Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	S. K. Basu, E. A. Mccutchan	NDS 165, 1 (2020)	1-Mar-2020

Q(β^-)=−2489 *3*; S(n)=10108 *24*; S(p)=5075 *5*; Q(α)=−5803 *15* 2017Wa10
S(2n)=22630 *60*, S(2P)=12940 *4* (2017Wa10).
α: Additional information 1.

^{90}Nb Levels

For influence of the chemical and physical environment on $T_{1/2}$(125), see 1965Co12, 1969Ol01, 1970Ol04, 1971Sm07, 1977Do07, 1978Me03.
For activities not definitely assigned to ^{90}Mo, see 1965Mc03 (80 μs), 1967Iv04 (20.1 ms), 1975DeYP (53 ms, 10 ms), 1977DeZT and 1977DeXV (85 ms *6*). No trace of a 50-100 ms component in the decay of the 382 level was found in a search with a mini-orange spectrometer (1982Hu01).

Cross Reference (XREF) Flags

A	^{90}Mo ε decay	E	^{90}Zr(p,n)	I	^{76}Ge(^{19}F,5nγ)
B	^{90}Zr(p,nγ)	F	^{89}Y(α,3nγ),^{90}Zr(^{3}He,p2nγ)	J	^{9}Be(^{124}Xe,Xγ)
C	^{90}Zr(^{3}He,t)	G	^{90}Zr(^{12}C,^{12}B)		
D	^{92}Mo(d,α)	H	^{63}Cu(^{31}P,3pnγ)		

E(level)†	J$^\pi$	$T_{1/2}$	XREF	Comments
0	8$^+$‡	14.60 h *5*	ABCD FGHIJ	%ε+%β^+=100 Q=+0.01 *4*; μ=+4.957 *5* J$^\pi$: J from atomic and molecular beam measurements (1975Ru06,1978Ru04); π from μ comparison with shell model predictions. $T_{1/2}$: from β(t) with chemically separated source (1968Pe01). Others in good agreement: 1954On06, 1957Sh32. μ: from weighted average of +4.961 *4* (from NMR on oriented nuclei, 1981Ha24) and +4.952 *4* (from colinear laser spectroscopy (CLS), 2009Ch25); for a latest compilation see 2014StZZ. Q: from colinear laser spectroscopy (CLS) (2009Ch25,2016St14). Other: +0.046 *7* (from multiple adiabatic passage NMR on Oriented Nuclei (MAPON), 1998Se01). Δ<r^2>(^{91g}Nb,^{90g}Nb)=+0.011 fm^2 *1* (2009Ch25).
122.370 *22*	6$^+$‡	63 μs *2*	ABC F H	%IT=100 μ=+3.720 *24* $T_{1/2}$: from γ(t) (1978Ba18). Others: 61 μs *4* (1971Ho27), 73 μs (1967Iv04). μ: from time differential perturbed angular distribution (TDPAD); corrected for Knight shift and diamagnetism (1978Ha52, 2014STZZ). J$^\pi$: E2 122.4γ to 8$^+$, member of ((π1g$_{9/2}$)(ν1g$_{9/2}$)$_1$) multiplet.
124.67 *25*	4$^-$#	18.91 s *6*	AB D F	%IT=100 Q=−0.26 *4*; μ=−0.018 *9* J$^\pi$: from L(d,α)=3. $T_{1/2}$: weighted average of 18.97 s *4* (2011Ki45), 18.82 s *9* (1969Ge03), 18.84 s *9* (1971Sm07), and 18.76 s *10* (1974Co33), γ(t) and ce(t) for the 122-keV transition. Decay of level 124.67 has not been observed. Other: 1978Me03 (18.87 s *2*, statistical uncertainty only). μ: From colinear laser spectroscopy (CLS) (2009Ch25, 2014StZZ). Q: From colinear laser spectroscopy (CLS) (2009Ch25, 2016St14). Δ<r^2>(^{91g}Nb,^{90m}Nb)=+0.042 fm^2 *2* (2009Ch25).

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Adopted Levels, Gammas (continued)

^{90}Nb Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$	XREF	Comments
171.10 *10*	7+‡	<1 μs	BCD F	Jπ: from L(d,α)=6. $T_{1/2}$: From γγ(t) in ^{89}Y(α,3nγ).
285.30 *10*	5+‡		ABCD F H	Jπ: M1+E2 162.9γ to 6+.
328.00 *10*	4(+)‡		ABC F H	Jπ: M1 42.7 γ to 5+.
362.4 *3*	5−#		BC F	Jπ: from D 237.7γ to 4−.
382.01 *25*	1+‡	6.19 ms *8*	AB D	%IT=100 $T_{1/2}$: From γ(t) with Ge(Li) (1974Ha50). Others: 6.3 ms *2* (1974Co33 ce(t)), 6.3 ms *2* (1977DeXV), 6.44 ms (1967Iv04). Jπ: from log *ft*=5.3 in ε decay from 0+ parent, E3 257.3γ to 4−.
651.19 *19*	4(+)‡		ABCD F H	Jπ: M1+E2 323.2γ to 2+.
812.90 *10*	(9)+‡		CD F HIJ	Jπ: M1 812.9γ to 8+.
822.6 *6*			AB	
827.4 *3*			AB	
847.7 *4*			BCD F	
854.32 *21*	2−		ABCD F H	Jπ: E1 203.1γ to 3+, 472.2γ to 1+.
958 *7*	(3,4,5)		CDE G	E(level),Jπ: from (^{3}He,t). *J*π assignment is tentative.
1128.2 *4*			B D	
1195.2 *9*			B D	
1231 *10*			D	E(level): from (d,α).
1255 *10*			D	E(level): from (d,a).
1279.7 *11*			BC	
1286 *10*	(3,4,5)		CD	E(level),Jπ: from (^{3}He,t). *J*π assignment is tentative.
1344.1 *4*	1+		AB D H	Jπ: 489.8γ to 2−, feeding from 0+ parent in ε decay.
1362.7 *6*	(3+)		BCD	Jπ: from γ′s to 1+, 4+ and 4−.
1372.1 *4*			B	
1414.2 *11*			BCD	
1433.3 *8*			B	
1498 *7*	2−,3−,4−		CD	Jπ: From L=3 transfer in ^{92}Mo(d,α) reaction (1974Co37). E(level): from (d,α).
1558 *7*	4−,5−,6−		CD	Jπ: From L=5 transfer in ^{92}Mo(d,α) reaction (1974Co37). E(level): from (d,α).
1630.7 *11*			B	
1646.7 *11*			BCD	
1692 *7*			CD	E(level): from (^{3}He,t).
1769.1 *4*	1+		ABCD H	Jπ: M1+E2 1387.4γ to 1+, log *ft*=5.2 from 0+ parent.
1804 *10*			D	Jπ: from (d,α).
1809.11 *20*	(9−)		F HIJ	Jπ: D 996.2γ to (9)+.
1815.7 *11*			BC	
1835.7 *9*			B D	
1844.8 *6*	(1+)		AB H	Jπ: D 990.2γ to 2−.
1873 *10*			CD F H	E(level): from (d,α).
1880.21 *20*	(11−)	463 ns *13*	F HIJ	μ=+8.78 *3* $T_{1/2}$: weighted average of 477 ns *10* from (^{31}P,3pnγ), 440 ns *20* from (α,3nγ) and 415 ns *67* from (^{124}Xe,Xγ). μ: from time differential perturbed angular distribution (TDPAD); corrected for Knight shift and diamagnetism (1978Ha52, 2014STZZ). Jπ: (E2) 71.1γ to (9−).
1971.7 *11*	(3,4,5)		BCD	Jπ: from 1847γ to 4−.
1985.61 *23*	(10+)		F H	Jπ: D 1172.7γ to (9)+.
1990.4 *8*			BC	
2000 *7*			B D	E(level): from (^{3}He,t).
2037 *10*			C	E(level): from (^{3}He,t).
2063.32 *24*	(10+)		I	Jπ: Q 2063.3γ to 8+.
2082 *10*			C	E(level): from (^{3}He,t).

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Adopted Levels, Gammas (continued)

^{90}Nb Levels (continued)

E(level)[†]	Jπ	XREF	Comments
2104 *10*		C	E(level): from (^{3}He,t).
2125.6 *7*	1^+	ABC H	Jπ: M1 1271.3γ to 2^-.
2168 *7*	(3,4,5)	CD	Jπ: Tentative assignement from(^{3}He,t).
2180.6 *5*	(12^-)	H	Jπ: M1 300.4γ to (11^-).
2309.0 *7*	3^+	A GH	Jπ: E1 1454.6γ to 2^-.
2344 *7*		CD H	E(level): from (^{3}He,t).
2370 *15*		CD	E(level): from (^{3}He,t).
2430 *15*		C	E(level): from (^{3}He,t).
2479 *15*		D	E(level): from (^{3}He,t).
2487.3 *3*	(12^-)	F HI	Jπ: M1 607.1γ to (11^-).
2530 *15*		C	E(level): from (^{3}He,t).
2560 *15*		C	E(level): from (^{3}He,t).
2580 *15*		C	E(level): from (^{3}He,t).
2650 *15*		C	E(level): from (^{3}He,t).
2680 *15*		C	E(level): from (^{3}He,t).
2690.0 *3*	(11^+)	I	Jπ: Q 1876.6γ to (9^+).
2710 *15*		C	E(level): from (^{3}He,t).
2730 *15*		C G	E(level): from (^{3}He,t).
2780 *15*		C	E(level): from (^{3}He,t).
2793.2 *6*		H	
2813.6 *5*	(13^-)	H	Jπ: 633.2γ to (12^-), 933.3γ to (11^-).
2818.8 *4*	(12^+)	I	Jπ: Q 7555γ to (10^+).
2850 *15*		C	E(level): from (^{3}He,t).
2880 *15*		C	E(level): from (^{3}He,t).
2950 *15*		C	E(level): from (^{3}He,t).
2980 *15*		C E	E(level): from (^{3}He,t).
3020 *15*		C H	E(level): from (^{3}He,t).
3071.8 *6*	(13^-)	F H	Jπ: D 584.5γ to (12^-).
3074.7 *6*	(13^-)	I	Jπ: D 587.1γ to (12^-).
3160 *15*		C	E(level): from (^{3}He,t).
3314.8 *5*	(13^+)	I	Jπ: D 496.0γ to (12^+).
3497.0 *5*	(13^+)	I	Jπ: D 678.2γ to (12^+).
3654.3 *5*	13^-	H	Jπ: E2 1773.9γ to 11^-.
3672.2 *7*	(14^-)	I	Jπ: D 597.5γ to (13^-).
3975.7 *6*	(14^+)	I	Jπ: D 660.9γ to (13^+).
4068.0 *6*	(15^+)	I	Jπ: (Q) 571.0γ to (13^+).
4330.6 *6*	$14^{(-)}$	H	Jπ: D 676.4γ to 13^-.
4422.1 *7*	(15^+)	I	Jπ: D 446.4γ to (14^+).
5037 *6*	0^+[‡]	C	E(level),Jπ: from (^{3}He,t).
5051.2 *6*		H	
5557.8 *5*	$15^{(-)}$	H	Jπ: Q 1903.4γ to 13^-.
5576.5 *8*	(15^-)	I	Jπ: D 1904.3γ to (14^-).
5762.6 *7*	(17^+)	I	Jπ: Q 1694.6γ to (15^+).
6147.1 *8*	(18^+)	I	Jπ: D 384.5γ to (17^+).
6155.5 *6*	$16^{(-)}$	H	Jπ: M1 597.7γ to $15^{(-)}$.
6229.9 *6*		H	
6684.6 *8*		I	
6742.3 *6*	$17^{(+)}$	H	Jπ: E1 586.8γ to $16^{(-)}$.
7024.2 *7*	$18^{(+)}$	H	Jπ: M1 281.9γ to $17^{(+)}$.
7351.0 *8*	(17^-)	I	Jπ: Q 1774.4γ to (15^-).
7768.1 *7*	$19^{(+)}$	H	Jπ: E2 1025.7γ to $17^{(+)}$.
8094.8 *9*	(18^-)	I	Jπ: D 743.8γ to (17^-).
8376.3 *9*		I	

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Adopted Levels, Gammas (continued)

^{90}Nb Levels (continued)

† From least-squares fit to Eγ, by evaluators.
‡ Probable configuration=((π $1g_{9/2}$)(ν $1g_{9/2}$)).
# Probable configuration=((π $2p_{1/2}$)(ν $1g_{9/2}$)).

Adopted Levels, Gammas (continued)

γ(^{90}Nb)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	δ	α	Comments
122.370	6^+	122.370[‡] *22*	100[‡]	0	8^+	E2		0.557	α(K)=0.464 *7*; α(L)=0.0768 *11*; α(M)=0.01365 *20*; α(N)=0.00187 *3*; α(O)=6.63×10^{-5} *10* B(E2)(W.u.)=0.00878 *28* Mult.,δ: from ce measurements in ^{90}Mo ε decay.
124.67	4^-	(2.3 *4*)		122.370	6^+	[M2,E3]		3.×10^9 *9*	α(M)=3.E9 8; α(N)=3.E8 9; α(O)=1.4×10^4 *17* E_γ: from level energy difference.
171.10	7^+	171.1[&] *1*	100[&]	0	8^+	D			Mult.: from (α,3nγ).
285.30	5^+	162.93[‡] *9*	100[‡]	122.370	6^+	M1+E2	0.24 *17*	0.067 *13*	α(K)=0.059 *11*; α(L)=0.0071 *17*; α(M)=0.0012 *3*; α(N)=0.00018 *4*; α(O)=9.8×10^{-6} *15* Mult.,δ: from ce measurements in ^{90}Mo ε decay.
328.00	$4^{(+)}$	42.70[‡] *4*	100[‡]	285.30	5^+	M1+(E2)	<0.18	2.9 *4*	α(K)=2.46 *22*; α(L)=0.38 *11*; α(M)=0.067 *20*; α(N)=0.009 *3*; α(O)=0.00041 *3* Mult.,δ: from ce measurements in ^{90}Mo ε decay.
362.4	5^-	237.7[&] *1*	100[&]	124.67	4^-	D			Mult.: from (α,3nγ).
382.01	1^+	257.34[‡] *4*	100[‡] *3*	124.67	4^-	E3(+M4)	<0.12	0.182 *12*	α(K)=0.149 *10*; α(L)=0.0269 *19*; α(M)=0.0048 *4*; α(N)=0.00066 *5*; α(O)=2.33×10^{-5} *22* B(E3)(W.u.)=4.60 *+13−16* Mult.,δ: from ce measurements in ^{90}Mo ε decay.
651.19	$4^{(+)}$	323.20[‡] *18*	100[‡]	328.00	$4^{(+)}$	M1+E2	0.6 *3*	0.0122 *15*	α(K)=0.0107 *13*; α(L)=0.00126 *17*; α(M)=0.00022 *3*; α(N)=3.2×10^{-5} *5*; α(O)=1.76×10^{-6} *18* Mult.,δ: from ce measurements in ^{90}Mo ε decay.
812.90	$(9)^+$	812.9[&] *1*	100[&]	0	8^+	M1		1.16×10^{-3}	α(K)=0.001019 *15*; α(L)=0.0001131 *16*; α(M)=1.99×10^{-5} *3*; α(N)=2.92×10^{-6} *4* α(O)=1.716×10^{-7} *24* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
822.6		440.5[‡] *6*	100[‡]	382.01	1^+				
827.4		445.37[‡] *21*	100[‡]	382.01	1^+				
847.7		485.4[#] *3*		362.4	5^-				
		722[#] *1*		124.67	4^-				
854.32	2^-	203.13[‡] *10*	100[‡] *9*	651.19	$4^{(+)}$	E1		0.01535	α(K)=0.01352 *19*; α(L)=0.001520 *22*; α(M)=0.000266 *4*; α(N)=3.86×10^{-5} *6*; α(O)=2.12×10^{-6} *3* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ). Inconsistent with ce measurements in ^{90}Mo ε decay which give M1+E2 with δ<0.36.
		472.2[‡] *3*	22[‡] *3*	382.01	1^+			1.59×10^{-3}	
1128.2		477.1[#] *3*		651.19	$4^{(+)}$				
		1003[#] *1*		124.67	4^-				

Adopted Levels, Gammas (continued)

γ(^{90}Nb) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α	Comments
1195.2		1071[#] *1*	100	124.67	4^-			
1279.7		1155[#] *1*	100[#]	124.67	4^-			
1344.1	1^+	489.8[#] *4*	100[#]	854.32	2^-		1.46×10^{-3}	
1362.7	(3^+)	711[#] *1*		651.19	$4^{(+)}$			
		981[#] *1*		382.01	1^+			
		1035[#] *1*		328.00	$4^{(+)}$			
		1238[#] *1*		124.67	4^-			
1372.1		517.7[#] *3*		854.32	2^-			
		1248[#] *1*		124.67	4^-			
1414.2		763[#] *1*	100[#]	651.19	$4^{(+)}$			
1433.3		1105[#] *1*		328.00	$4^{(+)}$			
		1309[#] *1*		124.67	4^-			
1630.7		1506[#] *1*	100[#]	124.67	4^-			
1646.7		1522[#] *1*	100[#]	124.67	4^-			
1769.1	1^+	425.1[‡] *3*	6.5[‡] *14*	1344.1	1^+			
		941.5[‡] *4*	100[‡] *12*	827.4				
		946.4[‡] *8*	12[‡] *4*	822.6				
		1387.4[‡] *5*	33[‡] *4*	382.01	1^+	M1+E2	4.06×10^{-4} *7*	α(K)=0.000320 *9*; α(L)=3.53×10^{-5} *9*; α(M)=6.21×10^{-6} *15*; α(N)=9.11×10^{-7} *23*; α(O)=5.34×10^{-8} *17* Mult.: from ^{90}Mo ε decay.
1809.11	(9^-)	996.2 *2*	100	812.90	$(9)^+$	D	3.11×10^{-4}	α(K)=0.000275 *4*; α(L)=3.01×10^{-5} *5*; α(M)=5.29×10^{-6} *8*; α(N)=7.76×10^{-7} *11*; α(O)=4.52×10^{-8} *7*
1815.7		1691[#] *1*	100[#]	124.67	4^-			
1835.7		641[#] *1*	[#]	1195.2				
		1184[#] *1*	[#]	651.19	$4^{(+)}$			
1844.8	(1^+)	990.2[‡] *6*	100[‡] *10*	854.32	2^-	D	3.15×10^{-4}	α(K)=0.000278 *4*; α(L)=3.05×10^{-5} *5*; α(M)=5.35×10^{-6} *8*; α(N)=7.85×10^{-7} *11*; α(O)=4.58×10^{-8} *7* Mult.: from DCO ratio data of (^{31}P,3pnγ).
		1463.5[‡] *9*	69[‡] *23*	382.01	1^+			
1880.21	(11^-)	71.1[&] *2*	6.7[&] *19*	1809.11	(9^-)	(E2)	3.97 *7*	α(K)=3.07 *6*; α(L)=0.746 *14*; α(M)=0.1338 *25*; α(N)=0.0177 *4*; α(O)=0.000406 *7* B(E2)(W.u.)=1.41 *+29−33*
		1067.3[&] *2*	100[&] *4*	812.90	$(9)^+$	(M2)	1.48×10^{-3}	α(K)=0.001306 *19*; α(L)=0.0001478 *21*; α(M)=2.61×10^{-5} *4*; α(N)=3.82×10^{-6} *6*; α(O)=2.23×10^{-7} *4* B(M2)(W.u.)=0.00181 *+15−13*
1971.7	(3,4,5)	1847[#] *1*	100[#]	124.67	4^-			

$^{90}_{41}Nb_{49}$-6

Adopted Levels, Gammas (continued)

γ(^{90}Nb) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.†	α	Comments
1985.61	(10$^+$)	1172.7& *2*	100	812.90	(9)$^+$	D	5.28×10^{-4}	α(K)=0.000463 *7*; α(L)=5.10×10^{-5} *8*; α(M)=8.98×10^{-6} *13*; α(N)=1.318×10^{-6} *19*; α(O)=7.77×10^{-8} *11* Mult.: from (α,3nγ).
1990.4		1340# *1*		651.19	4$^{(+)}$			
		1865# *1*		124.67	4$^-$			
2063.32	(10$^+$)	1249.9 *3*	16 *7*	812.90	(9)$^+$	D	4.72×10^{-4}	α(K)=0.000406 *6*; α(L)=4.46×10^{-5} *7*; α(M)=7.85×10^{-6} *11*; α(N)=1.153×10^{-6} *17*; α(O)=6.80×10^{-8} *10*
		2063.3 *3*	100 *14*	0	8$^+$	Q	5.02×10^{-4}	α(K)=0.0001460 *21*; α(L)=1.597×10^{-5} *23*; α(M)=2.80×10^{-6} *4*; α(N)=4.12×10^{-7} *6*; α(O)=2.42×10^{-8} *4*
2125.6	1$^+$	1271.3‡ *6*	100‡	854.32	2$^-$	M1	2.86×10^{-4}	α(K)=0.0001759 *25*; α(L)=1.92×10^{-5} *3*; α(M)=3.37×10^{-6} *5*; α(N)=4.94×10^{-7} *7*; α(O)=2.90×10^{-8} *4* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
2180.6	(12$^-$)	300.4‡	100‡	1880.21	(11$^-$)	M1	0.01218	α(K)=0.01071 *15*; α(L)=0.001220 *17*; α(M)=0.000215 *3*; α(N)=3.15×10^{-5} *5*; α(O)=1.82×10^{-6} *3* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
2309.0	3$^+$	1454.6‡ *7*	100‡ *30*	854.32	2$^-$	E1	3.66×10^{-4}	α(K)=0.0001396 *20*; α(L)=1.518×10^{-5} *22*; α(M)=2.67×10^{-6} *4*; α(N)=3.91×10^{-7} *6*; α(O)=2.30×10^{-8} *4* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
		1481.6‡ *14*	13‡ *13*	827.4				
2487.3	(12$^-$)	607.1& *2*	100&	1880.21	(11$^-$)	M1	0.00223	α(K)=0.00197 *3*; α(L)=0.000220 *3*; α(M)=3.88×10^{-5} *6*; α(N)=5.69×10^{-6} *8*; α(O)=3.32×10^{-7} *5* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
2690.0	(11$^+$)	626.7 *3*	53 *21*	2063.32	(10$^+$)	Q	0.00234	α(K)=0.00205 *3*; α(L)=0.000237 *4*; α(M)=4.18×10^{-5} *6*; α(N)=6.07×10^{-6} *9*; α(O)=3.36×10^{-7} *5*
		1876.6 *3*	1.0×10^2 *3*	812.90	(9)$^+$	Q	4.44×10^{-4}	α(K)=0.0001739 *25*; α(L)=1.91×10^{-5} *3*; α(M)=3.35×10^{-6} *5*; α(N)=4.91×10^{-7} *7*; α(O)=2.89×10^{-8} *4*
2793.2		807.7@*a*	100@	1985.61	(10$^+$)			
2813.6	(13$^-$)	633.2@	91@ *18*	2180.6	(12$^-$)		0.00203	
		933.3@	100@ *18*	1880.21	(11$^-$)		8.46×10^{-4}	
2818.8	(12$^+$)	755.5 *3*	100	2063.32	(10$^+$)	Q	1.42×10^{-3}	α(K)=0.001250 *18*; α(L)=0.0001428 *20*; α(M)=2.51×10^{-5} *4*; α(N)=3.66×10^{-6} *6*; α(O)=2.06×10^{-7} *3*
3071.8	(13$^-$)	584.5& *5*	100&	2487.3	(12$^-$)	D	0.00244	α(K)=0.00215 *3*; α(L)=0.000240 *4*; α(M)=4.24×10^{-5} *6*; α(N)=6.21×10^{-6} *9*; α(O)=3.63×10^{-7} *6* Mult.: from γγ(θ) in ^{63}Cu(^{31}P,3pnγ).
3074.7	(13$^-$)	587.1 *3*	100	2487.3	(12$^-$)	D	0.00241	α(K)=0.00213 *3*; α(L)=0.000238 *4*; α(M)=4.19×10^{-5} *6*; α(N)=6.15×10^{-6} *9*; α(O)=3.59×10^{-7} *5*
3314.8	(13$^+$)	496.0 *3*	100	2818.8	(12$^+$)	D	0.00358	α(K)=0.00316 *5*; α(L)=0.000355 *5*; α(M)=6.25×10^{-5} *9*; α(N)=9.16×10^{-6} *13*; α(O)=5.34×10^{-7} *8*

$^{90}_{41}Nb_{49}$-7

Adopted Levels, Gammas (continued)

γ(^{90}Nb) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α	Comments
3497.0	(13$^+$)	678.2 *3*	100	2818.8	(12$^+$)	D	1.73×10^{-3}	α(K)=0.001529 *22*; α(L)=0.0001704 *24*; α(M)=3.00×10^{-5} *5*; α(N)=4.40×10^{-6} *7*; α(O)=2.58×10^{-7} *4*
3654.3	13$^-$	1773.9[@]	100[@]	1880.21	(11$^-$)	E2	4.18×10^{-4}	α(K)=0.000193 *3*; α(L)=2.12×10^{-5} *3*; α(M)=3.73×10^{-6} *6*; α(N)=5.47×10^{-7} *8*; α(O)=3.21×10^{-8} *5* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
3672.2	(14$^-$)	597.5 *3*	100	3074.7	(13$^-$)	D	0.00232	α(K)=0.00204 *3*; α(L)=0.000228 *4*; α(M)=4.02×10^{-5} *6*; α(N)=5.90×10^{-6} *9*; α(O)=3.45×10^{-7} *5*
3975.7	(14$^+$)	660.9 *3*	100	3314.8	(13$^+$)	D	0.00184	α(K)=0.001622 *23*; α(L)=0.000181 *3*; α(M)=3.18×10^{-5} *5*; α(N)=4.67×10^{-6} *7*; α(O)=2.74×10^{-7} *4*
4068.0	(15$^+$)	571.0 *3*	100	3497.0	(13$^+$)	(Q)	0.00303	α(K)=0.00266 *4*; α(L)=0.000310 *5*; α(M)=5.47×10^{-5} *8*; α(N)=7.93×10^{-6} *12*; α(O)=4.34×10^{-7} *7*
4330.6	14$^{(-)}$	676.4[@]	100[@]	3654.3	13$^-$	D		Mult.: from γγ(θ) in ^{63}Cu(^{31}P,3pnγ).
4422.1	(15$^+$)	446.4 *3*	100	3975.7	(14$^+$)	D	0.00460	α(K)=0.00405 *6*; α(L)=0.000457 *7*; α(M)=8.05×10^{-5} *12*; α(N)=1.180×10^{-5} *17*; α(O)=6.86×10^{-7} *10*
5051.2		720.6[@][a]	100[@]	4330.6	14$^{(-)}$			
5557.8	15$^{(-)}$	1903.4[@]	100[@] *18*	3654.3	13$^-$	Q	4.52×10^{-4}	α(K)=0.0001694 *24*; α(L)=1.86×10^{-5} *3*; α(M)=3.26×10^{-6} *5*; α(N)=4.78×10^{-7} *7*; α(O)=2.81×10^{-8} *4* Mult.: from γγ(θ) in ^{63}Cu(^{31}P,3pnγ).
		2744.2[@]	47[@] *9*	2813.6	(13$^-$)	Q	7.61×10^{-4}	α(K)=8.85×10^{-5} *13*; α(L)=9.62×10^{-6} *14*; α(M)=1.690×10^{-6} *24*; α(N)=2.48×10^{-7} *4*; α(O)=1.468×10^{-8} *21* Mult.: from γγ(θ) in ^{63}Cu(^{31}P,3pnγ).
5576.5	(15$^-$)	1904.3 *3*	100	3672.2	(14$^-$)	D	4.27×10^{-4}	α(K)=0.0001750 *25*; α(L)=1.91×10^{-5} *3*; α(M)=3.36×10^{-6} *5*; α(N)=4.94×10^{-7} *7*; α(O)=2.92×10^{-8} *4*
5762.6	(17$^+$)	1694.6 *3*	100	4068.0	(15$^+$)	Q	4.03×10^{-4}	α(K)=0.000211 *3*; α(L)=2.32×10^{-5} *4*; α(M)=4.07×10^{-6} *6*; α(N)=5.97×10^{-7} *9*; α(O)=3.50×10^{-8} *5*
6147.1	(18$^+$)	384.5 *3*	100	5762.6	(17$^+$)	D	0.00661	α(K)=0.00581 *9*; α(L)=0.000658 *10*; α(M)=0.0001159 *17*; α(N)=1.699×10^{-5} *24* α(O)=9.86×10^{-7} *14*
6155.5	16$^{(-)}$	597.7[@]		5557.8	15$^{(-)}$	M1	0.00232	α(K)=0.00204 *3*; α(L)=0.000228 *4*; α(M)=4.02×10^{-5} *6*; α(N)=5.90×10^{-6} *9*; α(O)=3.45×10^{-7} *5* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
		1824.9[@]		4330.6	14$^{(-)}$			
6229.9		672.1[@][a]	100[@]	5557.8	15$^{(-)}$			
6684.6		537.5[a] *3*	100	6147.1	(18$^+$)			
6742.3	17$^{(+)}$	586.8[@]	100[@]	6155.5	16$^{(-)}$	E1	9.50×10^{-4}	α(K)=0.000839 *12*; α(L)=9.27×10^{-5} *13*; α(M)=1.628×10^{-5} *23*; α(N)=2.38×10^{-6} *4* α(O)=1.370×10^{-7} *20* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
7024.2	18$^{(+)}$	281.9[@]	100[@]	6742.3	17$^{(+)}$	M1	0.01429	α(K)=0.01257 *18*; α(L)=0.001435 *20*; α(M)=0.000253 *4*;

$^{90}_{41}Nb_{49}$-8

Adopted Levels, Gammas (continued)

γ(^{90}Nb) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α	Comments
								α(N)=3.70×10^{-5} *6*; α(O)=2.14×10^{-6} *3* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
7351.0	(17$^-$)	1774.4 *3*	100	5576.5	(15$^-$)	Q	4.19×10^{-4}	α(K)=0.000193 *3*; α(L)=2.12×10^{-5} *3*; α(M)=3.73×10^{-6} *6*; α(N)=5.47×10^{-7} *8*; α(O)=3.21×10^{-8} *5*
7768.1	19$^{(+)}$	744.0[@]	100[@] *18*	7024.2	18$^{(+)}$	M1	1.41×10^{-3}	α(K)=0.001241 *18*; α(L)=0.0001380 *20*; α(M)=2.43×10^{-5} *4*; α(N)=3.57×10^{-6} *5*; α(O)=2.09×10^{-7} *3* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
		1025.7[@]	48[@] *9*	6742.3	17$^{(+)}$	E2	6.80×10^{-4}	α(K)=0.000599 *9*; α(L)=6.72×10^{-5} *10*; α(M)=1.182×10^{-5} *17*; α(N)=1.727×10^{-6} *25* α(O)=9.92×10^{-8} *14* Mult.: from γγ(θ) and γ(lin pol) in ^{63}Cu(^{31}P,3pnγ).
8094.8	(18$^-$)	743.8 *3*	100	7351.0	(17$^-$)	D	1.41×10^{-3}	α(K)=0.001242 *18*; α(L)=0.0001381 *20*; α(M)=2.43×10^{-5} *4*; α(N)=3.57×10^{-6} *5*; α(O)=2.09×10^{-7} *3*
8376.3		281.5 *3*	100	8094.8	(18$^-$)			

† From ^{76}Ge(^{19}F,5nγ), except where noted.
‡ From ^{90}Mo ε decay.
# From ^{90}Zr(p,nγ).
@ From ^{63}Cu(^{31}P,3pnγ),
& From ^{89}Y(α,3nγ),^{90}Zr(^{3}He,p2nγ).
a Placement of transition in the level scheme is uncertain.

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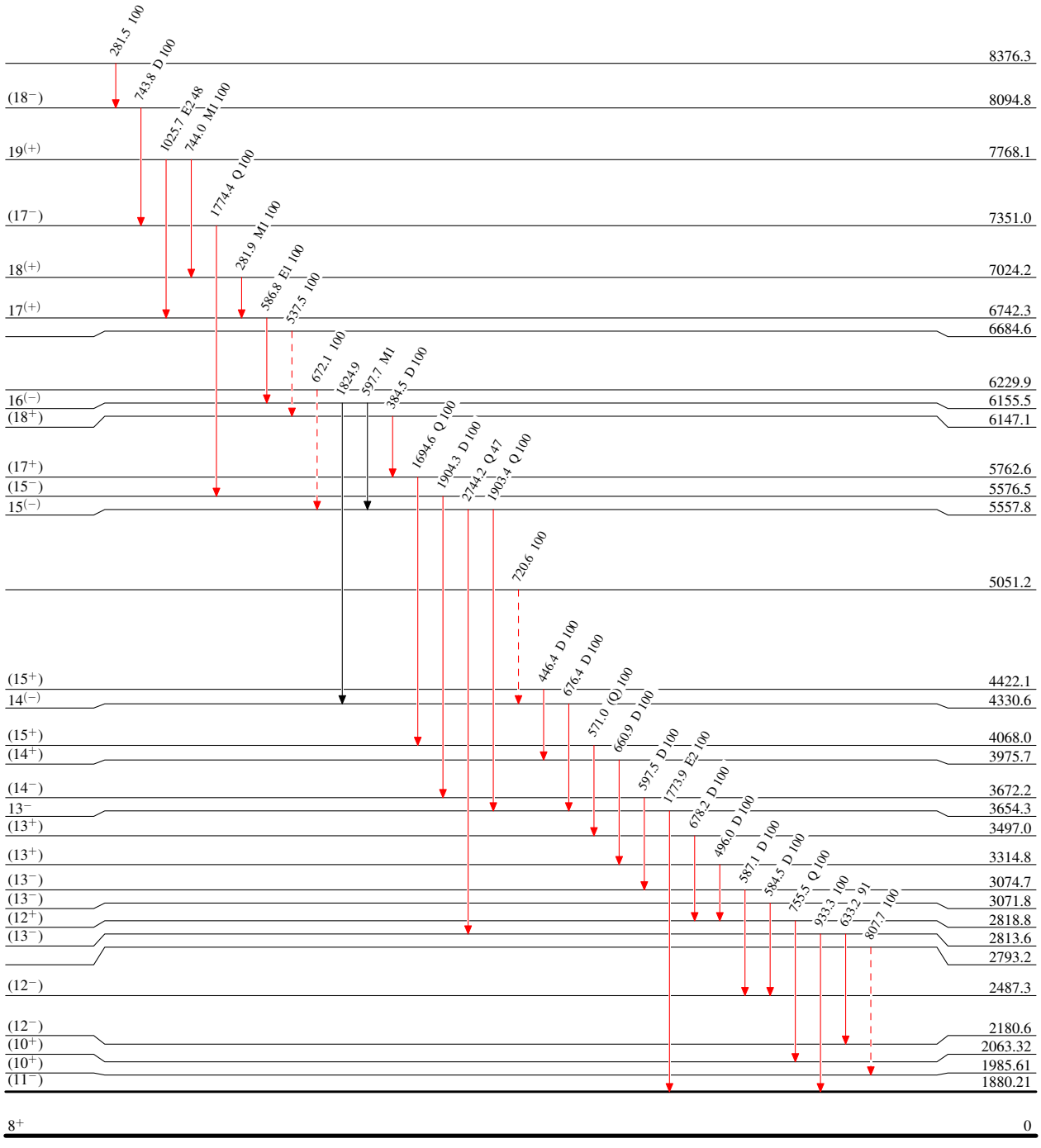
Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)

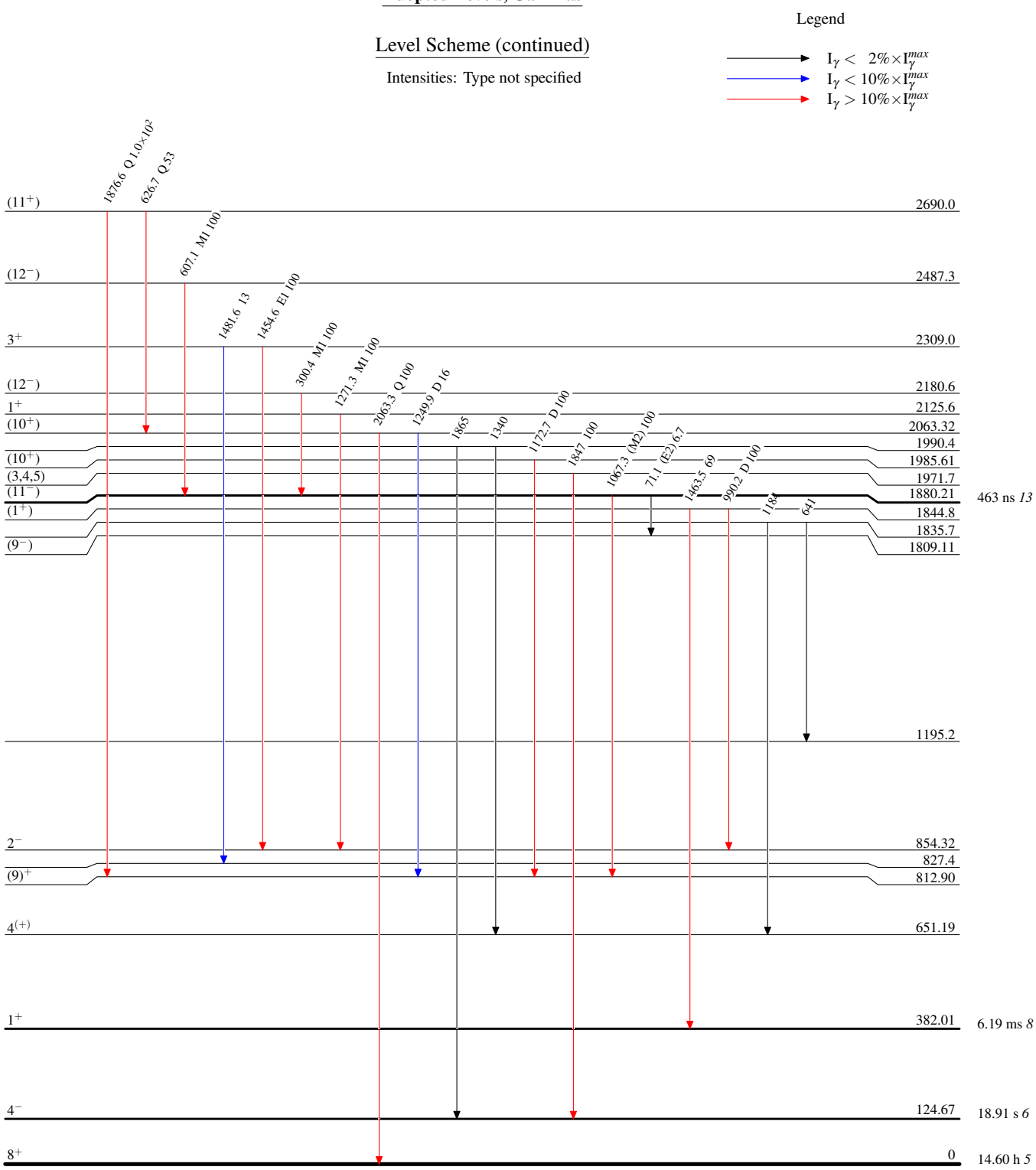


$^{90}_{41}Nb_{49}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

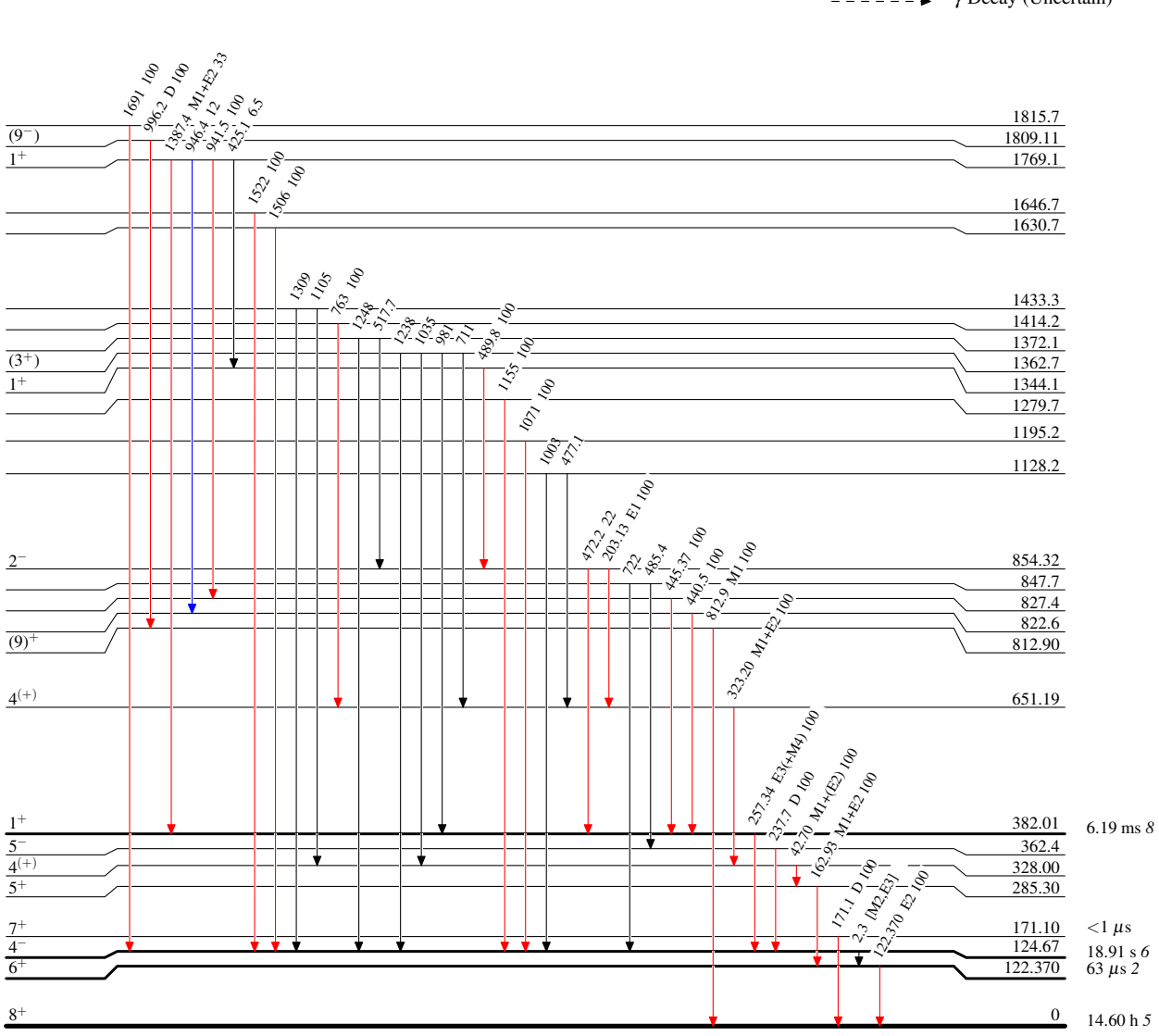


$^{90}_{41}Nb_{49}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified



$^{90}_{41}Nb_{49}$