IMPROVED CHARACTERISTICS OF THE 15.1 keV M1+E2 NUCLEAR TRANSITION IN ^{227}Th

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According to the latest nuclear data compilation [1], the second excited state 24.3 keV ($3/2^+$) of ^{227}Th is depopulated to the ($1/2^+$) ground state also by a cascade of the 15.1(2) keV (M1) and 9.3(1) keV (E2) gamma-ray transitions through the first excited state 9.3 keV ($5/2^+$). Characteristics of the both nuclear transitions play important role in the spin-parity assignment of the higher excited levels of ^{227}Th. Nevertheless, their adopted energies [1] exhibit (as can be seen above) very great uncertainties and their multipolarities (derived only in the pioneer work [2]) are not yet reliably determined.

Employing the advanced low energy nuclear electron spectroscopy technique developed in our laboratory, we measured the spectrum of the conversion electrons of the 15.1 keV nuclear transition emitted in the β^-decay of ^{227}Ac in which only the ground state and the lowest three excited levels of ^{227}Th are populated. From the measured spectra, the preliminary value of 15099.5(15) eV was determined for the transition energy which is more accurate than the present adopted one by a factor of 130. Moreover, we removed the present uncertainty in the transition multipolarity. It was found to be M1 + E2 with the preliminary value of the E2 admixture parameter $\Delta = 0.0015(5)$. The obtained results demonstrate that the internal conversion electron spectroscopy remains a powerful tool for determination of nuclear transition energies particularly in the low energy region which is comparable even with the crystal diffraction method.

1. Filip Kondev *et al*. // Nucl. Data Sheets for *A*=227. 2016. V.132. P.331.
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