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Measurements of $\Sigma_c^{0,++}$ (2455, 2520) baryon productions in proton–proton collisions with ALICE

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Recent measurements of charm-baryon production at midrapidity in small collision systems show a baryon-to-meson ratio significantly higher than that measured in e+e- and e-p collisions. These results indicate that the charm-baryon production in hadronic collisions is not fully understood and suggest a non-universality of fragmentation functions among different collision systems. Models that better describe the Λ_c^+/D^0 ratio in pp collisions point to a significant contribution to Λ_c^+ yield from decays of heavier charm-baryon states. Therefore, measurements of the production of charm-baryon states decaying to Λ_c^+ are crucial to understand the charm-quark hadronization in the presence of a surrounding partonic environment.

In this contribution, the measurements of $\Sigma_c(2455)^{0,++}$ and $\Sigma_c^*(2520)^{0,++}$ production in pp collisions at midrapidity obtained from the anlysis of the large datasets collected by ALICE during LHC Run 3 are presented. The classification of prompt and non-prompt $\Sigma_c^{0,++}$ baryons is performed by exploiting machine-learning techniques, taking advantage of the excellent tracking and vertexing performance of the upgraded ALICE detectors. The baryon-to-baryon ratio $\Sigma_c^*(2520)^{0,++}/\Sigma_c(2455)^{0,++}$ is presented and compared with model predictions. The baryon-to-meson ratios $\Sigma_c^{0,++,+++}/D^0$ and the feed-down contribution to Λ_c^+ production from $\Sigma_c^{0,++,+++}$ are also reported, with a more detailed p_T-differential study compared to Run 2 measurements. These measurements provide important constraints on the hadronization models and represent a fundamental contribution for the comprehension of charm quark hadronization.

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