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Heavy-flavour production measurements in small and large systems with ALICE

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Hadrons carrying heavy flavour, i.e. charm or beauty quarks, are unique probes in hadronic collisions at high energies. Due to their large masses, heavy quarks are predominantly produced in hard parton scattering processes in the initial phase of the collisions. Therefore, measurements of heavy-flavour hadron production in pp collisions provide tests of perturbative QCD and constitute a crucial baseline for the study of heavy-flavour production in heavy-ion collisions. In particular, the differential measurements of heavy-flavour particle multiplicity dependence or angular correlations with charged particles provide insight into their production mechanisms, fragmentation properties, as well as into the interplay between the hard and soft processes. At the LHC energies, multiple parton interactions may also influence heavy-flavour production. In addition, the charmed baryon-to-meson ratio is sensitive to hadronisation mechanisms.

In p-Pb collisions, heavy-flavour production is affected by cold nuclear matter effects, such as the modification of the parton density distribution of nucleons bound in nuclei with respect to those of free nucleons, multiple soft scatterings of partons in the initial state (k_{\perp} broadening), initial geometry fluctuations or gluon radiation (energy loss). The modelisation of those effects usually considers a dependence on the collision geometry. Heavy-flavour measurements in p-Pb collisions help to characterise the initial state of heavy-ion collisions and are the mandatory reference for the interpretation of the corresponding studies in Pb-Pb collisions, where heavy quarks interact with the medium constituents providing information on the transport properties of the medium.

ALICE capabilities allow for full reconstruction of the hadronic decays of open-charmed D mesons (D^0 , D^+ , D^{*+} and D_{s1}^+) and baryons (Λ_c^+) at central rapidity, studies of leptons from charm and beauty decays at central and forward rapidity, partial Λ_c^+ and X_{ic}^0 reconstruction of their electronic decay channel at central rapidity, as well as reconstruction of jets with D mesons at central rapidity. An overview of the heavy-flavour measurements in pp, p-Pb and Pb-Pb collisions with ALICE will be given. Special attention will be put on the production cross sections, baryon-to-meson ratio, nuclear modification factors, angular correlations between heavy flavours and charged particles, heavy flavour v_2 , and the studies of the multiplicity dependence of their yields, which will be discussed in terms of collision centrality or as a function of charged-particle multiplicity. Results will be compared with model calculations when possible.

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