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Projected 3-point Energy Correlator measurements in jets in p-p at $\sqrt{s_{NN}}$ = 13TeV with ALICE

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The sequential clustering of particles into jets offers an algorithmic connection of hadrons to the partons of the radiation shower. Jet substructure allows us to access the radiation history of a jet thereby providing a useful avenue to probe QCD through different energy scales. The N-point Energy Correlator (ENC) is a recently proposed observable that highlights this feature of jets as a multi-scale object. The evolution of jets from the perturbative (partonic) to non-perturbative (hadronic) regimes is imprinted in the slopes of the ENC. Experimentally, the ENC is defined as the energy-weighted cross-section of N particles in a jet as a function of their angular separation. This makes the ALICE detector suitable for these measurements due to its excellent momentum and track resolution. Theoretical calculations have shown excellent agreement with the recent measurement of the two-point energy correlator (EEC) in jets at ALICE $\sqrt{s_{NN}}$ = 5.02 TeV in p-p as well as in jets at STAR $\sqrt{s_{NN}}$ = 200 GeV in p-p. Extending the EEC to the three-point correlator (EEEC) is the first step in extending the scaling information of the energy flow to a shape dependence. An intermediate step to achieving this goal is measuring the projected EEEC (E3C) which retains information about the largest angular scale of the correlation. The motivation to study the E3C is two-fold i) It has been shown theoretically that the projected E3C operators encode the same scaling information as the full E3C, a highly non-trivial property of this observable. ii) Taking ratios of the projected E3C with the EEC may enable us to better access perturbative QCD since it is known that the EECs are not immune to hadronization effects. Moreover, these ratios may offer precision tests of the coupling strength of the strong force, α_S. In this poster, we will show the progress towards the first preliminary measurements of the projected E3C with ALICE at $\sqrt{s_{NN}}$ = 13 TeV in p-p. We will also present simulation studies that extend these measurements to heavy-ion collisions. Specifically, we will show the sensitivity of ENCs in jets to the heavy-ion background to motivate further measurements in the quark-gluon plasma.

Category

Experiment

Collaboration (if applicable)

ALICE

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