

Feasibility study of pions and kaons femtoscscopy correlations for 9.0 GeV Bi-Bi with UrQMD

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Details of analysis (pions & kaons) (previous)

- Dataset (reconstructed in MPD tracks) production:
[/eos/nica/mpd/sim/data/MiniDst/dst-BiBi-09GeV-mp07-20-pwg3-250ev/BiBi/09.0GeV-0-14fm/UrQMD/](#)

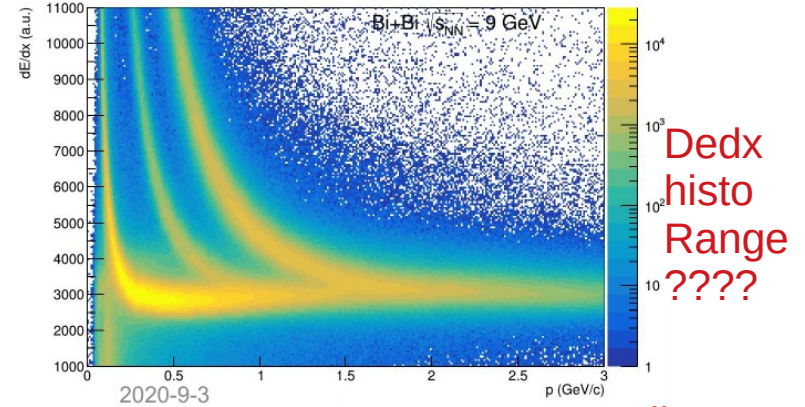
- 10 mln
 UrQMD Minimal Bias events
 BiBi 9 GeV
 - Mini Dst format

- Kinematic conditions for pions
 p_T (0.15-1.45) GeV/c
 $|\eta| < 1.0$

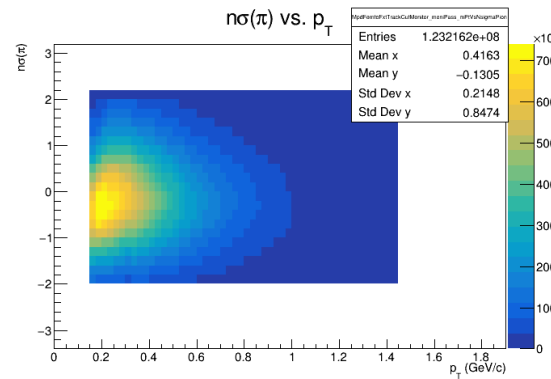
- Nhits TPC > 15
- DCA < 3 cm
- $|\text{VertexZ}| < 75$
- PID :
- Nsigma for pion and kaons

- Det
 in TPC & TOF = 2
- for pions: m_2 (-0.05, 0.08)
- for kaons: m_2 (0.1, 0.4)

- Average Separation > 5cm

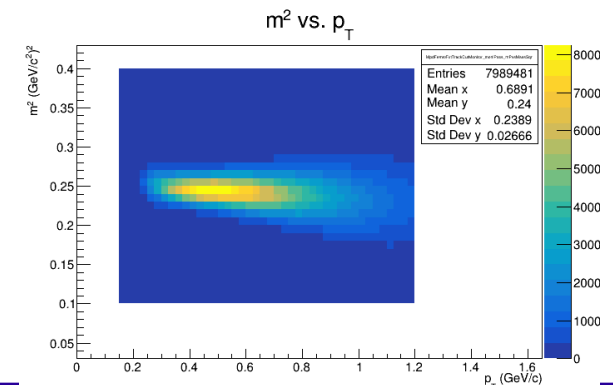
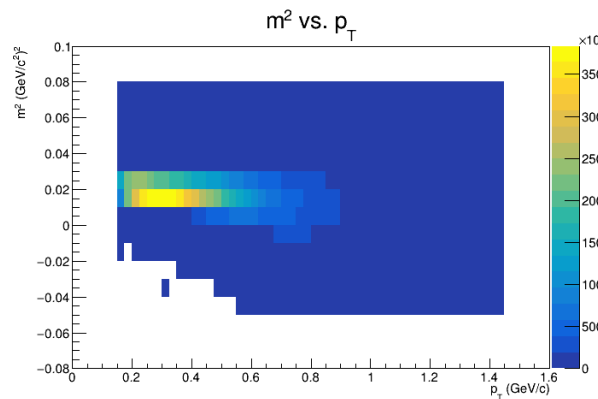
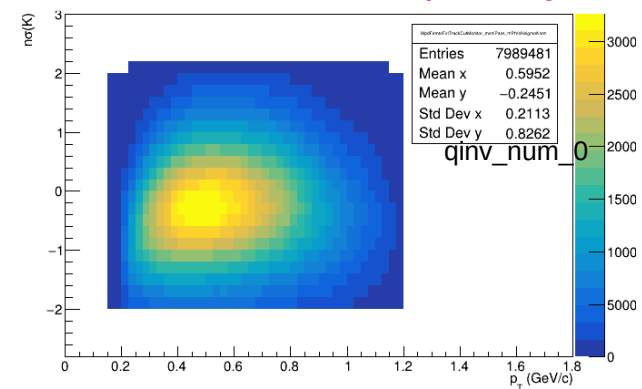


Pions: $1.2 \cdot 10^8$



Kaons: $0.08 \cdot 10^8$

All primary ?



Details of analysis pions (present)

- Dataset (reconstructed in MPD tracks) production:
/eos/nica/mpd/sim/data/MiniDst/dst-BiBi-09GeV-mp07-20-pwg3-250ev/BiBi/09.0GeV-0-14fm/UrQMD/

- trackCut->setDetectorSelection(4);**
//0 TPC, 1 TOF, 2 TPC+TOF,
3 if(TOF) TPC+TOF,
else TPC, 4 TOF $p > p_{\text{thresh}}$

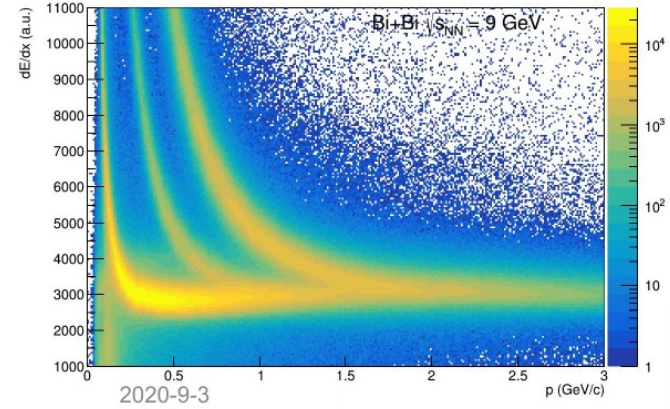
- trackCut->setPthresh(0.5);**

- /// Set min and max momentum of the track for TPC identification
trackCut->setTpcP(0.15,0.5);
trackCut->setTofP(0.5,1.45);

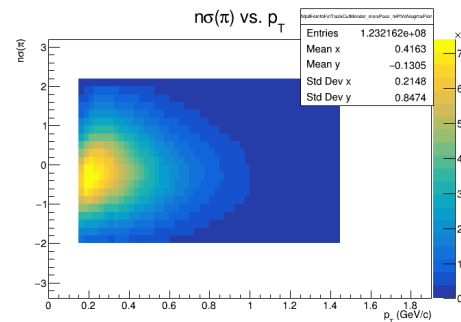
- /// Set min and max values of pion nSigma for TPC+TOF identification
trackCut->setTnTNSigmaPion(-2., 2.)

- trackCut->setNSigmaPion(-2., 2.);**

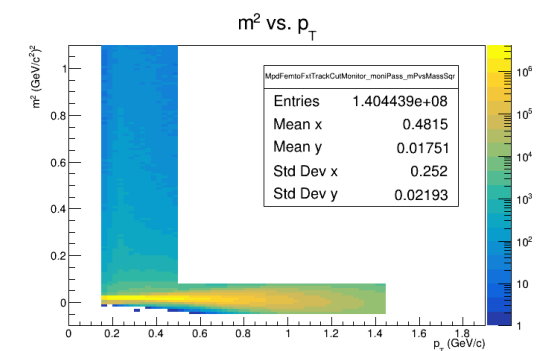
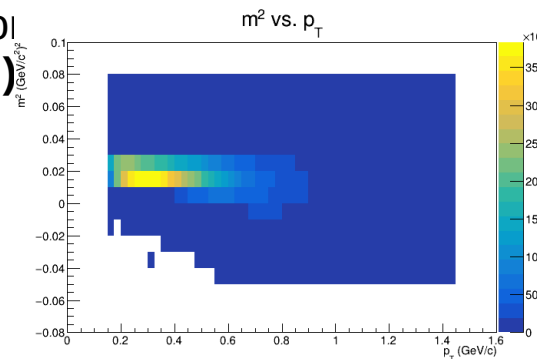
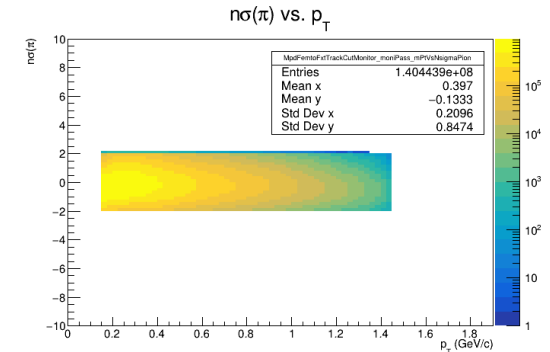
- No Average Separation cut**



Pions: $1.2 \cdot 10^8$



Pions: $1.4 \cdot 10^8$

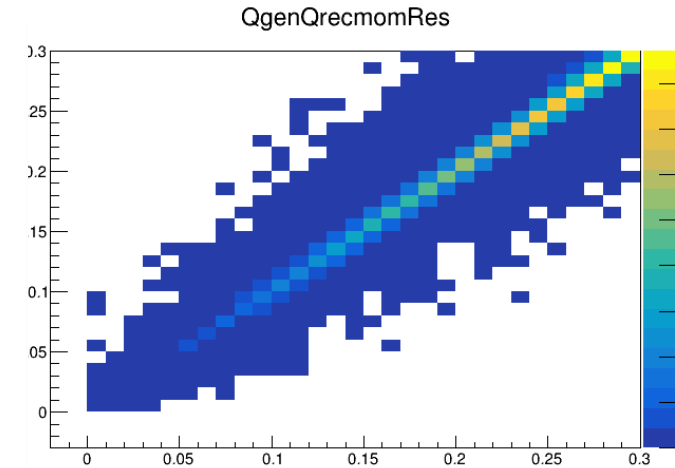
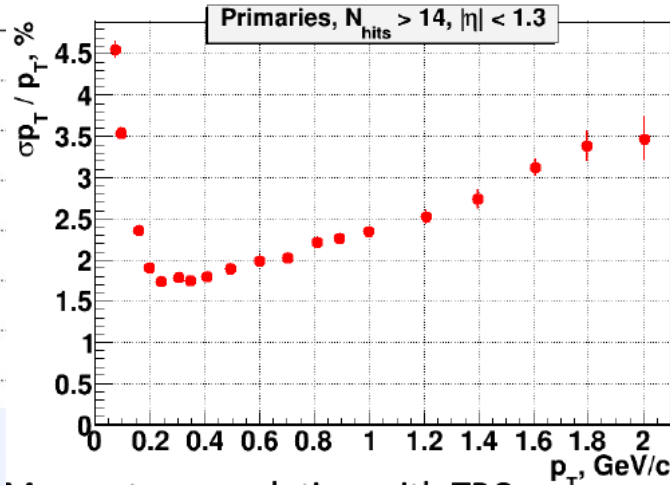
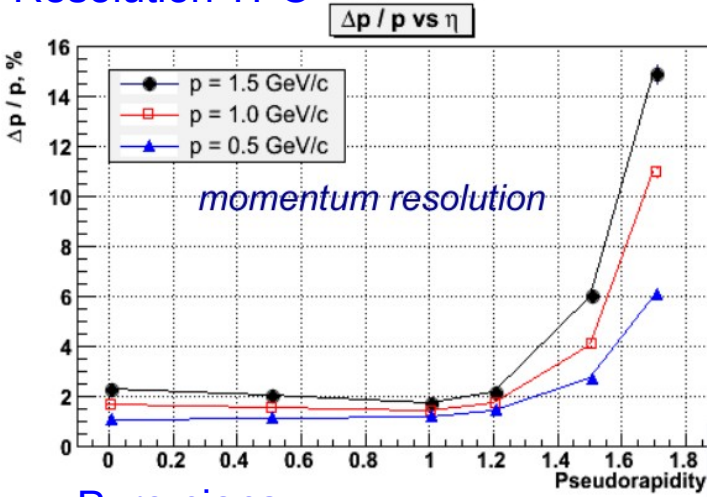


Test of class for resolution: pion QS+Coulomb

Calculations with class `MpdFemtoModelCorrFctnMomResolution`
`Ro = 5 fm; QS+Coulomb, PURE pions by pdg`
`pairCut → pairCut->setKt(0.15, 0.35);`

ALL registered as pions by pdg

Resolution TPC



kT: (0.15-0.25) GeV/c; QS

Ideal CF: $Ro = 4.96 \pm 0.01$ $Rs = 4.97 \pm 0.01$ $RI = 4.97 \pm 0.01$ $lambda = 0.99 \pm 0.003$

Reconstructed: $Ro = 4.86 \pm 0.01$ $Rs = 4.94 \pm 0.01$ $RI = 4.94 \pm 0.01$ $lambda = 0.96 \pm 0.003$

kT: (0.35-0.95) GeV/c; QS

Reconstructed: $Ro = 4.82 \pm 0.01$ $Rs = 4.95 \pm 0.01$ $RI = 4.94 \pm 0.01$ $lambda = 0.95 \pm 0.002$

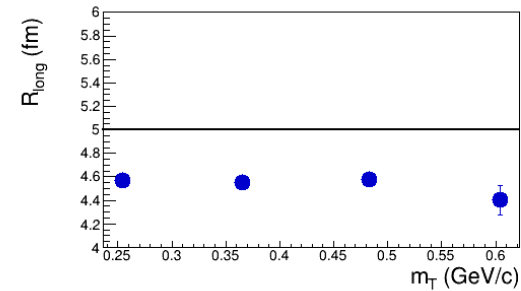
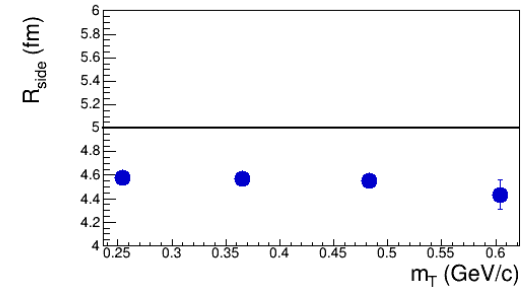
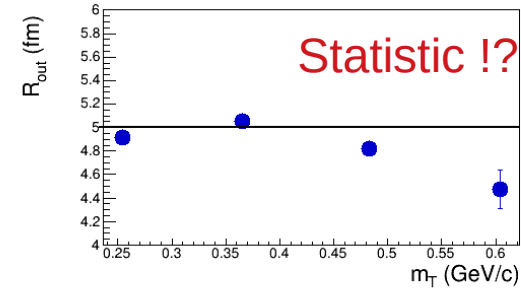
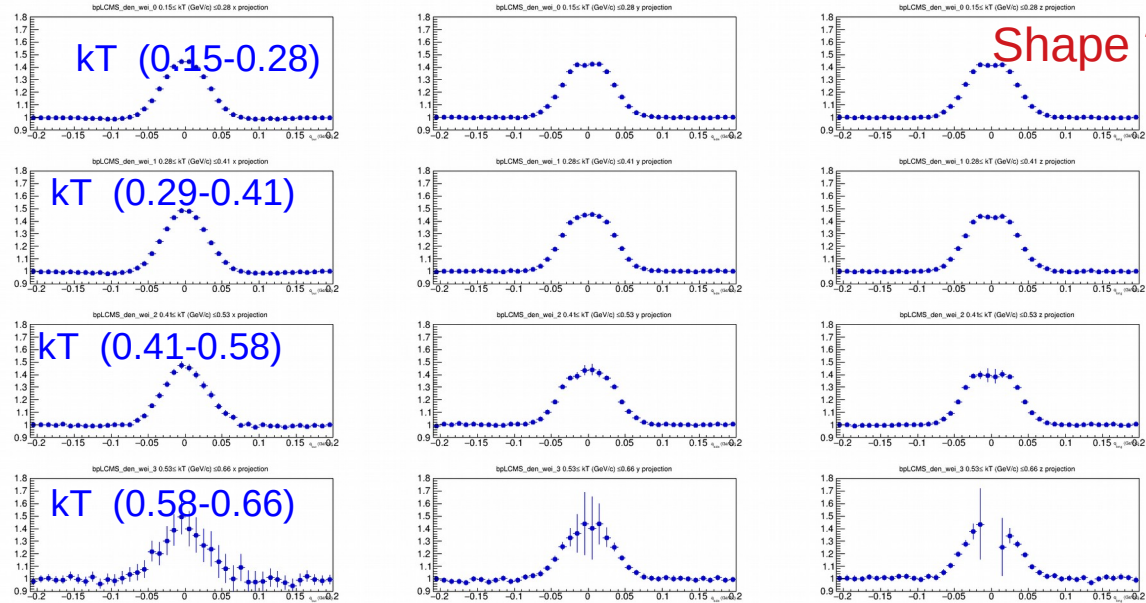
Resolution almost not depends on kT (p_T) range and is $< \sim 2\%$ for weight = QS

3D CF for pions : resolution / non-purity (previous)

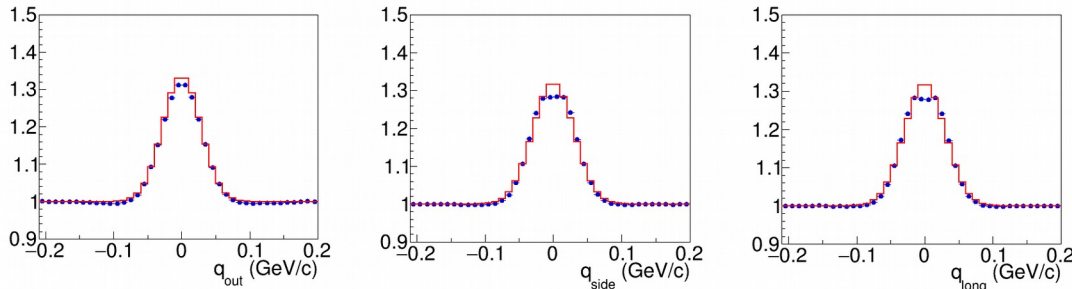
MpdFemtoModelBPLCMS3DCorrFctnKt class:

Test Rosl = 5 fm ; 10 mln MB events

kT (0.15-0.65) GeV/c & 4 kT bins – CF = (Dmixed, weight=QS)/ Dmixed



Example of fit: kT (0.15-0.35) GeV/c;



kT (0.15-0.65) GeV/c , 2 kT bins

-kT (0.15-0.40) Ro = 4.83 +/- 0.01 Rs = 4.94 +/- 0.007 RI = 4.93 +/- 0.008 lambda = 0.79 +/- 0.001

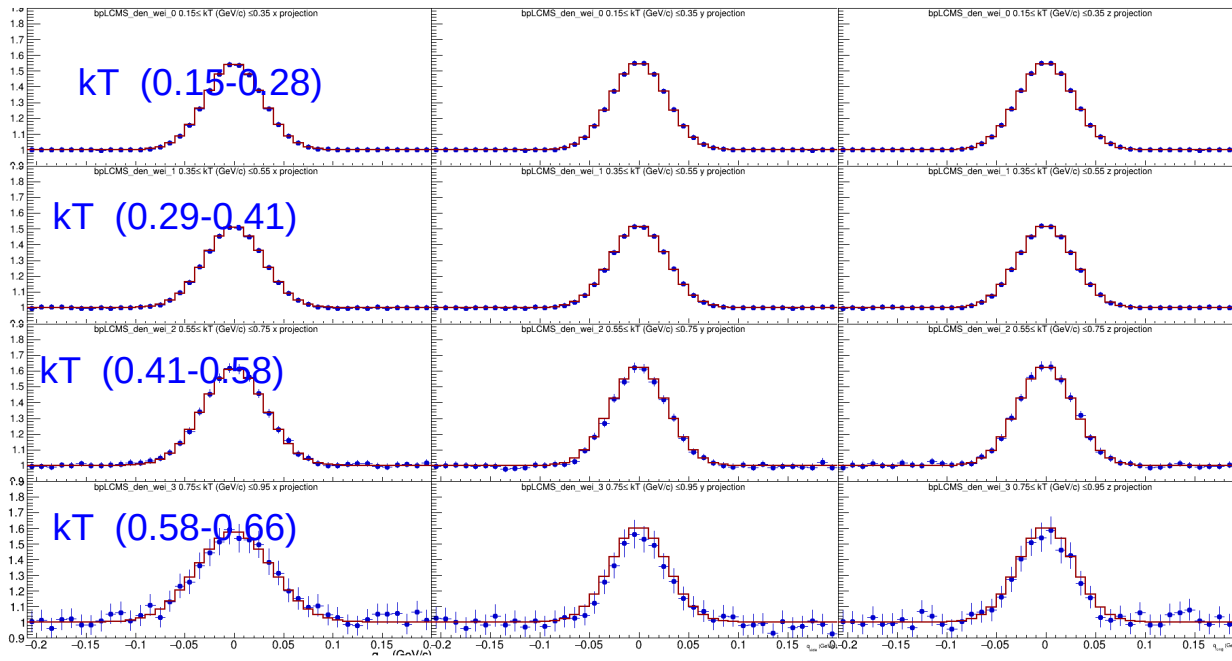
KT (0.4-0.65) Ro = 4.68 +/- 0.04 Rs = 4.87 +/- 0.03 RI = 4.87 +/- 0.03 lambda = 0.80 +/- 0.01

3D CF for pions : resolution / non-purity (now)

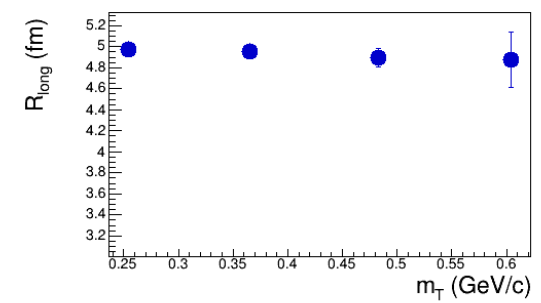
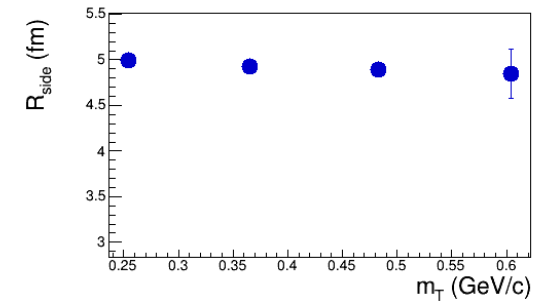
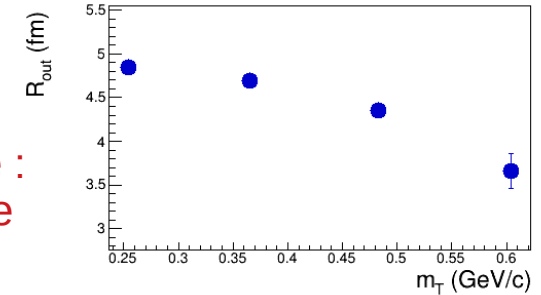
MpdFemtoModelBPLCMS3DCorrFctnKt class:

Test $R_{o1} = 5$ fm ; 10 mln MB events

kT (0.15-0.65) GeV/c & 4 kT bins – CF = (Dmixed, weight=QS)/ Dmixed



No problems with Shape :
No Average Separation cut



Statistic !?

No, purity ! Test with the same kT bin with class

MpdFemtoModelCorrFctnMomResolution

kT (0.35-0.95) GeV/c

MpdFemtoModelCorrFctnMomResolution (pions are selected)

$R_o = 4.82 \pm 0.01$ $R_s = 4.95 \pm 0.01$ $R_l = 4.94 \pm 0.01$ $\lambda = 0.95 \pm 0.002$

MpdFemtoModelBPLCMS3DCorrFctnKt class

$R_o = 4.70 \pm 0.02$ $R_s = 4.93 \pm 0.02$ $R_l = 4.94 \pm 0.02$ $\lambda = 0.84 \pm 0.006$

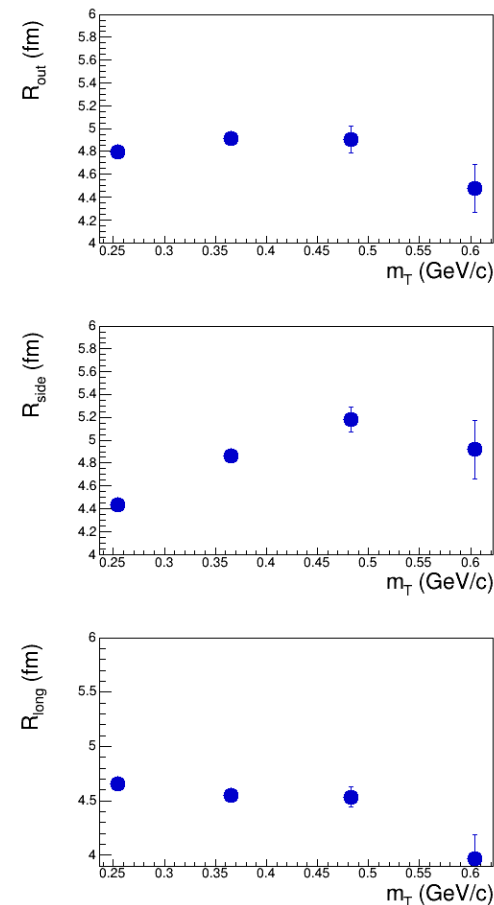
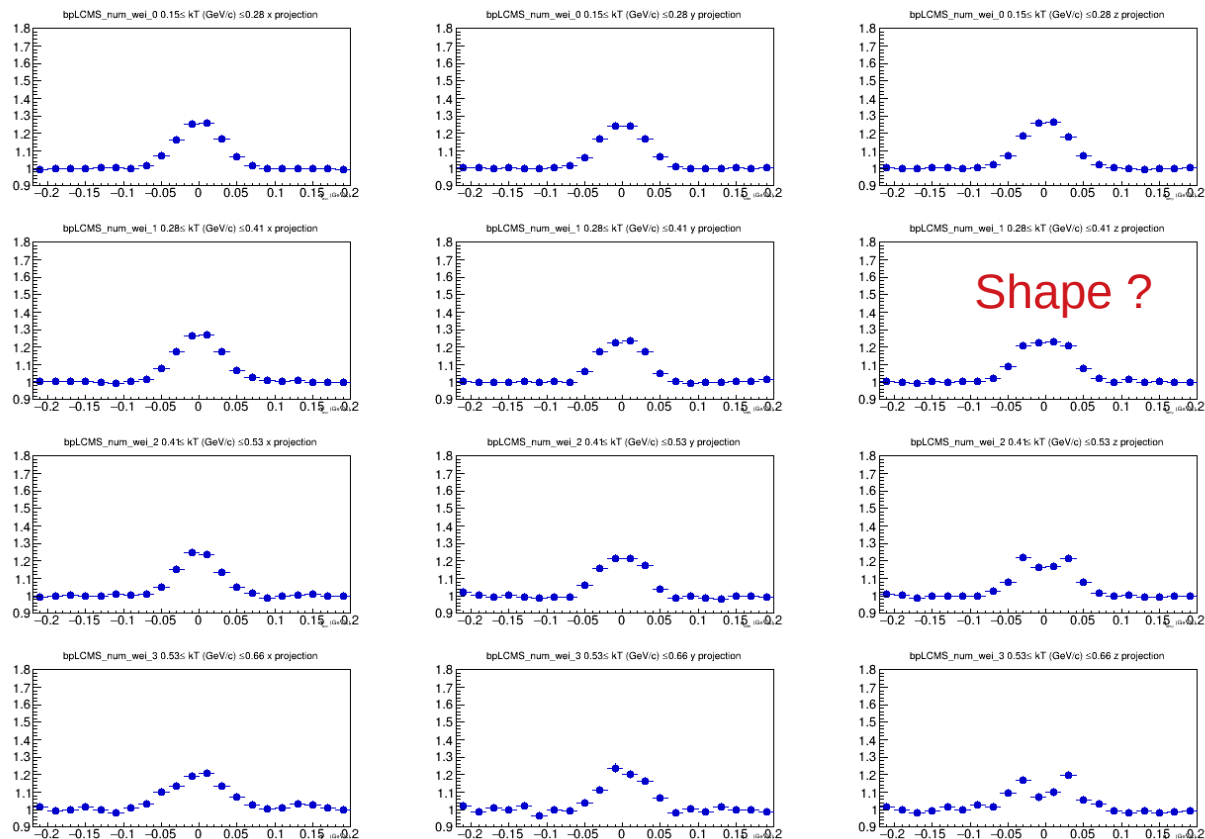
Weights = 1 for pion - non pions (?)

3D CF for pions : resolution / non-purity / TTC (previous)

MpdFemtoModelBPLCMS3DCorrFctnKt class:

Test Rosl = 5 fm ; 10 mln MB events

kT (0.15-0.65) GeV/c & 4 kT bins – CF = (Nsame, weight=QS)/ Dmixed



Statistic !!!

-kT (0.15-0.40) $R_o = 4.64 \pm 0.02$ $R_s = 4.81 \pm 0.02$ $R_l = 4.87 \pm 0.02$ $\lambda = 0.77 \pm 0.03$

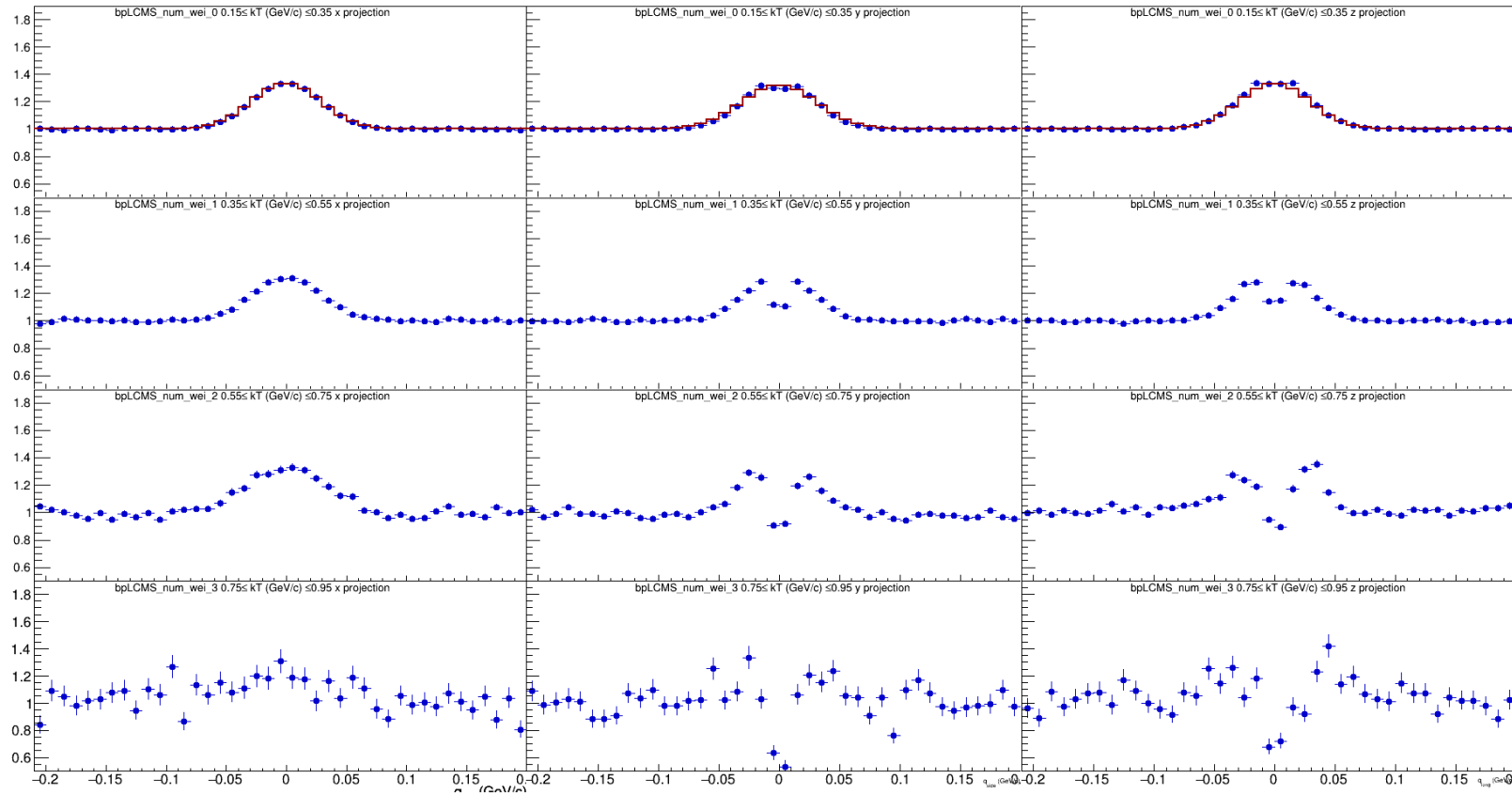
KT (0.40-0.65) $R_o = 4.59 \pm 0.1$ $R_s = 5.24 \pm 0.09$ $R_l = 4.60 \pm 0.07$ $\lambda = 0.77 \pm 0.03$

3D CF for pions : resolution / non-purity / No TTC

MpdFemtoModelBPLCMS3DCorrFctnKt class:

Test Rosl = 5 fm ; 10 mln MB events

kT (0.15-0.95) GeV/c & 4 kT bins – CF = (Nsame, weight=QS)/ Dmixed



Statistic (?)

Average separation cut should depend on kT range