Measurement of Energy Correlators within jets in $p + p$ Collisions at $\sqrt{s} = 200$ GeV in STAR

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Abstract

Advancements in jet-finding algorithms allow for detailed studies into the parton shower, fragmentation, and hadronization governed by Quantum Chromodynamics. Recent theoretical efforts in describing intra-jet energy flow propose a new observable, the N-point energy correlator [1]. This observable recontextualizes jet substructure by providing insight into both the perturbative structure of the jet as well as hadronization. From the two-point energy correlator as a function of opening angle, one can determine the crossover region where the scaling behavior of the correlator changes from a random distribution of hadrons at small opening angles to perturbative partons at large opening angles.

In this talk, first studies on the two-point energy correlator using STAR's $p + p$ dataset taken at $\sqrt{s} = 200$ GeV will be presented. The correlation functions are represented by the distribution of the opening angle in rapidity-azimuthal angle phase space between two constituents of a jet weighted by their energy product. Various selections on jet transverse momentum (p_{T}) as well as constituent p_{T} will be used to study how the transition region from partons to hadrons changes as a function of these variables. These measurements will be compared with PYTHIA to evaluate their susceptibility to detector effects.

References

[1] Patrick T. Komiske et al. *Analyzing N-point Energy Correlators Inside Jets with CMS Open Data*. 2022. DOI: 10.48550/ARXIV.2201.07800. URL: https://arxiv.org/abs/2201.07800.