Dimuon Study

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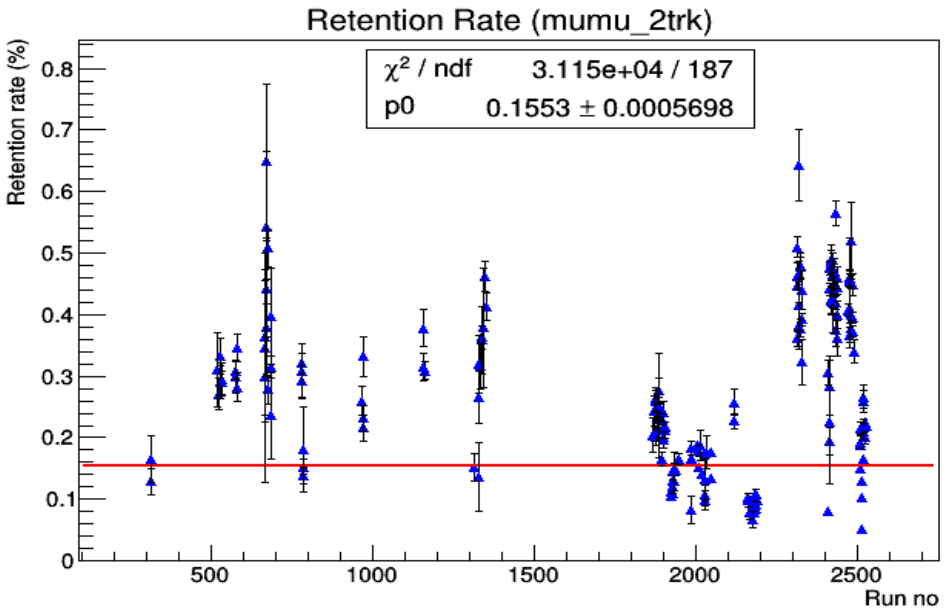
Tracking meeting

Dimuon skim

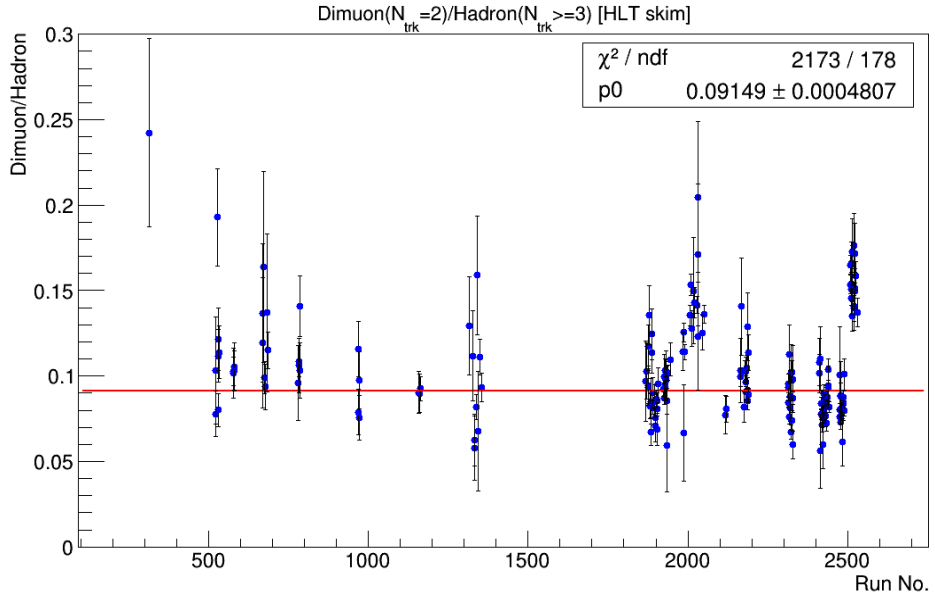
- **Samples used:**
  - Signal MC (standalone dimuon sample)
  - Data : ~92 pb^{-1} , Prod2 (Run: 314-2531)
- **Skim cuts applied:**
  - Number of good tracks ≥ 2
  - p_t >100 MeV, |d0| <2 cm and |z0|< 4 cm
  - Number of tracks (p_{cms} >5.0 GeV and E/p >0.8) =0
  - Total energy of ECL cluster (E <7 GeV)
  - P_{cms} (tracks1)/E_{beam} (CMS) > 0.35
  - P_{cms} (tracks2)/E_{beam} (CMS)> 0.2
  - Maximum angle between two tracks > 0.785
  - Energy of secondary most energetic cluster < 1 GeV

Retention Rate

- Retention rate (dimuon HLT sample)



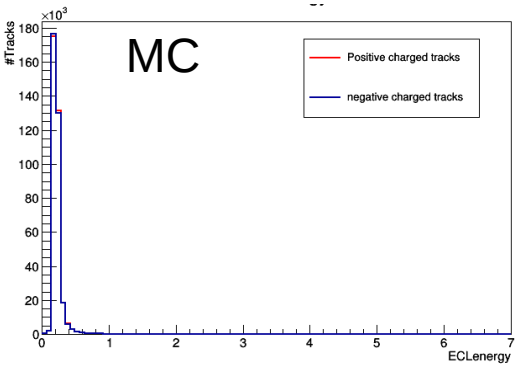
- Ratio of Dimuon (N=2) and Hadron (N>=3)



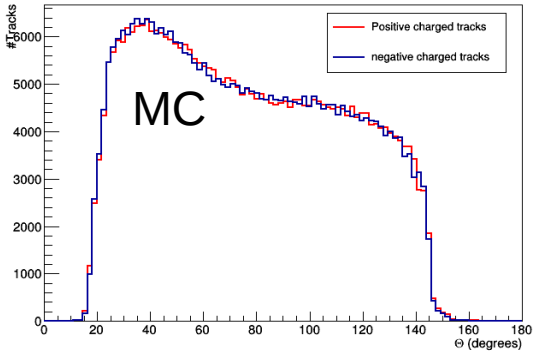
Comparison

Comparison is done for MC and data of ECL energy, θ distribution and E/p variables.

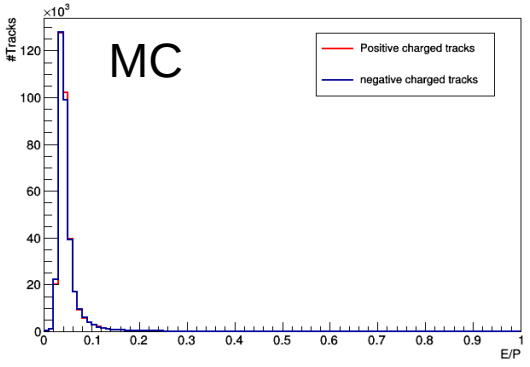
ECL energy

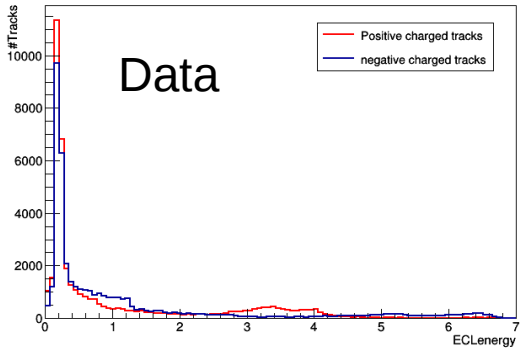


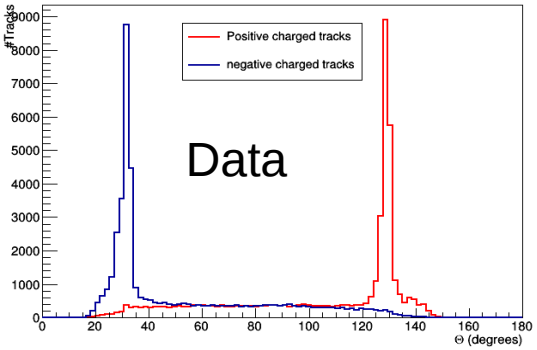
θ distribution

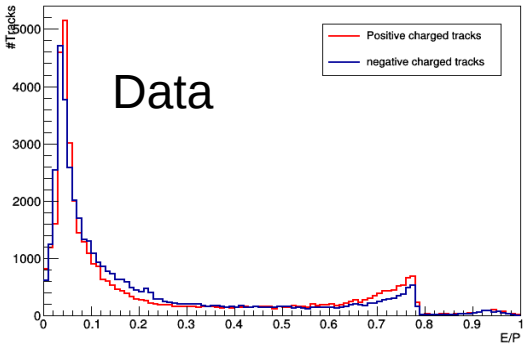


ECLenergy/Momentum







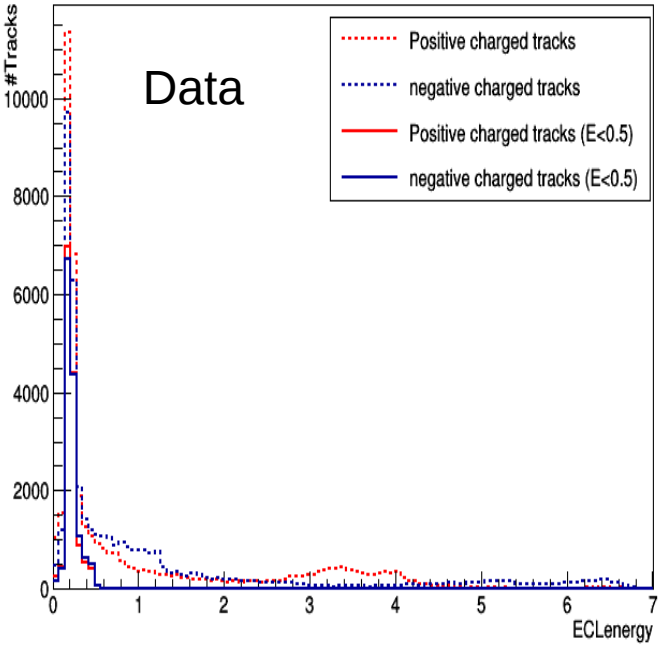


- Contamination from Bhabha observed in data.

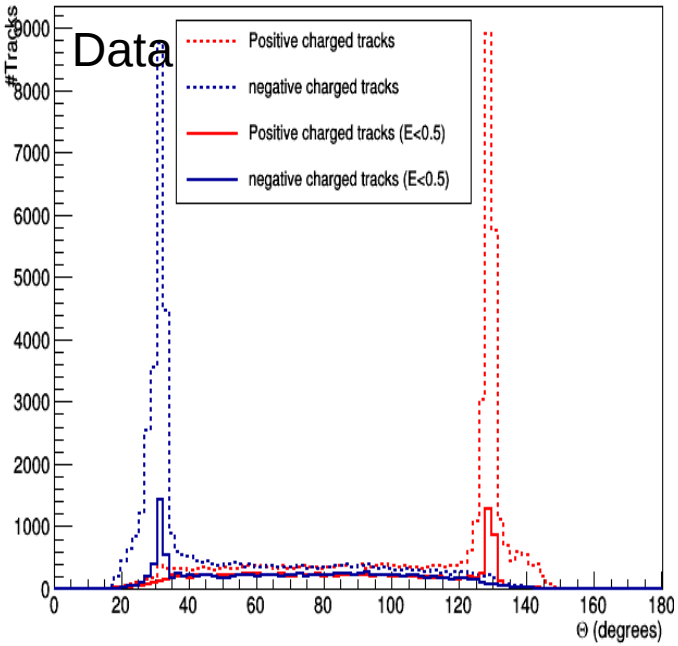
ECL energy (data)

- More detailed study of ECL energy with E<0.5 is performed for data.

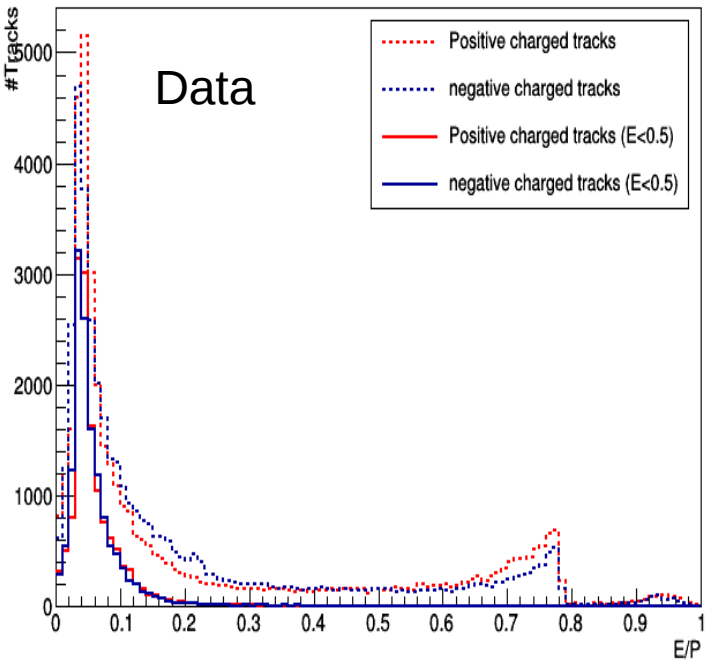
ECL energy



θ distribution



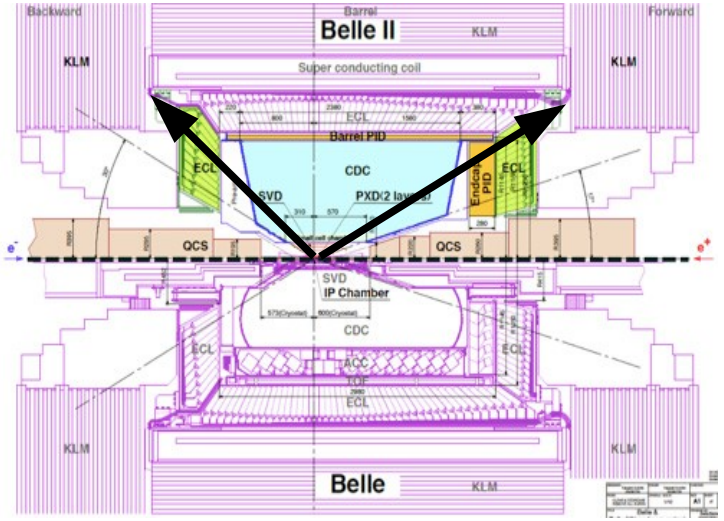
ECLenergy/Momentum



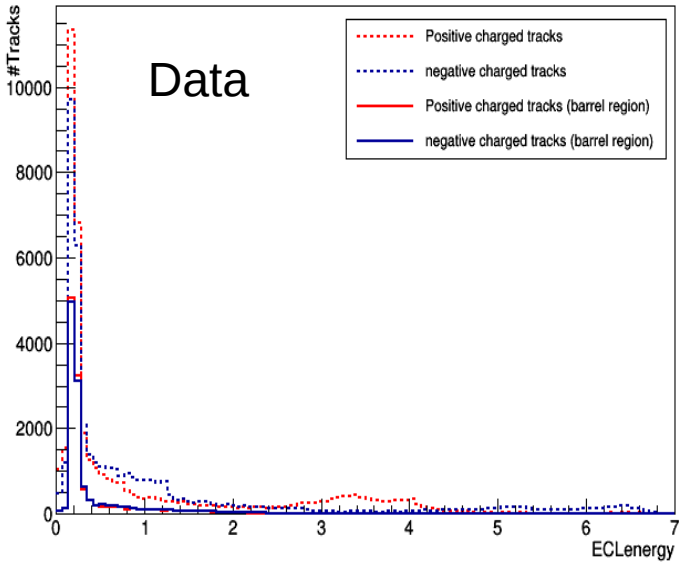
- Most of bhabha contamination removed with ECL energy <0.5. Still some it remains.

θ distribution (data)

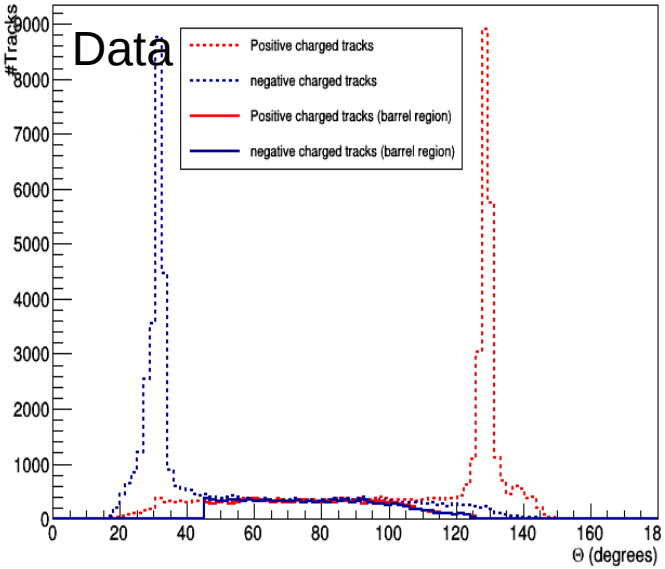
- KLM endcaps are off (scintillators off).
- Selected the muon candidates in barrel region (45° <θ<125°).



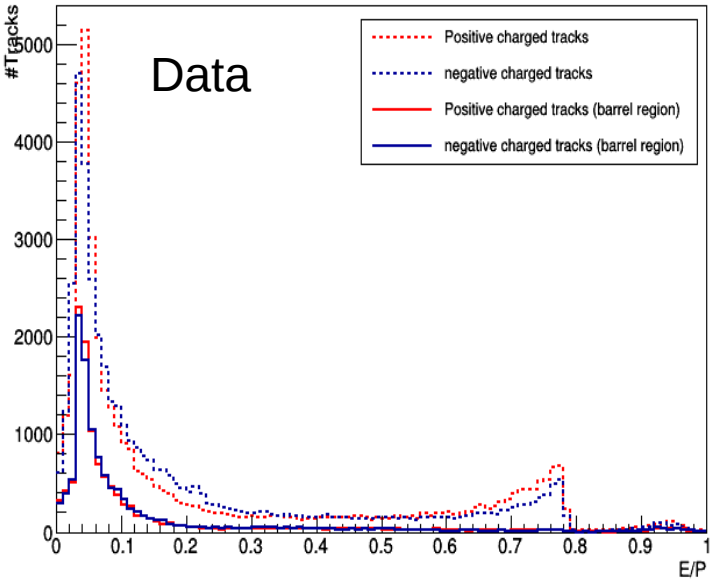
ECL energy



θ distribution



ECLenergy/Momentum

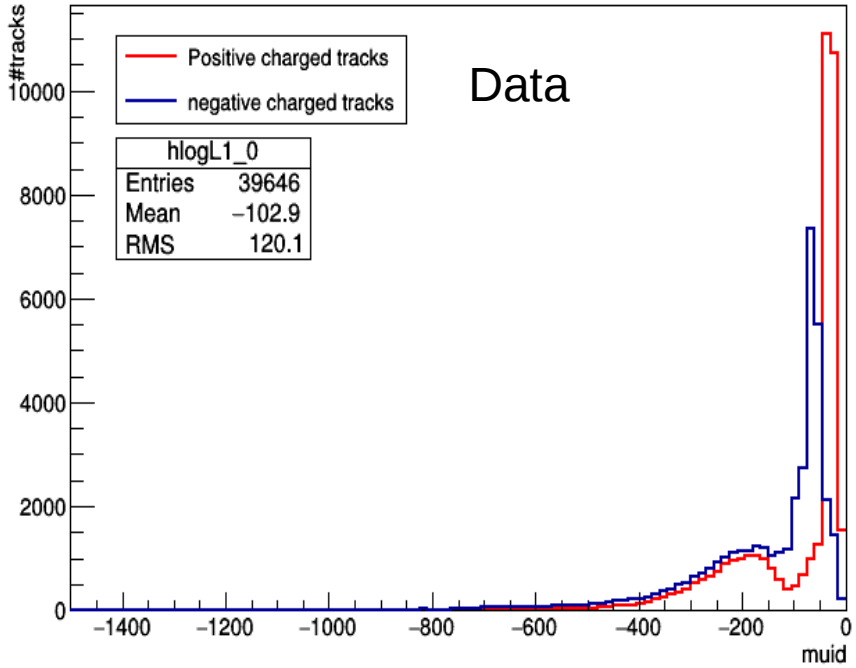


- Bhabha contamination is removed in barrel region.
- Barrel region is used for futher studies.

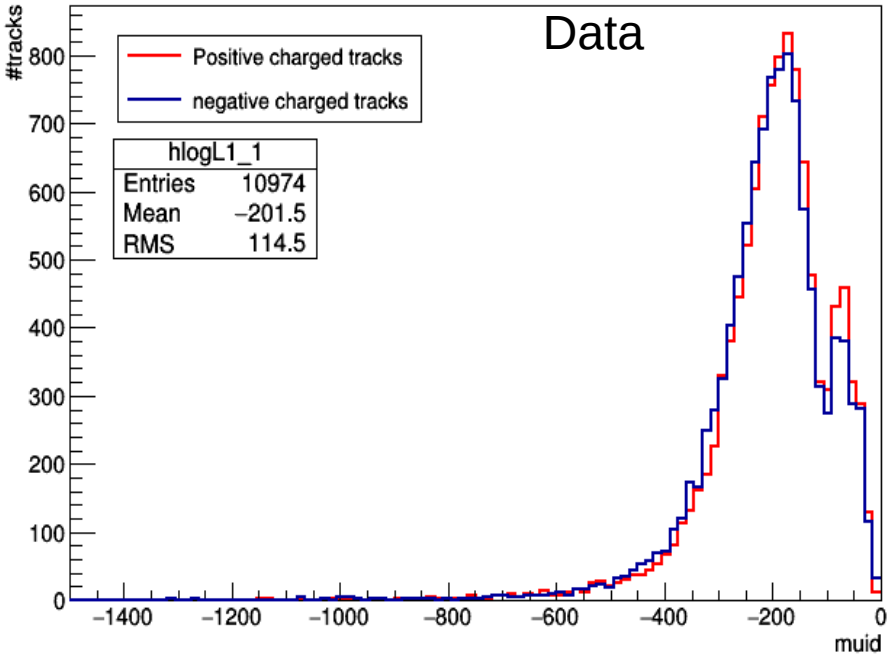
Log likelihood

- Negative log likelihood

Full θ range



In barrel (45° <θ<125°)



It seems in barrel region we have mostly dimuons?

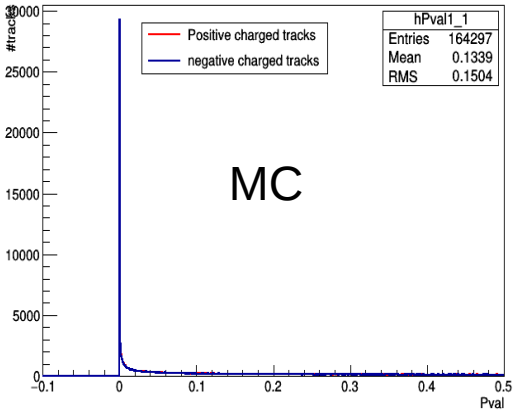
Yield Estimation:

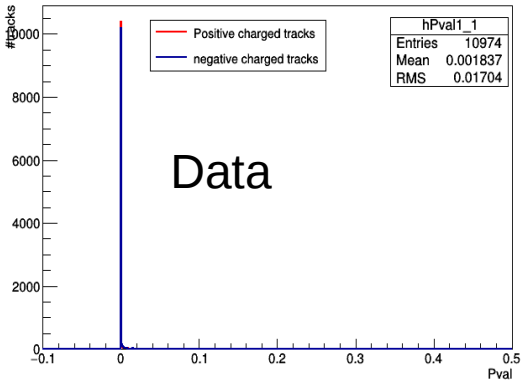
Luminosity =92 pb^{-1}

- Efficiency = 33% (signal MC) but no trigger efficiency included
- Expected yield ~ 34000
- Observed yield ~ 11000

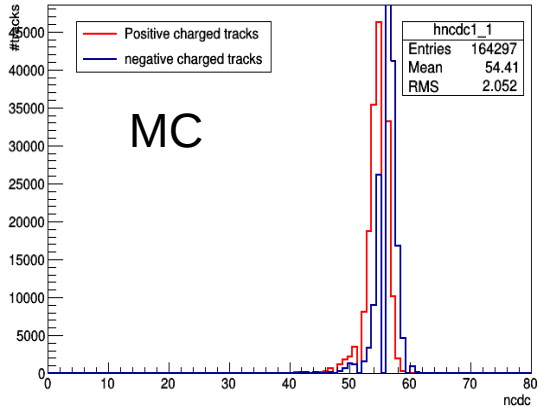
Barrel region

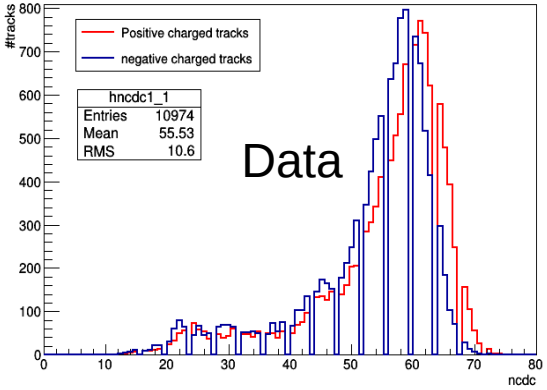
P value



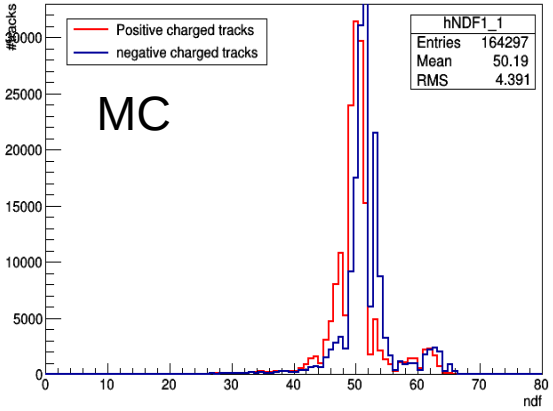


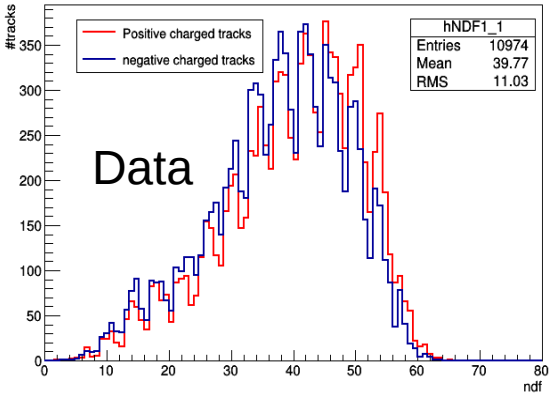
Number of CDC hits





Number of degree of freedom

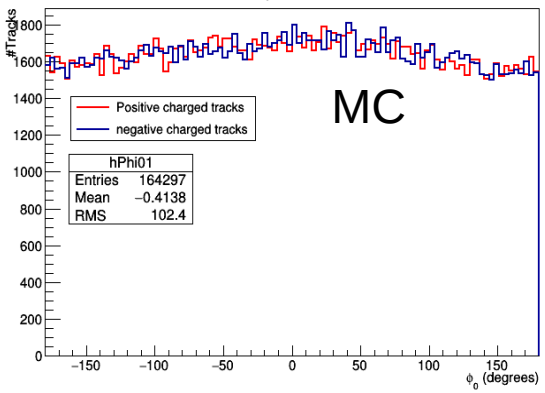




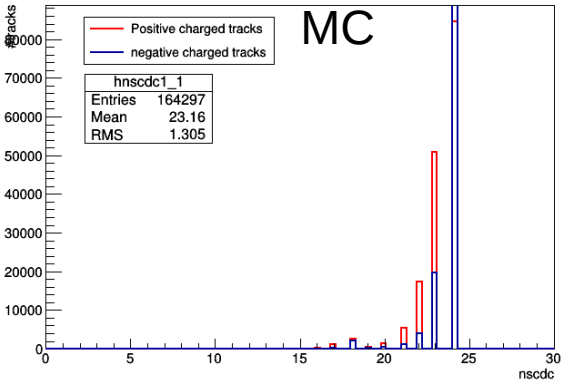
- Large difference of the p-value between data and MC.
- Average number of CDC hits is similar for MC and data but distribution is quite different.

Barrel region

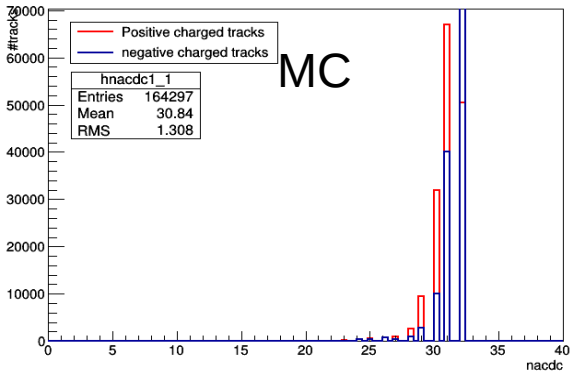
Φ distribution

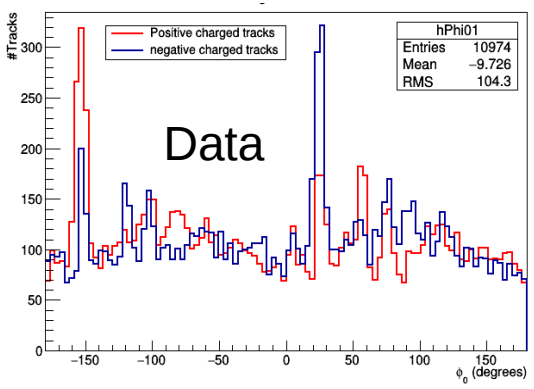


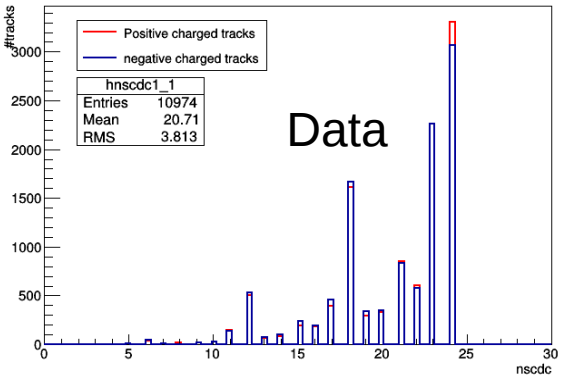
Number of stereo CDC hits

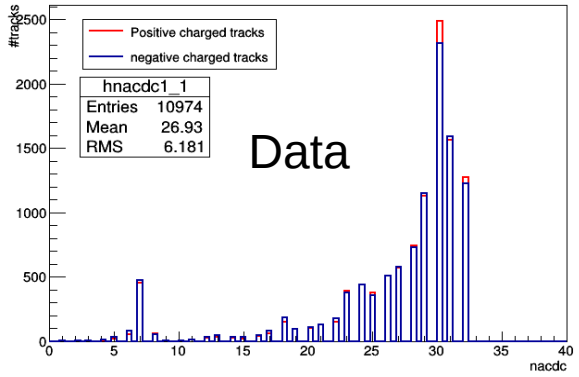


Number of axial CDC hits





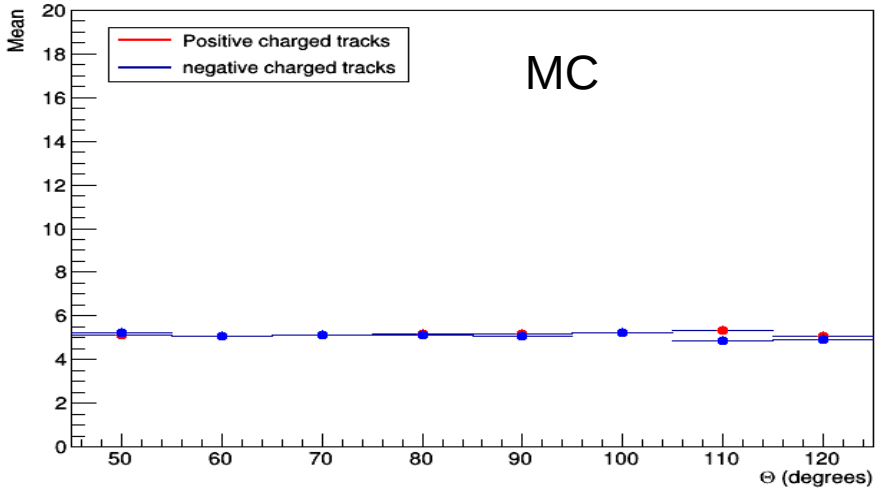




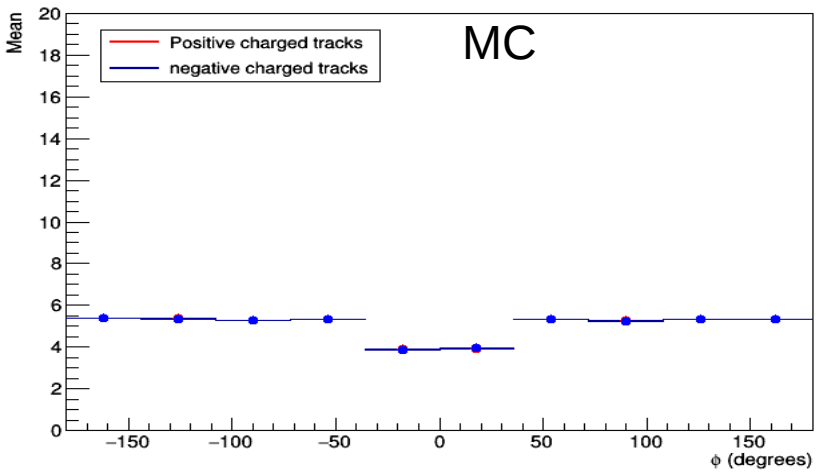
- Average of stereo and axial CDC hits is similar for MC and data.

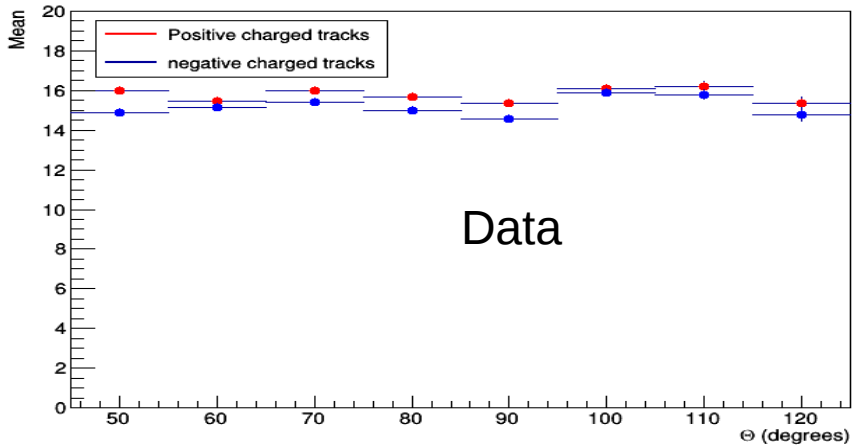
Barrel region

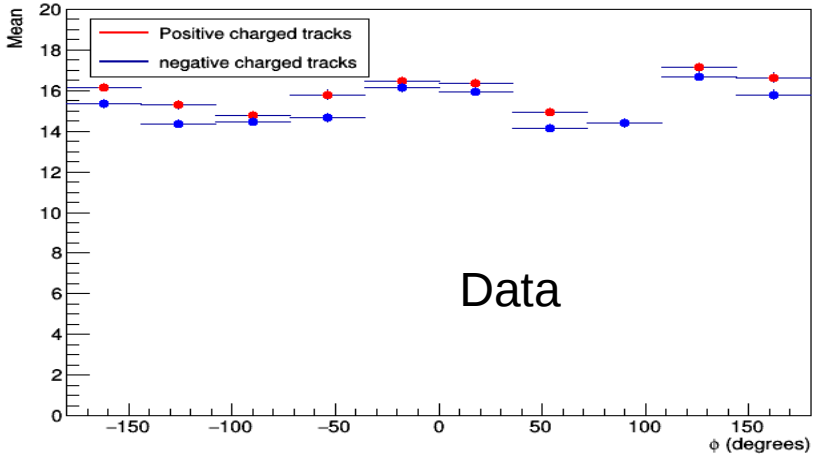
ncdc-ndf in θ bin



ncdc -ndf in Φ bin



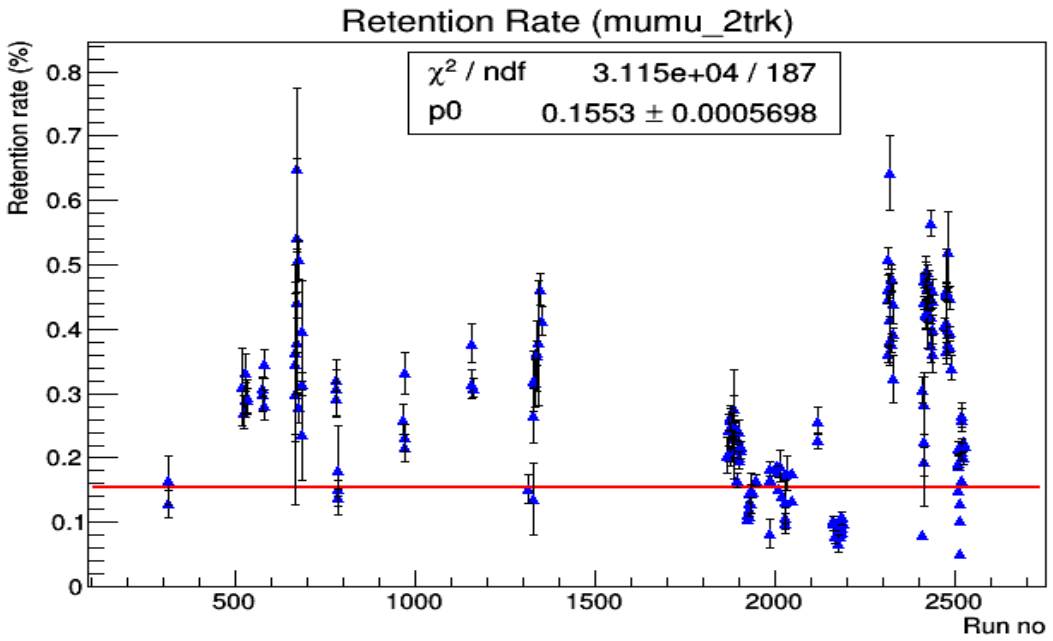




Difference of ncdc and ndf is higher for data.
More information can be retrieve from dimuon sample: d_0, Z_0 resolution....

Summary

- Still lot of work to do....
- Study trigger efficiency (check the trigger information in prod3)



- Estimate more precisely the background contamination:
  - Started to study DR2 sample.
  - Tighten the selection to get higher purity.