

Erratum: Meson-nucleus bound states in the quark meson coupling model **[Phys. Rev. C 110, 055201 (2024)]**

 Arpita Mondal and Amruta Mishra 


(Received 22 April 2025; published 8 July 2025)

 DOI: [10.1103/1kky-t65g](https://doi.org/10.1103/1kky-t65g)

In this erratum, we revise the reported expressions for mesic-nuclei potentials of K ($\bar{K}$) and B ($\bar{B}$) mesons in the subsection “Mesic-nuclei potentials” (Sec. II B) of the original paper. Consequently, the graphical behaviors of the corresponding potentials, the binding energies of K -mesic nuclei and B -mesic nuclei and their bound state wave functions are also corrected in the subsection “Mesic-nuclei bound states” (Sec. III D). Discussions of Sec. III D are also modified.

In the original paper, the signs of the vector-isoscalar interactions experienced by K ($\bar{K}$) and B ($\bar{B}$) inside the nuclei were not considered correctly in the analysis, whereas the expressions of D^- , $\bar{D}^0$, and D^0 remain unchanged. The vector-isoscalar potentials given by Eqs. (39)–(41) in the original manuscript are modified to,

$$V_v^{K^-,B^-}(r) = -V_\omega^q(r) - \frac{1}{2}V_\rho^q(r) - A(r), \quad V_v^{D^-}(r) = V_\omega^q(r) - \frac{1}{2}V_\rho^q(r) - A(r), \quad (39)$$

$$V_v^{\bar{K}^0,\bar{B}^0}(r) = -V_\omega^q(r) + \frac{1}{2}V_\rho^q(r), \quad V_v^{\bar{D}^0}(r) = V_\omega^q(r) + \frac{1}{2}V_\rho^q(r), \quad (40)$$

$$V_v^{K^0,B^0}(r) = V_\omega^q(r) - \frac{1}{2}V_\rho^q(r), \quad V_v^{D^0}(r) = -V_\omega^q(r) - \frac{1}{2}V_\rho^q(r). \quad (41)$$

Figures 4 and 5 of the original paper have been revised accordingly. Using the correct meson-nucleus potentials for the strange and bottom sectors, the binding energies as listed in Tables III and V, and the bound-state wave functions plotted in Fig. 6 of the original paper are also modified. Notably, due to the same light (anti)quark contents, the results

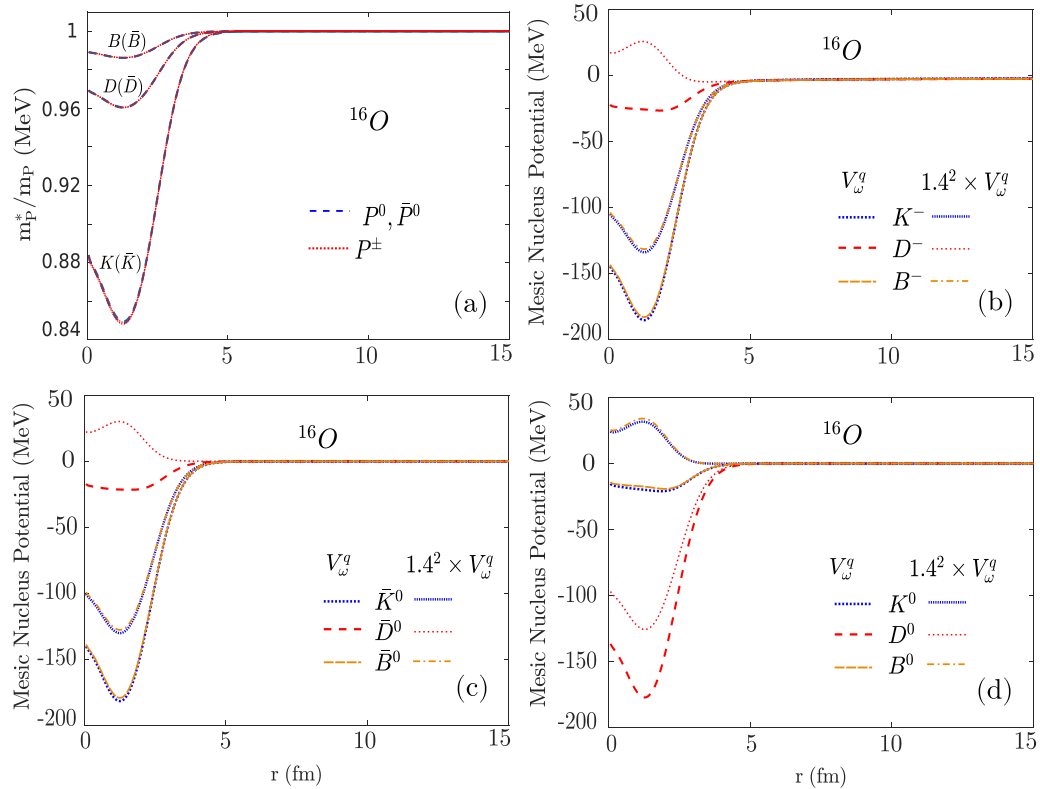
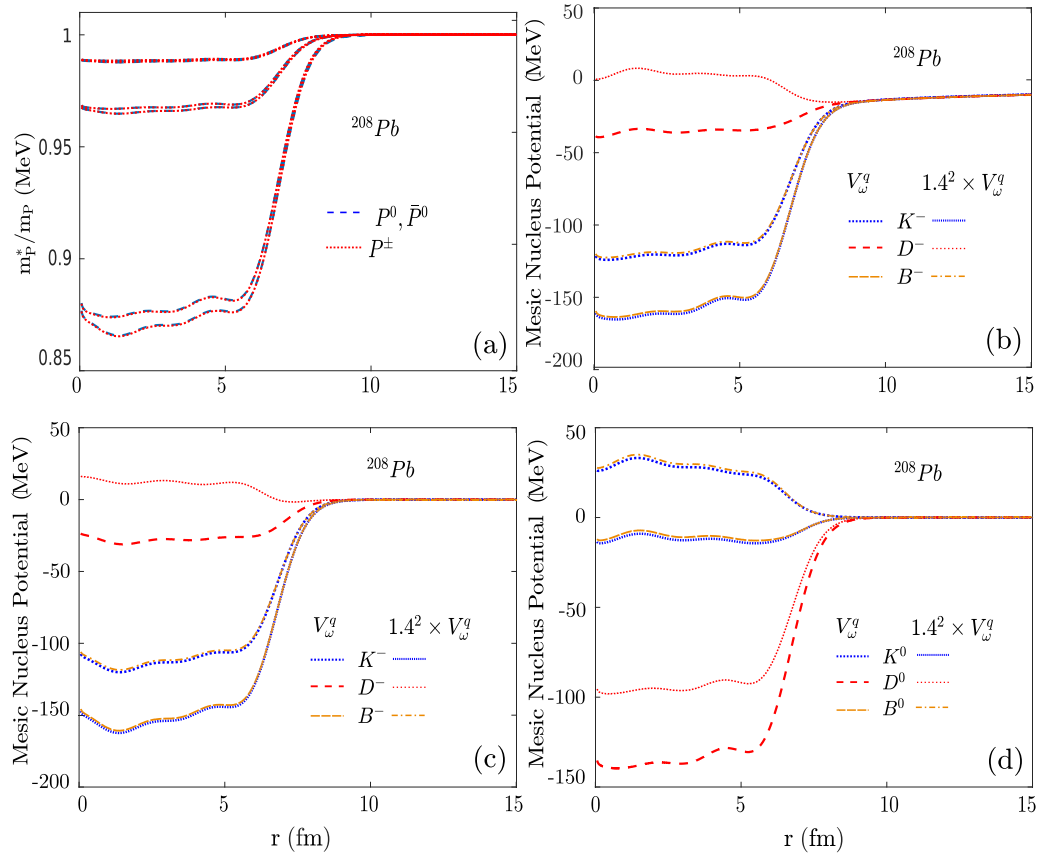


FIG. 4. Behavior of (a) the relative masses and (b)–(d) the vectorial interactions of P^- (K^- , D^- , B^-), $\bar{P}^0$ ($\bar{K}^0$, $\bar{D}^0$, $\bar{B}^0$), and P^0 (K^0 , D^0 , B^0) mesons while captured inside the ^{16}O nucleus. Results are presented for both the standard ω coupling (V_ω^q) and the phenomenologically suggested ω coupling ($\tilde{V}_\omega^q = 1.4^2 \times V_\omega^q$).

FIG. 5. Same as Fig. 4 but for ^{208}Pb .TABLE III. Binding energies (in MeV) for K -mesic-nucleus bound states in ^{16}O , ^{40}Ca , ^{90}Zr , ^{197}Au , and ^{208}Pb . We show the results for different conditions of nuclear and Coulomb interactions within the nuclei. The symbol “ $\times$ ” refers to unbound states.

		$^{16}_8\text{O}$	$^{40}_{20}\text{Ca}$	$^{90}_{40}\text{Zr}$	$^{197}_{79}\text{Au}$	$^{208}_{82}\text{Pb}$
$K^-(V_\omega^q)$	$1s$	-81.67	-105.17	-112.39	-112.28	-100.75
$K^-(V_\omega^q)$	$1p$	-42.95	-76.38	-92.81	-100.58	-90.02
$K^-(V_\omega^q, \text{ no Coulomb})$	$1s$	-74.98	-94.36	-93.29	-87.91	-75.81
$K^-(V_\omega^q, \text{ no Coulomb})$	$1p$	-36.66	-66.16	-74.40	-77.14	-65.79
$K^-(\tilde{V}_\omega^q)$	$1s$	-125.34	-155.29	-158.45	-153.75	-136.48
$K^-(\tilde{V}_\omega^q)$	$1p$	-80.67	-121.28	-136.56	-140.46	-123.96
$K^-(\tilde{V}_\omega^q, \text{ no Coulomb})$	$1s$	-118.54	-144.29	-139.18	-129.12	-111.32
$K^-(\tilde{V}_\omega^q, \text{ no Coulomb})$	$1p$	-74.17	-110.80	-117.89	-116.68	-99.49
$\bar{K}^0(V_\omega^q)$	$1s$	-77.44	-104.52	-106.16	-106.30	-104.72
$\bar{K}^0(V_\omega^q)$	$1p$	-38.48	-73.37	-88.31	-93.84	-93.62
$\bar{K}^0(\tilde{V}_\omega^q)$	$1s$	-121.25	-155.34	-151.82	-147.99	-140.59
$\bar{K}^0(\tilde{V}_\omega^q)$	$1p$	-76.43	-119.42	-133.62	-133.97	-127.84
$K^0(V_\omega^q)$	$1s$	-2.52	-5.93	-5.37	-7.29	-6.74
$K^0(V_\omega^q)$	$1p$	$\times$	$\times$	$\times$	-2.80	-2.55
$K^0(\tilde{V}_\omega^q)$	$1s$	$\times$	$\times$	$\times$	$\times$	$\times$
$K^0(\tilde{V}_\omega^q)$	$1p$	$\times$	$\times$	$\times$	$\times$	$\times$

TABLE V. Same as Table III but for B -mesic states.

		$^{16}_8\text{O}$	$^{40}_{20}\text{Ca}$	$^{90}_{40}\text{Zr}$	$^{197}_{79}\text{Au}$	$^{208}_{82}\text{Pb}$
$B^-(V_\omega^q)$	$1s$	-119.77	-134.88	-130.71	-121.83	-110.11
$B^-(V_\omega^q)$	$1p$	-113.62	-124.60	-127.52	-119.39	-107.22
$B^-(V_\omega^q, \text{ no Coulomb})$	$1s$	-112.73	-123.16	-110.82	-96.31	-84.16
$B^-(V_\omega^q, \text{ no Coulomb})$	$1p$	-106.67	-113.31	-107.73	-94.33	-81.65
$B^-(\tilde{V}_\omega^q)$	$1s$	-168.84	-193.55	-179.95	-165.04	-148.22
$B^-(\tilde{V}_\omega^q)$	$1p$	-162.63	-179.01	-176.69	-162.06	-144.43
$B^-(\tilde{V}_\omega^q, \text{ no Coulomb})$	$1s$	-161.79	-181.74	-160.01	-139.34	-122.15
$B^-(\tilde{V}_\omega^q, \text{ no Coulomb})$	$1p$	-155.64	-167.49	-156.81	-136.80	-118.68
$\bar{B}^0(V_\omega^q)$	$1s$	-115.66	-135.22	-122.03	-117.32	-114.61
$\bar{B}^0(V_\omega^q)$	$1p$	-109.45	-125.92	-118.73	-114.22	-111.59
$\bar{B}^0(\tilde{V}_\omega^q)$	$1s$	-164.77	-193.33	-171.11	-160.74	-152.78
$\bar{B}^0(\tilde{V}_\omega^q)$	$1p$	-158.51	-180.32	-167.67	-157.27	-149.15
$B^0(V_\omega^q)$	$1s$	-14.80	-14.43	-10.98	-10.70	-9.84
$B^0(V_\omega^q)$	$1p$	-11.79	-13.40	-9.44	-10.37	-9.52
$B^0(\tilde{V}_\omega^q)$	$1s$	$\times$	$\times$	$\times$	$\times$	$\times$
$B^0(\tilde{V}_\omega^q)$	$1p$	$\times$	$\times$	$\times$	$\times$	$\times$

for K^- , D^0 , and B^- reflect similar behaviors, whereas K^0 , D^- , and B^0 have similar trends. The discussions in Sec. III D are revised as follows:

(i) The sentence starting from the 7th line from below, on the right panel on page 10 up to the 8th line on the right panel of page 12, should be modified to “The Coulomb interaction provides more attractive potentials to the negatively charged mesons within the nucleus, contributing approximately 6–7, 9–11, 18–19, 23–25, and 24–26 MeV binding for the $1s$ state for K^- , D^- , and B^- mesons with ^{16}O , ^{40}Ca , ^{90}Zr , ^{197}Au , and ^{208}Pb nuclei, respectively. Due to the sole contribution of the Coulomb force, the D^- meson with the much more repulsive potential $\tilde{V}_\omega^q$ can also form bound states. This is due to the behavior of the wave functions for the potential $\tilde{V}_\omega^q$, which indicates that the negatively charged D^- mesons are comparatively pushed out of the nucleus and therefore the bound states are formed solely due to the Coulomb force. Having the same light quark structure and being blind to the Coulomb force, K^0 and B^0 mesons are unable to form the bound states for the potential $\tilde{V}_\omega^q$. Therefore, the neutral states only experience the nuclear forces, and the resulting bound states are more immersed within the nucleus. With the usual ω coupling (V_ω^q), the vector-isovector interaction produces a strong attractive potential for the $\bar{K}^0$ and $\bar{B}^0$ mesons compared with $\bar{D}^0$. The resulting binding energies become higher for the $\bar{K}^0$ and $\bar{B}^0$ mesons for a more repulsive ω coupling ($\tilde{V}_\omega^q$). However, for the modified potential $\tilde{V}_\omega^q$, $\bar{D}^0$ is less likely to bound within nuclei. It shows approximately 1, 6, 10, 16, and 26 MeV bindings are induced for the $\bar{D}^0$ meson while captured inside ^{16}O , ^{40}Ca , ^{90}Zr , ^{197}Au , and ^{208}Pb nucleus, respectively, while for $\bar{K}^0$ and $\bar{B}^0$ mesons the obtained binding energies are quite large. The values for $\bar{K}^0$ and $\bar{B}^0$ can be seen from Tables III and V, respectively. Notably, with the repulsive ω interaction, particles, which fail to form bound states, tend to form very light bound states with the heavy nuclei (e.g., ^{208}Pb).’

(ii) The sentence starting from the second line on the left panel of page 13 should be modified to “Furthermore, the K^- , D^0 , and B^- mesons form deeply bound states with the nuclei.”

Acknowledgment. We thank Guilherme Zeminiani for bringing the need for these corrections to our attention.

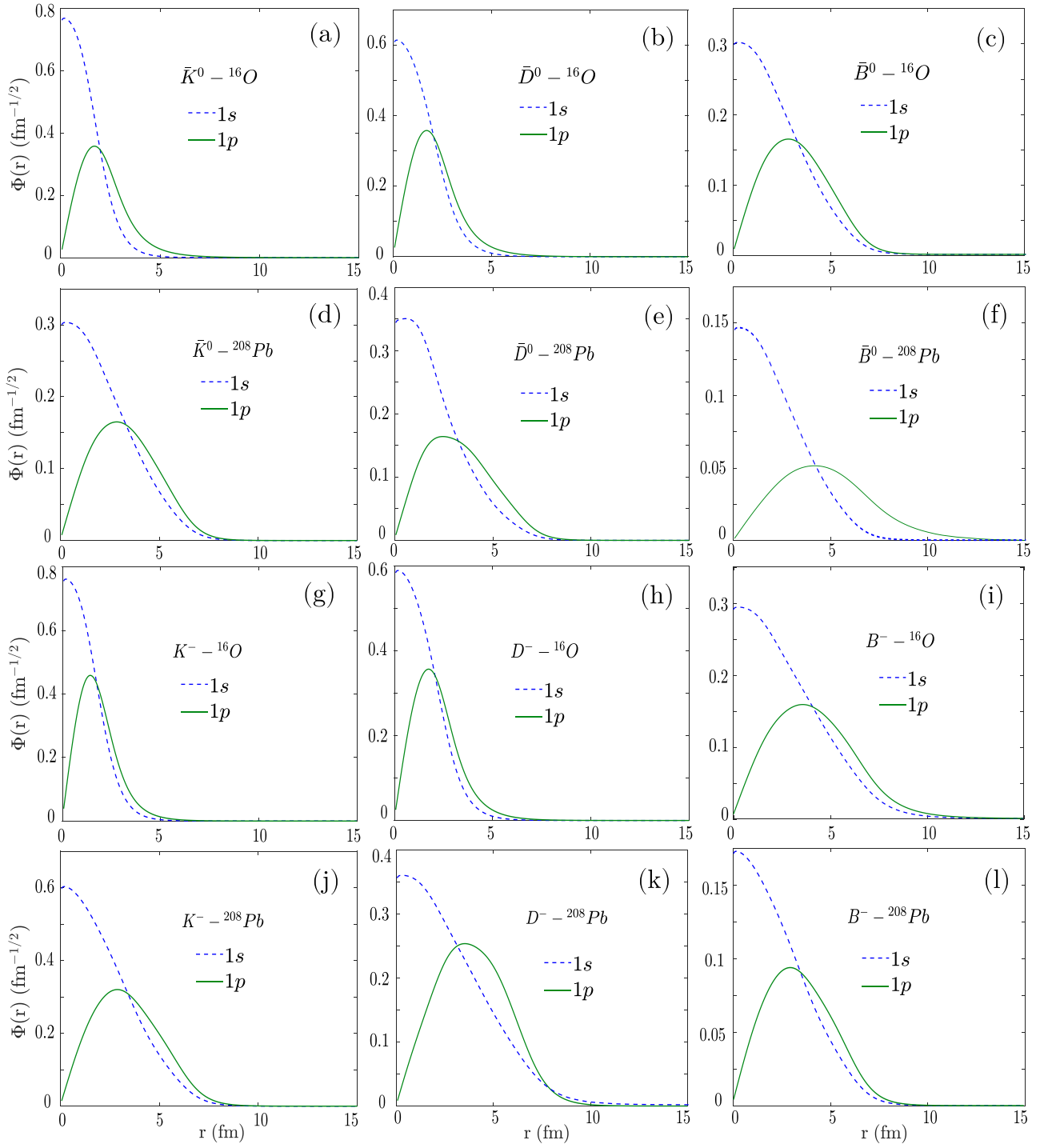


FIG. 6. Bound-state wave functions of the $\bar{P}^0$ ($\bar{K}^0$, $\bar{D}^0$, $\bar{B}^0$) and P^- (K^- , D^- , B^-) mesons in (a)–(c), (g)–(i) ^{16}O and (d)–(f), (j)–(l) ^{208}Pb nuclei are presented. We show the results considering only normal vector coupling V_ω^q .