Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Jun Chen and Ameenah R. Farhan	NDS 194,3 (2024)	8-Jan-2024

Q(β^-)=3993.6 *24*; S(n)=7815.4 *24*; S(p)=15121.8 *16*; Q(α)=−10501.9 *27* 2021Wa16
S(2n)=12688.9 *29*, S(2p)=28180 *200* (syst) (2021Wa16).
1970OsZZ, 1974Gr29, 1975Al11, 1977Al17, 1981Ru07: identification and production of ^{76}Zn from mass separation of fission fragments.
Mass measurements: 2008Ba54, 2008Ha23.
Additional information 1.
2019Gu05, 2015Ch31, 2011Ji08: theoretical structure calculations for even-even Zn isotopes.
Theoretical calculations: 18 primary references for structure and 12 for decay characteristics retrieved from the NSR database (www.nndc.bnl.gov/nsr/) are listed in this dataset under 'document' records.

^{76}Zn Levels

A 1031, (0$^+$) level proposed by 1990Wi12 in β^- decay is not confirmed in later study of this decay by 2005Va19.

Cross Reference (XREF) Flags

A	^{76}Cu β^- decay (637 ms)	D	^{9}Be(HI,^{76}Znγ)
B	^{77}Cu β^-n decay (469.8 ms)	E	Coulomb excitation
C	^{1}H(^{76}Zn,p′)		

E(level)†	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0	0$^+$	5.7 s *3*	ABCDE	%β^-=100 δ<r^2>(^{68}Zn,^{76}Zn)=+0.421 fm^2 *4*(stat) *57*(syst) (2019Xi07). $\delta\nu$(^{68}Zn,^{76}Zn)=+221.3 MHz *14*(stat) *108*(syst) (2019Xi07). Change in charge radius δ<r^2> and isotope shift $\delta\nu$ measured by 2019Xi07 using collinear laser spectroscopy at ISOLDE-CERN. The Zn beams were produced from a thick UC$_x$ target bombarded by a 1.4 GeV proton beam, and selectively ionized by the resonance ionization laser ion source (RILIS). T$_{1/2}$: from 1974Gr29 (integral β(t)). Other values from the same laboratory: 4.9 s *6* (1981Ru07); 5.4 s *3* (1970OsZZ); 5.60 s *6*, 5.1 s *1*, 6 s *1* (quoted by 1974Gr29). Other: 5.7 s (1981Gi17). Theoretical prediction: 1981Al25.
598.669 *21*	2$^+$	25.4 ps *+37−29*	ABCDE	B(E2)↑=0.145 *18* J$^\pi$: Coulomb excited state from 0$^+$; systematics of even-even nuclei. T$_{1/2}$: deduced from B(E2)↑=0.145 *18* in Coulomb excitation.
1296.470 *24*	(4$^+$)	10.4 ps *+25−22*	ABCDE	B(E2)↑=0.059 *+15−11* J$^\pi$: level populated in Coul. ex. by two-step process; E(1296)/E(599)=2.16 is consistent with 4$^+$ for this state. T$_{1/2}$: deduced by evaluators from B(E2)↑=0.059 *+15−11* in Coulomb excitation.
2266.465 *26*	(2$^+$)		A	J$^\pi$: γ to 0$^+$; systematics of even-even Zn isotopes suggests 2$^+$.
2349.635 *32*	(6$^+$)		A D	XREF: D(?). J$^\pi$: 2022Si25 in ^{76}Cu β^- decay propose this level as possibly the 6$^+$ yrast state seen in a high-spin experiment (Ref[38] in 2022Si25; unpublished).
2633.607 *27*	(4$^-$)	25.4 ns *4*	A	J$^\pi$: 2021Ch56 in ^{76}Cu β^- decay state that this state may be high-spin negative-parity state formed by the occupation of the ν0g$_{9/2}$ orbital; 2022Si25 propose 4$^-$ based on comparion of calculated β feeding with their observed β^- feeding. T$_{1/2}$: from distribution of time difference between the first and the second γ ray ($\gamma\gamma$(t)) fitted with an exponential decay plus a constant background (2021Ch56).
2739.20 *6*	(3$^+$)		A	J$^\pi$: proposed by 2022Si25 in ^{76}Cu β^- decay, based on measured γ intensity

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Adopted Levels, Gammas (continued)

^{76}Zn Levels (continued)

E(level)†	Jπ	XREF	Comments
			splitting with theoretical predictions.
2813.762 *30*	(4+,5)	A	Jπ: 180γ to (4−), 1571γ to (4+), 464γ to (6+).
2949.78 *11*		A	
2974.536 *30*	(3−)	A	Jπ: 2022Si25 in ^{76}Cu β− decay proposed (3−) based on comparion of calculated β feeding with their observed β feeding.
3017.06 *5*	(1)	A	Jπ: 3016.8γ to 0+; 2+ is disfavored by a predicted weak transition to g.s. relative to that of 2418γ if 2+, as compared to the observed relatively strong transition to g.s. (2022Si25).
3033.74 *9*		A	
3079.62 *14*		A	
3154.62 *6*	(2+,3)	A	Jπ: 137.5γ to (1), 1857.8γ to (4+).
3212.10 *17*		A	
3233.231 *33*	(3−,4−)	A	Jπ: possible allowed β− feeding from 3(−) parent; 1936.5γ to (4+).
3272.70 *4*	(3,4+)	A	Jπ: 1006.2γ to (2+), 639.1γ to (4−), 1976.4γ to (4+).
3512.1 *5*		A	
3514.36 *9*		A	
3572.7 *5*		A	
3604.94 *18*		A	
3638.09 *17*		A	
3710.54 *9*	(2+,3,4+)	A	Jπ: γs to 2+ and (4+).
3756.22 *13*		A	
3760.27 *14*		A	
3914.62 *9*		A	
3967.12 *30*		A	
3980.36 *15*		A	
4013.23 *30*		A	
4102.52 *30*		A	
4123.81 *7*	(3,4,5−)	A	Jπ: γs to (3−), (4−) and (4+).
4231.60 *14*	(2−,3,4+)	A	Jπ: γs to (2+) and (4−).
4317.35 *15*	(2−,3,4+)	A	Jπ: γs to 2+ and (4−).
4368.77 *30*		A	
4423.07 *19*		A	
4539.84 *17*		A	
4668.30 *8*		A	
4715.68 *11*	(2+,3)	A	Jπ: γs to (1) and (4+).
4858.65 *8*	(3,4,5)	A	Jπ: γs to (4−) and (4+).
4866.2 *4*		A	
4959.33 *8*	(3,4+)	A	Jπ: γs to 2+, (4−) and (4+).
5002.56 *21*		A	
5106.86 *15*		A	
5128.4 *4*		A	
5146.04 *14*	(3,4,5)	A	Jπ: γs to (4−) and (4+).
5184.5 *4*		A	
5238.1 *4*		A	
5317.41 *27*		A	
5345.63 *19*		A	
5351.02 *19*		A	
5373.23 *17*	(2+,3,4+)	A	Jπ: γs to 2+ and (4+).
5460.0 *4*		A	
5494.47 *16*		A	
5523.6 *5*		A	
5560.52 *14*	(2+,3,4+)	A	Jπ: γs to 2+ and (4+).
5717.28 *15*		A	
5725.0 *6*		A	
5886.67 *17*		A	
5921.5 *5*		A	
5973.1 *4*	(2+,3,4+)	A	Jπ: γs to 2+ and (4+).

† From a least-squares fit to Eγ values.

Adopted Levels, Gammas (continued)

$\gamma(^{76}Zn)$

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[‡]	Comments
598.669	2^+	598.695 *23*	100	0.0	0^+	[E2]	0.00115	B(E2)(W.u.)=15.2 *19* E_γ: weighted average of 598.706 *14* from ^{76}Cu β^- decay, 598.56 *5* from ^{77}Cu β^-n decay, 593 *10* from (^{76}Zn,P′), and 602 *9* from (HI,^{76}Znγ). Mult.: Coulomb excitation from 0^+ g.s.
1296.470	(4^+)	697.812 *14*	100	598.669	2^+	[E2]	0.00074	B(E2)(W.u.)=16.6 *46* E_γ: weighted average of 697.815 *14* from ^{76}Cu β^- decay, 697.72 *8* from ^{77}Cu β^-n decay, 708 *16* from (^{76}Zn,P′), and 703 *11* from (HI,^{76}Znγ). Mult.: expected from Coulomb excitation in a two-step process.
2266.465	(2^+)	1667.80 *3*	100 *2*	598.669	2^+			
		2266.38 *4*	57.0 *13*	0.0	0^+			
2349.635	(6^+)	1053.22 *3*	100	1296.470	(4^+)			
2633.607	(4^-)	1337.109 *16*	100	1296.470	(4^+)	[E1]		Mult.: possible E1 (2021Ch56) from analysis of expected transition probabilities for E1, M1, E2 and M2 transitions. B(E1)(W.u.)=6.2×10^{-9}, if 1337γ is the only transition from the 2633 level.
		2034.74 *14*	0.065 *13*	598.669	2^+			
2739.20	(3^+)	1442.76 *8*	76 *5*	1296.470	(4^+)			
		2140.46 *7*	100 *5*	598.669	2^+			
2813.762	$(4^+,5)$	180.12 *3*	74.7 *26*	2633.607	(4^-)			
		464.160 *22*	100 *9*	2349.635	(6^+)			
		1517.38 *4*	40.7 *16*	1296.470	(4^+)			
2949.78		2351.07 *11*	100	598.669	2^+			
2974.536	(3^-)	340.921 *20*	100.0 *21*	2633.607	(4^-)			
		707.92 *6*	4.87 *26*	2266.465	(2^+)			
		2375.80 *8*	5.18 *31*	598.669	2^+			
3017.06	(1)	2418.19 *8*	100 *5*	598.669	2^+			
		3016.81 *9*	75.0 *32*	0.0	0^+			
3033.74		1737.25 *8*	100	1296.470	(4^+)			
3079.62		2480.91 *14*	100	598.669	2^+			E_γ,I_γ: from ^{76}Cu β^- decay (637 ms).
3154.62	$(2^+,3)$	137.47 *5*	100 *5*	3017.06	(1)			
		888.59 *11*	51 *5*	2266.465	(2^+)			
		1857.8 *4*	18 *6*	1296.470	(4^+)			
		2555.62 *19*	33 *8*	598.669	2^+			
3212.10		2613.35 *17*	100	598.669	2^+			
3233.231	$(3^-,4^-)$	258.63 *3*	55 *5*	2974.536	(3^-)			
		419.50 *2*	100 *5*	2813.762	$(4^+,5)$			
		1936.49 *18*	7.4 *10*	1296.470	(4^+)			
3272.70	$(3,4^+)$	117.88 *13*	10.2 *14*	3154.62	$(2^+,3)$			
		298.10 *10*	28 *4*	2974.536	(3^-)			
		639.08 *14*	12.2 *17*	2633.607	(4^-)			
		1006.23 *3*	100.0 *24*	2266.465	(2^+)			
		1976.35 *16*	17 *2*	1296.470	(4^+)			
3512.1		2913.4 *5*	100	598.669	2^+			
3514.36		2217.85 *9*	100	1296.470	(4^+)			
3572.7		939.1 *5*	100	2633.607	(4^-)			

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Adopted Levels, Gammas (continued)

$\gamma(^{76}Zn)$ (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
3604.94		2308.38 *18*	100	1296.470	(4^+)
3638.09		365.47 *24*	100	3272.70	$(3,4^+)$
3710.54	$(2^+,3,4^+)$	2413.99 *11*	100 *8*	1296.470	(4^+)
		3111.89 *16*	65 *6*	598.669	2^+
3756.22		781.71 *13*	100 *14*	2974.536	(3^-)
		3156.8 *6*	42 *14*	598.669	2^+
3760.27		527.04 *13*	100	3233.231	$(3^-,4^-)$
3914.62		1280.98 *9*	100	2633.607	(4^-)
3967.12		2670.6 *3*	100	1296.470	(4^+)
3980.36		3381.61 *15*	100	598.669	2^+
4013.23		2716.71 *30*	100	1296.470	(4^+)
4102.52		1468.9 *3*	100	2633.607	(4^-)
4123.81	$(3,4,5^-)$	1149.43 *8*	100 *11*	2974.536	(3^-)
		1489.85 *18*	22.0 *33*	2633.607	(4^-)
		2826.95 *15*	42.0 *33*	1296.470	(4^+)
4231.60	$(2^-,3,4^+)$	1598.15 *19*	100 *12*	2633.607	(4^-)
		1964.89 *21*	49 *8*	2266.465	(2^+)
4317.35	$(2^-,3,4^+)$	1682.9 *5*	35 *13*	2633.607	(4^-)
		3718.66 *15*	100 *6*	598.669	2^+
4368.77		3770.0 *3*	100	598.669	2^+
4423.07		2156.57 *19*	100	2266.465	(2^+)
4539.84		3941.06 *17*	100	598.669	2^+
4668.30		1693.75 *7*	100	2974.536	(3^-)
4715.68	$(2^+,3)$	1077.63 *19*	90 *18*	3638.09	
		1561.2 *5*	78 *10*	3154.62	$(2^+,3)$
		1698.35 *15*	82 *10*	3017.06	(1)
		2082.34 *18*	100 *14*	2633.607	(4^-)
4858.65	(3,4,5)	1704.03 *23*	9.4 *19*	3154.62	$(2^+,3)$
		2224.91 *9*	100 *8*	2633.607	(4^-)
		3562.72 *24*	19.1 *19*	1296.470	(4^+)
4866.2		2516.5 *4*	100	2349.635	(6^+)
4959.33	$(3,4^+)$	2145.64 *8*	100 *7*	2813.762	$(4^+,5)$
		2325.57 *19*	33 *4*	2633.607	(4^-)
		3662.10 *21*	34 *5*	1296.470	(4^+)
		4361.1 *7*	4.3 *21*	598.669	2^+
5002.56		2368.91 *21*	100	2633.607	(4^-)
5106.86		1873.60 *14*	100	3233.231	$(3^-,4^-)$
5128.4		3831.8 *4*	100	1296.470	(4^+)
5146.04	(3,4,5)	1933.5 *6*	26 *9*	3212.10	
		2512.43 *19*	76 *10*	2633.607	(4^-)
		3849.46 *19*	100 *9*	1296.470	(4^+)
5184.5		4585.7 *4*	100	598.669	2^+
5238.1		4639.3 *4*	100	598.669	2^+
5317.41		2300.2 *3*	100 *16*	3017.06	(1)
		4719.0 *6*	39 *10*	598.669	2^+
5345.63		2112.37 *19*	100	3233.231	$(3^-,4^-)$
5351.02		2077.7 *6*	15 *6*	3272.70	$(3,4^+)$
		4054.50 *20*	100 *6*	1296.470	(4^+)
5373.23	$(2^+,3,4^+)$	2100.29 *20*	100 *13*	3272.70	$(3,4^+)$
		4078.0 *4*	61 *9*	1296.470	(4^+)
		4773.6 *5*	91 *11*	598.669	2^+
5460.0		4163.4 *4*	100	1296.470	(4^+)
5494.47		2519.89 *16*	100	2974.536	(3^-)
5523.6		2506.4 *6*	100 *48*	3017.06	(1)
		4925.0 *11*	100 *35*	598.669	2^+
5560.52	$(2^+,3,4^+)$	2287.5 *4*	16 *5*	3272.70	$(3,4^+)$

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Adopted Levels, Gammas (continued)

$\gamma(^{76}Zn)$ (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
5560.52	$(2^+,3,4^+)$	2585.56 *18*	46 *7*	2974.536	(3^-)
		4264.59 *25*	100 *6*	1296.470	(4^+)
		4963.0 *7*	27 *6*	598.669	2^+
5717.28		2742.69 *15*	100	2974.536	(3^-)
5725.0		5126.1 *6*	100	598.669	2^+
5886.67		1218.47 *22*	98 *43*	4668.30	
		1971.8 *3*	75 *18*	3914.62	
		4590.1 *4*	100 *12*	1296.470	(4^+)
5921.5		2315.9 *6*	100 *47*	3604.94	
		4625.7 *7*	82 *24*	1296.470	(4^+)
5973.1	$(2^+,3,4^+)$	4675.8 *5*	98 *12*	1296.470	(4^+)
		5375.4 *7*	100 *16*	598.669	2^+

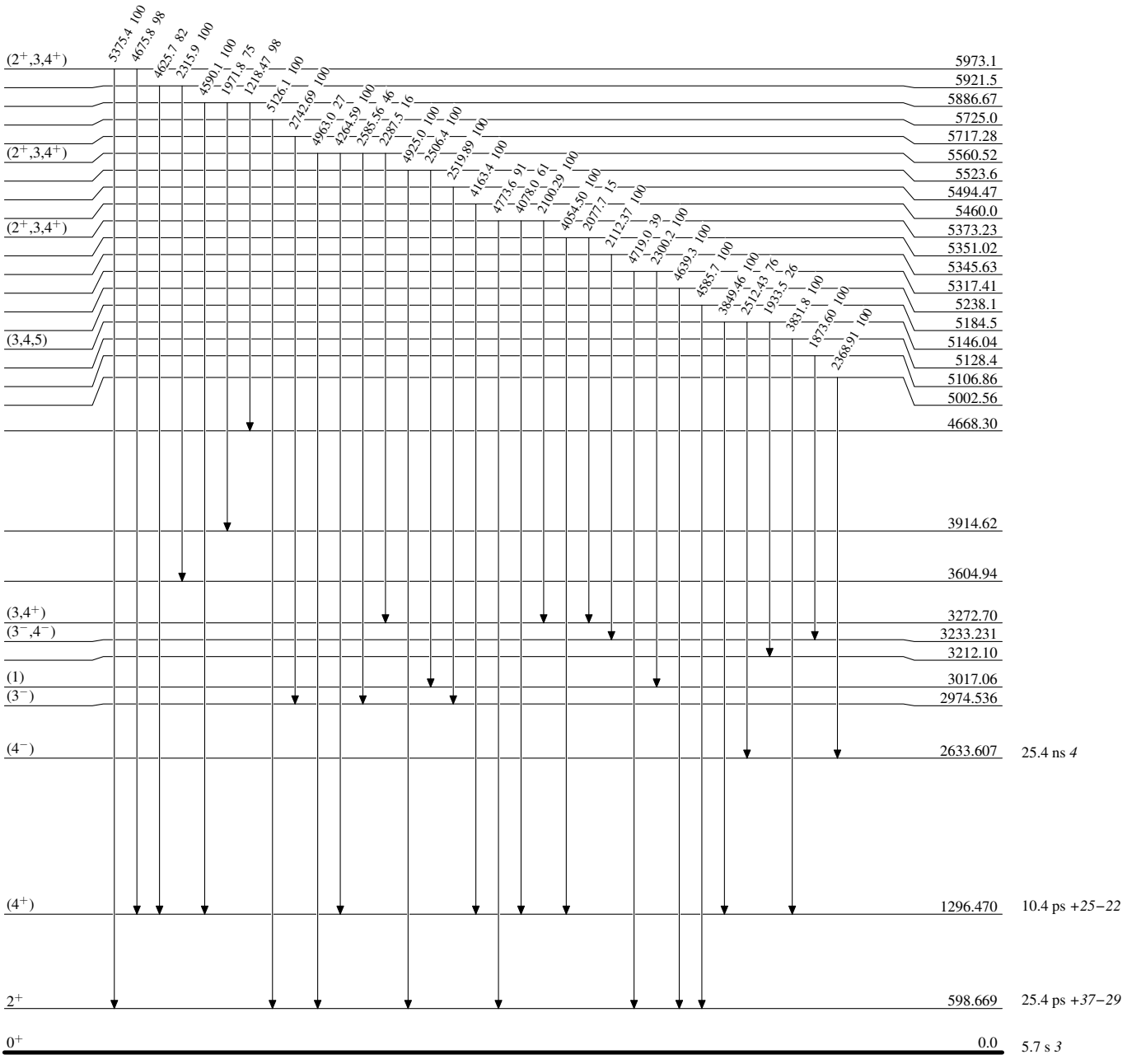
† From ^{76}Cu β^- decay, unless otherwise stated.

‡ 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

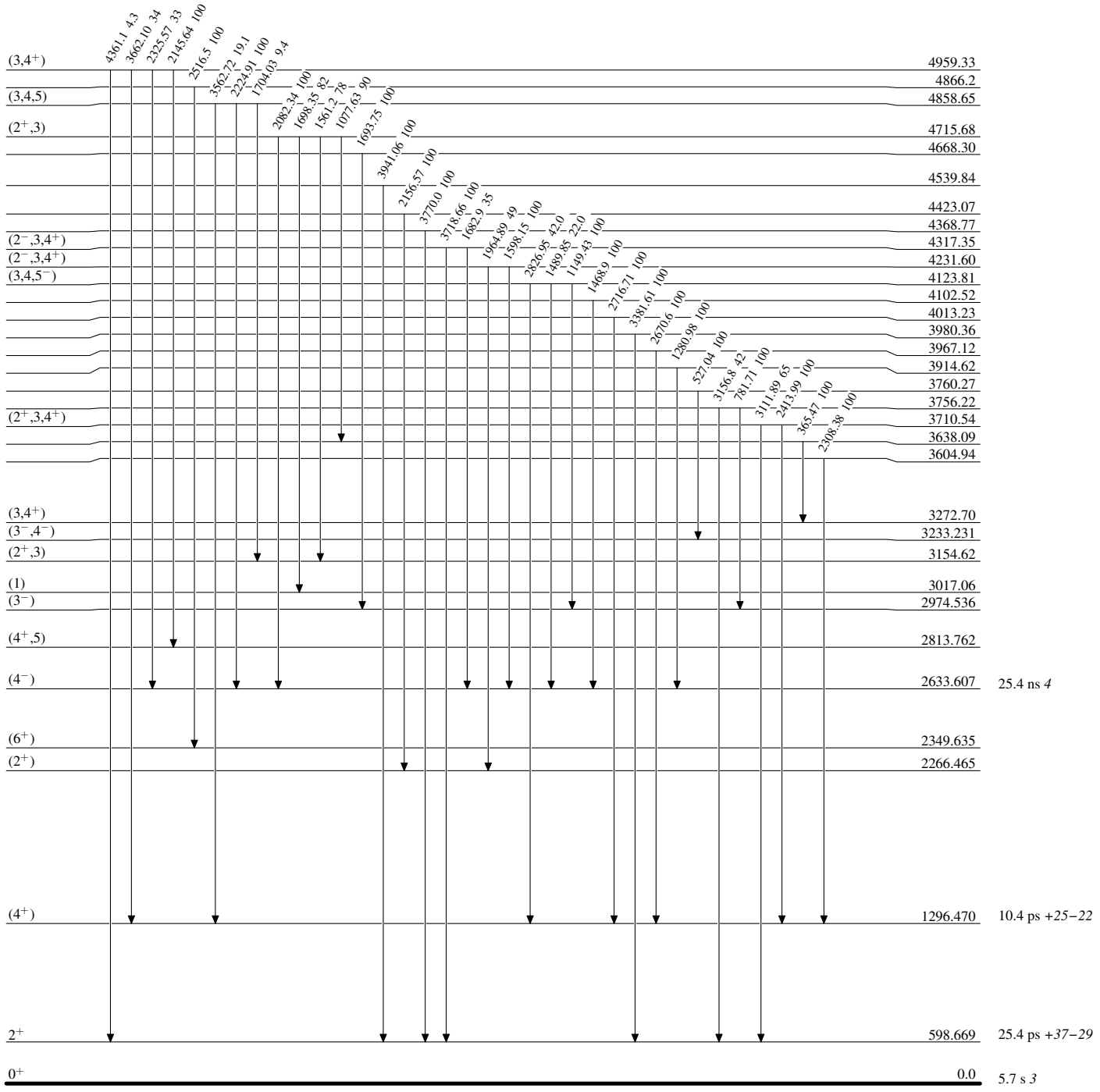


$^{76}_{30}Zn_{46}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

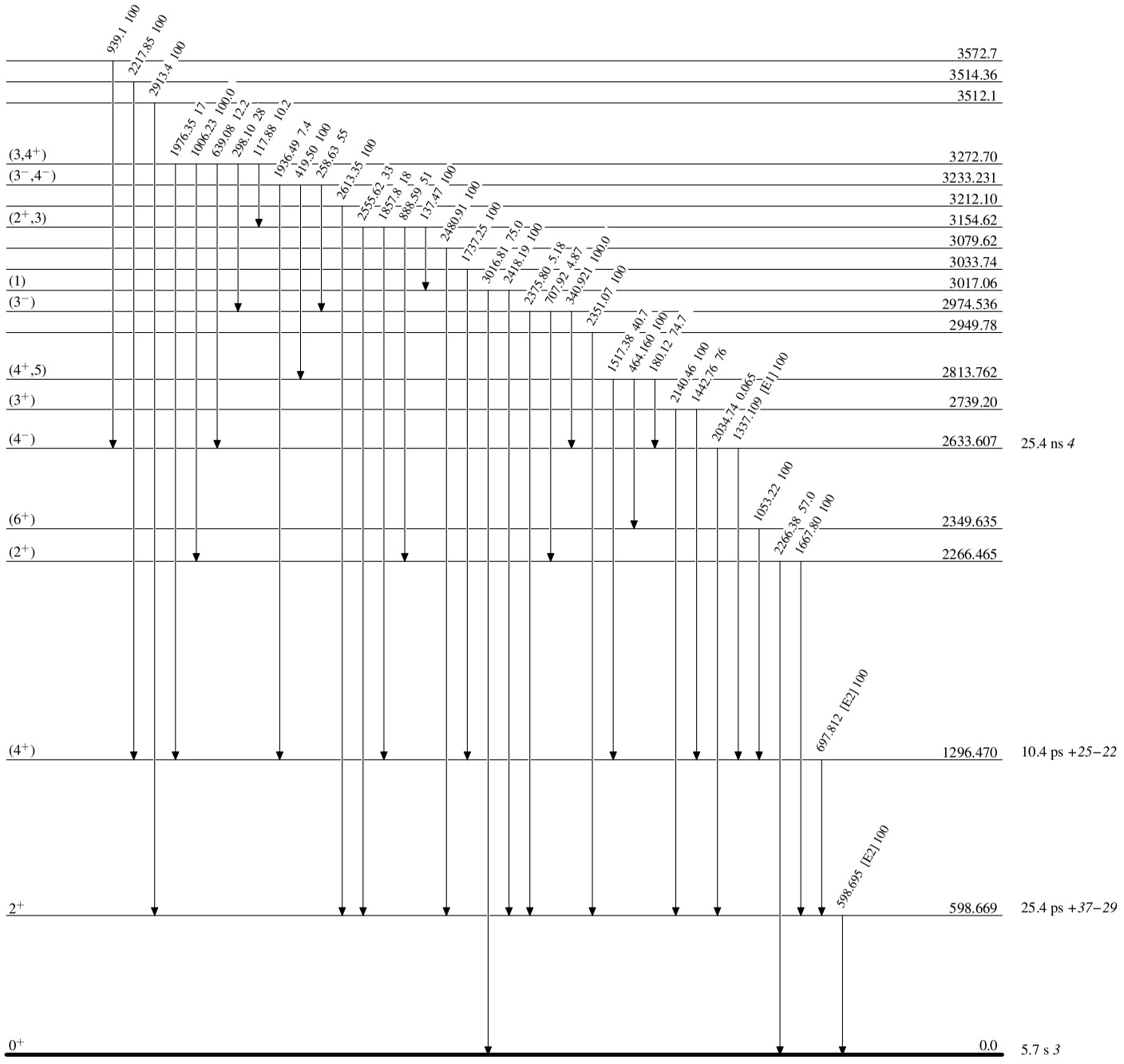


$^{76}_{30}Zn_{46}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{76}_{30}Zn_{46}$