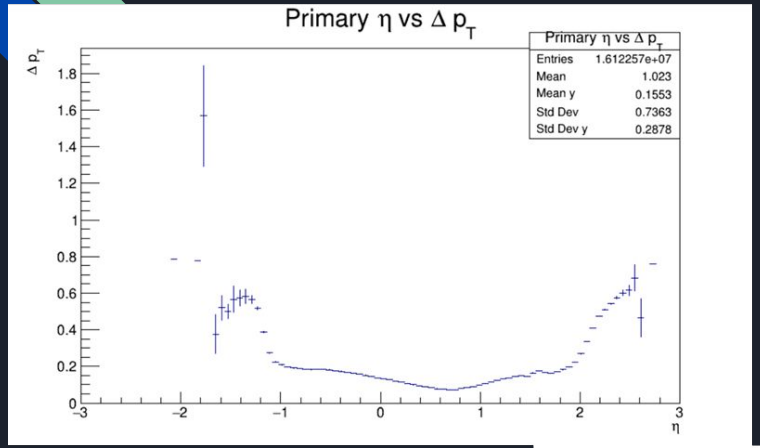
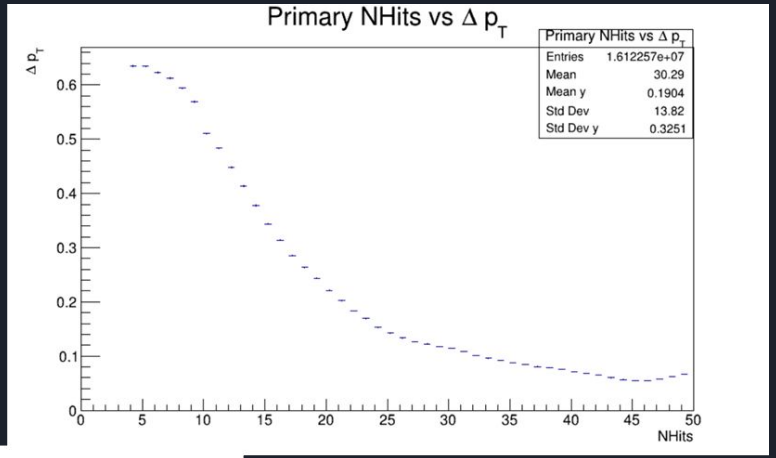
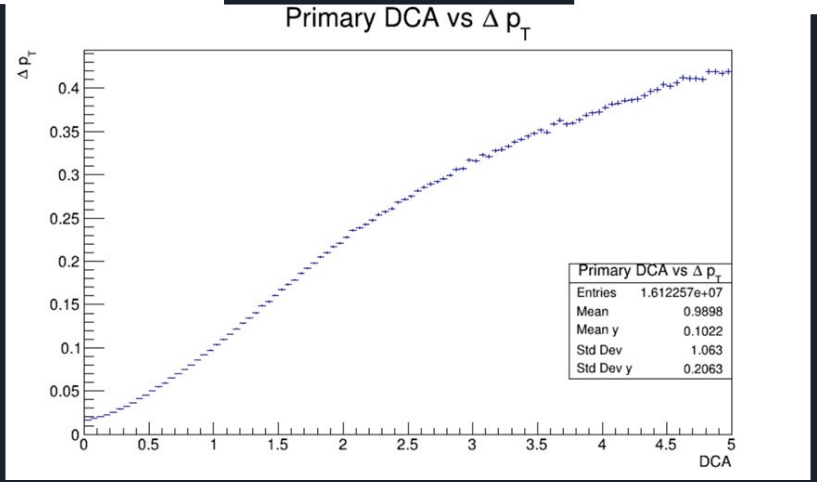
Centrality estimation in the Fixed Target Mode

Primary pT resolution distributions

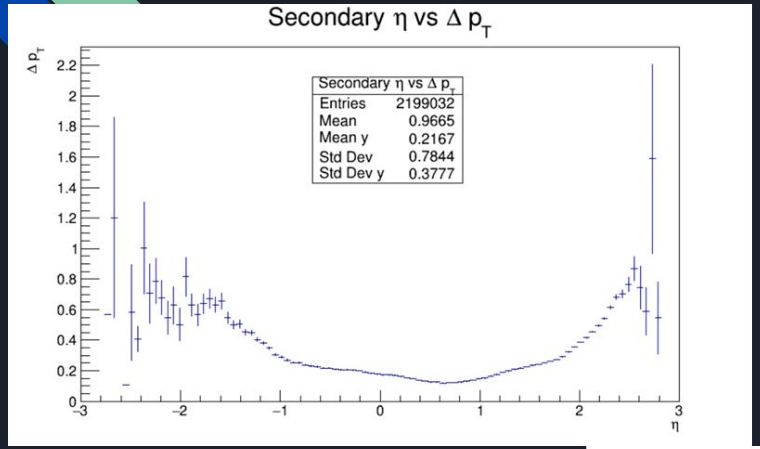


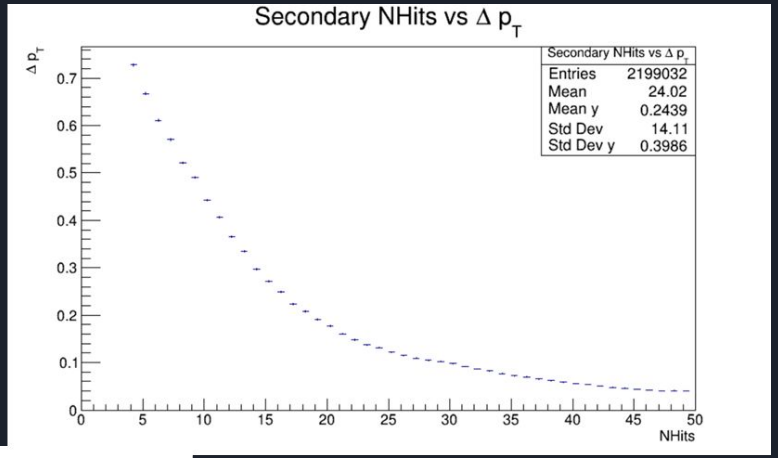


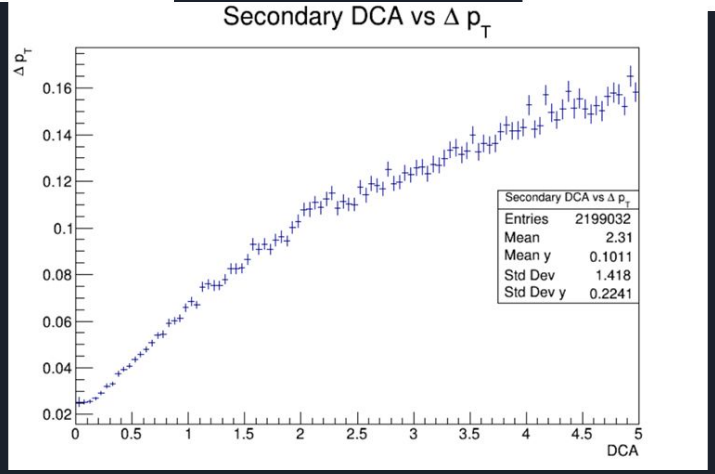


Cuts:
MCTracks > 304
RecoTracks > 3

Secondary pT resolution distributions







Cuts:
MCTracks > 304
RecoTracks > 3

Cuts

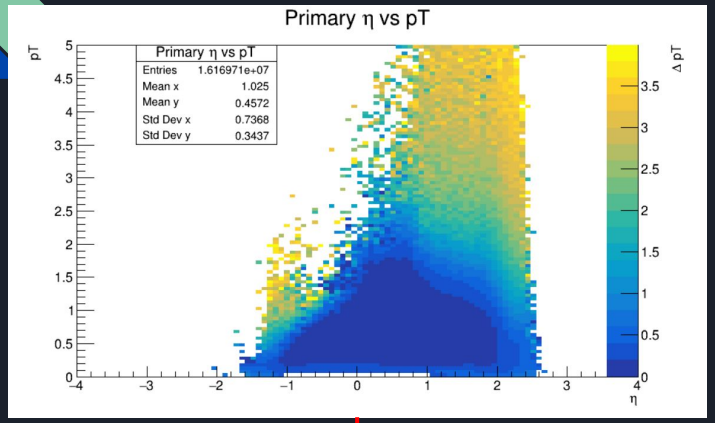
Cuts used
eta in [-1,2]
DCA <= 2
Nhits >= 20

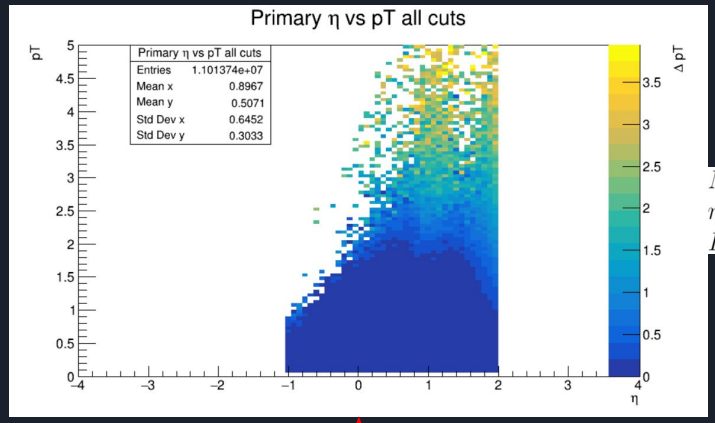
Number of events: 384,800

Reconstructed data

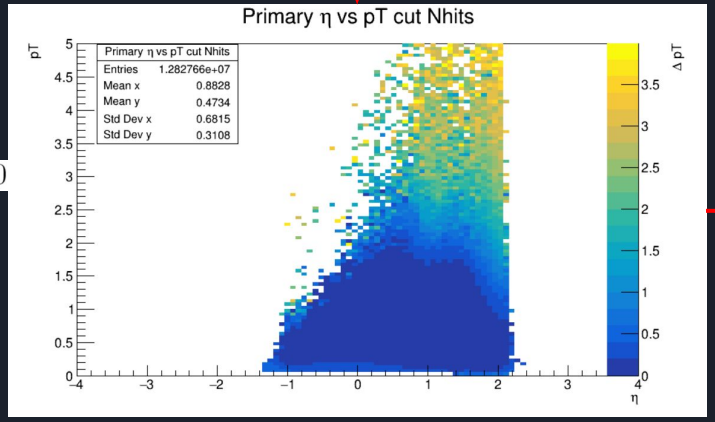
ncx cluster route:
/scratch1/maldonado/FXT/SIM_85_XeW_2.5GeV/

Primary eta vs pT distributions

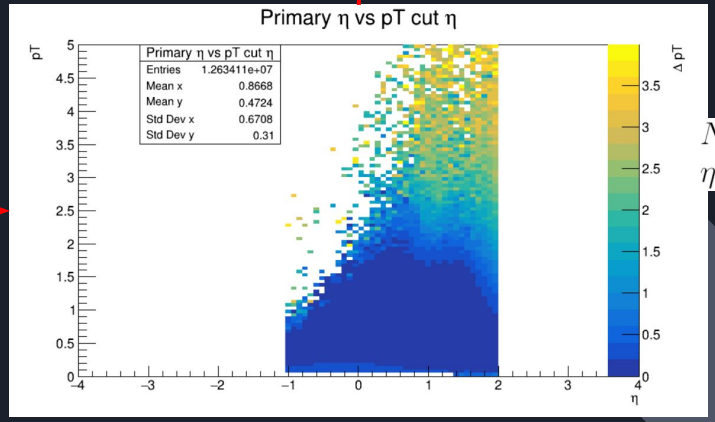




$Nhits > 20$
$\eta \in (-1, 2)$
$DCA < 2cm$

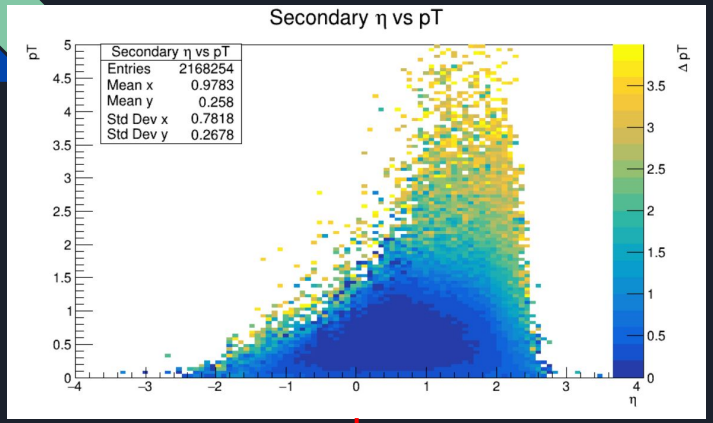


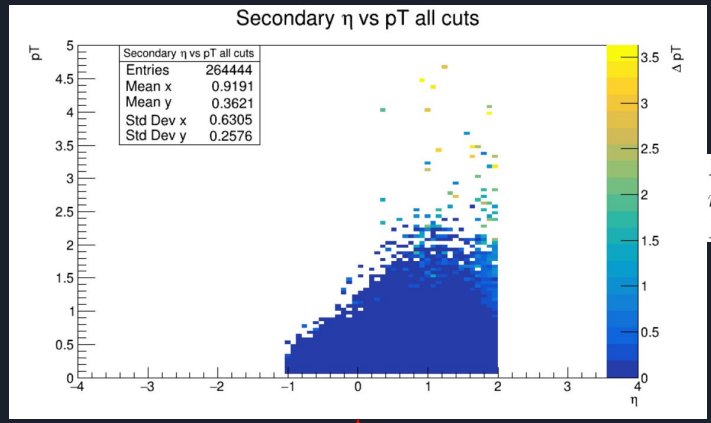
$Nhits > 20$



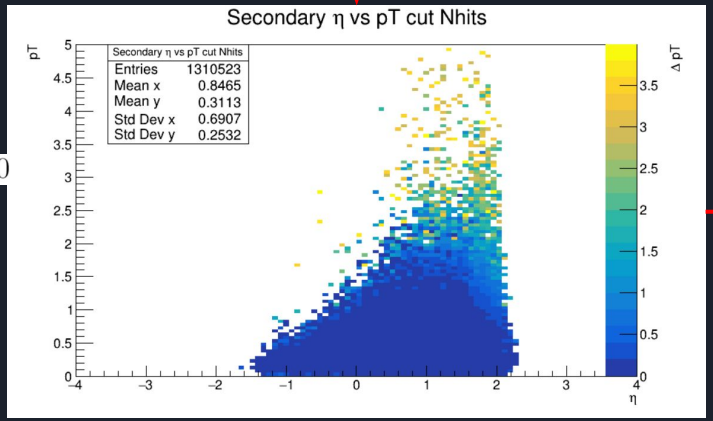
$Nhits > 20$
$\eta \in (-1, 2)$

Secondary eta vs pT distributions

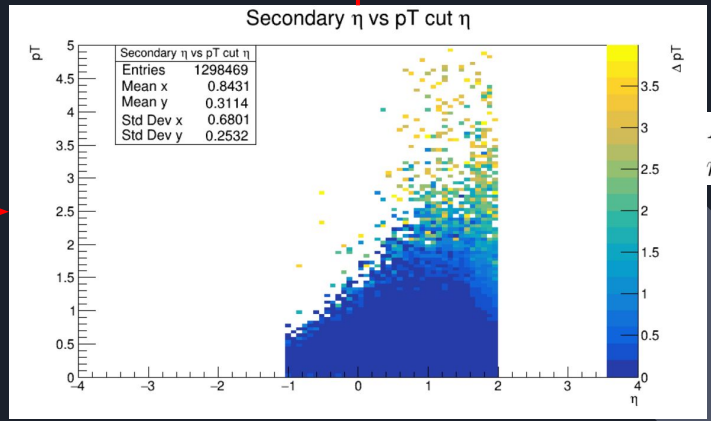




$Nhits > 20$
$\eta \in (-1, 2)$
$DCA < 2cm$

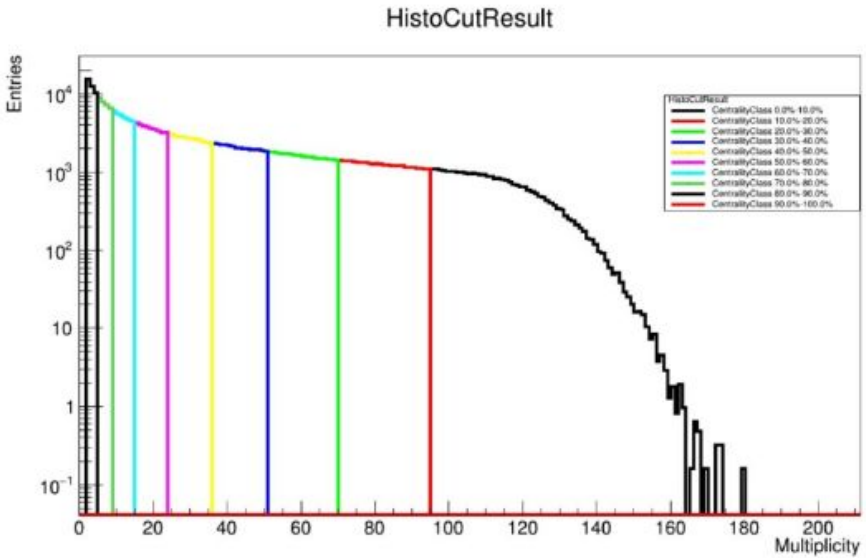


$Nhits > 20$

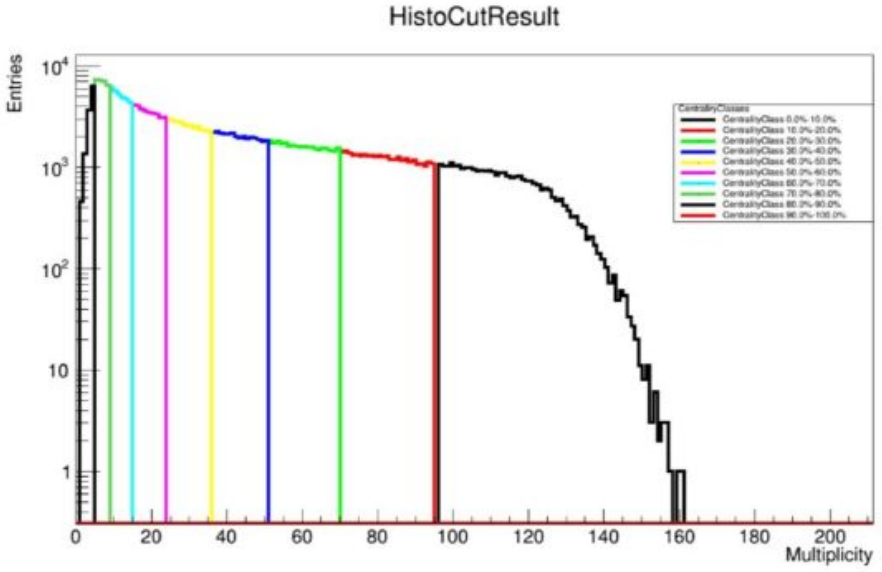


$Nhits > 20$
$\eta \in (-1, 2)$

MC Glauber Results

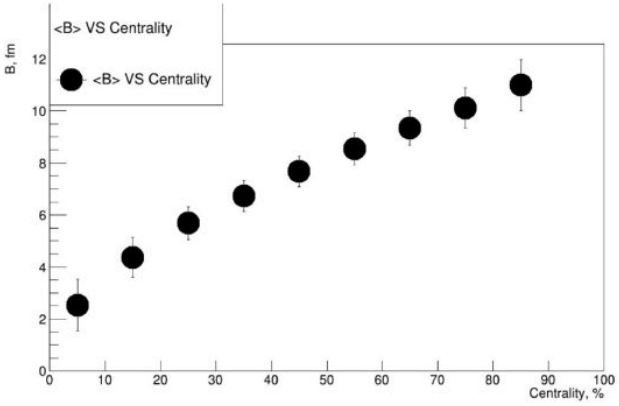


(a) Multiplicity fitted function

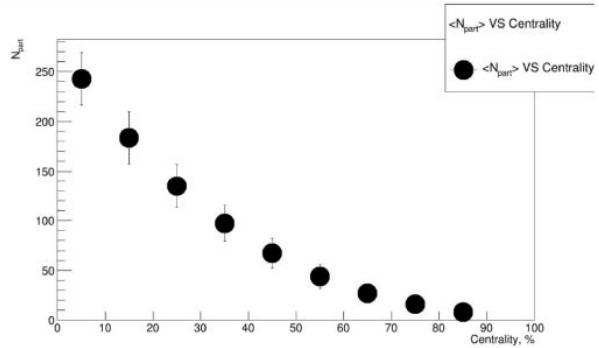


(b) Multiplicity input ditribution

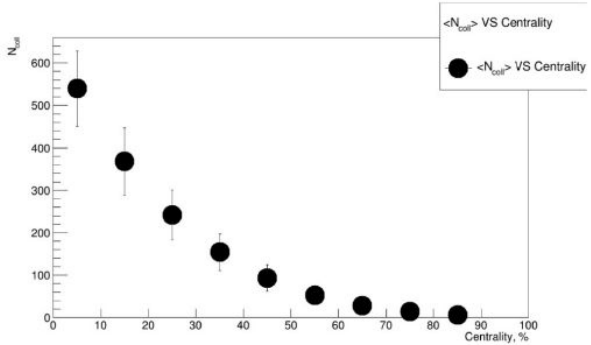
MC Glauber Results



(a) Mean impact parameter vs Centrality

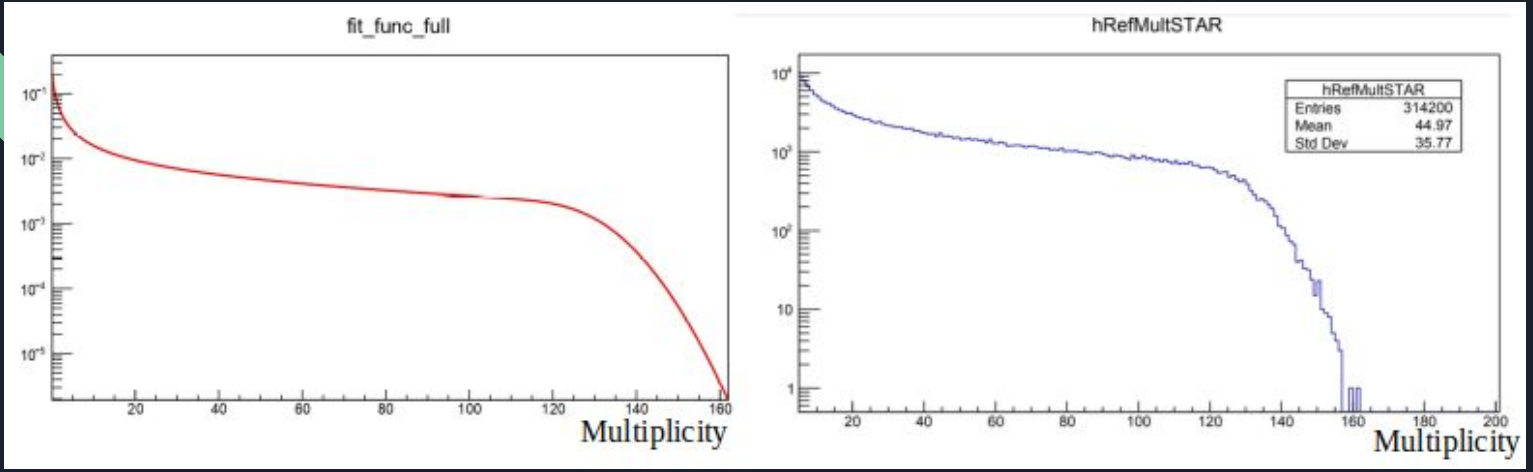


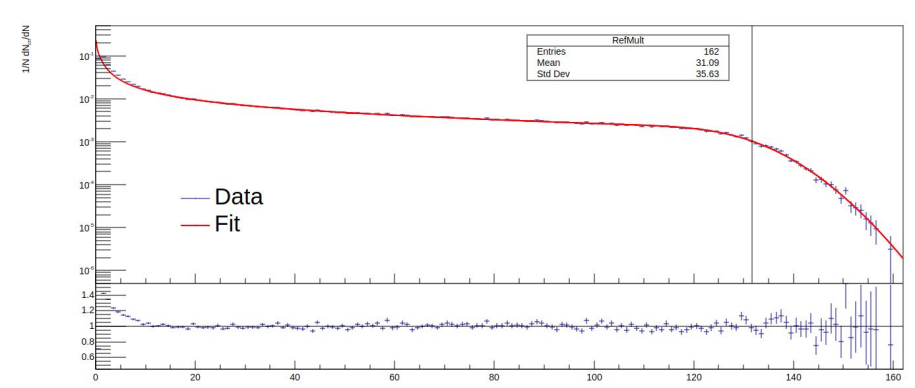
(b) Mean Number of participants vs Centrality



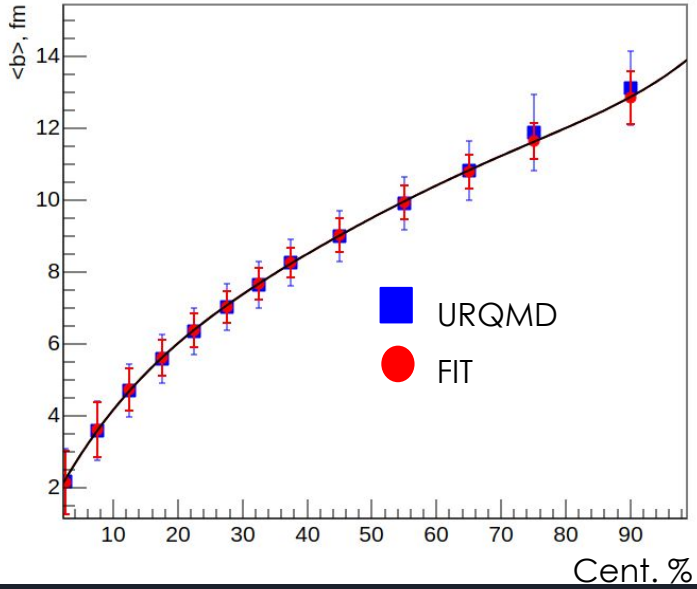
(c) Mean Number of collision vs Centrality

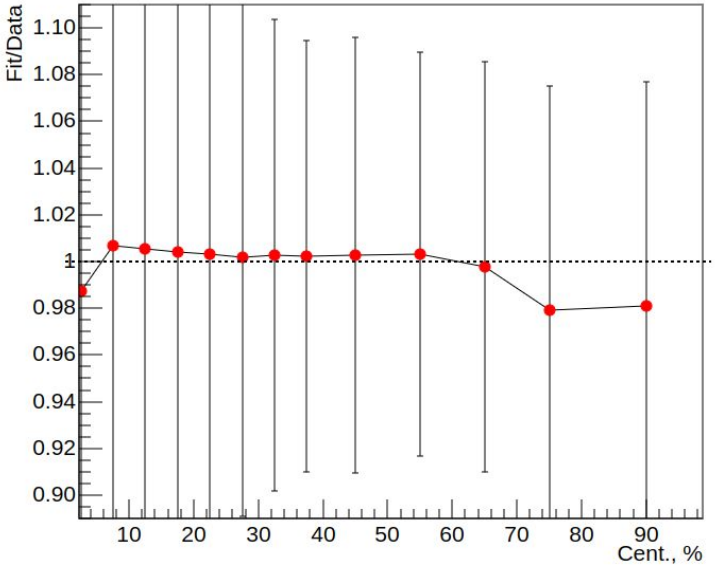
GammaFit Results





GammaFit Results





Comparison between Methods

Centrality, %	$N^{min}_{chMCGlauber}$	$N^{max}_{chMCGlauber}$	$N^{min}_{chGammaFit}$	$N^{max}_{chGammaFit}$	ΔN^{min}_{ch}	ΔN^{max}_{ch}
[0 - 10]	95	164	96	162	1	2
[10 - 20]	70	95	70	96	0	1
[20 - 30]	51	70	50	70	1	0
[30 - 40]	36	51	34	50	2	1
[40 - 50]	24	36	33	34	9	2
[50 - 60]	15	24	15	23	0	1
[60 - 70]	9	15	9	15	0	0
[70 - 80]	5	9	5	9	0	0
[80 - 90]	2	5	1	5	1	0

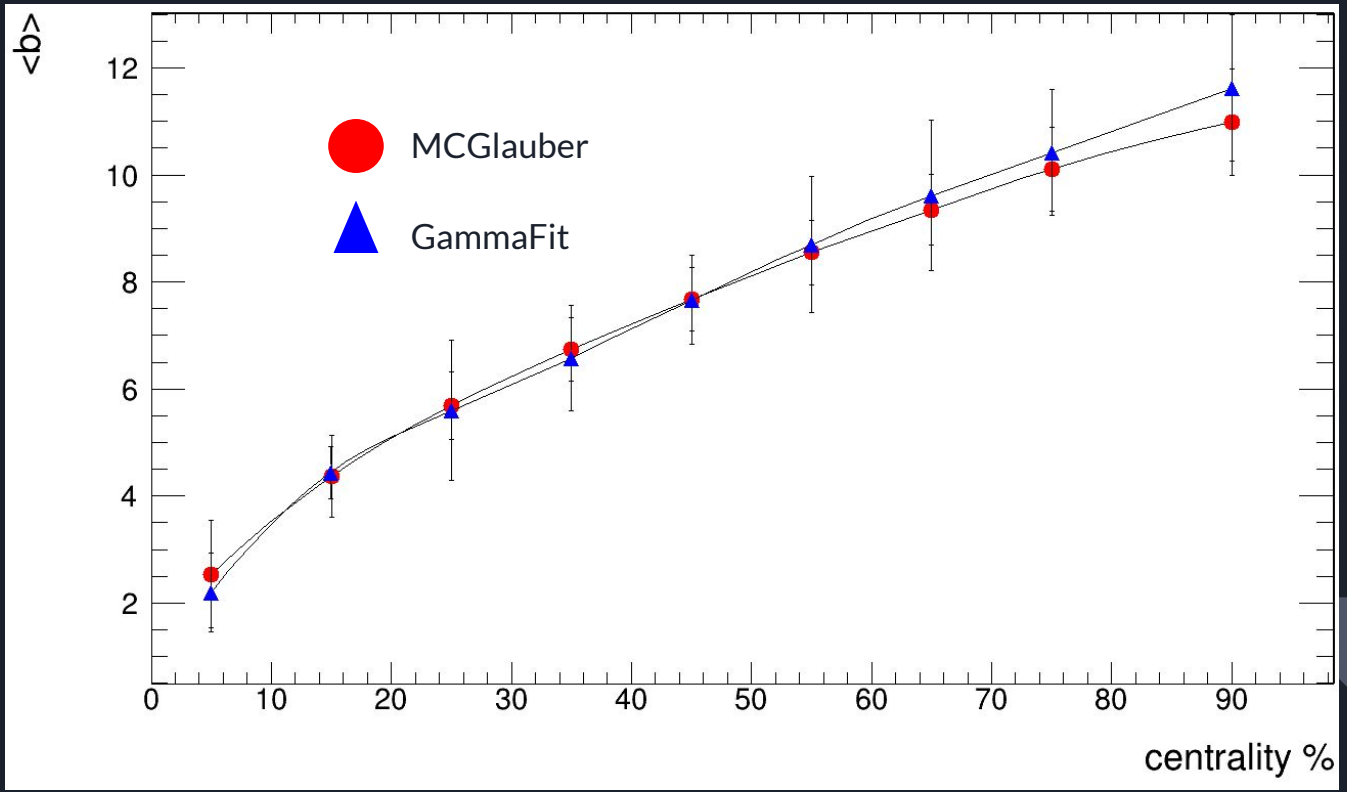
Table 4: Multiplicities extracted with the two methods and difference between them divided by centrality classes

Comparison between Methods

Centrality %	$\langle b_{MCGlauber} \rangle$	$\langle b_{GammaFit} \rangle$
0-10	2.54	2.21
10-20	4.37	4.7
20-30	5.69	5.62
30-40	6.74	6.4
40-50	7.68	7.68
50-60	8.55	8.24
60-70	9.35	9.02
70-80	10.11	10.84
80-100	10.99	11.63

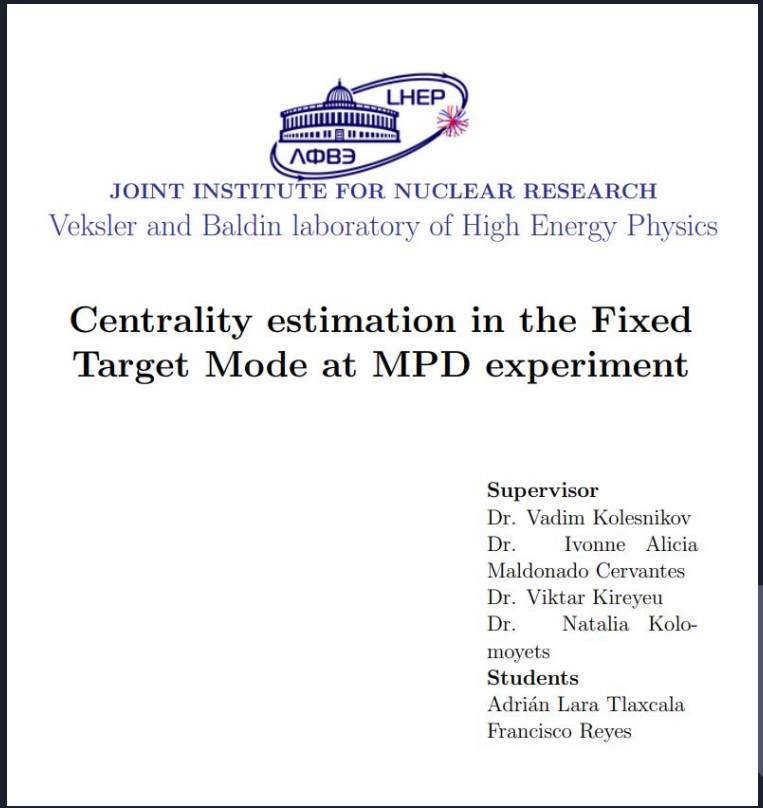
Table 5: Average impact parameter comparison between methods

Graphic Impact parameter comparison by both methods



Report

This week we made a report of the centrality analysis we have done and present it to Dr. Petr Parfenovo to ask for advice on how to implement the wagon evCentrality.



JOINT INSTITUTE FOR NUCLEAR RESEARCH
Veksler and Baldin laboratory of High Energy Physics

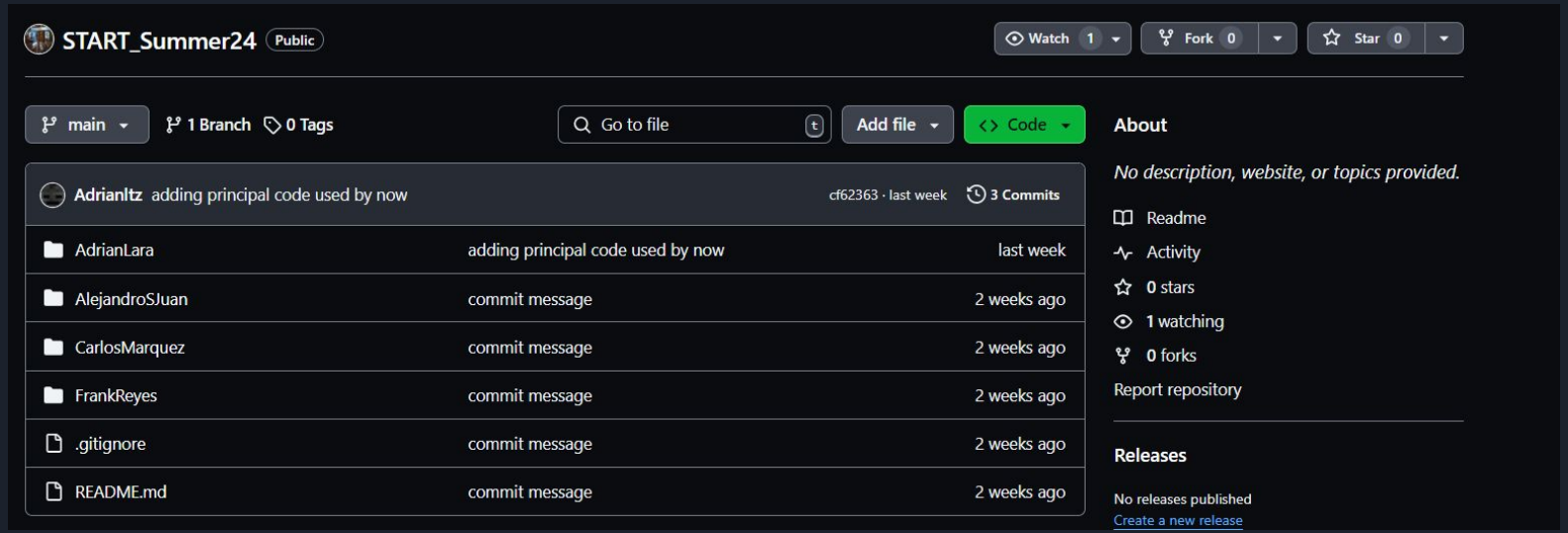
Centrality estimation in the Fixed Target Mode at MPD experiment

Supervisor
Dr. Vadim Kolesnikov
Dr. Ivonne Alicia Maldonado Cervantes
Dr. Viktar Kireyeu
Dr. Natalia Kolomoyets
Students
Adrián Lara Tlaxcala
Francisco Reyes

Github

In this week also started to upload the macros to github that can be found at the following link:

https://github.com/iamaldonado/START_Summer24.git



Future Work

Next thing to do is to obtain the reconstruction efficiency with the cuts implemented on centrality.

Also, we are working to implement the evCentrality Wagon to our Analysis. In particular we are looking for a way to obtain nTr to Centrality and Track Efficiency Histograms.

References

- FlowNICA. GitHub - FlowNICA/CentralityFramework: Грант РФФИ 18-02-40086 мега. GitHub. https://github.com/FlowNICA/CentralityFramework
- The NICA LHEP offline computing cluster. Accesed: 2024-07-31.
- M. Bleicher et al. Relativistic hadron hadron collisions in the ultrarelativistic quantum molecular dynamics model. J. Phys. G, 25:1859–1896, 1999. 22