Exploiting Two- and Three-point Charge-Energy Correlators at STAR as Probes of Jet Evolution

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The N-Point Energy correlator (ENC) is a jet substructure observable formed out of the distribution of angular distances between all particle groups of N constituents in a jet weighted by their energy product. This observable approximately separates non-perturbative and perturbative effects into the angular scales at which they dominate, reflecting a uniform distribution of hadrons at small angles and hard partonic splittings at large angles. Additionally, the energy scales at which hadron groups with different charge compositions form are sensitive to the hadronization mechanism, an effect shown in Monte-Carlo to be observable by charge-weighted ENCs.

We will present the first measurement of the projected three-point energy correlator (E3C) at RHIC, measured using pp data at $\sqrt{s} = 200$ GeV from the STAR experiment, and its ratio to the two-point correlator (EEC). These ENC measurements are shown for several jet transverse momentum ranges in the charge inclusive sample as well as in the charge-selected samples. The quark-rich sample at RHIC compared to the LHC allows for enhancement of charge-odd non-perturbative effects that are suppressed for gluons. This in tandem with the lower jet momentum allows for the observation window of these effects to move to angular scales easily resolvable by current experiments. Finally, first advancements towards study of the ENC in heavy-ion data at STAR are presented.