

Jet Substructure at LHCb

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The Large Hadron Collider beauty (LHCb) experiment allows for the exploration of jet substructure in novel ways. It is a fully instrumented spectrometer in the forward region, permitting increased sensitivity for heavy flavor hadron production as well as jets initiated by a light quark produced in association with a Z^0 boson. This allows for an analysis of the mass and flavor dependence of jet fragmentation and substructure properties, as well as a comprehensive comparison with gluon-dominated inclusive jet samples from other LHC experiments. Jet substructure measurements in pp collisions provide insight on heavy quark fragmentation and hadronization in vacuum, which can be used as a baseline to understand modification in the presence of quark-gluon plasma (QGP) produced in heavy-ion collisions. Heavy flavor production requires a hard process with energy above the heavy quark mass threshold and is therefore suppressed at later stages in high-energy collisions. This offers an ideal probe of medium evolution that is produced in the initial stages of heavy-ion collisions and perturbed throughout the lifetime of the plasma, accessible through the substructure of jets containing heavy flavor hadrons. In addition, the fantastic particle identification (PID) capabilities of LHCb allow for flavor-dependent correlations amongst jet constituents to be observed. Therefore, jets measured at LHCb provide a unique laboratory for studying in detail the process by which color charged partons become color neutral hadrons, how this process depends on the parton mass, and how it is affected in the high temperatures and energy densities of QGP produced in heavy-ion collisions. We present recent measurements of fragmentation properties for jets containing heavy quarkonia, as well as jets produced in association with a Z^0 boson. In addition, ongoing measurements of jet substructure for jets containing open heavy flavor hadrons in pp collisions will be discussed, as well as plans for future measurements in both pp and heavy-ion collisions.

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