

New TPC track selections

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Control of track quality

- Introduced by A. Zinchenko, available in -dev MpdRoot

- Track variables:

```
MpdTpcKalmanTrack *tr = (MpdTpcKalmanTrack*) mpdKalmanTracks->UncheckedAt(j);  
tr->GetNofShared(); // number of shared hits in the track  
tr->GetNofCrossed(); // number of pad rows crossed by the reconstructed track
```

- Constrain track to primary vertex (for primary tracks in the analysis):

```
TClonesArray *smoothTracks = new TClonesArray("MpdTpcKalmanTrack",9);
```

... for each track

```
smoothTracks->Delete();  
new ((*smoothTracks)[0]) MpdTpcKalmanTrack(*tr);  
vertex->GetIndices()->Set(1);  
(*vertex->GetIndices())[0] = 0;  
vertFind.SetVertices(vertexes);  
vertFind.SetTracks(smoothTracks);  
vertFind.SetSmoothSame(1);  
vertFind.Smooth();
```

```
MpdTpcKalmanTrack *tr1 = (MpdTpcKalmanTrack*) smoothTracks->UncheckedAt(0);  
TVector3 mom3 = tr1->Momentum3(); // vertex-constrained momentum
```

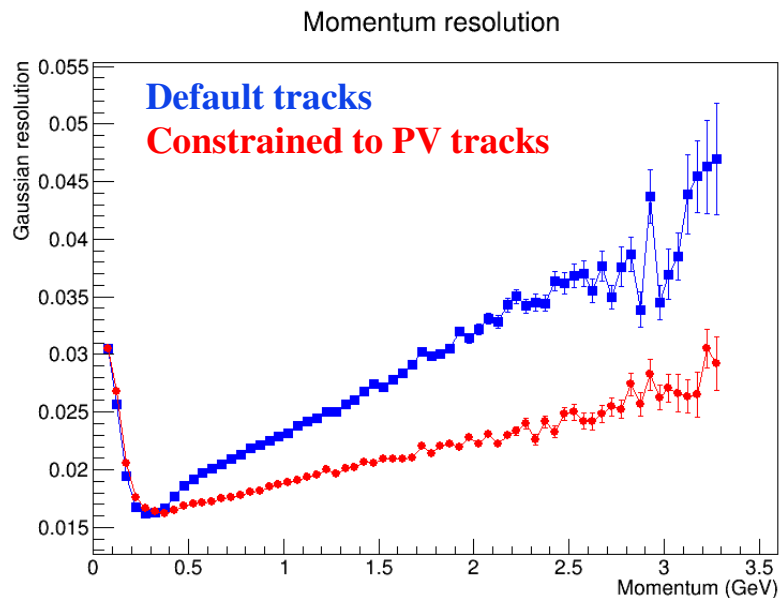
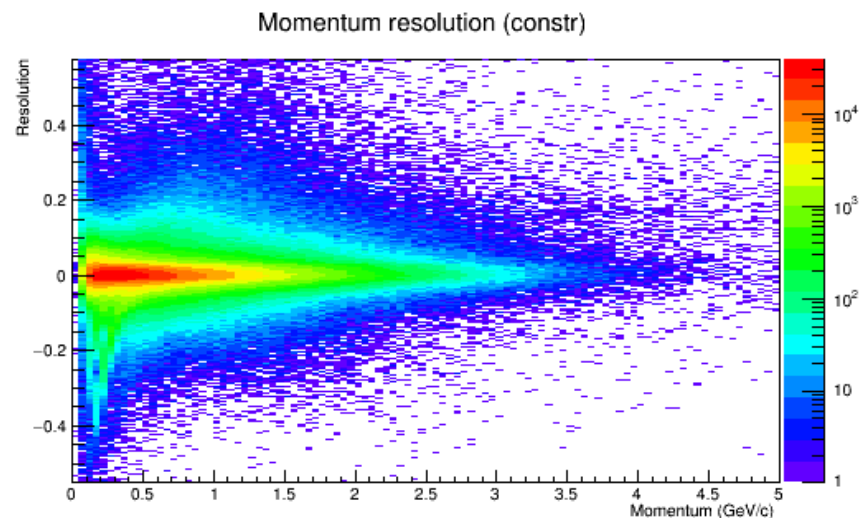
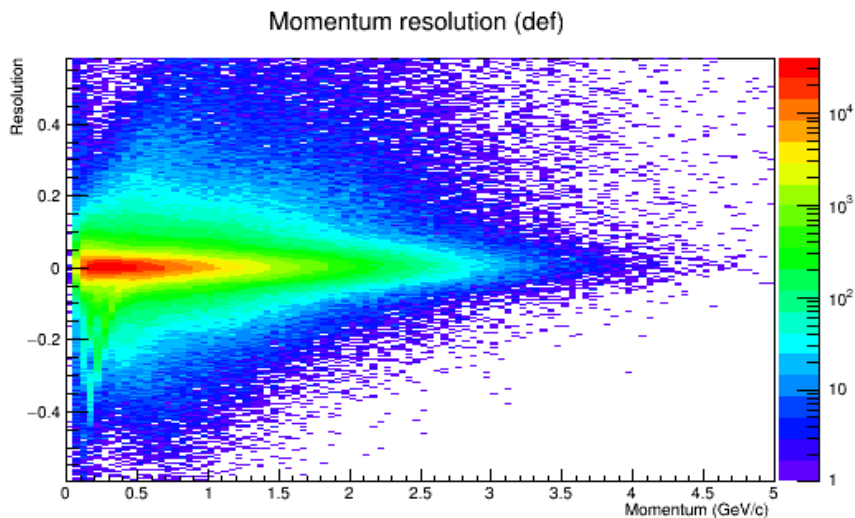
```
mom3.Px(); mom3.Py(); mom3.Pz(); // momentum for a track constrained to the primary vertex
```

Global selections

- 10,000 UrQMD events, BiBi@9.2, full reconstruction with Geant4
- Event selections:
 - ✓ reconstructed vertex
 - ✓ $\text{fabs}(z_{\text{vertex_rec}}) \leq 130$
 - ✓ $\text{fabs}(z_{\text{vertex_rec}} - z_{\text{vertex_gen}}) < 10$
- Track selections:
 - ✓ $n_{\text{hits_tpc}} > 10$
 - ✓ $\text{fabs}(\text{eta}) < 1.2$
 - ✓ $\text{fabs}(\text{DCA}_{x,y,z}) < 2$ // primary

Tracks constrained to PV

Momentum resolution

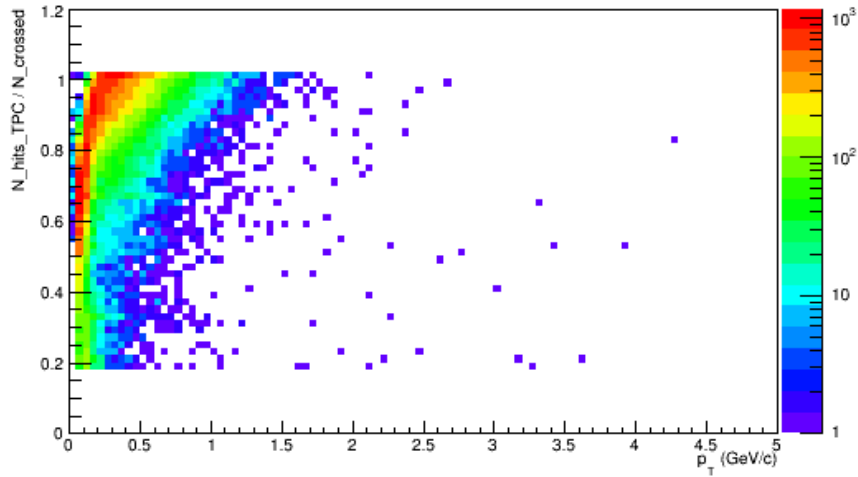


- At $p > 300$ MeV/c, constrained to PV primary tracks have much better momentum resolution
- Recommendation to use momenta of constrained to PV tracks for primary particle analyses (π , K, p, resonances, etc.)
- Add constrained momenta to MpdTrack ???

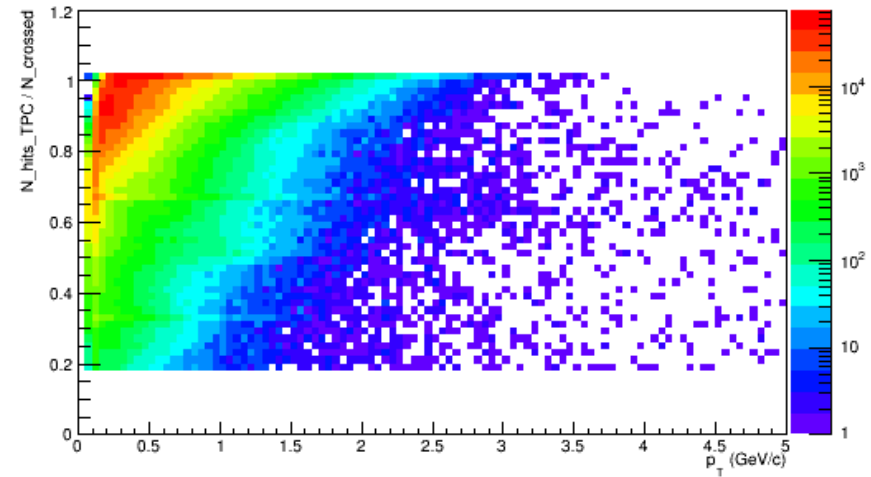
Number of crossed rows selection

$n_{\text{hits_TPC}} / n_{\text{crossed}}$

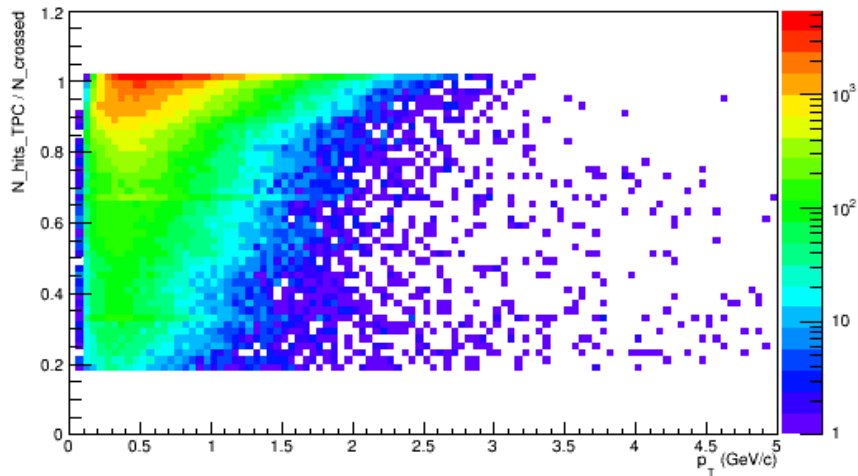
Electrons



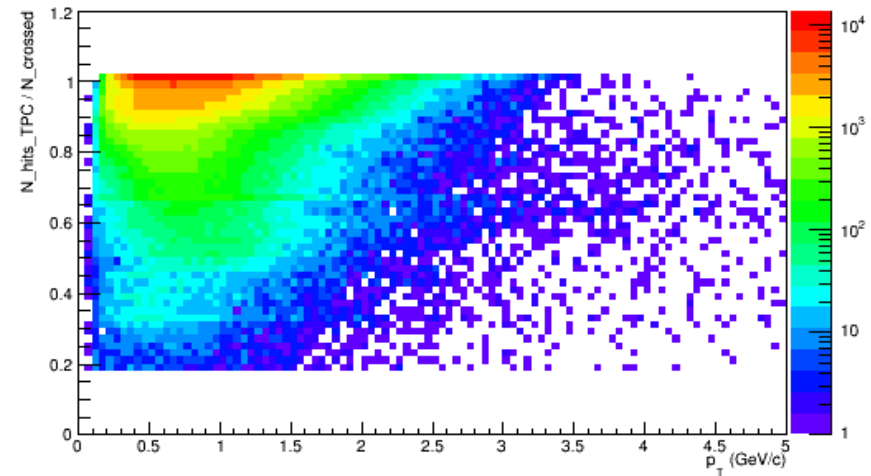
Pions



Kaons



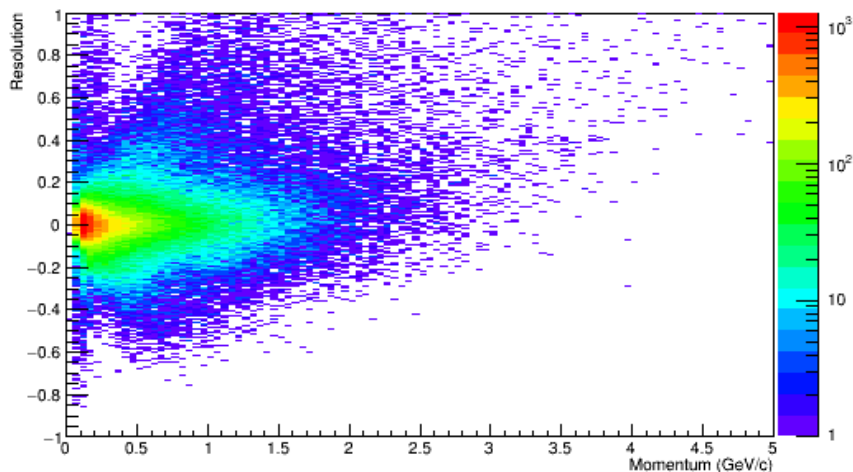
Protons



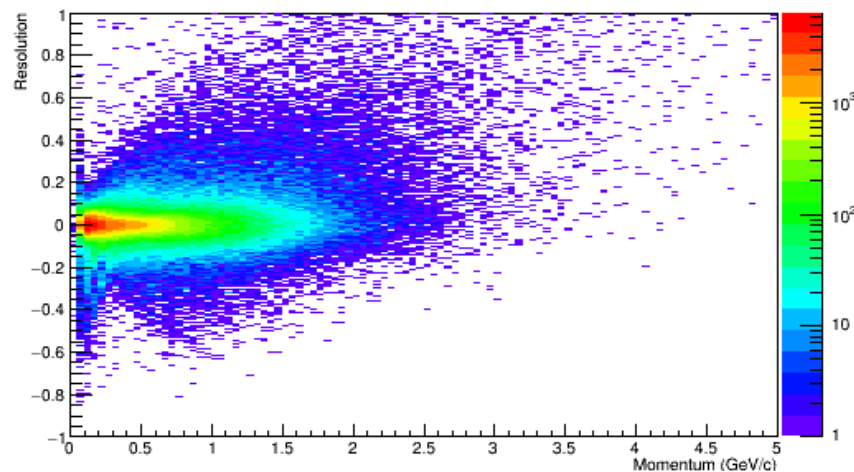
- Quite wide distributions at low transverse momenta
- Species dependence, light vs. heavy

Momentum resolution vs. $n_hits_TPC / n_crossed$

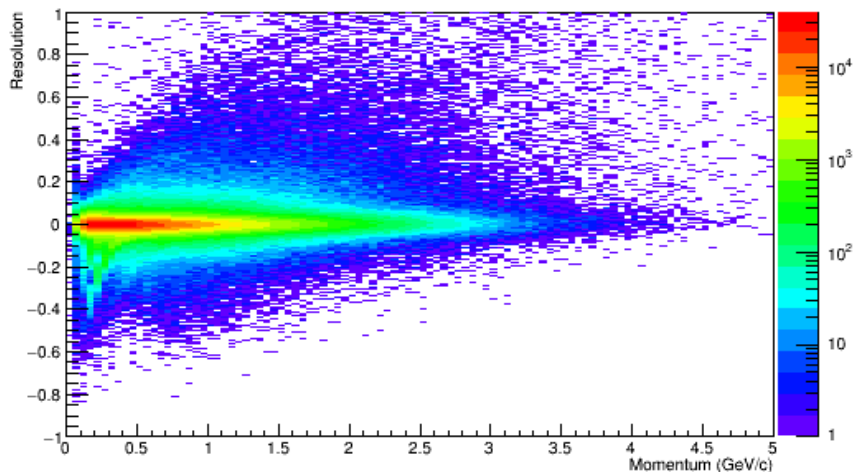
Momentum resolution ($n_hits_TPC / n_crossed = 0-0.6$)



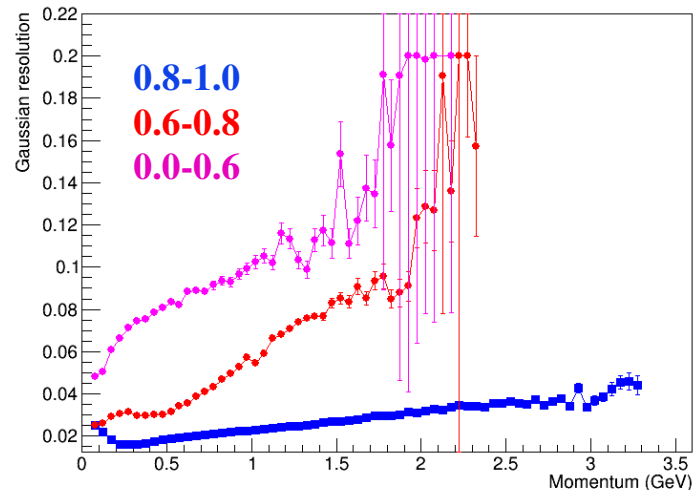
Momentum resolution ($n_hits_TPC / n_crossed = 0.6-0.8$)



Momentum resolution ($n_hits_TPC / n_crossed = 0.8-1.0$)



Momentum resolution

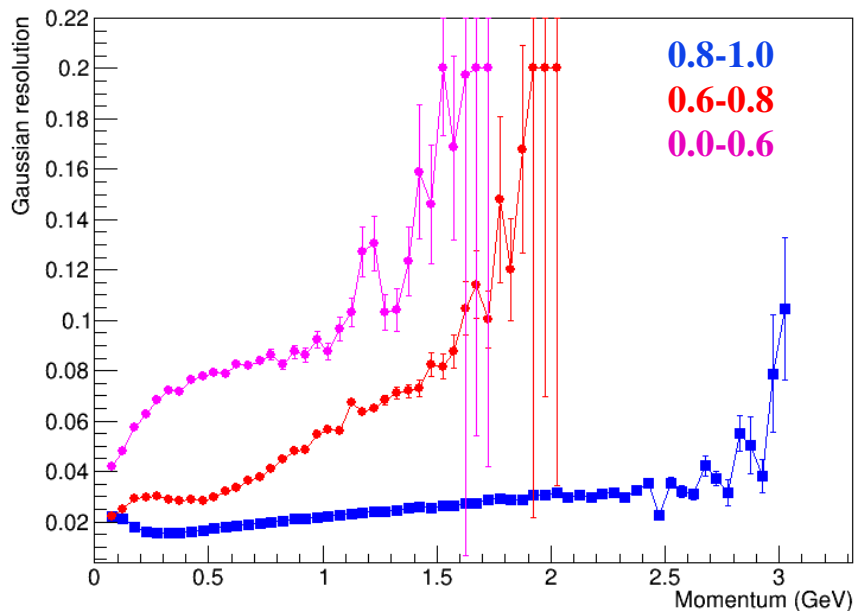


- Significant dependence of momentum resolution on the ratio value

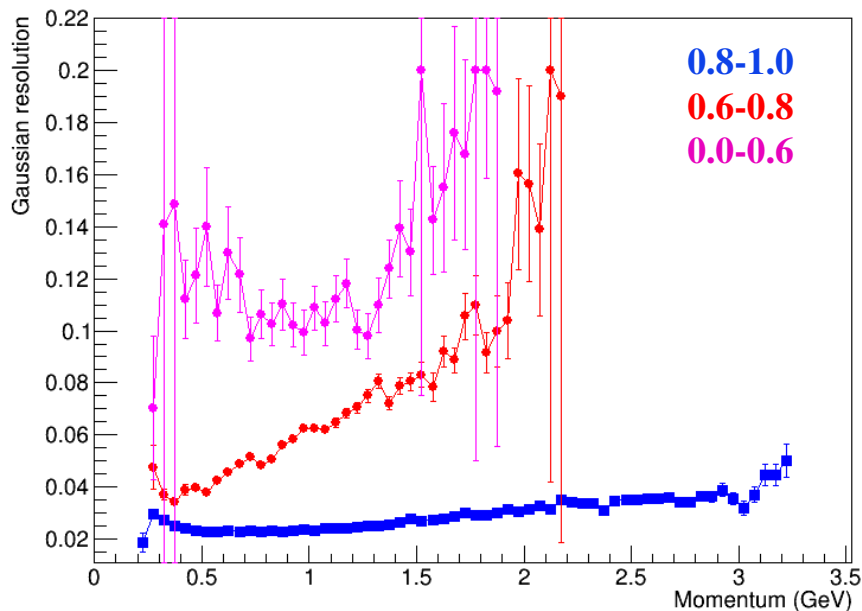
Momentum resolution vs. $n_hits_TPC / n_crossed$

- Species dependence: pions vs. protons

Momentum resolution (Pions)



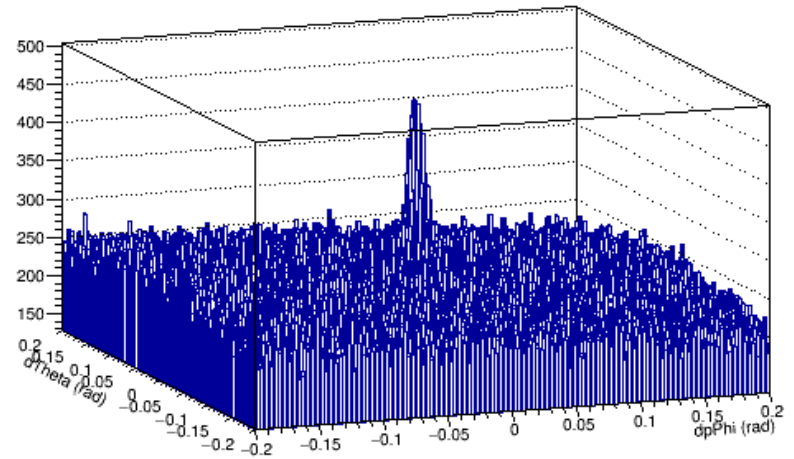
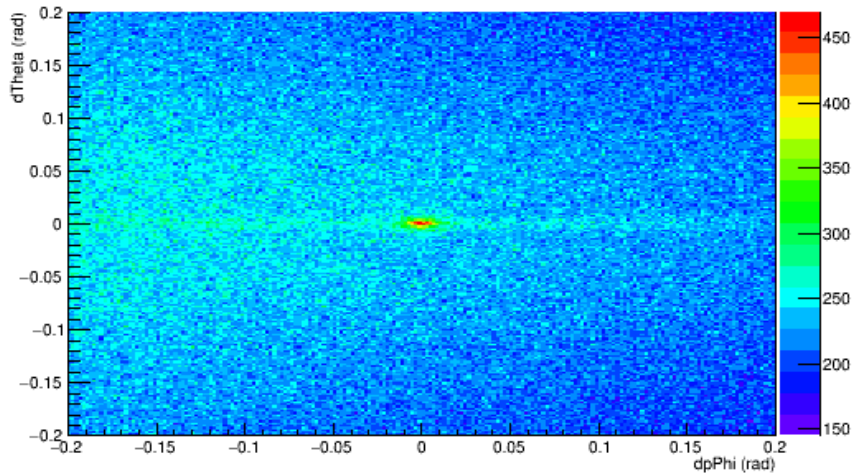
Momentum resolution (Proton)



- Effect does not depend on particle species
- Tracks with $n_hits_TPC / n_crossed < 0.8$ have much worse momentum resolution
- Recommendation is to select tracks with $n_hits_TPC / n_crossed > 0.8$

Spitted tracks

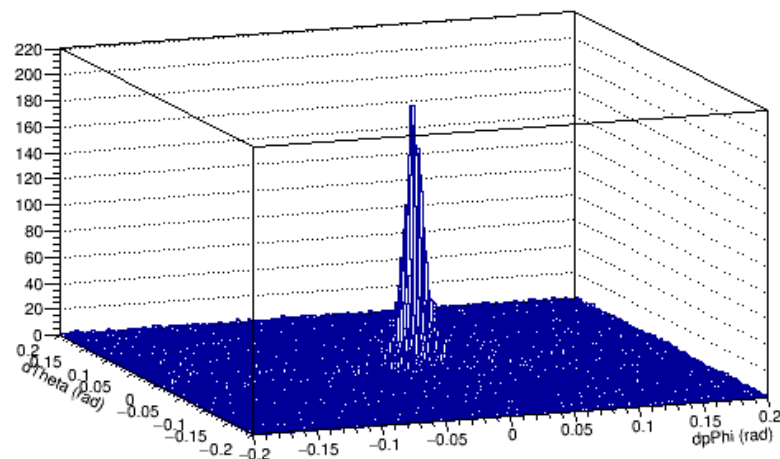
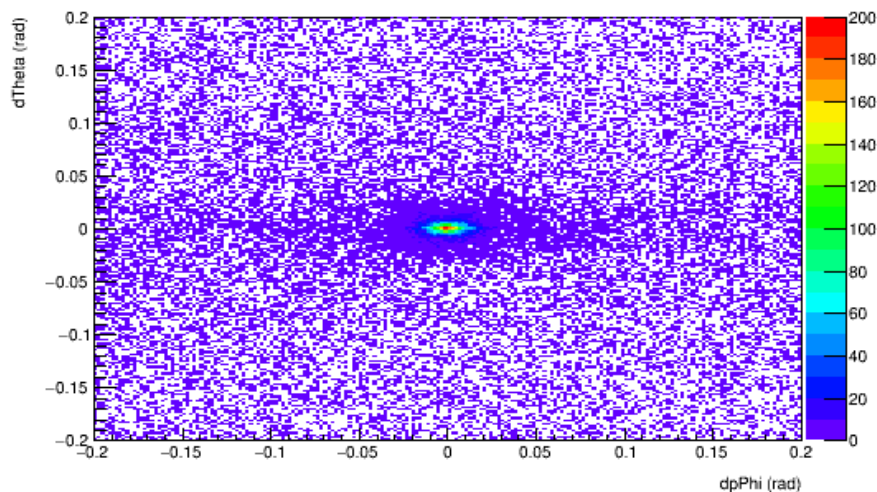
- $d\Phi$ (tr1-> Φ ()) vs. $d\Theta$ (tr1-> Θ ()) for constrained tracks:



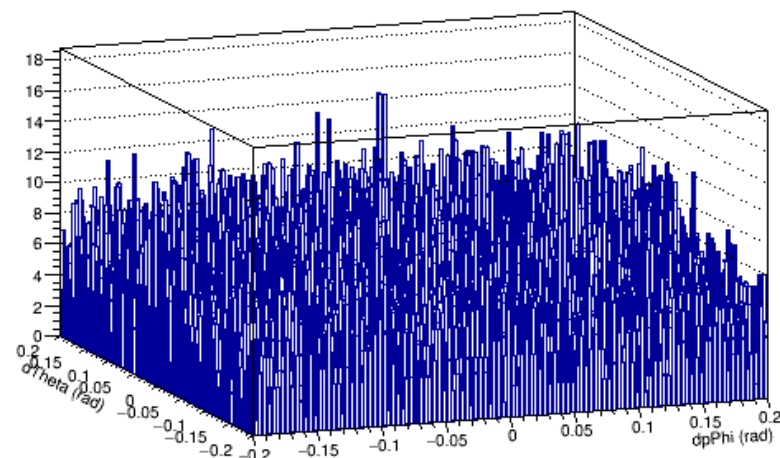
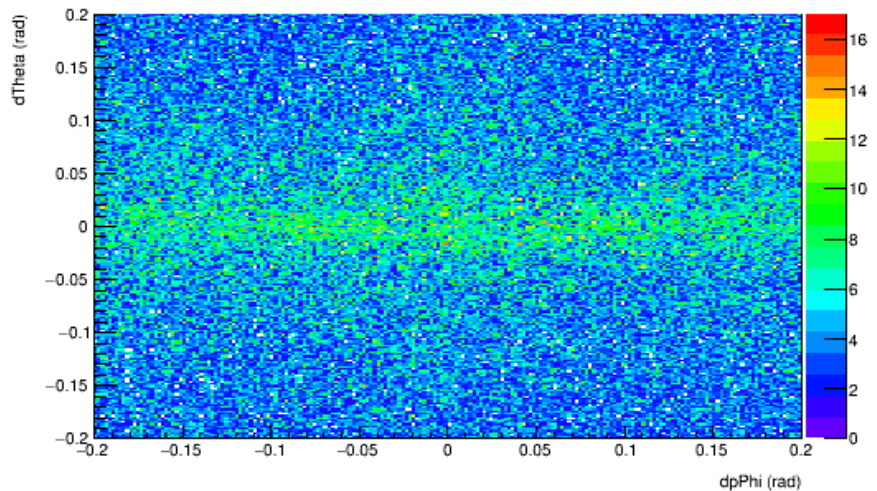
- Spitted tracks are observed as pairs of tracks with correlated (ϕ , θ)
- Are they sensitive to $n_{\text{hits_TPC}} / n_{\text{crossed}}$ selection ???

Spitted tracks by $n_hits_TPC / n_crossed$???

0.0-0.6

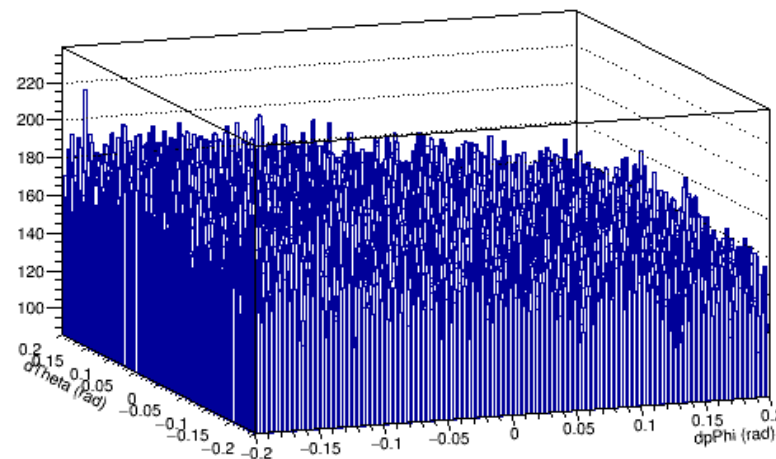
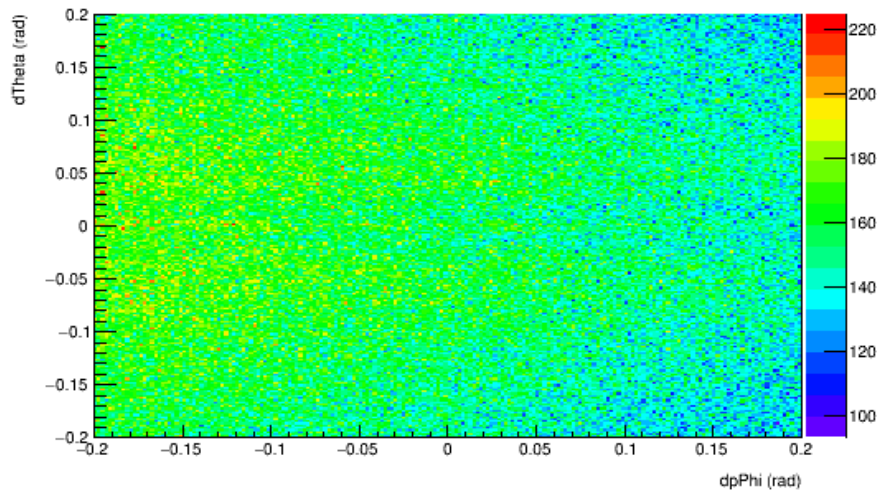


0.6-0.8



Spitted tracks by $n_hits_TPC / n_crossed$???

0.8-1.0

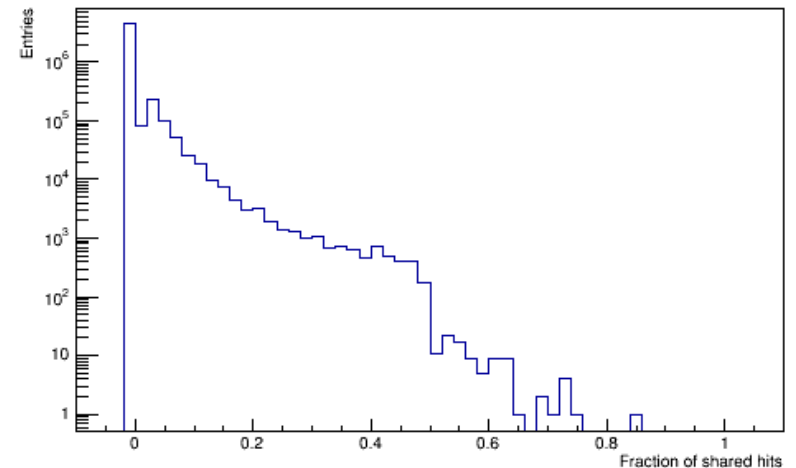
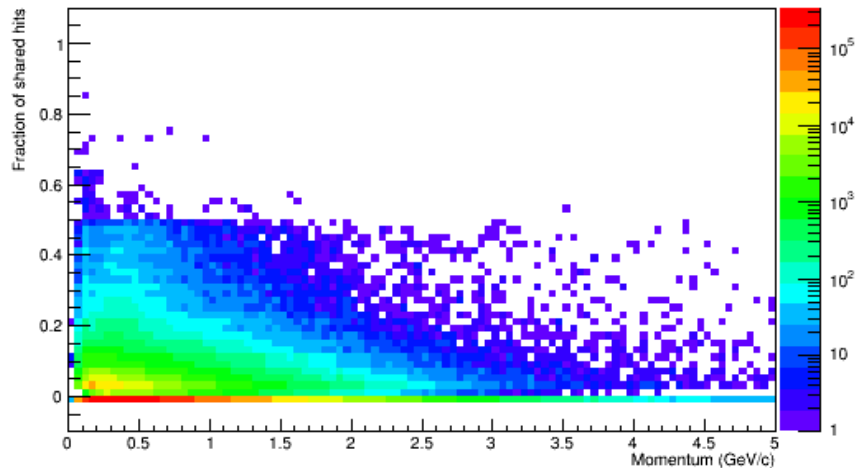


- Tracks with small $n_hits_TPC / n_crossed$ tend to be spitted tracks
- If tracks with $n_hits_TPC / n_crossed > 0.6$ are selected the effect is largely suppressed
- Recommendation is to select tracks with $n_hits_TPC / n_crossed > 0.6$

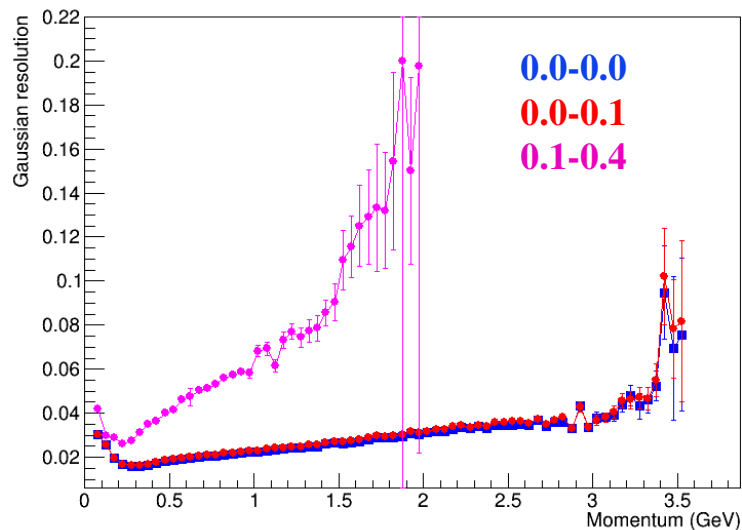
Number of shared hits

Fraction of shared hits

Number of shared hits



Momentum resolution



- Fraction of shared hits is not large, most of tracks do not have shared hits
- Recommendation is to select tracks with fraction of shared hits < 0.1

Conclusions

- Use tracks constrained to PC for primary track analyses
- Recommendations for track selections:
 - ✓ $n_{\text{hits_TPC}} / n_{\text{crossed}} > 0.8$
 - ✓ $n_{\text{shared}} / n_{\text{hits_TPC}} < 0.1$

BACKUP