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Effect of initial states on the production of heavy flavors using azimuthal angular correlation

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Heavy flavors (charm and beauty) are created via initial hard scatterings in ultra-relativistic heavy-ion collisions. The study of thermalization of heavy flavors in the Quark Gluon Plasma (QGP) is one of the major physics goals of the upcoming heavy-ion experimental programs. Azimuthal angular correlations ($\Delta\varphi$) of open heavy flavour species are expected to be influenced by the thermalization of heavy quarks. Besides thermalization, $\Delta\varphi$ distributions of heavy flavors also serve as an excellent tool to look into heavy flavor production processes. Furthermore, differential studies in $\Delta\varphi$ correlations will give ample information about heavy quark dynamics in the heavy-ion collision at different kinematic ranges.\\

In this contribution, we present a transverse momentum (p_{T}) differential study of the azimuthal angular correlations of $\mathrm{D}^0 - \mathrm{D}^0$ and $\mathrm{B} - \mathrm{B}$ mesons in pp and Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}}$ = 5.5 TeV using PYTHIA8. We also perform multiplicity differential calculations to examine the effects of the multi-parton interactions (MPIs) on the $\Delta\varphi$ distributions. Our findings suggest that MPI modifies the $\mathrm{D}^0 - \mathrm{D}^0$ correlations significantly, especially at low p_{T}, while a weak multiplicity-dependence is observed for $\mathrm{B} - \mathrm{B}$ correlations. In Pb–Pb collisions, azimuthal angular correlations of $\mathrm{D}^0 - \mathrm{D}^0$ are important from the perspective of charm thermalization while checking for additional initial state effects. We quantify the effect of nuclear parton distribution functions (PDF) on $\mathrm{D}^0 - \mathrm{D}^0$ and $\mathrm{B} - \mathrm{B}$ correlations by measuring the yield and width of the respective $\Delta\phi$ distributions. The correlation distribution also show sensitivity to the parton level processes, gluon splitting show its imprints in the NS peak of correlation distribution in the form of double NS peak at low trigger p_{T} observed for both charm as well as beauty quark. This study is crucial for drawing robust conclusions about the thermalization of heavy quarks in the QGP.

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