Erratum: Triton binding energy and neutron-deuteron scattering up to next-to-leading order in chiral effective field theory [Phys. Rev. C **96, 024002 (2017)]**

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(Received 6 May 2019; published 9 July 2019)

DOI: [10.1103/PhysRevC.100.019901](https://doi.org/10.1103/PhysRevC.100.019901)

Due to improper handling of the input files, the next-to-leading-order (NLO) three-body matrix elements reported in the original article are erroneous. We present here corrected results for the triton binding energy E_{3H} and the neutron-deuteron doublet scattering length $^2a_{nd}$ at NLO in a properly renormalized Chiral Effective Field Theory. Results have not changed for the two-nucleon system at leading order (LO) and NLO, and for the three-nucleon system at LO. The magnitude of the NLO three-nucleon contributions has roughly tripled. However, the qualitative behavior seen in the original paper persists, and the physics arguments have not been affected.

Rectified results for E_{3H} and $^2a_{nd}$ up to NLO are shown in Fig. 1 which is an update of Fig. 23 of our paper. Curves are shown for the different fitting procedures listed in Table I of the original article. For an appreciation of the NLO corrections, the unchanged results at LO are given together with experimental values. Compared to the previous calculation, the new results show larger NLO corrections and converge to values closer to experiment.

The correlation between E_{3H} and $^2a_{nd}$ is presented in Fig. 2, which replaces Fig. 18 of the original article. Because of the change in the cutoff dependence at low cutoff values, these quantities no longer display a clean linear correlation at low cutoff values. However, an approximately linear correlation holds at cutoff values beyond the breakdown scale of the theory. For the same range of cutoff values as LO, the area covered by NLO is now much smaller and closer to the experimental point.

The residual cutoff dependence of the corrected NLO results can be analyzed with Eqs. (23) and (24) of the original article. The updated parameters of the first three inverse powers of the cutoff Λ as well as the physical quantities in the $\Lambda \rightarrow \infty$ limit are presented in Tables I and II, which replace Tables III and IV of our paper. The parameters $p_{t1-3}^{(n)}$ and $p_{d1-3}^{(n)}$ that set the size of the cutoff dependence are mostly in the order of hundreds of MeV as expected. As in the original article, the four-parameter fits suffer from larger errors and are not reliable. The dominant cutoff dependence comes from Λ^{-2} at LO whereas it is from Λ^{-1} at NLO. The corresponding fits are shown in Figs. 3 and 4, which replace Figs. 19 and 20 of the original paper. Except at small values of the cutoff, the qualitative behavior is the same as observed in the original article.

The corrected results presented here do not alter the original conclusion that the three-nucleon system is properly renormalized when NLO corrections are treated perturbatively. Although the magnitude of the NLO corrections increased, the change in the triton binding energy from LO is less than 50% and is still consistent with a perturbative expansion. A stronger statement requires calculations to higher orders, which should be carried out in the future.

We are very grateful to C.-J. Yang for sharing his preliminary results on the triton binding energy in Chiral Effective Field Theory using the no-core shell model. Useful discussions with him led us to find a mistake in our NLO calculation.

TABLE I. Parameters of fits using Eq. (23) of the original paper to the leading-order and next-to-leading-order results for the triton binding energy from fitting procedure (II) for cutoff values $\Lambda \geq 1.2$ GeV. The parameters $E_{3H}^{(m)}(\infty)$ and $p_{t1-3}^{(m)}$ ($m = 0, 1$) are in MeV. Numbers in parentheses represent fitting errors.

LO				NLO			
$E_{3H}^{(0)}(\infty)$	$p_{t1}^{(0)}$	$[p_{t2}^{(0)}]^2$	$[p_{t3}^{(0)}]^3$	$E_{3H}^{(1)}(\infty)$	$p_{t1}^{(1)}$	$[p_{t2}^{(1)}]^2$	$[p_{t3}^{(1)}]^3$
-3.82	146(3)			-5.06	332(2)		
-3.88	35.6(4.6)	$[377(75)]^2$		-5.04	367(7)	$[210(93)]^2$	
-3.88	28.6(14)	$[403(194)]^2$	$-[254(310)]^3$	-5.03(1)	387(21)	$-[316(237)]^2$	$[354(354)]^3$

FIG. 1. Cutoff dependence of the triton energy (left) and the $J = 1/2$ neutron-deuteron scattering length (right) at NLO with the $n = 4$ regulator for different fitting procedures for the two-nucleon S -wave counterterms. Results are shown for strategies (I) (green dashed line), (II) (blue dotted line), (III) (magenta dot-dashed line), and (IV) (black dots), in comparison with experiment (red solid line). Solid lines with the same colors are the (unchanged) LO results reported in the original paper.

TABLE II. Parameters of fits using Eq. (24) of the original paper to the leading-order and next-to-leading-order results for the nd doublet scattering length from fitting procedure (II) for cutoff values $\Lambda \geq 1.2$ GeV. The parameters ${}^2a_{nd}^{(m)}$ and $p_{d1-3}^{(m)}$ ($m = 0, 1$) are in fm and MeV, respectively. Numbers in parentheses represent fitting errors.

LO				NLO			
${}^2a_{nd}^{(0)}(\infty)$	$p_{d1}^{(0)}$	$[p_{d2}^{(0)}]^2$	$[p_{d3}^{(0)}]^3$	${}^2a_{nd}^{(1)}(\infty)$	$p_{d1}^{(1)}$	$[p_{d2}^{(1)}]^2$	$[p_{d3}^{(1)}]^3$
5.05(1)	193(4)			2.50(1)	939(13)		
4.96	52.4(6.6)	$-[433(92)]^2$		2.69(1)	1410(12)	$[837(133)]^2$	
4.92(1)	-48.4(16.6)	$-[695(216)]^2$	$[616(332)]^3$	2.71(1)	1470(38)	$[947(346)]^2$	$-[543(459)]^3$

FIG. 2. Correlation between triton binding energy and nd doublet scattering length at leading order (left) and next-to-leading order (right). Different lines correspond to cutoff variation from the various fitting strategies, the arrow indicating the direction of increasing cutoff. Phenomenological model results (triangles) and the empirical value (circle) are also shown.

FIG. 3. Cutoff dependence of the triton binding energy at LO (left) and NLO (right) with the $n = 4$ regulator and fitting procedure (II). The blue, magenta, and black solid lines are, respectively, two-, three-, and four-parameter fits with Eqs. (20) and (23) of our paper to results for $\Lambda \geq 1.2 \text{ GeV}$.

FIG. 4. Cutoff dependence of the nd doublet scattering length at LO (left) and NLO (right) with the $n = 4$ regulator and fitting procedure (II). The blue, magenta, and black solid lines are two-, three-, and four-parameter fits, respectively, with Eqs. (21) and (24) of our paper to results for $\Lambda \geq 1.2 \text{ GeV}$.