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Studying jet substructure and hadronization at LHCb

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After a hard scattering event, an outgoing parton will radiate gluons which fragment into final-state hadrons. To study the radiation patterns of light and heavy partons, we look at the Lund jet plane (LJP), an observable where various types of emissions such as soft-collinear, hard-collinear, and non-perturbative emissions as well as initial-state radiation and the underlying event can be separately identified. To study fragmentation into hadrons, transverse-momentum-dependent fragmentation functions (TMD FFs) go beyond traditional collinear non-perturbative FFs and provide multidimensional information on the hadronization process. By measuring the LJP aimed at the parton level, and TMDs aimed at the hadron level, we obtain a more complete picture of the formation and evolution of jets. Recent results measuring TMD jet FFs for identified charged pions, kaons, and protons in a predominantly light quark jet sample will be presented, as well as the status of analyses of the LJP for light-, charm-, and beauty-initiated jets at the LHCb experiment, a forward ($2 < \eta < 5$) detector well-optimized for studying heavy flavor physics.

Primary author: CHAHROUR, Ibrahim (University of Michigan)

Presenter: CHAHROUR, Ibrahim (University of Michigan)

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