Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	D. Abriola(a), A. A. Sonzogni	NDS 111,1 (2010)	1-May-2009

Q(β^-)=−8801 *7*; S(n)=12793 *4*; S(p)=7264 *5*; Q(α)=−3314 *3* 2012Wa38
Note: Current evaluation has used the following Q record −8799 7 *12796* 7 *7265* 5 −3315 7 2009AuZZ.

^{72}Se Levels

Cross Reference (XREF) Flags

A	^{72}Br ε decay	D	^{74}Se(p,t)
B	^{73}Kr εp decay (27.3 s)	E	(HI,xnγ)
C	^{70}Ge(α,2nγ), ^{72}Ge(α,4nγ)	F	^{54}Fe(^{24}Mg,α2pγ)

E(level)†	Jπ‡	$T_{1/2}$&	XREF	Comments
0[a]	0^+	8.40 d *8*	ABCDEF	%ε=100 $T_{1/2}$: from 1958Cu91. Other: 9.7 d (1950Ho26).
862.07[a] *8*	2^+#	2.82 ps *20*	ABCDEF	
937.22[b] *15*	0^+#	17.5 ns *17*	ABCDEF	$T_{1/2}$: unweighted average of delayed coincidence measurements: 19.3 ns 4 from ^{70}Ge(α,2nγ) (1974Dr02) and 15.8 ns *10* from ^{72}Br ε decay (1974Ha04).
1316.68 *8*	2^+	8.7 ps *3*	AB E	Jπ: from $\gamma(\theta)$ in (HI,xnγ) and γ to 0^+.
1636.86[a] *12*	4^+	2.07 ps *16*	A C EF	Jπ: stretched E2 γ to 2^+.
1876.23 *17*	(2,4)		A E	
1998.93[b] *13*	2^+		A EF	Jπ: from γ's to 0^+ and 2^+, and $\gamma(\theta)$ (HI,xnγ).
2150.1 *8*	(2^+)		A	Jπ: γ's to 0^+, 2^+, and 4^+.
2293.69 *11*	(2)	<1.0 ps	E	
2371.50 *21*			A E	E(level): may be a doublet: $J^\pi=(2)^+$ from γ to 0^+ and log *ft*=6.34 from 3^+, J=(3) from $\gamma(\theta)$ in (HI,xnγ).
2405.74 *21*	3^-#	<1.0 ps	DE	
2433.76[c] *10*	3^-@	<1.0 ps	A EF	
2466.77[a] *15*	6^+	1.24 ps *8*	C EF	Jπ: stretched E2 γ to 4^+.
2586.35 *16*	(3)		A E	
2843	5^-#		D	
2929	3^-#		D	
2965.75 *23*			A	
3124.07 *21*	(4^+)		A DE	Jπ: L(p,t)=4 at 3138 *20*. γ's to 2^+, (3).
3173.20[c] *12*	5^-@	<1.0 ps	EF	
3213.51 *16*	$(2^+,3,4^+)$		E	Jπ: γ's to (2^+) and (4^+).
3226.2 *3*	$(2,3,4^+)$		A	Jπ: γ's to 2^+ and log *ft*=6.43 from 3^+.
3232.09 *13*			E	
3239.3 *9*			A	
3349.91 *13*	5^-@	<1.0 ps	DE	Jπ: L(p,t)=(5) for E≈3340.
3382.6 *3*			E	
3424.77[a] *25*	8^+	0.51 ps *5*	EF	Jπ: stretched E2 γ to 6^+.
3450	2^+#		D	
3521.95 *14*	6^-@	2.9 ps *3*	E	
3762	4^+#		D	
3769.99 *14*	7^-@	2.8 ps *2*	EF	
3917.25[c] *15*	7^-@	0.79 ps *17*	EF	
4092.8 *3*			E	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{72}Se Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[&]	XREF	Comments
4217.7 *3*			E	
4310	6^{+}[#]		D	
4325.7 *4*			E	Jπ: π=− from placement in the band.
4504.3[a] *3*	10^{+}	0.22 ps *2*	EF	Jπ: stretched E2 γ to 8^{+}.
4713.20 *25*			E	
4762.83[c] *19*	(9^{-})[@]	0.59 ps *8*	EF	
5709.7[a] *3*	12^{+}	0.14 ps *2*	EF	Jπ: stretched E2 γ to 10^{+}.
5830.8[c] *9*	(11^{-})[@]	0.83 ps *10*	EF	
6686.5 *9*	(11^{-})[@]		EF	
7038.1[a] *6*	14^{+}	0.097 ps *8*	EF	Jπ: stretched E2 γ to 12^{+}.
7041.9[c] *12*	(13^{-})[@]	<0.69 ps	EF	
7190.7 *10*	(12^{-})[@]		EF	
7795.7 *14*	(13^{-})[@]		EF	
8089.7[c] *12*	(14^{-})[@]		EF	
8495.1[a] *12*	16^{+}	0.040 ps *7*	EF	Jπ: stretched E2 γ to 14^{+}.
10095.1[a] *15*	18^{+}	0.042 ps *10*	EF	Jπ: stretched E2 γ to 16^{+}.
11832.2[a] *18*	20^{+}	0.069 ps *14*	EF	Jπ: stretched E2 γ to 18^{+}.
13742.2[a] *21*	22^{+}	<0.05 ps	EF	Jπ: stretched E2 γ to 20^{+}.
15896.2[a] *23*	24^{+}	<0.3 ps	EF	Jπ: stretched E2 γ to 22^{+}.
18216[a] *3*	(26^{+})	<0.3 ps	E	E(level): 1991Ch14 observed a 26^{+} level at 18184 *3* which decays to the 24^{+} level. Jπ: stretched (E2) γ to 24^{+}.
20798[a] *3*	(28^{+})	<0.3 ps	E	Jπ: stretched (E2) γ to (26^{+}).

[†] Levels not connected to any other level are taken from ^{74}Se(p,t); other level energies are calculated from the adopted Eγ data.
[‡] From γ(θ) in (HI,xnγ) and γ decay mode, except as noted.
[#] From L(p,t).
[@] From DCO ratios and systematics (1989My01).
[&] From (HI,xnγ), except as noted.
[a] Band(A): g.s. band.
[b] Band(B): second 0^{+} band.
[c] Band(C): negative parity.

Adopted Levels, Gammas (continued)

γ(^{72}Se)

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.[‡]	α[@]	Comments
862.07	2^+	862.03 *12*	100	0	0^+	E2	6.03×10^{-4}	α(K)=0.000537 *8*; α(L)=5.65×10^{-5} *8*; α(M)=8.79×10^{-6} *13*; α(N)=7.47×10^{-7} *11*; α(N+..)=7.47×10^{-7} *11* B(E2)(W.u.)=23.7 *17*
937.22	0^+	75 *2*		862.07	2^+	[E2]	2.4 *3*	α(K)=2.05 *22*; α(L)=0.32 *4*; α(M)=0.050 *6*; α(N)=0.0036 *5*; α(N+..)=0.0036 *5* Mult.: from adopted J^π values. I(γ+ce)=100 *17*. B(E2)(W.u.)=162 *28*.
		937		0	0^+	E0		Mult.: from ce data in (α,4nγ). I(γ+ce)=37 *17*.
1316.68	2^+	379.55 *23*	35 *2*	937.22	0^+	[E2]	0.00666	α(K)=0.00591 *9*; α(L)=0.000648 *10*; α(M)=0.0001006 *15*; α(N)=8.38×10^{-6} *12* α(N+..)=8.38×10^{-6} *12* B(E2)(W.u.)=77 *6*
		454.70 *10*	76 *5*	862.07	2^+			
		1316.70 *10*	100 *6*	0	0^+	E2	2.60×10^{-4}	α(K)=0.000203 *3*; α(L)=2.11×10^{-5} *3*; α(M)=3.28×10^{-6} *5*; α(N)=2.81×10^{-7} *4*; α(N+..)=3.20×10^{-5} *5* B(E2)(W.u.)=0.44 *4*
1636.86	4^+	774.73 *17*	100	862.07	2^+	E2	7.92×10^{-4}	α(K)=0.000705 *10*; α(L)=7.45×10^{-5} *11*; α(M)=1.158×10^{-5} *17*; α(N)=9.83×10^{-7} *14* α(N+..)=9.83×10^{-7} *14* B(E2)(W.u.)=55 *5*
1876.23	(2,4)	559.34 *24*	100 *6*	1316.68	2^+			
		1014.0 *8*	27 *14*	862.07	2^+			
1998.93	2^+	1061.69 *10*	79 *7*	937.22	0^+	[E2]	3.66×10^{-4}	α(K)=0.000326 *5*; α(L)=3.41×10^{-5} *5*; α(M)=5.30×10^{-6} *8*; α(N)=4.52×10^{-7} *7*; α(N+..)=4.52×10^{-7} *7*
		1136.87 *12*	100 *10*	862.07	2^+			
2150.1	(2^+)	512[&] *2*	100 *40*	1636.86	4^+			
		832 *2*	100 *40*	1316.68	2^+			
		2150.7 *10*	48 *14*	0	0^+			
2293.69	(2)	977.1 *1*	100 *8*	1316.68	2^+			
		1431.2 *2*	87 *3*	862.07	2^+			
2371.50		1054.7 *3*	50 *8*	1316.68	2^+			
		1433.6 *10*	13 *5*	937.22	0^+			
		1509.8 *4*	44 *7*	862.07	2^+			
		2371.9 *7*	100 *10*	0	0^+			
2405.74	3^-	1088.9 *3*	100	1316.68	2^+	[E1]	1.55×10^{-4}	α(K)=0.0001380 *20*; α(L)=1.422×10^{-5} *20*; α(M)=2.21×10^{-6} *3*; α(N+..)=1.89×10^{-7} *3* B(E1)(W.u.)>0.00030
2433.76	3^-	1117.2 *1*	25.0 *19*	1316.68	2^+			
		1571.58 *10*	100 *5*	862.07	2^+			
		2432.7 *8*	33 *7*	0	0^+			
2466.77	6^+	830.1 *2*	100	1636.86	4^+	E2	6.63×10^{-4}	α(K)=0.000590 *9*; α(L)=6.22×10^{-5} *9*; α(M)=9.67×10^{-6} *14*;

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Adopted Levels, Gammas (continued)

γ(^{72}Se) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.[‡]	α[@]	Comments
								α(N)=8.22×10^{-7} *12*; α(N+..)=8.22×10^{-7} *12* B(E2)(W.u.)=65 *5*
2586.35	(3)	710.12 *18*	47 *10*	1876.23	(2,4)			
		1269.5 *5*	24 *12*	1316.68	2$^+$			
		1724.43 *19*	100 *8*	862.07	2$^+$			
2965.75		379.9[&] *3*	≤100	2586.35	(3)			
		1089.2[&] *3*	≤88	1876.23	(2,4)			
		1648.5 *5*	43 *12*	1316.68	2$^+$			
3124.07	(4$^+$)	537.6 *3*	24 *8*	2586.35	(3)			
		752.8 *4*	55 *8*	2371.50				
		1125.1 *3*	100 *11*	1998.93	2$^+$			
		1807.4 *6*	33 *7*	1316.68	2$^+$			
3173.20	5$^-$	739.5 *1*	18 *3*	2433.76	3$^-$			
		879.3 *2*	≤13	2293.69	(2)			
		1536.1 *3*	100 *4*	1636.86	4$^+$			
3213.51	(2$^+$,3,4$^+$)	807.7 *2*	100 *18*	2405.74	3$^-$			
		920.0 *2*	36 *9*	2293.69	(2)			
		1576.5 *2*	91 *18*	1636.86	4$^+$			
3226.2	(2,3,4$^+$)	1227.3 *4*	47 *19*	1998.93	2$^+$			
		1349.9 *3*	100 *19*	1876.23	(2,4)			
		1909.4 *7*	59 *16*	1316.68	2$^+$			
3232.09		798.3 *1*	92 *8*	2433.76	3$^-$			
		1595.3 *2*	100 *15*	1636.86	4$^+$			
3239.3		1089.2 *3*	100	2150.1	(2$^+$)			
3349.91	5$^-$	916.1 *2*	11.6 *23*	2433.76	3$^-$			
		1713.0 *1*	100 *7*	1636.86	4$^+$			
3382.6		1088.9 *3*	100	2293.69	(2)			
3424.77	8$^+$	958.0 *2*	100	2466.77	6$^+$	E2	4.66×10^{-4}	α(K)=0.000415 *6*; α(L)=4.35×10^{-5} *6*; α(M)=6.77×10^{-6} *10*; α(N)=5.76×10^{-7} *8*; α(N+..)=5.76×10^{-7} *8* B(E2)(W.u.)=77 *8*
3521.95	6$^-$	172.0 *1*	45 *3*	3349.91	5$^-$			
		348.8 *1*	100 *3*	3173.20	5$^-$			
3769.99	7$^-$	248.1		3521.95	6$^-$			
		596.7 *1*	39 *3*	3173.20	5$^-$			
		1303.3 *1*	100 *3*	2466.77	6$^+$			
3917.25	7$^-$	744.1 *1*	100 *9*	3173.20	5$^-$			
		1450.3 *2*	78 *22*	2466.77	6$^+$			
4092.8		879.3 *2*	100	3213.51	(2$^+$,3,4$^+$)			
4217.7		1750.9 *2*	100	2466.77	6$^+$			
4325.7		555.7 *4*	100	3769.99	7$^-$			
4504.3	10$^+$	1079.5 *1*	100	3424.77	8$^+$	E2	3.52×10^{-4}	α(K)=0.000314 *5*; α(L)=3.28×10^{-5} *5*; α(M)=5.10×10^{-6} *8*;

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Adopted Levels, Gammas (continued)

γ(^{72}Se) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.[‡]	α[@]	Comments
								α(N)=4.35×10^{-7} *6*; α(N+..)=4.35×10^{-7} *6* B(E2)(W.u.)=99 *9*
4713.20		943.2 *2*	100	3769.99	7$^-$			
4762.83	(9$^-$)	845.6 *2*	100 *13*	3917.25	7$^-$			
		992.8 *2*	38 *13*	3769.99	7$^-$			
		1338.3		3424.77	8$^+$			
5709.7	12$^+$	1205.4 *2*	100	4504.3	10$^+$	E2	2.85×10^{-4}	α(K)=0.000246 *4*; α(L)=2.56×10^{-5} *4*; α(M)=3.98×10^{-6} *6*; α(N)=3.40×10^{-7} *5*; α(N+..)=9.54×10^{-6} *14* B(E2)(W.u.)=89 *13*
5830.8	(11$^-$)	1068.0	100	4762.83	(9$^-$)			
6686.5	(11$^-$)	1923.6	100	4762.83	(9$^-$)			
7038.1	14$^+$	1328.4 *5*	100	5709.7	12$^+$	E2	2.58×10^{-4}	α(K)=0.000199 *3*; α(L)=2.07×10^{-5} *3*; α(M)=3.22×10^{-6} *5*; α(N)=2.75×10^{-7} *4*; α(N+..)=3.48×10^{-5} *5* B(E2)(W.u.)=79 *7*
7041.9	(13$^-$)	1211.0	100	5830.8	(11$^-$)			
7190.7	(12$^-$)	504.2		6686.5	(11$^-$)			
		1359.8		5830.8	(11$^-$)			
7795.7	(13$^-$)	605.0	100	7190.7	(12$^-$)			
8089.7	(14$^-$)	899.0		7190.7	(12$^-$)			
		1047.8		7041.9	(13$^-$)			
8495.1	16$^+$	1457	100	7038.1	14$^+$	E2[#]	2.55×10^{-4}	α(K)=0.0001648 *23*; α(L)=1.708×10^{-5} *24*; α(M)=2.66×10^{-6} *4*; α(N)=2.27×10^{-7} *4* α(N+..)=7.05×10^{-5} *10* B(E2)(W.u.)=121 *22*
10095.1	18$^+$	1600	100	8495.1	16$^+$	E2[#]	2.79×10^{-4}	α(K)=0.0001367 *20*; α(L)=1.414×10^{-5} *20*; α(M)=2.20×10^{-6} *3*; α(N)=1.88×10^{-7} *3* α(N+..)=0.0001262 *18* B(E2)(W.u.)=72 *18*
11832.2	20$^+$	1737	100	10095.1	18$^+$	E2[#]	3.17×10^{-4}	α(K)=0.0001165 *17*; α(L)=1.204×10^{-5} *17*; α(M)=1.87×10^{-6} *3*; α(N)=1.603×10^{-7} *23* α(N+..)=0.000186 *3* B(E2)(W.u.)=29 *6*
13742.2	22$^+$	1910	100	11832.2	20$^+$	E2[#]	3.75×10^{-4}	α(K)=9.74×10^{-5} *14*; α(L)=1.005×10^{-5} *14*; α(M)=1.563×10^{-6} *22*; α(N)=1.339×10^{-7} *19* α(N+..)=0.000266 *4* B(E2)(W.u.)>25
15896.2	24$^+$	2154	100	13742.2	22$^+$	E2[#]	4.72×10^{-4}	α(K)=7.82×10^{-5} *11*; α(L)=8.06×10^{-6} *12*; α(M)=1.253×10^{-6} *18*; α(N)=1.074×10^{-7} *15* α(N+..)=0.000385 *6* B(E2)(W.u.)>2.3
18216	(26$^+$)	2320	100	15896.2	24$^+$	(E2)[#]	5.43×10^{-4}	α(K)=6.86×10^{-5} *10*; α(L)=7.05×10^{-6} *10*; α(M)=1.097×10^{-6} *16*; α(N)=9.41×10^{-8} *14*

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Adopted Levels, Gammas (continued)

γ(^{72}Se) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.[‡]	α[@]	Comments
								α(N+..)=0.000466 *7* B(E2)(W.u.)>1.6
20798	(28$^+$)	2582	100	18216	(26$^+$)	(E2)[#]	6.54×10^{-4}	α(K)=5.70×10^{-5} *8*; α(L)=5.86×10^{-6} *9*; α(M)=9.11×10^{-7} *13*; α(N)=7.81×10^{-8} *11*; α(N+..)=0.000591 *9* B(E2)(W.u.)>0.92

[†] γ data from levels above 3.3 MeV are from (HI,xnγ); for other γ radiations, data are from ^{72}Br ε decay and (HI,xnγ); averages have been calculated where possible.

[‡] Mult=E2 from γ(θ) in (HI,xnγ) and RUL, except as noted.

[#] Stretched E2 transitions from DCO ratios ≈1, (HI,xnγ).

[@] 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.

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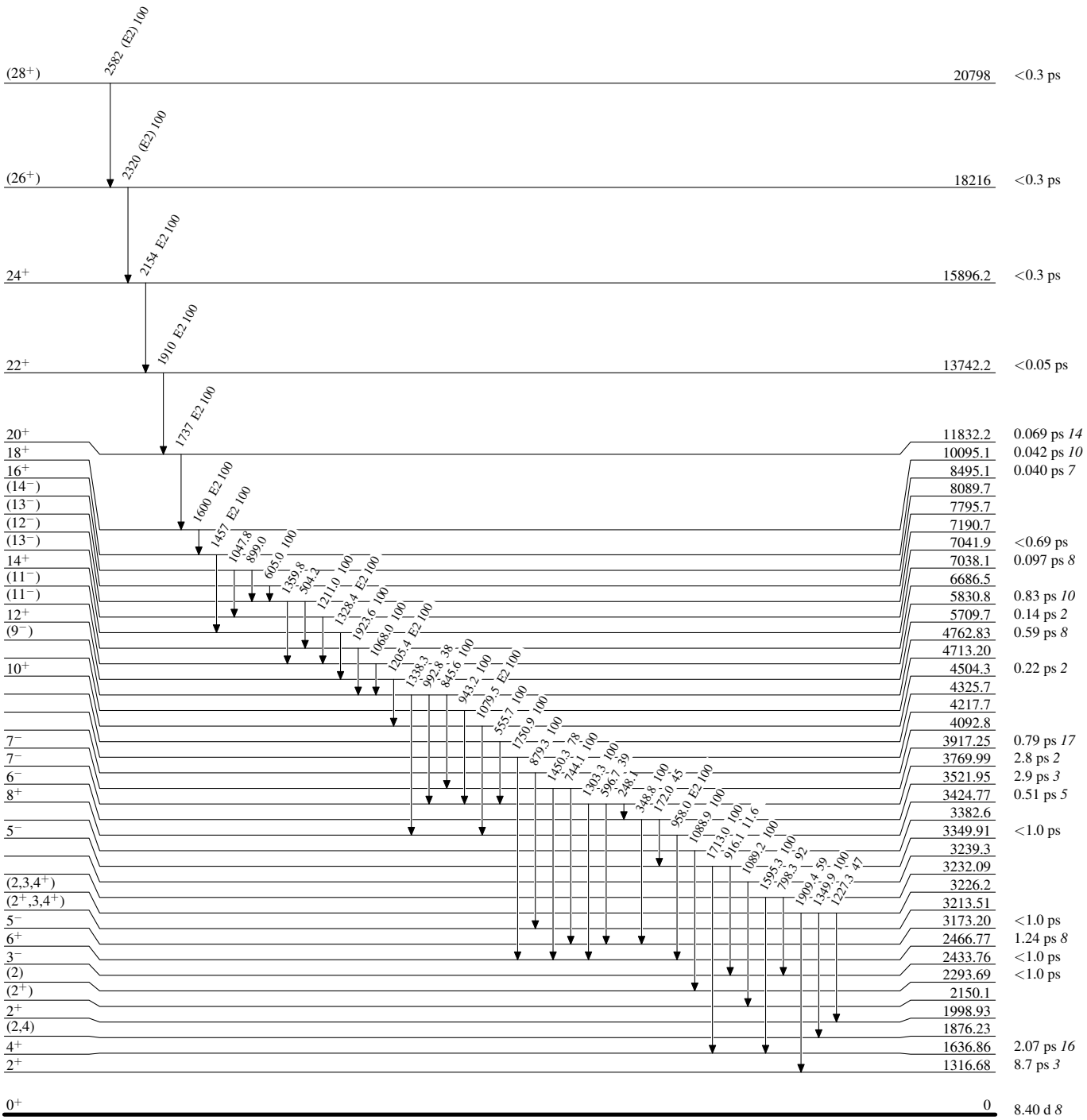
Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



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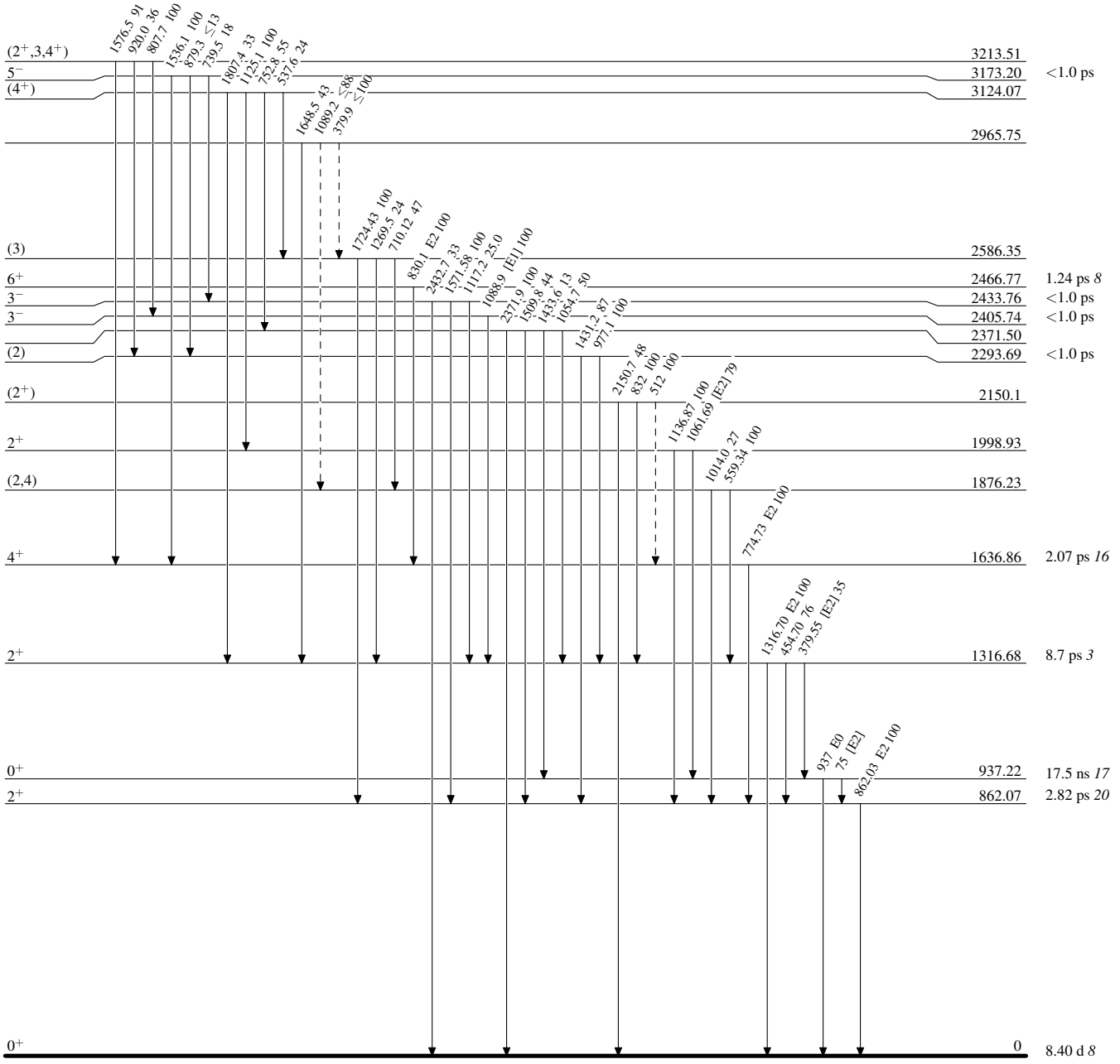
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



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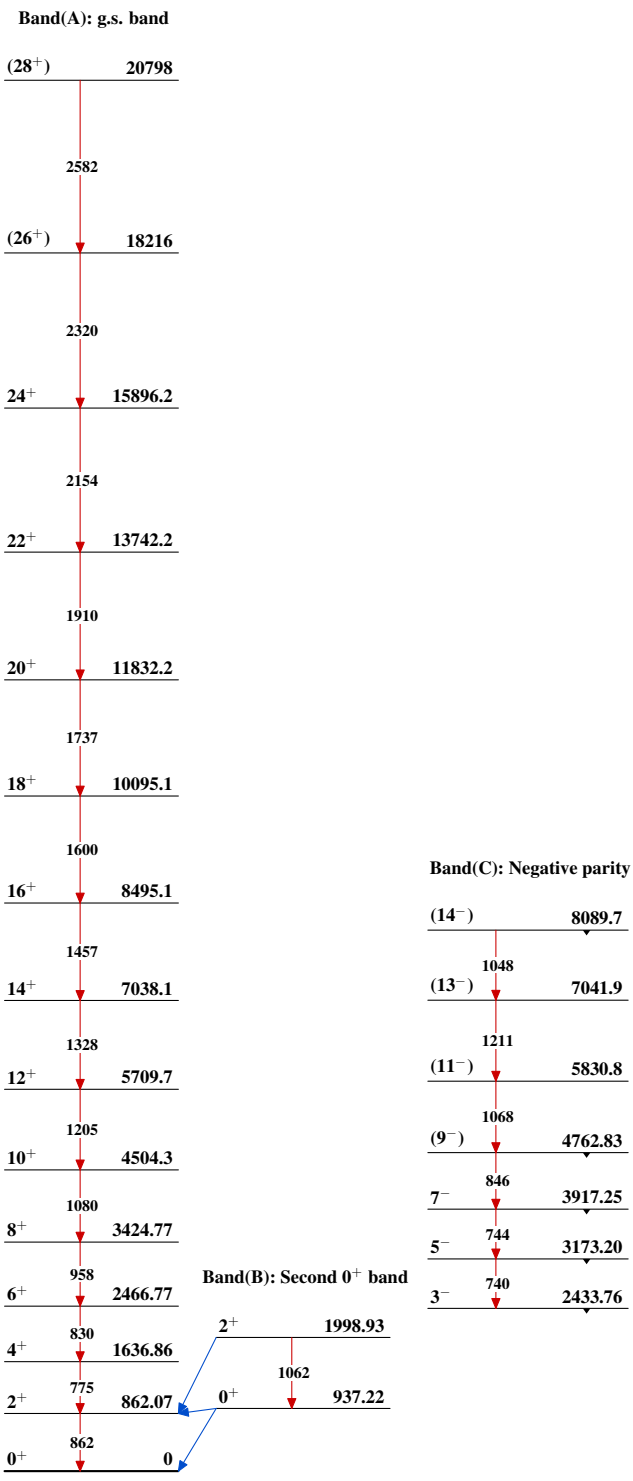
Adopted Levels, Gammas



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