MC Matching and Event Composition for Soft Muons

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Summary

1. Finalized MC matching and defined labeling
2. Defined gen flavor for both muons/ non muons
3. Looked at the composition of several processes w.r.t labels and gen flavor

Data Samples

MINIAODSIM:

/DYJetsToLL_M-50_HT-70to100_TuneCP5_13TeV-madgraphMLM-pythia8/RunIIFall17MiniAODv2-PU2017_12Apr2018_94X_mc2017_realistic_v14-v1/MINIAODSIM

/TTJets_DiLept_TuneCP5_13TeV-madgraphMLM-pythia8/RunIIAutumn18MiniAOD-102X_upgrade2018_realistic_v15-v1/MINIAODSIM

/QCD_Pt_600to800_TuneCP5_13TeV_pythia8/RunIIWinter19PFCalibMiniAOD-2018Conditions_105X_upgrade2018_realistic_v4-v1/MINIAODSIM

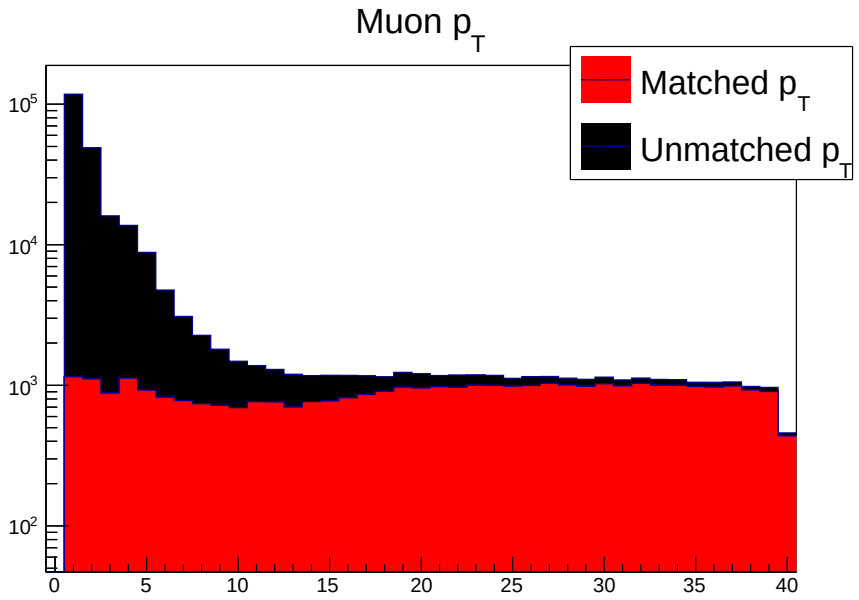
*all datasets have corresponding NANO child

Matching Criteria

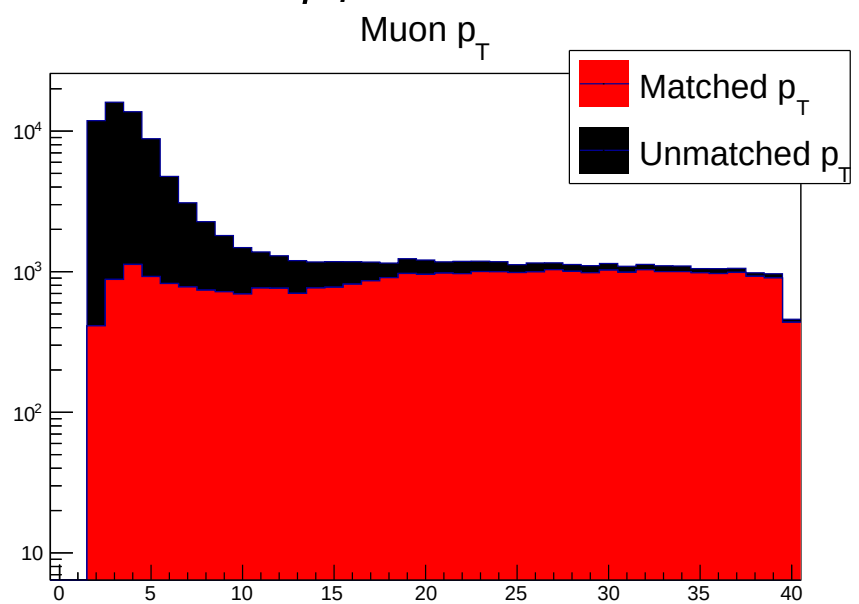
* $\Delta R < 0.2$
* $\Delta P_T^{rel} < 0.2$ ——— $\frac{|p_T^{mc} - p_T^{reco}|}{p_T^{mc}}$
* Resolve ambiguities ——— Forbid two RECO objects to match to the same GEN object
* Resolve by Quality ——— Choose the lowest ΔR pair

DY

No Cut



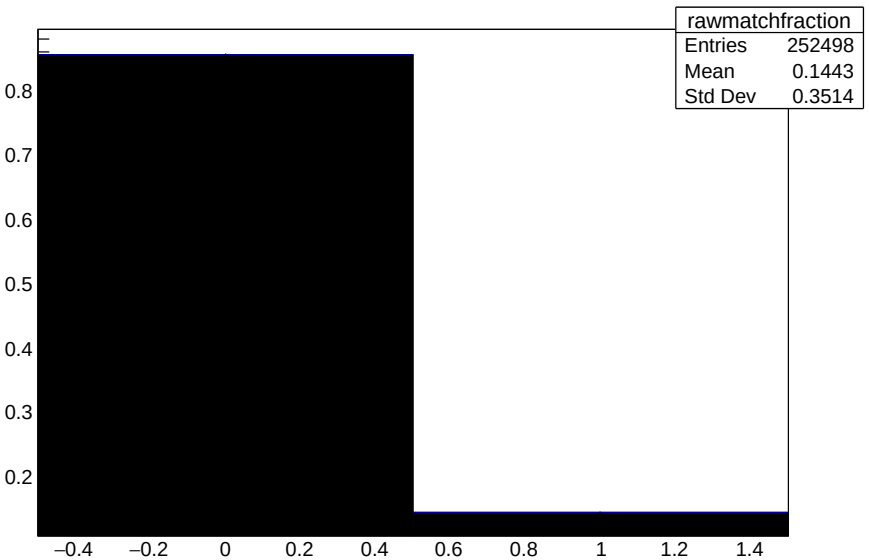
Reconstructed $p_T > 2$ GeV



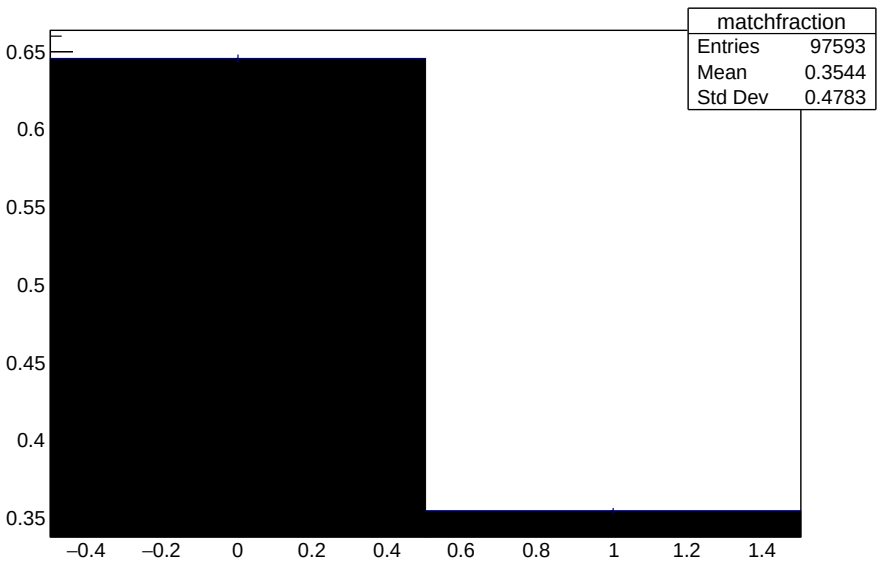
- many unmatchable junk muons at very low pT
- apply a simple pt cut to clean up

DY

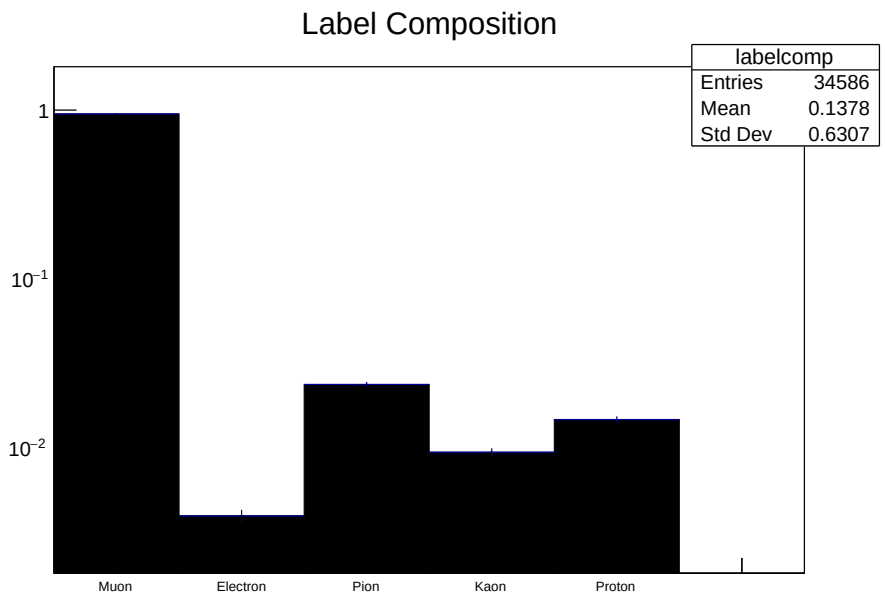
No Cut



Reconstructed $p_T > 2$ GeV

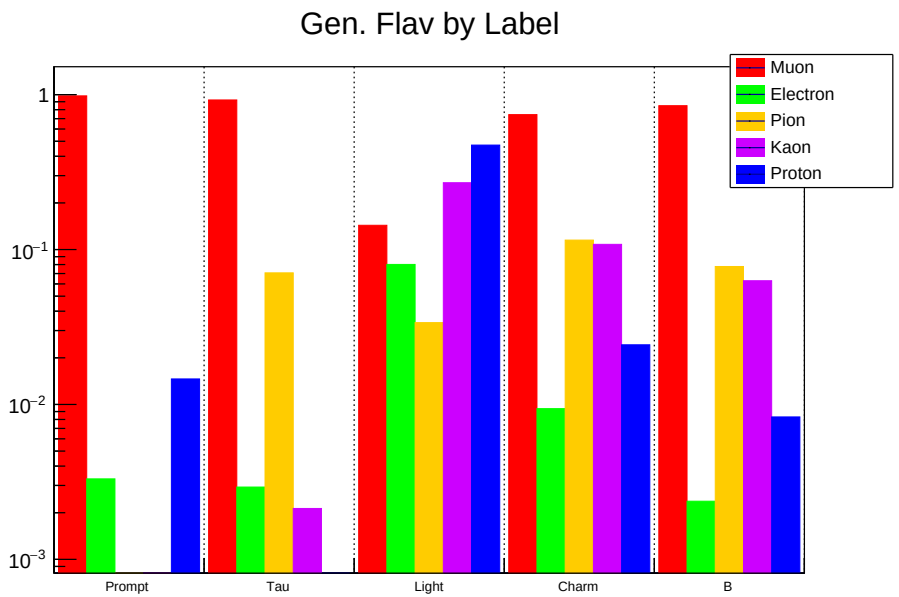


DY



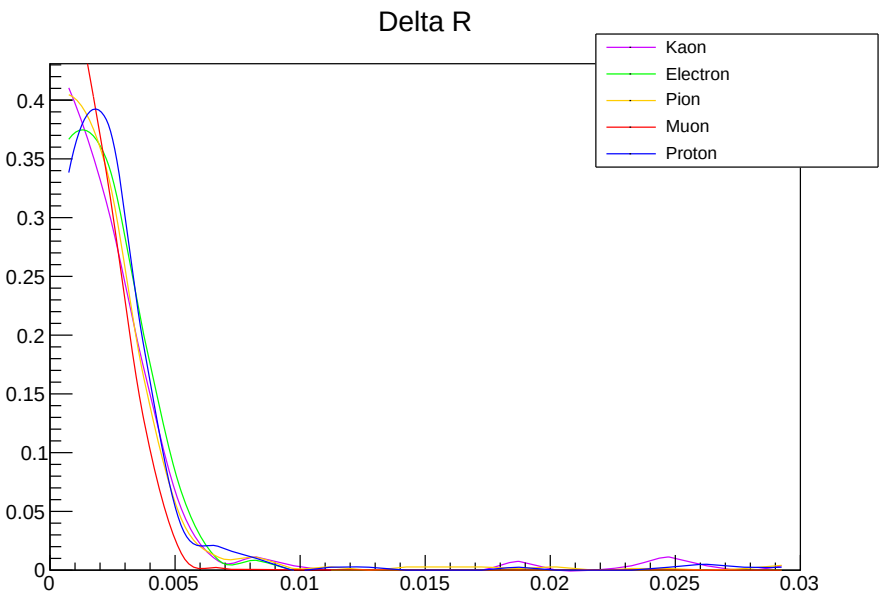
- From all matched particles, what is their true label
- normalized to unity

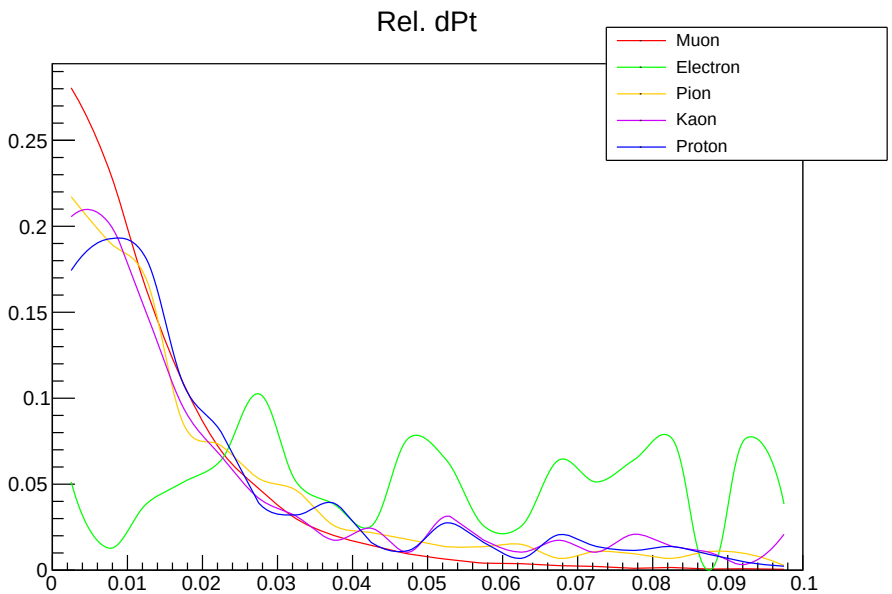
DY



- Of matched particles what is their origin?
- each flavor bin normalized to unity, by bin
- e.g. % prompt muons $= \frac{\text{N prompt muons}}{\text{N all labels which are prompt}}$

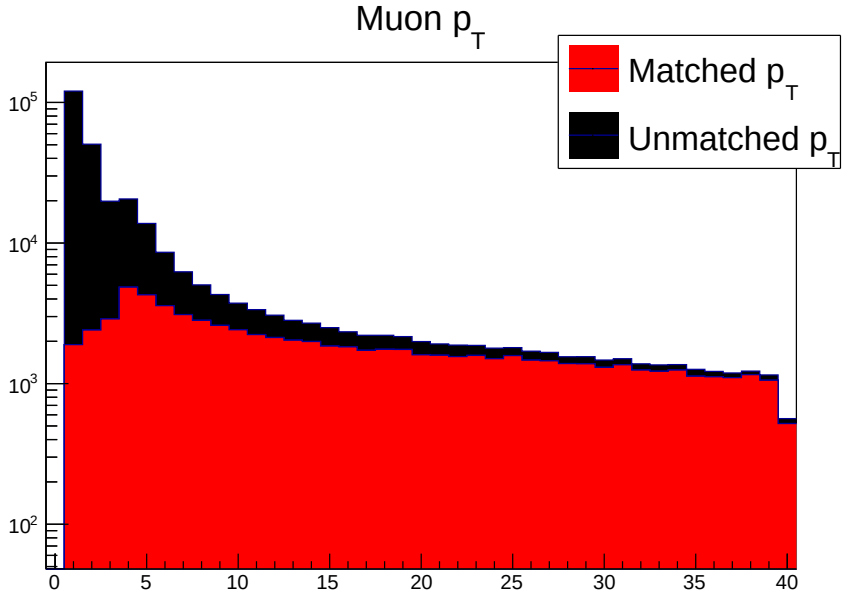
DY


Delta R
Kaon
Electron
Pion
Muon
Proton
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.005
0.01
0.015
0.02
0.025
0.03

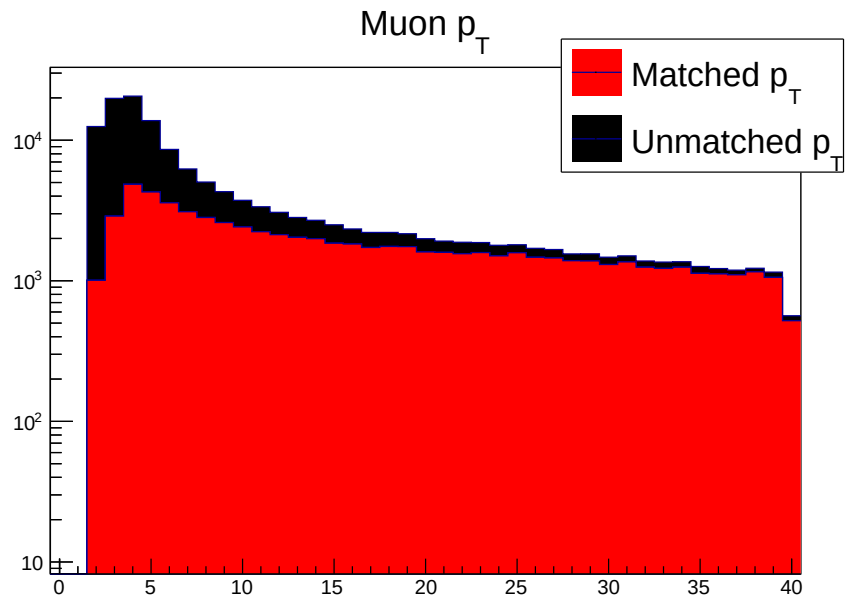

Rel. dPt
Muon
Electron
Pion
Kaon
Proton
0.25
0.2
0.15
0.1
0.05
0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1

TT

No Cut

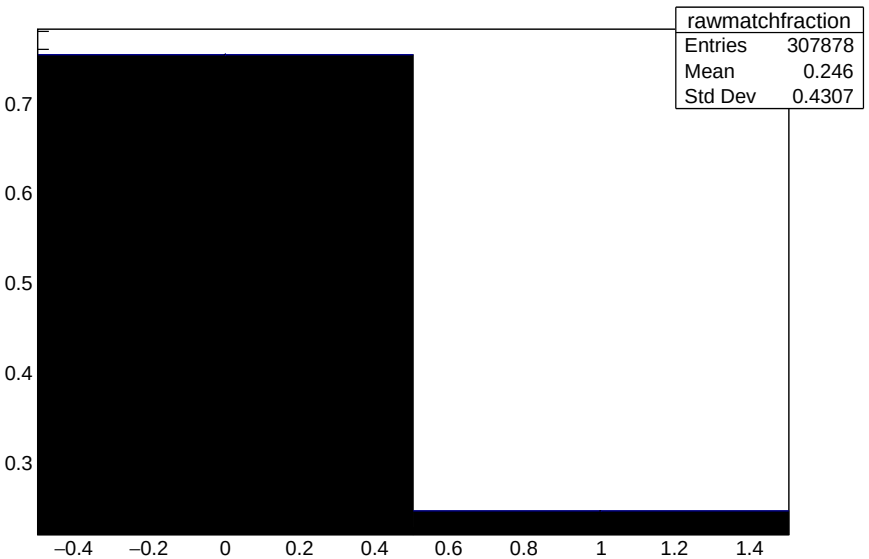


Reconstructed $p_T > 2$ GeV



TT

No Cut



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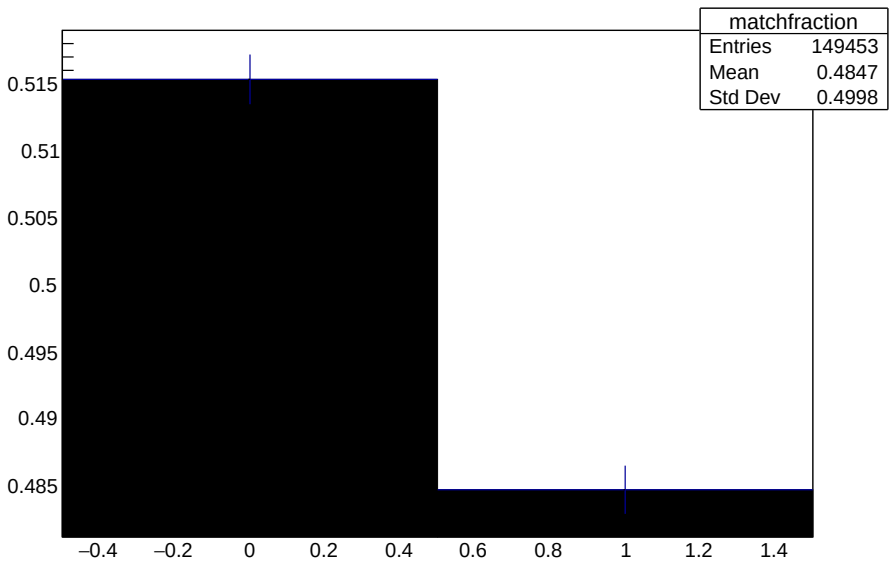
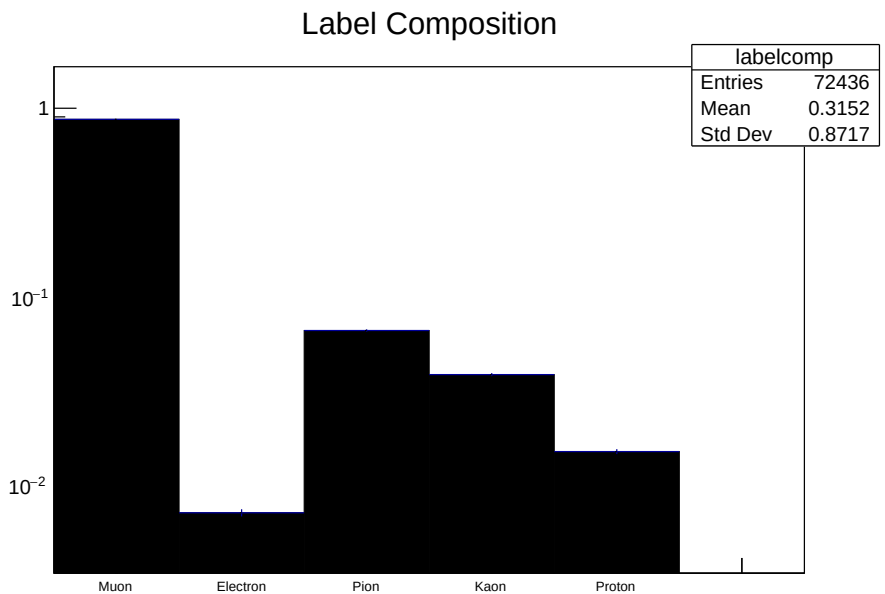
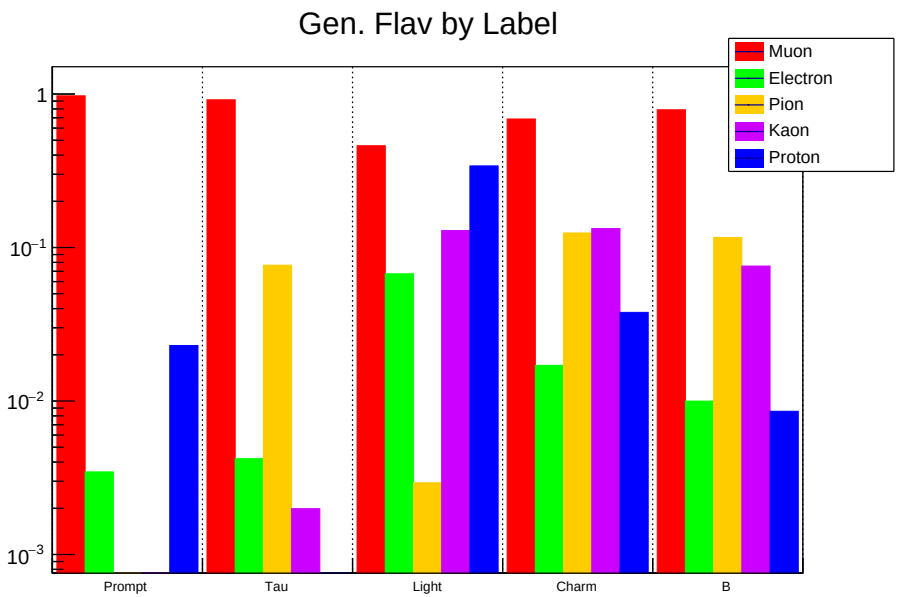
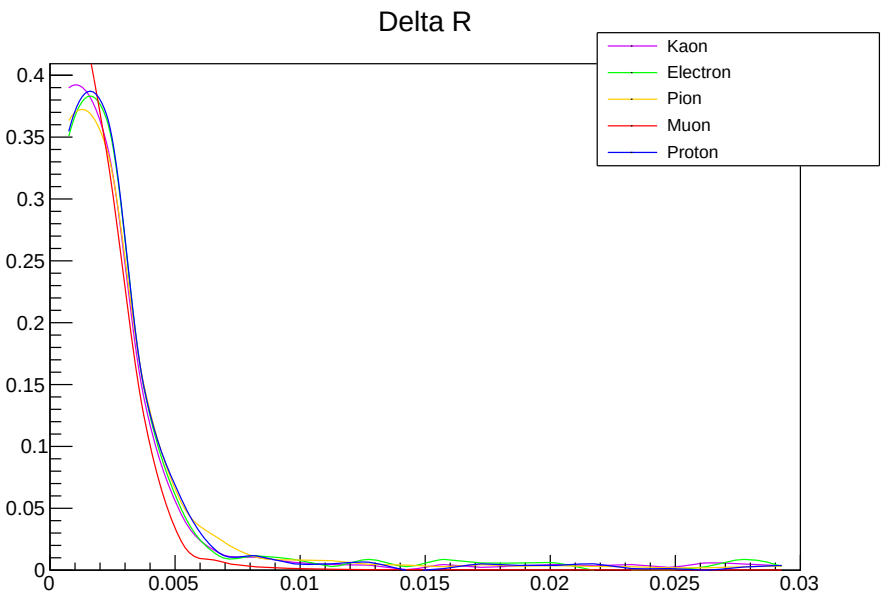


TT


Label Composition
labelcomp
Entries 72436
Mean 0.3152
Std Dev 0.8717
1
10^{-1}
10^{-2}
Muon
Electron
Pion
Kaon
Proton


Gen. Flav by Label
Muon
Electron
Pion
Kaon
Proton
1
10^{-1}
10^{-2}
10^{-3}
Prompt
Tau
Light
Charm
B

TT


Delta R
Kaon
Electron
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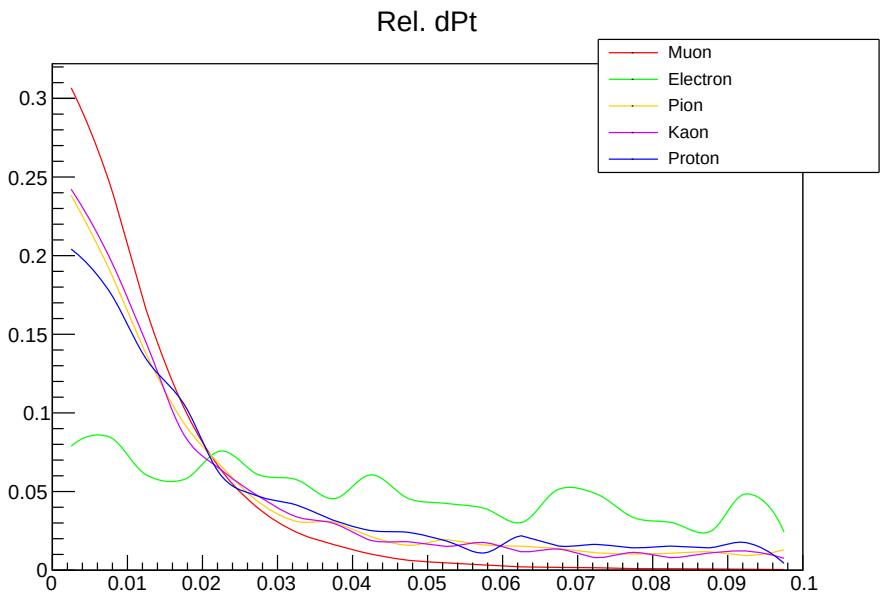
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.005
0.01
0.015
0.02
0.025
0.03


Rel. dPt
Muon
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0.3
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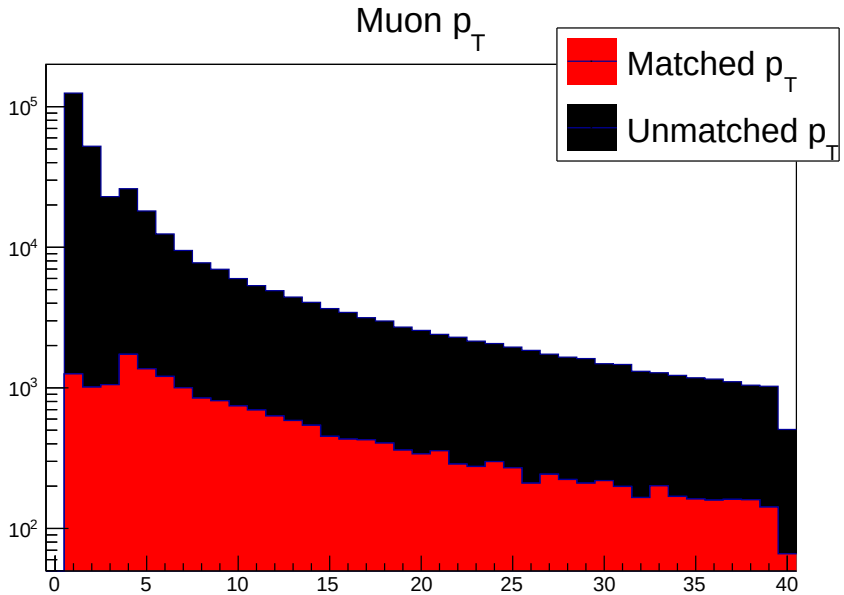
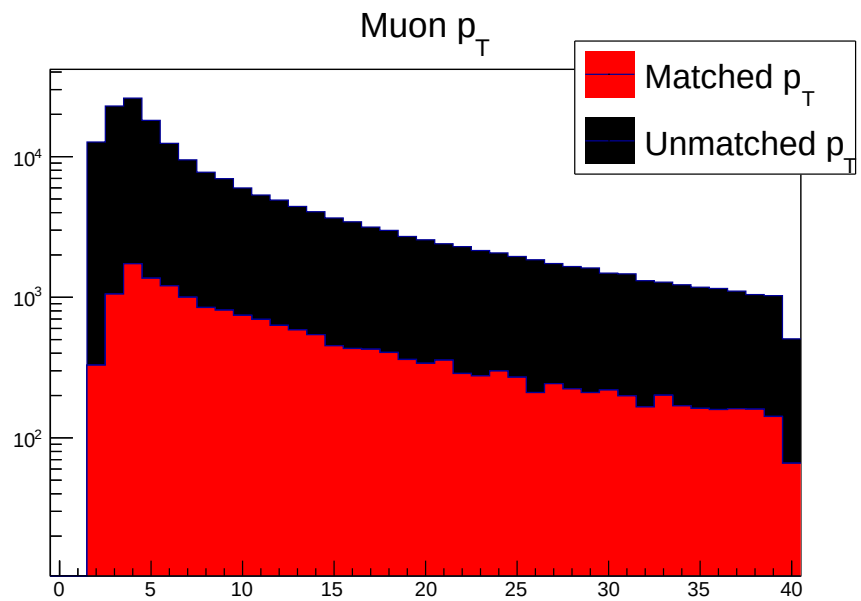
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1

QCD

No Cut

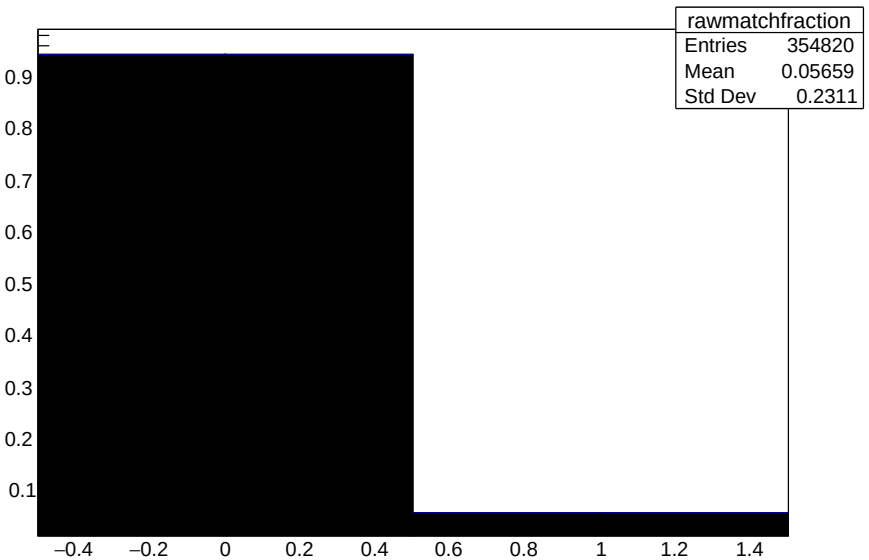


Reconstructed $p_T > 2$ GeV



QCD

No Cut



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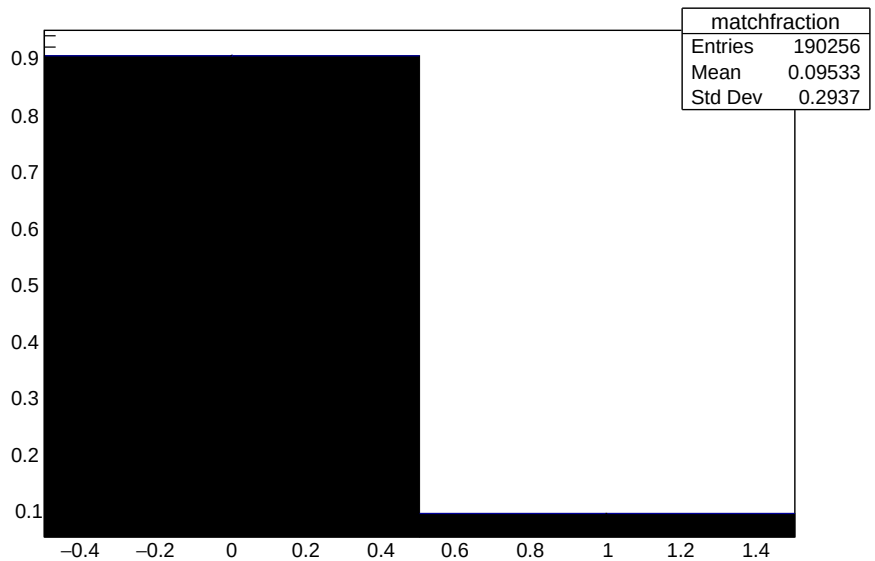

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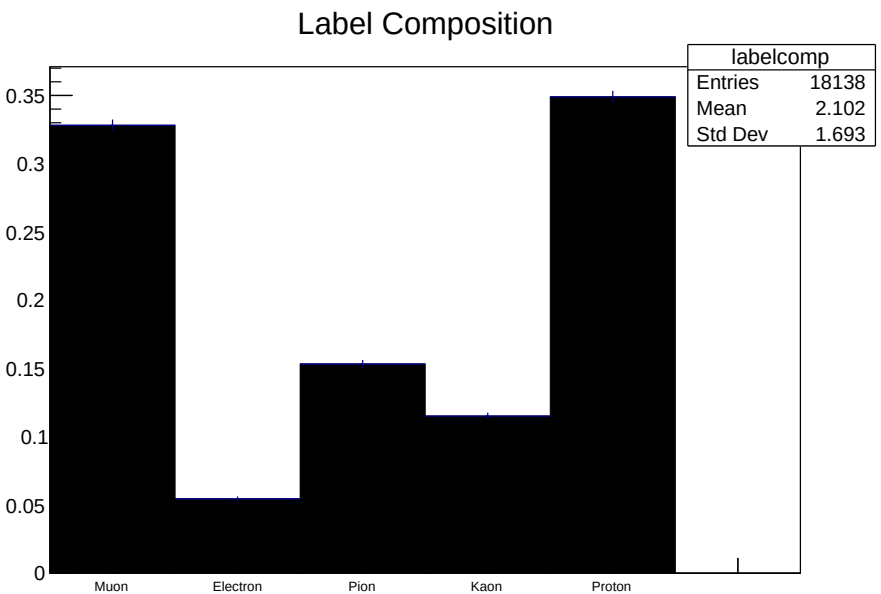
Label Composition
labelcomp
Entries 18138
Mean 2.102
Std Dev 1.693
0.35
0.3
0.25
0.2
0.15
0.1
0.05
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Muon
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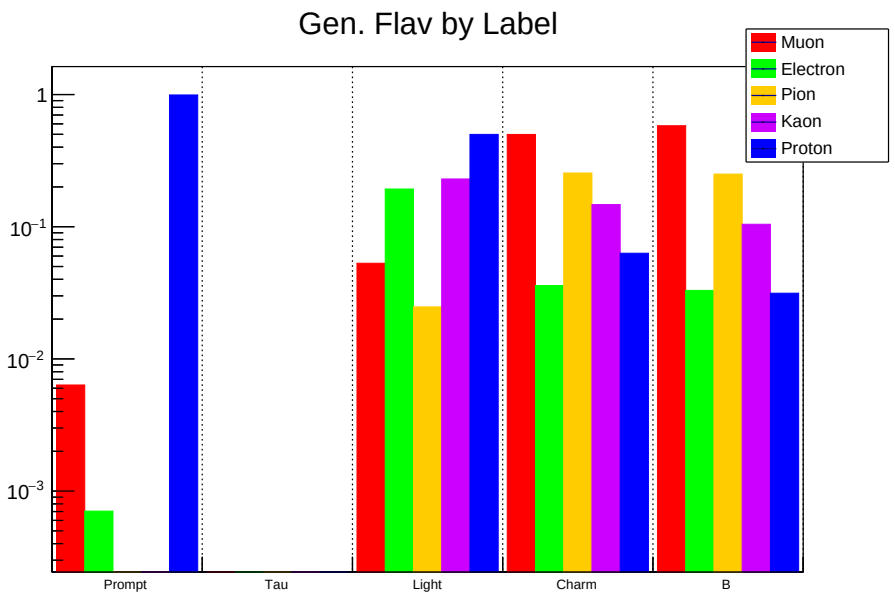
Proton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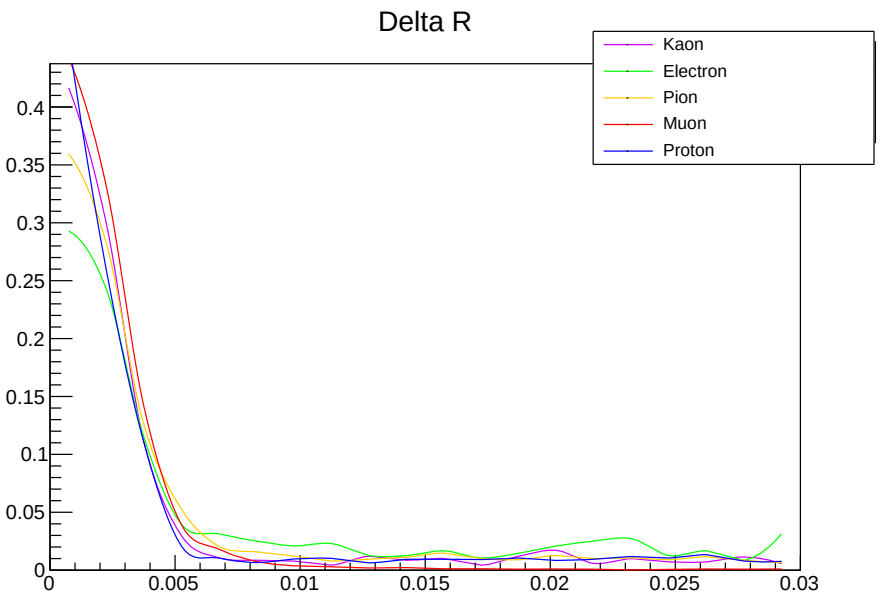
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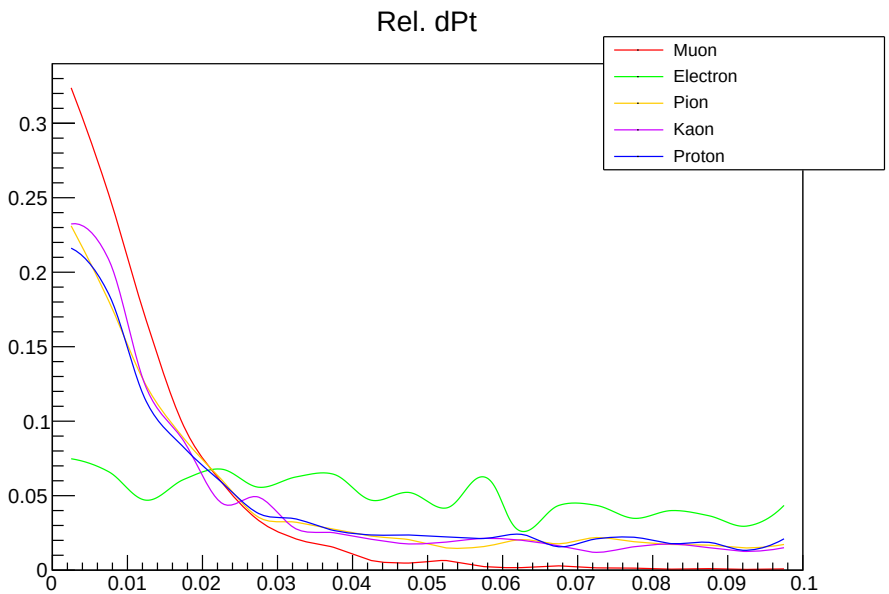
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