^{224}Ra α decay 1977Ku15,1962Wa28

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 112, 1115 (2011)	31-Oct-2010

Parent: ^{224}Ra: E=0; $J^\pi=0^+$; $T_{1/2}$=3.66 d *4*; Q(α)=5788.87 *15*; %α decay=100.0
Additional information 1.

^{220}Rn Levels

αγ(θ): 1954Mi53, 1974Or02.
αγ(θ,H): 1972Ab13, 1973He13, 1974Do11.
The decay scheme is that of 1977Ku15.

E(level)†	J^π	$T_{1/2}$	Comments
0‡	0^+	55.6 s *1*	$T_{1/2}$: from 1966Hu20 (value is rounded off from 55.61 s *4*). Others: 55.3 s *3* (1963Gi07), 56.3 s *2* (1961Ro14), 51.5 s *10* (1955Sc81).
240.986‡ *6*	2^+	0.146 ns *5*	$T_{1/2}$: from αγ(t) (1960Be25) (weighted average of 0.150 ns *10* and 0.145 ns *5*).
533.69‡ *10*	4^+		J^π: 4^+ from αγ(θ) from 0^+ parent (1989Po03).
645.44# *9*	1^-		J^π: 1^- from αγ(θ) from 0^+ parent (1989Po03).
663.03# *10*	(3^-)		

† From a least-squares fit to Eγ.
‡ Band(A): g.s. $K^\pi=0^+$ rotational band.
# Band(B): $K^\pi=0^-$ band.

α radiations

Eα†	E(level)	Iα@	HF#	Comments
5034	663.03	0.0030‡ *5*	7.4 *15*	Iα: $I_\alpha=3.1\times10^{-3}$% from 1962Wa28.
5051	645.44	0.0076‡ *11*	3.7 *6*	Iα: $I_\alpha=7.2\times10^{-3}$% from 1962Wa28.
5161	533.69	0.0071‡	8	Iα: Iα=0.0073% 18 from 1962Wa28.
5448.6 *12*	240.986	5.06 *5*	1.08 *1*	Eα: from 1991Ry01, 1962Ba19. Iα: weighted average of 5.05% *5* (1969Pe17), 5.07% *5* (1984Bo15).
5685.37 *15*	0	94.92 *5*	1.00	Eα: from 1991Ry01, adjusted measurement of 1971Gr17 (−0.19 keV). Iα: from ΣIα=100.

† From 1962Wa28, except where noted otherwise. Authors′ values have been increased by 1.6 keV to correct for changes in calibration energies (1991Ry01).
‡ From γ-ray transition intensity balance.
# HF(5685α)=1.00 yields $r_0(^{220}Rn)$=1.5419 *6*.
@ Absolute intensity per 100 decays.

^{224}Ra α decay 1977Ku15,1962Wa28 (continued)

γ(^{220}Rn)

Iγ normalization: From absolute Iγ(241γ)=4.10 *5* (1991BaZS).

E_γ‡	I_γ#@	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α†	Comments
240.986 *6*	4.10 *5*	240.986	2^+	0	0^+	E2	0.276	α(K)=0.1109 *16*; α(L)=0.1220 *17*; α(M)=0.0324 *5*; α(N+..)=0.01036 *15* α(N)=0.00843 *12*; α(O)=0.001724 *25*; α(P)=0.000202 *3* E_γ: from 1977Ku25, corrected for a change in calibration (new ^{198}Au Eγ=411.80205 *17* (1995HeZZ)). I_γ: recommended value from 1991BaZS, based on measurements by 1984Ge07, 1983Sc13, 1983Va22, 1982Sa36, 1969Pe17, and calculated value from I(5449α) and intensity balance at 241.0 level. Mult.: K:L2:L3=100:65:61 (1954Ro10); theory: K:L2:L3=100:62.3:31.4.
292.70 *10*	0.0062 *7*	533.69	4^+	240.986	2^+	(E2)	0.1487	α(K)=0.0727 *11*; α(L)=0.0564 *8*; α(M)=0.01484 *21*; α(N+..)=0.00475 *7* α(N)=0.00386 *6*; α(O)=0.000795 *12*; α(P)=9.50×10^{-5} *14* Mult.: from I(γ+ce)(293γ)=Iα(5161), with a 10% uncertainty assigned to Iα (compare data for the 645, 633 levels), one gets α=0.18 *17*. Theory values are 0.0352 (E1), 0.149 (E2), 0.639 (M1). Note that E1 and E2+M1 are not excluded.
404.2 *2*	0.0022 *5*	645.44	1^-	240.986	2^+	[E1]	0.01719	α(K)=0.01403 *20*; α(L)=0.00241 *4*; α(M)=0.000568 *8*; α(N+..)=0.000183 *3* α(N)=0.0001471 *21*; α(O)=3.17×10^{-5} *5*; α(P)=4.43×10^{-6} *7*
422.04 *10*	0.0030 *5*	663.03	(3^-)	240.986	2^+	[E1]	0.01567	α(K)=0.01280 *18*; α(L)=0.00219 *3*; α(M)=0.000516 *8*; α(N+..)=0.0001664 *24* α(N)=0.0001336 *19*; α(O)=2.88×10^{-5} *4*; α(P)=4.03×10^{-6} *6*
645.50 *10*	0.0054 *9*	645.44	1^-	0	0^+			

† Additional information 2.
‡ From 1977Ku15, unless otherwise noted.
# Relative Iγ from 1977Ku15, normalized to Iγ(abs.)=4.10 *5* (1991BaZS) for the 240.987γ, unless otherwise noted.
@ Absolute intensity per 100 decays.

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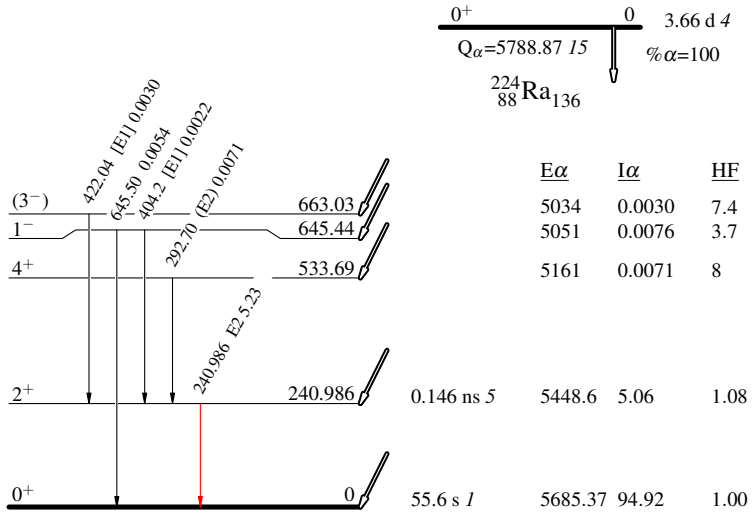
Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 decays through this branch

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



	Eα	Iα	HF
(3−) 663.03	5034	0.0030	7.4
1− 645.44	5051	0.0076	3.7
4+ 533.69	5161	0.0071	8
2+ 240.986 0.146 ns 5	5448.6	5.06	1.08
0+ 0 55.6 s 1	5685.37	94.92	1.00

$^{220}_{86}Rn_{134}$

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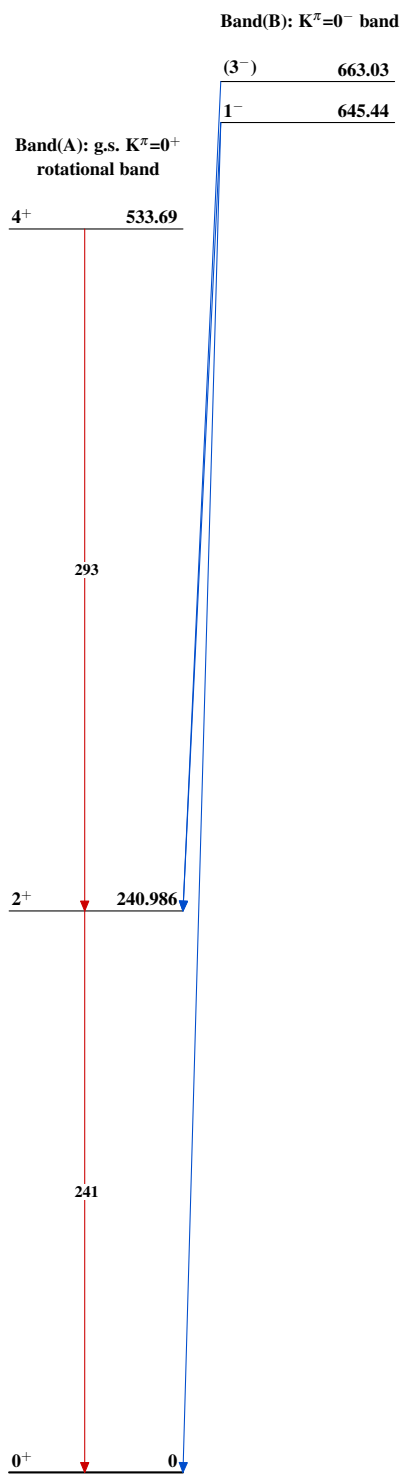

$^{220}_{86}Rn_{134}$