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Studies of beauty-quark production, hadronisation and cold nuclear matter effects via measurements of non-prompt charm hadrons in pp and p-Pb collisions with ALICE

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Measurements of beauty-hadron production in ultrarelativistic hadronic collisions provide a fundamental tool for testing perturbative QCD calculations. In particular, these calculations include a fragmentation function, which models the transition from the quark to a hadron state and is parameterized based on measurements in leptonic collisions. Recent results have shown that the beauty fragmentation function, as well as that of charm, is not universal across different collision systems. An extension of these studies to further energies, rapidities and collision systems has thus become crucial. Additionally, studies in p-Pb collisions allow us to shed light on the role of cold nuclear matter effects on beauty production and their impact on beauty-quark hadronisation.

The ALICE experiment is capable of performing high-precision measurements of non-prompt D mesons and Λ_c^+ baryons, profiting of its excellent tracking, vertexing and particle-identification performance, and exploiting machine-learning techniques for the classification of prompt and non-prompt D mesons.

In this presentation, the final results on non-prompt charm baryon-over-meson and meson-over-meson production yield ratios in pp collisions at $\sqrt{s} = 13$ TeV will be shown and compared to pQCD predictions, as well as to models with modified hadronisation mechanisms with respect to in-vacuum fragmentation. The final results of non-prompt charm-hadron production yield ratios in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV, as well as of nuclear modification factor of non-prompt D^0 , D^+ , D_s^+ , Λ_c^+ , will also be discussed. All measurements will be compared with their prompt counterparts. The final results of total $b\bar{b}$ production cross section at midrapidity in pp collisions will also be presented. Finally, the first studies of non-prompt/prompt production yield ratios of charm hadrons in pp collisions at $\sqrt{s} = 13.6$ TeV from the LHC Run3 data taking will be reported.

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