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$A = 4 - 7 \Xi$ hypernuclei based on interactions from chiral effective field theory

Experimental information on hypernuclei with double strangeness, in particular Ξ systems, is very limited because of low intensity of kaon beams and the extremely short life times of hyperons. In this contribution, I report on an investigation of the possible existence of bound Ξ states in systems with $A = 4 - 7$ baryons using the Jacobi NCSM [1] approach in combination with chiral NN [2] and ΞN [3] interactions. Three shallow bound states for the $NNN\Xi$ system (with $(J^\pi, T) = (1^+, 0), (0^+, 1)$ and $(1^+, 1)$) with quite similar binding energies are found. The ${}^5_{\Xi}H(\frac{1}{2}^+, \frac{1}{2})$ and ${}^7_{\Xi}H(\frac{1}{2}^+, \frac{3}{2})$ hypernuclei are also clearly bound with respect to the thresholds ${}^4\text{He} + \Xi$ and ${}^6\text{He} + \Xi$, respectively. A perturbative estimate suggests that the decay widths of these states could be sufficiently small enough for them to be observed in experiment. Such an observation would provide important experimental constraints on ΞN interactions.

References

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