Erratum: Precision analysis of electron energy spectrum and angular distribution of neutron β^- decay with polarized neutron and electron [Phys. Rev. C 95, 055502 (2017)]

A. N. Ivanov, R. Höllwieser, N. I. Troitskaya, M. Wellenzohn, and Ya. A. Berdnikov

(Received 1 September 2021; published 3 December 2021)

DOI: 10.1103/PhysRevC.104.069901

We correct the structure of the functions $h_n^{(1)}(E_e)$ and $h_n^{(2)}(E_e)$, describing the radiative corrections of the order of $O(\alpha/\pi)$ to the correlation coefficients $N(E_e)$ and $Q_e(E_e)$ of the electron energy and angular distribution of the neutron β decay for polarized neutrons, electrons, and unpolarized protons.

In the last line of Eq. (A1) in the original paper we have to add the term,

$$\cdots + \frac{\omega}{E_e}\frac{[\vec{\xi}_n\cdot\vec{\beta} - (\vec{\xi}_n\cdot\vec{n})(\vec{n}\cdot\vec{\beta})](\zeta_e^0 - \vec{n}\cdot\vec{\zeta}_e)}{(1-\vec{n}\cdot\vec{\beta})^2}\Bigg]\Bigg\}\Bigg), \tag{1}$$

where the ellipsis denotes the contribution of other terms in Eq. (A1) of our original paper. Such a term changes the functions $h_n^{(1)}(E_e)$ and $h_n^{(2)}(E_e)$, defining the radiative corrections of the order of $O(\alpha/\pi)$ to the correlation coefficients $N(E_e)$ and $Q_e(E_e)$ in Eq. (A9) of our paper as follows:

$$\begin{aligned}
h_n^{(1)}(E_e) &= \lim_{\omega_{\rm min}\to 0}\Big[g^{(3)}_{\beta^-_c\gamma}(E_e,\omega_{\rm min}) - g^{(1)}_{\beta^-_c\gamma}(E_e,\omega_{\rm min})\Big] + g_F(E_e)\frac{m_e}{E_e} - g_F(E_e)\frac{E_e}{m_e}\\
&= -\frac{1}{3}\frac{E_0-E_e}{E_e}\Bigg\{\Bigg(1+\frac{1+\beta^2}{8\beta^2}\frac{E_0-E_e}{E_e}\Bigg)\Bigg[\frac{1}{\beta}\ell n\Bigg(\frac{1+\beta}{1-\beta}\Bigg) - 2\Bigg] + \frac{1}{4}\frac{E_0-E_e}{E_e}\Bigg\} - \frac{\beta}{2}\ell n\Bigg(\frac{1+\beta}{1-\beta}\Bigg),\\
h_n^{(2)}(E_e) &= \lim_{\omega_{\rm min}\to 0}\Big[g^{(4)}_{\beta^-_c\gamma}(E_e,\omega_{\rm min}) - g^{(1)}_{\beta^-_c\gamma}(E_e,\omega_{\rm min})\Big] + g_F(E_e)\frac{m_e}{E_e} + g_F(E_e)\\
&= -\frac{1}{3}\frac{E_0-E_e}{E_e}\Bigg\{\Bigg(1+\frac{1+\beta^2}{8\beta^2}\frac{E_0-E_e}{E_e}\Bigg)\Bigg[\frac{1}{\beta}\ell n\Bigg(\frac{1+\beta}{1-\beta}\Bigg) - 2\Bigg] + \frac{1}{4}\frac{E_0-E_e}{E_e}\Bigg\}\\
&\quad +(1+\sqrt{1-\beta^2})\Bigg(\frac{1}{3}\frac{E_0-E_e}{\beta^2E_e}\Bigg[\frac{1}{\beta}\ell n\Bigg(\frac{1+\beta}{1-\beta}\Bigg) - 2\Bigg]\\
&\quad +\frac{1}{24}\frac{(E_0-E_e)^2}{\beta^2E_e^2}\Bigg\{\frac{3-\beta^2}{\beta^2}\Bigg[\frac{1}{\beta}\ell n\Bigg(\frac{1+\beta}{1-\beta}\Bigg) - 2\Bigg] - 2\Bigg\} + \frac{\sqrt{1-\beta^2}}{2\beta}\ell n\Bigg(\frac{1+\beta}{1-\beta}\Bigg)\Bigg).
\end{aligned} \tag{2}$$

For the details of the calculation we refer to the archive version arXiv:1705.07330v3 [hep-ph] of the original paper (see also Appendix B of the Ref. [1]).

This work was supported by the Austrian "Fonds zur Förderung der Wissenschaftlichen Forschung" (FWF) under Contract No. P31702-N27.

[1] A. N. Ivanov, R. Höllwieser, N. I. Troitskaya, M. Wellenzohn, and Y. A. Berdnikov, Structure of the correlation coefficients $S(E_e)$ and $U(E_e)$ of the neutron β decay, Phys. Rev. C **104**, 025503 (2021).

