Contribution ID: **84** Type: **Oral Presentation**

QCD factorization and universality of jet cross sections in heavy-ion collisions

Wednesday 6 November 2019 09:40 (20 minutes)

Nowadays powerful accelerators collide heavy-ions at high energies in order to recreate the Quark Gluon Plasma (QGP) which is a hot and dense state of matter that is believed to have filled our universe shortly after the Big Bang. We propose a new approach to study the QGP by using very energetic jets produced in the same collisions which can be utilized as controllable hard probes. Measuring the properties of the QGP such as the temperature or transport coefficients relies on whether it is possible to reliably separate the production of the probe and the formation of the medium. This concept is known as QCD factorization. Starting from an established factorization formalism in proton-proton collisions, we introduce medium modified jet functions to capture the interaction of jets with the QGP. Within a global analysis using a Monte Carlo sampling technique we find that it is indeed possible to describe the data obtained at the LHC. Our results thus support the validity of QCD factorization in the complex heavy-ion environment, and open up a new door to analyze heavy-ion jet data. In addition, our results may serve as guidance for constructing microscopic models of the QGP.

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Session Classification: Parallel Session - New theoretical developments II

Track Classification: New theoretical developments