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Measurement of open heavy-flavour hadron production in pp, p-Pb and Pb-Pb collisions with ALICE

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Heavy quarks (charm and beauty) are effective probes to test perturbative QCD-based calculations in pp collisions and to study cold nuclear matter (CNM) effects such as gluon saturation, shadowing, k_T broadening and energy loss in CNM in p-Pb collisions.

With the ALICE detectors, open heavy flavours are measured via the full reconstruction of hadronic decays of non-strange D mesons, D_s^+ mesons and Λ_c^+ baryons, and the semi-electronic decay channels of electrons from open charm and open beauty hadron decays and Ξ_c^0 at mid-rapidity and, via the semi-muonic decays at forward rapidity. The measurements of Λ_c^+ and Ξ_c^0 production can shed light on charm hadronisation mechanisms in the absence of the hot and dense QCD medium. The comparisons of charmed baryon-to-meson ratios with models tuned to e^+e^- collisions allow us to examine the possible contributions of charm quark recombination or coalescence, which may be more prevalent at large charged-particle multiplicities, and to potentially disentangle these effects from pure vacuum fragmentation. Recent observations in pp and p-Pb collisions showed remarkable similarities with Pb-Pb collisions, which might suggest the presence of collectivity. To further explore the origin the collective-like effects observed in pp and p-Pb collisions, the study of open heavy-flavour production as a function of the charged-particle multiplicity naturally links soft and hard processes that occur in the collision and allows one to study their interplay.

In this contribution, the production cross sections of D mesons and open heavy-flavour decay electrons measured at mid-rapidity, and open heavy-flavour decay muons measured at forward rapidity in pp collisions at $\sqrt{s} = 5.02$ TeV with ALICE detector will be presented. The latest ALICE results on Λ_c^+ and Ξ_c^0 production and Λ_c^+/D^0 ratio in pp collisions at $\sqrt{s} = 7$ TeV and in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV, and Ξ_c^0/D^0 ratio in pp collisions at $\sqrt{s} = 7$ TeV and their comparison to model calculations and to equivalent results from the light-flavour sector will be discussed. The results of beauty production using beauty-decay electrons and non-prompt D mesons in pp collisions at $\sqrt{s} = 5.02$ TeV and the self-normalized yield of open heavy-flavour decay electrons and muons as a function of multiplicity in pp and p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV will be presented. Finally, the nuclear modification factor (Q_{pPb}) of D mesons in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV and the comparison of the experimental results with theoretical models will be discussed as well.

Primary author: ALICE COLLABORATION

Presenter: FAGGIN, Mattia

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