Tight Muon Reconstruction Efficiency

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Introduction

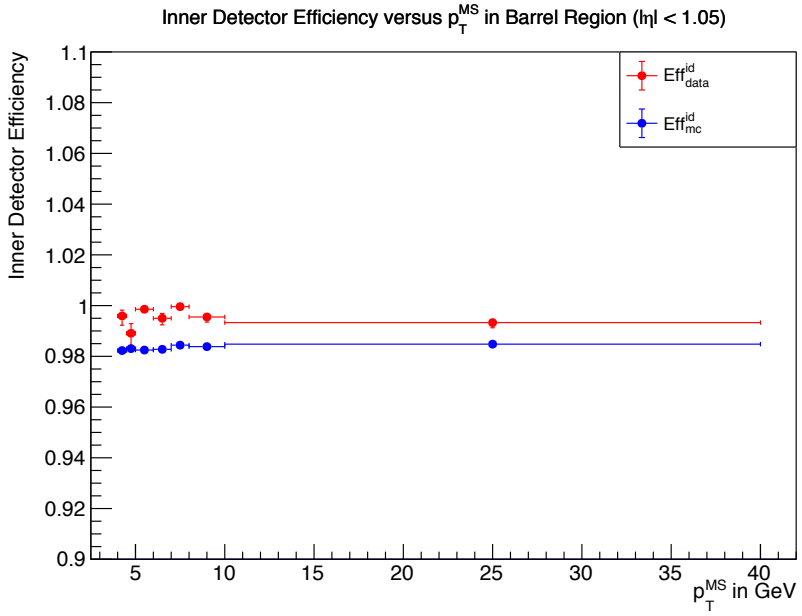
- Used Tag & Probe method to calculate the reconstruction efficiency of tight muon.

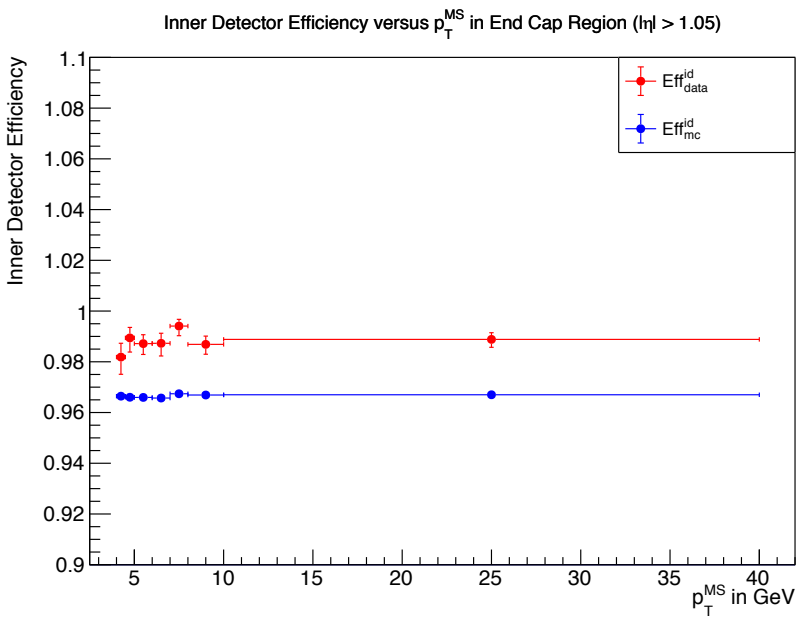
$$\varepsilon(\mu) = \varepsilon(\mu|\mathrm{ID})\times\varepsilon(\mathrm{ID}) \cong \varepsilon(\mu|\mathrm{ID})\times\varepsilon(\mathrm{ID}|\mathrm{MS})$$

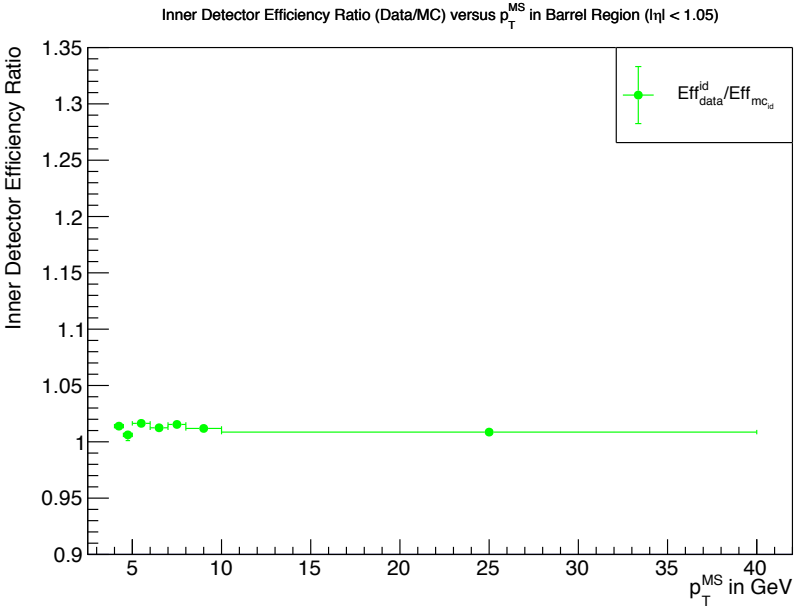
- $\varepsilon(\mathrm{ID}|\mathrm{MS})$ = (# of MS tracks that have a matched ID track)/(# of total MS tracks).
- $\varepsilon(\mu|\mathrm{ID})$ = (# of ID tracks that have a matched reconstructed muon)/(# of ID tracks).
- Event Selection:
  - Trigger mu3 || mu8 || mu10
  - GRL
  - At least 1 primary vertex
- $\varepsilon(\mathrm{ID}|\mathrm{MS})$ match: MS track with an ID track dR < 0.2
- $\varepsilon(\mu|\mathrm{ID})$ match: ID track with a reconstructed muon dR < 0.005
- Probe tracks Selection:
  - Opposite charge with tag
  - ID tracks: Muon ID Selections
  - MS tracks: No Selections
- Invariant mass window
  - for data: J/ψ 2.6 -3.6 GeV
  - for mc: Υ 8-11 GeV

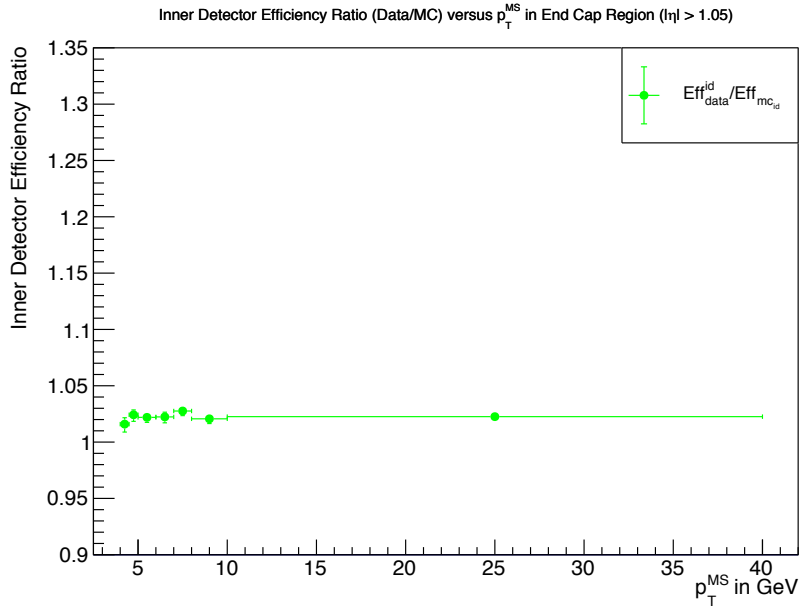
- Todo:
  - Use MC Truth information to calculate reconstruction efficiency and compare with MC T&P method.

Inner Detector Efficiency $\varepsilon(\mathrm{ID}|\mathrm{MS})$ vs probe MS track momentum p_T^{MS}

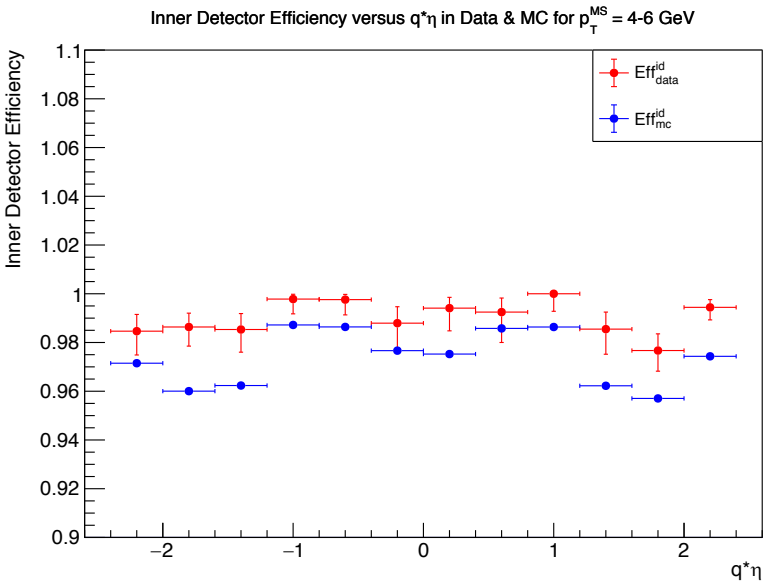


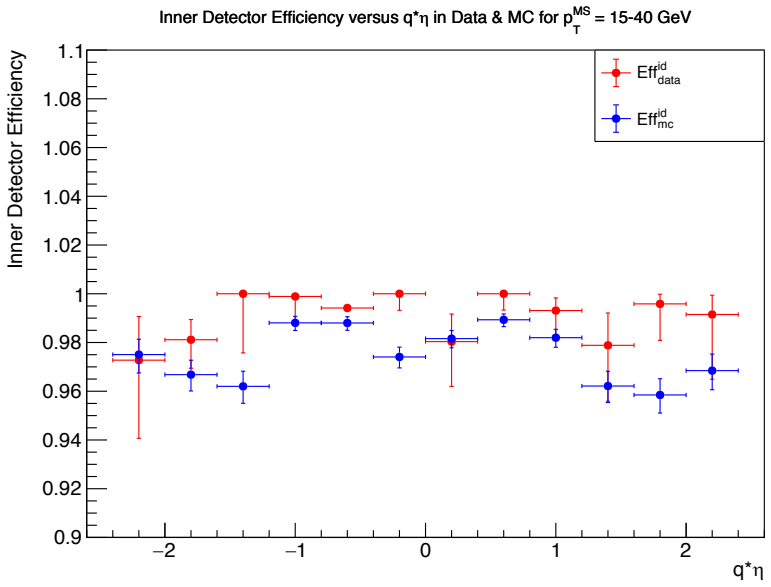


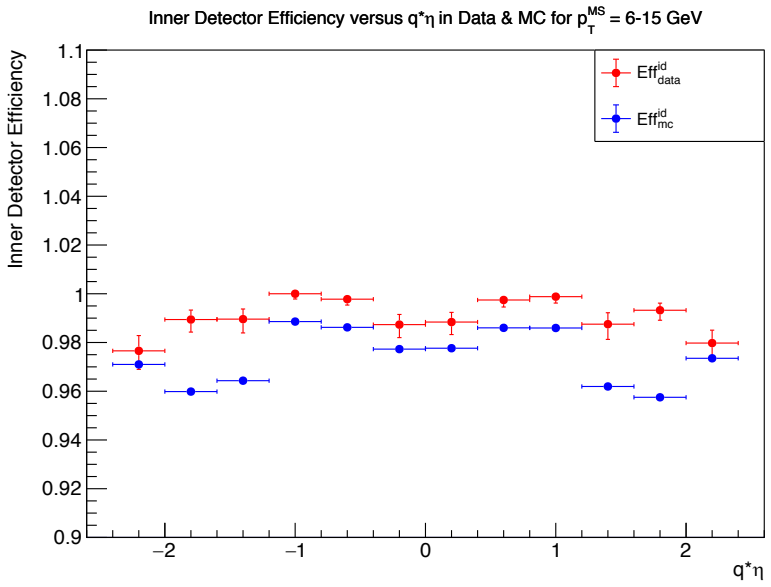


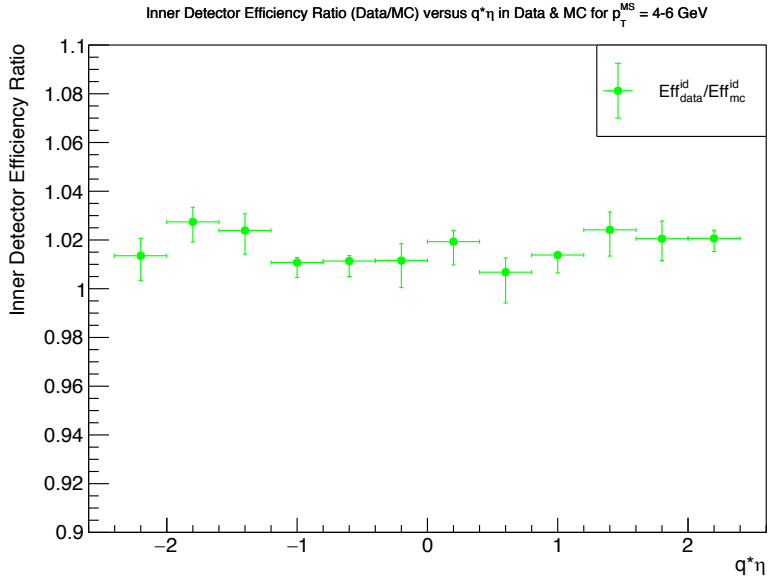


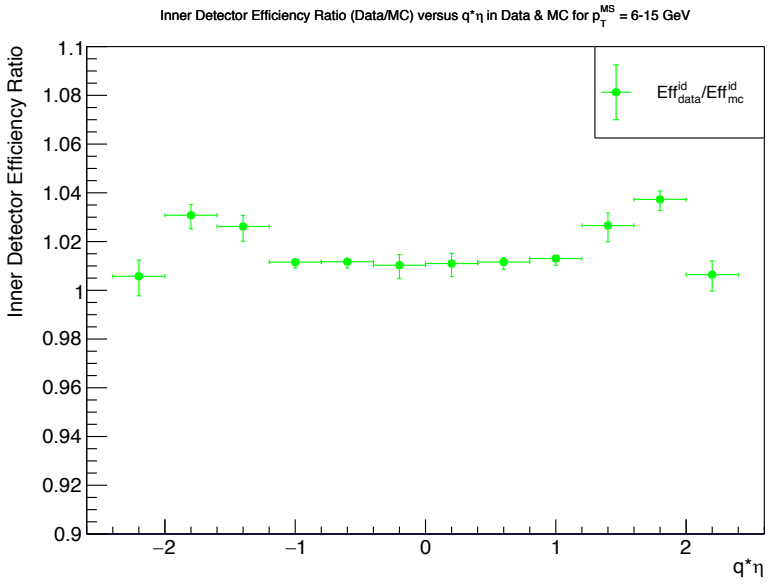
Inner Detector Efficiency $\varepsilon(\mathrm{ID}|\mathrm{MS})$ vs probe MS track rapidity q*η

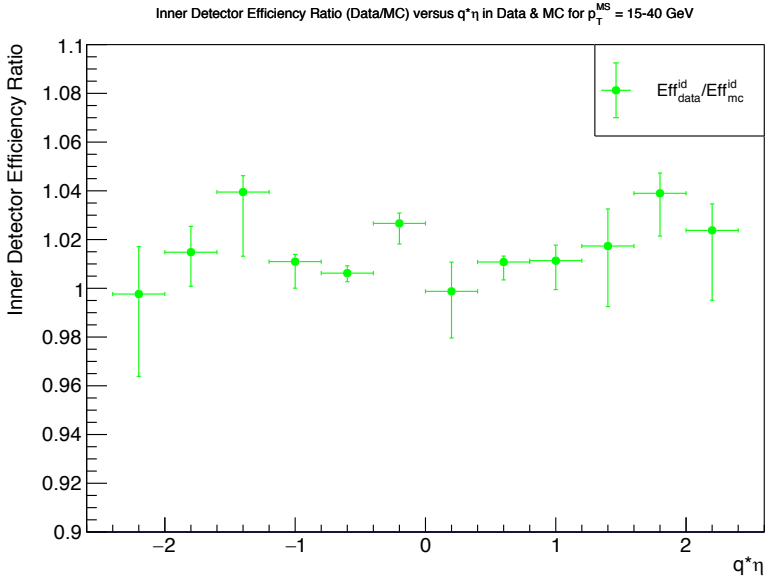




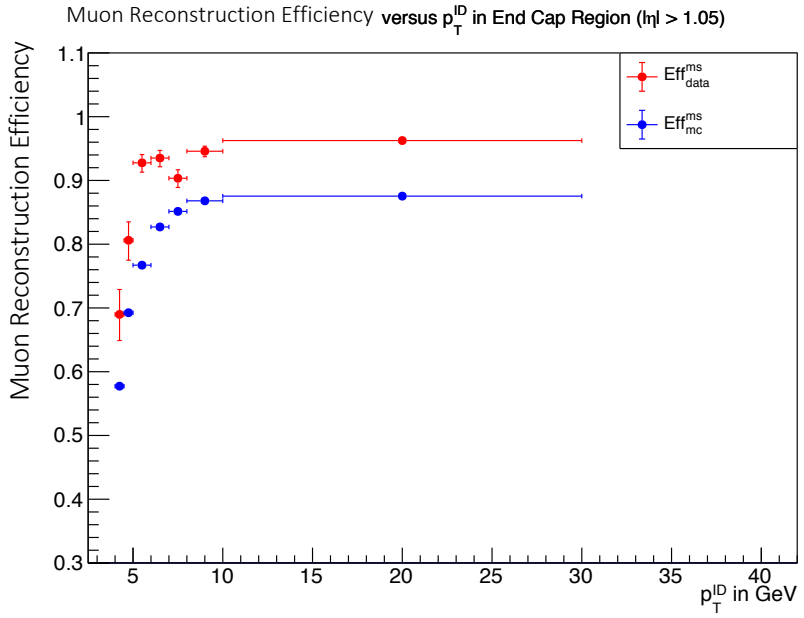


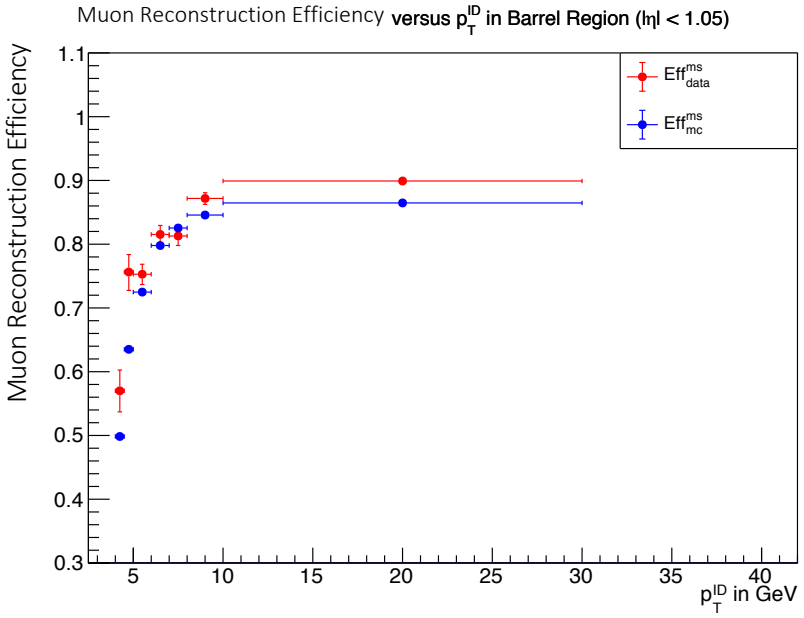


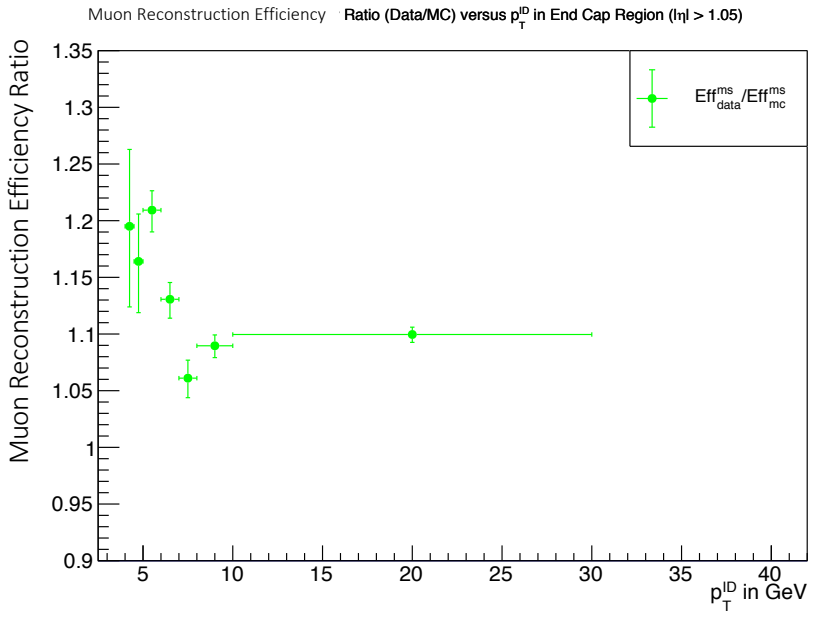


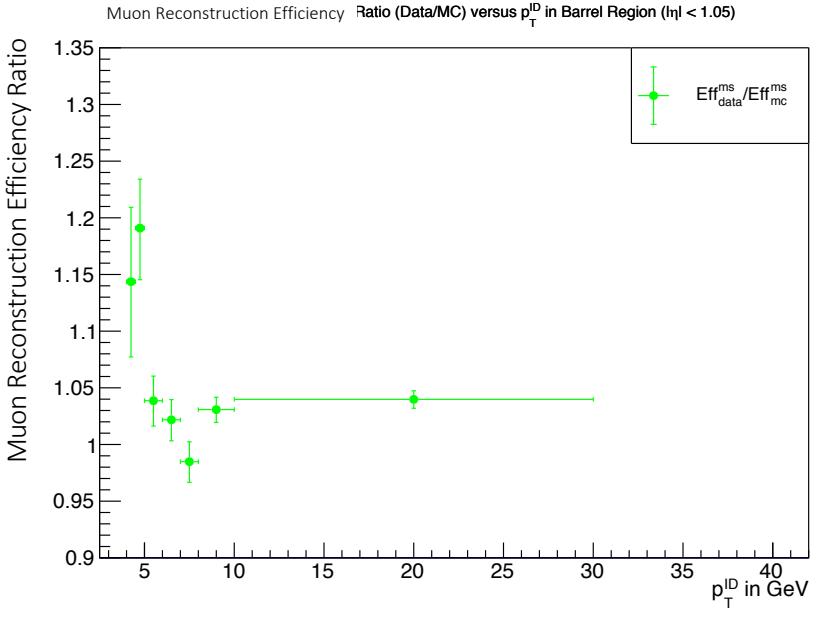


Tight Muon Reconstruction Efficiency $\varepsilon(\mu|\mathrm{ID})$ vs Probe ID Track Momentum p_T^{ID}

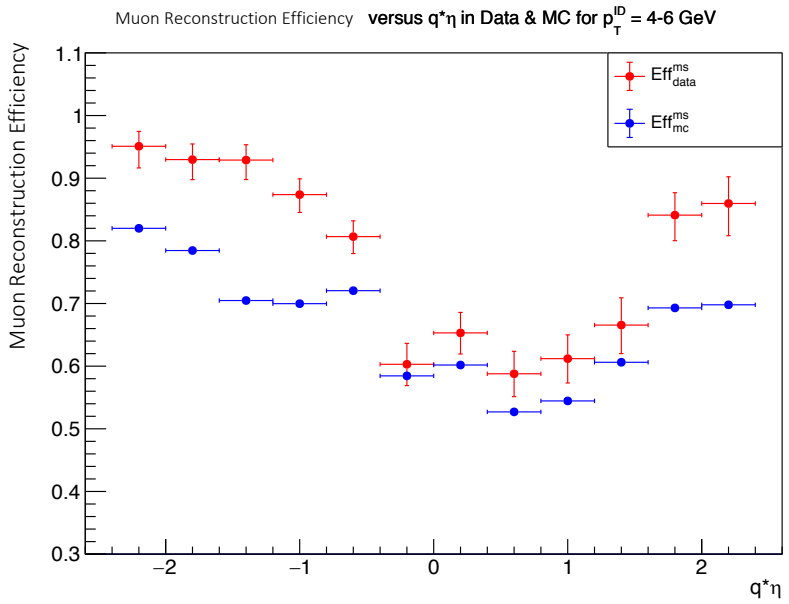


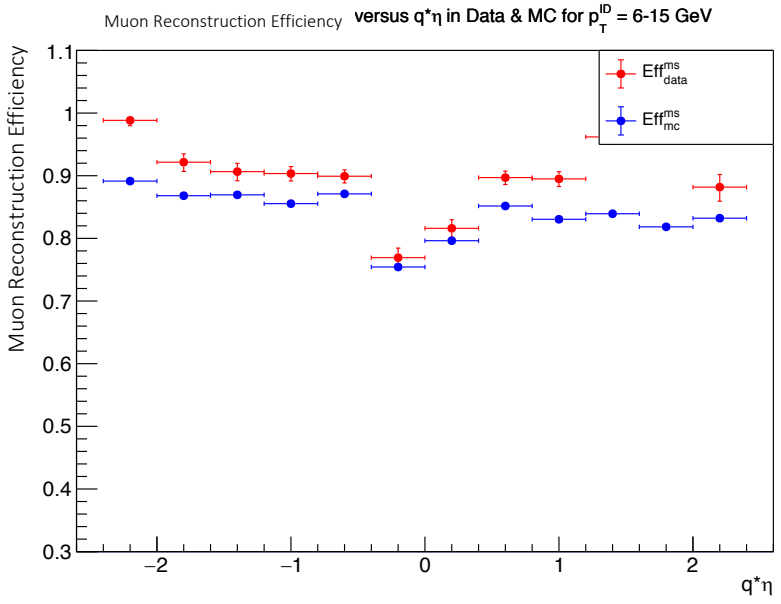


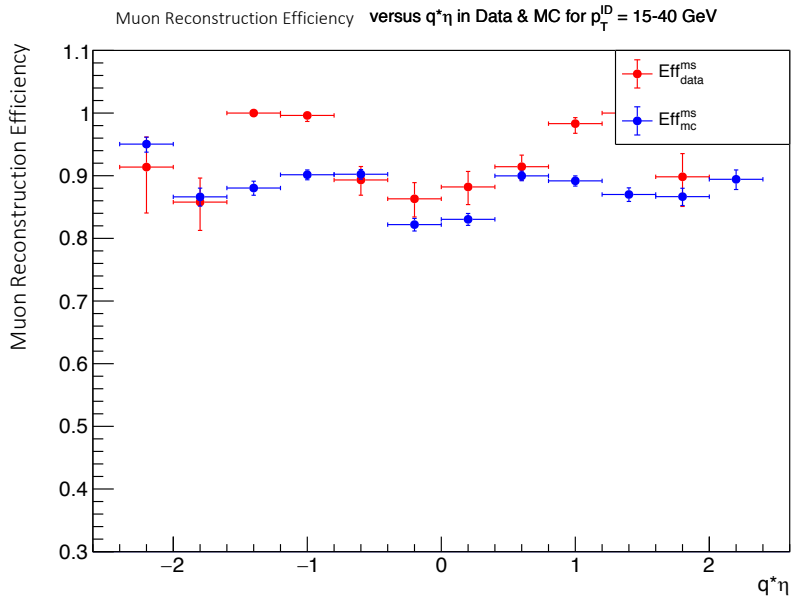


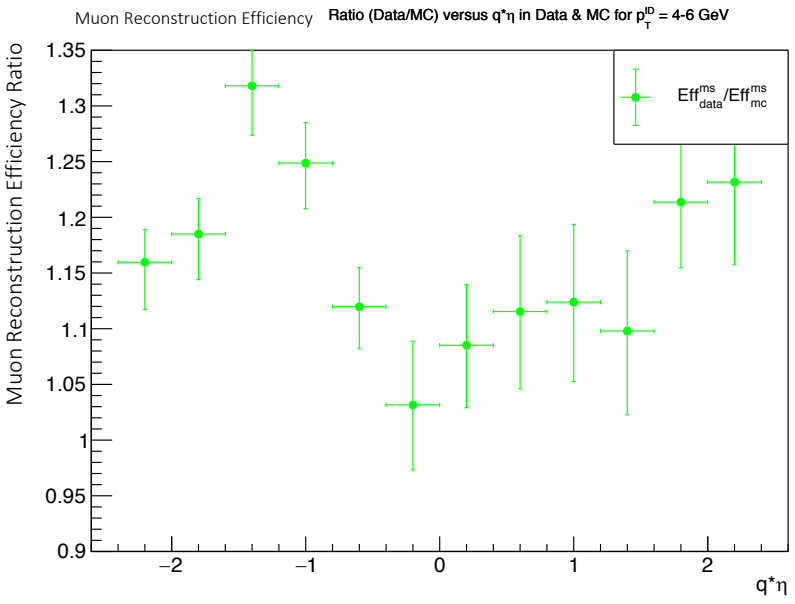


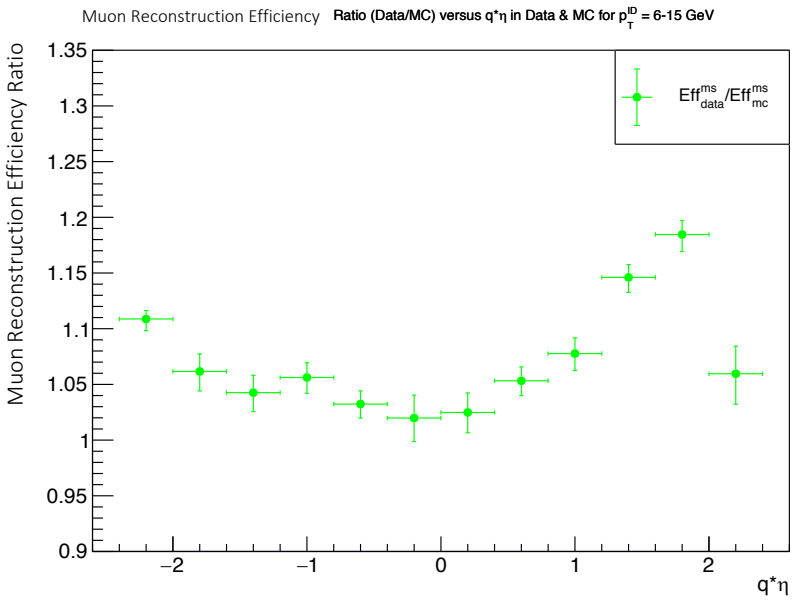
Tight Muon Reconstruction Efficiency $\varepsilon(\mu|\mathrm{ID})$ vs Probe ID Track rapidity q*η

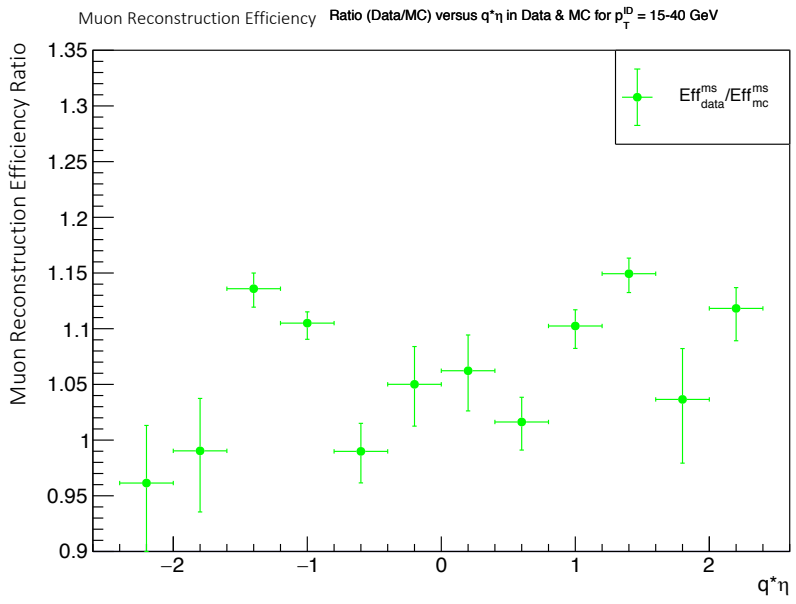






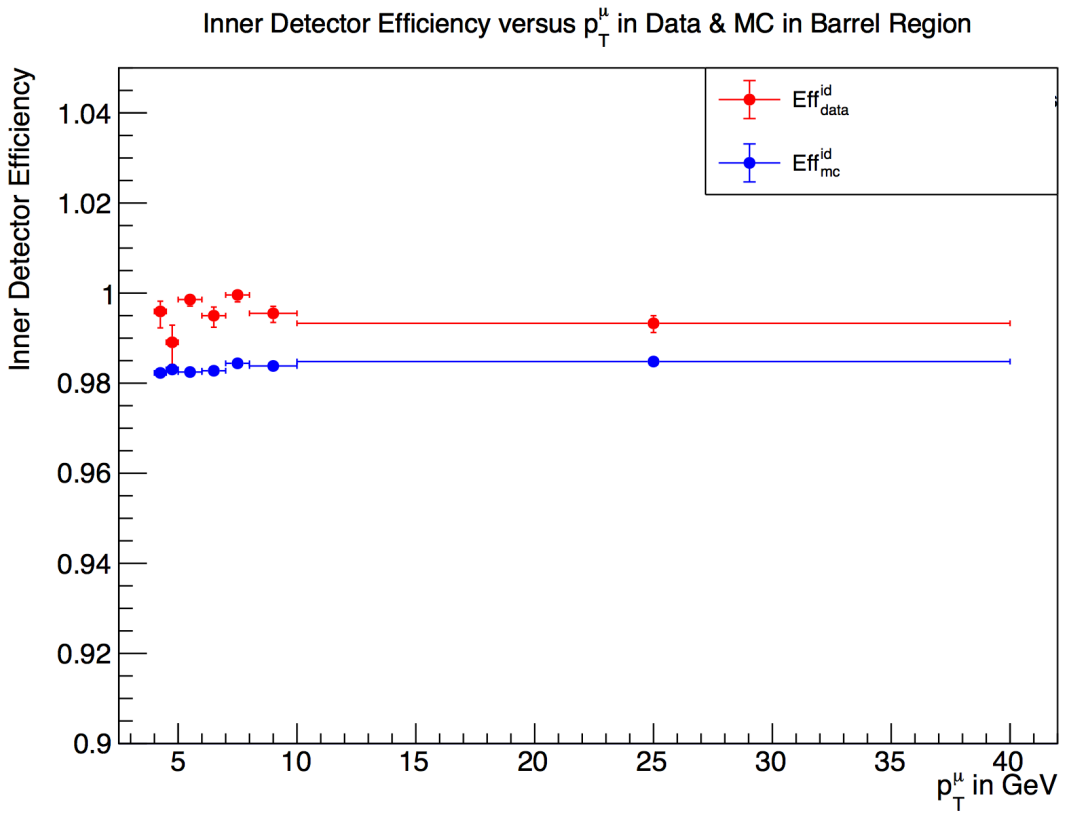


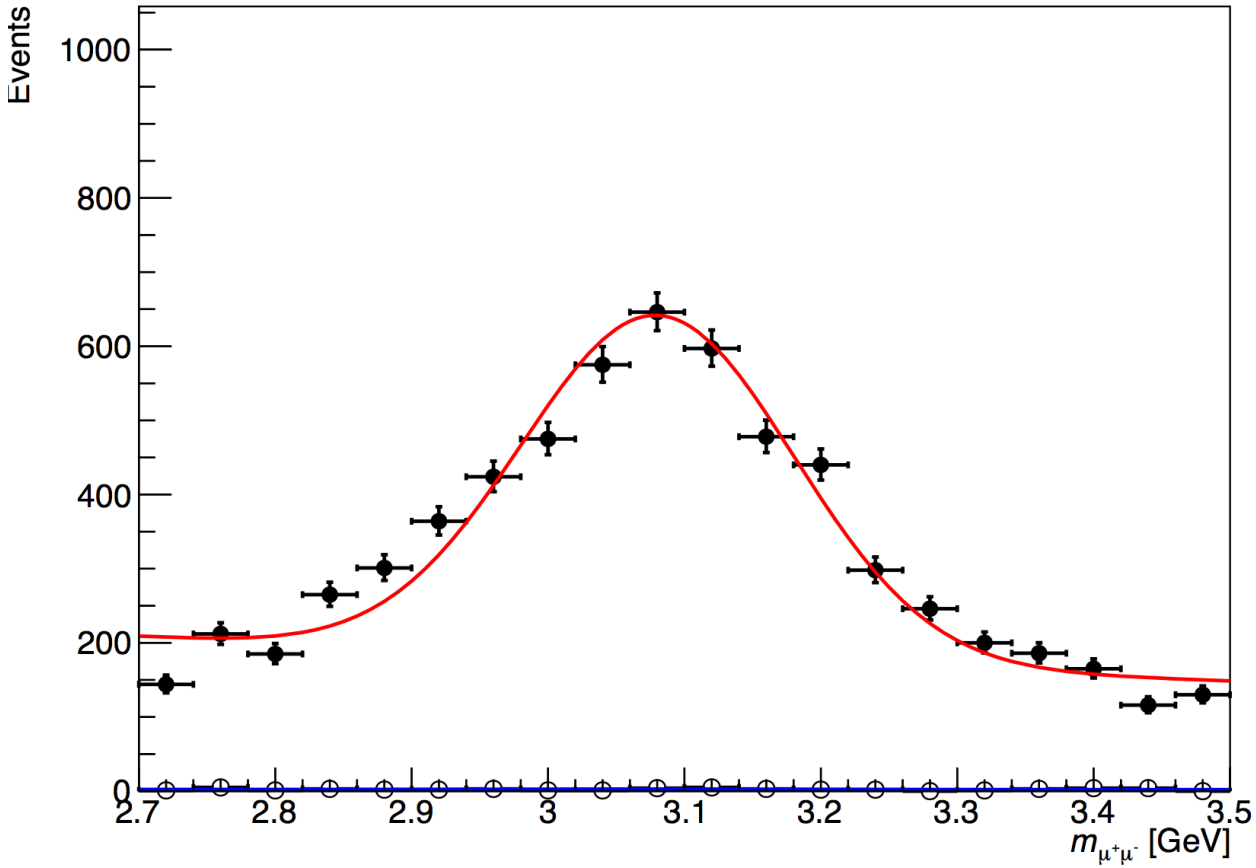




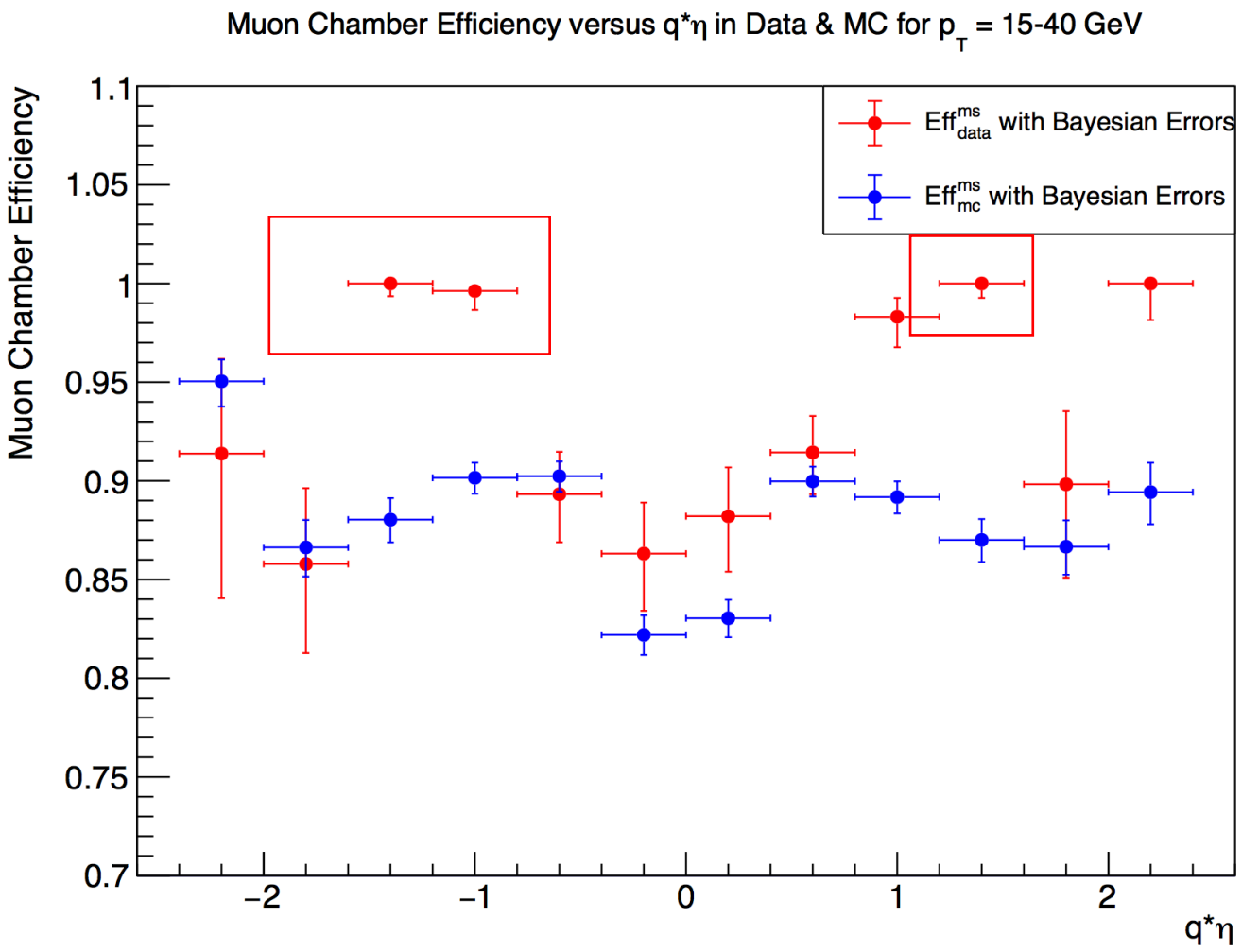
Backup

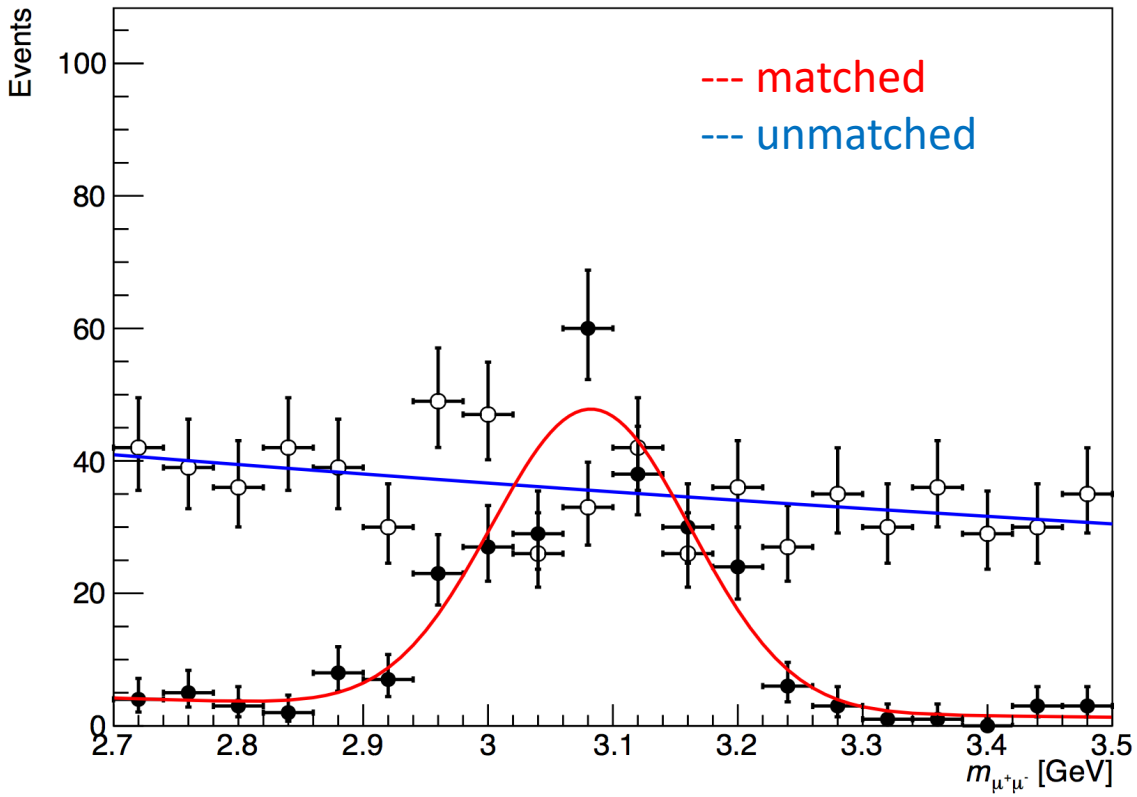
Eff_id for data in Barrel Region p_T = 6-7 GeV



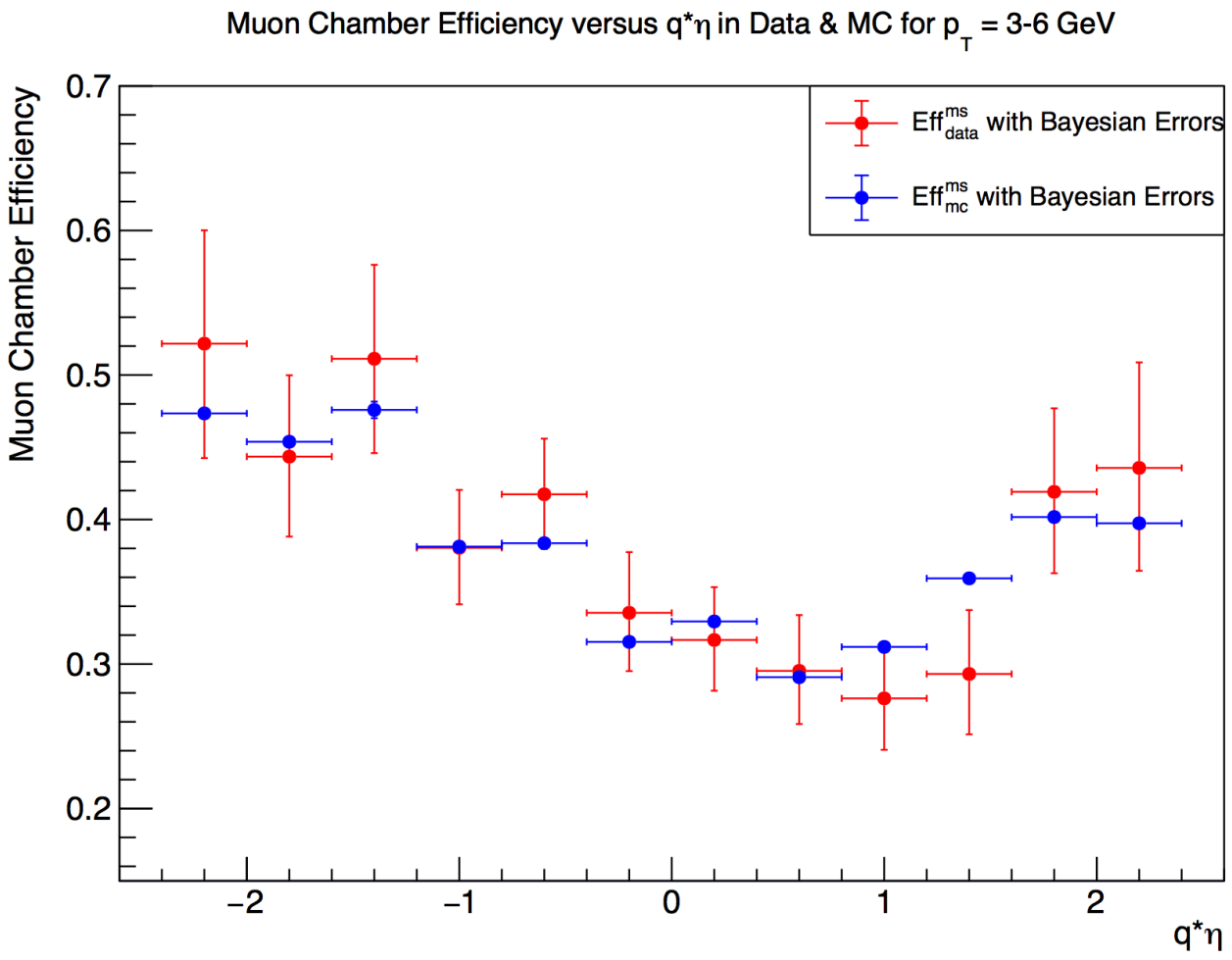


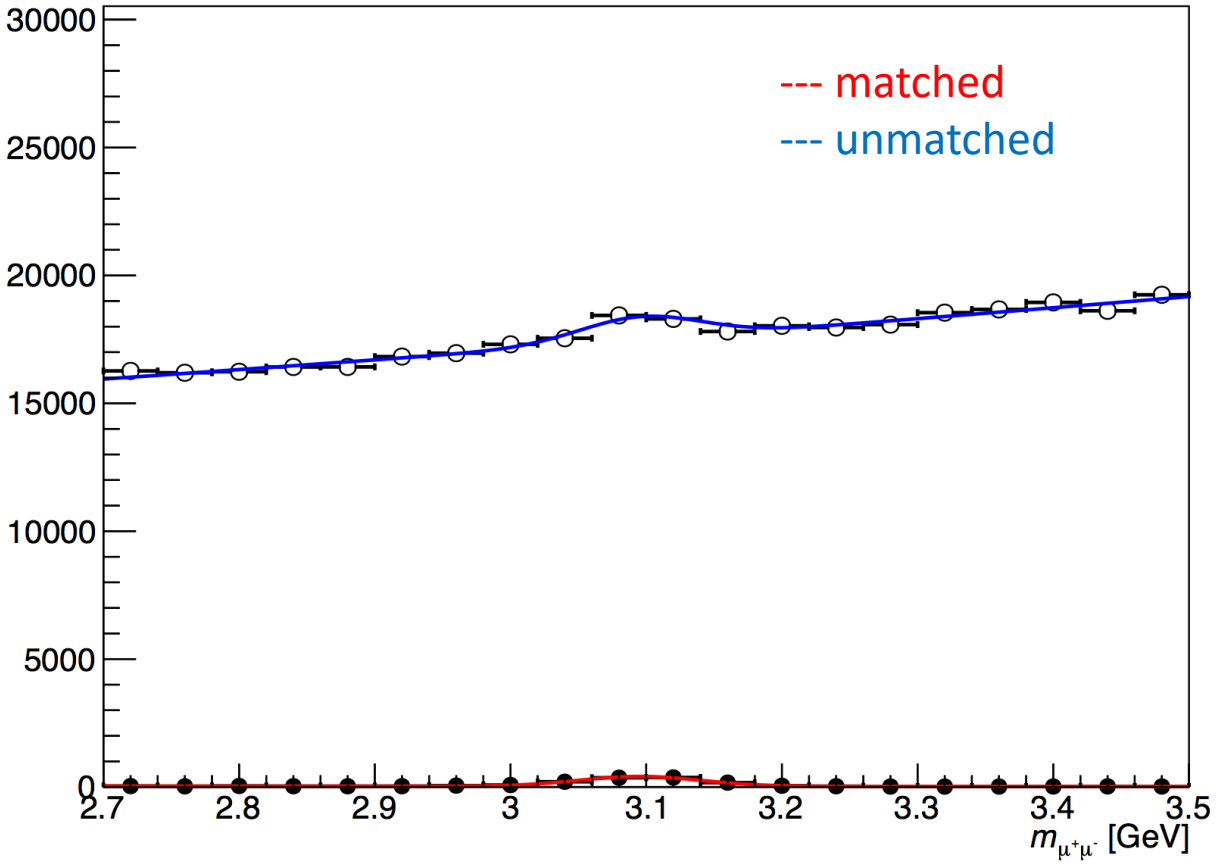
ID efficiency are in general high, signals are high comparing to the background and matched tracks are





- High pT region has very few data and some fake efficiencies are calculated.





- Low pT region has more data and data and MC go the same trend approximately.