^{179}Re ε decay 1975Me20,1973Ar11,1968Ha39

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 110, 265 (2009)	15-Nov-2008

Parent: ^{179}Re: E=0.0; J$^{\pi}$=5/2^{+}; $T_{1/2}$=19.5 min *1*; Q(ε)=2717 *29*; %ε+%β^{+} decay=100.0

Others: 1958Fo47, 1960Ha18, 1966Ho16, 1968Be43, 1969Hu03, 1970Ar15, 1972Ar14.

1975Me20: measured Eγ, Iγ, $\gamma\gamma$ coin, Ice. Detectors:Ge(Li), Si(Li).

1973Ar11: measured Eγ, Iγ, $\gamma\gamma$ coin. Detectors:Ge(Li).

1968Ha39: measured Eγ, Ice. Detectors: magnetic spectrograph.

The adopted decay scheme is basically that of 1975Me20. It should be noted that this scheme implies non-zero (ε+β^{+}) feeding of the 11/2^{-} 265 level and significantly negative feeding of the 318 level.

^{179}W Levels

E(level)	J$^{\pi}$†	$T_{1/2}$	Comments
0.0‡	7/2^{-}	37.05 min *16*	
119.910‡ *25*	9/2^{-}		
221.94# *4*	1/2^{-}	6.40 min *7*	$T_{1/2}$: from Adopted Levels. I(γ+ce)=37% feeding from levels above 222 keV.
264.81‡ *7*	11/2^{-}		
304.77# *4*	3/2^{-}		
309.00 *4*	9/2^{+}		
318.38# *4*	5/2^{-}		
430.22@ *4*	5/2^{-}		
477.34 *4*	7/2^{+}		
508.98# *6*	7/2^{-}		
531.41@ *5*	7/2^{-}		
533.29# *8*	9/2^{-}		
688.95& *11*	(3/2)$^{-}$		
720.19[a] *4*	3/2^{+}		
773.71[a] *4*	5/2^{+}		
787.37& *8*	(5/2)$^{-}$		
855.27 *5*	7/2^{+}		
1029.08 *9*	(5/2,7/2)$^{+}$		
1072.31 *11*	(5/2^{-})		
1480.36 *10*	(7/2,9/2)		
1606.35[b] *6*	(3/2)$^{+}$		
1649.05 *12*	(7/2)		
1680.28 *5*	(7/2)$^{+}$		possible K$^{\pi}$=7/2^{+} three-quasiparticle state with configuration (π 9/2[514])+(π 5/2[402])-(ν 7/2[514]) (1975Me20).
1750.30 *13*	(3/2,5/2)		
1808.89[b] *7*	(7/2)$^{+}$		
2206.27 *15*	(5/2,7/2^{+})		

† From Adopted Levels.
‡ Band(A): 7/2[514] g.s. band.
# Band(B): 1/2[521] band.
@ Band(C): 5/2[512] band.
& Band(D): 1/2[510] band.
[a] Band(E): K$^{\pi}$=3/2^{+} band. Three-quasiparticle state with possible configuration of ((π 9/2[514])-(π 5/2[402])-(ν 7/2[514])).
[b] Band(F): 3/2[651] band.

^{179}Re ε decay 1975Me20,1973Ar11,1968Ha39 (continued)

ε,β^+ radiations

E(decay)†	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I($\varepsilon+\beta^+$)‡	Comments
(5.1×10^2 *3*)	2206.27		0.48 *6*	5.99 *8*	0.48 *6*	εK=0.789 *3*; εL=0.1599 *21*; εM+=0.0510 *8*
(9.1×10^2 *3*)	1808.89		3.3 *3*	5.70 *5*	3.3 *3*	εK=0.8078 *8*; εL=0.1463 *6*; εM+=0.04589 *20*
(9.7×10^2 *3*)	1750.30		0.84 *8*	6.35 *5*	0.84 *8*	εK=0.8091 *7*; εL=0.1453 *5*; εM+=0.04552 *18*
(1.04×10^3 *3*)	1680.28		17.6 *14*	5.09 *5*	17.6 *14*	εK=0.8105 *6*; εL=0.1443 *4*; εM+=0.04515 *15*
(1.07×10^3 *3*)	1649.05		0.51 *7*	6.66 *7*	0.51 *7*	εK=0.8111 *6*; εL=0.1439 *4*; εM+=0.04500 *14*
(1.11×10^3 *3*)	1606.35		6.0 *5*	5.62 *5*	6.0 *5*	εK=0.8118 *5*; εL=0.1434 *4*; εM+=0.04480 *13*
(1.24×10^3 *3*)	1480.36		1.30 *12*	6.38 *5*	1.30 *12*	εK=0.8136 *4*; εL=0.1421 *3*; εM+=0.04432 *11*
(1.64×10^3 *3*)	1072.31	0.00080 *24*	0.27 *6*	7.33 *10*	0.27 *6*	av Eβ=298 *13*; εK=0.8150 *3*; εL=0.13890 *23*; εM+=0.04316 *8*
(1.69×10^3 *3*)	1029.08	0.0062 *19*	1.6 *4*	6.58 *11*	1.6 *4*	av Eβ=317 *13*; εK=0.8145 *4*; εL=0.13857 *23*; εM+=0.04305 *8*
(1.86×10^3 *3*)	855.27	0.019 *3*	2.04 *19*	6.56 *5*	2.06 *19*	av Eβ=393 *13*; εK=0.8112 *9*; εL=0.1371 *3*; εM+=0.04254 *10*
(1.94×10^3 *3*)	773.71	0.24 *5*	19 *3*	5.63 *7*	19 *3*	av Eβ=429 *13*; εK=0.8087 *11*; εL=0.1363 *3*; εM+=0.04228 *10*
(2.00×10^3 *3*)	720.19	0.70 *10*	44 *4*	5.28 *5*	45 *4*	av Eβ=453 *13*; εK=0.8066 *13*; εL=0.1357 *4*; εM+=0.04209 *11* Eβ+=950 *50*, 1975Me20 (spectrometer).
(2.03×10^3 *3*)	688.95	0.010 *2*	0.59 *8*	7.17 *6*	0.60 *8*	av Eβ=466 *13*; εK=0.8053 *14*; εL=0.1354 *4*; εM+=0.04198 *11*
(2.19×10^3 *3*)	531.41	0.048 *12*	1.7 *4*	6.79 *11*	1.7 *4*	av Eβ=535 *13*; εK=0.7969 *19*; εL=0.1334 *4*; εM+=0.04133 *14* Additional information 1.
(2.24×10^3 *3*)	477.34	0.07 *3*	2.1 *10*	6.71 *20*	2.2 *10*	av Eβ=559 *13*; εK=0.7933 *21*; εL=0.1326 *5*; εM+=0.04108 *14*
(2.29×10^3 *3*)	430.22	0.07 *6*	1.8 *14*	6.8 *4*	1.9 *15*	av Eβ=580 *13*; εK=0.7899 *23*; εL=0.1319 *5*; εM+=0.04085 *15*

† β^+ population of the 720 and 774 levels was determined from γ-ray spectrum in coincidence with $\gamma^{\pm}$. I($\gamma^{\pm}$)=7 *1* in the coincidence spectrum is about the same as in the singles spectrum (6.0 *6*), which indicates β^+ population of primarily those levels (1975Me20).

‡ Absolute intensity per 100 decays.

γ(^{179}W)

Iγ normalization: from decay scheme assuming no ε population of g.s., 120 or 222 levels (based on systematics of transitions between the 5/2[402] and 7/2[514] Nilsson orbitals in N=105 isotones), and setting Σ I(γ+ce)=100% for feeding to these levels from higher energy levels.
Additional unplaced γ-rays are reported by 1973Ar11 only; these may be due to source contaminants.
Experimental conversion coefficients are deduced from Iγ and Ice in 1975Me20 assuming α(K)=6.4 for M3 222γ, except as noted.

E_γ[†]	I_γ[‡&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	δ[#]	α[a]	Comments
24.3[@]	<0.4[@]	533.29	9/2⁻	508.98	7/2⁻				E_γ: from 1968Ha39.
^{x}32.2[@]	<0.4[@]								
^{x}35.05[@]	<0.4[@]								
^{x}38.3[@]	<0.4[@]					M1(+E2)		1.6×10^2 *15*	α(L)=1.2×10^2 *12*; α(M)=3.E1 3; α(N+..)=8 *8* α(N)=7 *7*; α(O)=1.0 *9*; α(P)=0.004 *3* Mult.: from L1/M=1.5 (1968Ha39).
^{x}52.45[@]	<2[@]					E2		66.0	α(L)=50.0 *7*; α(M)=12.62 *18*; α(N+..)=3.37 *5* α(N)=2.96 *5*; α(O)=0.402 *6*; α(P)=0.000373 *6* Mult.: from L2:L3=≈20:28 (1968Ha39).
53.45	<2	773.71	5/2⁺	720.19	3/2⁺	M1+E2	0.43	13.64	α(L)=10.41 *15*; α(M)=2.55 *4*; α(N+..)=0.691 *10* α(N)=0.602 *9*; α(O)=0.0866 *13*; α(P)=0.00214 *3* I_γ: upper limit for unobserved photons (1975Me20). Mult.: from L1:L2:L3:M=69:76:83:50 (1968Ha39).
^{x}63.85[@]	<1[@]					M1+E2		14 *12*	α(L)=11 *9*; α(M)=2.7 *22*; α(N+..)=0.7 *6* α(N)=0.6 *5*; α(O)=0.09 *7*; α(P)=0.0008 *7* Mult.: from L1:L2:L3:M=45:20:≈20:≈22 (1968Ha39).
^{x}71.95[@]	<0.3[@]								
^{x}77.5[@]	<0.2[@]								
78.5[@]	<0.2[@]	508.98	7/2⁻	430.22	5/2⁻				
82.81 *3*	5.2 *4*	304.77	3/2⁻	221.94	1/2⁻	E2(+M1)	>1.9	8.41 *13*	α(K)=1.7 *7*; α(L)=5.1 *5*; α(M)=1.28 *13*; α(N+..)=0.34 *4* α(N)=0.30 *3*; α(O)=0.041 *4*; α(P)=0.00017 *7* Mult.,δ: from α(L)exp=5.4 *8* (1975Me20); L2:L3:M=586:576:344 (1968Ha39) (cf. 2.78 *4*:2.64 *4*:1.41 *2* from E2 theory). Subshell ratios consistent with pure E2. δ(M1,E2)>1.9 from α(L)exp.
96.45 *4*	2.14 *10*	318.38	5/2⁻	221.94	1/2⁻	E2		4.51	α(K)=0.933 *13*; α(L)=2.71 *4*; α(M)=0.686 *10*; α(N+..)=0.184 *3* α(N)=0.1615 *23*; α(O)=0.0221 *4*; α(P)=7.71×10^{-5} *11* I_γ: 21.40 *10* in 1975Me20 is a misprint, based on spectrum and authors′ deduced I(γ+ce). 1973Ar11 report 1.4 *3*. Mult.: L2:L3:M=116:108:45 (1968Ha39) (cf. 1.37 *2*:1.24 *2*:0.686 *10* from E2 theory).
101.18 *7*	1.08 *10*	531.41	7/2⁻	430.22	5/2⁻	M1+E2	0.67	4.32 *7*	α(K)=2.89 *4*; α(L)=1.091 *16*; α(M)=0.265 *4*; α(N+..)=0.0725 *11* α(N)=0.0630 *9*; α(O)=0.00922 *14*; α(P)=0.000288 *4* Mult.: from K:L1:L2:L3:M=95:21:16:17:≈22 (1968Ha39).

From ENSDF

γ(^{179}W) (continued)

E_γ[†]	I_γ[‡&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	δ[#]	α[a]	Comments
101.6 *5*		221.94	1/2⁻	119.910	9/2⁻	[E4]		1.32×10^3 *5*	α(K)=4.09 *7*; α(L)=9.5×10^2 *4*; α(M)=292 *11*; α(N+..)=79 *3* α(N)=71 *3*; α(O)=8.9 *4*; α(P)=0.0165 *6* Iγ=0.0016 *3* in equilibrium with ^{179}W IT decay (6.40 min).
^{x}102.0[@]	<0.2[@]					E2		3.61	α(K)=0.850 *12*; α(L)=2.09 *3*; α(M)=0.528 *8*; α(N+..)=0.1415 *20* α(N)=0.1244 *18*; α(O)=0.01703 *24*; α(P)=6.77×10^{-5} *10* Mult.: from L2:L3=20:15 (1968Ha39).
111.90	0.20 *4*	430.22	5/2⁻	318.38	5/2⁻				
119.90 *3*	17.1 *9*	119.910	9/2⁻	0.0	7/2⁻	M1+E2	2.6	2.04	α(K)=0.837 *12*; α(L)=0.914 *13*; α(M)=0.229 *4*; α(N+..)=0.0617 *9* α(N)=0.0541 *8*; α(O)=0.00751 *11*; α(P)=7.10×10^{-5} *10* Mult.: from α(K)exp=0.59 *23*, α(L)exp=1.0 *4* (1975Me20). K:L1:L2:L3:M=305:65:250:225:134 (1968Ha39). other δ:≥2.8 from α(K)exp.
125.39 *12*	0.31 *4*	430.22	5/2⁻	304.77	3/2⁻	M1		2.49	α(K)=2.06 *3*; α(L)=0.327 *5*; α(M)=0.0746 *11*; α(N+..)=0.0211 *3* α(N)=0.0180 *3*; α(O)=0.00293 *5*; α(P)=0.000208 *3* Mult.: from α(L1)exp≈0.9 (I(ce) from 1968Ha39, Iγ from 1975Me20).
135.26 *10*	0.4 *1*	855.27	7/2⁺	720.19	3/2⁺	E2		1.225	α(K)=0.464 *7*; α(L)=0.577 *9*; α(M)=0.1451 *21*; α(N+..)=0.0390 *6* α(N)=0.0342 *5*; α(O)=0.00473 *7*; α(P)=3.49×10^{-5} *5* Mult.: from K:L2=<24:≈5 (1968Ha39).
^{x}139.0[@]	<0.1[@]								
^{x}139.6[@]	<0.1[@]								
^{x}142.45[@]	<0.1[@]					E2		1.013	α(K)=0.409 *6*; α(L)=0.458 *7*; α(M)=0.1150 *17*; α(N+..)=0.0309 *5* α(N)=0.0271 *4*; α(O)=0.00376 *6*; α(P)=3.08×10^{-5} *5* Mult.: from K:L2:L3=≈7:7:5 (1968Ha39).
144.66 *20*	0.21 *3*	264.81	11/2⁻	119.910	9/2⁻	M1+E2		1.3 *4*	α(K)=0.9 *5*; α(L)=0.32 *11*; α(M)=0.08 *3*; α(N+..)=0.021 *8* α(N)=0.019 *7*; α(O)=0.0027 *8*; α(P)=8.E−5 *6* Mult.: from Adopted Gammas; E2(+M1) from K:L2=≈7:≈3 (1968Ha39).
^{x}155.4[@]	<0.1[@]					M2		8.47	α(K)=6.27 *9*; α(L)=1.675 *24*; α(M)=0.407 *6*; α(N+..)=0.1154 *17* α(N)=0.0987 *14*; α(O)=0.01574 *22*; α(P)=0.000986 *14* Mult.: from K:L1=≈10:3 (1968Ha39) and absence of γ In 1975Me20.
^{x}156.4[@]	<0.1[@]								
^{x}160.55 *8*	0.50 *7*								
^{x}162.5[@]	<0.1[@]					M2		7.21	α(K)=5.37 *8*; α(L)=1.407 *20*; α(M)=0.341 *5*; α(N+..)=0.0967 *14* α(N)=0.0827 *12*; α(O)=0.01320 *19*; α(P)=0.000830 *12* Mult.: from α(K)exp>4.5 (I(ce) from 1968Ha39, Iγ limit from 1975Me20).
^{x}165.0[@]	<0.1[@]					M2		6.83	α(K)=5.09 *8*; α(L)=1.325 *19*; α(M)=0.321 *5*; α(N+..)=0.0911 *13* α(N)=0.0779 *11*; α(O)=0.01243 *18*; α(P)=0.000783 *11* Mult.: from α(K)exp>6.7 (I(ce) from 1968Ha39, Iγ from 1975Me20).
168.38 *5*	8.0 *4*	477.34	7/2⁺	309.00	9/2⁺	M1+E2	0.54	0.961	α(K)=0.754 *11*; α(L)=0.1593 *23*; α(M)=0.0374 *6*; α(N+..)=0.01041 *15* α(N)=0.00895 *13*; α(O)=0.001391 *20*; α(P)=7.45×10^{-5} *11* Mult.: from K:L1:L2:L3:M=160:28:≈7:6:10 (1968Ha39).

γ(^{179}W) (continued)

E_γ[†]	I_γ[‡&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α[a]	Comments
[x]178.5[@]	<0.1[@]							
[x]185.21 *12*	0.75 *15*							
[x]186.4 *3*	0.30 *10*							
189.11 *5*	26.8 *13*	309.00	9/2$^+$	119.910	9/2$^-$	E1	0.0722	α(K)=0.0598 *9*; α(L)=0.00959 *14*; α(M)=0.00218 *3*; α(N+..)=0.000604 *9* α(N)=0.000518 *8*; α(O)=8.08×10^{-5} *12*; α(P)=4.66×10^{-6} *7* Mult.: from K:L1:L2:L3:M=<90:8:3:≈3:<7 (1968Ha39).
191.0 *6*	<0.5	508.98	7/2$^-$	318.38	5/2$^-$			E_γ: from 1973Ar11. I_γ: upper limit for unobserved photons (1975Me20). Other value: 0.7 (1973Ar11).
[x]192.8[@]	<0.05[@]					(M2)	3.93	α(K)=2.98 *5*; α(L)=0.729 *11*; α(M)=0.1754 *25*; α(N+..)=0.0498 *7* α(N)=0.0425 *6*; α(O)=0.00681 *10*; α(P)=0.000434 *6* Mult.: from α(K)exp>5.6 (I(ce) from 1968Ha39, Iγ from 1975Me20).
204.22 *5*	1.90 *10*	508.98	7/2$^-$	304.77	3/2$^-$	E2	0.287	α(K)=0.1595 *23*; α(L)=0.0972 *14*; α(M)=0.0242 *4*; α(N+..)=0.00653 *10* α(N)=0.00571 *8*; α(O)=0.000807 *12*; α(P)=1.268×10^{-5} *18* Mult.: from K:L2:L3=≈12:5:≈3 (1968Ha39).
208.2 *5*	0.5 *3*	430.22	5/2$^-$	221.94	1/2$^-$			
214.92 *10*	0.90 *10*	533.29	9/2$^-$	318.38	5/2$^-$	E2	0.243	α(K)=0.1390 *20*; α(L)=0.0788 *12*; α(M)=0.0195 *3*; α(N+..)=0.00529 *8* α(N)=0.00462 *7*; α(O)=0.000655 *10*; α(P)=1.117×10^{-5} *16* Mult.: from Adopted Gammas; (E2) from α(K)exp≈0.31 (I(ce) from 1968Ha39, Iγ from 1975Me20).
[x]217.52 *10*	0.90 *6*					M1	0.528	α(K)=0.439 *7*; α(L)=0.0691 *10*; α(M)=0.01572 *23*; α(N+..)=0.00445 *7* α(N)=0.00379 *6*; α(O)=0.000618 *9*; α(P)=4.41×10^{-5} *7* Mult.: from α(K)exp≈0.9 (I(ce) from 1968Ha39, Iγ from 1975Me20).
221.97 *5*		221.94	1/2$^-$	0.0	7/2$^-$	M3	10.09	α(K)=6.39 *9*; α(L)=2.78 *4*; α(M)=0.715 *10*; α(N+..)=0.202 *3* α(N)=0.1738 *25*; α(O)=0.0268 *4*; α(P)=0.001346 *19* Mult.: from Adopted Gammas and K:L1:L2:L3:M=2000:720:≈100:360:270 (1968Ha39). Iγ=17.0 *10* in equilibrium with ^{179}W IT decay (6.40 min).
222.7 *6*	1.3 *5*	531.41	7/2$^-$	309.00	9/2$^+$			From 1973Ar11, not reported by 1975Me20.
[x]238.3 *5*	0.40 *15*							
241.7 *4*	3.4 *10*	1029.08	(5/2,7/2)$^+$	787.37	(5/2)$^-$	E1	0.0389	α(K)=0.0323 *5*; α(L)=0.00506 *8*; α(M)=0.001149 *17*; α(N+..)=0.000319 *5* α(N)=0.000274 *4*; α(O)=4.31×10^{-5} *7*; α(P)=2.60×10^{-6} *4* Mult.: from α(K)exp≈0.098 (I(ce) from 1968Ha39, Iγ from 1975Me20).
242.4 *3*	6.0 *10*	773.71	5/2$^+$	531.41	7/2$^-$	E1	0.0386	α(K)=0.0321 *5*; α(L)=0.00503 *8*; α(M)=0.001140 *17*; α(N+..)=0.000317 *5* α(N)=0.000272 *4*; α(O)=4.28×10^{-5} *7*; α(P)=2.58×10^{-6} *4* Mult.: from α(K)exp≈0.08 (I(ce) from 1968Ha39, Iγ from 1975Me20).
242.8 *4*	3.0 *10*	720.19	3/2$^+$	477.34	7/2$^+$	(E2)	0.1634	α(K)=0.1001 *15*; α(L)=0.0482 *8*; α(M)=0.01188 *19*; α(N+..)=0.00323 *5* α(N)=0.00282 *5*; α(O)=0.000403 *7*; α(P)=8.24×10^{-6} *12* Mult.: from K:L1=15:2.5 (1968Ha39).
[x]245.7[@]	<0.1[@]							
[x]252.92 *7*	1.0 *1*							
255.6[b] *3*	0.14[b] *5*	787.37	(5/2)$^-$	531.41	7/2$^-$			

γ(^{179}W) (continued)

E_γ [†]	I_γ [‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ [#]	α [a]	Comments
255.6[b] 3	0.14[b] 5	1029.08	(5/2,7/2)+	773.71	5/2+				
x264.0[@]	<1[@]					(M1(+E2))		0.22 10	α(K)=0.17 9; α(L)=0.038 3; α(M)=0.0089 4; α(N+..)=0.00246 15 α(N)=0.00212 11; α(O)=0.00033 4; α(P)=1.6×10^{-5} 10 Mult.: from α(K)exp>0.3 (I(ce) from 1968Ha39, Iγ from 1975Me20).
264.84 7	2.1 2	264.81	11/2−	0.0	7/2−	E2		0.1243	α(K)=0.0793 12; α(L)=0.0343 5; α(M)=0.00842 12; α(N+..)=0.00229 4 α(N)=0.00200 3; α(O)=0.000287 4; α(P)=6.64×10^{-6} 10 Mult.: from K:L2:L3:M=12:4:1.8:2.5 (1968Ha39).
x285.9[@]	<1[@]								
289.97 4	96 5	720.19	3/2+	430.22	5/2−	E1		0.0248	α(K)=0.0207 3; α(L)=0.00320 5; α(M)=0.000724 11; α(N+..)=0.000202 3 α(N)=0.0001729 25; α(O)=2.74×10^{-5} 4; α(P)=1.696×10^{-6} 24 Mult.: from α(K)exp=0.021 5, α(L)exp=0.0032 17 (1975Me20).
x293.1[@]	<0.5[@]								
296.34 5	31.8 16	773.71	5/2+	477.34	7/2+	M1+E2	0.7 4	0.18 4	α(K)=0.15 4; α(L)=0.0271 18; α(M)=0.0063 4; α(N+..)=0.00176 11 α(N)=0.00151 9; α(O)=0.000239 19; α(P)=1.4×10^{-5} 4 Mult.: from α(K)exp=0.15 3, α(L)exp=0.030 8 (1975Me20). K:L1:M=200:30:8 (1968Ha39). δ: from α(K)exp In 1975Me20.
x307.7[@]	<2[@]								
308.87 20	11.8 16	309.00	9/2+	0.0	7/2−	E1		0.0213	α(K)=0.0178 3; α(L)=0.00273 4; α(M)=0.000619 9; α(N+..)=0.0001727 25 α(N)=0.0001478 21; α(O)=2.34×10^{-5} 4; α(P)=1.467×10^{-6} 21 Mult.: from Adopted Gammas.
x309.3 4	5.2 16					(E1)		0.0213	α(K)=0.0177 3; α(L)=0.00272 4; α(M)=0.000617 9; α(N+..)=0.0001722 25 α(N)=0.0001473 22; α(O)=2.34×10^{-5} 4; α(P)=1.462×10^{-6} 21 Mult.: from α(K)exp≈0.054 (I(ce) from 1968Ha39, Iγ from 1975Me20) for ce doublet.
310.3 4	2.3 10	430.22	5/2−	119.910	9/2−				
322.02 15	0.47 15	855.27	7/2+	533.29	9/2−				
323.5 3	0.20 10	855.27	7/2+	531.41	7/2−				
x329.16 10	0.75 10								
x335.46 8	0.97 10					(M1)		0.1622	α(K)=0.1350 19; α(L)=0.0210 3; α(M)=0.00478 7; α(N+..)=0.001353 19 α(N)=0.001152 17; α(O)=0.000188 3; α(P)=1.347×10^{-5} 19 Mult.: from α(K)exp≈0.35 (I(ce) from 1968Ha39, Iγ from 1975Me20).
343.5 3	0.22 8	773.71	5/2+	430.22	5/2−				

$^{179}_{74}W_{105}$-6

γ(^{179}W) (continued)

E_γ[†]	I_γ[‡&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	δ[#]	α[a]	Comments
^{x}344.8[@]	<0.10[@]								
346.26 *22*	0.30 *10*	855.27	7/2$^+$	508.98	7/2$^-$				
357.35 *6*	4.8 *3*	477.34	7/2$^+$	119.910	9/2$^-$	[E1]		0.01511	α(K)=0.01263 *18*; α(L)=0.00192 *3*; α(M)=0.000434 *6*; α(N+..)=0.0001213 *17* α(N)=0.0001037 *15*; α(O)=1.652×10^{-5} *24*; α(P)=1.055×10^{-6} *15*
377.91 *8*	1.45 *10*	855.27	7/2$^+$	477.34	7/2$^+$	M1		0.1180	α(K)=0.0983 *14*; α(L)=0.01526 *22*; α(M)=0.00347 *5*; α(N+..)=0.000981 *14* α(N)=0.000835 *12*; α(O)=0.0001364 *20*; α(P)=9.78×10^{-6} *14* Mult.: from α(K)exp≈0.12 (I(ce) from 1968Ha39, Iγ from 1975Me20).
384.14 *14*	0.95 *9*	688.95	(3/2)$^-$	304.77	3/2$^-$	M1		0.1130	α(K)=0.0941 *14*; α(L)=0.01460 *21*; α(M)=0.00332 *5*; α(N+..)=0.000939 *14* α(N)=0.000799 *12*; α(O)=0.0001306 *19*; α(P)=9.36×10^{-6} *14* Mult.: from Adopted Gammas. α(K)exp≈0.21 (I(ce) from 1968Ha39, Iγ from 1975Me20).
^{x}400.4[@]	<4[@]								α(K)=0.18 *10*; α(L)=0.034 *21*; α(M)=0.008 *5*; α(N+..)=0.0024 *15* Mult.: α(K)exp≈0.042 (I(ce) from 1968Ha39, Iγ from 1975Me20).
401.82 *6*	25.7 *14*	720.19	3/2$^+$	318.38	5/2$^-$	E1		0.01153	α(K)=0.00966 *14*; α(L)=0.001454 *21*; α(M)=0.000329 *5*; α(N+..)=9.19×10^{-5} *13* α(N)=7.86×10^{-5} *11*; α(O)=1.255×10^{-5} *18*; α(P)=8.14×10^{-7} *12* Mult.: from α(K)exp=0.010 *5* (1975Me20).
^{x}405.5[@]	<0.5[@]								
411.53 *8*	4.0 *3*	531.41	7/2$^-$	119.910	9/2$^-$	M1		0.0941	α(K)=0.0784 *11*; α(L)=0.01215 *17*; α(M)=0.00276 *4*; α(N+..)=0.000781 *11* α(N)=0.000665 *10*; α(O)=0.0001086 *16*; α(P)=7.79×10^{-6} *11* Mult.: from α(K)exp≈0.15 (I(ce) from 1968Ha39, Iγ from 1975Me20).
415.44 *6*	37.9 *20*	720.19	3/2$^+$	304.77	3/2$^-$	E1		0.01069	α(K)=0.00896 *13*; α(L)=0.001345 *19*; α(M)=0.000304 *5*; α(N+..)=8.51×10^{-5} *12* α(N)=7.27×10^{-5} *11*; α(O)=1.163×10^{-5} *17*; α(P)=7.57×10^{-7} *11* Mult.: from α(K)exp=0.007 *4* (1975Me20).
430.24 *6*	100	430.22	5/2$^-$	0.0	7/2$^-$	M1(+E2)	≤0.29	0.0817 *24*	α(K)=0.0680 *21*; α(L)=0.01061 *24*; α(M)=0.00241 *6*; α(N+..)=0.000682 *15* α(N)=0.000581 *13*; α(O)=9.47×10^{-5} *22*; α(P)=6.74×10^{-6} *21* %Iγ=28 *4* assuming adopted normalization. Mult.: from α(K)exp=0.051 *8*, α(L)exp=0.011 *1* (1975Me20). δ: from Adopted Gammas; δ=0.9 *3* from α(K)exp In 1975Me20.
^{x}445.5 *5*	0.14 *5*								
455.32 *6*	5.3 *3*	773.71	5/2$^+$	318.38	5/2$^-$	(E1)		0.00871 *13*	α(K)=0.00731 *11*; α(L)=0.001090 *16*; α(M)=0.000246 *4*; α(N+..)=6.90×10^{-5} *10* α(N)=5.89×10^{-5} *9*; α(O)=9.44×10^{-6} *14*; α(P)=6.21×10^{-7} *9* Mult.: based on weakness of line In ce spectrum and strength In photon spectrum.

γ(^{179}W) (continued)

E_γ[†]	I_γ[‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[a]	Comments
^{x}463.6[@]	<1[@]							
464.75 *6*	13.4 *7*	773.71	5/2$^+$	309.00	9/2$^+$	E2	0.0252	α(K)=0.0190 *3*; α(L)=0.00476 *7*; α(M)=0.001134 *16*; α(N+..)=0.000313 *5* α(N)=0.000270 *4*; α(O)=4.09×10^{-5} *6*; α(P)=1.728×10^{-6} *25* Mult.: from α(K)exp=0.012 *8*, α(L)exp=0.0034 *12* (1975Me20).
467.08 *15*	1.4 *2*	688.95	(3/2)$^-$	221.94	1/2$^-$	M1	0.0675	α(K)=0.0563 *8*; α(L)=0.00868 *13*; α(M)=0.00197 *3*; α(N+..)=0.000558 *8* α(N)=0.000474 *7*; α(O)=7.76×10^{-5} *11*; α(P)=5.57×10^{-6} *8* Mult.: from Adopted Gammas. α(K)exp≈0.14 (I(ce) from 1968Ha39, Iγ from 1975Me20).
468.84 *15*	1.9 *2*	773.71	5/2$^+$	304.77	3/2$^-$			
^{x}476.5[@]	<3[@]							
477.34 *6*	33.0 *17*	477.34	7/2$^+$	0.0	7/2$^-$	E1	0.00785 *11*	α(K)=0.00659 *10*; α(L)=0.000980 *14*; α(M)=0.000221 *3*; α(N+..)=6.20×10^{-5} *9* α(N)=5.29×10^{-5} *8*; α(O)=8.49×10^{-6} *12*; α(P)=5.62×10^{-7} *8* Mult.: from α(K)exp=0.0043 *15*, α(L)exp=0.0020 *11* (1975Me20).
482.46 *15*	1.3 *1*	787.37	(5/2)$^-$	304.77	3/2$^-$	M1	0.0620	α(K)=0.0517 *8*; α(L)=0.00797 *12*; α(M)=0.00181 *3*; α(N+..)=0.000512 *8* α(N)=0.000435 *7*; α(O)=7.12×10^{-5} *10*; α(P)=5.12×10^{-6} *8* Mult.: from α(K)exp≈0.086 (I(ce) from 1968Ha39, Iγ from 1975Me20).
498.28 *6*	20.3 *10*	720.19	3/2$^+$	221.94	1/2$^-$	E1	0.00715 *10*	α(K)=0.00601 *9*; α(L)=0.000890 *13*; α(M)=0.000201 *3*; α(N+..)=5.63×10^{-5} *8* α(N)=4.81×10^{-5} *7*; α(O)=7.72×10^{-6} *11*; α(P)=5.13×10^{-7} *8* Mult.: from α(K)exp=0.0075 *19*, α(L)exp=0.0041 *19* (1975Me20).
^{x}518.26 *25*	0.34 *10*							
531.37 *8*	1.40 *14*	531.41	7/2$^-$	0.0	7/2$^-$	M1	0.0482	α(K)=0.0402 *6*; α(L)=0.00618 *9*; α(M)=0.001402 *20*; α(N+..)=0.000397 *6* α(N)=0.000338 *5*; α(O)=5.52×10^{-5} *8*; α(P)=3.97×10^{-6} *6* Mult.: from α(K)exp≈0.10 (I(ce) from 1968Ha39, Iγ from 1975Me20).
534.00 *20*	0.31 *7*	1606.35	(3/2)$^+$	1072.31	(5/2$^-$)			
546.13 *8*	3.5 *2*	855.27	7/2$^+$	309.00	9/2$^+$	M1	0.0449	α(K)=0.0375 *6*; α(L)=0.00575 *8*; α(M)=0.001305 *19*; α(N+..)=0.000369 *6* α(N)=0.000314 *5*; α(O)=5.14×10^{-5} *8*; α(P)=3.70×10^{-6} *6* Mult.: from α(K)exp=0.06 *4* (1975Me20) and≈0.086 (I(ce) from 1968Ha39, Iγ from 1975Me20).
551.78 *9*	1.8 *2*	1029.08	(5/2,7/2)$^+$	477.34	7/2$^+$			
557.19 *12*	0.77 *10*	2206.27	(5/2,7/2$^+$)	1649.05	(7/2)			
565.5 *3*	0.18 *6*	787.37	(5/2)$^-$	221.94	1/2$^-$			
^{x}570.8 *6*	0.11 *4*							
^{x}580.60 *10*	0.75 *8*							
^{x}584.27 *25*	0.24 *5*							
594.88 *20*	0.39 *6*	1072.31	(5/2$^-$)	477.34	7/2$^+$			
600.0	0.10 *3*	2206.27	(5/2,7/2$^+$)	1606.35	(3/2)$^+$			
^{x}608.93 *10*	1.00 *10*							
^{x}620.8 *4*	0.17 *4*							
624.96 *25*	0.21 *5*	1480.36	(7/2,9/2)	855.27	7/2$^+$			
^{x}627.7 *3*	0.23 *7*							

$^{179}_{74}$W$_{105}$-8

γ(^{179}W) (continued)

E_γ[†]	I_γ[‡&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α[a]	Comments
^{x}652.8 *3*	0.24 *8*							
^{x}665.2 *4*	0.16 *5*							
^{x}674.16 *25*	0.21 *5*							
^{x}684.06 *20*	0.26 *6*							
^{x}691.31 *20*	0.45 *9*							
^{x}704.82 *25*	0.27 *6*							
719.86 *20*	0.43 *8*	1029.08	(5/2,7/2)$^+$	309.00	9/2$^+$			
735.64 *20*	0.54 *8*	855.27	7/2$^+$	119.910	9/2$^-$			
^{x}742.58 *20*	0.55 *8*							
^{x}744.86 *12*	1.34 *11*							
^{x}761.89 *15*	0.68 *8*							
773.8 *6*	0.18 *6*	773.71	5/2$^+$	0.0	7/2$^-$			
^{x}781.2 *3*	0.36 *6*							
787.41 *9*	2.46 *20*	787.37	(5/2)$^-$	0.0	7/2$^-$			
^{x}798.84 *20*	0.56 *10*							
^{x}802.56 *12*	0.91 *10*							
^{x}812.12 *9*	1.96 *16*							
^{x}815.21 *15*	0.83 *10*							
^{x}827.60 *16*	1.05 *15*							
832.63 *6*	10.7 *8*	1606.35	(3/2)$^+$	773.71	5/2$^+$	M1	0.01530	α(K)=0.01280 *18*; α(L)=0.00194 *3*; α(M)=0.000439 *7*; α(N+..)=0.0001242 *18* α(N)=0.0001056 *15*; α(O)=1.729×10^{-5} *25*; α(P)=1.253×10^{-6} *18* Mult.: from α(K)exp=0.015 *4* (1975Me20).
^{x}836.51 *10*	1.3 *2*							
850.41 *16*	0.65 *15*	1072.31	(5/2$^-$)	221.94	1/2$^-$			
855.26 *18*	0.78 *20*	855.27	7/2$^+$	0.0	7/2$^-$			
^{x}862.60 *20*	1.30 *20*							
^{x}874.5 *5*	0.17 *5*							
886.15 *8*	9.0 *6*	1606.35	(3/2)$^+$	720.19	3/2$^+$	E2	0.00576 *8*	α(K)=0.00470 *7*; α(L)=0.000822 *12*; α(M)=0.000189 *3*; α(N+..)=5.30×10^{-5} *8* α(N)=4.54×10^{-5} *7*; α(O)=7.20×10^{-6} *10*; α(P)=4.36×10^{-7} *7* Mult.: from α(K)exp=0.006 *4* (1975Me20).
^{x}903.1 *10*	1.8 *6*							
^{x}935.19 *18*	1.2 *1*							
947.07 *10*	2.4 *2*	1480.36	(7/2,9/2)	533.29	9/2$^-$			
953.62 *25*	0.90 *12*	1808.89	(7/2)$^+$	855.27	7/2$^+$			
962.87 *25*	0.78 *8*	1750.30	(3/2,5/2)	787.37	(5/2)$^-$			
971.41 *12*	1.85 *15*	1480.36	(7/2,9/2)	508.98	7/2$^-$			
^{x}983.1 *6*	0.14 *4*							
^{x}989.0 *3*	0.30 *8*							
1030.12 *18*	0.95 *10*	1750.30	(3/2,5/2)	720.19	3/2$^+$			
^{x}1035.7 *7*	0.19 *5*							
^{x}1042.3 *3*	0.36 *8*							
1061.5 *5*	0.42 *8*	1750.30	(3/2,5/2)	688.95	(3/2)$^-$			

$\gamma(^{179}$W) (continued)

E_γ[†]	I_γ[‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[a]	Comments
[x]1068.4 *6*	0.17 *5*							
1072.2 *6*	0.22 *5*	1072.31	(5/2$^-$)	0.0	7/2$^-$			
[x]1110.28 *25*	0.60 *10*							
[x]1120.1 *3*	0.43 *7*							
1148.5 *6*	0.15 *5*	1680.28	(7/2)$^+$	531.41	7/2$^-$			
1171.0[b] *3*	0.29[b] *7*	1480.36	(7/2,9/2)	309.00	9/2$^+$			
1171.0[b] *3*	0.29[b] *7*	1680.28	(7/2)$^+$	508.98	7/2$^-$			
1202.97 *25*	0.32 *6*	1680.28	(7/2)$^+$	477.34	7/2$^+$			
[x]1236.7 *5*	0.20 *6*							
[x]1243.8 *4*	0.28 *6*							
1249.9 *5*	0.30 *6*	1680.28	(7/2)$^+$	430.22	5/2$^-$			
[x]1271.5 *7*	0.22 *6*							
1277.5 *5*	0.26 *8*	1808.89	(7/2)$^+$	531.41	7/2$^-$			
1288.21 *25*	0.80 *12*	1606.35	(3/2)$^+$	318.38	5/2$^-$			
1301.3 *4*	0.39 *10*	1606.35	(3/2)$^+$	304.77	3/2$^-$			
[x]1306.4 *8*	0.35 *10*							
1320.08 *25*	0.73 *10*	1750.30	(3/2,5/2)	430.22	5/2$^-$			
1331.6 *6*	0.30 *7*	1808.89	(7/2)$^+$	477.34	7/2$^+$			
1340.1 *3*	0.48 *9*	1649.05	(7/2)	309.00	9/2$^+$			
[x]1349.8 *4*	0.38 *8*							
[x]1362.4 *5*	0.27 *7*							
1371.27 *10*	3.84 *20*	1680.28	(7/2)$^+$	309.00	9/2$^+$			
1384.7 *6*	0.18 *6*	1606.35	(3/2)$^+$	221.94	1/2$^-$			
[x]1398.1 *6*	0.20 *6*							
[x]1402.2 *3*	0.45 *9*							
1432.1[b] *5*	0.23[b] *6*	1750.30	(3/2,5/2)	318.38	5/2$^-$			
1432.1[b] *5*	0.23[b] *6*	2206.27	(5/2,7/2$^+$)	773.71	5/2$^+$			
1486.2 *6*	0.26 *5*	2206.27	(5/2,7/2$^+$)	720.19	3/2$^+$			
1500.0 *3*	0.71 *10*	1808.89	(7/2)$^+$	309.00	9/2$^+$			
1529.2 *3*	0.47 *7*	1649.05	(7/2)	119.910	9/2$^-$			
1560.37 *8*	11.5 *7*	1680.28	(7/2)$^+$	119.910	9/2$^-$			
[x]1599.9 *4*	0.40 *8*							
[x]1608.7 *6*	0.36 *8*							
[x]1625.54 *25*	0.41 *7*							
1648.97 *15*	1.63 *16*	1649.05	(7/2)	0.0	7/2$^-$			
[x]1663.1 *9*	0.22 *7*							
[x]1667.8 *6*	0.36 *7*							
1680.27 *8*	46.4 *25*	1680.28	(7/2)$^+$	0.0	7/2$^-$	E1	1.04×10^{-3}	α(K)=0.000613 *9*; α(L)=8.50×10^{-5} *12*; α(M)=1.90×10^{-5} *3*; α(N+..)=0.000322 *5* α(N)=4.57×10^{-6} *7*; α(O)=7.47×10^{-7} *11*; α(P)=5.43×10^{-8} *8*; α(IPF)=0.000316 *5* Mult.: from α(K)exp=0.00085 *25* (1975Me20).
1688.94 *20*	1.56 *16*	1808.89	(7/2)$^+$	119.910	9/2$^-$			

$^{179}_{74}$W$_{105}$-10

γ(^{179}W) (continued)

E_γ [†]	I_γ [‡&]	E_i(level)	J^π_i	E_f	J^π_f
1697.8 *5*	0.15 *3*	2206.27	(5/2,7/2$^+$)	508.98	7/2$^-$
1728.8 *4*	0.32 *7*	2206.27	(5/2,7/2$^+$)	477.34	7/2$^+$
[x]1804.8 *4*	0.60 *15*				
1808.88 *8*	8.0 *6*	1808.89	(7/2)$^+$	0.0	7/2$^-$

[†] From 1975Me20. Data from 1973Ar11 are consistent, but less precise.

[‡] From 1975Me20. Data from 1973Ar11 are in only fair agreement. I($\gamma^\pm$)=6.0 *6* (1975Me20).

[#] From authors′ analysis of subshell ratio data In 1968Ha39, except As noted.

[@] Transition observed in ce data of 1968Ha39. Iγ given here is upper limit for unobserved photons (1975Me20).

[&] For absolute intensity per 100 decays, multiply by 0.281 *18*.

[a] 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.

[b] Multiply placed with undivided intensity.

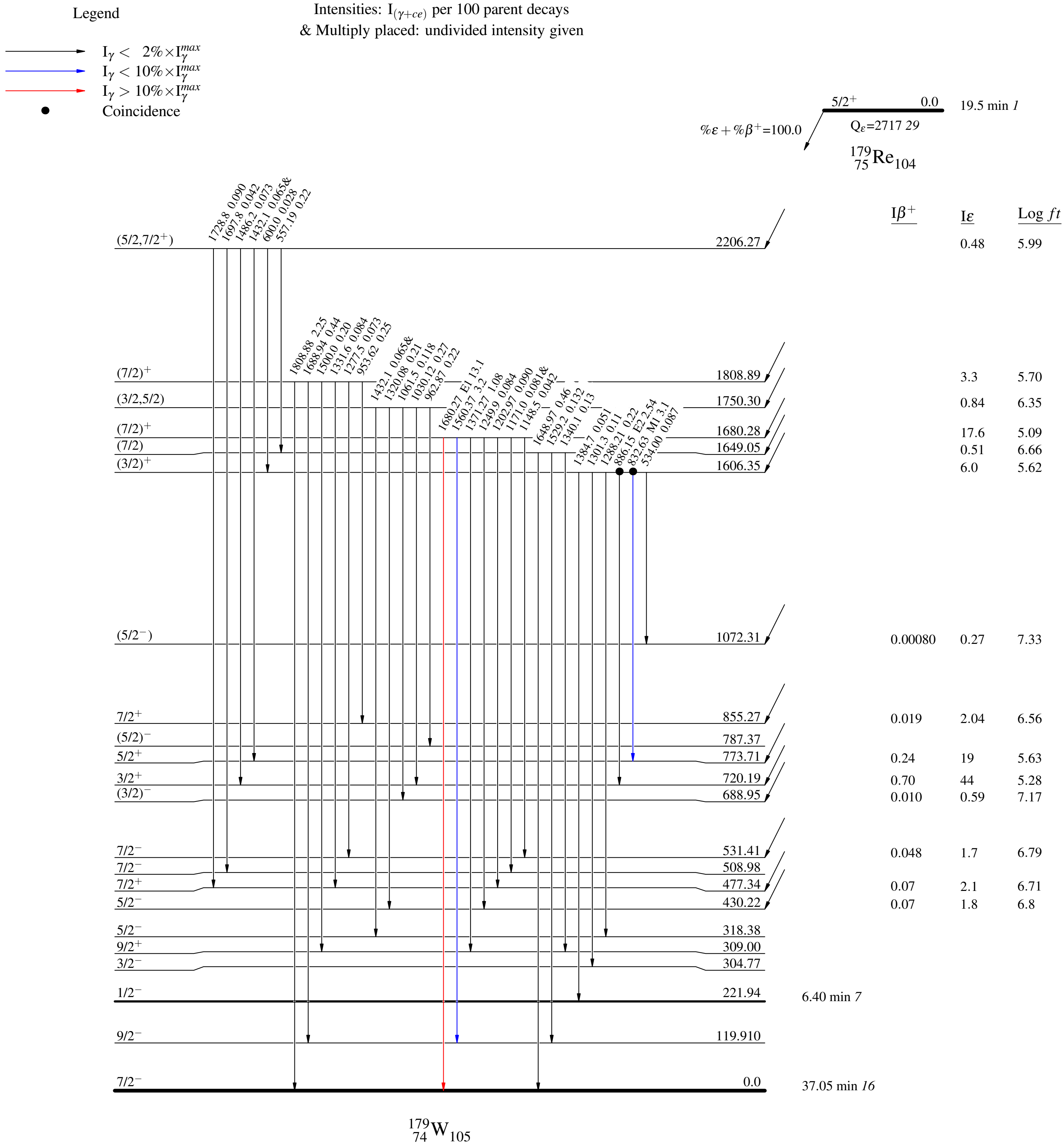
[x] γ ray not placed in level scheme.

$^{179}_{74}$W$_{105}$-11

^{179}Re ε decay 1975Me20,1973Ar11,1968Ha39

Decay Scheme

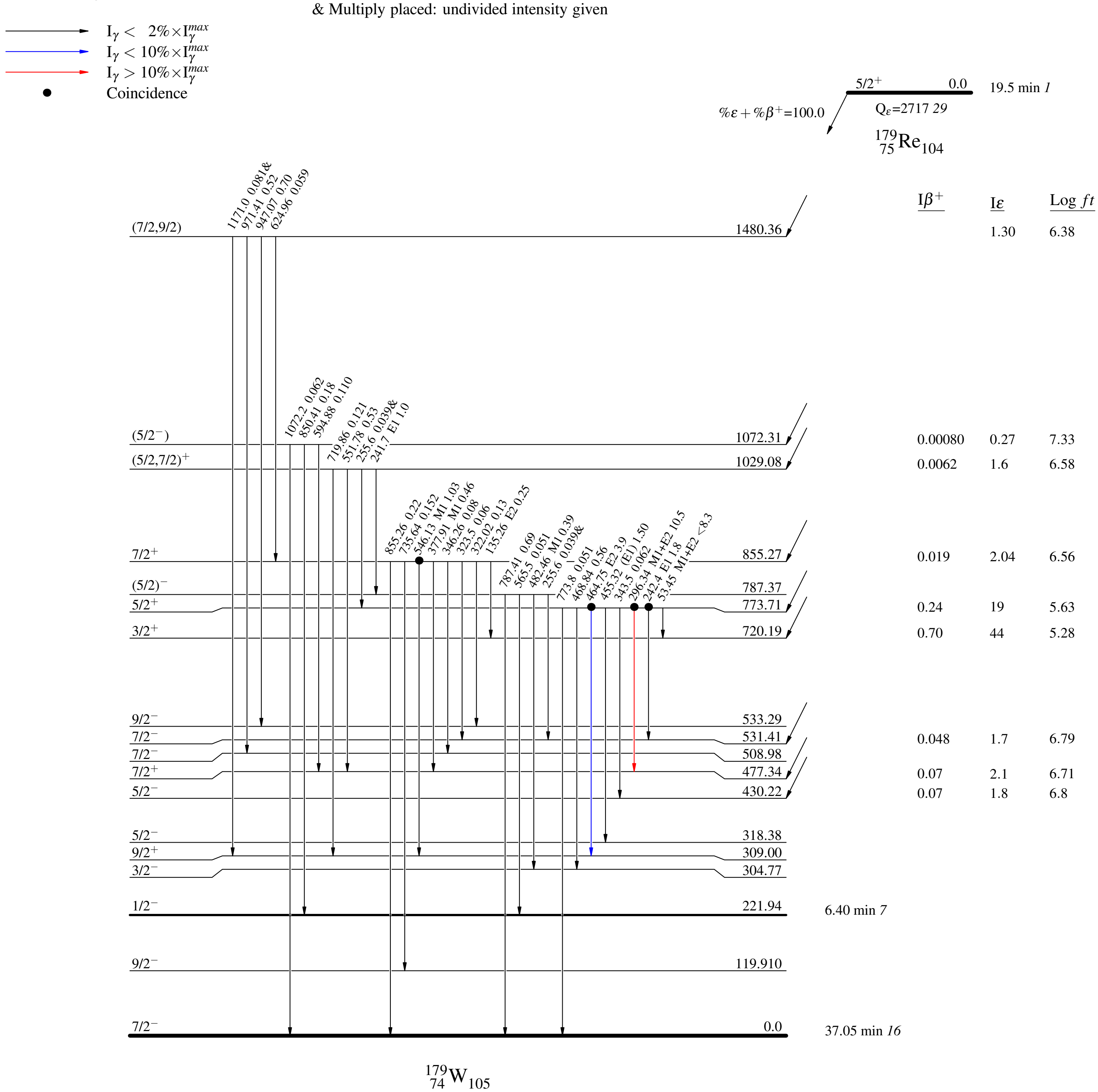
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given



^{179}Re ε decay 1975Me20,1973Ar11,1968Ha39

Decay Scheme (continued)

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

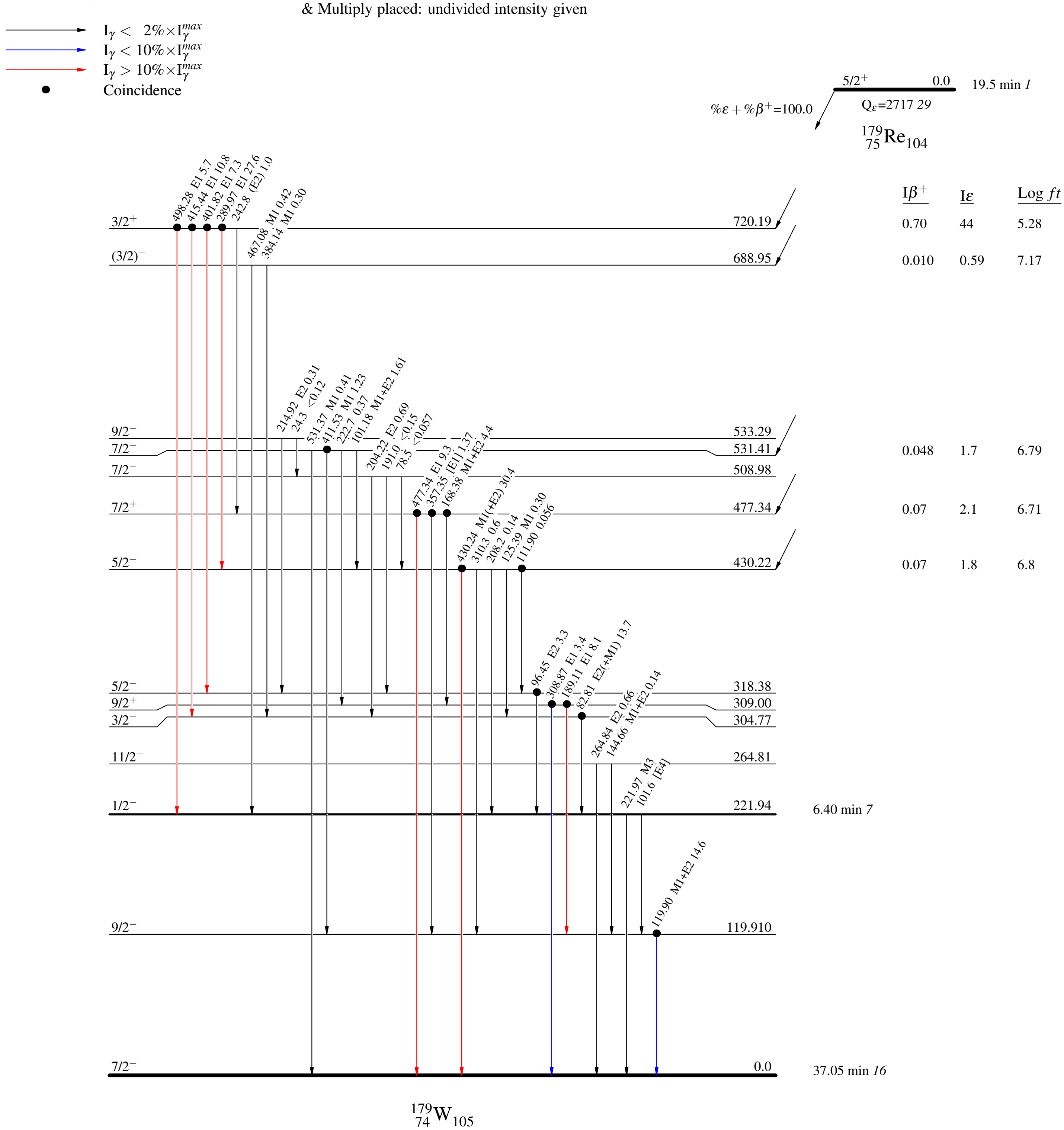


^{179}Re ε decay 1975Me20,1973Ar11,1968Ha39

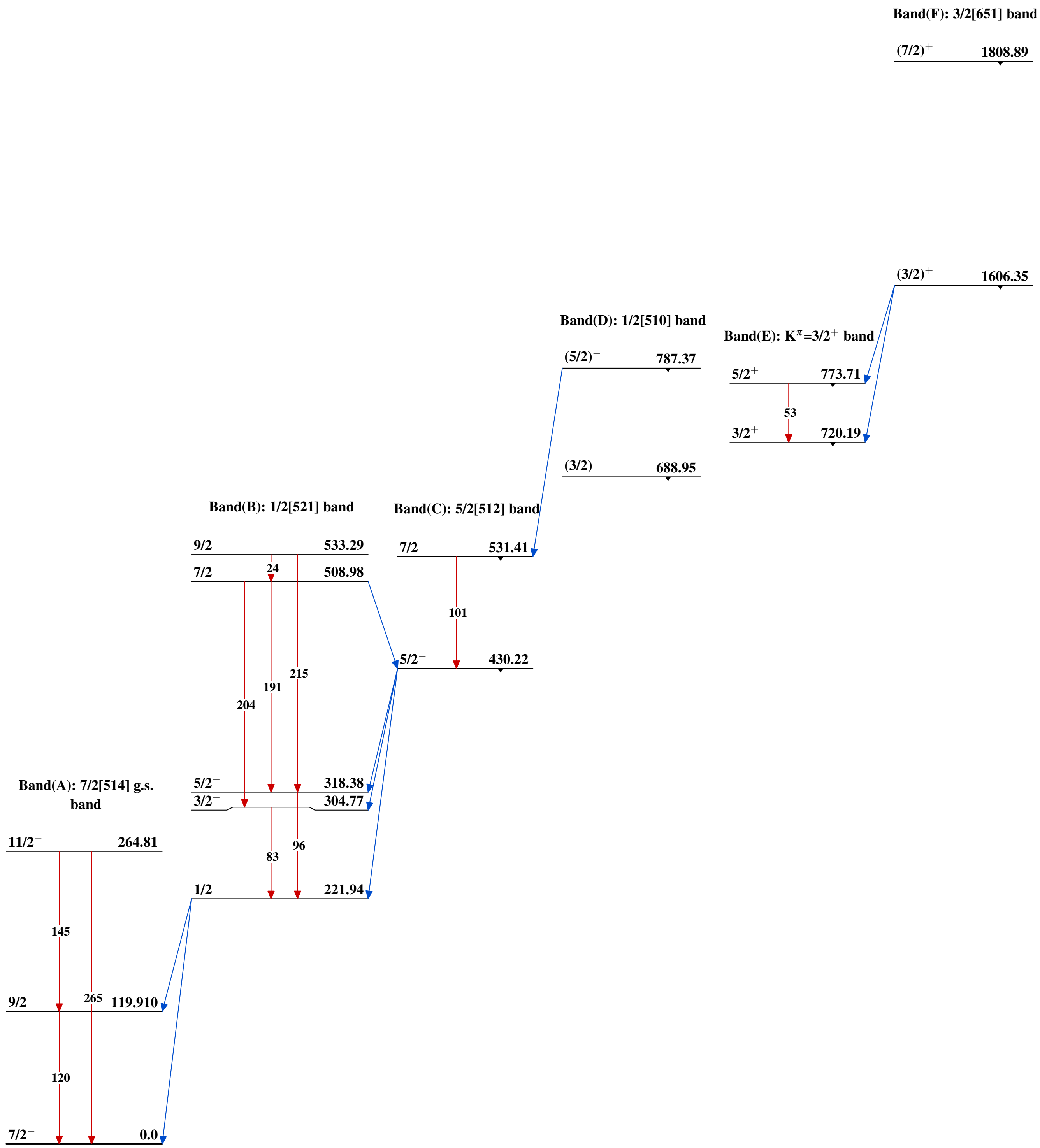
Decay Scheme (continued)

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

Legend



^{179}Re ε decay 1975Me20,1973Ar11,1968Ha39



$^{179}_{74}W_{105}$