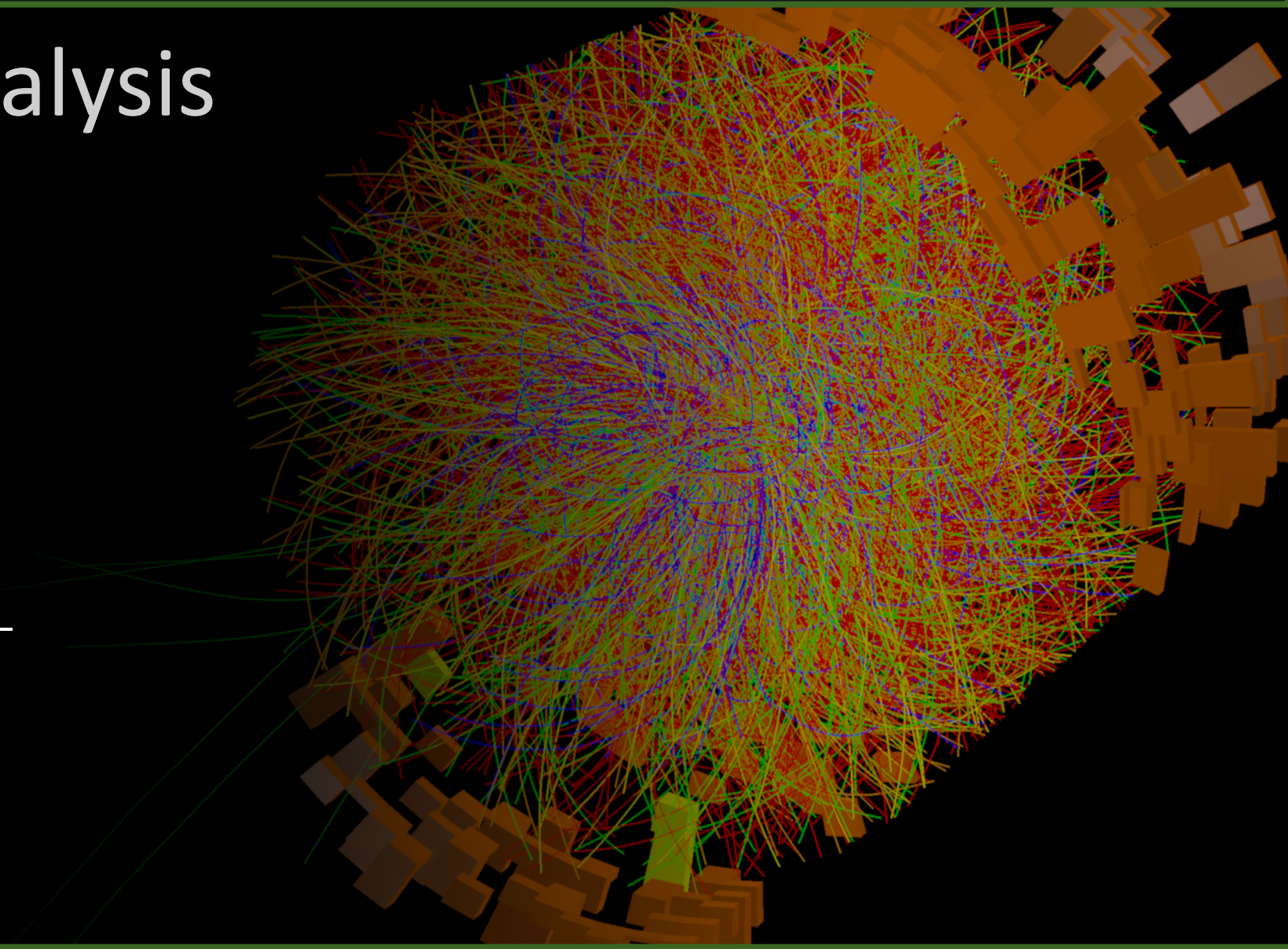
Inclucive Jet Analysis



Tsukuba University
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Study plan

- Data Jet QA (LHC18q/r(pass3): Pb-Pb 5.02 GeV)
- MC Jet QA (LHC19f4(pass1), LHC20g4(pass3))
- Estimate background ρ(p_T)
- Confirm the raw jet behavior

(pT distribution, Rcp, R dependence, jet area, leading pT cut dependency)

- **Embedding process ← Now**
- Unfolding ← Next (on going)
- Estimate Systematic Uncertainty

Remain problem: background estimation (differencial of cell threshold and seed threshold), pp (LHC17) tracking efficiency, multiplicity cut (LHC20g4), and etc…

Current status of the embedding process

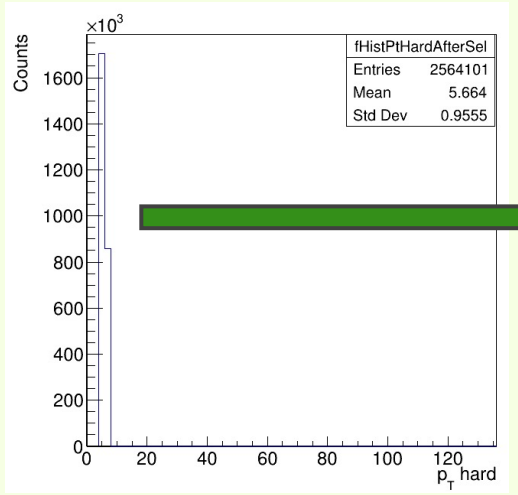
Embedding Condition

MB of LHC18r (Pb-Pb 5.02 GeV)

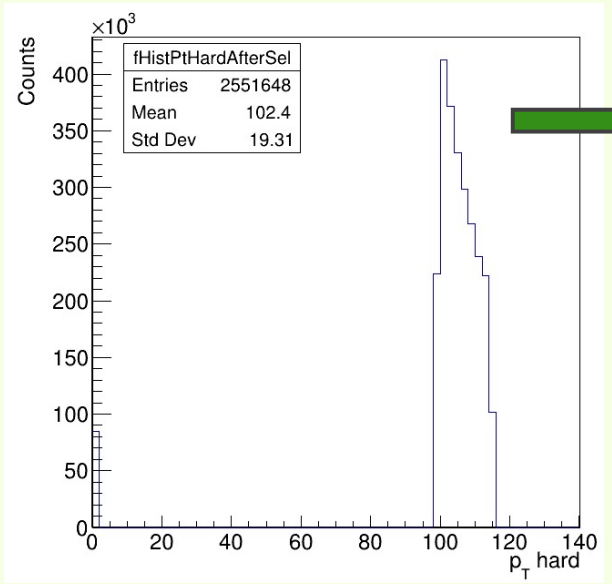
- Geometrical Matching (Matchig R = 0.3)
- Track cut: 0.15 GeV
- pT Bias Jet track: 5 GeV
- Max track cut: 100 GeV
- Jet pT cut: 1 GeV
- Z vertex cut: 10 mm

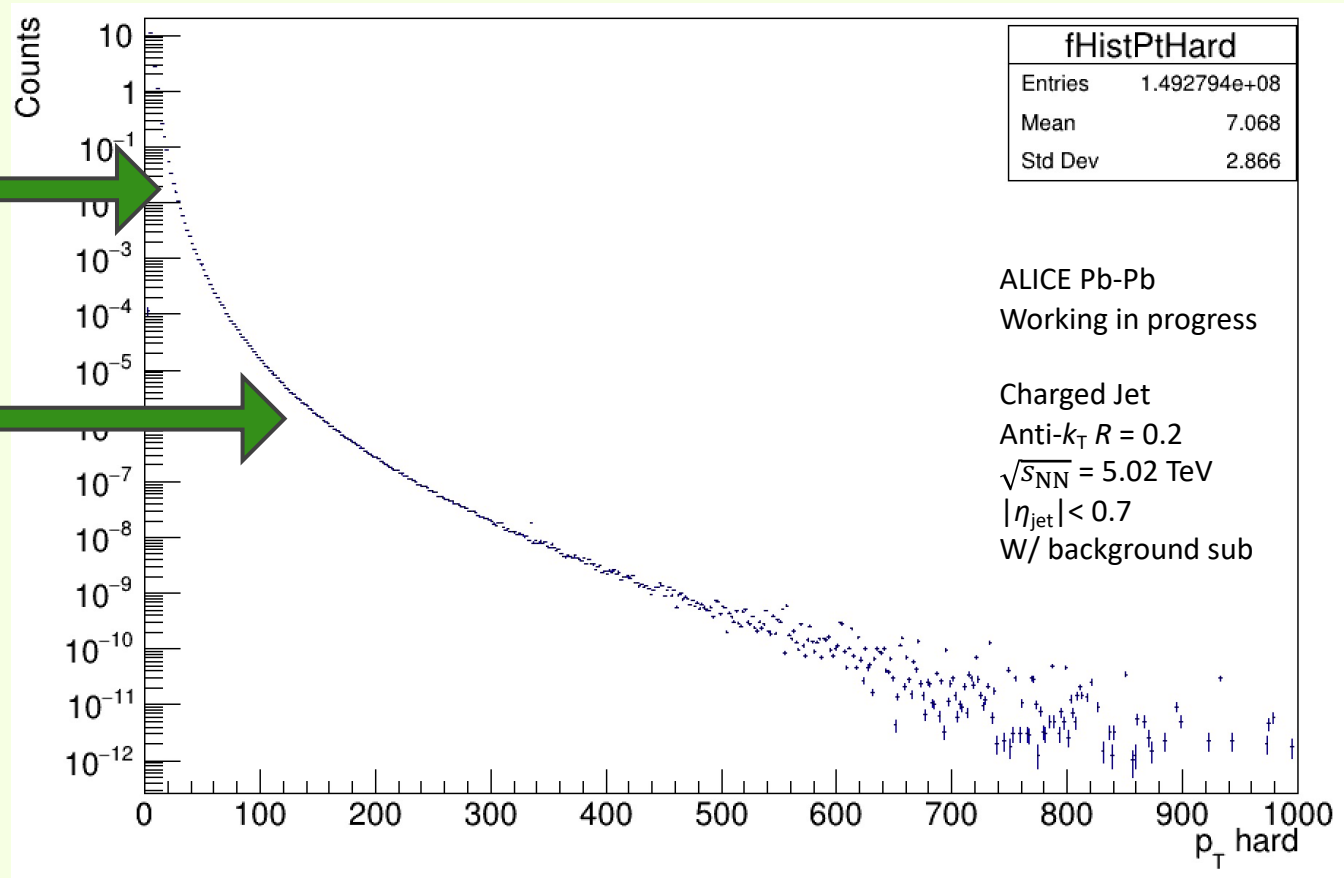
p_T hard bin merging with p_T hard scaling

I get the all pT hard bin charged jet results of only three runs of MB of LHC18r.
And I could smoothly merge these files by calculating p_T hard scaling parameter.



$$\text{Scale factor} = \frac{\text{xSec}_{p_T\ \text{hard}}}{\#\ \text{of trial}_{p_T\ \text{hard}}}$$

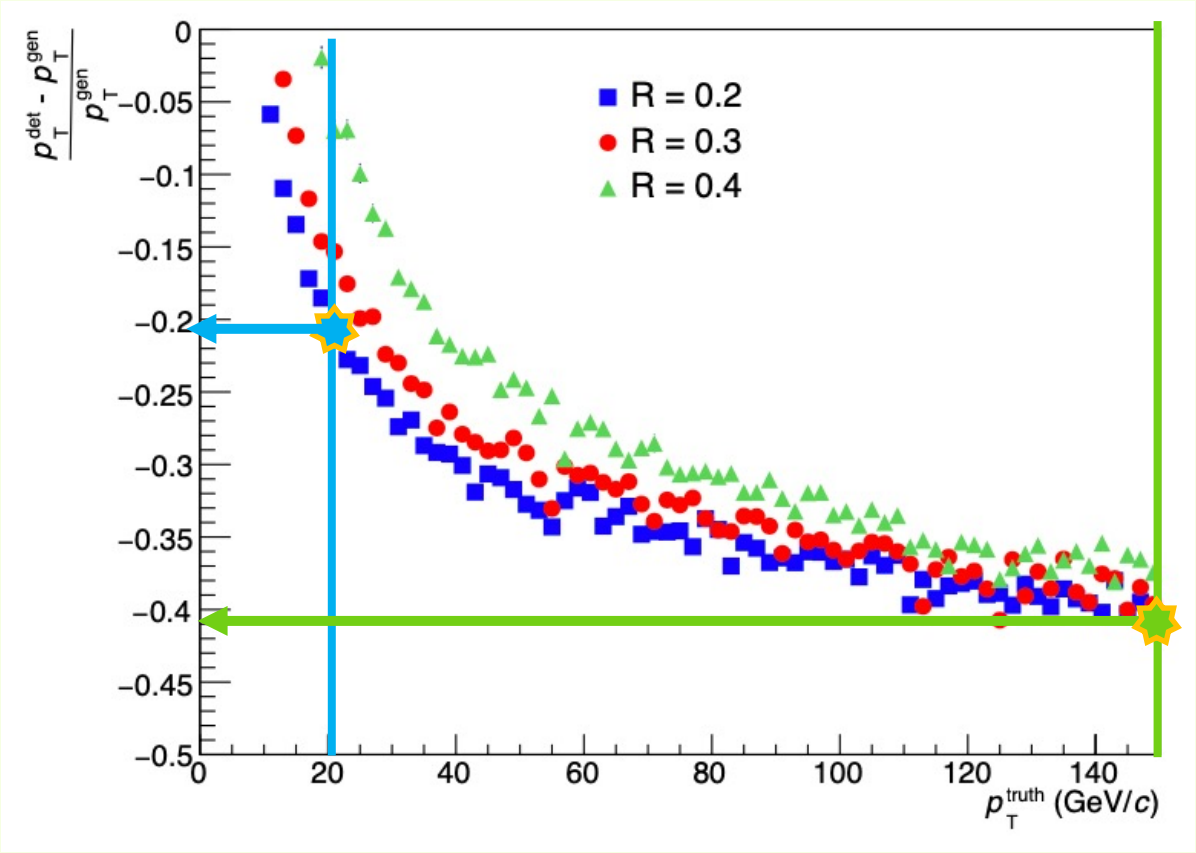




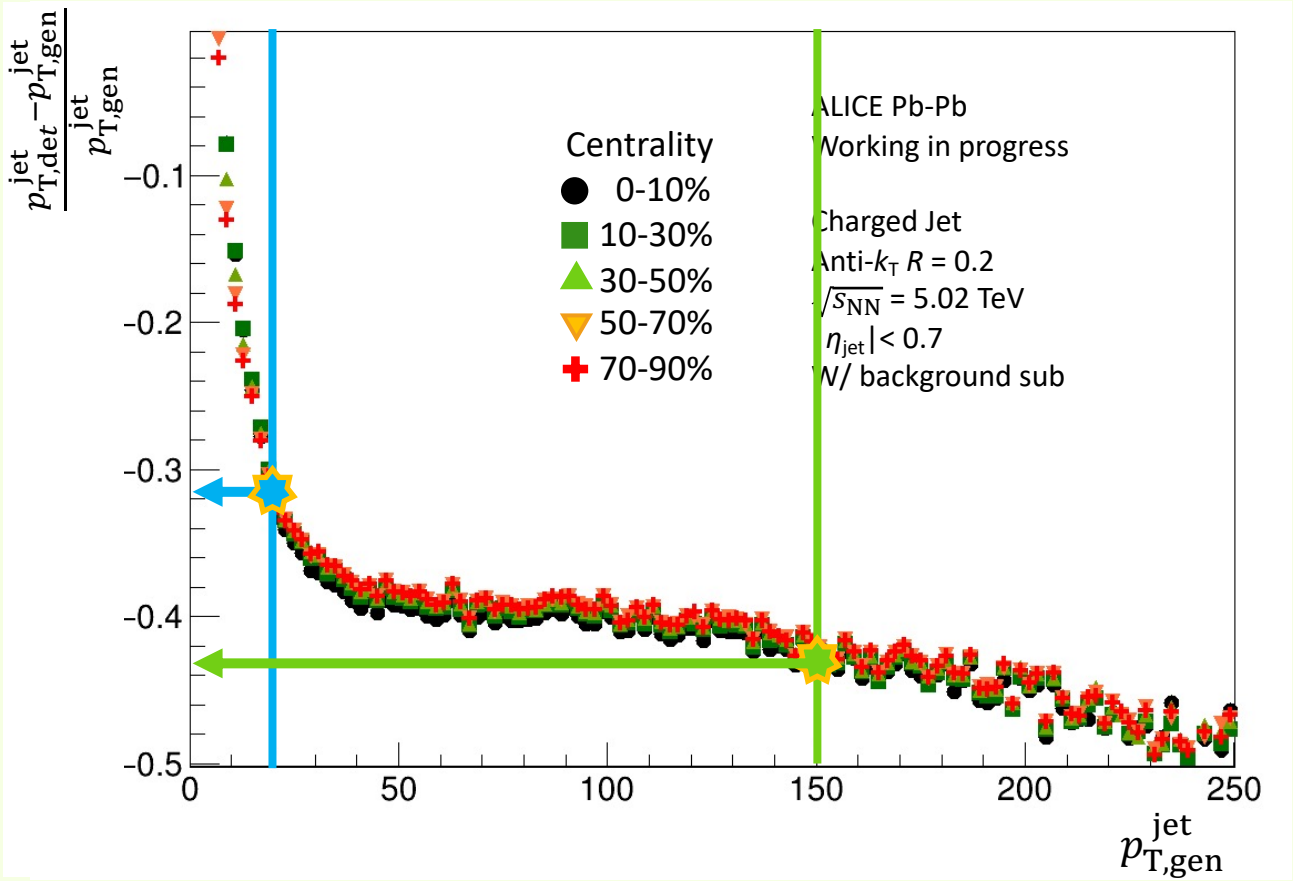
LHC15o Comparison

Jet Energy Scale(JES) shift

Preceding Study (2015)

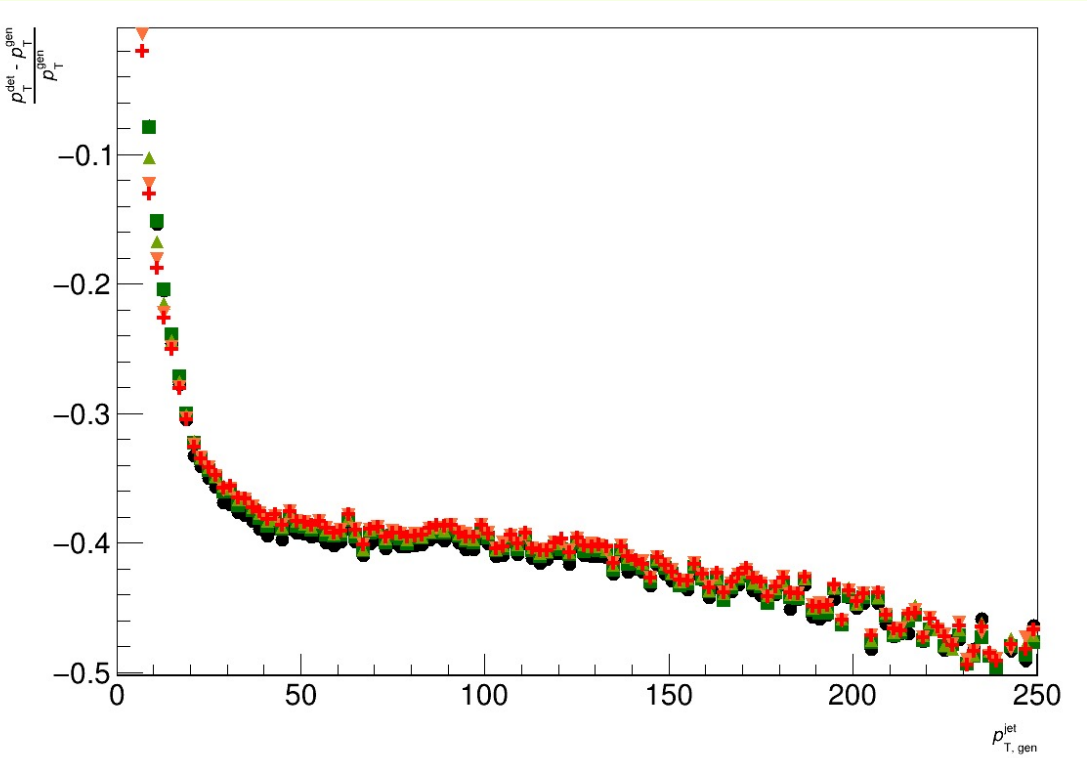


This Study (LHC18r)



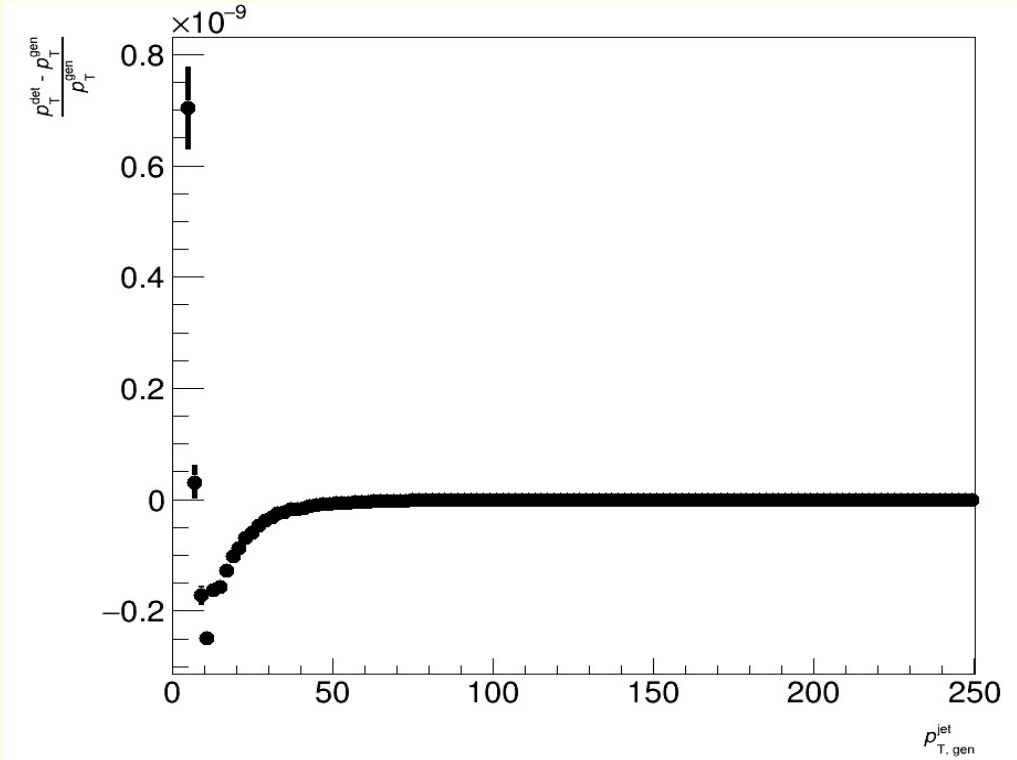
And the right plot also does not show the centrality dependence.

Jet Energy Scale(JES) shift



W/
pT-hard scale

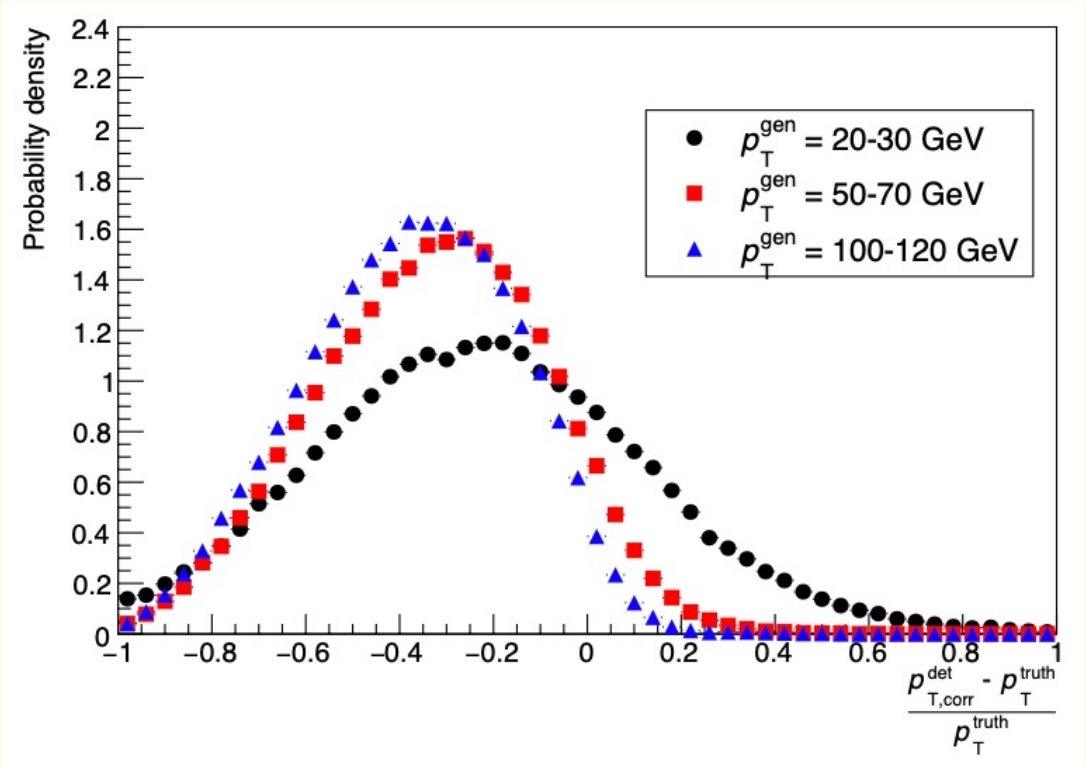
?



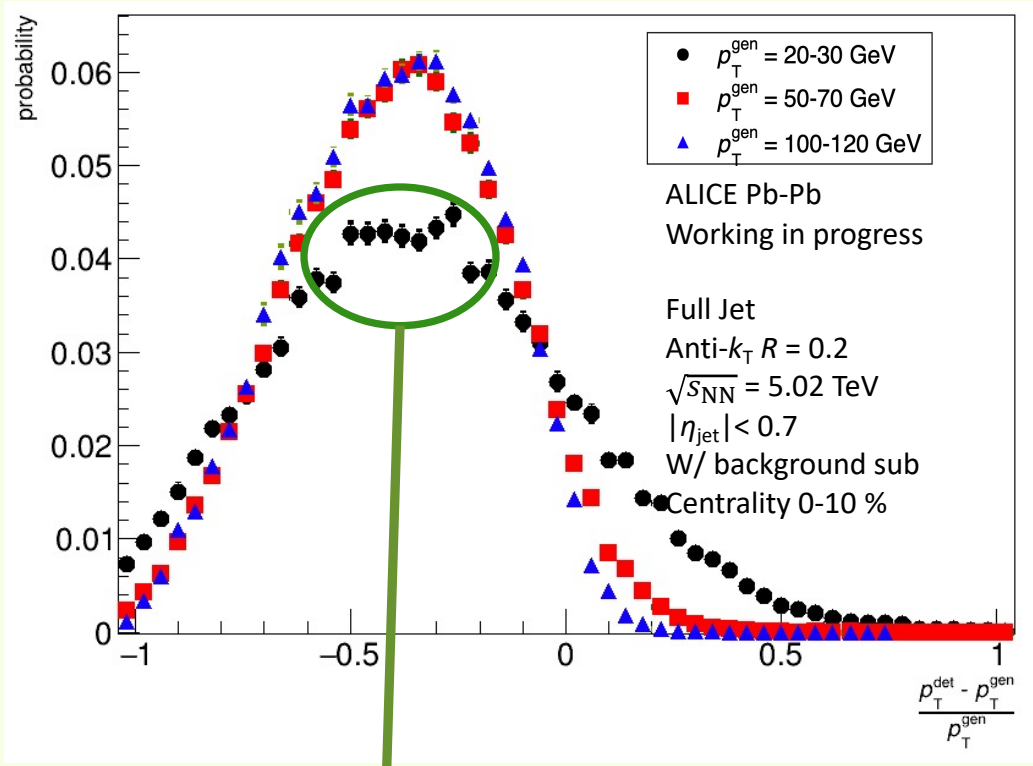
Left plot looks like the preceding result on the other hand w/o pT-hard scaling.
However, a scaled plot (right) is quite different from the preceding study.

Jet Energy Scale(JES) shift

Preceding Study (2015)



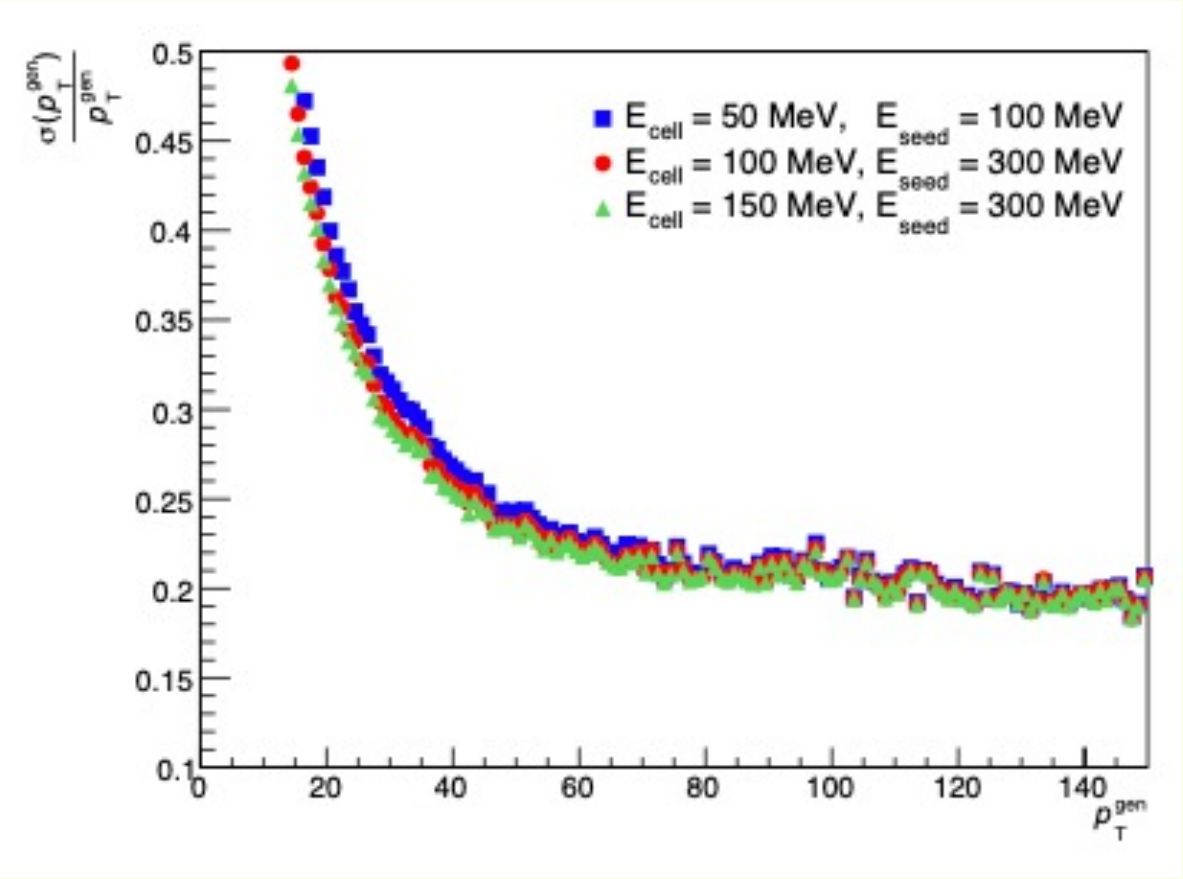
This Study (LHC18r) w/ pT scale



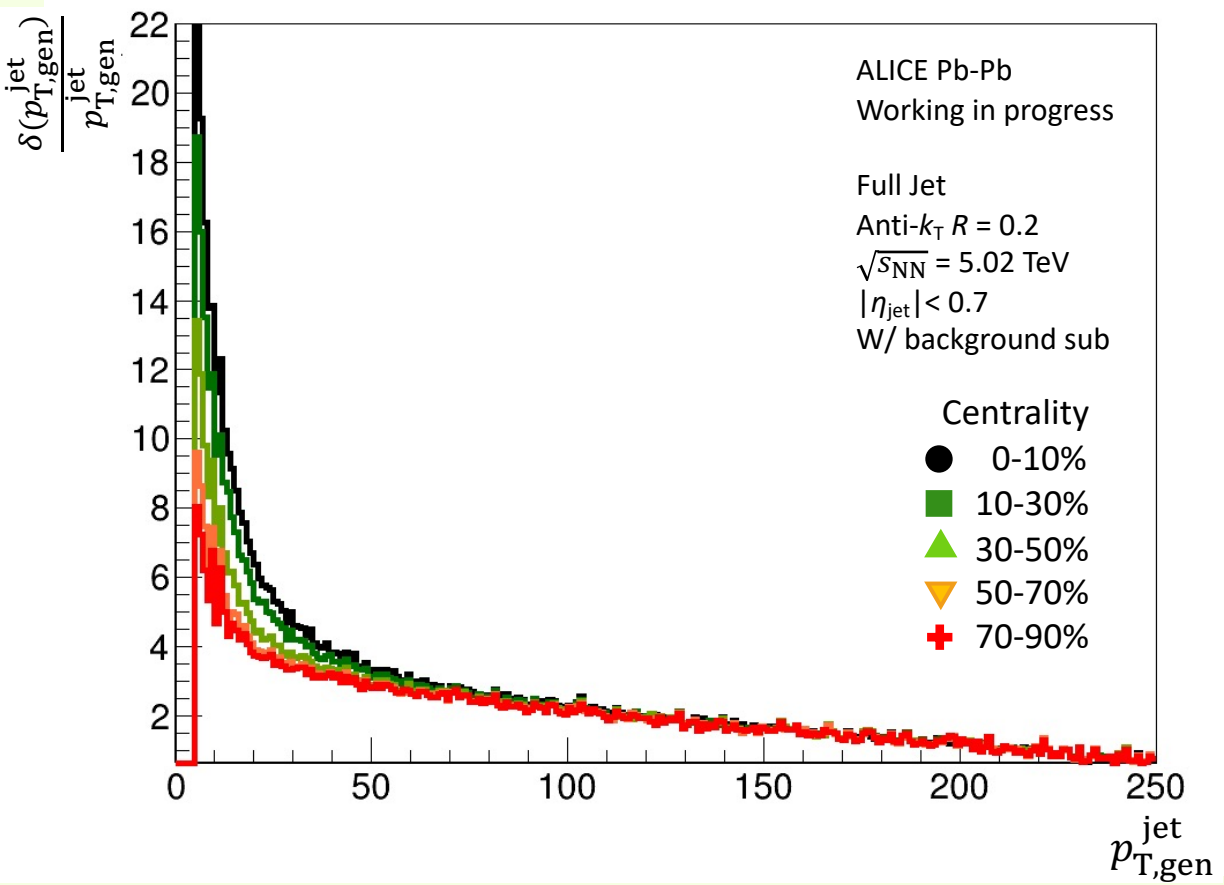
1. These plot's shapes are similar.
2. On the other hand, I could not understand why the left plot over than 1 even though the y axis shows plobability.
3. The plot of pt range 20-30 (black one) in the left plot has a strange peak.

Jet Energy Resolution (JER)

Preceding Study (2015)



This Study (LHC18r)

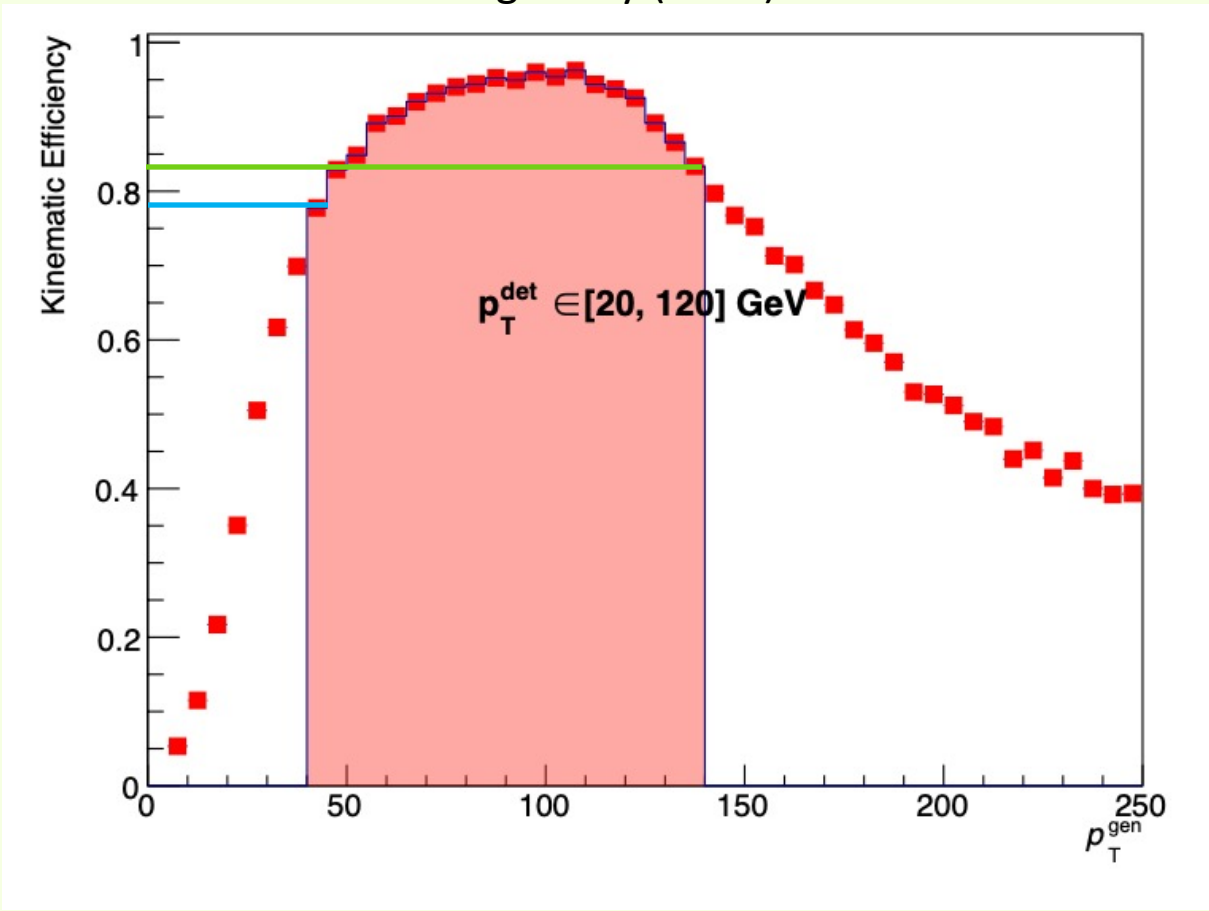


The JER plot of this study is far from the preceding study.

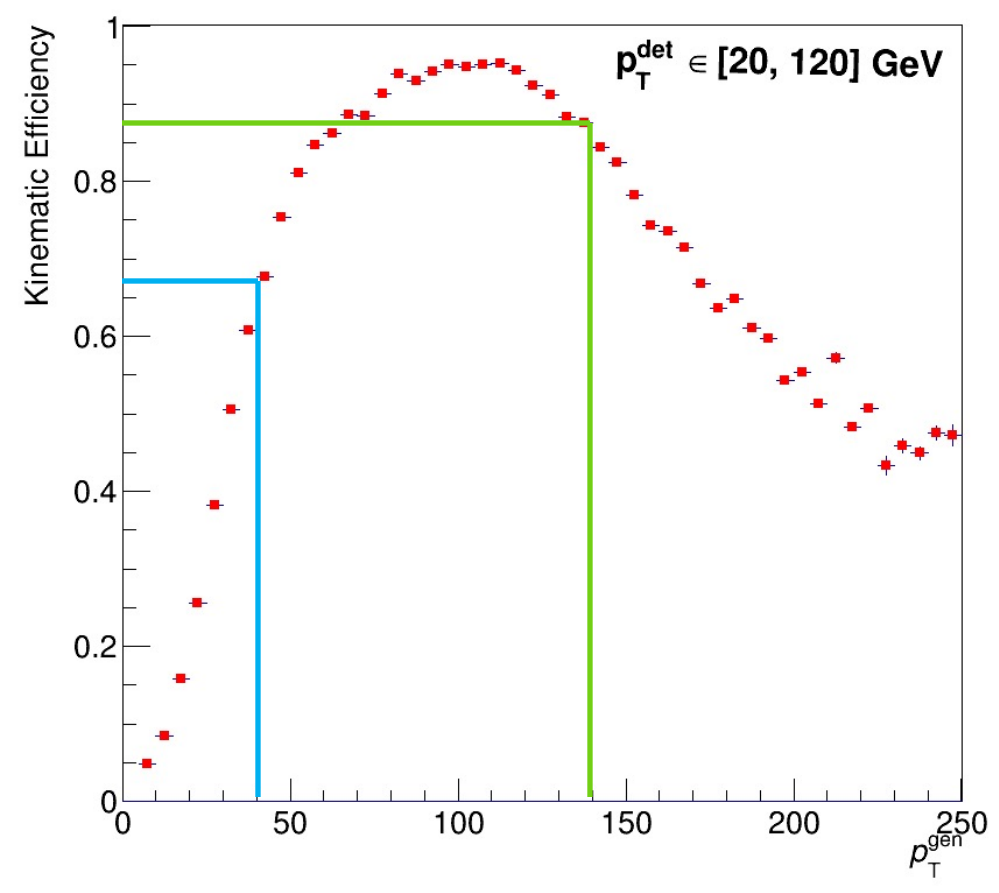
-> I still not understand the reason.

Kinematic efficiency

Preceding Study (2015)



This Study (LHC18r)

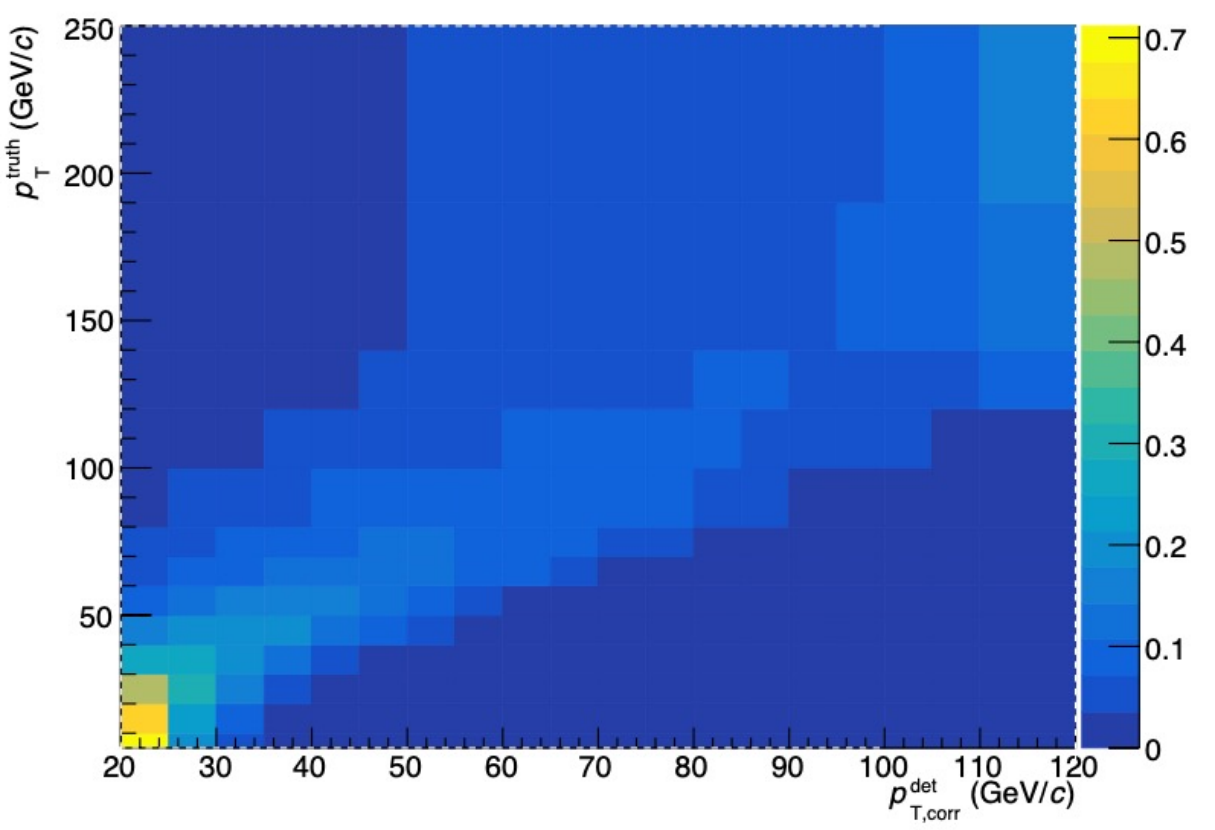


In high pT region, the efficiency seems resonable.

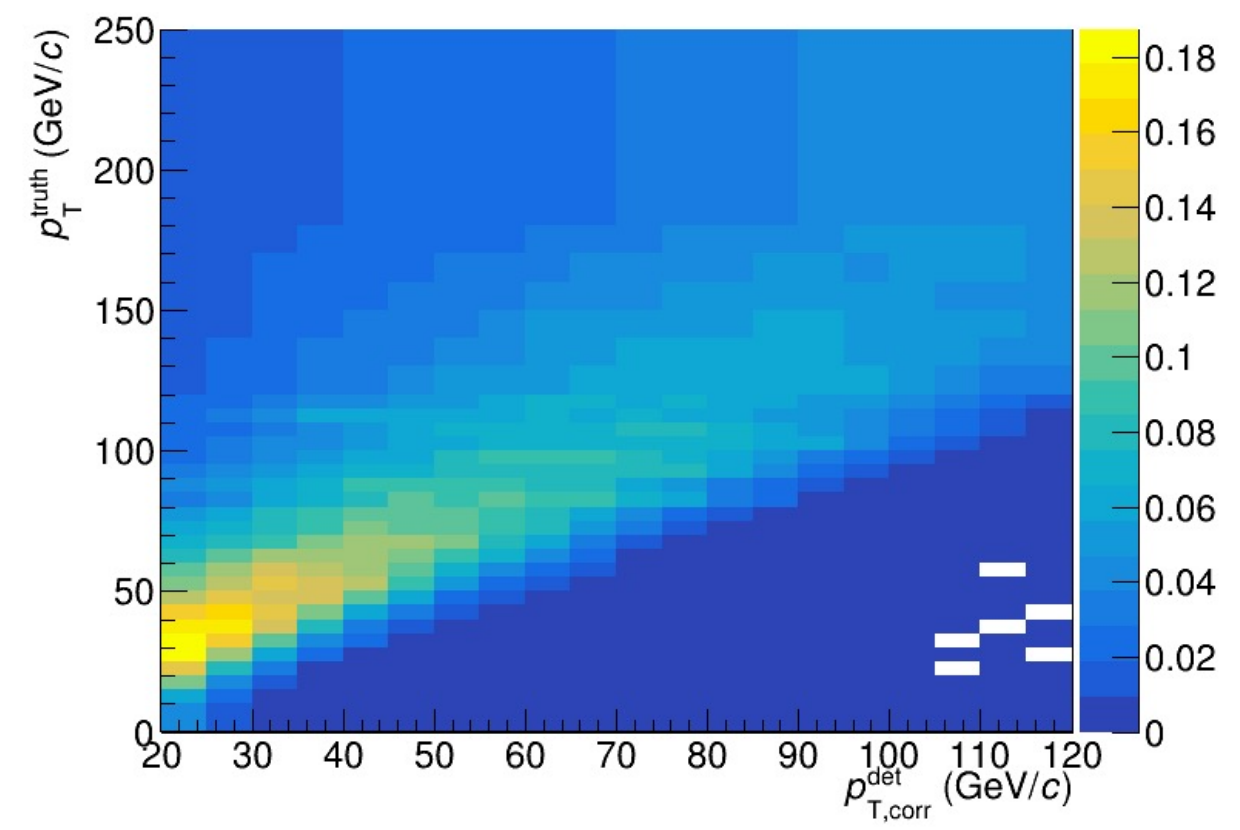
On the other hand, in low pT region, LHC18r result is lower than LHC15o results.

Response matrix

Preceding Study (2015)



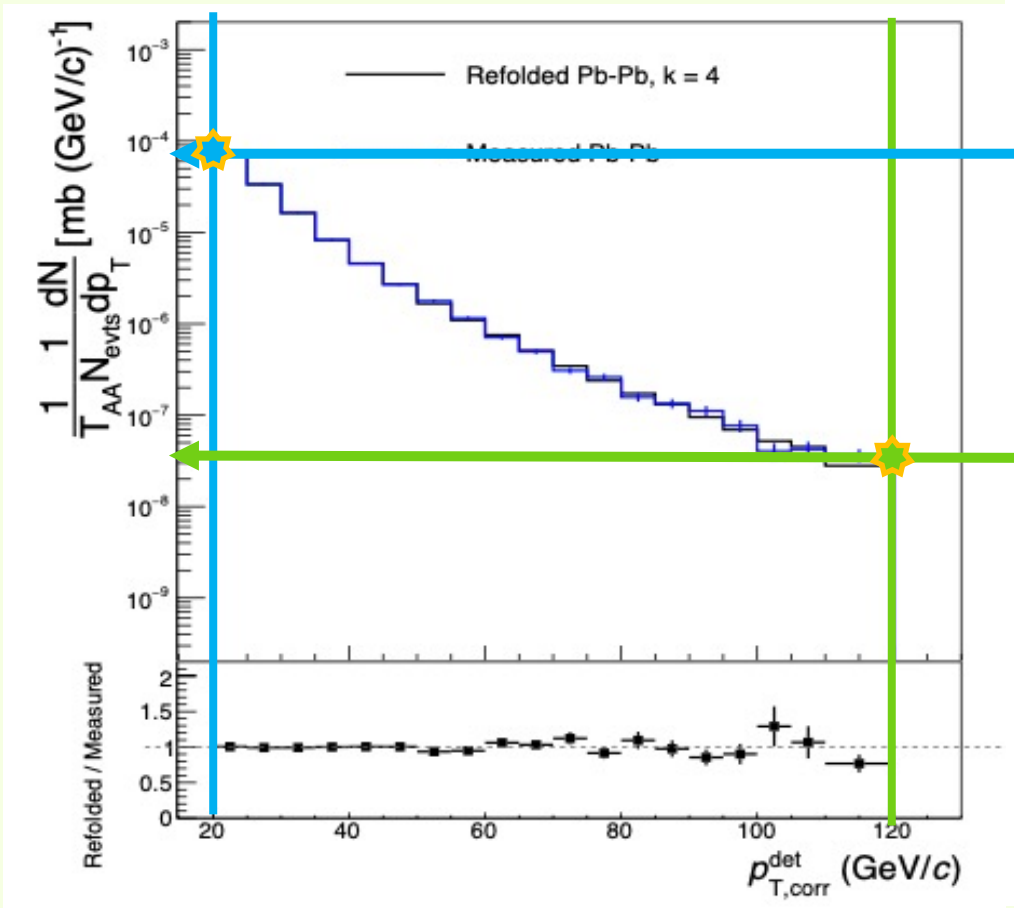
This Study (LHC18r)



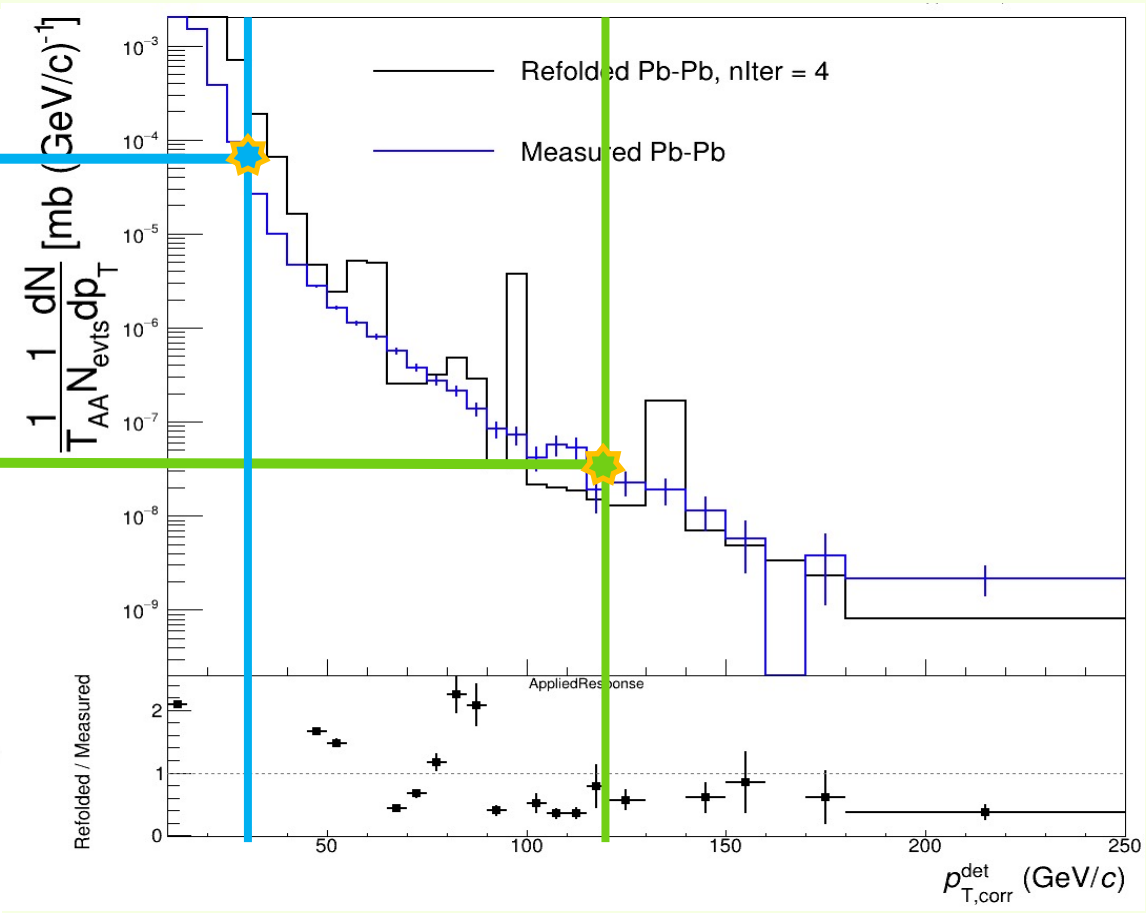
The diagonal components of LHC18r RM spreads than LHC15o one.

Refolding results

Preceding Study (2015)



Preceding Study (LHC18r)



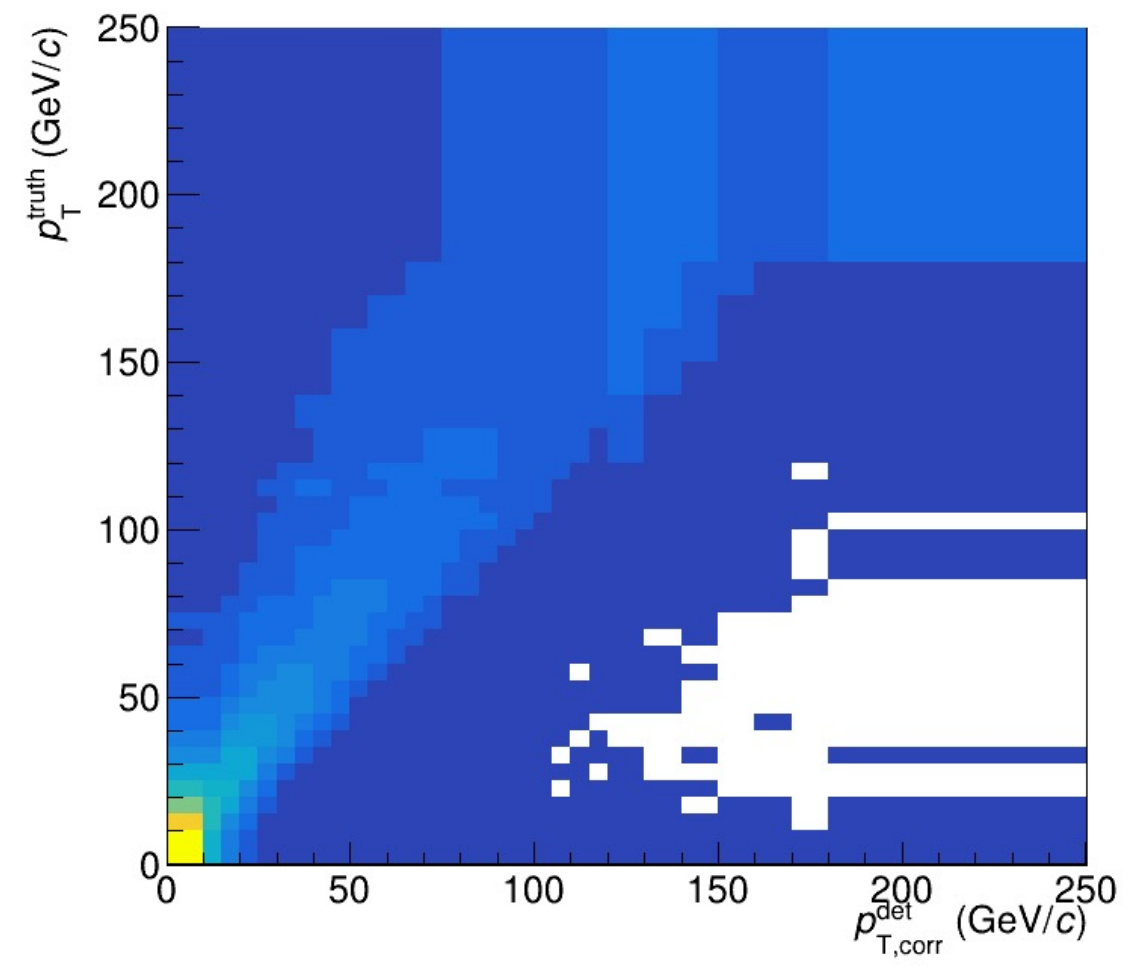
The measured resutls look slimilar.

However, the LHC18r refold results not stable.

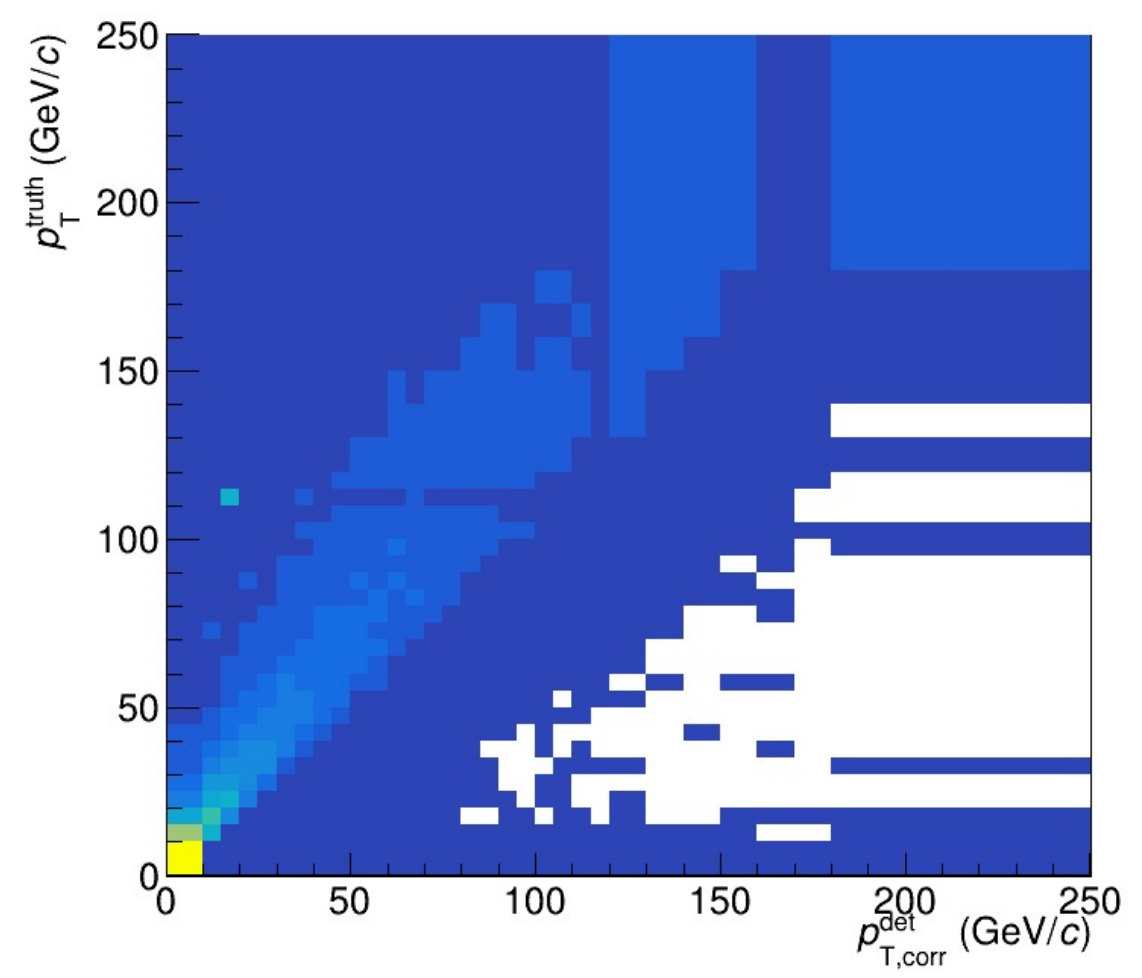
Different Centrality Comparison

Response Matrix (rebinned)

Centrality 0-10 %



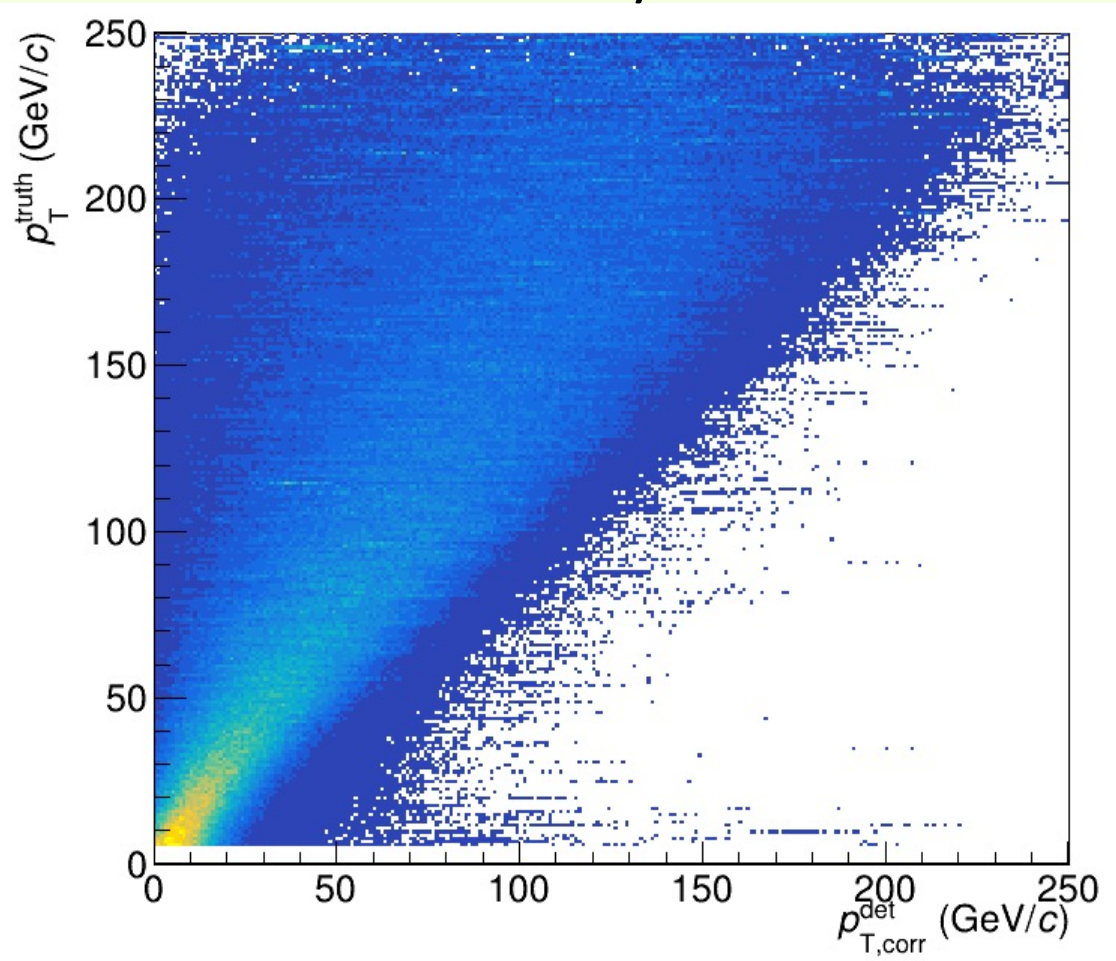
Centrality 70-90 %



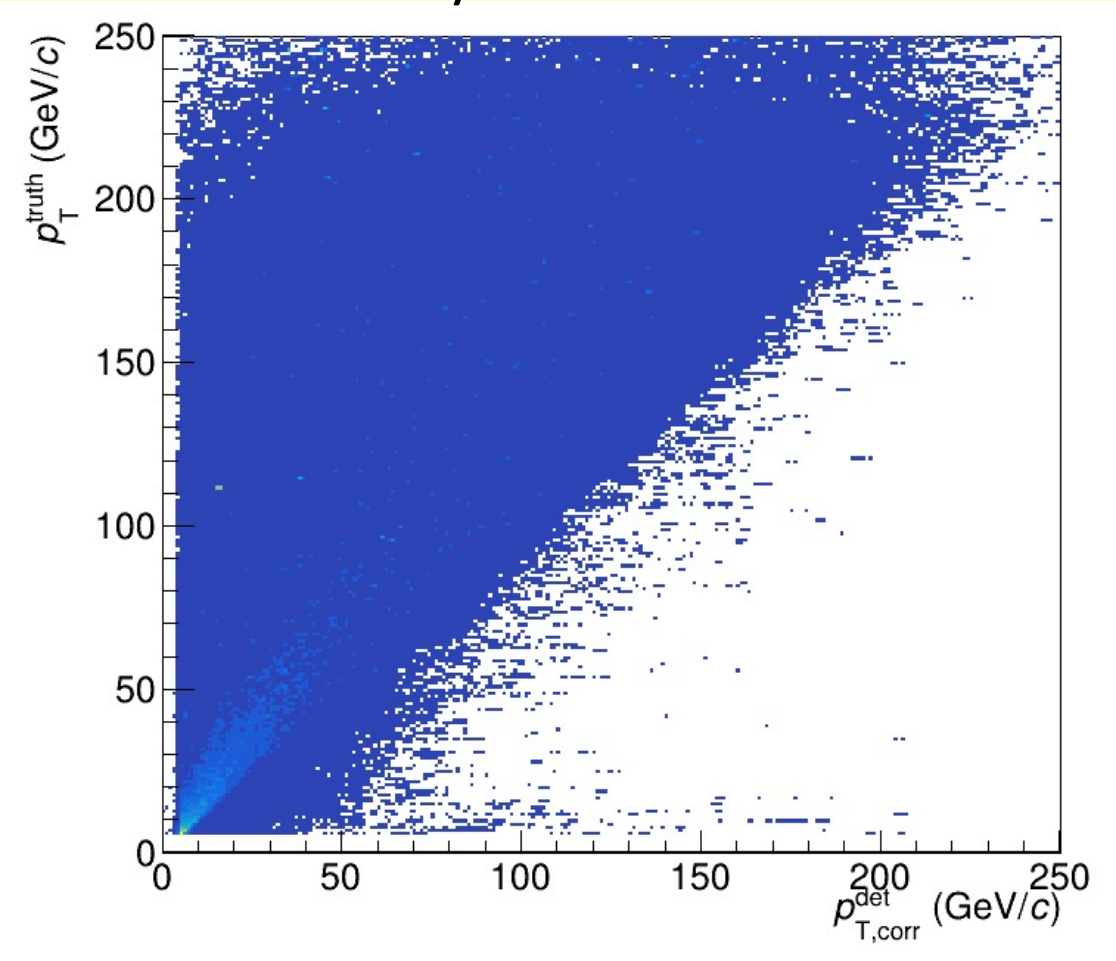
The peripheral RM is shaper than central RM

Response Matrix (fine binning)

Centrality 0-10 %

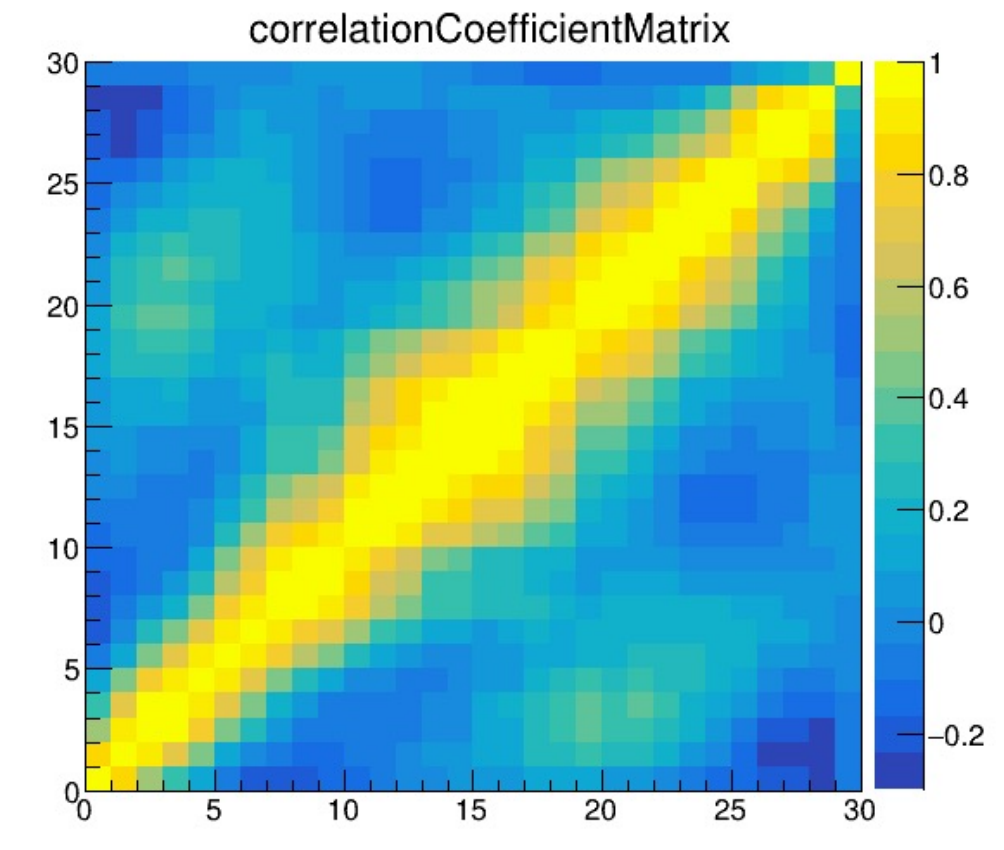


Centrality 70-90 %

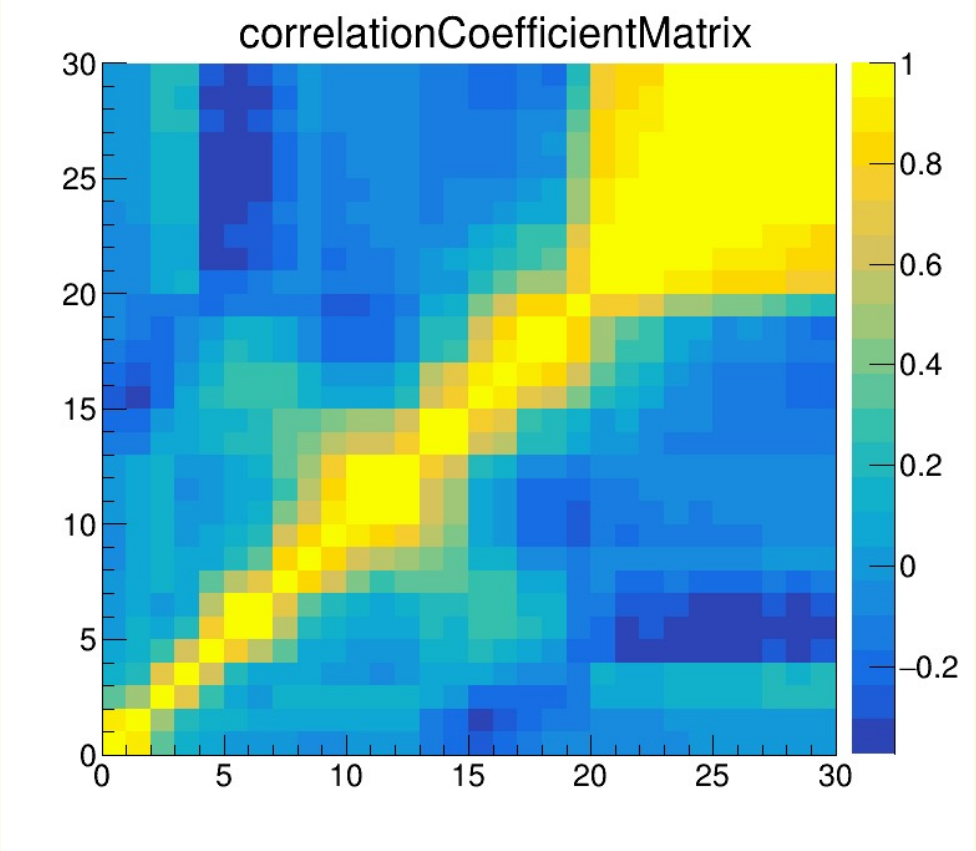


Coefficient Matrix

Centrality 0-10 %



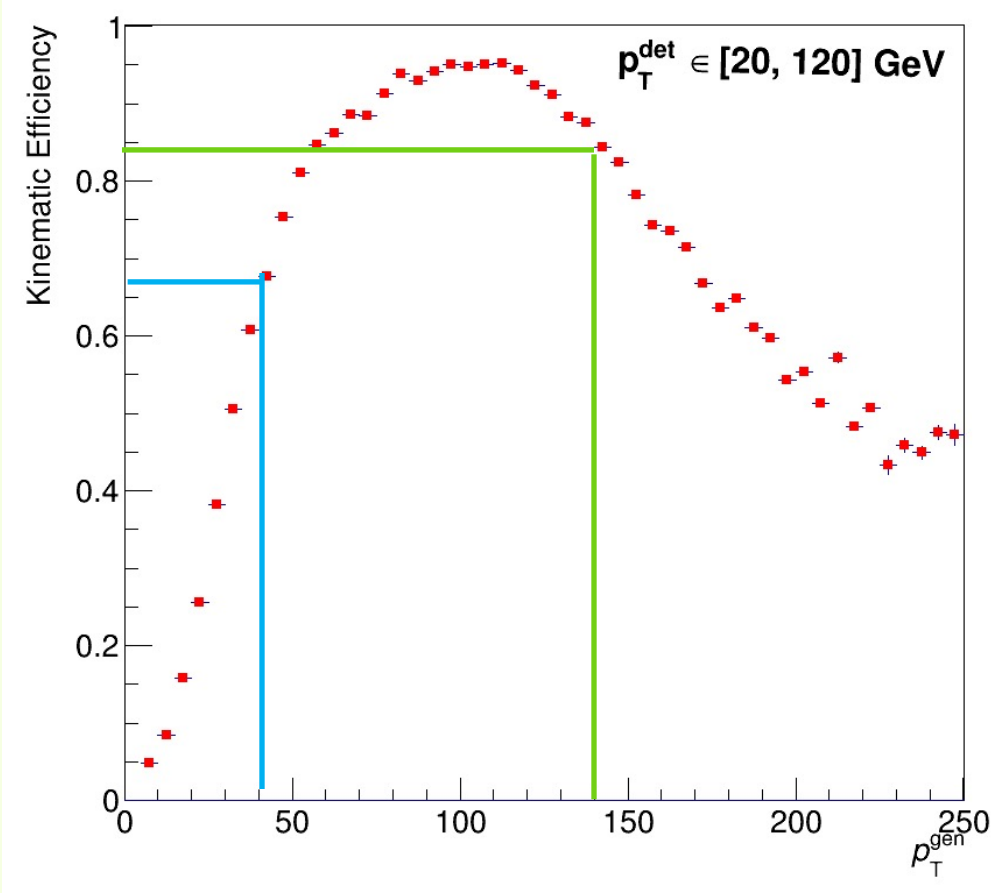
Centrality 70-90 %



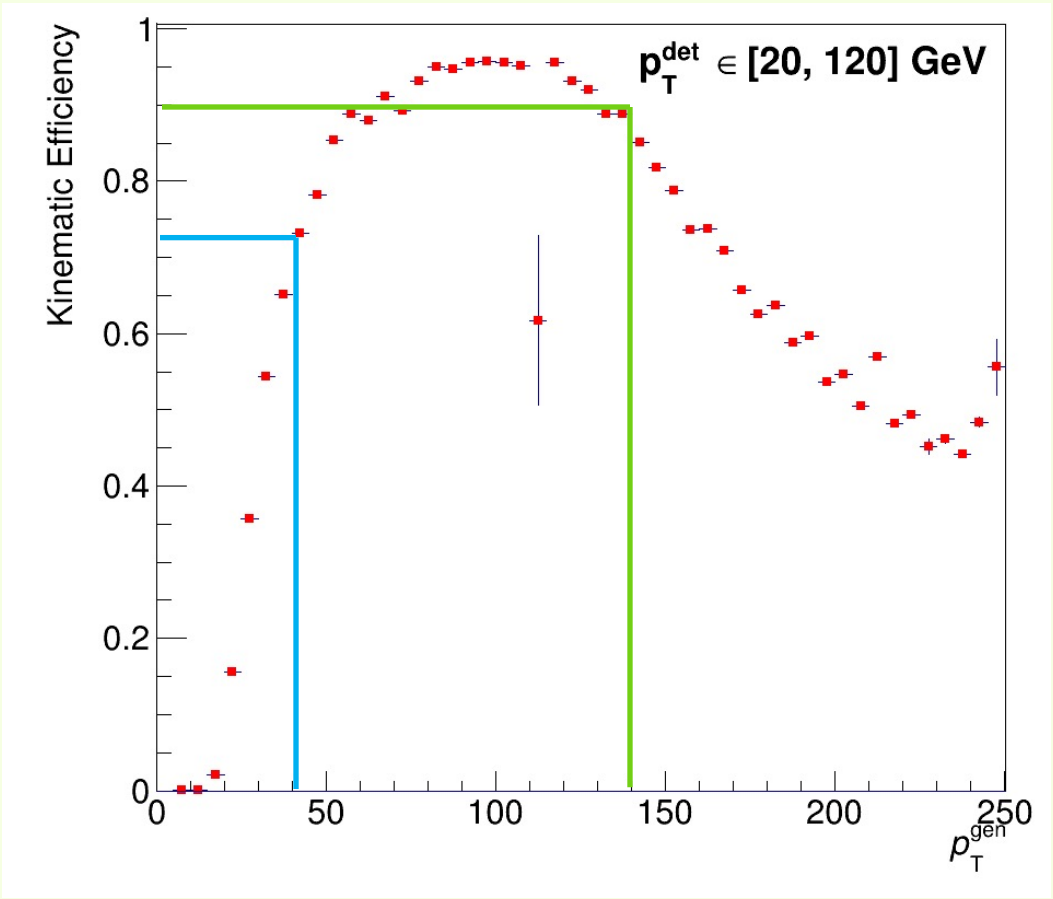
The peripheral RM is shaper than central RM

Kinematic efficiency

Centrality 0-10 %



Centrality 70-90 %

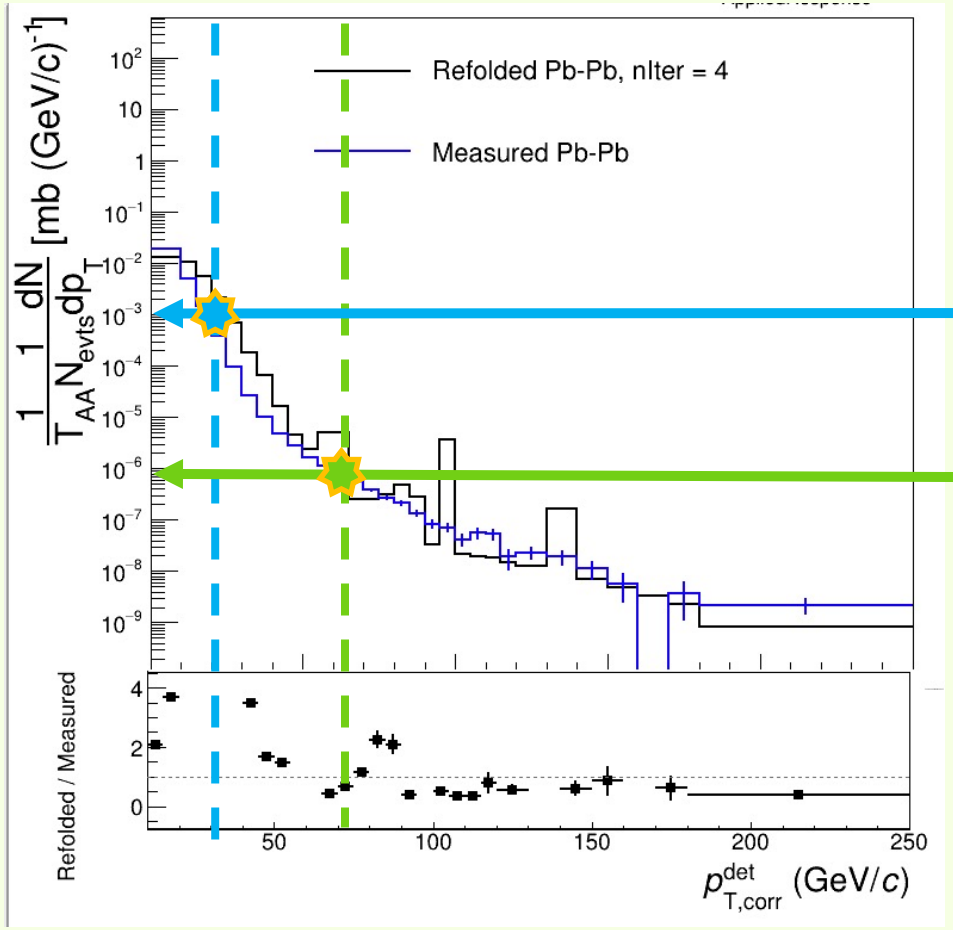


Peripehral kinematic efficiency is higher than the central one.

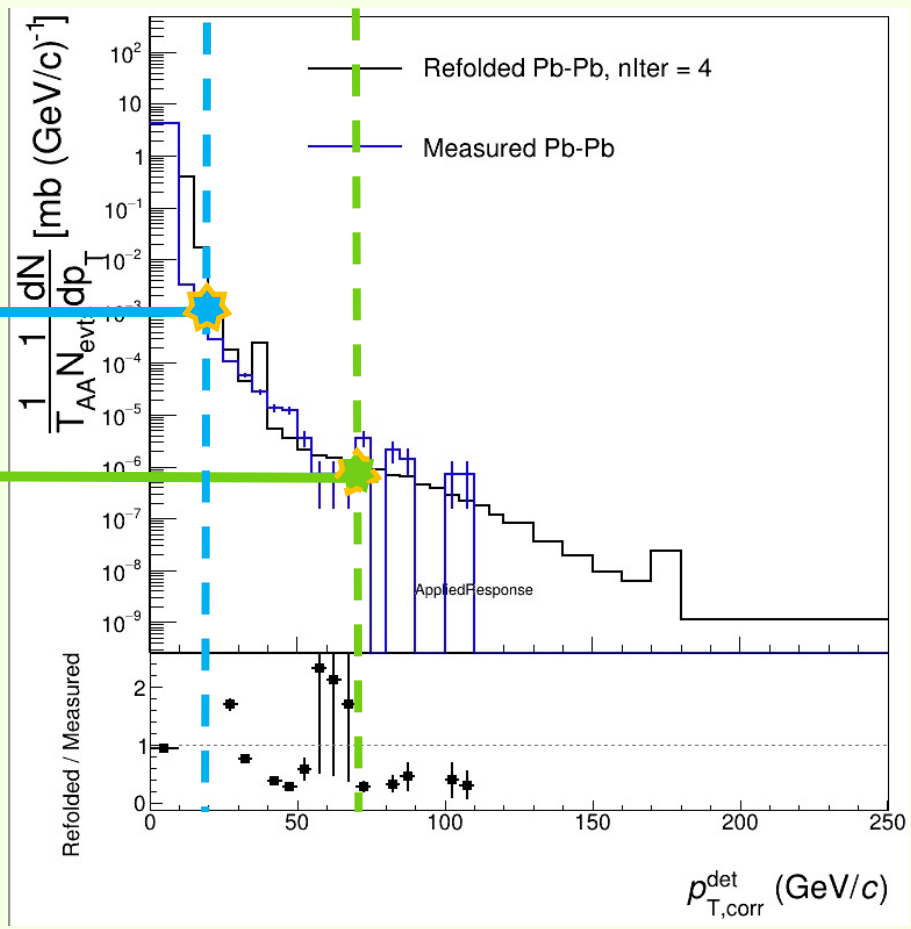
-> This result is reasonable

Unfolding results

Centrality 0-10 %



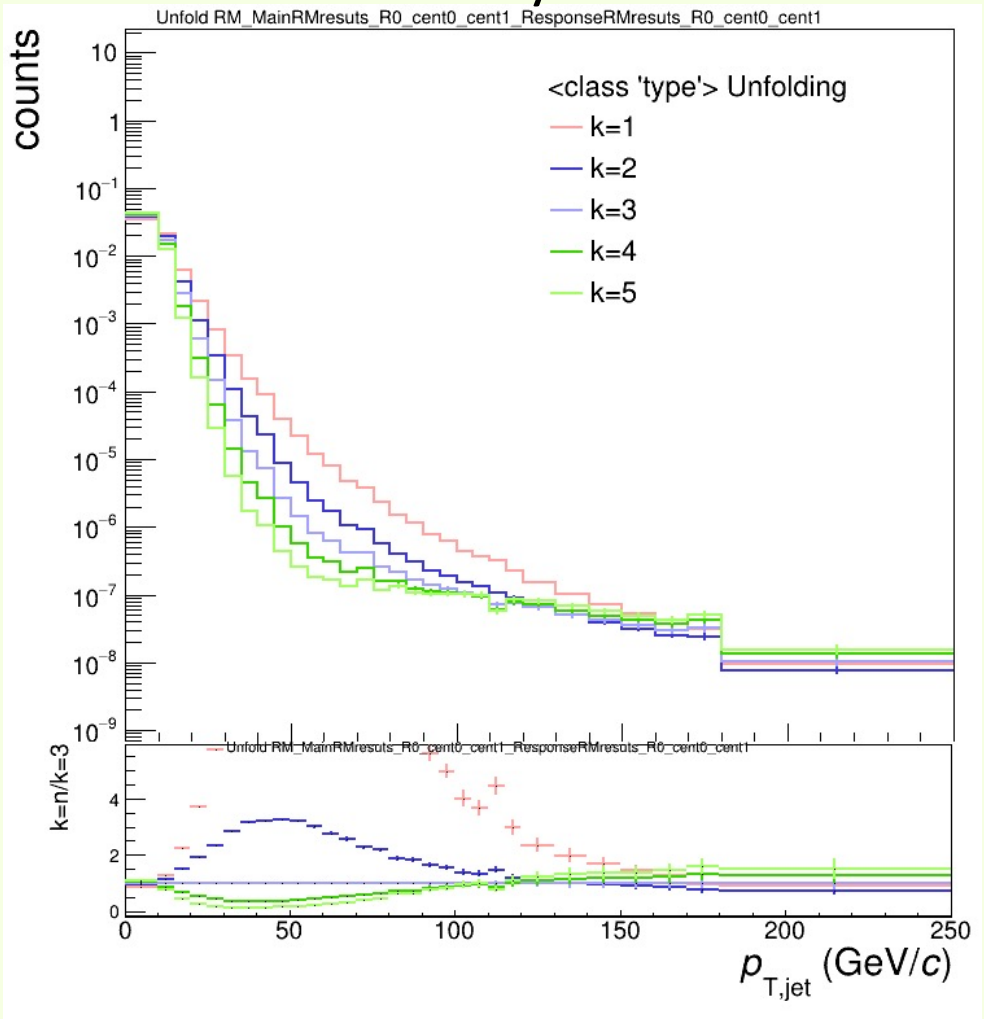
Centrality 70-90 %



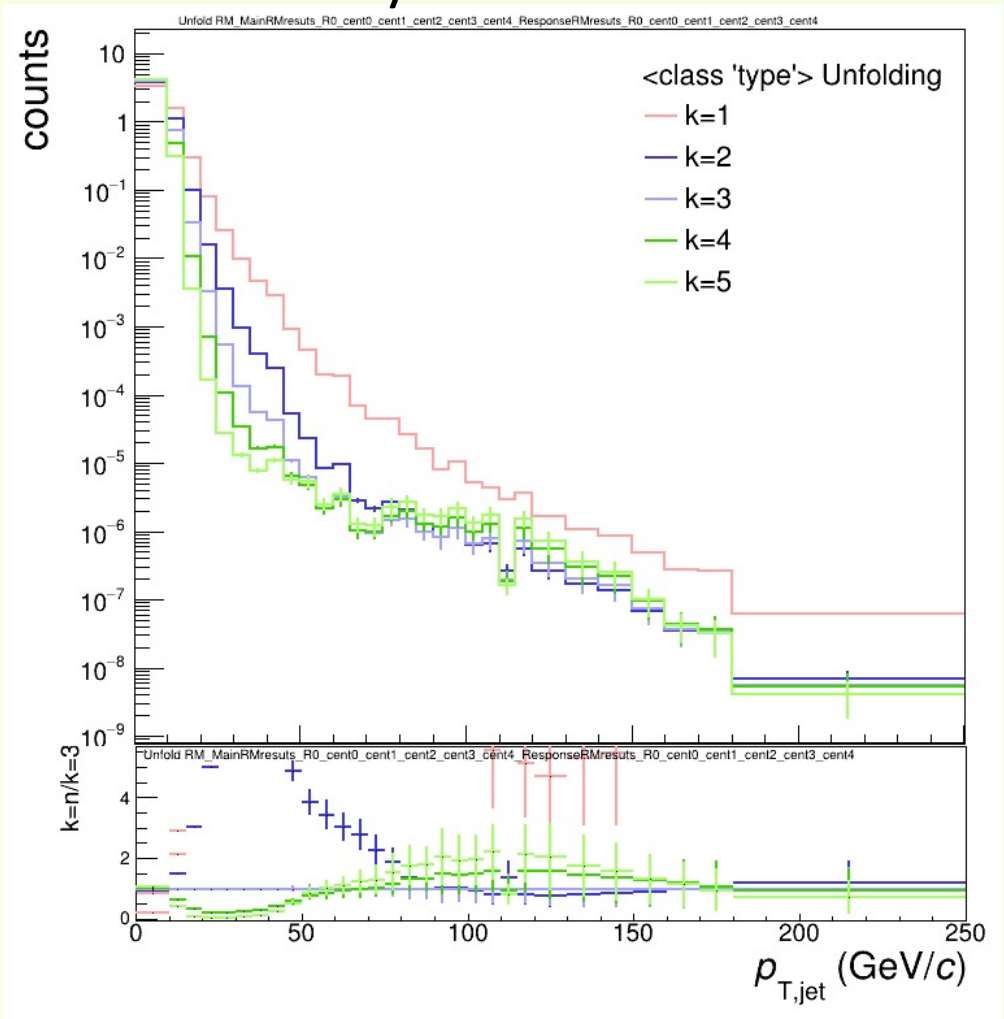
Not found a large difference between these plots.

But the peripheral result lack statistic in high pT region.

Centrality 0-10 %



Centrality 70-90 %



Questions

- Would you feel these results are reasonable?
- Why are you use pT hard scaling.
- Should we scale JESshift plot?
- Why does the unfold results not stable?
- How should we select the iteration times (and what is iteration parameter)?
- Why does the SVD package not success?

Error in <TDecompSVD::Diagonalize>: no convergence after 309 steps