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The role of strangeness and baryon enhancement in heavy-quark hadronization from pp to Pb–Pb collisions with ALICE

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Understanding charm-quark hadronization is key to characterizing the quark–gluon plasma formed in heavy-ion collisions. Measurements of strange and non-strange charm hadrons across collision systems probe hadronization mechanisms, particularly in Pb–Pb collisions where abundant strangeness is expected to enhance recombination effects and provide stringent tests of statistical-hadronization models. In addition, the observed enhancement of charm-baryon production relative to mesons compared with e^+e^- collisions challenges fragmentation-based descriptions and motivates models incorporating modified hadronization mechanisms. A consistent description of both strange and non-strange charm baryons remains an open question, calling for precise experimental constraints.

In this contribution, we present a combined study of charm-meson and charm-baryon production with ALICE. We report measurements of the D_s^+/D^+ production ratio from low-multiplicity pp collisions at $\sqrt{s} = 13.6$ TeV to Pb–Pb collisions at $\sqrt{s_{NN}} = 5.36$ TeV. We also present the first p_T -differential cross sections of the orbitally excited $D_{s1}(2536)^+$ and $D_{s2}(2573)^{*+}$ mesons in pp collisions at $\sqrt{s} = 13.6$ TeV, including their yield ratios to the D_s^+ ground state. Furthermore, we discuss measurements of non-strange (Λ_c^+ , $\Sigma_c^{0,++}$) and strange ($\Xi_c^{0,+}$) charm baryons in pp collisions at $\sqrt{s} = 13.6$ TeV from LHC Run 3, and compare them with model predictions. Finally, we highlight baryon-to-meson ratios as functions of event multiplicity, including the latest Λ_c^+/D^0 results.

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