MPI dependence of the near and away side p_T spectra for pp, p-Pb and Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV with ALICE detector at the LHC

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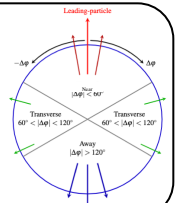
1. Introduction and Motivation

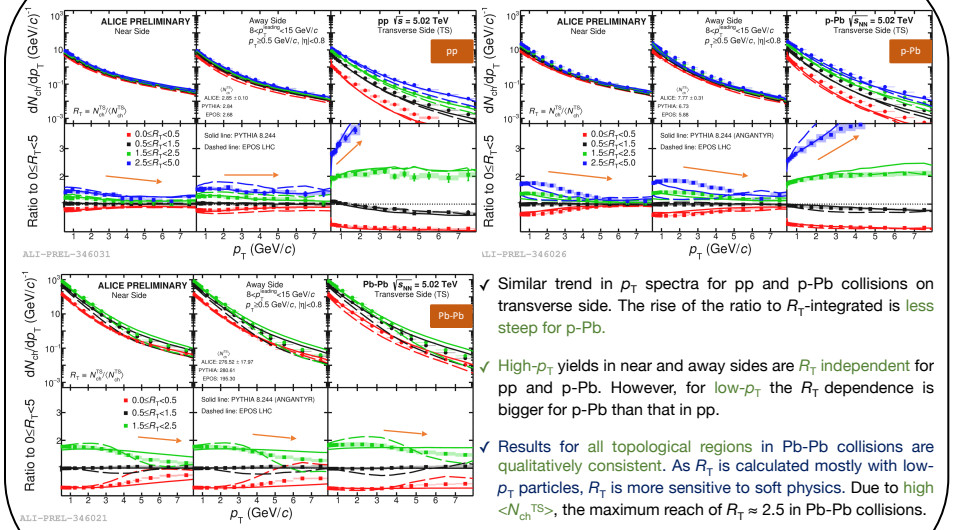
➢ In this work, we study particle production as a function of the relative transverse activity classifier, R_T = N_{ch}^{TS}/ $\langle N_{ch}^{TS} \rangle$, where N_{ch}^{TS} is the multiplicity measured in the transverse side [1-3].

➢ Using a Bayesian unfolding technique [4], p_T spectra as a function of R_T for the near, away and transverse sides in pp, p-Pb and Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV are obtained and compared with EPOS-LHC and PYTHIA 8.244 (ANGANTYR).

➢ The analysis investigates effects of Multi-Partonic Interaction (MPI) in different collision systems and presents a search for possible jet quenching effects in small systems.



2. Transverse Momentum (p_T) Spectra



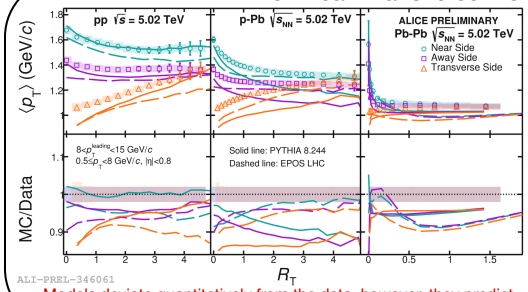
✓ Similar trend in p_T spectra for pp and p-Pb collisions on transverse side. The rise of the ratio to R_T-integrated is less steep for p-Pb.

✓ High-p_T yields in near and away sides are R_T independent for pp and p-Pb. However, for low-p_T the R_T dependence is bigger for p-Pb than that in pp.

✓ Results for all topological regions in Pb-Pb collisions are qualitatively consistent. As R_T is calculated mostly with low-p_T particles, R_T is more sensitive to soft physics. Due to high $\langle N_{ch}^{TS} \rangle$, the maximum reach of R_T ≈ 2.5 in Pb-Pb collisions.

Both PYTHIA 8.244 (ANGANTYR) and EPOS-LHC models describe data qualitatively for all collision systems. However, the quantitative disagreement is quite significant, especially in near and away sides.

3. Mean Transverse momentum ($\langle p_T \rangle$)



✓ At R_T = 0, $\langle p_T \rangle$ is similar across collision systems for all topological regions.

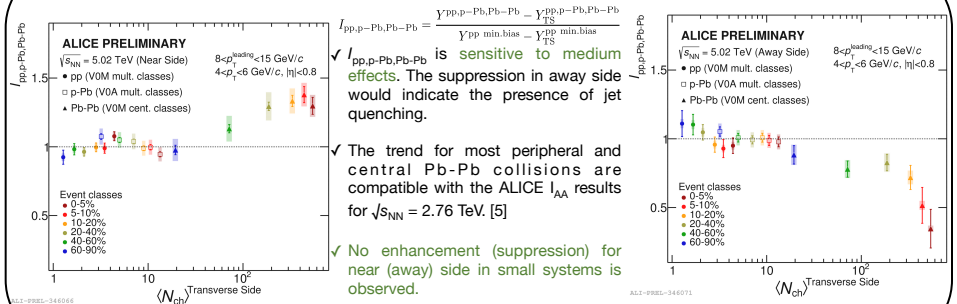
✓ For pp and p-Pb collisions, the $\langle p_T \rangle$ for transverse side increases with increasing $\langle R_T \rangle$. Near and away sides give a larger $\langle p_T \rangle$ than transverse side. For Pb-Pb collisions, the $\langle p_T \rangle$ is flat and similar for the three regions except at R_T = 0.

✓ PYTHIA/ANGANTYR: does a good job for pp and Pb-Pb but worse for p-Pb (likely due to underestimation of binary scaling of hard processes)

✓ EPOS LHC: does a good job but seems to underestimate UE activity for pp and p-Pb

Models deviate quantitatively from the data, however, they predict similar trend like data

4. Jet quenching in small systems?



$$I_{pp,p-Pb,Pb-Pb} = \frac{Y^{pp,p-Pb,Pb-Pb} - Y_{TS}^{pp,p-Pb,Pb-Pb}}{Y^{pp\ min.bias} - Y_{TS}^{pp\ min.bias}}$$

✓ $I_{pp,p-Pb,Pb-Pb}$ is sensitive to medium effects. The suppression in away side would indicate the presence of jet quenching.

✓ 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. [5]

✓ No enhancement (suppression) for near (away) side in small systems is observed.

Absence of jet quenching in pp and p-Pb collisions at the LHC

5. 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 at $\sqrt{s_{NN}}$ = 5.02 TeV are studied. These data will help to constrain MC predictions.

➢ Particle production in p-Pb collisions behave like pp rather than Pb-Pb. This suggests the presence of MPI in both pp and p-Pb collisions as proposed in [6].

➢ In contrast to Pb-Pb collisions, no enhancement (suppression) of $I_{pp,p-Pb,Pb-Pb}$ is seen for NS (AS) in pp and p-Pb collisions. Based on these results, no hint of jet quenching in small systems is observed.

References

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