Contribution ID: **78** Type: **Oral talk (15 min + 5 min questions)**

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

Tuesday, 12 July 2022 17:50 (20 minutes)

The 9.2, 15.1, and 24.3 keV nuclear transitions in 227Th were studied in the ␣–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.

1. Ch. Briançon et al., Nucl. Inst. Meth, 221 (1984) 547.
2. A. Inoyatov et al., J. Elect. Spec. Relat. Phenom., 160 (2007) 54.
3. A. Kovalík et al., Eur. Phys. J. A, 55 (2019) 131.
4. A. Kovalík et al., Phys. Lett. B, 820 (2021) 136593.
5. A. Kovalík et al., Eur. Phys. J. A, 57 (2021) 285.

The speaker is a student or young scientist

No

Section

1. Nuclear structure: theory and experiment

Primary authors: Dr KOVALÍK, Alojs (NPI ASCR, Řež, Czechia); Dr INOYATOV, Anvar (Joint Institute for Nuclear Research, Dubna, NPI ASUzR, Ulugbek, Uzbekistan); Dr FILOSOFOV, Dmitry (Joint Institute for Nuclear Research, Dubna); Mr DADAKHANOV, Jakhangir (Joint Institute for Nuclear Research); Dr KVASIL, Jan (Charles University, Praha, Czechia); Mr PEREVOSHCHIKOV, Lev (Joint Institute for Nuclear Research); Dr RYŠAVÝ, Milos (NPI ASCR, Řež, Czechia); Prof. ALEXA , Peter (VŠB-Technical University, Ostrava, Czechia)

Presenter: Dr INOYATOV, Anvar (Joint Institute for Nuclear Research, Dubna, NPI ASUzR, Ulugbek, Uzbekistan)

Session Classification: Nuclear structure: theory and experiment