



**Faculty  
of Physics**

WARSAW UNIVERSITY OF TECHNOLOGY



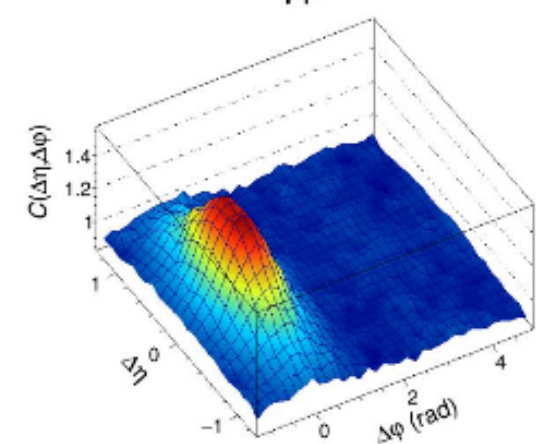
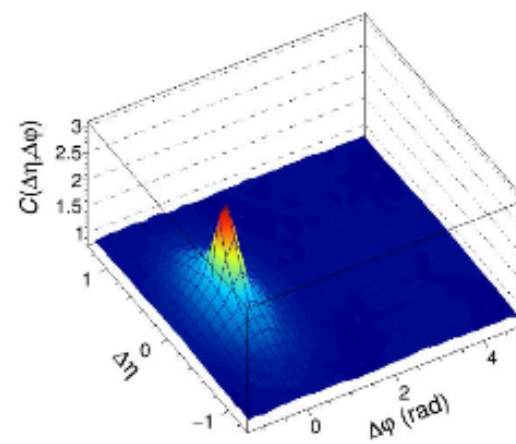
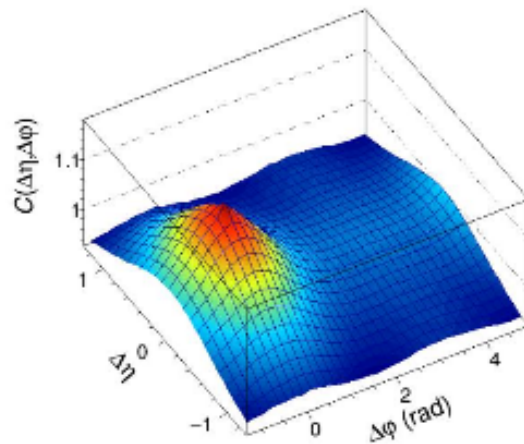
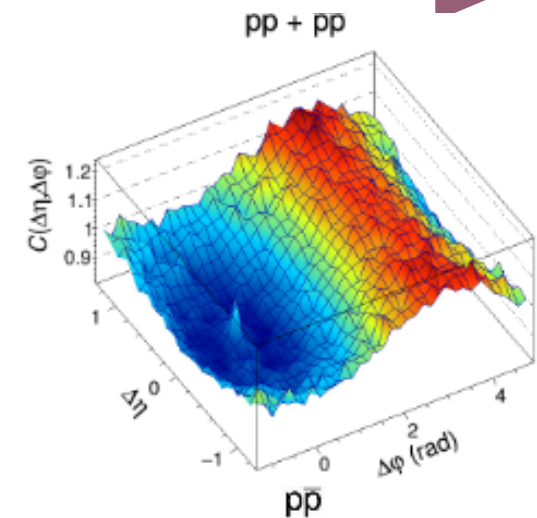
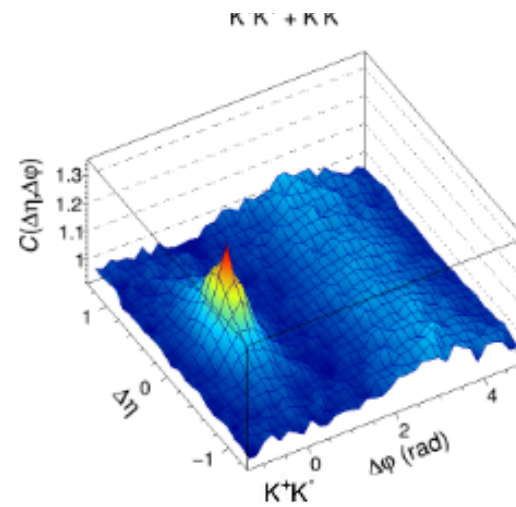
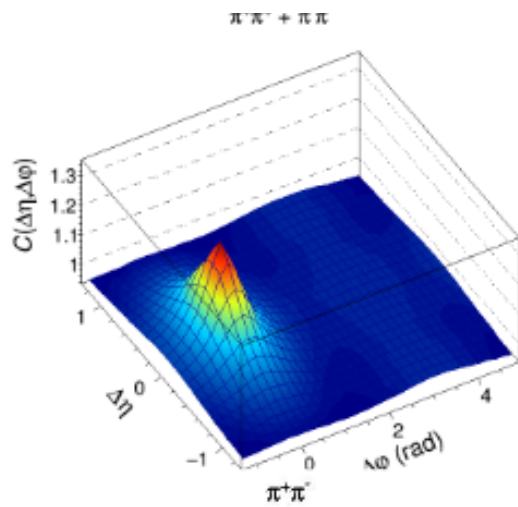
# Angular correlations in Xe-Xe

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**Supervisor: Małgorzata Janik**

25 April 2019



# $\Delta\eta\Delta\phi$ functions for pp collisions at 7 TeV



# Data sample

- ALICE collisions data

Xe-Xe collisions at 5.44 TeV from 2017

→ <u>no of events</u> :	0.2 < pT < 2.5 GeV/c	1364612
	1 < pT < 4 GeV/c	1139306

- Monte Carlo data

Xe-Xe, 5.44 TeV, HIJING: General-purpose Monte Carlo production for Xe-Xe

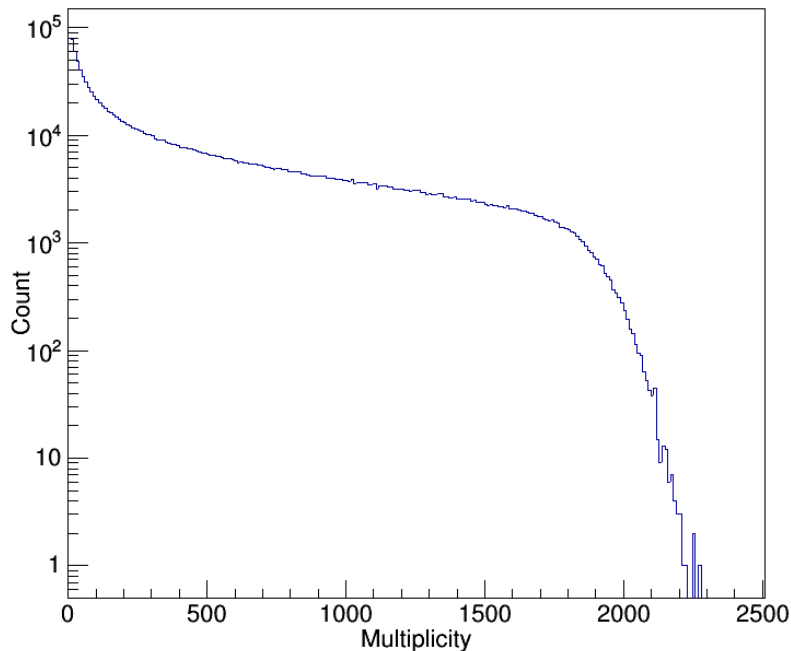
data simulated and reconstructed to show the real conditions in the detector



# Event Selection

- Minimum bias trigger
- z-vertex: (-10,10 cm)
- basic PileUpCuts

Normalized Event Multiplicity



# Track Selection

- Tracking method: TPC+ITS, tracks taken so that  $\phi = \text{const}$
- $|\eta| < 0.8$
- pT ranges (only pions):  
 $0.2 < pT < 2.5 \text{ GeV}/c$   
 $1.0 < pT < 4.0 \text{ GeV}/c$

# Particle identification

- The PID (Particle Identification) is based on  $N_\sigma$  method. The cuts used in this analysis are as follows

- Acceptance:

$$p_T > 0.5 \text{ GeV}/c \quad \rightarrow \quad N_\sigma = \sqrt{N_{\sigma TPC}^2 + N_{\sigma TOF}^2} < 2.0$$

$$p_T < 0.5 \text{ GeV}/c \quad \rightarrow \quad N_\sigma = |N_{\sigma TPC}| < 2.0$$

- Rejection

$$N_\sigma < 3.0 \quad \rightarrow \quad \text{reject the particle}$$

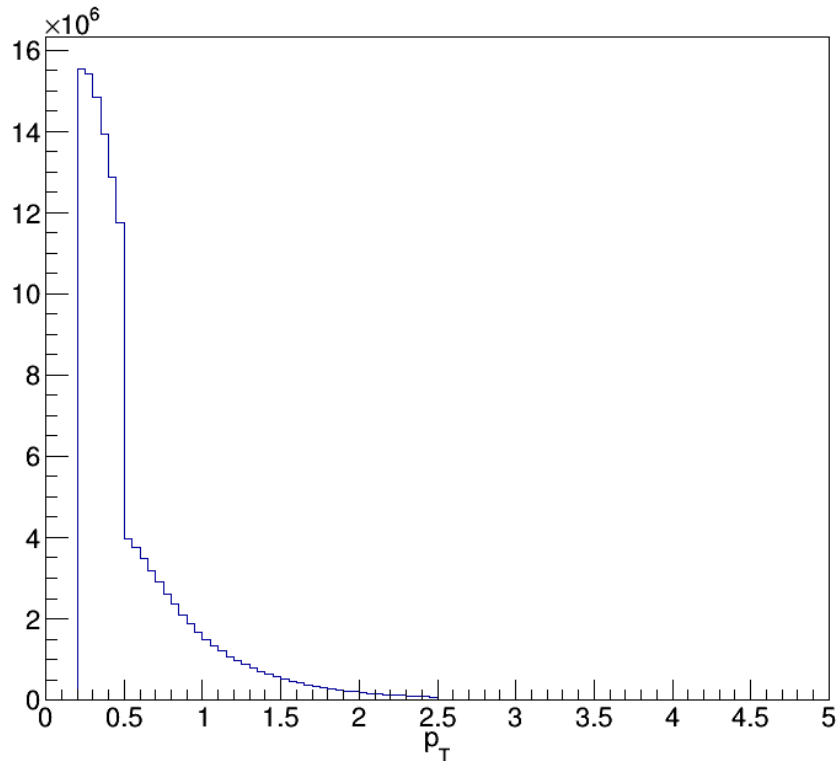
- If the track passes the PID  $N_\sigma$  cuts with above condition for more than one particle species, it is rejected.



# pT distributions

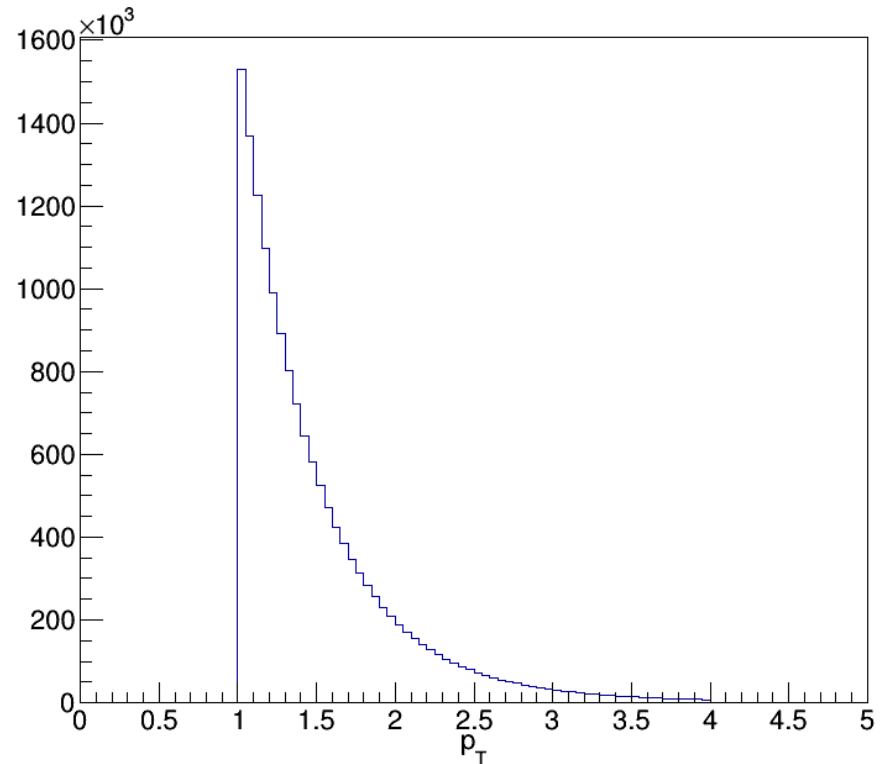
$0.2 < p_T < 2.5 \text{ GeV}/c$

$\pi^+$



$1 < p_T < 4 \text{ GeV}/c$

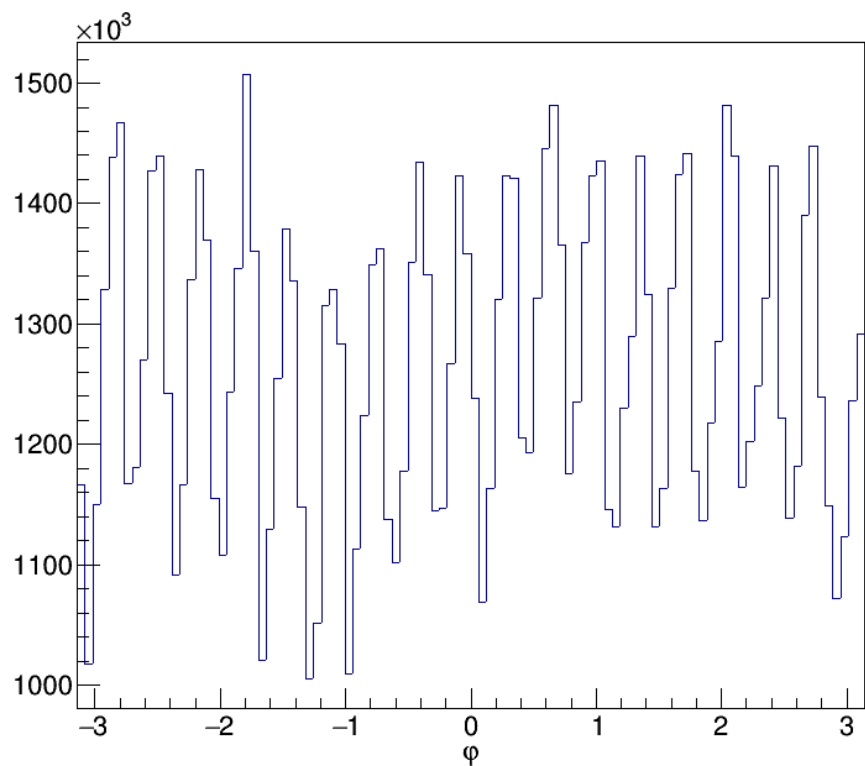
$\pi^+$



# $\phi$ distributions

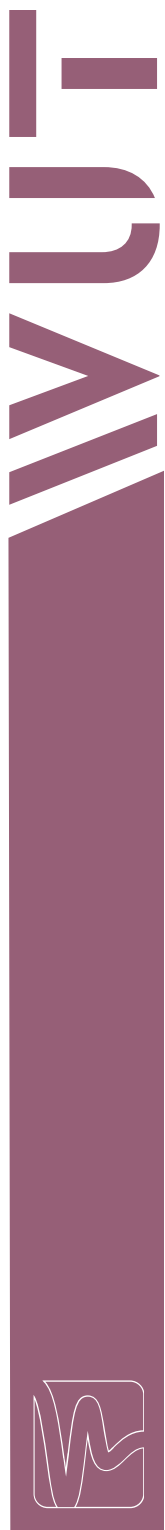
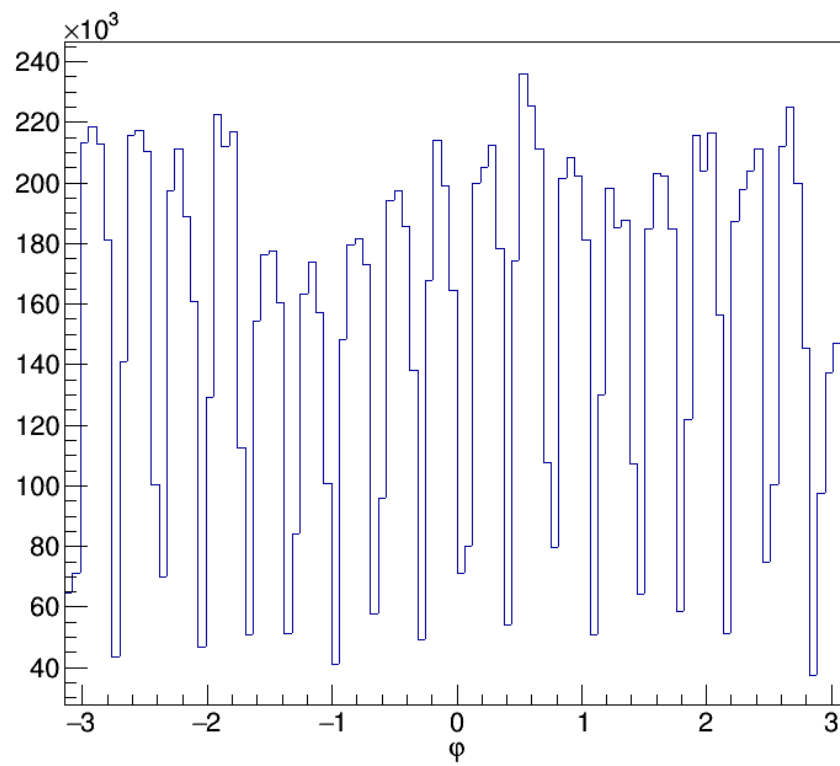
$0.2 < p_T < 2.5$  GeV/c

$\pi^+$



$1 < p_T < 4$  GeV/c

$\pi^+$

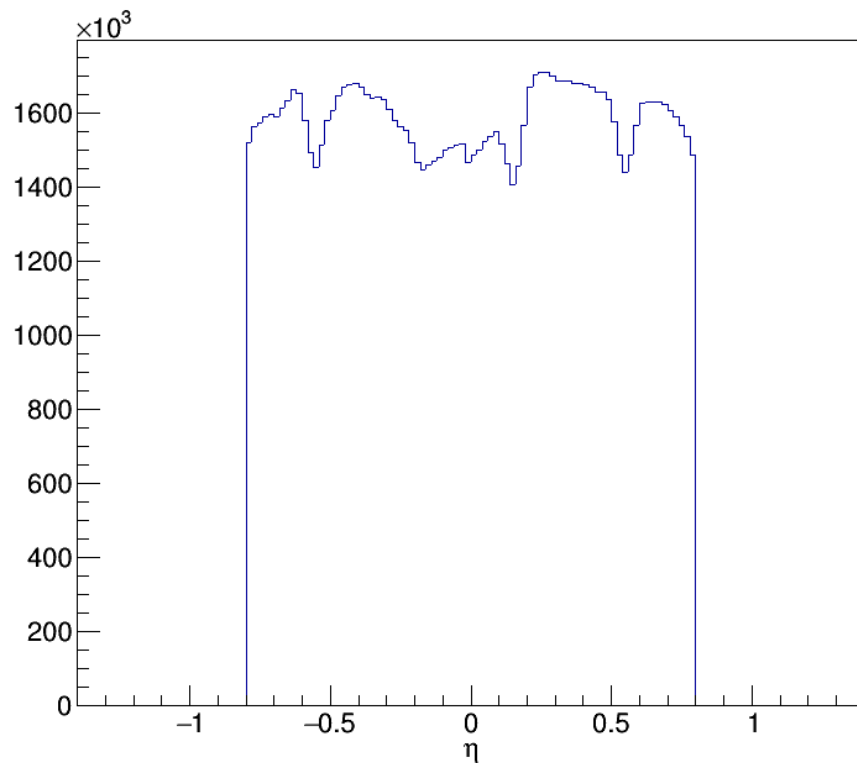


# $\eta$ distributions

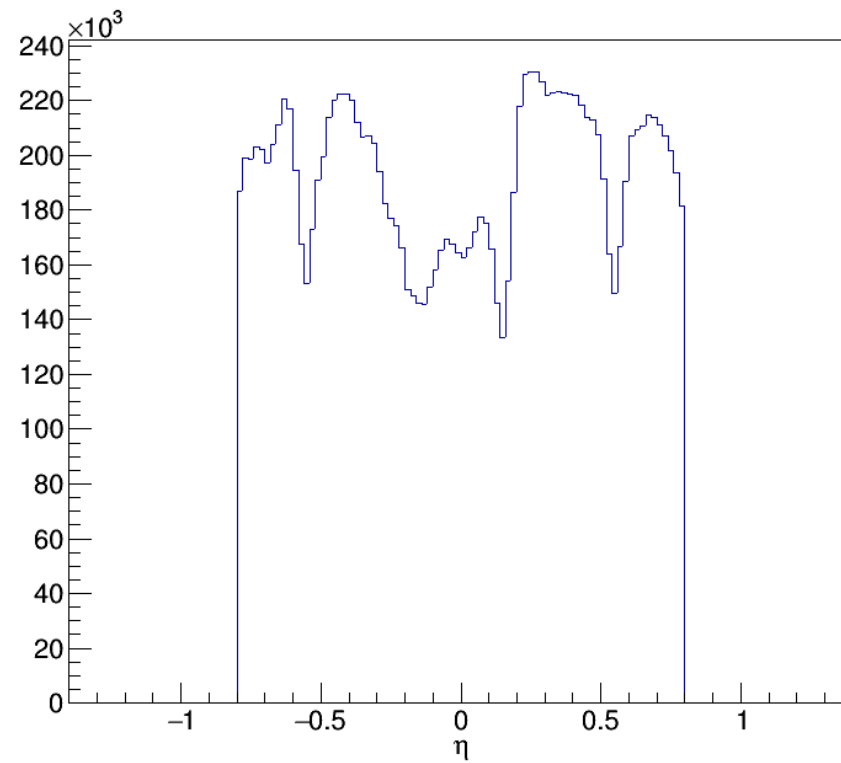
$0.2 < p_T < 2.5 \text{ GeV}/c$

$1 < p_T < 4 \text{ GeV}/c$

$\pi^+$



$\pi^+$

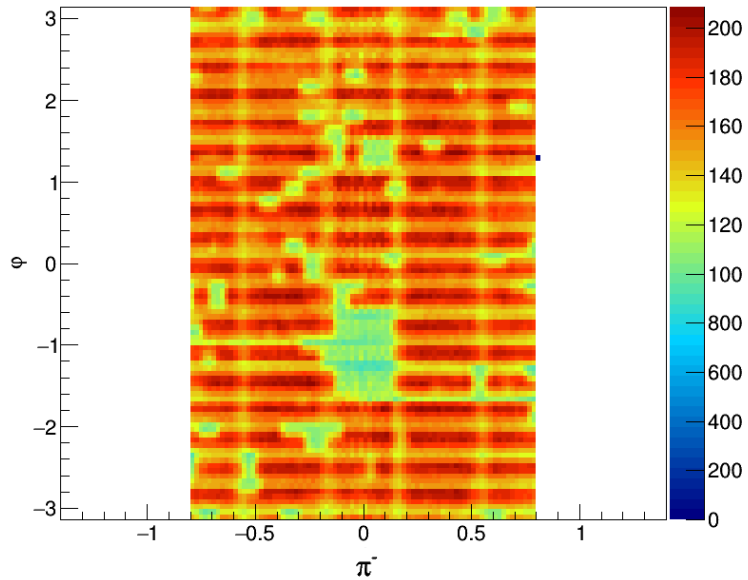




# $\eta\phi$ distributions

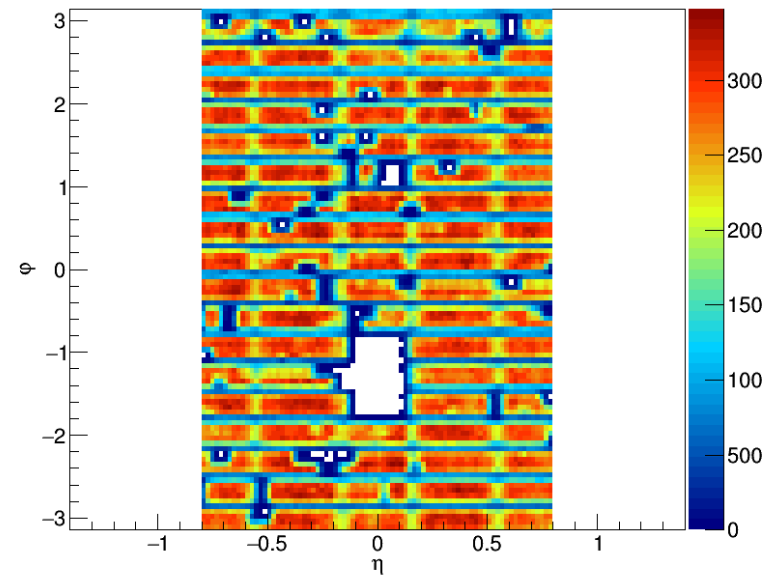
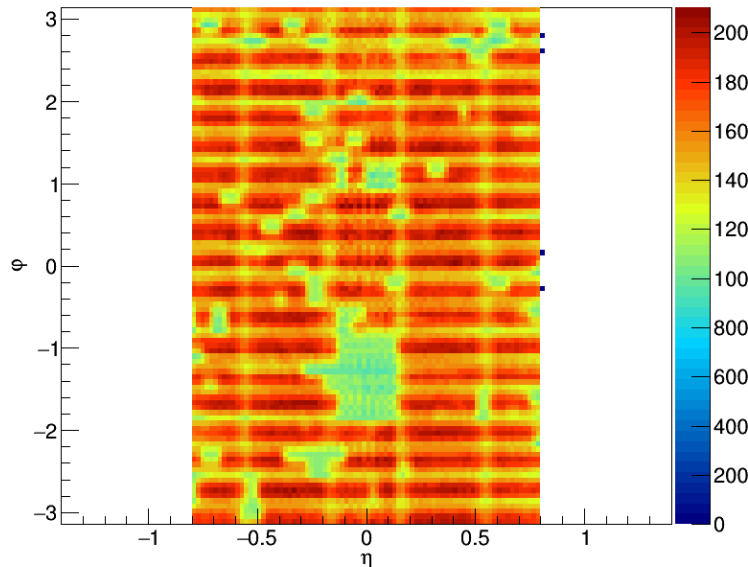
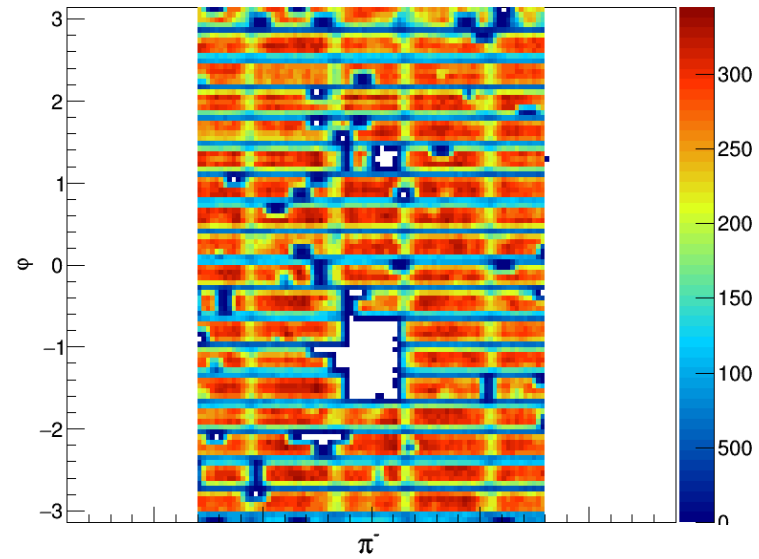
$0.2 < p_T < 2.5$  GeV/c

$\pi^+$



$1 < p_T < 4$  GeV/c

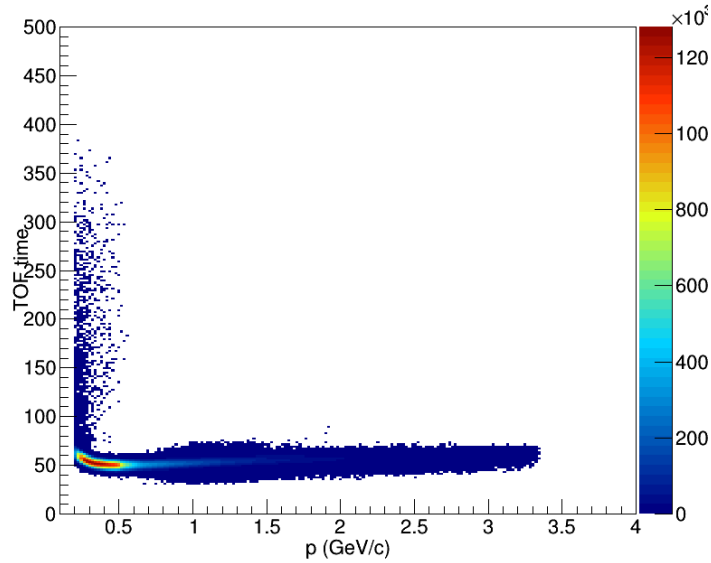
$\pi^+$



# dE/dx distributions

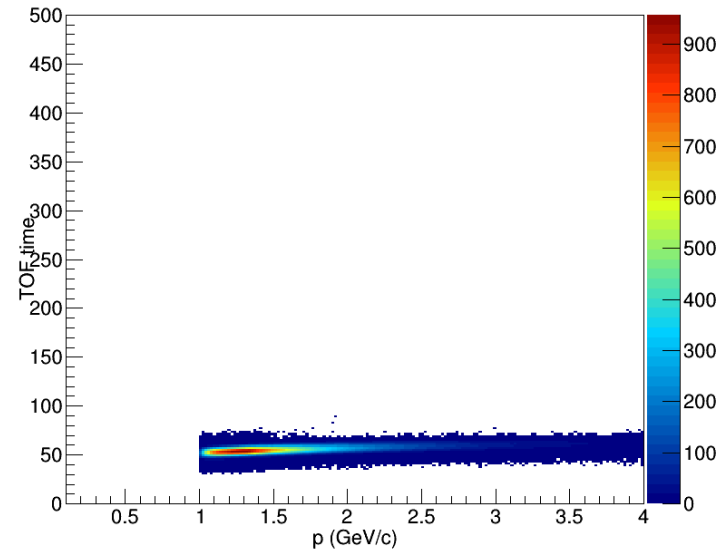
$0.2 < p_T < 2.5 \text{ GeV}/c$

$\pi^+$

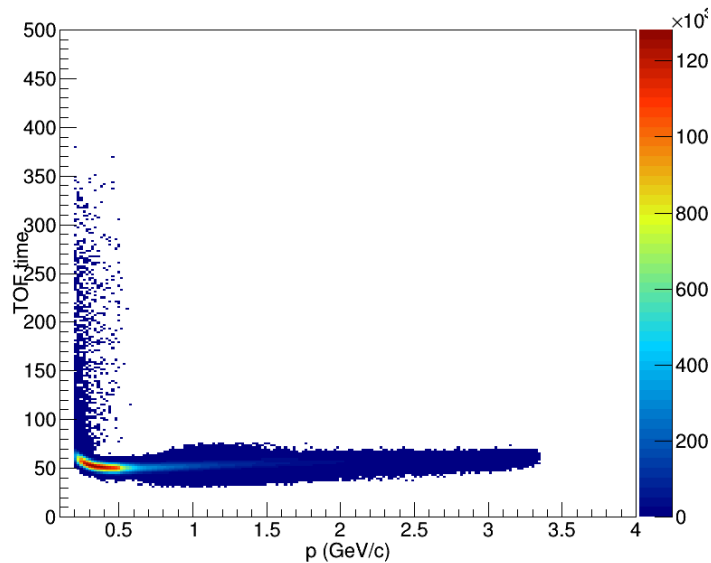


$1 < p_T < 4 \text{ GeV}/c$

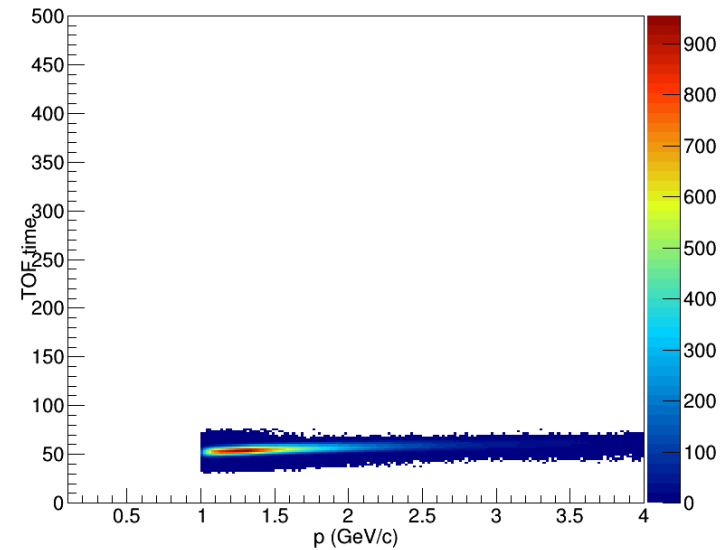
$\pi^+$



$\pi^-$

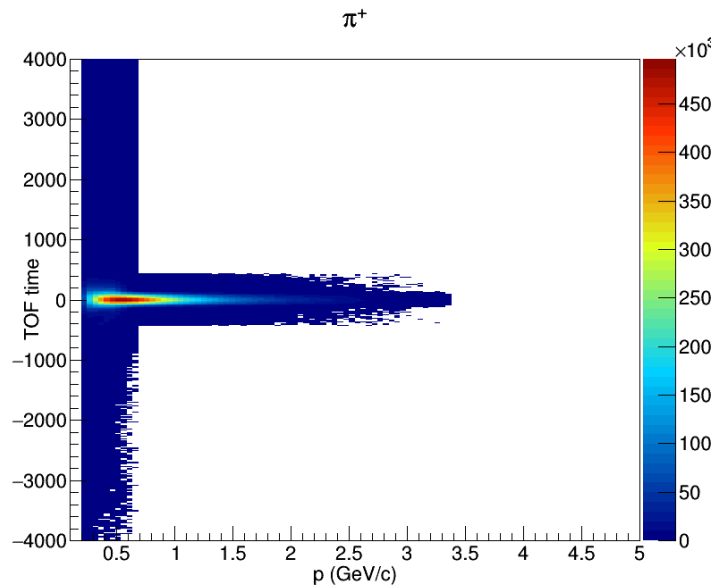


$\pi^-$

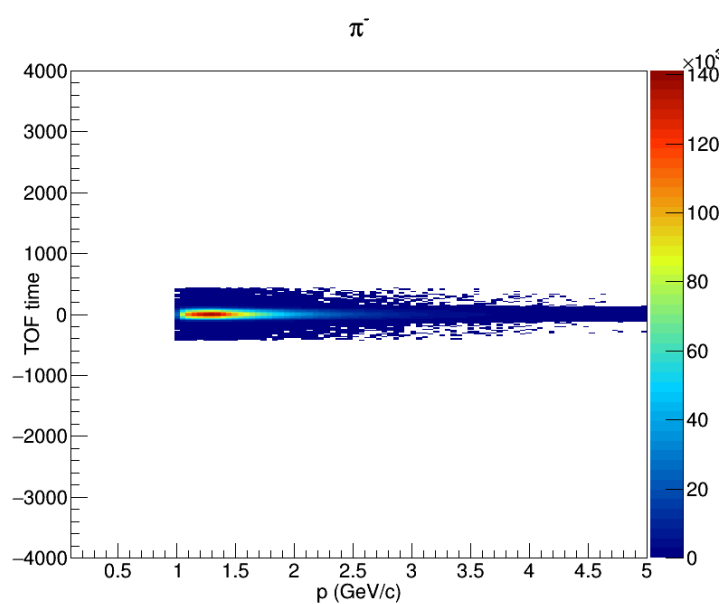
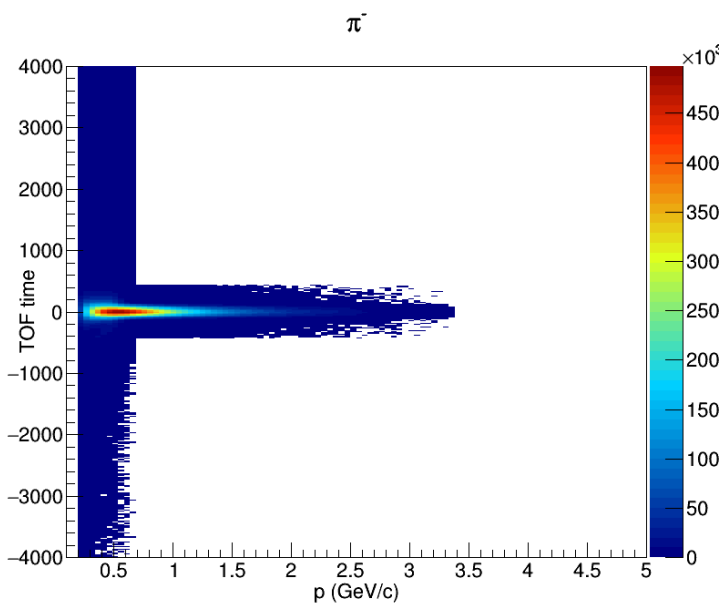
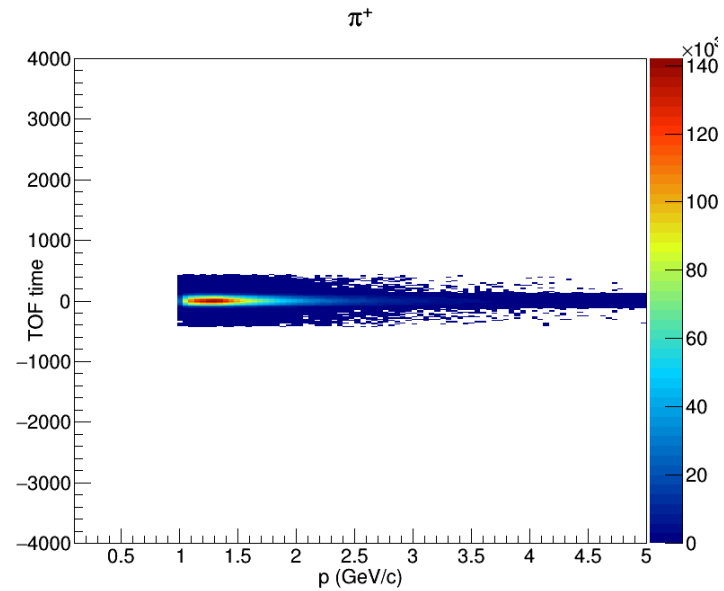


# TOF time distributions

$0.2 < p_T < 2.5 \text{ GeV}/c$



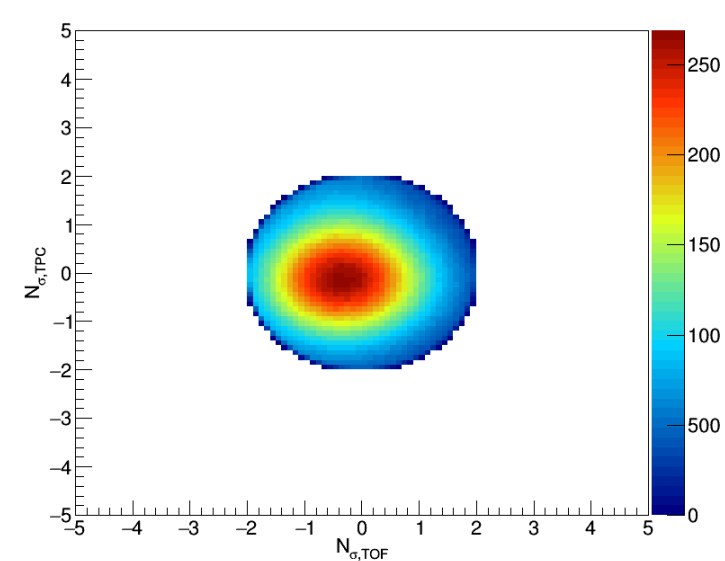
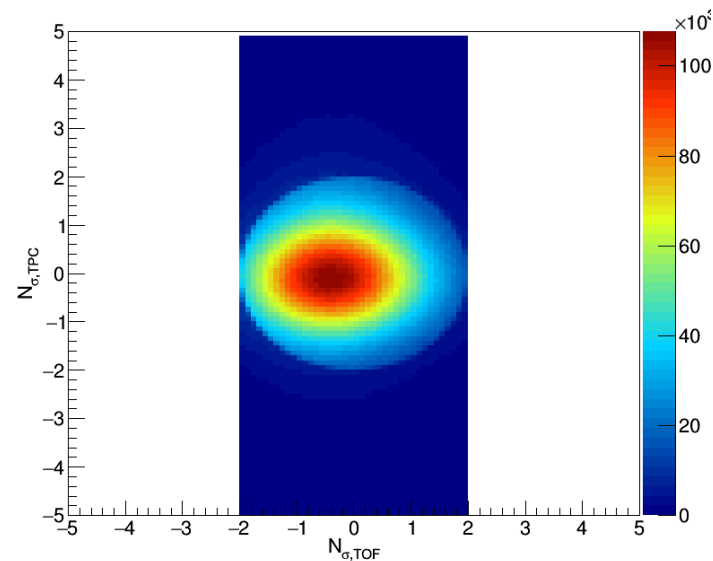
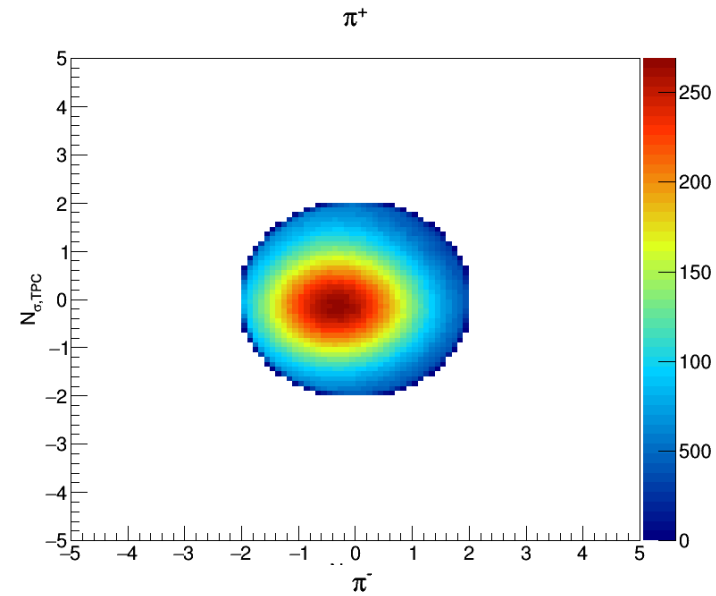
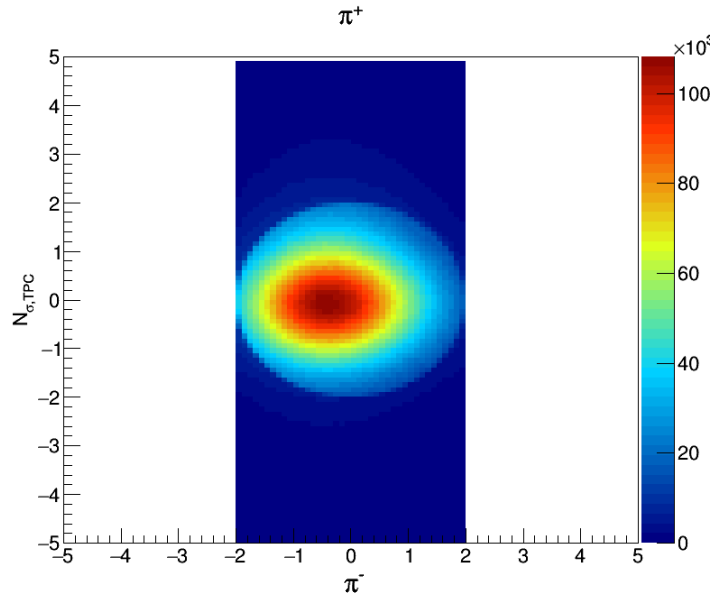
$1 < p_T < 4 \text{ GeV}/c$



# $N_{\sigma_{TPC}}$ vs $N_{\sigma_{TOF}}$ distributions

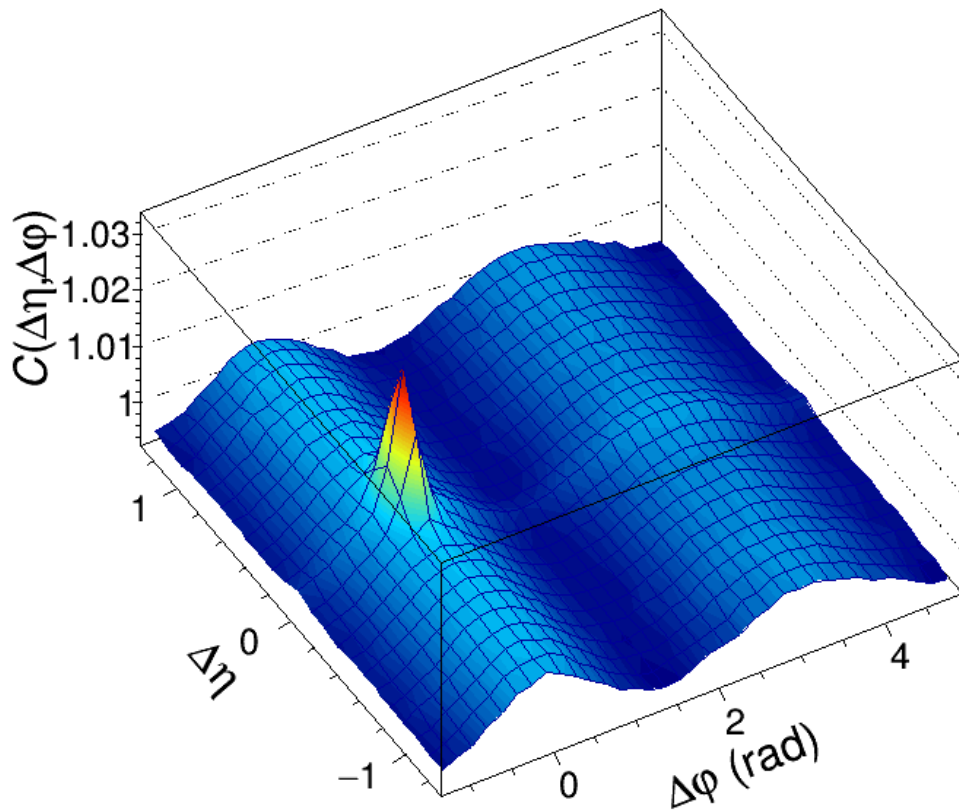
$0.2 < p_T < 2.5$  GeV/c

$1 < p_T < 4$  GeV/c

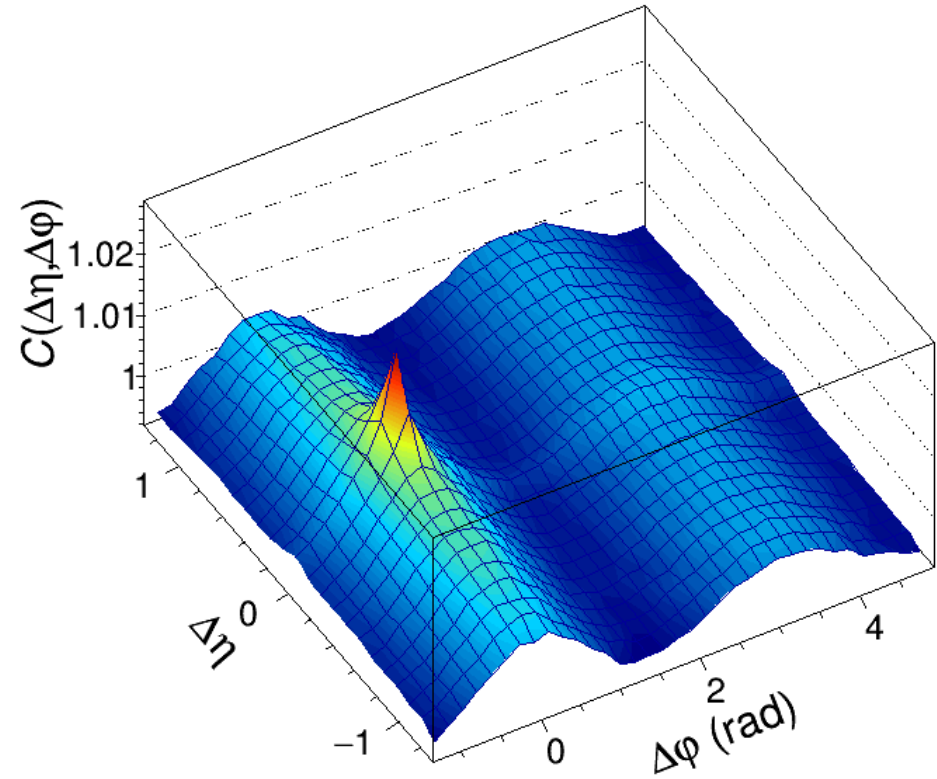


# $\Delta\eta\Delta\phi$ functions for data at $0.2 < p_T < 2.5 \text{ GeV}/c$

$\pi^+\pi^+ + \pi^-\pi^-$

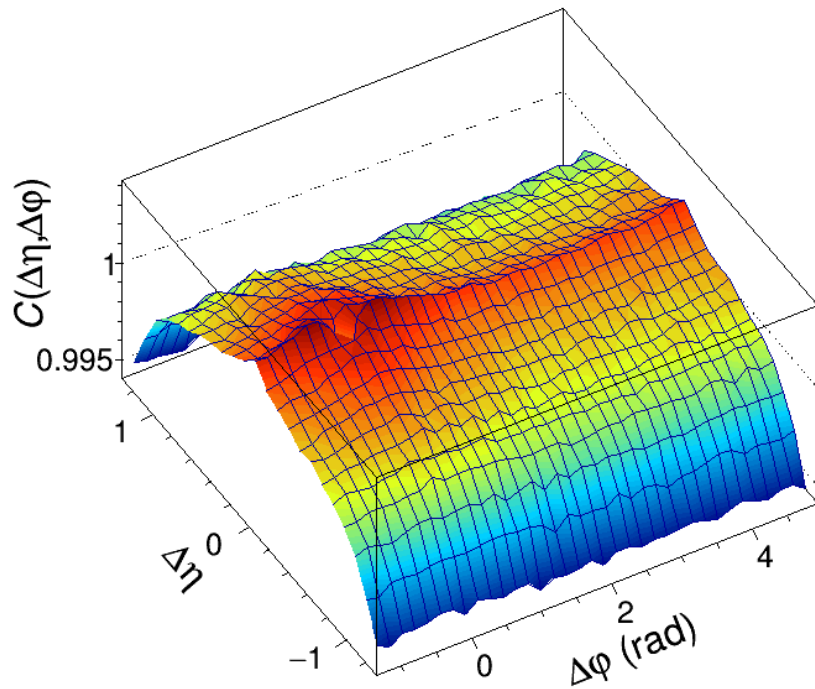


$\pi^+\pi^-$

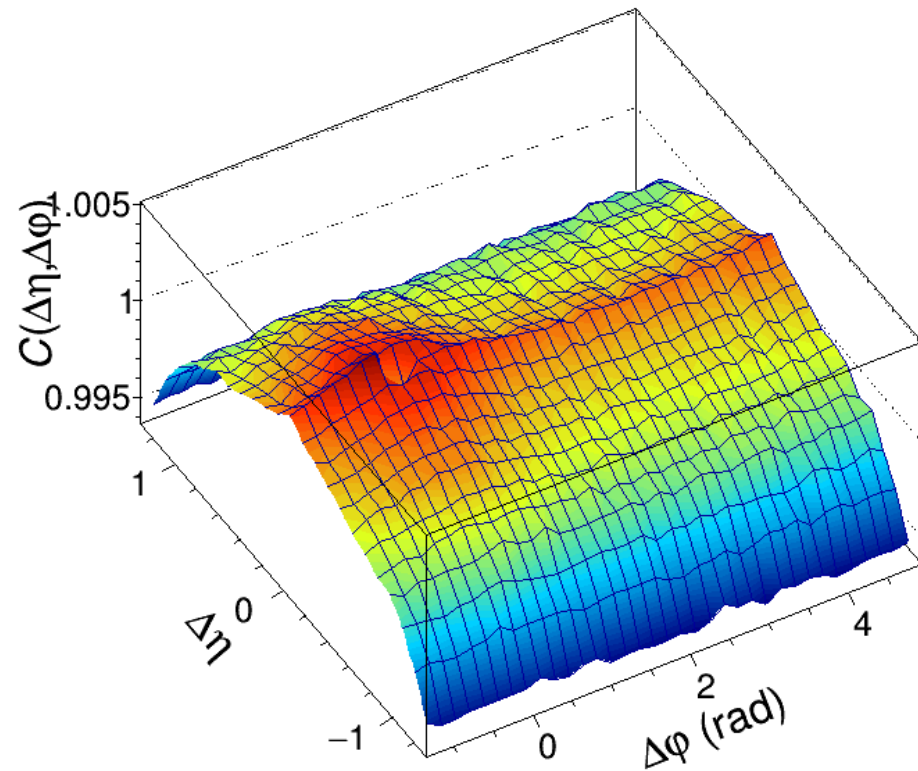


# $\Delta\eta\Delta\phi$ functions for MC rec. at $0.2 < p_T < 2.5 \text{ GeV}/c$

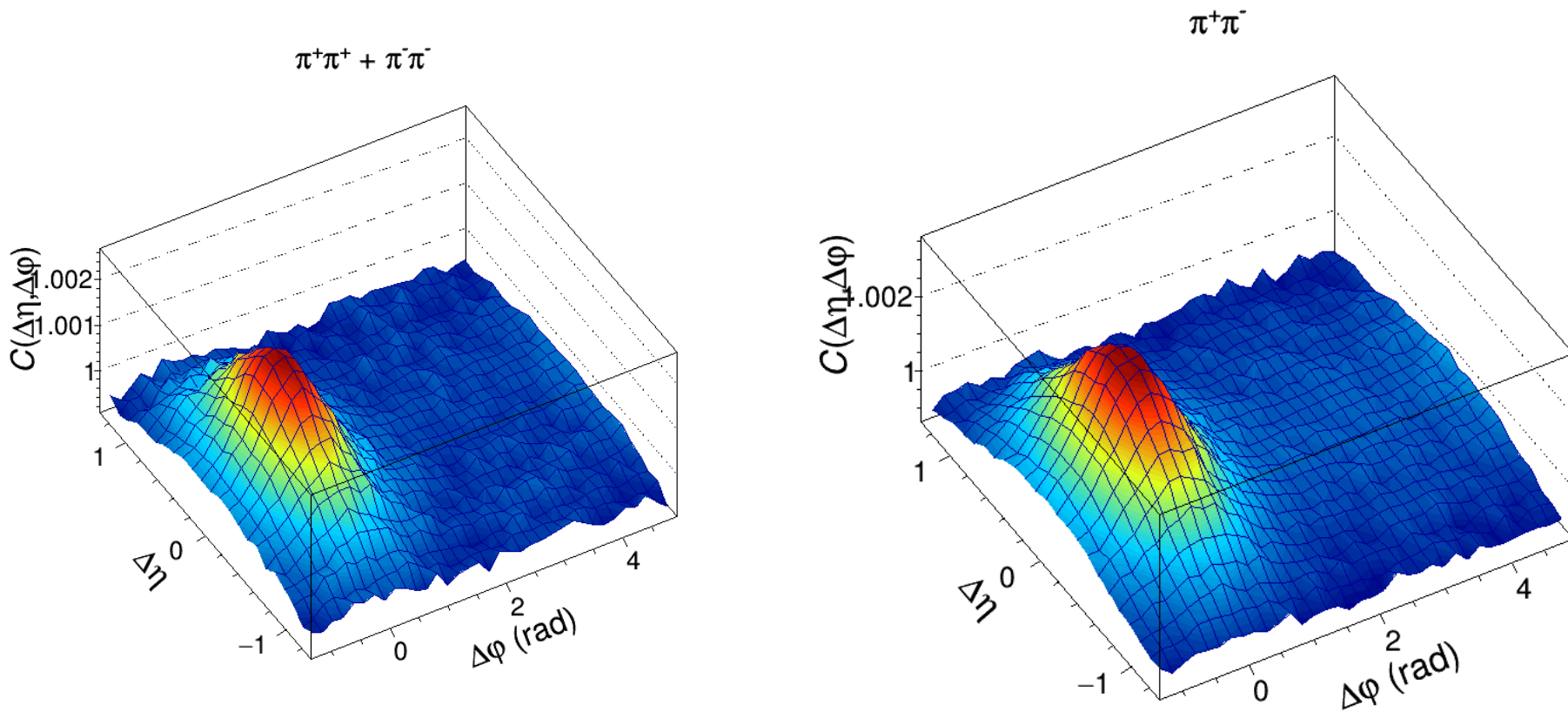
$\pi^+\pi^+ + \pi^-\pi^-$



$\pi^+\pi^-$



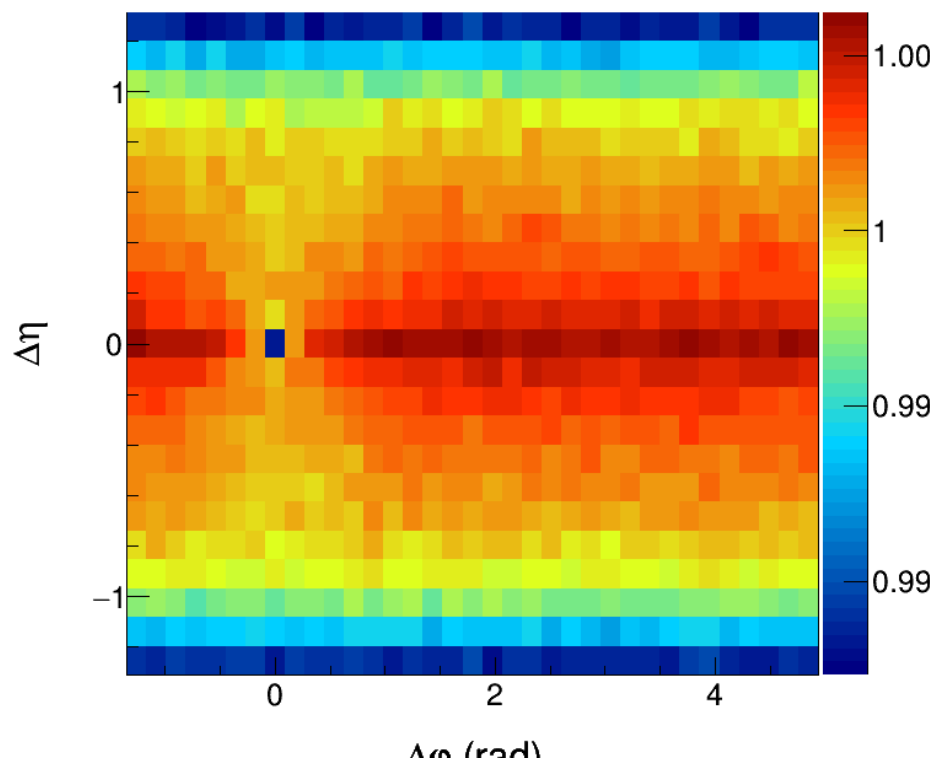
# $\Delta\eta\Delta\phi$ functions for MC truth at $0.2 < p_T < 2.5 \text{ GeV}/c$



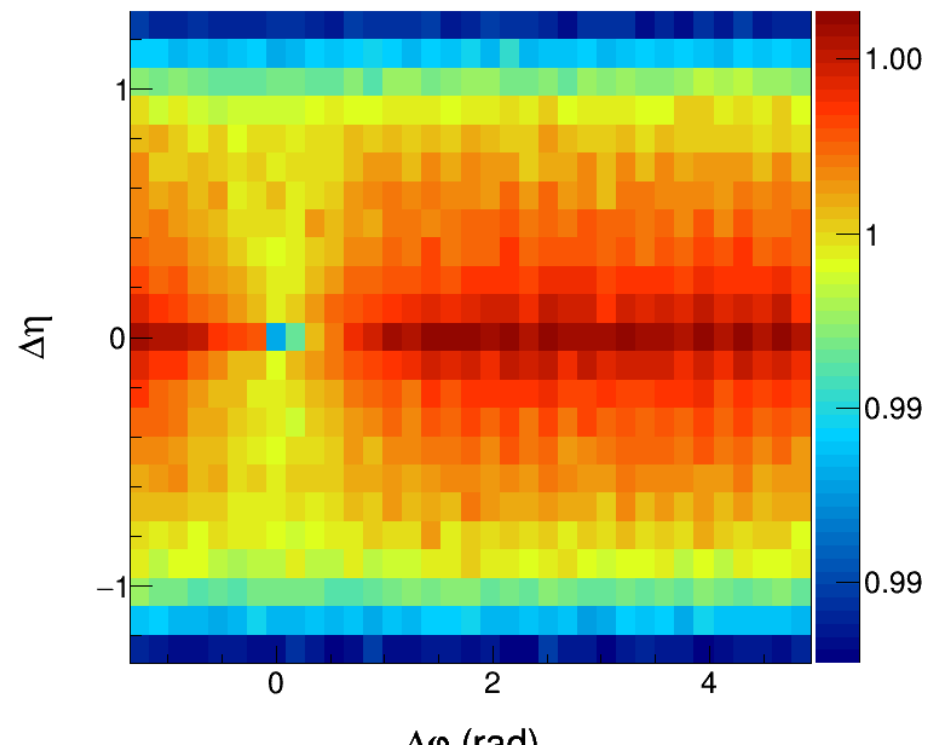
# MC reconstructed/MC truth

$0.2 < p_T < 2.5 \text{ GeV}/c$

$\pi^+\pi^+ + \pi^-\pi^-$

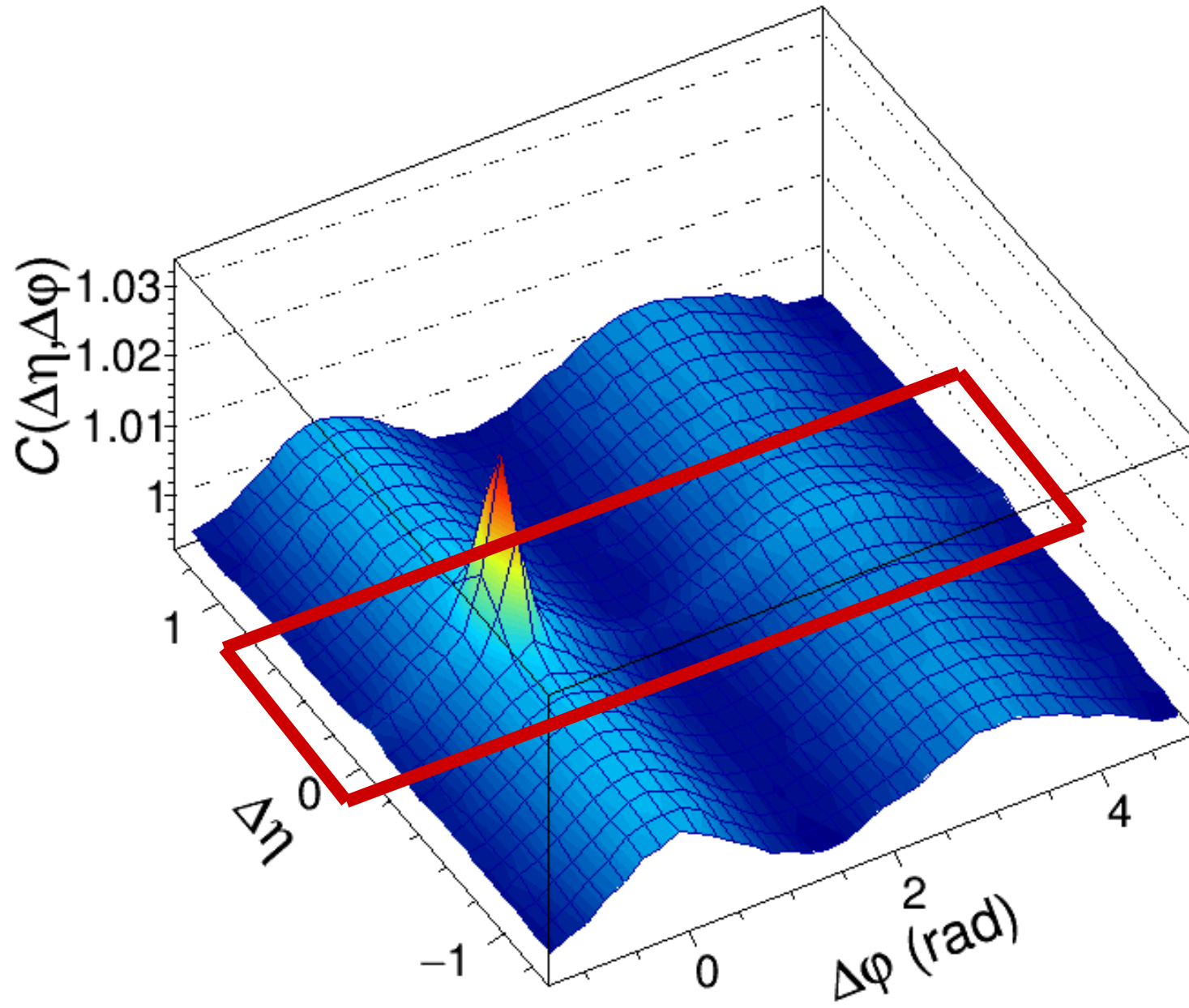


$\pi^+\pi^-$



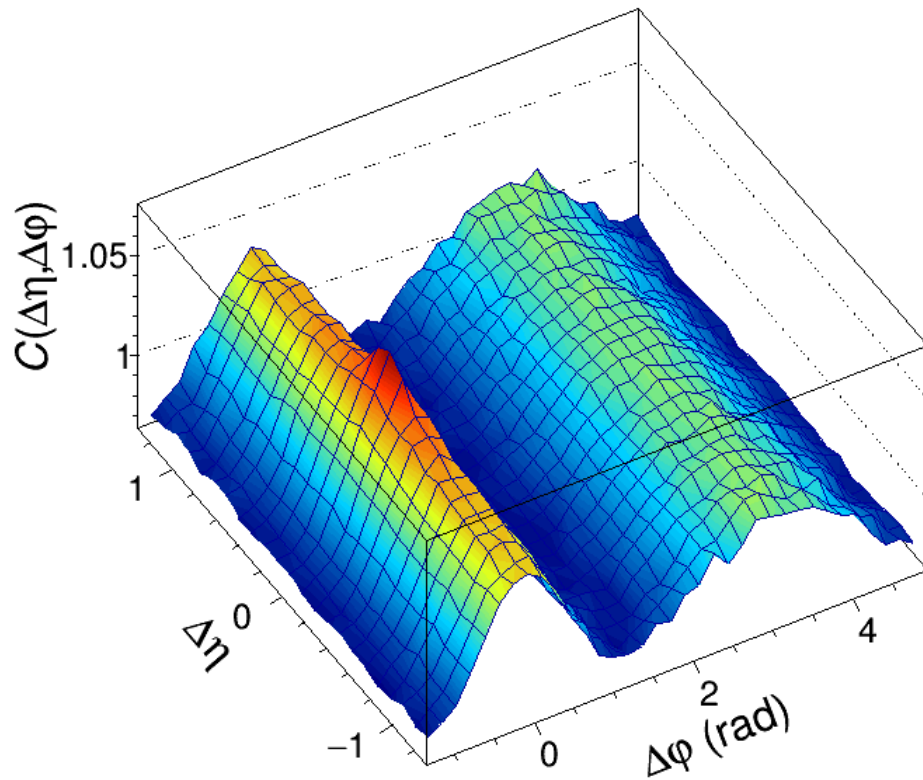


$$\pi^+\pi^+ + \pi^-\pi^-$$

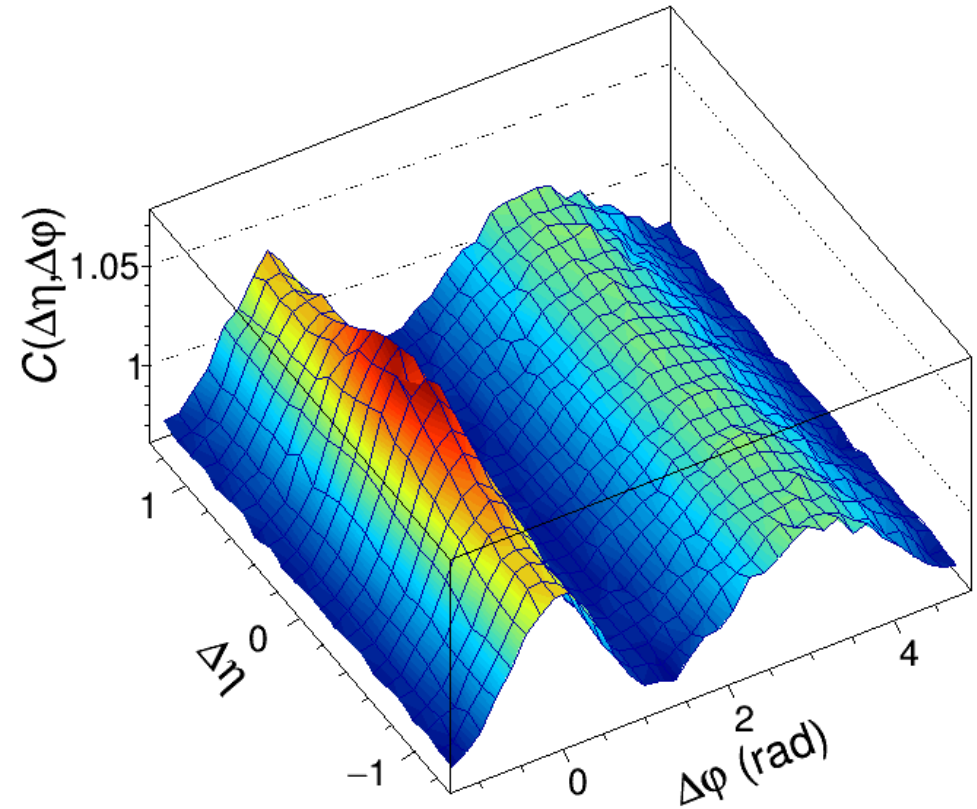


# $\Delta\eta\Delta\phi$ functions for data at $1 < p_T < 4 \text{ GeV}/c$

$\pi^+\pi^+ + \pi^-\pi^-$

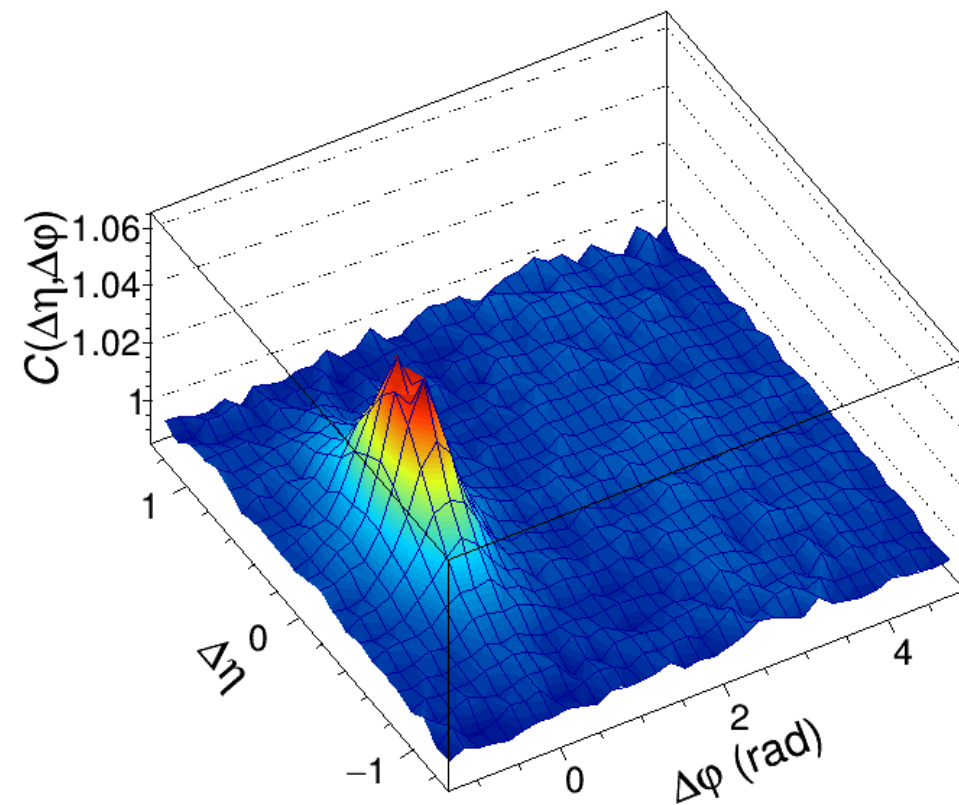


$\pi^+\pi^-$

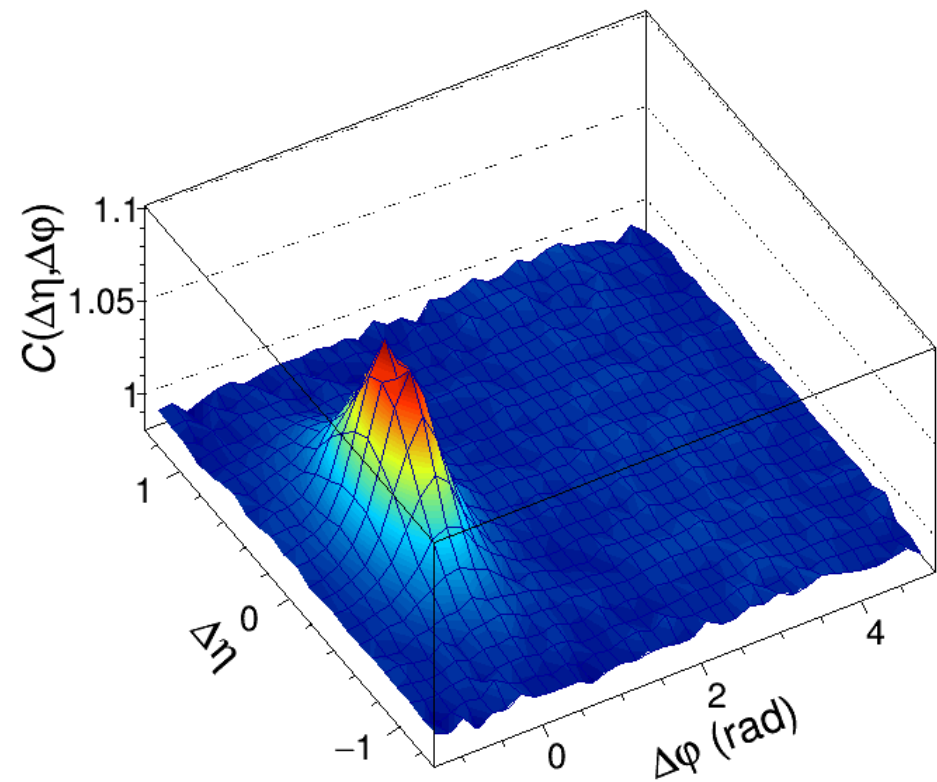


# $\Delta\eta\Delta\phi$ functions for MC rec. at $1 < p_T < 4$ GeV/c

$\pi^+\pi^+ + \pi^-\pi^-$

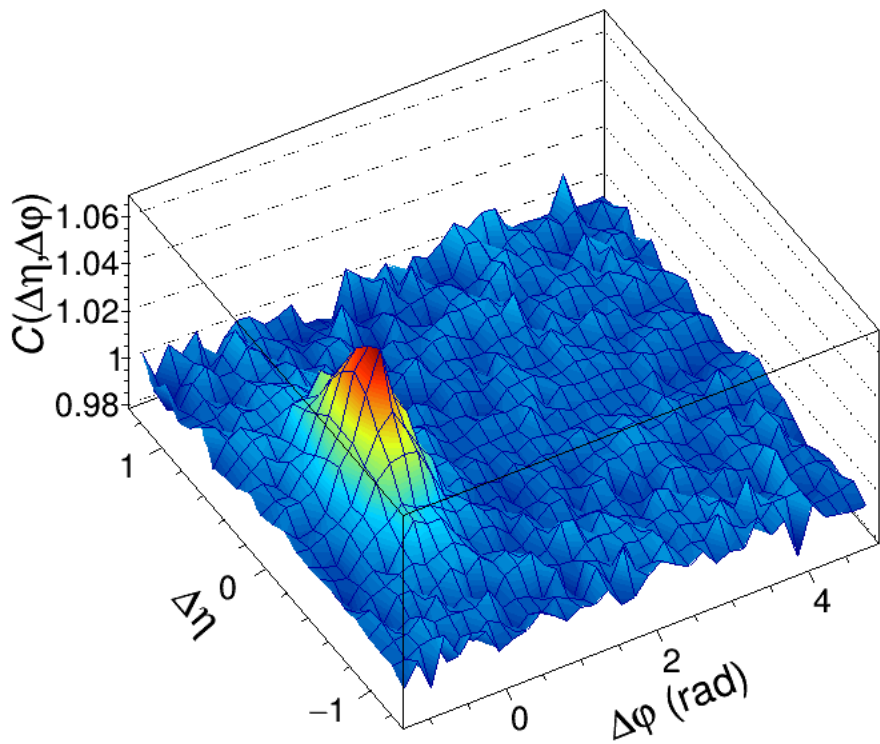


$\pi^+\pi^-$

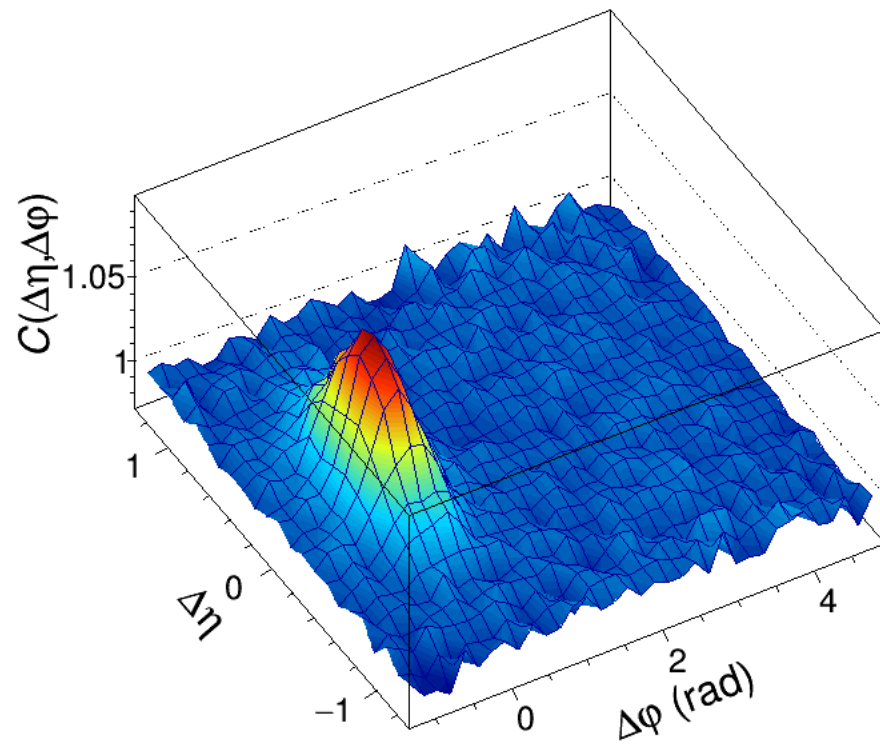


# $\Delta\eta\Delta\phi$ functions for MC truth at $1 < p_T < 4 \text{ GeV}/c$

$\pi^+\pi^+ + \pi^-\pi^-$



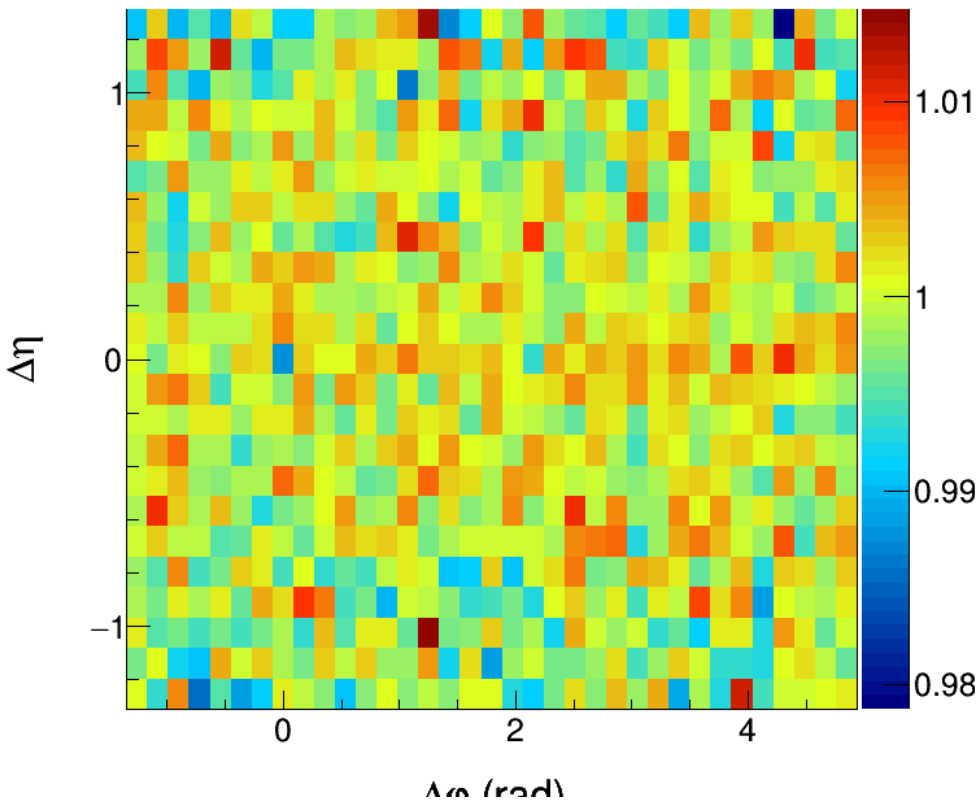
$\pi^+\pi^-$



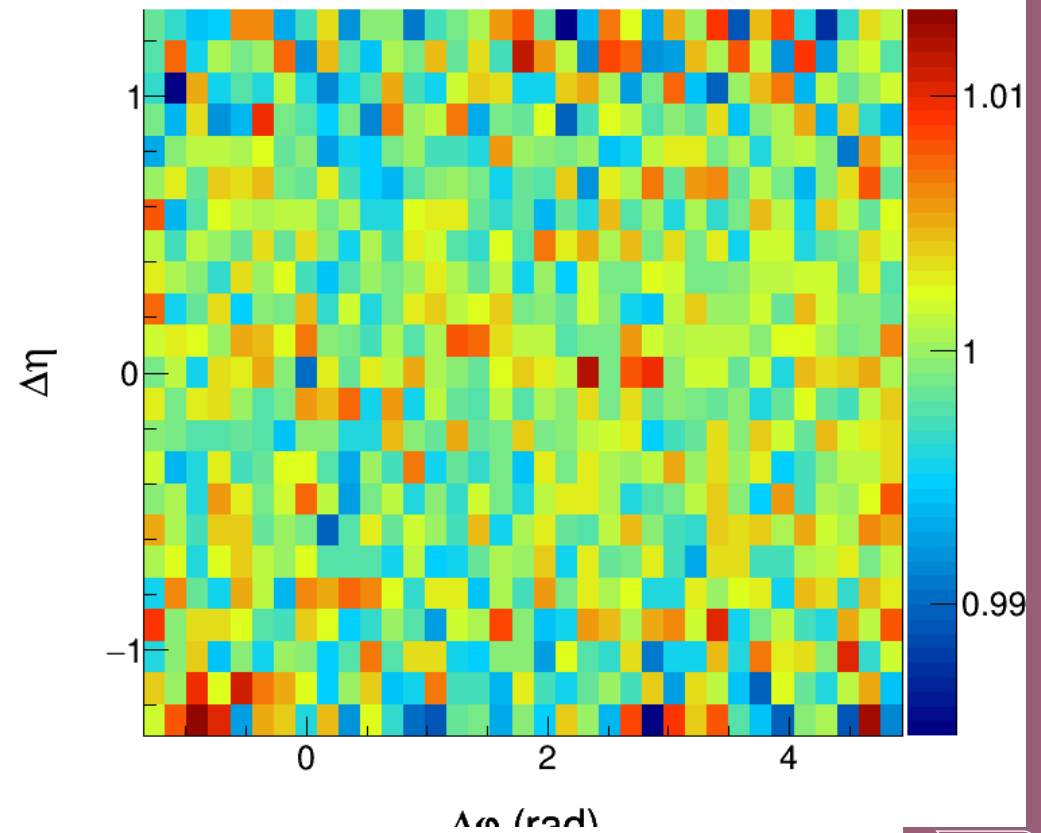
# MC reconstructed/MC truth

$1 < p_T < 4 \text{ GeV}/c$

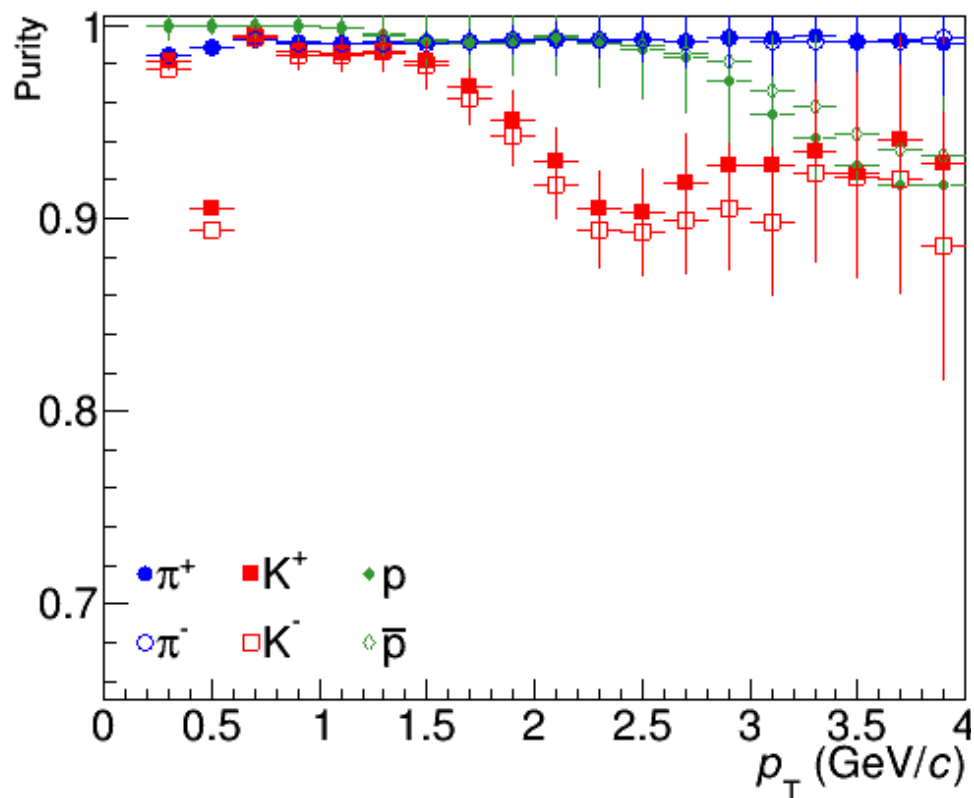
$\pi^+\pi^+ + \pi^-\pi^-$



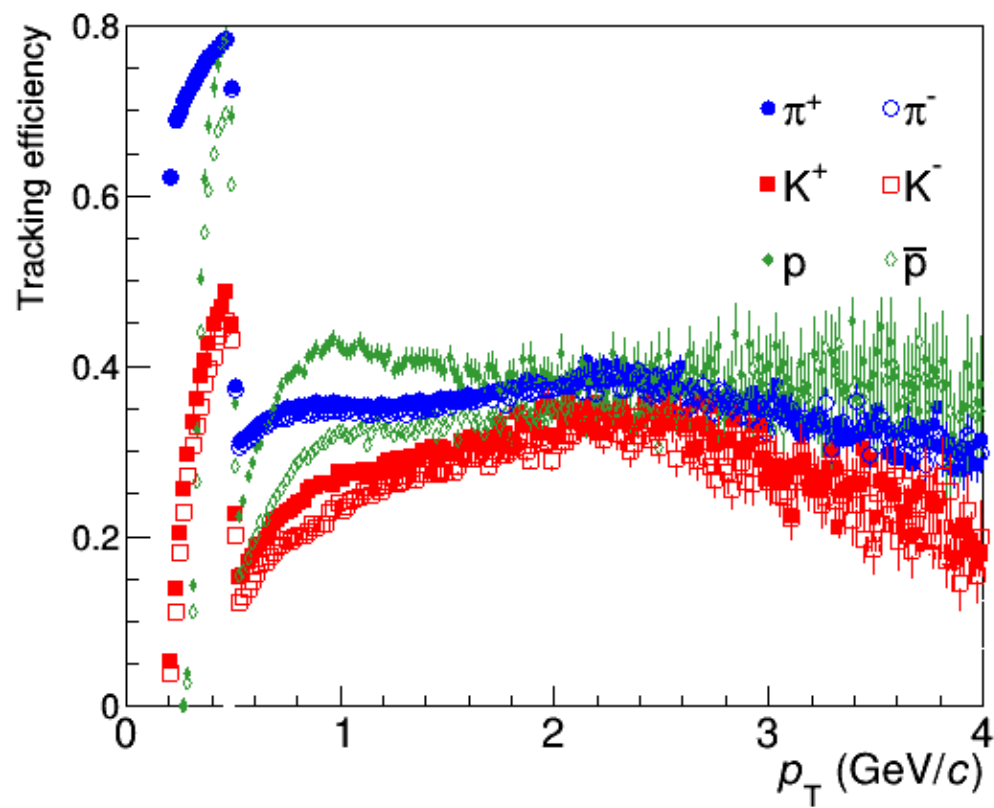
$\pi^+\pi^-$

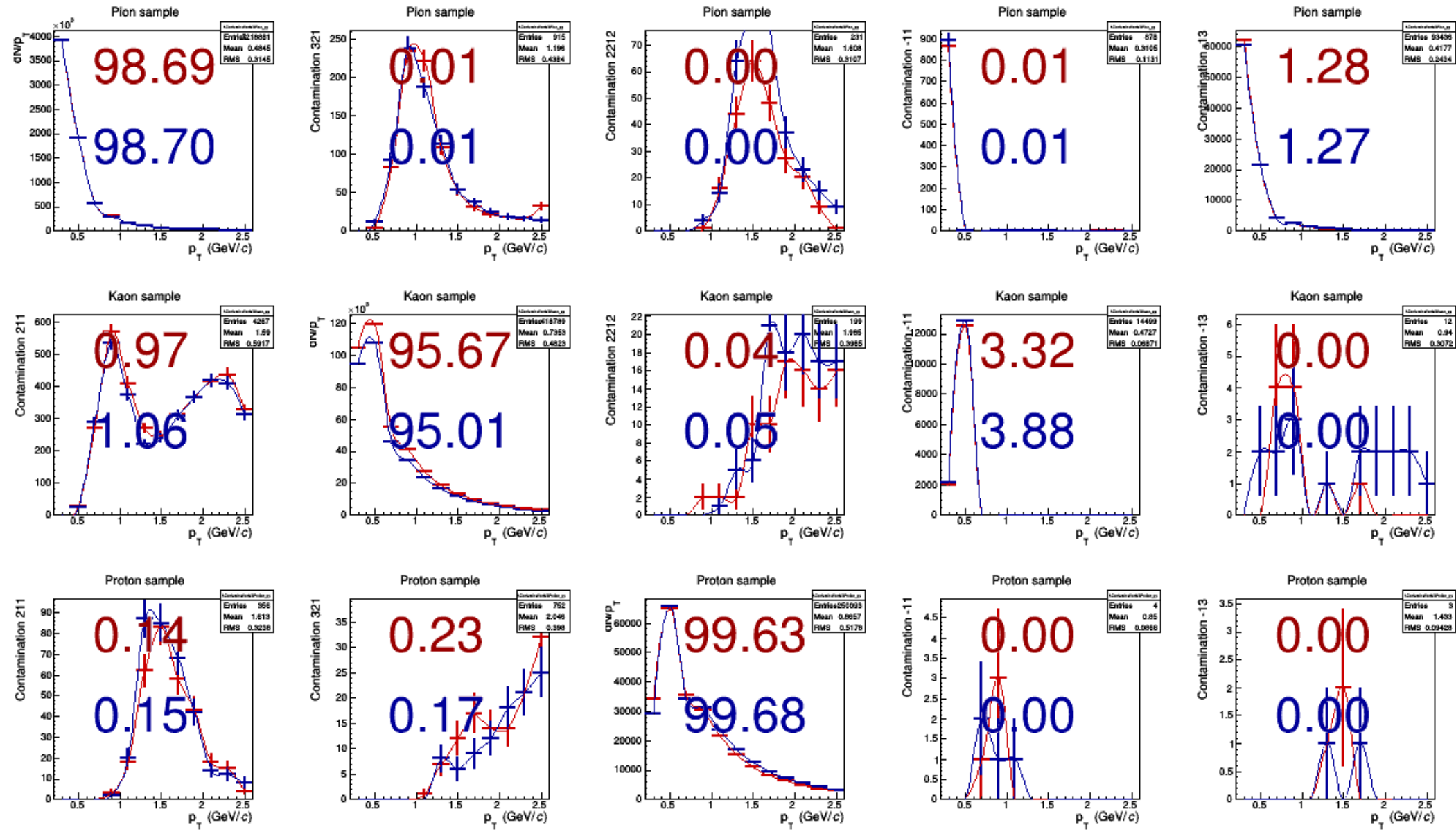


Purity

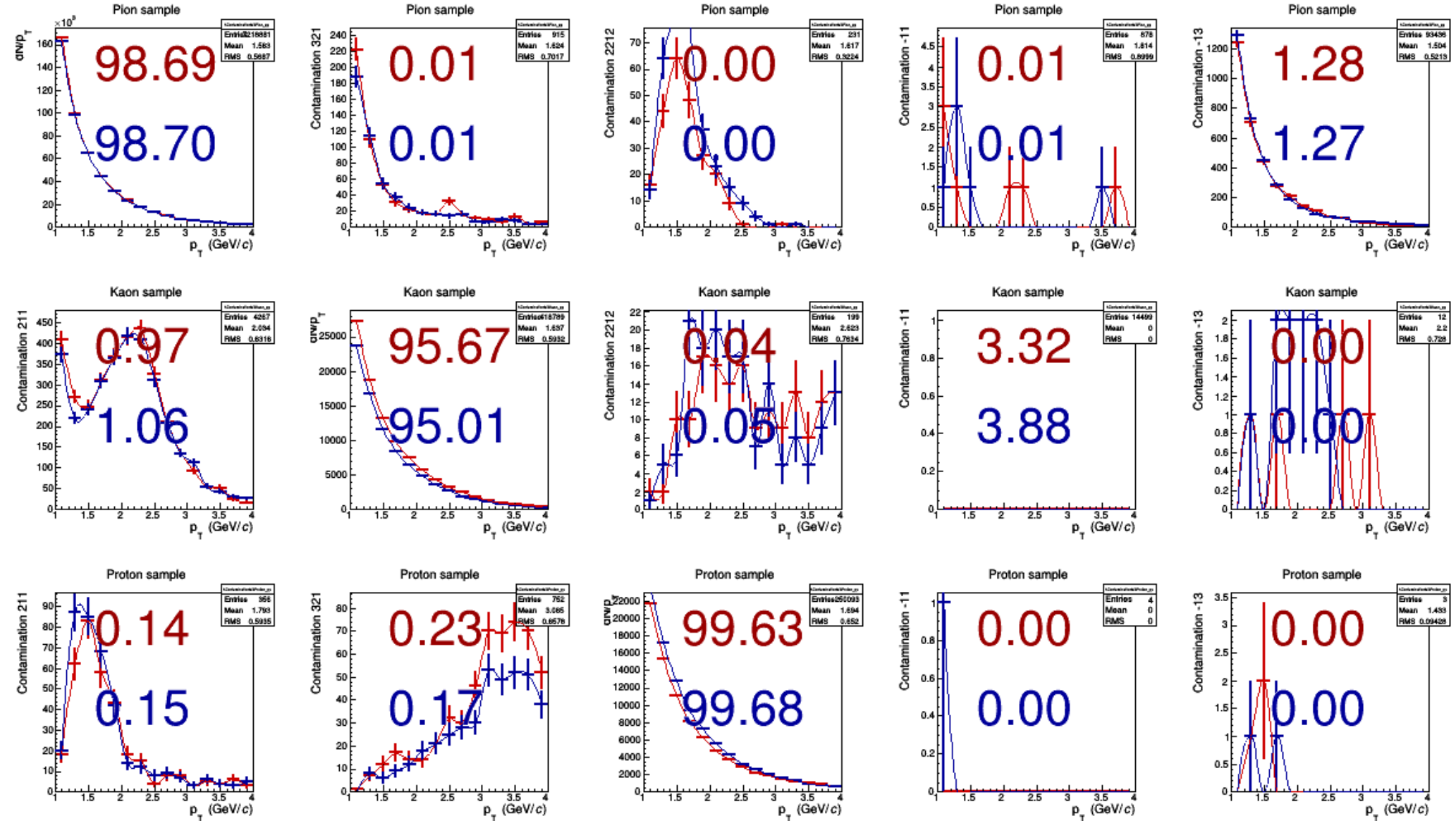


Total efficiency











## Summary:

- correlation functions without corrections for Xe-Xe collisions for pions
  - done
- efficiency and purity calculations
  - done

## Outlook:

- apply corrections to correlation functions
- make correlation functions for kaons and protons (if possible)
- change tracking method to fix the problem with lower  $p_T$  range
- study systematic effects

