Erratum: Deexcitation γ-ray transitions from the long-lived $I^\pi = 13/2^+$ metastable state in ^{195}Os [Phys. Rev. C 101, 041305(R) (2020)]

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We correct the erroneous argumentation about the relative γ-ray intensities in our previous paper and propose a new decay scheme of the isomeric state of ^{195}Os by further γ-γ coincidence analysis.

We assumed that the multipolarities of the 26-keV isomeric transition and other transitions are $M2$ or $E3$ and $M1$ or $E2$, respectively, in the decay scheme shown in Fig. 4 of the original paper. We deduced the relative γ-ray intensities in the analysis of the γ-ray spectrum in coincidence with the multisegmented proportional gas counter (MSPGC) [1] hit pattern "$M = 1$," assuming that x rays following the highly converted 26-keV transition are dominant triggers of the MSPGC. However, the origins of the MSPGC events in coincidence with the γ-ray detection could be conversion electrons from other transitions even if their conversion coefficients are low because those conversion electrons with energies higher than 100 keV can fire the inner cell of the MSPGC with much higher detection efficiency compared to x rays.

If conversion electrons from observed four transitions, 111, 149, 169, and 279 keV, contribute to the triggers of the MSPGC hit pattern $M = 1$, a considerable number of those γ rays can be detected in coincidence with two or more hits in the inner ring of the MSPGC. Figure 1 shows the γ-ray energy spectrum in coincidence with two or more hits in the inner ring and no hit in the outer ring of the MSPGC. All four γ-ray peaks are clearly seen, suggesting that not only x rays, but also the low-energy conversion electrons from those four transitions trigger the MSPGC.

The low relative γ-ray intensity 4 ± 3 for the 149-keV transition presented in the original paper is inconsistent with the assumption of the multipolarity of this transition $M1$ or $E2$. Although it was deduced under the erroneous assumption of the dominant MSPGC trigger, the relatively small intensity of the 149-keV line in the spectrum of Fig. 1 of the original paper indicates that this transition would be highly converted. To establish the decay scheme by disentangling it from the inconsistency, first we have examined the time correlation among the four observed γ transitions. All coincident γ rays of them were confirmed to be emitted in the prompt coincidence. It indicates that the 149-keV transition is a transition from a metastable state if the other three transitions have multipolarities of $M1$ or $E2$, and the 149-keV transition is highly converted.

From the above considerations, we newly propose a level scheme shown in Fig. 2. We suggest that the 279- and 111-keV transitions are from the $7/2^-$ and $5/2^-$ members of the rotational band built on the $\nu 3/2^-[501]$ ground state. We assign the 149-keV γ ray to the decay of the $\nu 13/2^+[606]$ isomeric state. The excitation energy of the isomeric state as proposed here is 26(10) keV lower than in the previous measurement by the ESR in GSI Darmstadt [2]. This disagreement might be associated with underestimated uncertainties in the storage ring data.

Since the detection efficiency of the MSPGC for electrons in the hit pattern $M = 1$ strongly depends on their energies in the energy range from 50 to 300 keV, the relative γ-ray intensities in the decay scheme cannot be deduced from the single-γ-ray energy spectrum in coincidence with the MSPGC events. We reanalyzed the γ-γ coincidence spectra shown in Fig. 3 of the original paper. The ratio of the efficiency-corrected γ-ray intensity of the 149-keV transtion to the 111-keV transition in coincidence with the 169-keV γ rays is 0.25(12). It is similar to the value of 0.407(8) obtained from the theoretical conversion

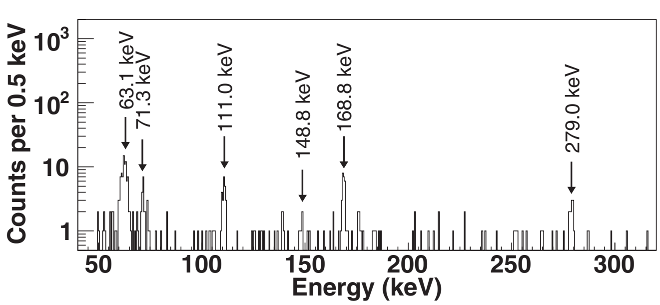

FIG. 1. γ-ray energy spectrum in coincidence with two or more hits in the inner ring and no hit in the outer ring of the MSPGC.

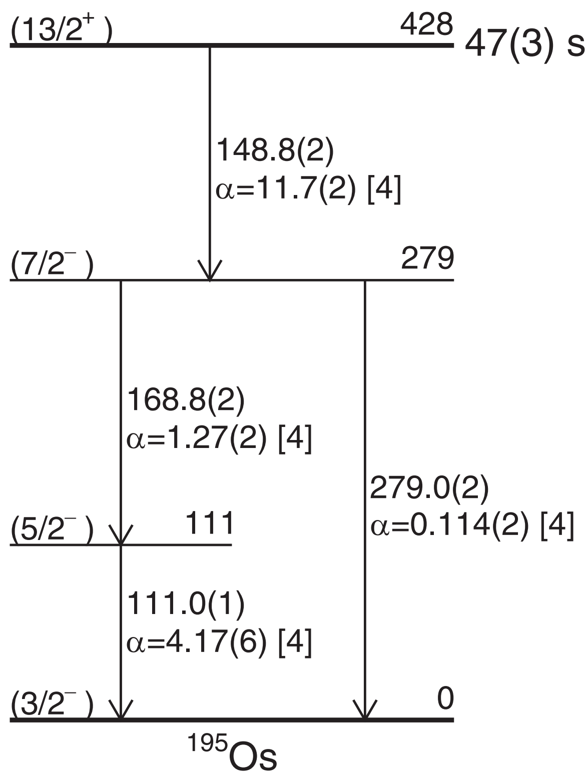

FIG. 2. Newly proposed level scheme for the decay of the $13/2^+$ isomeric state in ^{195}Os. Below the transition energies, the theoretical internal conversion coefficients [3] α are given.

coefficients 11.7(2) and 4.17(6) for the 149- and 111-keV transitions with an assumption of their multipolarities of $E3$ and $M1$, respectively [3]. Adopting the theoretical conversion coefficient 11.7(2) for the 149-keV transition, its partial half-life for the γ-ray transition becomes 10.0(7) min, which is consistent with the half-life of the fully stripped ion >9 min, measured at the ESR in GSI Darmstadt [2]. This partial half-life gives the reduced transition strength of $B(E3) = 5.6(4) \times 10^{-4}$ W.u. The reduced K hindrance factor $f_\nu = (T^{\gamma}_{1/2}/T^{\mathrm{W}}_{1/2})^{1/\nu}$ was obtained as $f_\nu = 42^{+1}_{-2}$, where $T^{\gamma}_{1/2}$ and $T^{\mathrm{W}}_{1/2}$ are the partial γ-ray half-life and the corresponding Weisskopf single-particle estimate, and $\nu = \Delta K - \lambda = 2$ is the degree of K forbiddenness with the K change $\Delta K = 5$ and the transition's multipolarity $\lambda = 3$. This value is similar to that obtained in ^{185}W where a $\nu = 2$ branch has a reduced hindrance factor of $f_\nu = 39$ [4]. The K hindrance supports a prolate shape, which is consistent with the limited systematics in the region [5].

The obtained energy of the $5/2^- \to 3/2^-$ transition of 111 keV fits well into the trend observed in lighter odd-mass osmium isotopes (58 keV in ^{191}Os [6] and 73 keV in ^{193}Os [7]), indicating that the deformation decreases with increasing mass number. The same conclusion was drawn from the even-mass osmium isotopes as well [8] in agreement with ground-state shape calculations [9]. The rotational states observed above the $13/2^+$ isomer [8,10,11] also indicate prolate shape.

The level scheme presented in this erratum was first proposed from the viewpoint of theoretical expectations by Prof. Z. Podolyák and Prof. P. M. Walker from the Department of Physics, University of Surrey. An anonymous referee brought our attention to the erroneous argumentation in the original paper and suggested that we reanalyze the experimental data to make it clear which decay scheme is reasonable as concerns the time correlation among the observed γ transitions, two-or-more-hit events in the inner ring of the MSPGC and the γ-γ coincident events, which are presented in this erratum. Hence, this erratum was made possible by both the alternative interpretation of the experimental data proposed by Prof. Z. Podolyák and Prof. P. M. Walker, and the questions about the erroneous argumentation as well as the recommendations for further analysis by the referee. We cordially appreciate their contributions to this erratum.

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