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First measurement of properties of strong interaction between deuterons and light hadrons in Pb–Pb collisions with ALICE

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Accurate knowledge of the strong interaction between charged kaons and (anti)deuteron is a missing piece of information in the field of the low-energy (anti)kaon-nucleon interactions for more than 40 years. The interaction between charged kaons and (anti)deuterons is a complex subject at both experimental and theoretical levels. From the experimental point of view, so far scattering cross sections at intermediate momenta were performed. Specific information on the strong interaction can be accessed also via kaonic deuterium X-ray spectroscopy but such measurements are challenging due to the available detection efficiency. One of the missing information on K^-d and K^+d interactions is their scattering lengths. Due to the lack of direct experimental measurements, theoretical predictions for K^-d have been made based on input from kaonic hydrogen measurements. There are no published theoretical predictions for the scattering length of K^+d . The first femtoscopic measurement of $K^+d \oplus K^- \bar{d}$ and $K^-d \oplus K^+ \bar{d}$ in Pb–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV are presented. In this study, the scattering lengths of K^+d and K^-d pairs associated with strong final-state interactions, as well as the source radii of the kaon-deuteron pairs were determined using the Lednický-Lyuboshitz model. The interaction parameters obtained for $K^+d \oplus K^- \bar{d}$ and $K^-d \oplus K^+ \bar{d}$ are compared with the values available in the literature to discriminate between the different theoretical approaches.

Category

Experiment

Collaboration (if applicable)

ALICE

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