

Proposal of Two Control HLTs

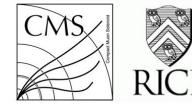
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Motivation

- Evaluate signal HLT efficiency (scale factor)
 - Signal HLT already in menu
 - "HLT_TrkMu16_DoubleTrkMu6NoFiltersNoVtx_v*"
 - L1_DoubleMu_12_5 OR L1_DoubleMu_15_5_SQ OR L1_DoubleMu_15_7 OR L1_TripleMu_5_3_3
- In analysis [1] of 2016 data, used orthogonal method
 - MET dataset (MET > 100 GeV), WZ MC (large MET)
 - Cons:
 - pT range/cuts not ideal for the analysis
 - Low statistics



Proposal

- Two control HLTs sharing the pT cuts from signal HLT
 - /users/wshi/HLT_TrkMu16_NoFiltersNoVtx/V3
 - "HLT_TrkMu16_NoFiltersNoVtx": Use L1 Seed "L1_SingleMu7"
 - Desired HLT prescale: 1 (see rate result later)
 - /users/wshi/HLT TrkMu6 NoFiltersNoVtx/V4
 - "HLT_TrkMu6NoFiltersNoVtx": Use L1 Seed "L1_SingleMu3"
 - Desired HLT prescale: 1 (see rate result later)
 - Minimum # of events needed
 - Want rate for control HLT similar to signal HLT
 - To reach 1% uncertainty/bin, need 10k events; if use 25 bins, need 250k events
 - Recent run 326217 (92 pb⁻¹): 6301 events passed signal HLT
 - Need (250k/6.3k) * 92 pb⁻¹ \approx 3.6 fb⁻¹



Integration test

- /users/wshi/HLT_TrkMu16_NoFiltersNoVtx/V3
 - Output
 - https://raw.githubusercontent.com/weishi10141993/DarkSector/master/HLTIntegrationTest
 HLT TrkMu16 NoFiltersNoVtx.txt
 - hlt.log
 - https://raw.githubusercontent.com/weishi10141993/DarkSector/master/hlt HLT TrkMu16N oFiltersNoVtx.log
- /users/wshi/HLT_TrkMu6_NoFiltersNoVtx/V4
 - Output
 - https://raw.githubusercontent.com/weishi10141993/DarkSector/master/HLTIntegrationTest
 HLT TrkMu6 NoFiltersNoVtx.txt
 - hlt.log
 - https://raw.githubusercontent.com/weishi10141993/DarkSector/master/hlt HLT TrkMu6No FiltersNoVtx.log





Rate study

- Use run 315188 [2]
 - /HLTPhysics{1-4}/Commissioning2018-v1/RAW
 - PU: 52-65
 - L1 menu v1_0_0, switchL1PS=False
 - HLT Prescale column: 600b + HLT Physics 3
 - Use HLT PS value = 50 (could be wrong)
 - Initial lumi 0.537e34; Ending lumi 0.458e34
 - Use 0.5e34 to scale to 2.0e34 lumi

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Rate result

- Control HLTs
 - /users/wshi/HLT_TrkMu16_NoFiltersNoVtx/V3: 10.86 Hz @2.0e34
 - L1_SingleMu7: 72 Hz (prescale 22000)
 - /users/wshi/HLT_TrkMu6_NoFiltersNoVtx/V4: 9.28 Hz @2.0e34
 - L1 SingleMu3: 17 Hz (prescale 670)
- Signal HLT
 - HLT_TrkMu16_DoubleTrkMu6NoFiltersNoVtx_v12: 9.48 Hz @2.0e34
 - In recent run 316217 (fill 6677, 2556b), rate is 1.06 Hz
 - https://cmswbm.cern.ch/rateplots/6677/MoreTriggers/png/HLT TrkMu16 DoubleTrkMu6NoFiltersNoVtx.png