Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Ictp-2014 Workshop Group	NDS 132, 257 (2016)	15-Jan-2016

Q(β^-)=1328.4 *23*; S(n)=4561.4 *3*; S(p)=7650 *12*; Q(α)=4365 *8* 2012Wa38
S(2n)=10957.5 *29*, S(2p)=13933 *11* (2012Wa38).

^{227}Ra evaluated by F.G. Kondev and S. Pascu.

^{227}Ra Levels

Cross Reference (XREF) Flags

- A ^{227}Fr β^- decay (2.47 min)
- B ^{226}Ra(n,γ) E=thermal
- C ^{226}Ra(d,p)
- D ^{226}Ra(pol t,d)

E(level)[†]	J$^\pi$[@]	T$_{1/2}$[&]	XREF	Comments
0.0[a]	3/2$^+$	42.2 min *5*	ABCD	%β^-=100 μ=−0.4038 *24*; Q=+1.53 *6* (2013StZZ) Evaluated rms charge radius=5.728 fm *30* (2013An02). J$^\pi$: from Collinear fast-beam laser spectroscopy (1988Ah02,1983Ah03, 1987We03). π=+ form μ. T$_{1/2}$: from 284γ(t) and 330γ(t) following ^{227}Ra β^- decay in 1971Lo15. Other value: 41.2 min *2* using β^- decay counting (1953Bu63). configuration: ν 3/2[631] Nilsson orbital assignment. Theoretical value of μ=−0.41, for 3/2$^+$,3/2[631] (including a Coriolis interaction with other orbitals and an octupole deformation ε_3=0.07), agrees with experimental value (1984Le04). Q(theory)=1.40 is also consistent with this interpretation (1988Le13). For additional theoretical interpretation see 1983Ra28, 1984Le04, 1988Le13, 1996Aa01 and 2004Ad41. μ: Collinear fast-beam laser spectroscopy (1988Ah02). Others: −0.41 (1983Ah03) and −0.391 *8* (1987We03). Q: Collinear fast-beam laser spectroscopy. Values are: +1.50 *15* (1988AH02,1987WE03,1983AH03), re-calculated as +1.58 *11* (1989Ne03). 2013StZZ evaluated as +1.53 *6*. Δ<r^2>=1.587 *80* (2012Wa24). Others: 1.365 (1988Ah02).
1.733[b] *9*	(5/2)$^+$		ABCD	J$^\pi$: 100.1γ E1 from 5/2$^-$; absence of γ rays that feed this level from the known J$^\pi$=1/2$^-$ states in ^{227}Ra. configuration: ν 5/2[633] Nilsson orbital assignment is based on the analogy with ^{229}Th. The positive sign of the analyzing power in the (pol t,d) reaction is consistent with this assignment.
25.768[a] *3*	5/2$^+$		ABCD	J$^\pi$: 64.267γ E1 from 3/2$^-$; band assignment.
64.077[a] *10*	7/2$^+$		AB	J$^\pi$: 37.9γ E1 from 5/2$^-$; band assignment.
83.4[‡][b] *24*	9/2$^+$		CD	J$^\pi$: (d,p) cross section and positive sign for the (pol t,d) analyzing power are consistent with 9/2$^+$,5/2[633]. Strongest transition observed in both (d,p) and (pol t,d) reactions.
90.0343[c] *17*	3/2$^-$	254 ps *9*	AB	J$^\pi$: 90.0γ E1 to 3/2$^+$, 64.3γ E1 to 5/2$^+$. Population in ^{226}Ra(n,γ) E=thermal by a primary transition. T$_{1/2}$: from β-BaF$_2$(64γ + 90γ)(Δt). Other: 262 ps *50*, earlier analysis in 1994MaZO. configuration: ν 3/2[761] Nilsson orbital assignment. Level is not populated in either in (d,p) or (pol t,d), which is consistent with the proposed configuration.

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Adopted Levels, Gammas (continued)

^{227}Ra Levels (continued)

E(level)[†]	J$^{\pi}$[@]	$T_{1/2}$[&]	XREF	Comments
101.8942[c] *18*	5/2$^-$	236 ps *30*	AB	J$^{\pi}$: 101.894γ E1 to 3/2$^+$, 37.9γ E1 to 7/2$^+$; band member.
120.711[d] *4*	1/2$^+$	≤47 ps	ABCD	J$^{\pi}$: 120.709γ M1(+E2) to 3/2$^+$, 555.15 E1 from 1/2$^-$ Analyzing power of≈0 in (pol t,d) suggests J=1/2. Strong population in (d,p) is consistent with 1/2$^+$,1/2[631]. configuration: ν 1/2[631] Nilsson orbital assignment.
138.6[‡c] *24*	(11/2$^-$)		CD	J$^{\pi}$: assignment is based on expected (d,p) and (pol t,d) cross sections for 11/2$^-$,3/2[761].
153.275 *12*	(1/2,3/2)$^+$		AB	J$^{\pi}$: 153.553γ to 3/2$^+$, 321.763γ M1(+E2) from 3/2$^+$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
161.051[d] *5*	3/2$^+$	≤39 ps	ABCD	J$^{\pi}$: 514.8γ E1 from 1/2$^-$; band assignment . Spectroscopic factor in (d,p), and negative sign for the analyzing power in (pol t,d) are consistent with 3/2$^+$,1/2[631].
176.973[d] *5*	(5/2)$^+$	≤58 ps	ABCD	J$^{\pi}$: 107.306γ E1 from 3/2$^-$; band assignment. Spectroscopic factor in (d,p) and probable positive sign for the analyzing power in (pol t,d) are consistent with 5/2$^+$,1/2[631].
186.3[‡a] *24*	(11/2$^+$)		CD	XREF: D(185). J$^{\pi}$: consistent with negative sign for the analyzing power in (pol t,d).
228.0[‡c] *24*	(15/2)$^-$		CD	J$^{\pi}$: assignment is consistent with (d,p) cross-section for 15/2$^-$,3/2[761] and with a probable positive sign for the (pol t,d) analyzing power. L=7 in (pol t,d).
267.3[‡d] *24*	(7/2$^+$)		CD	J$^{\pi}$: assignment is tentative and based on probable negative sign for the (pol t,d) analyzing power. Experimental (d,p) spectroscopic factor is about ten times larger than the theoretical value for 7/2$^+$,1/2[631].
284.280[e] *5*	3/2$^-$	≤29 ps	AB	J$^{\pi}$: 163.563γ E1 to 1/2$^+$, 182.394γ M1+E2 to 5/2$^-$. Experimental B(M1)(194γ)/B(M1)(182γ)=2.1 *3* compares with a theoretical value of 1.5 for J,K=3/2,1/2 (Alaga rule). Strong decays to J$^{\pi}$=1/2$^+$, 3/2$^+$, and 5/2$^+$ members of the 1/2[631] band suggest an octupole character. The experimental negative decoupling parameter of the band is likely due to the coupling with an octupole deformation (1981Vo03,1988Le13).
296.576[e] *4*	1/2$^-$	≤41 ps	AB	J$^{\pi}$: 372.2γ M1+E0 from 1/2$^-$. Strong decay to the J$^{\pi}$=1/2$^+$ and 3/2$^+$ members of the 1/2[631] rotational band suggests that the level belongs to a K=1/2 rotational band coupled to an octupole deformation.
299.4[‡d] *24*	(9/2$^+$)		CD	J$^{\pi}$: spectroscopic factor in (d,p) is in fair agreement with theoretical value for 9/2$^+$,1/2[631]. Positive sign for the analyzing power in (pol t,d) is consistent with this assignment.
337.6[‡] *24*			CD	
363[#] *3*			C	
384.355 *8*	1/2$^+$,3/2$^+$	≤21 ps	ABC	J$^{\pi}$: 384.348γ M1 to 3/2$^+$. Populated by primary transition in ^{226}Ra(n,γ) E=thermal.
406[#] *3*			C	
438.795 *9*	(3/2)$^+$		ABC	J$^{\pi}$: 413.029γ M1(+E2) to 5/2$^+$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
471.567[h] *7*	3/2$^-$	≤6 ps	AB	J$^{\pi}$: 381.556γ M1 to 3/2$^-$, 369.669γ M1 to 5/2$^-$, 204.30γ M1(+E2) from 1/2$^-$. configuration: Possible ν 1/2[770] Nilsson orbital assignment. Large experimental decoupling constant is consistent with 3/2$^-$,1/2[770]. Strong mixing with 1/2[501] may explain the intense γ-ray transitions from the 1/2$^-$,1/2[501] state at 675 keV. The (d,p) population may originate also from this mixing (1981Vo03).
472[#d] *3*	(13/2$^+$)		C	
475.033 *14*	3/2$^+$		AB	J$^{\pi}$: 178.47γ E1 to 1/2$^-$, 449.263γ M1 to 5/2$^+$.
498[#] *3*			C	
523.851 *9*	(3/2)$^-$	≤20 ps	ABC	XREF: C(526). J$^{\pi}$: 403.19γ E1 to 1/2$^+$, 498.4γ to 5/2$^+$.
598.51 *4*	(3/2$^+$)		AB	J$^{\pi}$: 534.335γ to 7/2$^+$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).

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Adopted Levels, Gammas (continued)

^{227}Ra Levels (continued)

E(level)[†]	J$^{\pi}$[@]	$T_{1/2}$[&]	XREF	Comments
675.863[f] *10*	1/2$^-$	≤10 ps	ABC	XREF: C(677). J$^{\pi}$: 379.15γ M1+E0 to 1/2$^-$;573.84γ (E2) to 5/2$^-$. configuration: ν 1/2[501] Nilsson assignment.
731.650 *15*	(3/2)$^+$		ABC	J$^{\pi}$: 347.251γ M1(+E2) to 1/2$^+$,3/2$^+$, 629.755γ (E1) to 5/2$^-$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
738.11[f] *11*	(5/2$^-$)		B	J$^{\pi}$: 299.37γ to (3/2)$^+$, 648.11γ to 3/2$^-$, 711.58γ to 5/2$^+$; absence of direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$); band structure.
755.6[‡g] *24*	(3/2$^-$)		CD	J$^{\pi}$: spectroscopic factor in (d,p) and positive sign of the analyzing power in (pol t,d) are consistent with 3/2$^-$,1/2[761].
806.6[‡g] *24*	(7/2$^-$)		CD	J$^{\pi}$: spectroscopic factor in (d,p) and positive sign of the analyzing power in (pol t,d) are consistent with 7/2$^-$,1/2[761].
858.0[‡] *24*			CD	
875[#] *3*			C	
906.4[‡] *24*			CD	
926.0[‡] *24*			CD	
948.3[‡] *24*			CD	
969.3[‡] *24*			CD	
1000.6[‡] *24*			CD	
1017.0[‡] *24*			CD	
1056.0[‡] *24*			CD	
1094.9 *3*	1/2,3/2		A CD	XREF: C(1099)D(1101). J$^{\pi}$: 810.4γ to 3/2$^-$, 1005.0γ to 5/2$^-$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
1127.1[‡] *24*			CD	XREF: C(1126).
1136[#] *3*			CD	XREF: C(1136).
1152[#] *3*			C	
1168.3[‡] *24*			CD	
1202[#] *3*			C	
1230[#] *3*			C	
1250[#] *3*			C	
1287[#] *3*			C	
1307.0[‡] *24*			CD	
1318.84 *17*	1/2,3/2		A	J$^{\pi}$: 846.8γ to 3/2$^-$, 1217.0γ to 5/2$^-$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
1331[#] *3*			C	
1391[#] *3*			C	
1432.22 *21*	1/2,3/2		A C	XREF: C(1427). J$^{\pi}$: 1147.4γ to 3/2$^-$, 1432.4γ to 3/2$^+$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
1444.1 *5*	1/2,3/2		A C	J$^{\pi}$: 1147.4γ to 1/2$^-$, 1354.2γ to 3/2$^-$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
1455.2 *3*			A	J$^{\pi}$: 983.5γ to 3/2$^-$, 1455.3γ to 3/2$^+$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
1468.14 *16*	1/2,3/2		A C	J$^{\pi}$: 1347.4γ to 1/2$^+$, 1378.1γ to 3/2$^-$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
1474.84 *21*			A	J$^{\pi}$: 1178.2γ to 1/2$^-$, 1384.9γ to 3/2$^-$; direct feeding in ^{227}Fr β^- decay (J$^{\pi}$=1/2$^+$).
1491[#] *3*			C	
1516[#] *3*			C	
1545[#] *3*			C	
1581[#] *3*			C	
1751[#] *3*			C	
1765[#] *3*			C	
1792[#] *3*			C	
1814[#] *3*			C	

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Adopted Levels, Gammas (continued)

^{227}Ra Levels (continued)

E(level)[†]	J^{π}[@]	XREF	Comments
1832[#] *3*		C	
1857[#] *3*		C	
1884[#] *3*		C	
1916[#] *3*		C	
1957[#] *3*		C	
1972[#] *3*		C	
2064[#] *3*		C	
2083[#] *3*		C	
2105[#] *3*		C	
2124[#] *3*		C	
2160[#] *3*		C	
2181[#] *3*		C	
2228[#] *3*		C	
2271[#] *3*		C	
2291[#] *3*		C	
2317[#] *3*		C	
2340[#] *3*		C	
(4561.4 *3*)	$1/2^+$	B	Additional information 1. E(level): S(n) value from 2012Wa38. J^{π}: s-wave neutron capture state.

[†] From a least-squares fit to Eγ, unless otherwise stated.
[‡] Weighted average from ^{226}Ra(d,p) and ^{226}Ra(pol t,d).
[#] From ^{226}Ra(d,p).
[@] based on deduced γ-ray transition multipolarities, band assignments and decay patterns. Nilsson state assignments are based on the comparison of experimental (d,p) and (pol t,d) cross-sections with values calculated using the DWBA approximation and Nilsson′s model, on the sign of analyzing powers in (pol t,d), and on the energy systematics of Nilsson orbitals in other neighboring odd-A actinides. Specific additional arguments are given with individual levels.
[&] From $\beta\gamma$(t) in ^{227}Fr β^- decay (1996Aa01), unless otherwise specified.
[a] Band(A): 3/2[631] rotational band.
[b] Band(B): 5/2[633] rotational band.
[c] Band(C): 3/2[761] rotational band.
[d] Band(D): 1/2[631] rotational band.
[e] Band(E): 1/2[631]$\otimes 0^-$ (octupole vibration).
[f] Band(F): 1/2[501] rotational band.
[g] Band(G): Possible 1/2[761] rotational band.
[h] Band(H): Possible 1/2[770] rotational band.

$\gamma(^{227}Ra)$

See 1982Ba56 for precise measurements of Ra K x ray energies in $^{226}Ra(n,\gamma)$.

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[@]	α[&]	Comments
64.077	7/2+	64.085 *10*	100	0.0	3/2+			
90.0343	3/2−	64.267 *2*	37[‡] *4*	25.768	5/2+	E1	0.358	α(L)=0.271 *4*; α(M)=0.0659 *10* α(N)=0.01704 *24*; α(O)=0.00365 *6*; α(P)=0.000546 *8*; α(Q)=2.36×10^{-5} *4* B(E1)(W.u.)=0.00060 *9* Mult.: from α(L1)exp+α(L2)exp≤0.20 and α(L3)exp≤0.10 (1987Bo04). Other value: α(L)exp + α(M)exp≤2.6, from γ-ray intensity balance in $^{226}Ra(n,\gamma)$ E=thermal (1981Vo03).
		(88.301[#] *9*)	≤3.3[‡]	1.733	(5/2)+	[E1]	0.1536	α(L)=0.1163 *17*; α(M)=0.0281 *4* α(N)=0.00729 *11*; α(O)=0.001583 *23*; α(P)=0.000245 *4*; α(Q)=1.173×10^{-5} *17* B(E1)(W.u.)=1.0×10^{-5} *+11−10*
		90.035 *2*	100[‡] *10*	0.0	3/2+	E1	0.1458	α(L)=0.1105 *16*; α(M)=0.0267 *4* α(N)=0.00693 *10*; α(O)=0.001504 *21*; α(P)=0.000233 *4*; α(Q)=1.123×10^{-5} *16* B(E1)(W.u.)=0.00059 *8* Mult.: from (α(L1)exp + α(L2)exp)≤0.09, α(L3)exp≤0.03, and α(M)exp=0.026 *5* (1987Bo04). Other: (α(L)exp + α(M)exp)≤0.9, from γ-ray intensity balance in $^{226}Ra(n,\gamma)$ E=thermal (1981Vo03).
101.8942	5/2−	(11.859[#] *25*)	≤0.12[‡]	90.0343	3/2−			
		37.9[‡] *1*	18[‡] *4*	64.077	7/2+	E1	1.466 *23*	α(L)=1.105 *18*; α(M)=0.273 *5* α(N)=0.0702 *11*; α(O)=0.01462 *23*; α(P)=0.00203 *4*; α(Q)=7.20×10^{-5} *11* B(E1)(W.u.)=0.0010 *3* Mult.: from α(M)exp≤1.5 (1987Bo04).
		76.1[‡] *1*	4.2[‡] *7*	25.768	5/2+	[E1]	0.228	α(L)=0.1727 *25*; α(M)=0.0419 *6* α(N)=0.01084 *16*; α(O)=0.00234 *4*; α(P)=0.000357 *6*; α(Q)=1.629×10^{-5} *24* B(E1)(W.u.)=3.0×10^{-5} *8* Mult.: α(L1)exp+α(L2)exp≤13; α(L3)exp≤4.8 (1987Bo04).
		100.1[‡] *2*	76[‡] *16*	1.733	(5/2)+	E1	0.1101 *17*	α(L)=0.0834 *13*; α(M)=0.0201 *3* α(N)=0.00523 *8*; α(O)=0.001139 *17*; α(P)=0.000178 *3*; α(Q)=8.87×10^{-6} *13* B(E1)(W.u.)=0.00024 *7* Mult.: from α(L)exp≤0.08 (1987Bo04).
		101.894 *2*	100[‡] *16*	0.0	3/2+	E1	0.1051	α(L)=0.0796 *12*; α(M)=0.0192 *3* α(N)=0.00499 *7*; α(O)=0.001088 *16*; α(P)=0.0001704 *24*; α(Q)=8.52×10^{-6} *12* B(E1)(W.u.)=0.00030 *7* Mult.: from α(L)exp≤0.07 (1987Bo04). Other: (α(L)exp + α(M)exp)≤2.6, from γ-ray intensity balance in $^{226}Ra(n,\gamma)$ E=thermal (1981Vo03).

Adopted Levels, Gammas (continued)

γ(^{227}Ra) (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.@	δ@	α&	Comments
120.711	1/2+	120.709 *8*	100	0.0	3/2+	M1(+E2)	<0.3	8.94 *24*	α(K)=7.0 *3*; α(L)=1.43 *7*; α(M)=0.347 *20* α(N)=0.092 *6*; α(O)=0.0207 *11*; α(P)=0.00356 *14*; α(Q)=0.000260 *11* B(M1)(W.u.)>0.024?
153.275	(1/2,3/2)+	151.553 *25*	100‡ *13*	1.733	(5/2)+				I_γ: 69 *8* in ^{226}Ra(n,γ) E=thermal.
		153.272 *15*	88‡ *13*	0.0	3/2+				
161.051	3/2+	(40.340# *6*)	≤5‡	120.711	1/2+	[M1+E2]		44.2	α(L)=33.5 *5*; α(M)=8.02 *12* α(N)=2.12 *3*; α(O)=0.483 *7*; α(P)=0.0842 *12*; α(Q)=0.00663 *10*
		135.280 *8*	100‡ *29*	25.768	5/2+	[M1+E2]		6.61	α(K)=5.31 *8*; α(L)=0.988 *14*; α(M)=0.236 *4* α(N)=0.0623 *9*; α(O)=0.01421 *20*; α(P)=0.00248 *4*; α(Q)=0.000194 *3*
		159.37‡ *5*	31‡ *3*	1.733	(5/2)+	[M1+E2]		4.15	α(K)=3.33 *5*; α(L)=0.619 *9*; α(M)=0.1478 *21* α(N)=0.0390 *6*; α(O)=0.00890 *13*; α(P)=0.001551 *22*; α(Q)=0.0001216 *17*
		161.052 *13*	60‡ *6*	0.0	3/2+	M1,E2		4.03	α(K)=3.24 *5*; α(L)=0.600 *9*; α(M)=0.1435 *20* α(N)=0.0378 *6*; α(O)=0.00863 *12*; α(P)=0.001505 *21*; α(Q)=0.0001180 *17* Mult.: from α(K)exp≤4.5 and α(L)exp≤0.65 (1987Bo04).
176.973	(5/2)+	(15.922# *7*)	≤1.8‡	161.051	3/2+				
		(56.262# *6*)	≤1.8‡	120.711	1/2+				
		113.03 *5*	18‡ *7*	64.077	7/2+	[M1+E2]		11.01	α(K)=8.82 *13*; α(L)=1.655 *24*; α(M)=0.396 *6* α(N)=0.1044 *15*; α(O)=0.0238 *4*; α(P)=0.00415 *6*; α(Q)=0.000326 *5* I_γ: other: 50 *6* in ^{226}Ra(n,γ) E=thermal.
		151.177 *21*	63 *13*	25.768	5/2+	[M1,E2]		4.82	α(K)=3.87 *6*; α(L)=0.719 *10*; α(M)=0.1718 *24* α(N)=0.0453 *7*; α(O)=0.01034 *15*; α(P)=0.00180 *3*; α(Q)=0.0001413 *20*
		175.228 *14*	100 *13*	1.733	(5/2)+	M1,E2		3.17	α(K)=2.55 *4*; α(L)=0.472 *7*; α(M)=0.1129 *16* α(N)=0.0298 *5*; α(O)=0.00679 *10*; α(P)=0.001184 *17*; α(Q)=9.28×10^{-5} *13* Mult.: α(K)exp≤5.6, α(L)exp≤0.4 and α(M)exp≤0.13 (1987Bo04).
284.280	3/2−	107.306 *4*	38‡ *4*	176.973	(5/2)+	E1		0.401	α(K)=0.309 *5*; α(L)=0.0694 *10*; α(M)=0.01674 *24* α(N)=0.00435 *6*; α(O)=0.000950 *14*; α(P)=0.0001494 *21*; α(Q)=7.59×10^{-6} *11* B(E1)(W.u.)>0.00067 Mult.: from α(L)exp≤0.35 (1987Bo04).
		123.17‡ *5*	8.6‡ *10*	161.051	3/2+	[E1]		0.290	α(K)=0.226 *4*; α(L)=0.0483 *7*; α(M)=0.01163 *17* α(N)=0.00303 *5*; α(O)=0.000664 *10*; α(P)=0.0001055 *15*; α(Q)=5.57×10^{-6} *8* B(E1)(W.u.)>0.00010

$^{227}_{88}Ra_{139}$-6

γ(^{227}Ra) (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.@	δ@	α&	Comments
284.280	3/2⁻	131.0‡ *1*	7.1‡ *10*	153.275	(1/2,3/2)⁺	[E1]		0.250	α(K)=0.196 *3*; α(L)=0.0411 *6*; α(M)=0.00989 *14* α(N)=0.00258 *4*; α(O)=0.000566 *8*; α(P)=9.03×10^{-5} *13*; α(Q)=4.85×10^{-6} *7* B(E1)(W.u.)>6.9×10^{-5}
		163.563 *7*	100‡ *10*	120.711	1/2⁺	E1		0.1462	α(K)=0.1156 *17*; α(L)=0.0232 *4*; α(M)=0.00556 *8* α(N)=0.001449 *21*; α(O)=0.000320 *5*; α(P)=5.18×10^{-5} *8*; α(Q)=2.94×10^{-6} *5* B(E1)(W.u.)>0.00050 Mult.: from α(K)exp≤0.5 and α(L)exp≤0.04 (1987Bo04).
		182.394 *15*	17.2‡ *20*	101.8942	5/2⁻	M1+E2	0.6 *3*	2.3 *4*	α(K)=1.7 *4*; α(L)=0.433 *10*; α(M)=0.107 *5* α(N)=0.0283 *13*; α(O)=0.00633 *21*; α(P)=0.001054 *15*; α(Q)=6.3×10^{-5} *14* B(M1)(W.u.)>0.0036; B(E2)(W.u.)>4.3 Mult.: from α(K)exp=1.8 *4* and α(L)exp=0.52 *10* (1987Bo04).
		194.255 *10*	9.6‡ *10*	90.0343	3/2⁻	M1,E2		2.37	α(K)=1.91 *3*; α(L)=0.353 *5*; α(M)=0.0843 *12* α(N)=0.0222 *4*; α(O)=0.00507 *8*; α(P)=0.000884 *13*; α(Q)=6.93×10^{-5} *10* I_γ: 13.4 *24* in ^{226}Ra(n,γ) E=thermal. Mult.: α(K)exp≤3.3 α(L)exp≤0.7 (1987Bo04).
		284.314 *30*	9.6‡ *20*	0.0	3/2⁺	(E1)		0.0397	α(K)=0.0320 *5*; α(L)=0.00588 *9*; α(M)=0.001402 *20* α(N)=0.000367 *6*; α(O)=8.19×10^{-5} *12*; α(P)=1.364×10^{-5} *19*; α(Q)=8.74×10^{-7} *13* B(E1)(W.u.)>9.1×10^{-6} I_γ: 15.9 *24* in ^{226}Ra(n,γ) E=thermal. Mult.: α(K)exp≤0.5 (1987Bo04).
296.576	1/2⁻	(12.296# *6*)	≤0.19‡	284.280	3/2⁻				
		135.525 *5*	100‡ *38*	161.051	3/2⁺	(E1)		0.230	α(K)=0.181 *3*; α(L)=0.0377 *6*; α(M)=0.00905 *13* α(N)=0.00236 *4*; α(O)=0.000518 *8*; α(P)=8.29×10^{-5} *12*; α(Q)=4.49×10^{-6} *7* B(E1)(W.u.)>0.00045 I_γ: 71 *9* in ^{226}Ra(n,γ) E=thermal. Mult.: from α(L)exp(135.5γ + 135.3γ)=0.3 *1* either 135.5γ or 135.3γ must be E1. Decay scheme requires E1 multipolarity for 135.5γ (1987Bo04).
		175.867 *4*	100‡ *23*	120.711	1/2⁺	(E1)		0.1227	α(K)=0.0974 *14*; α(L)=0.0192 *3*; α(M)=0.00461 *7* α(N)=0.001203 *17*; α(O)=0.000266 *4*; α(P)=4.33×10^{-5} *6*; α(Q)=2.50×10^{-6} *4* B(E1)(W.u.)>0.00021 Mult.: from α(K)exp≤2.6, α(L)exp≤0.18, and α(M)exp≤0.06 (1987Bo04).

$^{227}_{88}Ra_{139}$-7

Adopted Levels, Gammas (continued)

γ(^{227}Ra) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$†	I$_\gamma$†	E$_f$	J$^\pi_f$	Mult.@	δ@	α&	Comments
296.576	1/2$^-$	206.539 *5*	52‡ *5*	90.0343	3/2$^-$	[M1+E2]		2.00	α(K)=1.607 *23*; α(L)=0.297 *5*; α(M)=0.0709 *10* α(N)=0.0187 *3*; α(O)=0.00427 *6*; α(P)=0.000744 *11*; α(Q)=5.83×10^{-5} *9* I$_\gamma$: Other: 28 *6* in ^{226}Ra(n,γ) E=thermal.
		296.7‡ *1*	3.1‡ *15*	0.0	3/2$^+$	[E1]		0.0361	α(K)=0.0291 *4*; α(L)=0.00532 *8*; α(M)=0.001266 *18* α(N)=0.000331 *5*; α(O)=7.41×10^{-5} *11*; α(P)=1.235×10^{-5} *18*; α(Q)=7.98×10^{-7} *12* B(E1)(W.u.)>1.3×10^{-6}
384.355	1/2$^+$,3/2$^+$	263.7‡ *1*	2.6‡ *9*	120.711	1/2$^+$	[M1,E2]		1.012	α(K)=0.814 *12*; α(L)=0.1498 *21*; α(M)=0.0358 *5* α(N)=0.00943 *14*; α(O)=0.00215 *3*; α(P)=0.000375 *6*; α(Q)=2.94×10^{-5} *5* I$_\gamma$: other: 7.8 *26* in ^{226}Ra(n,γ) E=thermal.
		384.348 *8*	100‡ *8*	0.0	3/2$^+$	M1+E2	0.5 *3*	0.30 *6*	α(K)=0.24 *5*; α(L)=0.047 *6*; α(M)=0.0114 *13* α(N)=0.0030 *4*; α(O)=0.00068 *8*; α(P)=0.000117 *15*; α(Q)=8.6×10^{-6} *17* B(M1)(W.u.)>0.0079; B(E2)(W.u.)>0.22 Mult.: from α(K)exp=0.24 *4* and α(L)exp≤0.08 (1987Bo04).
438.795	(3/2)$^+$	348.803 *25*	26‡ *3*	90.0343	3/2$^-$				I$_\gamma$: other: 35 *5* in ^{226}Ra(n,γ) E=thermal.
		413.029 *11*	100‡ *8*	25.768	5/2$^+$	M1(+E2)	<0.4	0.280 *17*	α(K)=0.225 *15*; α(L)=0.0418 *18*; α(M)=0.0100 *4* α(N)=0.00264 *11*; α(O)=0.00060 *3*; α(P)=0.000105 *5*; α(Q)=8.1×10^{-6} *5* Mult.: from α(K)exp=0.29 *5* (1987Bo04).
		437.071 *28*	33‡ *5*	1.733	(5/2)$^+$	(M1,E2)		0.255	α(K)=0.205 *3*; α(L)=0.0373 *6*; α(M)=0.00891 *13* α(N)=0.00235 *4*; α(O)=0.000536 *8*; α(P)=9.34×10^{-5} *13*; α(Q)=7.33×10^{-6} *11* Mult.: from α(K)exp(437.1γ + 438.8γ)=0.21 *5* (1987Bo04).
		438.768 *18*	49‡ *8*	0.0	3/2$^+$	(M1,E2)		0.252	α(K)=0.203 *3*; α(L)=0.0370 *6*; α(M)=0.00881 *13* α(N)=0.00232 *4*; α(O)=0.000530 *8*; α(P)=9.24×10^{-5} *13*; α(Q)=7.25×10^{-6} *11* I$_\gamma$: other: 60 *8* in ^{226}Ra(n,γ) E=thermal. Mult.: from α(K)exp(438.8γ + 437.1γ)=0.21 *5* (1987Bo04).
471.567	3/2$^-$	187.274 *35*	2.3‡ *8*	284.280	3/2$^-$	[M1,E2]		2.63	α(K)=2.12 *3*; α(L)=0.391 *6*; α(M)=0.0935 *14* α(N)=0.0247 *4*; α(O)=0.00563 *8*; α(P)=0.000981 *14*; α(Q)=7.69×10^{-5} *11* I$_\gamma$: other: 14 *3* in ^{226}Ra(n,γ) E=thermal.
		294.52 *11*	7.5‡ *10*	176.973	(5/2)$^+$	(E1)		0.0367	α(K)=0.0295 *5*; α(L)=0.00541 *8*; α(M)=0.001289 *18* α(N)=0.000337 *5*; α(O)=7.54×10^{-5} *11*; α(P)=1.257×10^{-5} *18*; α(Q)=8.11×10^{-7} *12* B(E1)(W.u.)>3.5×10^{-5} Mult.: E1 or E2 from α(K)exp≤0.06 (1987Bo04). Decay

$^{227}_{88}$Ra$_{139}$-8

$\gamma(^{227}Ra)$ (continued)

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.@	δ@	α&	Comments
									scheme requires E1. I_γ: other: 13 *3* in $^{226}Ra(n,\gamma)$ E=thermal.
471.567	3/2$^-$	350.85‡ *5*	6.3‡ *5*	120.711	1/2$^+$	[E1]		0.0249	α(K)=0.0201 *3*; α(L)=0.00360 *5*; α(M)=0.000856 *12* α(N)=0.000224 *4*; α(O)=5.03×10^{-5} *7*; α(P)=8.44×10^{-6} *12*; α(Q)=5.62×10^{-7} *8* B(E1)(W.u.)>1.7×10^{-5}
		369.669 *8*	100‡ *6*	101.8942	5/2$^-$	M1(+E2)	<0.2	0.394 *9*	α(K)=0.317 *7*; α(L)=0.0584 *11*; α(M)=0.01394 *24* α(N)=0.00367 *7*; α(O)=0.000838 *15*; α(P)=0.000146 *3*; α(Q)=1.138×10^{-5} *25* B(M1)(W.u.)>0.027? Mult.,δ: from α(K)exp=0.34 *2* and α(L)exp=0.056 *6* (1987Bo04).
		381.556 *15*	63‡ *5*	90.0343	3/2$^-$	M1(+E2)	<0.22	0.361 *9*	α(K)=0.290 *8*; α(L)=0.0534 *10*; α(M)=0.01275 *24* α(N)=0.00336 *7*; α(O)=0.000767 *15*; α(P)=0.000134 *3*; α(Q)=1.04×10^{-5} *3* B(M1)(W.u.)>0.016? Mult.,δ: from α(K)exp=0.36 *5* and α(L)exp=0.067 *10* (1987Bo04).
		445.76‡ *10*	3.3‡ *8*	25.768	5/2$^+$	[E1]		0.01492	α(K)=0.01214 *17*; α(L)=0.00211 *3*; α(M)=0.000501 *7* α(N)=0.0001313 *19*; α(O)=2.95×10^{-5} *5*; α(P)=5.00×10^{-6} *7*; α(Q)=3.46×10^{-7} *5* B(E1)(W.u.)>4.4×10^{-6}
		469.8‡ *3*	3.3‡ *8*	1.733	(5/2)$^+$	[E1]		0.01339	α(K)=0.01091 *16*; α(L)=0.00189 *3*; α(M)=0.000447 *7* α(N)=0.0001171 *17*; α(O)=2.64×10^{-5} *4*; α(P)=4.47×10^{-6} *7*; α(Q)=3.12×10^{-7} *5* B(E1)(W.u.)>3.8×10^{-6}
475.033	3/2$^+$	178.47‡ *10*	45‡ *7*	296.576	1/2$^-$	E1		0.1185	α(K)=0.0940 *14*; α(L)=0.0185 *3*; α(M)=0.00444 *7* α(N)=0.001159 *17*; α(O)=0.000257 *4*; α(P)=4.17×10^{-5} *6*; α(Q)=2.42×10^{-6} *4* Mult.: from α(L)exp≤0.28 (1987Bo04).
		321.763 *25*	19‡ *3*	153.275	(1/2,3/2)$^+$	M1(+E2)	<0.6	0.52 *7*	α(K)=0.42 *6*; α(L)=0.081 *6*; α(M)=0.0195 *12* α(N)=0.0051 *3*; α(O)=0.00117 *8*; α(P)=0.000202 *15*; α(Q)=1.50×10^{-5} *20* I_γ: 34 *5* in $^{226}Ra(n,\gamma)$ E=thermal. Mult.,δ: from α(K)exp=0.6 *2* (1987Bo04).
		373.122 *61*	15‡ *3*	101.8942	5/2$^-$				
		411.140 *80*	24‡ *7*	64.077	7/2$^+$				
		449.263 *29*	74‡ *7*	25.768	5/2$^+$	M1(+E2)	<0.5	0.218 *19*	α(K)=0.175 *17*; α(L)=0.0326 *21*; α(M)=0.0078 *5* α(N)=0.00206 *13*; α(O)=0.00047 *3*; α(P)=8.1×10^{-5} *6*;

$^{227}_{88}Ra_{139}$-9

$\gamma(^{227}$Ra) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[@]	δ[@]	α[&]	Comments
									α(Q)=6.2×10^{-6} *6* Mult.,δ: from α(K)exp=0.21 *4* (1987Bo04).
475.033	3/2$^+$	473.330 *64*	27[‡] *7*	1.733	(5/2)$^+$				
		475.016 *23*	100[‡] *10*	0.0	3/2$^+$	(M1,E2)		0.203	α(K)=0.1642 *23*; α(L)=0.0298 *5*; α(M)=0.00711 *10* α(N)=0.00187 *3*; α(O)=0.000427 *6*; α(P)=7.45×10^{-5} *11*; α(Q)=5.85×10^{-6} *9* Mult.: from α(K)exp≈0.15 (1987Bo04).
523.851	(3/2)$^-$	139.65[‡] *10*	1.4[‡] *3*	384.355	1/2$^+$,3/2$^+$	[E1]		0.214	α(K)=0.1683 *24*; α(L)=0.0348 *5*; α(M)=0.00837 *12* α(N)=0.00218 *3*; α(O)=0.000480 *7*; α(P)=7.69×10^{-5} *11*; α(Q)=4.20×10^{-6} *6*
		362.86[‡] *5*	4.4[‡] *3*	161.051	3/2$^+$	(E1)		0.0231	α(K)=0.0187 *3*; α(L)=0.00334 *5*; α(M)=0.000793 *12* α(N)=0.000208 *3*; α(O)=4.66×10^{-5} *7*; α(P)=7.83×10^{-6} *11*; α(Q)=5.24×10^{-7} *8* B(E1)(W.u.)>5.5×10^{-6} Mult.: E1 or E2 from α(K)exp≤0.07 (1987Bo04). Decay scheme requires E1.
		403.19[‡] *10*	6.6[‡] *5*	120.711	1/2$^+$	E1		0.0184	α(K)=0.01495 *21*; α(L)=0.00263 *4*; α(M)=0.000625 *9* α(N)=0.0001637 *23*; α(O)=3.68×10^{-5} *6*; α(P)=6.21×10^{-6} *9*; α(Q)=4.23×10^{-7} *6* B(E1)(W.u.)>6.0×10^{-6} Mult.: from α(K)exp≤0.02 (1987Bo04).
		422.0[‡a] *2*	1.4[‡] *3*	101.8942	5/2$^-$	[M1+E2]		0.280	α(K)=0.226 *4*; α(L)=0.0411 *6*; α(M)=0.00980 *14* α(N)=0.00258 *4*; α(O)=0.000589 *9*; α(P)=0.0001028 *15*; α(Q)=8.06×10^{-6} *12*
		433.824 *9*	100[‡] *6*	90.0343	3/2$^-$	M1(+E2)	<0.4	0.246 *15*	α(K)=0.197 *13*; α(L)=0.0366 *17*; α(M)=0.0087 *4* α(N)=0.00231 *10*; α(O)=0.000525 *23*; α(P)=9.1×10^{-5} *5*; α(Q)=7.0×10^{-6} *5* B(M1)(W.u.)>0.0076? Mult.: from α(K)exp=0.22 *2*, α(L)exp=0.037 *6* and α(M)exp=0.012 *3* (1987Bo04).
		498.4[‡] *3*	1.4[‡] *3*	25.768	5/2$^+$	[E1]		0.01187	α(K)=0.00968 *14*; α(L)=0.001665 *24*; α(M)=0.000394 *6* α(N)=0.0001032 *15*; α(O)=2.33×10^{-5} *4*; α(P)=3.95×10^{-6} *6*; α(Q)=2.79×10^{-7} *4* B(E1)(W.u.)>6.8×10^{-7}
		523.75[‡] *10*	2.3[‡] *3*	0.0	3/2$^+$	[E1]		0.01074	α(K)=0.00877 *13*; α(L)=0.001500 *21*; α(M)=0.000355 *5* α(N)=9.30×10^{-5} *13*; α(O)=2.10×10^{-5} *3*; α(P)=3.57×10^{-6} *5*; α(Q)=2.53×10^{-7} *4* B(E1)(W.u.)>9.6×10^{-7}
598.51	(3/2$^+$)	159.742 *41*	60[‡] *27*	438.795	(3/2)$^+$				

$^{227}_{88}$Ra$_{139}$-10

$\gamma(^{227}Ra)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.@	δ@	α&	Comments
598.51	(3/2+)	534.335 *88*	100‡ *27*	64.077	7/2+				
		572.71 *17*	80‡ *20*	25.768	5/2+				
		596.76 *21*	60‡ *13*	1.733	(5/2)+				
		598.43 *18*	60‡ *13*	0.0	3/2+				
675.863	1/2−	200.85‡ *5*	2.0‡ *2*	475.033	3/2+	[E1]		0.0893	α(K)=0.0712 *10*; α(L)=0.01376 *20*; α(M)=0.00329 *5* α(N)=0.000860 *12*; α(O)=0.000191 *3*; α(P)=3.12×10^{-5} *5*; α(Q)=1.86×10^{-6} *3* B(E1)(W.u.)>2.6×10^{-5}
		204.30‡ *1*	9.9‡ *8*	471.567	3/2−	M1(+E2)	≤0.7	1.8 *3*	α(K)=1.41 *25*; α(L)=0.303 *6*; α(M)=0.0737 *12* α(N)=0.0195 *4*; α(O)=0.00439 *7*; α(P)=0.000747 *23*; α(Q)=5.1×10^{-5} *9* B(M1)(W.u.)>0.0087? Mult.: from α(K)exp=1.5 *3* (coincidence measurement), α(L)exp=0.34 *4* and α(M)exp=0.076 *1* (1987Bo04). Other value: α(K)exp=1.5 *3* (γ-K x ray coin) (1981Vo03).
		237.2‡ *2*	0.19‡ *5*	438.795	(3/2)+	[E1]		0.0603	α(K)=0.0483 *7*; α(L)=0.00911 *13*; α(M)=0.00218 *3* α(N)=0.000569 *8*; α(O)=0.0001266 *18*; α(P)=2.09×10^{-5} *3*; α(Q)=1.292×10^{-6} *19* B(E1)(W.u.)>1.5×10^{-6}
		291.55‡ *5*	2.49‡ *19*	384.355	1/2+,3/2+	(E1)		0.0375	α(K)=0.0302 *5*; α(L)=0.00554 *8*; α(M)=0.001320 *19* α(N)=0.000345 *5*; α(O)=7.72×10^{-5} *11*; α(P)=1.286×10^{-5} *18*; α(Q)=8.28×10^{-7} *12* B(E1)(W.u.)>1.0×10^{-5} Mult.: E1 or E2 from α(K)exp≤0.18 (1987Bo04). Decay scheme requires E1. α(K)exp=0.54 *24*, a less reliable value measured by γ-K x ray coin, suggests M1 multipolarity (1981Vo03).
		379.15‡ *10*	0.32‡ *5*	296.576	1/2−	M1+E0		3.0 *10*	Mult.: from α(K)exp=2.4 *8* (1987Bo04). α: From EKC=2.4 8 (1987BO04) and CC/KC=1.24 3 from BRICC.
		391.57‡ *2*	8.8‡ *6*	284.280	3/2−	M1(+E2)	≤0.3	0.331 *13*	α(K)=0.266 *11*; α(L)=0.0492 *14*; α(M)=0.0118 *3* α(N)=0.00310 *8*; α(O)=0.000707 *19*; α(P)=0.000123 *4*; α(Q)=9.5×10^{-6} *4* B(M1)(W.u.)>0.0017? Mult.,δ: from α(K)exp=0.29 *3* and α(L)exp≤0.08 (1987Bo04).
		514.8‡ *2*	6.4‡ *11*	161.051	3/2+	E1		0.01112	α(K)=0.00907 *13*; α(L)=0.001555 *22*; α(M)=0.000368 *6* α(N)=9.64×10^{-5} *14*; α(O)=2.17×10^{-5} *3*; α(P)=3.70×10^{-6} *6*; α(Q)=2.62×10^{-7} *4* B(E1)(W.u.)>4.9×10^{-6} Mult.: from α(K)exp≤0.01 (1987Bo04).
		555.15‡ *10*	10.1‡ *7*	120.711	1/2+	E1		0.00957	α(K)=0.00782 *11*; α(L)=0.001330 *19*; α(M)=0.000314 *5* α(N)=8.24×10^{-5} *12*; α(O)=1.86×10^{-5} *3*; α(P)=3.17×10^{-6} *5*;

From ENSDF

$^{227}_{88}Ra_{139}$-11

Adopted Levels, Gammas (continued)

$\gamma(^{227}Ra)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.@	δ@	α&	Comments
									α(Q)=2.27×10^{-7} *4* B(E1)(W.u.)>6.1×10^{-6} Mult.: from α(K)exp≤0.007 (1987Bo04).
		573.84‡ *10*	1.55‡ *11*	101.8942	5/2$^-$	(E2)		0.0282	α(K)=0.0193 *3*; α(L)=0.00659 *10*; α(M)=0.001674 *24* α(N)=0.000442 *7*; α(O)=9.75×10^{-5} *14*; α(P)=1.571×10^{-5} *22*; α(Q)=6.96×10^{-7} *10* B(E2)(W.u.)>0.098 Mult.: E1 or E2 from α(K)exp≤0.025 (1987Bo04). Decay scheme requires E2.
		585.804 *49*	100‡ *5*	90.0343	3/2$^-$	M1(+E2)	≤0.4	0.110 *7*	α(K)=0.089 *6*; α(L)=0.0162 *8*; α(M)=0.00387 *18* α(N)=0.00102 *5*; α(O)=0.000232 *11*; α(P)=4.05×10^{-5} *20*; α(Q)=3.15×10^{-6} *19* B(M1)(W.u.)>0.0053?

$^{227}_{88}Ra_{139}$-12

$\gamma(^{227}Ra)$ (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult. @	δ @	α &	Comments
									Mult.,δ: from α(K)exp=0.095 *10*, α(L)exp=0.018 *2*, α(M)exp=0.0046 *8* and α(N)exp=0.0011 *5* (1987Bo04).
675.863	$1/2^-$	(675.863‡# *10*)	≤1.39‡	0.0	$3/2^+$	[E1]		0.00654	α(K)=0.00536 *8*; α(L)=0.000894 *13*; α(M)=0.000211 *3* α(N)=5.53×10^{-5} *8*; α(O)=1.250×10^{-5} *18*; α(P)=2.14×10^{-6} *3*; α(Q)=1.571×10^{-7} *22* B(E1)(W.u.)>2.2×10^{-7}
731.650	$(3/2)^+$	207.852 *20*	31‡ *8*	523.851	$(3/2)^-$				
		347.251 *18*	100‡ *8*	384.355	$1/2^+,3/2^+$	M1(+E2)	≤0.4	0.459 *17*	α(K)=0.369 *15*; α(L)=0.0685 *18*; α(M)=0.0164 *4* α(N)=0.00432 *11*; α(O)=0.000985 *25*; α(P)=0.000171 *5*; α(Q)=1.32×10^{-5} *6* Mult.: from α(K)exp=0.46 *8* (1987Bo04).
		434.92 *13*	35‡ *12*	296.576	$1/2^-$				
		629.755 *73*	54‡ *8*	101.8942	$5/2^-$	(E1)		0.00748	α(K)=0.00613 *9*; α(L)=0.001029 *15*; α(M)=0.000243 *4* α(N)=6.37×10^{-5} *9*; α(O)=1.439×10^{-5} *21*; α(P)=2.46×10^{-6} *4*; α(Q)=1.79×10^{-7} *3* Mult.: E1 or E2 from α(K)exp≤0.04 (1987Bo04). Decay scheme requires E1.
		641.77 *11*	35‡ *8*	90.0343	$3/2^-$				
738.11	$(5/2^-)$	299.37 *11*	71 *14*	438.795	$(3/2)^+$				
		648.11 *55*	43 *14*	90.0343	$3/2^-$				
		711.58 *42*	100 *29*	25.768	$5/2^+$				
1094.9	1/2,3/2	810.4‡ *5*	45‡ *10*	284.280	$3/2^-$				
		993.0‡ *5*	100‡ *10*	101.8942	$5/2^-$				
		1005.0‡ *5*	45‡ *10*	90.0343	$3/2^-$				
1318.84	1/2,3/2	795.3‡ *5*	60‡ *13*	523.851	$(3/2)^-$				
		846.8‡ *5*	87‡ *13*	471.567	$3/2^-$				
		1217.0‡ *5*	100‡ *13*	101.8942	$5/2^-$				
1432.22	1/2,3/2	908.5‡ *5*	23‡ *7*	523.851	$(3/2)^-$				
		993.0‡ *5*	65‡ *7*	438.795	$(3/2)^+$				
		1048.4‡ *5*	39‡ *7*	384.355	$1/2^+,3/2^+$				
		1147.4‡ *5*	19‡ *7*	284.280	$3/2^-$				
		1342.4‡ *5*	100‡ *10*	90.0343	$3/2^-$				
		1432.3‡ *5*	23‡ *3*	0.0	$3/2^+$				
1444.1	1/2,3/2	1147.4‡ *5*	100‡ *33*	296.576	$1/2^-$				

From ENSDF

$^{227}_{88}Ra_{139}$-13

Adopted Levels, Gammas (continued)

$\gamma(^{227}Ra)$ (continued)

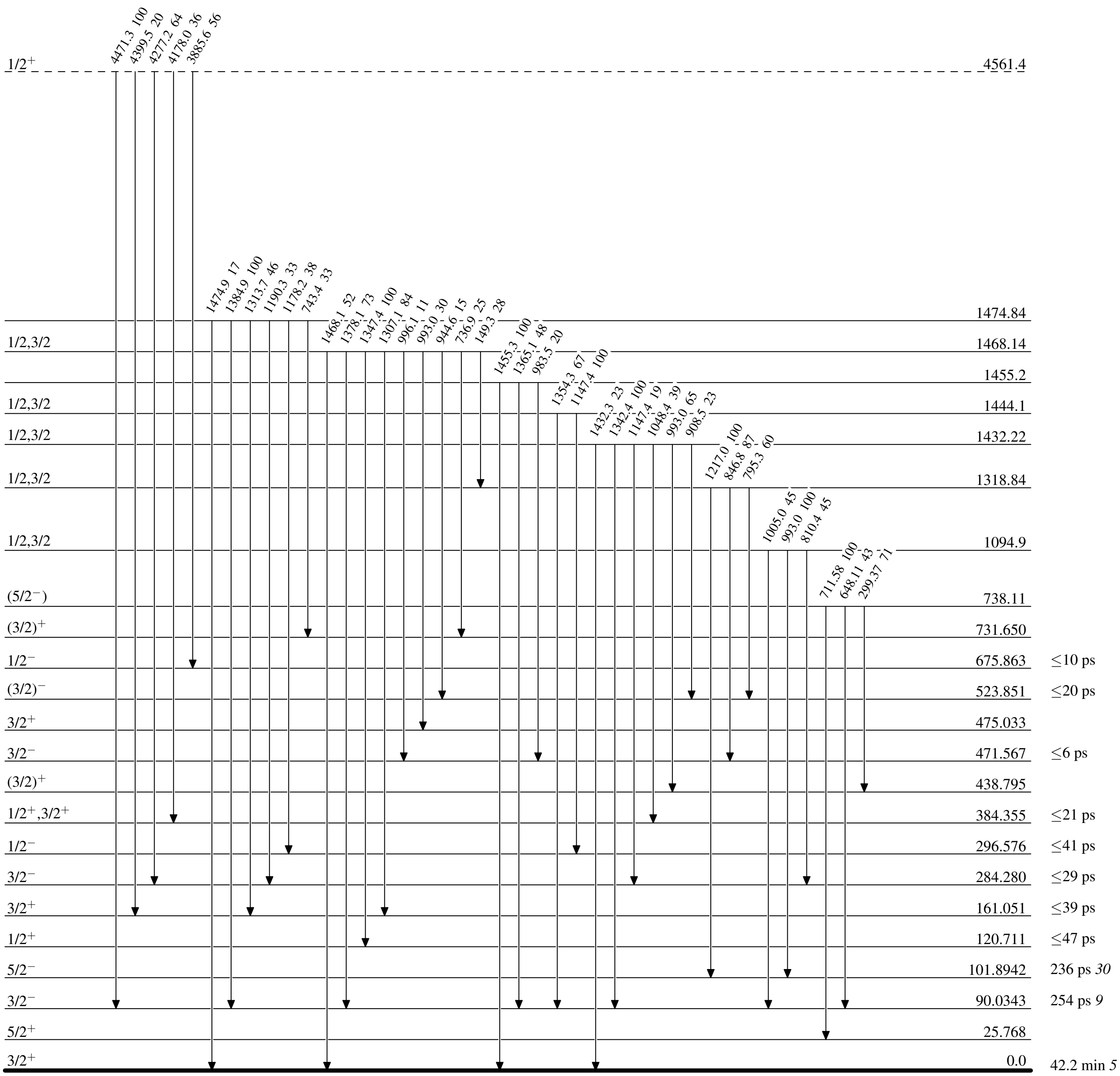
E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f
1444.1	1/2,3/2	1354.3[‡] *8*	67[‡] *17*	90.0343	3/2⁻
1455.2		983.5[‡] *5*	20[‡] *4*	471.567	3/2⁻
		1365.1[‡] *5*	48[‡] *8*	90.0343	3/2⁻
		1455.3[‡] *5*	100[‡] *12*	0.0	3/2⁺
1468.14	1/2,3/2	149.3[‡] *1*	28[‡] *3*	1318.84	1/2,3/2
		736.9[‡] *5*	25[‡] *3*	731.650	(3/2)⁺
		944.6[‡] *5*	15[‡] *5*	523.851	(3/2)⁻
		993.0[‡] *5*	30[‡] *3*	475.033	3/2⁺
		996.1[‡] *5*	11[‡] *3*	471.567	3/2⁻
		1307.1[‡] *5*	84[‡] *9*	161.051	3/2⁺
		1347.4[‡] *5*	100[‡] *10*	120.711	1/2⁺
		1378.1[‡] *5*	73[‡] *8*	90.0343	3/2⁻
1468.14	1/2,3/2	1468.1[‡] *5*	52[‡] *6*	0.0	3/2⁺
1474.84		743.4[‡] *5*	33[‡] *8*	731.650	(3/2)⁺
		1178.2[‡] *5*	38[‡] *8*	296.576	1/2⁻
		1190.3[‡] *5*	33[‡] *8*	284.280	3/2⁻
		1313.7[‡] *5*	46[‡] *8*	161.051	3/2⁺
		1384.9[‡] *5*	100[‡] *13*	90.0343	3/2⁻
		1474.9[‡] *5*	17[‡] *4*	0.0	3/2⁺
(4561.4)	1/2⁺	3885.6 *4*	56 *5*	675.863	1/2⁻
		4178.0 *4*	36 *5*	384.355	1/2⁺,3/2⁺
		4277.2 *4*	64 *5*	284.280	3/2⁻
		4399.5 *5*	20 *2*	161.051	3/2⁺
		4471.3 *3*	100 *7*	90.0343	3/2⁻

† From $^{226}Ra(n,\gamma)$ E=thermal, unless otherwise stated.
‡ From ^{227}Fr β^- decay (1981Vo03).
# From level energy differences.
@ From measured conversion coefficients in ^{227}Fr β^- decay, unless otherwise stated.
& From BrIcc v2.3a (30-Jun-2013) 2008Ki07, "Frozen Orbitals" appr. δ(E2/M1)=1.0 was assumed when not given.
a Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

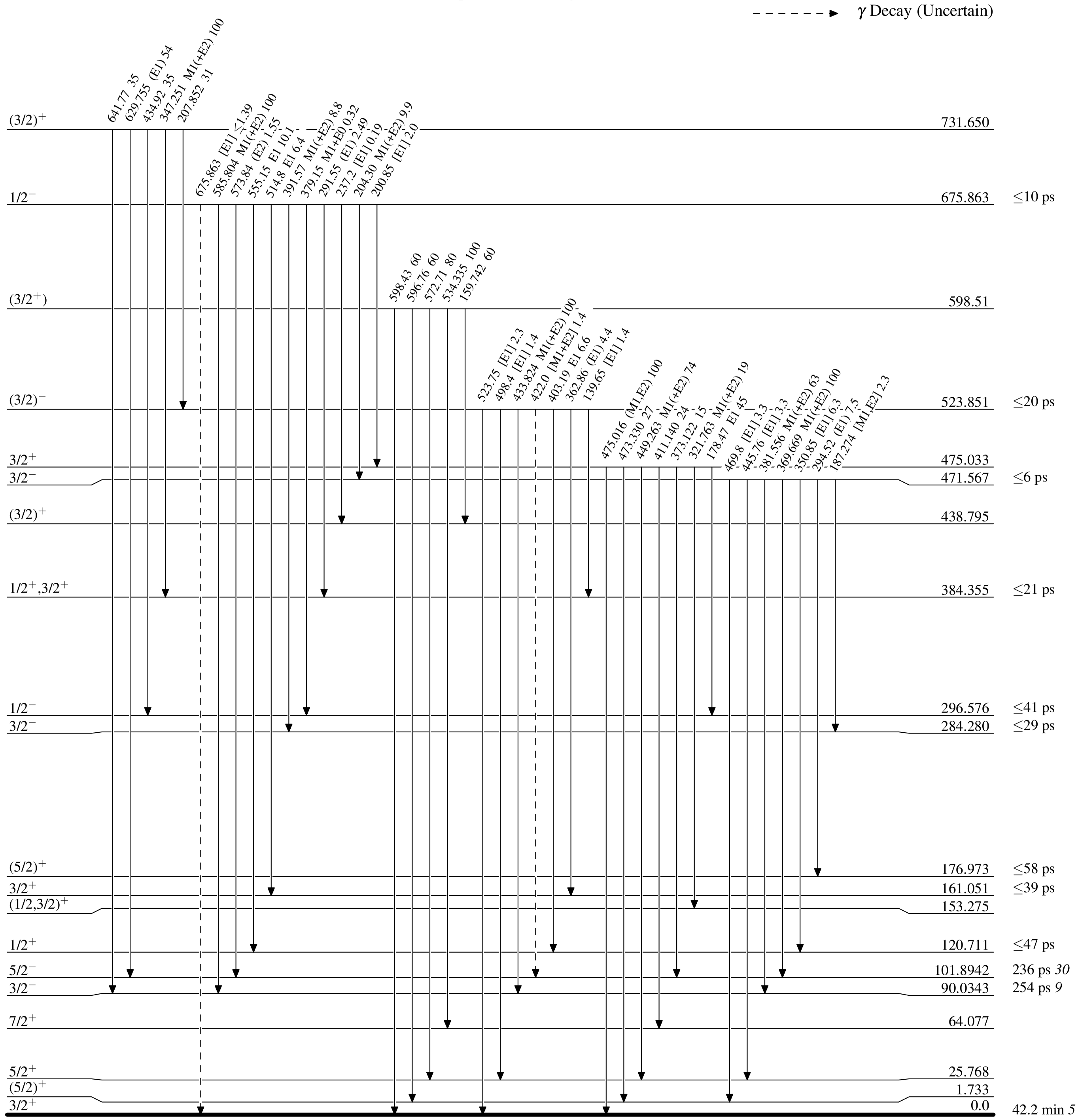


$^{227}_{88}Ra_{139}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

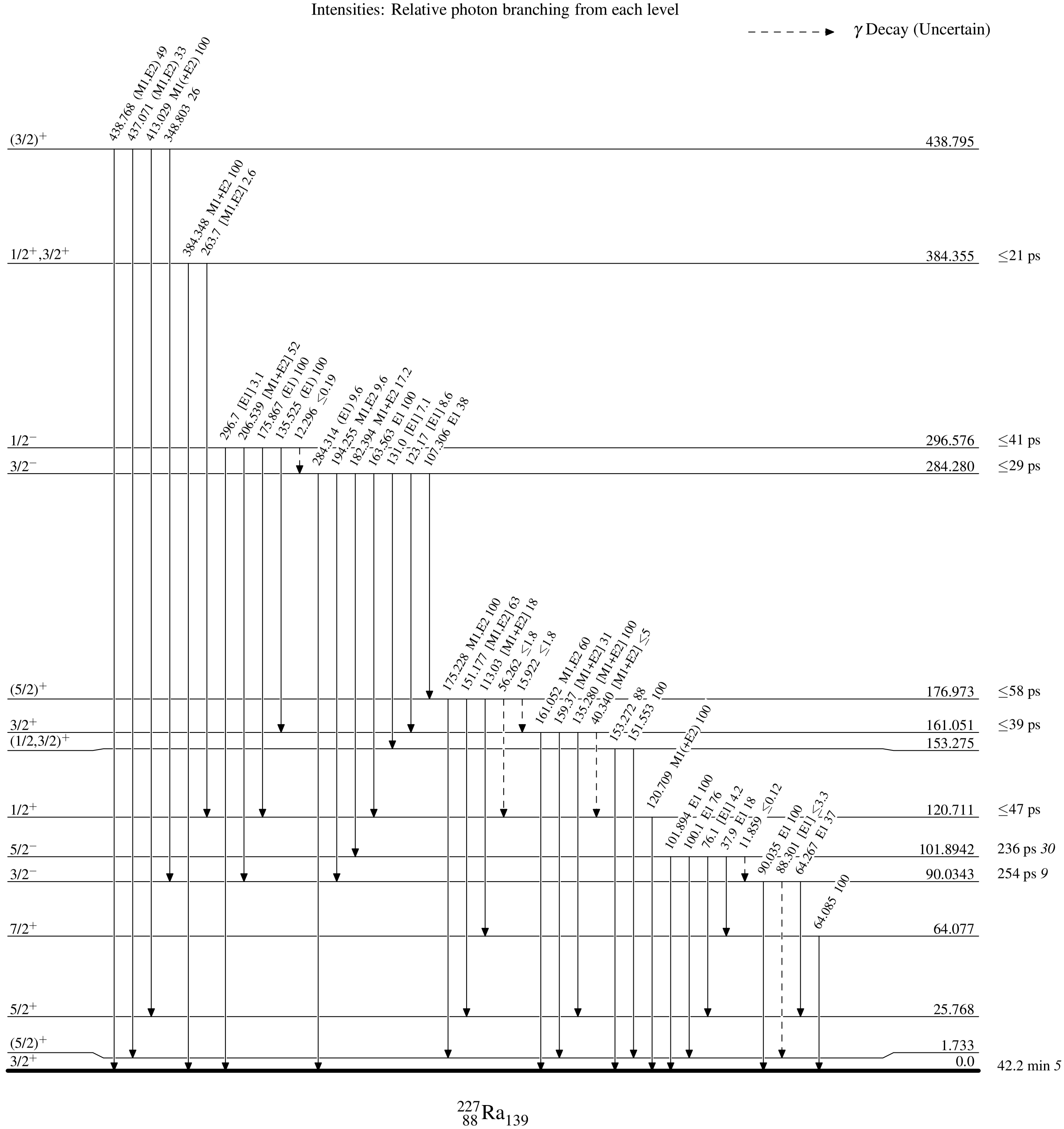


$^{227}_{88}Ra_{139}$

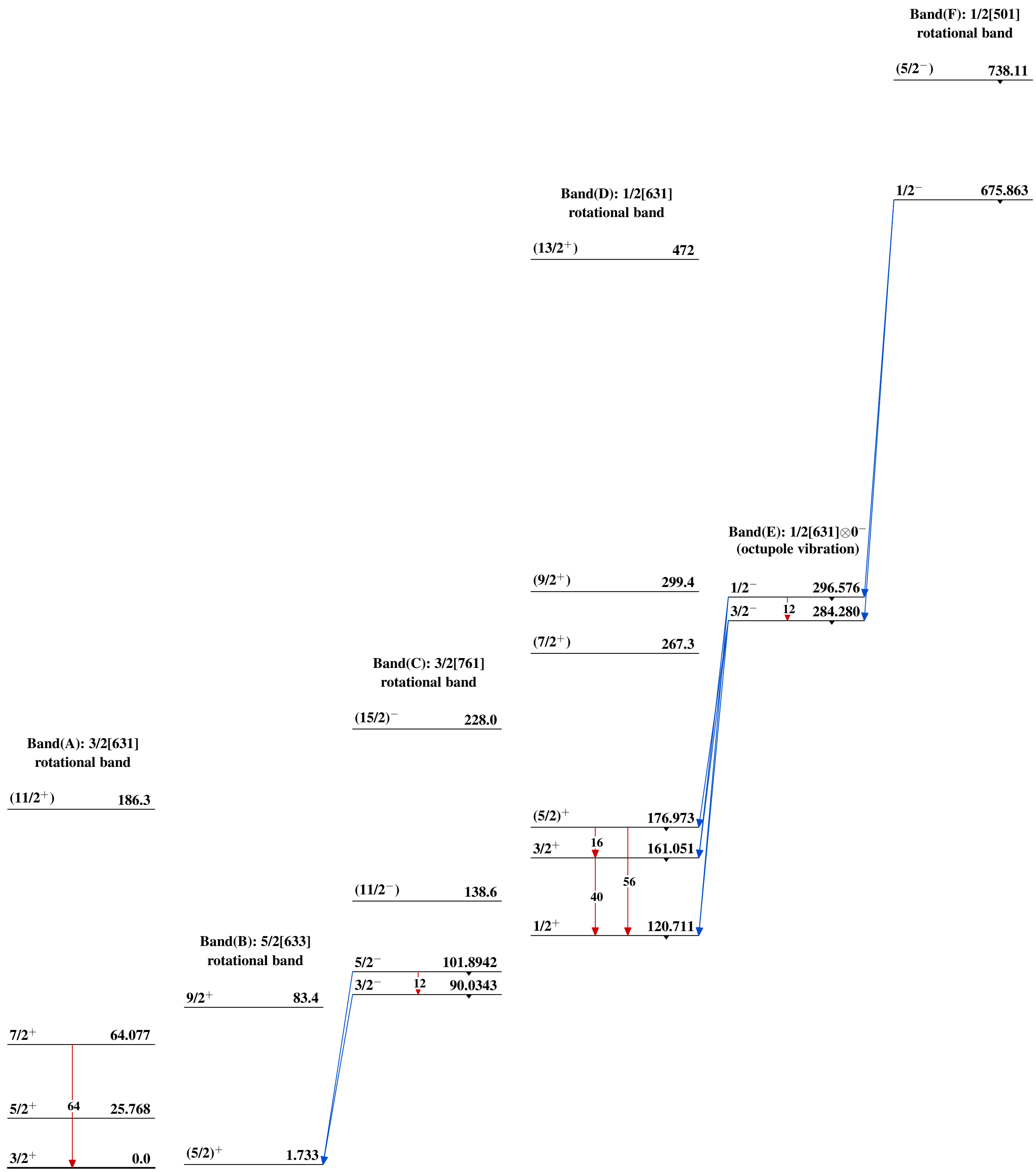
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, Gammas



$^{227}_{88}Ra_{139}$

Adopted Levels, Gammas (continued)

$^{227}_{88}Ra_{139}$