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Nuclear suppression of heavy quark production at forward rapidities at RHIC and LHC

Content :

The heavy ion collision experiments at RHIC and LHC are designed with a hope to explore the existence of a new form of matter known as Quark Gluon Plasma (QGP) and to explore its properties. The observed large elliptic flow, jet-quenching, and the recombination of partons as the mechanism of production of hadrons at intermediate transverse momenta at RHIC, gives evidence towards the formation of QGP.

Heavy quarks are produced from the initial fusion of gluons or light quarks at a time, $1/2M_Q$, which is much less than 0.1 fm/c, i.e much before the formation of QGP phase. Their large mass ensures that their production can be treated using pQCD and that it is nearly negligible at later times. The unique importance of heavy quarks as probes of QGP lies in their large mass.

The produced heavy quarks will traverse the QGP, colliding with quarks and gluons and radiating gluons before appearing as charm or bottom mesons or baryons. In this process they will loose energy and the hadrons thus produced would carry information of the energy loss suffered by the heavy quarks. The temperature likely to be reached at LHC in collision of heavy nuclei could be even larger and thus this energy loss will play a more significant role. The opening of a much wider window in rapidity at LHC is also likely to provide widely differing media at different rapidities through which the heavy quarks would propagate. Thus a valuable test of various theories for energy loss suffered by heavy quarks can be performed by studying it at RHIC and LHC and at different rapidities.

The effect of nuclear shadowing
in high energy nucleus-nucleus collisions
is well known.
With the increase of the mass number of the
nucleus and increasing contribution of terms having small x, the effect
becomes more pronounced. We introduce the
shadowing effect in our calculations by using EKS 98
parameterization for nucleon structure functions.

We study these effects in terms of nuclear modification factor R_{AA} for
heavy quarks.

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