

²²⁵Th α decay

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Ashok Jain, Sukhjeet Singh, Suresh Kumar, Jagdish Tuli		NDS 108, 883 (2007)	15-Jan-2007

Parent: ²²⁵Th: E=0.0; J π =3/2⁺; T_{1/2}=8.72 min 4; Q(α)=6920 5; % α decay \approx 90.0

²²¹Ra Levels

E(level)	J π	T _{1/2}	E(level)	J π	E(level)	J π
0.0	5/2 ⁺	28 s 2	146.81 20	(7/2) ⁻	359.02 8	(5/2) ⁺
53.14 8	7/2 ⁺		174 5		450.32 17	(5/2) ⁻
103.60 12	(5/2) ⁻		299.16 8	(7/2) ⁺	485.40 12	(3/2 ⁻ ,5/2 ⁻)
121.95 10	(9/2) ⁺		321.37 16	(3/2) ⁺		

α radiations

E α [‡]	E(level)	I α ^{#@}	HF [†]
6312 5	485.40	2 1	\approx 13
6345 5	450.32	2 1	\approx 18
6441 3	359.02	15 1	\approx 5.8
6478 3	321.37	43 2	\approx 2.9
6501 3	299.16	14 1	\approx 11
6627 5	174	3 1	\approx 166
6649 5	146.81	3 1	\approx 213
6699 5	103.60	2 1	\approx 474
6743 5	53.14	7 1	\approx 213
6797 5	0.0	9 1	\approx 267

[†] r₀(²²¹Ra)=1.5503 is used in calculations.

[‡] Measurements of 1961Ru06. Original energies have been increased by 4 keV, as recommended by 1979Ry03, because of changes in calibration energies. Other measurement: 1987LiZP.

[#] From 1961Ru06.

[@] For absolute intensity per 100 decays, multiply by \approx 0.90.

γ (²²¹Ra)

I γ normalization: Absolute photon intensities were measured by (α)(γ) coin: I(321 γ)=25.0 5 per 100 α decays (1987LiZP). Other absolute measurement: I(321 γ)=30 3 per 100 α decays (1961Ru06).

Measured: I(K x ray) per 100 α 's=27.0 10 (1987LiZP), 33 3 (1961Ru06).

E γ [†]	I γ ^{‡a}	E _i (level)	J _i π	E _f	J _f π	Mult. [#]	δ	α ^b	Comments
50.5 2	0.54 16	103.60	(5/2) ⁻	53.14	7/2 ⁺	[E1]		0.693	α (L)=0.523; α (M)=0.1276; α (N+..)=0.0429
53.2 2	4.4 4	53.14	7/2 ⁺	0.0	5/2 ⁺	M1+E2	0.22 +10-22	29 8	α (L)=22 7; α (M)=5.4 17; α (N+..)=1.9 6
68.8 2	2.19 20	121.95	(9/2) ⁺	53.14	7/2 ⁺	(M1)		9.77	α (L)=7.38; α (M)=1.764; α (N+..)=0.626
103.5 [@] 2	4.0 8	103.60	(5/2) ⁻	0.0	5/2 ⁺	E1		0.1022	α (L)=0.0772; α (M)=0.01857; α (N+..)=0.00639
121.9 2	0.53 12	121.95	(9/2) ⁺	0.0	5/2 ⁺	[E2]		4.20	α (K)=0.315; α (L)=2.84; α (M)=0.771; α (N+..)=0.280

Continued on next page (footnotes at end of table)

^{225}Th α decay (continued) $\gamma(^{221}\text{Ra})$ (continued)

E_γ †	I_γ ‡ ^a	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. #	α^b	Comments
126.4 2	0.76 16	485.40	(3/2 ⁻ , 5/2 ⁻)	359.02	(5/2) ⁺	(E1)	0.277	$\alpha(\text{K})=0.216$; $\alpha(\text{L})=0.0457$; $\alpha(\text{M})=0.0109$; $\alpha(\text{N}+..)=0.00378$
128.9 2	0.60 12	450.32	(5/2 ⁻)	321.37	(3/2) ⁺	[E1]	0.264	$\alpha(\text{K})=0.2064$; $\alpha(\text{L})=0.0434$; $\alpha(\text{M})=0.01040$; $\alpha(\text{N}+..)=0.00359$
146.8 2	4.2 10	146.81	(7/2) ⁻	0.0	5/2 ⁺	E1	0.1919	$\alpha(\text{K})=0.1510$; $\alpha(\text{L})=0.0309$; $\alpha(\text{M})=0.00740$; $\alpha(\text{N}+..)=0.00256$
^x 148.5 &	0.8 4							This γ was placed by 1987LiZP between a proposed level at 201.6 keV with $J^\pi=9/2^-$ and the 7/2 ⁺ state at 53.2 keV.
151.2 2	2.7 2	450.32	(5/2 ⁻)	299.16	(7/2) ⁺	(E1)	0.179	$\alpha(\text{K})=0.1409$; $\alpha(\text{L})=0.0287$; $\alpha(\text{M})=0.00685$; $\alpha(\text{N}+..)=0.00237$
164.0 2	1.7 6	485.40	(3/2 ⁻ , 5/2 ⁻)	321.37	(3/2) ⁺	(E1)	0.1471	$\alpha(\text{K})=0.1163$; $\alpha(\text{L})=0.0233$; $\alpha(\text{M})=0.00555$; $\alpha(\text{N}+..)=0.00192$
177.2 1	4.3 2	299.16	(7/2) ⁺	121.95	(9/2 ⁺)	[M1]	3.24	$\alpha(\text{K})=2.60$; $\alpha(\text{L})=0.483$; $\alpha(\text{M})=0.115$; $\alpha(\text{N}+..)=0.0410$
212.0 &	0.8 4	359.02	(5/2) ⁺	146.81	(7/2) ⁻	[E1]	0.792	$\alpha(\text{K})=0.0632$; $\alpha(\text{L})=0.01212$; $\alpha(\text{M})=0.00289$; $\alpha(\text{N}+..)=0.00100$
217.7 2	1.7 3	321.37	(3/2) ⁺	103.60	(5/2) ⁻	(E1)	0.0744	$\alpha(\text{K})=0.0594$; $\alpha(\text{L})=0.01135$; $\alpha(\text{M})=0.00271$; $\alpha(\text{N}+..)=0.00094$
246.0 1	22.5 5	299.16	(7/2) ⁺	53.14	7/2 ⁺	M1	1.294	$\alpha(\text{K})=1.040$; $\alpha(\text{L})=0.1922$; $\alpha(\text{M})=0.0458$; $\alpha(\text{N}+..)=0.01616$
299.2 1	3.7 7	299.16	(7/2) ⁺	0.0	5/2 ⁺	M1	0.753	$\alpha(\text{K})=0.606$; $\alpha(\text{L})=0.1115$; $\alpha(\text{M})=0.0266$; $\alpha(\text{N}+..)=0.00936$
305.9 1	18.0 18	359.02	(5/2) ⁺	53.14	7/2 ⁺	M1	0.709	$\alpha(\text{K})=0.570$; $\alpha(\text{L})=0.1049$; $\alpha(\text{M})=0.0250$; $\alpha(\text{N}+..)=0.00880$
321.4 ^c 1	100	321.37	(3/2) ⁺	0.0	5/2 ⁺	M1	0.619	$\alpha(\text{K})=0.498$; $\alpha(\text{L})=0.0915$; $\alpha(\text{M})=0.0218$; $\alpha(\text{N}+..)=0.00768$
359.0 1	18 2	359.02	(5/2) ⁺	0.0	5/2 ⁺	M1	0.458	$\alpha(\text{K})=0.368$; $\alpha(\text{L})=0.0675$; $\alpha(\text{M})=0.01610$; $\alpha(\text{N}+..)=0.00567$
381.8 [@] 2	1.5 3	485.40	(3/2 ⁻ , 5/2 ⁻)	103.60	(5/2) ⁻	[M1]	0.387	$\alpha(\text{K})=0.312$; $\alpha(\text{L})=0.0571$; $\alpha(\text{M})=0.0136$; $\alpha(\text{N}+..)=0.00479$
485.4 [@] 2	0.3 1	485.40	(3/2 ⁻ , 5/2 ⁻)	0.0	5/2 ⁺	[E1]	0.0126	$\alpha(\text{K})=0.0103$; $\alpha(\text{L})=0.00178$; $\alpha(\text{M})=0.0000419$; $\alpha(\text{N}+..)=0.0000146$

† From 1987LiZP ($\alpha\gamma$, γ) and 1989Ac01 ($\alpha\gamma$, (α)(ce)). Other measurement: 1961Ru06.

‡ Relative photon intensities are average values of I_γ 's measured by 1987LiZP and 1989Ac01. Other measurement: 1961Ru06.

From (α)(ce) measurements of 1989Ac01 and 1987LiZP. Multipolarities with square brackets are from decay scheme; they were not determined experimentally.

@ Observed by 1989Ac01 only.

& Observed by 1987LiZP only.

^a For absolute intensity per 100 decays, multiply by ≈ 0.23 .

^b Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ -ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

^c Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

^{225}Th α decay

Decay Scheme

Legend

- $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
- $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
- $I_\gamma > 10\% \times I_\gamma^{\text{max}}$
- - - γ Decay (Uncertain)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays

