^{207}Rn ε decay 1975ZeZY,1973KeZP

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev, S. Lalkovski	NDS 112, 707 (2011)	1-Aug-2010

Parent: ^{207}Rn: E=0; J^π=5/2$^-$; $T_{1/2}$=9.25 min *17*; Q(ε)=4612 *34*; %ε+%β^+ decay=79 *3*

1975ZeZY: mass separated ^{207}Rn source was produced in proton spallation reactions on a natural ThO target; E(p)=660 MeV; Detectors: several Ge(Li) and Si(Li); Measured: Eγ, Iγ, γγ coin, ce.

1973KeZP: ^{207}Rn source was produced in ^{197}Au(^{15}N,5n) reaction at E(^{15}N)=95 MeV; Detectors: several Ge(Li), NaI and Si(Li); Measured: Eγ, Iγ, γγ coin, ce. Others: 1971KeZZ and 1971KeZH (same collaboration).

^{207}At Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0	9/2$^-$	1.81 h *3*	J^π,$T_{1/2}$: From Adopted Levels.
344.55 *4*	7/2$^-$		
643.40 *20*	11/2$^-$		
673.98 *4*	(5/2)$^-$		
747.19 *5*	7/2$^-$		
973.28 *8*			
976.09 *10*			
1018.57 *6*	3/2$^-$,5/2,7/2		
1042.10 *10*	3/2$^-$,5/2,7/2		
1108.15 *25*			
1114.75?	7/2$^-$		
1119.95 *8*			
1197.95 *10*			
1224.76 *16*			
1284.13 *15*			
1351.21 *15*			
1534.80 *16*			
1539.36 *13*			
1553.55 *20*			
1799.43 *19*			
1823.24 *25*			
1841.27 *15*			
1966.59 *17*			
2038.66 *23*			
2149.53 *17*			

† From a least-squares fit to Eγ.
‡ From deduced transition multipolarities, unless otherwise specified.

ε,β^+ radiations

Because of the large unplaced photon intensity (≈20%), and the probable incompleteness of the decay scheme, only ε+β^+ branches with intensity >2% are shown.

E(decay)	E(level)	Iβ^+ [†]	Iε[†]	Log *ft*	I(ε+β^+)[†]	Comments
(3.49×10^3 *4*)	1119.95	0.33 *5*	2.3 *4*	7.11 *7*	2.6 *4*	av Eβ=1114 *15*; εK=0.699 *4*; εL=0.1317 *8*; εM+=0.04393 *25*
(3.50×10^3[‡] *4*)	1114.75?	0.43 *6*	3.0 *4*	6.99 *7*	3.4 *5*	av Eβ=1117 *15*; εK=0.699 *4*; εL=0.1316 *8*; εM+=0.04390 *25*
(3.57×10^3 *4*)	1042.10	0.28 *6*	1.8 *3*	7.22 *9*	2.1 *4*	av Eβ=1149 *15*; εK=0.691 *4*; εL=0.1301 *8*; εM+=0.0434 *3*

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^{207}Rn ε decay 1975ZeZY,1973KeZP (continued)

ϵ,β^+ radiations (continued)

E(decay)	E(level)	Iβ^+ †	Iε†	Log *ft*	I($\varepsilon+\beta^+$)†	Comments
(3.59×10^3 *4*)	1018.57	0.43 *4*	2.68 *21*	7.06 *4*	3.11 *24*	av Eβ=1159 *15*; εK=0.688 *4*; εL=0.1295 *8*; εM+=0.0432 *3*
(3.64×10^3 *4*)	976.09	0.26 *6*	1.5 *3*	7.31 *10*	1.8 *4*	av Eβ=1178 *15*; εK=0.684 *4*; εL=0.1286 *8*; εM+=0.0429 *3*
(3.86×10^3 *4*)	747.19	5.0 *6*	23 *2*	6.19 *5*	28 *3*	av Eβ=1280 *16*; εK=0.657 *4*; εL=0.1233 *9*; εM+=0.0411 *3*
(3.94×10^3 *4*)	673.98	2.09 *16*	8.9 *7*	6.62 *4*	11.0 *8*	av Eβ=1312 *16*; εK=0.648 *5*; εL=0.1215 *9*; εM+=0.0405 *3*
(4.27×10^3 *4*)	344.55	3.9 *5*	12.2 *16*	6.56 *6*	16.1 *21*	av Eβ=1459 *16*; εK=0.607 *5*; εL=0.1133 *9*; εM+=0.0377 *3* I(ε+β$^+$): if the 344.5γ deexcites only the 344 level. E(decay): E(β$^+$)=3250 *100* (1975ZeZY).

† Absolute intensity per 100 decays.

‡ Existence of this branch is questionable.

γ(^{207}At)

Iγ normalization: From the requirement that Σ Ti(γ′s to g.s.)=100 and the assumption that there is no direct feeding to the g.s..
On the basis of energy fits, the following γ′s that were initially placed by 1975ZeZY, were multiply placed by 1984Sc44: 344γ, 610γ, 643γ, 674γ, 780γ, 865γ, and 879γ.
I(γ$^{\pm}$)=178 *18* (1975ZeZY).

E_γ[‡]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	α[†]	Comments
188.0 *3*	5.6 *11*	1539.36		1351.21					
[x]233.8 *2*	15 *3*								
242.9 *4*	3.4 *10*	1351.21		1108.15					
245.7 *4*	3.4 *8*	1799.43		1553.55					
[x]295.5 *3*	8.8 *15*								
308.0[b] *4*	3.7[b] *8*	1284.13		976.09					
308.0[b] *4*	3.7[b] *8*	2149.53		1841.27					
329.45 *5*	66 *7*	673.98	(5/2)$^-$	344.55	7/2$^-$	(M1)		0.426	α(K)=0.346 *5*; α(L)=0.0611 *9*; α(M)=0.01444 *21*; α(N+..)=0.00465 *7* α(N)=0.00374 *6*; α(O)=0.000801 *12*; α(P)=0.0001106 *16* Mult.: Assigned M1 in 1975ZeZY, but α(K)exp was not given by the authors.
[x]337.6 *4*	2.8 *20*								
344.53[b] *5*	1000[b]	344.55	7/2$^-$	0	9/2$^-$	E2+M1	3.1 *+19−7*	0.115 *17*	α(K)=0.074 *15*; α(L)=0.0308 *15*; α(M)=0.0079 *4*; α(N+..)=0.00249 *11* α(N)=0.00203 *9*; α(O)=0.000414 *19*; α(P)=4.8×10^{-5} *4* I_γ: Alternate placement from the 1018 level, suggested by 1984Sc44 must have a negligible fraction of the intensity since no 344γ-344γ coin was reported by the authors. From intensity balance arguments, Iγ(344γ from 1018) must be less than≈240. Mult.: α(K)exp=0.075.
344.53[c] *5*		1018.57	3/2$^-$,5/2,7/2	673.98	(5/2)$^-$				I_γ: see comment given with placement from the 344 level.
350.1 *3*	12 *3*	2149.53		1799.43					
361.0 *4*	2.2 *10*	1108.15		747.19	7/2$^-$				
367.60[c] *5*	55 *6*	1114.75?	7/2$^-$	747.19	7/2$^-$	M1		0.316	α(K)=0.257 *4*; α(L)=0.0452 *7*; α(M)=0.01069 *15*; α(N+..)=0.00344 *5* α(N)=0.00277 *4*; α(O)=0.000593 *9*; α(P)=8.19×10^{-5} *12* E_γ: Observed in coin with the 344γ, and placed by the authors from 1041 keV to 747 keV levels, apparently a typing error. 1984Sc44 places this transition from the 1041 keV to 674 keV levels, but this placement is inconsistent with the coin data. The present evaluators suggest a placement from a new level at 1114 keV, which

γ(^{207}At) (continued)

Eγ[‡]	Iγ[‡a]	Ei(level)	$J^π_i$	Ef	$J^π_f$	Mult.[#]	α[†]	Comments
								accommodates two additional transitions, one of which is now defined as multiply placed. Mult.: α(K)exp=0.29.
377.9 *2*	15 *3*	1351.21		973.28				
[x]380.3 *6*	5.8 *20*							
402.68 *5*	260 *26*	747.19	7/2⁻	344.55	7/2⁻	M1	0.247	α(K)=0.201 *3*; α(L)=0.0353 *5*; α(M)=0.00834 *12*; α(N+..)=0.00269 *4* α(N)=0.00216 *3*; α(O)=0.000463 *7*; α(P)=6.39×10^{-5} *9* Mult.: α(K)exp=0.24.
[x]417.7 *2*	10 *2*							
[x]436.3 *3*	6.5 *18*							
[x]443.5 *4*	4.2 *13*							
446.1 *1*	11.0 *22*	1119.95		673.98	(5/2)⁻			
471.4[bc] *7*	4.4[b] *12*	1114.75?	7/2⁻	643.40	11/2⁻			
471.4[b] *7*	4.4[b] *12*	1823.24		1351.21				
[x]475.6 *2*	15 *4*							
477.8 *5*	7.8 *17*	1224.76		747.19	7/2⁻			
485.0 *6*	5.2 *16*	2038.66		1553.55				
[x]486.9 *5*	6.4 *18*							
520.2 *3*	3.0 *15*	1539.36		1018.57	3/2⁻,5/2,7/2			
524.2 *3*	5.0 *25*	1197.95		673.98	(5/2)⁻			
535.2 *5*	7.8 *20*	1553.55		1018.57	3/2⁻,5/2,7/2			
537.6 *5*	6.2 *18*	1284.13		747.19	7/2⁻			
[x]547.0 *2*	7.2 *20*							
[x]553.2 *1*	26 *5*							
559.2 *4*	4.6 *11*	1534.80		976.09				
561.1 *2*	7.8 *16*	1534.80		973.28				
566.3 *2*	6.4 *20*	1539.36		973.28				
[x]573.4 *4*	3.8 *12*							
580.1 *3*	7.6 *20*	1553.55		973.28				
599.0 *4*	5.2 *18*	1823.24		1224.76				
604.0 *4*	4.4 *11*	1351.21		747.19	7/2⁻			
610.1[b] *2*	8.4[b] *17*	1284.13		673.98	(5/2)⁻			
610.1[b] *2*	8.4[b] *17*	2149.53		1539.36				
616.2 *4*	4.8 *12*	1841.27		1224.76				
[x]620.7 *2*	7.0 *20*							
628.6 *1*	24 *5*	973.28		344.55	7/2⁻			
631.6 *1*	64 *6*	976.09		344.55	7/2⁻			
[x]636.0 *4*	3.0 *15*							
[x]638.1 *4*	3.0 *15*							
643.4[b] *2*	27[b] *5*	643.40	11/2⁻	0	9/2⁻			
643.4[b] *2*	27[b] *5*	1841.27		1197.95				
[x]647.2 *1*	39 *8*							
[x]655.6 *4*	4.2 *15*							

$^{207}_{85}$At$_{122}$-4

γ(^{207}At) (continued)

E_γ[‡]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	α[†]	Comments
[x]660.4 *2*	19 *4*								
[x]672.0 *3*	14 *4*								
674.00[b] *5*	≈180[b@]	673.98	(5/2)$^-$	0	9/2$^-$	E2[&]		0.01716	α(K)=0.01270 *18*; α(L)=0.00337 *5*; α(M)=0.000833 *12*; α(N+..)=0.000266 *4* α(N)=0.000215 *3*; α(O)=4.47×10^{-5} *7*; α(P)=5.59×10^{-6} *8* Mult.: α(K)exp=0.012.
674.00[b] *5*	≈90[b@]	1018.57	3/2$^-$,5/2,7/2	344.55	7/2$^-$	E1,E2[&]		0.012 *6*	α(K)=0.009 *4*; α(L)=0.0021 *14* Mult.: α(K)exp=0.012.
[x]685.8 *1*	27 *5*								
687.5 *2*	14 *4*	2038.66		1351.21					
691.5 *5*	2.6 *10*	1799.43		1108.15					
697.5 *1*	52 *8*	1042.10	3/2$^-$,5/2,7/2	344.55	7/2$^-$				
[x]700.5 *1*	9.7 *20*								
[x]712.8 *2*	13 *4*								
[x]739.8 *5*	5.0 *17*								
747.15 *7*	310 *30*	747.19	7/2$^-$	0	9/2$^-$	M1+E2	0.8 *4*	0.035 *9*	α(K)=0.028 *8*; α(L)=0.0051 *11*; α(M)=0.00122 *25*; α(N+..)=0.00039 *8* α(N)=0.00032 *7*; α(O)=6.7×10^{-5} *14*; α(P)=9.1×10^{-6} *20* Mult.: α(K)exp=0.029.
[x]751.6 *4*	10 *2*								
754.2 *6*	5.9 *14*	2038.66		1284.13					
763.4 *7*	2.0 *7*	1108.15		344.55	7/2$^-$				
768.6 *3*	6.2 *20*	1966.59		1197.95					
775.30 *9*	45 *6*	1119.95		344.55	7/2$^-$				
780.9[b] *4*	≈1.5[b]	1799.43		1018.57	3/2$^-$,5/2,7/2				
780.9[b] *4*	≈1.5[b]	1823.24		1042.10	3/2$^-$,5/2,7/2				
788.1 *4*	4.6 *13*	1534.80		747.19	7/2$^-$				
792.3 *4*	3.8 *10*	1539.36		747.19	7/2$^-$				
798.9 *3*	4.8 *14*	1841.27		1042.10	3/2$^-$,5/2,7/2				
804.3 *7*	4.4 *20*	1823.24		1018.57	3/2$^-$,5/2,7/2				
806.1 *5*	6.2 *23*	1553.55		747.19	7/2$^-$				
[x]820.7 *4*	5.0 *20*								
823.3 *4*	4.4 *16*	1799.43		976.09					
[x]834.8[c] *3*	3.8 *13*								E_γ: Value given by authors is 884.8, but the transition is listed between the 820.7 and 847.5 γ′s.
[x]847.5 *3*	7 *3*								
853.4 *1*	51 *10*	1197.95		344.55	7/2$^-$				
861.4 *4*	3.2 *12*	1534.80		673.98	(5/2)$^-$				
865.4[b] *4*	5.0[b] *23*	1539.36		673.98	(5/2)$^-$				
865.4[b] *4*	5.0[b] *23*	1841.27		976.09					
[x]873.5 *7*	5.3 *24*								
879.9[b] *7*	4.0[b] *15*	1224.76		344.55	7/2$^-$				

$^{207}_{85}$At$_{122}$-5

γ(^{207}At) (continued)

E_γ[‡]	I_γ[‡a]	E_i(level)	J_i^π	E_f	J_f^π
879.9[b] 7	4.0[b] 15	1553.55		673.98	(5/2)⁻
[x]884.5 3	6.6 25				
[x]892.7 7	22 4				
[x]908.6 1	30 15				
[x]919.8 3	6 3				
923.2[c] 6	2.8 14	2038.66		1114.75?	7/2⁻
939.4 3	7.6 24	1284.13		344.55	7/2⁻
947.9 4	6.5 20	1966.59		1018.57	3/2⁻,5/2,7/2
951.8 4	8 3	2149.53		1197.95	
973.35 13	55 10	973.28		0	9/2⁻
[x]983.0 5	5.2 20				
[x]985.8 3	8 3				
990.7 3	7.4 25	1966.59		976.09	
993.2 3	11 3	1966.59		973.28	
[x]999.2 2	26 4				
[x]1083.0 7	6 3				

E_γ[‡]	I_γ[‡a]	E_i(level)	E_f	J_f^π
[x]1121.1 5	5.0 20			
[x]1129.7 5	4.4 20			
[x]1172.0 4				
1176.3 6		2149.53	973.28	
1190.4 5	5.0 20	1534.80	344.55	7/2⁻
1224.8 2	13 3	1224.76	0	9/2⁻
[x]1254.6 2	7.4 3			
[x]1326.6 7				
[x]1474.3 7				
1478.8 7		1823.24	344.55	7/2⁻
[x]1507.5 6	10 4			
[x]1522.8 4	15 4			
1539.5 7	13 5	1539.36	0	9/2⁻
1799.6 8		1799.43	0	9/2⁻
1806.1 8		2149.53	344.55	7/2⁻
[x]2576.6 3	6.6 20			

† Additional information 1.

‡ From 1975ZeZY. Others: 1971KeZH, 1971KeZZ, 1973KeZP.

\# From α(K)exp data of 1973KeZP. No uncertainties are given by the authors. The evaluator has assigned an uncertainty of 20%. The authors in 1975ZeZY state that data of 1973KeZP give mult(329γ)=M1.

@ Iγ(674γ)=265 25 is given by the authors in their table. The divided intensities shown here are given in the authors′ decay scheme and presumably were deduced from $\gamma\gamma$.

& α(K)exp for the doubly placed 674γ is consistent only with mult=E2 for the more intense component, and with E1 or E2 for the weaker component.

a For absolute intensity per 100 decays, multiply by 0.0458 24.

b Multiply placed with undivided intensity.

c Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

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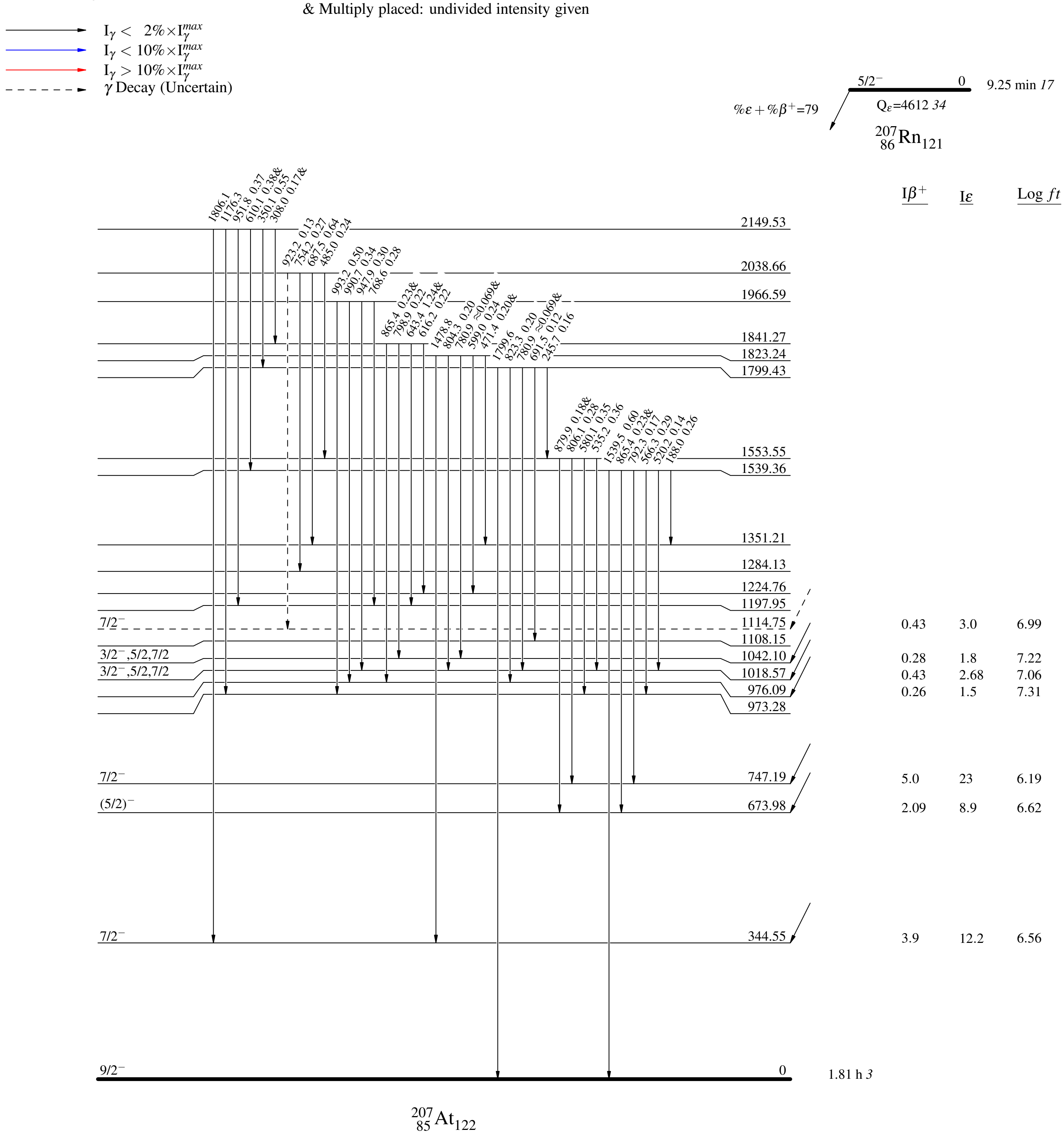
Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given



^{207}Rn ε decay 1975ZeZY,1973KeZP

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given