# Erratum: Tests of the standard model in neutron beta decay with polarized electrons and unpolarized neutrons and protons [Phys. Rev. D 99, 053004 (2019)]

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In Eq. (18) of this paper in the correlation coefficient $\tilde{\zeta}(E_e)\tilde{K}_e(E_e)$ the term $-g_F(E_e)E_e/m_e$ should be replaced by $g_F(E_e)$. The same replacement should be done in the definition of the function $h^{(4)}_n(E_e)$ in Eq. (A-8). Then, in Eqs. (A-4), (A-6) and (A-7) of this paper in the last term the factor $1/4\beta^4$ should be replaced by $1/2\beta^4$. Such a replacement allows to simplify the expression in brackets multiplied by the factor $(1+\sqrt{1-\beta^2})$. Having carried out such a replacement and correct algebraical actions in Eq. (A-8) we obtain the following expressions for the functions $h^{(3)}_n(E_e)$ and $h^{(4)}_n(E_e)$:

$$\begin{aligned} h^{(3)}_n(E_e) &= \lim_{\omega_{\rm min}\to 0}[g^{(5)}_{\beta^-_c\gamma}(E_e,\omega_{\rm min}) - g^{(1)}_{\beta^-_c\gamma}(E_e,\omega_{\rm min})] + g_F(E_e)\frac{m_e}{E_e} - g_F(E_e)\frac{E_e}{m_e} \\ &= -\frac{1}{3}\frac{E_0-E_e}{E_e}\left\{\left(1+\frac{1+\beta^2}{8\beta^2}\frac{E_0-E_e}{E_e}\right)\left[\frac{1}{\beta}\ell n\left(\frac{1+\beta}{1-\beta}\right)-2\right]+\frac{1}{4}\frac{E_0-E_e}{E_e}\right\} - \frac{\beta}{2}\ell n\left(\frac{1+\beta}{1-\beta}\right), \\ h^{(4)}_n(E_e) &= \lim_{\omega_{\rm min}\to 0}[g^{(6)}_{\beta^-_c\gamma}(E_e,\omega_{\rm min}) - g^{(1)}_{\beta^-_c\gamma}(E_e,\omega_{\rm min})] + g_F(E_e)\frac{m_e}{E_e} + g_F(E_e) \\ &= -\frac{1}{3}\frac{E_0-E_e}{E_e}\left\{\left(1+\frac{1+\beta^2}{8\beta^2}\frac{E_0-E_e}{E_e}\right)\left[\frac{1}{\beta}\ell n\left(\frac{1+\beta}{1-\beta}\right)-2\right]+\frac{1}{4}\frac{E_0-E_e}{E_e}\right\} + (1+\sqrt{1-\beta^2}) \\ &\quad\times\left\{\frac{1}{3}\frac{E_0-E_e}{\beta^2 E_e}\left[\frac{1}{\beta}\ell n\left(\frac{1+\beta}{1-\beta}\right)-2\right] + \frac{1}{24}\frac{(E_0-E_e)^2}{\beta^2E_e^2}\left(\frac{3-\beta^2}{\beta^2}\left[\frac{1}{\beta}\ell n\left(\frac{1+\beta}{1-\beta}\right)-2\right]-2\right) + \frac{\sqrt{1-\beta^2}}{2\beta}\ell n\left(\frac{1+\beta}{1-\beta}\right)\right\}. \end{aligned} \quad (1)$$

For the details of the calculation we refer to the paper (see also Appendix B to Ref. [1]). The corrected functions $h^{(3)}_n(E_e)$ and $h^{(4)}_n(E_e)$ coincide with the functions $h^{(1)}_n(E_e)$ and $h^{(2)}_n(E_e)$, defining the radiative corrections of order $O(\alpha/\pi)$ to the correlation coefficients $N(E_e)$ and $Q_e(E_e)$, respectively [2].

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

[2] A. N. Ivanov, R. Höllwieser, N. I. Troitskaya, M. Wellenzohn, and Ya. A. Berdnikov, Precision analysis of electron energy spectrum and angular distribution of neutron $\beta^-$-Decay with polarized neutron and electron, Phys. Rev. C **95**, 055502(E) (2017)