Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia	NDS 110,999 (2009)	1-Nov-2008

Q(β^-)=2.4670 *20*; S(n)=7359.2 *11*; S(p)=5996.7 *12*; Q(α)=1652.7 *22* 2012Wa38
Note: Current evaluation has used the following Q record $ 2.469 *4* 7356.810 *5995*.113 *1655*.521 2003Au03.

Re(n,n′) – 1968Sm03: Target: 37% ^{185}Re and 63% ^{187}Re, E≈0.25-1.5 MeV. The observed peaks were assigned to ^{185}Re or ^{187}Re from comparison of measured energies with known levels in each isotope.

^{187}Re Levels

Cross Reference (XREF) Flags

A	^{187}W β^- decay	E	^{187}Re(^{82}Se,^{82}Se′γ)
B	^{186}W(α,t),^{186}W(^{3}He,d)	F	Coulomb excitation
C	^{187}Re(γ,γ')	G	^{188}Os(t,α),(pol t,α)
D	^{187}Re(d,d′) E=12.1 MeV		

E(level)†	Jπ‡	$T_{1/2}$#	XREF	Comments
0.0@	5/2$^+$	4.33×10^{10} y *7*	ABCDEFG	%β^-=100; %α<0.0001 μ=+3.2197 *3*; Q=+2.07 *2* μ: from 1951Al11 (NMR). Same value by 1989Ra17 and 2005St24. Q: from 1981Ko11 (from pionic and muonic x rays). Same value by 1989Ra17 and 2005St24. <r^2>$^{1/2}$(^{187}Re)=7.69 *32* fm (magnetic) (1998Lo04); <r^2>$^{1/2}$(^{187}Re)=5.339 *13* fm (charge) (2004An14). %α: no α's observed for 1.5<Eα<3.7 MeV, emulsion (1954Po24). Jπ: spin from optical and microwave spectroscopy (1976Fu06). Parity from L=2 (^{3}He,d) and angular distribution and analyzing power in (Pol t,α). $T_{1/2}$: weighted average of 4.12×10^{10} y *11* (2001Ga01), 4.35×10^{10} y *13* (1986Li11) and 4.56×10^{10} y *12* (1983Lu09, 1980Lu10) – measured growth of ^{187}Os daughter. Other values: 4.3×10^{10} y 4_{stat} 3_{syst} (1999Al20), 4.3×10^{10} y *5* (1963Hi08), 6.2×10^{10} y *7* (1958He06) from measurements of daughter growth; 3.5×10^{10} y *4* (1984Na04), 6.6×10^{10} y *13* (1965Br12), 3.×10^{10} y (1962Wa15) from specific activity measurements. $T_{1/2}$=4.5×10^{10} y *3*, from neutral ^{187}Re decay to singly ionized ^{187}Os (1993As02). Fully ionized ^{187}Re half-life $T_{1/2}$=32.9 y *20* (1996Bo37); Others: 33 y *2* (1997No07), 31.2 y *+30−25* (1997We08), and 33 y *6* (1996Ki23).
134.244@ *4*	7/2$^+$	10.6 ps *7*	ABCDEFG	μ=+1.9 *9* μ: from 1989Ra17 and 2005St24 (perturbed angular correlations). Jπ: 134.2γ M1+E2 to 5/2$^+$. $T_{1/2}$: Weighted average of 11.1 ps *10* (Coulomb excitation), 10.4 ps *14* (1960Mo08,Mossbauer), and 10.0 ps *+10−14* (1963Bl12, (p,γ); in the weighted average 10.0 ps *12* was used).
206.2473& *10*	9/2$^-$	555.3 ns *17*	ABC E G	μ=+5.11 *9*; Q=3.04 *5* μ,Q: from 1989Ra17 and 2005St24 (differential perturbed angular correlations). Jπ: 206.2γ M2+E3 to 5/2$^+$ state and 72.0γ E1(+M2) to 7/2$^+$ state. $T_{1/2}$: from ^{187}W β^- decay ((479γ)(72γ)t).
303.36@ *7*	9/2$^+$	5.2 ps *18*	AB DEFG	Jπ: 168.5γ M1+E2 to 7/2$^+$ and 303 E2 to 5/2$^+$.

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Adopted Levels, Gammas (continued)

^{187}Re Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
				$T_{1/2}$: from Coulomb excitation (using B(E2)↑=0.57 *3* and adopted 303γ properties).
388.63[&] *7*	(11/2⁻)		B E G	Jπ: L=5 in (α,t), (^{3}He,d), band assignment.
508.53[@] *7*	(11/2⁺)		E	
511.768[a] *7*	1/2⁺	13 ps *3*	ABCD FG	Jπ: L=0 in (α,t),(^{3}He,d). $T_{1/2}$: Weighted average of 17 ps *6* (γ,γ′) and 13 ps *3* (Coulomb excitation).
581.99[g] *3*	(5/2⁺)		A F	Jπ: 36.4γ from 3/2⁺ state.
589.143[a] *16*	3/2⁺	>1.4 ps	ABCD FG	Jπ: 77.4γ M1 to 1/2⁺ state, 454.9γ E2 to 7/2⁺ state, and 589γ M1(+E2) to 5/2⁺ state. $T_{1/2}$: from (γ,γ′).
603.47[&] *9*	(13/2⁻)		E	
618.369[b] *8*	(3/2⁺)	9.7 ps *8*	ABC G	$T_{1/2}$: from (γ,γ′). Other: <50 ps (^{187}W β⁻ decay-1974Da31 β(ce(K) 107γ)t). Jπ: 106.6γ M1+E2 to 1/2⁺ state and 36.4γ M1+E2 to (5/2⁺) state.
625.516[b] *8*	(1/2⁺)	540 ps *11*	A C G	Jπ: 113.7γ M1 to 1/2⁺ state. If 491.2γ to 7/2⁺ state is correct, $J^\pi=3/2^+$; however, band assignment is consistent with 1/2⁺. $T_{1/2}$: from ^{187}W β⁻ decay.
647.26[a] *15*	5/2⁺		AB D F	Jπ: L=2 in (α,t),(^{3}He,d), band assignment.
685.795[c] *6*	5/2⁻	6.1 ps *3*	A C	Jπ: 479.5γ E2 to 9/2⁻ state, 551.5γ E1(+M2) to 7/2⁺ state, and 685.8γ E1(+M2) to 5/2⁺ g.s.. $T_{1/2}$: from (γ,γ′). Other values: 11.5 ps *21* (^{187}W β⁻ decay), weighted average of 10 ps *3* from 1974Da31 β(ce(K) 686γ) and 13 ps *3* (1967Be62); 5.9 ps (1973SaZD).
718.73? *4*			A	
744.84[@] *9*	(13/2⁺)		DE	Jπ: band assignment.
767.8[d] *4*	(7/2⁺)		A G	Jπ: assignment in the (t,α) from angular distributions.
772.876[e] *19*	(3/2⁺)	0.17 ps *2*	ABCD G	Jπ: 772.9γ M1+E2 to 5/2⁺ g.s., 261γ to 1/2⁺ state. $T_{1/2}$: from (γ,γ′). Other value: 0.18 ps *3* (1964La02,Mossbauer).
792.61[k] *8*	(13/2)		E	
816.562[b] *19*	(5/2⁺)		AB G	Jπ: 682.3γ to 7/2⁺ state, 191γ to (1/2⁺), and band assignment.
817[b] *3*	(7/2⁺)		G	
826.84 *12*	(3/2⁺,5/2⁺)		A	Jπ: 201.3γ to (1/2⁺) state, 693γ to 7/2⁺ state.
839.55[&] *9*	(15/2⁻)		E	
842.00[j] *10*	(7/2⁻,9/2⁺)		E	Jπ: 708γ to 7/2⁺ state and 842γ to 5/2⁺ state, both states are member of 5/2⁺[402] band; 453γ to 11/2⁻ state.
844.7[g] *4*	(9/2⁺)	54 fs *34*	A D F	Jπ: from Coulomb excitation. A large B(E2)(W.u.)=1.3×10^5 value weakens the tentative assignment of this level or the (5/2⁺) of 582 keV level. $T_{1/2}$: from Coulomb excitation. Note that adopted branching yields a large B(E2)(W.u.)=1.3×10^5.
864.556[f] *10*	3/2⁺	1.5 ps *5*	A C G	Jπ: 239γ M1+E2 to (1/2⁺) state, 246γ M1(+E2) to 5/2⁺ g.s., 246.2γ M1+E2 to 3/2⁺ state. $T_{1/2}$: from (γ,γ′).
879.465[e] *19*	(5/2⁺)	0.27 ps *9*	ABCD FG	Jπ: 745γ M1(+E2) to 7/2⁺ state, log *ft*=7.89 from 3/2⁻, band assignment. $T_{1/2}$: from ^{187}Re(γ,γ′) (1967La15), 0.17 ps *5* in Coulomb excitation.
933.62 *14*	(5/2⁻,7/2⁺)		A	Jπ: 727γ to 9/2⁻ state.
948 *3*	(1/2⁺)		G	Jπ: assignment from (t,α).
960.17[f] *5*	(5/2⁺)		A	Jπ: from comparison with the calculated level energy assuming a g.s. band member – proposed in ^{187}W β⁻ decay (1976Br09).

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Adopted Levels, Gammas (continued)

^{187}Re Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
969.3? *4*	(3/2+,5/2,7/2+)		A	Jπ: 835.5γ to 7/2+ state.
979 *3*	(5/2+)		G	Jπ: assignment from (t,α).
1000.93? *12*	(5/2−,7/2+)		A	Jπ: 794.8γ to 9/2− state.
1003.14? *5*			A	
1015.13[@] *10*	(15/2+)		E	
1034.11[j] *9*	(9/2−,11/2+)		E	
1042.56[k] *9*	(15/2)		E	
1079 *3*	1/2,3/2		B	Jπ: L=(0,1) in (α,t),(^{3}He,d).
1106.75[&] *10*	(17/2−)		E	
1126 *3*	3/2+,5/2+		B	Jπ: L=(2) in (α,t),(^{3}He,d).
1163 *3*	3/2+,5/2+		B	Jπ: L=(2) in (α,t),(^{3}He,d).
1190.45 *5*	(5/2+)		A D G	Jπ: 345.7γ to (9/2+) state, log *ft*=7.71 from 3/2−.
1200[i] *3*	(9/2−)		B D G	E(level): From (t,α),(pol t,α). Jπ: L=(5) in (α,t),(^{3}He,d), band assignment.
1209.5[h] *21*	(11/2−)		B G	E(level): Weighted average of 1208 *3* (t,α),(pol t,α) and 1211 *3* (α,t),(^{3}He,d). Jπ: L=(5) in (α,t),(^{3}He,d), band assignment.
1220.80 *25*			A	
1230.12 *4*	(3/2+,5/2+)		A	Jπ: Both 612.9γ to 3/2+ state, 641γ to 3/2+ state, and 1095.9γ to 7/2+ state.
1232.5[i] *21*	(5/2−)		B G	E(level): Weighted average of 1232 *3* (t,α),(pol t,α) and 1233 *3* (α,t),(^{3}He,d). Jπ: L=(3) in (α,t),(^{3}He,d) and band assignment.
1257.21[j] *12*	(11/2−,13/2+)		E	
1266 *3*			B	
1286 *3*			B	
1310.04[@] *11*	(17/2+)		E	
1319.00[k] *10*	(17/2)		E	Jπ: From band assignment.
1343 *3*			B	
1383.55[&] *12*	(19/2−)		B E	XREF: B(1380).
1423 *3*			B	
1458 *6*			G	
1474.33 *11*	(19/2−)	<3 ns	E	Jπ: 367.6γ and 634.8γ feeding (17/2−) and (15/2−) states, respectively, members of 9/2−[514] band; and (M1,E1) and from multipolarity assumptions for 155γ and 207γ using intensity balance at this level. A possible configuration for the K^π=19/2− state: π5/2+[402]⊗ν7−3/2−[512] 11/2+[615]. $T_{1/2}$: From (^{82}Se,^{81}Seγ).
1487 *3*	(5/2+)		B G	E(level): Weighted average of 1484 *6* (t,α),(pol t,α) and 1488 *3* (α,t),(^{3}He,d). Jπ: L=(2) in (α,t),(^{3}He,d). Assignment from (t,α).
1506 *3*	3/2,5/2,7/2		B	Jπ: L=(2,3) in (α,t),(^{3}He,d).
1510.94[j] *17*	(13/2−,15/2+)		E	
1546 *3*			B	
1608 *3*			B	
1638.84[@] *14*	(19/2+)		E	
≈1640			D	
≈1650			D	
1661 *6*	(3/2+)		G	Jπ: (3/2+) is the most likely from (t,α), (pol t,a) (1977Hi06) – (1/2,5/2)− are less likely assignments.
1673.94[&] *15*	(21/2−)		E	

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Adopted Levels, Gammas (continued)

^{187}Re Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
1681.63 *15*	(19/2$^+$)	114 ns *23*	E	Jπ: 207γ (E1) to (19/2$^-$) state. Possible K^π=19/2$^+$ configuration: π(9/2$^-$[514])⊗ν5−(−1/2$^-$[510] 11/2$^+$[615]). $T_{1/2}$: Determined from a time difference spectrum between the 329γ and the 215γ, 207γ, and 329γ (^{82}Se,^{81}Seγ).
1683 *3*			B	
1713 *3*			B	
1736 *3*			B	
1789 *3*	(3/2$^+$,5/2$^+$)		B	Jπ: L=(2) in (α,t),(^{3}He,d).
1790 *6*	(11/2$^-$)		G	Jπ: assignment in (t,α), 11/2$^-$ member of the 7/2$^-$[523] band (1977Hi06).
1808 *3*			B	
1836 *3*			B	
1870.53 *18*			E	
1876 *3*	(3/2$^+$,5/2$^+$)		B	Jπ: L=(2) in (α,t),(^{3}He,d).
1905 *3*	(3/2$^+$,5/2$^+$)		B	Jπ: L=(2) in (α,t),(^{3}He,d).
1922 *3*	(3/2$^+$,5/2$^+$)		B	Jπ: L=(2) in (α,t),(^{3}He,d).
1948 *3*	(1/2$^+$)		B	Jπ: L=(0) in (α,t),(^{3}He,d).
1963 *3*	(3/2$^+$,5/2$^+$)		B	Jπ: L=(2) in (α,t),(^{3}He,d).
1981.74[@] *17*	(21/2$^+$)		E	
1990 *3*	(3/2$^+$,5/2$^+$)		B	Jπ: L=(2) in (α,t),(^{3}He,d).
2109 *3*			B	
2199.63 *21*			E	

[†] From a least-squares fit to the adopted γ-ray energies, except otherwise noted.
[‡] From L value in (α,t),(^{3}He,d), analyzing powers in (t,α),(pol t,α); rotational band structure, and γ-ray multipolarity.
[#] For methods − please see the source dataset, if not noted.
[@] Band(A): 5/2$^+$[402].
[&] Band(B): 9/2$^-$[514].
[a] Band 1/2$^+$[400]+5/2$^+$[402],2$^+$.
[b] Band 1/2$^+$[411].
[c] Band 5/2$^-$[532]+9/2$^-$[514],2$^+$.
[d] Band 7/2$^+$[404].
[e] Band 3/2$^+$[402].
[f] Band 3/2$^+$[411]+1/2$^+$[411],2$^+$.
[g] Band 5/2$^+$[402],2$^+$.
[h] Band 11/2$^-$[505].
[i] Band 1/2$^-$[541].
[j] Band I: possible vibrational character.
[k] Band II: possible vibrational character.

Adopted Levels, Gammas (continued)

$\gamma(^{187}Re)$

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	δ[#]	α[@]	Comments
134.244	$7/2^+$	134.247 *7*	100	0.0	$5/2^+$	M1+E2	+0.175 *6*	2.20	α(K)=1.80 *3*; α(L)=0.306 *5*; α(M)=0.0704 *10*; α(N+..)=0.0201 *3* α(N)=0.01706 *25*; α(O)=0.00284 *4*; α(P)=0.000196 *3* B(M1)(W.u.)=0.260 *18*; B(E2)(W.u.)=179 *17*
206.2473	$9/2^-$	72.002 *4*	100 *2*	134.244	$7/2^+$	E1(+M2)	−0.008 *11*	0.904 *23*	B(E1)(W.u.)=(1.70×10^{-7} *5*); B(M2)(W.u.)=(0.010 *+27−10*)
		206.247 *1*	91.13 *12*	0.0	$5/2^+$	M2+E3	−0.07 *1*	3.35	α(K)=2.53 *4*; α(L)=0.622 *9*; α(M)=0.1503 *22*; α(N+..)=0.0431 *6* α(N)=0.0367 *6*; α(O)=0.00605 *9*; α(P)=0.000395 *6* B(M2)(W.u.)=0.707 *14*; B(E3)(W.u.)=50 *15*
303.36	$9/2^+$	168.5 *4*	100	134.244	$7/2^+$	M1+E2	+0.168 *7*	1.155 *18*	α(K)=0.951 *15*; α(L)=0.1573 *25*; α(M)=0.0361 *6*; α(N+..)=0.01032 *17* α(N)=0.00875 *14*; α(O)=0.001461 *23*; α(P)=0.0001034 *17* B(M1)(W.u.)=0.36 *13*; B(E2)(W.u.)=1.5×10^2 *6*
		303	19 *3*	0.0	$5/2^+$	E2		0.0855	α(K)=0.0566 *8*; α(L)=0.0221 *3*; α(M)=0.00542 *8*; α(N+..)=0.001497 *21* α(N)=0.001296 *19*; α(O)=0.000195 *3*; α(P)=5.28×10^{-6} *8* B(E2)(W.u.)=54 *21* E_γ,I_γ: From Coulomb excitation.
388.63	$(11/2^-)$	182.3[‡] *1*	100[‡]	206.2473	$9/2^-$				
508.53	$(11/2^+)$	204.9[‡] *1*	100[‡] *3*	303.36	$9/2^+$				
		374.7[‡] *1*	38.6[‡] *12*	134.244	$7/2^+$				
511.768	$1/2^+$	511.76 *1*	100	0.0	$5/2^+$	E2		0.0206	α(K)=0.01572 *22*; α(L)=0.00378 *6*; α(M)=0.000900 *13*; α(N+..)=0.000252 *4* α(N)=0.000216 *3*; α(O)=3.41×10^{-5} *5*; α(P)=1.558×10^{-6} *22* B(E2)(W.u.)=19 *5*
581.99	$(5/2^+)$	70.2	≈5	511.768	$1/2^+$				
		375.93[&] *13*	≈3	206.2473	$9/2^-$				Mult.: this γ would require M2 multipolarity which is not expected to compete strongly with M1+E2 transitions.
		582	≈100	0.0	$5/2^+$				
589.143	$3/2^+$	77.37 *5*	5.8 *13*	511.768	$1/2^+$	M1		10.77	α(K)=8.90 *13*; α(L)=1.450 *21*; α(M)=0.332 *5*; α(N+..)=0.0949 *14* α(N)=0.0804 *12*; α(O)=0.01351 *19*; α(P)=0.000986 *14* B(M1)(W.u.)<1.0
		454.92 *2*	24.1 *11*	134.244	$7/2^+$	E2		0.0278	α(K)=0.0206 *3*; α(L)=0.00544 *8*; α(M)=0.001304 *19*; α(N+..)=0.000364 *5* α(N)=0.000313 *5*; α(O)=4.88×10^{-5} *7*; α(P)=2.03×10^{-6} *3* B(E2)(W.u.)<40
		589.06 *5*	100 *1*	0.0	$5/2^+$	M1(+E2)		0.027 *13*	B(M1)(W.u.)<0.02; B(E2)(W.u.)<23

$^{187}_{75}Re_{112}$-5

Adopted Levels, Gammas (continued)

γ(^{187}Re) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	δ[#]	α[@]	Comments
									α(K)=0.022 *11*; α(L)=0.0038 *14*; α(M)=0.0009 *3*; α(N+..)=0.00025 *9* α(N)=0.00021 *8*; α(O)=3.5×10^{-5} *13*; α(P)=2.3×10^{-6} *12*
603.47	(13/2$^-$)	214.8[‡] *1*	100[‡] *13*	388.63	(11/2$^-$)				
		397.5[‡] *2*	9[‡] *4*	206.2473	9/2$^-$				
618.369	(3/2$^+$)	29.23 *3*	0.079 *17*	589.143	3/2$^+$				B(M1)(W.u.)=0.078 *13*
		36.38 *3*	0.118 *13*	581.99	(5/2$^+$)	M1+E2	0.12 *6*	21.6 *6*	α(L)=16.6 *5*; α(M)=3.89 *12*; α(N+..)=1.10 *4* α(N)=0.94 *3*; α(O)=0.152 *4*; α(P)=0.00894 *13* B(M1)(W.u.)=0.051 *8*; B(E2)(W.u.)=2.2×10^2 *23*
		106.596 *13*	0.408 *9*	511.768	1/2$^+$	M1+E2	0.9 *2*	4.01 *10*	α(K)=2.82 *19*; α(L)=0.91 *9*; α(M)=0.220 *22*; α(N+..)=0.061 *6* α(N)=0.053 *6*; α(O)=0.0081 *7*; α(P)=0.000304 *22* B(M1)(W.u.)=0.0039 *9*; B(E2)(W.u.)=1.1×10^2 *3*
		484.15 *3*	0.276 *13*	134.244	7/2$^+$				
		618.37 *1*	100.0 *4*	0.0	5/2$^+$	M1+E2	−0.50 *25*	0.0310 *24*	α(K)=0.0257 *20*; α(L)=0.00409 *25*; α(M)=0.00093 *6*; α(N+..)=0.000267 *16* α(N)=0.000226 *14*; α(O)=3.79×10^{-5} *24*; α(P)=2.72×10^{-6} *22* B(M1)(W.u.)=0.0071 *16*; B(E2)(W.u.)=1.9 *16*
625.516	(1/2$^+$)	7.1 *3*	0.28 *7*	618.369	(3/2$^+$)	M1(+E2)	≤0.03	6.6×10^2 *20*	α(M)=5.2×10^2 *15*; α(N+..)=1.5×10^2 *4* α(N)=1.2×10^2 *4*; α(O)=20 *6*; α(P)=1.16 *16* B(M1)(W.u.)>0.044; B(E2)(W.u.)<1.2×10^3
		113.746 *8*	7.00 *10*	511.768	1/2$^+$	M1		3.57	α(K)=2.96 *5*; α(L)=0.475 *7*; α(M)=0.1087 *16*; α(N+..)=0.0311 *5* α(N)=0.0264 *4*; α(O)=0.00443 *7*; α(P)=0.000323 *5* B(M1)(W.u.)=0.00061 *15*
		491.2	2.3 *7*	134.244	7/2$^+$			0.03 *3*	
		625.52 *1*	100.0 *5*	0.0	5/2$^+$	E2		0.01284	α(K)=0.01007 *15*; α(L)=0.00212 *3*; α(M)=0.000500 *7*; α(N+..)=0.0001406 *20* α(N)=0.0001204 *17*; α(O)=1.92×10^{-5} *3*; α(P)=1.007×10^{-6} *15* B(E2)(W.u.)=0.054 *13*
647.26	5/2$^+$	65.25 *18*		581.99	(5/2$^+$)				I_γ: not available.
		647.30 *25*	100 *33*	0.0	5/2$^+$				
685.795	5/2$^-$	103.8	0.032 *1*	581.99	(5/2$^+$)				B(E1)(W.u.)=5.6×10^{-6} *6*
		479.53 *1*	80.1 *3*	206.2473	9/2$^-$	E2		0.0243	α(K)=0.0183 *3*; α(L)=0.00461 *7*; α(M)=0.001102 *16*; α(N+..)=0.000308 *5* α(N)=0.000265 *4*; α(O)=4.14×10^{-5} *6*; α(P)=1.80×10^{-6} *3* B(E2)(W.u.)=22.9 *12*

$^{187}_{75}Re_{112}$-6

Adopted Levels, Gammas (continued)

γ(^{187}Re) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	δ[#]	α[@]	Comments
685.795	5/2⁻	551.55 *1*	18.48 *7*	134.244	7/2⁺	E1(+M2)	+0.001 *5*	0.00599	α(K)=0.00503 *7*; α(L)=0.000747 *11*; α(M)=0.0001690 *24*; α(N+..)=4.80×10^{-5} *7* α(N)=4.07×10^{-5} *6*; α(O)=6.75×10^{-6} *10*; α(P)=4.65×10^{-7} *7* B(E1)(W.u.)=(1.86×10^{-5} *10*); B(M2)(W.u.)=(0.0003 *+28−3*)
		685.81 *1*	100.0 *27*	0.0	5/2⁺	E1(+M2)	−0.008 *13*	0.00384	α(K)=0.00323 *5*; α(L)=0.000472 *8*; α(M)=0.0001068 *18*; α(N+..)=3.03×10^{-5} *5* α(N)=2.58×10^{-5} *5*; α(O)=4.29×10^{-6} *7*; α(P)=3.02×10^{-7} *5* B(E1)(W.u.)=(5.2×10^{-5} *3*); B(M2)(W.u.)=(0.03 *+11−3*)
718.73?		93.22[&] *4*	56 *9*	625.516	(1/2⁺)				
		100.38[&] *24*	100 *9*	618.369	(3/2⁺)				
744.84	(13/2⁺)	236.4[‡] *1*	100[‡] *3*	508.53	(11/2⁺)				
		441.3[‡] *1*	61.4[‡] *21*	303.36	9/2⁺				
767.8	(7/2⁺)	767.4[&] *8*	100	0.0	5/2⁺				
772.876	(3/2⁺)	147.3		625.516	(1/2⁺)				I_γ: not available.
		154.4	0.331 *13*	618.369	(3/2⁺)				
		261	0.26 *7*	511.768	1/2⁺				
		638.65 *13*	<0.08	134.244	7/2⁺				
		772.87 *2*	100.0 *4*	0.0	5/2⁺	M1(+E2)	0.4 *+5−4*	0.0190 *15*	α(K)=0.0158 *13*; α(L)=0.00244 *16*; α(M)=0.00056 *4*; α(N+..)=0.000159 *11* α(N)=0.000135 *9*; α(O)=2.27×10^{-5} *16*; α(P)=1.67×10^{-6} *14* B(M1)(W.u.)=(0.24 *9*); B(E2)(W.u.)=(3.E+1 *+6−3*)
792.61	(13/2)	404.0[‡] *1*	100[‡] *4*	388.63	(11/2⁻)				
		586.3[‡] *1*	18[‡] *4*	206.2473	9/2⁻				
816.562	(5/2⁺)	43.66 *5*	15 *4*	772.876	(3/2⁺)				
		191.1		625.516	(1/2⁺)				
		198.34 *12*	13 *4*	618.369	(3/2⁺)				
		682.34 *20*	54 *54*	134.244	7/2⁺				
		816.56 *2*	100 *17*	0.0	5/2⁺				
826.84	(3/2⁺,5/2⁺)	141.22	100	685.795	5/2⁻				
		201.3		625.516	(1/2⁺)				
		208.29 *16*	13 *4*	618.369	(3/2⁺)				
		693.06 *22*	21 *13*	134.244	7/2⁺				
		826.65 *25*	3.5 *5*	0.0	5/2⁺				

$^{187}_{75}Re_{112}$-7

Adopted Levels, Gammas (continued)

γ(^{187}Re) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	δ[#]	α[@]	Comments
839.55	(15/2⁻)	236.1[‡] *1*	100[‡] *6*	603.47	(13/2⁻)				
		450.9[‡] *1*	47[‡] *6*	388.63	(11/2⁻)				
842.00	(7/2⁻,9/2⁺)	453.4[‡] *1*	17[‡] *11*	388.63	(11/2⁻)				
		707.8[‡] *3*	100[‡] *11*	134.244	7/2⁺				
		842.1[‡] *3*	56[‡] *11*	0.0	5/2⁺				
844.7	(9/2⁺)	262.7	100 *25*	581.99	(5/2⁺)				I_γ: the branching intensity for this transition appears to be too large with respect to the apparent transition probability B(E2)(W.u.)=1.3×10^5 for this γ derived from the adopted branchings and B(E2)(844)=0.080.
		638.65[&] *13*	<30	206.2473	9/2⁻				
		844.7 *5*	2.3 *13*	0.0	5/2⁺				
864.556	3/2⁺	178.8	3.2 *16*	685.795	5/2⁻				B(E1)(W.u.)=0.0005 *3*
		239.13 *8*	24.3 *8*	625.516	(1/2⁺)	M1+E2	−0.53 *16*	0.37 *4*	α(K)=0.30 *4*; α(L)=0.0574 *9*; α(M)=0.01340 *20*; α(N+..)=0.00379 *6* α(N)=0.00324 *5*; α(O)=0.000527 *11*; α(P)=3.2×10^{-5} *4* B(M1)(W.u.)=0.11 *4*; B(E2)(W.u.)=2.2×10^2 *13*
		246.20 *4*	33.2 *24*	618.369	(3/2⁺)	M1+E2	+0.50 *15*	0.34 *4*	α(K)=0.27 *3*; α(L)=0.0525 *10*; α(M)=0.01224 *18*; α(N+..)=0.00347 *6* α(N)=0.00296 *5*; α(O)=0.000482 *12*; α(P)=2.9×10^{-5} *4* B(M1)(W.u.)=0.14 *6*; B(E2)(W.u.)=2.3×10^2 *14*
		275.61 *12*	0.65 *16*	589.143	3/2⁺				
		352.86 *17*	0.46 *18*	511.768	1/2⁺				
		730.32[&]	<4.8	134.244	7/2⁺				
		864.55 *1*	100.0 *6*	0.0	5/2⁺	M1(+E2)	−0.05 *9*	0.0150 *3*	α(K)=0.01253 *22*; α(L)=0.00191 *4*; α(M)=0.000435 *8*; α(N+..)=0.0001246 *21* α(N)=0.0001055 *18*; α(O)=1.78×10^{-5} *3*; α(P)=1.325×10^{-6} *23* B(M1)(W.u.)=(0.012 *4*); B(E2)(W.u.)=(0.016 *+60−16*)
879.465	(5/2⁺)	106.596[&] *13*	8.40 *18*	772.876	(3/2⁺)				
		576.31 *8*	2.2 *3*	303.36	9/2⁺				
		745.21 *2*	100.0 *8*	134.244	7/2⁺	M1(+E2)	0.4 *5*	0.020 *4*	α(K)=0.017 *4*; α(L)=0.0026 *5*; α(M)=0.00059 *11*; α(N+..)=0.00017 *3* α(N)=0.000144 *25*; α(O)=2.4×10^{-5} *5*; α(P)=1.8×10^{-6} *4* B(M1)(W.u.)=(0.11 *6*); B(E2)(W.u.)=(12 *+28−12*)
		879.44 *5*	46.4 *3*	0.0	5/2⁺	E2		0.00614	α(K)=0.00498 *7*; α(L)=0.000891 *13*; α(M)=0.000206 *3*; α(N+..)=5.85×10^{-5} *9*

$^{187}_{75}Re_{112}$-8

Adopted Levels, Gammas (continued)

γ(^{187}Re) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	α[@]	Comments
								α(N)=4.98×10^{-5} *7*; α(O)=8.14×10^{-6} *12*; α(P)=5.00×10^{-7} *7* B(E2)(W.u.)=18 *6*
933.62	(5/2$^-$,7/2$^+$)	165.7[&] *4*	2.3 *8*	767.8	(7/2$^+$)			
		727.22[&]	100	206.2473	9/2$^-$			
		933.80[&]	31	0.0	5/2$^+$			
960.17	(5/2$^+$)	115.5	100 *6*	844.7	(9/2$^+$)			
		825.95 *25*	5.0 *8*	134.244	7/2$^+$			
		960.17 *5*	28.2 *17*	0.0	5/2$^+$			
969.3?	(3/2$^+$,5/2,7/2$^+$)	835.55[&]	21	134.244	7/2$^+$			I_γ: uncertainty not available.
		968.78[&]	100	0.0	5/2$^+$			I_γ: uncertainty not available.
1000.93?	(5/2$^-$,7/2$^+$)	40.75[&] *20*	8.7 *25*	960.17	(5/2$^+$)			
		794.80[&]	100	206.2473	9/2$^-$			I_γ: uncertainty not available.
		1000.82[&]	19	0.0	5/2$^+$			I_γ: uncertainty not available.
1003.14?		123.66[&] *12*	56 *13*	879.465	(5/2$^+$)			
		138.50[&] *5*	100 *38*	864.556	3/2$^+$			
1015.13	(15/2$^+$)	270.2[‡] *1*	100[‡] *4*	744.84	(13/2$^+$)			
		506.7[‡] *1*	82.2[‡] *22*	508.53	(11/2$^+$)			
1034.11	(9/2$^-$,11/2$^+$)	192.3[‡] *2*	100[‡] *50*	842.00	(7/2$^-$,9/2$^+$)			
		645.4[‡] *1*	100[‡] *10*	388.63	(11/2$^-$)			
		731.2[‡] *2*	35[‡] *10*	303.36	9/2$^+$			
		899.9 *2*	85 *5*	134.244	7/2$^+$			
1042.56	(15/2)	249.9[‡] *1*	100[‡] *10*	792.61	(13/2)			
		439.1[‡] *1*	57[‡] *5*	603.47	(13/2$^-$)			
1106.75	(17/2$^-$)	267.2[‡] *1*	100[‡] *4*	839.55	(15/2$^-$)			
		503.3[‡] *1*	50[‡] *4*	603.47	(13/2$^-$)	(E2)	0.0215	α(K)=0.01633 *23*; α(L)=0.00397 *6*; α(M)=0.000948 *14*; α(N+..)=0.000265 *4* α(N)=0.000228 *4*; α(O)=3.58×10^{-5} *5*; α(P)=1.616×10^{-6} *23* Mult.: From (^{82}Se,^{82}Se′γ).
1190.45	(5/2$^+$)	345.7		844.7	(9/2$^+$)			
		374.31[&] *14*	20 *7*	816.562	(5/2$^+$)			
		564.62 *19*	100 *36*	625.516	(1/2$^+$)			
		1056.24 *5*	1.9 *5*	134.244	7/2$^+$			
		1190.38 *12*	1.80 *20*	0.0	5/2$^+$			
1220.80		573.71[&] *14*	100 *32*	647.26	5/2$^+$			
		1086.6[&] *18*	<16	134.244	7/2$^+$			

$^{187}_{75}Re_{112}$-9

Adopted Levels, Gammas (continued)

γ(^{187}Re) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	α[@]	Comments
1220.80		1220.80 *25*	33 *10*	0.0	$5/2^+$			
1230.12	$(3/2^+,5/2^+)$	612.9 *4*	7 *4*	618.369	$(3/2^+)$			
		641.1	100 *36*	589.143	$3/2^+$			
		1095.9[&]	<0.27	134.244	$7/2^+$			
		1230.10 *4*	4.4 *5*	0.0	$5/2^+$			
1257.21	$(11/2^-,13/2^+)$	223.5[‡] *2*	100[‡] *8*	1034.11	$(9/2^-,11/2^+)$			
		748.6[‡] *2*	29[‡] *8*	508.53	$(11/2^+)$			
		868.5[‡] *2*	50[‡] *4*	388.63	$(11/2^-)$			
		953.2[‡] *4*	21[‡] *13*	303.36	$9/2^+$			
1310.04	$(17/2^+)$	294.9[‡] *1*	100[‡] *8*	1015.13	$(15/2^+)$			
		565.2[‡] *1*	100[‡] *8*	744.84	$(13/2^+)$			
1319.00	(17/2)	276.4[‡] *1*	100[‡] *7*	1042.56	(15/2)			
		526.4[‡] *1*	40[‡] *7*	792.61	(13/2)			
1383.55	$(19/2^-)$	276.8[‡] *1*	100[‡] *12*	1106.75	$(17/2^-)$			
		544.0[‡] *1*	54.2[‡] *17*	839.55	$(15/2^-)$			
1474.33	$(19/2^-)$	155.2[‡] *2*	21[‡] *21*	1319.00	(17/2)	(M1,E1)	0.8 *7*	α(K)=0.7 *6*; α(L)=0.11 *9*; α(M)=0.024 *21*; α(N+..)=0.007 *6* α(N)=0.006 *5*; α(O)=0.0010 *9*; α(P)=7.E−5 *7* Mult.: From the intensity balance at the 1474 keV level and intensity ratio of 155γ and 207γ assuming multipolarities for 368γ M1 and 635γ E2 in ^{187}Re(^{82}Se,^{82}Se′γ).
		367.6[‡] *1*	100[‡] *5*	1106.75	$(17/2^-)$	(M1)	0.1378	α(K)=0.1146 *16*; α(L)=0.0180 *3*; α(M)=0.00410 *6*; α(N+..)=0.001175 *17* α(N)=0.000995 *14*; α(O)=0.0001675 *24*; α(P)=1.233×10^{-5} *18* B(M1)(W.u.)>9.4×10^{-5} Mult.: Assumed in ^{187}Re(^{82}Se,^{82}Se′γ) (2003Sh13).
		634.8[‡] *1*	5[‡] *4*	839.55	$(15/2^-)$	(E2)	0.01241	α(K)=0.00976 *14*; α(L)=0.00204 *3*; α(M)=0.000480 *7*; α(N+..)=0.0001350 *19* α(N)=0.0001156 *17*; α(O)=1.85×10^{-5} *3*; α(P)=9.76×10^{-7} *14* B(E2)(W.u.)>0.00092 Mult.: Assumed in ^{187}Re(^{82}Se,^{82}Se′γ) (2003Sh13).
1510.94	$(13/2^-,15/2^+)$	253.8[‡] *2*	100[‡] *6*	1257.21	$(11/2^-,13/2^+)$			
		907.4[‡] *2*	39[‡] *6*	603.47	$(13/2^-)$			
1638.84	$(19/2^+)$	328.8[‡] *1*	100[‡] *6*	1310.04	$(17/2^+)$			
		623.7[‡] *2*	67[‡] *12*	1015.13	$(15/2^+)$			
1673.94	$(21/2^-)$	290.4[‡] *1*	100[‡]	1383.55	$(19/2^-)$			
		567[‡]	[‡]	1106.75	$(17/2^-)$			I_γ: not reported.

$^{187}_{75}Re_{112}$-10

Adopted Levels, Gammas (continued)

$\gamma(^{187}Re)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	α[@]	Comments
1681.63	(19/2$^+$)	207.3[‡] *1*	100[‡]	1474.33	(19/2$^-$)	(E1)	0.0589	α(K)=0.0487 *7*; α(L)=0.00784 *11*; α(M)=0.00179 *3*; α(N+..)=0.000502 *7* α(N)=0.000428 *6*; α(O)=6.92×10^{-5} *10*; α(P)=4.13×10^{-6} *6* B(E1)(W.u.)=1.9×10^{-7} *4* Mult.: From the intensity balance at the 1474 keV level and intensity ratio of 155γ and 207γ assuming multipolarities for 368γ M1 and 635γ E2.
1870.53		188.9[‡] *1*	100[‡]	1681.63	(19/2$^+$)			
1981.74	(21/2$^+$)	342.9[‡] *1*	100[‡]	1638.84	(19/2$^+$)			
2199.63		329.1[‡] *1*	100[‡]	1870.53				

[†] From ^{187}W β^- decay, except otherwise noted.
[‡] From ^{187}Re(^{82}Se,^{82}Se′γ).
[#] From ^{187}W β^- decay (ce Ice measurements), except otherwise noted.
[@] 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.
[&] Placement of transition in the level scheme is uncertain.

$^{187}_{75}Re_{112}$-11

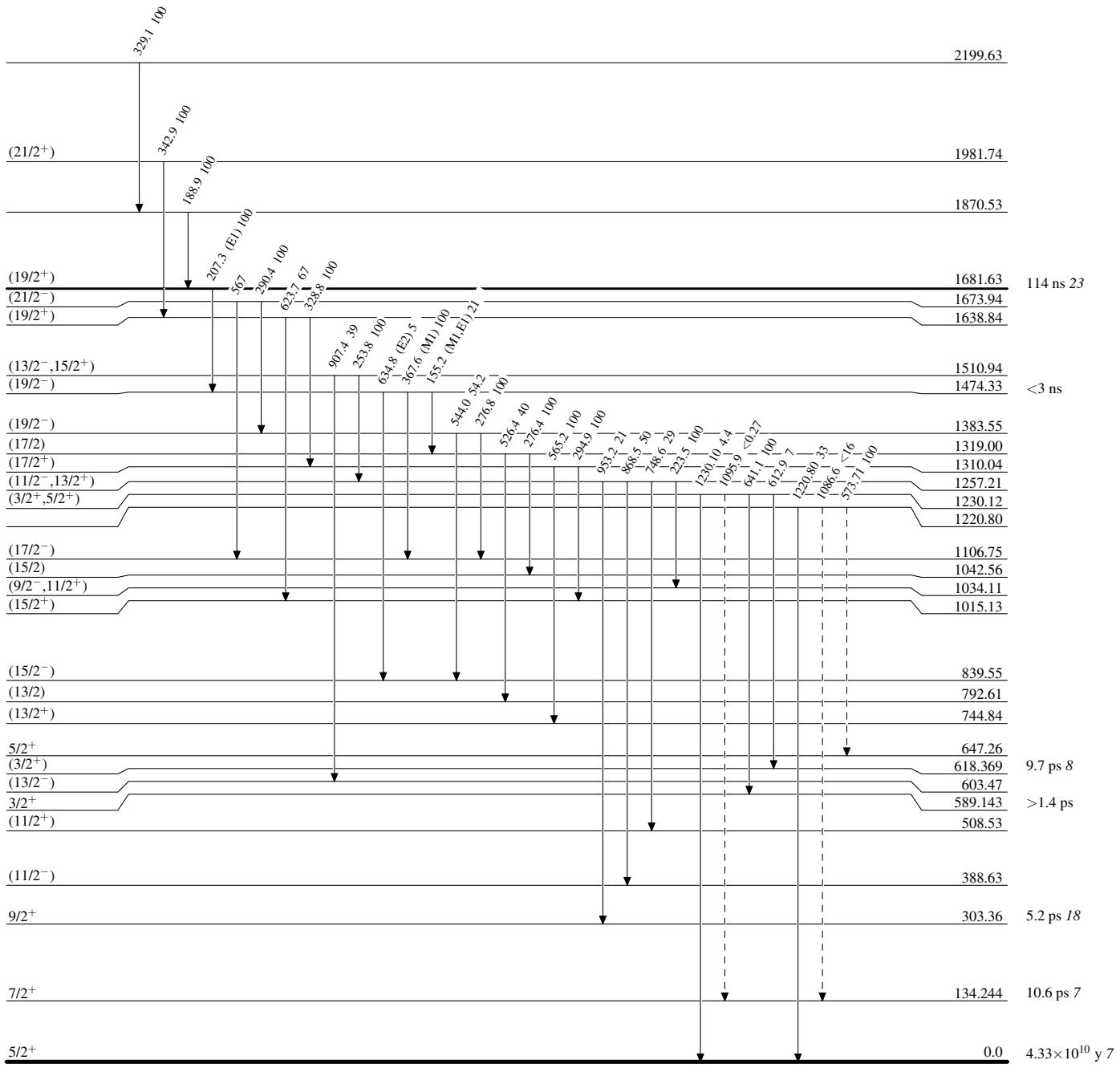
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{187}_{75}Re_{112}$

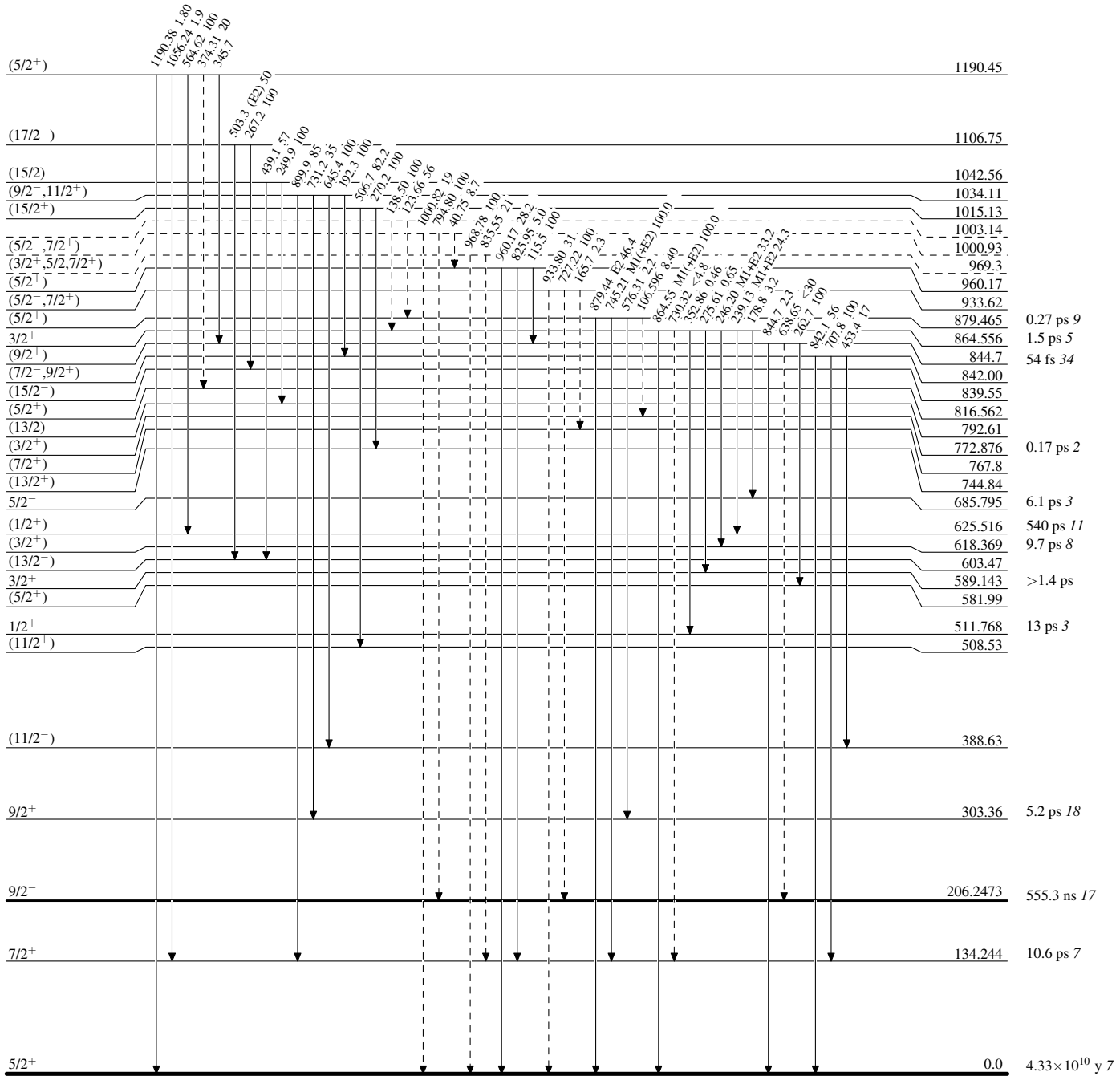
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{187}_{75}Re_{112}$

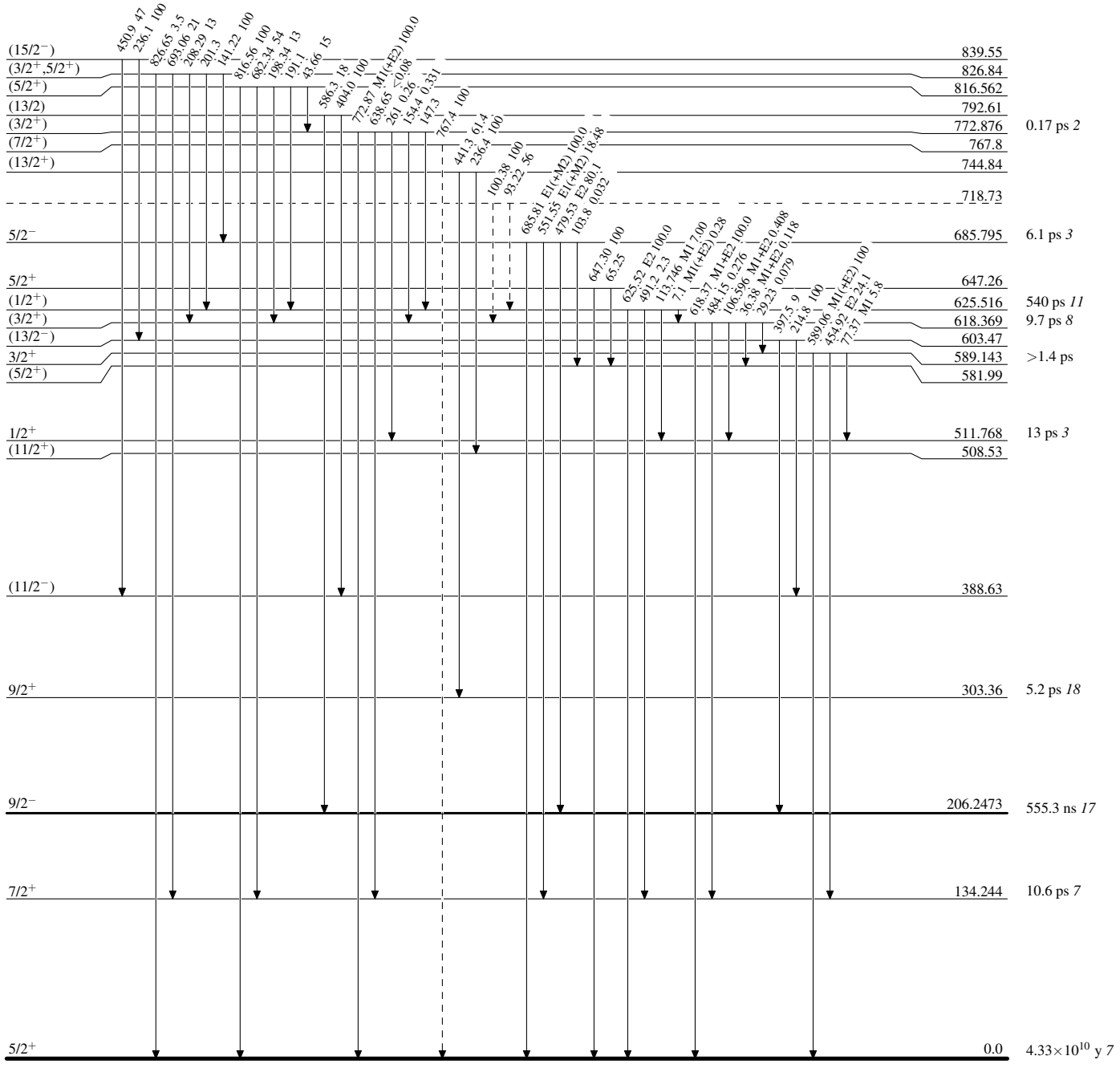
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{187}_{75}Re_{112}$

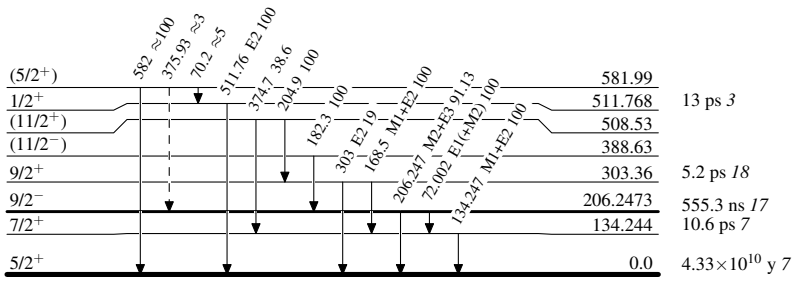
Adopted Levels, Gammas

Legend

Level Scheme (continued)

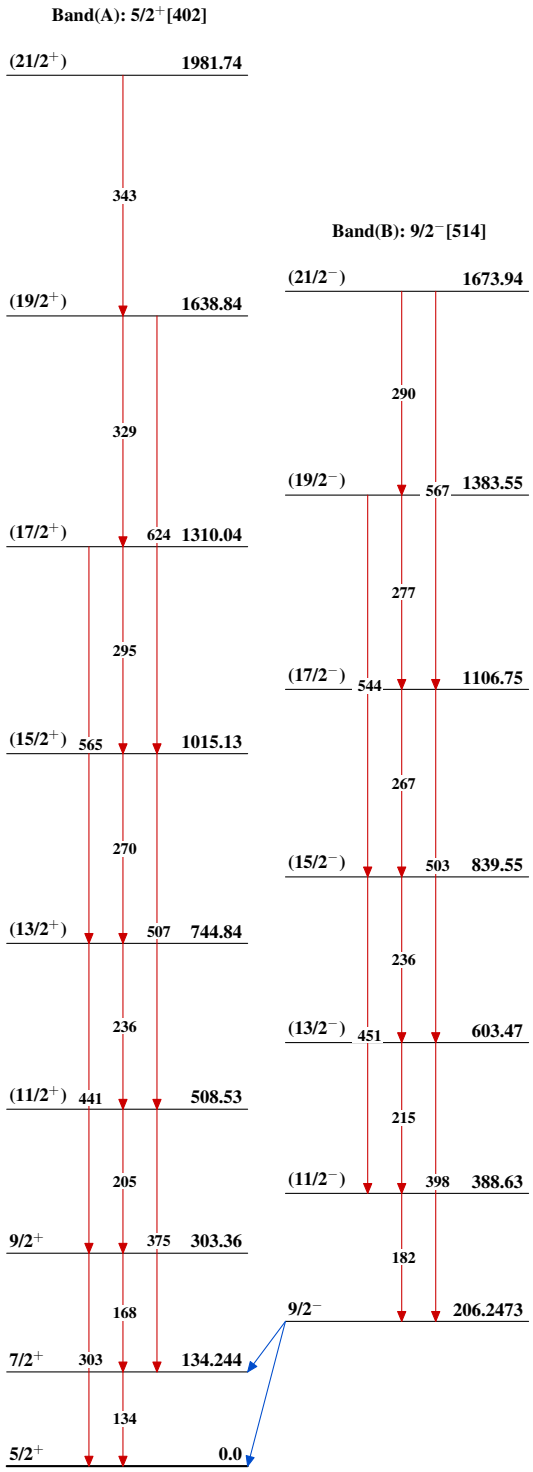
Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{187}_{75}Re_{112}$

Adopted Levels, Gammas



$^{187}_{75}Re_{112}$