D^+-Hadron azimuthal correlations in p-p collisions at $\sqrt{s}$ =13 TeV

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Topics

- Steps of Analysis
- Compare of LHC15f Pass1 and Pass 2 data using ALICE Event display
- $D^+ \rightarrow K^-\pi^+\pi^+$ Reconstruction strategy
- D^+ Invariant Mass reconstruction (TC)
- D^+-Hadron corrélations
- Future Plan

Steps of Analysis

General Steps:

1. Simulation: Generation of particles by models (Pythia, Hijing etc.) and transport of particles to detectors (Geant3, Geant4 and Fluka)

2. Digitization: Position reconstruction inside sensor by using charge

3. Reconstruction: Pattern Recognition and Track fitting by Kalman filtering

4. Particle Identification: Determining the type of stable particles
(e, muon, pion, kaon and Proton etc.) from track (Visualization of tracks in Event display)

$$\left(\frac{dm}{m}\right)^2 = \left(\gamma^2 \frac{d\beta}{\beta}\right)^2 + \left(\frac{dp}{p}\right)^2$$

5. Analysis: Vertex fitting and secondary particle reconstruction and much more

Compare of LHC15f Pass1 and Pass 2 data using ALICE Event display

https://alimonitor.cern.ch/catalogue/index.jsp?path=%2Falice%2Fdata%2F2015%2FLHC15f%2F000225716%2Fpass1#/ali

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- Network Traffic
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- CAF Monitoring
- SHUTTLE
- Build system
- HepSpec
- Dynamic charts

close all

Running jobs trend

cpass1_pass2
pass1
- 15000225716019.11
- 15000225716019.110
- 15000225716019.111
- 15000225716019.112
- 15000225716019.113
- 15000225716019.12
- 15000225716019.13
- 15000225716019.15
- 15000225716019.17
- 15000225716019.18
- 15000225716019.19
- 15000225716019.20
- 15000225716019.21
- 15000225716019.210
- 15000225716019.211
- 15000225716019.213
- 15000225716019.214
- 15000225716019.22
- 15000225716019.23

/alice/data/2015/LHC15f/000225716/pass1/15000225716019.11

Welcome shyam (~) with role (~)

Permissions	Owner	Timestamp	Size	Filename
-rwxr-xr-x	alidaq:alidaq	17 Jul 2015 11:22	5.605 KB	8000_8000_0_0.stat.aod
-rwxr-xr-x	alidaq:alidaq	17 Jul 2015 11:22	5.613 KB	8000_8000_0_8000.stat.qa_grp0
-rwxr-xr-x	alidaq:alidaq	17 Jul 2015 11:22	5.767 MB	AliAOD.Muons.root
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-rwxr-xr-x	alidaq:alidaq	17 Jul 2015 11:22	903.5 KB	AODQA.root
-rwxr-xr-x	alidaq:alidaq	17 Jul 2015 11:22	348.3 KB	aod.log
-rwxr-xr-x	alidaq:alidaq	17 Jul 2015 11:22	78.36 MB	aod_archive.zip
-rwxr-xr-x	alidaq:alidaq	17 Jul 2015 11:22	436.6 KB	EventStat_temp.root
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https://alimonitor.cern.ch/catalogue/index.jsp?path=%2Falice%2Fdata%2F2015%2FLHC15f%2F000225716%2Fpass2#/ali

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close all

Running jobs trend

- 15000225716019.112
- 15000225716019.113
- 15000225716019.114
- 15000225716019.12
- 15000225716019.13
- 15000225716019.14
- 15000225716019.15
- 15000225716019.16
- 15000225716019.17
- 15000225716019.18
- 15000225716019.19
- 15000225716019.20
- 15000225716019.21
- 15000225716019.211
- 15000225716019.212
- 15000225716019.213
- 15000225716019.214
- 15000225716019.22
- 15000225716019.23
- 15000225716019.24
- 15000225716019.25

/alice/data/2015/LHC15f/000225716/pass2/15000225716019.11

Welcome shyam (~) with role (~)

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-rwxr-xr-x	alidaq:alidaq	29 Aug 2015 22:26	200.2 MB	AliESDs.root
-rwxr-xr-x	alidaq:alidaq	29 Aug 2015 22:26	1.862 MB	AODQA.root
-rwxr-xr-x	alidaq:alidaq	29 Aug 2015 22:26	382.6 KB	aod.log
-rwxr-xr-x	alidaq:alidaq	29 Aug 2015 22:26	57.74 MB	aod_archive.zip
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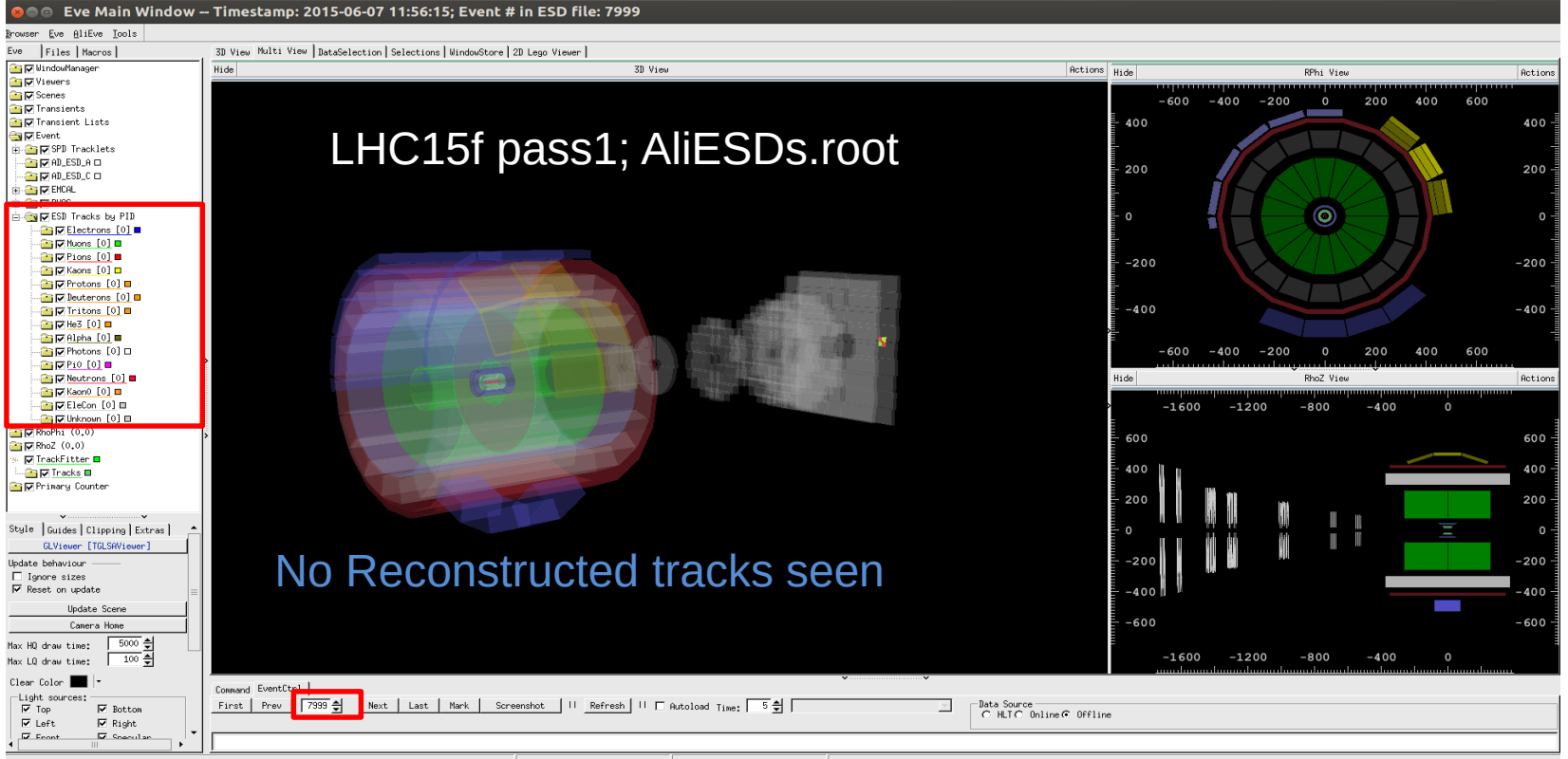
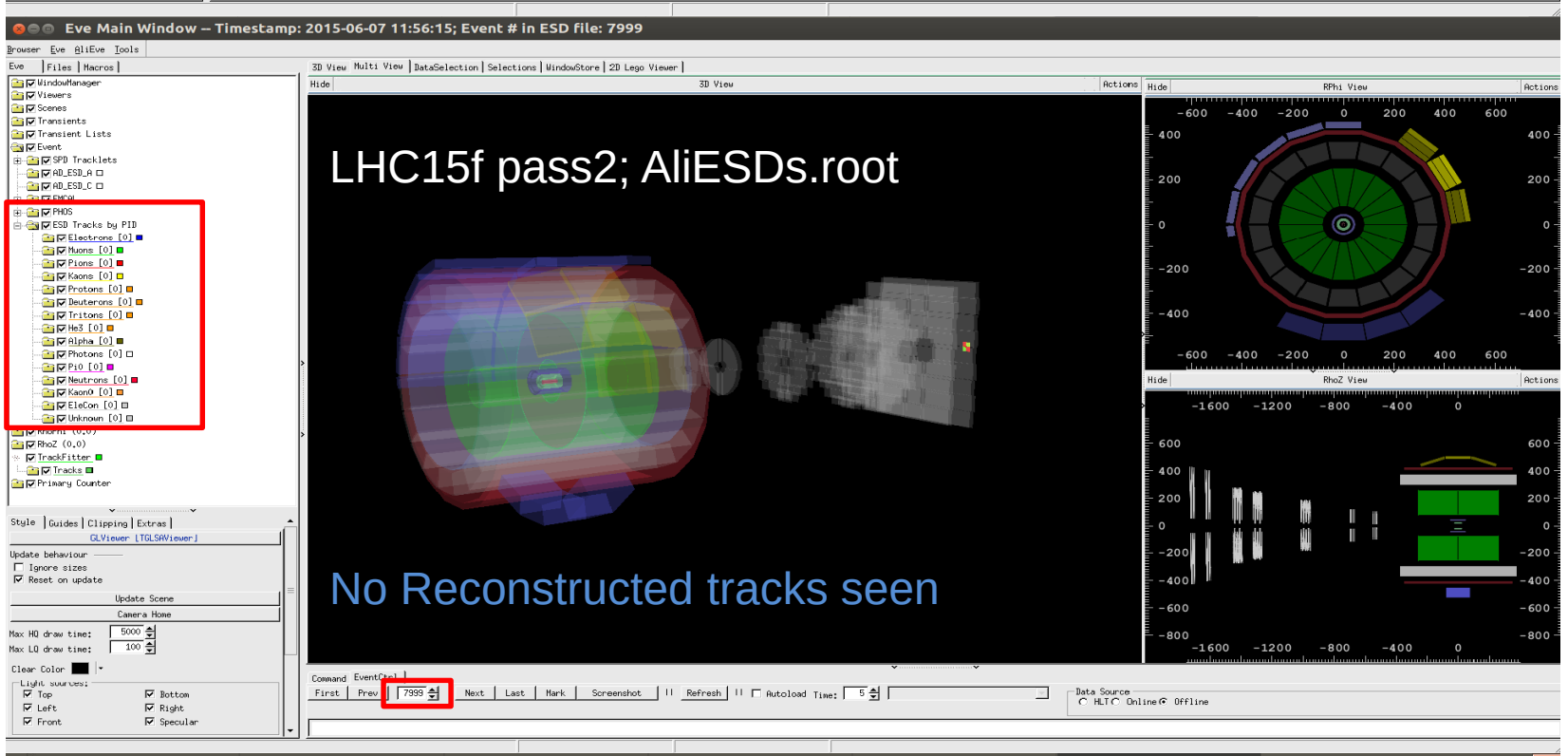

Eve Main Window -- Timestamp: 2015-06-07 11:56:15; Event # in ESD file: 7999
LHC15f pass1; AliESDs.root
No Reconstructed tracks seen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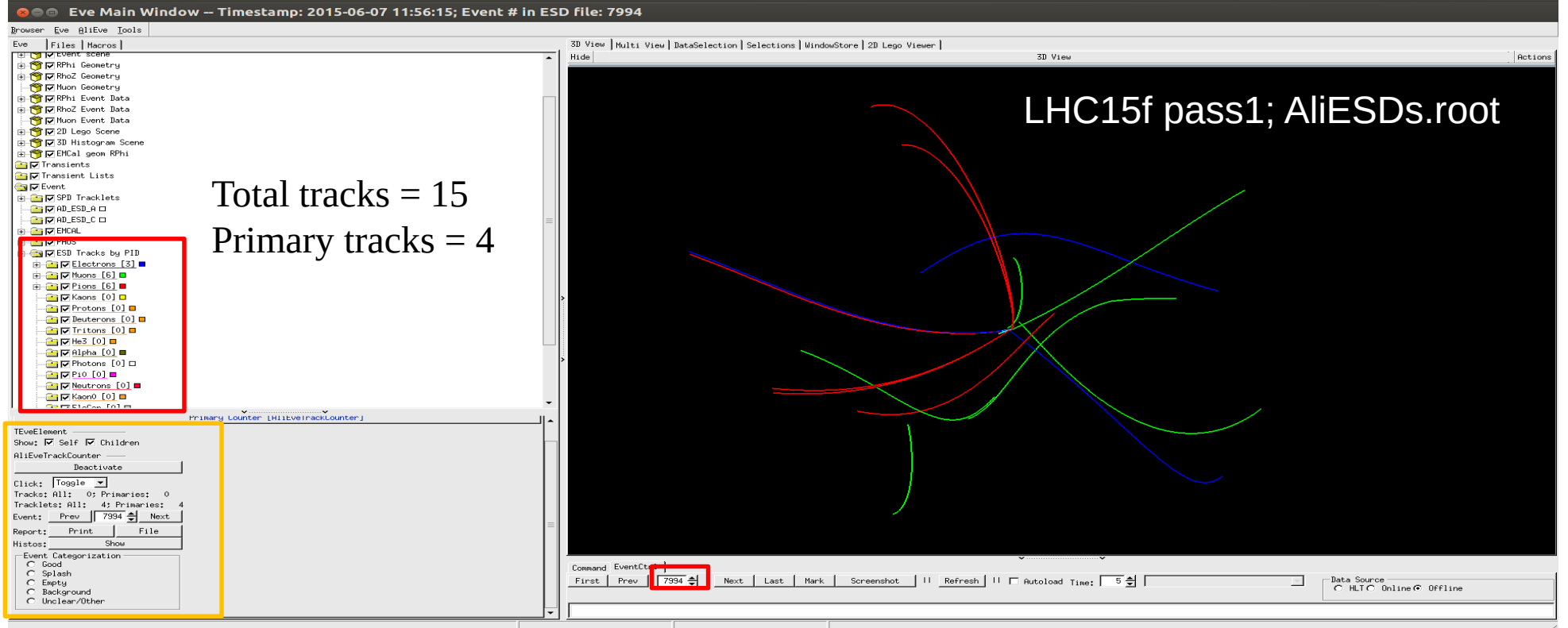
LHC15f pass2; AliESDs.root
No Reconstructed tracks seen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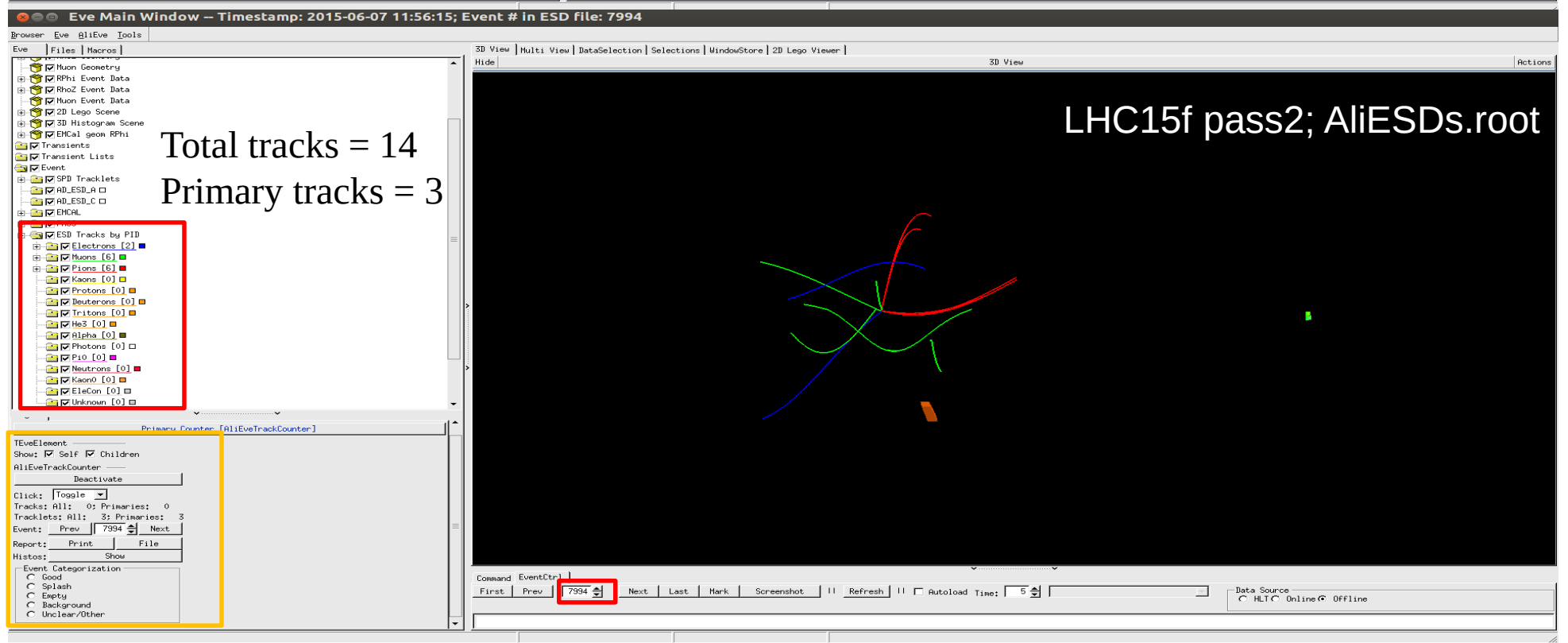
Total tracks = 15
Primary tracks = 4
LHC15f pass1; AliESDs.root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Primary tracks = 3
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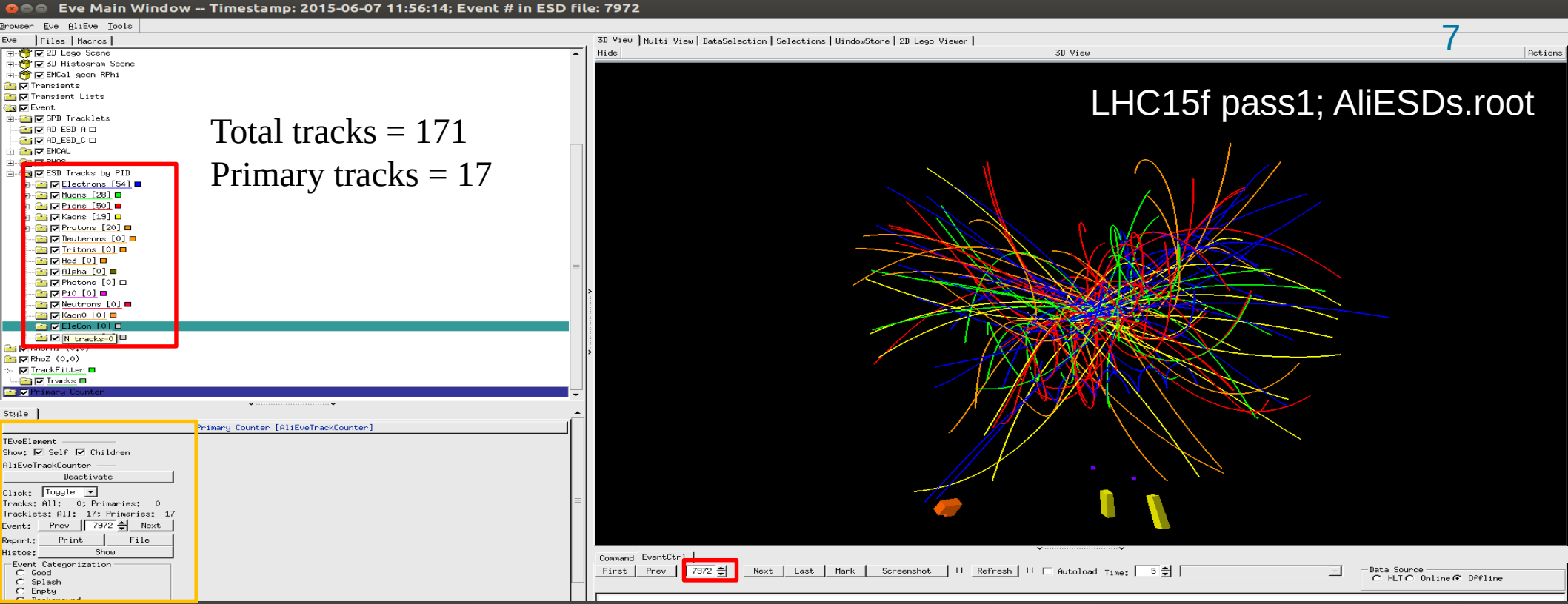
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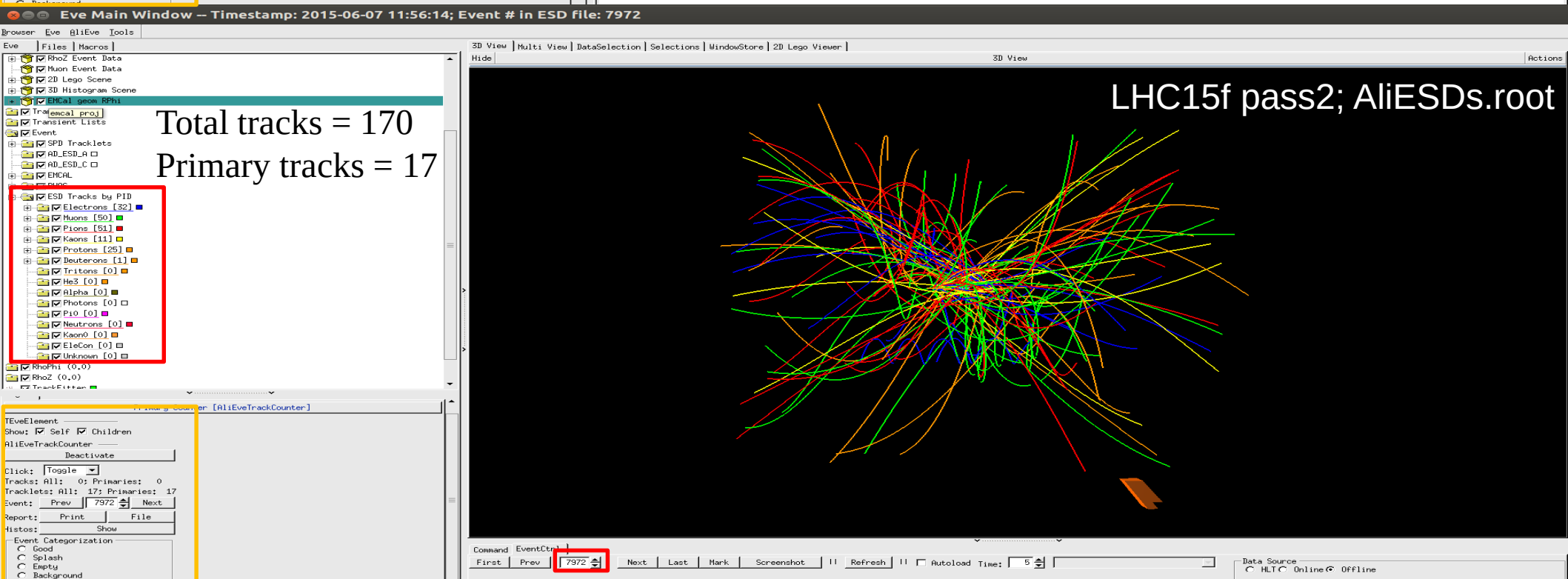
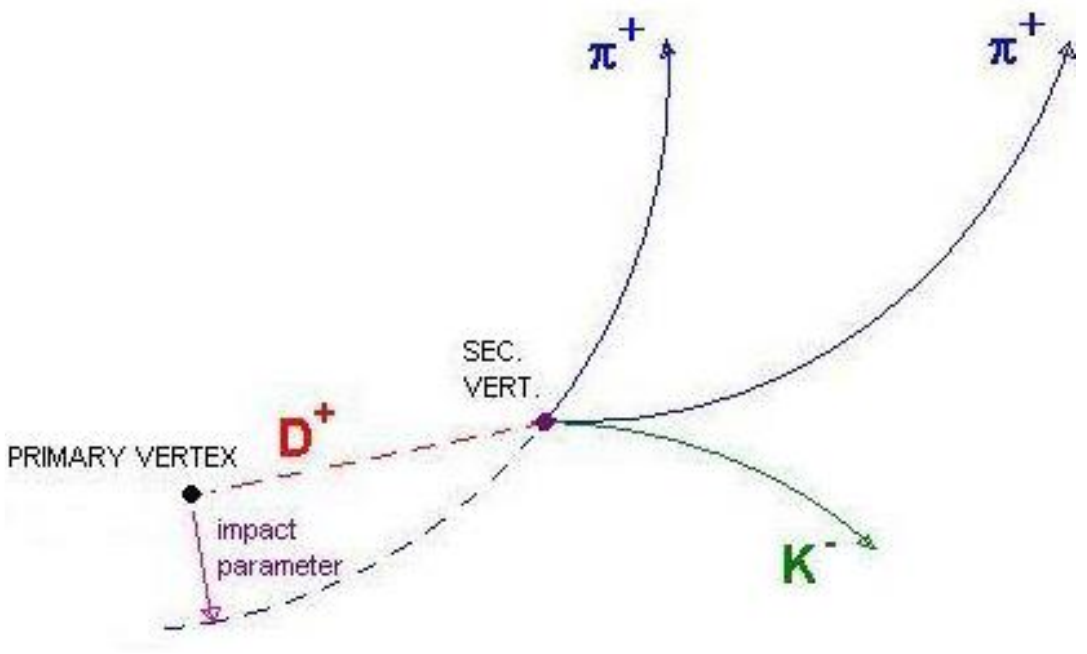
Total tracks = 171
Primary tracks = 17
LHC15f pass1; AliESDs.root


Eve Main Window -- Timestamp: 2015-06-07 11:56:14; Event # in ESD file: 7972
Total tracks = 170
Primary tracks = 17
LHC15f pass2; AliESDs.root

$D^+ \rightarrow K^-\pi^+\pi^+$ Reconstruction strategy

$p_t = 0.3\ B[T]R[m]$ GeV/c for |q|=1

- Cuts Applied:
- p_T^K , p_T^π
- d_0^K , d_0^π
- d_{12}
- σ_{vertex}
- d_{PS}
- p_T^{Max}
- $Cos\ \theta_p$
- $\sum d_0^2$



D+ InvMass reconstruction with Tight cuts :

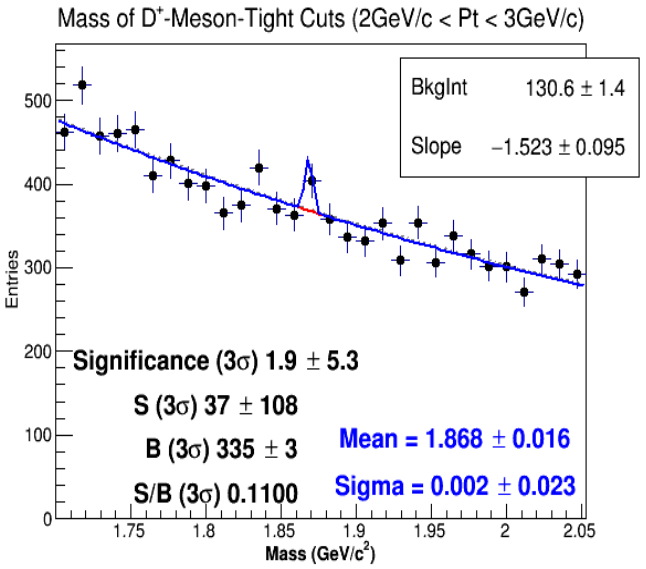
- Data set used is LHC15f pass2 ➡ Physics selection off

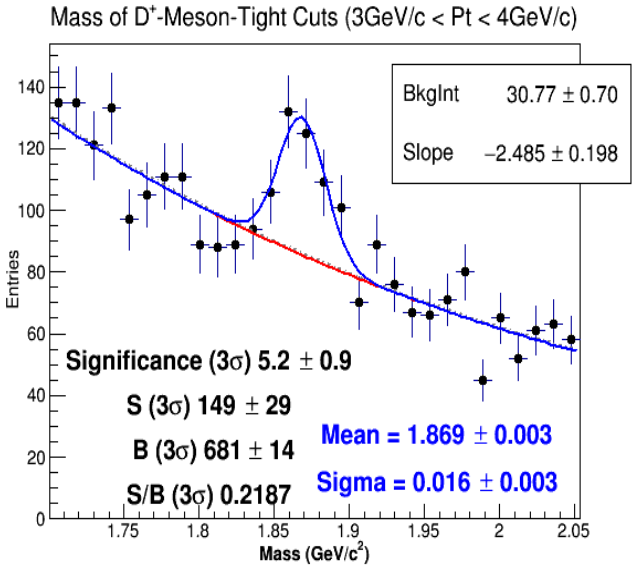
- Good Runs{56}={225000 225011 225016 225026 225031 225035 225037 225041 225043 225050 225051 225052 225106 225305 225307 225309 225310 225313 225314 225315 225322 225576 225578 225579 225580 225582 225586 225587 225705 225707 225708 225709 225710 225716 225717 225719 225753 225757 225762 225763 225766 225768 226062 226170 226220 226225 226444 226445 226452 226466 226468 226472 226476 226483 226495 226500}

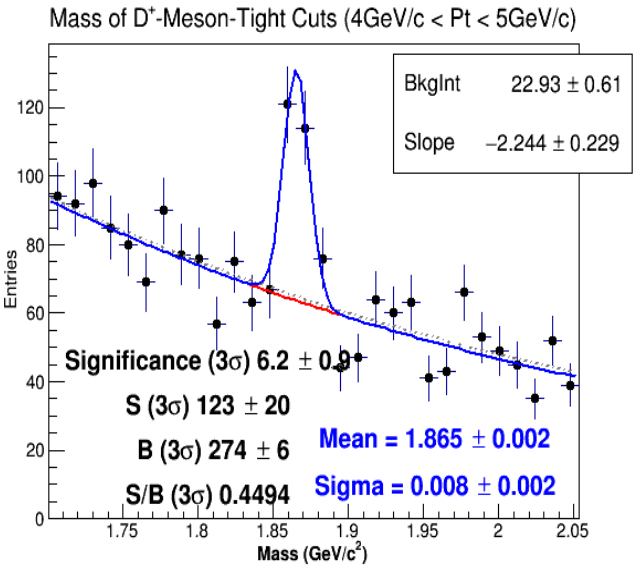
Event Analysed ~ 187M events

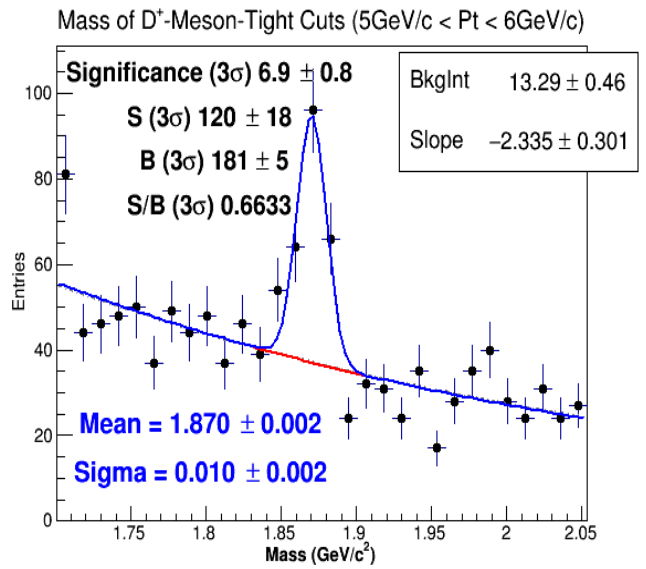
D^+ Invariant Mass reconstruction (TC)

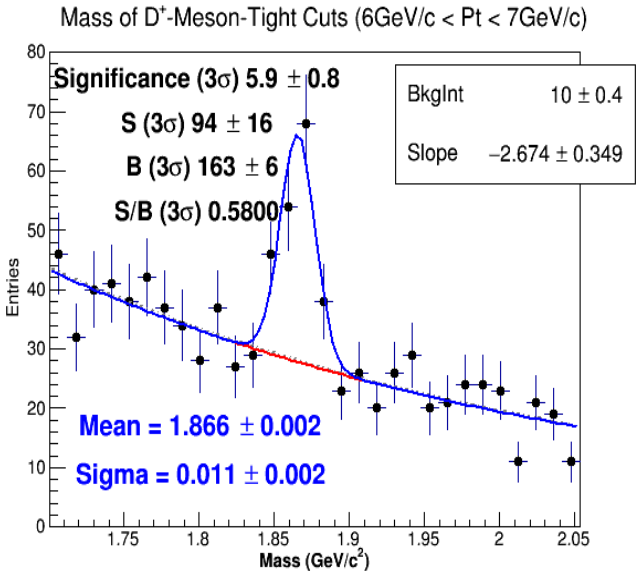
Histogram is Rebinned by 6

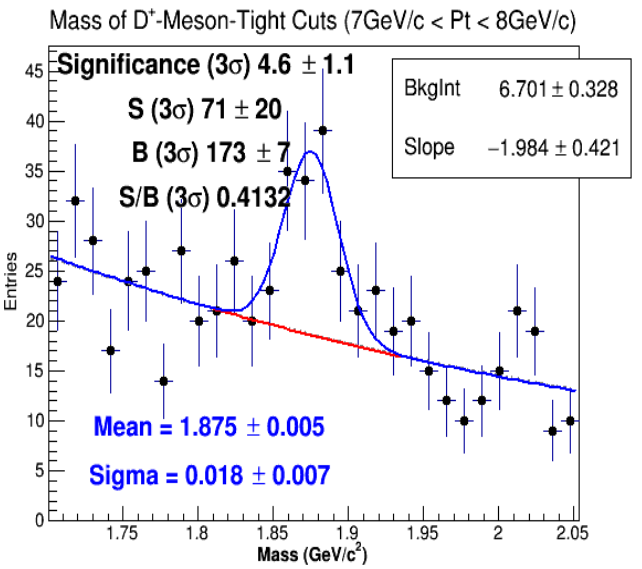


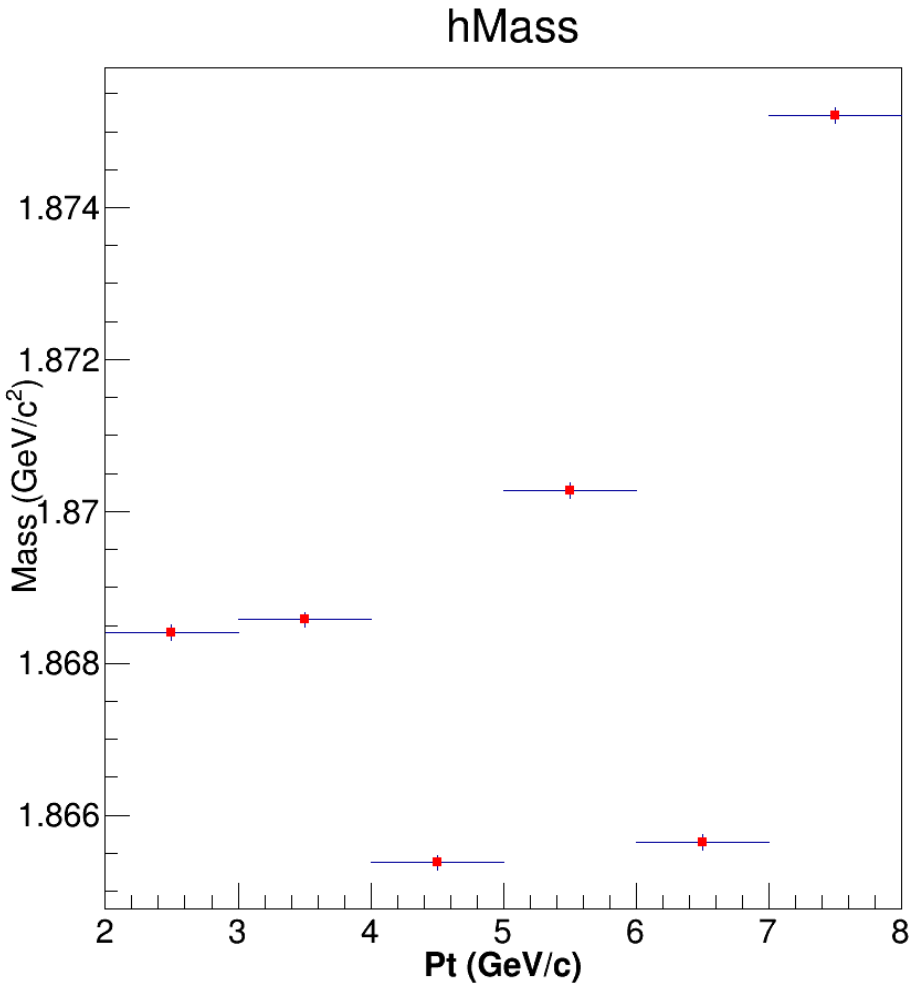


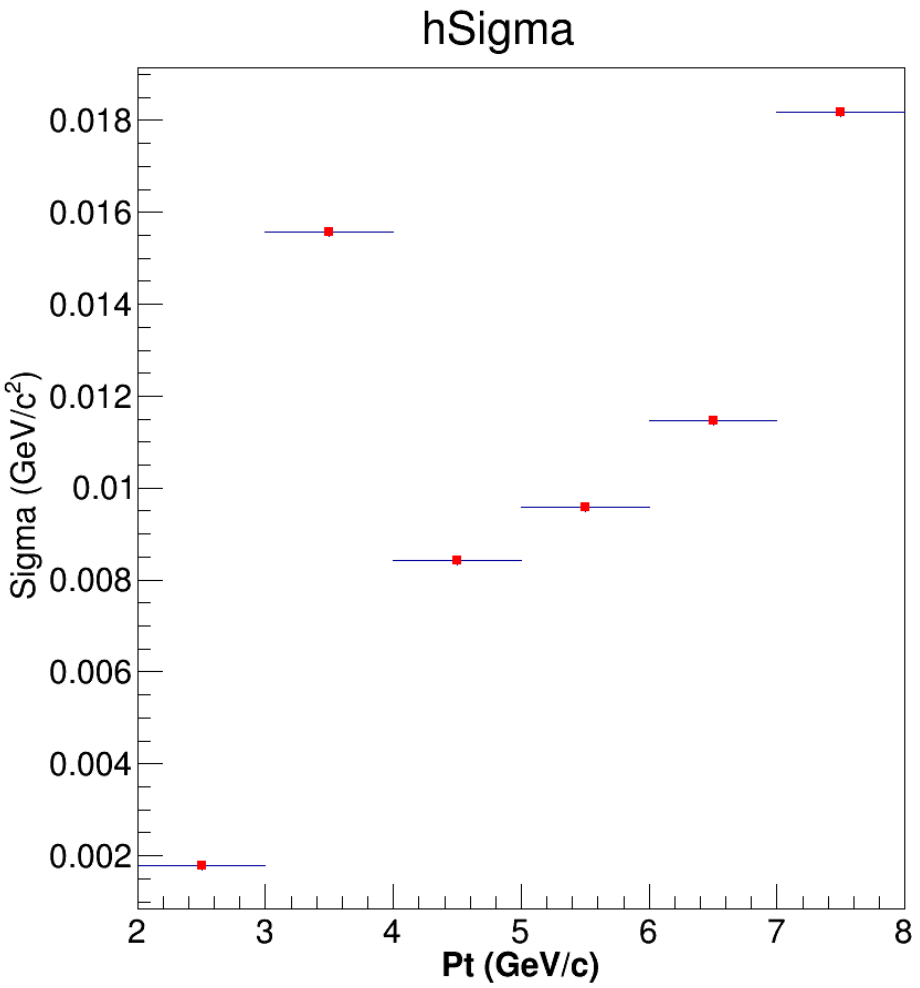









hMass
Mass (GeV/c^2)
1.874
1.872
1.87
1.868
1.866
2
3
4
5
6
7
8
Pt (GeV/c)


hSigma
Sigma (GeV/c^2)
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
2
3
4
5
6
7
8
Pt (GeV/c)

Trigger Particle D^+: $3.0 < p_T\left(\frac{GeV}{c}\right) < 5.0$

Low Momentum

$p_T > 0.3\frac{GeV}{c}$

$p_T > 0.5\frac{GeV}{c}$

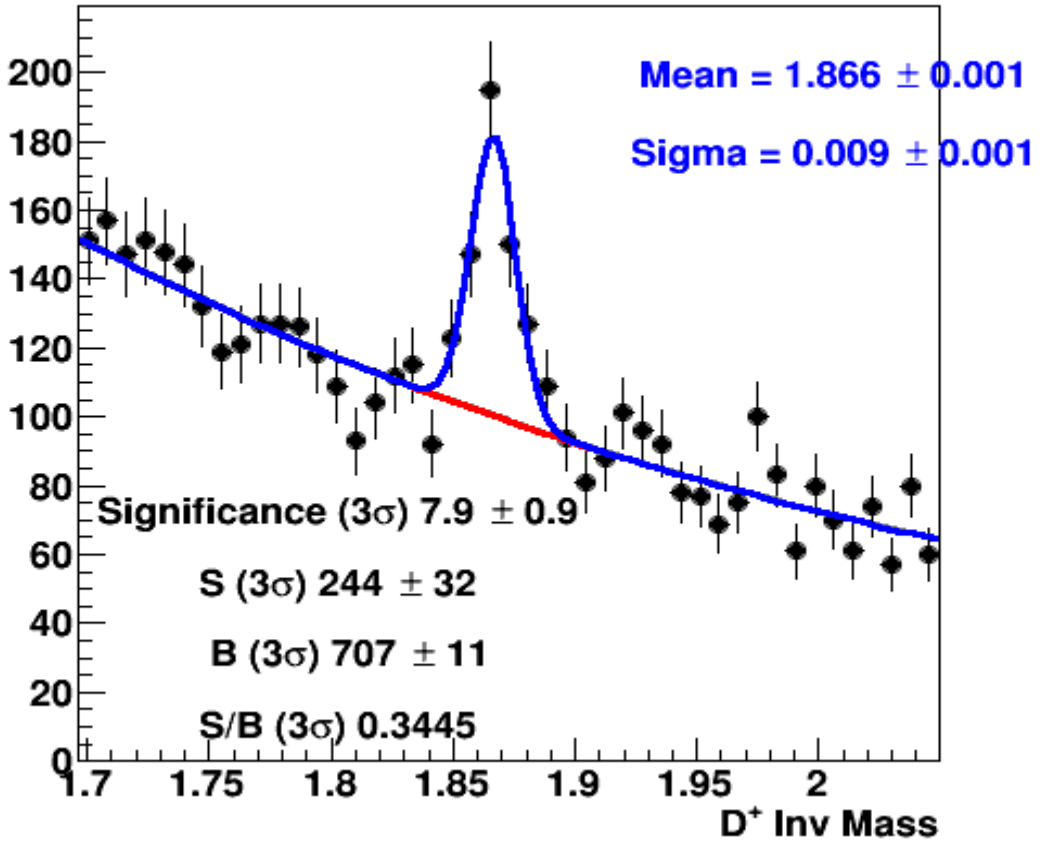
$p_T > 1.0\frac{GeV}{c}$

Associated Particles

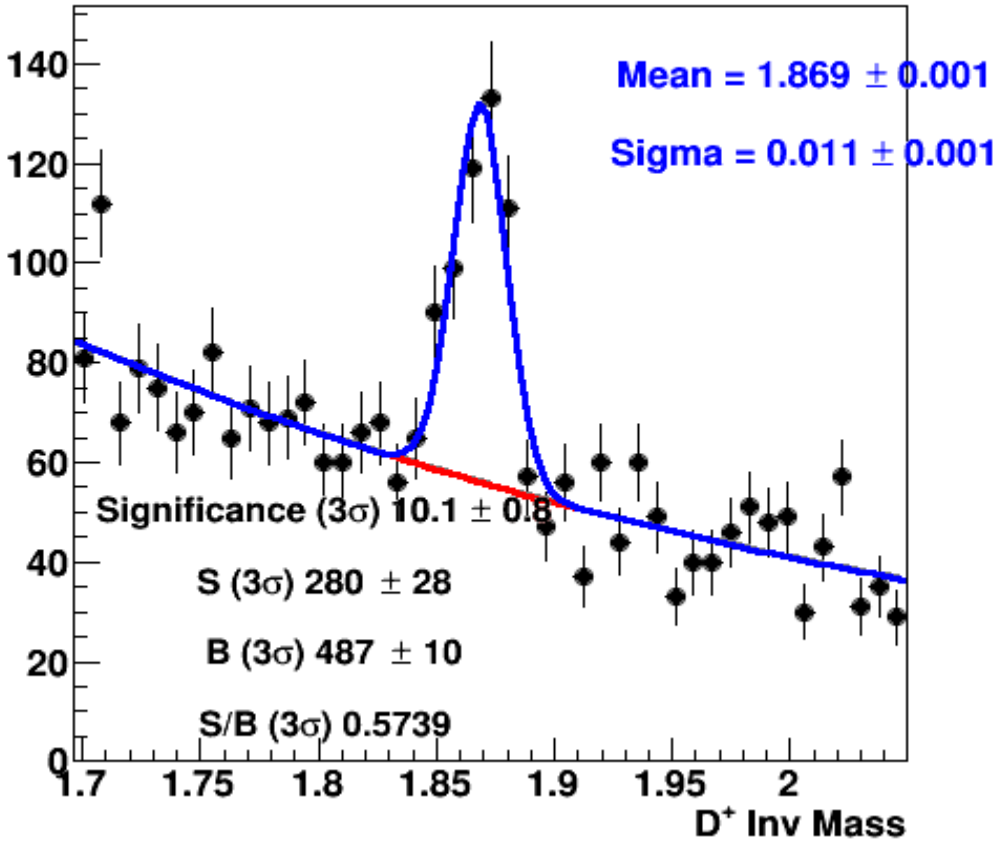
- Background Subtracted (Side bands)
- ME corrected

Histogram is Rebinned by 4

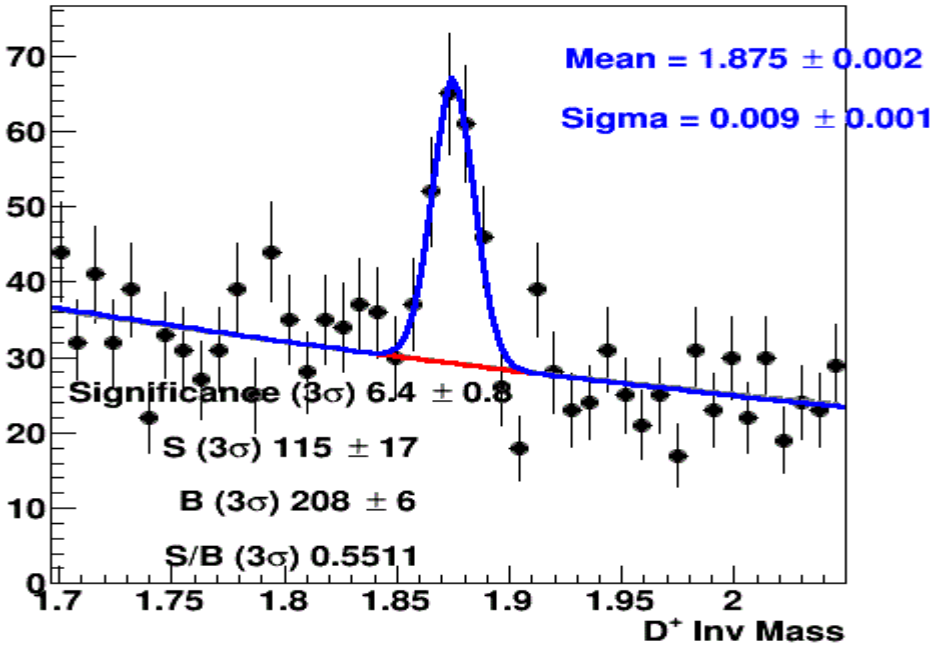
$3.0 < p_T\left(\frac{GeV}{c}\right) < 5.0$



$5.0 < p_T\left(\frac{GeV}{c}\right) < 8.0$

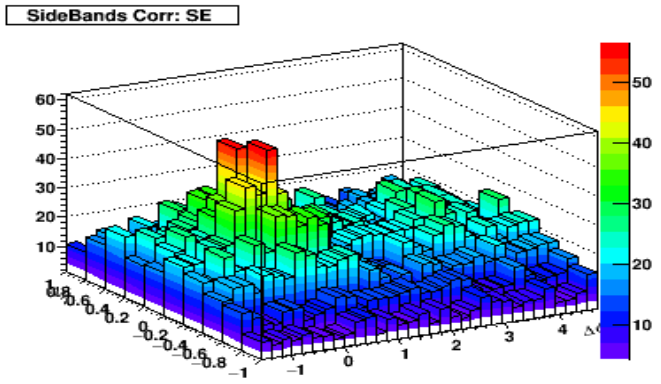


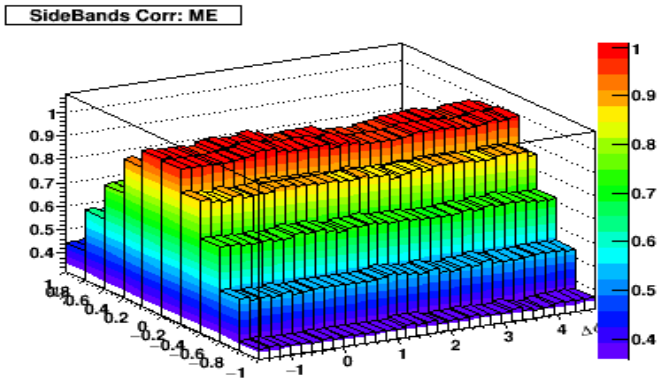
$$8.0 < p_T\left(\frac{GeV}{c}\right) < 16.0$$

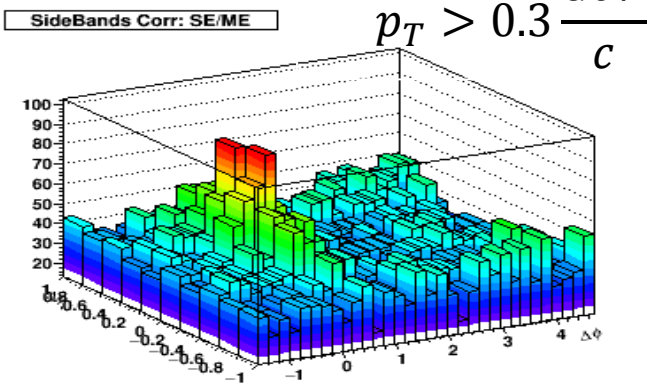


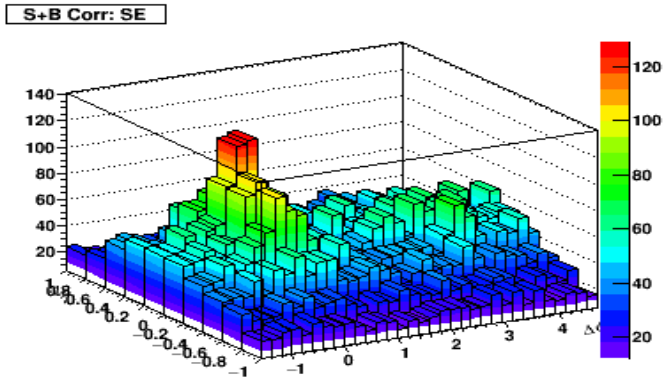
Trigger Particle D^+: $3.0 < p_T\left(\frac{GeV}{c}\right) < 5.0$ (Low Momentum)

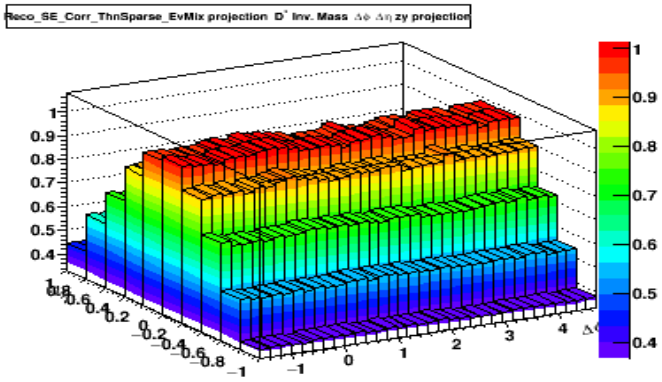
$$p_T > 0.3\,\frac{GeV}{c}$$

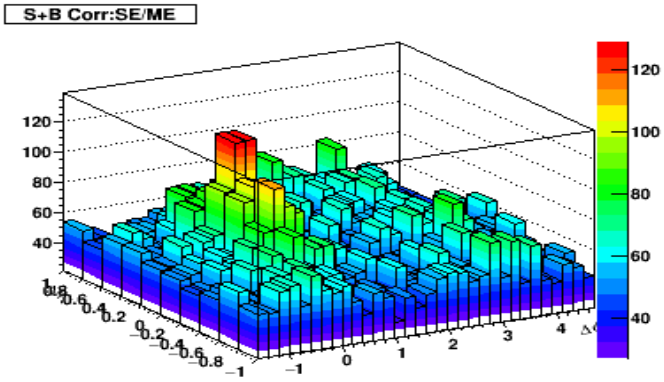




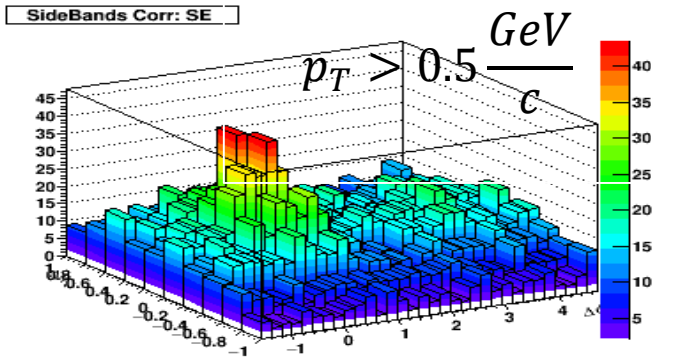


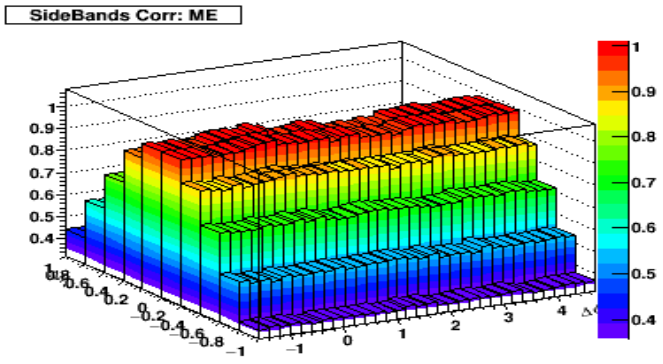


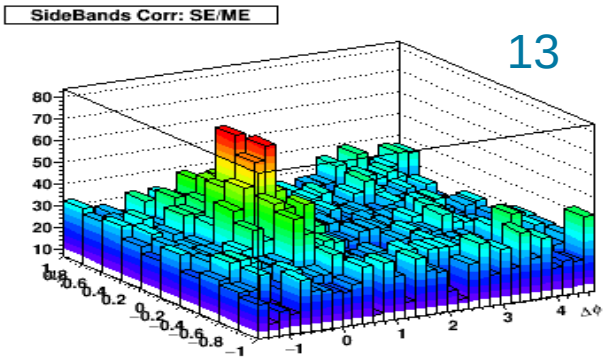


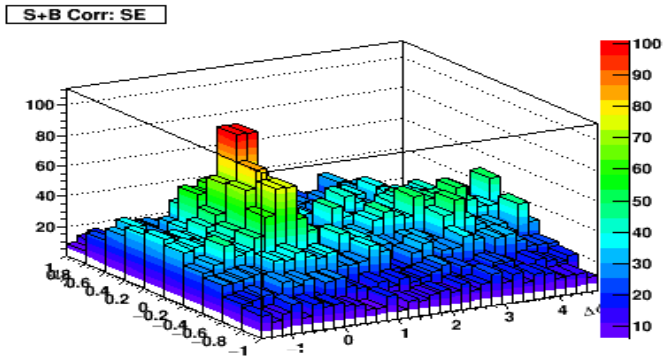


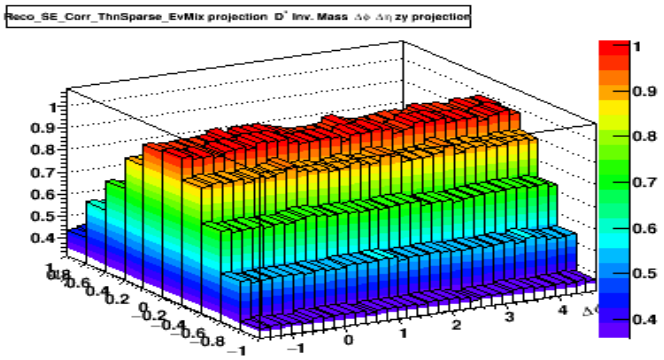
$p_T > 0.5 \frac{GeV}{c}$

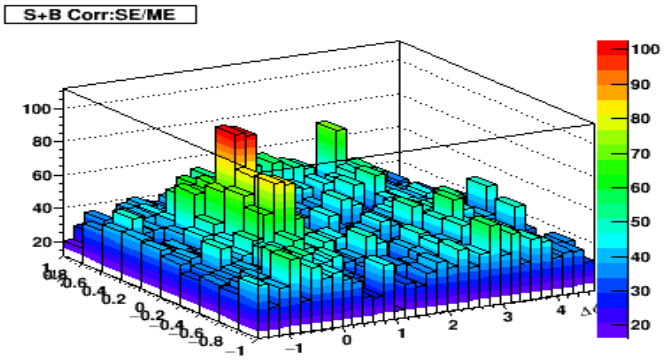




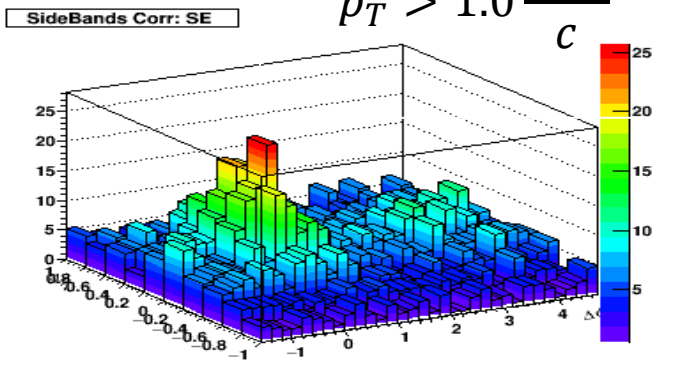


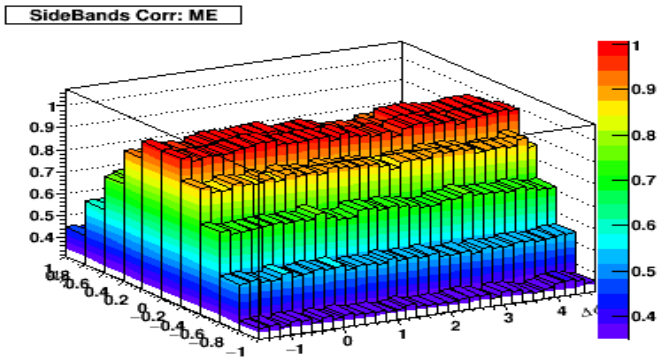


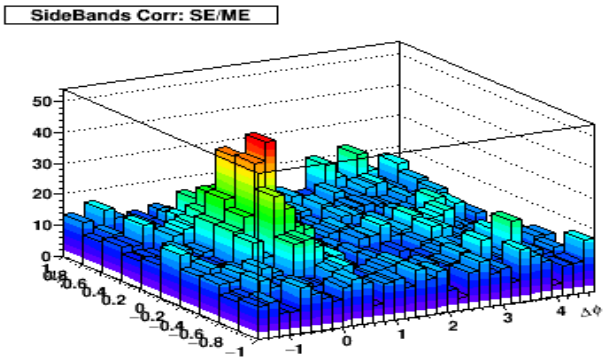


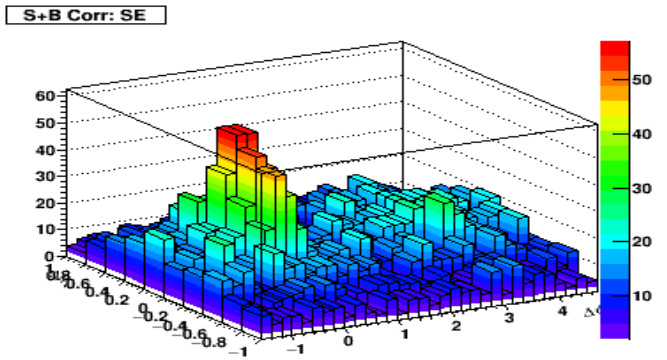


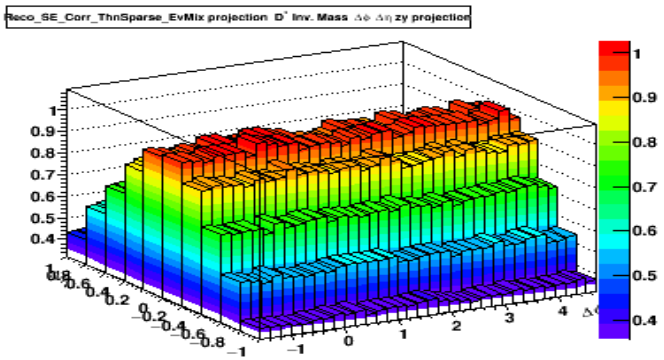
$p_T > 1.0 \frac{GeV}{c}$

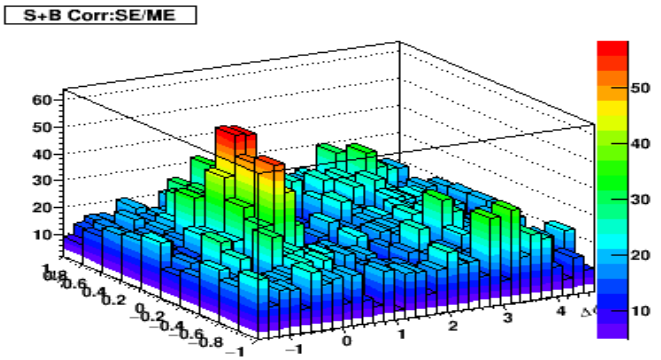


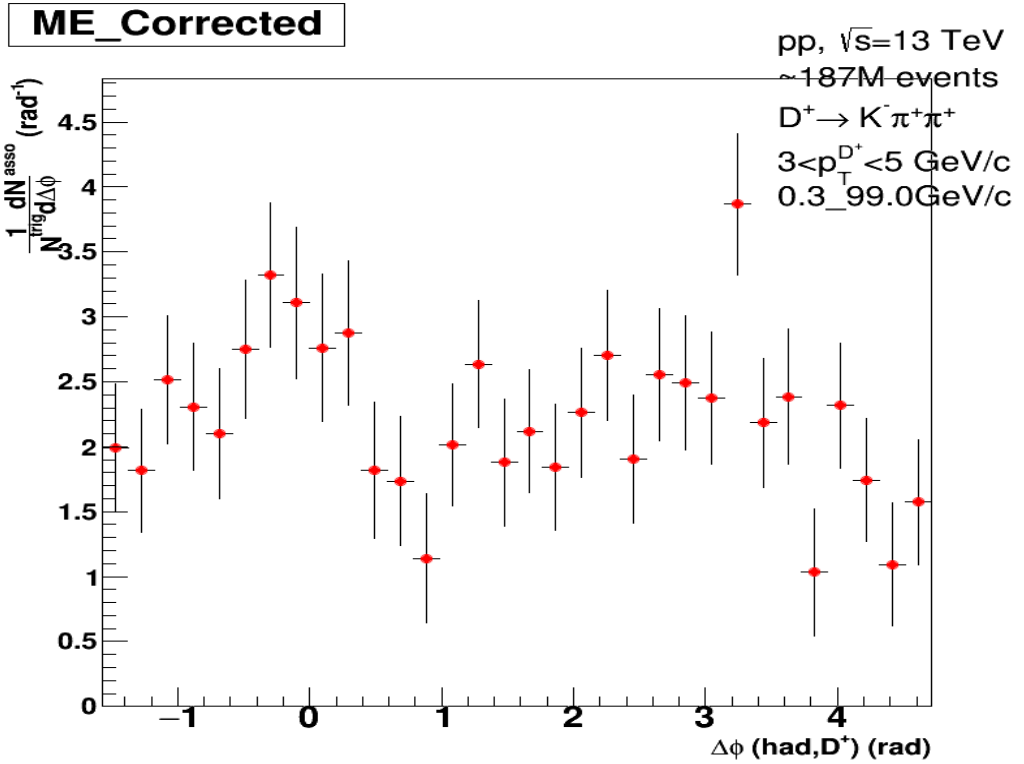


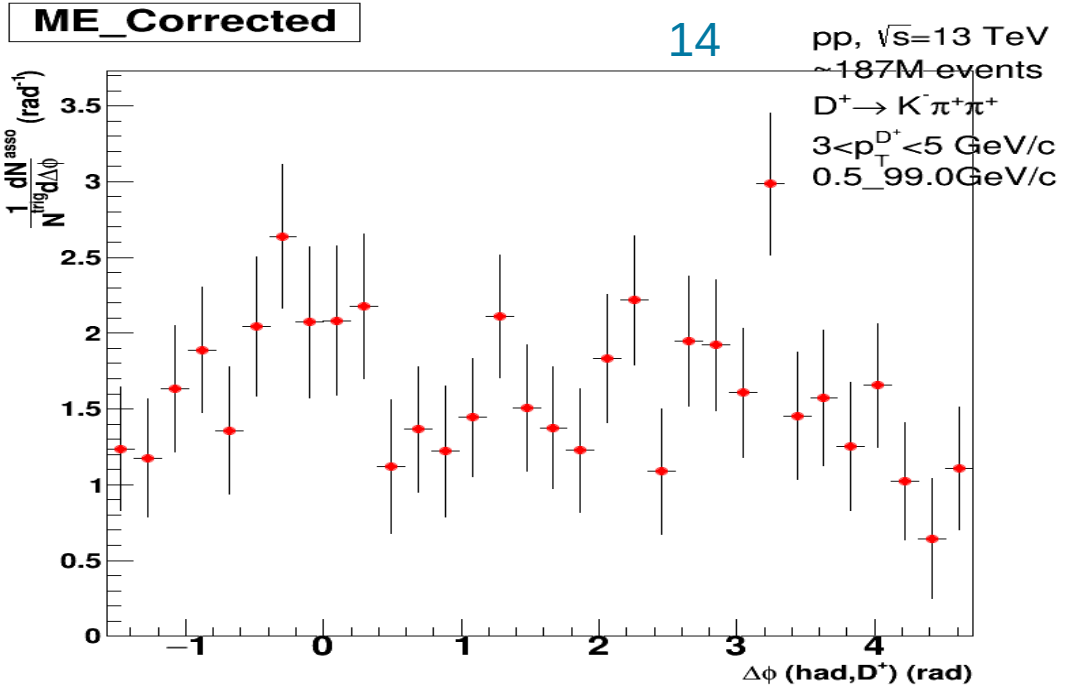


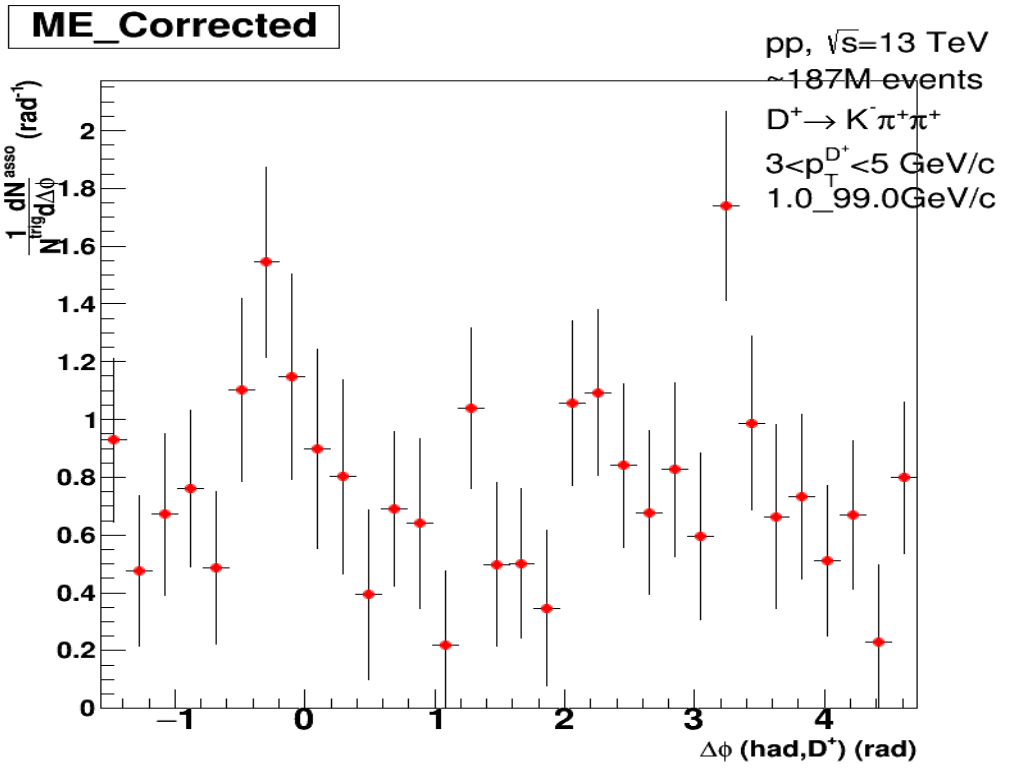






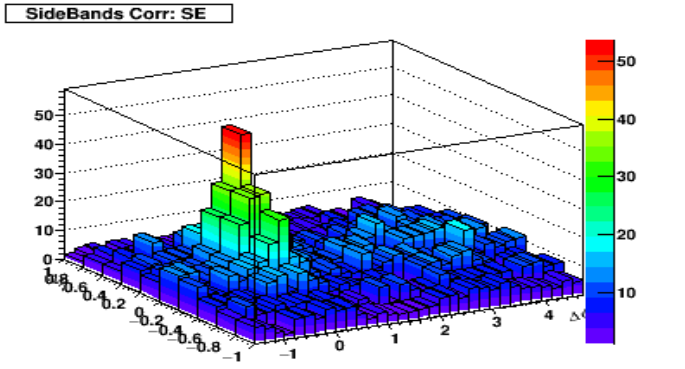

ME_Corrected
pp, √s=13 TeV
~187M events
D⁺→ K⁻π⁺π⁺
3<p_T^D⁺<5 GeV/c
0.3_99.0GeV/c
1/N^trig dN^asso/dΔφ (rad⁻¹)
Δφ (had,D⁺) (rad)

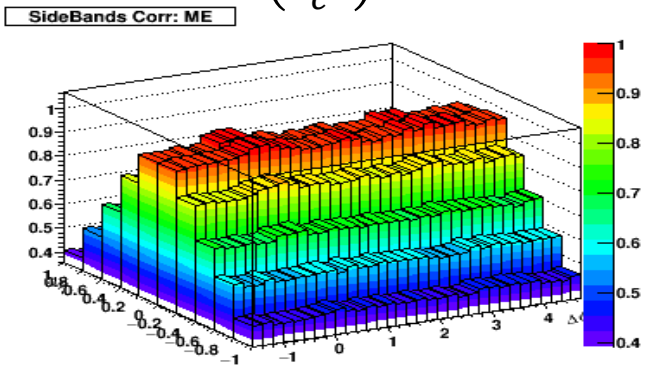

ME_Corrected
pp, √s=13 TeV
~187M events
D⁺→ K⁻π⁺π⁺
3<p_T^D⁺<5 GeV/c
0.5_99.0GeV/c
1/N^trig dN^asso/dΔφ (rad⁻¹)
Δφ (had,D⁺) (rad)

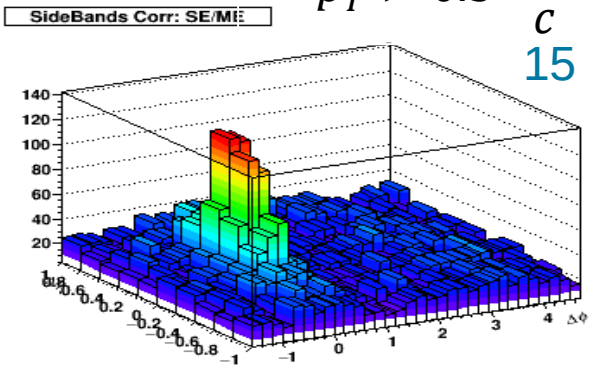

ME_Corrected
pp, √s=13 TeV
~187M events
D⁺→ K⁻π⁺π⁺
3<p_T^D⁺<5 GeV/c
1.0_99.0GeV/c
1/N^trig dN^asso/dΔφ (rad⁻¹)
Δφ (had,D⁺) (rad)

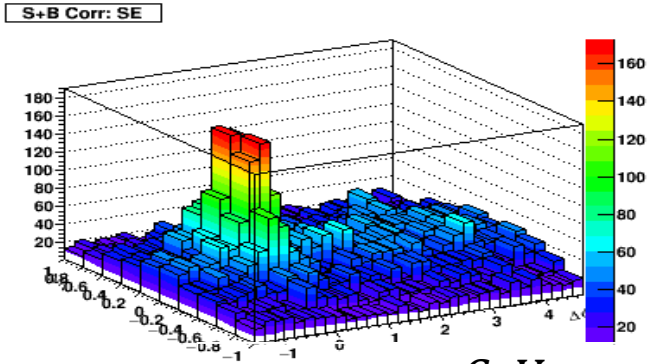
Trigger Particle D^+: $5.0 < p_T \left(\frac{GeV}{c}\right) < 8.0$ (Middle Momentum)

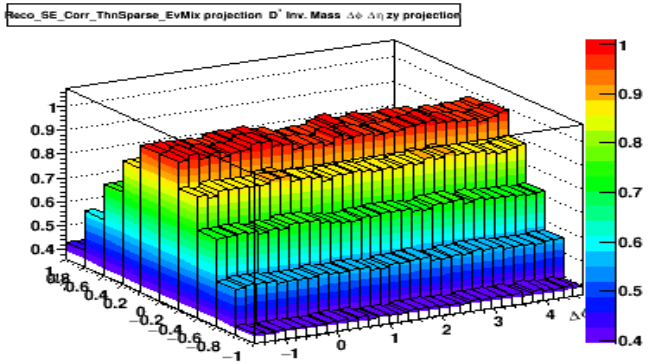
$p_T > 0.3 \frac{GeV}{c}$

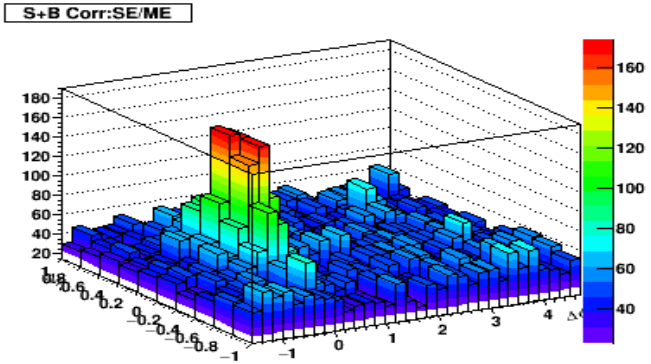




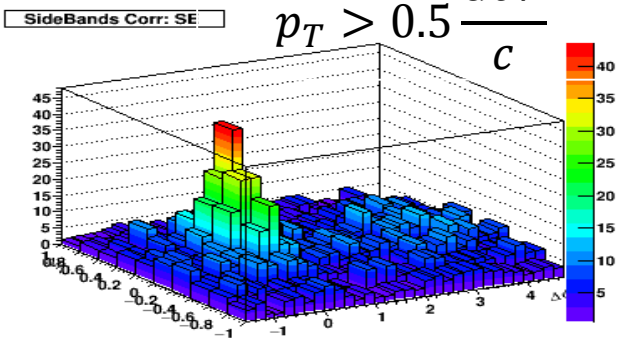


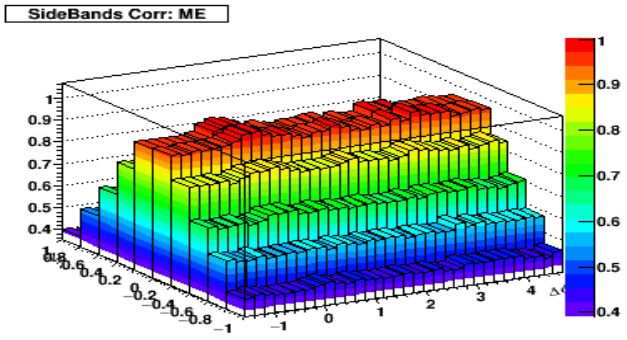


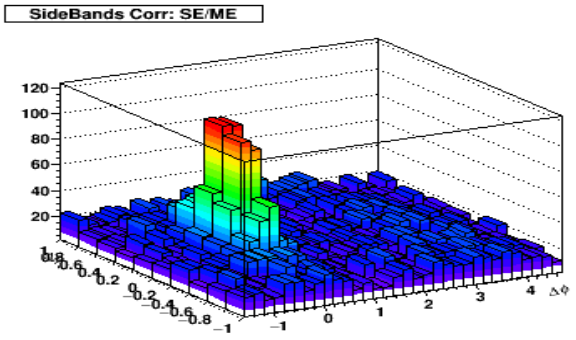


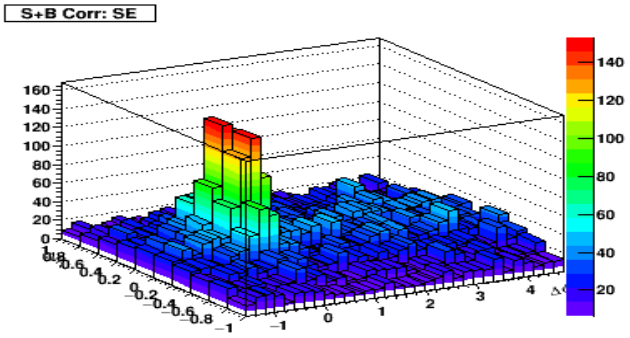


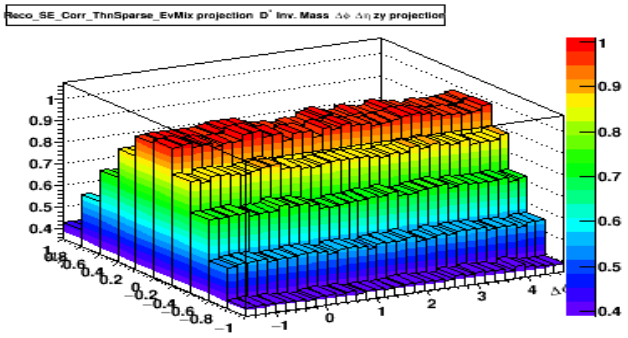
$p_T > 0.5 \frac{GeV}{c}$

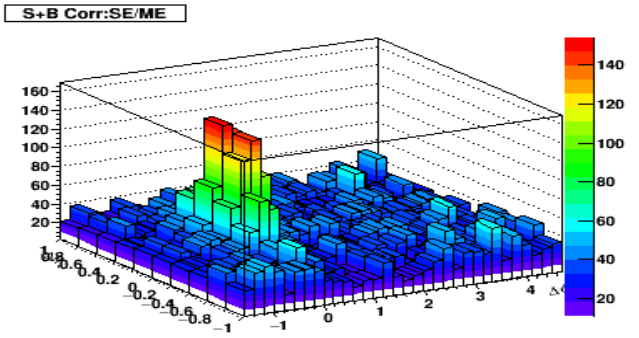






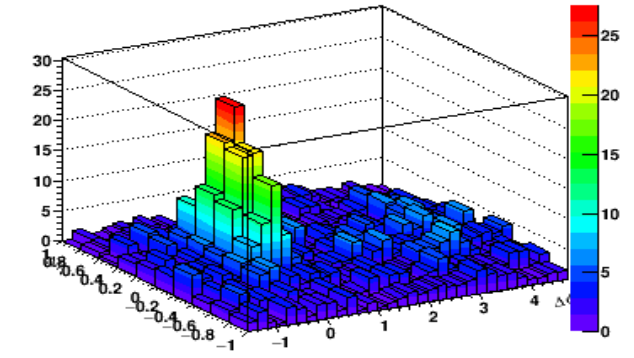




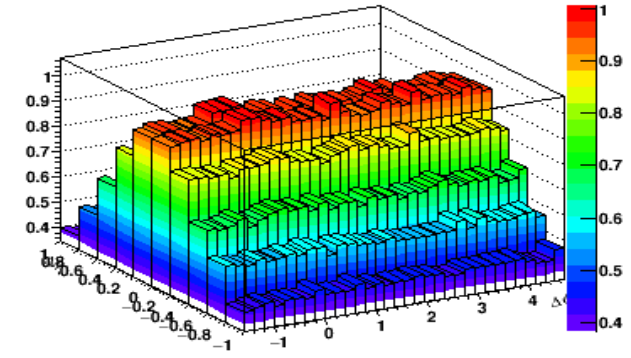


$$p_T > 1.0 \frac{GeV}{c}$$

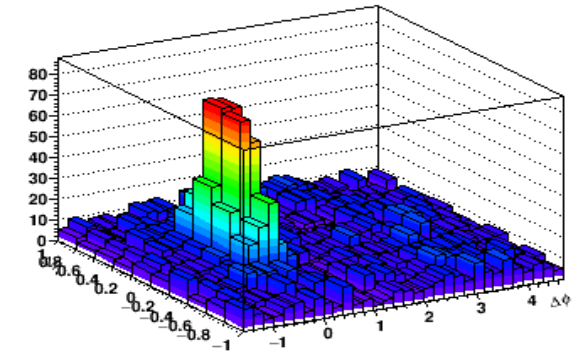
SideBands Corr: SE



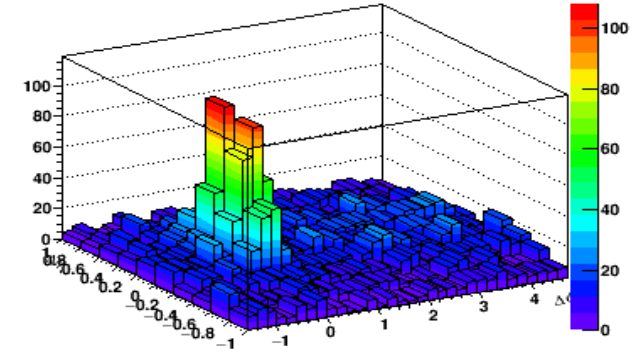
SideBands Corr: ME



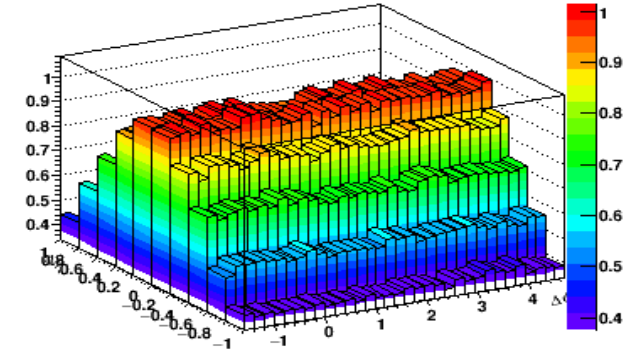
SideBands Corr: SE/ME



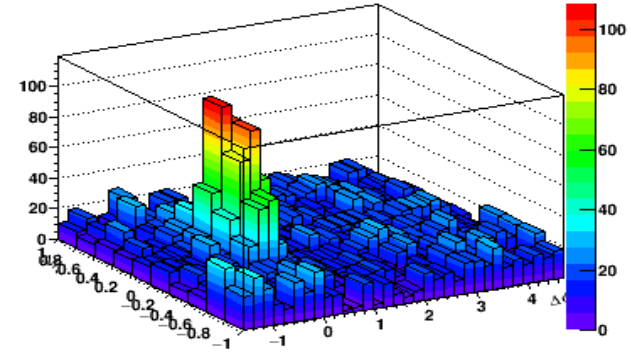
S+B Corr: SE

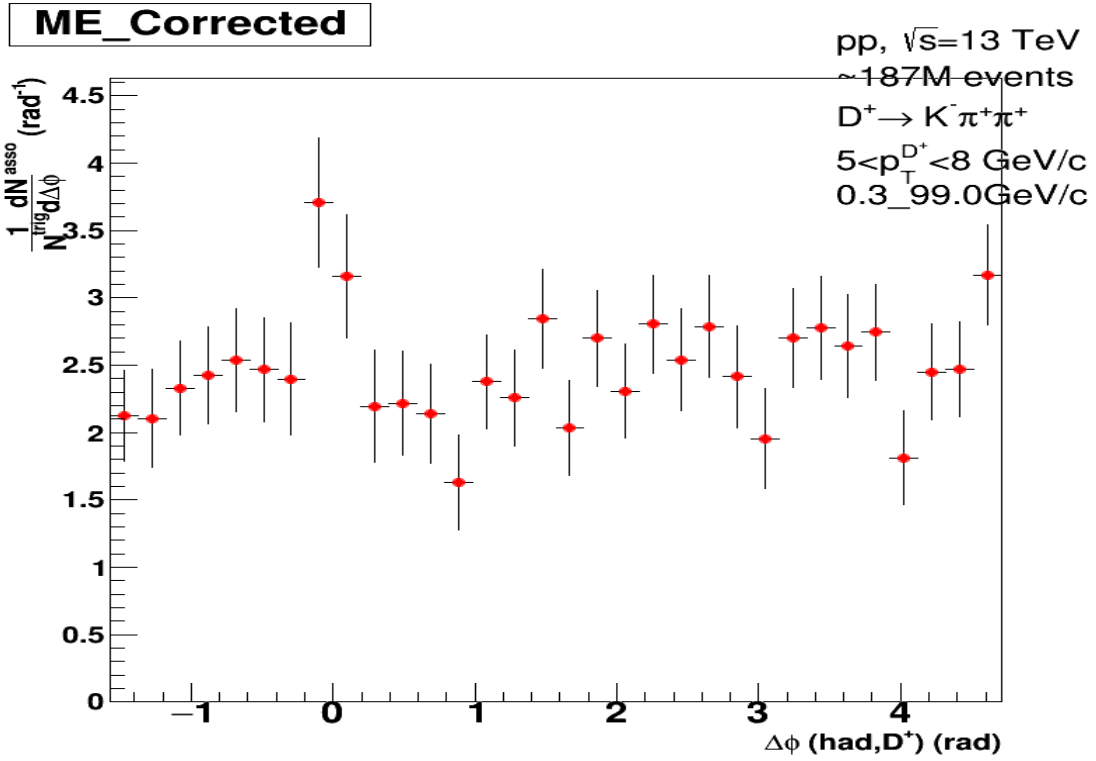


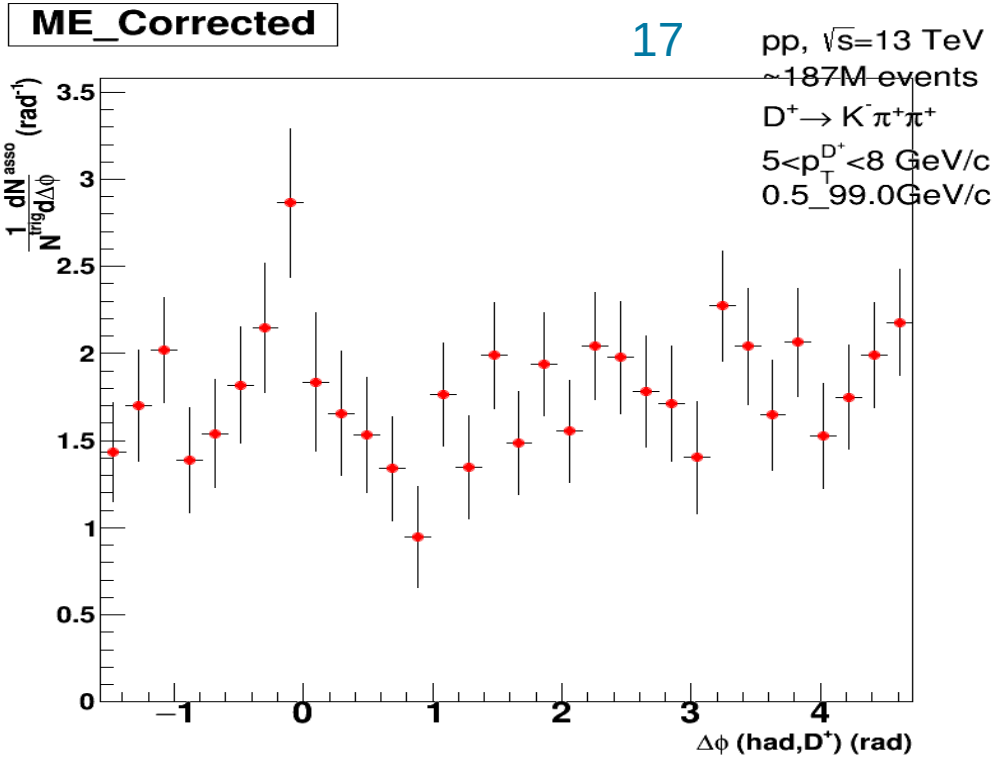
Reco_SE_Corr_ThnSparse_EvMix projection D° Inv. Mass Δφ Δη zy projection

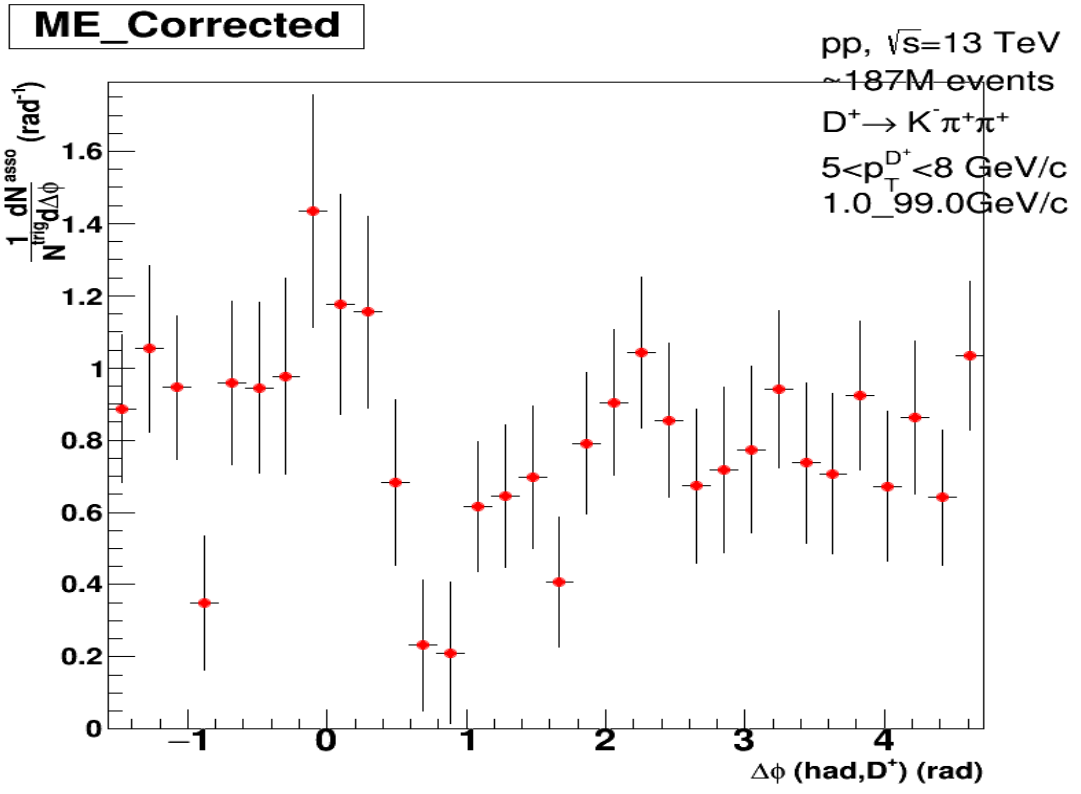


S+B Corr:SE/ME



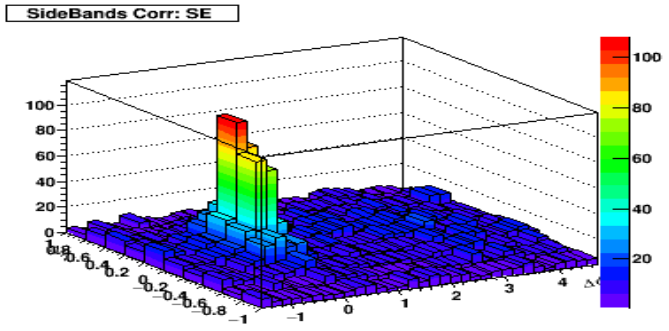

ME_Corrected
pp, √s=13 TeV
~187M events
D⁺→ K⁻π⁺π⁺
5<p_T^{D⁺}<8 GeV/c
0.3_99.0GeV/c
1/N^{trig} dN^{asso}/dΔφ (rad⁻¹)
Δφ (had,D⁺) (rad)

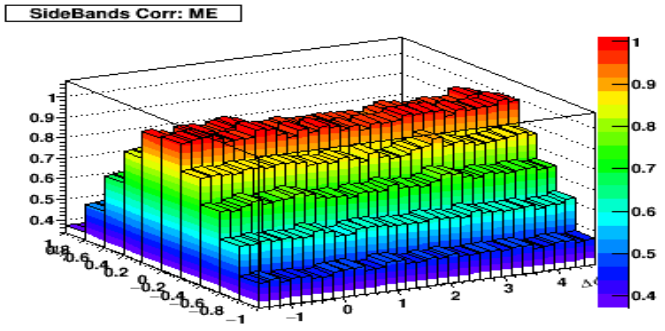

ME_Corrected
pp, √s=13 TeV
~187M events
D⁺→ K⁻π⁺π⁺
5<p_T^{D⁺}<8 GeV/c
0.5_99.0GeV/c
1/N^{trig} dN^{asso}/dΔφ (rad⁻¹)
Δφ (had,D⁺) (rad)

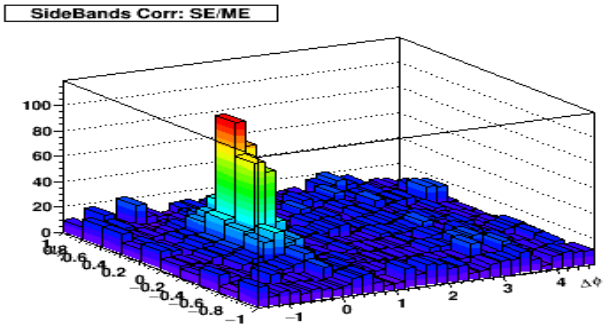

ME_Corrected
pp, √s=13 TeV
~187M events
D⁺→ K⁻π⁺π⁺
5<p_T^{D⁺}<8 GeV/c
1.0_99.0GeV/c
1/N^{trig} dN^{asso}/dΔφ (rad⁻¹)
Δφ (had,D⁺) (rad)

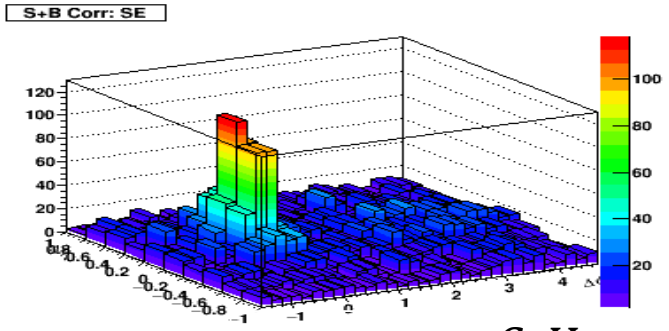
Trigger Particle D^+: $8.0 < p_T\left(\frac{GeV}{c}\right) < 16.0$ (High Momentum)

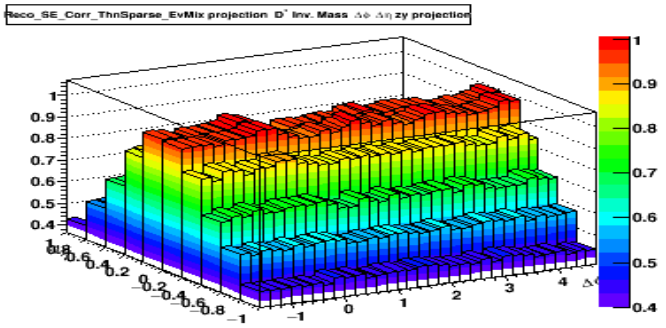
$p_T > 0.3\frac{GeV}{c}$

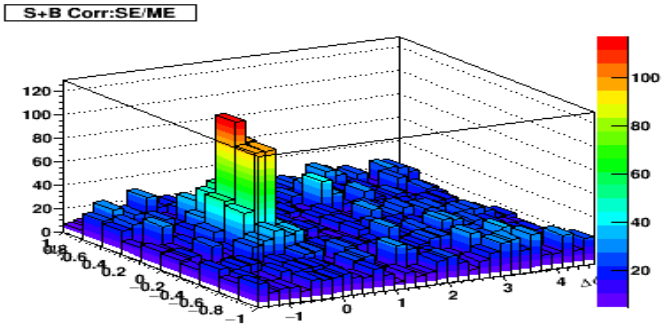




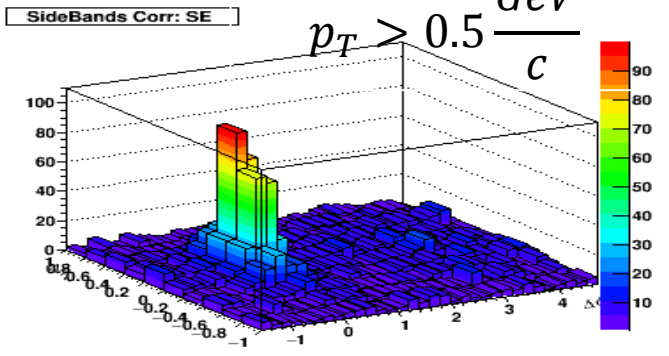


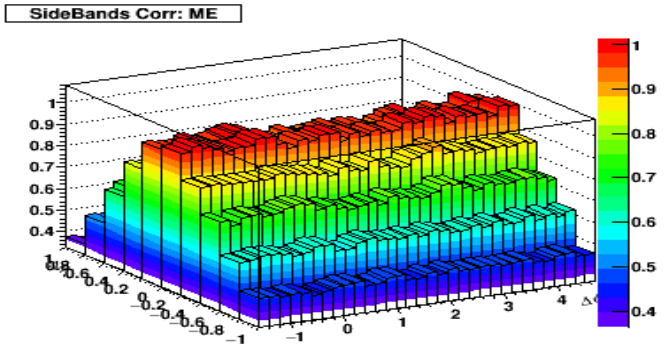


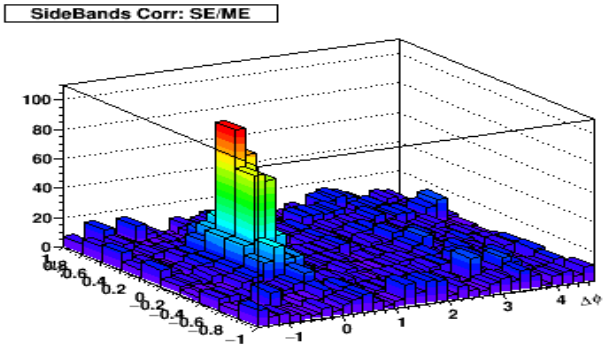


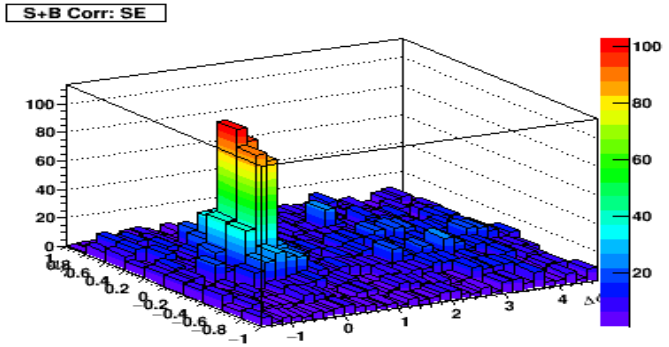


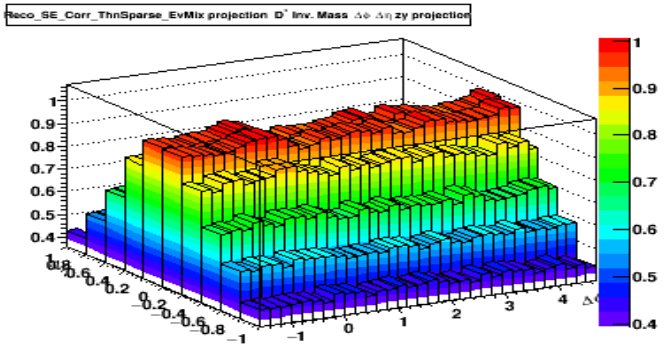
$p_T > 0.5\frac{GeV}{c}$

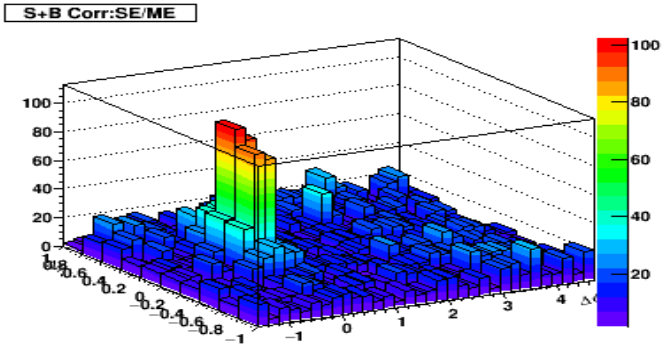






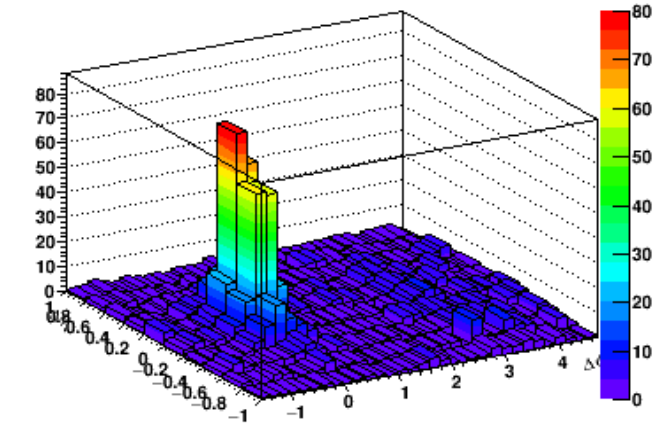




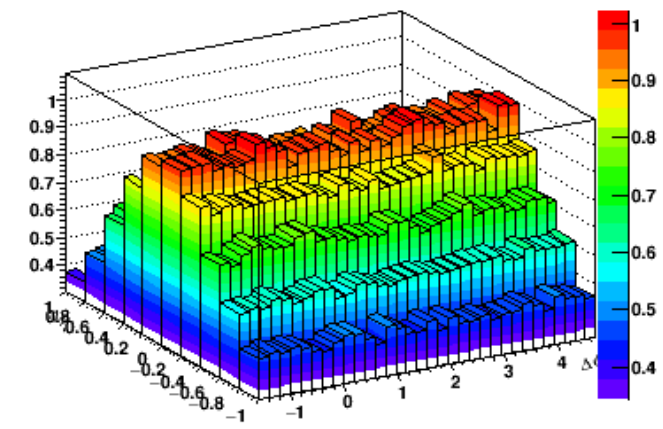


$$p_T > 1.0 \frac{GeV}{c}$$

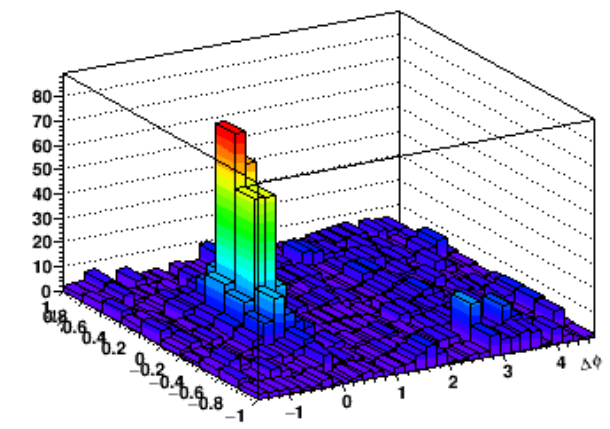
SideBands Corr: SE



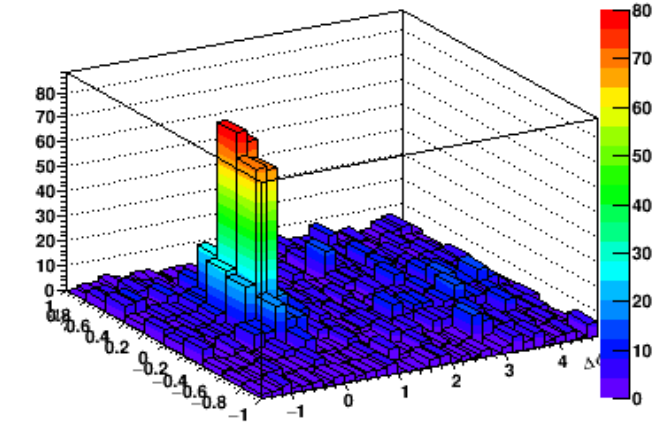
SideBands Corr: ME



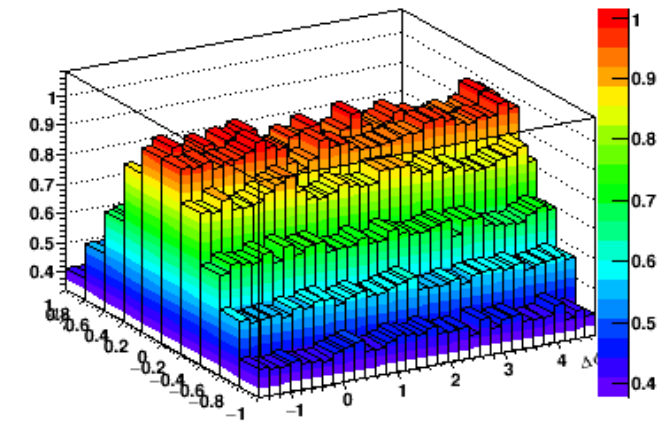
SideBands Corr: SE/ME



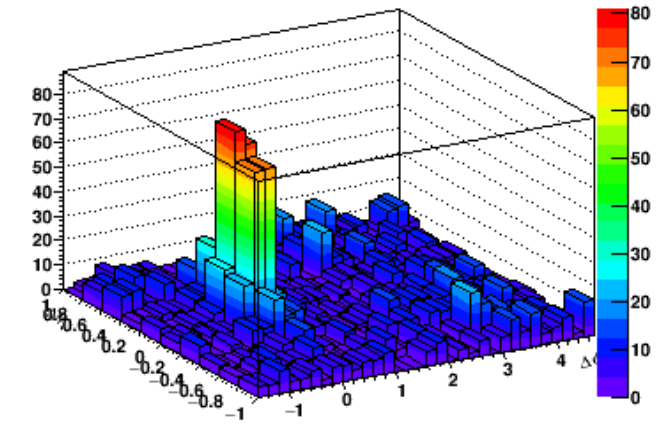
S+B Corr: SE

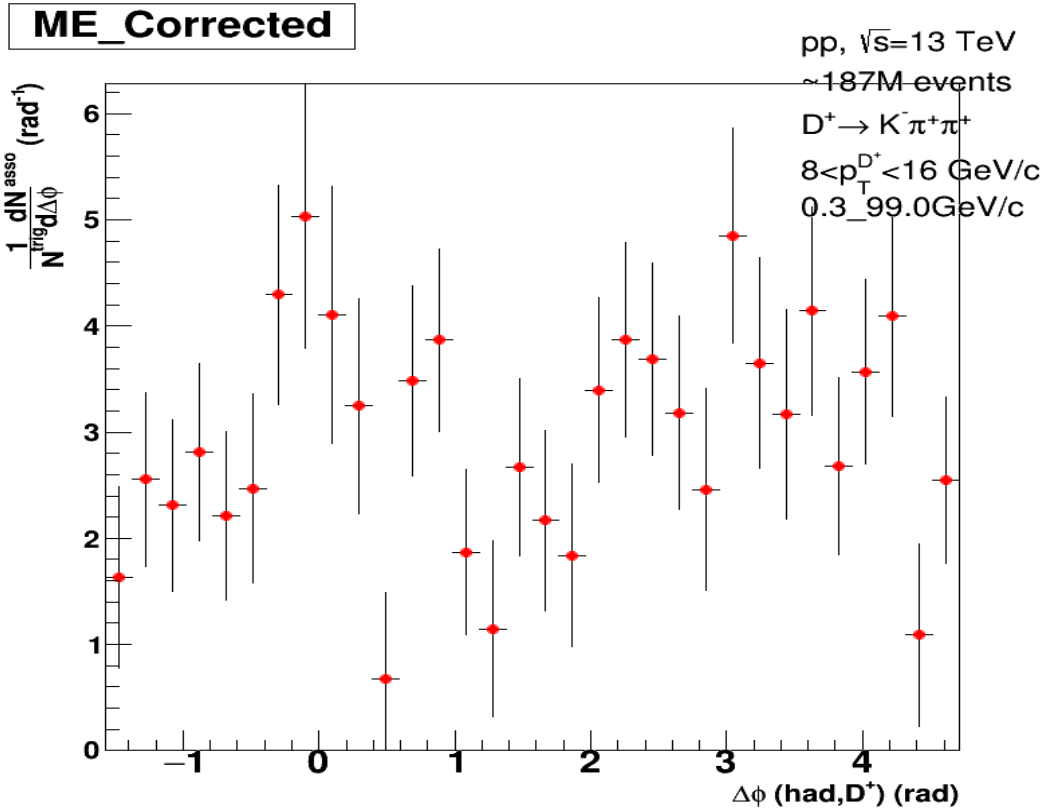


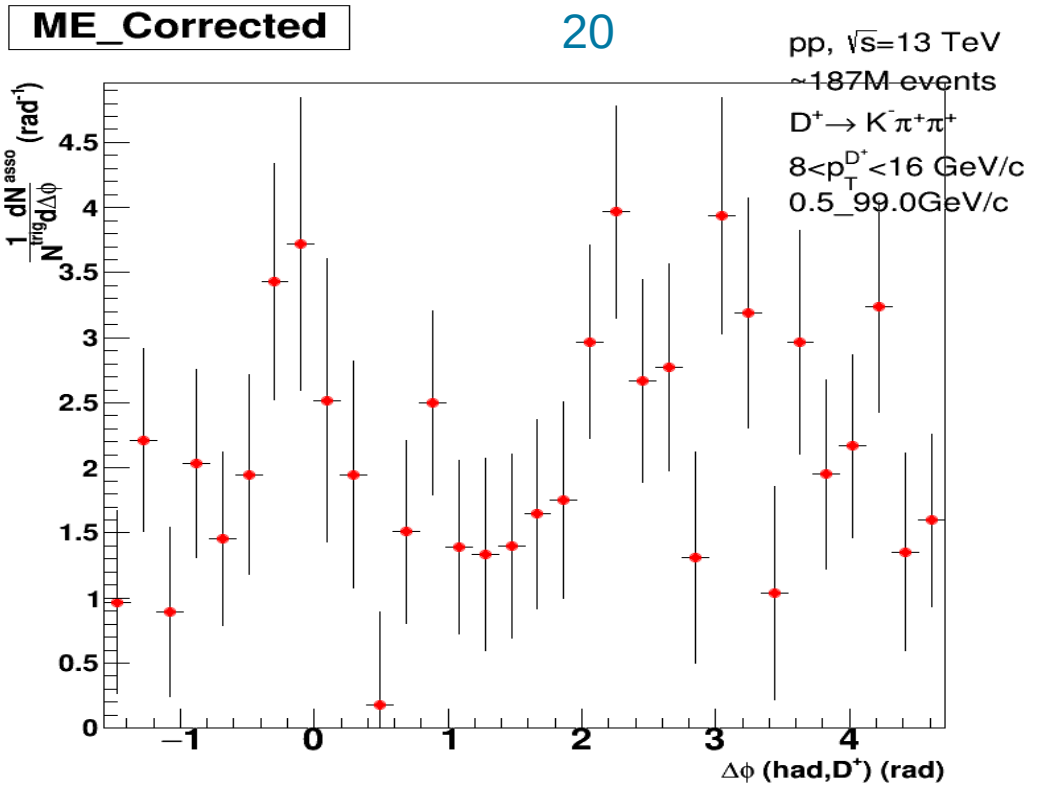
Reco_SE_Corr_ThnSparse_EvMix projection D* Inv. Mass Δφ Δη zy projection

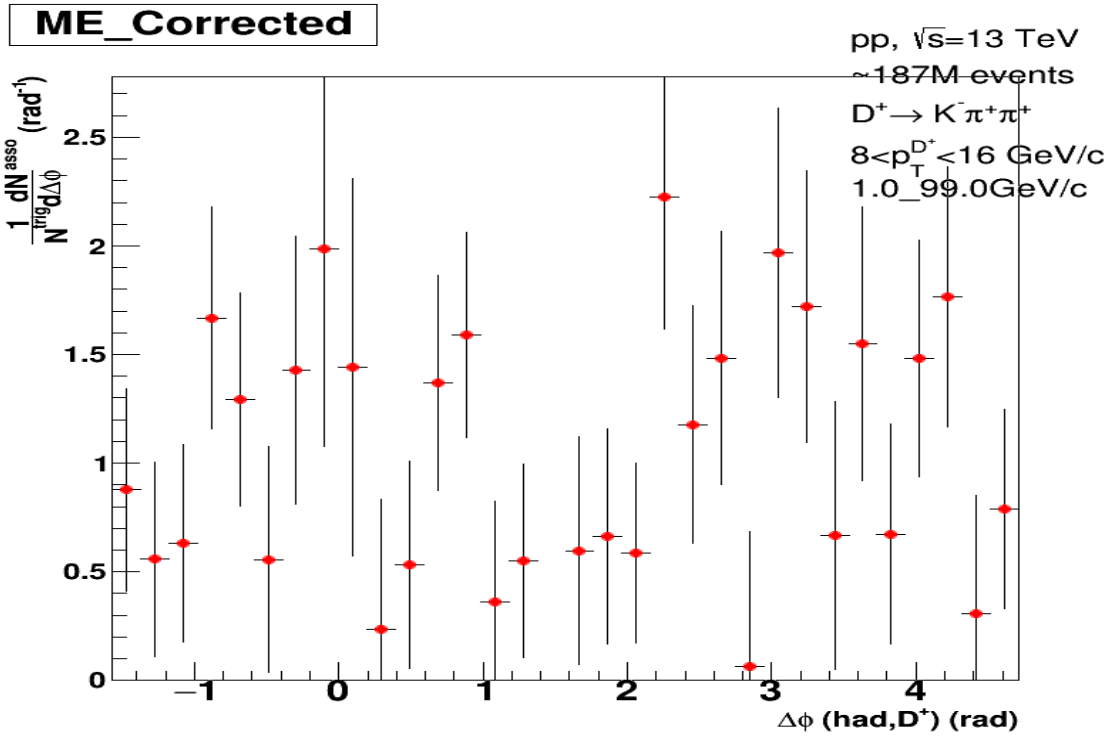


S+B Corr:SE/ME




ME_Corrected
pp, √s=13 TeV
~187M events
D+→ K-π+π+
8<p_T^D+<16 GeV/c
0.3_99.0GeV/c
1/N^trig dN^asso/dΔφ (rad^-1)
Δφ (had,D+) (rad)


ME_Corrected
pp, √s=13 TeV
~187M events
D+→ K-π+π+
8<p_T^D+<16 GeV/c
0.5_99.0GeV/c
1/N^trig dN^asso/dΔφ (rad^-1)
Δφ (had,D+) (rad)


ME_Corrected
pp, √s=13 TeV
~187M events
D+→ K-π+π+
8<p_T^D+<16 GeV/c
1.0_99.0GeV/c
1/N^trig dN^asso/dΔφ (rad^-1)
Δφ (had,D+) (rad)

Future Plan

- Event display not able to visualize the AOD tracks, some modification is required working on that.
- D^+-Hadron azimuthal correlations for pass 2 data is shown
- We need larger statistics for seeing correlation peaks clearly
- Working on track efficiency correction

THANK YOU