

Momentum and angular correlations in Z/γ -hadron production in relativistic heavy-ion collisions

We carry out a detailed study of medium modifications on momentum and angular correlations between a large transverse momentum hadron and a Z/γ trigger in relativistic heavy-ion collisions within a perturbative QCD parton model improved by the Sudakov resummation technique. The total energy loss of a hard parton propagating inside the medium is employed to modify the fragmentation function, while the medium-induced transverse momentum broadening is included in the resummation approach, and both of them are related to the jet transport parameter and obtained by the high-twist formalism. We obtain good agreements with the existing data on transverse momentum and azimuthal angular correlations for the Z/γ -hadron pairs in pp and AA collisions, and predict the correlations for the γ -hadron in central PbPb collisions at 5.02 TeV. The numerical analyses for the Z/γ -hadron in central PbPb collisions show that the normalized angular distribution is decorrelated due to the medium-induced transverse momentum broadening, however, the angular correlation is enhanced due to the parton energy loss, namely anti-broadening. The observed modification of the angular correlation is a result of the competition between the broadening and the anti-broadening. This work provides a reliable theoretical tool for a comprehensive and precise study of jet quenching in relativistic heavy-ion collisions.

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