Tracking – CDC

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exp 3, collision/cosmics

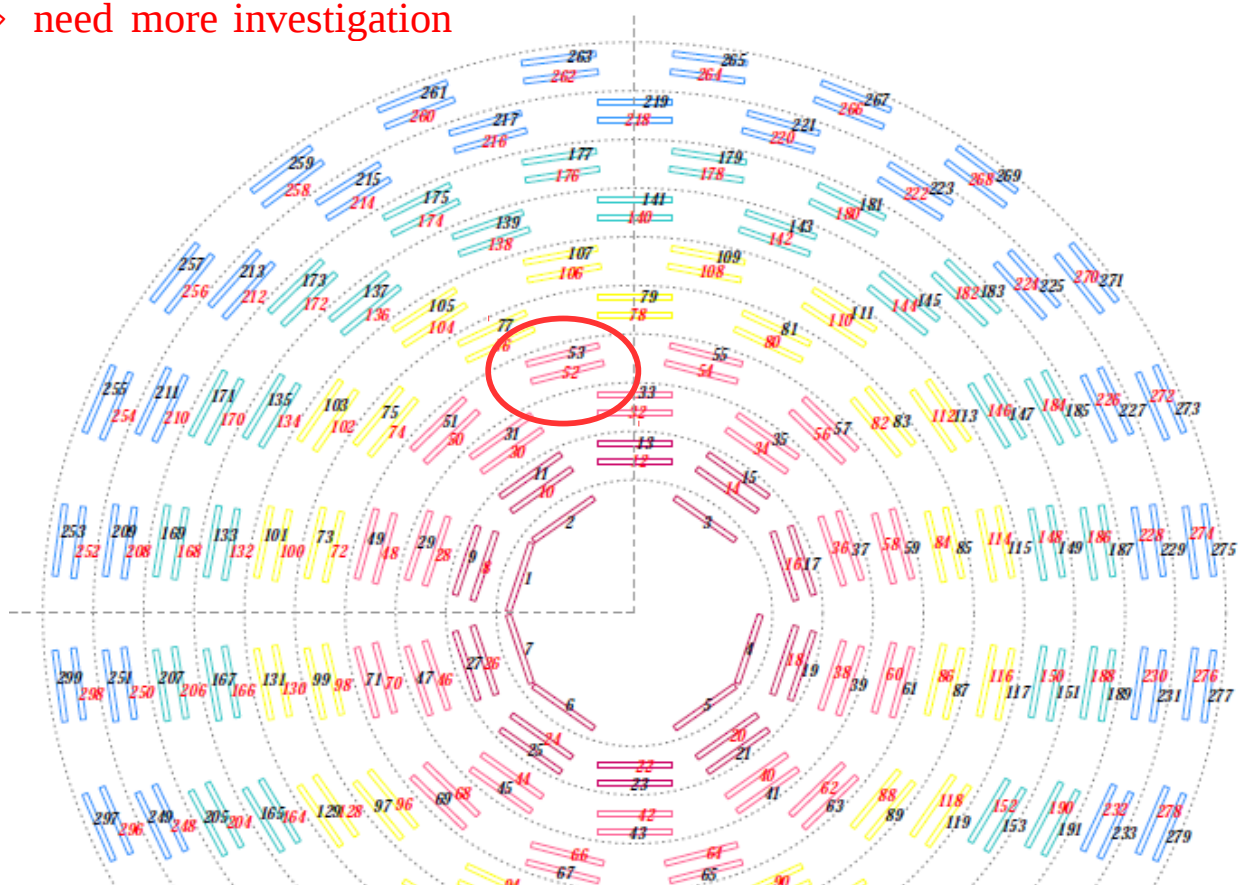
- **dip in ϕ**
- **preparation for prod3, cosmics**
- **magnetic field study**
- **dimuon study**

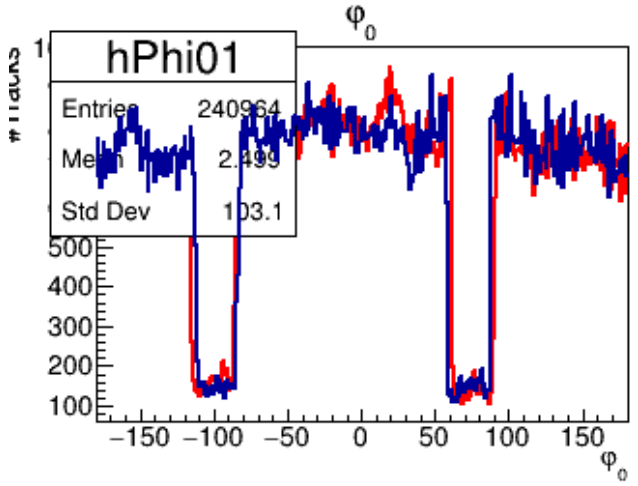
- **dip in ϕ**
  - reported in several occasions

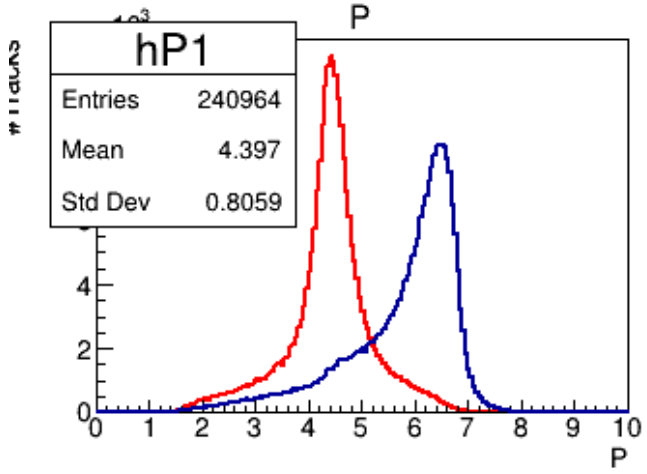
(H. Ozaki)

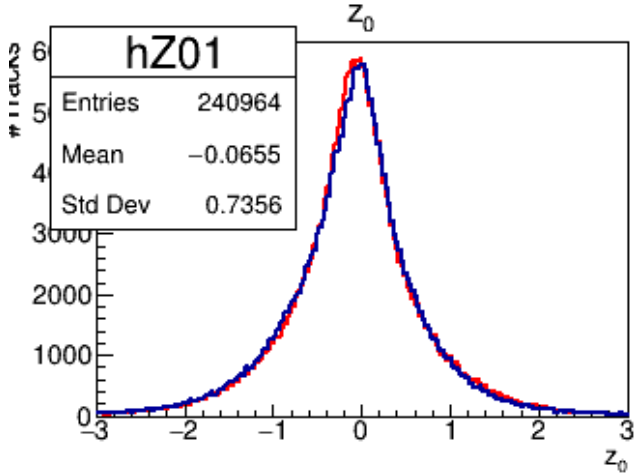
* The timing info. from the problematic boards seems healthy; only ADC info. has a problem.
* Those ADCs seem unstable, not totally dead. So ADC-counts seem to be set to non-zero values (values may be incorrect) sometimes, to zero sometimes.
* My understanding is that hits with ADC=0 are excluded from all tracking including T0-determination. No time walk correction is (cannot be) applied to hits with ADC=0.
* So sometimes tracking codes can use those hits (although time-walk correction may be incorrect), sometimes cannot use them at all.

but why tracking would be affected so much by this small ADC problem ?
⇒ need more investigation









Next (re)processing... (prod3)

release-01-02-04

- trigger information to mdst → TRG GDL/ECL unpacker
- update cdst format (ARICH, KLM information)
- HLT/calibration code update → calibration skims
- Event time estimation ?? (it seems not)

BIIDP-688	reprocessing with release-01-02-04 (prod3)		OPEN	Trabelsi Karim
BIIDP-689	instructions for including SVD hits in the reprocessing		OPEN	Thomas Lueck
BIIDP-691	Announcement from computing group of raw data available for DP group		OPEN	Takanori Hara
BIIDP-692	update of add_cdst including ARICH information		RESOLVED	Luka Santelj
BIIDP-693	TOP good run list (up to 1162)		CLOSED	Trabelsi Karim
BIIDP-694	update of dE/dx constants for exp3 prod3		OPEN	Jake Bennett
BIIDP-695	ECL energy calibration constants for prod3		RESOLVED	Christopher Hearty
BIIDP-696	KLM request to process exp3 cosmic data		RESOLVED	Trabelsi Karim
BIIDP-697	relation between run# and library version which should be used for SROOT-ROOT format conversion		OPEN	Thomas Hauth
BIIDP-698	magnetic field maps		IN PROGRESS	Aiqiang Guo
BIIDP-699	VXD alignment constants		RESOLVED	Tadeas Bilka
BIIDP-700	update the TOP calibration for exp3 prod3		IN PROGRESS	Umberto Tamponi
BIIDP-701	KLM request to add Muids and TracksToMuids to cdst data in prod3		CLOSED	Trabelsi Karim
BIIDP-703	Updating CDC constants for GCR3		IN PROGRESS	Makoto Uchida
BIIDP-706	Runs: 969 970 971, BAD SVD data		RESOLVED	Trabelsi Karim
BIIDP-707	SVD Runs 2314 to 2330 taken with lower ZeroSuppression		OPEN	Giulia Casarosa
BIIDP-709	BAD SVD Runs: 2425, 2430, 2431		OPEN	Trabelsi Karim
BIIDP-710	Modify the TOPBunchFinder steering parameters to cope with the 2ns bunch spacing		OPEN	Marko Staric

- new GT: for dE/dx, ECL, TOP, CDC VXD alignment

- expect release-01-02-04 ready today ?

⇒ prod 3 (re)processing, also setting for coming luminosity runs

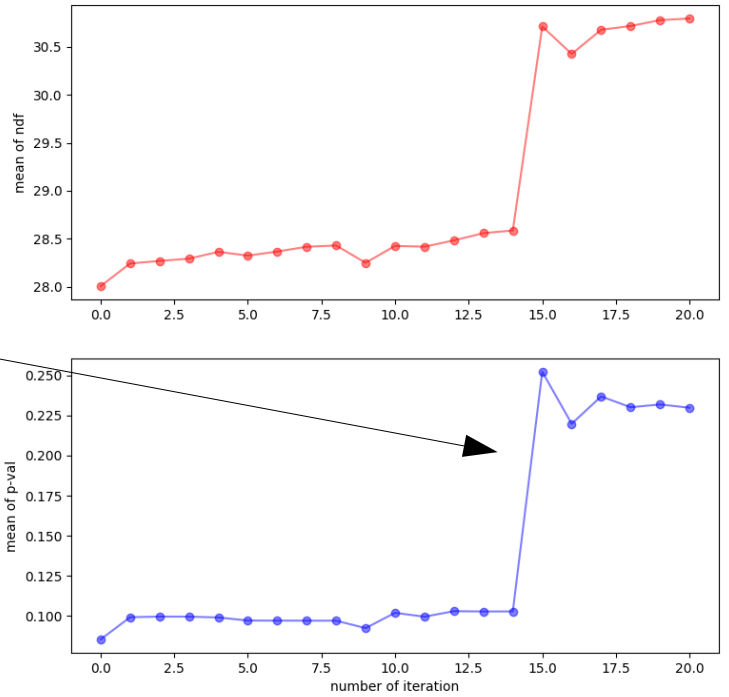
→ new magnetic field map (accounting for difference seen with 2016 measurements)?

Next (re)processing... (prod3)

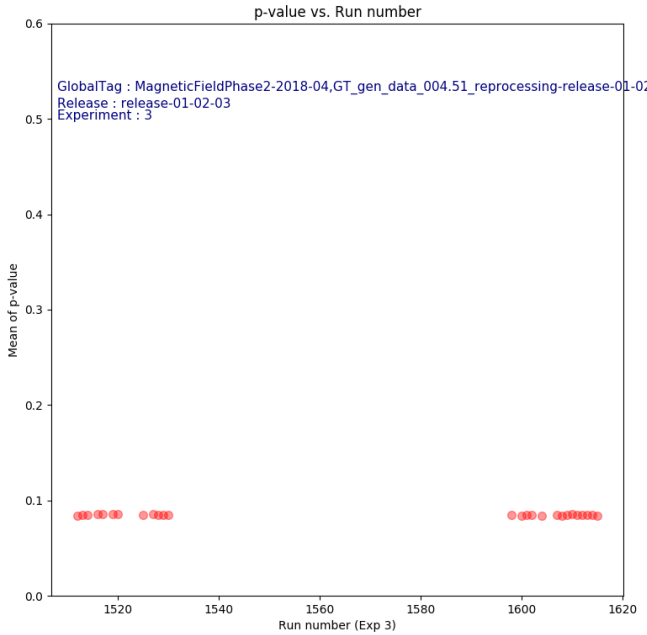
- **CDC: recalibrate with exp 3 cosmics (M. Uchida)**

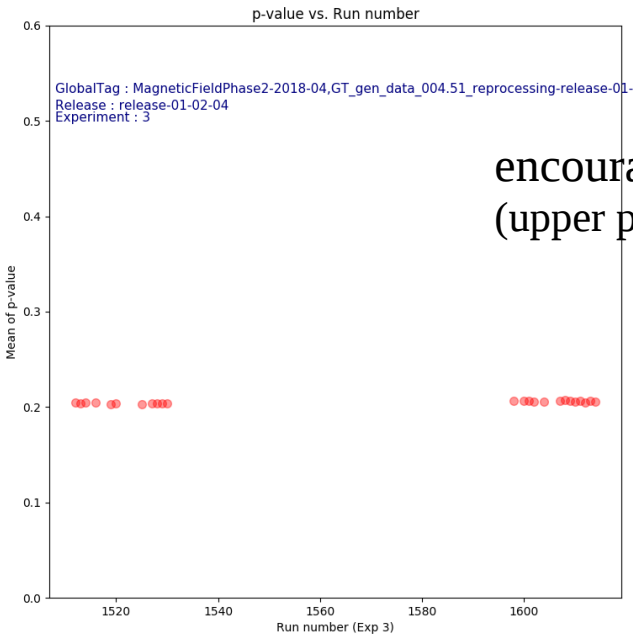
GCR 3: exp 3, runs 1512 - 1615

significant improvement in the iteration where 1st xt calibration



Validation of these new constants with GCR 3
https://confluence.desy.de/display/BI/Offline+monitoring+CDC+data





encouraging, better than GCR 2
(upper part of CDC especially improved)

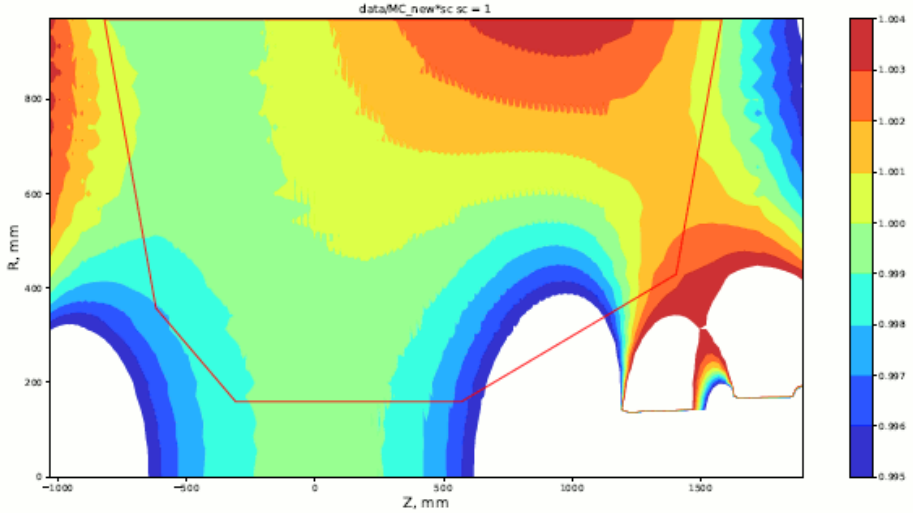
remaining thing to do: problem with one set of constants for layer 8 → generate lot of error messages...

and of course, before prod3 needs to solve problem with SVD hits association...

◦ magnetic field study

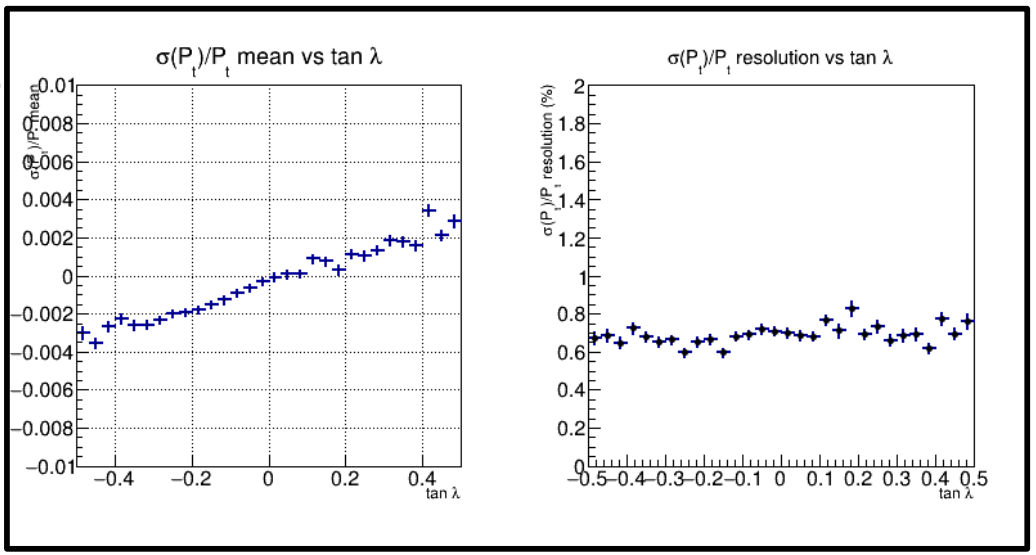
comparison latest magnetic field map (QCS off) and data taken in 2016

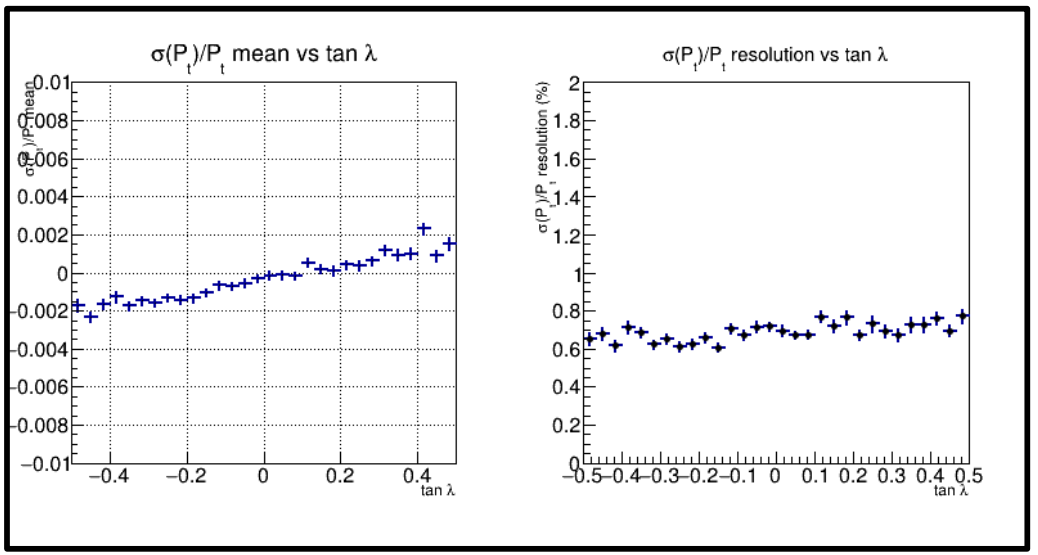
Aiqiang Guo (DESY)



asked Aiqiang to provide corrected magnetic field maps → M. Takahashi converted it to GT (BIIDP-698)

apply to GCR 3





in the good direction, though still room for improvement (need to try on GCR 2)

main current priority

- converge on main calibration skims (offline selection = HLT/calib selection)
- HLT variables accessible from HLT calib part → release-01-02-04
- additional lines are being prepared

Bhabha event selection

- N_bhabha_trk_cut = 2; //Number of Bhabha tracks
- N_bhabha_cls_cut = 2; // Number of bhabha clusters
- P_bhabha_cut = 0.5; //Momentum cut
- E_bhabha_1st_cut = 2.0; // for Ist energy cut
- E_bhabha_total_cut = 4.0; //total energy cut in calorimetor
- acol_angle_cut = 10.0; //acolinearity
- cos_barrel_rest1 = 46.7419; } For negative charge tracks, in barrel region
- cos_barrel_rest2 = 145.715; }
- cos_barrel_rest11 = 50.5; } For luminosity
- cos_barrel_rest12 = 129.5; }
- cos_foreward_rest1 = 23.0462; } For forward region
- cos_foreward_rest2 = 45.262; }
- cos_backward_rest1 = 146.804; } For backward region
- cos_backward_rest2 = 160.594; }

eeee selection

- Vr_4e_cut =0.3; // vertex R cut in cm
- Vz_4e_cut =3.2; // vertex Z cut in cm
- Vz_4e_cut2 =0.8; // 2nd level cut for Z
- Pt_4e_cut =0.25; // Pt cut
- S_Pz_4e_cut =-1.; //pz balance in CMS frame
- S_Pt_4e_cut =0.2; // pt balance in CMS frame
- W_4e_cut =5.0; // Invariant mass of 2 tracks
- E_tot_4e_max =6.0; //Max. total energy deposit at ECL
- E_tot_4e_min =0.6; //Min. total energy deposit at ECL

Radiative bhabha events

- Ntrk_eeg_cut = 1; // number of minimum tracks
- Ncls_eeg_cut = 3; //number of ECL clusters
- E3sum_eeg_cut = 8.0; //sum of the 3 bigest cluster energy.
- E_eeg_min_cut = 0.1; //min. energy deposit
- E_eeg_total_cut = 11.0; //total ECL energy
- Q_eeg_cut = 0.0; //charge sum of tracks

Gamma pair selection

- N_gamma_trk_cut = 2; // number of gamma tracks allowed
- N_gamma_cls_cut = 2; // number of gamma clusters
- E_gamma_cut = 0.5; //Energy deposited cut
- acol_gamma_cut = 15.0; //cluster acollinearity in deg
- E_gamma_1st_cut = 2.0; //Ist energy cut
- E_gamma_total_cut = 4.0; //total energy cut

mu pair selection

- N_mu_trk_cut = 2; // number of tracks
- P_mu_cut = 0.5; //track momentum
- T_mu_cut = 8.0; //time difference
- E_mu_sum_cut = 2.0; //total deposit energy
- E_mu_trk_sum_cut = 2.0; //total track associated ECL energy
- acol_mu_cut = 10.0; //acollinearity

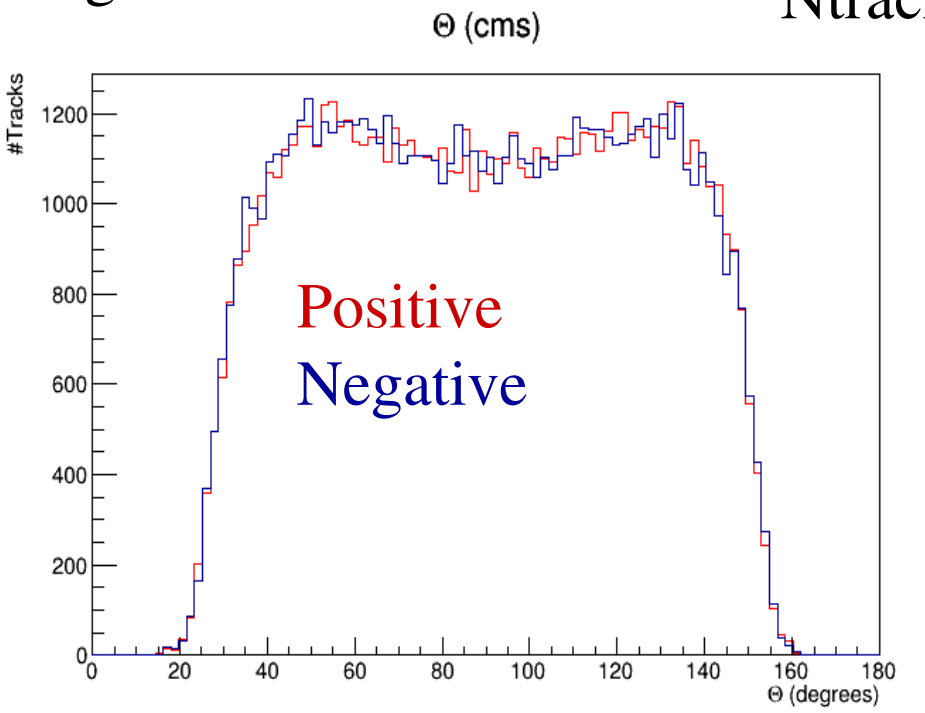
https://confluence.desy.de/display/BI/Experiment+3+skims

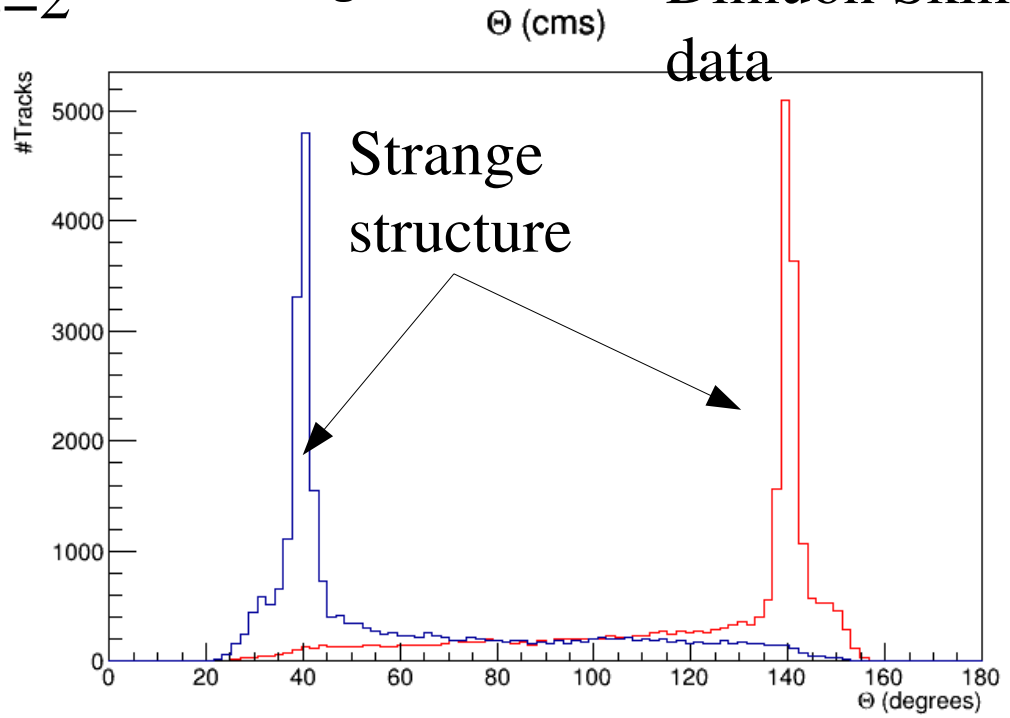
Signal MC

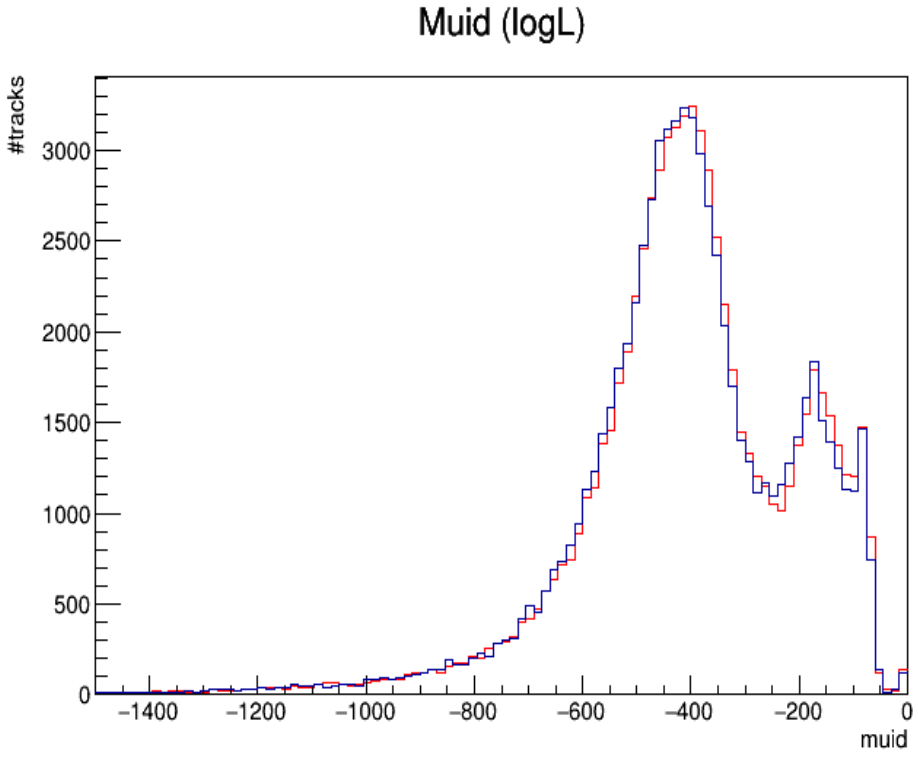
Ntracks=2

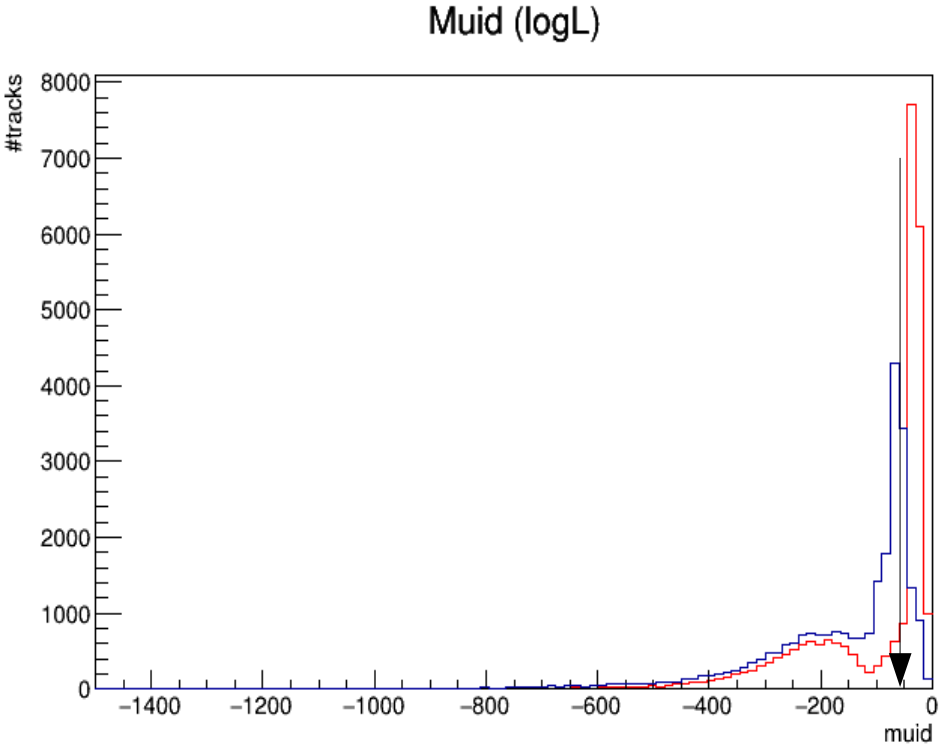
R . Garg

Dimuon Skim data

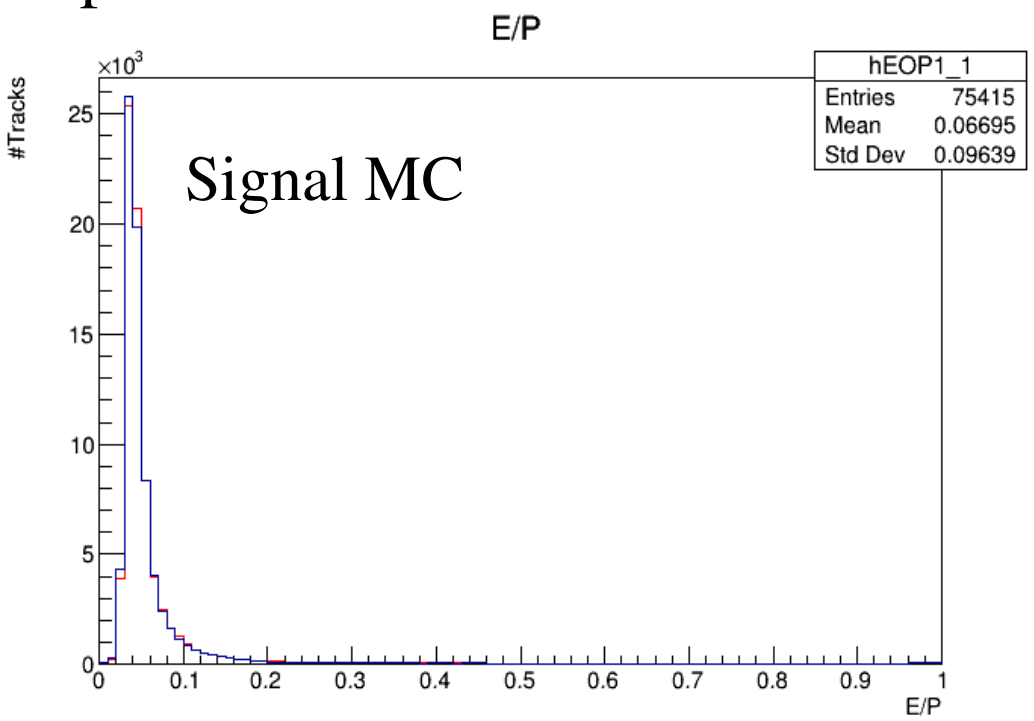


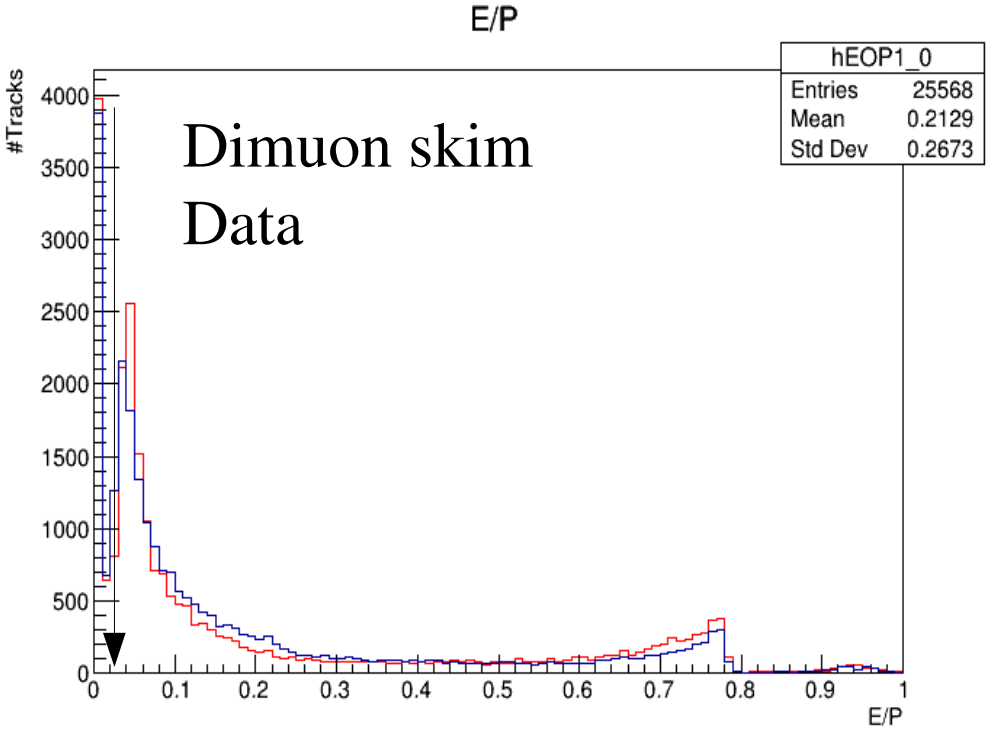


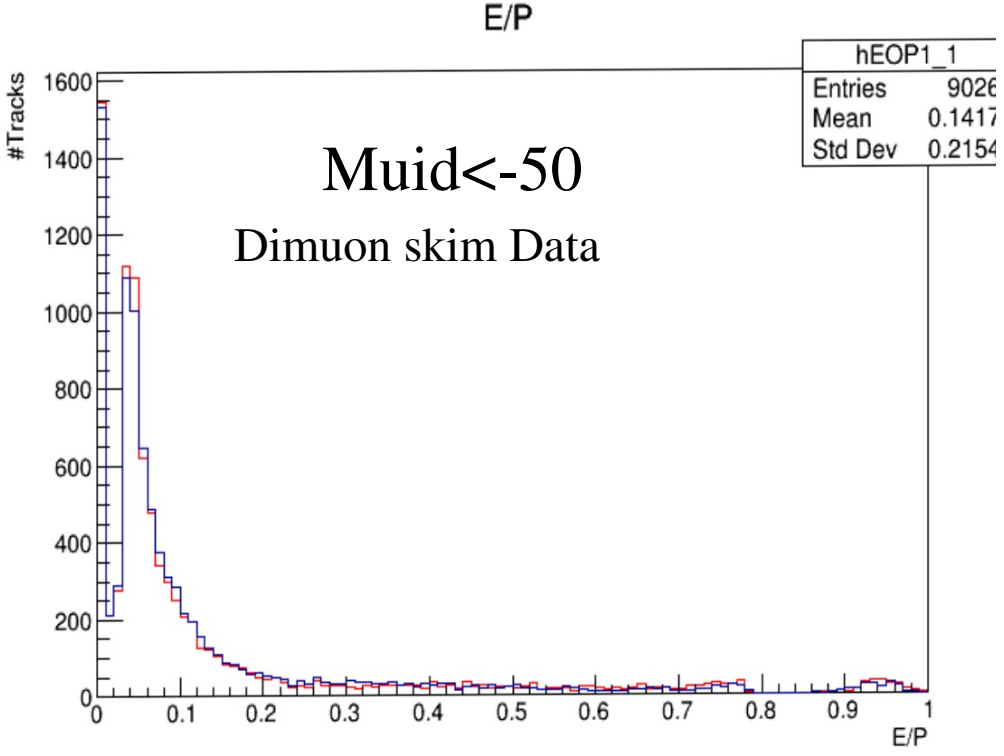


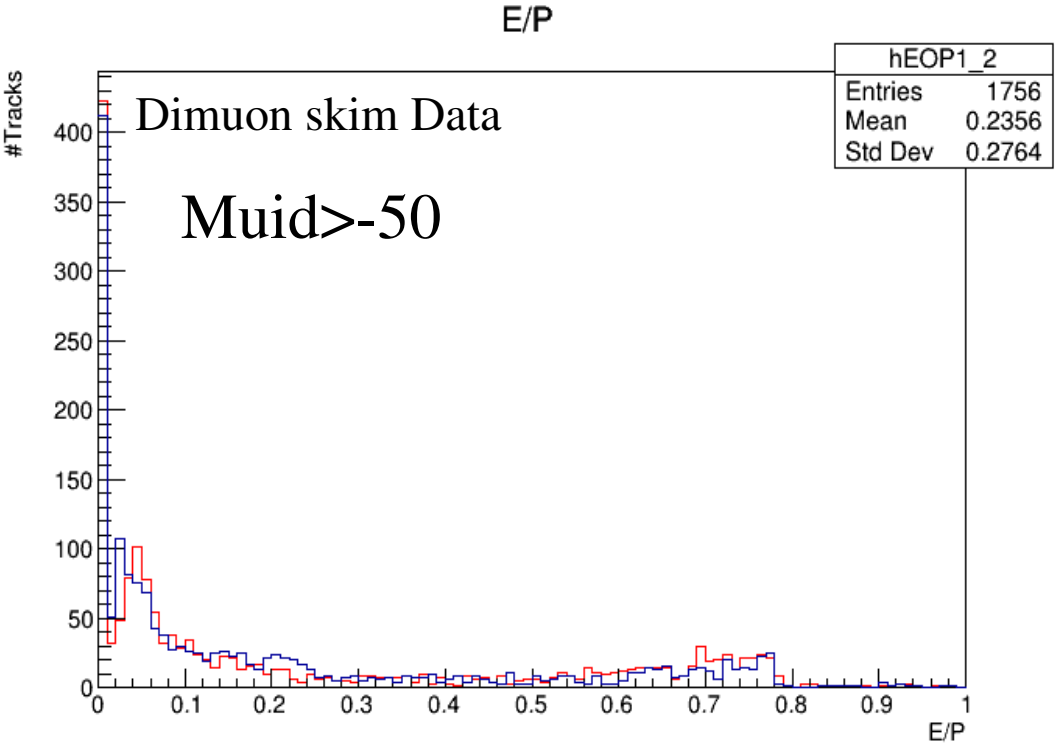


E/p

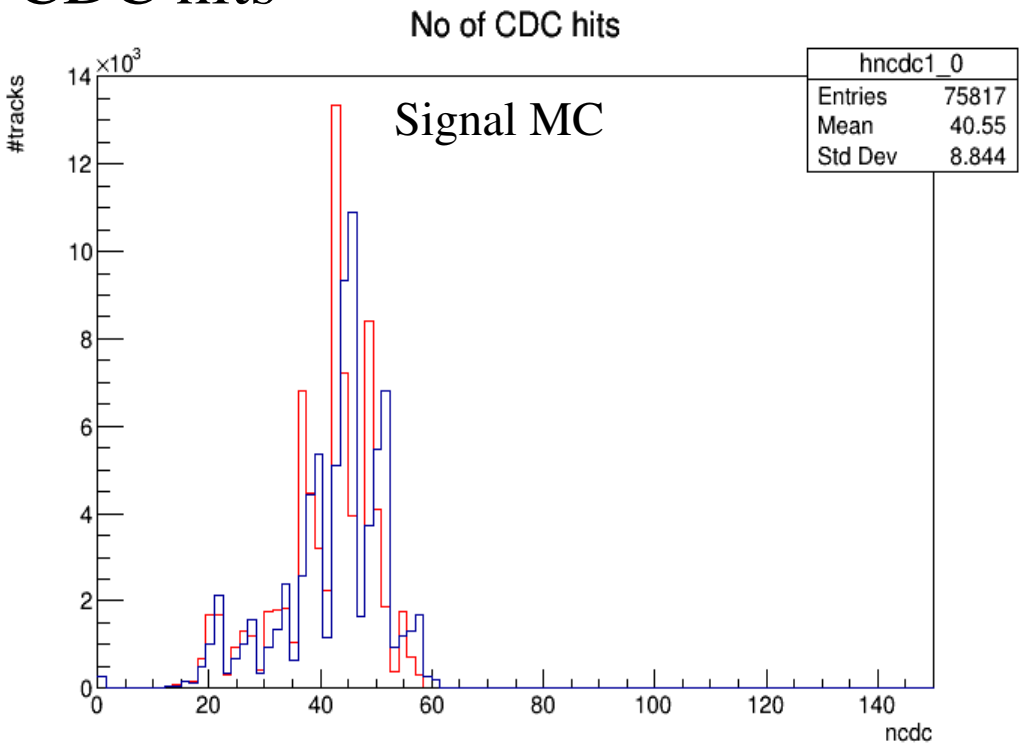

E/P
hEOP1_1
Entries 75415
Mean 0.06695
Std Dev 0.09639
Signal MC
#Tracks
E/P

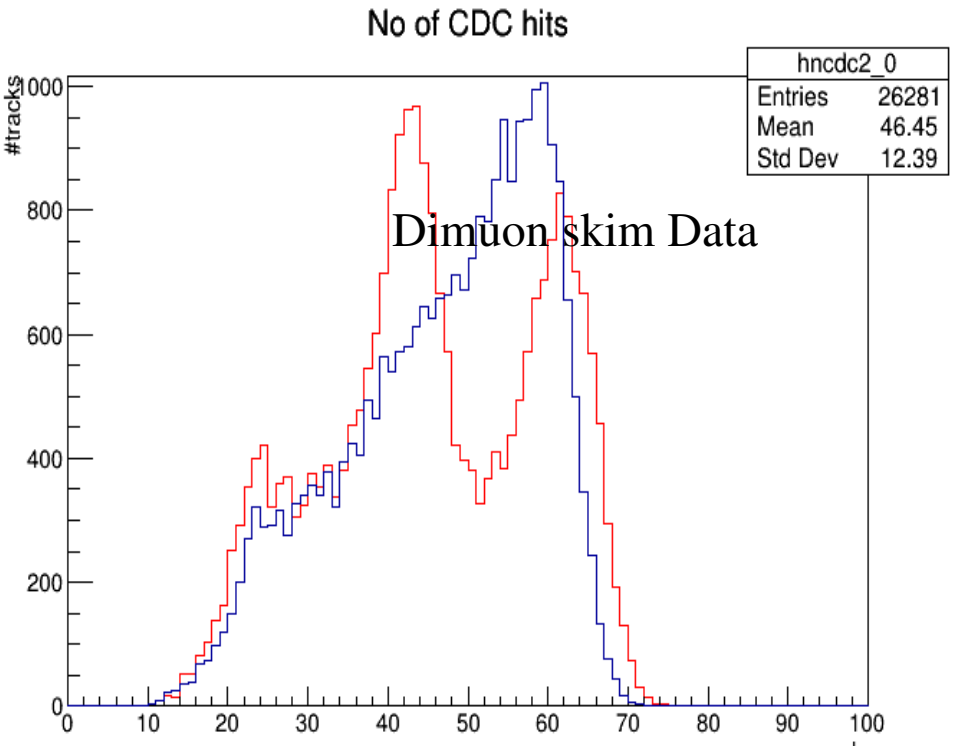

E/P
hEOP1_0
Entries 25568
Mean 0.2129
Std Dev 0.2673
Dimuon skim
Data
#Tracks
E/P

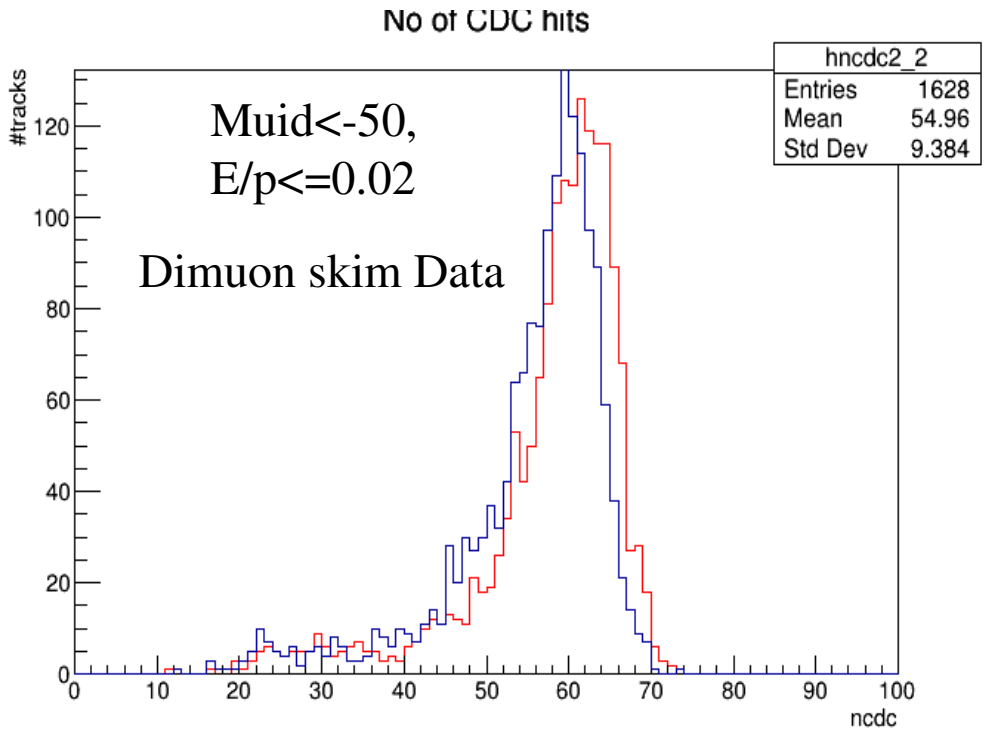

E/P
hEOP1_1
Entries 9026
Mean 0.1417
Std Dev 0.2154
Muid<-50
Dimuon skim Data
#Tracks
E/P

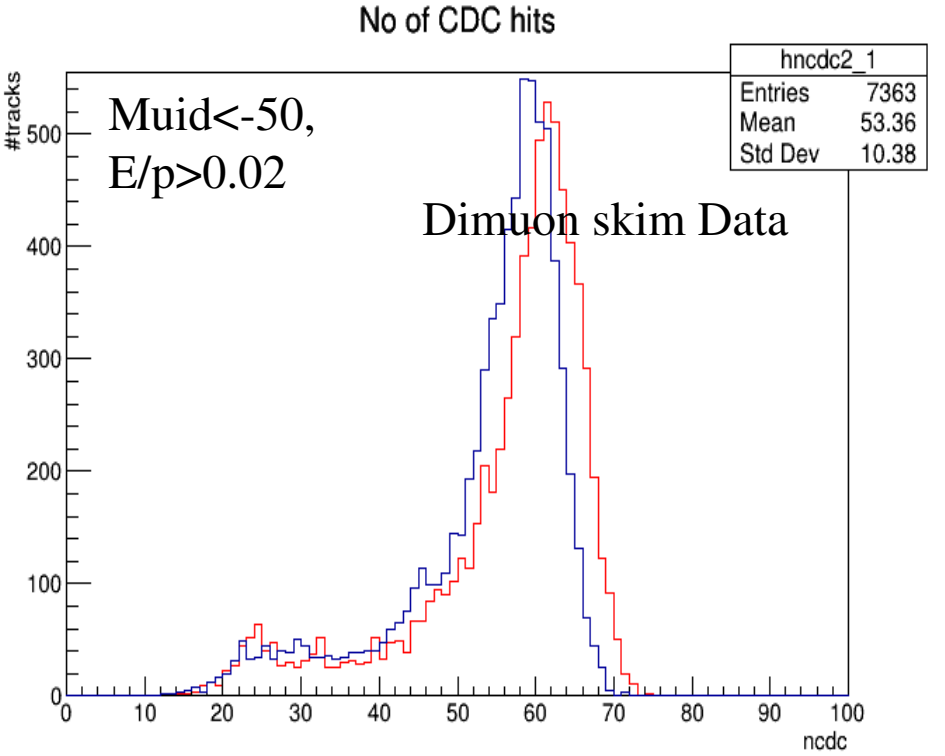

E/P
hEOP1_2
Entries 1756
Mean 0.2356
Std Dev 0.2764
Dimuon skim Data
Muid>-50
#Tracks
E/P

CDC hits

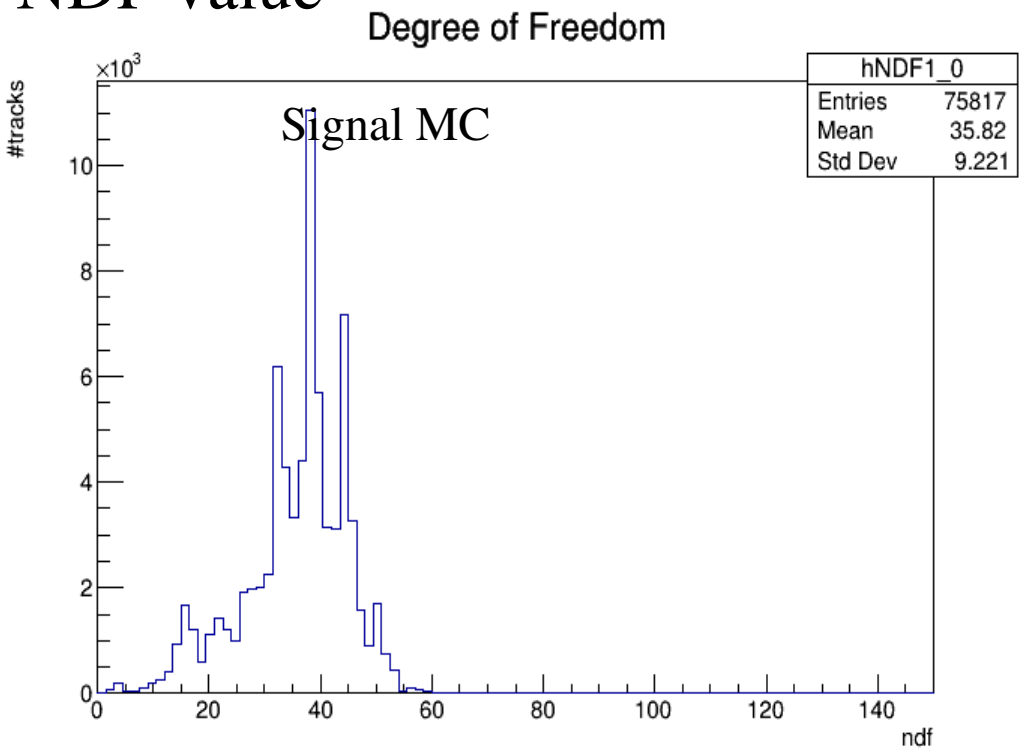

No of CDC hits
hncdc1_0
Entries 75817
Mean 40.55
Std Dev 8.844
Signal MC
#tracks
ncdc

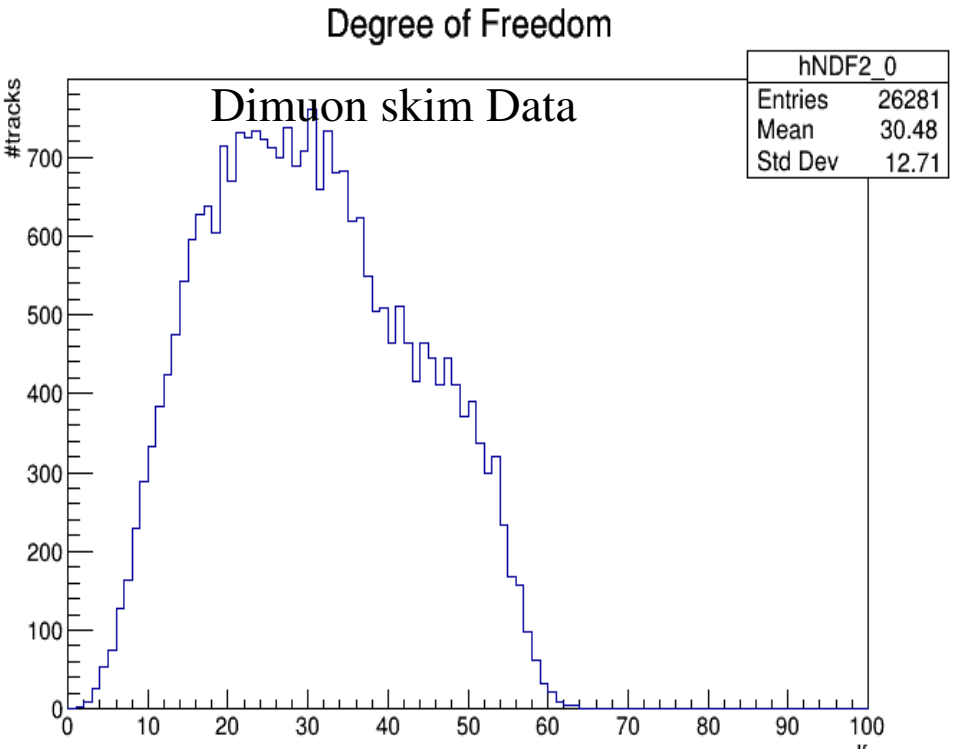

No of CDC hits
hncdc2_0
Entries 26281
Mean 46.45
Std Dev 12.39
Dimuon skim Data
#tracks

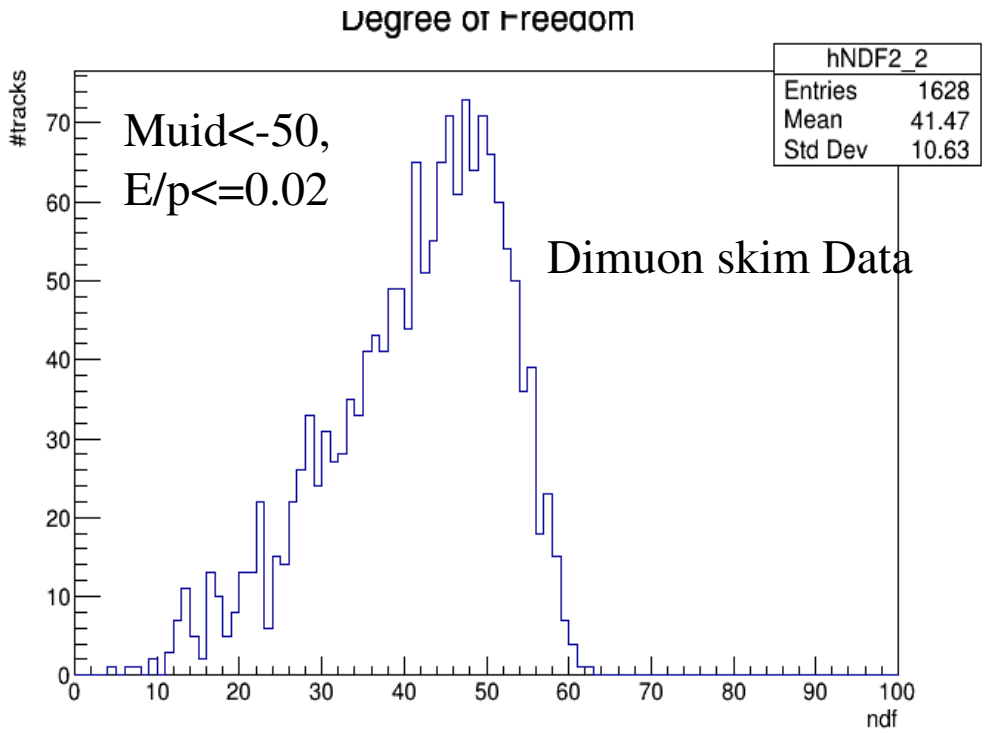

No of CDC hits
hncdc2_2
Entries 1628
Mean 54.96
Std Dev 9.384
Muid<-50,
E/p<=0.02
Dimuon skim Data
#tracks
ncdc

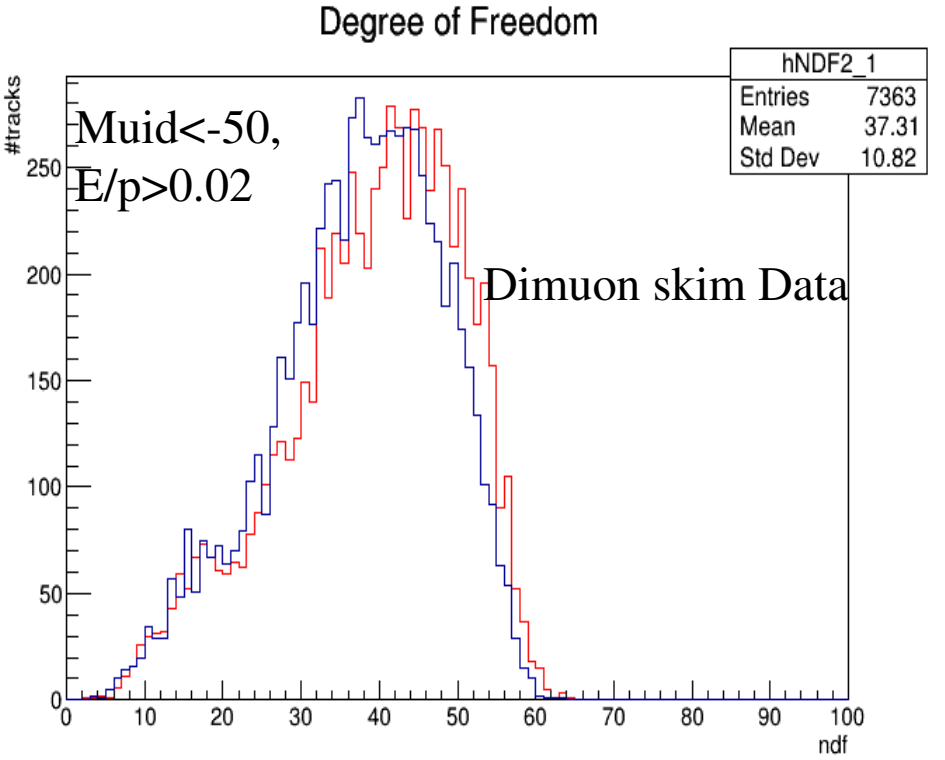

No of CDC hits
hncdc2_1
Entries 7363
Mean 53.36
Std Dev 10.38
Muid<-50,
E/p>0.02
Dimuon skim Data
#tracks
ncdc

NDF value

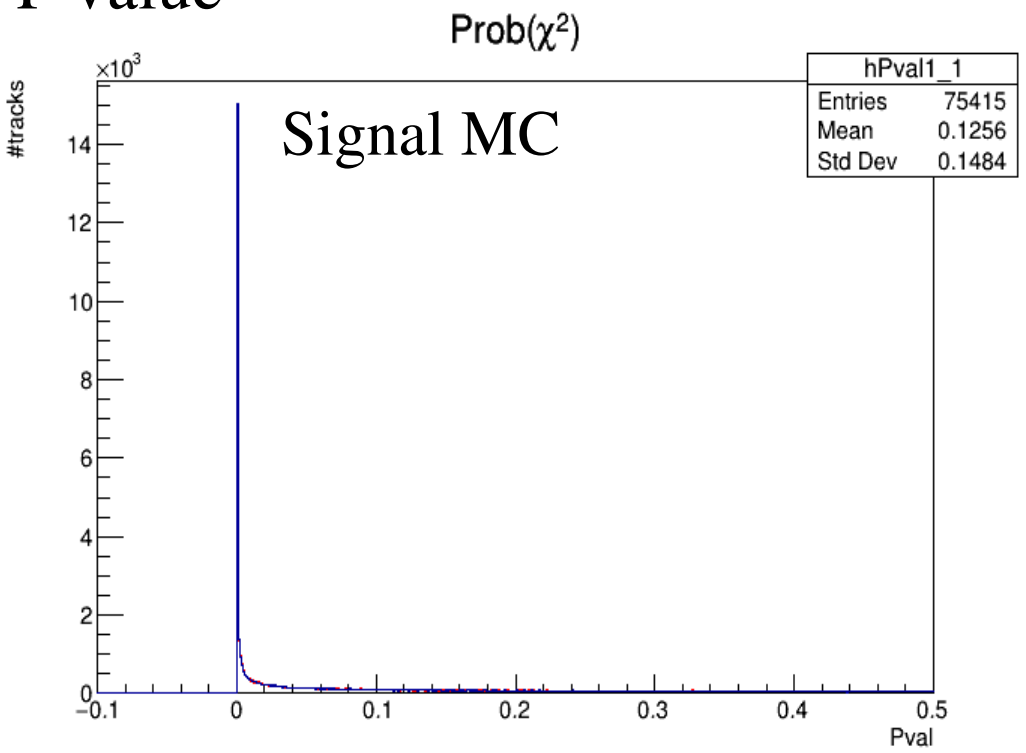

Degree of Freedom
Signal MC
hNDF1_0
Entries 75817
Mean 35.82
Std Dev 9.221
#tracks
ndf

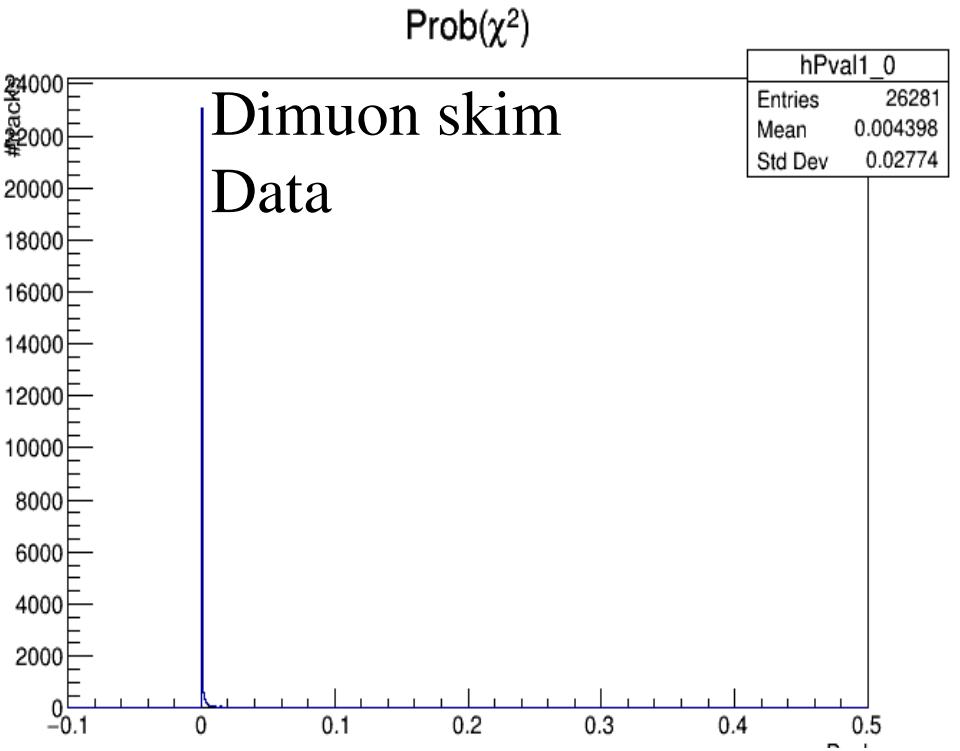

Degree of Freedom
Dimuon skim Data
hNDF2_0
Entries 26281
Mean 30.48
Std Dev 12.71
#tracks

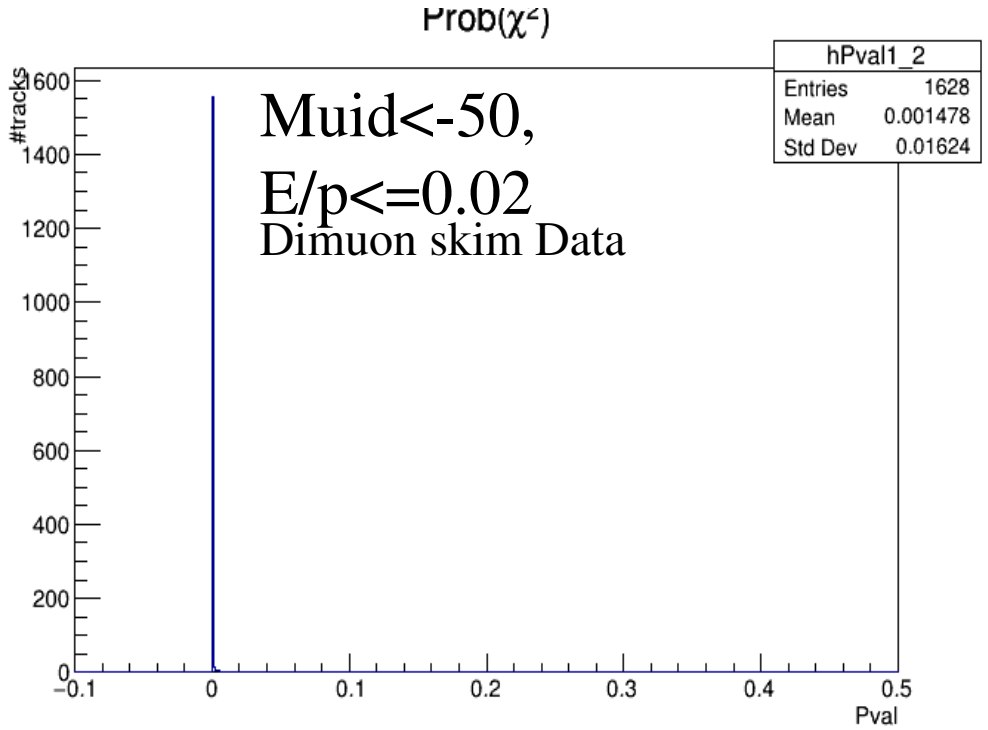

Muid<-50,
E/p<=0.02
Dimuon skim Data
hNDF2_2
Entries 1628
Mean 41.47
Std Dev 10.63
#tracks
ndf

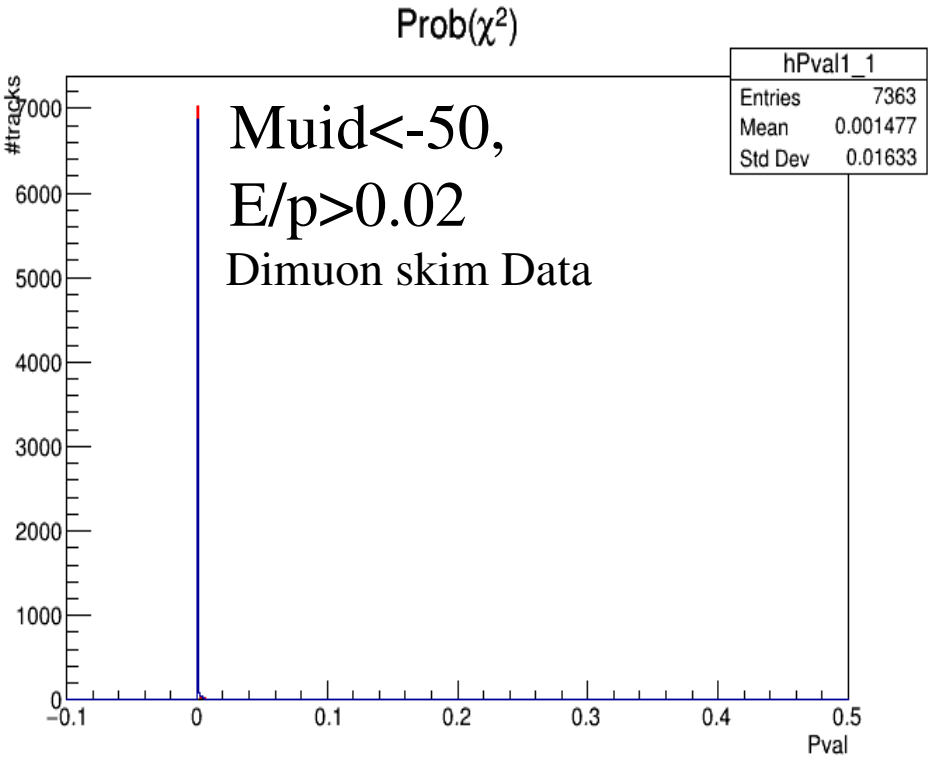

Degree of Freedom
Muid<-50,
E/p>0.02
Dimuon skim Data
hNDF2_1
Entries 7363
Mean 37.31
Std Dev 10.82
#tracks
ndf

P value


Prob(χ²)
Signal MC
hPval1_1
Entries 75415
Mean 0.1256
Std Dev 0.1484
#tracks
Pval

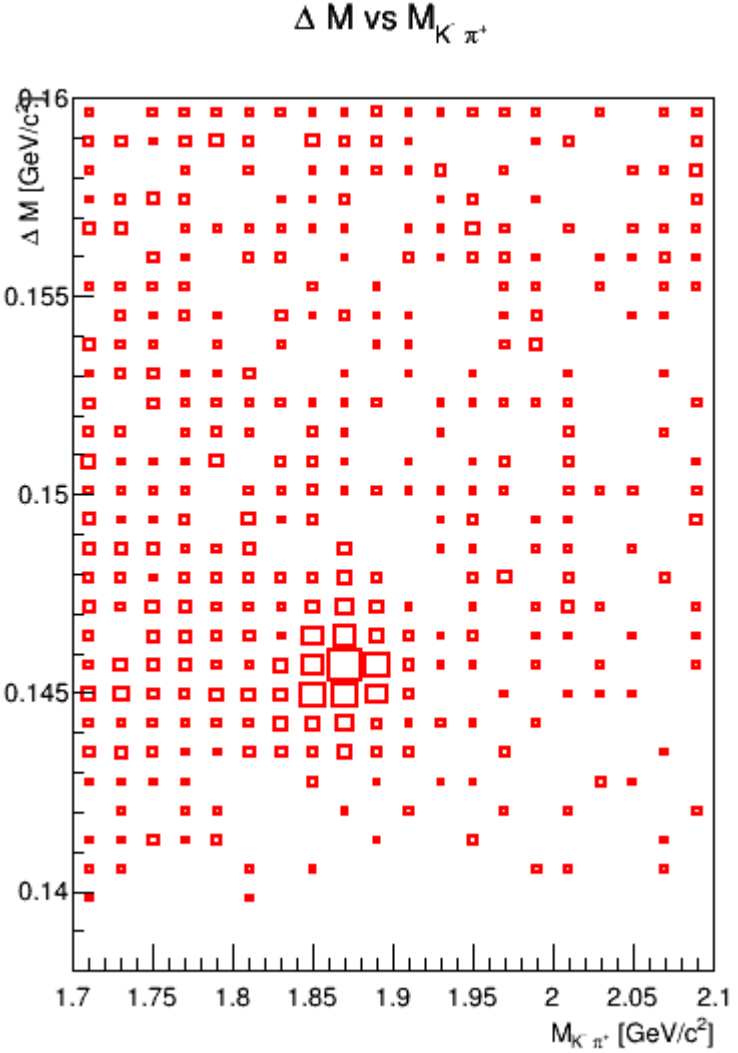

Prob(χ²)
Dimuon skim
Data
hPval1_0
Entries 26281
Mean 0.004398
Std Dev 0.02774
#tracks

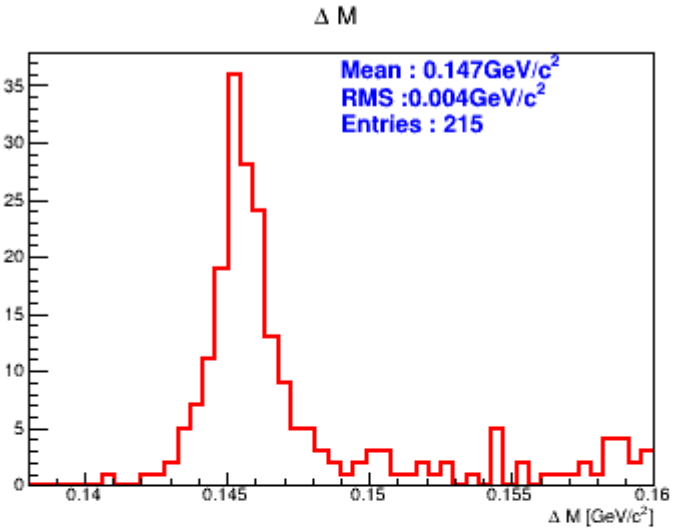

Muid<-50,
E/p<=0.02
Dimuon skim Data
hPval1_2
Entries 1628
Mean 0.001478
Std Dev 0.01624
#tracks
Pval

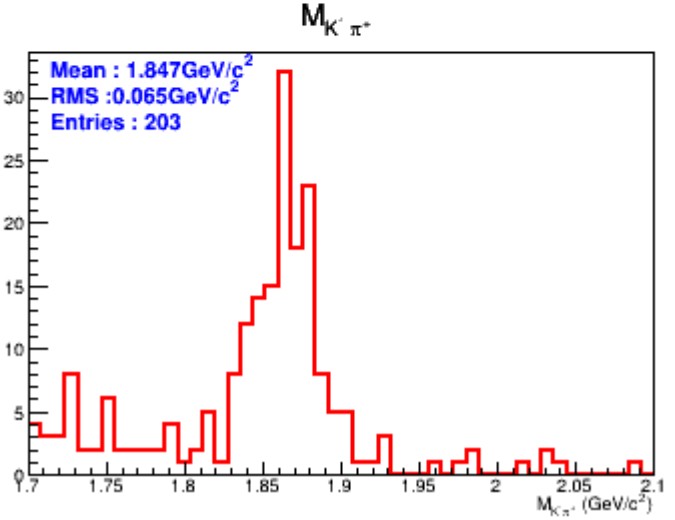

Prob(χ²)
Muid<-50,
E/p>0.02
Dimuon skim Data
hPval1_1
Entries 7363
Mean 0.001477
Std Dev 0.01633
#tracks
Pval

other control samples...soon...

$$D^* \rightarrow D^0(\rightarrow K^- \pi^+)\ \pi$$

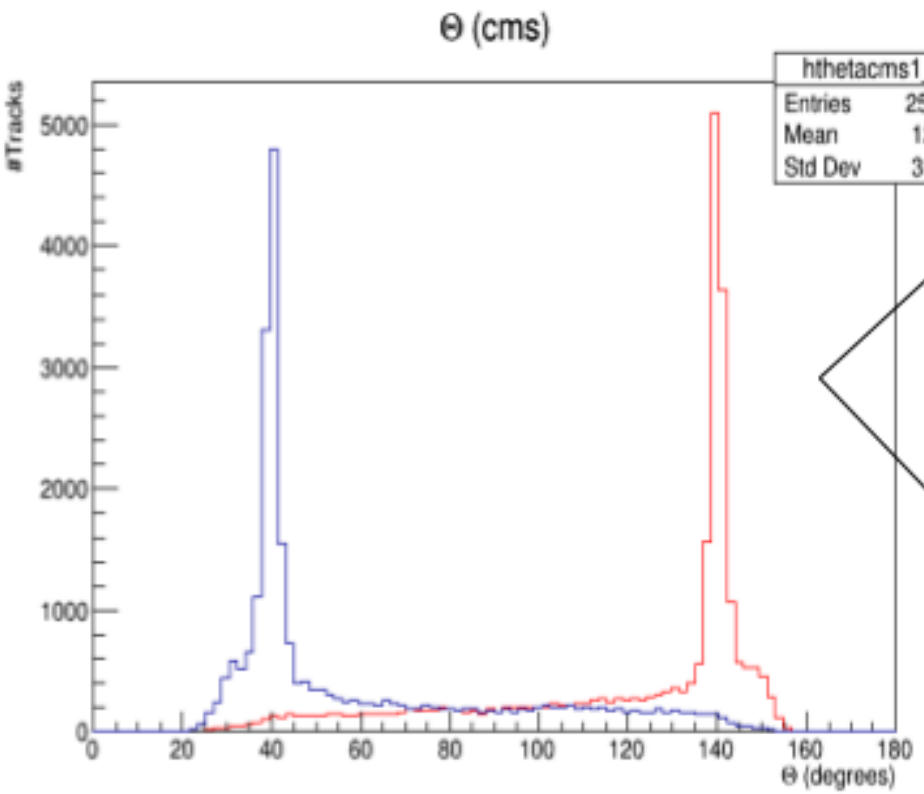




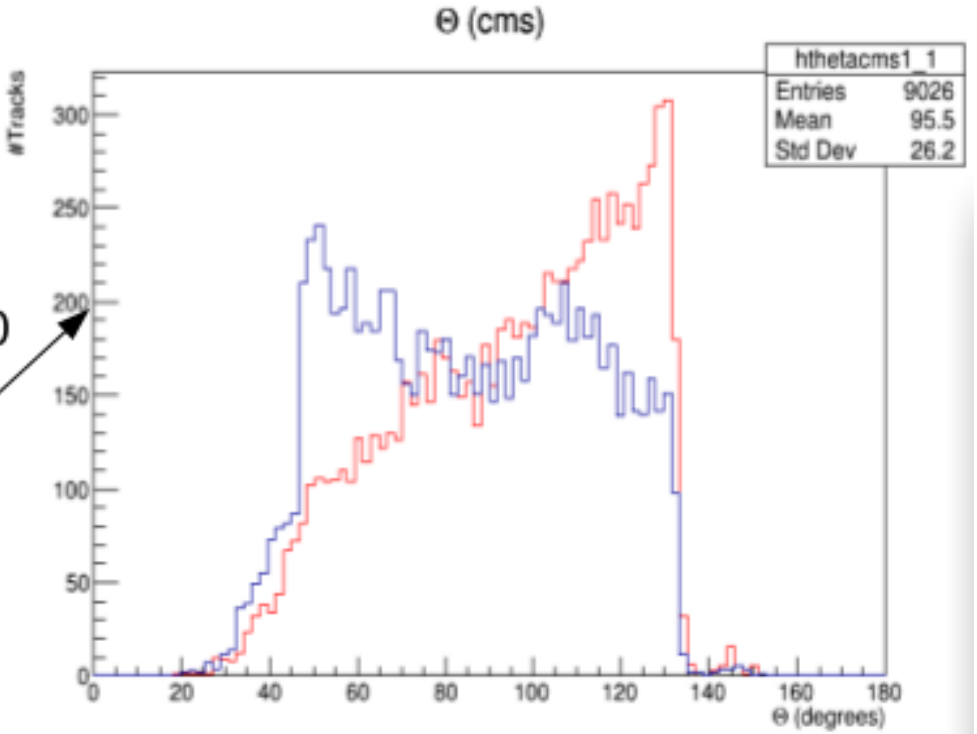


Dimuon Skim data

After Muid cut<-50 peak disappear. It seems Muid is working.



Muid<-50



Muid>-50