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Imaging the Shape Dependence of the Jet-Induced Medium Response with Energy Correlators

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Recently, the projected N-point energy correlators (ENCs) have seen a resurgence of interest for hadronic collisions at RHIC and the LHC to probe vacuum QCD. In this talk, we will show that the full three-point energy-energy-energy correlation (EEEC) function can be useful for studying the shape of energy flow within jets. In vacuum, it has been shown that these correlators elucidate the collinear singularity of vacuum QCD. For the first time, we will show how EEEC can uniquely characterize the energy flow originating from the jet-induced medium response in heavy-ion collisions. 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. This is due to 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. A quantitative description of this "medium response"is an area of active investigation. 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 this wake of the jet as when the three angles are well-separated the three-point correlator is dominated by the medium response.

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