Charged-particle production as a function of R_T in pp, p–Pb and Pb–Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV with ALICE

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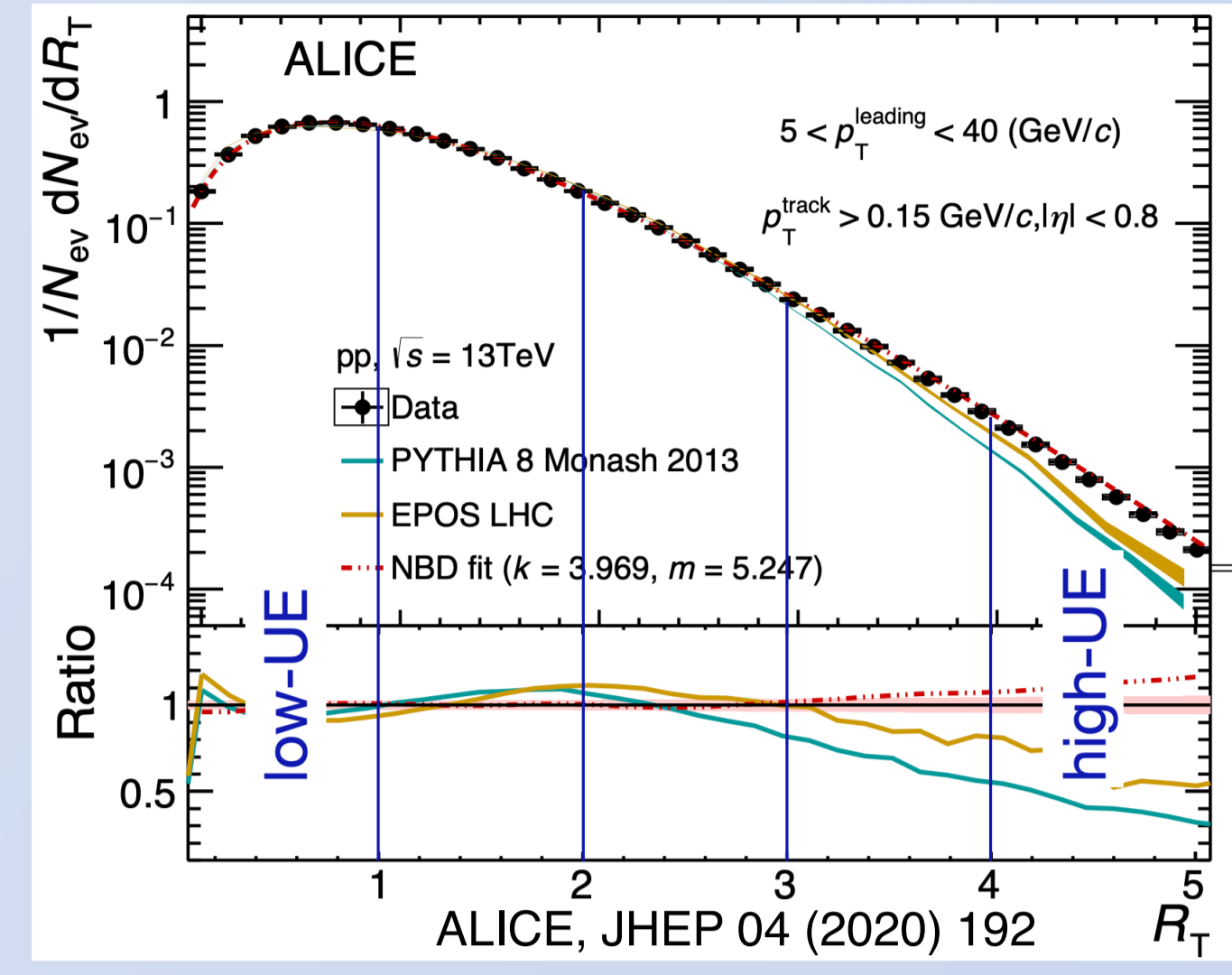Email: sushanta.tripathy@cern.ch

1. Introduction

✓ This study aims to investigate the possible similarities between pp, p–Pb and Pb–Pb collisions by studying charged-particle production as a function of the underlying event classifier , R_T [1].

✓ Using a Bayesian unfolding technique [2], p_T spectra for the near, away and transverse sides in pp, p–Pb and Pb–Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV are obtained.
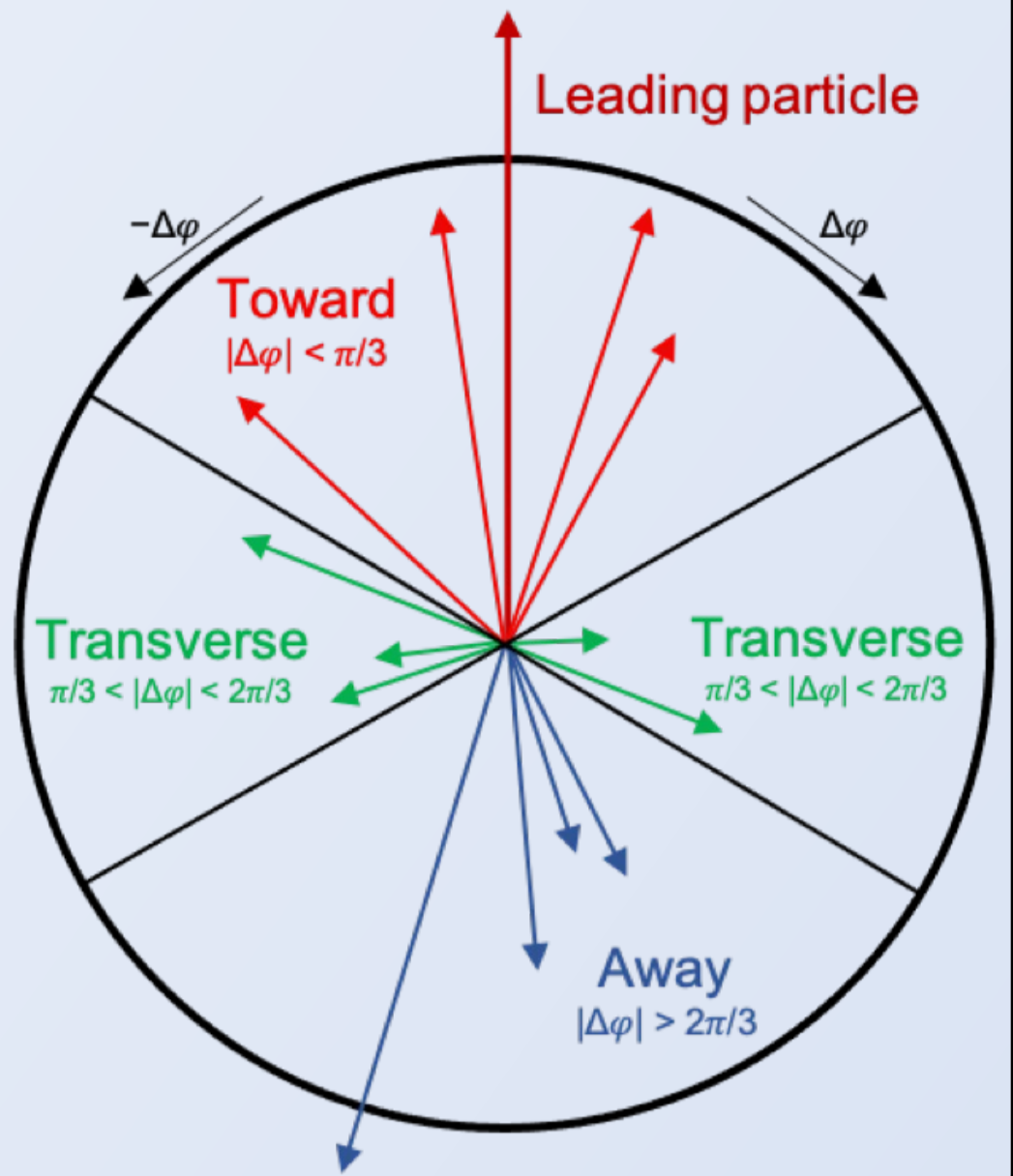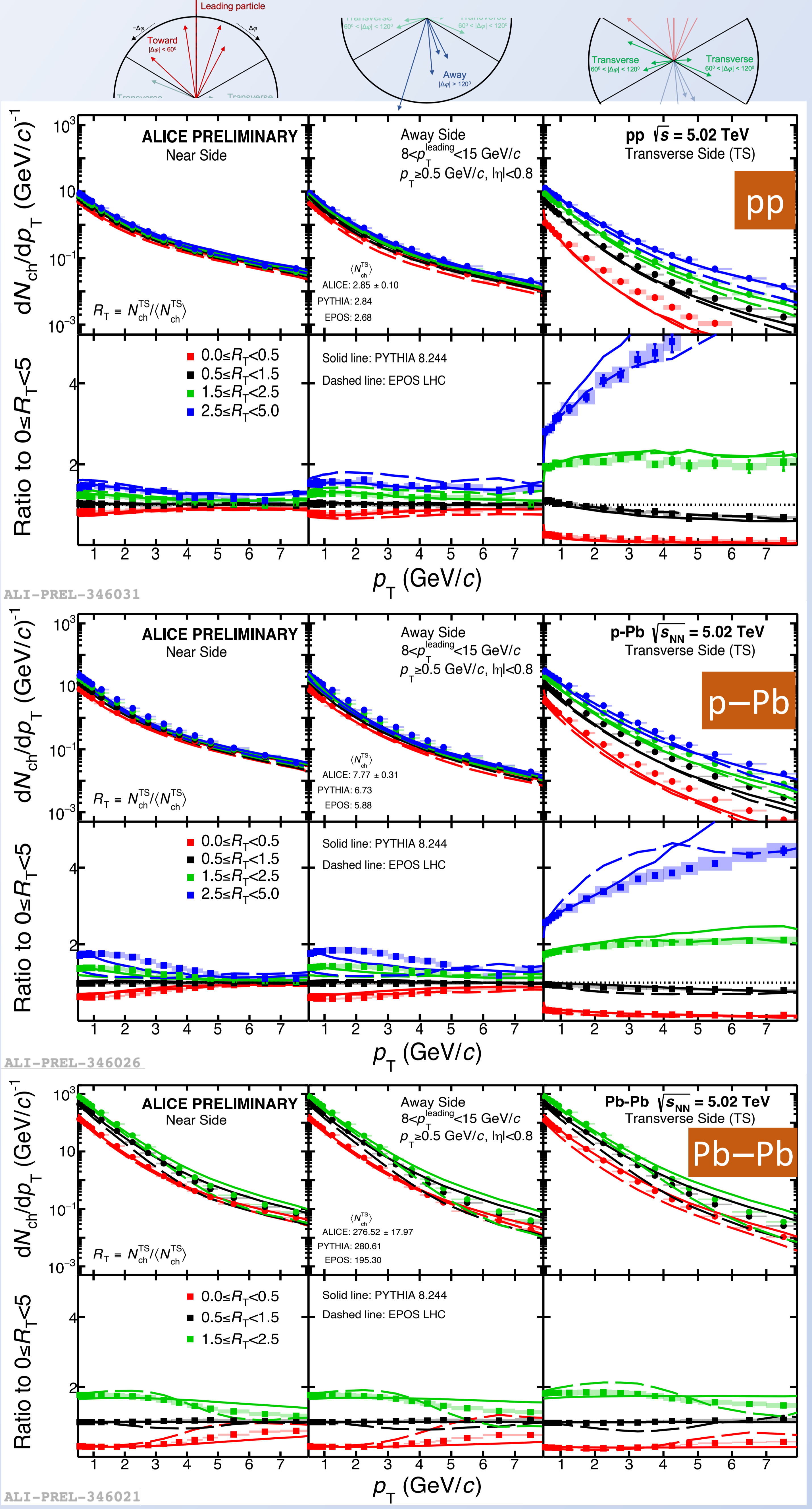

2. Relative transverse activity classifier, R_T
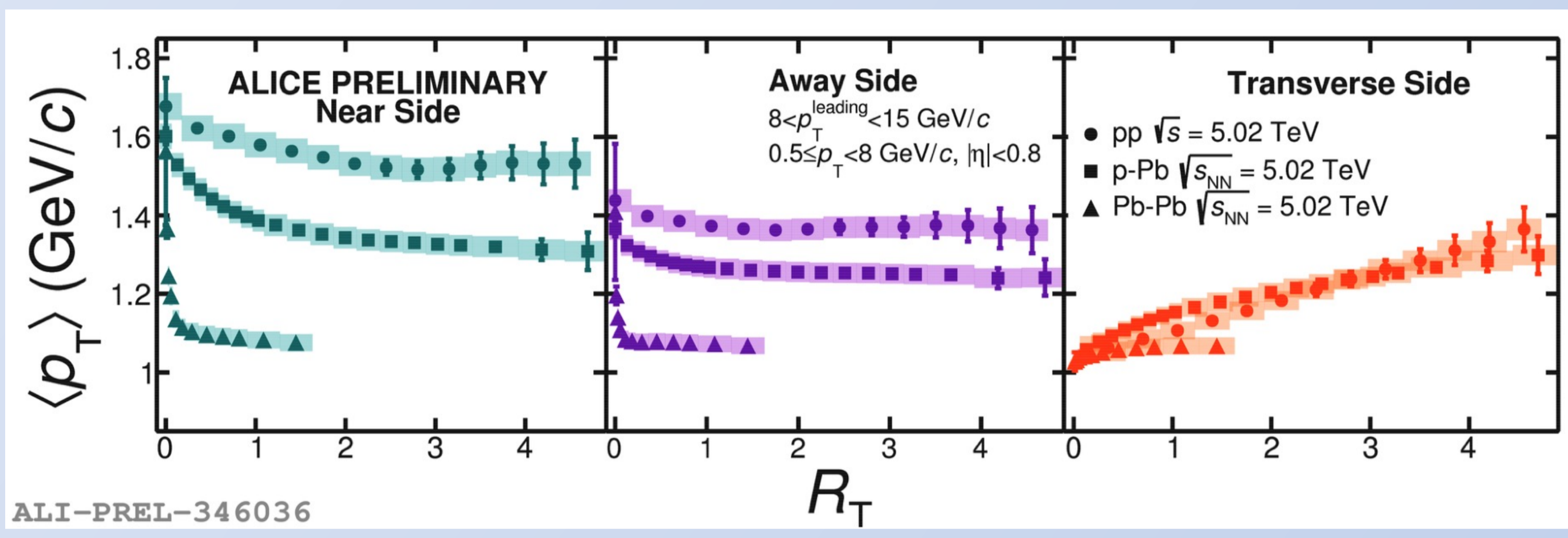
$$R_T = N_{ch}^T / < N_{ch}^T >$$

N_{ch}^T is the multiplicity in tranverse region

✓ $R_T \rightarrow 0$: Events with less UE (dominated by jets)

✓ Higher $R_T \rightarrow$ Higher UE contribution

✓ A p_T^{trig} cut is required to ensure the presence of a hard process: $p_T^{trig} > 5$ GeV/c

ALICE, JHEP 04 (2020) 192

3. Transverse Momentum (p_T) Spectra

ALI-PREL-346031

ALI-PREL-346026

ALI-PREL-346021

✓ Similar trend of p_T spectra for pp and p-Pb collisions in transverse side. The increase of the ratio to R_T-integrated is less steep for p–Pb.
✓ Results for all topological regions in Pb–Pb collisions are qualitatively consistent.
✓ Models describe data qualitatively for all collision systems

4. Mean Transverse Momentum ($<p_T>$)

ALI-PREL-346036

✓ At $R_T = 0$, $<p_T>$ is similar across collision systems for all topological regions.

✓ For large R_T, the $<p_T>$ approaches similar values in all three topological regions for a given system: dominant UE contribution

5. Search for jet modifications in small systems

$$I_X = \frac{dN_{ch}/dp_T|_{\text{jet like signal in } X \text{ collision}}}{dN_{ch}/dp_T|_{\text{jet like signal for MB pp collision}}}$$

X = pp, p–Pb and Pb–Pb collisions

ALICE, arXiv:2204.10157 [nucl-ex]
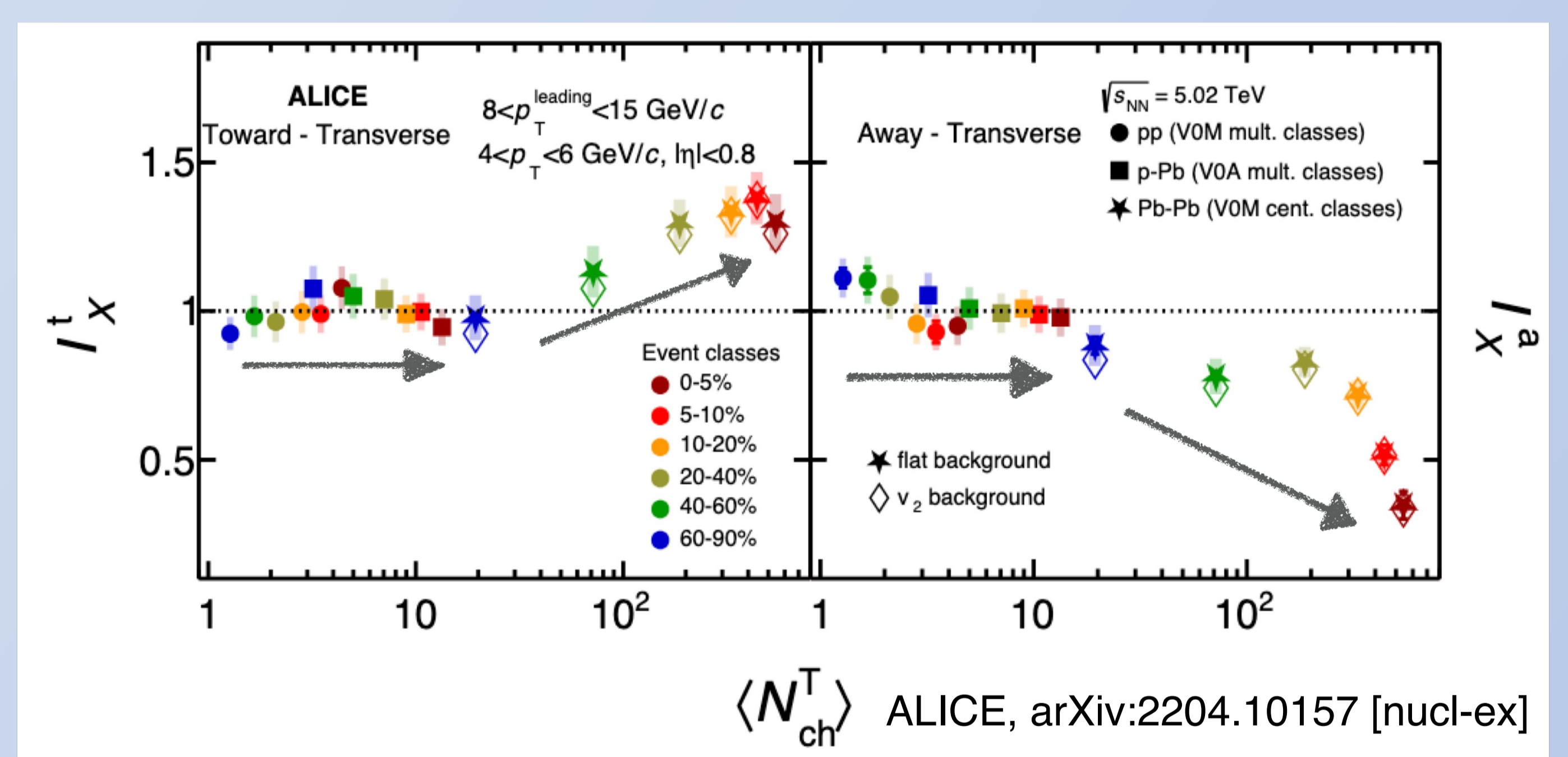
✓ I_X is sensitive to medium effects. The suppression in away side would indicate the presence of jet quenching in Pb–Pb collisions.

✓ The trend for most peripheral and central Pb–Pb collisions are compatible with the ALICE I_{AA} results for $\sqrt{s_{NN}}$ = 2.76 TeV. [3]

✓ No enhancement(suppression) for toward(away) side of I_X in pp and p–Pb collisions is observed.

6. Summary

✓ The p_T spectra as a function of R_T for the near, away and transverse sides in pp, p–Pb and Pb–Pb collisions will help to constrain MC models.
✓ The particle production in p–Pb collisions behaves like pp rather than Pb–Pb. This suggests the MPI effects in both pp and p-Pb collisions [4].
✓ In contrast to Pb-Pb collisions, no enhancement(suppression) of I_X is seen for toward(away) side in pp and p-Pb collisions.

References
[1] T. Martin, P. Skands and S. Farrington, Eur. Phys. J. C **76**, 299 (2016).
[2] M. Krüger, PoS Vol. 336 (2019) 236.
[3] ALICE, Phys. Rev. Lett. 108 (2012) 092301.
[4] ALICE, Phys. Lett. B 741 (2015) 38.