

Analysis Update: MC study for pp  
collisions at  $\sqrt{s} = 13 \text{ TeV}$

**Tutor: Dr. Antonio Ortiz Velásquez**

## Motivation

To study the hadronic correlations with low number of MPI to later study those events with high number of MPI in order to refine the search for the QGP in pp collisions.

## Features

$$|\eta| < 4$$

Near Side (NS):

$$|\phi| < \frac{\pi}{3}$$

Away Side (AS):

$$|\phi| > \frac{2\pi}{3}$$

Transverse Side (TS):

$$\frac{\pi}{3} < |\phi| < \frac{2\pi}{3}$$

New Transverse Side (NTS):

$$|\Delta\eta| < 3.2 \text{ and} \\ |\Delta\eta| > 2$$

$P_T^{\text{trig.}}$ :

$$0.15 \frac{\text{GeV}}{c} < P_T^{\text{trig.}} < 50 \frac{\text{GeV}}{c}$$

$$|\eta| < 0.8$$

$P_T^{\text{associated.}}$ :

$$0.15 < \frac{\text{GeV}}{c} < P_T^{\text{associated}}$$

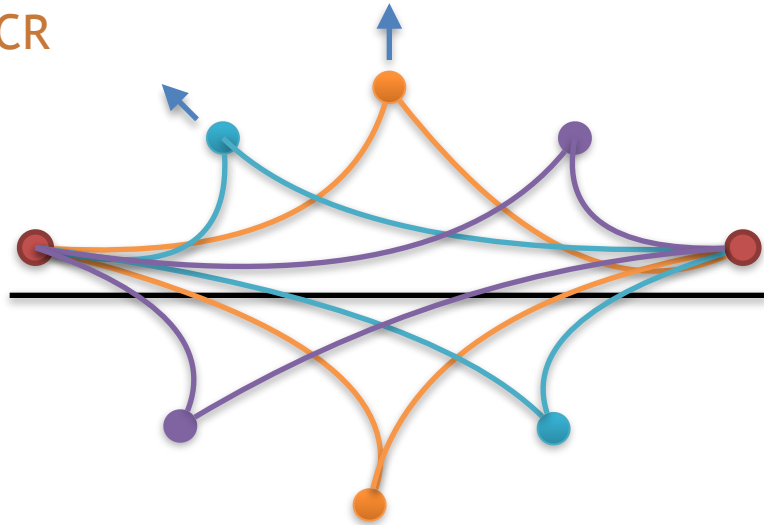
# Colour Reconnection (CR)

The MPI-based original Pythia 8 scheme.

Mechanism that allows the partons to interact before hadronizing.

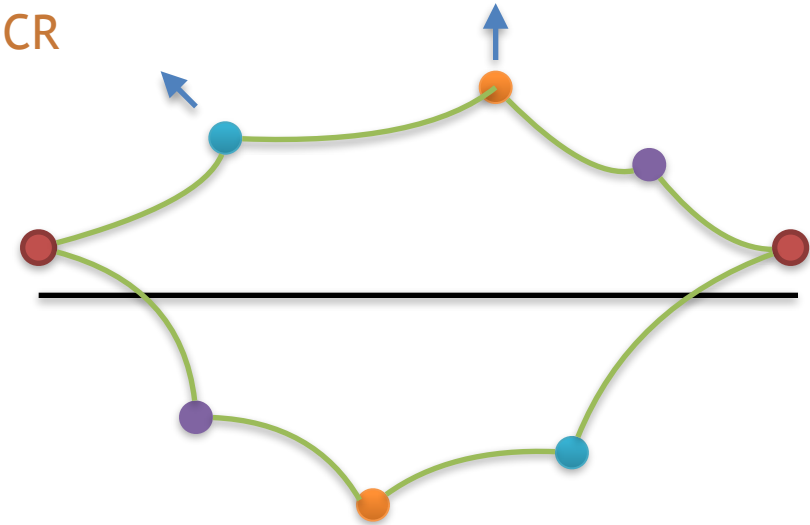
- Beam remnants
- ● ● Gluons and quarks

Without CR



$$N_{ch} \sim 12 \langle N_{ch}^S \rangle$$

With CR



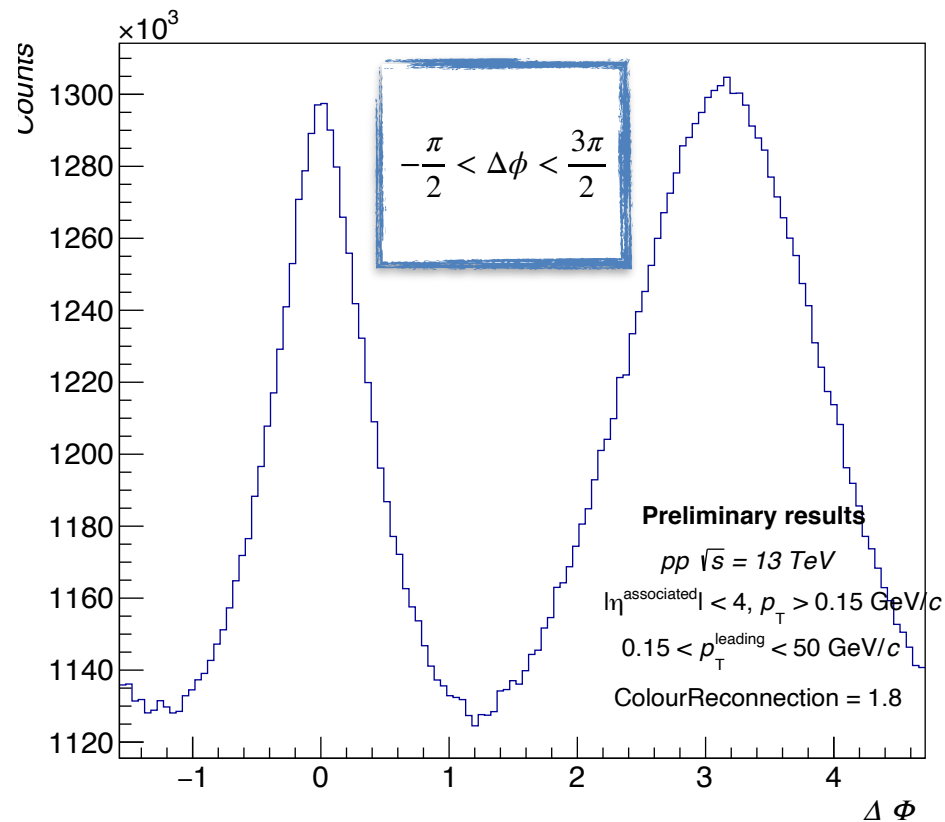
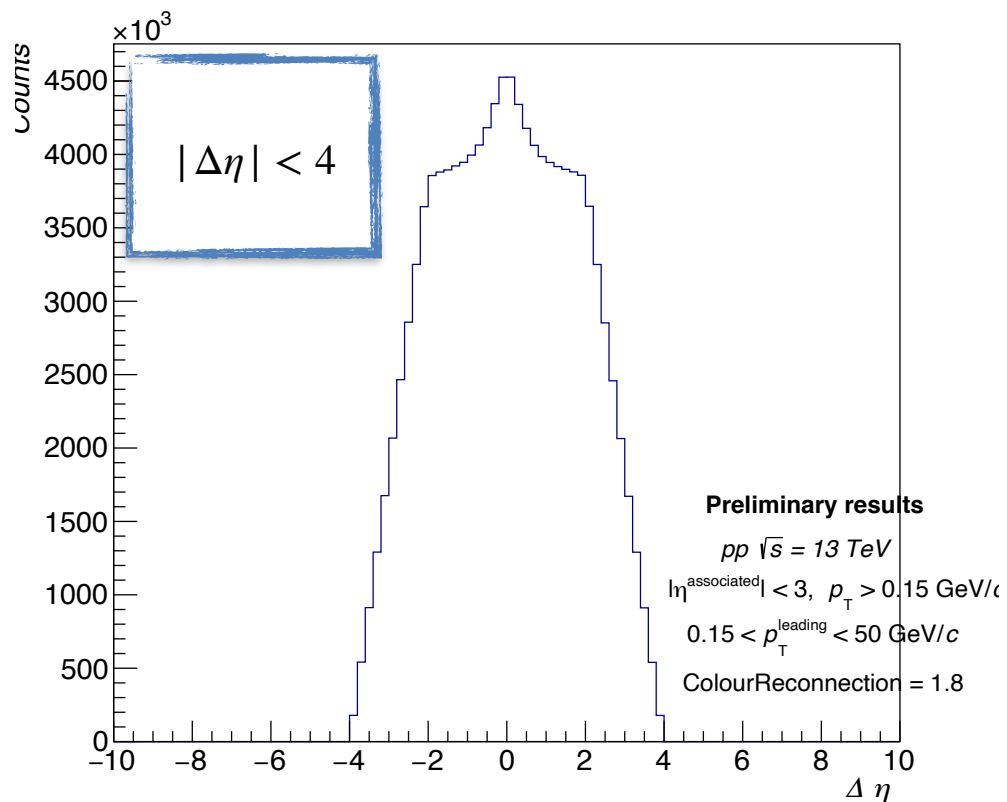
$$N_{ch} \sim 8 \langle N_{ch}^S \rangle$$

# Hadronic correlations

For each pair of particles, the hadronic correlations can be defined as follows

$$\Delta\eta = \eta^a - \eta^l$$

$$\Delta\phi = \phi^a - \phi^l$$

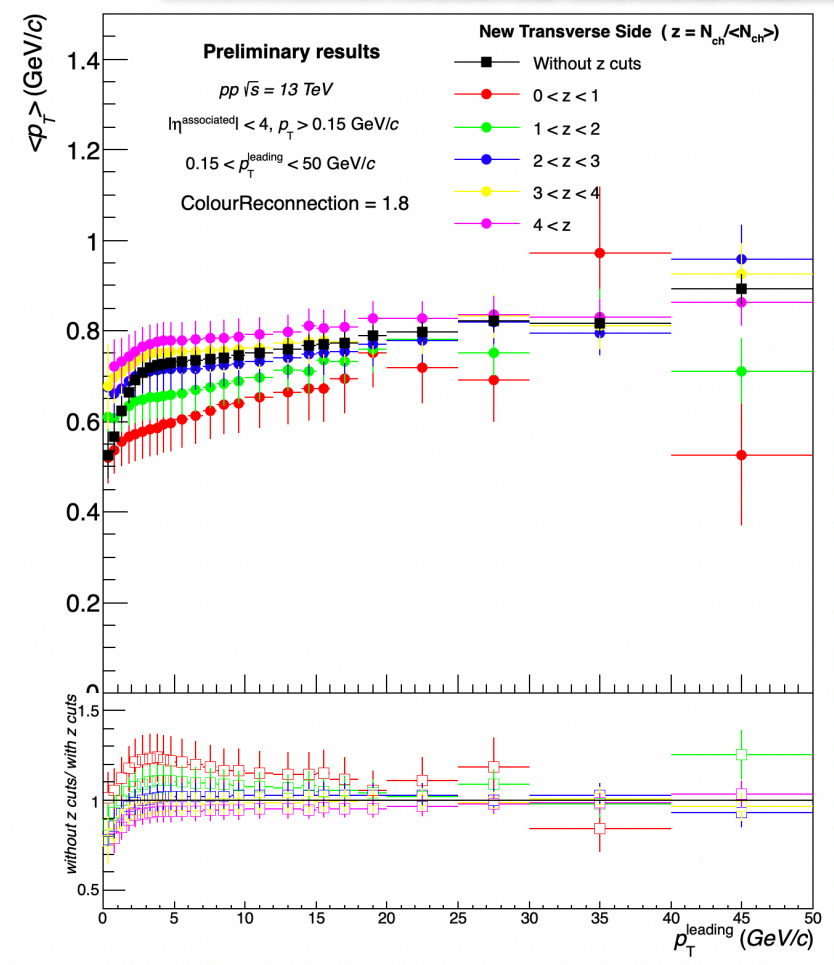
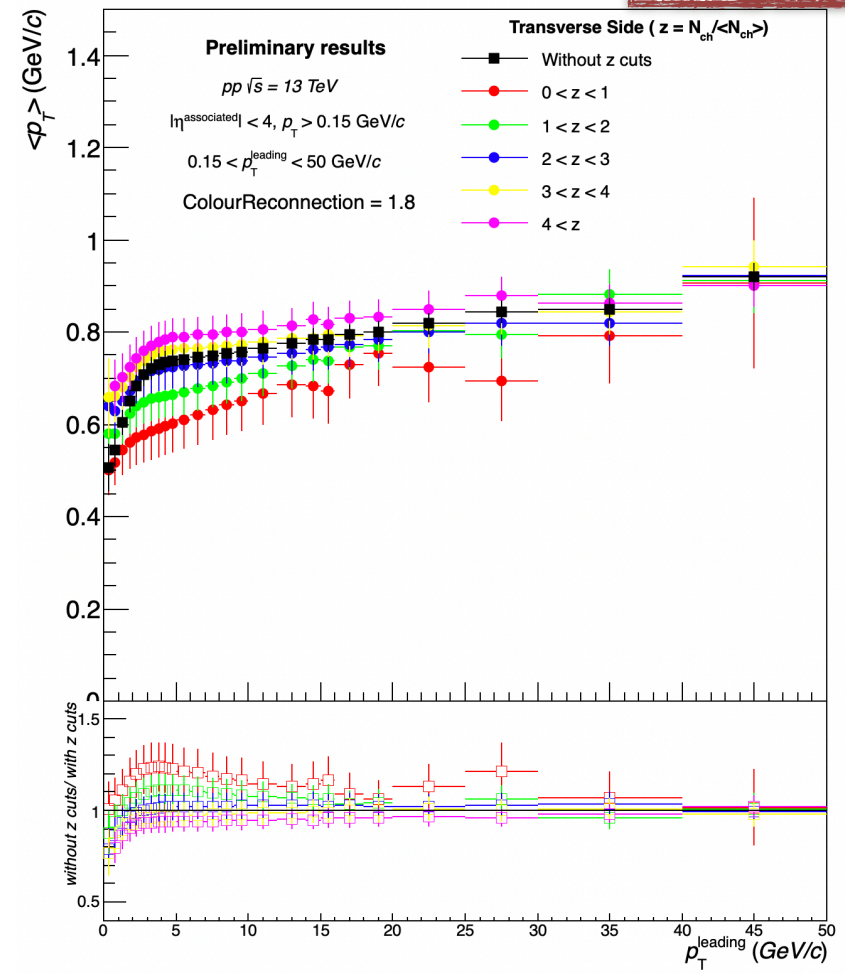


New Variable:  

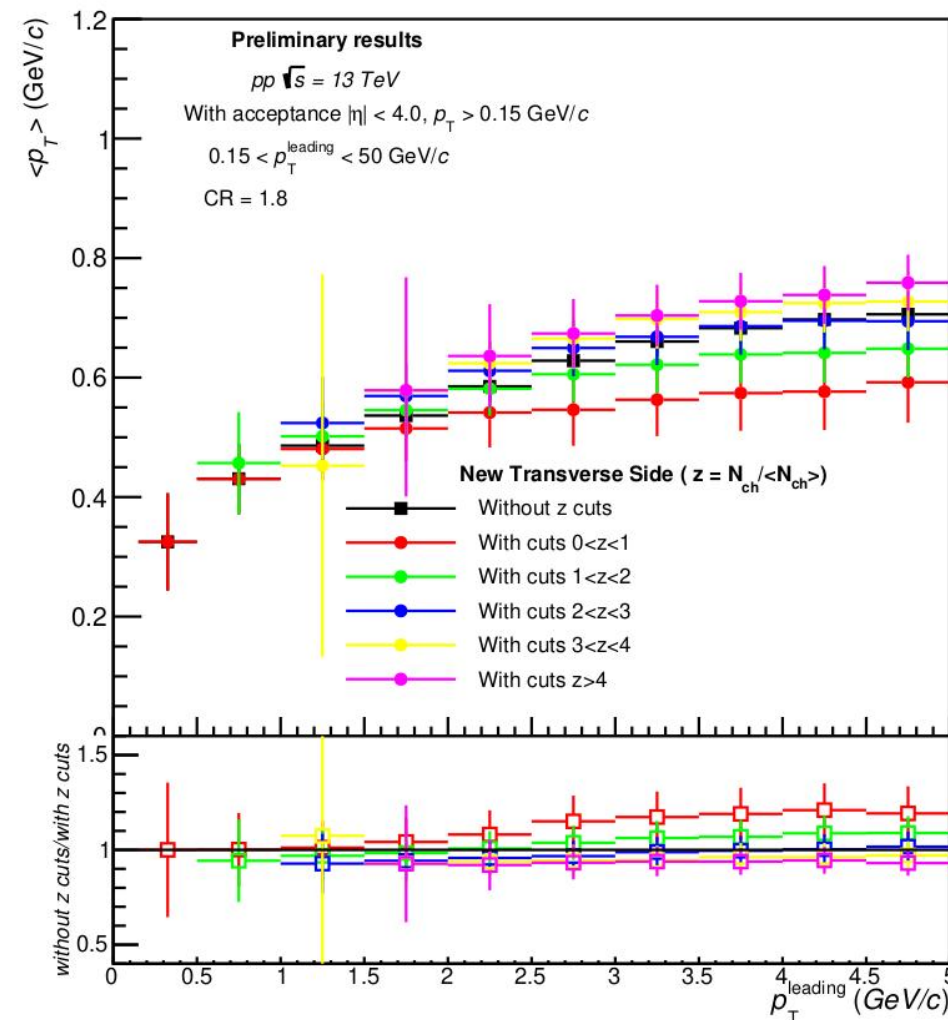
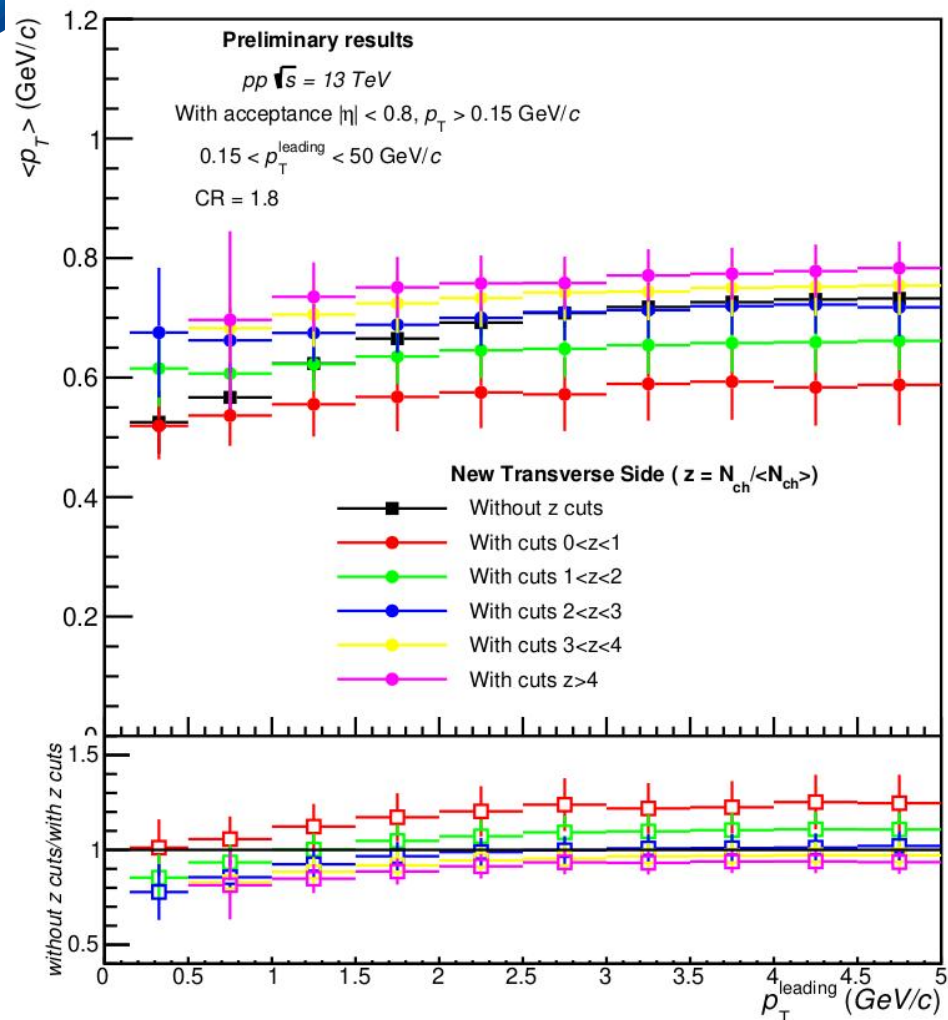
$$z = \frac{N_{ch}}{\langle N_{ch} \rangle}$$

Spectra is studied to observe a possible effect of additional contamination coming from the hard process.

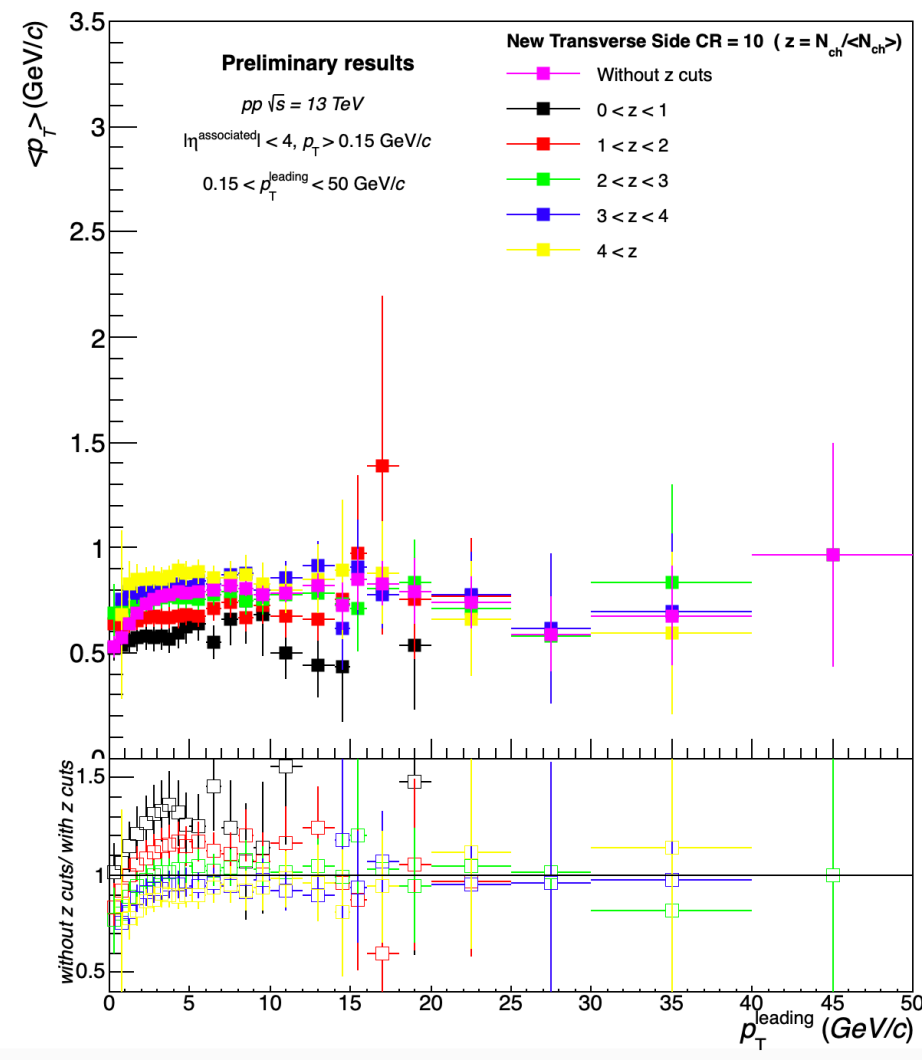
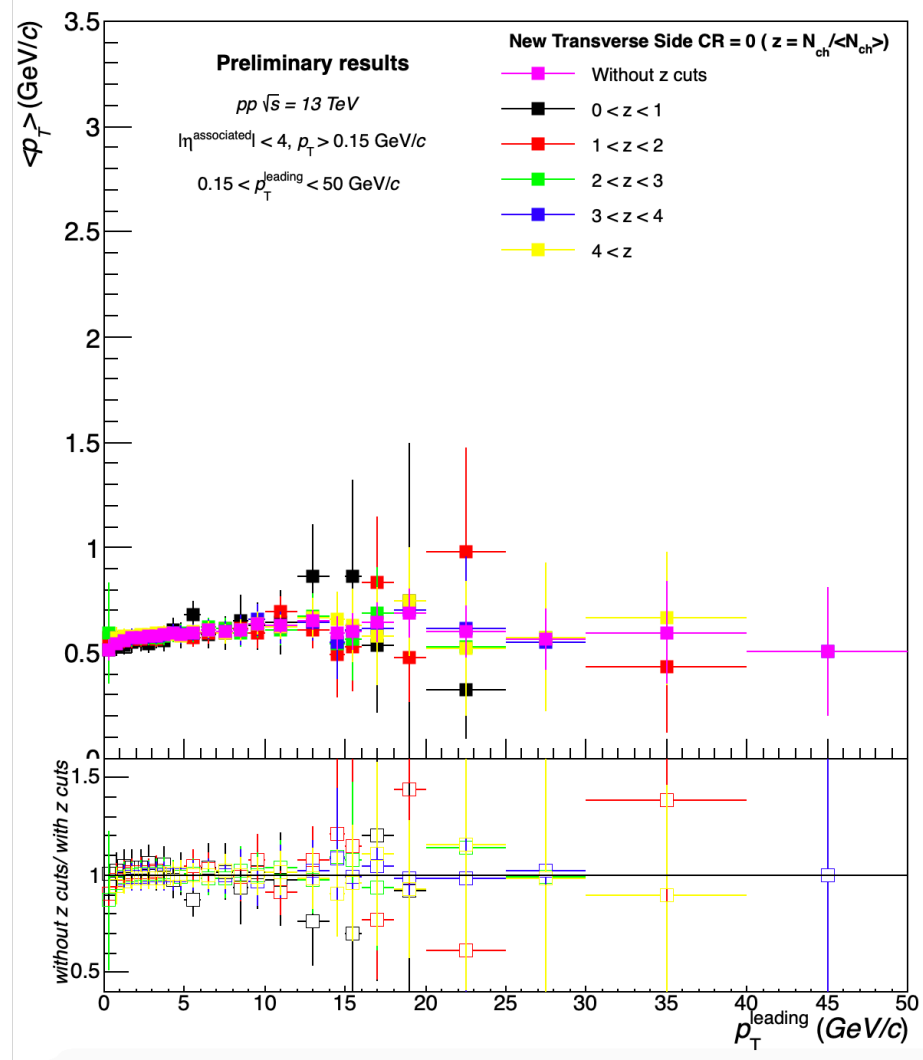
# $\langle p_T \rangle$ correlations



# Identification of the leader particle



# Effects by Colour Reconnection

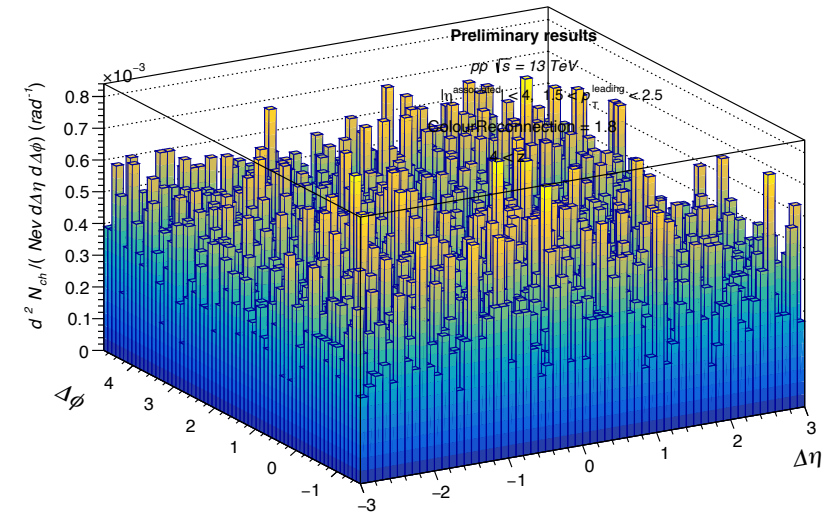
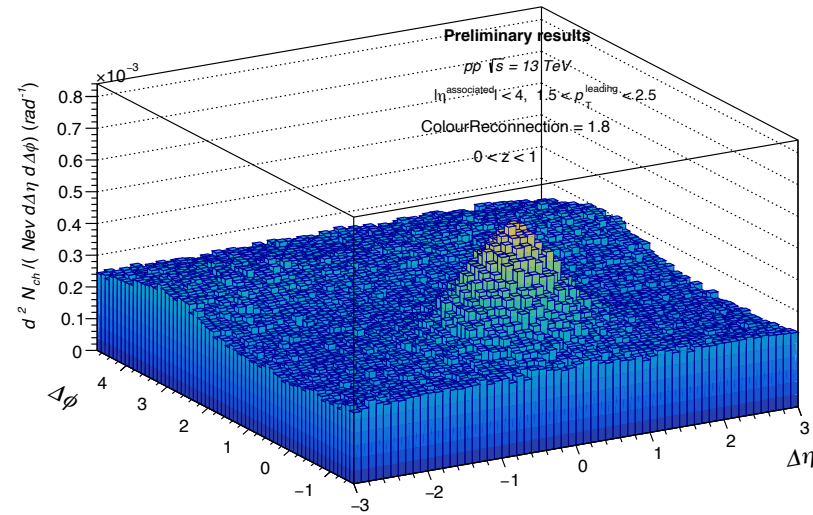
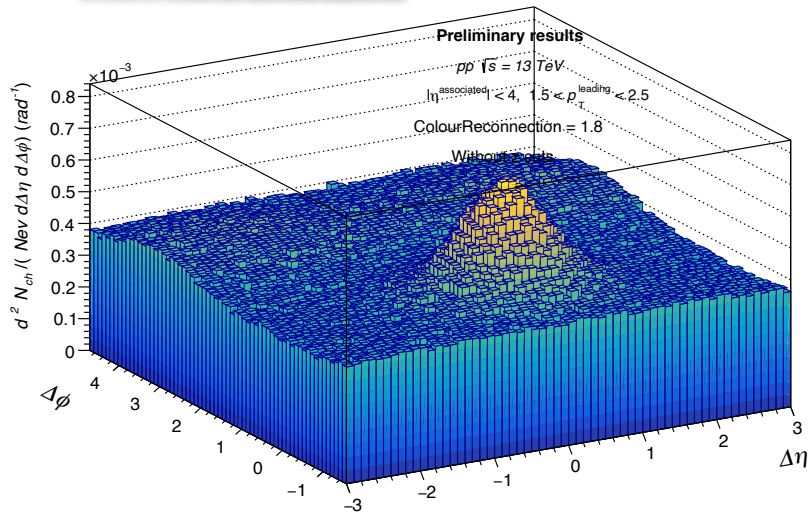




# Hadronic correlations

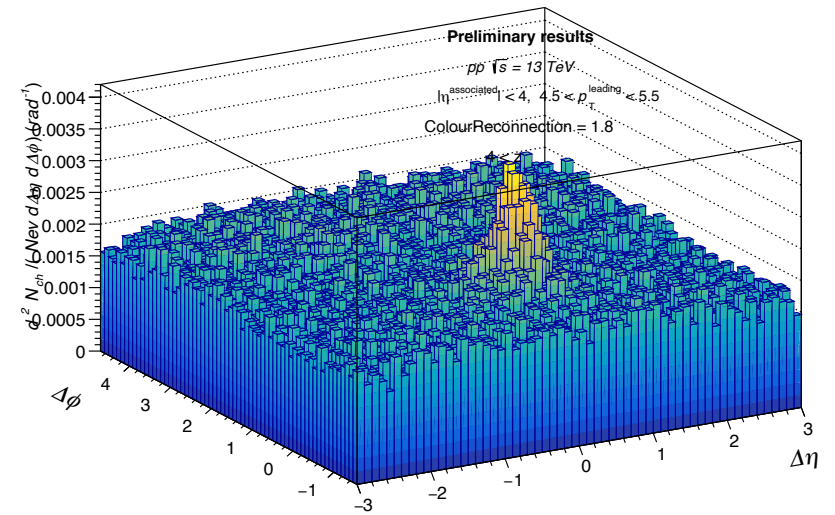
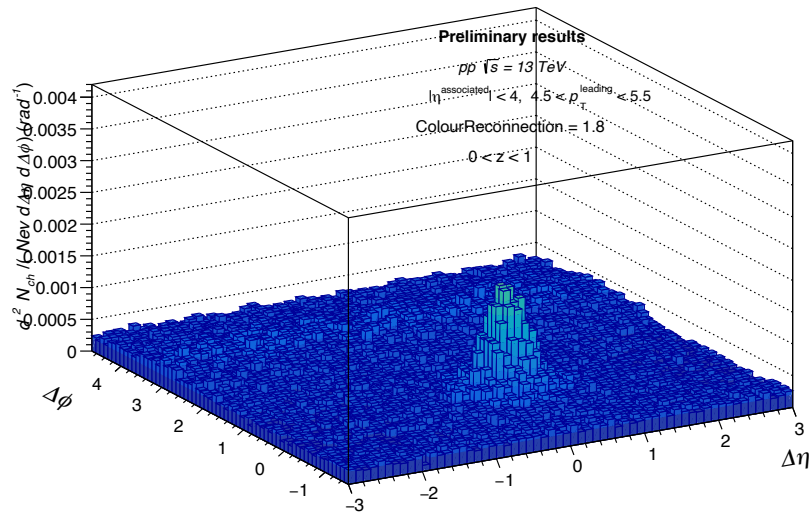
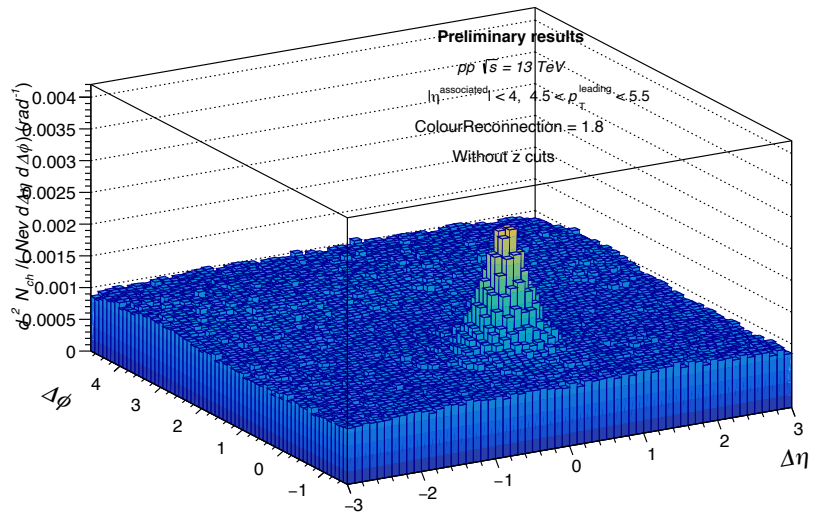
- Angular correlations were studied for the regions with  $-\frac{\pi}{2} < \Delta\phi < \frac{3\pi}{2}$  and taking into account the acceptability of  $|\eta| < 3$  and three different intervals for  $P_T^{\text{trig}}$ .

$$1.5 < P_T^{\text{trig}} < 2.5$$



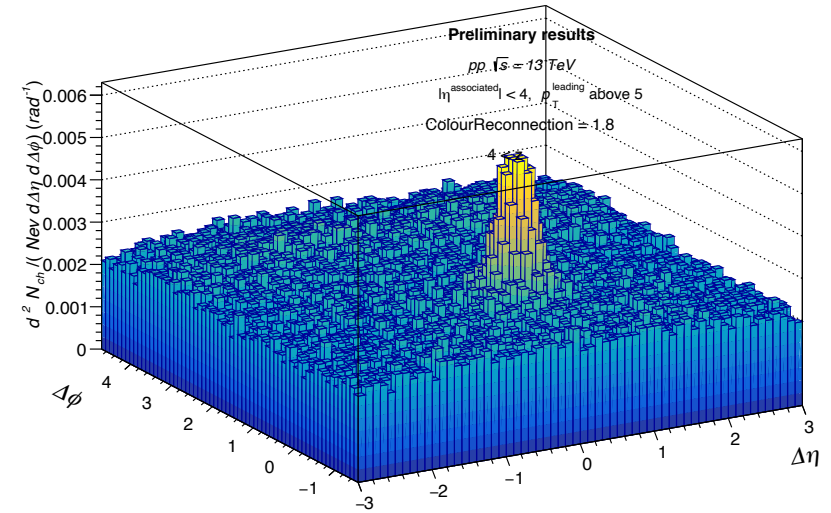
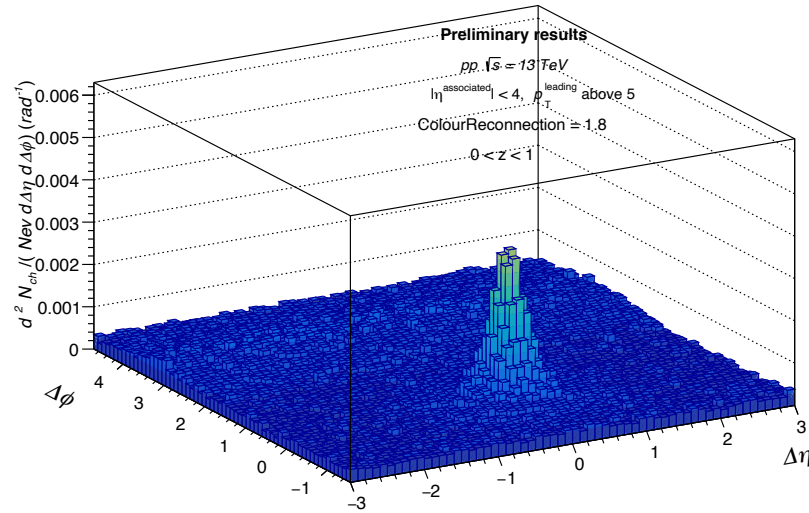
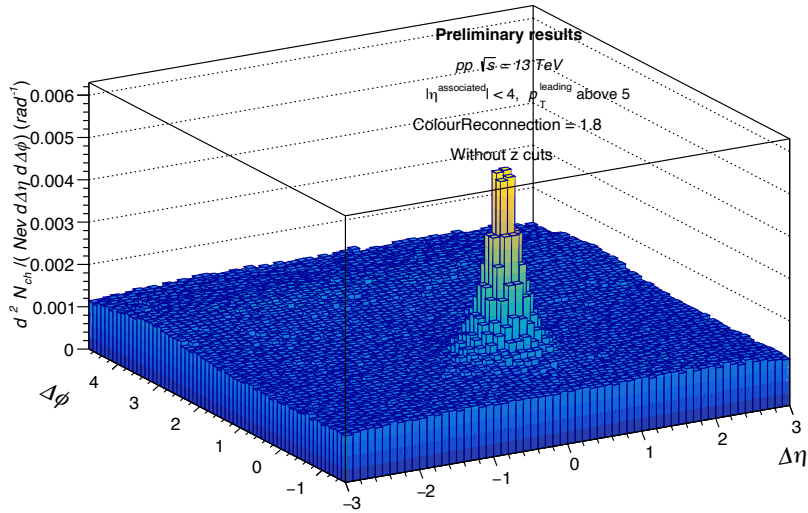
# Hadronic correlations

$$5.5 < P_T^{\text{trig}} < 5.5$$



# Hadronic correlations

$$P_T^{\text{trig}} > 5$$



# In the previous presentation



Study how  $\langle p_T \rangle$  changes considering different windows of total multiplicity.



Add the parameter  $\frac{\rho}{\langle \rho \rangle}$  to distinguish between high and low MPI.



Include other event generators in the analysis

Thank you

