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Extending the ALICE strong-interaction studies to nuclei: measurement of proton-deuteron, $K^{\pm}$-deuteron, and Λ-deuteron correlations in pp collisions at $\sqrt{s}$ = 13 TeV

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In the journey to explore the strong interaction among hadrons, ALICE has for the first time flared out its femtoscopic studies to nuclei. The large data sample of high-multiplicity pp collisions at $\sqrt{s}$ = 13 TeV allows the measurement of the proton-deuteron (p-d), the kaon-deuteron ($K^{\pm}$-d), and the Lambda-deuteron (Λ-d) momentum correlations. The femtoscopic study of these systems opens the door to investigate the formation mechanism of the light nuclei in hadron-hadron collisions.

In this contribution, the measured correlation functions for p-d, $K^{\pm}$-d, and Λ-d are presented and compared to theoretical predictions. In the case of p-d correlations, the data shows a shallow depletion at low relative momenta, while the full-fledged model calculations which include all relevant interactions predict a strong repulsive signal. Possible explanations include a late formation of the deuterons leading to the suppression of strong interactions between protons and deuterons. Likewise, the experimentally obtained $K^{\pm}$-d correlation function shows a Coulomb-like depletion which is well reproduced by the theoretical two-body Coulomb interaction. This result presents a complementary information to the p-d on the late formation of deuterons. In addition, the measured Λ-d correlation is in agreement with hypothesis of no strong interaction due to the late formation of deuterons, supporting the findings in p-d. In general, we demonstrate how correlation functions can be exploited to study the production mechanism of light nuclei at the LHC.

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