Jets in STAR

Isaac Mooney, for the STAR Collaboration

July 16, 2023

Abstract

Despite the relatively long history of jet measurements, there is still much to learn about jet evolution in the vacuum and in QCD media. The STAR experiment remains at the forefront of jet measurements in p+p, p+A, and A+A collisions, which provide insight into fundamental and emergent QCD phenomena, in a kinematic regime that is complementary to that of the LHC. In this talk, we will present recent results from STAR using novel experimental techniques and observables, as part of vibrant ongoing jet-substructure and jet-medium-interaction programs.

In p+p collisions, developments include an improved understanding of the interplay between jet substructure quantities, and between different points in the jet shower history, as well as a cleaner separation between perturbative and non-perturbative energy flows within jets than achieved previously. In p+Au collisions, STAR has investigated the relationship between hard processes and the underlying event and demonstrated that apparent jet modification is not due to final state hot nuclear matter effects. Finally, from heavy-ion collisions, we present recent results on jet-substructure and jet-yield modification, including modifications to the flavor content of jets. These measurements benefit from recent experimental advances which allow for a refined selection of jet populations to more precisely isolate physics effects such as path-length dependent energy loss. Additionally, future measurements will benefit from the high-statistics p+p, p+Au, and Au+Au datasets being taken in ongoing RHIC runs from 2023 to 2025, with a goal of $40\,\mathrm{nb}^{-1}$ of integrated sampled luminosity from rare triggers in Au+Au collisions. We will end with an outlook for future measurements using these data.