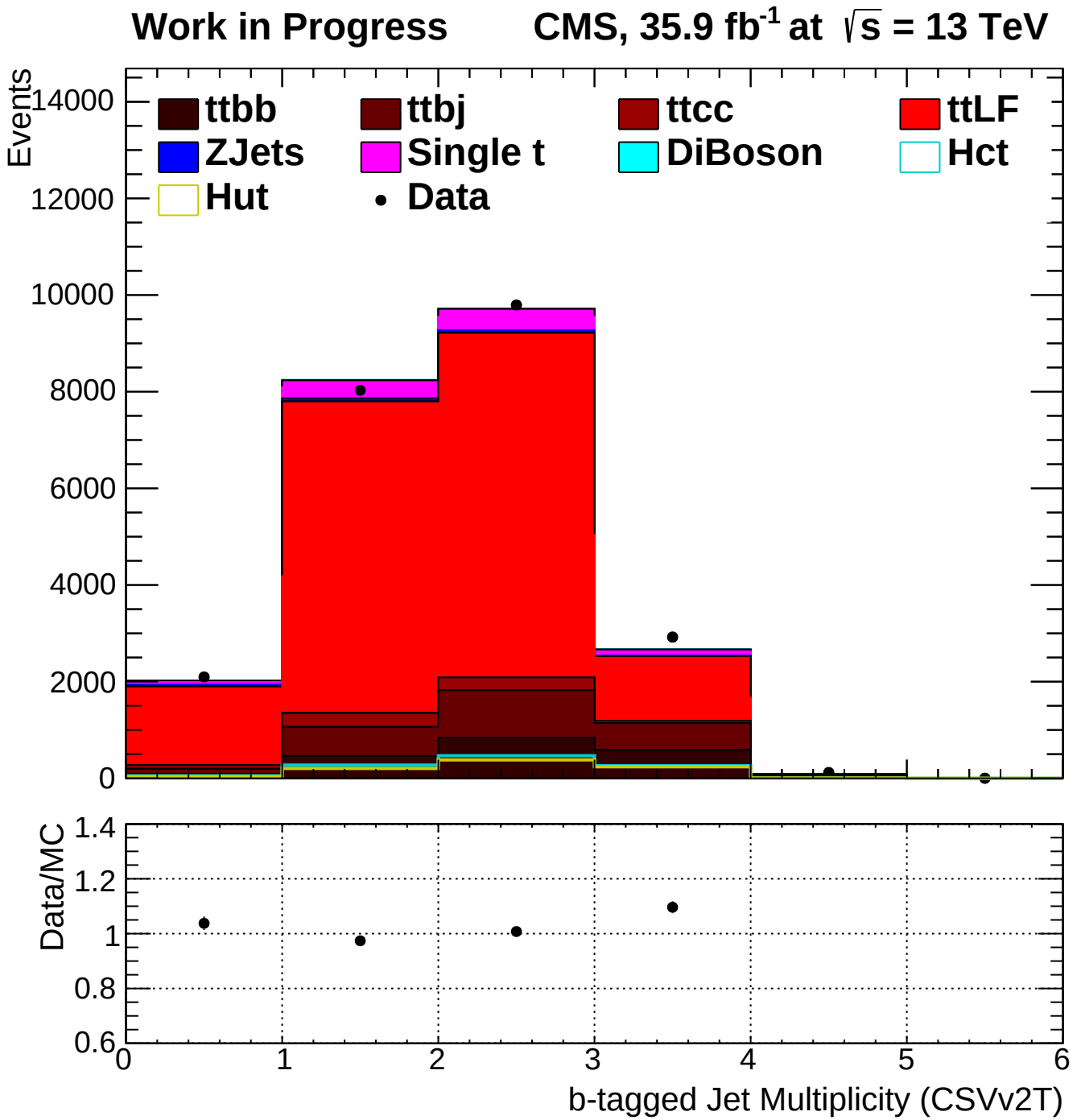
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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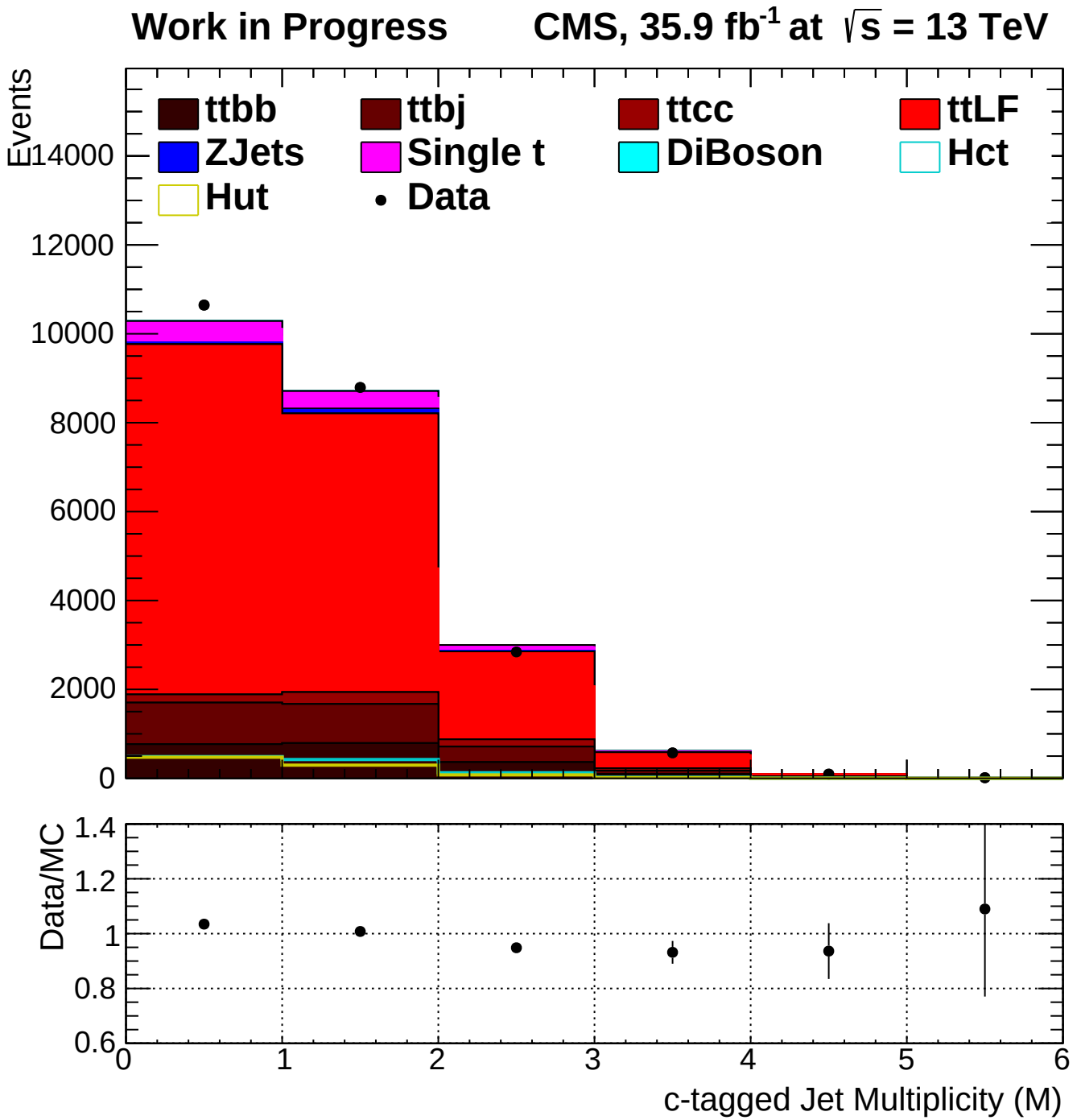
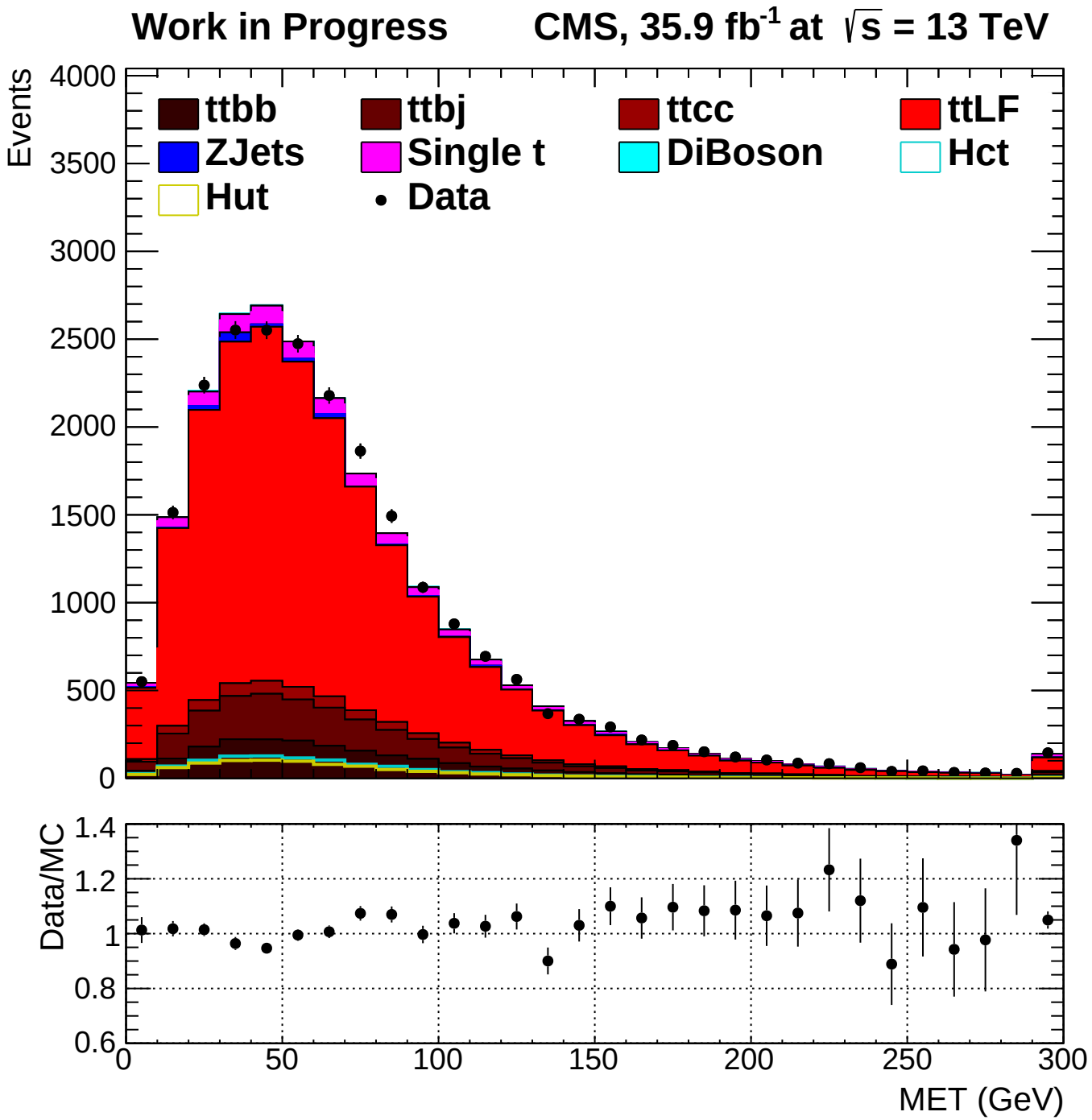
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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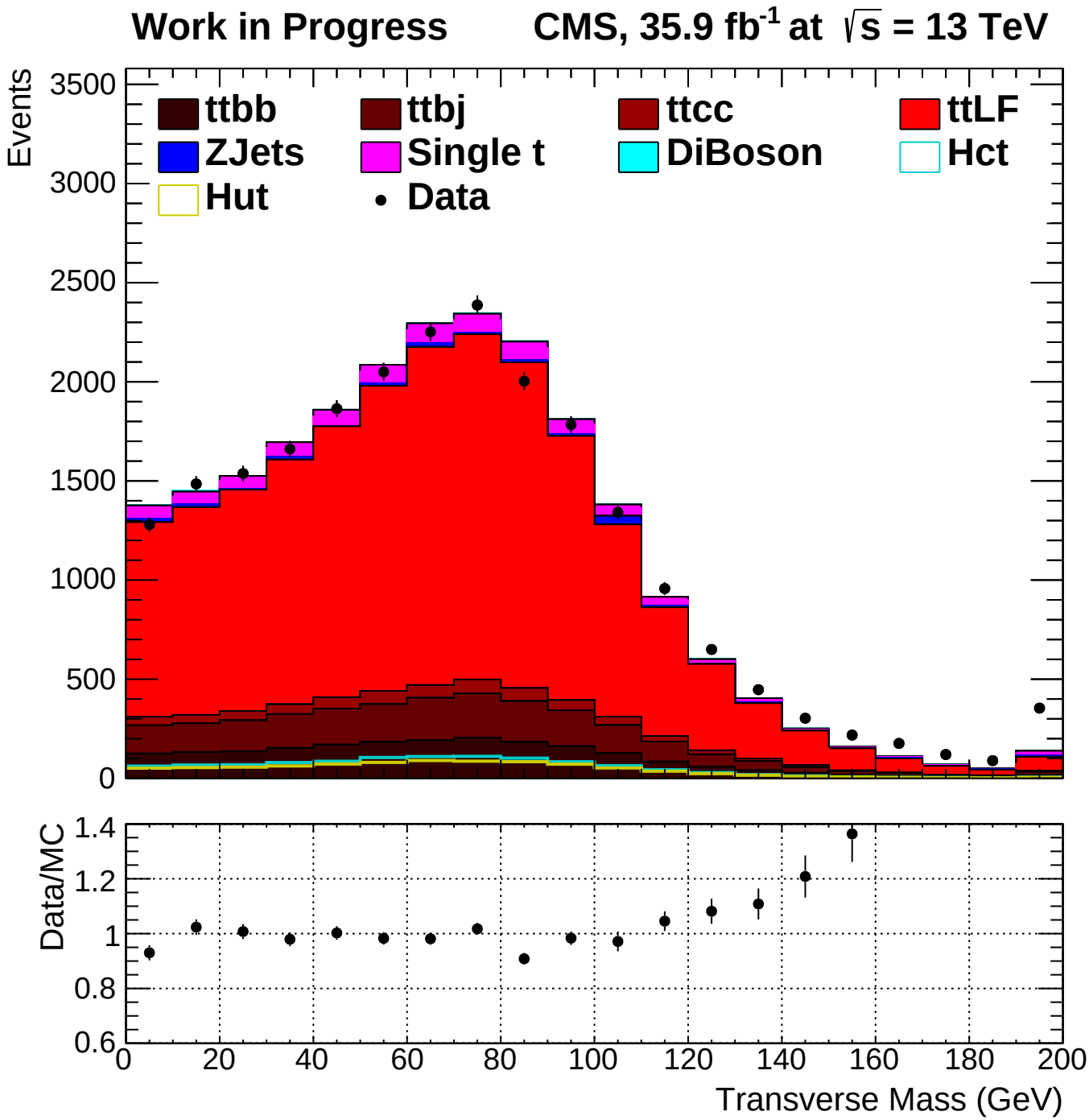
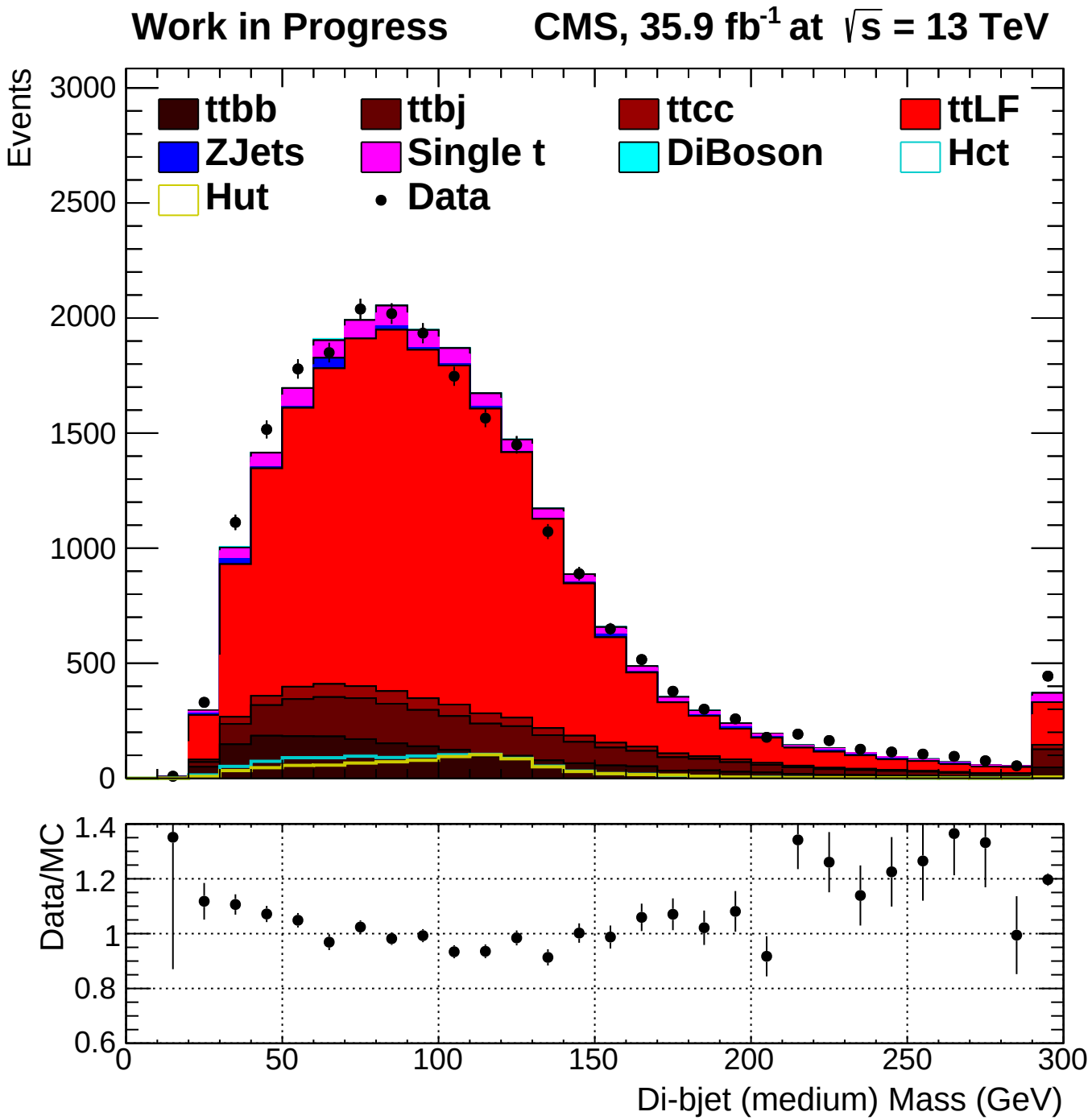
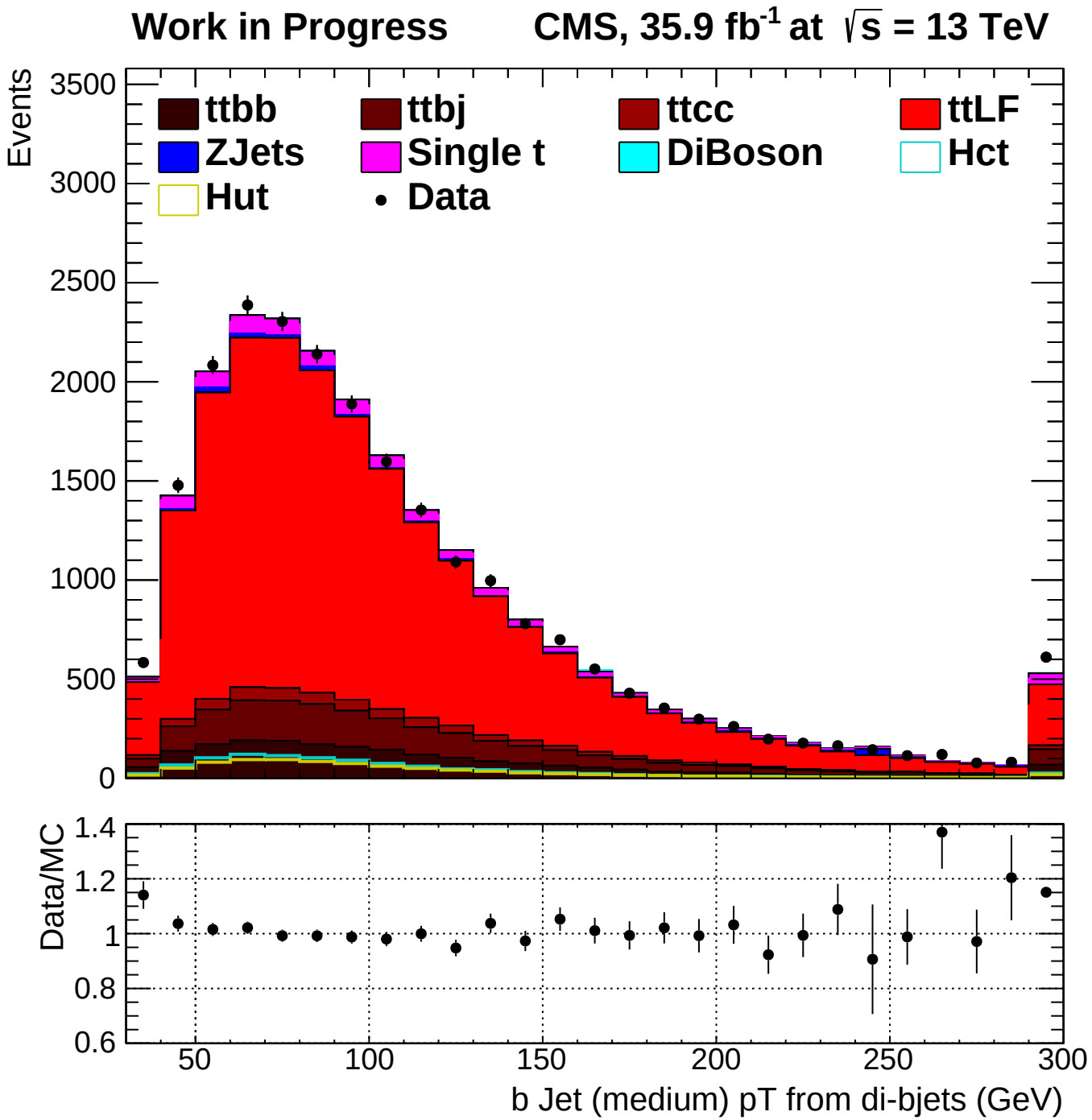
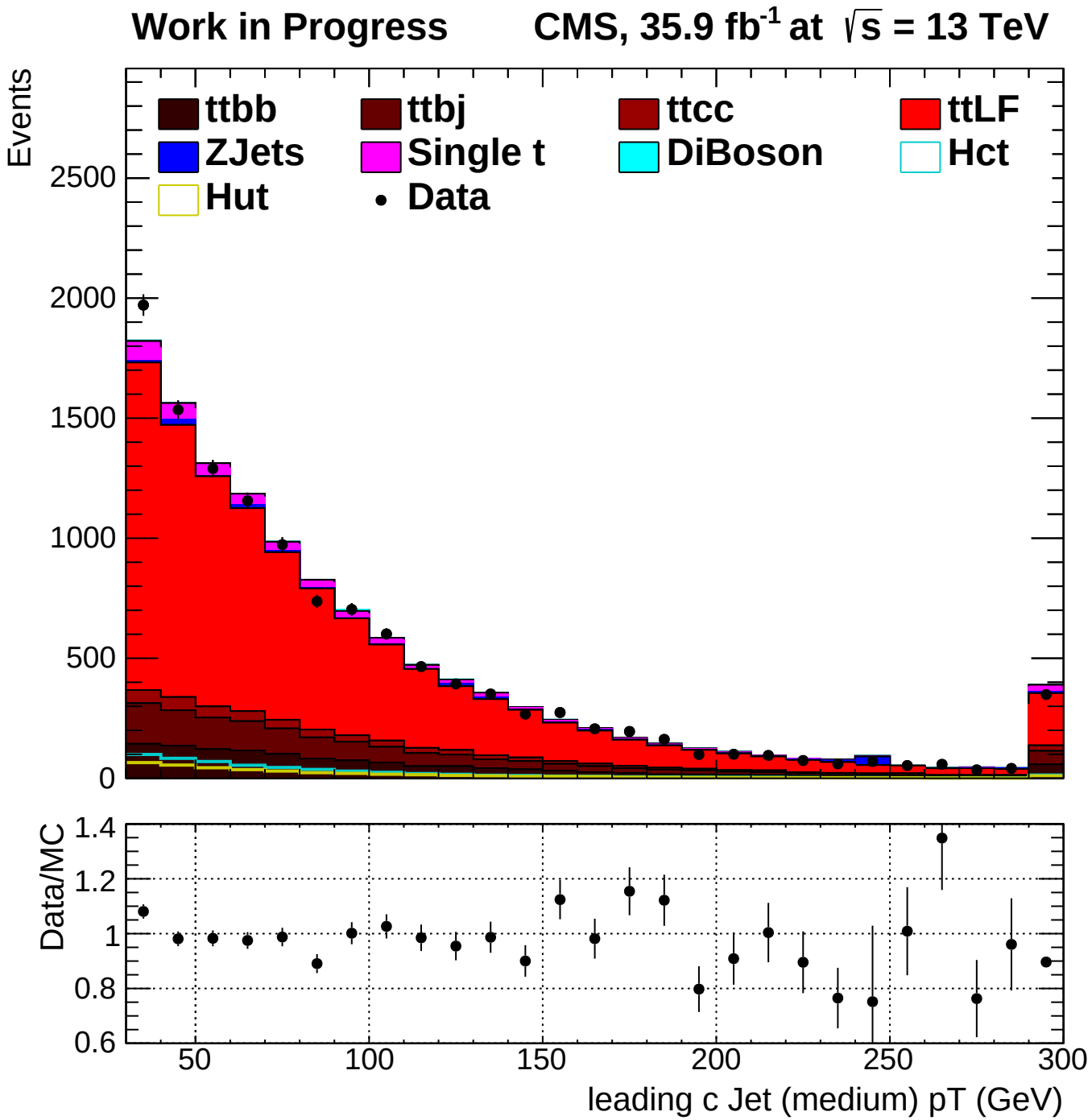
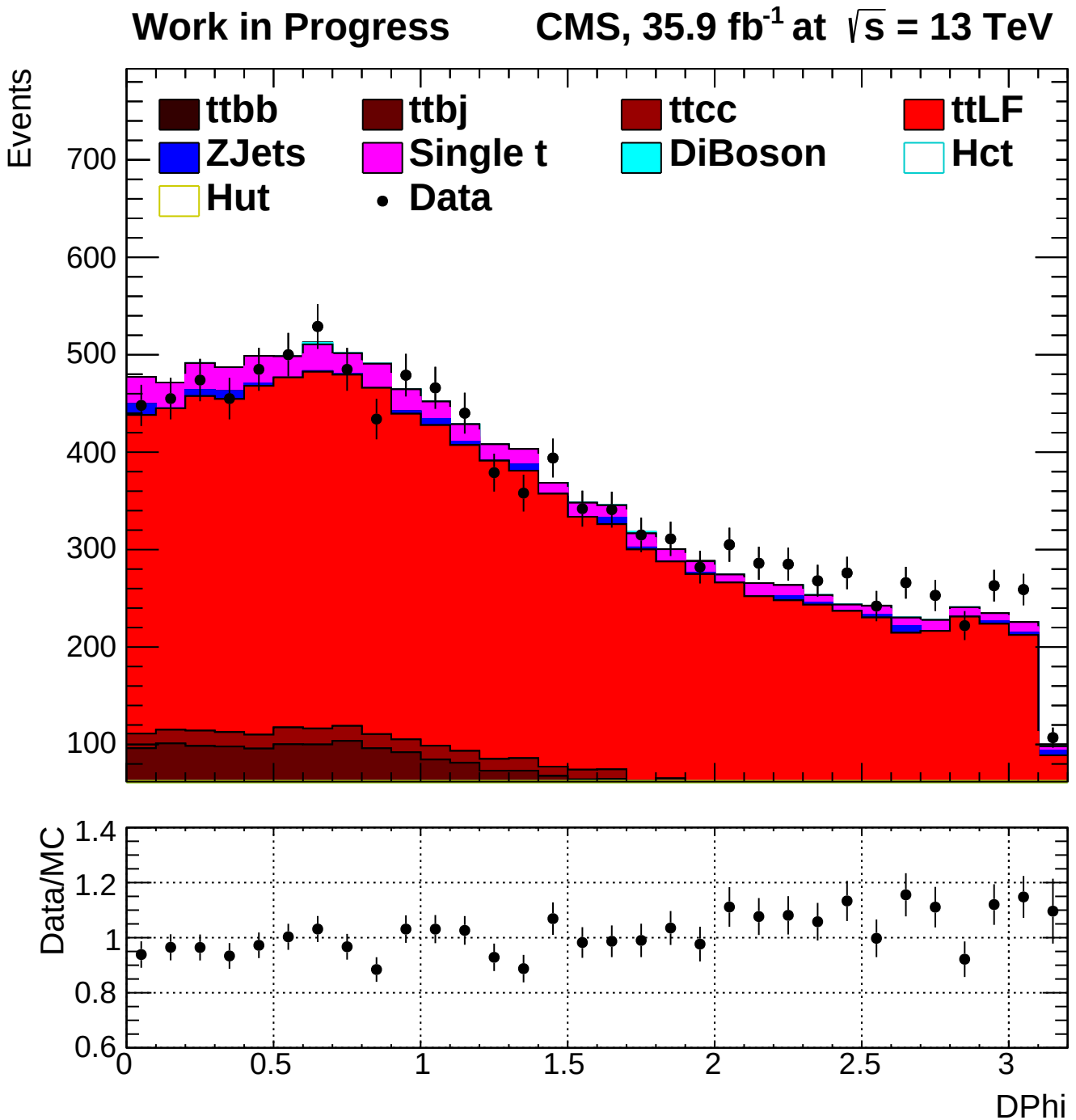
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

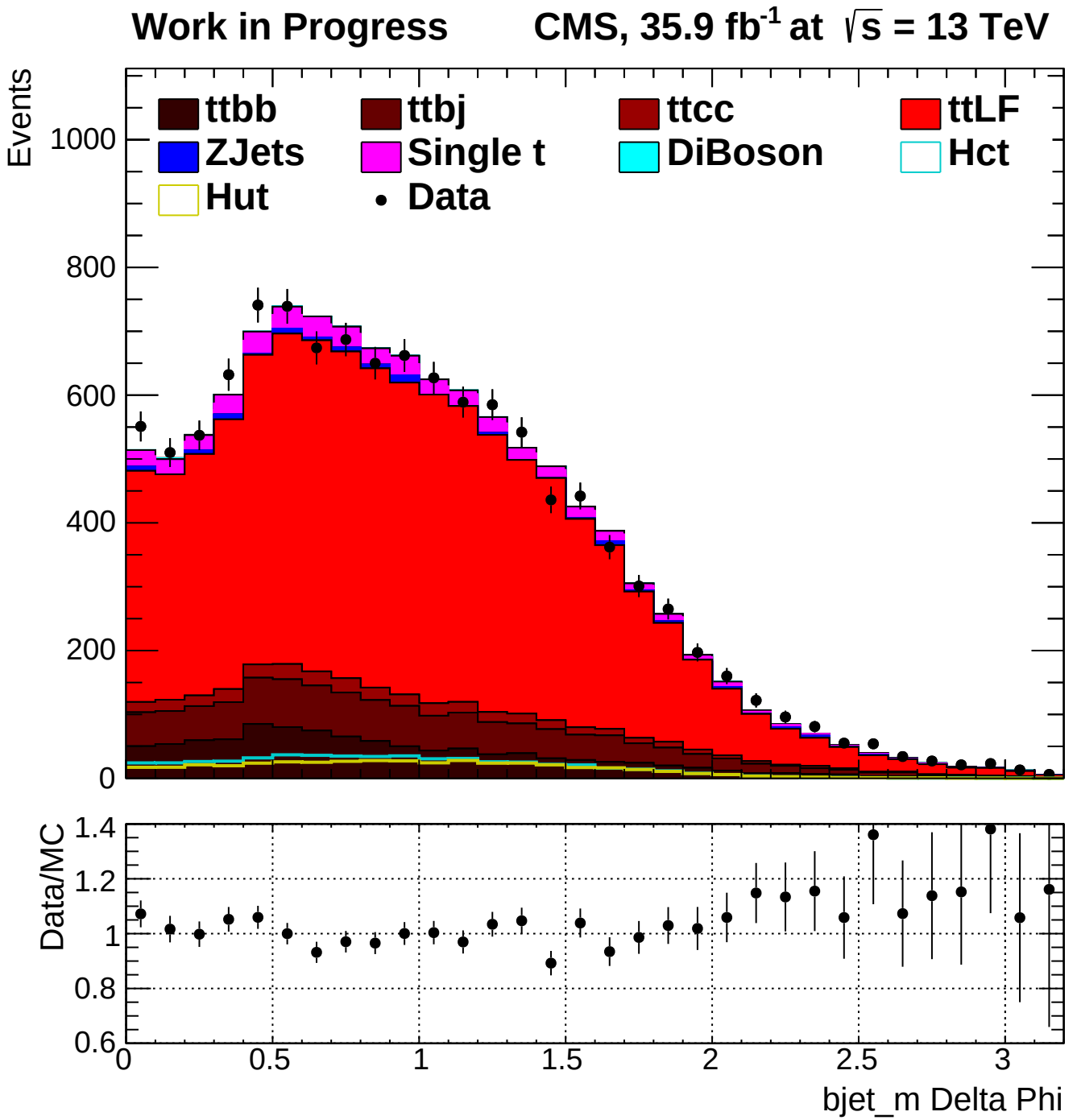

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

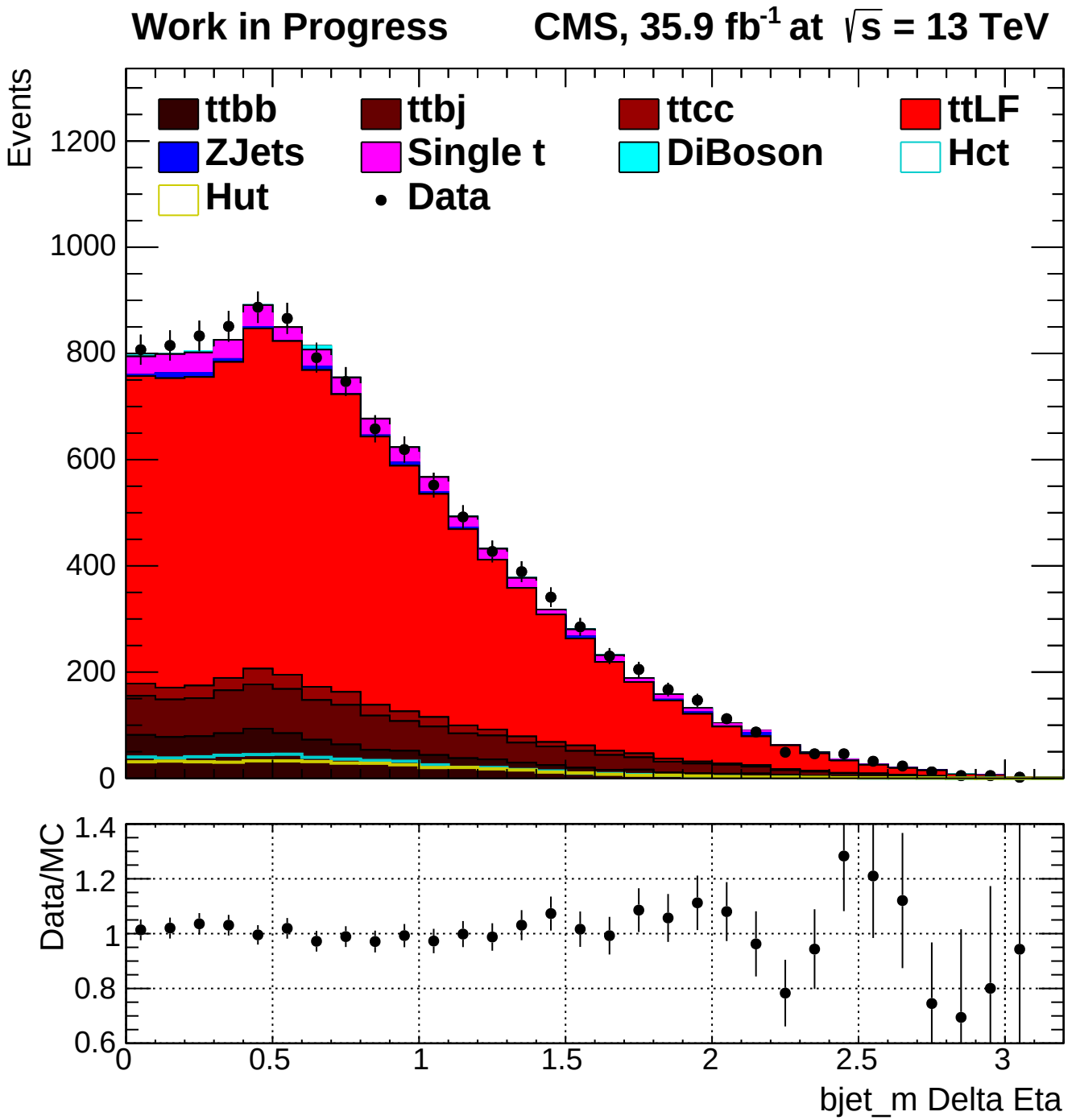

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
700
600
500
400
300
200
100
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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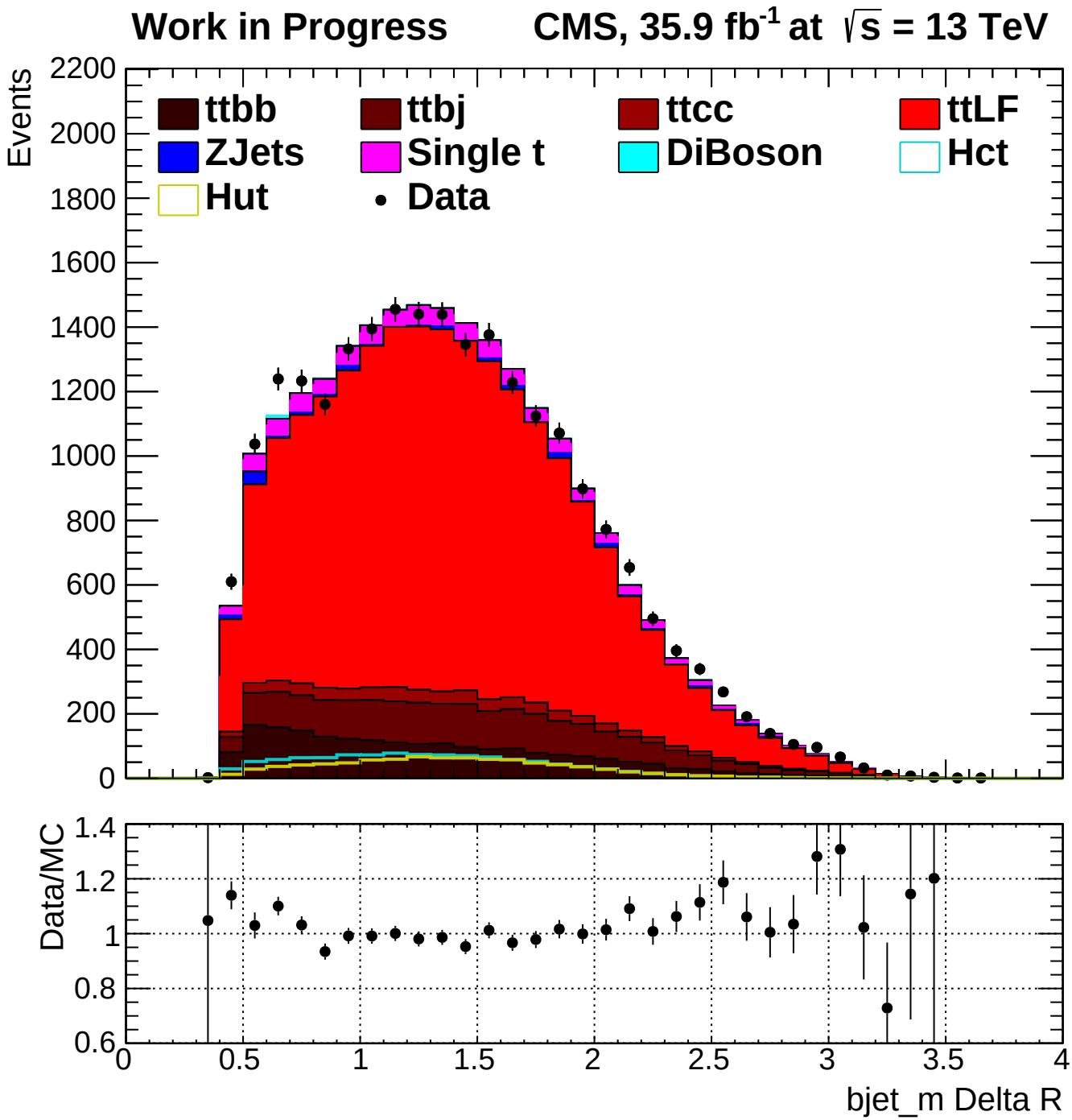
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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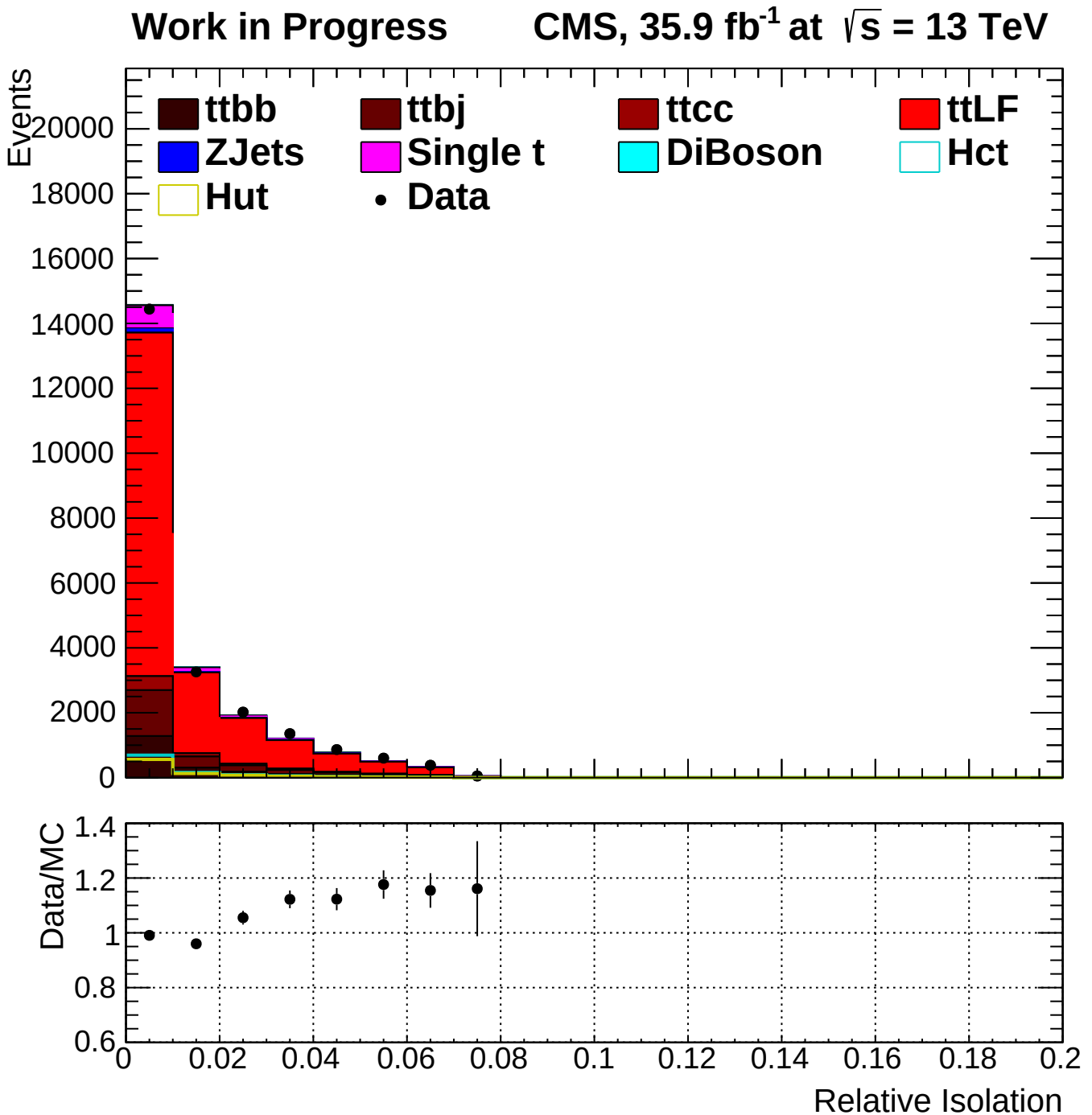
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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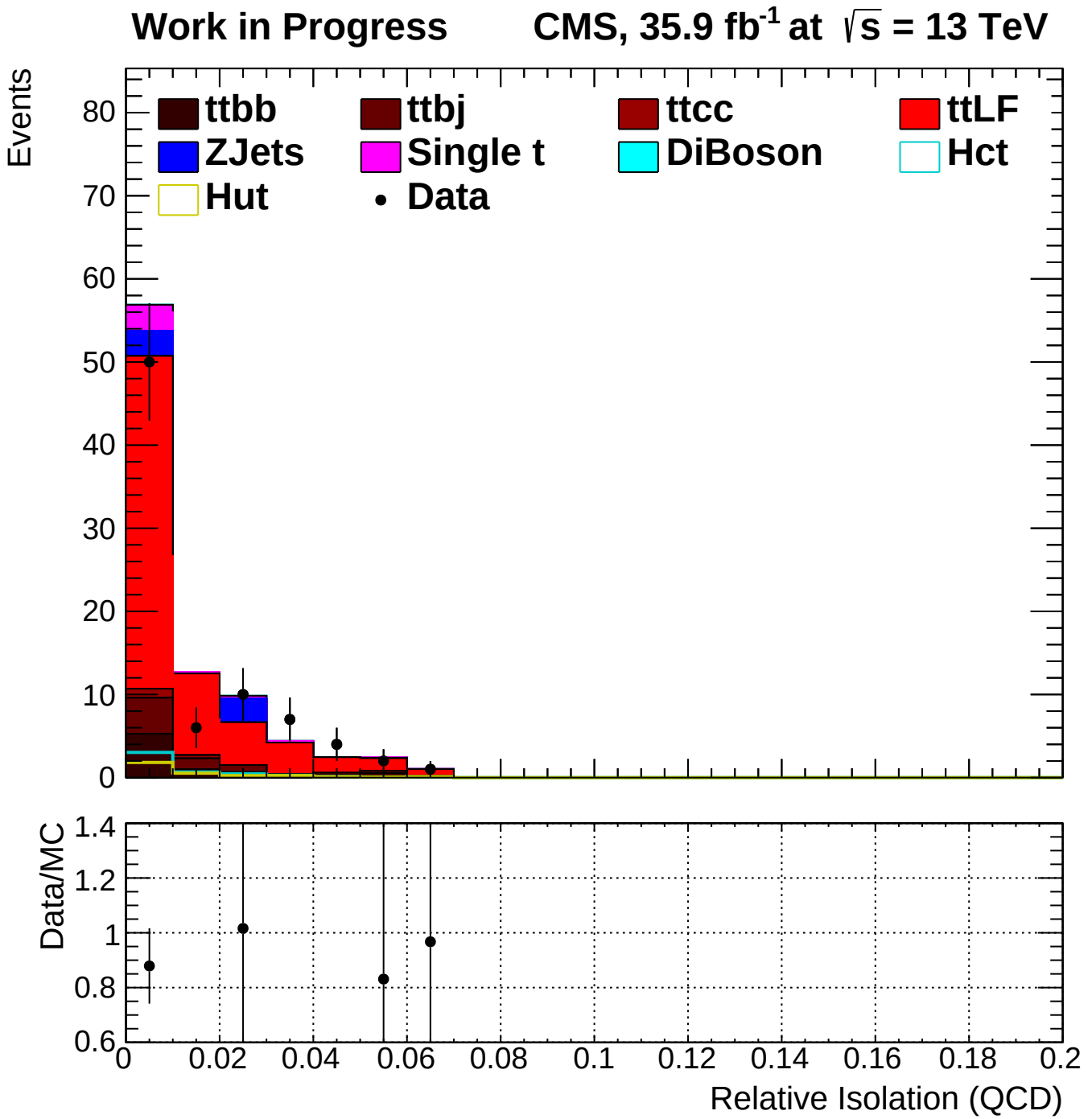
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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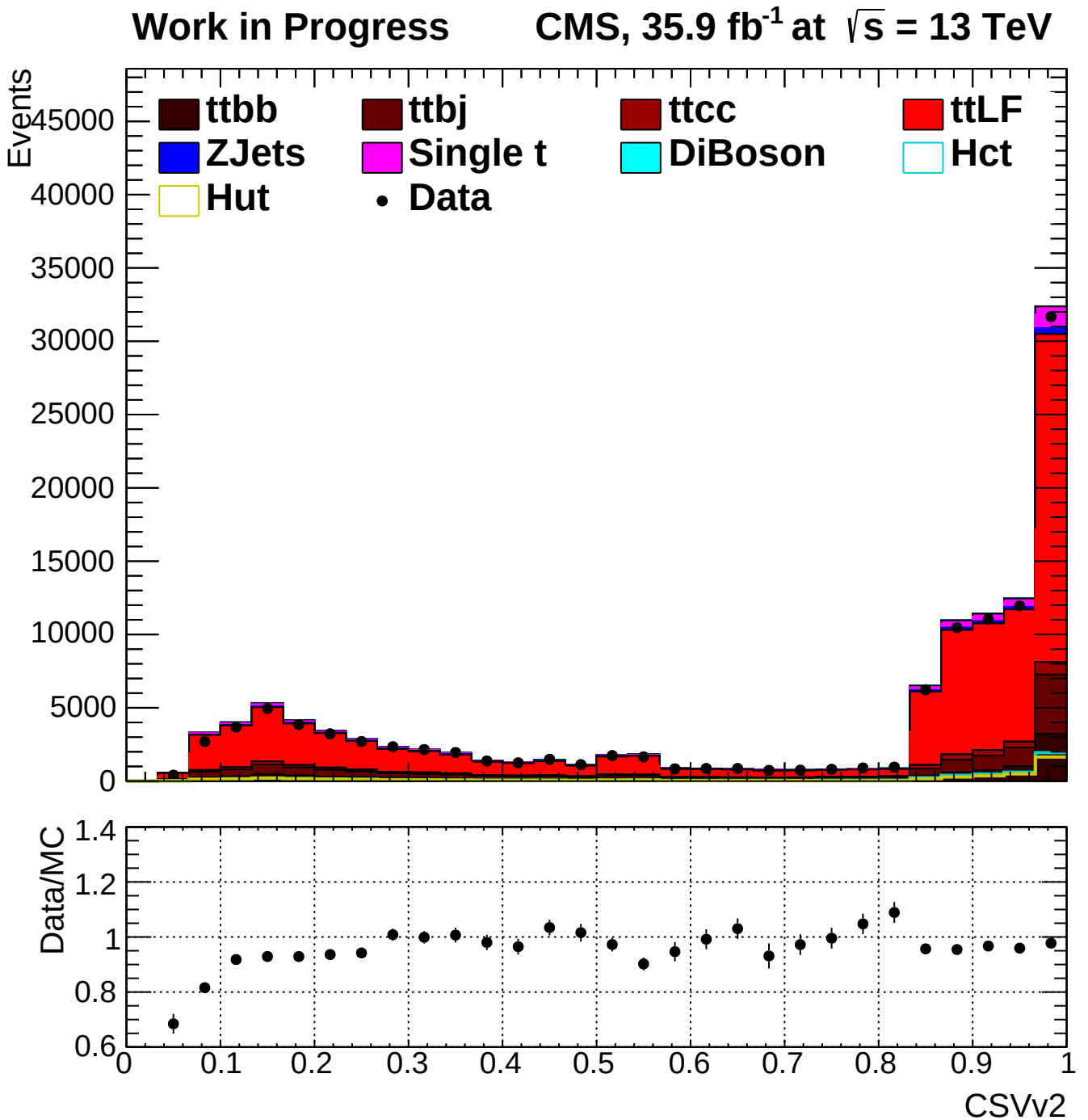
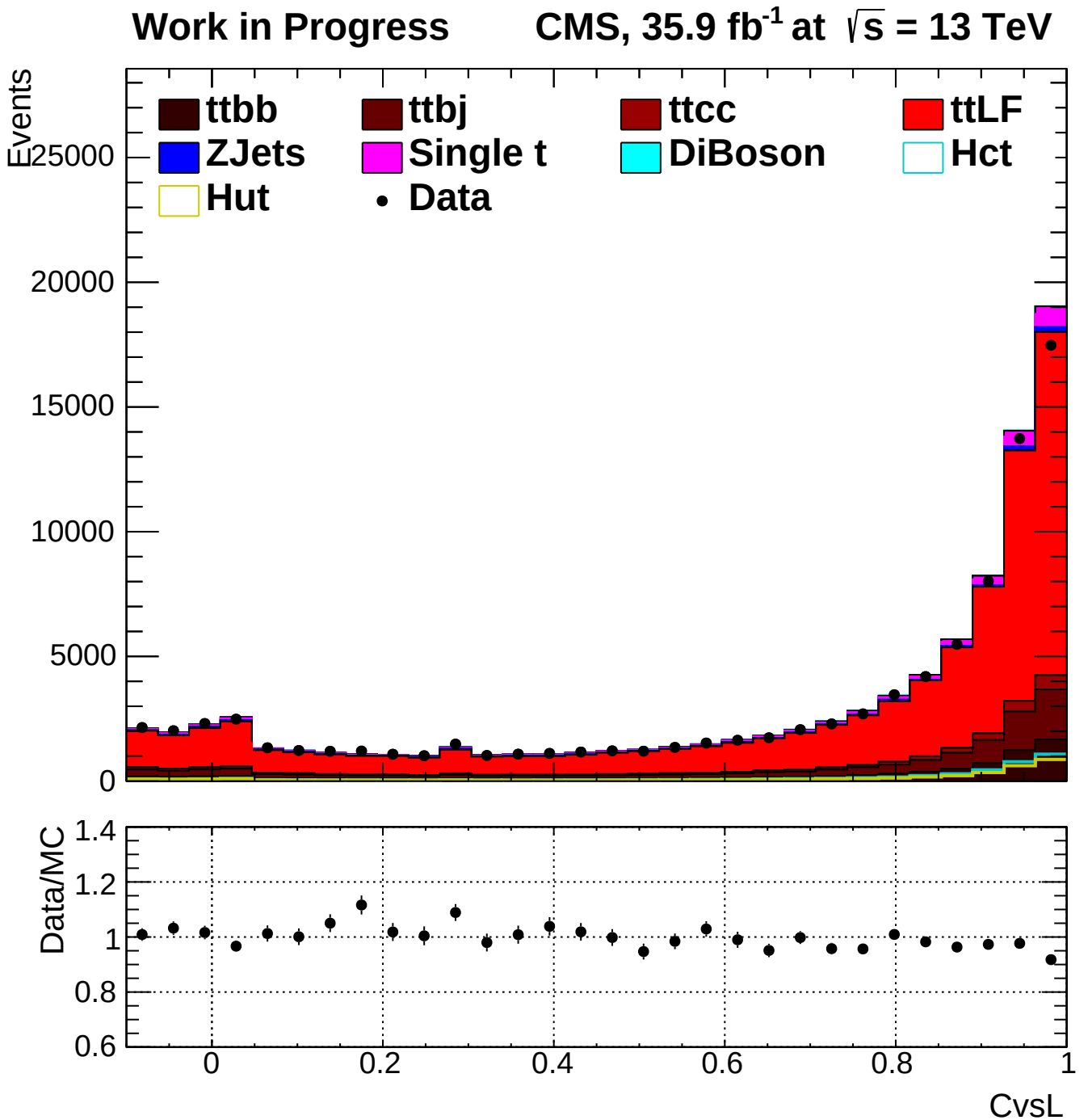
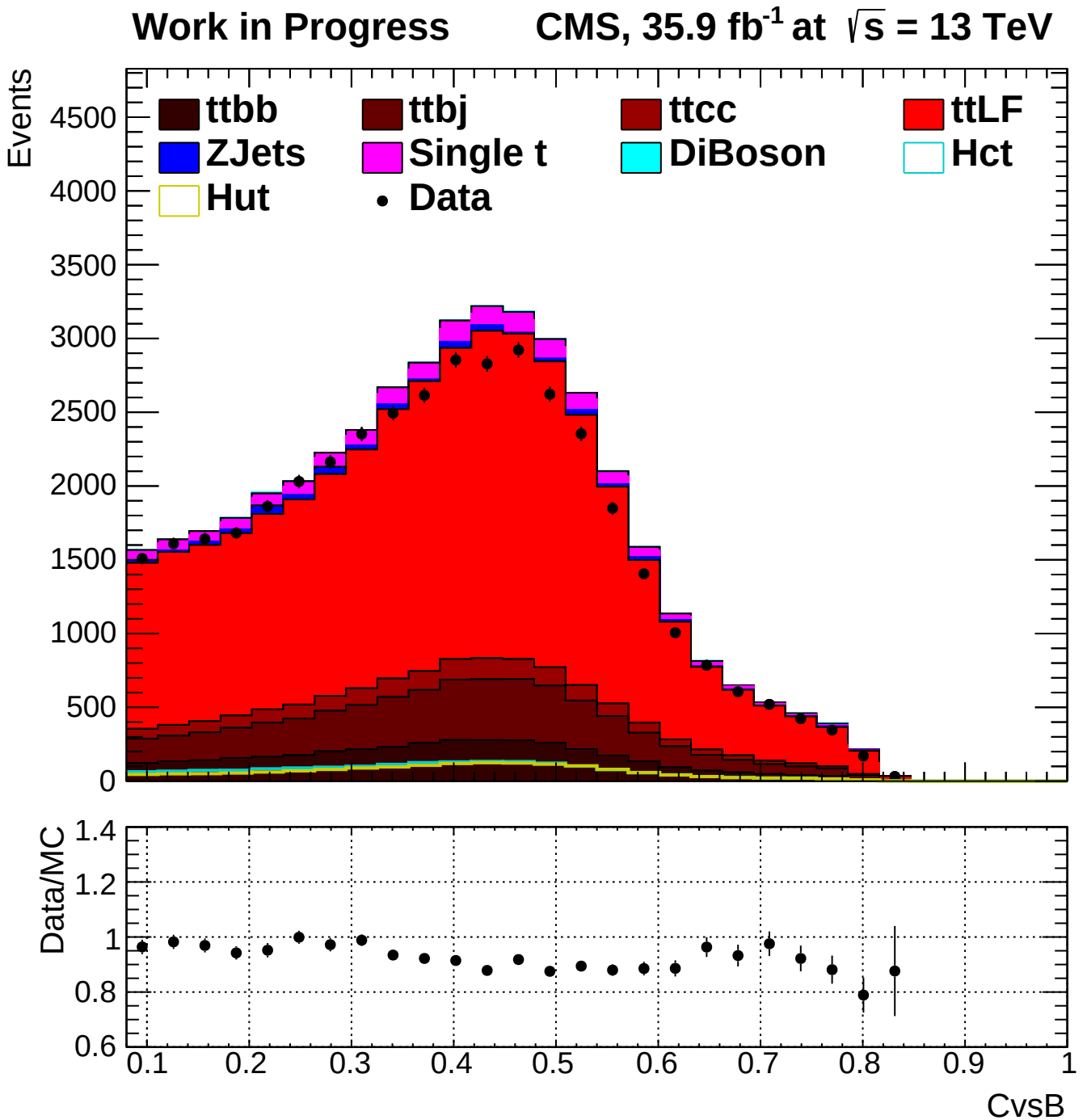
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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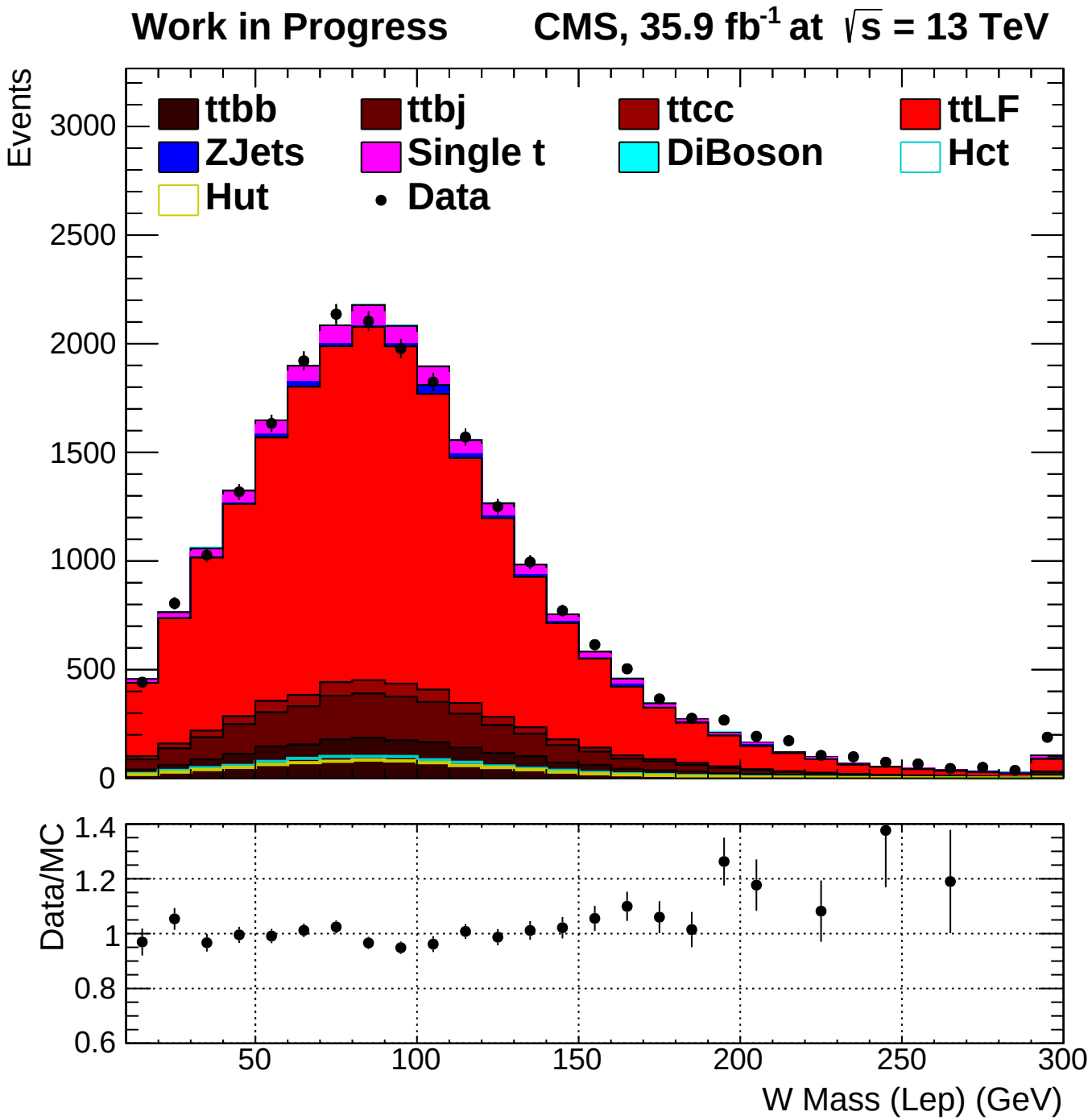
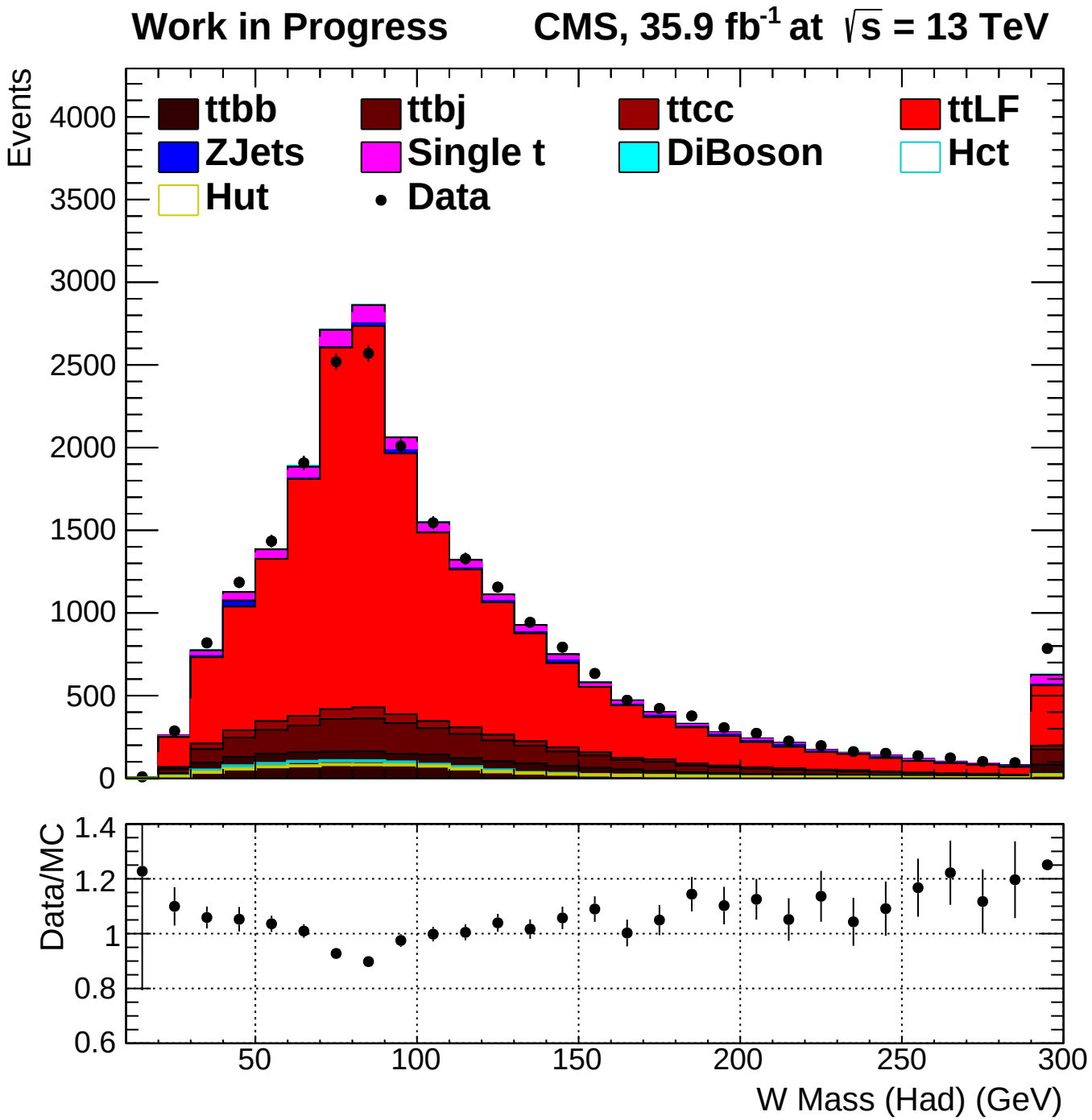
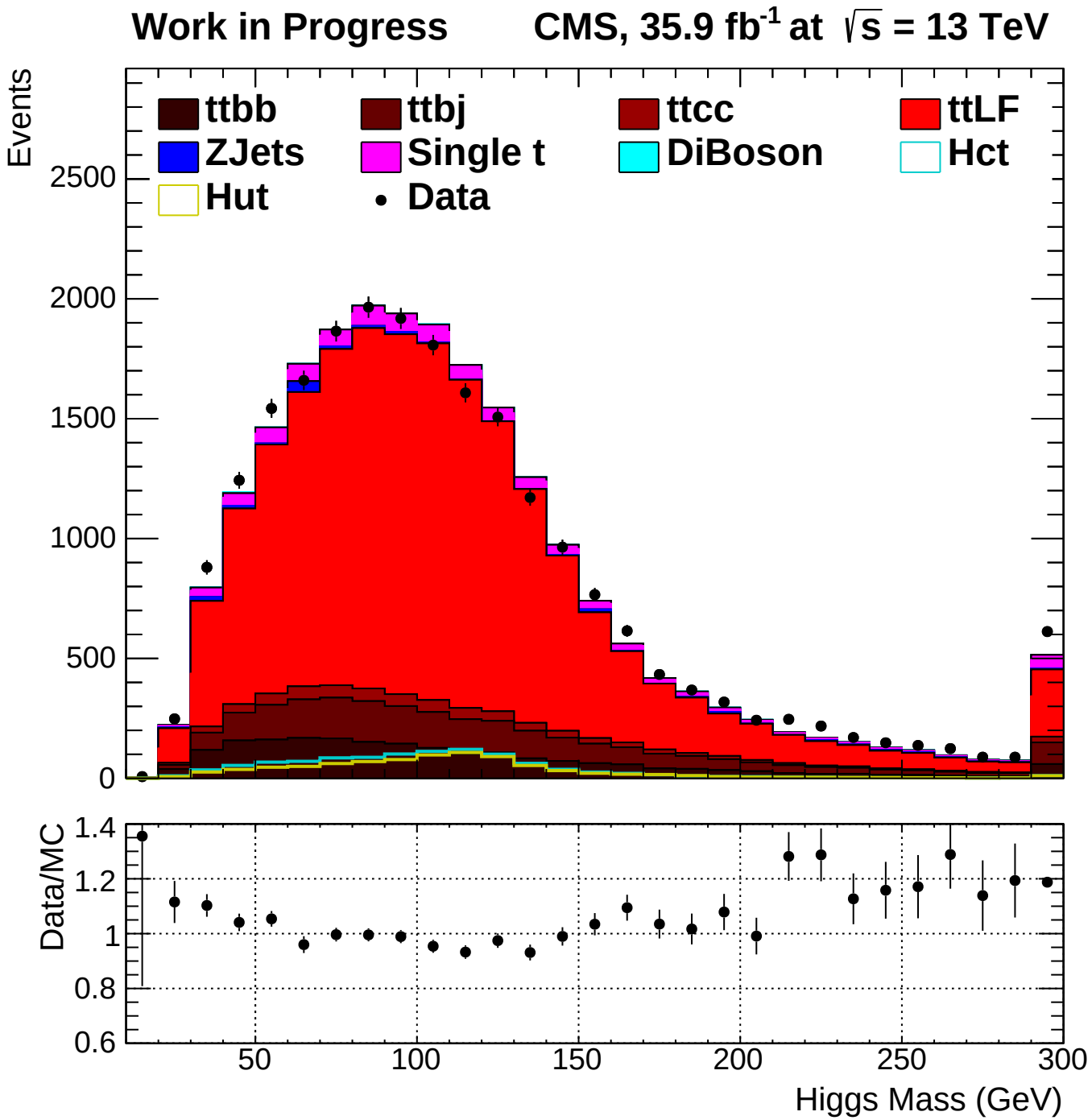
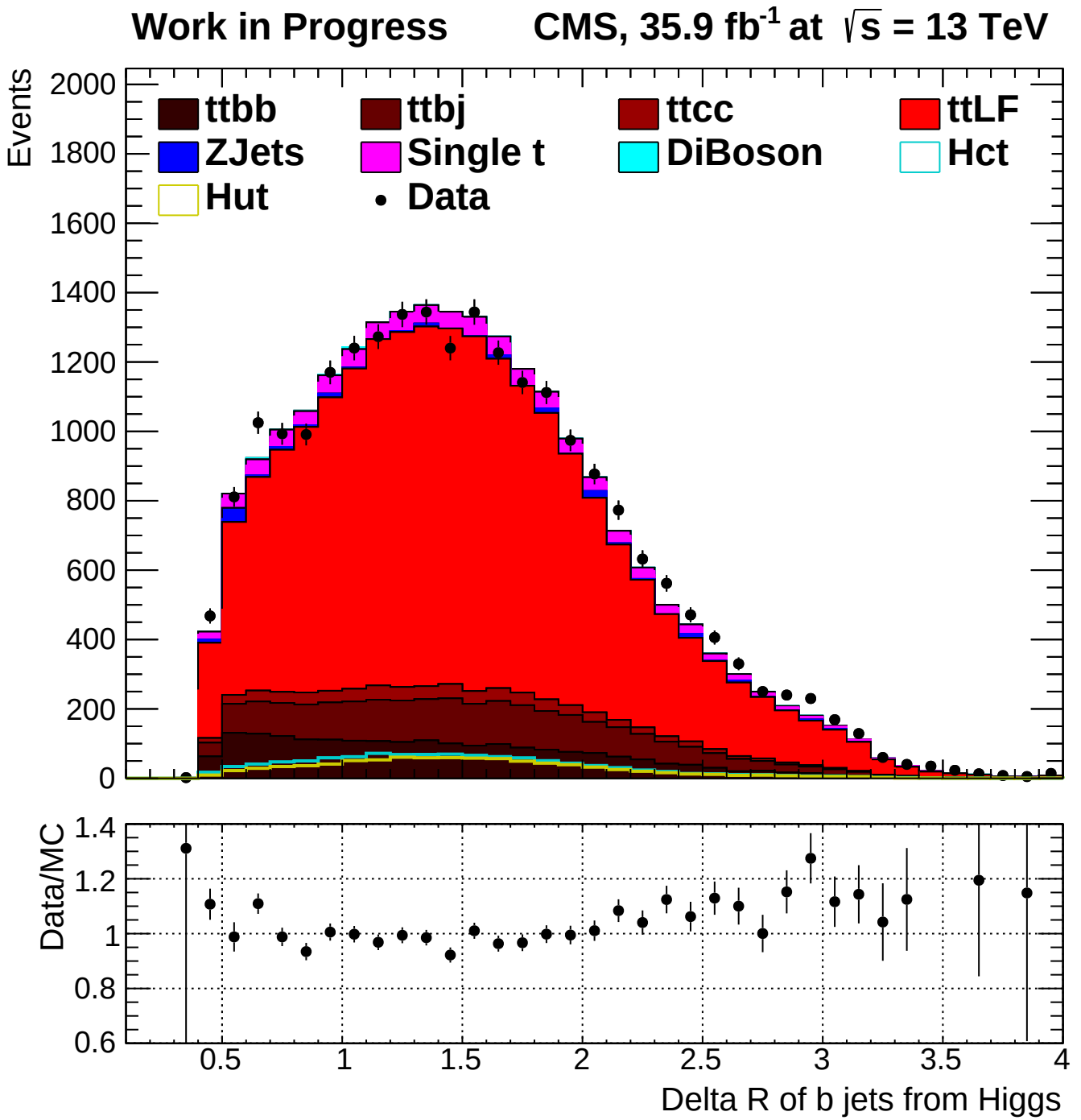
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
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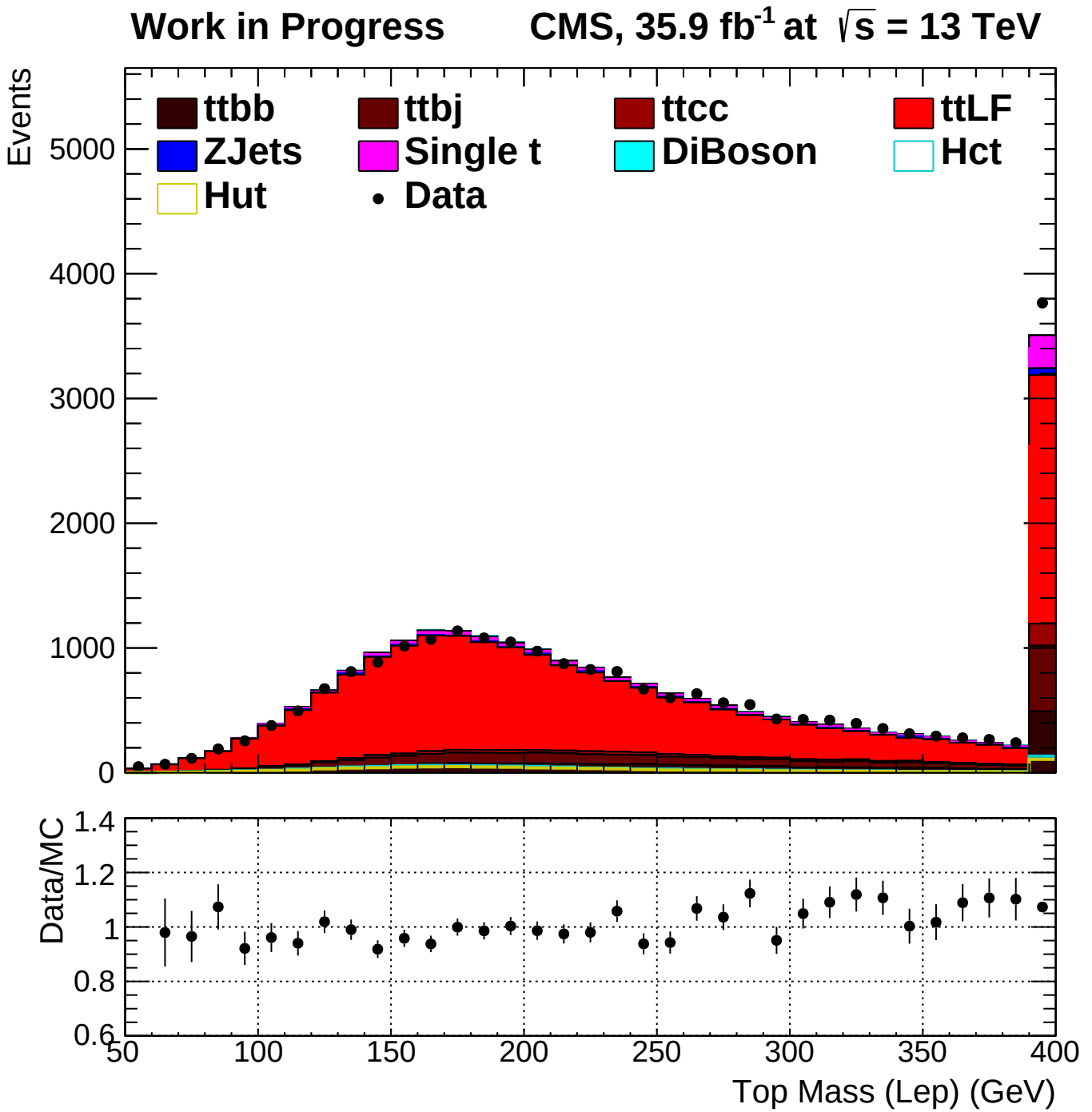
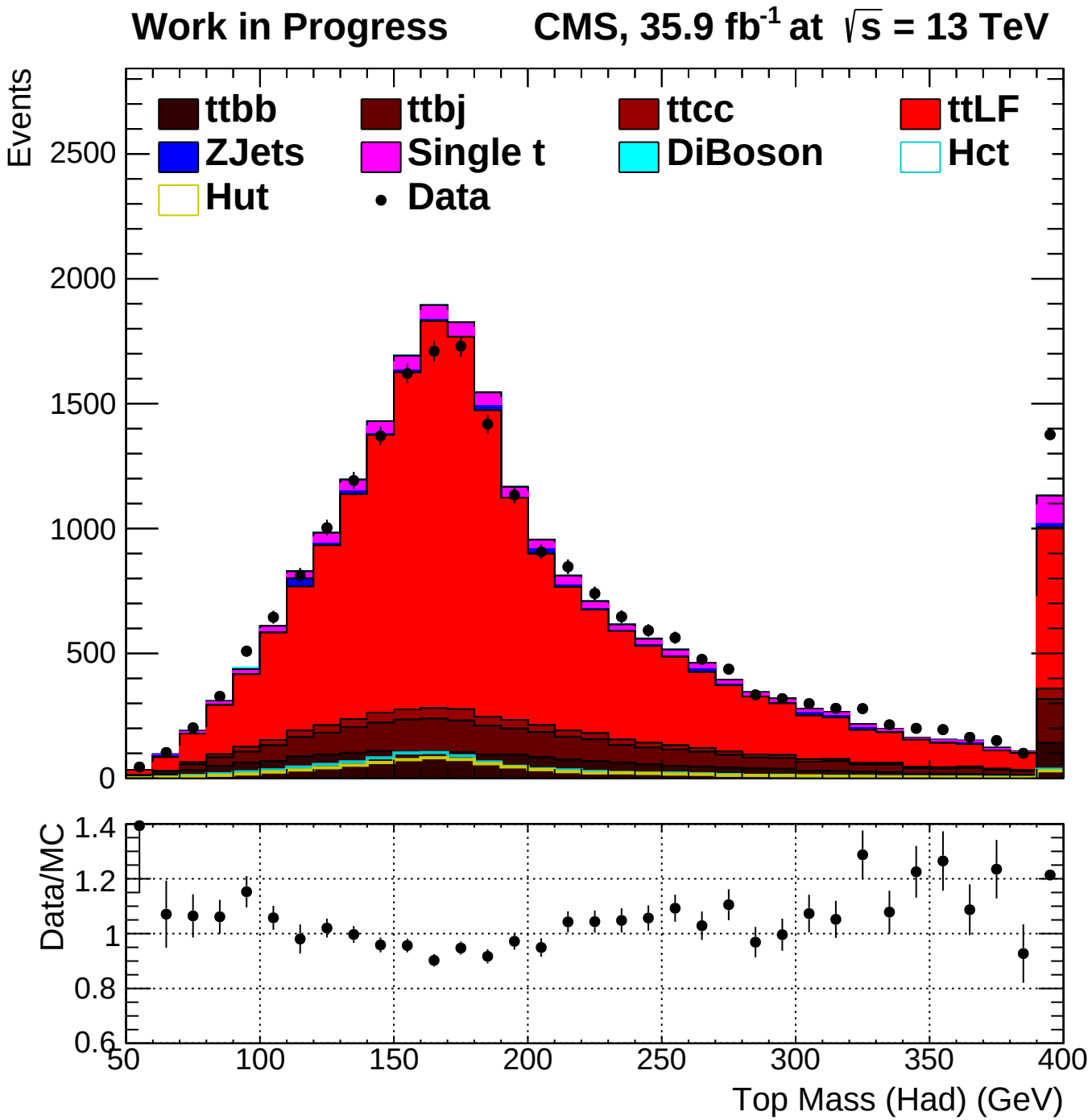
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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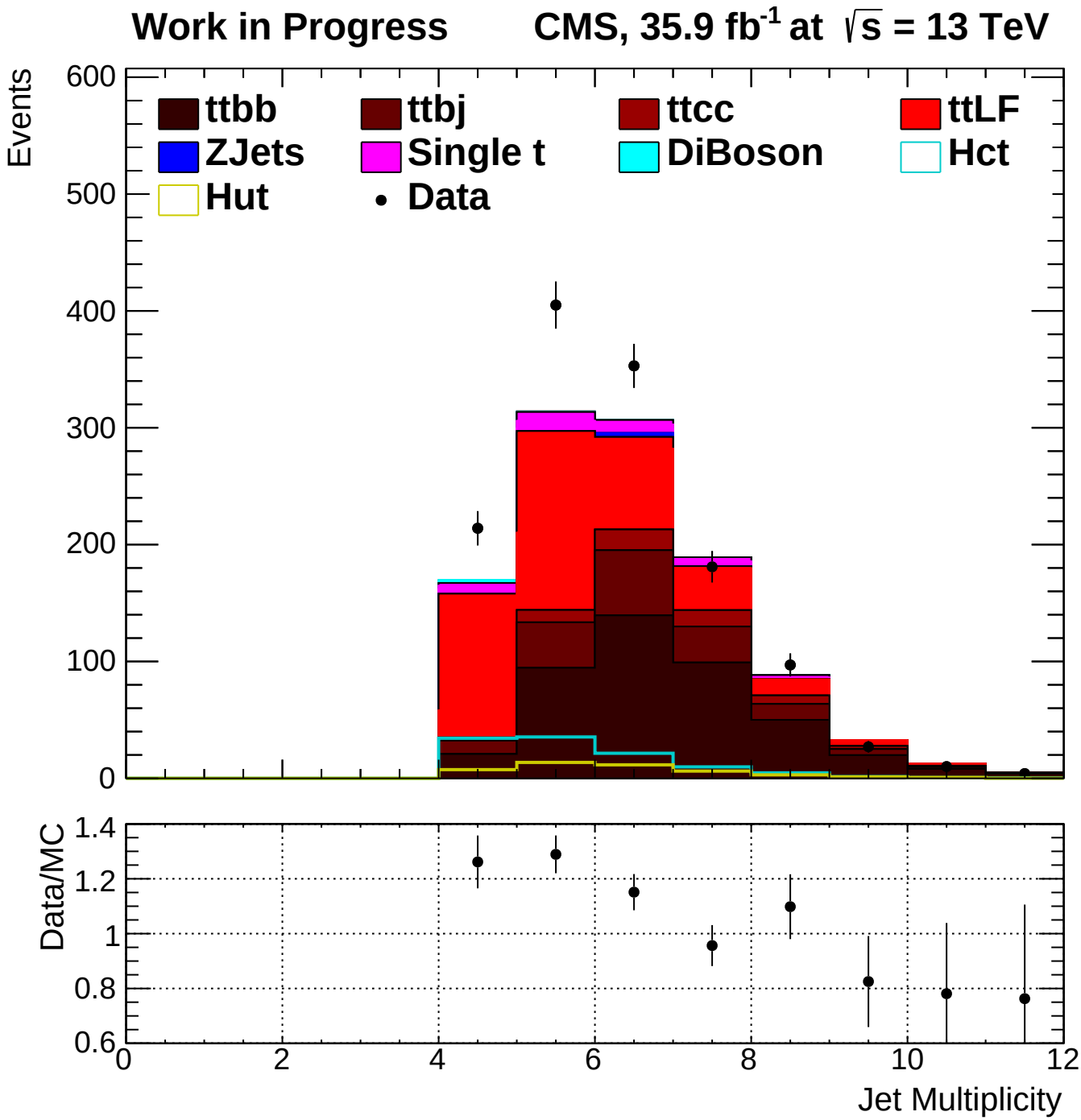
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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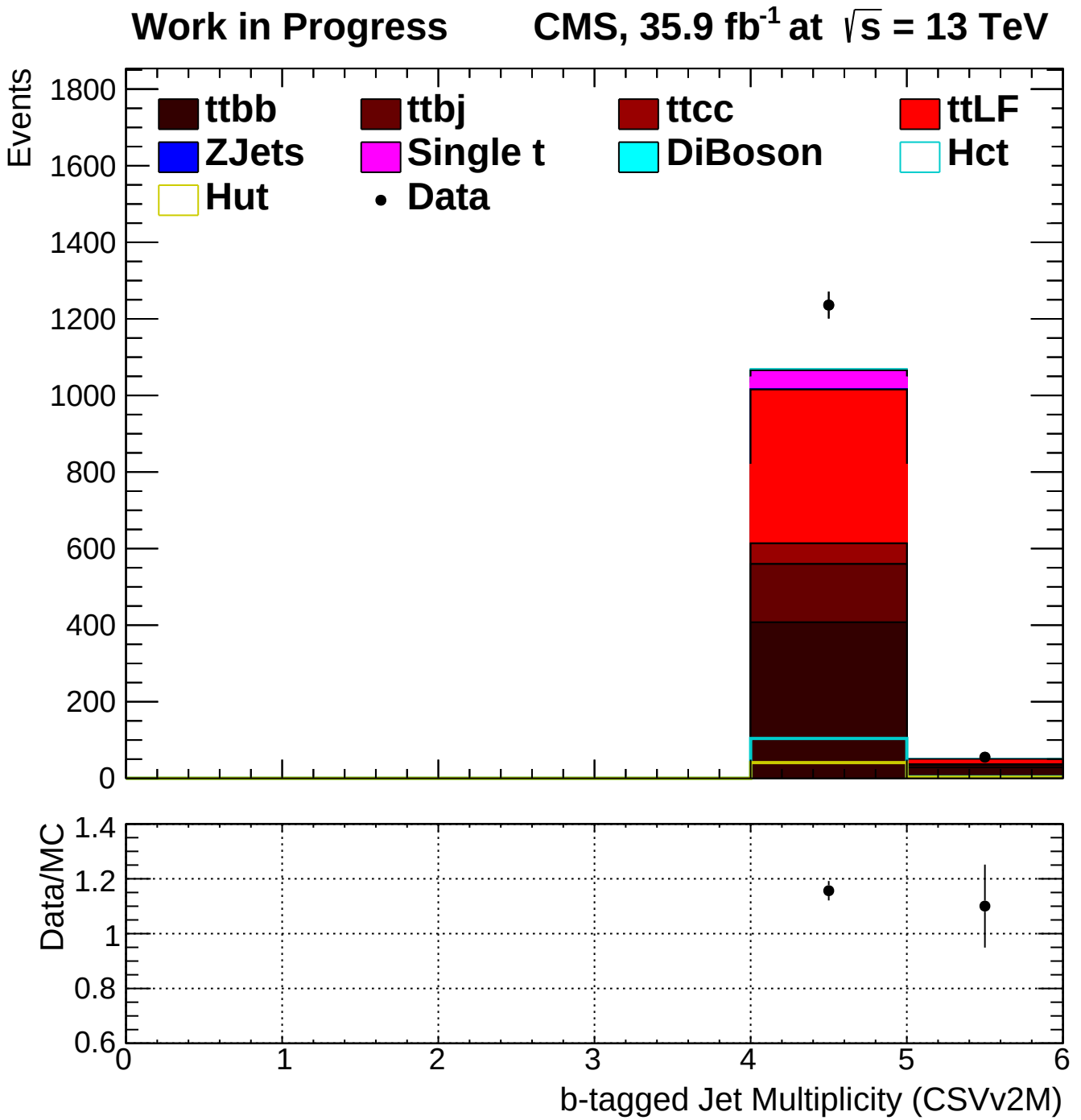
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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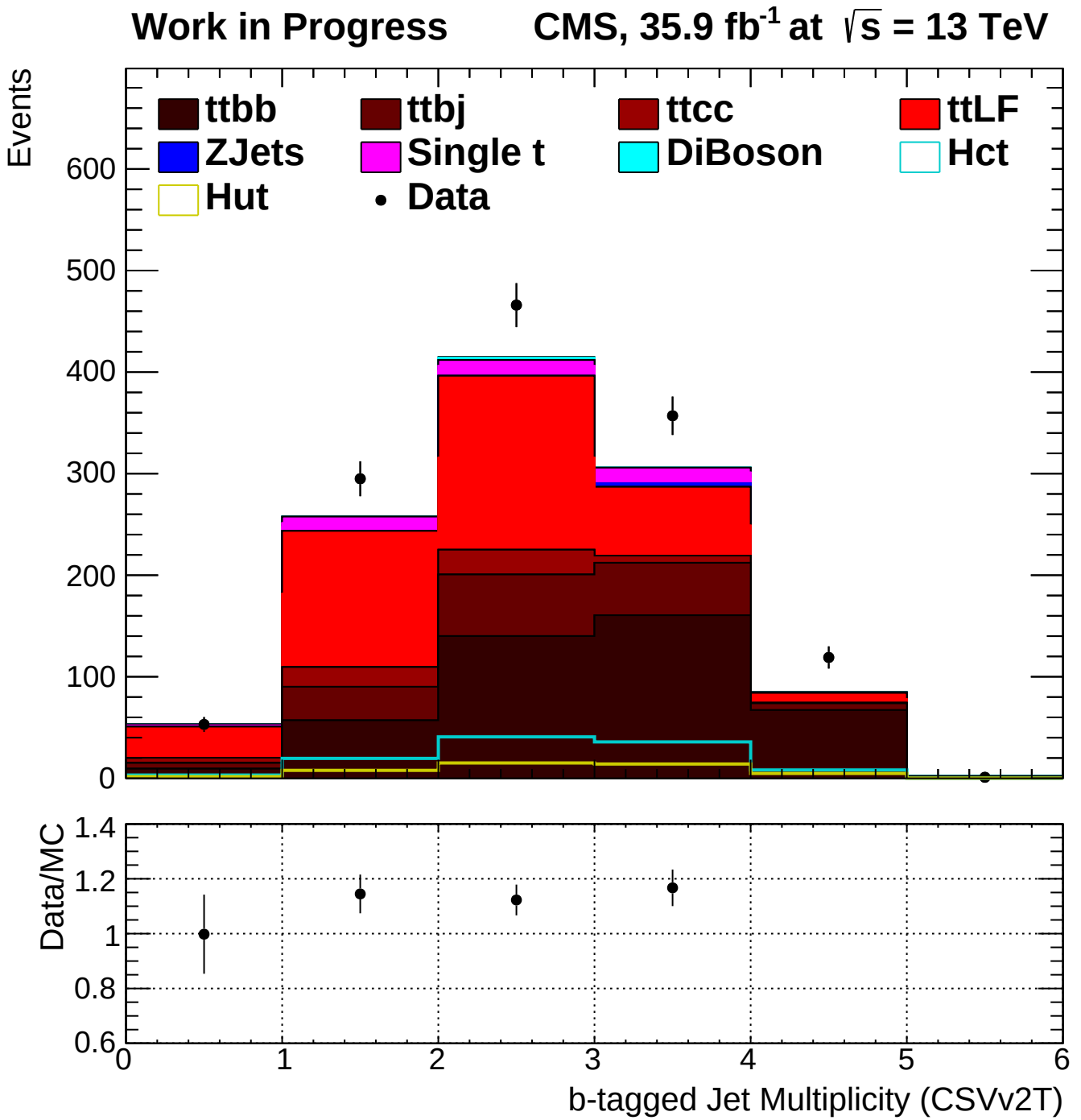
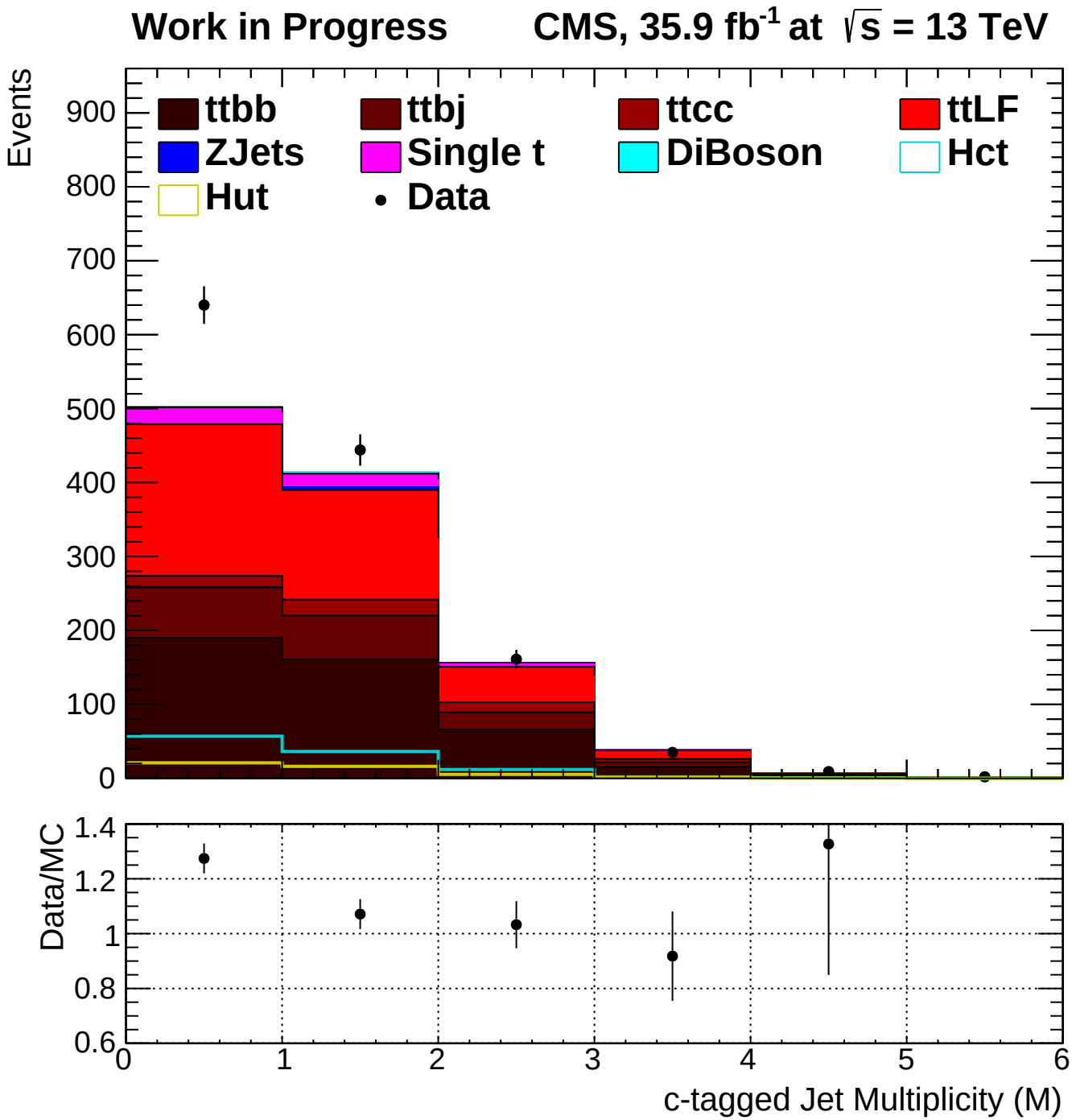
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
600
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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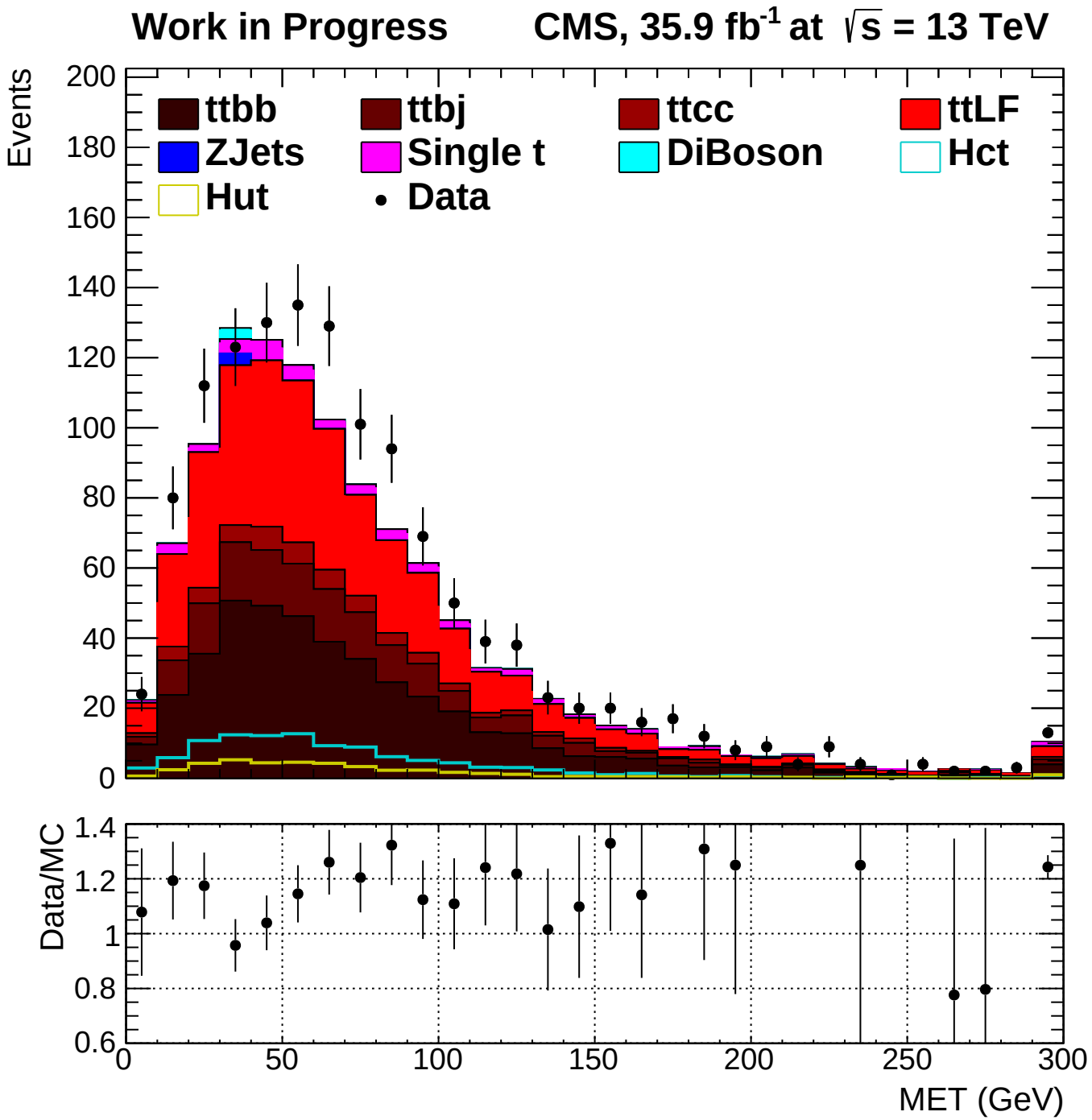
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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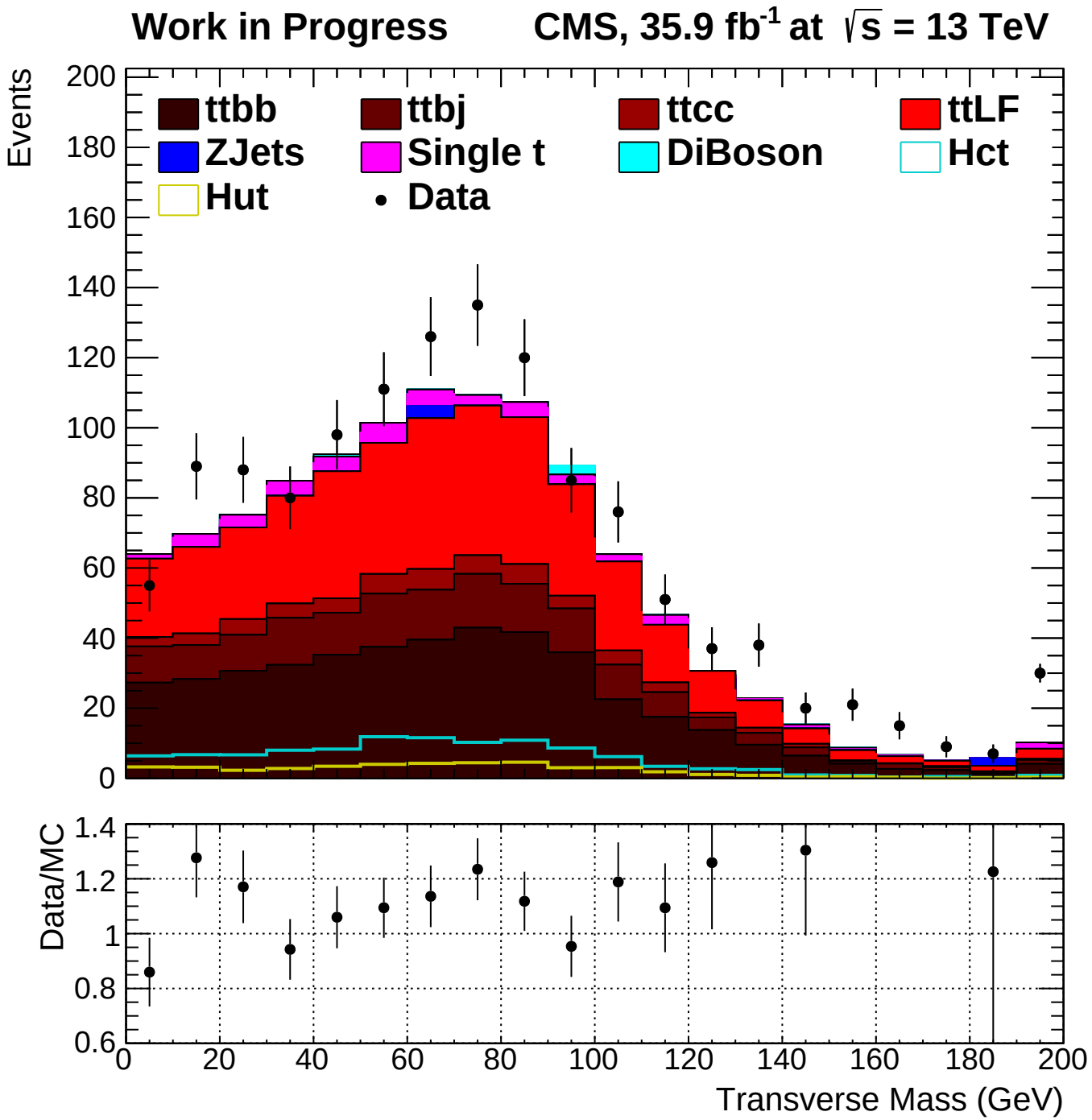
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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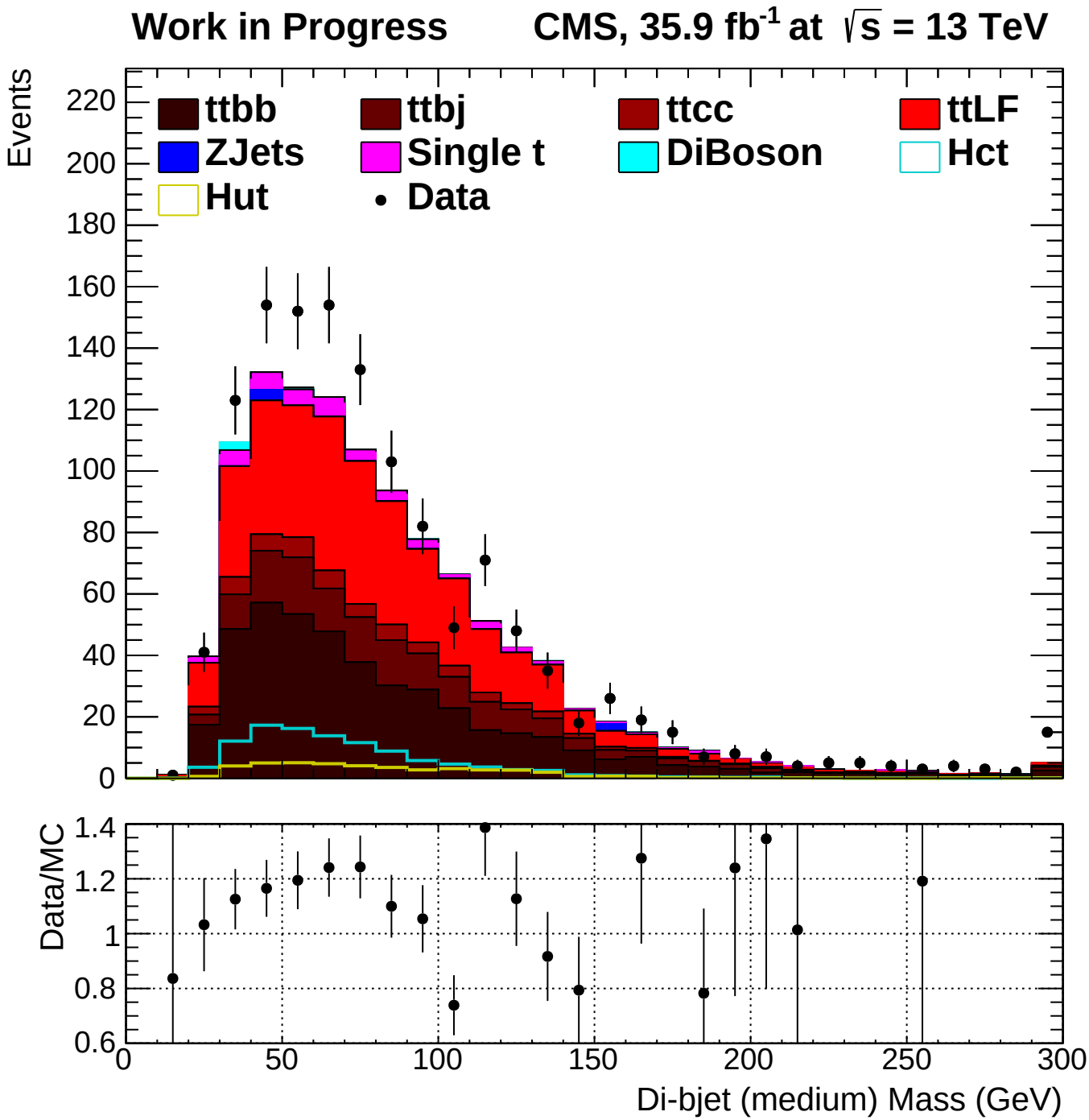
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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ttbj
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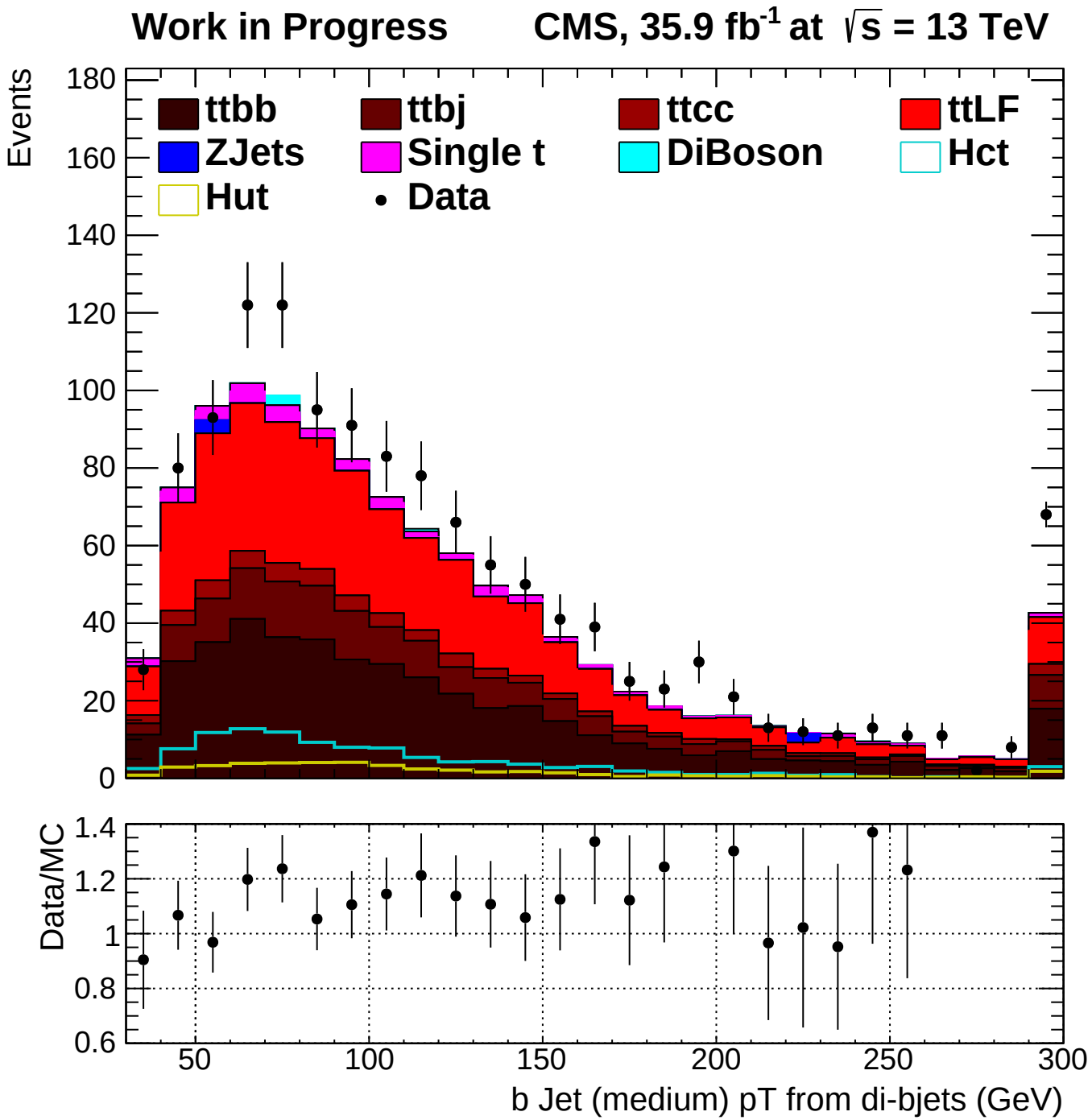
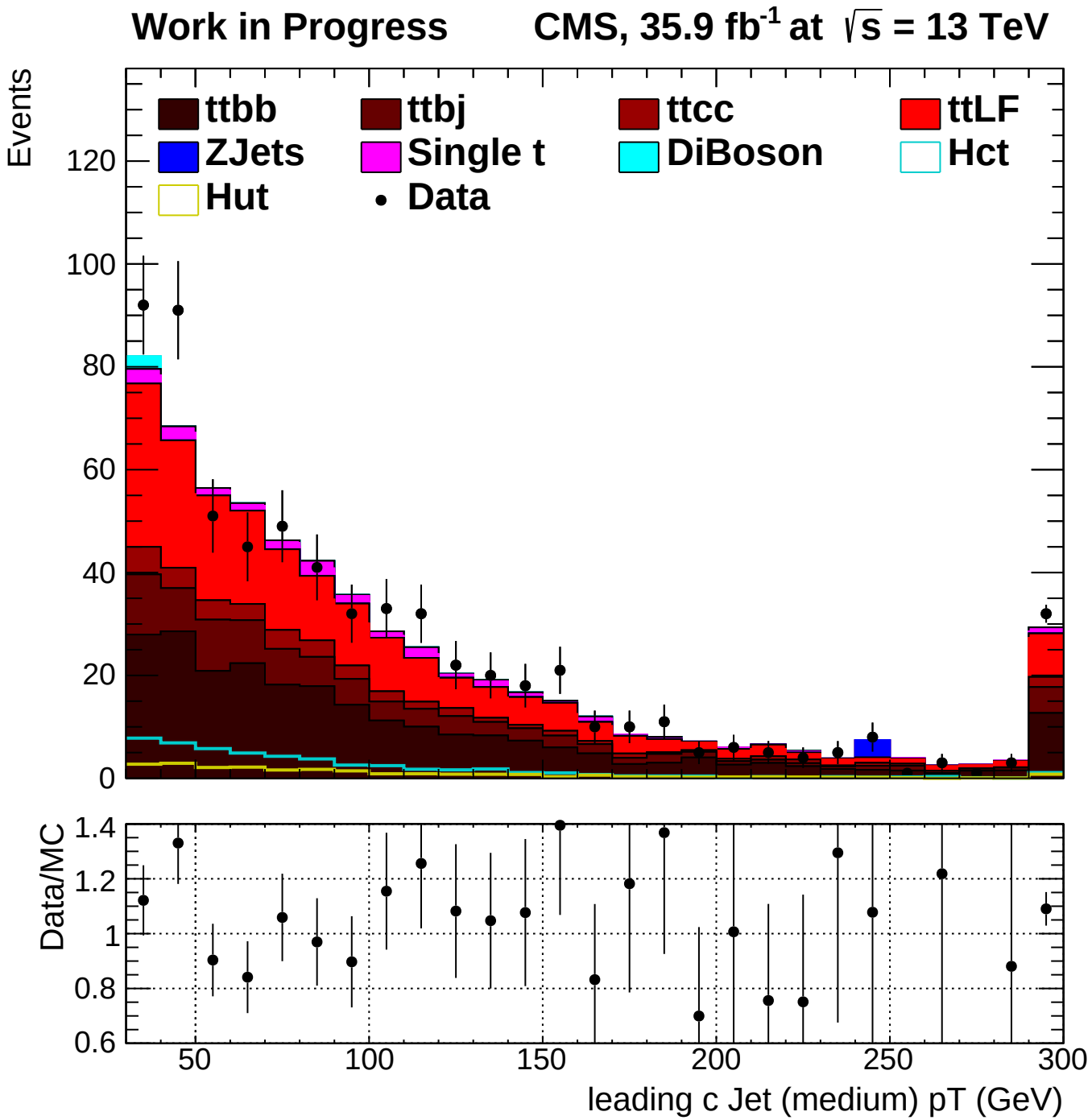
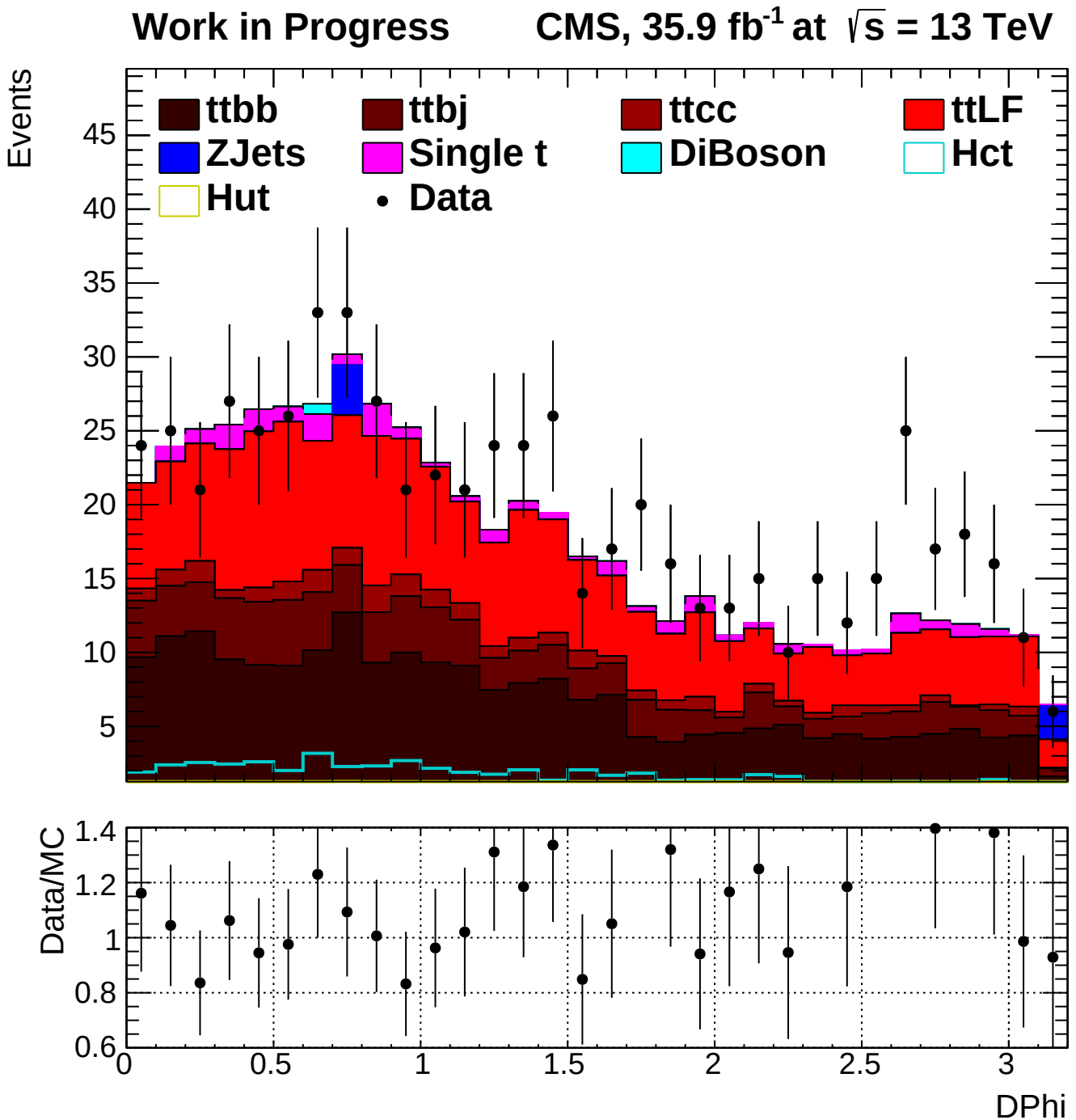
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
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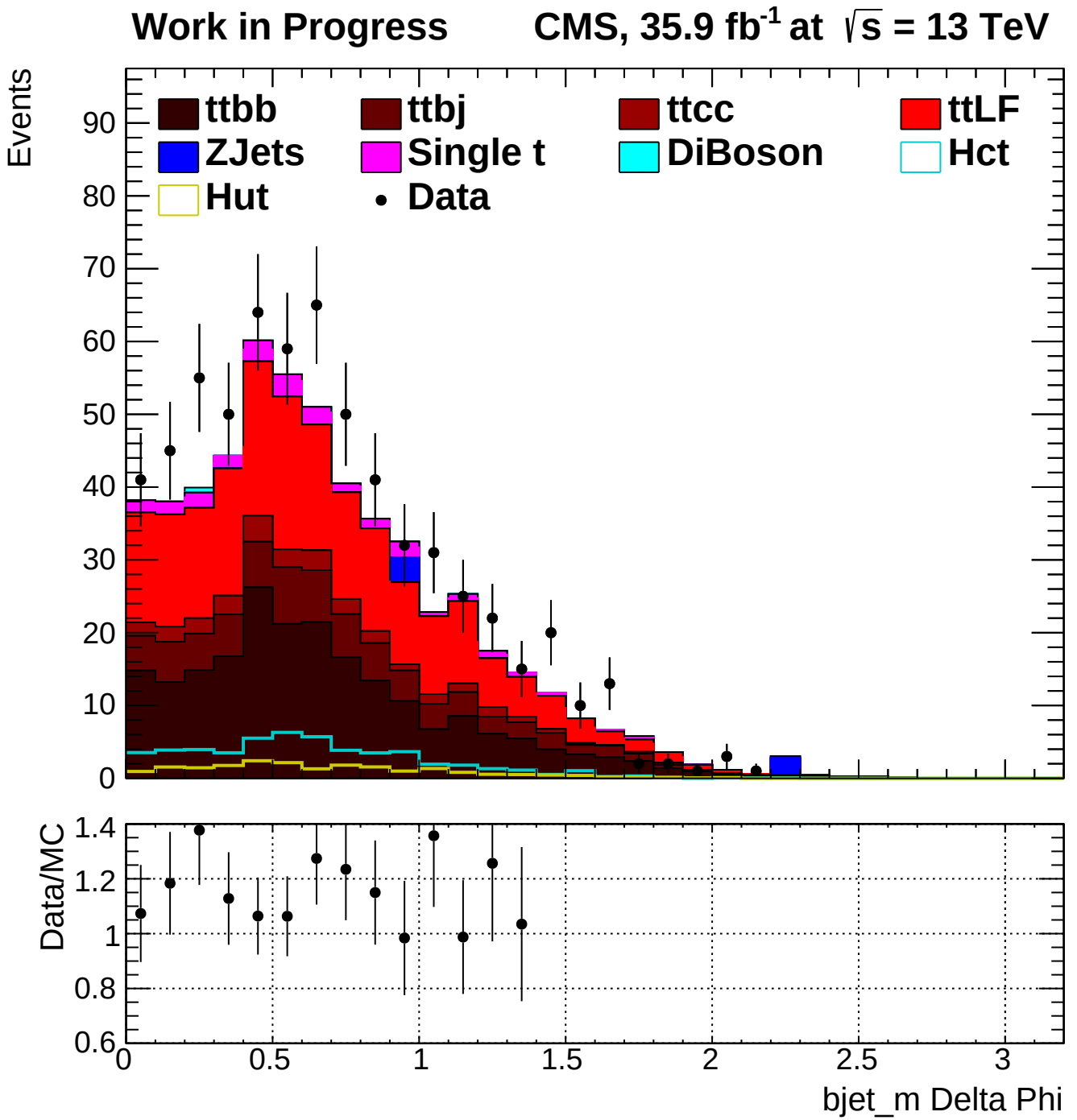
Hut
Data
Data/MC
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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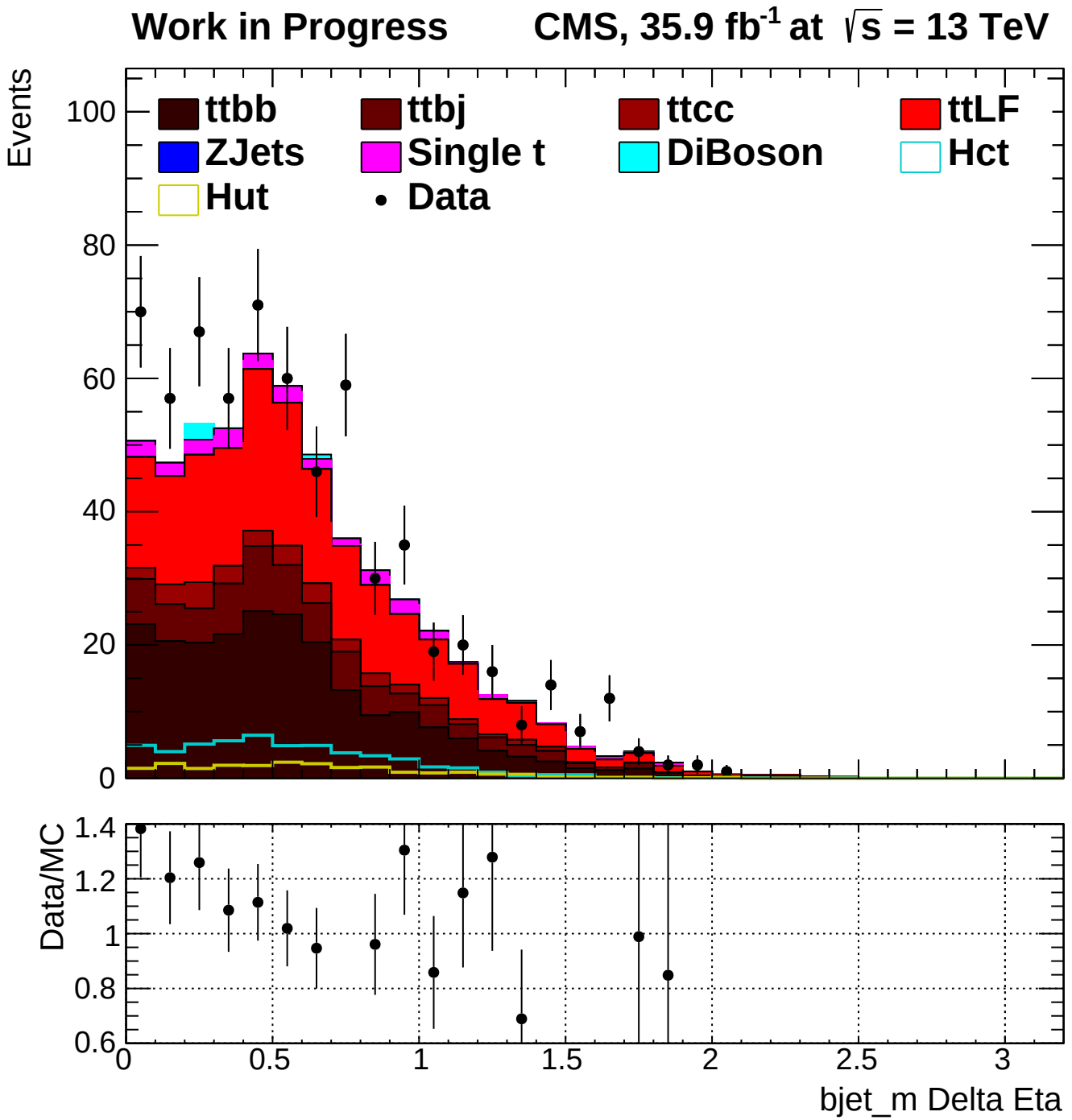
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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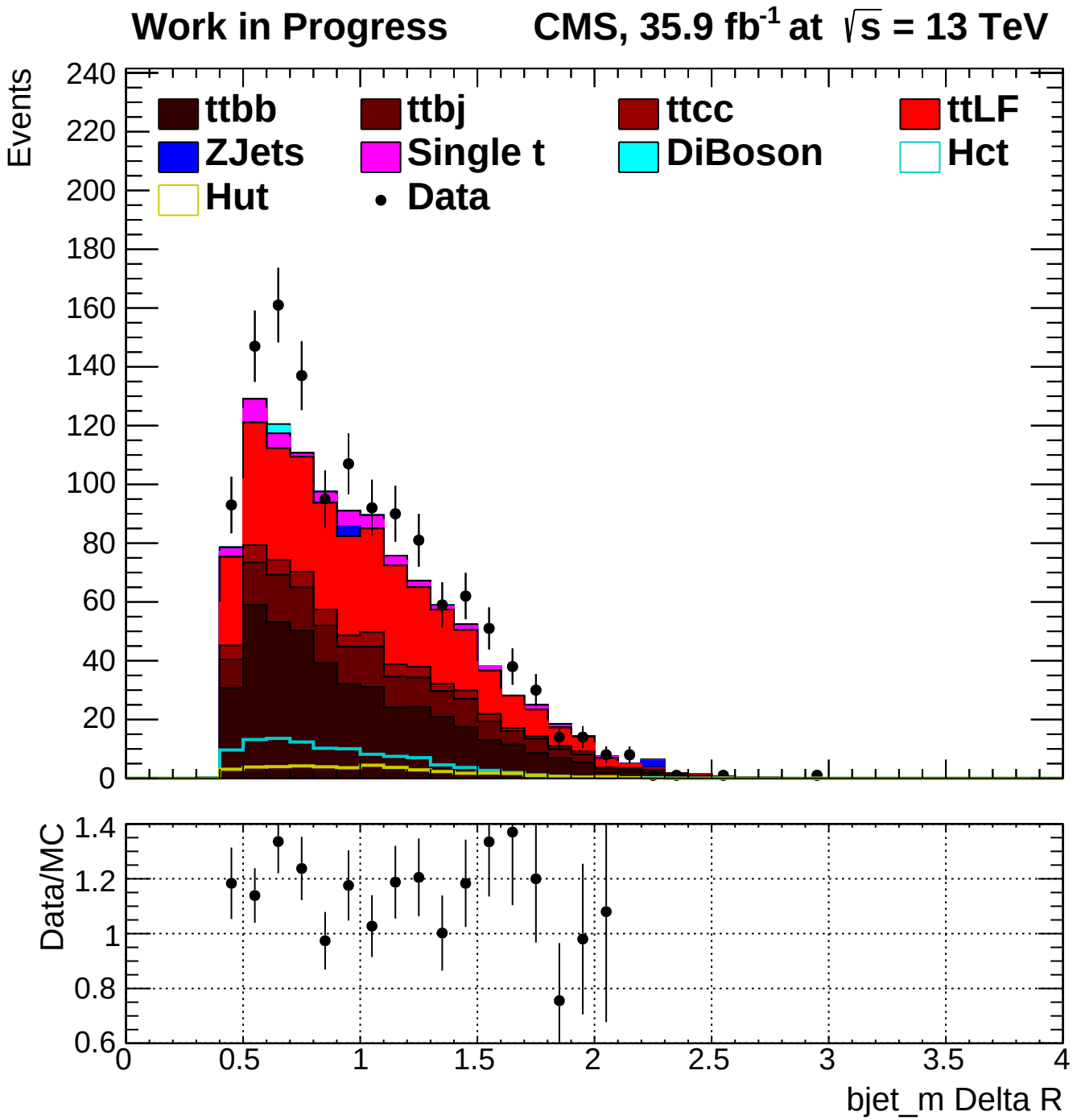
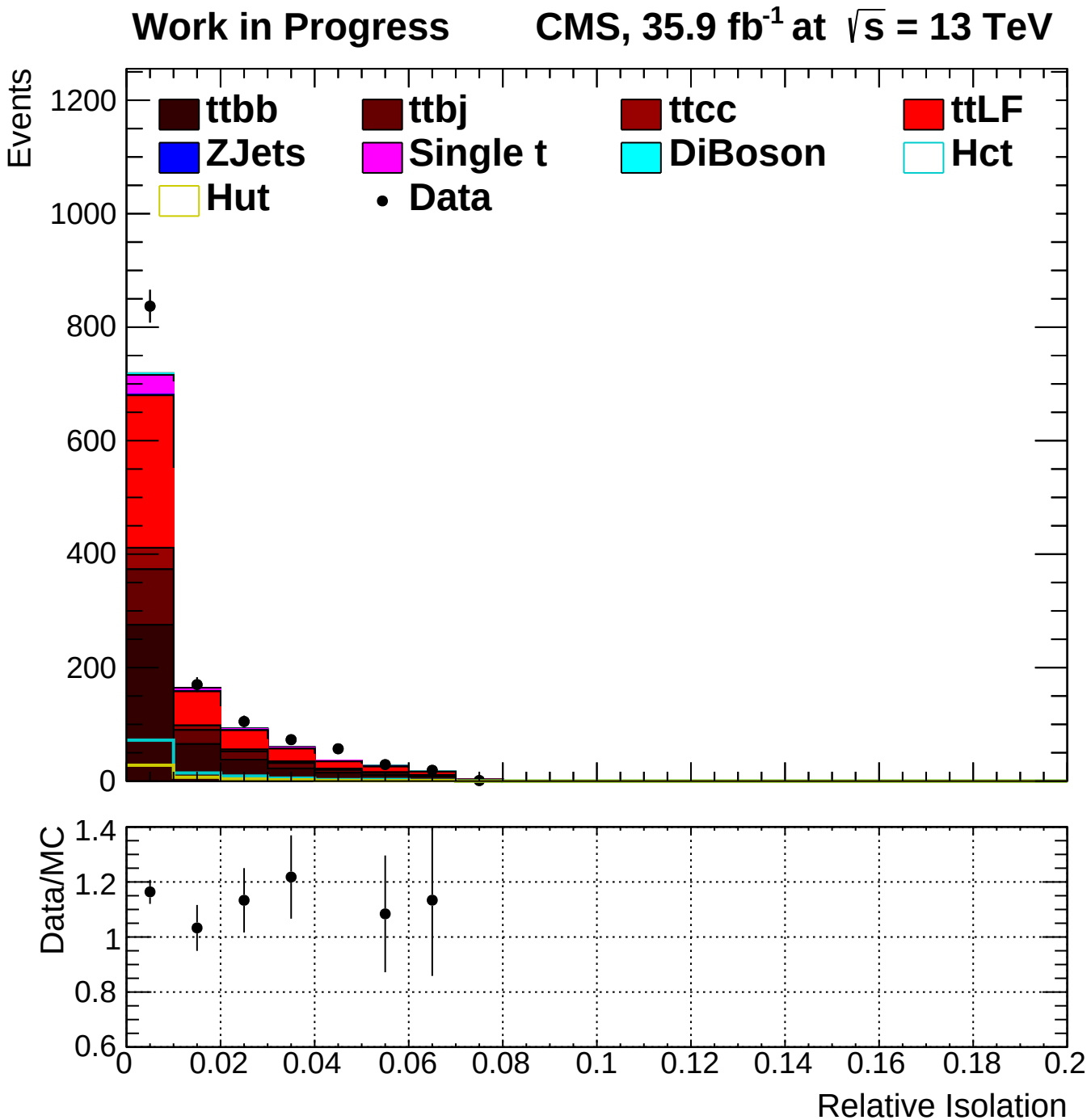
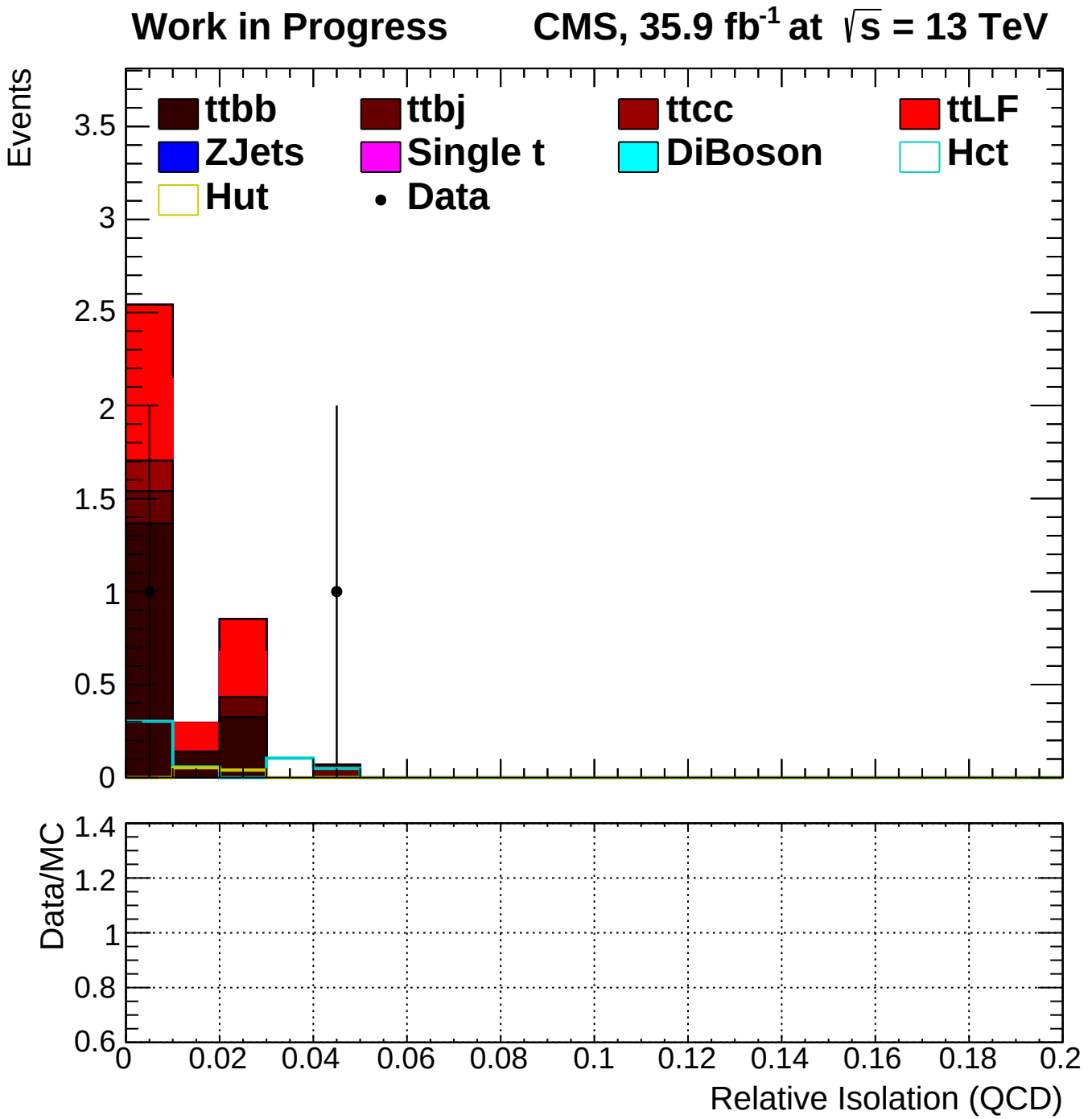
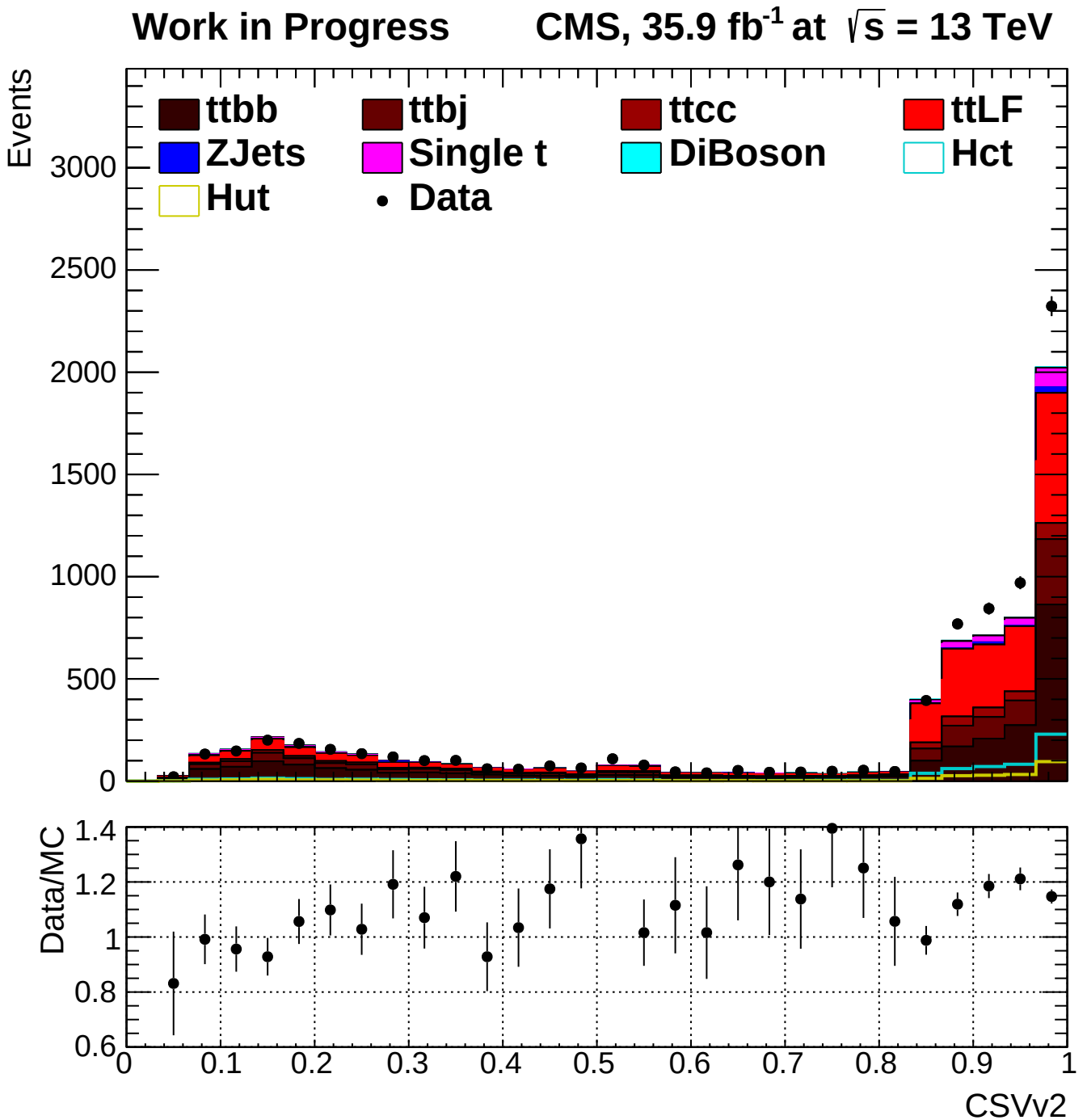
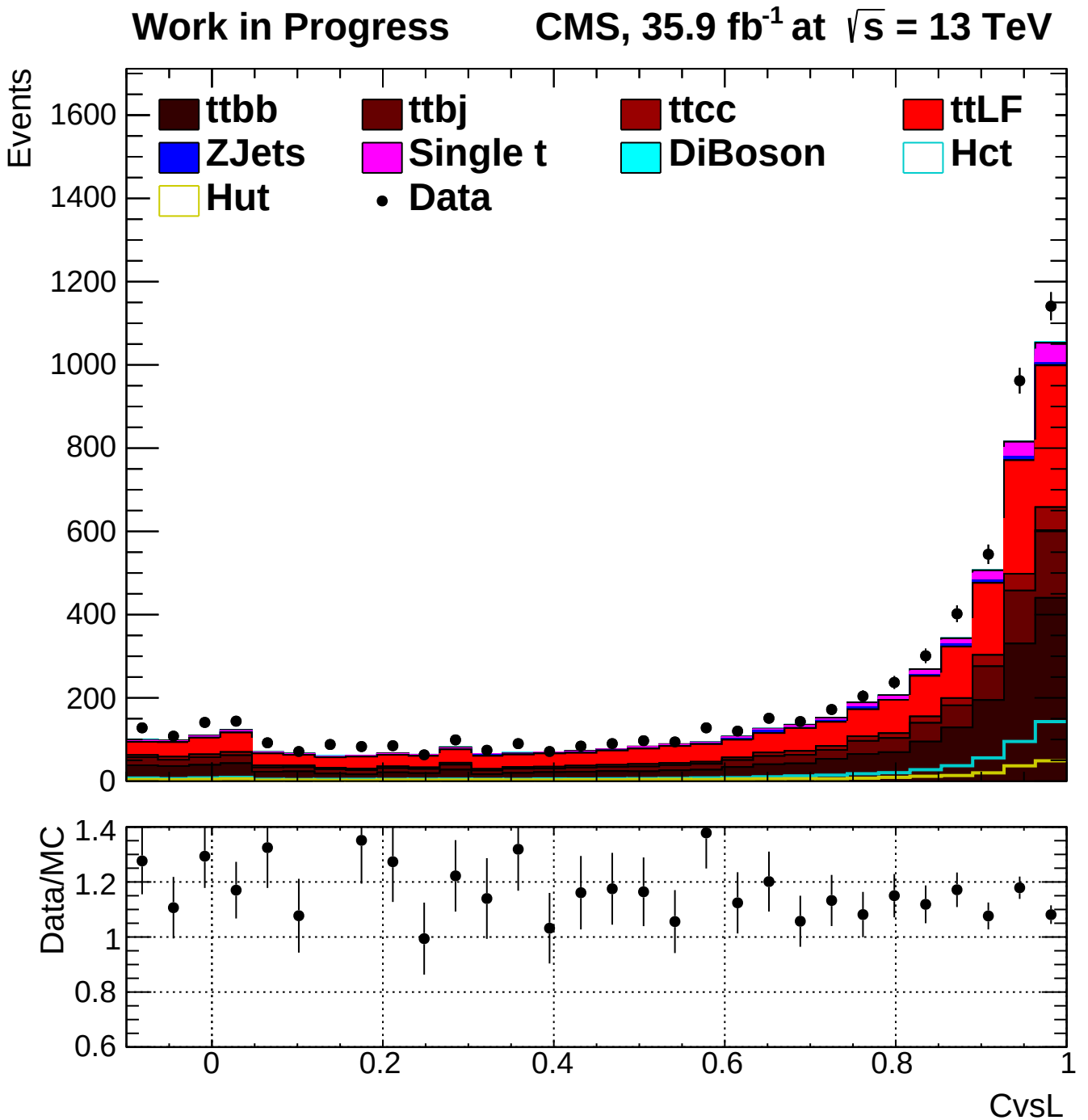
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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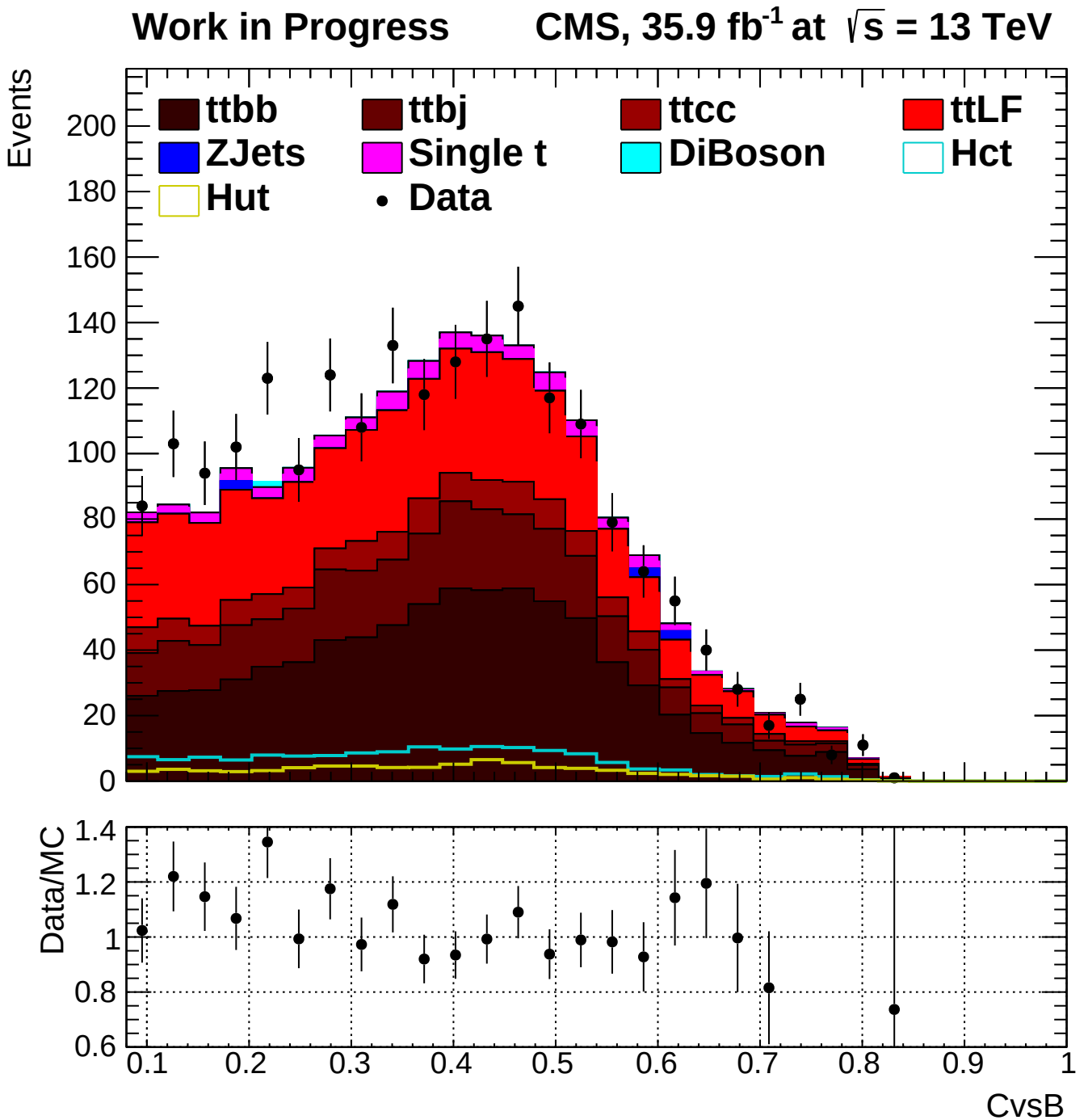
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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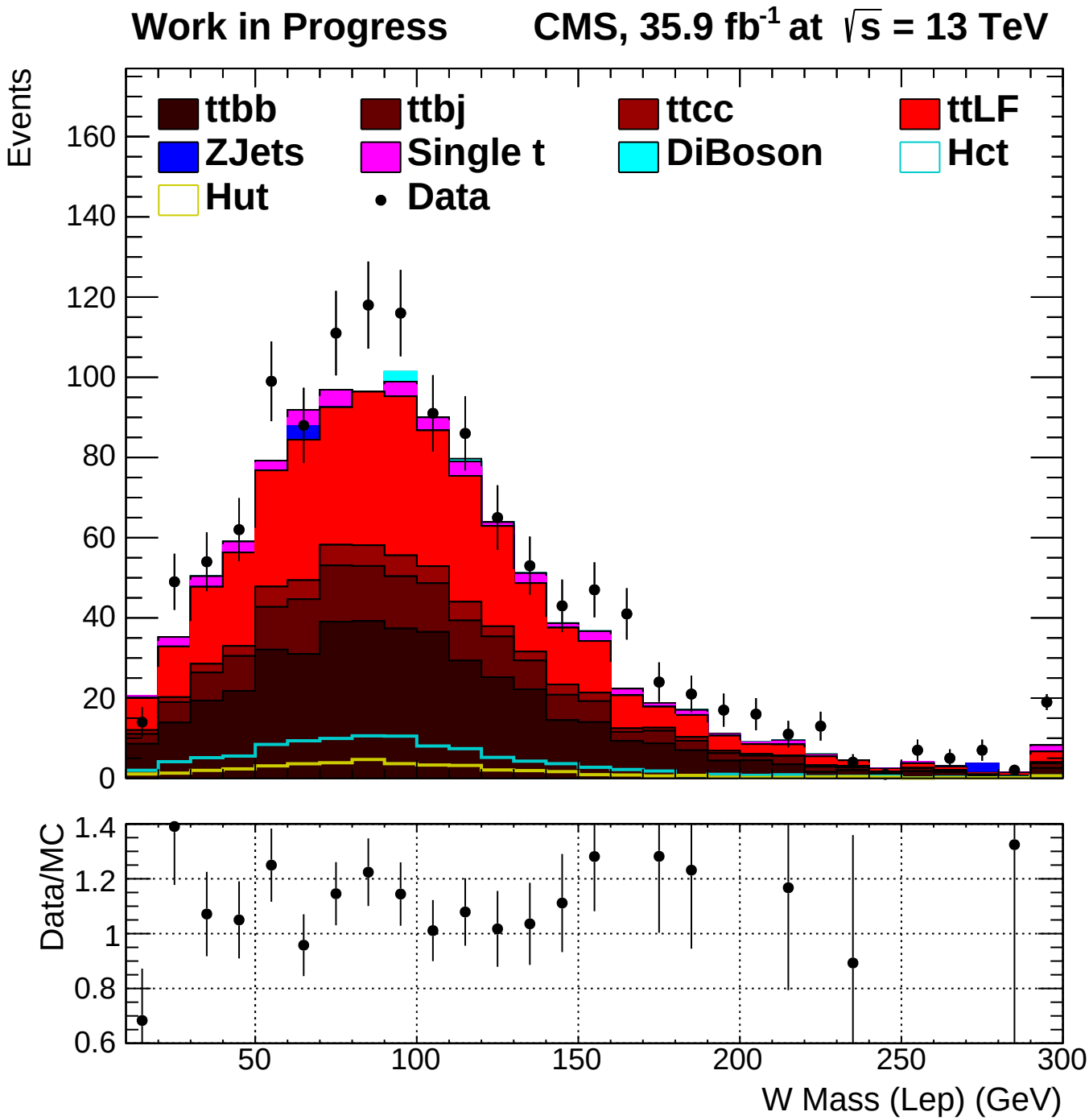
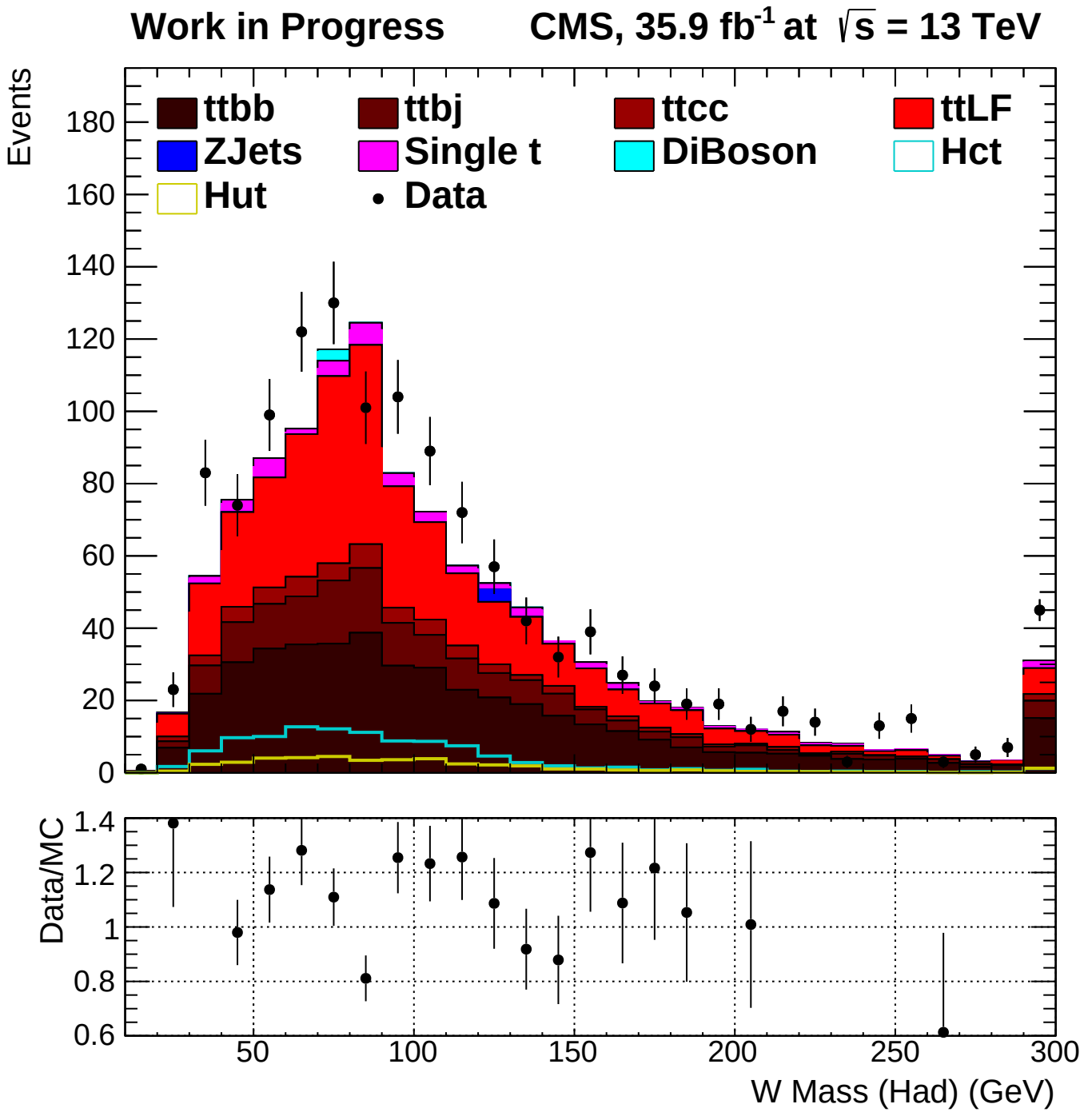
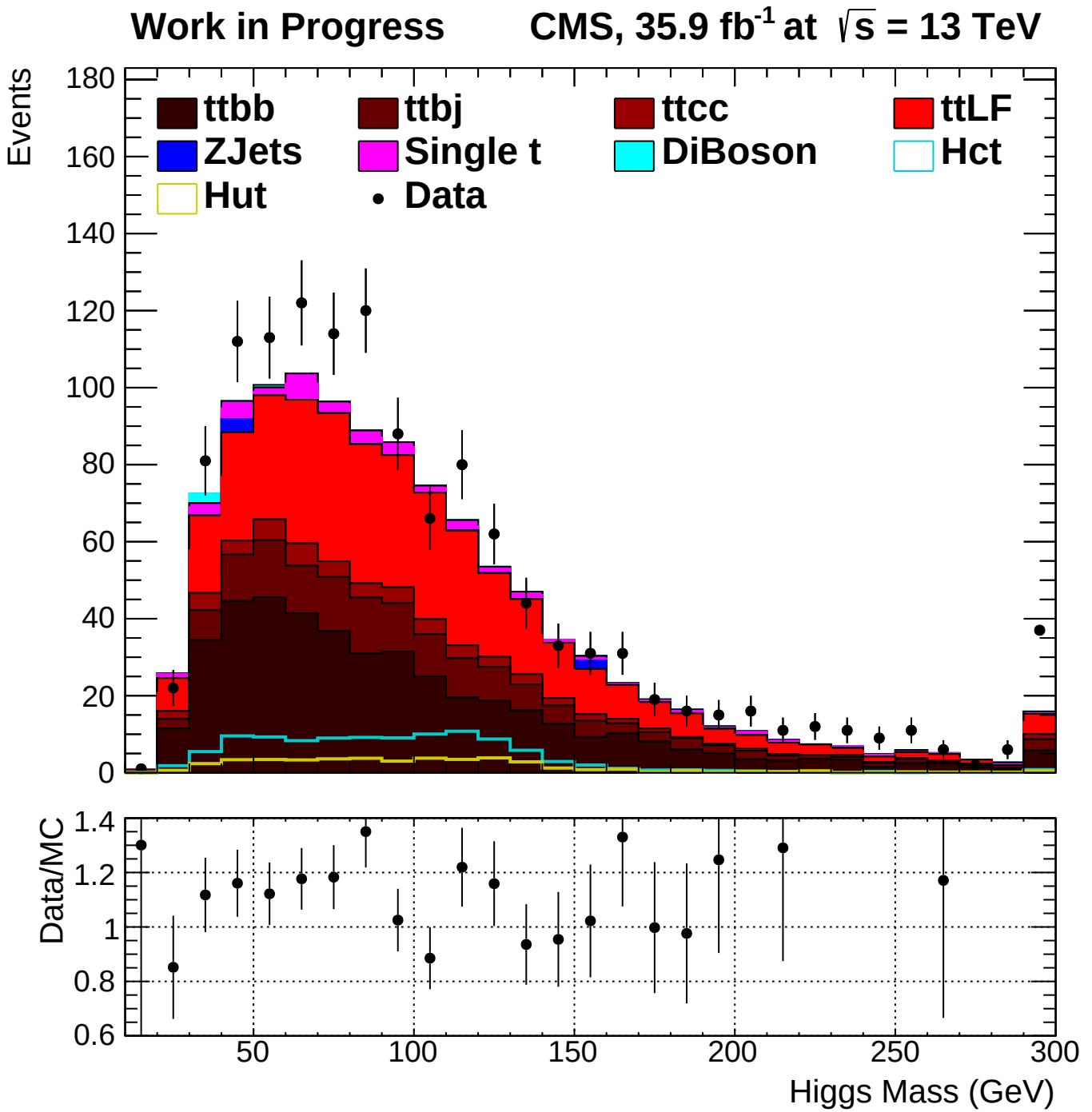
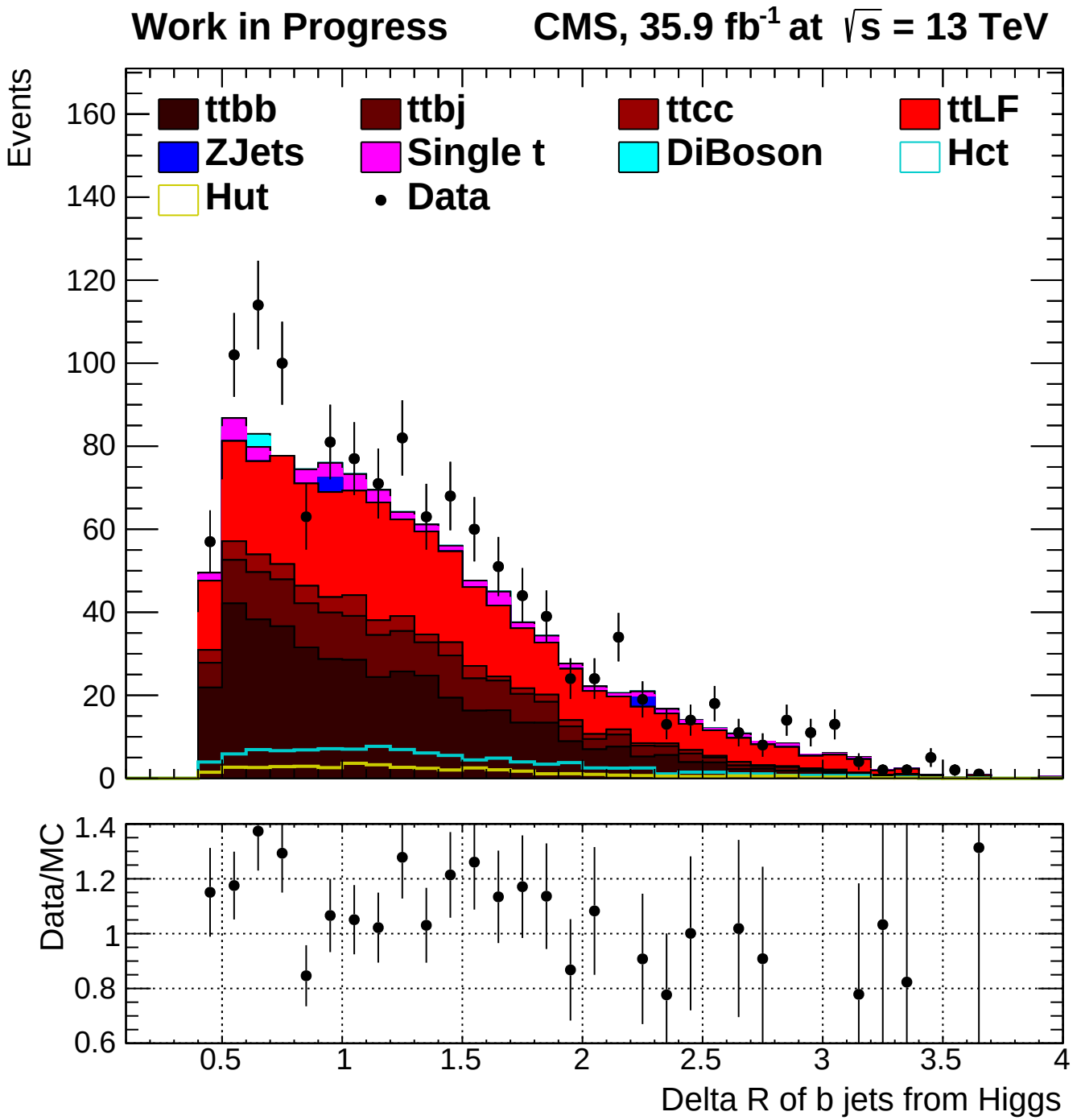
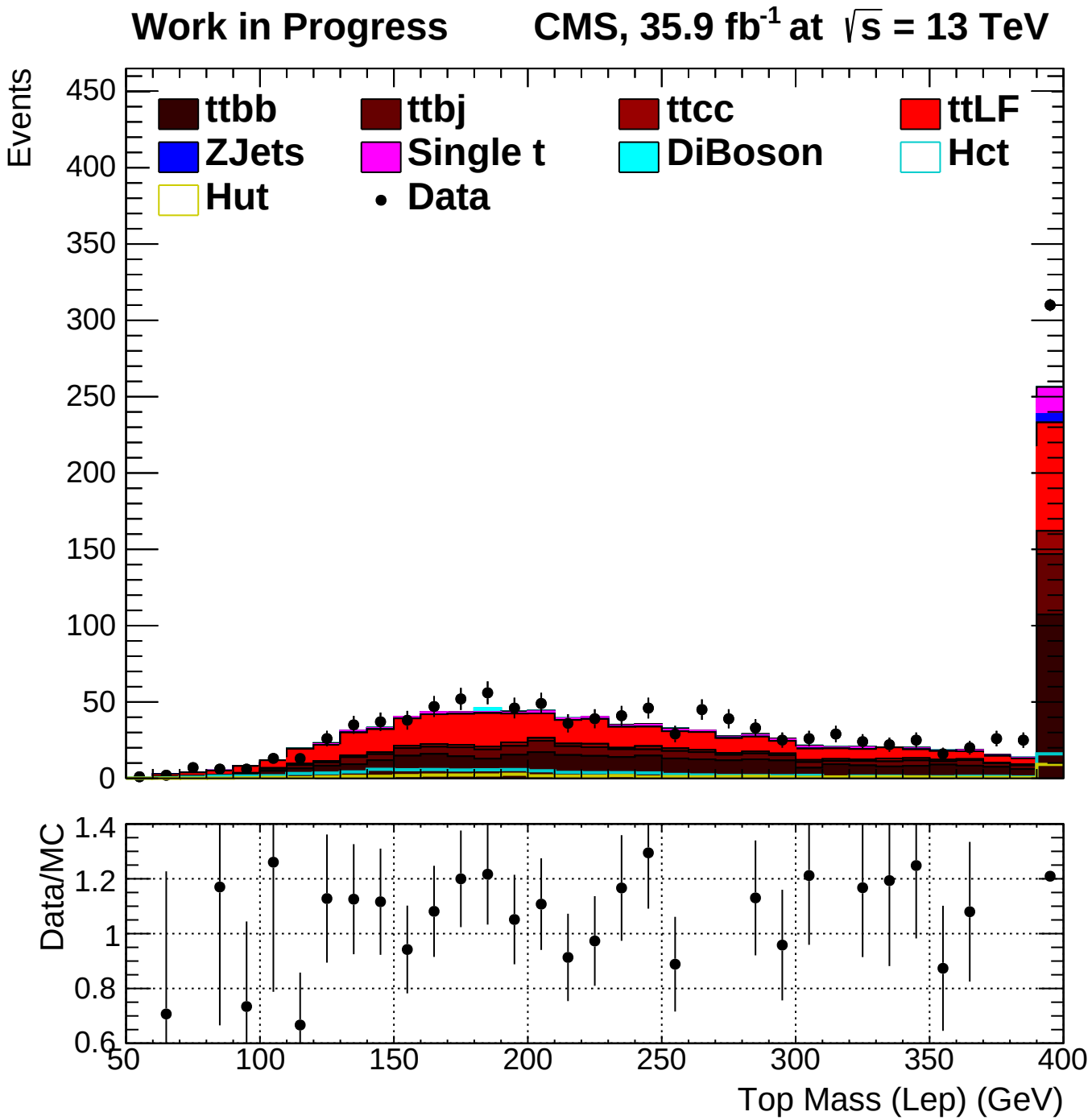
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB

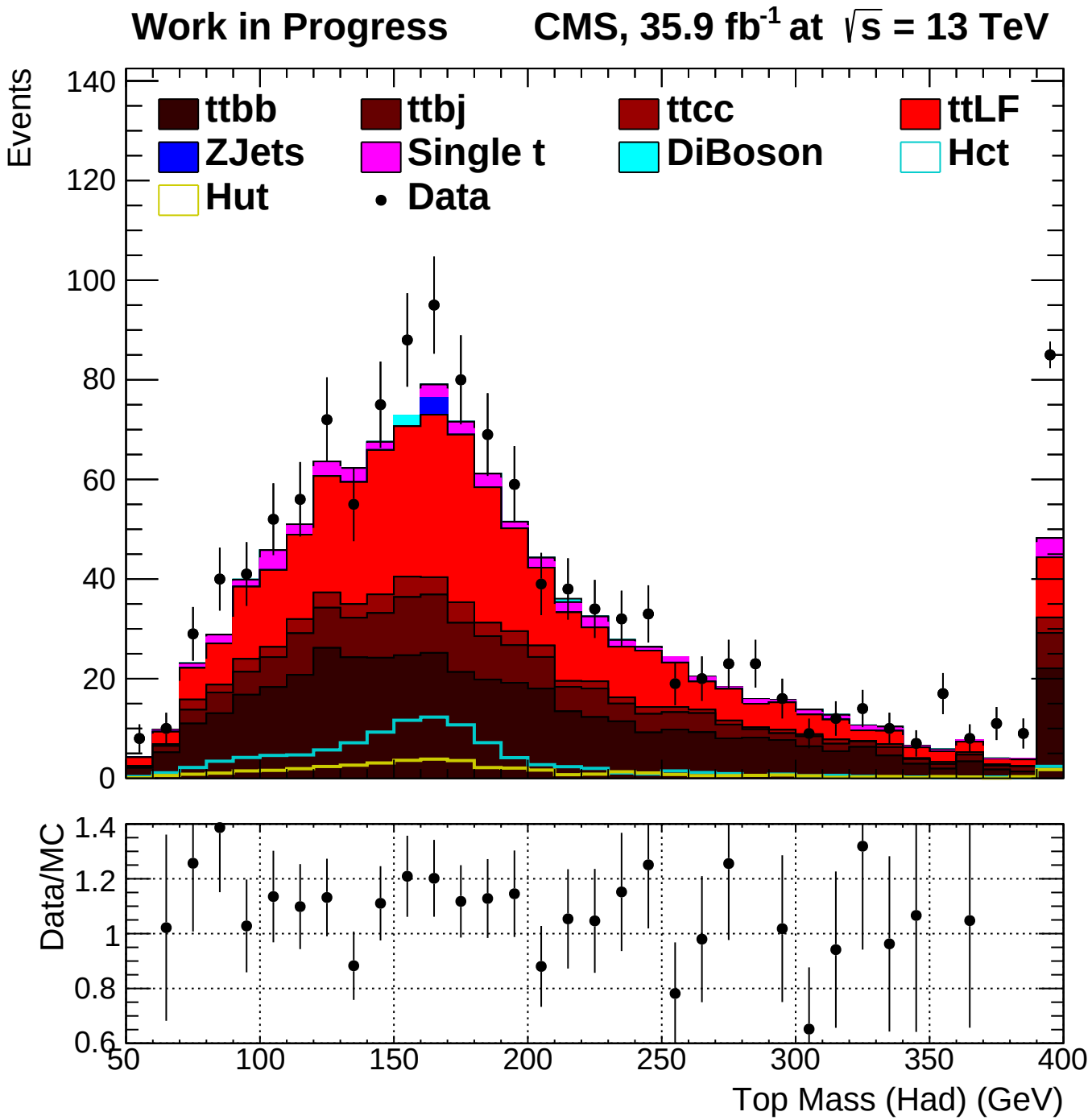

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)

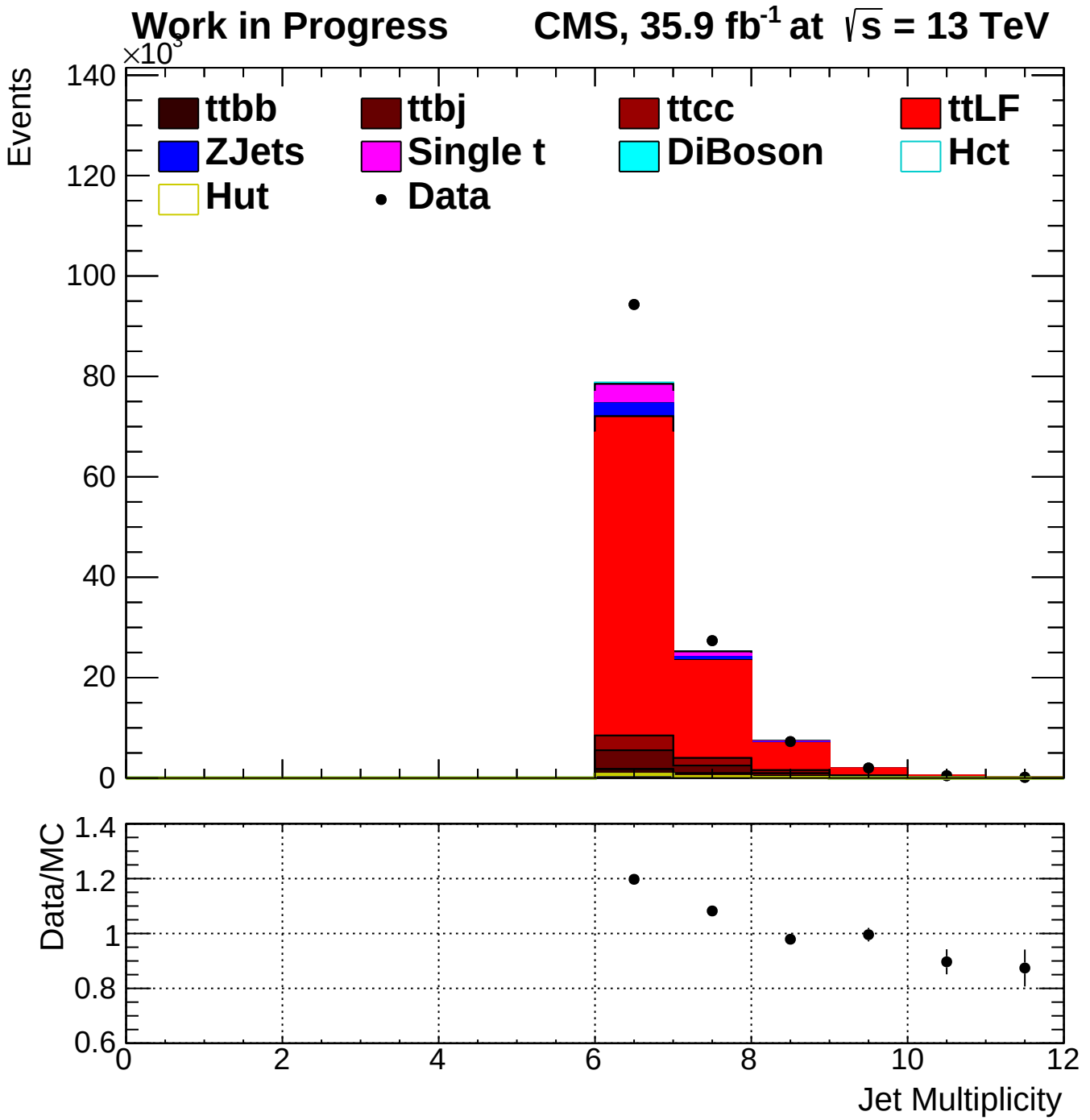

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

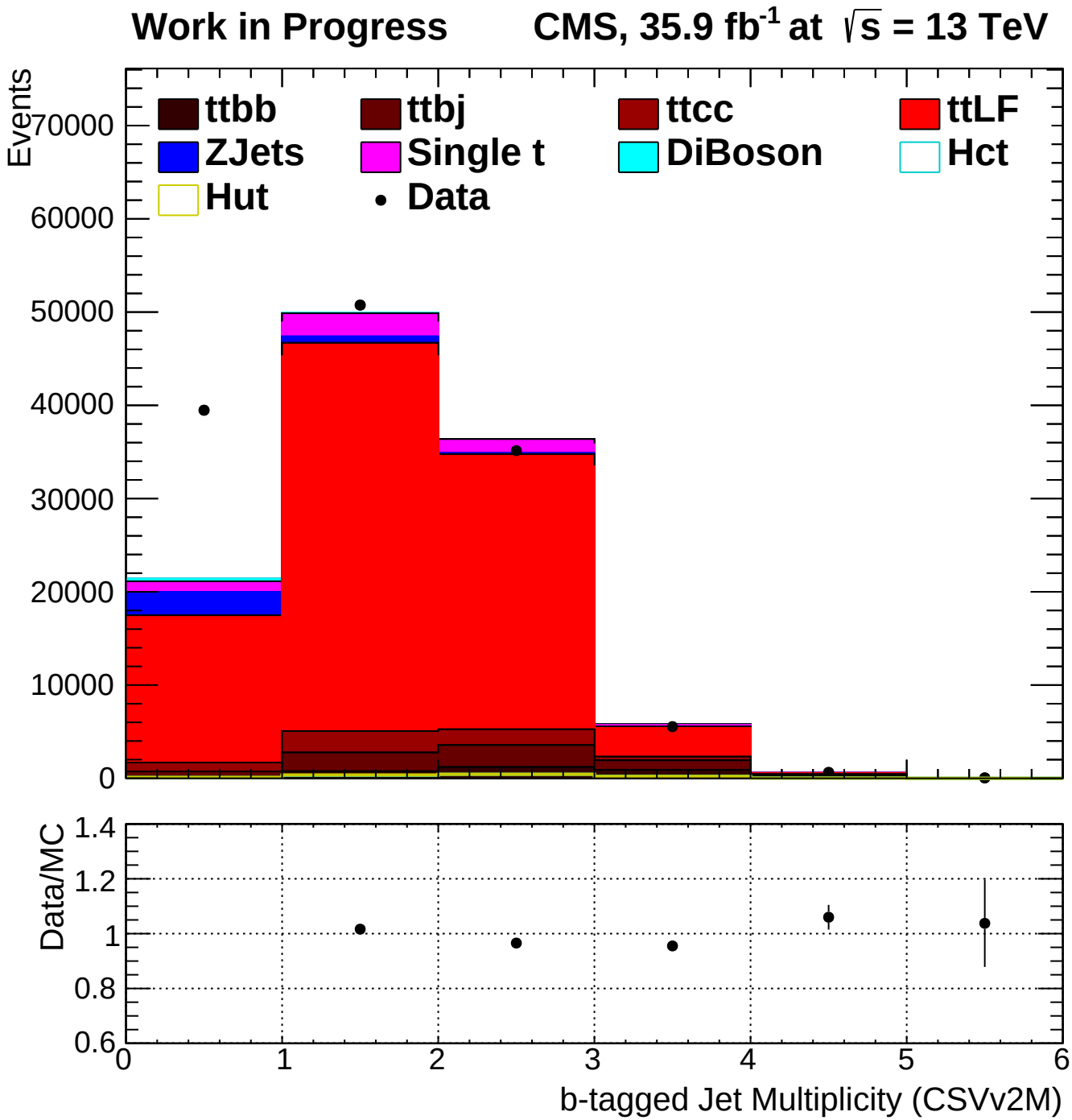

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

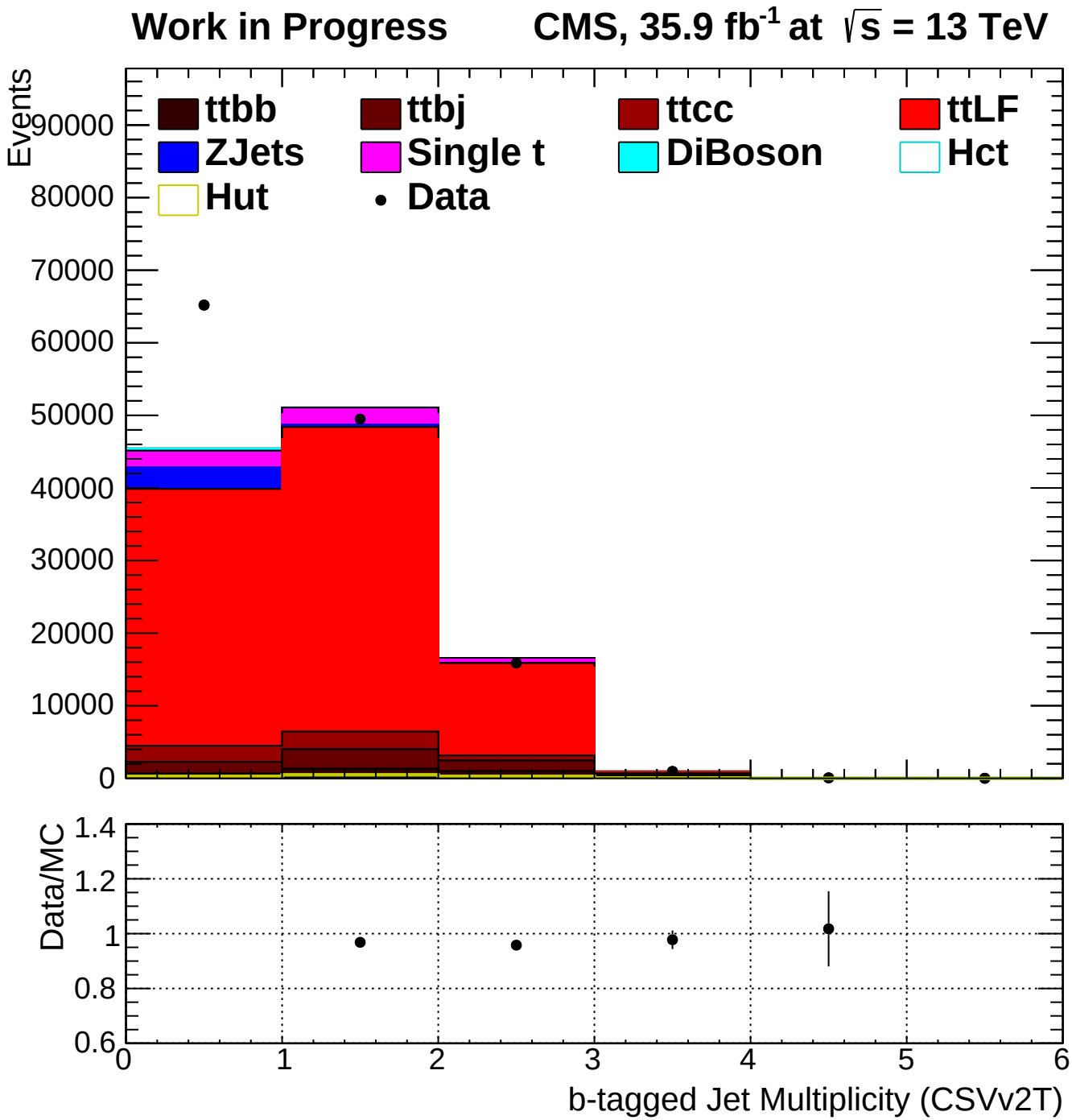

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs

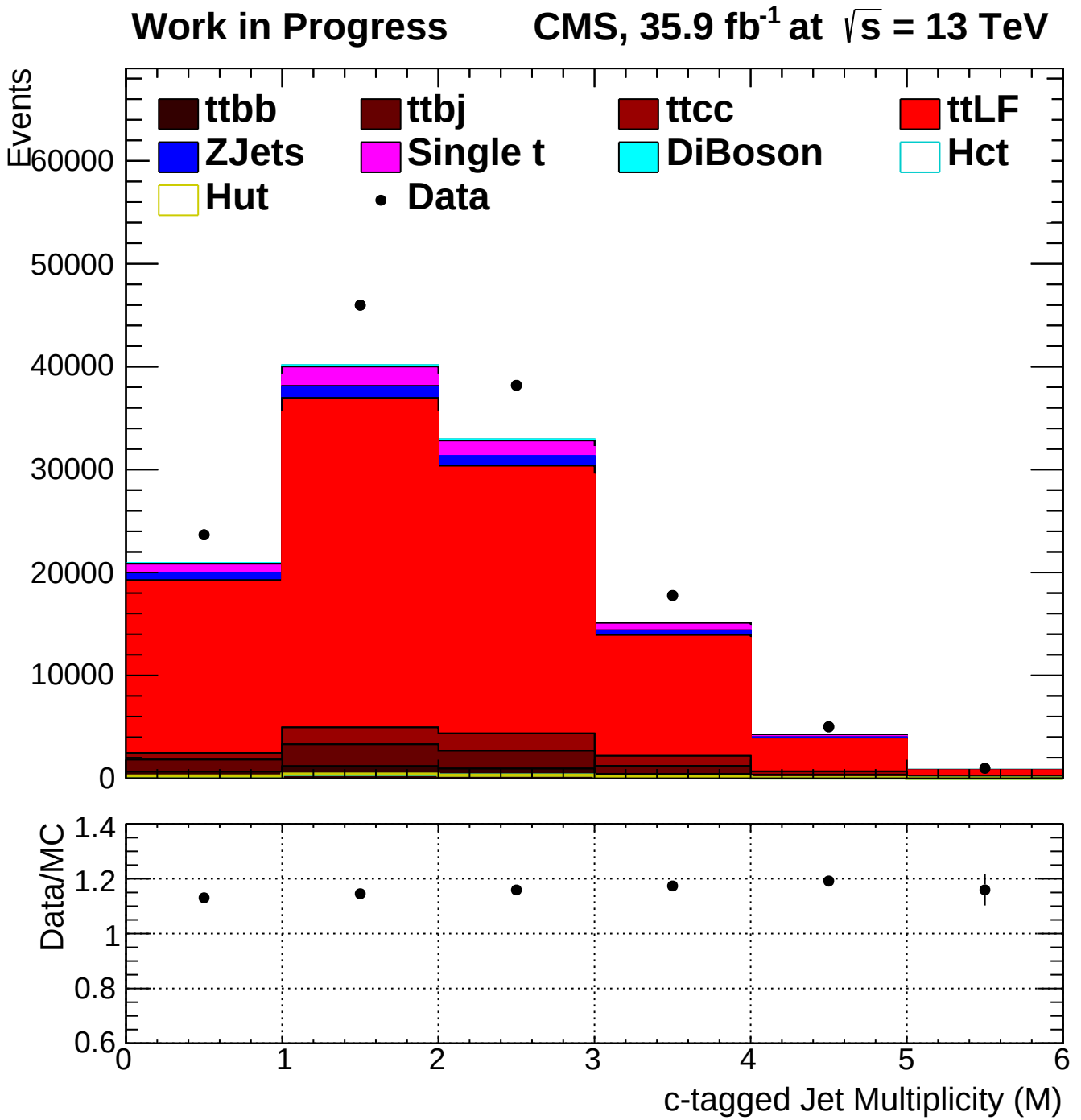

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Lep) (GeV)

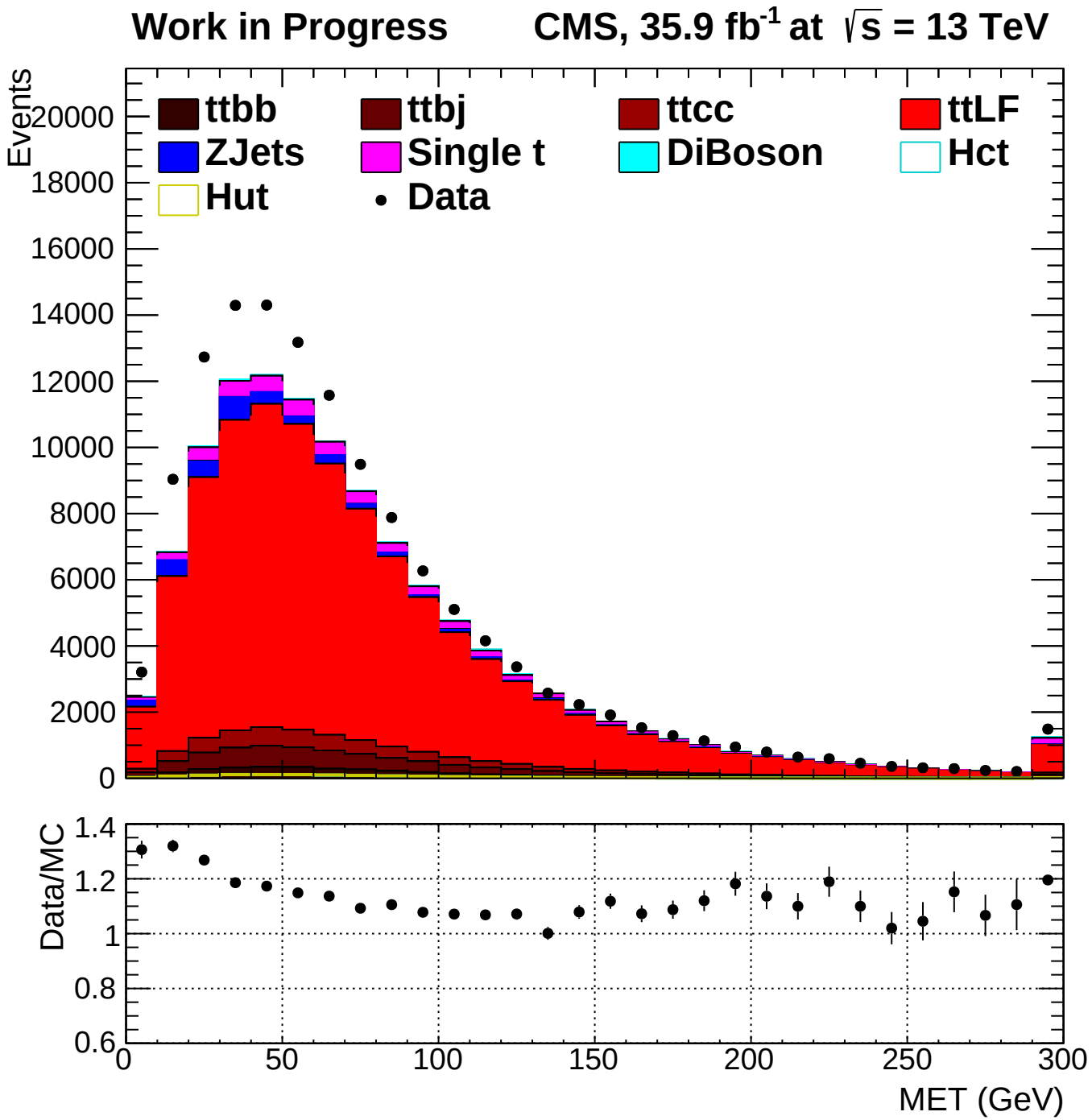

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

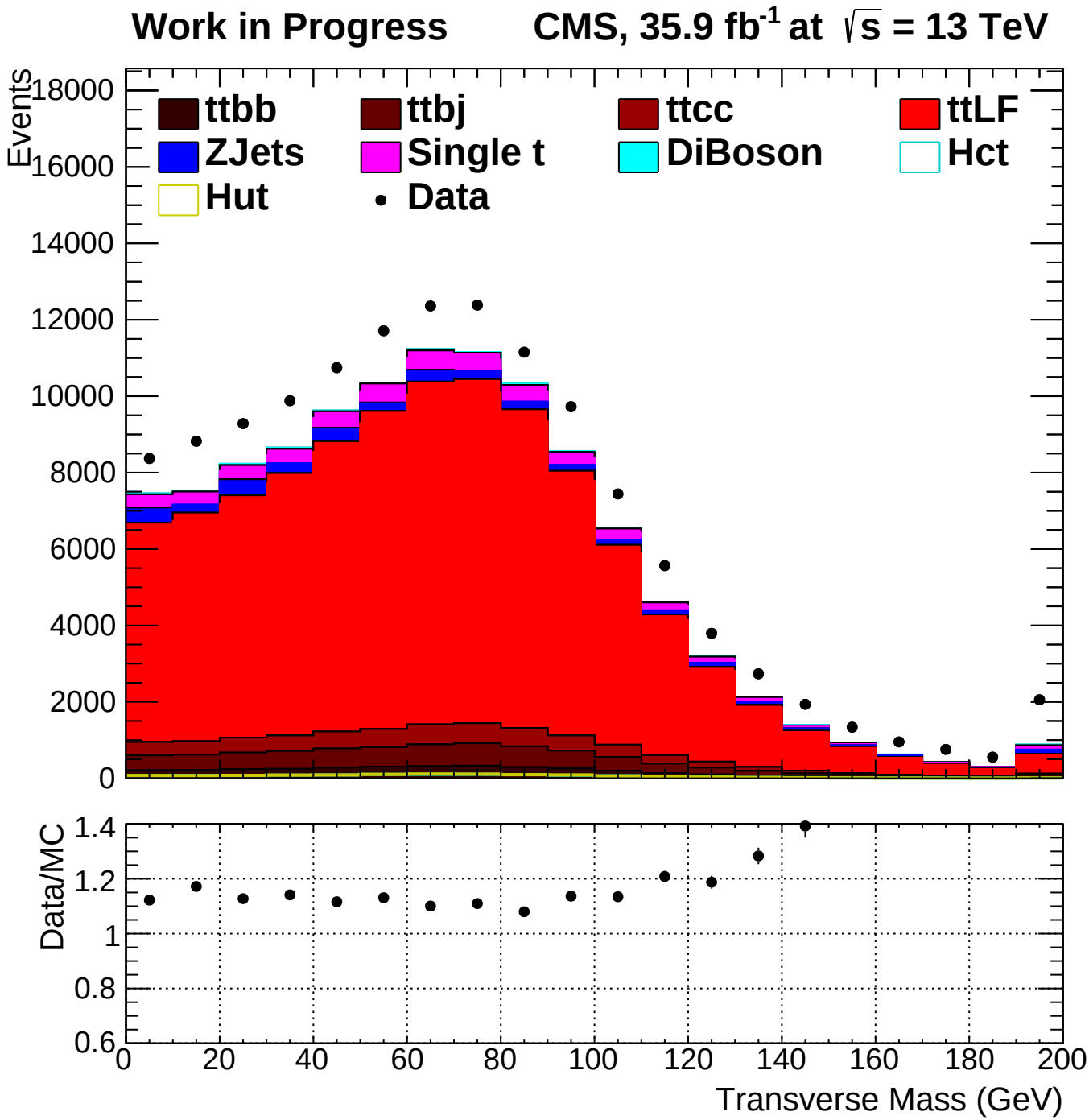

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Jet Multiplicity

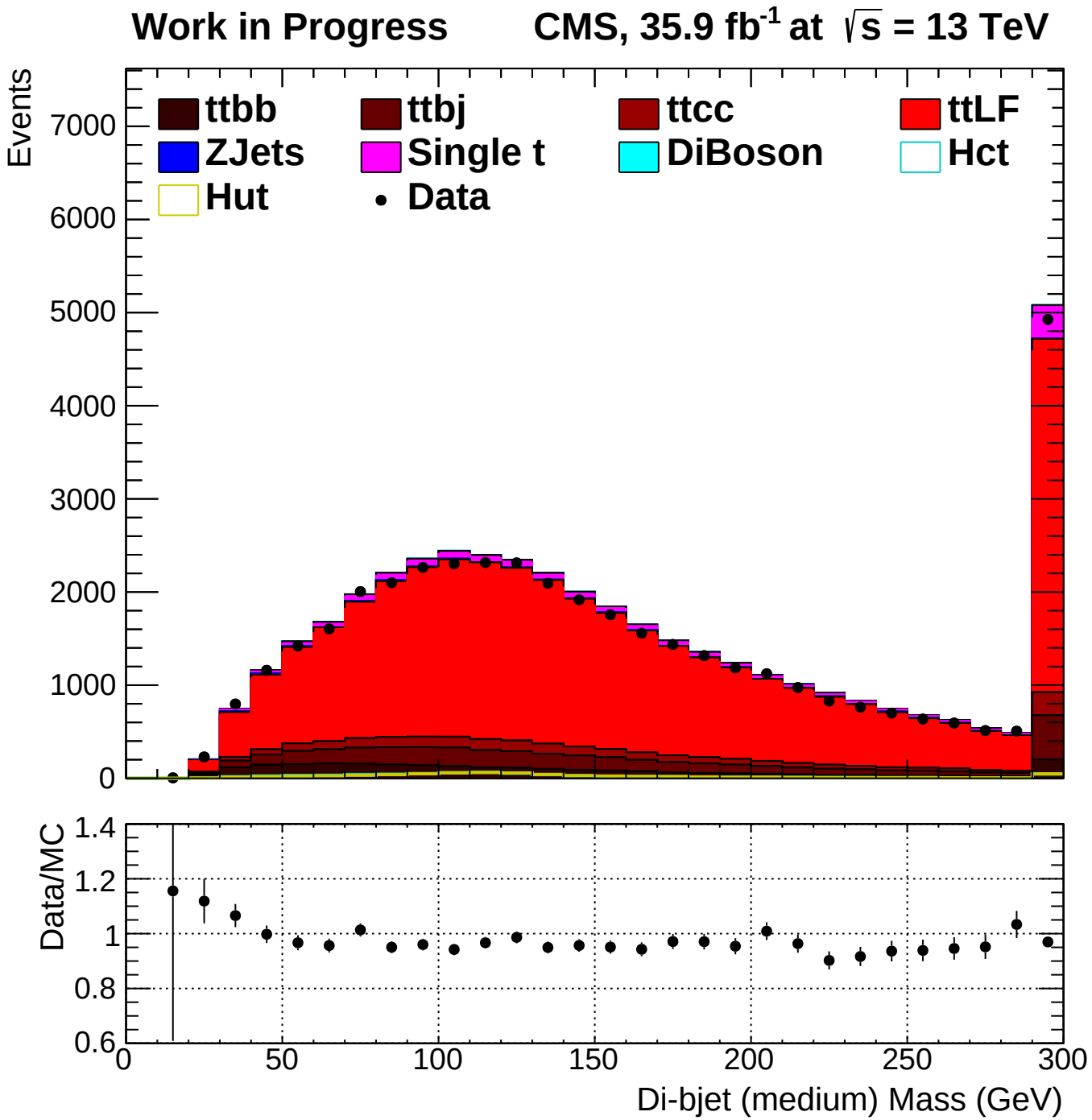

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

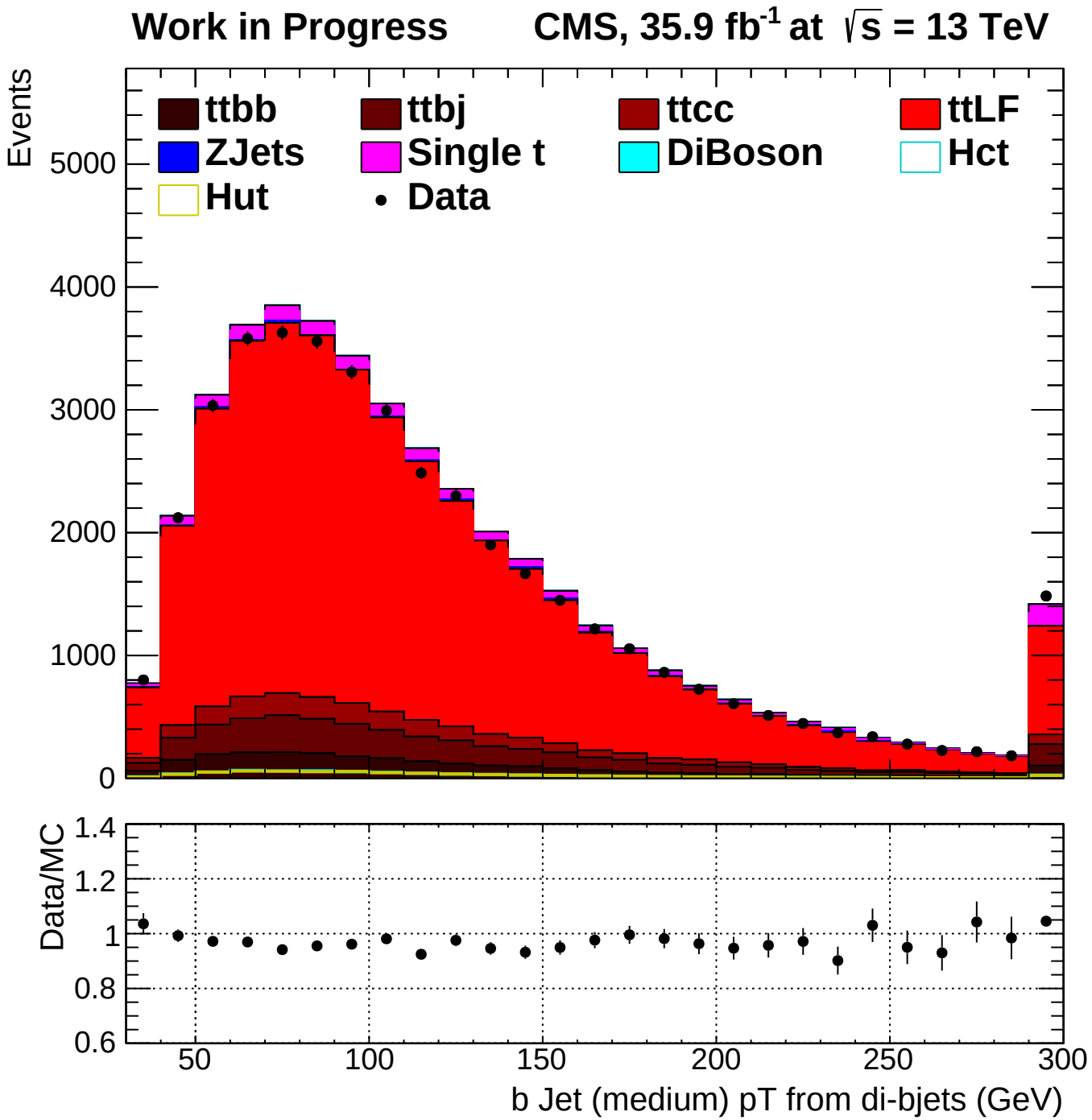

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

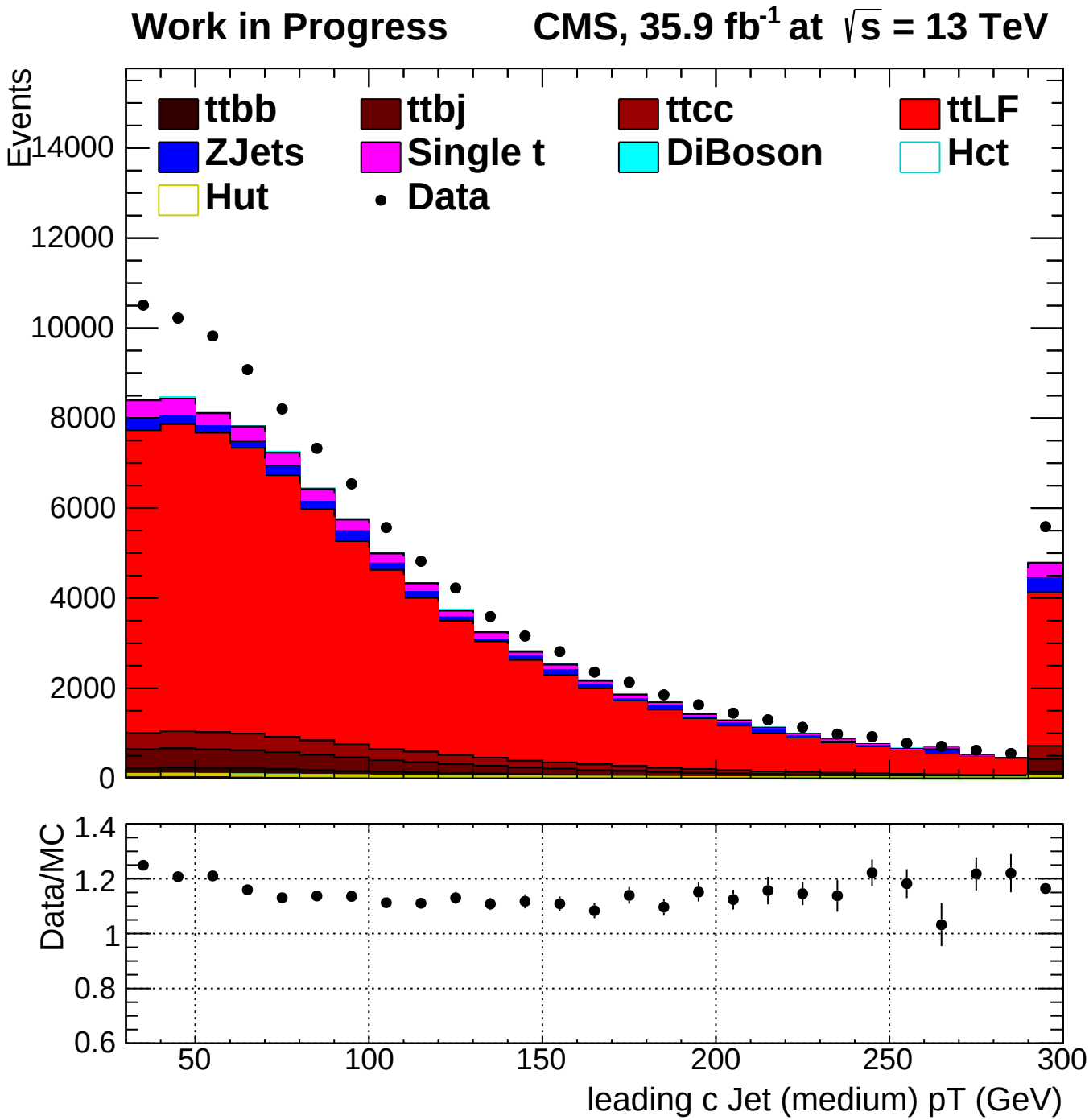

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

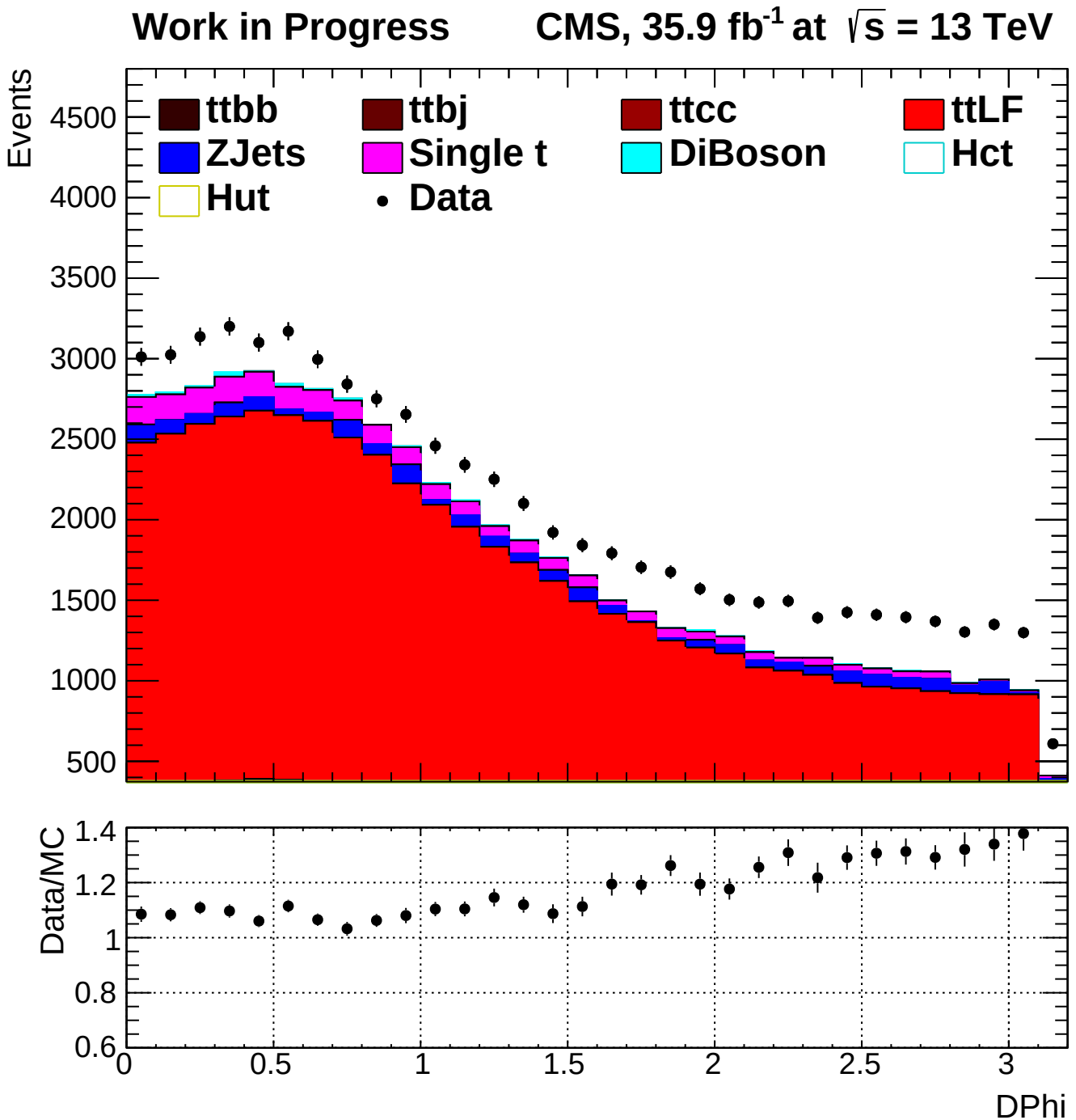

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

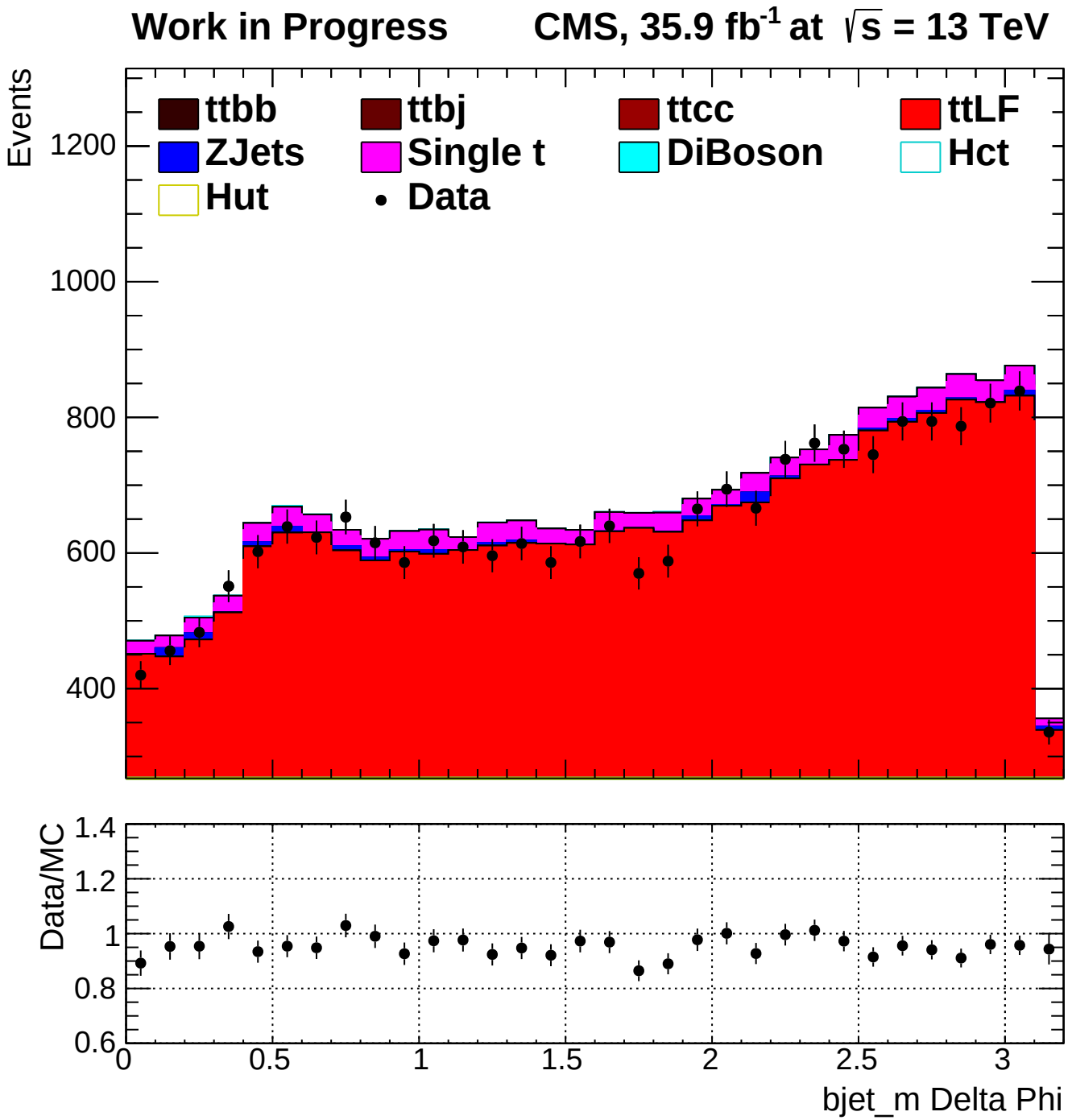

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

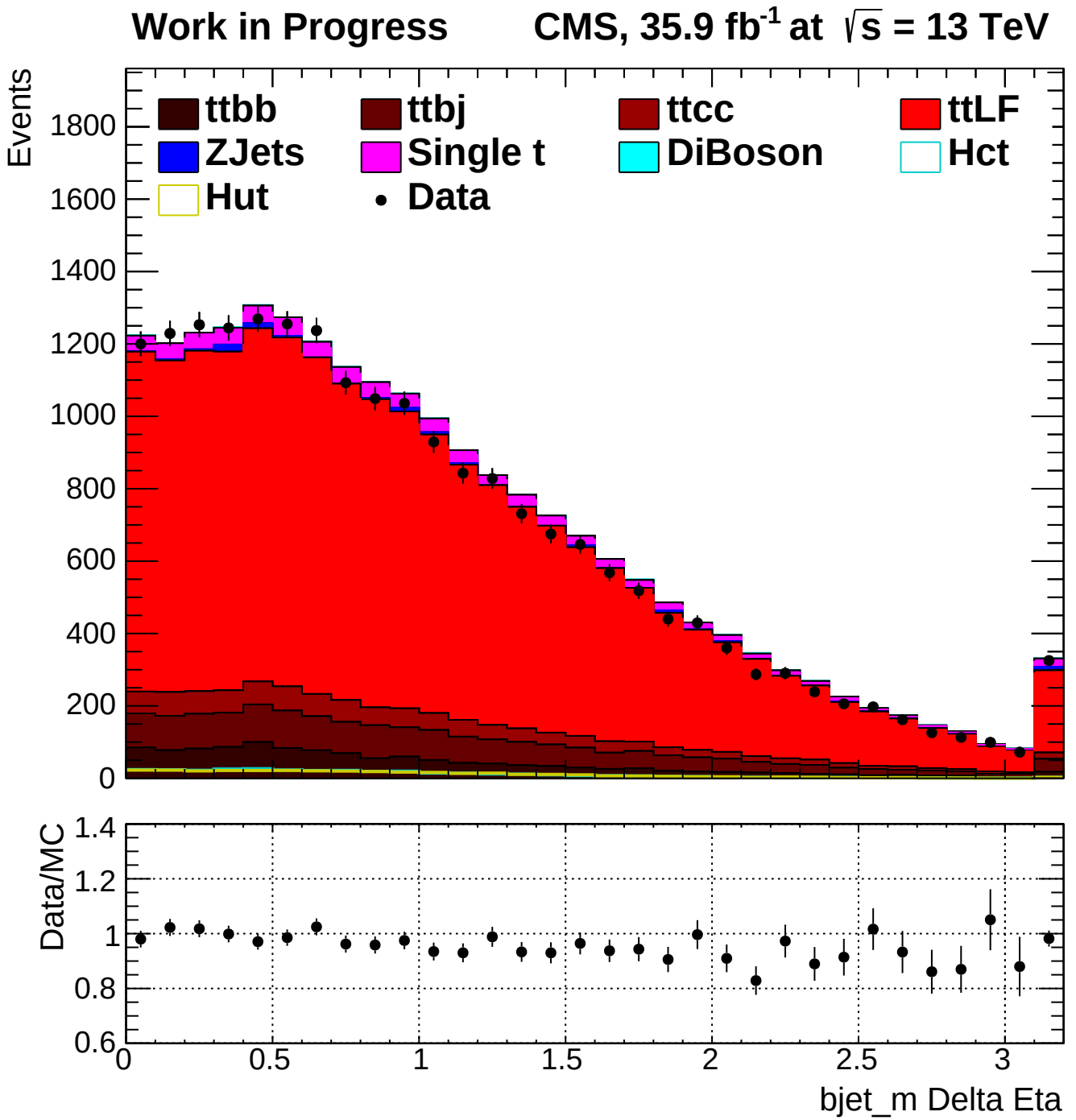

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
7000
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

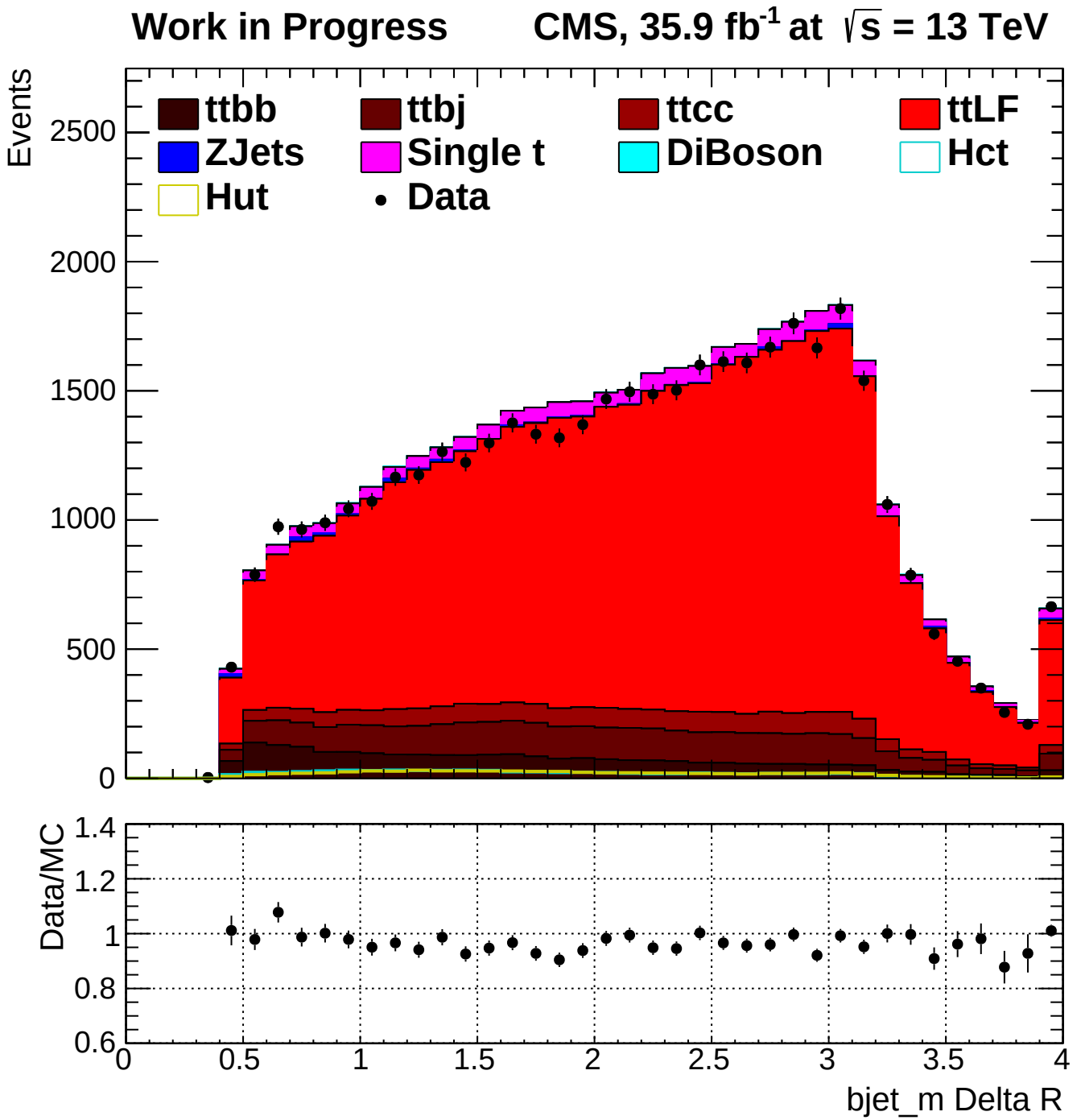

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

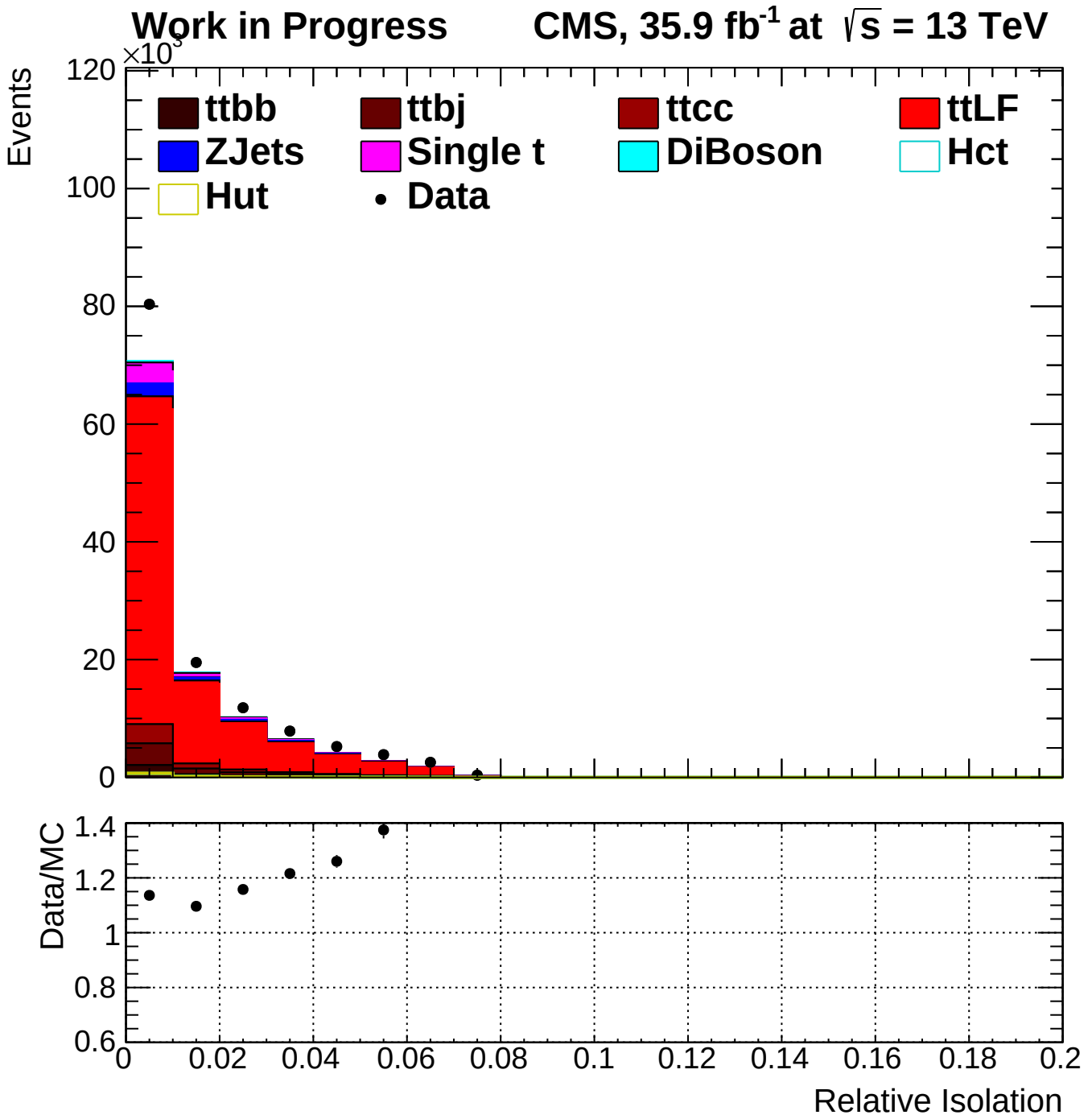

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

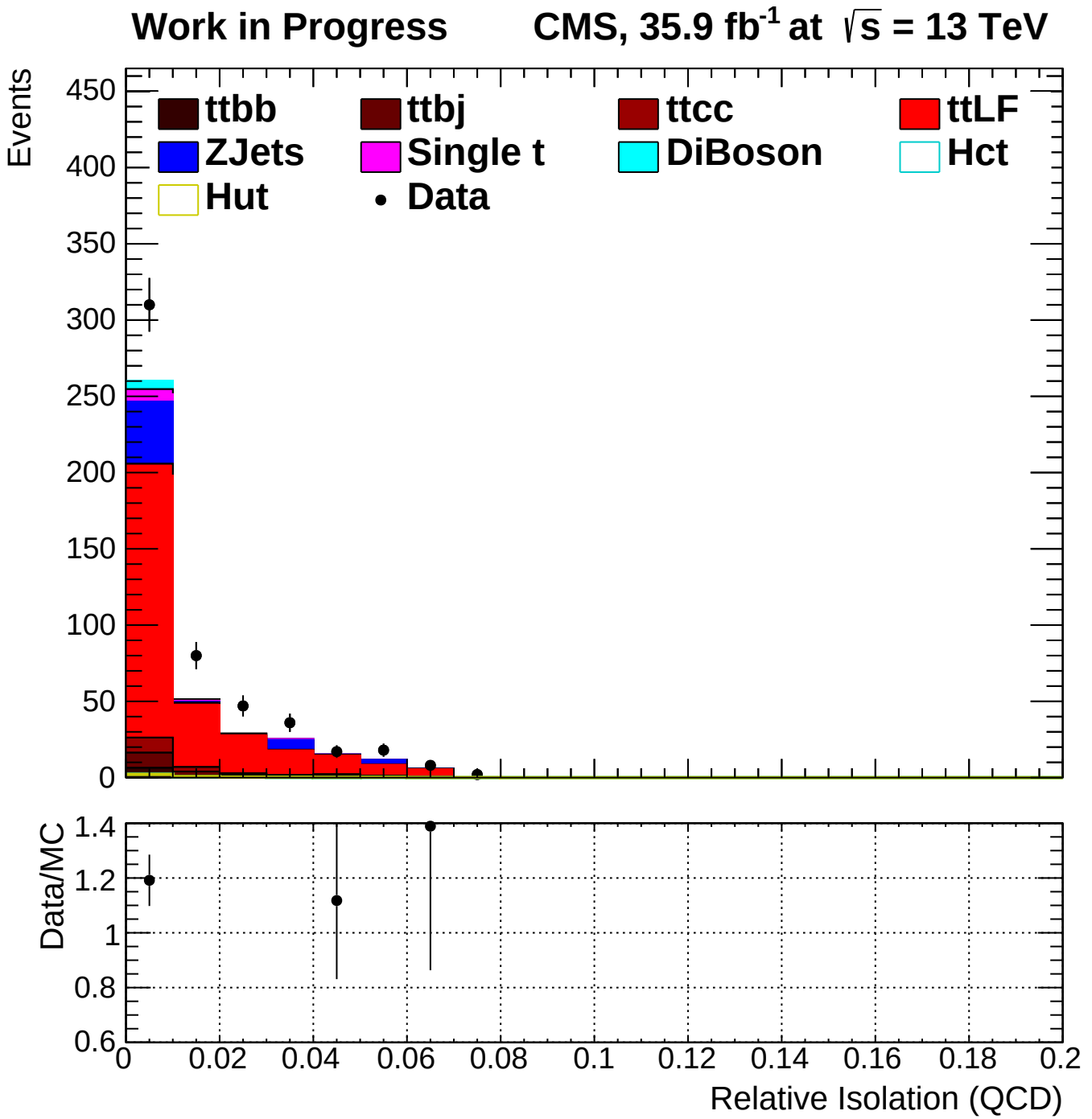

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
4500
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

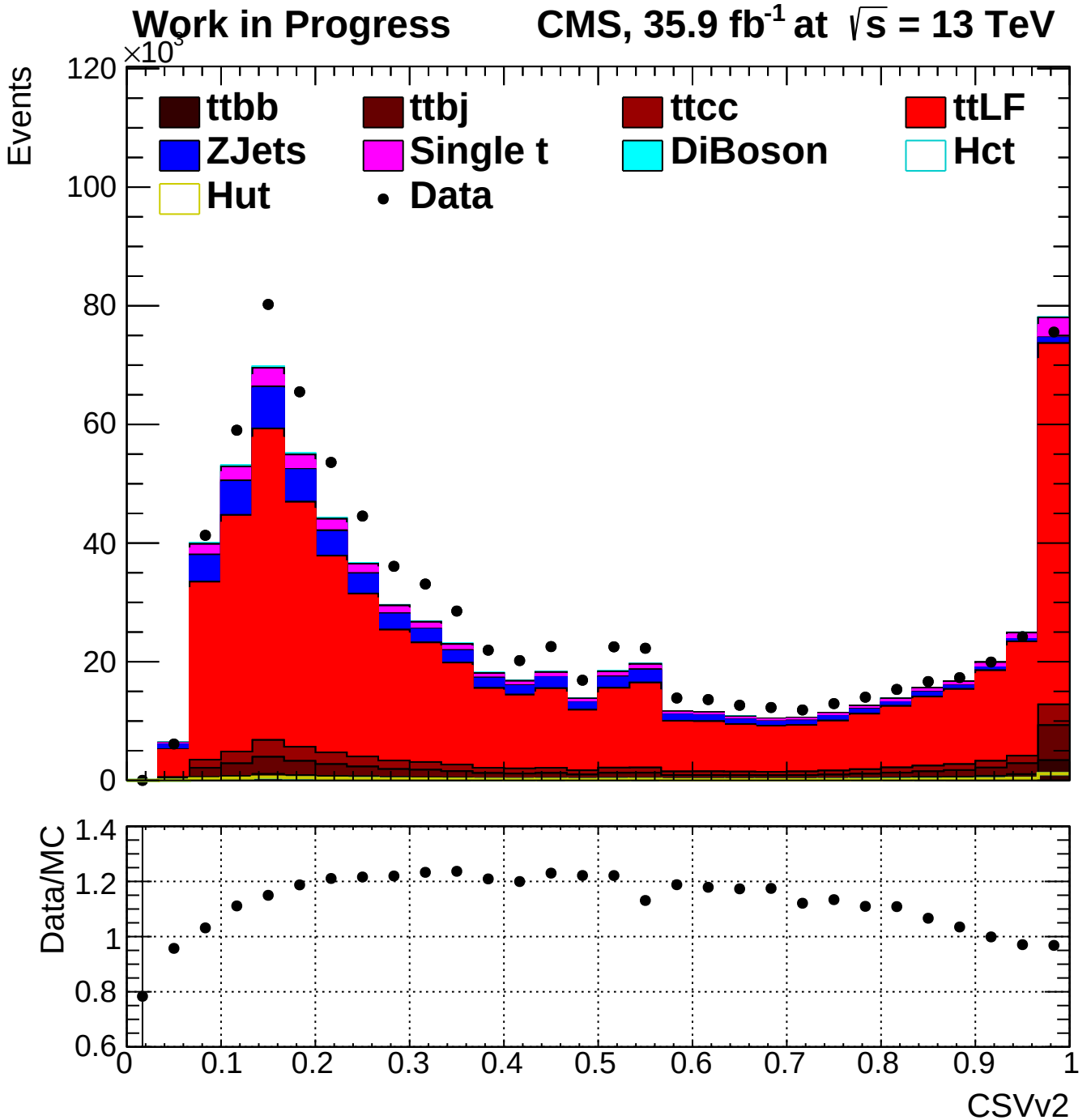

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1200
1000
800
600
400
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

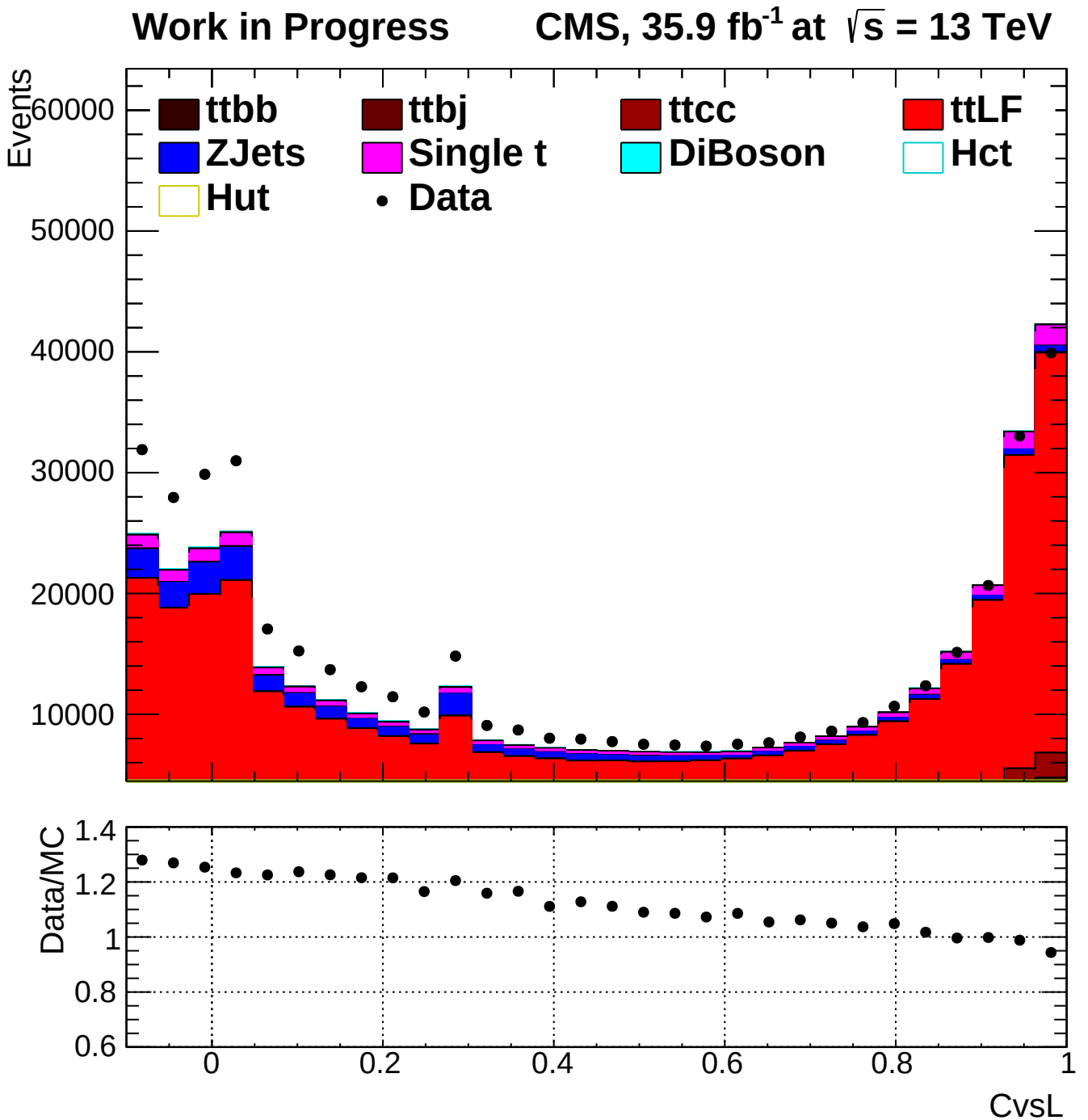

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta

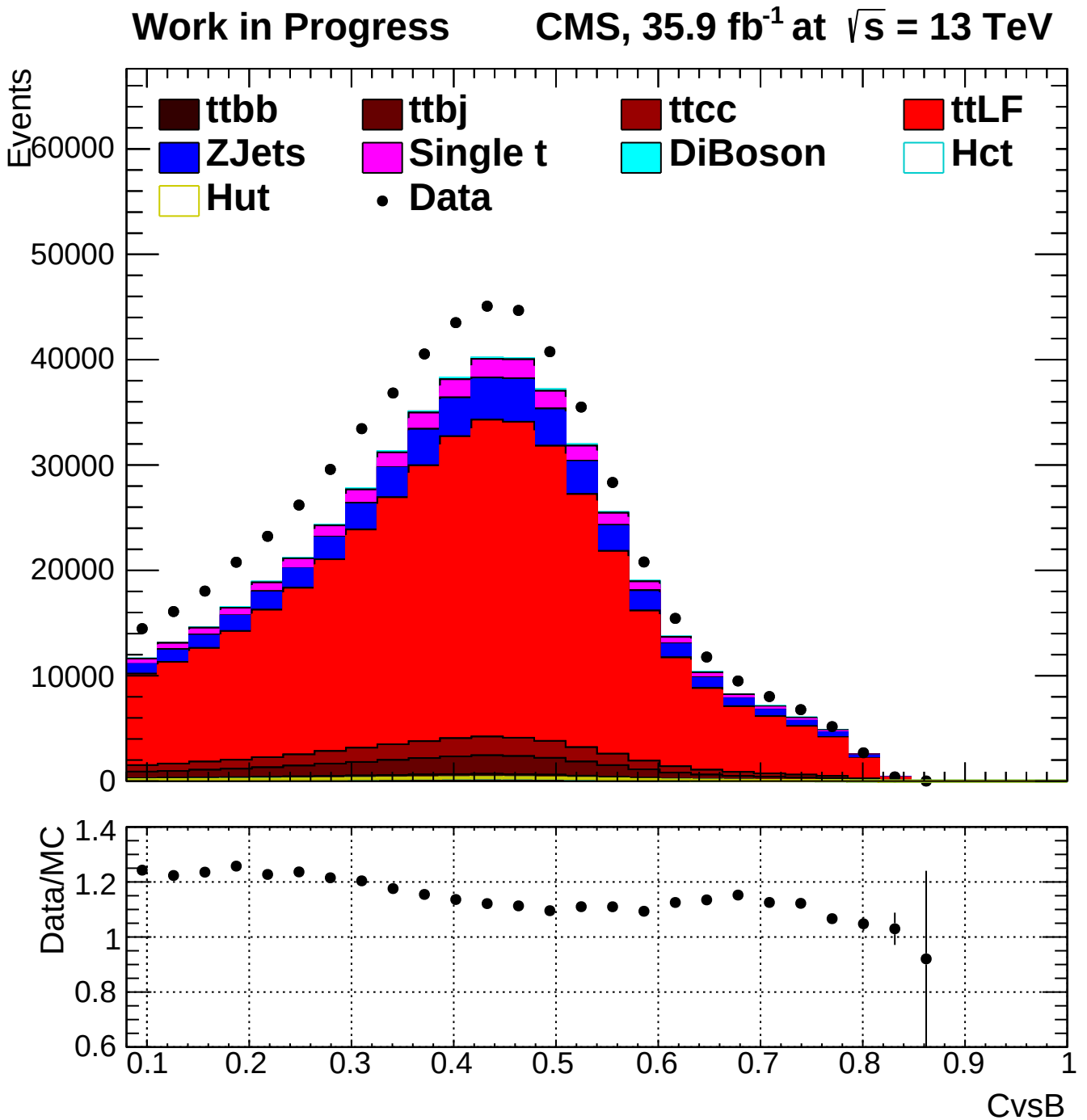

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

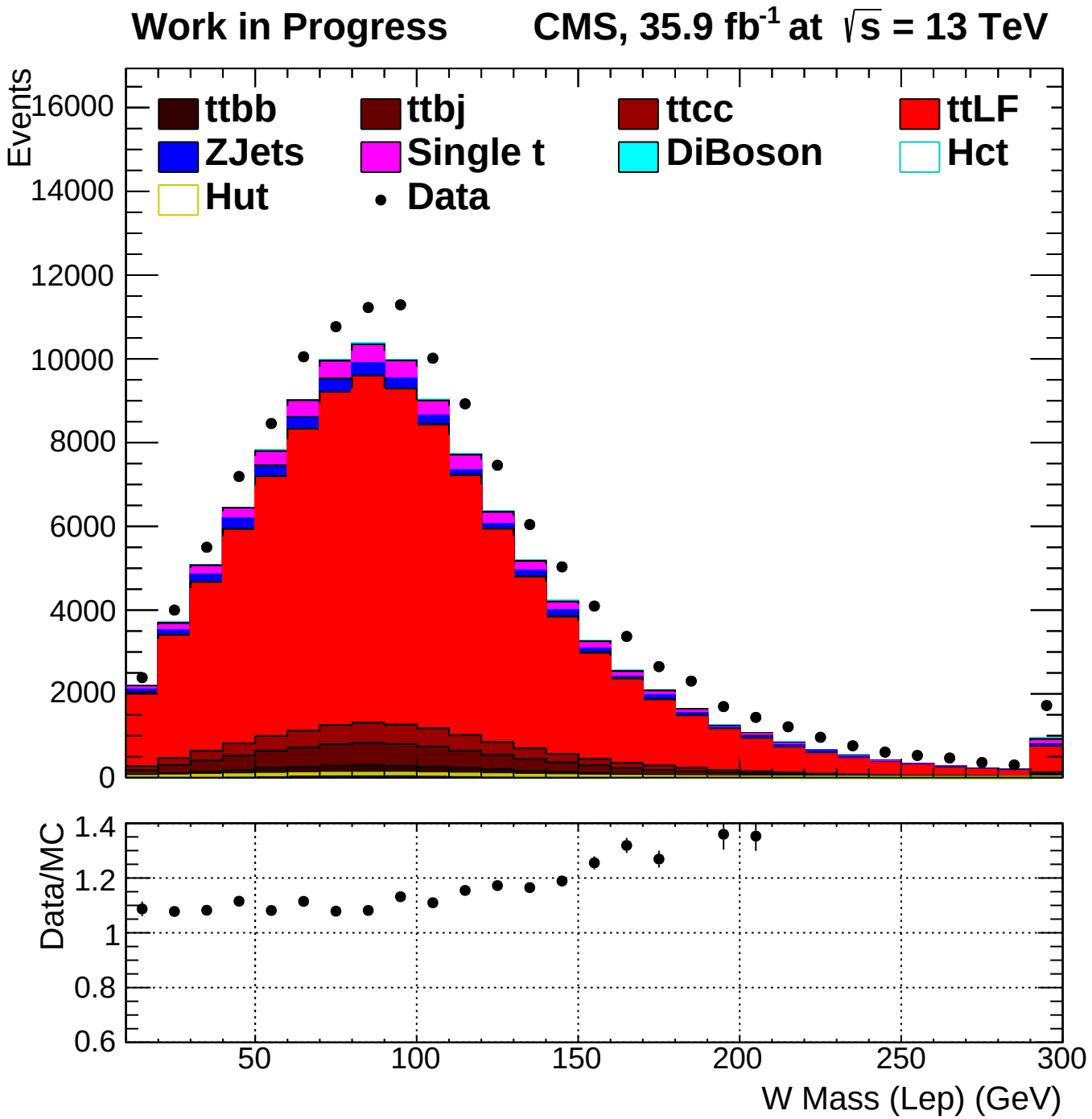

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation

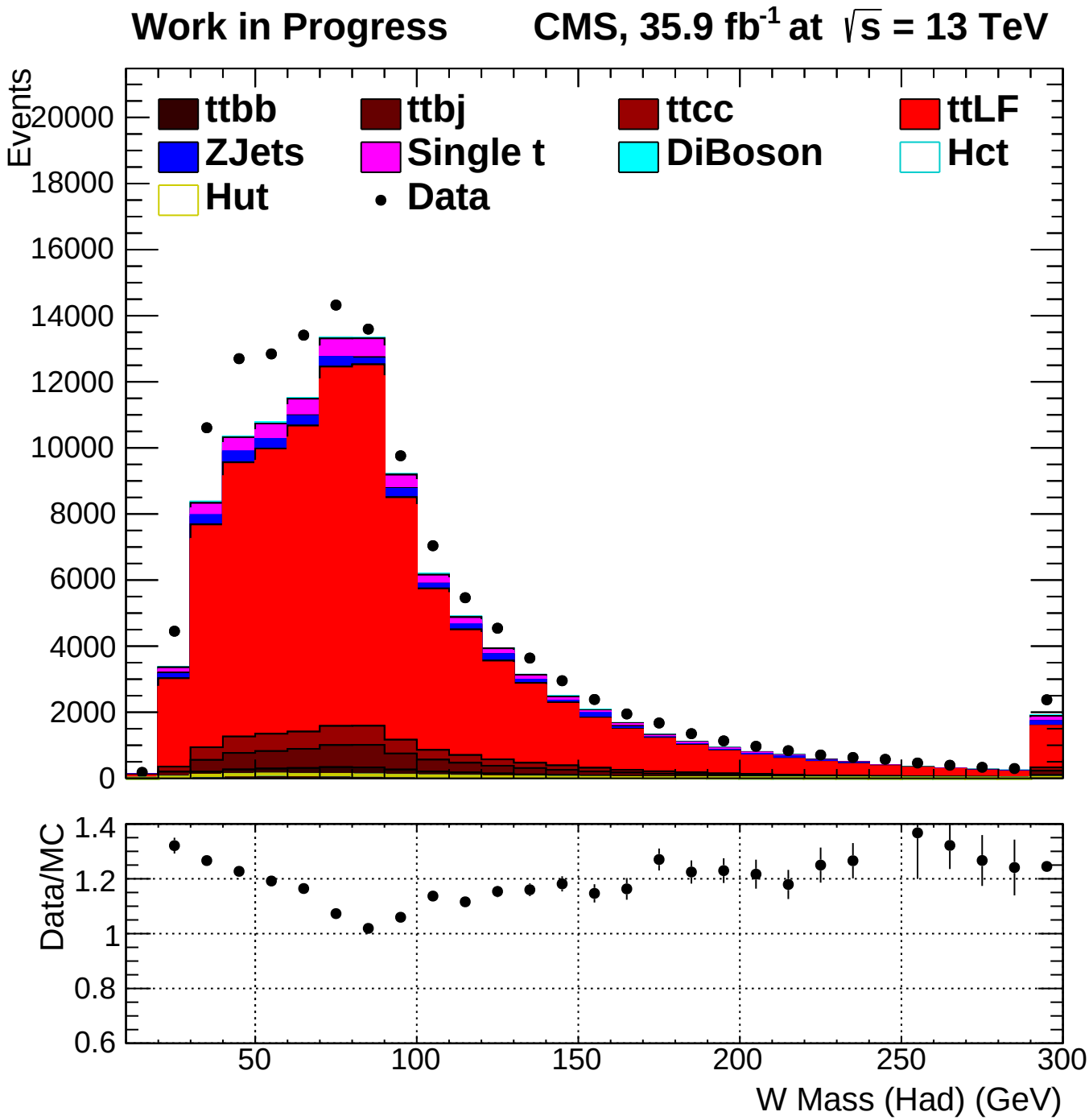

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

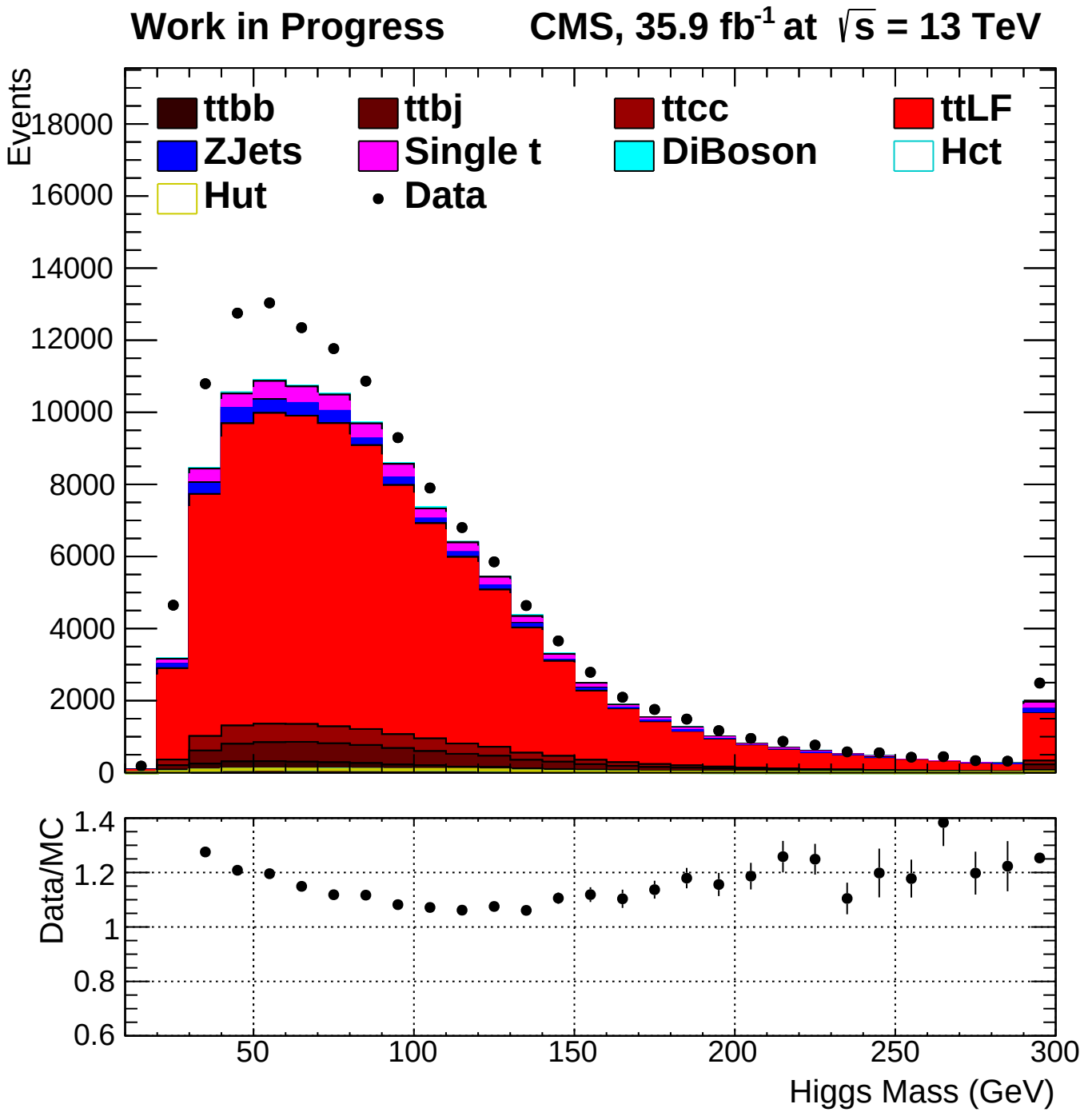

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
×10³
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2

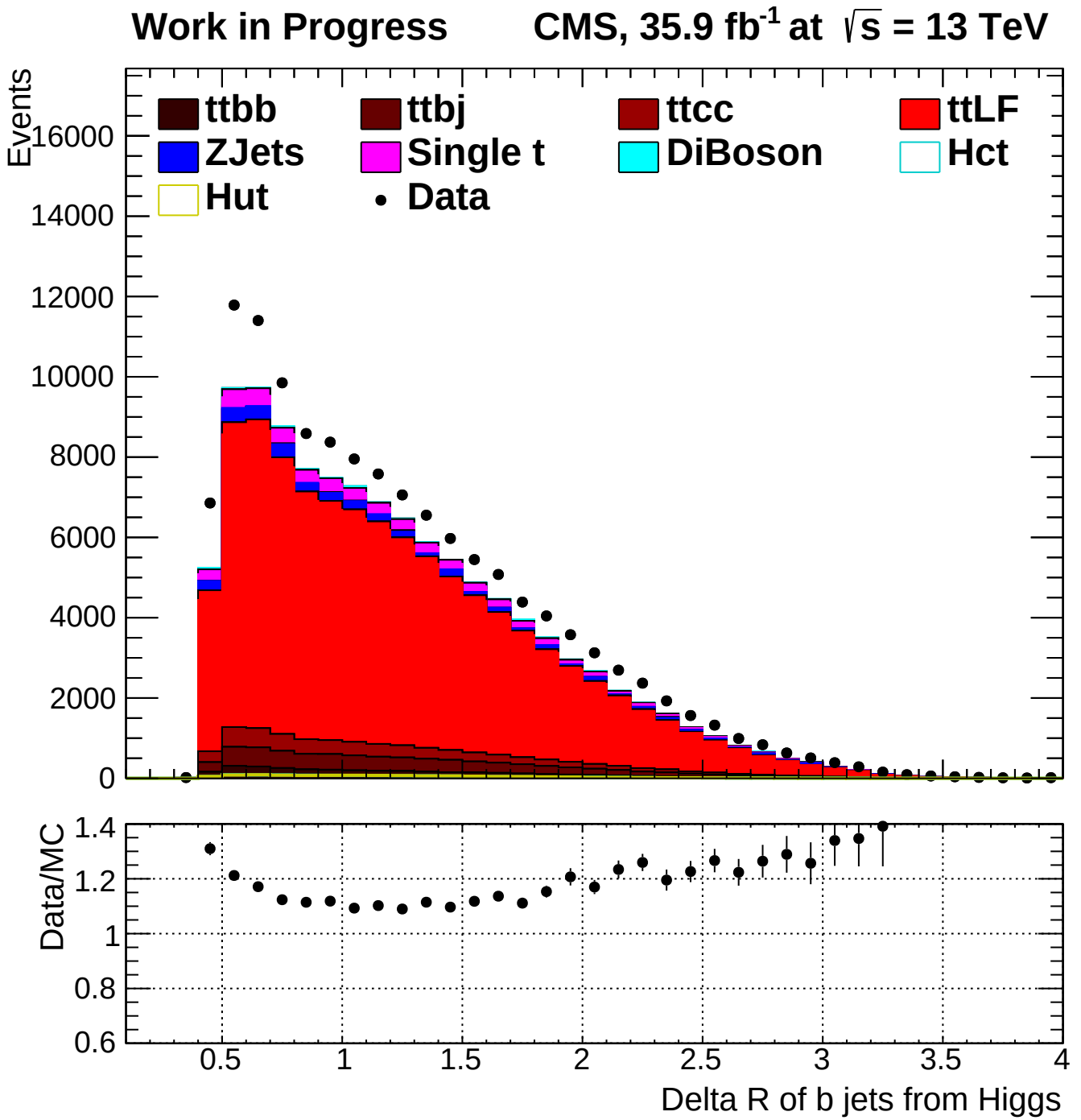

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

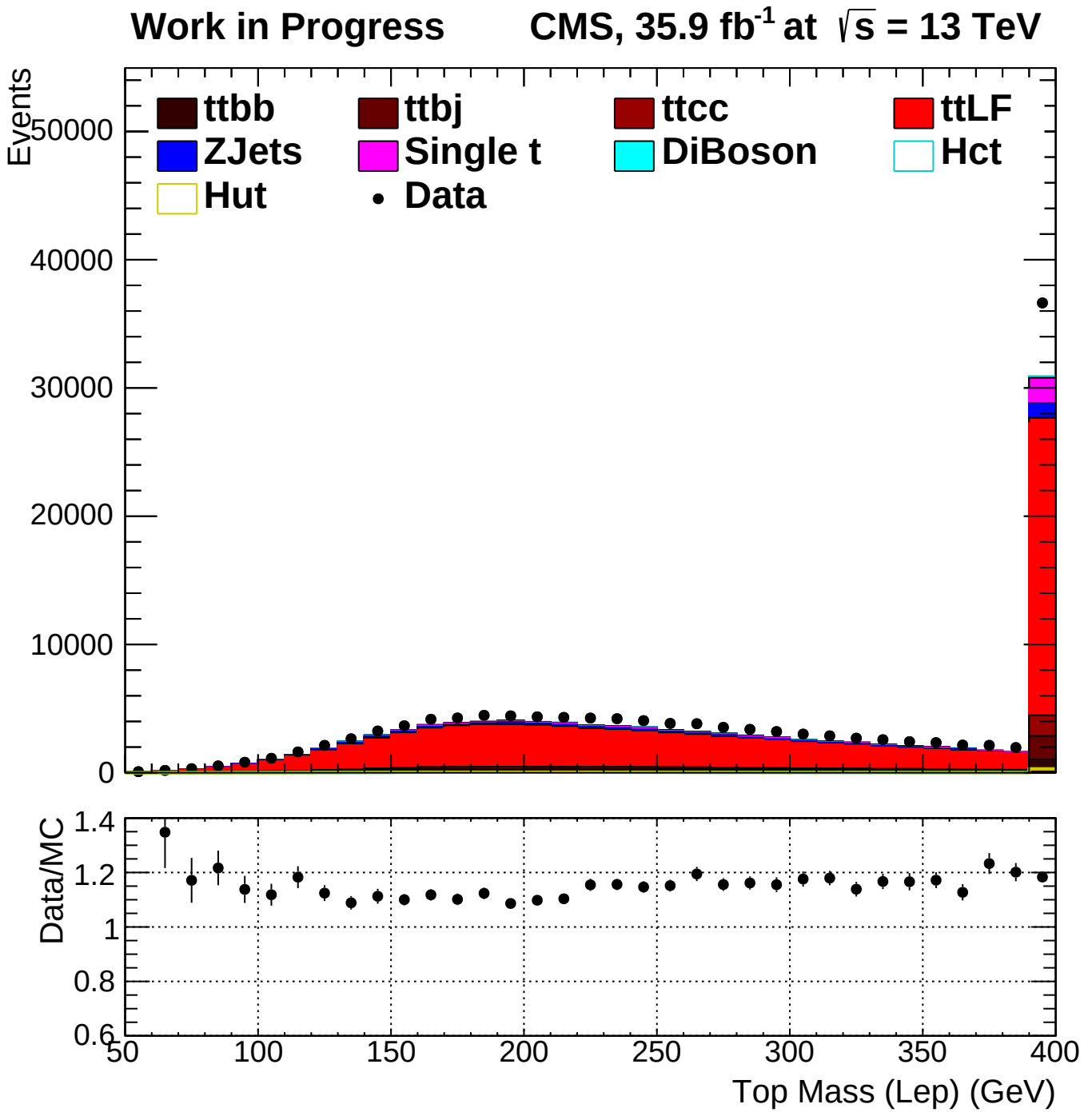

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB

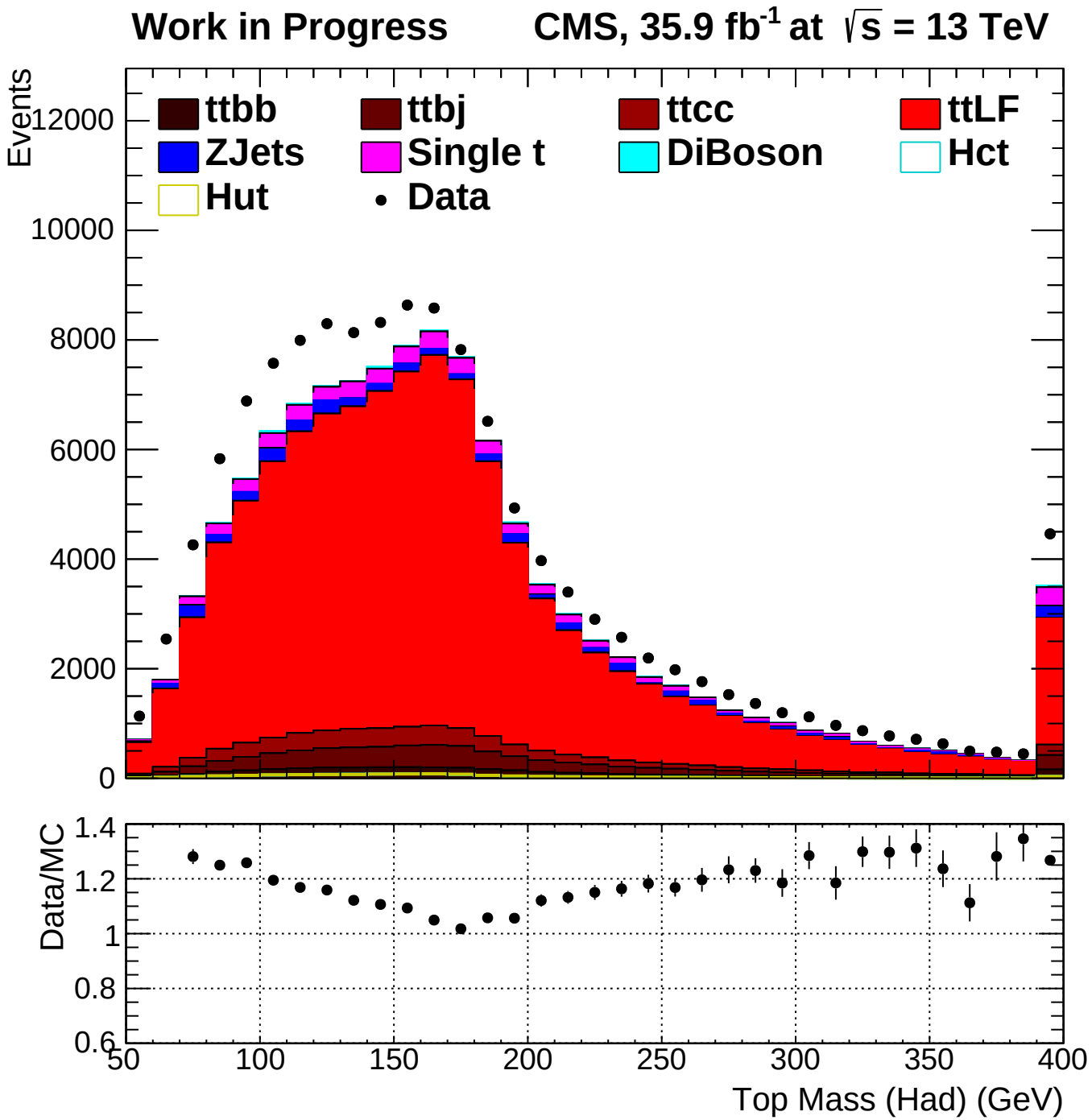

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16000
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)

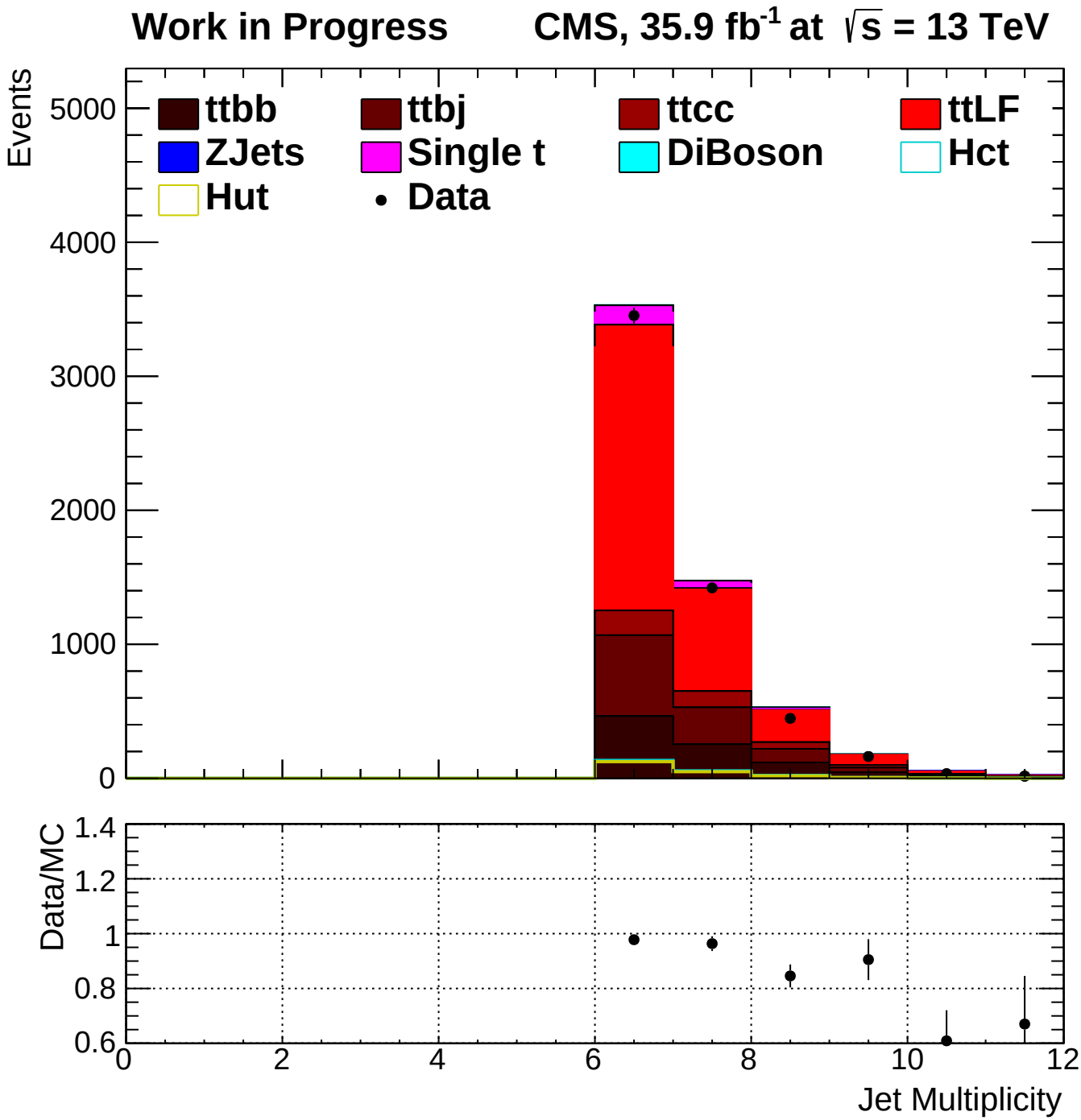

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)

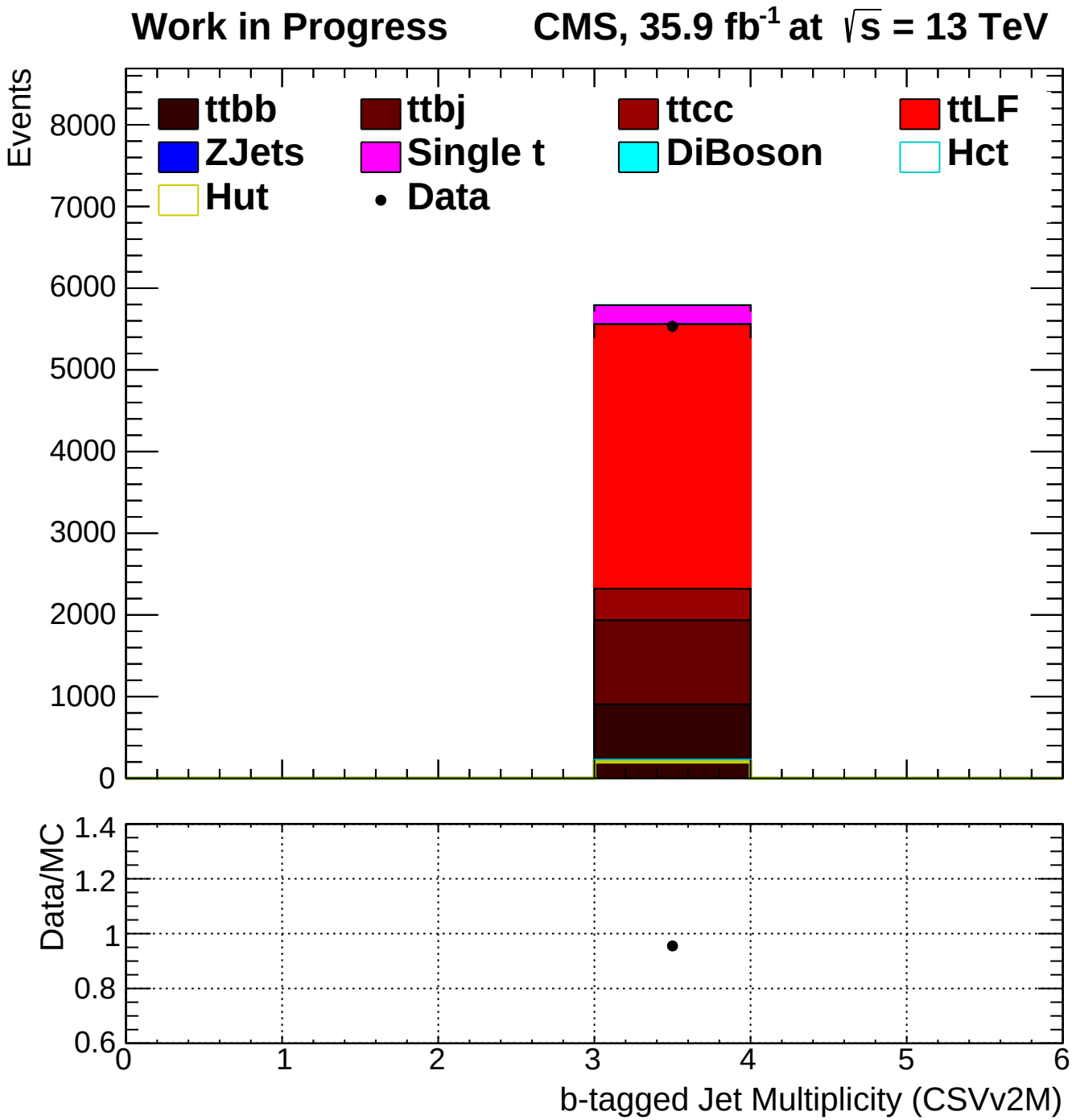

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)

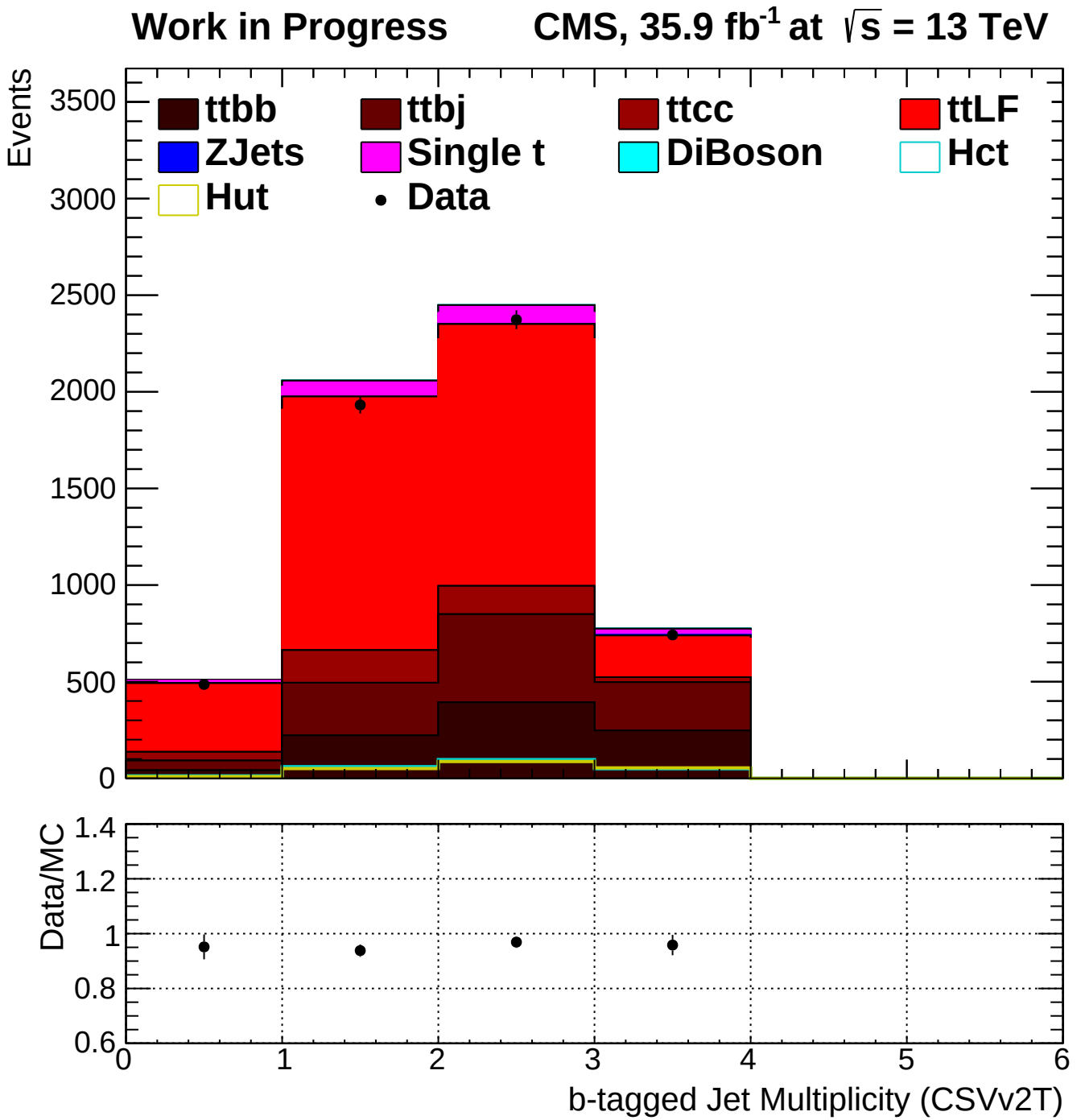

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16000
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
8000
7000
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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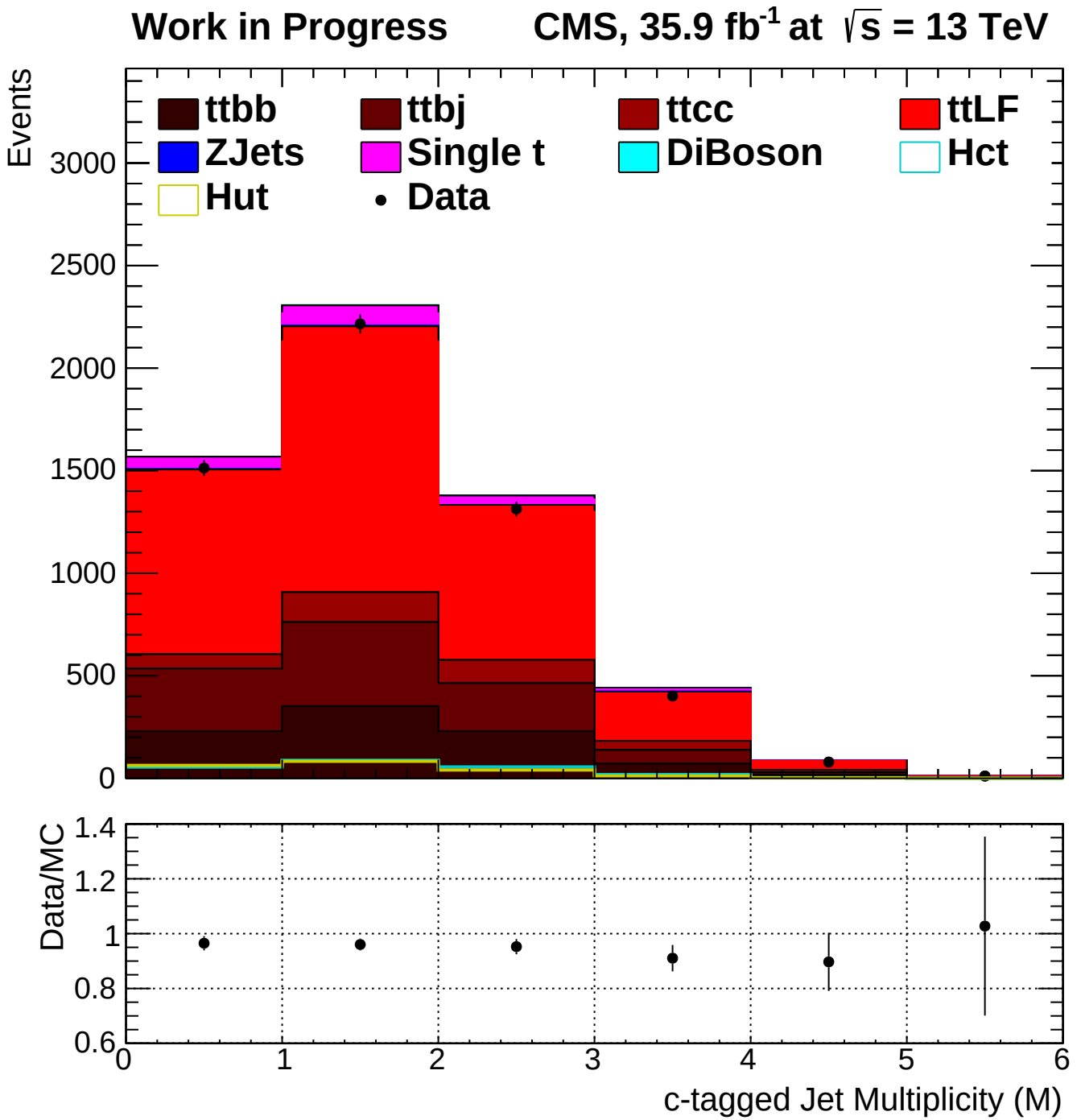
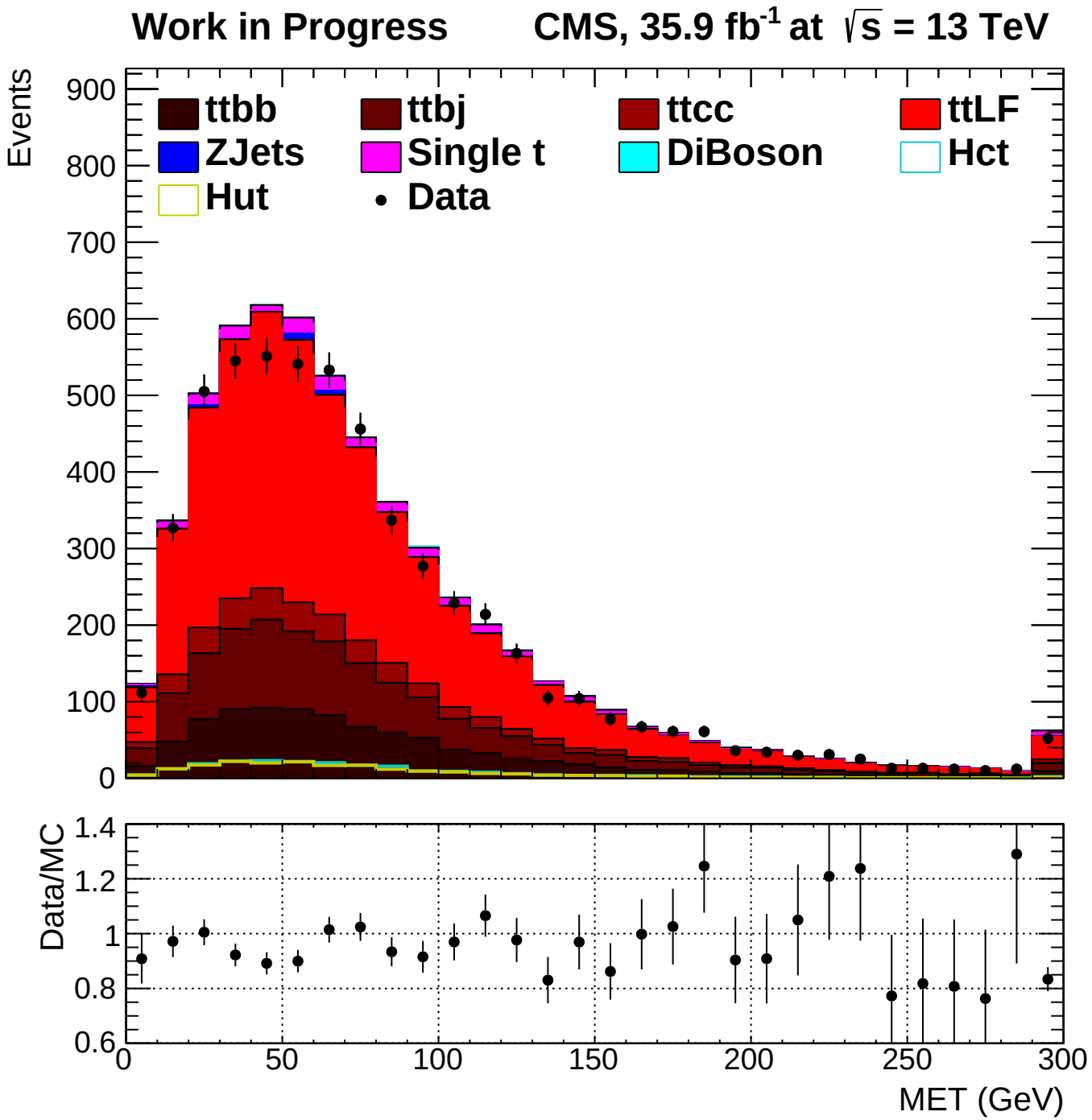
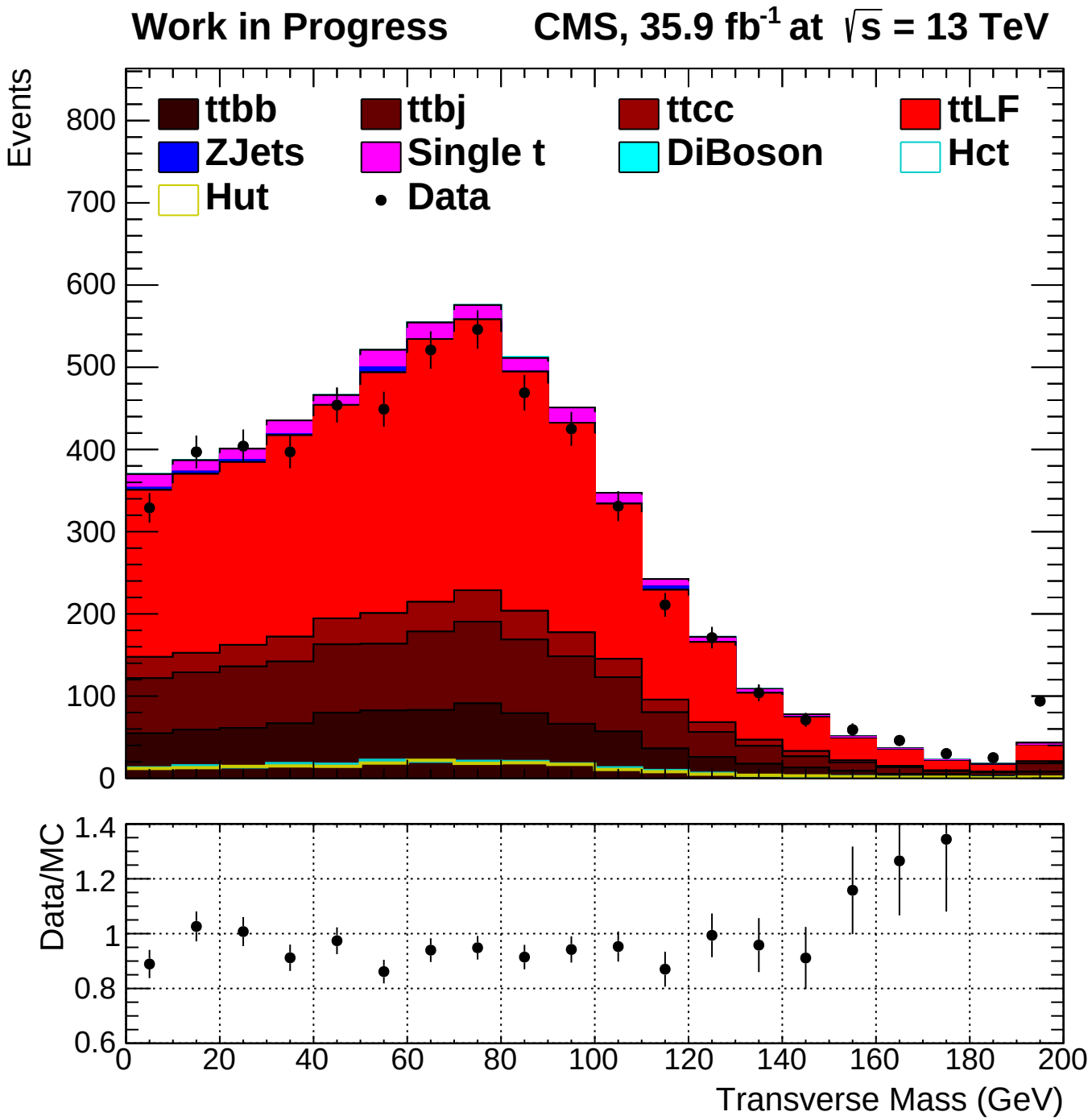
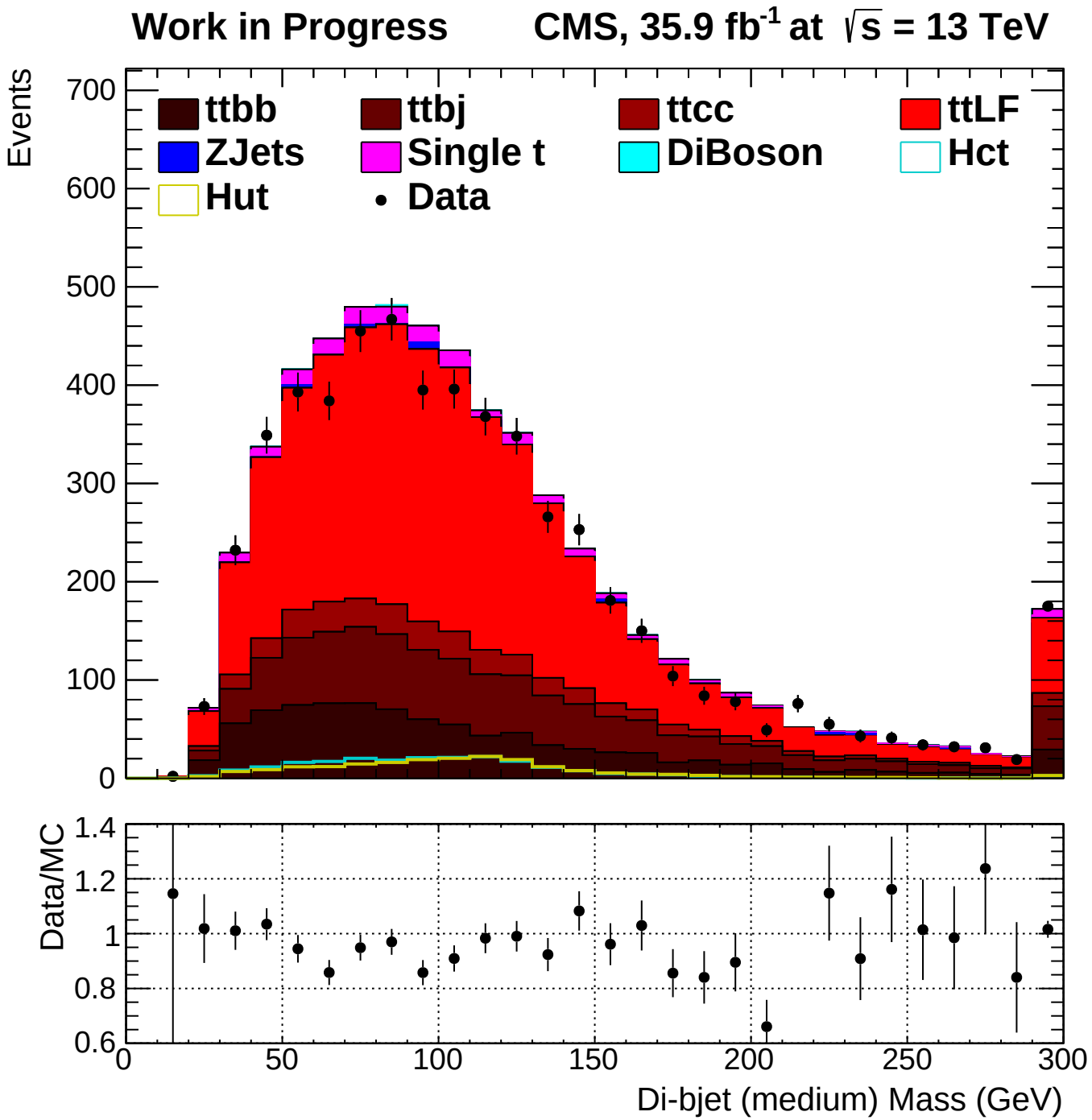
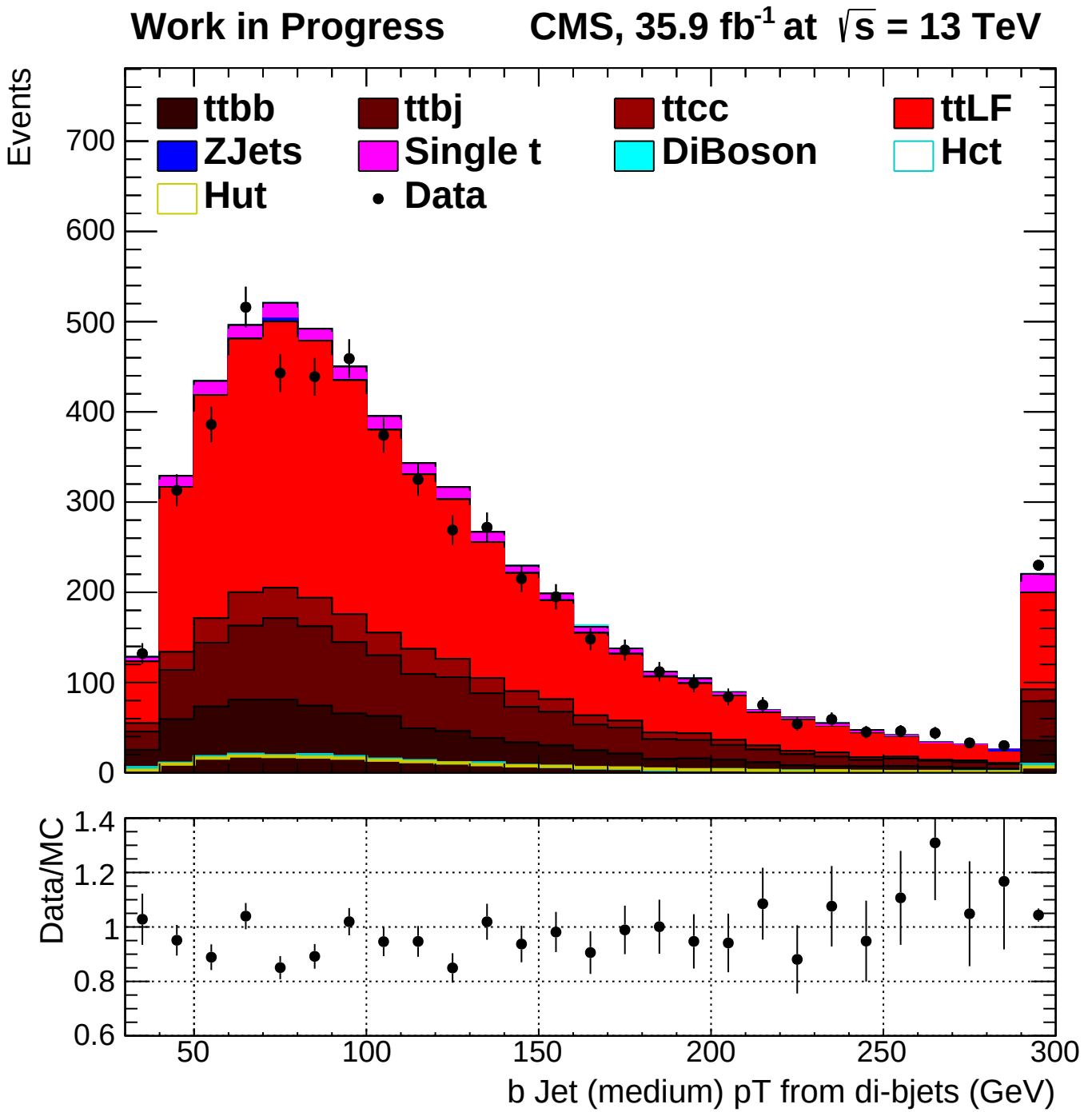
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

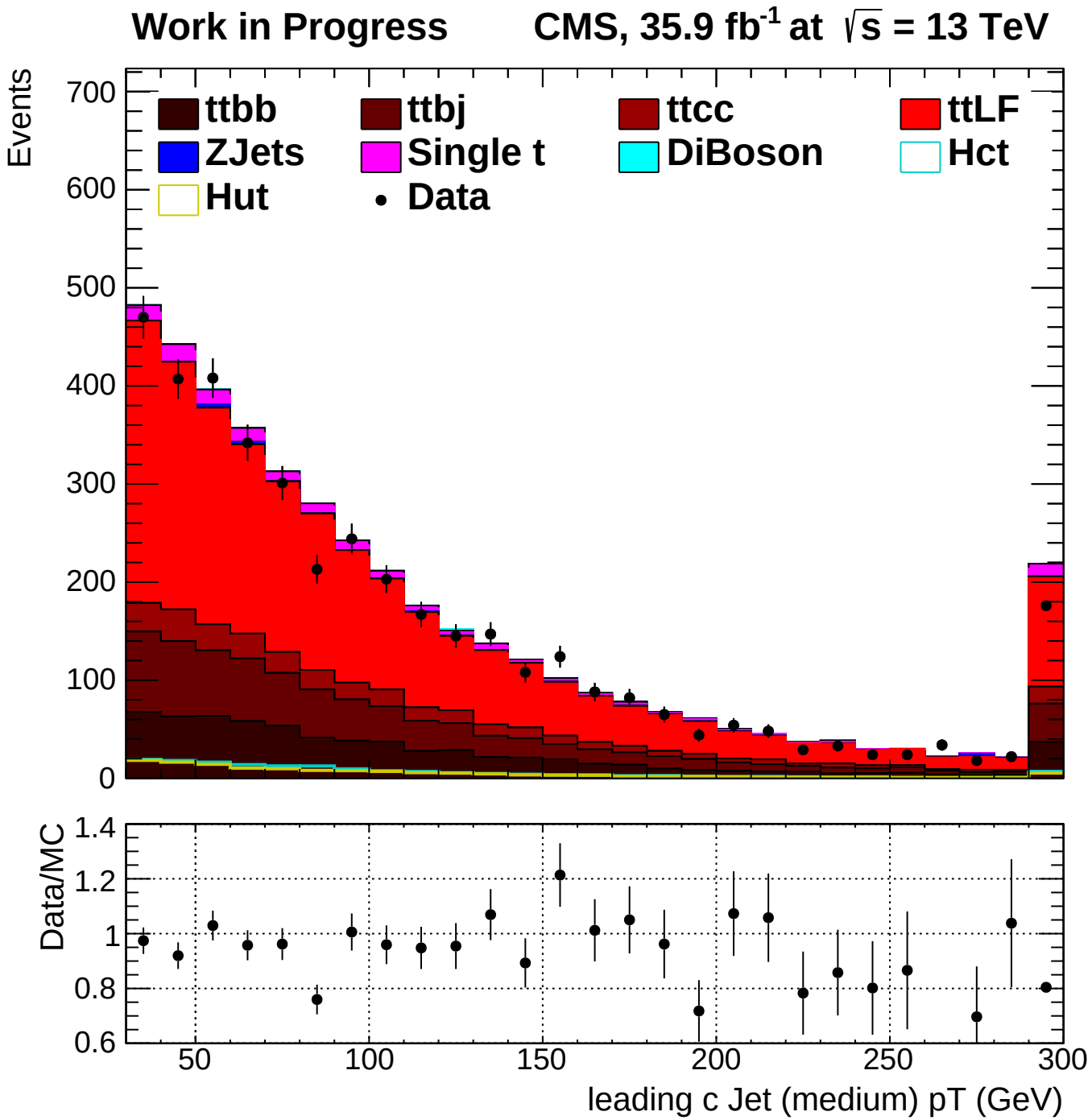

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

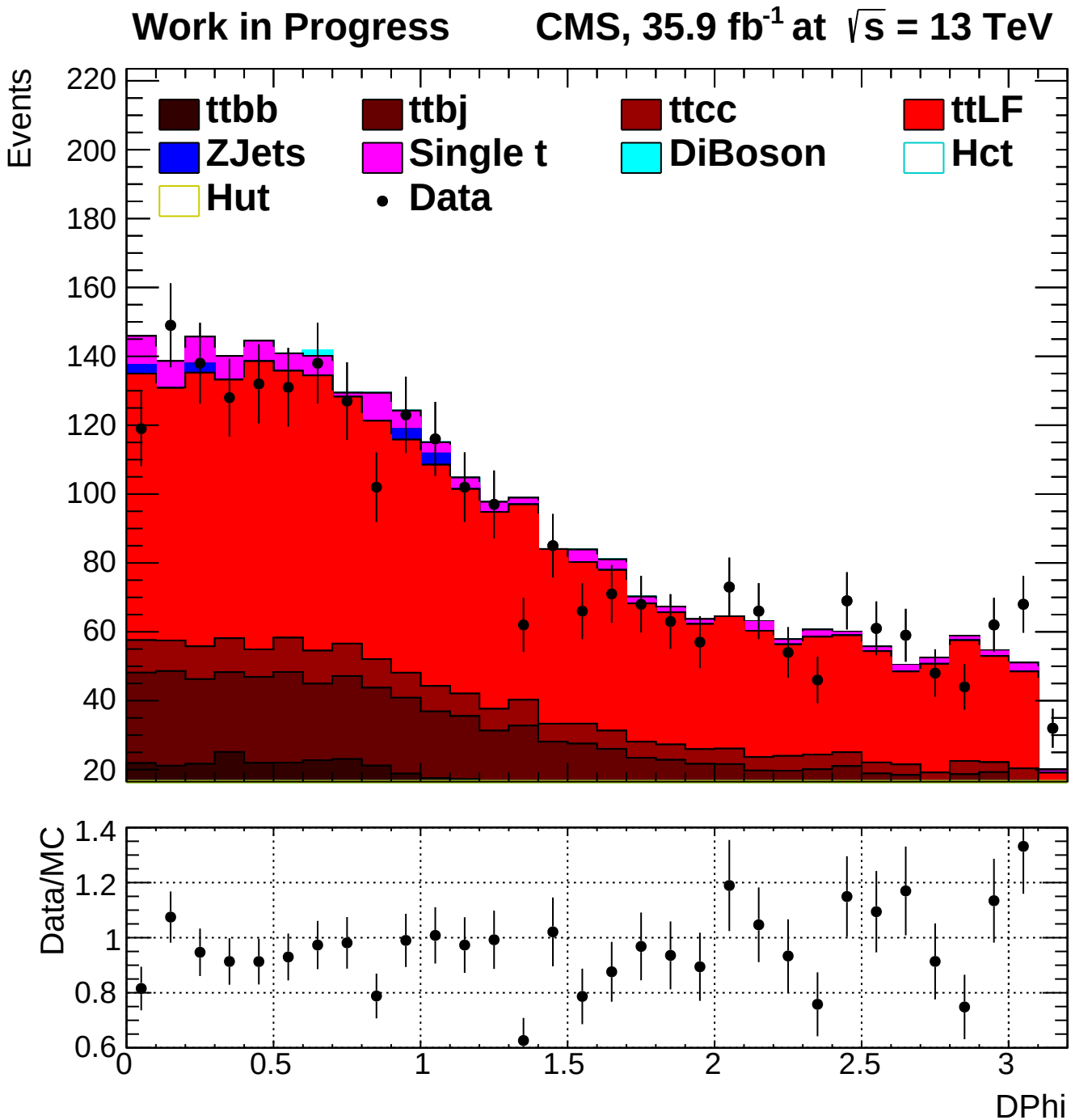

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)

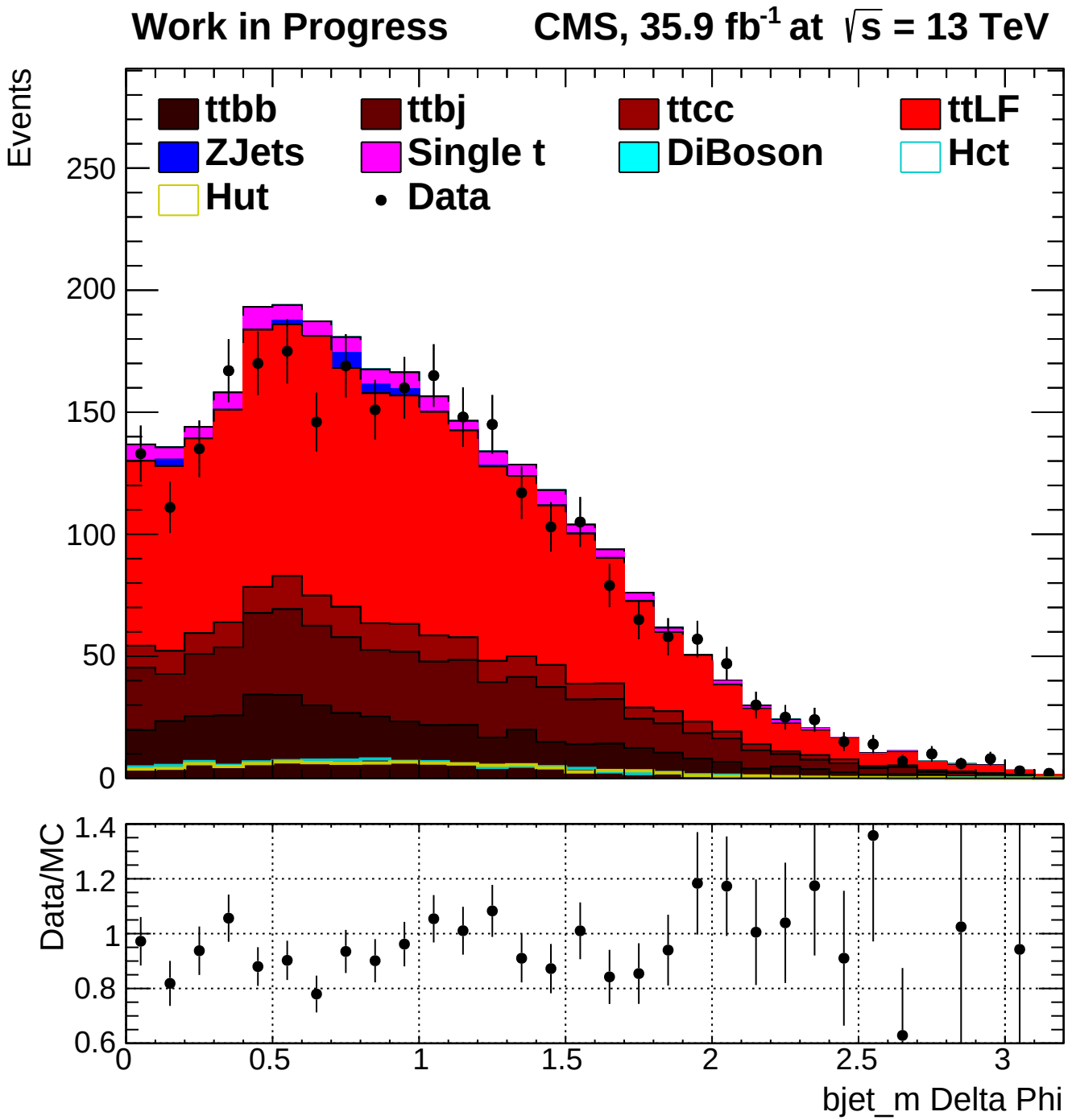

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

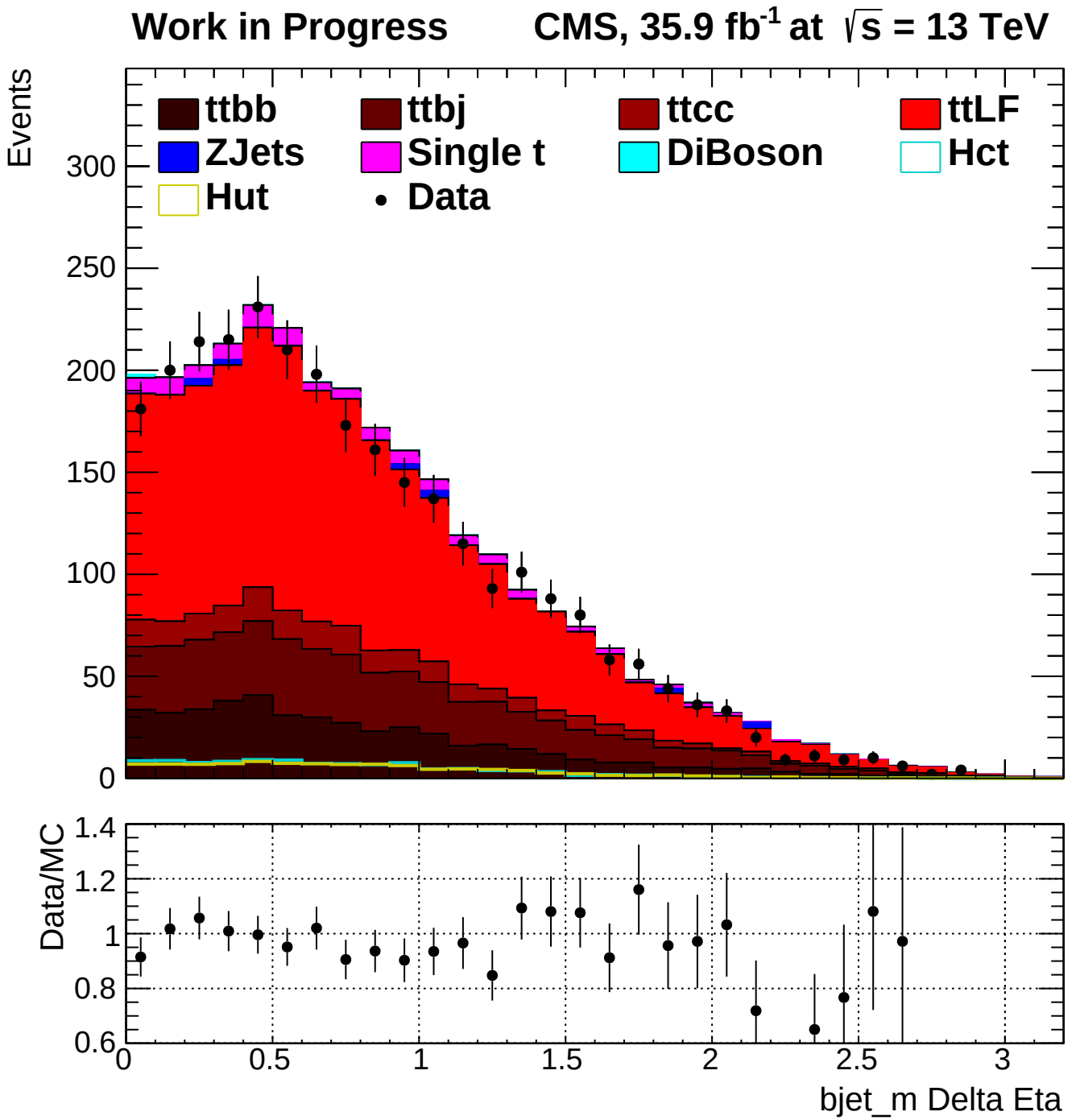

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)

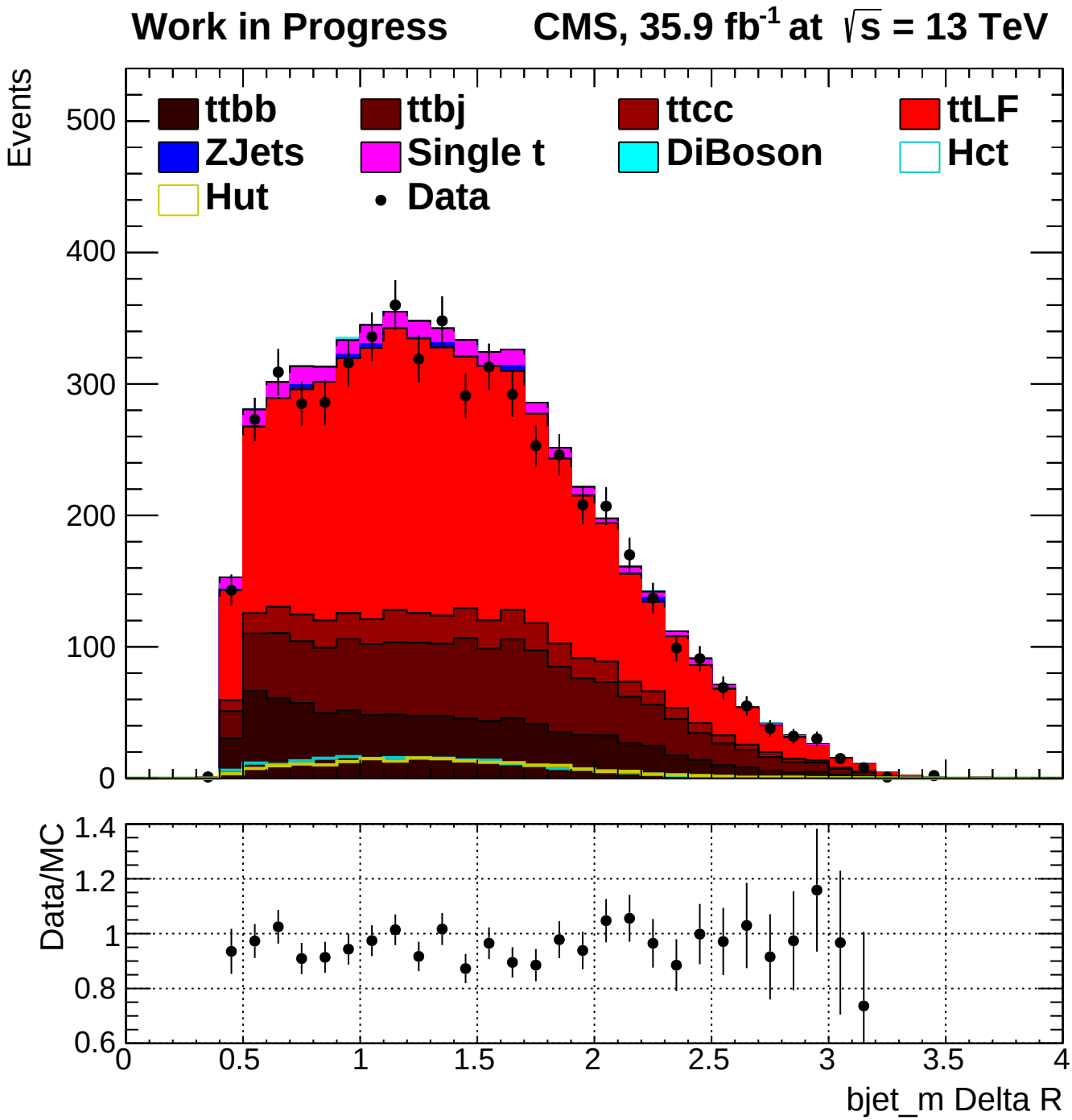

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)

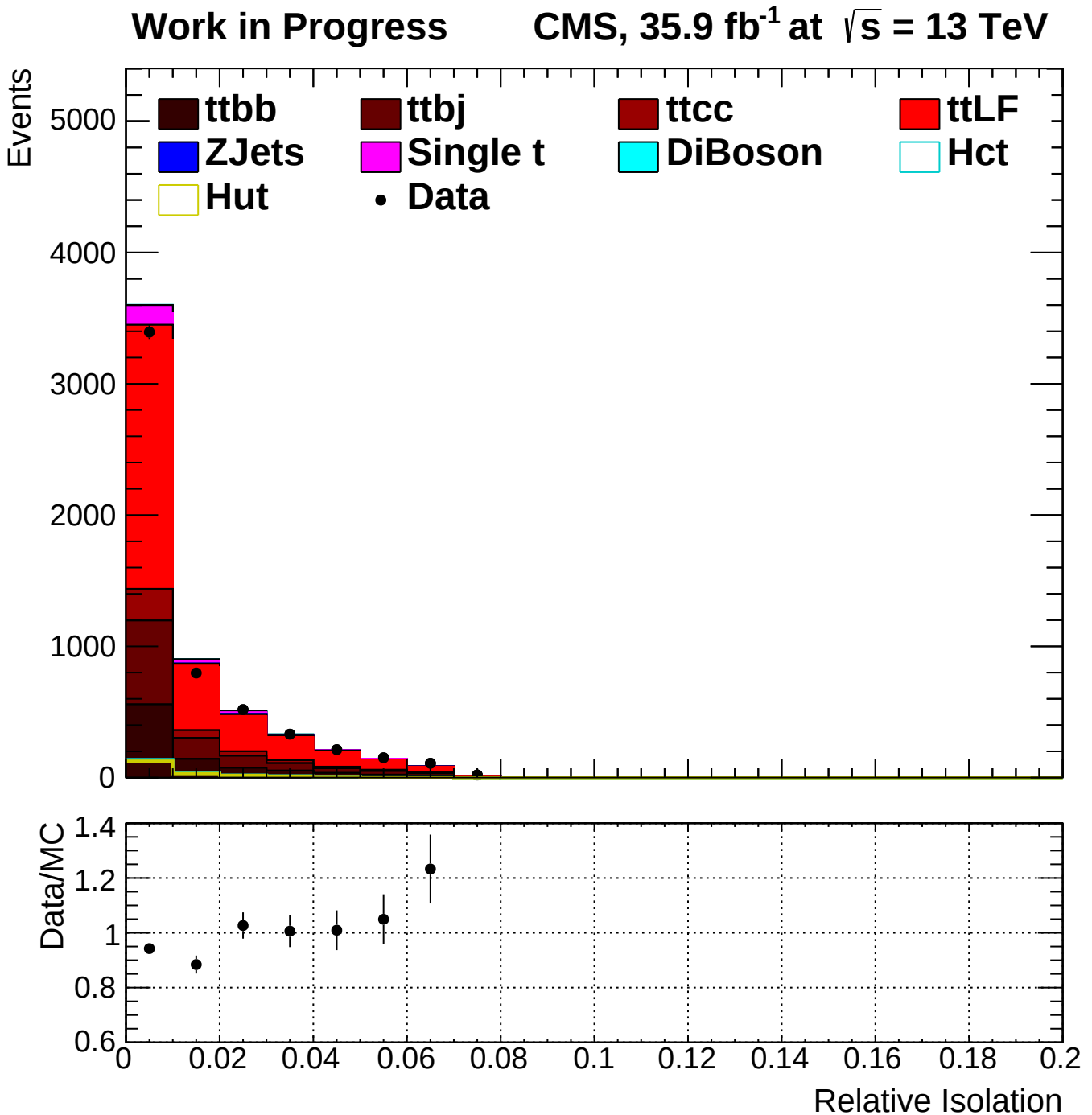

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)

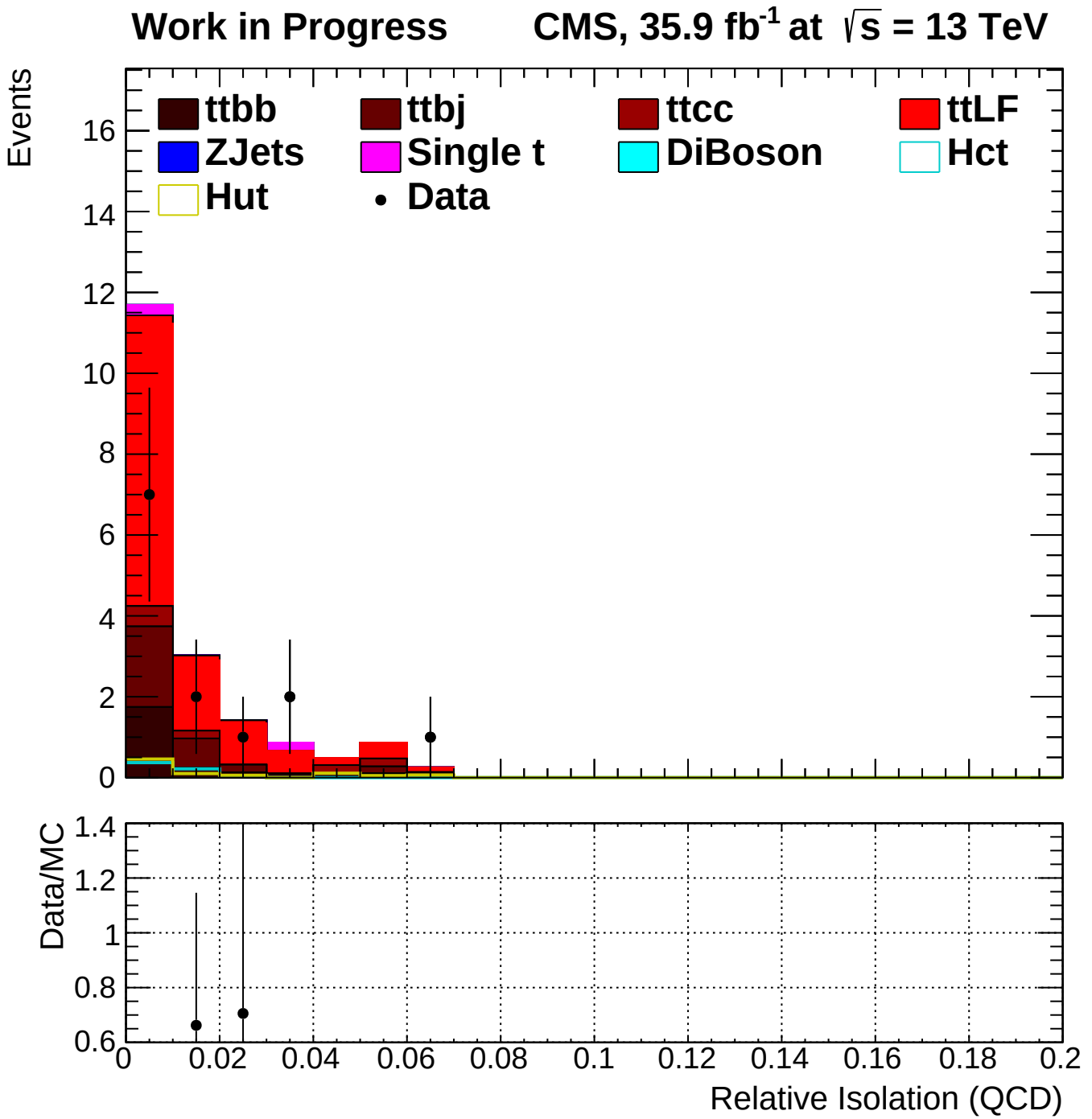

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
DPhi

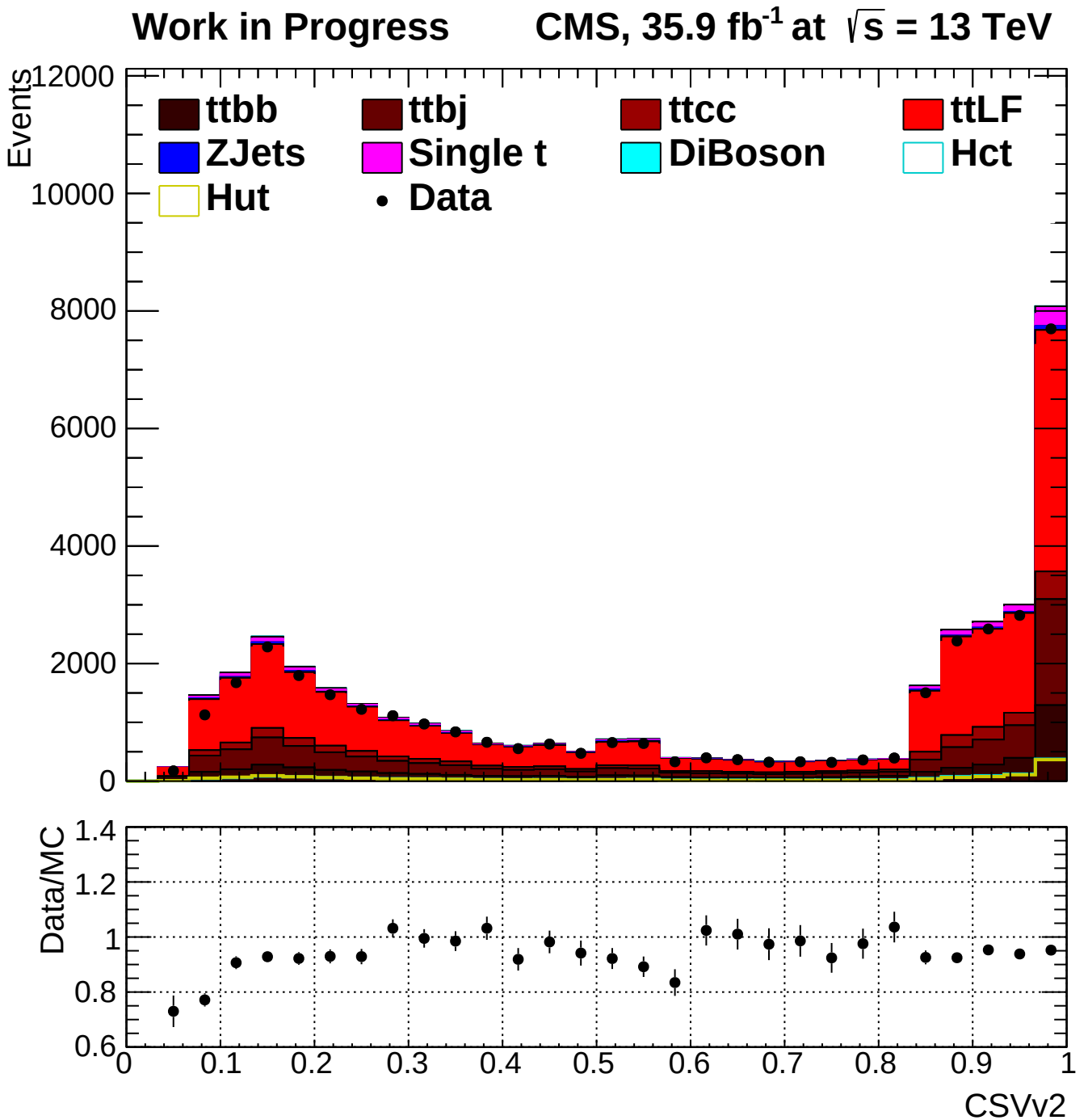

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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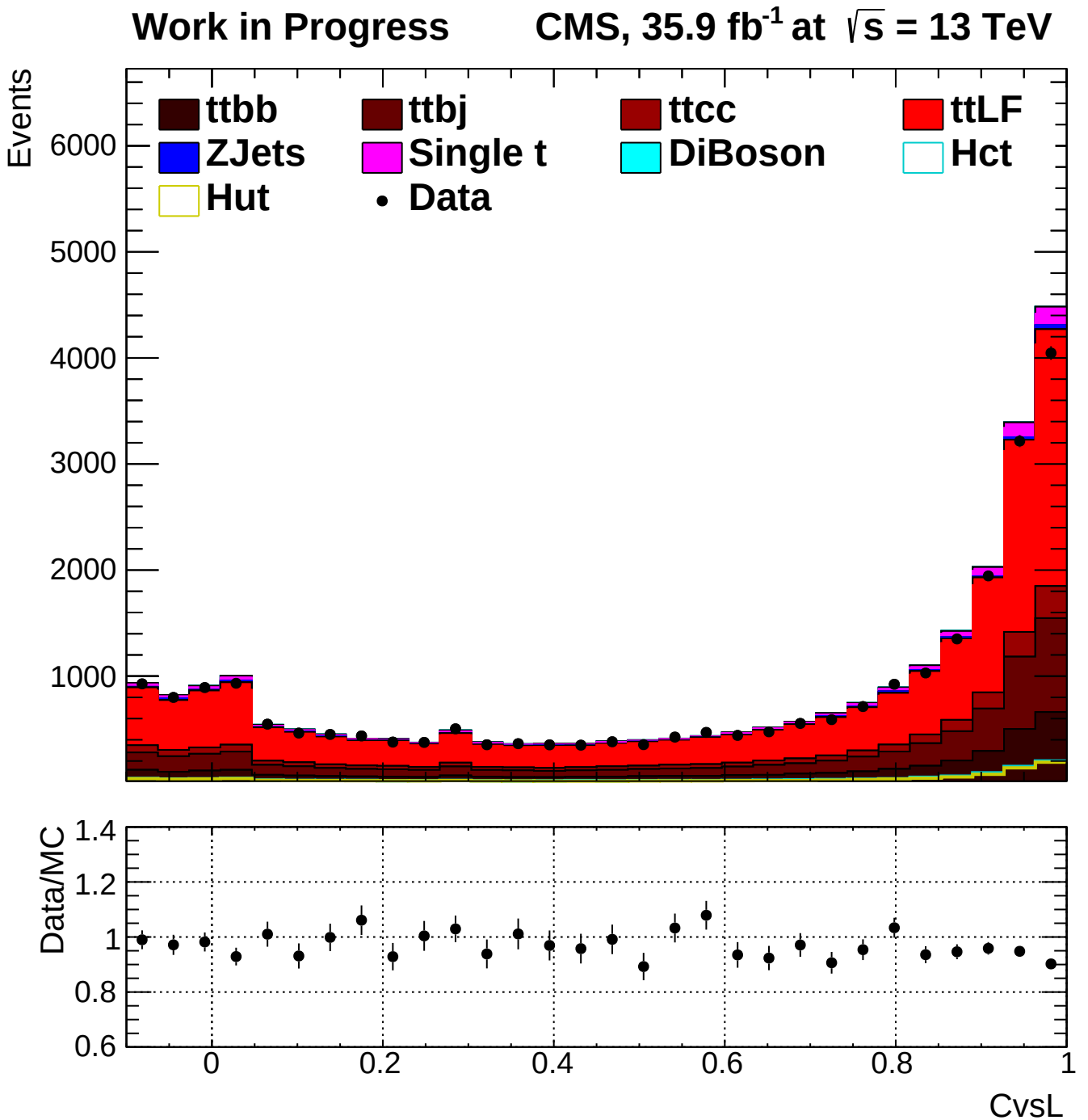
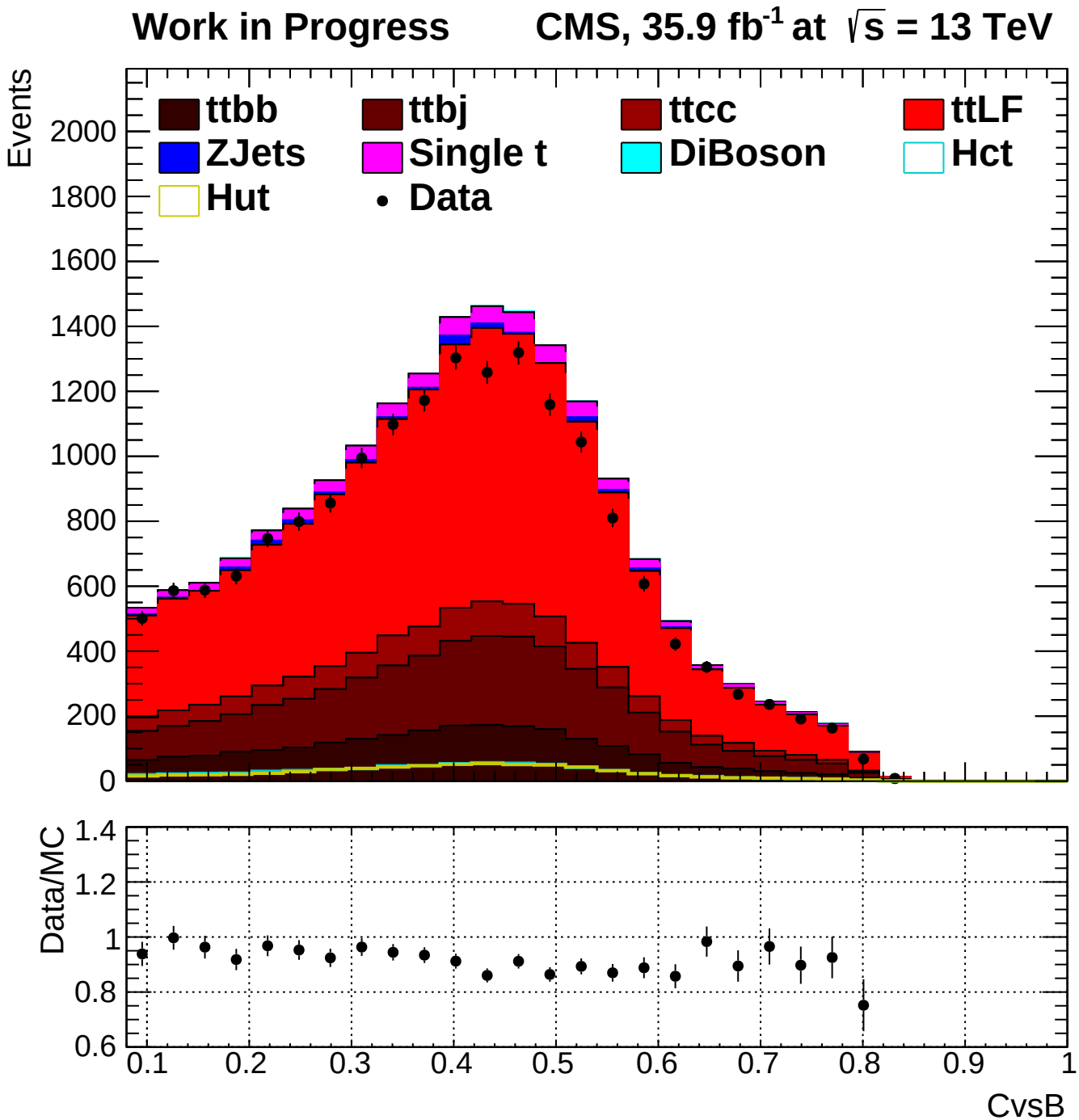
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CSVv2


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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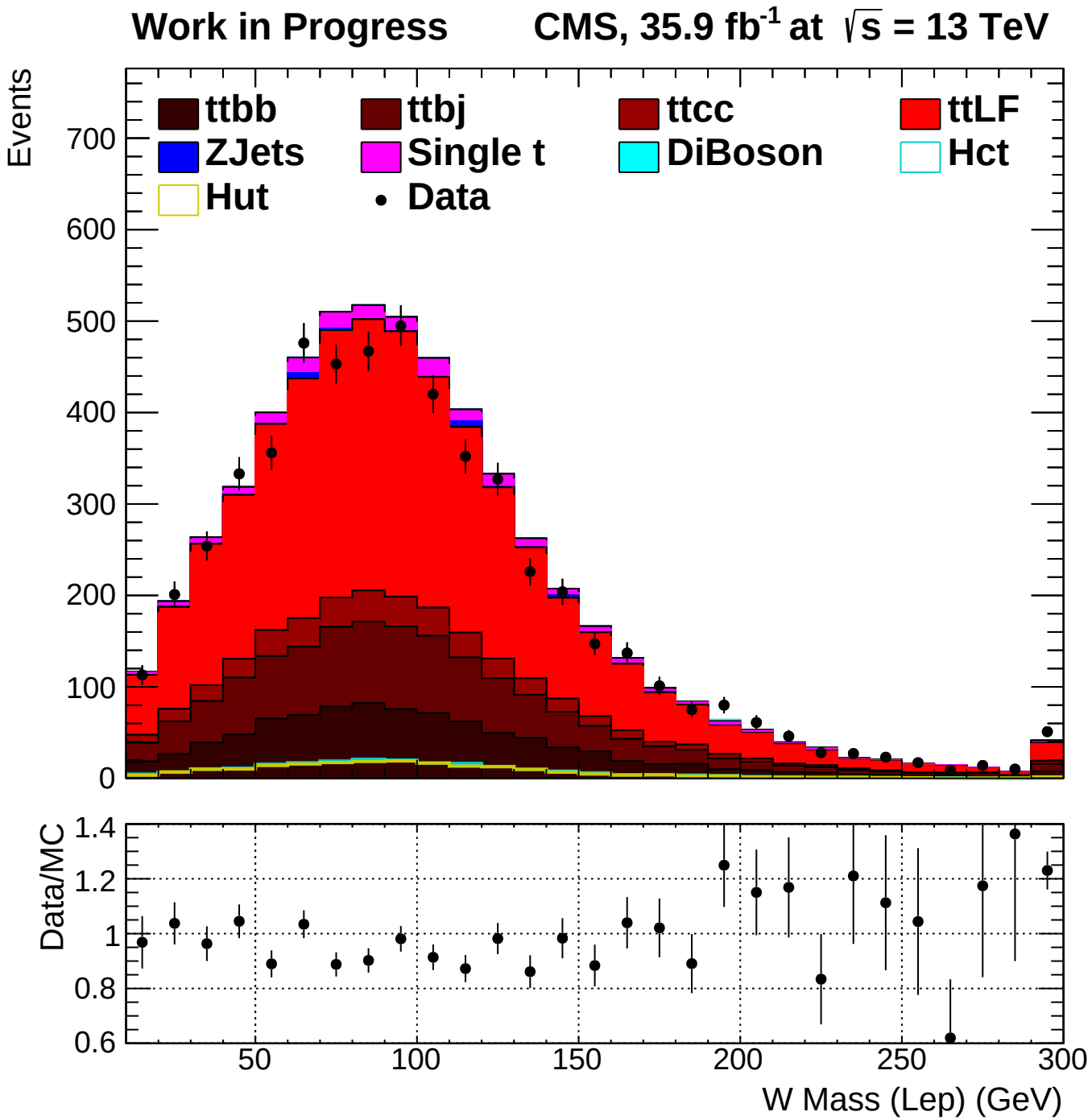
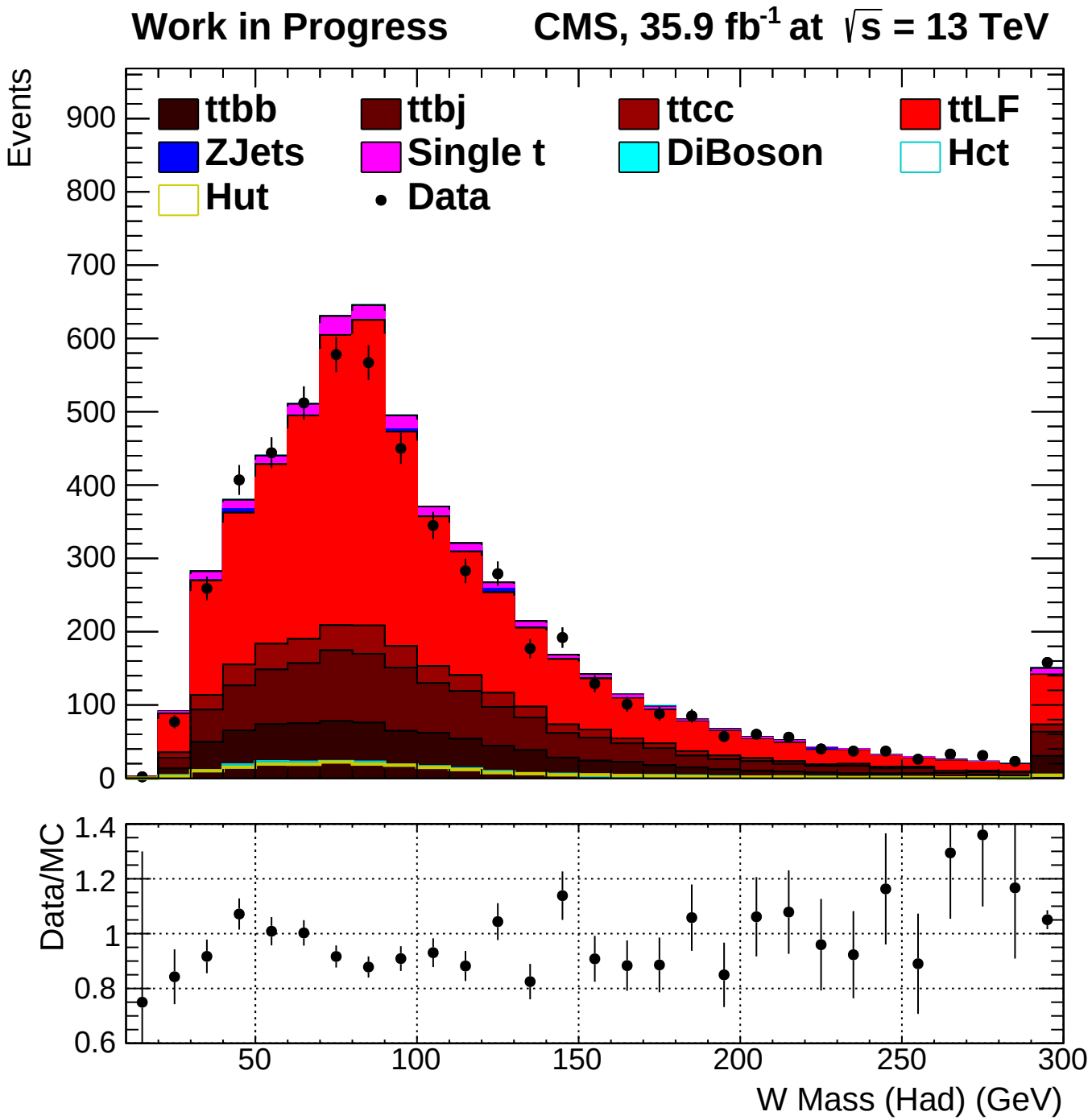
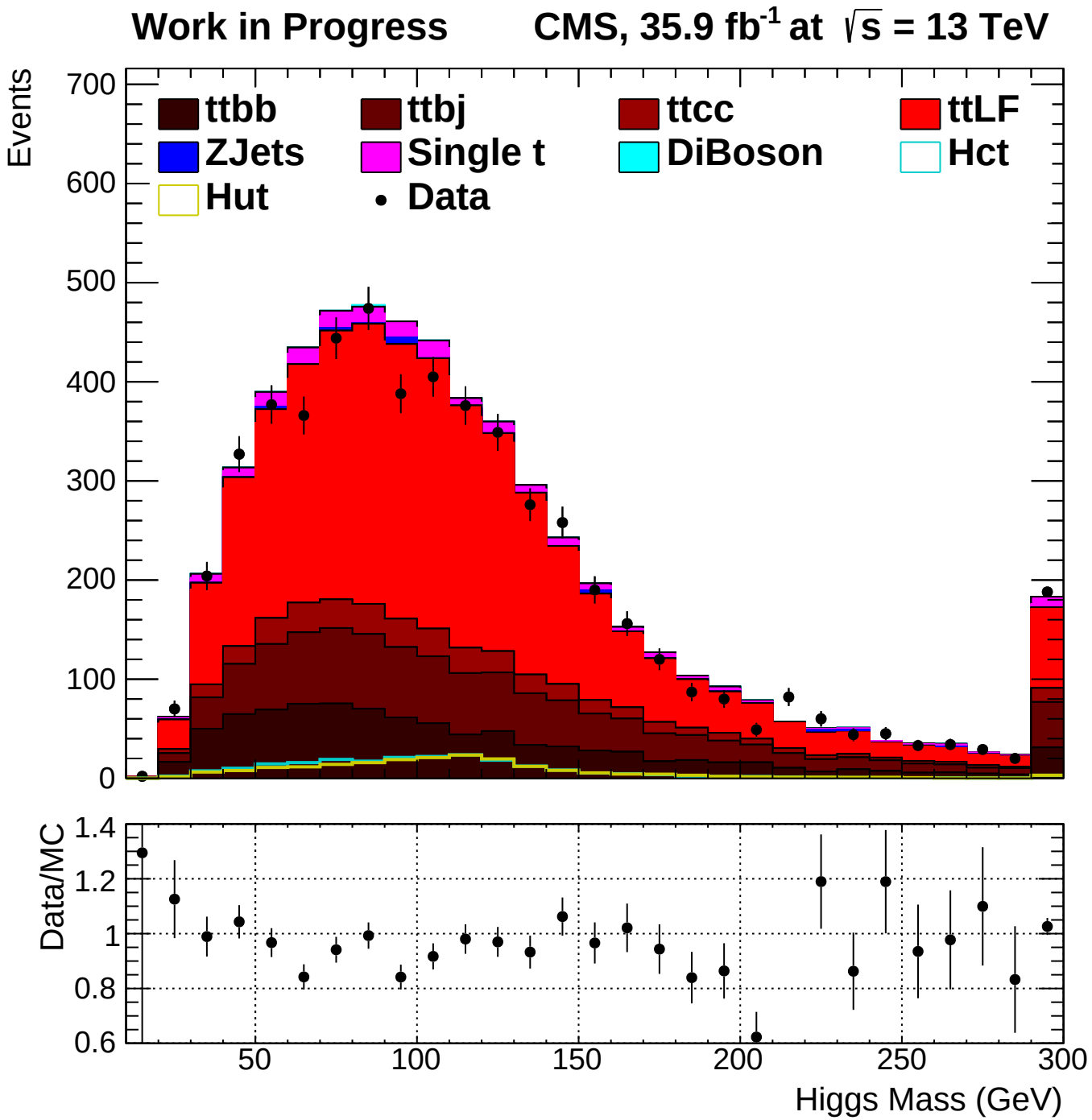
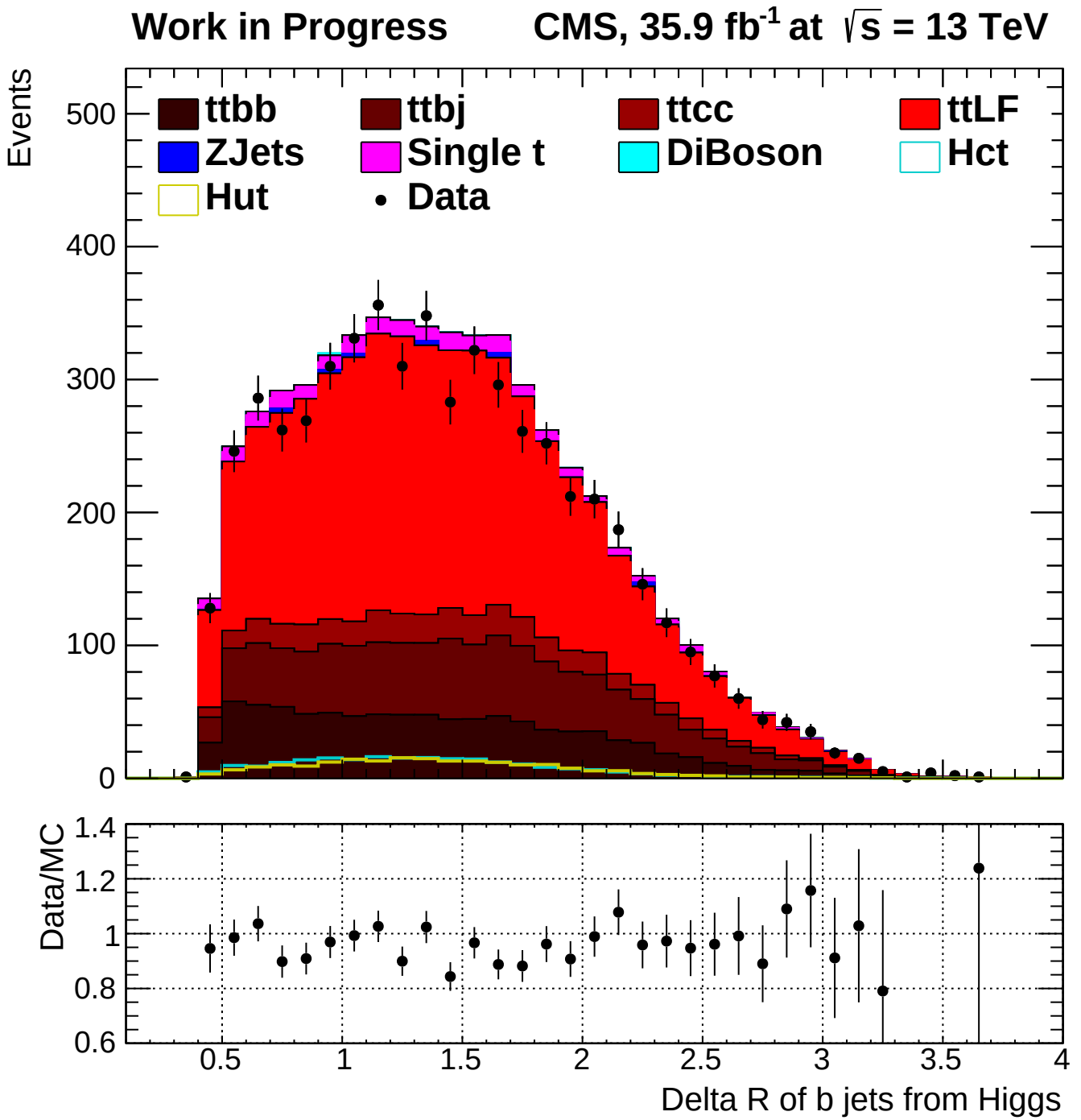
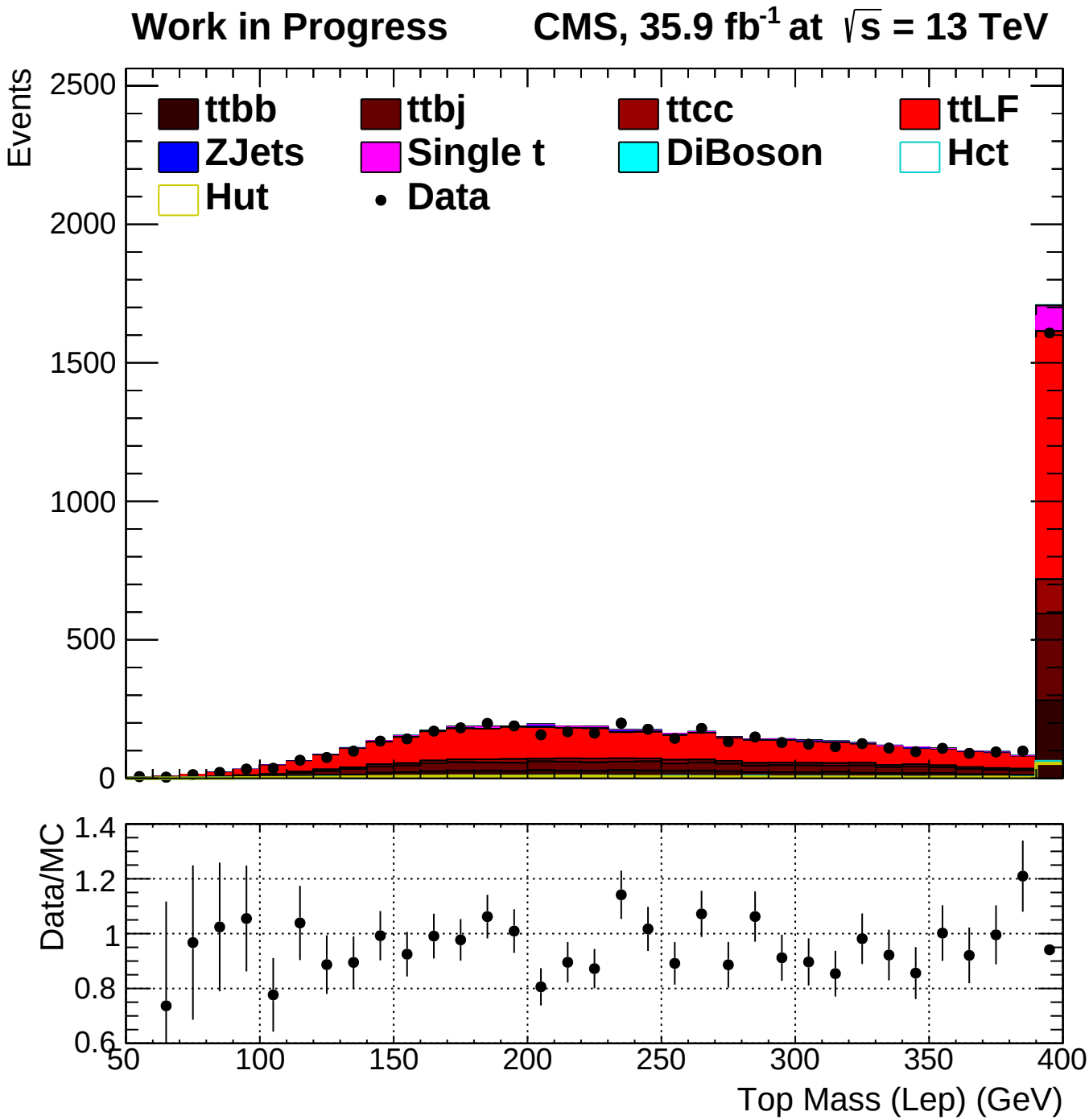
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB

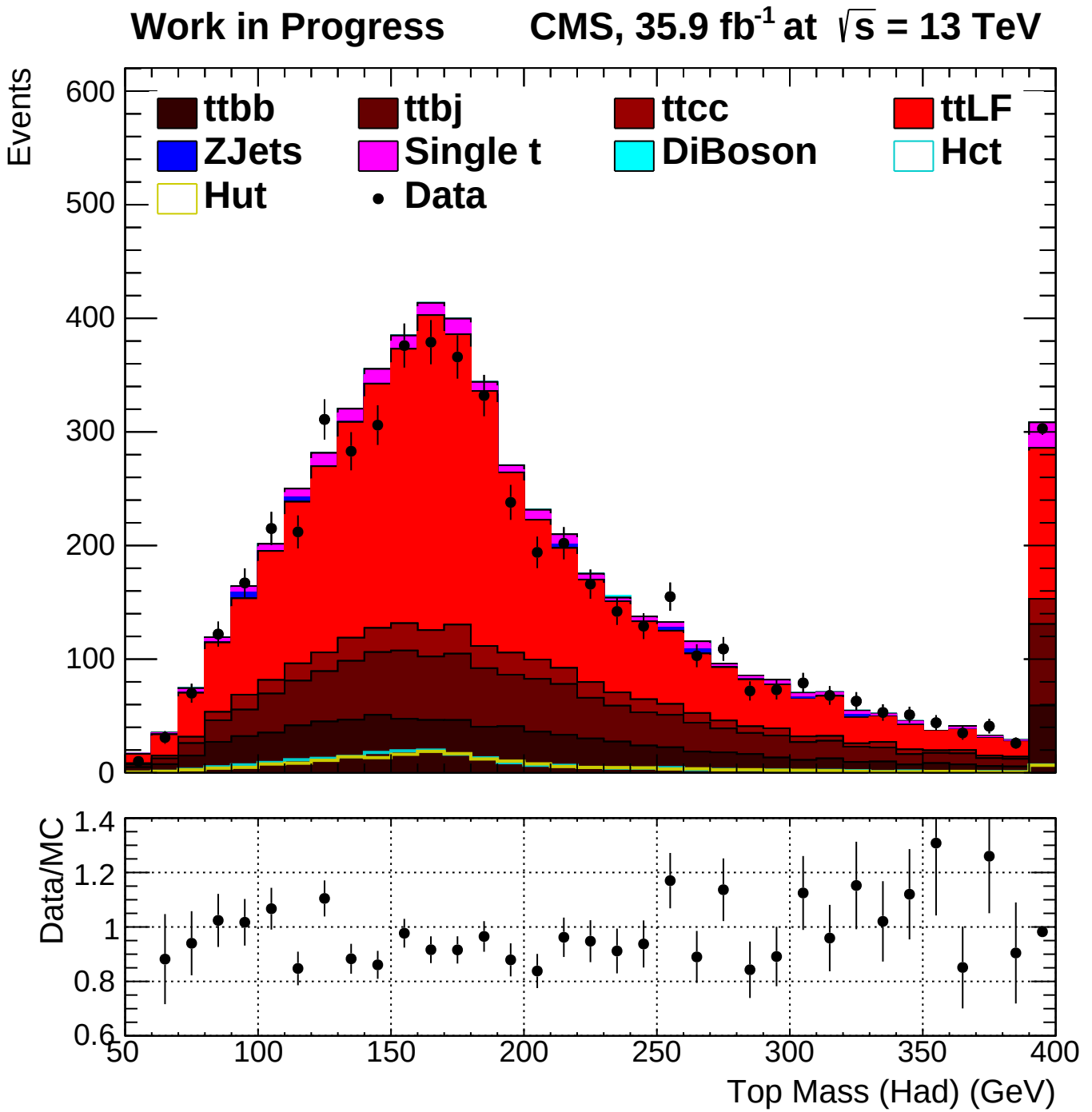

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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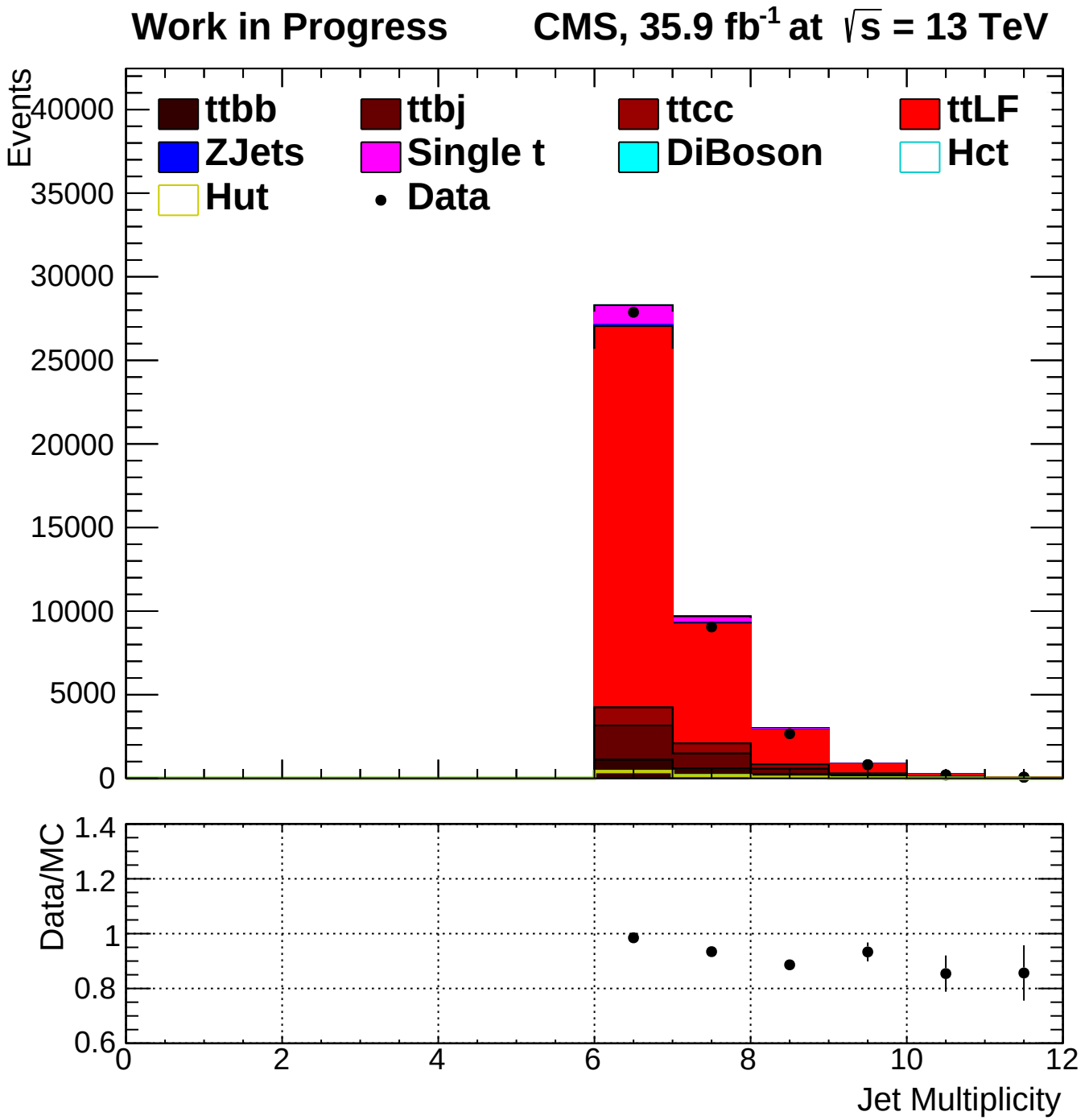
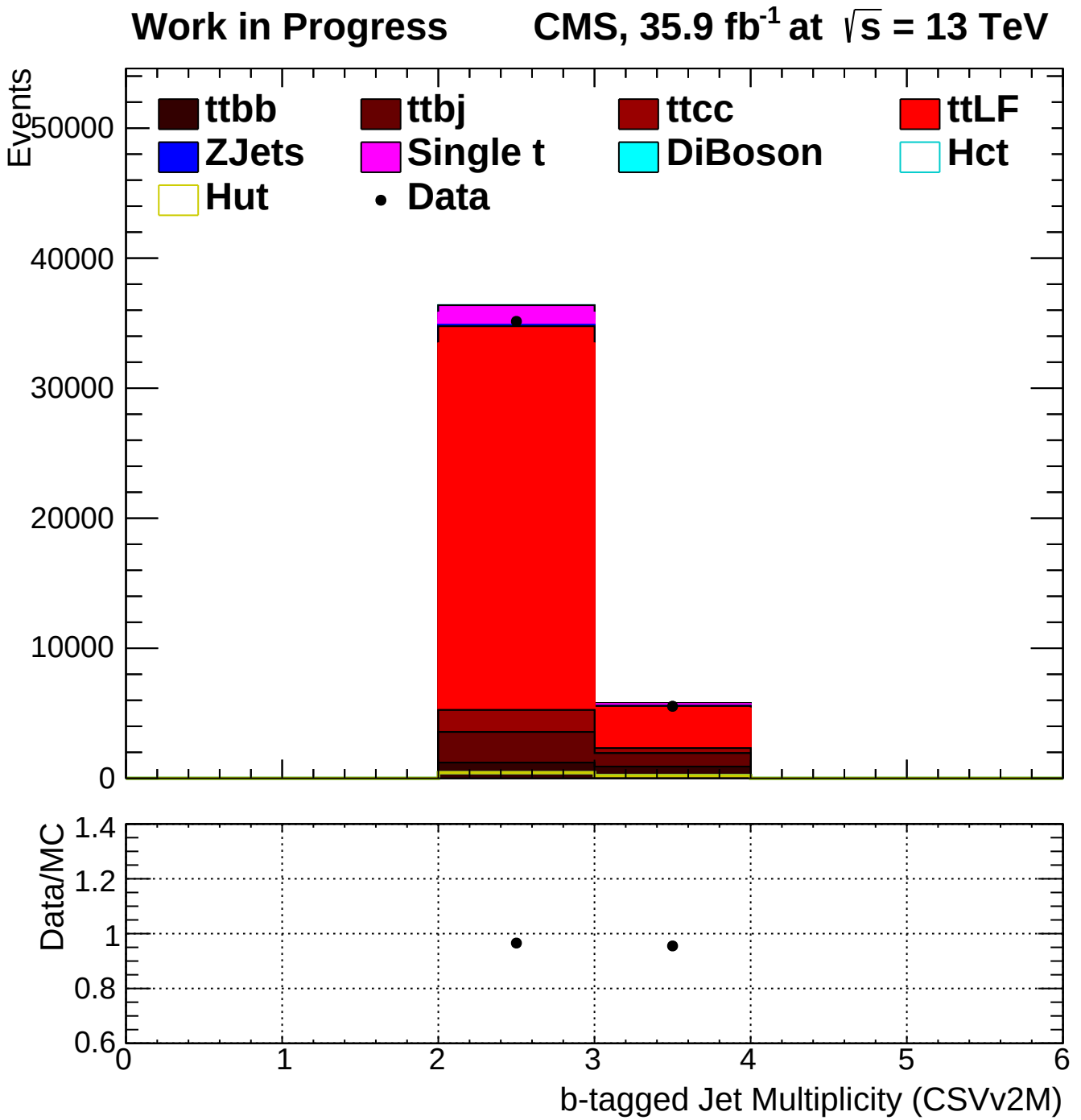
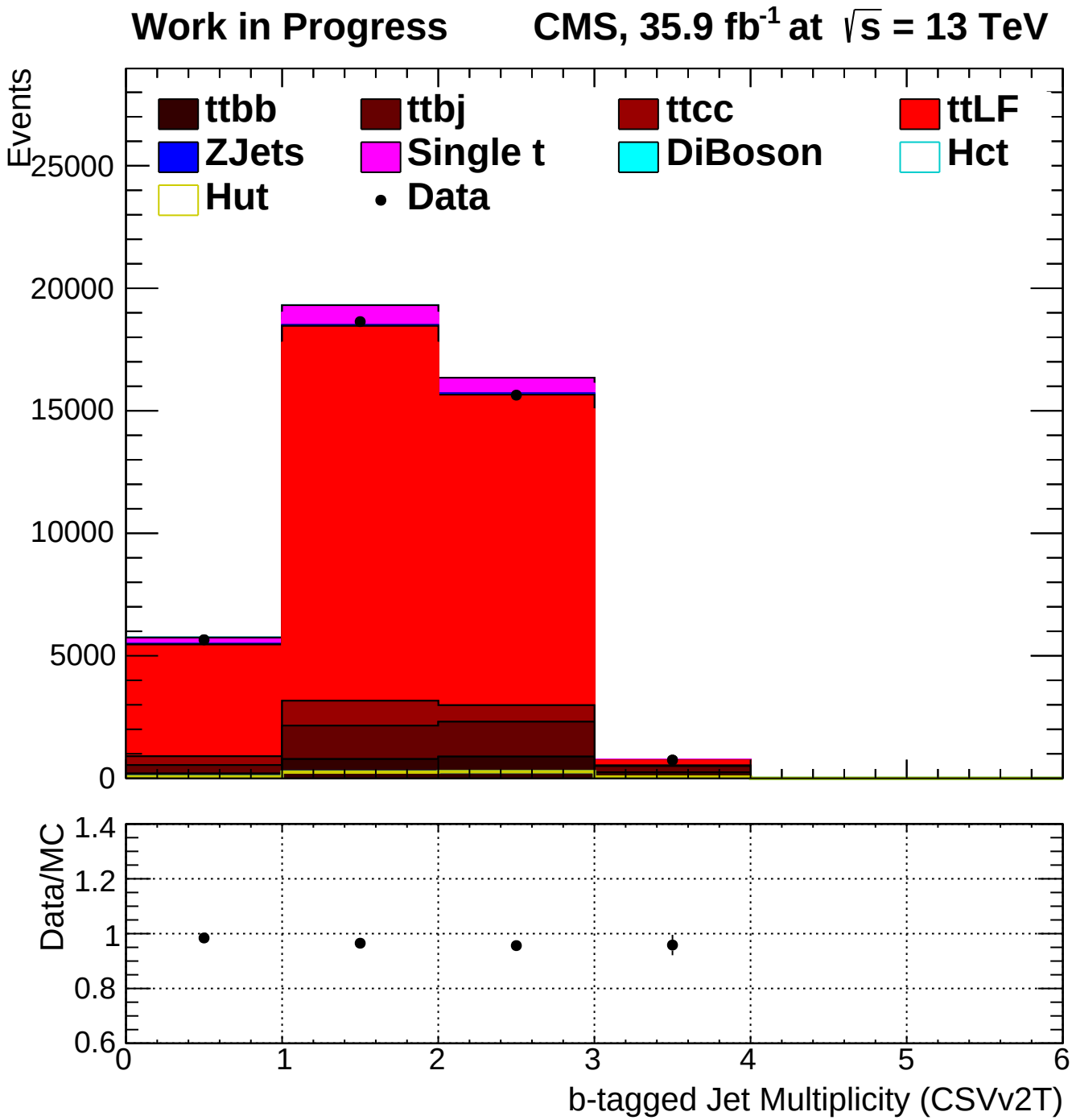
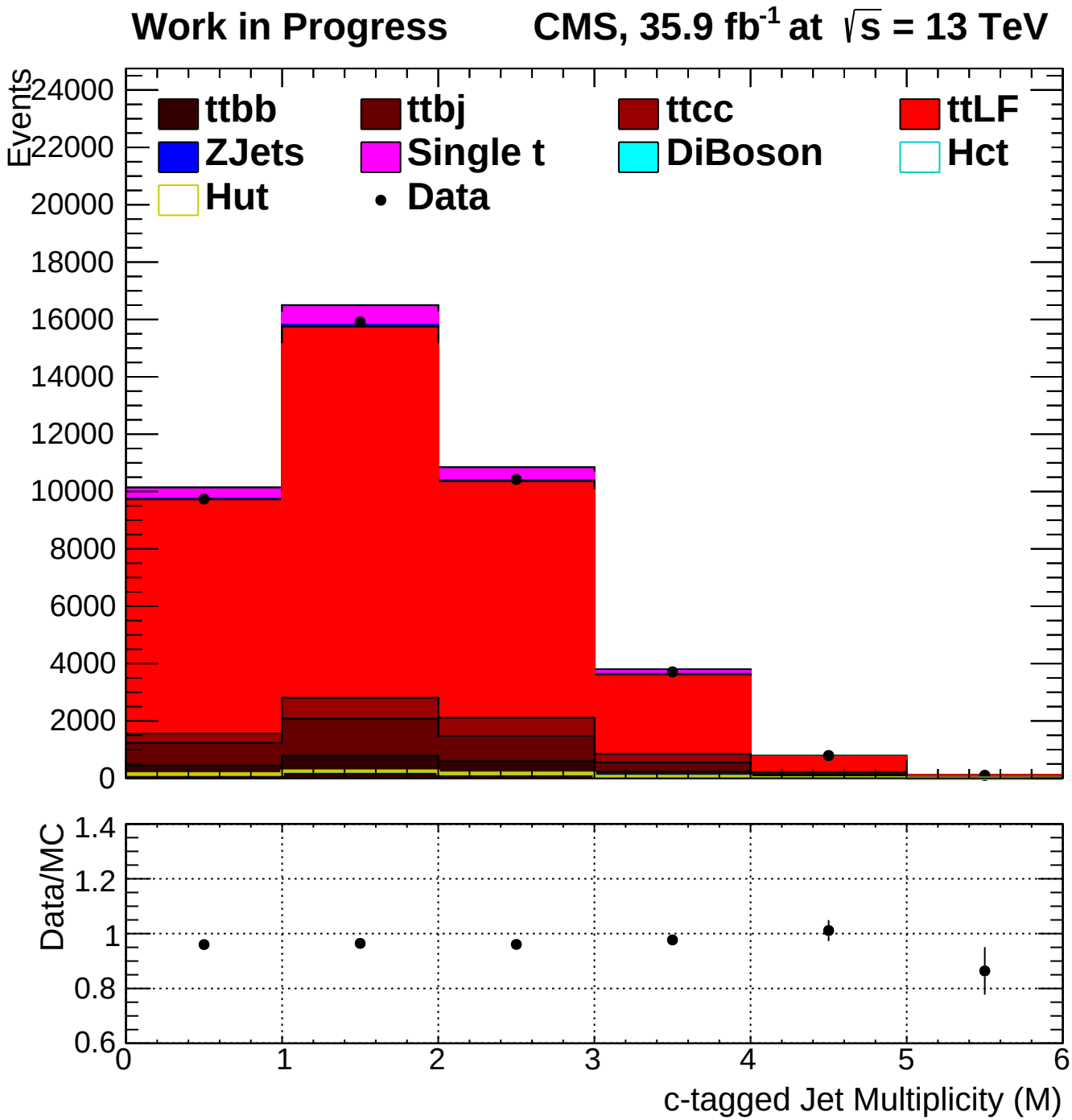
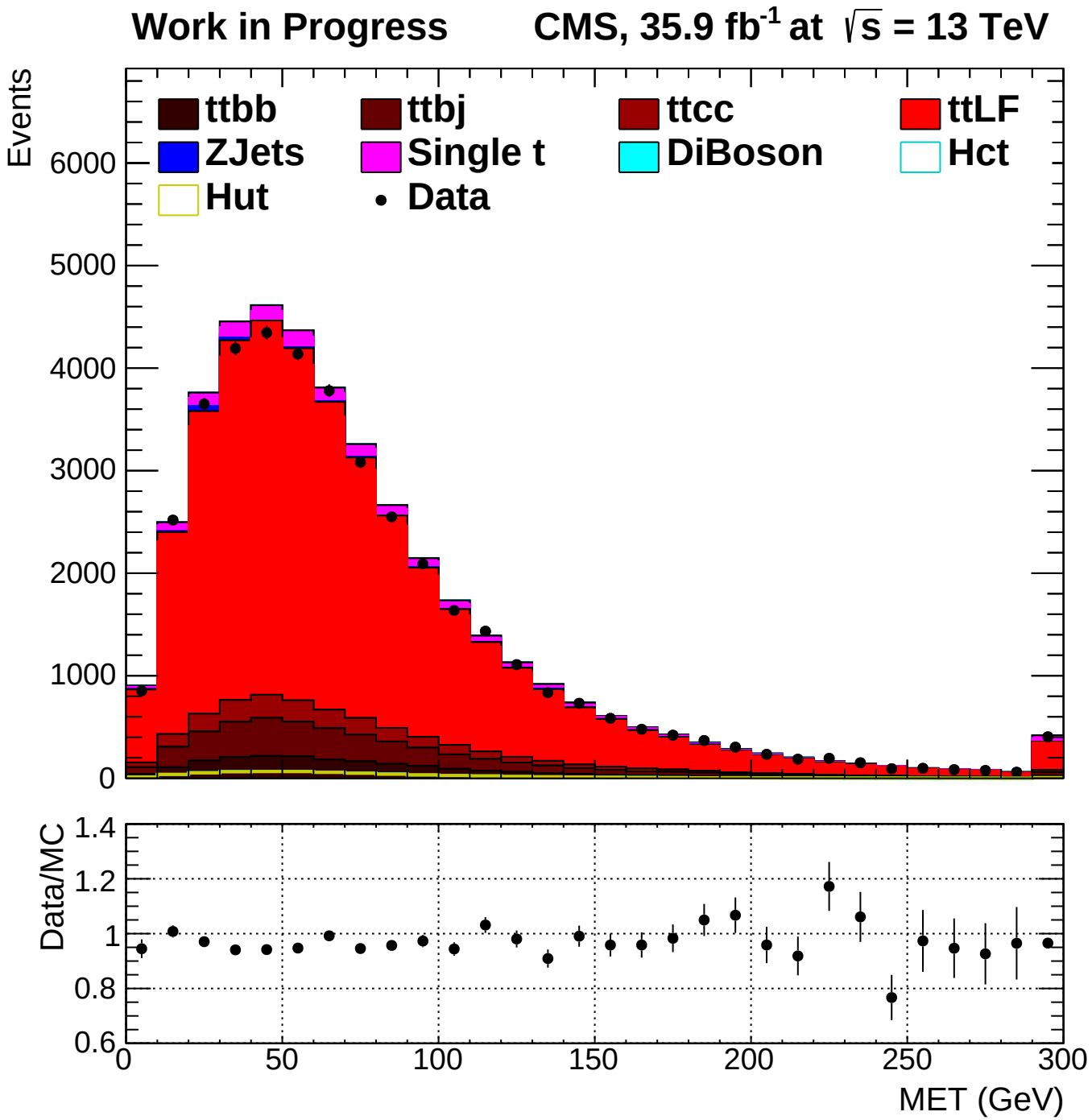
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)

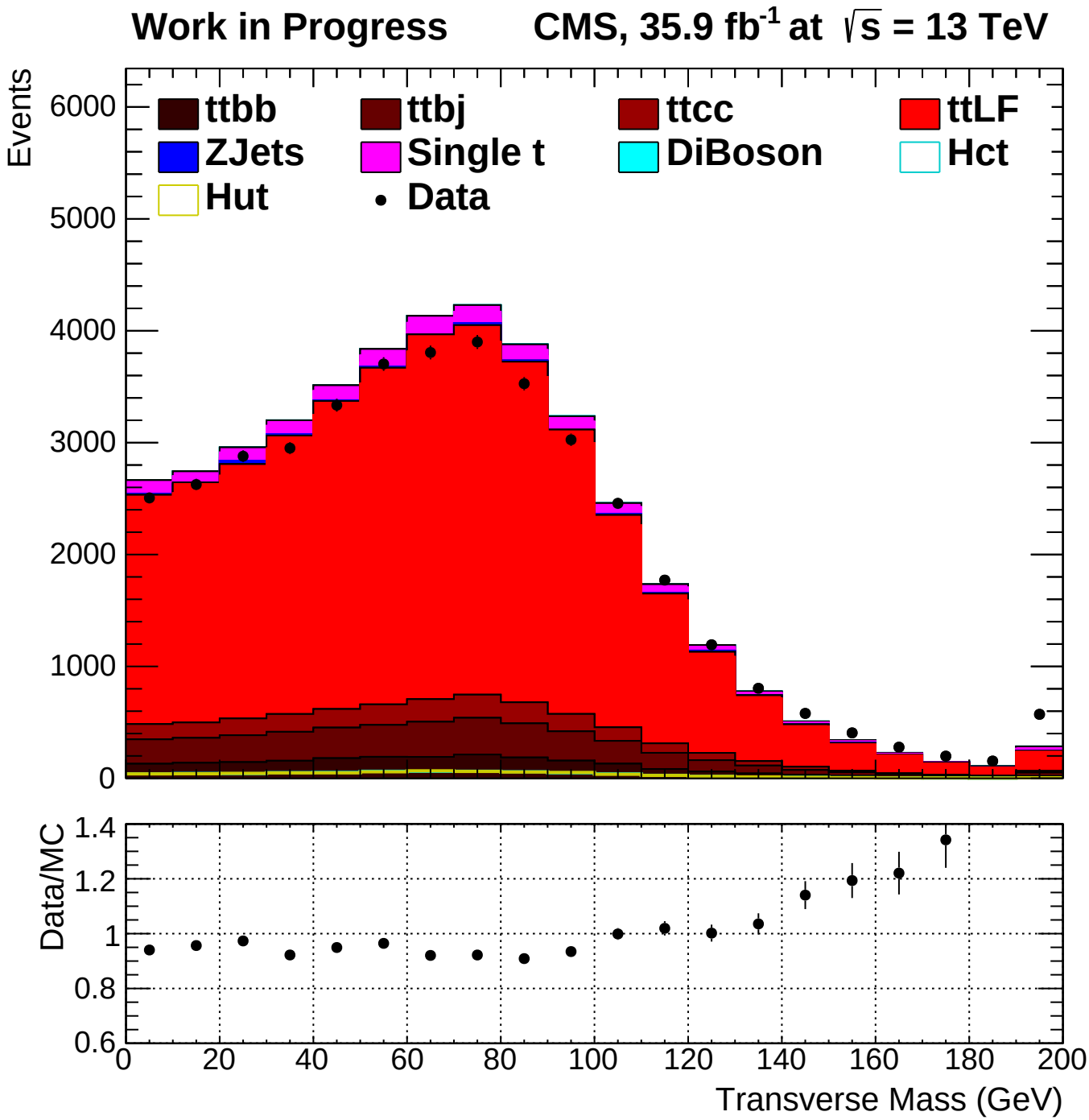

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
40000
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity

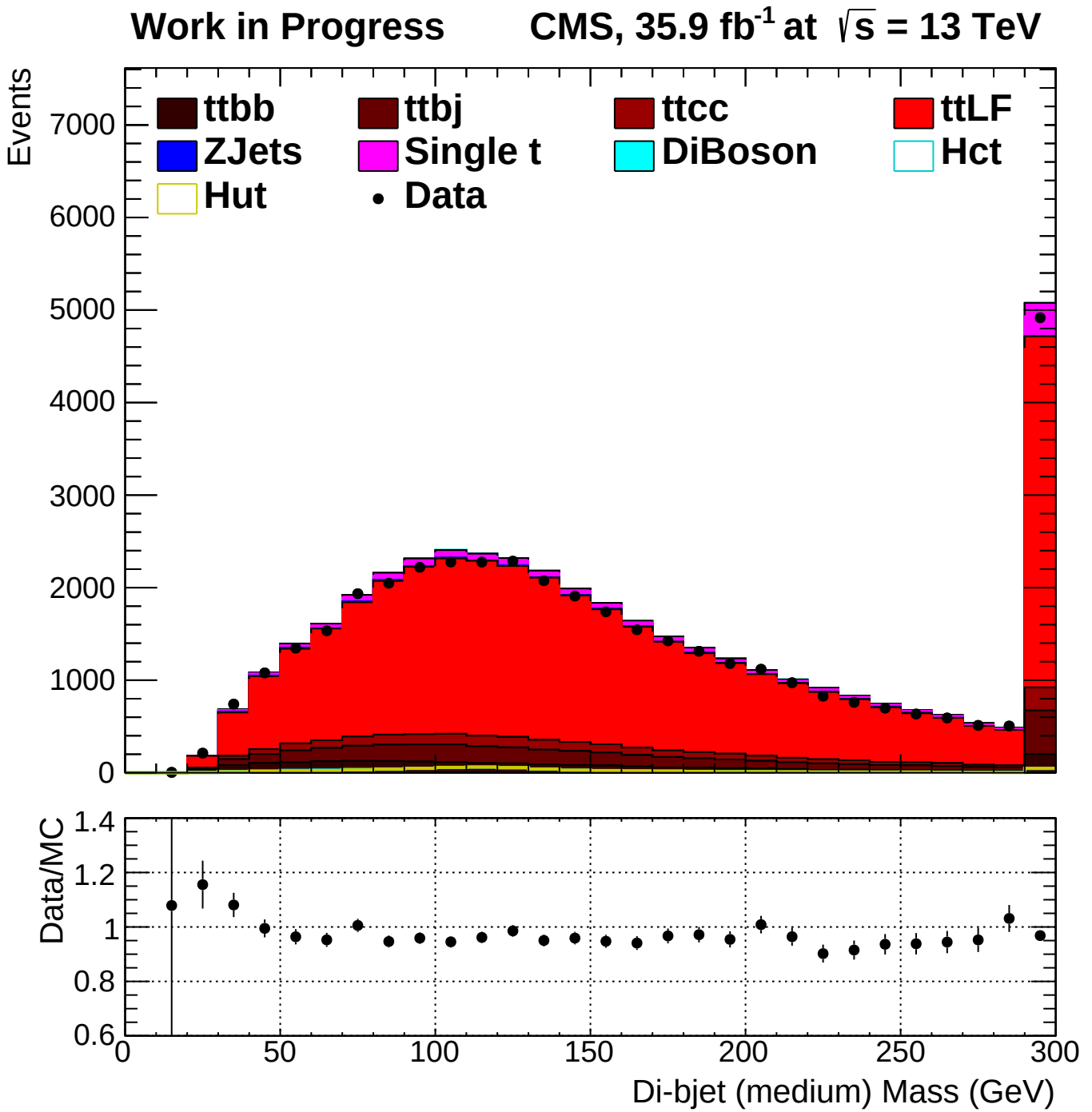

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

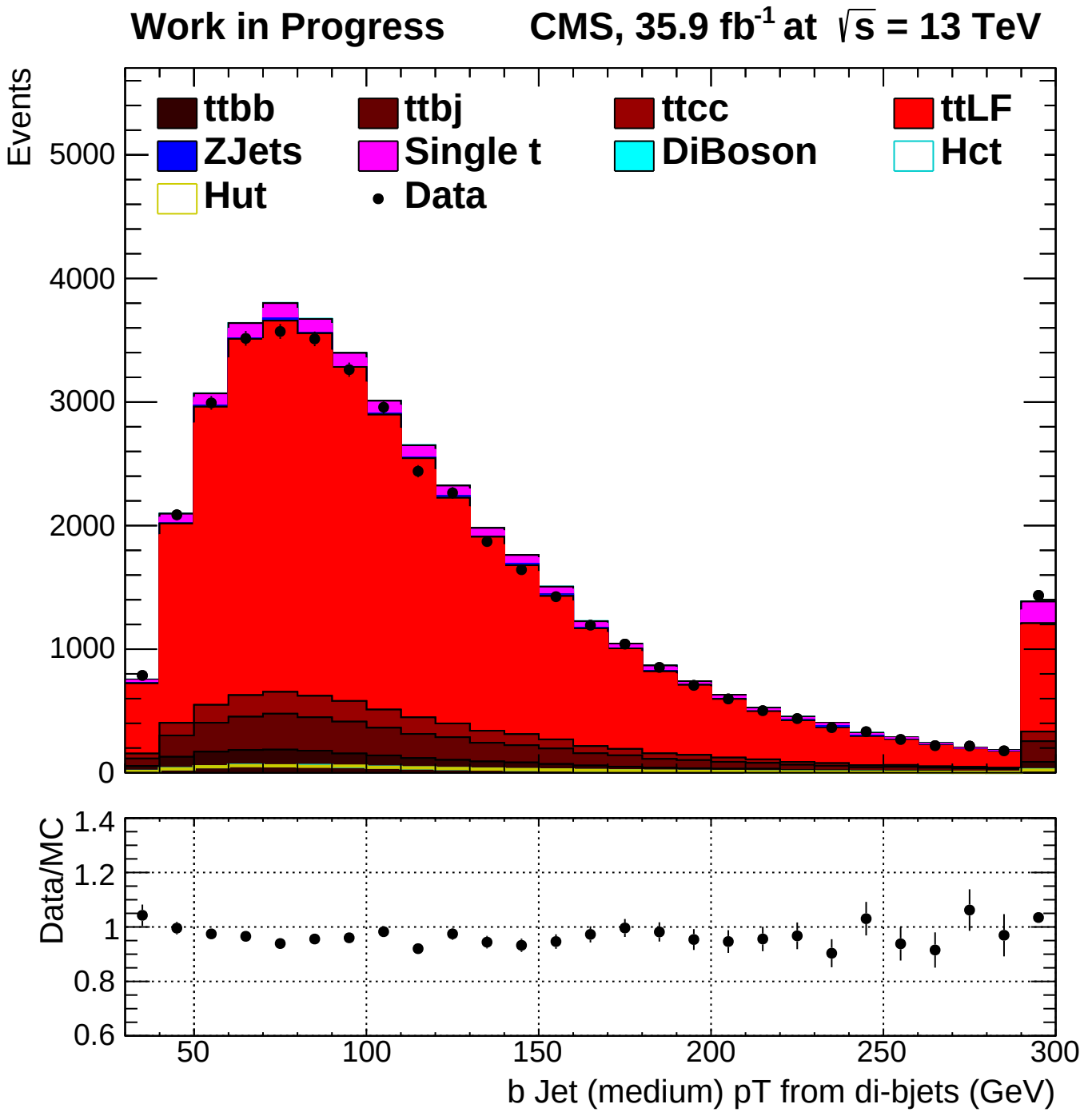

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

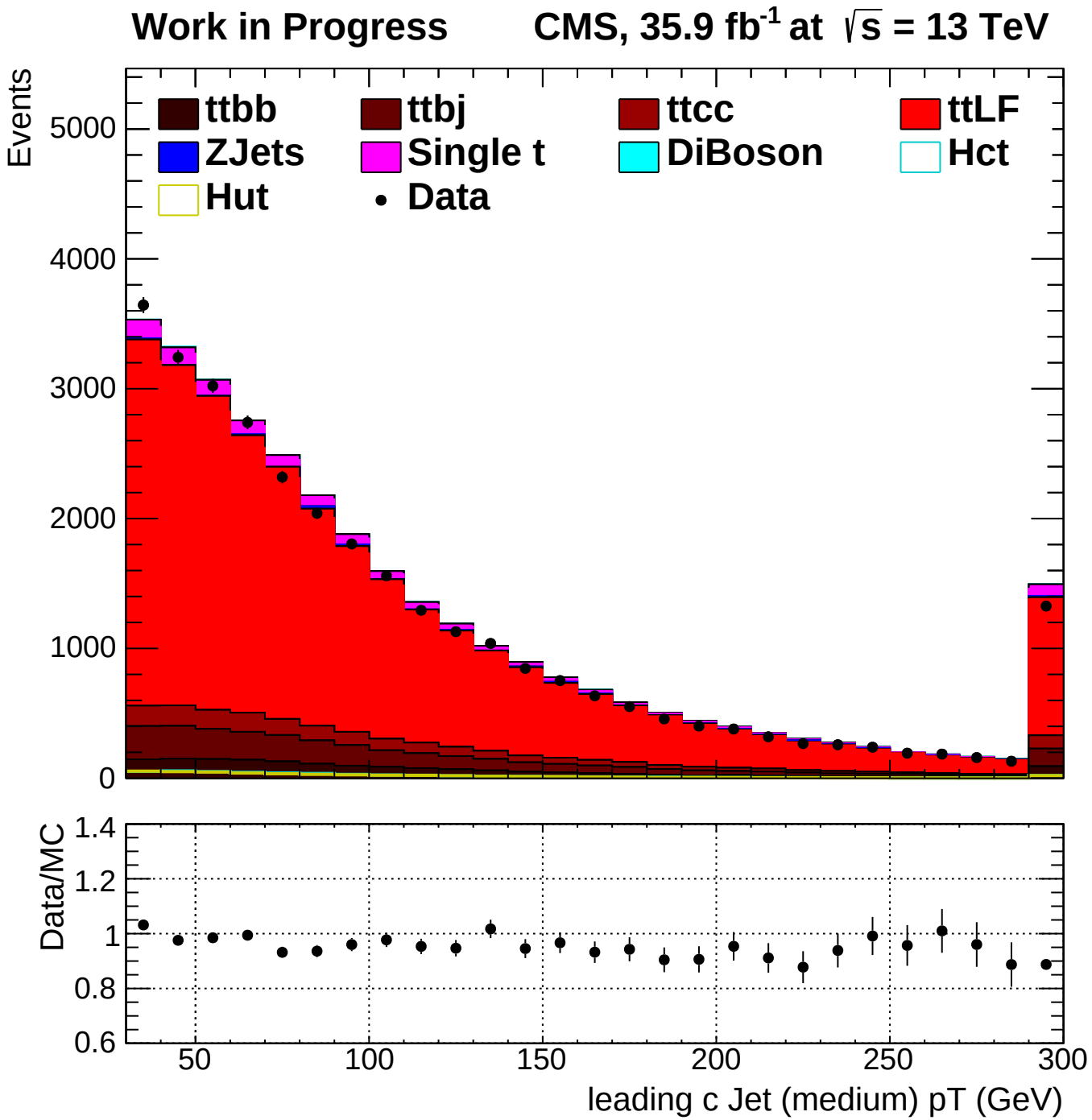

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
c-tagged Jet Multiplicity (M)

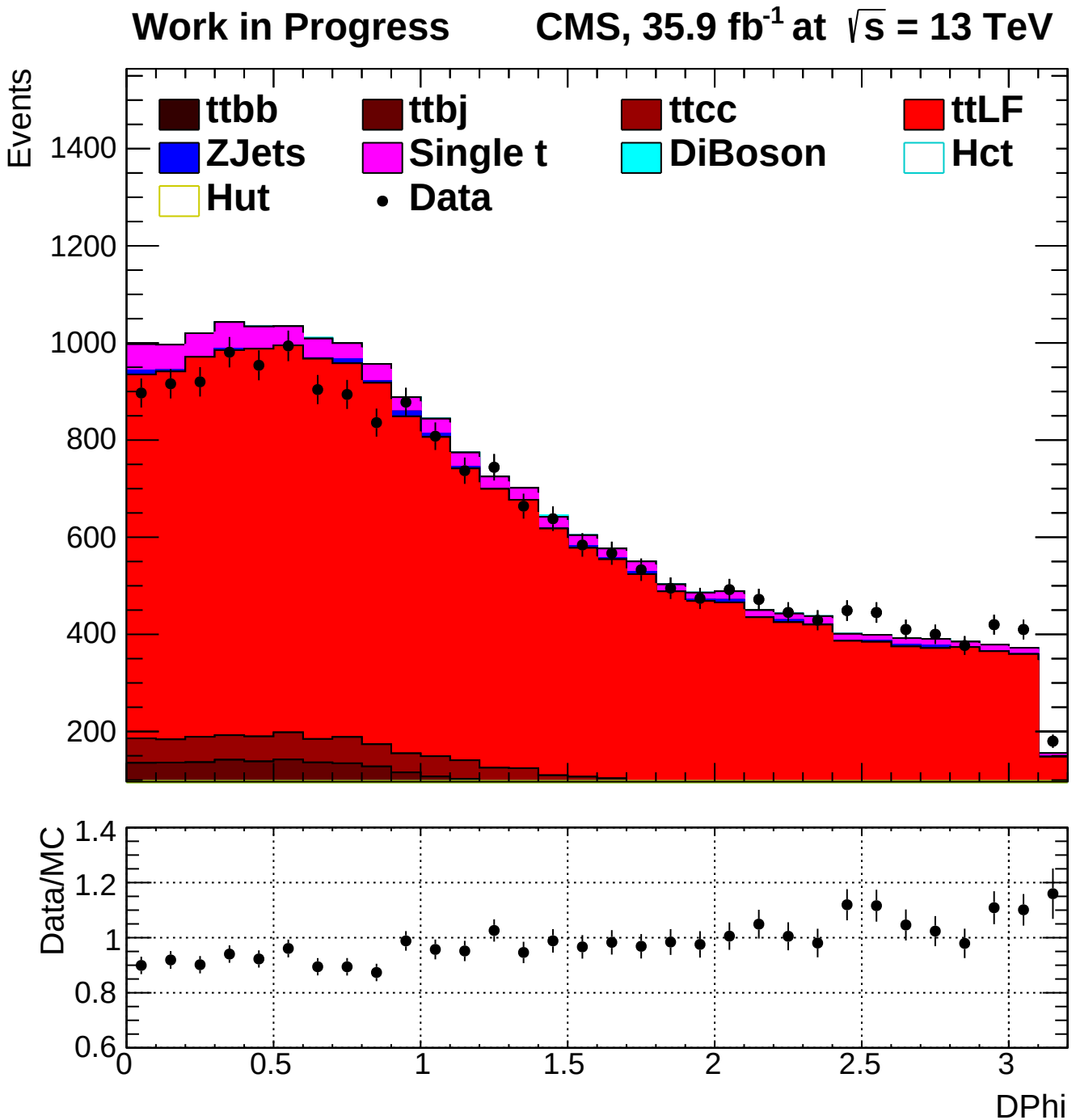

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
MET (GeV)

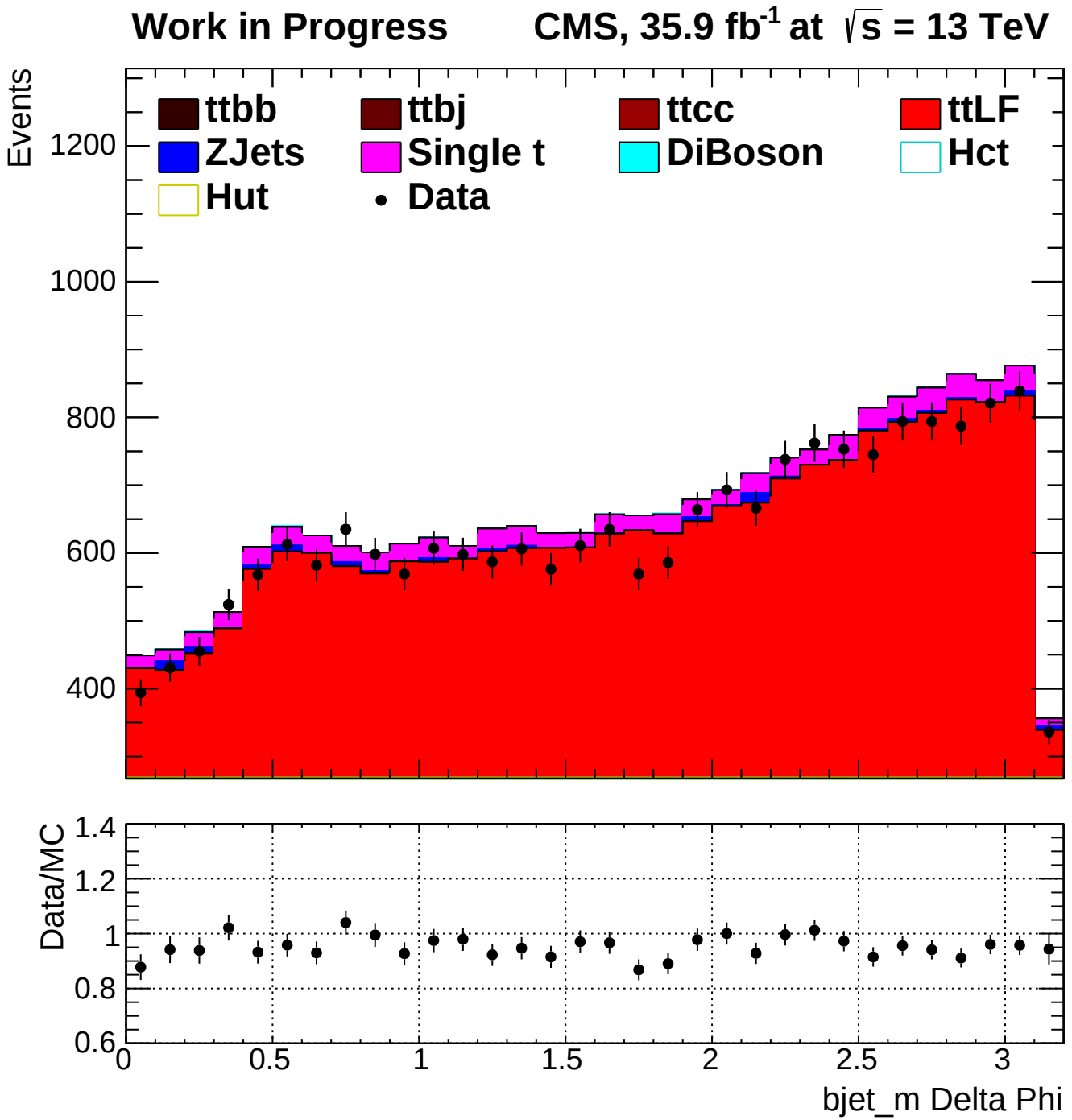

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)

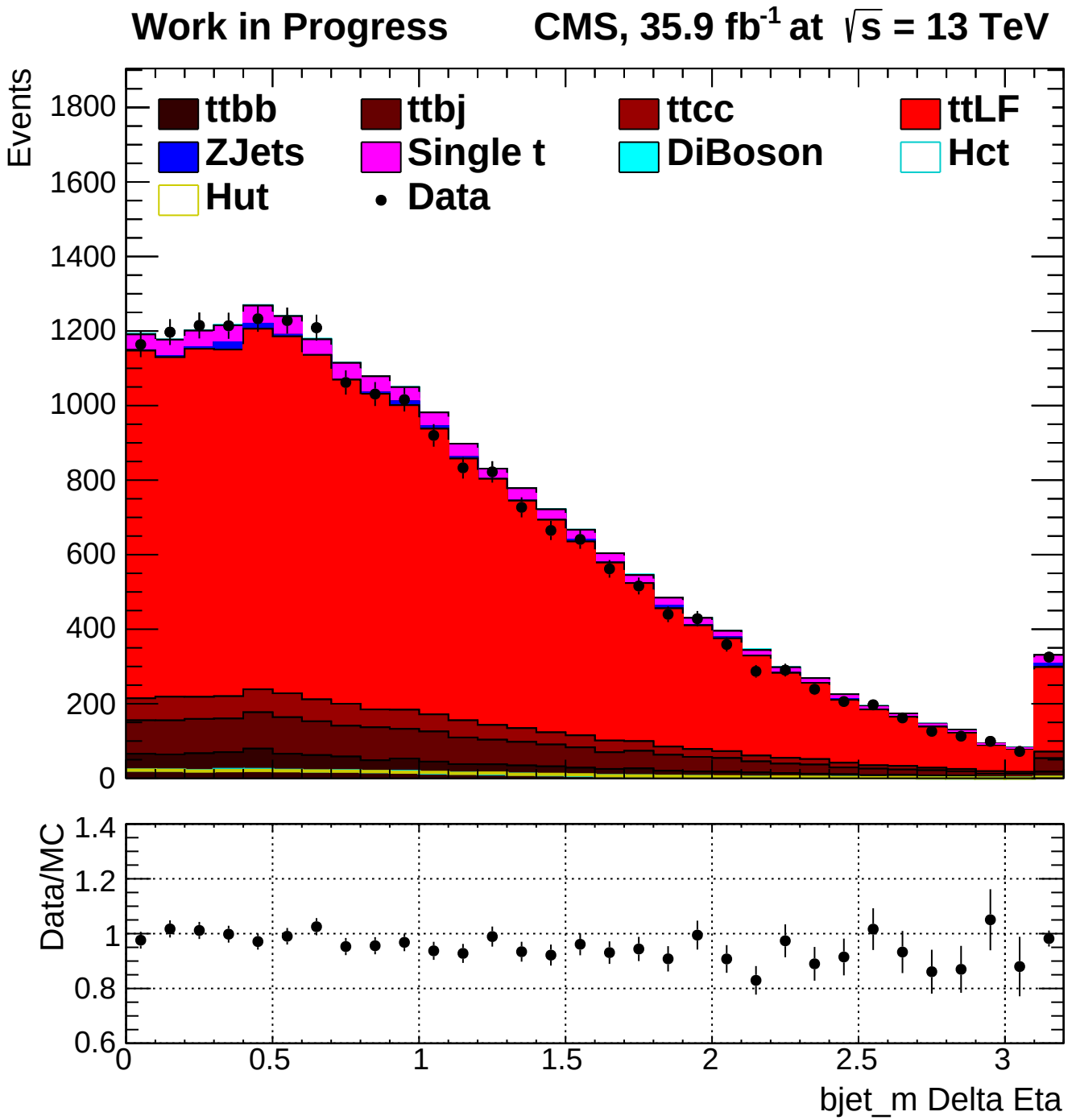

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
7000
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

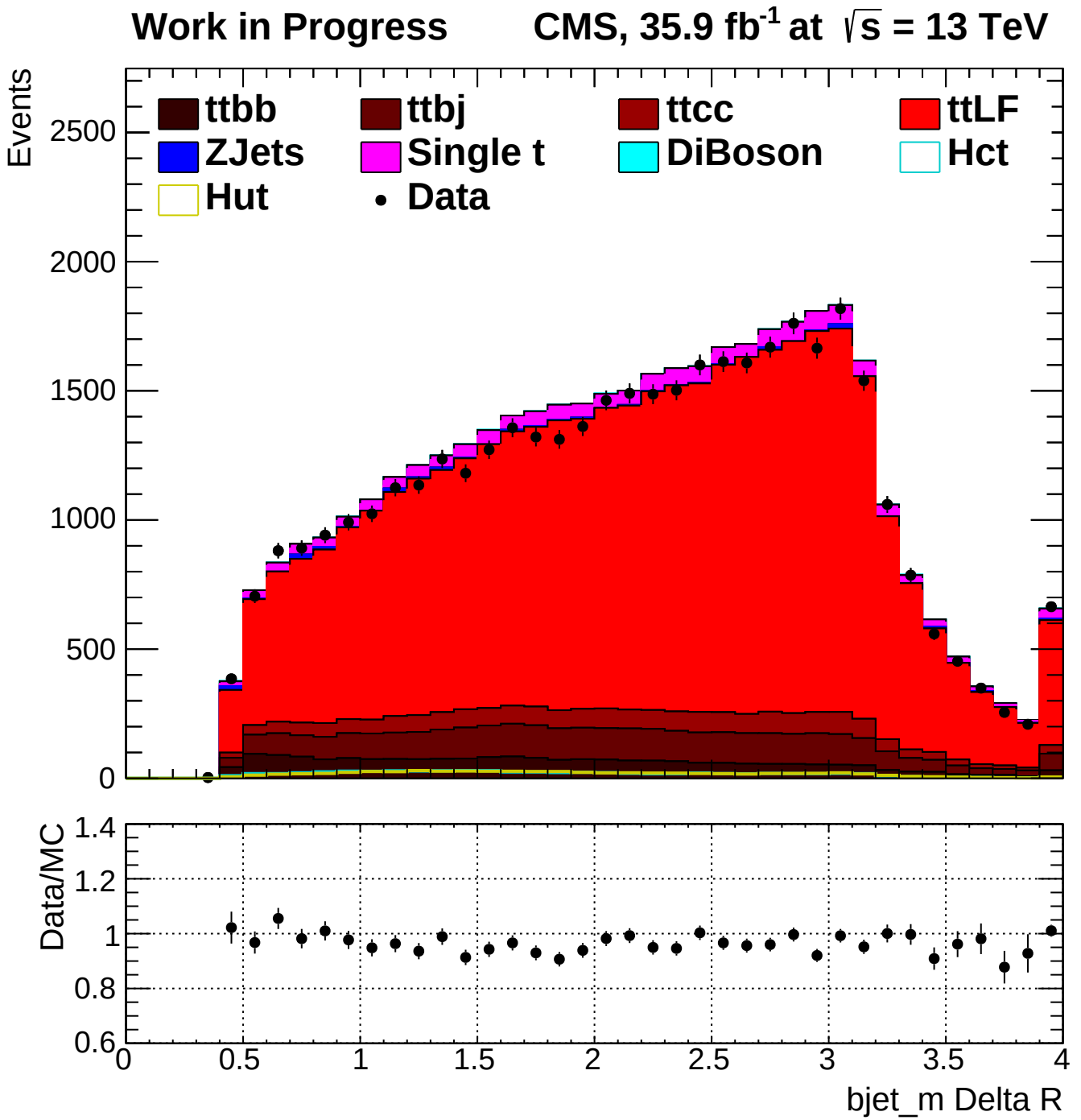

Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

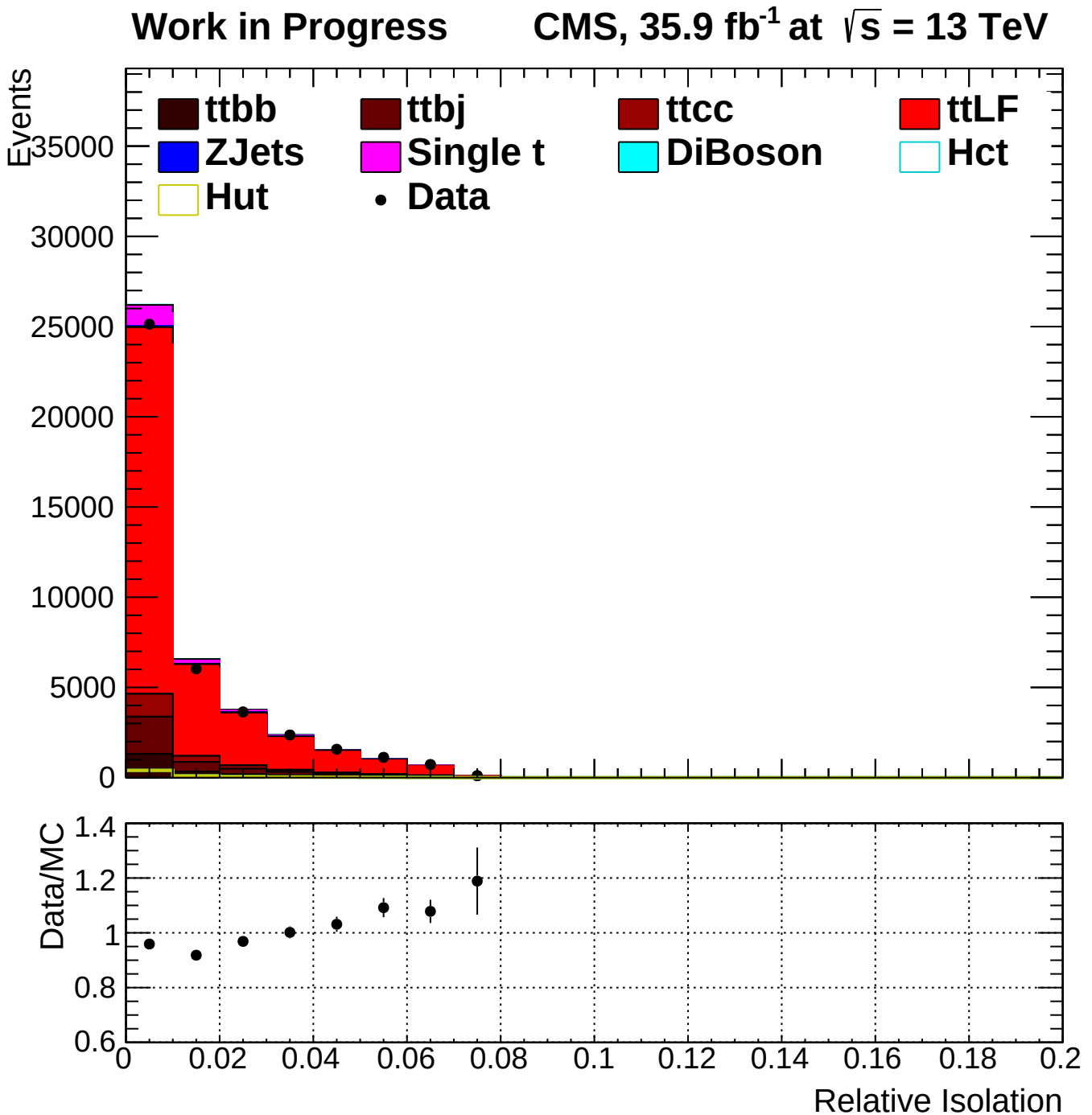

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

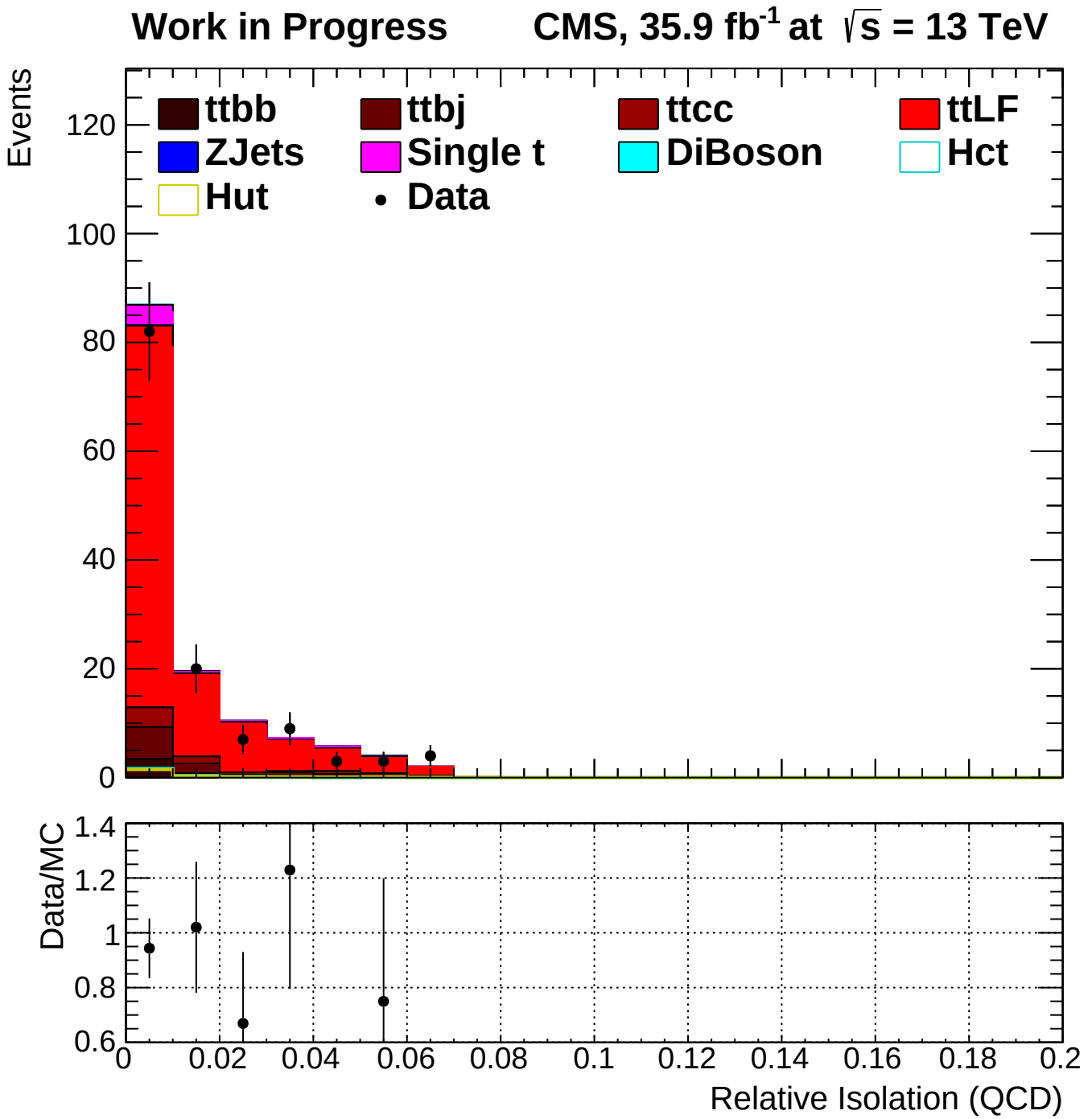

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1400
1200
1000
800
600
400
200
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
DPhi

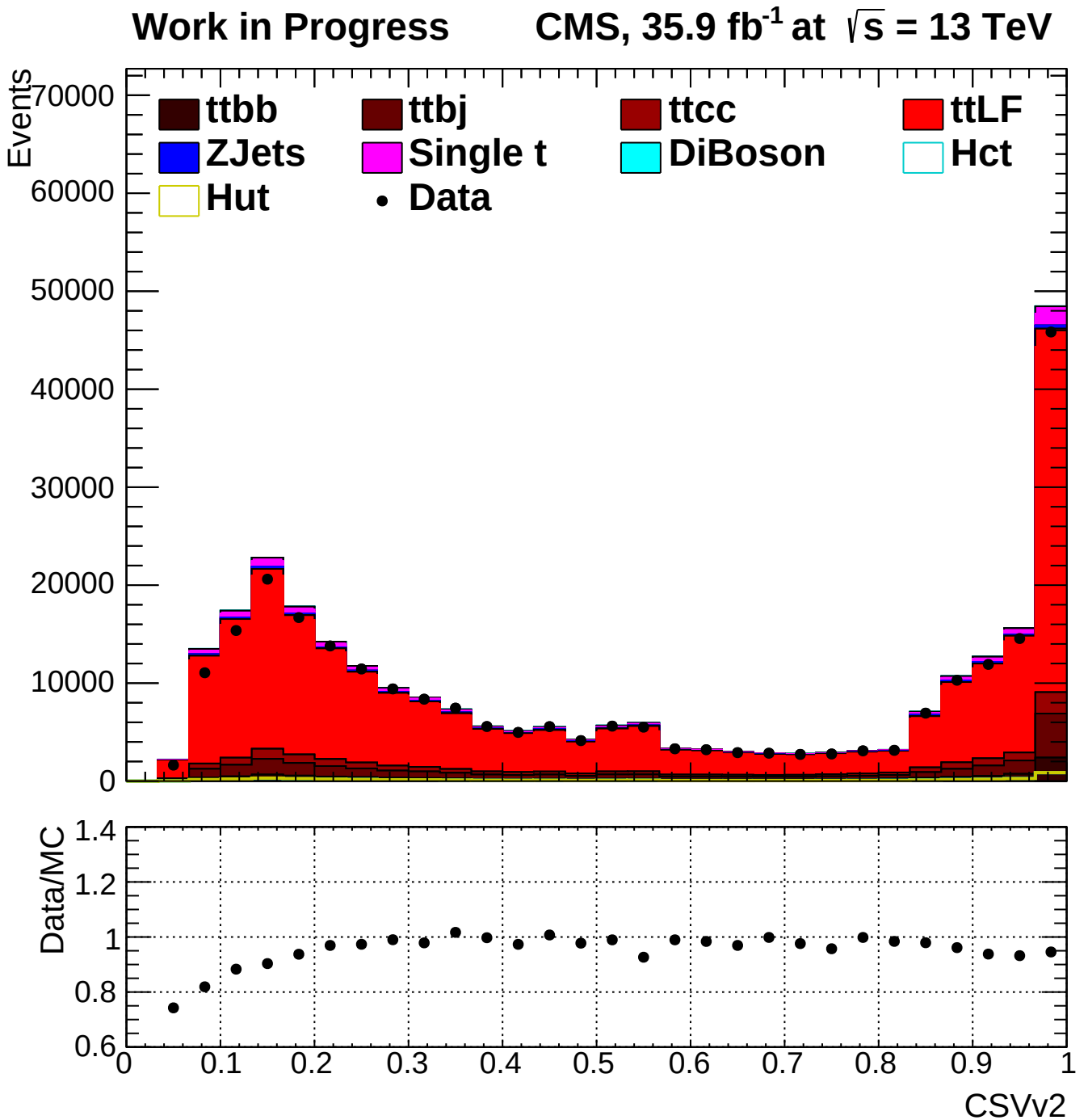

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
1200
1000
800
600
400
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

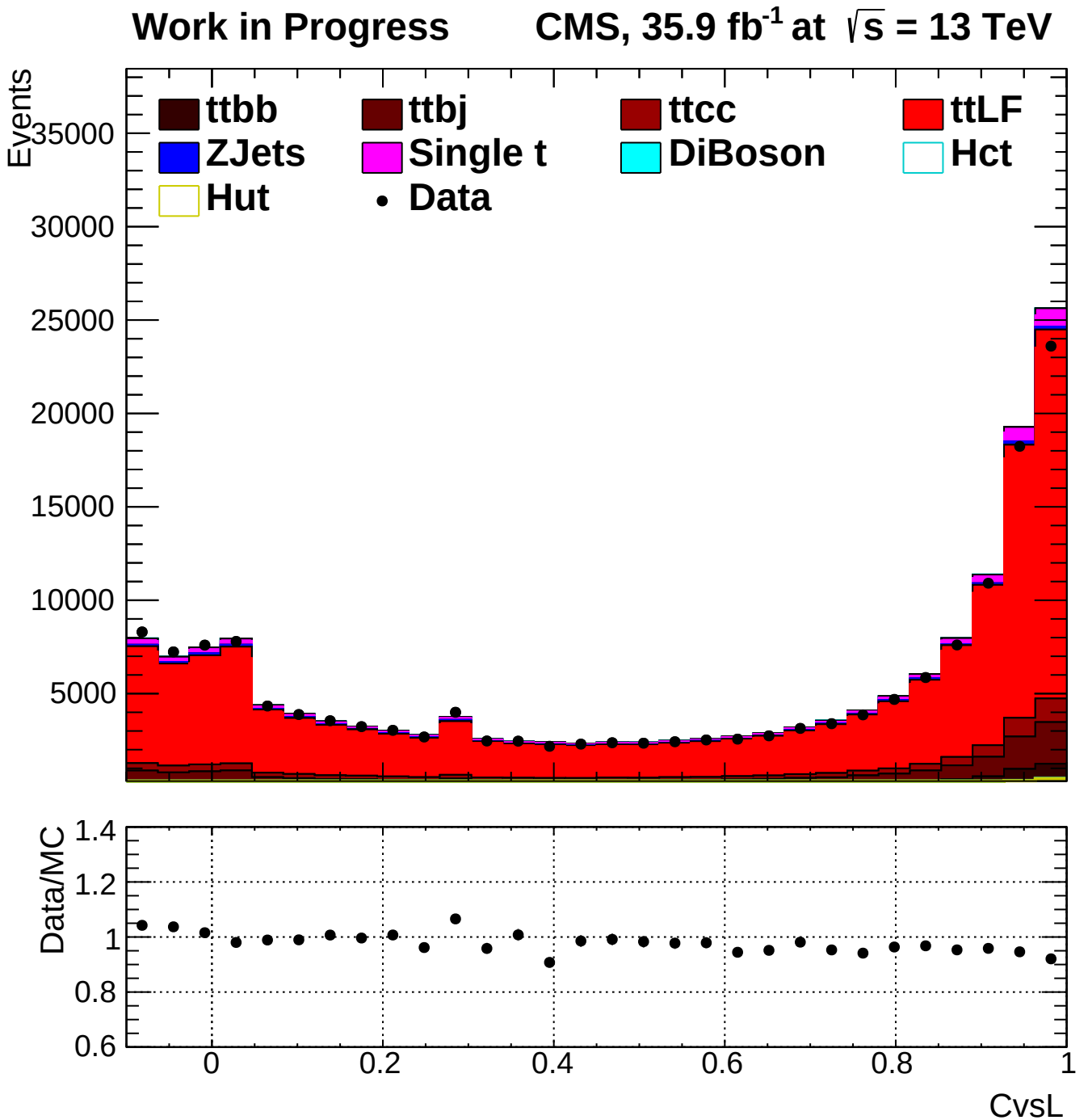

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta

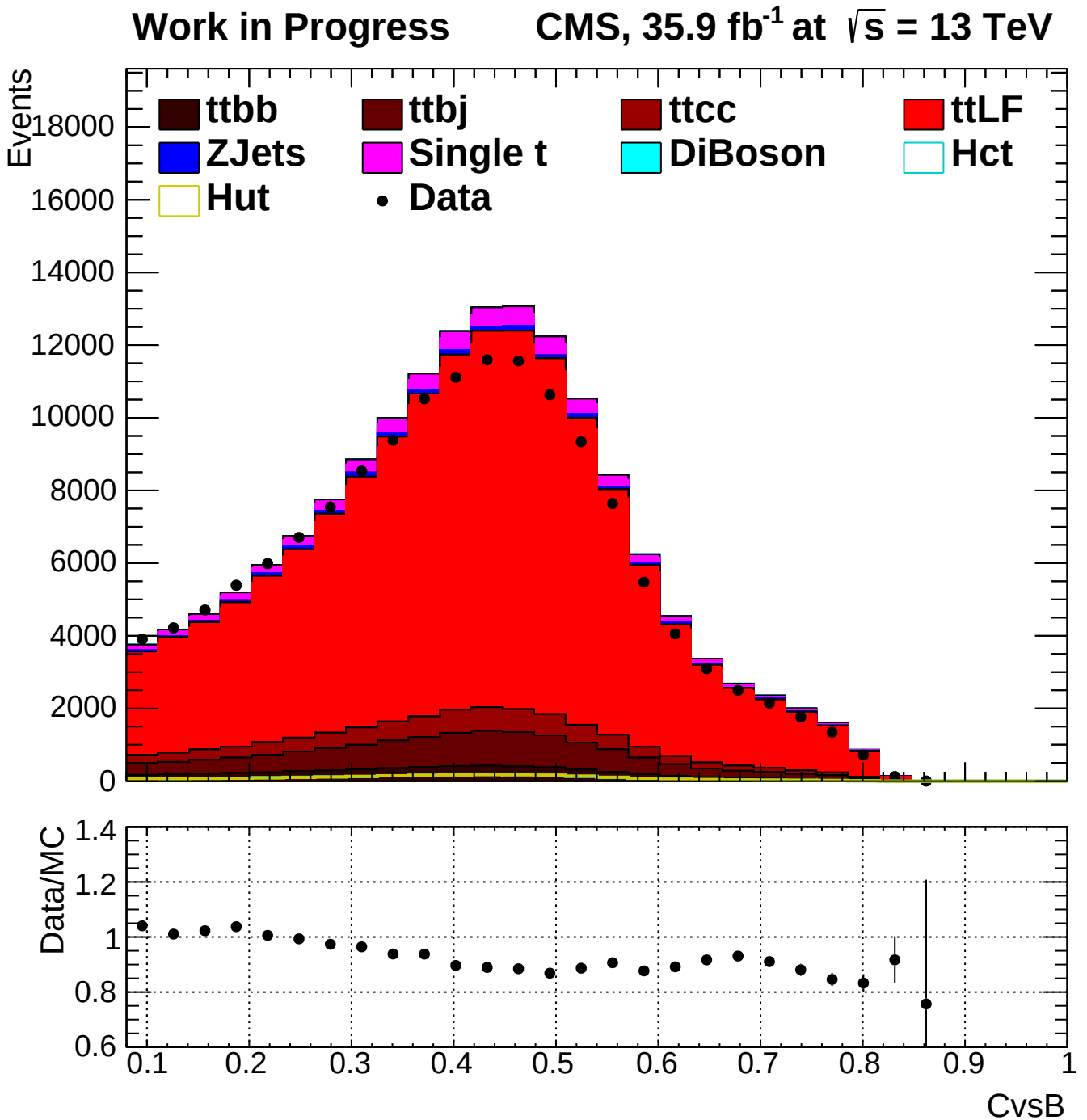

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

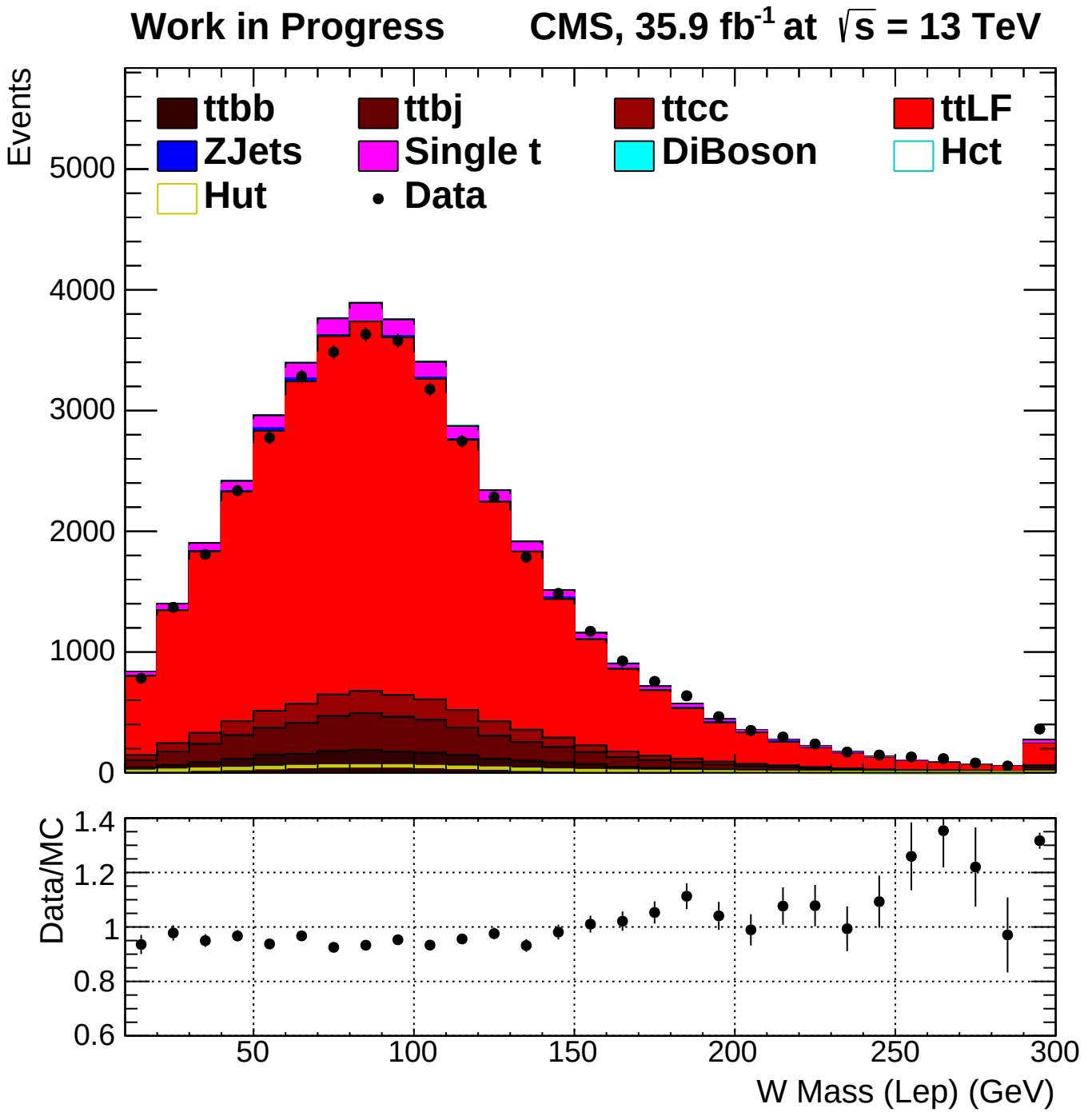

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
35000
30000
25000
20000
15000
10000
5000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

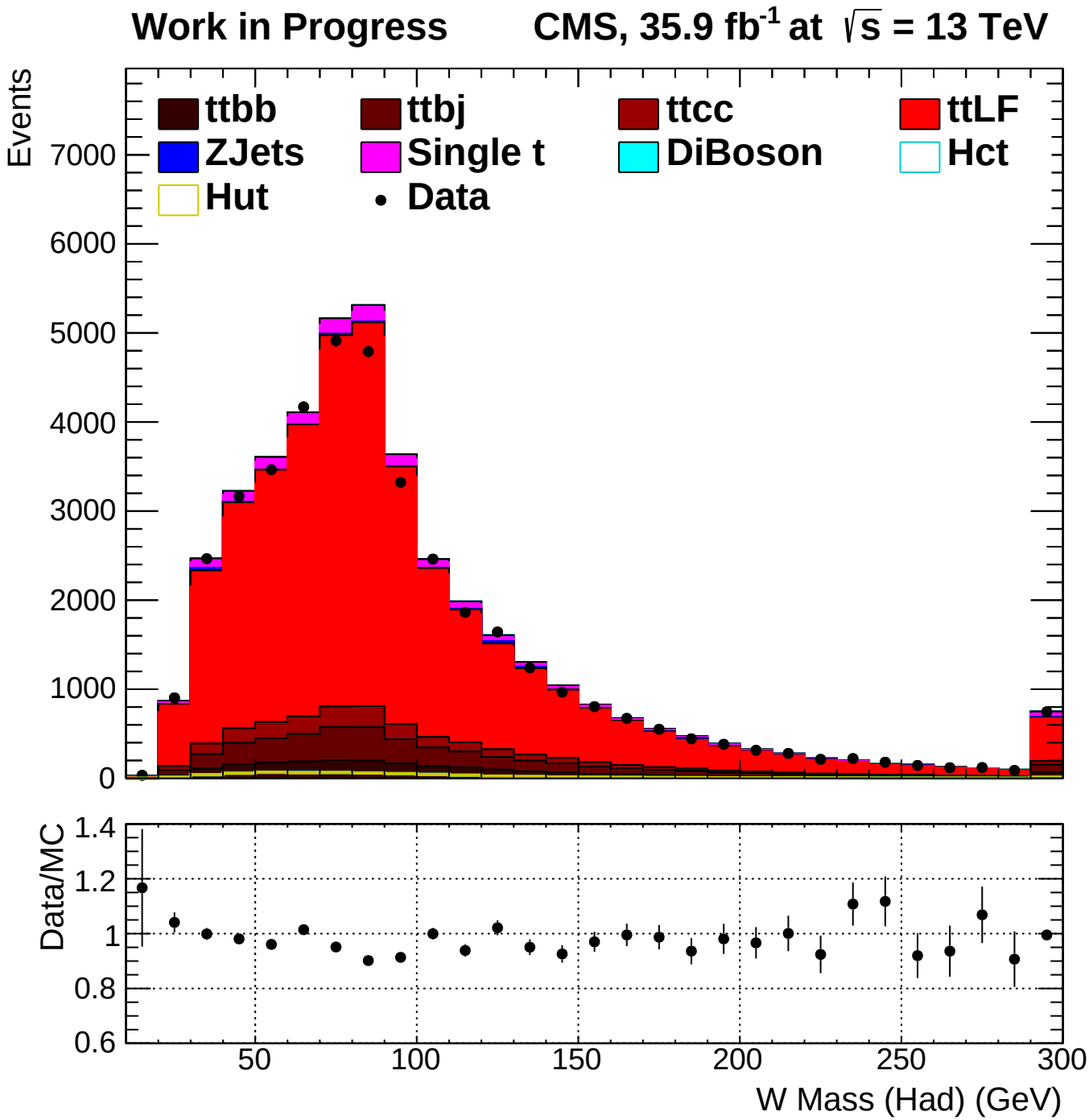

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

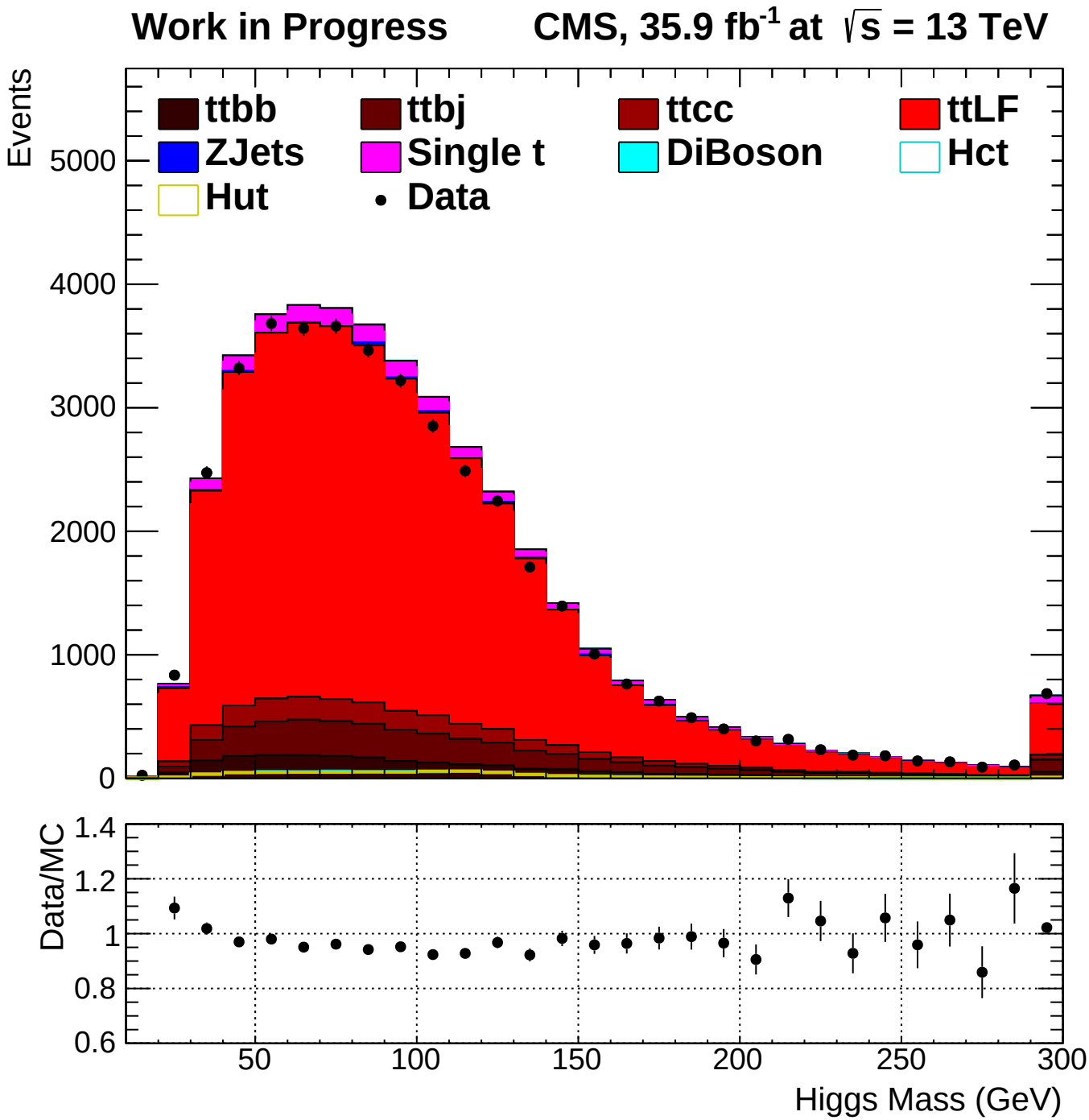

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
70000
60000
50000
40000
30000
20000
10000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

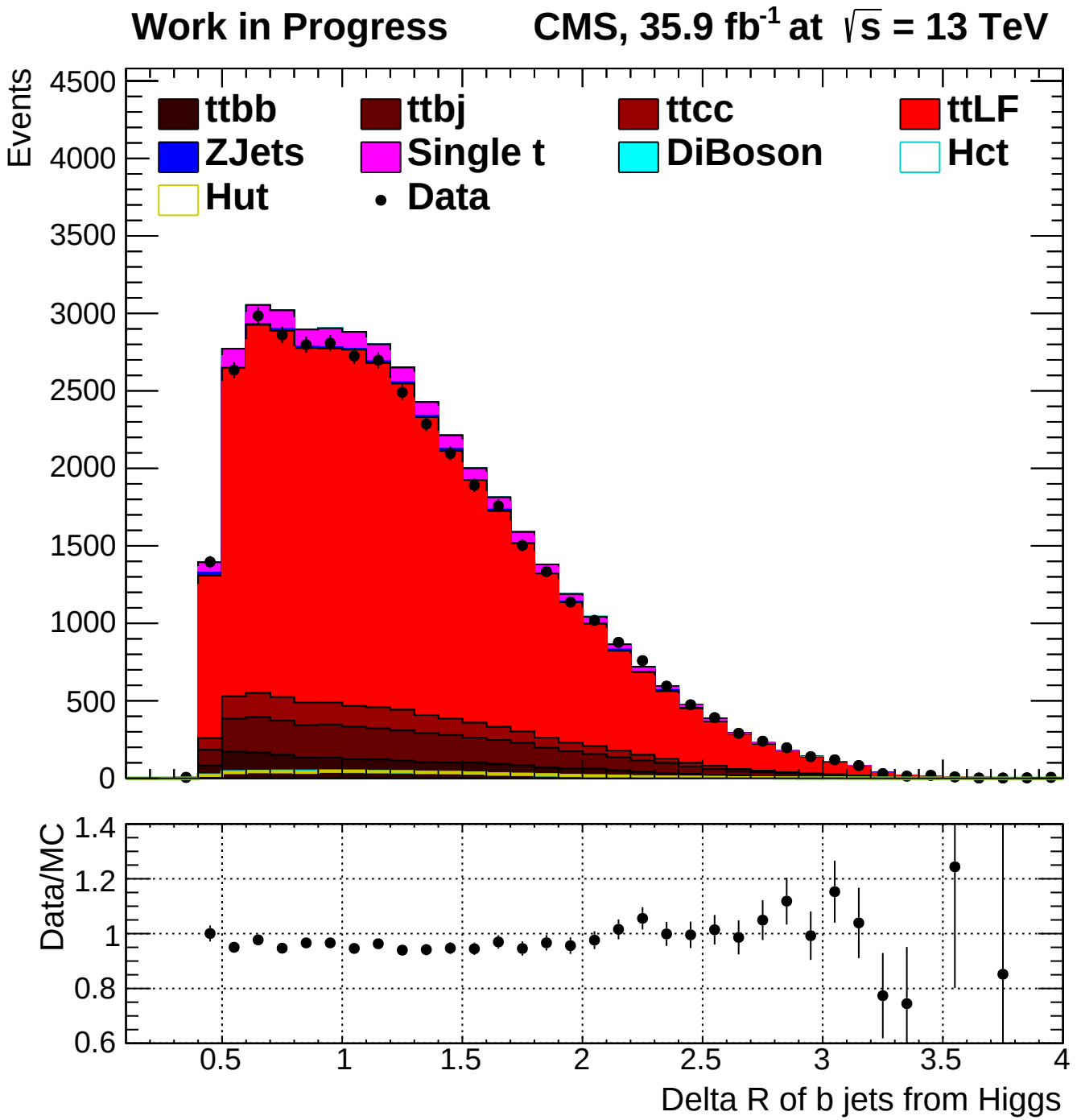

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CvsB


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
7000
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
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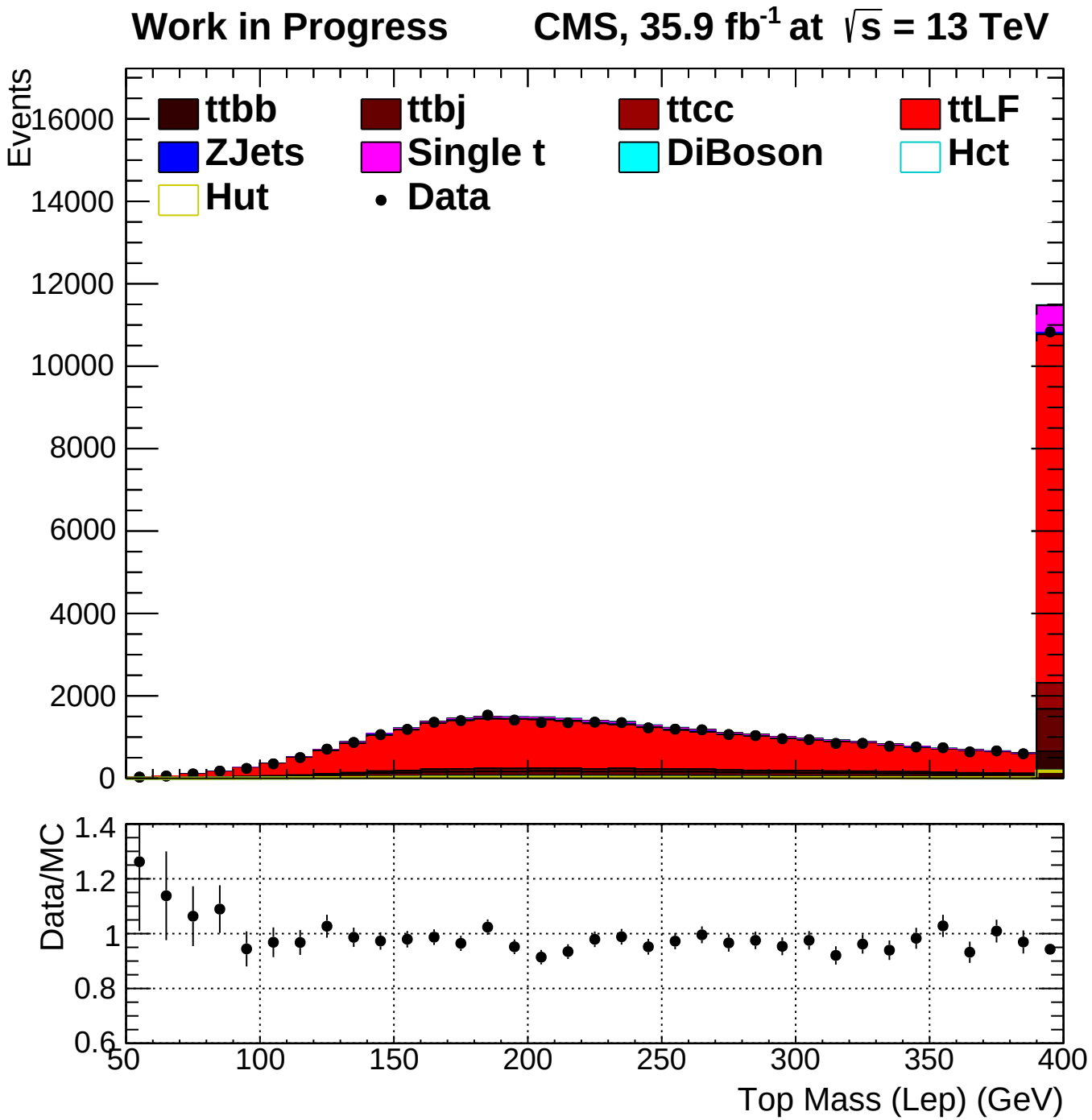
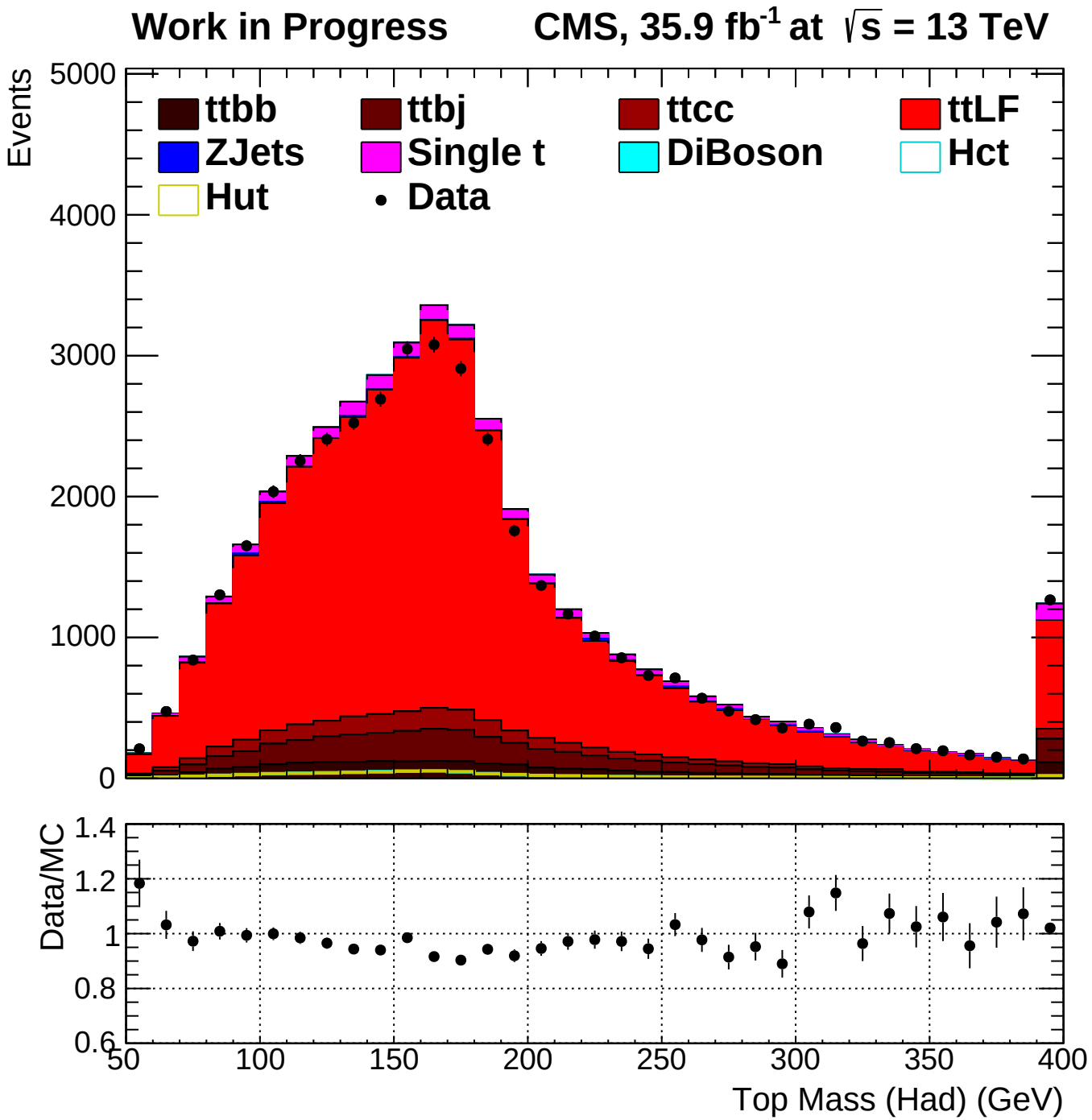
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
16000
14000
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
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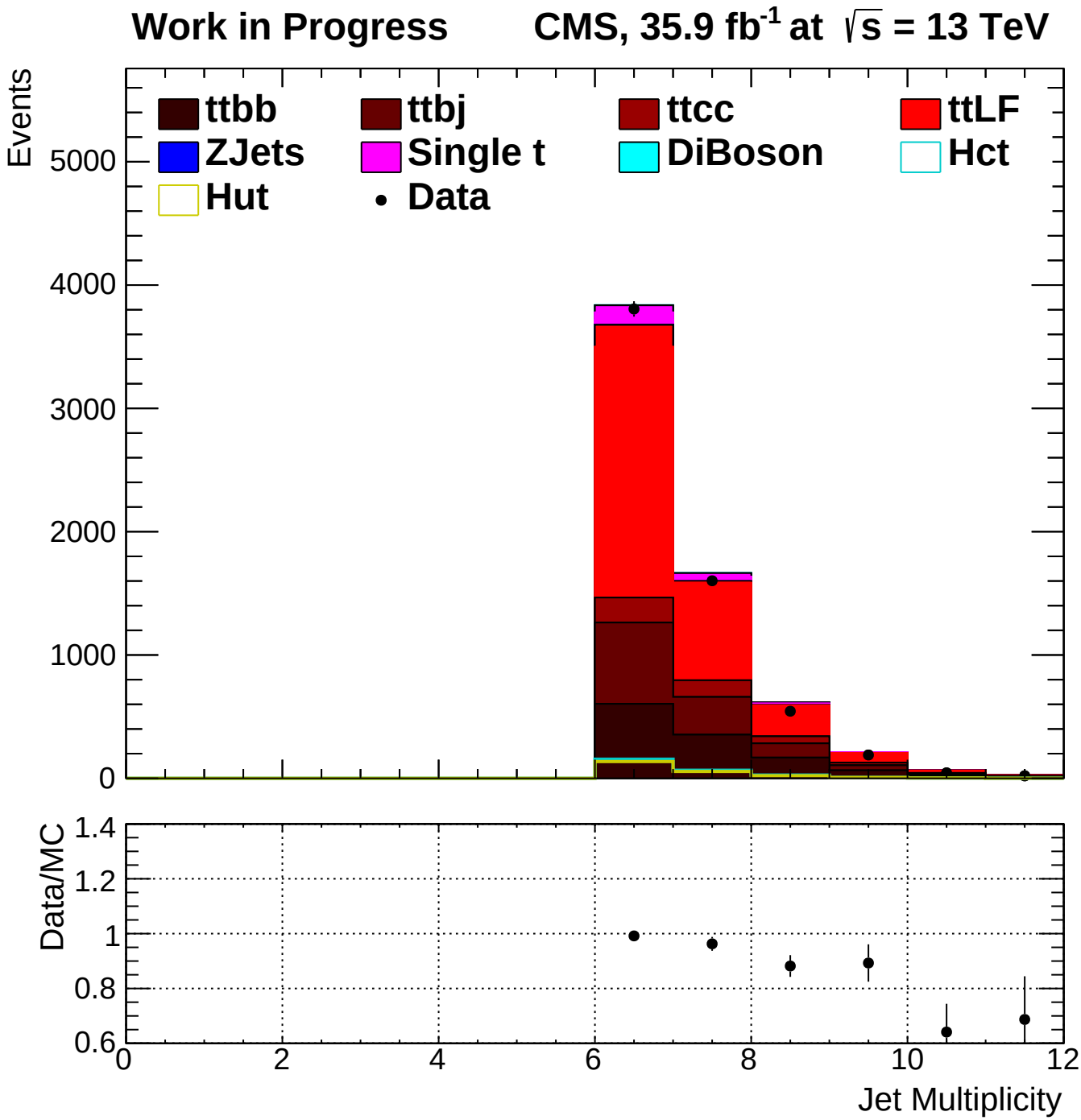
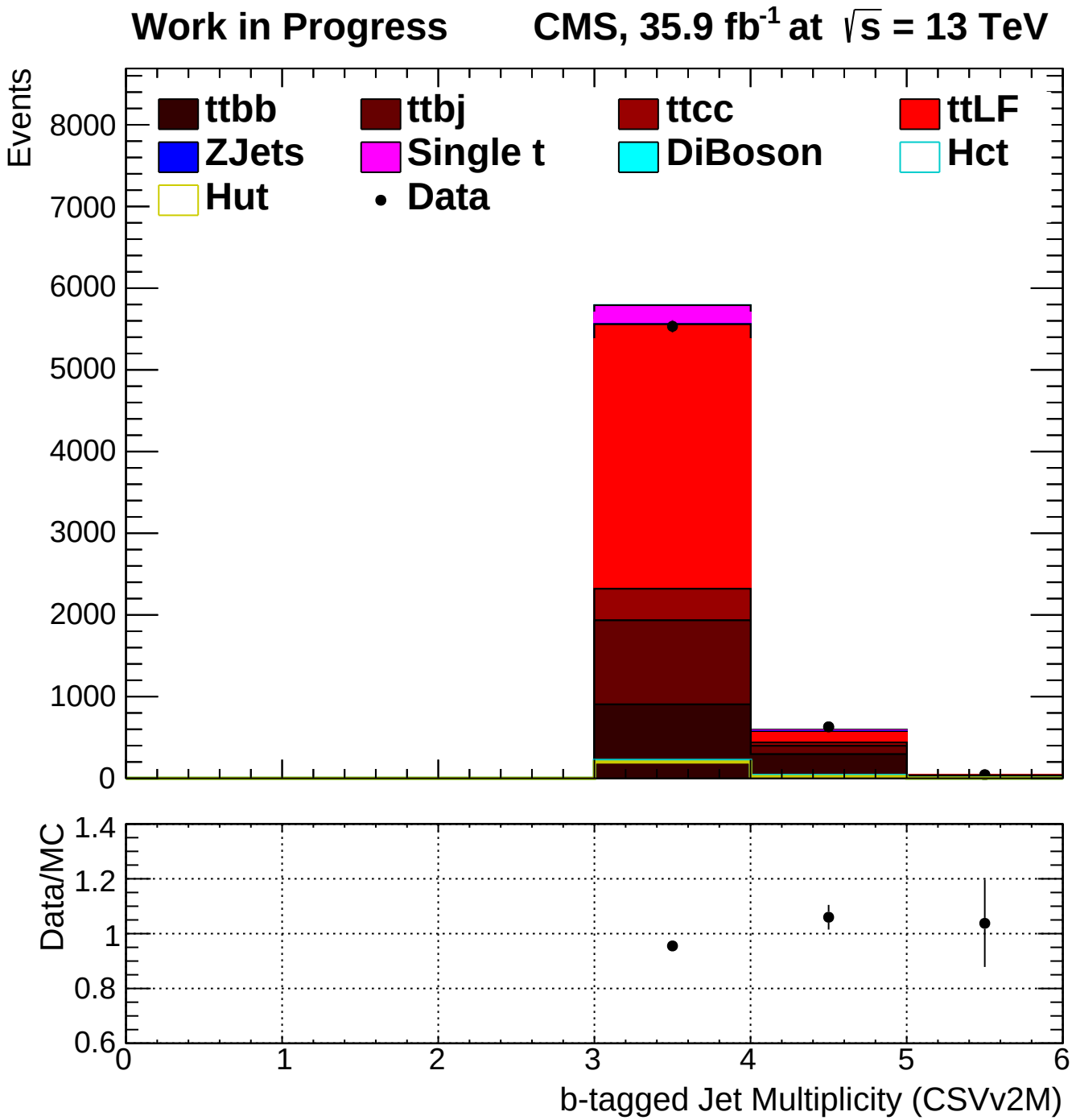
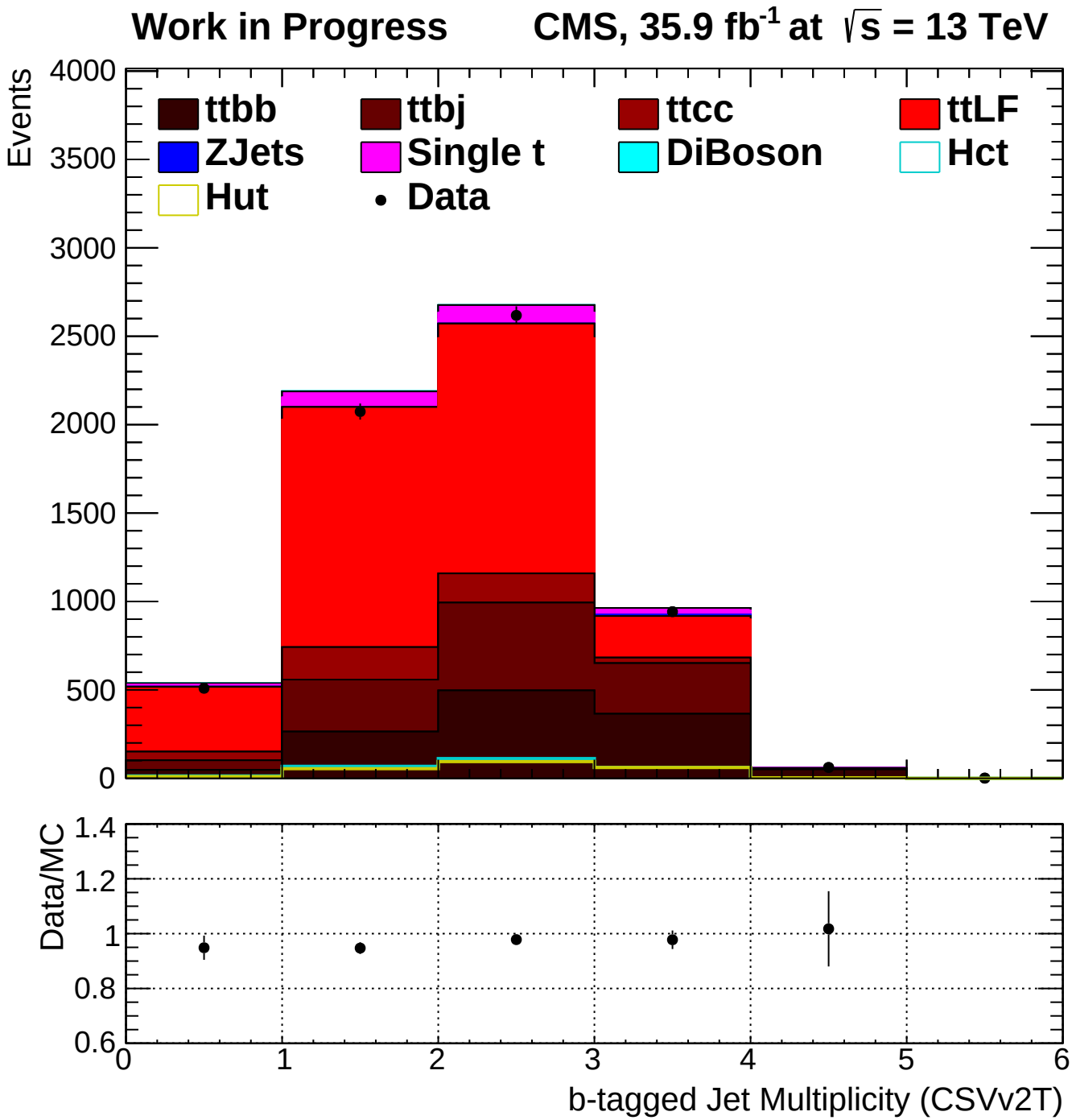
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
2
4
6
8
10
12
Jet Multiplicity


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
8000
7000
6000
5000
4000
3000
2000
1000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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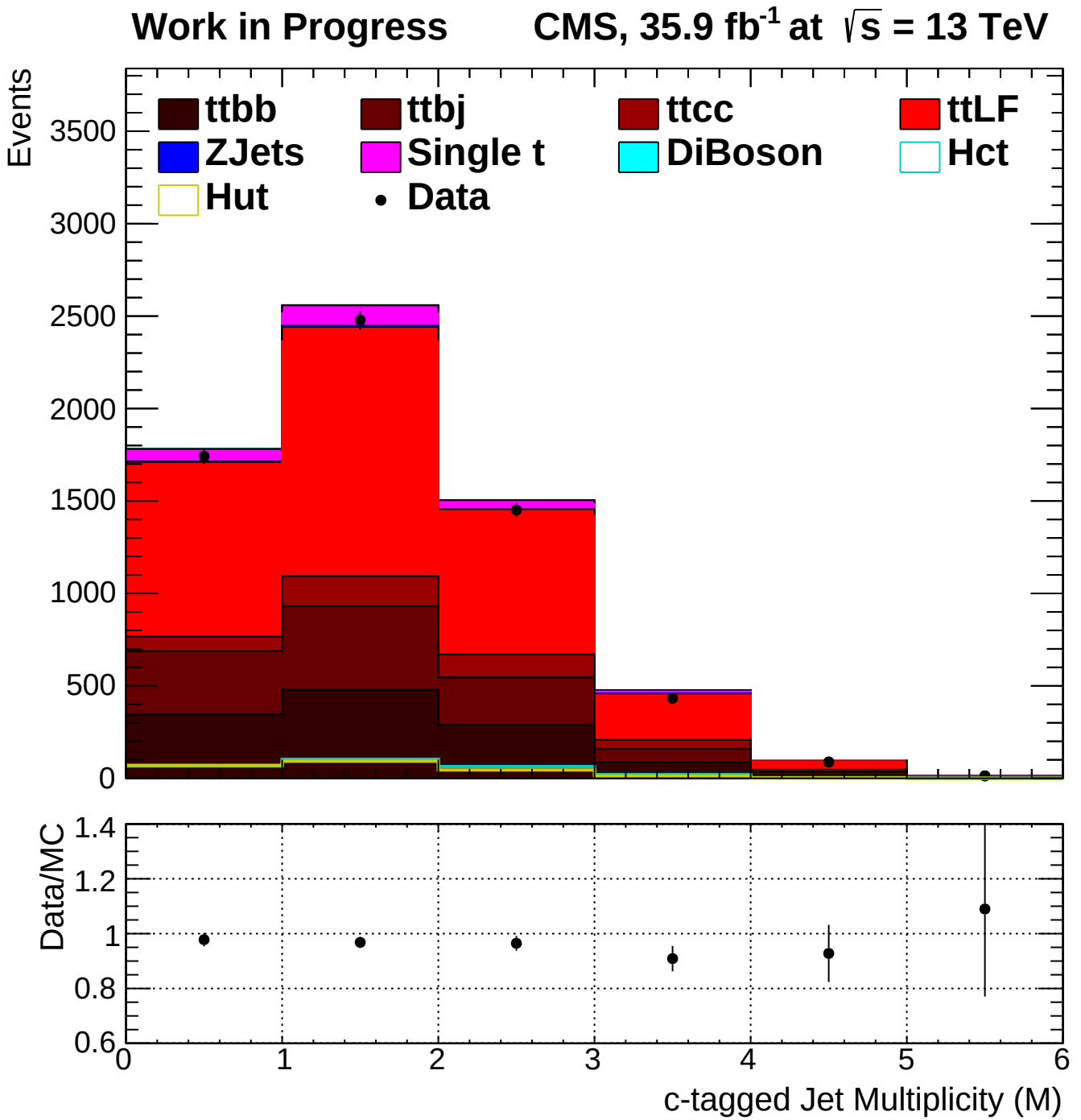
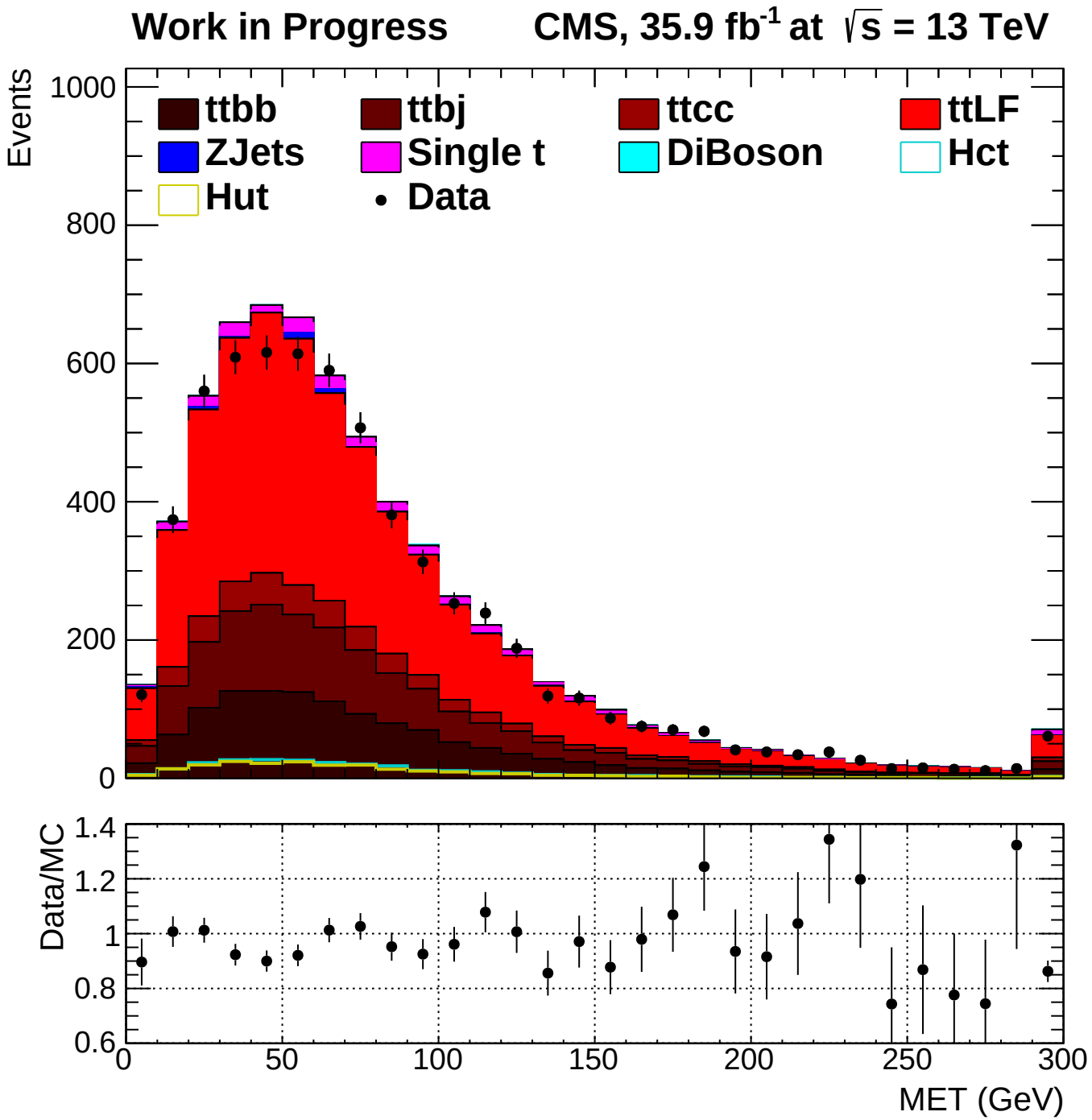
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b-tagged Jet Multiplicity (CSVv2T)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
3500
3000
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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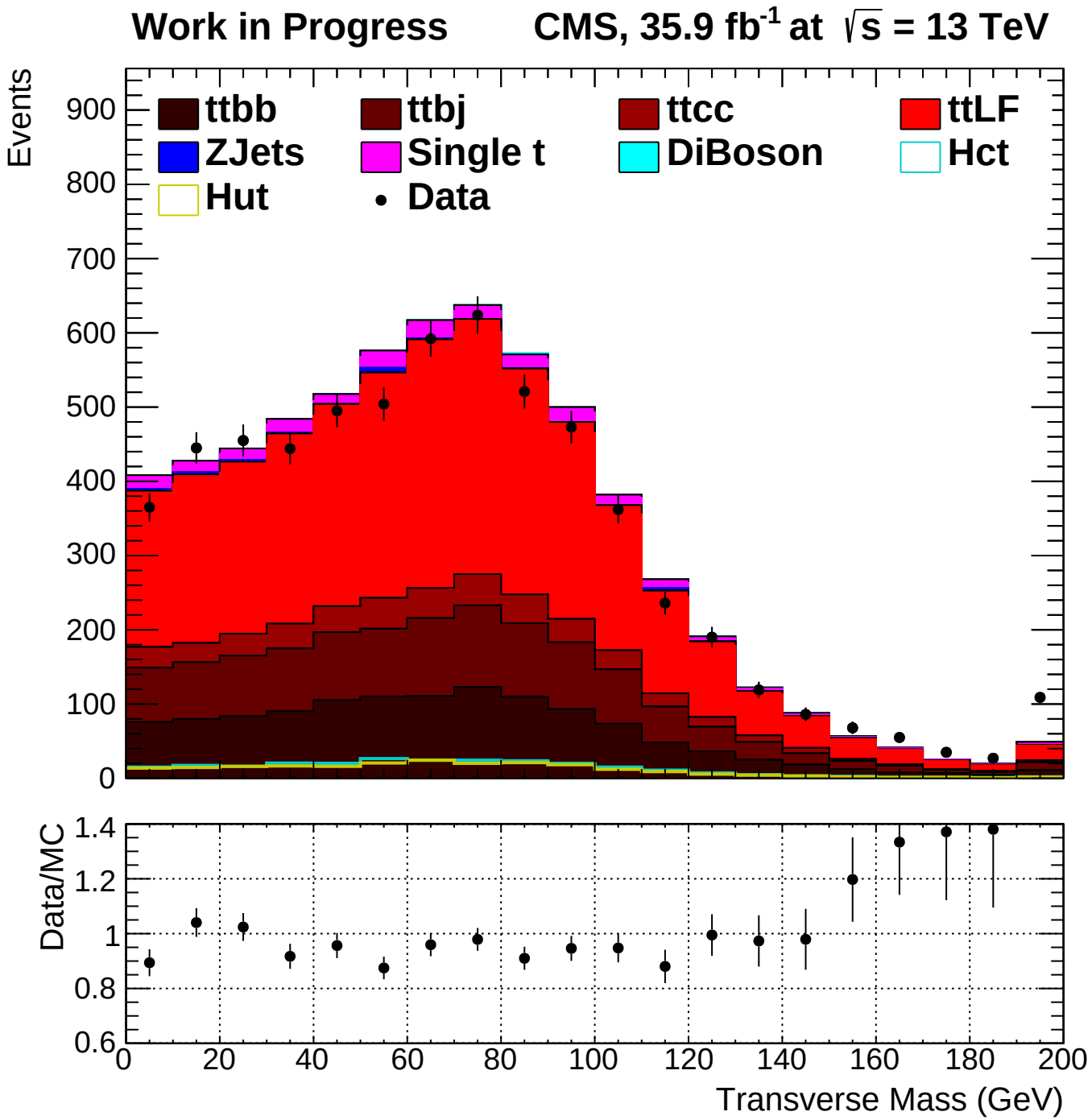
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
MET (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
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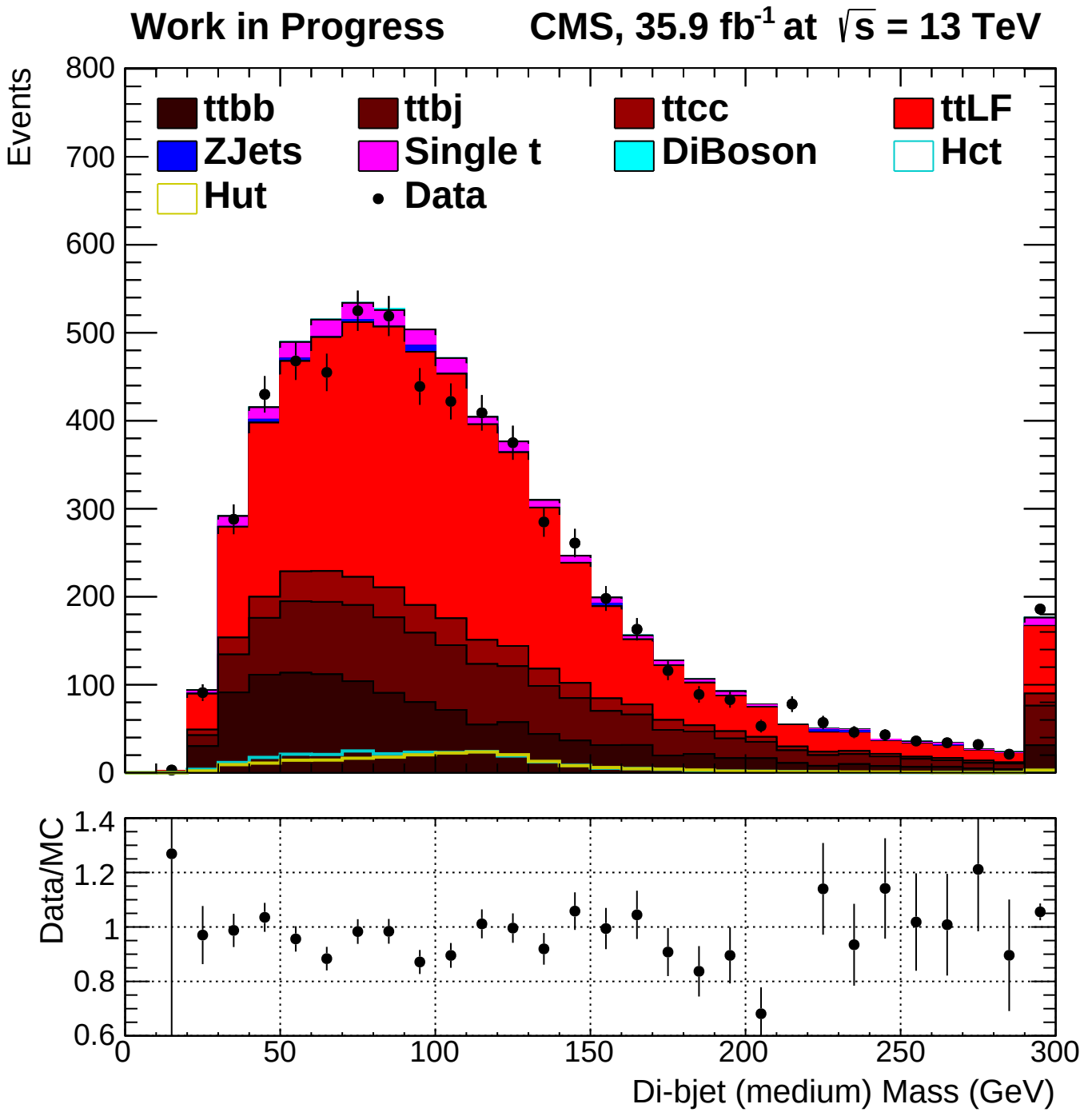
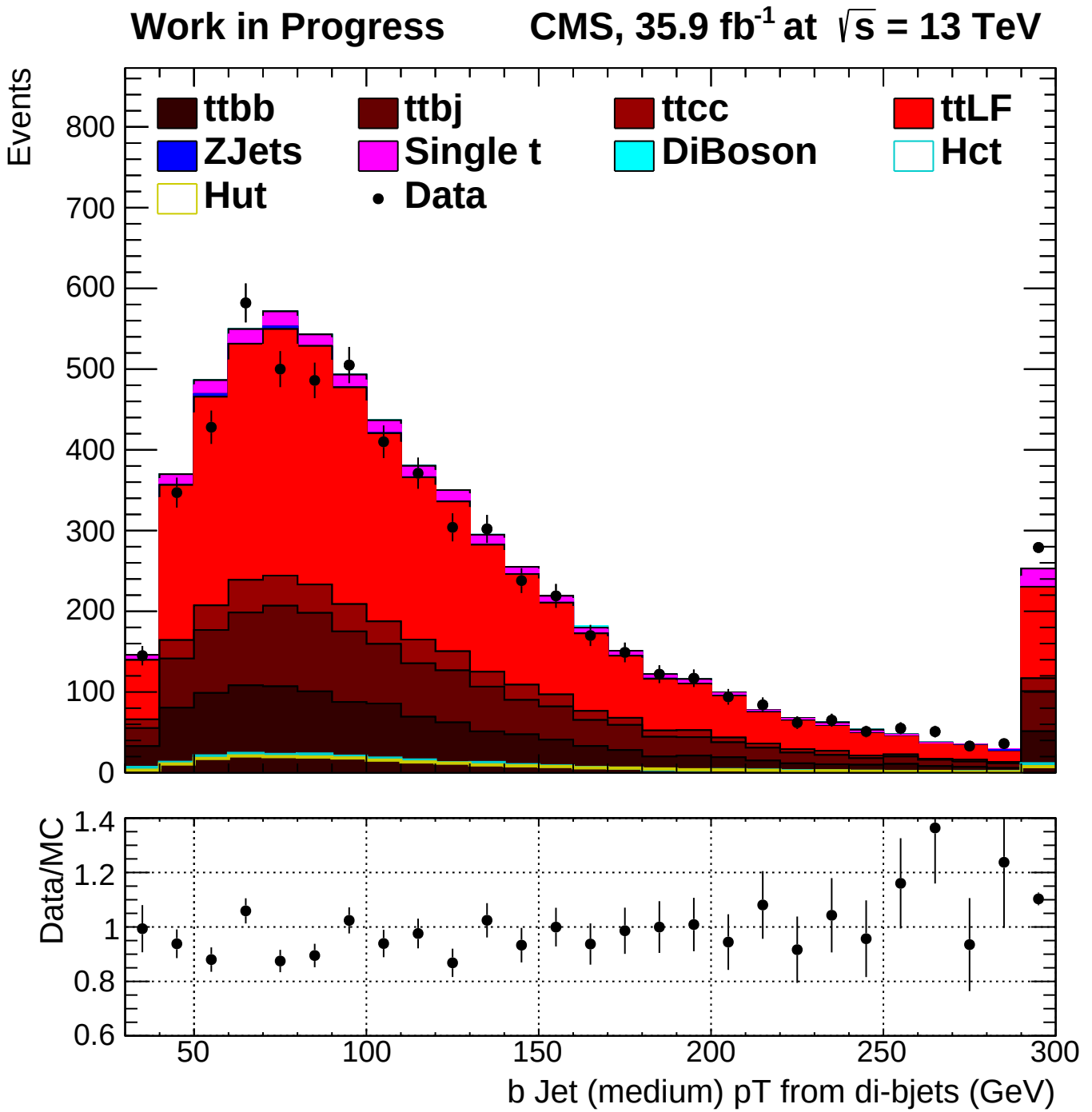
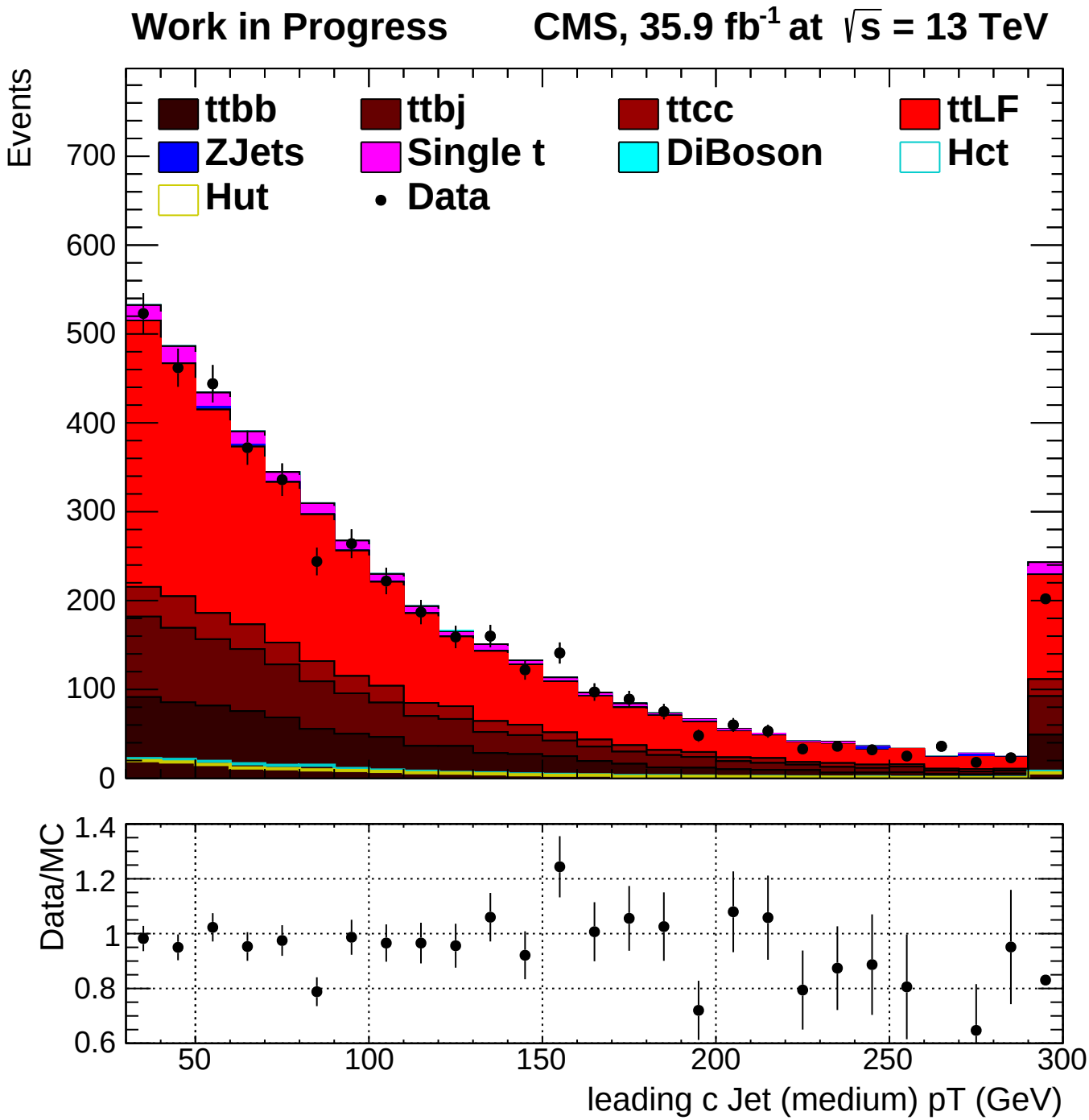
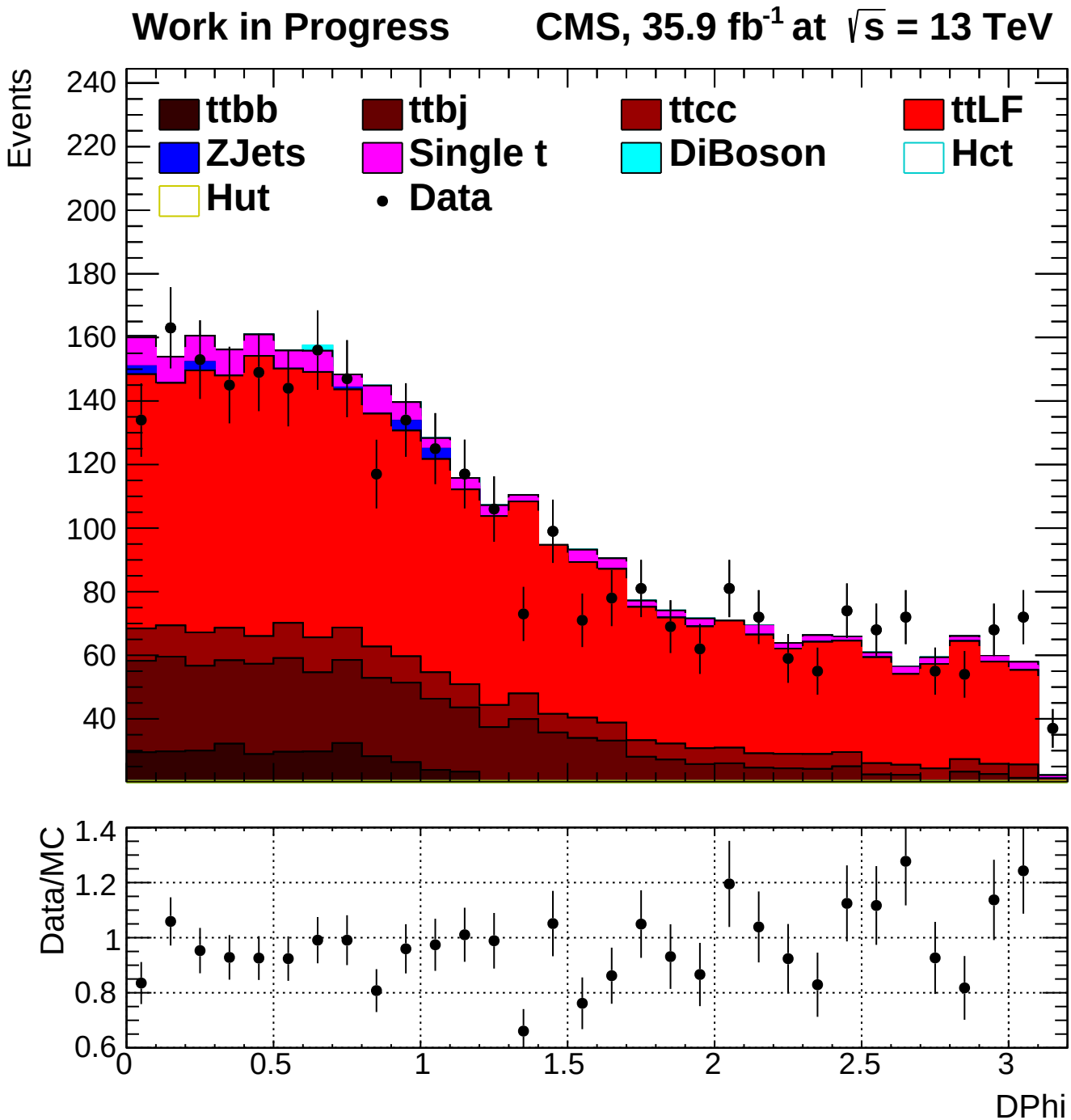
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Transverse Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Di-bjet (medium) Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
b Jet (medium) pT from di-bjets (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
leading c Jet (medium) pT (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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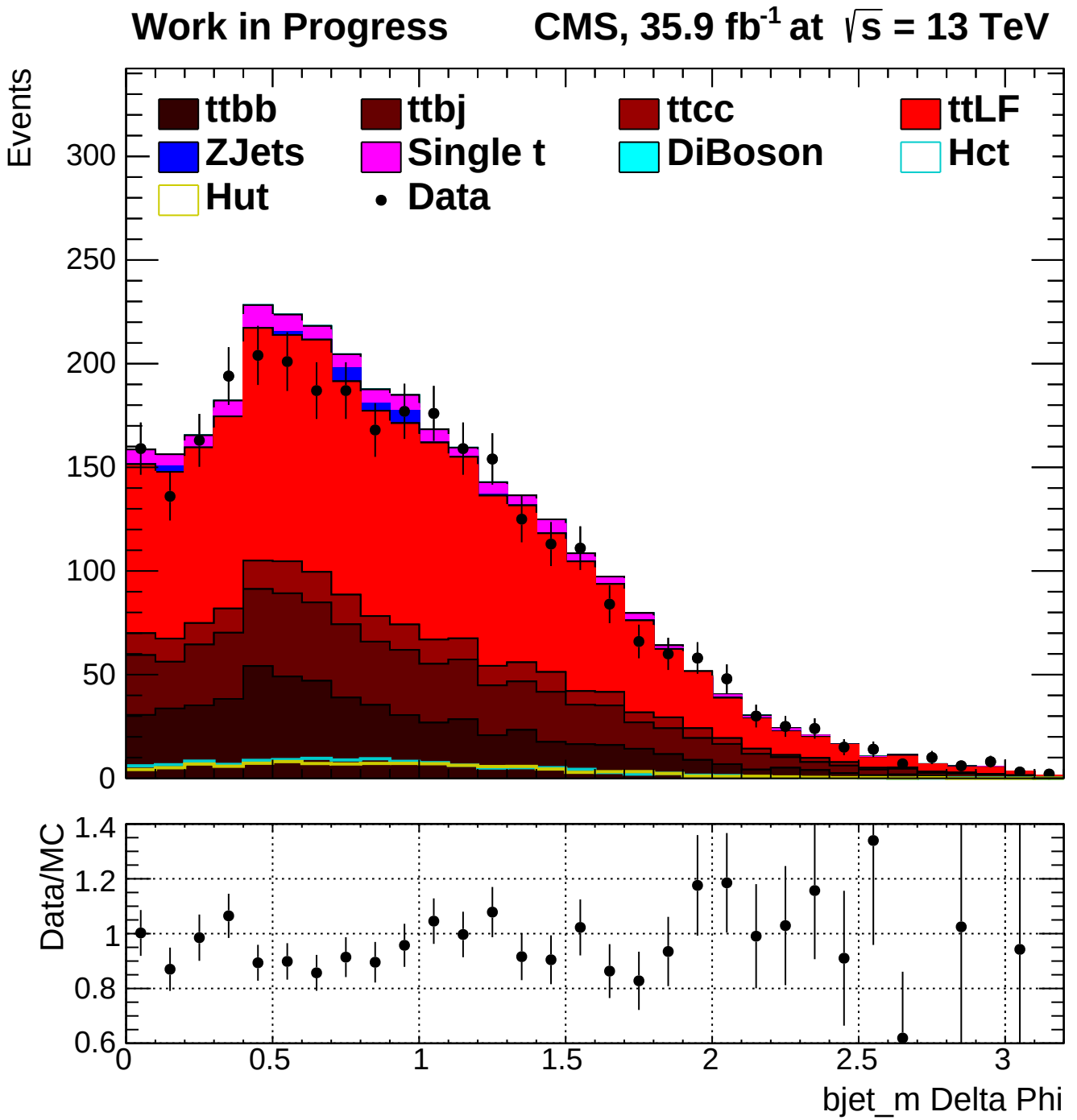
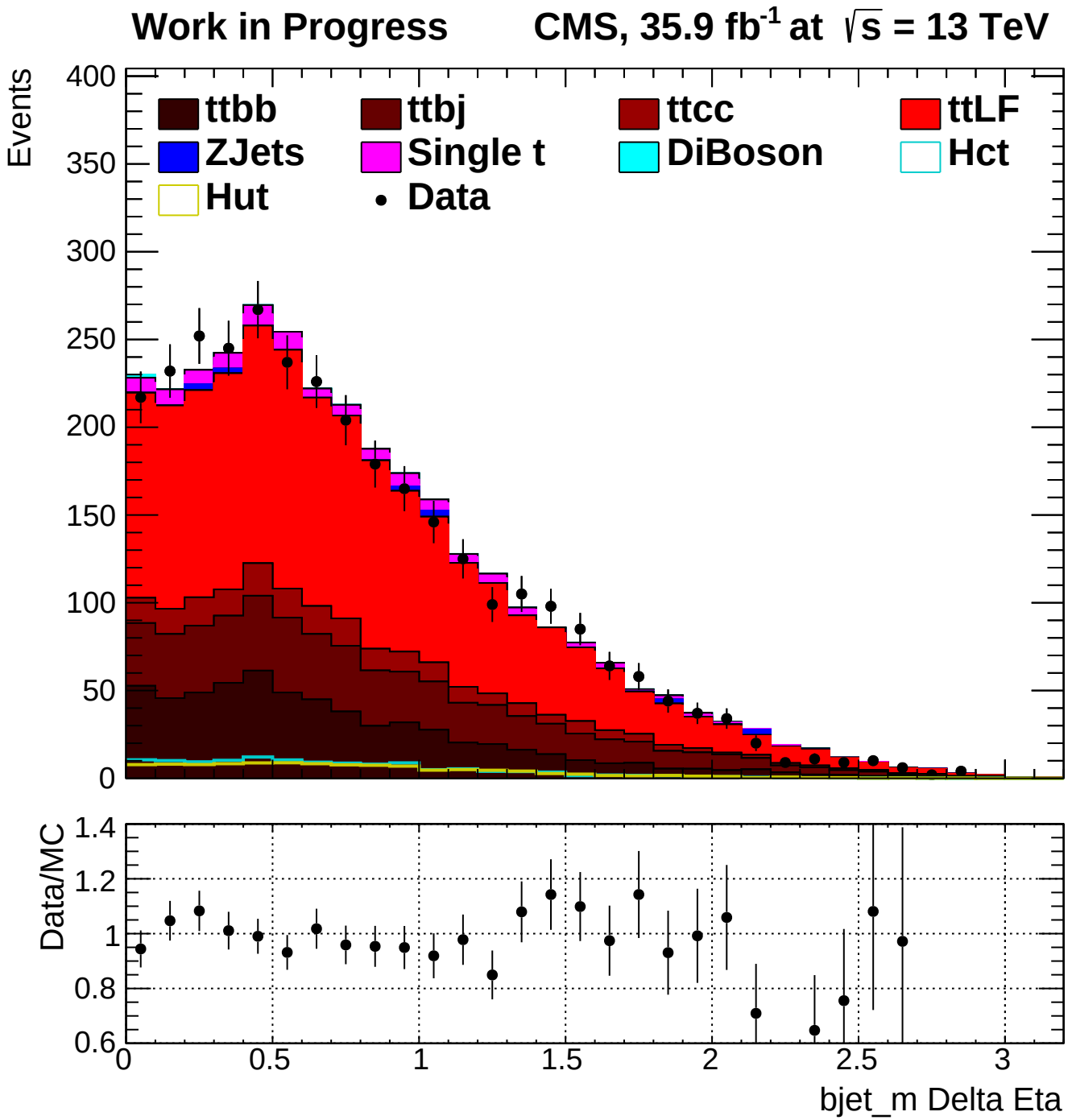
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
DPhi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
300
250
200
150
100
50
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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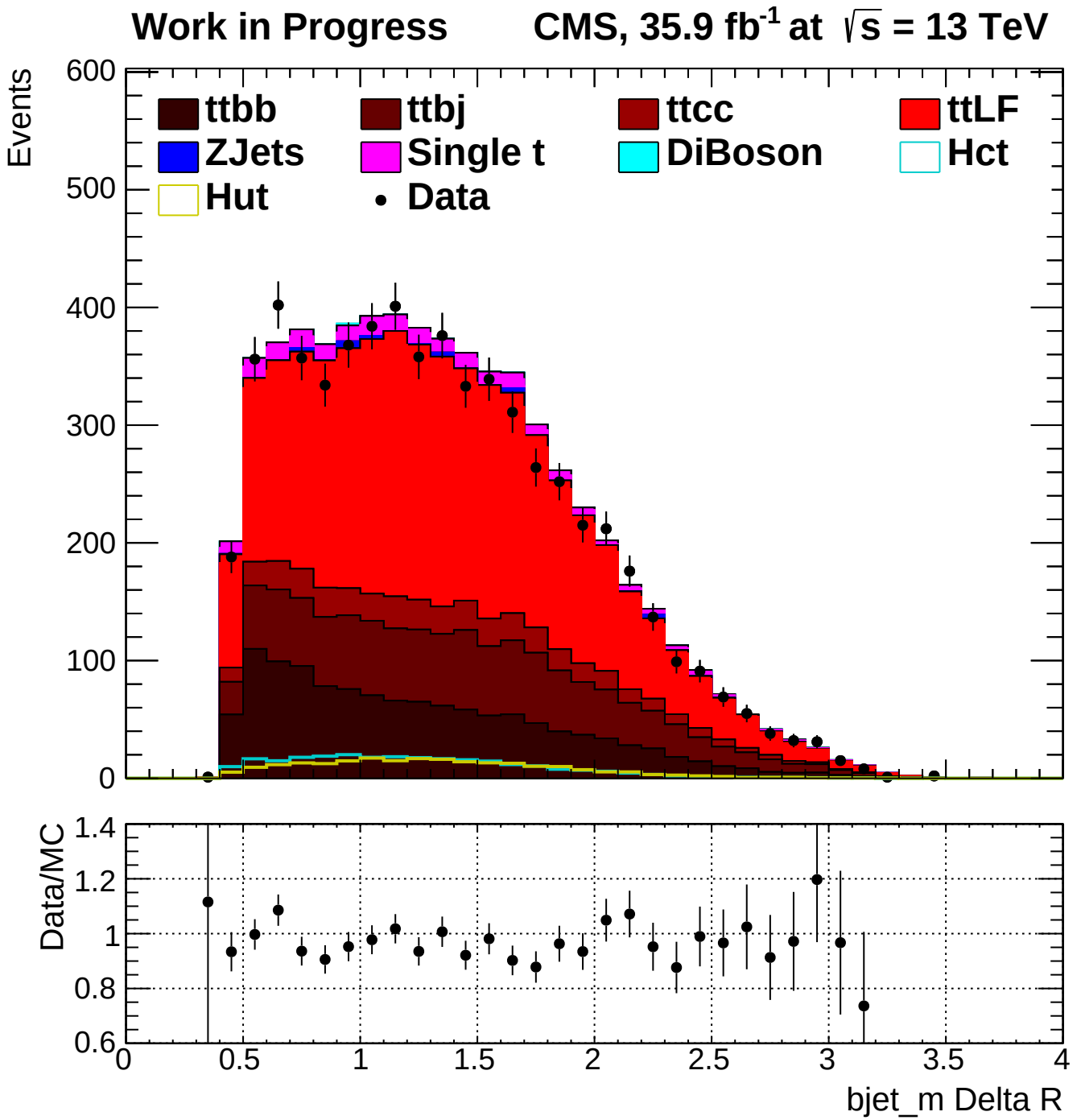
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta Eta


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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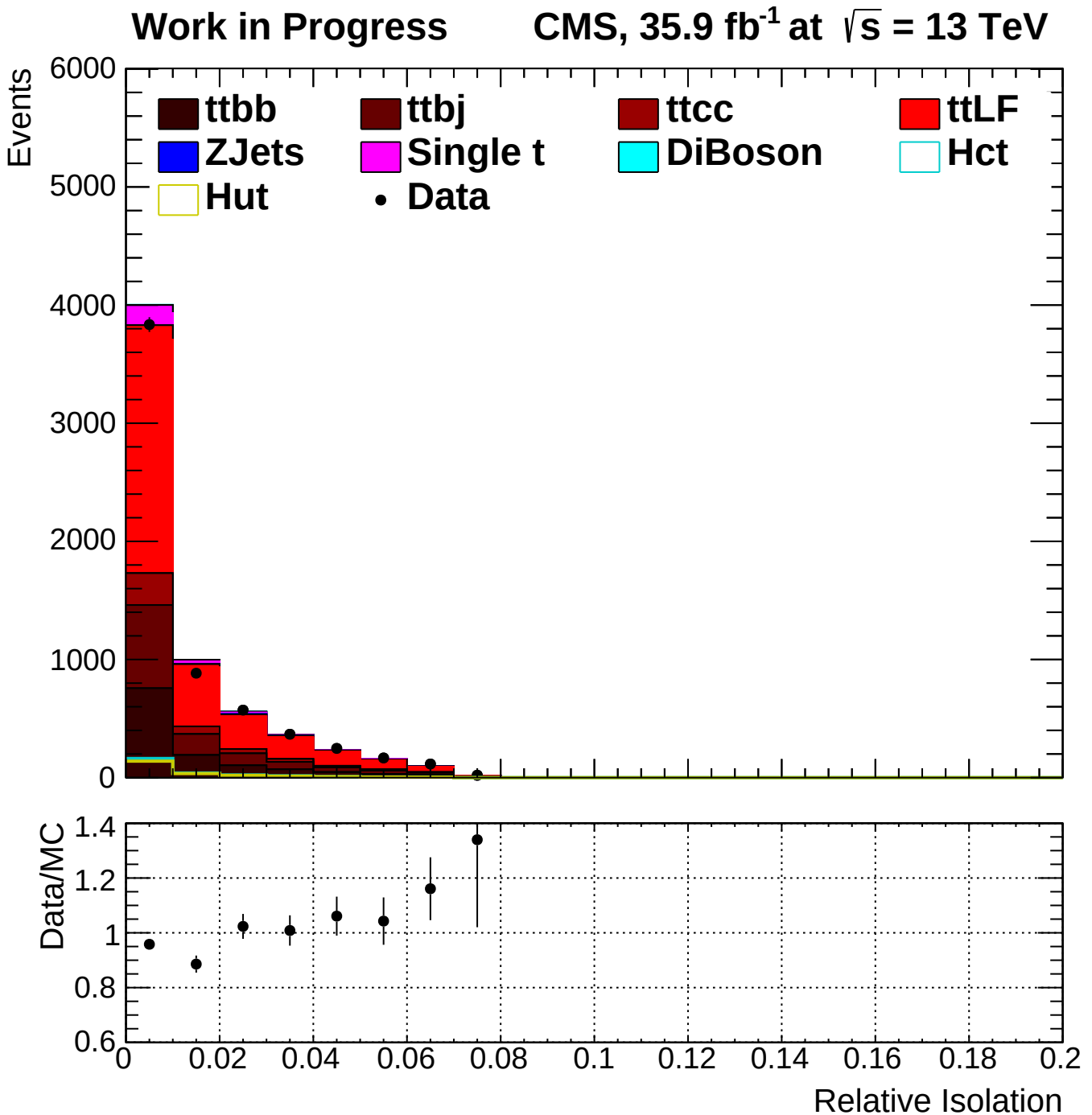
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
bjet_m Delta R


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
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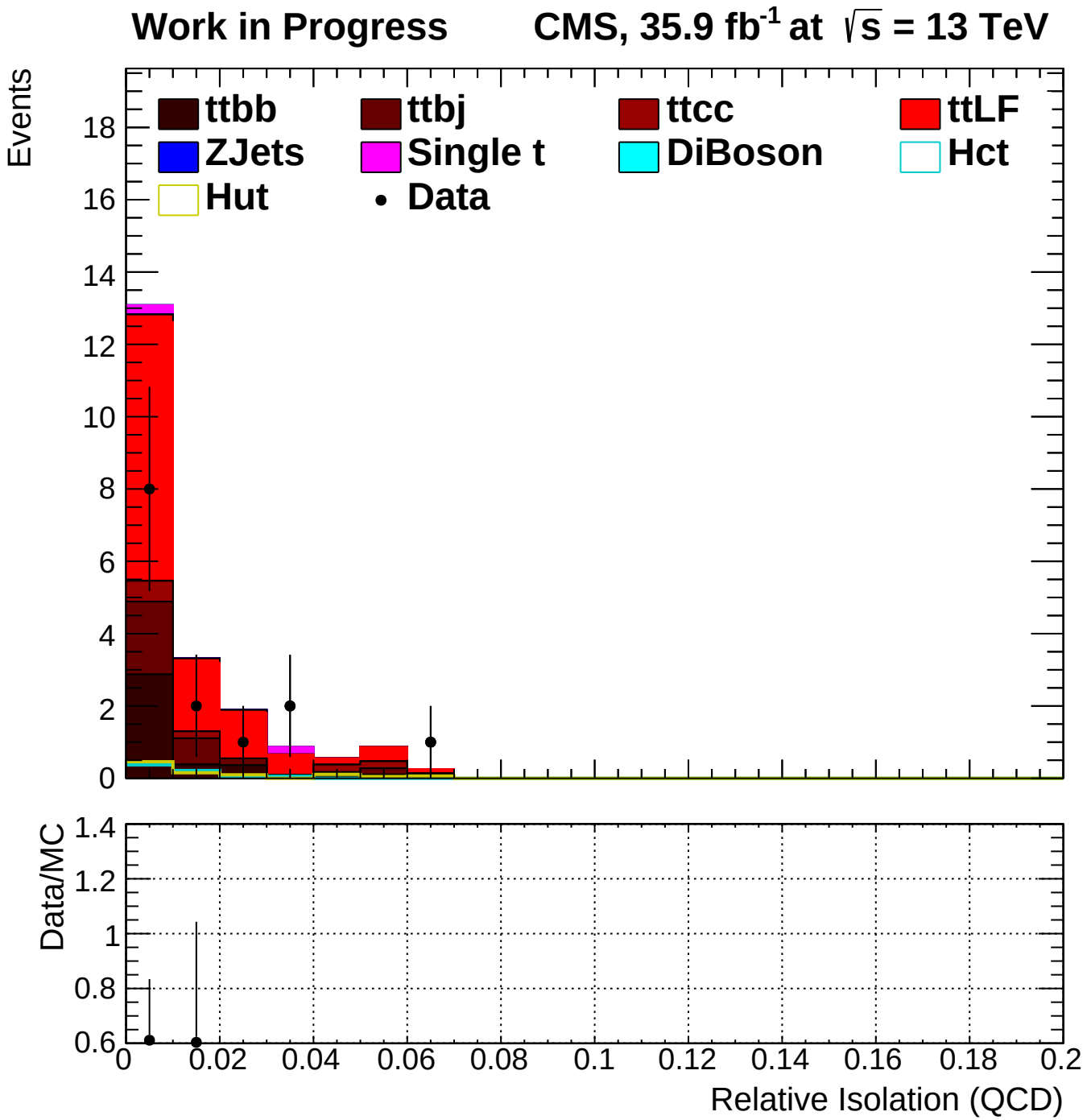
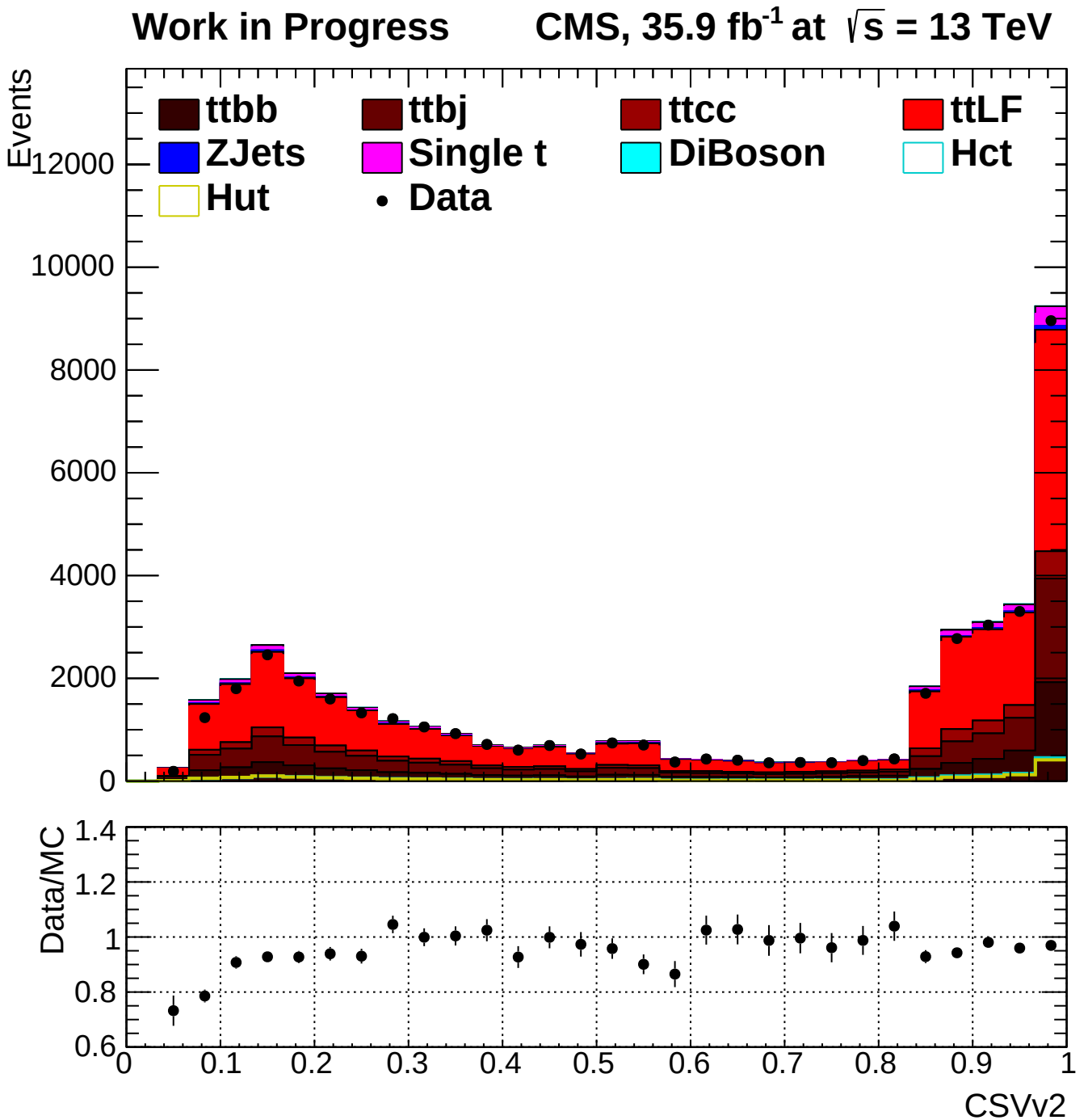
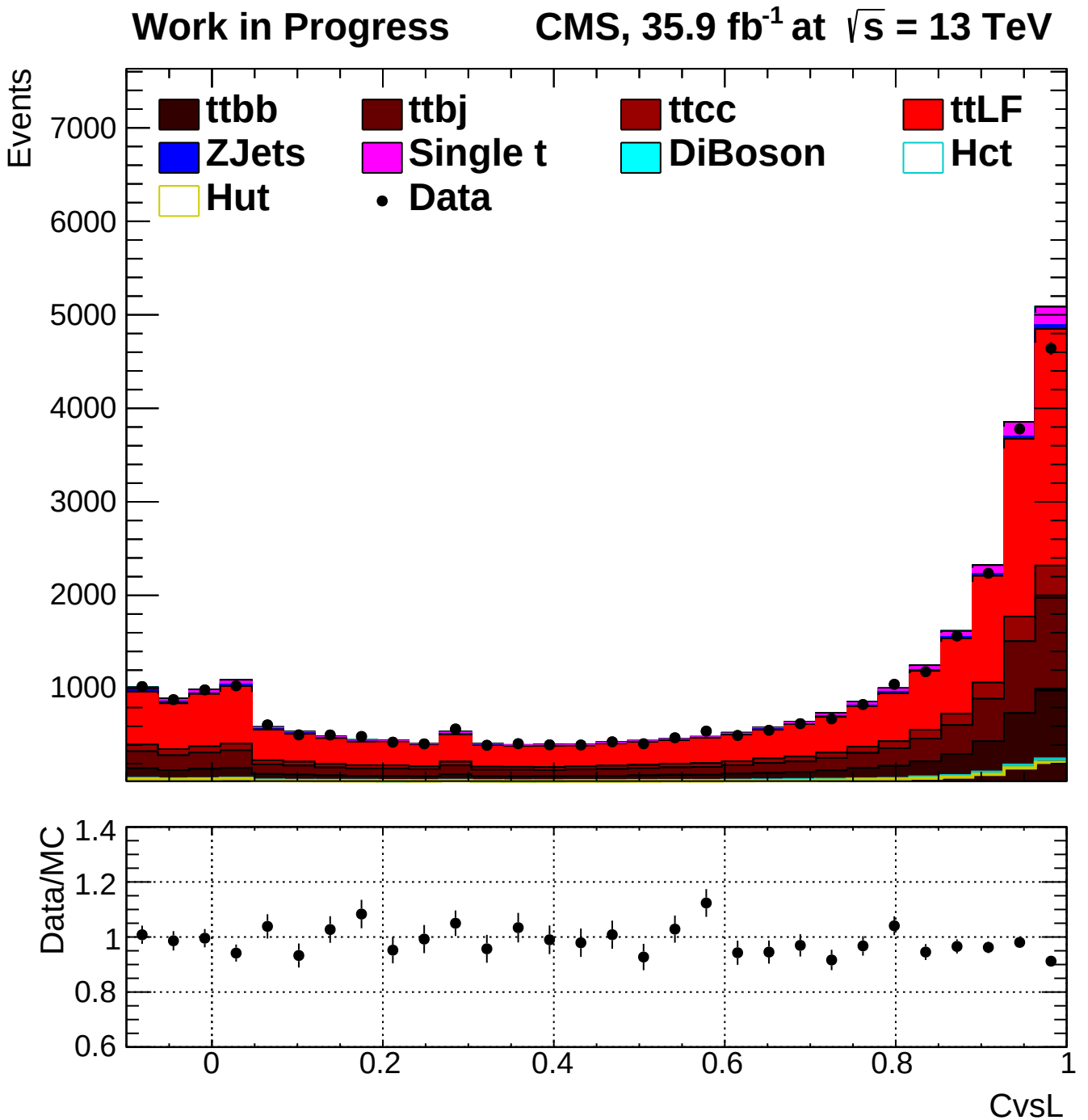
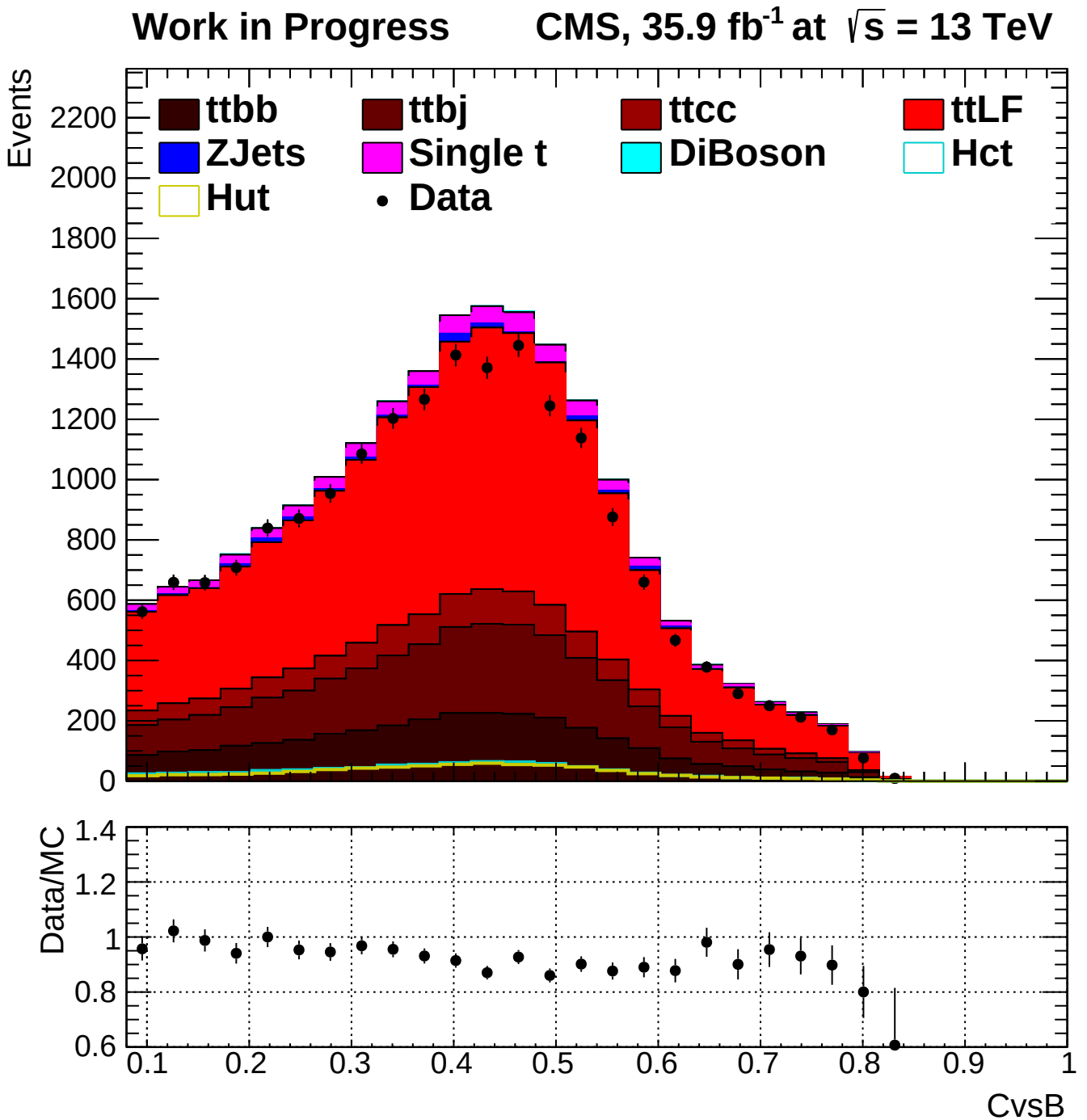
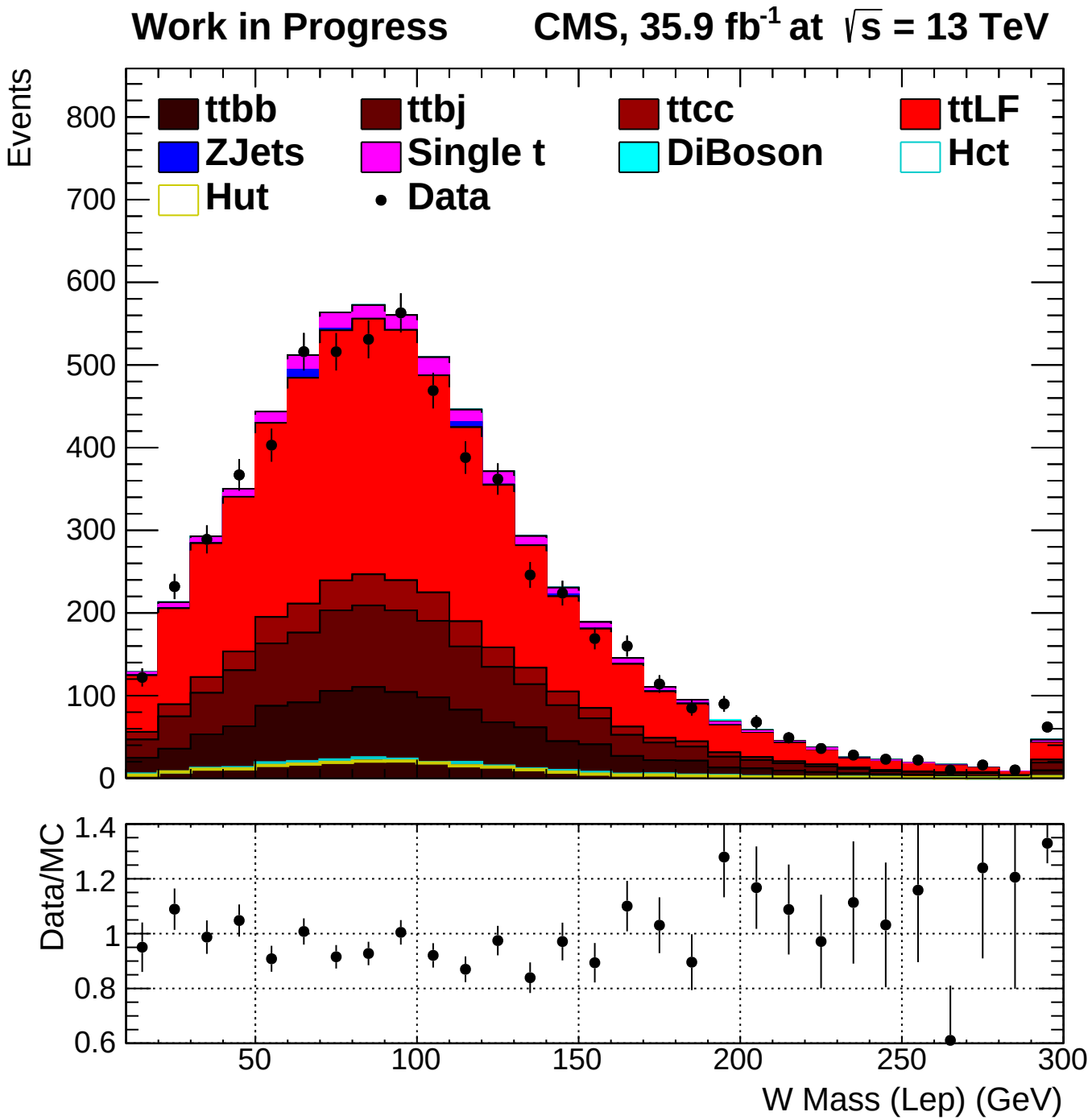
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation

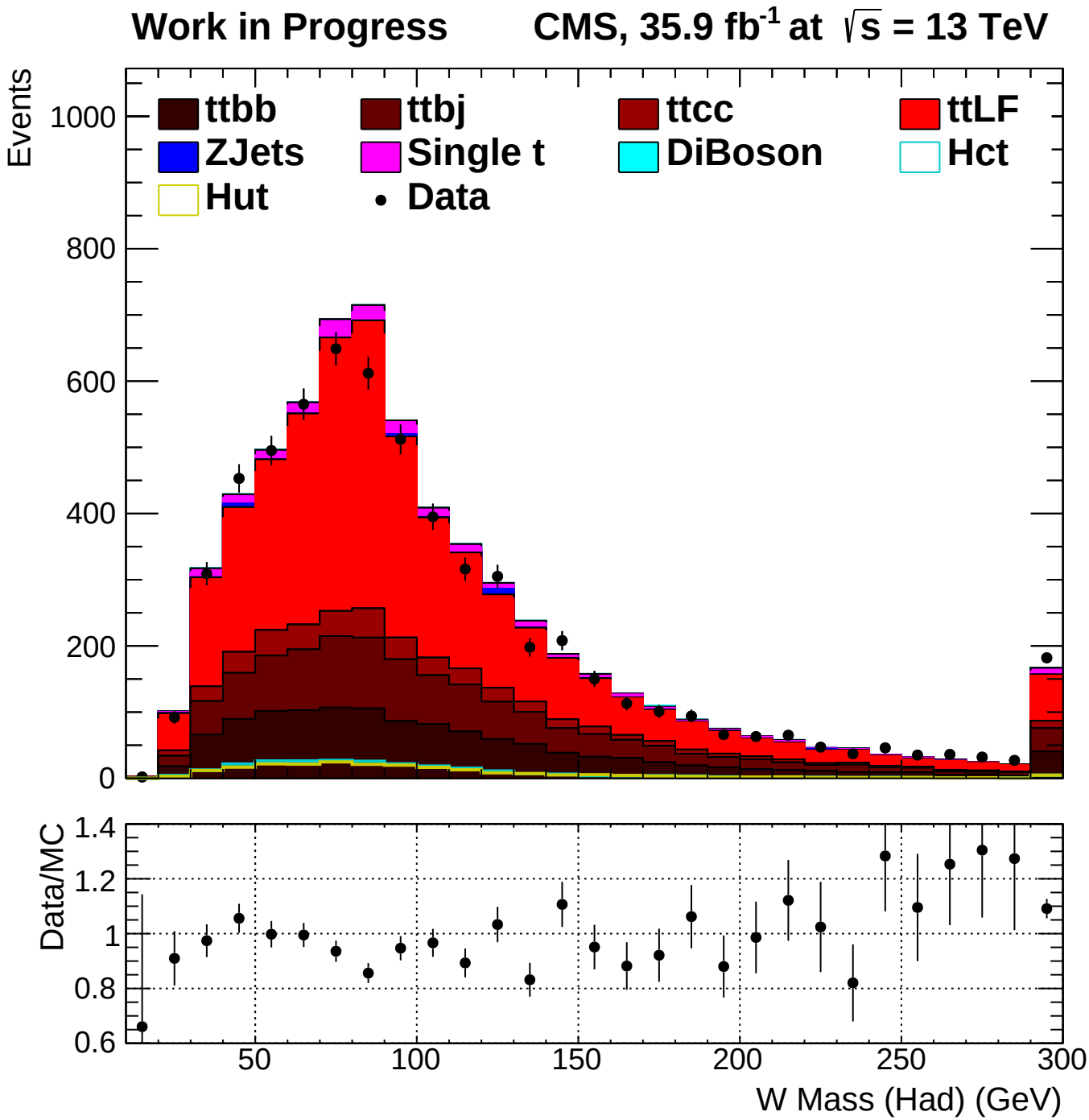

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Relative Isolation (QCD)

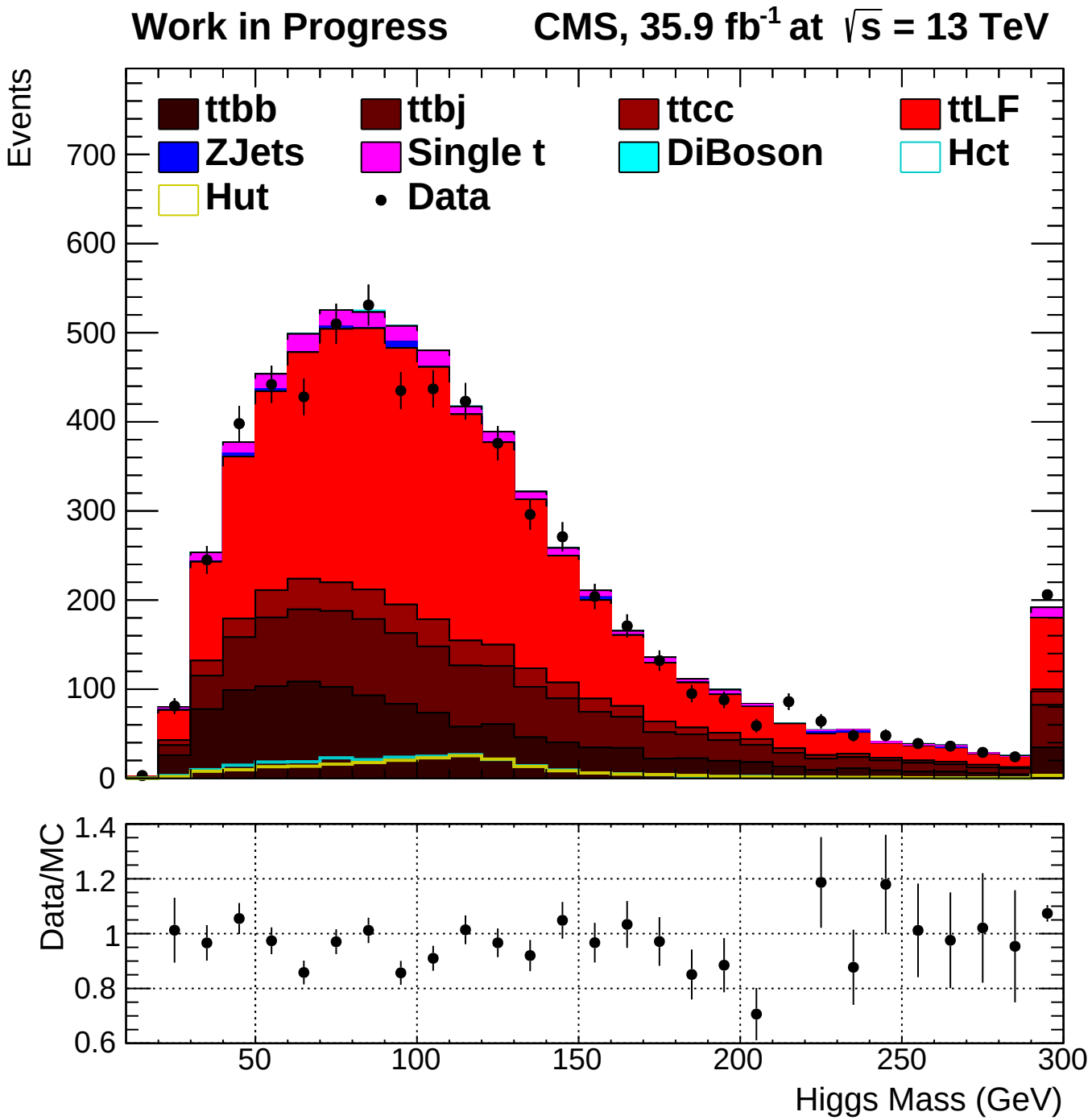

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
12000
10000
8000
6000
4000
2000
0
Data/MC
1.4
1.2
1
0.8
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
CSVv2

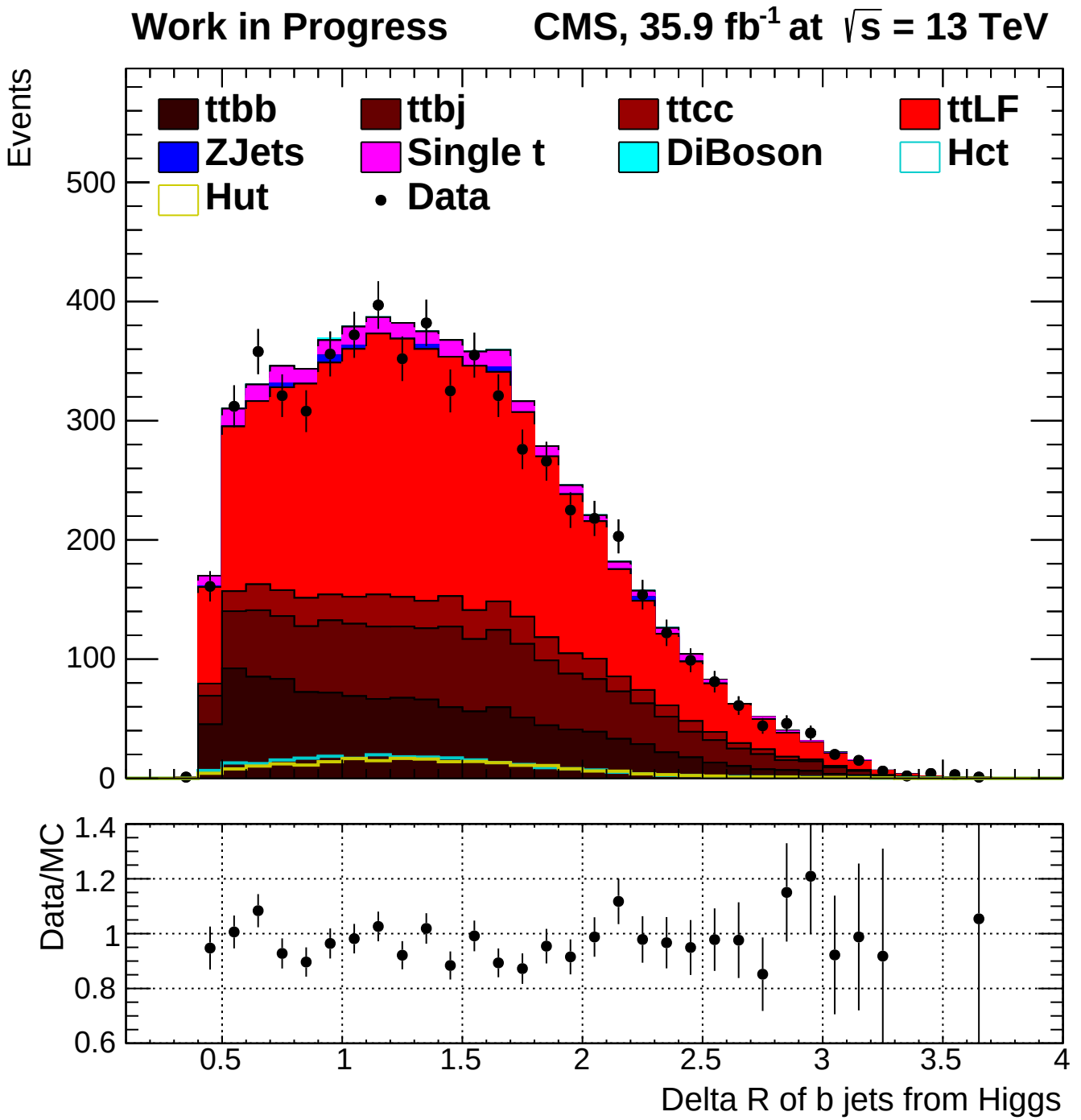

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.4
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
CvsL

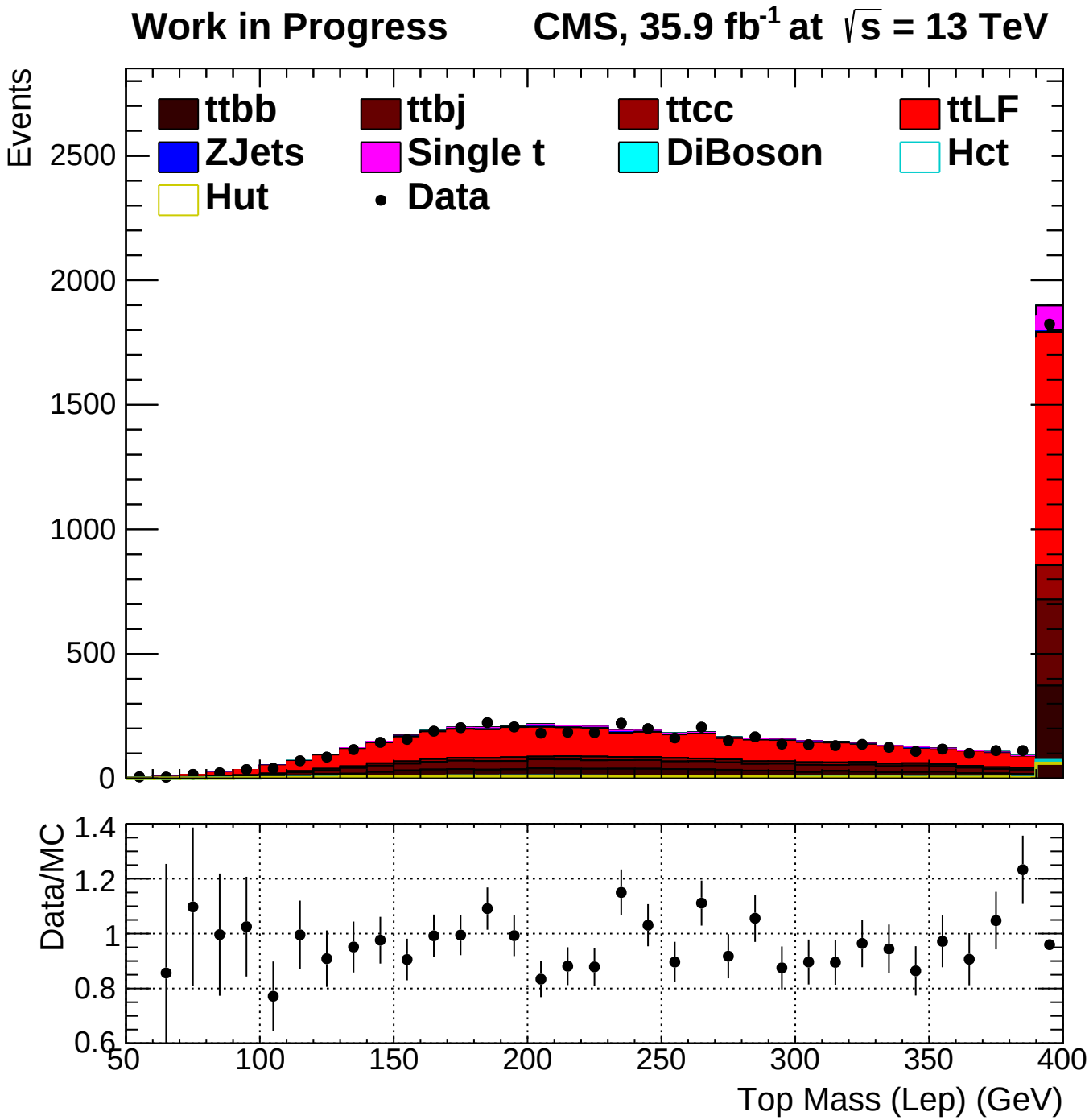

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
CvsB

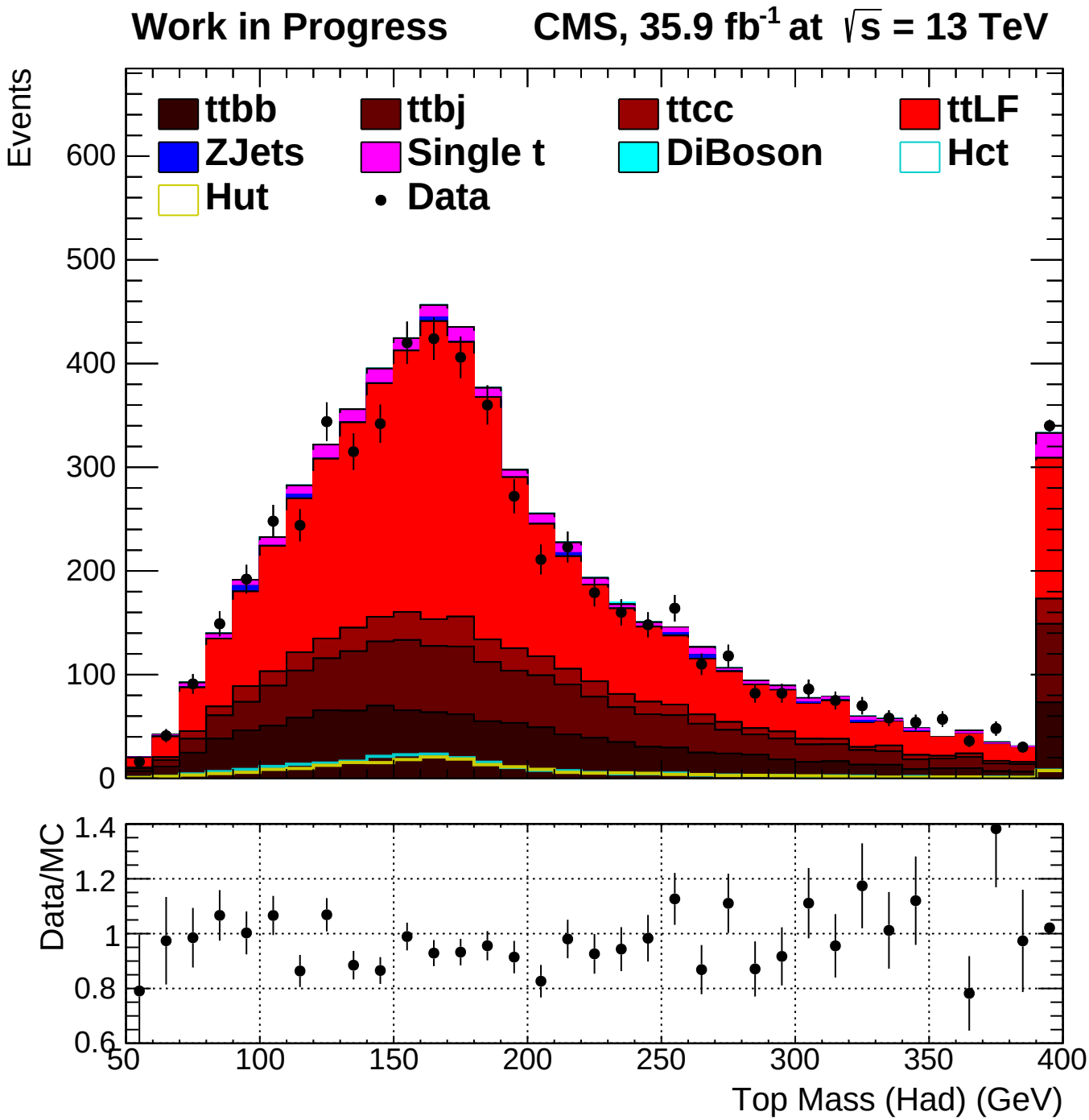

Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
W Mass (Had) (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Higgs Mass (GeV)


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
500
400
300
200
100
0
Data/MC
1.4
1.2
1
0.8
0.6
0.5
1
1.5
2
2.5
3
3.5
4
Delta R of b jets from Higgs


Work in Progress
CMS, 35.9 fb-1 at √s = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
2500
2000
1500
1000
500
0
Data/MC
1.4
1.2
1
0.8
0.6
50
100
150
200
250
300
350
400
Top Mass (Lep) (GeV)


Work in Progress
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13 TeV
Events
ttbb
ttbj
ttcc
ttLF
ZJets
Single t
DiBoson
Hct
Hut
Data
Data/MC
Top Mass (Had) (GeV)