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Energy dependence of KbarN interaction in nuclear medium

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We have constructed effective separable meson-baryon potentials to match the equivalent chiral amplitudes with the parameters of the model fitted to the kaonic hydrogen and low energy K^-p reactions data [1]. When the $\bar{K}N$ system is submerged in nuclear medium the $\bar{K}N$ scattering amplitude and the final state branching ratios exhibit a strong energy dependence when going to energies below the $\bar{K}N$ threshold [2]. The observed behavior is related to the dynamics of the well known $\Lambda(1405)$ resonance as well as to a combined effect of in-medium Pauli blocking and kaon selfenergy. A sharp increase of $\bar{K}N$ attraction below the $\bar{K}N$ threshold provides a link between shallow $\bar{K}$-nuclear potentials based on the chiral $\bar{K}N$ amplitude evaluated at threshold and the deep phenomenological optical potentials obtained in fits to kaonic atoms data.
The energy and density dependence of the in-medium $R(K^-N \to \pi\Lambda)$ branching ratio has allowed us to explain the A-dependence of the Λ-hypernuclear production rates [3] measured by the FINUDA collaboration in the experiment with stopped kaons. Similarly, we demonstrate the impact of a subthreshold energy dependence of the in-medium $\bar{K}N$ amplitude on the characteristics of $\bar{K}$-nuclear states and on the construction of the K^--nuclear optical potential used to describe the kaonic atoms data [2, 4].

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