Heavy Flavour Single Muon Cross Section in pp collision at 8 TeV

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Outline

- Motivation
- Strategy for Analysis
- Results of Efficiency Correction
- Background Subtraction

Relevant Details

- Aim of the analysis: Calculation of Heavy flavour muon cross section in pp collisions @ 8 TeV in ALICE
- Closely following the analysis note for a similar analysis done at 7TeV(https://twiki.cern.ch/twiki/pub/ALICE/SingleMuonpp/NoteHFSingleMupp7TeVOct5.pdf)
- Data Set: LHC12h + LHC12i
- Type of File: AOD
- Number of Events after Event cuts: 110M

Physics Motivation

- Heavy Flavour muons are produced in the early phase of collision, and see the evolution of the fireball. Thus, can be used as probes to understand the properties of QGP

- Results will act as benchmark for A-A and p-A collisions

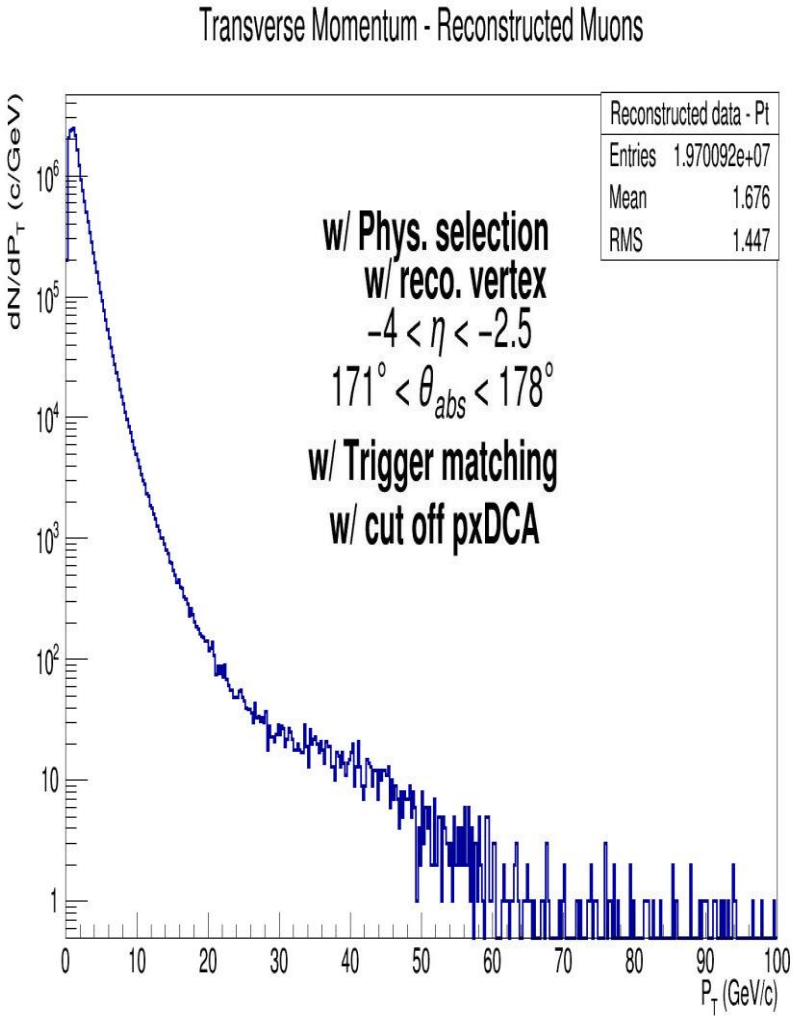
- This calculation is a direct test for pQCD predictions

Analysis Strategy

- Calculation of Pt and rapidity distribution
- Estimation and Subtraction of background
- Efficiency Correction
- Calculation of Luminosity and Cross-section

Cuts and Trigger

- Trigger: CMSH7-S-NOPF-MUON
- Event Cuts(AliMuonEventCuts):
  - Physics Selection
  - Vertex Selection(-10 cm<Vz <10 cm)
- Track Cuts:
  - Eta Cut (-4 < eta < -2.5)
  - Theta Cut (171° < θ_{abs}< 178°)
  - p x DCA Cut: Remove the beam induced background
  - Trigger Matching: Decrease the punching through hadrons



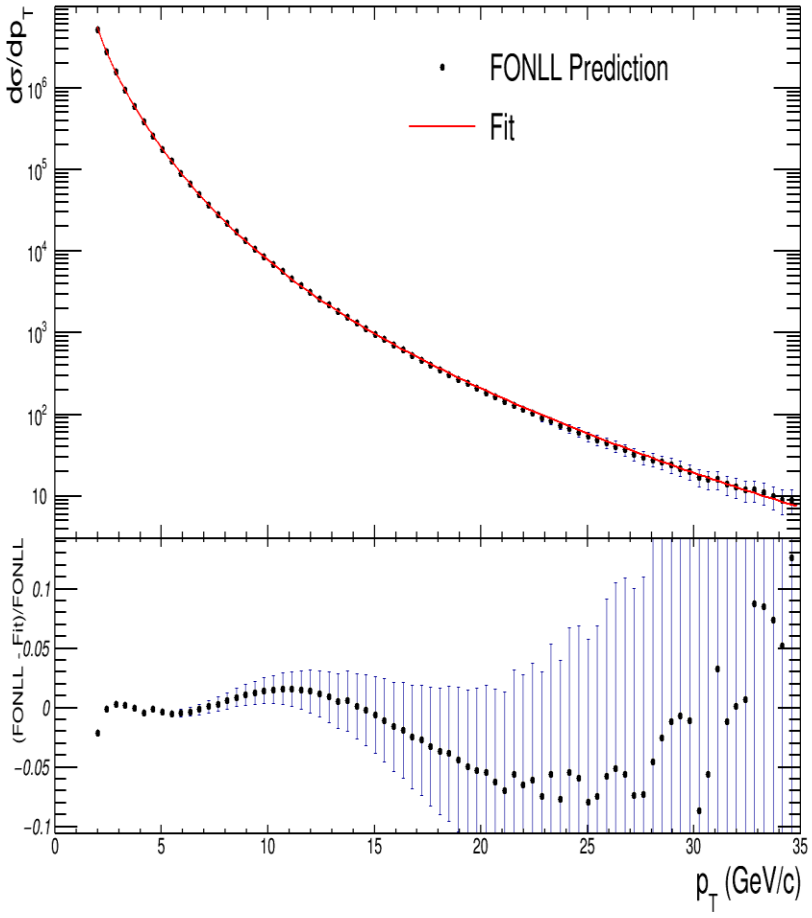
Efficiency Correction

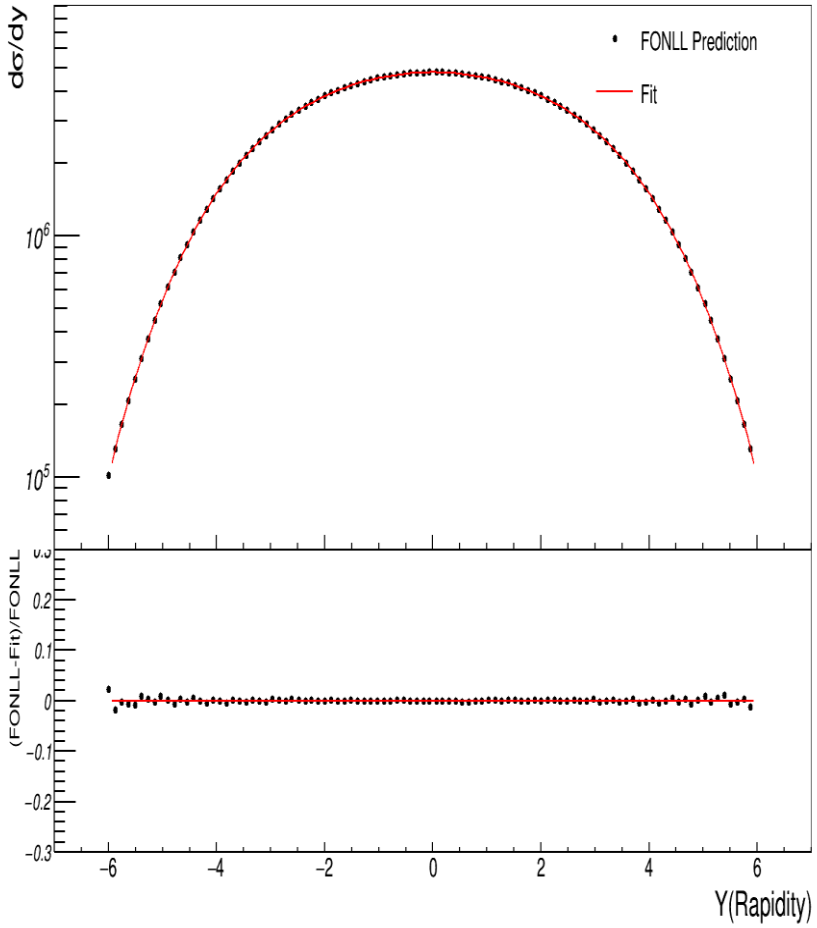
Efficiency Correction

- Efficiency(x) = Rec(x)/Generated(x)
- Calculated by performing MC simulations using a package given in AliPhysics
- Why this package?
  - Very low HF muons in minimum bias simulations which results in large fluctuations
- As input to the package, we use parameters obtained by fitting FONLL predictions

Simulation using input from FONLL

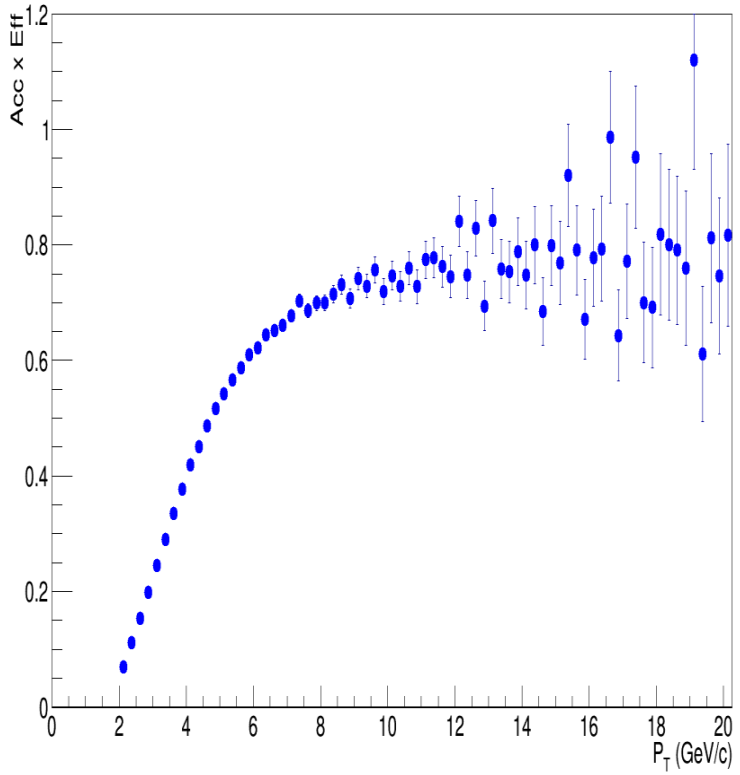
- Fit Plot



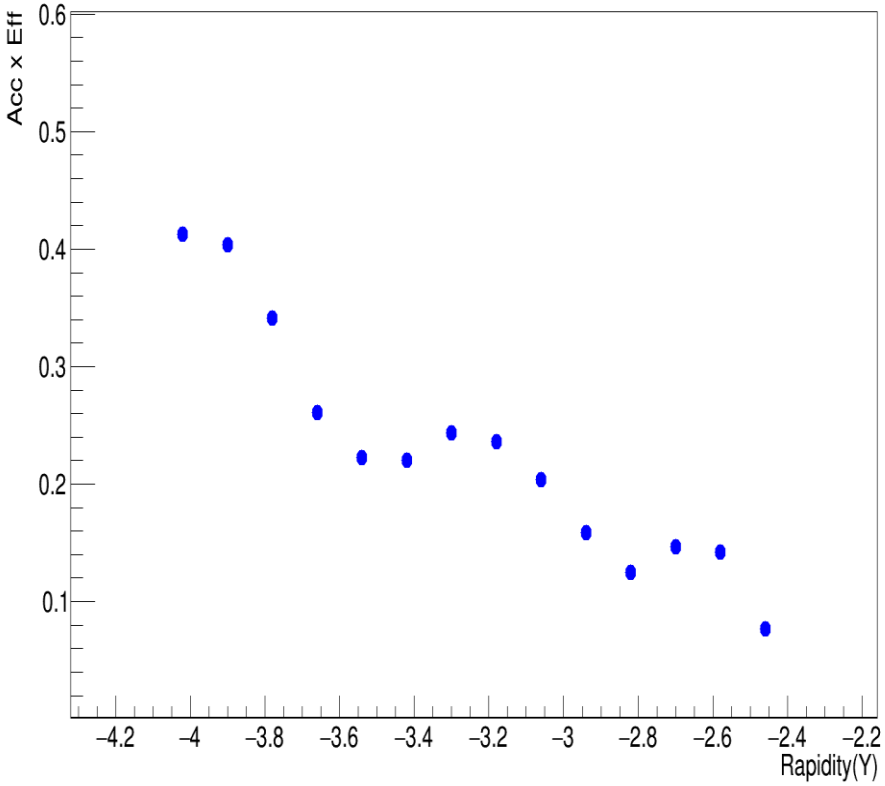


Results

- Acceptance x Efficiency with Pt and Eta

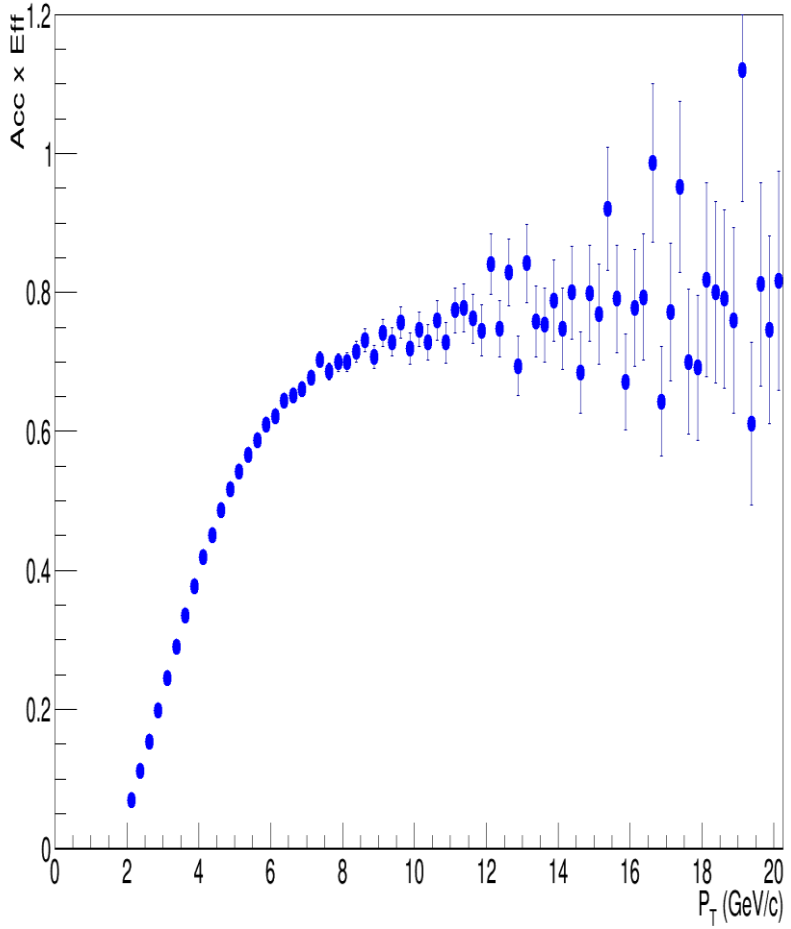


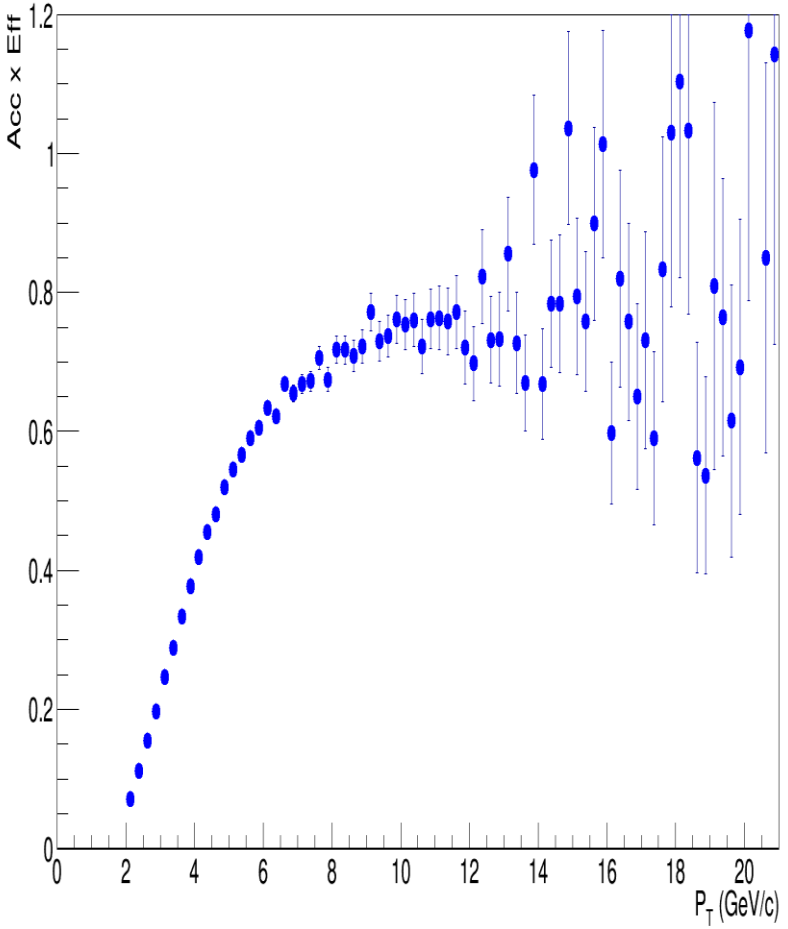
Acc x Eff ~ 68% (6 GeV/c to 20 GeV/c),



Acc x Eff ~ 20% (2 GeV/c to 45 GeV/c)

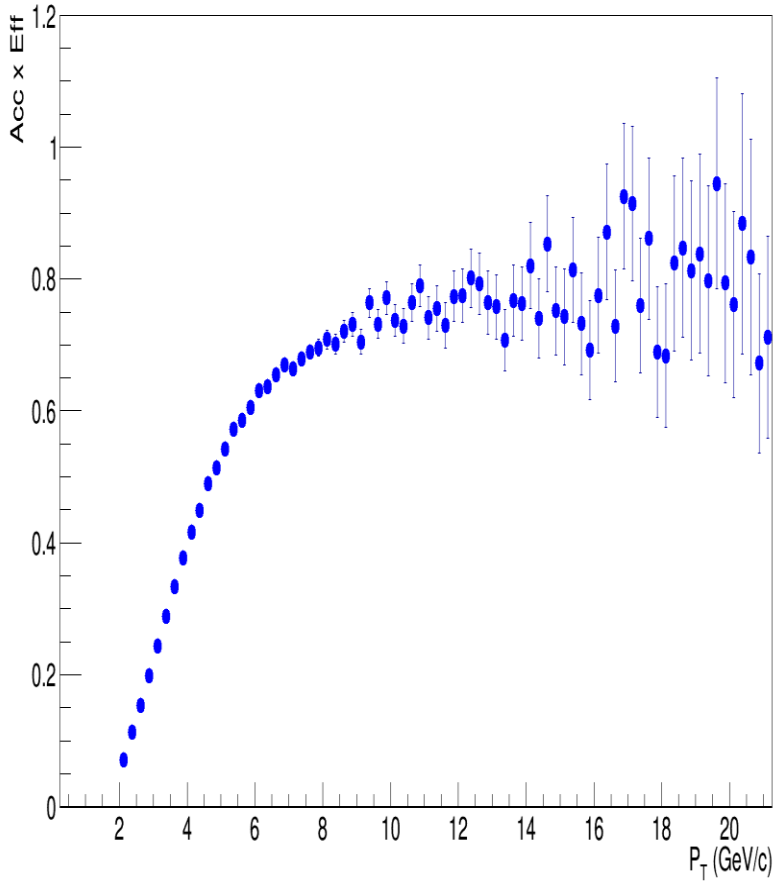
- Acc x Eff With Different Input Shapes



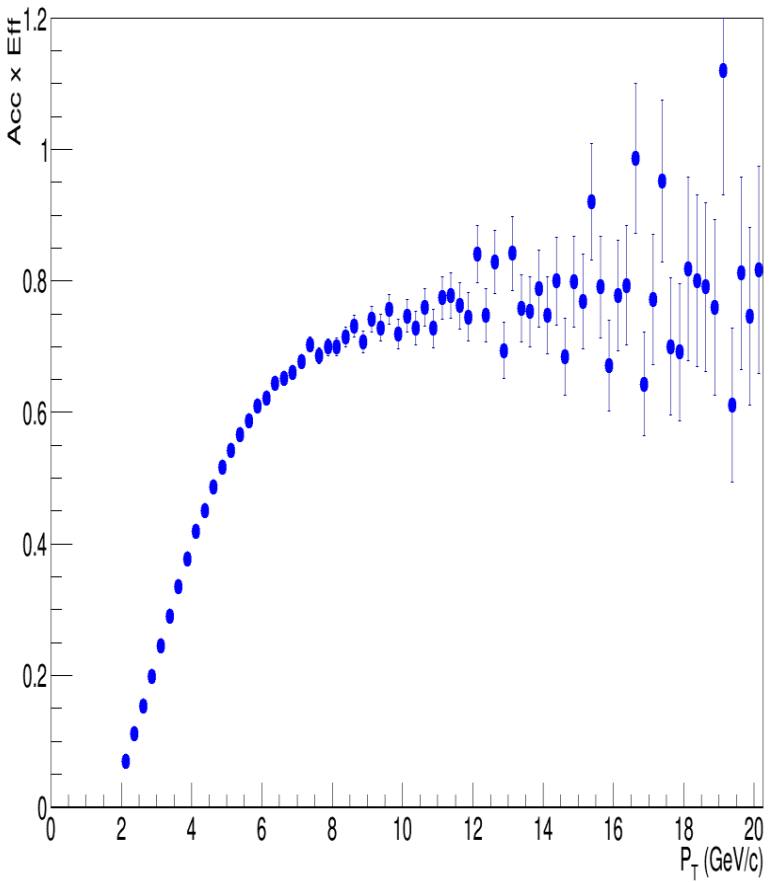


- Acc x Eff with Mis-alignment

With MisAlignment File



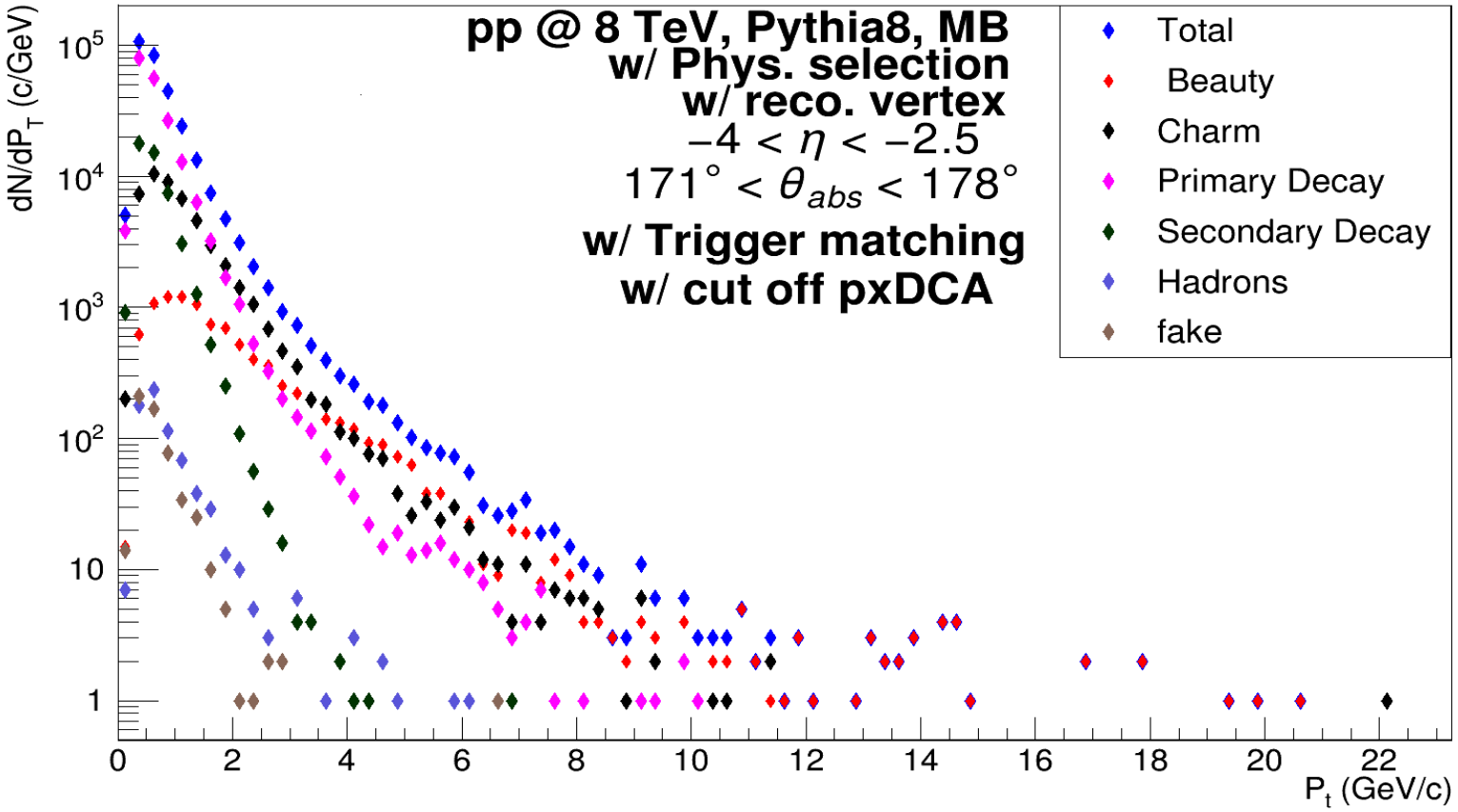
With Default Alignment



Background Subtraction

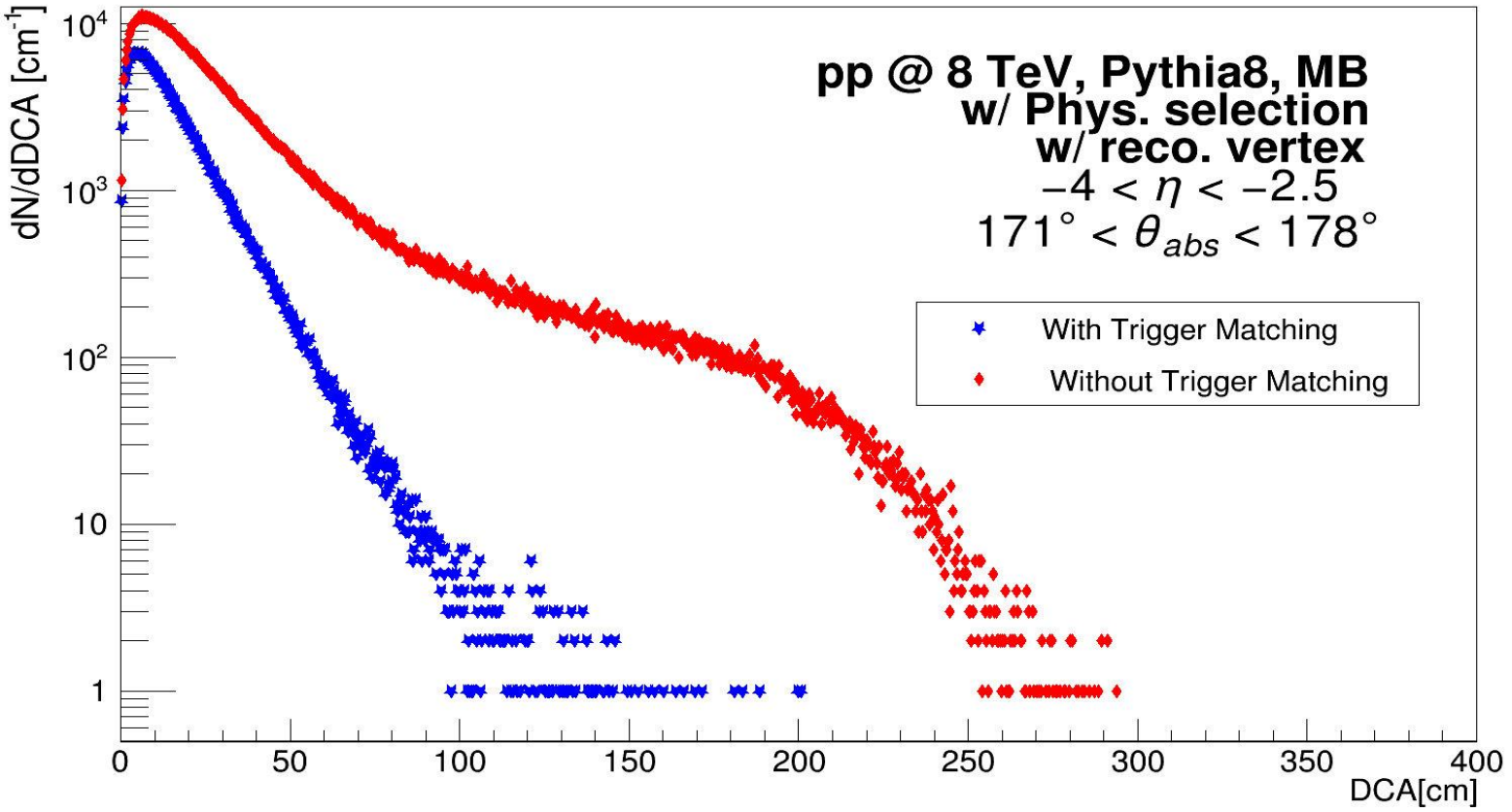
Background Sources

- Sources of muons: Obtained via MC simulation(LHC15h1h)

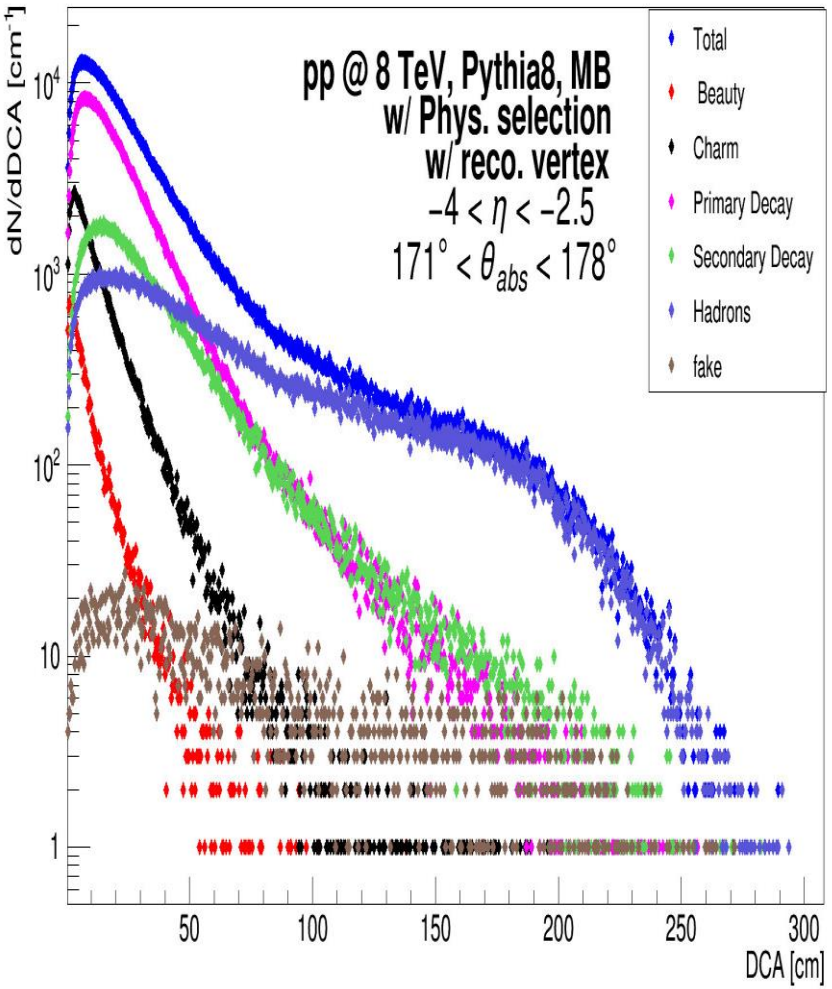


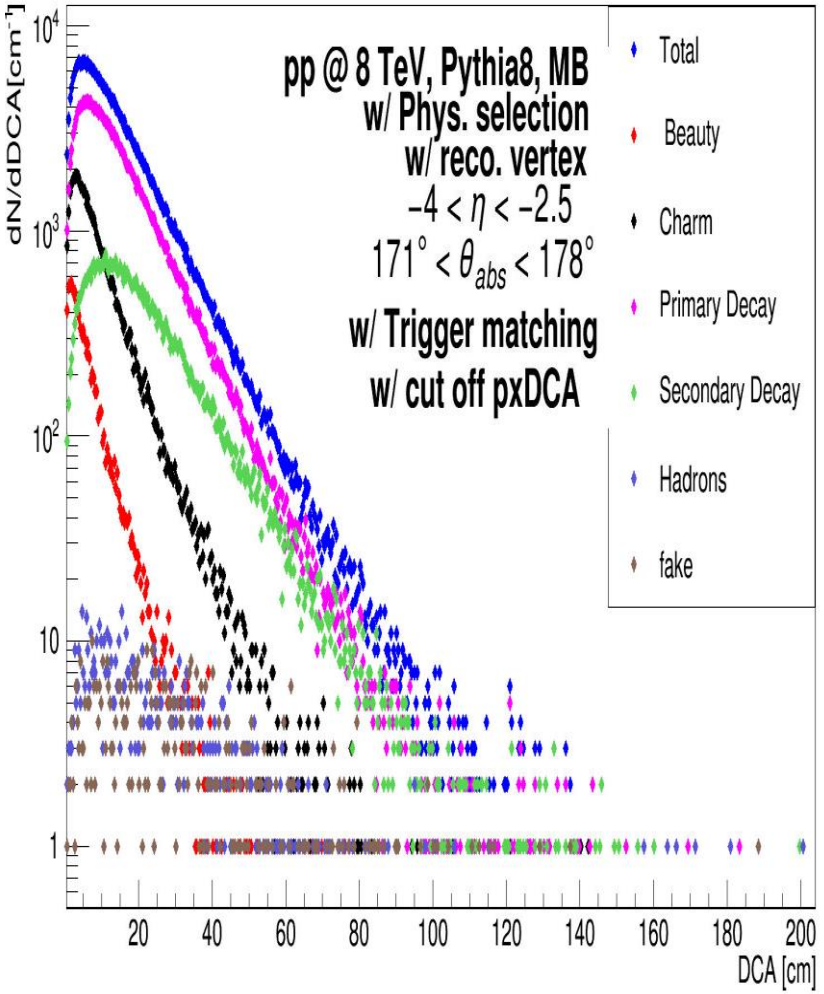
Background Subtraction

- Punch through Hadrons: Track Trigger Matching

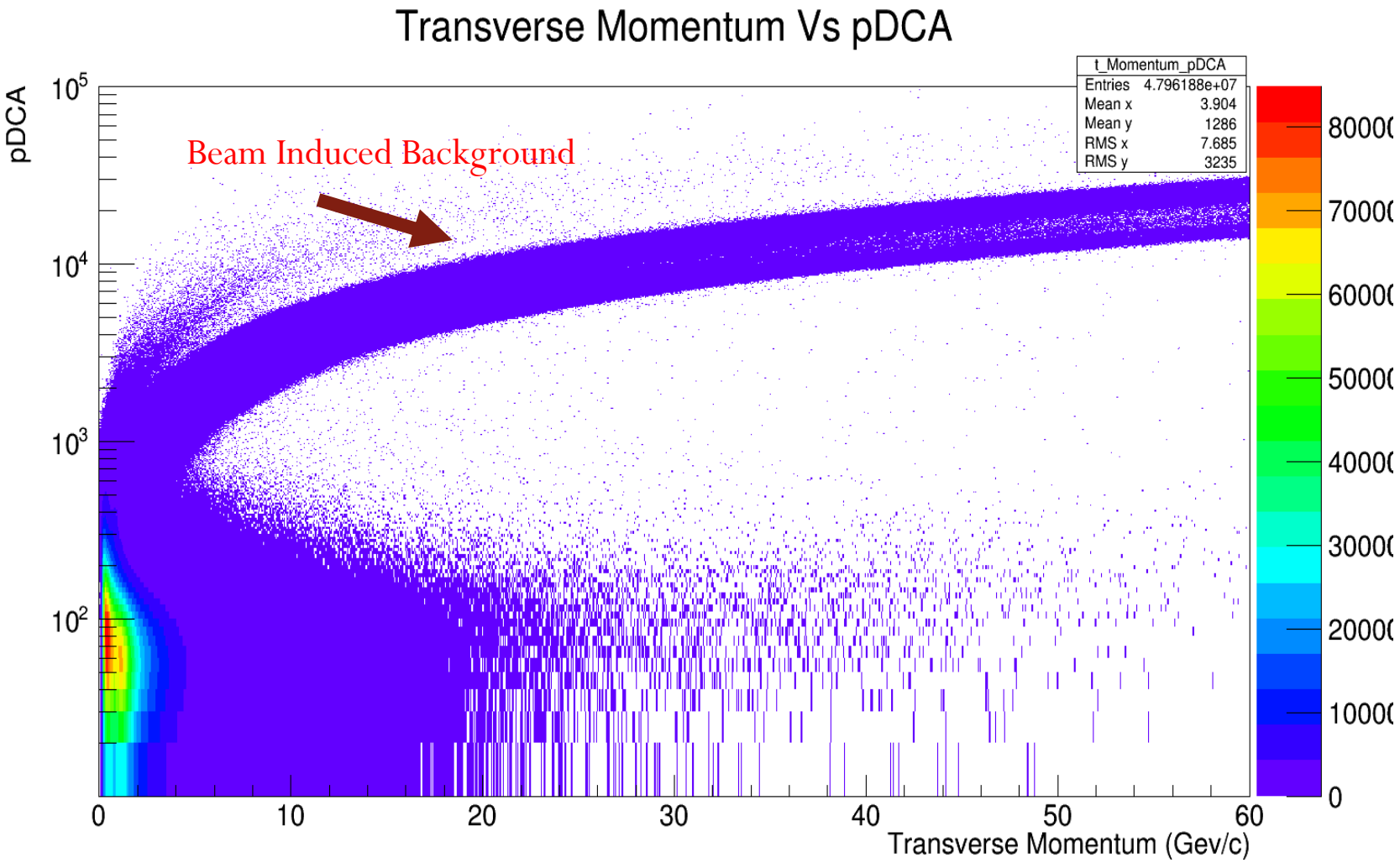


- DCA of different muon sources





- Beam Induced background removed by using pDCA cut



Primary Decay Muons

- The main source of muon background is from light hadron decays. This background can be estimated in two ways:
  - Monte Carlo Simulations - Run realistic simulations to obtain pi-K distribution and estimate muon background using this distribution as input to fast simulations
  - Data Driven Approach - Extrapolate the pi-K distribution measured in central rapidity, and use them as input to fast simulations

Thank You!