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First energy-energy correlators measurements for inclusive and heavy-flavour tagged jets with ALICE

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Many new jet substructure observables have been studied in recent years, with particular attention to those which can be calculated by perturbative QCD. N-point energy correlators are currently attracting both theoretical and experimental interest. To comprehensively study the perturbative and non-perturbative aspects of jet structure, we measured the energy-energy correlators (EEC) that emphasize the angular structure of the energy flow within jets. 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. The projected 3-point correlator (E3C) is the first step in observing multi-particle correlations in jets. They encodes the shape dependence of energy flow in jets and supplement the EEC to cleanly access the pQCD region.
We present first measurements of the EECs for D0-tagged and inclusive (gluon-dominated) jets in pp and p–Pb collisions at 13 TeV and 5.02 TeV with the ALICE experiment at the LHC. By comparing our results with perturbative QCD predictions, we can measure the modification in the radiation pattern of jets due to mass effects and due to the presence of a cold nuclear medium. We also perform the first E3C measurement for inclusive jets in pp collisions at 13 TeV. 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.

Category

Experiment

Collaboration (if applicable)

ALICE

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