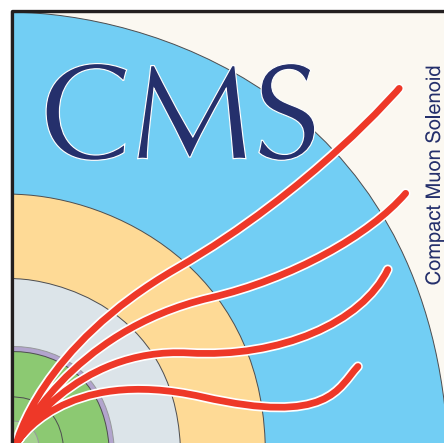


UL16 MC Validation after EMTF fix

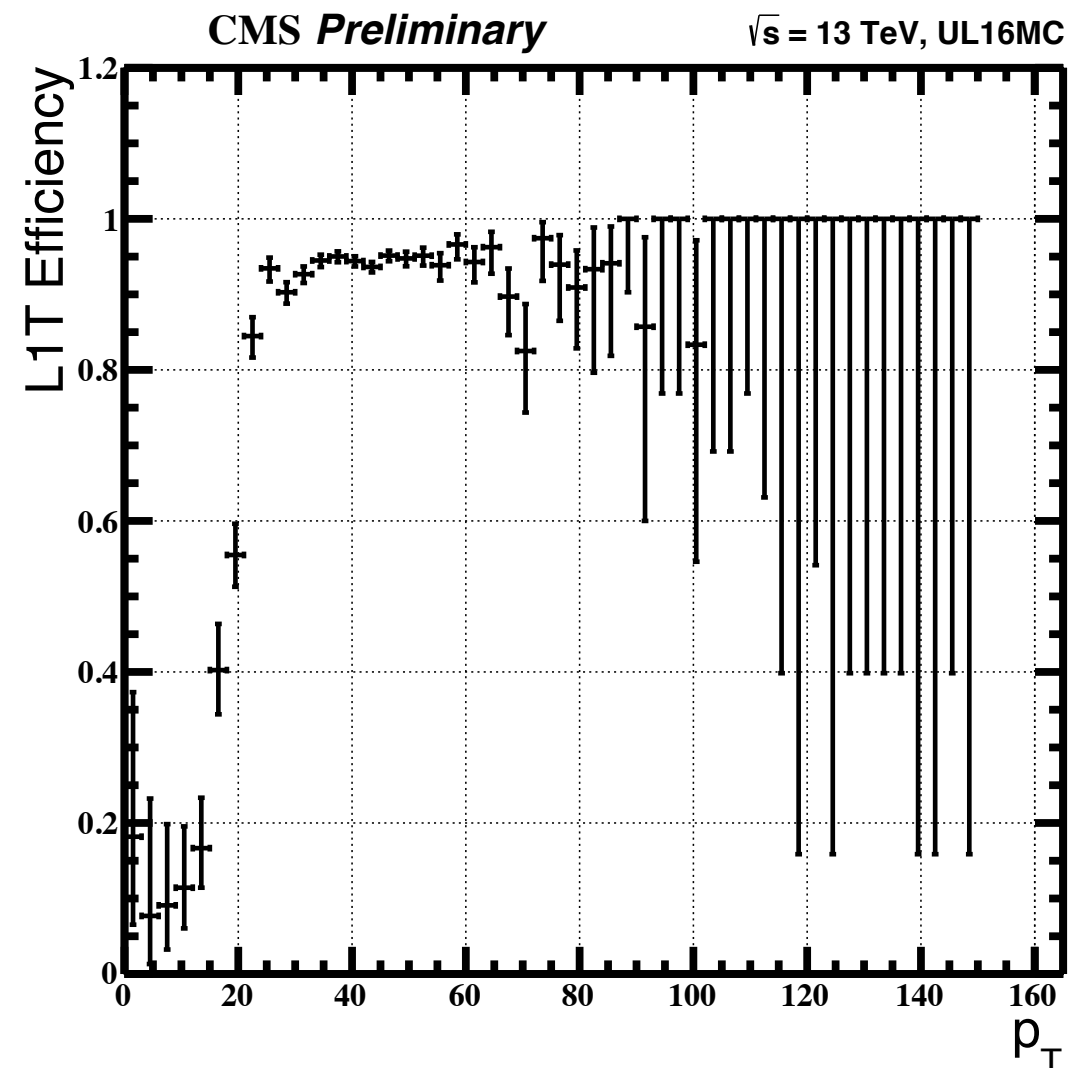
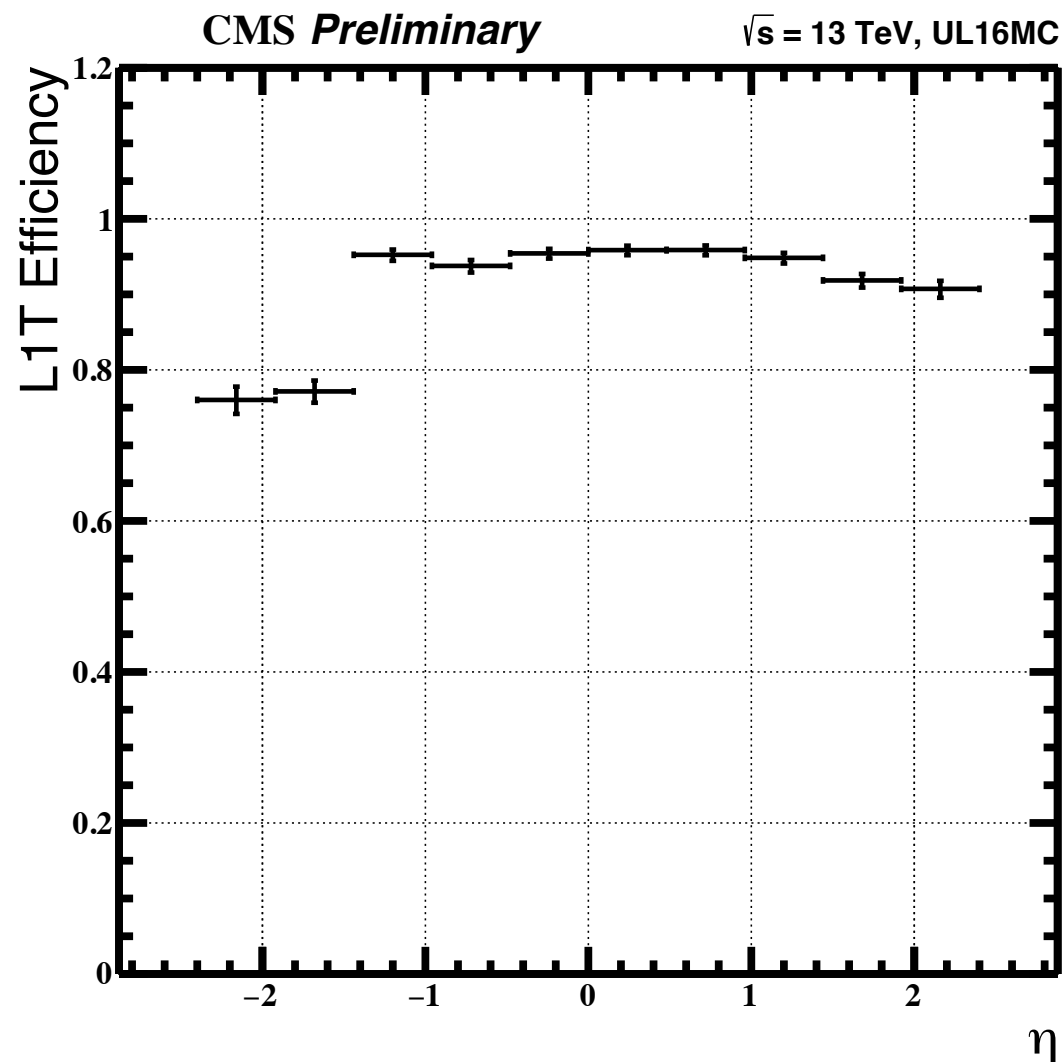
Efe Yigitbasi

19th March 2020



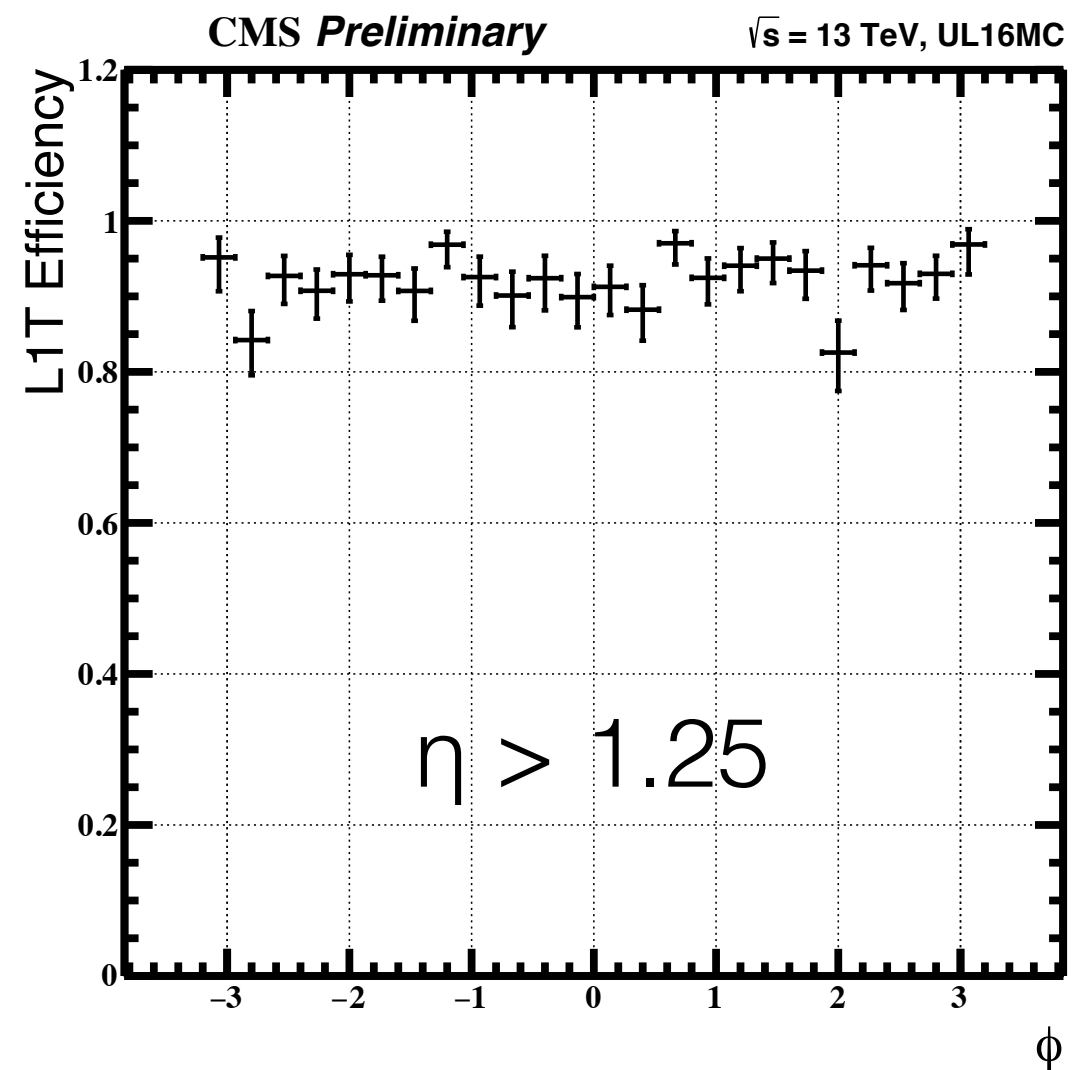
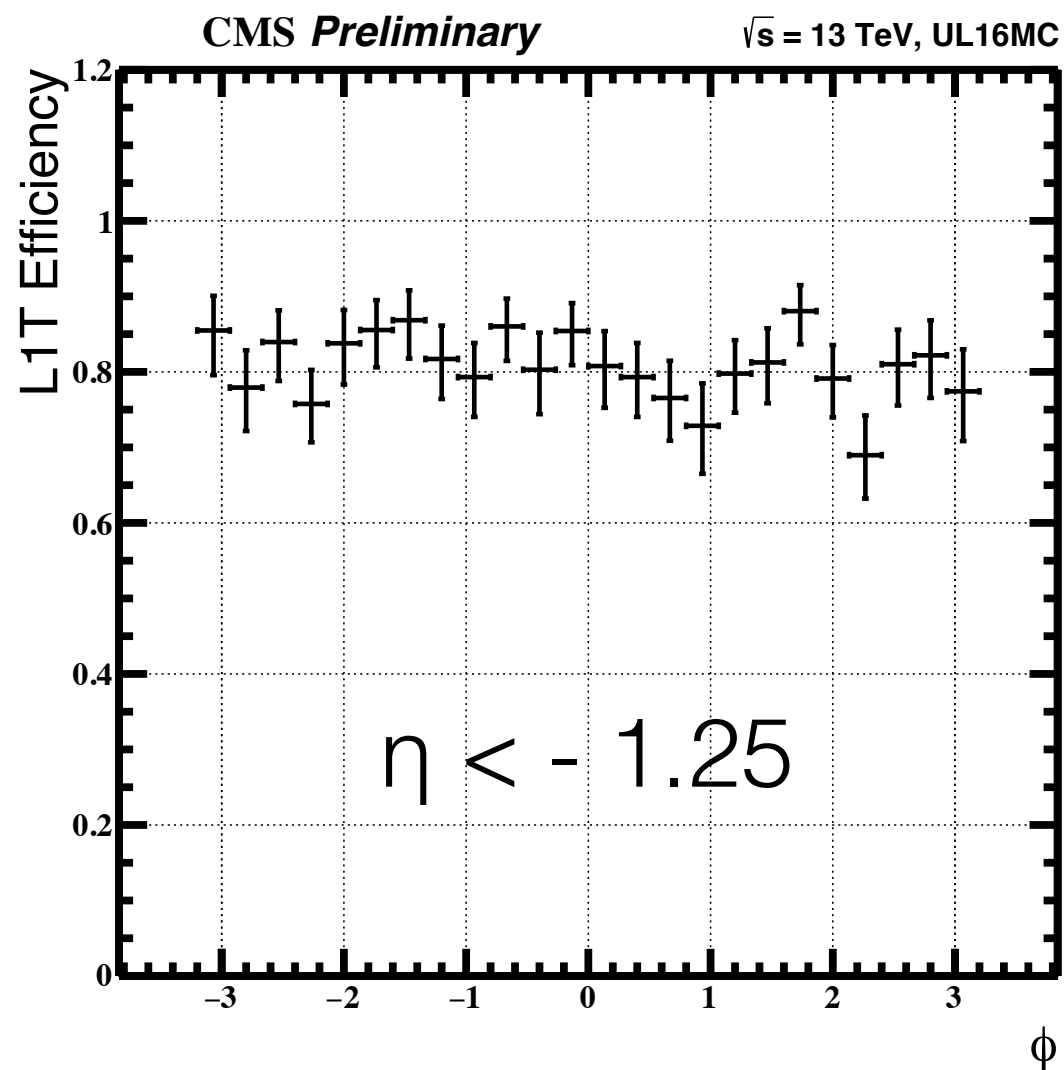
Introduction

- New files for validation sent around by L1T DPG:
 - `/ReIValZMM_13UP16/CMSSW_10_6_11_CANDIDATE-PU25ns_80X_mcRun2_asymptotic_v20_hlt16post-v1/GEN-SIM-RAW`
- Using the following as tag and probe we see efficiency problems at the negative endcap :
 - Tag:
 - Tight muon
 - $p_T > 24$ GeV
 - HLT Iso < 0.3
 - Probe:
 - Tight ID
 - $dR(\text{tag}, \text{probe}) > 0.3$



What went wrong?

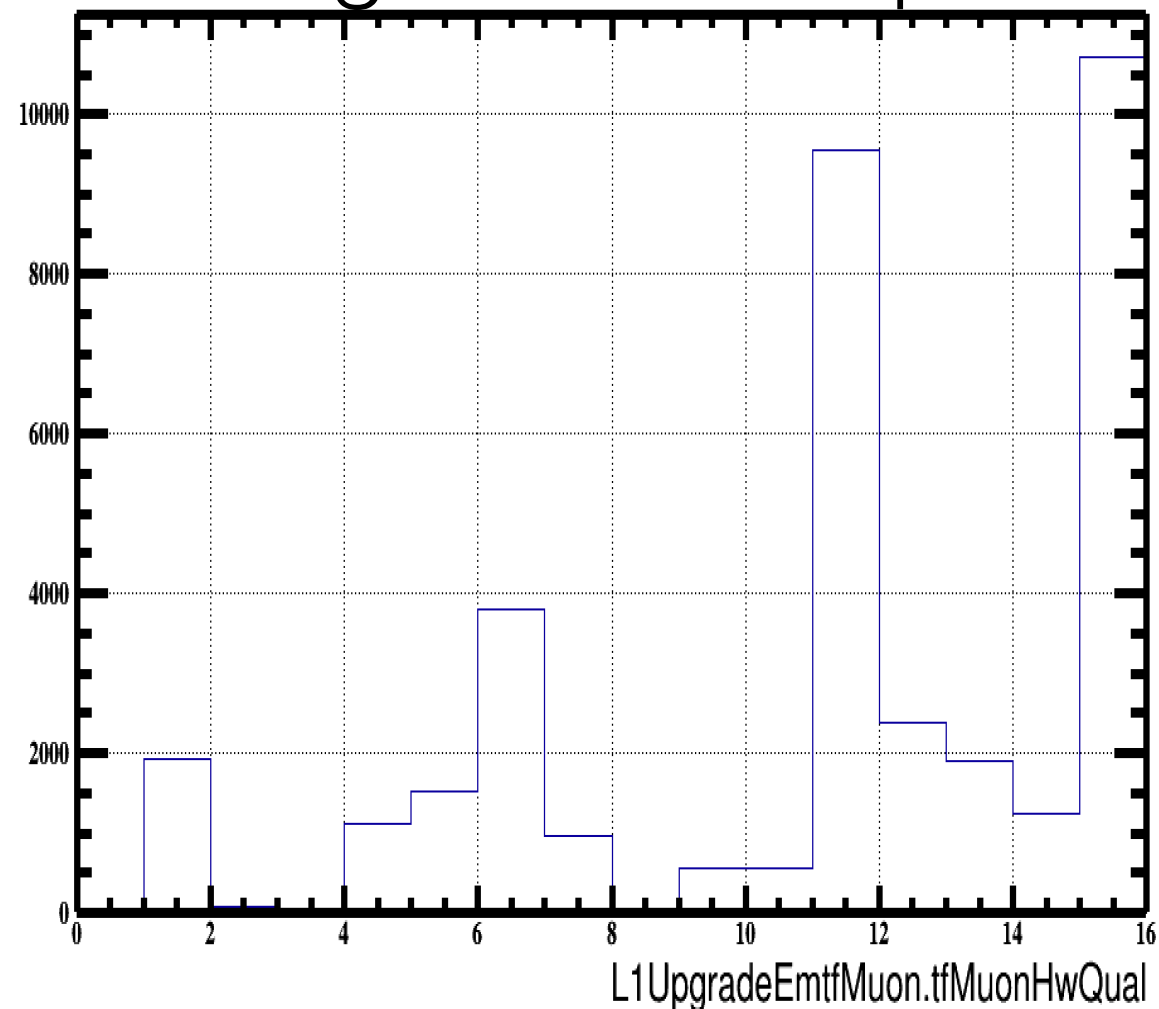
- Distributions in ϕ look flat but the negative endcap has overall lower efficiency
 - Tag:
 - Tight muon
 - $p_T > 24$ GeV
 - HLT Iso < 0.3
 - Probe:
 - Tight ID
 - $dR(\text{tag, probe}) > 0.3$



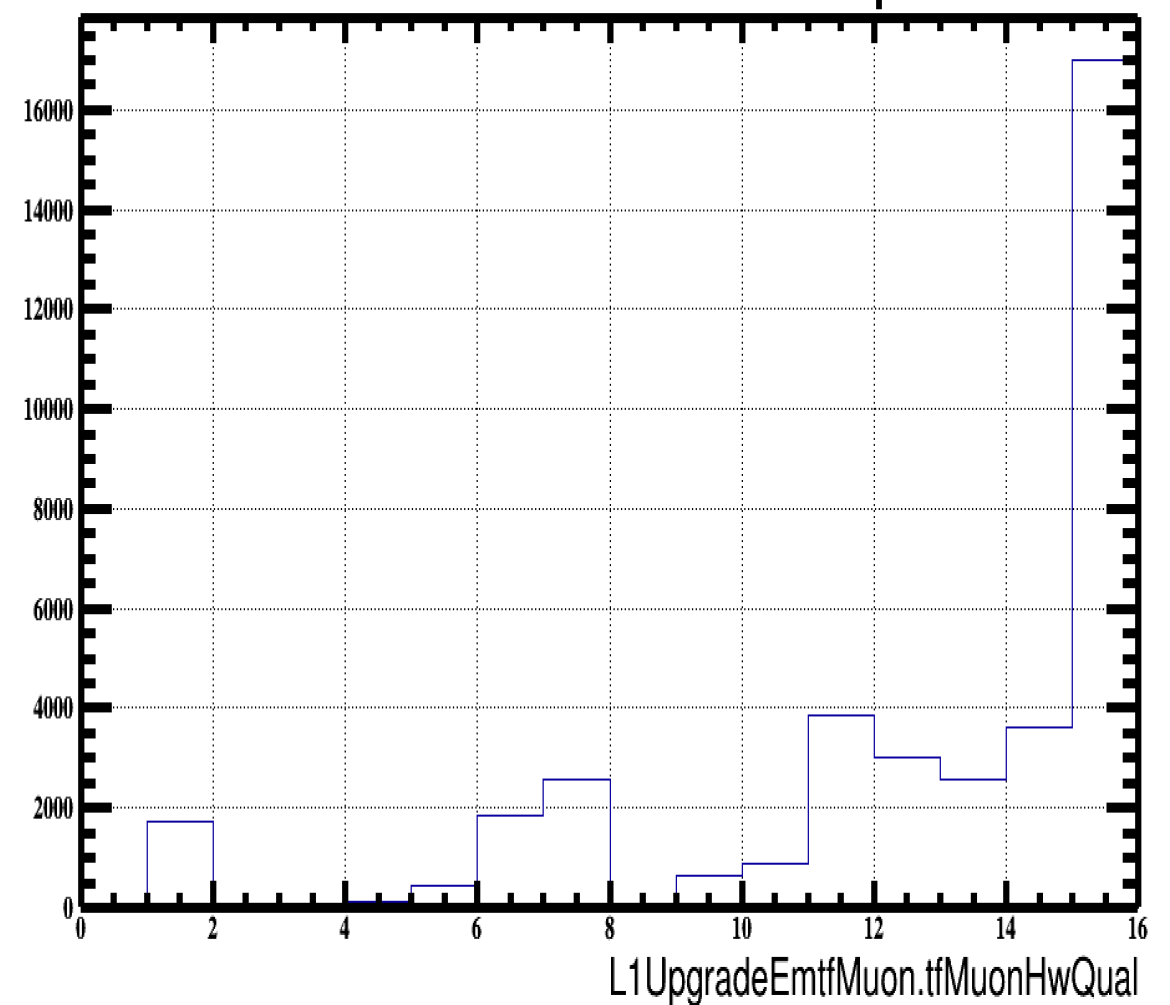
What went wrong?

- I tracked down the problem to be an issue with the quality of the muons in the endcaps.

Negative endcap



Positive endcap



What went wrong?

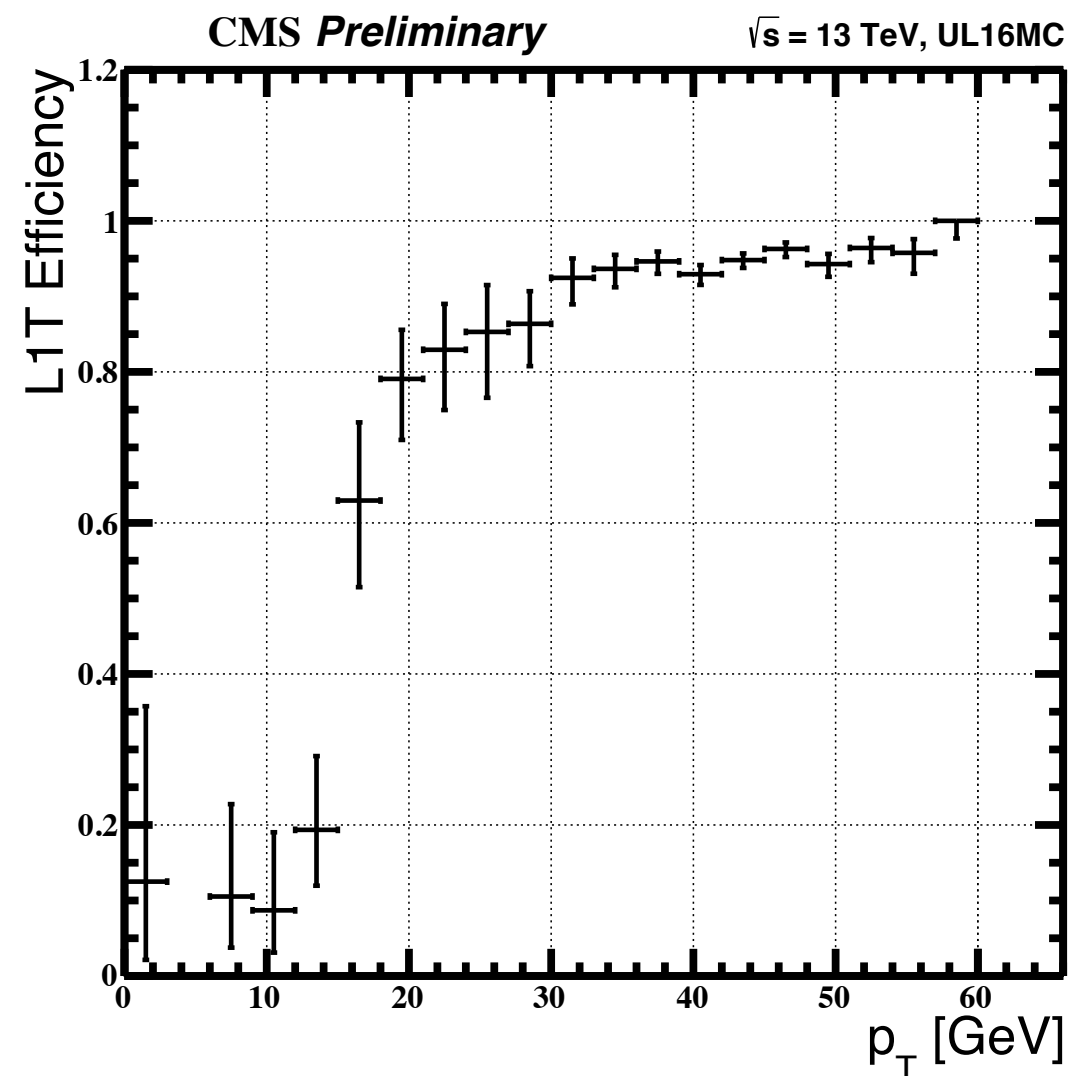
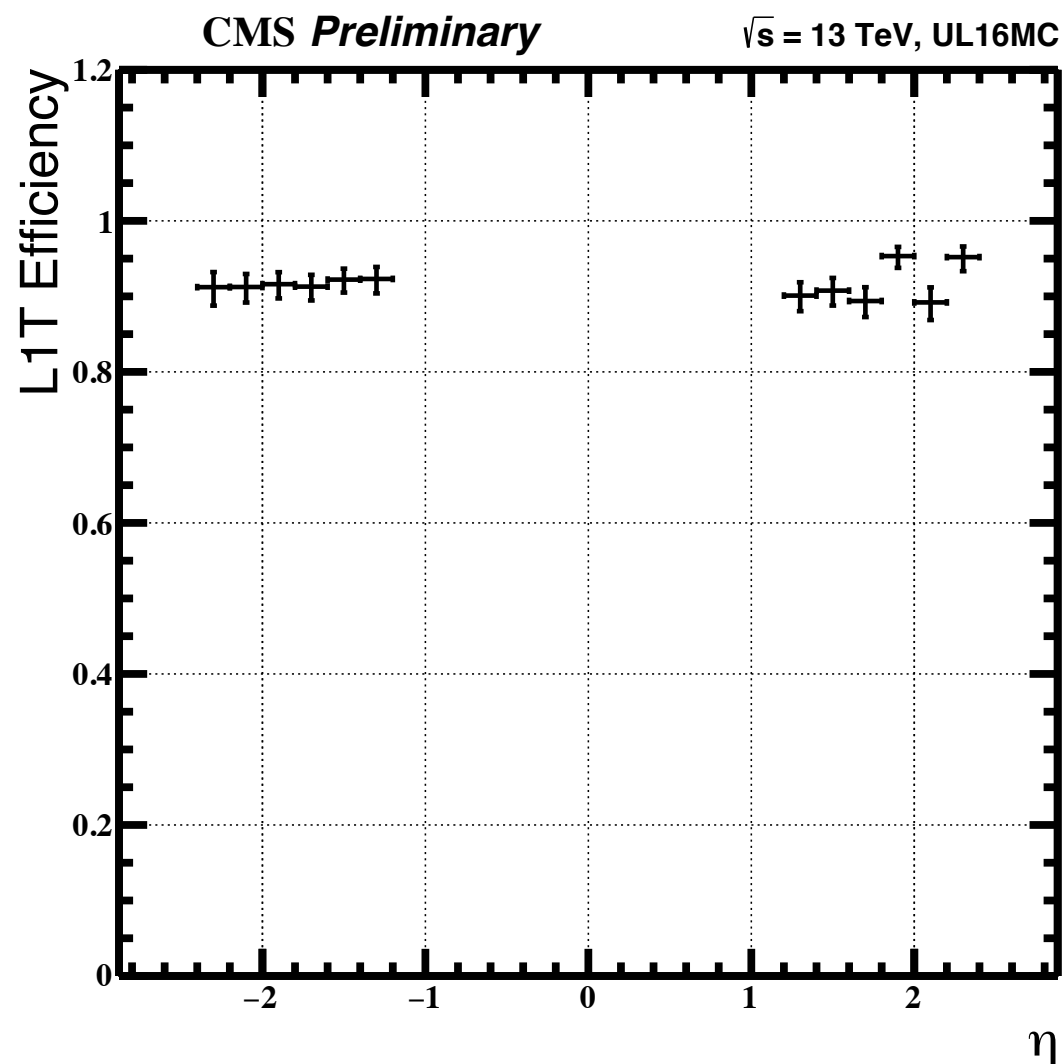
- Andrew found that the emulator was preventing the correct configuration of firmware version for 2016 MC.
 - For MC the emulator is using default 2018 firmware configurations.
 - For data the emulator is configurable to the old firmware in the emulator code.
- This line has to be fixed as following to prevent this issue from happening:

```
2 2 changes: 1 addition & 1 deletion src/TrackFinder.cc ...
@@ -164,7 +164,7 @@ void TrackFinder::process(
164 164     const int es = (endcap - emtf::MIN_ENDCAP) * (emtf::MAX_TRIGSECTOR - emtf::MIN_TRIGSECTOR + 1) + (sector - emtf:
165 165
166 166     // Run-dependent configure. This overwrites many of the configurables passed by the python config file.
167 -    if (iEvent.isRealData() && fwConfig_) {
167 +    if (fwConfig_) {
168 168         sector_processors_.at(es).configure_by_fw_version(condition_helper_.get_fw_version());
169 169     }
170 170
```

https://github.com/cms-sw/cmssw/compare/CMSSW_10_6_X...abrinke1:patch-3

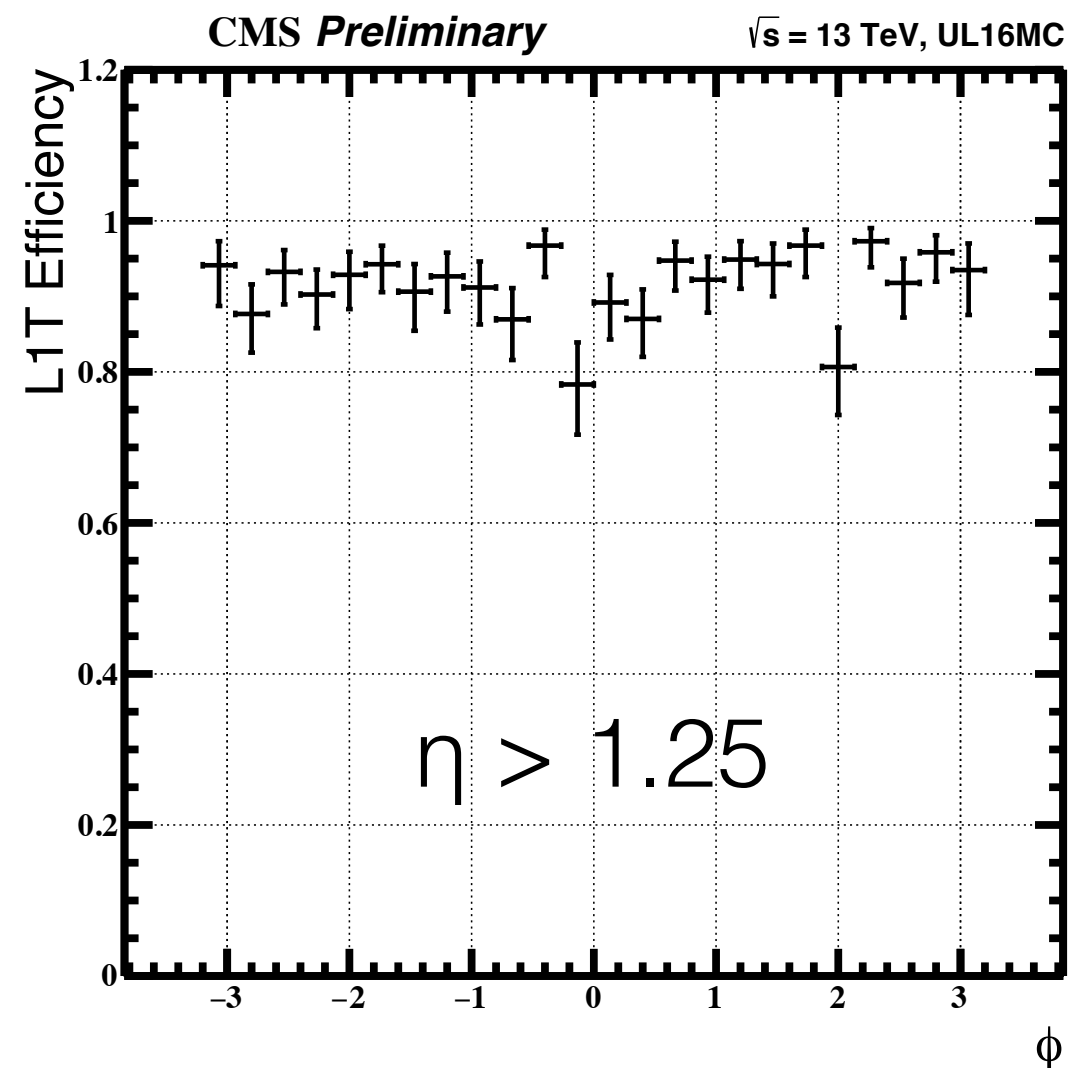
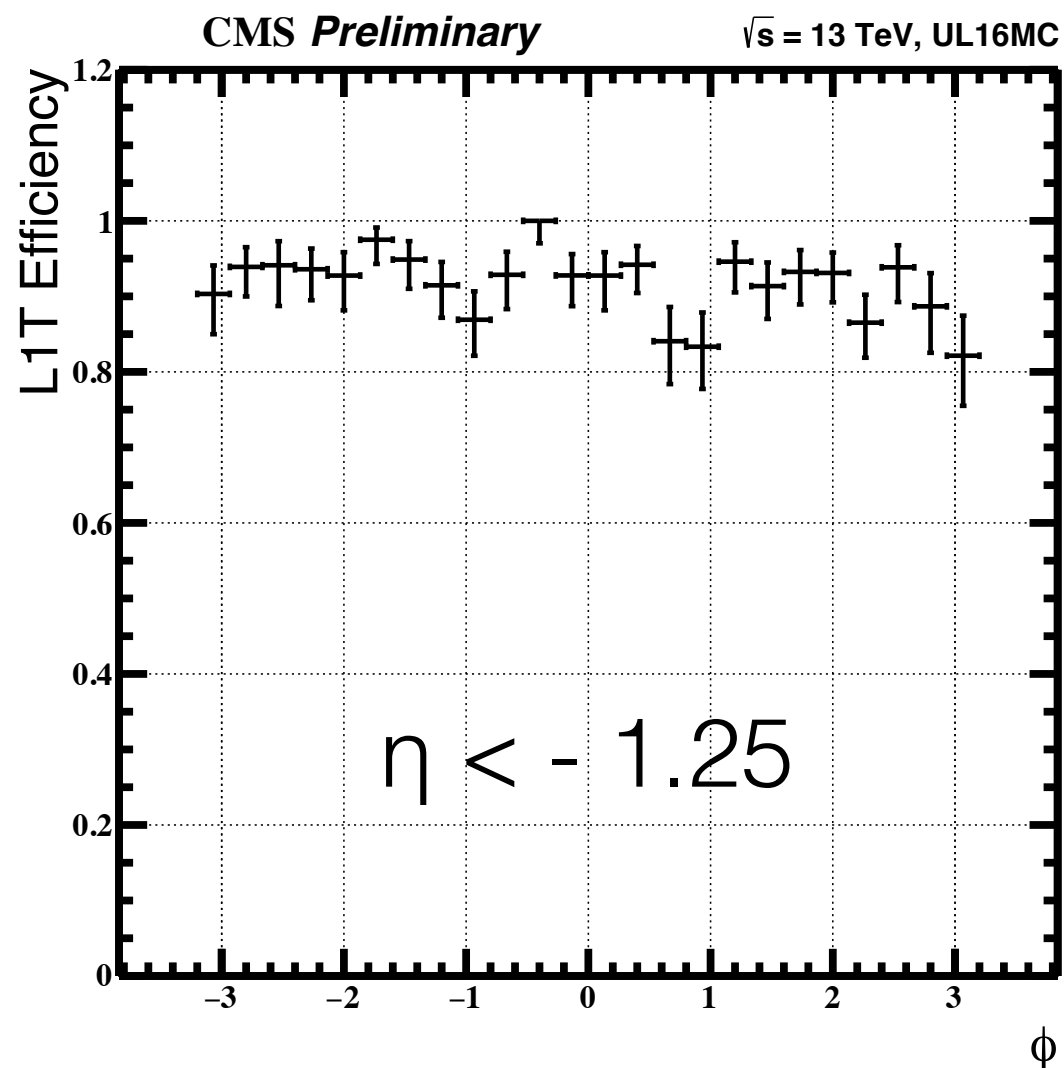
Validation of the new fix

- Rerunning the efficiency studies after re-emulating the new UL16 ReVals.
 - Removed some of the HLT requirements for T&P since I didn't rerun the HLT step.
 - Tag:
 - Tight muon
 - $p_T > 24$ GeV
 - Probe:
 - Tight ID
 - $dR(\text{tag}, \text{probe}) > 0.3$



Validation of the new fix

- Rerunning the efficiency studies after re-emulating the new UL16 ReVals.
 - Removed some of the HLT requirements for T&P since I didn't rerun the HLT step.
 - Tag:
 - Tight muon
 - $p_T > 24$ GeV
 - Probe:
 - Tight ID
 - $dR(\text{tag}, \text{probe}) > 0.3$



Conclusion

- Andrew's fix seems to be working correctly.
 - The efficiency in the negative endcap is similar to positive endcap now.
- We should submit a PR to include this fix in CMSSW.
- Do we want to run any other checks before we submit the PR?