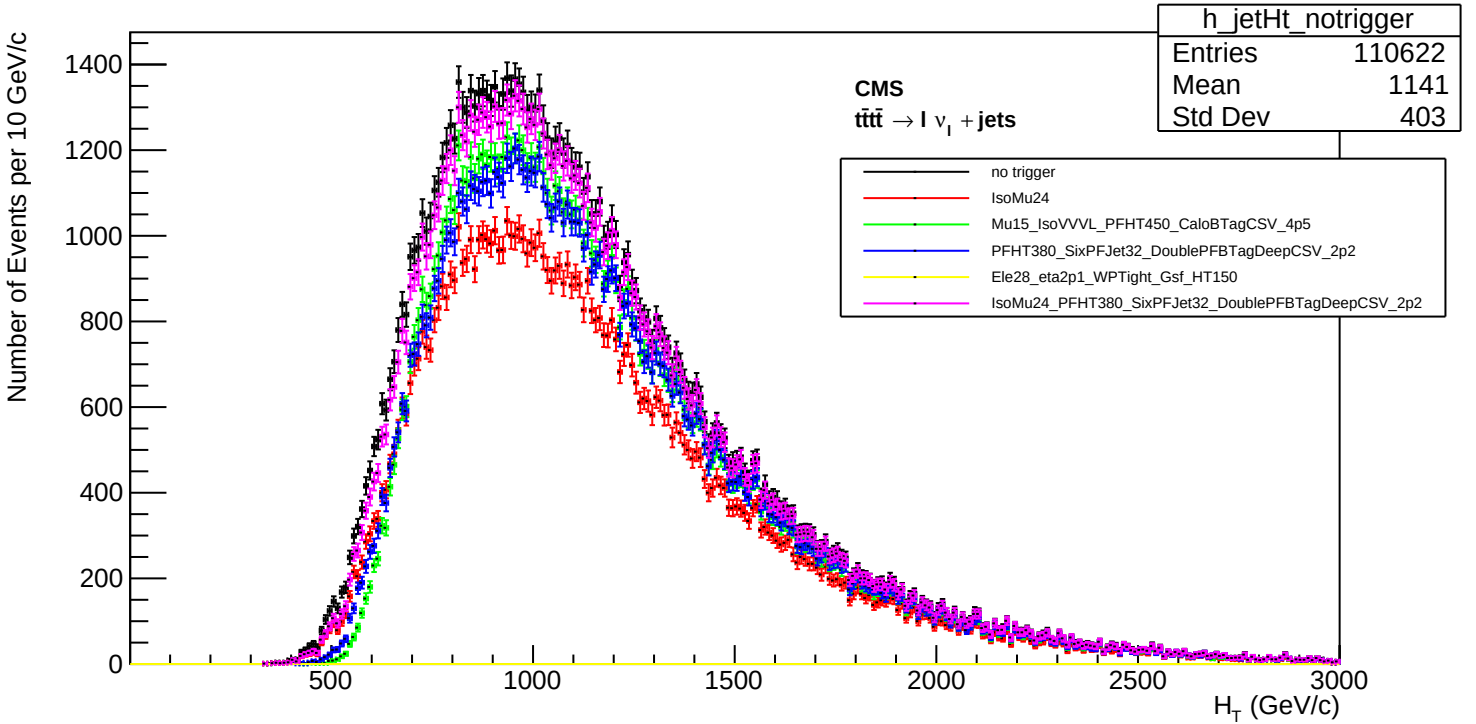
On-line (pre-)selection Requisites for:

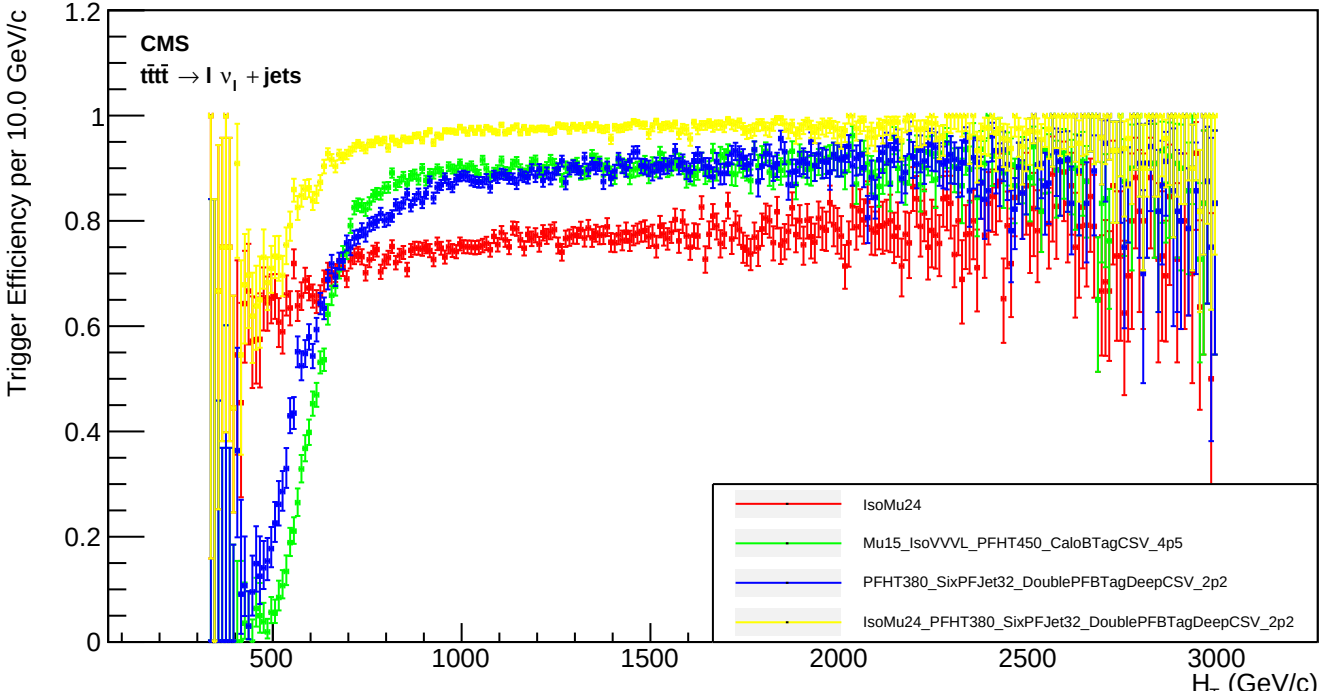
- **Jets:** number > 5
- **Muons:** number >0
- **Electrons:** number >0

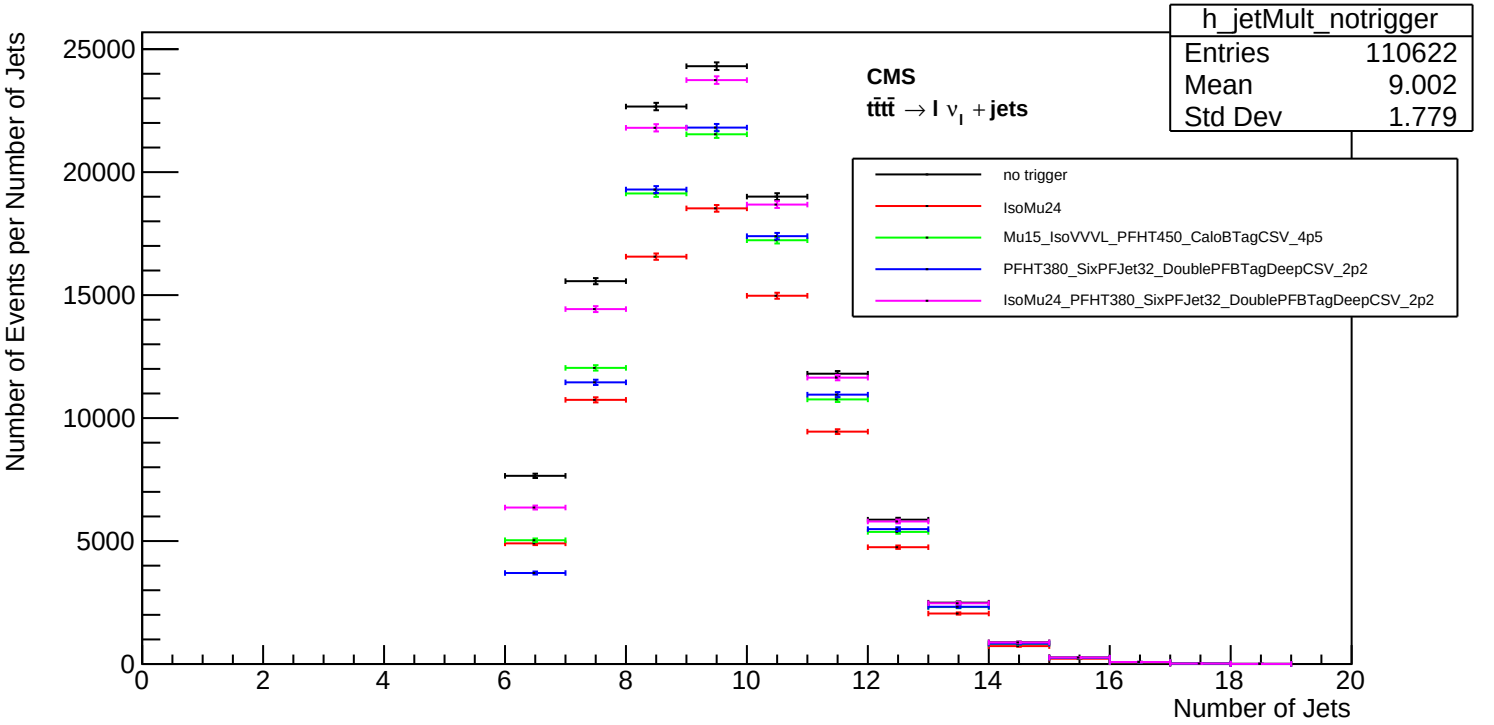
Event Limit: None (see last page)

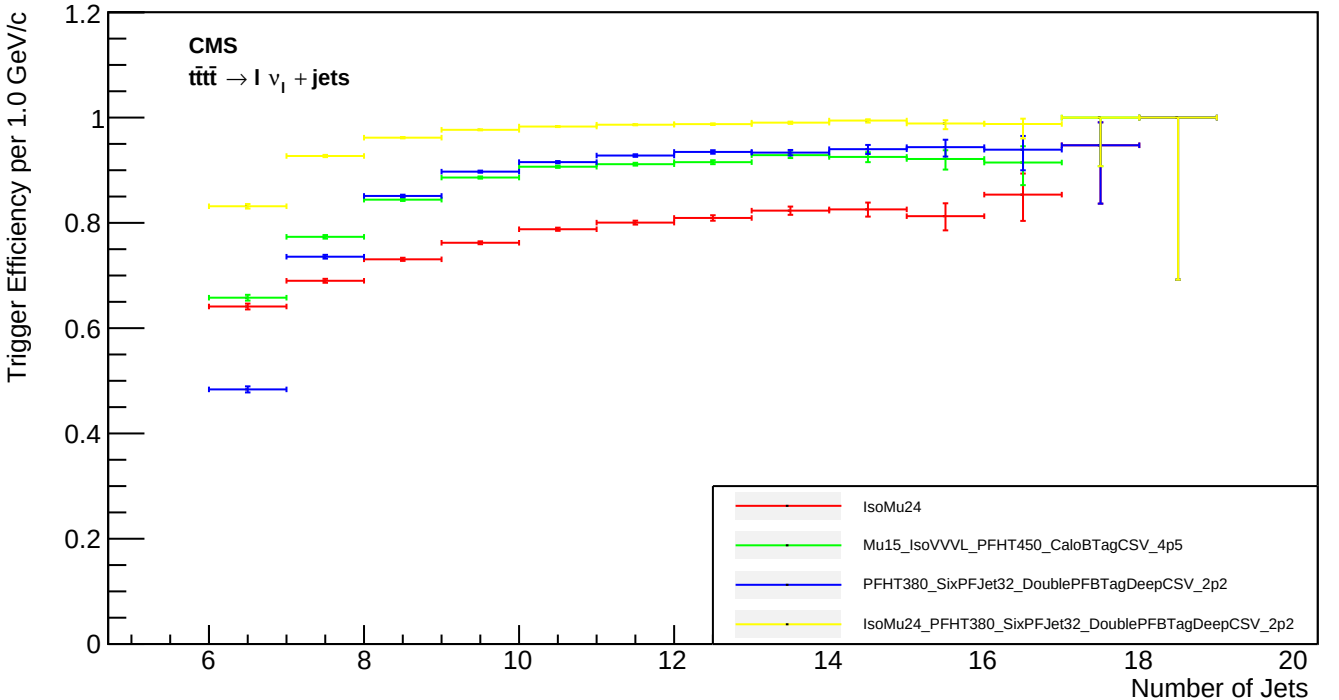
Off-line (post-)selection Requisites for:

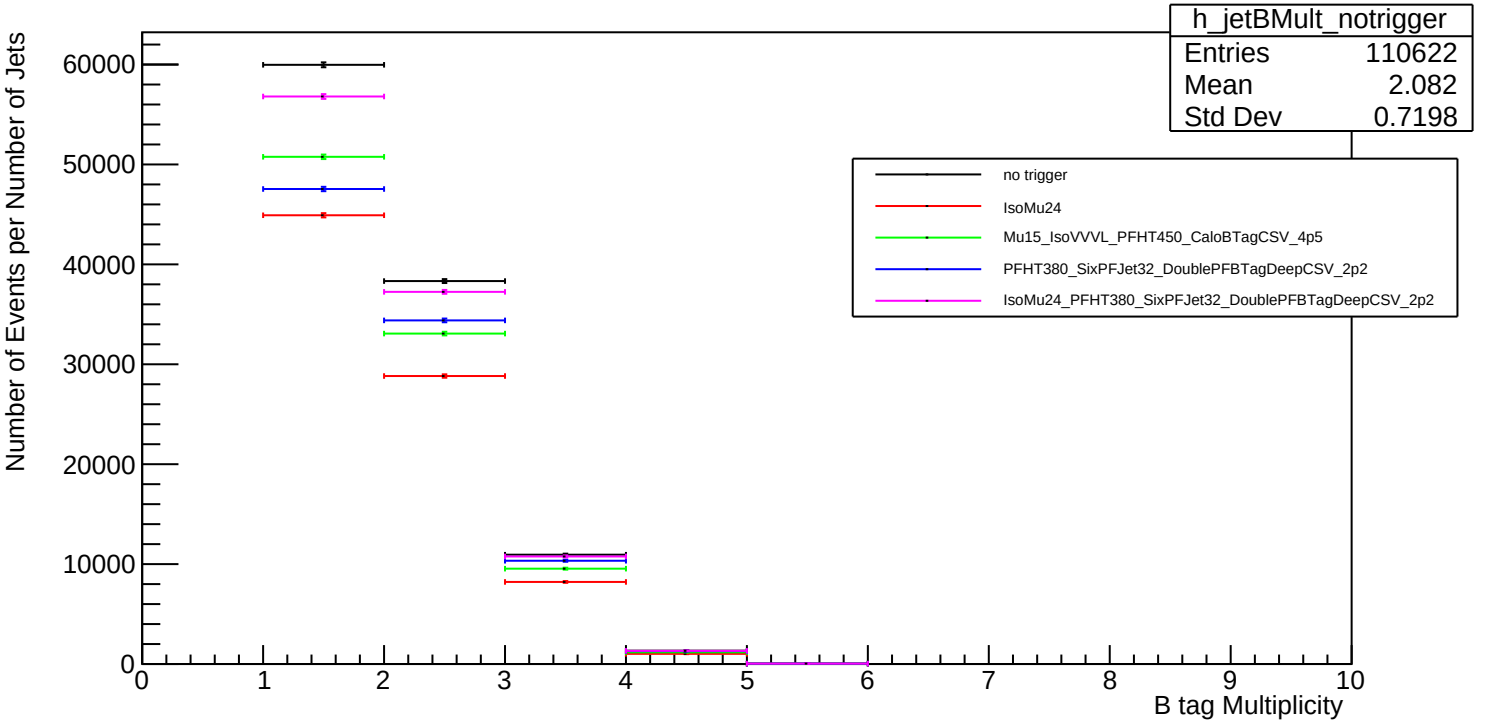
- **Jets:** jetId > 2 , p_T > 30 and |η|<2.4 (for at least 6)
  btagDeepFlavB > 0.7489 (for at least one jet)
- **Muons:** has tightId, |η|<2.4 and miniPFRelIso_all<0.15 (for at least 1)

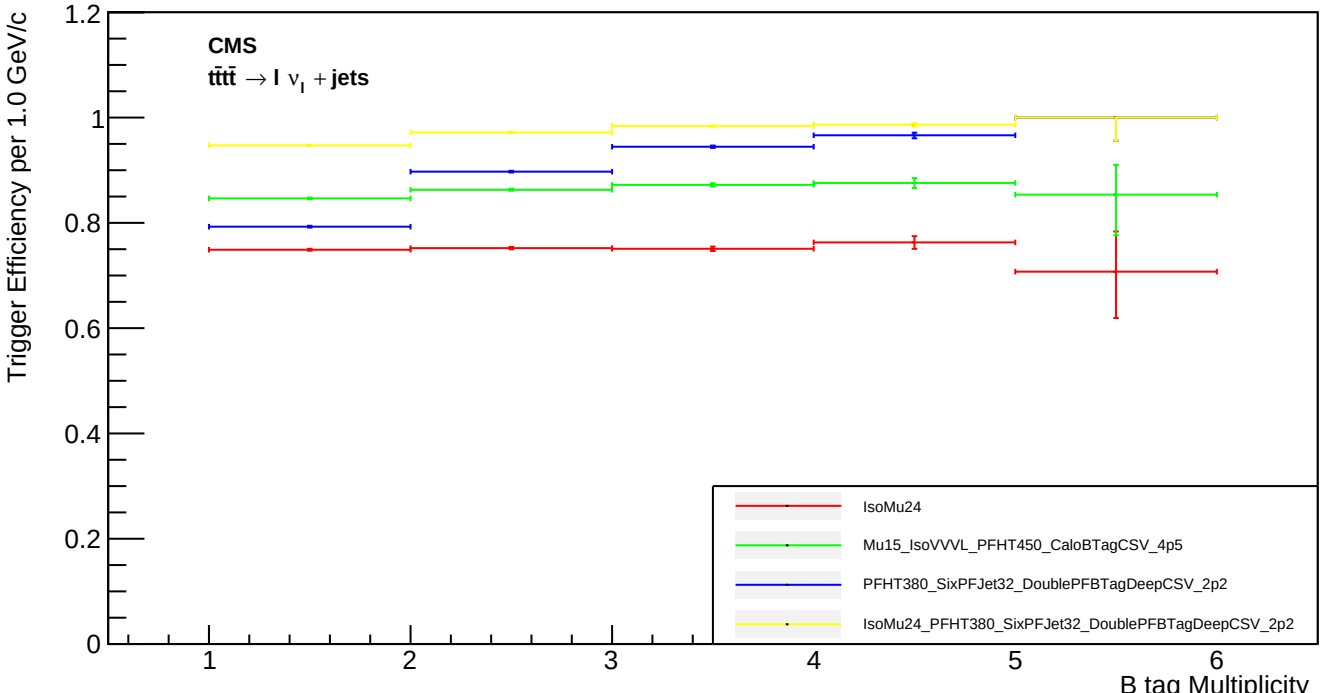

h_jetHt_notrigger
Entries 110622
Mean 1141
Std Dev 403
CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
no trigger
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Ele28_eta2p1_WPTight_Gsf_HT150
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Number of Events per 10 GeV/c
0
200
400
600
800
1000
1200
1400
500
1000
1500
2000
2500
3000
H_T (GeV/c)

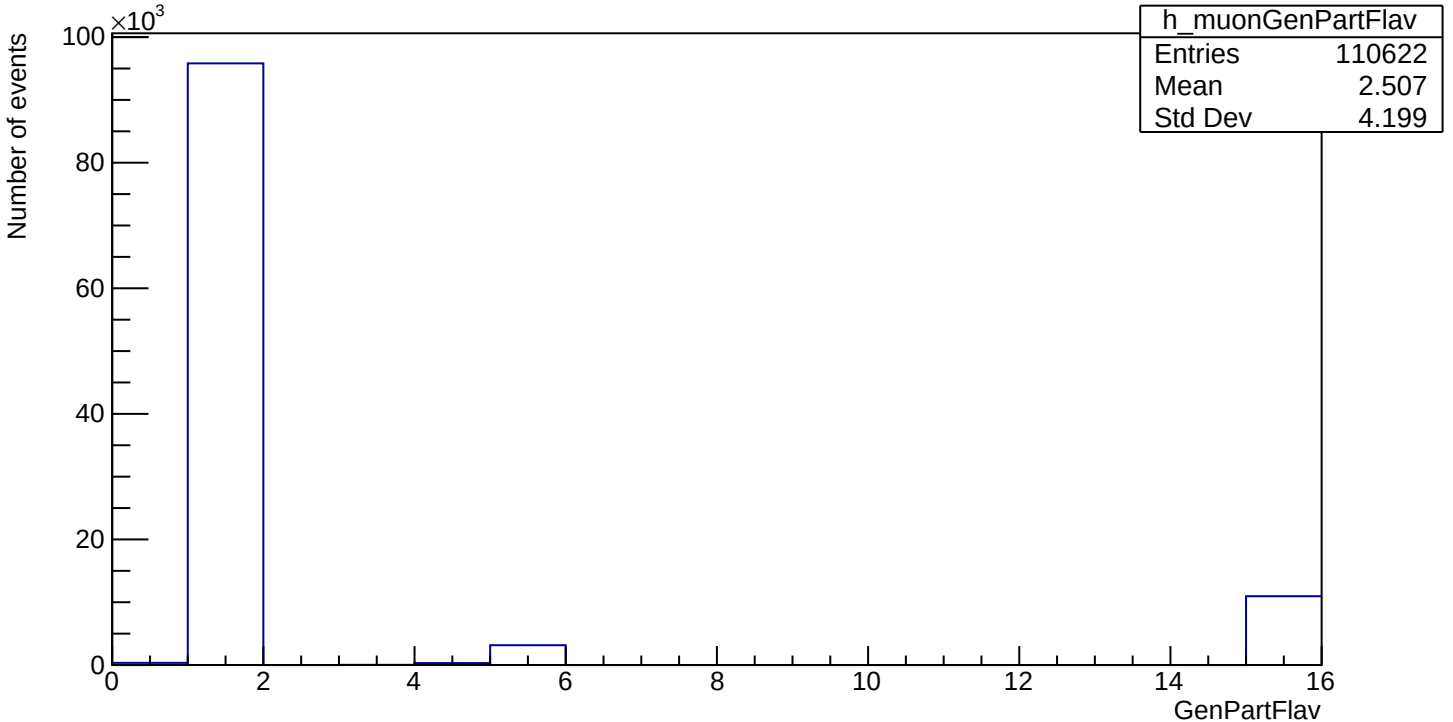

CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
Trigger Efficiency per 10.0 GeV/c
H_T (GeV/c)
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

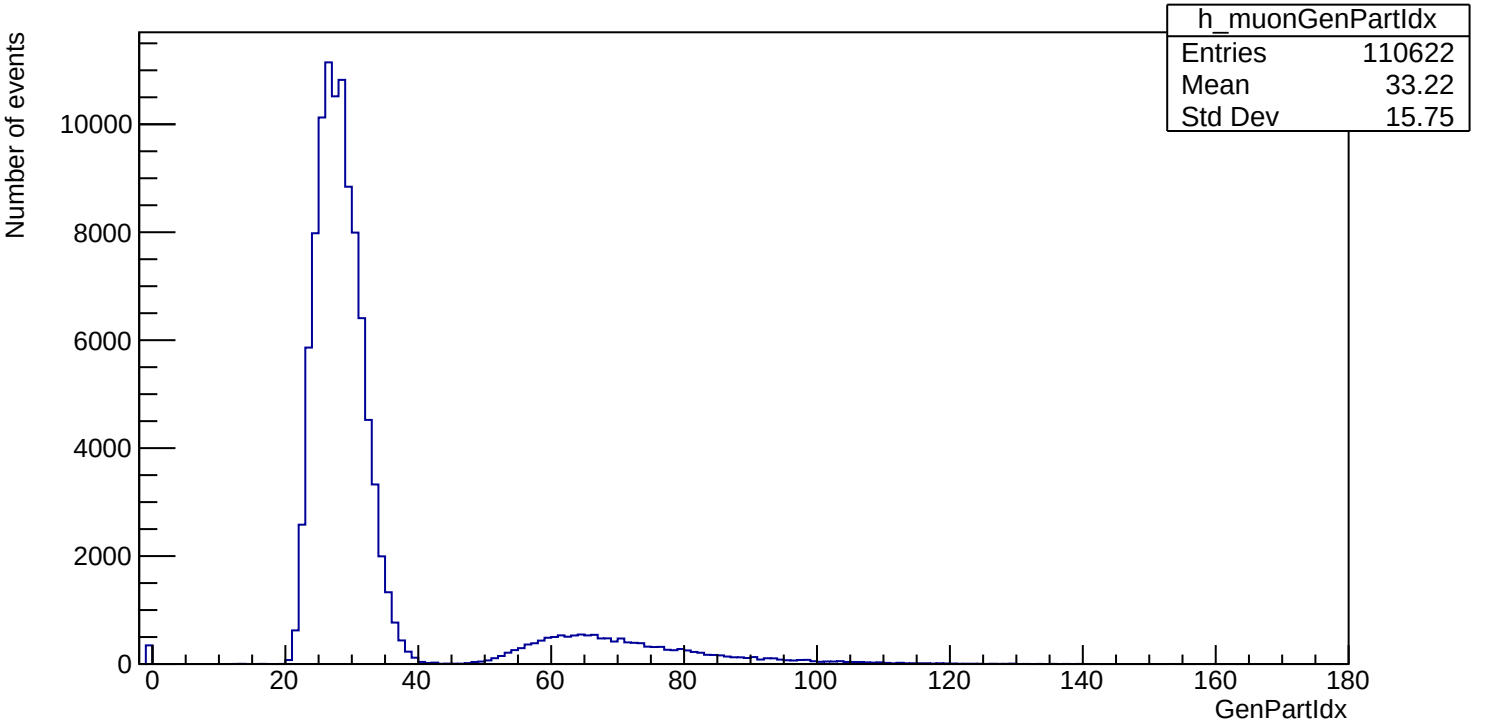

h_jetMult_notrigger
Entries 110622
Mean 9.002
Std Dev 1.779
CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
no trigger
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Number of Events per Number of Jets
Number of Jets
0
5000
10000
15000
20000
25000
0
2
4
6
8
10
12
14
16
18
20

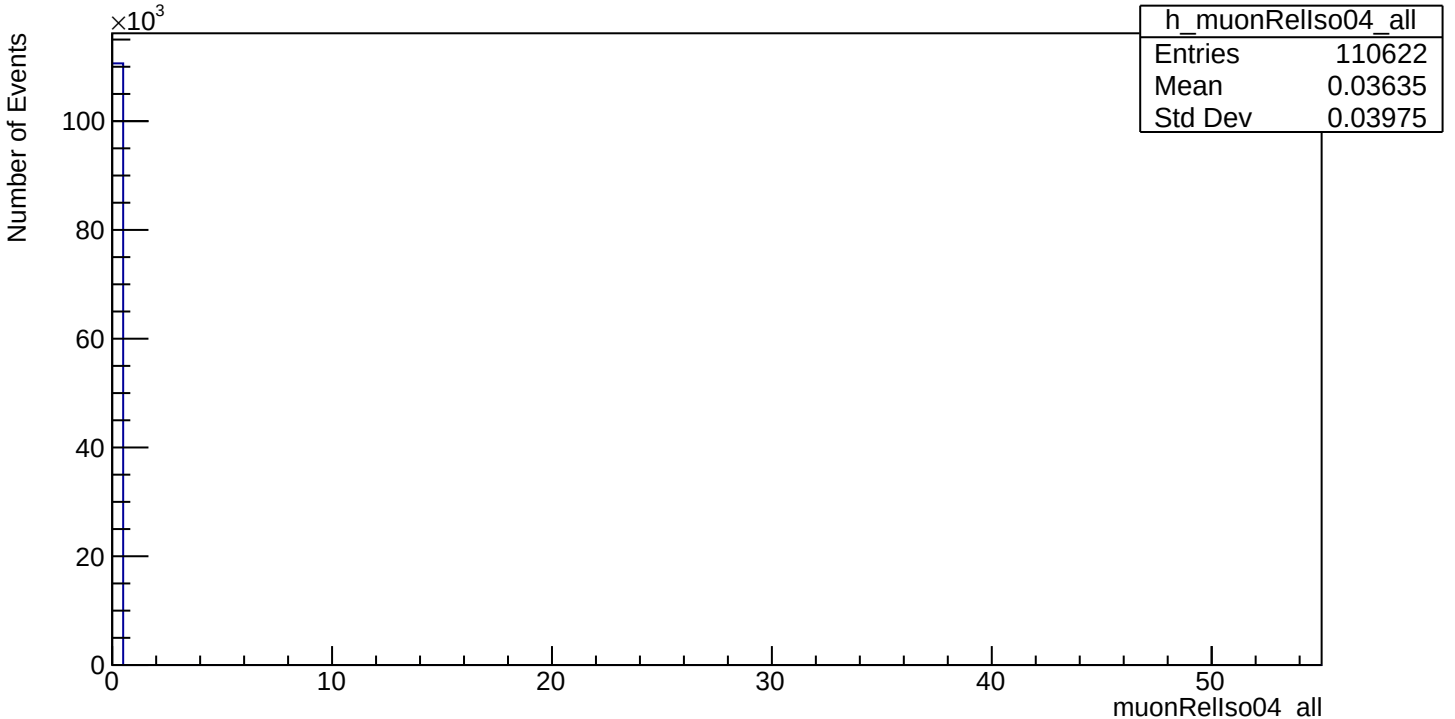

CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
Trigger Efficiency per 1.0 GeV/c
Number of Jets
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

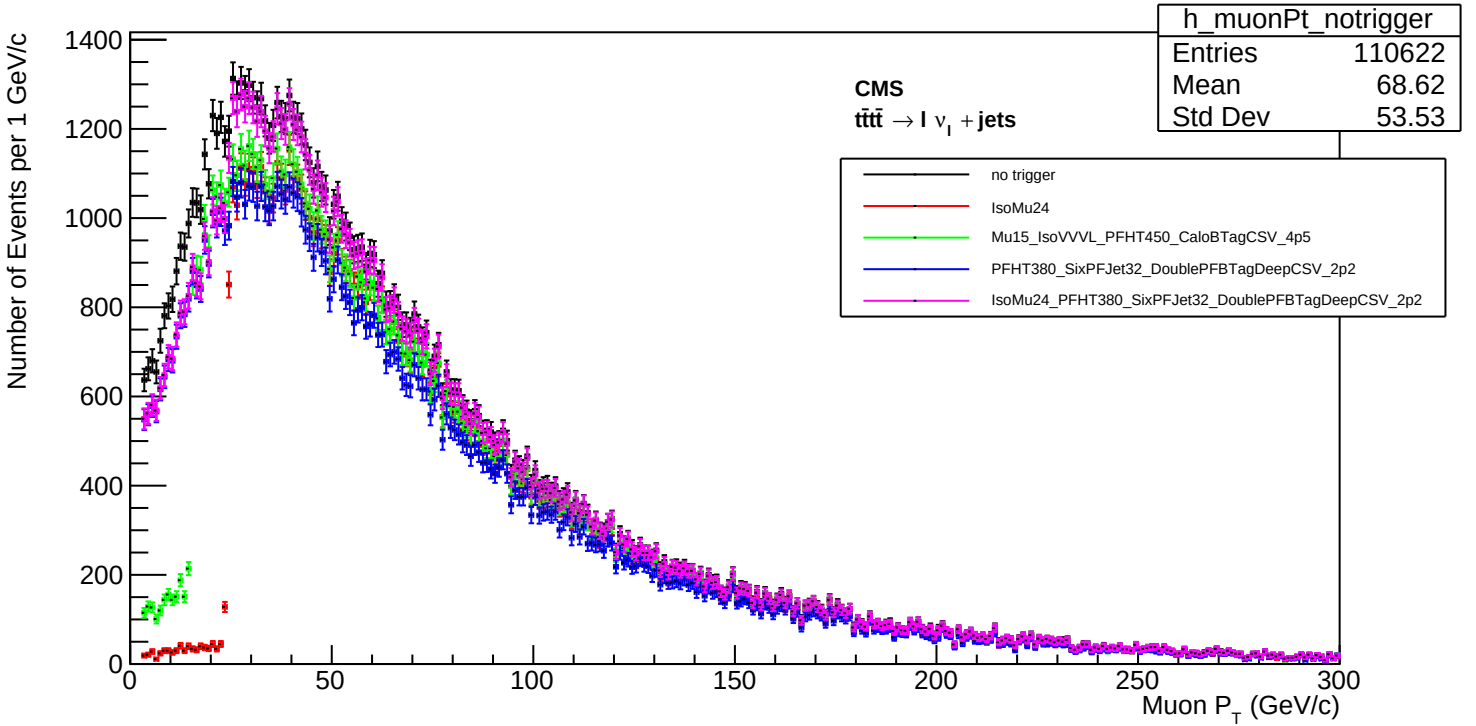

h_jetBMult_notrigger
Entries 110622
Mean 2.082
Std Dev 0.7198
no trigger
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Number of Events per Number of Jets
B tag Multiplicity
0
10000
20000
30000
40000
50000
60000
1
2
3
4
5
6
7
8
9
10

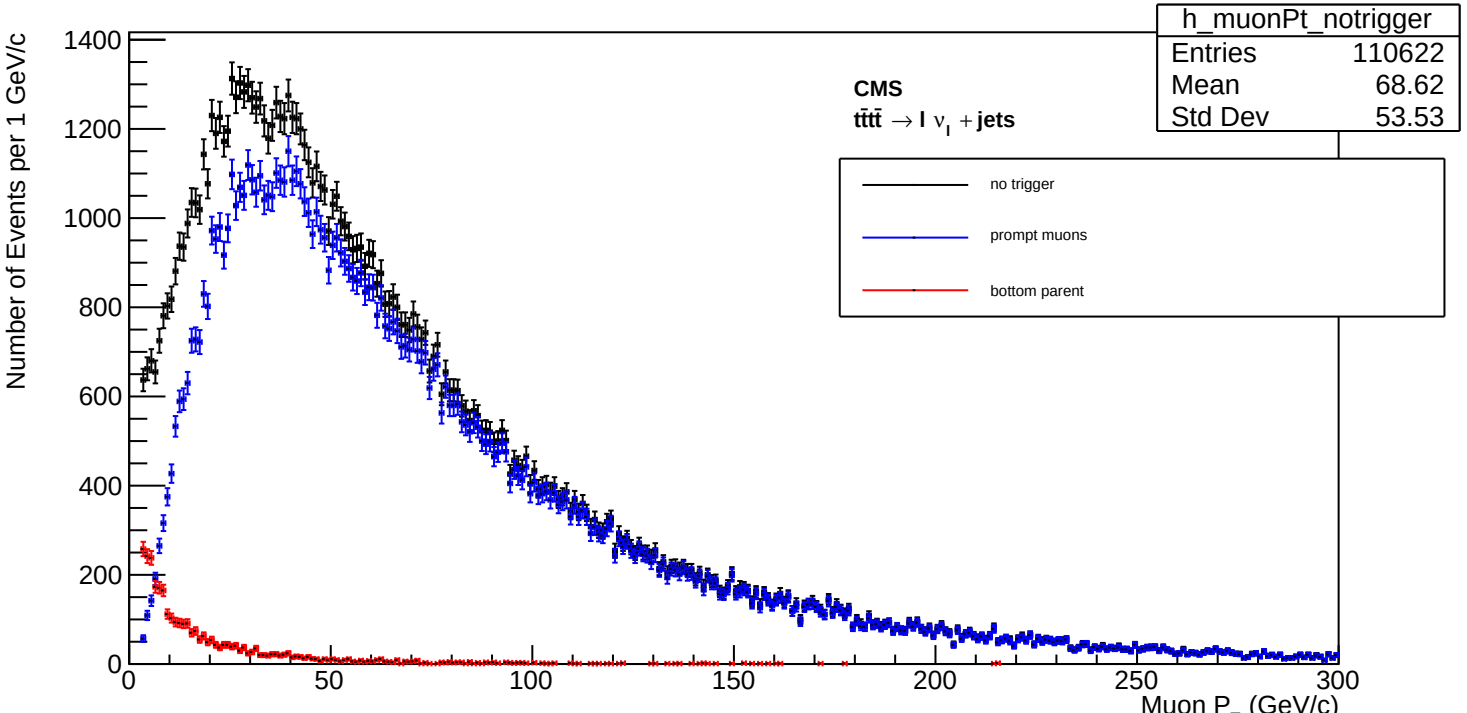

CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
Trigger Efficiency per 1.0 GeV/c
B tag Multiplicity
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

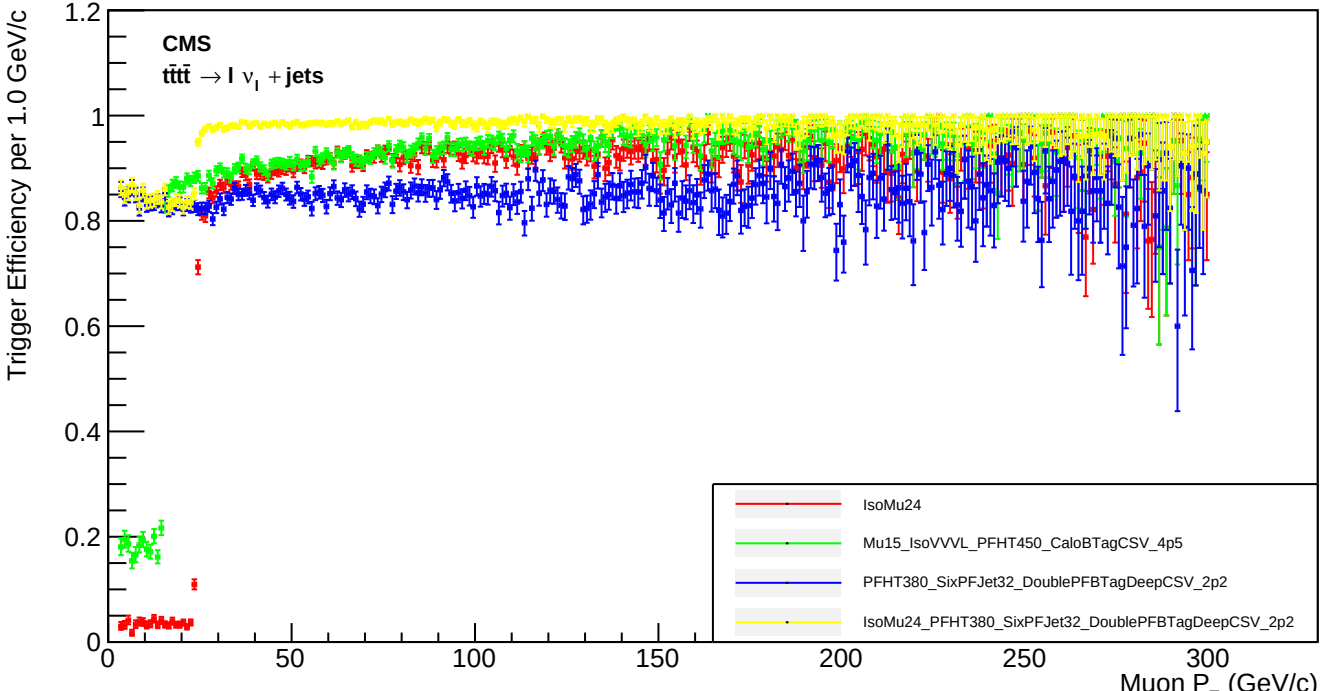

h_muonGenPartFlav
Entries 110622
Mean 2.507
Std Dev 4.199
×10^3
Number of events
GenPartFlav
0
20
40
60
80
100
0
2
4
6
8
10
12
14
16

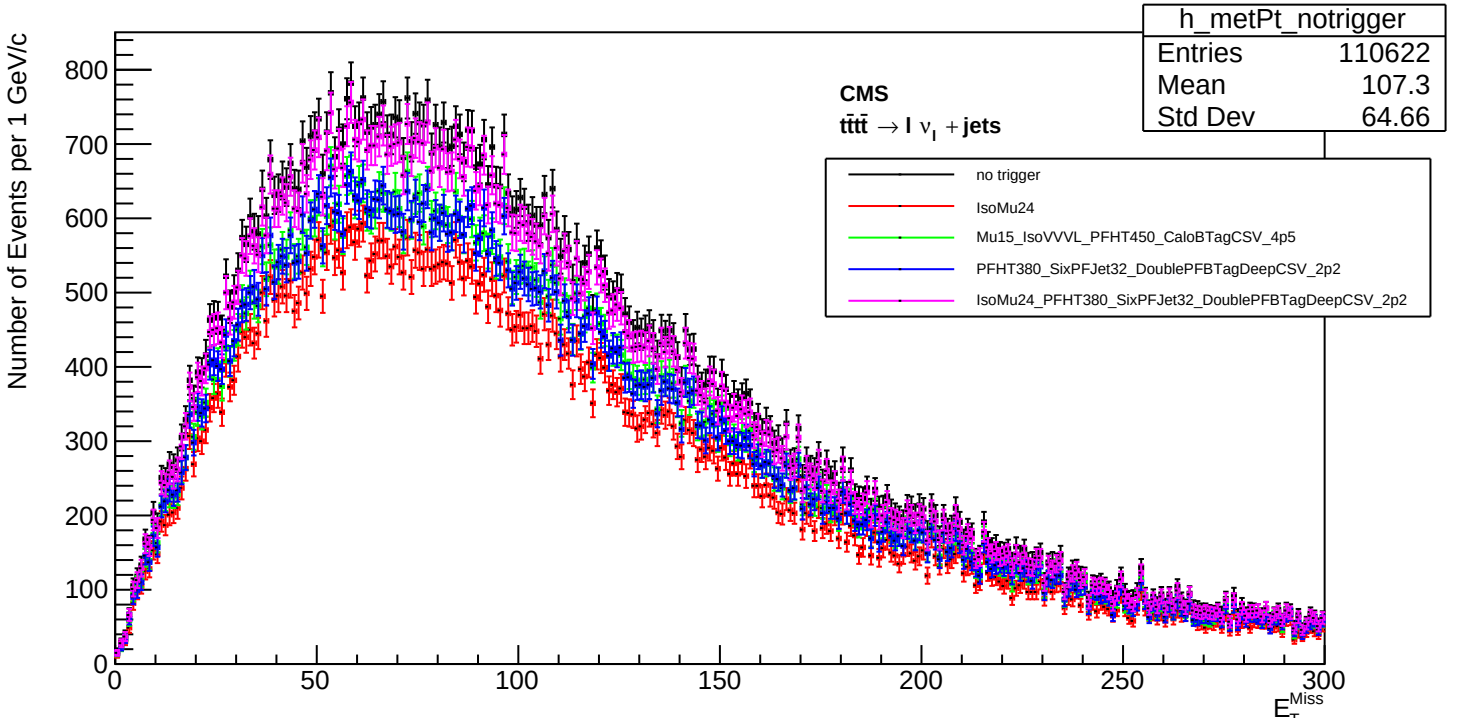

h_muonGenPartIdx
Entries 110622
Mean 33.22
Std Dev 15.75
Number of events
0
2000
4000
6000
8000
10000
0
20
40
60
80
100
120
140
160
180
GenPartIdx

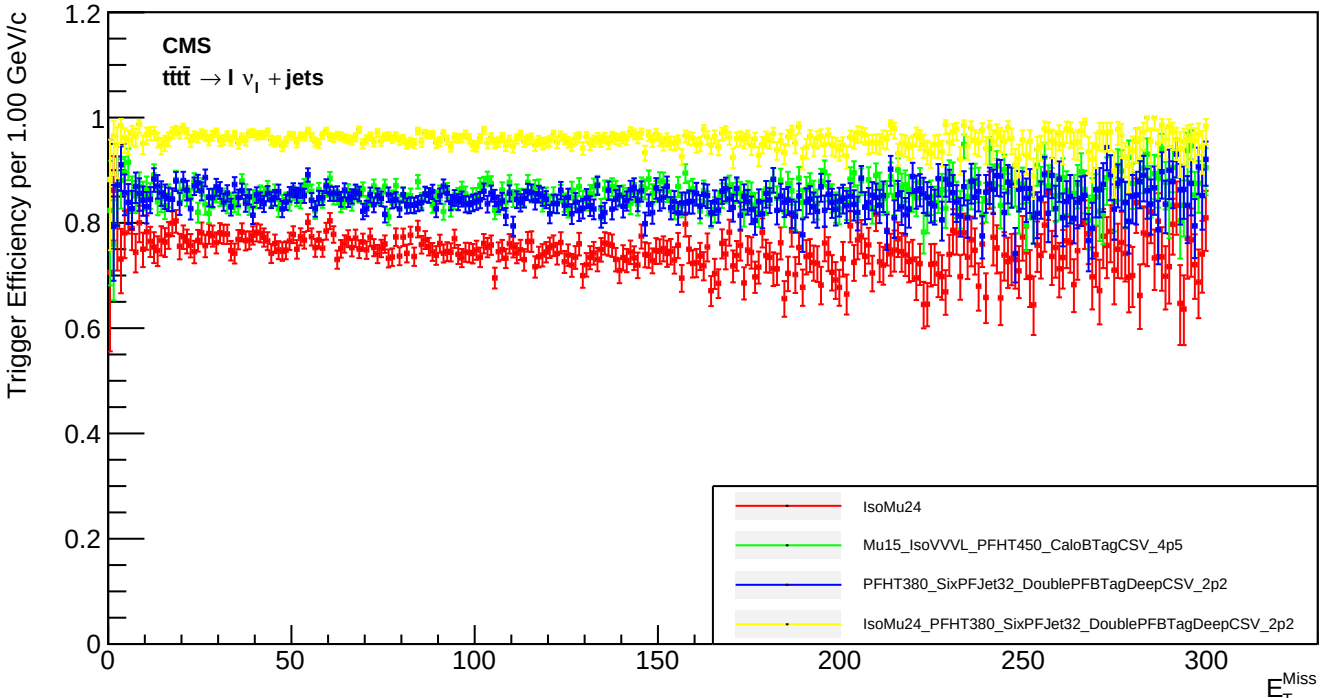

h_muonRelIso04_all
Entries 110622
Mean 0.03635
Std Dev 0.03975
×10^3
Number of Events
100
80
60
40
20
0
0
10
20
30
40
50
muonRelIso04_all

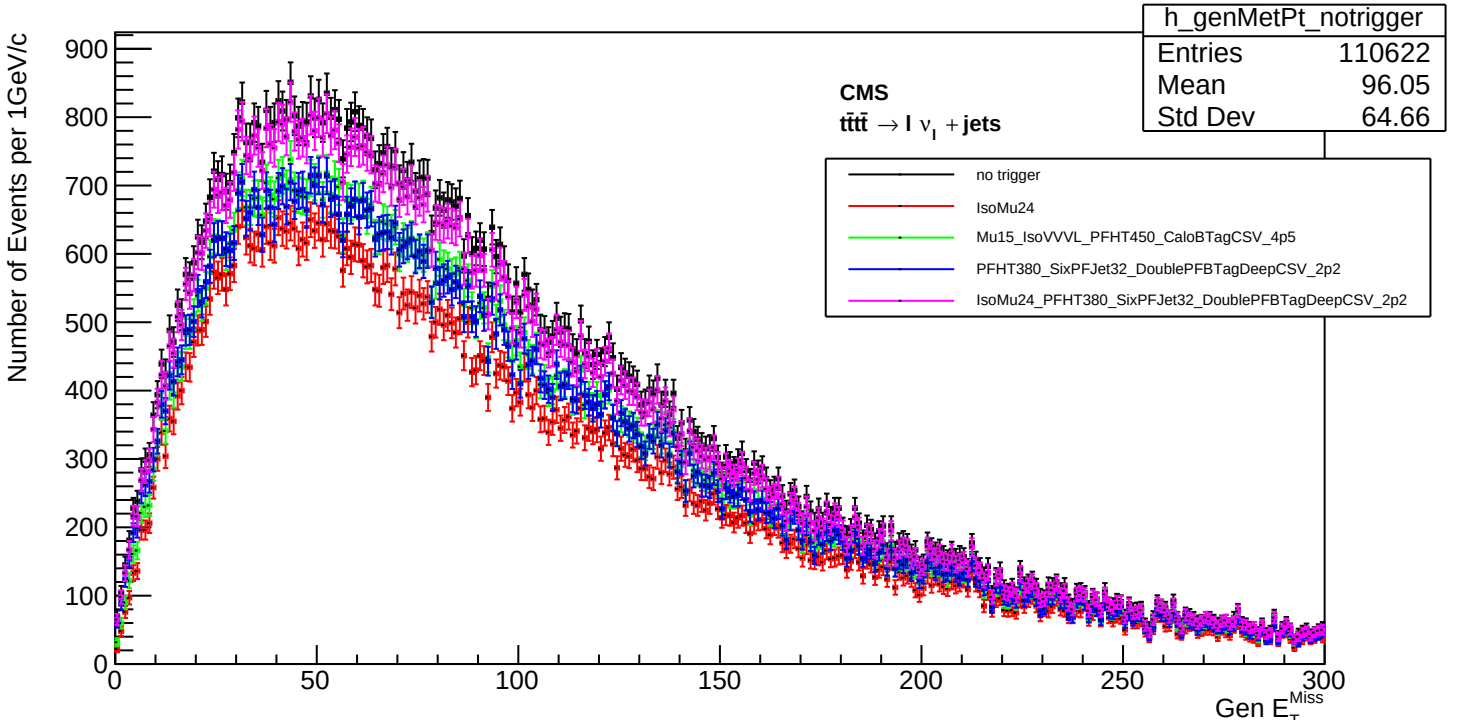

h_muonPt_notrigger
Entries 110622
Mean 68.62
Std Dev 53.53
CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
no trigger
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Number of Events per 1 GeV/c
Muon P_T (GeV/c)
0
200
400
600
800
1000
1200
1400
0
50
100
150
200
250
300

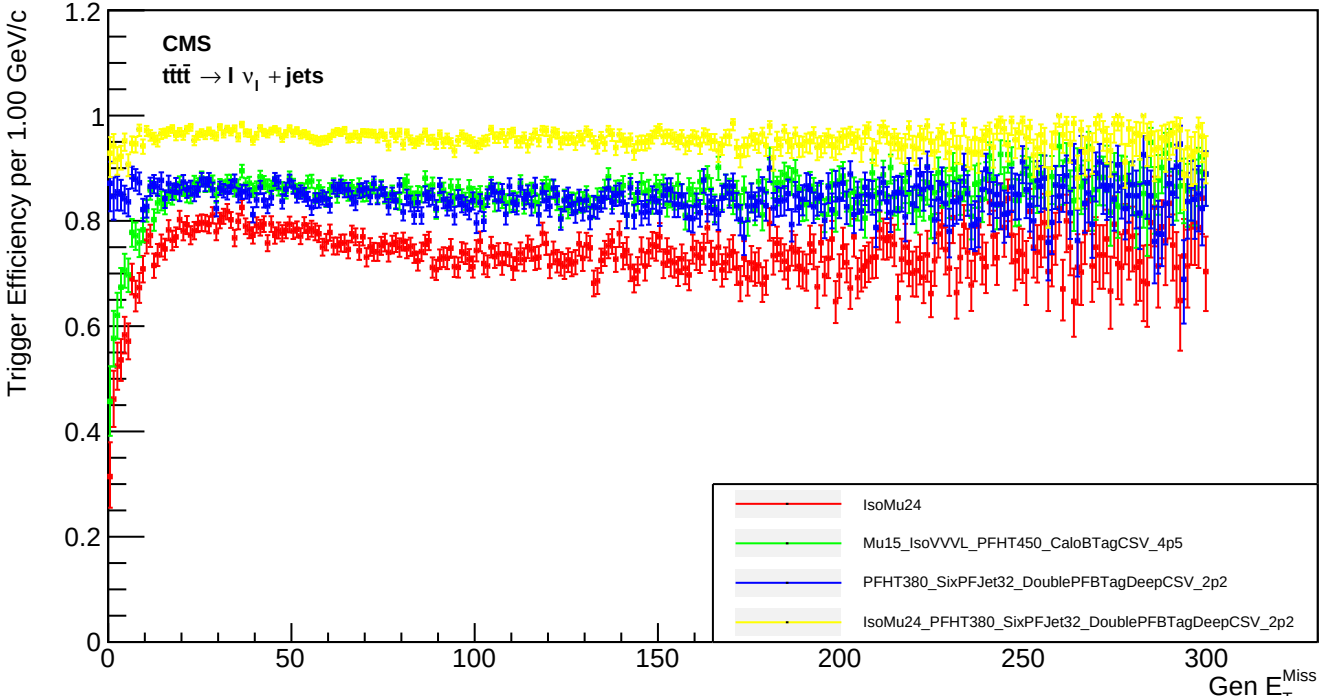

h_muonPt_notrigger
Entries 110622
Mean 68.62
Std Dev 53.53
CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
no trigger
prompt muons
bottom parent
Number of Events per 1 GeV/c
Muon P_T (GeV/c)
0
200
400
600
800
1000
1200
1400
0
50
100
150
200
250
300

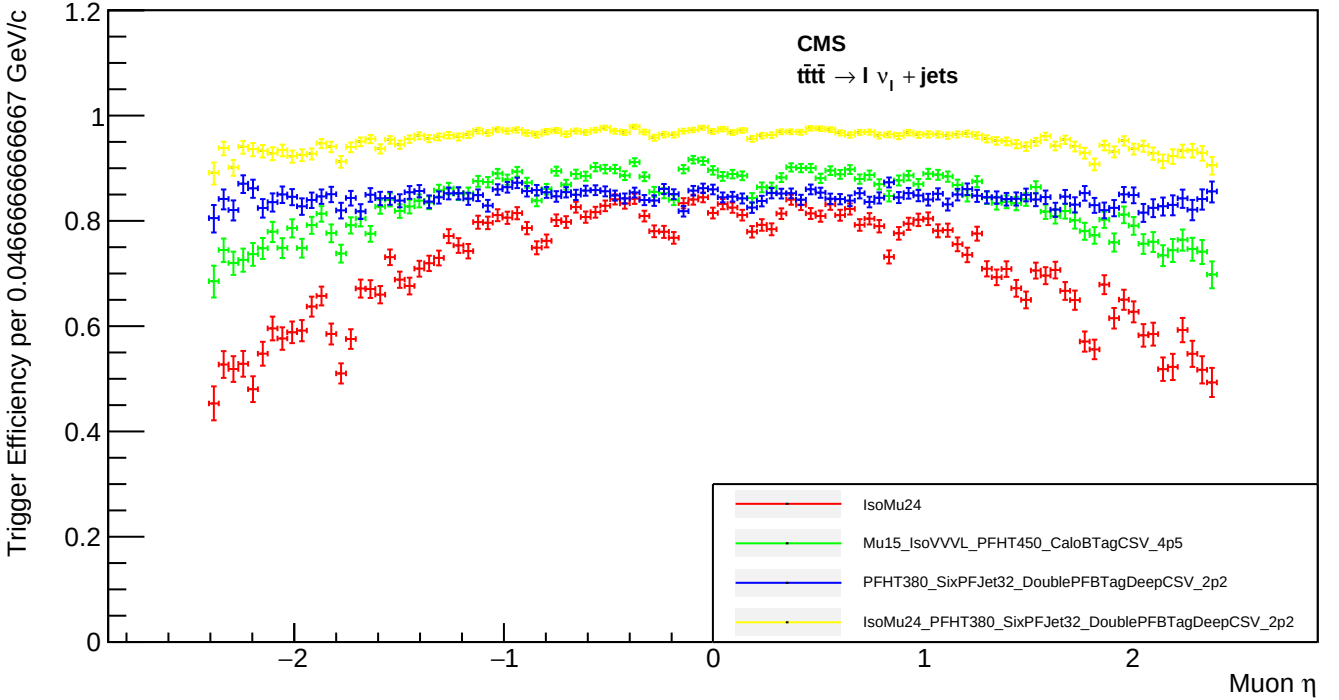

CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
Trigger Efficiency per 1.0 GeV/c
Muon P_T (GeV/c)
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2

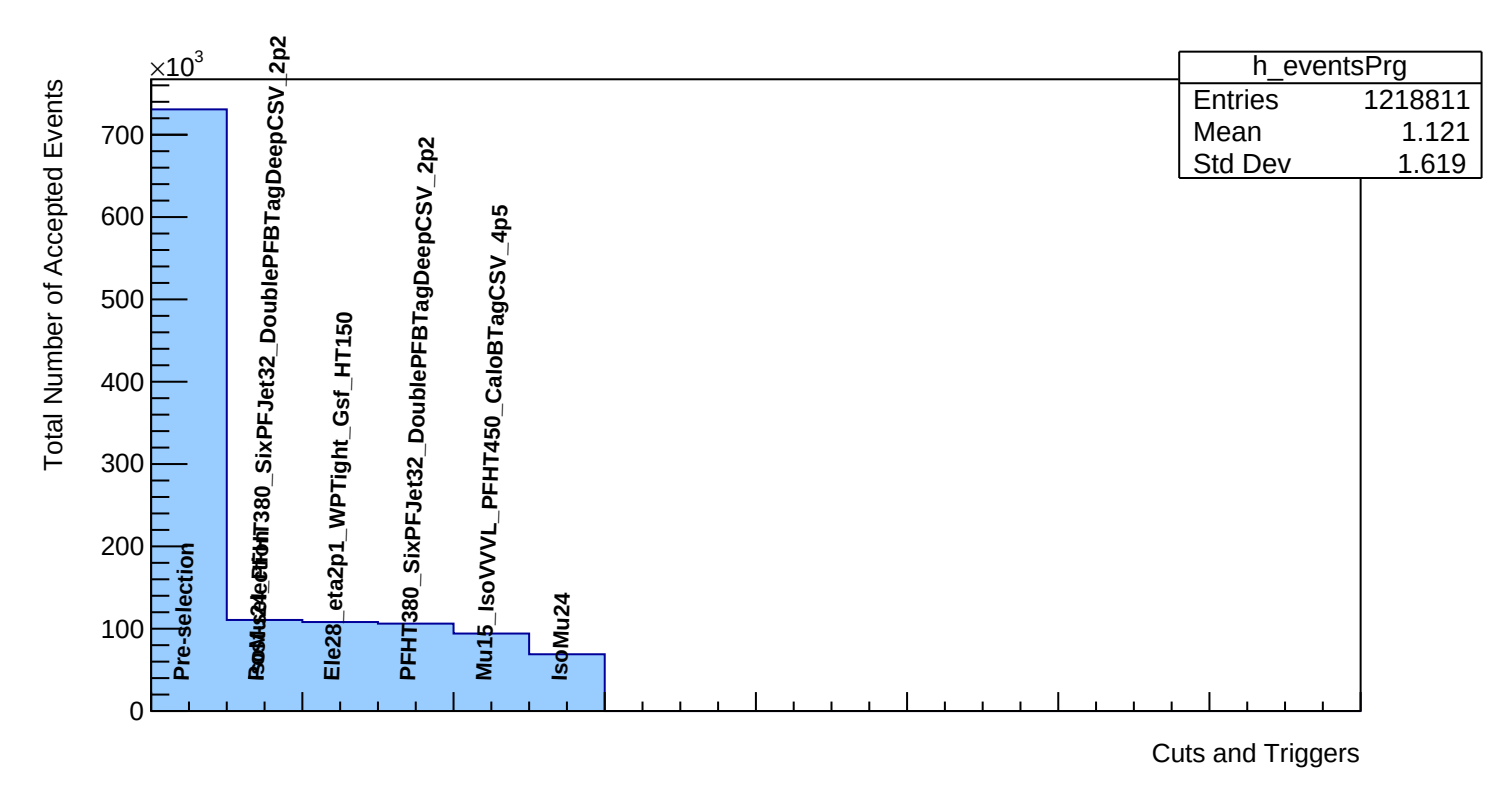

h_metPt_notrigger
Entries 110622
Mean 107.3
Std Dev 64.66
CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
no trigger
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Number of Events per 1 GeV/c
0
100
200
300
400
500
600
700
800
0
50
100
150
200
250
300
E_T^{Miss}


CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
Trigger Efficiency per 1.00 GeV/c
1.2
1
0.8
0.6
0.4
0.2
0
0
50
100
150
200
250
300
E_T^{Miss}
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2


h_genMetPt_notrigger
Entries 110622
Mean 96.05
Std Dev 64.66
CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
no trigger
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Number of Events per 1GeV/c
Gen E_T^{Miss}
0
50
100
150
200
250
300
100
200
300
400
500
600
700
800
900


CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
Trigger Efficiency per 1.00 GeV/c
Gen E_T^{Miss}
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
0
0.2
0.4
0.6
0.8
1
1.2
0
50
100
150
200
250
300


CMS
$t\bar{t}t\bar{t} \rightarrow l\ \nu_l + jets$
Trigger Efficiency per 0.0466666666667 GeV/c
Muon η
1.2
1
0.8
0.6
0.4
0.2
0
−2
−1
0
1
2
IsoMu24
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
IsoMu24_PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2


h_eventsPrg
Entries 1218811
Mean 1.121
Std Dev 1.619
×10^3
Total Number of Accepted Events
0
100
200
300
400
500
600
700
Pre-selection
Ele28_eta2p1_WPTight_Gsf_HT150
PFHT380_SixPFJet32_DoublePFBTagDeepCSV_2p2
Mu15_IsoVVVL_PFHT450_CaloBTagCSV_4p5
IsoMu24
Cuts and Triggers