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Application of low-energy theorems to NN scattering at unphysical pion masses

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The low-energy theorems (LET) for NN scattering are known to provide important relations between the coefficients in the effective-range expansion (ERE) of the amplitude, which are governed by the long-range part of the potential, see, e.g., [1, 2]. Therefore, as long as the long-range physics is appropriately included in the calculation, these relations should yield model independent predictions for the coefficients in the ERE, provided some of these coefficients are known. In particular, using the NN scattering length in the $3S_1$ channel as input, the effective range and the shape parameters predicted in Ref. [3] appear to be in a good agreement with those extracted from Nijmegen PWA [4]. In this work we extend the LET to the case of unphysical pion masses. It is emphasized that correlations provided by LET can be used as nontrivial consistency checks for the lattice calculations. As an example, we use the m_π dependence of the effective range suggested in the recent lattice study [5] as input to predict the m_π dependence of the binding energy and the shape parameters. Further, we discuss the results of chiral extrapolations calculated to NLO using the modified Weinberg formulation of chiral effective field theory.

References

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