

VBF Higgs to Invisible Trigger Efficiencies

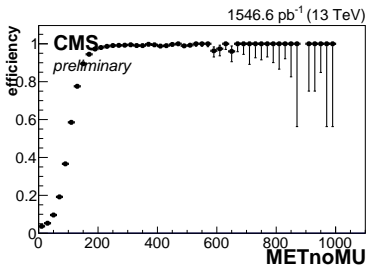
P. Dunne

Reminder

- ▶ Slow trigger turn on seen in met (300 GeV 95% efficiency) and jet 2 pt (80 GeV 95% efficiency)
- ▶ Possible culprits:
 - Calo prefilter + wrong JEC at HLT
 - L1 MET turn on
- ▶ Will investigate L1 MET turn on further in today's slides
- ▶ Also add HLT_IsoMu20 to preselection to rule out bias from triggers in SingleMuon

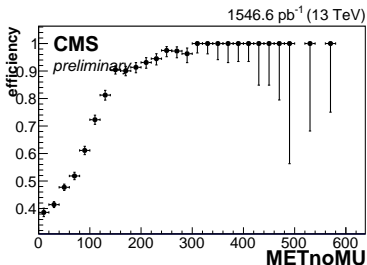
L1ETM60 Efficiency: Inclusive

- ▶ Measure L1 ETM turn on
- ▶ Trigger: L1ETM60
- ▶ Denominator: SingleMuon events passing HLT_IsoMu20
- ▶ 95% efficient by 200 GeV



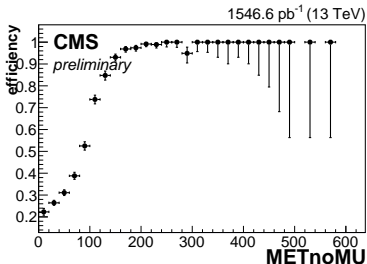
L1ETM60 Efficiency: VBF phase space

- ▶ Measure L1 ETM turn on when there is a VBF-like dijet
- ▶ Trigger: L1ETM60
- ▶ Denominator: SingleMuon events passing HLT_IsoMu20 and dijet $p_T > 80$, $M_{jj} > 600$, $\Delta\eta_{jj} > 3.6$
- ▶ Good turn on to 150 GeV then shelf



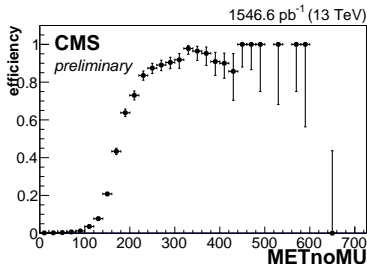
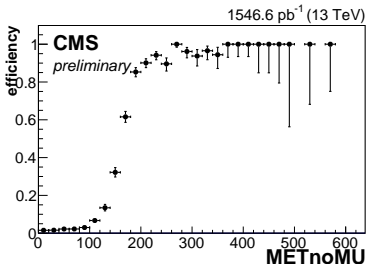
L1ETM60 Efficiency: VBF phase space

- ▶ L1 MET only sums up to $|\eta| = 3$, shelf seen on previous slide could be due to jets in the HF
- ▶ Add requirement that both jets have $|\eta| < 3$ to the denominator
- ▶ Good turn on recovered



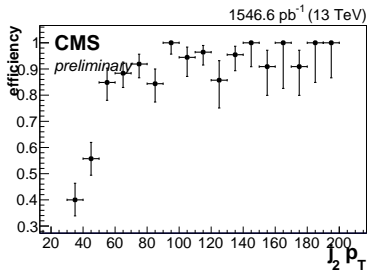
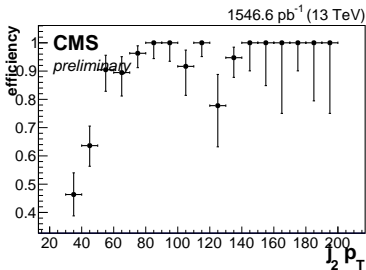
Signal trigger efficiency: MET

- ▶ Measure signal trigger efficiency before (right) and after (left) requiring L1ETM60
- ▶ Trigger: HLT_DiPFJet40_DEta3p5_MJJ600_PFMETNoMu140
- ▶ Denominator: SingleMuon events with dijet $p_T > 80$, $M_{jj} > 600$, $\Delta\eta_{jj} > 3.6$ plus for left plot only HLT_IsoMu20 and L1ETM60
- ▶ Clearly better after L1ETM60 cut: 95% efficient by 250 GeV



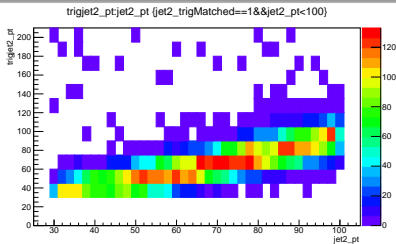
Signal trigger efficiency: jet p_T

- ▶ Measure signal trigger efficiency before (right) and after (left) requiring L1ETM60
- ▶ Trigger: HLT_DiPFJet40_DEta3p5_MJJ600_PFMETNoMu140
- ▶ Denominator: SingleMuon events with dijet $MET_{noMU} > 300$, $M_{jj} > 600$, $\Delta\eta_{jj} > 3.6$ plus for left plot only HLT_IsoMu20 and L1ETM60
- ▶ Slightly better after L1ETM60 cut: 95% efficient by 70 GeV



Calo jet prefilter

- ▶ Jet p_T still less efficient than run 1: 95% efficient at 70 GeV compared to 50 GeV
- ▶ According to [this](#) wrong JEC was used in HLT during Run2015
 - We have a calo prefilter at 30 GeV
 - Calo JEC are large so differences could cause the remaining jet pt issues
- ▶ Plot offline jet pt (x) against trigger calo jet pt (y)
- ▶ Large differences seen between calo jet pt and offline jet pt



Summary

- ▶ L1ETM60 fully efficient at ~ 200 GeV
- ▶ Requiring L1ETM60 in the denominator improves trigger turn ons
 - Indicates part of the inefficiency seen is due to L1
- ▶ Jet p_T still less efficient than in run 1
 - Calo jets with 30 GeV p_T frequently have offline p_T above pf trigger threshold
 - Could cause inefficiencies
 - Needs more investigation: We currently only have trigger jet information for events that pass the trigger
 - Reemulating trigger on raw data so we can check if events failing trigger fail calo filter or pf filter

Backup

