Erratum: Three-Nucleon Low-Energy Constants from the Consistency of Interactions and Currents in Chiral Effective Field Theory [Phys. Rev. Lett. **103**, 102502 (2009)]

Doron Gazit, Sofia Quaglioni, and Petr Navrátil

(Received 27 November 2018; published 15 January 2019)

DOI: [10.1103/PhysRevLett.122.029901](https://doi.org/10.1103/PhysRevLett.122.029901)

It was recently brought to our attention [1] that Eq. (2) contains an erroneous factor of -4 in the coefficient multiplying the c_D low-energy constant (LEC). The correct expression for the strength $\hat{d}_R$ of the contact term of the meson-exchange currents (MEC) is given by

$$\hat{d}_R = -\frac{M_N}{4\Lambda_\chi g_A} c_D + \frac{1}{3} M_N (c_3 + 2c_4) + \frac{1}{6}. \quad (2)$$

This mistake affects the determination of the LEC c_D entering the one-pion exchange plus the contact term of the three-nucleon (NNN) force at next-to-next-to-leading order (N^2 LO) from the triton β decay, i.e., the results shown in Fig. 3. The correct results are shown in the figure below, where the shaded area represents a 2σ tolerance band. Agreement with the empirical value based on a 2σ error bar is found for $c_D = 0.83 \pm 0.24$. The corresponding c_E values are given by $c_E = -0.052^{+0.033}_{-0.034}$. As in the original Letter, the computed $\langle E_1^A \rangle_{\text{theor}} / \langle E_1^A \rangle_{\text{emp}}$ ratio is rather insensitive to the NNN force. However, due to the roughly factor of -4 rescaling of c_D , the difference with respect to results obtained using $A = 3$ wave functions produced by the phenomenological AV18 nucleon-nucleon (NN) potential and by the next-to-next-to-next-to-leading order (N^3 LO) NN potentials of Epelbaum *et al.* [30] is now amplified. Similarly, calculations (without NNN force) carried out by setting c_4 to 3.4 GeV^{-1} in the axial-vector current, while the $A = 3$ wave functions are obtained from the N^3 LO NN potential of Ref. [22] produces a shift of about -1.2 in the c_D values.

Table I displayed the ^3H , ^3He , and ^4He ground state (g.s.) energies and point-proton radii obtained using the N^3 LO NN potential [22] with and without the local N^2 LO NNN interaction [23] with $c_D = -0.2$ and $c_E = -0.205$. The updated table

FIG. 3. The ratio $\langle E_1^A \rangle_{\text{theor}} / \langle E_1^A \rangle_{\text{emp}}$ using the N^3 LO NN potential [22] with and without the local N^2 LO NNN interaction [23], and the axial current with and without MEC (c_D and c_E are varied along the averaged trajectory of Fig. 2). The shaded area represents a 2σ tolerance band. Also shown are the results for the phenomenological AV18 potential (with $\Lambda = 500 \text{ MeV}$ imposed in the current), and for the N^3 LO NN potential of Epelbaum *et al.* [30] (with $\Lambda = 450, 600 \text{ MeV}$, and a 700 MeV spectral-function cutoff in the two-pion exchange).

TABLE I. Calculated ${}^3\text{H}$, ${}^3\text{He}$, and ${}^4\text{He}$ g.s. energies (in MeV) and point-proton radii (in fm), obtained using the N^3LO NN potential [22] with and without the local N^2LO NNN interaction [23] with $c_D = 0.83$ and $c_E = -0.052$, compared to experiment.

	${}^3\text{H}$		${}^3\text{He}$		${}^4\text{He}$	
	$E_{\text{g.s.}}$	$\langle r_p^2 \rangle^{1/2}$	$E_{\text{g.s.}}$	$\langle r_p^2 \rangle^{1/2}$	$E_{\text{g.s.}}$	$\langle r_p^2 \rangle^{1/2}$
NN	$-7.852(2)$	$1.651(5)$	$-7.124(2)$	$1.847(5)$	$-25.39(1)$	$1.515(2)$
$NN + NNN$	$-8.473(2)$	$1.607(5)$	$-7.729(2)$	$1.787(5)$	$-28.38(2)$	$1.469(5)$
Expt.	-8.482	1.60	-7.718	1.77	-28.296	$1.467(13)$ [31]

for the new set of LECs, $c_D = 0.83$ and $c_E = -0.052$ is shown above. The ${}^4\text{He}$ g.s. energy and point-proton radius for the lower $(0.59, -0.086)$ and upper $(1.07, -0.018)$ bounds of c_D and c_E are, respectively, $E_{\text{g.s.}} = -28.41(2)$, $\langle r_p^2 \rangle^{1/2} = 1.467(5)$, and $E_{\text{g.s.}} = -28.35(2)$, $\langle r_p^2 \rangle^{1/2} = 1.471(5)$. The other results and conclusions of the original Letter remain unaffected.

We thank E. Epelbaum, S. Pastore, R. Schiavilla, and K. Wendt for useful discussions. Computing support for this work came from the LLNL institutional Computing Grand Challenge program. Prepared in part by LLNL under Contract DE-AC52-07NA27344. This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics, under Work Proposal No. SCW1579, the LDRD project 18-ERD-008, and by the NSERC Grants No. 401945-2011 and No. SAPIN-2016-00033. TRIUMF receives federal funding via a contribution agreement with the National Research Council of Canada.

[1] R. Schiavilla (private communication).