

Light hadrons from $Xe+W$ @ 2.5 GeV (fixed target)

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Production 36: Xe+W, fixed target, $E_{\text{kin}} = 2.5$ GeV, UrQMD [7.5M events are presented here]
W target: $z = -85$ cm

$$\sqrt{s_{NN}} = m_N \sqrt{2 \left(1 + \frac{E_{\text{Lab}}}{m_N} \right)}, \quad E_{\text{Lab}} = E_{\text{kin}} + m_N - \text{energy of projectile nucleon}$$

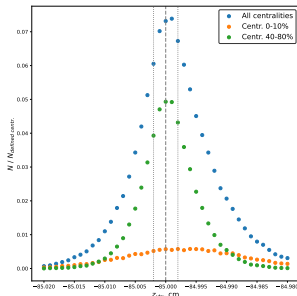
$$y_{\text{CM}} = y_{\text{Lab}} - \Delta y, \quad \Delta y = \frac{1}{2} \ln \frac{1 + \beta}{1 - \beta}; \quad \gamma = \frac{\sqrt{s_{NN}}}{2m_N} \Rightarrow \beta$$

$$E_{\text{kin}} = 2.5 \text{ GeV} \quad \Rightarrow \quad \sqrt{s_{NN}} = 2.87 \text{ GeV}; \quad \gamma = 1.53; \quad \beta = 0.76; \quad \Delta y = 0.986$$

Results are presented in lab. frame

MPDRoot setup

```
$ ls mpdroot/physics/pairKK/macros_FXT/  
DCAs_FXT.root          pPID.txt  
nTr_Centr_Req35-UrQMD.root  TrackRecEff_FXT.root  
pCentr.txt
```



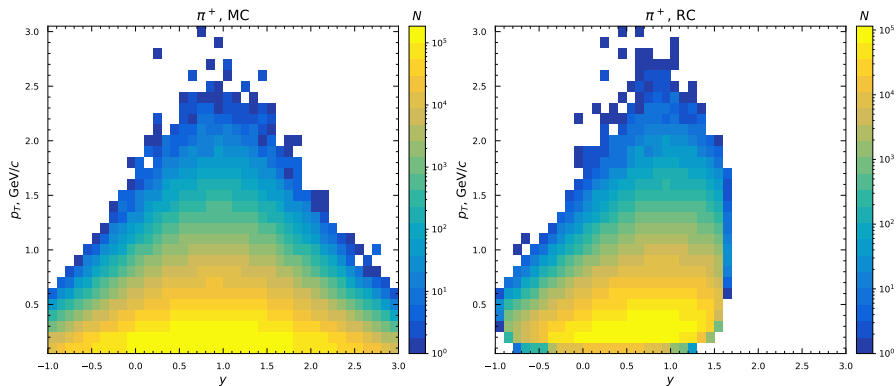
No cut on Zvtx (from conversation with V. Riabov)

Recommendation from Cross-PWG:
apply cuts on DCA in $n\sigma$ -s [not used now]

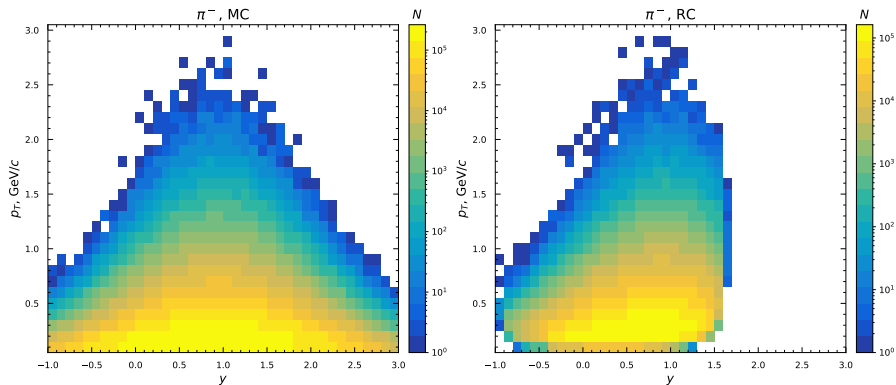
pHS.txt

```
#-----Parameters used for analysis-----  
# Abs[pdg] for considered particles:  
mAbsPDGs      211 321 2212  
# |sqrt{s}_{NN}|  
mSqrtSNN      2.8652 // [GeV]  
mGeneratorForPID  URQMD  
# Event selection:  
mZvtxCut      86 // cut on vertex z coordinate  
# Centrality binning  
mCentMin      0 10 20 30 40  
mCentMax      10 20 30 40 80  
# Track cuts:  
mNofHitsCut   27 // minimal number of hits for a track  
mDCAMax       1.0 // maximal |DCA|  
#  
mUseELC       true  
# Pt for hist  
mPtMin        0.05 // minimal pt for a track  
mPtMax        3.05 // maximal pt for a track  
mPtWidth      0.01 // GeV  
# Rapydity for hist  
mRapMin       -1.0  
mRapMax       3.0  
mRapWidth     0.01  
# PID cuts:  
mSigE         3.0 // nSigmas for dE/dx  
mSigB         3.0 // nSigmas for the average beta
```

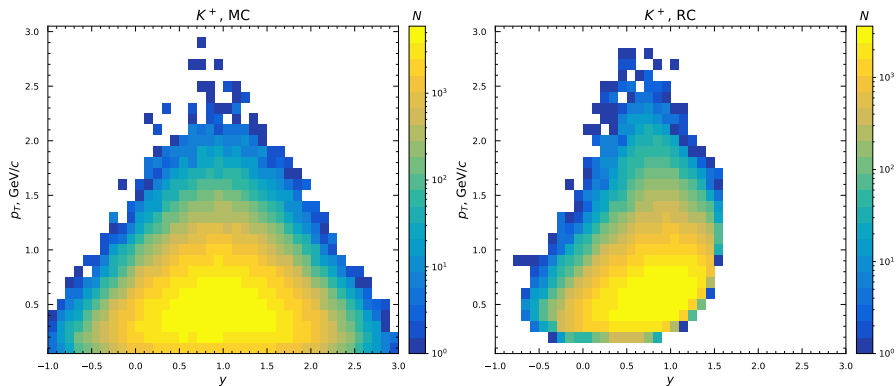
Phase Spaces: π^+



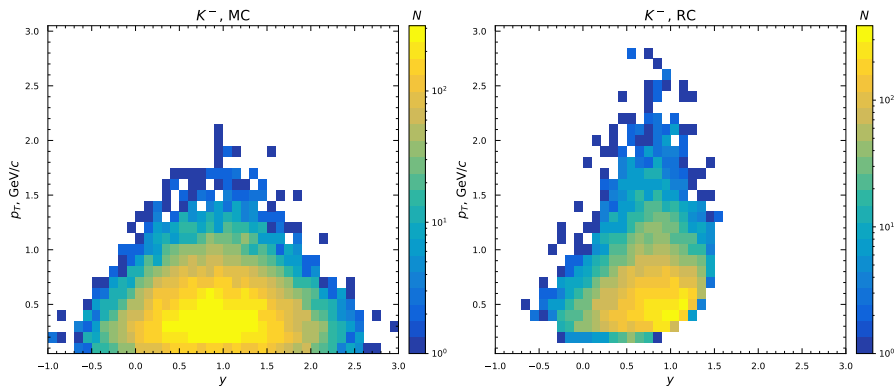
Phase Spaces: π^-



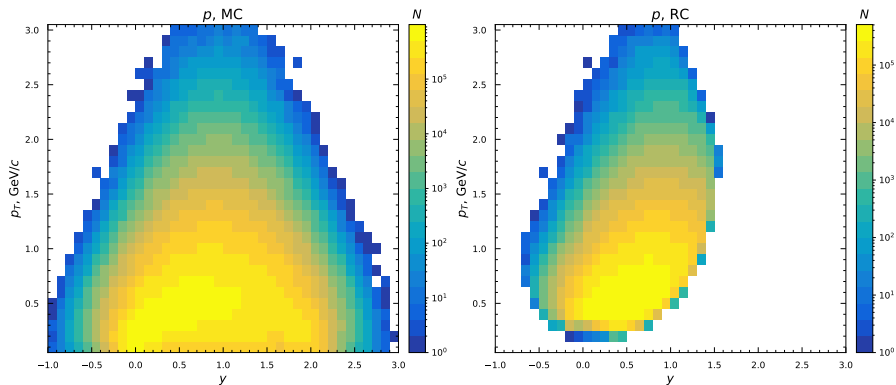
Phase Spaces: K^+



Phase Spaces: K^-



Phase Spaces: p



Efficiencies & Contaminations

Total correction:

$$W = \frac{\prod_i \text{Eff}_i}{\prod_j (1 - \text{Cont}_j)}$$

$$W = W[\text{TPC}, \text{TOF}, \text{PRIM}, \text{PID}, \text{CELL}] = \frac{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDRC}, \text{CELLRC}]}{N_{\text{MC}}[\text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}$$

$$\text{TPCeff} = \frac{N_{\text{RC}}[\text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}{N_{\text{MC}}[\text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}$$

$$\text{TOFMCeff} = \frac{N_{\text{RC}}[\text{TOFMC}, \text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}{N_{\text{RC}}[\text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}$$

$$\text{TOFeff} = \frac{N_{\text{RC}}[\text{TOFRC} \& \text{TOFMC}, \text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}{N_{\text{RC}}[\text{TOFMC}, \text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}$$

$$\text{TOFcont} = \frac{N_{\text{RC}}[\text{TOFRC} \& (!\text{TOFMC}), \text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}{N_{\text{RC}}[\text{TOFRC}, \text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}$$

$$\text{SecEff} = \frac{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC} \& \text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}{N_{\text{RC}}[\text{TOFRC}, \text{PRIMMC}, \text{PIDMC}, \text{CELLMC}]}$$

$$\text{SecCont} = \frac{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC} \& (!\text{PRIMMC}), \text{PIDMC}, \text{CELLMC}]}{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDMC}, \text{CELLMC}]}$$

$$\text{PIDeff} = \frac{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDRC} = \text{PIDMC}, \text{CELLMC}]}{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDMC}, \text{CELLMC}]}$$

$$\text{PIDcont} = \frac{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDRC} \neq \text{PIDMC}, \text{CELLMC}]}{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDRC}, \text{CELLMC}]}$$

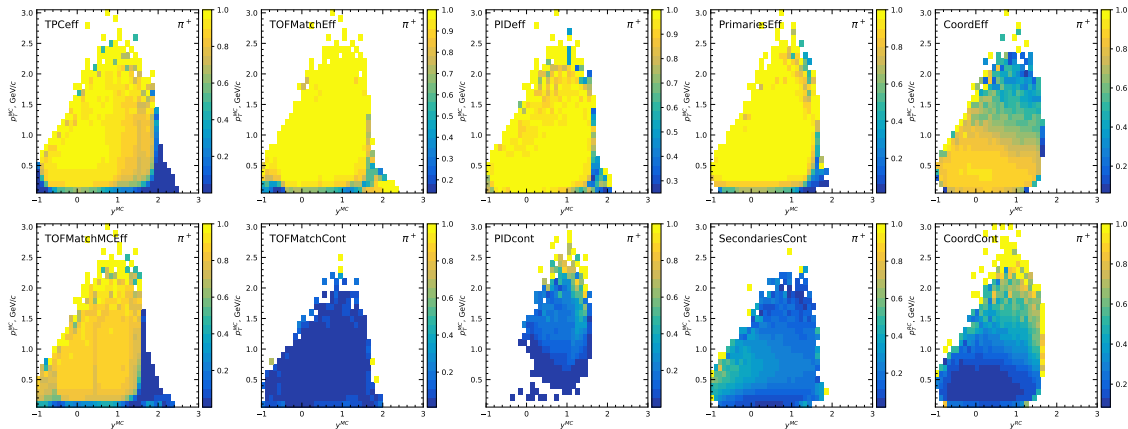
$$\text{CELLeff} = \frac{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDRC}, \text{CELLRC} = \text{CELLMC}]}{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDRC}, \text{CELLMC}]}$$

$$\text{CELLcont} = \frac{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDRC}, \text{CELLRC} \neq \text{CELLMC}]}{N_{\text{RC}}[\text{TOFRC}, \text{PRIMRC}, \text{PIDRC}, \text{CELLRC}]}$$

$A \cdot \varepsilon$, Purity



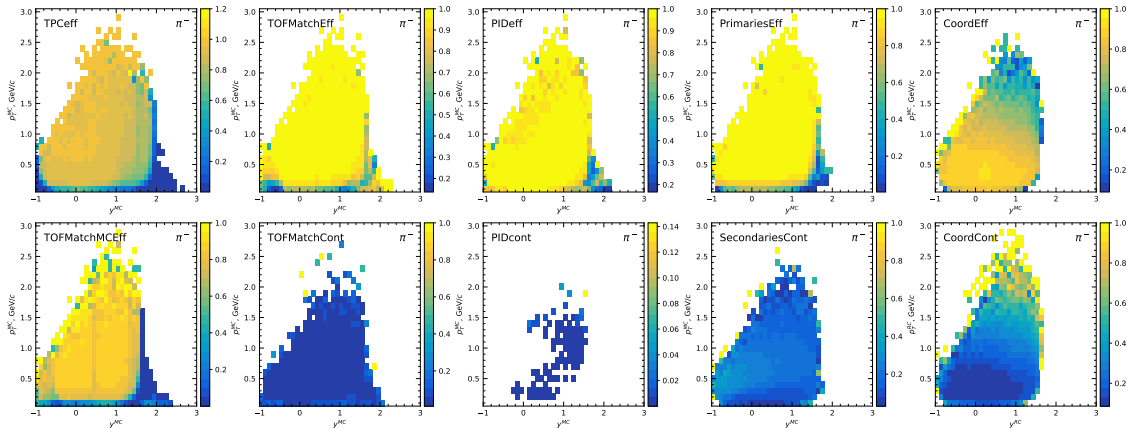
Additional corrections



$A \cdot \varepsilon$, Purity



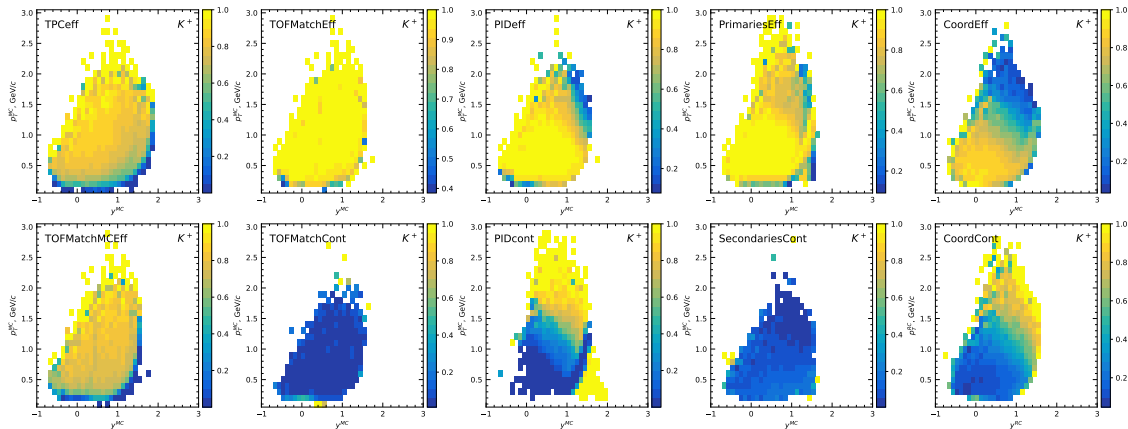
Additional corrections



$A \cdot \varepsilon$, Purity



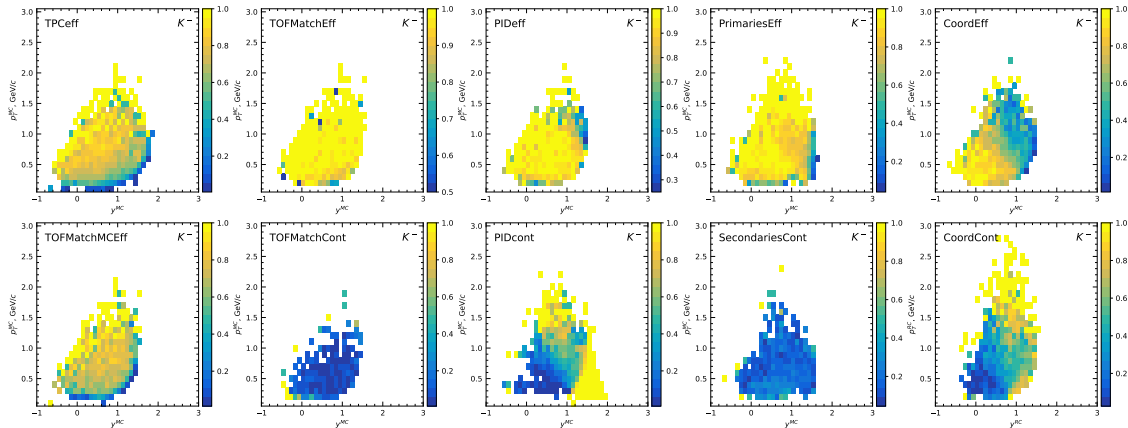
Additional corrections



$A \cdot \varepsilon$, Purity



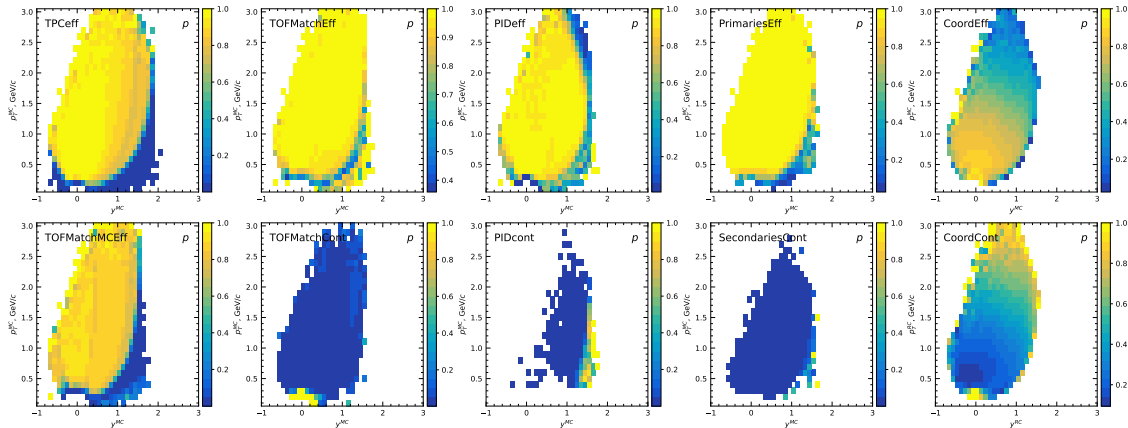
Additional corrections



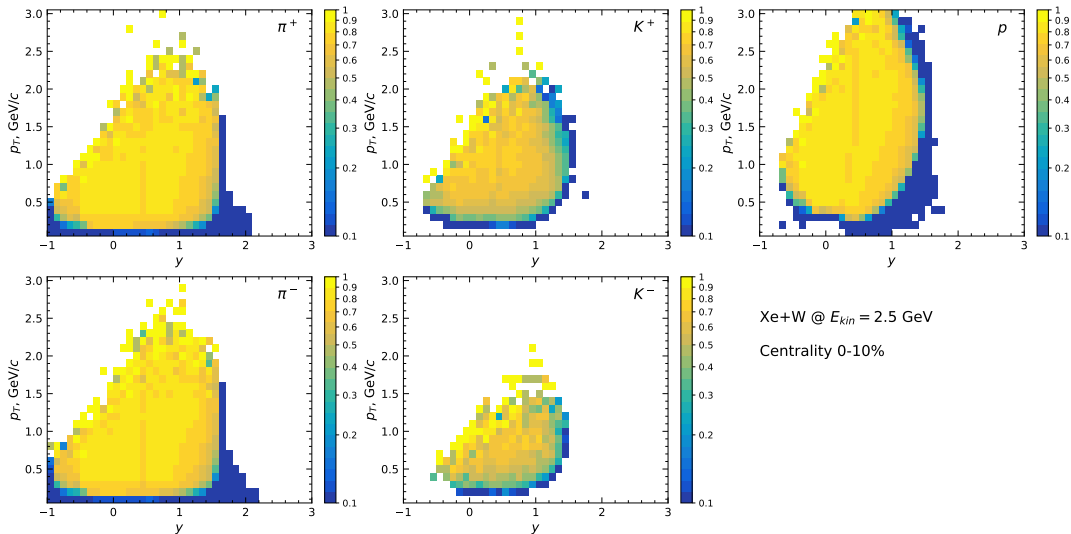
$A \cdot \varepsilon$, Purity



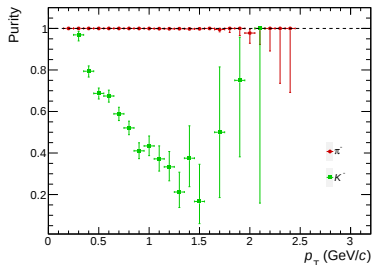
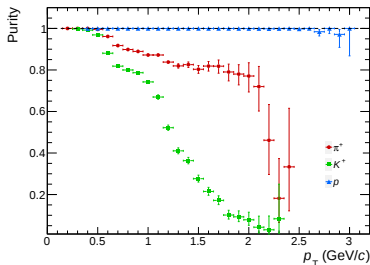
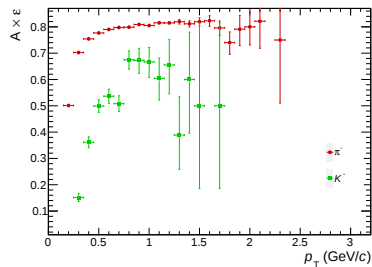
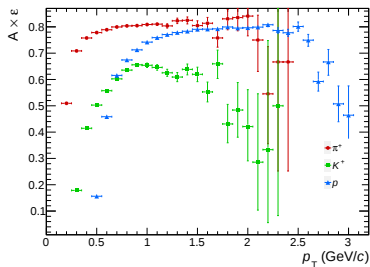
Additional corrections



PID efficiency



PID efficiency [Centr. 0-10%; $0.9 \leq y < 1.1$]



Amount of events in centrality bins

Centrality bins: 0-10%, 10-20%, 20-30%, 30-40%, 40-80%

Bi+Bi @ 9.2 GeV [18k events]:

Before ZvtxCut: $3272 + 2619 + 2846 + 2584 + 6438 = 17759 \sim 18k$

After ZvtxCut: $3217 + 2568 + 2790 + 2544 + 6324 = 17443$

Xe+W @ 2.5 GeV [500k events]:

Before ZvtxCut: $41249 + 37081 + 34428 + 34731 + 147189 = 294678 < 500k$

After ZvtxCut: the same as before ZvtxCut ✓

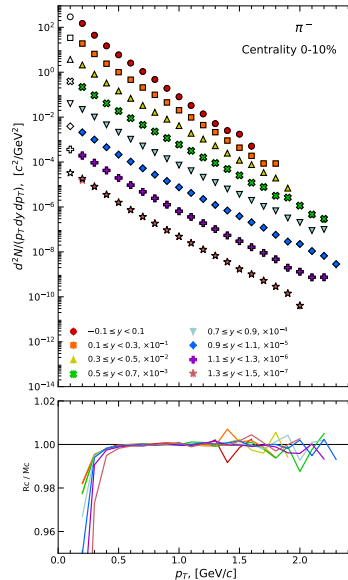
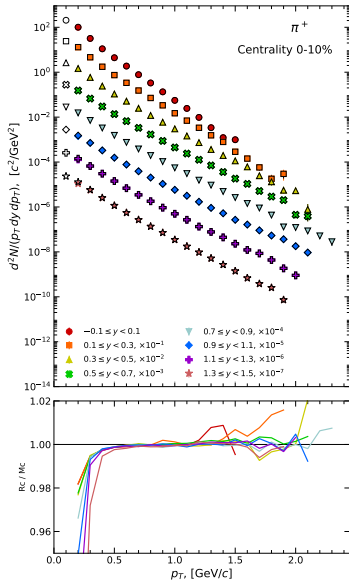
From V. Riabov: $\sim 1/3$ events are empty

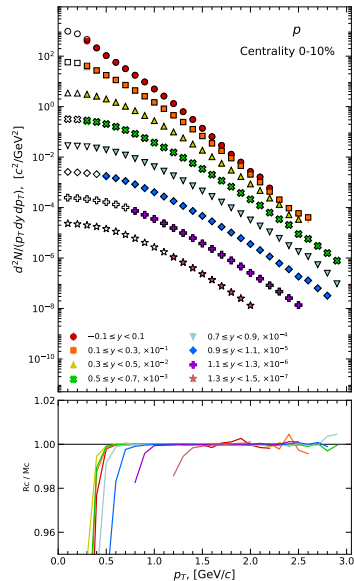
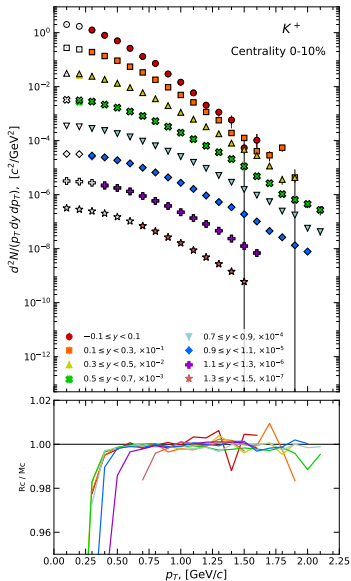
Where are $\sim 10\%$ more?

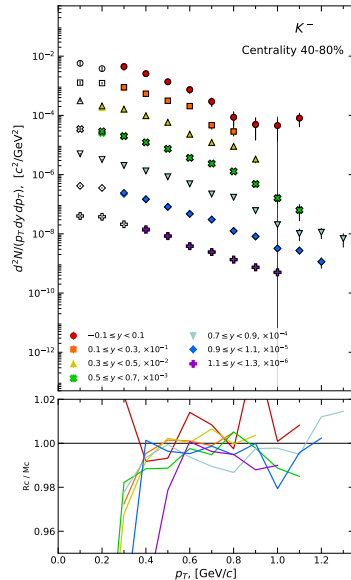
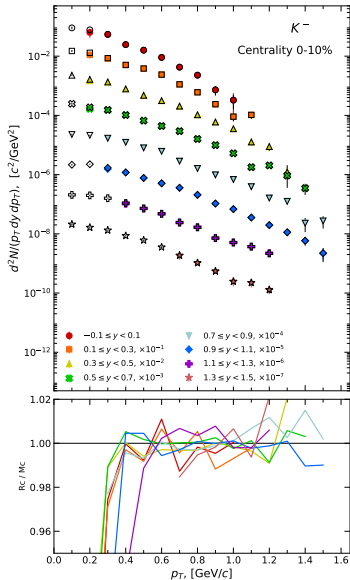
Why event.fVertex for empty events is not NULL?

Is it OK?

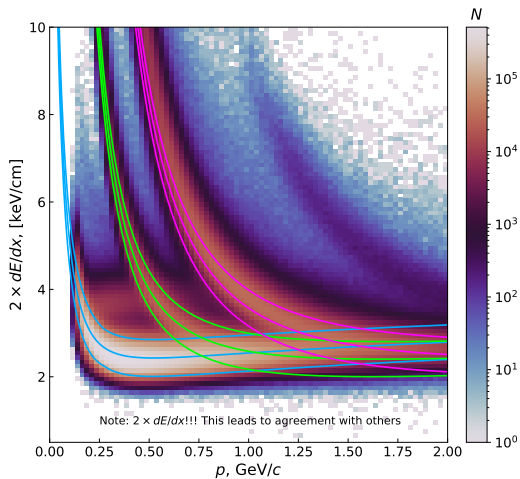
Lost during centrality definition



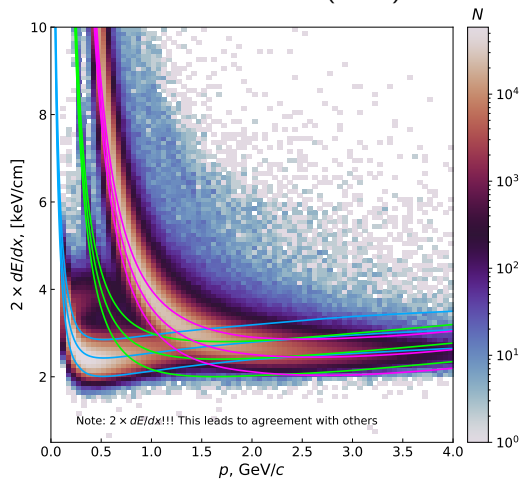


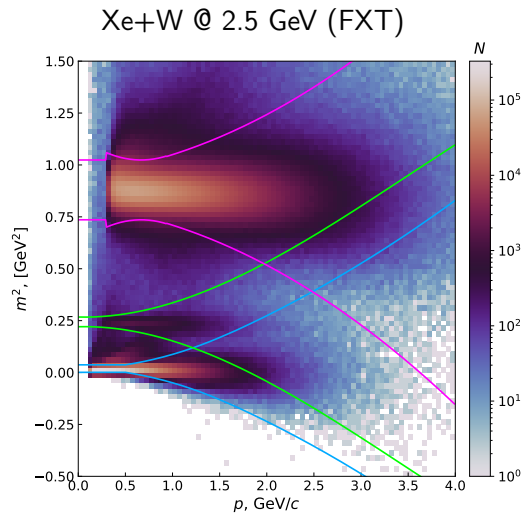
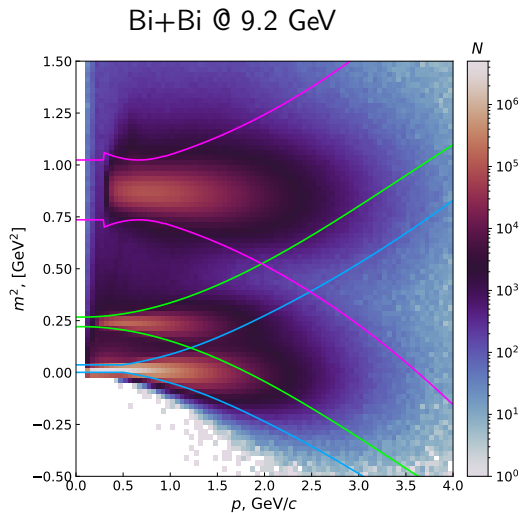


Bi+Bi @ 9.2 GeV

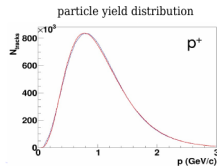
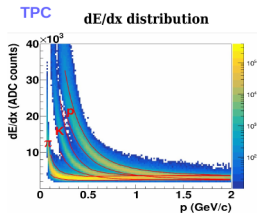


Xe+W @ 2.5 GeV (FXT)



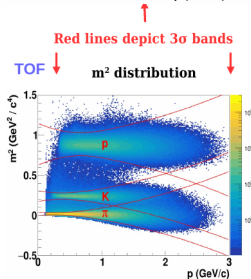


MPD particle ID



Track selection for PID:

- $|\eta| < 1.6$
- $N_{\text{HITS}} \geq 20$
- Primary only (GEANT)



Combined (TPC+TOF) PID efficiency

