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Elucidating QCD using energy-energy correlator measurement at RHIC and LHC

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In recent years, many new jet substructure observables have been studied, with particular attention given to those that can be calculated by perturbative QCD. N-point energy correlators are currently attracting both theoretical and experimental interest. The energy-energy correlators (EEC), or two-point correlator, which emphasize the angular structure of the energy flow within jets, allow for a comprehensive study of both the perturbative and non-perturbative aspects of jet structure. Defined as the energy-weighted cross-section of particle pairs inside jets, the EECs, as a function of pair distance, show a distinct separation of the perturbative from the non-perturbative regime, revealing parton flavor-dependent dynamics of jet formation as well as the confinement of the partons into hadrons. Extending the EEC to the three-point correlator (E3C) is extremely interesting, as these probe the parton shower beyond $1 \rightarrow 2$ splittings and encode additional information about the internal structure of jets. Moreover, taking ratios of the projected E3C with the EEC offers precision tests of the coupling strength of the strong force α_s.

In this talk, I will present an experimental overview of the recent measurements on EECs from the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC). The measurement will include the EEC and E3C for inclusive (gluon-dominated) jets in pp collisions. Additionally, heavy-flavor-tagged (reconstructed D^0) jets EEC will be discussed in comparison to inclusive jet samples. This comparison offers valuable insight into flavor dependencies, such as the Casimir factors of quarks and gluons, as well as the mass of heavy quarks, in parton fragmentation and hadronization. Moreover, I will discuss comparisons with different Monte Carlo (MC) generators and theoretical predictions. This suite of measurements will serve as a baseline for future studies in heavy-ion collisions, allowing for disentanglement of the dynamics of the dead cone from interactions with the quark-gluon plasma.

session

G. Heavy Ion Physics

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