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Imaging the Jet-Induced Medium Response with Energy Correlators

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In heavy-ion collisions, jets formed from hard-scattered partons experience an overall energy loss and have a modified internal structure compared to vacuum jets. These modifications are a result of the interactions between the energetic partons in a jet shower and the strongly coupled quark-gluon plasma (QGP). As the jet traverses the QGP, it loses momentum to the medium, which in turn responds to the presence of the jet. This "medium response"modifies the momentum distribution of the (soft) hadrons produced when the QGP freezes out. Since these hadrons carry the momentum lost by the parton shower, they and the modified shower both contribute to the energy flow in jets. The quantitative description of the medium response is an open question under active investigation. Recently, the projected N-point energy correlators (ENCs) have seen a resurgence of interest to probe vacuum QCD. For the first time, we will present a computation of the full three point energy-energy-energy correlation function in heavy-ion collisions and demonstrate its use for studying the shape of the energy flow originating from medium response. For this study, we utilize the Hybrid Model that implements a hydrodynamical medium response via the wake. We will show that measuring three-point correlation functions offer a promising experimental avenue for imaging the wake of the jet as when the three angles are well-separated the three-point correlator is dominated by the medium response.

Category

Theory

Collaboration

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