^{224}Rn β^- decay (107 min) 1979Va20

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Sukhjeet Singh	ENSDF	08-Mar-2022

Parent: ^{224}Rn: E=0.0; J$^\pi$=0$^+$; T$_{1/2}$=107 min *3*; Q(β^-)=696 *15*; %β^- decay=100.0
^{224}Rn-T$_{1/2}$: From ^{224}Rn Adopted Levels.
^{224}Rn-Q(β^-): From 2021Wa16.
1979Va20: ^{224}Rn source produced in Th(p,X),E=660 MeV protons followed by mass separation. Measured Eγ, Iγ, conversion electrons using Ge detectors for γ rays and magnetic toroidal β spectrometer for electrons. 1973AfZY is an earlier report from many of the same authors.
Decay scheme is unknown. Evaluators note that a 202.21γ and 63.55γ cascade with 265.76γ as a crossover transition is suggested by 202.21 *5* + 63.55 *10*=265.76 *11* consistent with the observed γ of 265.806 keV *17*. Also, almost equal intensities of 260.581γ and 265.806γ suggest a cascade of these two gamma rays.

^{224}Fr Levels

E(level)	J$^\pi$	T$_{1/2}$	Comments
0.0	1$^{(-)}$	3.33 min *10*	J$^\pi$,T$_{1/2}$: from Adopted Levels.

γ(^{224}Fr)

E$_\gamma$†	I$_\gamma$‡	E$_i$(level)	Mult.#	δ#	α@	Comments
^{x}63.55 *10*	1.4 *3*		M1(+E2)	<0.10	10.9 *4*	α(L)=8.2 *3*; α(M)=1.97 *8* α(N)=0.518 *19*; α(O)=0.115 *4*; α(P)=0.0184 *5*; α(Q)=0.001001 *16* α(L1)exp+α(L2)exp=5.7 *21*. Ice(L1+L2)=8.1 *24*.
^{x}108.44 *8*	1.5 *2*		M1(+E2)	<1.8	9.4 *20*	α(K)=6 *4*; α(L)=2.7 *11*; α(M)=0.7 *3* α(N)=0.19 *8*; α(O)=0.040 *16*; α(P)=0.0056 *18*; α(Q)=0.00014 *8* α(L1)exp+α(L2)exp=1.98 *48*. Ice(L1+L2)=3.0 *6*.
^{x}113.35 *7*	2.35 *25*		M1(+E2)	<1.6	8.3 *18*	α(K)=5 *3*; α(L)=2.3 *8*; α(M)=0.58 *23* α(N)=0.15 *6*; α(O)=0.032 *12*; α(P)=0.0046 *13*; α(Q)=0.00013 *6* α(L1)exp+α(L2)exp=1.64 *30*. Ice(L1+L2)=3.9 *6*.
^{x}156.17 *3*	1.45 *10*		M1(+E2)	<0.4	3.85 *19*	α(K)exp=5.0 *11* α(K)=3.04 *21*; α(L)=0.612 *20*; α(M)=0.148 *7* α(N)=0.0387 *17*; α(O)=0.0086 *3*; α(P)=0.00135 *3*; α(Q)=7.0×10^{-5} *5* Ice(K)=7.4 *15*.
^{x}202.21 *5*	4.7 *5*		M1(+E2)	<1.9	1.4 *6*	α(K)=1.0 *6*; α(L)=0.282 *7*; α(M)=0.0703 *24* α(N)=0.0184 *7*; α(O)=0.00401 *6*; α(P)=0.00060 *5*; α(Q)=2.3×10^{-5} *13* α(L1)exp+α(L2)exp=0.44 *17*. Ice(L1+L2)=2.1 *8*.
^{x}209.78 *10*	2.1 *3*		M1(+E2)	<1.5	1.3 *5*	α(K)=1.0 *5*; α(L)=0.250 *9*; α(M)=0.0620 *10* α(N)=0.0163 *3*; α(O)=0.00355 *8*; α(P)=0.00054 *5*; α(Q)=2.2×10^{-5} *10* α(L1)exp+α(L2)exp≈0.4. Ice(L1+L2)≈0.8. δ: 50% uncertainty assumed in Ice(L1+L2).
^{x}256.84 *4*	2.9 *3*		M1(+E2)	<0.5	0.92 *8*	α(K)exp=1.40 *37*

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^{224}Rn β^- decay (107 min) 1979Va20 (continued)

γ(^{224}Fr) (continued)

E_γ †	I_γ ‡	E_i(level)	Mult.#	δ#	α@	Comments
						α(K)=0.74 *8*; α(L)=0.142 *5*; α(M)=0.0341 *9* α(N)=0.00894 *24*; α(O)=0.00199 *7*; α(P)=0.000315 *14*; α(Q)=1.67×10^{-5} *16* α(L1)exp+α(L2)exp=0.27. Ice(K)=4.1 *10*, Ice(L1+L2)=0.8. δ: 50% uncertainty assumed in Ice(L1+L2).
^{x}260.581 *17*	21.5 *10*		M1(+E2)	<0.20	0.946 *20*	α(K)exp=0.92 *10* α(K)=0.761 *17*; α(L)=0.1399 *22*; α(M)=0.0334 *5* α(N)=0.00874 *13*; α(O)=0.00195 *3*; α(P)=0.000313 *5*; α(Q)=1.73×10^{-5} *4* α(L1)exp+α(L2)exp=0.20 *4*. Ice(K)=20 *2*, Ice(L1+L2)=4.3 *8*.
^{x}265.806 *17*	20.1 *10*		M1(+E2)	<0.25	0.888 *24*	α(K)exp=0.88 *11* α(K)=0.714 *22*; α(L)=0.1319 *23*; α(M)=0.0315 *5* α(N)=0.00825 *14*; α(O)=0.00184 *3*; α(P)=0.000294 *6*; α(Q)=1.62×10^{-5} *5* α(L1)exp+α(L2)exp=0.13 *2*. Ice(K)=18 *2*, Ice(L1+L2)=2.7 *5*.
^{x}328.331 *21*	3.7 *3*		M1(+E2)	<1.2	0.39 *12*	α(K)exp=0.43 *22* α(K)=0.31 *11*; α(L)=0.064 *11*; α(M)=0.0155 *22* α(N)=0.0041 *6*; α(O)=0.00090 *14*; α(P)=0.00014 *3*; α(Q)=6.9×10^{-6} *24* Ice(K)=1.6 *8*.

† From 1979Va20.
‡ From 1979Va20, values are relative to 100 *4* for 131.6γ in ^{224}Ra from ^{224}Fr decay.
# M1 assigned to all the γ rays in 1979Va20. Mixing ratios have been deduced by evaluators from Iγ and I(ce) data in 1970Va20 for ^{224}Rn-^{224}Fr equilibrium source and normalized to α(K)(theory,E1)=0.0601 *9* for 216γ, E1 in ^{224}Ra from ^{224}Fr decay.
@ 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.
^{x} γ ray not placed in level scheme.