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Antikaon-nucleon interactions and the momentum correlation functions in high-energy collisions

The strong interaction between an antikaon and a nucleon is at the origin of various interesting phenomena in kaon-nuclear systems [1]. In particular, the interaction in the isospin $I = 0$ channel is sufficiently attractive to generate a quasi-bound state, the $\Lambda(1405)$ resonance, below the $\bar{K}N$ threshold. Based on this picture, it may be expected that the $\bar{K}N$ interaction also generates quasi-bound states in kaon-nuclear systems, sometimes called kaonic nuclei. At the same time, the $\bar{K}N$ quasi-bound picture of the $\Lambda(1405)$ is also related to the discussion of hadronic molecules in hadron spectroscopy.

Femtoscopic study of the two-particle momentum correlation functions in high-energy collisions has become a new method to extract the hadron-hadron interactions. We study the two-particle correlation function of a K^-p pair from high-energy collisions in the $\bar{K}N$-$\pi\Sigma$-$\pi\Lambda$ coupled-channels framework [2]. The effects of all coupled channels together with the Coulomb potential and the threshold energy difference between K^-p and $\bar{K}^0n$ are treated completely. Realistic potentials based on the chiral SU(3) dynamics are used which fit the available scattering data [3]. We discuss the resulting K^-p correlation functions in comparison with the recent measurements by the ALICE collaboration with various collision conditions [4].

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