Abstract

The suppression of high $p_T$ single inclusive hadron and dihadron productions in high-energy heavy-ion collisions at RHIC and the LHC is studied within a next-to-leading order pQCD parton model. The jet quenching effect is included via the medium-modified fragmentation functions based on the higher-twist energy loss formalism. The evolution of the bulk medium is simulated by a (2+1)-dimensional viscous hydrodynamic model. The jet transport coefficient $q_0$ is quantitatively extracted for $A+A$ collisions at both RHIC and the LHC energies by comparing with experimental data. Our results show that $q_0$ extracted from dihadron suppression is consistent with single hadron suppression. We also predict dihadron $I_{AA}$ for central and non-central Pb+Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV.

NLO pQCD parton model and modified fragmentation functions

$\Delta R_{AA}$ and $I_{AA}$ are extracted with different $q_0$ for central Pb+Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV as compared to ALICE and CMS data.

The prediction of dihadron $I_{AA}$ for Pb+Pb collisions in the centrality of 50 - 60% with $q_0$ extracted from central Pb+Pb collisions.

Extract $\hat{q}_0$ at the LHC ($\sqrt{s_{NN}} = 2.76$ TeV)

We also extract $\hat{q}_0$ from central Pb+Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV. Then we still use them to calculate the $R_{AA}$ and $I_{AA}$ for non-central collisions.

Central Pb+Pb collision

$\Delta R_{AA}$ and $I_{AA}$ are extracted with different $q_0$ for central Pb+Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV as compared to CMS data.

Global fit $\chi^2$ as a function of $\hat{q}_0$.

Prediction for dihadron $I_{AA}$ at $\sqrt{s_{NN}} = 5.02$ TeV

Finally we predict the dihadron $I_{AA}$ for central and non-central Pb+Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV. As for the single hadron $R_{AA}$, we compare them not only with the experimental data of $\sqrt{s_{NN}} = 2.76$ TeV but also with the data of $\sqrt{s_{NN}} = 5.02$ TeV, because those three data sets are very close to each other.

Central Pb+Pb collisions

$\Delta R_{AA}$ and $I_{AA}$ in the 50 - 60 % centrality with $q_0$ extracted from central Pb+Pb collisions as compared to experimental data.