On-line (pre-)selection Requisites for:

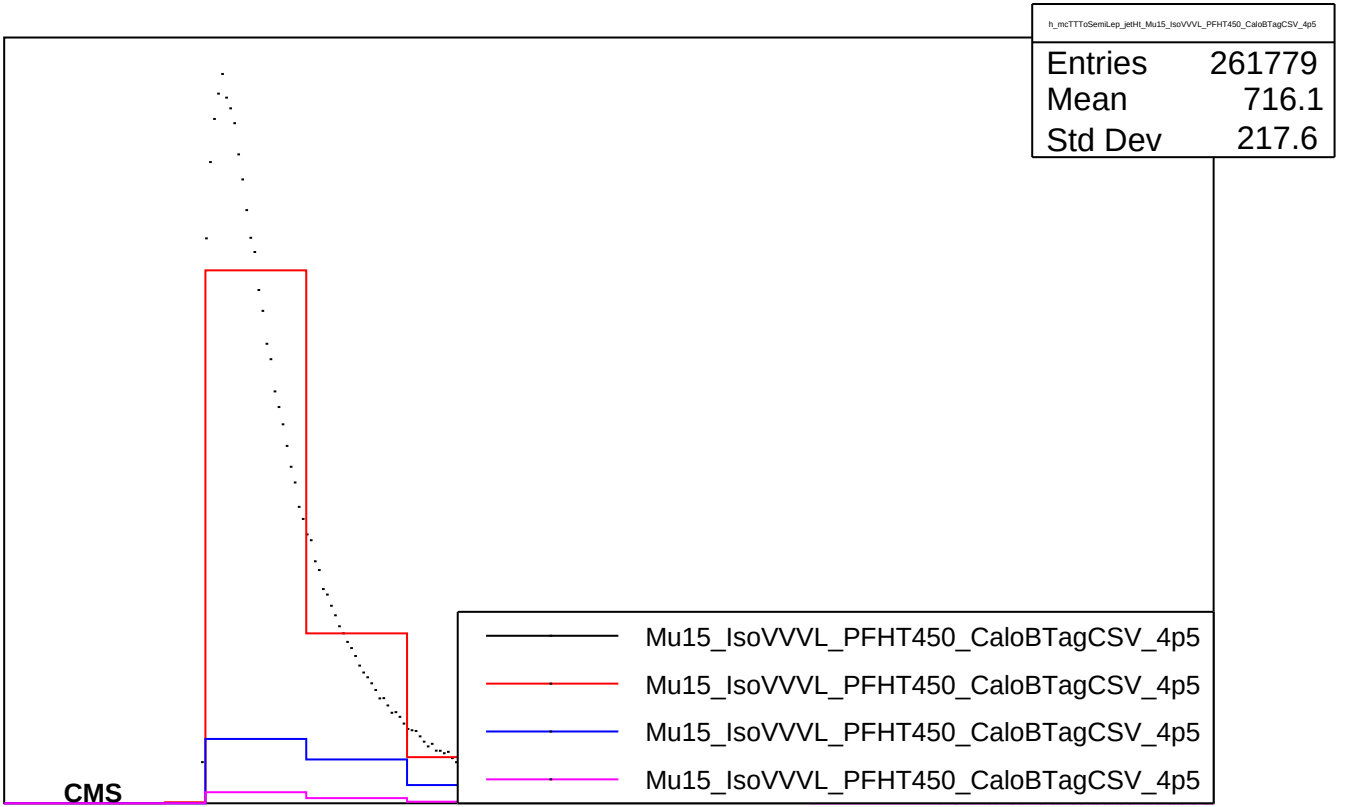
- **Jets:** number > 5
- **Muons plus Electrons:** number > 0

Event Limit: None (see last page)

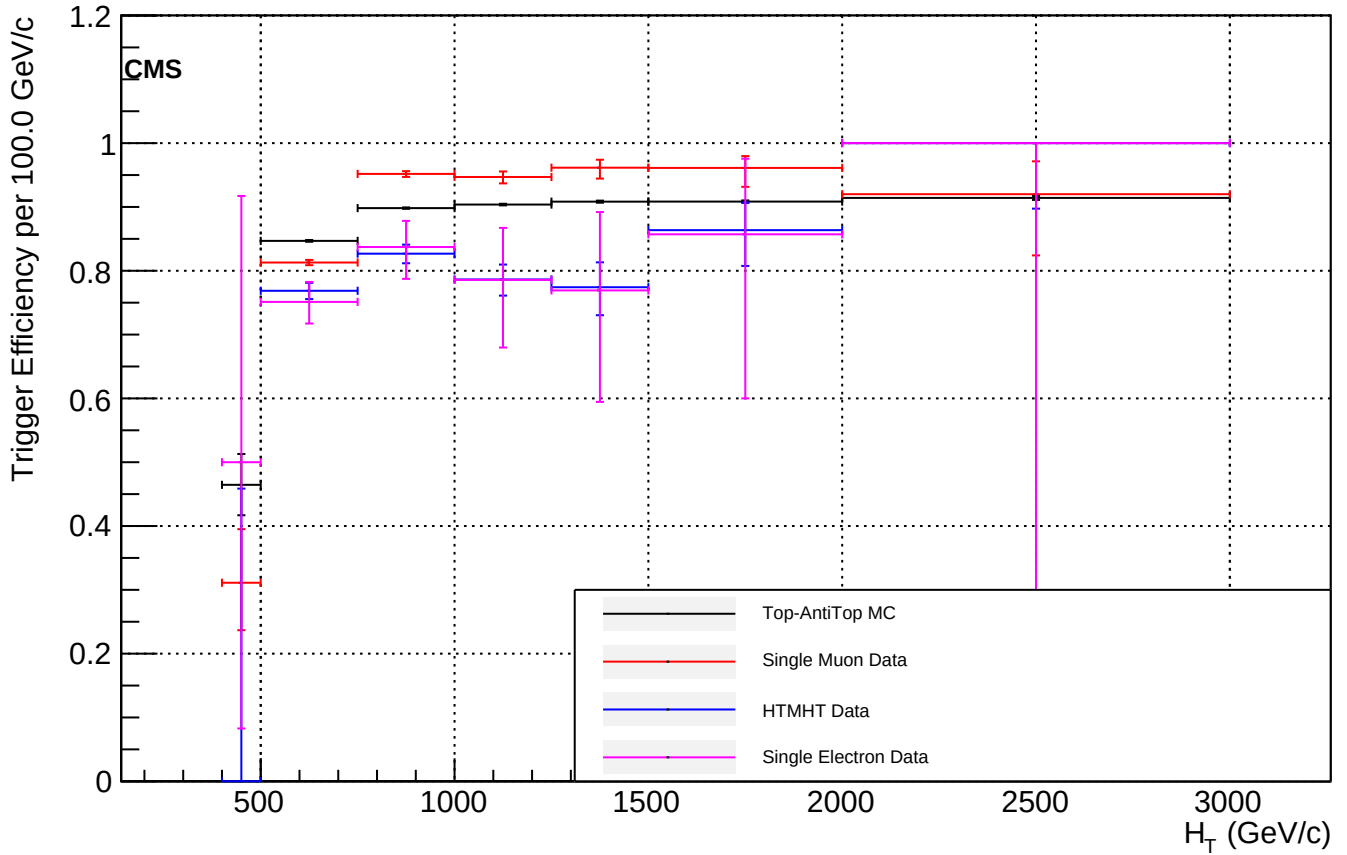
Off-line (post-)selection Requisites for:

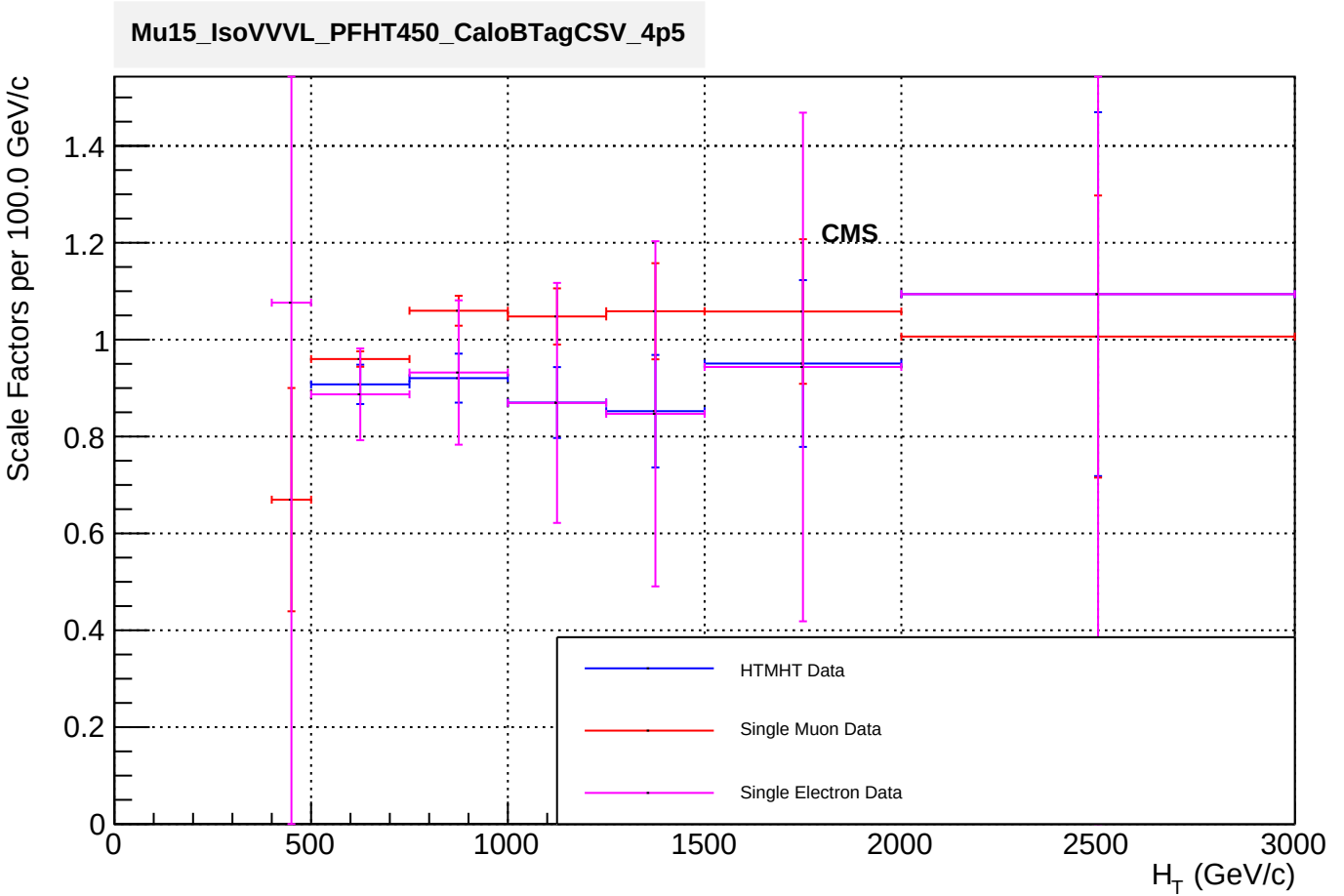
- **Jets:** jetId > 2 , p_T > 30 and |η|<2.4 (for at least 6 jets)
  btagDeepFlavB > 0.7489 (for at least one jet)
- **Muons:** has tightId, |η|<2.4 and miniPFRelIso_all<0.15 (for at least 1)

Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5

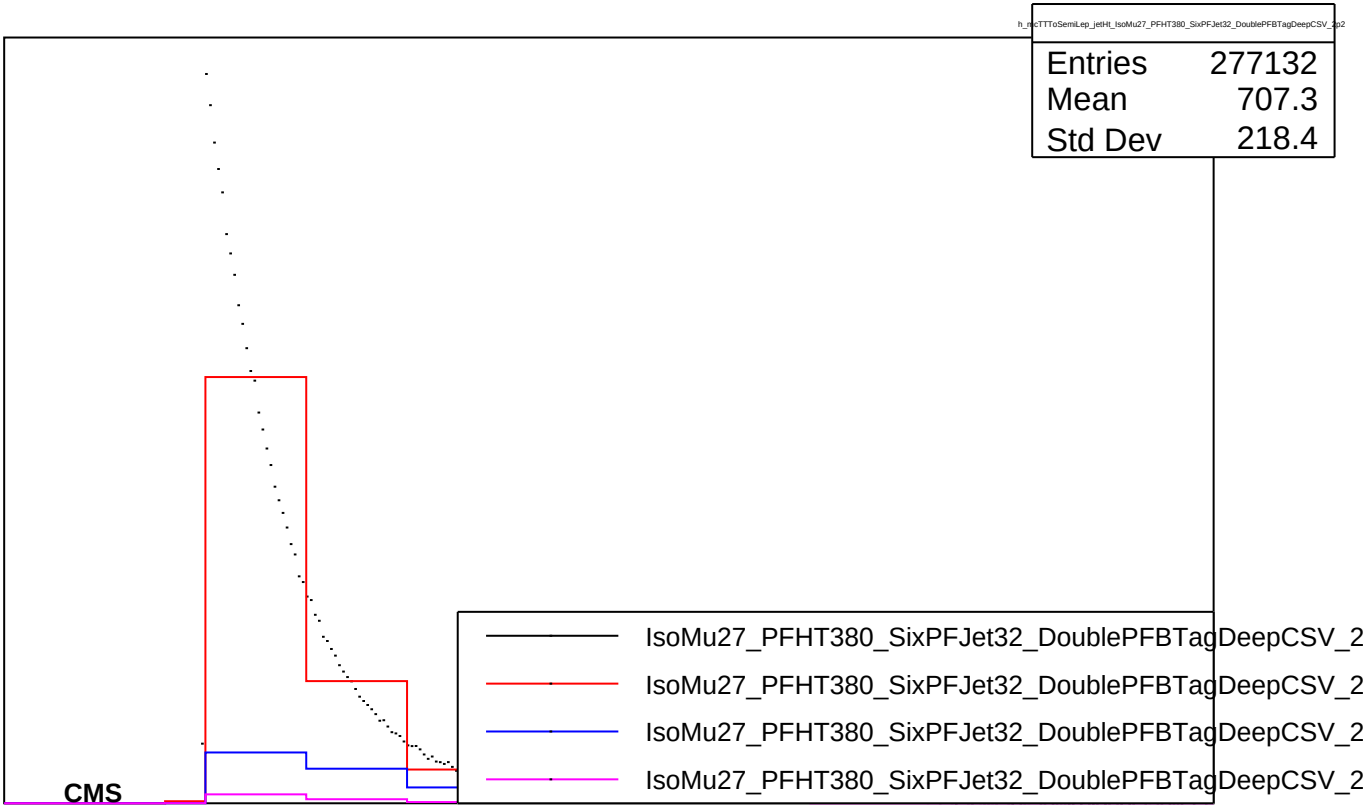


Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5

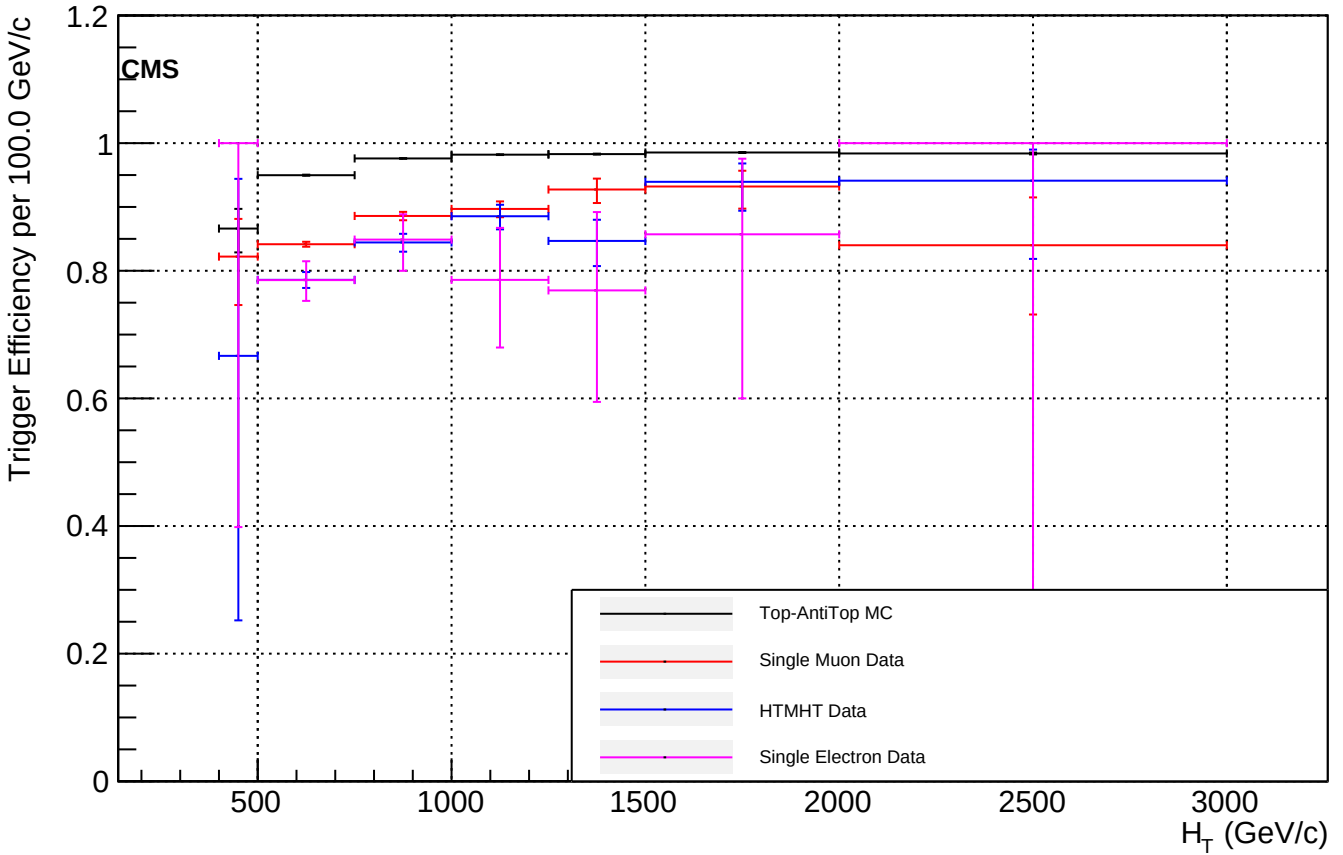


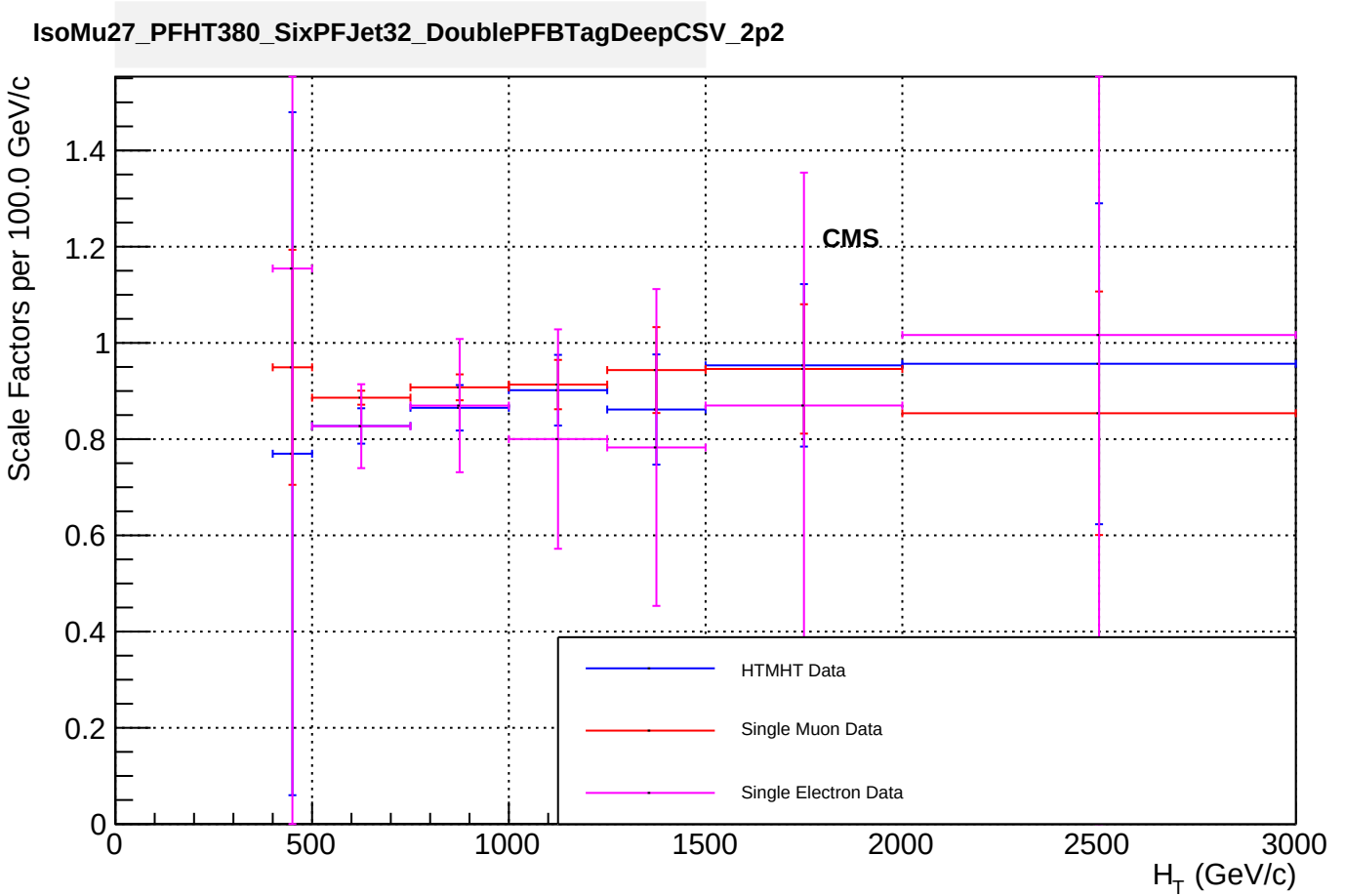

Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
CMS
Scale Factors per 100.0 GeV/c
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
500
1000
1500
2000
2500
3000
H_T (GeV/c)
HTMHT Data
Single Muon Data
Single Electron Data

IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

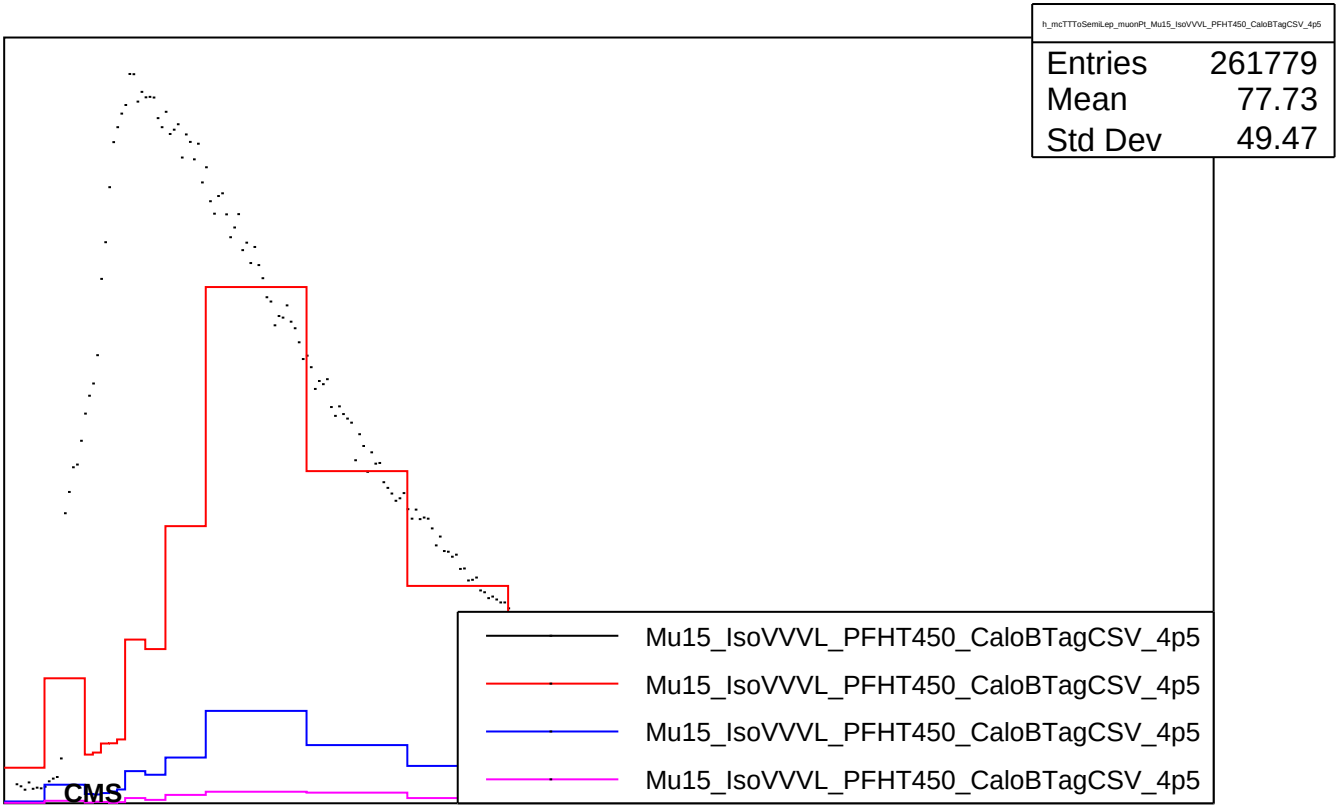


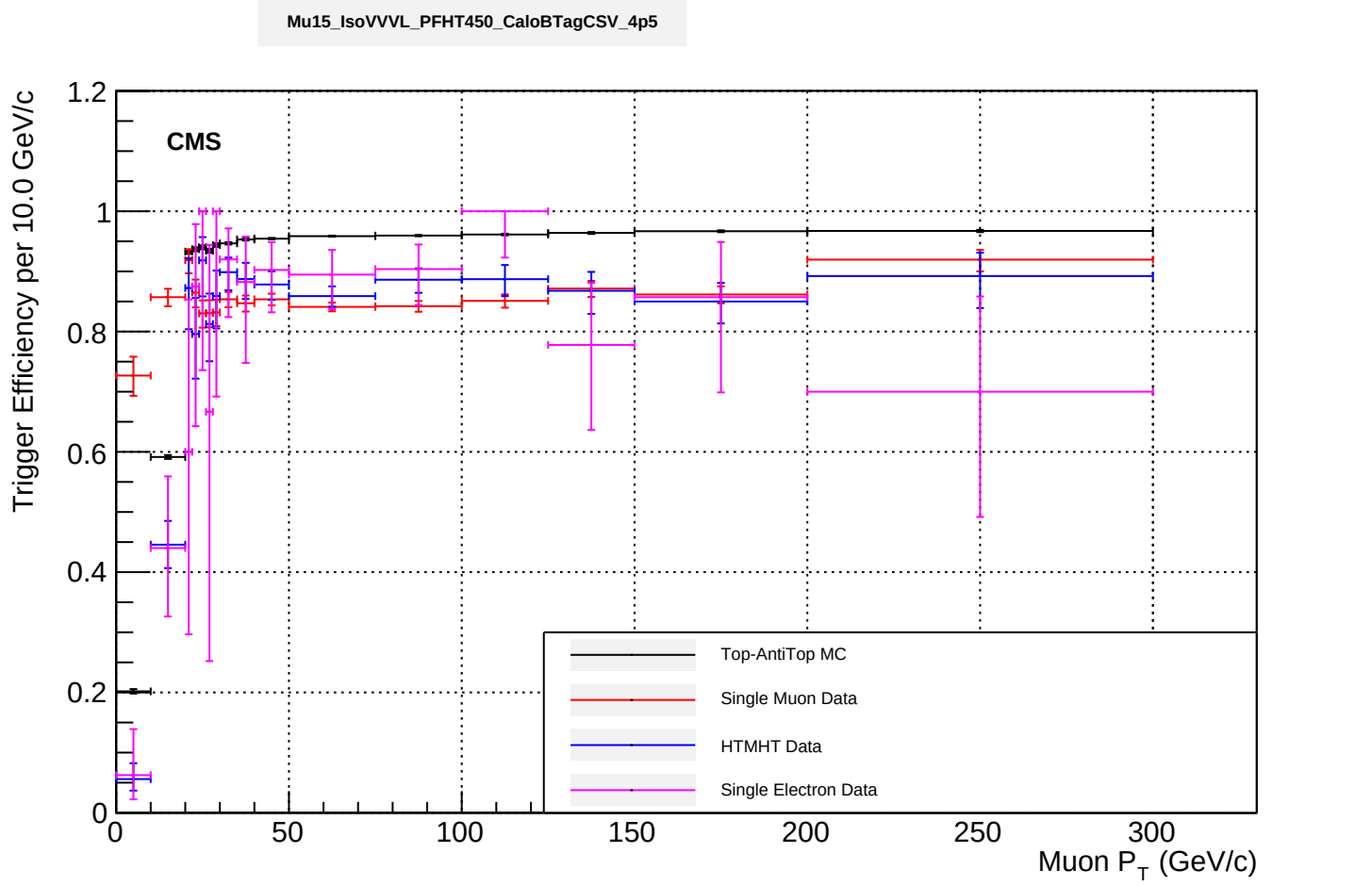
IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

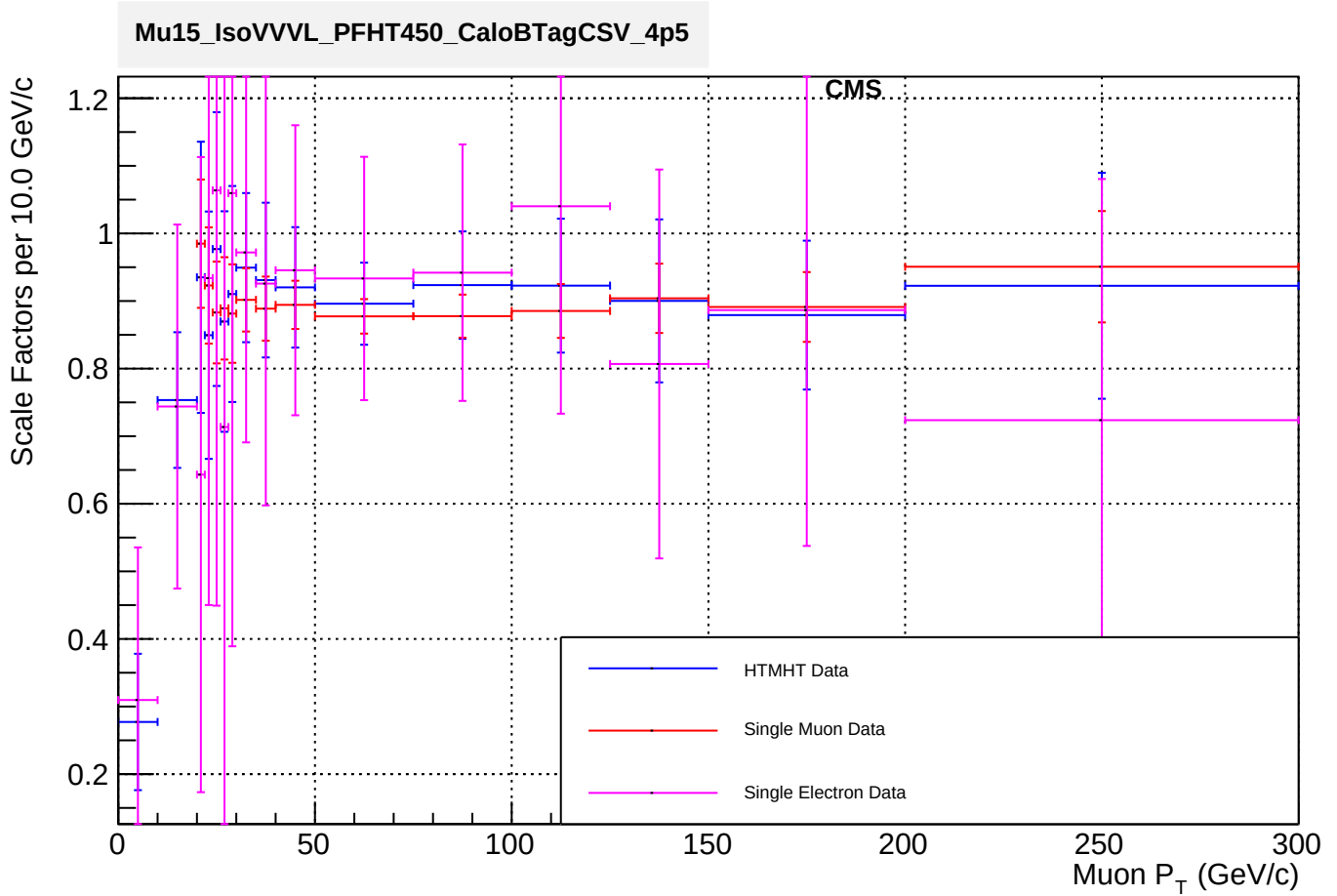



IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Scale Factors per 100.0 GeV/c
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
500
1000
1500
2000
2500
3000
H_T (GeV/c)
CMS
HTMHT Data
Single Muon Data
Single Electron Data

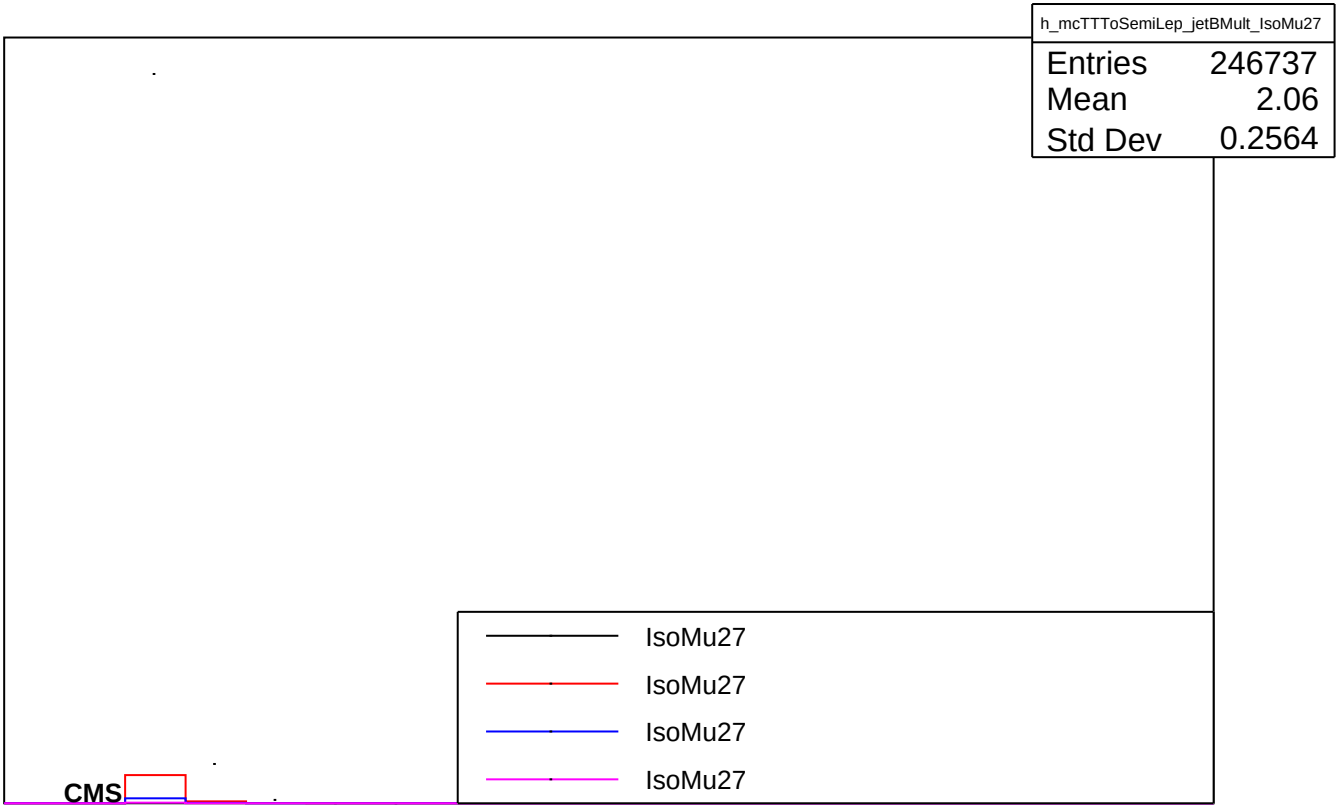
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5



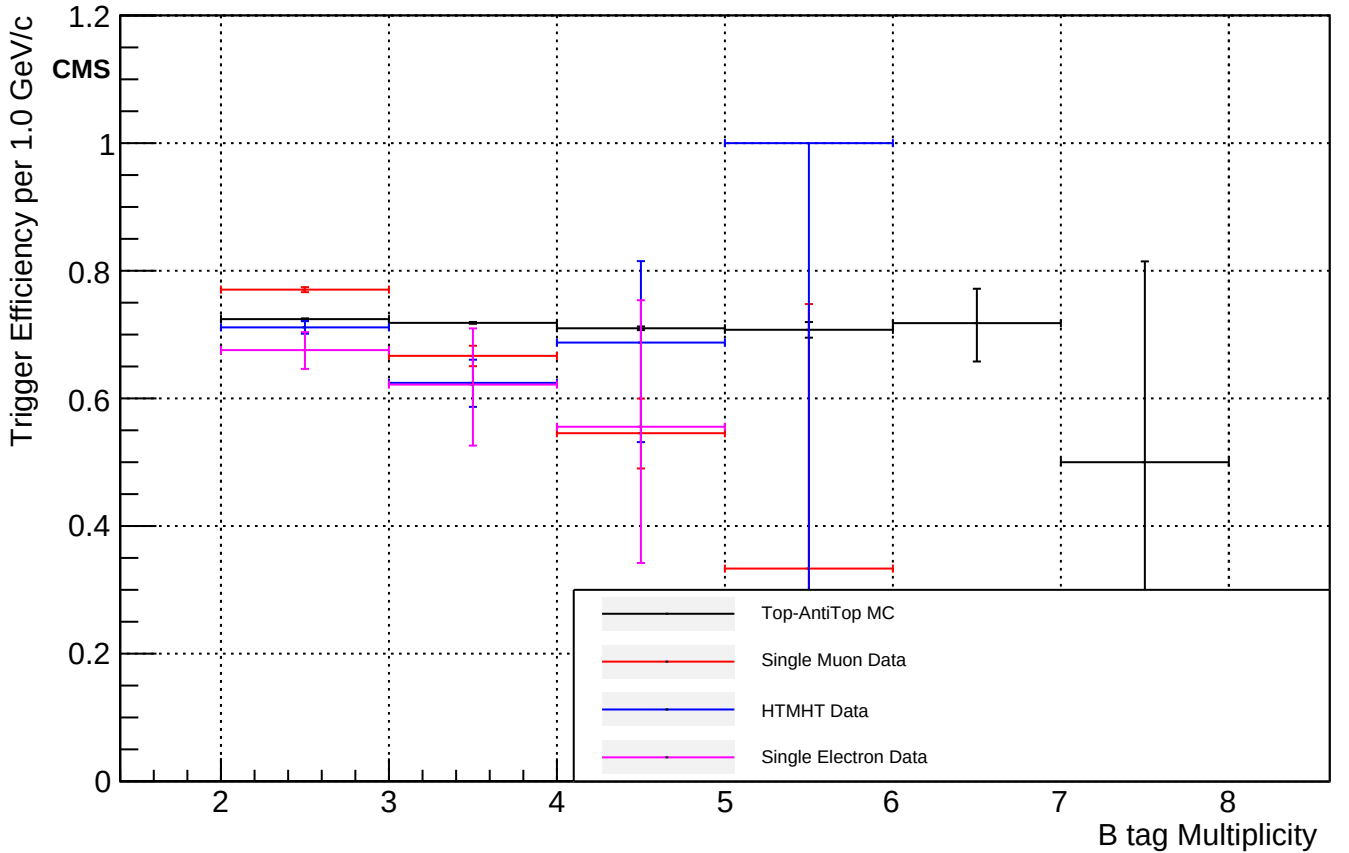

Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
CMS
Trigger Efficiency per 10.0 GeV/c
Muon P_T (GeV/c)
0
0.2
0.4
0.6
0.8
1
1.2
0
50
100
150
200
250
300
Top-AntiTop MC
Single Muon Data
HTMHT Data
Single Electron Data

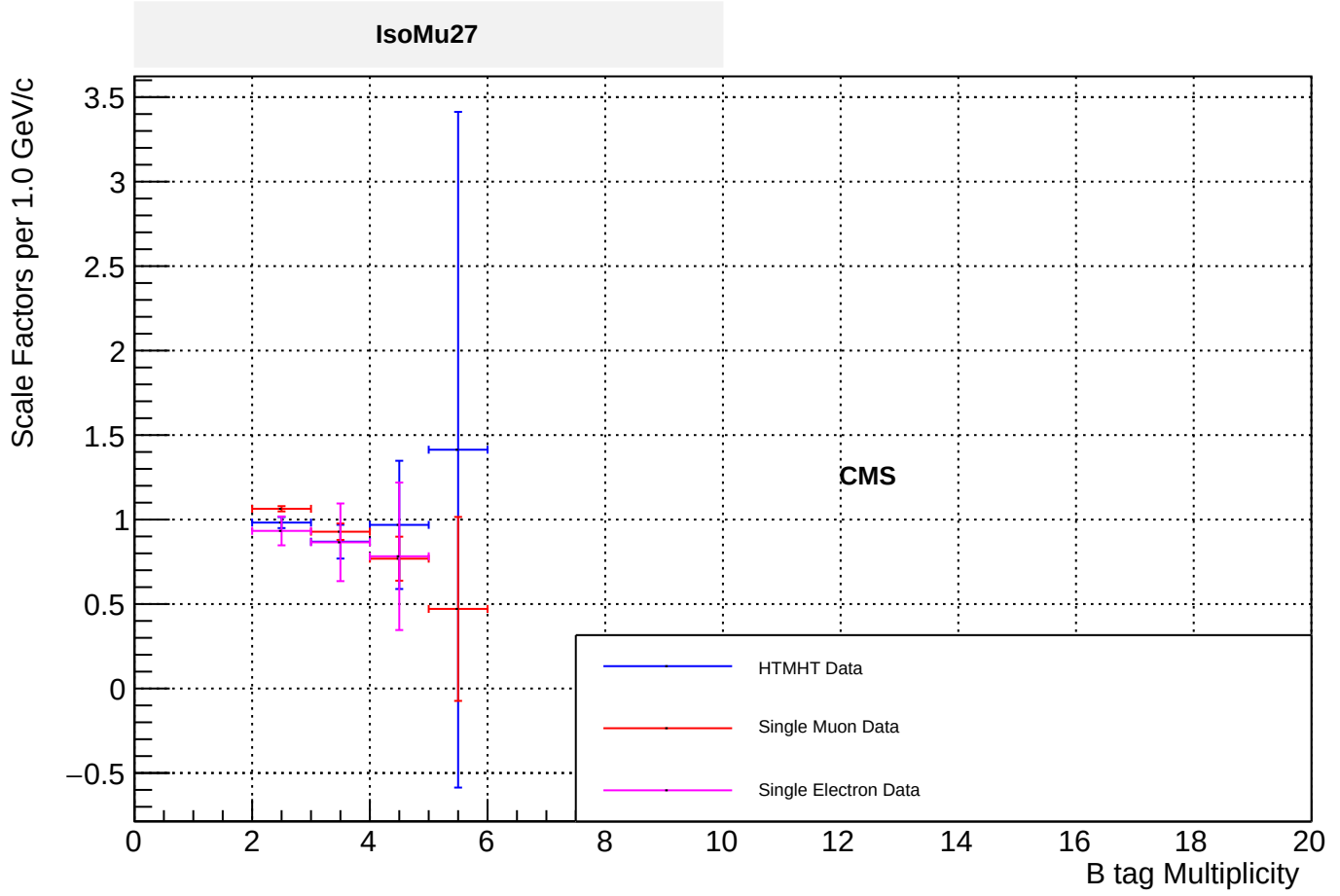

Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
CMS
Scale Factors per 10.0 GeV/c
1.2
1
0.8
0.6
0.4
0.2
0
50
100
150
200
250
300
Muon P_T (GeV/c)
HTMHT Data
Single Muon Data
Single Electron Data

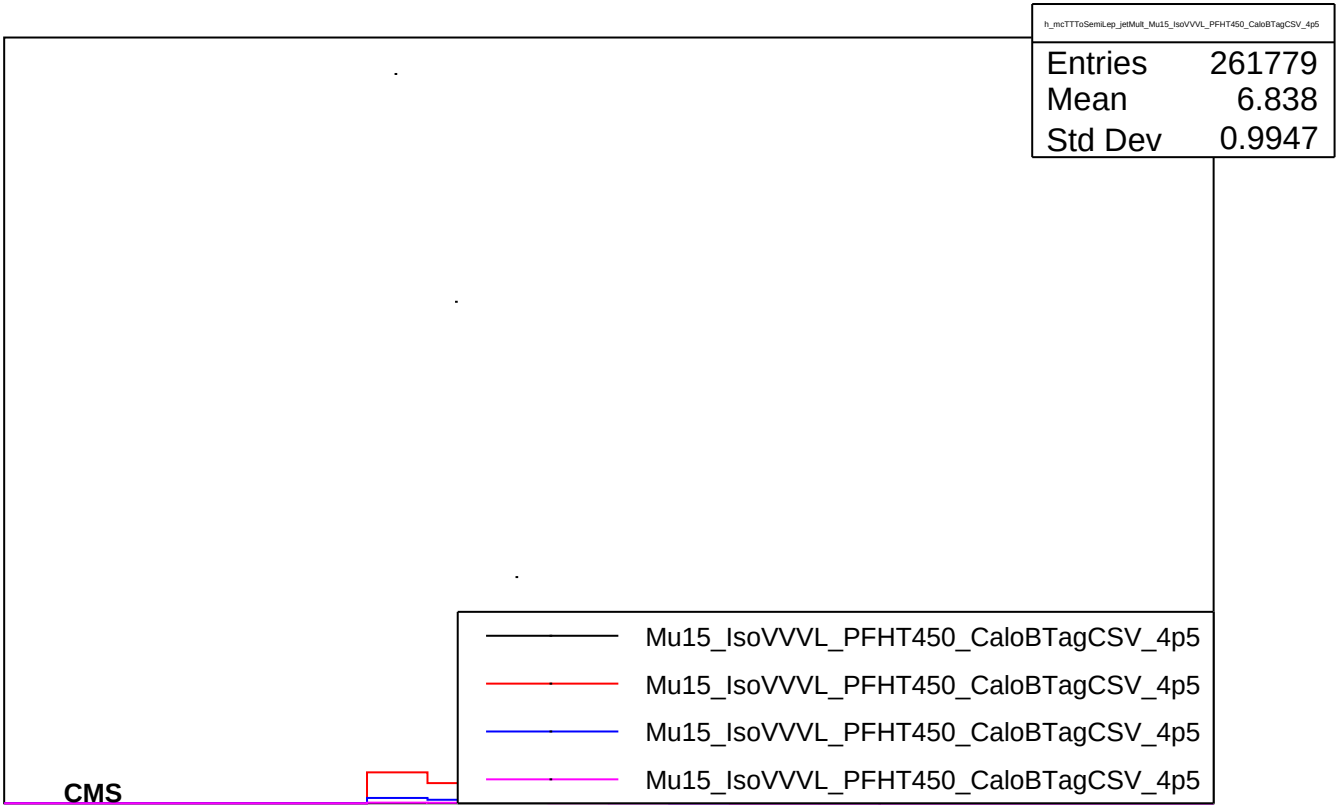
IsoMu27

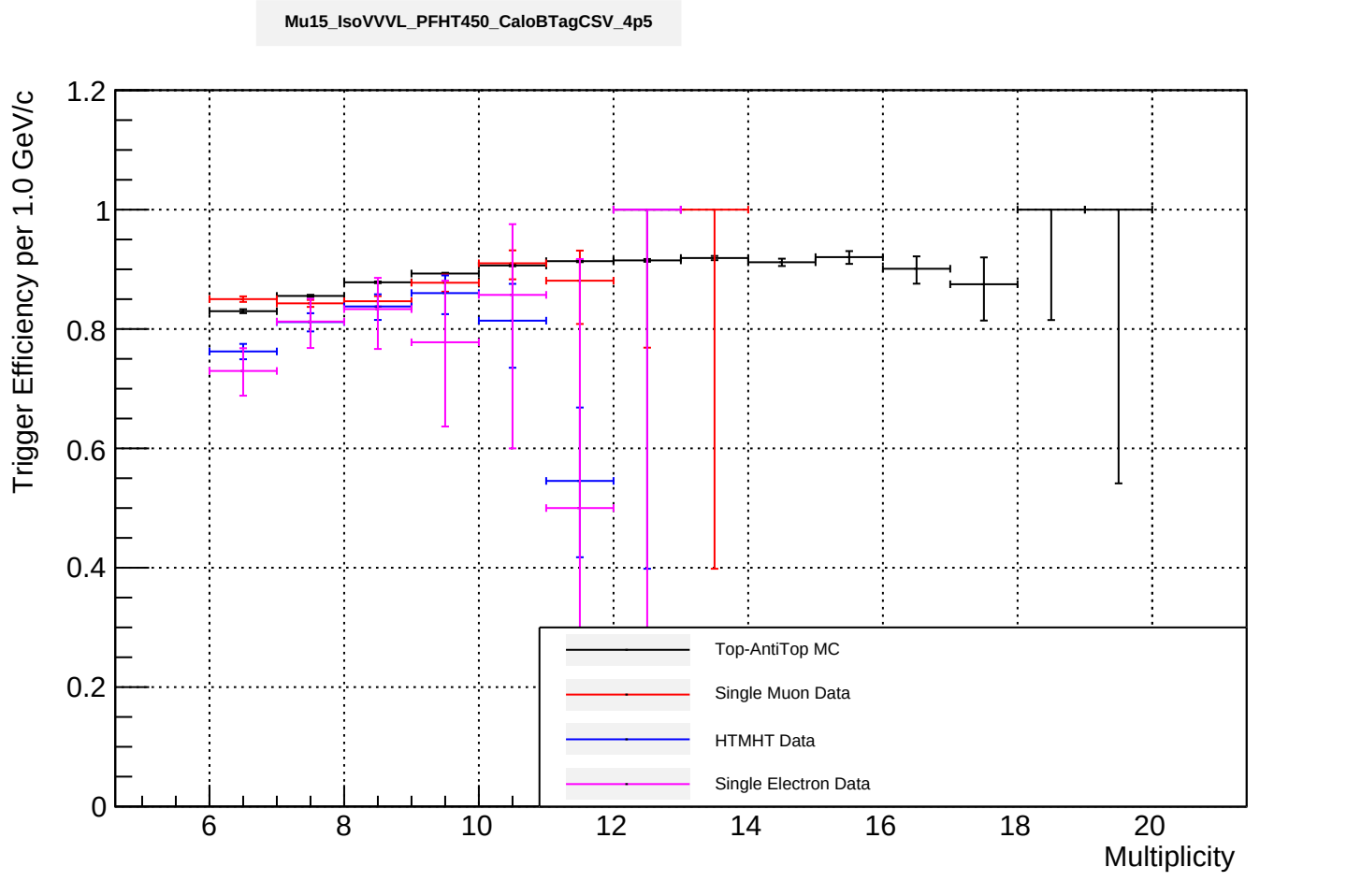

h_mcTTToSemiLep_jetBMult_IsoMu27
Entries 246737
Mean 2.06
Std Dev 0.2564
IsoMu27
IsoMu27
IsoMu27
IsoMu27
CMS

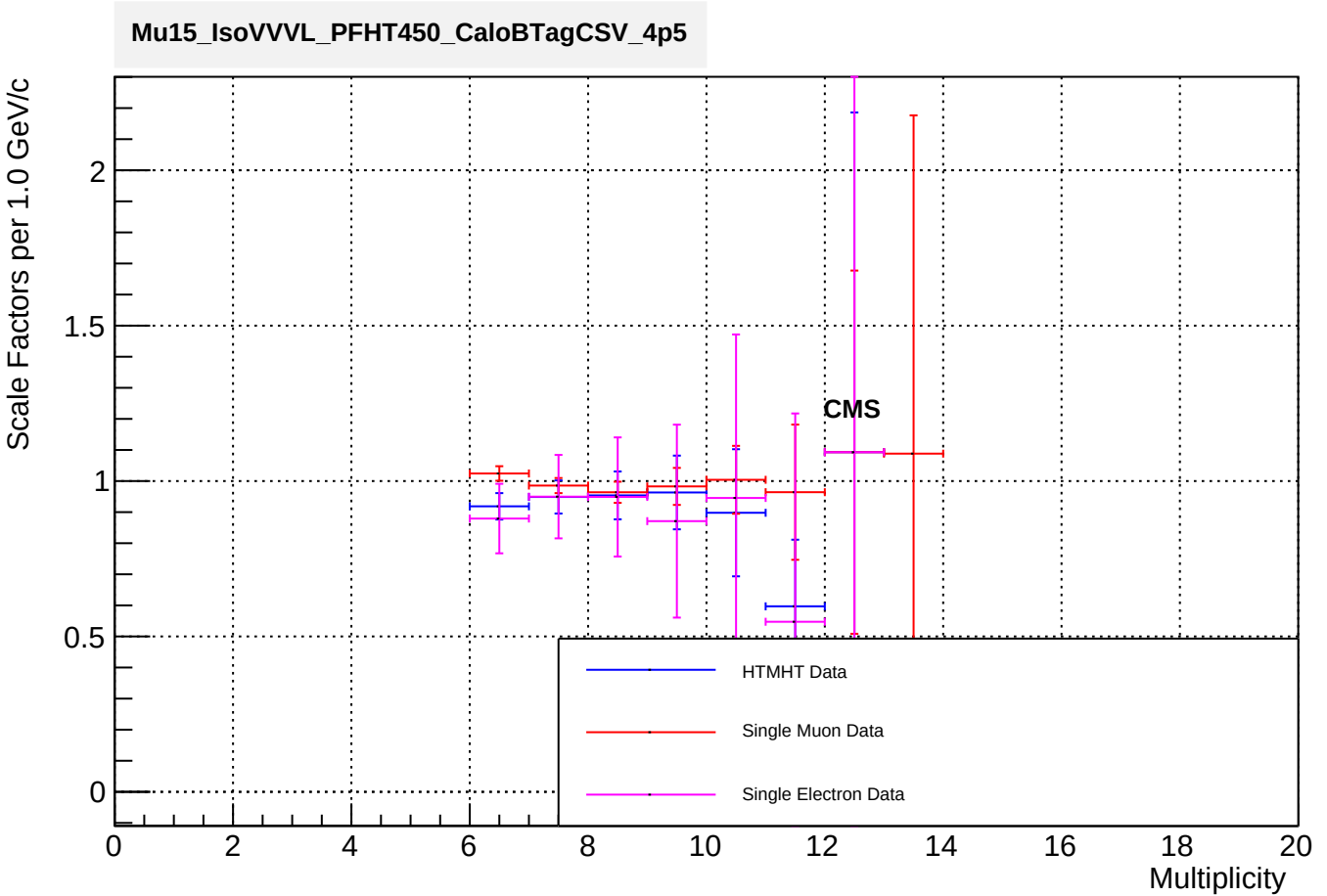
IsoMu27


CMS
Trigger Efficiency per 1.0 GeV/c
B tag Multiplicity
0
0.2
0.4
0.6
0.8
1
1.2
2
3
4
5
6
7
8
Top-AntiTop MC
Single Muon Data
HTMHT Data
Single Electron Data

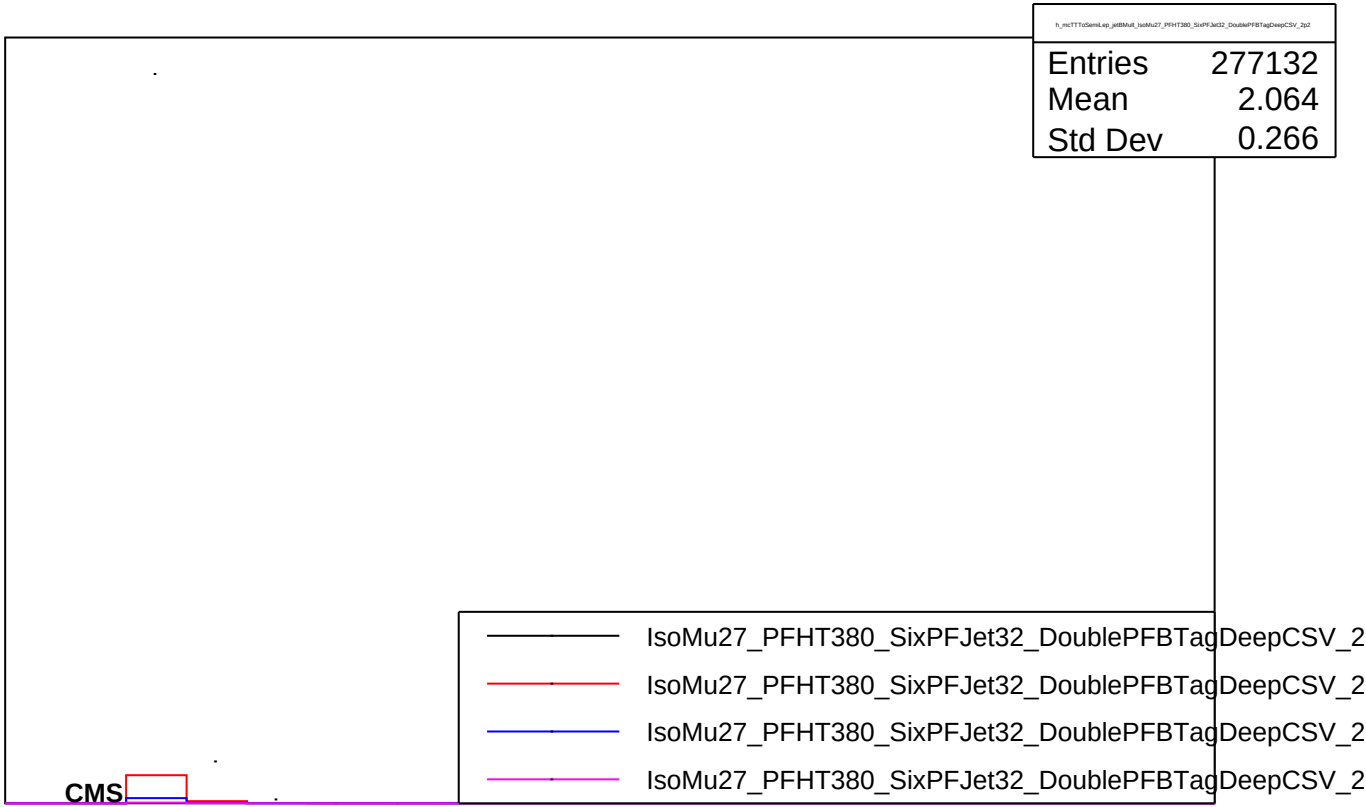

IsoMu27
Scale Factors per 1.0 GeV/c
3.5
3
2.5
2
1.5
1
0.5
0
−0.5
0
2
4
6
8
10
12
14
16
18
20
B tag Multiplicity
CMS
HTMHT Data
Single Muon Data
Single Electron Data


h_mcTTToSemiLep_jetMult_Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Entries 261779
Mean 6.838
Std Dev 0.9947
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
CMS

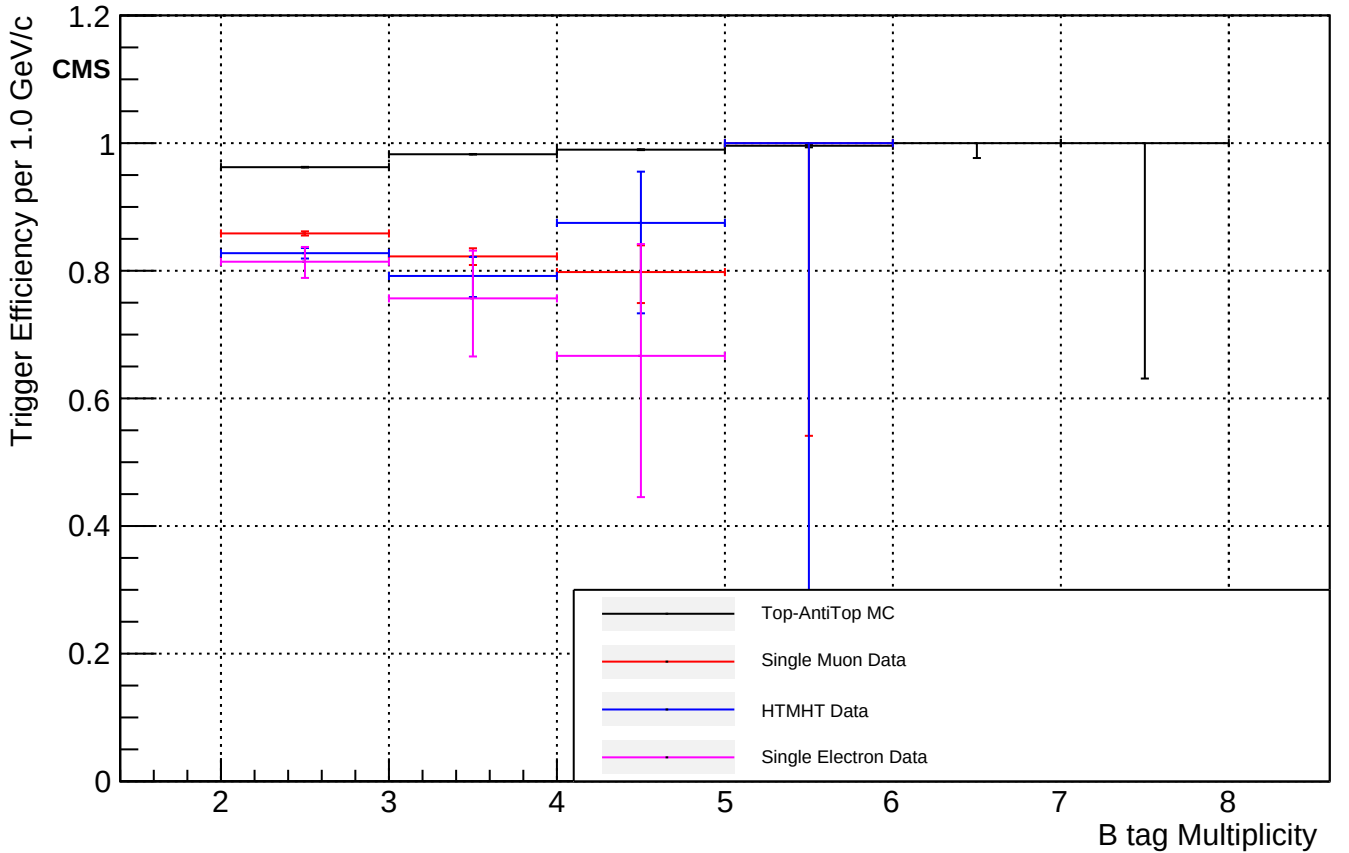

Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Trigger Efficiency per 1.0 GeV/c
1.2
1
0.8
0.6
0.4
0.2
0
6
8
10
12
14
16
18
20
Multiplicity
Top-AntiTop MC
Single Muon Data
HTMHT Data
Single Electron Data


Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Scale Factors per 1.0 GeV/c
Multiplicity
CMS
HTMHT Data
Single Muon Data
Single Electron Data
0
0.5
1
1.5
2
0
2
4
6
8
10
12
14
16
18
20

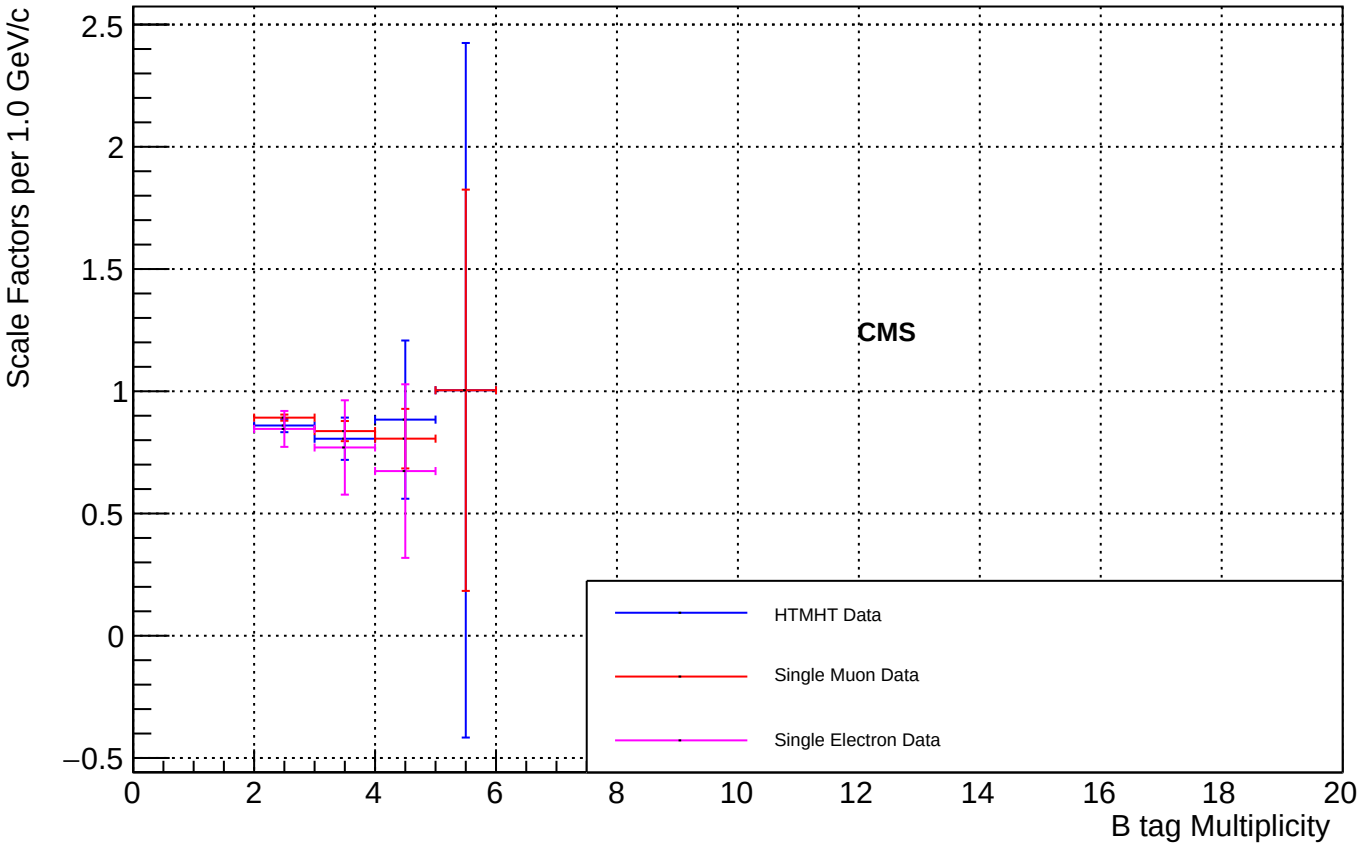
IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2



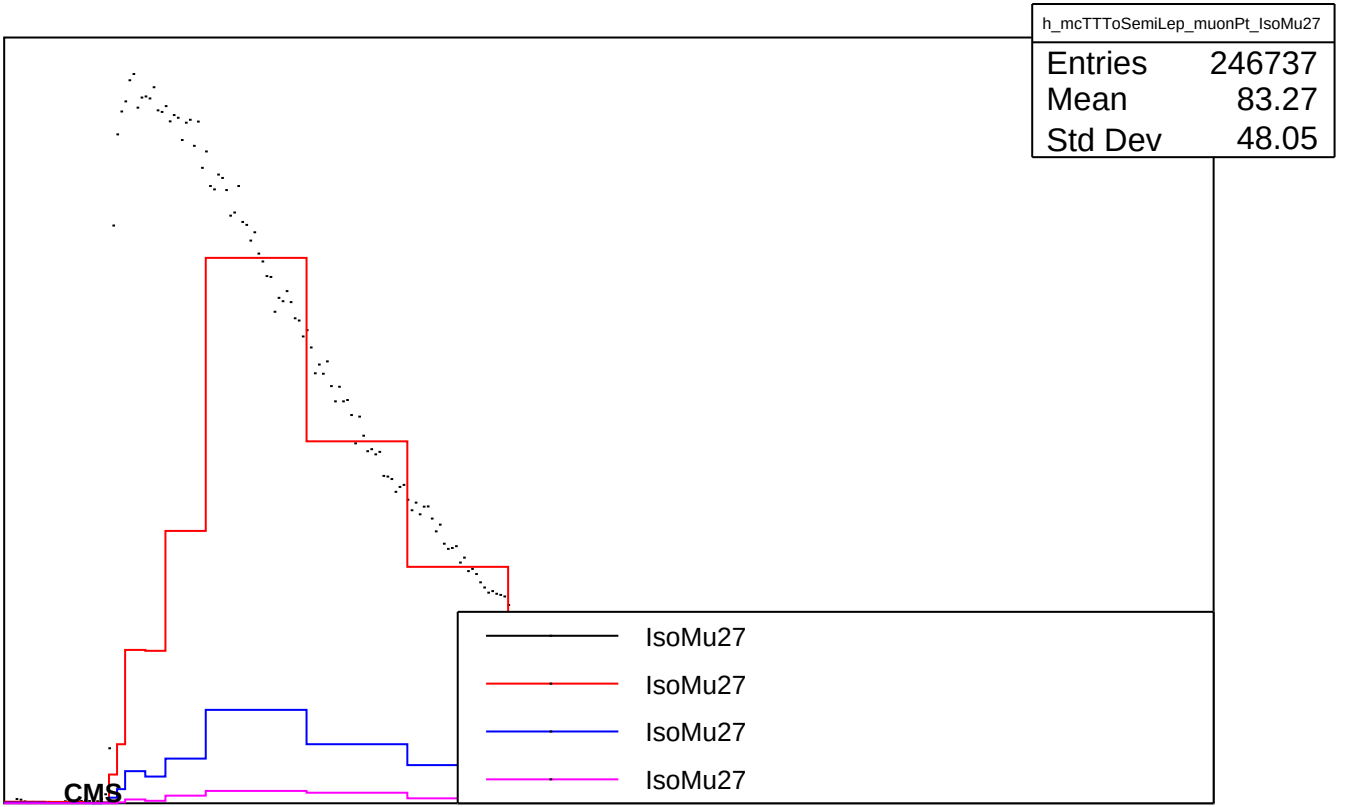
IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2



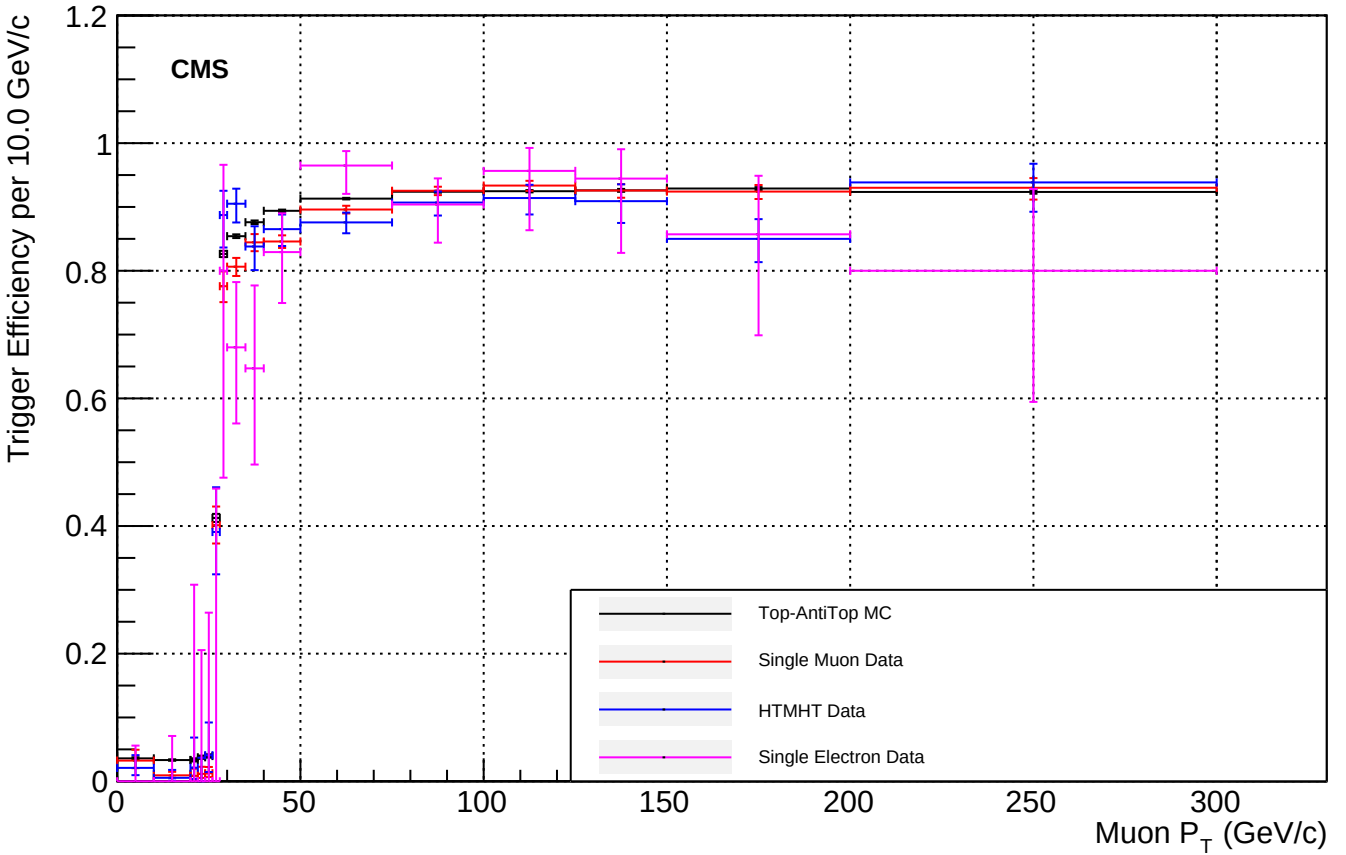
IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

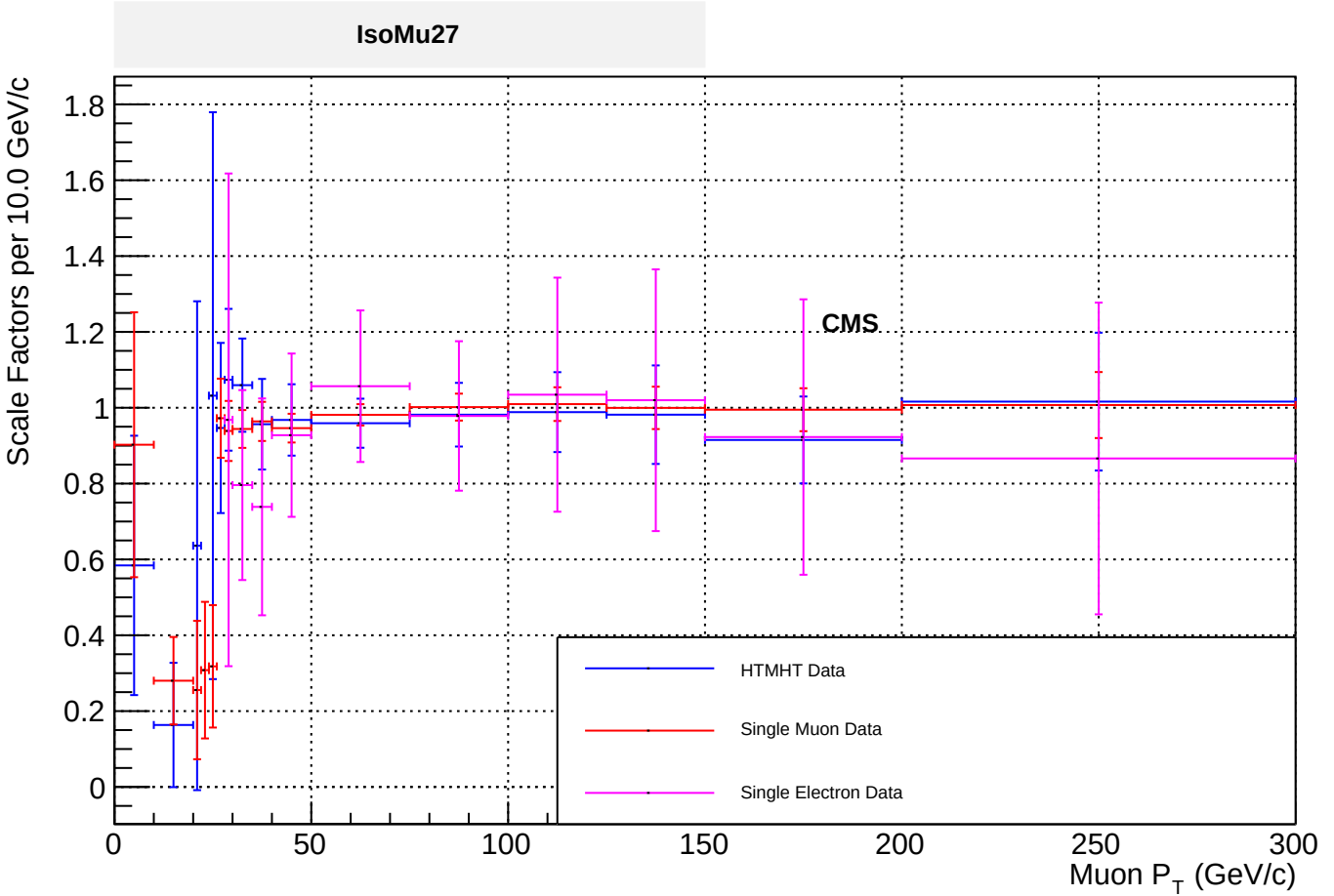


IsoMu27

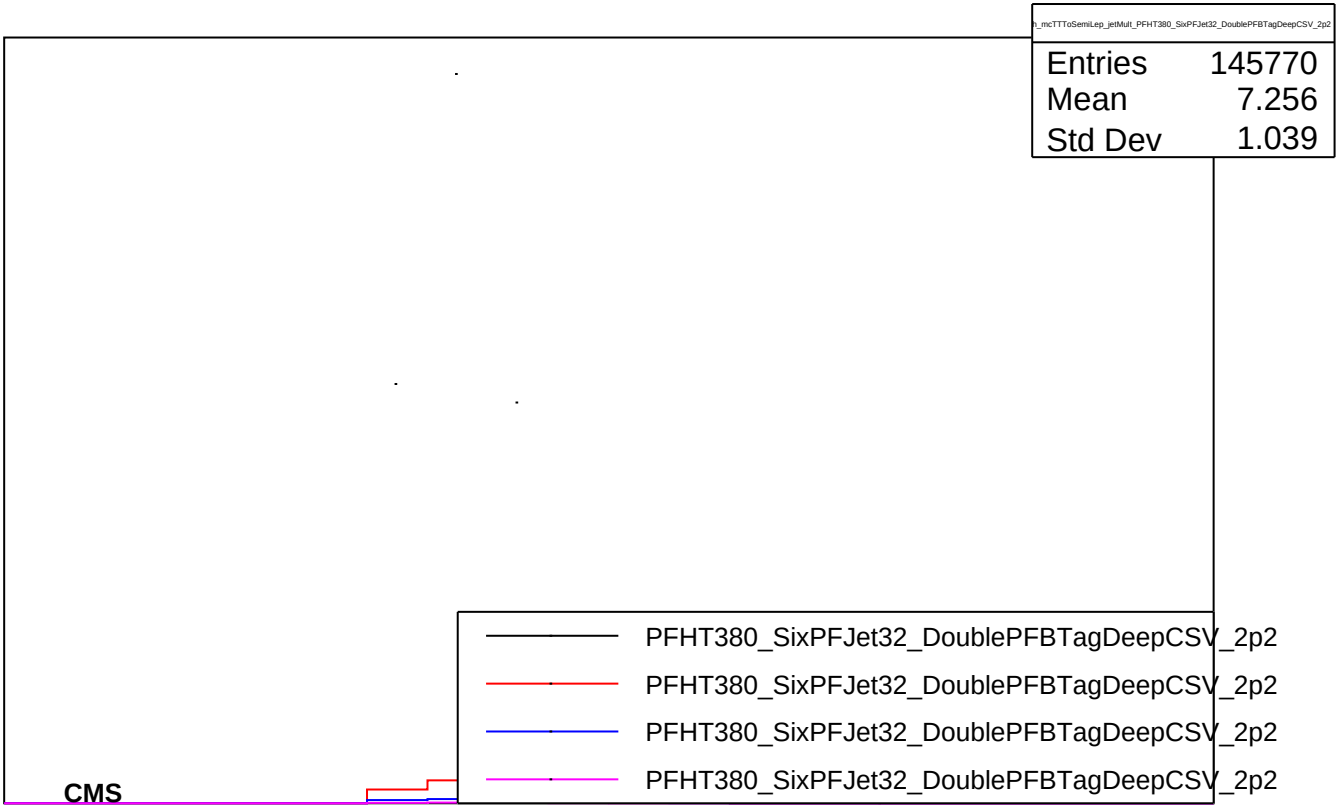

h_mcTTToSemiLep_muonPt_IsoMu27
Entries 246737
Mean 83.27
Std Dev 48.05
IsoMu27
IsoMu27
IsoMu27
IsoMu27
CMS

IsoMu27

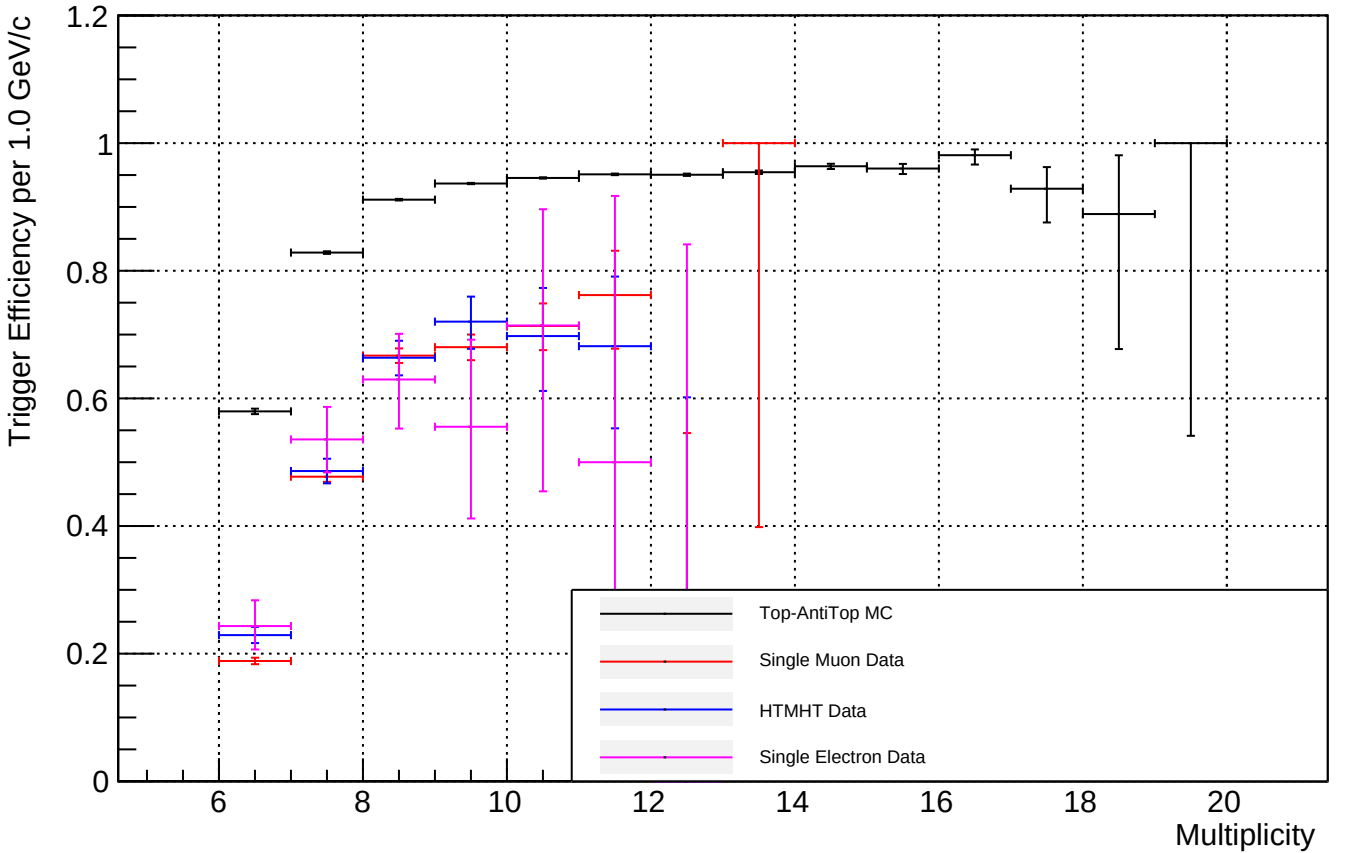

CMS
Trigger Efficiency per 10.0 GeV/c
Muon P_T (GeV/c)
0
0.2
0.4
0.6
0.8
1
1.2
0
50
100
150
200
250
300
Top-AntiTop MC
Single Muon Data
HTMHT Data
Single Electron Data

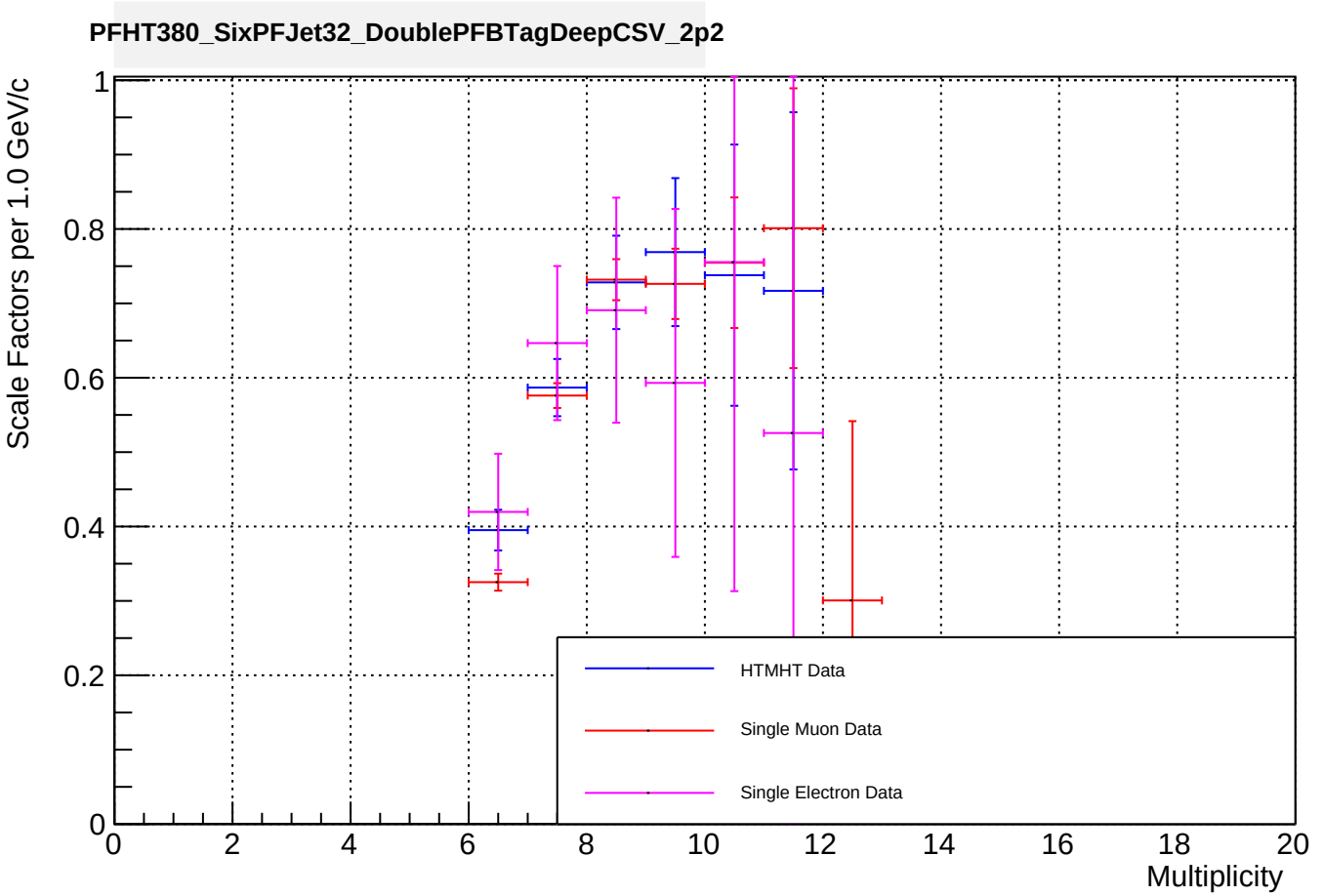

IsoMu27
CMS
Scale Factors per 10.0 GeV/c
Muon P_T (GeV/c)
HTMHT Data
Single Muon Data
Single Electron Data
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
0
50
100
150
200
250
300

PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

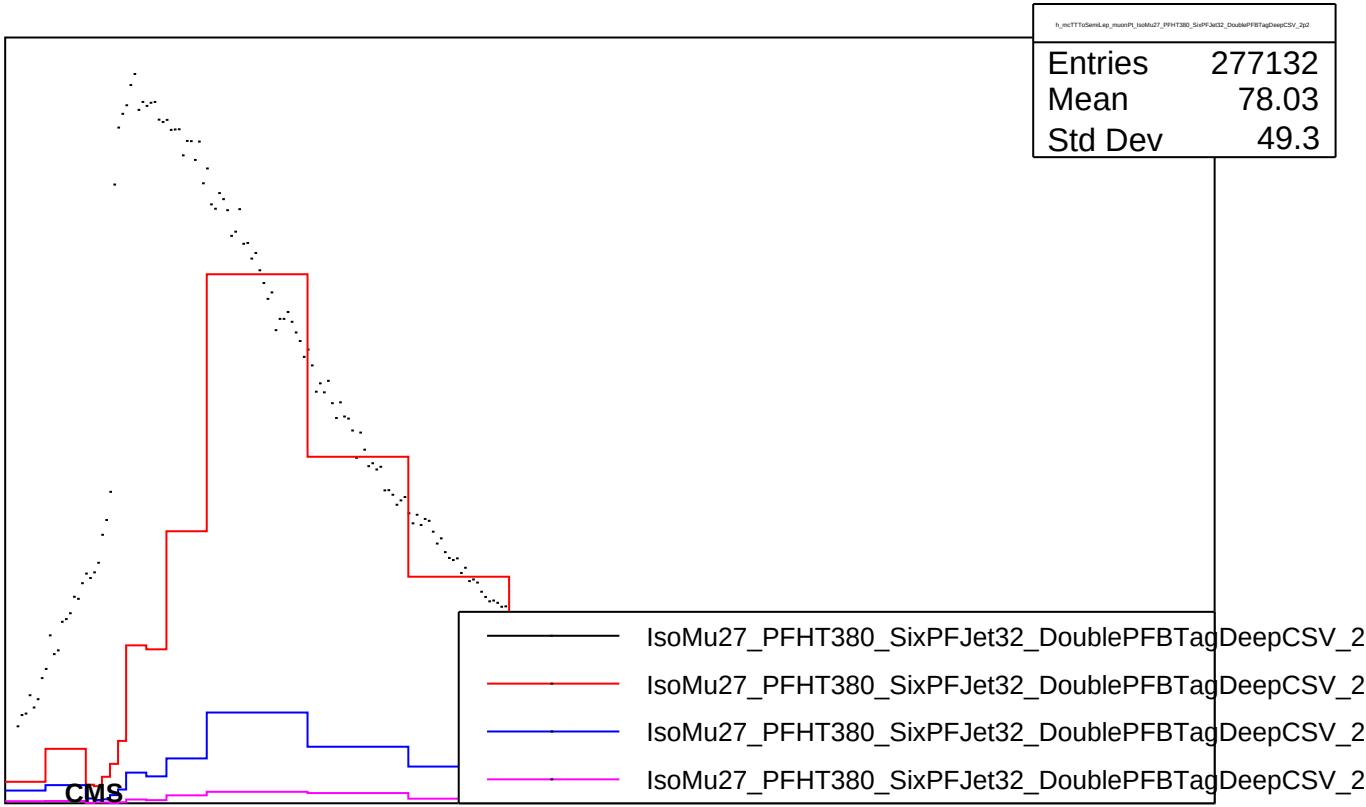


PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

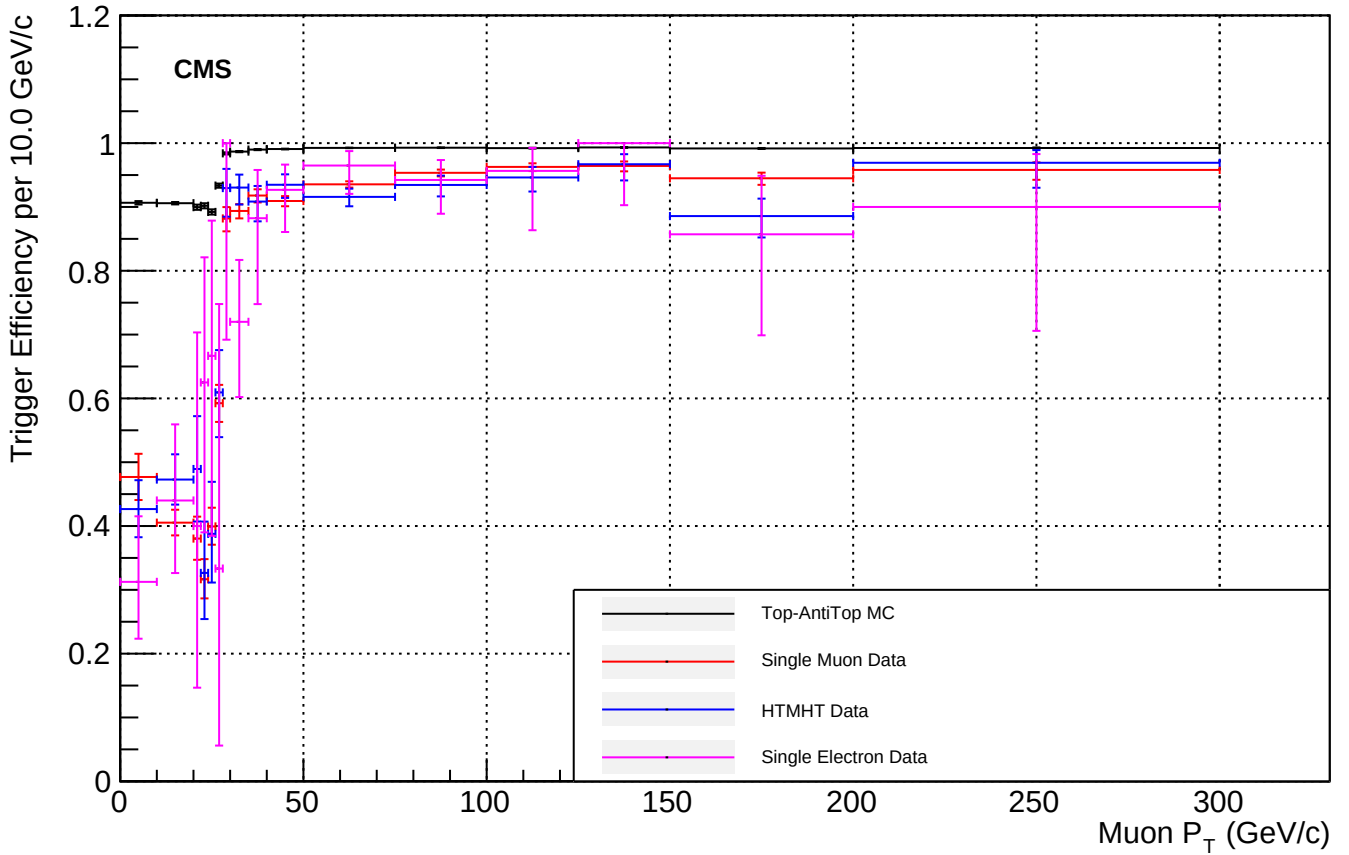


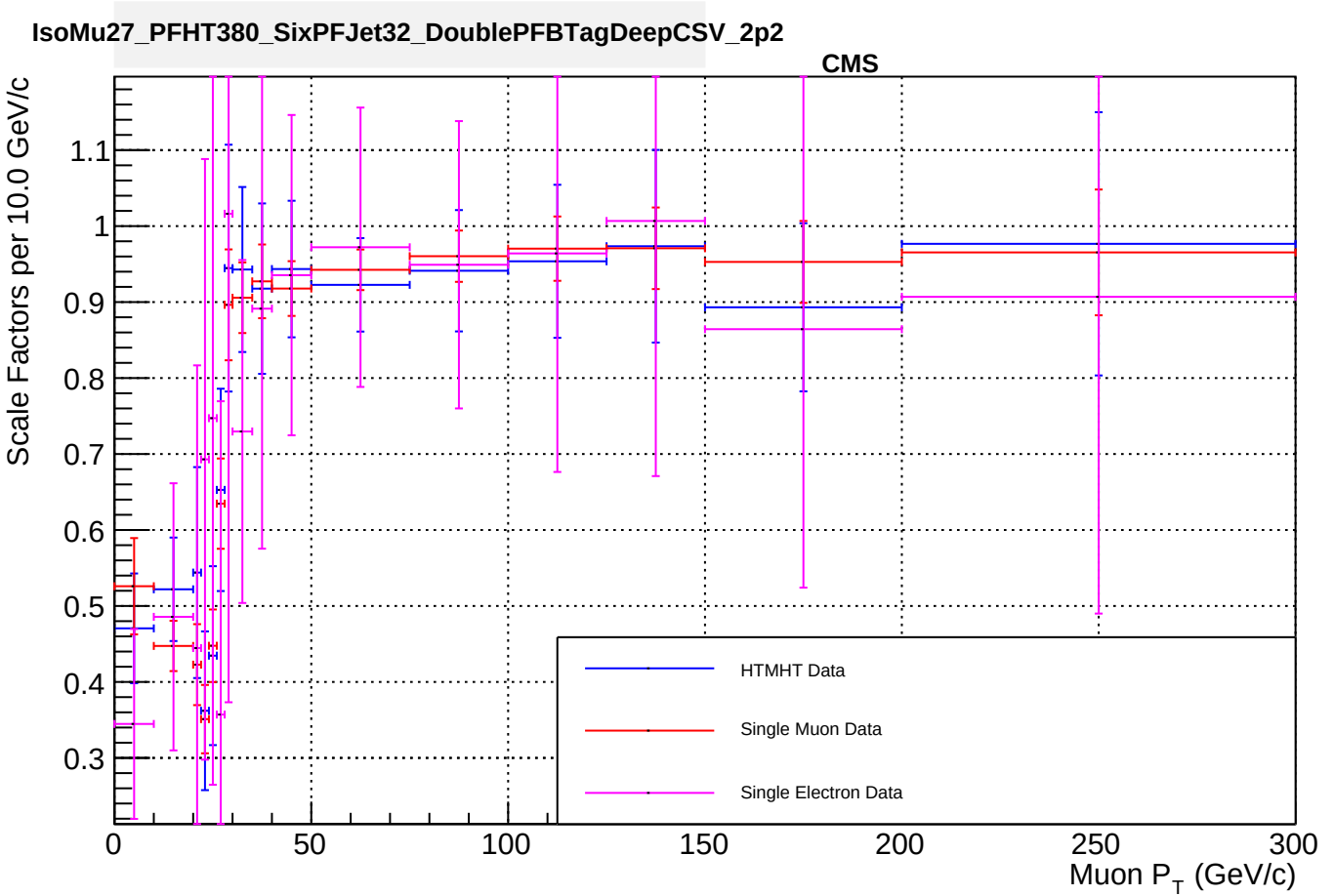

PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Scale Factors per 1.0 GeV/c
Multiplicity
0
0.2
0.4
0.6
0.8
1
0
2
4
6
8
10
12
14
16
18
20
HTMHT Data
Single Muon Data
Single Electron Data

IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

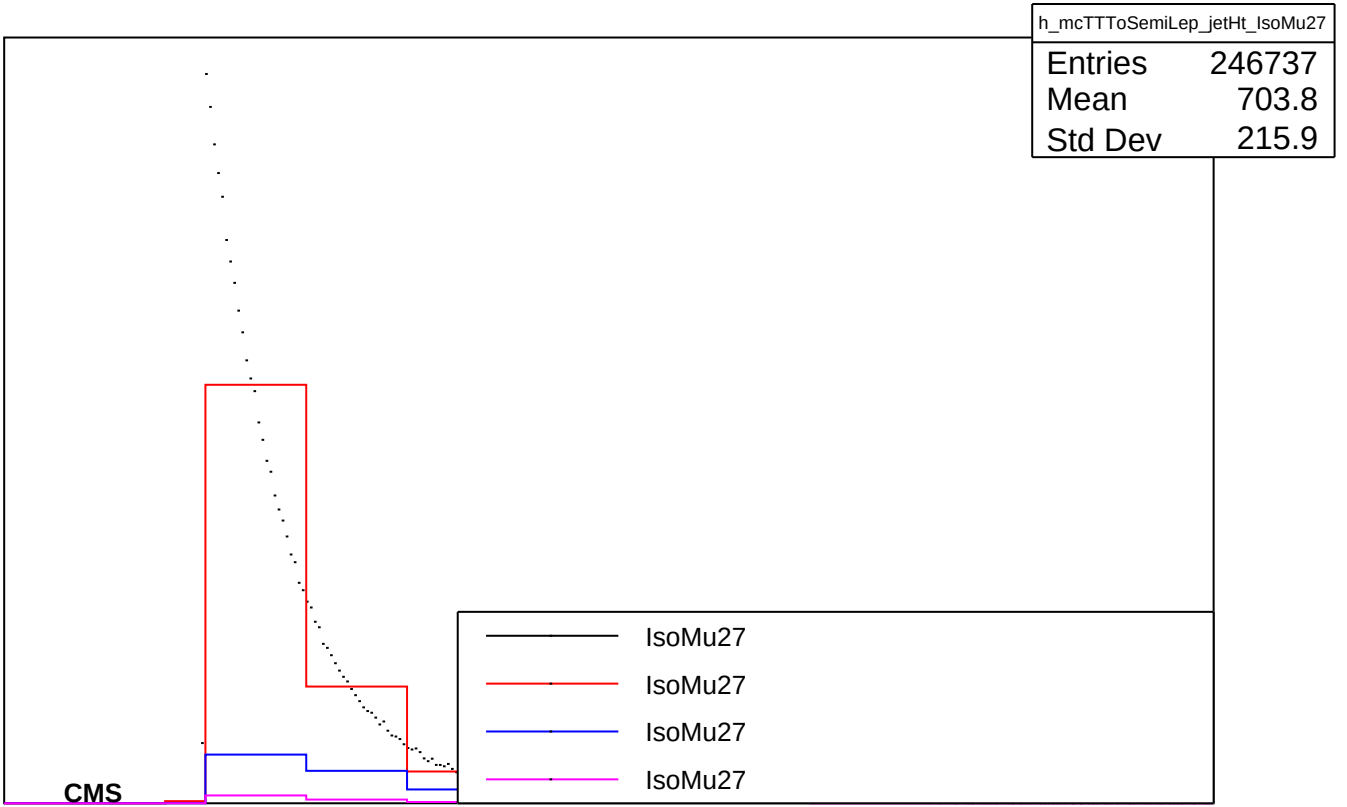


IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

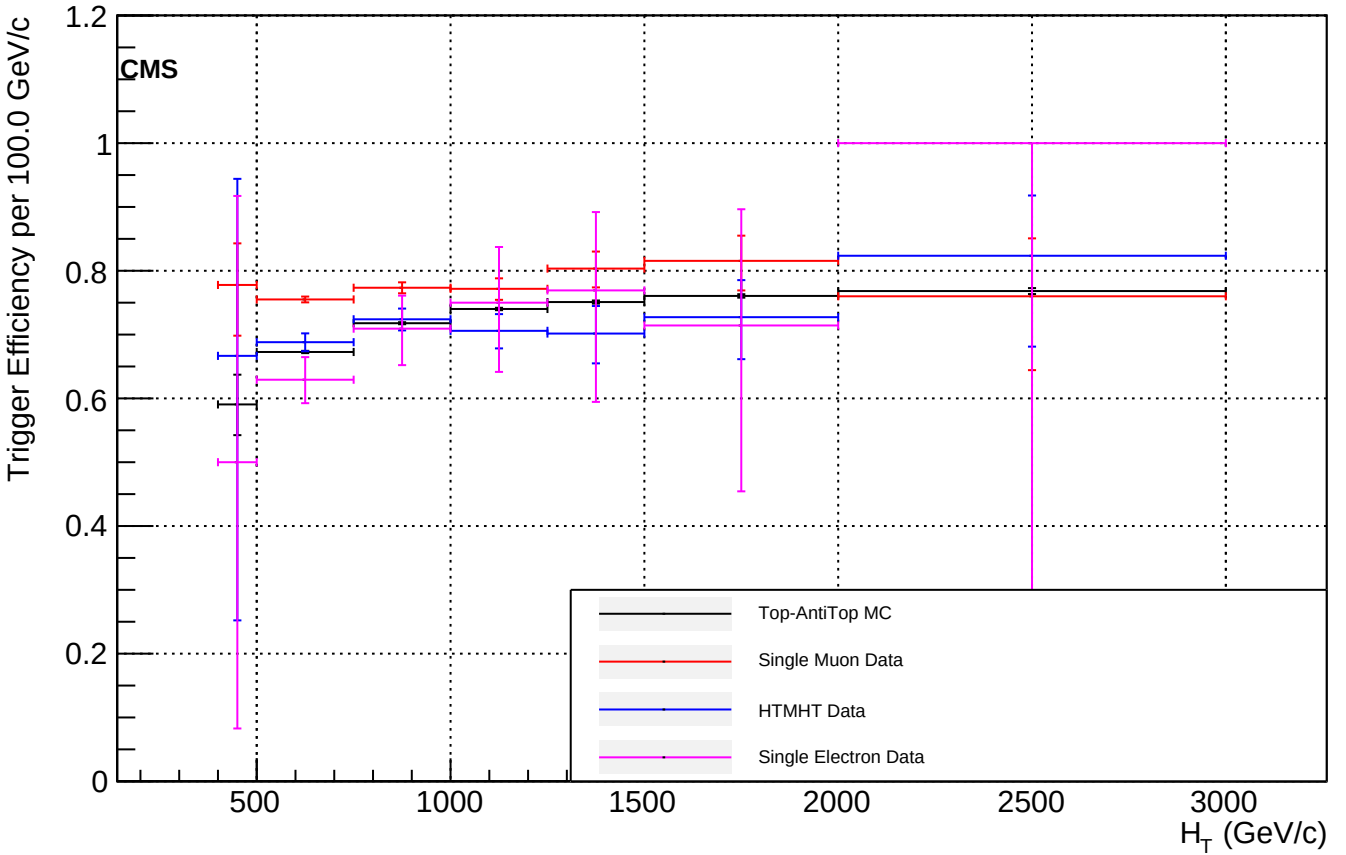


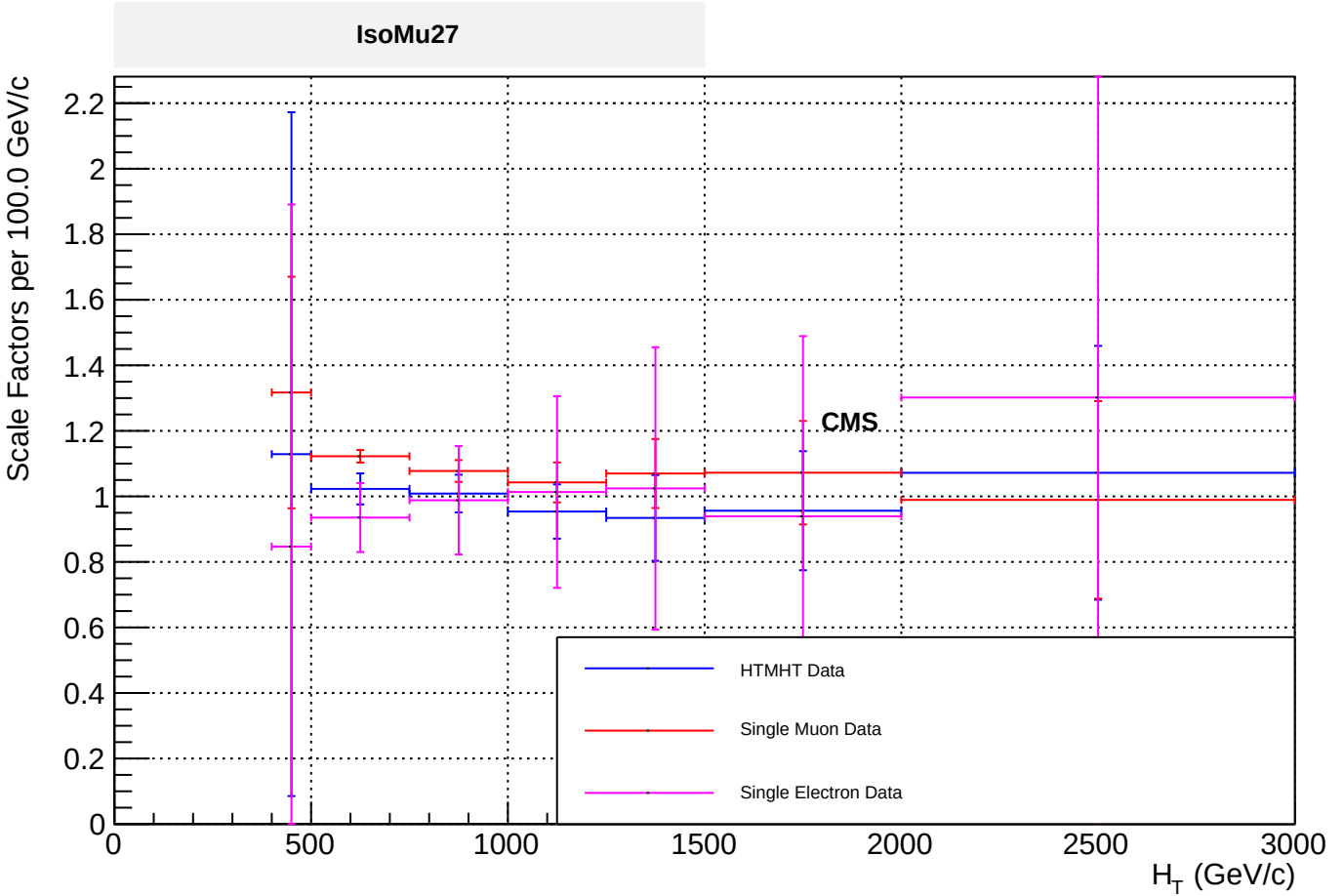

IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
CMS
Scale Factors per 10.0 GeV/c
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0
50
100
150
200
250
300
Muon P_T (GeV/c)
HTMHT Data
Single Muon Data
Single Electron Data

IsoMu27

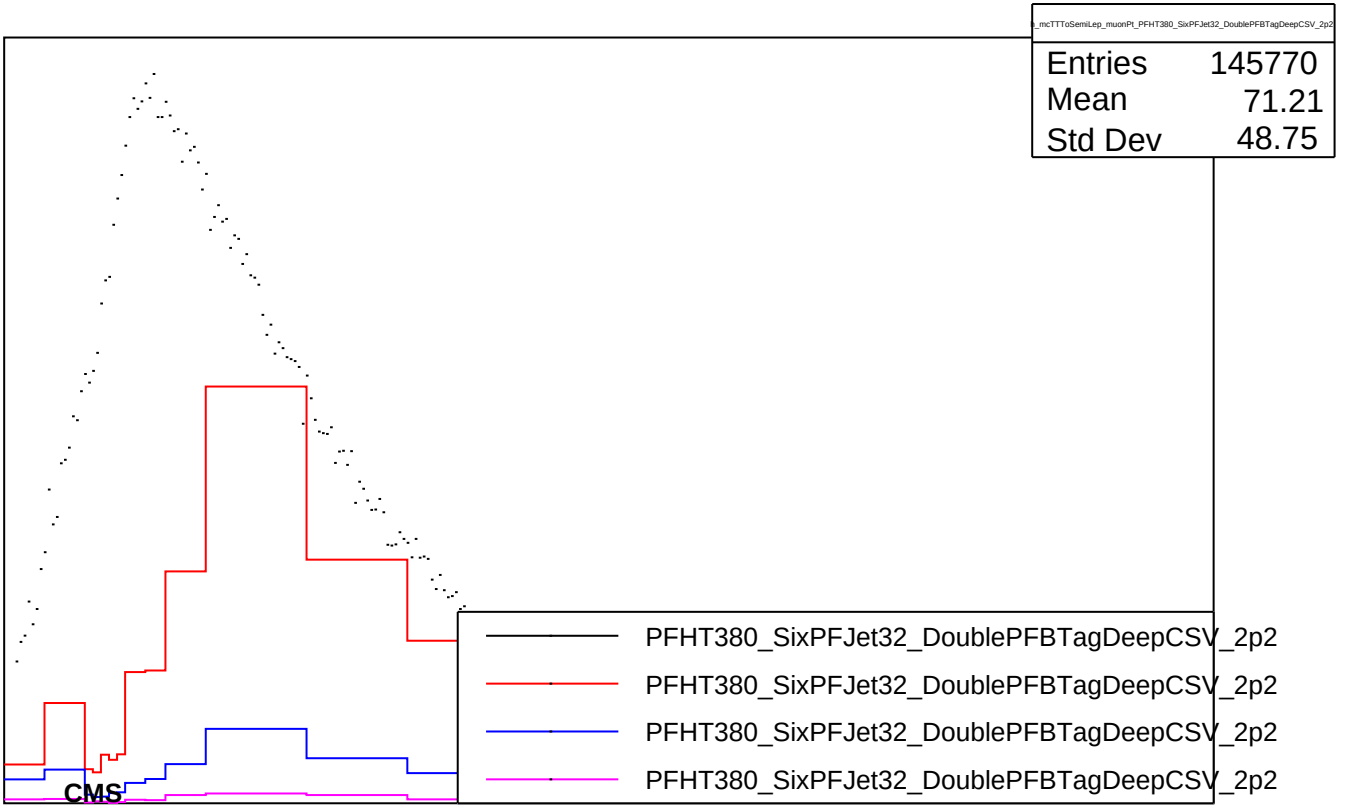

h_mcTTToSemiLep_jetHt_IsoMu27
Entries 246737
Mean 703.8
Std Dev 215.9
IsoMu27
IsoMu27
IsoMu27
IsoMu27
CMS

IsoMu27

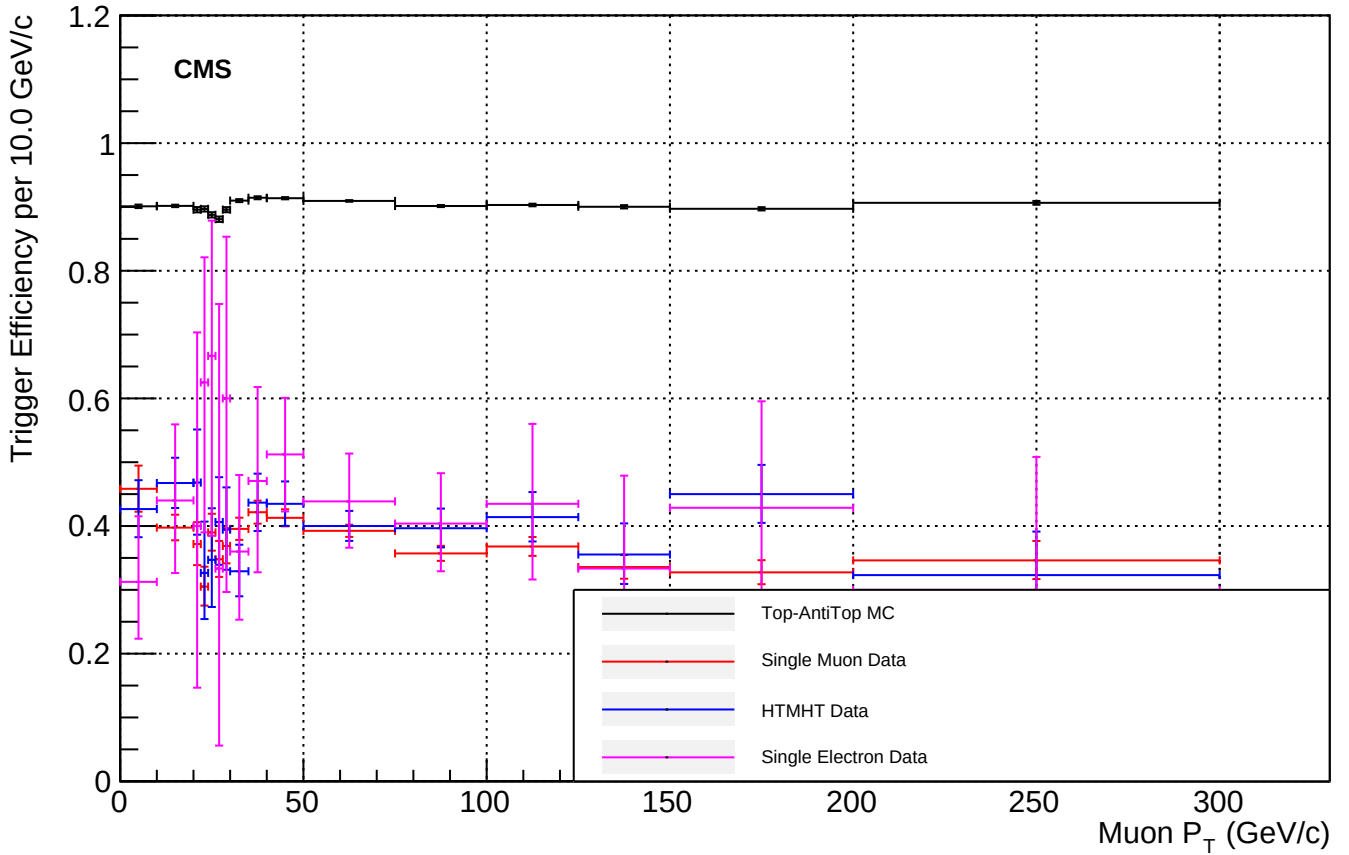

CMS
Trigger Efficiency per 100.0 GeV/c
1.2
1
0.8
0.6
0.4
0.2
0
500
1000
1500
2000
2500
3000
H_T (GeV/c)
Top-AntiTop MC
Single Muon Data
HTMHT Data
Single Electron Data

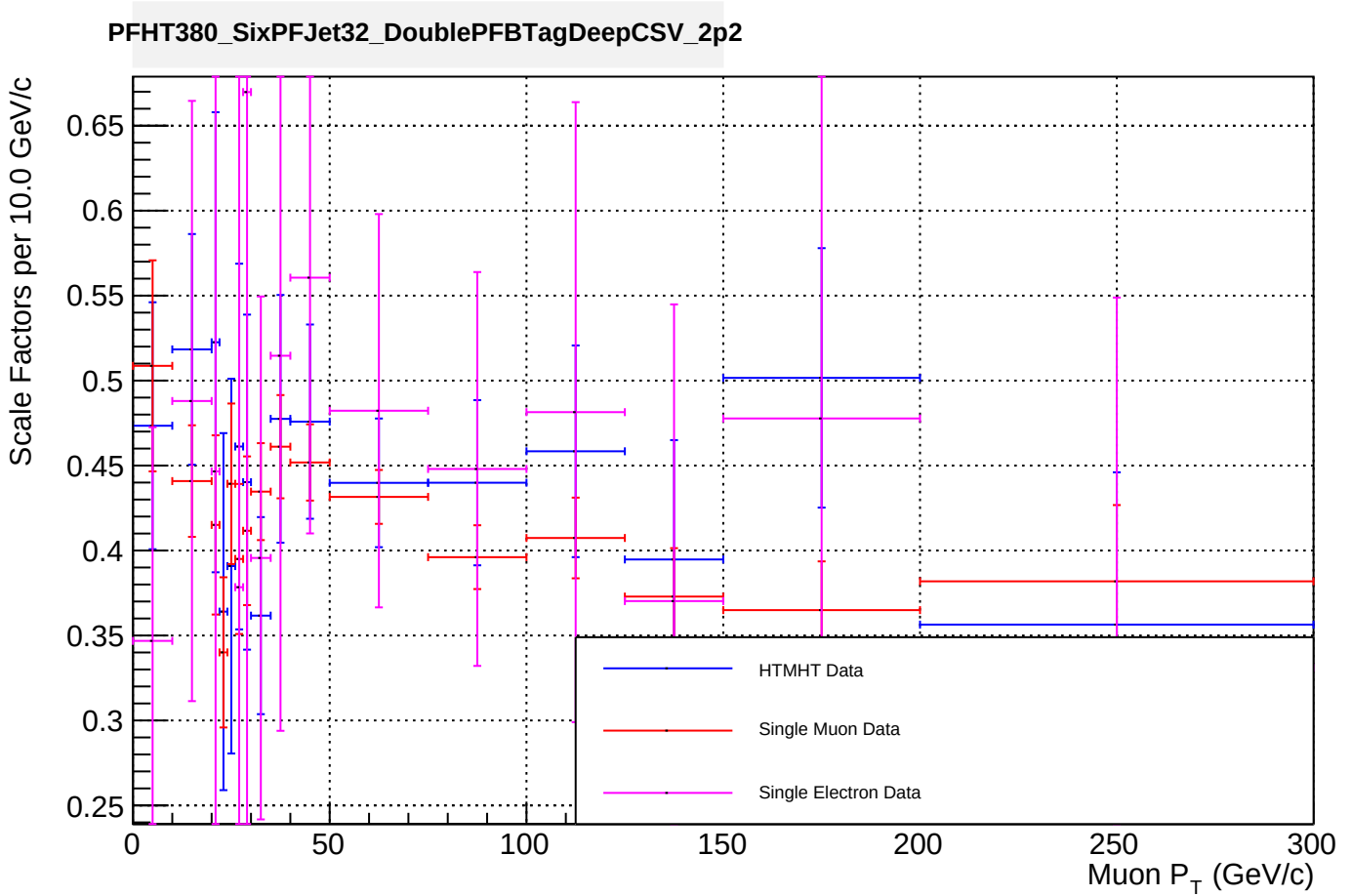

IsoMu27
Scale Factors per 100.0 GeV/c
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
500
1000
1500
2000
2500
3000
H_T (GeV/c)
CMS
HTMHT Data
Single Muon Data
Single Electron Data

PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

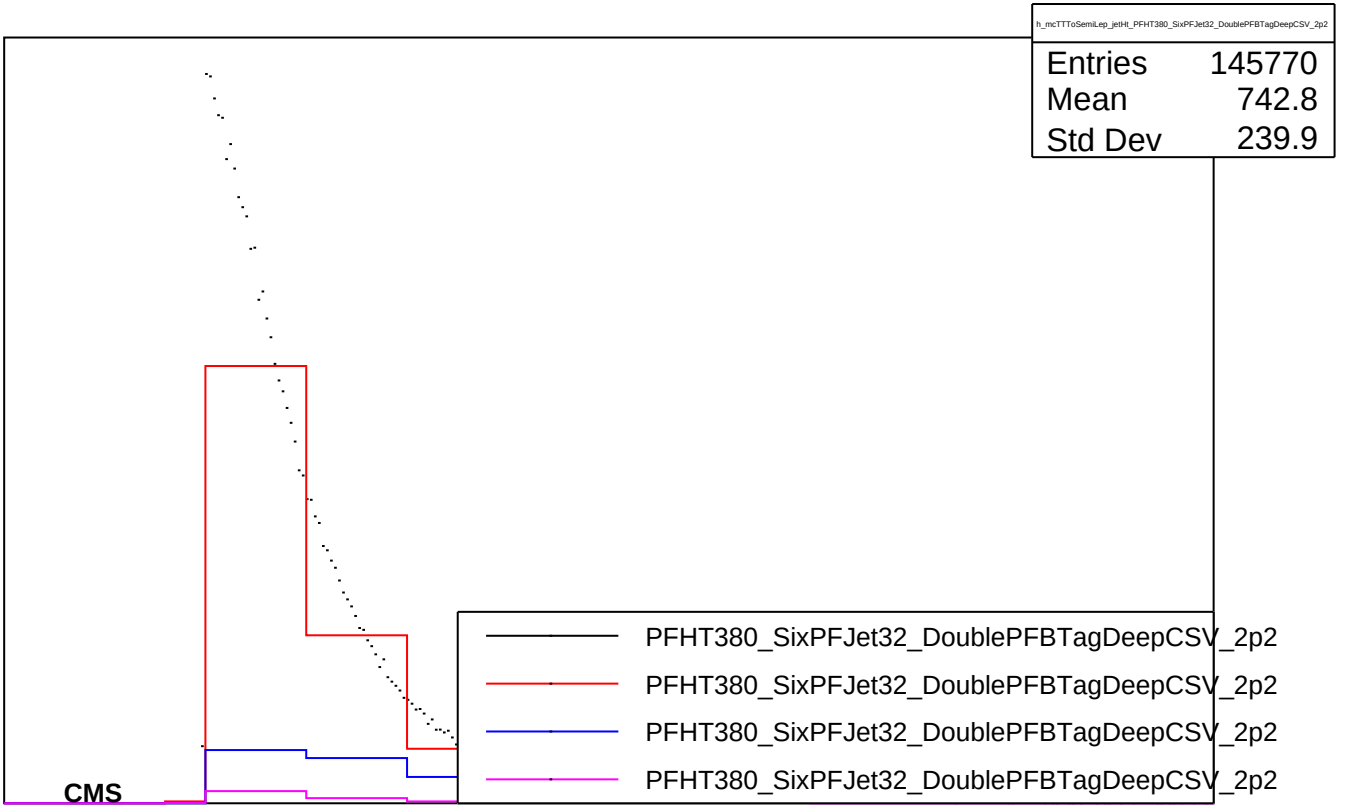


PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

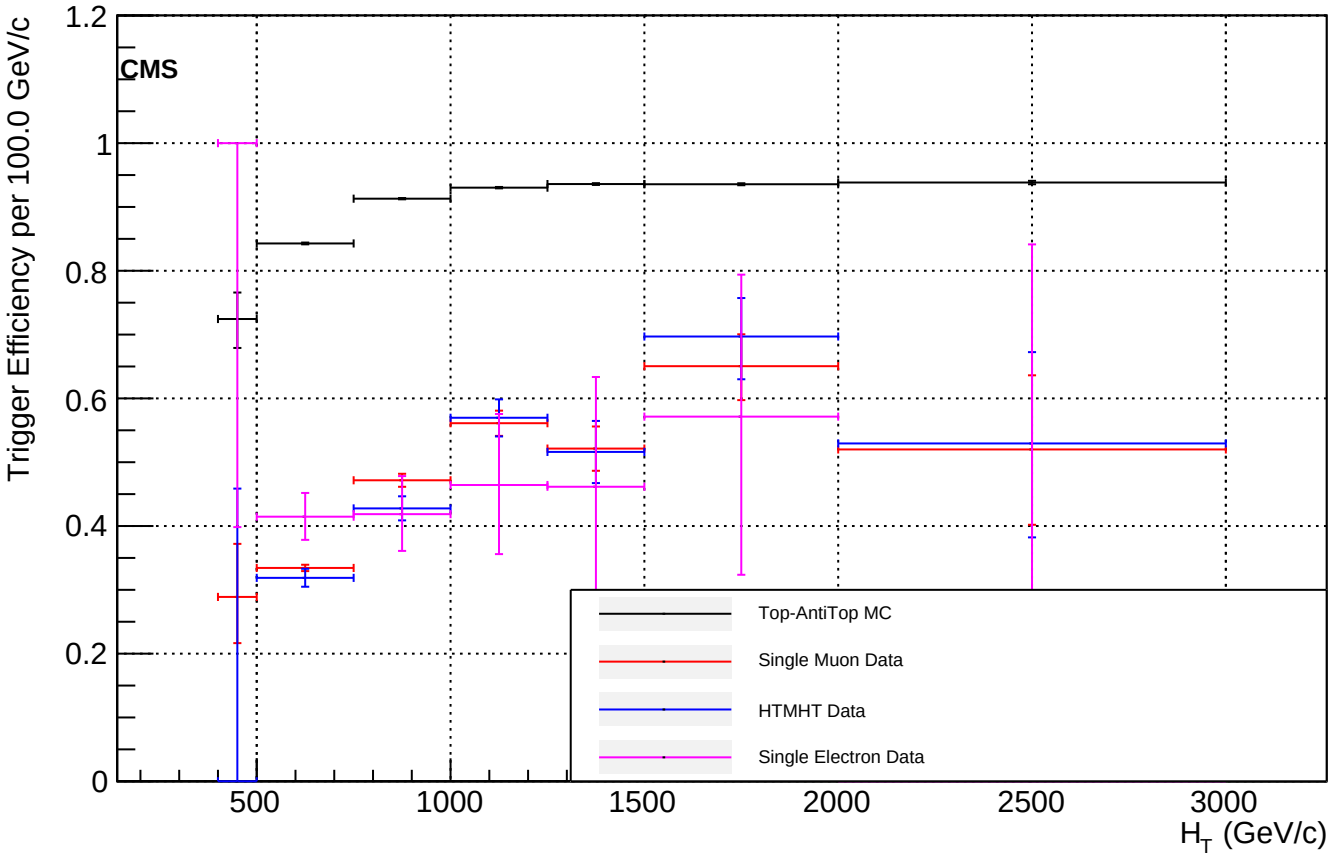


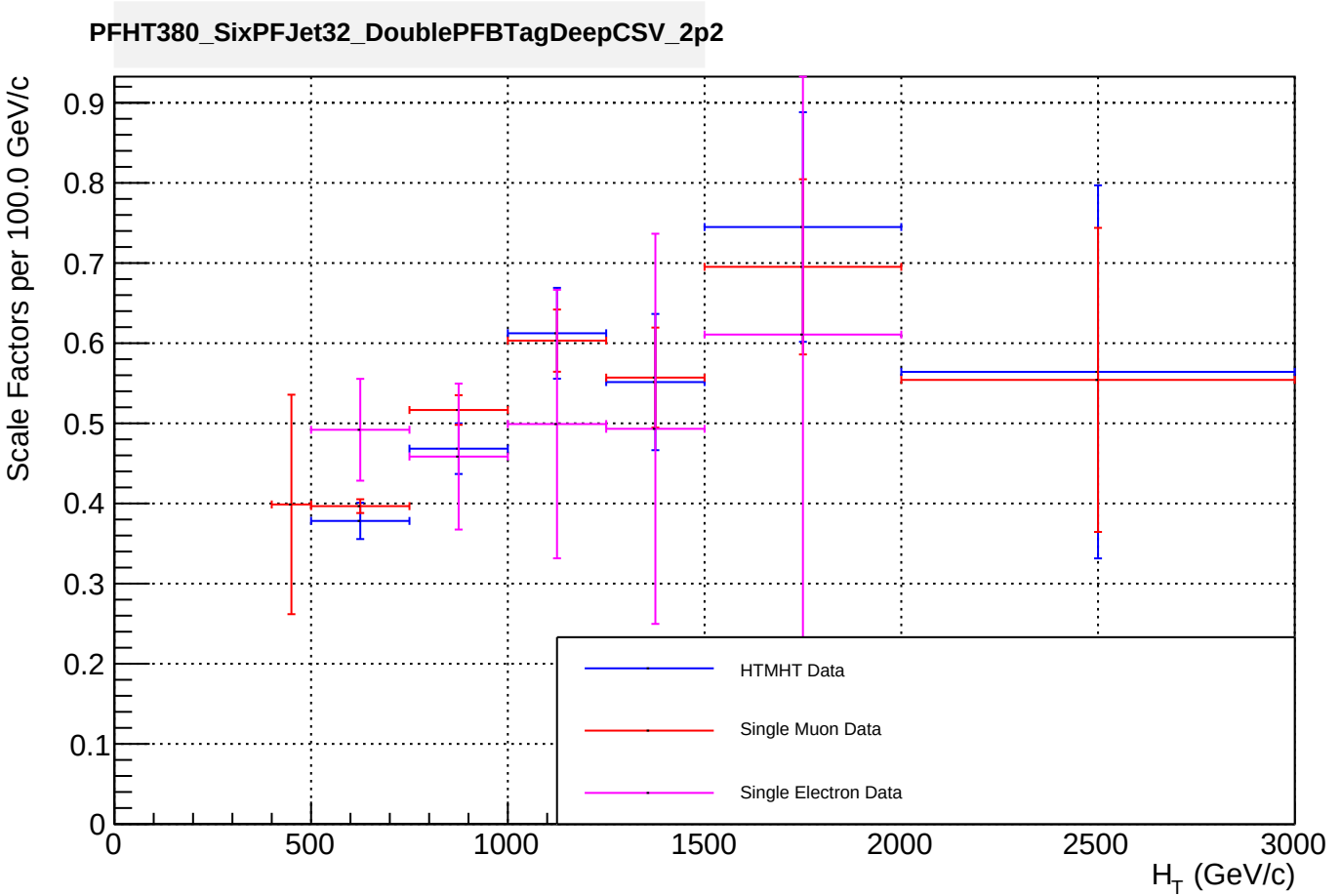

PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Scale Factors per 10.0 GeV/c
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0
50
100
150
200
250
300
Muon P_T (GeV/c)
HTMHT Data
Single Muon Data
Single Electron Data

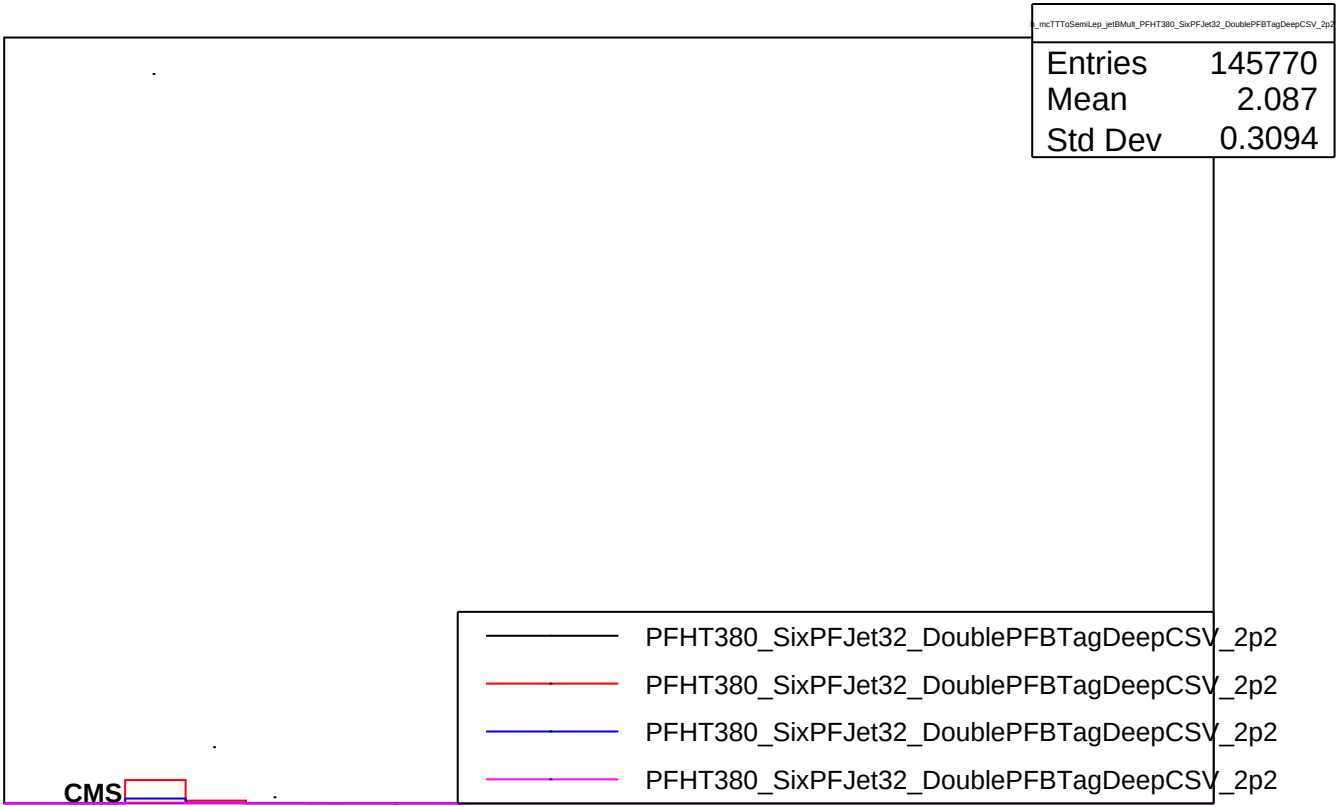
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2



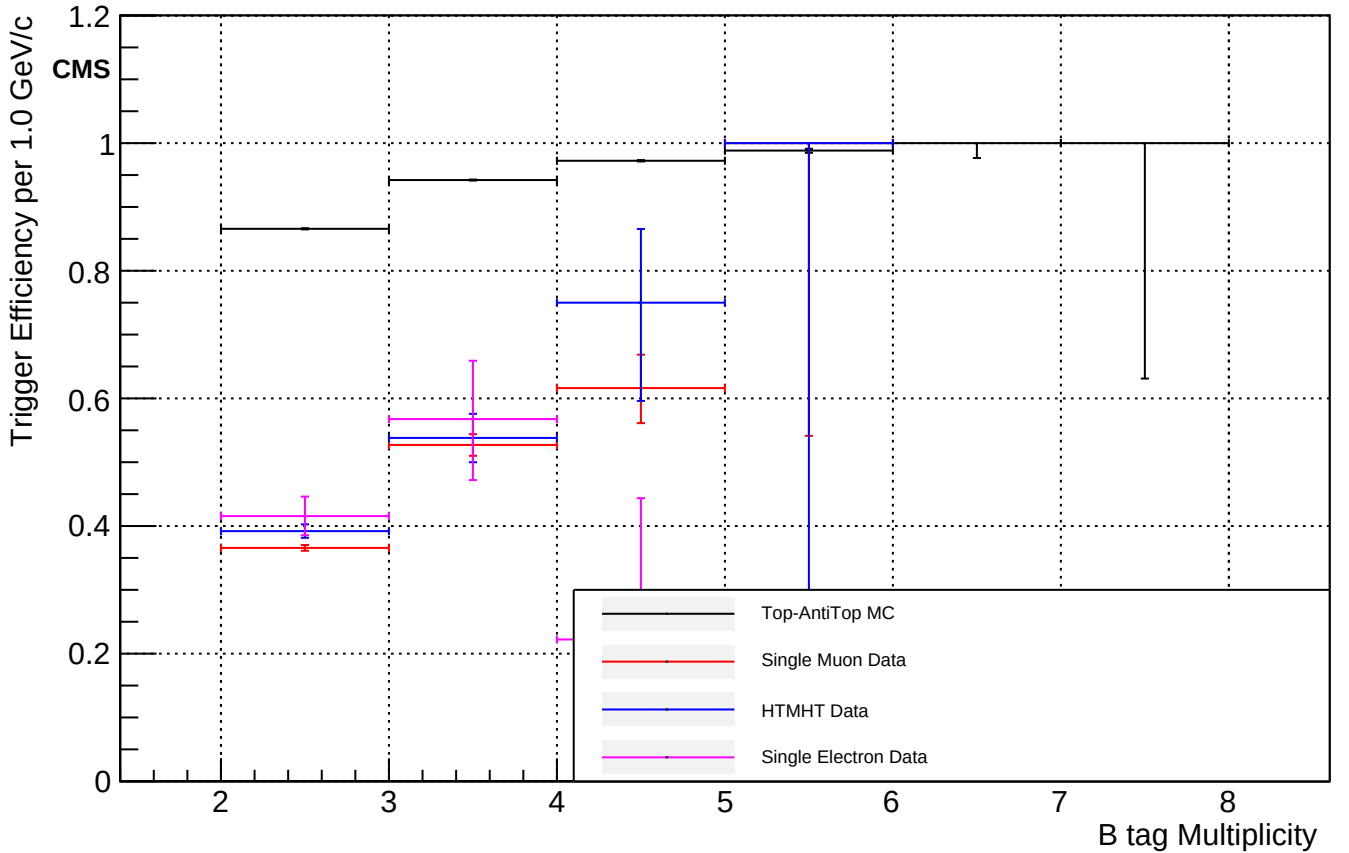
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

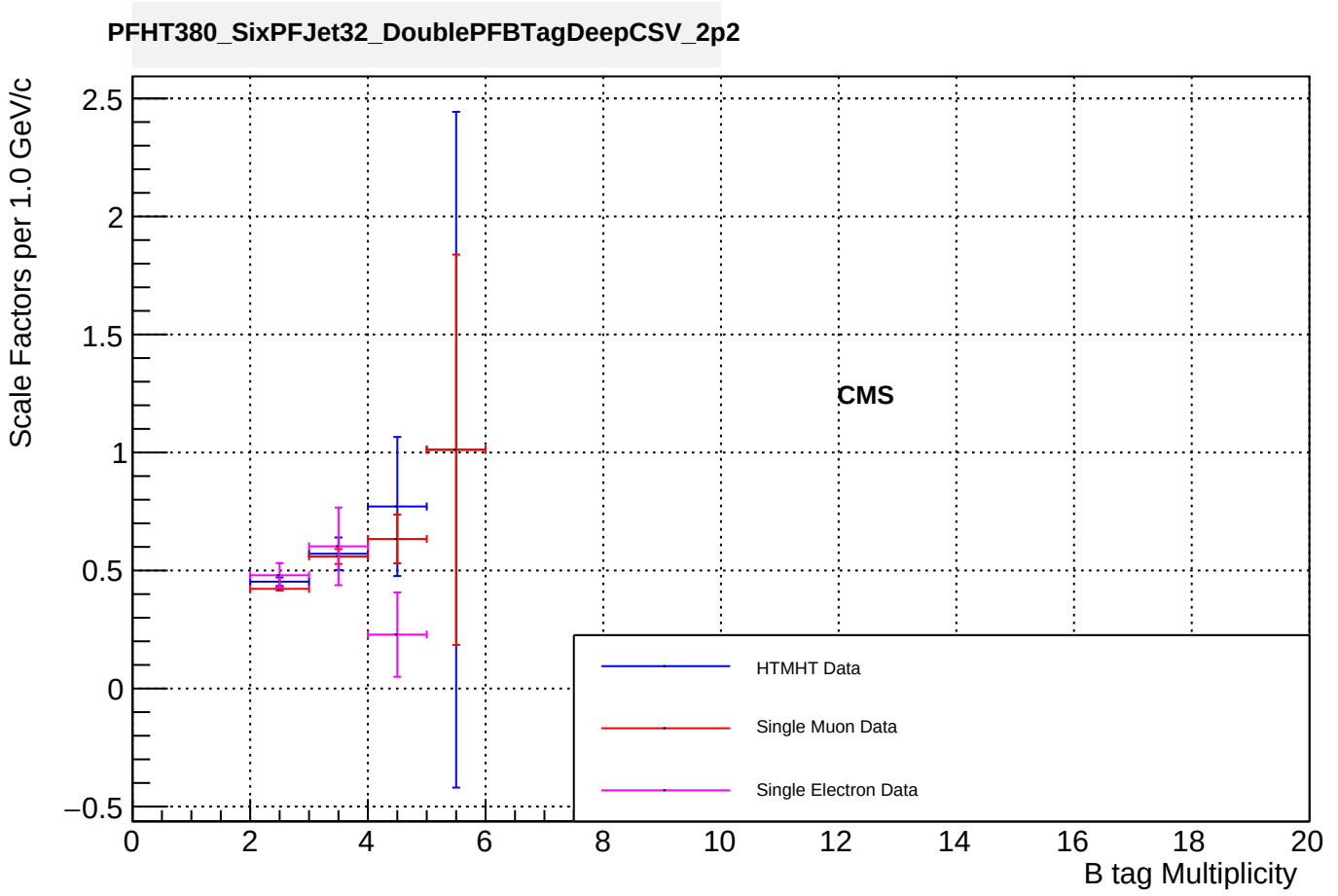


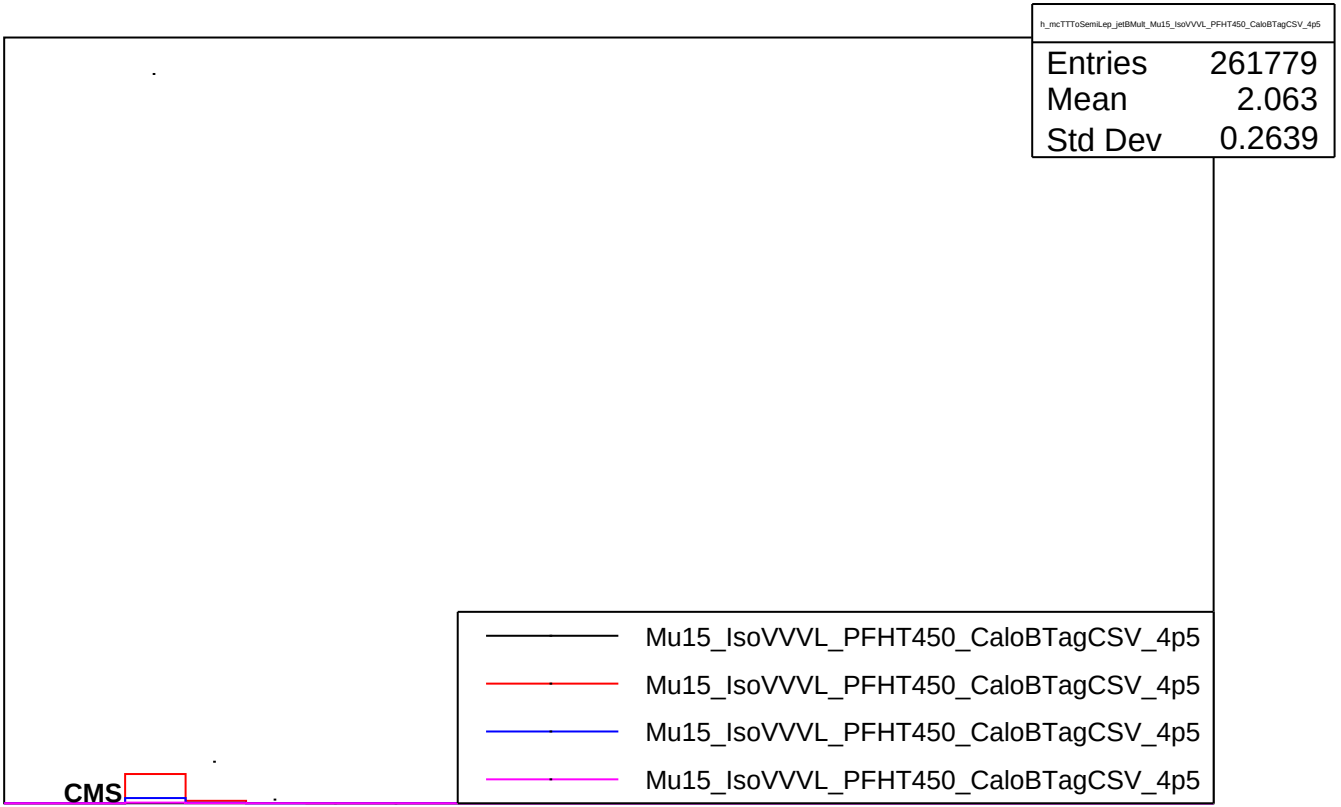

PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Scale Factors per 100.0 GeV/c
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
500
1000
1500
2000
2500
3000
H_T (GeV/c)
HTMHT Data
Single Muon Data
Single Electron Data

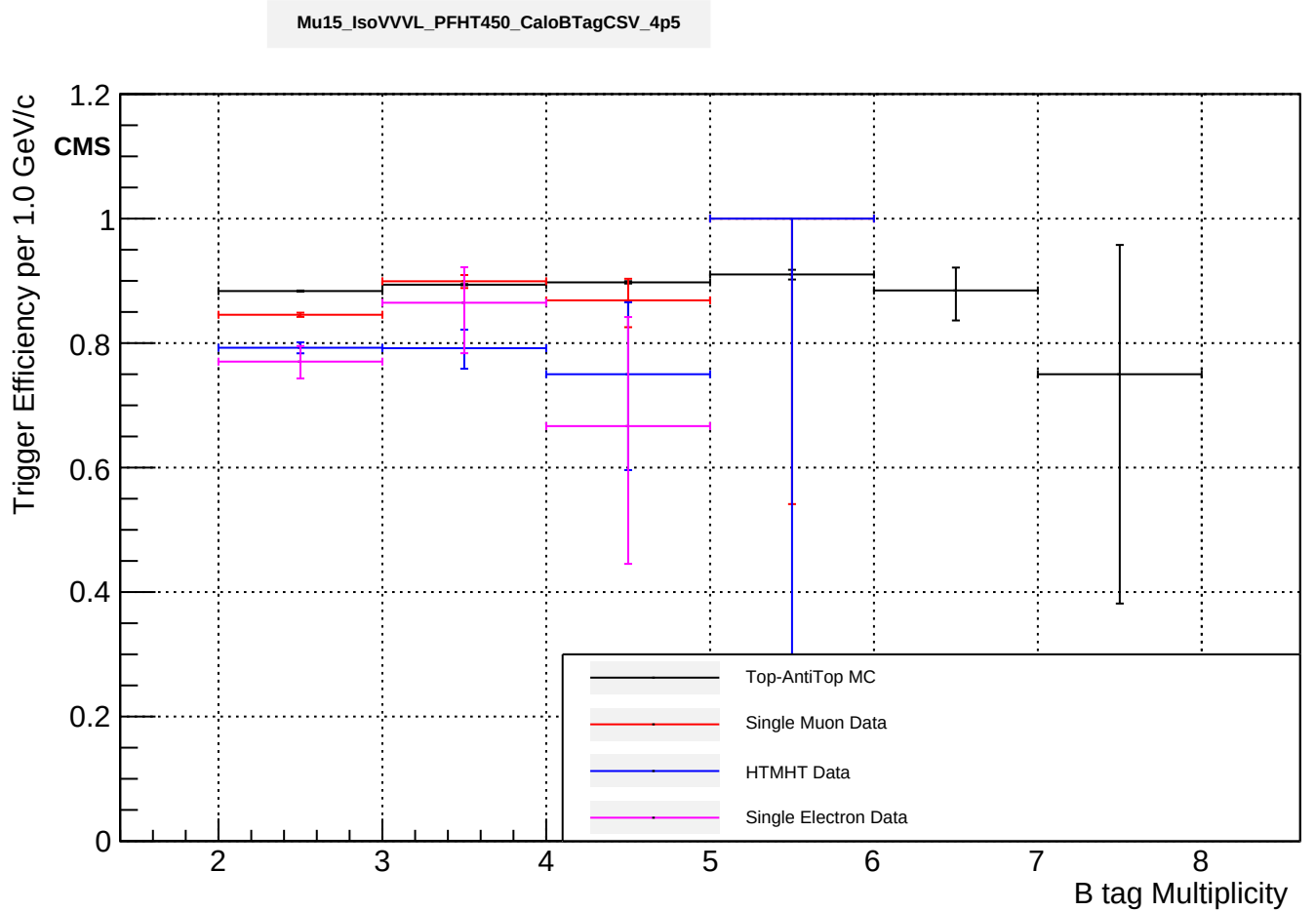

Entries 145770
Mean 2.087
Std Dev 0.3094
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
CMS

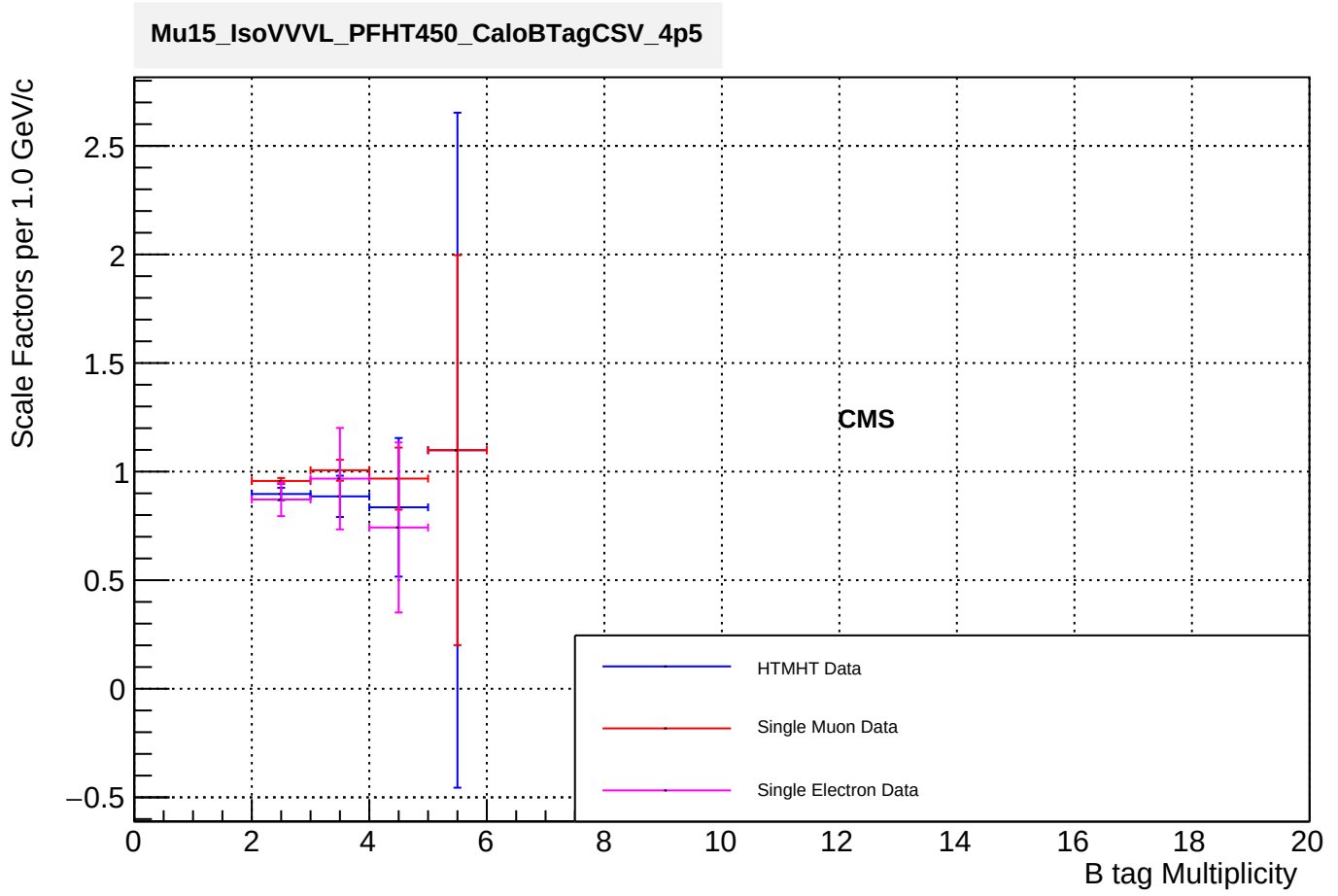
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2



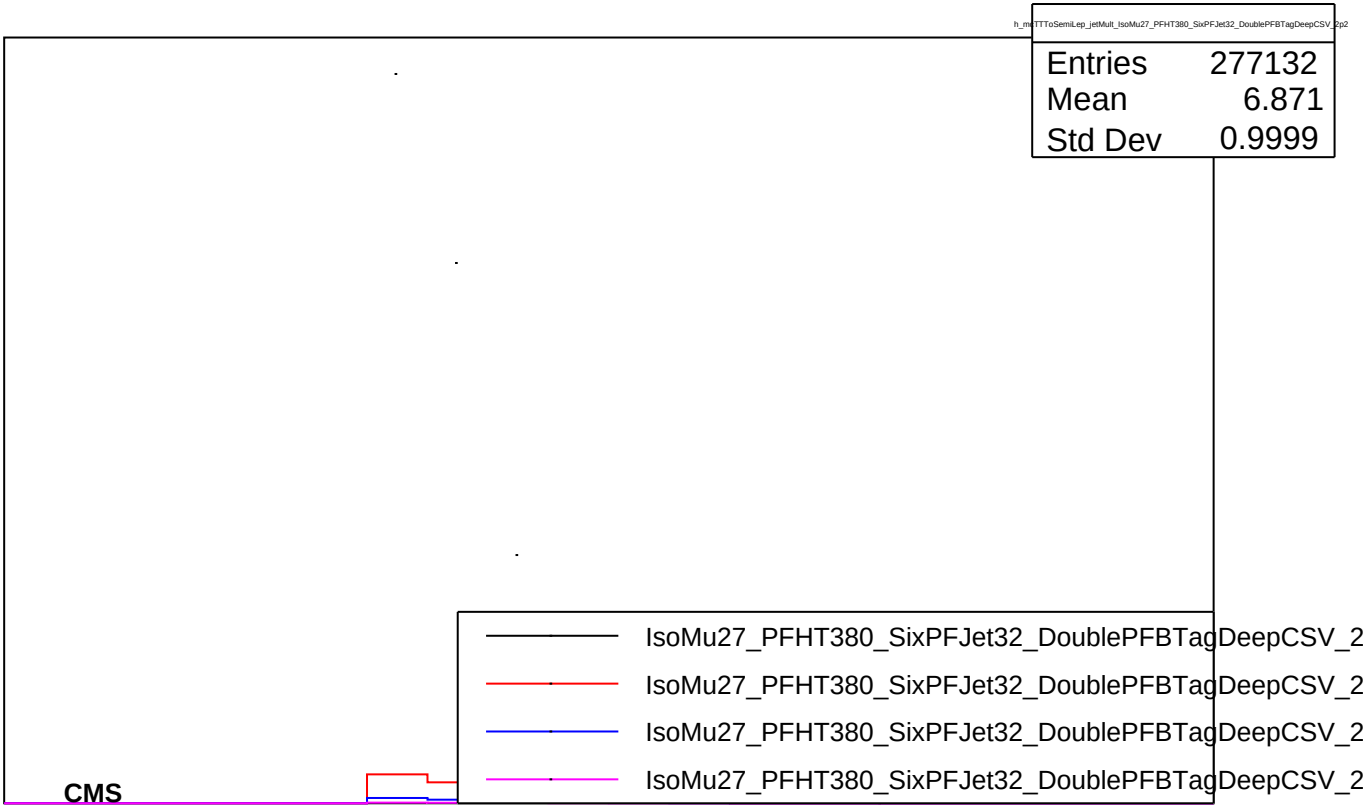

PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Scale Factors per 1.0 GeV/c
2.5
2
1.5
1
0.5
0
−0.5
0
2
4
6
8
10
12
14
16
18
20
B tag Multiplicity
CMS
HTMHT Data
Single Muon Data
Single Electron Data


h_mcTTToSemiLep_jetBMult_Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Entries 261779
Mean 2.063
Std Dev 0.2639
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
CMS

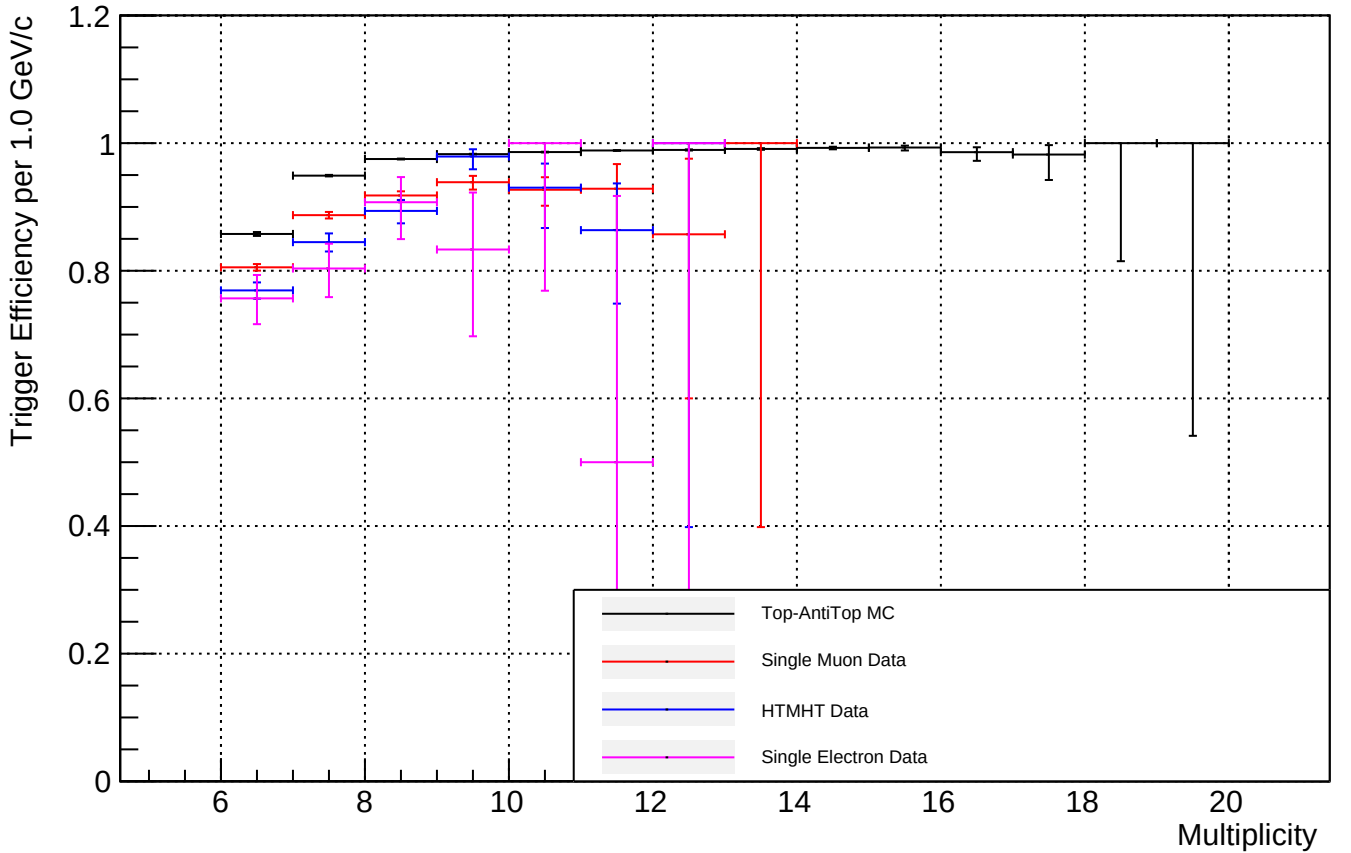

Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
CMS
Trigger Efficiency per 1.0 GeV/c
B tag Multiplicity
Top-AntiTop MC
Single Muon Data
HTMHT Data
Single Electron Data

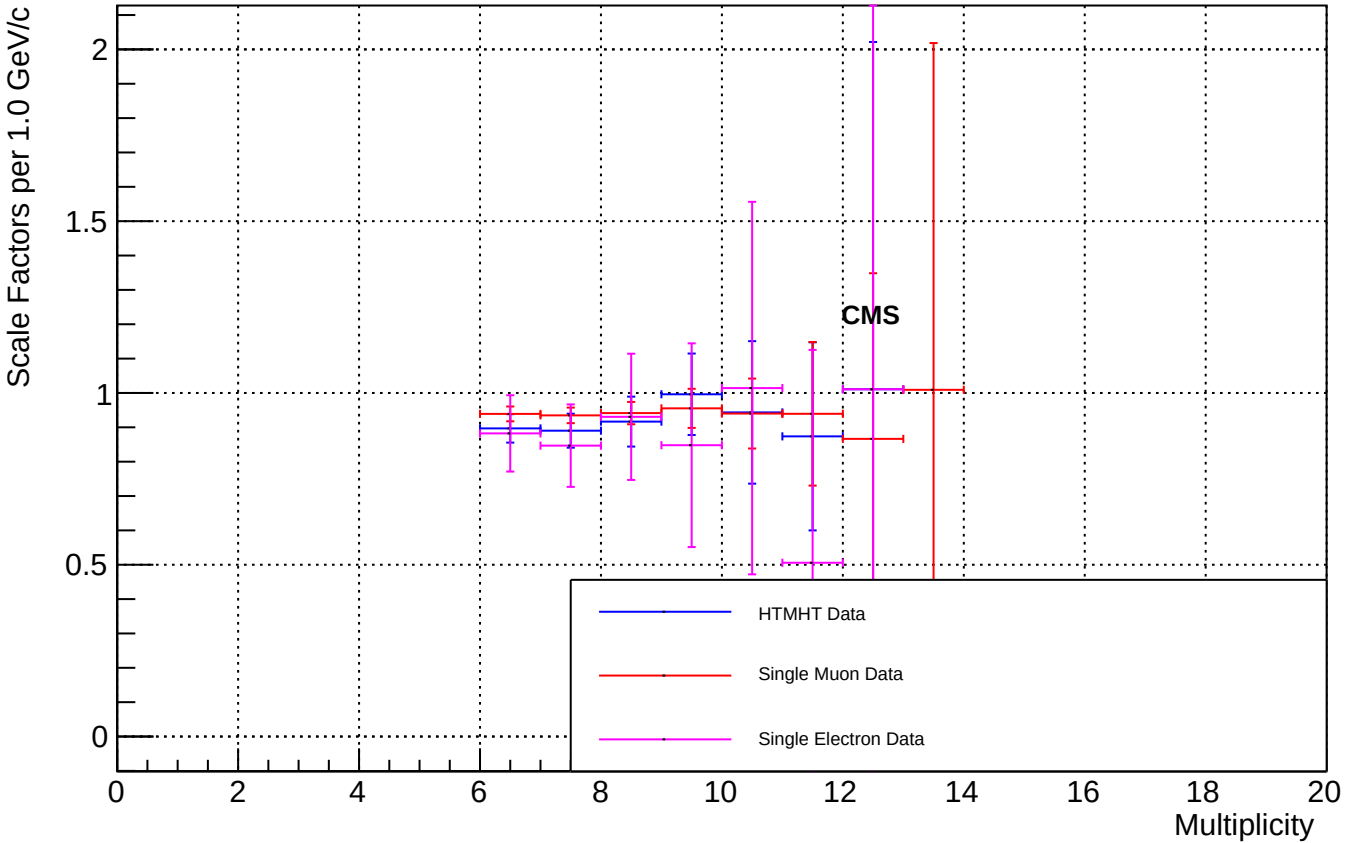

Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
Scale Factors per 1.0 GeV/c
2.5
2
1.5
1
0.5
0
−0.5
CMS
HTMHT Data
Single Muon Data
Single Electron Data
0
2
4
6
8
10
12
14
16
18
20
B tag Multiplicity

IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

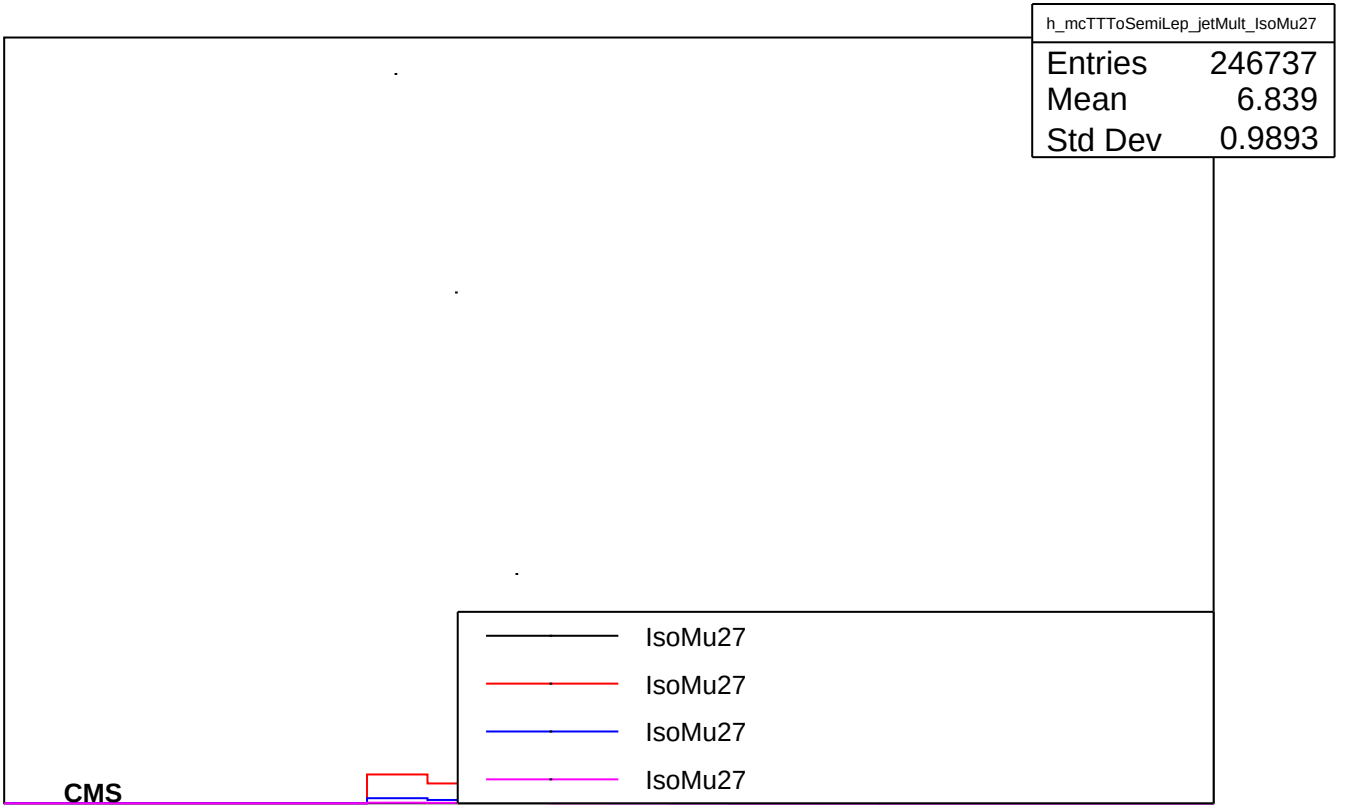


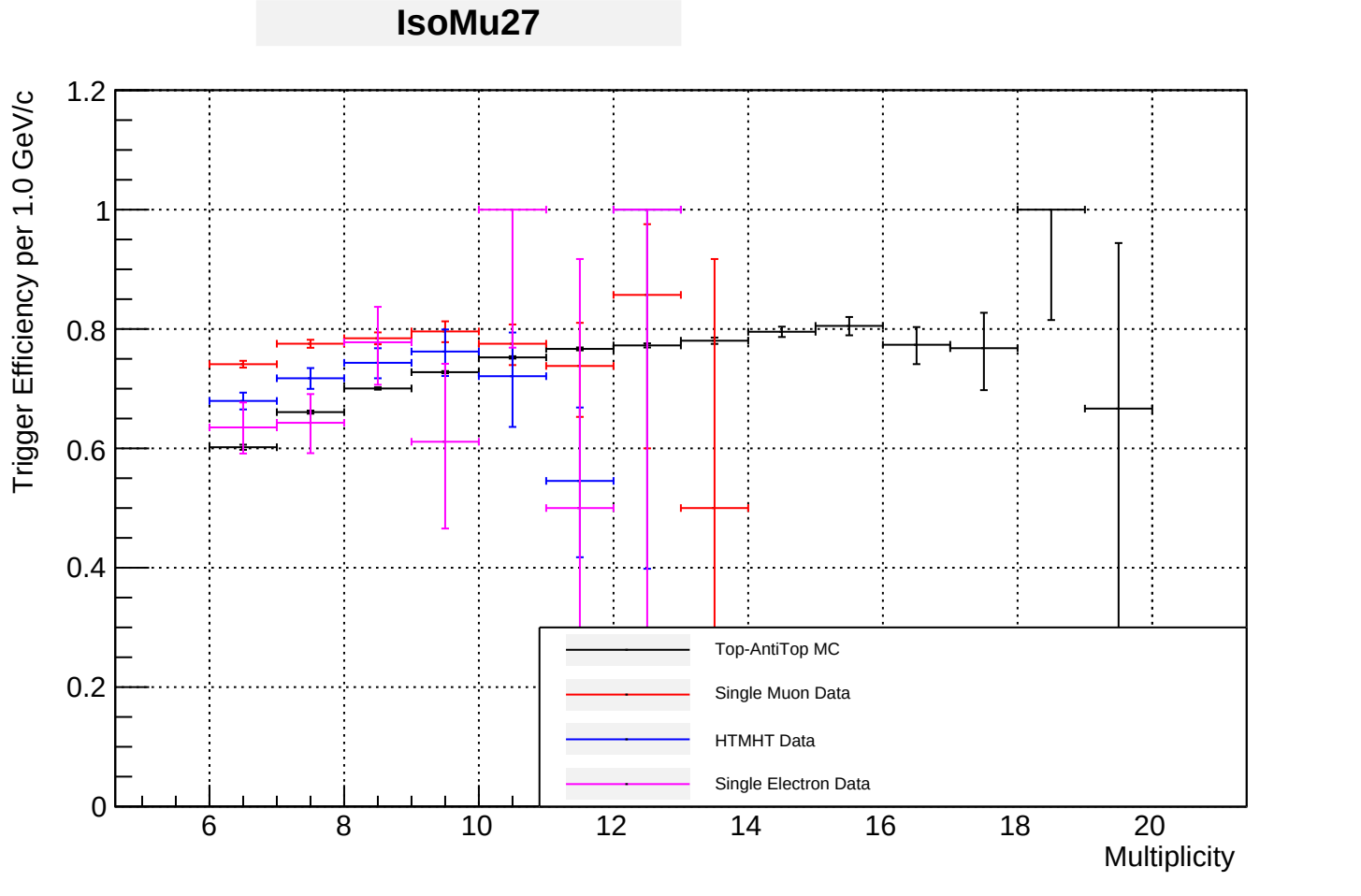
IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

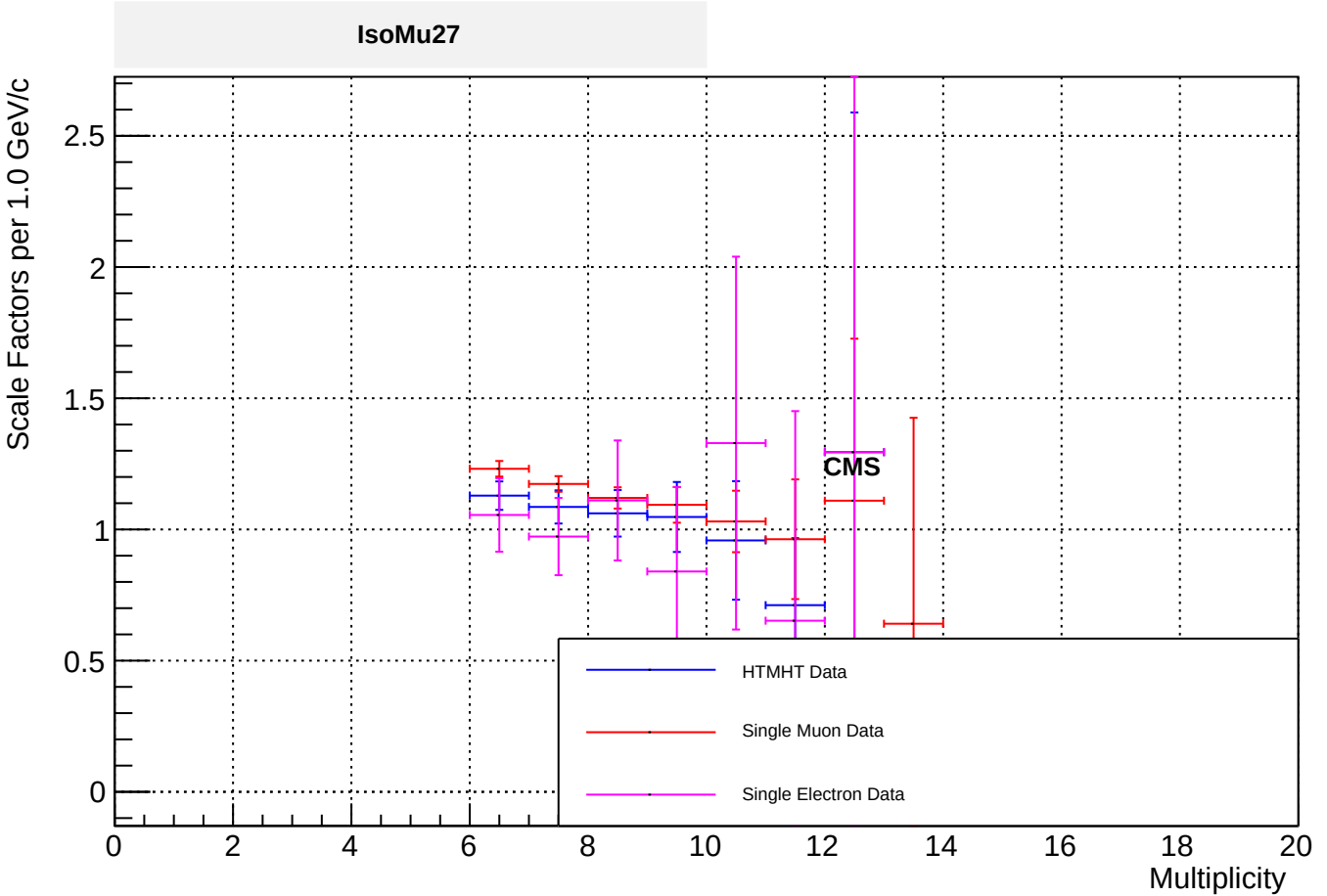


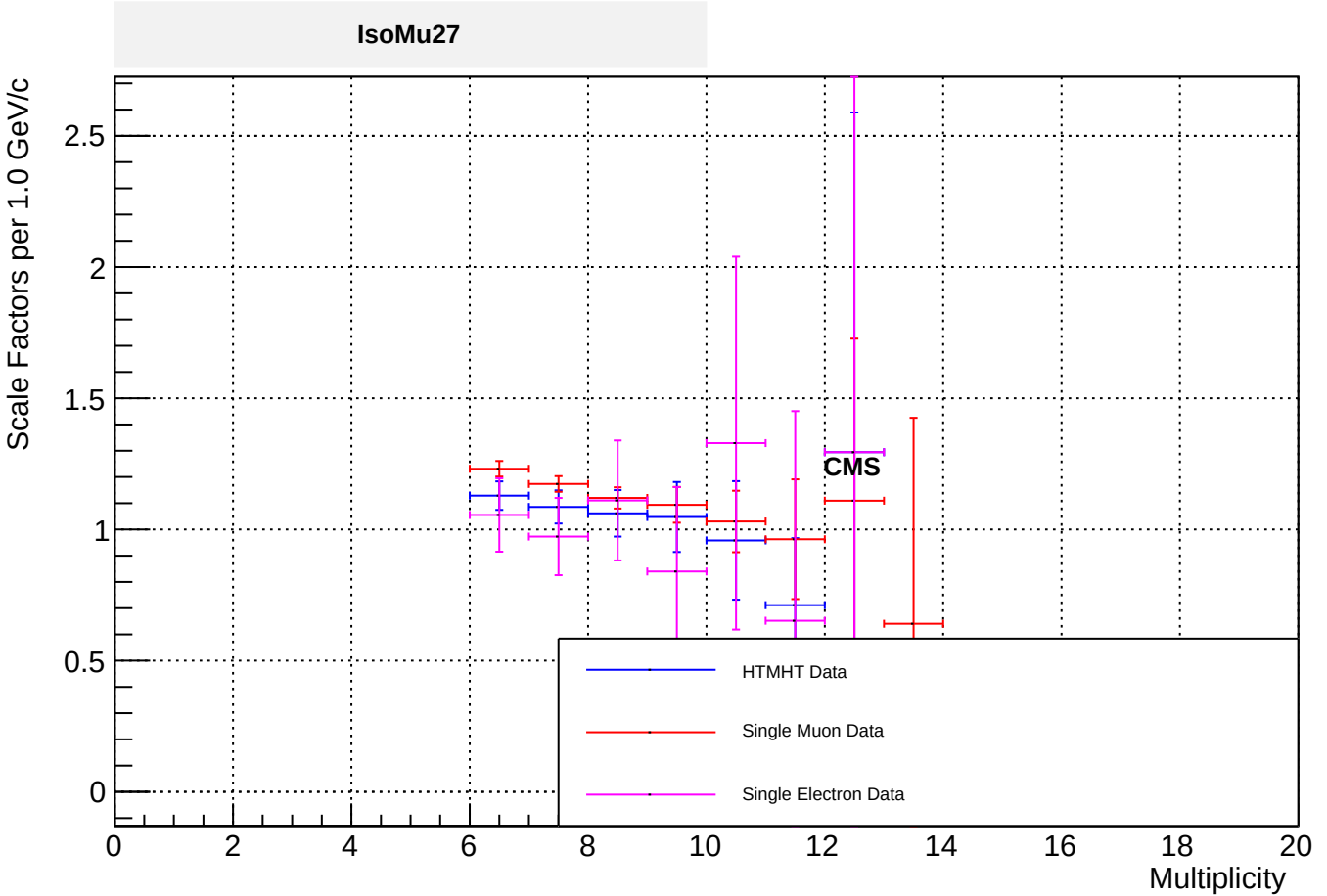

IsoMu27_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Scale Factors per 1.0 GeV/c
Multiplicity
CMS
HTMHT Data
Single Muon Data
Single Electron Data
0
0.5
1
1.5
2
0
2
4
6
8
10
12
14
16
18
20

IsoMu27


h_mcTTToSemiLep_jetMult_IsoMu27
Entries 246737
Mean 6.839
Std Dev 0.9893
IsoMu27
IsoMu27
IsoMu27
IsoMu27
CMS


IsoMu27
Trigger Efficiency per 1.0 GeV/c
1.2
1
0.8
0.6
0.4
0.2
0
6
8
10
12
14
16
18
20
Multiplicity
Top-AntiTop MC
Single Muon Data
HTMHT Data
Single Electron Data


IsoMu27
Scale Factors per 1.0 GeV/c
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
12
14
16
18
20
Multiplicity
CMS
HTMHT Data
Single Muon Data
Single Electron Data


IsoMu27
Scale Factors per 1.0 GeV/c
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
12
14
16
18
20
Multiplicity
CMS
HTMHT Data
Single Muon Data
Single Electron Data