**EXPERIMENTAL INVESTIGATIONS OF THE 9.2, 15.1, AND 24.3 keV NUCLEAR TRANSITIONS IN 227Th AND CONSEQUENCES OF THEIR RESULTS FOR SPIN-PARITY ASSIGNMENTS TO LOW-LYING STATES OF 227Th**

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The 9.2, 15.1, and 24.3 keV nuclear transitions in 227Th were studied in the β--decay of 227Ac by means of the internal conversion electron spectroscopy (ICES) using the combined electrostatic electron spectrometer [1] and the computer code SOFIE (see, e.g., Ref. [2]) to clarify the spin-parity assignment of the ground state and the two lowest excited states in 227Th. Results obtained were published in [3,4,5].

Energies of (9244.6±0.8), (15098.6±1.0), and (24343.1±1.1) eV were determined for the 9.2, 15.1, and 24.3 keV transitions, respectively, as well as the mixed character (M1+E2) for each of them with the δ2(E2/M1) values of (0.695±0.248), (0.0012±0.0003), and (0.0116±0.0004), respectively. An agreement within ±0.1 eV was found among the above transition energy values and those obtained from their interlinked relations based on the decay scheme. Using the gamma-ray spectroscopy, energy values of (24342.9±1.2), (28613.3±1.7), and (37860.2±2.0) eV were obtained for the 24.3, 28.6, and 37.8 keV transitions in 227Th, respectively. The almost zero difference of (0.2±1.6) eV for the 24.3 keV transition energies determined by the ICES and gamma-ray methods demonstrates a reliability of the transition energy determination in the present work.

Our investigation removed the uncertainty in the multipolarity character of the 15.1 keV transition. Determined [4] nonzero value of δ(E2/M1) parameter for the 9.2 keV transition questioned the current theoretical interpretation of low-lying levels of 227Th. Our calculations [4] prefer the 1/2+, 3/2+, and 3/2+ sequence instead of the adopted 1/2+, 5/2+ and 3/2+ one for the 0.0, 9.2, and 24.3 keV levels, respectively. In such a case, the assignment Iπ=5/2+ for any of these levels is excluded. Nevertheless, it is necessary to use more precise theoretical approaches to prove the proposed interpretation of the current experimental data. New experimental information on low-energy transitions connecting low-lying levels in similar nuclei is desirable as well.

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