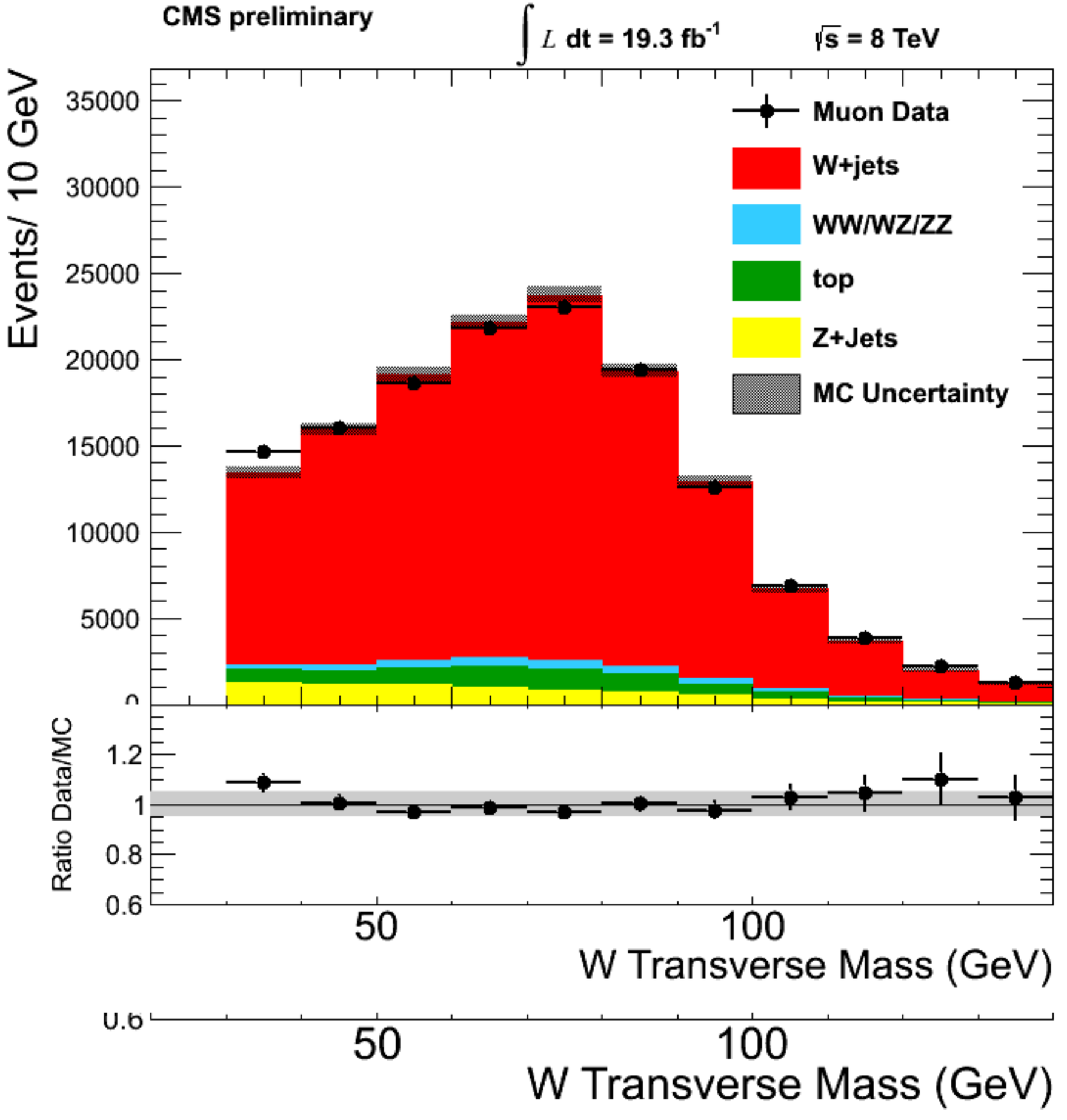
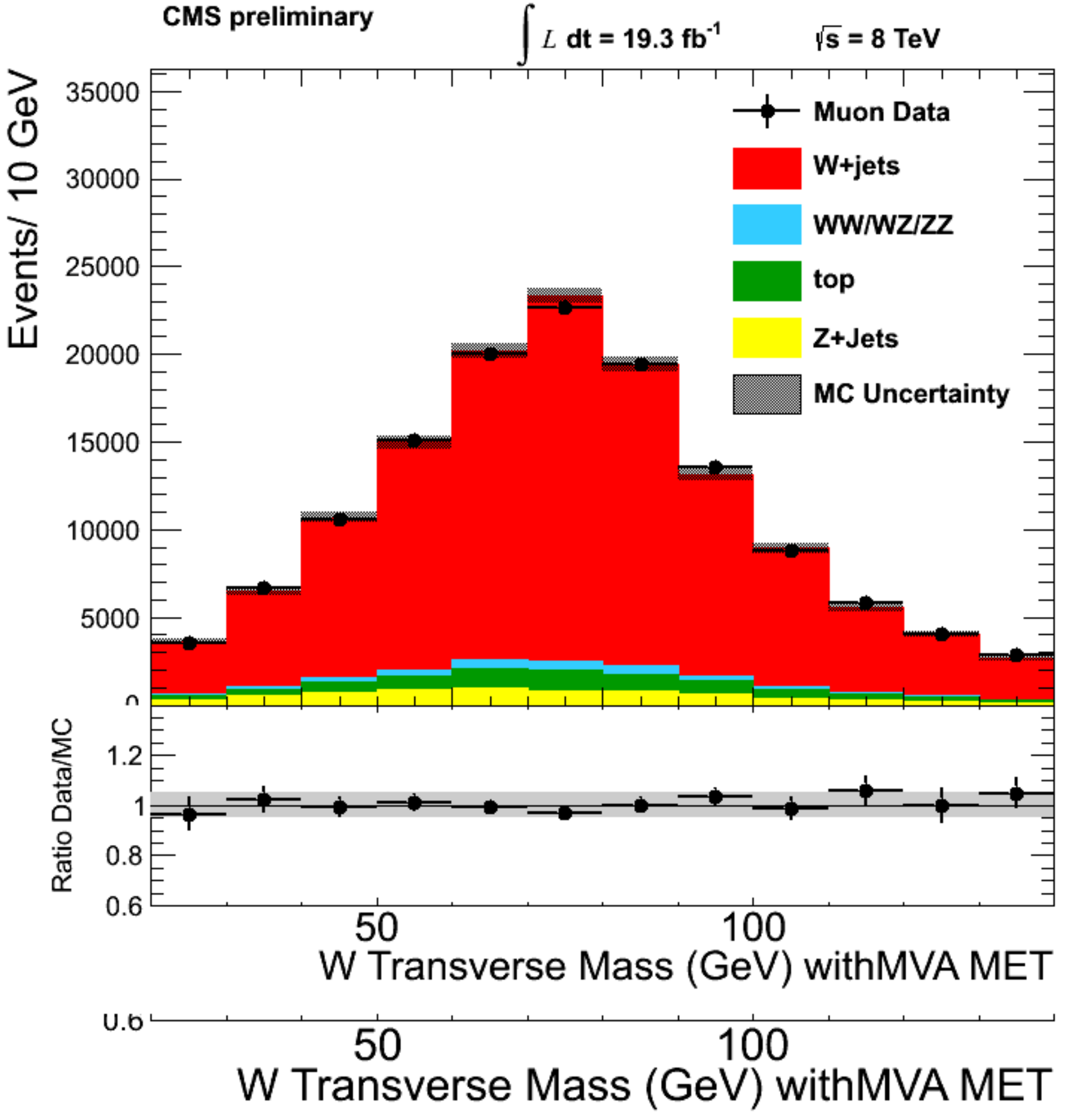
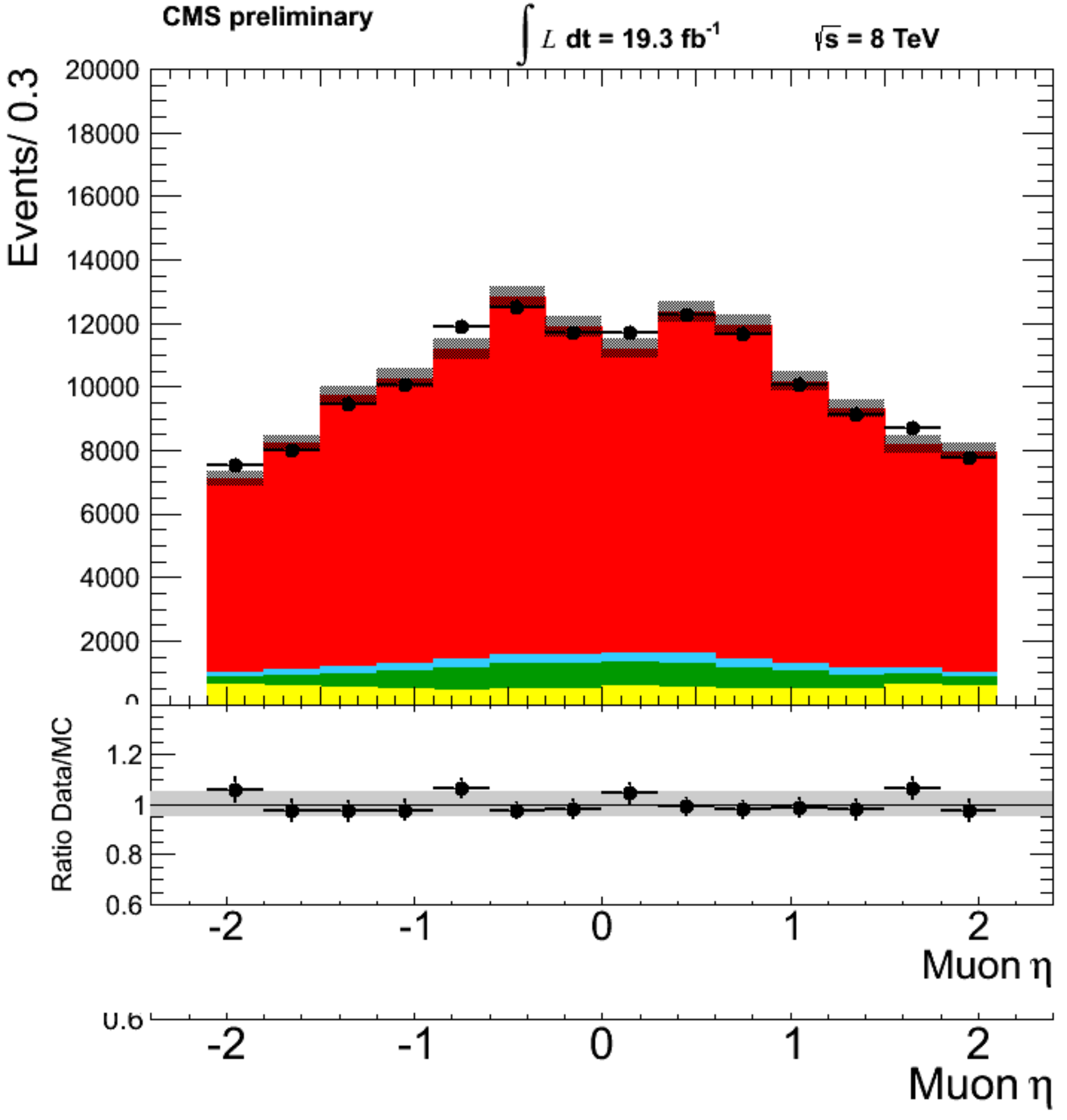
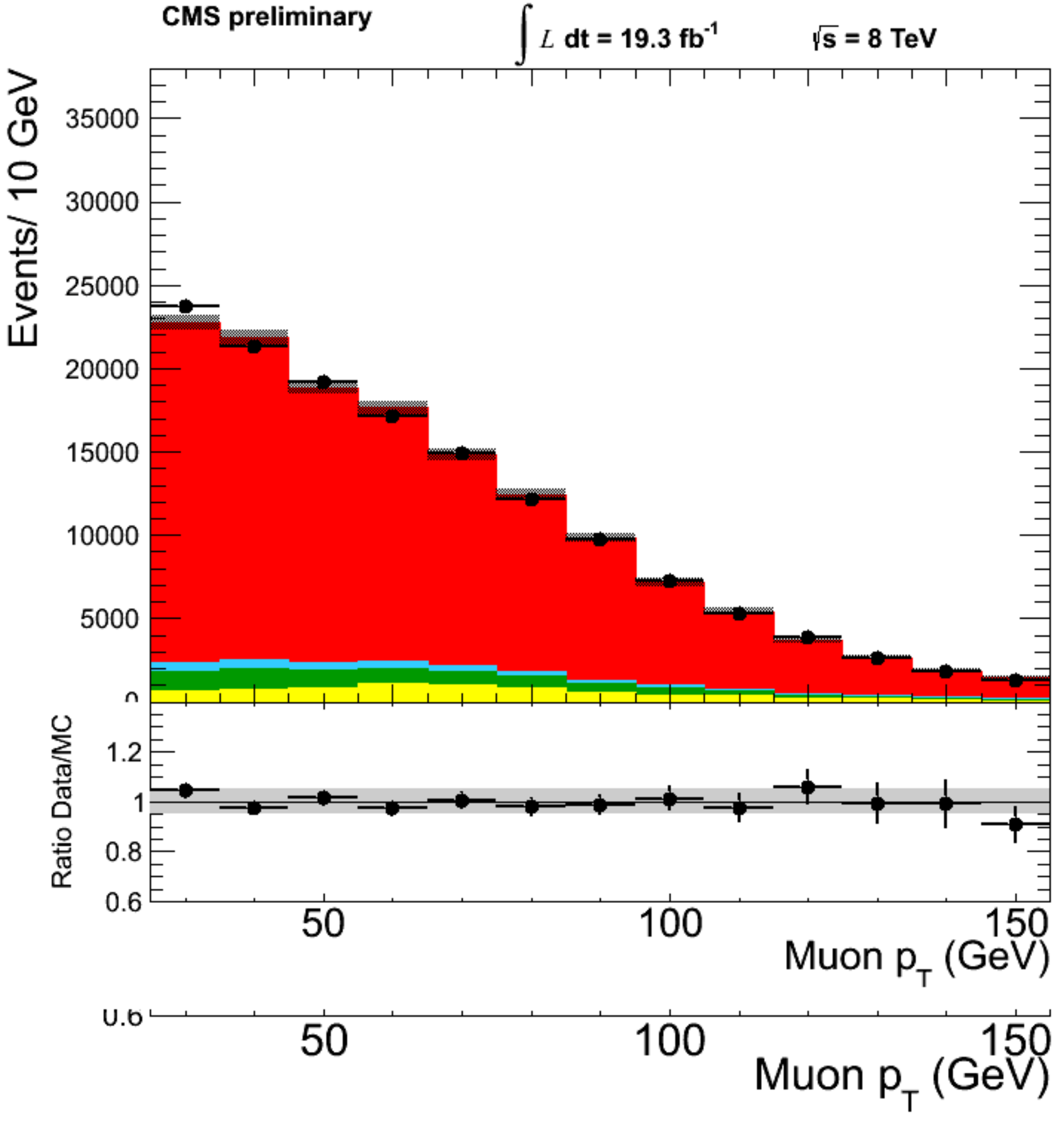
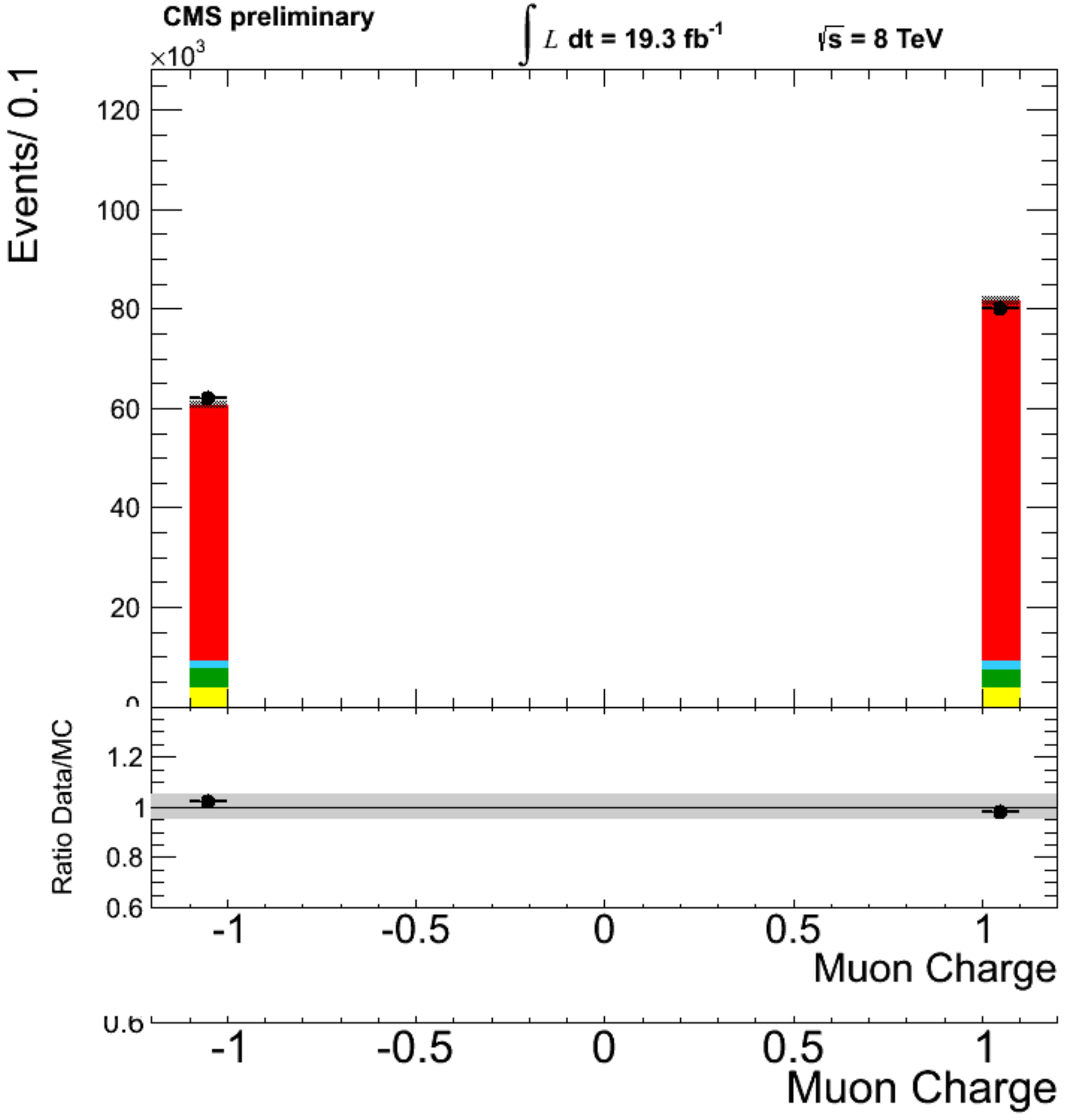
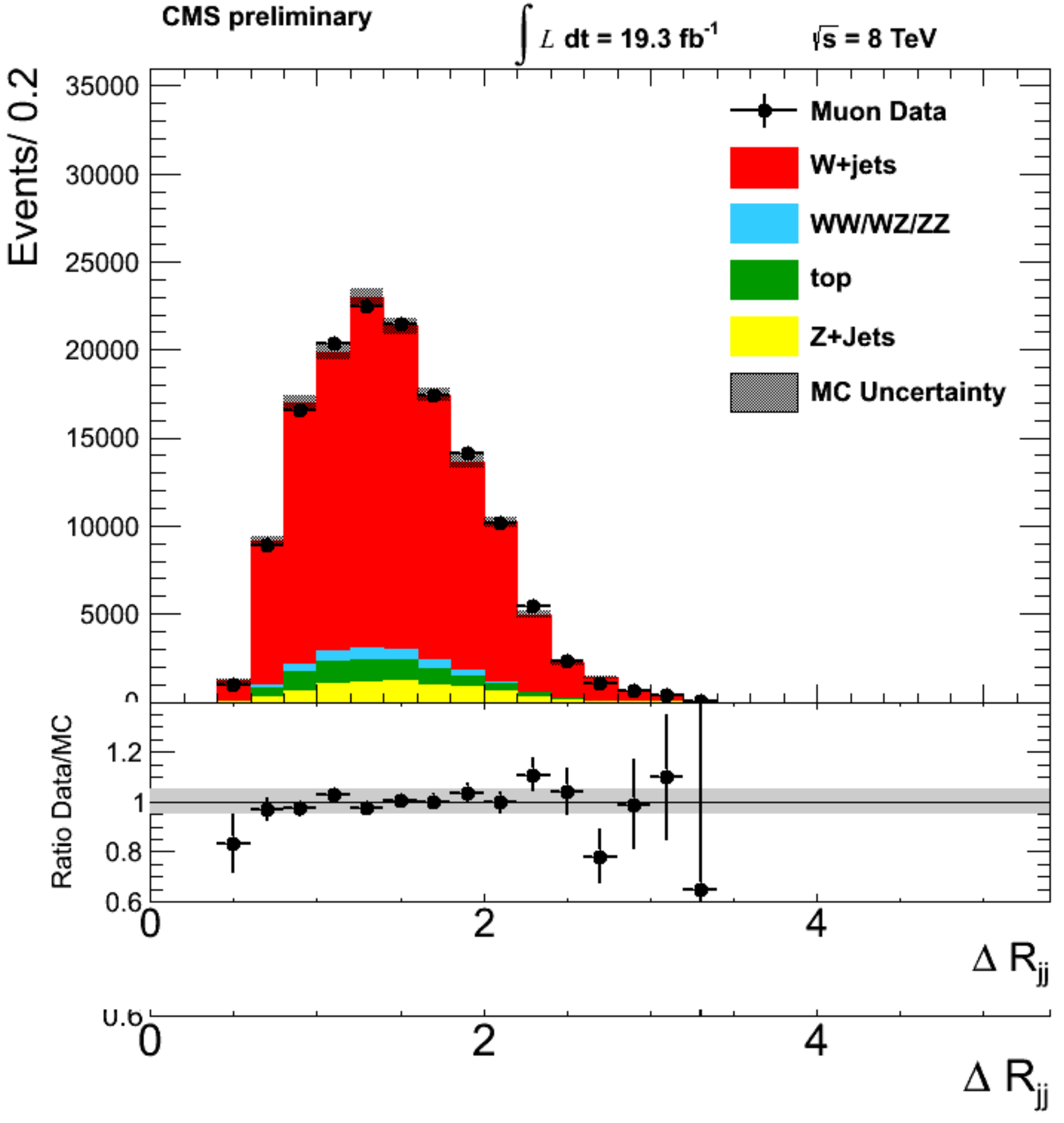

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 10 GeV
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
W Transverse Mass (GeV)
W Transverse Mass (GeV)

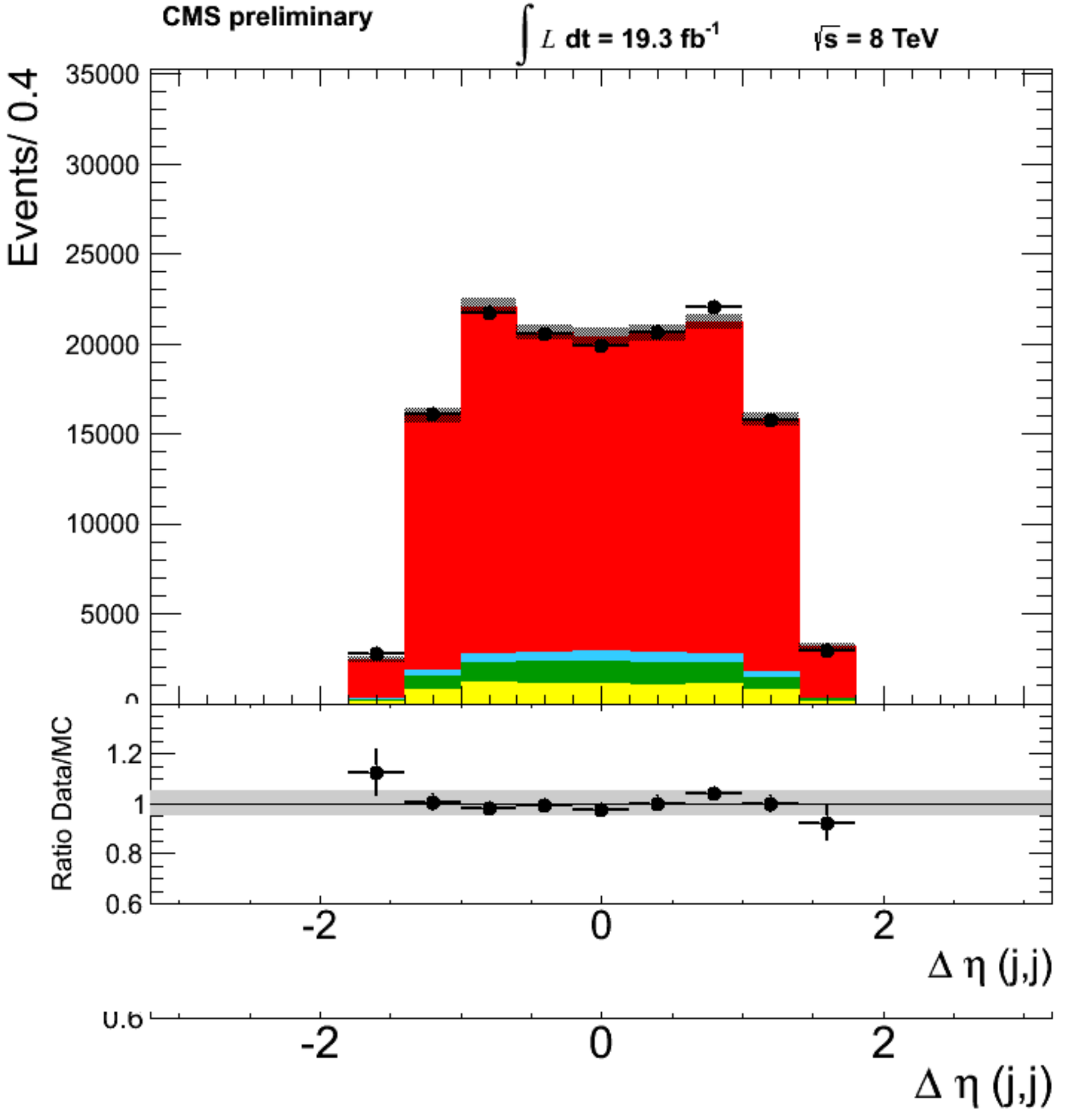

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 10 GeV
35000
30000
25000
20000
15000
10000
5000
0
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
1.2
1
0.8
0.6
50
100
W Transverse Mass (GeV) withMVA MET
0.6
50
100
W Transverse Mass (GeV) withMVA MET

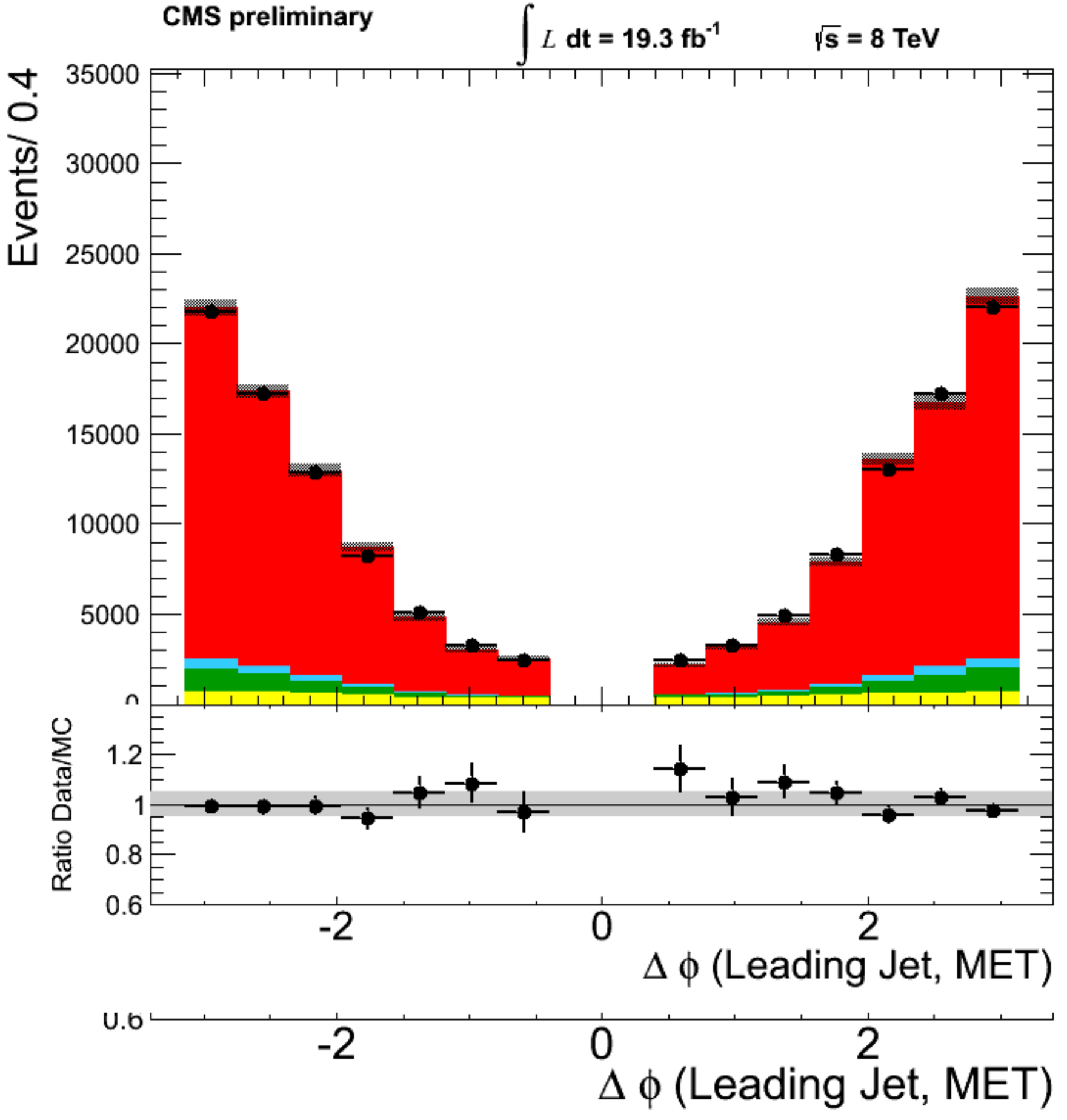

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.3
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
-1
0
1
2
Muon η
0.6
-2
-1
0
1
2
Muon η

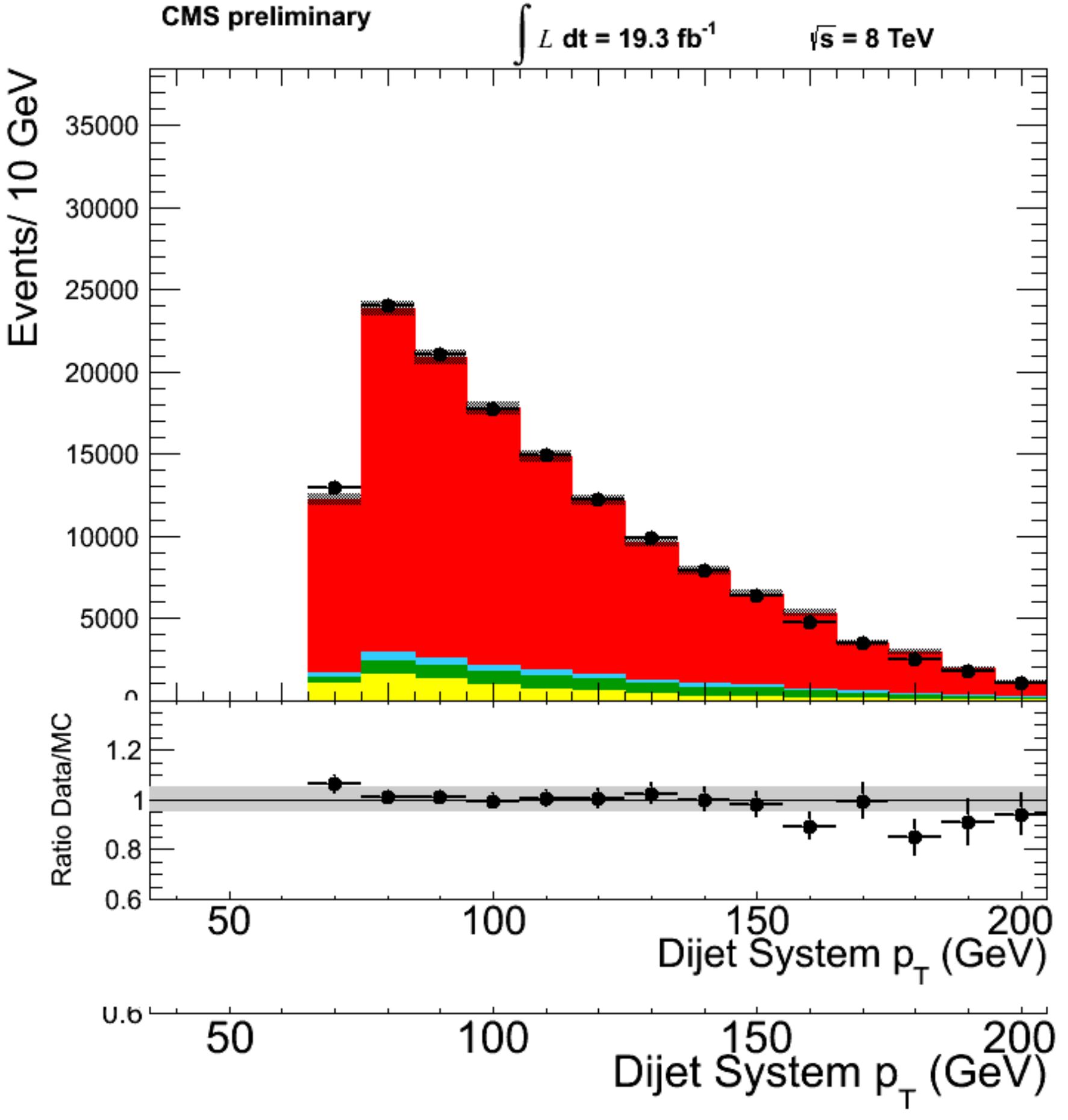

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 10 GeV
35000
30000
25000
20000
15000
10000
5000
Ratio Data/MC
1.2
1
0.8
0.6
50
100
150
Muon p_T (GeV)
0.6
50
100
150
Muon p_T (GeV)

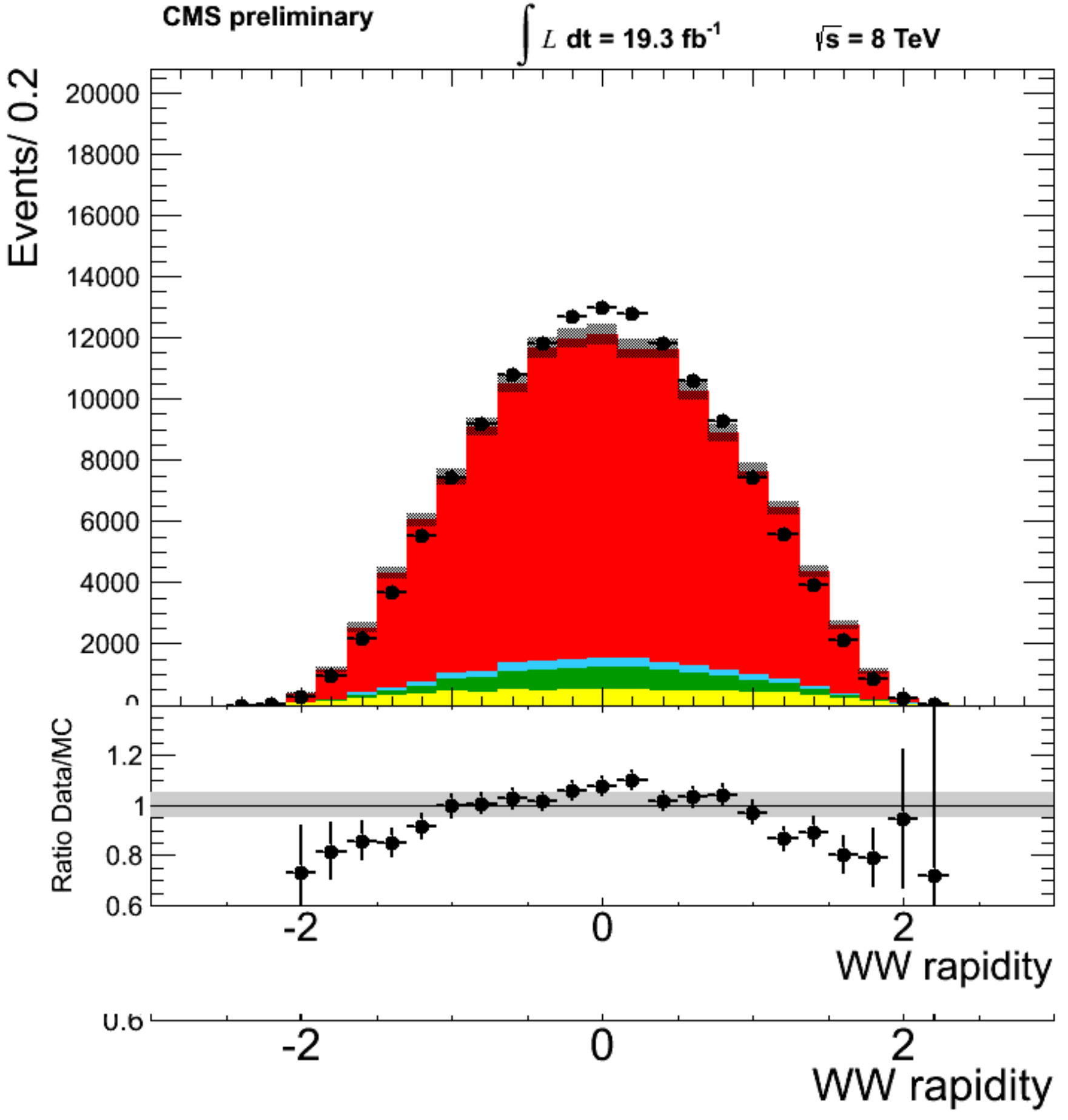

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
$\times 10^3$
Events/ 0.1
120
100
80
60
40
20
0
Ratio Data/MC
1.2
1
0.8
0.6
-1
-0.5
0
0.5
1
Muon Charge
0.6
-1
-0.5
0
0.5
1
Muon Charge

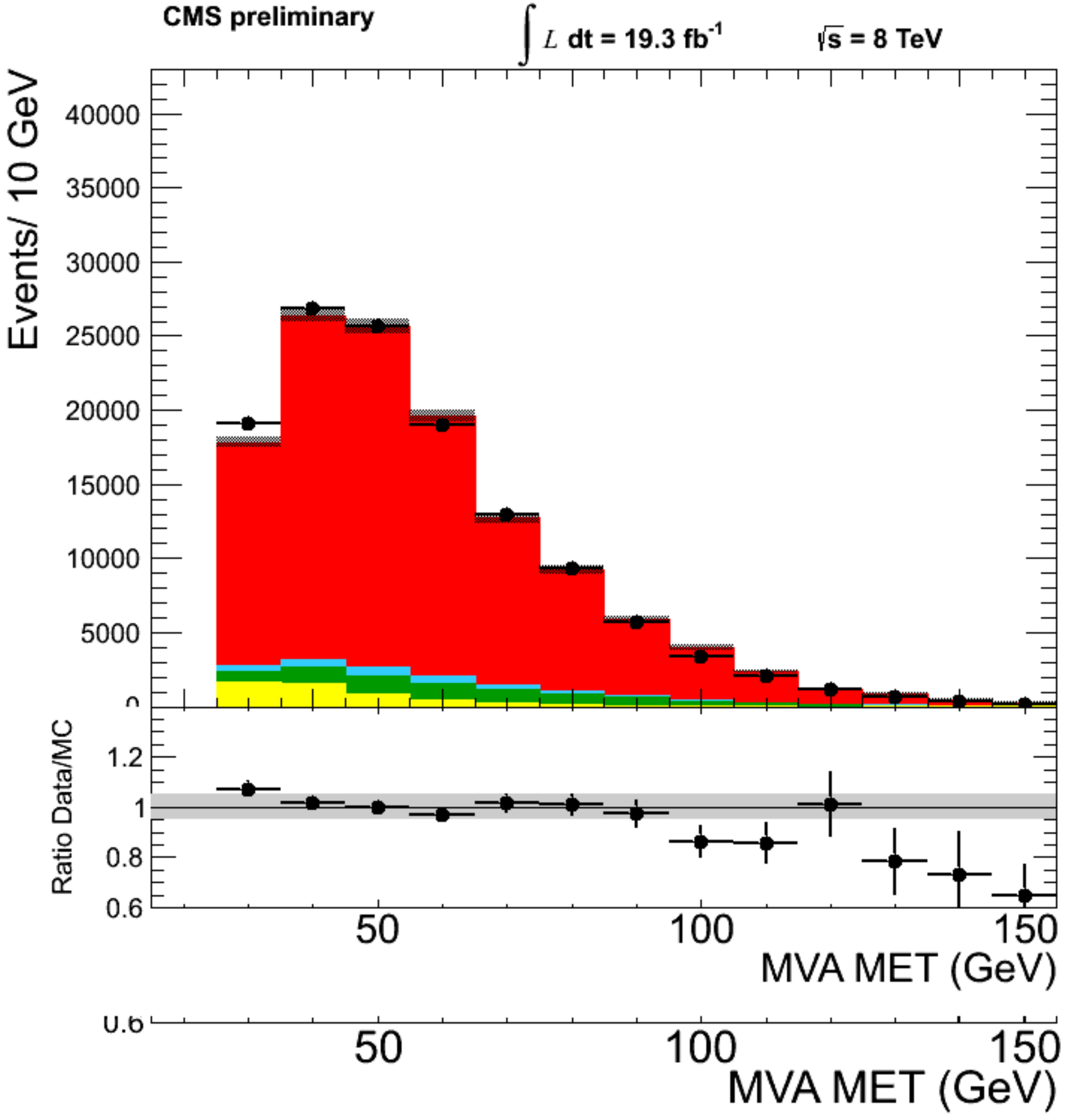

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.2
35000
30000
25000
20000
15000
10000
5000
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
1.2
1
0.8
0.6
0
2
4
Δ R_jj

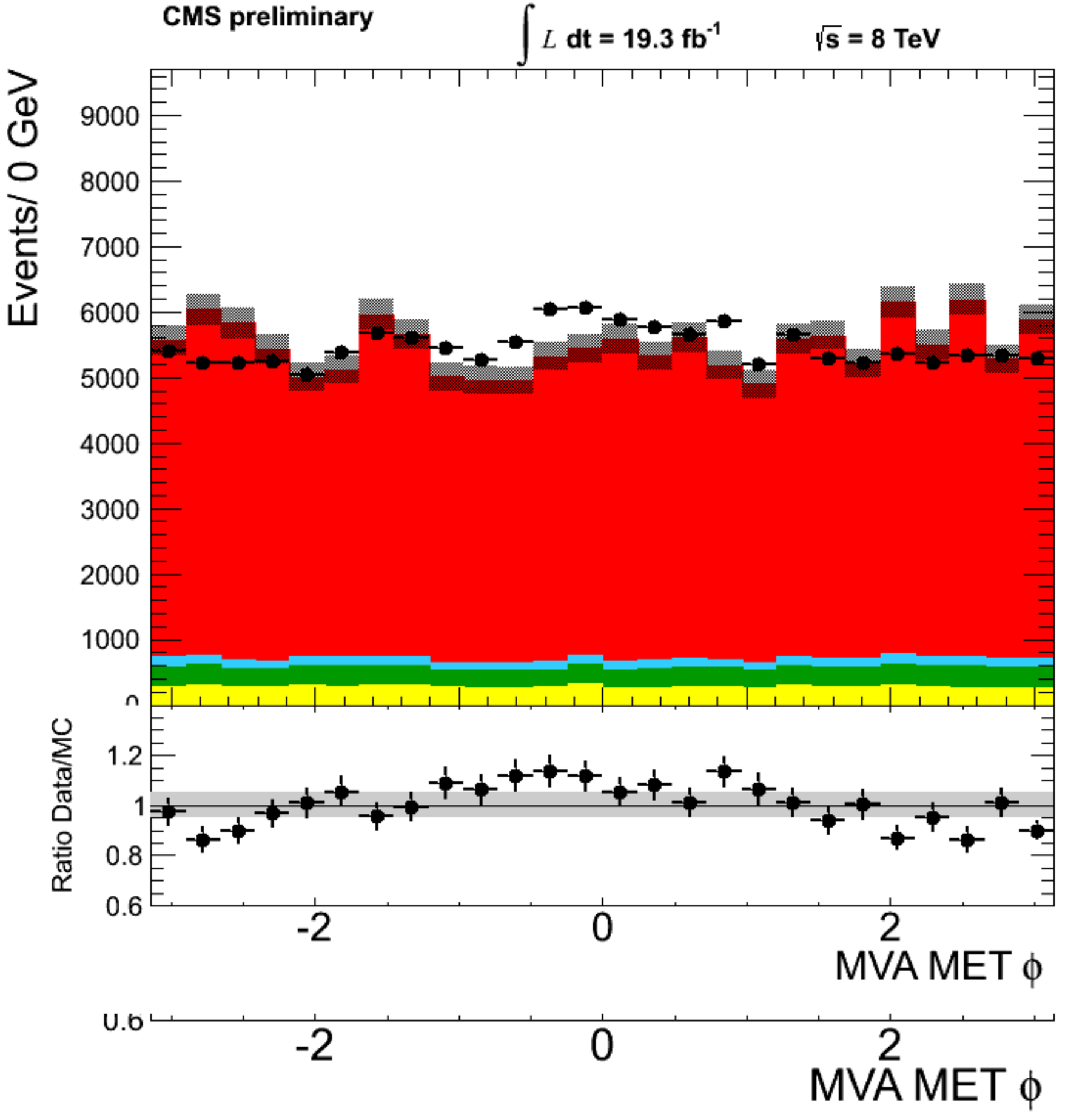

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4
35000
30000
25000
20000
15000
10000
5000
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Δ η (j,j)

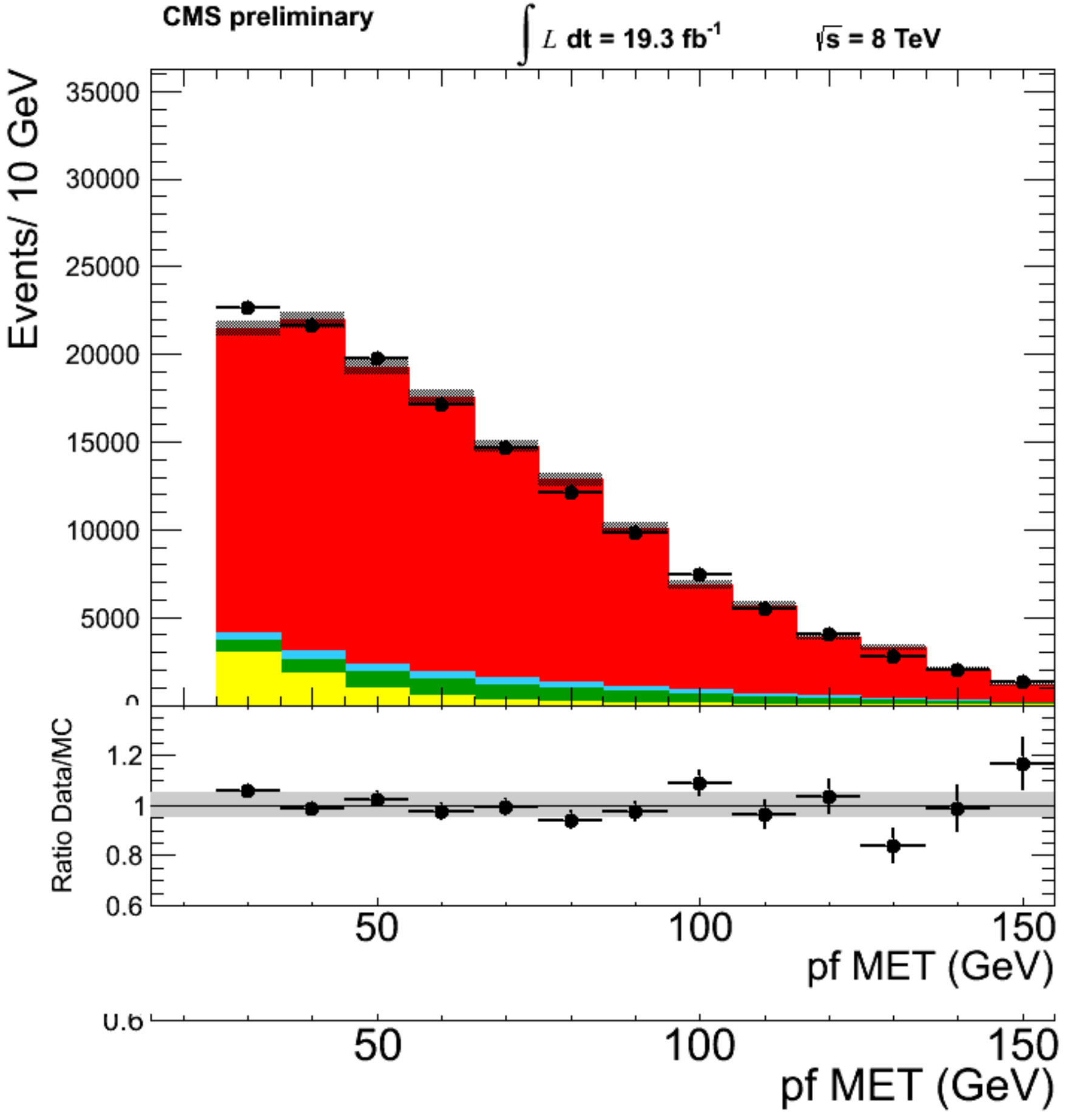

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4
35000
30000
25000
20000
15000
10000
5000
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Δ φ (Leading Jet, MET)
0.6
-2
0
2
Δ φ (Leading Jet, MET)

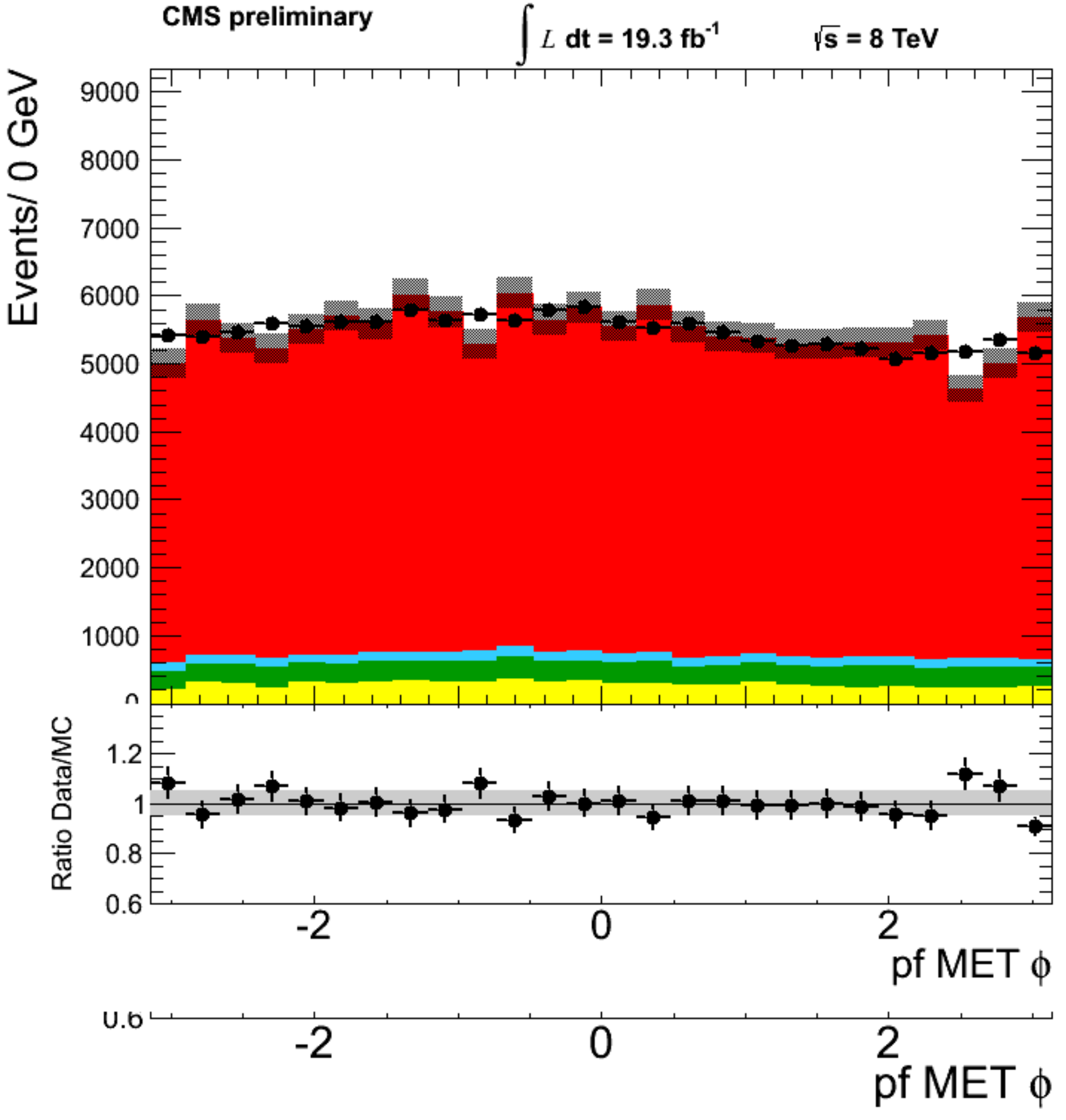

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 10 GeV
35000
30000
25000
20000
15000
10000
5000
Ratio Data/MC
1.2
1
0.8
0.6
50
100
150
200
Dijet System pT (GeV)
0.6
50
100
150
200
Dijet System pT (GeV)

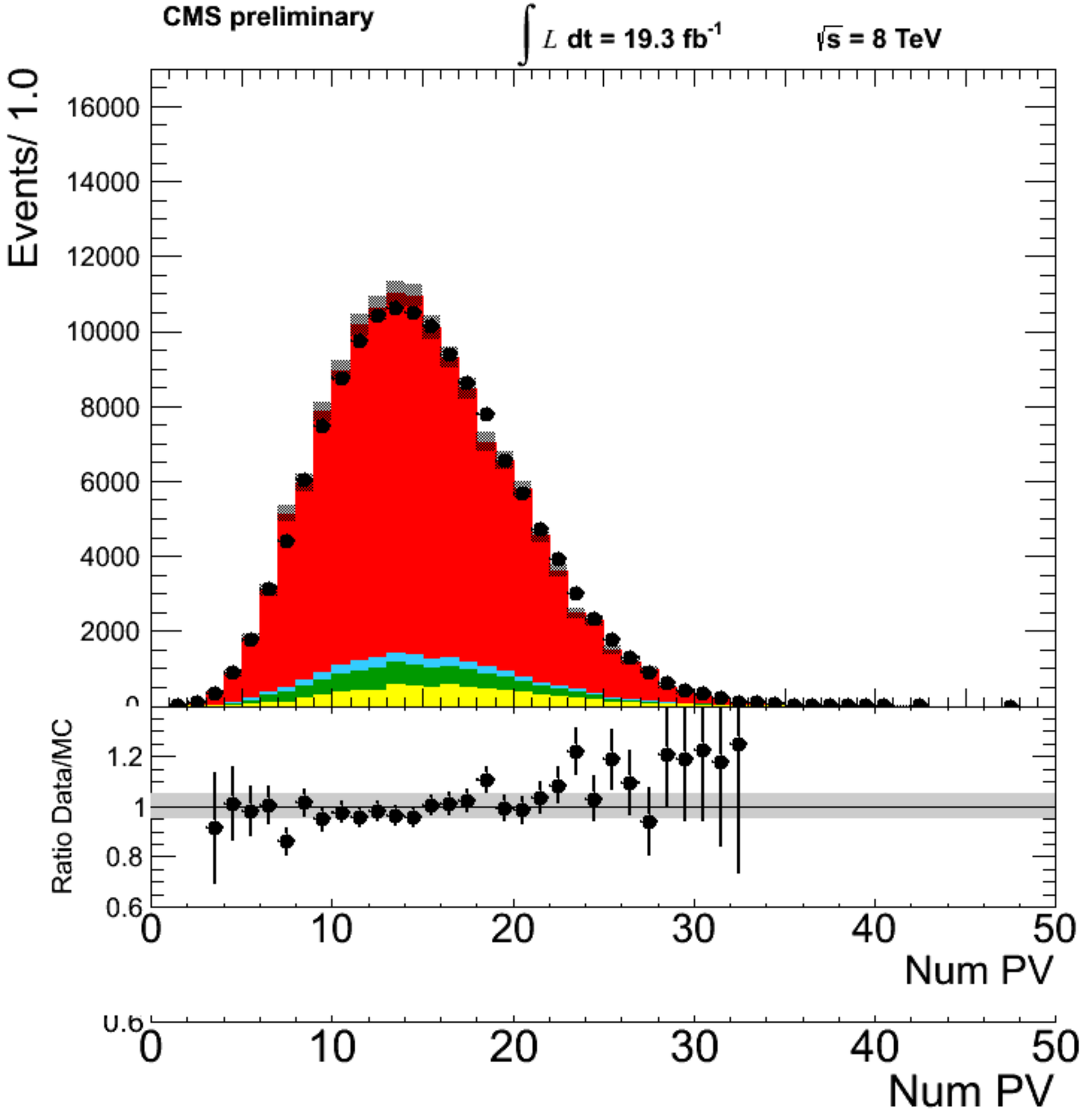

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.2
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
WW rapidity

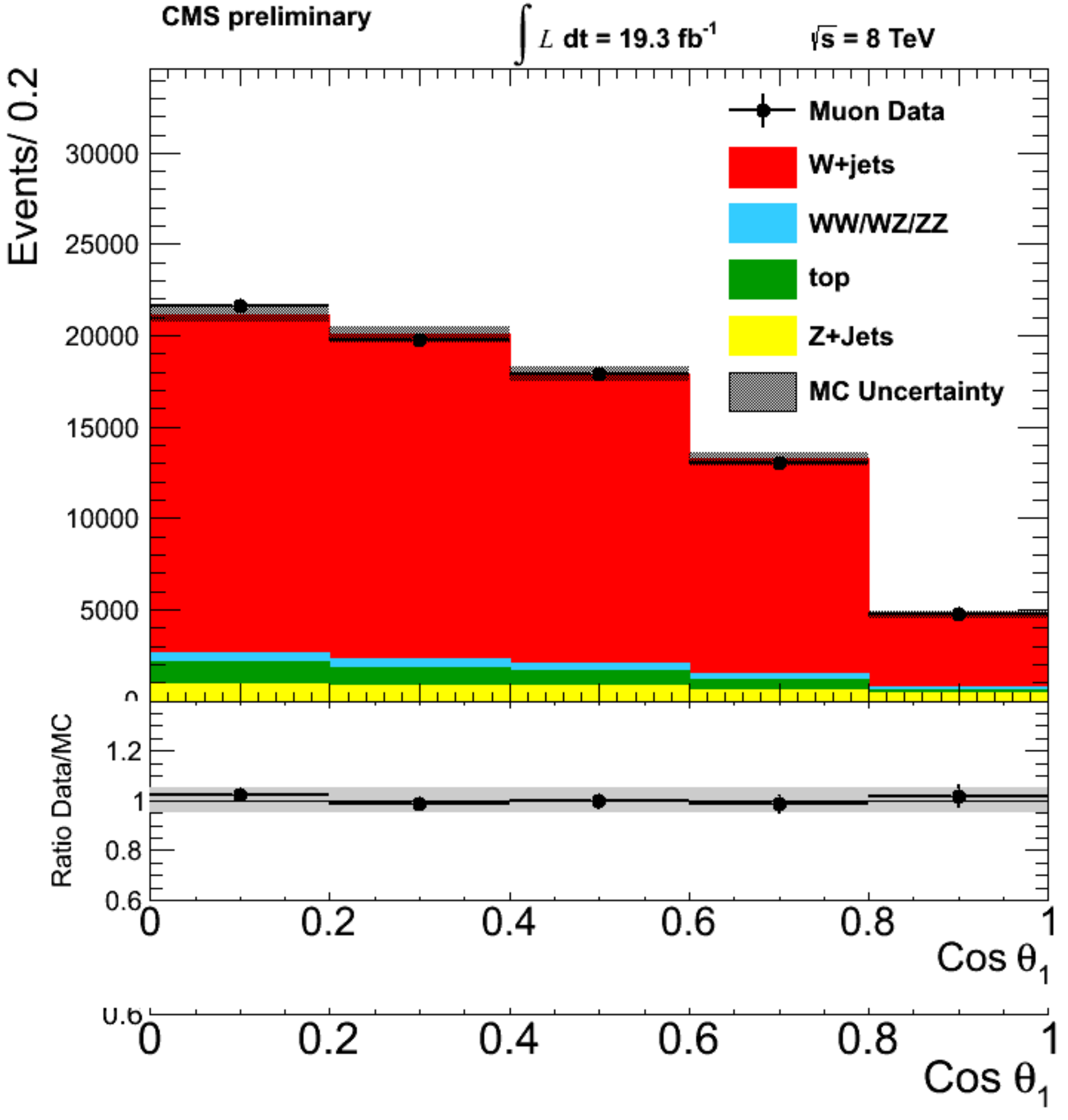

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 10 GeV
40000
35000
30000
25000
20000
15000
10000
5000
Ratio Data/MC
1.2
1
0.8
0.6
50
100
150
MVA MET (GeV)
0.6
50
100
150
MVA MET (GeV)

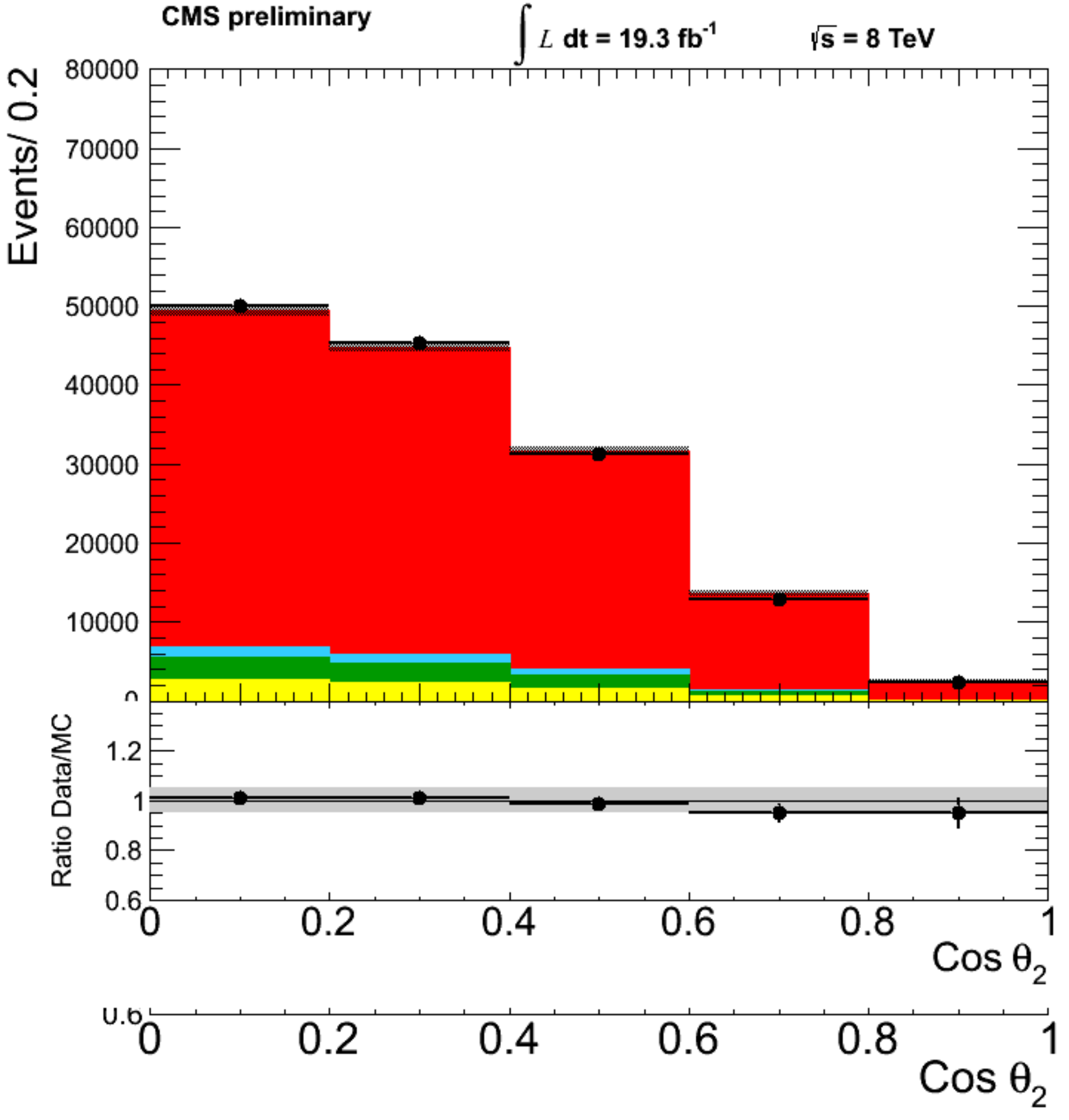

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0 GeV
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
MVA MET ϕ
0.6
-2
0
2
MVA MET ϕ

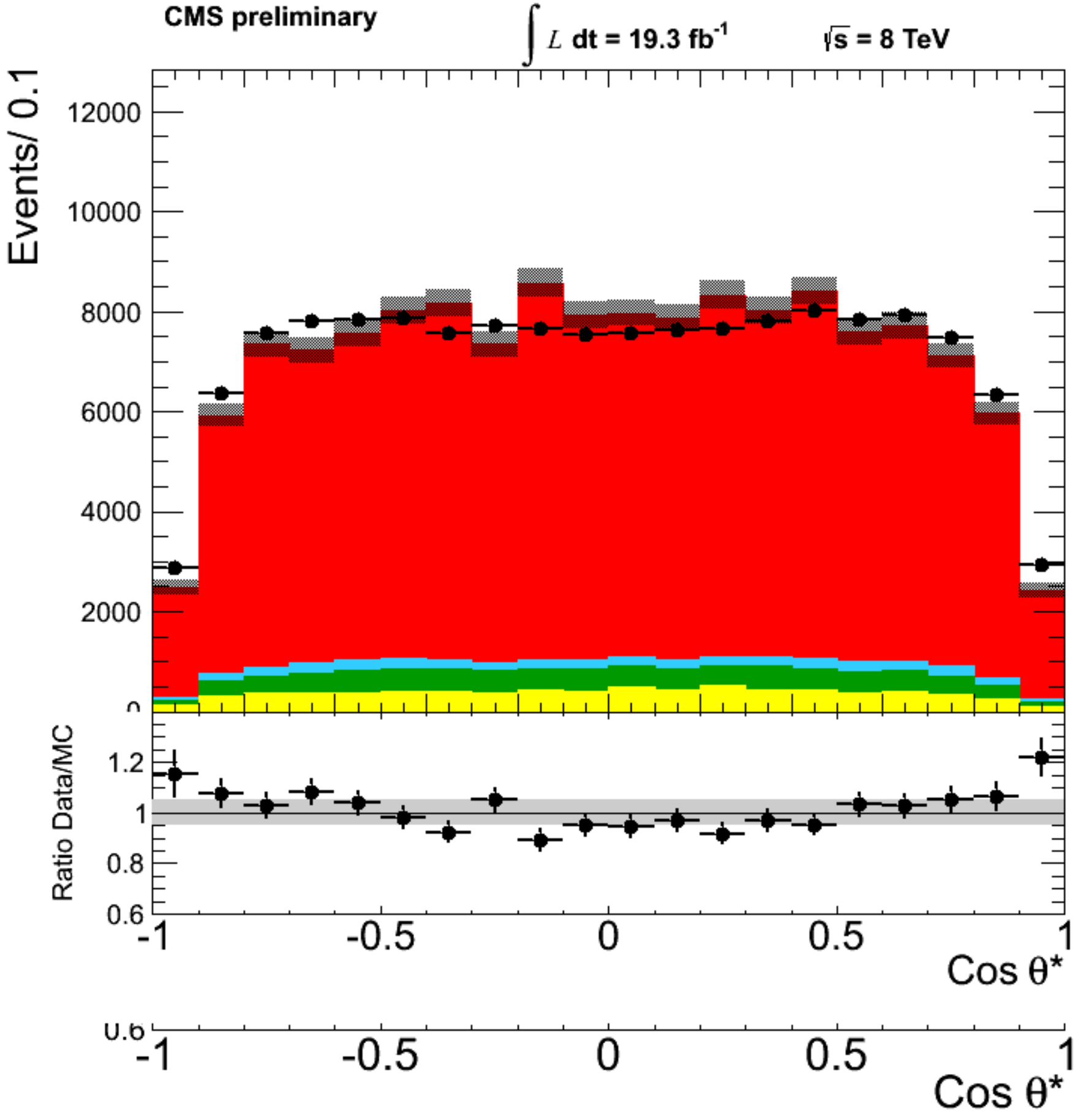

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 10 GeV
35000
30000
25000
20000
15000
10000
5000
Ratio Data/MC
1.2
1
0.8
0.6
50
100
150
pf MET (GeV)

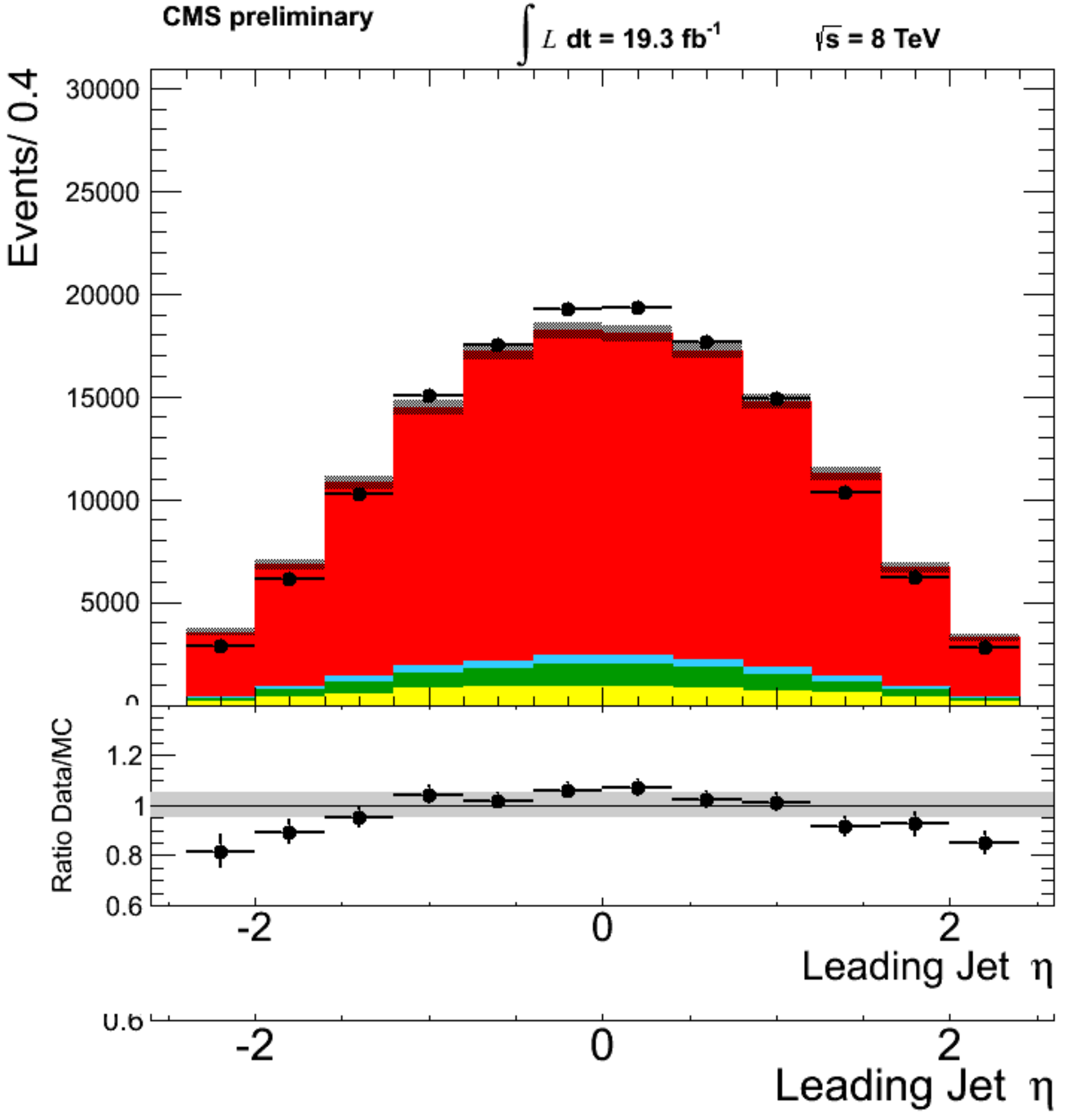

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0 GeV
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
pf MET ϕ
0.6
-2
0
2
pf MET ϕ

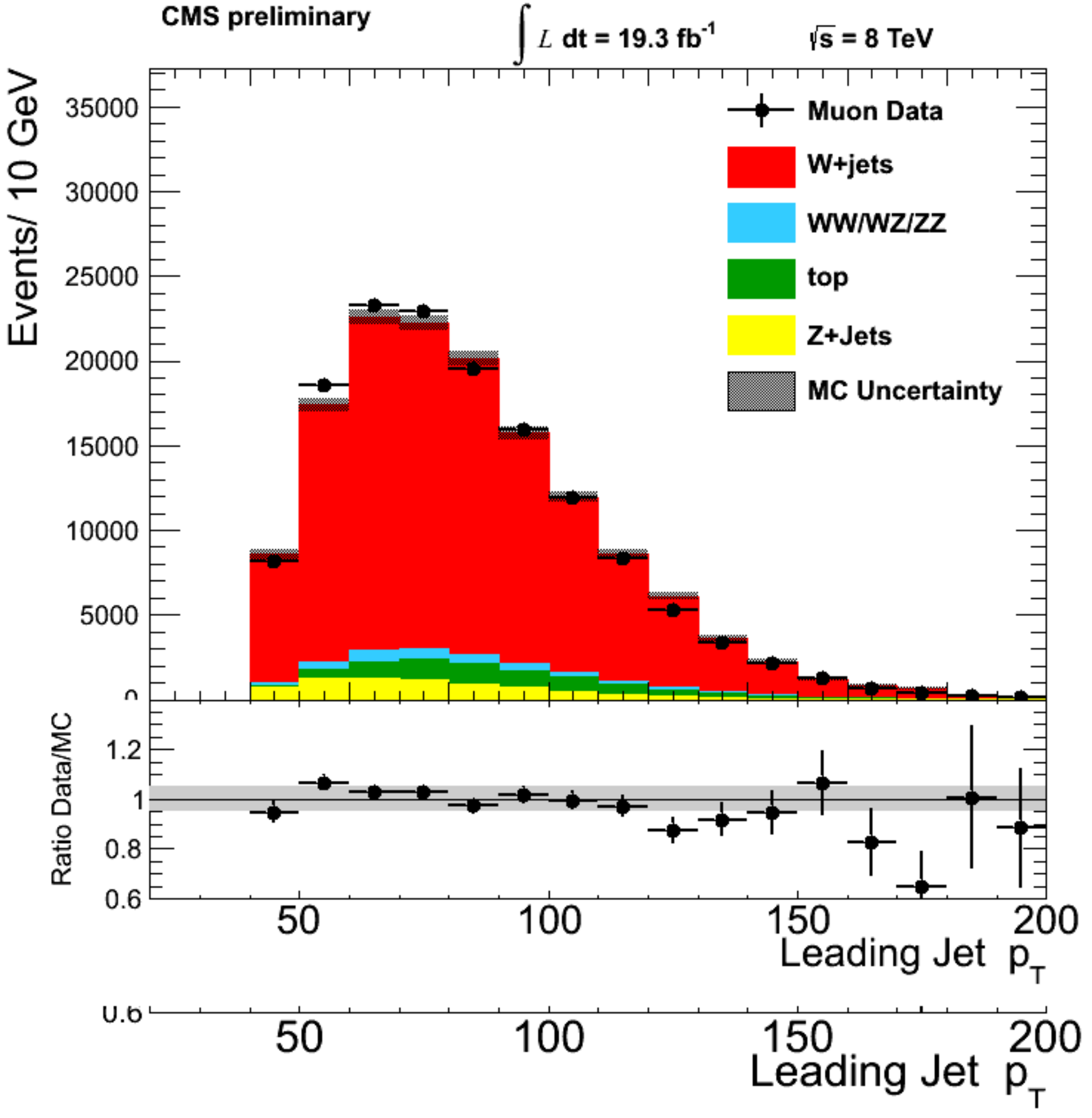

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 1.0
16000
14000
12000
10000
8000
6000
4000
2000
Ratio Data/MC
1.2
1
0.8
0.6
0
10
20
30
40
50
Num PV

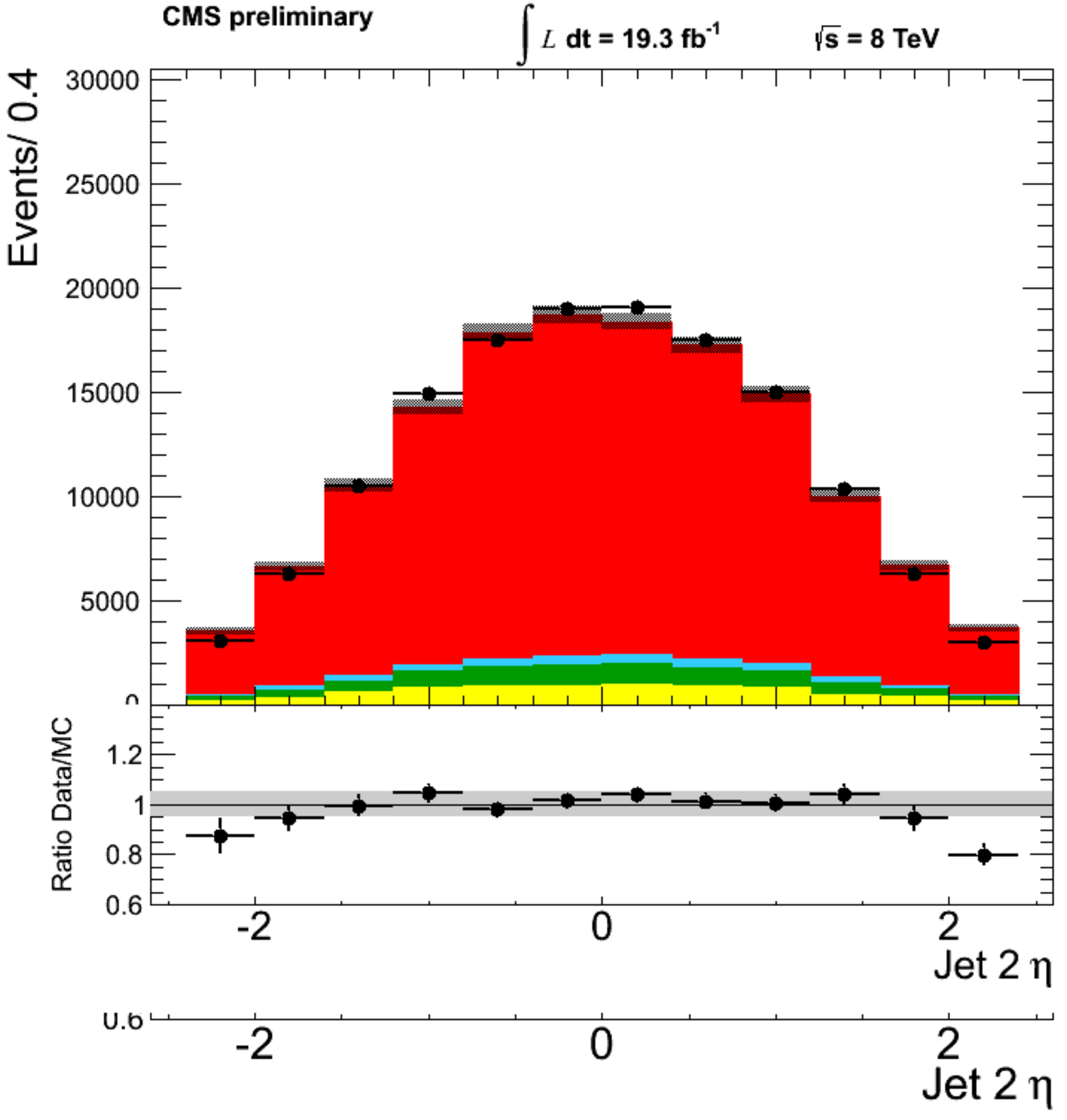

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 0.2
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
Cos θ_1
Cos θ_1

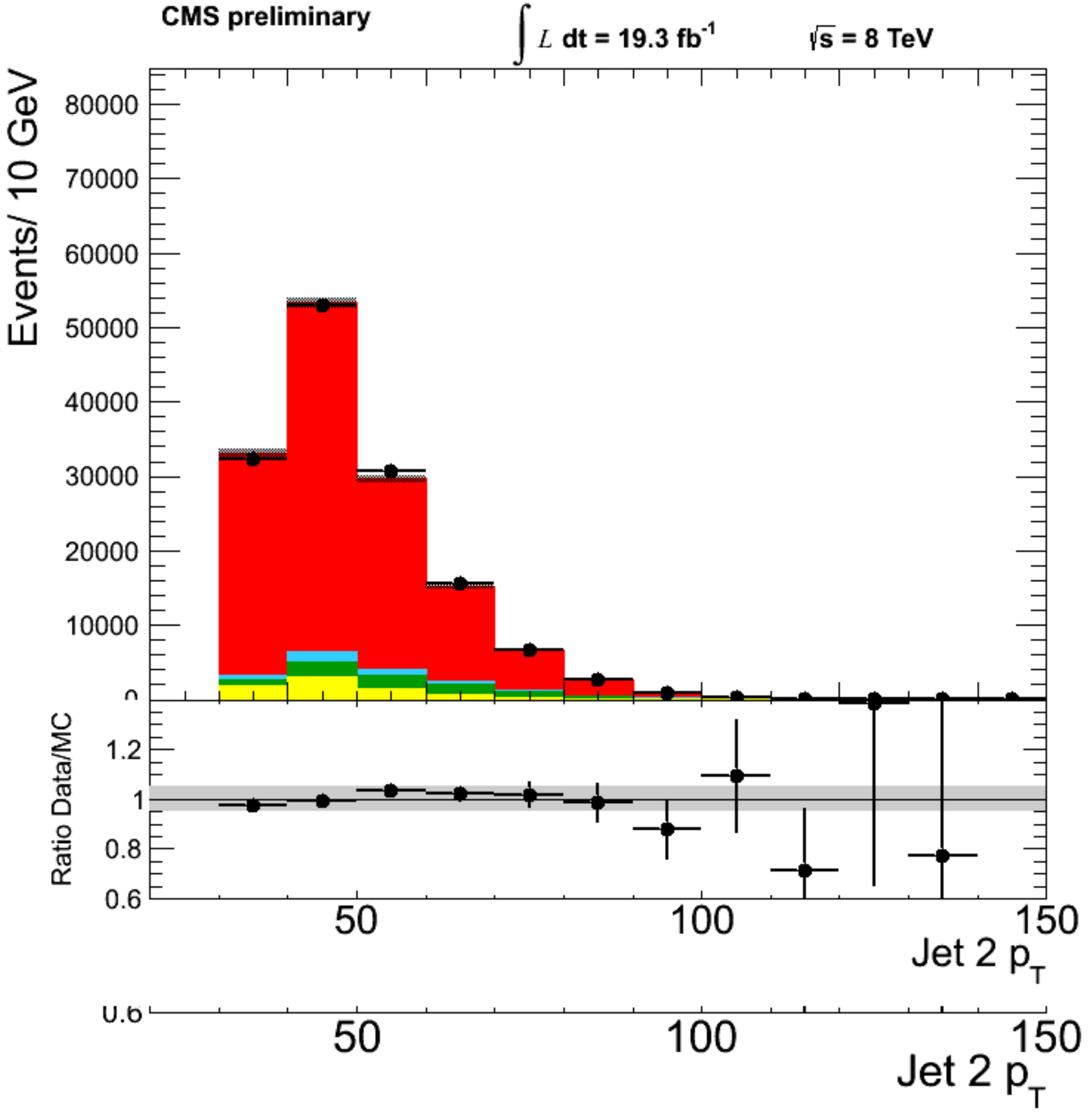

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.2
80000
70000
60000
50000
40000
30000
20000
10000
0
Ratio Data/MC
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
Cos θ_2

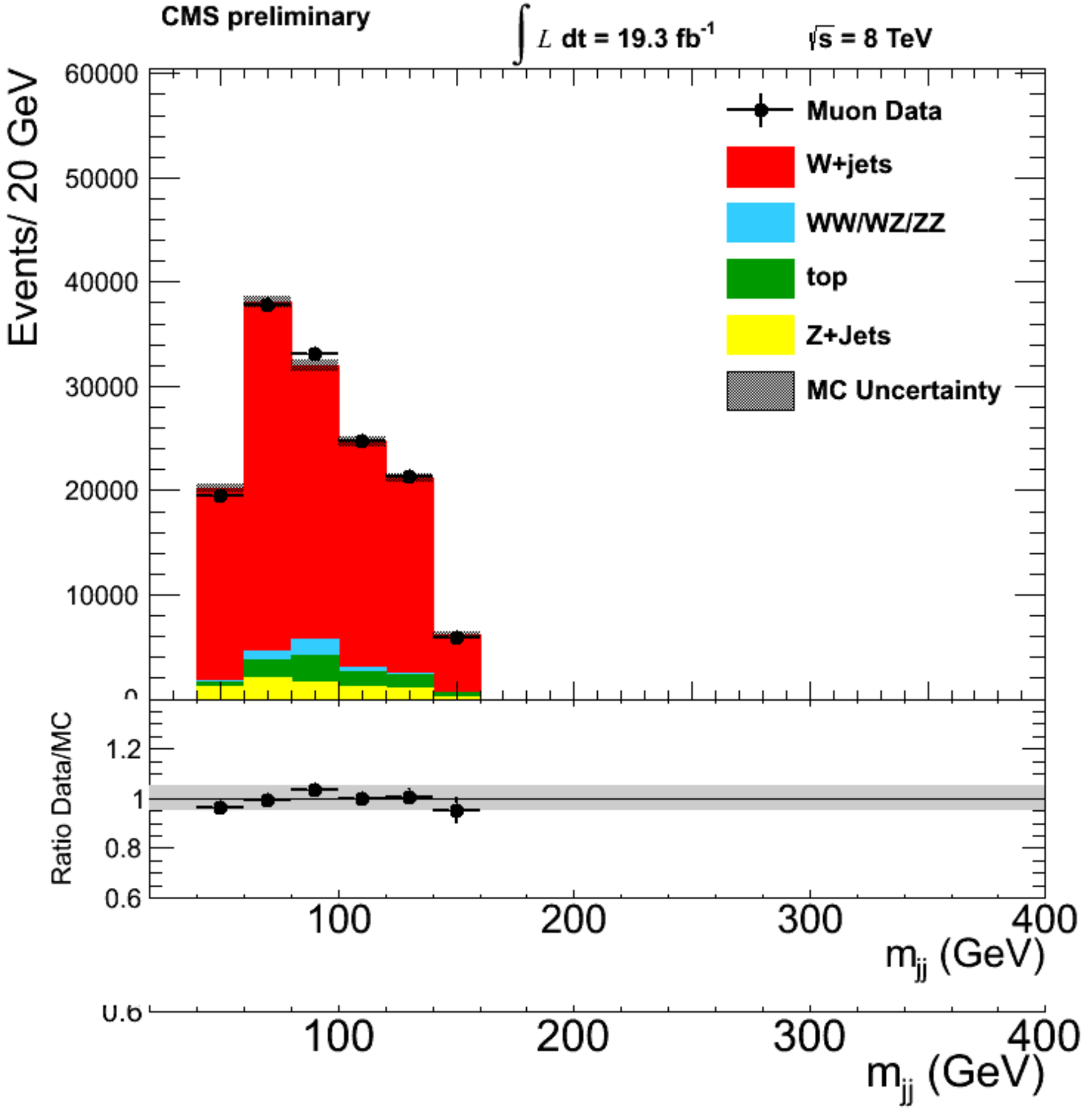

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.1
12000
10000
8000
6000
4000
2000
0
Ratio Data/MC
1.2
1
0.8
0.6
-1
-0.5
0
0.5
1
Cos θ*
0.6
-1
-0.5
0
0.5
1
Cos θ*

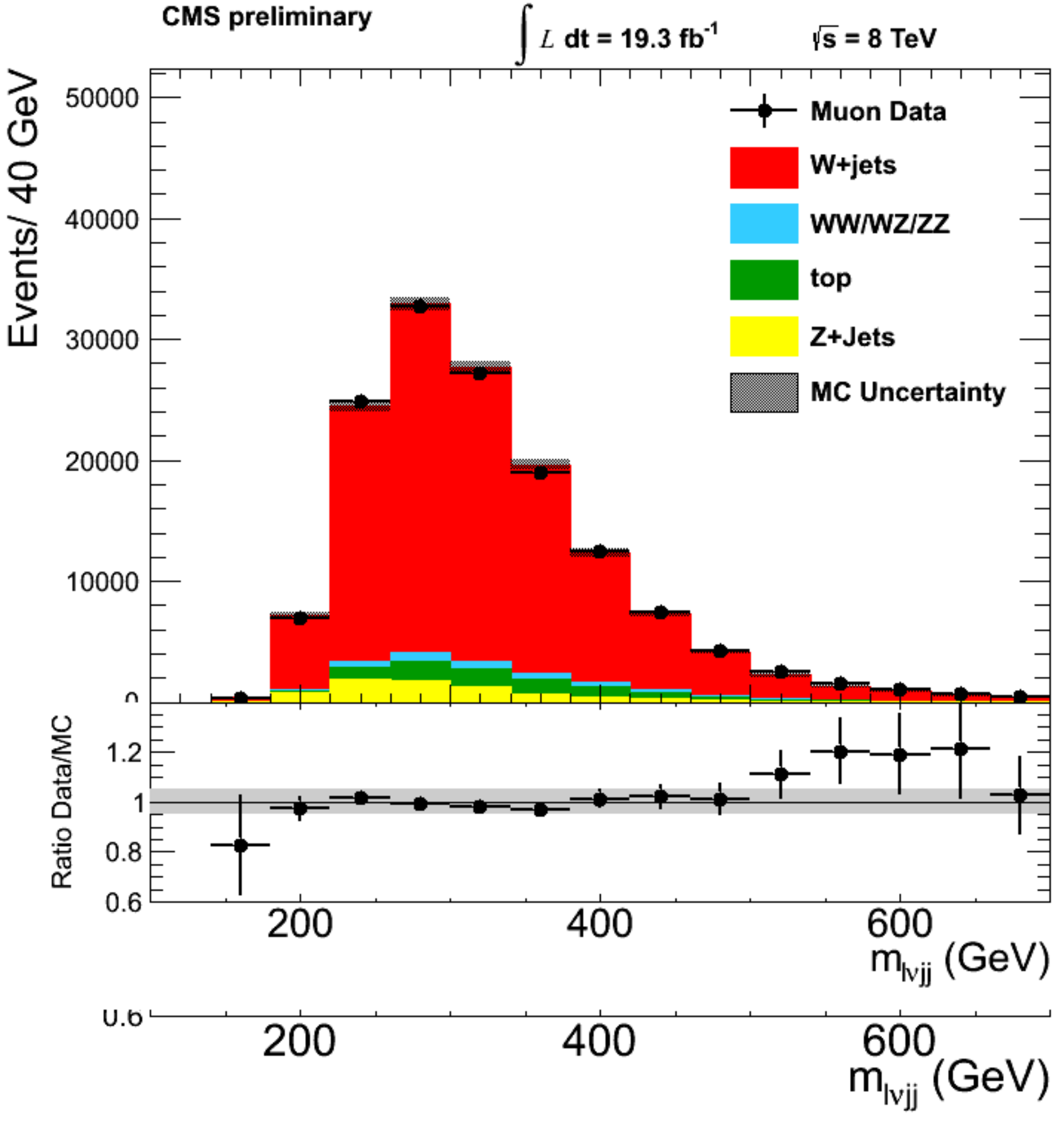

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4
30000
25000
20000
15000
10000
5000
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Leading Jet η

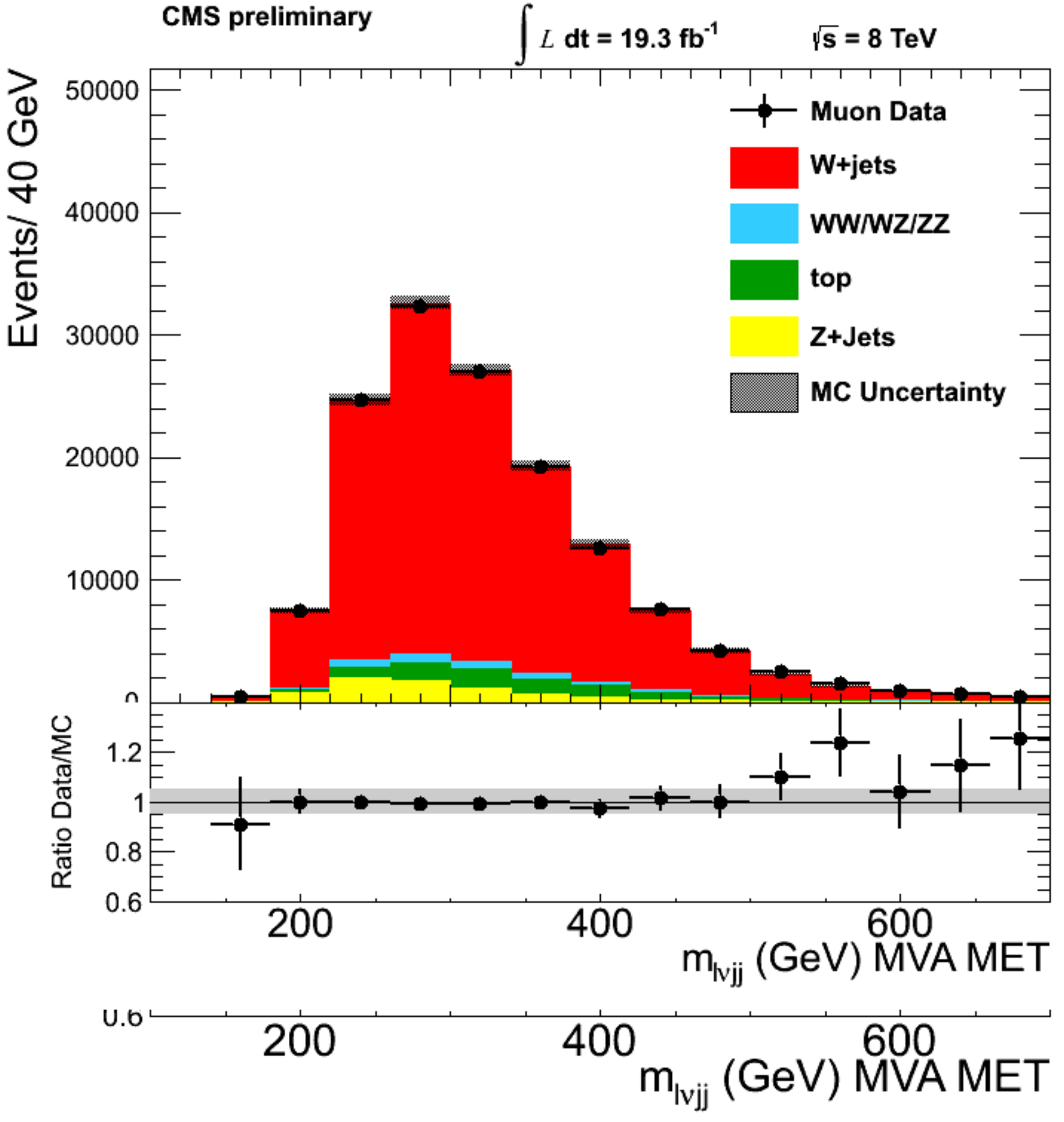

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 10 GeV
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
Leading Jet p_T
Leading Jet p_T

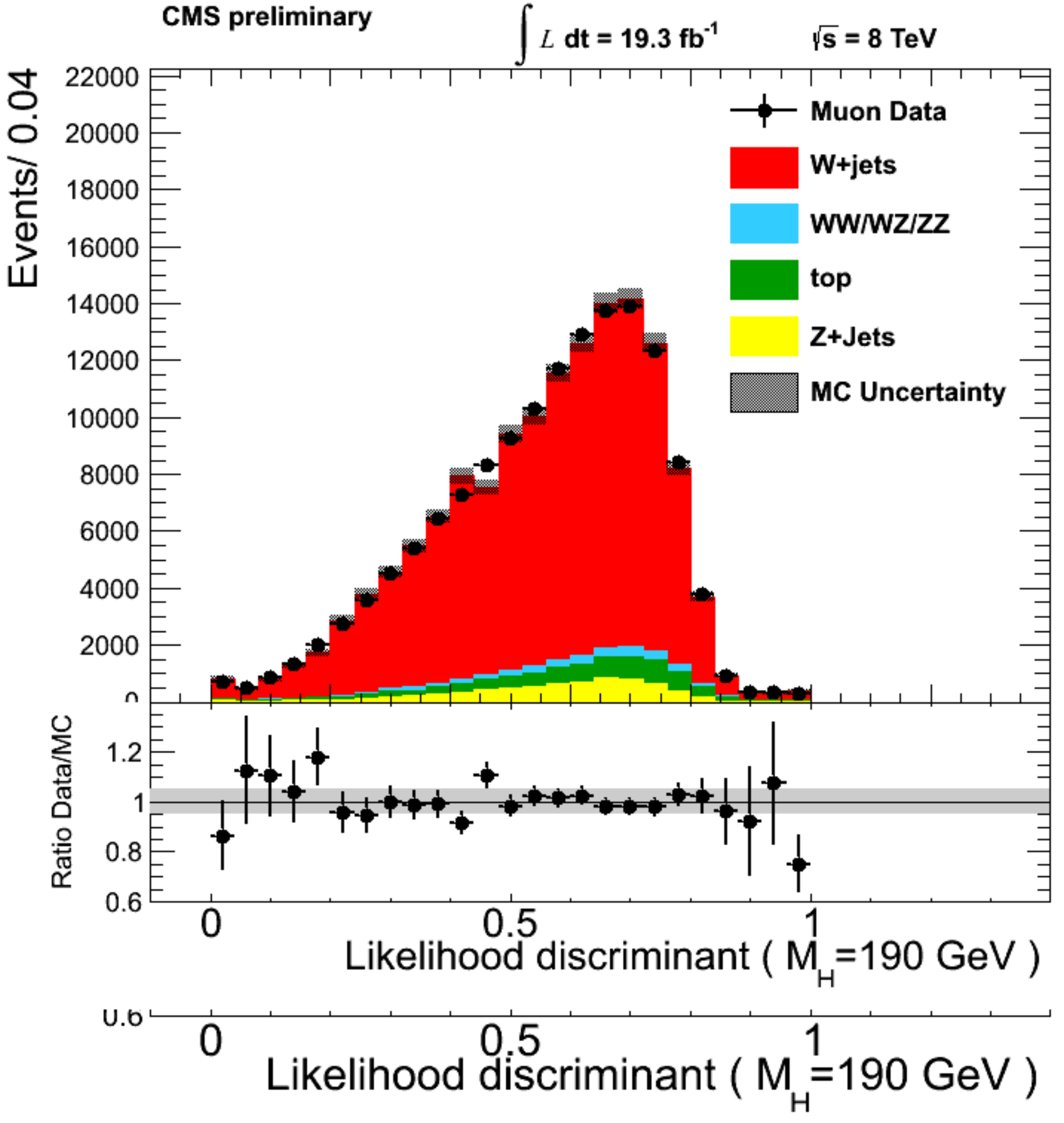

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4
30000
25000
20000
15000
10000
5000
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Jet 2 η

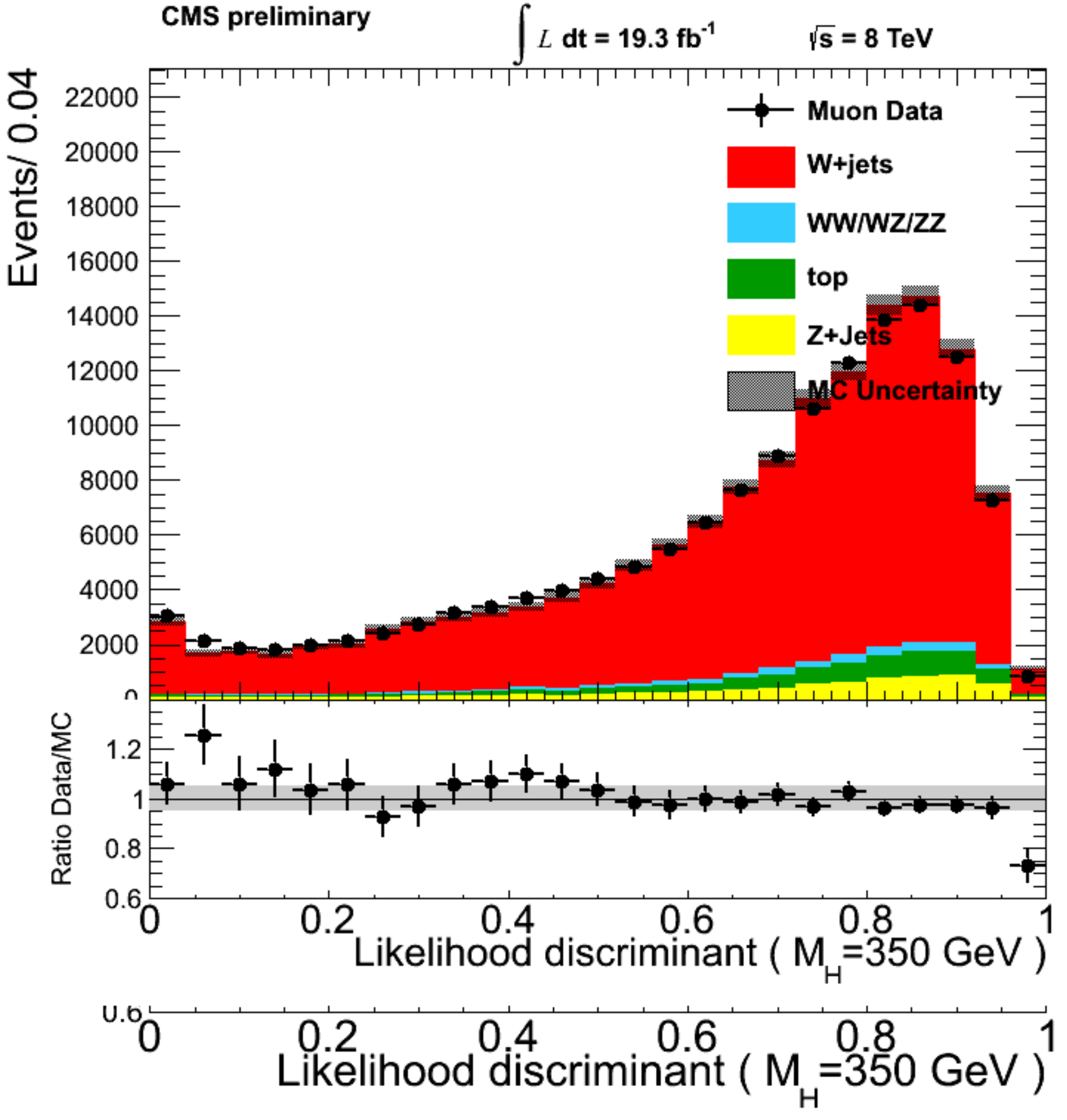

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 10 GeV
80000
70000
60000
50000
40000
30000
20000
10000
Ratio Data/MC
1.2
1
0.8
0.6
50
100
150
Jet 2 pT
0.6
50
100
150
Jet 2 pT

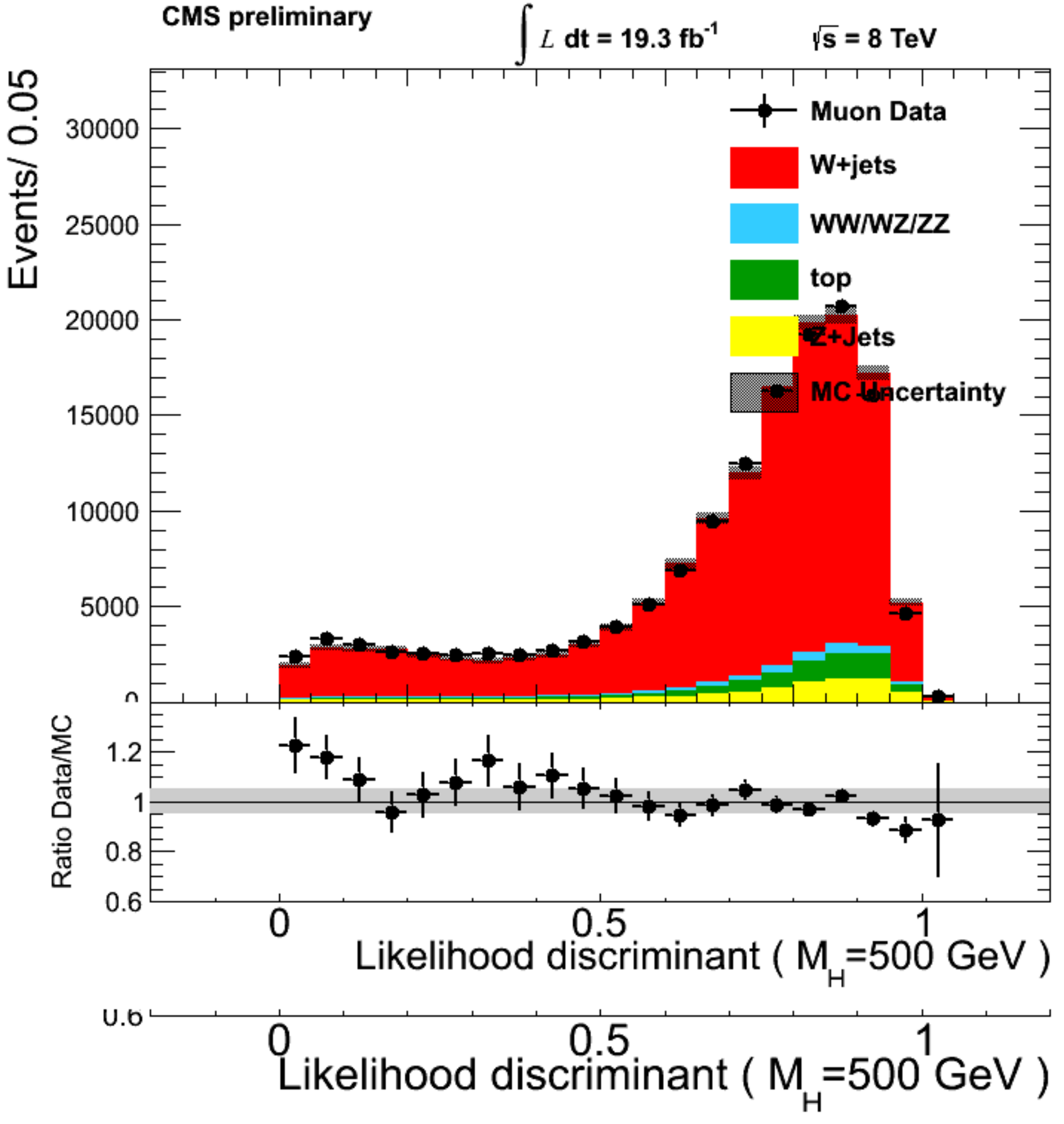

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 20 GeV
60000
50000
40000
30000
20000
10000
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
1.2
1
0.8
0.6
100
200
300
400
m_{jj} (GeV)

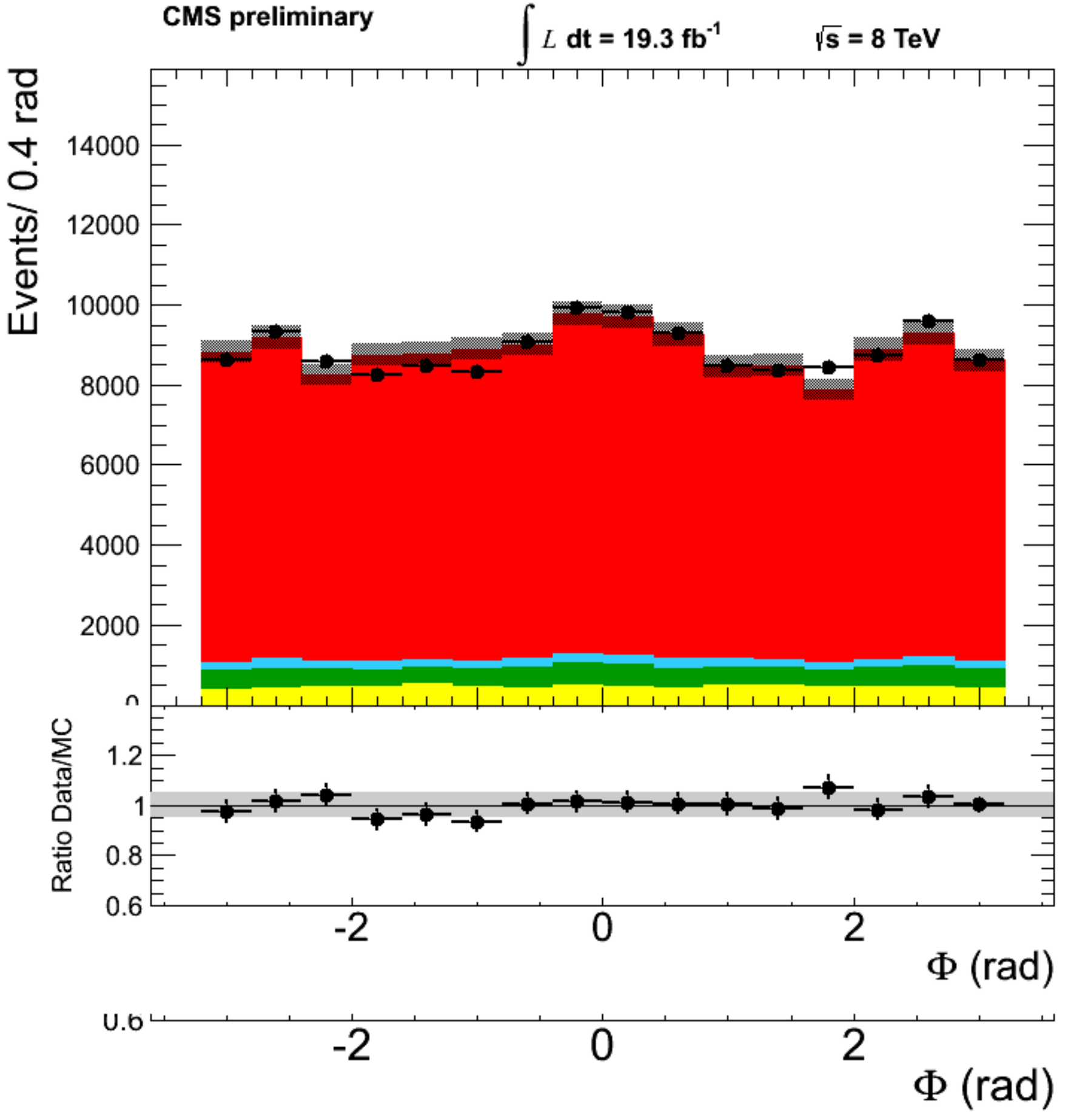

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 40 GeV
50000
40000
30000
20000
10000
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
1.2
1
0.8
0.6
200
400
600
mlνjj (GeV)

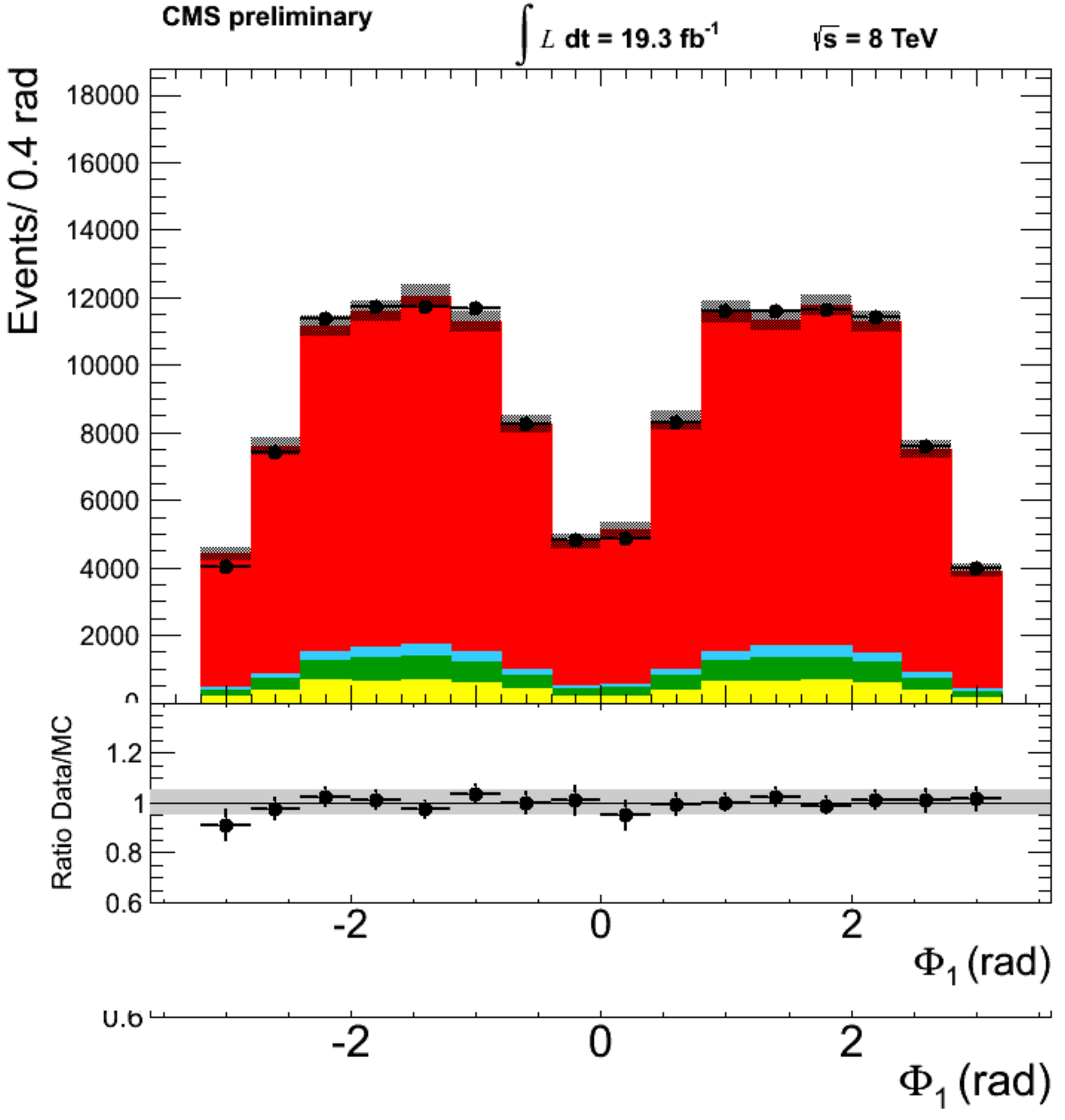

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 40 GeV
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
$m_{l\nu jj}$ (GeV) MVA MET

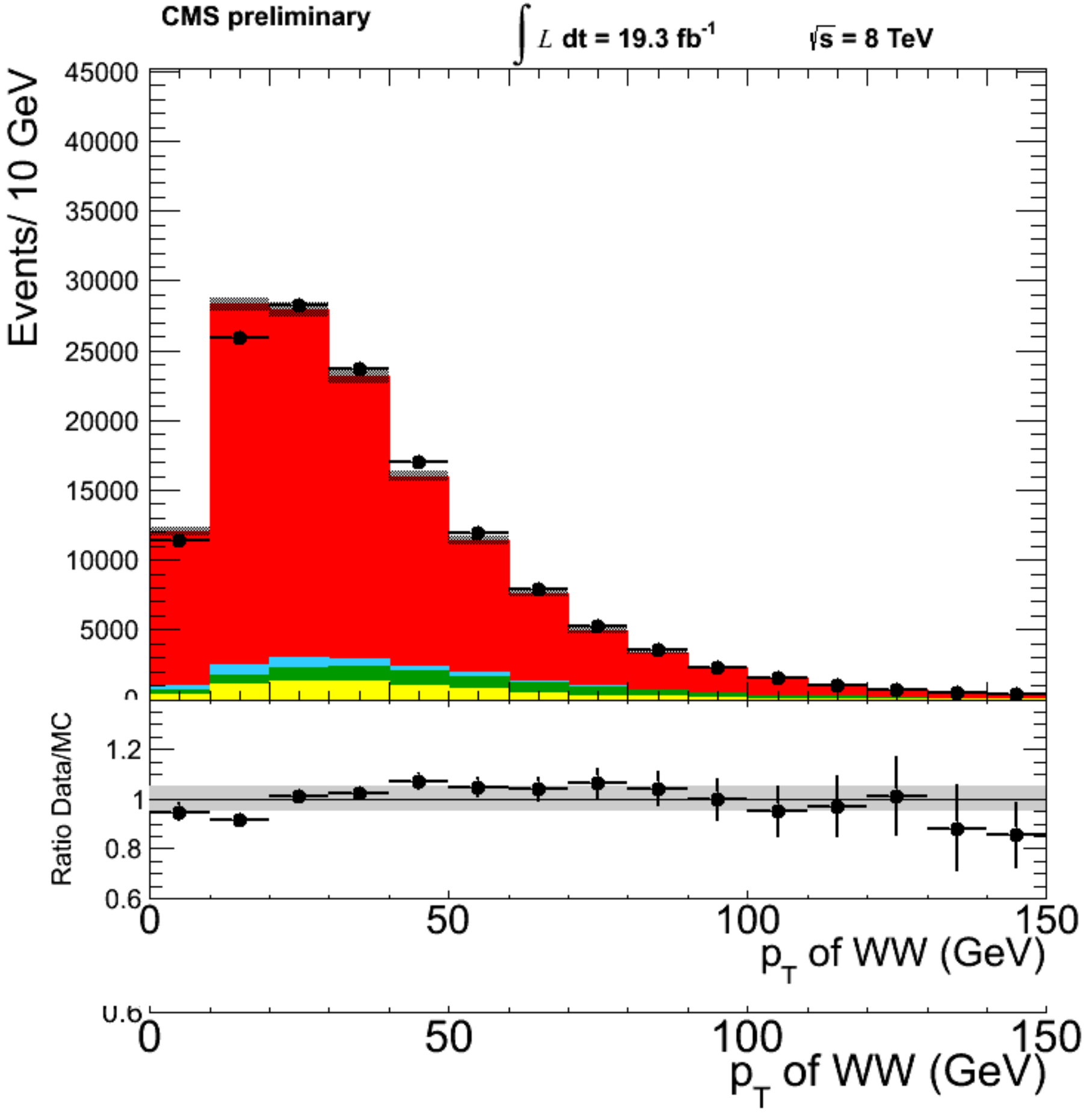

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.04
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
Likelihood discriminant (M_H=190 GeV)


CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.04
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
Likelihood discriminant (M_H=350 GeV)
Likelihood discriminant (M_H=350 GeV)


CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 0.05
Muon Data
W+jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
Ratio Data/MC
Likelihood discriminant (M_H=500 GeV)
Likelihood discriminant (M_H=500 GeV)


CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4 rad
14000
12000
10000
8000
6000
4000
2000
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Φ (rad)
0.6
-2
0
2
Φ (rad)


CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4 rad
18000
16000
14000
12000
10000
8000
6000
4000
2000
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Φ_1 (rad)


CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 10 GeV
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Ratio Data/MC
1.2
1
0.8
0.6
0
50
100
150
p_T of WW (GeV)
0.6
0
50
100
150
p_T of WW (GeV)