OMTF Performance Study Using L1 Ntuple

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Motivations

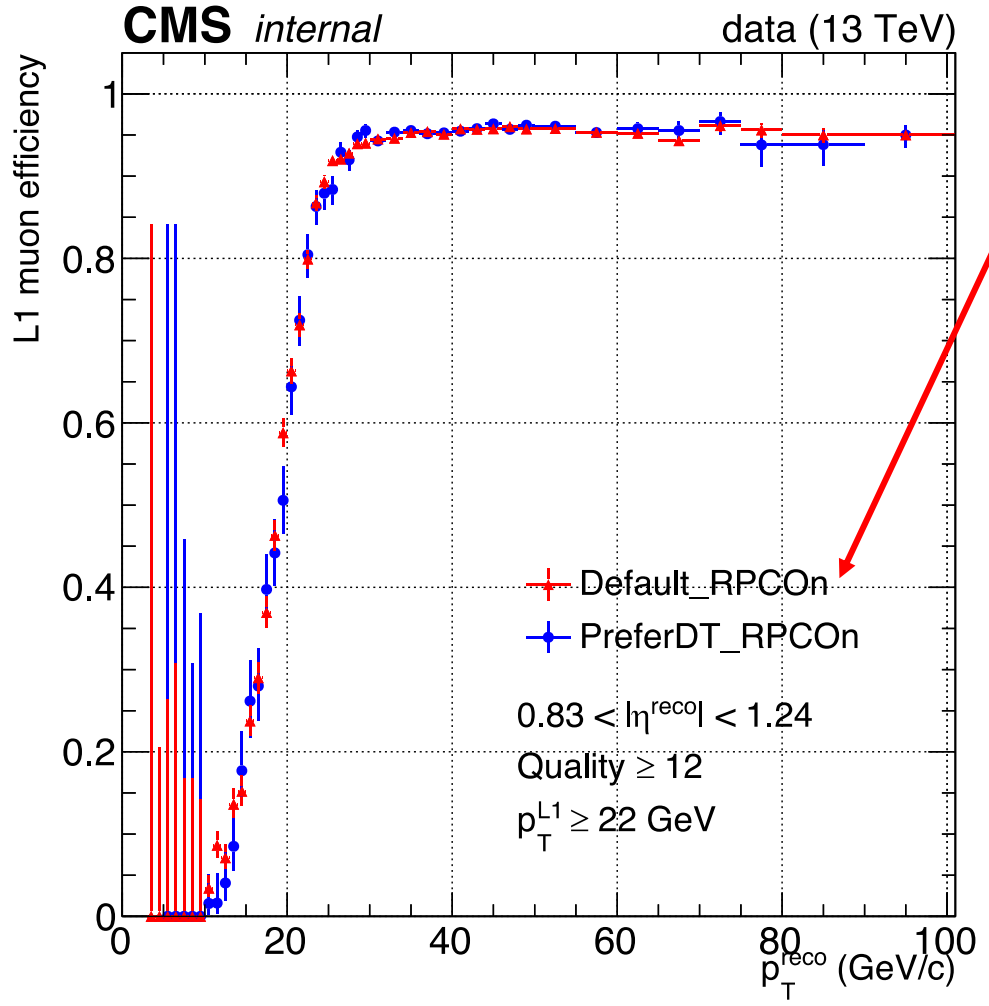
- Compare efficiency and rate performance for several OMTF algorithm options [1]
  - Default
  - Prefer DT: Prefer muon candidate with the DT reference hit
  - FW_V5: Mitigate degraded performance when RPC not available
    - Allow the coincidence of two DT segments or one DT + one CSC to produce a muon
    - Allow the “uncorrelated” DT segments (quality 2 and 3, i.e. based on only one superlayer) to be used by the algorithm
    - Enabled prefer DT reference hit option
  - For each option above, compare with & w/o RPC TPs

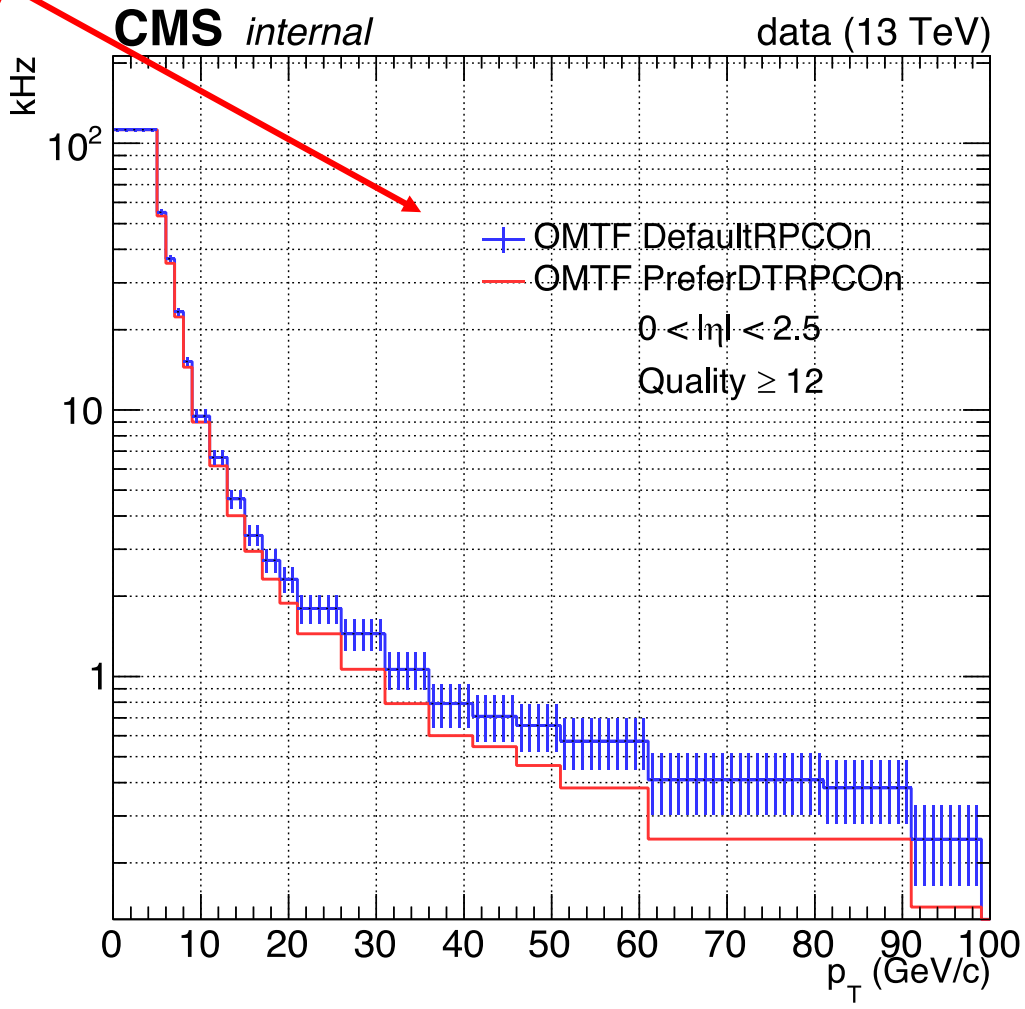
Tools

- L1T muon tool from Thomas Reis
- L1 Ntuples for various OMTF algorithm options
- Samples
  - /SingleMuon/Run2018A-ZMu-PromptReco-v1/RAW-RECO
    - Json: /afs/cern.ch/cms/CAF/CMSCOMM/COMM_DQM/certification/Collisions18/13TeV/DCSOnly/json_DCSONLY.txt
  - Run 317640 from /ZeroBias/Run2018B-v1/RAW
    - Json: /afs/cern.ch/cms/CAF/CMSCOMM/COMM_DQM/certification/Collisions18/13TeV/PromptReco/Cert_314472-317696_13TeV_PromptReco_Collisions18_JSON.txt

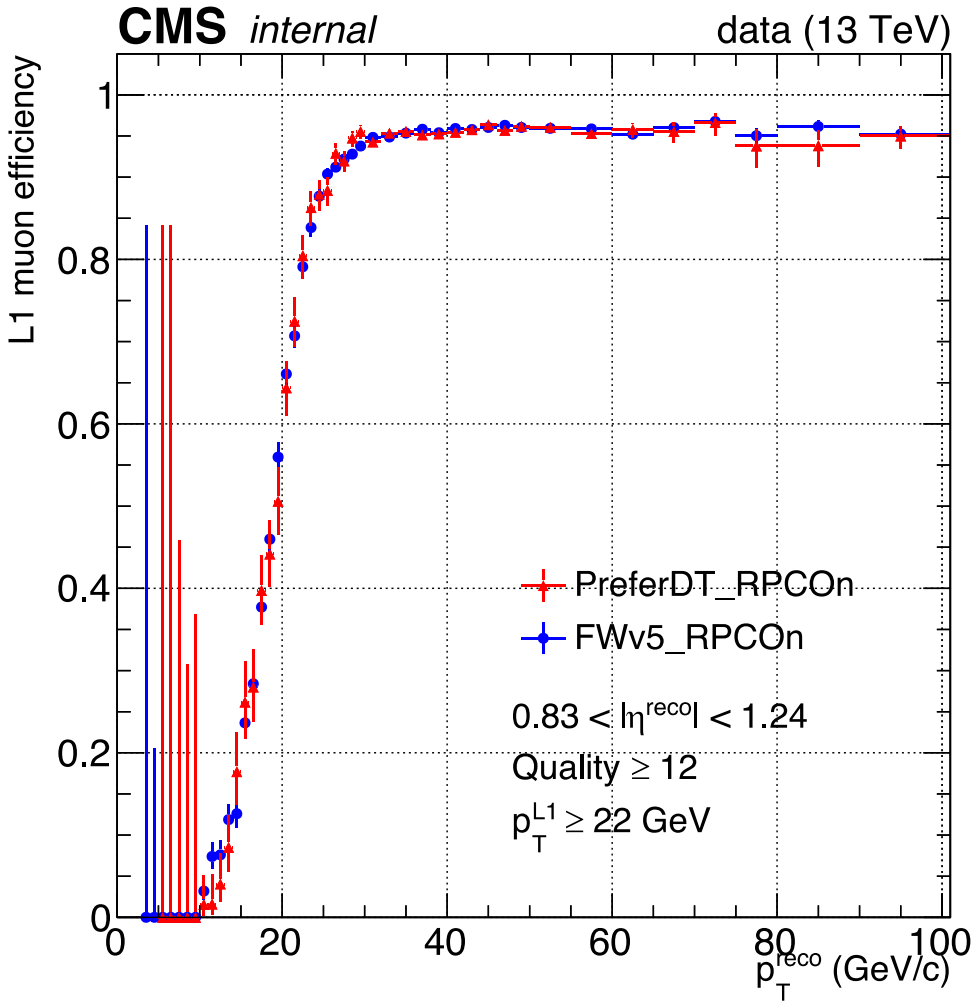
Default vs Prefer DT (both with RPC)

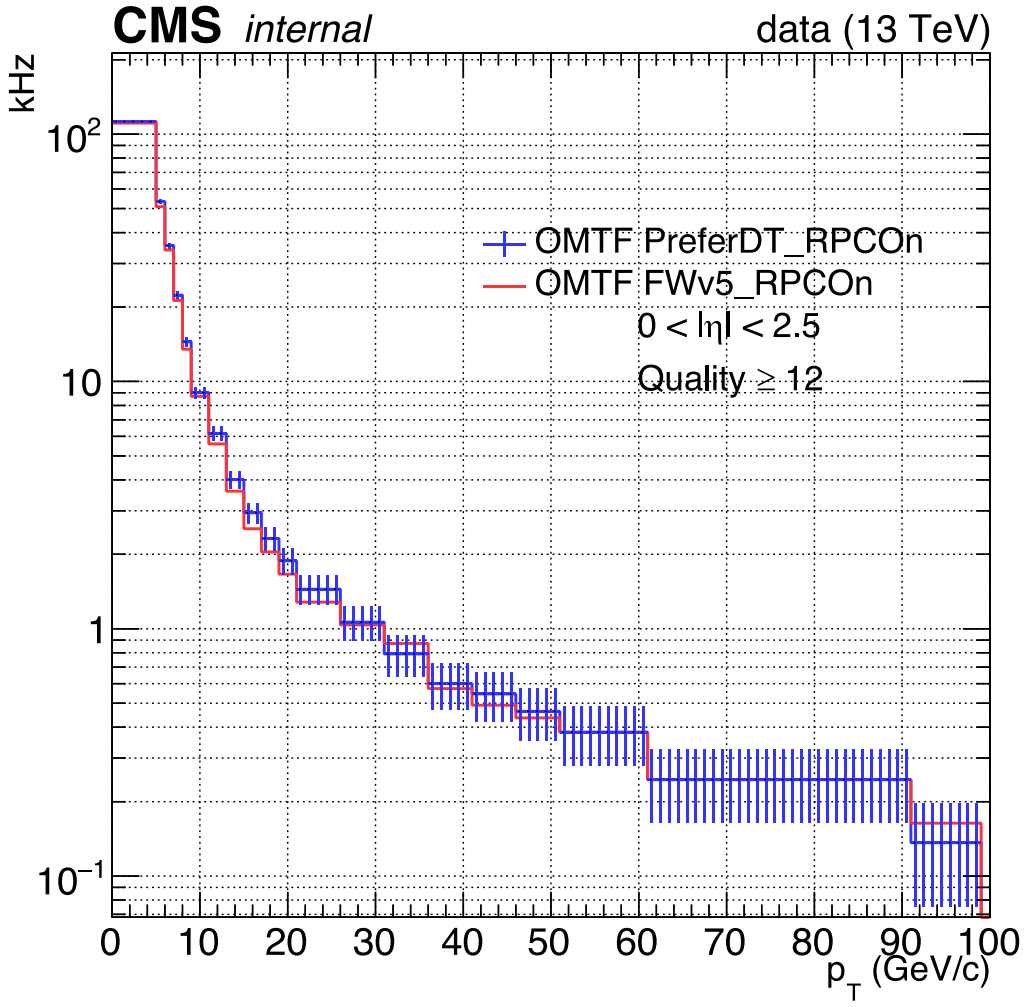
Note: Legend swapped!



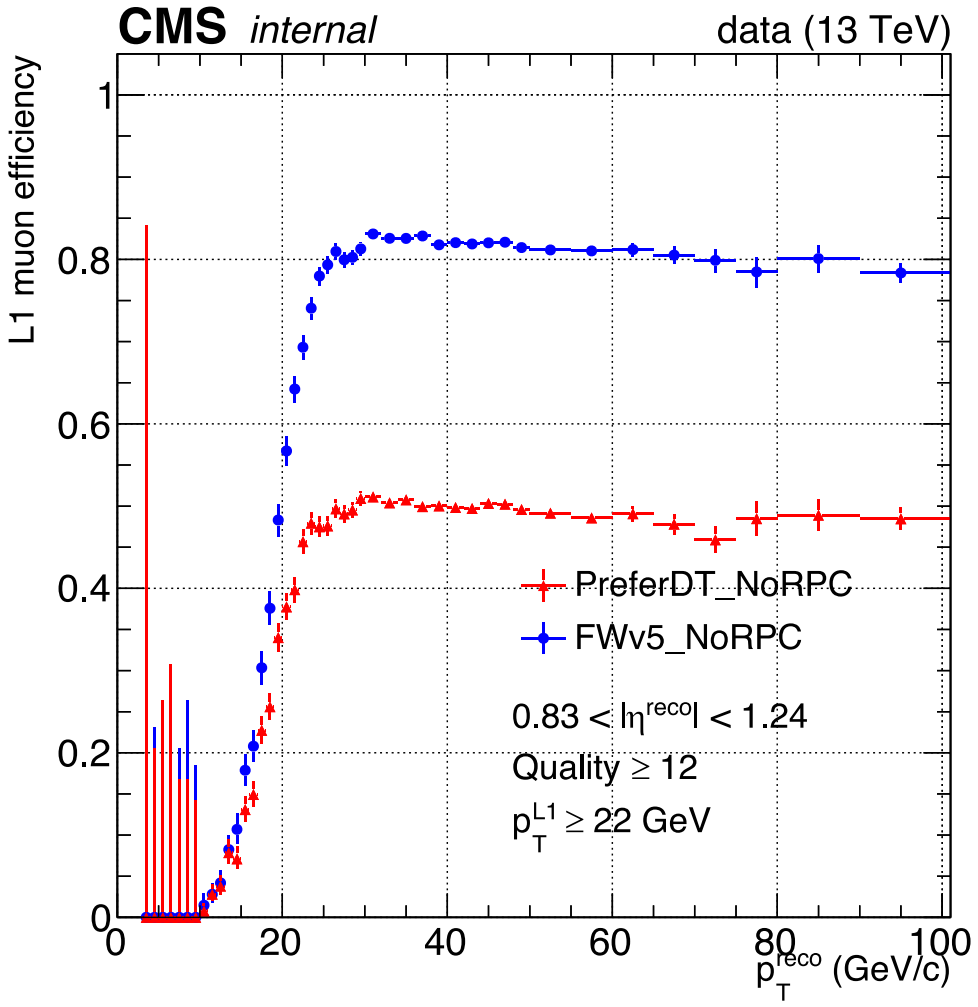


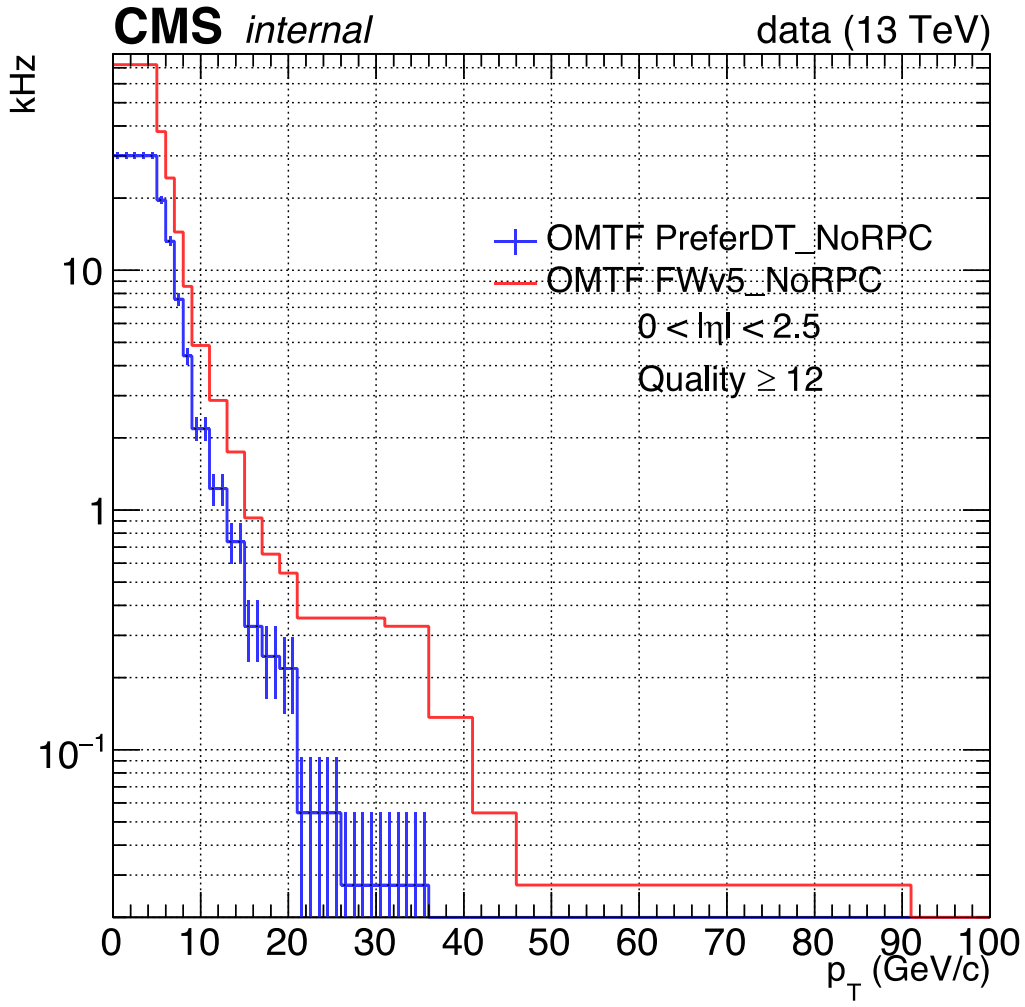
Prefer DT vs FW_v5 (both with RPC)





Prefer DT(no RPC) vs FW_v5 (no RPC)



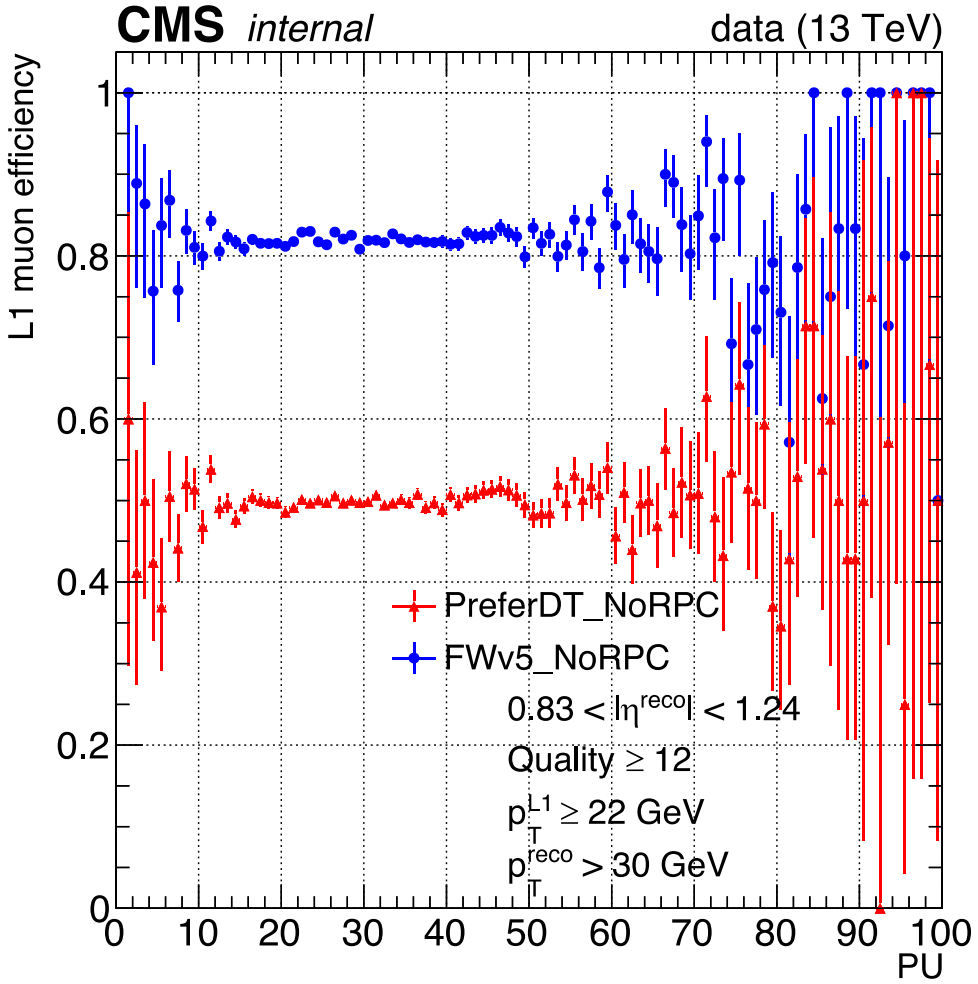


Conclusion

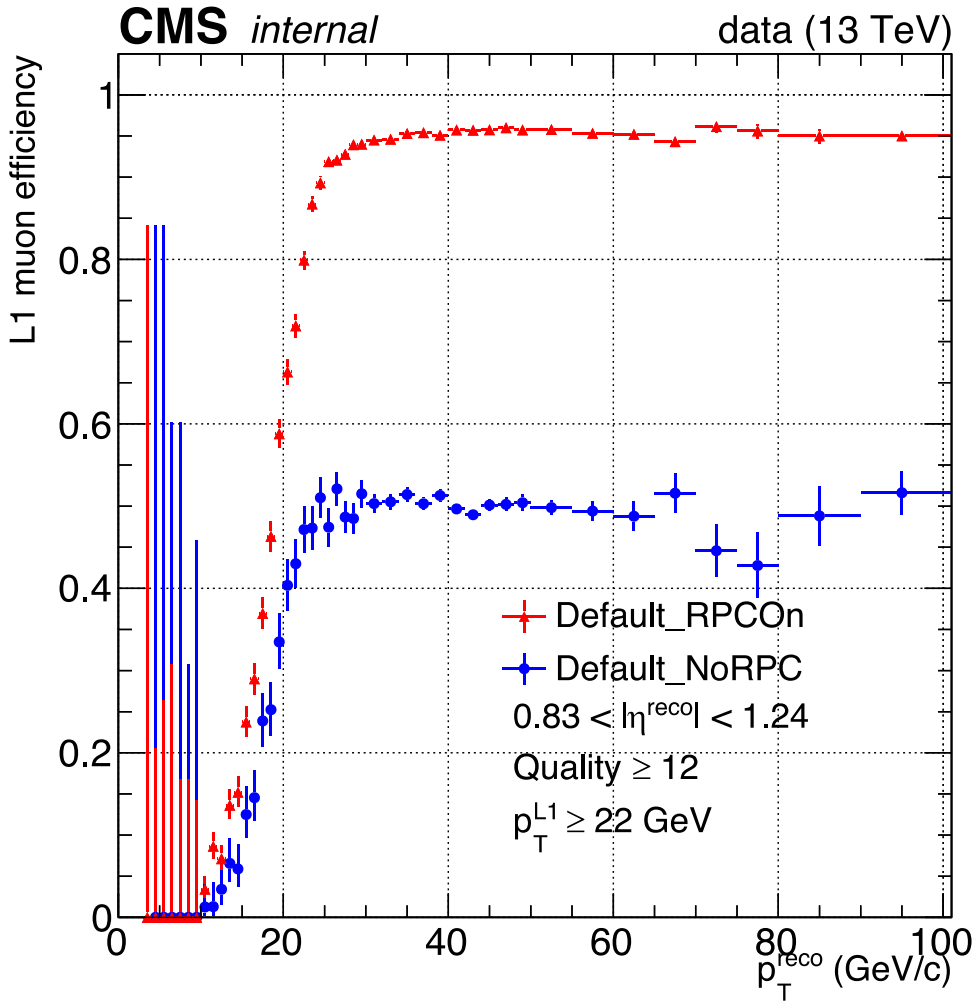
- FW v5 option recovers ~30% efficiency when RPCs are out compared to the “Prefer-DT-reference-hit” option
- Meanwhile, rate increase in FW v5 is tolerable
- Good for deployment from the perspective of this L1Ntulple study

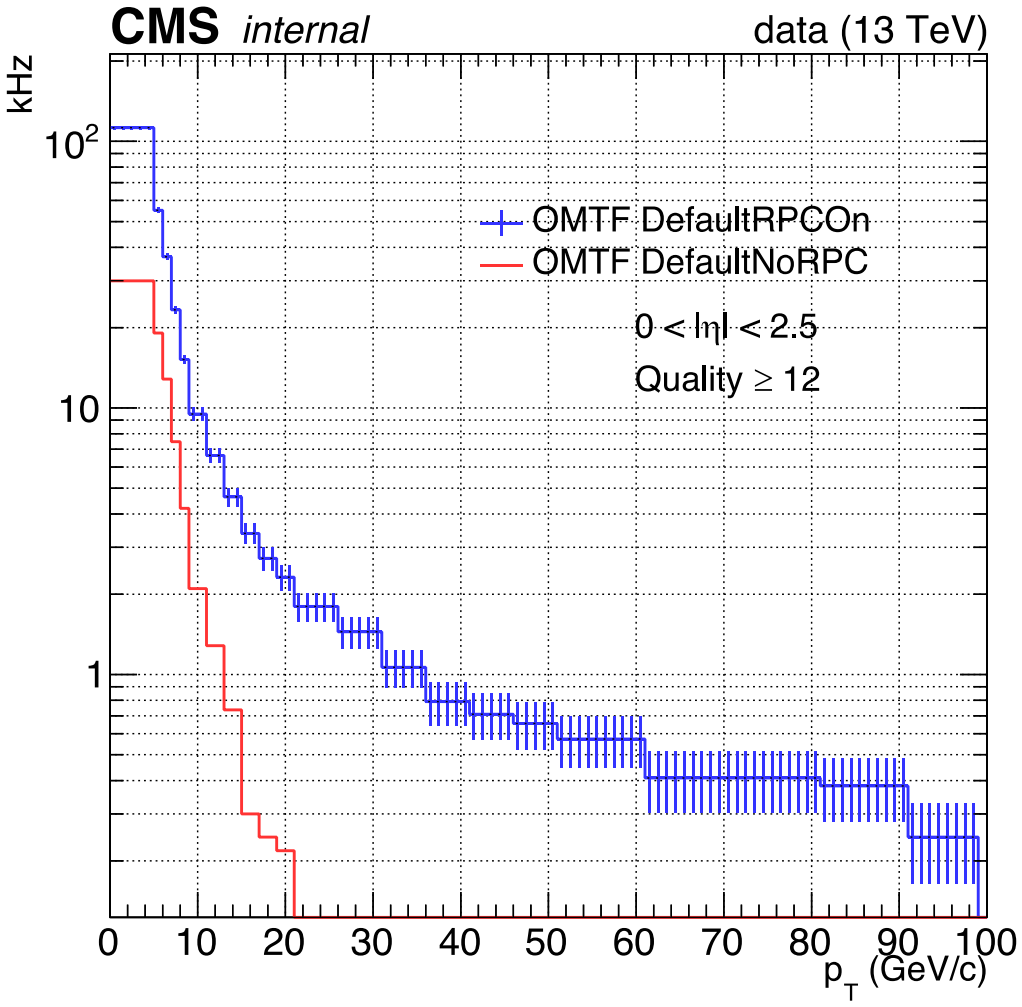
Back Up

Prefer DT(no RPC) vs FW_v5 (no RPC)

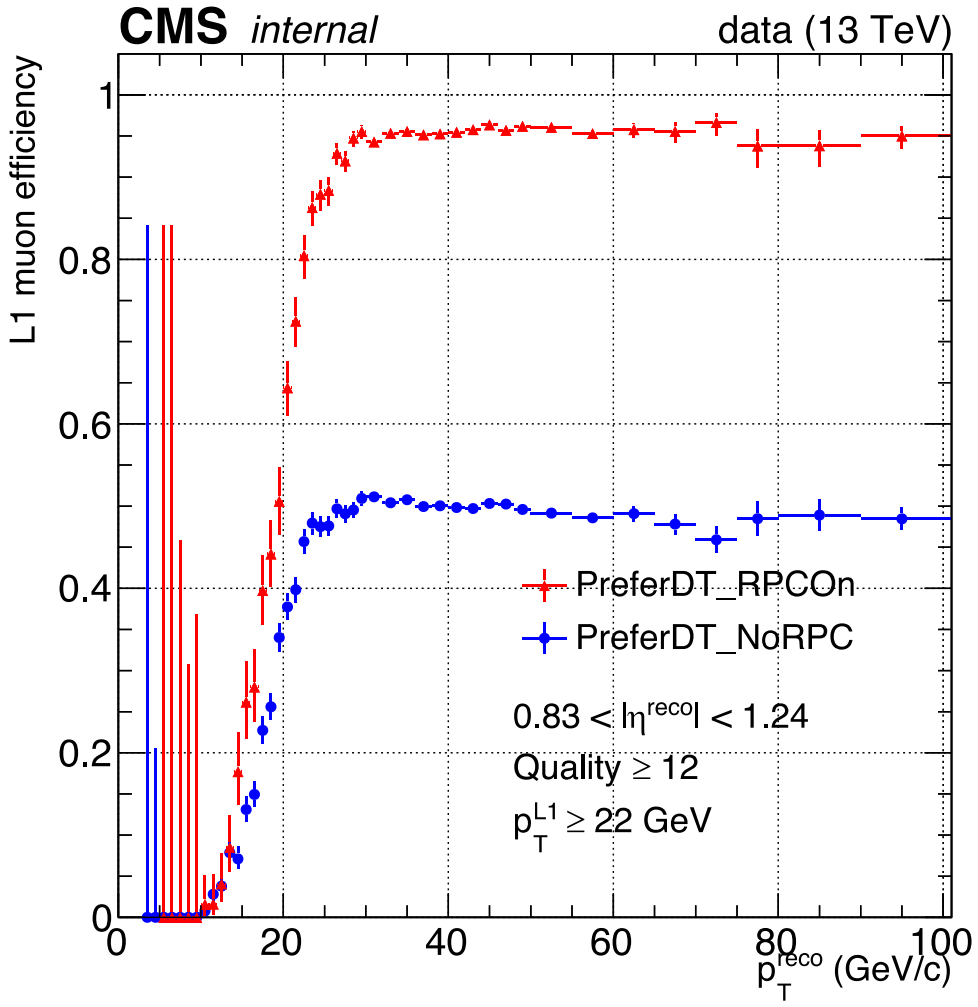


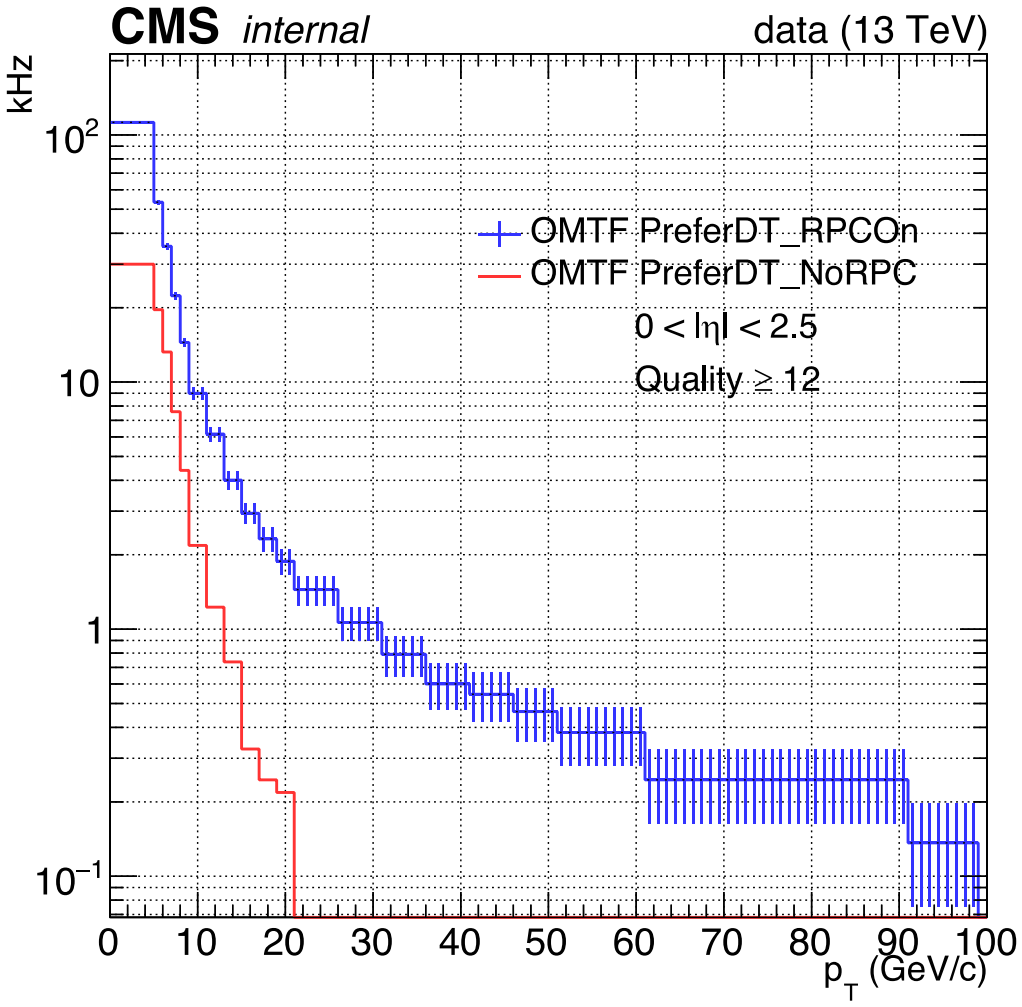
Default: w & w/o RPC



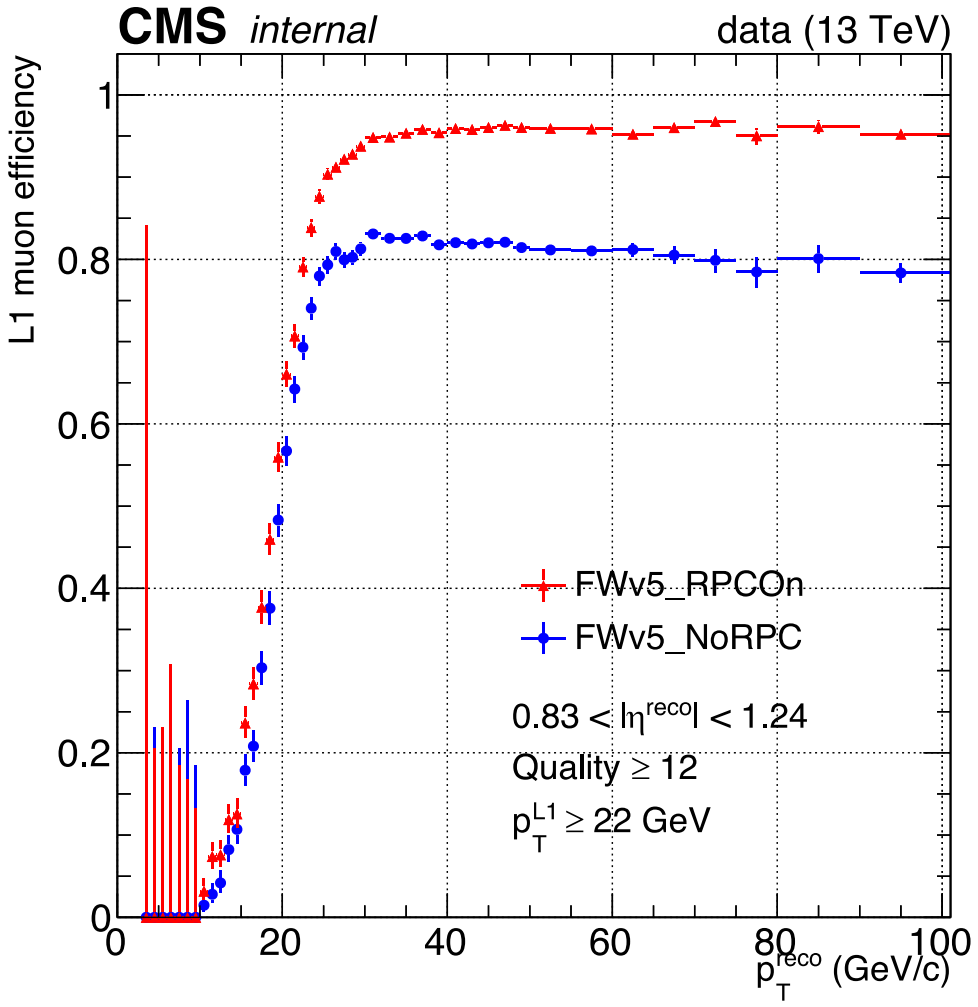


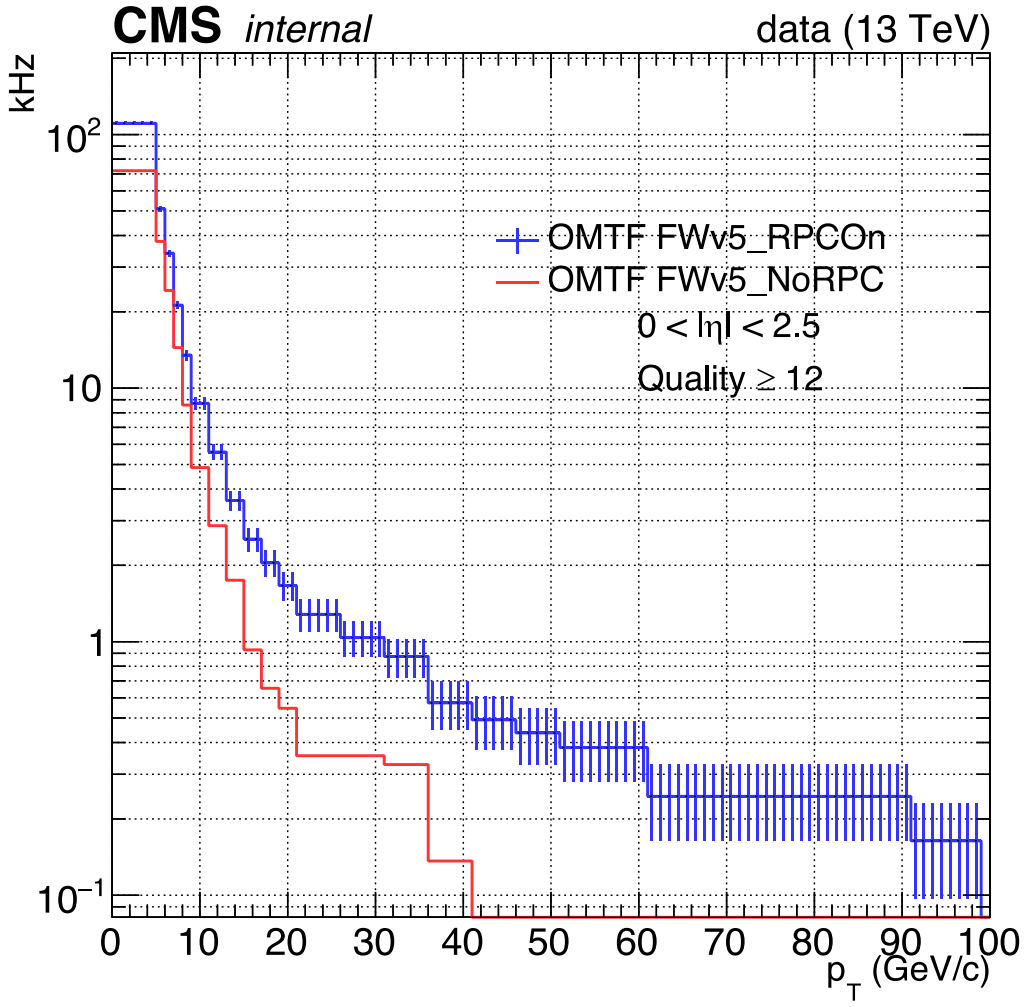
Prefer DT: w & w/o RPC





FW_v5: w & w/o RPC


CMS internal
data (13 TeV)
L1 muon efficiency
FWv5_RPCOn
FWv5_NoRPC
0.83 < |η^reco| < 1.24
Quality ≥ 12
p_T^L1 ≥ 22 GeV
p_T^reco (GeV/c)


CMS internal
data (13 TeV)
kHz
OMTF FWv5_RPCOn
OMTF FWv5_NoRPC
0 < |η| < 2.5
Quality ≥ 12
p_T (GeV/c)