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The role of isospin filtering reactions in the $S = -1$ sector.

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Collaboration

Abstract content

The plausible explanation of the $\Lambda(1405)$ resonance as a molecular state arising from coupled channel meson-baryon re-scattering in the strangeness $S = -1$ sector employing the lowest order chiral Lagrangian is one of the most important successes of Unitaritzed Chiral Perturbation Theory (UChPT). Despite this theoretical breakthrough, the aim for more precise calculations led the community to extend this approach with the inclusion of higher order terms and to explore higher energies. Unfortunately, the parameters of these higher-order terms are not fixed by the symmetries of the underlying theory, thus making the experimental fitting procedures to play a key role. In our previous studies [1,2], the relevance of the next-to-leading order (NLO) terms as well as the Born terms of the Chiral $SU(3)$ Lagrangian for the $K\Xi$ channels was proved establishing the experimental $K^-p \to K\Xi$ cross-section data as a very important ingredient to obtain more reliable values of the NLO parameters. The analysis of the isospin components of the $K^-p \to K\Xi$ cross-section for different parametrizations in [2] revealed the need to explore reactions acting as isospin selectors. Motivated by the previous findings, we present results of a new fit which includes additional experimental data from the reactions $K^-p \to \eta\Lambda(I = 0), \eta\Sigma^0(I = 1)$ [3] and analyse their effect on the NLO parameters. In addition, we give predictions for other isospin filtering processes whose measurement would provide valuable constraints on the chiral models, namely, the $K_L^0 p \to K^+\Xi^0$ reaction, which is an $I = 1$ filtering process and is planned to be measured at JLab, and the weak Λ_b decay into a J/Ψ and the $I = 0$ component of a $S = -1$ meson-baryon [4]. The stability and the accuracy of all the parameters involved in the model have been examined by means of the explicit inclusion of $\Lambda(1890), \Sigma(2030)$ and $\Sigma(2250)$ resonances into the channels estimated to be sensitive to the NLO terms.

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Primary author(s) : MAGAS, Volodymyr (University of Barcelona); RAMOS, Angels (University of Barcelona); FEIJOO, Albert (Nuclear Physics Institute, 25068 Rez, Czech Republic)

Presenter(s) : FEIJOO, Albert (Nuclear Physics Institute, 25068 Rez, Czech Republic)

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