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Heavy-flavor jet substructure for probing the flavour dependences of QCD parton showers with ALICE

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Properties of partonic fragmentation in QCD depend on parton flavours in $1 \rightarrow 2$ splitting processes in parton showers due to the different Casimir factors of quarks and gluons, and to the different masses of light- and heavy-flavour quarks. Heavy-flavour jets provide a unique experimental tool to probe these flavour dependencies, particularly at low and intermediate transverse momenta where mass effects are significant. The ALICE detector has excellent particle tracking and PID performance to tag jets with reconstructed heavy-flavour hadrons. These capabilities are essential for jet substructure studies as they remove significant contamination from heavy-flavour hadron decay products and allows us to trace the quark flavour through the splitting tree. We report a series of heavy-flavour jet substructure measurements tagged with a reconstructed D^0 meson. These include first measurements of the jet axes differences between different recombination and grooming schemes and the jet angularities where the angular exponent can tune the sensitivity to mass and Casimir effects. Additionally, the groomed momentum fraction and opening angle of the first splitting are reported, which link to fundamental ingredients of the splitting functions. Comparisons with flavour-untagged jets probe flavour dependencies from the charm quark mass and the high purity quark nature of the D^0 -tagged jet sample. Further comparisons to different MC generators will assess the role of these flavour dependencies in other parton shower prescriptions.

Category

Experiment

Collaboration (if applicable)

ALICE

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