Erratum: Proton-Proton Weak Capture in Chiral Effective Field Theory [Phys. Rev. Lett. **110**, 192503 (2013)]

L. E. Marcucci, R. Schiavilla, and M. Viviani

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Upon re-examination of the computer programs used for the calculation, we have identified an error in the determination of the P -wave reduced matrix elements (RMEs) associated with the longitudinal multipole operator. These RMEs are denoted as $L_{\Lambda}^{LSJ}(q)$ in the Letter.

As a consequence of this error, the results relative to the P -wave contributions in Tables I and II and in Figs. 2 and 3 are incorrect. In particular, (1) Table I should be replaced by the following table, where we do not list the cumulative, but rather the individual contributions of each partial wave, since the P -waves contributions are found to be much smaller than the S wave. (2) Table II should be replaced by the following table, where we have removed the lines corresponding to the $S + P$ waves, since the P -waves contributions are negligible. (3) Figures 2 and 3 should be replaced by the following figures, where again we only show the S -wave results. (4) The discussions in this Letter of the P -wave contributions are changed. In particular, we note the following. (i) On page 3, the sentence “the P -wave contributions to $S(0)$ sum up to $\sim 1\%$ of the total value” should be replaced with “the P -wave contributions to $S(0)$ are about 5 orders of magnitude smaller than the S -wave ones, and therefore negligible.” (ii) The following sentence “the results can be summarized in the conservative range $S(0) = (4.030 \pm 0.006) \times 10^{-23}$ MeV fm²” should be replaced with “the results can be summarized in the conservative range $S(0) = (4.008 \pm 0.005) \times 10^{-23}$ MeV fm².” (iii) The result obtained within the AV18 potential when all the S and P waves are included is again essentially identical to that obtained with the 1S_0 channel only, i.e., $S(0) = (4.000 \pm 0.003) \times 10^{-23}$ MeV fm².

In conclusion, the total P -wave contributions amount to $\simeq 1.6 \times 10^{-28}$ MeV fm², which is in agreement with the recent study of Ref. [2], performed in pionless effective field theory.

There is also an additional issue that has come to light [3,4] since publication of the Letter, i.e., an error in the relation, originally given in Ref. [5], between the low-energy constant (LEC) c_D in three-nucleon contact interaction and the LEC d_R in the contact two-nucleon axial current. Unfortunately, this error has propagated widely in the nuclear theory community.

TABLE I. Individual S - and P -wave contributions to the astrophysical S factor at zero c.m. energy in units of MeV fm². The theoretical uncertainties, given in parentheses, are due to the fitting procedure adopted for the LECs in the weak current and affect essentially only the S -wave contributions. The results have been obtained with the two different cutoff values $\Lambda = 500$ and 600 MeV.

	1S_0	3P_0	3P_1	3P_2
$\Lambda = 500$ MeV	$4.008(5) \times 10^{-23}$	5.5×10^{-30}	1.2×10^{-28}	3.9×10^{-29}
$\Lambda = 600$ MeV	$4.008(5) \times 10^{-23}$	5.4×10^{-30}	1.1×10^{-28}	3.9×10^{-29}

TABLE II. Values for $S^n(0)/S(0)$ with $n = 1-4$, in units of MeV ^{$-n$} , and the χ^2 as defined in the text, obtained with a polynomial fit of $S(E)$ up to orders $O(E^2)$ (Fit 1), $O(E^3)$ (Fit 2), and $O(E^4)$ (Fit 3), retaining only S waves, since the P -wave contributions are negligible. Also listed are the results of Ref. [1]. The theoretical uncertainties, listed only for $n = 1, 2, 3$, are given in parentheses and account for the cutoff sensitivity and the errors due to the LEC's fitting procedure.

n	1	2	3	4	χ^2
Fit 1	12.23(1)	178.4(3)			1.2×10^{-3}
Fit 2	11.42(1)	239.6(5)	$-1464(5)$		1.9×10^{-4}
Fit 3	10.82(1)	317.4(6)	$-5839(9)$	98×10^3	2.1×10^{-5}
Ref. [1]	11.3(1)	170(2)			4.7×10^{-1}

FIG. 1. The astrophysical S factor as function of the c.m. energy in the range 0–100 keV. Since the S - and $(S + P)$ -wave results essentially overlap, only the S -wave results are shown. In the inset, $S(E)$ is shown in the range 3–15 keV.

FIG. 2. The astrophysical S factor in the energy range 0–100 keV, calculated with $\Lambda = 500$ MeV and $c_D = -0.20$ and including the S -wave contributions is compared with the cubic polynomial fit and the quadratic fit of Ref. [1]. In the inset, $S(E)$ is shown in the range 3–15 keV. The $(S + P)$ -wave results are not shown, since they would be indistinguishable from the S -wave ones.

However, as we noted in Ref. [6], we expect this error to have a negligible impact on the present predictions. In order to test this expectation, as well as to take into account the most recent developments in both nuclear chiral interactions [7–9] and currents [10], we are in the process of re-examining the pp weak capture *in toto*.

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