generalTrack studies

DENER S. LEMOS

Tracking Group

Codes and Samples

Codes

- CMSSW_10_3_3_patch1
  - Tracking code
    - https://github.com/cmsHiTracking/TrackingCode/tree/CMSSW_10_2_0_pre5_trkAnalysis

Samples

- Official Hydjet Sample for MB
  - /MinBias_Hydjet_Drum5F_2018_5p02TeV/clindsey-RECODEBUG_20190625-5db5dfa073297cb96791f14c622e83e2/USER
- Embedded Sample (Hydjet + Pythia) for High-p_T
  - /DiJet_pThat-15_TuneCP5_HydjetDrumMB_5p02TeV_Pythia8/clindsey-RECODEBUG_100k_20100531-5db5dfa073297cb96791f14c622e83e2/ USER

Twiki

- https://twiki.cern.ch/twiki/bin/view/CMS/HITracking2018PbPb

Tracking Selections

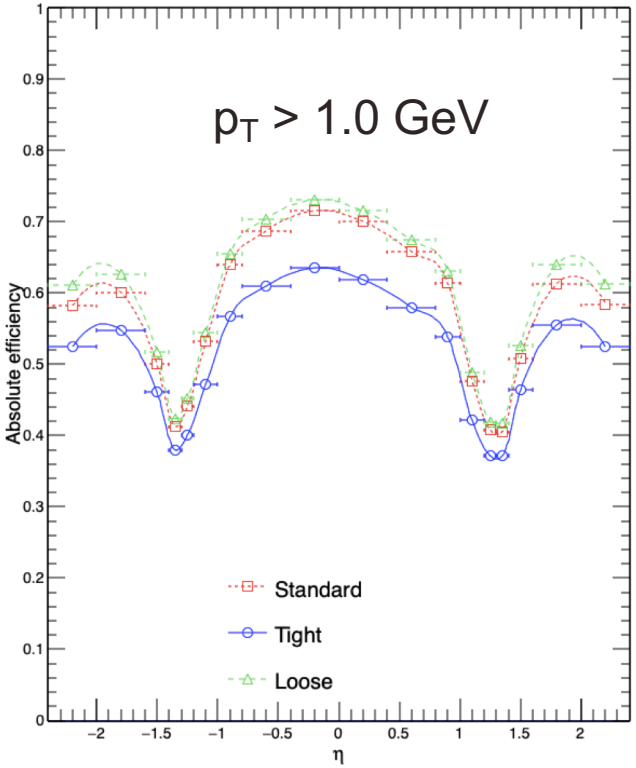
Compatibility between Prompt Reco and ReReco:
if(trk.algo() == 6 && trk.MVA() < 0.98)continue;

Variable	Default	Tight	Loose
Track Selection	highPurity	highPurity	highPurity
$\lvert d_z/\sigma_z \rvert$	< 3	< 2	< 5
$\lvert d_{xy}/\sigma_{xy} \rvert$	< 3	< 2	< 5
σ_{pT}/p_T	< 0.1	< 0.05	< 0.15
nHits	>= 11	>= 11	>= 11
χ^2/Ndof/NLayers	< 0.18	< 0.15	< 0.18
E_T^{Calo} ($p_T > 20$)	>0.5	>0.5	>0.5

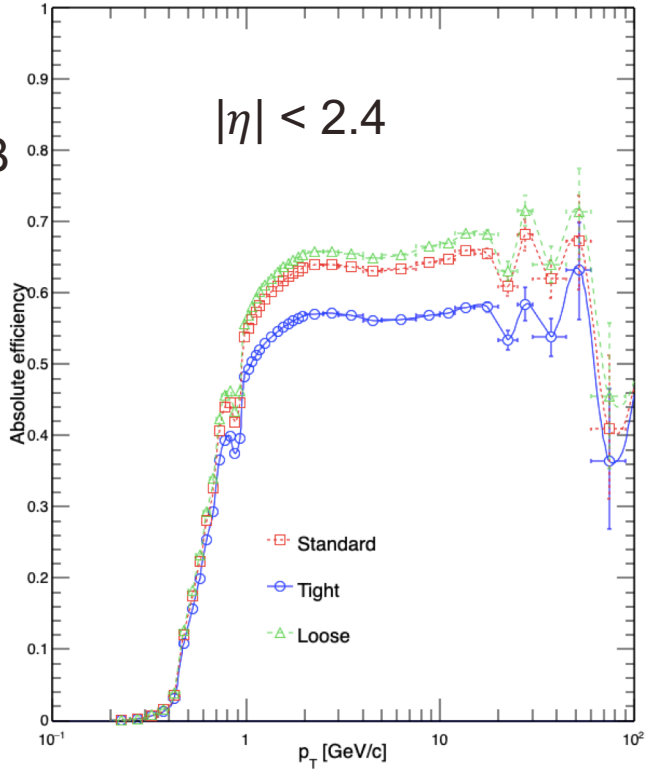
Kinematic Recommended: $p_T > 0.5$ GeV and $|\eta| < 2.4$

MB

Comparison between selections (Efficiency)

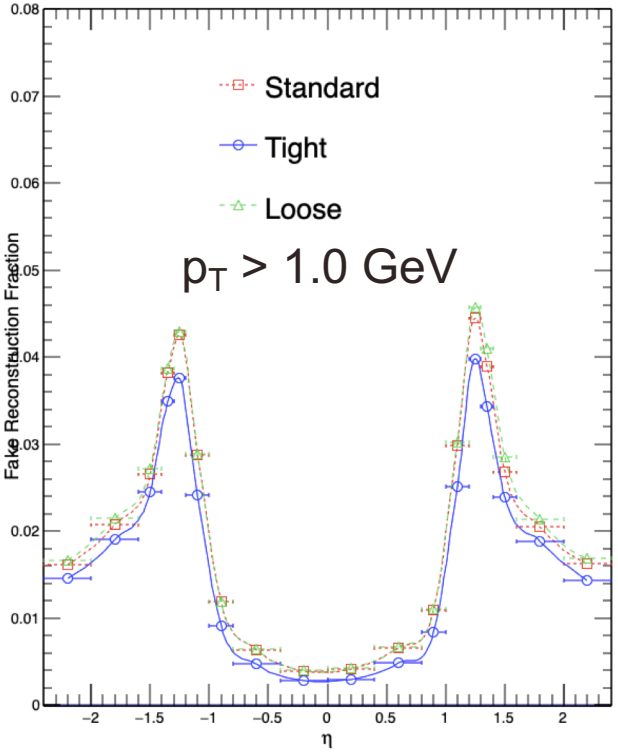


MB

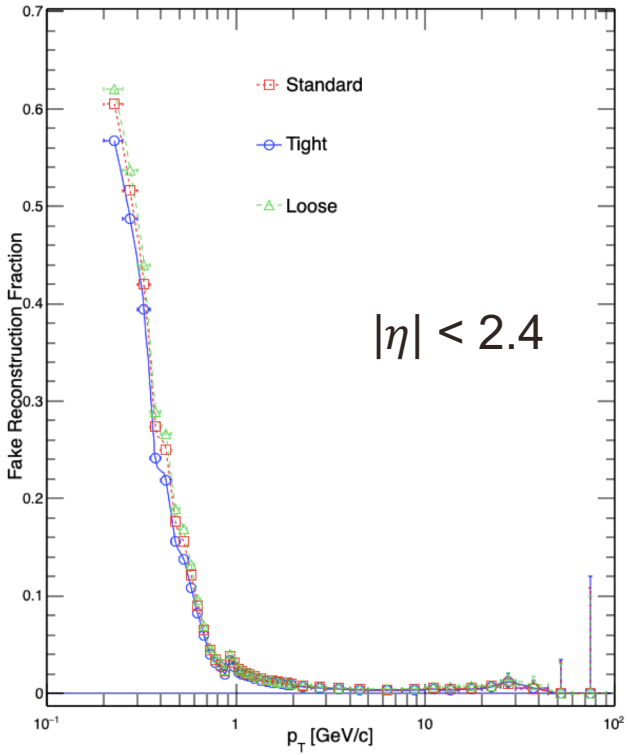


0-100%

Comparison between selections (Fakes)



MB

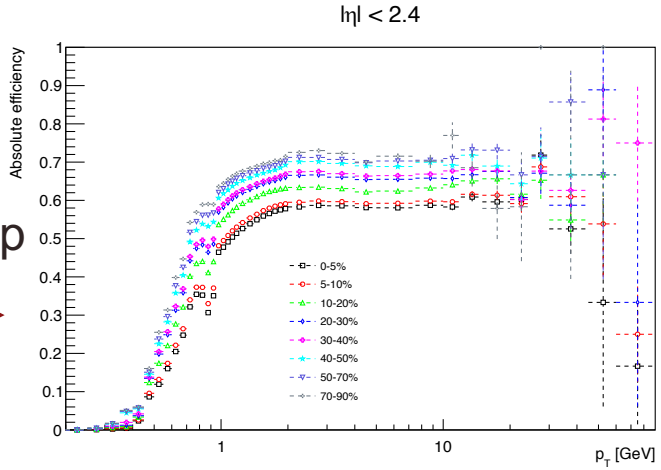


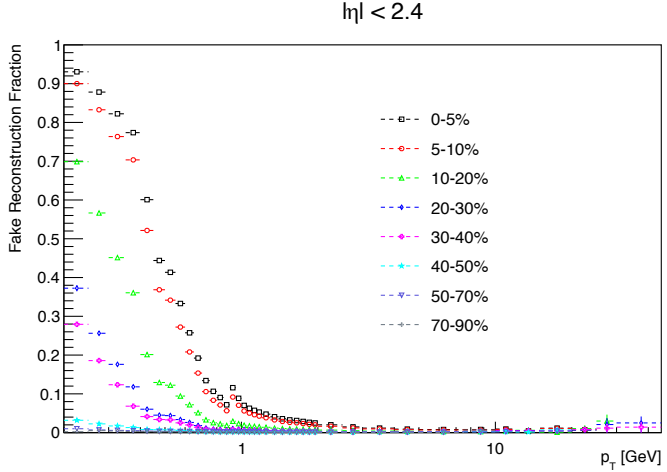
0-100%

Efficiency

Fake Rate

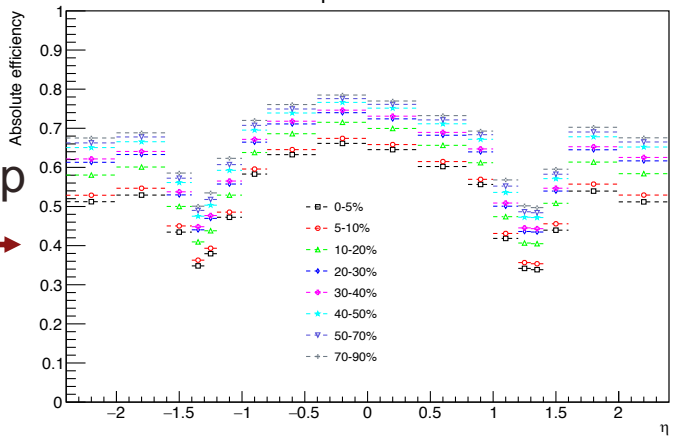
p_T dep

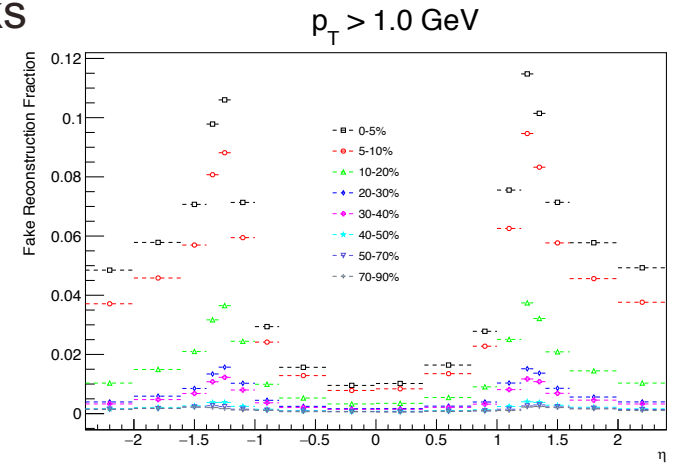




Std tracks

η dep

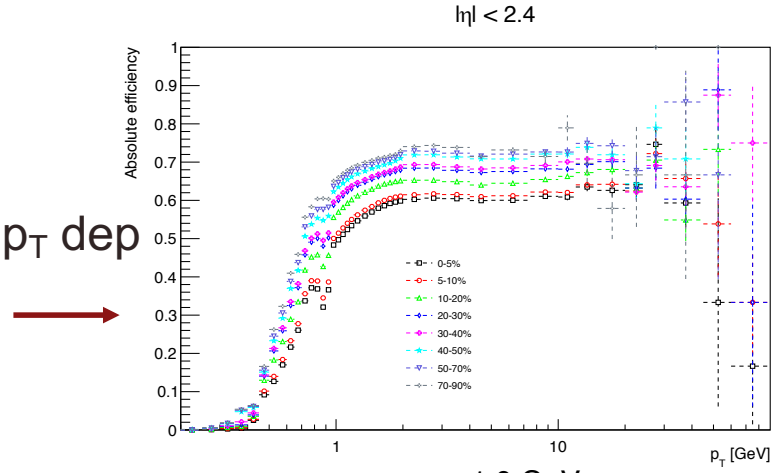


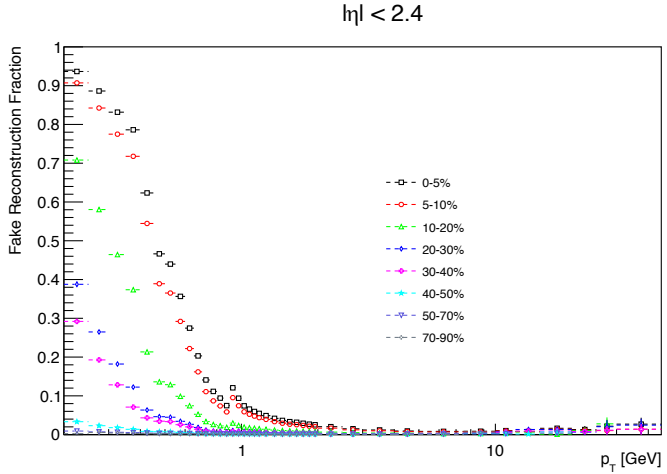


Efficiency

Fake Rate

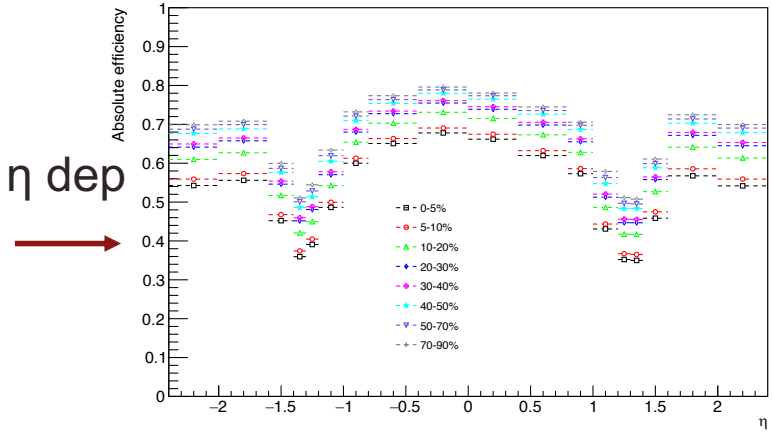
p_T dep

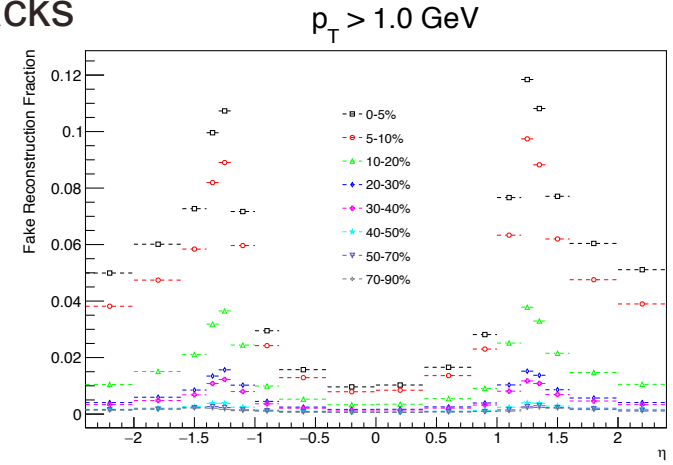




Loose tracks

η dep

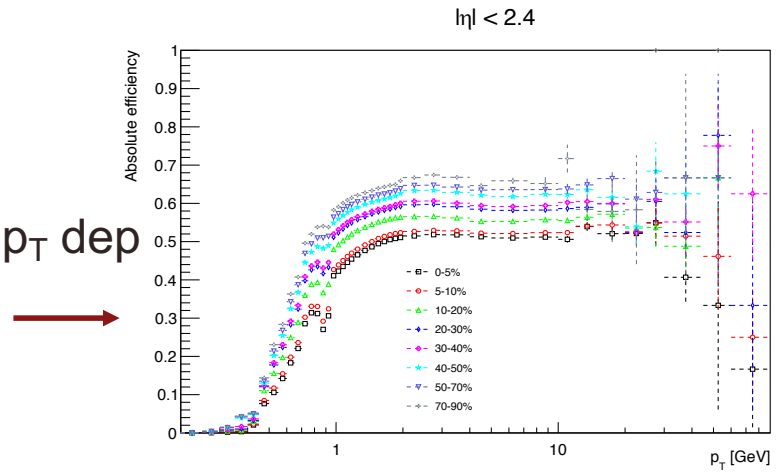


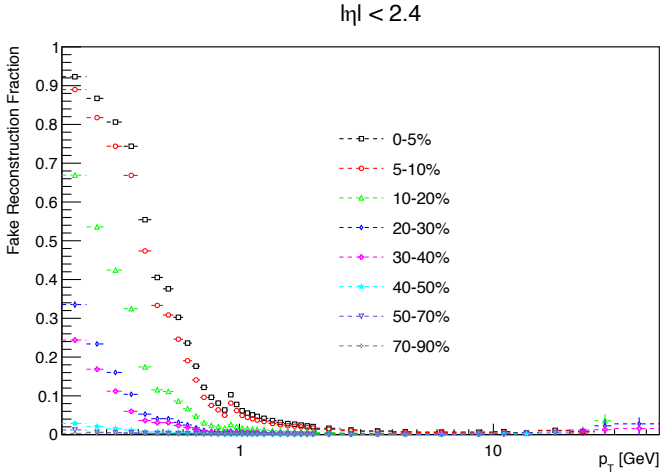


Efficiency

Fake Rate

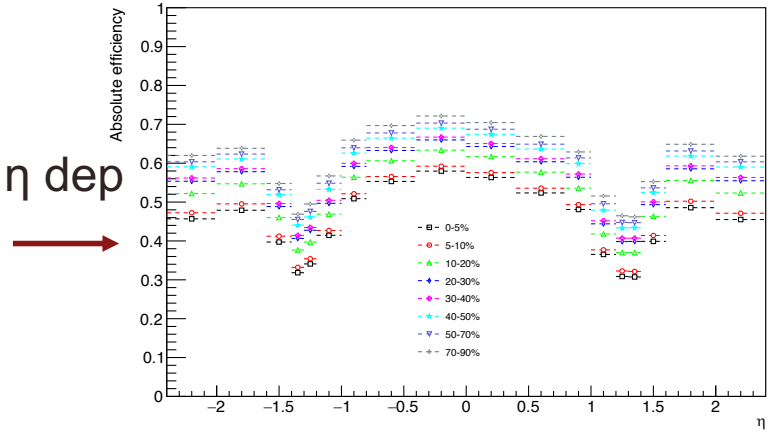
p_T dep

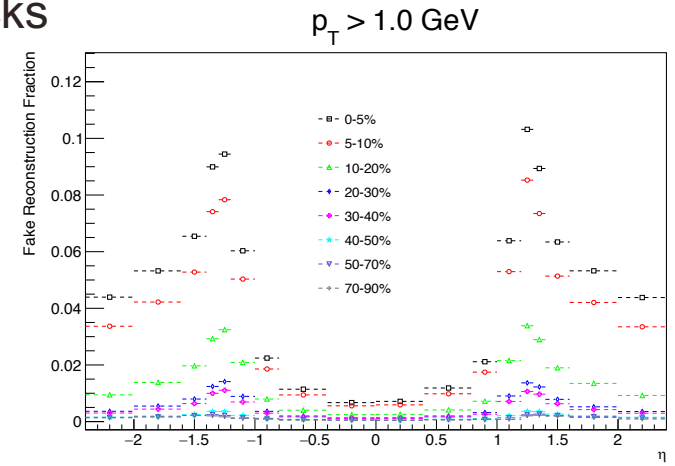




Tight tracks

η dep

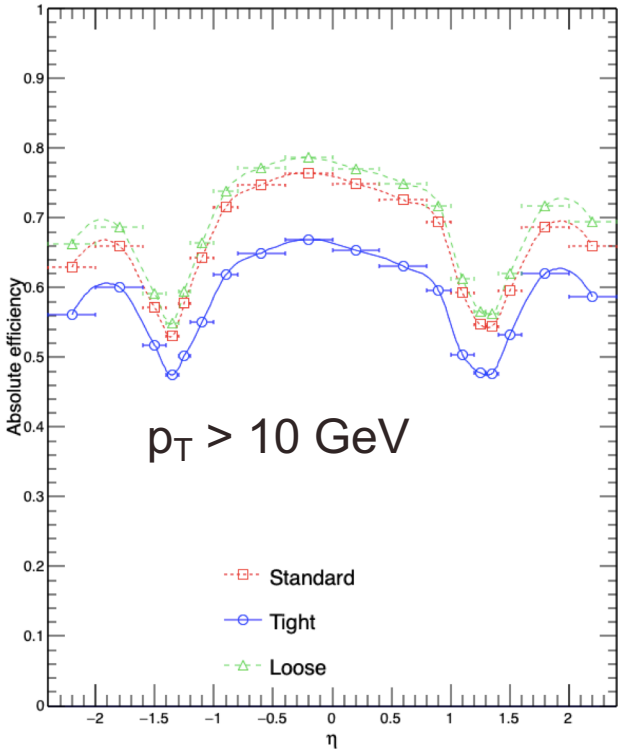


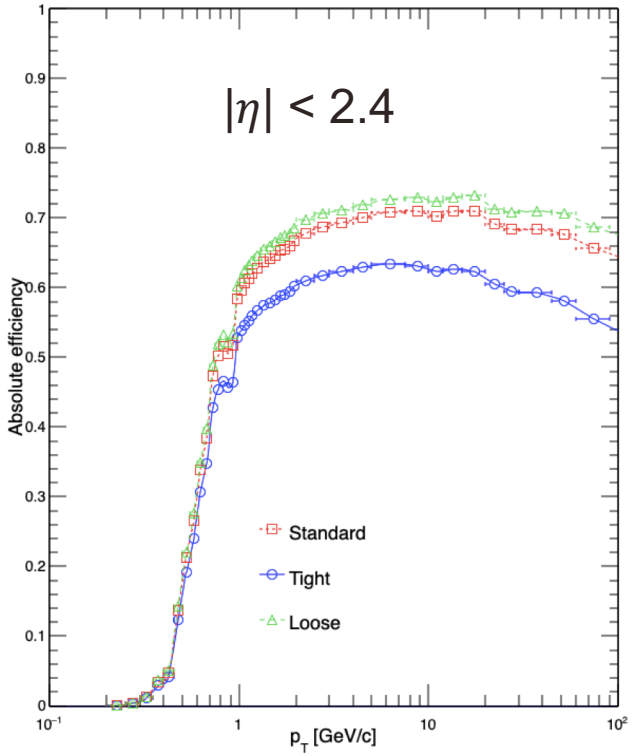


High-p_T

Comparison between selections (Efficiency)

High-p_T

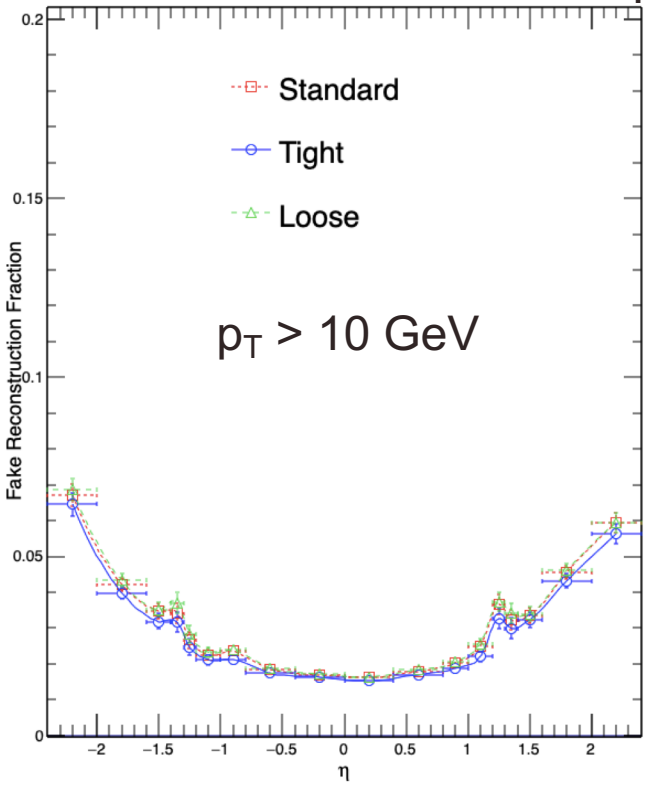


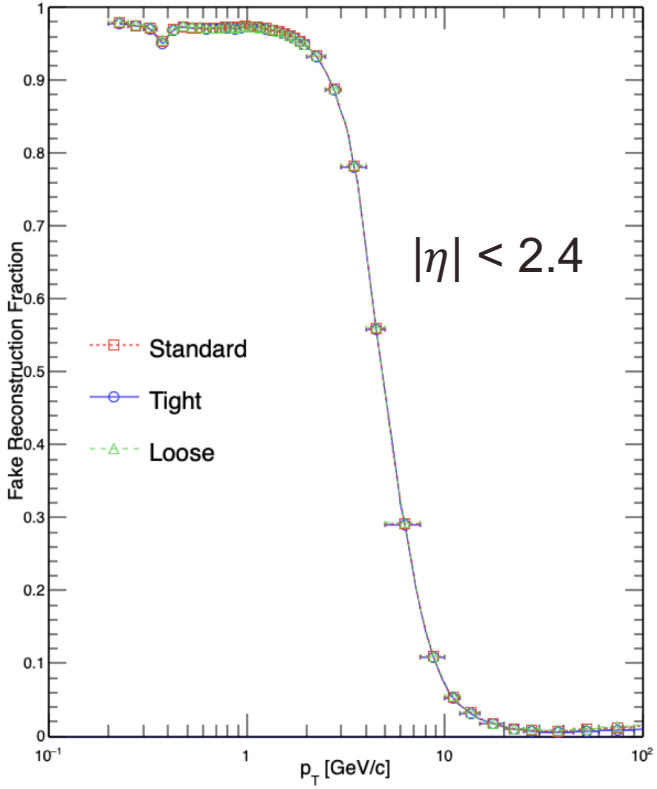


0-100%

Comparison between selections (Fakes)

High-p_T





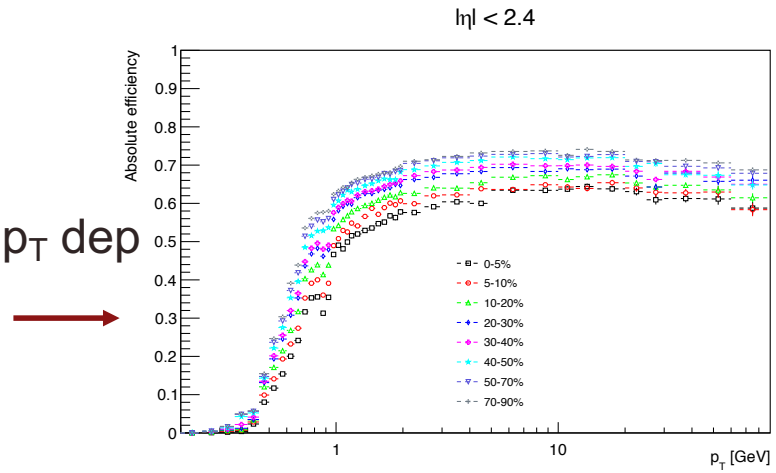
0-100%

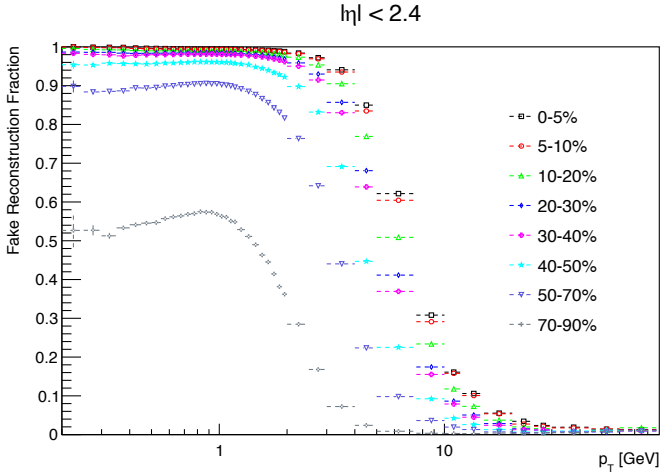
Efficiency

Fake Rate

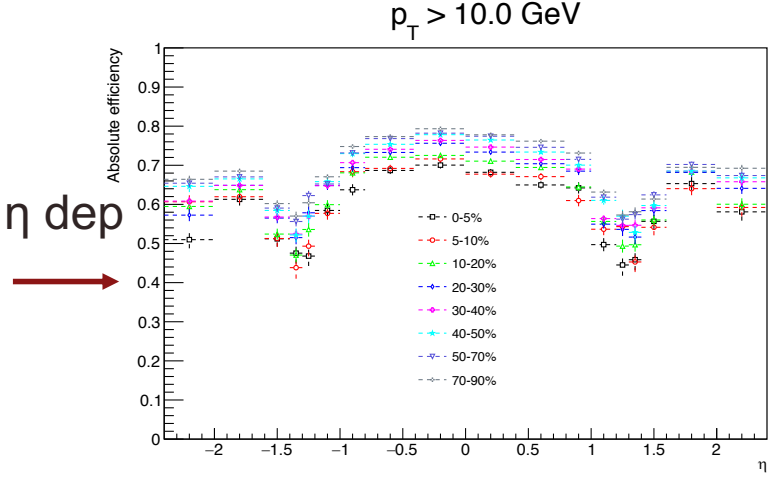
Std tracks

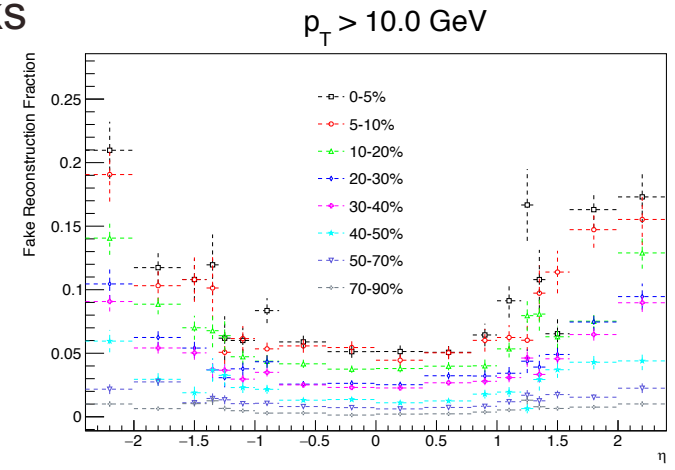
p_T dep





η dep

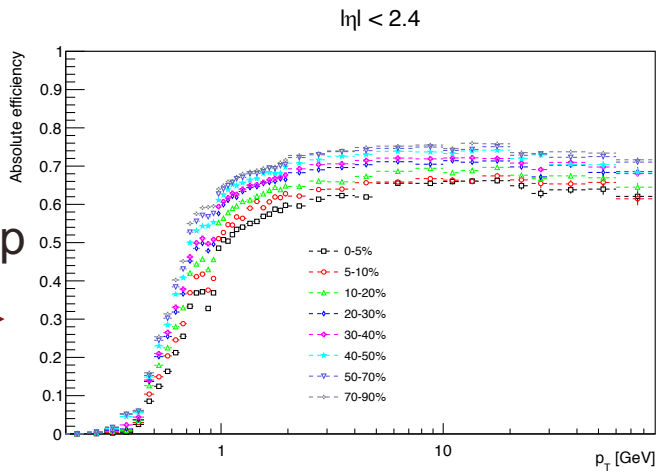


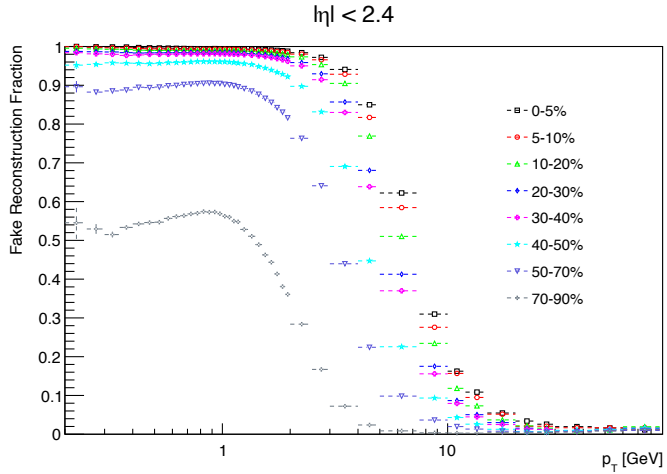


Efficiency

Fake Rate

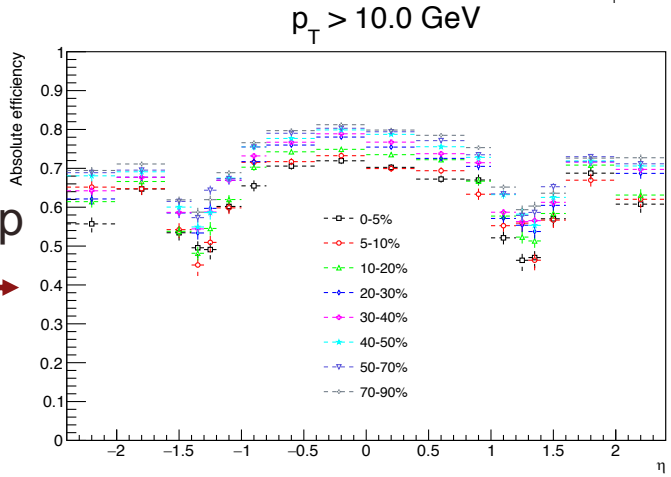
p_T dep

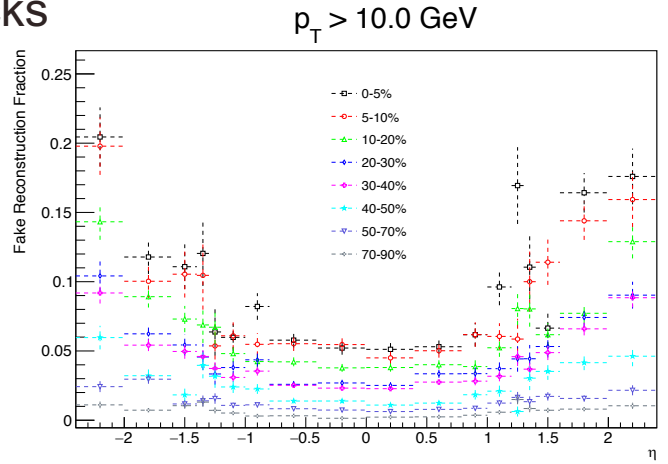




Loose tracks

η dep

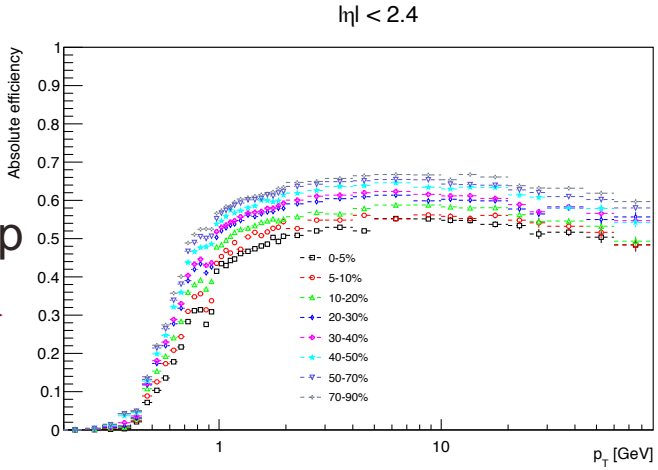


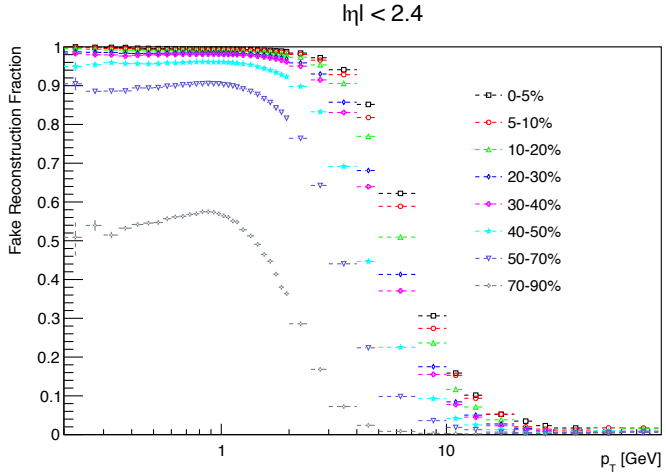


Efficiency

Fake Rate

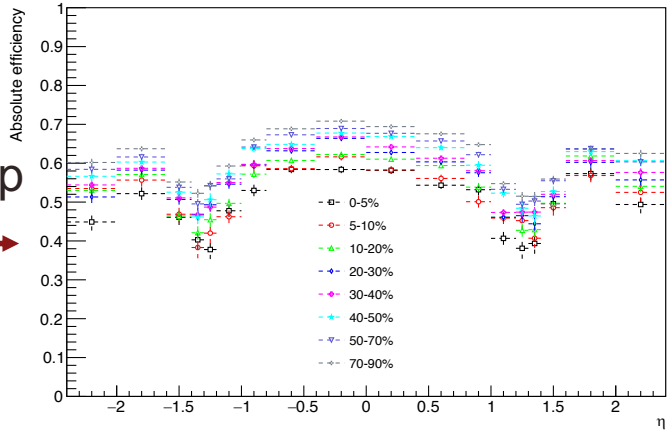
p_T dep

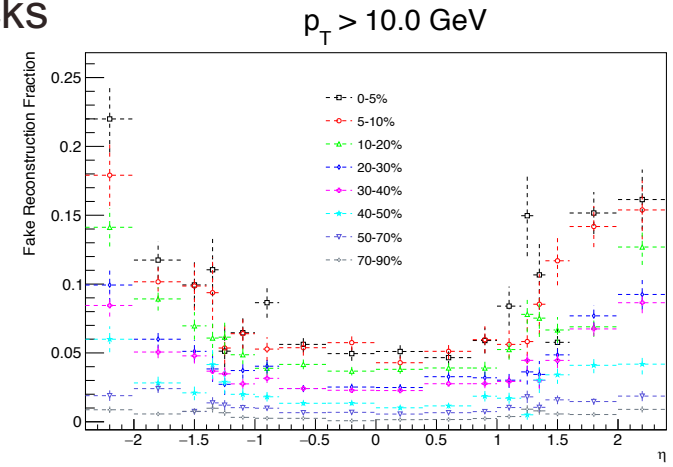




Tight tracks

η dep





Backup

Centrality

Centrality Selection

Twiki

- https://twiki.cern.ch/twiki/bin/view/CMSPublic/SWGuideHeavyIonCentrality

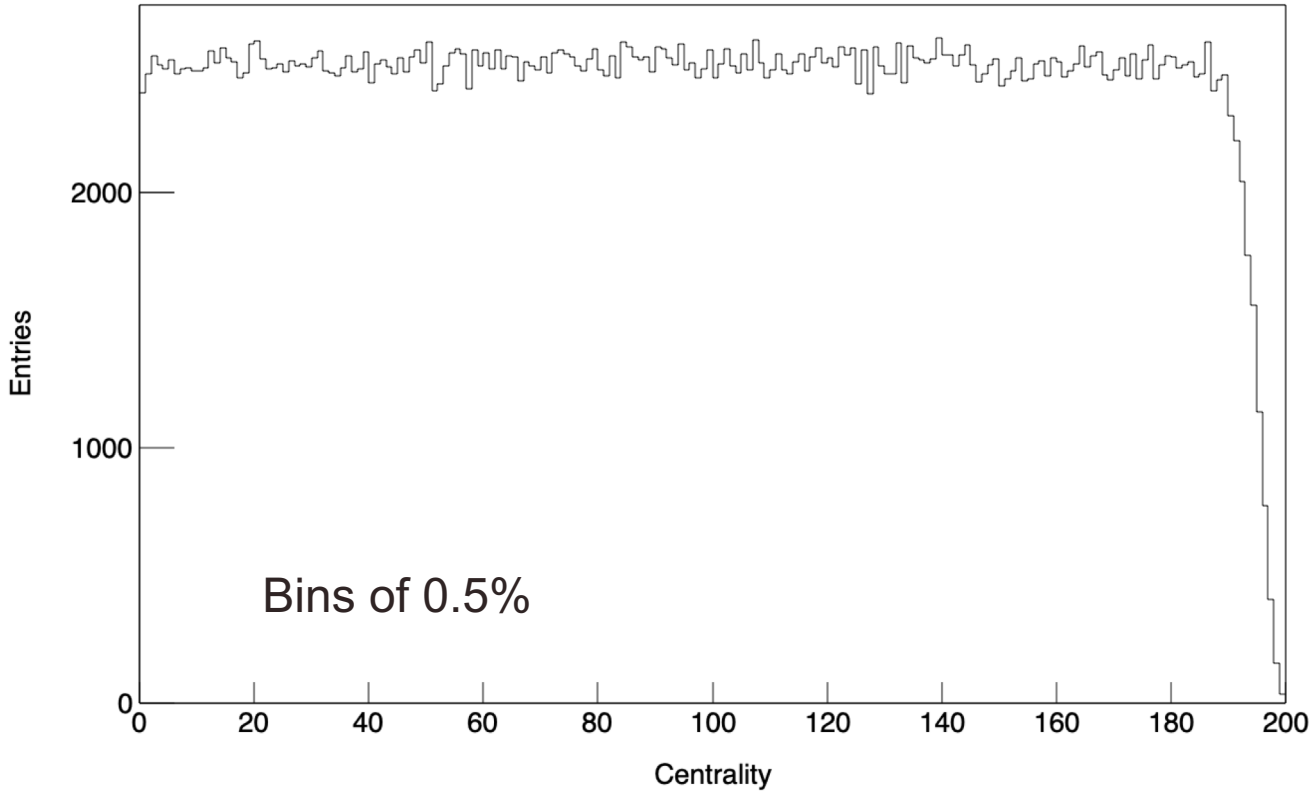
Table (for MC)

- CentralityTable_HFtowers200_HydjetDrum5F_v1032x02_mc

Filters

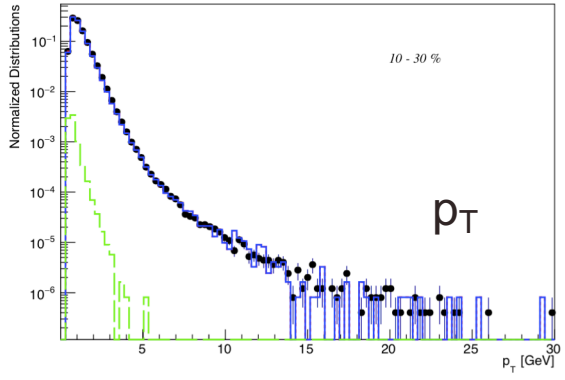
- hfCoincFilter2Th4
- primaryVertexFilter
- clusterCompatibilityFilter
- offlinePrimaryVerticesRecovery

Centrality plot for MC

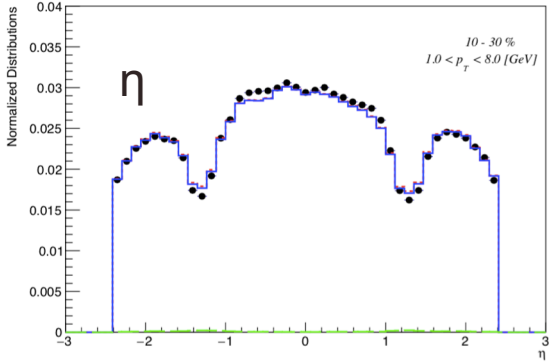


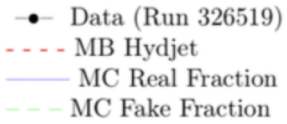
Tracking Selection

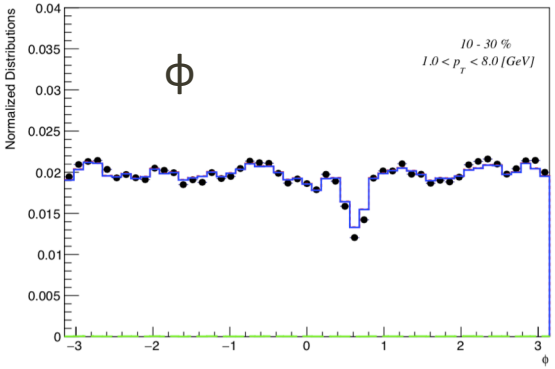
Comparison with MC (I)

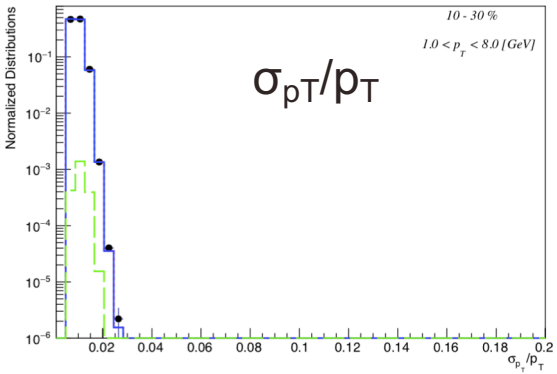


10-30%





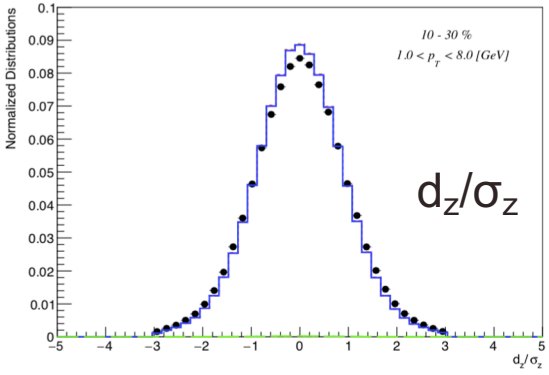




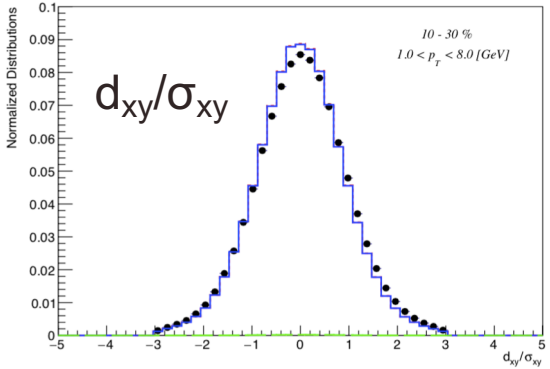
|η| < 2.4 for η dependence plot and |η| < 1.0 for other plots

p_T > 0.5 for p_T dependence plot and 1.0 < p_T < 8.0 GeV for other plots

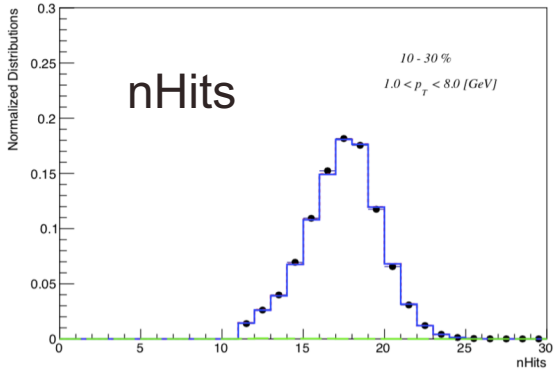
Comparison with MC (II)



10-30%

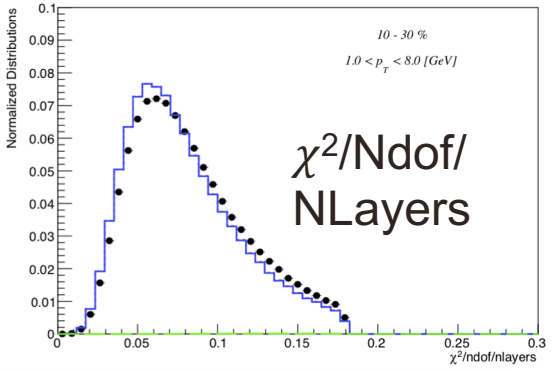


Data (Run 326519)
MB Hydjet
MC Real Fraction
MC Fake Fraction



$|\eta| < 1.0$

$1.0 < p_T < 8.0$ GeV



p_T and centrality dependence here:
https://indico.cern.ch/event/800162/contributions/3324901/attachments/1798420/2932572/generaltrack_19_02.pdf

Applying the tables

How to applied the tables? (I)

Download the tables: https://twiki.cern.ch/twiki/bin/view/CMS/HITracking2018PbPb

```
#include "trackingEfficiency2018PbPb.h"
```

Add the header

```
TrkEff2018PbPb trkEff =  TrkEff2018PbPb("general", false, "");
TrkEff2018PbPb trkEff_plus =  TrkEff2018PbPb("generalMB+", false, "");
TrkEff2018PbPb trkEff_minus =  TrkEff2018PbPb("generalMB-", false, "");
```

All trks

Pos. trks

Neg. trks

Table

isQuiet

path

In Crab cfg file:

```
config.JobType.inputFiles = [
'2018PbPb_Efficiency_GeneralTracks_MB_ChargePlus.root',
'2018PbPb_Efficiency_GeneralTracks_MB_ChargeMinus.root',
'2018PbPb_Efficiency_GeneralTracks_highPt.root',
'2018PbPb_Efficiency_GeneralTracks_MB.root',
'2018PbPb_Efficiency_PixelTracks.root']
```

Need to update loose and tight

How to applied the tables? (II)

In the loop over reco tracks after selection

```
float corr = trkEff.getCorrection(iter_tk->pt(),iter_tk->eta(),cent);
pT_reco_corr->Fill(iter_tk->pt(),corr);
eta_reco_corr->Fill(iter_tk->eta(),corr);
```

→ All trks

```
if(iter_tk->charge()>0){
float corr_plus = trkEff_plus.getCorrection(iter_tk->pt(),iter_tk->eta(),cent);
pT_reco_corr_pos->Fill(iter_tk->pt(),corr_plus);
eta_reco_corr_pos->Fill(iter_tk->eta(),corr_plus);
```

→ Pos. trks

```
}else if(iter_tk->charge()<0){
float corr_minus = trkEff_minus.getCorrection(iter_tk->pt(),iter_tk->eta(),cent);
pT_reco_corr_neg->Fill(iter_tk->pt(),corr_minus);
eta_reco_corr_neg->Fill(iter_tk->eta(),corr_minus);
```

→ Neg. trks

```
}
```

getCorretion = (1-fake)/efficiency

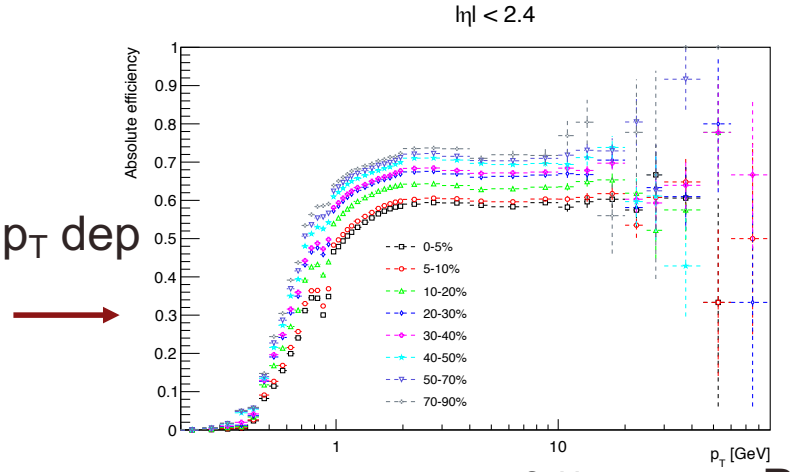
Please, make sure that the if statement is applied for +/- tracks

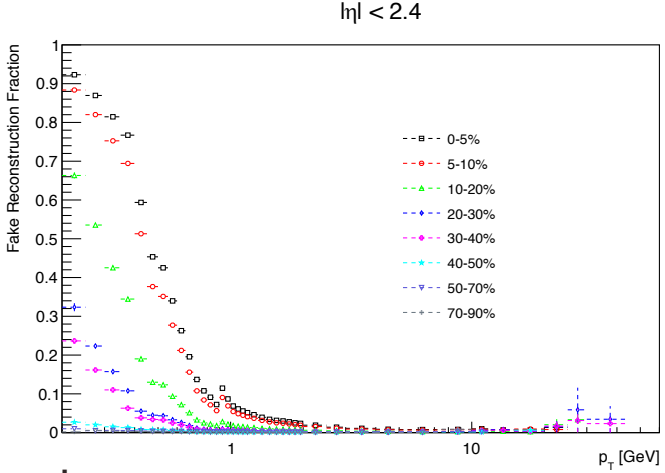
Positive and Negative

Efficiency

Fake Rate

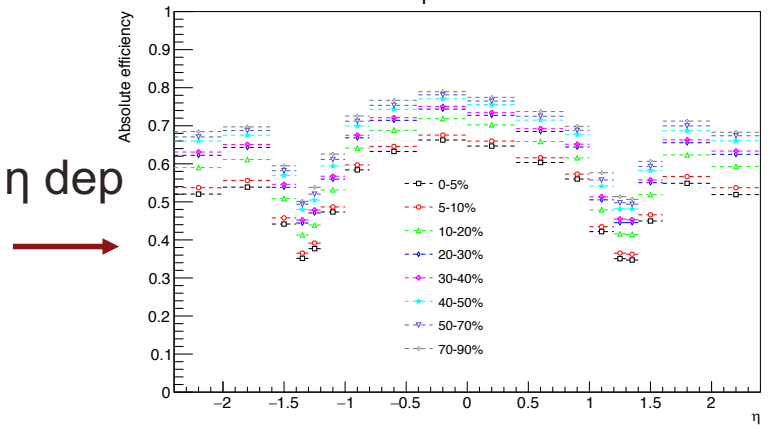
p_T dep

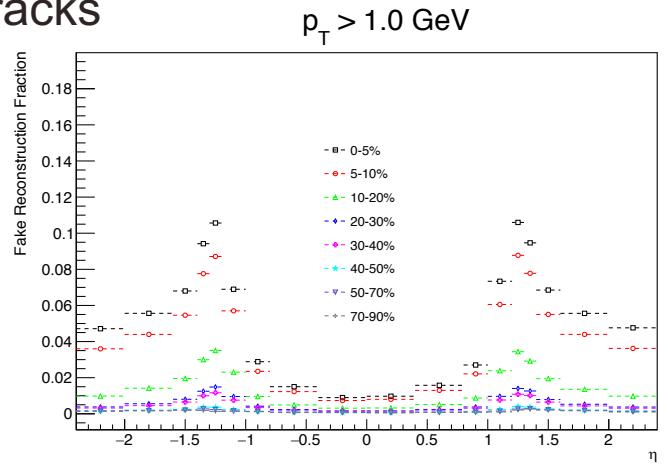




Positive tracks

η dep



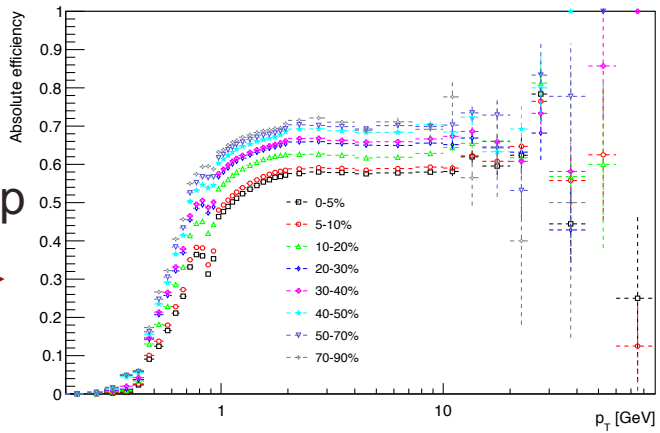


Efficiency

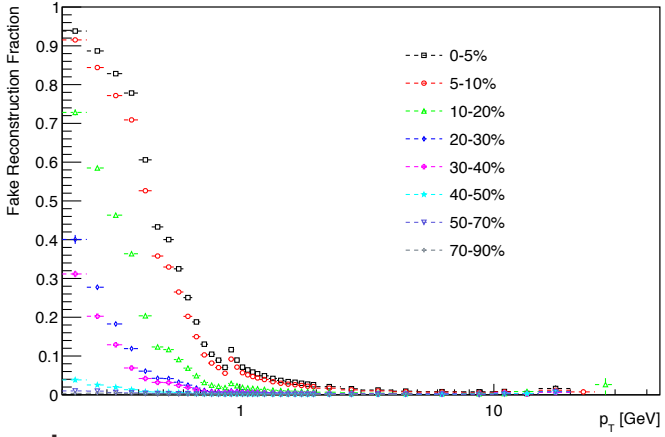
Fake Rate

p_T dep

$|\eta| < 2.4$



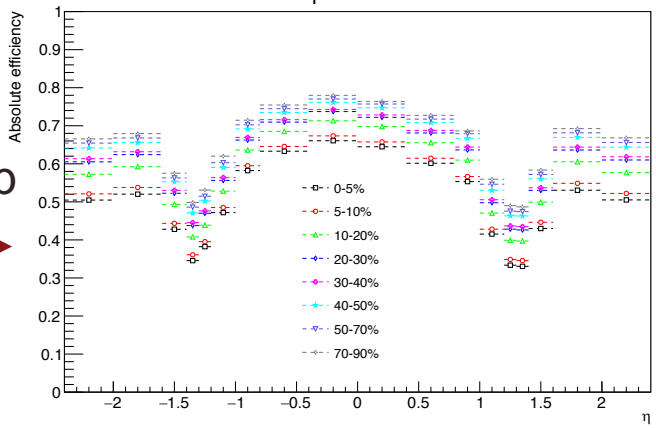
$|\eta| < 2.4$



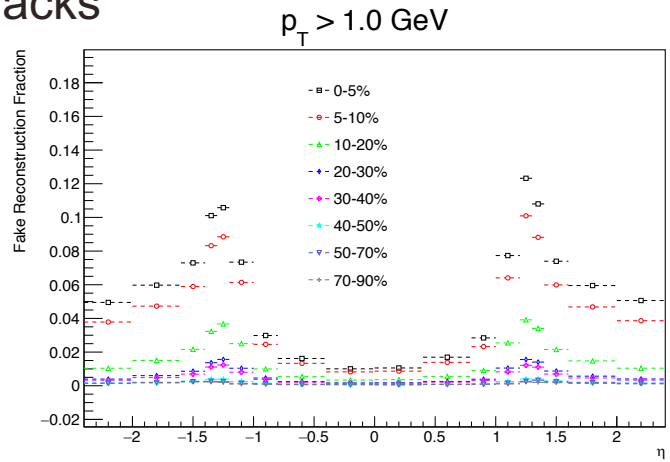
Negative tracks

η dep

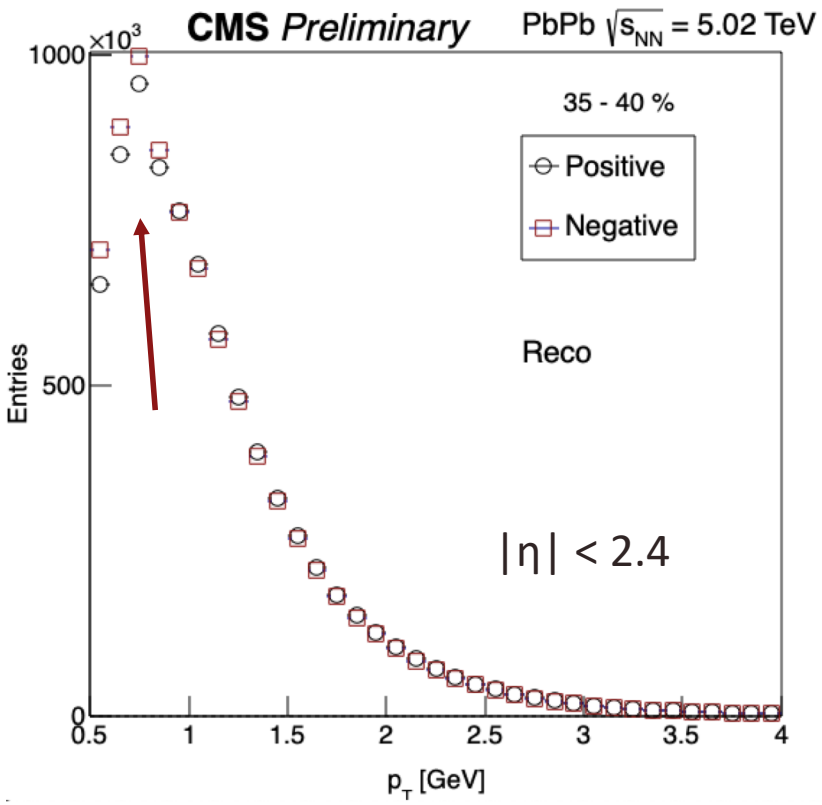
$p_T > 1.0$ GeV

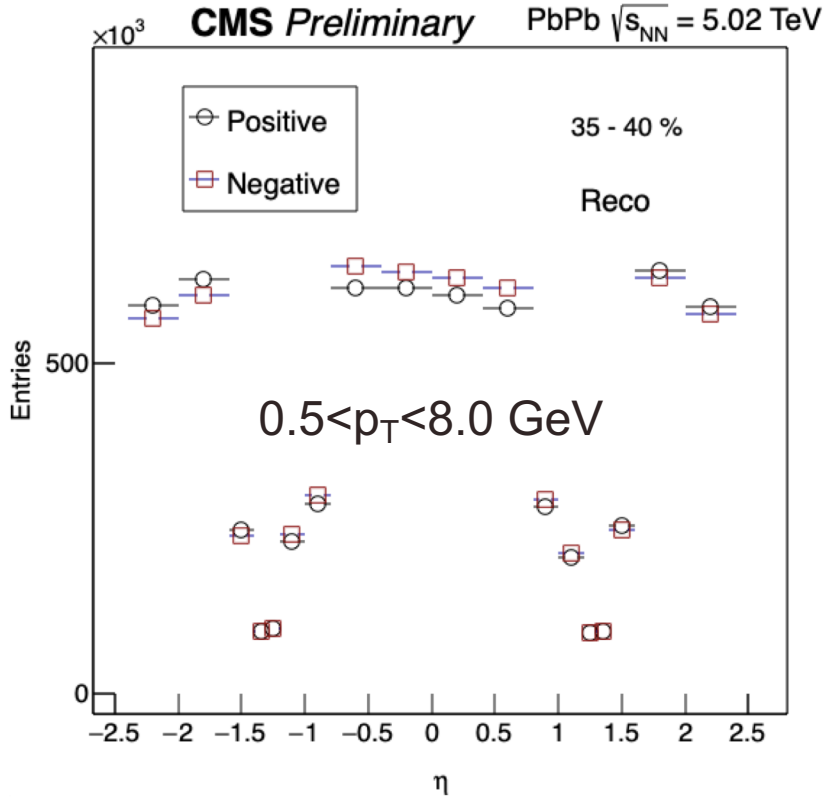


$p_T > 1.0$ GeV

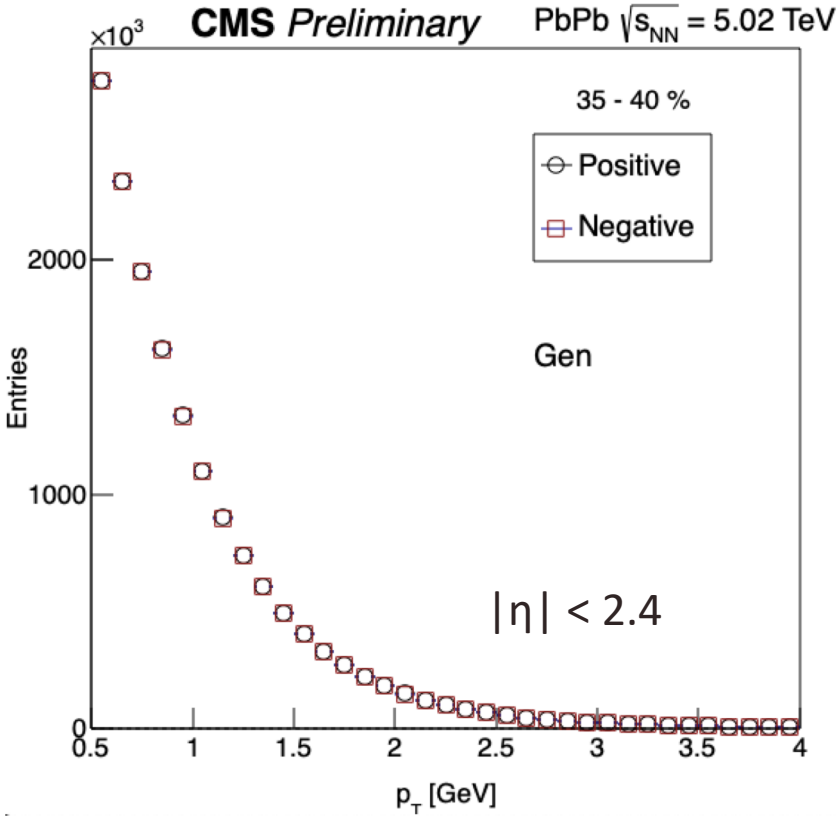


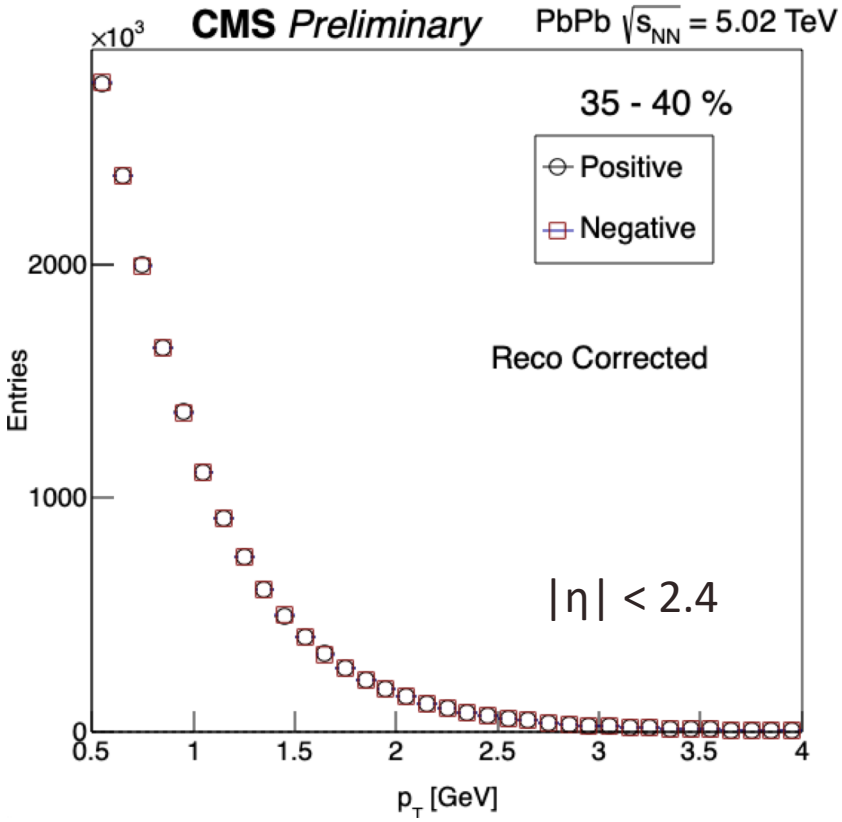
Positive vs Negative tracks



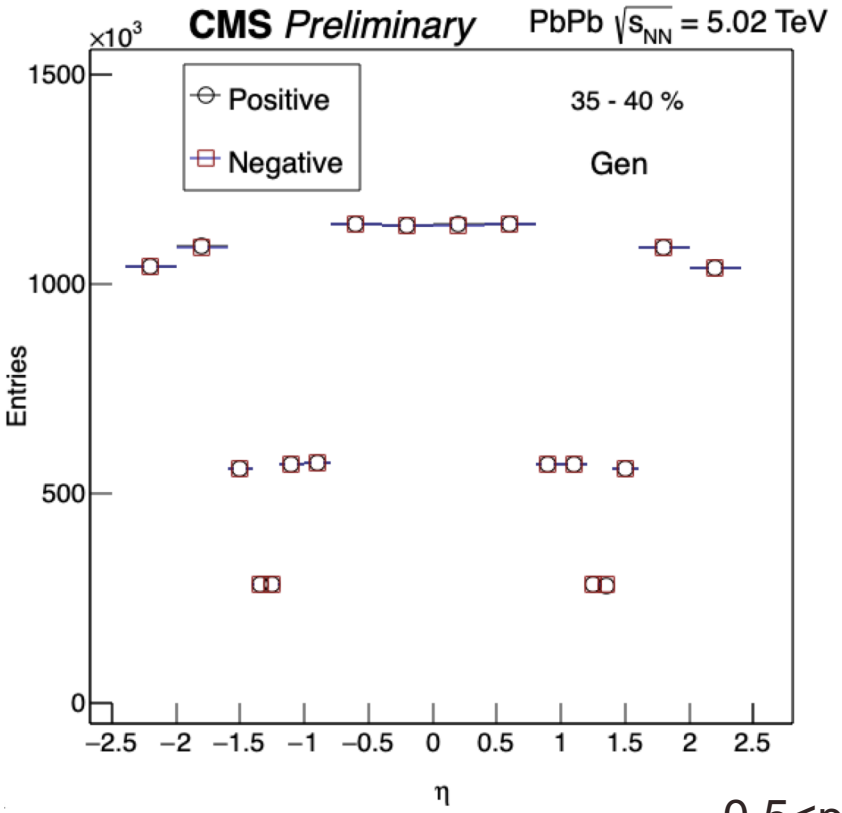


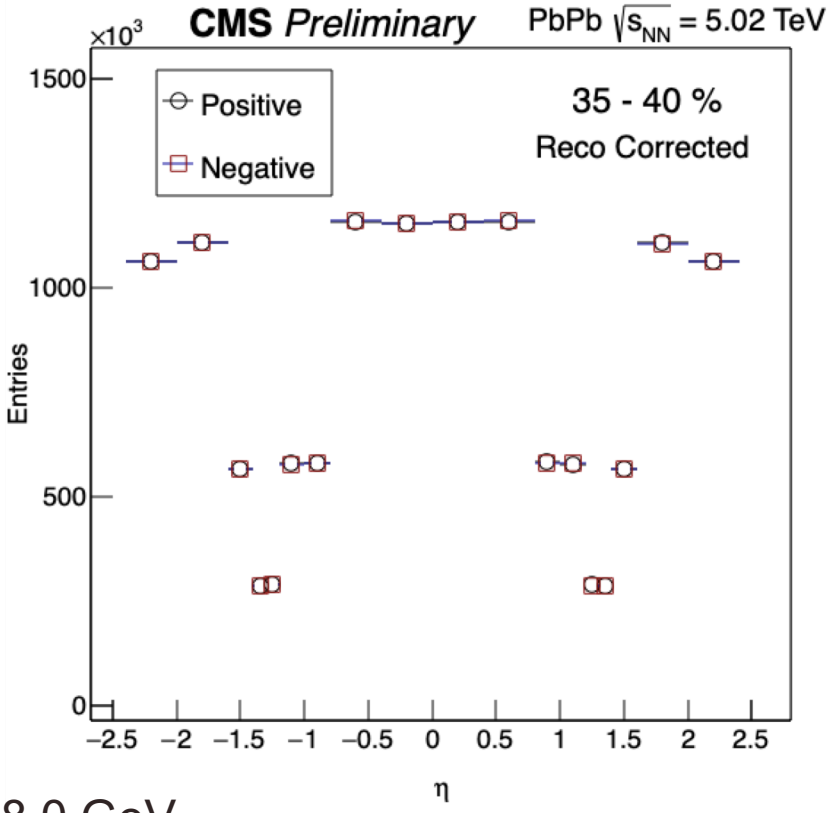
Comparison: Gen vs Reco corrected (p_T)





Comparison: Gen vs Reco corrected (η)

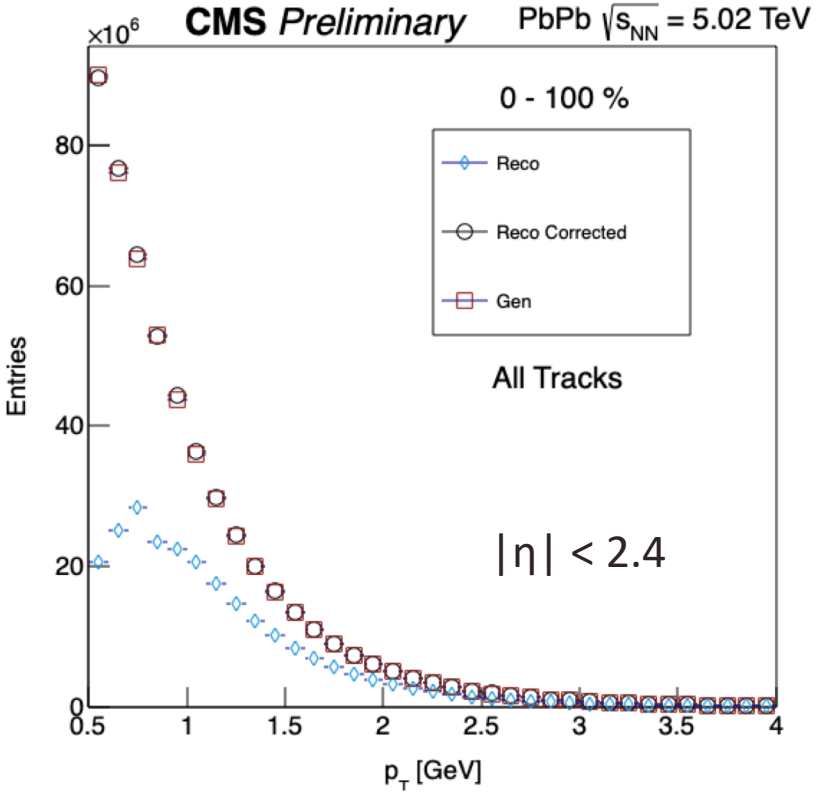


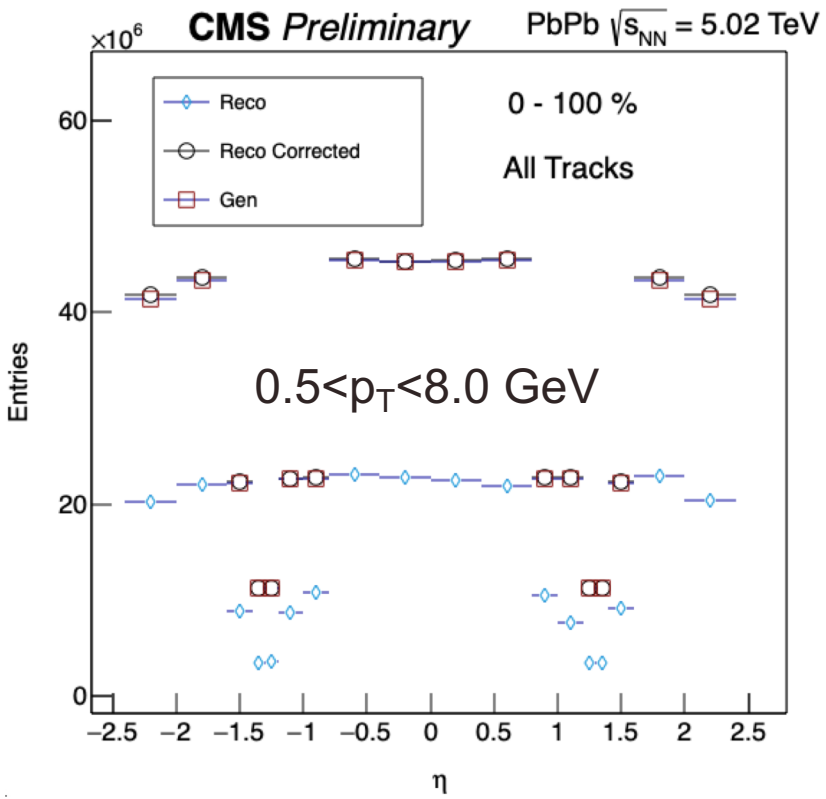


$0.5<p_T<8.0$ GeV

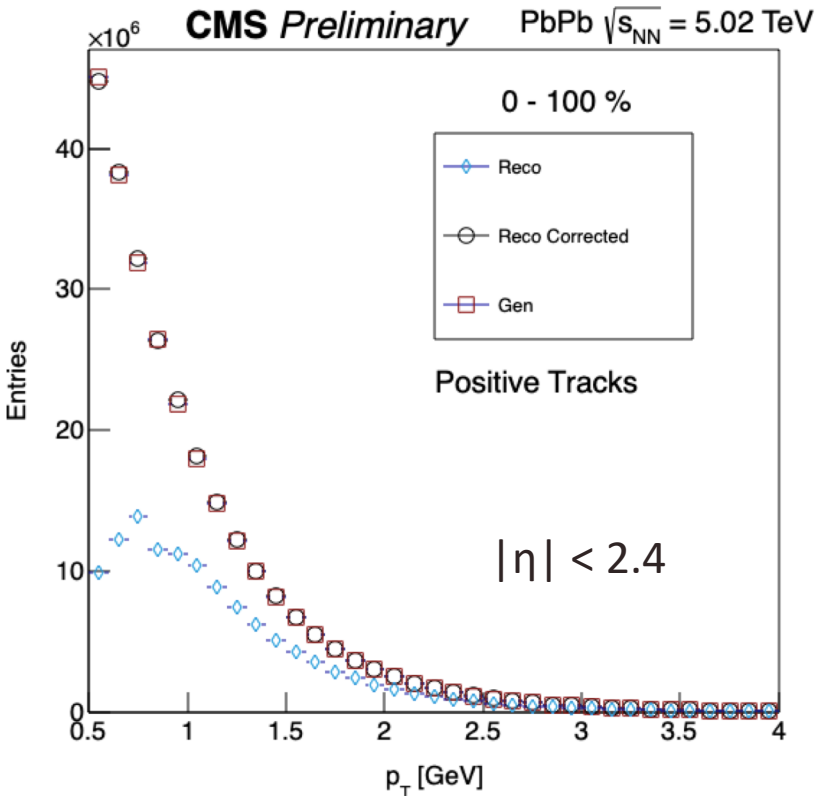
Gen vs Reco

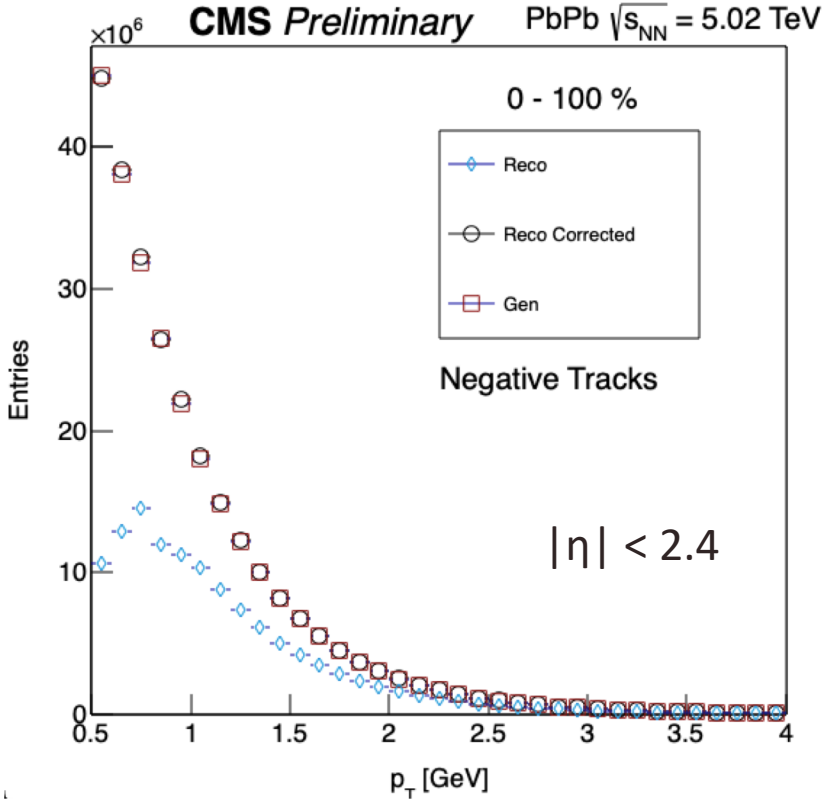
Results all tracks



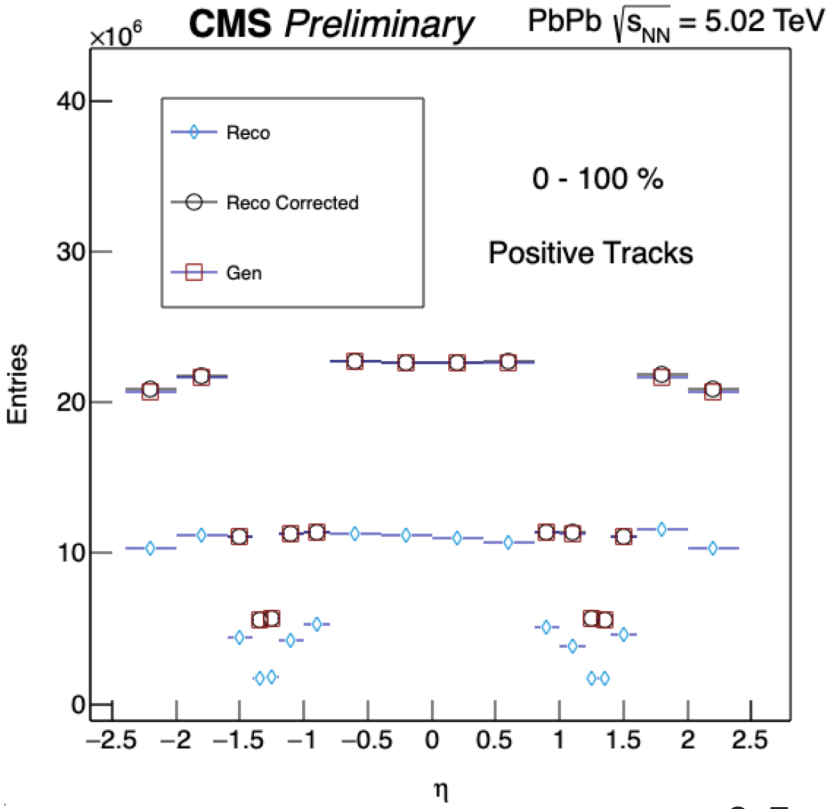


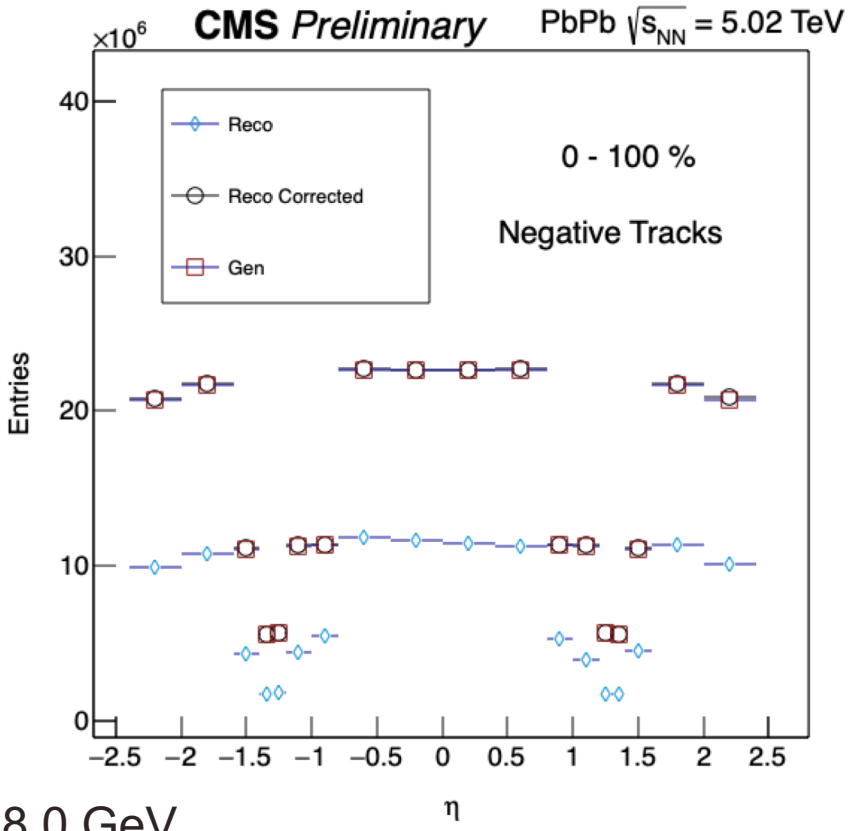
Results for + and – tracks (p_T)





Results for + and – tracks (η)





$0.5<p_T<8.0$ GeV