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The model study of flavor dependence for energy-energy correlation functions in pp collisions.

Jets are collimated bunches of hadrons, and they serve as a useful tool for studying QCD. Jets are generated from the hard scattering processes of quarks and gluons in particle collisions, such as those at the Large Hadron Collider (LHC). These processes can be theoretically described by perturbative QCD (pQCD) and are well-modeled by Monte Carlo simulations such as PYTHIA and HERWIG.

Heavy-flavor quarks are produced in the early stages of collisions, before the Quark-Gluon Plasma (QGP) is formed. These quarks interact with the medium and undergo hadronization. Therefore, heavy-flavor jets, which originate from heavy-flavor quarks, are a unique tool for studying the properties of the QGP. Furthermore, due to the dead-cone effect, heavy-flavor jets are relatively less contaminated by gluons compared to light-flavor jets.

To understand the properties of jets, studying the substructure within jets is essential. The Energy-Energy Correlator (EEC) is a correlation function of the energy flow within a jet and is known as a robust observable against soft emissions or collinear splittings. Experimentally, the EEC is defined as the energy-weighted two-particle correlation as a function of the angular distance between pairs of particles. In this study, we use Monte Carlo simulations, such as PYTHIA and HERWIG, to investigate the flavor dependence of the EEC in proton-proton collisions. We expect to observe the heavy-flavor dead-cone effect in the EEC through this analysis.

Category

Experiment

Collaboration (if applicable)

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