Erratum: Three New Low-Energy Resonances in the ^{22}Ne$(p,\gamma)^{23}$Na Reaction [Phys. Rev. Lett. 115, 252501 (2015)]

F. Cavanna, R. Depalo, M. Aliotta, M. Anders, D. Bemmerer, A. Best, A. Boeltzig, C. Broggini, C. G. Bruno, A. Caciolli, P. Corvisiero, T. Davinson, A. di Leva, Z. Elekes, F. Ferraro, A. Formicola, Zs. Fülöp, G. Gervino, A. Guglielmetti, C. Gustavino, Gy. Gyürky, G. Imbriani, M. Junker, R. Menegazzo, V. Mossa, F. R. Pantaleo, P. Prati, D. A. Scott, E. Somorjai, O. Straniero, F. Strieder, T. Szücs, M. P. Takács, and D. Trezzi

(The LUNA Collaboration)

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The reported strengths of newly discovered resonances in original Letter were affected by an error in the analysis. The energy straggling of the ion beam was erroneously neglected. When taking this effect into account, 18–19% higher values are found for the resonance strengths. The astrophysical implications are unchanged.

The strength $\omega\gamma = \omega\Gamma_p\Gamma_\gamma/(\Gamma_p + \Gamma_\gamma)$ of a radiative proton capture resonance is given by the statistical factor ω and the proton and γ-ray widths $\Gamma_{p,\gamma}$, respectively. If the target thickness ΔE in energy is large compared to the total width, i.e., $\Delta E \gg \Gamma = \Gamma_p + \Gamma_\gamma$, the resonance strength can be obtained from the experimental yield by the thick-target approximation [1].

For the experiment of original Letter and Ref. [2], $\Delta E \approx 3.9$ keV and both the proton [3] and γ-ray [4,5] widths of the three ^{23}Na levels studied are well below 1 keV. Therefore, the thick-target approximation was explicitly assumed in original Letter and Ref. [2] for the analysis.

However, this approximation is not applicable for this case. When including the effect of proton beam energy straggling in the calculated yields, a lower plateau yield emerges than in the thick-target case. As a consequence, the resonance strength data by original Letter and Ref. [2] must be corrected by a factor $1/C$ (Table I). A conservative error bar of 50% is assigned to the correction.

The observed strong increase in original Letter and Ref. [2] of the thermonuclear reaction rate, by a factor of 3 and more, is even stronger when using the corrected resonance strengths. The recalculation of the reaction rate is deferred to a forthcoming LUNA publication that will include new data with a different setup on the lowest-energy resonances and on the direct-capture component [6,7].

The astrophysical consequences shown in original Letter and [2] used a previous calculation [8] and remain valid. For newer astrophysical work, see Ref. [9], which is also unaffected by the present correction.

TABLE I. Original and corrected values for the resonance strength $\omega\gamma$, and straggling correction factor C in original Letter and [2]. For the corrected values, the statistical error bars (unchanged) and the systematical error bars (including the new correction) are given separately.

E_p [keV]	$\omega\gamma_{\mathrm{orig}}$ [eV] Original Letter and [2]	C	$\omega\gamma_{\mathrm{corr}}$ [eV]	stat.	syst.
156.2	$(1.48 \pm 0.10) \times 10^{-7}$	0.845	1.8×10^{-7}	6%	8%
189.5	$(1.87 \pm 0.06) \times 10^{-6}$	0.850	2.2×10^{-6}	2%	8%
259.7	$(6.89 \pm 0.16) \times 10^{-6}$	0.841	8.2×10^{-6}	1%	8%

[1] C. Iliadis, *Nuclear Physics of Stars* 2nd ed. (Wiley-VCH, Weinheim, 2015).
[2] R. Depalo *et al.*, Phys. Rev. C **94**, 055804 (2016).
[3] S. E. Hale, A. E. Champagne, C. Iliadis, V. Y. Hansper, D. C. Powell, and J. C. Blackmon, Phys. Rev. C **65**, 015801 (2001).
[4] R. Vodhanel, M. K. Brussel, R. Moreh, W. C. Sellyey, and T. E. Chapuran, Phys. Rev. C **29**, 409 (1984).
[5] D. Jenkins *et al.*, Phys. Rev. C **87**, 064301 (2013).

[6] F. Ferraro *et al.*, Eur. Phys. J. A **54**, 44 (2018).
[7] F. Ferraro *et al.* (to be published).
[8] R. G. Izzard, M. Lugaro, A. I. Karakas, C. Iliadis, and M. van Raai, Astron. Astrophys. **466**, 641 (2007).
[9] A. Slemer *et al.*, Mon. Not. R. Astron. Soc. **465**, 4817 (2017).