Efficiency of the Transverse Momentum

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On the last session

- Comparative of the new cuts on Full and Low Magnetic Field.
- See a new cut in DCA Global.
- See what happened with the primary vertex position.

In this session

- See a new cut in the primary vertex position.
- Efficiency of the Transverse Momentum.
- Rewrite, order and comment my code. A few corrections.

Let’s Remember

The system we are studying is Request 28, that is, reduced magnetic field. We will compare it with full magnetic field, that is, Request 25.

	Request 25	Request 28
Collision system	Bi + Bi @9.2GeV	Bi + Bi @9.2GeV
Event Generator	UrQMD	UrQMD
Production	5 Million Events	10 Million Events
Magnetic Field	5 kG	2 kG

Available resources at ICN cluster

Cut on the Vertex Position

On the last session I mentioned that we have a few error. The error was the resolution definition of the primary vertex

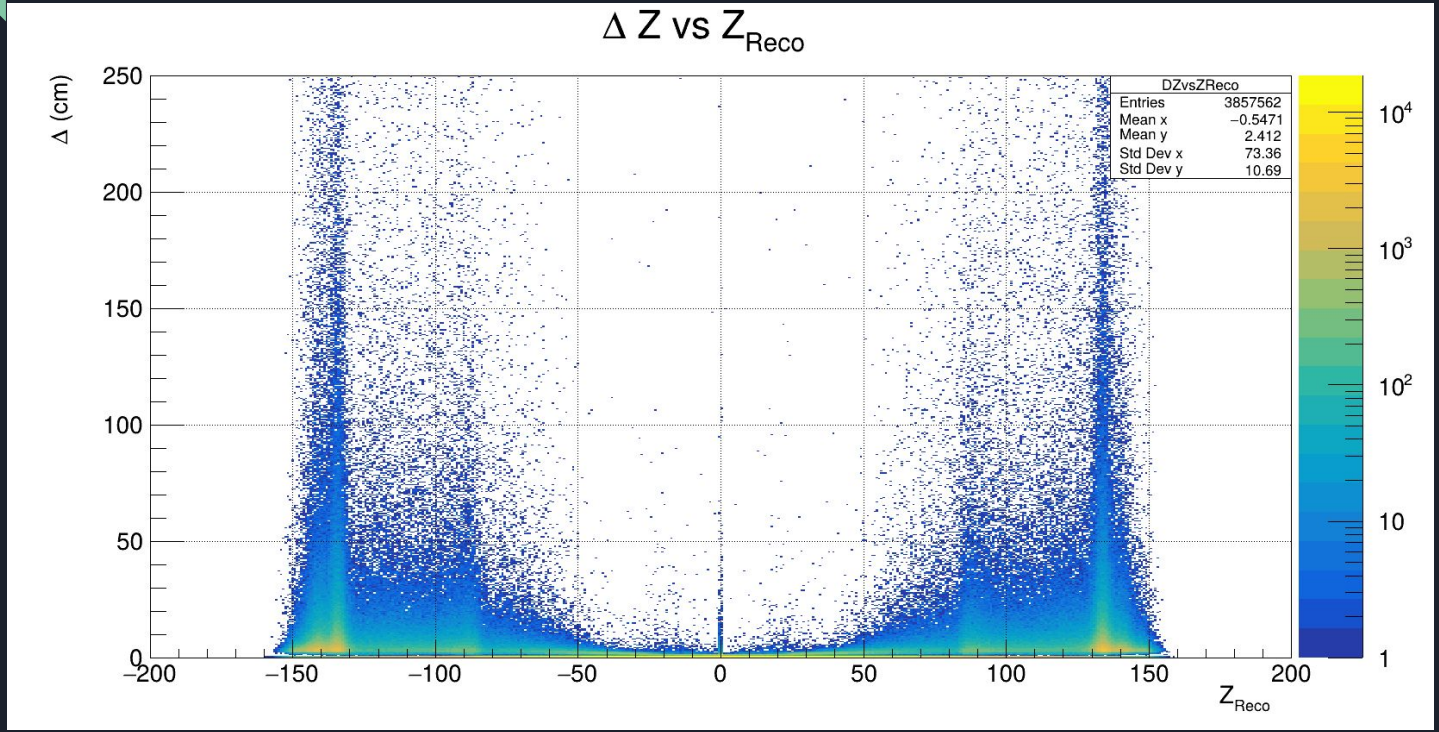
I was using:

$$\Delta Z = \frac{|Z_{reco} - Z_{MC}|}{Z_{MC}}$$

But the correct is:

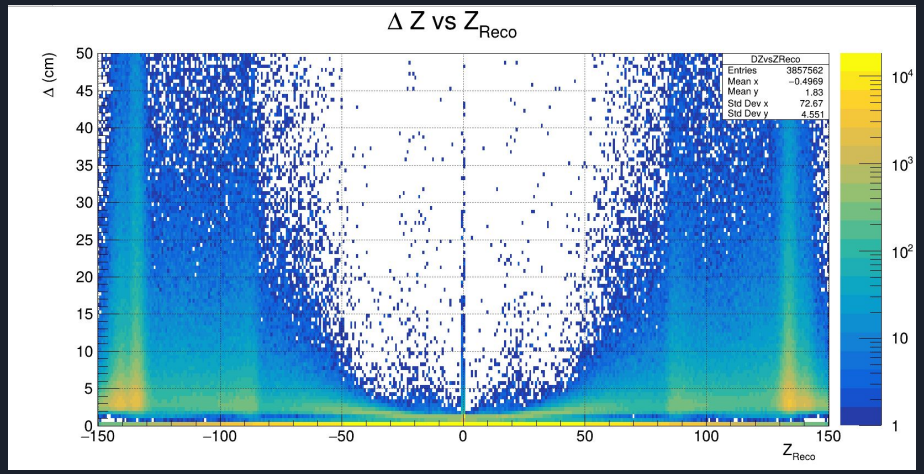
$$\Delta Z = \left| \frac{Z_{reco} - Z_{MC}}{Z_{MC}} \right|$$

With this solution, again I made the plot the resolution of the primary vertex against the primary vertex on the z-axis, but now have sense.

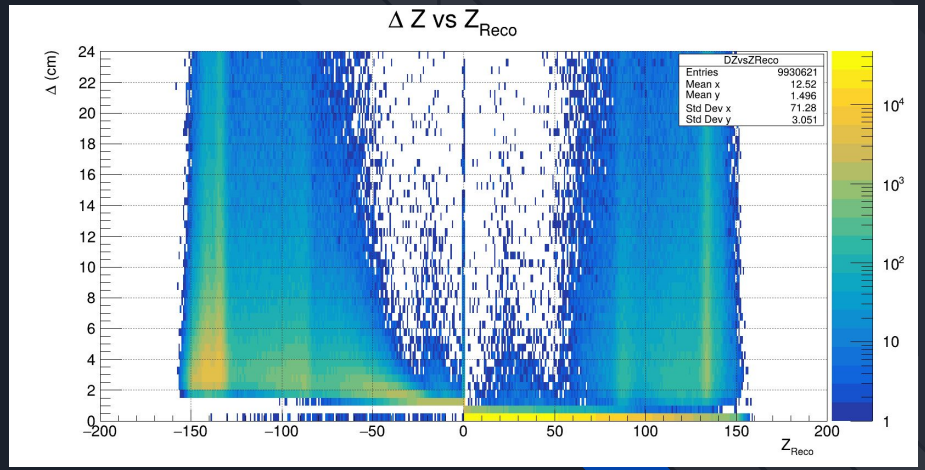


Again I made a zoom and comparative with the last meeting. Now have sense.

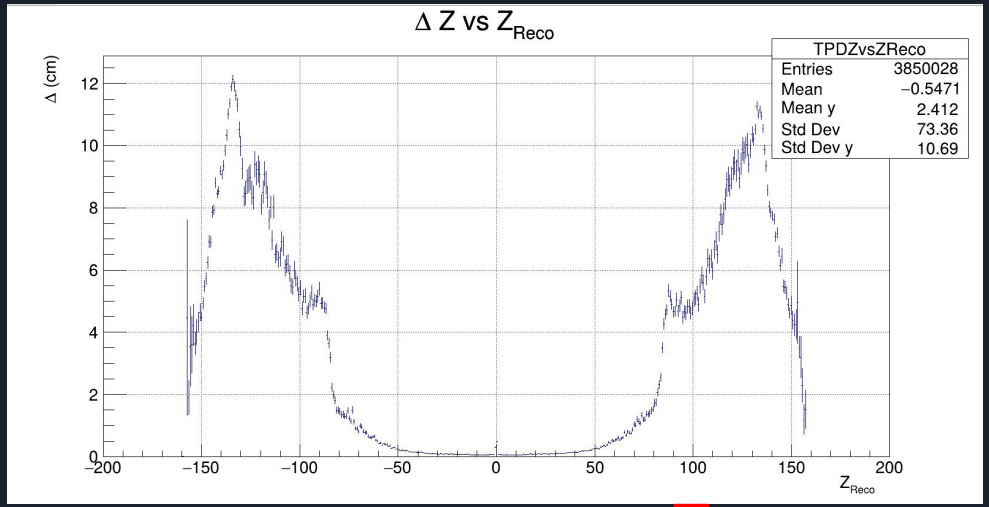
Now



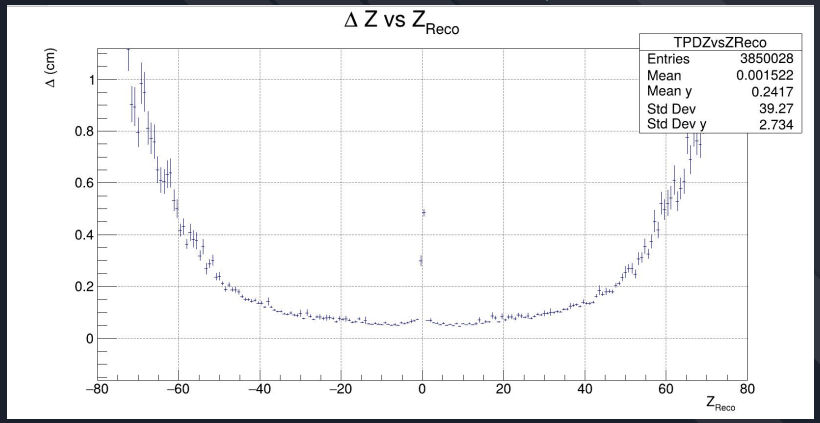
Last meeting



Now I see the TProfile of this. We see more symmetry than the last meeting. But it is enough to be able to visualize where we can make a cut



Made a zoom and I see that we can make a cut in the range of -50 to 50.



The Cuts to Low versus Magnetic Field

Low Magnetic Field

Variable	Cut
Transverse Momentum	$p_T > 0.15\ (GeV/c)$
Pseudo rapidity	$\eta \in (-1.5, 1.5)$
Number of Hits	$Number\ of\ Hits > 27$
DCA Global	$DCA\ Global > 1\ cm$
Primary Vertex Position	$\mathrm{Vtx} \in (-50, 50)$

Full Magnetic Field

Variable	Cut
Transverse Momentum	$p_T > 0.1\ (GeV/c)$
Pseudo rapidity	$\eta \in (-1, 1)$
Number of Hits	$Number\ of\ Hits > 16$
DCA Global	$DCA\ Global > 0.5\ cm$

Efficiency of the Transverse Momentum

Now with this cuts, we see the Efficiency of the Transverse Moment. To obtain this, we divide the distributions of the transverse momentum reconstructed between the transverse momentum Monte Carlo.

At the moment we only see the efficiency of the primary and secondary of the pions, protons and kaons.

$$Efficiency = \frac{p_T^{RECO}}{p_T^{MC}}$$

By the way, I only use all the cuts the the transverse momentum reconstruction, and for the transverse momentum, we only use:

Reconstruction

Variable	Cut
Transverse Momentum	$p_T > 0.15\ (GeV/c)$
Pseudo rapidity	$\eta \in (-1.5, 1.5)$
Number of Hits	$Number\ of\ Hits > 27$
DCA Global	$DCA\ Global > 1\ cm$
Primary Vertex Position	$\mathrm{Vtx} \in (-50, 50)$

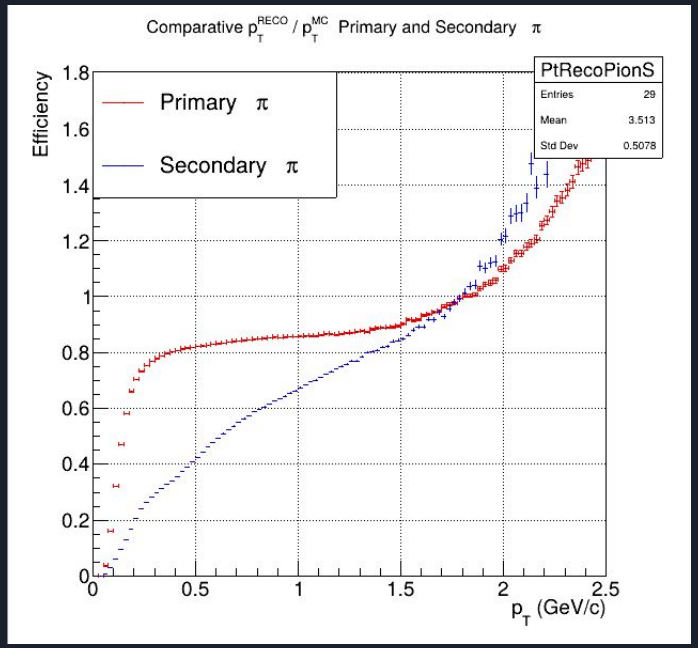
Monte Carlo

Variable	Cut
Transverse Momentum	$p_T > 0.15\ (GeV/c)$
Pseudo rapidity	$\eta \in (-1.5, 1.5)$
Primary Vertex Position	$\mathrm{Vtx} \in (-50, 50)$

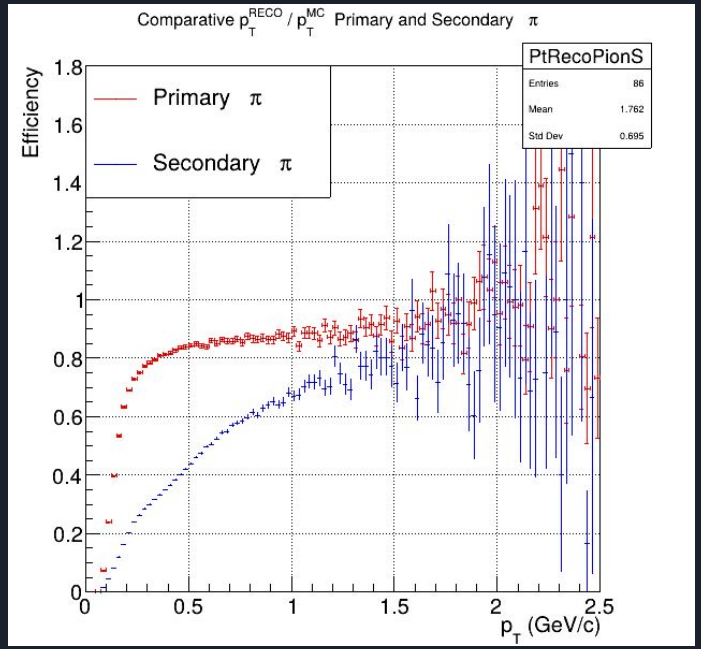
Efficiency of the Transverse Momentum of Pions

We compare low and full magnetic field:

Low Magnetic Field
10 Million events



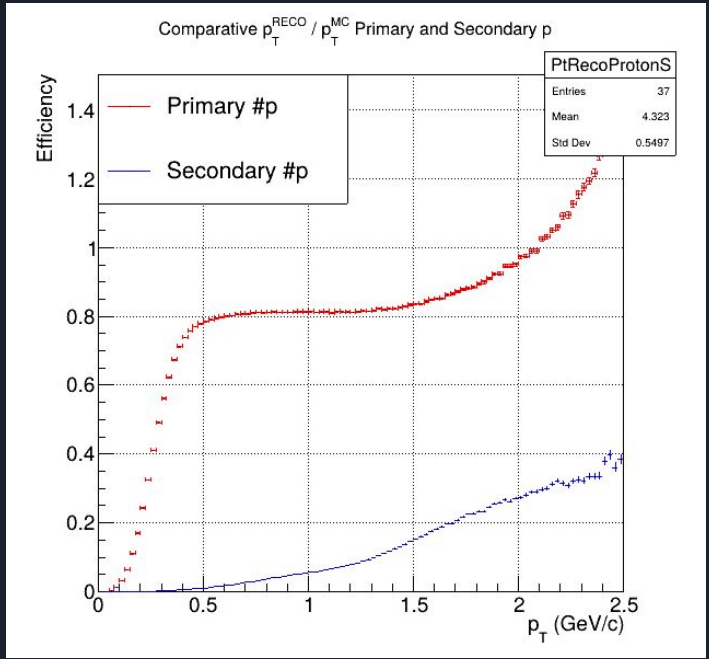
Full Magnetic Field
25, 000 events



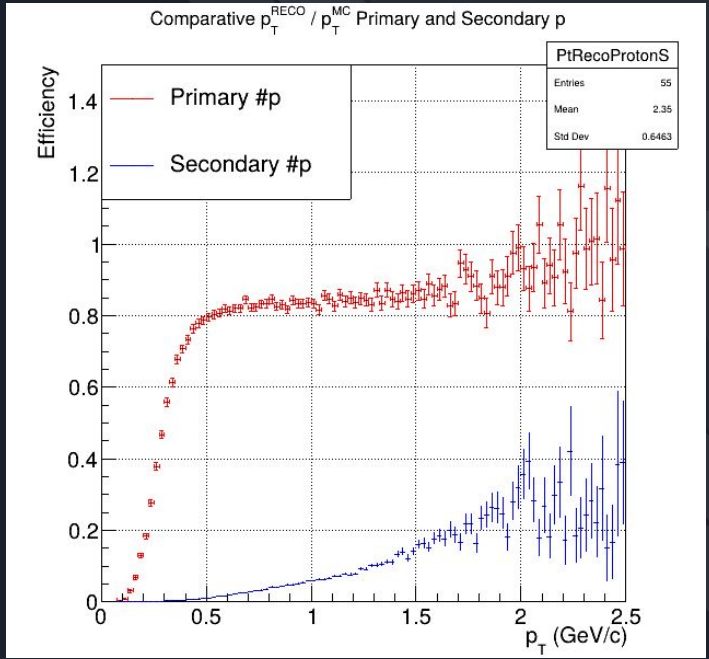
Efficiency of the Transverse Momentum of Protons

We compare low and full magnetic field:

Low Magnetic Field
10 Million events



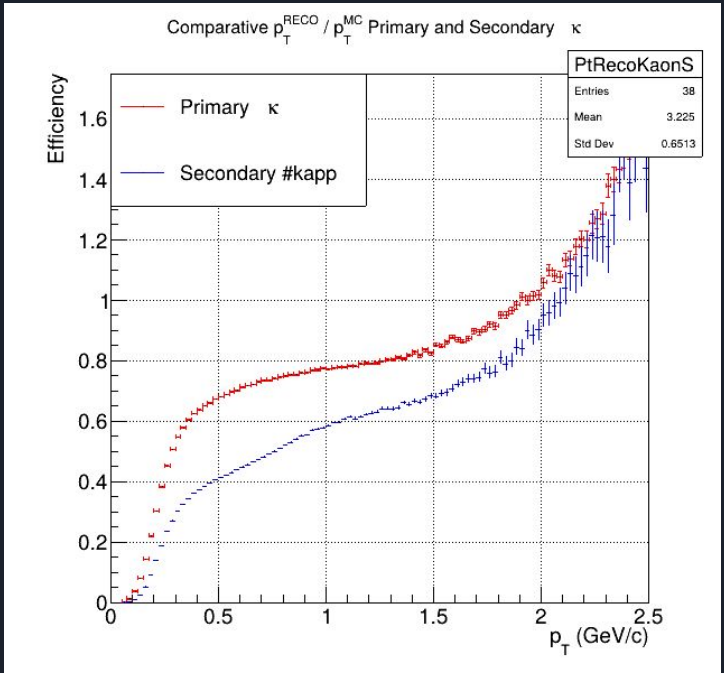
Full Magnetic Field
25, 000 events



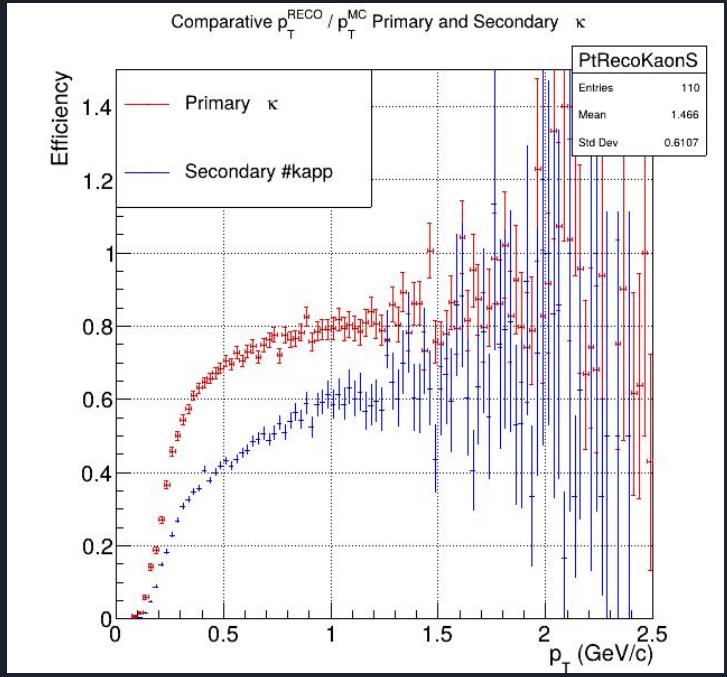
Efficiency of the Transverse Momentum of Kaons

We compare low and full magnetic field:

Low Magnetic Field
10 Million events

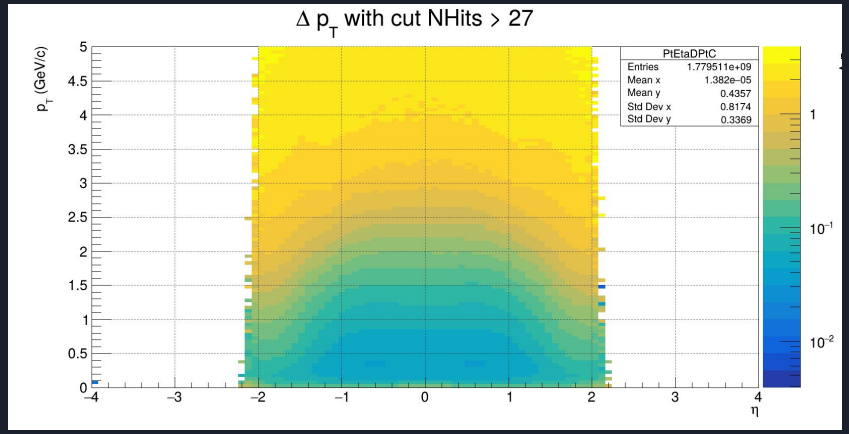


Full Magnetic Field
25, 000 events

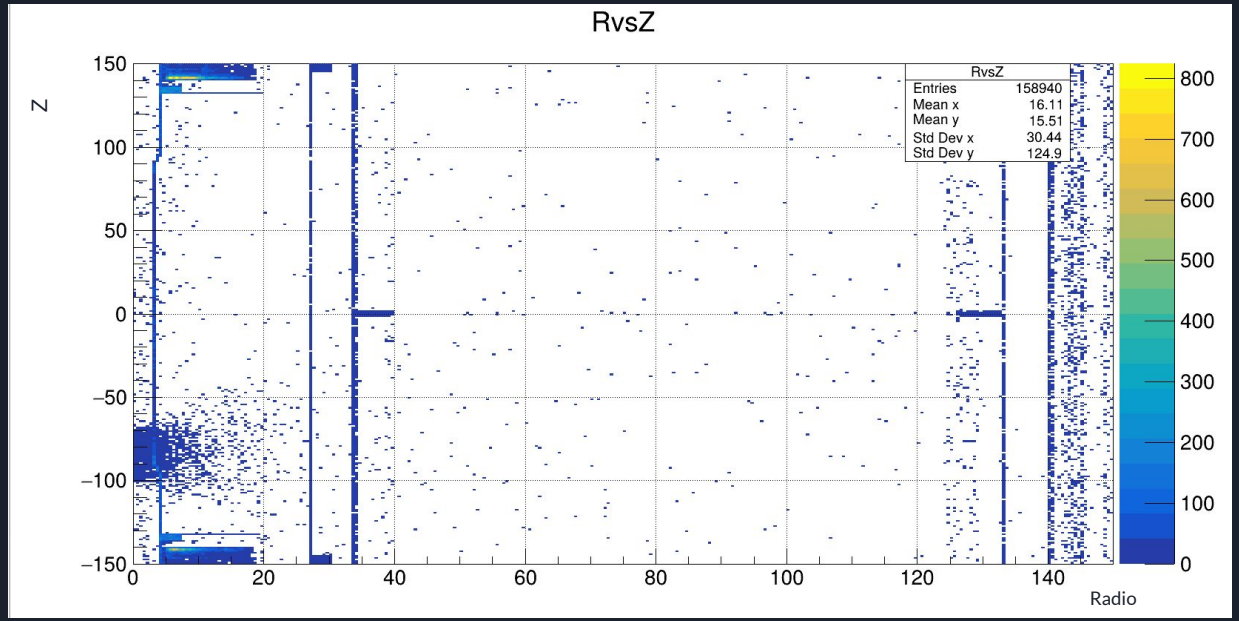


Let’s see the resolution in the phase space

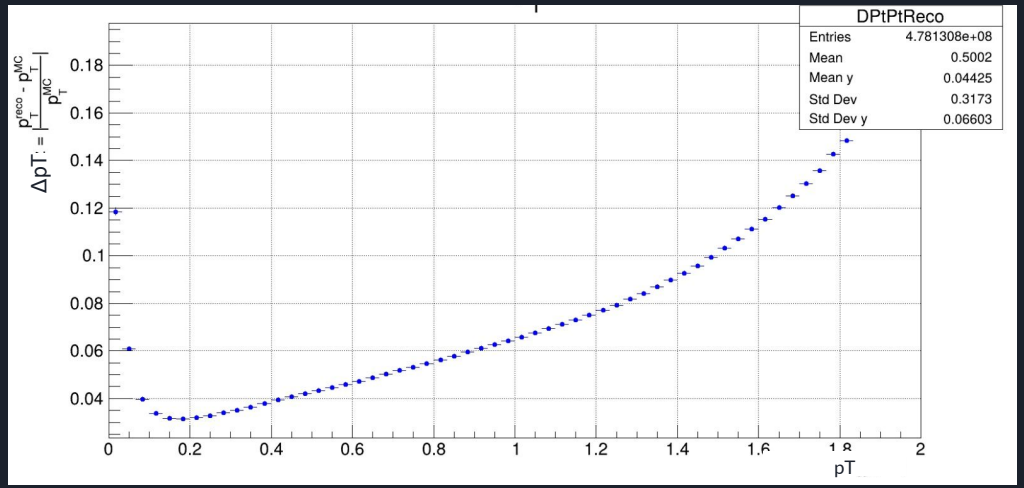
The histograms from the last pages have sense, because if we see this histogram. We can see that all up of 2 is noise.

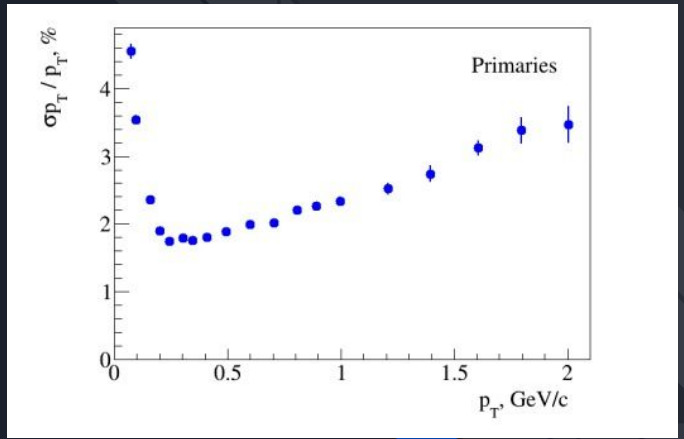


Let’s see what happened with the secondary protons

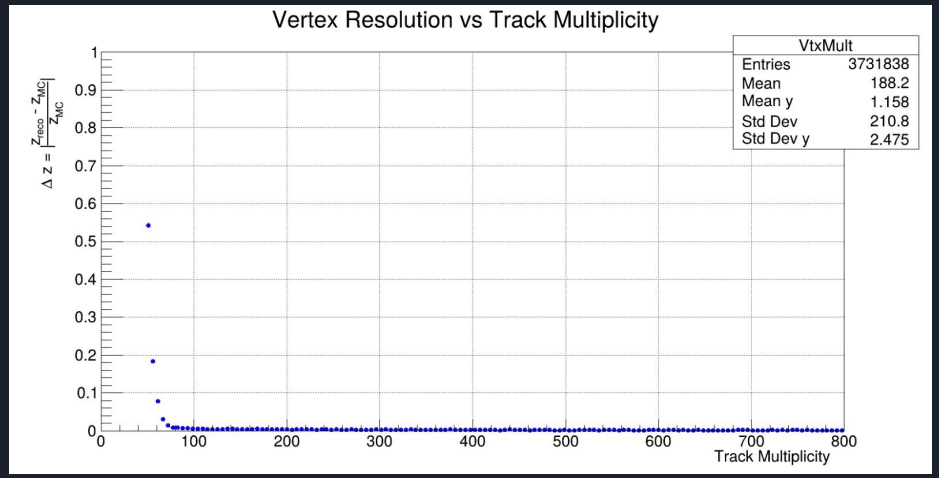


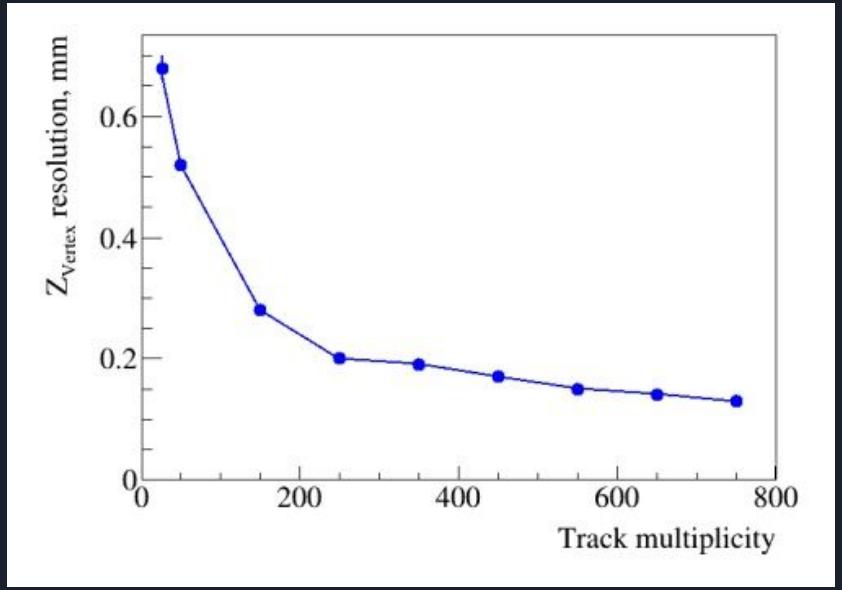
Resolution of Primary vertex versus pT





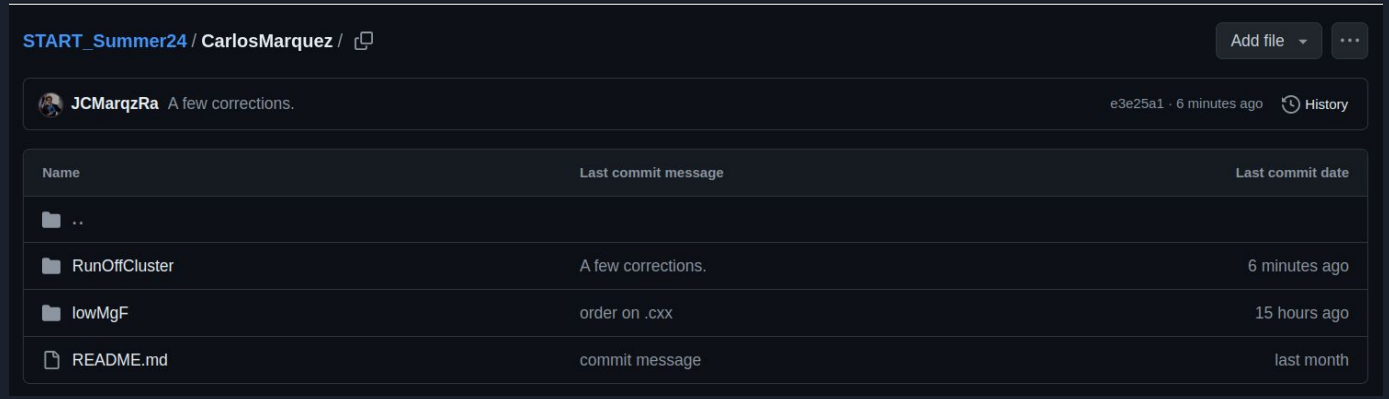
Resolution of Primary vertex versus Track Multiplicity





Rewrite, order and comment my code.

The code is cleaned and started to order, explaining each step. This is updated on GitHub of the START program: https://github.com/iamaldonado/START_Summer24/tree/main/CarlosMarquez



Summary

- See a new cut in the primary vertex position.
- Efficiency of the Transverse Momentum.
- Rewrite, order and comment my code. A few corrections.

The Nexts Steps

- Now, we want to compare with more information for the full and low magnetic field. Since not much information has been managed to run in the cluster
- I will continue with this work from Mexico.