INTERNAL-CONVERSION STUDIES OF HIGH-ENERGY TRANSITIONS IN ^{228}Th

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In the ^{228}Pa → ^{228}Th decay selected parts of the conversion electron spectrum were measured in order to clear up the discrepancies between the data on γ-transition energies.

The energy of γ transitions in the ^{228}Pa → ^{228}Th decay, measured recently using Ge(Li) detectors [1], are different from those reported by Arbman *et. al* [2]. In the latter work the transition energies were determined from the conversion-electron studies using a double-focusing high-resolution spectrometer (below 1 MeV) and a six-gap high-transmission spectrometer (above 1 MeV) with an accuracy of 0.1% on the absolute scale. Pronounced discrepancies up to 5 keV, are observed for energies exceeding 1 MeV (see Table I). These discrepancies may suggest that there exist EO transitions (not observed in former measurements [1]) or they may be also due to incorrect energy calibration of the magnetic spectrometer used in the work [2]. Selected parts of the electron conversion spectrum were remeasured by the present authors to settle the problem of the transition energies.

The ^{228}Pa (22h) activity was produced by bombarding a ^{232}Th target with 100 MeV protons in the JINR synchrocyclotron at Dubna. After chemical treatment [1], a thin ^{228}Pa

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β-source was prepared. The measurements were carried out in a double beta spectrometer of the $\pi\sqrt{2}$ type, described for the first time by Shestopalova [3] (see also [4]). The spectrometer was set at a resolution of 0.22%. The magnetic field was measured using the

TABLE I

Transition energy (keV)[1]			Relative intensity of the K-conversion lines[1]	
Arbman *et al.* [2]	Kurcewicz *et al.* [1]	Present work	Arbman *et al.* [2]	Present work
905.2	904.5 (3)	904.4 (4)	10.8	8.8 (10)
912.2	911.2 (1)	911.2	100	100
923		921.7 (3)	18.8	24.1 (32) } 35.6 (36)
924		923.8 (5)	10.0	10.8 (31) }
966.0			58.4	
970.0			54.0	
976.8			20.0	
1034.1			2.4	
(1123)			0.8	
1168			0.8	
	1246.4 (2)	1247.6 (6)		2.9 (3)
1253	1253.1 (6)	1253.8 (9)	7.6	0.29 (8)
(1293)			0.6	
(1423)			0.24	
1464	1459.3 (2)	1459.1 (6)	1.0	1.73 (30)
(1489)			0.32	
(1503)			0.32	
1563			1.2	
1593	1588.0 (2)	1587.2 (8)	5.2	4.1 (6)
1624			2.0	
1678	1666.3 (2)	1666.1 (10)	1.2	1.2 (3)
1708			0.8	
1744	1738.4 (2)	1737.6 (7)	2.4	2.60 (26)
1758	1757.8 (2)	1757.3 (8)	0.6	1.50 (30)
1838	1835.0 (2)	1834.4 (7)	2.4	1.56 (23)
	1842.2 (3)	1841.5 (10)		0.60 (20)
1888	1886.9 (3)	1886.8 (6)	2.4	2.97 (45)

[1] in parentheses: errors related to the last meaning figures

proton-resonance method. The conversion electrons of the selected, relatively intense lines in the energy interval of 800 to 1800 keV were measured (see Fig. 1).

The spectrometer was calibrated using two conversion lines: the K conversion line of the 1903.15 ± 0.30 keV EO transition in ^{140}Ce [5] and the K conversion line of the $911.2 \pm \pm 0.1$ keV transition from ^{228}Pa (the energy of this transition having been taken from γ-ray studies [1]). The γ-transition energies measured according to the calibration procedure applied in the present work are in fair agreement with the results of the γ-ray studies [1].

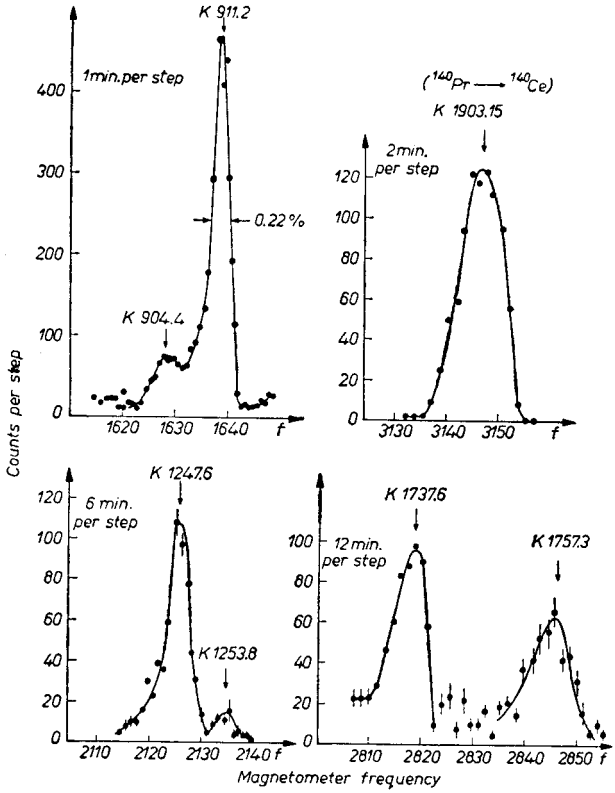

Fig. 1. Examples of the ^{228}Pa internal conversion lines and the K 1903.15 ^{140}Pr line measured by means of the double beta spectrometer of $\pi\sqrt{2}$ type at Dubna

In Table I there are also included data on the relative intensities of the internal conversion lines.

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