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Measurements of charm quark production and hadronization at CMS

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The study of charm quark hadrons is an important probe to the processes of hadronization of heavy quarks. More specifically, we present results on the production of Λ_c baryon, the nuclear modification factors (R_{AA}), and the Λ_c/D^0 yield ratios at $\sqrt{s_{NN}} = 5.02$˜TeV in proton-proton (pp) collisions and in different centrality regions in lead-lead (PbPb) collisions, using data recorded with the CMS detector in 2017 and 2018, respectively. The reported R_{AA} for Λ_c provides useful information regarding the energy loss mechanism of charm quark in the quark-gluon plasma. Its p_T-dependence is similar to that of other charm and beauty hadrons but with its minimum shifted towards higher p_T. Comparing the Λ_c/D^0 production ratio in pp and PbPb collisions suggests that coalescence as an hadronization process is not significant for $p_T > 10$˜GeV/c. The ratio becomes comparable to the measurements in e^+e^- collisions for $p_T > 30$˜GeV/c. We also present results of the Λ_c baryon and D^0 meson production and their ratios in proton-lead (Pb) collisions at $\sqrt{s_{NN}} = 8.16$˜TeV as a function of p_T and final-state multiplicity using the data recorded by the CMS experiment in 2016. We do not observe any significant multiplicity dependence for the baryon over meson ratio for charm hadrons. The difference between the results from charm quarks and that from light quarks, based on a previous study, suggests coalescence processes of heavy quarks saturate earlier than those of light quarks.

Category

Experiment

Collaboration (if applicable)

CMS

Primary author: CHANDRA, Soumik (Purdue University (US))

Presenter: CHANDRA, Soumik (Purdue University (US))

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