Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	D. Abriola, P. Demetriou, M. Hassanvand, M. Hussain	NDS 114, 661 (2013)	28-Feb-2013

Q(β^-)=−6370 *50*; S(n)=7700 *17*; S(p)=3124 *17*; Q(α)=7042 *3* 2012Wa38
S(2n)=17160 *50*, S(2p)=4817 *22*, Q(εp)=3148 *9* (2012Wa38).

^{211}Ra evaluated by D. Abriola, P. Demetriou, M. Hassanvand, M. Hussain.

^{211}Ra Levels

Cross Reference (XREF) Flags

A ^{211}Ra IT decay
B ^{215}Th α decay

E(level)†	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0	5/2$^{(-)}$	13 s *2*	AB	%α>93; %ε+%β^+<7 Q=+0.46 *5* (2011StZZ); μ=+0.8780 *38* (2011StZZ) Q: other value: Q=+0.48 *4*, Collinear Fast Beam Laser Spectroscopy (1989Ne03, 2011StZZ). Evaluated nuclear rms charge radios <r^2>$^{1/2}$=5.593 fm *18* (2008 update of 2004An14 work available on http://cdfe.sinp.msu.ru.). See also 2009An12 for trends of nuclear radii. %α and %ε; from general assumption of log *ft*>5.9 for forbidden ε decay to the ^{211}Fr 9/2$^-$ ground state. More specifically, from systematics (1998Si17) for a ΔJ=2 forbidden transition most likely log *ft*>7.5 leading to even lower %ε. J$^\pi$: J=5/2 from hyperfine structure (1983Ah03, 2011StZZ); π=(−) from HF=1.20 for α branch (%α>93) to ^{207}Rn 5/2$^-$ ground state. T$_{1/2}$: weighted average of 15 s *2* (1967Va22), 12 s *2* (1968Lo15), 9 s *4* (2007Le14).
133.86 *10*	(1/2$^-$)		B	J$^\pi$: E2 γ to 5/2$^{(-)}$ g.s. and systematics of neighboring isotones ^{207}Po, ^{209}Rn.
194.54 *13*	(3/2$^-$)		B	J$^\pi$: M1 γ to 5/2$^{(-)}$ g.s. and systematics of neighboring isotones ^{207}Po, ^{209}Rn.
295.1 *3*	(3/2$^-$)		B	J$^\pi$: from systematics of neighboring isotones ^{207}Po, ^{209}Rn.
802.0 *6*	(9/2$^-$)		A	J$^\pi$: from systematics of neighboring isotones ^{207}Po, ^{209}Rn.
1198.1 *8*	(13/2$^+$)	9.7 μs *6*	A	J$^\pi$: from systematics of neighboring isotones ^{207}Po, ^{209}Rn. T$_{1/2}$: from measurement by 2006Ha17. Other measurement: 4.0 μs *5* (2004He25). Value from 2006Ha17 is in better agreement with the systematics of neighboring N=123 isotones which predict T$_{1/2}$=12.3 μs. 2006Ha17 advise further independent confirmation. Value of 9.4 μs *4* measured by A.M. Denis Bacelor et al., Phys. Lett. B (in press, available online May 17, 2013) is in agreement with that from 2006Ha17.

† From least squares fit to Eγ values.

γ(^{211}Ra)

E$_i$(level)	J$_i^\pi$	E$_\gamma$†	I$_\gamma$	E$_f$	J$_f^\pi$	Mult.	α‡	Comments
133.86	(1/2$^-$)	133.88 *10*	100	0.0	5/2$^{(-)}$	E2	2.78	α(exp)=2.5 *5* α(K)=0.296 *5*; α(L)=1.82 *3*; α(M)=0.496 *8*; α(N)=0.1310 *19*; α(O)=0.0279 *4*; α(P)=0.00407 *6*

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{211}Ra)$ (continued)

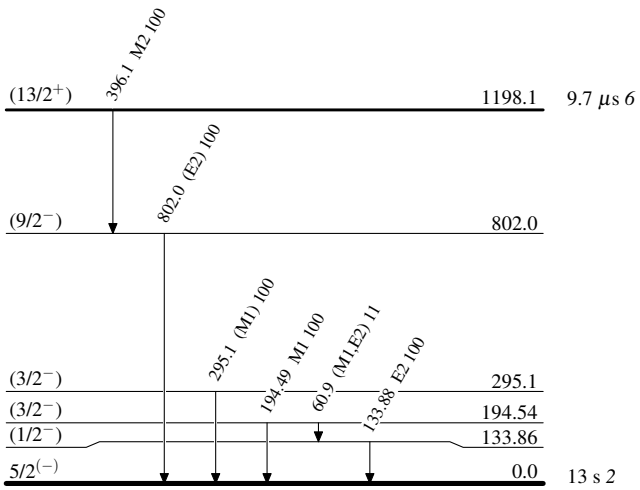
E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.	α[‡]	Comments
								α(Q)=2.20×10^{-5} *4* Mult.: from comparison of α(exp) and α(E2,theory)=2.78.
194.54	(3/2$^-$)	60.9 *3*	11 *3*	133.86	(1/2$^-$)	(M1,E2)	57 *44*	α(L)=47 *37*; α(M)=11 *9*; α(N)=3.0 *24*; α(O)=0.6 *5*; α(P)=0.09 *7*; α(Q)=0.0012 *8*; α(N+..)=4 *3* Mult.: from spin assignments of initial and final levels of γ ray.
		194.49 *14*	100 *14*	0.0	5/2$^{(-)}$	M1	2.37	α(exp)=3.8 *2* α(K)=1.90 *3*; α(L)=0.352 *5*; α(M)=0.0840 *12*; α(N)=0.0222 *4*; α(O)=0.00506 *8* α(P)=0.000881 *13*; α(Q)=6.91×10^{-5} *10* Mult.: from comparison of α(exp) and α(M1,theory)=2.37.
295.1	(3/2$^-$)	295.1 *3*	100	0.0	5/2$^{(-)}$	(M1)	0.742	α(exp)=1.0 *5* α(K)=0.597 *9*; α(L)=0.1096 *16*; α(M)=0.0262 *4*; α(N)=0.00690 *10*; α(O)=0.001574 *23* α(P)=0.000275 *4*; α(Q)=2.15×10^{-5} *3* Observed by 2005Ku31 only. Mult.: from comparison of α(exp) with α(M1,theory)=0.742 and α(E3,theory)=1.1, M1 and E3 are possible; Weisskopf half-life estimates for M1 $T_{1/2}$=8.57×10±*7* μs *7* and E3 $T_{1/2}$=2.36 ms *4* rule out E3 since γ ray is observed to be prompt according to 2005Ku31.
802.0	(9/2$^-$)	802.0 *6*	100	0.0	5/2$^{(-)}$	(E2)	0.01387 *20*	α(K)=0.01037 *15*; α(L)=0.00263 *4*; α(M)=0.000653 *10*; α(N)=0.0001721 *25* α(O)=3.84×10^{-5} *6*; α(P)=6.37×10^{-5} *6*; α(Q)=3.59×10^{-7} *5* Mult.: from spins of initial and final states.
1198.1	(13/2$^+$)	396.1 *6*	100	802.0	(9/2$^-$)	M2	1.014 *15*	α(K)=0.759 *12*; α(L)=0.192 *3*; α(M)=0.0479 *8*; α(N)=0.01275 *19*; α(O)=0.00290 *5* α(P)=0.000499 *8*; α(Q)=3.6×10^{-5} *6* B(M2)(W.u.)=0.0046 *3* Mult.: From comparison of α(exp) and α_k/α with α(M2,theory)=1.014 and α(E4,theory)=1.387 M2 and E4 are possible; Weisskopf estimates for M2 $T_{1/2}$=0.09 μs *15* and E4 $T_{1/2}$=172 s *5* compared with measured $T_{1/2}$=4.0 μs *5* rule out E4.

[†] From weighted average of values from 2005Ku31 and 2000He17, unless otherwise stated.
[‡] 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.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{211}_{88}Ra_{123}$