Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Zoltan Elekes and Janos Timar	NDS 129, 191 (2015)	28-Feb-2015

Q(β^-)=1268 *14*; S(n)=7962 *20*; S(p)=13753 *28*; Q(α)=−9085 *18* 2012Wa38

^{128}Sn Levels

Cross Reference (XREF) Flags

A	^{128}In β^- decay (0.84 s)	F	^{129}In β^-n decay (1.23 s)
B	^{128}In β^- decay (0.72 s)	G	Coulomb excitation
C	^{128}Sn IT decay (6.5 s)	H	^{9}Be(^{136}Xe,Xγ)
D	^{128}Sn IT decay (2.91 μs)	I	(HI,xnγ)
E	^{129}In β^-n decay (0.610 s)		

E(level)	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0	0$^+$	59.07 min *14*	ABCDEFGHI	%β^-=100 Q=−0.02 *18* T$_{1/2}$: weighted average of 59.1 min *5* (1976Nu01), 60.0 min *4* (1968Er03), 59.0 min *1* (quoted in 1968Er03), 59.8 min *8* (1964St28). Others: 59 min *1* (1962Uh01), 62 min *2* (1962Dr01), 57 min *4* (1962Ha16), 58 min *5* (1962Dr01). T$_{1/2}$: isotope shift=0.801 GHz *12*, charge radius=4.692 fm *4* was measured in 2005Le34. Q: from Coulomb excitation.
1168.82 *4*	(2)$^+$	1.63 ps *10*	ABCD GHI	J$^\pi$: log *ft*=5.86 from (3)$^+$; γ to 0$^+$; syst of the first excited state of even-even Sn isotopes. T$_{1/2}$: from B(E2) in Coulomb excitation (2011Al25).
2000.37 *6*	(4$^+$)†		BCD GHI	
2091.50 *11*	(7$^-$)†	6.5 s *5*	BCD HI	%IT=100 No β^- transition to ^{128}Sb (8$^-$) g.s. was observed (1979Fo10), and the authors do not give any limit. T$_{1/2}$: from ^{128}Sn IT decay (6.5 s) (1979Fo10).
2104.07 *5*	(2)$^+$		A G	J$^\pi$: log *ft*=5.81 from (3)$^+$; γ to 0$^+$.
2120.91 *8*	(5$^-$)†	8.6 ns *8*	B D	T$_{1/2}$: from ^{128}In β^- decay (0.72 s) (1979Fo10).
2258.36 *6*	(2)$^+$		A	J$^\pi$: log *ft*=6.31 from (3)$^+$; γ to 0$^+$.
2274.06 *10*	(2$^-$,3,4$^+$)		A	J$^\pi$: log *ft*=6.81 from (3)$^+$; γ to (2)$^+$, no γ to 0$^+$.
2378.08 *13*	(7$^-$)		B	J$^\pi$: log *ft*=6.19 from (8$^-$), γ to (5$^-$).
2412.71 *12*	(8$^+$)	<40 ns	B D HI	T$_{1/2}$: from time distribution of 321γ (1981Fo02). J$^\pi$: E1 γ to (7$^-$).
2491.89 *17*	(10$^+$)	2.91 μs *14*	B D HI	g=−0.20 *4* (2010At03) T$_{1/2}$: weighted average of 2.69 μs *23* in ^{128}In β^- decay (0.72 s) and 3.00 μs *15* in ^{9}Be(^{136}Xe,Xγ). g: TDPAD method (2010At03). Comparison with shell-model calculations confirm dominance of $\nu h^{-2}_{11/2}$ configuration. J$^\pi$: E2 γ to (8$^+$); high spin ordering. However, log *ft*=5.97 from (8$^-$) suggest (7$^-$,8$^-$,9$^-$).
2547.10 *11*	(7$^-$)		B	J$^\pi$: log *ft*≈7.7 from (8$^-$), G to (5$^-$).
2578.62 *8*	(2)$^+$		A	J$^\pi$: log *ft*=6.40 from (3)$^+$; γ to 0$^+$.
2633.09 *9*	(2,3,4$^+$)		A	J$^\pi$: log *ft*=6.43 from (3)$^+$; γ to (2)$^+$.
2642.27 *6*	(2,3,4$^+$)		A	J$^\pi$: log *ft*=6.47 from (3)$^+$; γ to (2)$^+$.
2756.54 *9*	(2,3,4$^+$)		A	J$^\pi$: log *ft*=6.91 from (3)$^+$; γ to (2)$^+$.
2952.46 *9*	(2,3,4$^+$)		A	J$^\pi$: log *ft*=6.54 from (3)$^+$; γ to (2)$^+$.
2959.48 *21*	(7,8,9)		B	J$^\pi$: log *ft*=6.76 from (8$^-$).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{128}Sn Levels (continued)

E(level)	J^π	$T_{1/2}$	XREF	Comments
3091.97 *8*	(2,3,4$^+$)		A	J^π: log *ft*=6.43 from (3)$^+$; γ to (2)$^+$.
3146.7 *3*	(9$^-$)		HI	J^π: from comparison to shell-model calculation in ^{9}Be(^{136}Xe,Xγ).
3175.78 *11*	(7$^-$)		B	J^π: log *ft*=6.31 from (8$^-$); γ to (5$^-$).
3225.6 *3*	(2)$^+$		A	J^π: log *ft*=6.48 from (3)$^+$; γ to 0$^+$.
3383.14 *15*	(7$^-$)		B	J^π: log *ft*=7.0 from (8$^-$); γ to (5$^-$).
3519.86 *9*	(2)$^+$		A	J^π: log *ft*=5.21 from (3)$^+$; γ to 0$^+$.
3553.8 *3*	(12$^+$)		HI	J^π: from comparison to shell-model calculation in ^{9}Be(^{136}Xe,Xγ).
3608.50 *18*	(7,8,9$^-$)		B	J^π: log *ft*=6.32 from (8$^-$); γ to (7$^-$).
3633.46 *13*			B	
3769.08 *19*	(7,8,9)		B	J^π: log *ft*=6.29 from (8$^-$).
3772.1 *3*	(11$^-$)		HI	J^π: from comparison to shell-model calculation in ^{9}Be(^{136}Xe,Xγ).
3871.48 *15*	(7$^-$,8$^-$,9$^-$)		B	J^π: log *ft*=5.88 from (8$^-$).
3886.39 *13*	(2)$^+$		A	J^π: log *ft*=5.76 from (3)$^+$; γ to 0$^+$.
3954.85 *9*	(2)$^+$		A	J^π: log *ft*=5.55 from (3)$^+$; γ to 0$^+$.
3958.55 *15*	(7$^-$,8$^-$,9$^-$)		B	J^π: log *ft*=4.87 from (8$^-$).
3979.8 *3*	(13$^-$)		HI	J^π: from comparison to shell-model calculation in ^{9}Be(^{136}Xe,Xγ).
3987.6 *3*	(7,8,9$^-$)		B	J^π: log *ft*=6.43 from (8$^-$); γ to (7$^-$).
3997.61 *9*	(2,3,4)$^+$		A	J^π: log *ft*=5.75 from (3)$^+$; γ to (2)$^+$.
4038.01 *13*	(2)$^+$		A	J^π: log *ft*=5.93 from (3)$^+$; γ to 0$^+$.
4065.36 *14*	(9$^-$)		B	J^π: log *ft*=5.03 from (8$^-$); γ to (10$^+$).
4075.03 *10*	(2,3,4)$^+$		A	J^π: log *ft*=5.79 from (3)$^+$; γ to (2)$^+$.
4099.5 *4*	(15$^-$)	220 ns *30*	HI	J^π: from comparison to shell-model calculation in ^{9}Be(^{136}Xe,Xγ). $T_{1/2}$: from time distribution of delayed γ rays in ^{9}Be(^{136}Xe,Xγ).
4213.63 *15*	(7$^-$,8$^-$,9$^-$)		B	J^π: log *ft*=5.71 from (8$^-$).
4219.87 *9*	(2,3,4)$^+$		A	J^π: log *ft*=5.71 from (3)$^+$; γ to (2)$^+$.
4227.2 *3*	(2)$^+$		A	J^π: log *ft*=6.26 from (3)$^+$; γ to 0$^+$.
4243.02 *16*	(7$^-$,8$^-$,9$^-$)		B	J^π: log *ft*=5.93 from (8$^-$).
4297.70 *14*	(2)$^+$		A	J^π: log *ft*=5.09 from (3)$^+$; γ to 0$^+$.
4509.8 *10*	(2)$^+$		A	J^π: log *ft*=6.81 from (3)$^+$; γ to 0$^+$.
4898.01 *19*	(7$^-$,8$^-$,9$^-$)		B	J^π: log *ft*=5.65 from (8$^-$).

† All γ cascades from the (8$^-$) ^{128}In β^- decay (0.72 s) pass through the 2000.37-keV level which decays to (2)$^+$. This fact suggests J^π(2000.37)=(4$^+$). If J^π=(4$^+$) is assumed for the 2000.37-keV level, J^π=(7$^-$) and (5$^-$) can be assigned for 2091.50- and 2120.91-keV levels, which populate the (4$^+$) state by E3 and E1 γ transitions, respectively.

γ(^{128}Sn)

E_i(level)	J^π_i	E_γ †	I_γ †	E_f	J^π_f	Mult. ‡	α @	Comments
1168.82	(2)$^+$	1168.80 *5*	100	0.0	0$^+$			
2000.37	(4$^+$)	831.54 *5*	100	1168.82	(2)$^+$			
2091.50	(7$^-$)	91.15 *10*	100	2000.37	(4$^+$)	E3	26.3	α(K)=9.62 *14*; α(L)=13.31 *21*; α(M)=2.84 *5*; α(N)=0.494 *8*; α(O)=0.01410 *22* B(E3)(W.u.)=0.136 *11*
2104.07	(2)$^+$	935.20 *5*	100 *6*	1168.82	(2)$^+$			
		2104.07 *10*	81 *5*	0.0	0$^+$			
2120.91	(5$^-$)	120.54 *5*	100	2000.37	(4$^+$)	E1	0.1069	α(K)=0.0926 *13*; α(L)=0.01159 *17*; α(M)=0.00225 *4*; α(N)=0.000417 *6*; α(O)=3.21×10^{-5} *5* B(E1)(W.u.)=1.60×10^{-5} *15*
2258.36	(2)$^+$	1089.53 *10*	100 *7*	1168.82	(2)$^+$			
		2258.46 *10*	42 *3*	0.0	0$^+$			
2274.06	(2$^-$,3,4$^+$)	1105.20 *10*	100	1168.82	(2)$^+$			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{128}Sn)$ (continued)

E_i(level)	J^π_i	E_γ †	I_γ †	E_f	J^π_f	Mult. ‡	α @	Comments
2378.08	(7⁻)	257.17 *10*	100	2120.91	(5⁻)			
2412.71	(8⁺)	321.22 *7*	100	2091.50	(7⁻)	E1	0.00716	α(K)=0.00623 *9*; α(L)=0.000754 *11*; α(M)=0.0001469 *21*; α(N)=2.75×10⁻⁵ *4*; α(O)=2.28×10⁻⁶ *4* B(E1)(W.u.)>2.0×10⁻⁷
2491.89	(10⁺)	79.28 *15*	100	2412.71	(8⁺)	E2	3.64	α(K)=2.42 *4*; α(L)=0.982 *16*; α(M)=0.201 *4*; α(N)=0.0354 *6*; α(O)=0.001331 *21* B(E2)(W.u.)=0.346 *18*
2547.10	(7⁻)	426.19 *7*	100	2120.91	(5⁻)			
2578.62	(2)⁺	474.50 *15*	24 *6*	2104.07	(2)⁺			
		1409.80 *10*	100 *9*	1168.82	(2)⁺			
		2578.60 *15*	91 *9*	0.0	0⁺			
2633.09	(2,3,4⁺)	1464.31 *10*	100	1168.82	(2)⁺			
2642.27	(2,3,4⁺)	538.16 *5*	71 *5*	2104.07	(2)⁺			
		1473.55 *10*	100 *6*	1168.82	(2)⁺			
2756.54	(2,3,4⁺)	1587.69 *15*	100	1168.82	(2)⁺			
2952.46	(2,3,4⁺)	310.48 *20*	12 *3*	2642.27	(2,3,4⁺)			
		1783.56 *10*	100 *7*	1168.82	(2)⁺			
2959.48	(7,8,9)	468.0 *3*	43 *17*	2491.89	(10⁺)			
		546.59 *20*	100 *25*	2412.71	(8⁺)			
3091.97	(2,3,4⁺)	449.67 *7*	55 *7*	2642.27	(2,3,4⁺)			
		1923.27 *15*	100 *10*	1168.82	(2)⁺			
3146.7	(9⁻)	1055.1# *3*		2091.50	(7⁻)			
3175.78	(7⁻)	763.12 *15*	19 *4*	2412.71	(8⁺)			
		1054.91 *10*	100 *9*	2120.91	(5⁻)			
3225.6	(2)⁺	583.3 *3*	24 *6*	2642.27	(2,3,4⁺)			
		3225.8 *5*	100 *10*	0.0	0⁺			
3383.14	(7⁻)	207.46 *15*	51 *11*	3175.78	(7⁻)			
		1261.81 *25*	100 *22*	2120.91	(5⁻)			
3519.86	(2)⁺	886.88 *15*	2.7 *6*	2633.09	(2,3,4⁺)			
		2350.90 *15*	8.4 *6*	1168.82	(2)⁺			
		3519.81 *15*	100 *9*	0.0	0⁺			
3553.8	(12⁺)	1062.0# *3*		2491.89	(10⁺)			
3608.50	(7,8,9⁻)	1061.39 *15*	100	2547.10	(7⁻)			
3633.46		457.68 *7*	100	3175.78	(7⁻)			
3769.08	(7,8,9)	1356.36 *15*	100	2412.71	(8⁺)			
3772.1	(11⁻)	625.3# *3*		3146.7	(9⁻)			
3871.48	(7⁻,8⁻,9⁻)	1779.97 *10*	100	2091.50	(7⁻)			
3886.39	(2)⁺	1130.31 *25*	7.2 *17*	2756.54	(2,3,4⁺)			
		3886.16 *15*	100 *8*	0.0	0⁺			
3954.85	(2)⁺	1696.51 *10*	33 *3*	2258.36	(2)⁺			
		2785.83 *25*	18 *3*	1168.82	(2)⁺			
		3954.75 *15*	100	0.0	0⁺			
3958.55	(7⁻,8⁻,9⁻)	1867.04 *10*	100	2091.50	(7⁻)			
3979.8	(13⁻)	207.6# *3*	56# *6*	3772.1	(11⁻)			
		426.0# *2*	100# *9*	3553.8	(12⁺)			
3987.6	(7,8,9⁻)	811.78 *25*	100	3175.78	(7⁻)			
3997.61	(2,3,4)⁺	1045.19 *25*	18 *5*	2952.46	(2,3,4⁺)			
		1241.01 *10*	45 *5*	2756.54	(2,3,4⁺)			
		1739.32 *10*	100 *5*	2258.36	(2)⁺			
		1893.2 *3*	20 *5*	2104.07	(2)⁺			
4038.01	(2)⁺	1281.42 *15*	35 *4*	2756.54	(2,3,4⁺)			
		4038.03 *20*	100 *12*	0.0	0⁺			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{128}Sn)$ (continued)

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π
4065.36	(9^-)	1573.37 *25*	4.6 *10*	2491.89	(10^+)
		1973.86 *10*	100 *5*	2091.50	(7^-)
4075.03	$(2,3,4)^+$	1816.65 *10*	100 *8*	2258.36	$(2)^+$
		2906.18 *15*	30 *4*	1168.82	$(2)^+$
4099.5	(15^-)	119.7 *2*		3979.8	(13^-)
4213.63	(7^-,8^-,9^-)	2122.11 *10*	100	2091.50	(7^-)
4219.87	$(2,3,4)^+$	1945.62 *25*	22 *6*	2274.06	(2^-,3,4^+)
		1961.48 *10*	71 *6*	2258.36	$(2)^+$
		3051.09 *15*	100 *12*	1168.82	$(2)^+$
4227.2	$(2)^+$	3058.2 *9*	100 *32*	1168.82	$(2)^+$
		4227.1 *3*	47 *11*	0.0	0^+
4243.02	(7^-,8^-,9^-)	609.55 *15*	67 *12*	3633.46	
		1067.25 *15*	100 *15*	3175.78	(7^-)
4297.70	$(2)^+$	3128.84 *20*	9.3 *9*	1168.82	$(2)^+$
		4297.61 *20*	100 *7*	0.0	0^+
4509.8	$(2)^+$	4509.7 *10*	100	0.0	0^+
4898.01	(7^-,8^-,9^-)	1264.61 *20*	100 *14*	3633.46	
		1514.79 *20*	71 *14*	3383.14	(7^-)

† From ^{128}In β^- decay unless otherwise noted.

‡ From α(K)exp in ^{128}In β^- decay (0.72 s).

From (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.

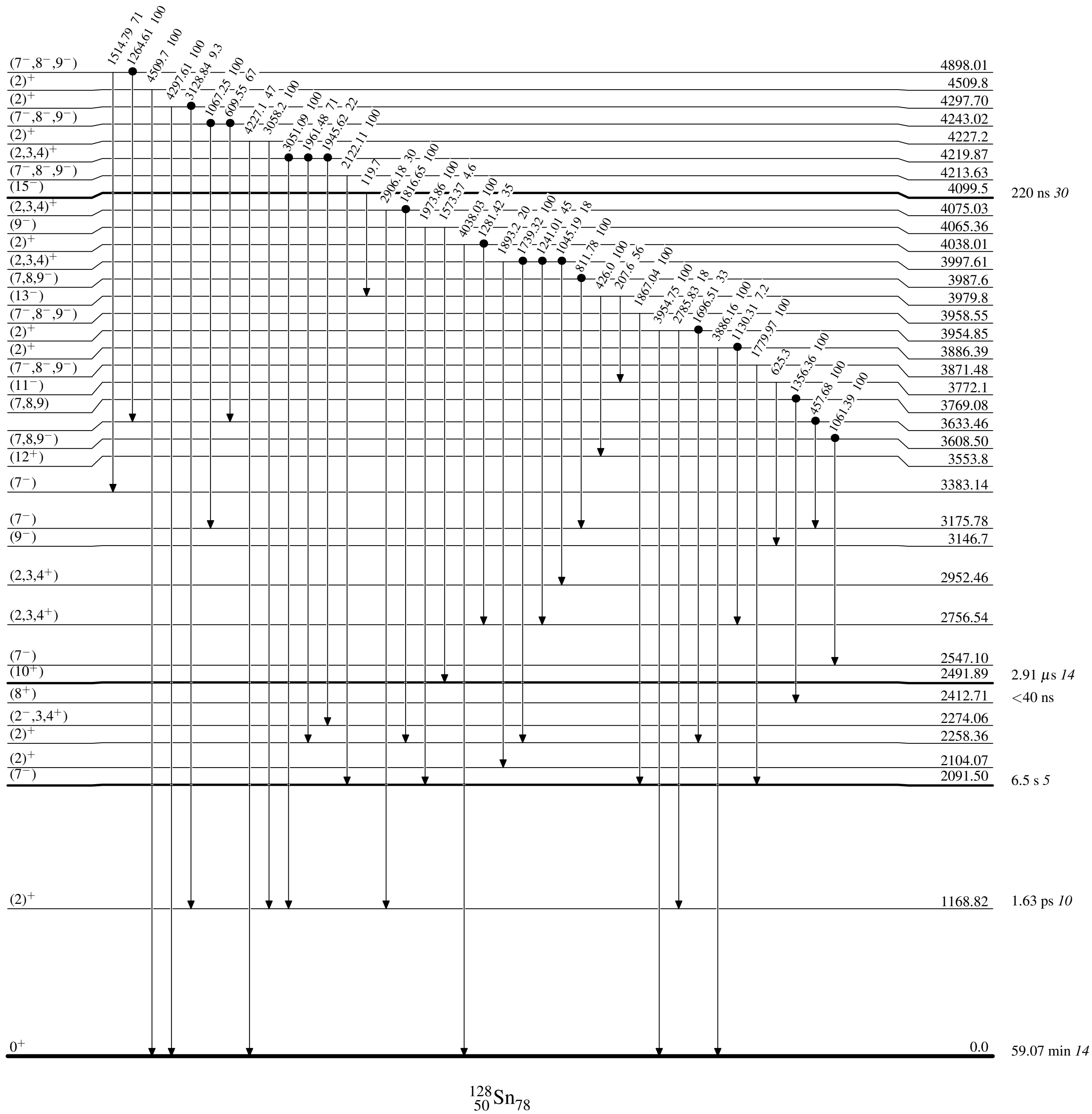
Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

Legend

● Coincidence



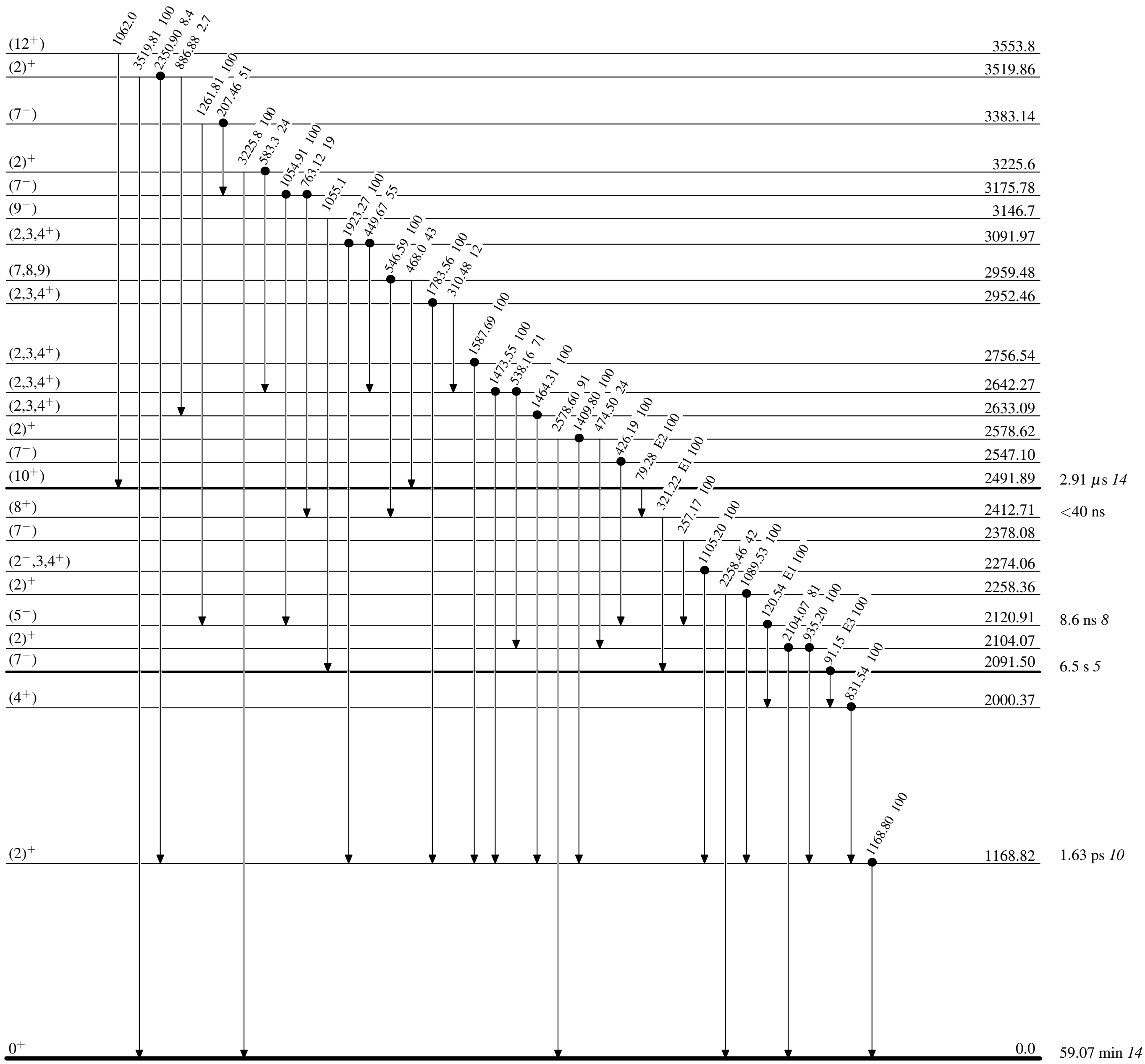
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

● Coincidence



$^{128}_{50}Sn_{78}$