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Scanning the Lund plane of D-tagged jets to expose charm quark mass effects

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The development of iterative declustering techniques has brought the ability to reconstruct the jet tree and access the building blocks of the QCD parton shower. The iterative declustering of an angular-ordered jet allows to access the kinematic properties and mass effects at the level of each individual emission. In order to expose mass effects in heavy flavor-tagged jets, we study the splittings selected by two different grooming algorithms. We measure the splittings selected by newly proposed late-kt algorithm, that is designed to select collinear and perturbative splittings. In addition, the splittings given by a modified version of the SoftDrop algorithm that also requires the selected splitting to satisfy a perturbative kt cut, are studied. The splittings selected with these two algorithms populate different regions of the Lund jet plane, and we show how differently sensitive to the charm quark mass, gluon splitting to charm quark-antiquark pairs, and hadronization effects they are. The comparison of the results for the two algorithms exposes a modification of the structure in D-jets relative to inclusive jets due to the charm quark mass in a regime of high jet pT. The measurement of the substructure of D-jets and inclusive jets is performed using data collected with the CMS experiment, in proton-proton collisions at a center-of-mass energy of 5.02 TeV.

Primary authors: MIJUSKOVIC, Jelena (Istituto Nazionale di Fisica Nucleare); LIAO, hongbo

Presenter: MIJUSKOVIC, Jelena (Istituto Nazionale di Fisica Nucleare)

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