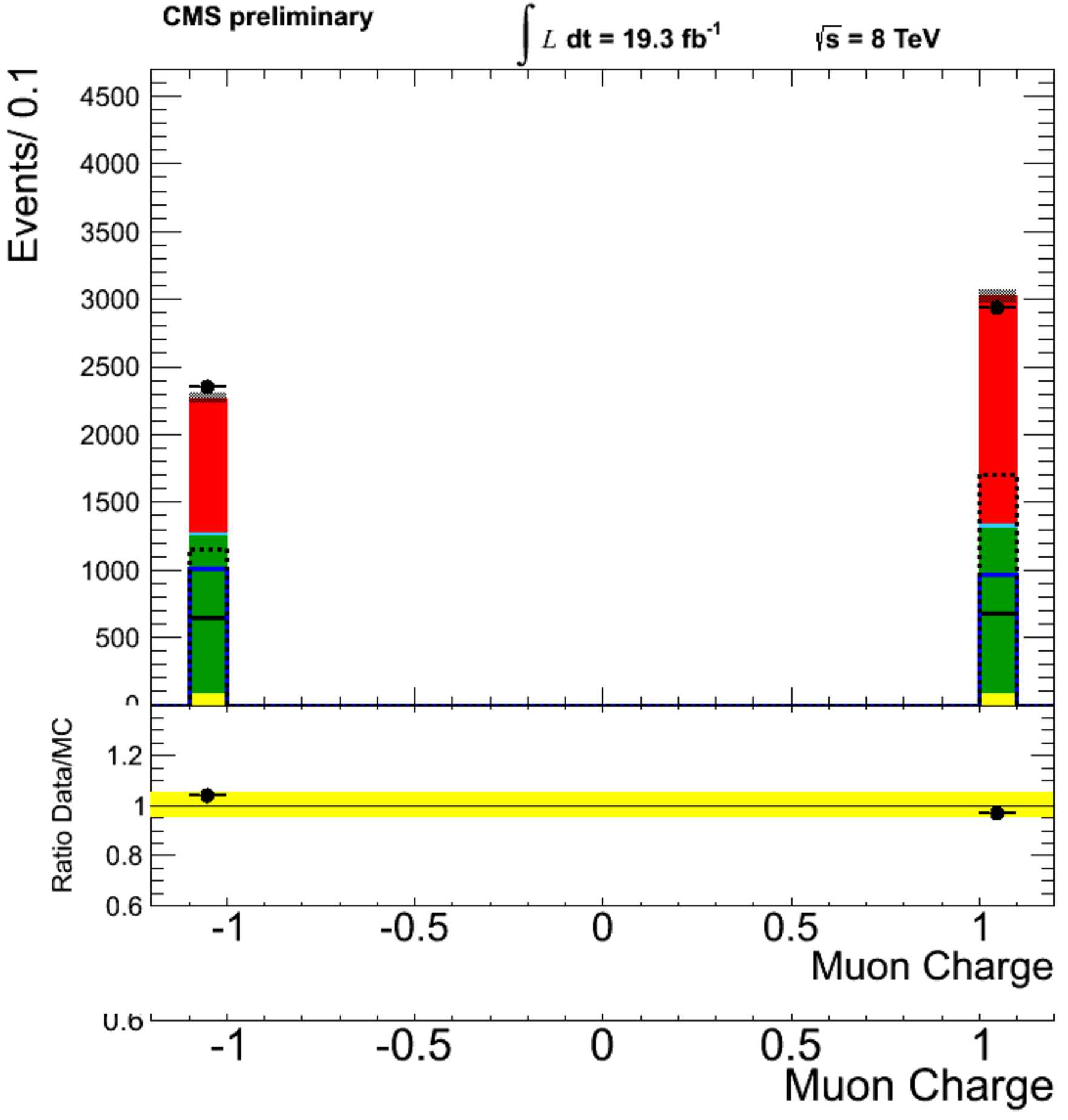
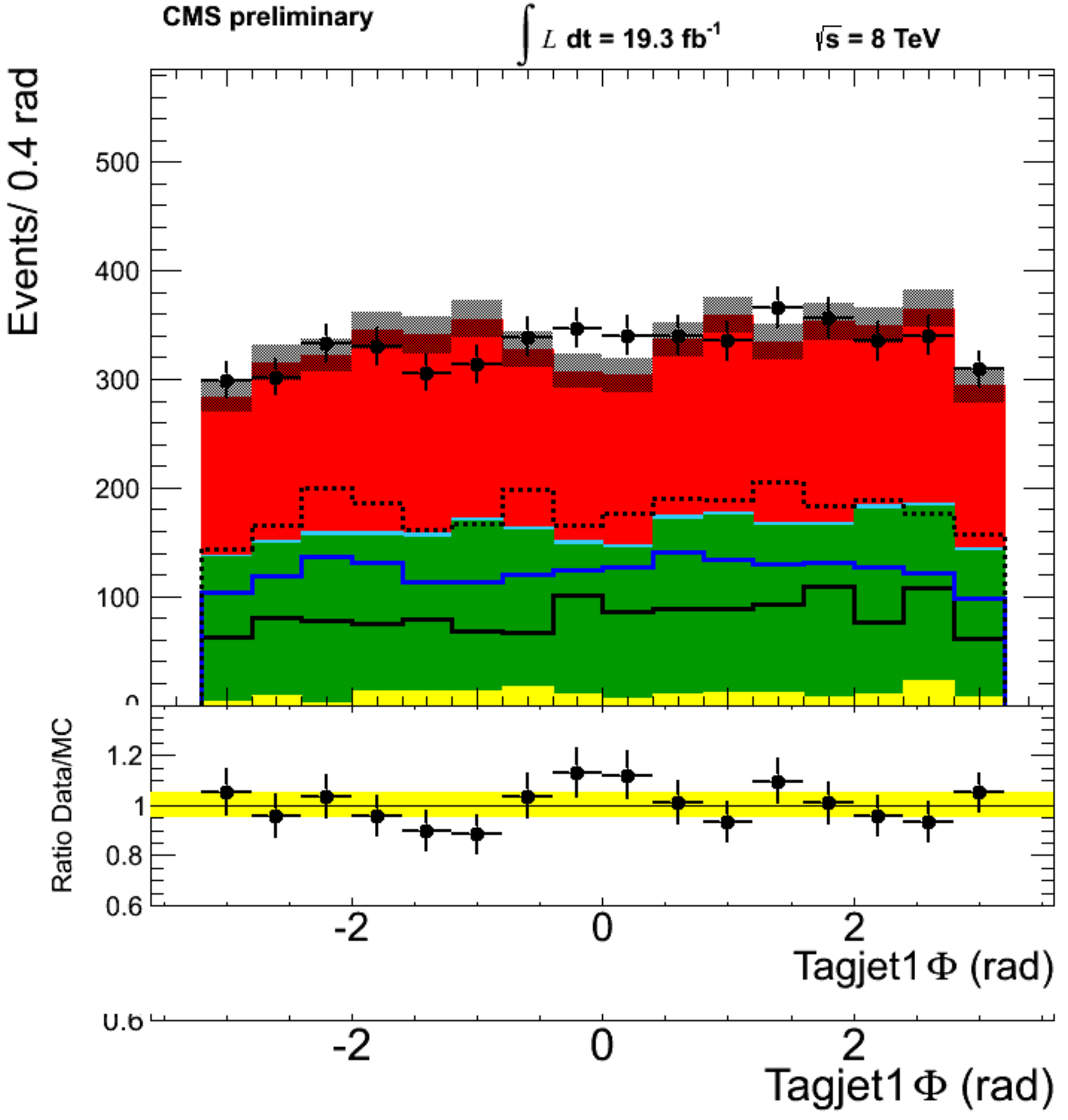
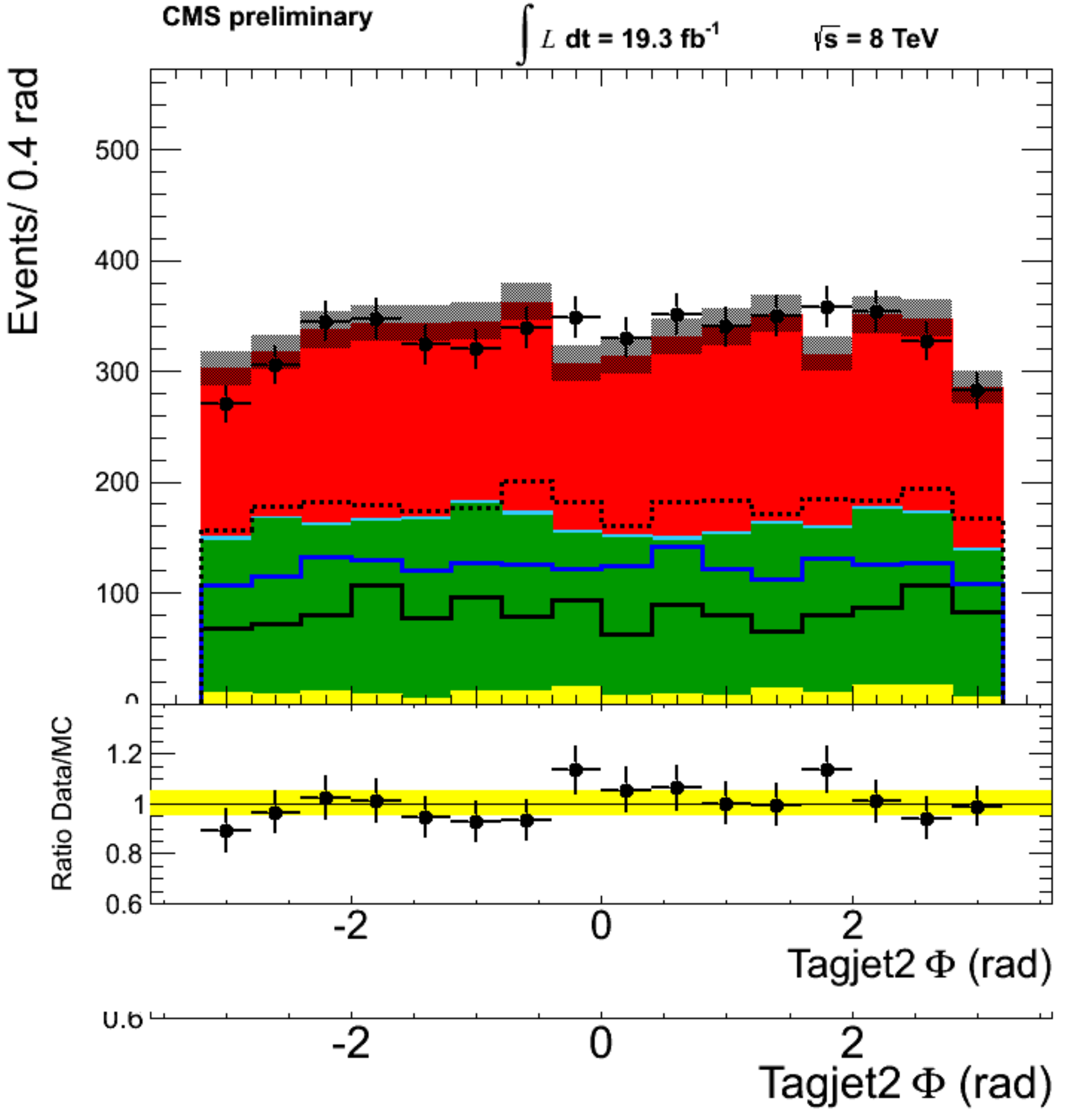
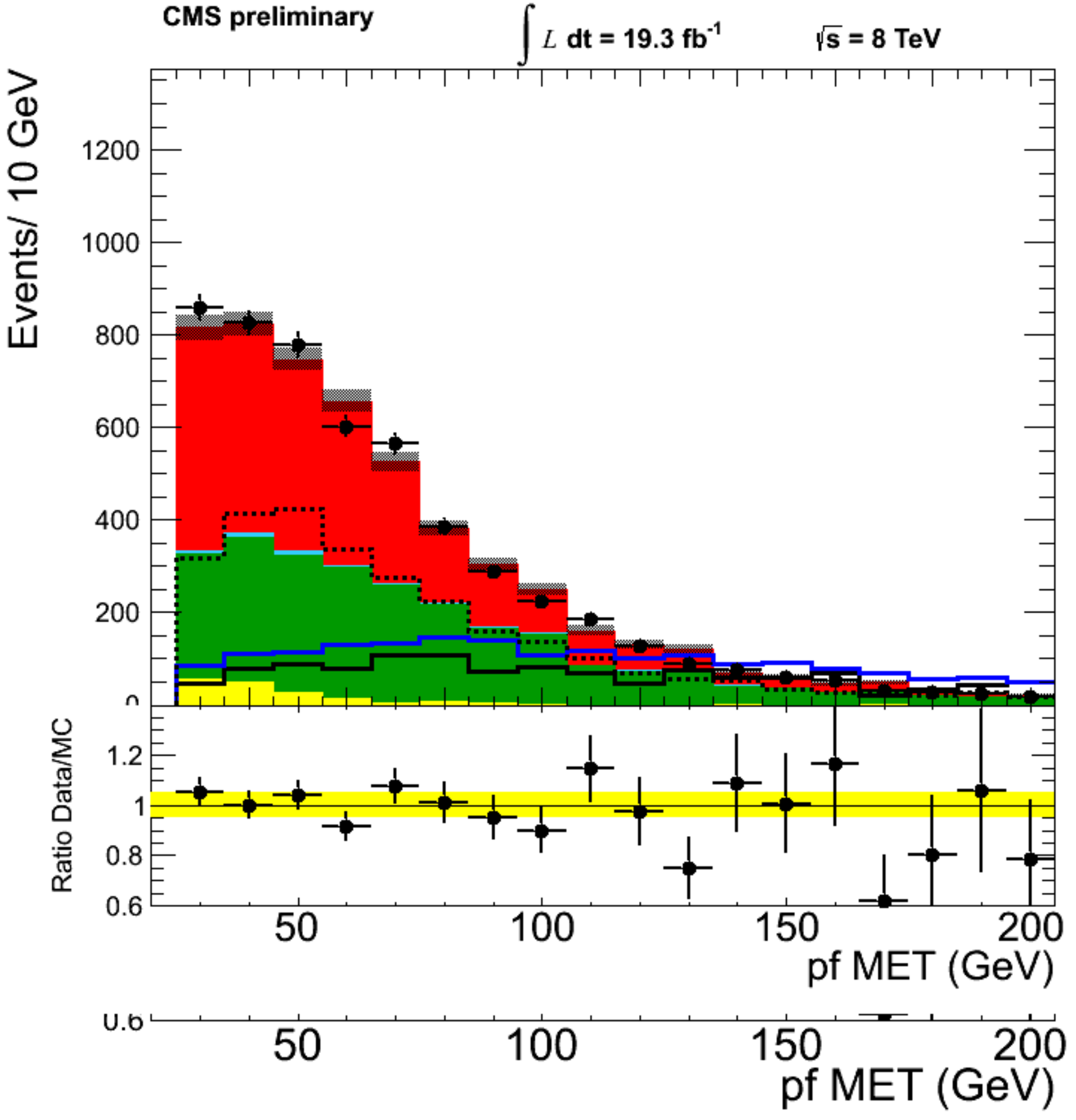
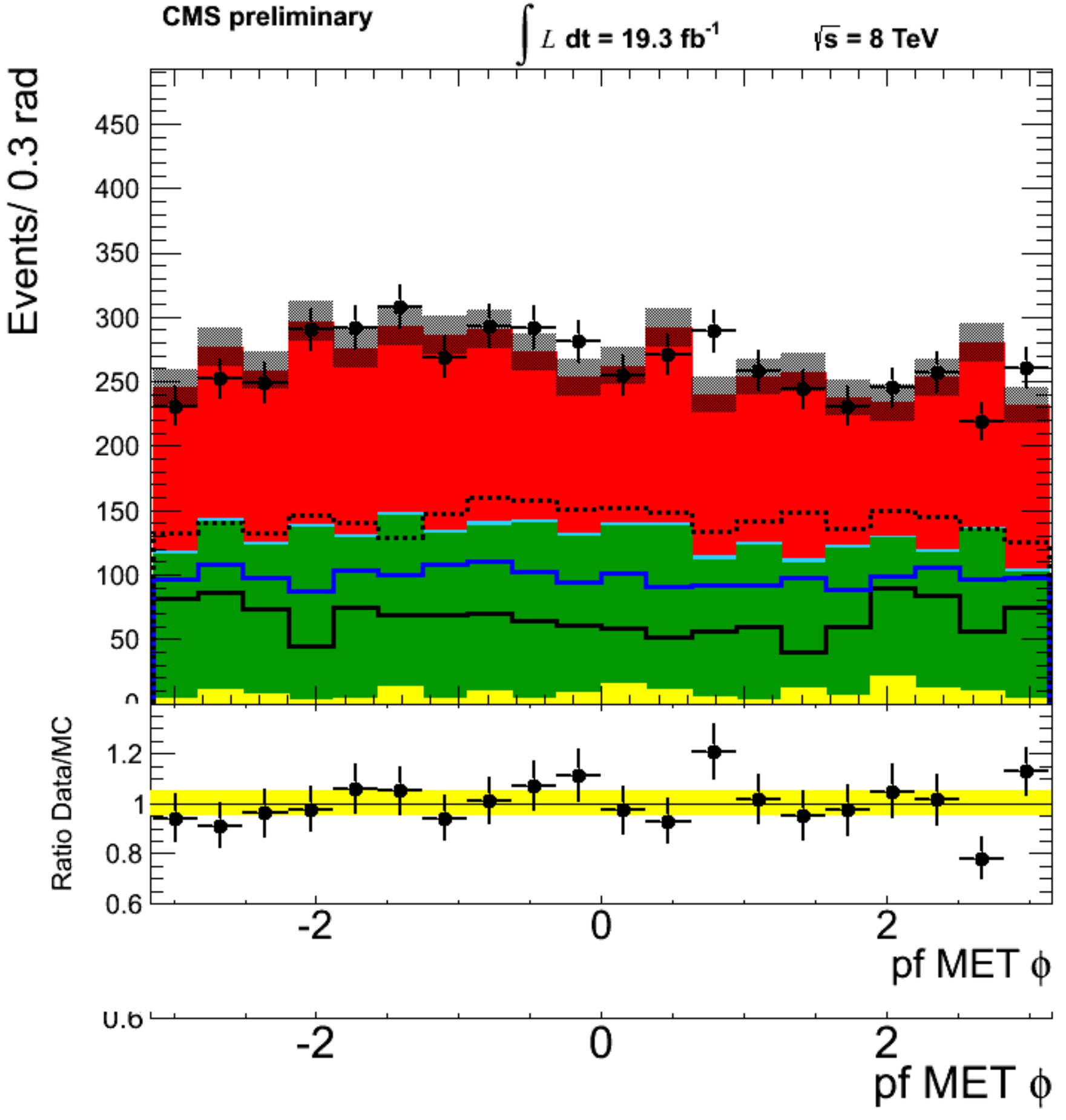
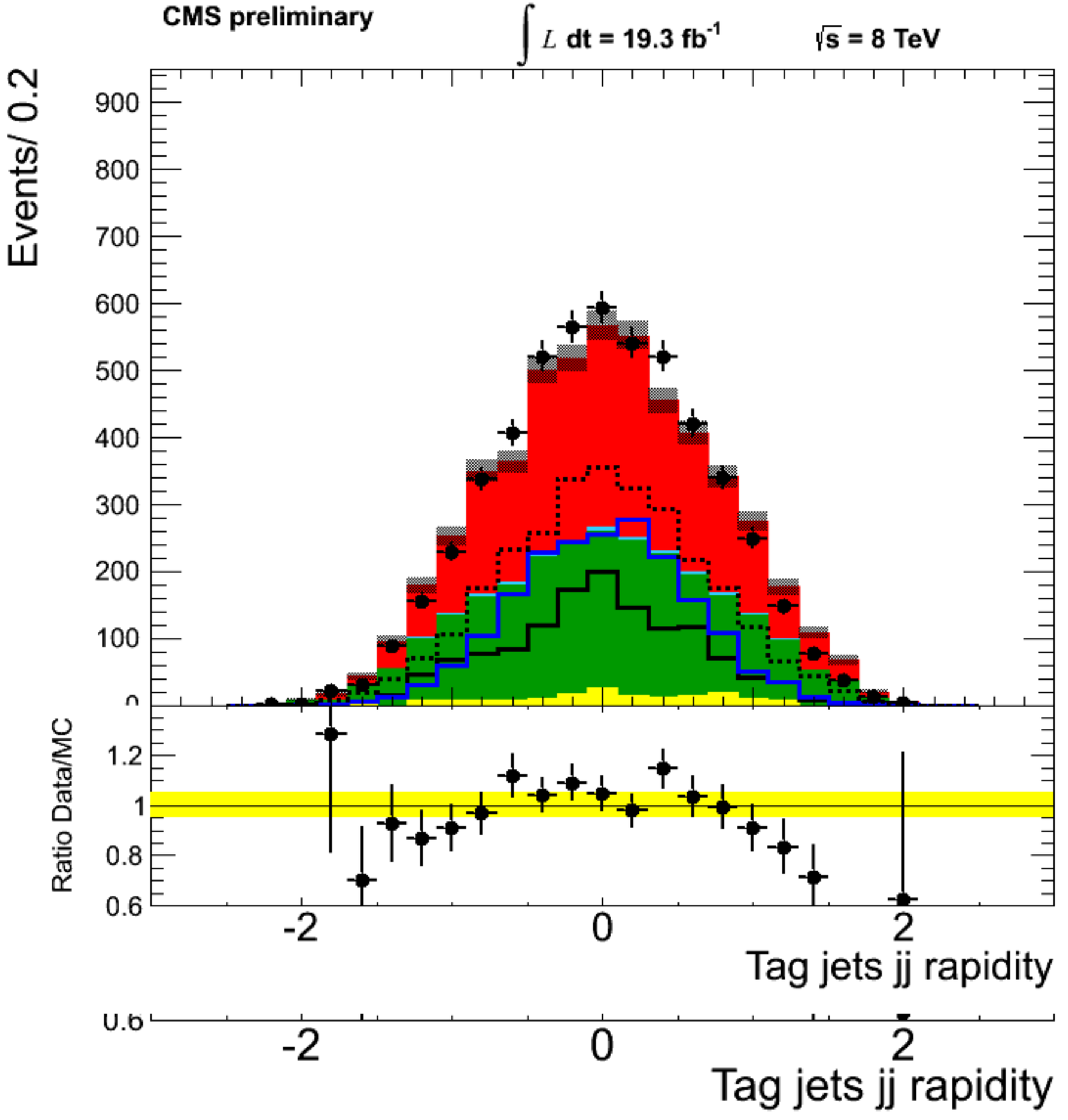

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.1
4500
4000
3500
3000
2500
2000
1500
1000
500
Ratio Data/MC
1.2
1
0.8
0.6
-1
-0.5
0
0.5
1
Muon Charge
Muon Charge

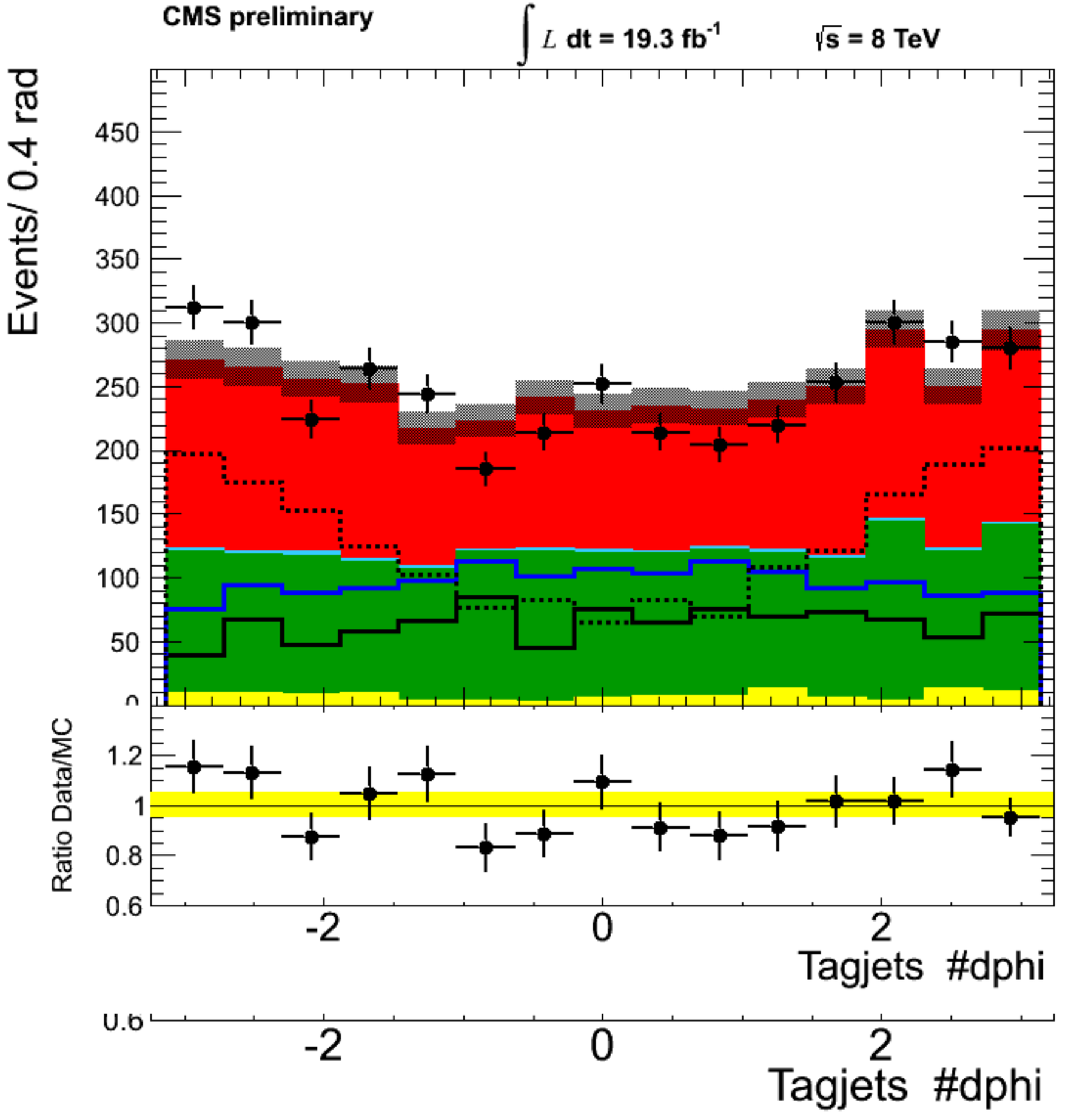

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4 rad
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Tagjet1 Φ (rad)
0.6
-2
0
2
Tagjet1 Φ (rad)

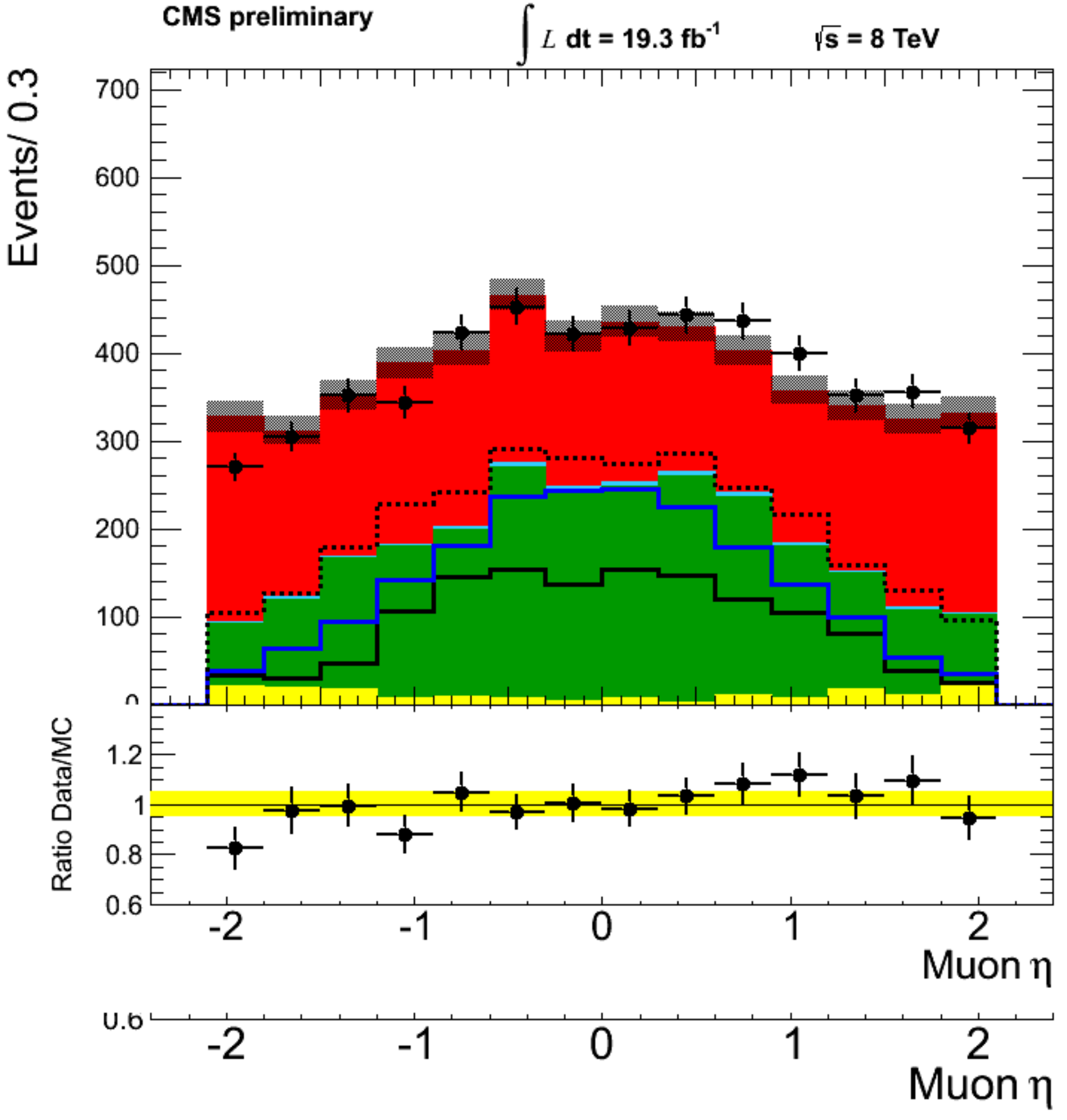

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4 rad
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Tagjet2 Φ (rad)
0.6
-2
0
2
Tagjet2 Φ (rad)

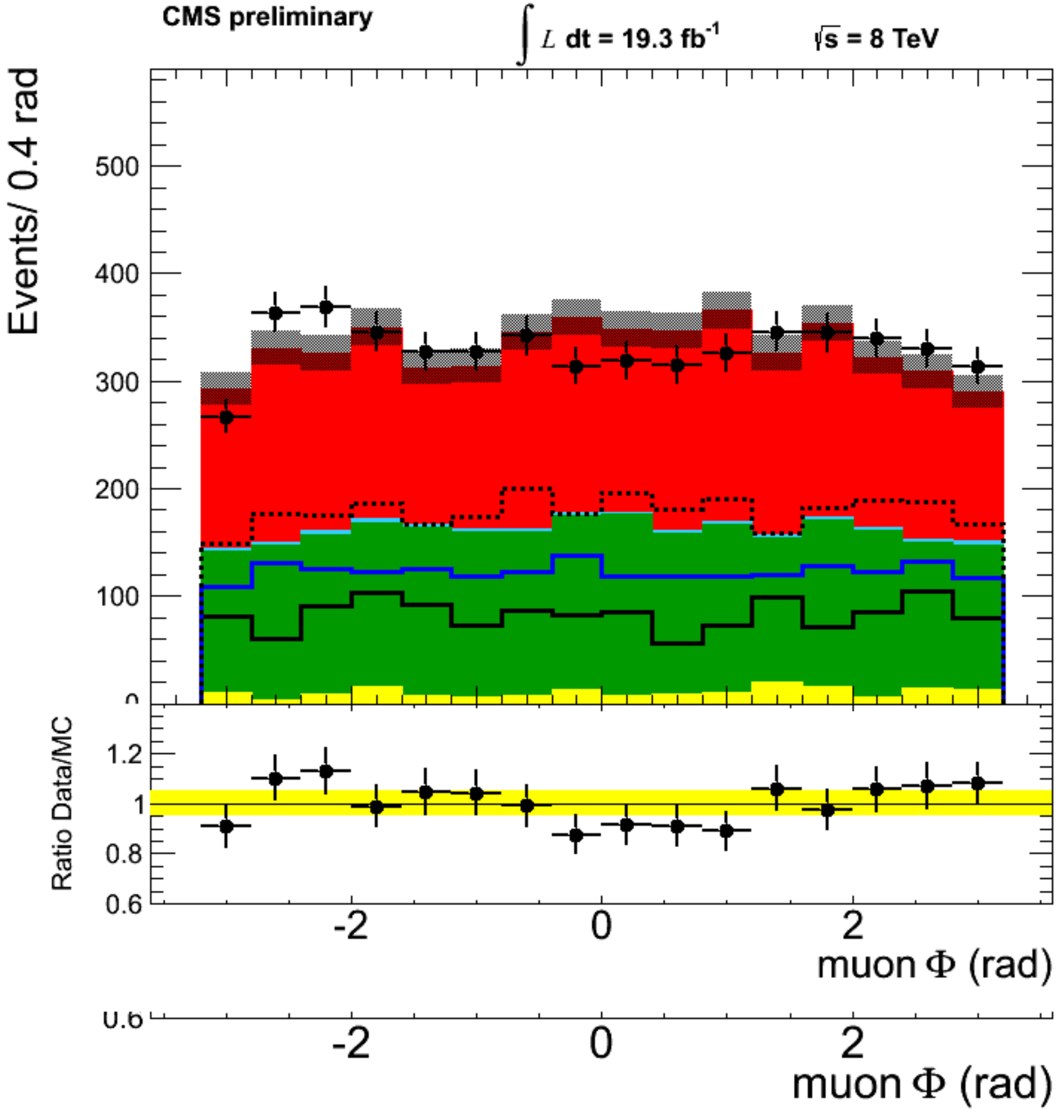

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 10 GeV
1200
1000
800
600
400
200
Ratio Data/MC
1.2
1
0.8
0.6
50
100
150
200
pf MET (GeV)

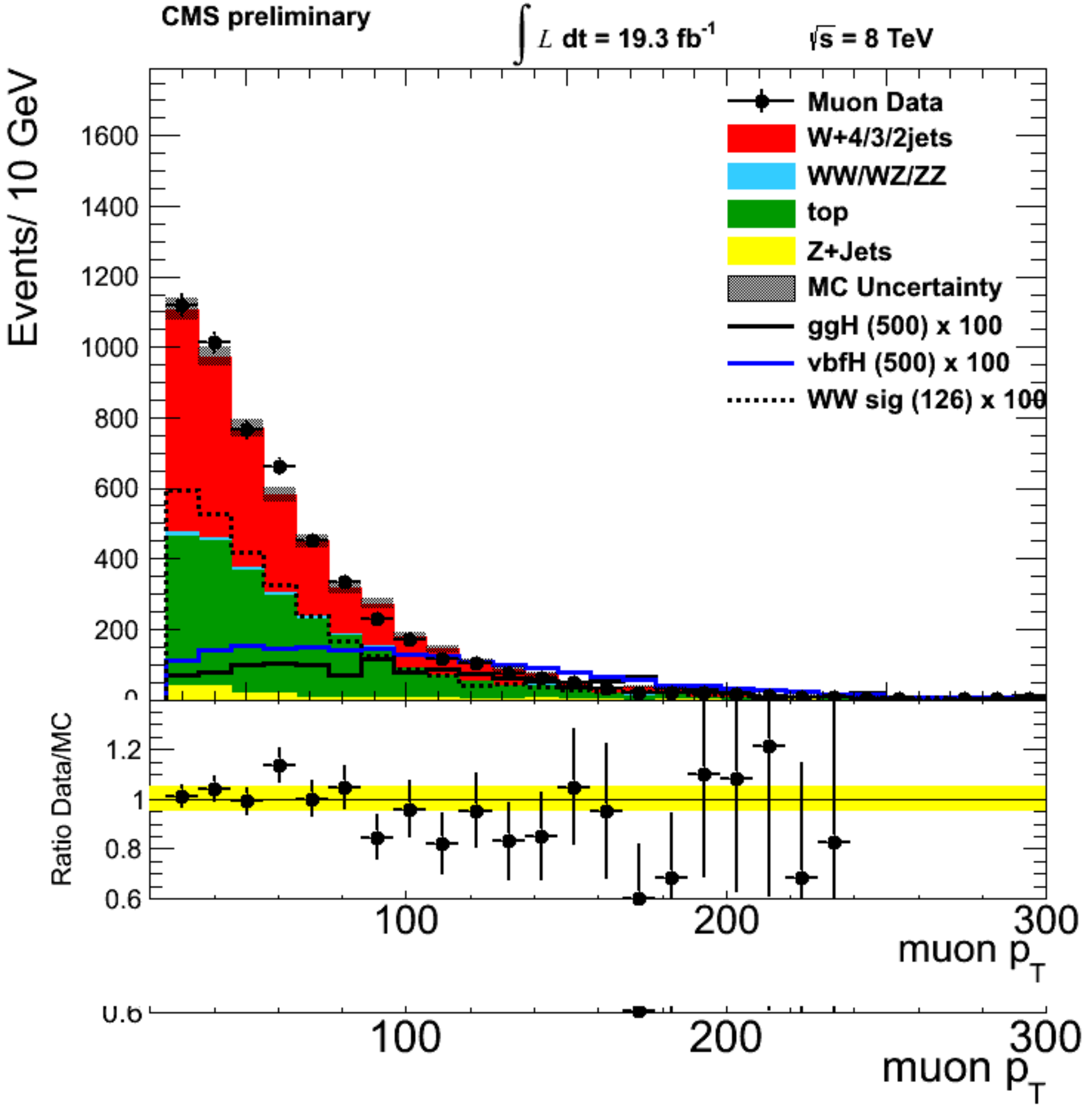

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.3 rad
450
400
350
300
250
200
150
100
50
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
pf MET ϕ
0.6
-2
0
2
pf MET ϕ

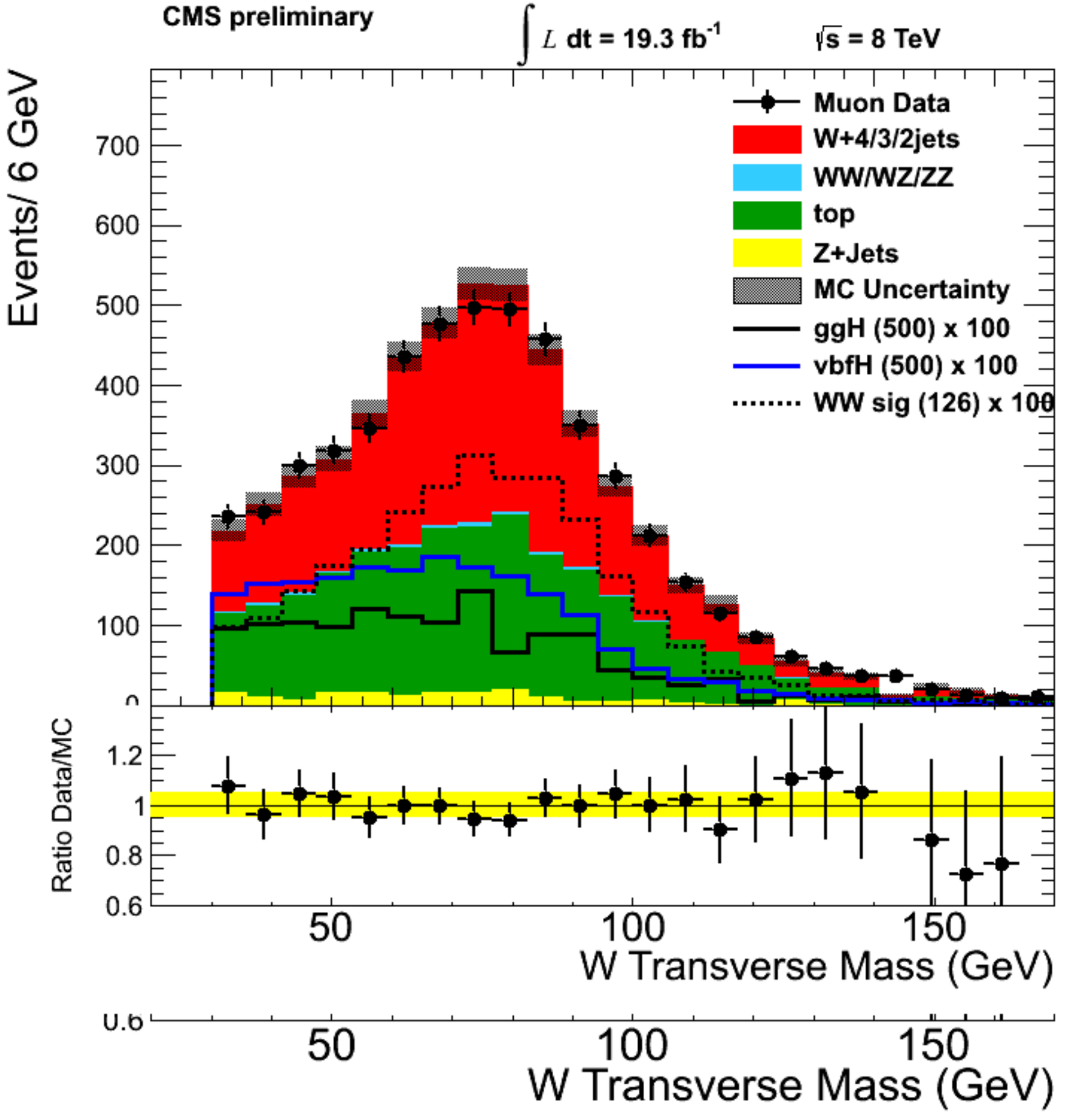

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.2
900
800
700
600
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Tag jets jj rapidity
0.6
-2
0
2
Tag jets jj rapidity

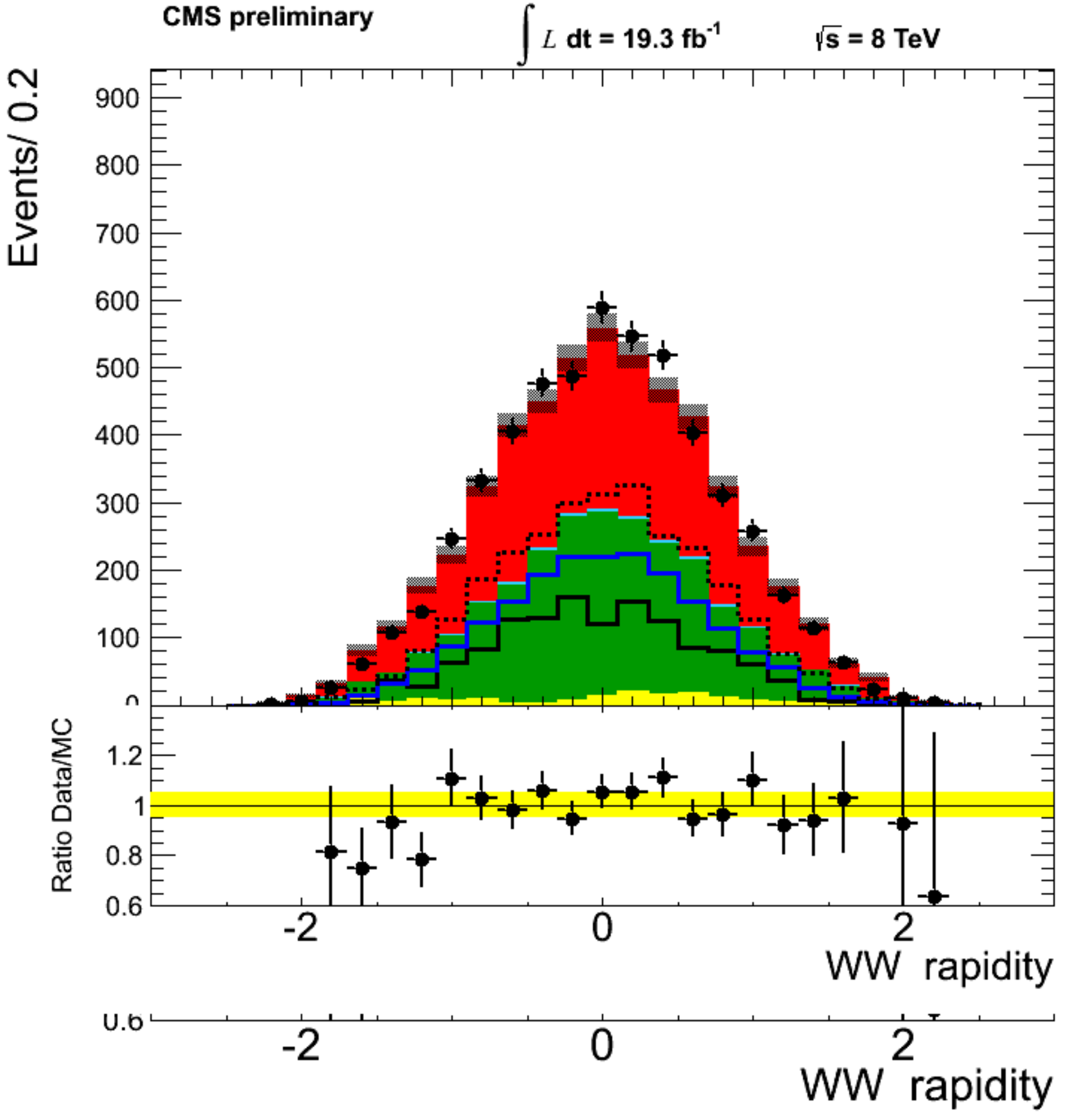

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4 rad
450
400
350
300
250
200
150
100
50
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Tagjets #dphi
0.6
-2
0
2
Tagjets #dphi

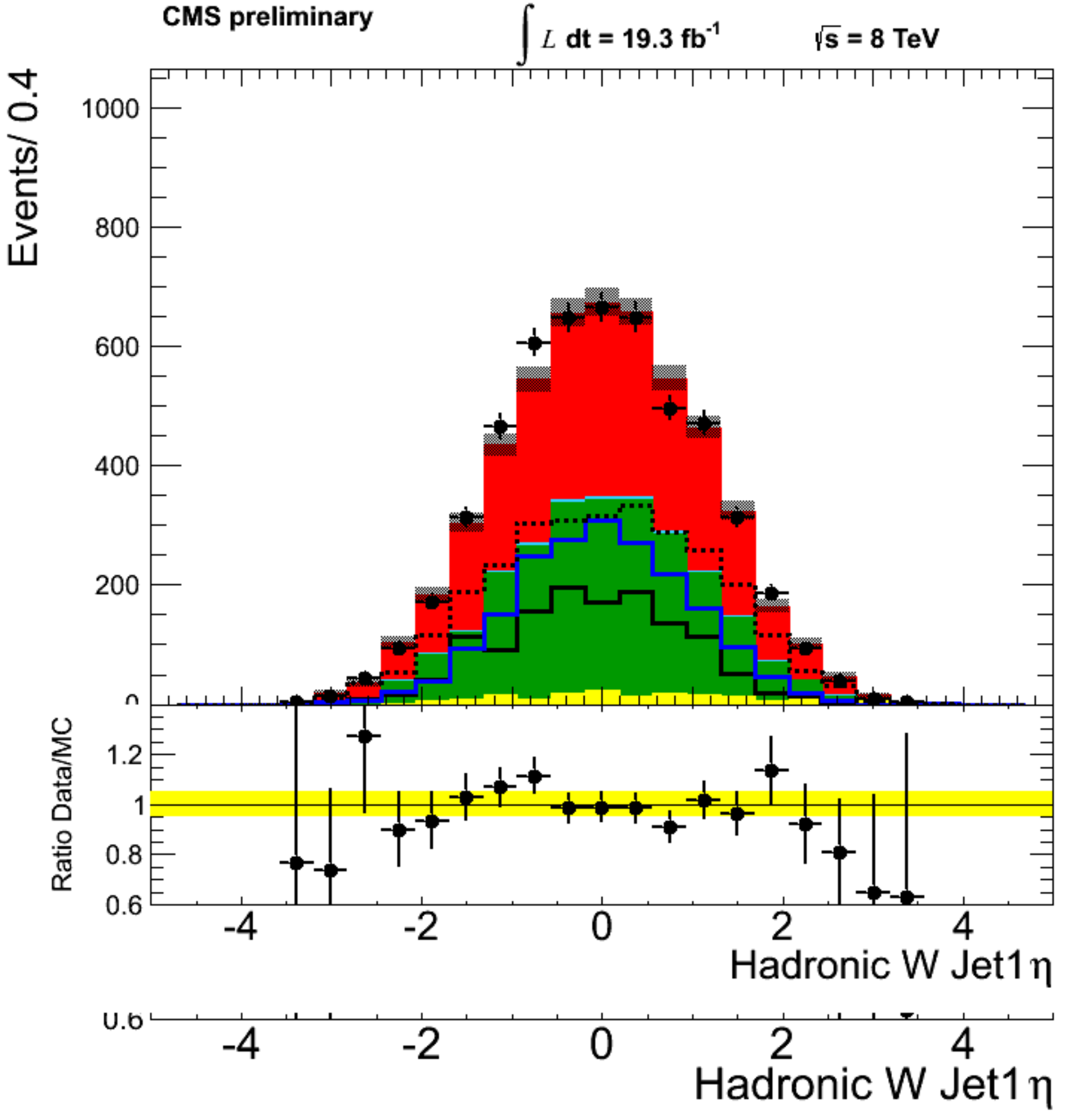

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.3
700
600
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
-1
0
1
2
Muon η
0.6
-2
-1
0
1
2
Muon η

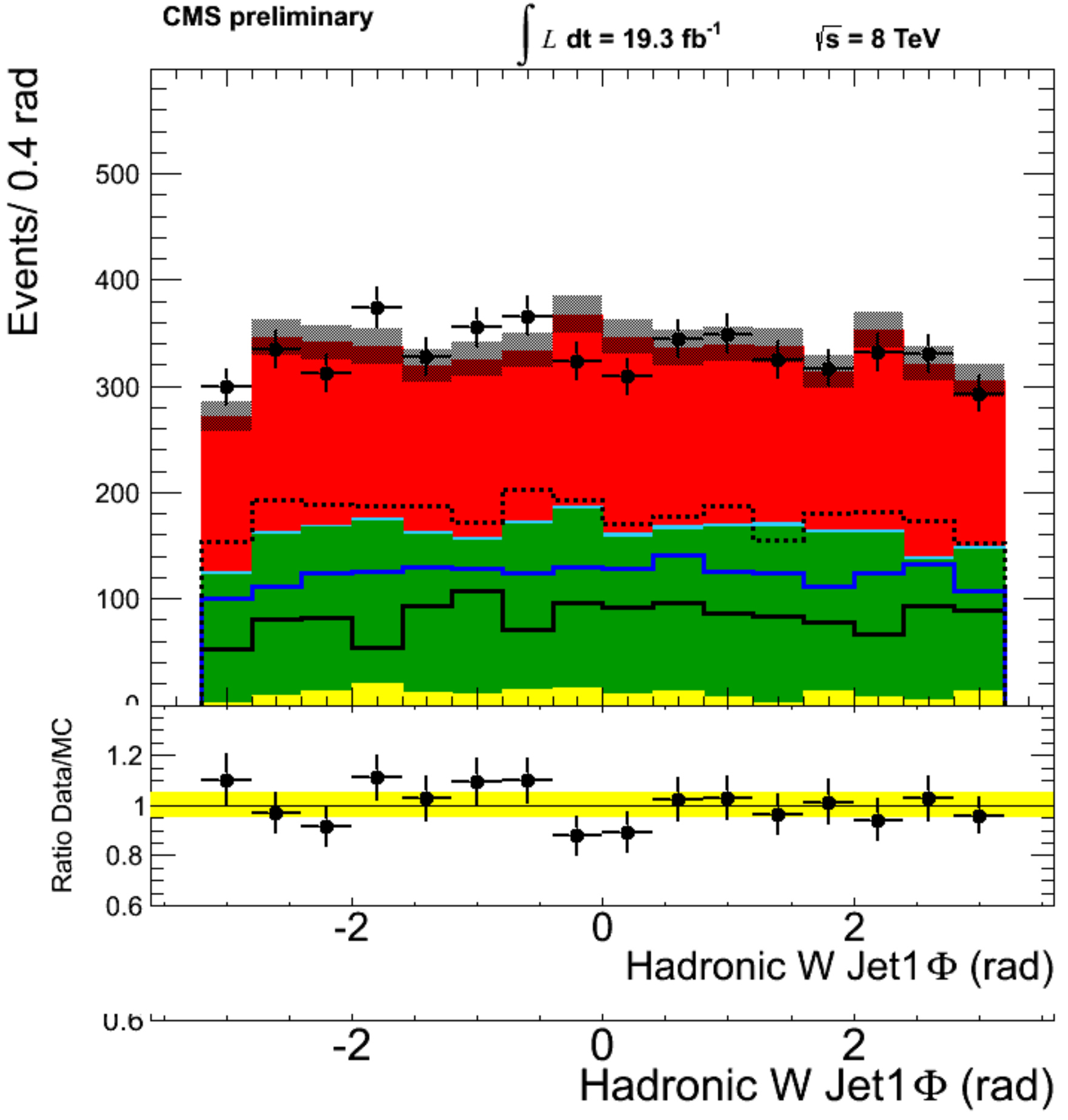

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.4 rad
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
muon Φ (rad)
0.6
-2
0
2
muon Φ (rad)

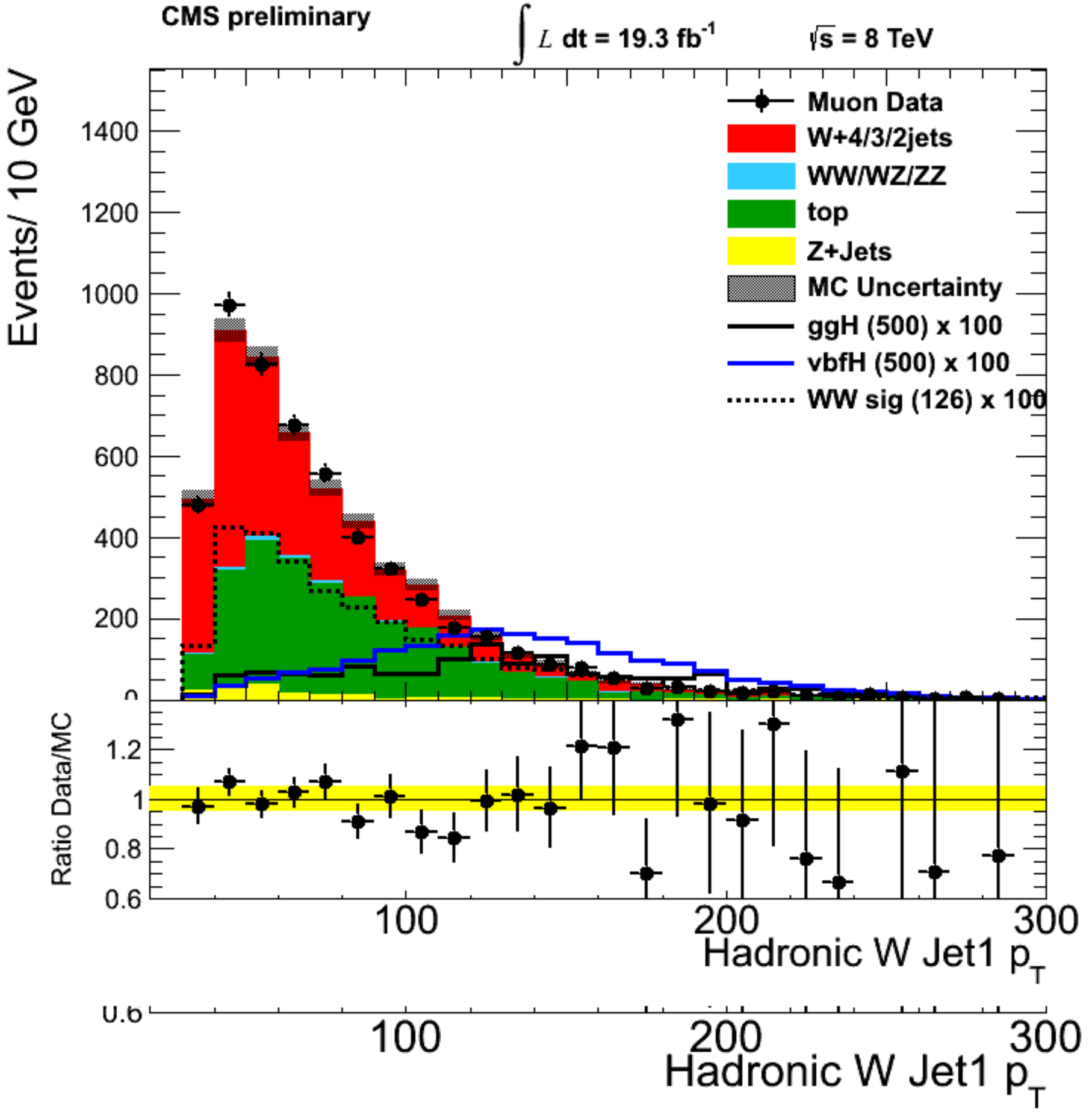

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 10 GeV
Muon Data
W+4/3/2jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
ggH (500) x 100
vbfH (500) x 100
WW sig (126) x 100
Ratio Data/MC
muon p_T
muon p_T

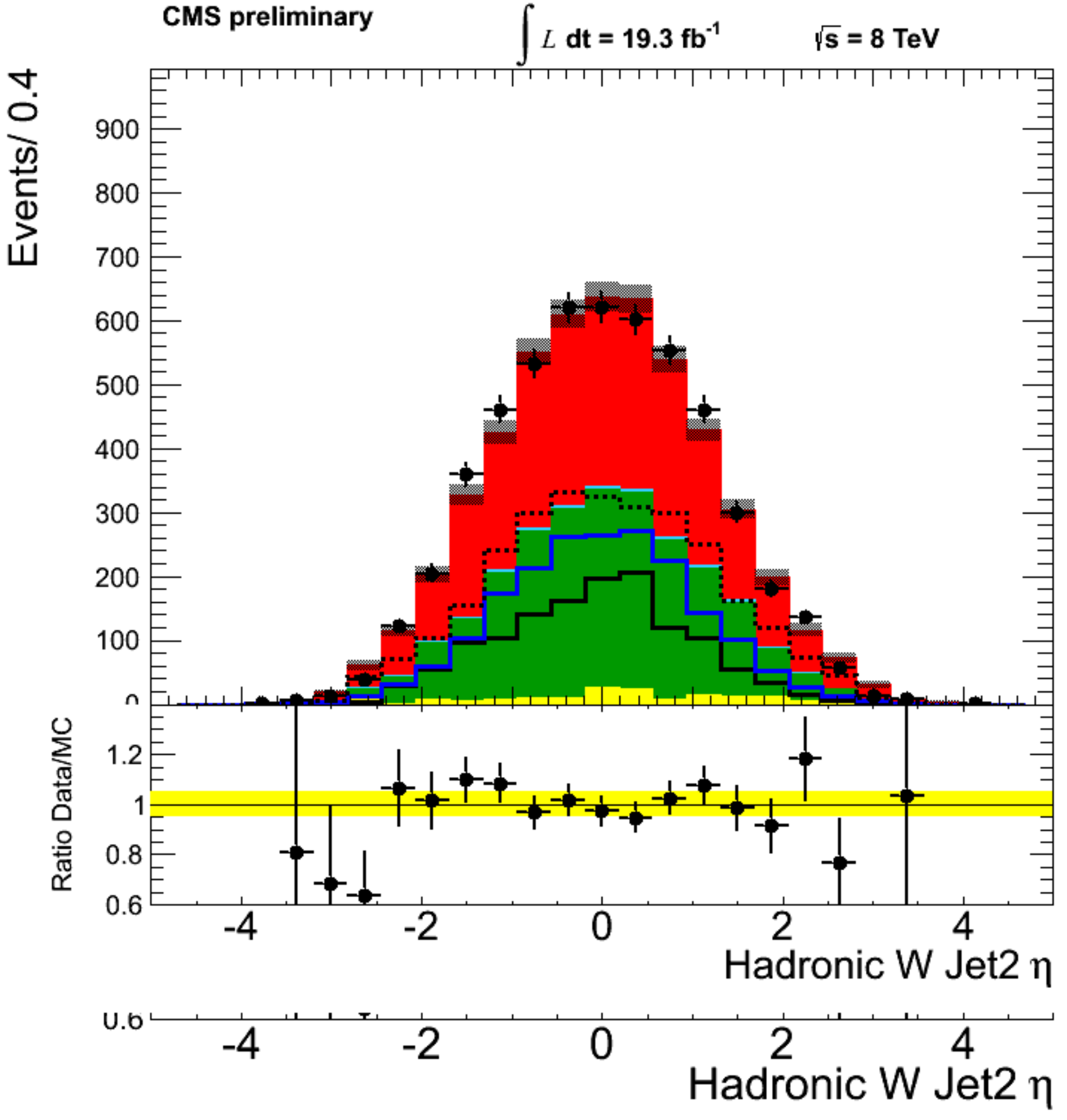

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 6 GeV
Muon Data
W+4/3/2jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
ggH (500) x 100
vbfH (500) x 100
WW sig (126) x 100
Ratio Data/MC
W Transverse Mass (GeV)
W Transverse Mass (GeV)

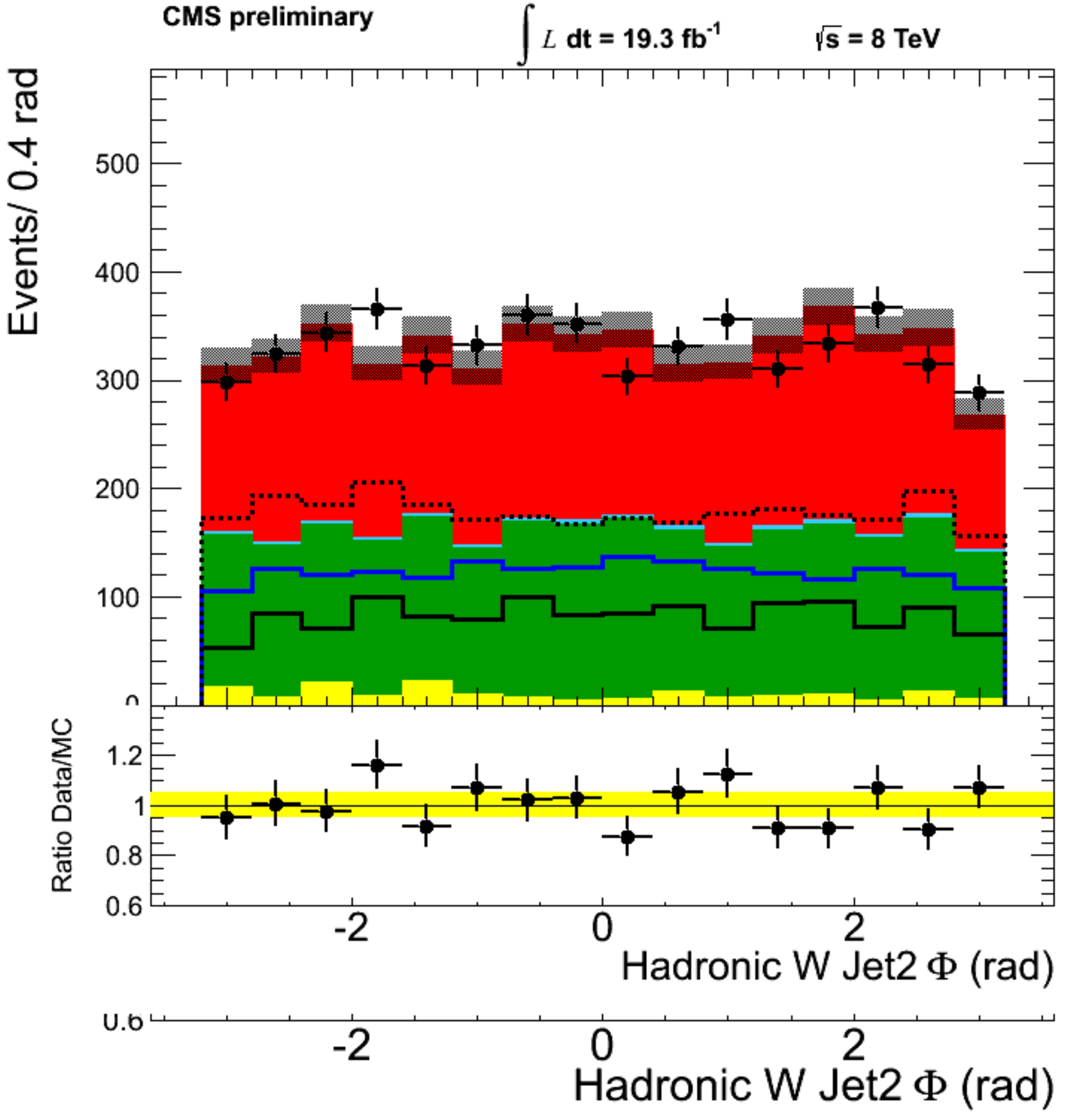

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.2
900
800
700
600
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
WW rapidity
0.6
-2
0
2
WW rapidity

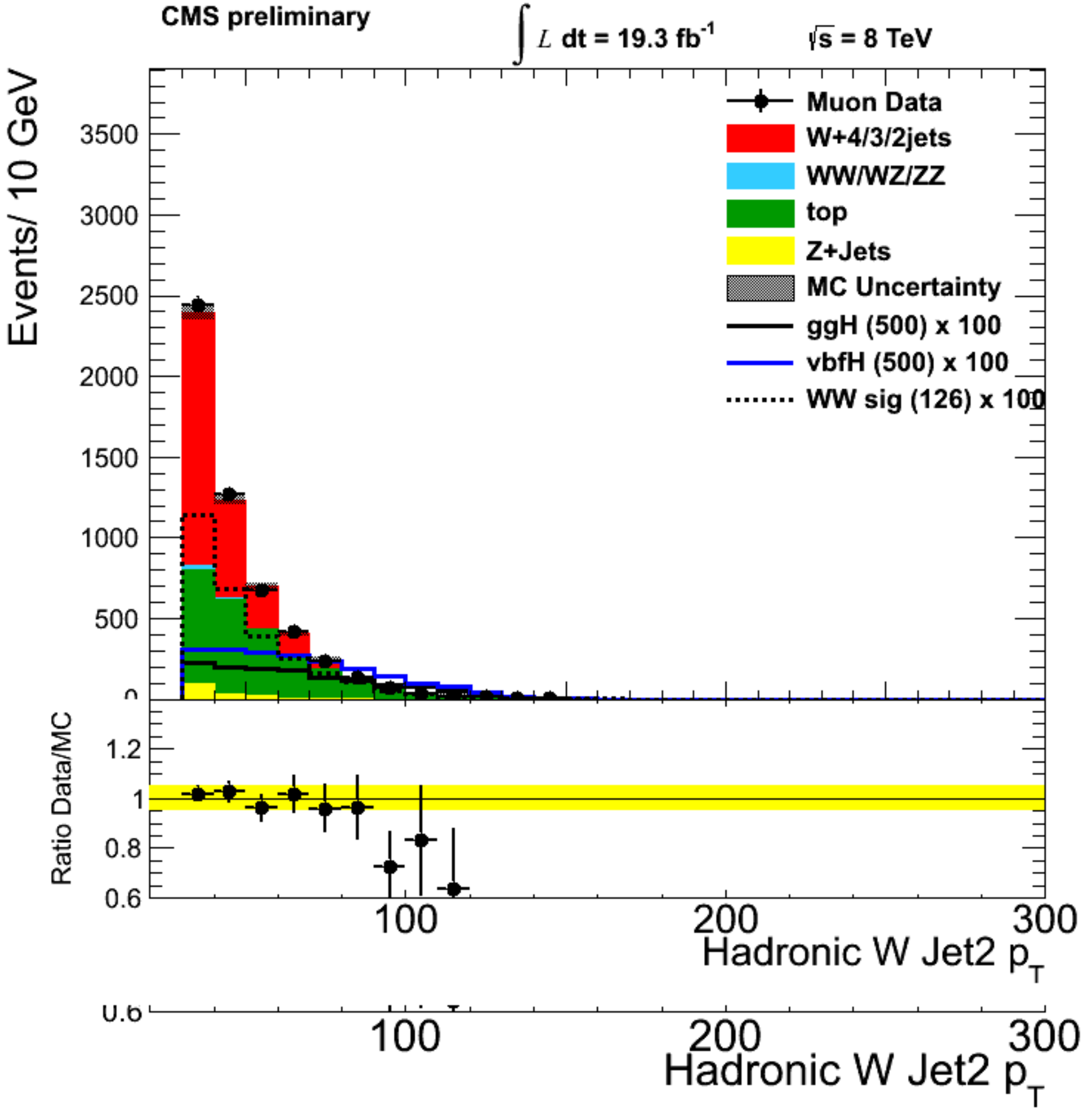

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.4
1000
800
600
400
200
0
Ratio Data/MC
1.2
1
0.8
0.6
-4
-2
0
2
4
Hadronic W Jet1 η
0.6
-4
-2
0
2
4
Hadronic W Jet1 η

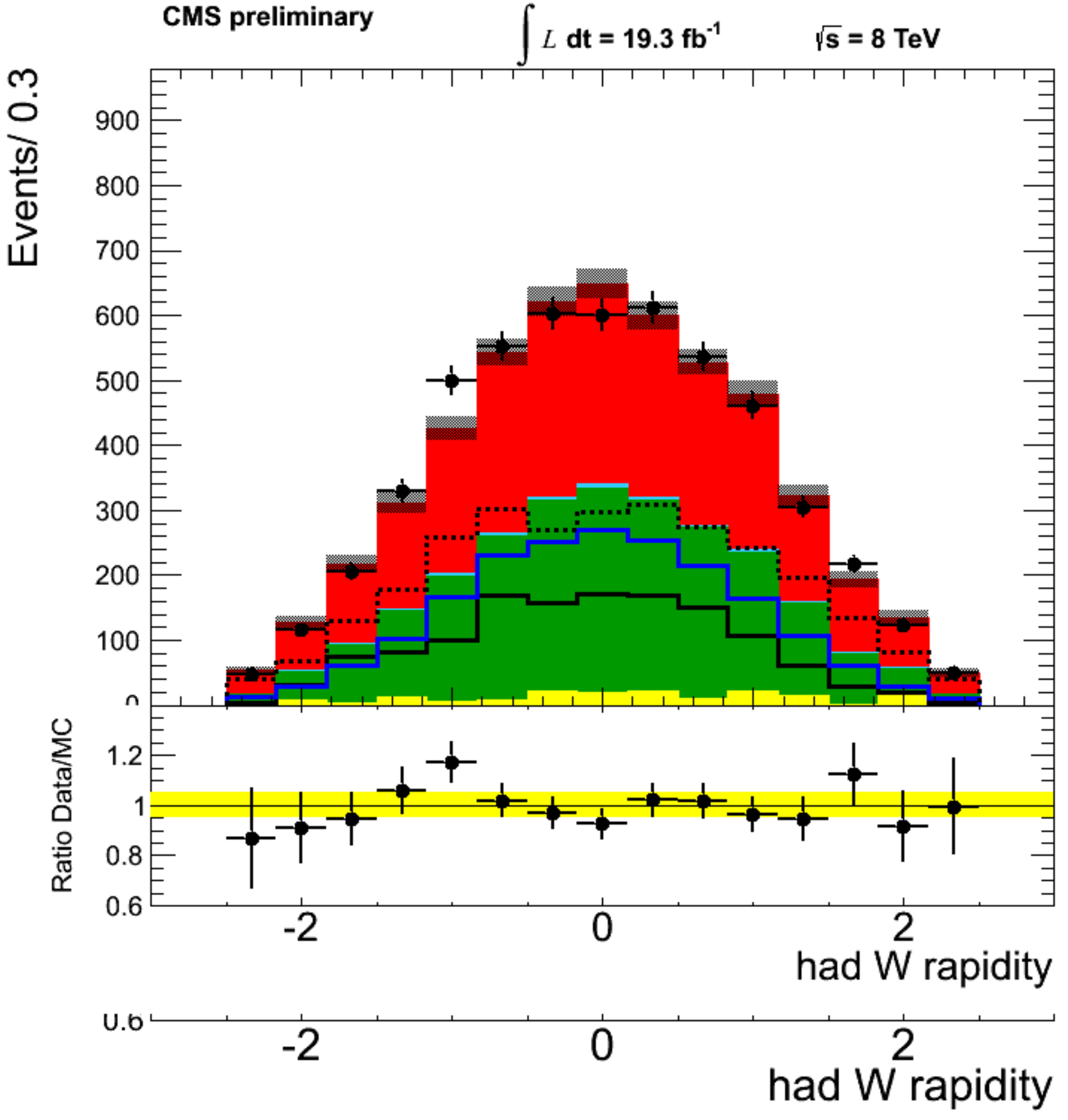

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4 rad
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Hadronic W Jet1 Φ (rad)
0.6
-2
0
2
Hadronic W Jet1 Φ (rad)

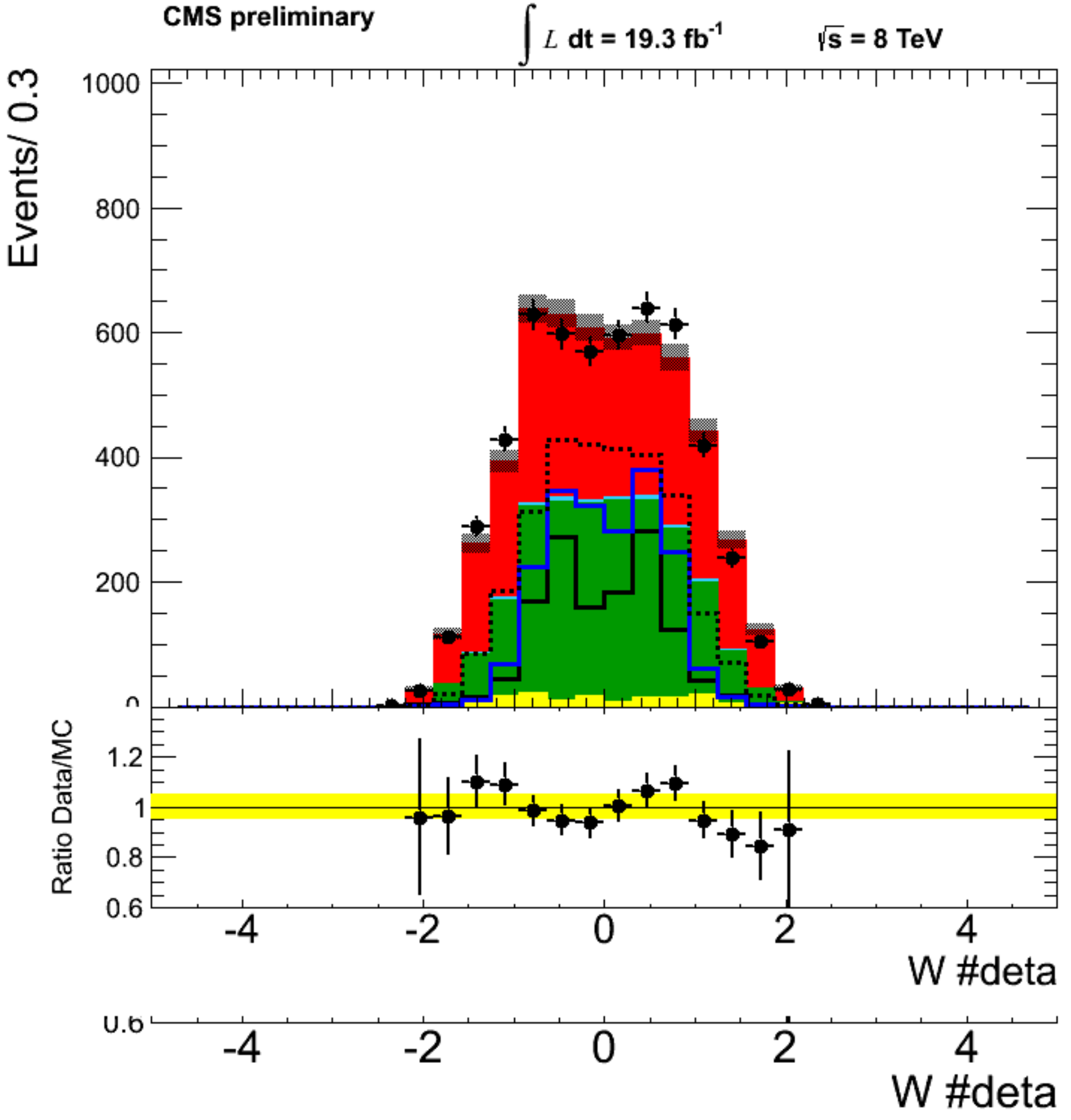

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 10 GeV
Muon Data
W+4/3/2jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
ggH (500) x 100
vbfH (500) x 100
WW sig (126) x 100
Ratio Data/MC
Hadronic W Jet1 pT

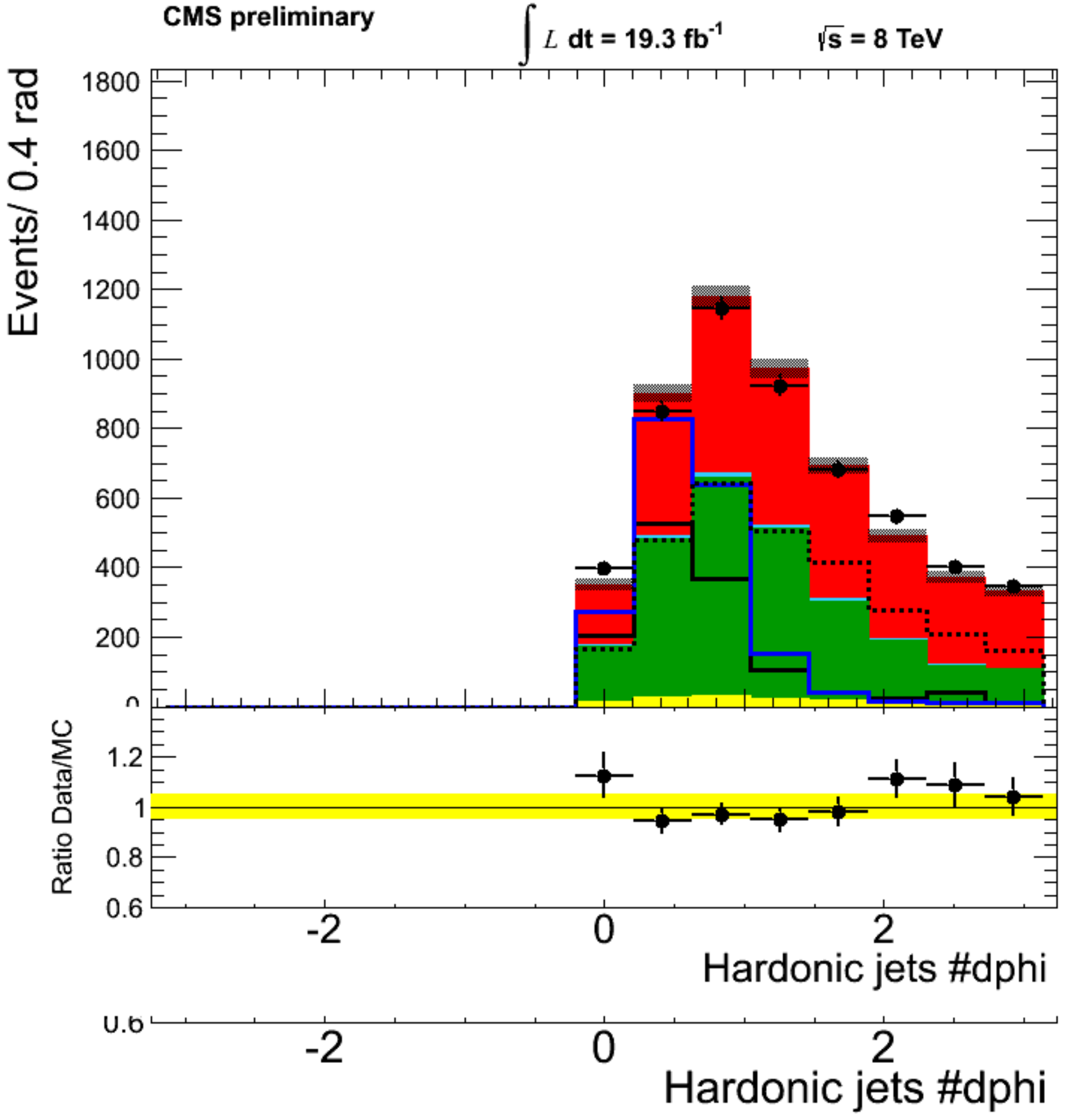

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.4
900
800
700
600
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-4
-2
0
2
4
Hadronic W Jet2 η
0.6
-4
-2
0
2
4
Hadronic W Jet2 η

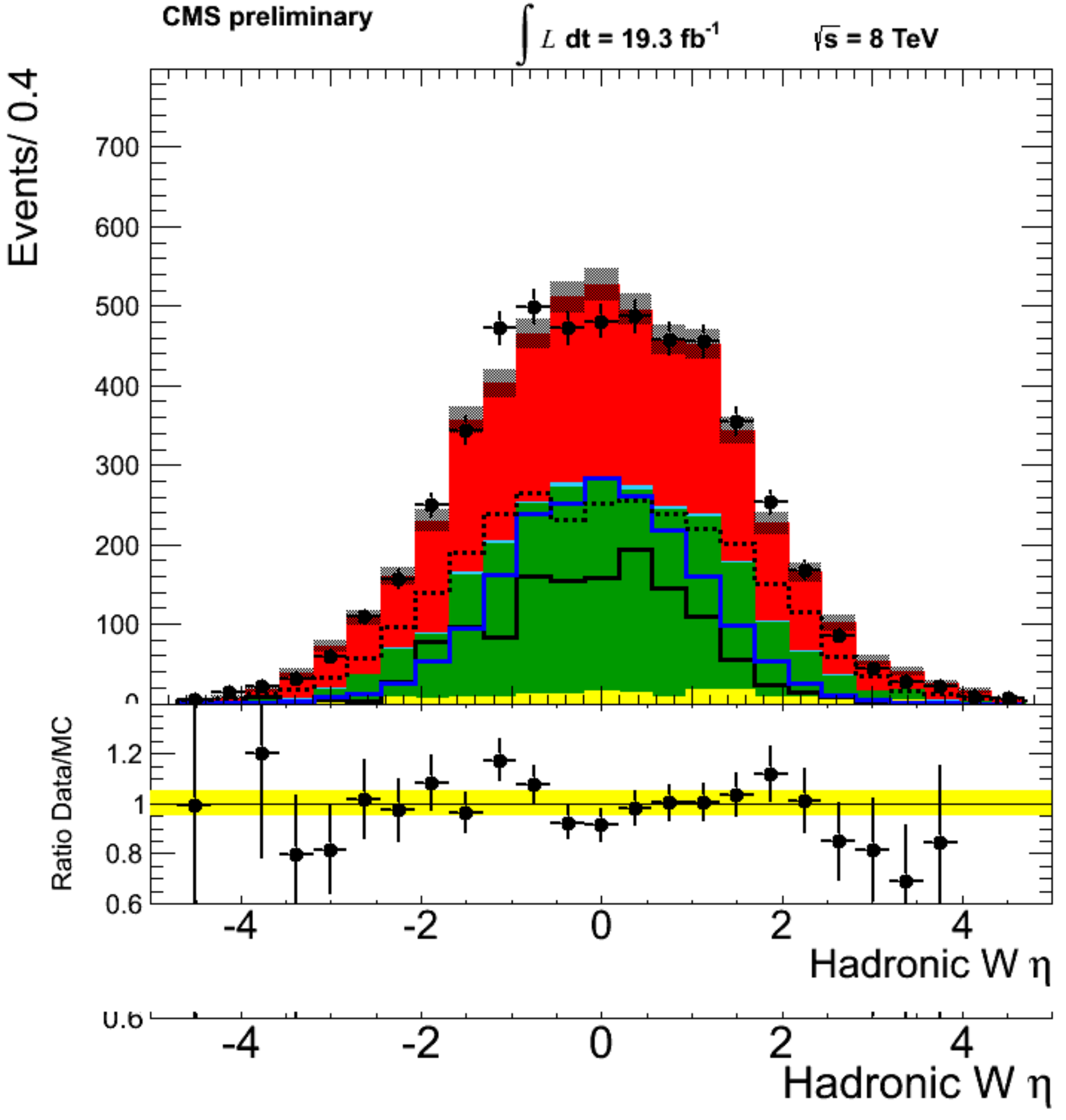

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4 rad
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Hadronic W Jet2 Φ (rad)
0.6
-2
0
2
Hadronic W Jet2 Φ (rad)

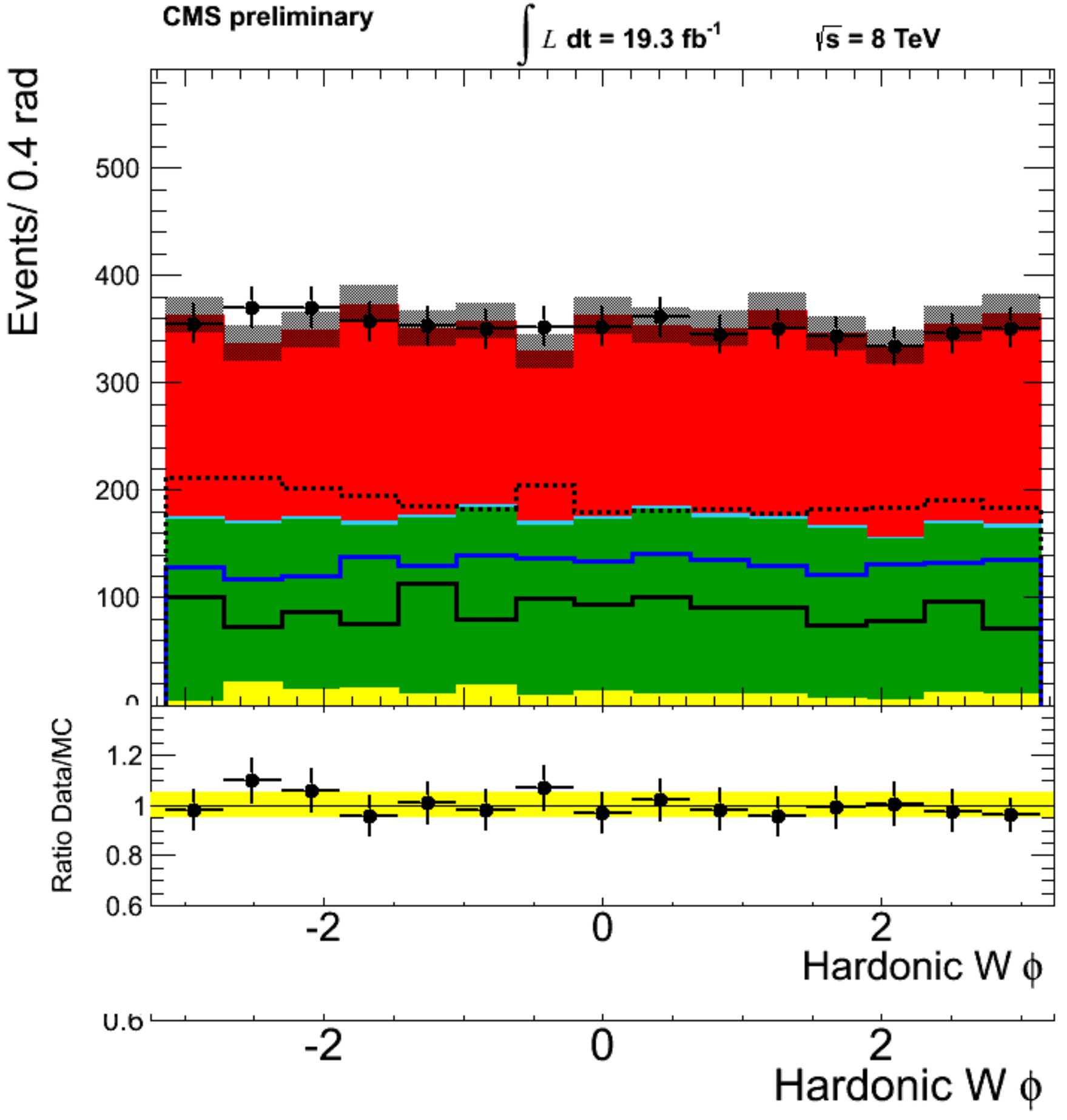

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 10 GeV
Muon Data
W+4/3/2jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
ggH (500) x 100
vbfH (500) x 100
WW sig (126) x 100
Ratio Data/MC
Hadronic W Jet2 pT

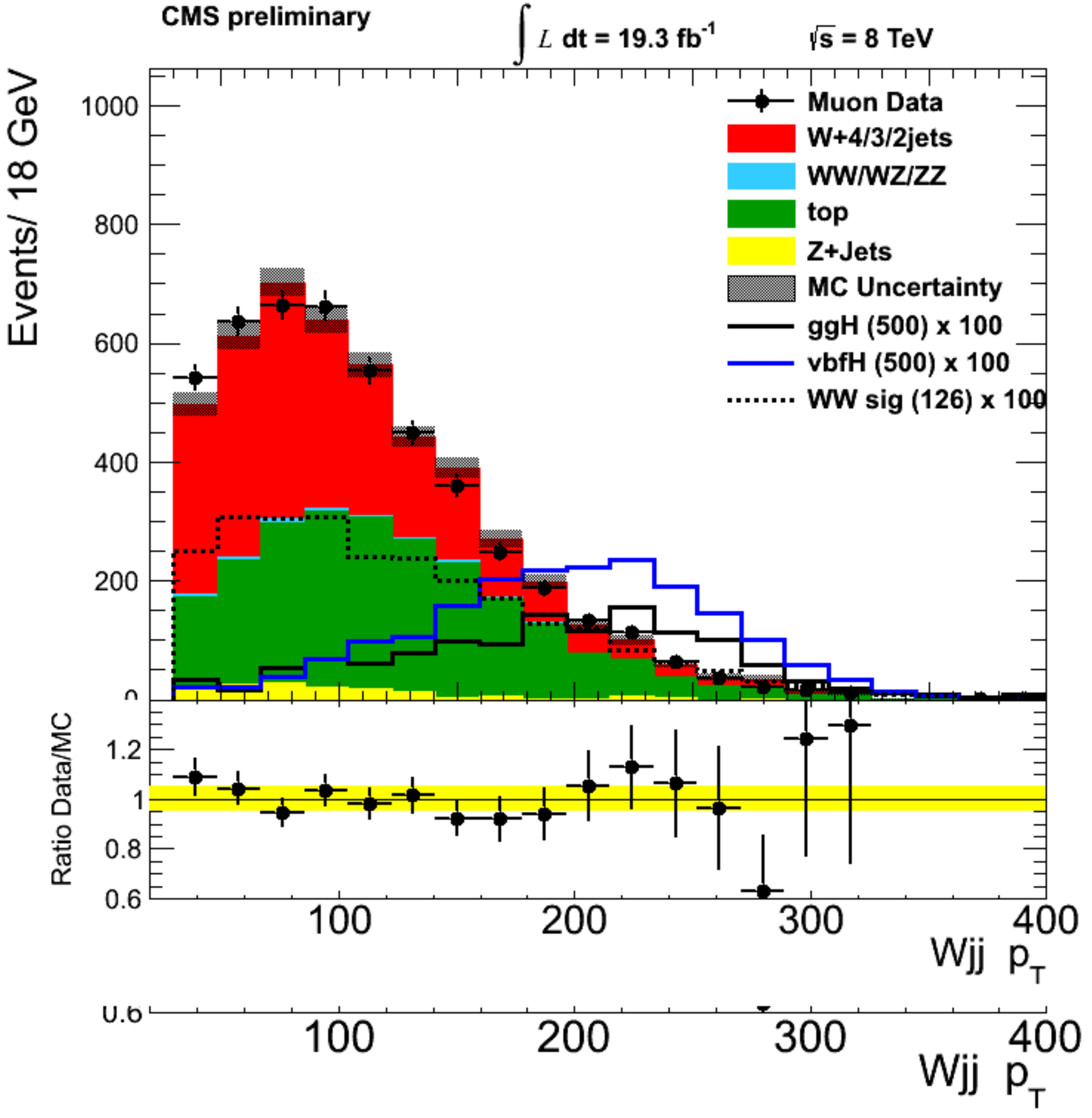

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.3
900
800
700
600
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
had W rapidity
0.6
-2
0
2
had W rapidity

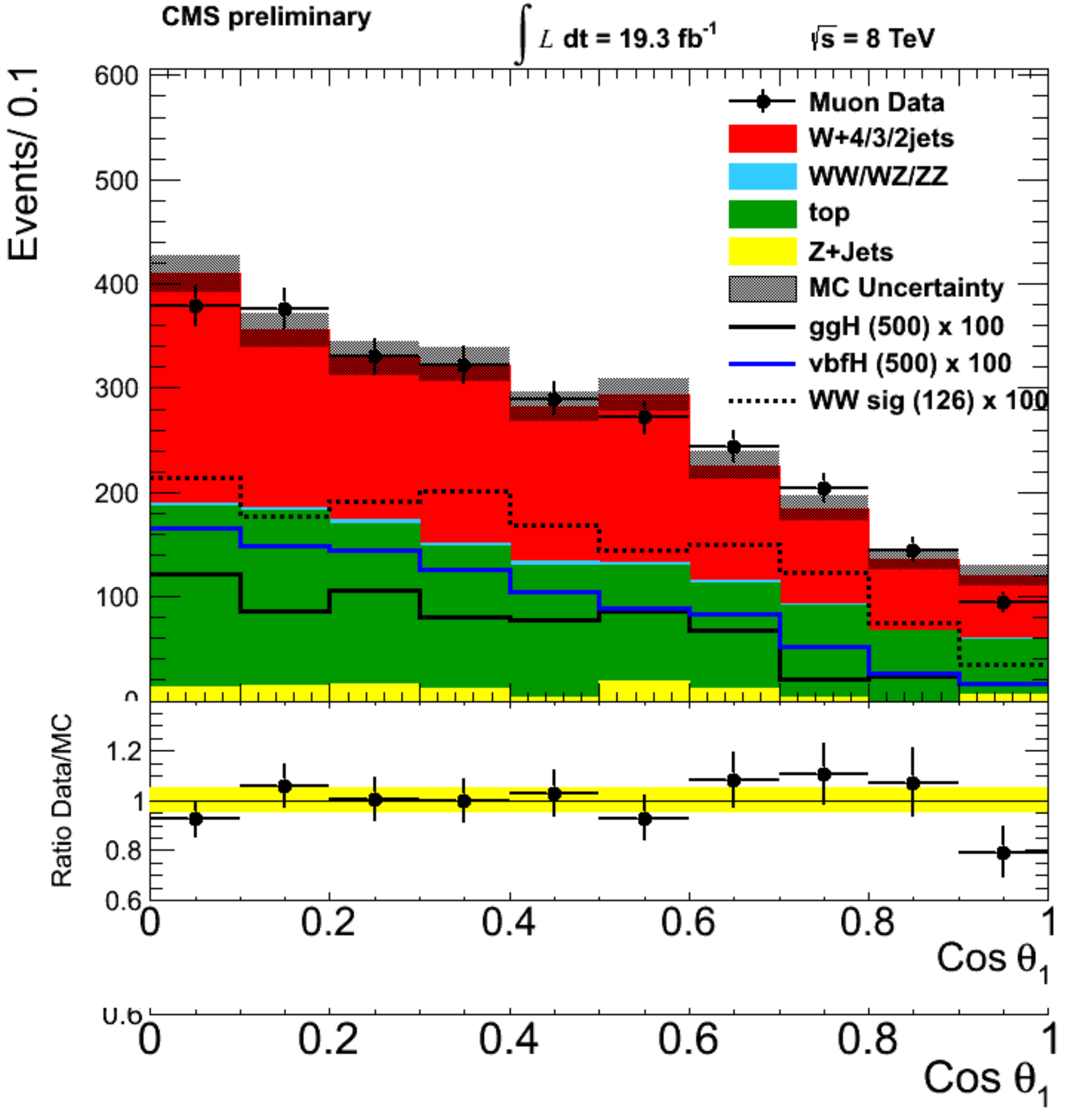

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.3
1000
800
600
400
200
0
Ratio Data/MC
1.2
1
0.8
0.6
-4
-2
0
2
4
W #deta
0.6
-4
-2
0
2
4
W #deta

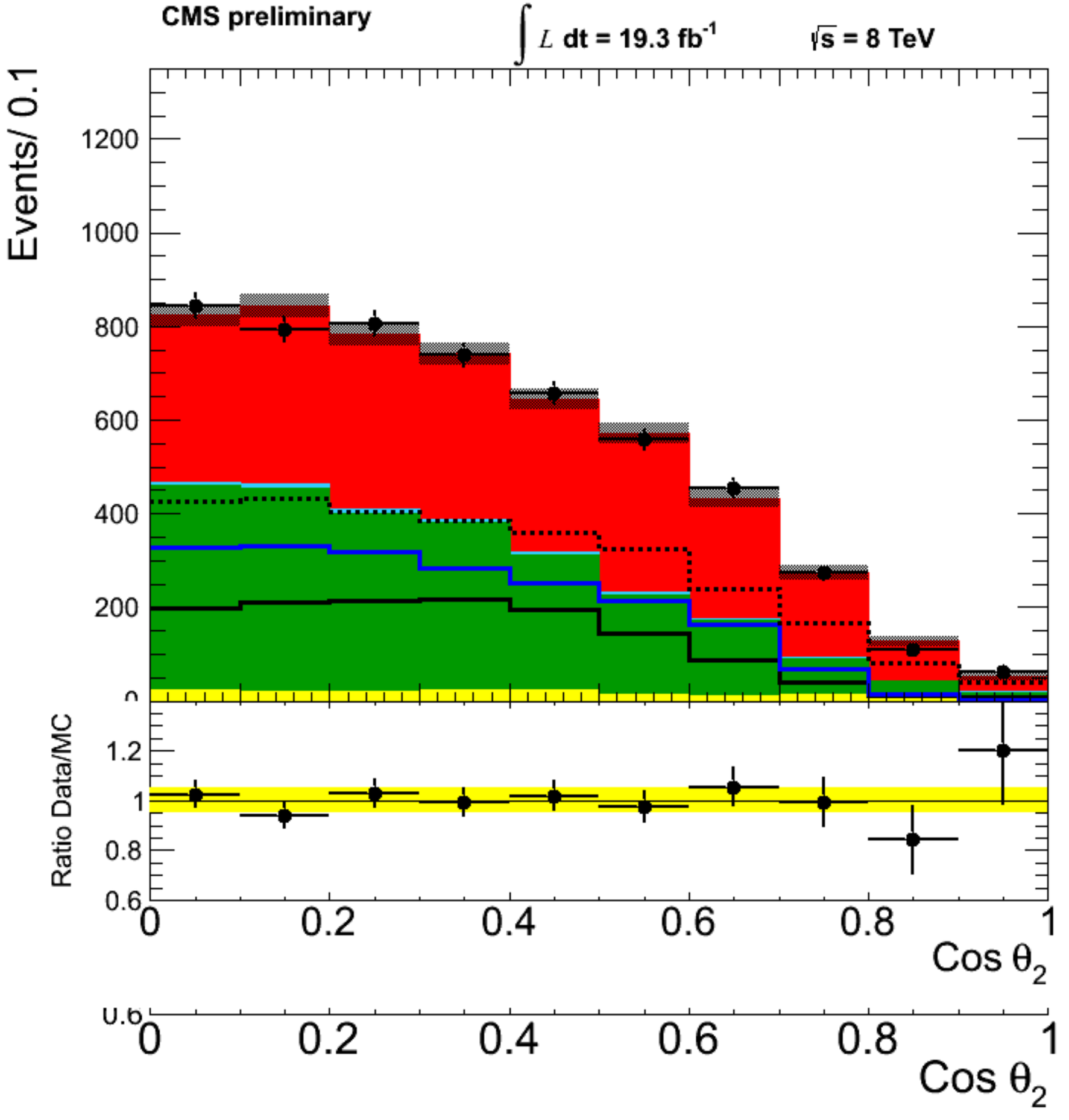

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4 rad
1800
1600
1400
1200
1000
800
600
400
200
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Hardonic jets #dphi
0.6
-2
0
2
Hardonic jets #dphi

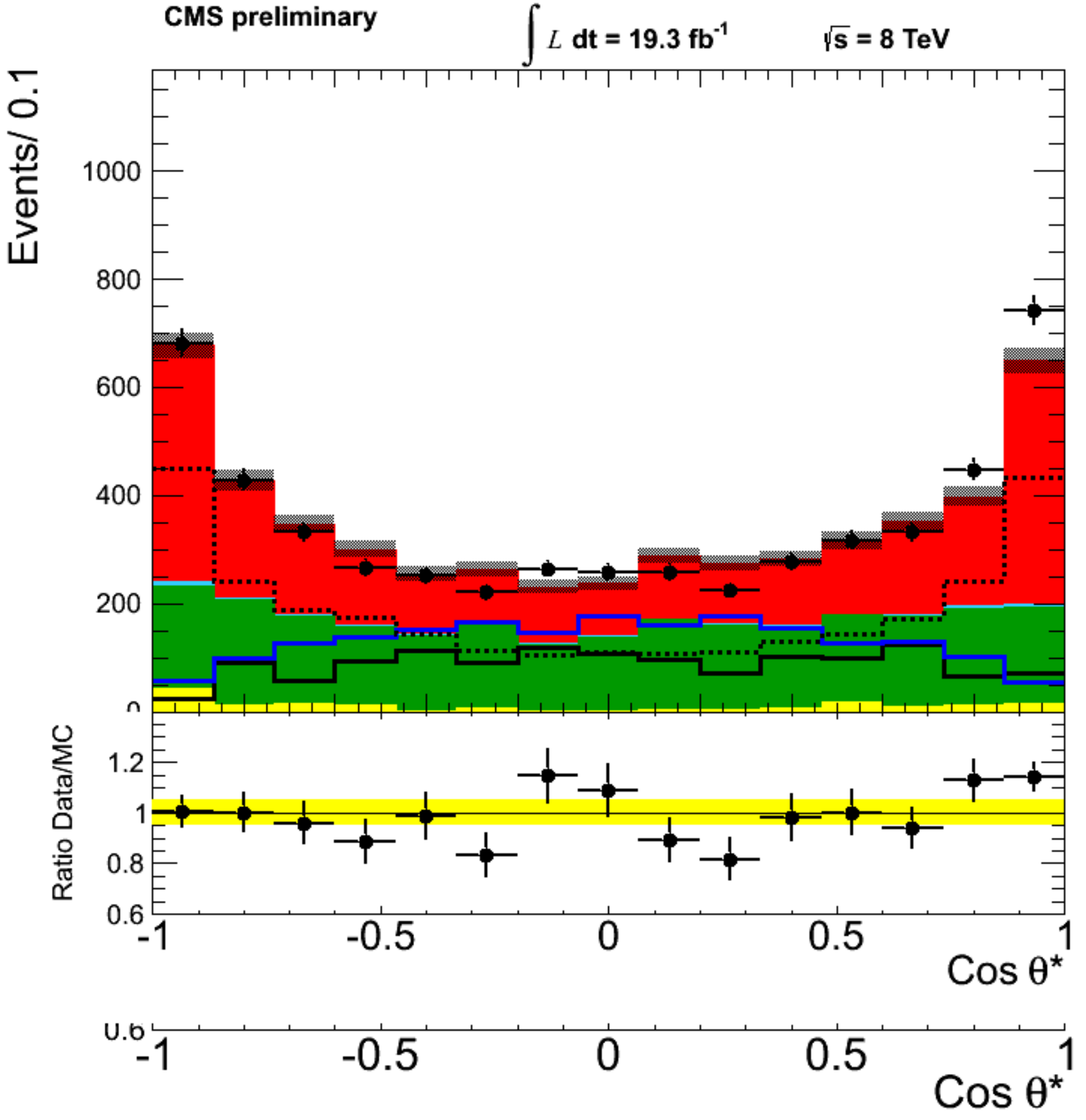

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4
700
600
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-4
-2
0
2
4
Hadronic W η
0.6
-4
-2
0
2
4
Hadronic W η

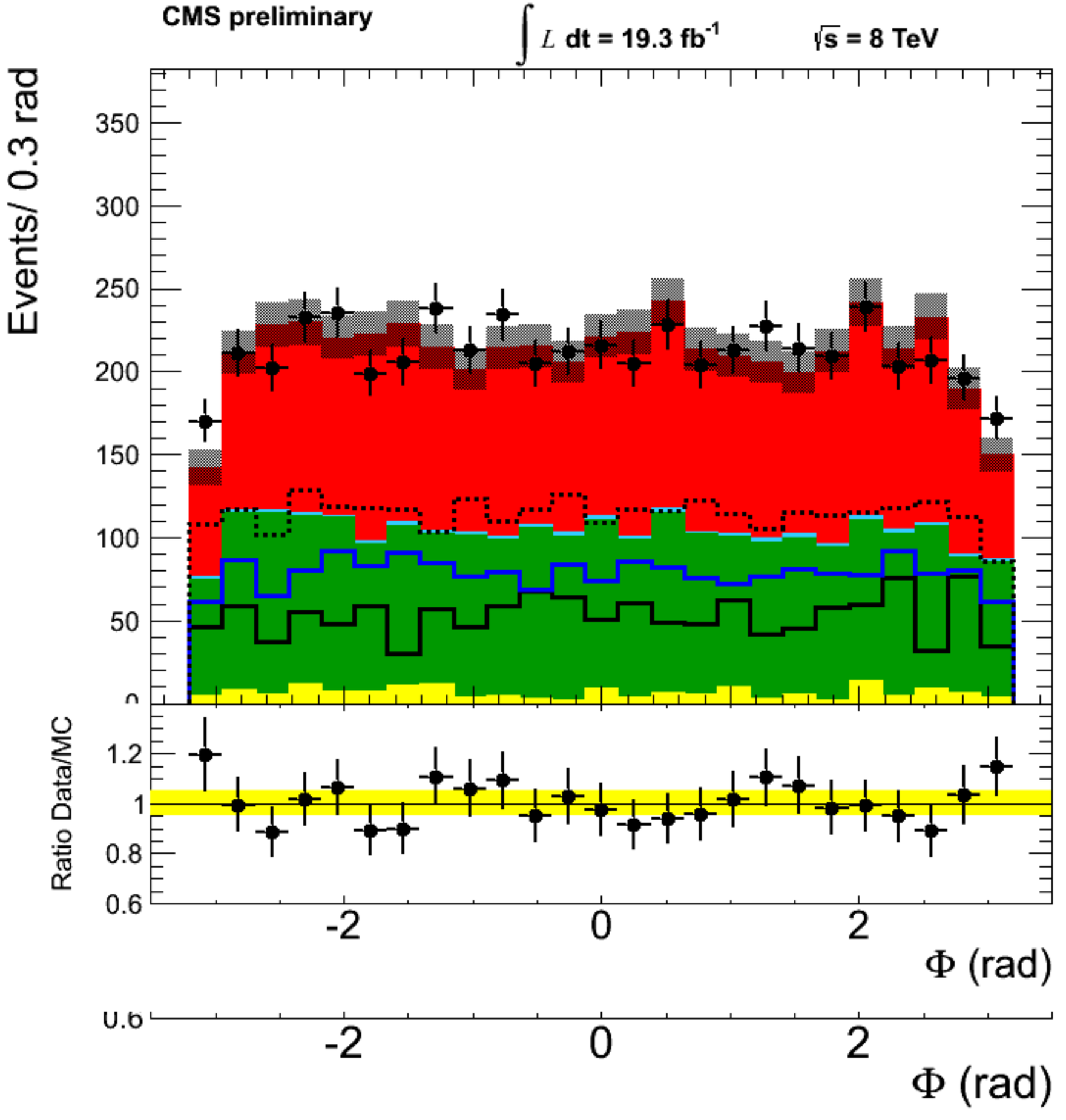

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.4 rad
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Hardonic W ϕ
0.6
-2
0
2
Hardonic W ϕ

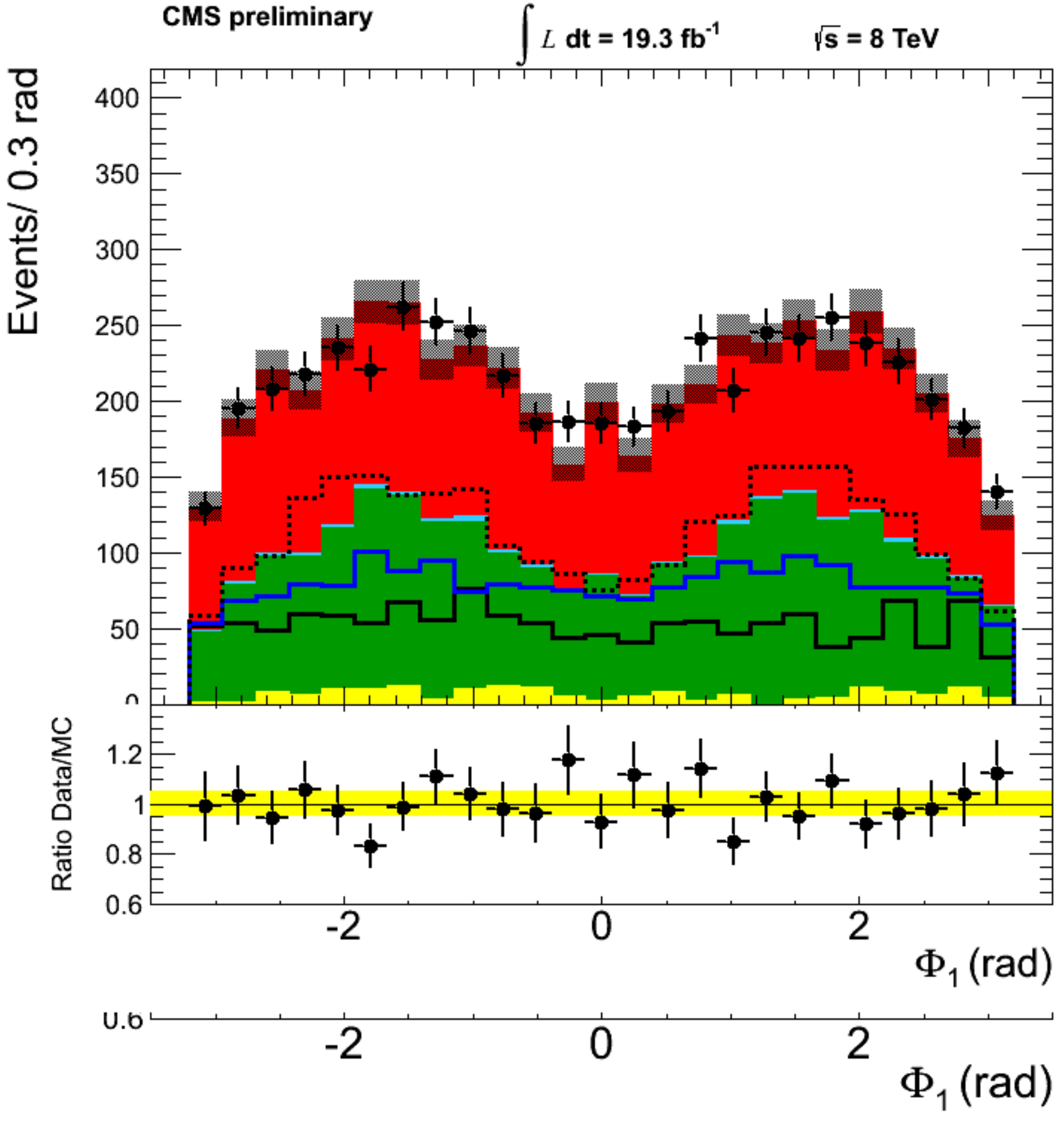

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 18 GeV
Muon Data
W+4/3/2jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
ggH (500) x 100
vbfH (500) x 100
WW sig (126) x 100
Ratio Data/MC
Wjj p_T

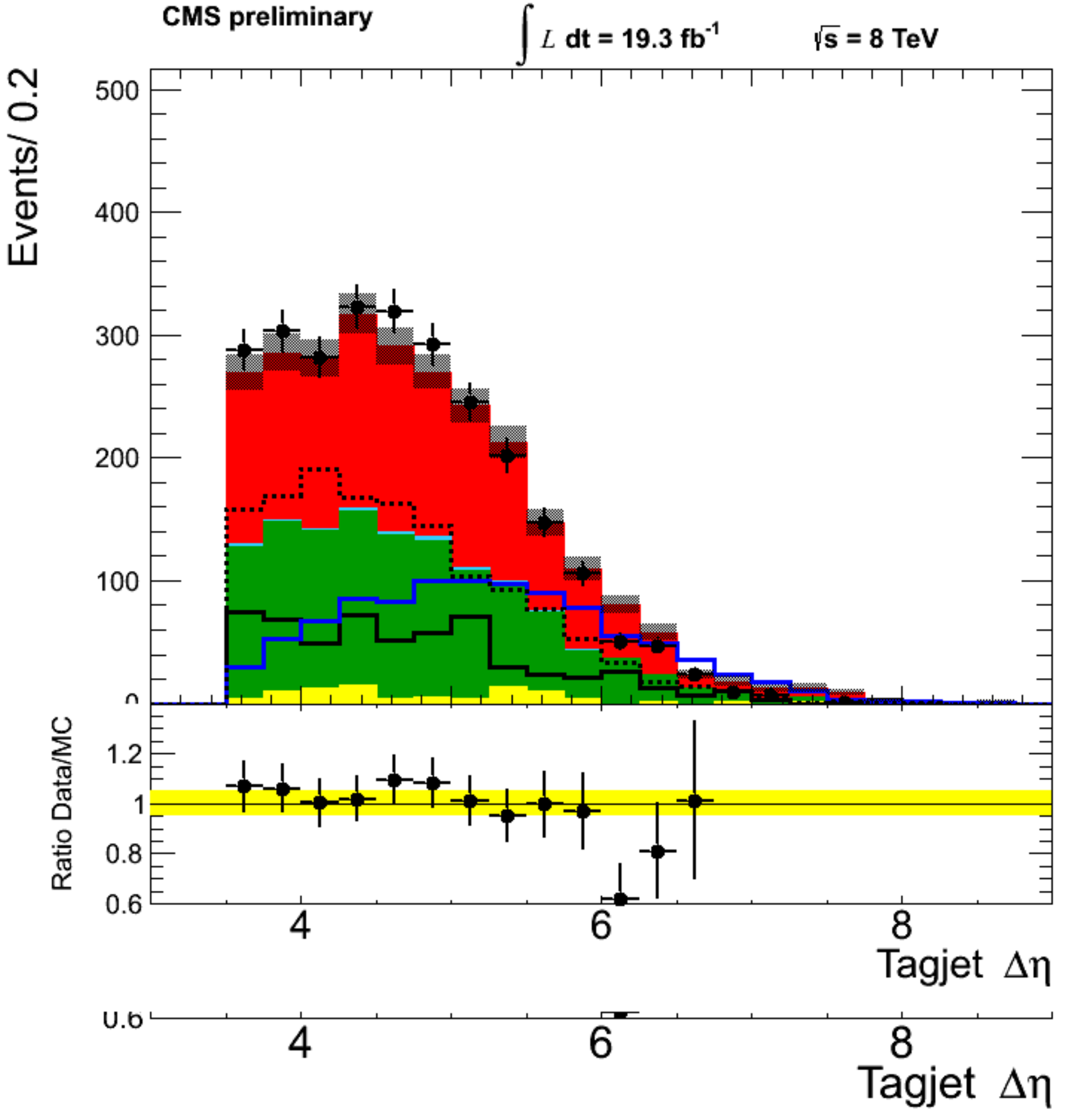

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 0.1
Muon Data
W+4/3/2jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
ggH (500) x 100
vbfH (500) x 100
WW sig (126) x 100
Ratio Data/MC
Cos θ_1

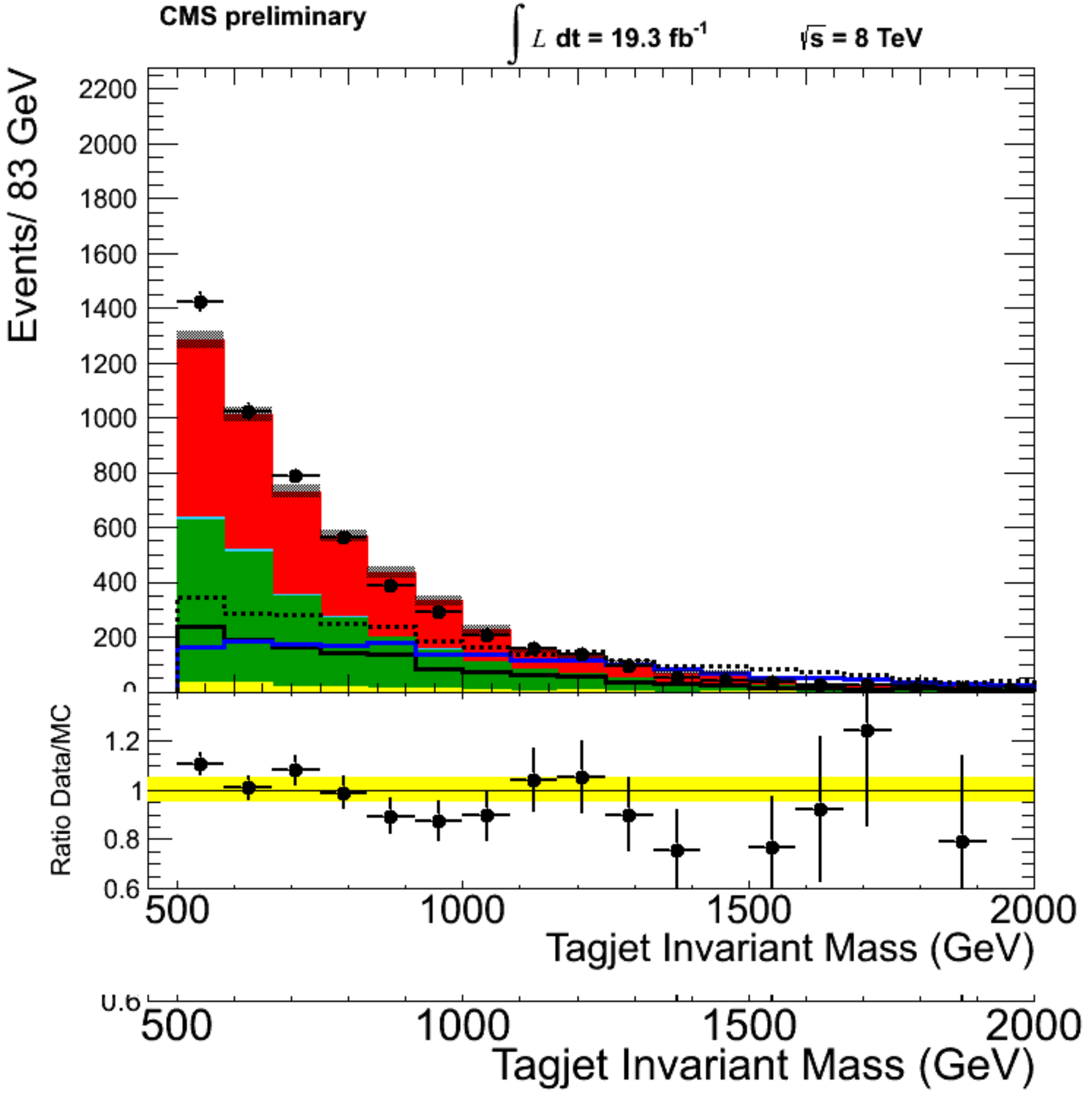

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.1
1200
1000
800
600
400
200
0
Ratio Data/MC
1.2
1
0.8
0.6
0
0.2
0.4
0.6
0.8
1
Cos θ2
0.6
0
0.2
0.4
0.6
0.8
1
Cos θ2

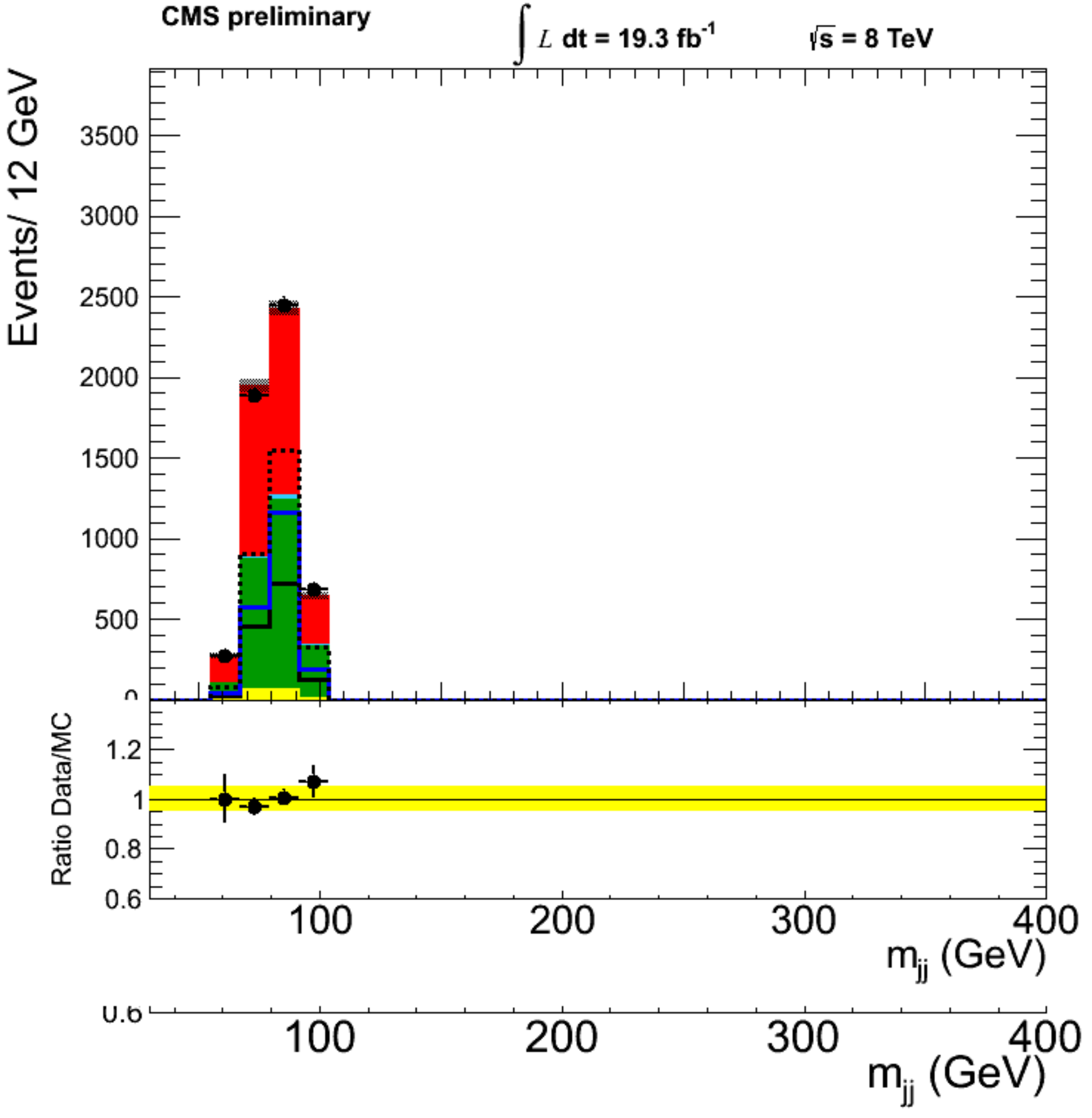

CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.1
1000
800
600
400
200
0
Ratio Data/MC
1.2
1
0.8
0.6
-1
-0.5
0
0.5
1
Cos θ*
0.6
-1
-0.5
0
0.5
1
Cos θ*

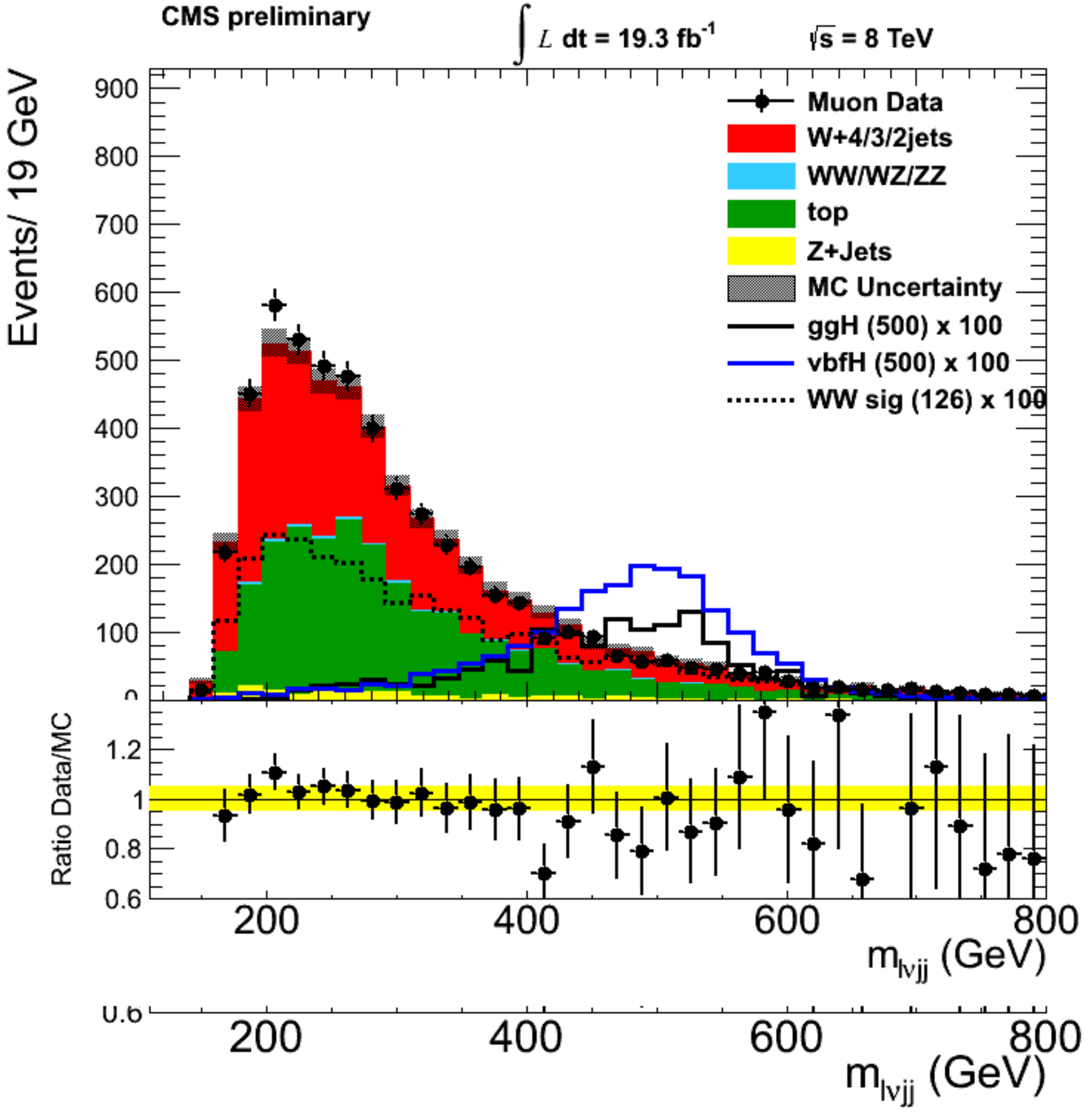

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.3 rad
350
300
250
200
150
100
50
0
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Φ (rad)
0.6
-2
0
2
Φ (rad)

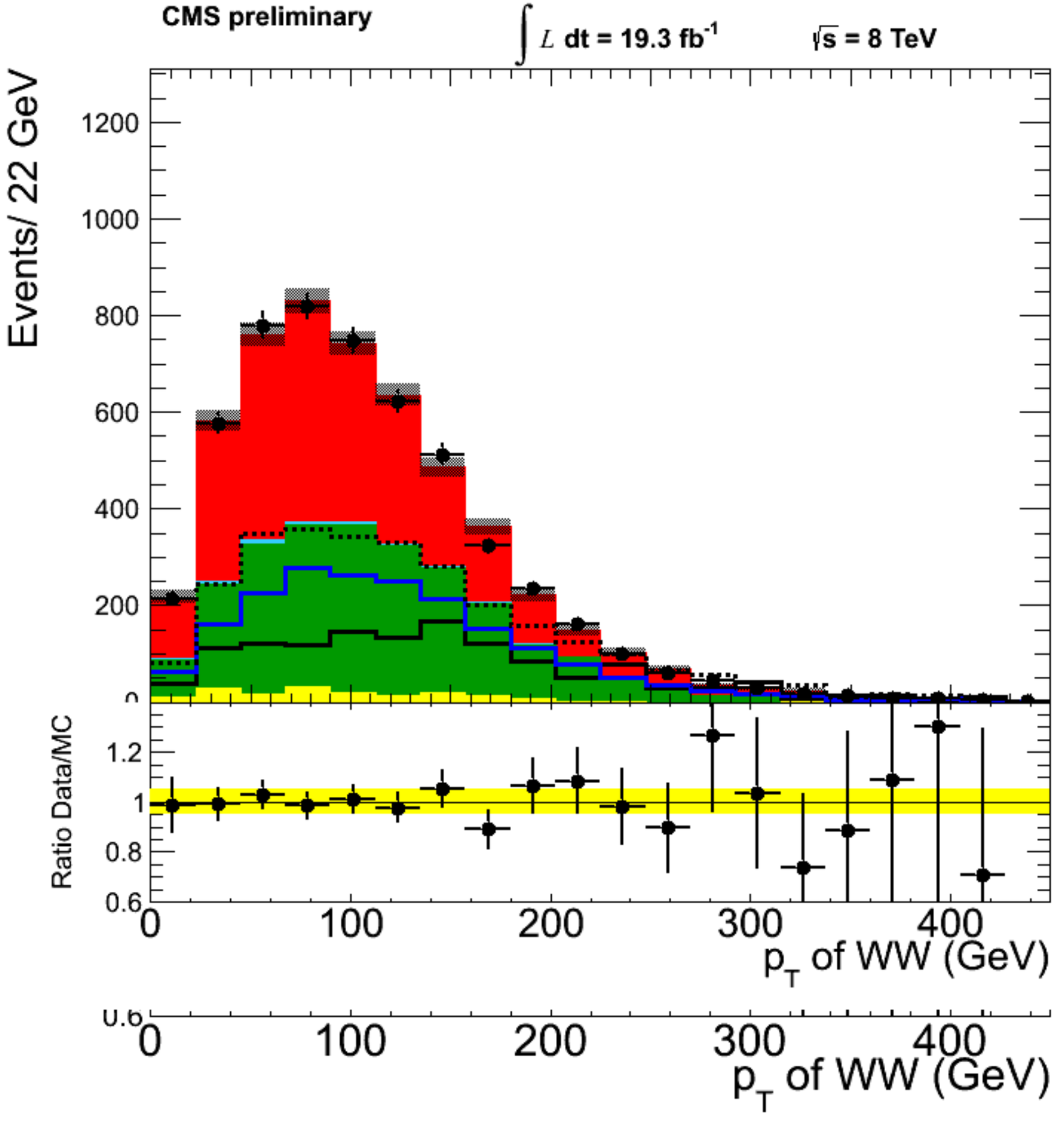

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.3 rad
400
350
300
250
200
150
100
50
Ratio Data/MC
1.2
1
0.8
0.6
-2
0
2
Φ_1 (rad)

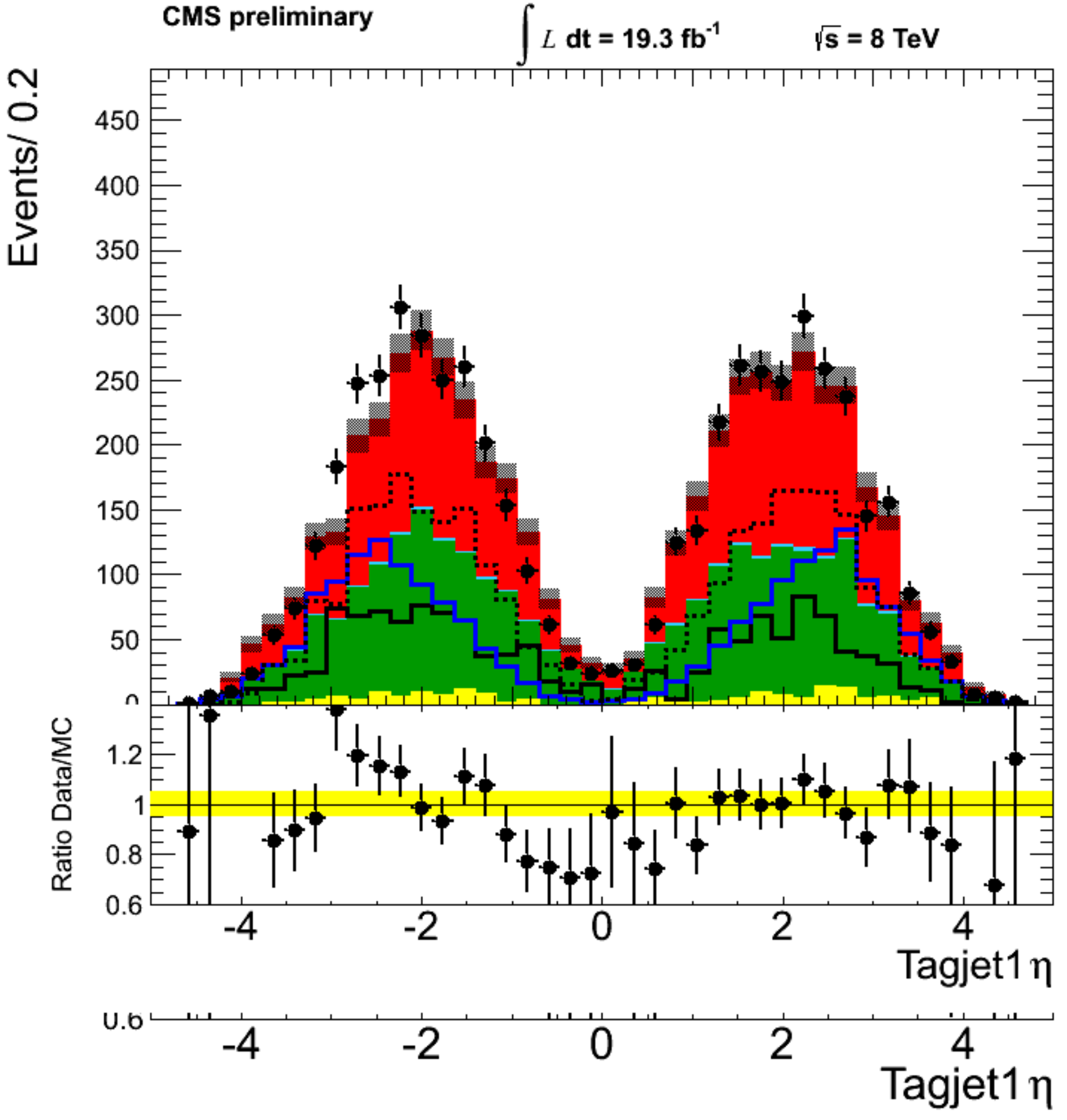

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 0.2
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
4
6
8
Tagjet Δη
0.6
4
6
8
Tagjet Δη

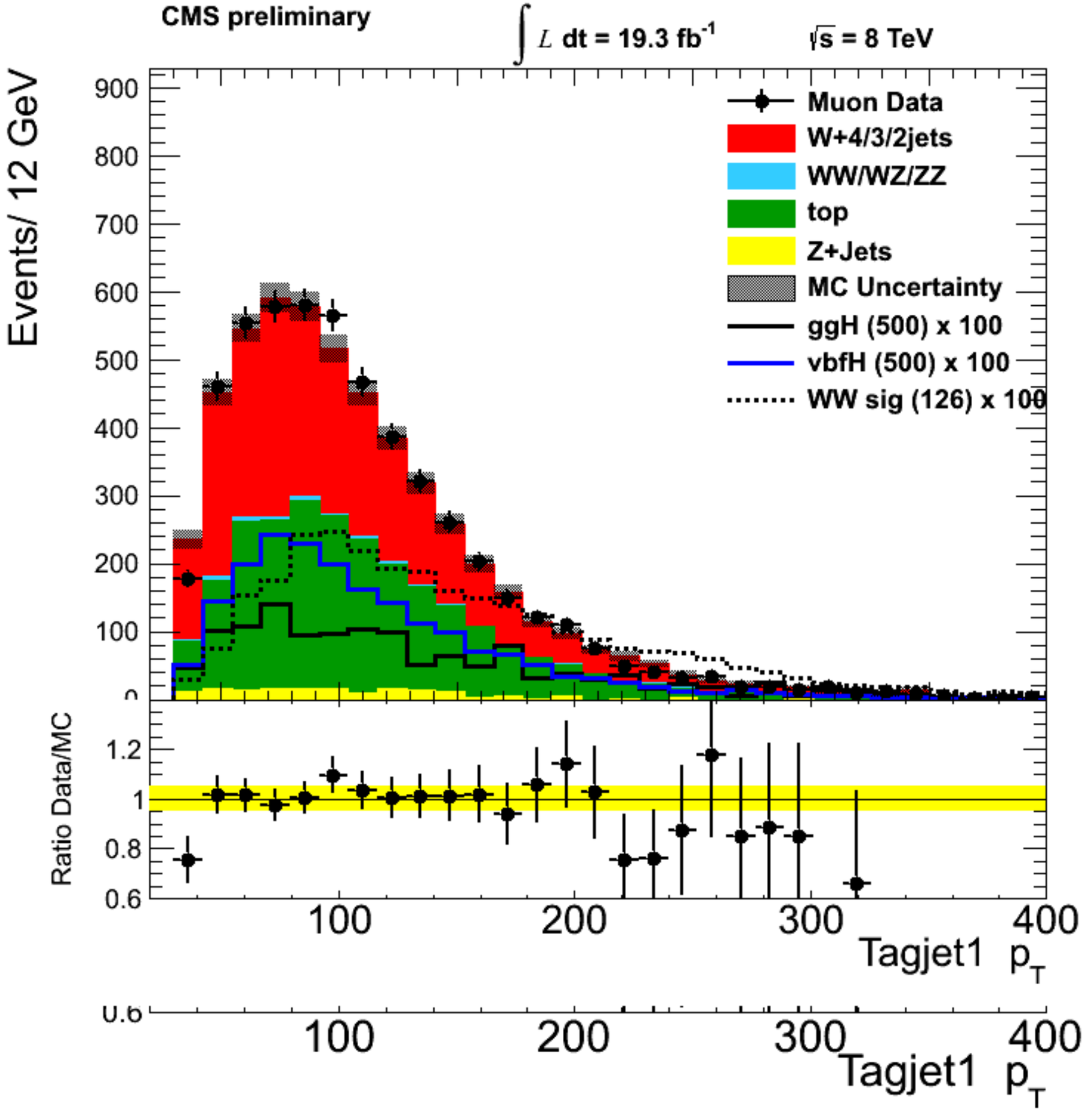

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 83 GeV
Ratio Data/MC
Tagjet Invariant Mass (GeV)
Tagjet Invariant Mass (GeV)

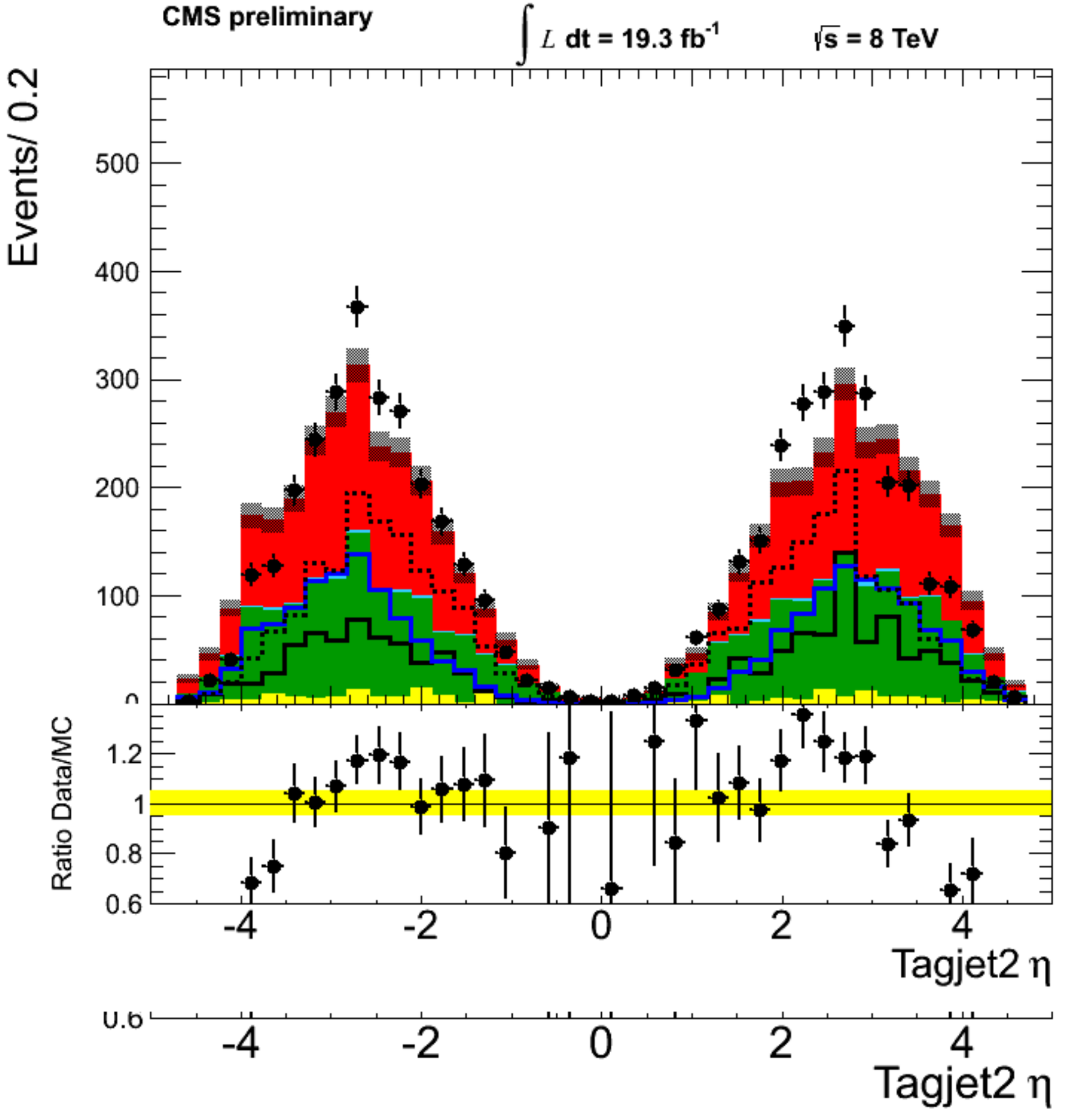

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 12 GeV
3500
3000
2500
2000
1500
1000
500
0
Ratio Data/MC
1.2
1
0.8
0.6
100
200
300
400
m_{jj} (GeV)
0.6
100
200
300
400
m_{jj} (GeV)

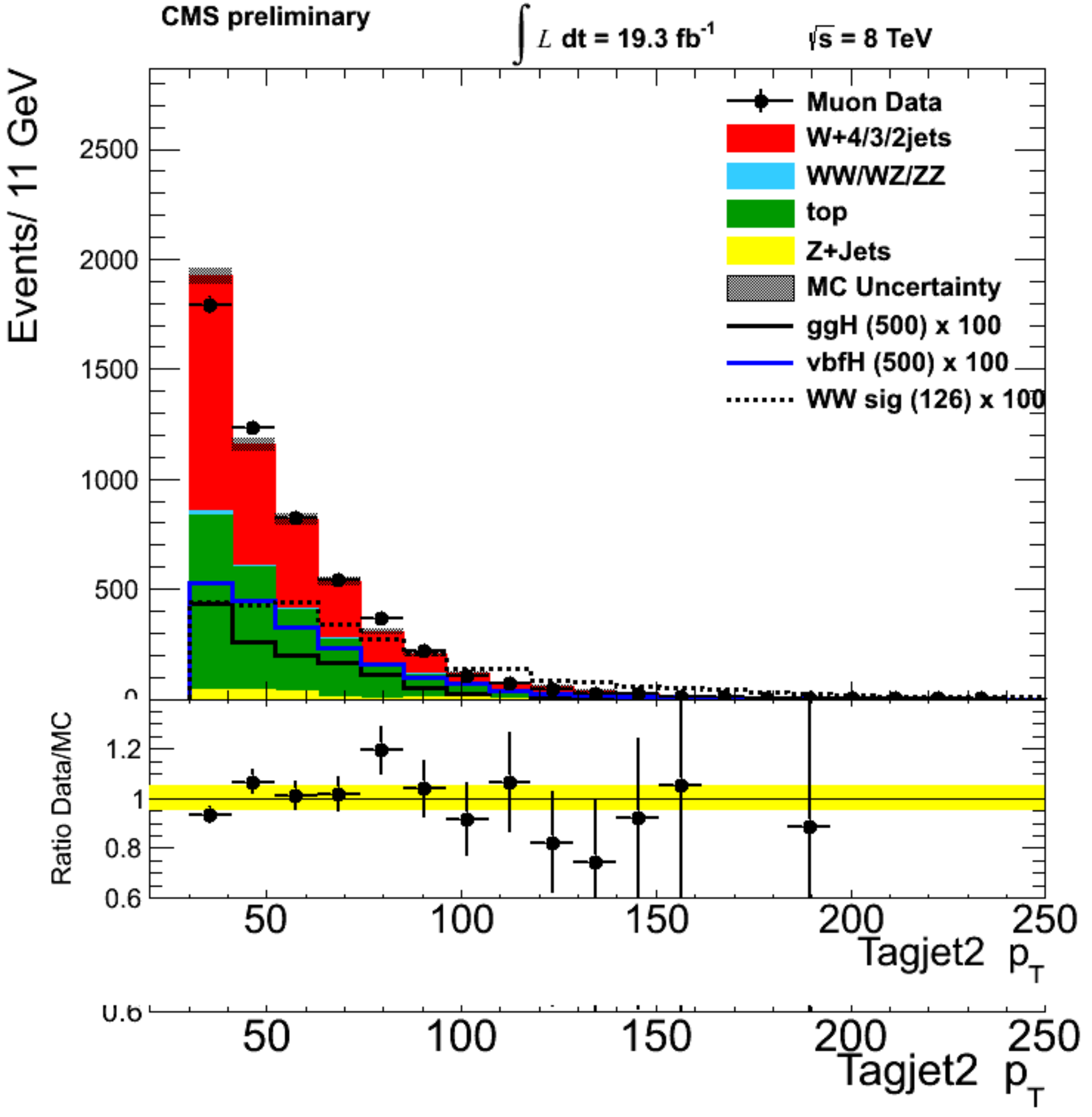

CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 19 GeV
Muon Data
W+4/3/2jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
ggH (500) x 100
vbfH (500) x 100
WW sig (126) x 100
Ratio Data/MC
$m_{l\nu jj}$ (GeV)


CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s} = 8$ TeV
Events/ 22 GeV
1200
1000
800
600
400
200
0
Ratio Data/MC
1.2
1
0.8
0.6
0
100
200
300
400
p_T of WW (GeV)
0.6
0
100
200
300
400
p_T of WW (GeV)


CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 0.2
450
400
350
300
250
200
150
100
50
0
Ratio Data/MC
1.2
1
0.8
0.6
-4
-2
0
2
4
Tagjet1 η
0.6
-4
-2
0
2
4
Tagjet1 η


CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 12 GeV
Muon Data
W+4/3/2jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
ggH (500) x 100
vbfH (500) x 100
WW sig (126) x 100
Ratio Data/MC
Tagjet1 p_T


CMS preliminary
∫ L dt = 19.3 fb-1
√s = 8 TeV
Events/ 0.2
500
400
300
200
100
0
Ratio Data/MC
1.2
1
0.8
0.6
-4
-2
0
2
4
Tagjet2 η
0.6
-4
-2
0
2
4
Tagjet2 η


CMS preliminary
$\int L\,dt = 19.3\ fb^{-1}$
$\sqrt{s}$ = 8 TeV
Events/ 11 GeV
Muon Data
W+4/3/2jets
WW/WZ/ZZ
top
Z+Jets
MC Uncertainty
ggH (500) x 100
vbfH (500) x 100
WW sig (126) x 100
Ratio Data/MC
Tagjet2 p_T