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Phenomenological study of the angle between jet axes in heavy-ion collisions

This work presents a phenomenological study on the angle between the Standard and the Winner-Take-All (WTA) jet axes (ΔR) in high-energy nuclear collisions. Our theoretical results calculated by the LBT model show that the ΔR distribution in Pb+Pb at $\sqrt{s} = 5.02$ TeV is narrower than that in p+p, which agrees well with the recent ALICE measurements. The narrowing of ΔR seems to violate the p_T-broadening nature of the jet quenching effect, usually explained by the influence of "selection bias". However, the physical details still need to be fully understood. Utilizing a matching-jet method to track the jet evolution in the QGP to remove the selection bias in the Monte Carlo simulations, we observe that the ΔR distribution becomes broader due to the jet-medium interactions. At the same time, by rescaling the quark/gluon-jet fractions in Pb+Pb collisions to be the same as that in p+p, we find that the fraction change may not significantly influence the modification pattern of jet ΔR. On the other hand, the selected jet sample in A+A collisions has a significantly narrower initial ΔR distribution than the p+p baseline, and such a biased comparison between p+p and A+A conceals the actual jet-broadening effect in the experimental measurements. The investigations presented in this work will deepen our understanding of the relationship between the actual intra-jet modifications in the QGP and the experimental observations.

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