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Precise tests of the hadron-hadron strong interaction via femtoscopy with ALICE

Wednesday, 19 May 2021 15:15 (30 minutes)

In this talk, we will show how the study of two-particle correlations at small relative momentum can be used to give a direct insight into short-range hadron-hadron strong interactions.

Our experimental knowledge on hadron-hadron interactions is based mostly on scattering data and, in the case of systems with strangeness, the study of exotic atoms and the characterization of hypernuclei. We now demonstrate that the femtoscopic technique can be applied to study the effects of the strong interaction between hadrons with unprecedented precision. Two-particle correlations at small relative momentum originate from final-state interactions and are also sensitive to the size of the particle-emitting source. In the pp and p-Pb collisions studied by ALICE, hadrons originate from very small spacetime volumes, of the order of 1 fm. Since the proton-proton interaction is well known, the proton-proton correlation function is used to constrain the size and shape of the hadron-emitting source. Newly developed analysis tools are used to compare the experimentally measured correlation functions to theory predictions using either potentials or wave functions as input.

We will present results from baryon-hyperon (p-Λ, p-Σ^0, p-Ξ^- and p-Ω^-), hyperon-hyperon (Λ-Λ) and baryon-meson (p-K^-) correlations using ALICE data in pp and p-Pb collisions. The high precision of the ALICE data allow testing with high sensitivity the predictions from the most recent models of such interactions, including chiral, meson exchange models, and recent Lattice QCD calculations. The consequences for the equation of state for neutron-rich matter including hyperons and for the possible existence of exotic di-baryons are discussed.

Collaboration

ALICE

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