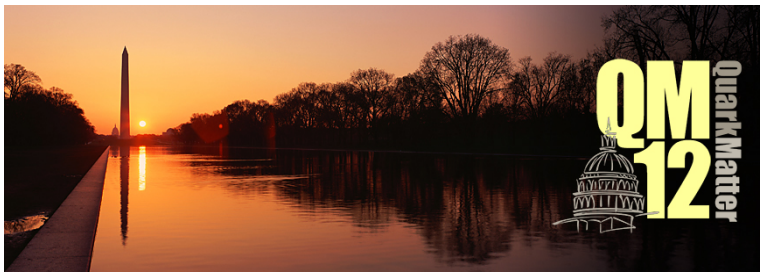

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Jet probes of cold and hot QCD matter

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Parton energy loss in the hot QCD medium will manifest itself not only in leading hadron spectra but also in reconstructed jet productions in high-energy nucleus-nucleus collisions. With its more differential power full jets in heavy-ion collisions can then provide excellent tools to study the properties of the QGP and impose constraints on different parton energy loss models.

With this motivation, we investigate the cold nuclear matter(CNM) effects on jet productions in high-energy nuclear collisions at LHC with the NLO perturbative QCD. The nuclear modifications for dijet angular distributions, dijet invariant mass spectra, dijet transverse momentum spectra and dijet momentum imbalance due to CNM effects are calculated by incorporating EPS, EKS, HKN and DS parametrization sets of parton distributions in nucleus. It is found that dijet angular distributions and dijet momentum imbalance are insensitive to the initial-state CNM effects and thus provide optimal tools to study the final-state hot QGP effects such as jet quenching.

Furthermore we present the results and predictions at NLO for productions of the single, double and tagged jets in relativistic heavy-ion collisions by including parton energy loss effect in the QGP and the CNM effects. We demonstrate how an enhanced di-jet transverse momentum imbalance in central Pb+Pb reactions at the LHC, recently measured by the ATLAS and CMS experiments, can be derived from these results. We show quantitatively that a significant fraction of this enhancement may be related to the ambiguity in the separation between the jet and soft background medium and point to a suite of measurements that can help build a consistent picture of parton shower modification in heavy ion collisions at the LHC.

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