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Longitudinal momentum fraction of heavy flavor meson in jets in high-energy nuclear collisions

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Heavy flavor jets are powerful tools to gain insight into the in-medium partonic energy loss mechanisms and the transport properties of the quark-gluon plasma (QGP) in high-energy nuclear collisions. In this work, we present the first theoretical study of the longitudinal momentum fraction $z_{||}$ carried by D^0 meson in jets in Pb+Pb collisions at $\sqrt{s_{\mathrm{NN}}}$ = 5.02 TeV. The p+p baseline is provided by POWHEG+PYTHIA8 which matches the next-to-leading order hard processes with the parton shower. The in-medium evolution of heavy quark jets is employed by a Monte Carlo transport model which takes into account the collsional and radiative partonic energy loss in the expanding QGP. We observe steeper $z_{||}$ distributions of B^0-jet compared to that of D^0-jet at the same kinematics region in p+p collisions, which may be a hint of the harder jet fragmentation function of b-jet compared to c-jet in vacuum. In A+A collisions, it is shown that the jet quenching effect would in general decrease the values of $z_{||}$. In addition, we predict visibly stronger nuclear modifications of B^0-jet $z_{||}$ distributions compared to D^0-jet within the same p_{T} windows, as a result of the much steeper initial $z_{||}$ distribution of B^0-jet in vacuum.

Experiment/Theory

Theory/Phenomenology

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