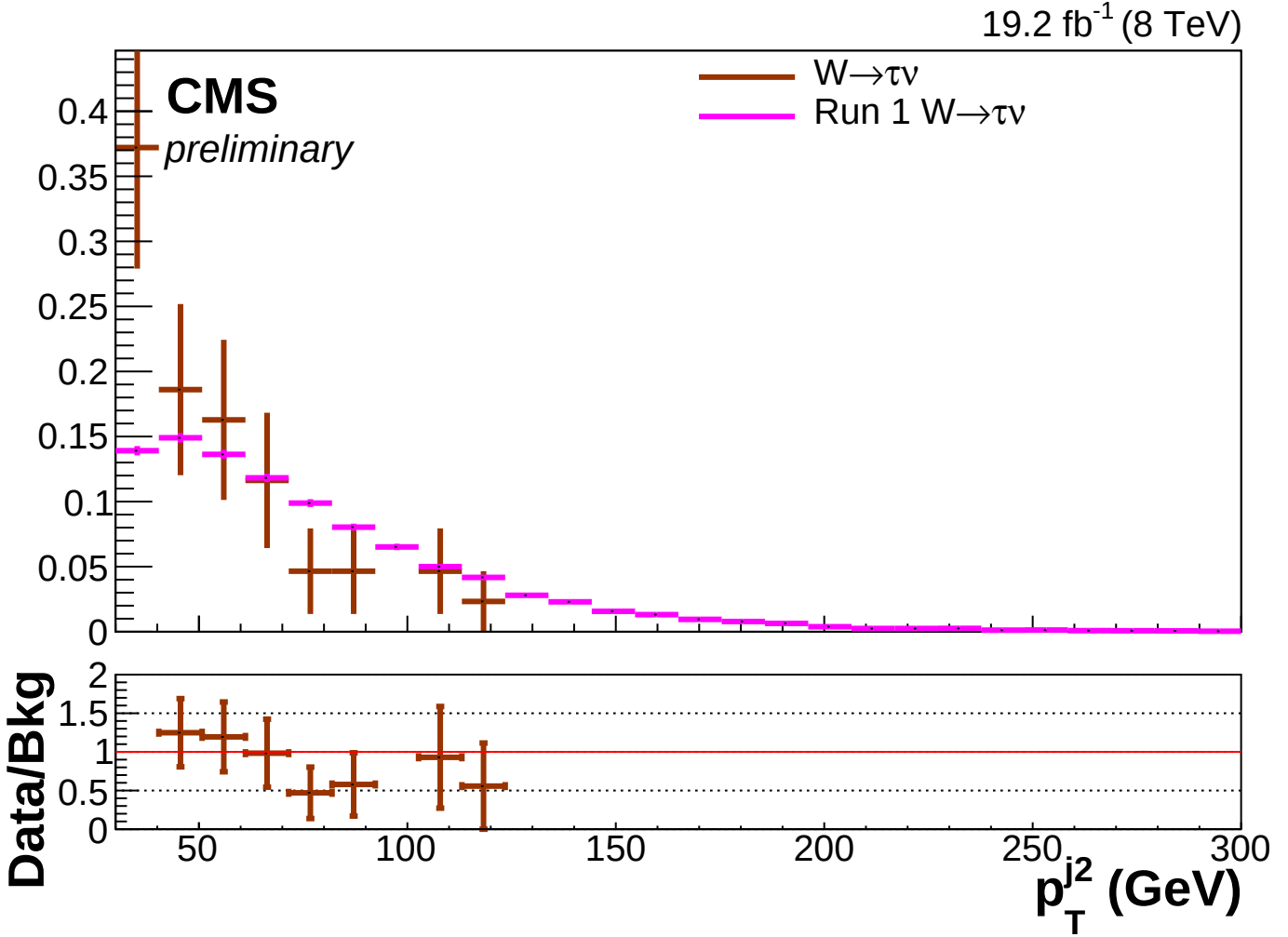
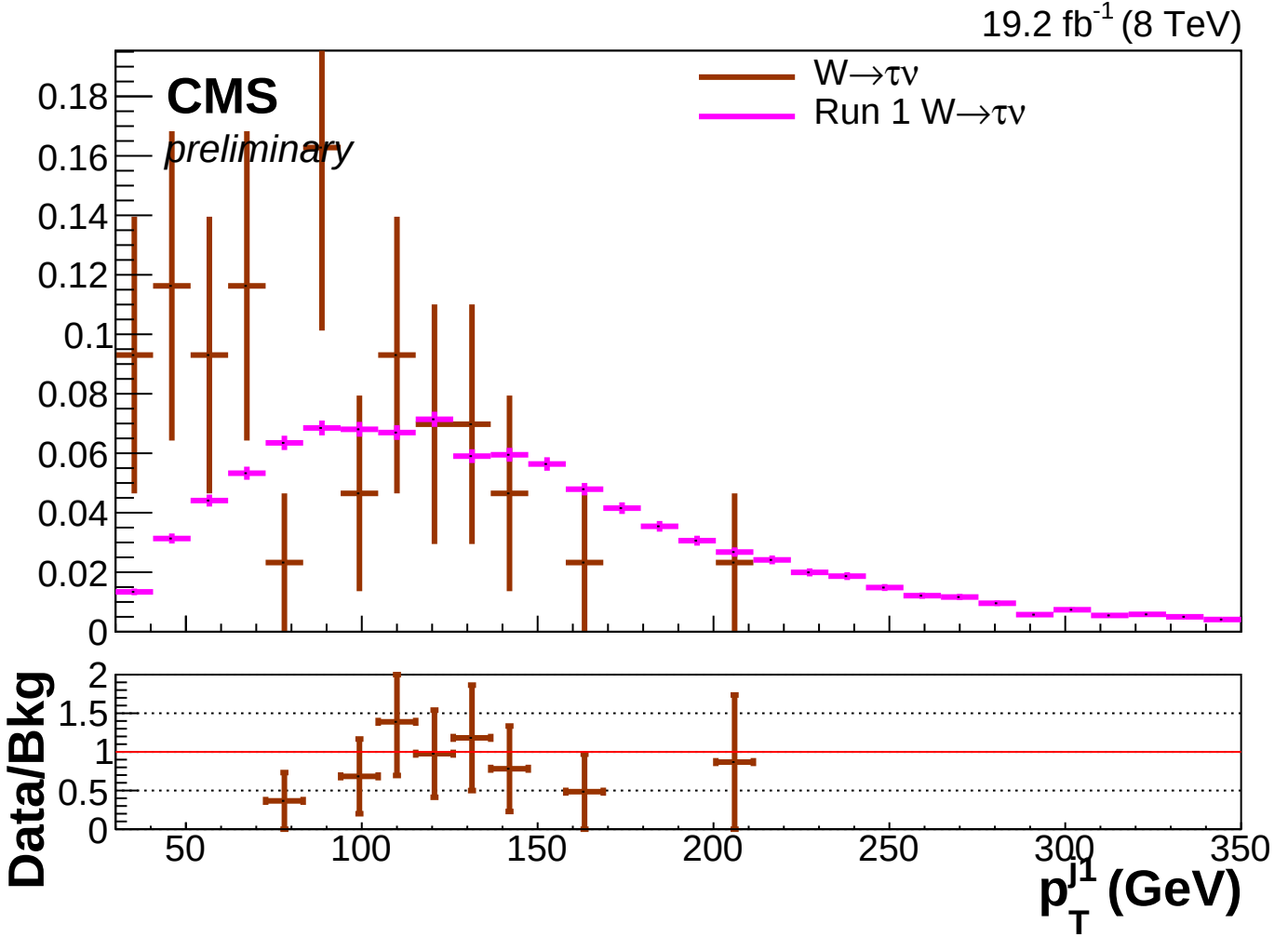
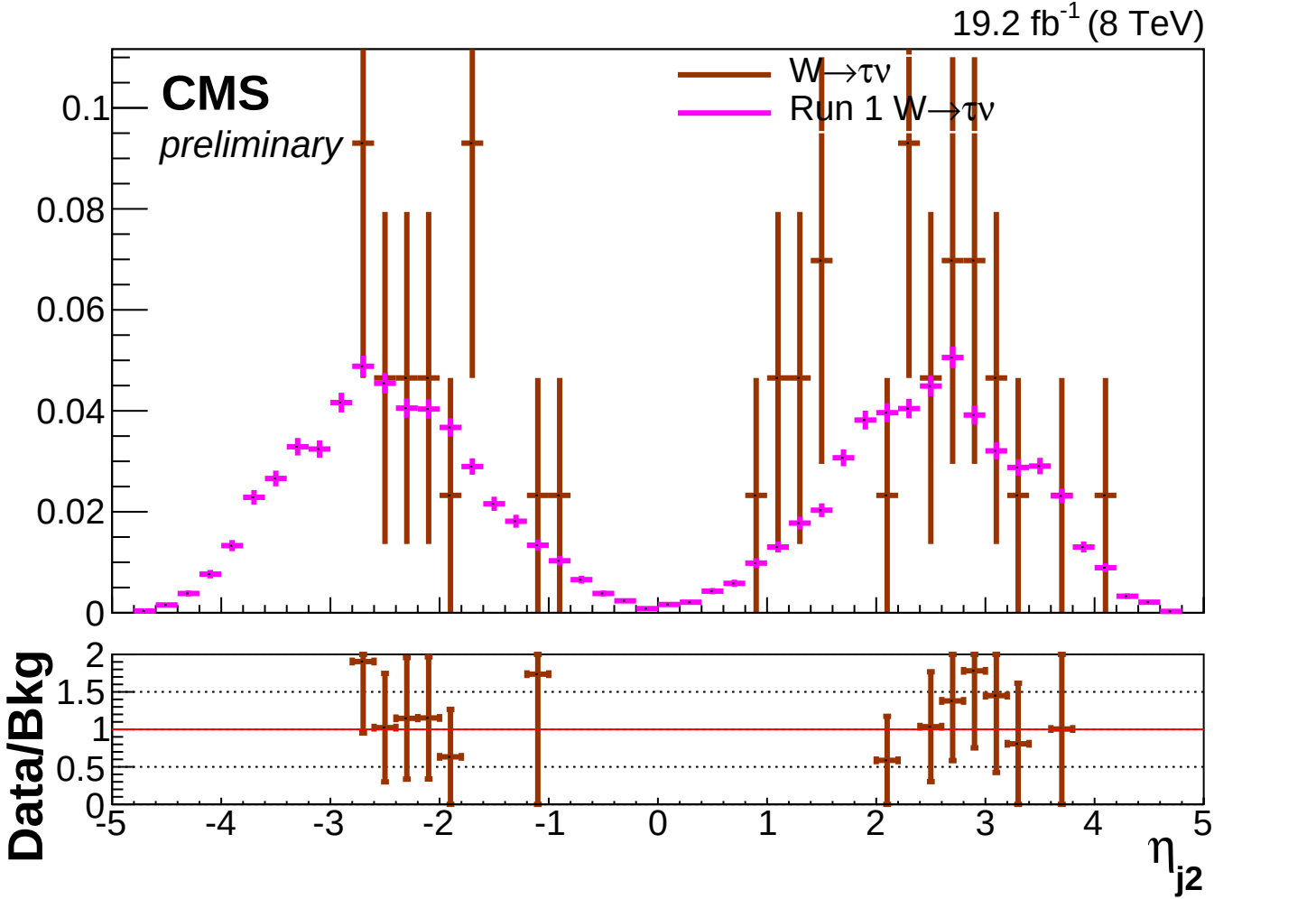
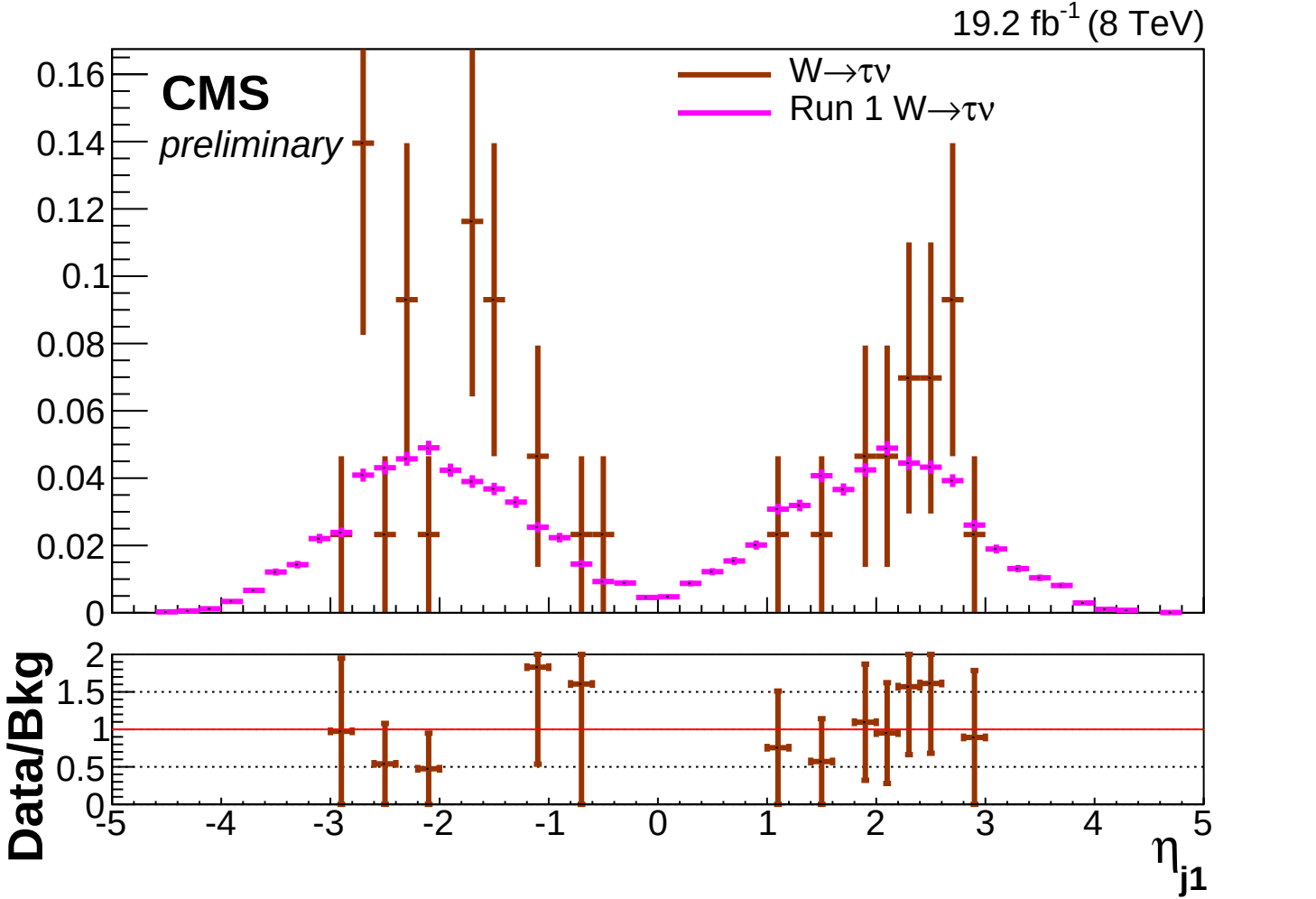
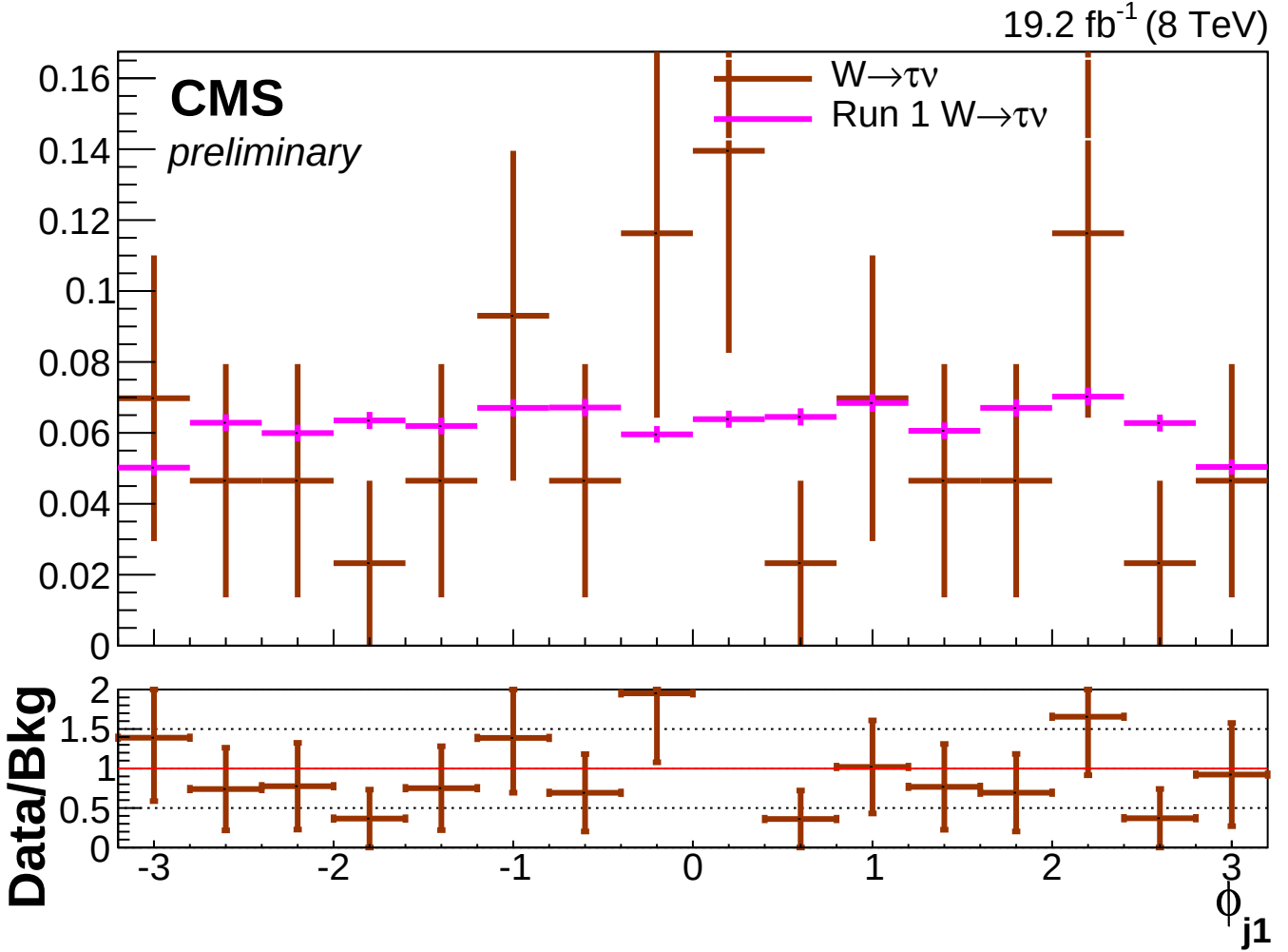
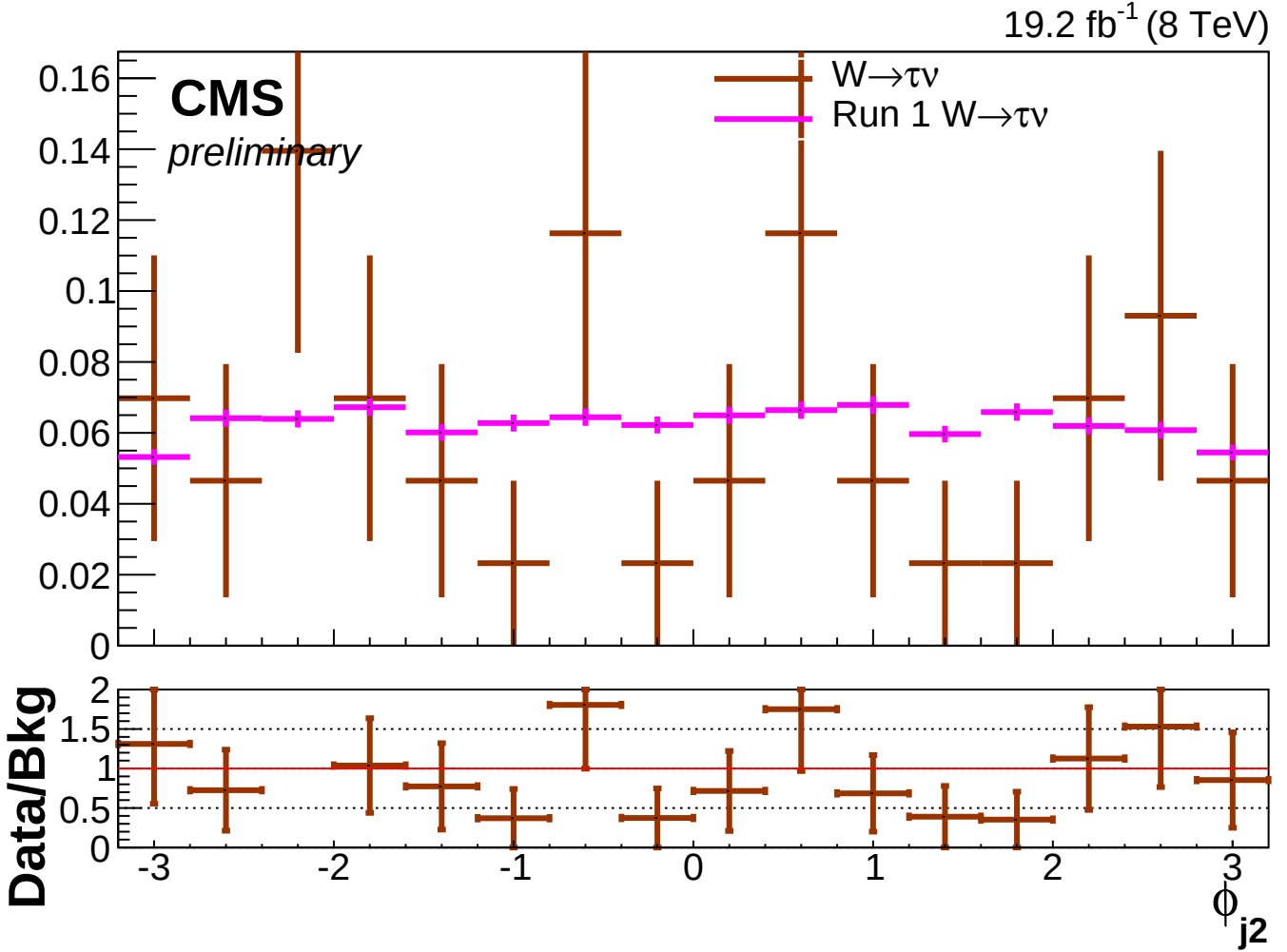

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
50
100
150
200
250
300
pT j2 (GeV)

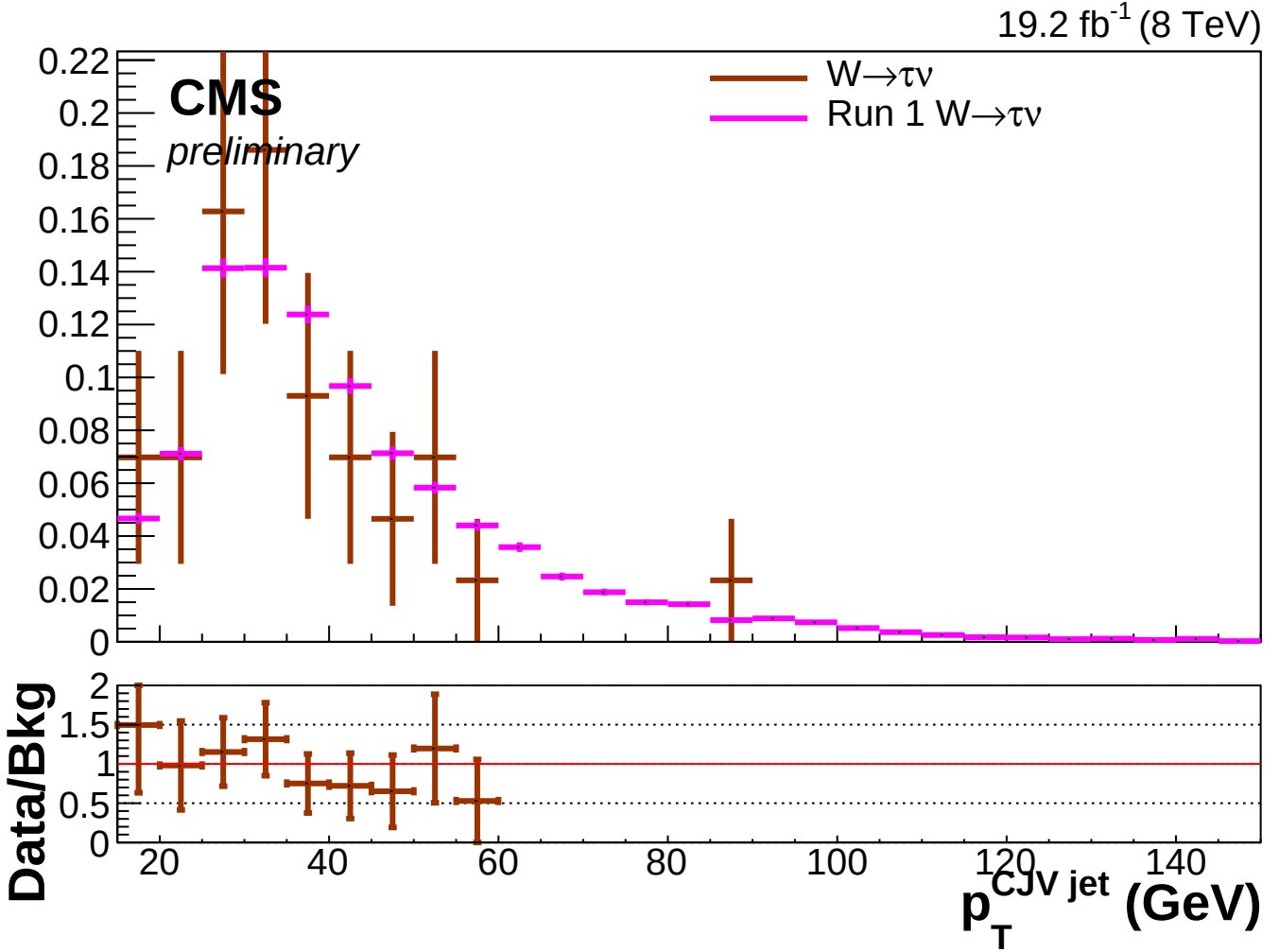

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
50
100
150
200
250
300
350
pTj1 (GeV)

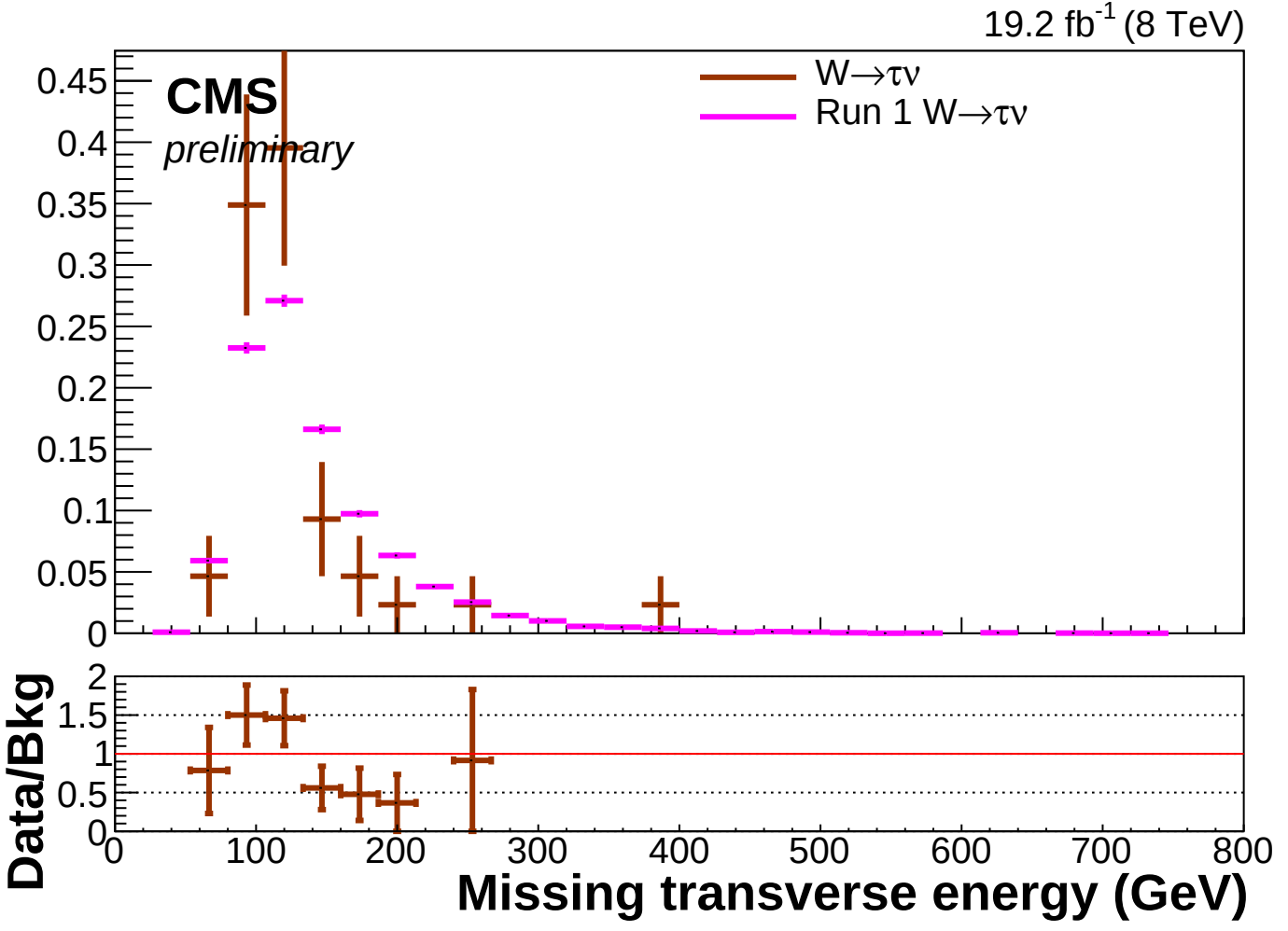

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
-5
-4
-3
-2
-1
0
1
2
3
4
5
ηj2

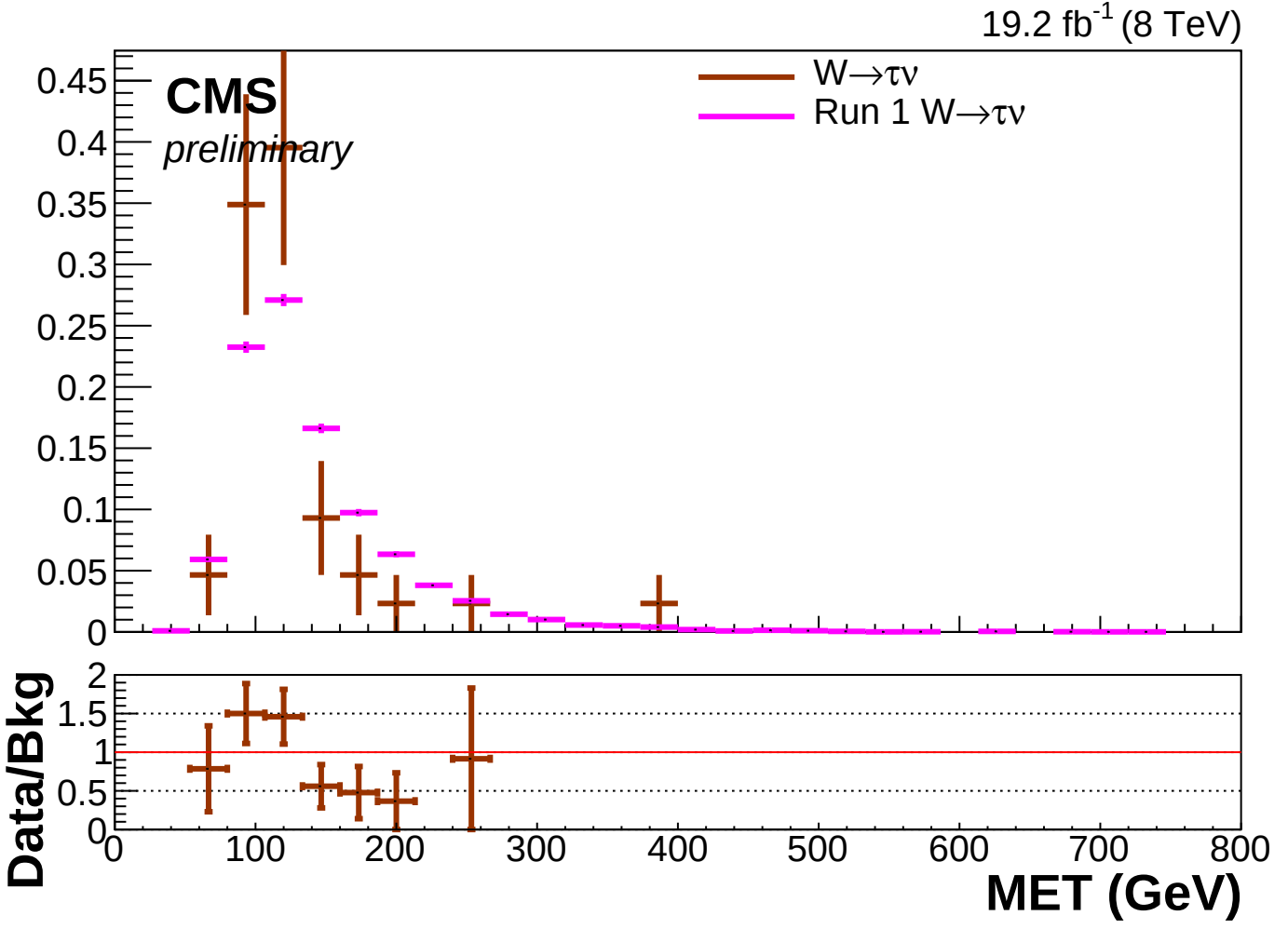

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
-5
-4
-3
-2
-1
0
1
2
3
4
5
ηj1

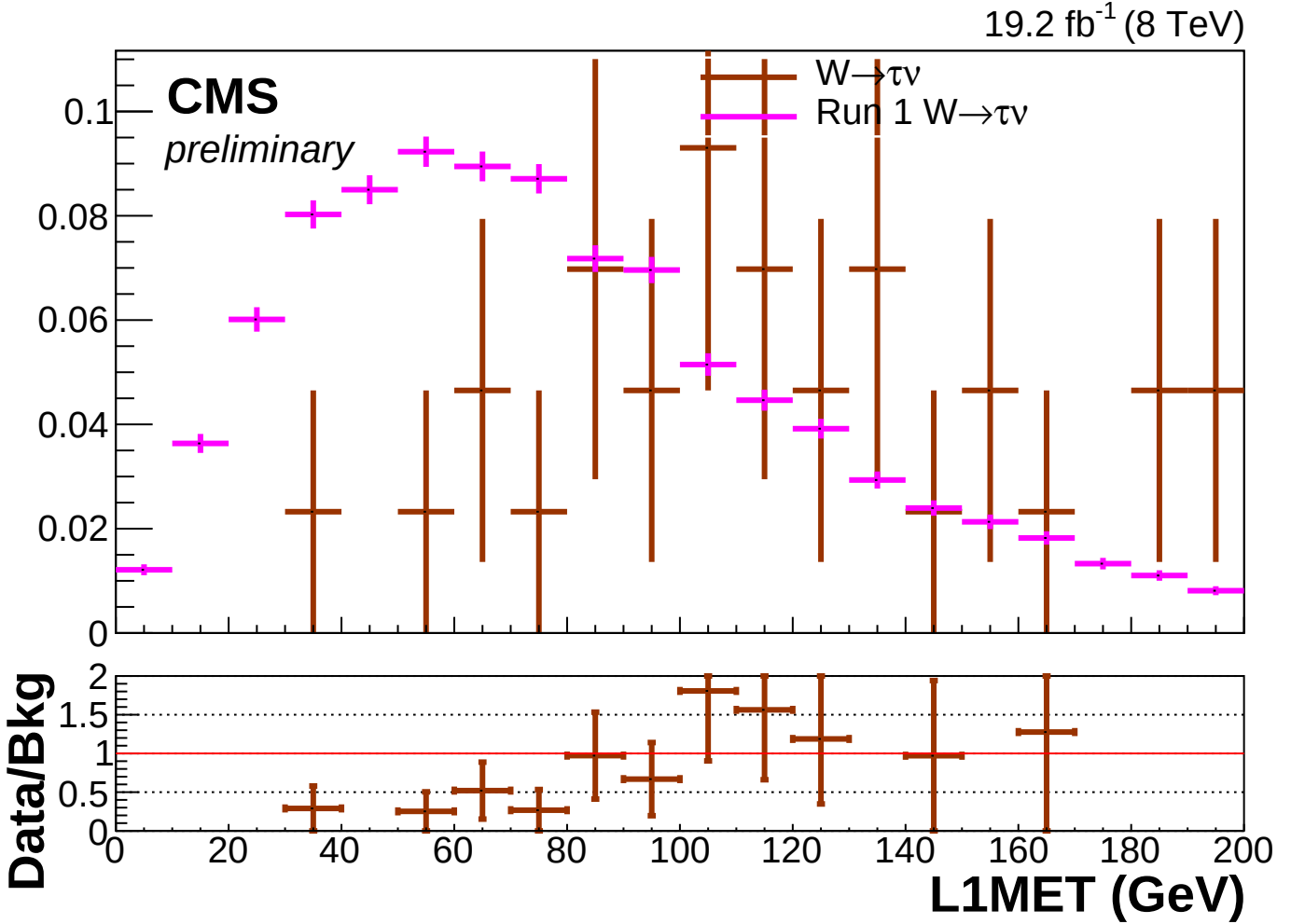

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
-3
-2
-1
0
1
2
3
Φj1

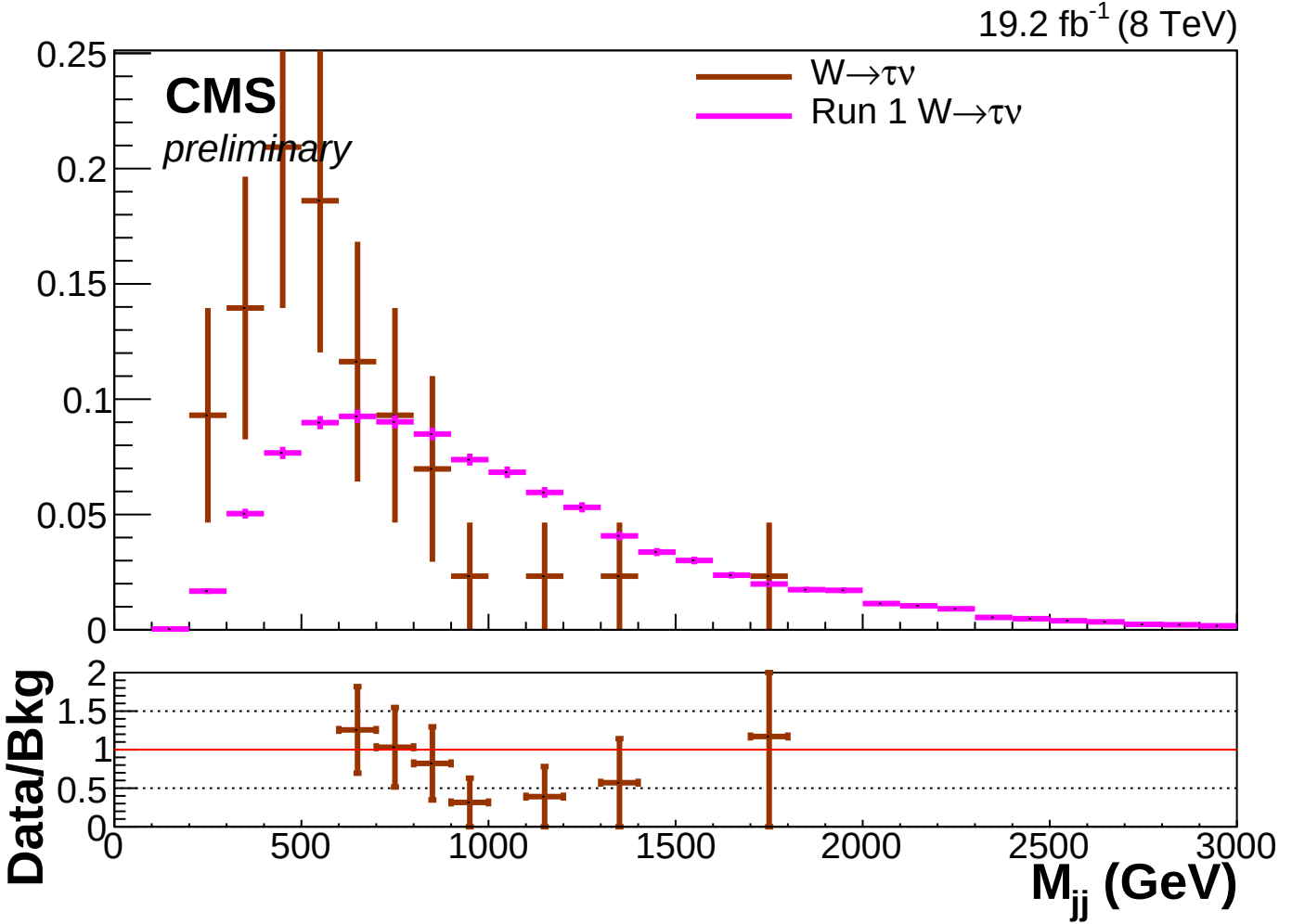

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
-3
-2
-1
0
1
2
3
φj2

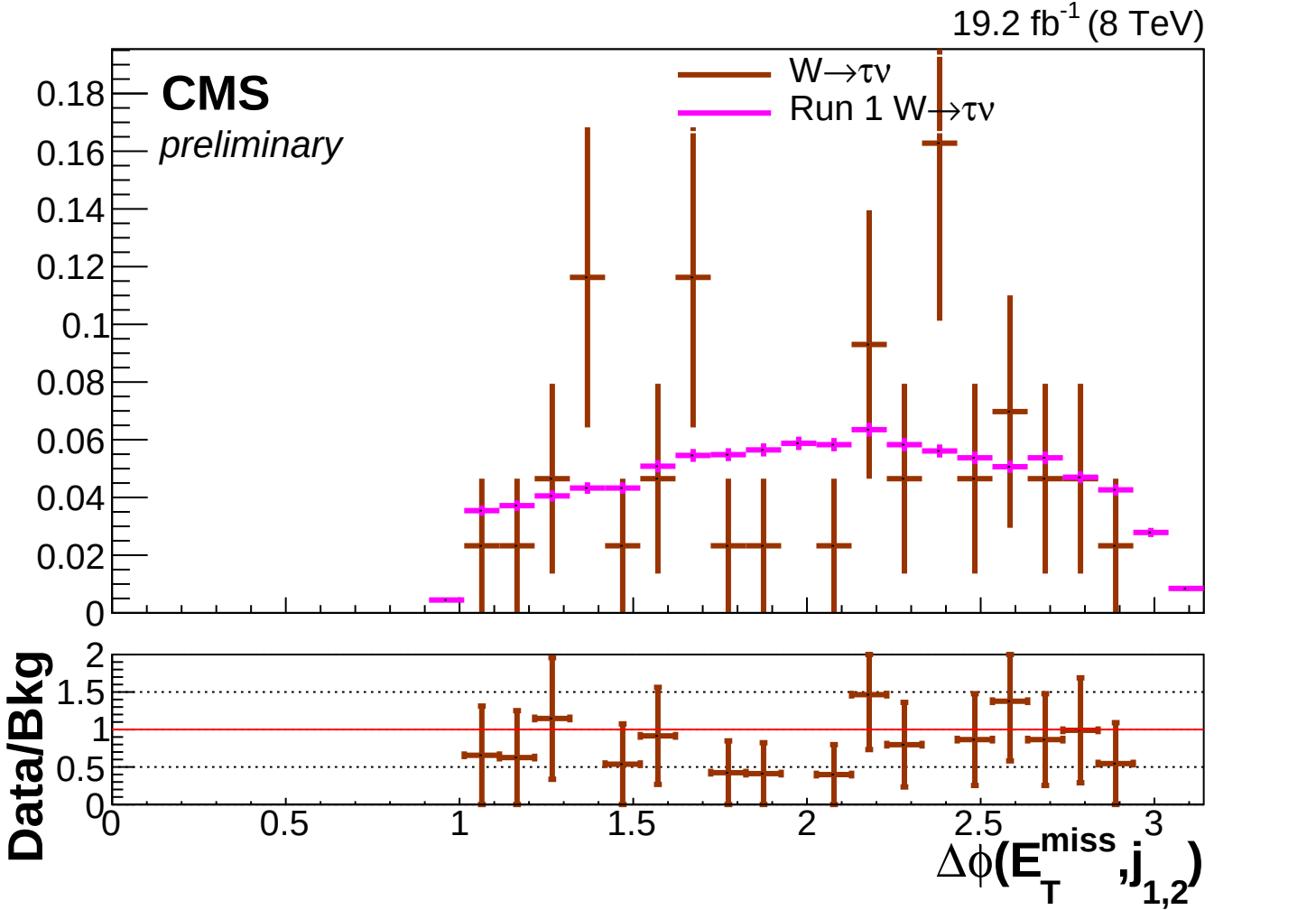

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
20
40
60
80
100
120
140
pTCJV jet (GeV)

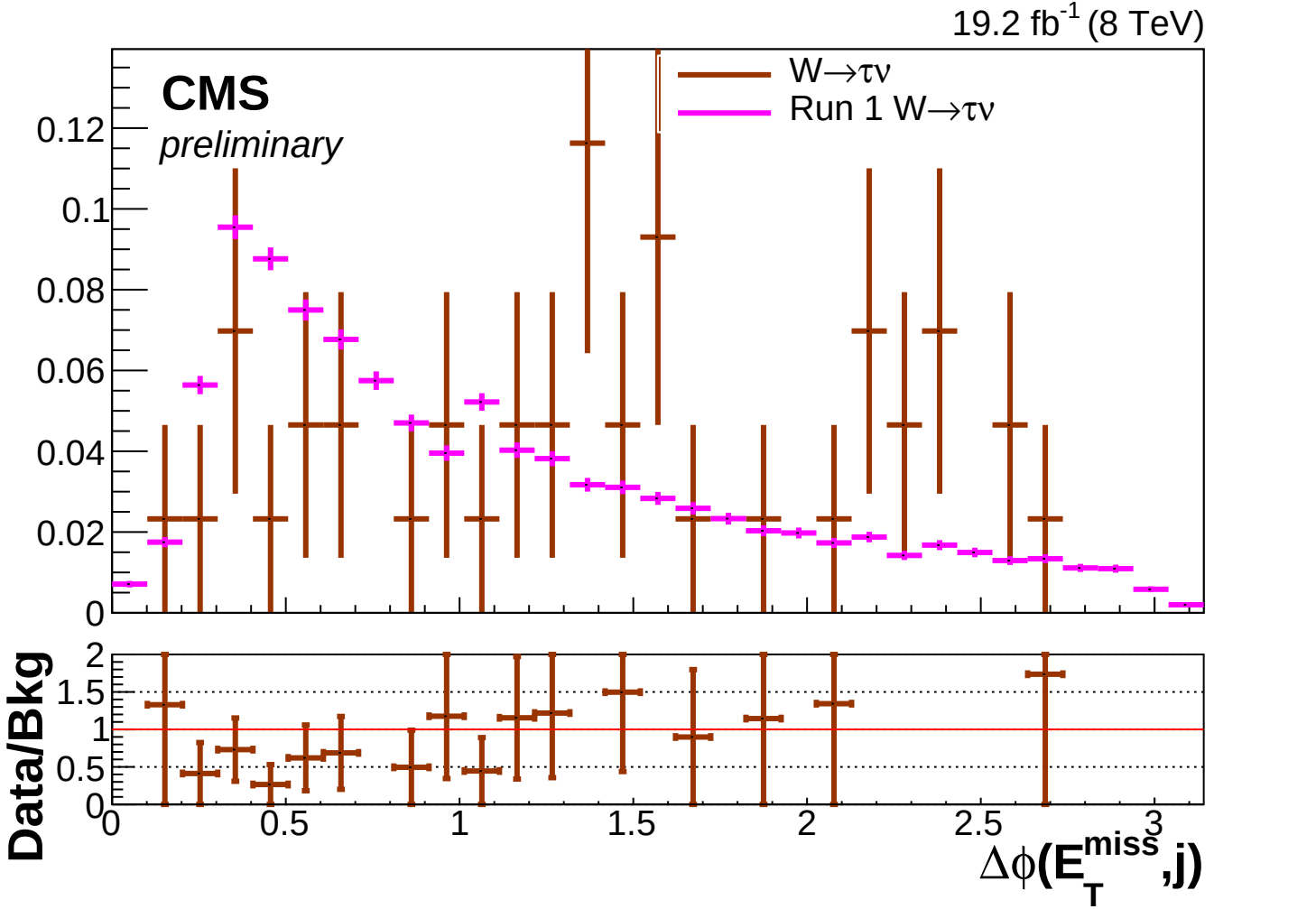

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
100
200
300
400
500
600
700
800
Missing transverse energy (GeV)

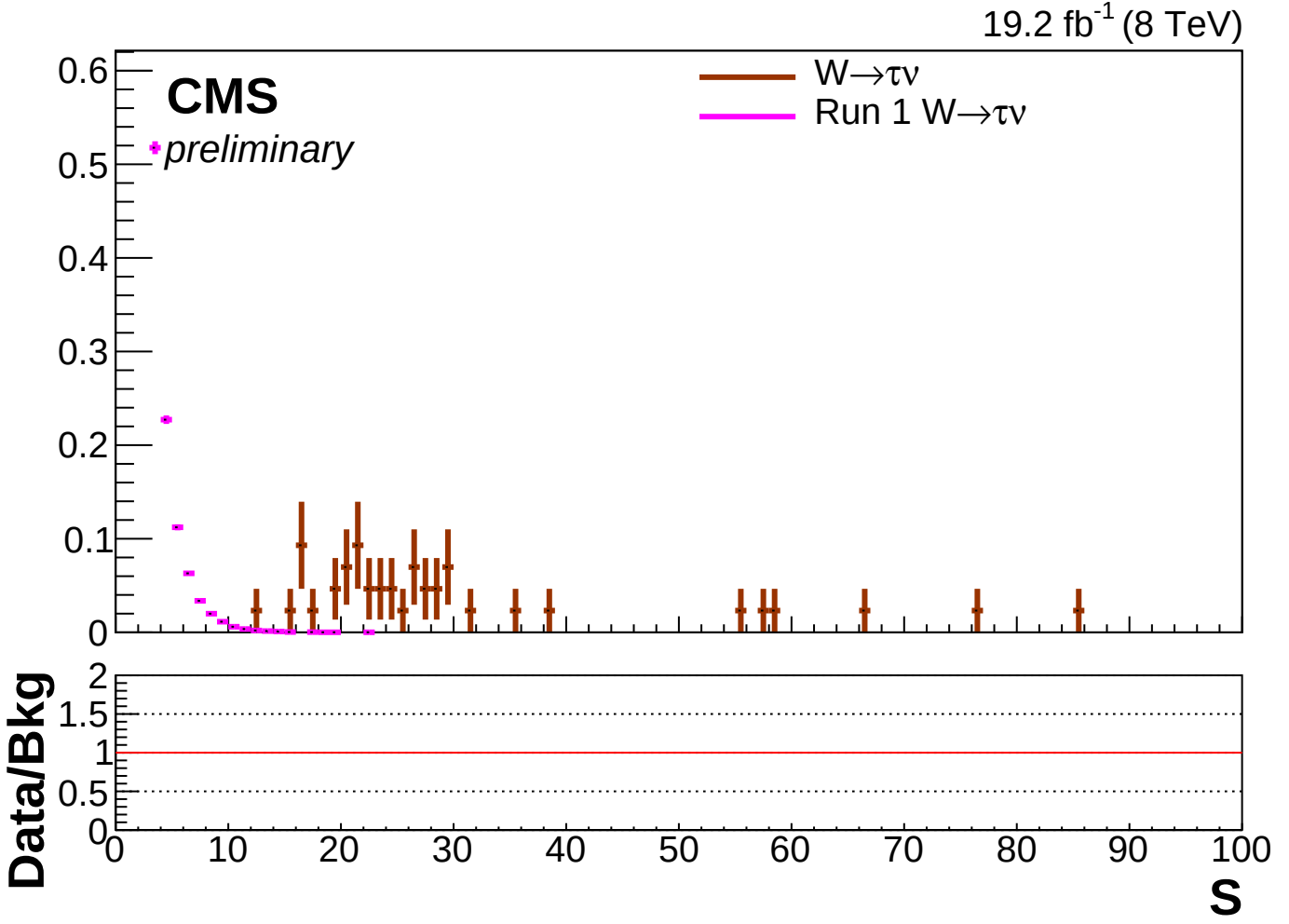

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
100
200
300
400
500
600
700
800
MET (GeV)

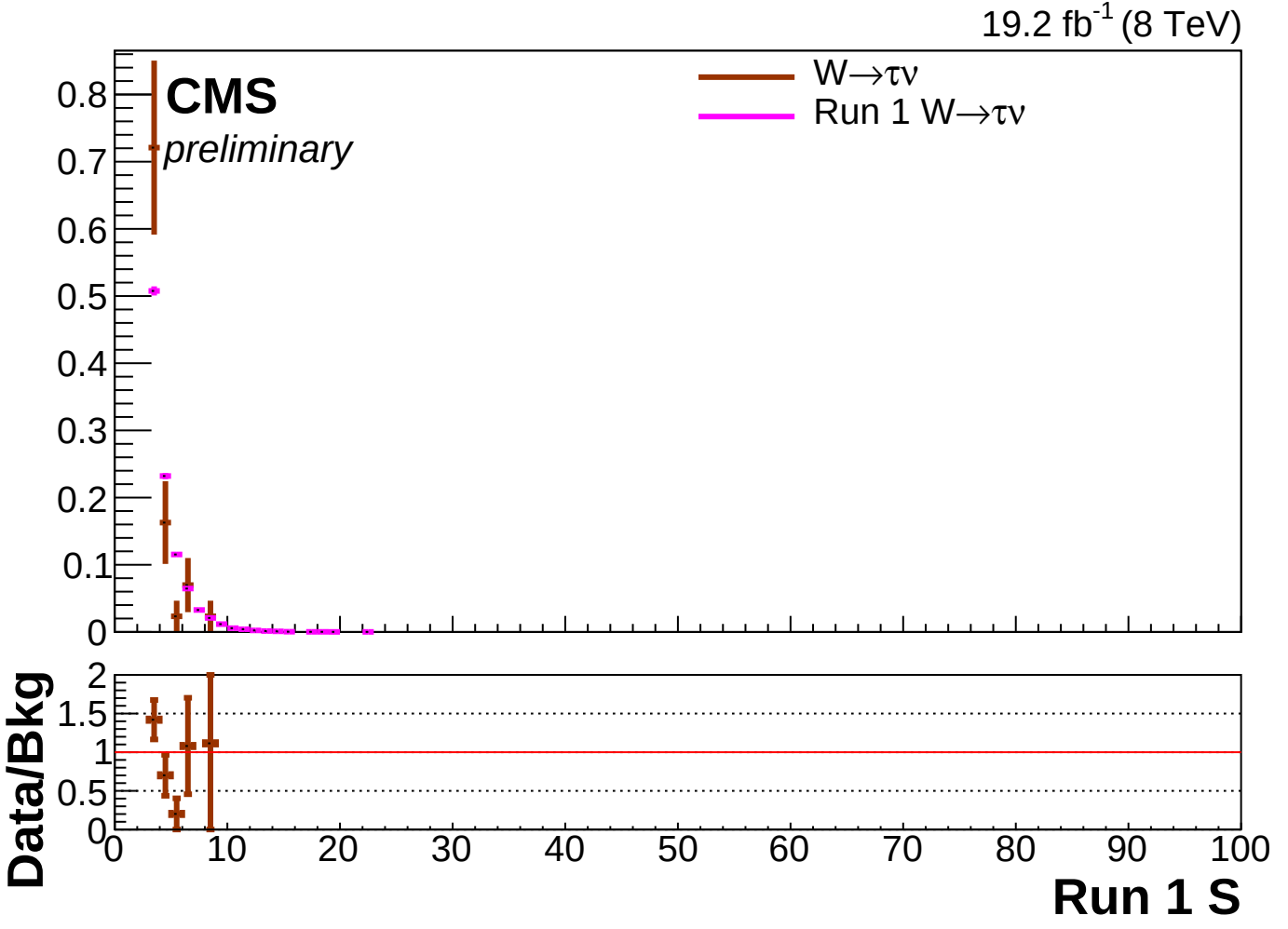

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
20
40
60
80
100
120
140
160
180
200
L1MET (GeV)

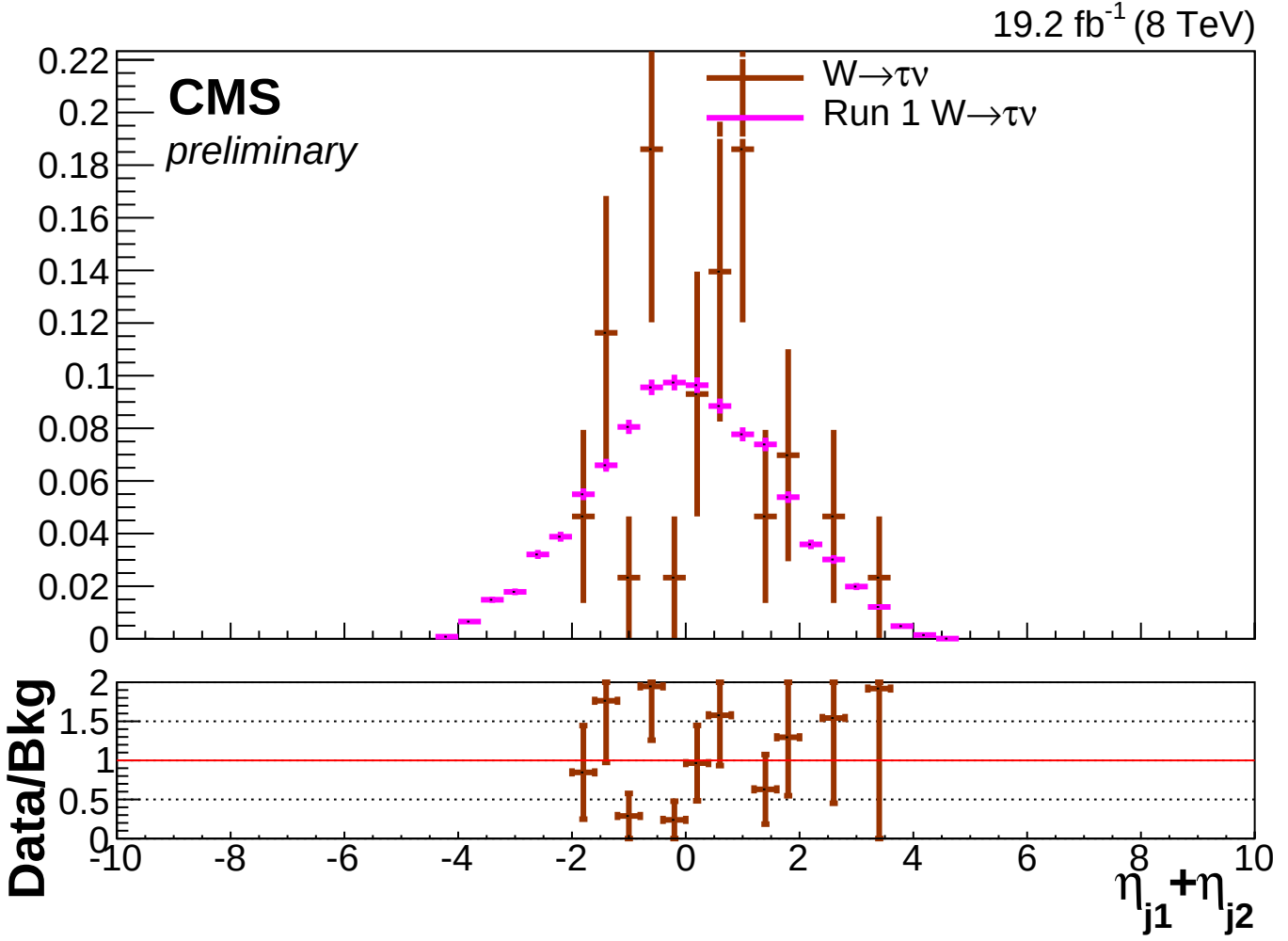

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
500
1000
1500
2000
2500
3000
Mjj (GeV)

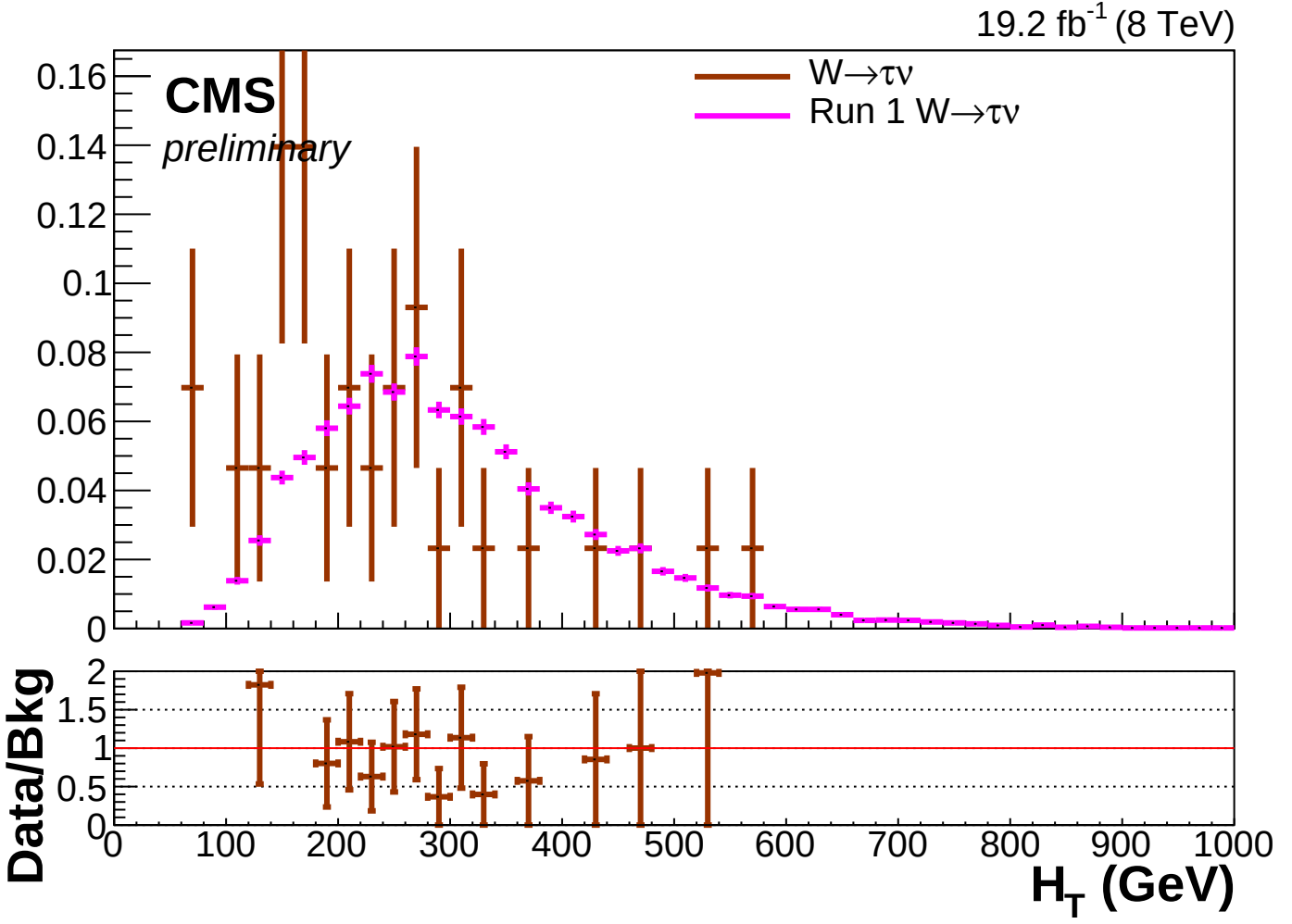

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
Δφ(E_T^miss, j_1,2)

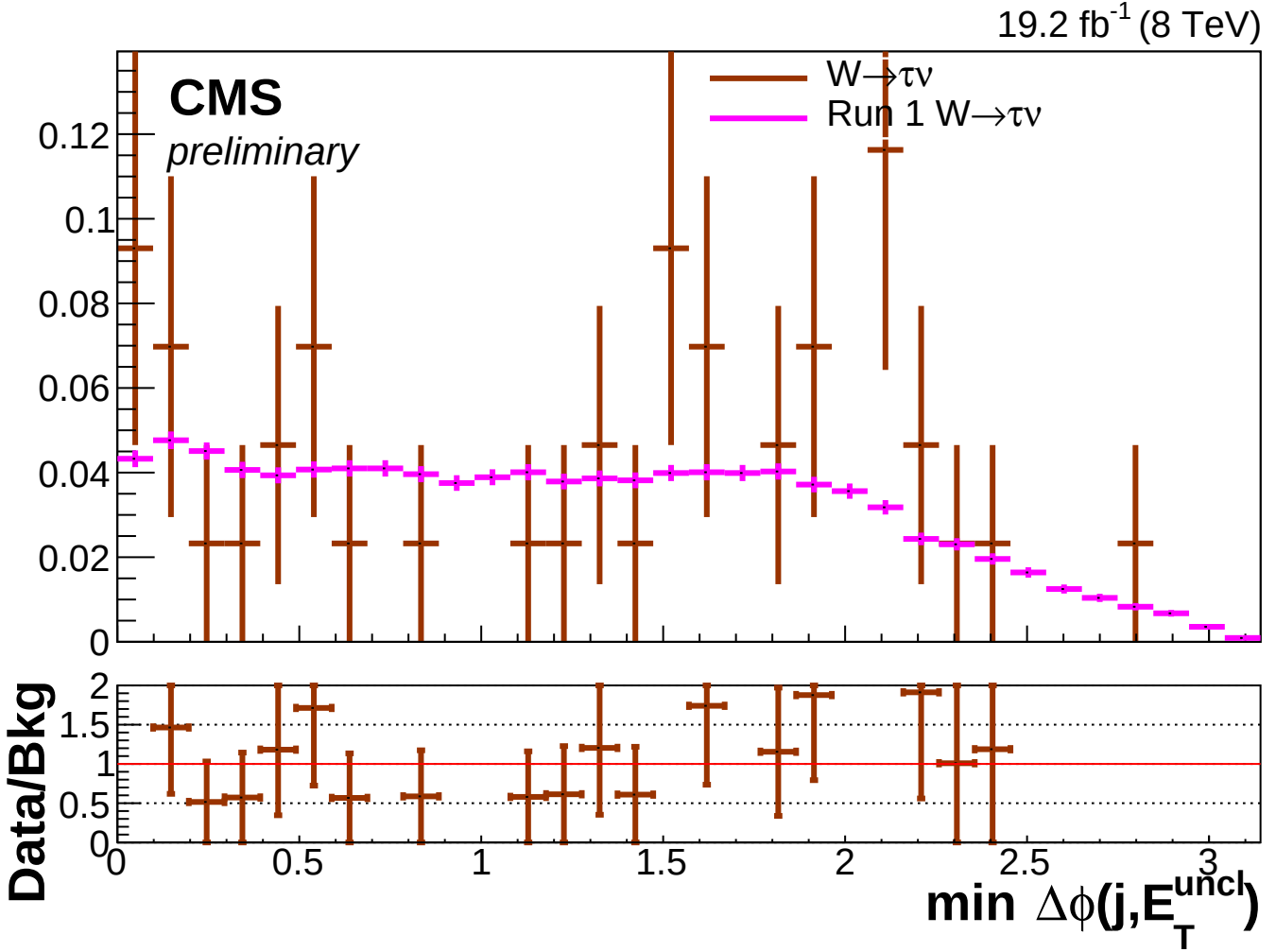

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
Δφ(E_T^miss,j)

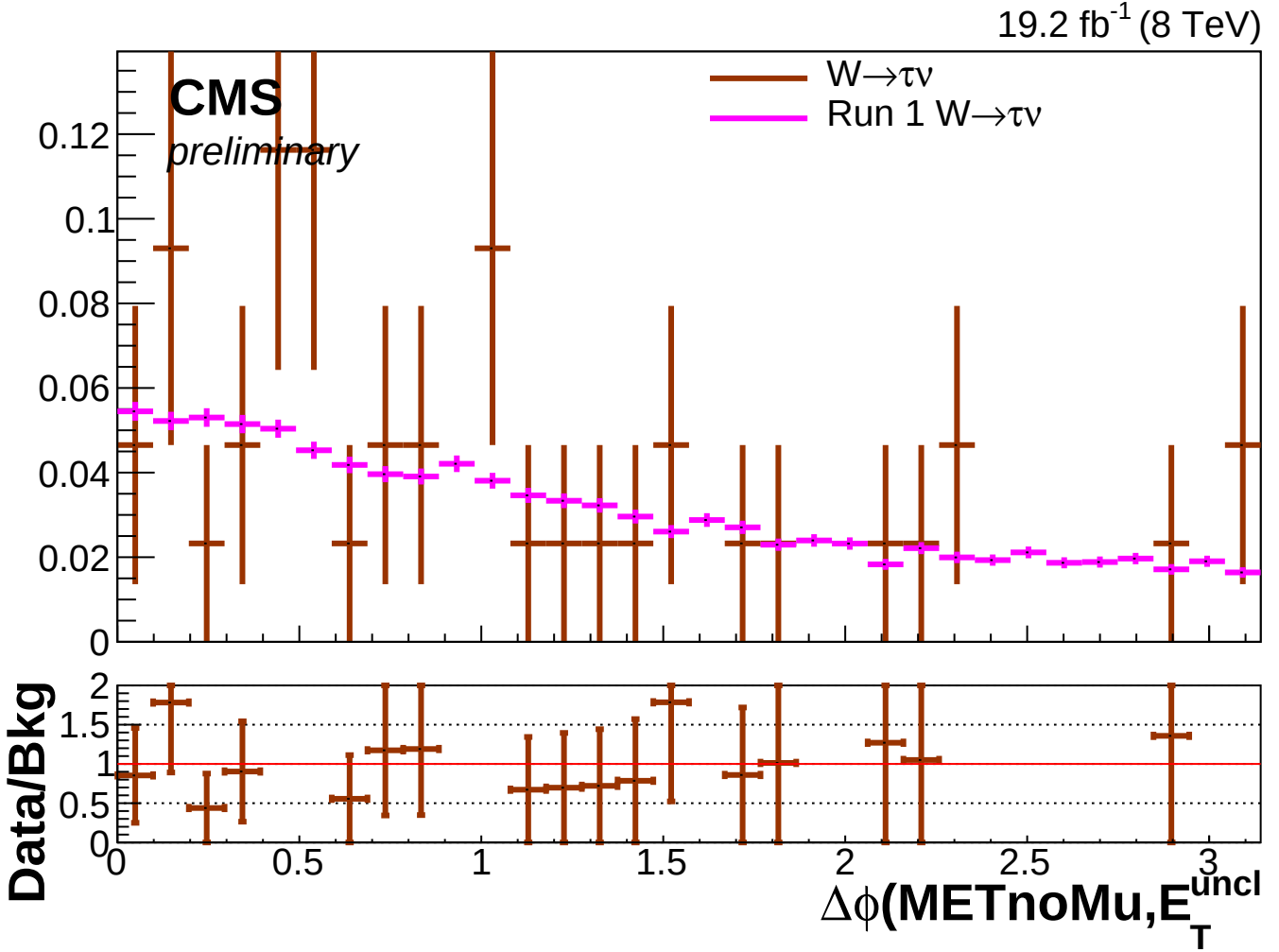

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.6
0.5
0.4
0.3
0.2
0.1
0
Data/Bkg
2
1.5
1
0.5
0
0
10
20
30
40
50
60
70
80
90
100
S

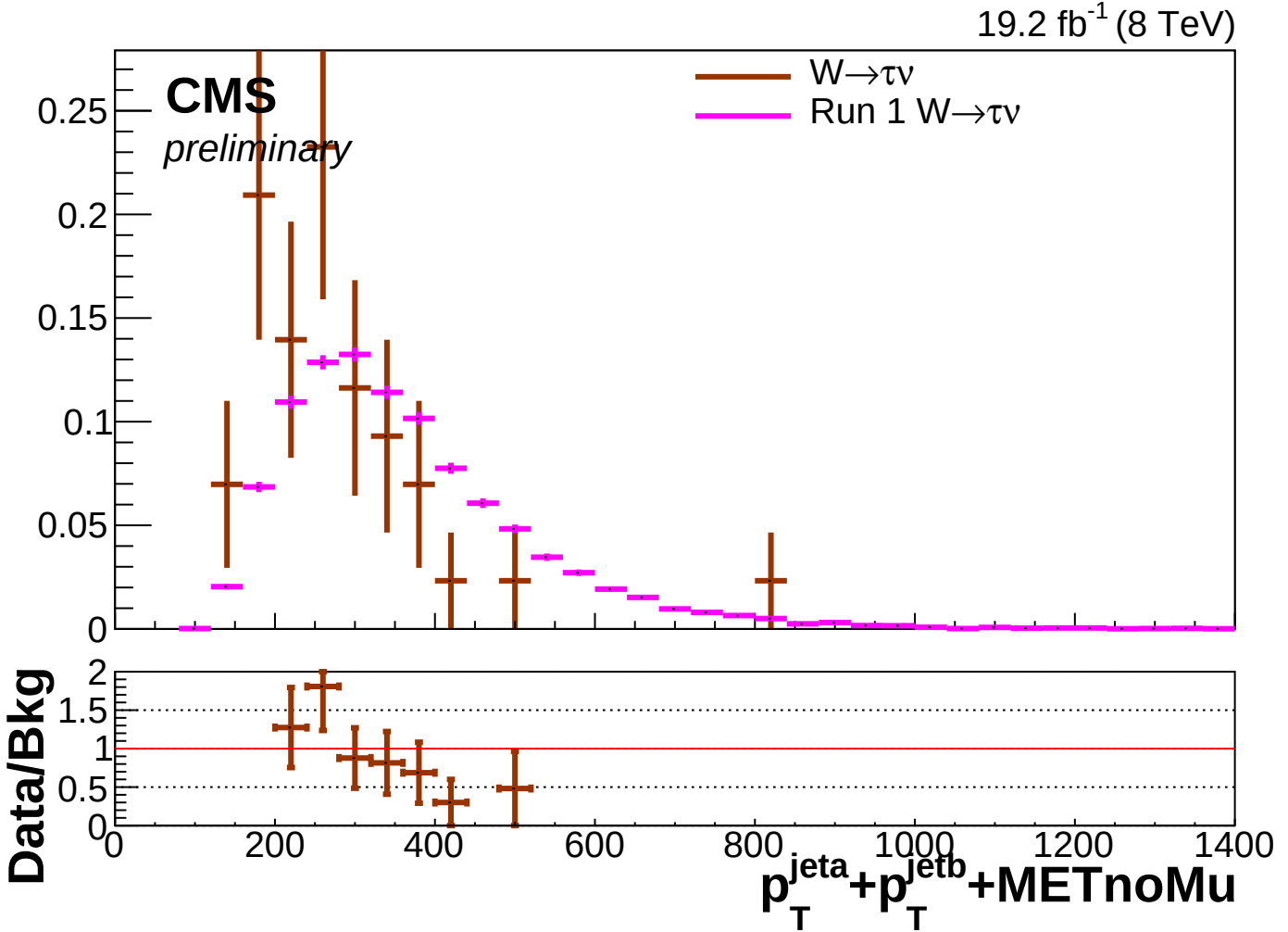

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Data/Bkg
2
1.5
1
0.5
0
0
10
20
30
40
50
60
70
80
90
100
Run 1 S

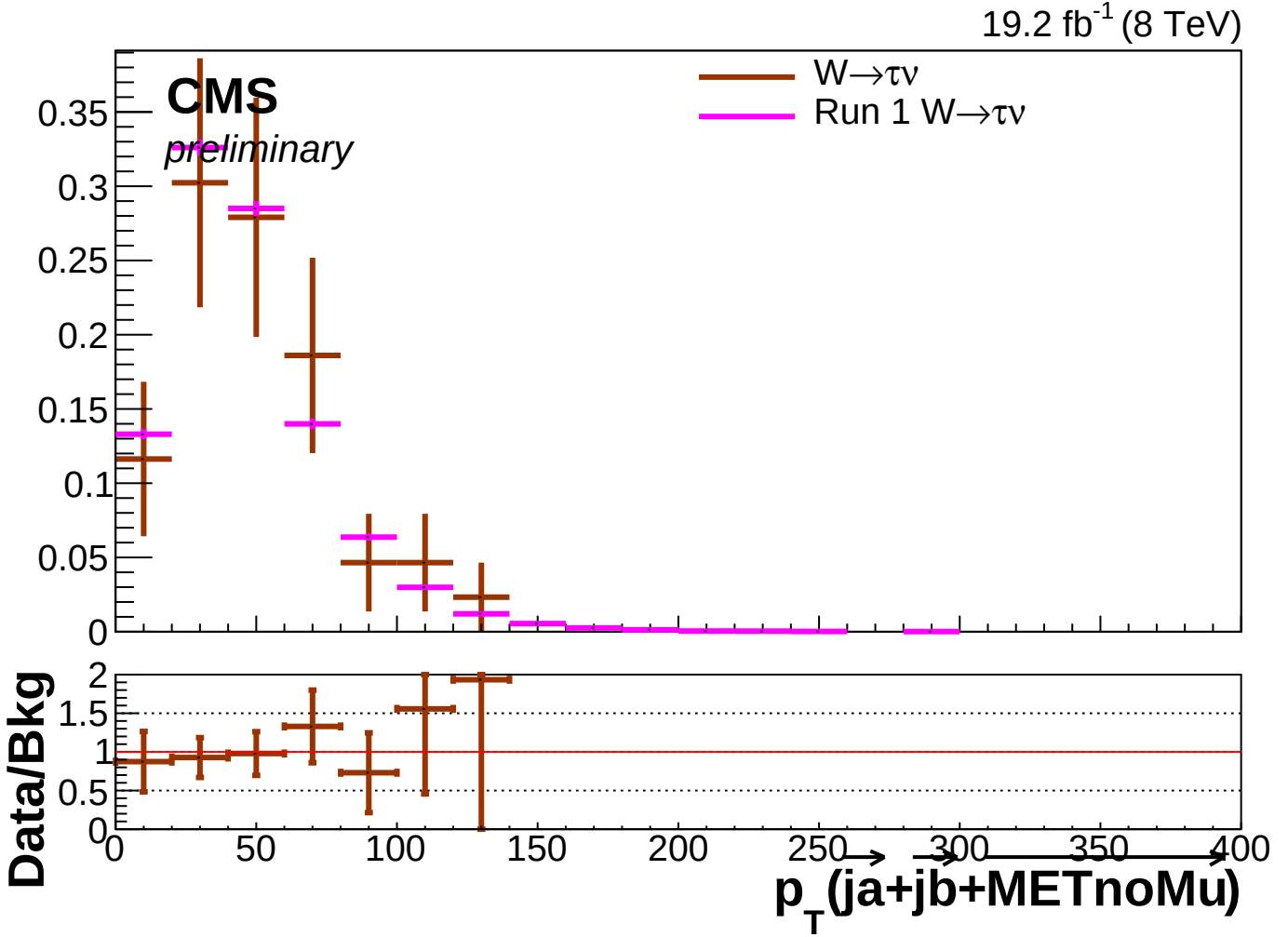

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
-10
-8
-6
-4
-2
0
2
4
6
8
10
ηj1+ηj2

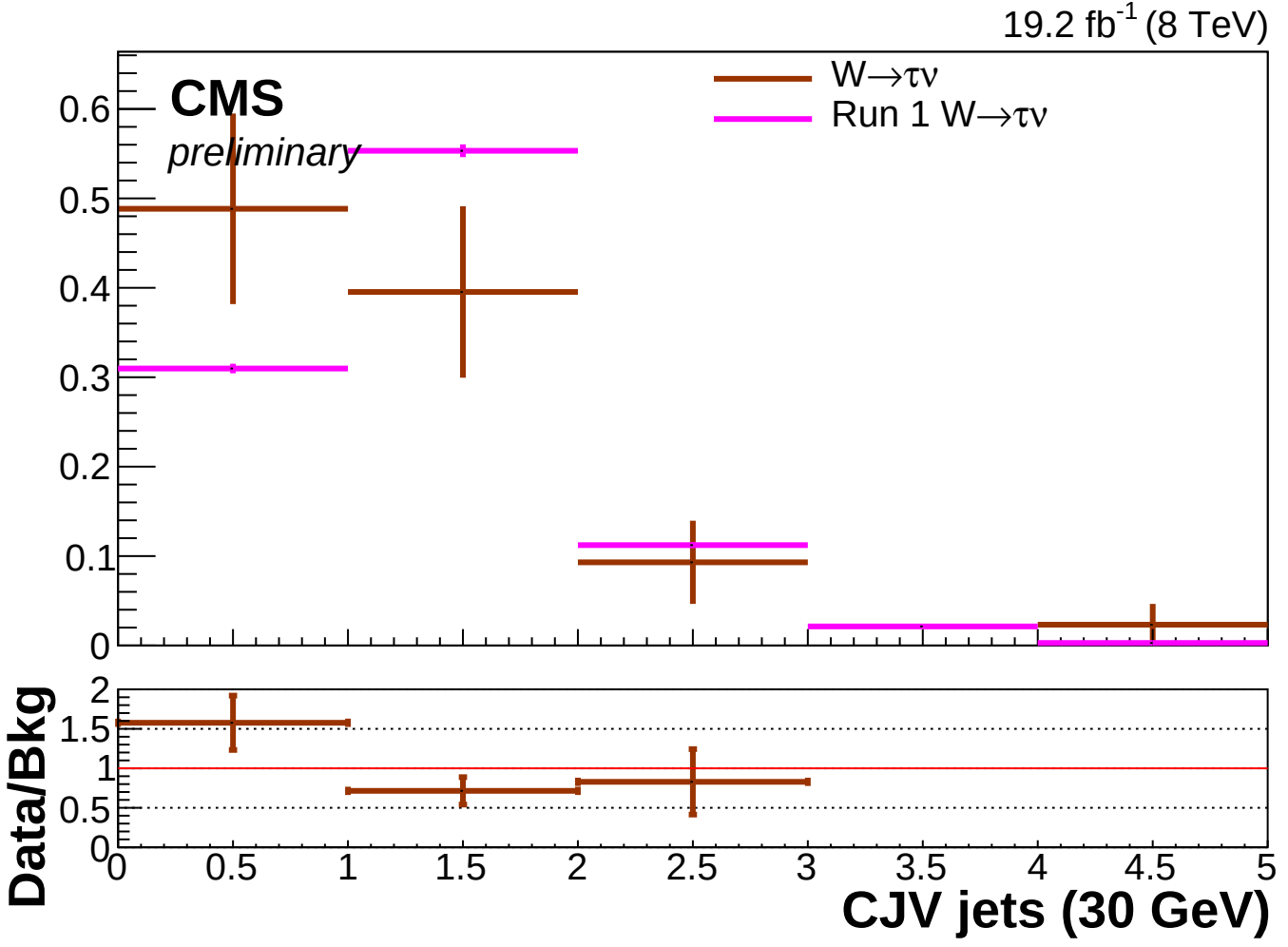

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
100
200
300
400
500
600
700
800
900
1000
HT (GeV)

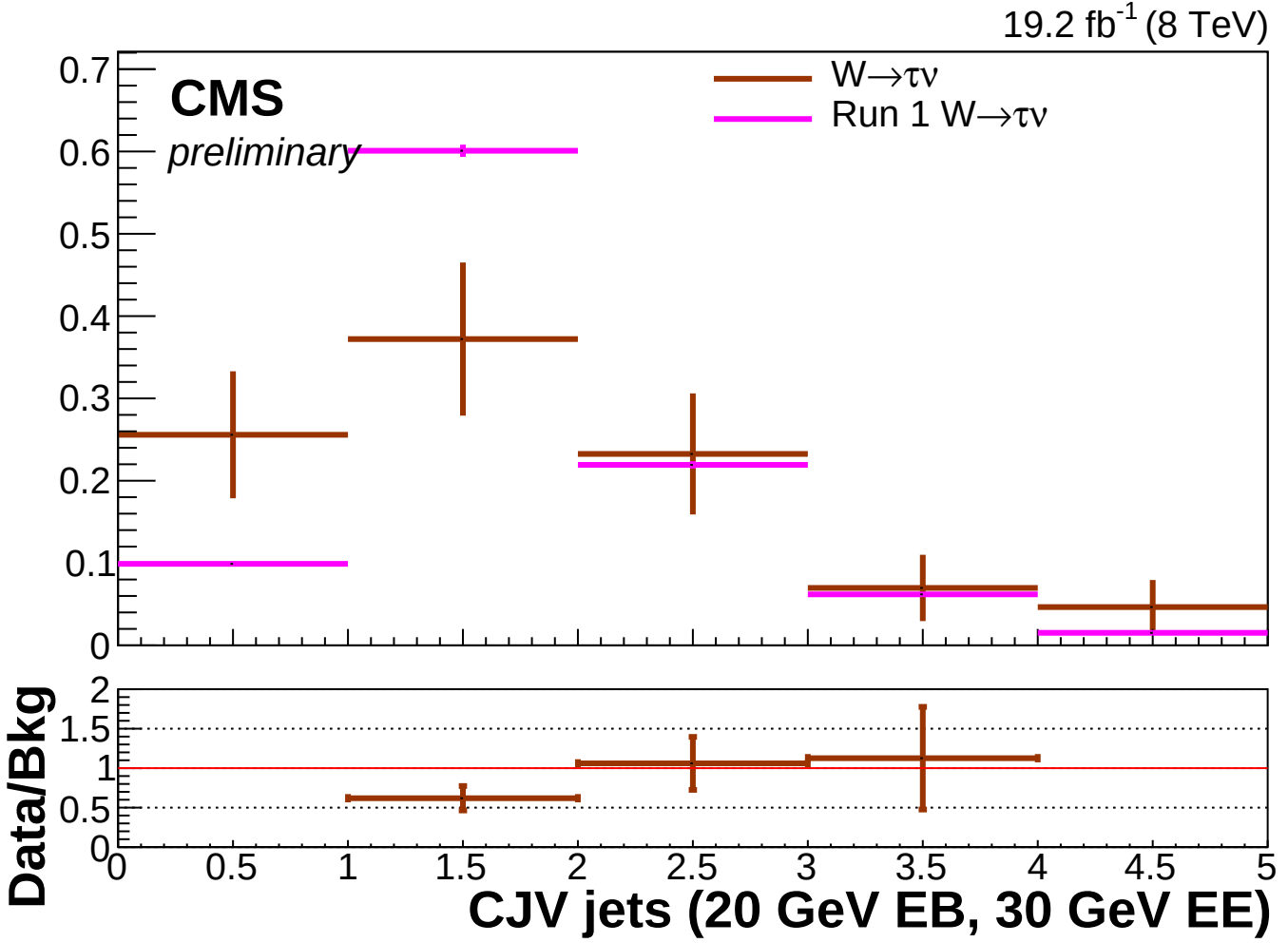

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
min Δφ(j,E_T^uncl)

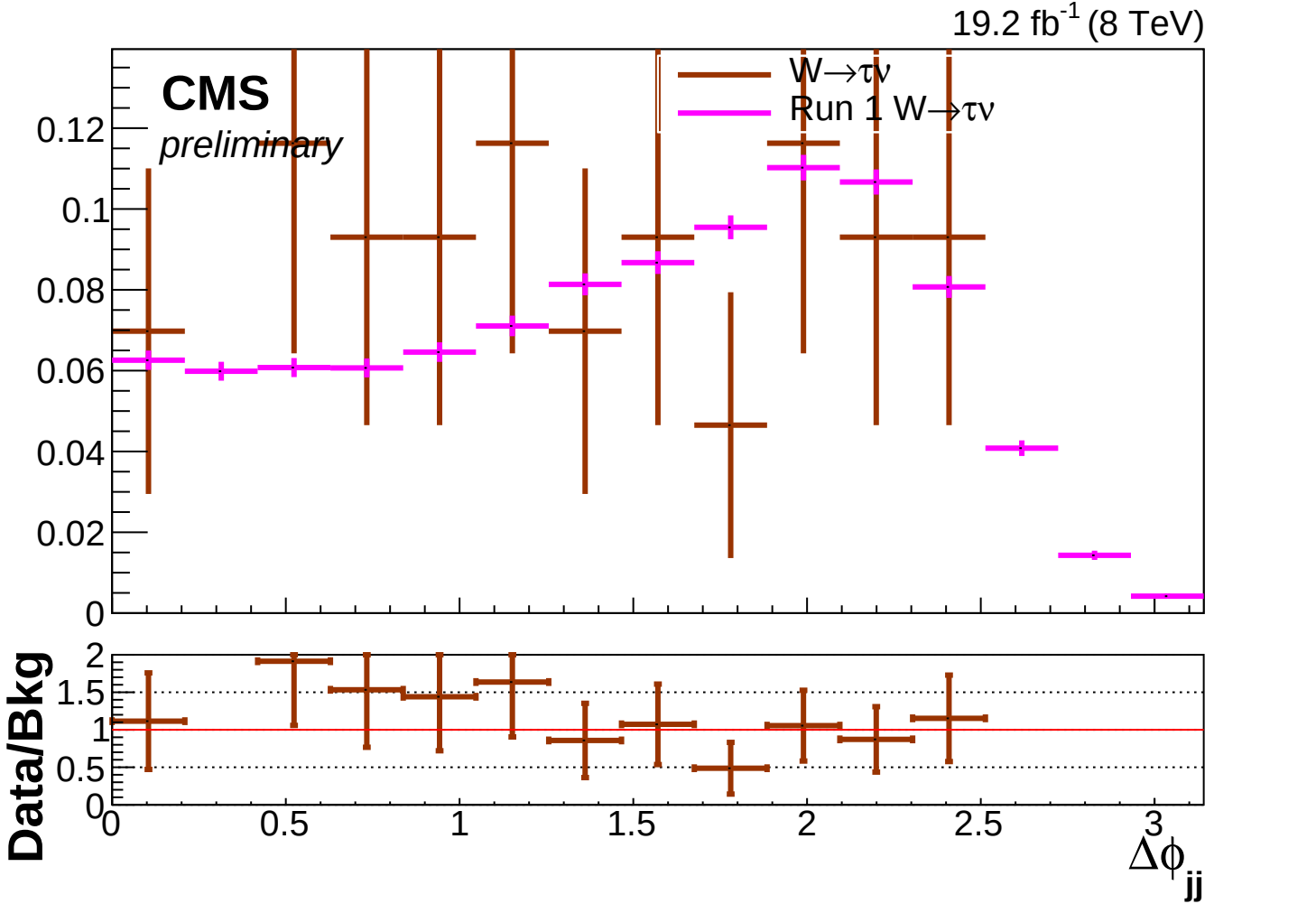

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
Δφ(METnoMu,E_T^uncl

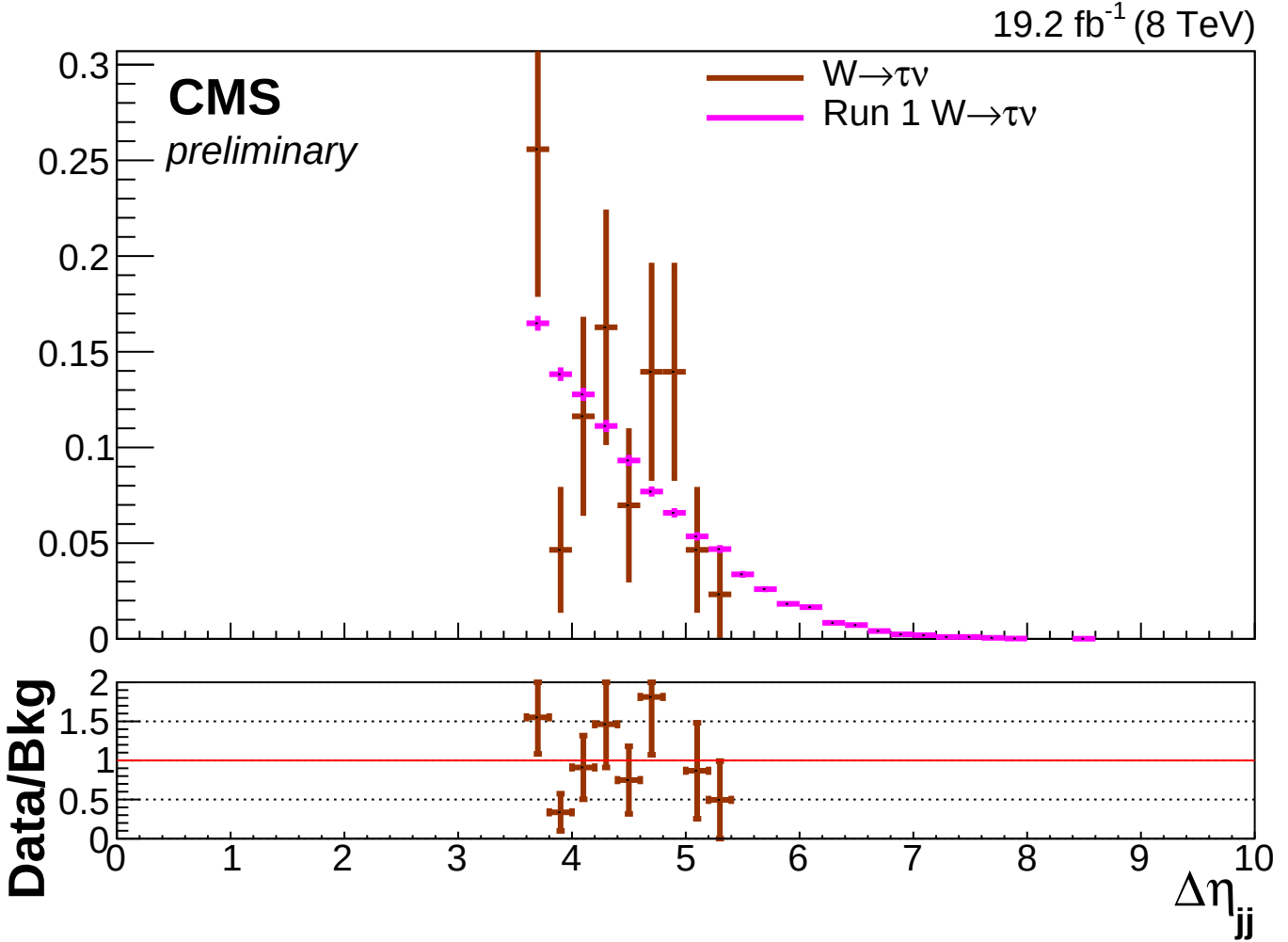

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
200
400
600
800
1000
1200
1400
pTjeta+pTjetb+METnoMu

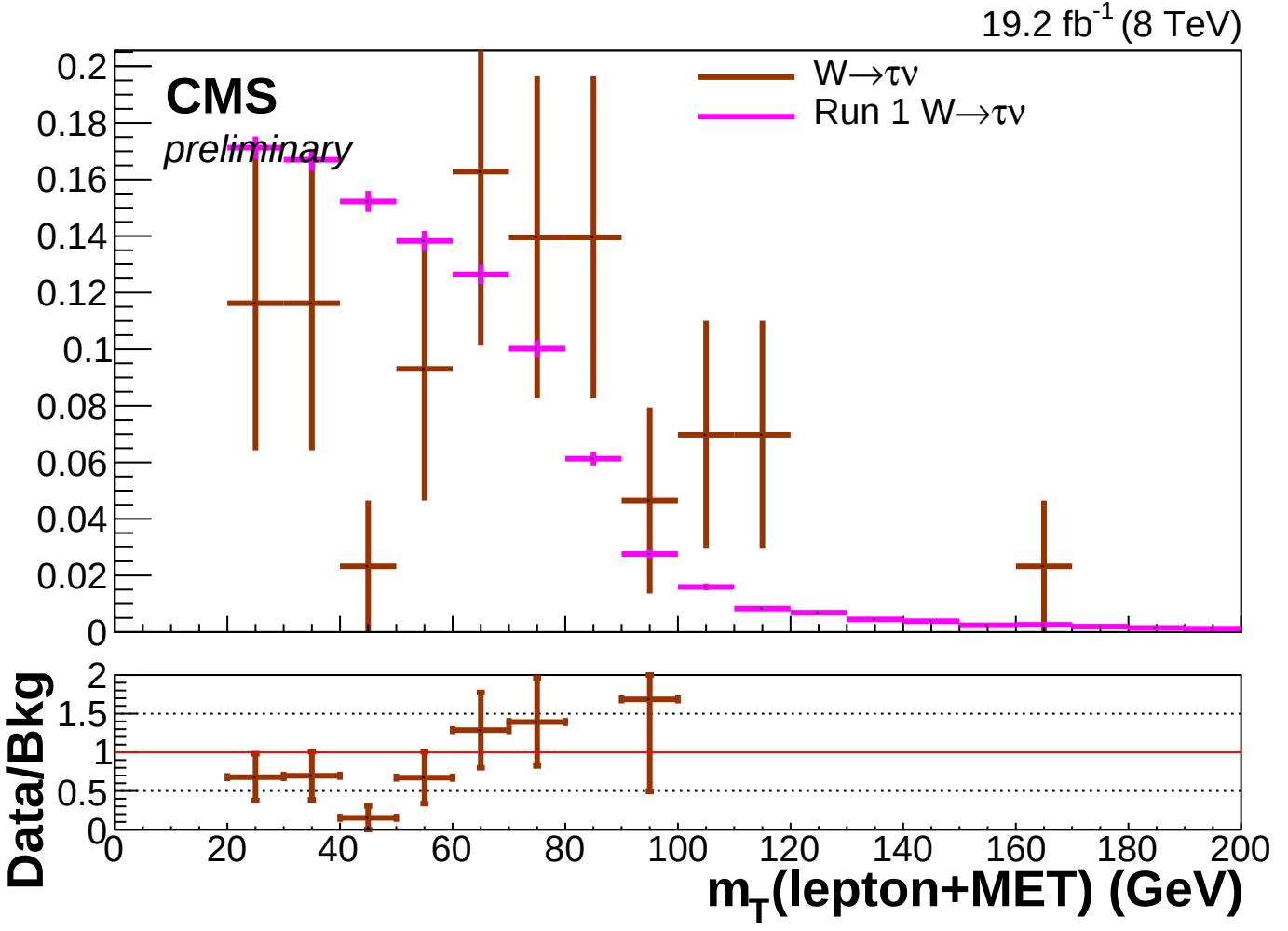

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
50
100
150
200
250
300
350
400
pT(ja+jb+METnoMu)

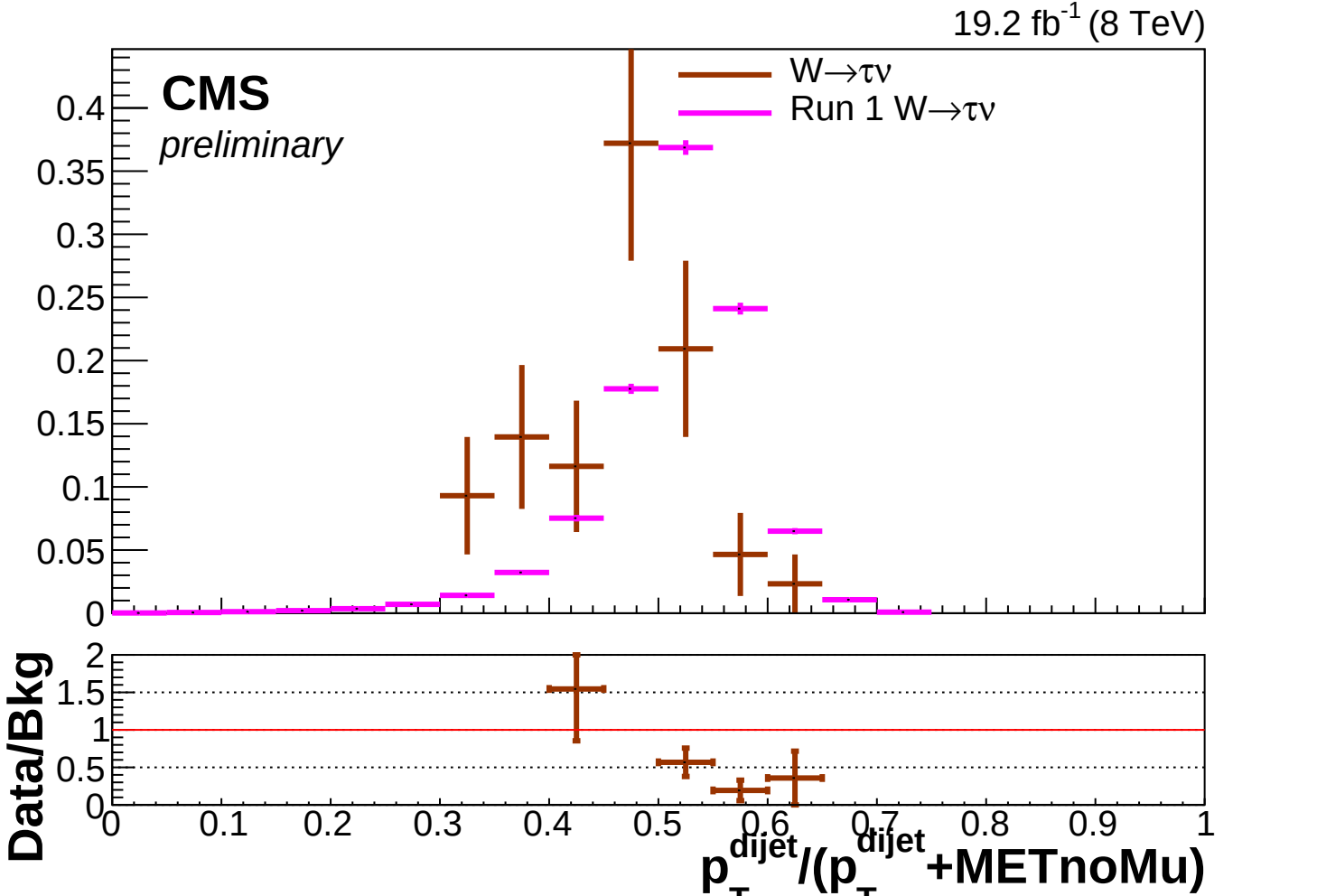

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.6
0.5
0.4
0.3
0.2
0.1
0
Data/Bkg
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
CJV jets (30 GeV)

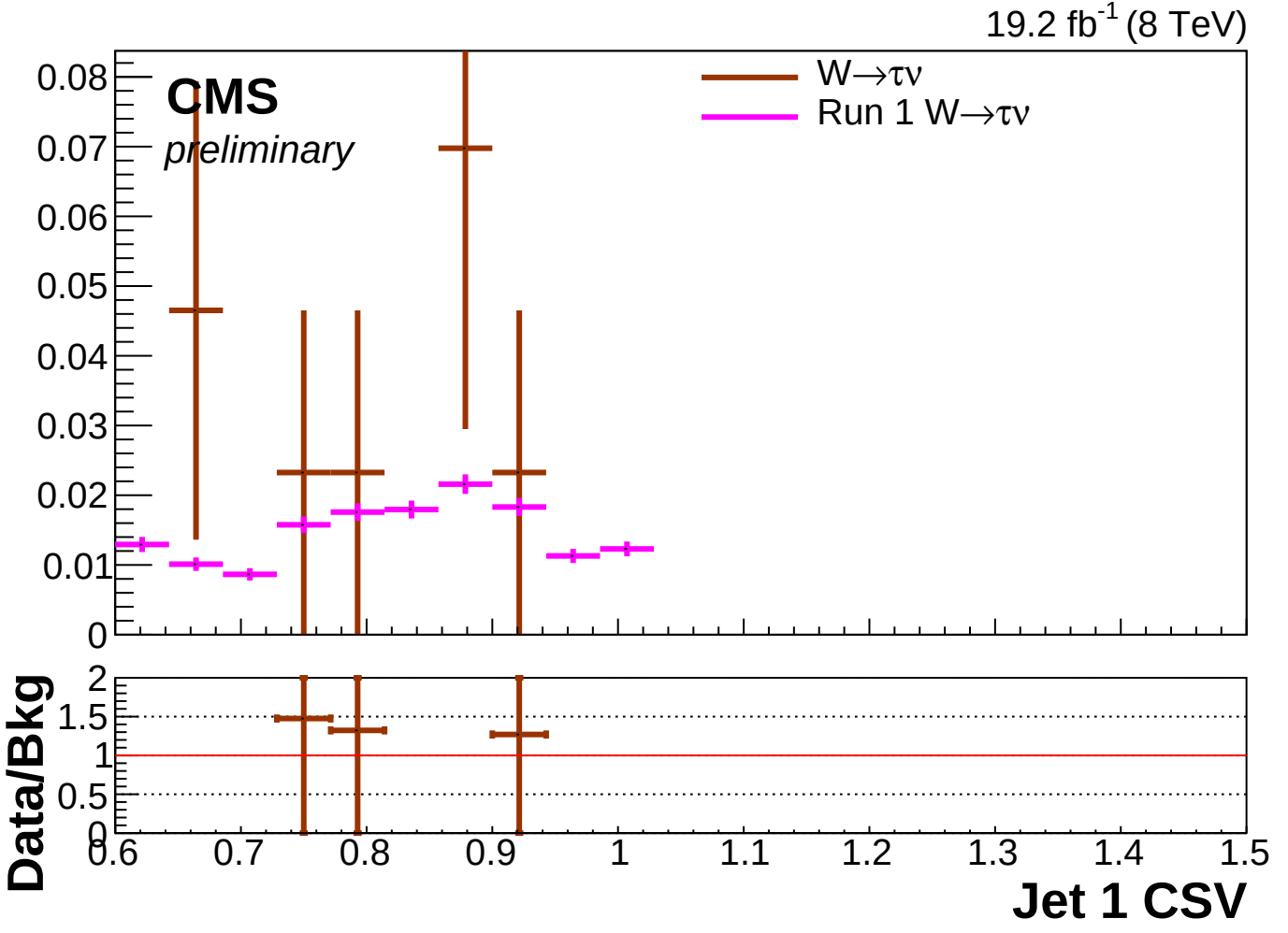

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Data/Bkg
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
CJV jets (20 GeV EB, 30 GeV EE)

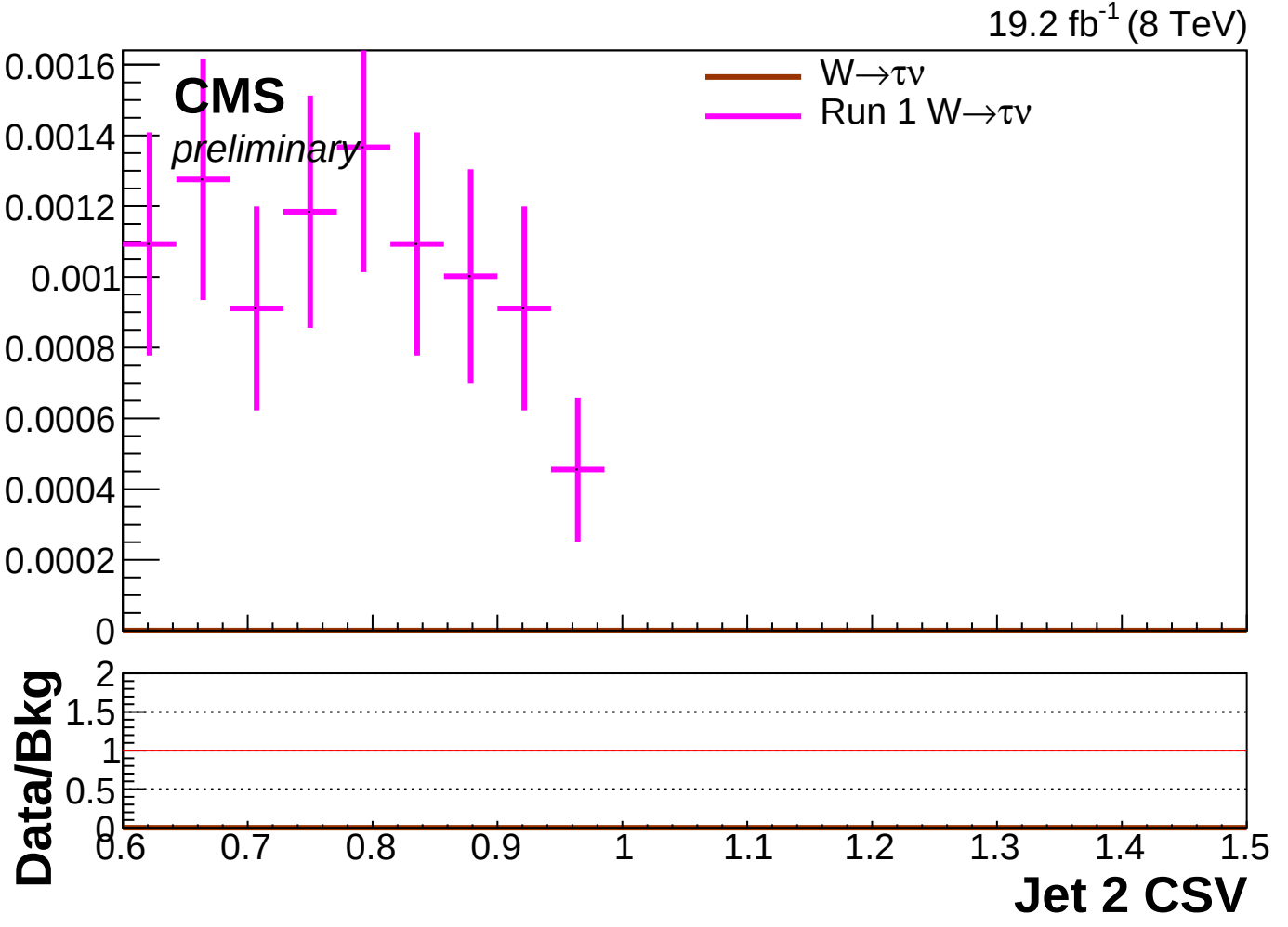

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
Δφjj

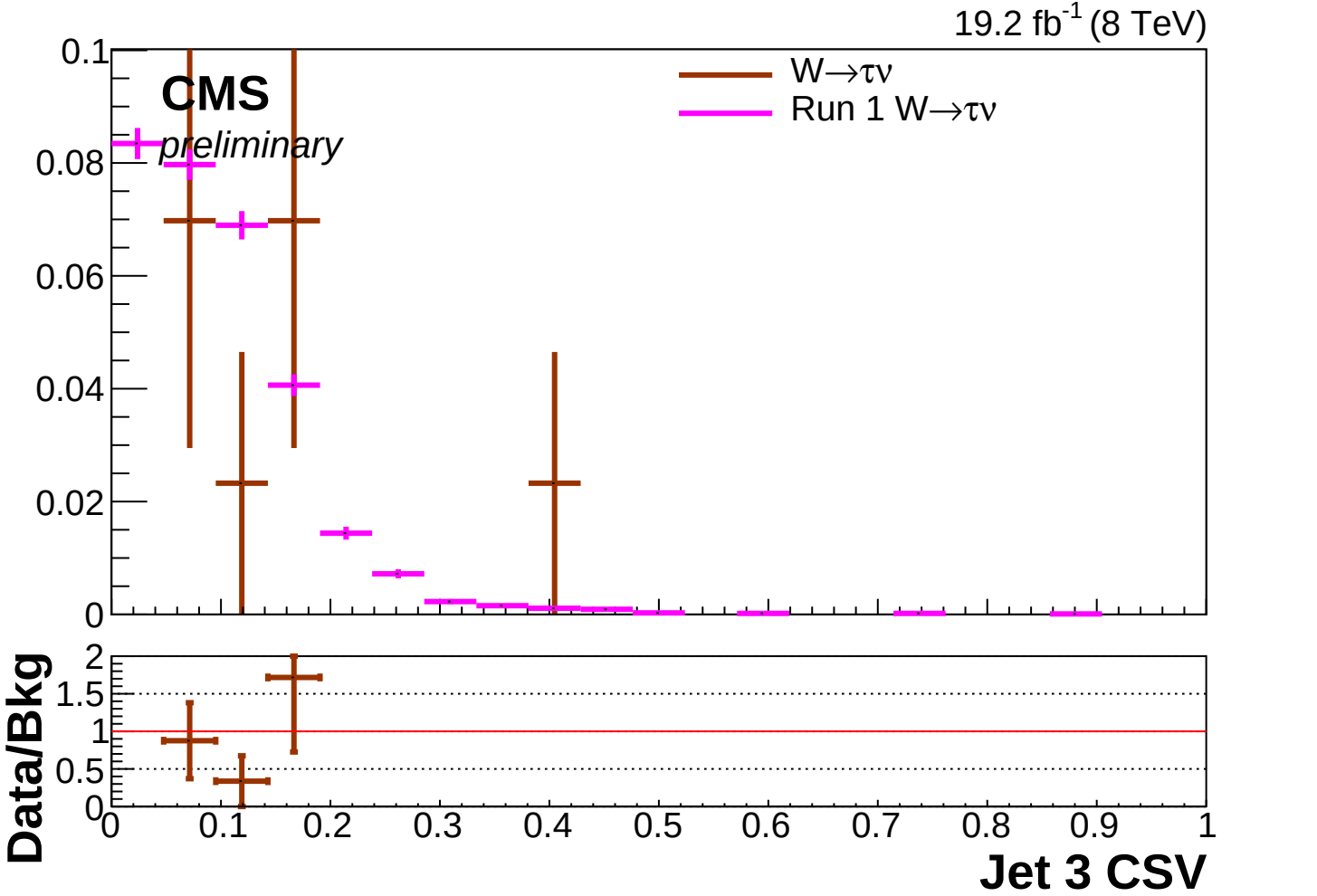

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
1
2
3
4
5
6
7
8
9
10
Δηjj

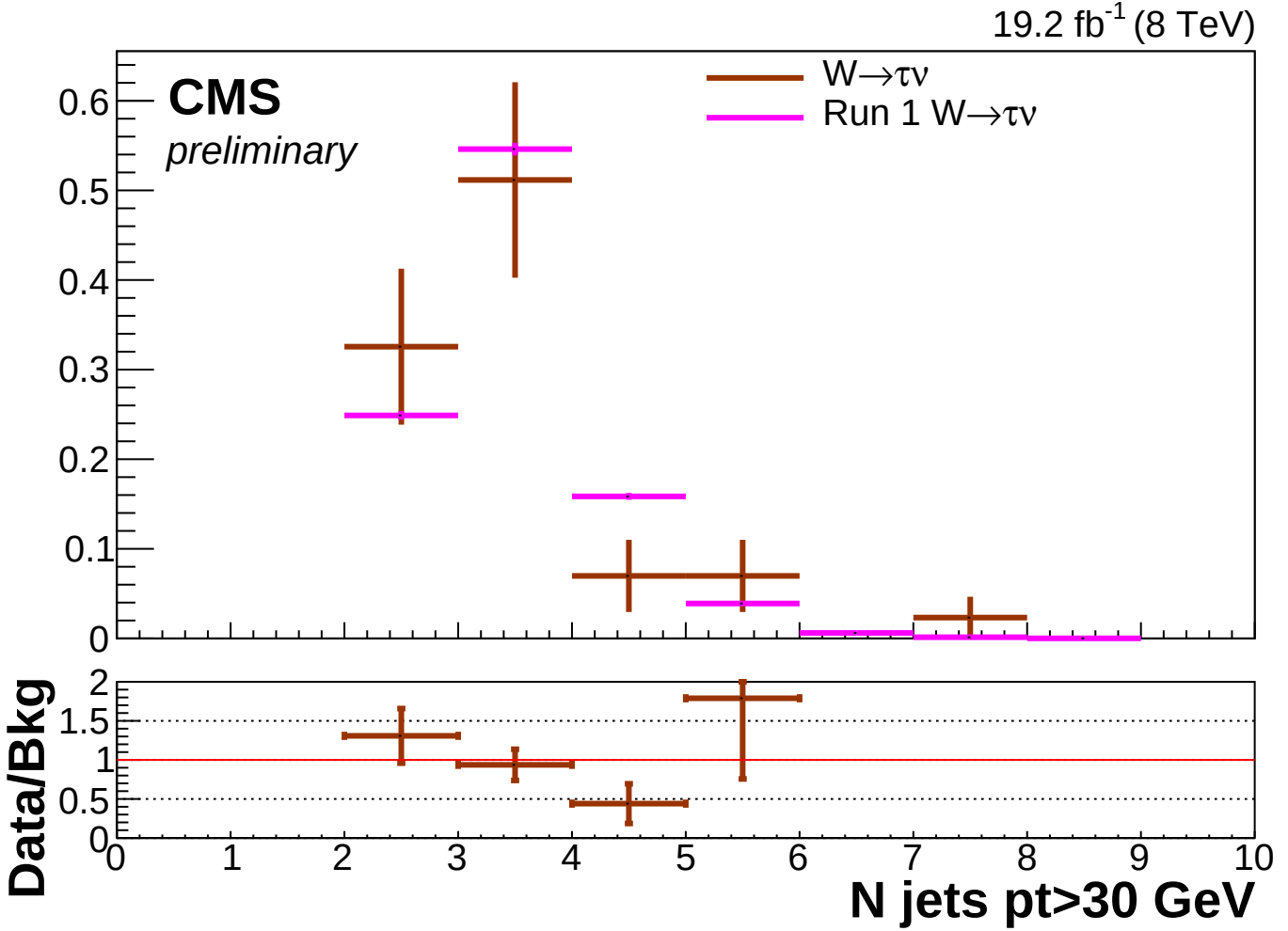

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
20
40
60
80
100
120
140
160
180
200
mT(lepton+MET) (GeV)

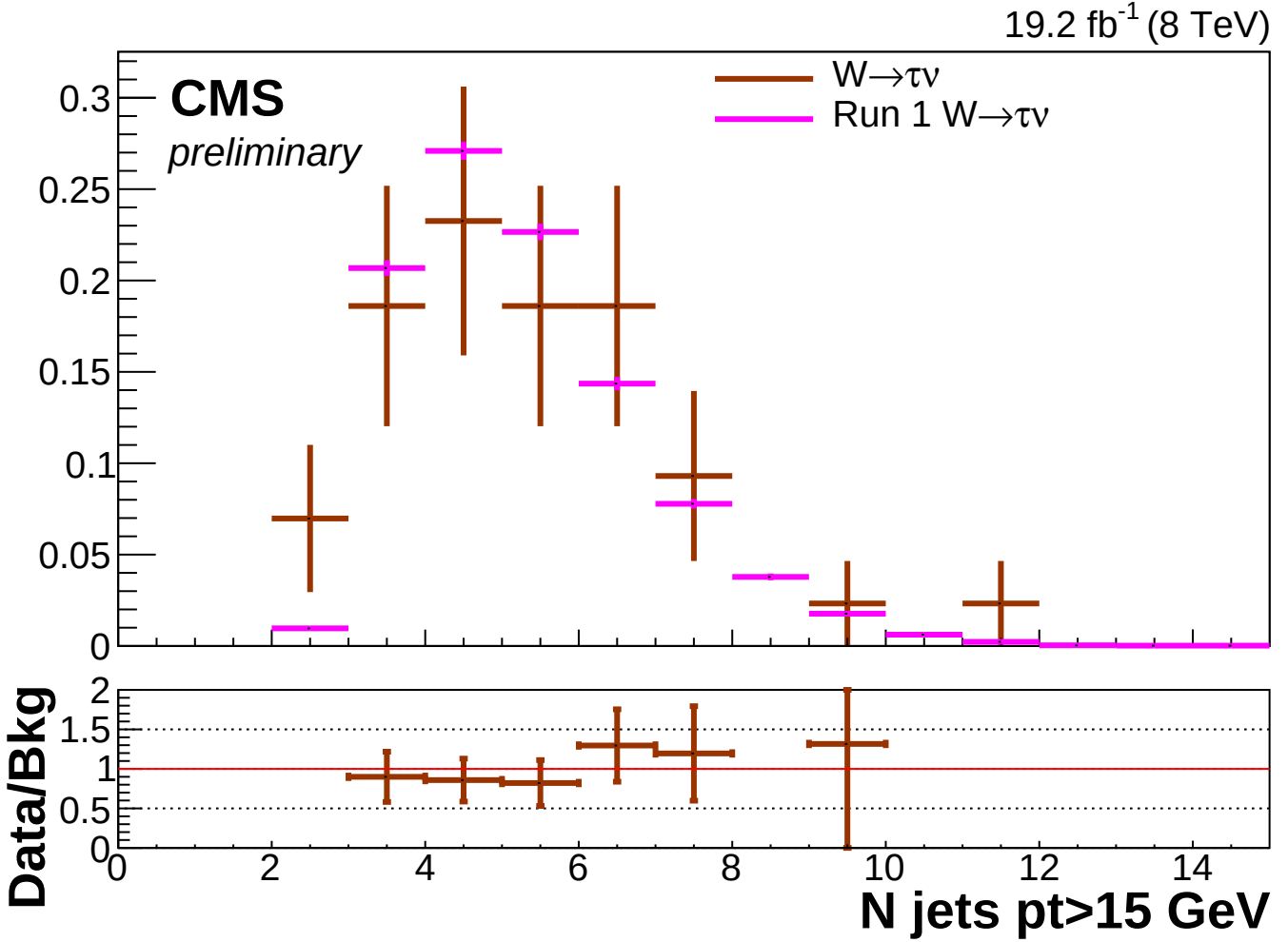

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
p_T^dijet/(p_T^dijet+METnoMu)

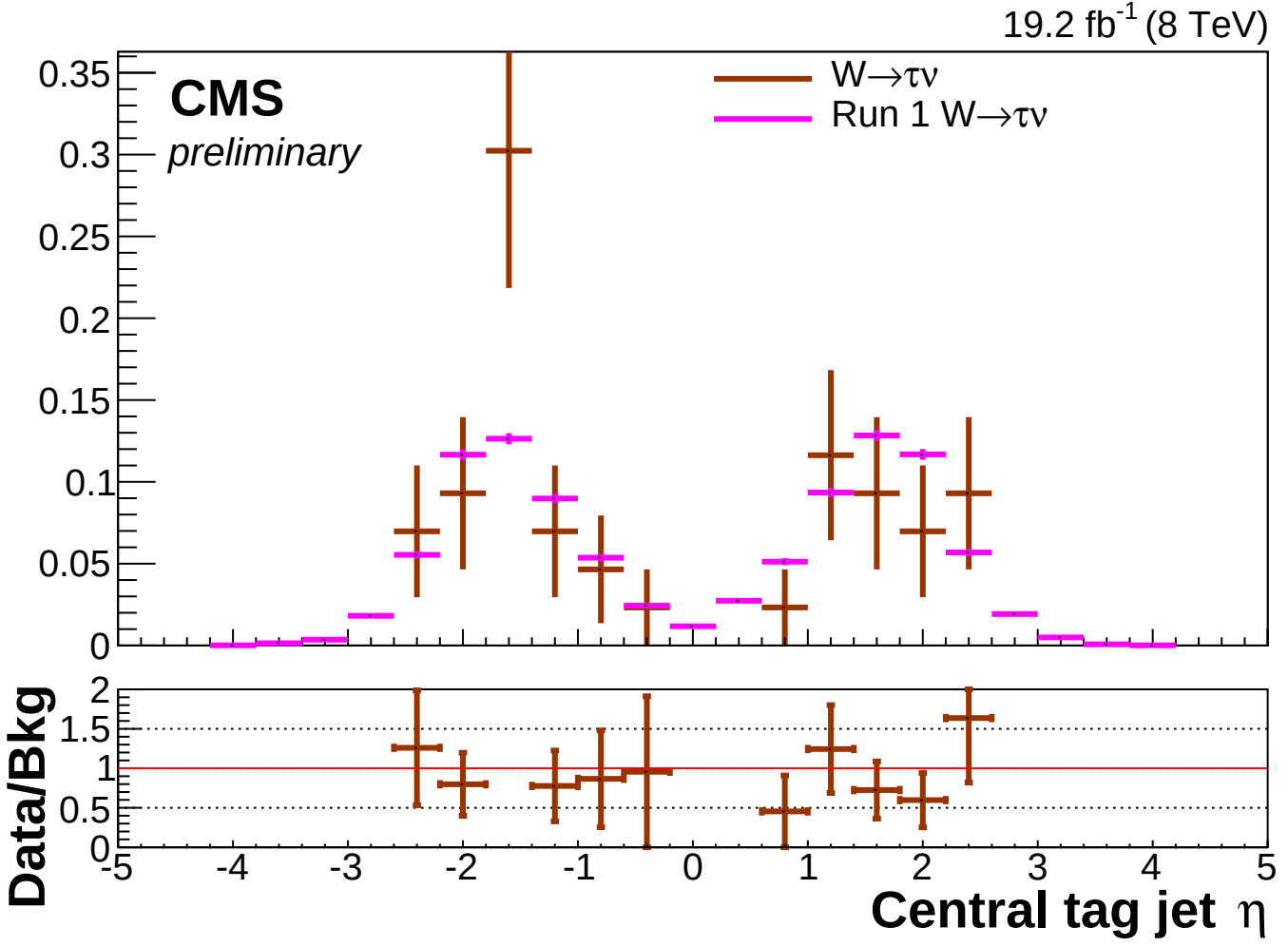

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Data/Bkg
2
1.5
1
0.5
0
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
Jet 1 CSV

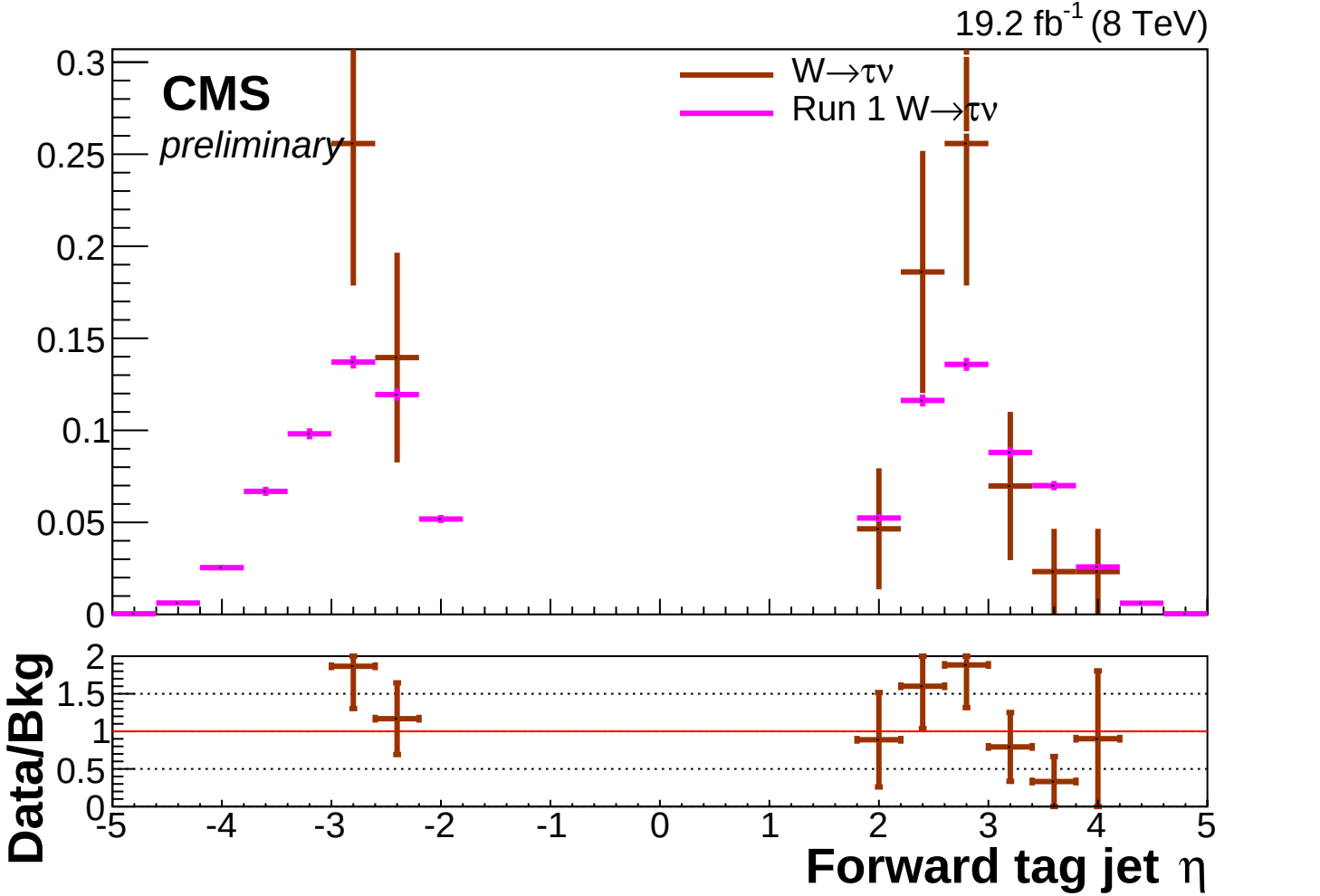

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Data/Bkg
2
1.5
1
0.5
0
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
Jet 2 CSV

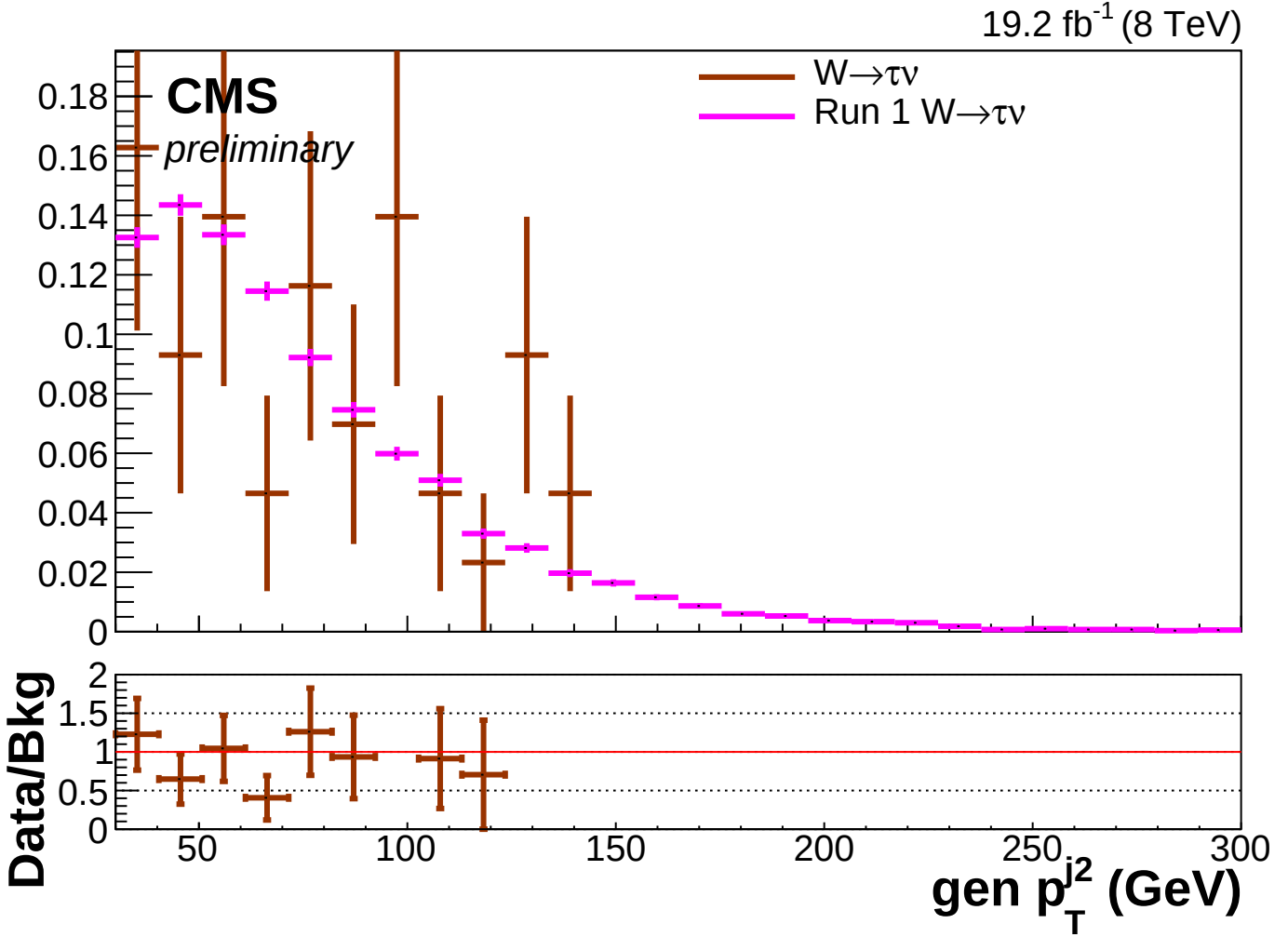

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Jet 3 CSV

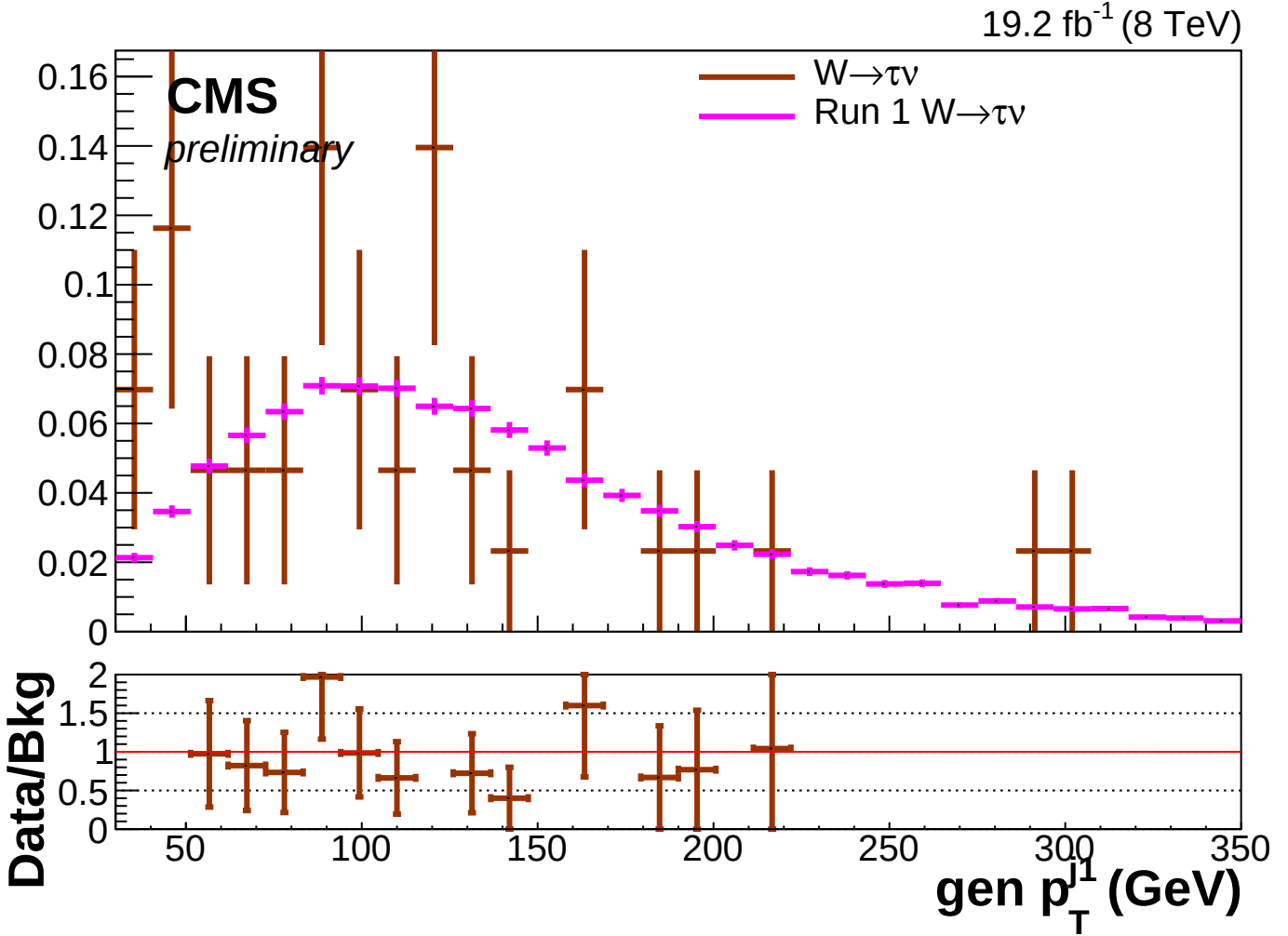

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.6
0.5
0.4
0.3
0.2
0.1
0
Data/Bkg
2
1.5
1
0.5
0
0
1
2
3
4
5
6
7
8
9
10
N jets pt>30 GeV

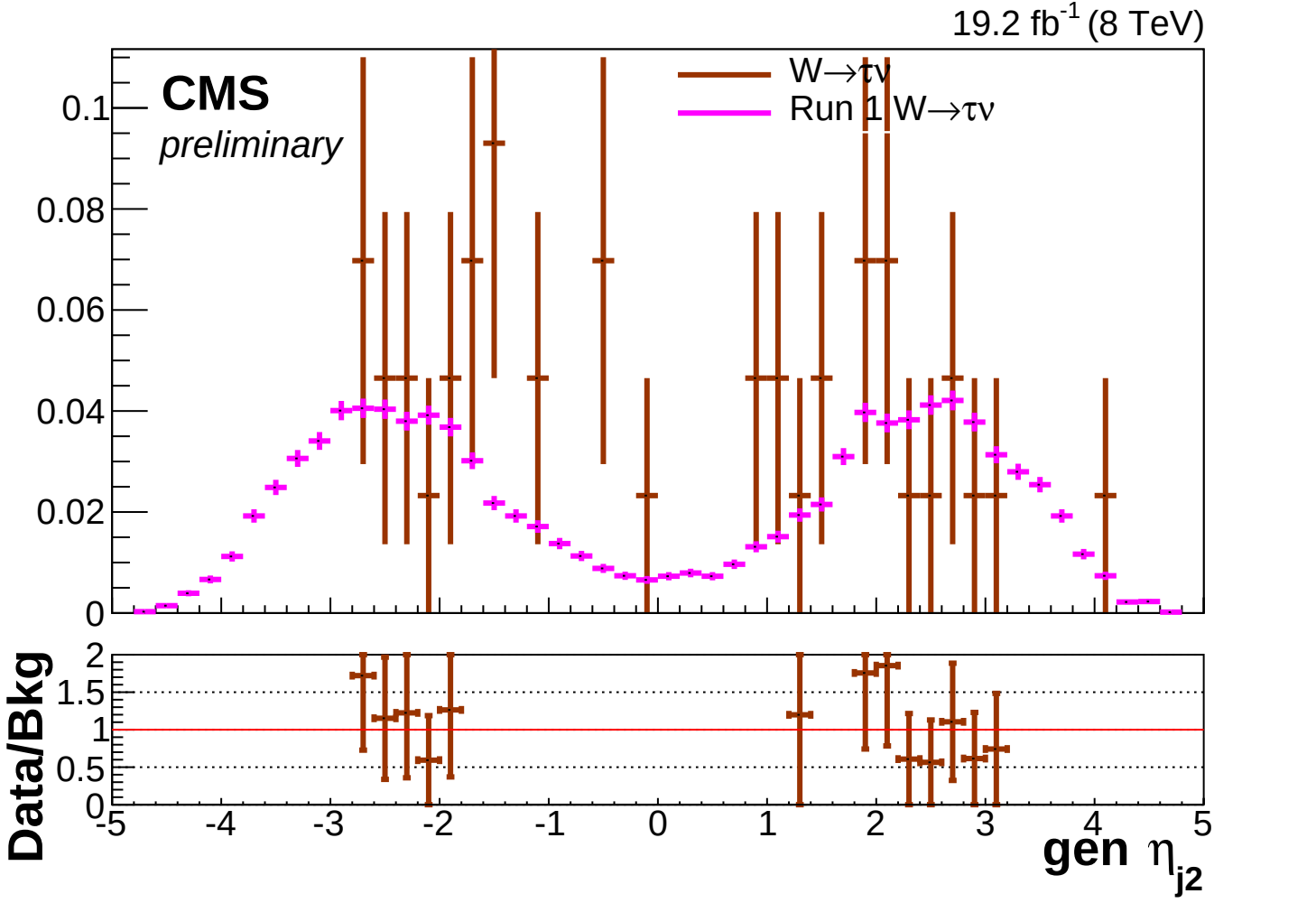

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
2
4
6
8
10
12
14
N jets pt>15 GeV

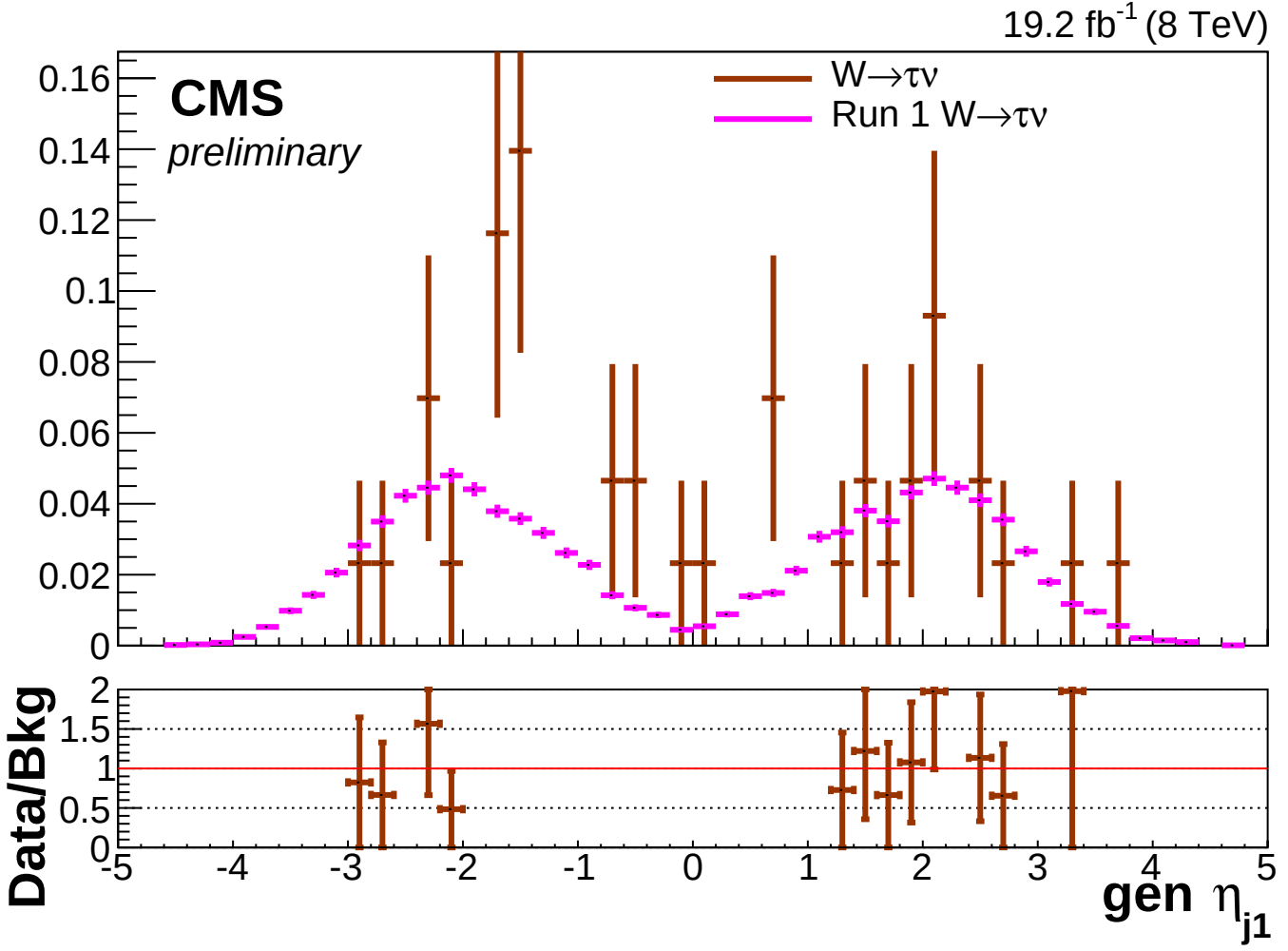

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
-5
-4
-3
-2
-1
0
1
2
3
4
5
Central tag jet η

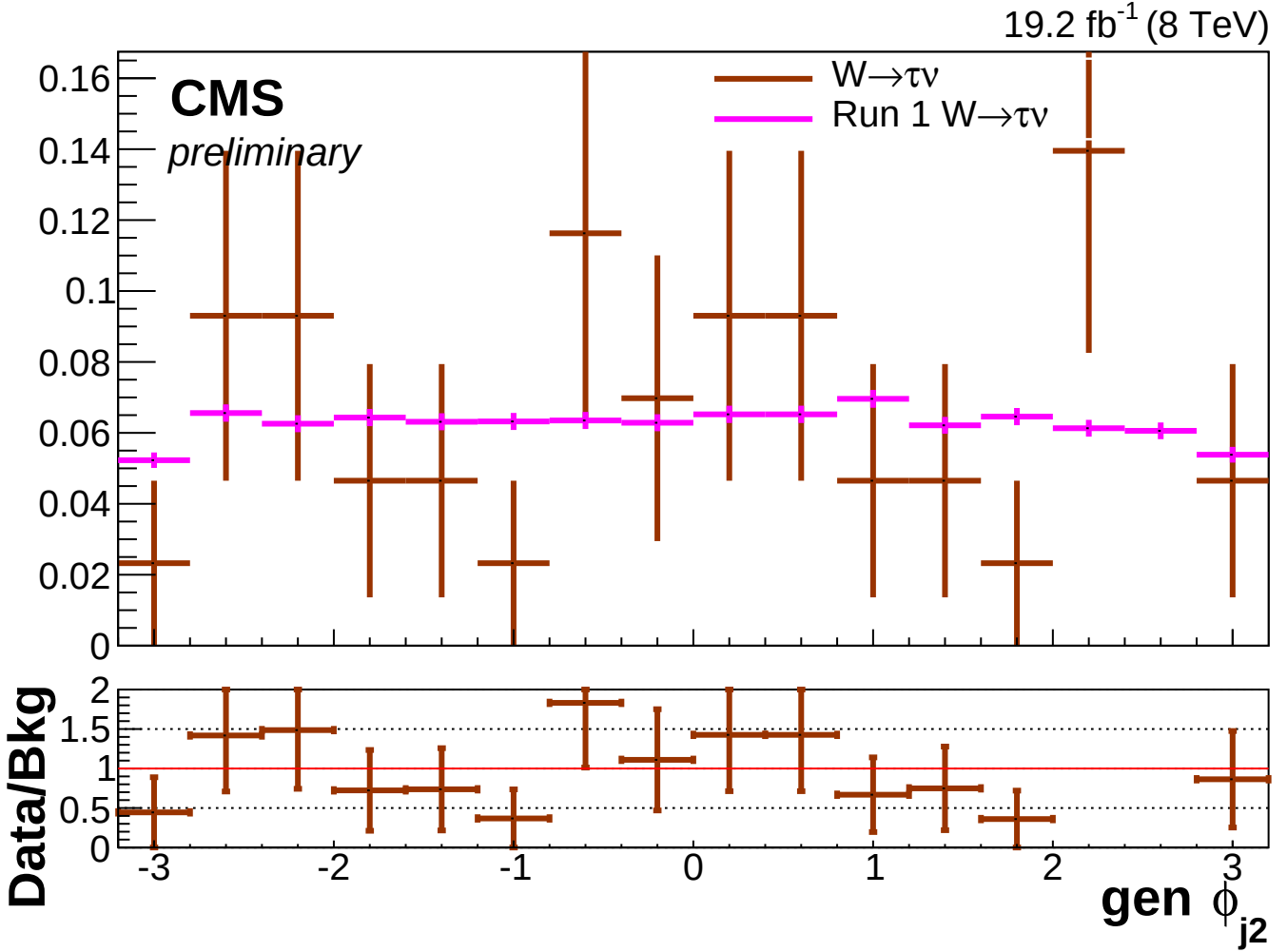

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
-5
-4
-3
-2
-1
0
1
2
3
4
5
Forward tag jet η

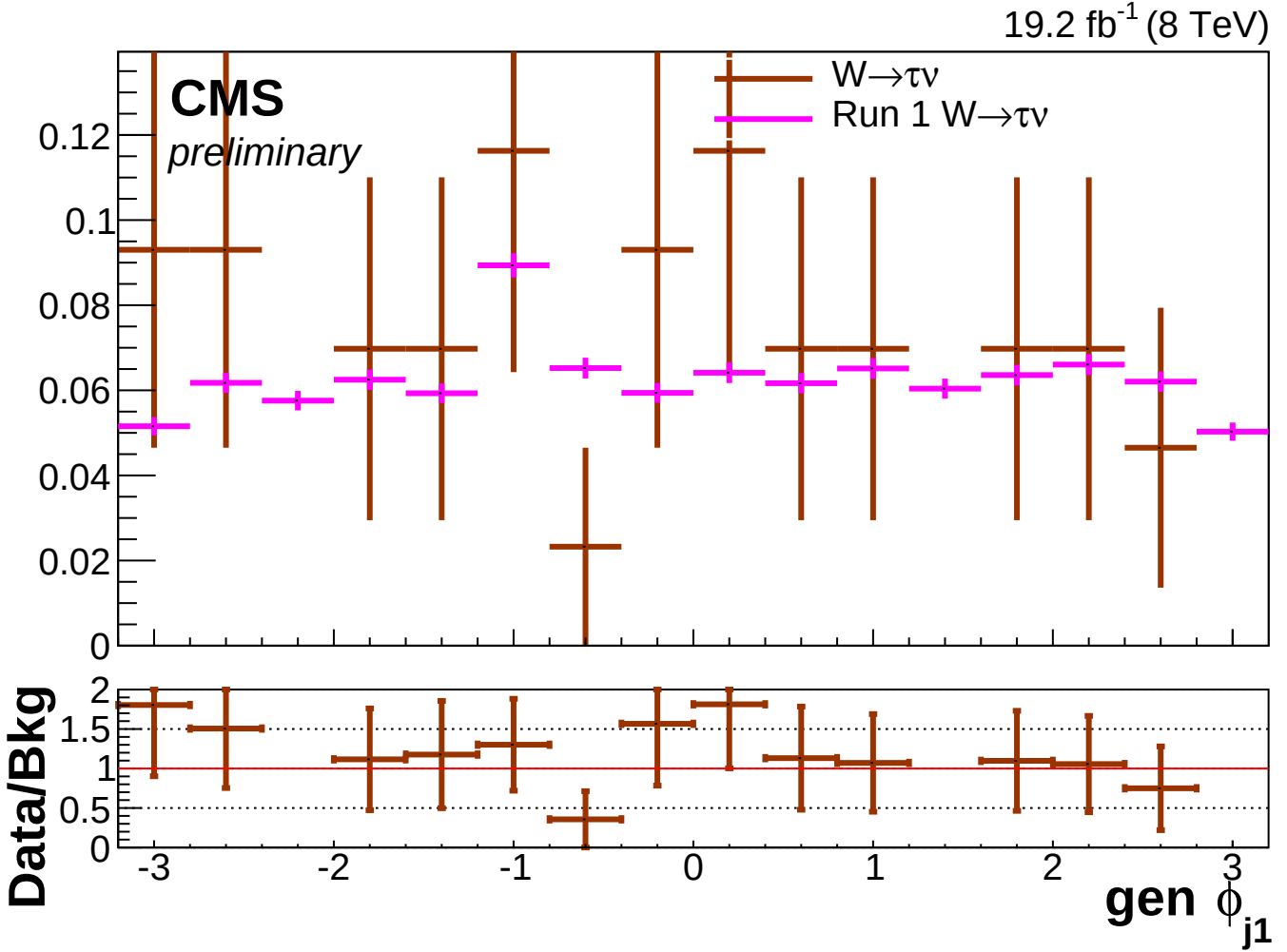

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
50
100
150
200
250
300
gen pTj2 (GeV)

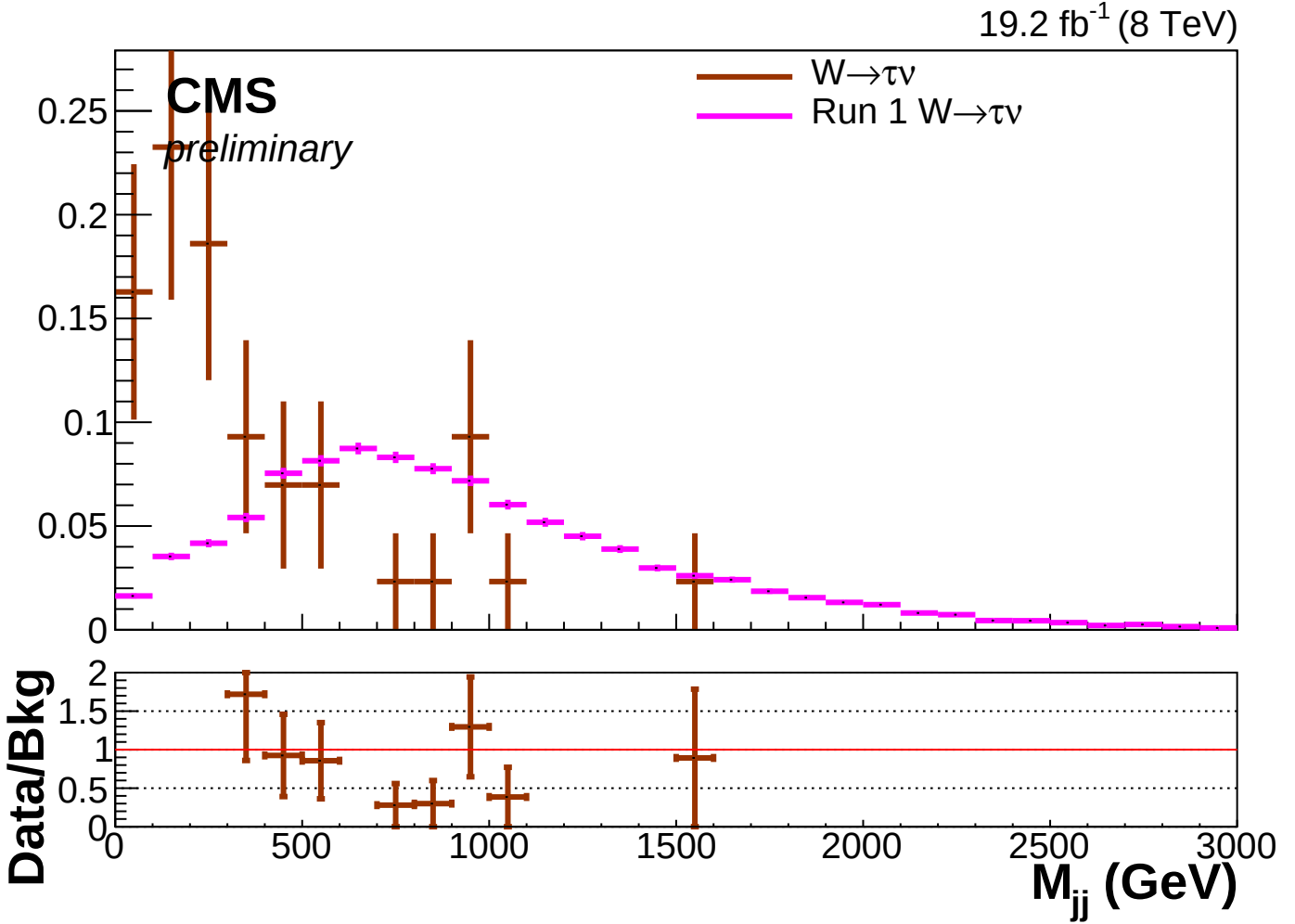

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
50
100
150
200
250
300
350
gen pTj1 (GeV)

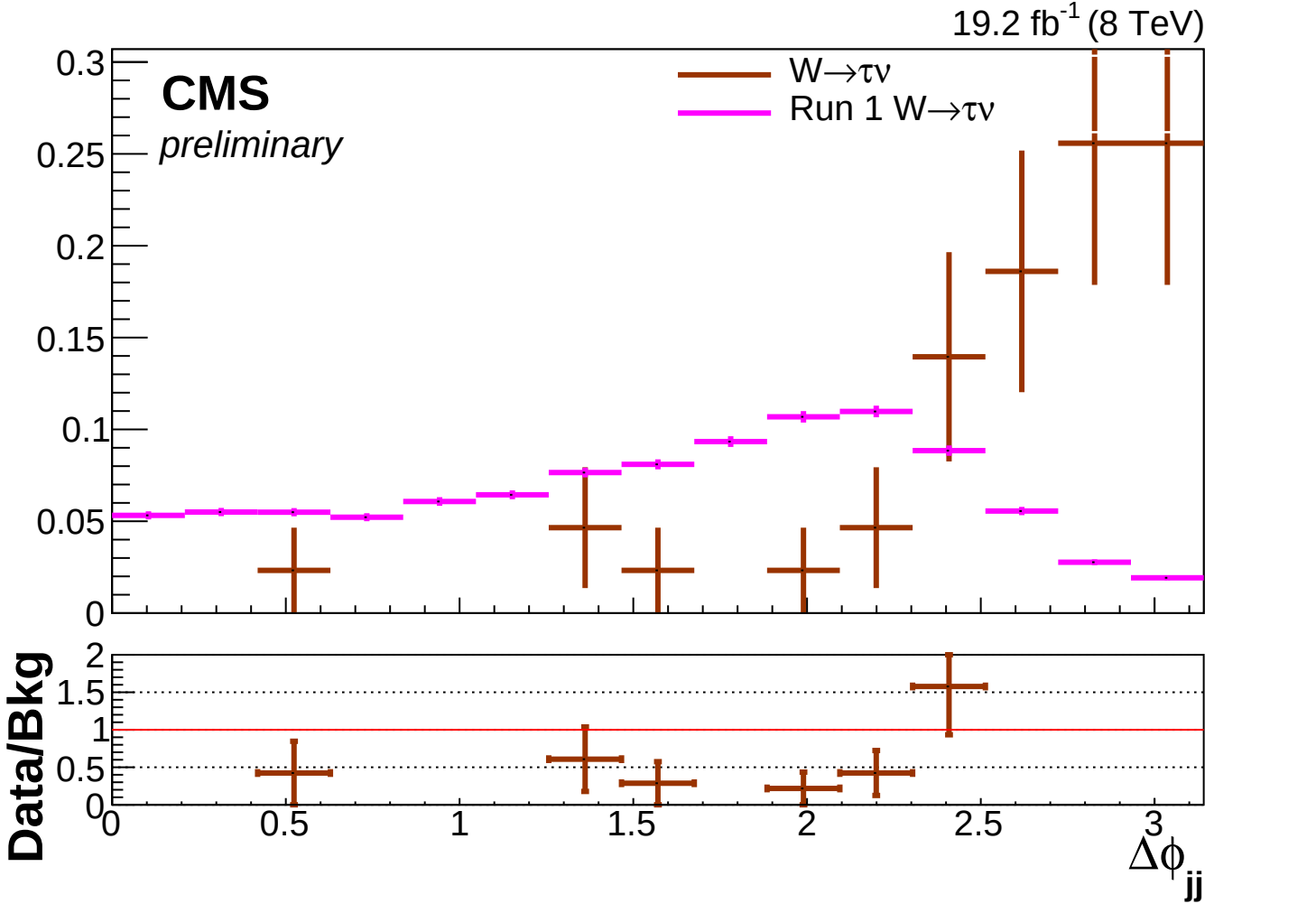

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
-5
-4
-3
-2
-1
0
1
2
3
4
5
gen ηj2

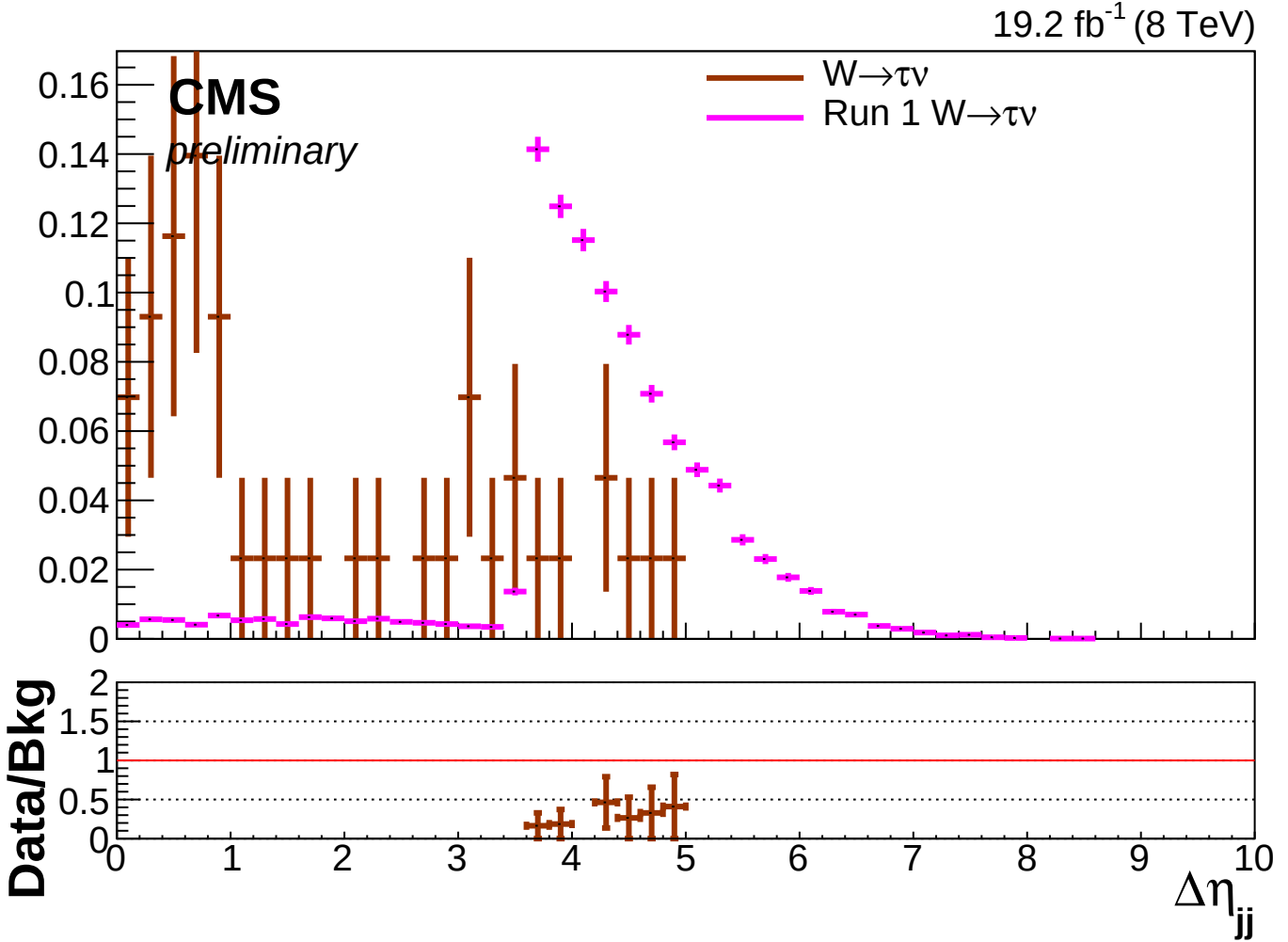

19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
-5
-4
-3
-2
-1
0
1
2
3
4
5
gen ηj1


19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
-3
-2
-1
0
1
2
3
gen φj2


19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
-3
-2
-1
0
1
2
3
gen ϕj1


19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
500
1000
1500
2000
2500
3000
Mjj (GeV)


19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.3
0.25
0.2
0.15
0.1
0.05
0
Data/Bkg
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
Δφjj


19.2 fb-1 (8 TeV)
CMS
preliminary
W→τν
Run 1 W→τν
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Data/Bkg
2
1.5
1
0.5
0
0
1
2
3
4
5
6
7
8
9
10
Δηjj