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Extracting the jet transport coefficient of cold nuclear matter from world data

Summary

Quantifying the differences between nuclear and hadronic collisions, phenomenologically known as medium modification due to multiple scatterings between the hard probe and medium, can provide a solid baseline for unambiguous identification of the medium fundamental property. In this talk, we consider parton propagation in cold nuclear matter within the framework of high-twist expansion, which has been shown to be a successful approach to describe the nuclear effects as observed in heavy ion collisions. Through global analysis of world data on transverse momentum broadening in semi-inclusive eA deep inelastic scattering, Drell-Yan process and heavy quarkonium production in pA collisions, as well as the nuclear modification of the structure functions in DIS related to the coherent dynamical shadowing, we perform the first global extraction of jet transport coefficient for cold nuclear matter. This provide the first evidence that the medium transport property, rather than a constant value as commonly used in heavy ion collisions, depends on the probing scale similar to that in standard parton distribution functions of proton. We expect the extracted scale dependence of qhat for cold nuclear matter can be extended to precisely identify the fundamental property of quark gluon plasma.

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